BRAKES

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BASE BRAKE SYSTEM

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DESCRIPTION AND OPERATION

BRAKE SYSTEM

All vehicles are equipped with power assist four-wheel disc Antilock Brakes (ABS).

Dual piston disc brake calipers are used on the front. Single piston disc brake calipers are used on the rear. Ventilated disc brake rotors are used on the front and solid rotors are used on the rear.

Power brake assist is supplied by a vacuum operated, dual diaphragm power brake booster. The master cylinder used for all applications has an aluminum body and nylon reservoir with single filler cap. A fluid level indicator is mounted to the side of the reservoir.

The braking force of the rear wheels is controlled by electronic brake distribution (EBD). The EBD functions like a rear proportioning valve. The EBD system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the HCU.

Factory installed brake linings on all models consists of organic base material combined with metallic particles.

SERVICE WARNINGS & CAUTIONS

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS FROM AFTERMARKET LININGS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM. EXERCISE CARE WHEN SERVICING BRAKE PARTS. DO NOT CLEAN BRAKE PARTS WITH COMPRESSED AIR OR BY DRY BRUSHING. USE A VACUUM CLEANER SPECIFICALLY DESIGNED FOR THE REMOVAL OF ASBESTOS FIBERS FROM BRAKE COMPONENTS. IF A SUITABLE VACUUM CLEANER IS NOT AVAILABLE, CLEANING SHOULD BE DONE WITH A WATER DAMPENED CLOTH. DO NOT SAND, OR GRIND BRAKE LINING UNLESS EQUIPMENT USED IS DESIGNED TO CONTAIN THE DUST RESIDUE. DISPOSE OF ALL RESIDUE CONTAINING ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS TO MINIMIZE EXPOSURE TO YOURSELF AND OTHERS. FOLLOW PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY FOR THE HANDLING, PROCESSING, AND DISPOSITION OF DUST OR DEBRIS THAT MAY CONTAIN ASBESTOS FIBERS.

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean the system components. These fluids damage rubber cups and seals. Use only fresh brake fluid or Mopar brake cleaner to clean or flush brake system components. These are the only cleaning materials recommended. If system contamination is suspected, check the fluid for dirt, discoloration, or separation into distinct layers. Also check the reservoir cap seal for distortion. Drain and flush the system with new brake fluid if contamination is suspected.

CAUTION: Use Mopar brake fluid, or an equivalent quality fluid meeting SAE/DOT standards J1703 and DOT 3. Brake fluid must be clean and free of contaminants. Use fresh fluid from sealed containers only to ensure proper antilock component operation.

CAUTION: Use Mopar multi-mileage or high temperature grease to lubricate caliper slide pins. Use multi-mileage grease or Dow G807 silicone grease on caliper slide pins to ensure proper operation.

BRAKE PEDAL

A suspended-type brake pedal is used, the pedal pivots on a shaft mounted in the pedal support bracket. The bracket is attached to the dash panel.

The brake pedal is a serviceable component. The pedal, pedal, pad bushings, shaft and pedal bracket are all replaceable parts.

BRAKE LAMP SWITCH

The plunger type brake lamp switch is mounted on a bracket attached to the brake pedal support. The switch can be adjusted when necessary.

ELECTRONIC BRAKE DISTRIBUTION

The electronic brake distribution (EBD) functions like a rear proportioning valve. The EBD system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the HCU.

Upon entry into EBD the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the HCU resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure the outlet valve is switched off and the inlet valve is

DESCRIPTION AND OPERATION (Continued)

pulsed. This increases the pressure to the rear brakes. This will continue until the required slip difference is obtained. At the end of EBD braking (no brake application) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on in case of another brake application.

The EBD will remain functional during many ABS fault modes. If the red and amber warning lamps are illuminated the EBD may have a fault.

RED BRAKE WARNING LAMP

A red warning lamp is used for the service brake portion of the hydraulic system. The lamp is located in the instrument cluster. The red warning light alerts the driver if the fluid level is low or the parking brakes are applied.

The lamp is turned on momentarily when the ignition switch is turn to the on position. This is a self test to verify the lamp is operational.

A red warning lamp with a amber warning lamp may indicate a electronic brake distribution fault.

POWER BRAKE BOOSTER

The booster assembly consists of a housing divided into separate chambers by two internal diaphragms. The outer edge of each diaphragm is attached to the booster housing. The diaphragms are connected to the booster primary push rod.

Two push rods are used in the booster. The primary push rod connects the booster to the brake pedal. The secondary push rod connects the booster to the master cylinder to stroke the cylinder pistons.

The atmospheric inlet valve is opened and closed by the primary push rod. Booster vacuum supply is

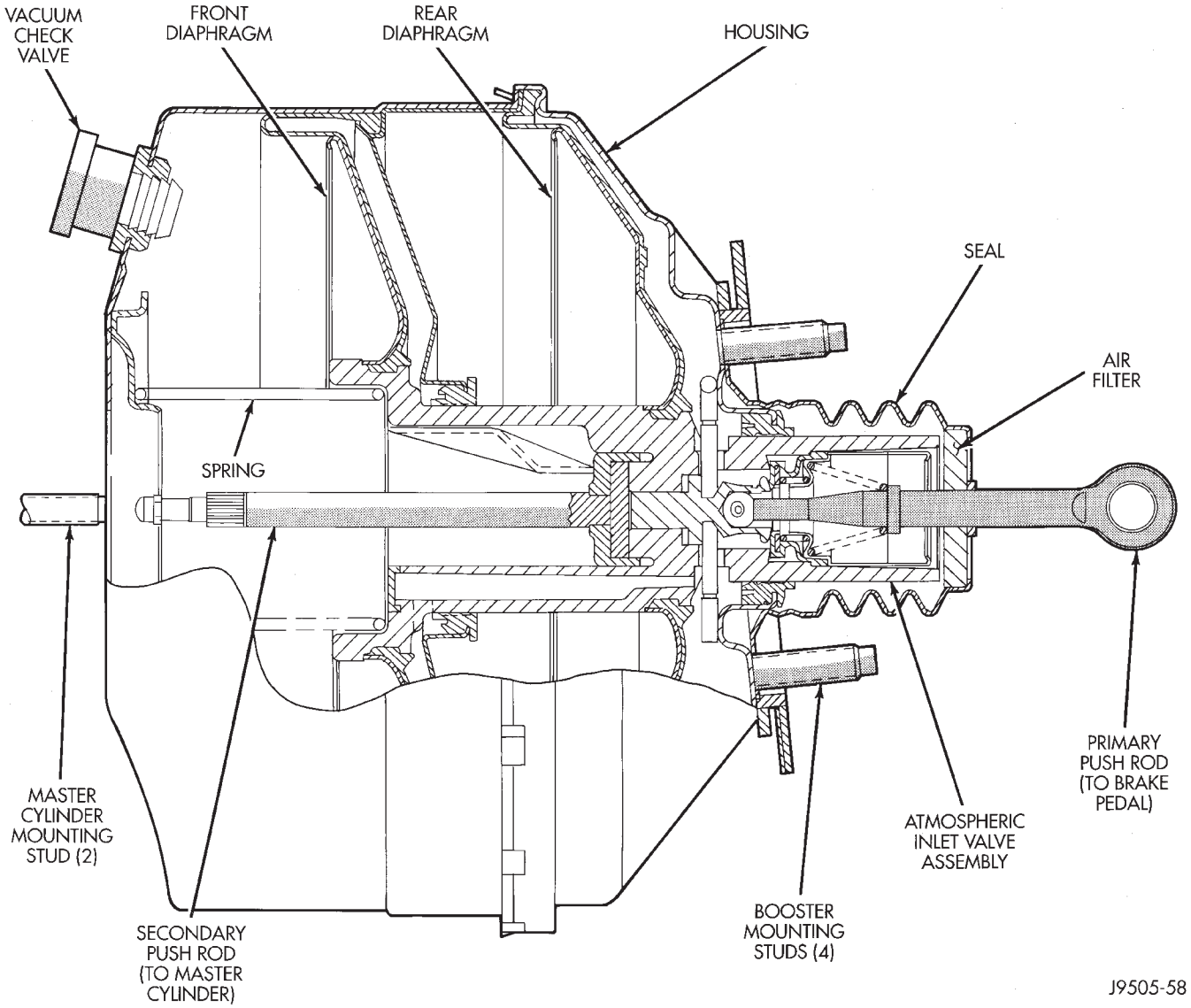


Fig. 1 Power Brake Booster–Typical

DESCRIPTION AND OPERATION (Continued)

through a hose attached to an intake manifold fitting at one end and to the booster check valve at the other. The vacuum check valve in the booster housing is a one-way device that prevents vacuum leak back.

Power assist is generated by utilizing the pressure differential between normal atmospheric pressure and a vacuum. The vacuum needed for booster operation is taken directly from the engine intake manifold. The entry point for atmospheric pressure is through a filter and inlet valve at the rear of the housing (Fig. 1).

The chamber areas forward of the booster diaphragms are exposed to vacuum from the intake manifold. The chamber areas to the rear of the diaphragms, are exposed to normal atmospheric pressure of 101.3 kilopascals (14.7 pounds/square in.).

Brake pedal application causes the primary push rod to open the atmospheric inlet valve. This exposes the area behind the diaphragms to atmospheric pressure. The resulting pressure differential provides the extra apply force for power assist.

The booster check valve, check valve grommet and booster seals are serviceable.

MASTER CYLINDER

The master cylinder body is made of aluminum and contains a primary and secondary piston assembly. The cylinder body including the piston assemblies are not serviceable. If diagnosis indicates an internal problem with the cylinder body, it must be replaced as an assembly. The master cylinder has a removable reservoir and fluid level indicator. The reservoir, reservoir grommets and fluid level switch are the only replaceable parts on the master cylinder.

FRONT DISC BRAKES

The calipers are twin piston type. The calipers are free to slide laterally on the anchor, this allows continuous compensation for lining wear.

When the brakes are applied fluid pressure is exerted against the caliper pistons. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper pistons and within the caliper bores will be equal (Fig. 2).

Fluid pressure applied to the pistons is transmitted directly to the inboard brake shoe. This forces the shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bores forces the caliper to slide inward on the slide pins. This action brings the outboard brake shoe lining into contact with the outer surface of the disc brake rotor.

Fluid pressure acting simultaneously on the pistons and caliper to produces a strong clamping action. When sufficient force is applied, friction will

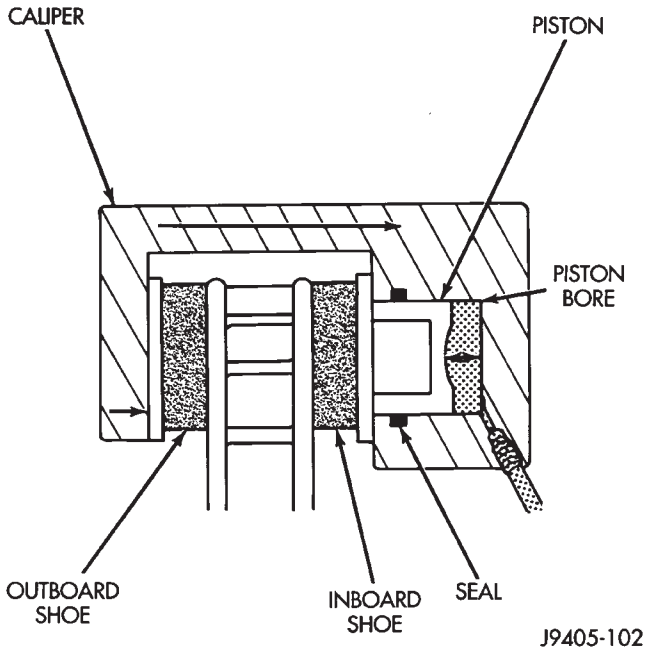


Fig. 2 Brake Caliper Operation

stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and pistons. Upon release of the pedal, the caliper and pistons return to a rest position. The brake shoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seals control the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seals are deflected outward by fluid pressure and piston movement (Fig. 3). When the brakes (and fluid pressure) are released, the seals relax and retract the pistons.

The front outboard brake shoes have wear indicators.

REAR DISC BRAKES

The rear disc brakes consist of single piston floating-type calipers and solid rotors. The rear caliper is mounted on an anchor attached to an adapter attached the rear axle tube flange. The anchors are secured to the adapters with mounting bolts. The disc brake rotor splash shield is part of the adaptor. The disc brake rotor has a built in brake drum used for the parking brakes (Fig. 4). The parking brake shoes are mounted to the adaptor.

DESCRIPTION AND OPERATION (Continued)

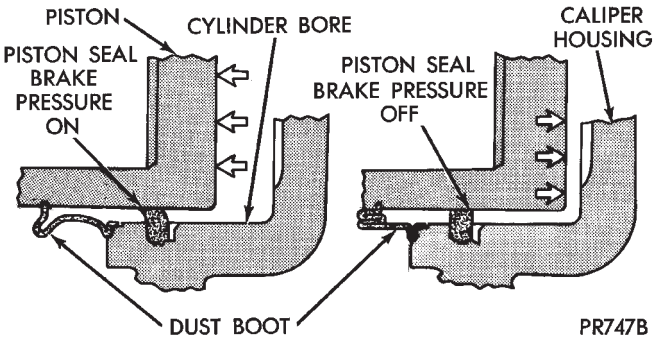


Fig. 3 Lining Wear Compensation By Piston Seal

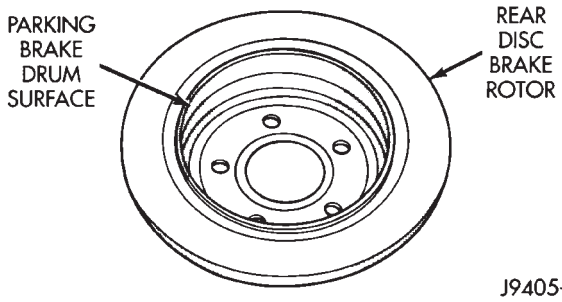


Fig. 4 Rear Disc Brake Rotor

PARKING BRAKES

The parking brakes operated by a automatic tensioner mechanism built into the hand lever and cable system. The front cable is connected to the hand lever and the equalizer. The rear cables attached to the equalizer and the parking brake shoe actuator.

A set of drum type brake shoes are used for parking brakes. The shoes are mounted to the rear disc brake adaptor. The parking brake drum is integrated into the rear disc brake rotor.

Parking brake cable adjustment is controlled by an automatic tensioner mechanism. The only adjustment if necessary is to the park brake shoes if the linings are worn.

BRAKE HOSES AND LINES

Flexible rubber hose is used at both front brakes, rear brakes and at the rear axle junction block. Double walled steel tubing is used. Double inverted style and ISO style flares are used on the brake lines.

DIAGNOSIS AND TESTING

BASE BRAKE SYSTEM

Base brake components consist of the brake shoes, calipers, rear park brake drums/rotors, front brake rotors, brake lines, master cylinder, booster, HCU and parking brake shoes.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, electrical or vacuum operated component.

The first diagnosis step is the preliminary check.

PRELIMINARY BRAKE CHECK

(1) Check condition of tires and wheels. Damaged wheels and worn, damaged, or underinflated tires can cause pull, shudder, vibration, and a condition similar to grab.

(2) If complaint was based on noise when braking, check suspension components. Jounce front and rear of vehicle and listen for noise that might be caused by loose, worn or damaged suspension or steering components.

(3) Inspect brake fluid level and condition. Note that the brake reservoir fluid level will decrease in proportion to normal lining wear. **Also note that brake fluid tends to darken over time. This is normal and should not be mistaken for contamination.**

(a) If fluid level is abnormally low, look for evidence of leaks at calipers, brake lines, master cylinder, and HCU.

(b) If fluid appears contaminated, drain out a sample to examine. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals, cups, hoses, master cylinder, and HCU will also have to be replaced after flushing. Use clean brake fluid to flush the system.

(4) Check parking brake operation. Verify free movement and full release of cables and lever. Also note if vehicle was being operated with parking brake partially applied.

(5) Check brake pedal operation. Verify that pedal does not bind and has adequate free play. If pedal lacks free play, check pedal and power booster for being loose or for bind condition. Do not road test until condition is corrected.

(6) Check booster vacuum check valve and hose.

(7) If components checked appear OK, road test the vehicle.

ROAD TESTING

(1) If complaint involved low brake pedal, pump pedal and note if it comes back up to normal height.

(2) Check brake pedal response with transmission in neutral and engine running. Pedal should remain firm under constant foot pressure.

(3) During road test, make normal and firm brake stops in 25-40 mph range. Note faulty brake operation such as low pedal, hard pedal, fade, pedal pulsation, pull, grab, drag, noise, etc.

DIAGNOSIS AND TESTING (Continued)

(4) Attempt to stop the vehicle with the parking brake only (do not exceed 25 mph) and note grab, drag, noise, etc.

PEDAL FALLS AWAY

A brake pedal that falls away under steady foot pressure is generally the result of a system leak. The leak point could be at a brake line, fitting, hose, or caliper. If leakage is severe, fluid will be evident at or around the leaking component.

Internal leakage (seal by-pass) in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

An internal leak in the ABS system may also be the problem with no visual fluid leak.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up, the most likely causes are worn linings, rotors, or calipers are not sliding on the slide pins. The proper course of action is to inspect and replace all worn component and make the proper adjustments.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However substandard brake hoses can cause a spongy pedal. The proper course of action is to bleed the system, and replace substandard quality brake hoses if suspected.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster, check valve, check valve seal/grommet or low vacuum could also cause a hard pedal or high pedal effort.

PEDAL PULSATION

Pedal pulsation is caused by components that are loose, or beyond tolerance limits.

The primary cause of pulsation are disc brake rotors with excessive lateral runout or thickness variation. Other causes are loose wheel bearings or calipers and worn, damaged tires.

NOTE: Some pedal pulsation may be felt during ABS activation.

BRAKE DRAG

Brake drag occurs when the lining is in constant contact with the rotor or drum. Drag can occur at one wheel, all wheels, fronts only, or rears only.

Drag is a product of incomplete brake release. Drag can be minor or severe enough to overheat the linings, rotors and park brake drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and park brake drums from the overheat-cool down process. In most cases, the rotors, wheels and tires are quite warm to the touch after the vehicle is stopped.

Severe drag can char the brake lining all the way through. It can also distort and score rotors to the point of replacement. The wheels, tires and brake components will be extremely hot. In severe cases, the lining may generate smoke as it chars from overheating.

Common causes of brake drag are:

- Parking brake partially applied.
- Loose/worn wheel bearing.
- Seized caliper.
- Caliper binding.
- Loose caliper mounting.
- Mis-assembled components.
- Damaged brake lines.

If brake drag occurs at the front, rear or all wheels, the problem may be related to a blocked master cylinder return port, faulty power booster (binds-does not release) or the ABS system.

BRAKE FADE

Brake fade is usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the Brake Drag information in this section for causes.

BRAKE PULL

Front brake pull condition could result from:

- Contaminated lining in one caliper
- Seized caliper piston
- Binding caliper
- Loose caliper
- Rusty caliper slide surfaces
- Improper brake shoes
- Damaged rotor
- Wheel alignment.
- Tire pressure.

A worn, damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake unit is still functioning normally, its braking effect is

DIAGNOSIS AND TESTING (Continued)

magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

REAR BRAKE DRAG OR PULL

Rear drag or pull may be caused by improperly adjusted park brake shoes or seized parking brake cables, contaminated lining, bent or binding shoes or improperly assembled components. This is particularly true when only one rear wheel is involved. However, when both rear wheels are affected, the master cylinder or ABS system could be at fault.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water soaked lining. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and or replacement will be necessary.

BRAKE LINING CONTAMINATION

Brake lining contamination is mostly a product of leaking calipers or worn seals, driving through deep water puddles, or lining that has become covered with grease and grit during repair. Contaminated lining should be replaced to avoid further brake problems.

WHEEL AND TIRE PROBLEMS

Some conditions attributed to brake components may actually be caused by a wheel or tire problem.

A damaged wheel can cause shudder, vibration and pull. A worn or damaged tire can also cause pull.

NOTE: Propshaft angle can also cause vibration/ shudder.

Severely worn tires with very little tread left can produce a grab-like condition as the tire loses and recovers traction. Flat-spotted tires can cause vibration and generate shudder during brake operation. Tire damage such as a severe bruise, cut, ply separation, low air pressure can cause pull and vibration.

BRAKE NOISES

Some brake noise is common on some disc brakes during the first few stops after a vehicle has been parked overnight or stored. This is primarily due to the formation of trace corrosion (light rust) on metal surfaces. This light corrosion is typically cleared from the metal surfaces after a few brake applications causing the noise to subside.

BRAKE SQUEAK/SQUEAL

Brake squeak or squeal may be due to linings that are wet or contaminated with brake fluid, grease, or oil. Glazed linings and rotors with hard spots can also contribute to squeak. Dirt and foreign material embedded in the brake lining will also cause squeak/ squeal.

A very loud squeak or squeal is frequently a sign of severely worn brake lining. If the lining has worn through to the brake shoes in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors may become so scored that replacement is necessary.

NOTE: The front outer brake shoes are equipped with a wear indicator. The indicator will produce an audible noise when it contacts the rotor surface.

BRAKE CHATTER

Brake chatter is usually caused by loose or worn components, or glazed/burnt lining. Rotors with hard spots can also contribute to chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.

THUMP/CLUNK NOISE

Thumping or clunk noises during braking are frequently **not** caused by brake components. In many cases, such noises are caused by loose or damaged steering, suspension, or engine components.

BRAKE LAMP SWITCH

Brake lamp switch operation can be tested with an ohmmeter. The ohmmeter is used to check continuity between the pin terminals at different plunger positions (Fig. 5).

NOTE: The switch wire harness must be disconnected before testing switch continuity.

SWITCH CIRCUIT IDENTIFICATION

- Terminals 1 and 2 are for brake sensor circuit.
- Terminals 5 and 6 are for the stop lamp circuit.
- Terminals 3 and 4 are for the speed control circuit.

SWITCH CONTINUITY TEST

(1) Check continuity between terminal pins 5 and 6 as follows:

(a) Pull plunger all the way out to fully extended position.

DIAGNOSIS AND TESTING (Continued)

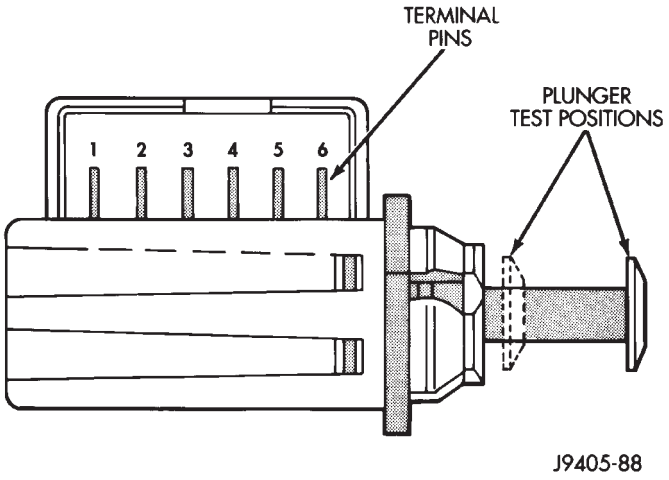


Fig. 5 Brake Lamp Switch Terminal Identification

(b) Attach test leads to pins 5 and 6 and note ohmmeter reading.

(c) If continuity exists, proceed to next test. Replace switch if meter indicates lack of continuity (shorted or open).

(2) Check continuity between terminal pins 1 and 2 and pins 3 and 4 as follows:

(a) Push switch plunger inward to fully retracted position.

(b) Attach test leads to pins 1 and 2 and note ohmmeter reading.

(c) If continuity exists, switch is OK. Replace switch if meter indicates lack of continuity (switch is open).

RED BRAKE WARNING LAMP

The red warning lamp illuminates when the parking brake is applied or when the fluid level in the master cylinder is low. It will also illuminate at start up as part of a bulb check.

If the light comes on, first verify that the parking brakes are fully released. Then check pedal action and fluid level. If a problem is confirmed, inspect the brake hydraulic system for leaks.

A red warning lamp with a amber warning lamp may indicate a electronic brake distribution fault.

MASTER CYLINDER/POWER BOOSTER

NOTE: Inspect and repair any external fluid leaks before performing test.

(1) Start engine and check booster vacuum hose connections. A hissing noise indicates vacuum leak. Correct any vacuum leak before proceeding.

(2) Stop engine and shift transmission into Neutral.

(3) Pump brake pedal until all vacuum reserve in booster is depleted.

(4) Press and hold brake pedal under light foot pressure. The pedal should hold firm, if the pedal falls away the master cylinder or HCU may be faulty (internal leakage).

(5) Start engine and note pedal action. It should fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.

(6) If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and turn off the engine.

(7) Wait a minimum of 90 seconds and try brake action again. Booster should provide two or more vacuum assisted pedal applications. If vacuum assist is not provided, some component of the booster is faulty.

POWER BOOSTER VACUUM TEST

(1) Connect vacuum gauge to booster check valve with short length of hose and T-fitting (Fig. 6).

(2) Start and run engine at curb idle speed for one minute.

(3) Observe the vacuum supply. If vacuum supply is not adequate, repair vacuum supply.

(4) Clamp hose shut between vacuum source and check valve.

(5) Stop engine and observe vacuum gauge.

(6) If vacuum drops more than one inch HG (33 millibars) within 15 seconds, booster diaphragm, check valve or check valve seal/grommet is faulty.

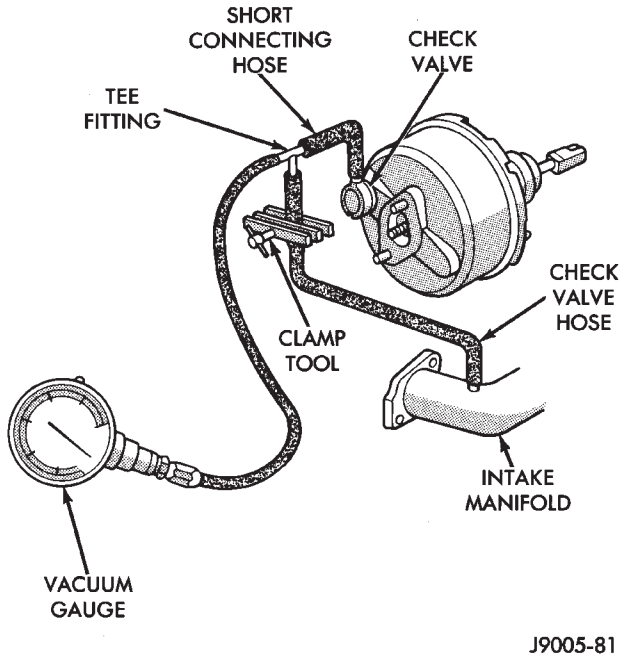


Fig. 6 Typical Booster Vacuum Test Connections

POWER BOOSTER CHECK VALVE TEST

(1) Disconnect vacuum hose from check valve.

DIAGNOSIS AND TESTING (Continued)

(2) Remove check valve and valve seal from booster.

(3) Use a hand operated vacuum pump for test.

(4) Apply 51-67 kPa (15-20 in.) vacuum at large end of check valve (Fig. 7).

(5) Vacuum should hold steady. If gauge on pump indicates vacuum loss, check valve or check valve seal/grommet is faulty and both should be replaced.

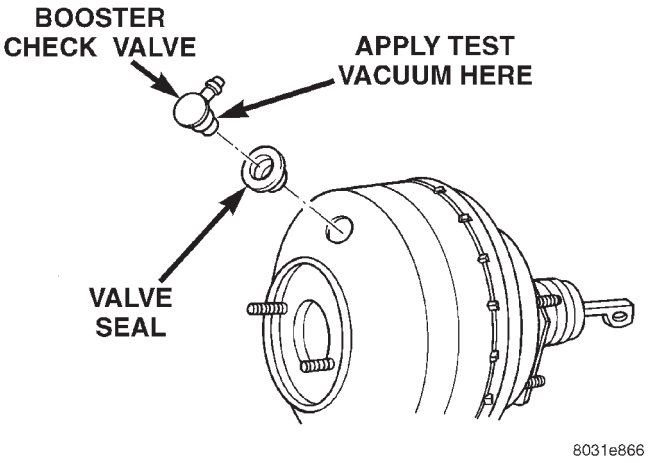


Fig. 7 Vacuum Check Valve And Seal

FRONT DISC BRAKE ROTOR

ROTOR MINIMUM THICKNESS

Rotor minimum usable thickness is 24.5 mm (0.964 in.). Do not resurface a rotor if machining would cause thickness to fall below this limit.

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if worn below minimum thickness, or if refinishing would reduce thickness below the allowable minimum.

FRONT ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at four to six points around the rotor face. Position the micrometer approximately 19 mm (3/4 in.) from the rotor outer circumference for each measurement (Fig. 8).

Thickness should not **vary** by more than 0.0127 mm (0.0005 in.) from point to point on the rotor. Refinish or replace the rotor if necessary.

FRONT ROTOR LATERAL RUNOUT

Check rotor lateral runout whenever pedal pulsation, or rapid, uneven brake lining wear has occurred.

The rotor must be securely clamped to the hub to ensure an accurate runout measurement. Secure the rotor with the wheel nuts and 4 or 5 large diameter flat washers on each stud.

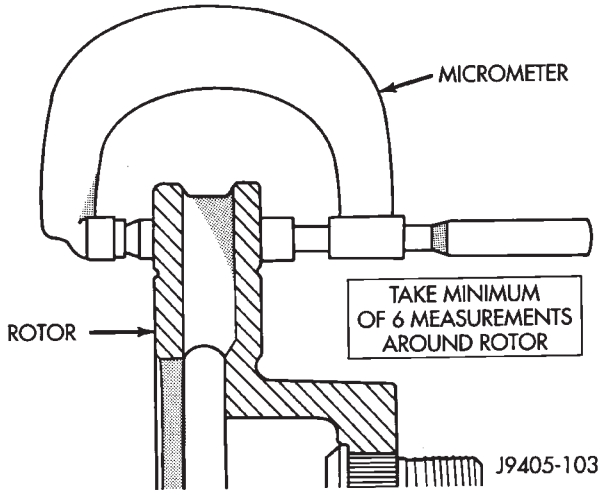


Fig. 8 Measuring Rotor Thickness Variation

Use a dial indicator to check lateral runout (Fig. 9).

Maximum allowable rotor lateral runout is 0.76 mm (0.003 in.).

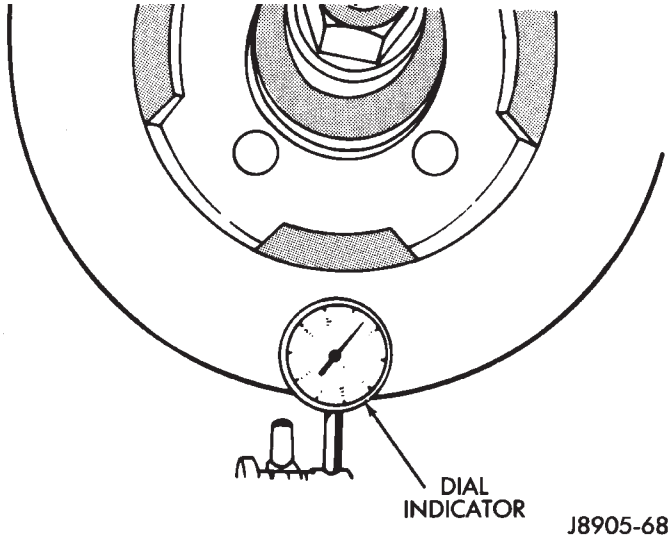


Fig. 9 Checking Rotor Lateral Runout

REAR DISC BRAKE ROTOR

ROTOR MINIMUM THICKNESS

Minimum usable thickness of the rear disc brake rotor is 8.5 mm (0.335 in.). The thickness specification is located on the center section of the rotor.

Never resurface a rotor if machining would cause thickness to fall below this limit.

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if worn below minimum thickness, or if refinishing would reduce thickness below the allowable minimum.

DIAGNOSIS AND TESTING (Continued)

REAR ROTOR THICKNESS VARIATION

Variations in rotor thickness will cause pedal pulsation, noise and shudder.

Measure rotor thickness at four to six points around the rotor face. Position the micrometer approximately 19 mm (3/4 in.) from the rotor outer circumference for each measurement (Fig. 8).

Thickness should not **vary** by more than 0.0127 mm (0.0005 in.) from point to point on the rotor. Refinish or replace the rotor if necessary.

REAR ROTOR LATERAL RUNOUT

Check rotor lateral runout whenever diagnosis indicates pedal pulsation and rapid, uneven brake lining wear.

The rotor must be securely clamped to the hub to ensure an accurate runout measurement. Secure the rotor with the wheel nuts and 4 or 5 large diameter flat washers on each stud.

Use a dial indicator to check lateral runout (Fig. 9). Maximum allowable lateral runout is 0.76 mm (0.003 in.).

PARKING BRAKE

NOTE: Parking brake adjustment is controlled by an automatic cable tensioner and does not require adjustment. The only adjustment that may be necessary would be to the park brake shoes if they are worn.

The parking brake switch is in circuit with the red warning lamp in the dash. The switch will cause the lamp to illuminate only when the parking brakes are applied. If the lamp remains on after parking brake release, the switch or wires are faulty.

If the red lamp comes on a fault has occurred in the front or rear brake hydraulic system.

If the red warning lamp and yellow warning lamp come on, the electronic brake distribution may be at fault.

In most cases, the actual cause of an improperly functioning parking brake (too loose/too tight/won't hold), can be traced to a parking brake component.

NOTE: The leading cause of improper parking brake operation, is excessive clearance between the parking brake shoes and the shoe braking surface. Excessive clearance is a result of lining and/or drum wear, drum surface machined oversize.

Excessive parking brake lever travel (sometimes described as a loose lever or too loose condition), is the result of worn brake shoes, improper brake shoe adjustment, or improperly assembled brake parts.

A too loose condition can also be caused by inoperative or improperly assembled parking brake shoe parts.

A condition where the parking brakes do not hold, will most probably be due to a wheel brake component.

Items to look for when diagnosing a parking brake problem, are:

- Brake shoe wear
- Drum surface (in rear rotor) machined oversize
- Front cable not secured to lever
- Rear cable not attached to actuator
- Rear cable seized
- Parking brake lever not seated
- Parking brake lever bind

BRAKE LINE AND HOSES

Flexible rubber hose is used at both front and rear brakes and at the rear axle junction block. Inspect the hoses whenever the brake system is serviced, at every engine oil change, or whenever the vehicle is in for service.

Inspect the hoses for surface cracking, scuffing, or worn spots. Replace any brake hose immediately if the fabric casing of the hose is exposed due to cracks or abrasions.

Also check brake hose installation. Faulty installation can result in kinked, twisted hoses, or contact with the wheels and tires or other chassis components. All of these conditions can lead to scuffing, cracking and eventual failure.

The steel brake lines should be inspected periodically for evidence of corrosion, twists, kinks, leaks, or other damage. Heavily corroded lines will eventually rust through causing leaks. In any case, corroded or damaged brake lines should be replaced.

Factory replacement brake lines and hoses are recommended to ensure quality, correct length and superior fatigue life. Care should be taken to make sure that brake line and hose mating surfaces are clean and free from nicks and burrs. Also remember that right and left brake hoses are not interchangeable.

Use new copper gaskets at all caliper connections. Be sure brake line connections are properly made (not cross threaded) and tightened to recommended torque.

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of petroleum in the brake fluid.

To test for contamination, put a small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

DIAGNOSIS AND TESTING (Continued)

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder with reservoir, caliper seals, HCU and all hydraulic fluid hoses.

SERVICE PROCEDURES

BRAKE FLUID LEVEL

Always clean the master cylinder reservoir and cap before adding fluid. This will prevent dirt from falling in the reservoir and contaminating the brake fluid.

The reservoir has a MIN and a MAX mark on the side (Fig. 10) fill to the MAX mark.

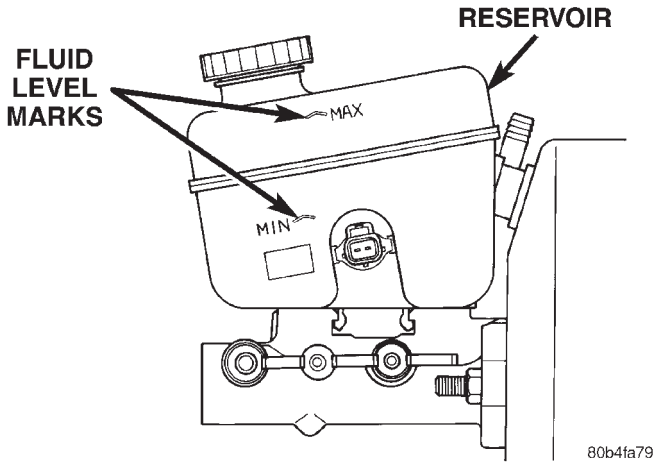


Fig. 10 Master Cylinder Fluid Level

MASTER CYLINDER BLEEDING

A new master cylinder should be bled before installation on the vehicle. Required bleeding tools include bleed tubes and a wood dowel to stroke the pistons. Bleed tubes can be fabricated from brake line.

BLEEDING PROCEDURE

(1) Mount master cylinder in vise with brass jaws.

(2) Attach bleed tubes to cylinder outlet ports. Then position each tube end into the bottom of the reservoir (Fig. 11).

(3) Fill reservoir with fresh brake fluid.

(4) Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.

BASE BRAKE BLEEDING

Use Mopar brake fluid, or an equivalent quality fluid meeting SAE J1703-F and DOT 3 standards only. Use fresh, clean fluid from a sealed container at all times.

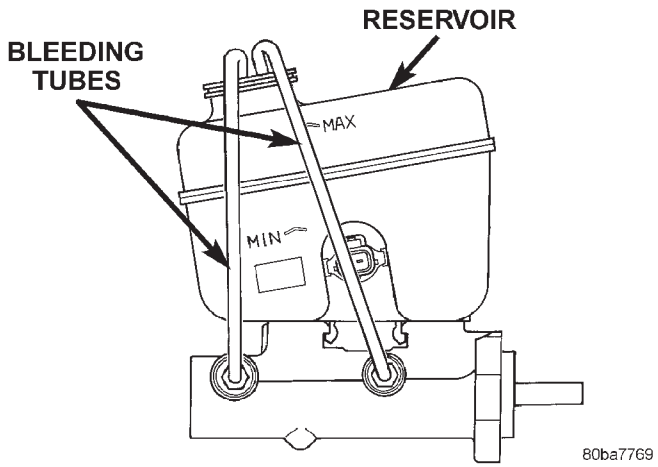


Fig. 11 Master Cylinder Bleeding

Do not pump the brake pedal at any time while bleeding. Air in the system will be compressed into small bubbles that are distributed throughout the hydraulic system. This will make additional bleeding operations necessary.

Do not allow the master cylinder to run out of fluid during bleed operations. An empty cylinder will allow additional air to be drawn into the system. Check the cylinder fluid level frequently and add fluid as needed.

Bleed only one brake component at a time in the following sequence:

- Master Cylinder
- Right Rear Wheel
- Left Rear Wheel
- Right Front Wheel
- Left Front Wheel

MANUAL BLEEDING

(1) Fill the master cylinder reservoir with brake fluid.

(2) If calipers are overhauled, open all caliper bleed screws. Then close each bleed screw as fluid starts to drip from it. Top off master cylinder reservoir once more before proceeding.

(3) Attach one end of bleed hose to bleed screw and insert opposite end in glass container partially filled with brake fluid (Fig. 12). Be sure end of bleed hose is immersed in fluid.

(4) Open up bleeder, then have a helper press down the brake pedal. Once the pedal is down close the bleeder. Repeat bleeding until fluid stream is clear and free of bubbles. Then move to the next wheel.

PRESSURE BLEEDING

Follow the manufacturers instructions carefully when using pressure equipment. Do not exceed the tank manufacturers pressure recommendations. Gen-

SERVICE PROCEDURES (Continued)

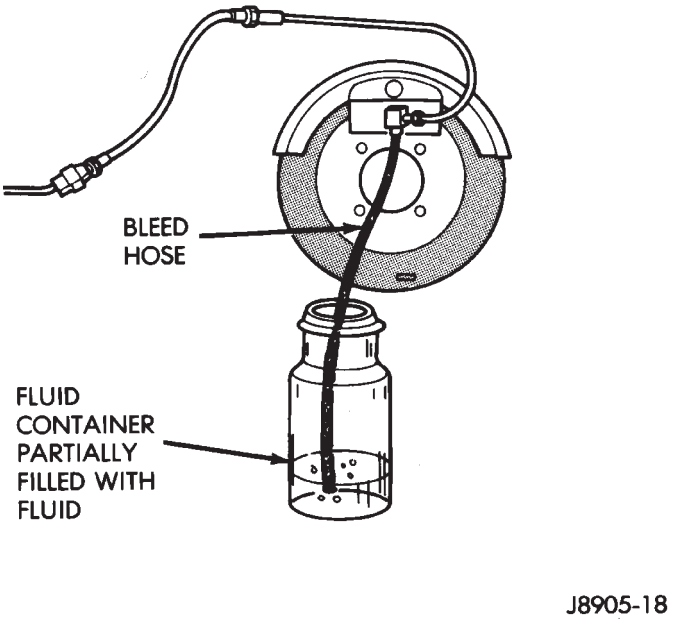


Fig. 12 Bleed Hose Setup

erally, a tank pressure of 51-67 kPa (15-20 psi) is sufficient for bleeding.

Fill the bleeder tank with recommended fluid and purge air from the tank lines before bleeding.

Do not pressure bleed without a proper master cylinder adapter. The wrong adapter can lead to leakage, or drawing air back into the system. Use adapter provided with the equipment or Adapter 6921.

DISC ROTOR MACHINING

The disc brake rotor can be machined if scored or worn. The lathe must machine both sides of the rotor simultaneously with dual cutter heads. The rotor mounting surface must be clean before placing on the lathe. Equipment capable of machining only one side at a time may produce a tapered rotor. A hub mounted on-vehicle lathe is recommended. This type of lathe trues the rotor to the vehicles hub/bearing.

CAUTION: Brake rotors that do not meet minimum thickness specifications before or after machining must be replaced.

BRAKE TUBE FLARING

A preformed metal brake tube is recommended and preferred for all repairs. However, double-wall steel tube can be used for emergency repair when factory replacement parts are not readily available.

Special bending tools are needed to avoid kinking or twisting of metal brake tubes. Special flaring tools are needed to make a double inverted flare or ISO flare (Fig. 13).

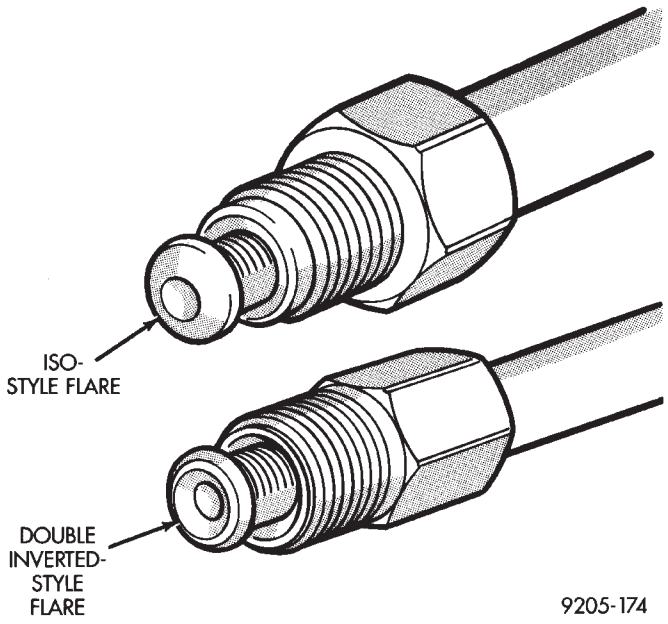


Fig. 13 Inverted Flare And ISO Flare

DOUBLE INVERTED FLARING

(1) Cut off damaged tube with Tubing Cutter.

(2) Ream cut edges of tubing to ensure proper flare.

(3) Install replacement tube nut on the tube.

(4) Insert tube in flaring tool.

(5) Place gauge form over the end of the tube.

(6) Push tubing through flaring tool jaws until tube contacts recessed notch in gauge that matches tube diameter.

(7) Tighten the tool bar on the tube

(8) Insert plug on gauge in the tube. Then swing compression disc over gauge and center tapered flaring screw in recess of compression disc (Fig. 14).

(9) Tighten tool handle until plug gauge is squarely seated on jaws of flaring tool. This will start the inverted flare.

(10) Remove the plug gauge and complete the inverted flare.

ISO FLARING

To make a ISO flare use Snap-On® Flaring Tool TFM-428 or equivalent.

(1) Cut off damaged tube with Tubing Cutter.

(2) Remove any burrs from the inside of the tube.

(3) Install tube nut on the tube.

(4) Position the tube in the flaring tool flush with the top of the tool bar (Fig. 15). Then tighten the tool bar on the tube.

(5) Install the correct size adaptor on the flaring tool yoke screw.

(6) Lubricate the adaptor.

SERVICE PROCEDURES (Continued)

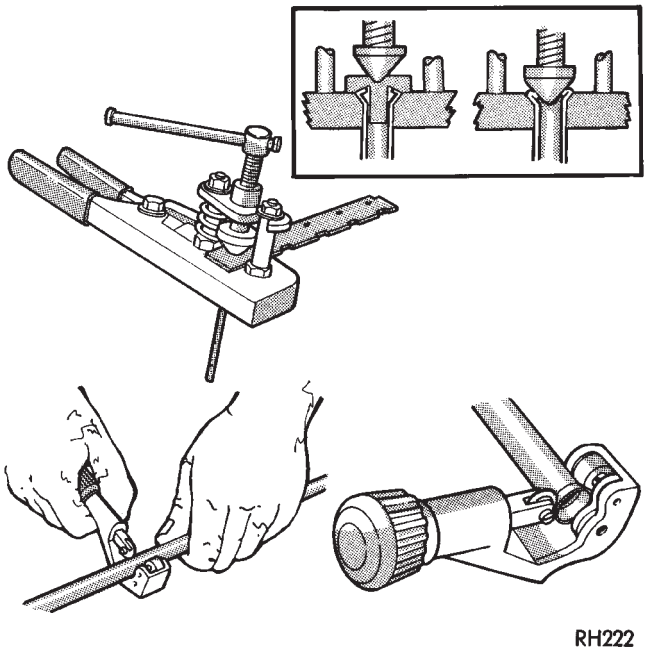


Fig. 14 Inverted Flare Tools

(7) Align the adaptor and yoke screw over the tube (Fig. 15).

(8) Turn the yoke screw in until the adaptor is squarely seated on the tool bar.

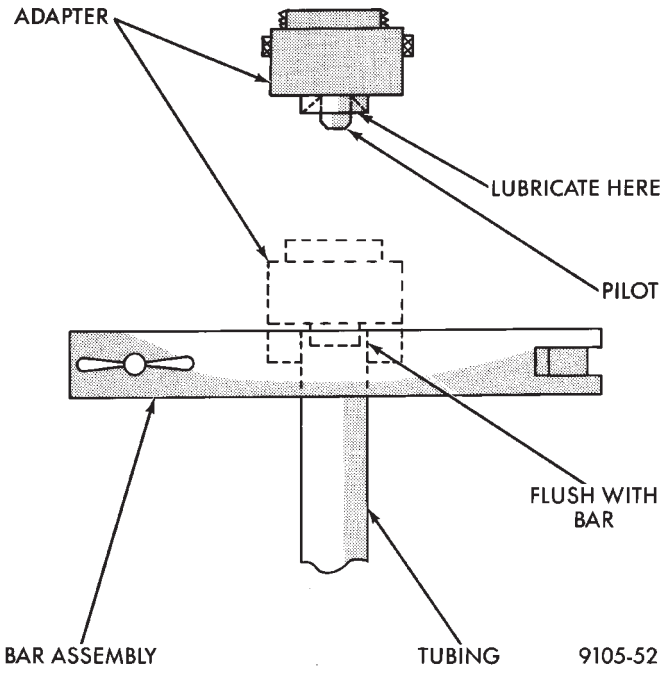


Fig. 15 ISO Flaring

REMOVAL AND INSTALLATION

BRAKE LAMP SWITCH

REMOVAL

(1) Remove steering column cover and lower trim panel for switch access (if necessary).

(2) Press brake pedal downward to fully applied position.

(3) Rotate switch approximately 30° in counter-clockwise direction to unlock switch retainer. Then pull switch rearward and out of bracket.

(4) Disconnect switch wire harness and remove switch from vehicle (Fig. 16).

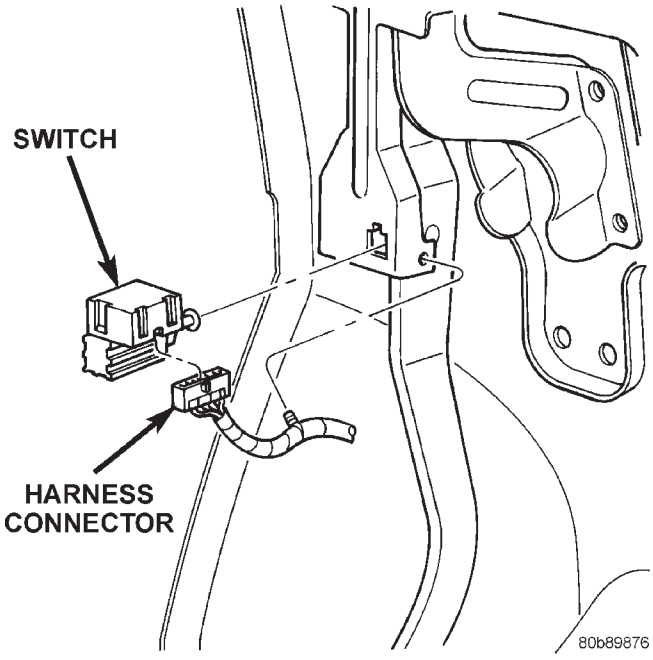


Fig. 16 Stop Lamp Switch

INSTALLATION

(1) Pull switch plunger all the way out to fully extended position.

(2) Connect harness wires to switch.

(3) Press and hold brake pedal in applied position.

(4) Install switch as follows: Align tab on switch with notch in switch bracket. Then insert switch in bracket and turn it clockwise about 30° to lock it in place.

(5) Release brake pedal. Then pull pedal lightly rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make ratcheting sound as it self adjusts.

CAUTION: Booster damage may occur if the pedal pull exceeds 20 lbs.

REMOVAL AND INSTALLATION (Continued)

BRAKE PEDAL

REMOVAL

(1) Remove retainer clip that holds booster to pedal pin (Fig. 17).

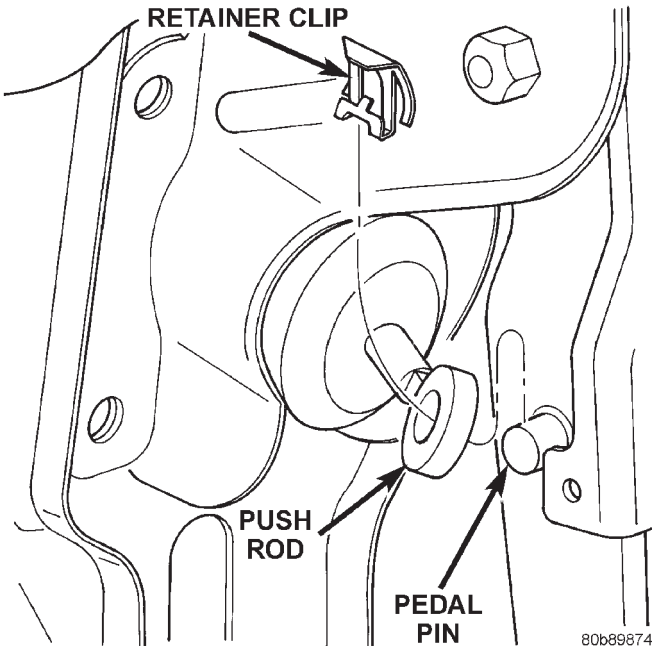


Fig. 17 Push Rod Retainer Clip

(2) Remove nut from pedal shaft.
(3) Slide pedal shaft out and remove brake pedal.
(4) Remove pedal bushings (Fig. 18) if they are to be replaced.

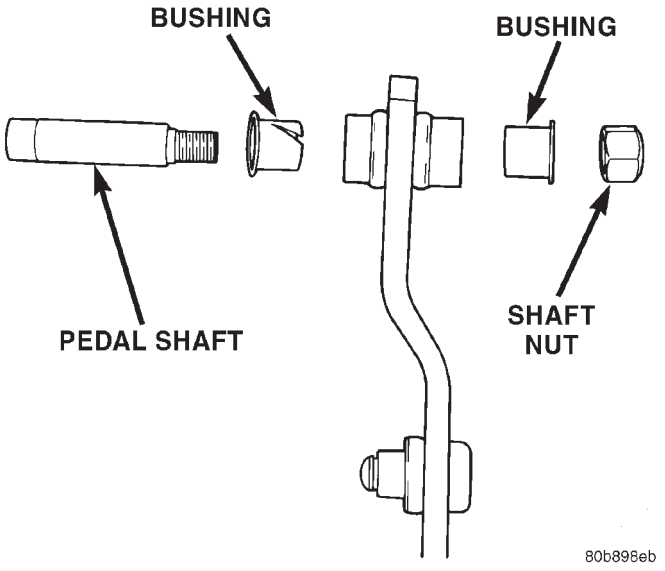


Fig. 18 Pedal Bushings

INSTALLATION

(1) Lubricate bushings, pedal shaft and pedal pin with Mopar multi-mileage grease.
(2) Install bushings into pedal.
(3) Position pedal in bracket and install pedal shaft in support and through pedal.
(4) Install new nut on pedal shaft and tighten to 27 N·m (20 ft. lbs.).

NOTE: Pedal shaft nut should not be reused.

(5) Install booster push rod on pedal pin and install retainer clip on pedal pin.
(6) Check and adjust stop lamp switch if necessary.

BRAKE FLUID LEVEL SENSOR

REMOVAL

(1) Remove the wire connector from the fluid level sensor.
(2) From the other side of the master cylinder reservoir release the sensor locking taps with a small screw driver.
(3) Pull the sensor out of the reservoir from the connector side of the sensor.

INSTALLATION

(1) Install the sensor with a new o-ring into the reservoir until the locking tabs are engaged.
(2) Install the wire connector to the fluid level sensor.

MASTER CYLINDER RESERVOIR

REMOVAL

(1) Remove reservoir cap and remove fluid with a **clean** suction gun.
(2) Remove the wire connector from the brake fluid level sensor.
(3) Insert the tool (Fig. 19) provided with the reservoir to release the reservoir retaining tabs.
(4) Pull the reservoir straight up out of the cylinder.
(5) Remove and discard grommets from the cylinder body.

INSTALLATION

(1) Lubricate new grommets with clean brake fluid. Install new grommets into the cylinder body.

CAUTION: Do not use tools to install the grommets. Tools may cut, or tear the grommets. Install the grommets using finger pressure only.

(2) Start reservoir in grommets then press the reservoir straight down to seat the reservoir into the cylinder grommets.

REMOVAL AND INSTALLATION (Continued)

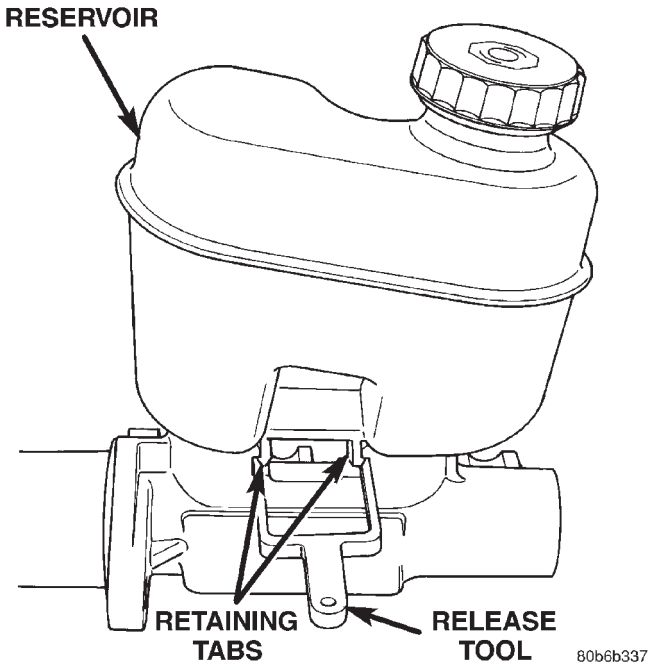


Fig. 19 Release Tool

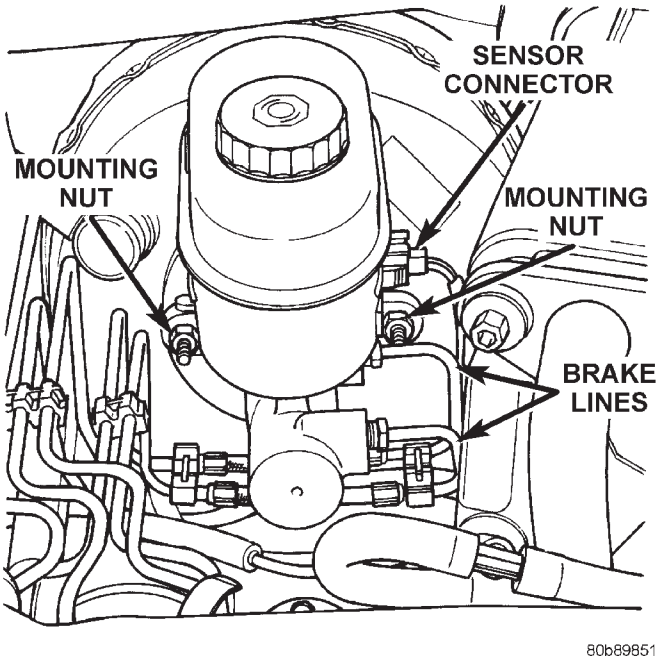


Fig. 20 Master Cylinder Mounting

CAUTION: Do not rock the reservoir during installation.

(3) Verify retaining tabs are seated.
(4) Install the wire connector to the brake fluid level sensor.
(5) Fill master cylinder.

MASTER CYLINDER

REMOVAL

(1) Remove the wire connector from the brake fluid level sensor.
(2) Remove brake lines from master cylinder.
(3) Remove nuts that attach master cylinder to booster studs (Fig. 20).
(4) Remove master cylinder from booster.

INSTALLATION

NOTE: Bleed new master cylinder on bench before installation, refer to Service Procedures.

(1) Have an assistant depress the brake pedal while guiding the master cylinder on the booster rod and mounting studs.

CAUTION: Do not depress brake pedal too hard and ensure the booster rod is in the master cylinder piston or booster/master cylinder damage will occur.

(2) Install master cylinder mounting nuts and tighten nuts to 25 N·m (18 lb. lbs.).

NOTE: Use original or factory replacement nuts only.

(3) Install brake lines and tighten to 16 N·m (144 in. lbs.).
(4) Install fluid level sensor connector.
(5) Fill and bleed brake system.

POWER BRAKE BOOSTER

REMOVAL

(1) Remove the master cylinder.
(2) Disconnect vacuum hose at booster check valve.
(3) Remove retainer clip (Fig. 21) that holds booster push rod on pedal pin. Then slide push rod off pin.
(4) Remove four nuts (Fig. 22) that attach booster to dash panel.
(5) In engine compartment, slide booster forward, tilt it upward slightly, and remove it from engine compartment.

INSTALLATION

(1) Check condition of grommet that secures check valve in booster. Replace grommet if cut, torn, or loose.
(2) Install new booster dash seal.
(3) Align and position booster on engine compartment side of dash panel.
(4) Inside passenger compartment:
(a) Lubricate pedal pin Mopar multi-mileage grease.

REMOVAL AND INSTALLATION (Continued)

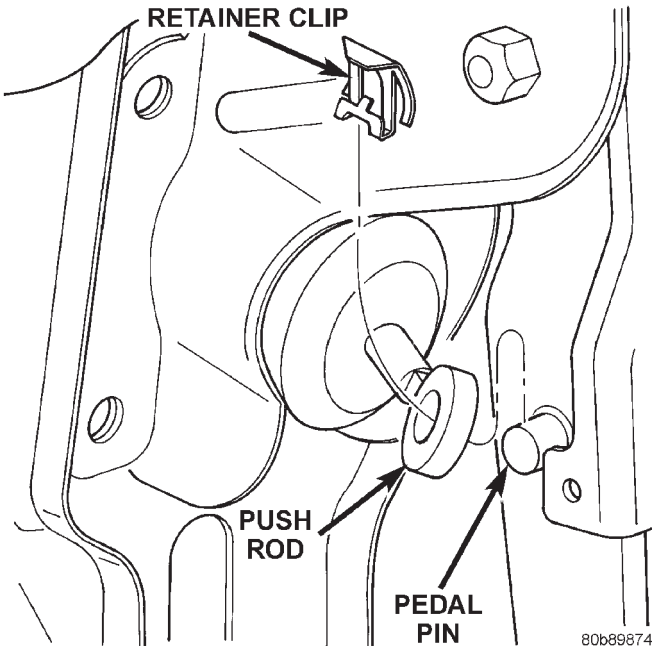


Fig. 21 Retainer Clip

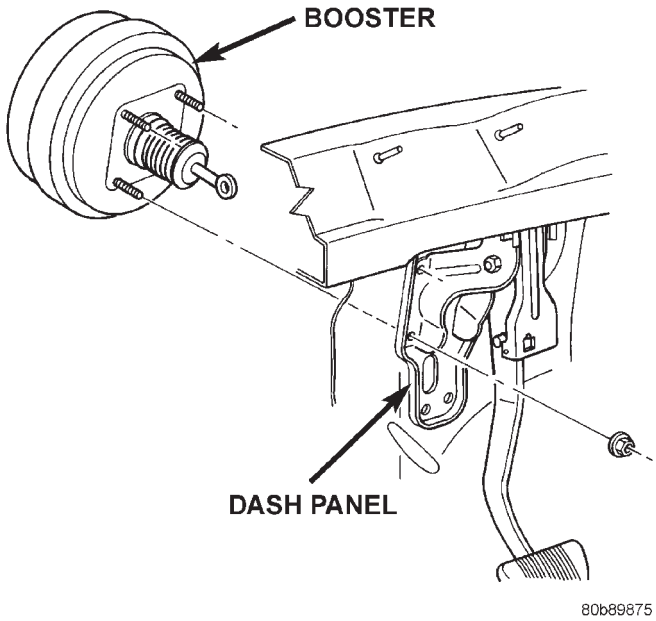


Fig. 22 Power Brake Booster Mounting

(b) Install booster attaching nuts on studs. Tighten attaching nuts to 39 N·m (29 ft. lbs.).

(c) Slide booster push rod on pedal pin. Then secure rod to pin with retainer clip.

(5) In engine compartment, attach vacuum hose to booster check valve.

(6) Install the master cylinder with new gasket and nuts.

CAUTION: The master cylinder installation procedure must be perform as written or damage to the booster/master cylinder may occur.

(7) Fill and bleed brake system.

FRONT DISC BRAKE CALIPER

REMOVAL

(1) Raise and support vehicle.

(2) Remove front wheel and tire assembly.

(3) Drain small amount of fluid from master cylinder brake reservoir with **clean** suction gun.

(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 23).

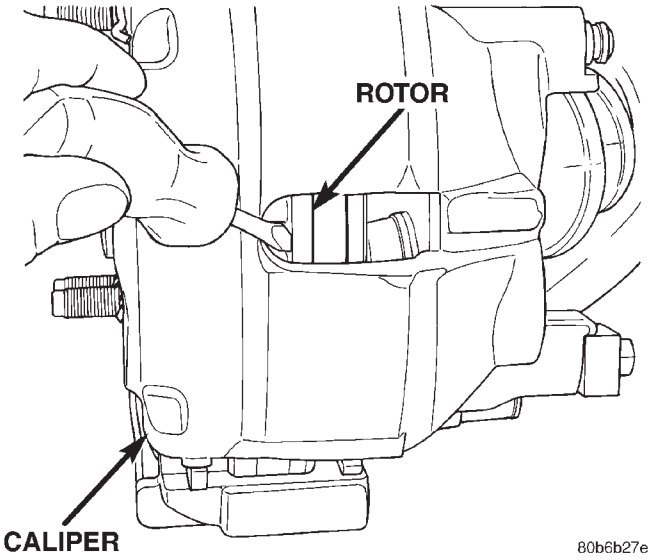


Fig. 23 Bottoming Caliper Piston

(5) Remove brake hose banjo bolt and gasket washers.

(6) Remove the caliper support spring by prying the spring out of the caliper (Fig. 24).

(7) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 25).

(8) Remove caliper from the anchor.

(9) Remove the inboard brake shoe (Fig. 26).

INSTALLATION

(1) Install the inboard brake shoe (Fig. 26).

(2) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the caliper.

(3) Install the caliper on the anchor.

(4) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).

(5) Install the caliper slide pin bushing caps.

(6) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring

REMOVAL AND INSTALLATION (Continued)

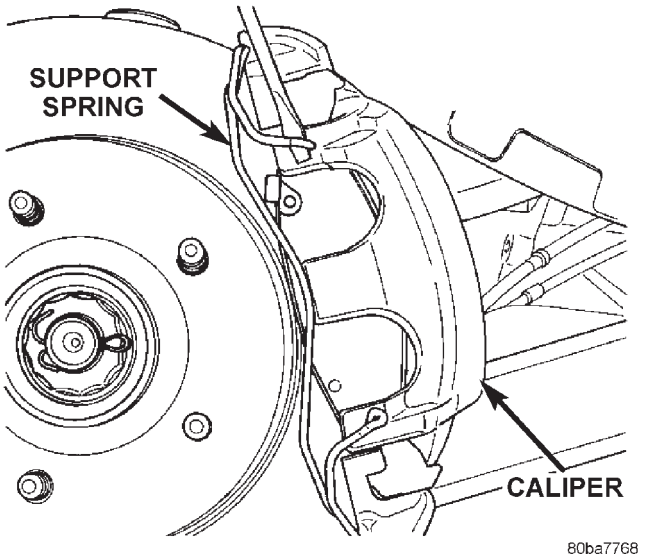


Fig. 24 Caliper Support Spring

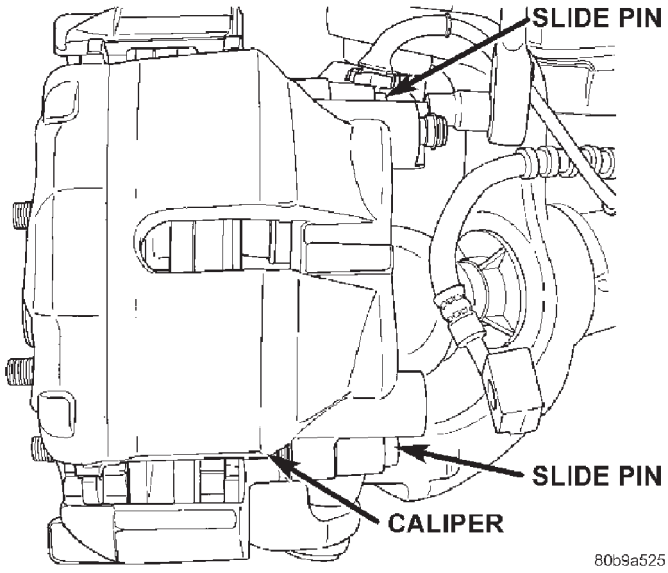


Fig. 25 Slide Pins

into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.

(7) Install brake hose to caliper with **new gasket washers** and tighten banjo bolt to 31 N·m (23 ft. lbs.).

CAUTION: Verify brake hose is not twisted or kinked before tightening banjo bolt.

(8) Fill and bleed brake system.
(9) Install wheel and tire assemblies.
(10) Remove supports and lower vehicle.
(11) Verify brake fluid level.

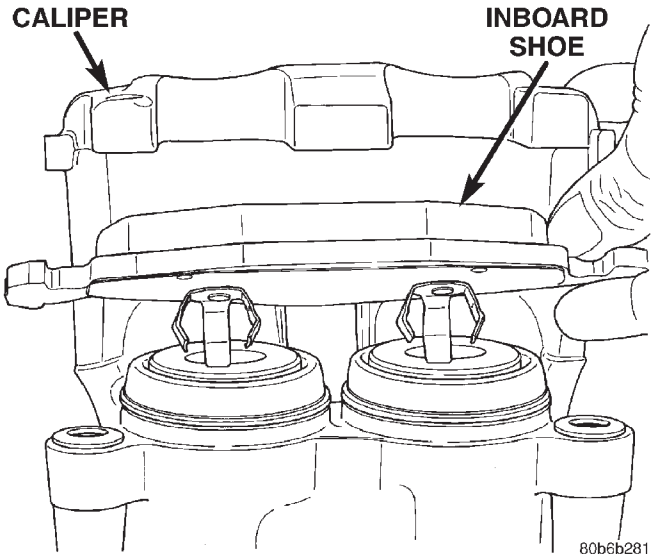


Fig. 26 Inboard Brake Shoe

FRONT DISC BRAKE SHOES

REMOVAL

(1) Raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Drain small amount of fluid from master cylinder brake reservoir with **clean** suction gun.
(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 27).

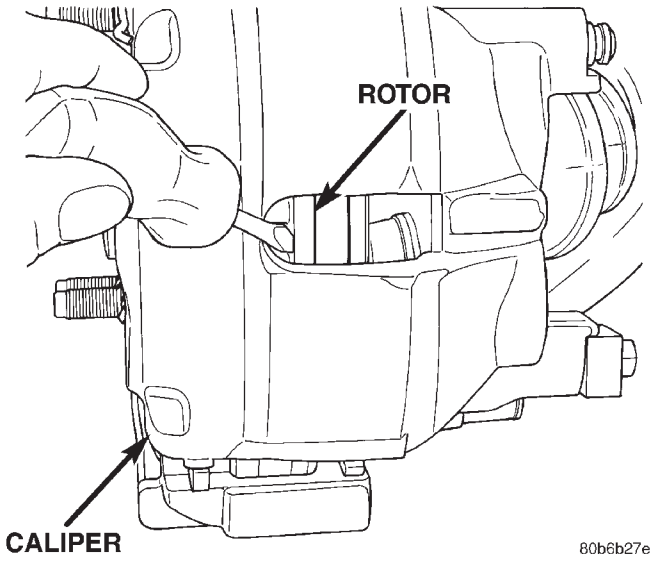


Fig. 27 Bottoming Caliper Piston

(5) Remove the caliper support spring by prying the spring out of the caliper (Fig. 28).
(6) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 29).
(7) Remove caliper from the anchor.

REMOVAL AND INSTALLATION (Continued)

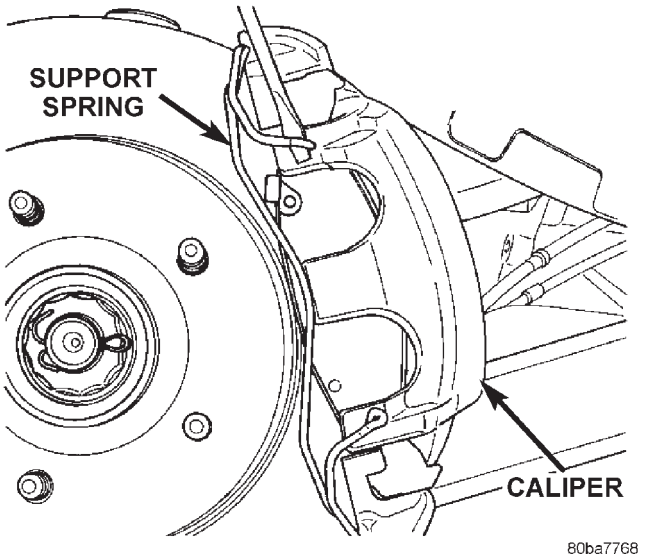


Fig. 28 Caliper Support Spring

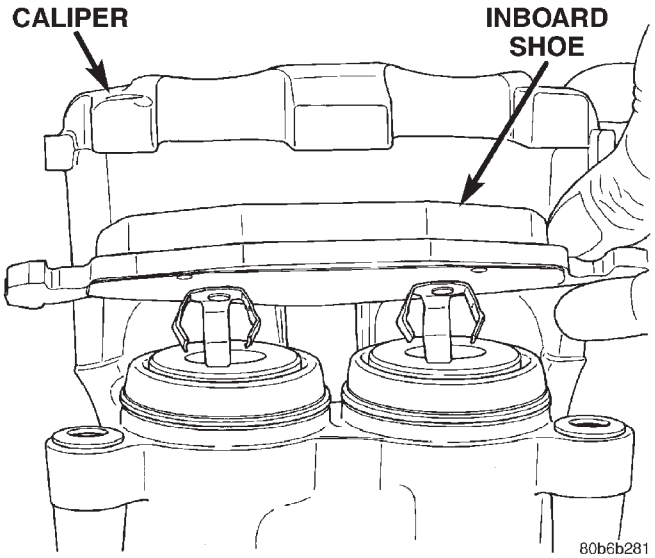


Fig. 30 Inboard Brake Shoe

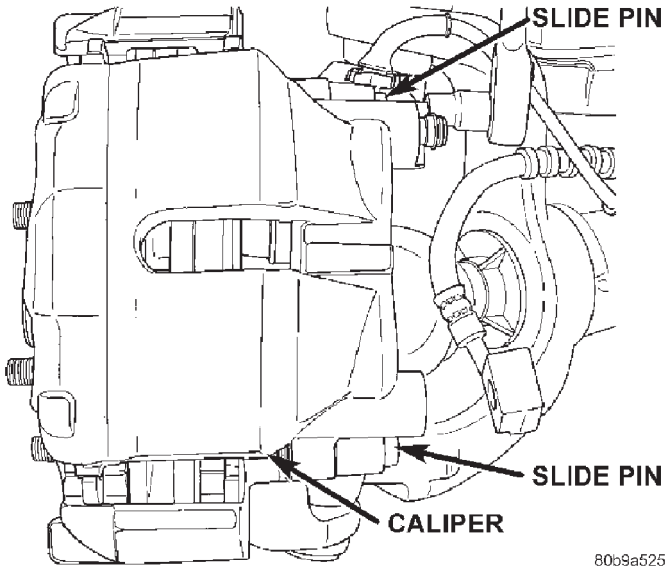


Fig. 29 Caliper Slide Pins

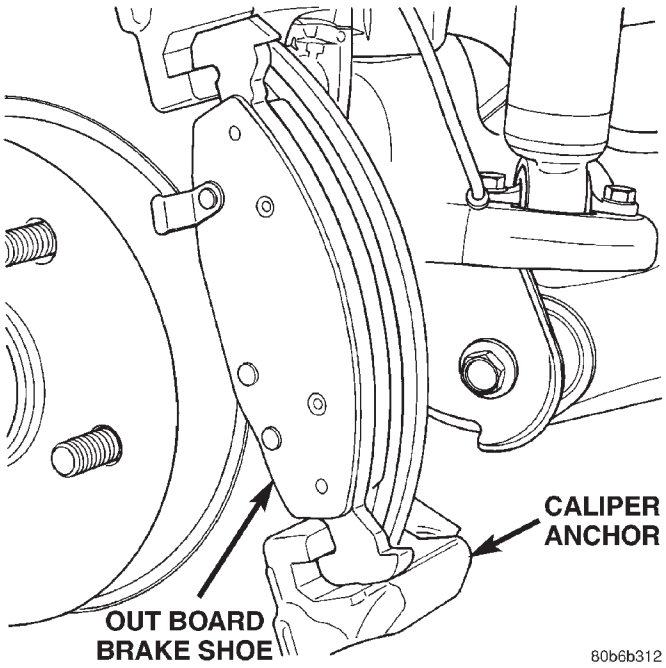


Fig. 31 Outboard Brake Shoe

(8) Secure caliper to nearby suspension part with wire. **Do not allow brake hose to support caliper weight.**

(9) Remove the inboard brake shoe from the caliper (Fig. 30).

(10) Remove the outboard brake shoe (Fig. 31) from the caliper anchor.

INSTALLATION

(1) Install the inboard brake shoe onto the caliper (Fig. 30).

(2) Install the outboard shoe onto the caliper anchor (Fig. 31).

(3) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the brake shoes.

(4) Install caliper on the caliper anchor.

(5) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).

(6) Install the caliper slide pin bushing caps.

(7) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.

(8) Install wheel and tire assembly.

(9) Remove support and lower vehicle.

REMOVAL AND INSTALLATION (Continued)

(10) Pump brake pedal until caliper pistons and brake shoes are seated.

(11) Fill brake fluid.

FRONT DISC BRAKE ROTOR

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assembly.

(3) Remove the caliper anchor bolts (Fig. 32) and remove the caliper and anchor as an assembly from the steering knuckle.

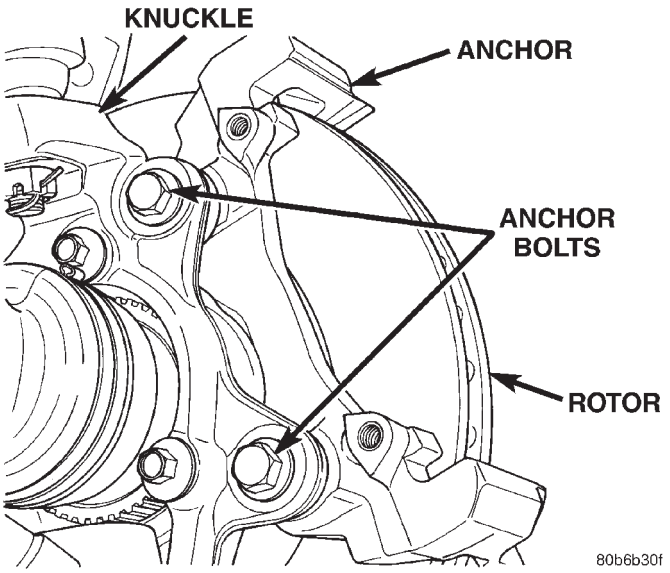


Fig. 32 Caliper Anchor Bolts

(4) Secure caliper anchor assembly to nearby suspension part with a wire. **Do not allow brake hose to support caliper weight.**

(5) Remove retainers securing rotor to hub studs.

(6) Remove rotor from hub.

INSTALLATION

(1) Install rotor on hub studs.

(2) Install the caliper anchor assembly on the knuckle. Install anchor bolts and tighten to 90-115 N·m (66-85 ft. lbs.).

(3) Install wheel and tire assembly.

(4) Remove support and lower the vehicle.

(5) Pump brake pedal to seat caliper pistons and brake shoes. Do not move vehicle until firm brake pedal is obtained.

REAR DISC BRAKE CALIPER

REMOVAL

(1) Raise and support vehicle.

(2) Remove rear wheel and tire assembly.

(3) Drain small amount of fluid from master cylinder brake reservoir with a **clean** suction gun.

(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 33).

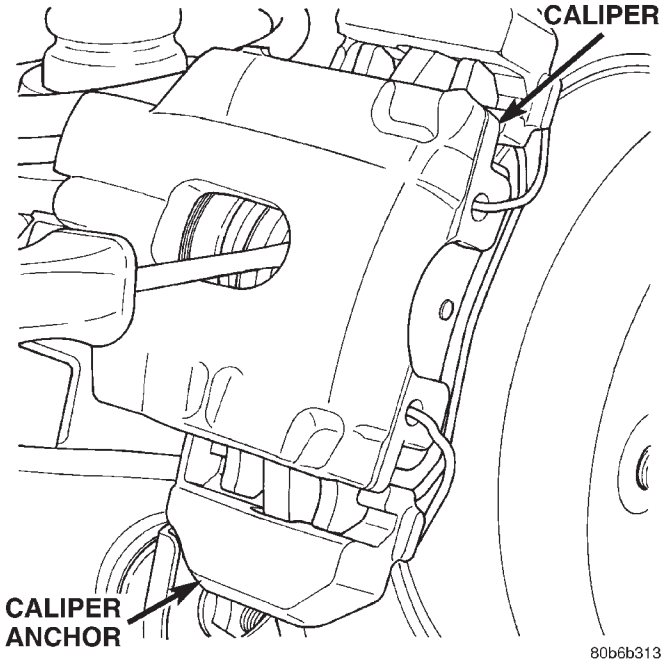


Fig. 33 Bottoming Caliper Piston

(5) Remove brake hose banjo bolt and discard gasket washers.

(6) Remove the caliper support spring by prying the spring out of the caliper (Fig. 34).

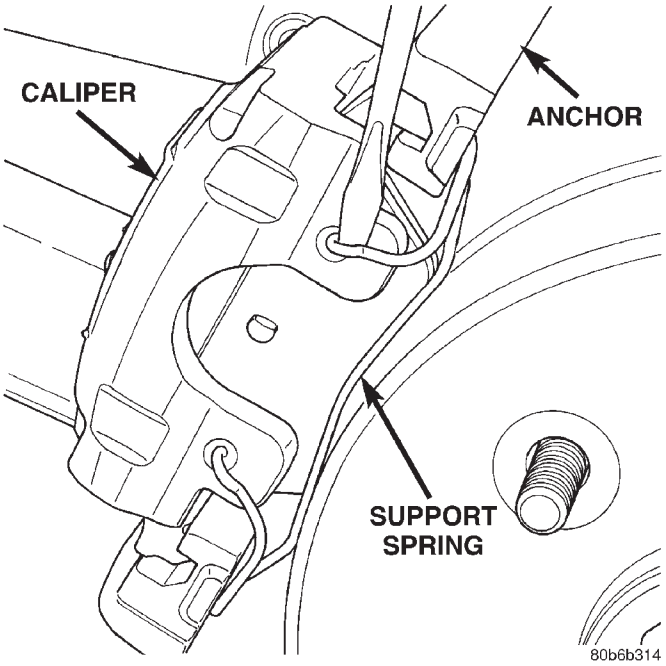


Fig. 34 Caliper Support Spring

REMOVAL AND INSTALLATION (Continued)

(7) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 35).

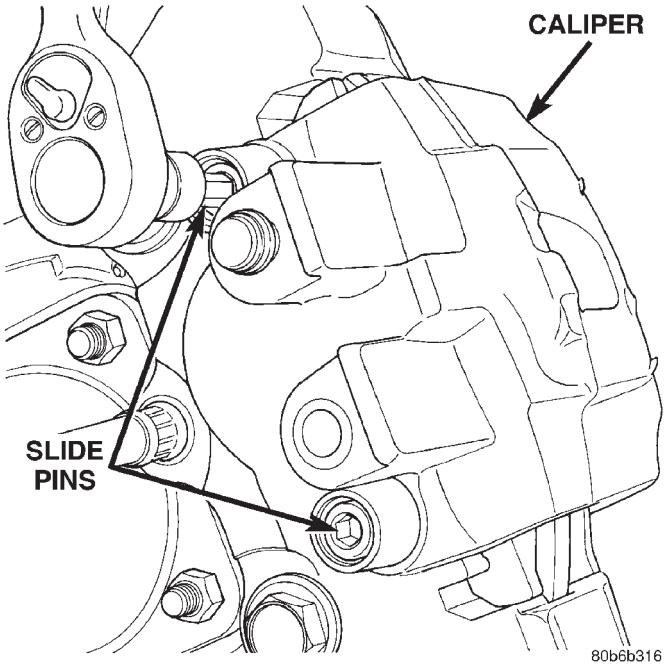


Fig. 35 Caliper Slide Pins

(8) Remove caliper from the anchor.
(9) Remove the inboard brake shoe (Fig. 36).

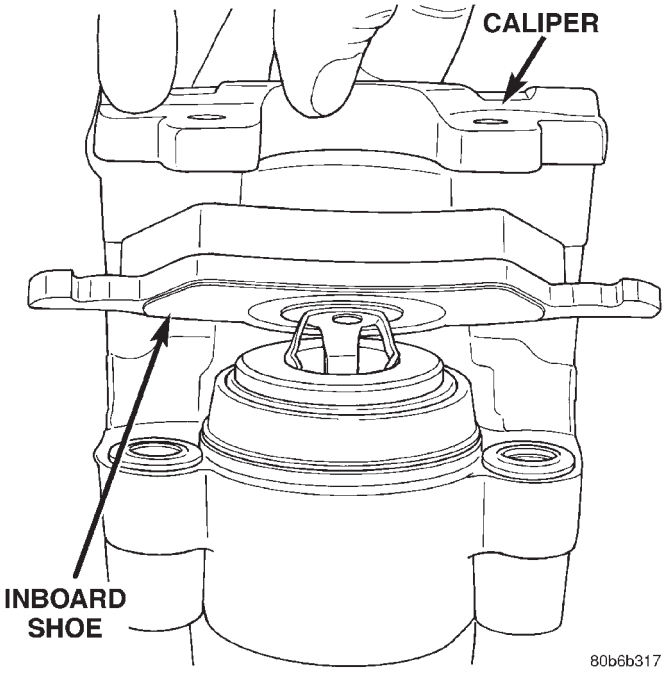


Fig. 36 Inboard Brake Shoe

INSTALLATION

(1) Install the inboard brake shoe (Fig. 36).
(2) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the caliper.
(3) Install the caliper on the anchor.
(4) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).
(5) Install the caliper slide pin plugs.
(6) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.
(7) Install brake hose to caliper with **new** gasket washers and tighten banjo bolt to 31 N·m (23 ft. lbs.).

CAUTION: Verify brake hose is not twisted or kinked before tightening fitting bolt.

(8) Fill and bleed brake system.
(9) Install wheel and tire assemblies.
(10) Remove supports and lower vehicle.

REAR DISC BRAKE SHOES

REMOVAL

(1) Raise and support vehicle.
(2) Remove rear wheel and tire assembly.
(3) Drain small amount of fluid from master cylinder brake reservoir with a **clean** suction gun.
(4) Bottom caliper pistons into the caliper by prying the caliper over (Fig. 37).

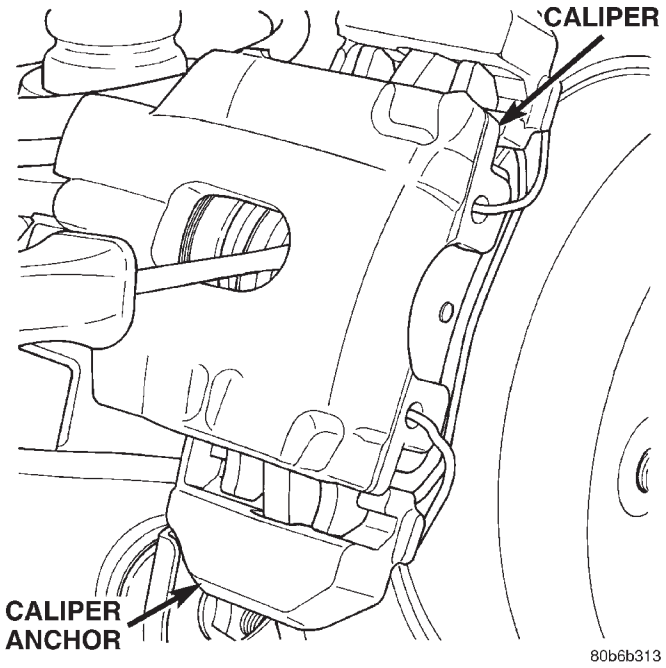


Fig. 37 Bottoming Caliper Piston

(5) Remove the caliper support spring by prying the spring out of the caliper (Fig. 38).
(6) Remove the caliper slide pin bushing caps and remove the slide pins (Fig. 39).

REMOVAL AND INSTALLATION (Continued)

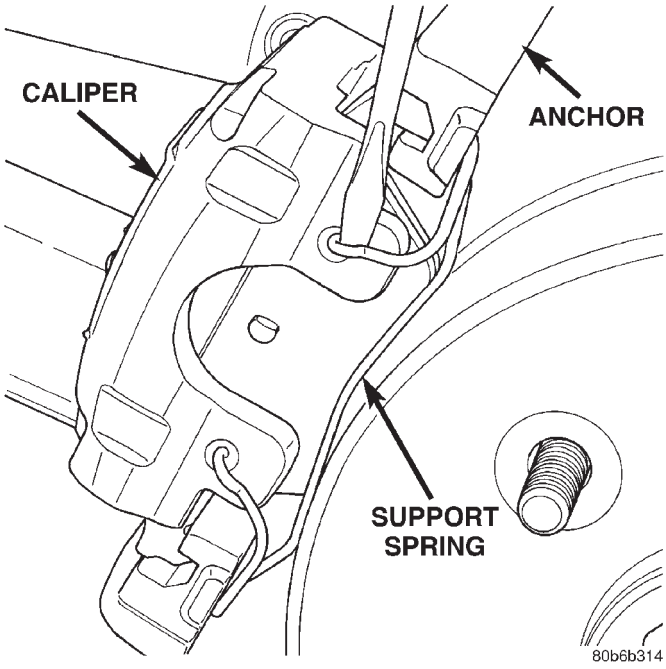


Fig. 38 Caliper Support Spring

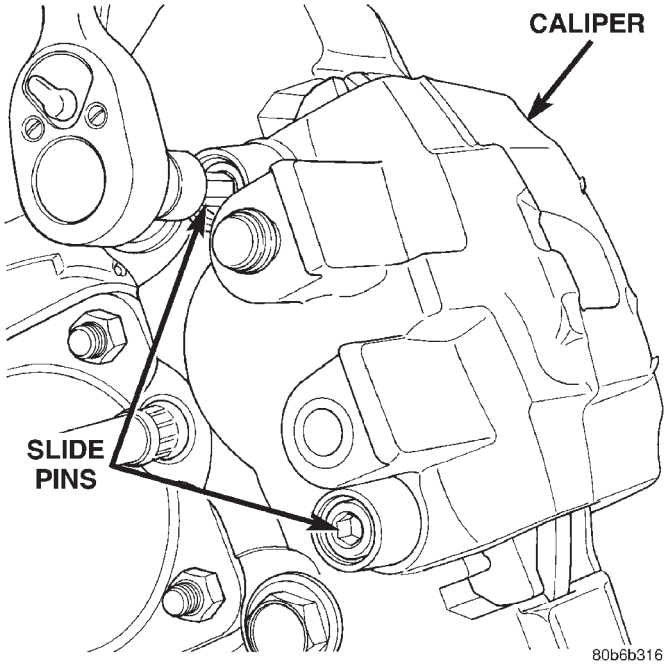


Fig. 39 Caliper Slide Pins

(7) Remove caliper from the anchor.

(8) Secure caliper to nearby suspension part with wire. **Do not allow brake hose to support caliper weight.**

(9) Remove the inboard brake shoe from the caliper (Fig. 40).

(10) Remove outboard brake shoe (Fig. 41) from the caliper anchor.

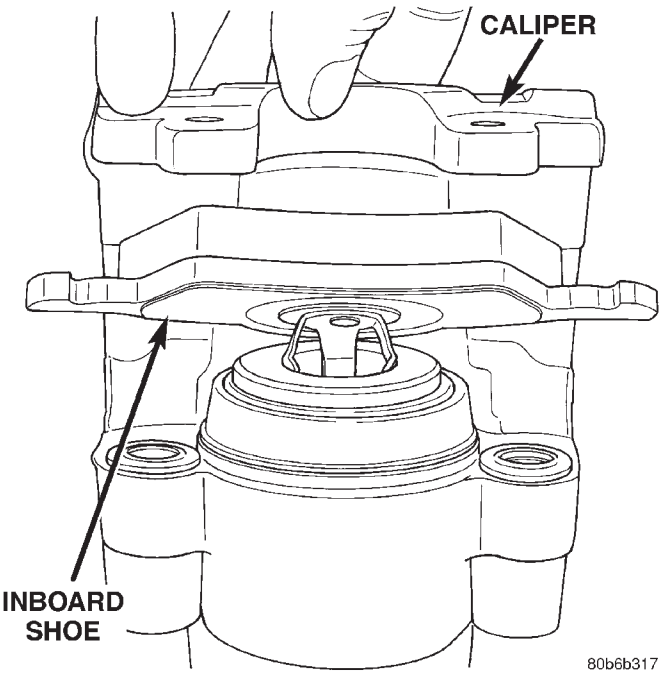


Fig. 40 Inboard Brake Shoe

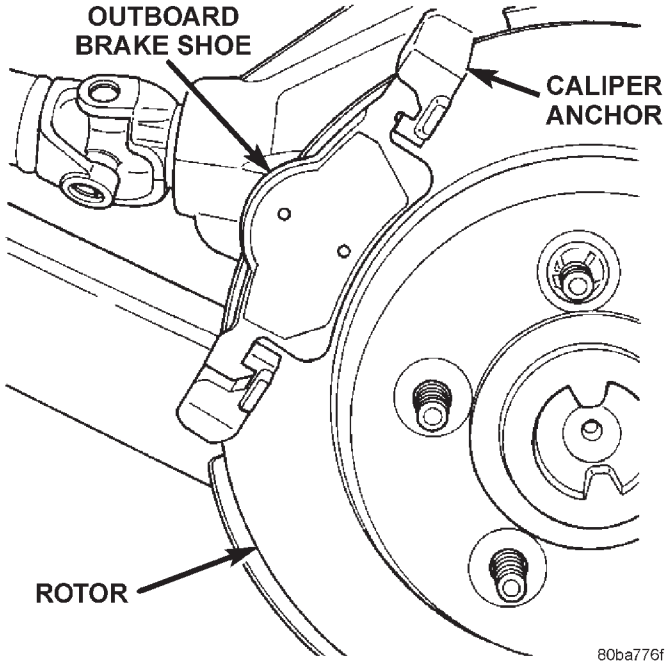


Fig. 41 Outboard Brake Shoe

INSTALLATION

(1) Install the inboard brake shoe onto the caliper (Fig. 40).

(2) Install the outboard brake shoe onto the caliper anchor (Fig. 41).

(3) Lubricate the slide pins and slide pin bushings with Dow Corning® grease G807 or the grease provided with the brake shoes.

(4) Install caliper on the anchor.

REMOVAL AND INSTALLATION (Continued)

(5) Install the caliper slide pin and tighten to 29-41 N·m (21-30 ft. lbs.).

(6) Install the caliper slide pin bushing caps.

(7) Install the caliper support spring in the top end of the caliper and under the anchor. Then install other end into the lower caliper hole. Hold the spring into the caliper hole with your thumb while prying the end of the spring out and down under the anchor with a screw drive.

(8) Install wheel and tire assembly.

(9) Remove support and lower vehicle.

(10) Pump brake pedal until caliper piston and brake shoes are seated.

(11) Fill brake fluid level if necessary.

REAR DISC BRAKE ROTOR

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assembly.

(3) Remove the caliper anchor bolts (Fig. 42).

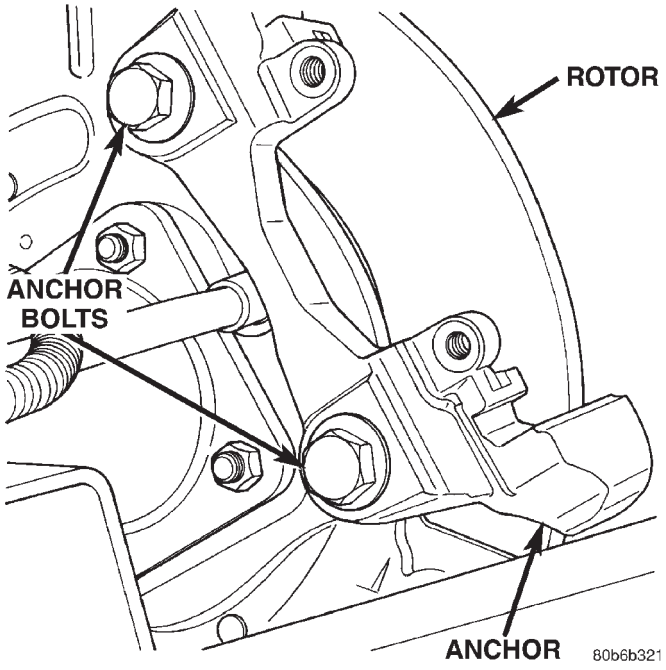


Fig. 42 Caliper Anchor Bolts

(4) Remove caliper and anchor as an assembly.

(5) Secure caliper anchor assembly to nearby suspension part with wire. **Do not allow brake hose to support caliper weight.**

(6) Remove retainers securing rotor to axle studs.

(7) Remove rotor off axle studs.

INSTALLATION

(1) Install rotor on axle studs.

(2) Install the caliper anchor assembly.

(3) Install anchor bolts and tighten to 90-115 N·m (66-85 ft. lbs.).

(4) Install wheel and tire assembly.

(5) Remove support and lower the vehicle.

(6) Pump brake pedal until caliper pistons and brake shoes are seated.

PARKING BRAKE LEVER

REMOVAL

(1) Remove center console, refer to Group 23 Body.

(2) Lift up rear seat and carpet covering the parking brake cables.

(3) Place a screw driver through the front cable eyelet (Fig. 43) and pry back on the front cable.

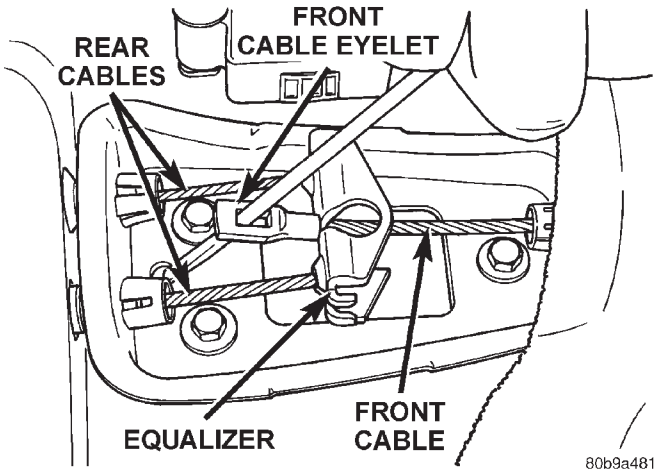


Fig. 43 Front Cable Eyelet

(4) Have an assistant pry down the lock out spring through the hole in the side of the park brake lever (Fig. 44) with a small screw driver. Then slowly release the front cable.

NOTE: Their should be slack in the cable if the lock out spring is engaged.

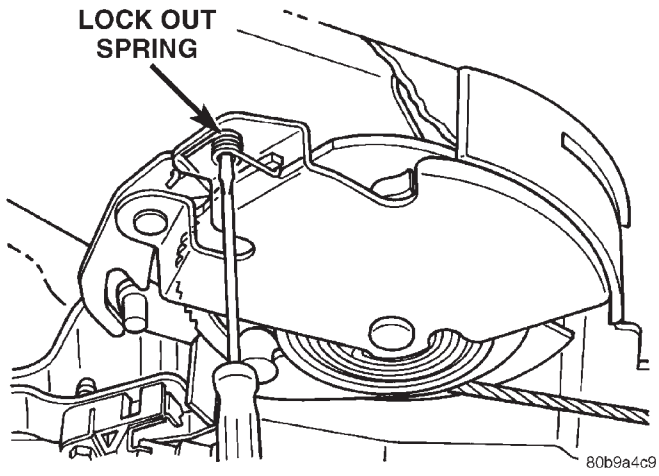


Fig. 44 Lock Out Spring

REMOVAL AND INSTALLATION (Continued)

(5) Disconnect parking brake switch wiring connector.

(6) Disengage front cable end from parking brake lever.

(7) Compress the cable retainer with a 13 mm wrench (Fig. 45) and remove the cable from the parking brake lever bracket.

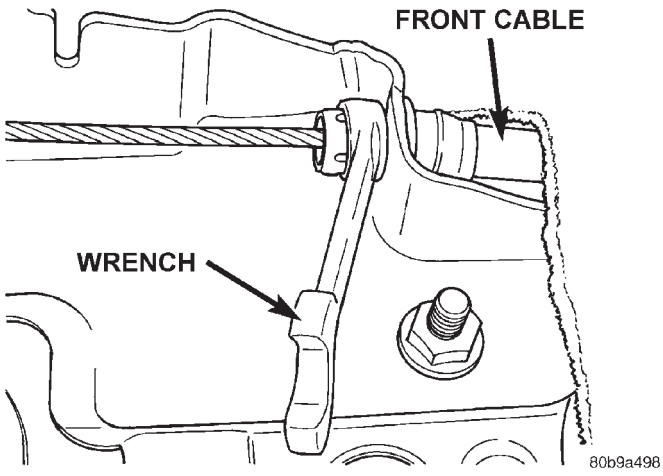


Fig. 45 Parking Brake Lever Bracket

(8) Remove the park brake lever mounting nuts and console bracket. (Fig. 46).

(9) Lift the lever assembly off the mounting studs and pull the front cable out of the lever bracket.

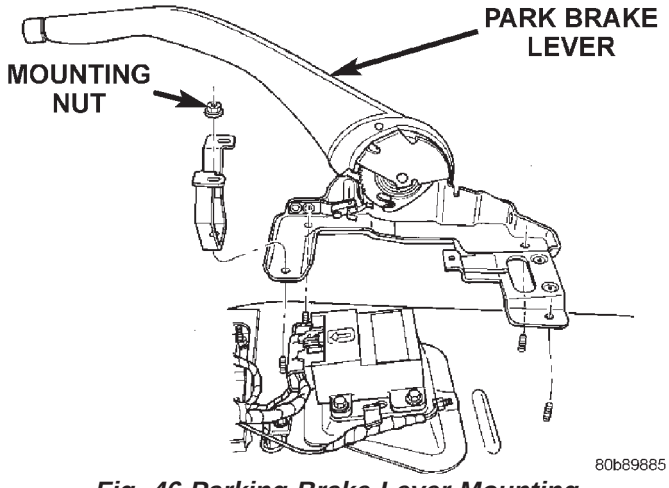


Fig. 46 Parking Brake Lever Mounting

INSTALLATION

(1) Install the lever assembly on the mounting studs while feeding the front cable into the lever bracket.

(2) Install the console bracket (Fig. 46) and mounting nuts.

(3) Engage the front cable end to the lever.

(4) Connect parking brake switch wire connector.

(5) Pull on the lever to release the lock out spring.

(6) Install center console, refer to Group 23 Body.

(7) Fold down the rear carpet cover and rear seat.

FRONT PARKING BRAKE CABLE

REMOVAL

(1) Remove center console, refer to Group 23 Body.

(2) Lift up rear seat and carpet covering the parking brake cables.

(3) Place a screw driver through the front cable eyelet (Fig. 47) and pry back on the front cable.

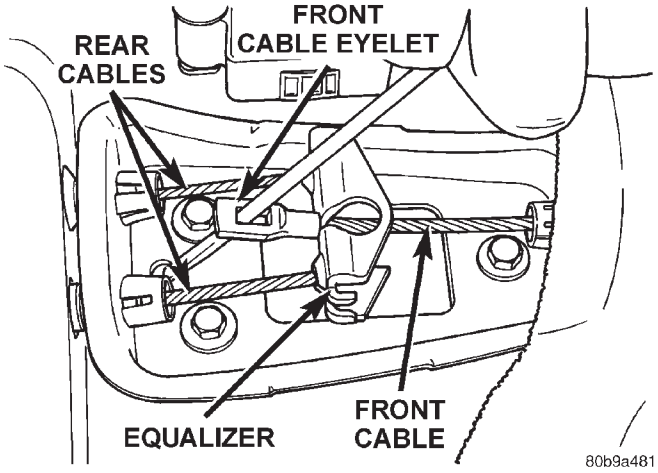


Fig. 47 Front Cable Eyelet

(4) Have an assistant pry down the lock out spring through the hole in the side of the park brake lever (Fig. 48) with a small screw driver. Then slowly release the front cable.

NOTE: Their should be slack in the cable if the lock out spring is engaged.

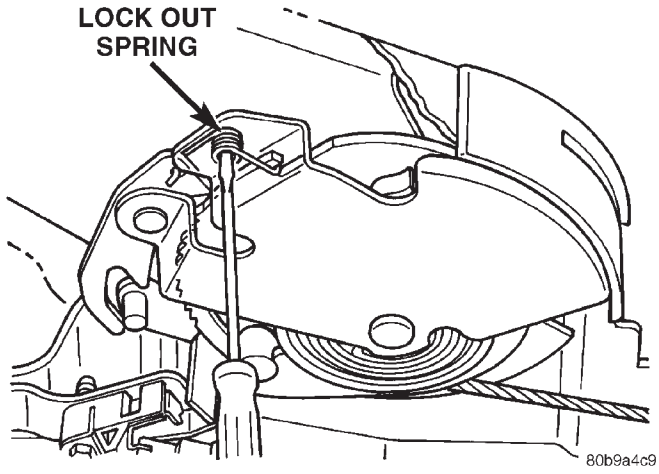


Fig. 48 Lock Out Spring

(5) Disengage front cable end from the equalizer (Fig. 49).

(6) Disengage front cable end from the parking brake lever.

(7) Remove the front carpet, refer to Group 23 Body.

REMOVAL AND INSTALLATION (Continued)

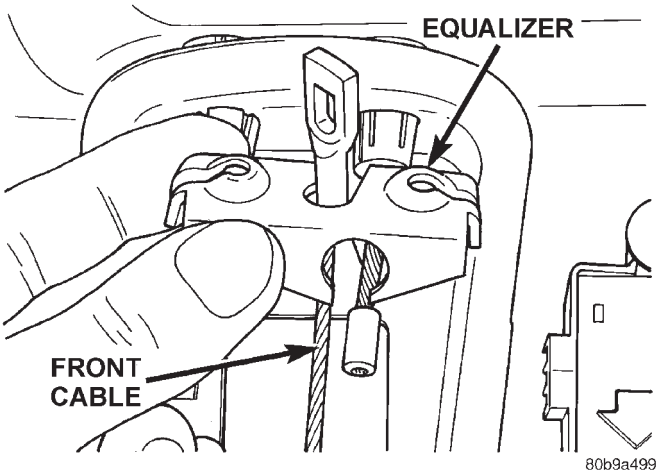


Fig. 49 Cable Equalizer

(8) Remove front cable retainer nuts (Fig. 50) from the floor pan.

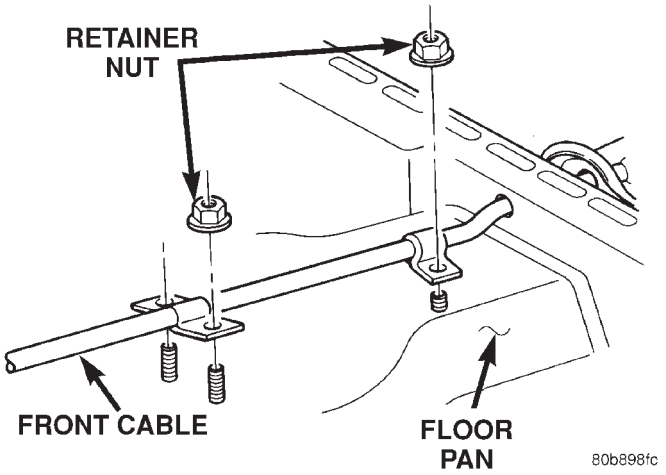


Fig. 50 Front Parking Brake Cable

(9) Compress the cable retainers with a 13 mm wrench (Fig. 51). Remove the cable from parking brake lever bracket and equalizer bracket.

INSTALLATION

(1) Install cable into the parking brake lever bracket and equalizer bracket.

(2) Install front cable to the floor pan and install retainer nuts.

(3) Engage front cable ends to the parking brake lever and equalizer.

(4) Install the front carpet, refer to Group 23 Body.

(5) Pull on the lever to release the lock out spring.

(6) Install center console, refer to Group 23 Body.

(7) Fold down the rear carpet cover and rear seat.

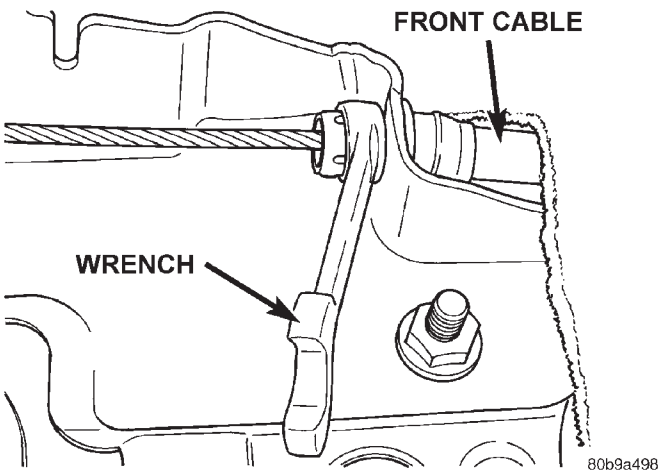


Fig. 51 Brake Lever Bracket

REAR PARKING BRAKE CABLES

REMOVAL

(1) Remove center console, refer to Group 23 Body.

(2) Lift up rear seat and carpet covering the parking brake cables.

(3) Place a screw driver through the front cable eyelet (Fig. 52) and pry back on the front cable.

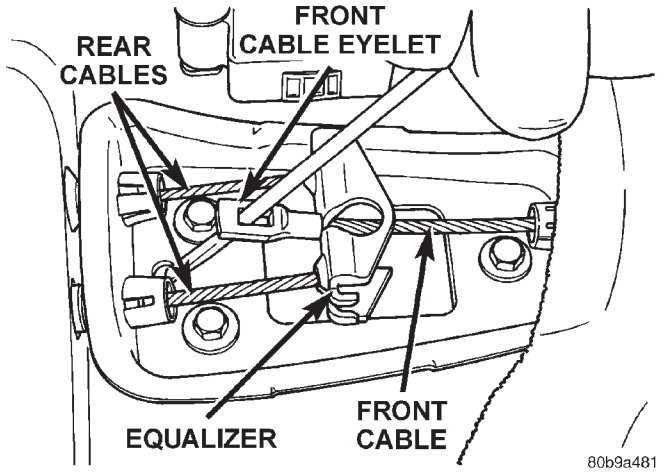


Fig. 52 Front Cable Eyelet

(4) Have an assistant pry down the lock out spring through the hole in the side of the park brake lever (Fig. 53) with a small screw driver. Then slowly release the front cable.

NOTE: Their should be slack in the cable if the lock out spring is engaged.

(5) Disengage rear cables ends from the equalizer.

(6) Compress the cable retainers with a 13 mm wrench (Fig. 54) and remove the cable from equalizer bracket.

(7) Raise and support the vehicle.

REMOVAL AND INSTALLATION (Continued)

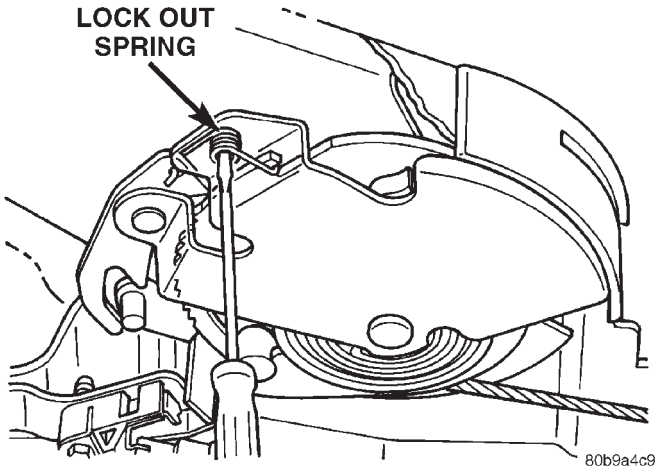


Fig. 53 Lock Out Spring

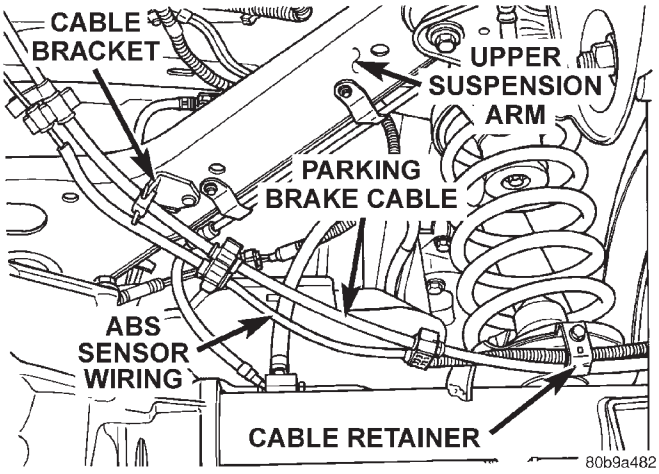


Fig. 55 Left Rear Parking Brake Cable

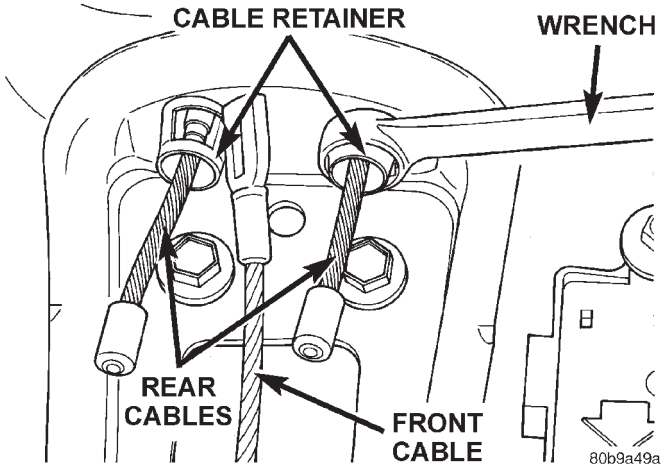


Fig. 54 Cable Retainers

(8) Remove the wheel and tire assemblies.

(9) Remove the brake calipers, caliper anchors and rotors.

(10) Remove the ABS sensor wiring harness (Fig. 55) from the rear brake cables.

(11) Remove the cable retainer bolts (Fig. 55) from the rear spring pads.

(12) Pull the cables out of the upper suspension arm brackets.

(13) Push the cable in and lift up the end of cable with a small screw driver to disengage the cable from the parking brake actuator (Fig. 56).

(14) Remove the cable from the vehicle.

INSTALLATION

(1) Install the cables through the caliper anchor mount. Then push the end of cable strand in to engage the cable end to the parking brake actuator.

(2) Feed the other end of the cables through the body and into the equalizer bracket (Fig. 57).

(3) Push the cables into the upper suspension arm brackets.

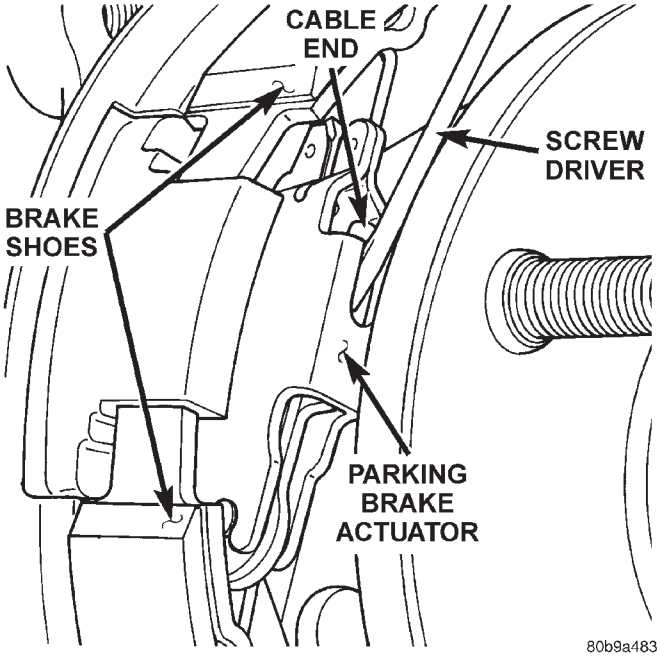


Fig. 56 Parking Brake Actuator

(4) Install the cable retainer bolts to the rear spring pads.

(5) Install the ABS sensor wiring harness to the rear brake cables.

(6) Install the rotors, caliper anchors and brake calipers.

(7) Install the wheel and tire assemblies.

(8) Remove support and lower the vehicle.

(9) Engage the cable ends into the parking brake equalizer.

(10) Pull on the lever to release the lock out spring.

(11) Install center console, refer to Group 23 Body.

(12) Fold down the rear carpet cover and rear seat.

(13) Verify parking brake operation.

REMOVAL AND INSTALLATION (Continued)

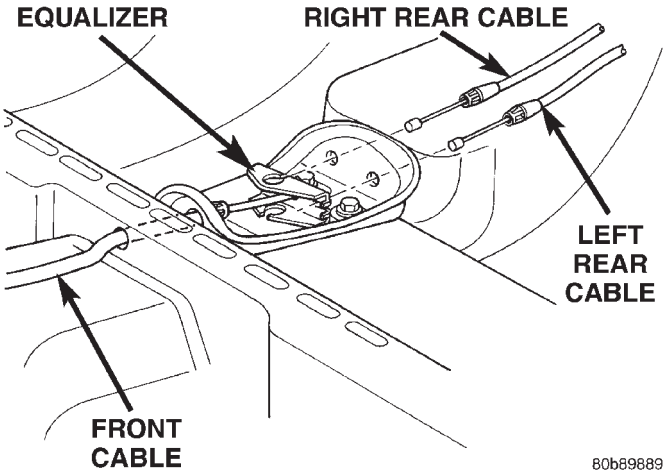


Fig. 57 Equalizer Bracket

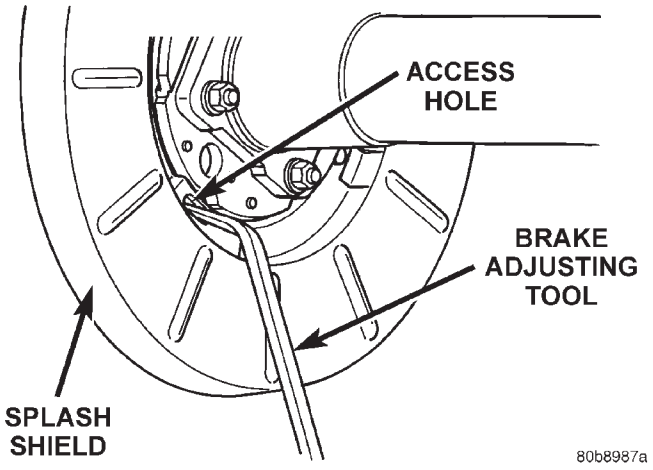


Fig. 59 Retracting Parking Brake Shoes

PARKING BRAKE SHOES

REMOVAL

(1) Lock out park brake lever (Fig. 58).

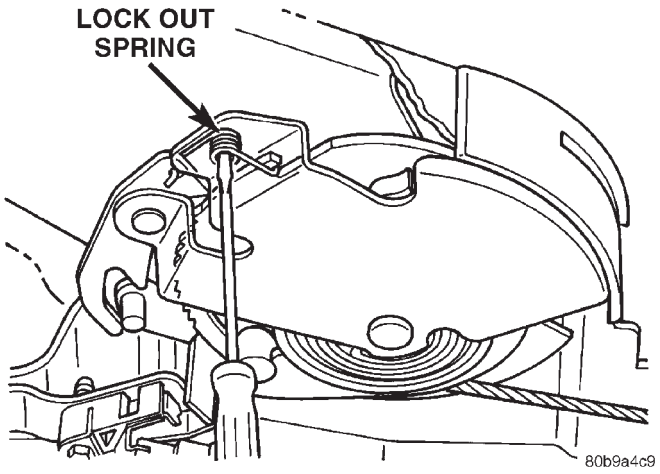


Fig. 58 Lock Out Spring

(2) Raise vehicle.

(3) Remove rear wheel and tire assembly.

(4) Remove caliper and anchor as an assembly.

(5) Remove rubber access plug from back of rear disc brake splash shield.

(6) If necessary retract parking brake shoes with brake adjuster tool (Fig. 59). Position tool at top of star wheel and rotate wheel downward in clockwise direction (while facing front of vehicle).

(7) Remove rotor from axle hub flange.

(8) Remove the lower shoe to shoe spring/adjuster spring with needle nose pliers (Fig. 60).

(9) Remove the upper shoe to shoe spring/return spring with brake pliers (Fig. 61).

(10) Remove shoe hold-down clips and pins (Fig. 62). Clip is held in place by pin which fits in clip notch. To remove clip, first push clip ends together

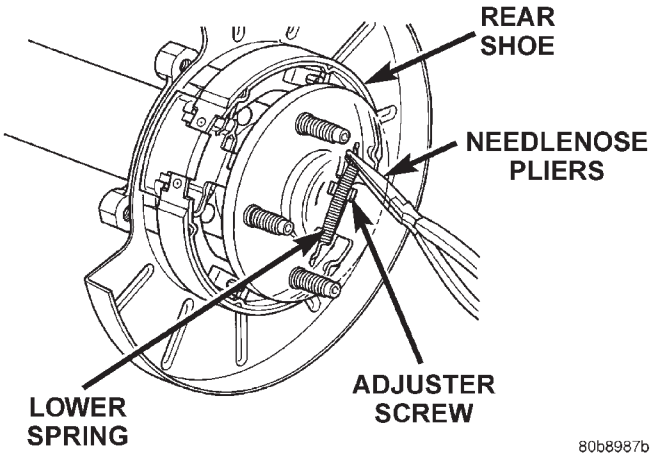


Fig. 60 Lower Spring

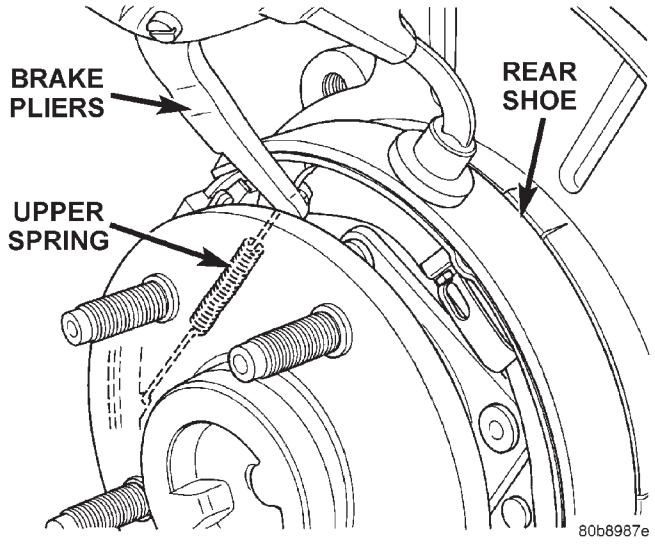


Fig. 61 Upper Spring

REMOVAL AND INSTALLATION (Continued)

and slide clip until head of pin clears narrow part of notch. Then remove clip and pin.

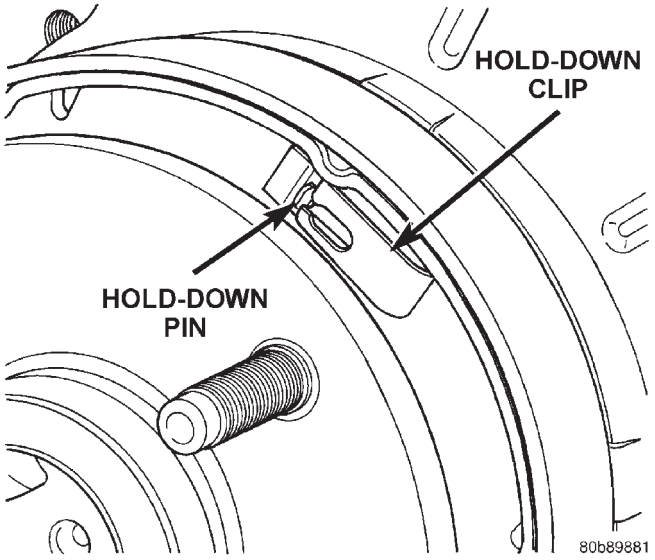


Fig. 62 Hold-Down Clip And Pin

(11) Remove shoes and adjuster.

INSTALLATION

(1) Install shoes on splash shield with hold down clips and pins. Be sure shoes are properly engaged in the park brake actuator.

(2) Lubricate and install adjuster screw assembly. Be sure notched ends of screw assembly are properly seated on shoes and that star wheel is aligned with access hole in shield.

(3) Install lower shoe to shoe spring/adjuster spring. Needle nose pliers can be used to connect spring to each shoe.

(4) Install the upper shoe to shoe spring/return spring with brake pliers (Fig. 60).

(5) Install rotor and caliper anchor assembly.

(6) Install anchor bolts and tighten to 90-115 N·m (66-85 ft. lbs.).

(7) Actuate park brake lever to unlock the park brake system.

(8) Adjust parking brake shoes (Fig. 59).

(9) Install wheel and tire assembly.

(10) Lower vehicle and verify correct parking brake operation.

DISASSEMBLY AND ASSEMBLY

FRONT DISC BRAKE CALIPER

DISASSEMBLY

(1) Drain the brake fluid from caliper.

(2) C-clamp a block of wood over one piston (Fig. 63).

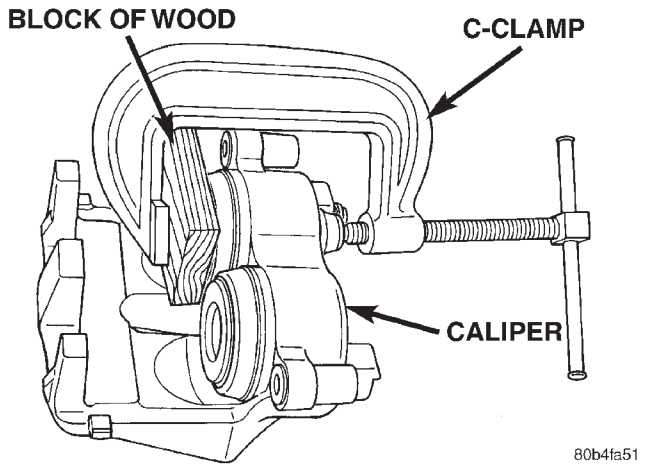


Fig. 63 C-Clamp One Piston

(3) Take another piece of wood and pad it with one-inch thickness of shop towels. Place this piece in the outboard shoe side of the caliper in front of the other piston. This will cushion and protect caliper piston during removal (Fig. 64).

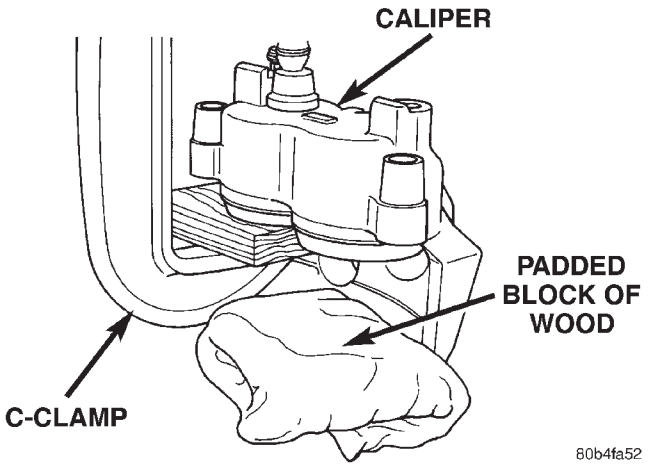


Fig. 64 Protect Caliper Piston

(4) To remove the caliper piston direct **short bursts of low pressure air** with a blow gun through the caliper brake hose port. Use only enough air pressure to ease the piston out.

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS COULD RESULT IN PERSONAL INJURY.

(5) Remove the C-clamp and block of wood from the caliper and clamp it over the dust boot of the

DISASSEMBLY AND ASSEMBLY (Continued)

first piston removed. This will seal the empty piston bore.

(6) Move the padded piece of wood in front of the other piston.

(7) Remove the second piston using the same procedure with **short bursts of low pressure air**.

(8) Remove piston dust boots with a suitable pry tool (Fig. 65) and discard.

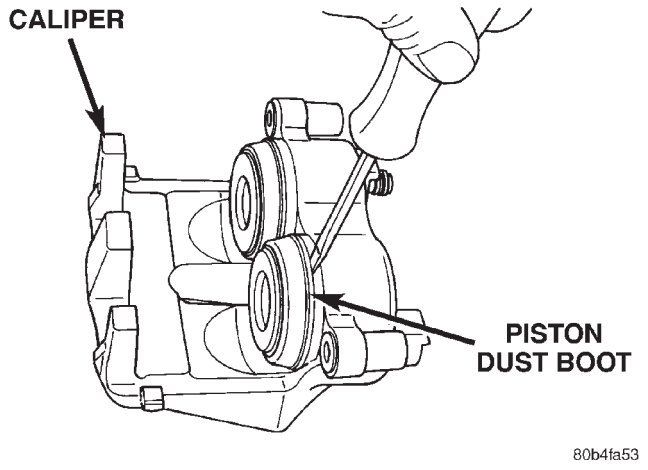


Fig. 65 Piston Dust Boot Removal

(9) Remove piston seals from caliper (Fig. 66) and discard.

CAUTION: Do not scratch piston bore while removing the seals.

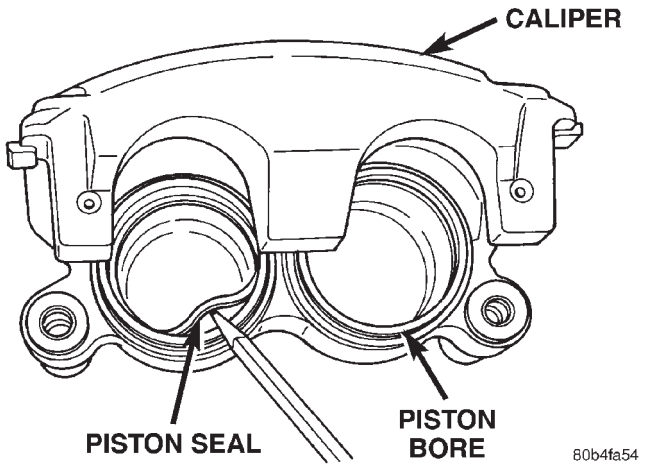


Fig. 66 Piston Seal

(10) Remove caliper slide pin bushings (Fig. 67).

(11) Remove caliper bleed screw.

ASSEMBLY

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

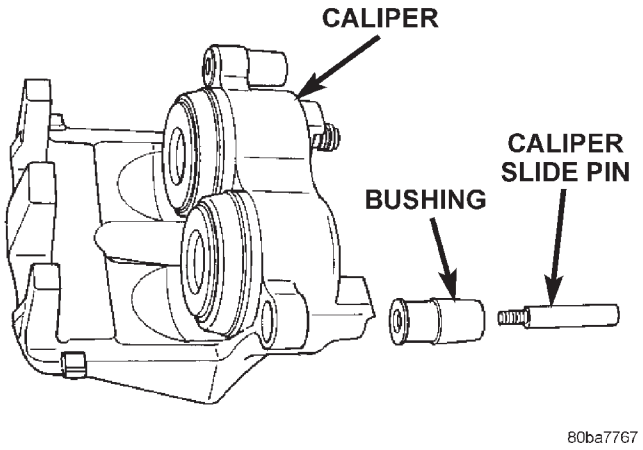


Fig. 67 Caliper Slide Pin Bushings

(1) Lubricate caliper pistons, piston seals and piston bores with clean brake fluid.

(2) Install new piston seals into seal groove with finger (Fig. 68).

NOTE: Verify seal is fully seated and not twisted.

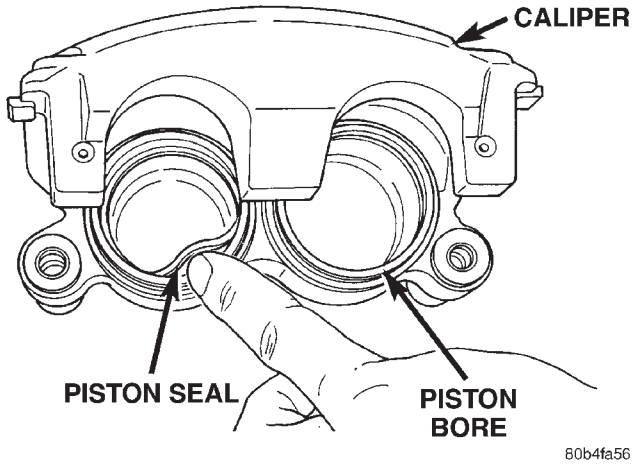


Fig. 68 Piston Seal

(3) Install new dust boot on caliper piston and seat boot lip into piston groove (Fig. 69).

(4) Stretch boot rearward to straighten boot folds, then move boot forward until folds snap into place.

(5) Install piston into caliper bore and press piston down to the bottom of the caliper bore by hand or with hammer handle (Fig. 70).

(6) Seat dust boot in caliper (Fig. 71) with Installer 8280 and Handle C-4171.

(7) Install the second piston and dust boot.

(8) Install caliper slide pin bushings into the caliper.

(9) Install caliper bleed screw.

DISASSEMBLY AND ASSEMBLY (Continued)

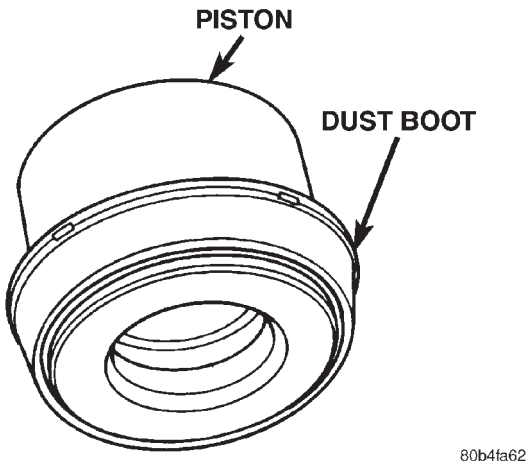


Fig. 69 Dust Boot On Piston

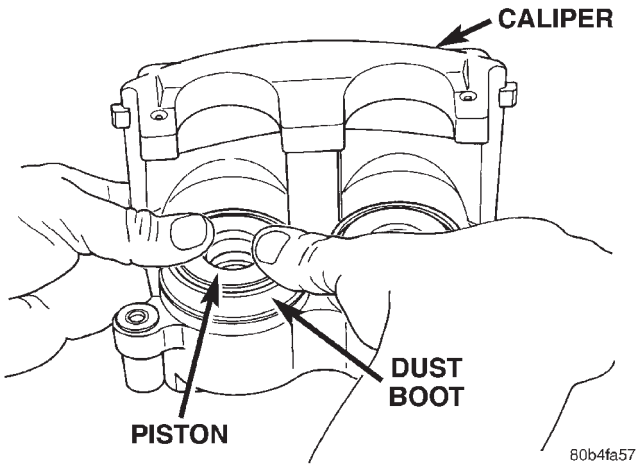


Fig. 70 Caliper Piston Installation

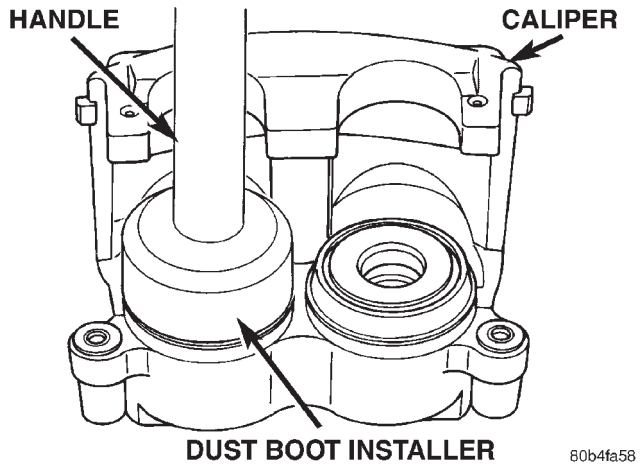


Fig. 71 Seating Dust Boot

REAR DISC BRAKE CALIPER

DISASSEMBLY

(1) Drain brake fluid out of caliper.

(2) Take a piece of wood and pad it with one-inch thickness of shop towels. Place this piece in the outboard shoe side of the caliper in front of the piston. This will cushion and protect caliper piston during removal (Fig. 72).

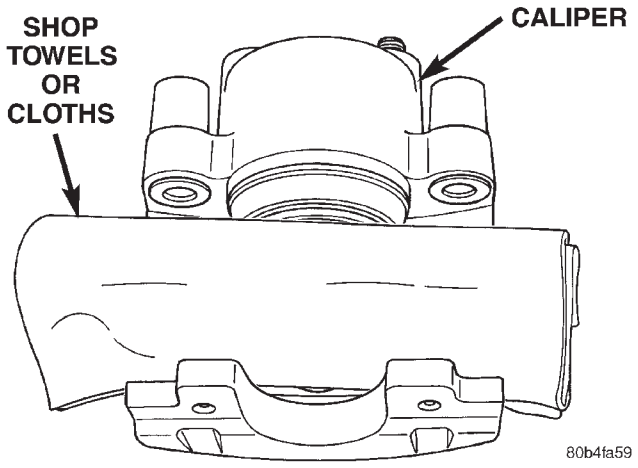


Fig. 72 Padding Caliper Interior

(3) To remove caliper piston direct **short bursts of low pressure air** with a blow gun through the caliper brake hose port (Fig. 73). Use only enough air pressure to ease the piston out.

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston.

WARNING: NEVER ATTEMPT TO CATCH THE PISTON AS IT LEAVES THE BORE. THIS MAY RESULT IN PERSONAL INJURY.

(4) Remove caliper piston dust boot with a suitable pry tool (Fig. 74) and discard.

(5) Remove piston seal from the caliper (Fig. 75) and discard.

CAUTION: Do not scratch the piston bore while removing the seal.

(6) Remove caliper slide pin bushings (Fig. 76).

(7) Remove caliper bleed screw.

ASSEMBLY

CAUTION: Dirt, oil, and solvents can damage caliper seals. Insure assembly area is clean and dry.

DISASSEMBLY AND ASSEMBLY (Continued)

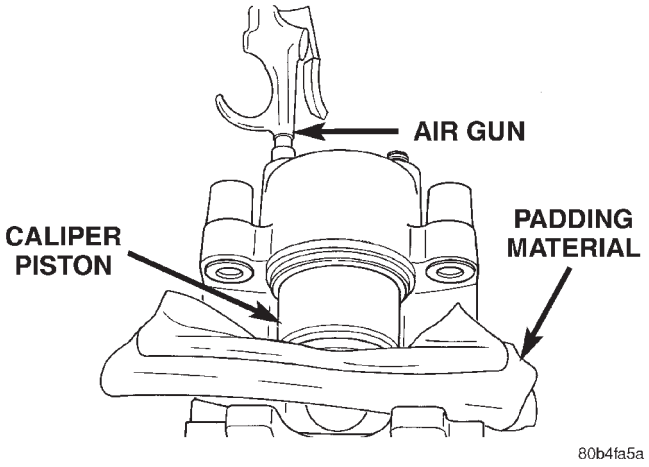


Fig. 73 Caliper Piston Removal

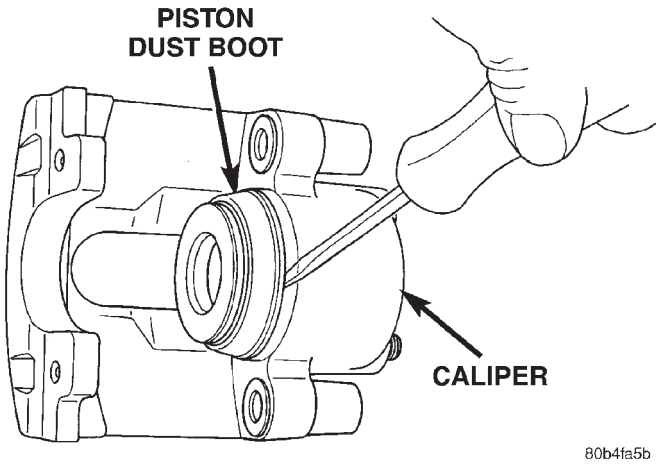


Fig. 74 Caliper Piston Dust Boot Removal

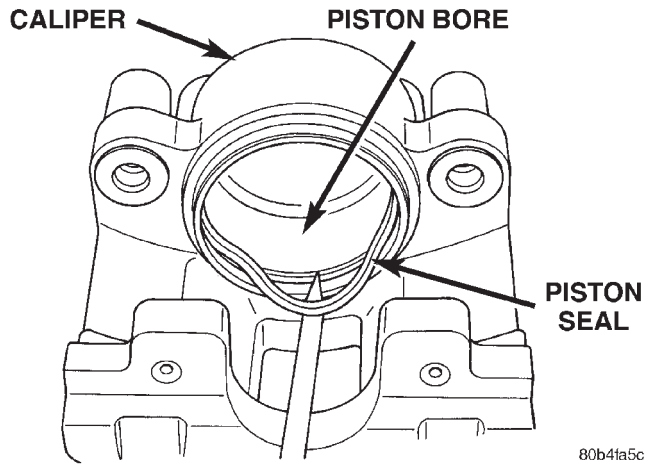


Fig. 75 Piston Seal Removal

(1) Lubricate caliper piston, piston seal and piston bore with clean brake fluid.

(2) Install new piston seal into seal groove with finger (Fig. 77).

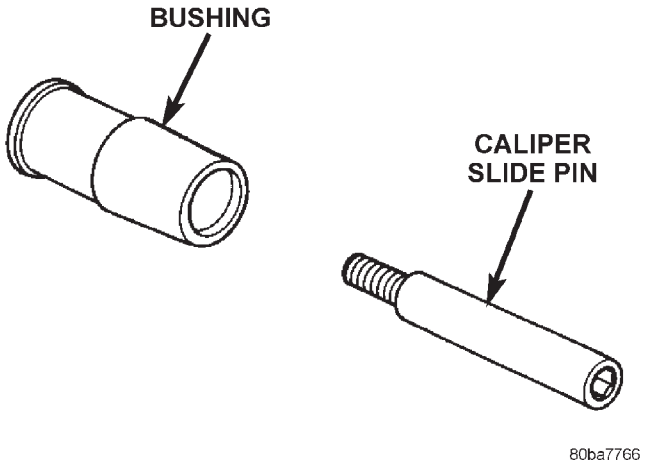


Fig. 76 Slide Pin And Bushing

NOTE: Verify seal is fully seated and not twisted.

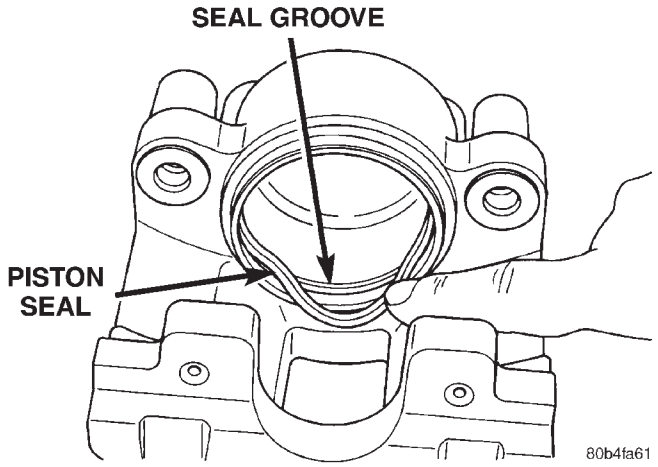


Fig. 77 Piston Seal Installation

(3) Install new dust boot on caliper piston and seat boot lip into piston groove (Fig. 78).

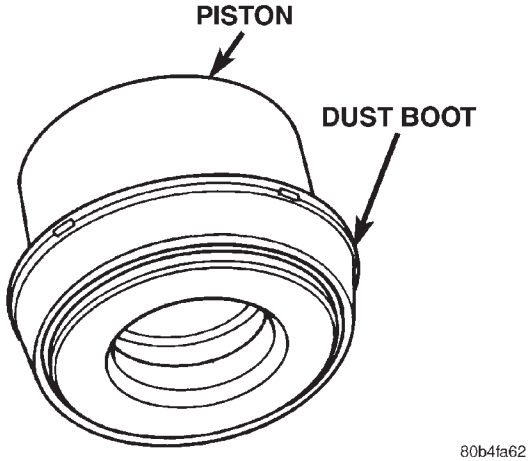


Fig. 78 Dust Boot On Piston

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Stretch boot rearward to straighten boot folds, then move boot forward until folds snap into place.

(5) Install piston into caliper bore and press piston down to the bottom of the caliper bore by hand or with hammer handle (Fig. 79).

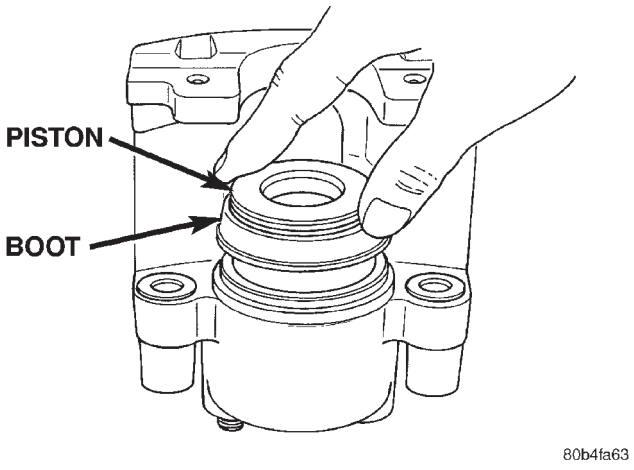


Fig. 79 Caliper Piston Installation

(6) Seat dust boot in caliper with Installer 8280 and Handle C-4171 (Fig. 80).

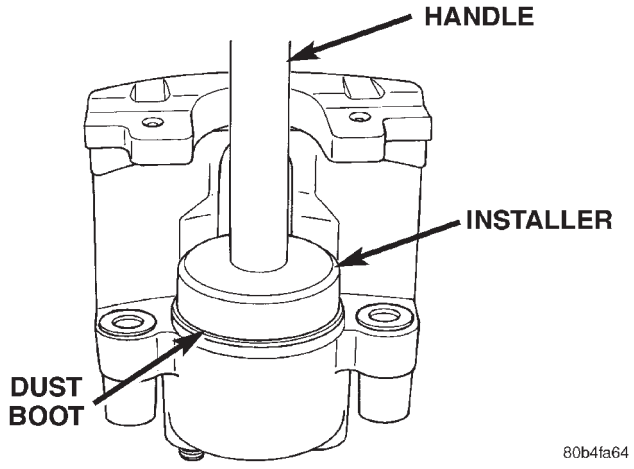


Fig. 80 Piston Dust Boot Installation

(7) Install caliper slide pin bushings into the caliper (Fig. 81).

(8) Install caliper bleed screw.

CLEANING AND INSPECTION

CALIPER

CLEANING

Clean the caliper components with clean brake fluid or brake clean only. Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

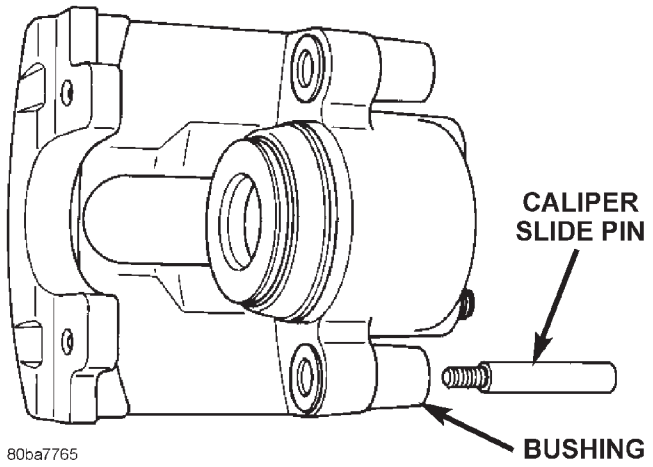


Fig. 81 Slide Pin And Bushing

CAUTION: Do not use gasoline, kerosene, thinner, or similar solvents. These products may leave a residue that could damage the piston and seal.

INSPECTION

The piston is made from a phenolic resin (plastic material) and should be smooth and clean.

The piston must be replaced if cracked or scored. Do not attempt to restore a scored piston surface by sanding or polishing.

CAUTION: If the caliper piston is replaced, install the same type of piston in the caliper. Never interchange phenolic resin and steel caliper pistons. The pistons, seals, seal grooves, caliper bore and piston tolerances are different.

The bore can be **lightly** polished with a brake hone to remove very minor surface imperfections (Fig. 82). The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

ADJUSTMENTS

BRAKE LAMP SWITCH

(1) Press and hold brake pedal in applied position.

(2) Pull switch plunger all the way out to fully extended position.

(3) Release brake pedal. Then pull pedal lightly rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make ratcheting sound as it self adjusts.

CAUTION: Booster damage may occur if the pedal pull exceeds 20 lbs.

ADJUSTMENTS (Continued)

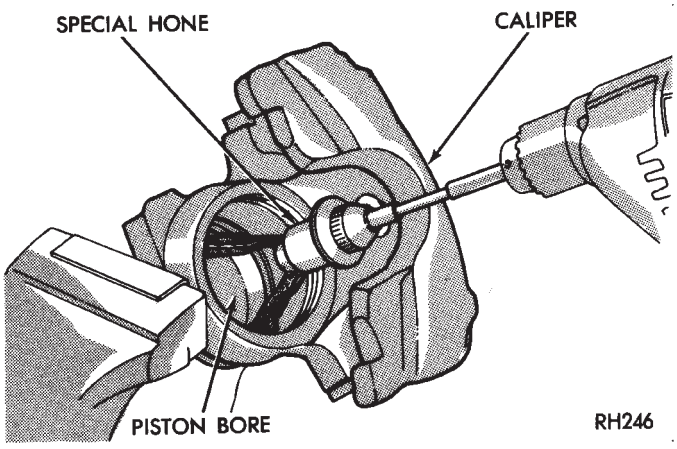


Fig. 82 Polishing Piston Bore

PARKING BRAKE SHOE

(1) Remove wheel and tire assemblies.
(2) Secure rotor with two wheel nuts.
(3) Remove rubber access plug from back of splash shield.
(4) Insert brake tool through access hole in splash shield (Fig. 83). Position tool at bottom of star wheel.

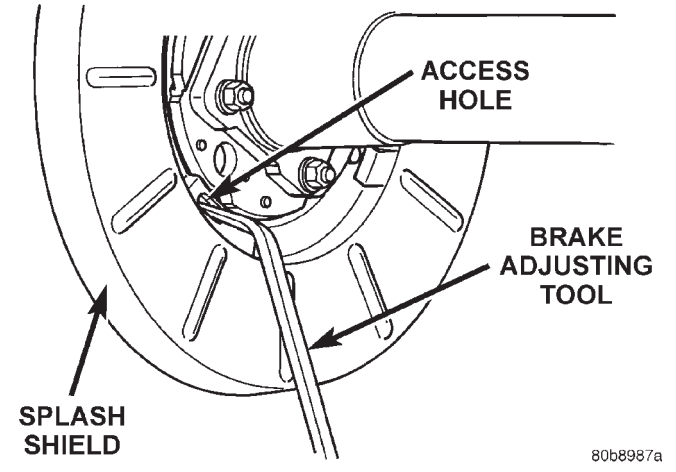


Fig. 83 Park Brake Shoe Adjustment

(5) Rotate star wheel upward in counterclockwise direction to expand shoes (while facing front of vehicle).
(6) Expand shoes until light drag is experienced. Then back off adjuster screw only enough to eliminate drag.
(7) Install plug in splash shield access hole.
(8) Install wheel and tire assemblies.

SPECIFICATIONS

BRAKE FLUID

The brake fluid used in this vehicle must conform to DOT 3 specifications and SAE J1703 standards. No other type of brake fluid is recommended or approved for usage in the vehicle brake system. Use only Mopar brake fluid or an equivalent from a tightly sealed container.

CAUTION: Never use reclaimed brake fluid or fluid from an container which has been left open. An open container will absorb moisture from the air and contaminate the fluid.

CAUTION: Never use any type of a petroleum-based fluid in the brake hydraulic system. Use of such type fluids will result in seal damage of the vehicle brake hydraulic system causing a failure of the vehicle brake system. Petroleum based fluids would be items such as engine oil, transmission fluid, power steering fluid, etc.

BRAKE COMPONENTS

Front Disc Brake Caliper
Type . . . . . Floating
Pistons . . . . . 48 mm (1.889 in.)
Front Disc Brake Rotor
Type . . . . . Ventilated
Diameter . . . . . 305 mm (12 in.)
Max. Runout . . . . . 0.76 mm (0.003 in.)
Max. Thickness Variation . 0.0127 mm (0.0005 in.)
Min. Thickness . . . . . 24.5 mm (0.9646 in.)
Rear Disc Brake Caliper
Type . . . . . Floating
Piston . . . . . 48 mm (1.889 in.)
Rear Disc Brake Rotor
Type . . . . . Solid
Diameter . . . . . 305 mm (12 in.)
Max. Runout . . . . . 0.76 mm (0.003 in.)
Max. Thickness Variation . 0.0127 mm (0.0005 in.)
Min. Thickness . . . . . 8.5 mm (0.335 in.)
Drum Max. Diameter . . . . . 196 mm (7.7166 in.)
Brake Booster
Type . . . . . Dual Diaphragm

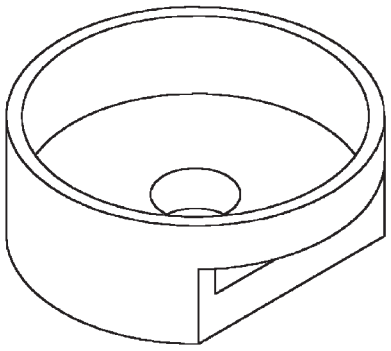
SPECIFICATIONS (Continued)

TORQUE CHART

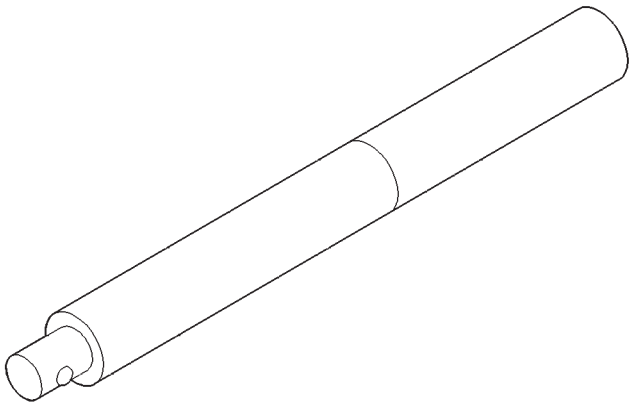
DESCRIPTION	TORQUE
Brake Pedal	
Support Bolt	23-34 N·m (17-25 ft. lbs.)
Pivot Nut	27-35 N·m (20-26 ft. lbs.)
Brake Booster	
Mounting Nuts	39 N·m (29 ft. lbs.)
Master Cylinder	
Mounting Nuts	25 N·m (18 ft. lbs.)
Primary Brake Line	16 N·m (144 in. lbs.)
Secondary Brake Line	16 N·m (144 in. lbs.)
Front Caliper	
Slide Pins	29-41 N·m (21-30 ft. lbs.)
Anchor Bolts	90-115 N·m (66-85 ft. lbs.)
Brake Hose Banjo Bolt	31 N·m (23 ft. lbs.)
Bleed Screw	16 N·m (144 in. lbs.)
Rear Caliper	
Slide Pins	29-41 N·m (21-30 ft. lbs.)
Anchor Bolts	90-115 N·m (66-85 ft. lbs.)
Brake Hose Banjo Bolt	31 N·m (23 ft. lbs.)
Bleed Screw	16 N·m (144 in. lbs.)

SPECIAL TOOLS

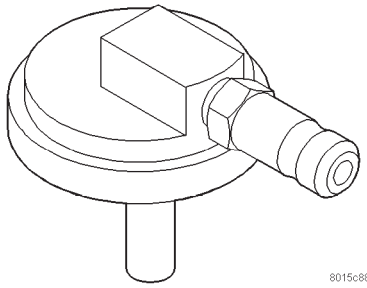
BASE BRAKES



Installer Caliper Dust Boot 8280



Handle C-4171



Adapter Pressure Bleeder 6921

ANTILOCK BRAKES

INDEX

DESCRIPTION AND OPERATION

ANTILOCK BRAKE SYSTEM

The antilock brake system (ABS) is an electronically operated, all wheel brake control system.

The hydraulic system is a three channel design. The front wheel brakes are controlled individually and the rear wheel brakes in tandem (Fig. 1). The ABS electrical system is separate from other electrical circuits in the vehicle. A specially programmed controller antilock brake unit operates the system components.

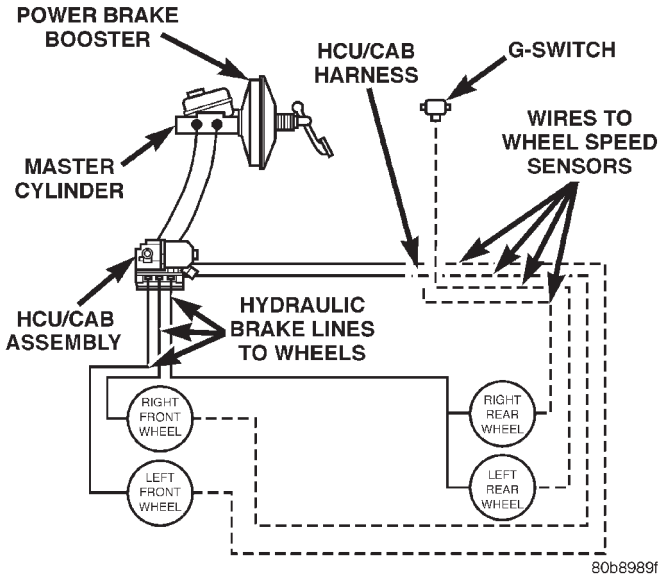


Fig. 1 Antilock Brake System

ABS system major components include:
- Controller Antilock Brakes (CAB)
- Hydraulic Control Unit (HCU)
- Wheel Speed Sensors (WSS)
- G-Switch
- ABS Warning Lamp

The purpose of the antilock system is to prevent wheel lockup during periods of high wheel slip. Preventing lockup helps maintain vehicle braking action and steering control.

The antilock CAB activates the system whenever sensor signals indicate periods of high wheel slip. High wheel slip can be described as the point where wheel rotation begins approaching 20 to 30 percent of actual vehicle speed during braking. Periods of high wheel slip occur when brake stops involve high pedal pressure and rate of vehicle deceleration.

Battery voltage is supplied to the CAB ignition terminal when the ignition switch is turned to Run position. The CAB performs a system initialization procedure at this point. Initialization consists of a static and dynamic self check of system electrical components.

The static check occurs after the ignition switch is turned to Run position. The dynamic check occurs when vehicle road speed reaches approximately 30 kph (18 mph). During the dynamic check, the CAB briefly cycles the pump and solenoids to verify operation.

If an ABS component exhibits a fault during initialization, the CAB illuminates the amber warning lamp and registers a fault code in the microprocessor memory.

ELECTRONIC BRAKE DISTRIBUTION

The electronic brake distribution (EBD) functions like a rear proportioning valve. The EBD system uses the ABS system to control the slip of the rear wheels in partial braking range. The braking force of the rear wheels is controlled electronically by using the inlet and outlet valves located in the HCU.

DESCRIPTION AND OPERATION (Continued)

Upon entry into EBD the inlet valve for the rear brake circuit is switched on so that the fluid supply from the master cylinder is shut off. In order to decrease the rear brake pressure the outlet valve for the rear brake circuit is pulsed. This allows fluid to enter the low pressure accumulator (LPA) in the HCU resulting in a drop in fluid pressure to the rear brakes. In order to increase the rear brake pressure the outlet valve is switched off and the inlet valve is pulsed. This increases the pressure to the rear brakes. This will continue until the required slip difference is obtained. At the end of EBD braking (no brake application) the fluid in the LPA drains back to the master cylinder by switching on the outlet valve and draining through the inlet valve check valve. At the same time the inlet valve is switched on in case of another brake application.

The EBD will remain functional during many ABS fault modes. If the red and amber warning lamps are illuminated the EBD may have a fault.

ANTILOCK BRAKING

The antilock system prevents lockup during high slip conditions by modulating fluid apply pressure to the wheel brake units.

Brake fluid apply pressure is modulated according to wheel speed, degree of slip and rate of deceleration. A sensor at each wheel converts wheel speed into electrical signals. These signals are transmitted to the CAB for processing and determination of wheel slip and deceleration rate.

The ABS system has three fluid pressure control channels. The front brakes are controlled separately and the rear brakes in tandem. A speed sensor input signal indicating a high slip condition activates the CAB antilock program.

Two solenoid valves are used in each antilock control channel. The valves are all located within the HCU valve body and work in pairs to either increase, hold, or decrease apply pressure as needed in the individual control channels.

The solenoid valves are not static during antilock braking. They are cycled continuously to modulate pressure. Solenoid cycle time in antilock mode can be measured in milliseconds.

CONTROLLER ANTILOCK BRAKES

The CAB monitors wheel speed sensor inputs continuously while the vehicle is in motion. However, the CAB will not activate any ABS components as long as sensor inputs and the acceleration switch indicate normal braking.

The CAB is mounted to the HCU and operates the ABS system (Fig. 2) separate from other vehicle electrical circuits. CAB voltage source is through the ignition switch in the RUN position.

The CAB contains dual microprocessors. A logic block in each microprocessor receives identical sensor signals. These signals are processed and compared simultaneously.

The CAB contains a self check program that illuminates the ABS warning light when a system fault is detected. Faults are stored in a diagnostic program memory and are accessible with the DRB scan tool.

ABS faults remain in memory until cleared, or until after the vehicle is started approximately 50 times. Stored faults are **not** erased if the battery is disconnected.

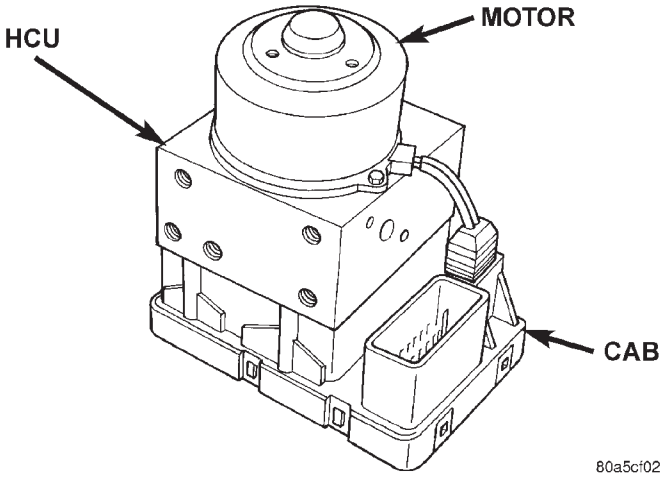


Fig. 2 Controller Antilock Brakes

HYDRAULIC CONTROL UNIT

The HCU consists of a valve body, pump motor, and wire harness (Fig. 2).

Accumulators in the valve body store extra fluid released to the system for ABS mode operation. The pump provides the fluid volume needed and is operated by a DC type motor. The motor is controlled by the CAB.

The valves modulate brake pressure during antilock braking and are controlled by the CAB.

The HCU provides three channel pressure control to the front and rear brakes. One channel controls the rear wheel brakes in tandem. The two remaining channels control the front wheel brakes individually.

During antilock braking, the solenoid valves are opened and closed as needed. The valves are not static. They are cycled rapidly and continuously to modulate pressure and control wheel slip and deceleration.

During normal braking, the HCU solenoid valves and pump are not activated. The master cylinder and power booster operate the same as a vehicle without an ABS brake system.

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure increase,

DESCRIPTION AND OPERATION (Continued)

pressure hold, and pressure decrease. The valves are all contained in the valve body portion of the HCU.

Pressure Decrease

The outlet valve is opened and the inlet valve is closed during the pressure decrease cycle.

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB closes the inlet then opens the outlet valve, which also opens the return circuit to the accumulators. Fluid pressure is allowed to bleed off (decrease) as needed to prevent wheel lock.

Once the period of high wheel slip has ended, the CAB closes the outlet valve and begins a pressure increase or hold cycle as needed.

Pressure Hold

Both solenoid valves are closed in the pressure hold cycle. Fluid apply pressure in the control channel is maintained at a constant rate. The CAB maintains the hold cycle until sensor inputs indicate a pressure change is necessary.

Pressure Increase

The inlet valve is open and the outlet valve is closed during the pressure increase cycle. The pressure increase cycle is used to counteract unequal wheel speeds. This cycle controls re-application of fluid apply pressure due to changing road surfaces or wheel speed.

WHEEL SPEED SENSORS AND TONE WHEEL

A wheel speed sensor is used at each wheel. The front sensors are mounted to the steering knuckles. The rear sensors are mounted at the outboard end of the axle. Tone wheels are mounted to the outboard ends of the front and rear axle shafts. The gear type tone wheel serves as the trigger mechanism for each sensor.

The sensors convert wheel speed into a small digital signal. The CAB sends 12 volts to the sensors. The sensor has an internal magneto resistance bridge that alters the voltage and amperage of the signal circuit. This voltage and amperage is changed by magnetic induction when the toothed tone wheel passes the wheel speed sensor. This digital signal is sent to the CAB. The CAB measures the voltage and amperage of the digital signal for each wheel.

G-SWITCH

The G-switch (Fig. 3) is located under the rear seat. The switch is monitored by the CAB at all times. The switch contains three mercury switches which monitor vehicle deceleration rates (G-force). Sudden changes in deceleration rates trigger the switch, sending a signal to the CAB.

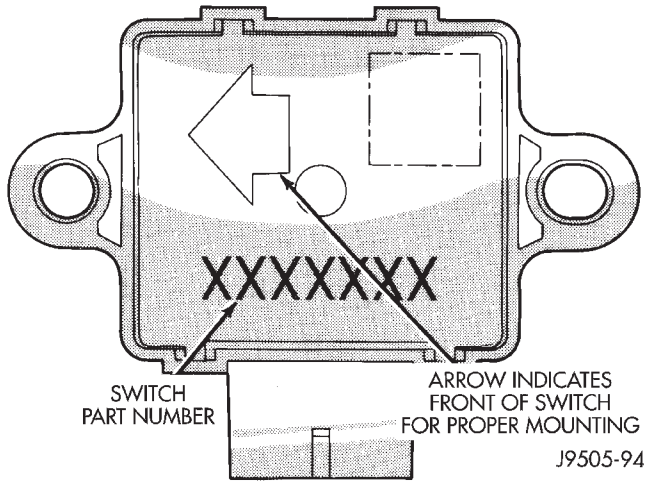


Fig. 3 G-Switch

ABS WARNING LAMP

The amber ABS warning lamp is located in the instrument cluster. The lamp illuminates at start-up to perform a self check. The lamp goes out when the self check program determines the system is operating normal. If an ABS component exhibits a fault the CAB will illuminate the lamp and register a trouble code in the microprocessor. The lamp is controlled by the CAB. The CAB controls the lamp sending a message to the instrument cluster.

A red warning lamp with a amber warning lamp may indicate a electronic brake distribution fault.

DIAGNOSIS AND TESTING

ANTILOCK BRAKES

The ABS brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the systems input and output circuits to verify the system is operating correctly. If the on board diagnostic system senses that a circuit is malfunctioning the system will set a trouble code in its memory.

NOTE: An audible noise may be heard during the self-test. This noise should be considered normal.

NOTE: The MDS or DRB III scan tool is used to diagnose the ABS system. For additional information refer to the Antilock Brake section in Group 8W. For test procedures refer to the Chassis Diagnostic Manual.

SERVICE PROCEDURES

BLEEDING ABS BRAKE SYSTEM

ABS system bleeding requires conventional bleeding methods plus use of the DRB scan tool. The procedure involves performing a base brake bleeding, followed by use of the scan tool to cycle and bleed the HCU pump and solenoids. A second base brake bleeding procedure is then required to remove any air remaining in the system.

(1) Perform base brake bleeding. Refer to base brake section for procedure.

(2) Connect scan tool to the Data Link Connector.

(3) Select ANTILOCK BRAKES, followed by MISCELLANEOUS, then ABS BRAKES. Follow the instructions displayed. When scan tool displays TEST COMPLETE, disconnect scan tool and proceed.

(4) Perform base brake bleeding a second time. Refer to base brake section for procedure.

(5) Top off master cylinder fluid level and verify proper brake operation before moving vehicle.

REMOVAL AND INSTALLATION

CONTROLLER ANTILOCK BRAKES

REMOVAL

(1) Remove negative battery cable from the battery.

(2) Remove air cleaner housing refer to Group 14 Fuel System.

(3) Pull CAB harness connector release up and remove connector (Fig. 4).

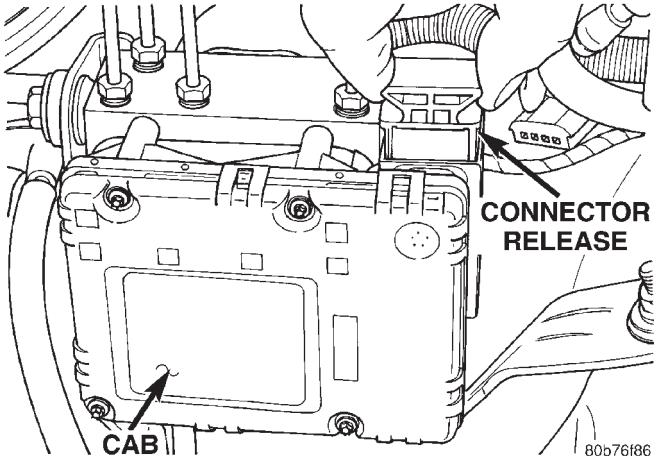


Fig. 4 CAB Connector Release

(4) Remove pump motor connector.

(5) Remove CAB mounting bolts (Fig. 5) and remove the CAB from the HCU.

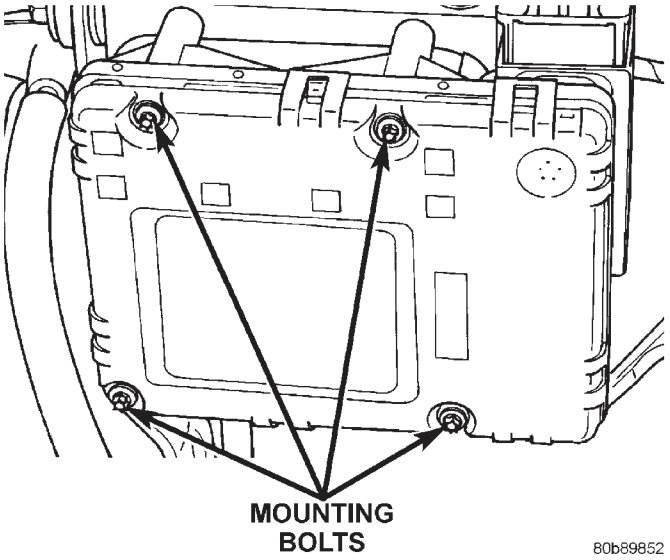


Fig. 5 CAB Mounting Bolts

INSTALLATION

(1) Install the CAB onto the HCU and tighten mounting bolts to 1.8 N·m (16 in. lbs.).

(2) Install pump motor connector.

(3) Install CAB harness connector and push down connector release.

(4) Install air cleaner housing.

(5) Install negative battery cable to the battery.

HYDRAULIC CONTROL UNIT/CONTROLLER ANTILOCK BRAKES

REMOVAL

(1) Remove negative battery cable from the battery.

(2) Remove air cleaner housing refer to Group 14 Fuel System.

(3) Pull CAB harness connector release up and remove connector (Fig. 6).

(4) Remove the brake lines from the HCU.

(5) Remove HCU/CAB side mounting bolt and two rear mounting bolts (Fig. 7).

(6) Remove HCU/CAB assembly from the vehicle.

INSTALLATION

(1) Install HCU/CAB assembly into the mounting bracket and tighten mounting bolts to 12 N·m (9 ft. lbs.).

(2) Install the brake lines to the HCU and tighten to 16 N·m (12 ft. lbs.).

(3) Install CAB harness connector and push down connector release.

(4) Install air cleaner housing.

(5) Install negative battery cable to the battery.

(6) Bleed base and ABS brake systems.

REMOVAL AND INSTALLATION (Continued)

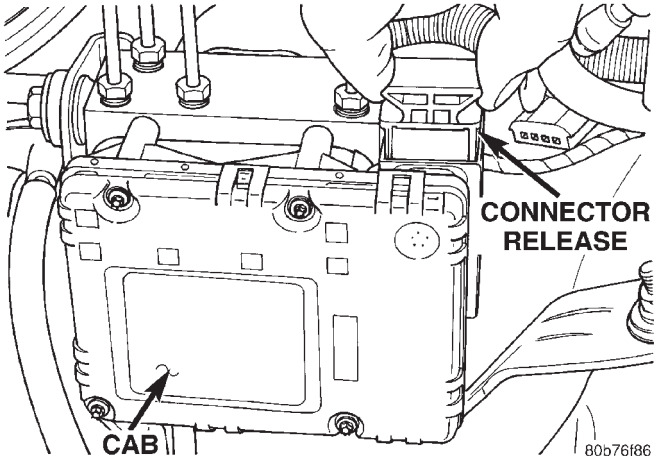


Fig. 6 CAB Connector Release

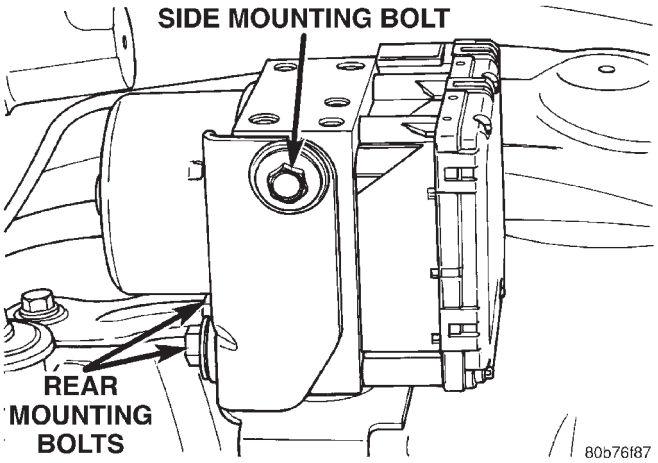


Fig. 7 HCU/CAB Assembly

FRONT WHEEL SPEED SENSOR

REMOVAL

(1) Raise and support vehicle.

(2) Remove front wheel sensor mounting bolt (Fig. 8).

(3) Remove the sensor from the steering knuckle.

(4) Disengage sensor wire from the brackets (Fig. 8) on the steering knuckle.

(5) Disconnect the sensor from the sensor harness (Fig. 9) and (Fig. 10).

(6) Remove sensor and wire.

INSTALLATION

(1) Install the sensor on the steering knuckle.

(2) Apply Mopar Lock N' Seal or Loctite® 242 to sensor mounting bolt. Use new sensor bolt if original bolt is worn or damaged.

(3) Install the sensor mounting bolt and tighten bolt to 12-14 N·m (106-124 in. lbs.).

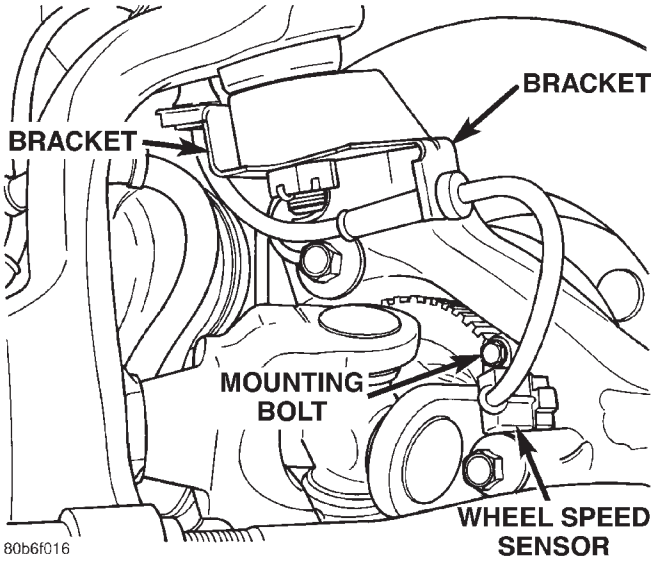


Fig. 8 Sensor Location

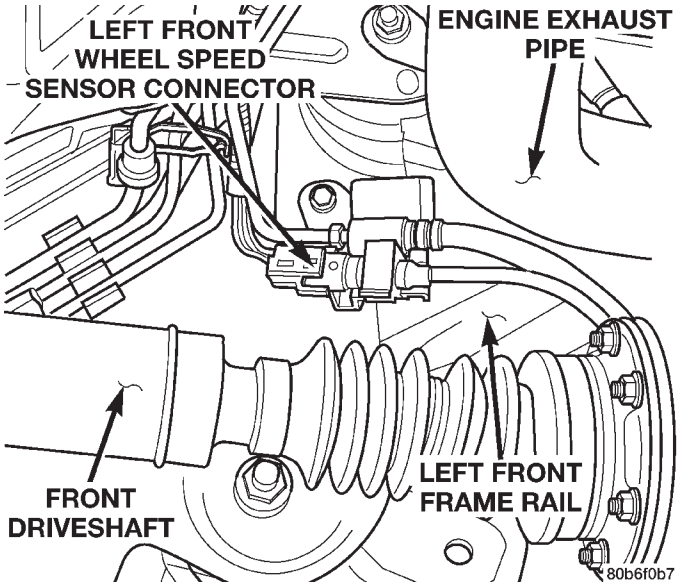


Fig. 9 Left Sensor Connector

(4) Engage grommets on sensor wire to the steering knuckle brackets.

(5) Connect sensor wire to harness connector.

(6) Check sensor wire routing. Be sure wire is clear of all chassis components and is not twisted or kinked at any spot.

(7) Remove support and lower vehicle.

REAR WHEEL SPEED SENSOR

REMOVAL

(1) Raise and fold rear seat forward. Then move carpeting aside for access to rear sensor connectors.

(2) Disconnect rear sensor wire at harness connectors (Fig. 11).

REMOVAL AND INSTALLATION (Continued)

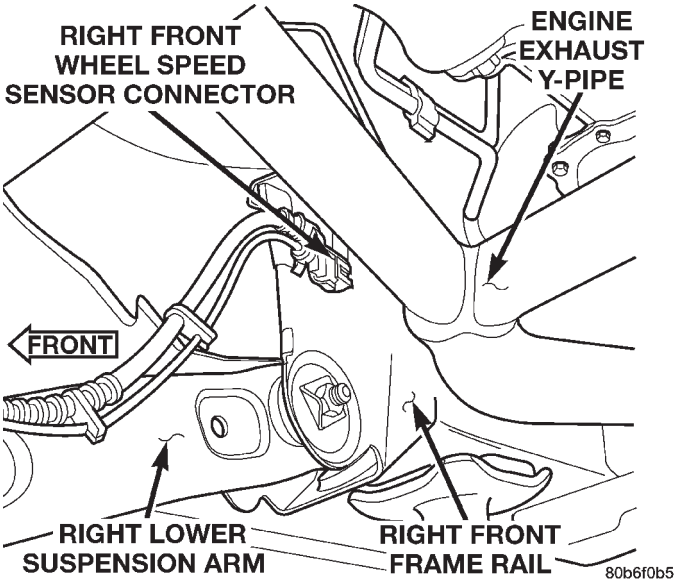


Fig. 10 Right Sensor Connector

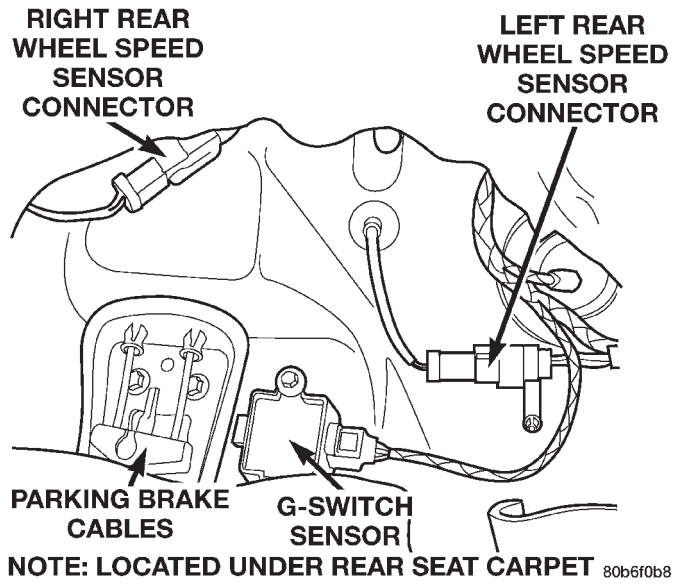


Fig. 11 Rear Sensor Connector

(3) Push sensor wires and grommets through floorpan holes.

(4) Raise and support the vehicle.

(5) Disengage sensor wire from axle and chassis brackets and from brake line retainers.

(6) Remove the sensor mounting bolt from the rear brake backing plate (Fig. 12).

(7) Remove sensor from the backing plate.

INSTALLATION

(1) Insert sensor through the backing plate (Fig. 13).

(2) Apply Mopar Lock N' Seal or Loctite 242 to original sensor bolt. Use new bolt if original is worn or damaged.

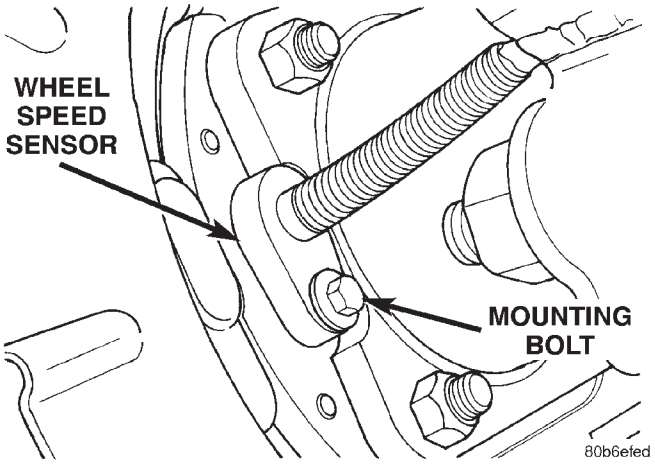


Fig. 12 Sensor Mounting Bolt

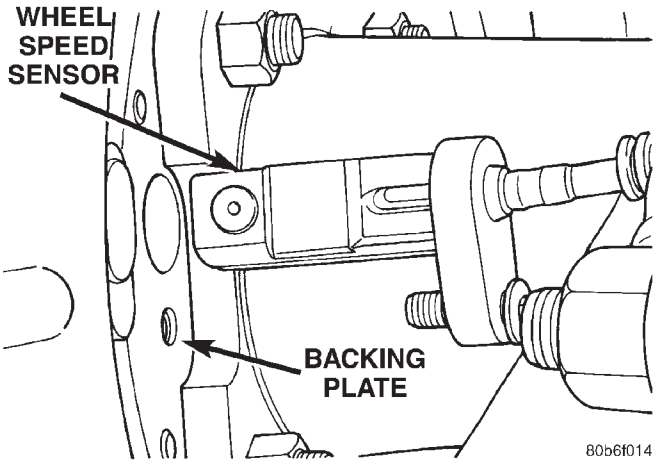


Fig. 13 Wheel Speed Sensor

(3) Tighten sensor bolt to 12-14 N·m (106-124 in. lbs.).

(4) Secure sensor wire in brackets and in retainers on rear brake lines. Verify that sensor wire is secure and clear of rotating components.

(5) Route sensor wires to rear seat area.

(6) Feed sensor wires through floorpan access hole and seat sensor grommets in floorpan.

(7) Remove support and lower the vehicle.

(8) Fold rear seat and carpet forward for access to sensor wires and connectors.

(9) Connect sensor wires to harness connectors.

(10) Reposition carpet and fold rear seat down.

G-SWITCH

REMOVAL

(1) Fold the rear seat bottom assembly up for access to the switch.

(2) Lift up the carpeting and disconnect switch harness (Fig. 14).

REMOVAL AND INSTALLATION (Continued)

(3) Remove the switch mounting bolts and remove the switch.

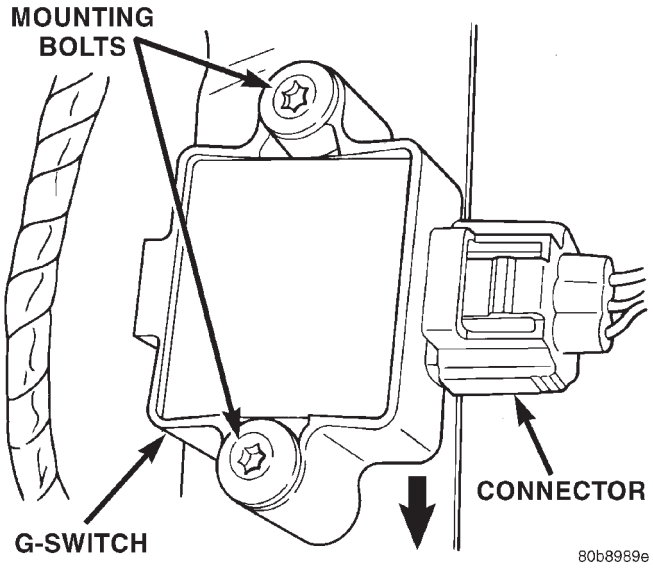


Fig. 14 G-Switch Mounting

INSTALLATION

CAUTION: The mercury switch (inside the G-Switch), will not function properly if the switch is installed incorrectly. Verify that the switch locating arrow is pointing to the front of the vehicle (Fig. 15).

(1) Note position of locating arrow on switch. Position switch so arrow faces forward.

(2) Install the switch and tighten mounting bolts to 5.6 N·m (50 in. lbs.).

(3) Connect harness to switch. Be sure harness connector is firmly seated.

(4) Place the carpet in position and fold the rear seat back down.

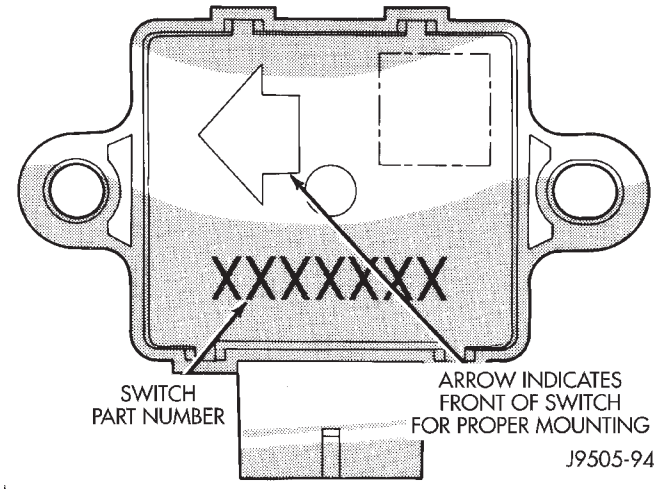


Fig. 15 G-Switch

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
G-Sensor	
Sensor Bolt	5.6 N·m (50 in. lbs.)
Hydraulic Control Unit/Controller Antilock Brakes	
Mounting Bolts	12 N·m (9 ft. lbs.)
Brake Lines	16 N·m (144 in. lbs.)
CAB Screws	1.8 N·m (16 in. lbs.)
Wheel Speed Sensors	
Front Sensor Bolt	12-14 N·m (106-124 in. lbs.)
Rear Sensor Bolt	12-14 N·m (106-124 in. lbs.)