BRAKES

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GENERAL INFORMATION

BRAKE SYSTEM

All vehicles are equipped with power assist four-wheel disc brakes. Antilock (ABS) brakes are also standard equipment on all models.

Single piston, disc brake calipers are used front and rear. Ventilated disc brake rotors are used at the front and solid rotors are used at 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 combination valve is used for all applications. The valve contains a pressure differential switch and rear brake proportioning valve.

SERVICE WARNINGS & CAUTIONS

WARNING: DUST AND DIRT ACCUMULATING ON BRAKE PARTS DURING NORMAL USE MAY CONTAIN ASBESTOS FIBERS. 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. 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.

Use Mopar multi-mileage or high temperature grease to lubricate caliper slide surfaces, drum brake pivot pins, and shoe contact points on the backing plates. Use multi-mileage grease or GE 661 or Dow 111 silicone grease on caliper bushings and slide pins to ensure proper operation.

DESCRIPTION AND 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 and instrument panels.

The brake pedal is a serviceable component. The pedal, pivot pin, sleeve, pedal bushings and spacers/washers are all replaceable parts. The pedal bracket can also be replaced when necessary.

STOP LAMP SWITCH

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

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 panel.

The red warning light alerts the driver if a pressure differential exists between the front and rear hydraulic systems. The light also alerts the driver when the parking brakes are applied.

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 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.

DESCRIPTION AND OPERATION (Continued)

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 pressure for power assist.

MASTER CYLINDER

The master cylinder has a removable nylon reservoir (Fig. 2). The 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 reservoir and grommets are the only replaceable parts on the master cylinder.

COMBINATION VALVE

The combination valve contains a pressure differential valve and switch and a rear brake proportioning valve. The valve is not repairable. It must be replaced if diagnosis indicates this is necessary.

The pressure differential switch is connected to the brake warning light. The switch is actuated by movement of the switch valve. The switch monitors fluid

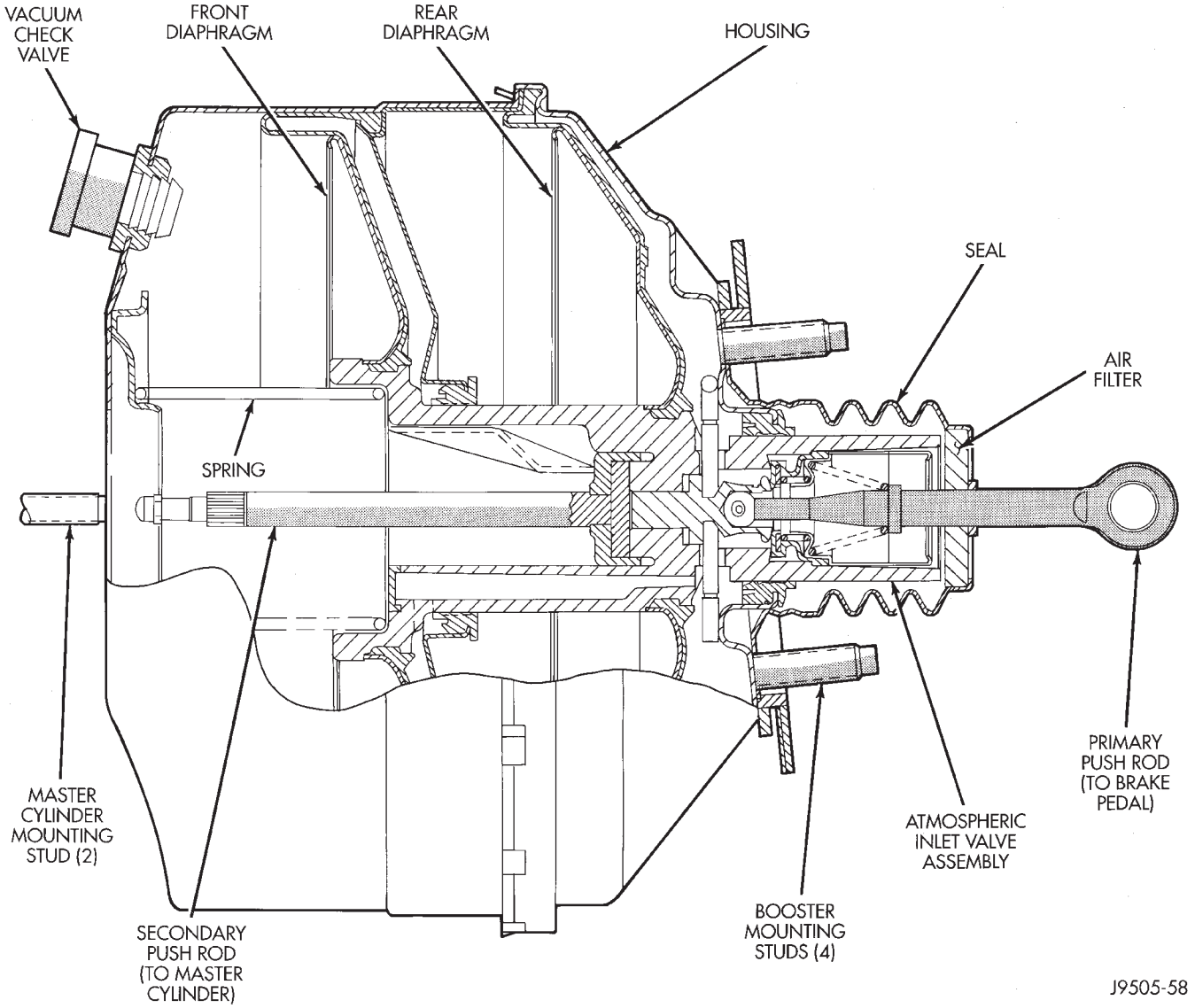


Fig. 1 Power Brake Booster

DESCRIPTION AND OPERATION (Continued)

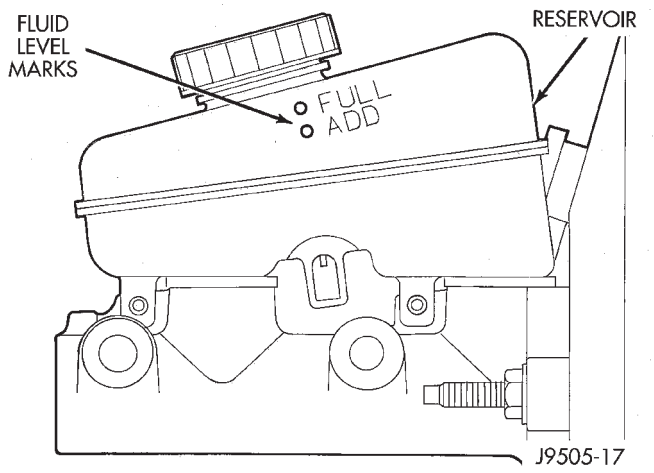


Fig. 2 Master Cylinder

pressure in the separate front/rear brake hydraulic circuits.

A decrease or loss of fluid pressure in either hydraulic circuit will cause the switch valve to shuttle to the low pressure side. Movement of the valve pushes the switch plunger upward. This action closes the switch internal contacts completing the electrical circuit to the red warning light. The switch valve will remain in an actuated position until repairs are made.

The rear proportioning valve is used to balance front-rear brake action. The valve allows normal fluid flow during moderate effort brake stops. The valve only controls (meters) fluid flow during high effort brake stops.

FRONT DISC BRAKES

The calipers are a single piston type. The calipers are free to slide laterally, this allows continuous compensation for lining wear.

When the brake are applied fluid pressure is exerted against the caliper piston. The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal (Fig. 3).

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

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will stop the rotors from turning and bring the vehicle to a stop.

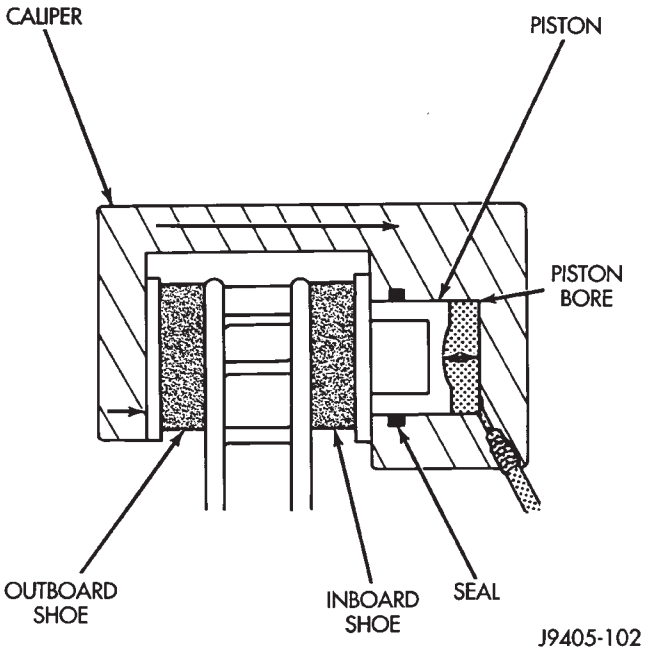


Fig. 3 Brake Caliper Operation

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brakeshoes 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 seal controls the amount of piston extension needed to compensate for normal lining wear.

During brake application, the seal is deflected outward by fluid pressure and piston movement (Fig. 4). When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston.

The amount of piston retraction is determined by brakelining wear. Generally the amount is just enough to maintain contact between the piston and inboard brakeshoe.

REAR DISC BRAKES

Rear disc brake components consist of single piston, floating-type, rear disc brake calipers and solid rotors.

The rear calipers are mounted in a bracket attached to the rear axle tube flange (Fig. 5). The calipers are secured to the bracket with mounting bolts. The bracket also secures the rear disc brake rotor splash shield to the tube flange.

The rotor and splash shield used for rear disc brake applications are unique. The parking brake-

DESCRIPTION AND OPERATION (Continued)

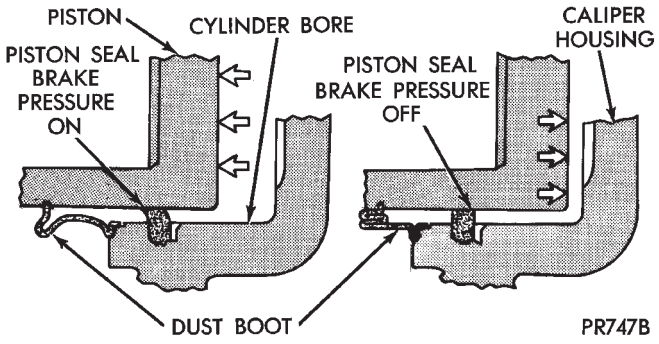


Fig. 4 Lining Wear Compensation By Piston Seal

shoes are mounted on the splash shield. The disc brake rotor has a built in brake drum surface for the parking brakeshoes (Fig. 6). Parking brakeshoe service is covered in the parking brake service section.

The outboard shoe now has an anti-rattle spring attached at the shoe rear. A wear strip is mounted to the inboard shoe.

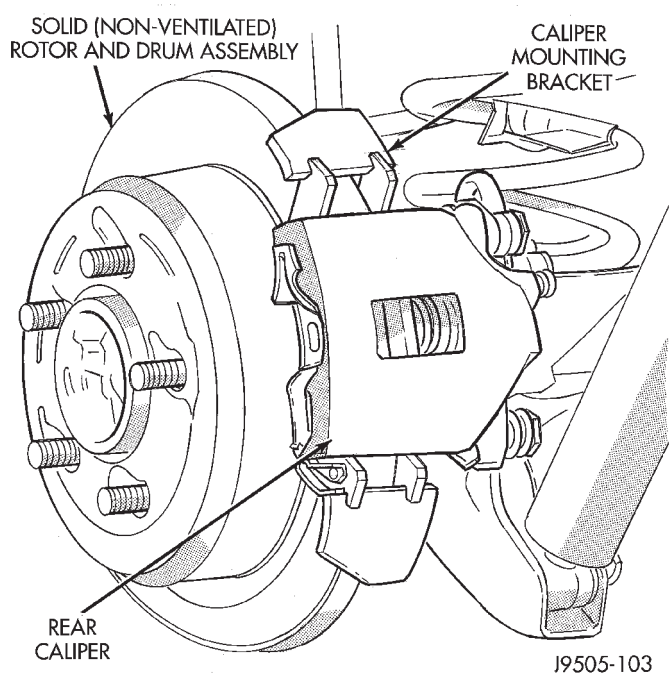


Fig. 5 Rear Disc Brake Caliper Mounting

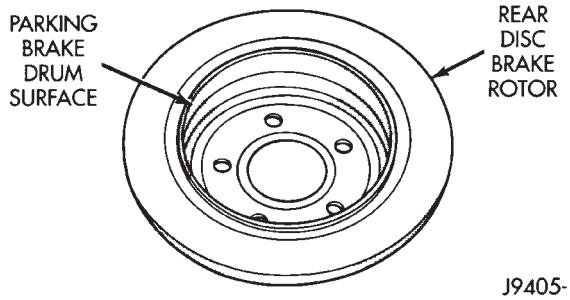


Fig. 6 Rear Disc Brake Rotor

PARKING BRAKES

The parking brakes are operated by a cable and hand lever system. Three cables are used, consisting of one front cable and two rear cables. All three cables are interconnected at the cable tensioner and equalizer mechanism. The front cable is connected to the hand lever and the rear cables are connected to the brakeshoes. Cable adjustment is performed at the tensioner which is attached to the front cable.

A separate set of brakeshoes are used for parking brake operation. The shoes are mounted on the disc brake splash shield and are enclosed within the combination disc brake rotor and parking brake drum. The rear cables are connected to a cam and lever mechanism, the cam and lever operates the shoes.

The cable is connected to the lever by a rectangular eyelet on the cable end. A retainer on the cable secures it in a bracket attached to the rear of the caliper bracket. The lever is mounted on the floorpan adjacent to the driver.

NOTE: Parking brake cable adjustment is controlled by a tensioner mechanism. The cable tensioner, once adjusted at the factory, will not need further adjustment under normal circumstances. There are only time a adjustment is required is when the tensioner, or cables have been replaced or disconnected.

BRAKE HOSES AND LINES

Flexible rubber hose is used at both front brakes and at the rear axle junction block. Double walled steel tubing is used to connect the master cylinder to the major hydraulic braking components and then to the flexible rubber hoses.

DIAGNOSIS AND TESTING

BASE BRAKE SYSTEM

Base brake components consist of the brakeshoes, calipers, wheel cylinders, brake drums, rotors, brakelines, master cylinder, booster, and parking brake components.

Brake diagnosis involves determining if the problem is related to a mechanical, hydraulic, 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

DIAGNOSIS AND TESTING (Continued)

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 front disc 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, wheel cylinders, brakelines, and master cylinder.

(b) If fluid appears contaminated, drain out a sample. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals and cups 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 pedal. 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) 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.

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 brakeline, fitting, hose, or caliper/wheel cylinder. Internal leakage in the master cylinder caused by worn or damaged piston cups, may also be the problem cause.

If leakage is severe, fluid will be evident at or around the leaking component. However, internal leakage in the master cylinder may not be physically evident.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up, worn lining, rotors, or drums are the most likely causes.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However, thin brake drums or substandard brake lines and hoses can also cause a spongy pedal. The proper course of action is to bleed the system, or replace thin drums and suspect quality brake lines and hoses.

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 or check valve could also be faulty.

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, or out of round brake drums. 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 brakeshoe release. Drag can be minor or severe enough to overheat the linings, rotors and drums.

Minor drag will usually cause slight surface charring of the lining. It can also generate hard spots in rotors and drums from the overheat-cool down process. In most cases, the rotors, drums, 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 and drums 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:

- Seized or improperly adjusted parking brake cables.
- Loose/worn wheel bearing.
- Seized caliper or wheel cylinder piston.
- Caliper binding on corroded bushings or rusted slide surfaces.
- Loose caliper mounting bracket.
- Drum brakeshoes binding on worn/damaged support plates.
- Misassembled components.

DIAGNOSIS AND TESTING (Continued)

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

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 adapter/caliper slide surfaces
- Improper brakeshoes
- Damaged rotor

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 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 GRAB OR PULL

Rear grab or pull is usually caused by improperly adjusted or seized parking brake cables, contaminated lining, bent or binding shoes and support plates, 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, proportioning valve, or RWAL valve 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 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 brakeshoes in spots, metal-to-metal contact occurs. If the condition is allowed to continue, rotors and drums can become so scored that replacement is necessary.

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. However, calipers that bind on the slide surfaces can generate a thump or clunk noise. In addition, worn out, improperly adjusted, or improperly assembled rear brakeshoes can also produce a thump noise.

BRAKELINING CONTAMINATION

Brakelining contamination is mostly a product of leaking calipers or wheel cylinders, 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.

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. A tire with internal damage such as a severe bruise, cut, or ply separation can cause pull and vibration.

DIAGNOSIS AND TESTING (Continued)

STOP LAMP SWITCH

Stop 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. 7).

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.

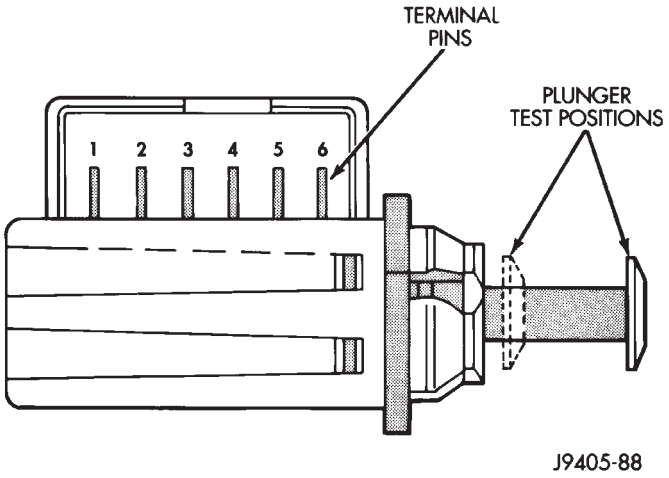


Fig. 7 Stop Lamp Switch Terminal Identification

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.

(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 brakes are applied and when there is a leak in the front or rear wheel brake hydraulic circuit. It will also illuminate at startup 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.

MASTER CYLINDER/POWER BOOSTER

(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 master cylinder is faulty (internal leakage).

(5) Start engine and note pedal action it should falls away slightly under light foot pressure then holds 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 immediately stop turn off ignition to stop 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, booster is faulty.

POWER BOOSTER VACUUM TEST

(1) Connect vacuum gauge to booster check valve with short length of hose and T-fitting (Fig. 8).

(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 or check valve is faulty.

POWER BOOSTER CHECK VALVE TEST

(1) Disconnect vacuum hose from check valve.

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

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

(4) Apply 15-20 inches vacuum at large end of check valve (Fig. 9).

DIAGNOSIS AND TESTING (Continued)

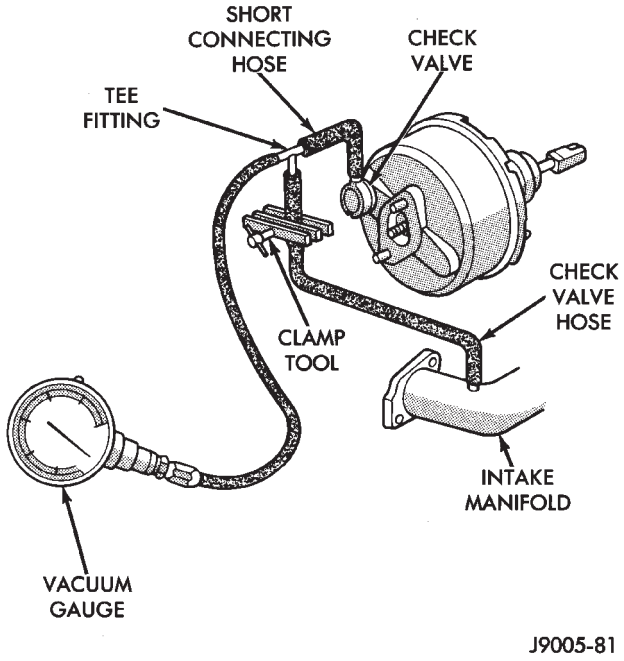


Fig. 8 Typical Booster Vacuum Test Connections

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

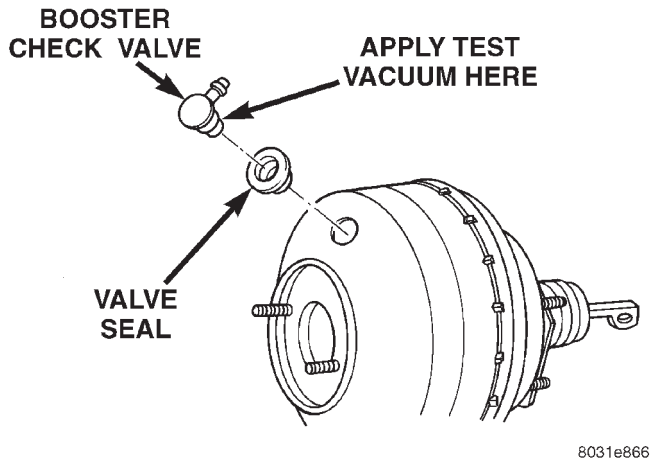


Fig. 9 Vacuum Check Valve And Seal

COMBINATION VALVE

Metering Valve

Metering valve operation can be checked visually and with the aid of a helper. Observe the metering valve stem while a helper applies and releases the brakes. If the valve is operating correctly, the stem will extend slightly when the brakes are applied and retract when the brakes are released. If the valve is faulty, replace the entire combination valve as an assembly.

Pressure Differential Switch

(1) Have helper sit in drivers seat to apply brake pedal and observe red brake warning light.

(2) Raise vehicle on hoist.

(3) Connect bleed hose to a rear wheel cylinder and immerse hose end in container partially filled with brake fluid.

(4) Have helper press and hold brake pedal to floor and observe warning light.

(a) If warning light illuminates, switch is operating correctly.

(b) If light fails to illuminate, check circuit fuse, bulb, and wiring. The parking brake switch can be used to aid in identifying whether or not the brake light bulb and fuse is functional. Repair or replace parts as necessary and test differential pressure switch operation again.

(5) If warning light still does not illuminate, switch is faulty. Replace combination valve assembly, bleed brake system and verify proper switch and valve operation.

FRONT DISC BRAKE ROTOR

ROTOR MINIMUM THICKNESS

Rotor minimum usable thickness is 22.7 mm (0.89 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 3/4 inch from the rotor outer circumference for each measurement (Fig. 10).

Thickness should not **vary** by more than 0.013 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 brakelining 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.

Use a dial indicator to check lateral runout (Fig. 11).

Maximum allowable rotor lateral runout is 0.13 mm (0.005 in.).

DIAGNOSIS AND TESTING (Continued)

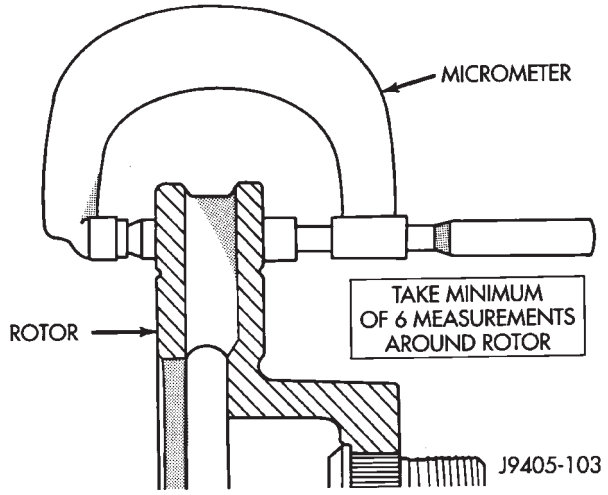


Fig. 10 Measuring Rotor Thickness Variation

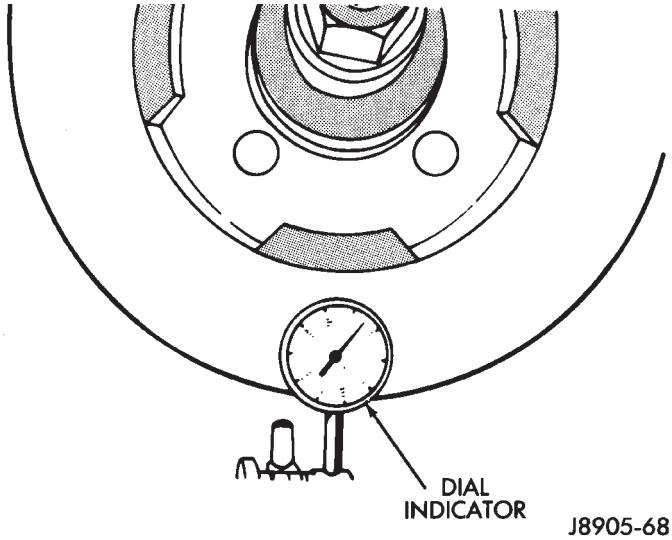


Fig. 11 Checking Rotor Lateral Runout

REAR DISC BRAKE ROTOR

ROTOR MINIMUM THICKNESS

Minimum usable thickness of the rear disc brake rotor is 9.5 mm (0.374 in.). The thickness specification is located on the edge of the parking brake drum section of the rotor (Fig. 12).

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.

REAR ROTOR THICKNESS VARIATION

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

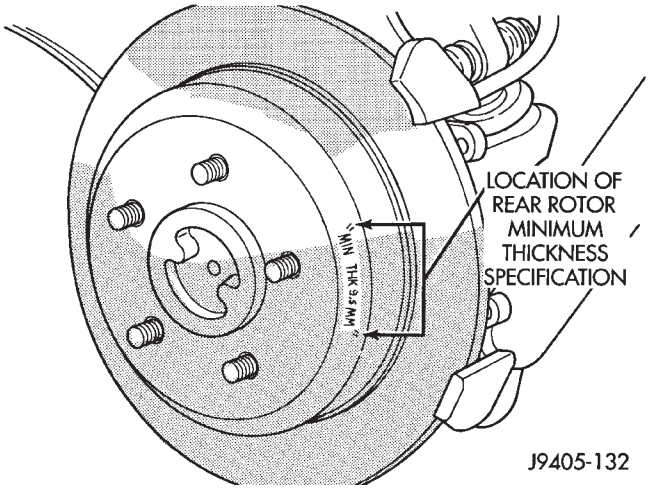


Fig. 12 Thickness Specification On Rear Rotor

Measure rotor thickness at four to six points around the rotor face. Position the micrometer approximately 3/4 inch from the rotor outer circumference for each measurement (Fig. 10).

Thickness should not **vary** by more than 0.0254 mm (0.001 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 brakelining 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. 11). Maximum allowable lateral runout is 0.13 mm (0.005 in.).

PARKING BRAKE

NOTE: Parking brake adjustment is controlled by a cable tensioner. Once the tensioner is adjusted at the factory, it should not require further attention. However, there are two instances when adjustment will be required. The first is when a new tensioner, or cables have been installed. And the second, is when the tensioner and cables are disconnected for access to other brake components.

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, or cable tensioner adjustment is incorrect.

DIAGNOSIS AND TESTING (Continued)

If the red lamp comes on while the vehicle is in motion and brake pedal height decreases, a fault has occurred in the front or rear brake hydraulic system.

In most cases, the actual cause of an improperly functioning parking brake (too loose/too tight/wont hold), can be traced to a parking brake component.

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

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

A “too loose” condition can also be caused by inoperative or improperly assembled parking brakeshoe 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:

- Rear brakeshoe wear
- Drum surface (in rear rotor) machined oversize
- Front cable not secured to lever
- Rear cable not attached to lever
- Rear cable seized
- Parking shoes reversed
- Parking brake strut not seated in shoes
- Parking brake lever not seated
- Parking brake lever bind
- Cam and lever worn or misassembled
- Adjuster screws seized
- Adjuster screws reversed

Parking brake adjustment and parts replacement procedures are described in the Parking Brake section.

BRAKE LINE AND HOSES

Flexible rubber hose is used at both front 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 condition 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 seal washers 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.

If brake fluid is contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals, Antilock Brakes hydraulic unit 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 ADD and a FULL mark on the side (Fig. 13) fill to the FULL mark.

MASTER CYLINDER

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.

(2) Attach bleed tubes to cylinder outlet ports. Then position each tube end in matching reservoir fluid compartment (Fig. 14).

(3) Fill reservoir with fresh brake fluid.

(4) Press cylinder pistons inward with wood dowel. Then release pistons and allow them to return under

SERVICE PROCEDURES (Continued)

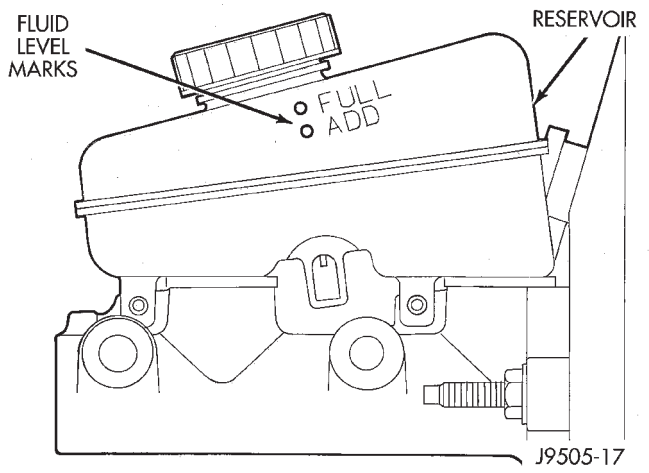


Fig. 13 Master Cylinder Fluid Level

spring pressure. Continue bleeding operations until air bubbles are no longer visible in fluid.

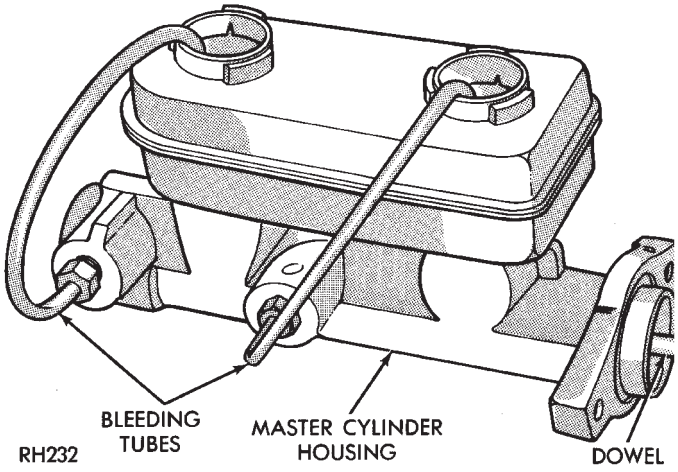


Fig. 14 Master Cylinder Bleeding

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.

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.

The Brakes should be bled in sequence. First the right rear wheel then the left rear wheel. Then move to the front brakes and bleed the right front wheel then the left front wheel.

MANUAL BLEEDING

(1) Remove reservoir filler caps and fill reservoir with Mopar, or equivalent quality DOT 3 brake fluid.

(2) If calipers, or wheel cylinders were overhauled, open all caliper and wheel cylinder 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. 15). Be sure end of bleed hose is immersed in fluid.

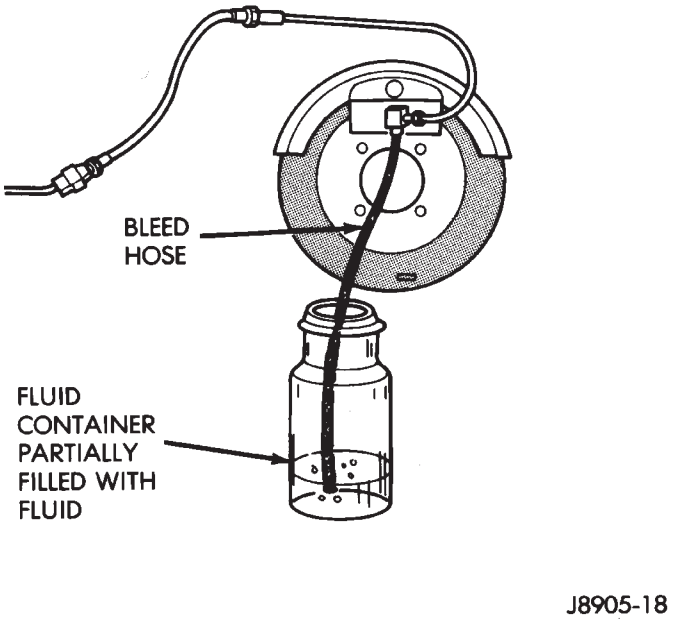


Fig. 15 Typical Fluid Container And Bleed Hose Setup

(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.

DISC ROTOR MACHINING

Rotor braking surfaces can be sanded or machining in a disc brake lathe.

The lathe must machine both sides of the rotor simultaneously with dual (two) cutter heads (Fig. 16). Equipment capable of machining only one side at a time will produce a tapered rotor.

The lathe should also be equipped with a grinder attachment or dual sanding discs for final cleanup or light refinishing (Fig. 16).

If the rotor surfaces only need minor cleanup of rust, scale, or minor scoring, use abrasive discs to clean up the rotor surfaces. However, when a rotor is scored or worn, machining with cutting tools will be required.

SERVICE PROCEDURES (Continued)

CAUTION: Do not machine the rotor if it will cause the rotor to fall below minimum allowable thickness.

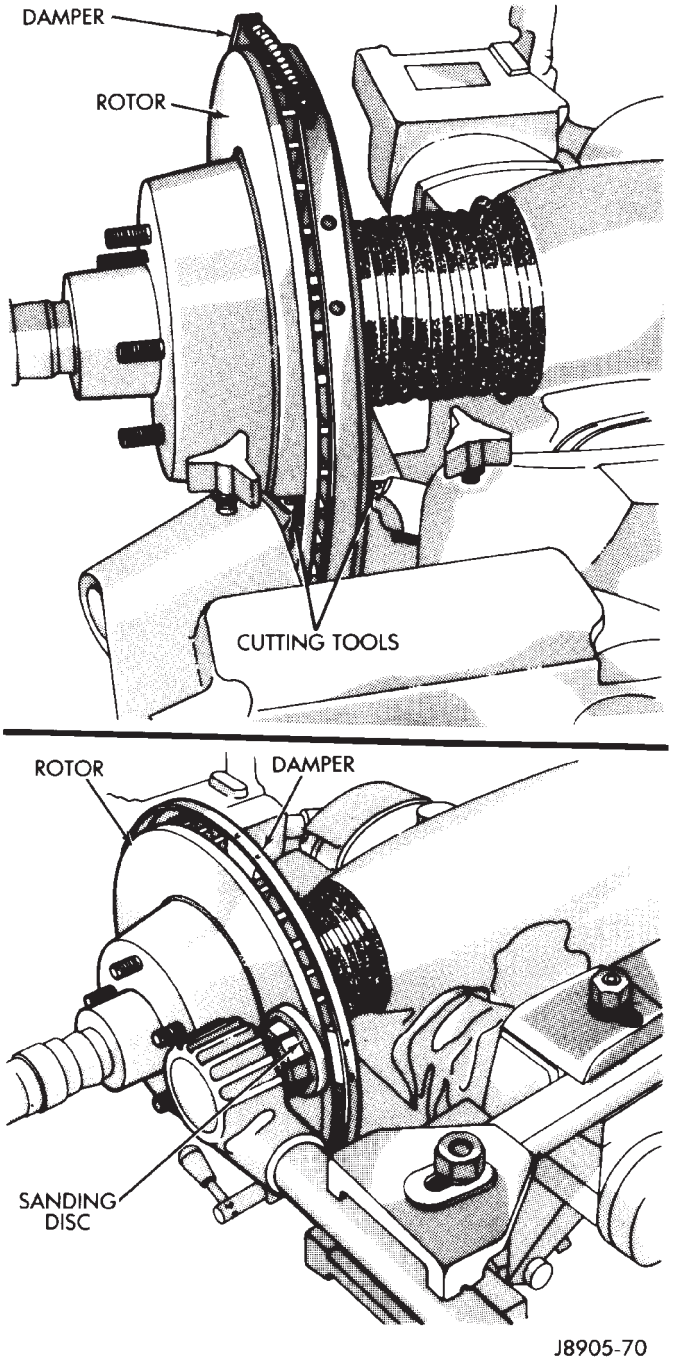


Fig. 16 Rotor Refinishing

BRAKE LINE

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

Special, heavy duty tube bending and flaring equipment is required to prepare double wall brake line. Special bending tools are needed to avoid kinking or twisting metal brake line. In addition, special flaring tools are needed to provide the inverted-type, double flare required on metal brake lines.

FLARING PROCEDURE

(1) Cut off damaged tube with Tubing Cutter.

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

(3) Install replacement tube nut on section of tube to be repaired.

(4) Insert tube in flaring tool. Center tube in area between vertical posts.

(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) Squeeze flaring tool jaws to lock tubing in place.

(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. 17).

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

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

(11) Remove the flaring tools and verify that the inverted flare is correct.

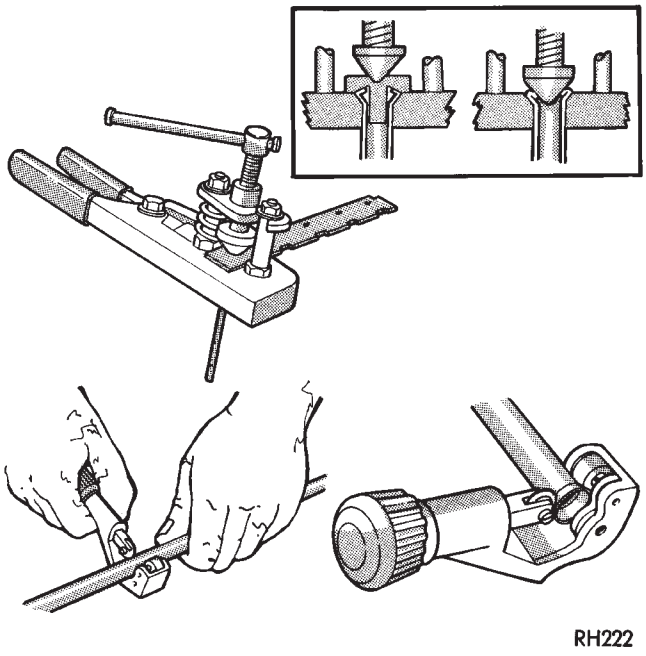


Fig. 17 Inverted Flare Tools

REMOVAL AND INSTALLATION

STOP 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 counterclockwise direction to unlock switch retainer. Then pull switch rearward and out of bracket.

(4) Disconnect switch wire harness and remove switch from vehicle (Fig. 18).

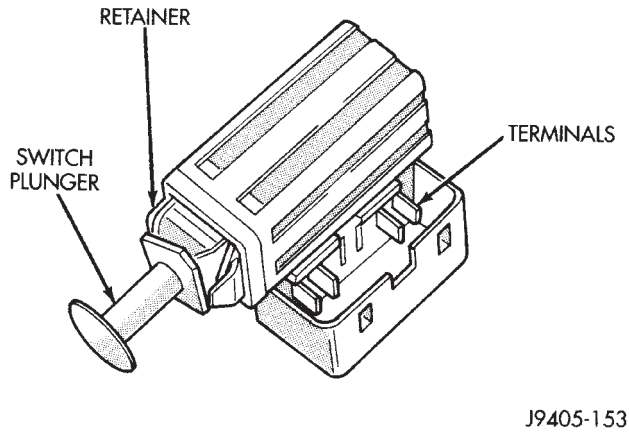


Fig. 18 Stop Lamp Switch

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 fully rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make racheting sound as it self adjusts.

BRAKE PEDAL

REMOVAL

(1) Remove lower trim panel and air conditioning duct if necessary.

(2) Remove steering column lower trim panel and bezel.

(3) Remove necessary dash panel-to-instrument panel brace rods.

(4) Remove retainer clip and washers attaching booster push rod to pedal pin (Fig. 19).

(5) Remove nut securing pedal shaft in support bracket.

(6) Slide pedal shaft outward for clearance and remove brake pedal.

(7) Remove pedal bushings if they are to be replaced.

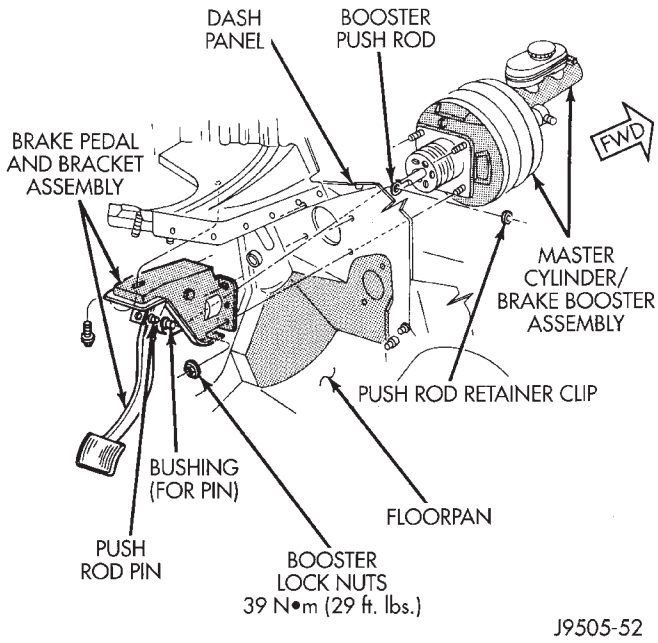


Fig. 19 Brake Pedal Mounting

INSTALLATION

(1) Install new bushings in pedal. Lubricate bushings and pivot pin with Mopar multi-mileage grease.

(2) Position pedal, sleeve and spacer(s) in bracket and install pedal shaft in support and through pedal.

(3) Install new nut on pedal shaft. **Shaft nut is specially formed and should not be reused. Be sure to install new nut to secure shaft.**

(4) Tighten pedal shaft nut to 27 N·m (20 ft. lbs.) on models with manual transmission. Tighten nut to 35 N·m (26 ft. lbs.) on models with automatic transmission.

(5) Install bushing on pedal pin if removed (Fig. 19).

(6) Install booster push rod on pedal pin. Secure push rod to pedal with retainer ring and washers.

(7) Install dash brace rod, if equipped.

(8) Install instrument panel trim and air conditioning duct if removed.

(9) Check and adjust brakelight switch if necessary.

COMBINATION VALVE

REMOVAL

(1) Remove brakelines that connect master cylinder to combination valve (Fig. 20).

REMOVAL AND INSTALLATION (Continued)

(2) Disconnect brakelines that connect combination valve to HCU.

(3) Disconnect wire from combination valve switch terminal. Be careful when separating wire connector as lock tabs are easily damaged if not fully disengaged.

(4) Slide HCU solenoid harness connectors off combination valve bracket. Then move harness aside for working clearance.

(5) Remove nuts attaching combination valve bracket to booster studs and valve bracket off booster studs (Fig. 21).

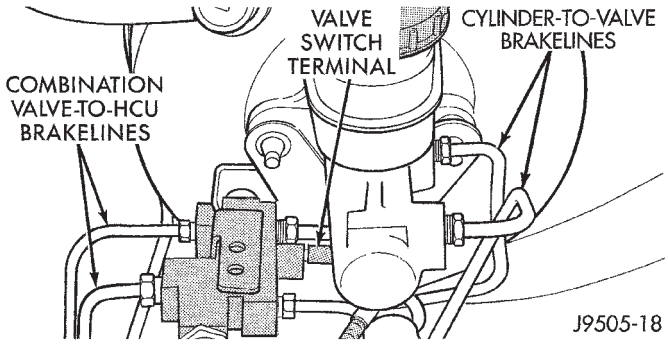


Fig. 20 Combination Valve Brakelines

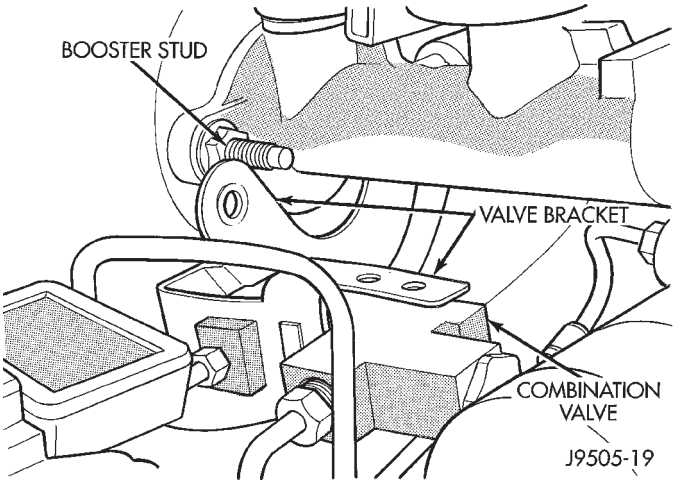


Fig. 21 Combination Valve Bracket

INSTALLATION

(1) Position valve bracket on booster studs and tighten bracket attaching nuts to 25 N·m (220 in. lbs.).

(2) Align and start all four brakeline fittings in combination valve by hand to avoid cross threading. Then tighten fittings just enough to prevent leakage.

(3) Connect wire to differential pressure switch in combination valve.

(4) Tighten brakeline fittings at master cylinder just enough to prevent leakage.

(5) Attach HCU solenoid harness connectors to combination valve bracket.

(6) Bleed brakes.

MASTER CYLINDER

REMOVAL

(1) Remove brakelines from master cylinder.

(2) Remove combination valve.

(3) Remove nuts that attach master cylinder to booster studs (Fig. 22). **Retain nuts as they are special locking types.**

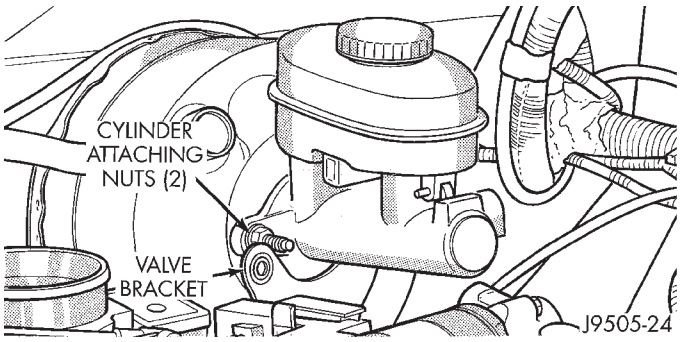


Fig. 22 Master Cylinder Mounting

(4) Remove master cylinder from booster.

INSTALLATION

(1) Remove protective cover from end of primary piston.

(2) Bleed master cylinder.

(3) Slide master cylinder onto booster studs. Align booster push rod in cylinder primary piston and seat cylinder against booster.

(4) Install master cylinder mounting nuts and tighten nuts to 25 N·m (220 in. lbs.). **Use original or factory replacement nuts only.**

(5) Install combination valve and tighten mounting nuts to 25 N·m (220 in. lbs.).

(6) Install brakelines that connect master cylinder to combination valve.

(7) Fill and bleed brake system.

POWER BRAKE BOOSTER

REMOVAL

(1) Remove air filter housing,.

(2) Remove master cylinder, combination valve, and HCU.

(3) Disconnect vacuum hose at booster check valve (Fig. 23).

(4) Remove retainer clip that booster push rod to pedal pin (Fig. 24). Then slide push rod off pin.

(5) Remove four locknuts that attach booster to dash panel.

(6) In engine compartment, slide booster forward, tilt it upward slightly, and remove it from engine compartment.

REMOVAL AND INSTALLATION (Continued)

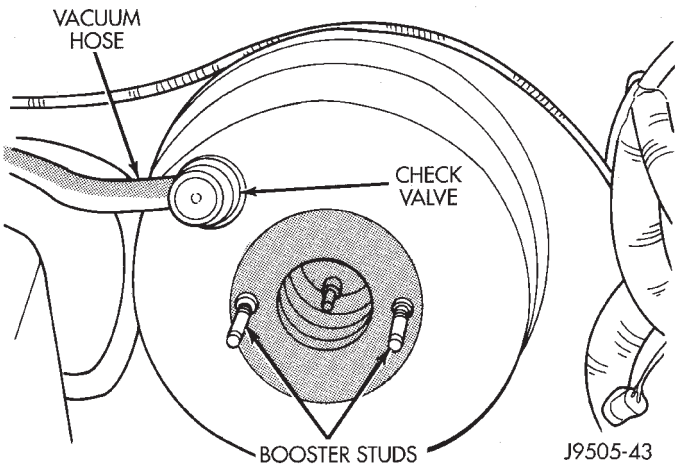


Fig. 23 Booster Check Valve And Hose

(7) If booster will be stored on bench for any length of time, cover booster with shop towels to prevent dust entry and place short lengths of rubber hose over booster studs to protect threads.

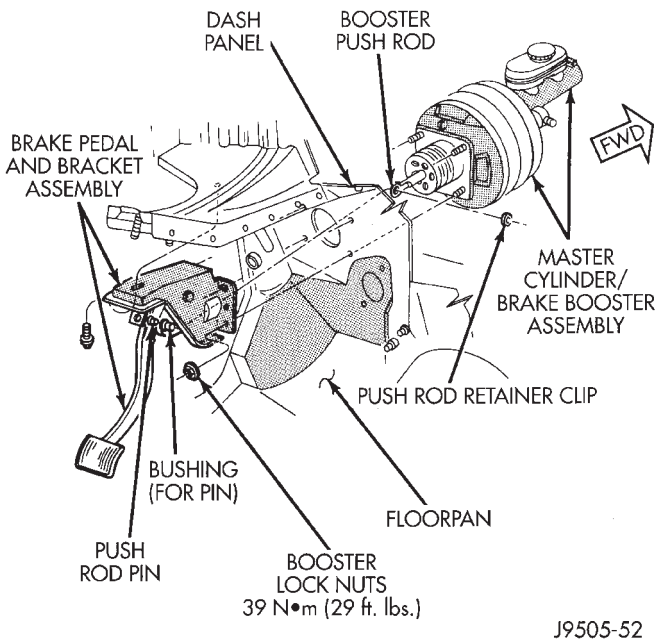


Fig. 24 Power Brake Booster Mounting

INSTALLATION

(1) Check condition of grommet that secures check valve in booster. Replace grommet if cut, torn, or loose (no longer secures valve tightly).

(2) Wipe booster mounting surface of dash panel clean with shop towel.

(3) Align and position booster on engine compartment side of dash panel.

(4) (4) Inside passenger compartment:

(5) (a) Lubricate pedal pin and bushing with Mopar multi-mileage grease.

(6) (b) Install booster attaching nuts on studs. Tighten attaching nuts to 41 N·m (30 ft. lbs.).

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

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

(9) (6) Install master cylinder, combination valve, and HCU. Refer to procedures in this section.

(10) (7) Bleed brakes. Refer to section covering brake bleeding.

(11) (8) Install engine air cleaner and hoses.

DISC BRAKE CALIPER

REMOVAL

(1) Raise vehicle and remove front wheel and tire assemblies.

(2) Remove and discard brake hose mounting bolt (Fig. 25).

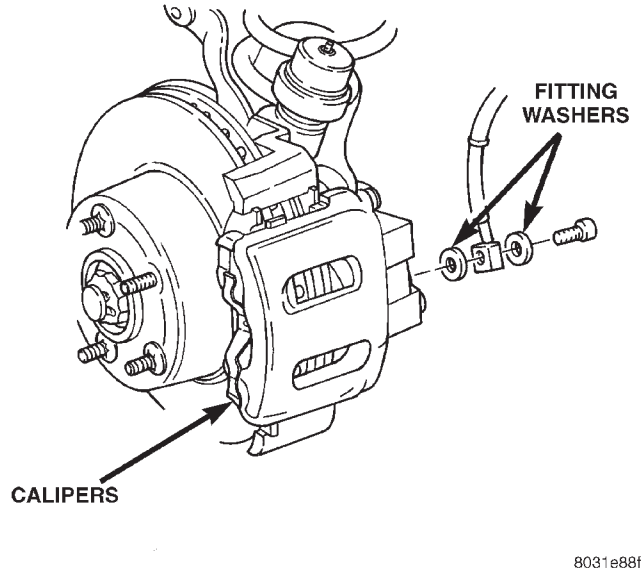


Fig. 25 Brake Hose And Bolt

(3) Remove caliper mounting bolts.

(4) Rotate caliper rearward with pry tool if necessary. Then rotate caliper and brakeshoes off mounting ledges.

(5) Remove caliper from vehicle.

INSTALLATION

(1) Install brakeshoes in caliper.

(2) Connect brake hose to caliper but do not tighten fitting bolt completely at this time. **Be sure to use new gaskets on bolt to avoid leaks**

(3) Install caliper. Position mounting notches at lower end of brakeshoes on bottom mounting ledge.

REMOVAL AND INSTALLATION (Continued)

Then rotate caliper over rotor and seat notches at upper end of shoes on mounting ledge.

(4) Coat caliper mounting bolts with GE 661 or Dow 111 silicone grease. Then install and tighten bolts to 10-20 N·m (7-15 ft. lbs.).

CAUTION: If new caliper bolts are being installed, or if the original reason for repair was a drag/pull condition, check caliper bolt length before proceeding. If the bolts have a shank length greater than 67.6 mm (2.66 in.), they may contact the inboard brakeshoe causing a partial apply condition. Refer to Figure 14 for the required caliper bolt length.

(5) Position front brake hose clear of all chassis components and tighten caliper fitting bolt to 31 N·m (23 ft. lbs.).

CAUTION: Be sure the brake hose is not twisted or kinked at any point. Also be sure the hose is clear of all steering and suspension components. Loosen and reposition the hose if necessary.

(6) Install wheel and tire assembly.

(7) Fill master cylinder and bleed brake system.

DISC BRAKESHOE

REMOVAL

(1) Raise vehicle and remove front wheel and tire assemblies.

(2) Drain small amount of fluid from master cylinder front brake reservoir with suction gun.

(3) Bottom caliper piston in bore with C-clamp. Position clamp screw on outboard brakeshoe and clamp frame on rear of caliper. Typical C-clamp attachment is shown in (Fig. 26). **Do not allow clamp screw to bear directly on outboard shoe retainer spring. Use wood or metal spacer between shoe and clamp screw if necessary.**

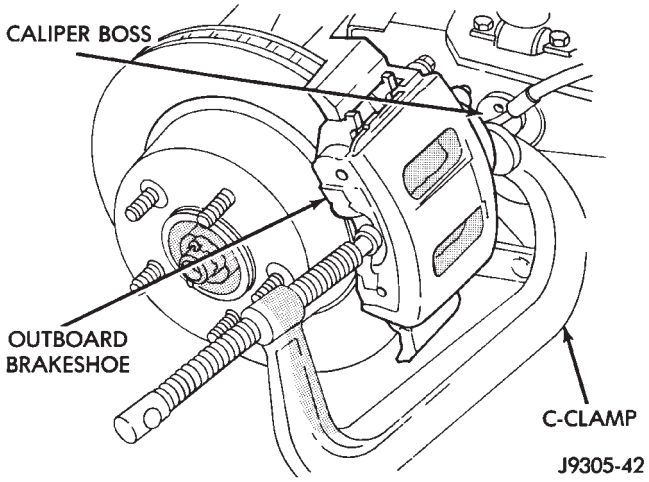


Fig. 26 Bottoming Caliper Piston With C-Clamp

(4) Remove caliper mounting bolts (Fig. 27).

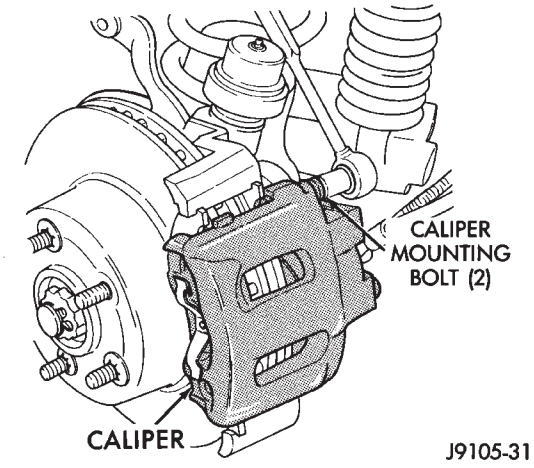


Fig. 27 Caliper Mounting Bolts

(5) Tilt top of caliper outward with pry tool if necessary (Fig. 28) and remove caliper.

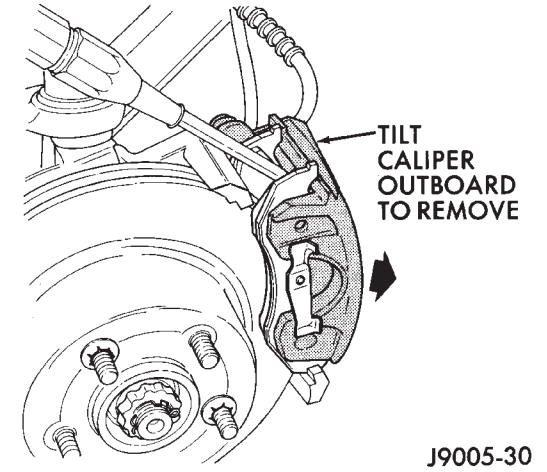


Fig. 28 Caliper Removal

(6) Remove outboard shoe by pressing one end of shoe inward to disengage shoe lug. Then rotate shoe upward until retainer spring clears caliper. Press opposite end of shoe inward to disengage shoe lug and rotate shoe up and out of caliper (Fig. 29).

(7) Remove inboard shoe. Grasp ends of shoe and tilt shoe outward to release springs from caliper piston (Fig. 30). Then remove shoe from caliper.

NOTE: If original brakeshoes will be used, keep them in sets (left and right); they are not interchangeable.

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

(9) Wipe caliper off with shop rags or towels. **Do not use compressed air. Compressed air can**

REMOVAL AND INSTALLATION (Continued)

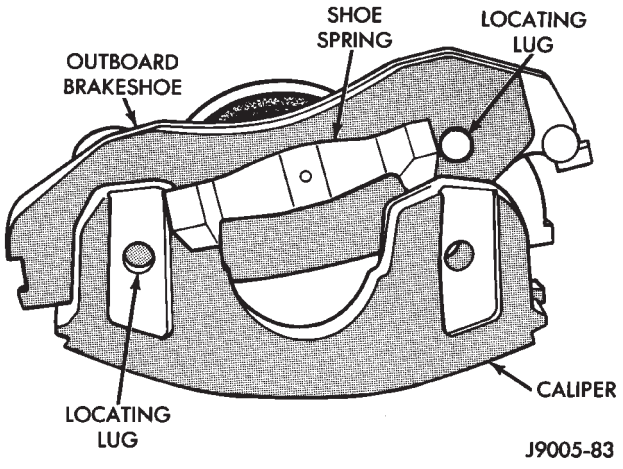


Fig. 29 Outboard Brakeshoe Removal

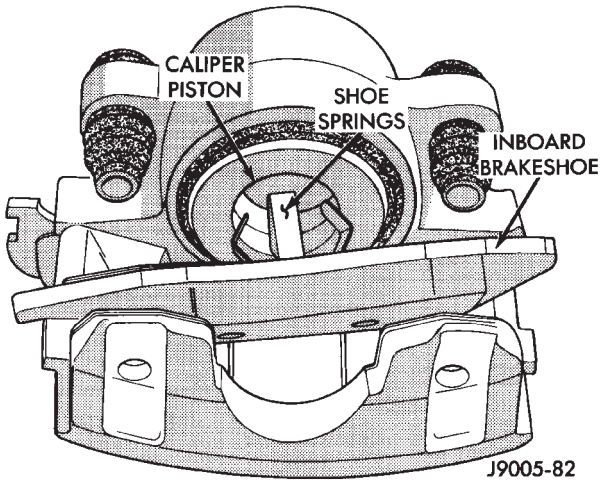


Fig. 30 Inboard Brakeshoe Removal

unseat dust boot and force dirt into piston bore.

INSTALLATION

(1) Clean brakeshoe mounting ledge slide surfaces of steering knuckle with wire brush. Then apply light coat of Mopar multi-mileage grease to slide surfaces. Lubricate mounting bolts and bushings with GE 661 or Dow 111 silicone grease (Fig. 31).

(2) Install inboard shoe in caliper and verify shoe retaining springs are fully seated into the piston.

(3) Install outboard shoe in caliper by starting one end of shoe in caliper and rotating shoe downward into place. Verify shoe locating lugs and shoe spring are seated.

(4) Install caliper by position notches at lower end of brakeshoes on bottom mounting ledge. Then install caliper over rotor and seat upper ends of brakeshoes on top mounting ledge (Fig. 32).

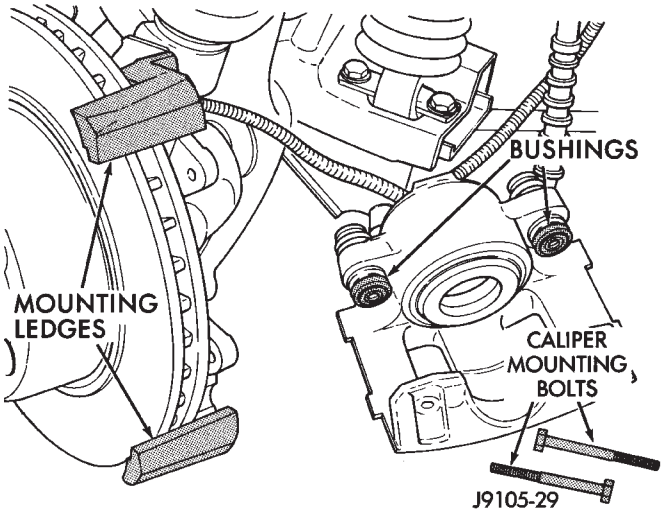


Fig. 31 Caliper Lubrication Points

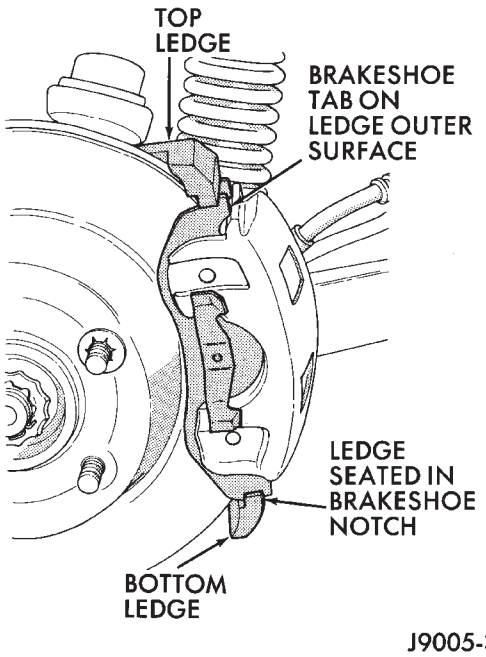


Fig. 32 Caliper Installation

CAUTION: Before securing the caliper, be sure the caliper brake hose is not twisted, kinked or touching any chassis components.

(5) Install and tighten caliper mounting bolts to 10-20 N·m (7-15 ft. lbs.).

CAUTION: If new caliper bolts are being installed, or if reason for repair was a drag/pull condition, check caliper bolt length. If the bolts have a shank length greater than 67.6 mm (2.66 in.), they will contact the inboard brakeshoe causing a partial apply condition. Refer to (Fig. 33) for correct caliper bolt length.

(6) Install wheel and tire assemblies.

REMOVAL AND INSTALLATION (Continued)

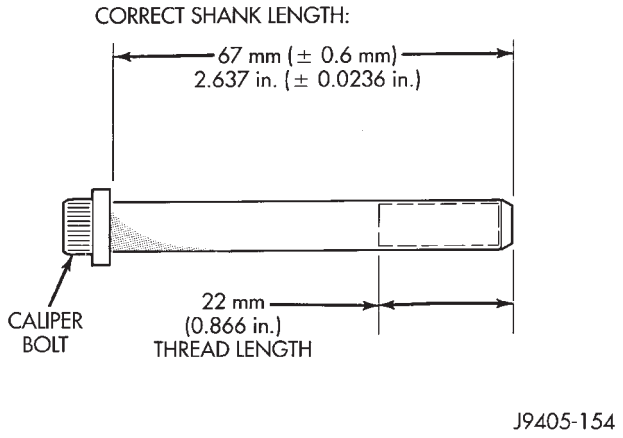


Fig. 33 Mounting Bolt Dimensions

(7) Pump brake pedal until caliper pistons and brakeshoes are seated.

(8) Top off brake fluid level if necessary.

DISC BRAKE ROTOR

REMOVAL

(1) Remove wheel and tire assemble.

(2) Remove caliper.

(3) Remove retainers securing rotor to hub studs (Fig. 34).

(4) Remove rotor from hub.

(5) If rotor shield requires service, remove front hub and bearing assembly.

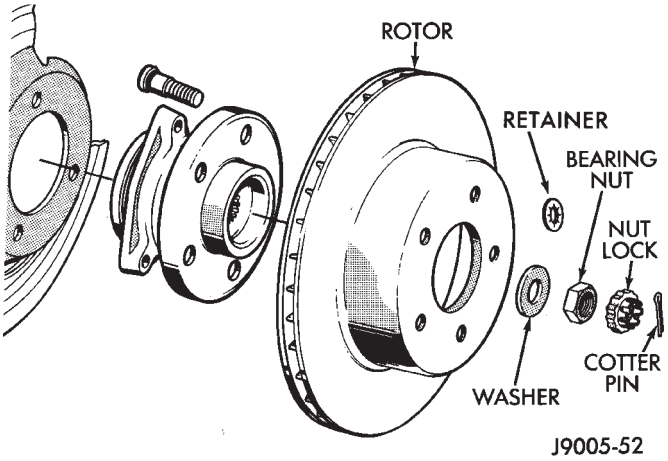


Fig. 34 Rotor & Hub

INSTALLATION

(1) If new rotor is being installed, remove protective coating from rotor surfaces with Mopar carb cleaner.

(2) Install rotor on hub.

(3) Install caliper.

(4) Install new spring nuts on wheel studs.

(5) Install wheel and tire assembly.

REAR DISC BRAKE CALIPER

REMOVAL

(1) Raise vehicle and remove tire and wheel assemblies.

(2) Press caliper piston into caliper bore with C-clamp (Fig. 35).

(3) Remove caliper mounting bolts (Fig. 36).

(4) Rotate caliper rearward by hand or with pry tool. Then rotate caliper and brakeshoes off ledges of mounting bracket.

(5) Remove caliper fitting bolt and disconnect rear brake hose at caliper. Discard metal washers on fitting bolt. Washers should be replaced and not reused.

(6) Remove caliper from vehicle.

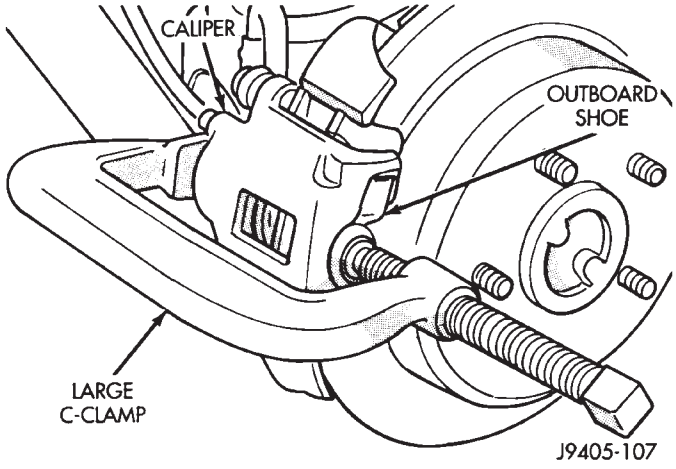


Fig. 35 Bottoming Caliper Piston

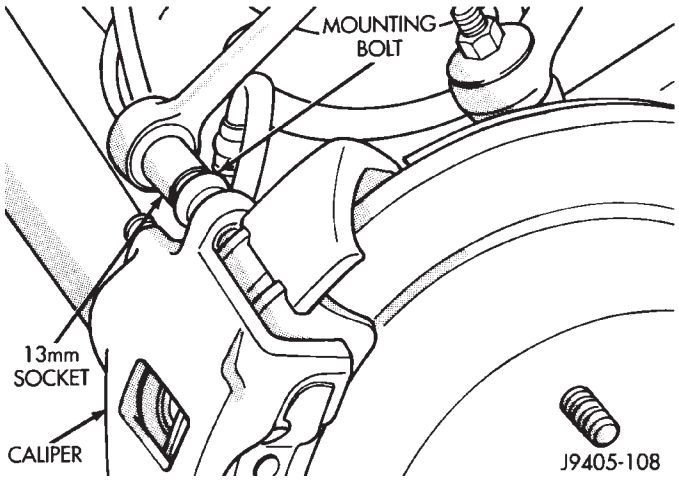


Fig. 36 Caliper Mounting Bolt

INSTALLATION

(1) Verify that brakeshoes are correctly positioned in caliper.

(2) Position caliper over rotor and into bracket. Be sure brakeshoe tabs are properly seated on mounting bracket ledges.

REMOVAL AND INSTALLATION (Continued)

(3) Connect rear brake hose to caliper. Use new washers on hose fitting and tighten hose fitting bolt to 24-38 N·m (216-336 in. lbs.).

(4) Check brake hose position before proceeding. Verify that hose is not twisted, kinked, or touching any suspension components.

CAUTION: Check caliper bolt length before proceeding (Fig. 37). If the bolts have a shank length greater than 67.6 mm (2.66 in.), they will contact the inboard brakeshoe causing a partial apply condition.

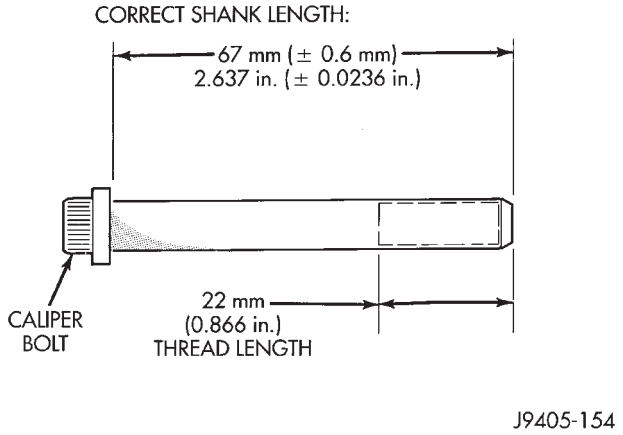


Fig. 37 Caliper Mounting Bolt Dimensions

(5) Lubricate and install caliper mounting bolts. Start bolts by hand then tighten bolts to 10-20 N·m (7-15 ft. lbs.).

(6) Fill and bleed brake system.

(7) Install wheel and tire assemblies.

(8) Lower vehicle.

REAR DISC BRAKESHOES

REMOVAL

(1) Raise and support vehicle.

(2) Remove rear wheel and tire assemblies.

(3) Press caliper piston back into caliper bore with large C-clamp.

(4) Remove caliper mounting bolts.

(5) Rotate caliper rearward and off rotor (Fig. 38). Support caliper with wire attached to nearby suspension component. **Do not allow brake hose to support caliper weight.**

(6) Press one corner of outboard shoe inward then pry shoe upward with suitable tool and rotate shoe out of caliper.

(7) Pry inboard shoe outward until shoe retainers come out of caliper piston. Then remove shoe from caliper.

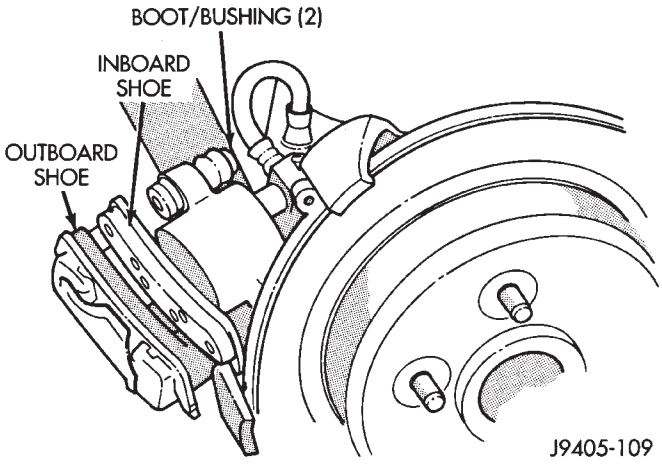


Fig. 38 Rear Caliper

(8) Inspect caliper mounting bolt bushings and boots. Replace boots if torn or cut. Replace bushings, or bolts if either exhibits wear, or heavy corrosion.

INSTALLATION

(1) Clean brakeshoe contact surfaces of caliper mounting bracket (Fig. 39). Use wire brush or emery cloth.

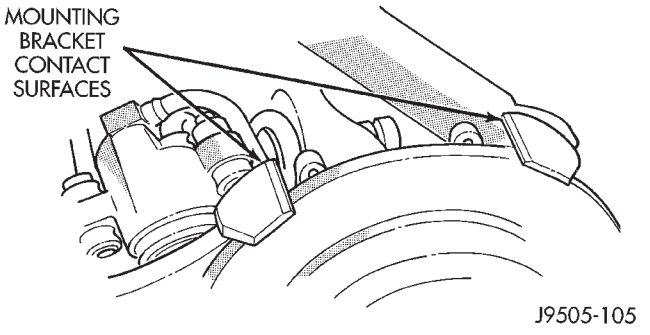


Fig. 39 Brakeshoe Contact Surfaces

(2) Install brakeshoes in caliper.

(3) Install caliper over rotor and into mounting bracket.

(4) Verify that brakeshoe lugs are properly seated on caliper mounting bracket (Fig. 40). Be sure springs on outboard shoes are also seated against bracket.

(5) Verify hose must not be twisted or kinked.

(6) Lubricate and install caliper mounting bolts and tighten to 10-20 N·m (7-15 ft. lbs.).

(7) Install wheel and tire assemblies.

(8) Turn ignition On and run HCU pump until it shuts off. Then pump brake pedal until shoes are seated and indicator lights go out.

(9) Top off brake fluid level if necessary. Use Mopar brake fluid or equivalent meeting SAE J1703 and DOT 3 standards only.

REMOVAL AND INSTALLATION (Continued)

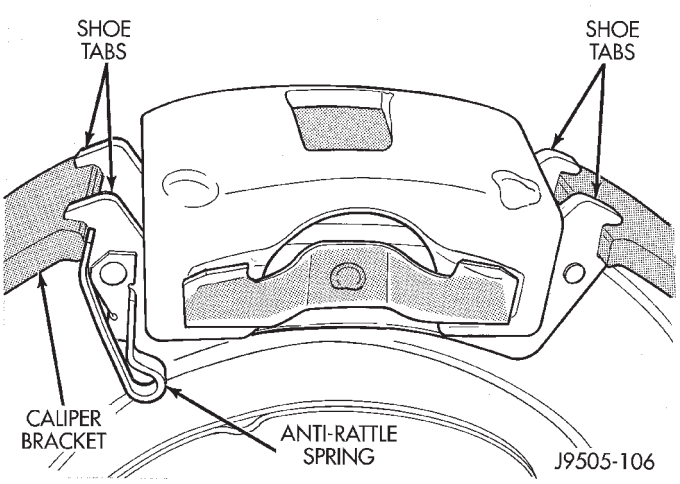


Fig. 40 Correct Brakeshoe Position

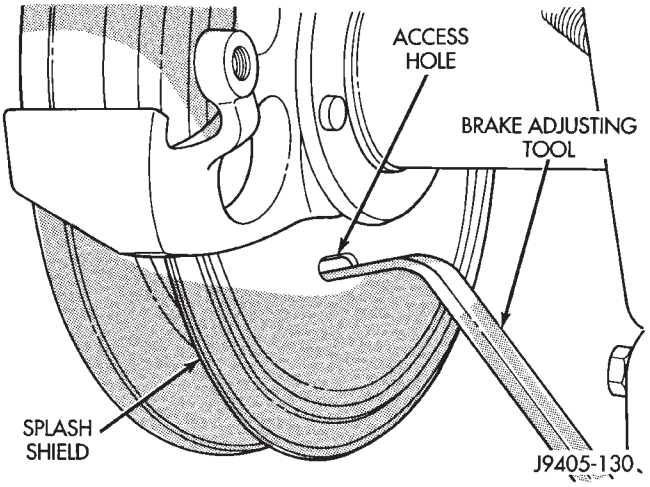


Fig. 41 Backing Off Parking Brake Shoes

REAR DISC BRAKE ROTOR

REMOVAL

(1) Raise vehicle.
(2) Remove wheel and tire assembly.
(3) Remove caliper.
(4) Remove access plug from splash shield and back off parking brakeshoes by rotating adjuster screw star wheel with brake tool (Fig. 41). At driver side rear wheel, rotate adjuster screw star wheel clockwise to back off shoes. At passenger side wheel, rotate star wheel in counterclockwise direction. Direction of rotation is while looking from rear to front of vehicle.
(5) If rotor and/or axle hub contact surfaces are heavily rusted, apply Mopar rust penetrant to rotor and axle hub and through spaces around wheel studs.
(6) Remove push nuts securing rotor to axle shaft studs.
(7) Work rotor off axle hub and studs. Use plastic or rawhide mallet to loosen rotor if necessary.
(8) Clean and inspect rotor braking surfaces. Refinish, or replace rotor if necessary.

INSTALLATION

(1) Clean axle hub and hub bore in rotor with wire brush, or emery cloth.
(2) Install rotor on axle hub.
(3) Install disc brake caliper.
(4) Install wheel and tire assembly and lower vehicle.
(5) Adjust parking brakeshoes. Use brake tool to rotate adjuster screw star wheel. Tighten shoes until light drag is created. Then back off shoes about 1/2 to one turn of star wheel.
(6) Install plug in splash shield access hole.
(7) Pump brake pedal to seat caliper piston and brakeshoes. Do not move vehicle until firm brake pedal is obtained.

PARKING BRAKE HAND LEVER

REMOVAL

(1) Release parking brakes.
(2) Disconnect battery negative cable.
(3) Raise vehicle on hoist.
(4) Remove front cable adjusting nut and disengage cable tensioner from equalizer. Then remove front cable from tensioner (Fig. 42).
(5) Disengage front cable from insert and insert from floorpan.
(6) Lower vehicle.
(7) Remove center console, refer to Group 23 Body.
(8) Disconnect parking brake switch and air bag module wiring connectors.
(9) Remove screws attaching air bag control module to floorpan and parking brake lever. Then move module aside for access to lever (Fig. 43).
(10) Remove screws attaching parking brake lever to bracket and lift lever upward for access to front cable (Fig. 42).
(11) Disengage front cable from parking brake lever and remove lever assembly from vehicle.

INSTALLATION

(1) Connect front cable to lever assembly.
(2) Seat front cable in floor pan.
(3) Install lever assembly on mounting bracket.
(4) Connect parking brake switch wire.
(5) Install air bag control module and connect module wires harnesses.
(6) Install parking lever cover.
(7) Install center console, refer to Group 23 Body.
(8) Raise vehicle.

REMOVAL AND INSTALLATION (Continued)

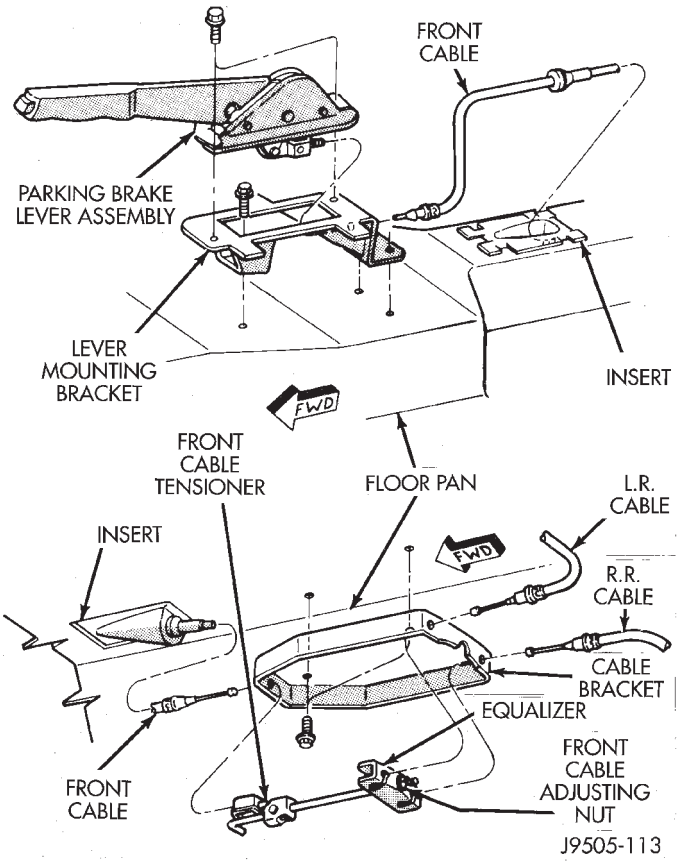


Fig. 42 Parking Brake Lever And Cable Attachment

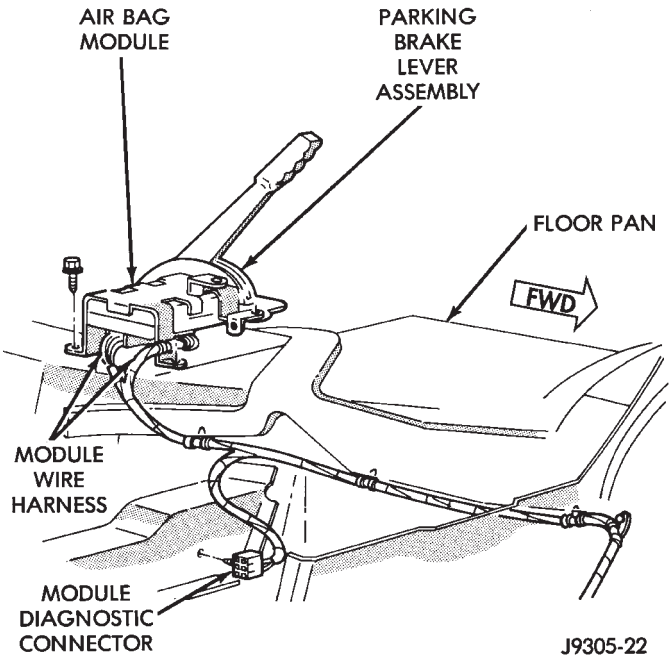


Fig. 43 Air Bag Module Mounting

(9) Assemble front cable, cable tensioner and cable bracket.

(10) Adjust parking brake front cable.

(11) Lower vehicle.

(12) Connect battery negative cable.

FRONT PARKING BRAKE CABLE

REMOVAL

(1) Release parking brakes.

(2) Disconnect battery negative cable and raise vehicle on hoist.

(3) Remove front cable adjusting nut and disengage cable tensioner from equalizer. Then remove front cable from tensioner (Fig. 44).

(4) Disengage front cable from insert and insert from floorpan.

(5) Lower vehicle.

(6) Remove console, refer to Group 23 Body.

(7) Remove park brake lever.

(8) Disconnect front cable from parking brake lever and remove cable.

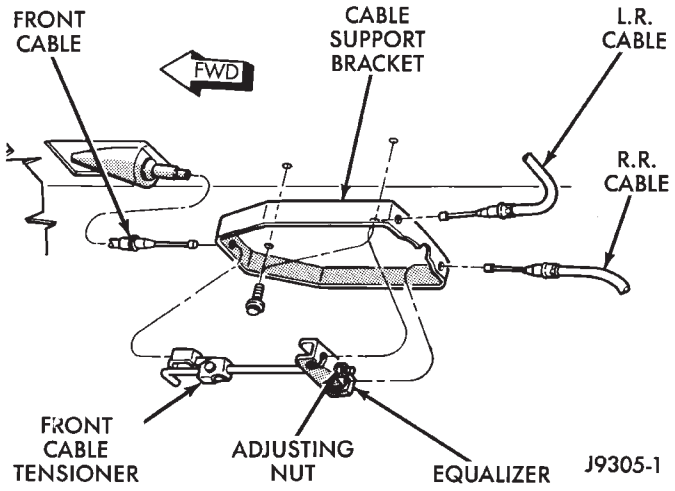


Fig. 44 Park Brake Cable Attachment

INSTALLATION

(1) Connect front cable to lever assembly.

(2) Seat front cable in floor pan.

(3) Install lever assembly.

(4) Install console.

(5) Raise vehicle.

(6) Assemble front cable, cable tensioner and equalizer.

(7) Adjust parking brake system if new cable, or tensioner has been installed, or if tensioner mechanism has been loosened, or removed for access to other components. Refer to Parking Brake Adjustment procedure in this section.

(8) Lower vehicle.

(9) Connect battery negative cable.

REAR PARKING BRAKE CABLE

REMOVAL

(1) Raise vehicle and loosen adjusting nut at equalizer to provide slack in rear cables.

REMOVAL AND INSTALLATION (Continued)

(2) Disengage cable at equalizer. Then disengage cable from body and chassis clips and retainers.

(3) Slide cable eyelet off actuating lever (Fig. 45).

(4) Compress retainer securing cable in bracket attached to caliper bracket. Then remove cable from bracket.

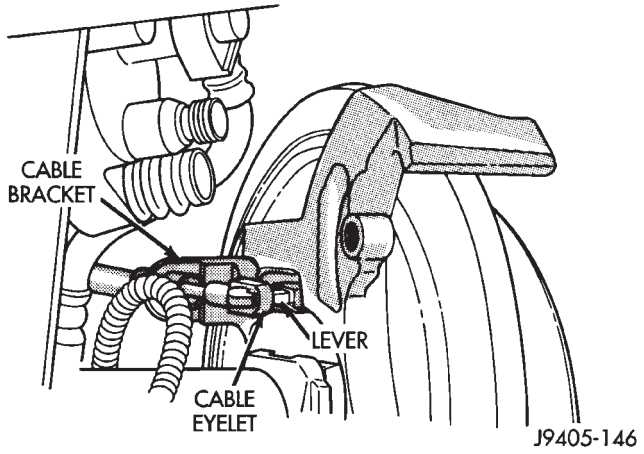


Fig. 45 Rear Cable Attachment

INSTALLATION

(1) Install cable eyelet on lever. Be sure eyelet is seated in lever notch.

(2) Seat cable retainer in caliper bracket.

(3) Route cable up to cable tensioner and equalizer. Then connect cable to equalizer.

(4) Check cable routing. Be sure cable is secured in body and chassis clips and retainers. Also be sure cable is not twisted, kinked or touching any rotating components.

(5) Adjust parking brake.

PARKING BRAKESHOES

REMOVAL

(1) Raise vehicle.

(2) Remove rear wheel and tire assembly.

(3) Remove caliper. **Do not allow brake hose to support caliper weight. Support caliper with wire attached to suspension component.**

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

(5) Retract parking brakeshoes with brake adjuster tool (Fig. 46). Position tool at top of star wheel and rotate wheel downward in clockwise direction (while facing front of vehicle).

(6) Remove rotor from axle hub flange.

(7) Remove shoe holddown clips and pins (Fig. 47). Clip is held in place by pin which fits in clip notch. To remove clip, first push clip ends together with thumb or forefinger. Next, slide clip upward until head of pin clears narrow part of notch. Then remove pin and clip.

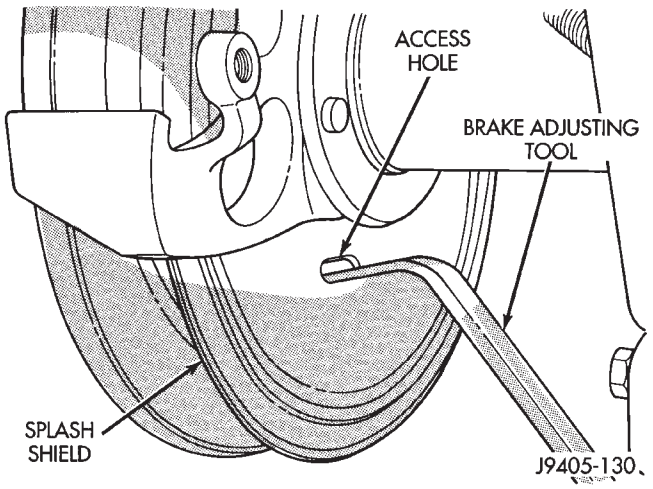


Fig. 46 Retracting Parking Brake Shoes

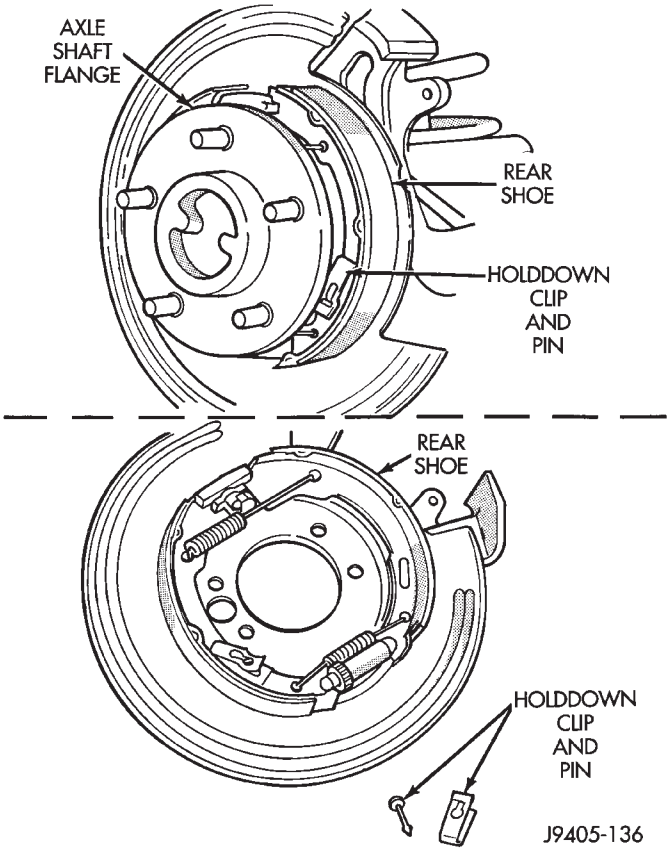


Fig. 47 Holddown Clip And Pin

(8) Remove upper and lower springs from shoes with needle nose pliers (Fig. 48).

(9) Tilt shoes outward and remove adjuster screw. **Note adjuster screw position for installation reference.**

(10) Inspect condition of all brake components. Replace parts if bent, damaged or worn.

(11) Clean and inspect condition of adjuster screw assembly. Replace assembly if worn, or damaged.

REMOVAL AND INSTALLATION (Continued)

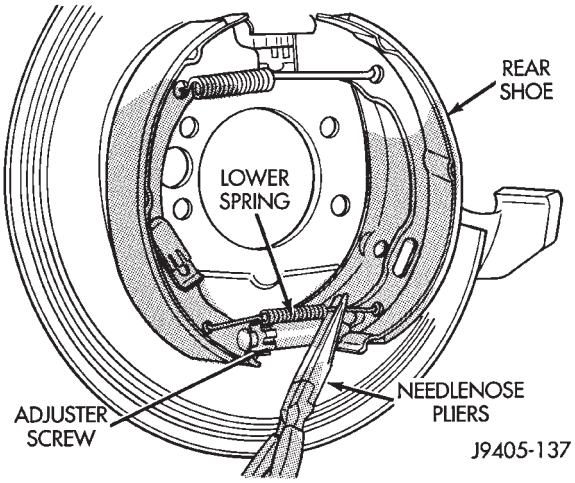


Fig. 48 Lower Spring

INSTALLATION

(1) Lubricate shoe contact pads and cam and lever with Mopar multi-mileage grease (Fig. 49).

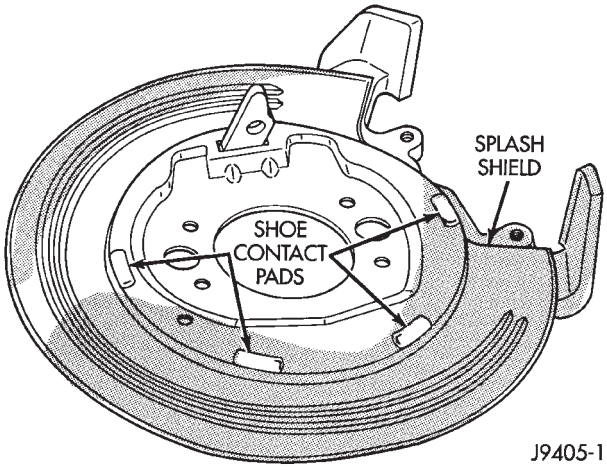


Fig. 49 Shoe Contact Pads

(2) Install shoes on splash shield with hold down clips and pins. Be sure shoes are properly engaged in caliper bracket and cam.

(3) 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.

(4) Install shoe upper and lower return spring. Needle nose pliers can be used to connect spring to each shoe. Operate lever to verify that shoes expand and retract properly.

(5) Install rotor and caliper.

(6) Adjust parking brakeshoes.

(7) Install wheel and tire assembly.

(8) Adjust parking brake cable tensioner.

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

PARKING BRAKE CAM AND LEVER

NOTE: The cams are reversible and can be used on either wheel. The levers are NOT reversible. They are marked R and L and the lever notch (for the cable eyelet), must faces rearward on both sides.

REMOVAL

(1) Raise vehicle.

(2) Remove wheel and tire assembly.

(3) Remove brake caliper and rotor.

(4) Remove parking brakeshoes.

(5) Move lever forward and disconnect parking brake rear cable from lever.

(6) Pull lever forward through boot. Disengage cam from lever and remove cam (Fig. 50). Note cam position for installation reference.

(7) Remove lever.

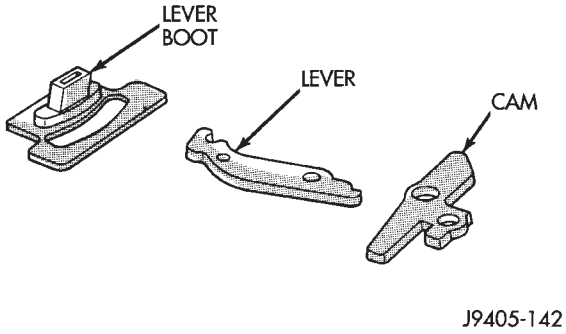


Fig. 50 Cam, Lever And Boot

INSTALLATION

(1) Lubricate replacement lever with silicone grease. Then insert lever part way through boot. Be sure lever notch is facing rearward.

(2) Engage cam in lever. Then simultaneously slide cam into place on splash shield and work lever through boot (Fig. 51).

(3) Install parking brakeshoes.

(4) Verify correct installation of cam and lever by pulling lever toward front of vehicle. Cam should expand both brakeshoes as lever is pulled forward.

(5) Install rotor and adjust parking brakeshoes.

(6) Connect rear cable to lever. Be sure cable eyelet is securely attached in lever notch.

(7) Install brake caliper and wheel and tire assembly.

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

SPLASH SHIELD/CALIPER BRACKET/LEVER BOOT

REMOVAL

(1) Raise vehicle and remove wheel and tire assembly.

REMOVAL AND INSTALLATION (Continued)

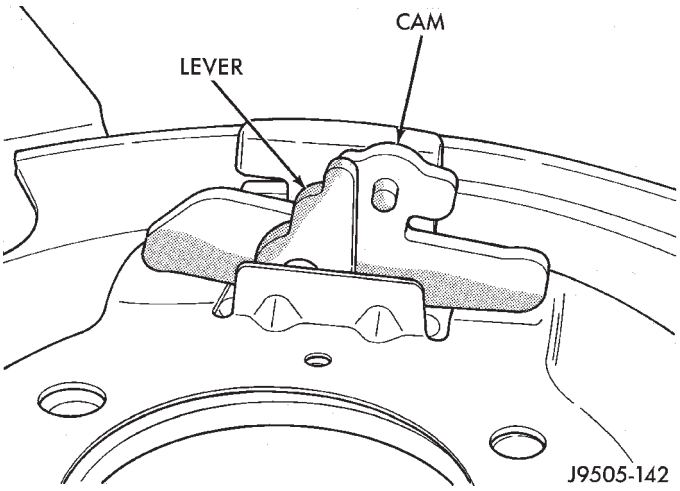


Fig. 51 Cam And Lever

(2) Remove caliper bolts and lift caliper off rotor and bracket. Suspend caliper from chassis or suspension component with wire.

(3) Retract parking brakeshoes and remove rotor.

(4) Remove axle shaft. Refer to Group 3 for procedure.

(5) Remove parking brakeshoes from splash shield.

(6) Remove nuts attaching splash shield and caliper bracket to axle tube flange.

(7) Remove splash shield and caliper bracket from axle studs and work lever out of rear cable eyelet.

(8) Mark position of splash shield and bracket for assembly reference. Use paint or scriber to mark parts.

(9) Drill out rivets that retain splash shield to caliper bracket (Fig. 52). If rivet heads did not come completely off after drilling, remove remaining pieces with small chisel. **Note that the rivets do not have to be replaced at installation. The rivets are only used during manufacture to keep the boot in place during handling.**

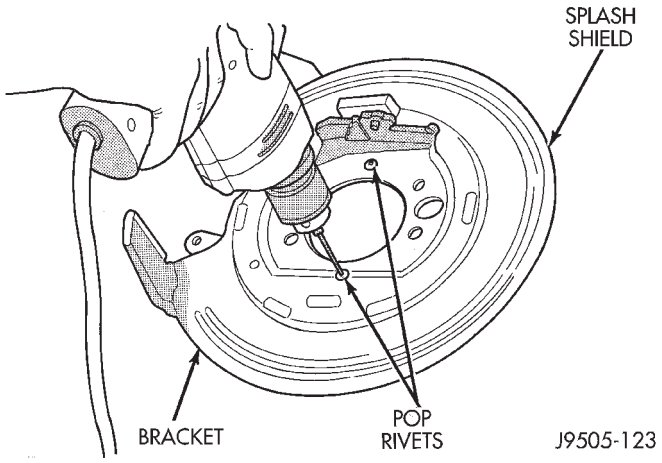


Fig. 52 Drilling Out Splash Shield Rivets

(10) Note position of cam and lever for installation reference. Then remove cam and lever from splash shield and bracket.

(11) Separate splash shield and caliper bracket. Then remove lever boot from bracket (Fig. 53).

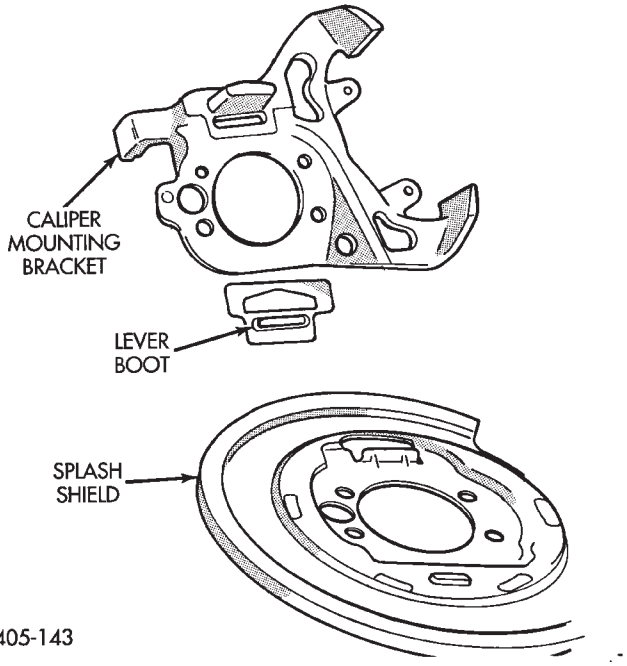


Fig. 53 Caliper Bracket, Splash Shield And Lever Boot

INSTALLATION

(1) If original bracket and shield will be reused, clean them with Mopar carb and brake cleaner. Also clean shoe contact pad surfaces of shield with 400 grit paper. Lubricate pad surfaces with light coat of Mopar multi-mileage grease.

(2) Apply thin coat of contact cement or silicone adhesive to new lever boot and to boot mounting area of caliper bracket (Fig. 54). Apply adhesive to areas where boot and bracket contact one another. Adhesive is needed to hold boot in position when splash shield is attached to bracket.

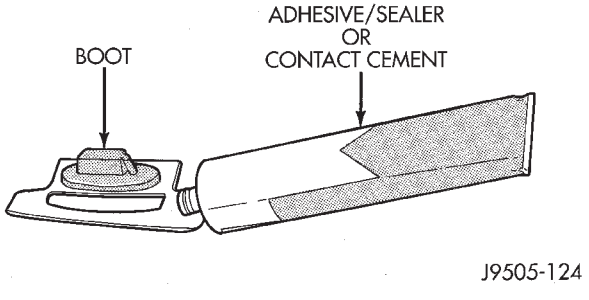


Fig. 54 Applying Adhesive To Parking Brake Lever Boot

(3) Install new boot on caliper bracket. Metal retainer part of boot fits over ledge on caliper as shown

REMOVAL AND INSTALLATION (Continued)

(Fig. 55). Rubber part of boot extends through rear opening in bracket. Allow adhesive on boot and bracket to set up for a minute or two before proceeding.

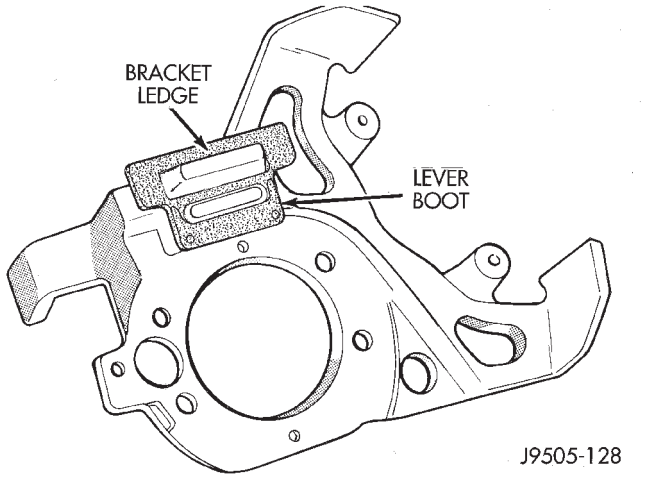


Fig. 55 Lever Boot Installation

(4) Position splash shield on caliper bracket. Then carefully install shield and bracket assembly on axle tube flange studs.

CAUTION: Be sure the parking brake lever boot is not displaced when the shield/assembly is installed. If the boot becomes mispositioned, it will prevent the shield from seating squarely on the bracket. This will cock the shield causing it to rub against the rotor after installation. Inspect the boot and reposition it if necessary.

(5) Apply Mopar Lock N' Seal (or Loctite 242), to axle tube stud nuts. Then install and tighten nuts to 43-61 N·m (32-45 ft. lbs.).

(6) Assemble and install cam and lever. Push lever through boot and seat cam between lip on shield and ledge on bracket (Fig. 56). Then engage lever in cable eyelet. Be sure cable notch in lever is facing rearward. Remove and reposition cam and lever if necessary.

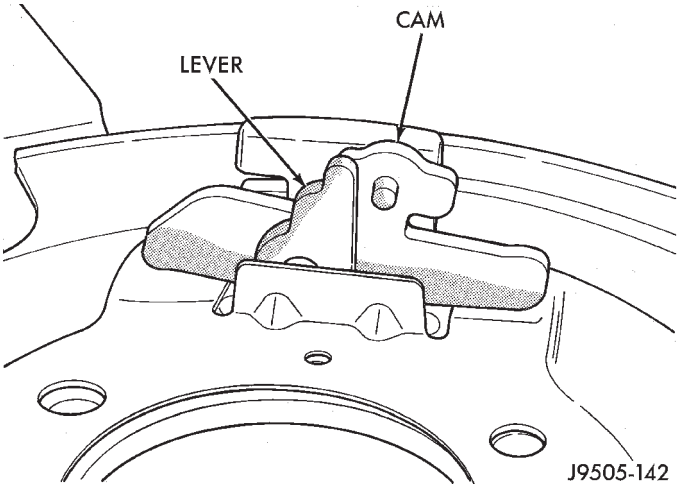


Fig. 56 Cam And Lever Installation

(7) Install parking brakeshoes on splash shield. Verify positioning of cam and lever, shoes, springs and holddown clips and pins (Fig. 57).

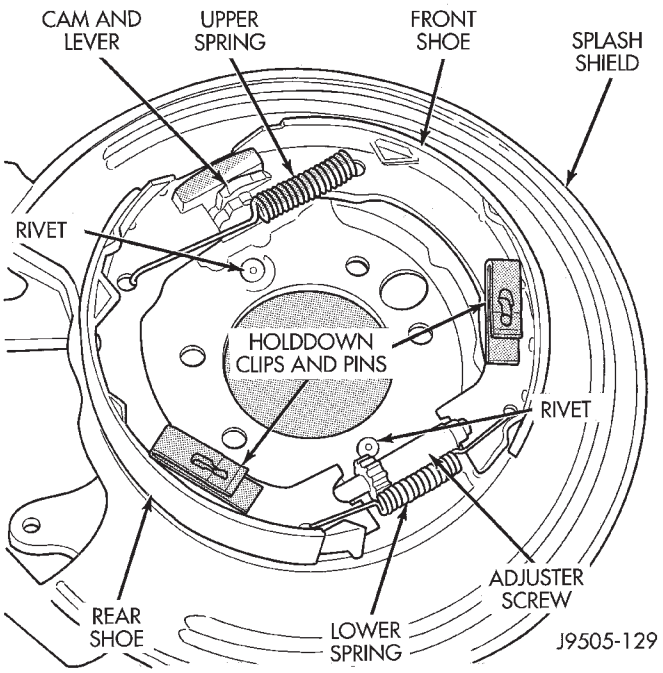


Fig. 57 Parking Brakeshoes Mounted On Shield

(8) Verify correct positioning of caliper bracket and shield (Fig. 58). Caliper opening and ledges should be to rear as shown.

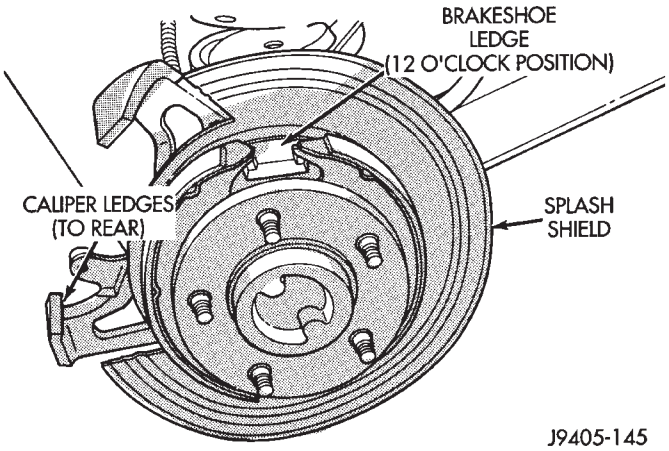


Fig. 58 Checking Caliper Bracket And Shield Position

(9) Install axle shaft, shaft retainer clips and housing cover. Check lube level and add lubricant if needed.

(10) Install rotor, caliper, and wheel and tire assembly. Then adjust parking brakeshoes.

(11) Lower vehicle and verify correct service and parking brake operation.

DISASSEMBLY AND ASSEMBLY

MASTER CYLINDER RESERVOIR

REMOVAL

(1) Remove reservoir cap and empty fluid into drain container.

(2) Remove pins that retain reservoir to master cylinder. Use hammer and pin punch to remove pins (Fig. 59).

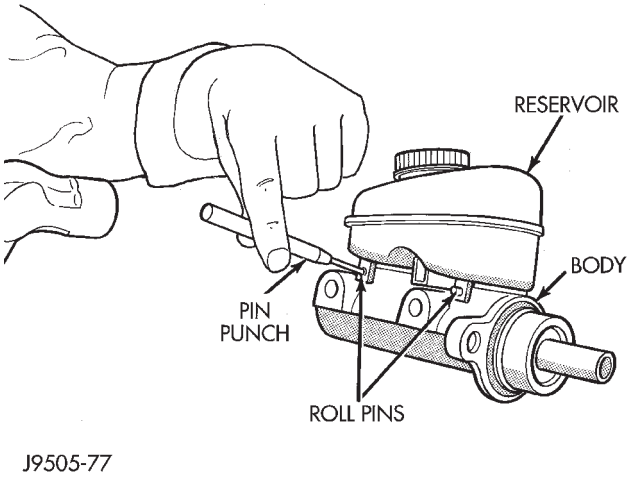


Fig. 59 Reservoir Retaining Pins

(3) Clamp cylinder body in vise with brass protective jaws.

(4) Loosen reservoir from grommets with pry tool (Fig. 60).

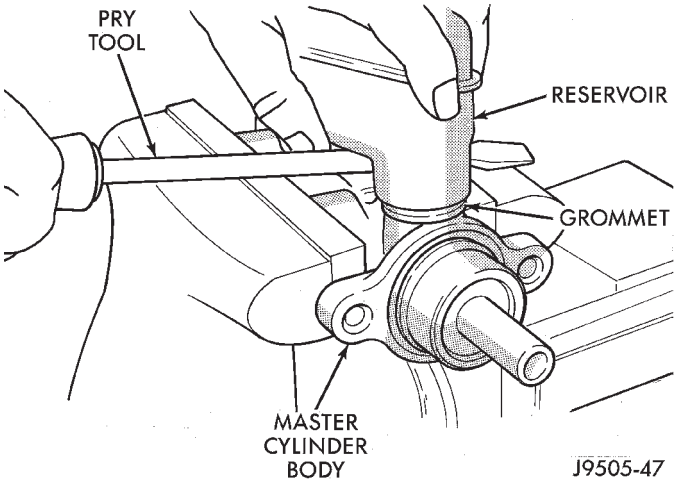


Fig. 60 Loosening Reservoir

(5) Remove reservoir by rocking it to one side and pulling free of grommets (Fig. 61).

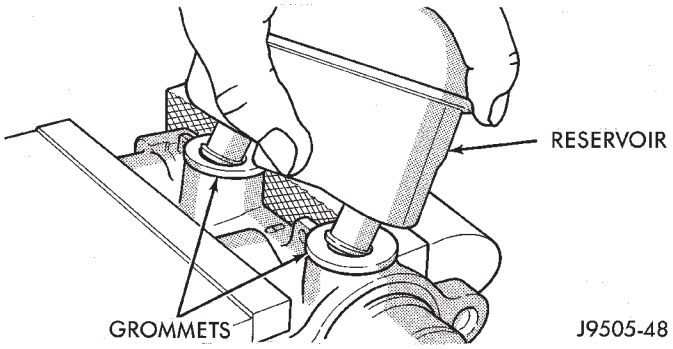


Fig. 61 Reservoir Removal

(6) Remove old grommets from cylinder body (Fig. 62).

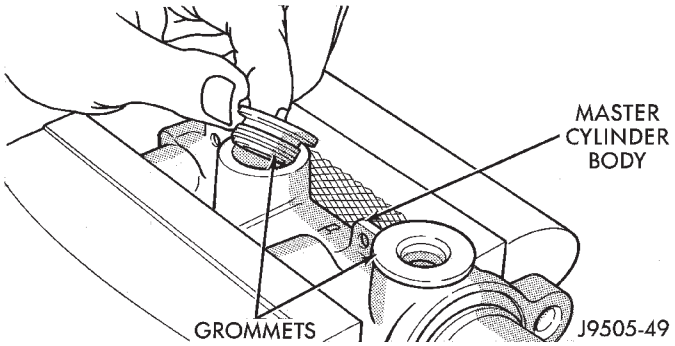


Fig. 62 Grommet Removal

INSTALLATION

CAUTION: Do not use any type of tool to install the grommets. Tools may cut, or tear the grommets creating a leak problem after installation. Install the grommets using finger pressure only.

(1) Lubricate new grommets with clean brake fluid and Install new grommets in cylinder body (Fig. 63). Use finger pressure to install and seat grommets.

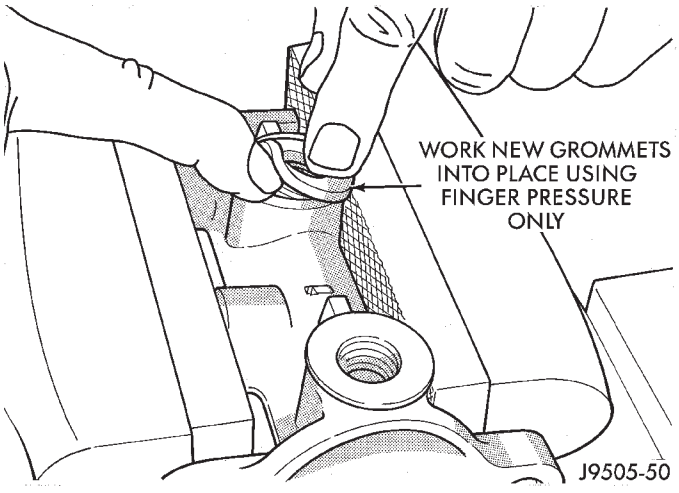


Fig. 63 Grommet Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Start reservoir in grommets. Then rock reservoir back and forth while pressing downward to seat it in grommets.

(3) Install pins that retain reservoir to cylinder body.

(4) Fill and bleed master cylinder on bench before installation in vehicle.

DISC BRAKE CALIPER

DISASSEMBLY

(1) Remove brakeshoes from caliper.

(2) Drain brake fluid out of caliper.

(3) Pad interior of caliper with minimum, 2.54 cm (1 in.) thickness of shop towels or rags (Fig. 64). Towels are needed to protect caliper piston during removal.

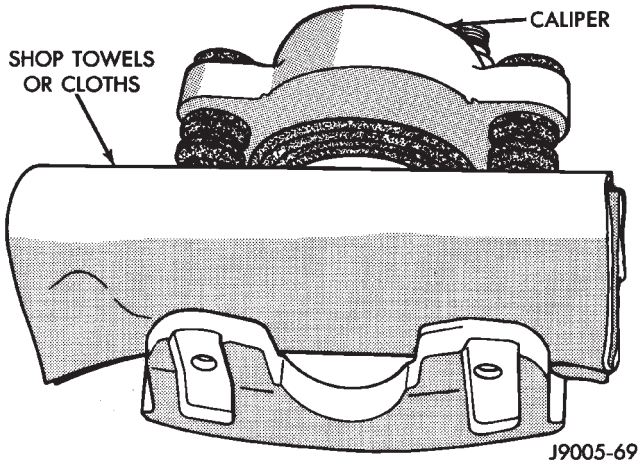


Fig. 64 Padding Caliper Interior

(4) Remove caliper piston with **short bursts** of low pressure compressed air. Direct air through fluid inlet port and ease piston out of bore (Fig. 65).

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston. Use only enough air pressure to ease the piston out. NEVER attempt to catch the piston as it leaves the bore. This will result in personal injury.

(5) Remove caliper piston dust boot with suitable tool (Fig. 66) and discard boot.

(6) Remove caliper piston seal with wood or plastic tool (Fig. 67) and discard seal. Do not use metal tools as they will scratch piston bore.

(7) Remove caliper mounting bolt bushings and boots (Fig. 68).

ASSEMBLY

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

(2) Lubricate caliper bushings and interior of bushing boots with Dielectric silicone grease.

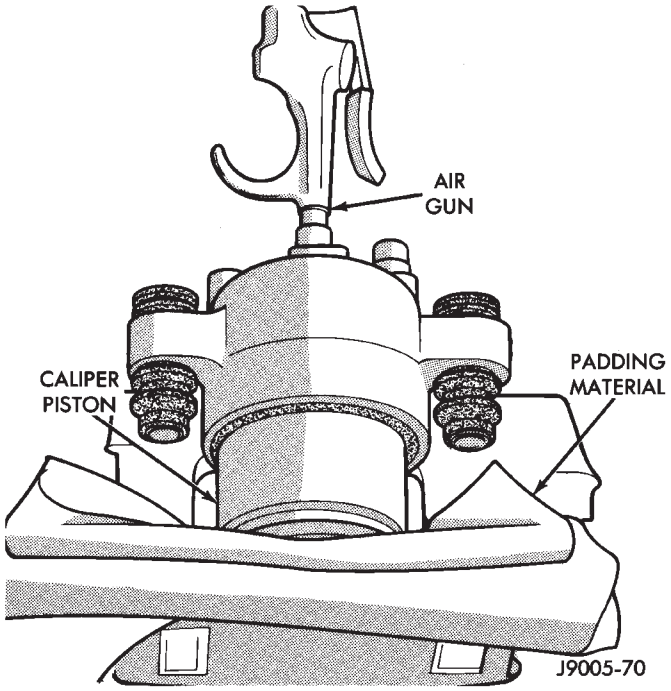


Fig. 65 Caliper Piston Removal

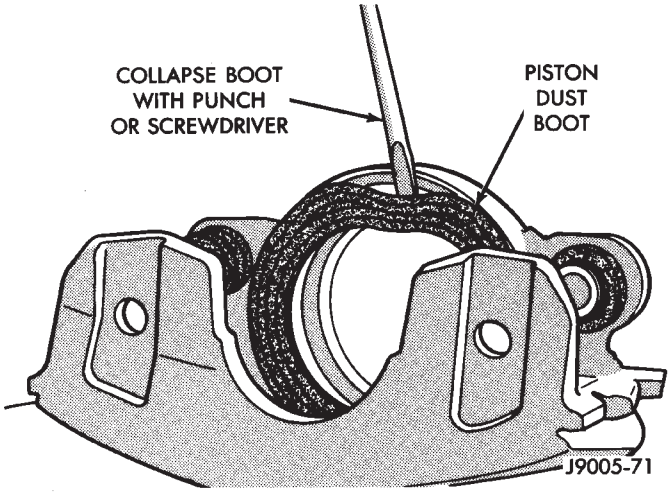


Fig. 66 Caliper Piston Dust Boot Removal

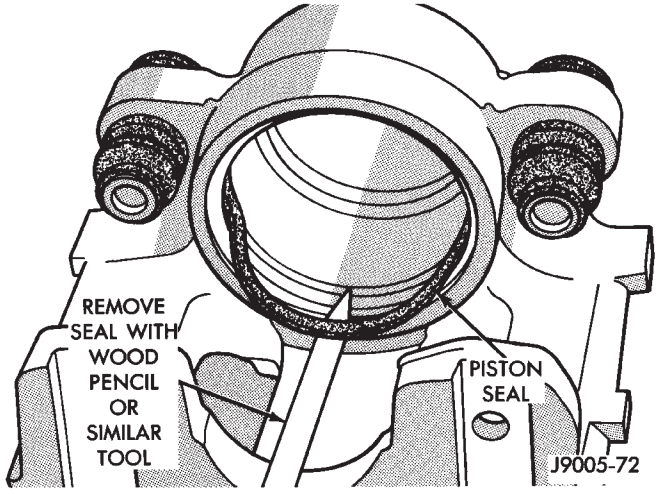


Fig. 67 Piston Seal Removal

DISASSEMBLY AND ASSEMBLY (Continued)

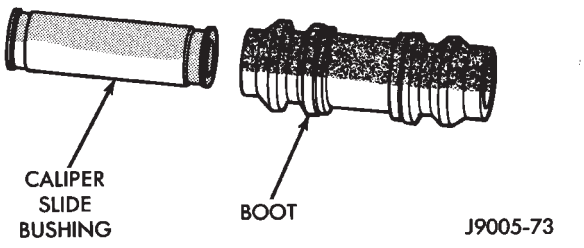


Fig. 68 Mounting Bolt Bushing And Boot

(3) Install bushing boots in caliper, then insert bushing into boot and push bushing into place (Fig. 69).

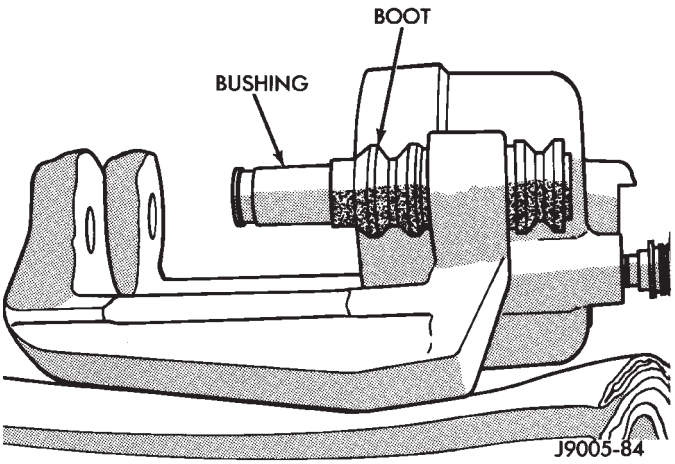


Fig. 69 Bushings And Boots Installation

(4) Install new piston seal into seal groove with finger (Fig. 70).

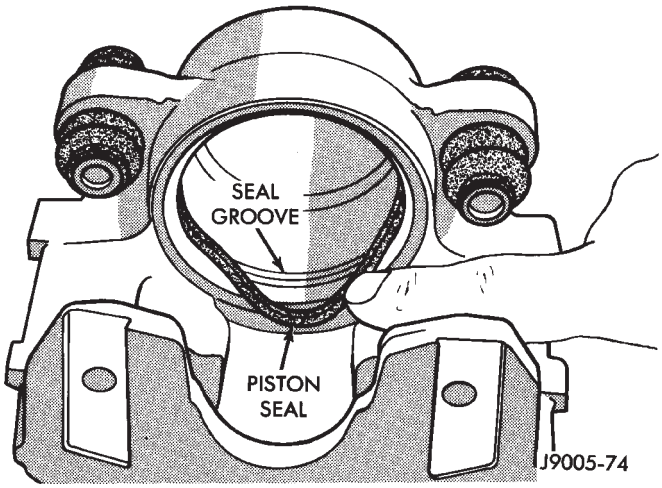


Fig. 70 Piston Seal Installation

(5) Install dust boot on caliper piston and seat boot in piston groove (Fig. 71).

(6) Press piston into caliper bore by hand, use a turn and push motion to work piston into seal (Fig. 72).

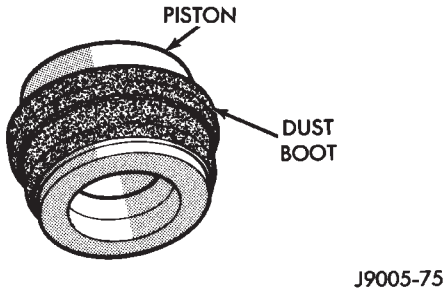


Fig. 71 Dust Boot On Piston

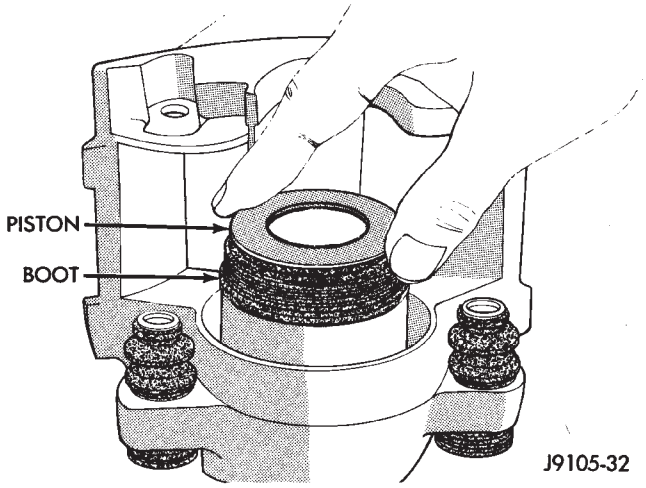


Fig. 72 Caliper Piston Installation

(7) Press caliper piston to bottom of bore.

(8) Seat dust boot in caliper with Installer Tool C-4842 and Tool Handle C-4171 (Fig. 73).

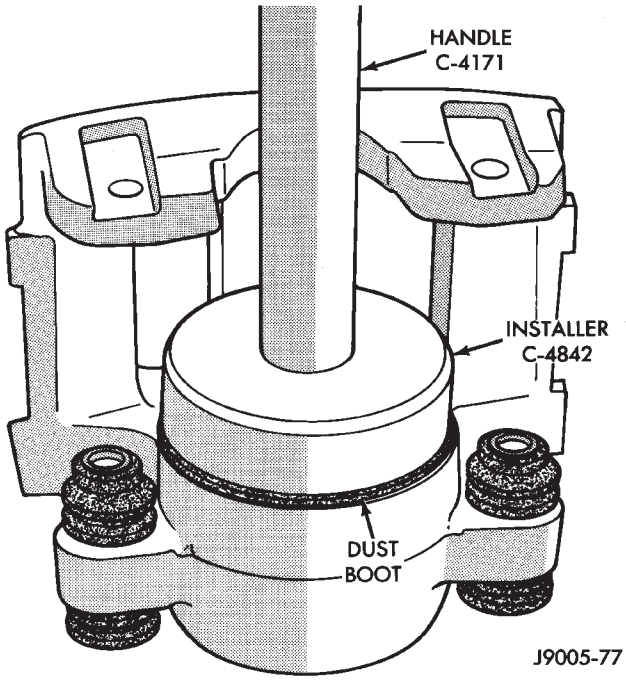


Fig. 73 Piston Dust Boot Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Replace caliper bleed screw if removed.

REAR DISC BRAKE CALIPER

DISASSEMBLY

(1) Remove caliper and brakeshoes.

(2) Remove mounting bolt boots and bushings from caliper (Fig. 74).

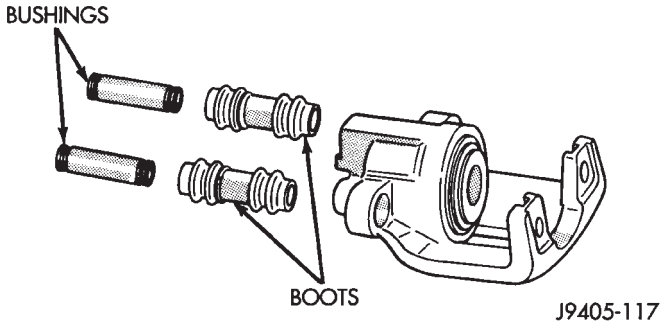


Fig. 74 Mounting Bolt Bushings And Boots

(3) Pad interior of caliper with minimum, one-inch thickness of shop towels or rags (Fig. 75). Towels are needed to protect caliper piston during removal.

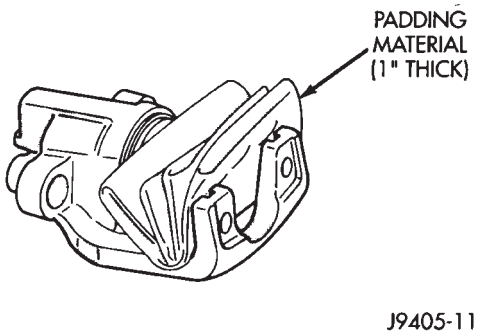


Fig. 75 Padding Caliper

(4) Remove caliper piston with **short bursts** of low pressure compressed air. Direct air through fluid inlet port and ease piston out of bore (Fig. 76).

CAUTION: Do not blow the piston out of the bore with sustained air pressure. This could result in a cracked piston. Use only enough air pressure to ease the piston out. In addition, NEVER attempt to catch the piston as it leaves the bore. This could result in personal injury.

(5) Remove caliper piston dust boot (Fig. 77).

(6) Remove and discard caliper piston seal with pencil, or plastic tool (Fig. 78). Do not use metal tools as they will scratch piston bore.

ASSEMBLY

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

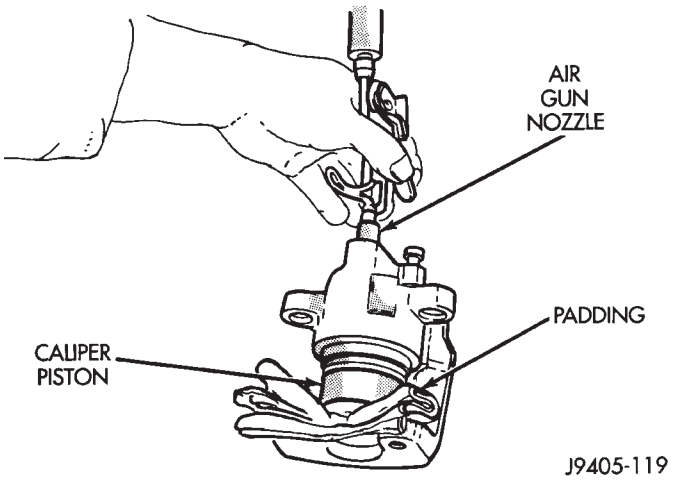


Fig. 76 Caliper Piston Removal

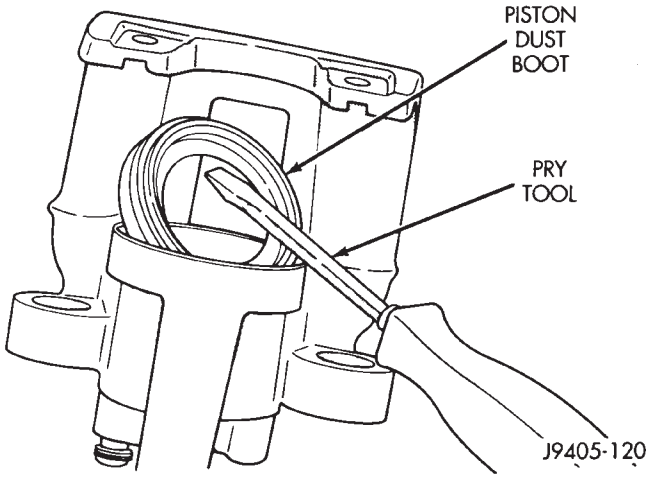


Fig. 77 Caliper Piston Dust Boot

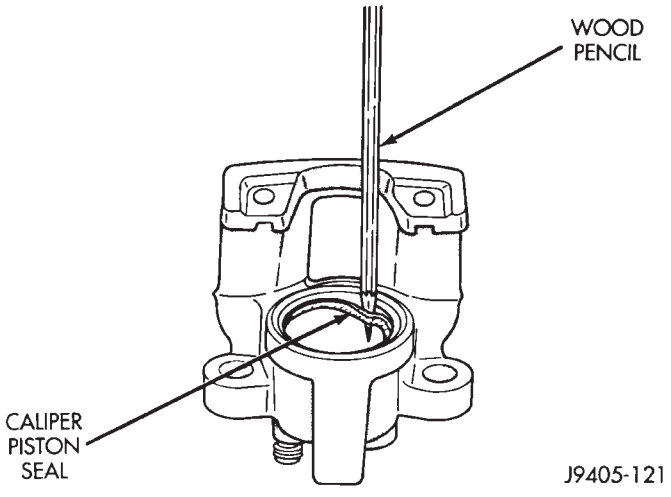


Fig. 78 Caliper Piston Seal

(2) Install new piston seal in groove machined in piston bore. Be sure seal is fully seated and is not twisted. Press seal into place with fingertips.

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Lubricate caliper piston with clean brake fluid and start piston into bore and seal by hand. Use a twisting, rocking motion to start piston into seal. **Keep piston level while starting it in seal otherwise seal can be folded over.**

(4) Once piston is firmly started in seal, press piston about 2/3 of way into bore with C-clamp or bench vise (Fig. 79).

CAUTION: Position a protective wood block between the piston and C-clamp or vise jaws. The wood block will avoid chipping or cracking the piston while pressing it into place.

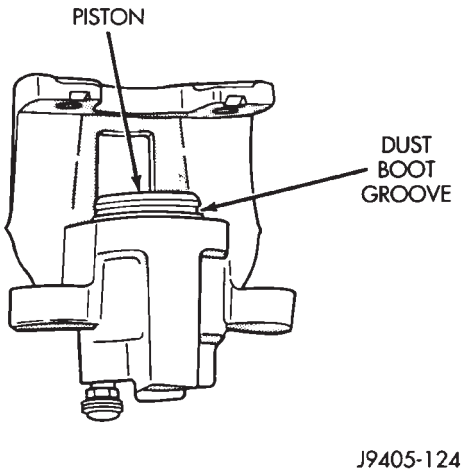


Fig. 79 Piston Installed In Caliper

(5) Install dust boot on piston. Be sure boot lip is fully seated in groove at top of caliper piston.

(6) Seat dust boot in caliper either by hand, or with a suitable size installer tool (Fig. 80).

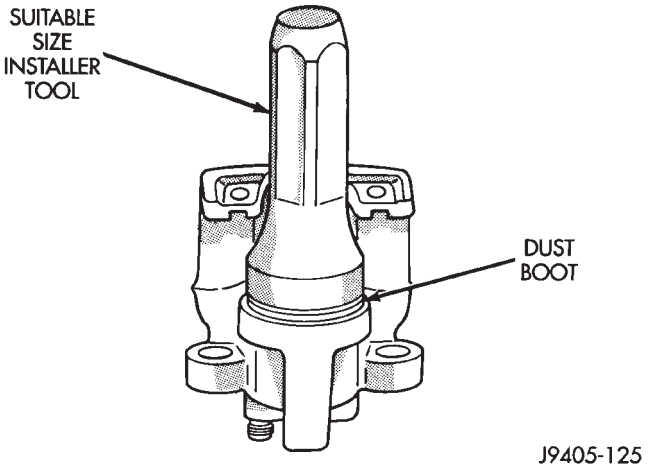


Fig. 80 Seating Caliper Piston Dust Boot

(7) Press caliper to bottom of bore after seating dust boot. Be sure to use wood block to protect piston and boot.

(8) Install caliper bleed screw, if removed.

(9) Install bushing and boot assemblies in caliper. Be sure boots are centered in caliper as shown.

(10) Apply GE or Dow silicone grease to interior of bushing boots. Then apply same lubricant to exterior and interior of bushings.

(11) Install mounting bolt bushings in boots (Fig. 81). Be sure boot lips are seated in grooves at ends of bushings.

(12) Center bushing boots in caliper.

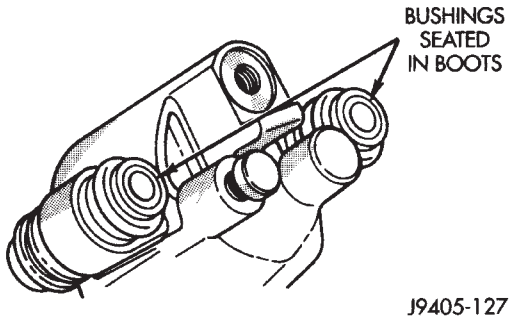


Fig. 81 Bushings Installed In Boots

(13) Install brakeshoes in caliper.

(14) Install caliper.

CLEANING AND INSPECTION

CALIPER

CLEANING

Clean the caliper components with clean brake fluid or Mopar brake cleaning solvent only. Do not use gasoline, kerosene, thinner, or similar solvents. These products may leave a residue that could damage the piston and seal.

Wipe the caliper and piston dry with lint free towels or use low pressure compressed air.

INSPECTION

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

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

NOTE: If the caliper piston must be 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 for resin and steel pistons. Do not intermix these components at any time.

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

CLEANING AND INSPECTION (Continued)

corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

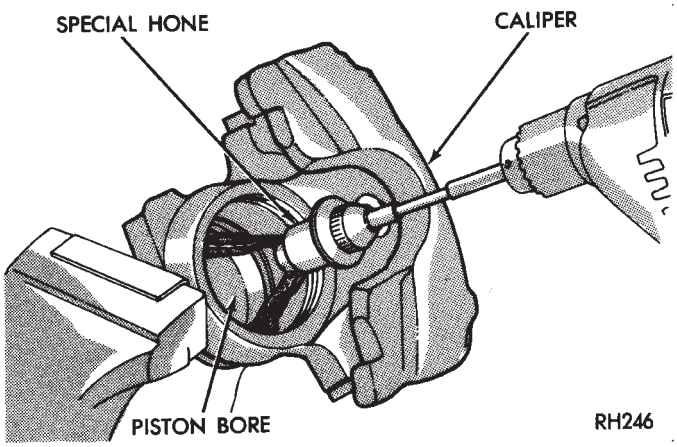


Fig. 82 Lightly Polishing Piston Bore With Tool

ADJUSTMENTS

STOP 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 fully rearward. Pedal will set plunger to correct position as pedal pushes plunger into switch body. Switch will make racheting sound as it self adjusts.

PARKING BRAKE CABLE TENSIONER

NOTE: Parking brake adjustment is only necessary when the tensioner, or a cable has been replaced or disconnected for service. When adjustment is necessary, perform the following procedure for proper parking brake operation.

ADJUSTMENT

(1) Raise vehicle.
(2) Back off tensioner adjusting nut to create slack in cables.
(3) Remove rear wheel/tire assemblies and remove brake drums.
(4) Check rear brakeshoe adjustment with standard brake gauge. **Excessive shoe-to-drum clearance, or worn brake components will result in faulty parking brake adjustment and operation.**
(5) Verify that parking brake cables operate freely and are not binding, or seized. Replace faulty cables, before proceeding.
(6) Reinstall brake drums and wheel/tire assemblies after brakeshoe adjustment is complete.
(7) Lower vehicle enough for access to parking brake lever. Then **fully** apply parking brakes. Leave brakes applied until adjustment is complete.
(8) Raise vehicle and mark tensioner rod 6.5 mm (1/4 in.) from tensioner bracket (Fig. 83).
(9) Tighten adjusting nut at equalizer until mark on tensioner rod moves into alignment with tensioner bracket.
(10) Lower vehicle until rear wheels are 15-20 cm (6-8 in.) off shop floor.
(11) Release parking brake lever and verify that rear wheels rotate freely without drag.
(12) Lower vehicle.

NOTE: Do not loosen/tighten equalizer adjusting nut for any reason after completing adjustment.

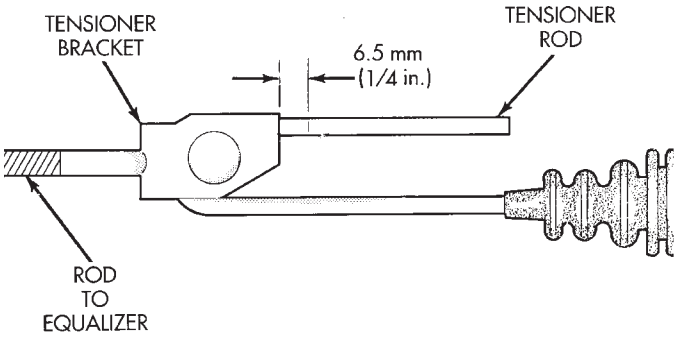


Fig. 83 Tensioner Rod Measurement

PARKING BRAKESHOE

(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. 84). Position tool at bottom of star wheel.
(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

SPECIFICATIONS (Continued)

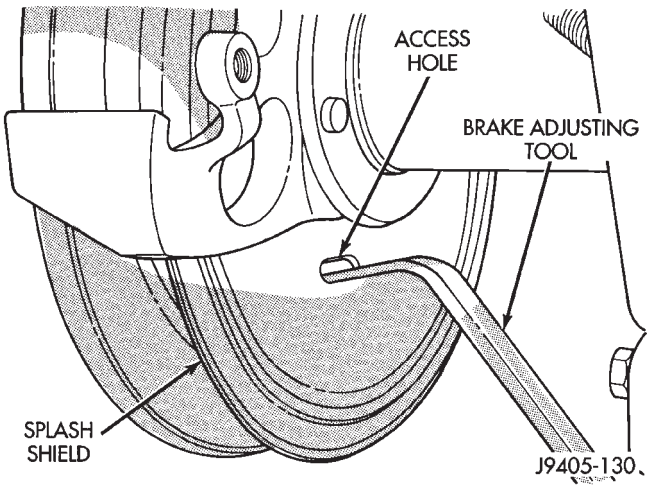


Fig. 84 Park Brakeshoe Adjustment

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.

BRAKE COMPONENTS

Front Disc Brake Caliper
- Type . . . . . .Floating

Front Disc Brake Rotor
- Type . . . . . .Ventilated
- Max. Runout. . . . . .0.13 mm (0.005 in.)
- Max. Thickness Variation . . .0.013mm (0.0005 in.)

Rear Disc Brake Caliper
- Type . . . . . .Floating

Rear Disc Brake Rotor
- Type . . . . . .Solid
- Max. Runout. . . . . .0.13 mm (0.005 in.)
- Max. Thickness Variation . . .0.0254 mm (0.001 in.)

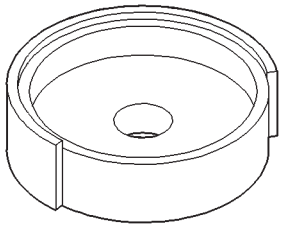
Brake Booster
- Type . . . . . .Dual Diaphragm

TORQUE CHART

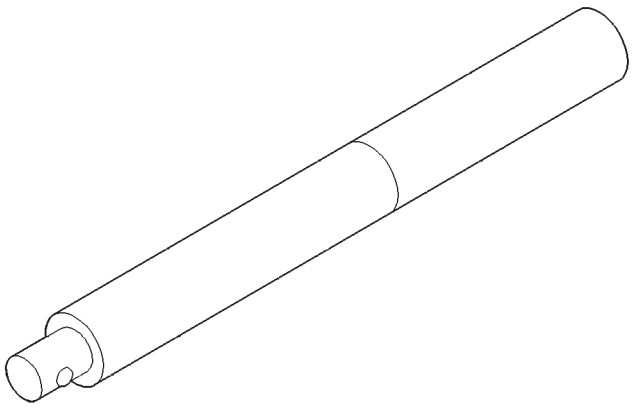
DESCRIPTION	TORQUE
Brake Pedal	
Support Bolt	23-34 N·m (17-25 ft. lbs.)
Pivot Bolt/Nut	27-35 N·m (20-26 ft. lbs.)
Brake Booster	
Mounting Nuts	41 N·m (30 ft. lbs.)
Master Cylinder	
Mounting Nuts	13-25 N·m (10-18 ft. lbs.)
Primary Brakeline	15-18 N·m (11-13 ft. lbs.)
Secondary Brakeline	15-18 N·m (11-13 ft. lbs.)
Combination Valve	
Mounting Nuts	25 N·m (18.5 ft. lbs.)
Brakeline to Master Cyl.	15-18 N·m (11-13 ft. lbs.)
Front Caliper	
Mounting Bolts	10-20 N·m (7-15 ft. lbs.)
Brake Hose Bolt	31 N·m (23 ft. lbs.)
Rear Caliper	
Mounting Bolts	10-20 N·m (7-15 ft. lbs.)
Brake Hose Bolt	31 N·m (23 ft. lbs.)
Parking Brake	
Lever Screws	10-14 N·m (7-10 ft. lbs.)
Lever Bracket Screws	10-14 N·m (7-10 ft. lbs.)
Cable Retainer Nut.	1-2 N·m (12-16 in. lbs.)

SPECIAL TOOLS

BASE BRAKES



Installer Caliper Dust Boot C-4842



Handle C-4171

ANTILOCK BRAKES

INDEX

GENERAL INFORMATION

ABS

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

The system is designed to prevent wheel lockup and maintain steering control during periods of high wheel slip when braking. Preventing lockup is accomplished by modulating fluid pressure to the wheel brake units.

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 (CAB) operates the system components.

ABS system major components include:

- Controller Antilock Brakes (CAB)
- Hydraulic Control Unit (HCU)
- Wheel Speed Sensors (WSS)
- Acceleration Switch
- Main Relay And Pump Motor Relay
- ABS Warning Light
- Pump Motor Sensor

DESCRIPTION AND OPERATION

ABS

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.

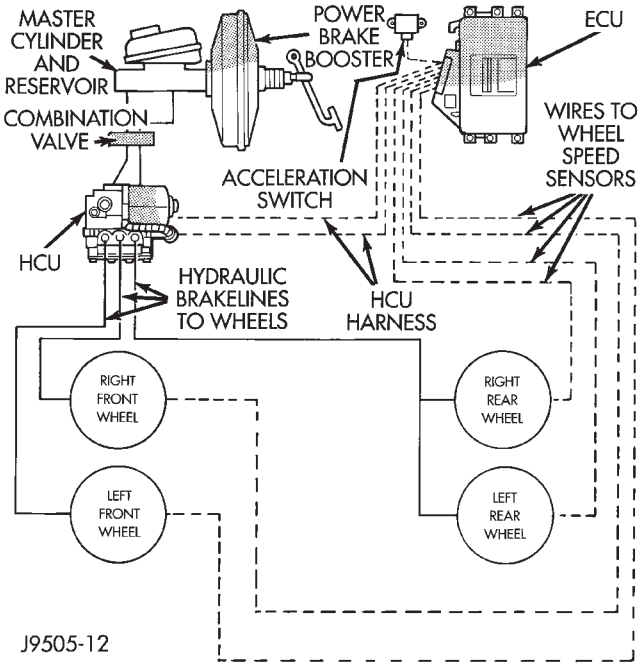


Fig. 1 Jeep ABS System

The static check occurs after the ignition switch is turned to Run position. The dynamic check occurs when vehicle road speed reaches approximately 10 kph (6 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

DESCRIPTION AND OPERATION (Continued)

light and registers a fault code in the microprocessor memory.

NORMAL BRAKING

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.

During normal braking, the master cylinder, power booster and wheel brake units all function as they would in a vehicle without ABS. The HCU components are not activated.

ANTILOCK BRAKING

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 zero (or lockup) during braking. Periods of high wheel slip occur when brake stops involve high pedal pressure and rate of vehicle deceleration.

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 (CAB)

A separate electronic control unit (CAB) operates the ABS system (Fig. 2). The CAB is separate from other vehicle electrical circuits. CAB voltage source is through the ignition switch in the RUN position.

The CAB is located under the instrument panel in the passenger compartment. In left hand drive models, it at the right side of the steering column. In right hand drive models, it is near the cowl panel

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.

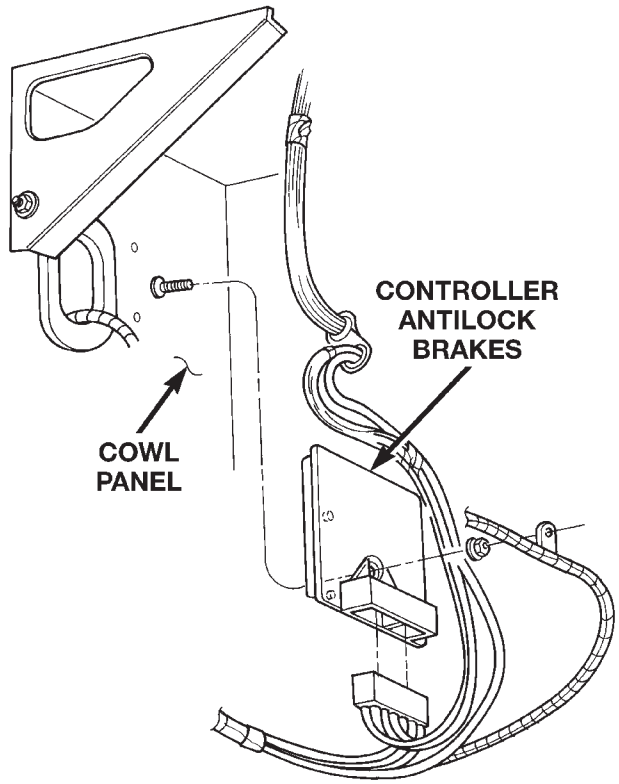


Fig. 2 Controller Antilock Brakes

HYDRAULIC CONTROL UNIT (HCU)

The hydraulic control unit (HCU) consists of a valve body, pump body, accumulators, pump motor, and wire harnesses (Fig. 3).

The pump, motor, and accumulators are combined into an assembly attached to the valve body. The accumulators store the 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 valve body contains the solenoid valves. The valves modulate brake pressure during antilock braking and are controlled by the CAB.

DESCRIPTION AND OPERATION (Continued)

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.

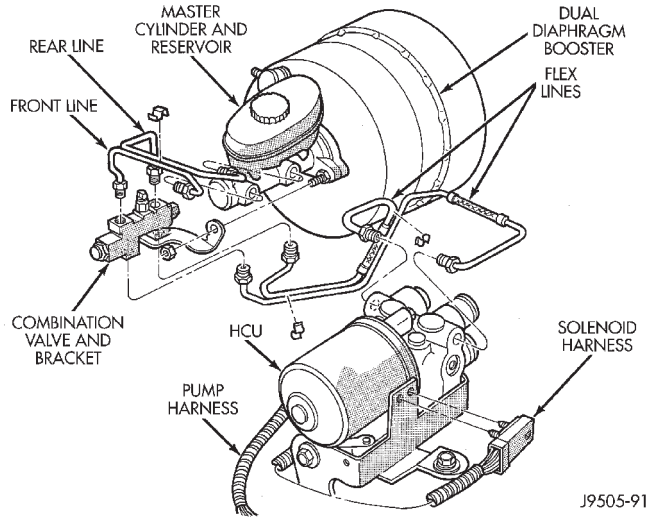


Fig. 3 ABS Master Cylinder-Booster-Combination Valve-HCU

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, 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 (Fig. 4).

A pressure decrease cycle is initiated when speed sensor signals indicate high wheel slip at one or more wheels. At this point, the CAB 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 (Fig. 5). 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

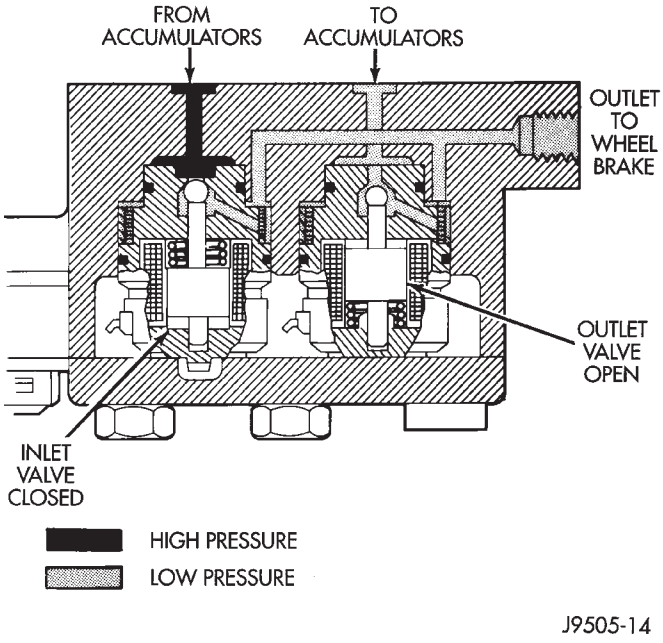


Fig. 4 Pressure Decrease Cycle

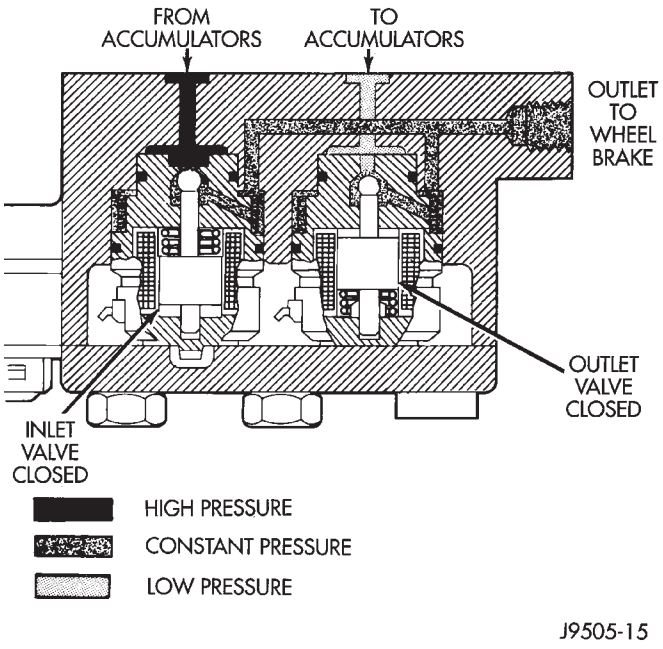


Fig. 5 Pressure Hold Cycle

The inlet valve is open and the outlet valve is closed during the pressure increase cycle (Fig. 6). 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.

DESCRIPTION AND OPERATION (Continued)

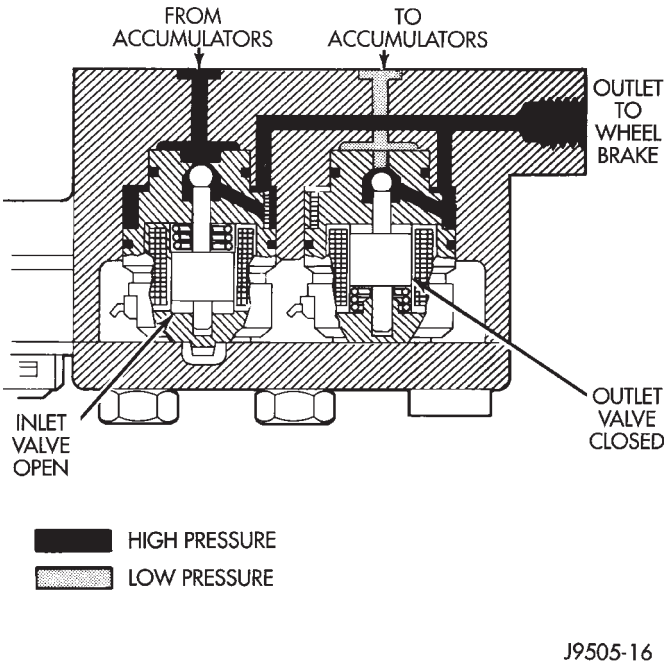


Fig. 6 Pressure Increase Cycle

WHEEL SPEED SENSORS AND TONE WHEEL

A speed sensor is used at each wheel. The front sensors are mounted to the steering knuckles. The rear sensors at the outboard end of the axle.

The sensors convert wheel speed into a small AC electrical signal. This signal is transmitted to the CAB. The CAB convert the AC signal into a digital signal for each wheel. This voltage is generated by magnetic induction when a tone wheel passes by the stationary magnetic of the wheel speed sensor.

A gear type tone ring serves as the trigger mechanism for each sensor. The tone rings are mounted at the outboard ends of the front and rear axle shafts.

Different sensors are used at the front and rear wheels (Fig. 7). The front/rear sensors have the same electrical values but are not interchangeable. The sensors have a resistance between 900 and 1300 ohms.

SPEED SENSOR AIR GAP

Front Sensor

Front sensor air gap is fixed and not adjustable. Only rear sensor air gap is adjustable.

Although front air gap is not adjustable, it can be checked if diagnosis indicates this is necessary. Front air gap should be 0.40 to 1.3 mm (0.0157 to 0.051 in.). If gap is incorrect, the sensor is either loose, or damaged.

Rear Sensor

A rear sensor air gap adjustment is only needed when reinstalling an original sensor. Replacement

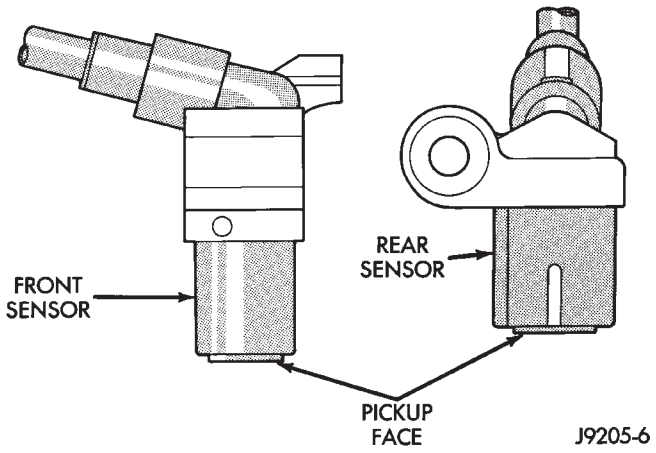


Fig. 7 Wheel Speed Sensors

sensors have an air gap spacer attached to the sensor pickup face. The spacer establishes correct air gap when pressed against the tone ring during installation. As the tone ring rotates, it peels the spacer off the sensor to create the required air gap. Rear sensor air gap is 0.92-1.45 mm (0.036-0.057 in.).

Sensor air gap measurement, or adjustment procedures are provided in this section. Refer to the front, or rear sensor removal and installation procedures as required.

COMBINATION VALVE

The combination valve contains a pressure differential valve and switch and a rear brake proportioning valve. The valve is not repairable. It must be replaced if diagnosis indicates this is necessary.

The pressure differential switch is connected to the brake warning light. The switch is actuated by movement of the switch valve. The switch monitors fluid pressure in the separate front/rear brake hydraulic circuits.

A decrease or loss of fluid pressure in either hydraulic circuit will cause the switch valve to shuttle to the low pressure side. Movement of the valve pushes the switch plunger upward. This action closes the switch internal contacts completing the electrical circuit to the red warning light. The switch valve will remain in an actuated position until repairs are made.

The rear proportioning valve is used to balance front-rear brake action. The valve allows normal fluid flow during moderate effort brake stops. The valve only controls (meters) fluid flow during high effort brake stops.

ACCELERATION SWITCH

The acceleration switch is located under the rear seat.

DESCRIPTION AND OPERATION (Continued)

The switch (Fig. 8), provides an additional vehicle deceleration reference during 4-wheel drive operation. The switch is monitored by the CAB at all times. The switch reference signal is utilized by the CAB when all wheels are decelerating at the same speed.

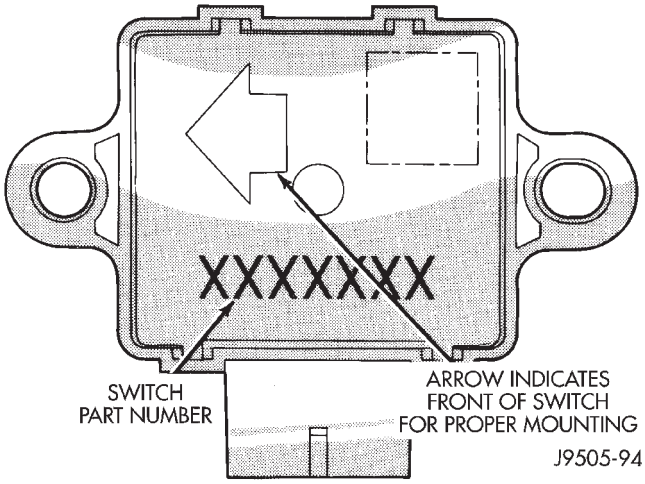


Fig. 8 Acceleration Switch

ABS SYSTEM RELAYS

The ABS system has two relays, which are the main and motor pump relays. The main relay is used for the solenoid valves and CAB. The main relay is connected to the CAB at the power control relay terminal. The motor pump relay is used for the motor pump only. The pump motor relay starts/stops the pump motor when signaled by the CAB.

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 and or the main relay through an in-harness diode. The CAB controls the lamp by directly grounding the circuit. The main relay grounds the lamp circuit when it is de-energized.

DIAGNOSIS AND TESTING

ABS BRAKE SYSTEM

ABS WARNING LAMP DISPLAY

The amber antilock lamp illuminates at startup as part of the system self check feature. The lamp illuminates for 1-3 seconds then goes off as part of the normal bulb check routine.

An ABS circuit fault is indicated when the amber lamp remains on after startup, or illuminates at any time during vehicle operation.

Verify that a fault is actually related to the ABS system before making repairs. For example, if the red lamp illuminates but the amber ABS lamp does not, the problem is related to a service brake component and not the ABS system. Or, if neither lamp illuminates but a brake problem is noted, again, the problem is with a service brake component and not with the ABS system.

DRB SCAN TOOL

ABS diagnosis is performed with the DRB scan tool. Diagnosis information is provided in the Chassis Diagnostic Manual.

ABS DIAGNOSTIC CONNECTOR

The ABS diagnostic connector is located inside the vehicle. The connector is the access point for the DRB scan tool.

The connector is blue or black in color and is a 6-way type. The connector is under the carpet at the forward end of the console just under the IP center.

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 ABS diagnostic connector under carpet at front of console, just under instrument panel center bezel.

(3) Select CHASSIS SYSTEM, followed by TEVES ABS BRAKES, then BLEED BRAKES. 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 harness connectors from controller.

REMOVAL AND INSTALLATION (Continued)

(2) Remove mounting nut and remove controller (Fig. 9).

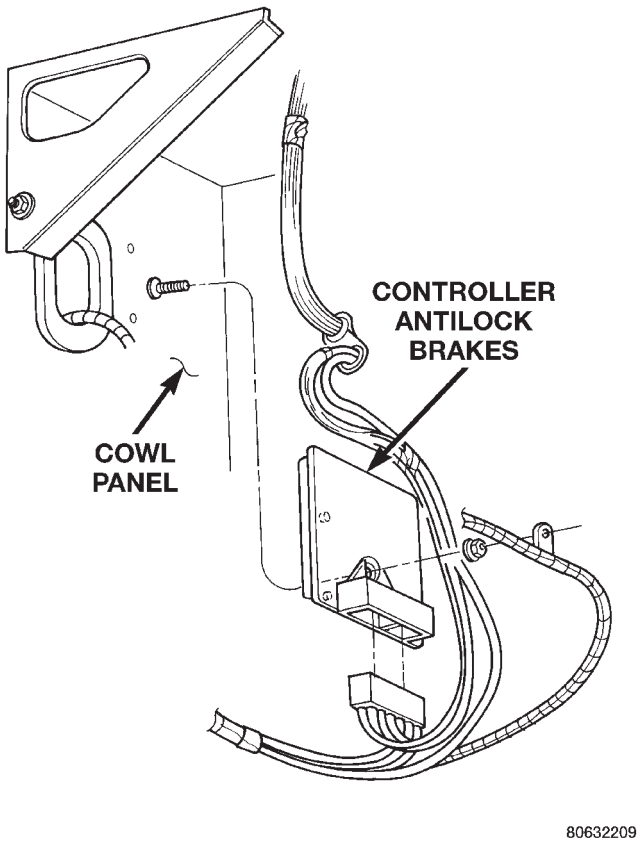


Fig. 9 Controller Antilock Brakes

INSTALLATION

(1) Install controller on mounting stud.

(2) Install mounting nut and tighten to 6 N·m (55 in. lbs.).

(3) Connect harness connectors to controller.

HYDRAULIC CONTROLLER UNIT

REMOVAL

(1) Remove air filter housing.

(2) Slide HCU solenoid harness connector off retaining tab on combination valve. Then unplug connector from engine compartment harness and move it aside (Fig. 10).

(3) Remove combination valve.

(4) Remove master cylinder.

(5) Remove mounting nuts from HCU bracket to suspension support panel (Fig. 11). Retain bracket nuts.

(6) Disconnect HCU pump motor harness (Fig. 12).

(7) Disconnect three brakelines at rear of HCU (Fig. 13).

(8) If HCU is to be replaced, remove flex lines from HCU.

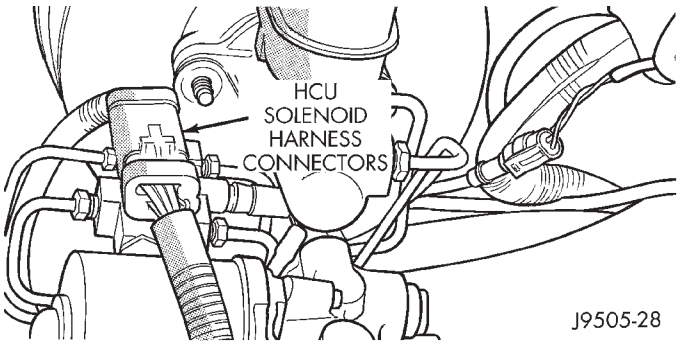


Fig. 10 HCU Solenoid Harness Connector

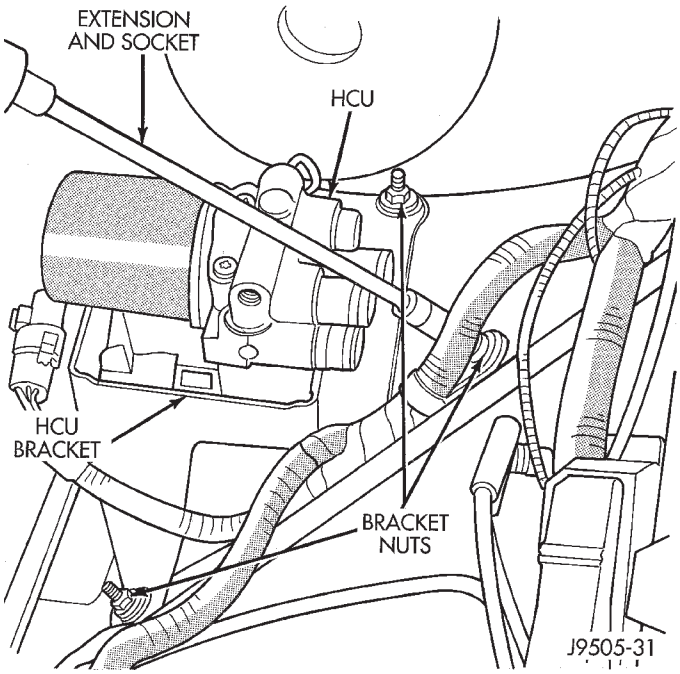


Fig. 11 HCU Bracket Mounting Nuts

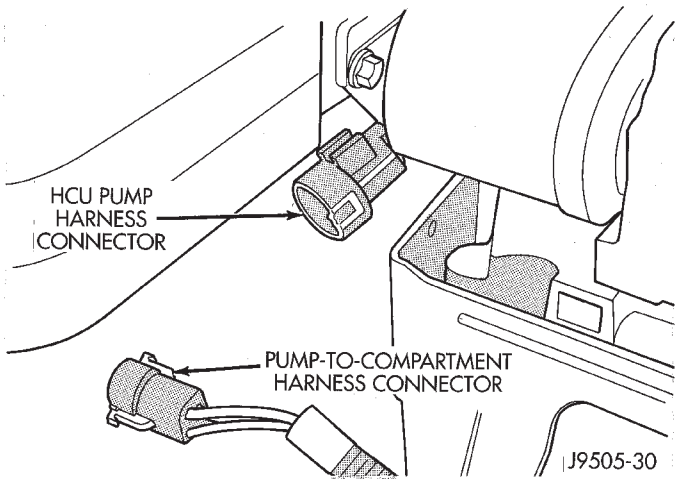


Fig. 12 HCU Pump Motor Harness Connector

(9) Lift HCU and bracket off mounting studs and remove assembly from engine compartment (Fig. 14).

REMOVAL AND INSTALLATION (Continued)

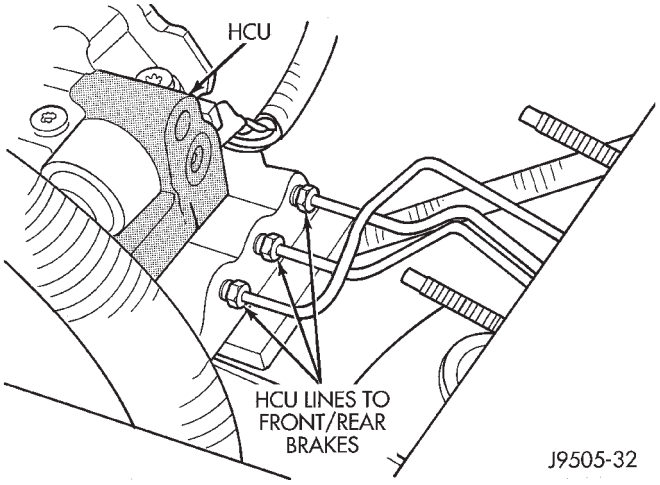


Fig. 13 HCU Brakeline Connections

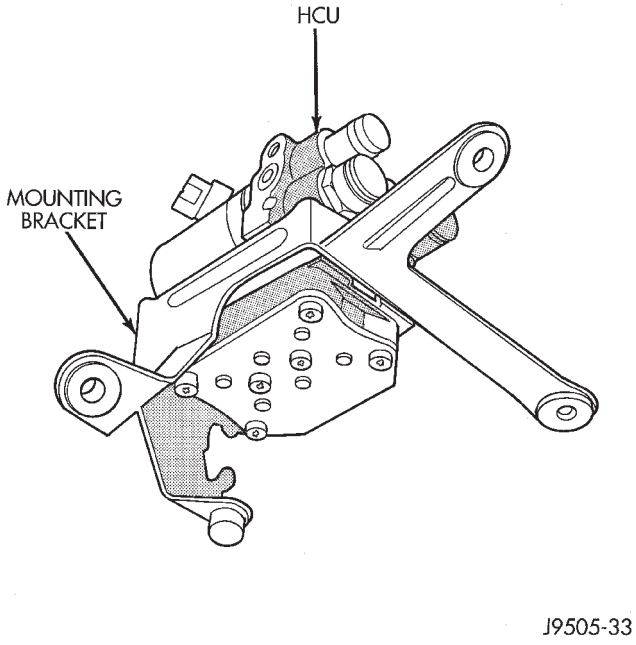


Fig. 14 HCU And Bracket

(10) Remove mounting bolts attaching mounting bracket to HCU (Fig. 15).

(11) Separate bracket from HCU (Fig. 16). **Note that special shoulder bolts are used to attach bracket to HCU. If bolts are damaged, do not use substitute bolts. Use factory replacement bolts only.**

(12) Inspect rubber isolators and sleeves in HCU bracket. Replace any washers or isolators if missing, or damaged with factory replacement parts only. Do not use substitute fasteners.

INSTALLATION

(1) Transfer mounting bracket to new HCU. Use original shoulder style bolts to attach bracket to HCU; do not use substitute fasteners.

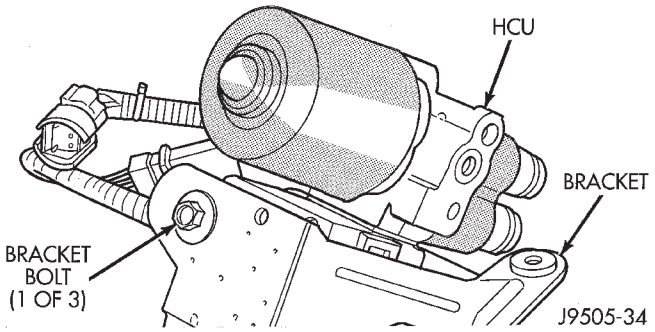


Fig. 15 HCU Bracket Bolts

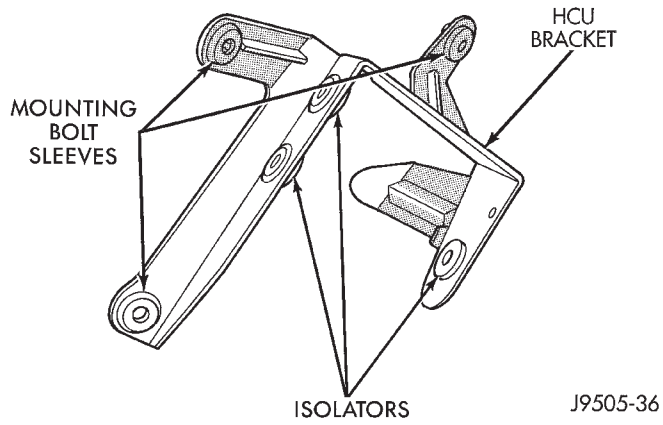


Fig. 16 HCU Bracket Isolators And Sleeves

(2) Position stud plate on underside of panel and secure it with new retaining nuts (Fig. 17).

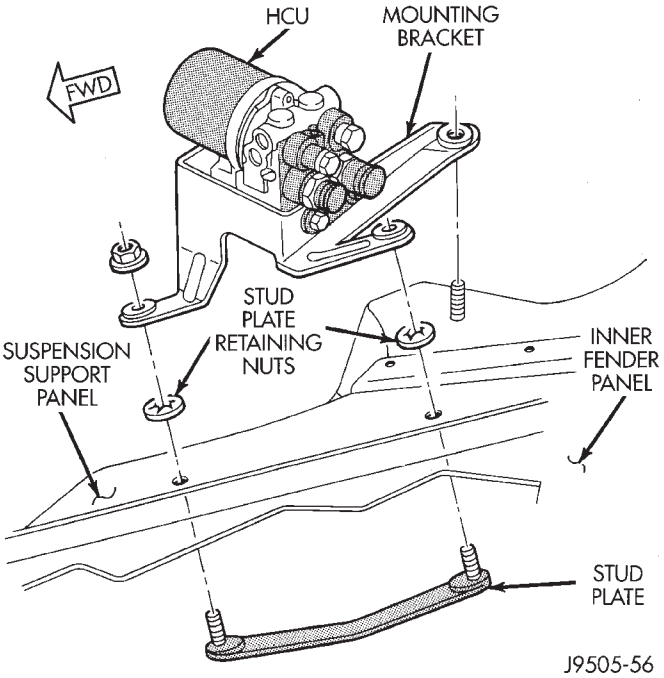


Fig. 17 Stud Plate And HCU Bracket

REMOVAL AND INSTALLATION (Continued)

(3) Install HCU bracket on mounting studs and tighten bracket mounting nuts to 10-13 N·m (92-112 in. lbs.).

(4) Start brakeline fittings into ports at rear of HCU. **Start fittings by hand to avoid cross threading.** Then tighten fittings to 14-16 N·m (125-140 in. lbs.).

(5) Install the master cylinder on booster and tighten mounting nuts to 25 N·m (220 in. lbs.). **Cylinder attaching nuts are special and have an interference fit thread. Do not use substitute fasteners at any time.**

(6) Install combination valve and tighten nuts to 25 N·m (220 in. lbs.).

(7) Install brakelines from HCU to combination valve and tighten to 16 N·m (145 in. lbs.).

(8) Install master cylinder-to-combination valve brakelines and tighten to 16 N·m (145 in. lbs.).

(9) Connect HCU solenoid and pump motor wire harnesses.

(10) Connect wire to combination valve switch.

(11) Fill and bleed brake system.

(12) Install air filter housing.

FRONT WHEEL SPEED SENSOR

REMOVAL

(1) Turn ignition switch to OFF position.

(2) Raise vehicle.

(3) Remove wheel and tire assembly.

(4) Remove bolt attaching front sensor to steering knuckle (Fig. 18).

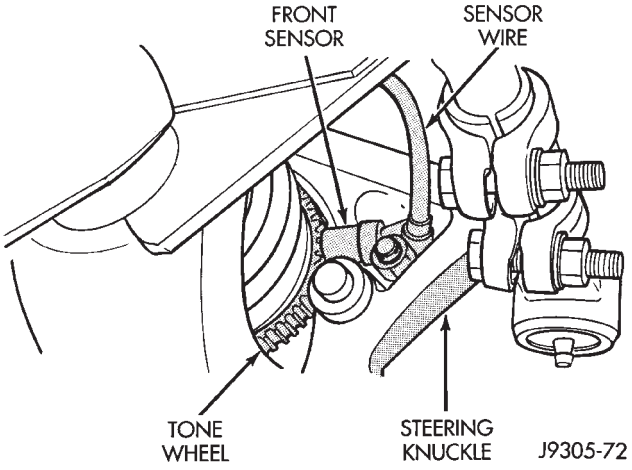


Fig. 18 Sensor Location

(5) Disengage sensor wire from brackets on steering knuckle and frame member (Fig. 19) and (Fig. 20).

(6) Unseat grommet that secures sensor wire in fender panel.

(7) In engine compartment, disconnect sensor wire connector at harness plug.

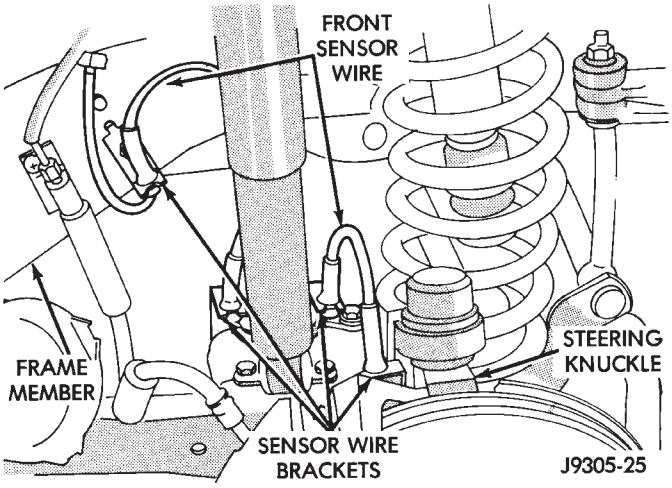


Fig. 19 Sensor Wire Routing

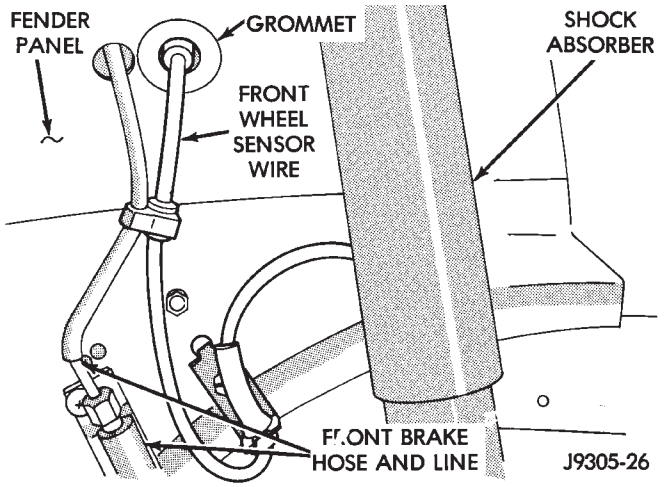


Fig. 20 Sensor Wire Grommet

(8) Remove sensor and wire assembly.

INSTALLATION

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

(2) Position sensor on steering knuckle. Seat sensor locating tab in hole in knuckle and install sensor attaching bolt finger tight.

(3) Tighten sensor bolt to 14 N·m (11 ft. lbs.).

(4) Route sensor wire from steering knuckle to fender panel.

(5) Engage grommets on sensor wire in brackets on body, chassis, frame, and steering knuckle.

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

(7) Seat sensor wire in body grommet and seat grommet in fender panel.

(8) Connect sensor wire to harness in engine compartment.

REMOVAL AND INSTALLATION (Continued)

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 wires at harness connectors.

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

(4) Raise vehicle.

(5) Remove wheel and brake drum.

(6) Disengage sensor wire from axle and chassis brackets and from brakeline retainers (Fig. 21).

(7) Unseat sensor grommet from brake support plate.

(8) Remove bolt attaching sensor to support plate bracket (Fig. 22).

(9) Remove sensor and wire through opening in support plate.

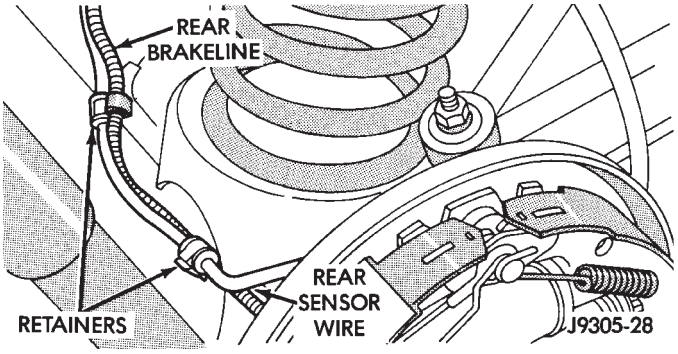


Fig. 21 Sensor Wire Attachment

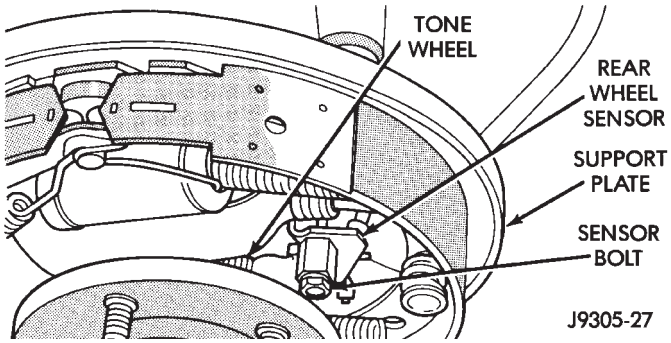


Fig. 22 Sensor Mounting

INSTALLATION

(1) Insert sensor wire through support plate hole. Then seat sensor wire grommet in hole to secure wire.

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

(3) Install sensor bolt finger tight only at this time.

(4) If **original sensor** is being installed or adjusted, remove any remaining pieces of cardboard spacer from sensor pickup face. Set air gap to 0.92-1.45 mm (0.036-0.057 in.) with feeler gauge (Fig. 23). Tighten sensor bolt to 14 N·m (11 ft. lbs.).

(5) If **new sensor** is being installed, push cardboard spacer on sensor face (Fig. 24) against tone ring. Then tighten sensor bolt to 14 N·m (11 ft. lbs.). Correct air gap will be established as tone ring rotates and peels spacer off sensor face.

(6) Route sensor wires to rear seat area.

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

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

(9) Install brake drum and wheel and lower vehicle.

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

(11) Connect sensor wires to harness connectors.

(12) Reposition carpet and fold rear seat down.

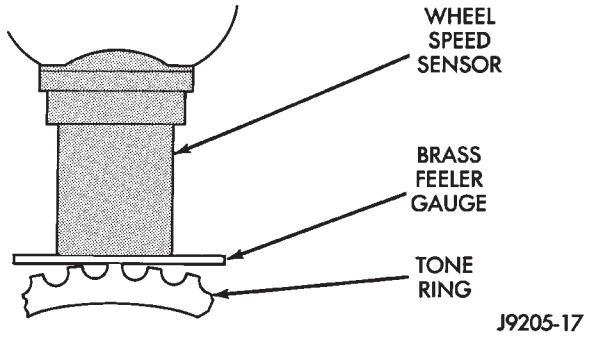


Fig. 23 Setting Air Gap On Original Rear Sensor

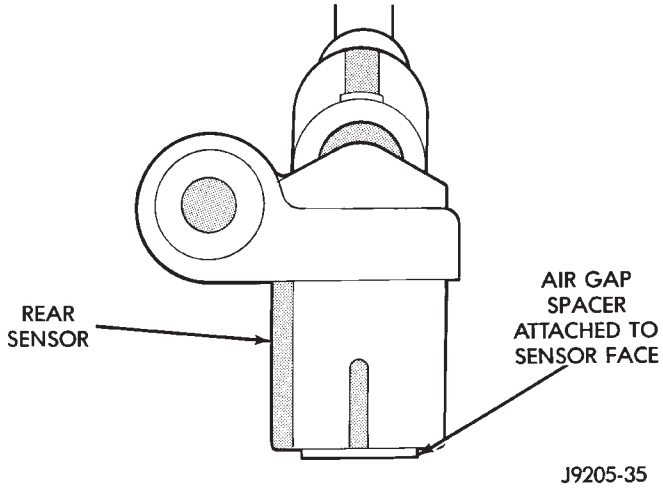


Fig. 24 New Rear Sensor With Air Gap Spacer

ACCELERATION SWITCH

REMOVAL

(1) Turn ignition switch to OFF position.

(2) Disconnect battery negative cable.

REMOVAL AND INSTALLATION (Continued)

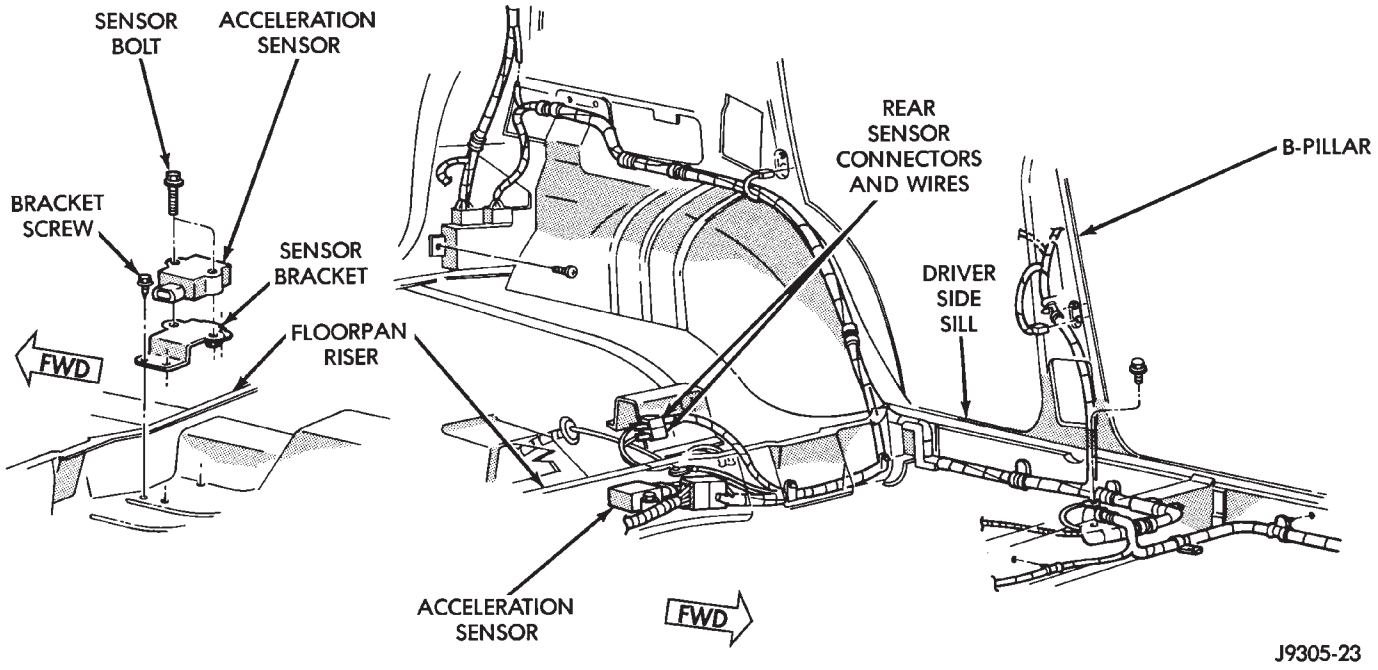


Fig. 25 Acceleration Sensor Mounting

(3) Tilt rear seat assembly forward for access to sensor.
(4) Disconnect sensor harness (Fig. 25).
(5) Remove screws attaching sensor to bracket.
(6) Remove sensor.

INSTALLATION

CAUTION: The mercury switch (inside the acceleration switch), will not function properly if the switch is mispositioned. Verify that the locating arrow is pointing to the front of the vehicle.

(1) Note position of locating arrow on switch. Position switch so arrow faces forward.
(2) Position switch in mounting bracket.
(3) Install and tighten switch attaching screws to 2-4 N·m (17-32 in. lbs.).
(4) Connect harness to switch. Be sure harness connector is firmly seated.
(5) Move rear seat back to normal position.
(6) Connect battery negative cable.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Acceleration Sensor	
Sensor Bolt	8-9 N·m (71-83 in. lbs.)
Bracket Bolt	1-2 N·m (13-18 in. lbs.)
Hydraulic Control Unit	
Mounting Nuts	10-13 N·m (92-112 in. lbs.)
Brakelines	14-16 N·m (125-140 in. lbs.)
Controller Anitlock Brakes	
Mounting Bolts	8-13 N·m (75-115 in. lbs.)
Wheel Speed Sensors	
Front Mounting Bolt	4-6 (34-50 in. lbs.)
Rear Mounting Bolt	12-14 N·m (106-124 in. lbs.)