

BRAKES

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BASE BRAKE SYSTEM

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GENERAL INFORMATION

BRAKE SYSTEM

This vehicle is equipped with front disc brakes and rear drum brakes. The front disc brakes consist of single piston calipers and ventilated rotors. The rear brakes are dual brake shoe, internal expanding units with cast brake drums. The parking brake mechanism is cable operated and connected to the rear brake trailing shoes. Power brake assist is standard equipment. A vacuum operated power brake booster is used for all applications.

Two antilock brake systems are used on this vehicle. A rear wheel antilock (RWAL) brake system is standard. An all-wheel antilock brake system (ABS) is available as an option. The RWAL and ABS systems are designed to retard wheel lockup while braking. Retarding wheel lockup is accomplished by modulating fluid pressure to the wheel brake units. Both systems are monitored by a microprocessor which controls the operation of the systems.

SERVICE WARNINGS & CAUTIONS

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

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean the system components. These fluids damage rubber cups and seals. Use only fresh brake fluid or Mopar brake cleaner to clean or flush brake system components. These are the only

cleaning materials recommended. If system contamination is suspected, check the fluid for dirt, discoloration, or separation into distinct layers. Also check the reservoir cap seal for distortion. Drain and flush the system with new brake fluid if contamination is suspected.

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

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

DESCRIPTION AND OPERATION

BRAKE PEDAL

A suspended-type brake pedal is used. The pedal is attached to the pedal support bracket with a pivot pin and bushings. The booster push rod is attached to the pedal with a clip. The pedal, bushings, pivot pin and support bracket are all serviceable components.

STOP LAMP SWITCH

The stop lamp switch is mounted on a bracket on the brake pedal support. The switch is self adjusting. An initial adjustment is only necessary when the switch has been replaced, or removed for service access to other components.

RED BRAKE WARNING LAMP

A red warning lamp is used for the service brake portion of the hydraulic system. The lamp is located in the instrument cluster. The red warning light alerts the driver if a pressure differential exists between the front and rear hydraulic systems or the parking brakes are applied.

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

POWER BRAKE BOOSTER

All models are equipped with power assist brakes. A tandem diaphragm, power brake booster is used for all applications.

DESCRIPTION AND OPERATION (Continued)

The booster unit consists of a single housing divided into chambers by a tandem diaphragm. The outer edge of the diaphragm is secured to the housing. The booster push rod, which connects the booster to the brake pedal and master cylinder, is attached to the center of the diaphragm. A check valve is used in the booster outlet connected to the engine intake manifold. Power assist is generated by utilizing a combination of vacuum and atmospheric pressure to boost brake assist.

NOTE: The power brake booster is not a repairable component. The booster must be replaced as an assembly if diagnosis indicates a malfunction has occurred.

MASTER CYLINDER

A two-piece master cylinder is used on all models. The cylinder body containing the primary and secondary pistons is made of aluminum. The removable fluid reservoir is made of nylon reinforced with glass fiber. The reservoir is the only serviceable component.

The fluid compartments of the nylon reservoir are interconnected to permit fluid level equalization. However, the equalization feature does not affect circuit separation in the event of a front or rear brake malfunction. The reservoir compartments will retain enough fluid to operate the functioning hydraulic circuit.

Care must be exercised when removing/installing the master cylinder connecting lines. The threads in the cylinder fluid ports can be damaged if care is not exercised. Start all brake line fittings by hand to avoid cross threading.

The cylinder reservoir can be replaced when necessary. However, the aluminum body section of the master cylinder is not a repairable component.

NOTE: If diagnosis indicates that an internal malfunction has occurred, the aluminum body section must be replaced as an assembly.

COMBINATION VALVE

The combination valve contains a pressure differential valve and switch and a proportioning valve. The combination valve/proportioning valve are not repairable and must be replaced as an assembly.

PRESSURE DIFFERENTIAL SWITCH

The pressure differential switch is connected to the brake warning lamp. The switch is triggered by movement of the switch valve. The purpose of the switch is to monitor 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 forward or rearward in response to the pressure differential. Movement of the switch valve will push the switch plunger upward. This closes the switch internal contacts completing the electrical circuit to the warning lamp. The switch valve may remain in an actuated position until repair restores system pressures to normal levels.

PROPORTIONING VALVE

The proportioning valve is used to balance front-rear brake action at high decelerations. The valve allows normal fluid pressure during moderate braking. The valve only controls fluid pressure during high decelerations brake stops, when a percentage of rear weight is transferred to the front wheels.

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 brakes 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. 1).

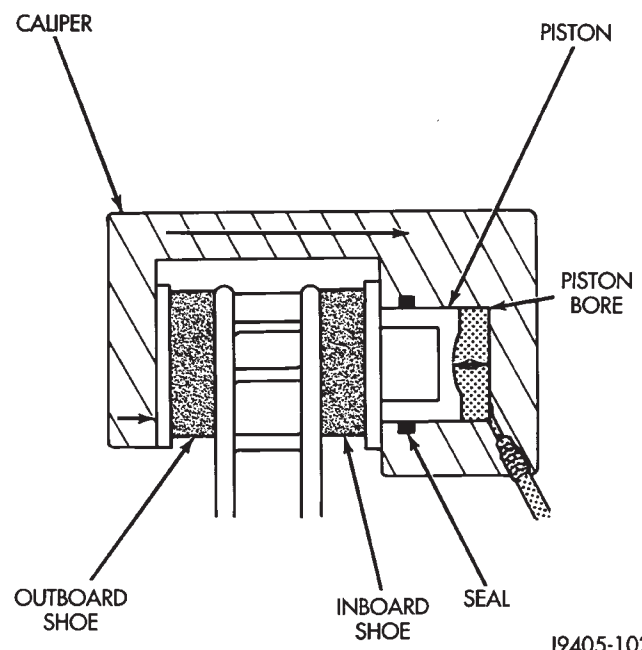


Fig. 1 Brake Caliper Operation

Fluid pressure applied to the piston is transmitted directly to the inboard brake shoe. This forces the shoe lining against the inner surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on

DESCRIPTION AND OPERATION (Continued)

the mounting bolts. This action brings the outboard brake shoe 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.

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 brake shoes do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston 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. 2). When the brakes (and fluid pressure) are released, the seal relaxes and retracts the piston.

The amount of piston retraction is determined by the amount of seal deflection. Generally the amount is just enough to maintain contact between the piston and inboard brake shoe.

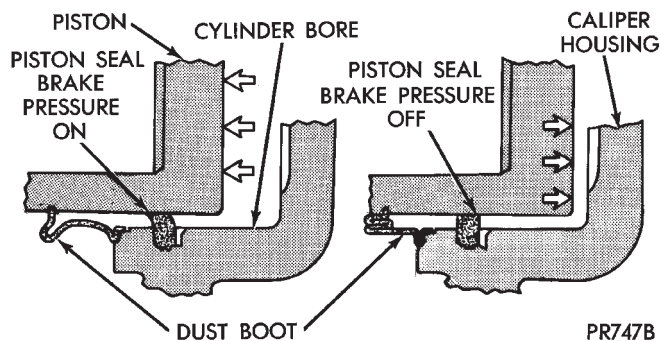


Fig. 2 Lining Wear Compensation By Piston Seal

DRUM BRAKES

Drum brakes on all models are dual shoe, internal expanding units with an automatic self adjusting mechanism (Fig. 3). Eleven inch brakes are used on all models.

PARKING BRAKES

The parking brakes are operated by a system of cables and levers attached to the rear brake secondary shoes.

The rear drum brake shoes serve as the parking brakes. The shoes make contact with the brake drum surface by a cable and lever mechanism attached to the secondary brake shoe.

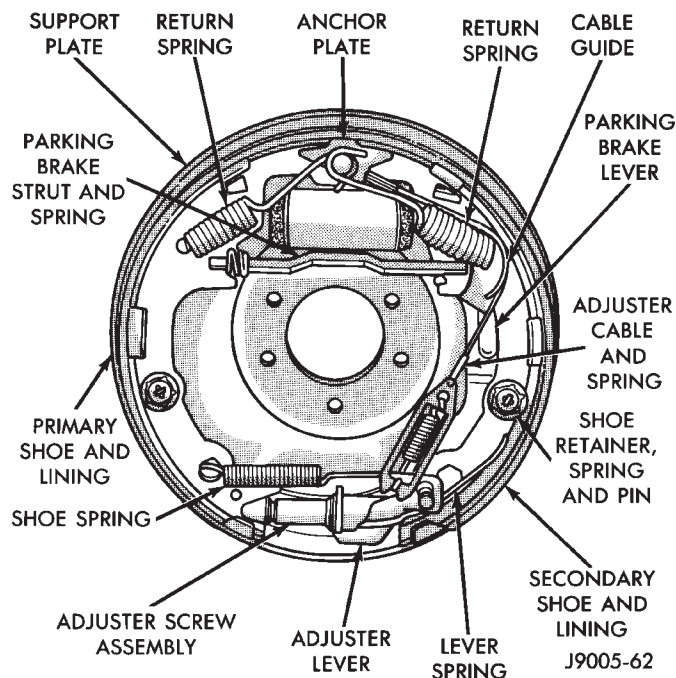


Fig. 3 Brake Assembly

The parking brake pedal assembly is mounted on the driver side cowl panel. The front cable is directly attached to the assembly. The pedal assembly contains a spring loaded mechanism to hold the pedal in the applied position. A rod is used to release the ratchet mechanism and return the pedal to released position.

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 brake shoes, calipers, wheel cylinders, brake drums, rotors, brake lines, 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.

DIAGNOSIS AND TESTING (Continued)

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

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

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

(b) If fluid appears contaminated, drain out a sample to examine. System will have to be flushed if fluid is separated into layers, or contains a substance other than brake fluid. The system seals 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) Check booster vacuum check valve and hose.

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

ROAD TESTING

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

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

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

(4) Attempt to stop the vehicle with the parking brake only and note grab, drag, noise, etc.

PEDAL FALLS AWAY

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

Internal leakage (seal by-pass) in the master cylinder caused by worn or damaged piston cups, may also be the problem cause. However, internal leakage in the master cylinder, ABS or RWAL system may not be physically evident.

An internal leak in the ABS or RWAL system may also be the problem with no physically evident.

LOW PEDAL

If a low pedal is experienced, pump the pedal several times. If the pedal comes back up worn linings, rotors, drums, or rear brakes out of adjustment are the most likely causes. The proper course of action is to inspect and replace all worn component and make the proper adjustments.

SPONGY PEDAL

A spongy pedal is most often caused by air in the system. However, 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, and replace thin drums and substandard quality brake hoses if suspected.

HARD PEDAL OR HIGH PEDAL EFFORT

A hard pedal or high pedal effort may be due to lining that is water soaked, contaminated, glazed, or badly worn. The power booster 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 brake shoe 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.

DIAGNOSIS AND TESTING (Continued)

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.
- Drum brake shoes binding on worn/damaged support plates.
- Mis-assembled components.

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 caliper slide surfaces
- Improper brake shoes
- 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 or proportioning 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 LINING CONTAMINATION

Brake lining 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.

BRAKE NOISES

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

BRAKE SQUEAK/SQUEAL

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

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

DIAGNOSIS AND TESTING (Continued)

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 brake shoes can also produce a thump noise.

STOP LAMP SWITCH

NOTE: For fuse, wiring color and wiring location refer to Group 8W.

The stop lamp switch has a 12 volt feed circuit from the fuse block. Verify fuse is OK, then check the feed from the fuse block to the switch. If the switch has 12 volts depress the brake pedal and check for voltage to the stop lamp circuit. If no voltage is present the switch must be replaced. If the switch does not have 12 volts from the fuse block check for continuity between the fuse block the switch and repair as necessary.

RED BRAKE WARNING LAMP

The red brake warning lamp is connected to the parking brake switch and to the pressure differential warning switch in the combination valve.

The red light illuminates for approximately 2-4 seconds at engine start up. This is a self test feature designed to check bulb operation.

The red warning lamp illuminates when the parking brake is applied. It also illuminates if a fluid pressure drop occurs in either the front or rear brake hydraulic circuit. A pressure drop moves the valve in the combination valve toward the low pressure side. When the valve moves it pushes the pressure differential switch contact plunger upward. This closes the contacts and completes the circuit to the lamp. The lamp will remain on until repairs are made and normal fluid pressure is restored.

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 fall away slightly under light foot pressure then hold firm. If no pedal action is discernible, power booster, vacuum supply, or vacuum check valve is faulty. Proceed to the POWER BOOSTER VACUUM TEST.

(6) If the POWER BOOSTER VACUUM TEST passes, rebuild booster vacuum reserve as follows: Release brake pedal. Increase engine speed to 1500 rpm, close the throttle and 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. 4).

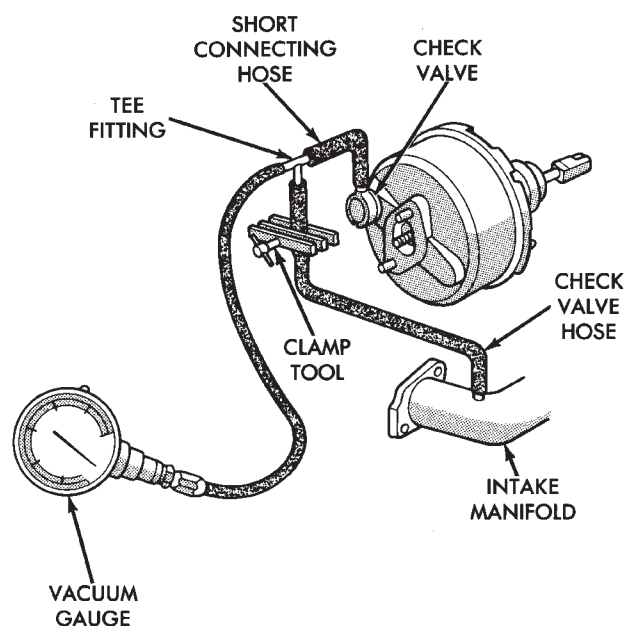
(2) Start and run engine at curb idle speed for one minute.

(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.



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Fig. 4 Typical Booster Vacuum Test Connections

DIAGNOSIS AND TESTING (Continued)

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

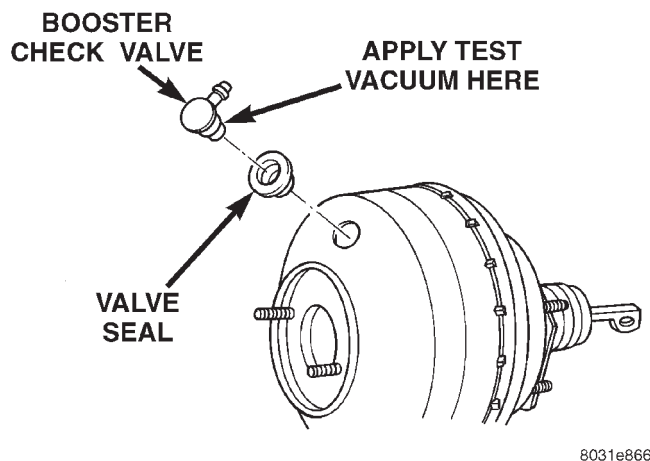


Fig. 5 Vacuum Check Valve And Seal

COMBINATION VALVE

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.

DISC BRAKE ROTOR

The rotor braking surfaces should not be refinished unless necessary.

Light surface rust and scale can be removed with a lathe equipped with dual sanding discs. The rotor

surfaces can be restored by machining in a disc brake lathe if surface scoring and wear are light.

Replace the rotor under the following conditions:

- severely scored
- tapered
- hard spots
- cracked
- below minimum thickness

ROTOR MINIMUM THICKNESS

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

Rotor minimum thickness is usually specified on the rotor hub. The specification is either stamped or cast into the hub surface.

ROTOR RUNOUT

Check rotor lateral runout with dial indicator C-3339 (Fig. 6). Excessive lateral runout will cause brake pedal pulsation and rapid, uneven wear of the brake shoes. Position the dial indicator plunger approximately 25.4 mm (1 in.) inward from the rotor edge. Maximum allowable rotor runout is 0.102 mm (0.004 in.).

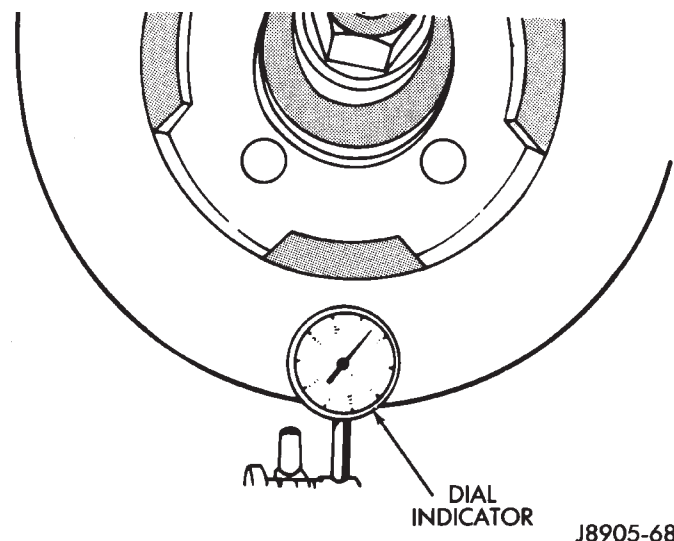


Fig. 6 Checking Rotor Runout And Thickness Variation

ROTOR THICKNESS VARIATION

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

Measure rotor thickness at 6 to 12 points around the rotor face (Fig. 7).

Position the micrometer approximately 25.4 mm (1 in.) from the rotor outer circumference for each measurement.

DIAGNOSIS AND TESTING (Continued)

Thickness should not **vary** by more than 0.013 mm (0.0005 in.) from point-to-point on the rotor. Machine or replace the rotor if necessary.

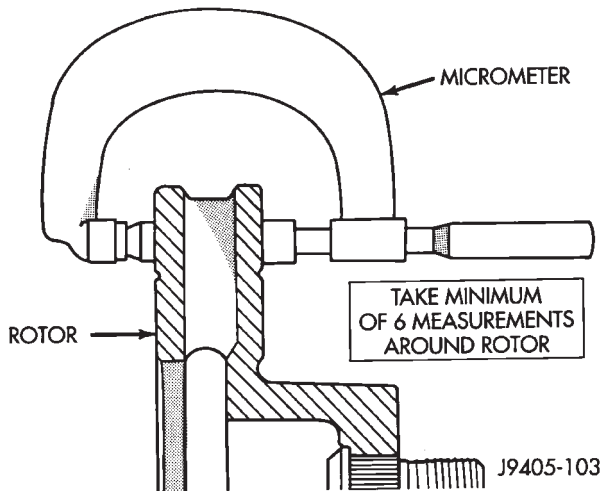


Fig. 7 Measuring Rotor Thickness

BRAKE DRUM

The maximum allowable diameter of the drum braking surface is indicated on the drum outer edge. Generally, a drum can be machined to a maximum of 1.52 mm (0.060 in.) oversize. Always replace the drum if machining would cause drum diameter to exceed the size limit indicated on the drum.

BRAKE DRUM RUNOUT

Measure drum diameter and runout with an accurate gauge. The most accurate method of measurement involves mounting the drum in a brake lathe and checking variation and runout with a dial indicator.

Variations in drum diameter should not exceed 0.076 mm (0.003 in.). Drum runout should not exceed 0.20 mm (0.008 in.) out of round. Machine the drum if runout or variation exceed these values. Replace the drum if machining causes the drum to exceed the maximum allowable diameter.

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 compo-

nents. All of these conditions can lead to scuffing, cracking and eventual failure.

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

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

Use new copper 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 caps before checking fluid level. If not cleaned, dirt could enter the fluid.

The fluid fill level is indicated on the side of the master cylinder reservoir (Fig. 8).

The correct fluid level is to the FULL indicator on the side of the reservoir. If necessary, add fluid to the proper level.

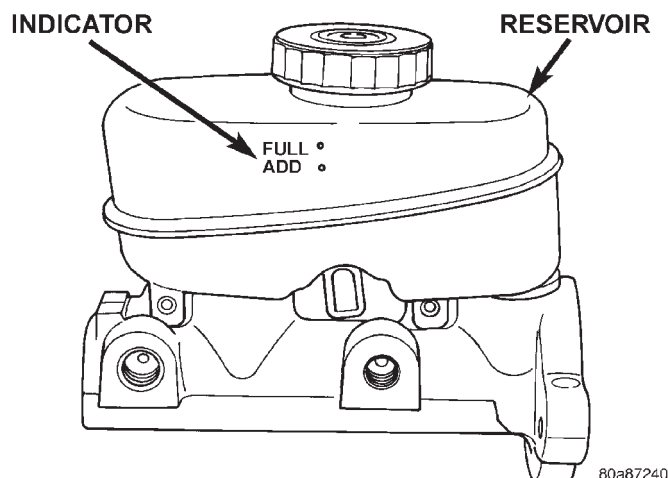
MASTER CYLINDER BLEEDING

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

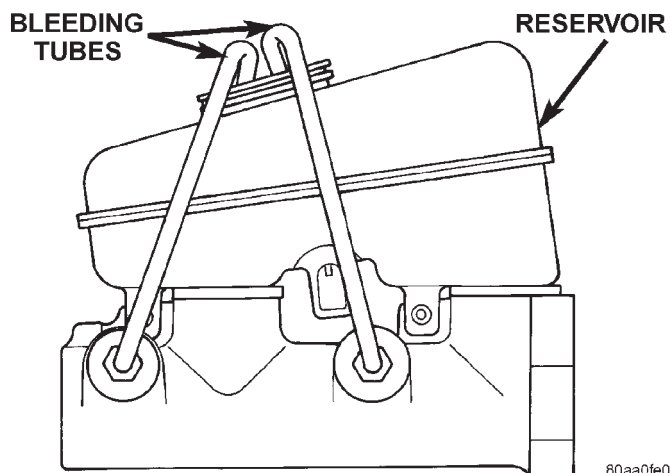
BLEEDING PROCEDURE

- (1) Mount master cylinder in vise.
- (2) Attach bleed tubes to cylinder outlet ports. Then position each tube end into the reservoir (Fig. 9).

SERVICE PROCEDURES (Continued)

**Fig. 8 Master Cylinder Fluid Level - Typical**

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

**Fig. 9 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.

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

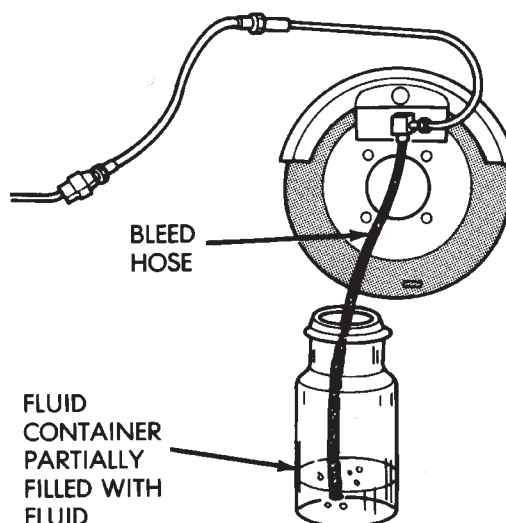
- master cylinder
- combination valve
- right rear wheel
- left rear wheel
- right front wheel
- left front wheel

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. 10). Be sure end of bleed hose is immersed in fluid.

**Fig. 10 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.

PRESSURE BLEEDING

Follow the manufacturers instructions carefully when using pressure equipment. Do not exceed the tank manufacturers pressure recommendations. Generally, a tank pressure of 15-20 psi is sufficient for bleeding.

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SERVICE PROCEDURES (Continued)

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

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

DISC ROTOR MACHINING

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

The lathe must machine both sides of the rotor simultaneously with dual (two) cutter heads (Fig. 11). 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. 12).

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.

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

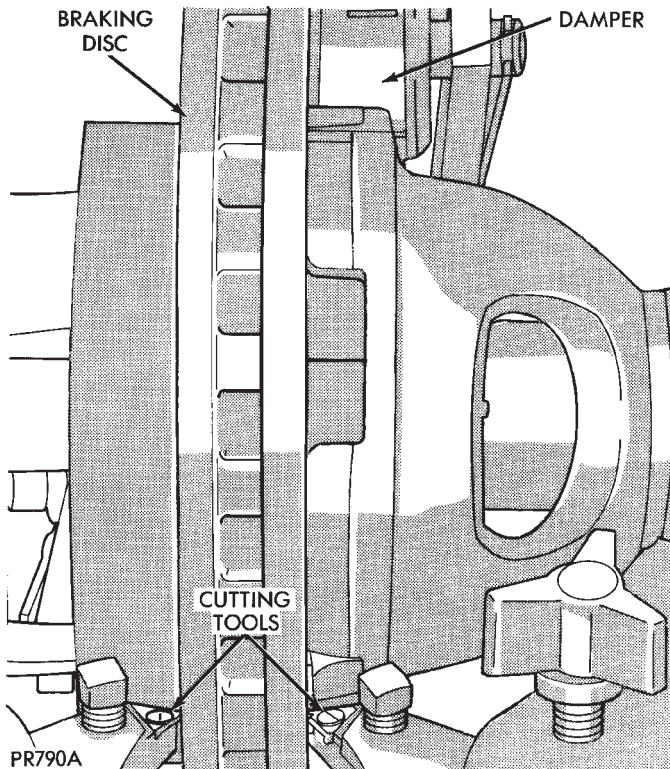


Fig. 11 Rotor Refinishing

BRAKE DRUM MACHINING

The brake drums can be machined on a drum lathe when necessary. Initial machining cuts should be lim-

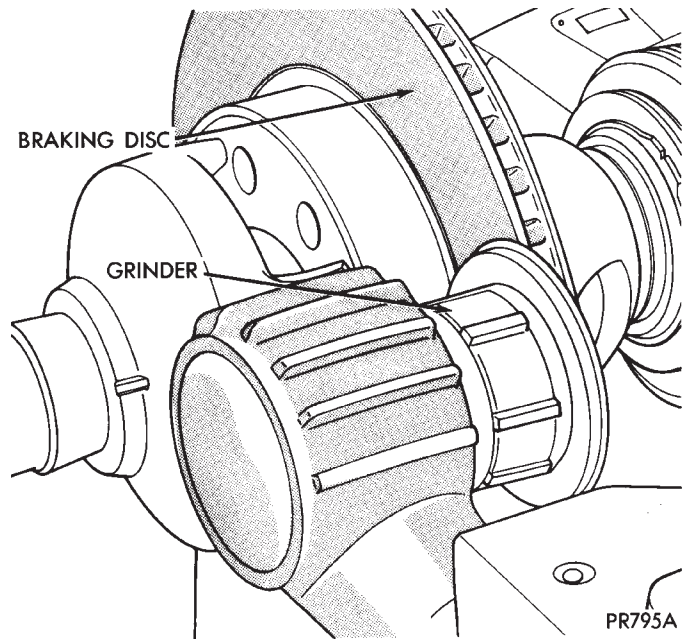


Fig. 12 Rotor Grinder

ited to 0.12 - 0.20 mm (0.005 - 0.008 in.) at a time as heavier feed rates can produce taper and surface variation. Final finish cuts of 0.025 to 0.038 mm (0.001 to 0.0015 in.) are recommended and will generally provide the best surface finish.

Be sure the drum is securely mounted in the lathe before machining operations. A damper strap should always be used around the drum to reduce vibration and avoid chatter marks.

The maximum allowable diameter of the drum braking surface is stamped or cast into the drum outer edge. Always replace the drum if machining would cause drum diameter to exceed the size limit indicated on the drum.

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.

SERVICE PROCEDURES (Continued)

(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.

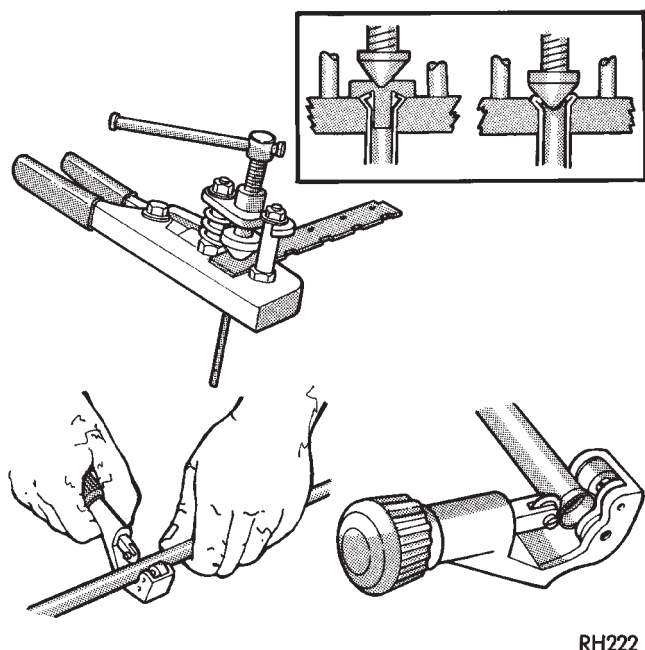
(7) Squeeze flaring tool jaws to lock tubing in place.

(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. 13).

(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.



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Fig. 13 Inverted Flare Tools

REMOVAL AND INSTALLATION

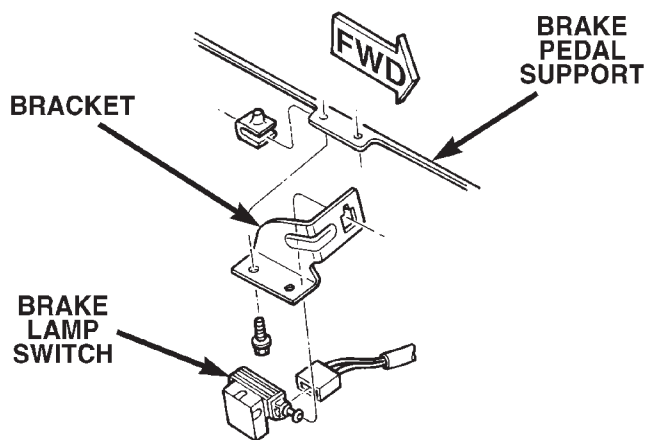
STOP LAMP SWITCH

REMOVAL

- (1) Disconnect switch harness (Fig. 14).
- (2) Press and hold brake pedal in applied position.
- (3) Rotate switch counterclockwise about 30° to align switch lock tab with notch in bracket.
- (4) Pull switch rearward out of mounting bracket and release brake pedal.

INSTALLATION

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



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Fig. 14 Stop Lamp Switch & Bracket

(2) Push switch plunger inward 4 detent positions (or clicks). This is required preset position for switch installation. Plunger will extend approximately 14 mm (0.55 in.) out of housing at this setting.

(3) Connect harness wires to switch.

(4) Press and hold brake pedal down.

(5) Install switch. 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.

(6) Release brake pedal. Then lightly pull pedal fully rearward. Pedal will adjust switch plunger to correct position as pedal is moved to rear.

CAUTION: Do not use excessive force to move the pedal rearward for switch adjustment. Excessive force will damage the switch.

BRAKE PEDAL

REMOVAL

- (1) Remove stop lamp switch.
- (2) Remove clip securing booster push rod to brake pedal (Fig. 15).
- (3) Remove pedal pivot pin C-clip and slide pin out of support bracket and pedal.
- (4) Remove pedal and bushings.

INSTALLATION

- (1) Replace bushings if worn or damaged.
- (2) Lubricate pedal bushings and pivot pin with Mopar multi mileage grease, Lubriplate, or a silicone grease.
- (3) Install bushings in pedal and position pedal in support.
- (4) Insert pivot pin through support and pedal bushings and install C-clip.
- (5) Install booster push rod on brake pedal and install push rod retainer clip.
- (6) Install stop lamp switch.

REMOVAL AND INSTALLATION (Continued)

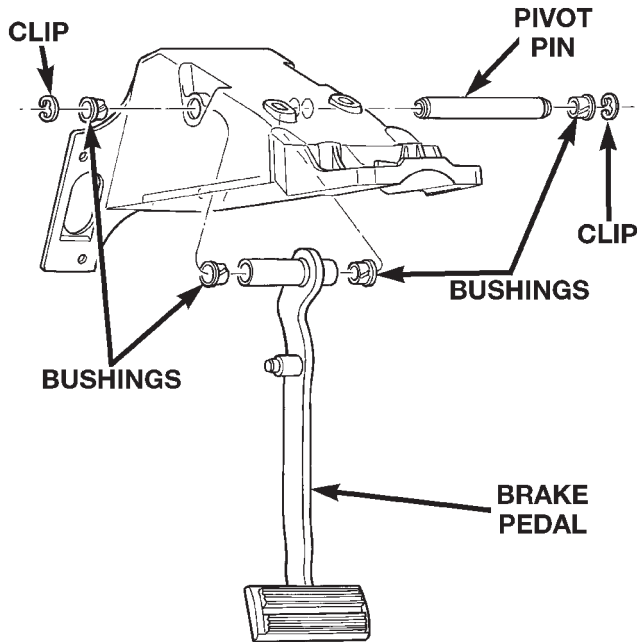


Fig. 15 Brake Pedal Mounting

COMBINATION VALVE

REMOVAL

- (1) Disconnect wire from the pressure differential switch.
- (2) Disconnect brake lines from combination valve.
- (3) Remove the bolt from the combination valve and remove the valve.

INSTALLATION

- (1) Install the combination valve to the bracket and tighten the mounting bolt to 20-27 N·m (15-20 ft. lbs.). If vehicle is equipped with ABS brakes tighten the bolt to 10-13 N·m (7-10 ft. lbs.).
- (2) Install the brake lines to the combination valve.
- (3) Tighten the brake line to 19 N·m (170 in. lbs.).
- (4) Connect the wire to the pressure differential switch.
- (5) Bleed brakes system.

MASTER CYLINDER

REMOVAL

- (1) Remove brake lines from the master cylinder (Fig. 16).
- (2) Remove mounting nut from the master cylinder (Fig. 16).
- (3) Remove master cylinder.

INSTALLATION

NOTE: If master cylinder is replaced bleed cylinder before installation.

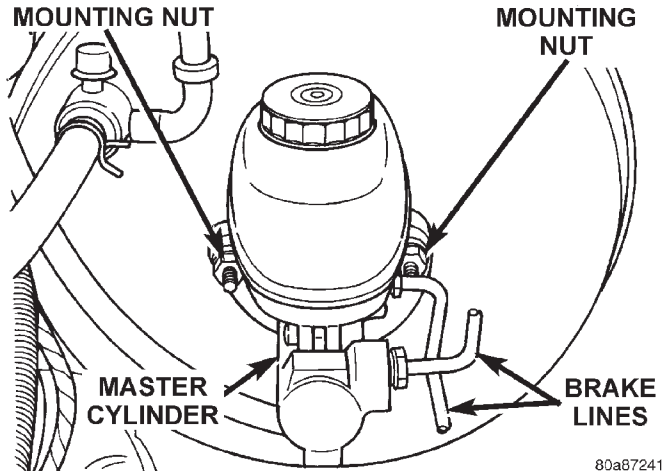


Fig. 16 Master Cylinder

- (1) Install master cylinder on booster mounting studs.
- (2) Install mounting nuts and tighten to 28 N·m (250 in. lbs.).
- (3) Install brake lines and tighten to 19 N·m (170 in. lbs.).
- (4) Fill and bleed brake system.

POWER BRAKE BOOSTER

REMOVAL

- (1) Remove master cylinder.
- (2) Disconnect vacuum lines at booster.
- (3) Remove clip securing booster push rod to brake pedal (Fig. 17).
- (4) Remove nuts from booster mounting studs (Fig. 18).
- (5) Remove booster and gasket from front cowl panel.

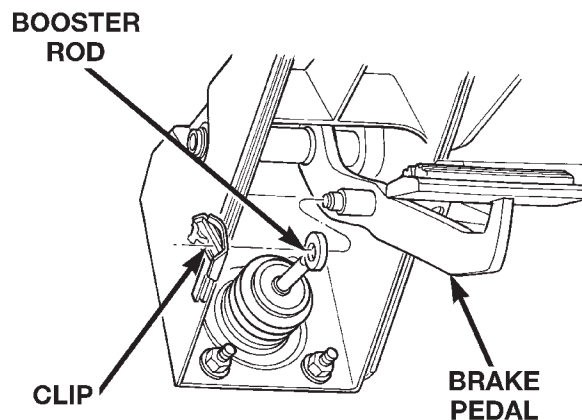
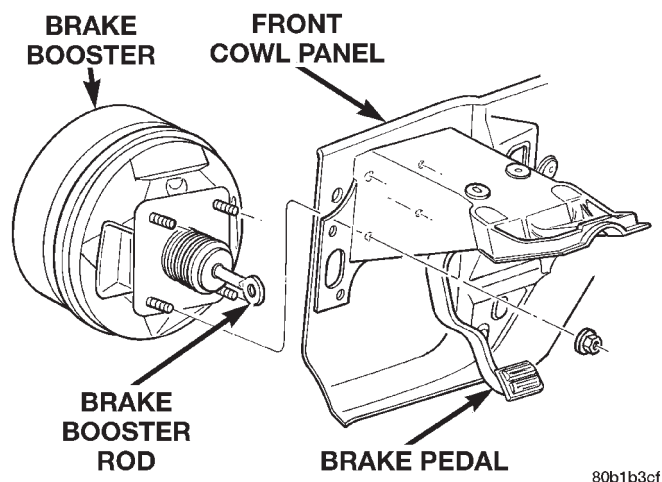


Fig. 17 Booster Rod Clip

REMOVAL AND INSTALLATION (Continued)



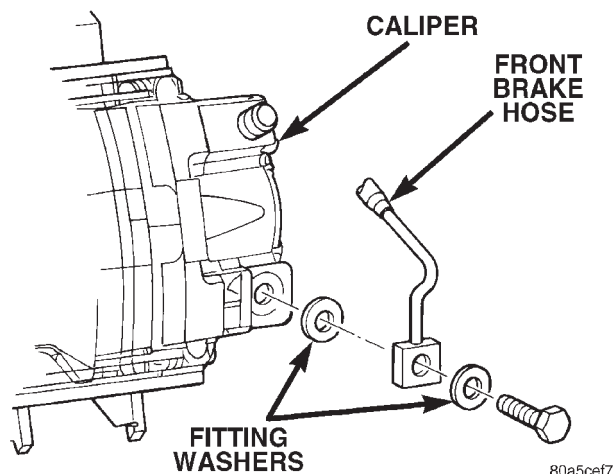
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Fig. 18 Power Brake Booster Mounting**INSTALLATION**

- (1) Position gasket on booster studs.
- (2) Guide booster studs into cowl panel holes and seat booster on panel.
- (3) Install and tighten booster attaching nuts to 28 N·m (250 in. lbs.).
- (4) Install booster push rod on brake pedal and install clip.
- (5) Install booster check valve if removed and connect vacuum hose to check valve.
- (6) Install master cylinder.
- (7) Fill and bleed brake system.

DISC BRAKE CALIPER**REMOVAL**

- (1) Raise and support vehicle.
- (2) Remove front wheel and tire assemblies.
- (3) Disconnect brake hose at caliper. Discard hose fitting washers if worn, or damaged (Fig. 19).



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Fig. 19 Caliper Brake Hose Connection

- (4) Remove caliper slide pins.

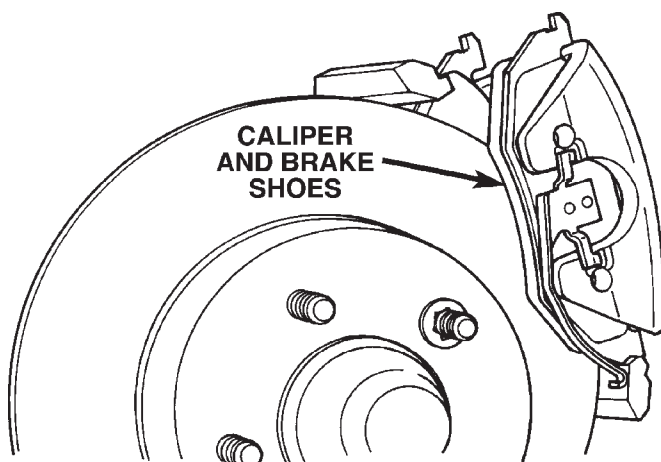
- (5) Remove caliper and brake shoes from caliper.

INSTALLATION

- (1) Install brake shoes in caliper.
- (2) Install caliper and shoes over rotor and into ledges in steering knuckle. Be sure ends of brake shoes are properly seated on slide surfaces of ledges.
- (3) Align caliper in adapter and install caliper slide pins. Tighten caliper slide pins to 30 N·m (22 ft. lbs.).
- (4) Connect brake hose to caliper. Use new washers to attach hose fitting if original washers are scored, worn, or damaged.
- (5) Fill and bleed brake system.
- (6) Install wheel and tire assemblies.
- (7) Remove supports and lower vehicle.
- (8) Pump brake pedal to seat shoes and verify firm pedal before moving vehicle.
- (9) Check master cylinder fluid level again and top off if necessary.

DISC BRAKE SHOES**REMOVAL**

- (1) Clean master cylinder reservoir and filler caps.
- (2) Remove reservoir filler cap and drain approximately 1/4 of fluid from reservoir. Use clean suction gun or similar device to drain fluid.
- (3) Raise and support vehicle.
- (4) Remove front wheel and tire assemblies.
- (5) Bottom caliper pistons in bores with large C-clamp. Position clamp frame on rear of caliper and clamp screw on outboard brake shoe.
- (6) Remove caliper slide pins.
- (7) Remove caliper and brake shoes (Fig. 20).



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Fig. 20 Removing Caliper Assembly

- (8) Remove outboard brake shoe (Fig. 21). Pry one end of shoe retainer spring away from caliper. Then tilt shoe upward and rotate it out of caliper.

REMOVAL AND INSTALLATION (Continued)

(9) Remove inboard shoe by tilting shoe outward until retainer spring is clear of caliper piston (Fig. 22).

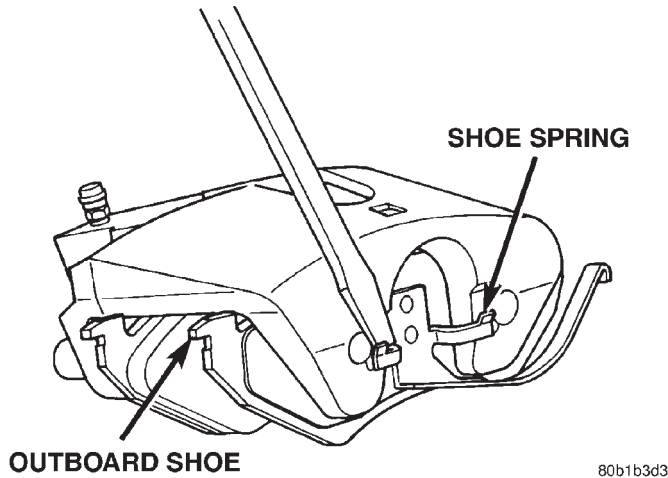


Fig. 21 Outboard Brake Shoe

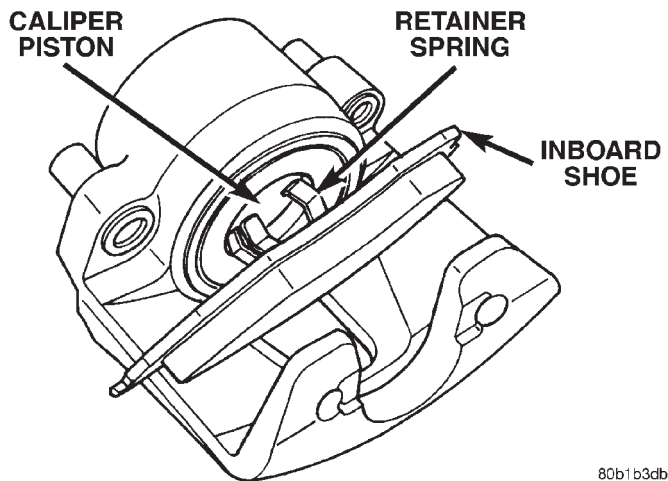


Fig. 22 Inboard Brake Shoe

(10) Support caliper with wire from suspension component. Do not allow brake hose to support caliper weight.

INSTALLATION

- (1) Clean slide surfaces of adapter ledges with a wire brush. Then lubricate surfaces with a thin coat of high temperature grease.
- (2) Install new slide pin bushings if necessary.
- (3) Install inboard shoe. Be sure retainer spring is firmly seated in caliper piston.
- (4) Insert outboard brake shoe in caliper (Fig. 23).
- (5) Ensure the outboard shoe retainer spring are seated in the caliper (Fig. 24).
- (6) Install caliper and brake shoes over rotor and into adapter. Be sure shoe tangs are properly seated on adapter ledges.

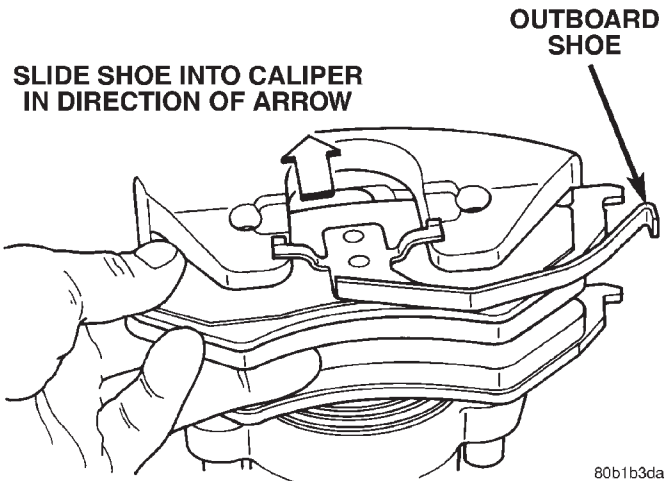


Fig. 23 Installing Outboard Shoe

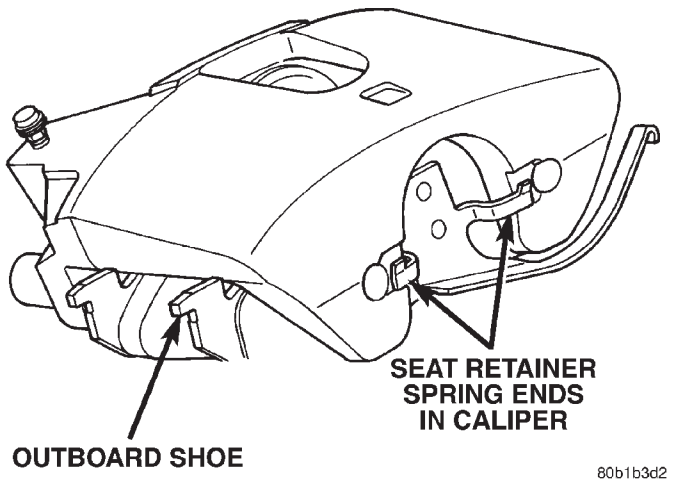


Fig. 24 Outboard Shoe Retainer Spring

(7) Install and tighten caliper slide pins to 25-35 N·m (18-26 ft. lbs.). **Start the slide pins by hand before tightening. Do not cross thread the pins.**

- (8) Install wheel and tire assembly.
- (9) Lower vehicle.
- (10) Apply brakes several times to seat shoes and caliper pistons. Do not move vehicle until firm brake pedal is obtained.
- (11) Top off master cylinder fluid.

DISC BRAKE ROTOR

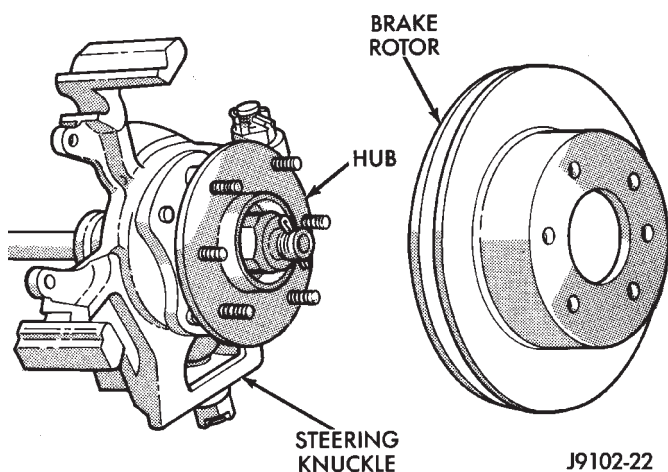
REMOVAL

- (1) Raise and support vehicle.
- (2) Remove wheel and tire assembly.
- (3) Remove brake caliper.
- (4) Remove retainers on wheel studs and remove rotor (Fig. 25).

INSTALLATION

- (1) Install rotor hub and install retainers.
- (2) Install brake caliper.

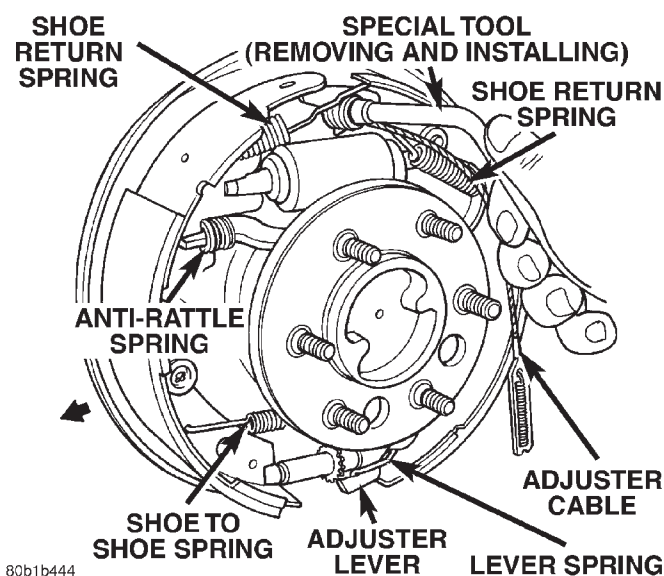
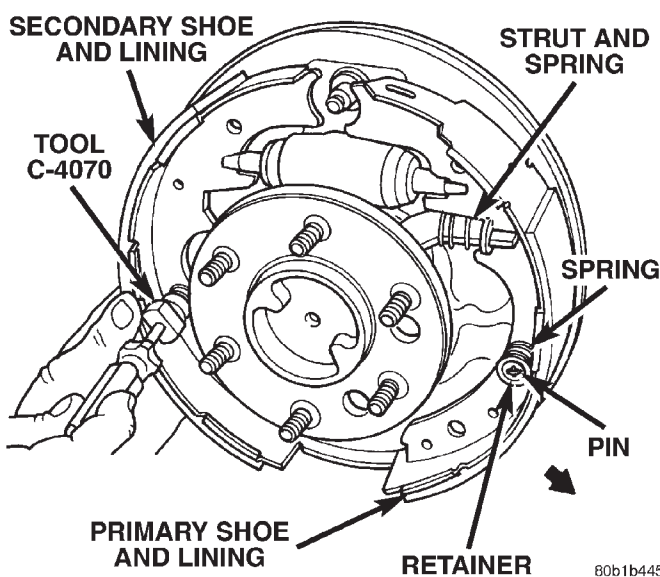
REMOVAL AND INSTALLATION (Continued)

**Fig. 25 Brake Rotor**

- (3) Install wheel and tire assembly.
- (4) Remove support and lower vehicle.
- (5) Depress brake pedal several time to seat brake shoes.

REAR BRAKE SHOES**REMOVAL**

- (1) Raise and support vehicle.
- (2) Remove wheel and tire assembly.
- (3) Remove clip nuts securing brake drum to wheel studs.
- (4) Remove drum. If drum is difficult to remove, remove rear plug from access hole in support plate. Back-off self adjusting by inserting a thin screwdriver into access hole and push lever away from adjuster screw star wheel. Then insert an adjuster tool into brake adjusting hole rotate adjuster star wheel to retract brake shoes.
- (5) Vacuum brake components to remove brake lining dust.
- (6) Remove shoe return springs with brake spring plier tool (Fig. 26).
- (7) Remove adjuster cable. Slide cable eye off anchor pin. Then unhook and remove cable from adjuster lever.
- (8) Remove cable guide from secondary shoe and anchor plate from anchor pin.
- (9) Remove adjuster lever. Disengage lever from spring by sliding lever forward to clear pivot and work lever out from under spring.
- (10) Remove adjuster lever spring from pivot.
- (11) Disengage and remove shoe spring from brake shoes.
- (12) Disengage and remove adjuster screw assembly from brake shoes.
- (13) Remove brake shoe retainers, springs (Fig. 27).

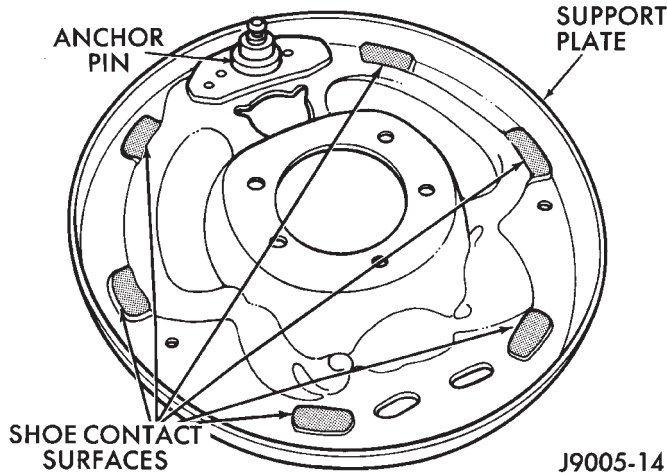
**Fig. 26 Shoe Return Springs****Fig. 27 Shoe Retainers, Springs and Pins**

- (14) Remove secondary brake shoe from support plate.
- (15) Remove strut and spring (Fig. 27).
- (16) Remove parking brake lever retaining clip from the secondary shoe and remove the lever.
- (17) Remove primary shoe from support plate.
- (18) Disengage parking brake lever from parking brake cable.

INSTALLATION

- (1) Clean and inspect individual brake components, refer to Cleaning and Inspection Section.
- (2) Lubricate anchor pin and brake shoe contact pads on support plate with high temperature grease or Lubriplate (Fig. 28).

REMOVAL AND INSTALLATION (Continued)

**Fig. 28 Shoe Contact Surfaces**

(3) Lubricate adjuster screw socket, nut, button and screw thread surfaces with grease or Lubriplate.

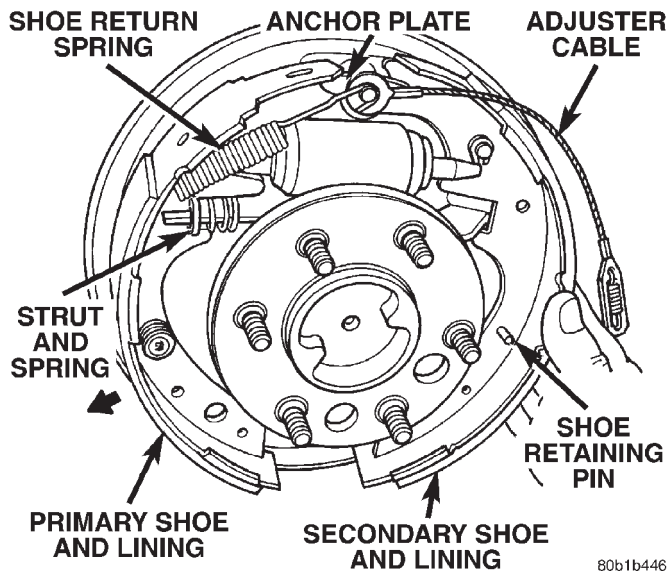
(4) Install the parking brake cable to the parking brake lever.

(5) Install parking brake lever to the secondary shoe and install retaining clip.

(6) Install primary shoe on support plate. Secure shoe with new spring retainers and pin.

(7) Install spring on parking brake strut and engage strut in primary.

(8) Install secondary shoe on support plate (Fig. 29). Insert strut in shoe and guide shoe onto anchor pin. Temporarily secure shoe with retaining pin.

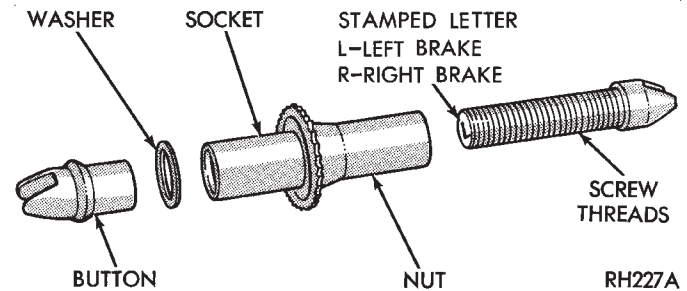
**Fig. 29 Brake Shoe Installation**

(9) Install anchor plate and adjuster cable eyelet on support plate anchor pin.

(10) Install cable guide in secondary shoe and position cable in guide.

(11) Assemble adjuster screw (Fig. 30). Then install and adjuster screw between the brake shoes.

CAUTION: Be sure the adjuster screws are installed on the correct brake unit. The adjuster screws are marked L (left) and R (right) for identification.

**Fig. 30 Adjuster Screw**

(12) Install adjuster lever and spring and connect adjuster cable to lever.

(13) Install secondary shoe retainers and spring.

(14) Install shoe spring. Connect spring to secondary shoe first. Then to primary shoe.

(15) Verify adjuster operation. Pull adjuster cable upward, cable should lift lever and rotate star wheel. Be sure adjuster lever properly engages star wheel teeth.

(16) Adjust brake shoes to drum with brake gauge.

(17) Install wheel and tire assembly.

WHEEL CYLINDER**REMOVAL**

- (1) Remove wheel and tire assembly.
- (2) Remove brake drum.
- (3) Disconnect wheel cylinder brake line.
- (4) Remove brake shoe return springs and move shoes out of engagement with cylinder push rods.
- (5) Remove cylinder attaching bolts and remove cylinder from support plate.

INSTALLATION

- (1) Apply bead of silicone sealer around cylinder mounting surface of support plate.
- (2) Install cylinder mounting bolts and tighten to 20 N·m (15 ft. lbs.).
- (3) Connect brake line to cylinder.
- (4) Install brake shoe return spring.
- (5) Install brake drum.
- (6) Install wheel and tire assembly.
- (7) Bleed brake system.

REMOVAL AND INSTALLATION (Continued)

BRAKE SUPPORT PLATE

REMOVAL

- (1) Remove wheel and tire assembly and brake drum.
- (2) Remove brake shoe assembly.
- (3) Remove parking brake cable from parking brake lever.
- (4) Compress parking brake cable retainer tabs. Then push retainer and cable through and out of support plate.
- (5) Disconnect brake line at wheel cylinder.
- (6) Remove wheel cylinder from support plate.
- (7) Remove axle shaft, refer to Group 3 for procedures.
- (8) Remove bolts attaching support plate to axle and remove support plate.

INSTALLATION

- (1) Apply bead of silicone sealer around axle mounting surface of support plate.
- (2) Install support plate on axle flange. Tighten attaching bolts to 47-81 N·m (35-60 ft. lbs.).
- (3) Apply bead of silicone sealer around wheel cylinder mounting surface and install wheel cylinder.
- (4) Install brake line in wheel cylinder.
- (5) Install parking brake cable in support plate.
- (6) Install axle shaft, refer to Group 3 for procedure.
- (7) Connect parking brake cable to lever on secondary shoe and install brake shoes on support plate.
- (8) Adjust brake shoes to drum with brake gauge.
- (9) Install brake drum and wheel and tire assembly.
- (10) Bleed brake system.

FRONT PARK BRAKE CABLE

REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove cable adjuster nut (Fig. 31).
- (3) Pull cable through the body mount.
- (4) Remove support and lower vehicle.
- (5) Remove left kick panel.
- (6) Fold left front edge of floor covering rearward and remove cable grommet from floor pan.
- (7) Engage parking brake pedal and remove cable from park brake pedal assembly.
- (8) Pull the cable through the floor pan.
- (9) Remove cable from vehicle.

INSTALLATION

- (1) Insert front cable through floor pan and install grommet.
- (2) Insert cable retainer into hole at bottom of pedal assembly bracket and connect cable end.
- (3) Install kick panel.

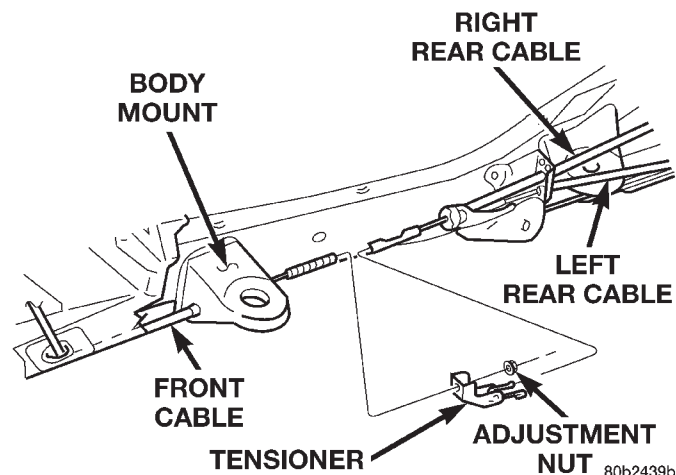


Fig. 31 Cable Tensioner

- (4) Raise and support vehicle.
- (5) Insert the cable through the body mount.
- (6) Install the cable into the tensioner and install the adjuster nut finger tight.
- (7) Perform parking brake adjustment procedure.
- (8) Remove support and lower vehicle.

REAR PARK BRAKE CABLES

REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the rear wheel and tire assemblies.
- (3) Loosen tensioner adjuster nut.
- (4) Remove the right cable from the tension rod and pull the cable housing through the left cable connector (Fig. 32).
- (5) Remove the left cable connector.
- (6) Pull both cables through the cable bracket.
- (7) Remove the right cable mounting retainers (Fig. 33).
- (8) Remove the brake drums.
- (9) Disconnect the each cable from park brake lever.
- (10) Compress tabs on each cable housing retainer at the brake support plate.
- (11) Remove the cables from the brake support plates.

INSTALLATION

- (1) Push each cable housing through the brake support plate hole until cable housing retainer tabs lock into place.

NOTE: Pull on the cable housing to ensure it is lock into place.

REMOVAL AND INSTALLATION (Continued)

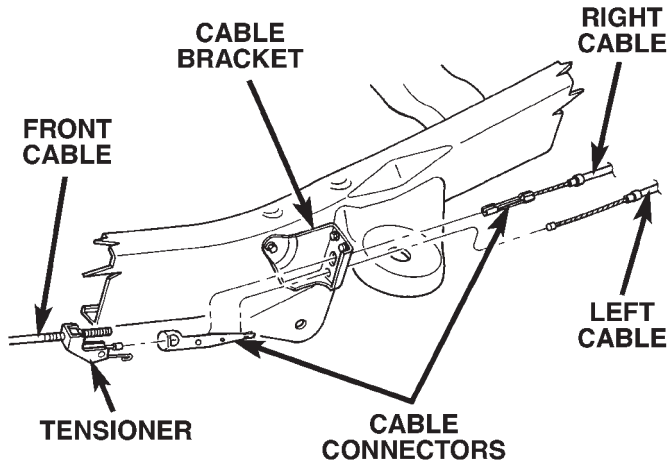


Fig. 32 Cable Connectors

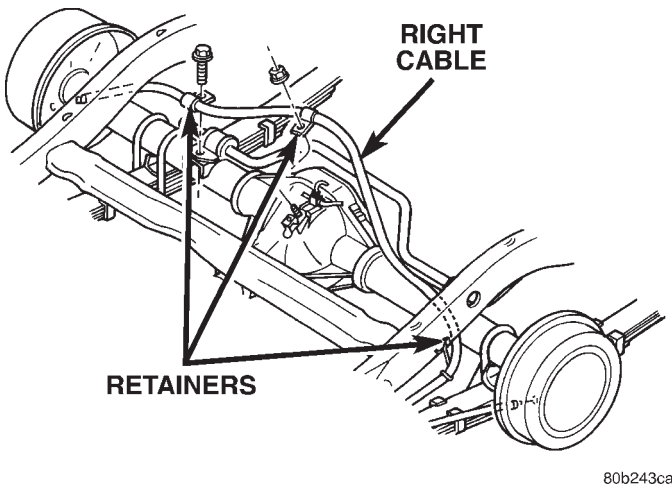


Fig. 33 Cable Retainers

(2) Pull back on the end of the cable. Then push the cable in to engage the cable in the park brake lever.

NOTE: Pull on the cable end to ensure it is attached to the park brake lever.

- (3) Install the brake drums.
- (4) Install right cable mounting retainers.
- (5) Push the cables housing through the cable bracket.

- (6) Install the left cable onto the cable connector.
- (7) Push the right cable housing through the left cable connector and connect the cable to the tension rod.
- (8) Install the wheel and tire assemblies.
- (9) Perform park brake adjustment procedure.
- (10) Remove support and lower the vehicle.

PARK BRAKE PEDAL ASSEMBLY

Removal

- (1) Remove left side kick panel.
- (2) Remove brake release rod from pedal assembly- (Fig. 34).
- (3) Disconnect brake warning lamp switch.
- (4) Remove front parking brake cable.
- (5) Remove mounting nuts and mounting bolt.
- (6) Slide assembly rearward off the mounting studs (Fig. 34).

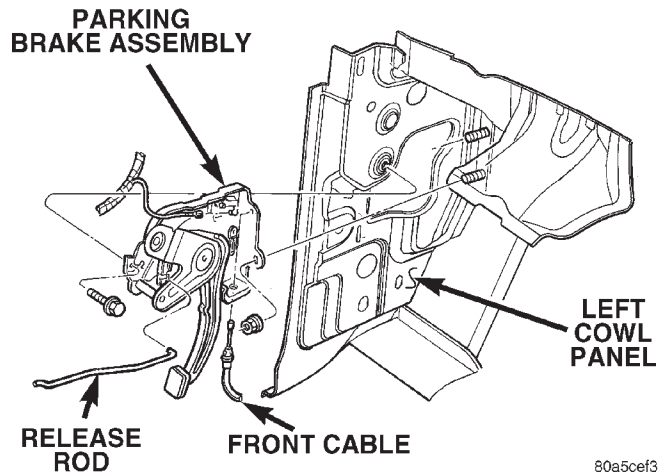


Fig. 34 Parking Brake Pedal Assembly

Installation

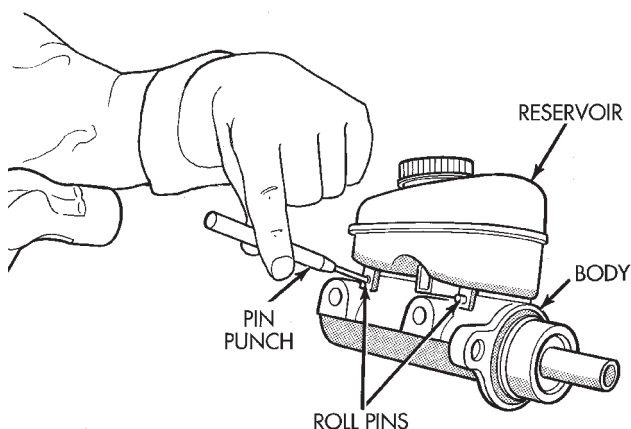
- (1) Install assembly on the mounting studs.
- (2) Install mounting bolt and nuts.
- (3) Install front parking brake cable.
- (4) Connect brake warning lamp switch.
- (5) Install brake release rod to pedal assembly.
- (6) Install left side kick panel.

DISASSEMBLY AND ASSEMBLY

MASTER CYLINDER RESERVOIR

REMOVAL

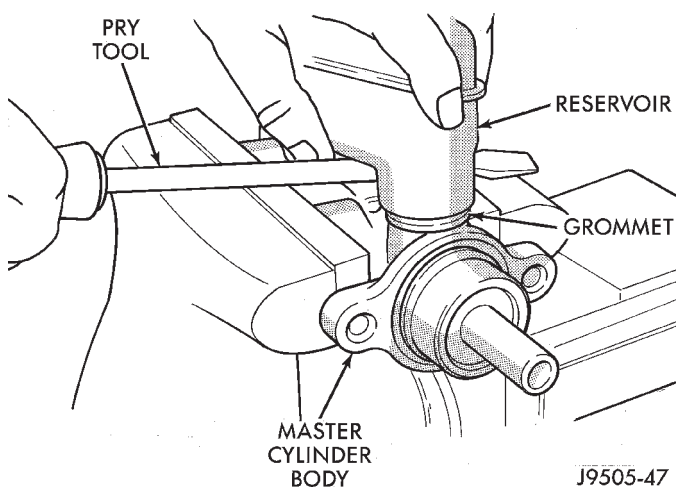
- (1) Remove reservoir cap and empty fluid into drain container.
- (2) Clamp cylinder body in vise with brass protective jaws.
- (3) Remove pins that retain reservoir to master cylinder. Use hammer and pin punch to remove pins (Fig. 35).



J9505-77

Fig. 35 Reservoir Retaining Pins

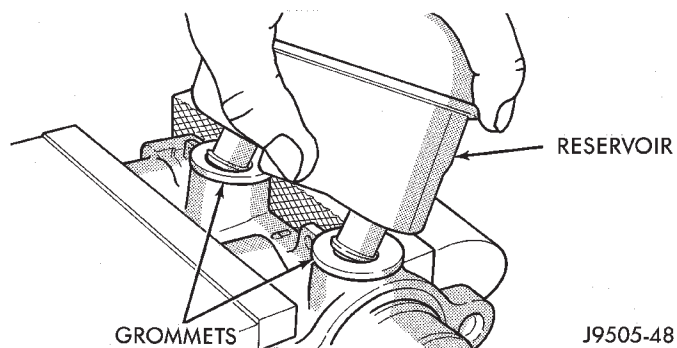
- (4) Loosen reservoir from grommets with pry tool (Fig. 36).



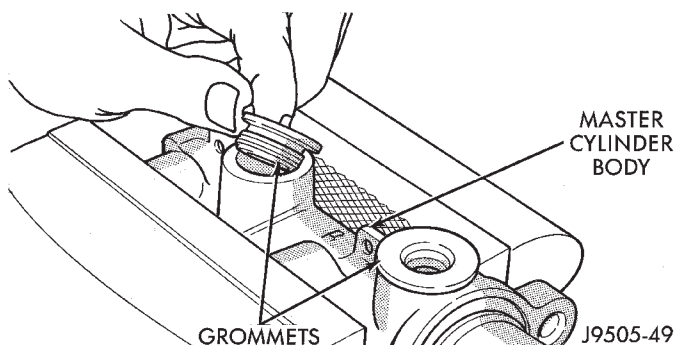
J9505-47

Fig. 36 Loosening Reservoir

- (5) Remove reservoir by rocking it to one side and pulling free of grommets (Fig. 37).
- (6) Remove old grommets from cylinder body (Fig. 38).



J9505-48

Fig. 37 Reservoir Removal

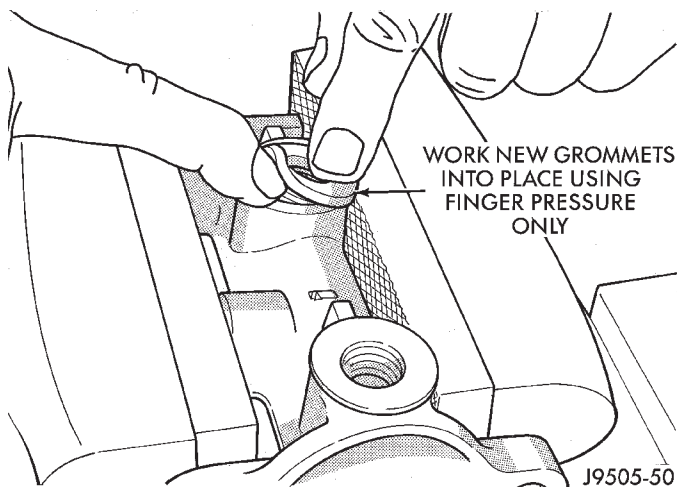
J9505-49

Fig. 38 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. 39). Use finger pressure to install and seat grommets.



J9505-50

Fig. 39 Grommet Installation

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

DISASSEMBLY AND ASSEMBLY (Continued)

- (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) Drain old brake fluid out of caliper into drain pan.
- (2) Remove piston dust boot (Fig. 40). Use screwdriver to push boot out of groove.

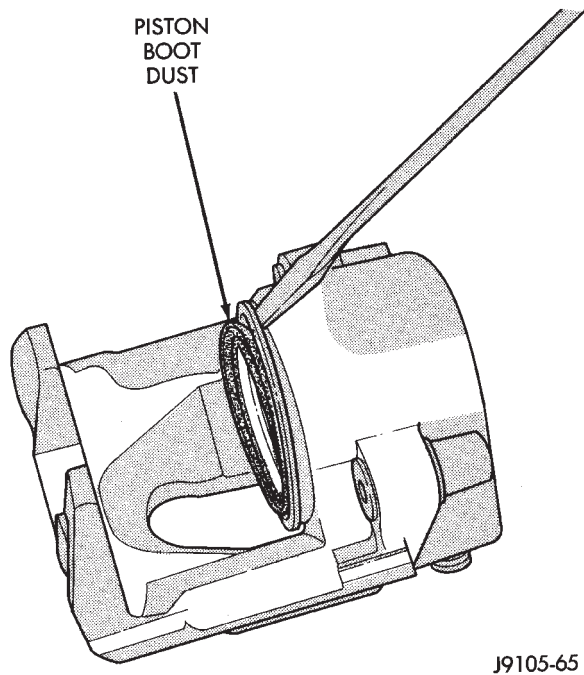


Fig. 40 Piston Dust Boot

- (3) Pad outboard shoe side of caliper interior with a minimum 1 inch thickness of shop towels (Fig. 41). Towels will prevent piston damage when piston comes out of the caliper bore.
- (4) Remove caliper piston with short bursts of compressed air. Apply air pressure through fluid inlet port of caliper (Fig. 41).

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.

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

- (5) Remove caliper piston seal with wood pencil or plastic tool (Fig. 42). Do not use metal tools as they will scratch piston bore.

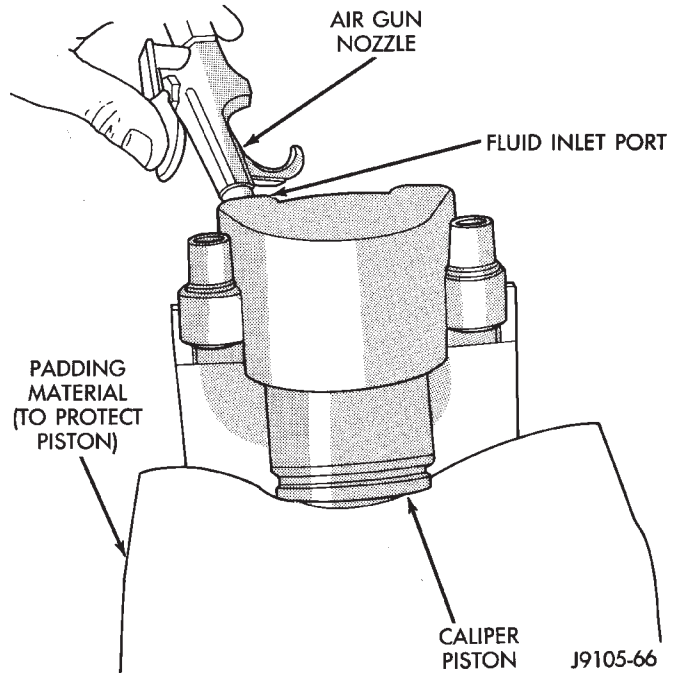


Fig. 41 Caliper Piston

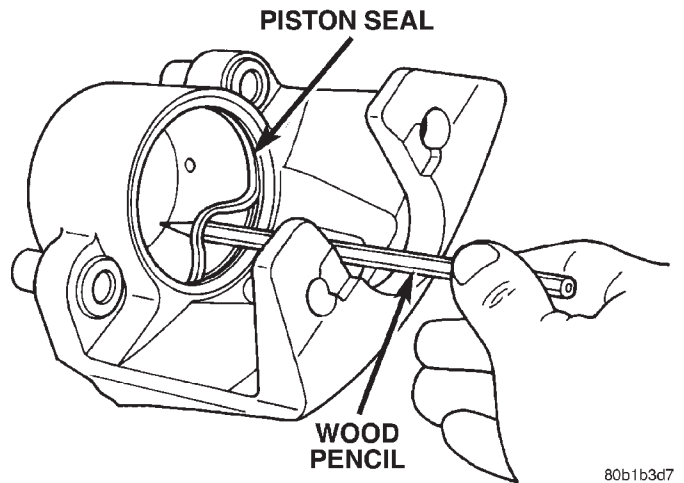


Fig. 42 Caliper Piston Seal

- (6) Remove caliper slide pin bushings and boots.
- (7) Remove caliper bleed screw and cap.

ASSEMBLY

- (1) Lubricate slide pin boots and bushings with GE, or Dow silicone grease. Then install the boots and bushings in caliper.
- (2) Coat caliper piston bore, piston and new piston seal with clean brake fluid.
- (3) Install new piston seal in caliper bore. Press seal into groove with finger (Fig. 43). Lubricate seal and caliper bore with additional, fresh brake fluid after seal installation.
- (4) Apply light coat of GE 661, Dow 111 or similar silicone grease to edge and groove of piston and dust

DISASSEMBLY AND ASSEMBLY (Continued)

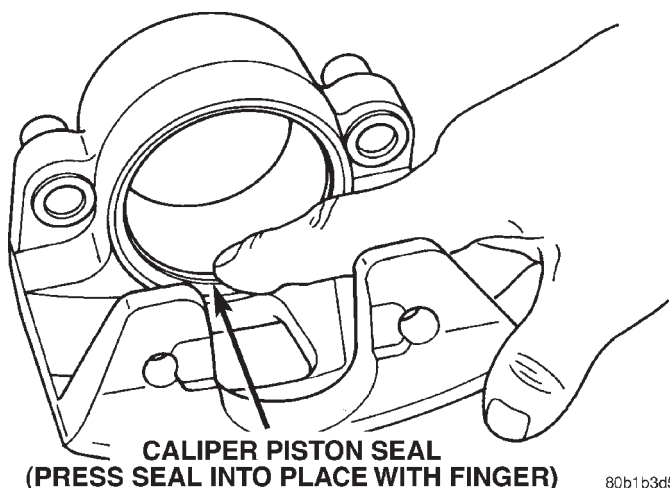


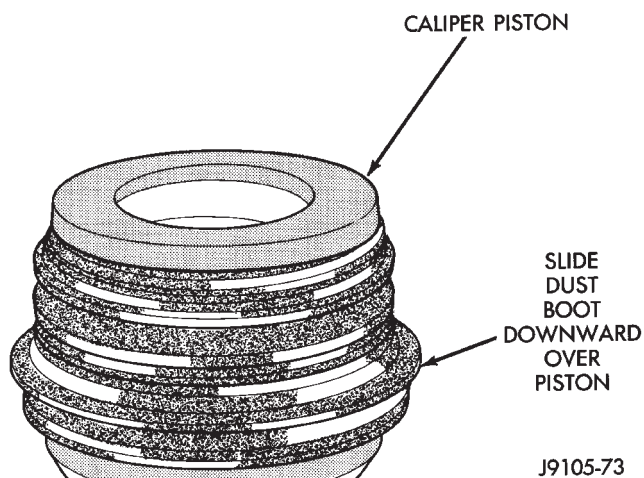
Fig. 43 Caliper Piston Seal

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seal. Grease acts as corrosion protection for these areas.

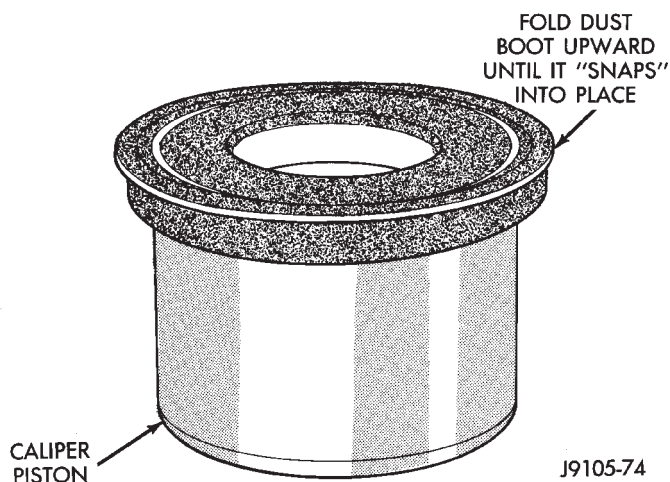
(5) Slide new seal boot over piston until boot lip seats in piston groove (Fig. 44).

(6) Push retainer part of boot forward until folds in boot snap into place (Fig. 45).



J9105-73

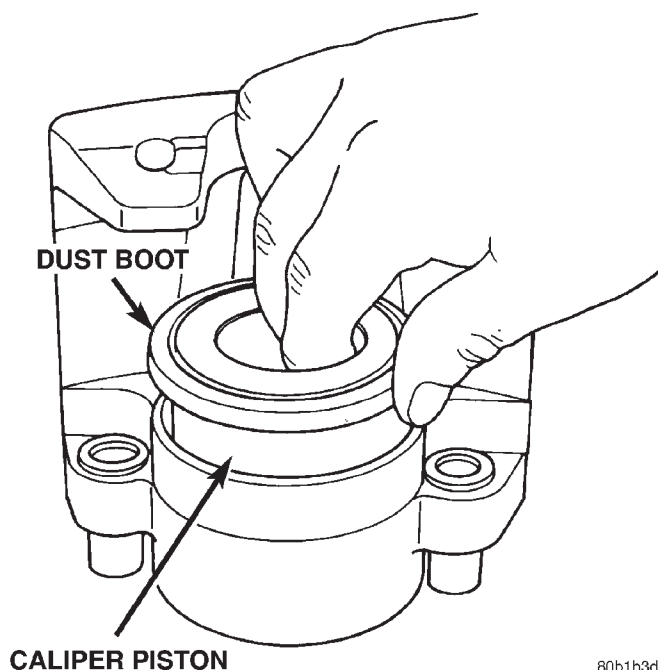
Fig. 44 Sliding Boot Onto Piston



J9105-74

Fig. 45 Snapping Boot Folds Into Place

(7) Start caliper piston in bore with a twisting motion. When piston is started in seal, push piston only **part way** into bore (Fig. 46). Maintain uniform pressure on piston to avoid cocking it in bore.

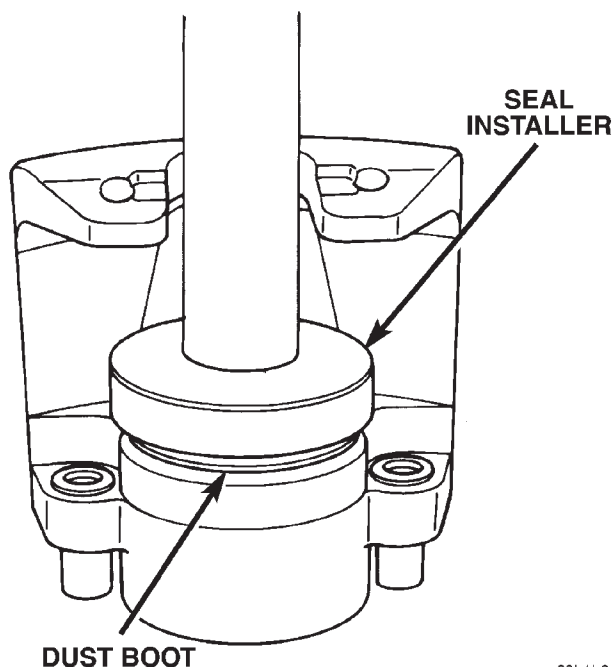


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Fig. 46 Installing Caliper Piston And Boot

(8) Press caliper piston to bottom of bore.

(9) Seat piston dust boot with Installer 8248 and Handle C-4171 (Fig. 47).



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Fig. 47 Seating Piston Dust Boot

DISASSEMBLY AND ASSEMBLY (Continued)

(10) Install caliper bleed screw and bleed screw cap if removed (Fig. 48).

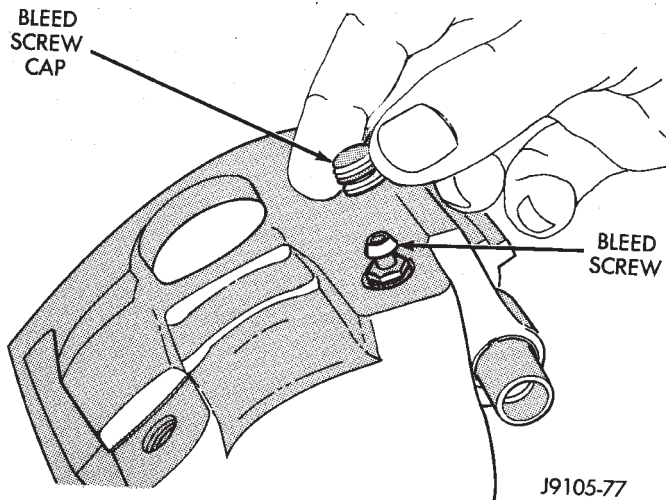


Fig. 48 Installing Caliper Bleed Screw And Cap

WHEEL CYLINDER

DISASSEMBLY

- (1) Remove push rods and boots (Fig. 49).
- (2) Press pistons, cups and spring and expander out of cylinder bore.
- (3) Remove bleed screw.

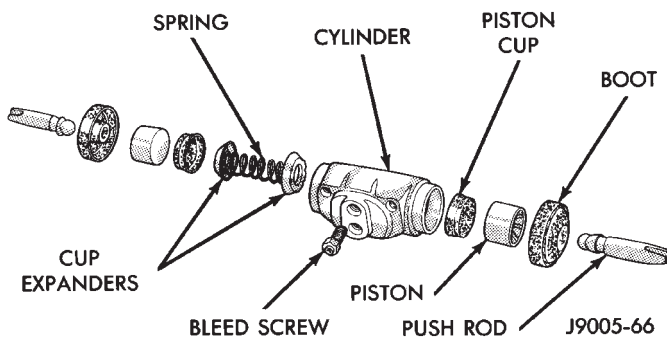


Fig. 49 Wheel Cylinder Components—Typical

ASSEMBLY

- (1) Lubricate wheel cylinder bore, pistons, piston cups and spring and expander with clean brake fluid.
- (2) Install first piston in cylinder bore. Then install first cup in bore and against piston. **Be sure lip of piston cup is facing inward (toward spring and expander) and flat side is against piston.**
- (3) Install spring and expander followed by remaining piston cup and piston.
- (4) Install boots on each end of cylinder and insert push rods in boots.
- (5) Install cylinder bleed screw.

CLEANING AND INSPECTION

REAR DRUM BRAKE

CLEANING

Clean the individual brake components, including the support plate and wheel cylinder exterior, with a water dampened cloth or with brake cleaner. Do not use any other cleaning agents. Remove light rust and scale from the brake shoe contact pads on the support plate with fine sandpaper.

INSPECTION

As a general rule, riveted brake shoes should be replaced when worn to within 0.78 mm (1/32 in.) of the rivet heads. Bonded lining should be replaced when worn to a thickness of 1.6 mm (1/16 in.).

Examine the lining contact pattern to determine if the shoes are bent or the drum is tapered. The lining should exhibit contact across its entire width. Shoes exhibiting contact only on one side should be replaced and the drum checked for runout or taper.

Inspect the adjuster screw assembly. Replace the assembly if the star wheel or threads are damaged, or the components are severely rusted or corroded.

Discard the brake springs and retainer components if worn, distorted or collapsed. Also replace the springs if a brake drag condition had occurred. Overheating will distort and weaken the springs.

Inspect the brake shoe contact pads on the support plate, replace the support plate if any of the pads are worn or rusted through. Also replace the plate if it is bent or distorted (Fig. 50).

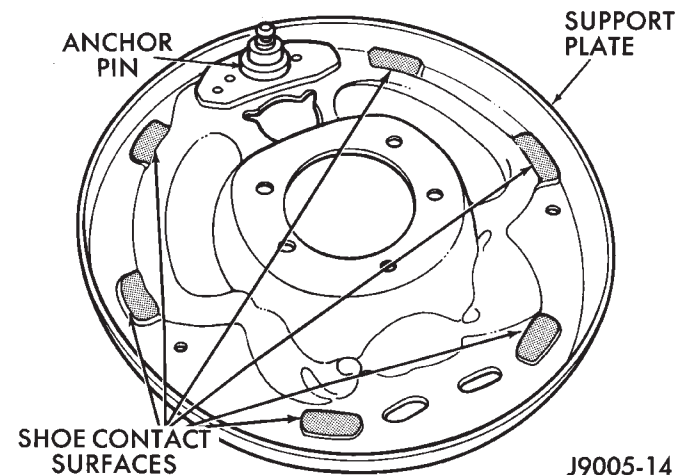


Fig. 50 Shoe Contact Surfaces

CALIPER

CLEANING

Clean the caliper components with clean brake fluid or brake clean only. Wipe the caliper and piston

CLEANING AND INSPECTION (Continued)

dry with lint free towels or use low pressure compressed air.

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

INSPECTION

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

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

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

The bore can be **lightly** polished with a brake hone to remove very minor surface imperfections (Fig. 51). The caliper should be replaced if the bore is severely corroded, rusted, scored, or if polishing would increase bore diameter more than 0.025 mm (0.001 inch).

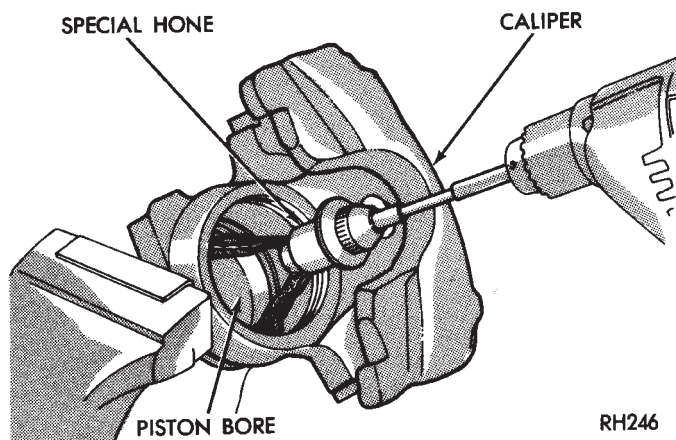


Fig. 51 Polishing Piston Bore

WHEEL CYLINDER

CLEANING

Clean the cylinder and pistons with clean brake fluid or brake cleaner only. Do not use any other cleaning agents.

Dry the cylinder and pistons with compressed air. Do not use rags or shop towels to dry the cylinder components. Lint from cloth material will adhere to the cylinder bores and pistons.

INSPECTION

Inspect the cylinder bore. Light discoloration and dark stains in the bore are normal and will not impair cylinder operation.

The cylinder bore can be lightly polished but only with crocus cloth. Replace the cylinder if the bore is scored, pitted or heavily corroded. Honing the bore to restore the surface is not recommended.

Inspect the cylinder pistons. The piston surfaces should be smooth and free of scratches, scoring and corrosion. Replace the pistons if worn, scored, or corroded. Do attempt to restore the surface by sanding or polishing.

Discard the old piston cups and the spring and expander. These parts are not reusable. The original dust boots may be reused but only if they are in good condition.

ADJUSTMENTS

STOP LAMP SWITCH

- (1) Push and hold brake pedal in applied position.
- (2) Push switch forward until fully seated against bracket.
- (3) Release brake pedal.
- (4) Lightly pull brake pedal rearward until master cylinder push rod bottoms against master cylinder internal stop. This action will set switch plunger at proper stroke length.

CAUTION: Do not use excessive force to move the pedal rearward and do not overextend the pedal and push rod.

REAR DRUM BRAKE

The rear drum brakes are equipped with a self-adjusting mechanism. Under normal circumstances, the only time adjustment is required is when the shoes are replaced, removed for access to other parts, or when one or both drums are replaced.

Adjustment can be made with a standard brake gauge or with adjusting tool. Adjustment is performed with the complete brake assembly installed on the backing plate.

ADJUSTMENT WITH BRAKE GAUGE

- (1) Be sure parking brakes are fully released.
- (2) Raise rear of vehicle and remove wheels and brake drums.
- (3) Verify that left and right automatic adjuster levers and cables are properly connected.
- (4) Insert brake gauge in drum. Expand gauge until gauge inner legs contact drum braking surface. Then lock gauge in position (Fig. 52).

ADJUSTMENTS (Continued)

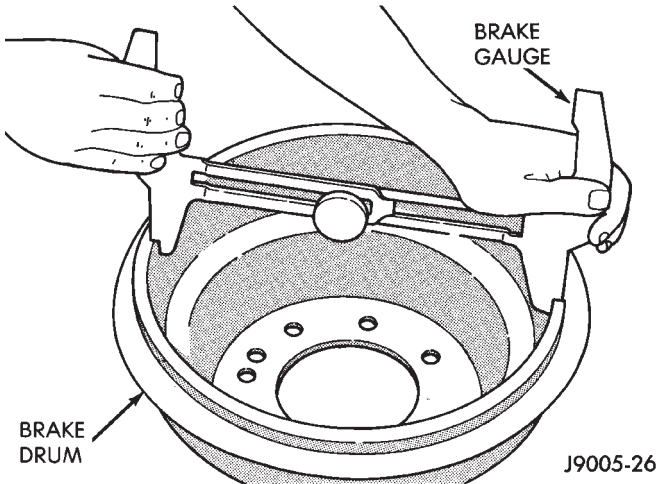


Fig. 52 Adjusting Gauge On Drum

(5) Reverse gauge and install it on brake shoes. Position gauge legs at shoe centers as shown (Fig. 53). If gauge does not fit (too loose/too tight), adjust shoes.

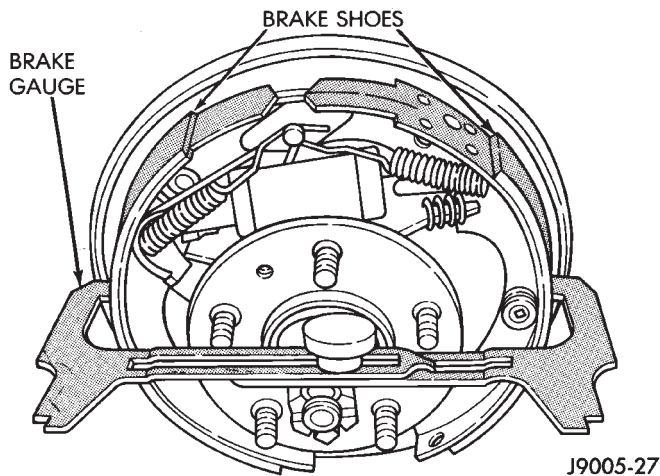


Fig. 53 Adjusting Gauge On Brake Shoes

(6) Pull shoe adjuster lever away from adjuster screw star wheel.

(7) Turn adjuster screw star wheel (by hand) to expand or retract brake shoes. Continue adjustment until gauge outside legs are light drag-fit on shoes.

(8) Install brake drums and wheels and lower vehicle.

(9) Drive vehicle and make one forward stop followed by one reverse stop. Repeat procedure 8-10 times to operate automatic adjusters and equalize adjustment.

NOTE: Bring vehicle to complete standstill at each stop. Incomplete, rolling stops will not activate automatic adjusters.

ADJUSTMENT WITH ADJUSTING TOOL

(1) Be sure parking brake lever is fully released.
(2) Raise vehicle so rear wheels can be rotated freely.

(3) Remove plug from each access hole in brake support plates.

(4) Loosen parking brake cable adjustment nut until there is slack in front cable.

(5) Insert adjusting tool through support plate access hole and engage tool in teeth of adjusting screw star wheel (Fig. 54).

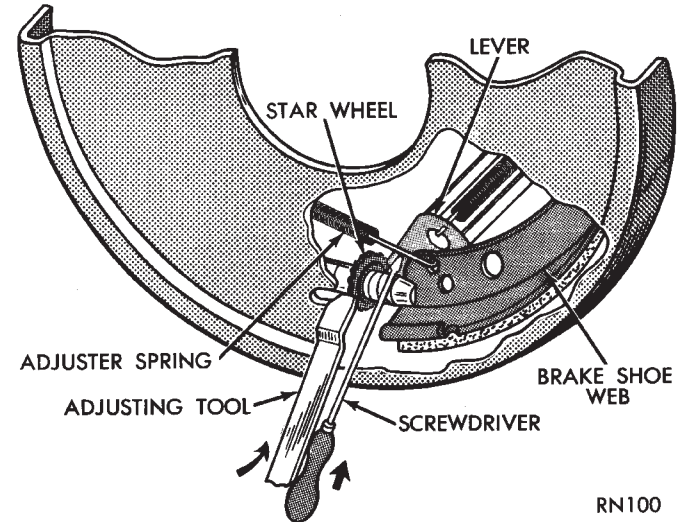


Fig. 54 Brake Adjustment

(6) Rotate adjuster screw star wheel (move tool handle upward) until slight drag can be felt when wheel is rotated.

(7) Push and hold adjuster lever away from star wheel with thin screwdriver.

(8) Back off adjuster screw star wheel until brake drag is eliminated.

(9) Repeat adjustment at opposite wheel. Be sure adjustment is equal at both wheels.

(10) Install support plate access hole plugs.

(11) Adjust parking brake cable and lower vehicle.

(12) Install brake drums and wheels and lower vehicle.

(13) Drive vehicle and make one forward stop followed by one reverse stop. Repeat procedure 8-10 times to operate automatic adjusters and equalize adjustment.

NOTE: Bring vehicle to complete standstill at each stop. Incomplete, rolling stops will not activate automatic adjusters.

ADJUSTMENTS (Continued)

PARK BRAKE CABLE TENSIONER

NOTE: Tensioner adjustment is only necessary when the tensioner, or a cable has been replaced or disconnected for service. When adjustment is necessary, perform adjustment only as described in the following procedure. This is necessary to avoid faulty park brake operation.

- (1) Raise vehicle.
- (2) Back off cable tensioner adjusting nut create slack in cables.
- (3) Remove rear wheel/tire assemblies. Then remove brake drums.
- (4) Verify brakes are in good condition and operating properly.
- (5) Verify park brake cables operate freely and are not binding, or seized.
- (6) Check rear brake shoe adjustment with standard brake gauge.
- (7) Install drums and verify that drums rotate freely without drag.
- (8) Install wheel/tire assemblies.
- (9) Lower vehicle enough for access to park brake foot pedal. Then fully apply park brakes.

NOTE: Leave park brakes applied until adjustment is complete.

- (10) Raise vehicle again.
- (11) Mark tensioner rod 6.35 mm (1/4 in.) from edge of tensioner if no mark is visible (Fig. 55).

NOTE: The rod is mark from the factory.

- (12) Tighten adjusting nut at the on tensioner rod moves into alignment with tensioner.

CAUTION: Do not loosen, or tighten the tensioner adjusting nut for any reason after completing adjustment.

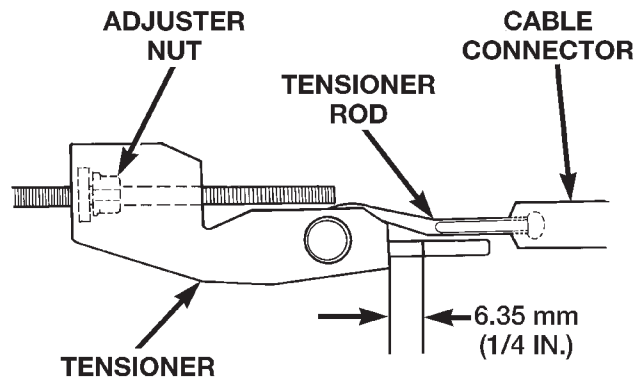
- (13) Lower vehicle until rear wheels are 15-20 cm (6-8 in.) off shop floor.

- (14) Release park brake foot pedal and verify that rear wheels rotate freely without drag. Then lower vehicle.

SPECIFICATIONS

BRAKE FLUID

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



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Fig. 55 Adjustment Mark On Cable Tensioner Rod

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

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

BASE BRAKES

Disc Brake Caliper

Type Sliding
Bore 70 mm (2.75 in.)

Disc Brake Rotor

Type Ventilated
Dimensions 287 x 24 mm
(11.3 x 0.9 in.)
Max. Runout 0.102 mm (0.004)
Max. Thickness Variation .. 0.013 mm (0.0005 in.)
Min. Rotor Thickness 22.6 mm (0.8898 in.)

Brake Drum

Dimensions 279 x 57 mm
(11 x 2.25 in.)
Max. Runout 0.20 mm (0.008 in.)
Max. Diameter Variation ... 0.076 mm (0.003 in.)

Brake Booster

Type Tandem Diaphragm

Master Cylinder

Bore 27 mm (1.06 in.)

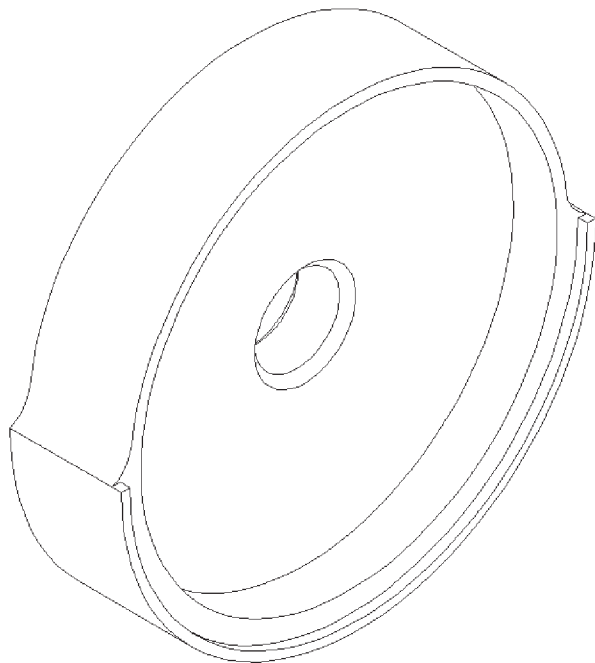
SPECIFICATIONS (Continued)

TORQUE CHART

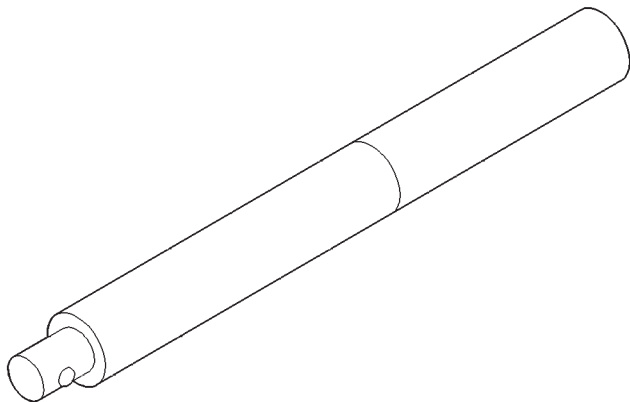
DESCRIPTION	TORQUE
Brake Booster	
Mounting Nuts	28 N·m (250 in. lbs.)
Master Cylinder	
Mounting Nuts	28 N·m (250 in. lbs.)
Caliper	
Mounting Pins	30 N·m (22 ft. lbs.)
Wheel Cylinder	
Bolts	20 N·m (15 ft. lbs.)
Combination Valve	
Bolt (RWAL)	20-27 N·m (15-20 ft. lbs.)
Bolt (ABS)	10-13 N·m (7-10 ft. lbs.)
Support Plate	
Mounting Bolts/Nuts	64 N·m (47 ft. lbs)
Brake Line Fittings	
Master Cylinder	19 N·m (170 in. lbs.)
Combination Valve	19 N·m (170 in. lbs.)
Wheel Cylinder	16 N·m (145 in. lbs.)
Brake Hose	
Front Fitting	16 N·m (145 in. lbs.)
Front Bolt	28 N·m (250 in. lbs.)
Rear Fitting	19 N·m (170 in. lbs.)

SPECIAL TOOLS

BASE BRAKES



Install Dust Boot 8248



Universal Handle C-4171

REAR WHEEL ANTILOCK BRAKES

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DESCRIPTION AND OPERATION

REAR WHEEL ANTILOCK

Rear Wheel Antilock (RWAL) brake system is standard equipment on all Dodge trucks and full size vans. The RWAL brake system is designed to prevent rear wheel lock-up under heavy braking conditions on virtually all types of road surfaces. Antilock braking is desirable because a vehicle which is stopped without locking the wheels will retain directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during braking.

When the brakes are applied, hydraulic fluid is routed from the master cylinder's secondary circuit, through the combination valve, to the RWAL valve Hydraulic Control Unit (HCU). From there hydraulic fluid is routed to the rear brake wheel cylinders. The Controller Antilock Brake (CAB) monitors rear wheel speed through the rear wheel speed sensor (WSS). If a wheel is about to lock-up, the CAB signals the RWAL valve (HCU). The HCU modulates the hydraulic brake pressure to the rear wheels to prevent wheel lock-up.

NORMAL BRAKING

During light brake application, rear wheel deceleration is not sufficient to activate the antilock system components. During a normal stop hydraulic brake fluid flows unrestricted to the rear wheel cylinders to stop the vehicle. The antilock solenoid valves are inactive. The isolation valve is open and the dump valve is closed allowing normal fluid flow to the rear wheel cylinders.

ANTILOCK BRAKING

If the CAB senses that rear wheel speed deceleration is excessive, it will energize the isolation solenoid. This prevents a further increase of driver induced brake pressure to the rear wheels. If this initial action is not enough to prevent rear wheel lock-up, the CAB will momentarily energize a dump solenoid. This opens the dump valve to vent a small amount of isolated rear brake pressure to an accumulator. The action of fluid moving to the accumulator reduces the isolated brake pressure at the wheel cylinders. The dump (pressure venting) cycle is limited to very short time periods (milliseconds). The CAB will pulse the dump valve until rear wheel deceleration matches the vehicle's deceleration rate or the desired slip rate programmed into the CAB. The system will switch to normal braking once wheel locking tendencies are no longer present.

RWAL PERFORMANCE CHARACTERISTICS

WHEEL/TIRE SIZE AND INPUT SIGNALS

The antilock system depends on accurate signals from the rear wheel speed sensor, to achieve maximum antilock performance. Vehicle's wheels and tires should all be the same size and type to ensure an accurate signal. Tires other than those specified by the manufacturer may result in unsatisfactory antilock performance.

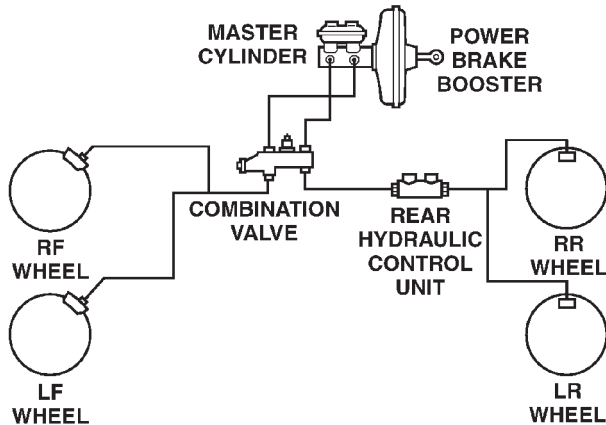
LOW VEHICLE SPEED

The RWAL braking system will revert to normal braking and automatically turn off if the vehicle is moving less than a few mph. The lower limit at which RWAL is cancelled may be different depending on tire and wheel diameters.

DESCRIPTION AND OPERATION (Continued)

HYDRAULIC PRESSURE

The RWAL system controls hydraulic pressure to both rear wheels simultaneously, not each one independently. If one rear wheel starts to decelerate too rapidly, the RWAL system affects the hydraulic pressure to both rear brakes (Fig. 1).



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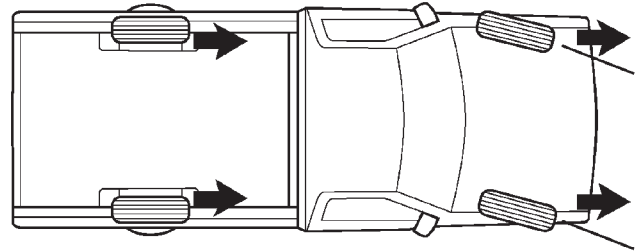
Fig. 1 RWAL Hydraulic Circuit

DIRECTIONAL STABILITY

The RWAL system operates on the rear wheels only, it is possible to lock the front wheels of the vehicle during a high deceleration stop. In this event, the vehicle will be stable, but the driver will be unable to alter the direction of the vehicle with the steering wheel (Fig. 2).

STOPPING DISTANCE

The RWAL brake system limits wheel slip to approximately 20%. This provides for maximum brake effectiveness. Wheel slip means how well the tires grip the road surface. With light or no braking there is no wheel slip. With the wheels locked (not rotating) during a panic stop, there is 100% wheel slip. To obtain the shortest stopping distance and the greatest control over the vehicle during heavy braking, approximately 20% wheel slip is most efficient, under most conditions.



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Fig. 2 Directional Stability

PEDAL FEEL

The brake pedal feel is similar to that of a conventional brake system. Under certain conditions the pedal may drop slightly when there is a need for pressure increase during a long antilock stop. The sequence of antilock events is to isolate, decrease, and then increase pressure to maintain brake effectiveness. When the system is in the increase mode is when the pedal will drop slightly.

TIRE NOISE

The RWAL system prevents complete rear wheel lock-up, but some wheel slip is desired to obtain optimum braking performance. During brake pressure modulation brake pressure is increased and wheel slip controlled by the CAB is allowed to reach up to approximately 20%. This means that the wheel rolling speed is approximately 20% less than that of a free rolling wheel at any given vehicle speed. The wheel slip may result in some tire "chirping", depending upon the road surface. This sound should not be interpreted as a total wheel lock-up and can be considered normal under most conditions.

BRAKE PEDAL

During antilock braking, the RWAL valve cycles rapidly in response to CAB inputs. The driver may experience a pulsing sensation in the brake pedal and vehicle as the valves modulate brake fluid pressure as needed. Brake pedal and vehicle pulsations during an antilock stop should be considered as normal.

DESCRIPTION AND OPERATION (Continued)

RWAL COMPONENT LOCATION

COMPONENT	LOCATION	FUNCTION
CONTROLLER ANTILOCK BRAKE	Driver side inner fender on a bracket.	Tests, monitors and controls the rear brake system.
HYDRAULIC CONTROL UNIT/ RWAL VALVE	Driver side inner fender on a bracket.	Modulates hydraulic pressure to rear brakes during an ABS stop.
REAR WHEEL SPEED SENSOR	Top of the rear axle housing.	Sends an AC voltage sinewave to the CAB whose frequency is proportional to vehicle speed.
EXCITER RING	Ring gear inside the differential housing.	Used to pull the magnetic field across the wheel speed sensor's windings.
RED BRAKE WARNING LAMP	Instrument cluster.	Indicator for park brake engagement, hydraulic brake malfunction, or ABS malfunction.
AMBER ABS WARNING LAMP	Instrument cluster.	Indicator of an ABS malfunction.
BRAKE WARNING LAMP DIODE	Instrument panel harness near the parking brake switch.	Isolates the park brake switch circuit from the CAB for proper red brake warning lamp operation.
ISOLATION AND DUMP VALVE FUSE	Inside the CAB.	Fail-safe device for unwanted control of the isolation and dump solenoid/valves
ISOLATION AND DUMP SOLENOID/VALVES	Inside the HCU/RWAL valve.	Used to modulation hydraulic pressure to the rear brakes during an ABS stop.

CONTROLLER ANTILOCK BRAKES

The Controller Antilock Brakes (CAB) is a micro-processor which handles testing, monitoring and controlling the ABS brake system operation (Fig. 3). The CAB functions are:

- Perform self-test diagnostics.
- Monitors the RWAL brake system for proper operation.
- Controls the RWAL valve solenoids.

NOTE: If the CAB needs to be replaced, the rear axle type and tire revolutions per mile must be programmed into the new CAB. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile refer to Group 22 Tire and Wheels. To program the CAB refer to the Chassis Diagnostic Manual.

SYSTEM SELF-TEST

When the ignition switch is turned-on the micro-processor RAM and ROM are tested. If an error occurs during the test a DTC will be set into the RAM memory. However it is possible the DTC will not be stored in memory if the error has occurred in the RAM module were the DTC's are stored. Also it

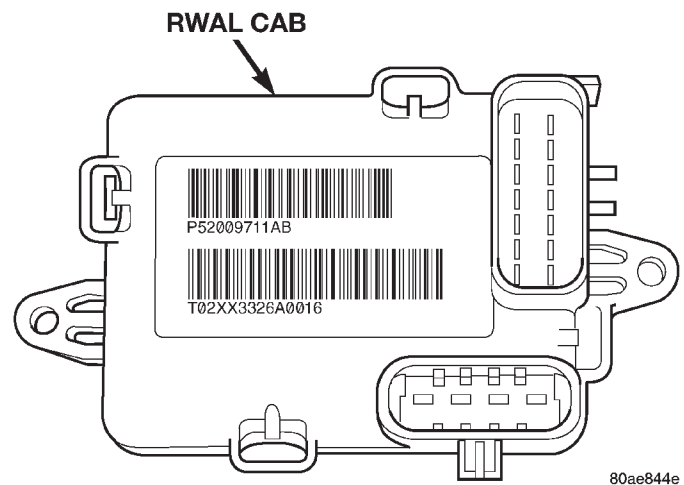


Fig. 3 RWAL CAB

is possible a DTC may not be stored if the error has occurred in the ROM which signals the RAM to store the DTC.

CAB INPUTS

The CAB continuously monitors the speed of the differential ring gear by monitoring signals generated by the rear wheel speed sensor. The CAB determines

DESCRIPTION AND OPERATION (Continued)

a wheel locking tendency when it recognizes the ring gear decelerating too rapidly. The CAB monitors the following inputs to determine when a wheel locking tendency may exist:

- Rear Wheel Speed Sensor
- Brake Lamp Switch
- Brake Warning Lamp Switch
- Reset Switch
- 4WD Switch (If equipped)

CAB OUTPUTS

The CAB controls the following outputs for antilock braking and brake warning information:

- RWAL Valve
- ABS Warning Lamp
- Brake Warning Lamp

RWAL VALVE

If the CAB senses that rear wheel speed deceleration is excessive, it will energize a isolation solenoid by providing battery voltage to the solenoid. This prevents a further increase of driver induced brake pressure to the rear wheels. If this initial action is not enough to prevent rear wheel lock-up, the CAB will momentarily energize a dump solenoid (the CAB energizes the dump solenoid by providing battery voltage to the solenoid). This opens the dump valve to vent a small amount of isolated rear brake pressure to an accumulator. The action of fluid moving to the accumulator reduces the isolated brake pressure at the wheel cylinders. The dump (pressure venting) cycle is limited to very short time periods (milliseconds). The CAB will pulse the dump valve until rear wheel deceleration matches the vehicle deceleration rate or the desired slip rate programmed into the CAB. The system will switch to normal braking once wheel locking tendencies are no longer present.

A predetermined maximum number of consecutive dump cycles can be performed during any one antilock stop. If excessive dump cycles occur, a DTC will be set and stored in the CAB memory. If during an antilock stop, the driver releases the brake pedal, the reset switch contacts will open. This signal to the CAB is an indication that pressure has equalized across the RWAL valve. The CAB will then reset the dump cycle counter in anticipation of the next antilock stop. Additionally, any fluid stored in the accumulator will force its way past the dump valve, back into the hydraulic circuit and return to the master cylinder.

A fuse internal to the CAB, provides a fail-safe device which prevents unwanted control over the isolation and dump solenoids. The fuse is in series with the isolation and dump solenoids output circuits. If the internal fuse is open, the CAB cannot provide voltage to energize either solenoid and antilock stops are prevented. If the fuse is open, the braking system

will operate normally but without antilock control over rear brake pressure.

REAR WHEEL SPEED SENSOR AND EXCITER RING

The rear Wheel Speed Sensor (WSS) is mounted in the rear differential housing (Fig. 4). The WSS consists of a magnet surrounded by windings from a single strand of wire. The sensor sends a small AC signal to the CAB. This signal is generated by magnetic induction. The magnetic induction is created when a toothed sensor ring (exciter ring or tone wheel) passes the stationary magnetic WSS.

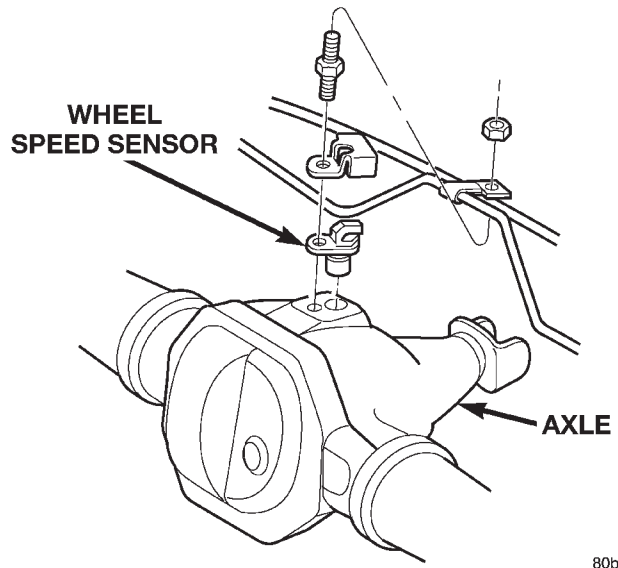


Fig. 4 Rear Wheel Speed Sensor Location

The exciter ring is press fitted onto the differential carrier next to the final drive ring gear (Fig. 5). For replacement procedure of the exciter ring, refer to Group 3 Differential and Driveline.

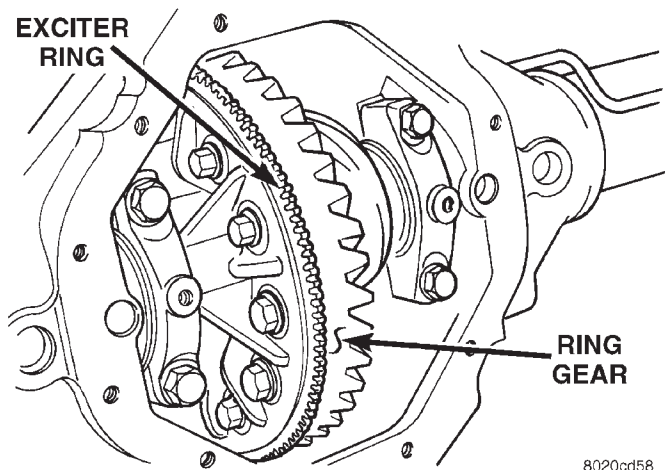
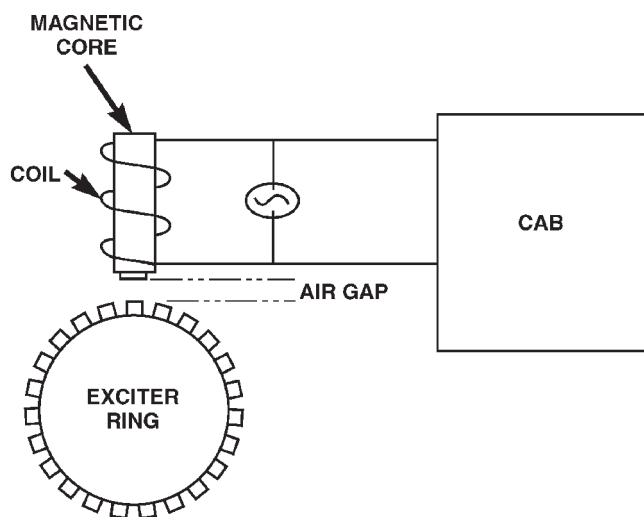


Fig. 5 Exciter Ring Location

When the ring gear is rotated, the exciter ring passes the tip of the WSS. As the exciter ring passes

DESCRIPTION AND OPERATION (Continued)

the tip of the WSS, the magnetic lines of force of the sensor are cut, causing the magnetic field to be moved across the sensor's windings. This, in turn causes current to flow through the WSS circuit (Fig. 6). Every time a tooth of the exciter ring passes the tip of the WSS, an AC signal is generated. Each AC signal (positive to negative signal or sinewave) is interpreted by the CAB. It then compares the frequency of the sinewave to a time value to calculate vehicle speed. The CAB continues to monitor the frequency to determine a deceleration rate that would indicate a possible wheel-locking tendency.



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Fig. 6 Operation of the Wheel Speed Sensor

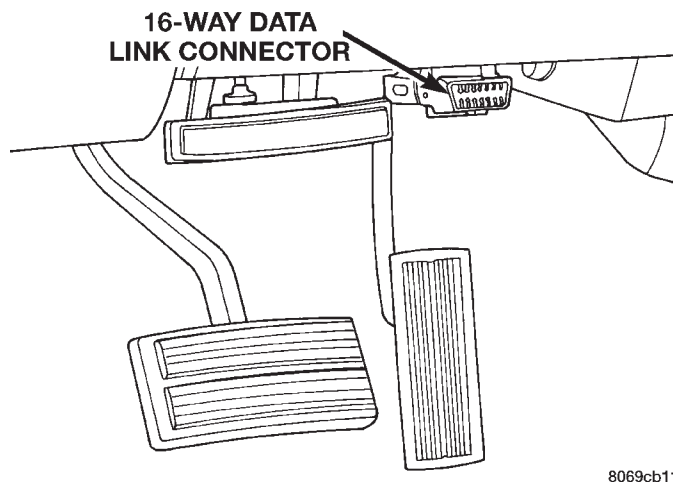
The signal strength of any magnetic induction sensor is directly affected by:

- Magnetic field strength; the stronger the magnetic field, the stronger the signal
- Number of windings in the sensor; more windings provide a stronger signal
- Exciter ring speed; the faster the exciter ring rotates, the stronger the signal will be
- Distance between the exciter ring teeth and WSS; the closer the WSS is to the exciter ring, the stronger the signal will be

The rear WSS is not adjustable. A clearance specification has been established for manufacturing tolerances. If the clearance is not within these specifications, then either the WSS or other components may be damaged. The clearance between the WSS and the exciter ring is 0.005 – 0.050 in.

The assembly plant performs a "Rolls Test" on every vehicle that leaves the assembly plant. One of the test performed is a test of the WSS. To properly test the sensor, the assembly plant connects test

equipment to the Data Link Connector (DLC). This connector is located to the right of the steering column and attached to the lower portion of the instrument panel (Fig. 7). The rolls test terminal is spliced to the WSS circuit. The vehicle is then driven on a set of rollers and the WSS output is monitored for proper operation.



8069cb11

**Fig. 7 Data Link Connector - Typical
BRAKE WARNING LAMPS**

RED WARNING LAMP

The red brake warning lamp is used to alert the driver of a hydraulic fault or that the parking brake is applied. For the RWAL system, the red brake warning lamp also is used to alerts the driver of a problem with the RWAL system.

The brake warning lamp illuminates when ignition voltage is supplied to the bulb and a ground is provided for the bulb. The bulb has ignition voltage supplied to it any time the ignition switch is in the RUN or START positions. A ground for the bulb is provided when:

- The ignition switch is turned to the START position.
- The parking brakes are applied and the park brake switch is actuated.
- A hydraulic fault has occurred and the pressure differential switch is actuated.
- A RWAL fault has occurred.

ABS WARNING LAMP

The amber ABS warning lamp is used to alerts the driver of RWAL problem and identify DTCs stored in the CABs memory.

The ABS warning lamp illuminates when ignition voltage is supplied to the bulb and a ground is provided for the bulb. The bulb has ignition voltage supplied to it anytime the ignition switch is in the RUN or START positions. A ground for the bulb is provided by the CAB only. A circuit in the CAB monitors the

DESCRIPTION AND OPERATION (Continued)

brake warning lamp switch and the ignition switch bulb check circuit (grounds the brake warning lamp bulb during the START position). When the CAB identifies a ground on this circuit, the CAB illuminates the ABS warning lamp.

STOP LAMP SWITCH

The primary function of the switch is to turn on the stop lamps during braking. The switch is also used to send signals to components that must know when the brakes are applied, such as the Powertrain Control Module (PCM), which uses the signal to cancel speed control. The CAB uses the brake switch signal to monitor brake pedal application. When the switch contacts open (brakes applied), the CAB receives the brake applied signal. The CAB then monitors the ABS system to anticipate the need for an ABS stop.

DIAGNOSIS AND TESTING

REAR WHEEL ANTILOCK

Diagnosis of base brake conditions which are mechanical in nature should be performed first. This includes brake noise, lack of power assist, parking brake, or vehicle vibration during normal braking.

The RWAL brake system performs several self-tests every time the ignition switch is turned on and the vehicle is driven. The CAB monitors the system inputs and outputs circuits to verify the system is operating properly. If the CAB senses a malfunction in the system it will set a DTC into memory and trigger the warning lamp.

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

ABS SERVICE PRECAUTIONS

The ABS uses an electronic control module, the CAB. This module is designed to withstand normal current draws associated with vehicle operation. Care must be taken to avoid overloading the CAB circuits. **In testing for open or short circuits, do not ground or apply voltage to any of the circuits unless instructed to do so for a diagnostic procedure.** These circuits should only be tested using a high impedance multi-meter or the DRB tester as described in this section. Power should never be removed or applied to any control module with the ignition in the ON position. Before removing or connecting battery cables, fuses, or connectors, always turn the ignition to the OFF position.

CAUTION: Use only factory wiring harnesses. Do not cut or splice wiring to the brake circuits. The addition of after-market electrical equipment (car phone, radar detector, citizen band radio, trailer lighting, trailer brakes, ect.) on a vehicle equipped with antilock brakes may affect the function of the antilock brake system.

SERVICE PROCEDURES

RWAL BRAKE BLEEDING

RWAL brake bleeding can be performed manually, or with pressure bleeding equipment.

Use Mopar DOT 3 brake fluid, or an equivalent meeting SAE J1703-F and DOT 3 standards, to fill and bleed the brake system.

Bleed only one brake component at a time. Recommended bleed sequence is:

- master cylinder
- combination valve
- rear antilock valve
- left rear wheel
- right rear wheel
- right front wheel
- left front wheel

MANUAL BLEEDING

Use a bleed hose at each caliper/cylinder bleed screw. Attach one end of the hose to the bleed screw and insert the opposite end in glass container partially filled with brake fluid. A glass container makes it easier to see air bubbles as they exit the bleed hose. Be sure the end of the bleed hose remains immersed in fluid. This prevents air from being drawn back into the system.

Do not allow the master cylinder to run out of fluid when bleeding the brakes. An empty cylinder will allow air to be drawn back into the system. Check fluid level frequently during bleeding operations.

Be sure to tighten each brake line fitting, or bleed screw once bleeding is completed. Loose fittings and bleed screws allows air to enter the system.

PRESSURE BLEEDING

If pressure bleeding equipment will be used, the front brake metering valve will have to be held open to bleed the front brakes. The valve stem is located in the forward end or top of the combination valve. The stem must either be pressed inward, or held outward slightly. a spring clip tool or helper is needed to hold the valve stem in position.

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

SERVICE PROCEDURES (Continued)

erally, a tank pressure of 15-20 psi is sufficient for bleeding.

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

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

REMOVAL AND INSTALLATION

CONTROLLER

NOTE: If the CAB needs to be replaced, the rear axle type and tire revolutions per mile must be programmed into the new CAB. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile refer to Group 22 Tire and Wheels. To program the CAB refer to the Chassis Diagnostic Manual.

REMOVAL

(1) Push the CAB harness connector lock to release the lock and remove the connector (Fig. 8) from the controller.

(2) Remove the RWAL valve harness connector from the controller.

(3) Remove the controller mounting screws and remove the controller from the mounting bracket (Fig. 8).

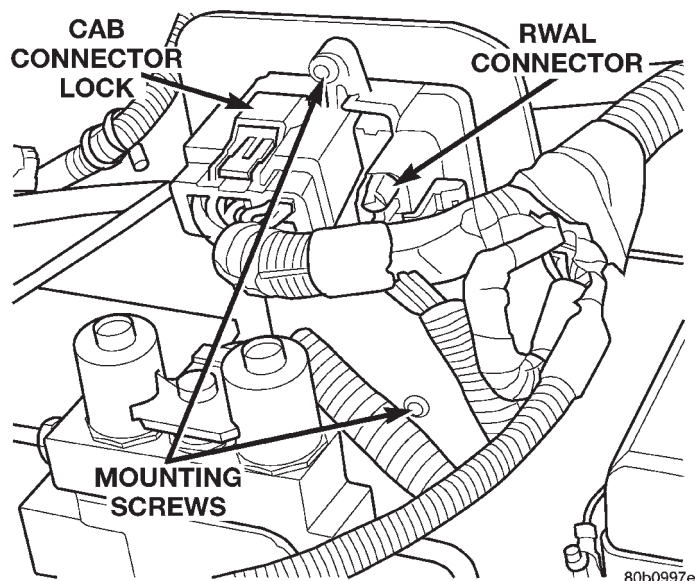


Fig. 8 RWAL Controller

INSTALLATION

(1) Position the controller on the bracket.

(2) Install the mounting screws and tighten to 6 N·m (53 in. lbs.).

(3) Install the RWAL valve harness connector into the controller.

(4) Install the CAB harness connector into the controller and push down on the connector lock.

RWAL VALVE

REMOVAL

(1) Remove RWAL valve harness connector from the RWAL controller.

(2) Remove the brake lines from the valve.

(3) Remove the valve mounting bolt (Fig. 9) and remove the valve from the bracket.

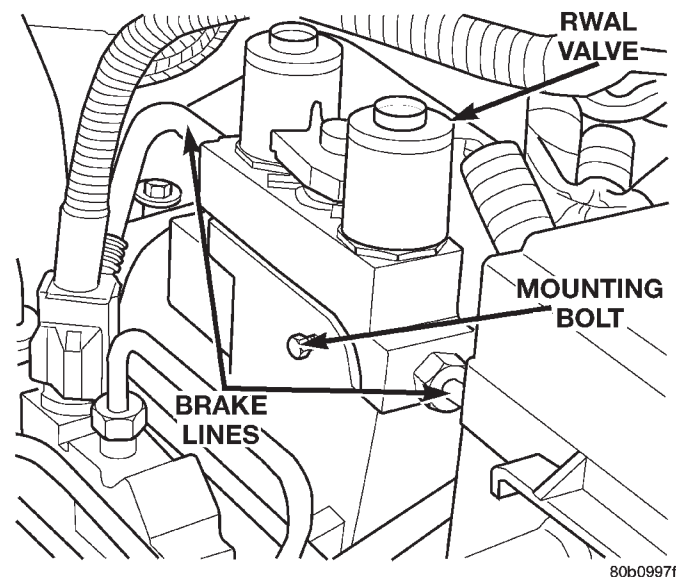


Fig. 9 RWAL Valve

INSTALLATION

(1) Position the valve on the bracket and install the mounting bolt. Tighten the mounting bolt to 20-27 N·m (15-20 ft. lbs.).

(2) Install the brake lines and tighten to 19 N·m (170 in. lbs.).

(3) Install the RWAL valve harness connector into the RWAL controller.

(4) Bleed the brake system.

WHEEL SPEED SENSOR

REMOVAL

(1) Raise vehicle on hoist.

(2) Remove brake line mounting nut and remove the brake line from the sensor stud.

(3) Remove mounting stud from the sensor and shield (Fig. 10).

(4) Remove sensor and shield from differential housing.

(5) Disconnect sensor wire harness and remove sensor.

REMOVAL AND INSTALLATION (Continued)

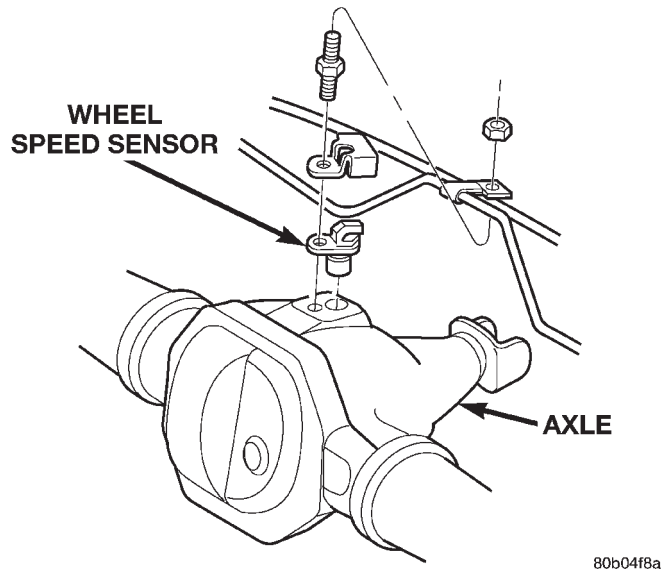


Fig. 10 Rear Speed Sensor Mounting

INSTALLATION

- (1) Connect harness to sensor. **Be sure seal is securely in place between sensor and wiring connector.**
- (2) Install O-ring on sensor (if removed).
- (3) Insert sensor in differential housing.

- (4) Install sensor shield.
- (5) Install the sensor mounting stud and tighten to 24 N·m (200 in. lbs.).
- (6) Install the brake line on the sensor stud and install the nut.
- (7) Lower vehicle.

EXCITER RING

The exciter ring is mounted on the differential case. If the ring is damaged refer to Group 3 Differential and Driveline for service procedures.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
Controller	
Mounting Screws	6 N·m (53 in. lbs.)
RWAL Valve	
Mounting Bolt	20-27 N·m (15-20 ft. lbs.)
Brake Line Fittings	19 N·m (170 in. lbs.)
Wheel Speed Sensor	
Mounting Bolt	24 N·m (200 in. lbs.)

FOUR WHEEL ANTILOCK BRAKES

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GENERAL INFORMATION

ANTILOCK BRAKE SYSTEM

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 operates the system components.

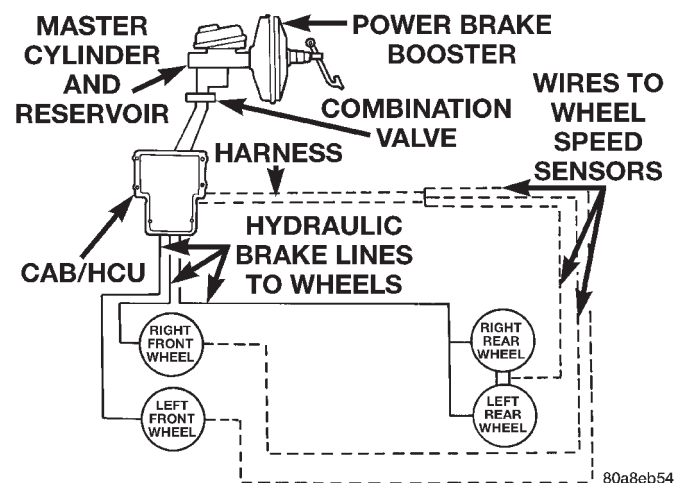


Fig. 1 Antilock Brake System

ABS system major components include:

- Controller Antilock Brakes (CAB)
- Hydraulic Control Unit (HCU)
- Wheel Speed Sensors (WSS)
- ABS Warning Light

DESCRIPTION AND OPERATION

ANTILOCK BRAKE SYSTEM

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

The static and dynamic checks occurs at ignition start up. During the dynamic check, the CAB briefly cycles the pump and solenoids to verify operation. An audible noise may be heard during this self check. This noise should be considered normal.

If an ABS component exhibits a fault during initialization, the CAB illuminates the amber warning 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 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.

DESCRIPTION AND OPERATION (Continued)

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 20 to 30 percent of actual vehicle speed during braking. Periods of high wheel slip occur when brake stops involve high pedal pressure and rate of vehicle deceleration.

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

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

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

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

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

CONTROLLER ANTILOCK BRAKES

The CAB is mounted on the top of the hydraulic control unit (Fig. 2).

The CAB operates the ABS system and is separate from other vehicle electrical circuits. CAB voltage source is through the ignition switch in the RUN position.

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

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

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

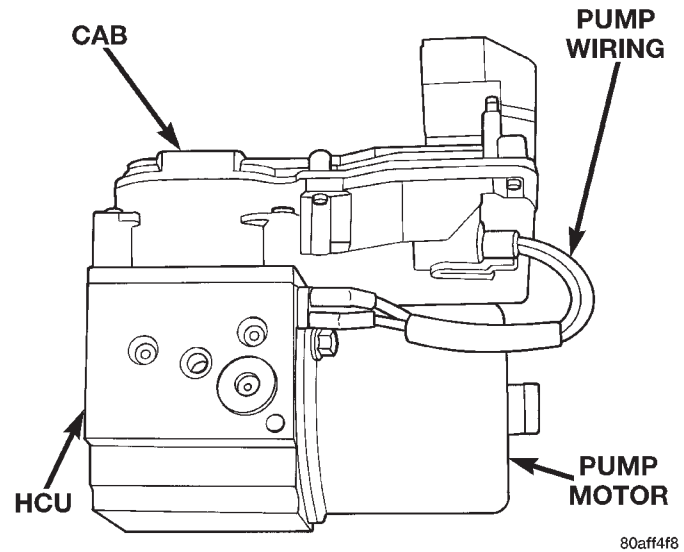


Fig. 2 CAB/HCU

NOTE: If the CAB needs to be replaced, the rear axle type and tire revolutions per mile must be programmed into the new CAB. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile refer to Group 22 Tire and Wheels. To program the CAB refer to the Chassis Diagnostic Manual.

HYDRAULIC CONTROL UNIT

The hydraulic control unit (HCU) consists of a valve body, pump, accumulator and motor (Fig. 2).

The pump, motor, and accumulator are combined into an assembly attached to the valve body. The accumulator store the extra fluid which had to be dumped from the brakes. This is done to prevent the wheels from locking up. 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.

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

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

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

DESCRIPTION AND OPERATION (Continued)

During antilock braking, solenoid valve pressure modulation occurs in three stages, pressure decrease, pressure hold, and pressure increase. The valves are all contained in the valve body portion of the HCU.

Pressure Decrease

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

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

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

Pressure Hold

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

Pressure Increase

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

WHEEL SPEED SENSOR

The ABS brake system uses 3 wheel speed sensors. A sensor is mounted to each front steering knuckles. The third sensor is mounted on top of the rear axle differential housing. The sensor is a magnet coil that is mounted over a tone wheel front/exciter ring rear with an air gap between them.

The sensors measure the wheel speed by monitoring the rotation of the tone wheels front/exciter ring rear. As the teeth of the tone wheels front/exciter ring rear move through the magnetic field of the sensor an AC voltage is generated. This signal frequency increases or decreases proportionally to the speed of the wheel. The CAB monitors these signals for changes in wheel deceleration. If the CAB detects a sudden wheel or wheels deceleration within a predetermined amount the CAB will activate the ABS system.

ABS WARNING LAMP

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

DIAGNOSIS AND TESTING**ANTILOCK BRAKES**

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

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

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

SERVICE PROCEDURES**BLEEDING ABS BRAKE SYSTEM**

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

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

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

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

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

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

REMOVAL AND INSTALLATION

CONTROLLER ANTILOCK BRAKES

NOTE: If the CAB needs to be replaced, the rear axle type and tire revolutions per mile must be programmed into the new CAB. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile refer to Group 22 Tire and Wheels. To program the CAB refer to the Chassis Diagnostic Manual.

REMOVAL

- (1) Disconnect battery negative cable.
- (2) Push the harness connector locks to release the locks, (Fig. 3) then remove the connectors from the CAB.
- (3) Disconnect the pump motor connector (Fig. 4).
- (4) Remove screws attaching CAB to the HCU (Fig. 5).
- (5) Remove the CAB.

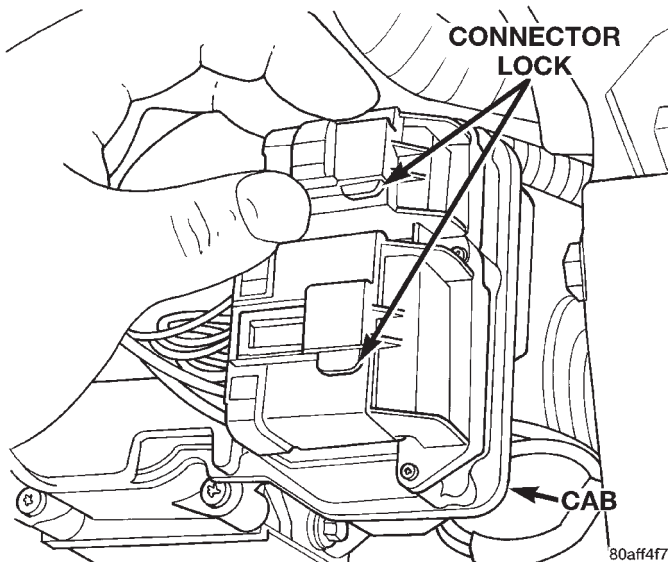


Fig. 3 Harness Connector Locks

INSTALLATION

- (1) Place the CAB onto the HCU.

NOTE: Insure the CAB seal is in position before installation.

- (2) Install the mounting screws and tighten to 4-4.7 N·m (36-42 in. lbs.).
- (3) Connect the pump motor harness.
- (4) Connect the harnesses to the CAB and lock the connectors.
- (5) Connect battery.

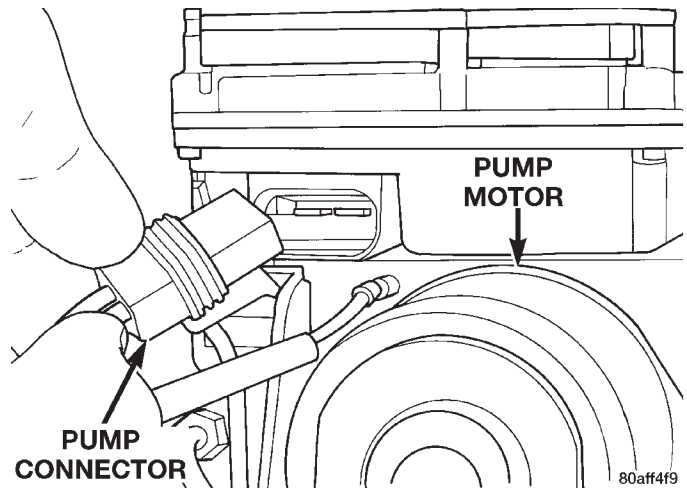


Fig. 4 Pump Motor Connector

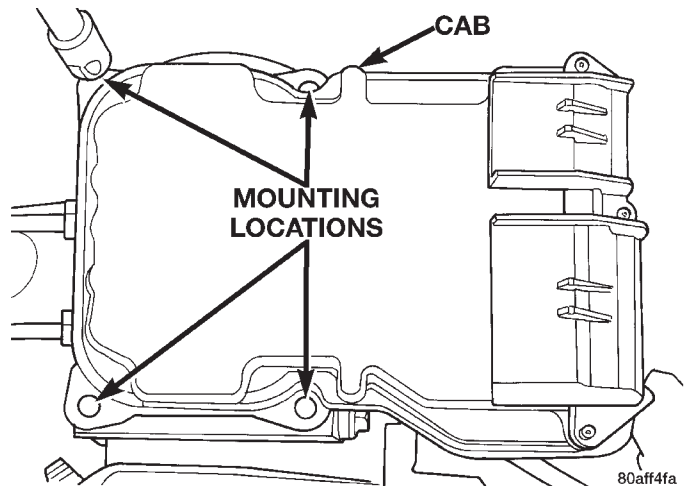


Fig. 5 Controller Mounting Screws

ANTILOCK CONTROL ASSEMBLY

NOTE: If the antilock control assembly needs to be replaced, the rear axle type and tire revolutions per mile must be programmed into the new CAB. For axle type refer to Group 3 Differential and Driveline. For tire revolutions per mile refer to Group 22 Tire and Wheels. To program the CAB refer to the Chassis Diagnostic Manual.

REMOVAL

- (1) Disconnect battery negative cable.
- (2) Remove the brake lines from HCU (Fig. 6).
- (3) Push the harness connector locks to release the locks, (Fig. 3) then remove the connectors from the CAB.
- (4) Remove the three nuts which attaches the assembly to the mounting bracket (Fig. 7).
- (5) Remove the assembly from the vehicle.
- (6) Remove the two bolts from the HCU assembly mounting bracket and remove the bracket.

REMOVAL AND INSTALLATION (Continued)

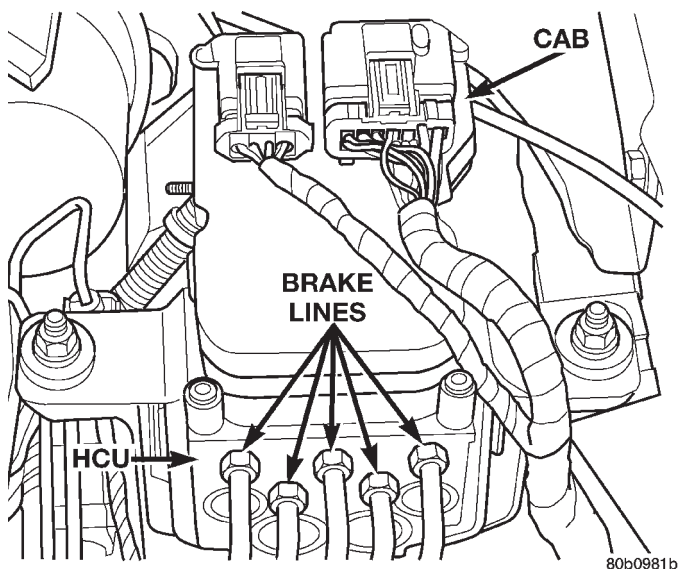


Fig. 6 HCU Brake Lines

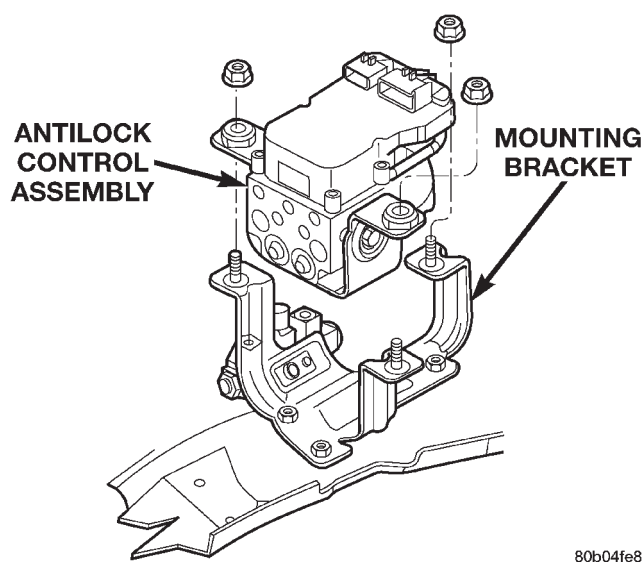


Fig. 7 Mounting Bracket

INSTALLATION

- (1) Install the antilock assembly bracket and tighten bolts to 14-15 N·m (10-12 ft. lbs.).
- (2) Install the assembly into the mounting bracket and install the three mounting nuts. Tighten the nuts to 12 N·m (102 in. lbs.).
- (3) Connect the CAB harnesses.
- (4) Connect the brake lines to the HCU. Tighten brake line fittings to 19 N·m (170 in. lbs.).
- (5) Connect battery.
- (6) Bleed brake system.

FRONT WHEEL SPEED SENSOR-4WD

CAUTION: Special bolts are used to attach the front sensor. The bolts have a special shoulder,

thread length and surface treatment. If the original bolts must be replaced, use only factory replacement bolts. Do not use substitute bolt under any circumstances.

REMOVAL

- (1) Raise and support vehicle.
- (2) Remove wheel and tire assembly.
- (3) Remove brake caliper and rotor.
- (4) Remove bolts attaching sensor to hub/bearing (Fig. 8).
- (5) Remove clamps securing sensor wire to control arm and inner fender panel.
- (6) In engine compartment, disconnect sensor wire and remove sensor.

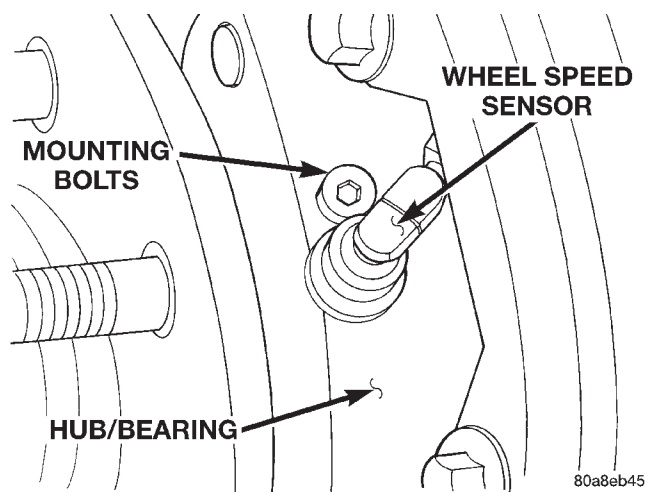


Fig. 8 Wheel Speed Sensor

INSTALLATION

- (1) Guide sensor wire around upper control arm.
- (2) Position sensor on hub/bearing and install attaching bolts. Tighten bolt to 18-25 N·m (160-220 in. lbs.).
- (3) Secure sensor wire retaining clamps to control arm and fender panel with original hardware.
- (4) In engine compartment, connect sensor wire to harness connector. Insure wire is routed away from hot or rotating underhood components.
- (5) Install brake rotor and caliper.
- (6) Install wheel and tire assembly.
- (7) Turn steering wheel back and forth to verify that wire is clear of steering and suspension components.
- (8) Remove supports and lower vehicle.

TONE WHEEL

The tone wheel is located in the hub/bearing housing. To replace the tone wheel the hub/bearing must be replaced. Refer to Group 2 Suspension for the service procedure.

REMOVAL AND INSTALLATION (Continued)

WHEEL SPEED SENSOR

REMOVAL

- (1) Raise vehicle on hoist.
- (2) Remove brake line mounting nut and remove the brake line from the sensor stud.
- (3) Remove mounting stud from the sensor and shield (Fig. 9).

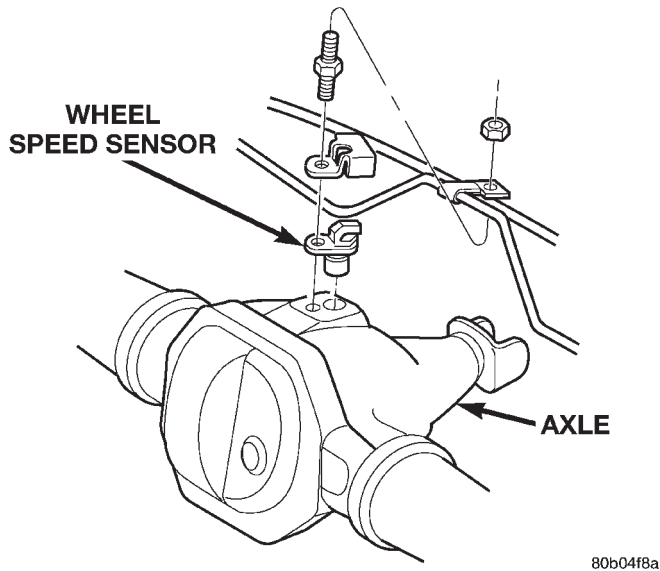


Fig. 9 Rear Speed Sensor Mounting

- (4) Remove sensor and shield from differential housing.
- (5) Disconnect sensor wire harness and remove sensor.

INSTALLATION

- (1) Connect harness to sensor. **Be sure seal is securely in place between sensor and wiring connector.**
- (2) Install O-ring on sensor (if removed).
- (3) Insert sensor in differential housing.
- (4) Install sensor shield.
- (5) Install the sensor mounting stud and tighten to 24 N·m (200 in. lbs.).
- (6) Install the brake line on the sensor stud and install the nut.
- (7) Lower vehicle.

EXCITER RING

The exciter ring is mounted on the differential case. If the ring is damaged refer to Group 3 Differential and Driveline for service procedures.

SPECIFICATIONS

TORQUE CHART

DESCRIPTION	TORQUE
ABS Assembly	
Bracket bolts	14-15 N·m (10-12 ft. lbs.)
Mounting Nuts	12 N·m (102 in. lbs.)
CAB Screws	4-4.7 N·m (36-42 in. lbs.)
Brake Line Fittings	19 N·m (170 in. lbs.)
Wheel Speed Sensors	
Front Sensor Bolt	21 N·m (190 in. lbs.)
Rear Sensor Bolt	22.5 N·m (200 in. lbs.)

