

BRAKES

CONTENTS

	page		page
ANTILOCK BRAKE SYSTEM—MARK 20	51	BRAKE INFORMATION	1
BASE BRAKE SYSTEM	3		

BRAKE INFORMATION

INDEX

page

GENERAL INFORMATION	
BASE BRAKE SYSTEM COMPONENTS	1

GENERAL INFORMATION

BASE BRAKE SYSTEM COMPONENTS

The vehicle is available with 3 different types of brake systems. The standard brake system has front and rear disc brakes without antilock brakes. The second brake system has front and rear disc brakes with antilock brakes. The third brake system has front and rear disc brakes with antilock brakes and traction control. The traction control system is dependent on the antilock brake system and is not available without antilock brakes.

Standard brake equipment consists of the following major components:

- Master Cylinder.
- Junction Block.
- Proportioning valves.
- Double-pin-floating Caliper Front and Rear Disc Brakes.
- Vacuum operated Brake Booster.
- Brake Pedal.

The antilock brake system uses the standard power brake system caliper assemblies, braking discs, brake lines and hoses. The unique parts of the

antilock brake system consists of the following components:

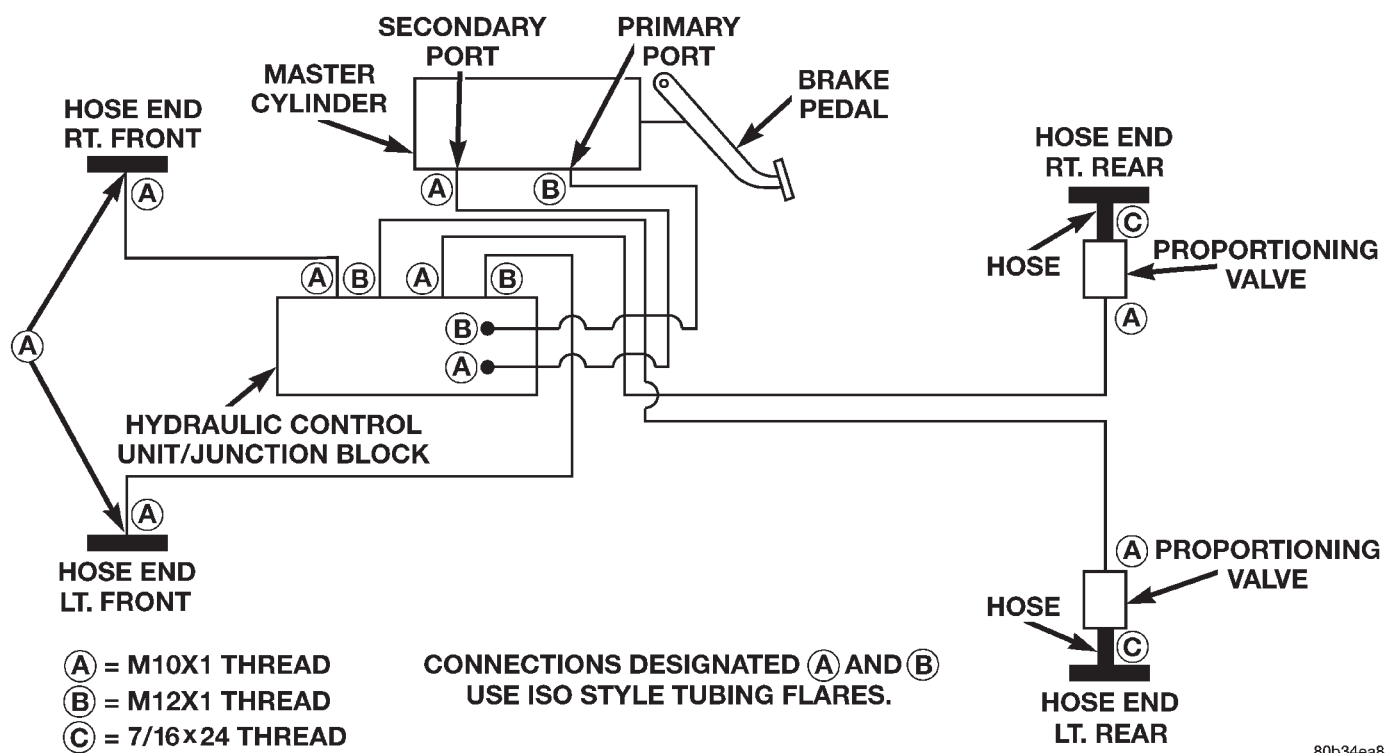
- Integrated Control Unit (ICU) containing both a hydraulic and an electrical control unit. This component replaces the Junction Block in the hydraulic system.
- Wheel Speed Sensors.
- Tone Wheels.

These components will be described in detail in the antilock brake section in this group of the service manual.

The hydraulic brake system is diagonally split on both the Non-ABS and ABS braking systems (Fig. 1). The left front and right rear brakes are on one hydraulic circuit and the right front and left rear are on the other.

All available brake systems on this vehicle use the same type of brake line fittings and tubing flares. The brake line fittings used are double wall ISO style tubing flares and fittings at all tubing joint locations. Only the outlets of the proportioning valves and the rear flex hoses threading into them have non-ISO style flares. They are double inverted style flares. See (Fig. 1) for specific joint locations and tube fitting size.

GENERAL INFORMATION (Continued)



80b34ea8

Fig. 1 Brake Tube Nut Thread Sizes And Tube Routing

BASE BRAKE SYSTEM

INDEX

	page		page
DESCRIPTION AND OPERATION		JUNCTION BLOCK (NON-ABS)	34
CHASSIS TUBES AND HOSES	5	MASTER CYLINDER	31
FRONT DISC BRAKES	3	PARK BRAKE INTERMEDIATE CABLE	37
MASTER CYLINDER	5	PARK BRAKE LEVER (PEDAL) AND FRONT CABLE ASSEMBLY	35
MASTER CYLINDER RESERVOIR FLUID LEVEL SENSOR	7	PARK BRAKE REAR CABLES	38
PARKING BRAKE	5	PARK BRAKE SHOES WITH REAR DISC BRAKES	39
PROPORTIONING VALVES	5	PARK BRAKE TENSIONER	39
REAR DISC BRAKES	5	PROPORTIONING VALVE	34
REAR WHEEL HUB AND BEARING	8	REAR DISC BRAKE CALIPER	26
RED BRAKE WARNING LAMP	7	REAR DISC BRAKE SHOES	28
STOP LAMP SWITCH	8	REAR WHEEL HUB AND BEARING	30
VACUUM BOOSTER	6	STOP LAMP SWITCH	40
DIAGNOSIS AND TESTING		VACUUM BOOSTER	32
BRAKE FLUID CONTAMINATION	17	DISASSEMBLY AND ASSEMBLY	
BRAKE ROTOR THICKNESS AND RUNOUT	14	BRAKE FLUID RESERVOIR	40
BRAKE SYSTEM BASIC DIAGNOSIS GUIDE	8	FRONT AND REAR DISC BRAKE CALIPER	41
BRAKE SYSTEM DIAGNOSIS CHARTS	10	CLEANING AND INSPECTION	
PROPORTIONING VALVE	16	CHASSIS TUBES AND HOSES	46
REAR WHEEL HUB AND BEARING	18	FRONT DISC BRAKES	45
RED BRAKE WARNING LAMP TEST	18	REAR DISC BRAKES	46
STOP LAMP SWITCH	18	ADJUSTMENTS	
SERVICE PROCEDURES		PARK BRAKE CABLE TENSIONER	47
BRAKE BLEEDING	18	STOP LAMP SWITCH	46
BRAKE ROTOR MACHINING	20	SPECIFICATIONS	
CHASSIS BRAKE TUBE REPAIR	21	BRAKE ACTUATION SYSTEM	48
MASTER CYLINDER BLEEDING	20	BRAKE FASTENER TORQUE SPECIFICATIONS	48
MASTER CYLINDER FLUID LEVEL	18	BRAKE FLUID	47
REMOVAL AND INSTALLATION		SPECIAL TOOLS	
CHASSIS BRAKE TUBES AND HOSES	33	BASE BRAKE SYSTEM	49
FRONT DISC BRAKE CALIPER	23		
FRONT DISC BRAKE SHOES	25		

DESCRIPTION AND OPERATION

FRONT DISC BRAKES

The front disc brake assembly used on this vehicle consists of the following components.

- Disc brake caliper
- Shoes and linings
- Rotor
- hub and bearing

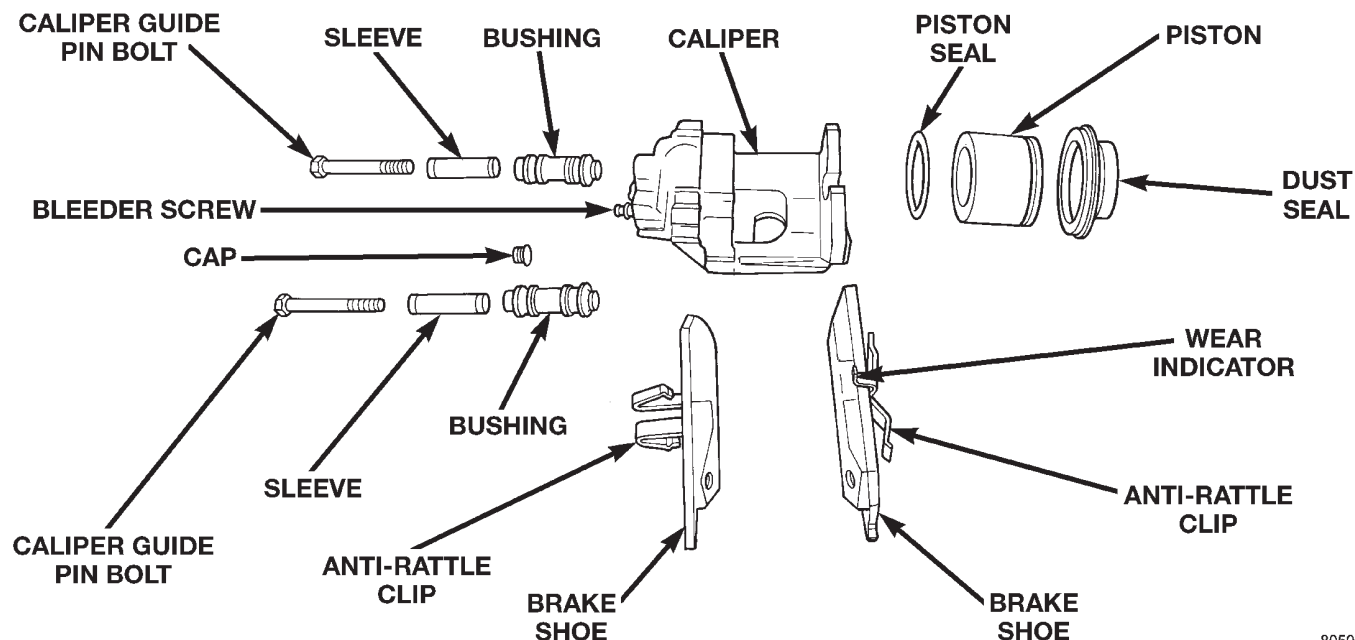
Disc Brake Caliper. The floating double pin single piston Kelsey-Hayes Family Calipers (Fig. 1) used on this vehicle are mounted directly to the steering knuckles and use no adapter. The caliper is mounted to the steering knuckle using bushings, sleeves and 2 through bolts which thread directly into the steering knuckle (Fig. 2).

The floating double pin single piston calipers, (Fig. 1) used on this vehicle are mounted directly to the steering knuckles and use no adapter. The caliper is mounted to the steering knuckle using bushings, sleeves and 2 through bolts which thread directly into the steering knuckle (Fig. 2).

Two machined abutments on the steering knuckle (Fig. 2) position and align the caliper fore and aft. The guide pin bolts, sleeves, and bushings control the side-to-side movement of the caliper.

The disc brake calipers have anti-rattle clips attached to the inner and outer brake shoe and lining assemblies (Fig. 1). The brake caliper also has brake shoe retractor clips to help pull the front disc brake shoes away from the rotor (Fig. 1).

DESCRIPTION AND OPERATION (Continued)



80500563

Fig. 1 Front Disc Brake Caliper Assembly

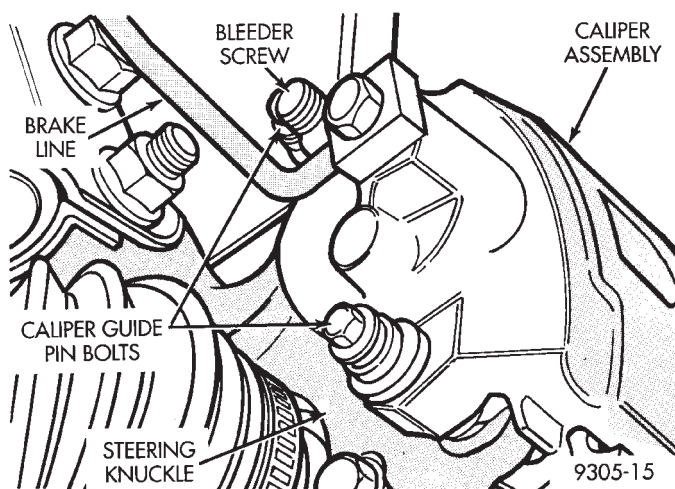


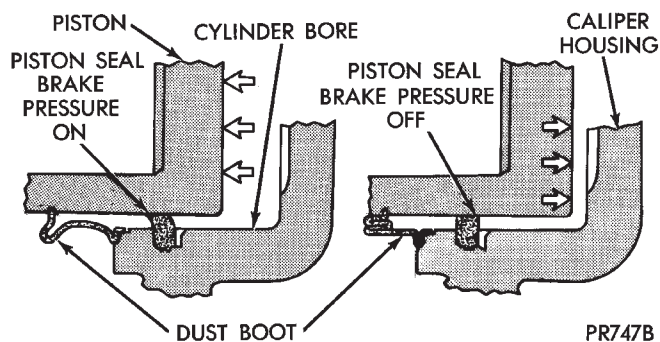
Fig. 2 Disc Brake Caliper Mounting

WARNING: THE PISTONS THAT ARE USED IN THE FRONT AND REAR DISC BRAKE CALIPER ASSEMBLIES ARE UNIQUE TO THE CALIPER THEY ARE USED IN. THE DIMENSIONS OF THESE PISTONS ARE DIFFERENT, DO NOT INTERCHANGE THE CALIPER PISTONS. IMPROPER USE COULD CAUSE A COMPLETE FAILURE OF THE BRAKE SYSTEM.

The caliper is a one piece casting with the inboard side containing a single piston cylinder bore. The front disc brake caliper phenolic piston is 60 mm (2.36 inch) in diameter.

A square cut rubber piston seal is located in a machined groove in the cylinder bore. This provides a hydraulic seal between the piston and the cylinder wall (Fig. 3). The piston seal is designed to pull the

piston back into the bore of the caliper when the brake pedal is released. This, along with the brake shoe retractor clips, maintains the proper brake shoe to rotor clearance.



PR747B

Fig. 3 Piston Seal Function for Automatic Adjustment Of Front Brakes

A molded rubber dust boot is installed in a groove in the cylinder bore and the piston, keeping contamination from the cylinder wall and the piston (Fig. 3).

As brake shoe linings wear, master cylinder reservoir brake fluid level will go down. If brake fluid has been added to the reservoir, reservoir overflow may occur when the piston is pushed back into the new lining position. Overflowing can be avoided in this case by removing a small amount of fluid from the master cylinder reservoir.

Brake Shoes. The brake shoe lining material used has been specifically formulated to meet the braking requirements of the vehicle. When brake shoes are replaced, only brake shoes meeting the original equipment manufacturer formulation (such as Mopar

DESCRIPTION AND OPERATION (Continued)

replacement parts) should be used. This will maintain the original braking performance of this vehicle. An audible wear indicator (Fig. 1) is mounted on the outboard pad of the front disc brake assemblies. Upon contact with the brake rotor, this indicator emits a sound, signaling that brake shoes may need inspection and/or replacement.

Rotor. The purpose of the rotor is to slow down and stop the front wheels of the vehicle. This is accomplished by applying the brake shoes against the braking surfaces of the rotor. The rotor is made of iron and is vented to help cool it during brake applications.

Hub and Bearing. The hub and bearing is used to mount the front brake rotor and wheel. The rotor is mounted to the front face of the hub by the wheel mounting studs and retained by the wheel mounting nuts. The hub/bearing is mounted to the steering knuckle using four mounting bolts.

REAR DISC BRAKES

The rear disc brakes are similar to front disc brakes, however, there are several distinctive features that require different service procedures. This single piston, floating caliper rear disc brake assembly includes a hub and bearing assembly, adapter, braking disc (rotor), caliper, shoes and linings. The parking brake system on all vehicles equipped with rear disc brakes, consists of a small duo-servo drum brake mounted to the caliper adapter. The drum brake shoes expand out against a braking surface (hat section) on the inside area of the rotor.

This vehicle is equipped with a caliper assembly that has a 36 mm (1.42 in.) piston and uses a 14 inch solid non-vented rotor.

The caliper assembly on all applications float on rubber bushings using internal metal sleeves which are attached to the adapter using threaded guide pin bolts.

The adapter and disc shield are mounted to the rear suspension knuckles of vehicle. The adapter is used to mount the brake shoes and actuating cables for the parking brake system. The adapter also mounts the rear caliper assembly to the vehicle. The adapter has two machined abutments which are used to position and align the caliper and brake shoes for movement inboard and outboard (Fig. 4).

PARKING BRAKE

The parking brake mechanism on vehicles equipped with rear disc brakes, consists of a small duo-servo brake which is mounted to the disc brake caliper adapter. The hat (center) section (Fig. 5) of the rear rotor serves as the braking surface (drum) for the parking brakes.

The parking brake shoes are mechanically operated by an internal lever connected to a flexible steel cable. The wheel brake (rear) cables are joined at an equalizer which is attached to the intermediate cable. The intermediate cable is attached to the front cable leading to the foot lever.

PROPORTIONING VALVES

ANTILOCK AND NON-ANTILOCK BRAKES

Two in line proportioning valves (Fig. 6) are used on both the Teves Mark 20 Antilock Brake System and on all Non-Antilock Brake applications. One valve is used for each rear brake hydraulic circuit.

On light pedal applications equal brake pressure will be transmitted to the front and rear brakes. On heavier pedal applications the pressure transmitted to the rear will be lower than the front brakes. This will prevent premature rear wheel skid. If hydraulic pressure is lost in one half of the diagonally split system, the operation of the proportioning valve in the remaining half is not effected.

The in-line proportioning valves are located in the rear of the vehicle, at the rear brake flex hose. The proportioning valves are not serviceable, but are a replaceable component.

CHASSIS TUBES AND HOSES

The purpose of the chassis brake tubes and flex hoses is to transfer the pressurized brake fluid developed by the master cylinder to the wheel brakes of the vehicle. The chassis tubes are steel with a corrosion resistant coating applied to the external surfaces and the flex hoses are made of reinforced rubber. The rubber flex hoses allow for the movement of the vehicles suspension.

MASTER CYLINDER

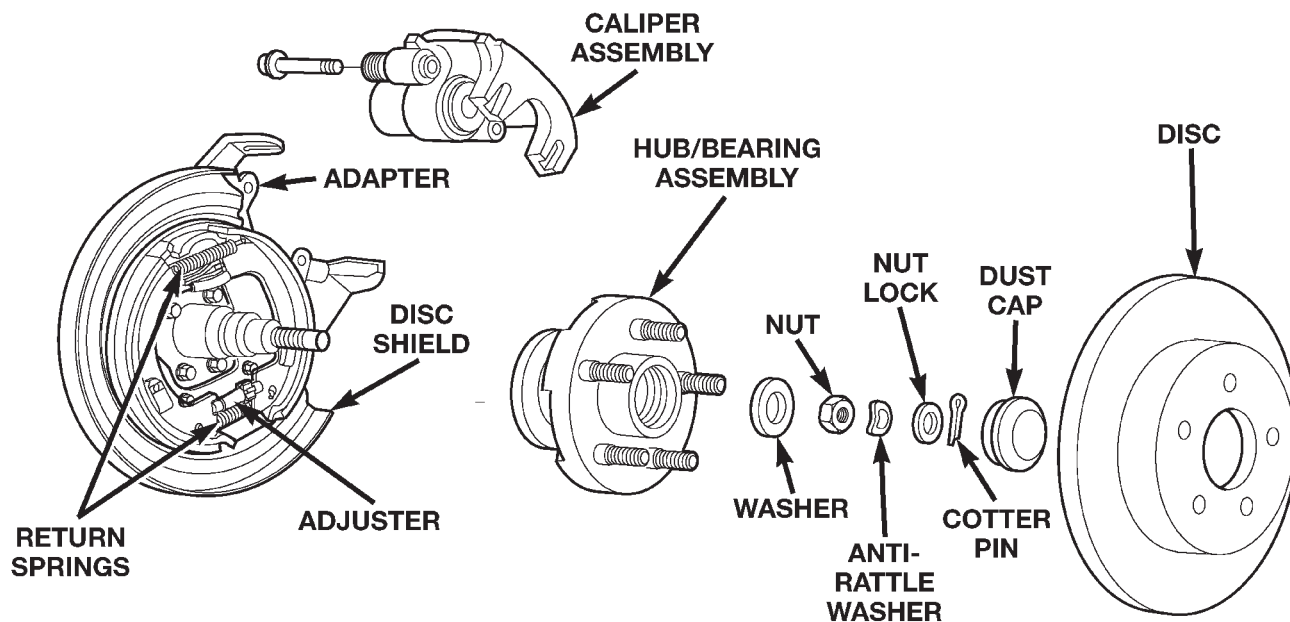
Only one master cylinder is available for all applications. A Bosch center valve master cylinder is used.

The only serviceable components on the master cylinder assembly is the reservoir and sealing grommets. The master cylinder itself, cannot be serviced, and must be replaced as an assembly, if found to be defective.

The reservoir is indexed to prevent installation in the wrong direction. The cap diaphragm is slit to allow atmospheric pressure to equalize on both sides of the diaphragm.

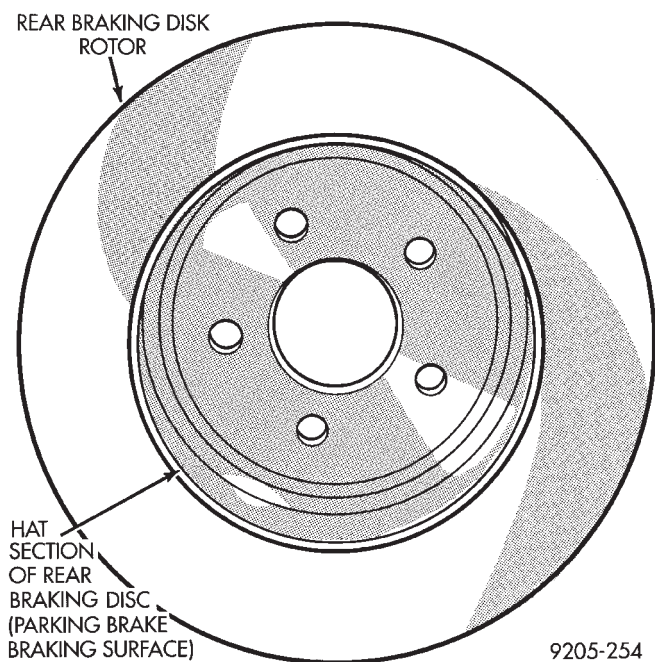
The primary and secondary outlet tubes of the master cylinder are connected to a junction block on non-ABS equipped vehicles. The master cylinder primary outlet port connects to the inboard port of the junction block, and the secondary outlet port connects to the outboard port of the junction block. The

DESCRIPTION AND OPERATION (Continued)



80abfe8d

Fig. 4 Rear Disc Brake Assembly



9205-254

Fig. 5 Drum In Hat Braking Disc

inboard port of the junction block supplies the right front and left rear brakes. The outboard port of the junction block supplies the left front and right rear brakes.

On vehicles equipped with Antilock Brakes (with or without Traction Control), the master cylinder primary outlet port outlet tubes connect to the inboard port of the ICU, and the secondary outlet port outlet tubes connect to the outboard port of the ICU.

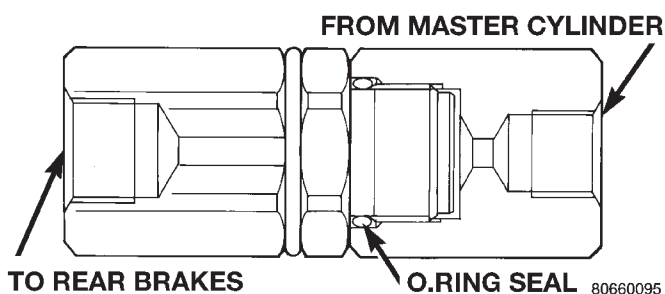


Fig. 6 Proportioning Valve

VACUUM BOOSTER

The purpose of the vacuum operated power brake booster. Is to reduce the amount of force applied to the brake pedal by the drivers foot. To obtain the required hydraulic pressure in the brake system to stop the vehicle.

This vehicle utilizes a Bosch vacuum booster for all applications.

The power brake booster can be identified if required, by the tag attached to the body of the booster assembly (Fig. 7). This tag contains the following information. The production part number of the power booster assembly, the date it was built and who manufactured it.

NOTE: The power brake booster assembly is not a repairable part and must be replaced as a complete unit if it is found to be faulty in any way. The power booster vacuum check valve is not repairable but can be replaced as an assembly.

DESCRIPTION AND OPERATION (Continued)

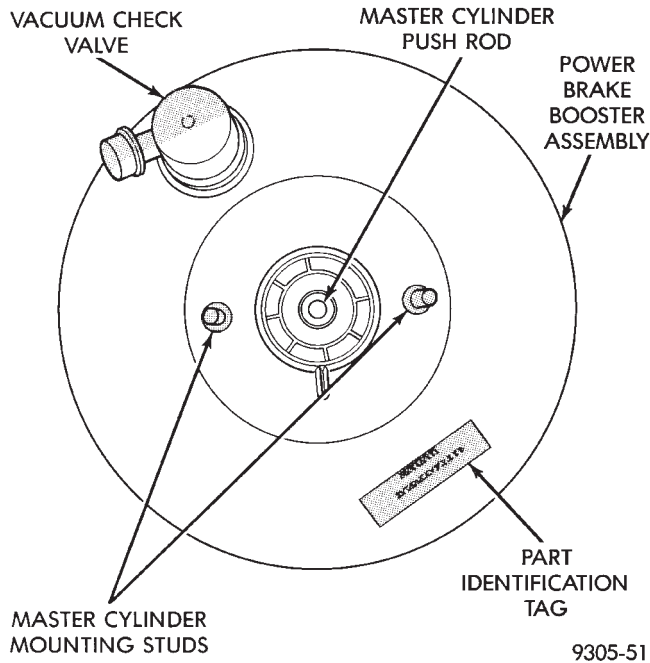


Fig. 7 Power Brake Booster Identification

The power brake booster is vacuum operated. The vacuum is supplied from the intake manifold on the engine through the power brake booster check valve (Fig. 8).

As the brake pedal is depressed, the power booster's input rod moves forward. This opens and closes valves in the power booster, creating a vacuum on one side of a diaphragm and allowing atmospheric pressure to enter on the other. This difference in pressure forces the output rod of the power booster out against the primary piston of the master cylinder. As the pistons in the master cylinder move forward this creates the hydraulic pressure in the brake system.

Different engine combinations require different vacuum hose routings.

The power brake booster assembly mounts on the engine side of the dash panel. It is externally connected to the brake system by an input push rod to the brake pedal. A vacuum line connects the power booster to the intake manifold. The master cylinder is bolted to the front of the power brake booster assembly.

RED BRAKE WARNING LAMP

The red Brake warning lamp is located in the instrument cluster and is used to indicate a low brake fluid condition or that the parking brake is applied. In addition, the brake warning lamp is turned on as a bulb check by the ignition switch when the ignition switch is placed in the crank position. Problems with this system will generally be of the type where the warning lamp fails to turn on when it should, or remains on when it should not.

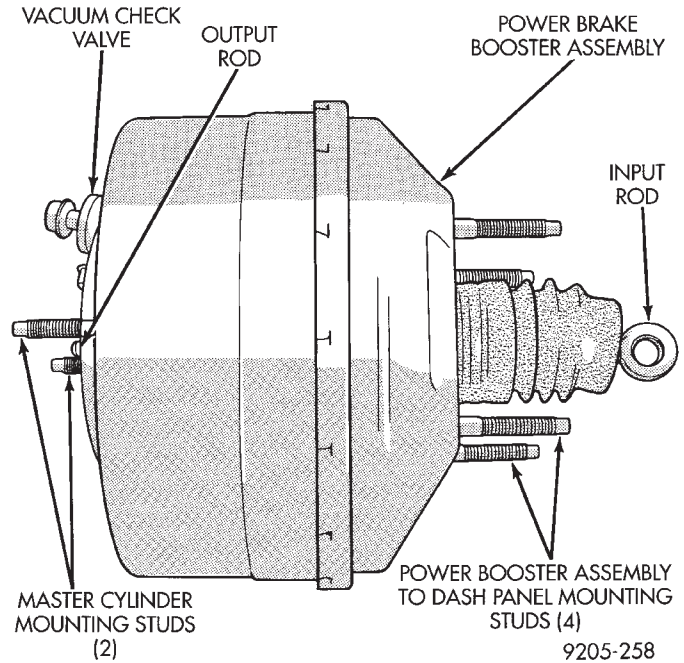


Fig. 8 Power Brake Booster Assembly

The warning lamp bulb is supplied a 12-volt ignition feed anytime the ignition switch is on. The bulb is then illuminated by completing the ground circuit either through the park brake switch, the fluid level sensor in the master cylinder reservoir, or the ignition switch in the crank position.

As the fluid drops below the minimum level, the fluid level sensor closes the brake warning light circuit.

MASTER CYLINDER RESERVOIR FLUID LEVEL SENSOR

The purpose of the brake fluid level sensor is to provide the driver with early warning that brake fluid in the master cylinder is below a normal level.

The brake fluid level sensor used on this vehicle's master cylinder is internal to the master cylinder fluid reservoir (Fig. 9). The vehicle wiring harness has a connector which plugs directly into the brake fluid reservoir.

As the fluid drops below the design level the sensor closes the Red Brake Warning Light circuit. This will turn on the red brake warning light. At this time, the master cylinder fluid reservoir should be checked and filled to the full mark with DOT 3 brake fluid. **If the brake fluid level has dropped in the master cylinder fluid reservoir, the entire brake hydraulic system should be checked for evidence of a leak.**

The brake fluid level sensor in the master cylinder brake fluid reservoir is not a repairable item. If the level sensor is found to be defective the brake fluid reservoir must be replaced.

DESCRIPTION AND OPERATION (Continued)

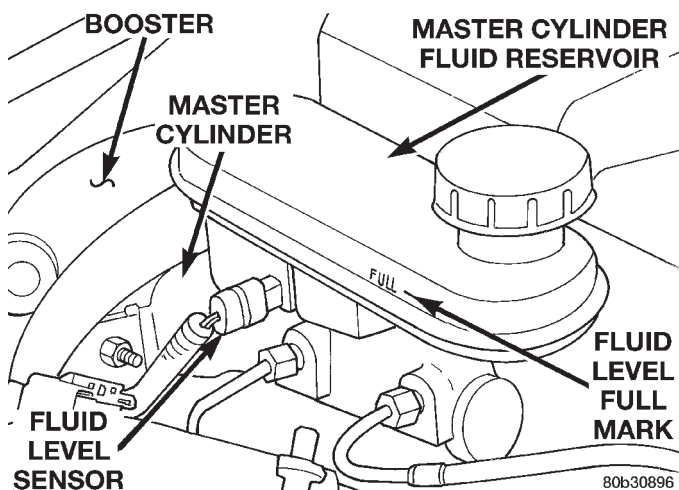


Fig. 9 Master Cylinder Reservoir Level Sensor

STOP LAMP SWITCH

The stop lamp switch controls operation of the vehicles stop lamps. Also, if the vehicle is equipped with speed control, the stop lamp switch will deactivate speed control when the brake pedal is depressed.

The stop lamp switch controls operation of the right and left tail, stop and turn signal lamp and CHMSL lamp, by supplying battery current to these lamps.

The stop lamp switch controls the lamp operation by opening and closing the electrical circuit to the stop lamps.

REAR WHEEL HUB AND BEARING

CAUTION: If a vehicle is equipped with antilock brakes, the tone wheels for the rear wheel speed sensors are pressed onto the hub.

All vehicles are equipped with permanently lubricated, and sealed for life, rear wheel bearings. There is no periodic lubrication or maintenance recommended for these units. However, if servicing of a rear wheel hub and bearing is required, refer to procedures in the diagnosis and testing section, or the removal and installation section in this group of the service manual for the inspection and replacement of the rear wheel hub and bearing.

DIAGNOSIS AND TESTING

BRAKE SYSTEM BASIC DIAGNOSIS GUIDE

SYMPTOM	CHART 1 MISC. COND.	CHART 2 WARNING LIGHT	CHART 3 POWER BRAKES	CHART 4 BRAKE NOISE	CHART 5 WHEEL BRAKES
Brake Warning Light On		X	NO	NO	
Excessive Pedal Travel	6	X	NO		O
Pedal Goes To The Floor	6	X			
Stop Light On Without Brakes	3				
All Brakes Drag	5				
Rear Brakes Drag	2	NO	NO		
Grabby Brakes			O		X
Spongy Brake Pedal		X	NO		
Premature Rear Brake Lockup	4	NO	NO		O
Excessive Pedal Effort	1		O		

DIAGNOSIS AND TESTING (Continued)

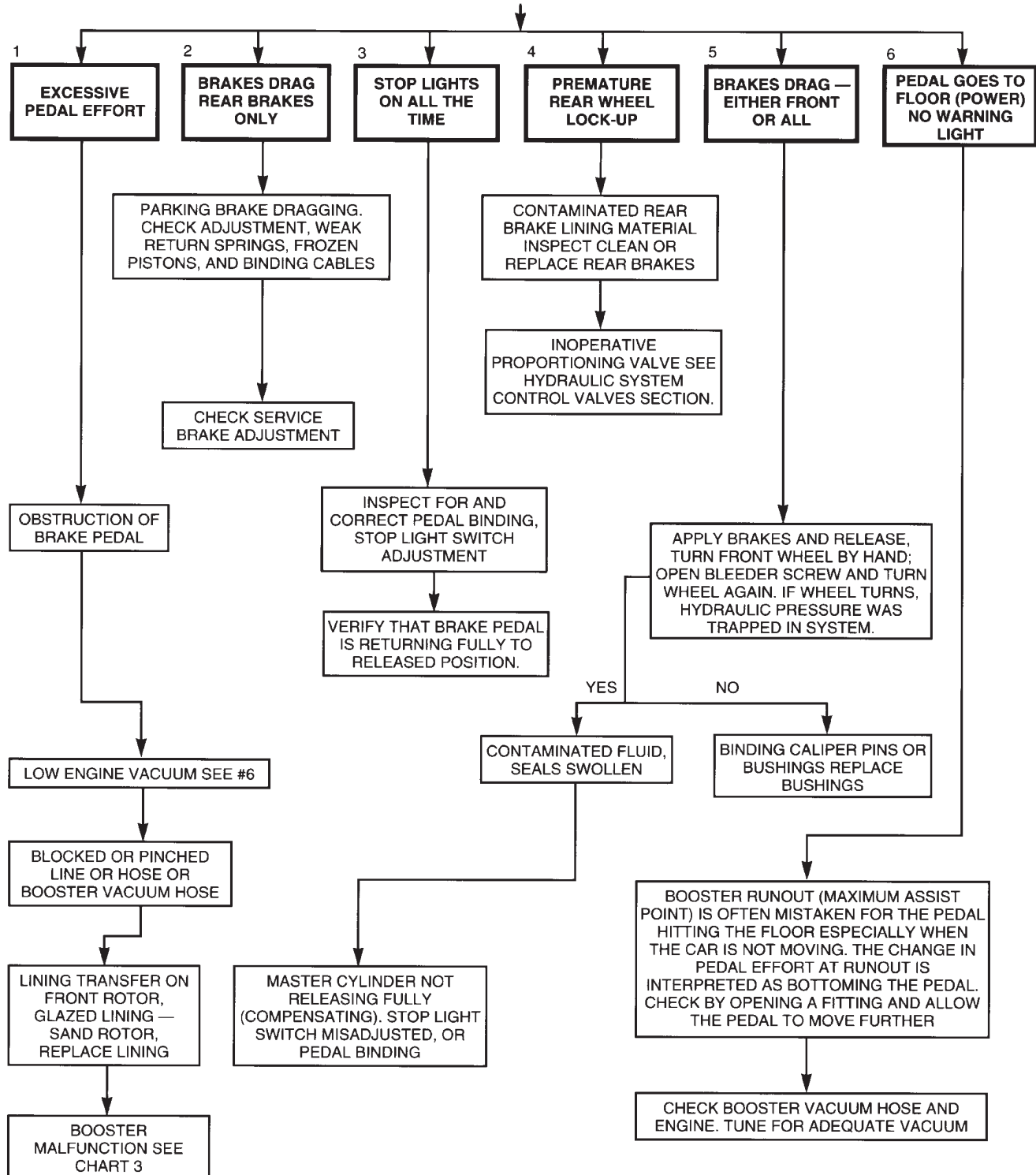
SYMPTOM	CHART 1 MISC. COND.	CHART 2 WARNING LIGHT	CHART 3 POWER BRAKES	CHART 4 BRAKE NOISE	CHART 5 WHEEL BRAKES
Rough Engine Idle		NO	O		
Brake Chatter (Rough)		NO	NO		X
Surge During Braking		NO	NO		X
Noise During Braking		NO	NO	X	
Rattle Or Clunking Noise		NO	NO	X	
Pedal Pulsates During Braking		NO	NO		X
Pull To Right Or Left		NO	NO		X
No: Not A Possible Cause X: Most Likely Cause O: Possible Cause					

DIAGNOSIS AND TESTING (Continued)

BRAKE SYSTEM DIAGNOSIS CHARTS

MISCELLANEOUS BRAKE SYSTEM CONDITIONS

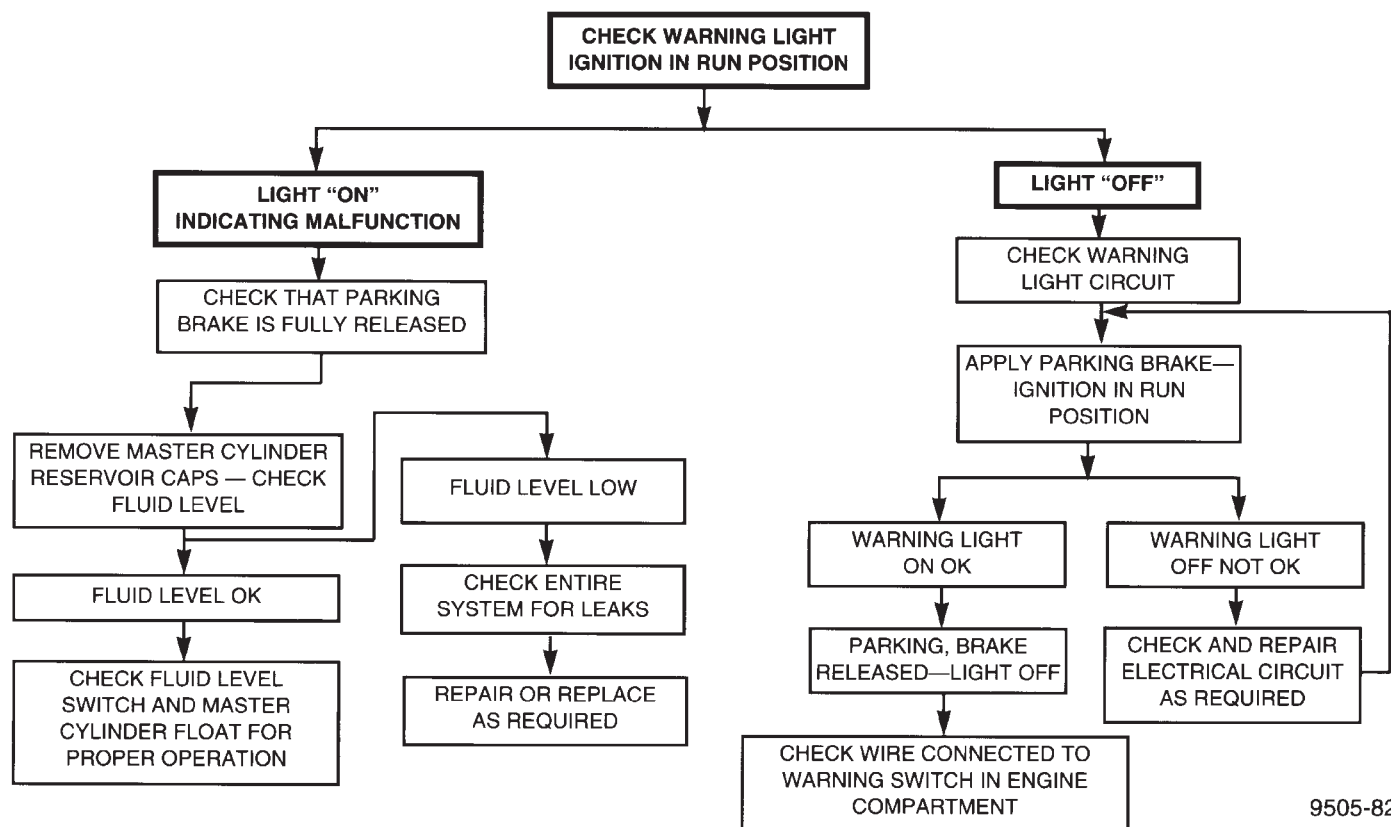
CHART 1 MISCELLANEOUS CONDITIONS



DIAGNOSIS AND TESTING (Continued)

RED BRAKE WARNING LAMP

CHART 2 WARNING LAMP FUNCTION

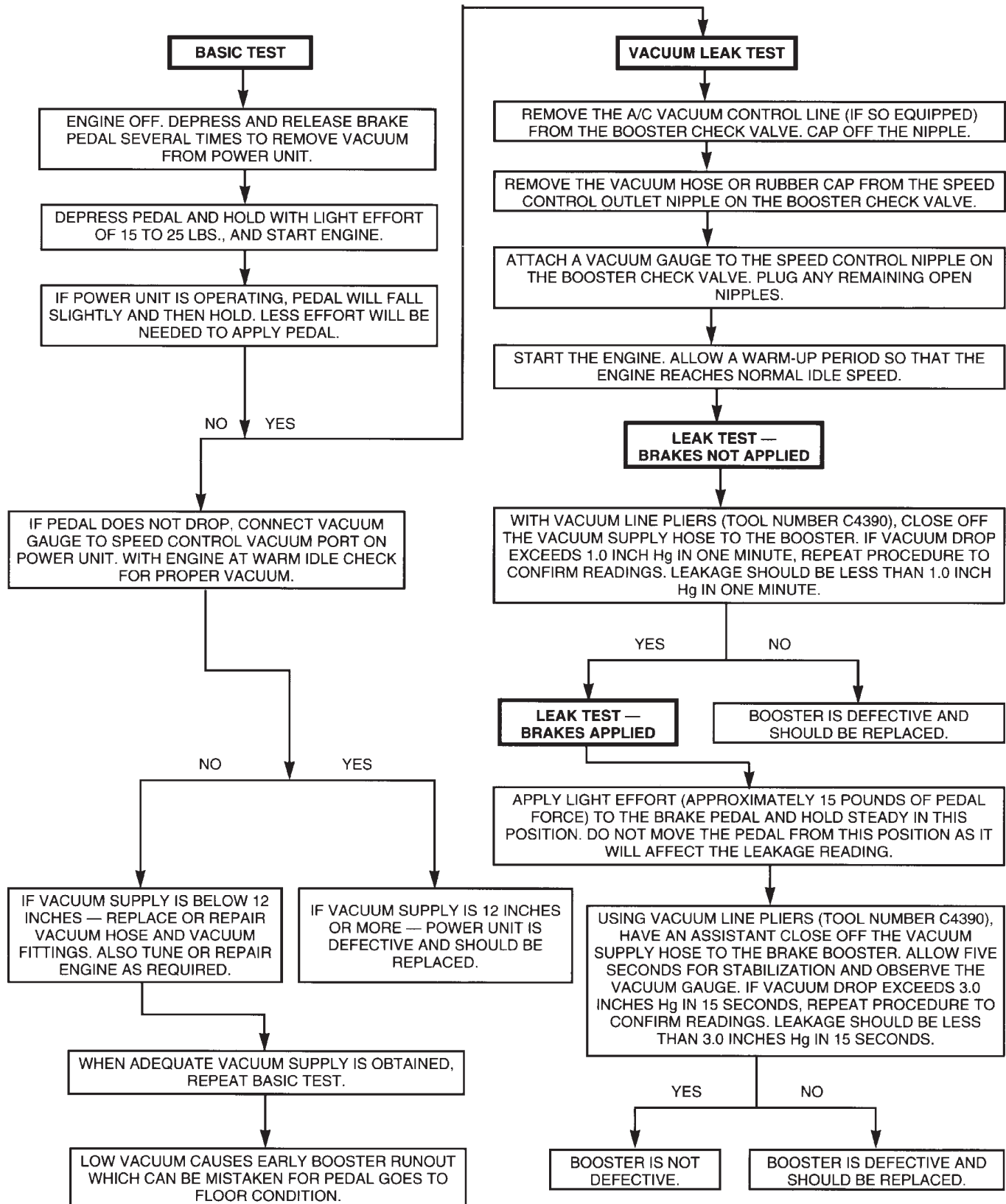


9505-82

DIAGNOSIS AND TESTING (Continued)

POWER BRAKE SYSTEM DIAGNOSIS

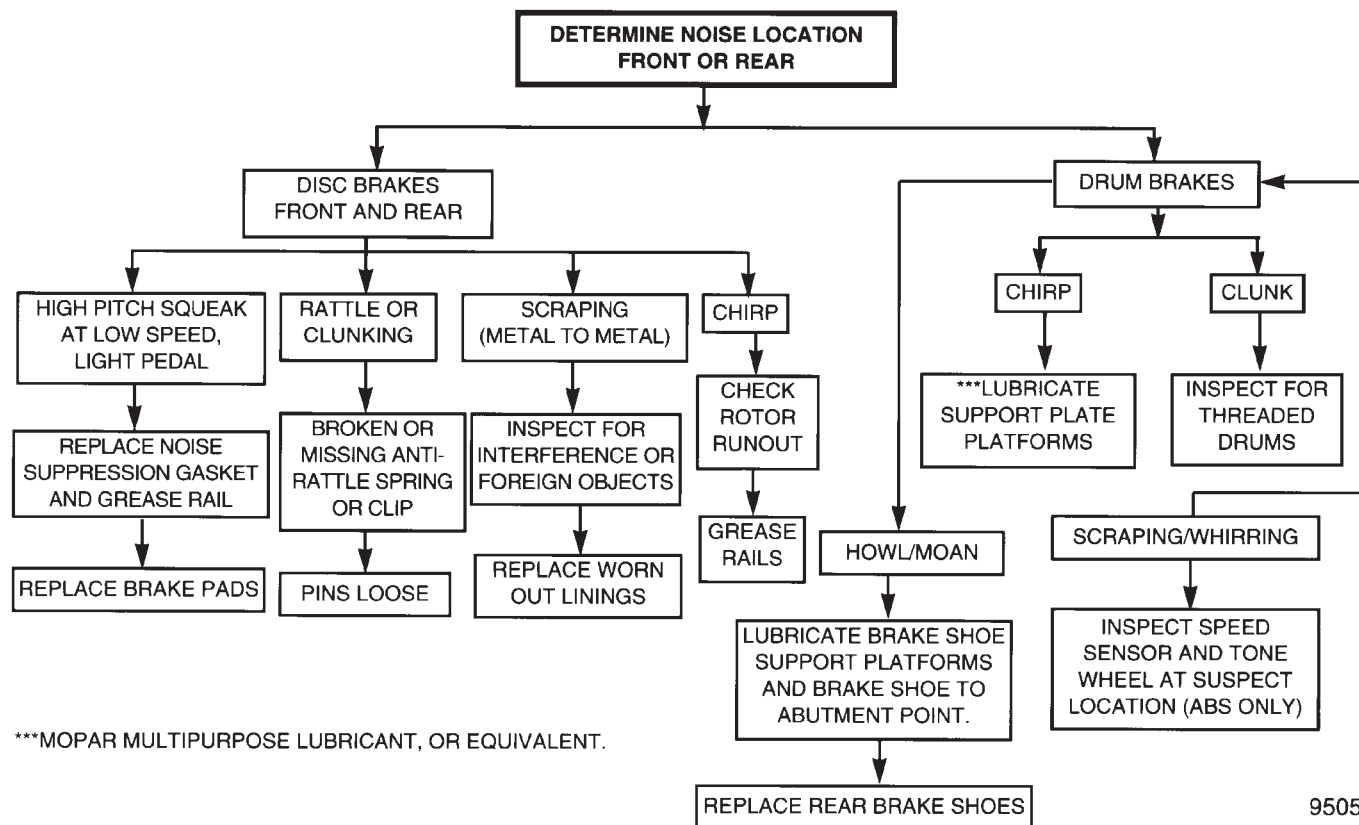
CHART 3 POWER BRAKES



DIAGNOSIS AND TESTING (Continued)

BRAKE NOISE

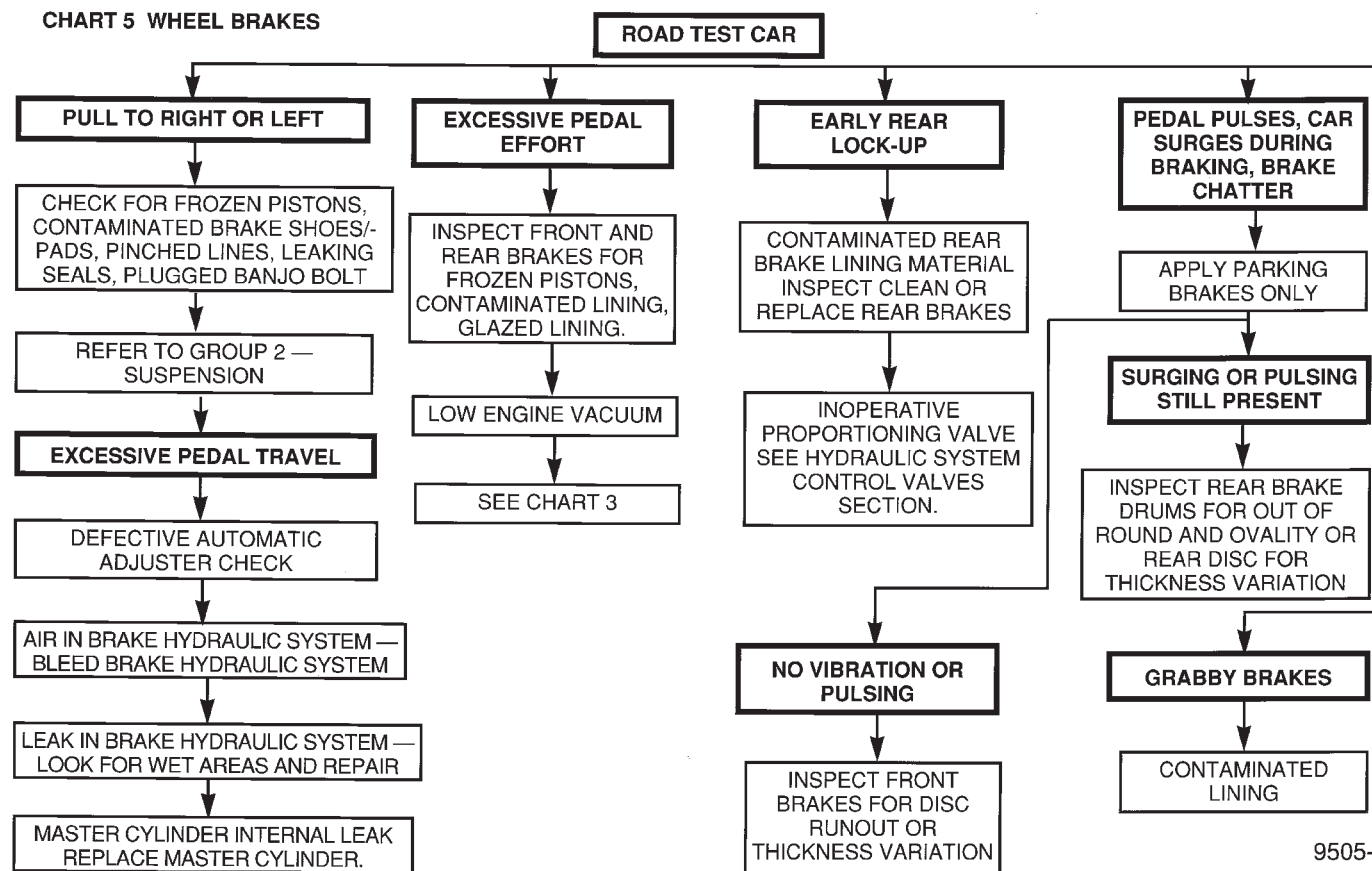
CHART 4 BRAKE NOISE



DIAGNOSIS AND TESTING (Continued)

VEHICLE ROAD TEST

CHART 5 WHEEL BRAKES



9505-85

BRAKE ROTOR THICKNESS AND RUNOUT

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

Before refinishing or refacing a rotor, the disc should be checked and inspected for the following conditions:

Braking surface scoring, rust, impregnation of lining material and worn ridges.

Excessive lateral runout or wobble.

Thickness variation (Parallelism).

Dishing or distortion (Flatness).

If a vehicle has not been driven for a period of time, the rotor surface will rust in the area not covered by the brake lining and cause noise and chatter when the brakes are applied.

Excessive wear and scoring of the rotor can cause temporary improper lining contact if ridges are not removed before installation of new brake pad assemblies.

Some discoloration or wear of the rotor surface is normal and does not require resurfacing when linings are replaced.

Excessive runout or wobble in a rotor can increase pedal travel due to piston knock back. This will increase guide pin bushing wear due to tendency of caliper to follow rotor wobble.

Thickness variation in a rotor can also result in pedal pulsation, chatter and surge due to variation in brake output. This can also be caused by excessive runout in rotor or hub.

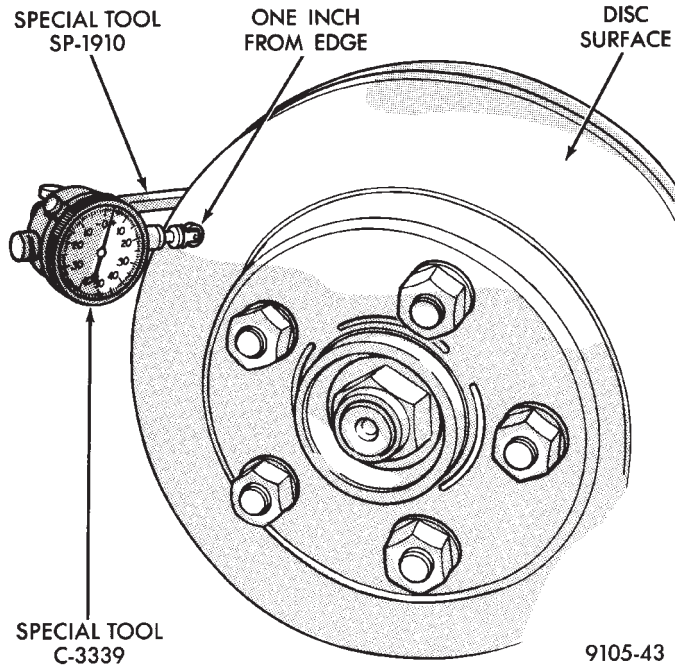
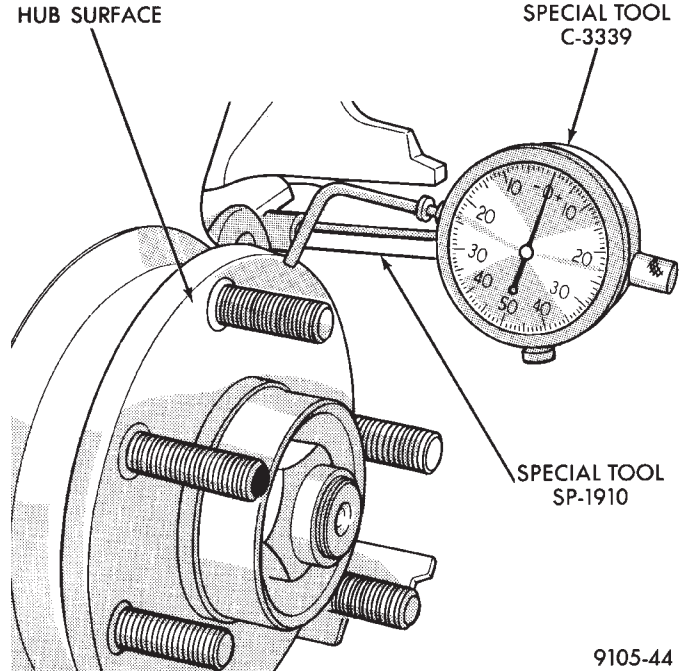
Dishing or distortion can be caused by extreme heat and abuse of the brakes.

ROTOR RUNOUT AND THICKNESS VARIATION

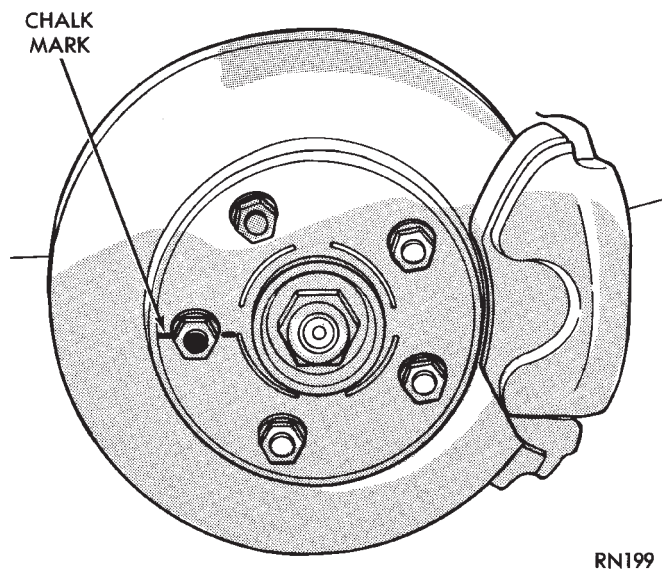
On vehicle rotor runout is the combination of the individual runout of the hub face and the runout of the rotor. (The hub and rotor runouts are separable). To measure runout on the vehicle, remove the wheel and reinstall the lug nuts tightening the rotor to the hub. Mount Dial Indicator, Special Tool C-3339 with Mounting Adaptor, Special Tool SP-1910 on steering arm. Dial indicator plunger should contact braking surface of rotor approximately one inch from edge of rotor (Fig. 10). Check lateral runout (both sides of rotor) runout should not exceed 0.09 mm (0.0035 inch).

If runout is in excess of the specification, check the lateral runout of the hub face. Before removing rotor from hub, make a chalk mark across both the rotor and one wheel stud on the high side of runout so you'll know exactly how the rotor and hub was originally mounted (Fig. 11). Remove rotor from hub.

DIAGNOSIS AND TESTING (Continued)

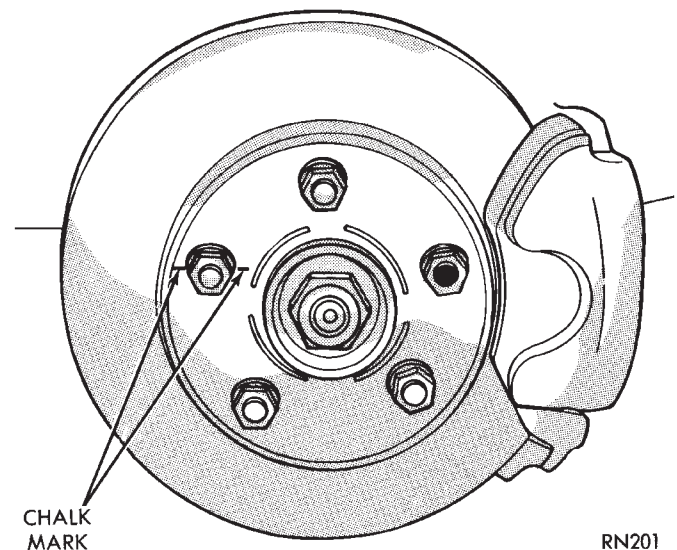
**Fig. 10 Checking Rotor For Runout****Fig. 12 Checking Hub for Runout**

specifications. Finally, check runout of rotor to see if runout is now within specifications.

**Fig. 11 Marking Rotor and Wheel Stud**

Install Dial Indicator, Special Tool C-3339 and Mounting Adaptor, Special Tool SP-1910 on steering knuckle. Position stem so it contacts hub face near outer diameter. Care must be taken to position stem outside the stud circle but inside the chamfer on the hub rim (Fig. 12). **Clean hub surface before checking.**

Runout should not exceed 0.03 mm (0.0012 inch). If runout exceeds this specification, hub must be replaced. See Suspension Group 2. If hub runout does not exceed this specification, install rotor on hub with chalk marks two wheel studs apart (Fig. 13). Tighten nuts in the proper sequence and torque to

**Fig. 13 Index Rotor And Wheel Stud**

If runout is not within specifications. Install a new rotor or reface rotor, being careful to remove as little as possible from each side of rotor. Remove equal amounts from each side of rotor. Do not reduce thickness below minimum thickness cast into the un-machined surface of the rotor.

Thickness variation measurements of rotor should be made in conjunction with runout. Measure thickness of rotor at 12 equal points with a micrometer at a radius approximately 25.4 mm (1 inch) from edge of rotor (Fig. 14). If thickness measurements vary by

DIAGNOSIS AND TESTING (Continued)

more than 0.013 mm (0.0005 inch) rotor should be removed and resurfaced, or a new rotor installed. If cracks or burned spots are evident, rotor must be replaced.

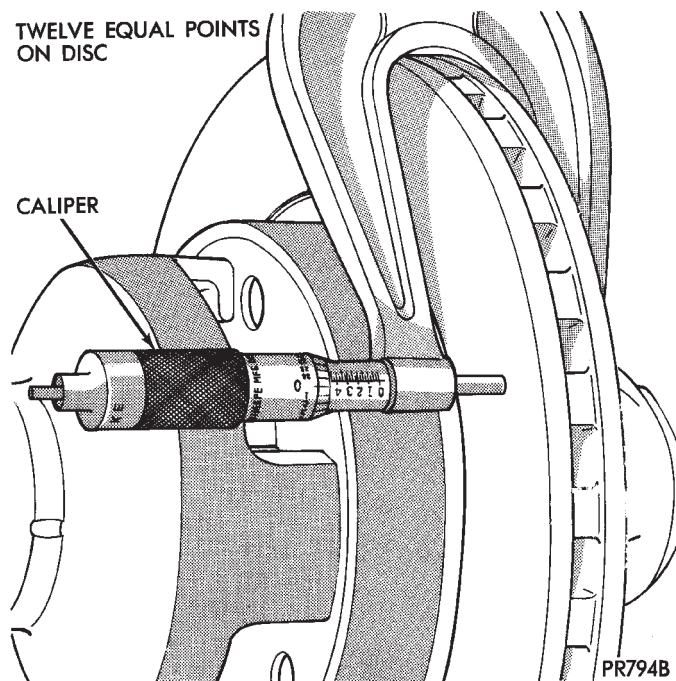


Fig. 14 Checking Rotor For Thickness

Light scoring and/or wear is acceptable. If heavy scoring or warping is evident, the rotor must be machined or replaced. See Brake Rotor Machining in the Service Procedures Section in this group of the service manual. Refer to front or rear brake rotor in the Removal And Installation section in this group of the service manual for the required brake rotor replacement procedure.

PROPORTIONING VALVE

PROPORTIONING VALVE TEST (WITH AND WITHOUT ANTILOCK BRAKES)

CAUTION: Not all components use the same type tubing flare. The tube leading into the proportioning valve has an ISO flare, while the flex hose coming out of the proportioning valve has a standard double-inverted flare. Use the correct adapters when installing gauges to test proportioning valves.

Both vehicles, with Antilock Brakes, and without Antilock Brakes, have two proportioning valves. One valve is connected to each rear flex hose. One proportioning valve controls the right rear brake, and the other proportioning valve controls the left rear brake.

On vehicles without ABS, if premature wheel skid occurs on a hard brake application, it could be an indication that a malfunction has occurred with one

of the two rear brake proportioning valves. Test the valve that controls the side of the vehicle on which the skid occurs.

On vehicles with ABS, if premature rear wheel ABS cycling occurs on a hard brake application, it could be an indication that a malfunction has occurred with one of the two proportioning valves. Since ABS cycles both rear brakes together, both valves must be tested to isolate the suspect proportioning valve.

(1) Raise the vehicle on jack stands or centered on a hoist. See hoisting in the Lubrication and Maintenance section of this manual.

(2) Clean any debris away from the suspect proportioning valve, connections, and area.

(3) Remove the chassis brake tube (Fig. 15) from the suspect proportioning valve.

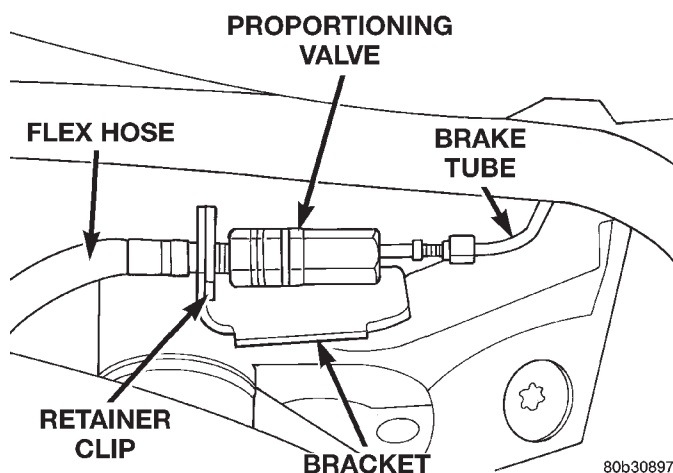


Fig. 15 Proportioning Valve

(4) Remove the proportioning valve from the rear flex hose which is held stationary by a bracket mounted on the back side of the crossmember.

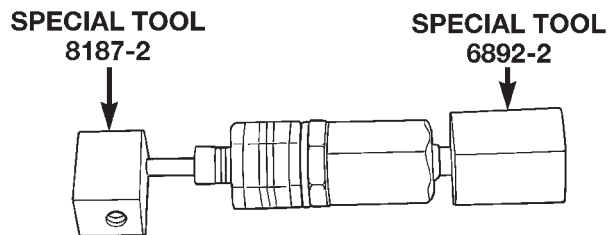
(5) Remove the retainer clip securing the rear flex hose from its bracket (Fig. 15). **This should be done to allow the proportioning valve pressure test fittings to be installed without bending the chassis brake tube.**

CAUTION: Be sure the pressure test fittings being installed into the proportioning valve, have the correct thread sizes for installation into the proportioning valve and installation of the chassis brake tubes.

(6) Correctly install Pressure Test Fittings, Special Tool 6892-2 into the inlet port, and Special Tool 8187-2 into the outlet port, of the proportioning valve (Fig. 16).

(7) Install the proportioning valve and the Pressure Test Fittings, Special Tool 6892-2 and 8187-2, as an assembly back into the chassis brake tube.

DIAGNOSIS AND TESTING (Continued)

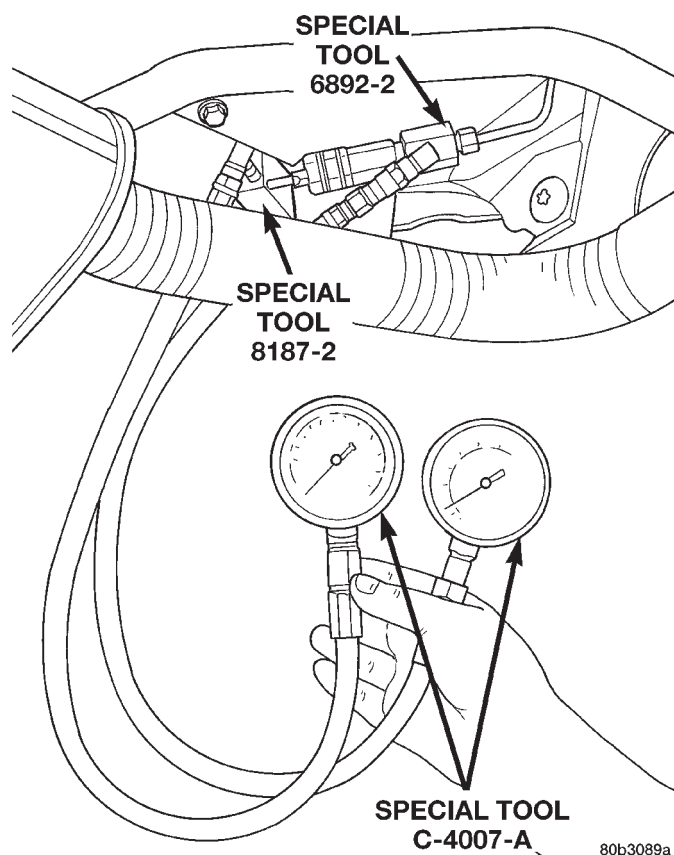


80b30898

Fig. 16 Proportioning Valve With Fittings

Connect Special Tool 6892-2 to the chassis brake tube, and Special Tool 8187-2 to the brake flex hose.

(8) Install a Pressure Gauge, Special Tool C-4007-A into each pressure test fitting (Fig. 17). Bleed any air out of the system. This includes bleeding the air from the hose between the pressure test fitting and pressure gauge, which is done at the pressure gauge.



80b3089a

Fig. 17 Pressure Gauges Installed

(9) With the aid of a helper, apply pressure to the brake pedal until reading on proportioning valve inlet gauge, is at the pressure shown on the following chart. Then check the pressure reading on the proportioning valve outlet gauge. If proportioning valve outlet pressure does not agree with value shown on the following chart, when inlet pressure shown on chart is obtained, replace the proportioning valve. If proportioning valve is within pressure specifications do not replace proportioning valve.

(10) Remove the pressure gauges from the pressure test fittings.

(11) Remove the proportioning valve and the Pressure Test Fittings, Special Tool 6892-2, and 8187-2 from the chassis brake tube and rear flex hose. Remove the pressure test fittings from the proportioning valve (Fig. 16).

(12) Install the rear brake flex hose to its mounting bracket using a new retainer clip.

(13) Install the proportioning valve to the rear brake flex hose. Tighten to a torque of 17 N·m (145 in. lbs.).

(14) Install the chassis brake tube to the proportioning valve (Fig. 15). Tighten the tube nut to a torque of 17 N·m (145 in. lbs.).

(15) Bleed the affected brake line. See Bleeding Brake System in the Service Adjustments section of the manual for proper bleeding procedure.

(16) On vehicles with Antilock Brakes, repeat the above steps for the other proportioning valve.

(17) If no problem is found with the proportioning valves, check the rear wheel brake shoe linings for contamination or for replacement brake shoes not meeting OEM brake lining material specifications. These conditions can also be a possible cause for a premature rear wheel skid.

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.

PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS

Sales Code	Brake System Type	Split Point	Slope	Identification	Inlet Pressure	Outlet Pressure
BRT	15" Disc/Disc W/ABS	400 psi	0.43	Bar Code Label	1000 psi	525-600 psi
BNM	15" Disc/Disc W/ABS And Traction Control	400 psi	0.43	Bar Code Label	1000 psi	525-600 psi

DIAGNOSIS AND TESTING (Continued)

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.

RED BRAKE WARNING LAMP TEST

For diagnosis of specific problems with the red brake warning lamp system, refer to Brake System Diagnostics Chart 2, located in the Diagnosis And Testing section in this group of the service manual.

STOP LAMP SWITCH

The required procedure for testing the stop lamp switch is covered in Group 8H Vehicle Speed Control System in this service manual. The electrical circuit for stop lamps is covered in Group 8W Rear Lighting in this service manual.

REAR WHEEL HUB AND BEARING

The rear hub and bearing assembly is designed for the life of the vehicle and should require no maintenance. The following procedure may be used for evaluation of bearing condition.

With wheel and brake drum removed, rotate flanged outer ring of hub. Excessive roughness, lateral play or resistance to rotation may indicate dirt intrusion or bearing failure. If the rear wheel bearings exhibit these conditions during inspection, the hub and bearing assembly should be replaced.

Damaged bearing seals and resulting excessive grease loss may also require bearing replacement. Moderate grease loss from bearing is considered normal and should not require replacement of the hub and bearing assembly.

SERVICE PROCEDURES**MASTER CYLINDER FLUID LEVEL**

Check master cylinder reservoir brake fluid level a minimum of twice a year.

The master cylinder brake fluid reservoir used on this vehicle includes a brake fluid level sensor. The brake fluid level sensor location is in the body of the brake fluid reservoir (Fig. 18). In the event of low brake fluid level in the brake fluid reservoir, the RED brake warning light in the instrument panel will turn on.

Master cylinder fluid reservoirs on both standard and antilock brake systems, are marked with a FULL fill line indicating the fluid reservoirs proper fluid level (Fig. 18).

NOTE: When filling brake fluid reservoir, use only Mopar® brake fluid or an equivalent stored in a tightly sealed container. Brake fluid must conform

to DOT 3, specifications. Do not use brake fluid with a lower boiling point than DOT 3, as brake failure could result during prolonged hard braking. Do not use petroleum-based fluid because seal damage in the brake system will result.

If necessary, add brake fluid to reservoir, bringing brake fluid level to the FULL fill line shown on fluid reservoir (Fig. 18).

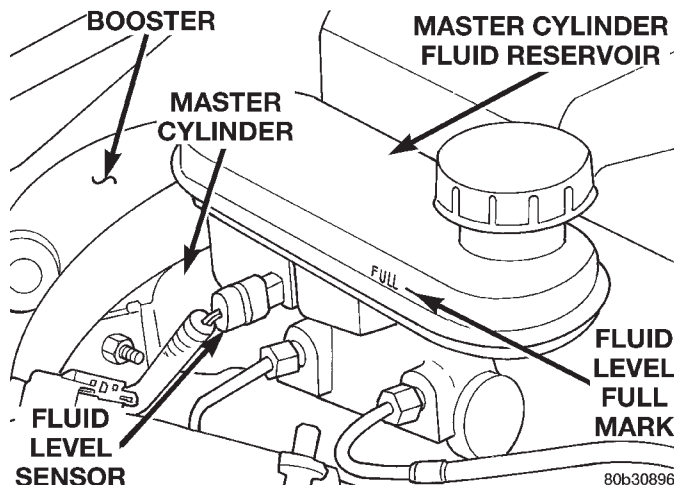


Fig. 18 Master Cylinder Fluid Level

BRAKE BLEEDING

NOTE: To bleed this vehicle's antilock brakes hydraulic system, see the antilock brake system service procedures in this group of the service manual. It describes in detail the required procedure which needs to be followed when bleeding the antilock brake system.

CAUTION: Before removing the master cylinder cover, wipe it clean to prevent dirt and other foreign matter from dropping into the master cylinder.

PRESSURE BLEEDING

CAUTION: Use bleeder tank Special Tool C-3496-B or equivalent, with Adapter, Special Tool 8224 (Fig. 19), to pressurize the brake hydraulic system for bleeding.

Follow pressure bleeder manufacturer's instructions, for use of pressure bleeding equipment.

When bleeding the brake system. Some air may be trapped in the brake lines or valves far upstream. As much as ten feet from the bleeder screw (Fig. 20). Therefore, it is essential to have a fast flow of a large volume of brake fluid when bleeding the brakes. This will ensure all the air is bled from the brakes hydraulic system.

SERVICE PROCEDURES (Continued)

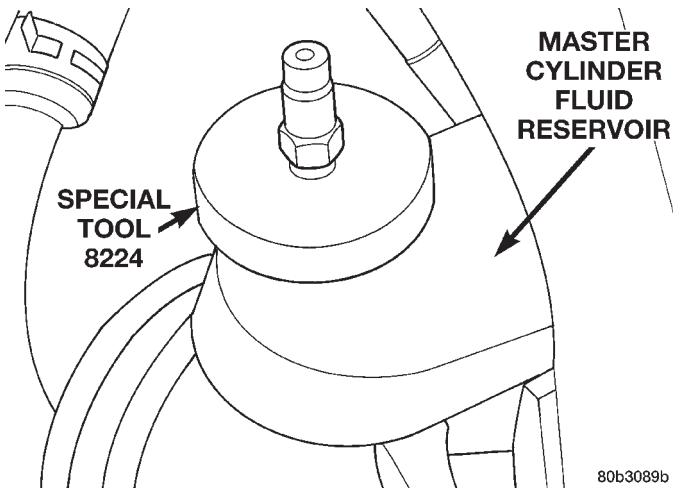


Fig. 19 Pressure Bleeding Adapter Mounted On Fluid Reservoir

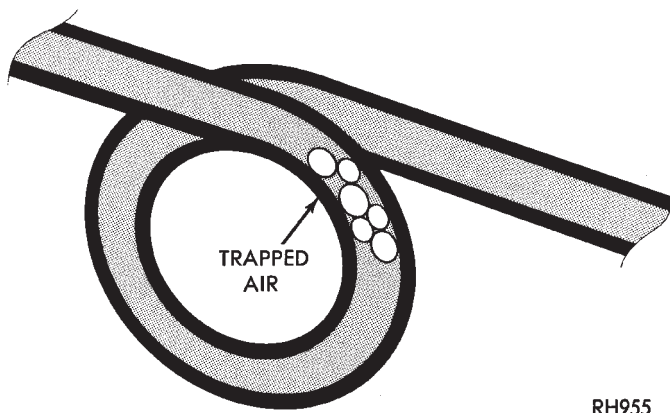


Fig. 20 Trapped Air in Brake Line

(1) Remove rubber dust caps from all 4 bleeder screws.

(2) Attach a clear hose to the bleeder screw at one wheel and feed the hose into a clear jar containing fresh brake fluid (Fig. 21).

CAUTION: Just cracking the bleeder screw often restricts fluid flow, and a slow weak fluid discharge will NOT get all the air out.

(3) Open bleeder screw (Fig. 21) on caliper assembly or wheel cylinder, at least **one full turn** or more to obtain an adequate flow of brake fluid.

(4) After 4 to 8 ounces of brake fluid has been bled through an individual wheel's brake hydraulic system. And an air-free flow (no bubbles) is maintained in the clear plastic hose and jar, this will indicate a good bleed of this individual hydraulic circuit.

(5) Repeat the procedure at all the other remaining bleeder screws. Then check the pedal for travel. If pedal travel is excessive or has not been improved.

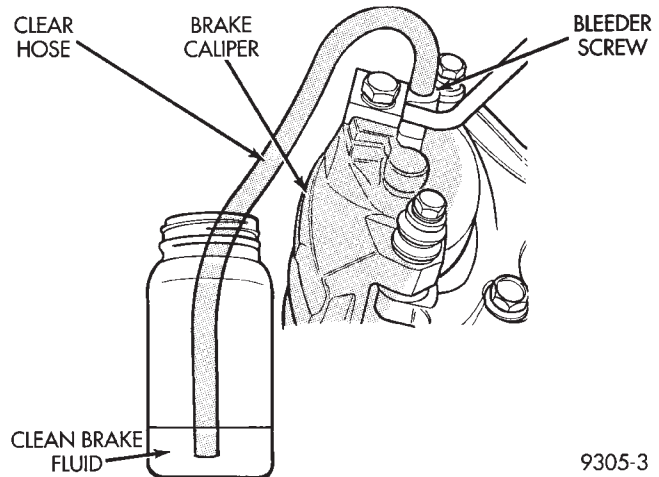


Fig. 21 Proper Method for Purging Air From Brake System

Enough fluid has not passed through the system to expel all the trapped air. Be sure to monitor the fluid level in the pressure bleeder. It must stay at the proper level so air will not be allowed to reenter the brake system through the master cylinder.

(6) Replace all 4 bleeder screw rubber dust caps.

BLEEDING WITHOUT A PRESSURE BLEEDER

If a pressure bleeder is not available. A good brake fluid flow can be obtained by manual bleeding of the brake hydraulic system, following these steps.

(1) Remove rubber duct caps from all 4 bleeder screws.

(2) Attach a clear hose to the bleeder screw at one wheel and feed the hose into a clear jar containing fresh brake fluid (Fig. 21).

(3) Pump the brake pedal three or four times and hold it down before the bleeder screw is opened.

(4) Then, while the pedal is being held down, open the bleeder screw at least 1 full turn. When the bleeder screw opens the brake pedal will drop all the way to the floor.

(5) Release the brake pedal only **after** the bleeder screw is closed.

(6) Repeat steps 1 through 5, four or five times at each bleeder screw. This should pass a sufficient amount of fluid to expel all the trapped air from the brakes hydraulic system. Be sure to monitor brake fluid level in master cylinder fluid reservoir, to ensure it stays at a proper level. This will ensure air does not reenter brake hydraulic system through master cylinder.

(7) Only after a short stroke and solid brake pedal feel is obtained, test drive vehicle to ensure brakes are operating correctly.

(8) Replace all 4 bleeder screw dust caps.

SERVICE PROCEDURES (Continued)

MASTER CYLINDER BLEEDING

CAUTION: When clamping the master cylinder in a vise for bleeding, carefully tighten the vise just enough to hold the master cylinder from moving. Excessive pressure can damage the master cylinder.

- (1) Clamp the master cylinder in a vise (Fig. 22).

NOTE: The master cylinder on this vehicle uses ISO style flares and metric threads on the master cylinder outlet ports. Special Tool Packages 8129 and 8305 have ISO style flares and metric threads on their bleeding tubes.

- (2) Position the appropriate bleeding tools from packages, Special Tool 8129 and 8305, on the master cylinder. Place open ends in the fluid reservoir. Then, attach the bleeding tube fittings to the master cylinder outlet ports (Fig. 22).

NOTE: Make sure the open ends of the bleeding tubes are below the surface of the brake fluid when the reservoir is filled to the proper level.

- (3) Fill reservoir with brake fluid conforming to DOT 3 specifications such as Mopar or Equivalent.

- (4) Using a wooden dowel per (Fig. 22). Depress master cylinder pistons slowly, and then allow pistons to return to released position. Repeat several times until all air bubbles are expelled.

- (5) Remove bleeding tubes from cylinder, plug outlets and install filler cap.

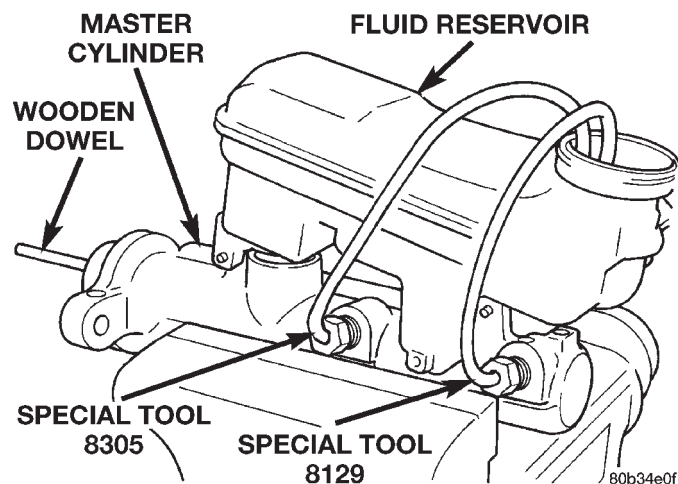


Fig. 22 Bleeding Master Cylinder

- (6) Remove master cylinder from vise and install on power brake vacuum booster.

NOTE: It is not necessary to bleed the entire hydraulic system after replacing the master cylinder, providing that the master cylinder has been bled and filled upon installation.

BRAKE ROTOR MACHINING**BRAKE ROTOR MACHINING**

NOTE: Refacing of the rotor is not required each time the brake pads are replaced.

Any servicing of the rotor requires extreme care to maintain the rotor within service tolerances to ensure proper brake action.

If the rotor surface is deeply scored or warped, or there is a complaint of brake roughness or brake pedal pulsation, the rotor should be refaced using a hub-mounted on-car brake lathe (Fig. 23), or replaced.

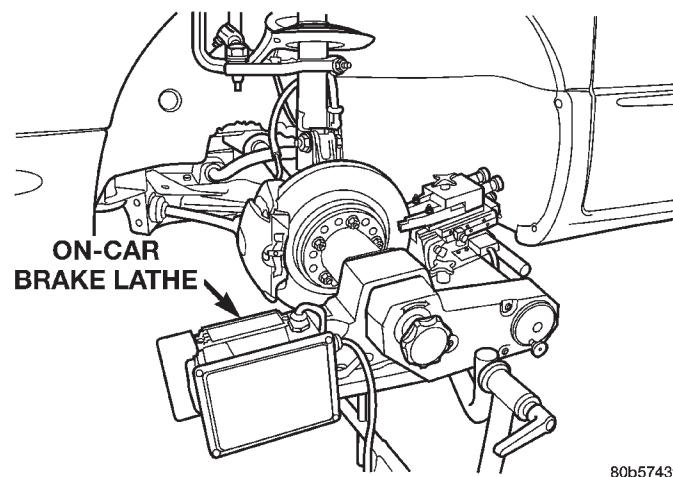


Fig. 23 Refacing Brake Rotor

The use of a hub-mounted on-car brake lathe is highly recommended to eliminate the possibility of excessive runout. It trues the brake rotor to the vehicle's hub and bearing.

NOTE: All rotors have markings for minimum allowable thickness cast on an un-machined surface of the rotor (Fig. 24) or (Fig. 25).

Minimum allowable thickness is the minimum thickness which the brake rotor machined surface may be cut to.

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

SERVICE PROCEDURES (Continued)

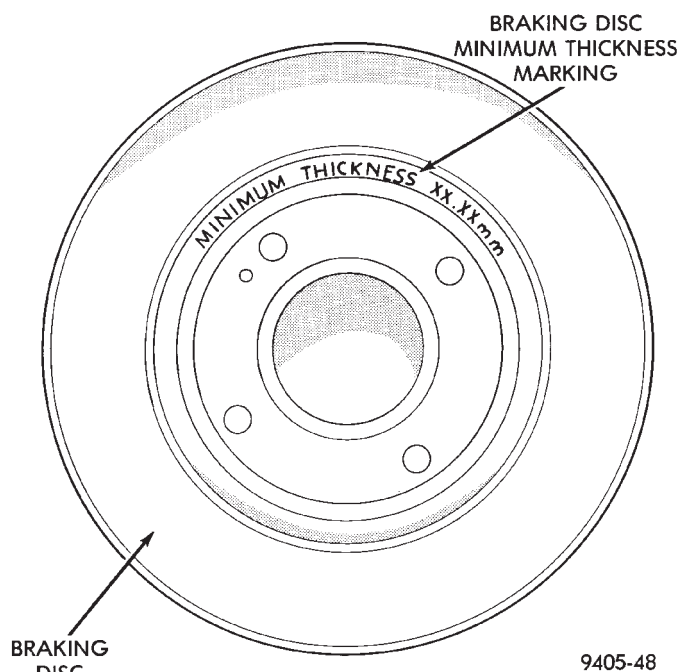


Fig. 24 Front Rotor Thickness Markings

Before installation, verify the brake rotor face and the hub adapters are free of any chips, rust, or contamination.

When mounting and using the brake lathe, strict attention to the brake lathe manufacturer's operating instructions is required.

Machine both sides of the brake rotor at the same time. Cutting both sides at the same time minimizes the possibility of a tapered or uneven cut.

SPECIFICATIONS AND LIMITS

When refacing a rotor, the required 0.08 mm (0.003 inch) TIR (Total Indicator Reading) and 0.013 mm (0.0005 inch) thickness variation limits **MUST BE MAINTAINED**. Extreme care in the operation of rotor turning equipment is required.

CHASSIS BRAKE TUBE REPAIR

All available brake systems on this vehicle use **ISO STYLE TUBING FLARES** (Fig. 26) at all chassis brake tube to component locations, **Only the con-**

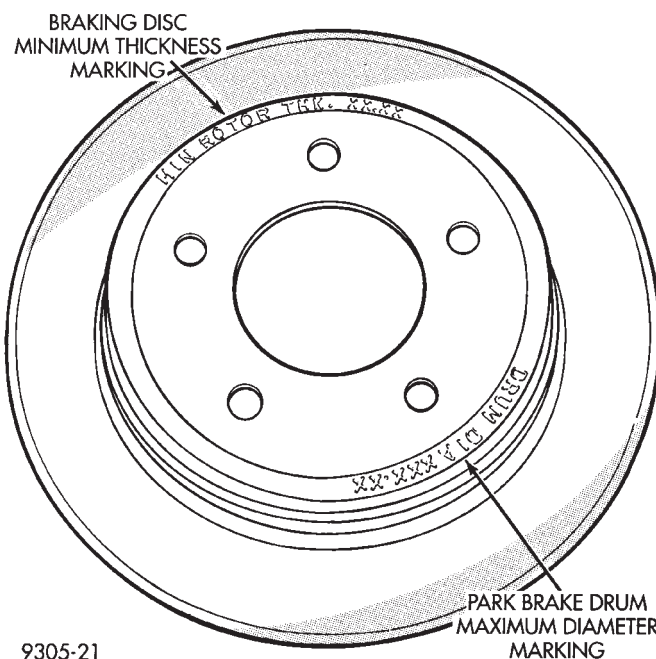


Fig. 25 Rear Rotor Thickness Markings

nection between the rear proportioning valve and flex hose uses a double inverted flare.

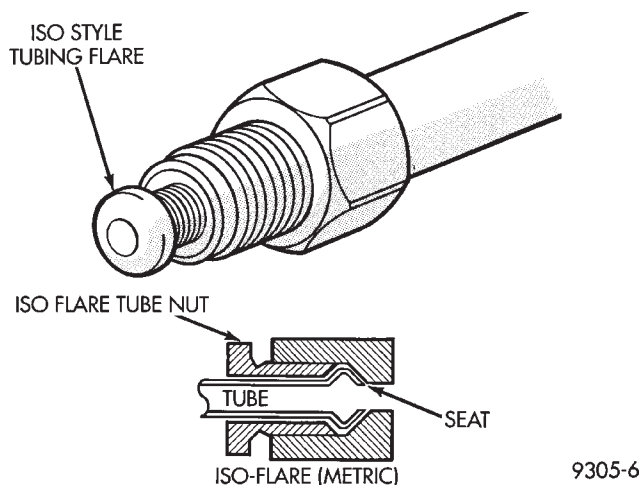


Fig. 26 I.S.O. Style Tubing Flare And Fitting Connection

BRAKE ROTOR REFINISHING LIMITS

Braking Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Run Out*	Rotor Micro Finish
Front Rotor	25.87–26.13 mm 1.019 -1.029 in.	24.4 mm .960 in.	.013 mm .0005 in.	.08 mm .003 in.	15-80 RMS
Rear Rotor	11.63–12.13 mm .458 -.478 in.	10.4 mm .409 in.	.013 mm .0005 in.	.08 mm .003 in.	15-80 RMS

* TIR Total Indicator Reading (Measured On Vehicle)

SERVICE PROCEDURES (Continued)

Only double wall 4.75mm (3/16 in.) steel tubing should be used for replacement of the chassis brake tubes. **The chassis brake tubes used on this vehicle are coated with a zinc alloy and aluminum rich coating referred to as Prokote 2000. If a chassis brake tube requires replacement, only brake tubing with the same coating should be used as a service replacement.** Care should be taken when replacing brake tubing, to be sure the proper bending and flaring tools and procedures are used, to avoid kinking. Do not route the tubes against sharp edges, moving components or into hot areas. All tubes should be properly attached with recommended retaining clips and fasteners.

Care must be taken when servicing components to avoid damage to the flexible stainless steel hoses between the master cylinder and junction block or antilock hydraulic control unit.

ISO STYLE TUBE FLARING PROCEDURE

CAUTION: ALWAYS USE THE PROPER TYPE OF ISO FLARING TOOL AND REQUIRED PROCEDURE, WHEN TUBE FLARING IS REQUIRED WHEN SERVICING THE VEHICLES HYDRAULIC BRAKE SYSTEM. THIS IS REQUIRED TO ENSURE THE INTEGRITY OF THE VEHICLE'S HYDRAULIC BRAKING SYSTEM.

Using Tubing Cutter, Special Tool C-3478-A or equivalent, cut off damaged seat on tubing (Fig. 27). Ream out any burrs or rough edges showing on inside of tubing. This will make the ends of tubing square (Fig. 28) and ensure better seating of flared end tubing. **Be sure to put the tube nut on tubing before the tubing is flared.**

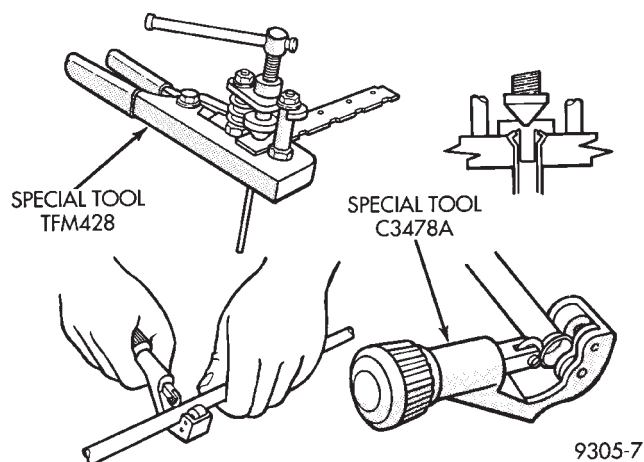
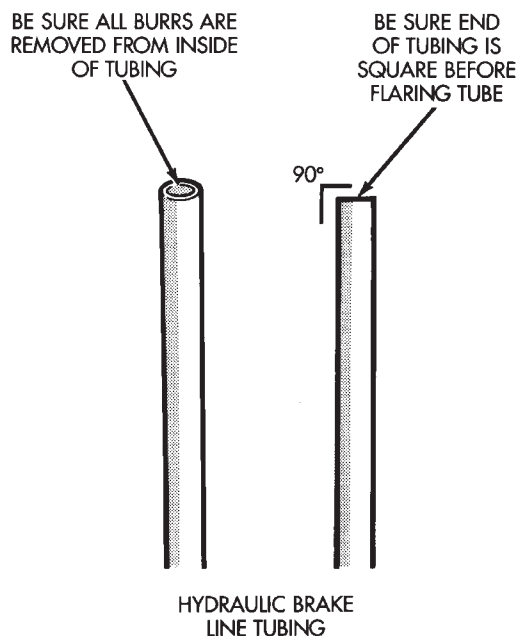


Fig. 27 Cutting and Flaring of Brake Line Tubing

CAUTION: All ISO style tubing flares are of metric dimensions. When performing any service procedures on a vehicle using ISO style tubing flares,



9205-175

Fig. 28 Tube End Properly Prepared For Flaring

metric size tubing of 4.75 mm **MUST** be used with metric ISO tube flaring equipment.

To create a (metric) ISO style tubing flare, Use Snap-On Flaring Tool TFM-428, (Fig. 27) or equivalent. See (Fig. 29) and proceed with the steps listed below. **Be sure to place the tubing nut on tube before proceeding to flare the tubing.**

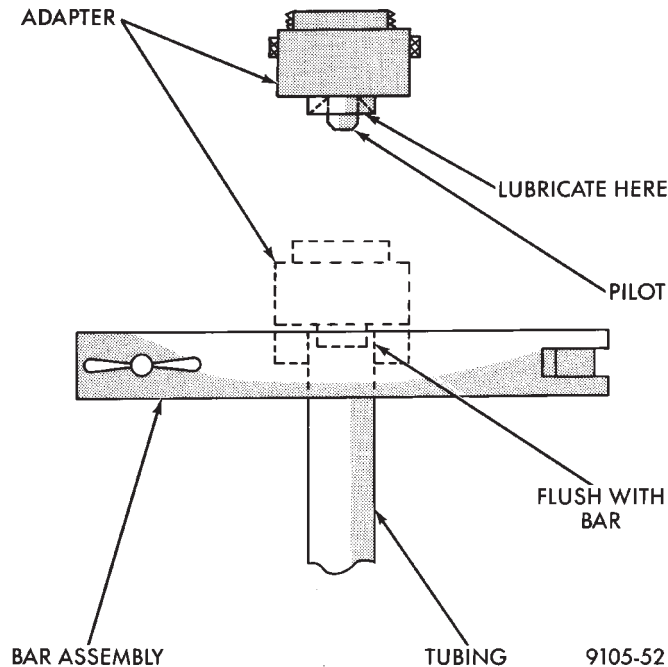
(1) Carefully prepare the end of the tubing to be flared. Be sure the end of the tubing is square and all burrs on the inside of the tubing are removed (Fig. 28). **This preparation is essential to obtain the correct form of a (metric) ISO tubing flare.**

(2) Open the jaws of the Flaring Tool. Align the jaws of the flaring tool around the tubing. Close the jaws of the Flaring Tool around the tubing, but do not lock the tubing in place.

(3) Position tubing in jaws of the Flaring Tool so that it is flush with top surface of flaring tool bar assembly (Fig. 29).

(4) Install the correct size adaptor for the brake tubing being flared, on the feed screw of the yoke assembly. Center the yoke and adaptor over the end of the tubing. Apply lubricant to the adaptor area that contacts the brake tubing. Make sure the adaptor pilot is fully inserted in the end of the brake tubing. Tighten screw on yoke assembly until the adaptor has seated squarely on the surface of the bar assembly (Fig. 29). This process will properly create a metric ISO tubing flare.

SERVICE PROCEDURES (Continued)

*Fig. 29 ISO Tubing Flare Tool*

REMOVAL AND INSTALLATION

FRONT DISC BRAKE CALIPER

During service procedures, grease or any other foreign material must be kept off brake shoe assemblies, and braking surfaces of rotor.

Handle the rotor and caliper carefully, to avoid damaging the rotor and/or scratching or nicking of brake shoe lining.

If inspection reveals that the caliper piston seal is leaking, it **MUST** be replaced immediately.

During removal and installation of a wheel and tire assembly, use care not to strike the caliper.

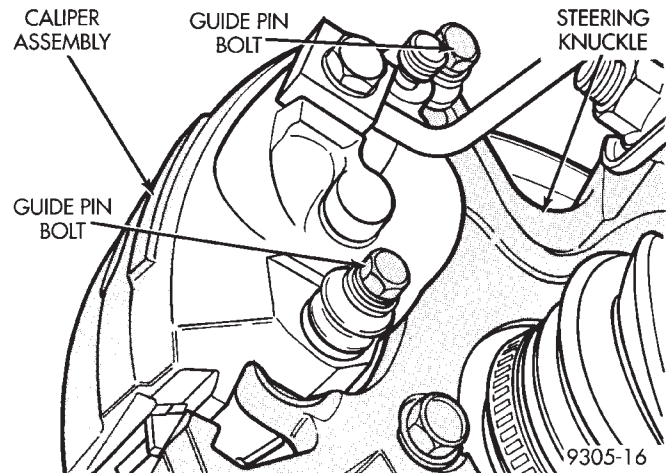
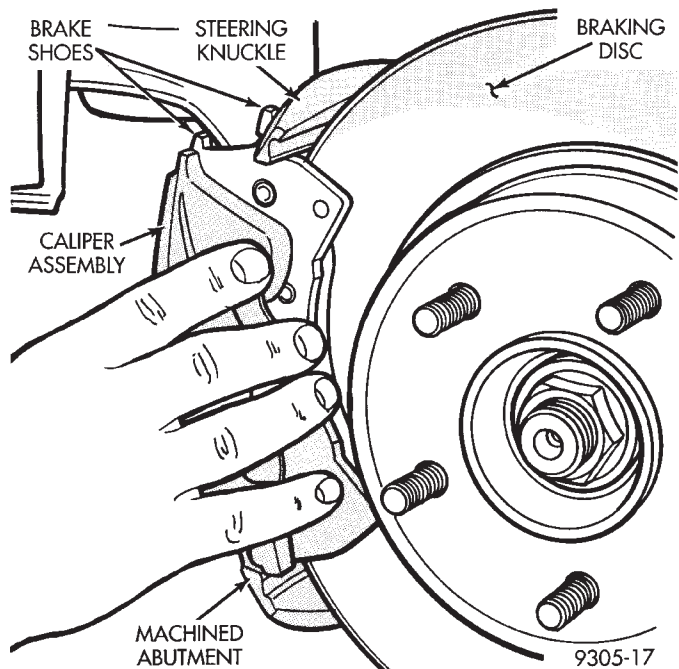
REMOVE

(1) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(2) Remove front wheel and tire assemblies from vehicle.

(3) Remove the 2 caliper assembly to steering knuckle guide pin bolts (Fig. 30).

(4) Remove caliper assembly from steering knuckle. Proceed by first rotating top of caliper away from steering knuckle and then lifting caliper off bottom machined abutment on steering knuckle (Fig. 31).

*Fig. 30 Removing Caliper Assembly Guide Pin Bolts**Fig. 31 Removing Caliper Assembly*

(5) If the caliper is to be completely removed from the vehicle, remove the banjo bolt connecting the brake flex hose to the caliper. There will be 2 washers (one on each side of the flex hose fitting) that will come off at the same time.

(6) If the caliper is not being completely removed from the vehicle, support the caliper firmly to prevent weight of caliper from damaging the flexible brake hose (Fig. 32).

(7) If required, remove rotor from hub by pulling it straight off wheel mounting studs (Fig. 33).

REMOVAL AND INSTALLATION (Continued)

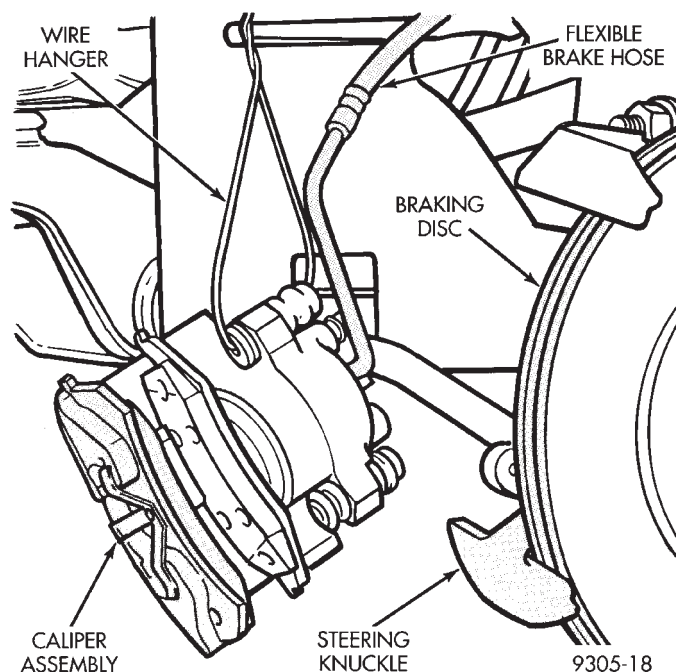


Fig. 32 Storing Caliper

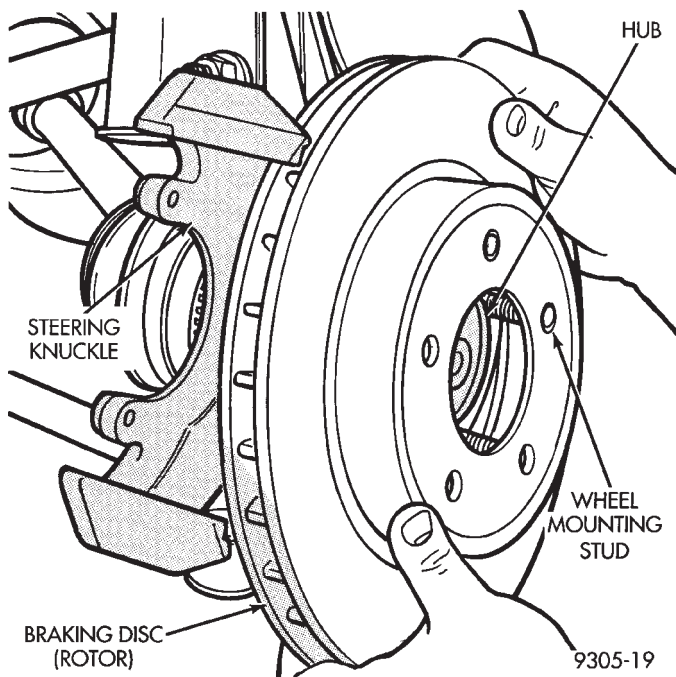


Fig. 33 Removing Or Installing Braking Disc

INSTALL

CAUTION: Use care when installing the caliper assembly on the steering knuckle, so seals on caliper guide pin bushings do not get damaged by the steering knuckle bosses.

(1) Completely retract the caliper piston back into the piston bore of the caliper, if new brake shoes have been installed.

(2) If removed, install rotor on hub (Fig. 33).

NOTE: Make sure shoe retainer clips are in position between the shoe backing plates on each end of shoes before caliper installation.

(3) Carefully position caliper and brake shoe assemblies over rotor using the reversed required removal procedure (Fig. 31).

(4) Install the banjo bolt connecting the flex hose to the caliper. One washer should be installed on each side of the flex hose fitting before installing the banjo bolt. Tighten banjo bolt to a torque of 48 N·m (35 ft. lbs.).

CAUTION: When being installed, extreme caution should be taken not to crosstread the caliper guide pin bolts.

(5) Install the caliper guide pin bolts. Tighten guide pin bolts to a torque of 22 N·m (192 in. lbs.).

(6) Install the wheel and tire assembly.

(7) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

(8) Remove jackstands or lower hoist. **Before moving vehicle, pump the brake pedal several times to insure the vehicle has a firm brake pedal to adequately stop vehicle.**

WARNING: Before moving vehicle after performing any service to the vehicle brake system, be sure to obtain a firm brake pedal.

(9) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoe linings.

REMOVAL AND INSTALLATION (Continued)

FRONT DISC BRAKE SHOES

WARNING: ALTHOUGH FACTORY INSTALLED BRAKE LININGS ARE MADE FROM ASBESTOS FREE MATERIALS, SOME AFTER MARKET BRAKE LINING MAY CONTAIN ASBESTOS. THIS SHOULD BE TAKEN INTO ACCOUNT WHEN SERVICING A VEHICLE'S BRAKE SYSTEM, WHEN AFTERMARKET BRAKE LININGS MAY HAVE BEEN INSTALLED ON THE VEHICLE. ALWAYS WEAR A RESPIRATOR WHEN CLEANING BRAKE COMPONENTS AS ASBESTOS CAN CAUSE SERIOUS BODILY HARM SUCH AS ASBESTOSIS AND OR CANCER. NEVER CLEAN BRAKE COMPONENTS BY USING COMPRESSED AIR, USE ONLY A VACUUM CLEANER SPECIFICALLY DESIGNED FOR THE REMOVAL OF BRAKE DUST. IF A VACUUM CLEANER IS NOT AVAILABLE, CLEAN BRAKE PARTS USING ONLY WATER DAMPENED SHOP TOWELS. DO NOT CREATE BRAKE LINING DUST BY SANDING BRAKE LININGS WHEN SERVICING A VEHICLE. DISPOSE OF ALL DUST AND DIRT SUSPECTED OF CONTAINING ASBESTOS FIBERS USING ONLY SEALED AIR-TIGHT BAGS OR CONTAINERS. FOLLOW ALL RECOMMENDED SAFETY PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA), FOR HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS.

REMOVE

(1) Remove caliper as described in Front Disc Brake Caliper Removal and Installation, found elsewhere in this section of this service manual.

(2) Remove the shoe retractor clips from between the shoes.

(3) Remove outboard brake shoe, by prying the shoe retaining clip over raised area on caliper. Then slide the brake shoe off the caliper (Fig. 34).

(4) Pull inboard brake shoe away from piston, until retaining clip is free from cavity in piston (Fig. 35).

CALIPER INSPECTION

Check for piston seal leaks (brake fluid in and around boot area and inboard lining) and for any ruptures of the piston dust boot. If boot is damaged, or fluid leak is visible, disassemble caliper assembly and install a new seal and boot, (and piston if scored). Refer to procedures titled Disc Brake Caliper Disassembly.

Check the caliper dust boot and caliper pin bushings to determine if they are in good condition.

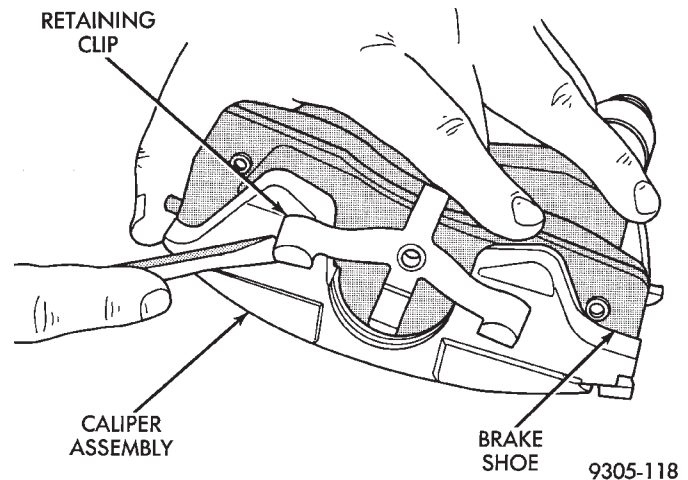


Fig. 34 Removing Outboard Brake Shoe

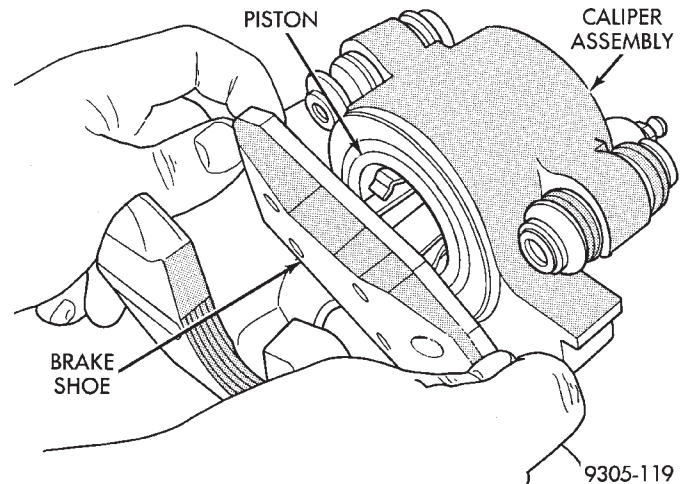


Fig. 35 Inboard Brake Shoe

Replace if they are damaged, dry, or found to be brittle. Refer to Cleaning And Inspection Of Brake Caliper.

INSTALL

NOTE: Step 1 below is only required when installing a caliper after new brake shoes have been installed.

(1) Completely retract caliper piston back into piston bore of caliper assembly.

(2) Lubricate both steering knuckle abutments with a liberal amount of Mopar® Brake Grease for Caliper Slides Lubricant, or equivalent.

(3) Remove the protective paper from the noise suppression gasket on both the inner and outer brake shoe assemblies (if equipped).

NOTE: The inboard and outboard brake shoes are not common, refer to (Fig. 36) for inboard and outboard brake shoe assembly identification.

REMOVAL AND INSTALLATION (Continued)

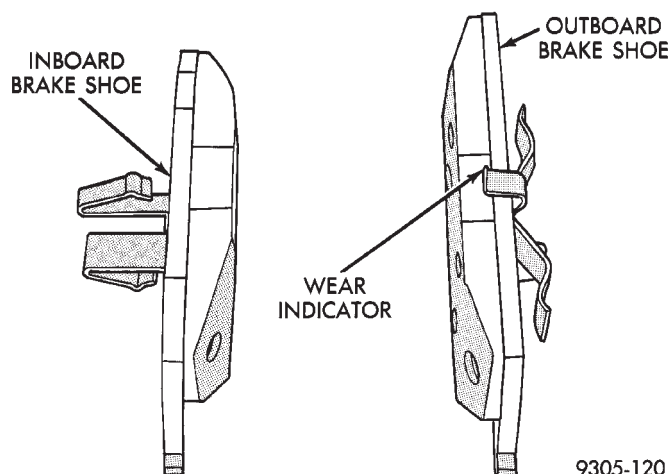


Fig. 36 Front Brake Shoe Assembly Identification

NOTE: When installing inboard brake shoe into caliper piston, be sure brake shoe is positioned squarely against the face of the caliper piston.

(4) Install the new inboard brake shoe assembly into the caliper piston by firmly pressing it into bore of caliper piston with thumbs (Fig. 35).

(5) Slide the new outboard brake shoe assembly onto the caliper assembly (Fig. 37).

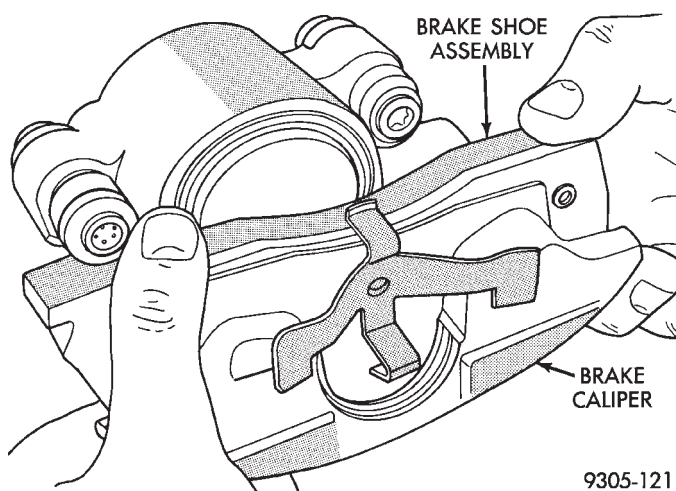


Fig. 37 Installing Outboard Brake Shoe Assembly

(6) Install shoe retractor clips between outboard and inboard shoes, at both ends of shoe backing plates (Fig. 38).

(7) Reinstall caliper as described in Front Disc Brake Caliper Removal and Installation, found elsewhere in this section of this service manual.

CAUTION: Before vehicle is moved after performing a service procedure on the vehicle brake system, pump the brake pedal several times to insure the vehicle has a firm brake pedal that is adequate to stop the vehicle.

(8) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoe linings.

REAR DISC BRAKE CALIPER

During service procedures, grease or any other foreign material must be kept off brake shoe assemblies, and braking surfaces of rotor.

Handling of the rotor and caliper, must be done in such a way as to avoid damage to the rotor and scratching or nicking of lining on the brake shoes.

If inspection reveals that the caliper piston seal is leaking, it **MUST** be replaced immediately.

During removal and installation of a wheel and tire assembly, use care not to strike the caliper.

REMOVE

(1) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(2) Remove rear wheel and tire assemblies from vehicle.

(3) Remove the 2 caliper assembly to adapter guide pin bolts (Fig. 39).

(4) Remove caliper from adapter using following procedure. First rotate top of caliper away from adapter. Then lift the caliper off the bottom abutment on the adapter (Fig. 40).

(5) Support caliper assembly firmly from rear strut to prevent weight of caliper from damaging the flexible brake hose (Fig. 41).

(6) Remove the rear rotor from hub by pulling it straight off the wheel mounting studs (Fig. 42).

INSTALL

NOTE: Step 1 below is only required when installing the disc brake caliper after new brake shoes have been installed.

(1) Completely retract caliper piston back into piston bore of caliper assembly.

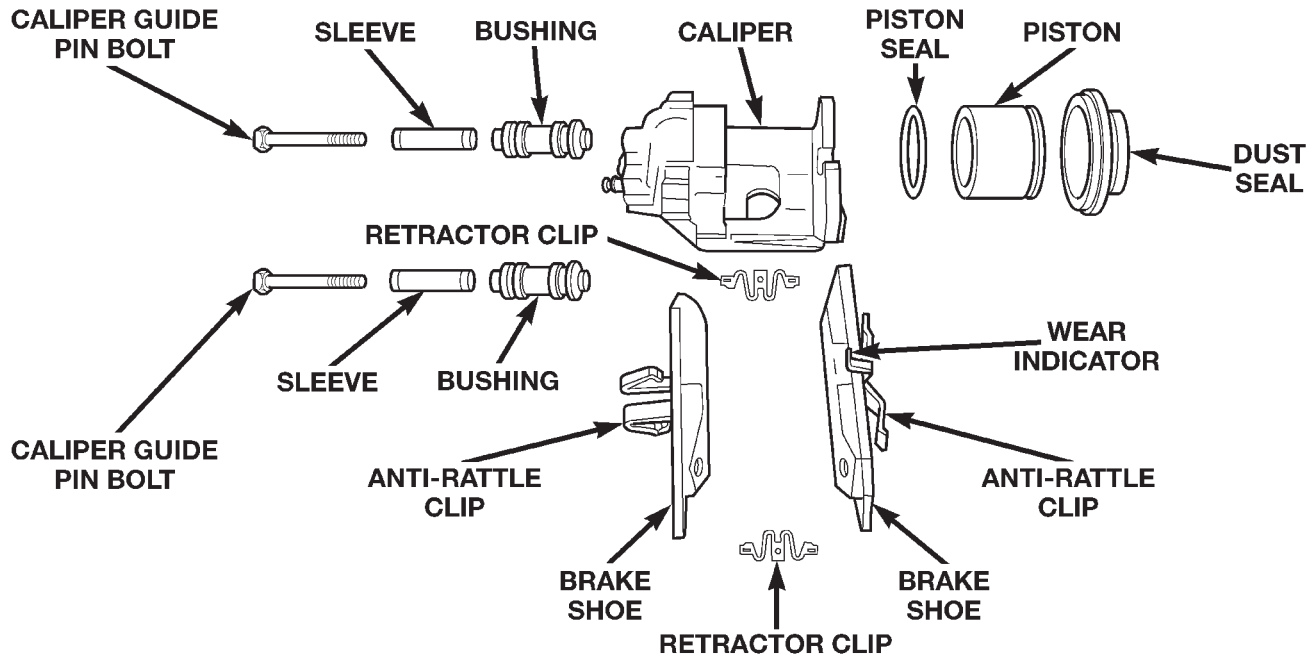
(2) Lubricate both adapter abutments with a liberal amount of Mopar® Multipurpose Lubricant, or equivalent.

(3) Install the rear rotor on the hub, making sure it is squarely seated on the face of the hub (Fig. 42).

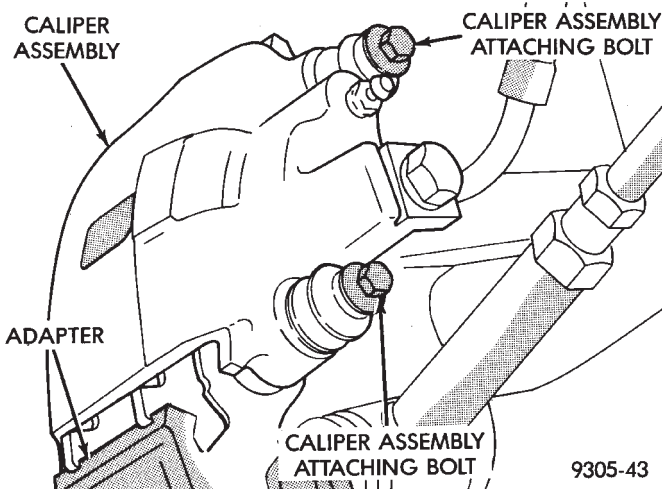
CAUTION: Use care when installing the caliper assembly onto the adapter, so the caliper guide pin bushings do not get damaged by the mounting bosses.

(4) Carefully lower caliper and brake shoes over rotor and onto the adapter using the reverse procedure for removal (Fig. 40).

REMOVAL AND INSTALLATION (Continued)

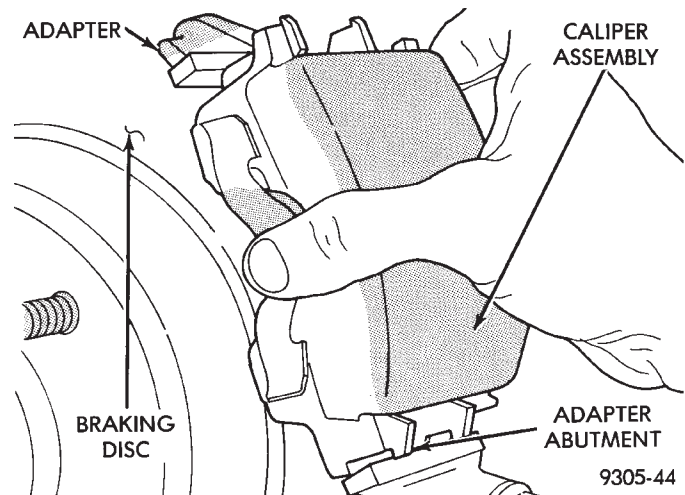


80abfe8b

Fig. 38 Front Disc Brake Caliper Assembly**Fig. 39 Removing Caliper Guide Pin Bolts**

CAUTION: When installing guide pin bolts extreme caution should be taken not to crossthread the caliper guide pin bolts.

- (5) Install the caliper guide pin bolts. Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).
- (6) Install the wheel and tire assembly.
- (7) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half

**Fig. 40 Removing / Installing Caliper Assembly**

specification. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

- (8) Remove jackstands or lower hoist.

CAUTION: Before moving vehicle, pump the brake pedal several times to insure the vehicle has a firm brake pedal to adequately stop vehicle.

- (9) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoe linings.

REMOVAL AND INSTALLATION (Continued)

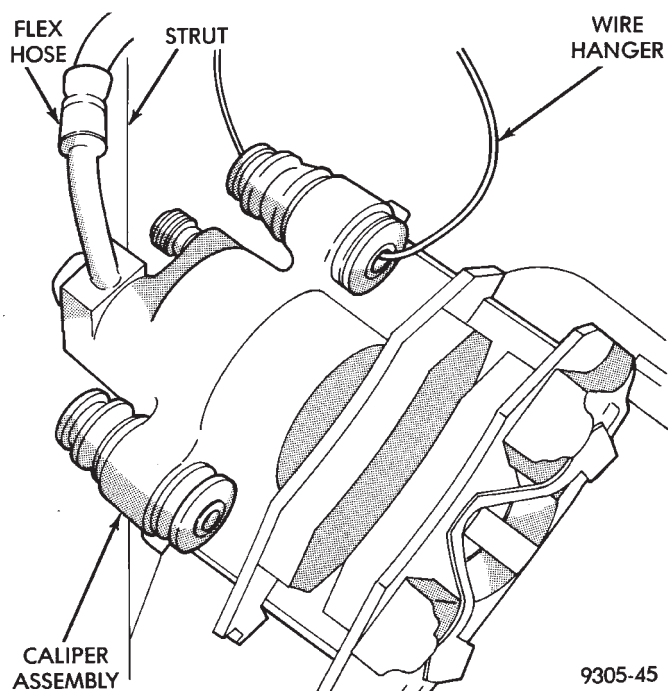


Fig. 41 Storing Caliper

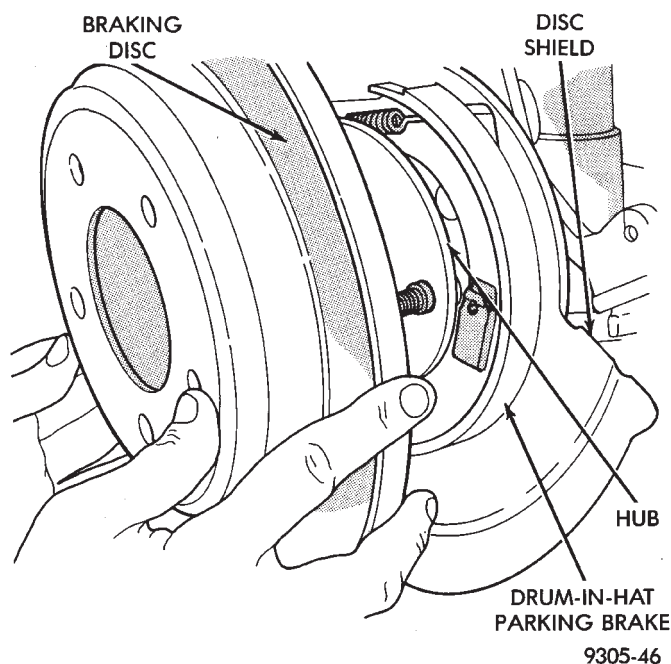


Fig. 42 Removing / Installing Rear Rotor

REAR DISC BRAKE SHOES

WARNING: ALTHOUGH FACTORY INSTALLED BRAKE LININGS ARE MADE FROM ASBESTOS FREE MATERIALS, SOME AFTER MARKET BRAKE LININGS MAY CONTAIN ASBESTOS. THIS SHOULD BE TAKEN INTO ACCOUNT WHEN SERVICING A VEHICLE'S BRAKE SYSTEM, WHEN AFTERMARKET BRAKE LININGS MAY HAVE BEEN INSTALLED ON THE VEHICLE. ALWAYS WEAR A RESPIRATOR WHEN CLEANING BRAKE COMPONENTS, AS ASBESTOS CAN CAUSE SERIOUS BODILY HARM SUCH AS ASBESTOSIS AND OR CANCER. NEVER CLEAN BRAKE COMPONENTS BY USING COMPRESSED AIR, USE ONLY A VACUUM CLEANER SPECIFICALLY DESIGNED FOR THE REMOVAL OF BRAKE DUST. IF A VACUUM CLEANER IS NOT AVAILABLE, CLEAN BRAKE PARTS USING ONLY WATER DAMPENED SHOP TOWELS. DO NOT CREATE BRAKE LINING DUST BY SANDING BRAKE LININGS WHEN SERVICING A VEHICLE. DISPOSE OF ALL DUST AND DIRT SUSPECTED OF CONTAINING ASBESTOS FIBERS USING ONLY SEALED AIR-TIGHT BAGS OR CONTAINERS. FOLLOW ALL RECOMMENDED SAFETY PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA), FOR HANDLING AND DISPOSAL OF PRODUCTS CONTAINING ASBESTOS.

During service procedures, grease or any other foreign material must be kept off brake shoe assemblies, and braking surfaces of brake drum and external surfaces of hub/bearing assembly.

Handling of the braking disc (rotor) and caliper should be done in such a way as to avoid deformation of the disc and scratching or nicking of brake linings.

If inspection reveals that the square sectioned caliper piston seal is worn or damaged, it **MUST** be replaced immediately.

During removal and installation of a wheel and tire assembly, use care not to strike the caliper.

REMOVE

(1) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

REMOVAL AND INSTALLATION (Continued)

(2) Remove rear wheel and tire assemblies from vehicle.

(3) Remove the 2 caliper assembly to adapter guide pin bolts (Fig. 43).

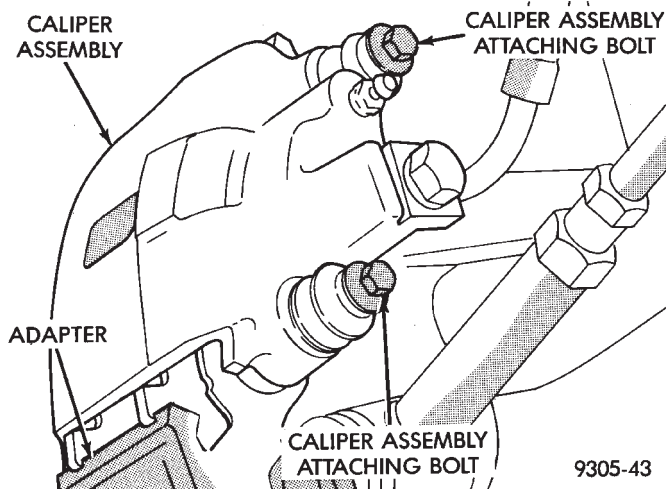


Fig. 43 Caliper Guide Pin Bolts

(4) Remove caliper from adapter using the following procedure. First rotate top of caliper away from adapter. Then lift caliper assembly off bottom abutment of adapter to remove it from the vehicle (Fig. 44).

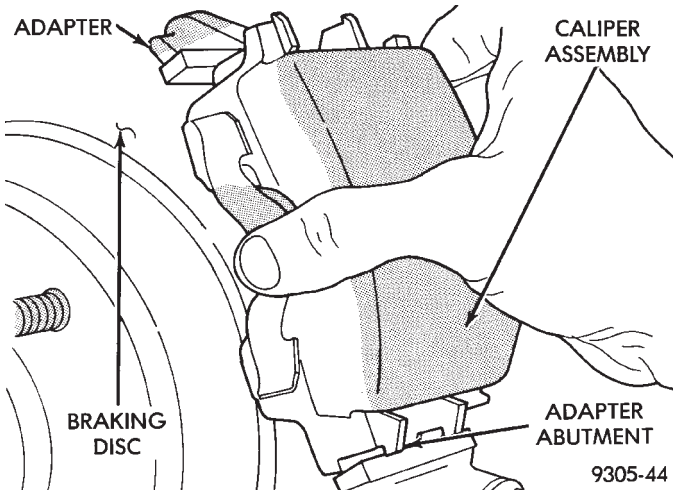


Fig. 44 Removing / Installing Caliper

(5) Support caliper assembly firmly from rear strut to prevent weight of caliper from damaging the flexible brake hose (Fig. 45).

(6) Remove the rear rotor from the hub by pulling it straight off the wheel mounting studs (Fig. 46).

(7) Remove outboard brake shoe, by prying brake shoe retaining clip over raised area on caliper and sliding the shoe off the caliper (Fig. 47).

(8) Pull inboard brake shoe away from piston, until the retaining clip is free from the cavity in the piston (Fig. 48).

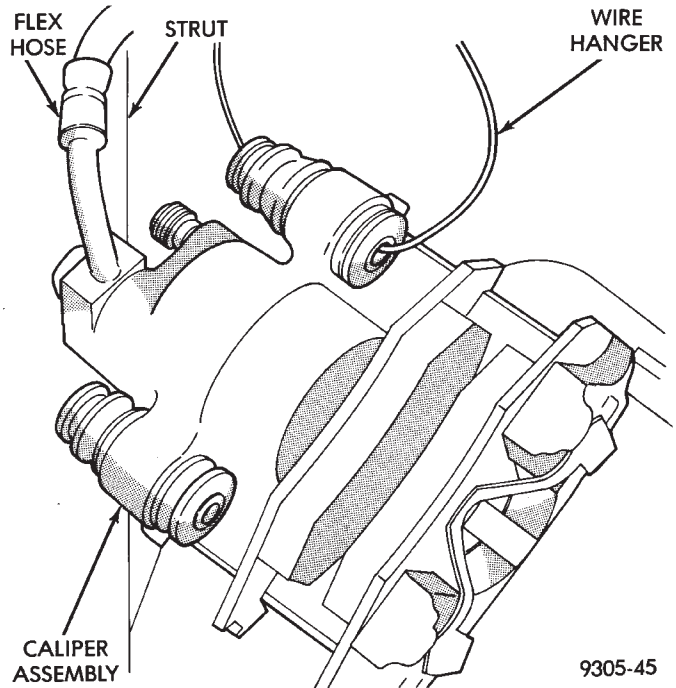


Fig. 45 Storing Caliper

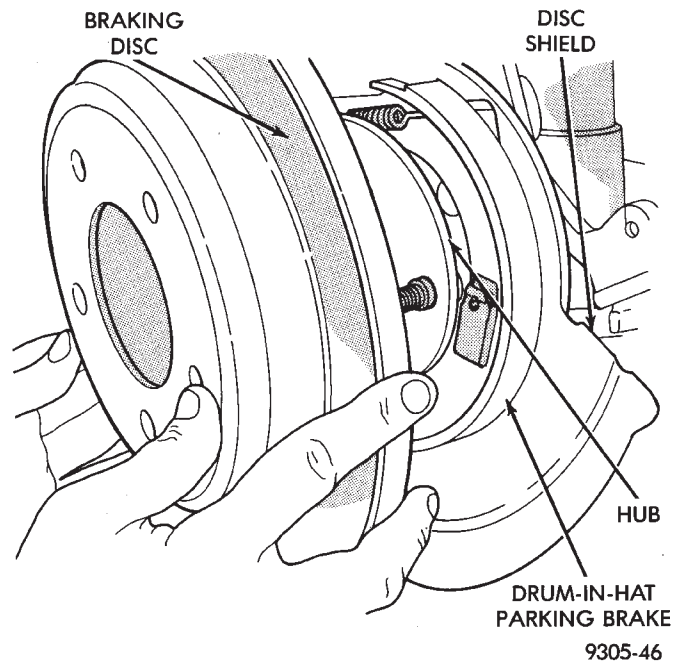
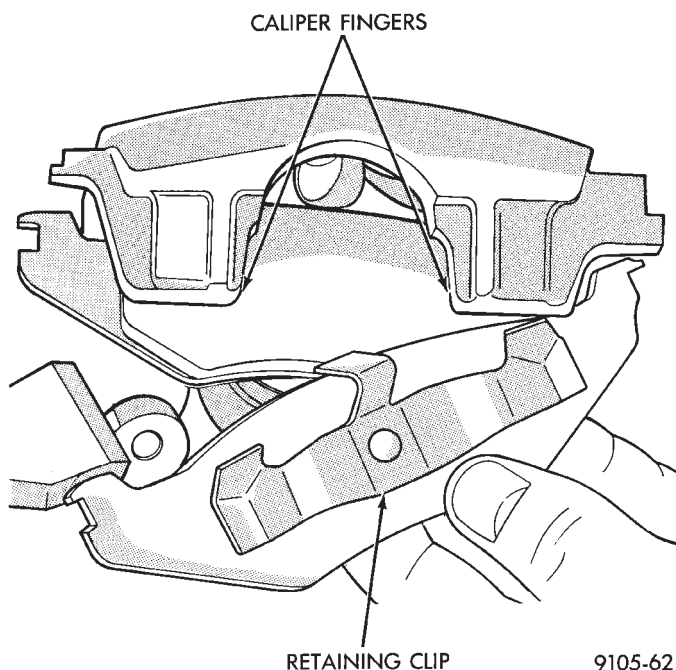
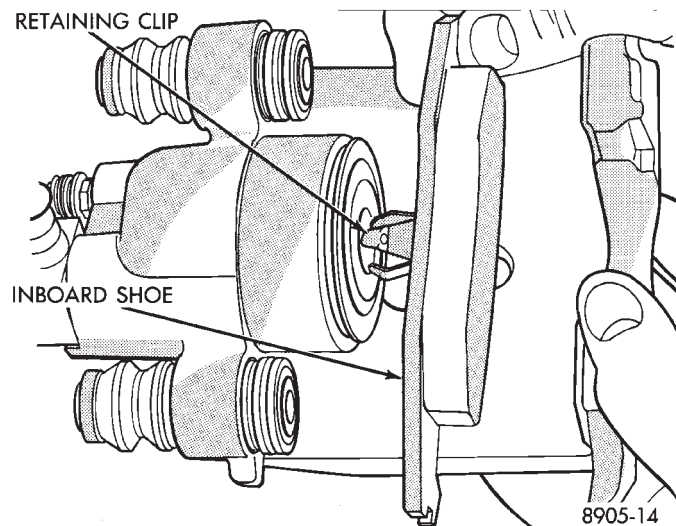


Fig. 46 Removing / Installing Rear Rotor

CALIPER INSPECTION

Check for piston seal leaks (brake fluid in and around boot area and inboard lining) and for any ruptures of the piston dust boot. If boot is damaged, or fluid leak is visible, disassemble caliper assembly and install a new seal and boot, (and piston if scored). Refer to procedures titled Disc Brake Caliper Disassembly.

REMOVAL AND INSTALLATION (Continued)

**Fig. 47 Removing / Installing Outboard Brake Shoe****Fig. 48 Removing / Installing Inboard Brake Shoe**

Check the caliper dust boot and caliper pin bushings to determine if they are in good condition. Replace if they are damaged, dry, or found to be brittle. Refer to Cleaning And Inspection Of Brake Caliper.

INSTALL

NOTE: Step 1 below is only required when installing a caliper after new brake shoes have been installed.

(1) Completely retract caliper piston back into piston bore of caliper assembly.

(2) Lubricate both adapter abutments with a liberal amount of Mopar® Multipurpose Lubricant, or equivalent.

(3) Install the rear rotor on the hub, making sure it is squarely seated on the face of the hub (Fig. 46).

(4) Remove the protective paper from the noise suppression gasket on both the inner and outer brake shoe assemblies (if equipped).

(5) Install the new inboard brake shoe assembly into the caliper piston by firmly pressing into piston bore with thumbs. Be sure inboard brake shoe assembly is positioned squarely against the face of the caliper piston (Fig. 48).

(6) Slide the new outboard brake shoe assembly onto the caliper assembly (Fig. 47).

CAUTION: Use care when installing the caliper assembly onto the adapter, so the caliper guide pin bushings do not get damaged by the mounting bosses.

(7) Carefully lower caliper and brake shoes over rotor and onto adapter, reversing the removal procedure (Fig. 44).

CAUTION: When installing the caliper guide pin bolts extreme caution should be taken not to cross thread the guide pin bolts.

(8) Install the caliper guide pin bolts. Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).

(9) Install the wheel and tire assembly.

(10) Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

(11) Remove jackstands or lower hoist.

CAUTION: Before moving vehicle, pump the brake pedal several times to insure the vehicle has a firm brake pedal to adequately stop the vehicle.

(12) Road test the vehicle and make several stops to wear off any foreign material on the brakes and to seat the brake shoe linings.

REAR WHEEL HUB AND BEARING**REMOVE**

(1) Raise vehicle on jackstands or a frame contact type hoist. See Hoisting in the Lubrication And Maintenance section of this service manual for the required lifting procedure to be used for this vehicle.

(2) Remove rear wheel and tire assembly.

(3) Remove disc brake caliper from the adapter.

(4) Remove the rotor from the hub and bearing.

REMOVAL AND INSTALLATION (Continued)

(5) Remove rear hub and bearing assembly dust cap (Fig. 49).

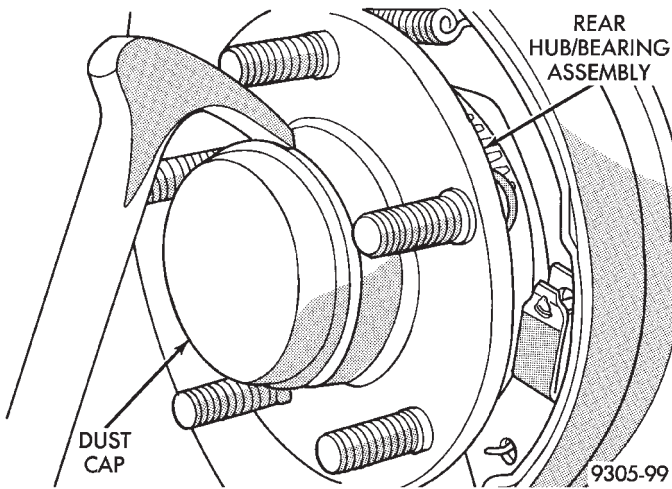


Fig. 49 Rear Hub And Bearing Dust Cap

(6) Remove rear hub and bearing assembly cotter pin, nut retainer and hub/bearing retaining nut and washer (Fig. 50). Then remove rear hub and bearing assembly from spindle.

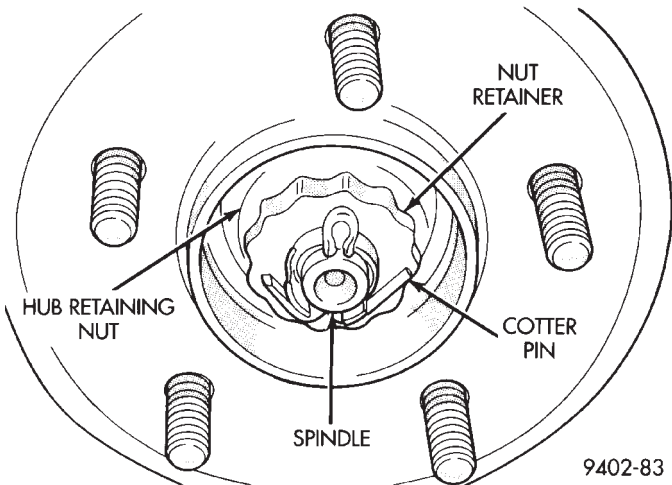


Fig. 50 Hub And Bearing Retaining Nut

INSTALL

(1) Install rear hub and bearing assembly on rear spindle. Install hub and bearing assembly washer and retaining nut (Fig. 50). Tighten the hub and bearing retaining nut to a torque of 168 N·m (124 ft. lbs.).

(2) Install wave washer, nut retainer and cotter pin on spindle.

(3) Install rear hub and bearing dust cap (Fig. 49).

(4) Install rear brake rotor on hub.

(5) Install rear disc brake caliper onto the adapter. Install the caliper assembly to adapter guide pin bolts and torque to 22 N·m (17 ft. lbs.).

(6) Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 129 N·m (95 ft. lbs.).

MASTER CYLINDER

REMOVE

(1) Disconnect brake fluid level sensor wire connector on the side of the master cylinder reservoir.

(2) Disconnect primary and secondary brake tubes from master cylinder housing. Install plugs at brake tube outlets.

(3) Remove the 2 nuts (Fig. 51) attaching the master cylinder to the vacuum booster.

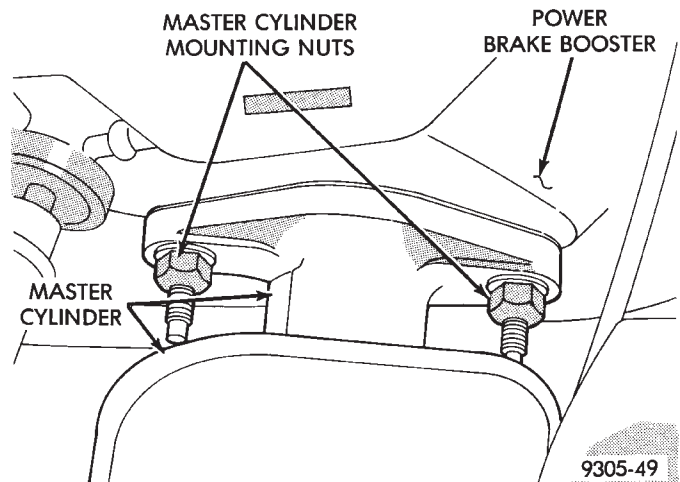


Fig. 51 Master Cylinder Mounting

(4) Slide master cylinder straight out from the vacuum booster.

INSTALL

CAUTION: If the master cylinder is being replaced or or has been repaired, the master cylinder must be bled before installation. See Master Cylinder Bleeding in Service Procedures within this group of this service manual.

(1) Install master cylinder on studs of vacuum booster, aligning the vacuum booster push rod with master cylinder piston.

(2) Install the master cylinder mounting nuts (Fig. 51). Tighten the nuts to a torque of 28 N·m (250 in. lbs.).

(3) Connect brake tubes to master cylinder primary and secondary ports. Tighten fittings to 17 N·m (145 in. lbs.) torque.

(4) Reconnect brake fluid level sensor.

REMOVAL AND INSTALLATION (Continued)

VACUUM BOOSTER

REMOVE

(1) Remove the battery ground cable from the ground stud on the right strut tower. Then, correctly isolate the ground cable by installing the cable isolator on the ground stud (Fig. 52).

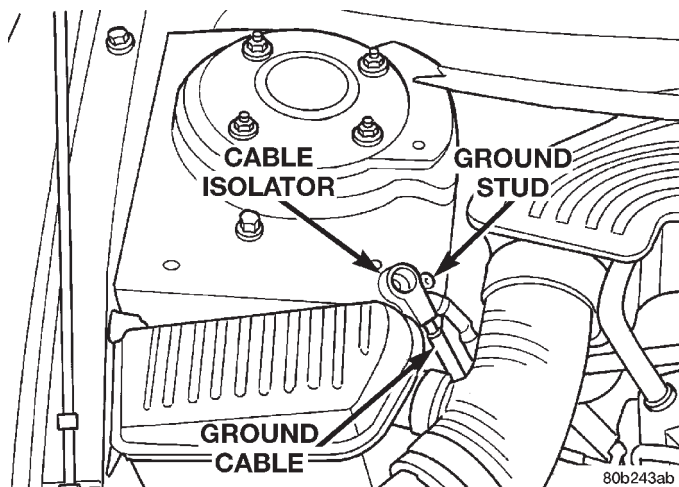


Fig. 52 Correctly Isolated Remote Ground Cable

(2) Remove caps from both wiper arms at the attachment to the pivots to expose the wiper arm attaching nut. Remove the nut (Fig. 53) attaching each wiper arm to its pivot.

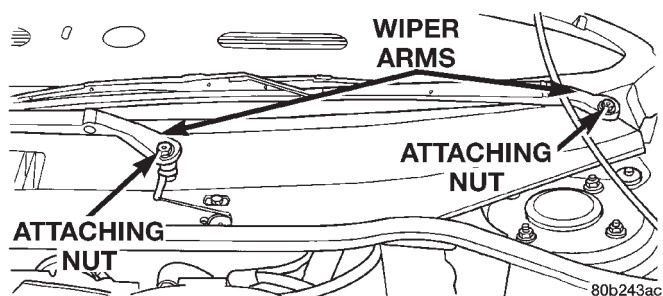


Fig. 53 Wiper Arm Attachment To Pivot

(3) Remove the wiper arms from the pivots. Wiper arms are removed from the pivots by rocking them back and force on the pivots until they can be pulled off the pivots.

(4) Remove the wiper module cover and cowl cover (Fig. 54) from the vehicle.

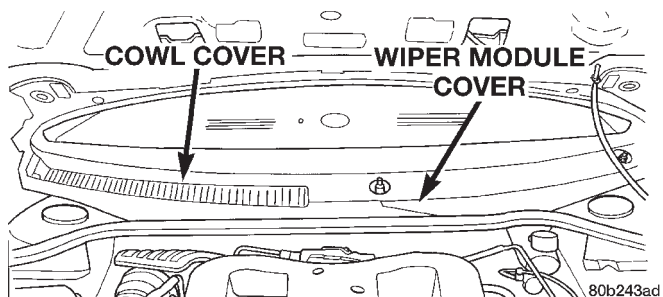


Fig. 54 Wiper Module And Cowl Cover

(5) Remove the 8 bolts, attaching the reinforcement (Fig. 55) to the strut towers and the 1 bolt (Fig. 55) attaching the wiper module to the reinforcement. Remove the reinforcement from the vehicle.

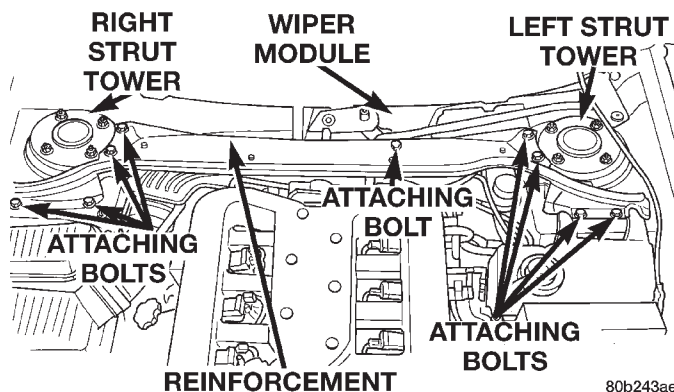


Fig. 55 Reinforcement Attachment To Vehicle

(6) Disconnect the wire connector from the brake fluid level sensor on the right side of the master cylinder reservoir.

(7) Remove the 2 nuts (Fig. 56) attaching the master cylinder to the vacuum booster.

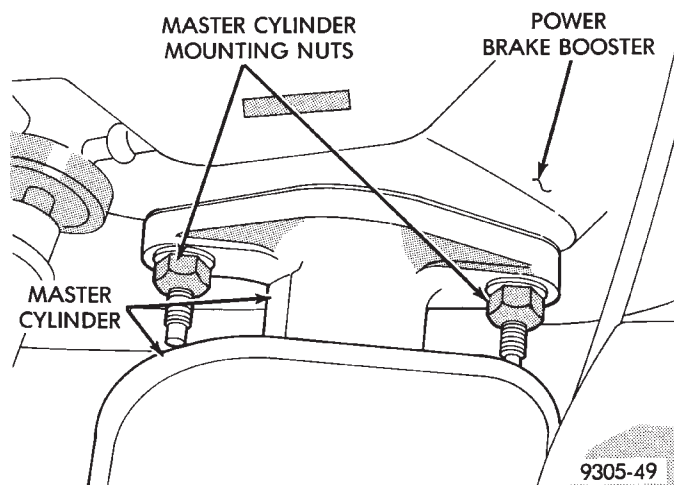


Fig. 56 Master Cylinder Mounting

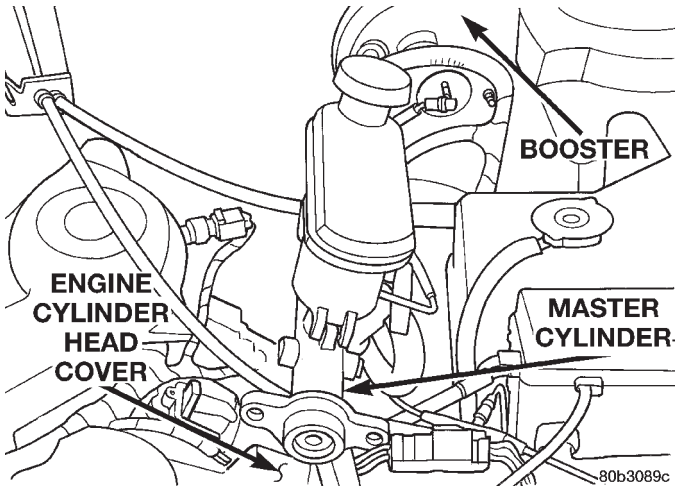
(8) Carefully slide master cylinder off vacuum booster with brake lines attached, and position it backwards, on top of left engine cylinder head cover (Fig. 57).

(9) Disconnect vacuum hose from power brake booster check valve. **DO NOT REMOVE CHECK VALVE FROM POWER BRAKE BOOSTER.**

(10) From under instrument panel, position a small screwdriver between the center tang on the power brake booster input rod to brake pedal pin retaining clip.

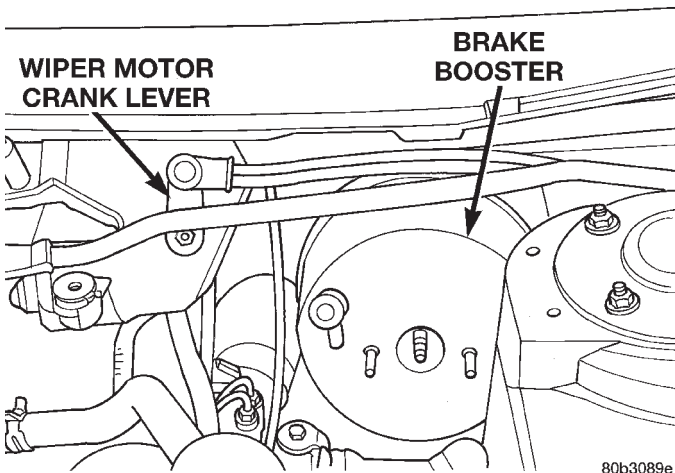
(11) Rotate screwdriver enough to allow retainer clip center tang to pass over end of brake pedal pin and pull retainer clip off pin. **Discard retainer clip it is not to be reused, replace only with a new retainer clip.**

REMOVAL AND INSTALLATION (Continued)

**Fig. 57 Master Cylinder Positioning**

(12) Remove the four nuts that attach the vacuum booster to the vehicle dash panel. Nuts are accessible from under the dash panel in the area of the steering column and pedal bracket.

(13) Rotate the windshield wiper motor crank lever until the crank lever points in the 12 o'clock position (Fig. 58).

**Fig. 58 Wiper Crank Lever Positioning**

(14) Slide the vacuum booster out of the dash panel, and remove from vehicle.

CAUTION: Do not attempt to disassemble the vacuum booster. It is serviced **ONLY** as a complete assembly.

INSTALL

- (1) Position vacuum booster on dash panel.
- (2) Install and tighten the 4 power brake booster to dash panel mounting nuts to 29 N·m (250 in. lbs.) torque.

(3) Using lubriplate, or equivalent, coat the bearing surface of brake pedal pin.

(4) Connect vacuum booster input rod to brake pedal pin and install a NEW retainer clip. **Use only a new retainer clip DO NOT USE the old clip.**

NOTE: Before installing master cylinder, reposition under hood wiring harness above master cylinder mounting studs (Fig. 57), in front of booster.

(5) Carefully position master cylinder on vacuum booster. Position wire harness routing bracket onto right master cylinder mounting stud.

(6) Install and tighten the 2 master cylinder to vacuum booster mounting nuts (Fig. 56) to 29 N·m (250 in. lbs.) torque.

(7) Reconnect brake fluid level sensor connector.

(8) Connect all vacuum hoses onto the vacuum booster check valve.

(9) Check stop light switch operation.

(10) Install the wiper module reinforcement (Fig. 55) on the vehicle. Install the 8 bolts, attaching the reinforcement (Fig. 55) to the strut towers. Install the bolt (Fig. 55) attaching the wiper module to the reinforcement.

(11) Install the covers (Fig. 54) over the wiper module and the cowl. Install and securely tighten the attaching screws.

(12) Reconnect the battery ground cable to the ground stud on the shock tower.

(13) Turn windshield wipers on, then off, in order to park wipers in the proper position before installing wiper arms.

(14) Install the wiper arms (Fig. 53) on the pivots. Install and securely tighten the wiper arm to pivot attaching nuts. Install the caps on the wiper arms covering the pivot nuts.

(15) Verify proper operation of the brake booster and brake system.

CHASSIS BRAKE TUBES AND HOSES

Always use factory recommended brake hose to ensure quality, correct length and superior fatigue life. Care should be taken to make sure that the tube and hose mating surfaces are clean and free from nicks and burrs. **Front and rear right and left side hoses, are not interchangeable.**

Connections should be correct and properly made. Use new copper seal washers on all connections using Banjo Bolts and tighten all fittings to their specified torques.

The flexible front hydraulic brake hose should always be installed on the vehicle by first attaching the Banjo connector to the caliper assembly. Then attach the remaining hose end bracket to the vehicle

REMOVAL AND INSTALLATION (Continued)

frame to minimize hose twisting. Then hand start the steel brake tube fitting into the hose end fitting. Tighten all attachment screws and tube fittings to specified torque. The frame bracket is keyed so that it will only fit one way.

Vehicles equipped with rear disc brakes have brake flex hoses attached to the brake caliper on each side of vehicle. The brake flex hose should be first attached to the Banjo bolt at the caliper, then secured to the flex hose/bracket at the rear suspension crossmember. Next, attach the rear proportioning valve to the flex hose. last, fasten the steel brake tubing to the rear proportioning valve. Tighten all attachment screws and brake line tube fittings to their specified torque (See Specifications Section) at the end of this group for the required fitting torques.

JUNCTION BLOCK (NON-ABS)

REMOVE

(1) Disconnect and isolate the negative battery connection at the right front strut tower.

(2) Using a brake pedal holding tool such as shown (Fig. 59), depress brake pedal past its first 1 inch of travel and secure in this position. This will isolate the master cylinder reservoir from the brake hydraulic system, not allowing the brake fluid to drain out of the reservoir.

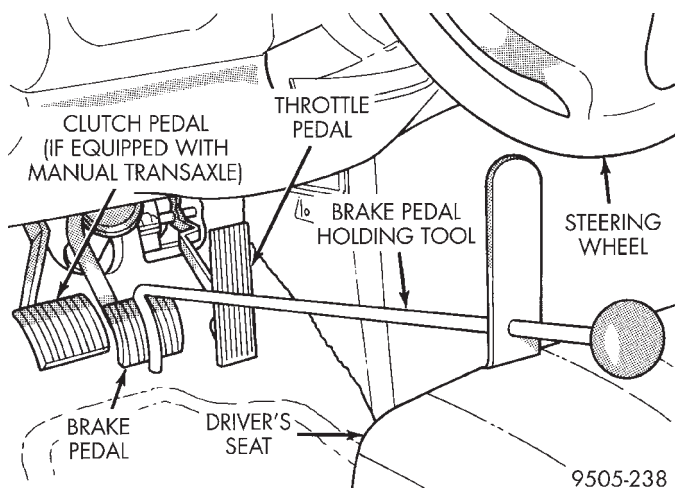


Fig. 59 Brake Pedal Holding Tool Installed

(3) Raise the vehicle on jack stands or centered on a hoist. See hoisting in the Lubrication and Maintenance section of this manual.

(4) Remove fasteners holding the forward half of the left inner fender shield in place. Move the forward half of the inner fender shield back out of the way.

(5) Clean any debris away from the fittings on top of the junction block.

(6) Remove the 4 chassis brake tubes mounted across the front top of the junction block.

(7) Remove the 2 remaining brake tubes, from the primary and secondary master cylinder ports, from the top of the junction block.

(8) Remove the 3 bolts attaching the junction block to the mounting bracket.

(9) Remove the junction block from the vehicle.

INSTALL

(1) Install the junction block to the mounting bracket using the 3 attaching bolts. Tighten bolts to 26 N·m (230 in. lbs.).

(2) Install the 2 brake tubes, from the primary and secondary master cylinder ports, to the top rear corners of the junction block. Tighten the tube fittings to 17 N·m (145 in. lbs.).

(3) Install the 4 chassis brake tubes to the junction block. Tighten the tube fittings to 17 N·m (145 in. lbs.).

(4) Reinstall the inner fender shield.

(5) Lower the vehicle to the ground.

(6) Remove the brake pedal holding tool.

(7) Bleed the Brake system. See Bleeding Brake System in the Service Adjustments section of the manual for proper bleeding procedure.

PROPORTIONING VALVE

REMOVE

(1) Raise the vehicle on jack stands or centered on a hoist. See hoisting in the Lubrication and Maintenance section of this manual.

(2) Clean any debris away from the proportioning valve, connections, and area.

(3) Remove the chassis brake tube (Fig. 60) from the proportioning valve.

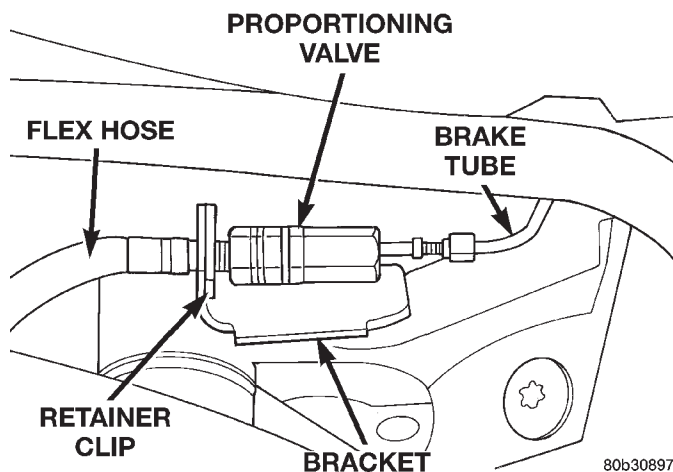


Fig. 60 Proportioning Valve

(4) Remove the proportioning valve from the rear flex hose which is held stationary by a bracket mounted on the back side of the crossmember.

REMOVAL AND INSTALLATION (Continued)

INSTALL

(1) Install the proportioning valve to the rear brake flex hose. Tighten to a torque of 17 N·m (145 in. lbs.).

(2) Install the chassis brake tube to the proportioning valve (Fig. 60). Tighten the tube nut to a torque of 17 N·m (145 in. lbs.).

(3) Bleed the affected brake line. See Bleeding Brake System in the Service Adjustments section of the manual for proper bleeding procedure.

(4) Lower the vehicle to the ground.

PARK BRAKE LEVER (PEDAL) AND FRONT CABLE ASSEMBLY**REMOVE**

NOTE: The park brake lever assembly on this vehicle is serviced with the front cable installed on it. They should be removed, replaced, and installed as an assembly.

(1) Remove remote ground cable from ground stud on shock tower. Then correctly isolate ground cable from vehicle by installing isolator on stud (Fig. 61).

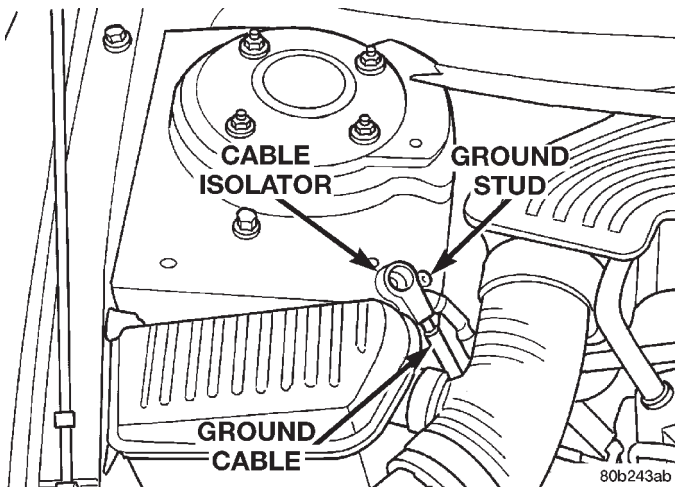


Fig. 61 Correctly Isolated Remote Ground Cable

(2) Raise the vehicle using a frame contact type hoist or correctly supported on jackstands. See Hoisting in the Lubrication and Maintenance group of this service manual for the required lifting procedure for this vehicle.

(3) Loosen the park brake tensioner adjuster nut, in front of the rear crossmember, until tension is removed from cables.

(4) Disconnect the cable connector between the front and intermediate cable.

(5) Lower the vehicle to the ground.

(6) Remove the driver's door opening sill cover.

(7) Remove the driver's side kick panel.

(8) Remove the fuse panel cover from the left end of the instrument panel (Fig. 62).

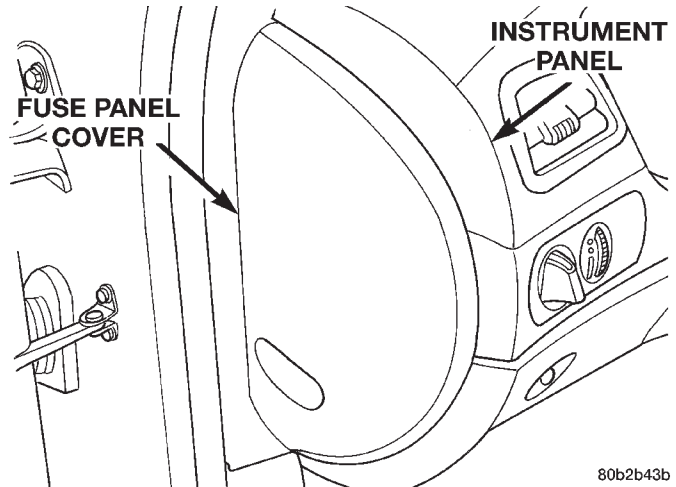


Fig. 62 Fuse Panel Cover

(9) Remove the 2 screws behind the fuse panel cover, (Fig. 63) attaching the lower instrument panel cover to the instrument panel mounting bracket.

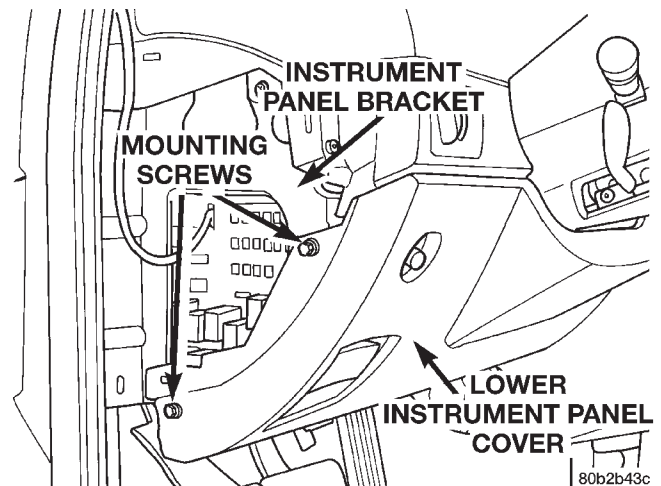


Fig. 63 Lower Instrument Panel Cover Mounting Screws

(10) Remove the lower instrument panel cover from the instrument panel. It is attached by retaining clips along the top and right edge.

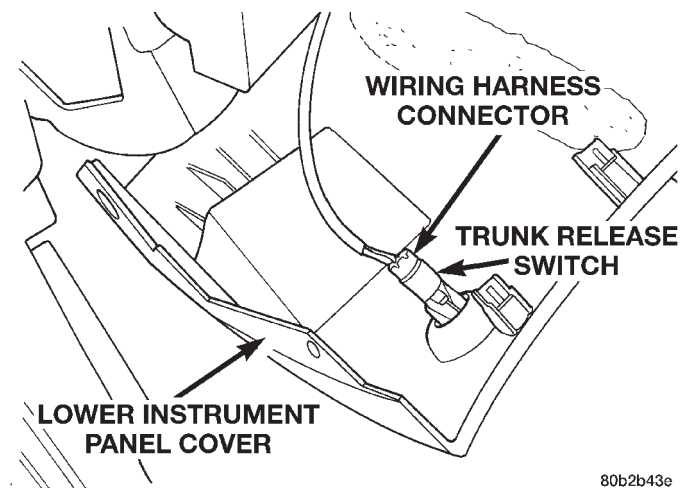
(11) Remove the wiring harness connector from the trunk release switch in the lower instrument panel cover (Fig. 64).

(12) Remove the park brake release cable, from the park brake release handle in the lower instrument panel cover (Fig. 65).

(13) Remove the 4 bolts mounting the reinforcement (Fig. 66) to the instrument panel. Remove the reinforcement from the instrument panel. Remove the diagnostic connector from the reinforcement.

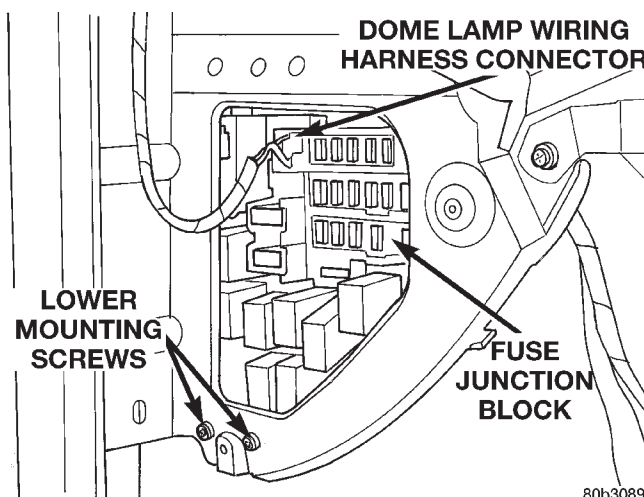
(14) Remove the lower A/C duct below the steering column. It is secured with 1 screw.

REMOVAL AND INSTALLATION (Continued)



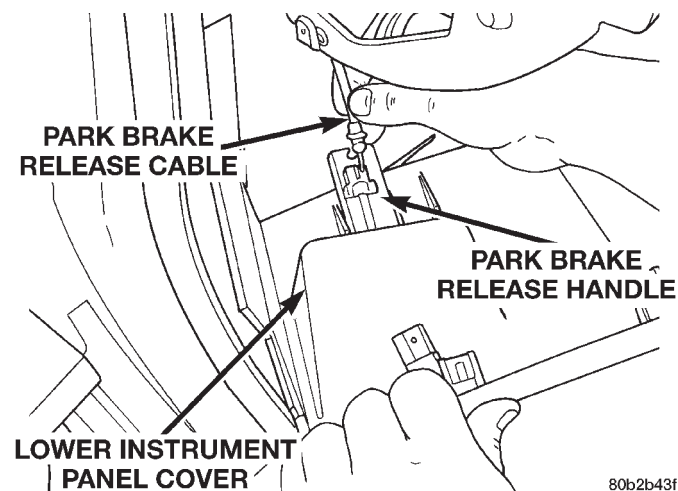
80b2b43e

Fig. 64 Trunk Release Wiring



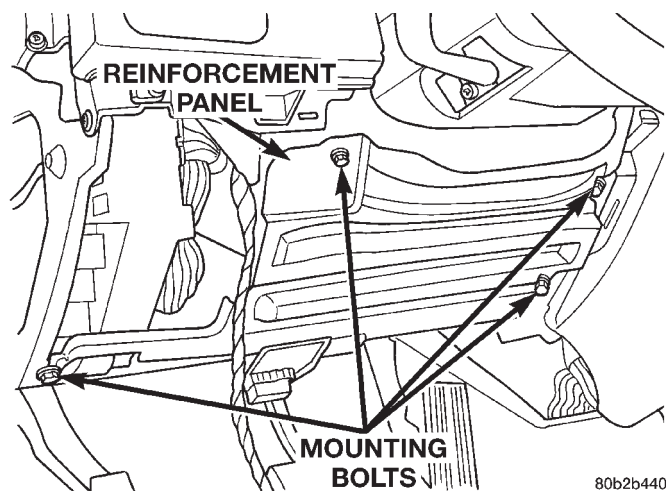
80b3089f

Fig. 67 Fuse Junction Block



80b2b43f

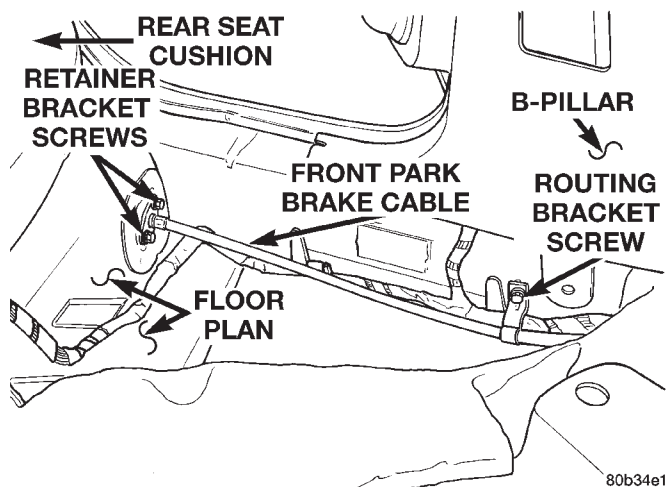
Fig. 65 Park Brake Release Cable



80b2b440

Fig. 66 Reinforcement Panel

(15) Remove the 2 lower mounting screws securing fuse junction block bracket to instrument panel end housing (Fig. 67).



80b34e10

Fig. 68 Front Park Brake Cable At Rear Floor Pan

(23) Remove 2 routing bracket screws securing front park brake cable to left side of the passenger compartment floor. One is at the base of the B-pillar by the seat belt anchor bolt (Fig. 68), and the other is

REMOVAL AND INSTALLATION (Continued)

below the park brake lever assembly on the floor pan (Fig. 69).

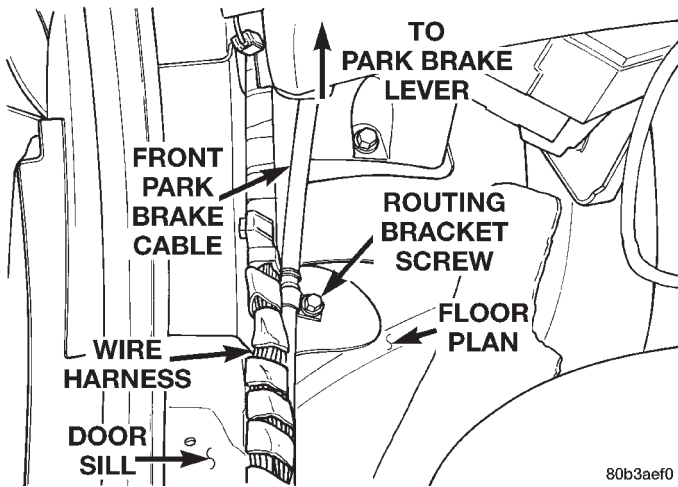


Fig. 69 Front Park Brake Cable Attachment At Front Floor Pan

(24) Remove the rear bolt, and loosen the 2 front nuts on studs, securing the park brake lever assembly in place.

(25) Lower the park brake lever assembly enough to gain access to the warning lamp ground wire connector. Remove the brake warning light ground wire from the switch on the park brake lever assembly.

(26) Continue to move park brake lever, with front park brake cable attached, downward, and remove both from vehicle together.

INSTALL

(1) Install the park brake lever, with front cable, assembly back in vehicle by first running the front cable, starting from front to the rear, along the left side of passenger compartment. Guide it into the hole at the rear of the floor pan.

(2) Guiding the lever assembly up past the fuse junction block, position the park brake release cable into place. Also, reinstall the brake warning lamp wire, through access hole in lever assembly, onto switch.

(3) Position the lever assembly in its mounting place. Install the rear mounting bolt and tighten it to a torque of 27 N·m (19 ft. lbs.). Tighten the 2 mounting nuts to a torque of 27 N·m (19 ft. lbs.).

(4) Ensure that the park brake cable is properly routed and install the two routing bracket screws.

(5) Install the 2 screws securing the front park brake cable retainer bracket to the rear floor pan.

(6) Reposition the carpeting in place.

(7) Reinstall the front seat belt anchor bolt at the base of the B-pillar.

(8) Reinstall the rear door opening sill cover.

(9) Reposition the fuse junction block in place, and install the two lower, then, the two upper mounting screws.

(10) Reinstall the lower A/C duct in place.

(11) Install the diagnostic connector to the instrument panel steel reinforcement. Reinstall the steel reinforcement to the instrument panel.

(12) Connect the park brake release cable to the release handle.

(13) Reconnect the trunk release harness connector to the release switch.

(14) Reinstall the lower instrument panel cover below the steering column. Reinstall the 2 screws securing the lower instrument panel cover behind the fuse panel cover.

(15) Reinstall the fuse panel cover on left side of instrument panel.

(16) Reinstall driver's side kick panel

(17) Reinstall driver's door opening sill cover

(18) Raise the vehicle up.

(19) Reconnect the cable connector between the front and intermediate cables.

(20) Adjust parking brake. See Adjustments in this group of the service manual for the proper parking brake adjustment procedure.

(21) Lower the vehicle.

PARK BRAKE INTERMEDIATE CABLE**REMOVE**

(1) Raise the vehicle using a frame contact type hoist or correctly supported on jackstands. See Hoisting in the Lubrication and Maintenance group of this service manual for the required lifting procedure for this vehicle.

(2) Loosen the park brake cable tensioner adjuster nut until tension is removed from cables.

(3) Disconnect the cable connector between the front and intermediate cable.

(4) Remove the bolt attaching the intermediate cable retainer to the body torque box (Fig. 70).

(5) Remove the intermediate cable from the body torque box (Fig. 70).

(6) Remove the connector from the intermediate cable at the right rear park brake cable.

(7) Remove the intermediate cable from the tensioner bracket using the box end of a 1/2 inch wrench.

(8) Release the latch on the routing clip for the intermediate cable, mounted above the left rear cable retainer clip, on rear suspension crossmember.

(9) Remove the intermediate park brake cable.

INSTALL

(1) Install the intermediate park brake cable.

REMOVAL AND INSTALLATION (Continued)

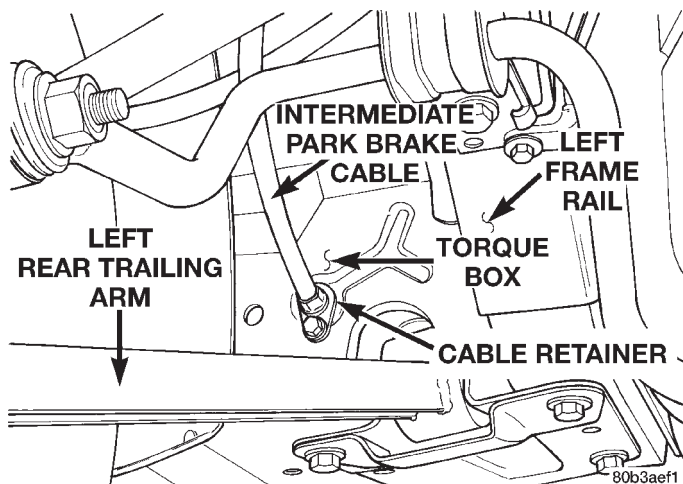


Fig. 70 Cable At Torque Box

NOTE: When guiding the cable towards the front of the rear crossmember from the left side, make sure the cable is routed between the rear suspension crossmember and the frame rail crossing below the rear park brake cable. It should also be routed below the brake tubes at this point.

(2) Install the intermediate cable to the tensioner bracket by snapping it into place.

(3) Reinstall retainer clip on top of left side of crossmember, around intermediate cable and into place.

(4) Connect the intermediate cable to the right rear cable connector.

(5) Install the intermediate cable through the hole in the body torque box (Fig. 70). Install the bolt attaching the intermediate cable retainer to the body torque box.

(6) Connect the intermediate cable to the front cable connector.

(7) Adjust parking brake. See Adjustments in this group of the service manual for the proper parking brake adjustment procedure.

(8) Lower the vehicle.

PARK BRAKE REAR CABLES

This procedure can be used to remove and install either rear park brake cable.

REMOVE

Raise vehicle using a frame contact type hoist or correctly jack and support the vehicle using jack stands. See Hoisting in the Lubrication And Maintenance Group of this service manual for the required lifting procedures to be used for this vehicle.

(1) Loose the park brake cable tensioner nut until tension is removed from cables.

(2) **Left rear cable only** - Remove the rear cable from the connector at the park brake cable tensioner.

(3) **Right rear cable only** - Remove the rear cable from the connector at the intermediate cable.

(4) Remove the retainer clip securing the preferred rear park brake cable to the crossmember (Fig. 71).

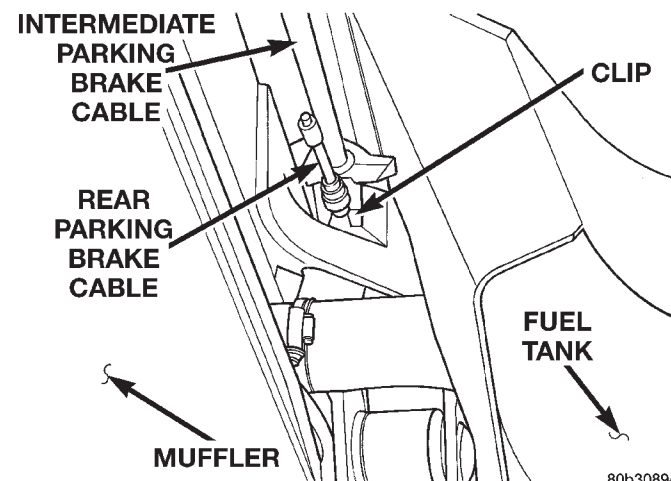


Fig. 71 Left Rear Parking Brake Retainer Clip

(5) Lower the vehicle enough to have rear brakes at good working height.

(6) Remove the rear wheel and tire assembly from the side of the vehicle requiring service to the park brake cable.

(7) Remove the rear disc brake caliper from the adapter and rotor (See Disc Brake Caliper Removal in Removal and Installation section of this group)

(8) Remove the rear brake rotor from the rear hub/bearing assembly.

(9) Remove the park brake shoes from the disc brake adapter (See Rear Disc Brake Shoes in the Removal and Installation section of this group).

(10) Remove the park brake actuator lever from the rear park brake cable.

(11) Using a screwdriver, carefully compress the retainer tabs securing the rear park brake cable to the disc brake adapter.

(12) Remove the rear park brake cable from the disc brake adapter and vehicle.

INSTALL

(1) Install the rear parking brake cable by routing the leading end above the intermediate cable, then, between the frame, crossmember, and stabilizer bar.

(2) Install the other end of the cable into the disc brake adapter, allowing the retainer tabs to lock into place in the adapter.

(3) Install the park brake actuator lever onto the end of the rear park brake cable behind the spring.

(4) Reinstall the park brake shoes.

(5) Reinstall the rear disc brake rotor on the hub/bearing.

(6) Reinstall the brake caliper on the rotor and adapter.

REMOVAL AND INSTALLATION (Continued)

- (7) Install the caliper guide pin bolts and tighten to 41 N·m (30 ft. lbs.).
- (8) Reinstall the tire and wheel assembly.
- (9) Raise the vehicle back up.
- (10) Install the rear park brake cable into the rear suspension crossmember mounting hole.
- (11) Install a new retainer clip, on the end of the cable housing, to secure it in place.
- (12) **Left rear cable only** - Connect the left rear park brake cable to the connector on the park brake cable tensioner.
- (13) **Right rear cable only** - Connect the right rear park brake cable to the connector on the intermediate park brake cable.
- (14) When repairs are complete, adjust parking brake shoes before adjusting parking brake tensioner. See Parking Brake Cable Tensioner Adjustment in the Adjustment section of this group in this service manual for complete parking brake adjustment procedure.

PARK BRAKE TENSIONER

REMOVE

(1) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual for the required lifting procedure to be used for this vehicle.

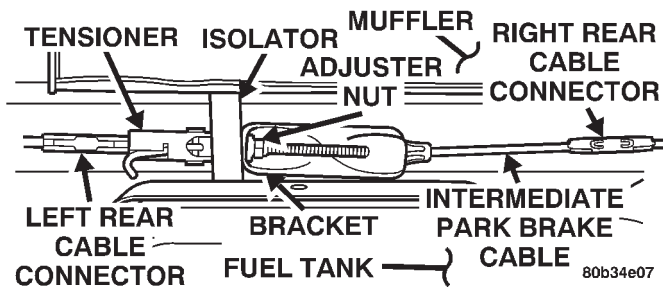


Fig. 72 Tensioner

- (2) Remove the park brake tensioner adjuster nut (Fig. 72), releasing the tensioner from the equalizer bracket to the intermediate cable.
- (3) Disconnect the connector and remove the park brake tensioner from the left rear parking brake cable (Fig. 72).
- (4) Remove the park brake tensioner with its isolator from the vehicle.

INSTALL

- (1) Mark tensioner rod 6.35 mm (1/4 in.) from edge of tensioner bracket (Fig. 73).
- (2) Install the park brake tensioner, with its isolator, in the vehicle, with the threaded adjustment

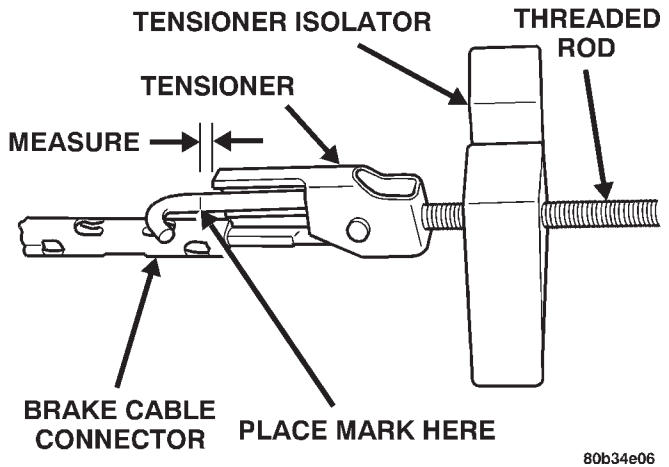


Fig. 73 Adjustment Mark On Cable Tensioner Rod

stud pointed towards the right side of the vehicle (Fig. 72).

- (3) Connect the left rear park brake cable to the cable connector on the tensioner (Fig. 72).
- (4) Attach the threaded end of the tensioner to the equalizer bracket (Fig. 72), and install a new adjuster nut. Do not tighten at this time.
- (5) Verify the rear park brake shoes are properly adjusted.
- (6) Lower vehicle enough for access to park brake foot pedal. Fully apply park brakes.

NOTE: Leave park brakes applied until adjustment is complete.

- (7) Raise vehicle again.
- (8) Tighten adjusting nut at equalizer (Fig. 72) until mark on tensioner rod (Fig. 73) moves into alignment with edge of tensioner bracket.

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

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

(10) Release park brake foot pedal and verify that rear wheels rotate freely without drag. Verify pedal returns to the fully released position.

- (11) Lower vehicle to the ground.

PARK BRAKE SHOES WITH REAR DISC BRAKES

REMOVE

- (1) Remove rear disc brake caliper assembly from adapter and rotor (See Disc Brake Caliper Removal).
- (2) Remove rear rotor from rear hub.
- (3) Remove dust cap from rear hub.

REMOVAL AND INSTALLATION (Continued)

(4) Remove the cotter pin, nut retainer, wave washer and rear hub/bearing assembly retaining nut and washer from the rear spindle.

(5) Remove rear hub and bearing assembly from rear spindle.

(6) Remove rear brake shoe assembly hold down clip.

(7) Turn brake shoe adjuster wheel until adjuster is at shortest length.

(8) Remove adjuster assembly from the parking brake shoe assemblies.

(9) Remove lower shoe to shoe spring.

(10) Pull rear brake shoe assembly away from anchor. Then remove rear brake shoe and upper spring.

(11) Remove front brake shoe hold-down clip. Then remove front brake shoe assembly.

INSTALL

(1) Install front brake shoe and hold down clip.

(2) Install rear brake shoe and the upper brake shoe to shoe return spring.

(3) Pull rear brake shoe over anchor block until properly located on adapter.

(4) Install the lower shoe to shoe return spring.

(5) Install brake shoe adjuster assembly with star wheel rearward.

(6) Install rear brake shoe hold down clip.

(7) Adjust brake shoes to a diameter to 171 mm (6.75 inch).

(8) Install rear hub and bearing assembly on spindle.

(9) Install hub and bearing assembly washer and retaining nut. Torque the hub and bearing assembly retaining nut to 168 N·m (124 ft. lbs.).

(10) Install the wave washer, retaining nut and cotter pin.

(11) Install hub and bearing assembly dust cap.

(12) Install rear rotor.

(13) Install rear disc brake caliper on the adapter (See Brake Shoe Removal).

(14) Install wheel and tire assemblies.

(15) Tighten wheel stud nuts to 129 N·m (95 ft. lbs.).

STOP LAMP SWITCH**REMOVE**

(1) Depress and hold the brake pedal.

(2) Rotate stop lamp switch in a counter-clockwise direction approximately 30 degrees.

(3) Pull the switch rearward and remove from its mounting bracket.

(4) Disconnect wiring harness connector from stop lamp switch.

INSTALL

NOTE: Prior to installing stop lamp switch into bracket, the plunger must be moved to its fully extended position using procedure in Step 1.

(1) Hold stop lamp switch firmly in one hand. Then using other hand, pull outward on the plunger of the stop lamp switch until it has ratcheted out to its fully extended position.

(2) Connect the wiring harness connector to the stop lamp switch.

(3) Mount the stop lamp switch into the bracket using the following procedure. Depress the brake pedal as far down as possible. Then install switch in bracket by aligning index key on switch with slot at top of square hole in mounting bracket. When switch is fully installed in bracket, rotate switch clockwise approximately 30° to lock switch into bracket.

CAUTION: Do not use excessive force when pulling back on brake pedal to adjust the stop lamp switch. If too much force is used, damage to the stop lamp switch or striker can result.

(4) Gently pull back on brake pedal until the pedal stops moving. This will cause the switch plunger to ratchet backward to the correct position.

DISASSEMBLY AND ASSEMBLY**BRAKE FLUID RESERVOIR****DISASSEMBLE**

(1) Using an appropriate cleaner such as Mopar, Brake Parts Cleaner, clean the master cylinder housing and brake fluid reservoir.

(2) Remove the brake fluid reservoir caps. Using a syringe or equivalent empty brake fluid from reservoir.

(3) Remove the master cylinder from the vacuum booster.

(4) Clamp the master cylinder in vise.

(5) Remove the 2 fluid reservoir to master cylinder retaining pins (Fig. 74).

NOTE: Do not pry off fluid reservoir using a tool, damage to reservoir may result.

(6) Remove reservoir from master cylinder (Fig. 75) by pulling upward on the reservoir while rock it from side to side.

(7) Remove the master cylinder housing-to-reservoir grommets (Fig. 76).

DISASSEMBLY AND ASSEMBLY (Continued)

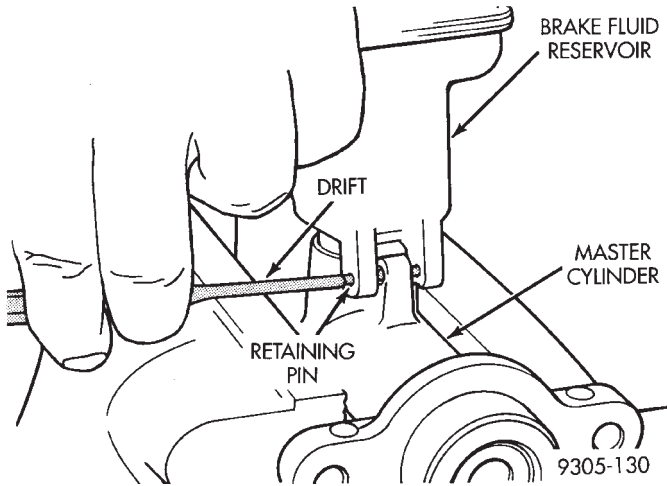


Fig. 74 Reservoir Retaining Pins

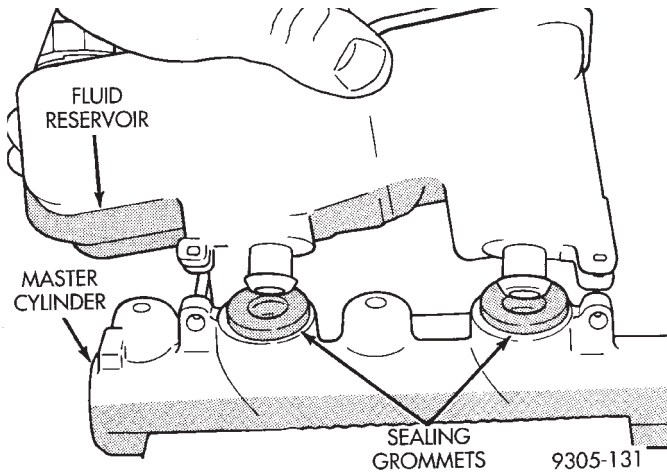


Fig. 75 Removing Reservoir

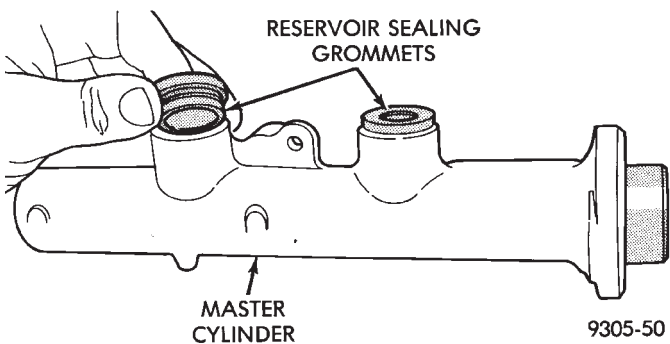


Fig. 76 Reservoir Sealing Grommets

ASSEMBLE

(1) Install new housing-to-reservoir grommets in master cylinder housing (Fig. 76).

(2) Lubricate brake fluid reservoir mounting area with clean brake fluid. Place reservoir in position over grommets. Seat reservoir into sealing grommets using a rocking motion while pushing down on reservoir.

(3) Make sure bottom of reservoir touches the top of both sealing grommets.

(4) Install the 2 fluid reservoir to master cylinder retaining pins (Fig. 74).

FRONT AND REAR DISC BRAKE CALIPER

CLEANING AND INSPECTION

Check for brake fluid leaks in and around dust boot area and inboard brake pad, and for any ruptures, brittleness or damage to the piston dust boot. If the dust boot is damaged, or a fluid leak is visible, disassemble caliper assembly and install a new piston seal and dust boot, and piston if scored. Refer to Caliper Disassembly And Re-Assembly Procedures in Disc Brake Caliper Service in this section of the service manual.

Check the guide pin dust boots to determine if they are in good condition. Replace if they are damaged, dry, or found to be brittle. Refer to Guide Pin Bushing Service in Disc Brake Caliper Service in this section of the service manual.

CALIPER GUIDE PIN BUSHING SERVICE

The double pin caliper uses a sealed for life bushing and sleeve assembly. If required this assembly can be serviced using the following procedure.

REMOVING CALIPER GUIDE PIN BUSHINGS

(1) Remove caliper from brake rotor (See Brake Shoe Removal). Hang caliper assembly on a wire hook away from the brake rotor.

(2) Push out and then pull the steel sleeve from the inside of the bushing using your fingers as shown in (Fig. 77).

(3) Using your fingers, collapse one side of the bushing. Then pull on the opposite side to remove the bushing from the brake caliper housing (Fig. 78).

INSTALLING CALIPER GUIDE PIN BUSHINGS

(1) Fold the bushing in half lengthwise at the solid middle section of the bushing (Fig. 79).

(2) Insert the folded bushing into the caliper housing (Fig. 80). **Do not use a sharp object to perform this step due to possible damage to the bushing.**

(3) Unfold the bushing using your fingers or a wooden dowel until the bushing is fully seated into the caliper housing. Flanges should be seated evenly on both sides of the bushing hole (Fig. 81).

(4) Lubricate the inside surfaces of the bushing using Mopar, Silicone Dielectric Compound or an equivalent.

(5) Install guide pin sleeve into one end of bushing until seal area of bushing is past seal groove in sleeve (Fig. 82).

DISASSEMBLY AND ASSEMBLY (Continued)

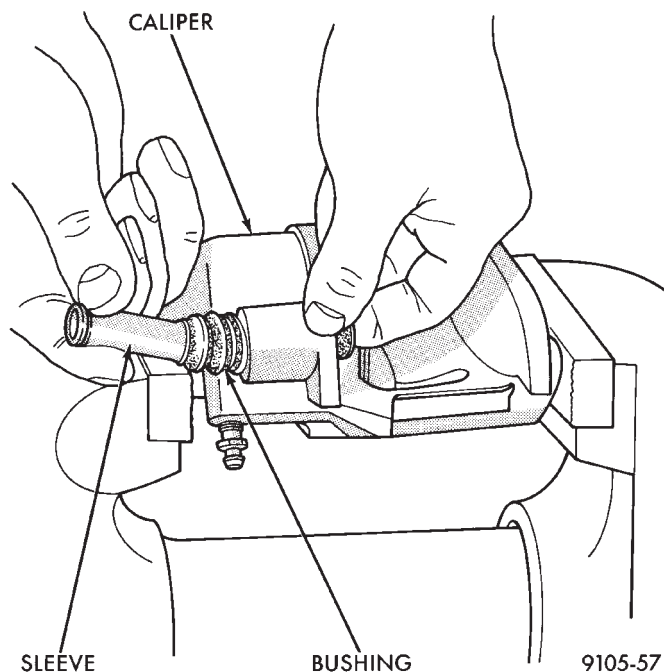


Fig. 77 Removing Inner Sleeve From Bushing

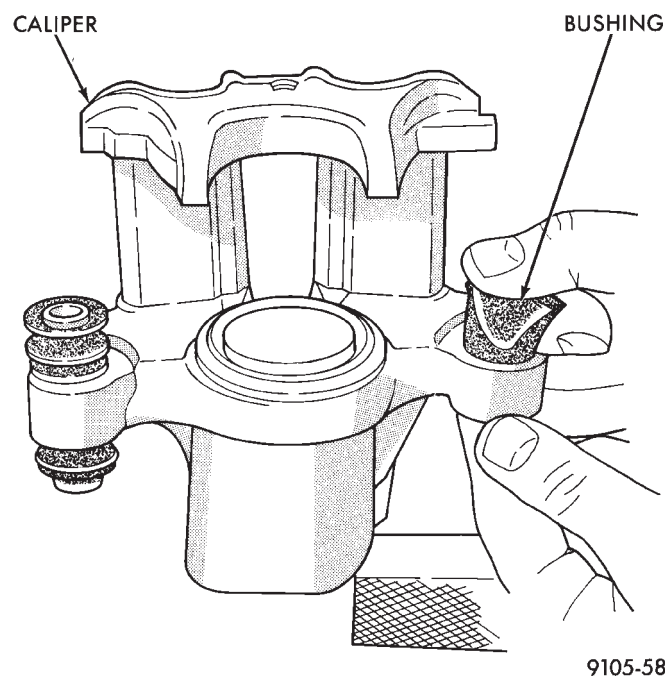
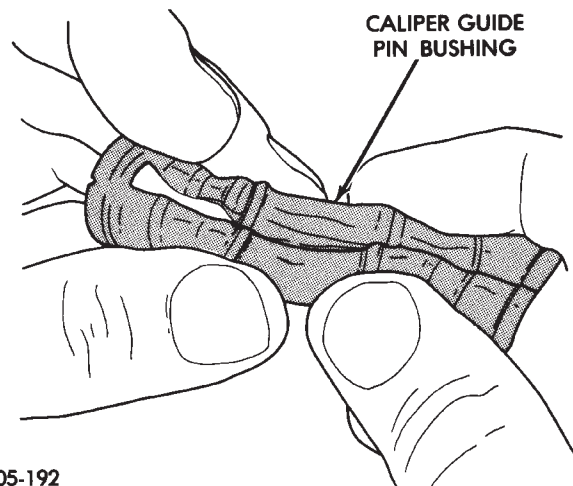


Fig. 78 Removing Bushing From Caliper

(6) Holding convoluted boot end of bushing with one hand, push steel sleeve bushing through boot until one end of bushing is fully seated into seal groove on one end of sleeve (Fig. 82).

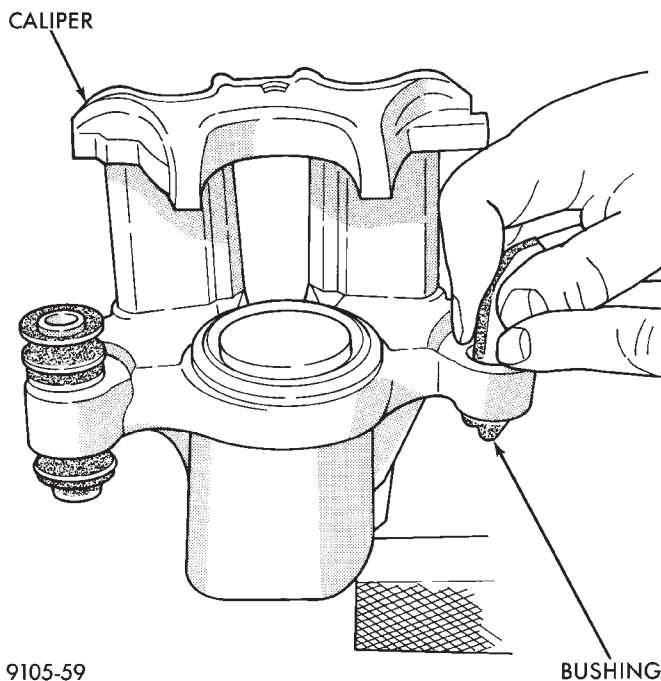
(7) Holding sleeve in place, work other end of bushing over end of sleeve and into the seal groove on sleeve (Fig. 83). Be sure other end of bushing did not come out of seal groove in sleeve.

(8) When the sleeve is seated properly into the bushing, the sealed for life sleeve/bushing can be



9205-192

Fig. 79 Folded Caliper Guide Pin Bushing



9105-59

Fig. 80 Installing Caliper Guide Pin Bushing

held between your fingers and easily slid back and forth without the bushing unseating from the sleeve groove.

CALIPER DISASSEMBLY

WARNING: UNDER NO CONDITION SHOULD AIR PRESSURE EVER BE USED TO REMOVE A PISTON FROM A CALIPER BORE. PERSONAL INJURY COULD RESULT FROM SUCH A PRACTICE.

(1) Remove caliper from brake rotor (See Brake Shoe Removal). Hang assembly on a wire hook away from rotor, so hydraulic fluid cannot get on rotor. Place a small piece of wood between the piston and caliper fingers.

DISASSEMBLY AND ASSEMBLY (Continued)

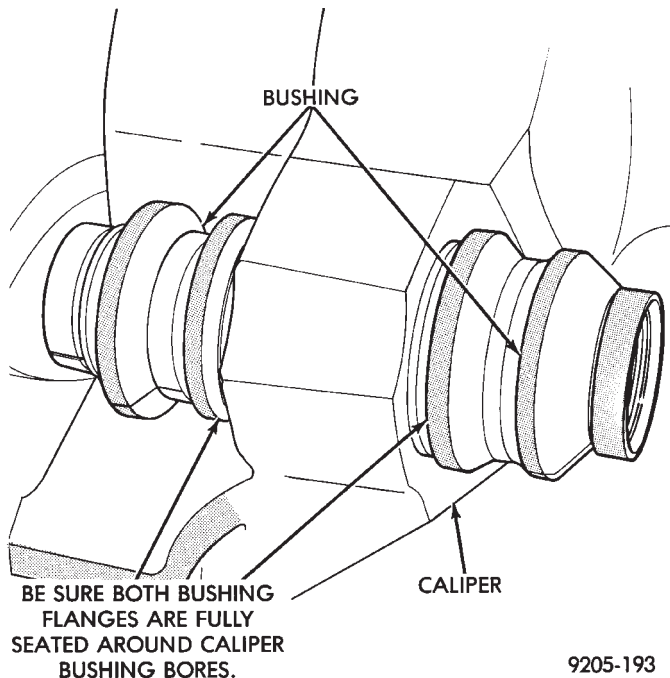


Fig. 81 Bushing Correctly Installed In Caliper

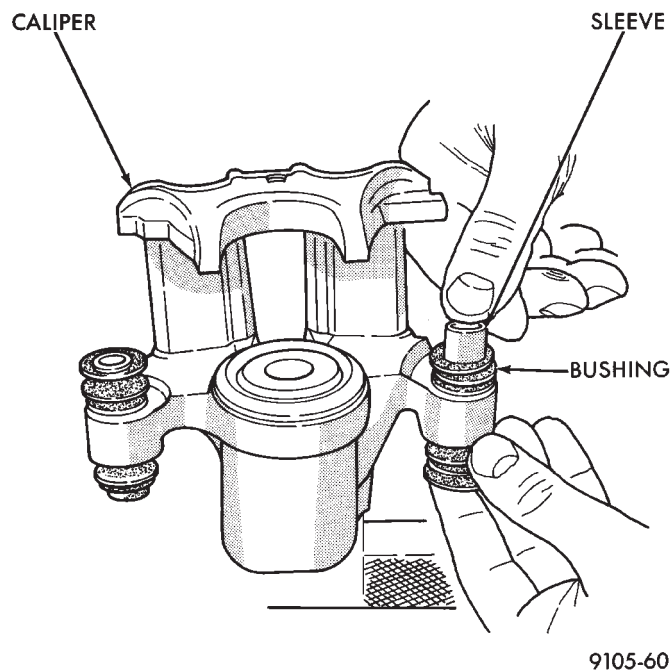


Fig. 82 Installing Sleeve In Bushing

(2) **Carefully** depress brake pedal to hydraulically push piston out of bore. Then apply and hold down the brake pedal to any position beyond the first inch of pedal travel. This will prevent loss of brake fluid from the master cylinder.

(3) If both front caliper pistons are to be removed, disconnect brake tube at flexible brake hose at frame rail. Plug brake tube and remove piston from opposite caliper using the same process as above for the first piston removal.

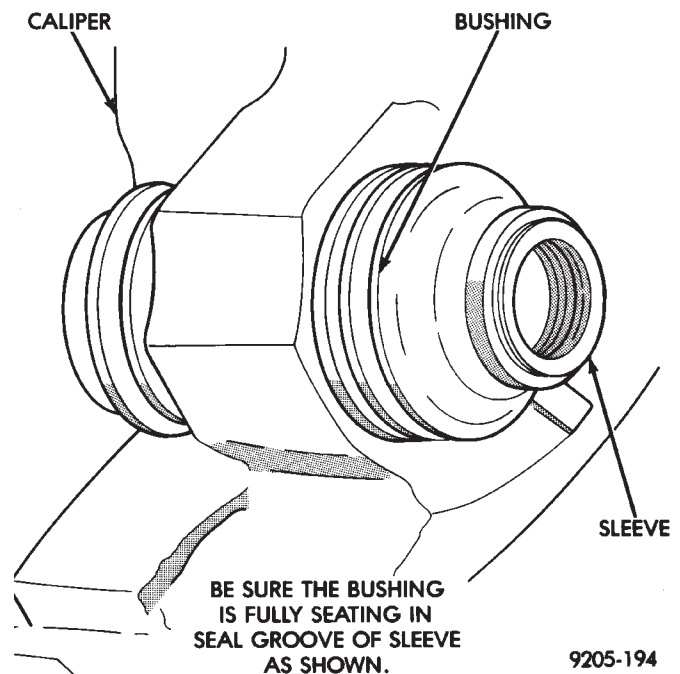


Fig. 83 Correctly Installed Caliper Sleeve And Bushing

(4) Disconnect the brake fluid flex hose from the caliper assembly.

CAUTION: Do not use excessive force when clamping caliper in vise. Excessive vise pressure will cause bore distortion and binding of piston.

(5) To disassemble caliper, mount in a vise equipped with protective jaws.

(6) Remove guide pin sleeves and guide pin bushings. See Removing Guide Pin Bushings in the caliper disassembly section of this manual.

(7) Remove the piston dust boot from the caliper and discard (Fig. 84).

(8) Using a soft tool, such as a plastic trim stick, work piston seal out of its groove in caliper piston bore (Fig. 85). Discard old seal. **Do not use a screw driver or other metal tool for this operation, because of the possibility of scratching piston bore or burring edges of seal groove.**

(9) Clean all parts using alcohol or a suitable solvent and wipe dry **using only a lint free cloth**. No lint residue can remain in caliper bore. Clean out all drilled passages and bores. **Whenever a caliper has been disassembled, a new boot and seal must be installed at assembly.**

(10) Inspect the piston bore for scoring or pitting. Bores that show light scratches or corrosion can usually be cleared of the light scratches or corrosion using crocus cloth. Bores that have deep scratches or scoring should be honed. Use Caliper Hone, Special Tool C-4095, or equivalent providing the diameter of

DISASSEMBLY AND ASSEMBLY (Continued)

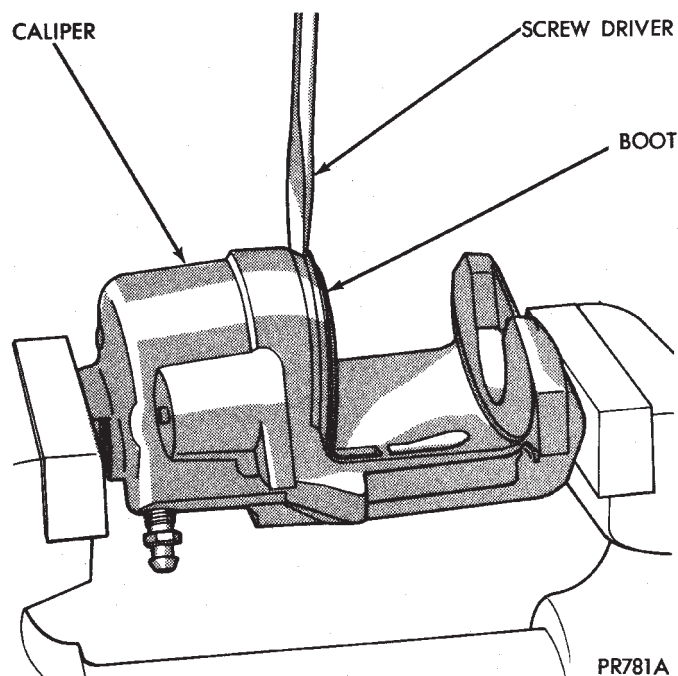


Fig. 84 Removing Caliper/Piston Dust Boot

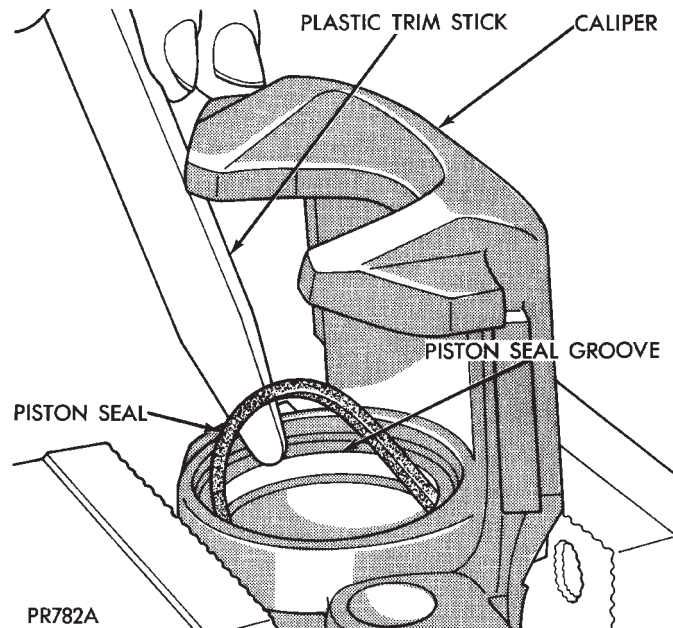


Fig. 85 Removing Piston Seal From Caliper

the bore is not increased more than 0.0254 mm (0.001 inch) (Fig. 86).

(11) If the bore does not clean up within this specification, a new caliper housing should be installed. Install a new piston if the old one is pitted or scored.

NOTE: When using Caliper Honing Tool, Special Tool C-4095, coat the stones and bore with brake fluid. After honing the bore, carefully clean the seal and boot grooves with a stiff non-metallic rotary brush.

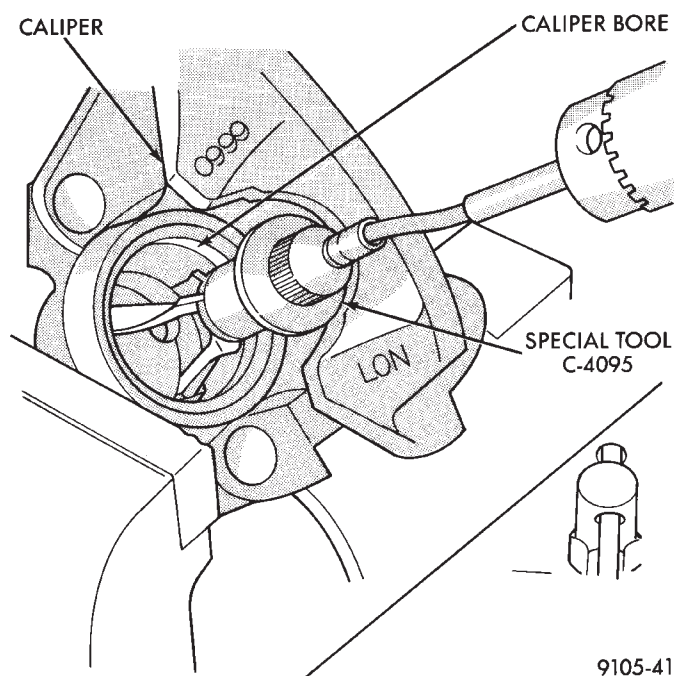


Fig. 86 Honing Brake Caliper Piston Bore

NOTE: Use extreme care in cleaning the caliper after honing. Remove all dirt and grit by flushing the caliper with brake fluid; wipe dry with a clean, lint free cloth and then clean a second time.

CAUTION: When inspecting caliper piston, do not use anything but solvents to clean piston surface. If surface of piston cannot be cleaned using only solvents, piston must be replaced.

(12) Inspect caliper piston for pitting, scratches, or any physical damage. Replace piston if there is evidence of scratches, pitting or physical damage.

CALIPER ASSEMBLY

CAUTION: Excessive vise pressure will cause bore distortion and binding of piston.

(1) Clamp caliper in a vise (with protective caps installed on jaws of vise).

(2) Dip new piston seal in clean brake fluid and install in the groove of the caliper bore. Seal should be positioned at one area in groove and gently worked around the groove (Fig. 87), using only your fingers until properly seated. **NEVER USE AN OLD PISTON SEAL.** Be sure that fingers are clean and seal is not twisted or rolled (Fig. 87).

(3) Coat new piston boot with clean brake fluid leaving a generous amount inside boot.

(4) Position dust boot over piston after coating with brake fluid.

DISASSEMBLY AND ASSEMBLY (Continued)

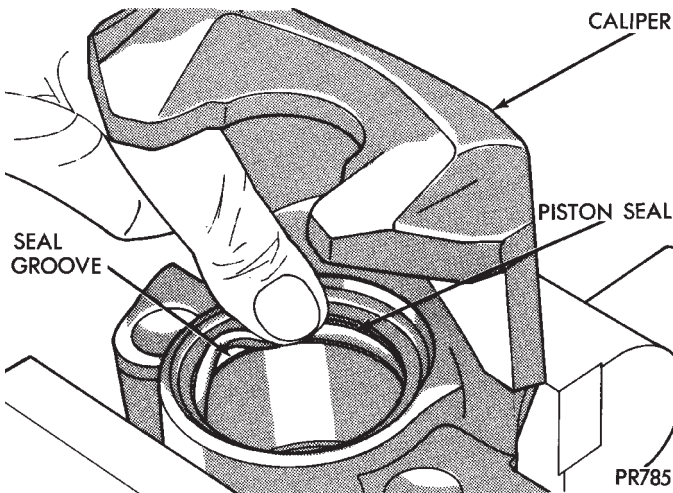


Fig. 87 Installing New Piston Seal In Caliper

CAUTION: Force must be applied to the piston uniformly to avoid cocking and binding of the piston in the bore of the caliper.

(5) Install piston into caliper bore pushing it past the piston seal until it bottoms in the caliper bore (Fig. 88).

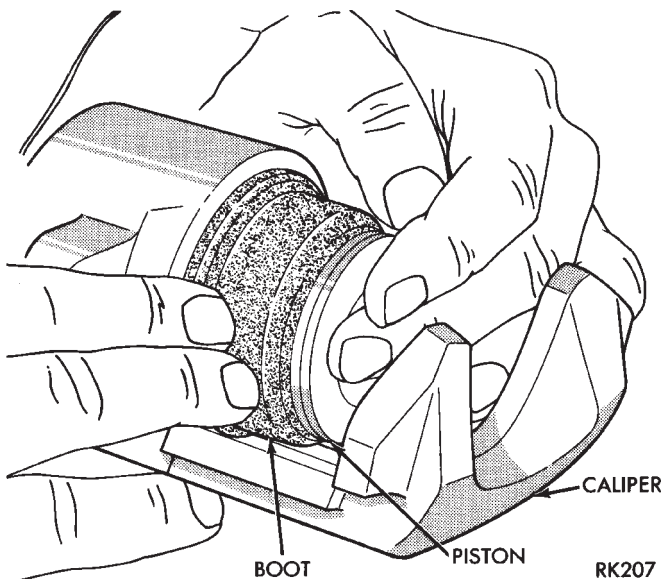
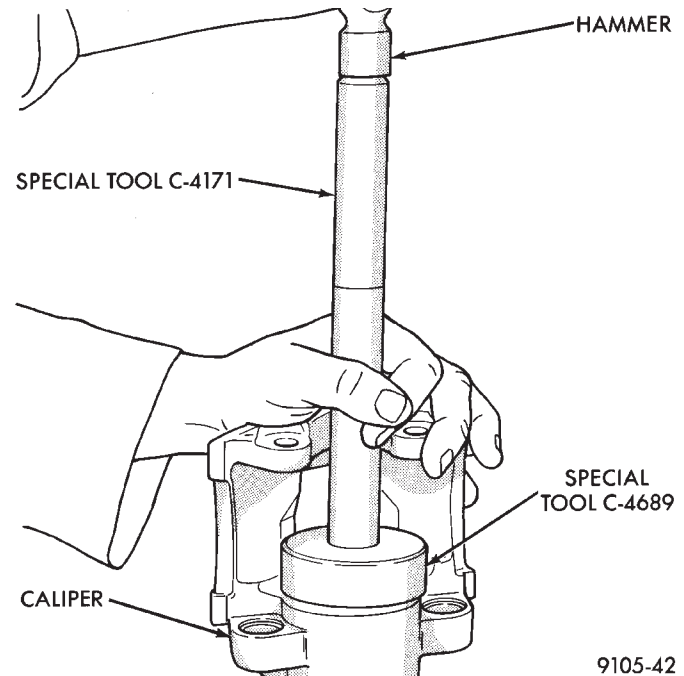


Fig. 88 Installing Piston Into Caliper Bore

(6) Position dust boot into the counterbore of the caliper assembly piston bore.

(7) Using a hammer and Installer Piston Caliper Boot, Special Tool C-4689 and Handle, Special Tool C-4171, drive boot into counterbore of the caliper (Fig. 89).

(8) Install guide pin sleeves and bushings. See Install Guide Pin Bushings section in the caliper disassembly section of this manual.



9105-42

Fig. 89 Installing Dust Boot In Caliper Counterbore

(9) Install brake pads. See Installing Brake Pads in the Brake Pad Service Procedures section of this manual.

(10) Before installing caliper assembly on vehicle, inspect brake rotor. If any conditions as described in Checking Brake Rotor for Runout and Thickness are present the rotor, must be replaced or refaced. If the rotor does not require any servicing, install caliper assembly.

(11) Install brake hose onto caliper using banjo bolt. Torque the brake hose to caliper assembly banjo bolt to 33 N·m (24 ft. lbs.). **New seal washers MUST always be used when installing brake hose to caliper.**

(12) Bleed the brake system (see Bleeding Brake System).

CLEANING AND INSPECTION

FRONT DISC BRAKES

BRAKE SHOE (PAD) LINING WEAR

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the wheel and tire assemblies, and the calipers.

Remove the front disc brake shoes. Refer to Front Disc Brake Shoe Removal in the Removal And Installation section in this group of the service manual for the required procedure.

CLEANING AND INSPECTION (Continued)

The combined brake shoe and lining material thickness should be measured at the thinnest part of the assembly.

When a set of brake shoes are worn to a total thickness of approximately 6.5 mm (1/4 inch), they should be replaced.

Replace **both** brake shoe assemblies (inboard and outboard). It is necessary that **both** front wheel sets be replaced whenever brake shoe assemblies on either side are replaced.

If the brake shoe assemblies do not require replacement, reinstall, the assemblies making sure each brake shoe is returned to the original position. Refer to Front Disc Brake Shoe Installation in the Removal And Installation section in this group of the service manual for the required procedure.

CALIPER INSPECTION

Check for brake fluid leaks in and around boot area and inboard lining, and for any ruptures, brittleness or damage to the piston dust boot. If the boot is damaged, or a fluid leak is visible, disassemble caliper assembly and install a new seal and boot, and piston if scored. Refer to Front Disc Brake Caliper in the Disassembly And Assembly Section in this group of the service manual.

Check the guide pin dust boots to determine if they are in good condition. Replace if they are damaged, dry, or found to be brittle. Refer to Front Disc Brake Caliper in the Disassembly And Assembly Section in this group of the service manual.

REAR DISC BRAKES

BRAKE PAD LINING WEAR

If a visual inspection does not adequately determine the condition of the lining, a physical check will be necessary. To check the amount of lining wear, remove the wheel and tire assemblies, and the calipers.

Remove the rear disc brake shoes. Refer to Rear Disc Brake Shoe Removal in the Removal And Installation section in this group of the service manual for the required procedure.

The combined brake shoe and lining material thickness should be measured at the thinnest part of the assembly.

When a set of brake shoes are worn to a total thickness of approximately 7.0 mm (9/32 inch) they should be replaced.

Replace **both** brake shoe assemblies (inboard and outboard). It is necessary that **both** rear wheel sets be replaced whenever brake shoe assemblies on either side are replaced.

If the brake shoe assemblies do not require replacement, reinstall, the assemblies making sure each brake shoe is returned to the original position.

Refer to Rear Disc Brake Shoe Installation in the Removal And Installation section in this group of the service manual for the required procedure.

CALIPER INSPECTION

Check for brake fluid leaks in and around boot area and inboard lining, and for any ruptures, brittleness or damage to the piston dust boot. If the boot is damaged, or a fluid leak is visible, disassemble caliper assembly and install a new seal and boot, and piston if scored. Refer to Rear Disc Brake Caliper in the Disassembly And Assembly Section in this group of the service manual.

Check the guide pin dust boots to determine if they are in good condition. Replace if they are damaged, dry, or found to be brittle. Refer to Rear Disc Brake Caliper in the Disassembly And Assembly Section in this group of the service manual.

CHASSIS TUBES AND HOSES

Flexible rubber hose is used at both front and rear brakes. Inspection of brake hoses should be performed whenever the brake system is serviced and every 7,500 miles or 12 months, whichever comes first (every engine oil change). Inspect hydraulic brake hoses for severe surface cracking, scuffing, worn spots or physical damage. If the fabric casing of the rubber hose becomes exposed due to cracks or abrasions in the rubber hose cover, the hose should be replaced immediately. Eventual deterioration of the hose can take place with possible burst failure. Faulty installation can cause twisting, resulting in wheel, tire, or chassis interference.

The steel brake tubing should be inspected periodically for evidence of corrosion, physical damage or contact with moving or hot components of the vehicle.

ADJUSTMENTS

STOP LAMP SWITCH

(1) Remove stop lamp switch from its bracket by rotating it approximately 30° in a counter-clockwise direction.

(2) Disconnect wiring harness connector from stop lamp switch.

(3) Hold stop lamp switch firmly in one hand. Then using other hand, pull outward on the plunger of the stop lamp switch until it has ratcheted out to its fully extended position.

(4) Install the stop lamp switch into the bracket using the following procedure. Depress the brake pedal as far down as possible. Then while keeping the brake pedal depressed, install the stop lamp switch into the bracket by aligning index key on switch with slot at top of square hole in mounting

ADJUSTMENTS (Continued)

bracket. When switch is fully installed in the square hole of the bracket, rotate switch clockwise approximately 30° to lock the switch into the bracket.

CAUTION: Do not use excessive force when pulling back on brake pedal to adjust the stop lamp switch. If too much force is used, damage to the vacuum booster, stop lamp switch or striker can result.

(5) Connect the wiring harness connector to the stop lamp switch.

(6) Gently pull back on brake pedal until the pedal stops moving. This will cause the switch plunger to ratchet backward to the correct position.

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) Fully back off cable tensioner adjusting nut at equalizer to create slack in cables.
- (3) Remove rear wheel/tire assemblies. Remove brake calipers and rotors.
- (4) Verify park brakes are in good condition and operating properly.
- (5) Verify park brake cables operate freely and are not binding, or seized.
- (6) Check park brake shoe adjustment.
- (7) Reinstall rotors and make sure rotors turn freely.
- (8) Reinstall brake calipers. Tighten guide pin bolts to 41 n·m (30 ft. lbs.).
- (9) Reinstall wheel/tire assemblies after brake shoe adjustment is complete.
- (10) Lower vehicle enough for access to park brake foot pedal. Fully apply park brakes.

NOTE: Leave park brakes applied until adjustment is complete.

- (11) Raise vehicle again.
- (12) Mark tensioner rod 6.35 mm (1/4 in.) from edge of tensioner bracket (Fig. 90).
- (13) Tighten adjusting nut at equalizer until mark on tensioner rod moves into alignment with tensioner bracket.

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

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

(15) Release park brake foot pedal and verify that rear wheels rotate freely without drag. Verify pedal returns to fully released position.

(16) Lower the vehicle.

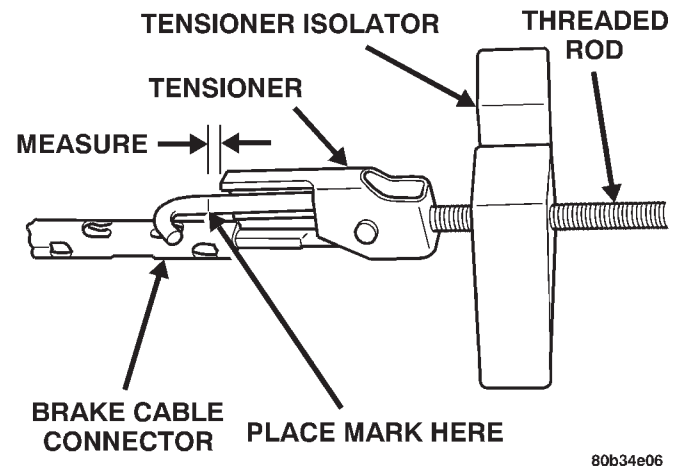


Fig. 90 Adjustment Mark On Cable Tensioner Rod
SPECIFICATIONS

BRAKE FLUID

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

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

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

SPECIFICATIONS (Continued)

BRAKE ACTUATION SYSTEM

ACTUATION

Vacuum Operated Power Brakes Standard
Hydraulic System Dual-Diagonally Split

MASTER CYLINDER ASSEMBLY:

Type Dual Tandem
Body Material Anodized Aluminum
Reservoir Material Glass Reinforced Nylon

MASTER CYLINDER BORE / STROKE AND
SPLIT:

All 23.8 mm x 39.4 mm (.937 in. x 1.55 in.)
Displacement Split 50 / 50

MASTER CYLINDER FLUID OUTLET PORTS:

Outlet Fitting Type ISO Flare
Primary Tube Nut Thread M-12
Secondary Tube Nut Thread M-10

ABS INTEGRATED CONTROL UNIT (ICU):

Hydraulic Tube Fitting Type ISO Flare
BOOSTER:

Make/Type . Bosch, Vacuum Assist With And With
Out ABS

Mounting Studs M8 x 1.25
Type 205 mm With And With Out ABS
Boost At 20 inches Of Manifold

Vacuum 4690 All

IN-LINE PROPORTIONING VALVE:

Material Aluminum
Function Hydraulic Pressure Proportioning

BRAKE PEDAL

Pedal Ratio 3.18:1

BRAKE FASTENER TORQUE SPECIFICATIONS

DESCRIPTION TORQUE

BRAKE TUBES:

Tube Nuts 17 N·m (145 in. lbs.)

BRAKE HOSE:

Caliper Banjo Bolt 48 N·m (35 ft. lbs.)
Intermediate Bracket 12 N·m (105 in. lbs.)

MASTER CYLINDER:

Mounting Nuts 28 N·m (250 in. lbs.)

BRAKE BOOSTER:

Dash Panel
Mounting Nuts 28 N·m (250 in. lbs.)

JUNCTION BLOCK (NON-ABS BRAKES)

Support Bracket Bolts 26 N·m (230 in. lbs.)

DISC BRAKE CALIPER:

Guide Pin Bolts 22 N·m (192 in. lbs.)
Bleeder Screw 15 N·m (125 in. lbs.)

ABS INTEGRATED CONTROL UNIT (ICU):

Mounting Bracket Bolts 11 N·m (97 in. lbs.)
Mounting Bracket To Frame Bolts 26 N·m
(230 in. lbs.)

CAB To HCU Screws 2 N·m (17 in. lbs.)

PARKING BRAKE:

Lever Assembly Mounting Bolts 28 N·m
(250 in. lbs.)

REAR HUB AND BEARING:

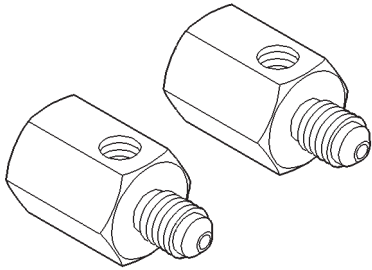
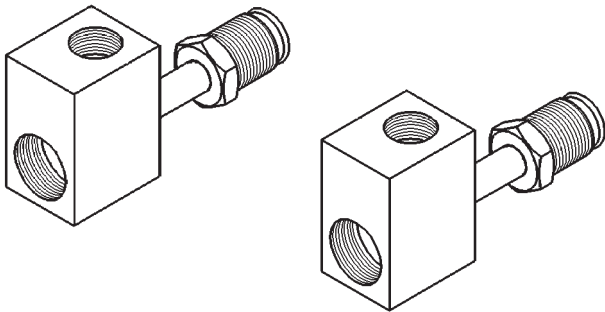
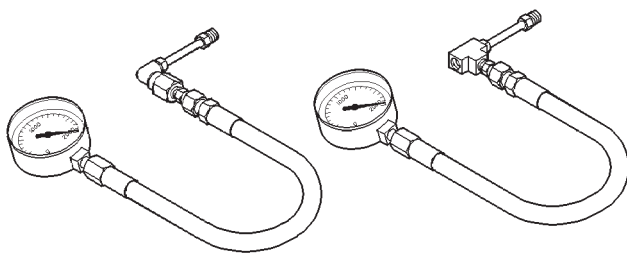
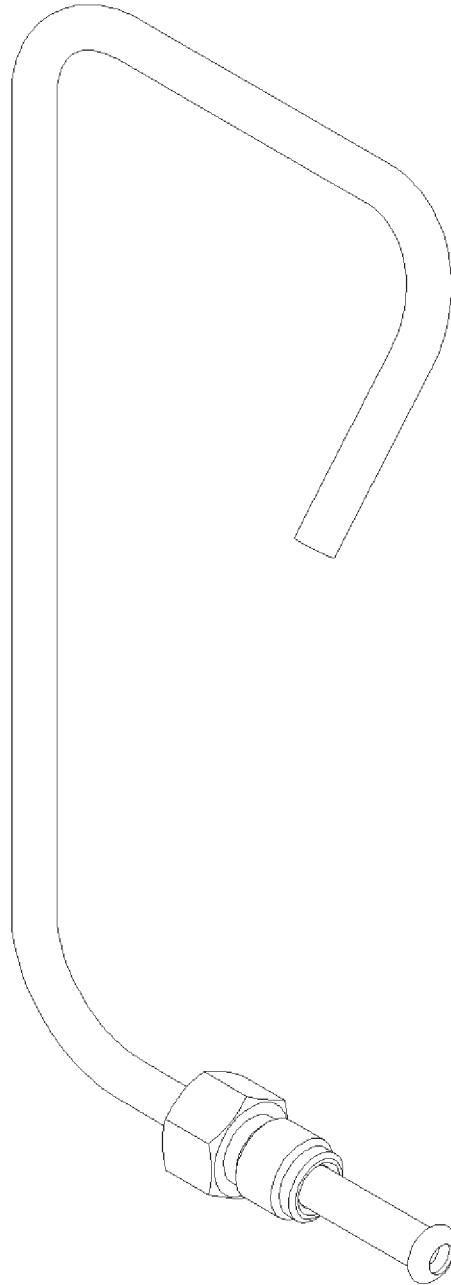
Spindle Retaining Nut 168 N·m (124 ft. lbs.)

WHEEL:

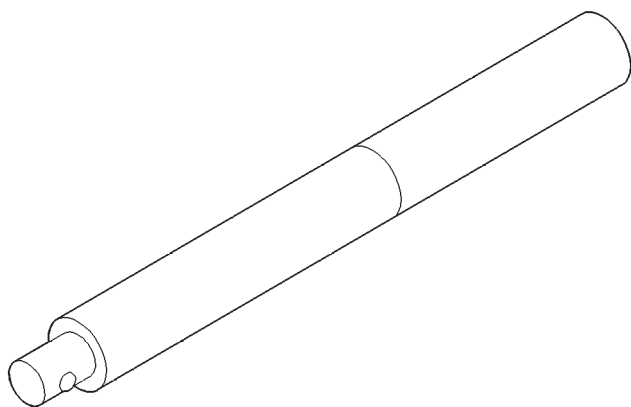
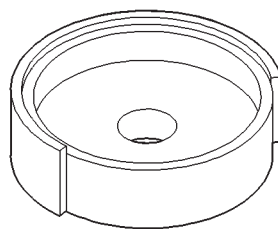
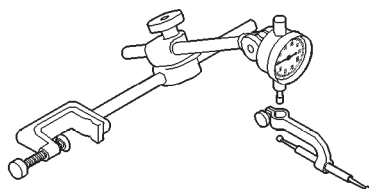
Mounting Nut 110-135 N·m (85-115 ft. lbs.)

SPECIAL TOOLS

BASE BRAKE SYSTEM

*Adapters, Brake Pressure Test 6892**Adapters, Brake Pressure Test 8187**Gauge Set C-4007-A**Master Cylinder Bleed Tube 8305*

SPECIAL TOOLS (Continued)

***Handle, Universal C-4171******Installer, Dust Boot C-4689***

8011d42b

Dial Indicator C-3339

ANTILOCK BRAKE SYSTEM-MARK 20

INDEX

	page	page
DESCRIPTION AND OPERATION		
ABS BRAKE SYSTEM COMPONENTS	53	BRAKE FLUID CONTAMINATION 62
ABS BRAKES OPERATION AND VEHICLE PERFORMANCE	51	DRB DIAGNOSTIC SCAN TOOL USAGE 60
ABS COMPONENT ABBREVIATION LIST	51	INTERMITTENT DIAGNOSTIC TROUBLE CODES 61
ABS FLUID ACCUMULATORS	54	TEST DRIVING ABS COMPLAINT VEHICLE 62
ABS FUSES	54	TONE WHEEL INSPECTION 62
ABS RELAYS	54	SERVICE PROCEDURES
ABS WARNING LAMP (YELLOW)	55	BLEEDING TEVES MARK 20 HYDRAULIC SYSTEM 62
ANTILOCK BRAKES	51	BRAKE FLUID LEVEL INSPECTION 62
CONTROLLER ANTILOCK BRAKE (CAB)	55	REMOVAL AND INSTALLATION
HCU PUMP/MOTOR	54	ABS GENERAL SERVICE PRECAUTIONS 63
HYDRAULIC CIRCUITS AND VALVE OPERATION	56	ABS INTEGRATED CONTROL UNIT 64
INLET AND OUTLET VALVES AND SOLENOIDS .	54	CONTROLLER ANTILOCK BRAKES (CAB) 66
INTEGRATED CONTROL UNIT (ICU)	53	FRONT WHEEL SPEED SENSORS 66
WHEEL SPEED SENSORS	54	MASTER CYLINDER AND POWER BRAKE BOOSTER 66
DIAGNOSIS AND TESTING		PROPORTIONING VALVES 65
ABS BRAKE DIAGNOSTIC TOOL CONNECTOR .	60	REAR WHEEL SPEED SENSORS 67
ABS DIAGNOSTIC TROUBLE CODES	61	SPECIFICATIONS
ABS DIAGNOSTICS MANUAL	60	BRAKE FASTENER TORQUE SPECIFICATIONS 68
ABS GENERAL DIAGNOSTICS INFORMATION .	60	SPEED SENSOR TONE WHEEL RUNOUT 68
ABS SERVICE PRECAUTIONS	60	WHEEL SPEED SENSOR TO TONE WHEEL CLEARANCE 68
ABS SYSTEM SELF DIAGNOSTICS	60	
ABS WIRING DIAGRAM INFORMATION	60	

DESCRIPTION AND OPERATION

ANTILOCK BRAKES

The purpose of an Antilock Brake System (ABS) is to prevent wheel lock-up under braking conditions on virtually any type of road surface. 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.

This section of the service manual covers the description and on-car service for the ITT Teves Mark 20 ABS Brake System. If service is required on base brake system components used in conjunction with this system, refer to the Base Brake System section within this group of the service manual for the specific service information required.

ABS COMPONENT ABBREVIATION LIST

In this section of the service manual, several abbreviations are used for the components of the

Teves Mark 20 ABS Brake System. They are listed below for your reference.

- CAB—Controller Antilock Brake
- ICU—Integrated Control Unit
- HCU—Hydraulic Control Unit
- TCS—Traction Control System
- ABS—Antilock Brake System
- PSI—Pounds Per Square Inch (pressure)
- WSS—Wheel Speed Sensor
- FWD—Front Wheel Drive
- DTC—Diagnostic Trouble Code

ABS BRAKES OPERATION AND VEHICLE PERFORMANCE

This ABS System represents the current state-of-the-art in vehicle braking systems and offers the driver increased safety and control during braking. This is accomplished by a sophisticated system of electrical and hydraulic components. As a result, there are a few performance characteristics that may at first seem different but should be considered normal. These characteristics are discussed below.

DESCRIPTION AND OPERATION (Continued)

NORMAL BRAKING SYSTEM FUNCTION

Under normal braking conditions, the ABS System functions the same as a standard brake system with a diagonally split master cylinder and conventional vacuum assist.

ABS SYSTEM OPERATION

If a wheel locking tendency is detected during a brake application, the brake system will enter the ABS mode. During ABS braking, hydraulic pressure in the four wheel circuits is modulated to prevent any wheel from locking. Each wheel circuit is designed with a set of electric solenoids to allow modulation, although for vehicle stability, both rear wheel solenoids receive the same electrical signal.

During an ABS stop, the brakes hydraulic system is still diagonally split. However, the brake system pressure is further split into four control channels. During antilock operation of the vehicle's brake system the front wheels are controlled independently and are on two separate control channels and the rear wheels of the vehicle are controlled together.

The system can build and release pressure at each wheel, depending on signals generated by the wheel speed sensors (WSS) at each wheel and received at the Controller Antilock Brake (CAB).

ABS operation is available at all vehicle speeds above 3 to 5 mph. Wheel lockup may be perceived at the very end of an ABS stop and is considered normal.

VEHICLE HANDLING PERFORMANCE DURING ABS BRAKING

It is important to remember that an antilock brake system does not shorten a vehicle's stopping distance under all driving conditions, but does provide improved control of the vehicle while stopping. Vehicle stopping distance is still dependent on vehicle speed, weight, tires, road surfaces and other factors.

Though ABS provides the driver with some steering control during hard braking, there are conditions however, where the system does not provide any benefit. In particular, hydroplaning is still possible when the tires ride on a film of water. This results in the vehicles tires leaving the road surface rendering the vehicle virtually uncontrollable. In addition, extreme steering maneuvers at high speed or high speed cornering beyond the limits of tire adhesion to the road surface may cause vehicle skidding, independent of vehicle braking. For this reason, the ABS system is termed Antilock instead of Anti-Skid.

NOISE AND BRAKE PEDAL FEEL

During ABS braking, some brake pedal movement may be felt. In addition, ABS braking will create ticking, popping and/or groaning noises heard by the driver. This is normal due to pressurized fluid being

transferred between the master cylinder and the brakes. If ABS operation occurs during hard braking, some pulsation may be felt in the vehicle body due to fore and aft movement of the suspension as brake pressures are modulated.

At the end of an ABS stop, ABS will be turned off when the vehicle is slowed to a speed of 3–4 mph. There may be a slight brake pedal drop anytime that the ABS is deactivated, such as at the end of the stop when the vehicle speed is less than 3 mph or during an ABS stop where ABS is no longer required. These conditions will exist when a vehicle is being stopped on a road surface with patches of ice, loose gravel or sand on it. Also stopping a vehicle on a bumpy road surface will activate ABS because of the wheel hop caused by the bumps.

TIRE NOISE AND MARKS

Although the ABS system prevents complete wheel lock-up, some wheel slip is desired in order to achieve optimum braking performance. Wheel slip is defined as follows, 0 percent slip means the wheel is rolling freely and 100 percent slip means the wheel is fully locked. During brake pressure modulation, wheel slip is allowed to reach up to 25 to 30% . This means that the wheel rolling velocity is 25 to 30% less than that of a free rolling wheel at a given vehicle speed. This slip may result in some tire chirping, depending on the road surface. This sound should not be interpreted as total wheel lock-up.

Complete wheel lock up normally leaves black tire marks on dry pavement. The ABS System will not leave dark black tire marks since the wheel never reaches a fully locked condition. Tire marks may however be noticeable as light patched marks.

START UP CYCLE

When the ignition is turned on, a popping sound and a slight brake pedal movement may be noticed. Additionally, when the vehicle is first driven off a humming may be heard and/or felt by the driver at approximately 20 to 40 kph (12 to 25 mph). The ABS warning lamp will also be on for up to 5 seconds after the ignition is turned on. All of these conditions are a normal function of ABS as the system is performing a diagnosis check.

PREMATURE ABS CYCLING

NOTE: When working on a vehicle which has a complaint of premature ABS cycling it may be necessary to use a DRB Scan Tool to detect and verify the condition.

There is one complaint called Premature ABS Cycling in which neither the Red Brake Warning Lamp nor the Amber Antilock Lamp were illumi-

DESCRIPTION AND OPERATION (Continued)

nated and no fault codes were stored in the CAB. Symptoms of Premature ABS Cycling, include clicking sounds from the solenoids valves, pump motor running and pulsations in the brake pedal. This condition can occur at any braking rate of the vehicle and on any type of road surface. This creates an additional condition which needs to be correctly assessed when diagnosing problems with the antilock brake system.

The following conditions are common causes that need to be checked when diagnosing a condition of Premature ABS Cycling. Damaged tone wheels, incorrect tone wheels, damage to a wheel speed sensor mounting boss on a steering knuckle, a loose wheel speed sensor mounting bolt, and excessive tone wheel runout. Also, an excessively large tone wheel to wheel speed sensor air gap can lead to the condition of Premature ABS Cycling. Special attention is to be given to these components when diagnosing a vehicle exhibiting the condition of Premature ABS Cycling. After diagnosing the defective component, repair or replace as required.

When the component repair or replacement is completed, test drive the vehicle to verify the condition of Premature ABS Cycling has been corrected.

ABS BRAKE SYSTEM COMPONENTS

The following components of the ITT Teves Mark 20 ABS brake system are described in this section of the service manual. If service is required on base brake system components used in conjunction with this system, refer to the Base Brake System section within this group of the service manual for the specific service information required.

- Integrated Control Unit (Includes Internal Valves And Solenoids)
- Hydraulic Control Unit (Part Of Integrated Control Unit)
- Controller Antilock Brake (Part Of Integrated Control Unit)
- ABS Fuses
- ABS Relays
- Wheel Speed Sensors

INTEGRATED CONTROL UNIT (ICU)

The hydraulic control unit (HCU) (Fig. 1) used with the Teves Mark 20 ABS is different from the HCU used on previous Chrysler products with ABS. The HCU used on this ABS system is part of the integrated control unit (ICU). The HCU is part of what is referred to as the ICU because the HCU and the controller antilock brakes (CAB) are combined (integrated) into one unit. This differs from previous Chrysler products with ABS, where the HCU and the CAB were separate components located in different areas of the vehicle.

NOTE: The HCU and CAB used on a vehicle that is equipped with only ABS and on a vehicle that is equipped with ABS and traction control are different. The HCU on a vehicle equipped with ABS and traction control has a valve block housing (Fig. 1) that is approximately 1 inch longer on the low pressure fluid accumulators side than a HCU for a vehicle that is equipped with only ABS.

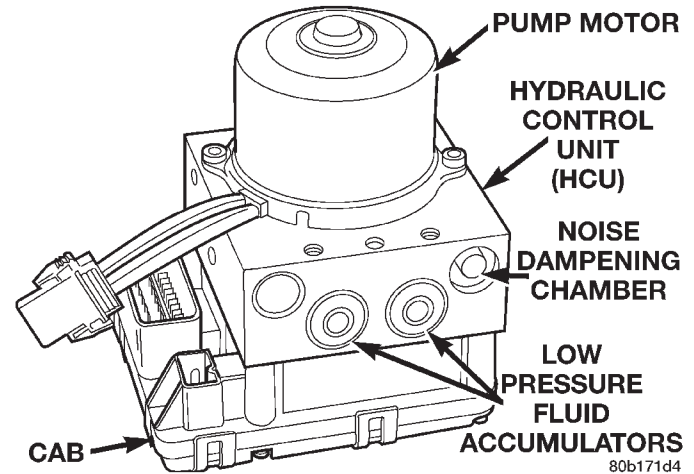


Fig. 1 Teves Mark 20 ICU

The ICU is located on the driver's side of the vehicle, and is mounted to the front left front wheel. The **ABS only** ICU contains the following components for controlling the brake system hydraulic pressure during ABS braking: The CAB, eight valve solenoids, (four inlet valves and four outlet valves) fluid accumulators a pump, and an electric motor. Unlike the ABS only system, the **ABS with traction control** ICU contains 10 valves and solenoids. The extra two valves and solenoids are used to isolate the brake system during traction control operation.

CAUTION: No components of the ICU are serviceable. If any component that makes up the ICU is diagnosed as not functioning properly it **MUST** be replaced. The replaceable components of the ICU, are the HCU and the CAB (Fig. 1). The mounting bracket is also replaceable as a separate component of the ICU. The remaining components of the ICU are not serviceable items. No attempt should ever be made to remove or service any individual components of the HCU. This is due to the concern of contamination entering the HCU while performing a service procedure. Also no attempt should ever be made to remove or service any individual components of the CAB.

CAUTION: At no time when servicing the ICU should a 12 volt power source be applied to any electrical connector of the HCU or the CAB.

DESCRIPTION AND OPERATION (Continued)

INLET AND OUTLET VALVES AND SOLENOIDS

There are four inlet valves and four outlet valves, one of each per wheel. Each valve is controlled by a solenoid. Inlet valves are normally open when the solenoid is off. Outlet valves are normally closed when the solenoid is off. When ABS braking occurs, the CAB energizes and de-energizes the solenoids, opening and closing the valves as necessary.

- **Inlet Valve Open/Outlet Valve Closed** — This is the position the valves are in during a pressure-build cycle, and also during normal, non-ABS braking. Fluid is allowed to enter the brake circuit through the open inlet valve. Fluid is blocked from the decay circuit by the closed outlet valve. Fluid enters the valve block and flows to the wheel brake.

- **Inlet Valve Closed/Outlet Valve Open** — This is the position the valves are in during a pressure-decay cycle. Fluid is blocked from entering the brake circuit by the closed inlet valve. The fluid flows back from the wheel brake through the open outlet valve into the decay circuit. The decay circuit connects to a fluid accumulator where the fluid is stored until it is needed.

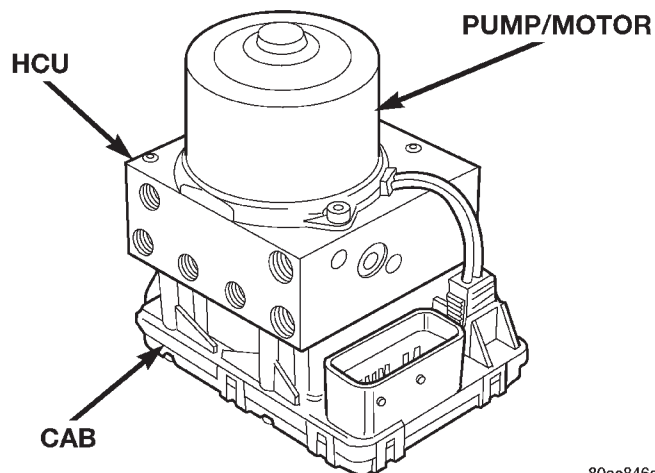
- **Inlet Valve Closed/Outlet Valve Closed** — This is the position the valves are in during a pressure-hold cycle. Fluid is blocked from entering the brake circuit by the closed inlet valve. Fluid is prevented from entering the decay circuit by the closed outlet valve. Brake pressure is held trapped at the wheel brake in order to hold the brake steady.

ABS FLUID ACCUMULATORS

There are two fluid accumulators in all hydraulic control units, one each for the primary and secondary hydraulic circuits. The fluid accumulators temporarily store brake fluid that is removed from the wheel brakes during an ABS cycle. This fluid is then used by the pump in the valve body to provide build pressure for the brake hydraulic system.

HCU PUMP/MOTOR

The HCU (Fig. 2) contains 2 pump assemblies, one for the primary and one for the secondary hydraulic circuit of the brake system. Both pumps are driven by a common electric motor (Fig. 2) which is part of the HCU. The pumps draw brake fluid from the fluid accumulators to supply build pressure to the brakes during an ABS stop. The pump motor runs during the drive-off cycle as a check and during an ABS stop and is controlled by the CAB. The Pump/Motor Assembly is not a serviceable item. If the pump/motor requires replacement the complete HCU (Fig. 2) (minus the CAB) must be replaced.



80ae846a

Fig. 2 Teves Mark 20 HCU Pump/Motor

ABS FUSES

The fuse for the ABS pump motor and the ABS system are located in the Power Distribution Center (PDC). The PDC is located on the drivers side of the engine compartment forward of the strut tower. Refer to the diagram inside the PDC cover, for the exact location of fuses.

ABS RELAYS

On the Mark 20 Antilock Brake System, both the pump motor relay and the system relay are integrated into the CAB. If either relay is diagnosed as not functioning properly, the CAB will need to be replaced. Refer to Controller Antilock Brakes in the Removal And Installation Section in this group of the service manual for the procedure.

WHEEL SPEED SENSORS

One Wheel Speed Sensor (WSS) is located at each wheel, and sends a small AC signal to the control module CAB. This signal is generated by magnetic induction created when a toothed sensor ring (tone wheel) passes the stationary magnetic wheel speed sensor. The CAB converts the AC signal generated at each wheel into a digital signal. If a wheel locking tendency is detected by the CAB, it will then modulate hydraulic pressure via the HCU to prevent the wheel(s) from locking.

Each front wheel speed sensor is attached to a boss in the steering knuckle. The tone wheel is part of the outboard constant velocity joint. Each rear wheel speed sensor, on rear disc brake applications, is mounted to the rear brake caliper adapter and the rear tone wheel is an integral part of the rear wheel hub/bearing assembly.

DESCRIPTION AND OPERATION (Continued)

All four wheel speed sensors are serviced individually. The front tone wheels are serviced as an assembly with the driveshaft outboard constant velocity joint. The rear tone wheels are serviced as an assembly with the rear hub/bearing assembly.

Correct ABS system operation is dependent on accurate wheel speed signals. The vehicle's wheels and tires must all be the same size and type to generate accurate signals. Variations in wheel and tire size can produce inaccurate wheel speed signals.

CONTROLLER ANTILOCK BRAKE (CAB)

The Controller Antilock Brake (CAB) is a microprocessor based device which monitors the ABS system during normal braking and controls it when the vehicle is in an ABS stop. The CAB is mounted to the bottom of the HCU (Fig. 3). The CAB uses a 25-way electrical connector on the vehicle wiring harness. The power source for the CAB is through the ignition switch in the Run, or On, position. **THE (CAB) IS ON THE PCI BUS.**

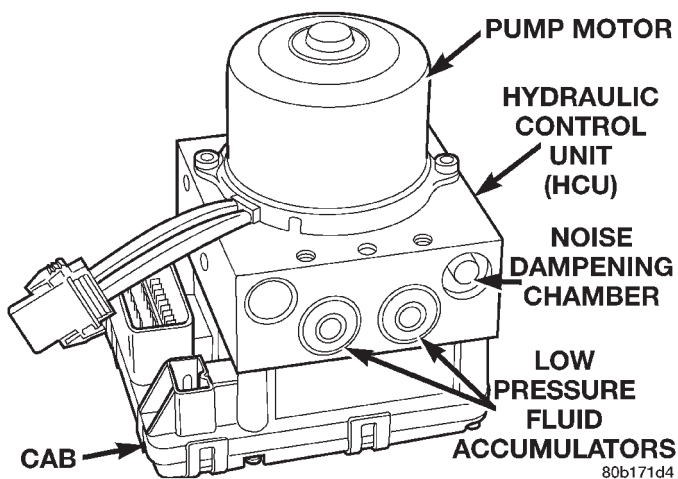


Fig. 3 Controller Antilock Brake (CAB)

The primary functions of the (CAB) are to:

- (1) Detect wheel locking or wheel slipping tendencies by monitoring the speed of all four wheels of the vehicle.
- (2) Illuminate the TRAC lamp in the message center on the instrument panel when a traction control event is occurring.
- (3) Control fluid modulation to the wheel brakes while the system is in an ABS mode or the traction control system is activated.
- (4) Monitor the system for proper operation.
- (5) Provide communication to the DRB Scan Tool while in diagnostic mode.
- (6) Store diagnostic information.
- (7) Turn on the ABS lamps.

The CAB continuously communicates with the Instrument Cluster (MIC) by sending out a message

on the PCI Bus. All ABS lamps are illuminated by the bus.

The CAB continuously monitors the speed of each wheel through the signals generated by the wheel speed sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the CAB commands the CAB command coils to actuate. The CAB command coils then open and close the valves in the HCU which modulate brake fluid pressure in some or all of the hydraulic circuits. The CAB continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present.

The ABS system is constantly monitored by the CAB for proper operation. If the CAB detects a fault, it will turn on the Amber ABS Warning Lamp and disable the ABS braking system. The normal base braking system will remain operational.

The CAB contains a self-diagnostic program which will turn on the Amber ABS Warning Lamp when a ABS system fault is detected. Faults are then stored in a diagnostic program memory. There are multiple fault messages which may be stored in the CAB and displayed through the DRB Scan Tool. These fault messages will remain in the CAB memory even after the ignition has been turned off. The fault messages can be read and or cleared from the CAB memory by a technician using the DRB Scan Tool. The fault occurrence and the fault code will also be automatically cleared from the CAB memory after the identical fault has not been seen during the next 3,500 miles of vehicle operation. Mileage though of the last fault occurrence will not be automatically cleared.

CONTROLLER ANTILOCK BRAKE INPUTS

- Four Wheel Speed Sensors.
- Stop Lamp Switch.
- Ignition Switch.
- System and Pump voltage.
- Grounds.
- Diagnostics Communications (PCI).
- If equipped, Traction Control Switch (Via BUS).

CONTROLLER ANTILOCK BRAKE OUTPUTS

- PCI Communication to the Instrument Cluster (MIC).
- ABS warning lamp actuation (Via BUS).
- Diagnostic communication (PCI) (Via BUS).
- If equipped, Traction Control Lamp (Via BUS).

ABS WARNING LAMP (YELLOW)

The ABS system uses a yellow colored ABS Warning Lamp. The ABS warning lamp is located on the left side of the instrument panel, in the instrument cluster. The purpose of the warning lamp is discussed in detail below.

DESCRIPTION AND OPERATION (Continued)

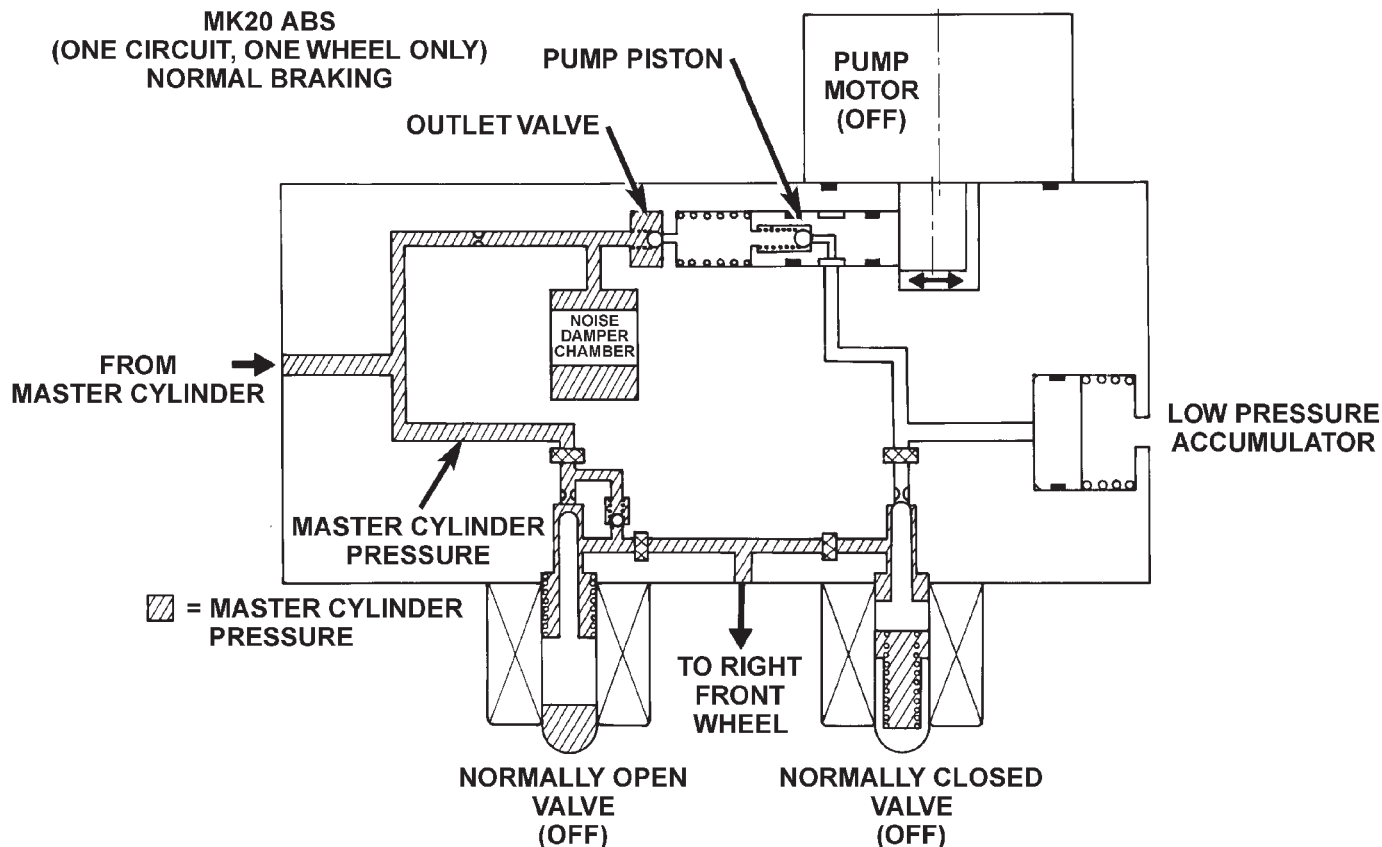


Fig. 4 Normal Braking Hydraulic Circuit

80a89435

The ABS warning lamp will turn on when the CAB detects a condition which results in a shutdown of ABS function or when the body controller does not receive PCI messages from the CAB. When the ignition key is turned to the on position, the ABS Warning Lamp is on until the CAB completes its self tests and turns the lamp off (approximately 4 seconds after the ignition switch is turned on). Under most conditions, when the ABS warning lamp is on, only the ABS function of the brake system is affected. The standard brake system and the ability to stop the car will not be affected when only the ABS warning lamp is on.

The ABS warning lamp is controlled indirectly by the CAB. The MIC controls the lamp by directly grounding the circuit.

HYDRAULIC CIRCUITS AND VALVE OPERATION

Through the following operation descriptions the function of the various hydraulic control valves in the

ABS will be described. The fluid control valves mentioned below, control the flow of pressurized brake fluid to the wheel brakes during the different modes of ABS braking.

For explanation purposes, all wheel speed sensors except the right front are sending the same wheel speed information. The following diagrams show only the right front wheel in a antilock braking condition.

NORMAL BRAKING HYDRAULIC CIRCUIT AND SOLENOID VALVE FUNCTION

This condition is the normal operation of the vehicles base brake hydraulic system. The hydraulic system circuit diagram (Fig. 4) shows a situation where no wheel spin or slip is occurring relative to the speed of the vehicle. The driver is applying the brake pedal to build pressure in the brake hydraulic system to apply the brakes and stop the vehicle.

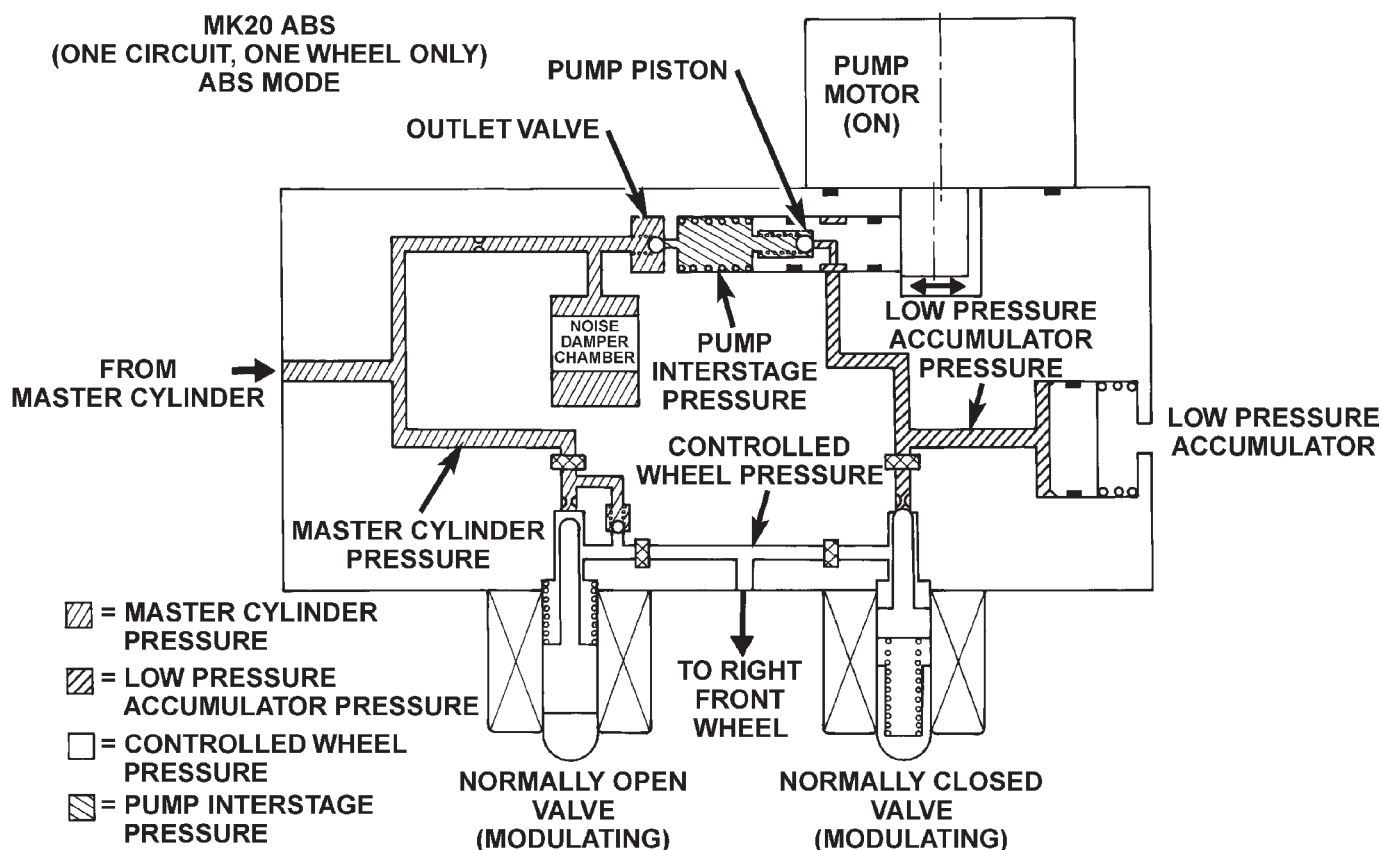
DESCRIPTION AND OPERATION (Continued)

TEVES MARK 20 ABS CIRCUIT AND SOLENOID VALVE FUNCTION

This hydraulic circuit diagram (Fig. 5) shows the vehicle in the ABS braking mode. This hydraulic circuit (Fig. 5) shows a situation where one wheel is slipping because the driver is attempting to stop the vehicle at a faster rate than the surface the vehicle's tires are on will allow. The normally open and normally closed valves modulate the brake hydraulic pressure as required. The pump/motor is switched on so that the brake fluid from the low pressure accumulators is returned to the master cylinder circuits. The brake fluid will then be routed to either the master cylinder or the wheel brake depending on the position of the normally open valve.

TEVES MARK 20 ABS WITH TRACTION CONTROL NORMAL BRAKING HYDRAULIC CIRCUIT – SOLENOID AND SHUTTLE VALVE FUNCTION

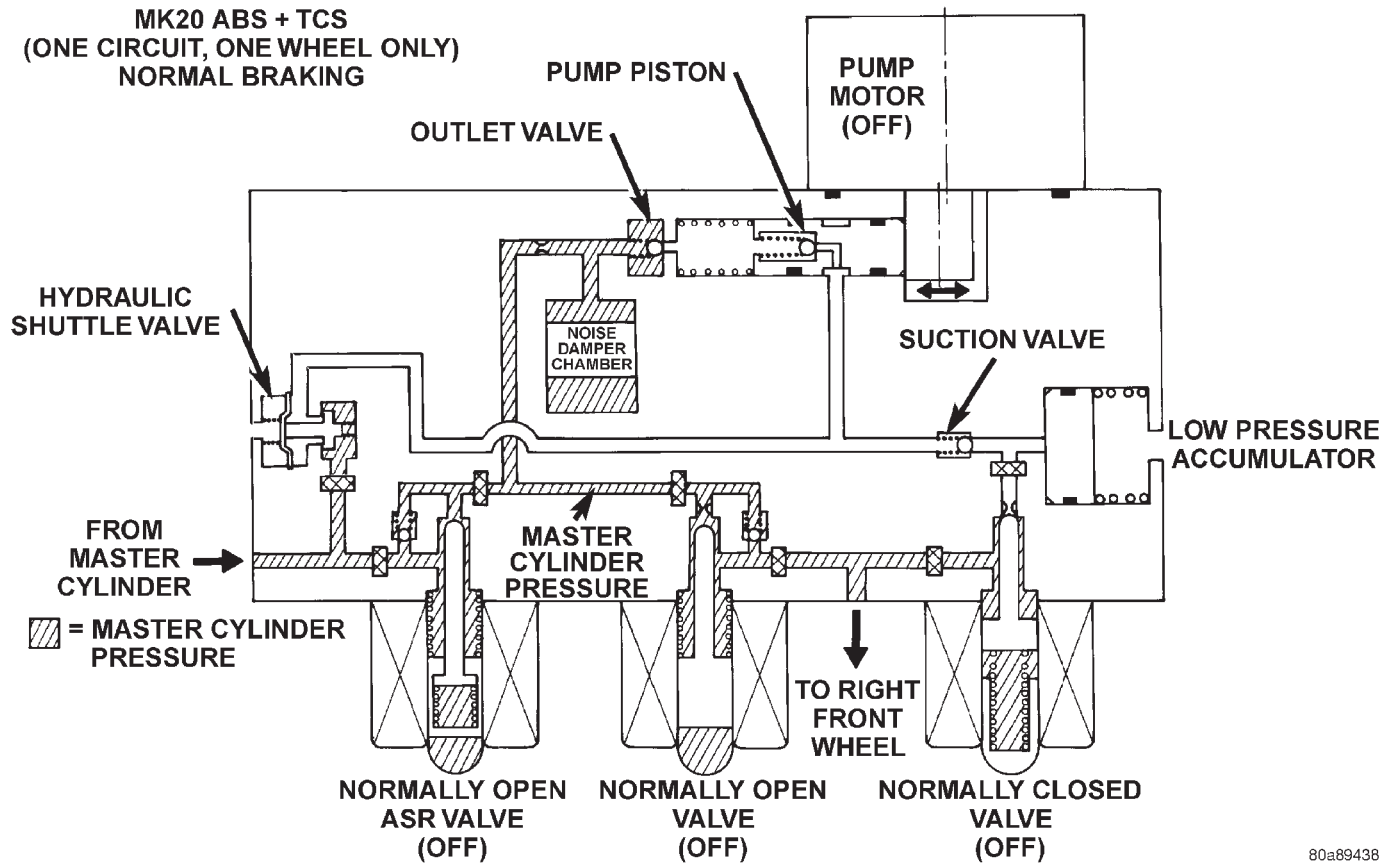
This condition is the normal operation of the vehicle's base brake hydraulic system when the vehicle is equipped with ABS and traction control. The hydraulic system circuit diagram (Fig. 6) shows a situation where no wheel spin or slip is occurring relative to the speed of the vehicle. The driver is applying the brake pedal to build pressure in the brake hydraulic system to apply the brakes and stop the vehicle. The hydraulic shuttle valve (Fig. 6) closes with every brake pedal application so pressure is not created at the inlet to the pump.



80a89436

Fig. 5 ABS Mode Hydraulic Circuit

DESCRIPTION AND OPERATION (Continued)



80a89438

Fig. 6 ABS With Traction Control Normal Braking Hydraulic Circuit

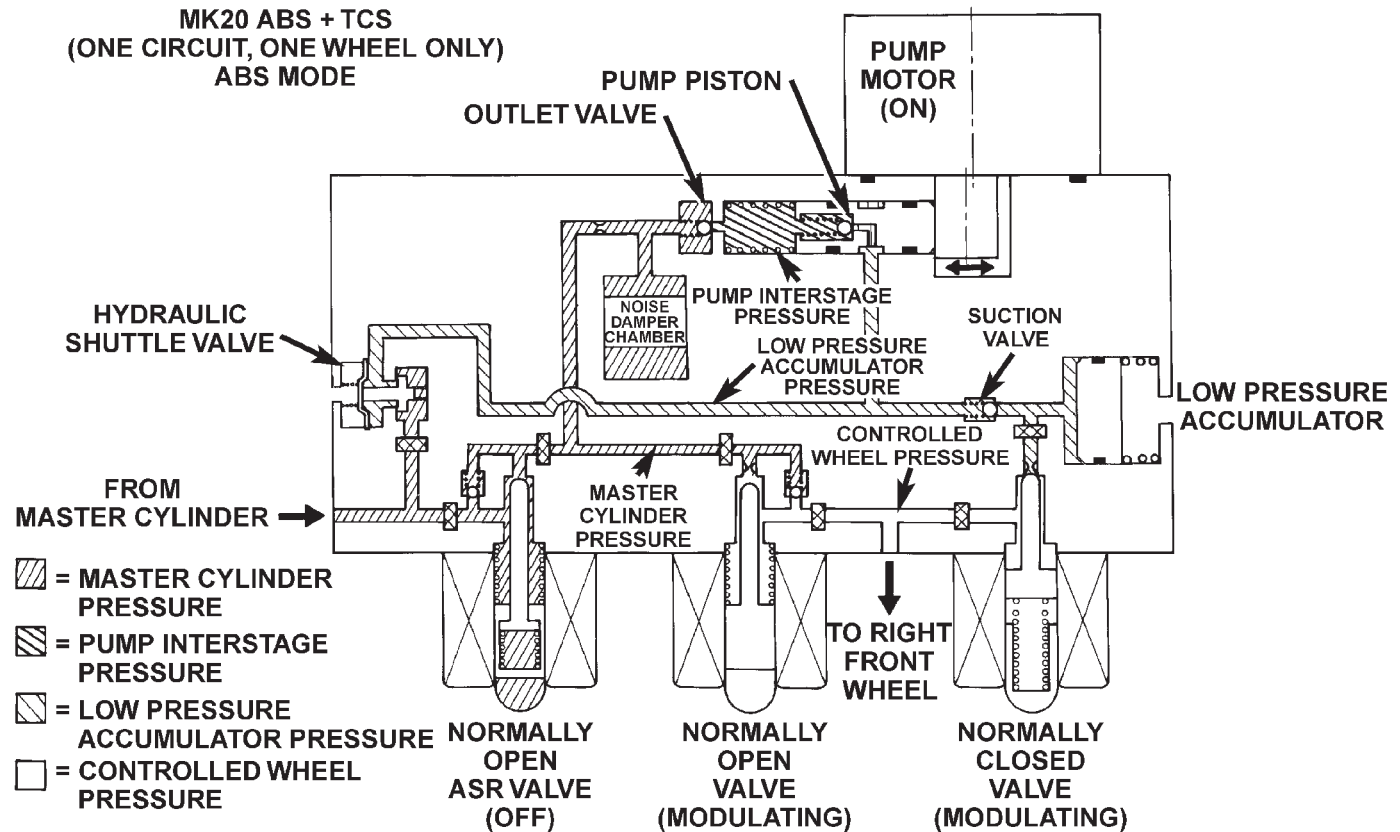
TEVES MARK 20 ABS WITH TRACTION CONTROL ABS BRAKING HYDRAULIC CIRCUIT – SOLENOID AND SHUTTLE VALVE FUNCTION

This hydraulic circuit diagram (Fig. 7) shows a vehicle equipped with ABS and traction control in the ABS braking mode. This hydraulic circuit (Fig. 7) shows a situation where one wheel is slipping because the driver is attempting to stop the vehicle at a faster rate than the surface the vehicle's tires are on will allow. The hydraulic shuttle valve (Fig. 7) closes upon brake application so that the pump can not suck brake fluid from the master cylinder. The normally open and normally closed valves modulate the brake hydraulic pressure as required. The pump/motor is switched on so that the brake fluid from the low pressure accumulators is returned to the master cylinder circuits. The brake fluid will then be routed to either the master cylinder or the wheel brake

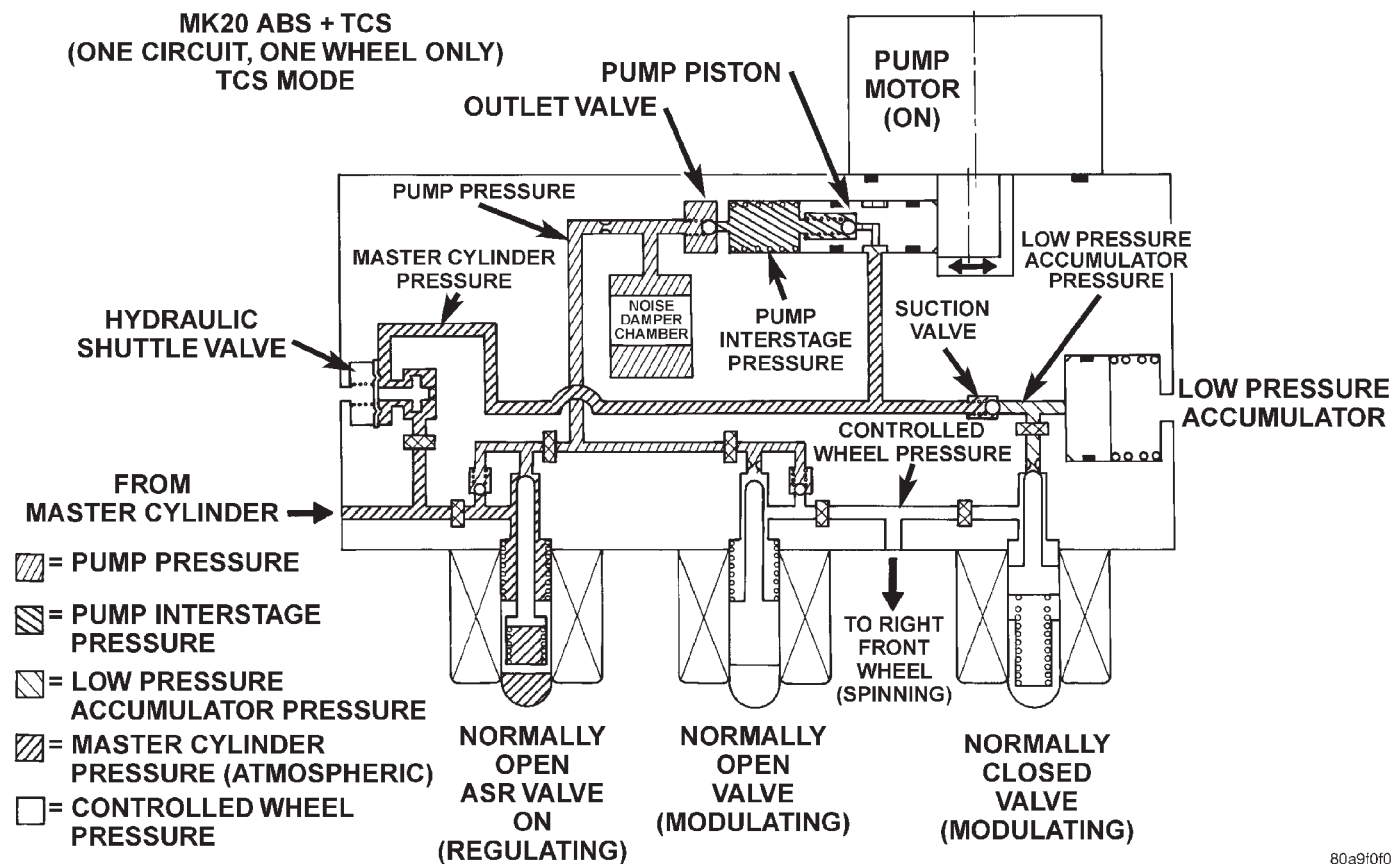
depending on the position of the normally open valve.

TEVES MARK 20 ABS WITH TRACTION CONTROL – TRACTION CONTROL HYDRAULIC CIRCUIT – SOLENOID AND SHUTTLE VALVE FUNCTION

This hydraulic circuit diagram (Fig. 8) shows a vehicle equipped with ABS and traction control in the traction control mode. The hydraulic circuit (Fig. 8) shows a situation where a driven wheel is spinning and brake pressure is required to reduce its speed. The normally open ASR valve (Fig. 8) is energized to isolate the brake fluid being pumped from the master cylinder and to isolate the driven wheel. Also, the normally open ASR valve bypasses the pump output back to the master cylinder at a fixed pressure setting. The normally open and normally closed valves (Fig. 8) modulate the brake pressure as required to the spinning wheel.



80a89439



80a9f0f0

DIAGNOSIS AND TESTING

ABS GENERAL DIAGNOSTICS INFORMATION

This section contains the information necessary to diagnose the ITT Teves Mark 20 ABS Brake System. Specifically, this section should be used to help diagnose conditions which result in any of the following:

- (1) ABS Warning Lamp turned on.
- (2) Brakes Lock-up on hard application

Diagnosis of base brake conditions which are obviously mechanical in nature should be directed to Group 5 Brakes in this service manual. This includes brake noise, brake pulsation, lack of power assist, parking brake, Red BRAKE Warning Lamp lighting, or vehicle vibration during normal braking.

Many conditions that generate customer complaints may be normal operating conditions, but are judged to be a problem due to not being familiar with the ABS system. These conditions can be recognized without performing extensive diagnostic work, given adequate understanding of the operating principles and performance characteristics of the ABS. See the ABS System Operation Section in this group of the service manual to familiarize yourself with the operating principles of the ITT Teves Mark 20 ABS system.

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, etc.) on a vehicle equipped with antilock brakes may affect the function of the antilock brake system.

ABS WIRING DIAGRAM INFORMATION

During the diagnosis of the antilock brake system it may become necessary to reference the wiring diagrams covering the antilock brake system and its components. For wiring diagrams refer to Antilock Brakes in Group 8W of this service manual. This

group will provide you with the wiring diagrams and the circuit description and operation information covering the antilock brake system.

ABS DIAGNOSTICS MANUAL

Detailed procedures for diagnosing specific ABS conditions are covered in the diagnostics manual covering the ITT Teves Mark 20 ABS system. The following information is presented to give the technician a general background on the diagnostic capabilities of the ITT Teves Mark 20 ABS system. Please refer to the above mentioned manual for any further electronic diagnostics and service procedures that are required.

DRB DIAGNOSTIC SCAN TOOL USAGE

The diagnostics of the ITT Teves Mark 20 ABS system used on this vehicle is performed using the DRB scan tool. Refer to the diagnostics manual covering the ITT Teves Mark 20 ABS system for the required diagnostics and testing procedures and the DRB operators manual for its proper operational information.

ABS BRAKE DIAGNOSTIC TOOL CONNECTOR

On this vehicle, the diagnostic connector used for the diagnosis of the Mark 20 ABS system is located under the lower instrument panel directly below the steering column. The Mark 20 ABS system uses the J1962 connector which is shared by other vehicle diagnostic systems, such as the powertrain control module, and the air bag control module.

ABS SYSTEM SELF DIAGNOSTICS

The ITT Teves Mark 20 ABS system is equipped with a self diagnostic capability which may be used to assist in the isolation of ABS faults. The features of the self diagnostics system are described below.

START-UP CYCLE

The self diagnostic ABS start up cycle begins when the ignition switch is turned to the on position. Electrical checks are completed on ABS components, such as the Controller, solenoid continuity, and the system relay operation. During this check the Amber ABS Warning Light is turned on for approximately 5 seconds and the brake pedal may emit a popping sound and move slightly when the solenoid valves are checked.

DRIVE-OFF CYCLE

Further Functional testing is accomplished once the vehicle is set in motion and reaches a speed of about 20 kph (12 mph.). This cycle is performed only once after each ignition on/off cycle.

- The pump/motor is activated briefly to verify function. When the pump/motor is activated a whirling or buzzing sound may be heard by the driver, which is normal when the pump/motor is running.

DIAGNOSIS AND TESTING (Continued)

- The wheel speed sensor output is verified to be within the correct operating range.

ONGOING TESTS

Other tests are performed on a continuous basis. These include checks for solenoid continuity, wheel speed sensor continuity and wheel speed sensor output.

ABS DIAGNOSTIC TROUBLE CODES

Diagnostic trouble codes (DTC) are kept in the controller's memory until either erased by the technician using the DRB or erased automatically after 3,500 miles. DTC's are retained by the controller even if the ignition is turned off or the battery is disconnected. More than one DTC can be stored at a time. The number of occurrences and the DTC that was stored is displayed. Most functions of the CAB and the ABS system can be accessed by the technician for testing and diagnostic purposes by using the DRB.

LATCHING VERSUS NON-LATCHING DIAGNOSTIC TROUBLE CODES

Some DTC's detected by the CAB are latching; the DTC is latched and ABS braking is disabled until the ignition switch is reset. Thus ABS braking is non-operational, even if the original DTC has disappeared. Other DTC's are non-latching; any warning lights that are turned on, are only turned on as long as the DTC condition exists. As soon as the condition goes away, the ABS Warning Light is turned off, although a DTC will be set in most cases.

INTERMITTENT DIAGNOSTIC TROUBLE CODES

As with virtually any electronic system, intermittent electrical problems in the ABS system may be difficult to accurately diagnose.

Most intermittent electrical problems are caused by faulty electrical connections or wiring. When an intermittent fault is encountered, check suspect circuits for:

A visual inspection for loose, disconnected, or mis-routed wires should be done before attempting to diagnose or service the Mark 20 antilock brake system. A visual inspection will eliminate unnecessary testing and diagnostics time. A thorough visual inspection will include the following components and areas of the vehicle.

(1) Inspect fuses in the power distribution center (PDC) and the wiring junction block. Verify that all fuses are fully inserted into the PDC and wiring junction block. A label on the underside of the PDC cover identifies the locations of the ABS fuses in the PDC.

(2) Inspect the 25-way electrical connector at the CAB for damage, spread or backed-out wiring terminals.

Verify that the 25-way connector is fully inserted in the socket on the CAB. Be sure that wires are not stretched tight or pulled out of the connector.

(3) Verify that all the wheel speed sensor connections are secure.

(4) Poor mating of connector halves or terminals not fully seated in the connector body.

(5) Improperly formed or damaged terminals. All connector terminals in a suspect circuit should be carefully reformed to increase contact tension.

(6) Poor terminal to wire connection. This requires removing the terminal from the connector body to inspect.

(7) Pin presence in the connector assembly

(8) Proper ground connections. Check all ground connections for signs of corrosion, tight fasteners, or other potential defects. Refer to wiring diagram manual for ground locations.

(9) Problems with main power sources of the vehicle. Inspect battery, generator, ignition circuits and other related relays and fuses.

(10) If a visual check does not find the cause of the problem, operate the car in an attempt to duplicate the condition and record the trouble code.

(11) Most failures of the ABS system will disable ABS function for the entire ignition cycle even if the fault clears before key-off. There are some failure conditions, however, which will allow ABS operation to resume during the ignition cycle in which a failure occurred if the failure conditions are no longer present. The following conditions may result in intermittent illumination of the ABS Warning Lamp. All other failures will cause the lamp to remain on until the ignition switch is turned off. Circuits involving these inputs to the CAB should be investigated if a complaint of intermittent warning system operation is encountered.

(12) Low system voltage. If Low System Voltage is detected by the CAB, the CAB will turn on the ABS Warning Lamp until normal system voltage is achieved. Once normal voltage is seen at the CAB, normal operation resumes.

(13) High system voltage. If high system voltage is detected by the CAB, the CAB will turn on the Amber ABS Warning Lamp. The ABS is disabled at this time.

(14) Additionally, any condition which results in interruption of electrical current to the CAB or modulator assembly may cause the ABS Warning Lamp to turn on intermittently.

(15) The MIC can turn on the ABS and BRAKE warning lamps simultaneously if communication with the PCI BUS is interrupted. The odometer will also display the statement "NO BUS."

DIAGNOSIS AND TESTING (Continued)

tone wheel inspection

Carefully inspect tone wheel at the suspected faulty wheel speed sensor for missing, chipped or broken teeth, this can cause erratic speed sensor signals.

Tone wheels should show no evidence of contact with the wheel speed sensors. If contact was made, determine cause and correct before replacing the wheel speed sensor.

Excessive runout of the tone wheel can cause erratic wheel speed sensor signals. Refer to Tone Wheel Runout in the Specification Section in this section of the service manual for the tone wheel runout specification. Replace driveshaft assembly or rear hub/bearing assembly if tone wheel runout exceeds the specification.

Inspect tone wheels for looseness on their mounting surfaces. Tone wheels are pressed onto their mounting surfaces and should not rotate independently from the mounting surface.

Check the wheel speed sensor head alignment to the tone wheel. Also check the gap between the speed sensor head and the tone wheel to ensure it is at specification. Refer to Wheel Speed Sensor Clearance in the Specification Section in this section of the service manual.

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.

test driving abs complaint vehicle

Most ABS complaints will require a test drive as a part of the diagnostic procedure. The purpose of the test drive is to duplicate the condition.

NOTE: Remember conditions that result in the turning on of the Red BRAKE Warning Lamp may indicate reduced braking ability. If both the ABS & BRAKE Warning Lamp come on simultaneously, the PCI BUS communication is lost. The following procedure should be used to test drive an ABS complaint vehicle.

Before test driving a brake complaint vehicle, note whether the Red or Amber Brake Warning Lamp is turned on. If it is the Red Brake Warning Lamp,

refer to the hydraulic system section in the brake group of this manual. If the ABS Warning lamp was/is on, test drive the vehicle as described below, to verify the complaint. While the ABS Warning Lamp is on, the ABS is not functional. The standard brake system and the ability to stop the car may not be affected if only the ABS Warning Lamp is on.

Discuss with the owner of the vehicle or note any other electrical problems or conditions that may be occurring on the vehicle. They may have an effect on the antilock brake system's function.

(1) Turn the key to the off position and then back to the on position. Note whether the ABS Warning Lamp continues to stay on. If it does, refer to the diagnostic manual covering the Mark 20 ABS system for the required test procedures.

(2) If the ABS Warning Lamp goes out, shift into gear and drive the car to a speed of 20 km/h (12 mph) to complete the ABS start up cycle. If at this time the ABS Warning Lamp goes on refer to the Mark 20 Diagnostic Manual.

(3) If the ABS Warning Lamp remains OUT, drive the vehicle a short distance. During this test drive be sure that the vehicle achieves at least 40 mph. Brake to at least one complete stop in an ABS cycle, and again accelerate to 25 mph.

(4) If a functional problem with the ABS system is determined while test driving a vehicle, refer to the diagnostic manual covering the Mark 20 ABS system for the required test procedures and proper use of the DRB diagnostic scan tool.

service procedures**brake fluid level inspection**

CAUTION: Use only Mopar brake fluid or an equivalent from a tightly sealed container. Brake fluid must conform to DOT 3 specifications. Do not use petroleum-based fluid because seal damage in the brake system will result.

For the specific procedure covering the inspection of the brake fluid level and adding brake fluid to the reservoir, refer to the Service Adjustments Section in this group of the service manual.

bleeding teves mark 20 hydraulic system

The hydraulic system for the base brakes must be bled anytime air enters the hydraulic system. Air can enter the hydraulic system for the base brakes due to the disconnection of brake lines, hoses or any other hydraulically operated component of the base brake system. The ABS system, particularly the ICU, should only be bled when the ICU is replaced or it is removed from the vehicle. The ICU must also always be bled if

SERVICE PROCEDURES (Continued)

for any reason it is suspected that the ICU has ingested air. Under most circumstances that require the bleeding of the brakes hydraulic system, only the base brake hydraulic system needs to be bled.

It is important to note that excessive air in the brake system will cause a soft or spongy feeling brake pedal.

During the brake bleeding procedure, be sure the brake fluid level remains close to the FULL level in the master cylinder fluid reservoir. Check the fluid level periodically during the bleeding procedure and add DOT 3 brake fluid as required.

The ITT Teves Mark 20 ABS must be bled as two independent braking systems. The non ABS portion of the brake system is to be bled the same as any non ABS system. Refer to the Service Adjustments section in this manual for the proper bleeding procedure to be used. This brake system can be either pressure bled or manually bled.

The ABS portion of the brake system **MUST** be bled separately. This bleeding procedure requires the use of the DRB Diagnostic Tester and the bleeding sequence procedure outlined below.

ABS BLEEDING PROCEDURE

When bleeding the ABS system, the following bleeding sequence **MUST** be followed to insure complete and adequate bleeding. The ABS system can be bled using a manual bleeding procedure or standard pressure bleeding equipment.

If the brake system is to be bled using pressurized bleeding equipment, refer to Bleeding Brake System in the Service Adjustments section at the beginning of this group for proper equipment usage and procedures.

(1) Assemble and install all brake system components on the vehicle making sure all hydraulic fluid lines are installed and properly torqued.

(2) Connect the DRB Diagnostics Tester to the diagnostics connector. The Teves Mark 20 ABS diagnostic connector is located under the instrument panel to the left of the steering column cover.

(3) Using the DRB, check to make sure the CAB does not have any fault codes stored. If it does, remove them using the DRB.

WARNING: WHEN BLEEDING THE BRAKE SYSTEM WEAR SAFETY GLASSES. A CLEAR BLEED TUBE MUST BE ATTACHED TO THE BLEEDER SCREWS AND SUBMERGED IN A CLEAR CONTAINER FILLED PART WAY WITH CLEAN BRAKE FLUID. DIRECT THE FLOW OF BRAKE FLUID AWAY FROM THE PAINTED SURFACES OF THE VEHICLE. BRAKE FLUID AT HIGH PRESSURE MAY COME OUT OF THE BLEEDER SCREWS WHEN OPENED.

(4) Bleed the base brake system using the standard pressure or manual bleeding procedure as outlined in the Service Adjustments section of this service manual.

(5) Using the DRB, go to the "Bleed ABS" routine. Apply the brake pedal firmly and initiate the "Bleed ABS" cycle one time. Release the brake pedal.

(6) Bleed the base brake system again, as in step Step 4 above.

(7) Repeat steps Step 5 and Step 6 above until brake fluid flows clear and is free of any air bubbles. Check brake fluid level in reservoir periodically to prevent reservoir from running low on brake fluid.

(8) Test drive the vehicle to be sure brakes are operating correctly and that the brake pedal does not feel spongy.

REMOVAL AND INSTALLATION

ABS GENERAL SERVICE PRECAUTIONS

CAUTION: Review this entire section prior to performing any mechanical work on a vehicle equipped with the ITT Teves Mark 20 ABS brake system. This section contains information on precautions pertaining to potential component damage, vehicle damage and personal injury which could result when servicing an ABS equipped vehicle.

CAUTION: Only the recommended jacking or hoisting positions for this vehicle are to be used whenever it is necessary to lift a vehicle. Failure to raise a vehicle from the recommended locations could result in lifting a vehicle by the hydraulic control unit mounting bracket. Lifting a vehicle by the hydraulic control unit mounting bracket will result in damage to the mounting bracket and the hydraulic control unit.

CAUTION: Certain components of the ABS System are not intended to be serviced individually. Attempting to remove or disconnect certain system components may result in improper system operation. Only those components with approved removal and installation procedures in this manual should be serviced.

CAUTION: Brake fluid will damage painted surfaces. If brake fluid is spilled on any painted surfaces, wash off with water immediately.

REMOVAL AND INSTALLATION (Continued)

CAUTION: When performing any service procedure on a vehicle equipped with ABS do not apply a 12 volt power source to the ground circuit of the pump motor in the HCU. Doing this will damage the pump motor and will require replacement of the entire HCU.

The following are general cautions which should be observed when servicing the ABS system and/or other vehicle systems. Failure to observe these precautions may result in ABS System component damage.

If welding work is to be performed on the vehicle, using an electric arc welder, the CAB connector should be disconnected during the welding operation.

The CAB 25 way connector should never be connected or disconnected with the ignition switch in the ON position.

Many components of the ABS System are not serviceable and must be replaced as an assembly. Do not disassemble any component which is not designed to be serviced.

ABS INTEGRATED CONTROL UNIT

REMOVE

(1) Remove the remote ground cable from the ground stud on the right strut tower.

(2) Correctly isolate remote ground cable when servicing vehicle by installing the ground cable insulator on the strut tower ground stud as shown in (Fig. 9) and installing the nut on the stud. **This will prevent accidental grounding of the remote ground cable.**

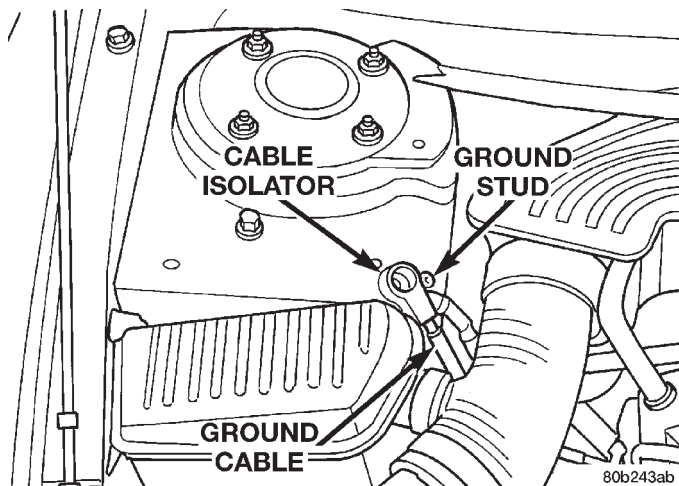


Fig. 9 Correctly Isolated Remote Ground Cable

(3) Using a brake pedal positioning tool such as shown in (Fig. 10) depress brake pedal past its first 1 inch of travel and hold in this position. This will isolate the master cylinder reservoir from the brake hydraulic system, not allowing the brake fluid to drain out of the reservoir.

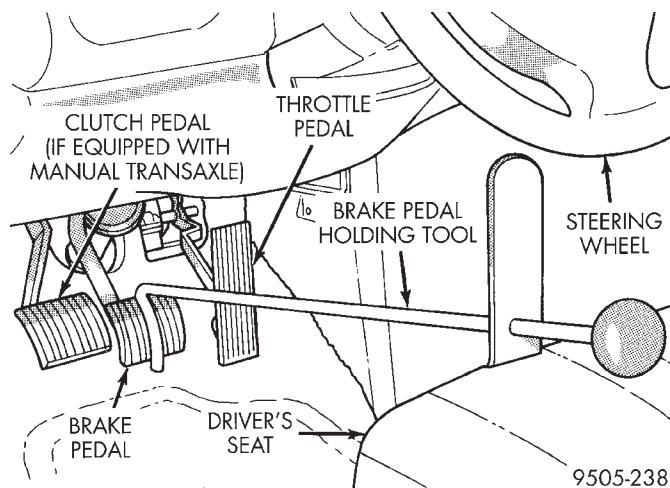


Fig. 10 Brake Pedal Holding Tool Installed

(4) Remove the bolt and 2 nuts securing the speed control servo to vehicle. Disconnect the wire harness connector from speed control servo. Leaving the cable attached to the speed control servo, move it aside, out of the way.

(5) Remove the screw attaching the washer bottle filler neck to the vehicle. Move neck to the side without loosening the filler tube (Fig. 11).

(6) Remove the nut and bolt holding the transmission controller and bracket to vehicle (Fig. 11). Lift transmission controller up and move away from mounting position.

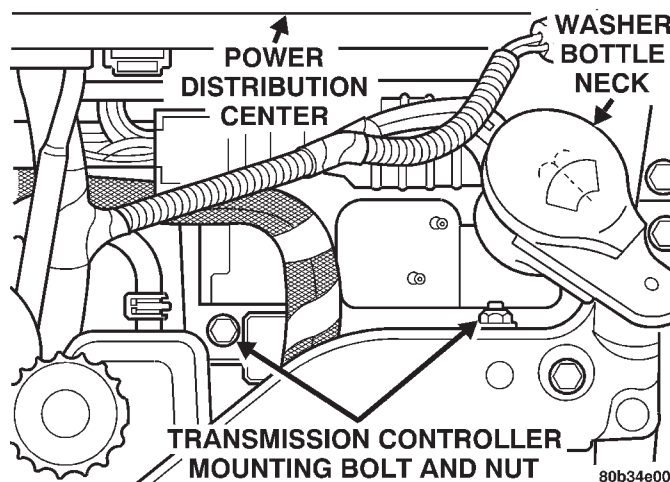


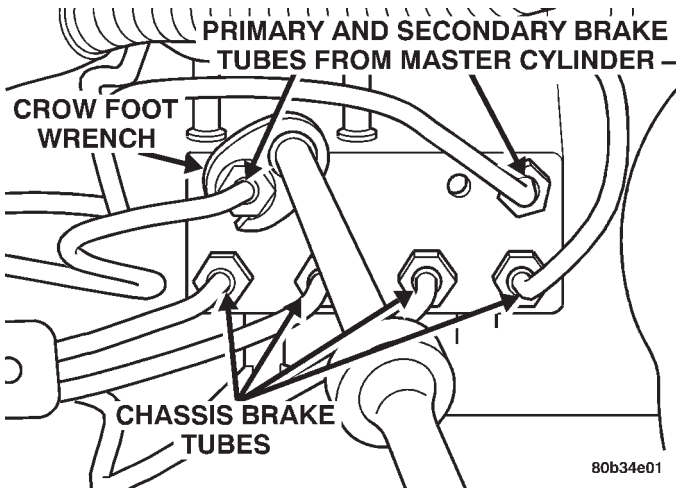
Fig. 11 Transmission Controller Mounting

(7) Using Mopar, Brake Parts Cleaner or an equivalent, thoroughly clean all surfaces of the HCU. Also, thoroughly clean all brake tube to HCU connections.

(8) Remove the primary and secondary brake tubes coming from the master cylinder, at the HCU, using a crow foot wrench (Fig. 12).

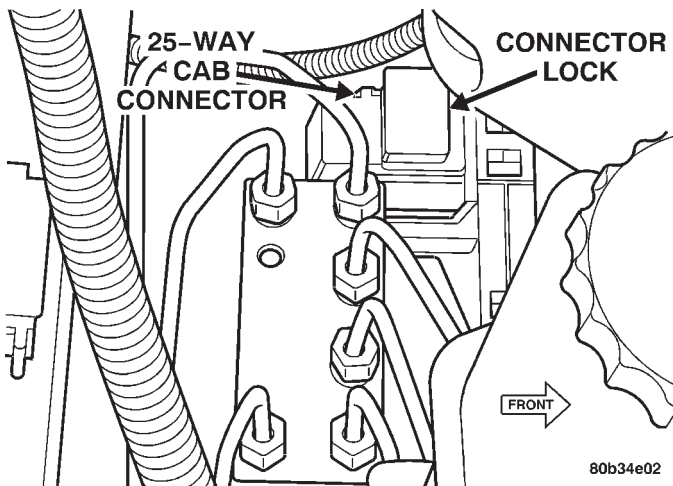
(9) Remove the chassis brake tubes at the HCU (Fig. 12), using a crow foot wrench.

REMOVAL AND INSTALLATION (Continued)

**Fig. 12 Brake Tube Fittings**

CAUTION: Do not apply a 12 volt power source to any terminals of the 25 HCU connector when disconnected from the CAB.

(10) Disconnect the 25 way wiring harness connector from the CAB using the following procedure. Grasp the lock on the 25 way connector (Fig. 13), and pull it up from the connector as far as possible. This will unlock and raise the 25 way connector out of the socket on the CAB.

**Fig. 13 25-Way CAB Connector Lock**

(11) Raise vehicle on jackstands or centered on a hoist. See Hoisting in the Lubrication and Maintenance section of this manual.

(12) Remove the left front tire and wheel assembly.

(13) Remove fasteners securing the inner fender splash shield in place. Move the splash shield out of the way.

(14) Remove the 3 bolts attaching the ICU to the mounting bracket.

(15) Remove the ICU from its mounting bracket. Then, remove the ICU from the vehicle by pulling it

out around the left side of the mounting bracket, then through the wheel well.

INSTALL

(1) Install the ICU back in the vehicle and attach it to its mounting bracket. Tighten the 3 ICU mounting bolts to 11 N·m (97 in. lbs.).

(2) Reinstall the inner fender splash shield.

(3) Reinstall the tire and wheel assembly.

(4) Lower the vehicle.

CAUTION: Before installing the 25 way connector in the CAB be sure that the seal is properly installed in the connector.

(5) Install the 25 way connector into the socket on the CAB. The connector is installed using the following procedure. Position the 25 way connector in the socket on the CAB and carefully push it onto CAB as far as it will go. When connector is fully seated into the CAB socket push in the connector lock (Fig. 13) as far as it will go. This will pull the 25 connector into the socket on the CAB and lock it in the installed position.

(6) Install the 4 chassis brake tubes on the HCU (Fig. 12). Tighten the chassis brake tubes to 17 N·m (145 in. lbs.).

(7) Install the primary and secondary brake lines from the master cylinder on the HCU (Fig. 12). Tighten the primary and secondary brake tubes to 17 N·m (145 in. lbs.).

(8) Reinstall the transmission controller (Fig. 11).

(9) Reattach the washer bottle filler neck to the radiator support.

(10) Reinstall the speed control servo to its mounting studs and radiator support.

(11) Remove brake pedal positioning tool.

(12) Install the remote ground cable onto the ground stud located on left shock tower. Install the remote ground cable attaching nut and tighten to a torque of 28 N·m (250 in. lbs.).

NOTE: The ICU may need to be initialized, using the DRB scan tool, after installation.

(13) Bleed the base brakes and the ABS brakes hydraulic system. Refer to the Bleeding ABS System in this section of the manual for the proper bleeding procedure.

(14) Road test vehicle to ensure proper operation of the base and ABS systems.

PROPORTIONING VALVES

If the rear brake proportioning valves require removal or replacement, refer to Proportioning Valves in the Removal And Installation section, of the Base Brake section within this service manual group.

REMOVAL AND INSTALLATION (Continued)

MASTER CYLINDER AND POWER BRAKE BOOSTER

If the Master Cylinder or the Power Booster need to be serviced or replaced, refer to Master Cylinder or Power Brake Booster in the Removal And Installation Section in the Base Brake Section of this service manual.

CONTROLLER ANTILOCK BRAKES (CAB)**REMOVE**

NOTE: To replace the controller antilock brakes (CAB) on this vehicle, the integrated control unit (ICU) and CAB need to be removed from the vehicle as a unit. The CAB can then be separated from the HCU. Do not attempt to replace the CAB with the ICU mounted in the vehicle.

(1) Remove the ICU from the vehicle. Refer to ABS Integrated Control Unit in the Removal And Installation Section in this group of the service manual for the removal procedure.

(2) Unplug the pump motor wiring harness (Fig. 14) from the CAB.

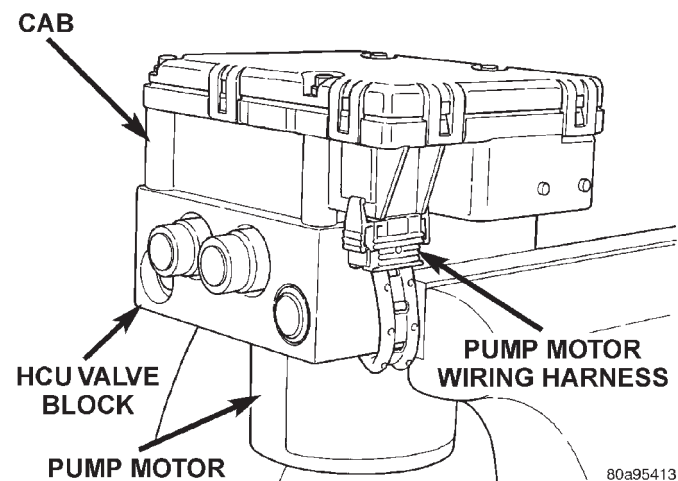


Fig. 14 Pump Motor To CAB Wiring Harness

(3) Remove the 4 bolts (Fig. 15) attaching the CAB to the HCU.

(4) Remove the CAB from the HCU (Fig. 16).

INSTALL

(1) Install the CAB (Fig. 16) on the HCU.

(2) Install the 4 bolts mounting the CAB (Fig. 15) to the HCU. Tighten the CAB mounting bolts to a torque of 2 N·m (17 in. lbs.).

(3) Plug the pump/motor wiring harness into the CAB (Fig. 14).

(4) Install the ICU. Refer to ABS Integrated Control Unit in the Removal And Installation Section in this group of the service manual for the Installation procedure.

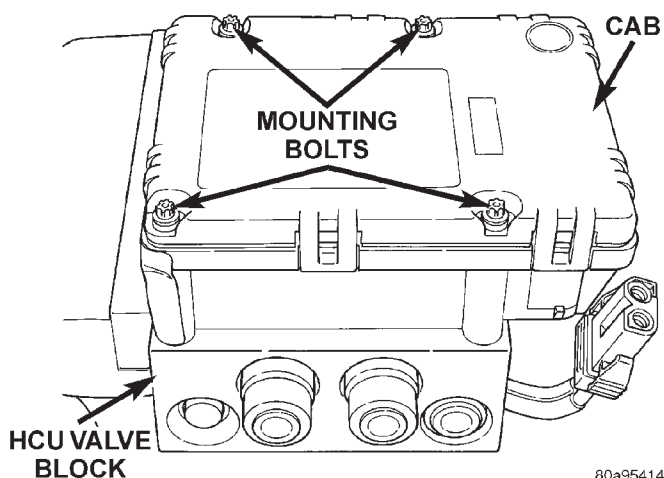


Fig. 15 CAB Attaching Bolts

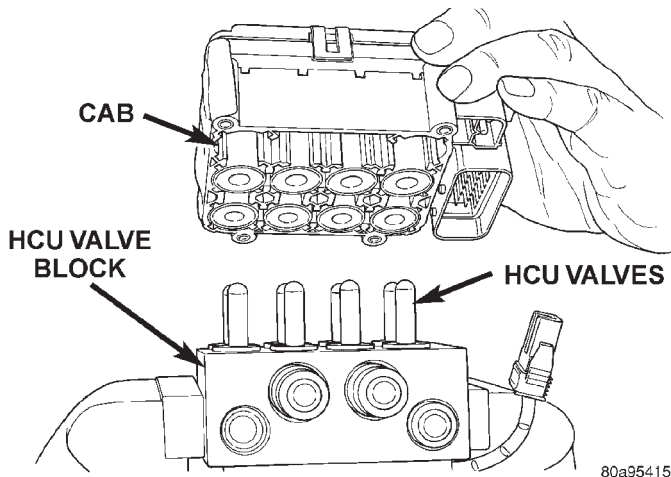


Fig. 16 Remove/Install CAB

NOTE: The ICU may need to be initialized, using the DRB scan tool, after ICU installation.

(5) Bleed the base brakes and the ABS brakes hydraulic system. Refer to the Bleeding ABS System in this section of the manual for the proper bleeding procedure.

(6) Road test vehicle to ensure proper operation of the base and ABS brake systems.

FRONT WHEEL SPEED SENSORS**REMOVE**

(1) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual, for the required lifting procedure to be used for this vehicle.

(2) Remove the tire and wheel assembly from the vehicle.

(3) Remove bolt securing the speed sensor cable routing bracket (Fig. 17) to the strut assembly.

REMOVAL AND INSTALLATION (Continued)

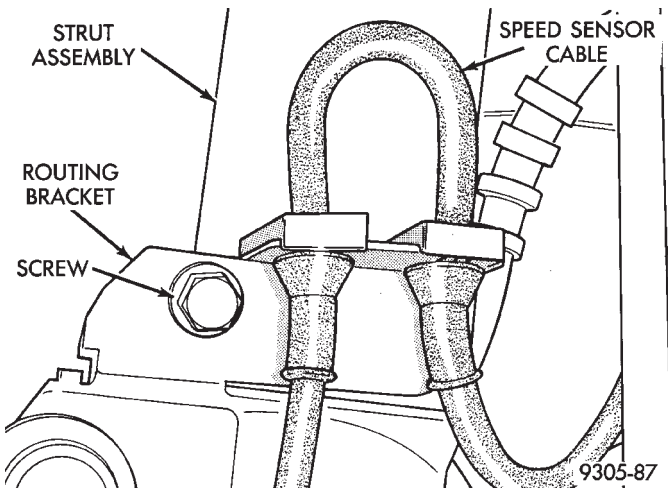


Fig. 17 Speed Sensor Cable Routing Bracket

(4) Remove retainer, holding the speed sensor sealing grommet, from the inner fender. pull the grommet out, then unplug the speed sensor cable from the vehicle wiring harness

(5) Remove bolt attaching speed sensor to steering knuckle. Carefully remove speed sensor head from steering knuckle. If sensor is seized in place by corrosion, tap the edge of the sensor ear with a hammer and brass punch (Fig. 18), working it side to side.

CAUTION: If speed sensor head locating pin has seized to the steering knuckle, do not attempt to remove speed sensor head by grasping with pliers and turning. This will damage the speed sensor head. Use only the following procedure.

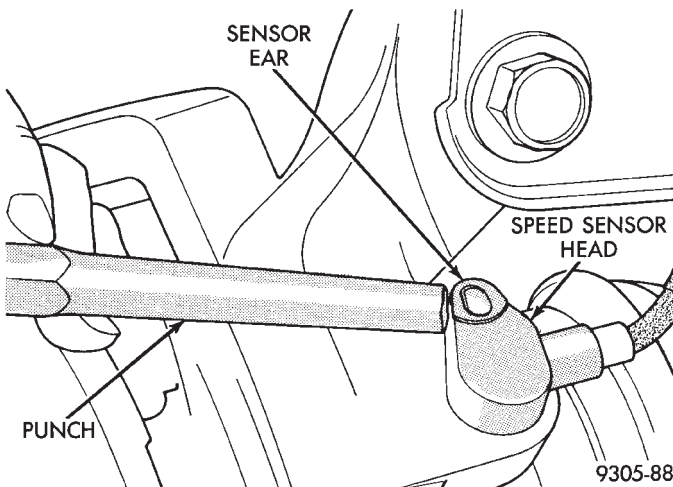


Fig. 18 Speed Sensor Head Attachment To Steering Knuckle

INSTALL

CAUTION: Proper installation of wheel speed sensor cables is critical to continued system operation. Be sure that cables are installed in retainers. Failure to install cables in retainers as shown in this section may result in contact with moving parts and/or over extension of cables, resulting in an open circuit.

(1) Connect the wheel speed sensor cable connector to the vehicle wiring harness.

(2) Install the speed sensor cable assembly grommet into the front inner fender. Install speed sensor cable grommet and retainer bracket on the inner fender of the vehicle and install and securely tighten attaching bolt.

CAUTION: When installing the wheel speed sensor cable routing bracket on the strut, the speed sensor cable must be looped upward as shown (Fig. 17). If speed sensor cable is not routed in this direction it may rub, damaging the speed sensor cable.

(3) Install the speed sensor cable routing bracket on the steering knuckle. Install and tighten routing bracket mounting bolt to a torque of 12 N·m (105 in. lbs.)

(4) Apply a small amount of High Temperature Multipurpose grease to the sensor head before installation. Install speed sensor head on steering knuckle. Install the speed sensor head attaching screw and tighten to a torque of 7 N·m (60 in. lbs.).

(5) Install the wheel and tire assembly on vehicle.

(6) Lower the vehicle to the ground.

(7) Road test vehicle to ensure proper operation of the base and ABS systems.

REAR WHEEL SPEED SENSORS

REMOVE

NOTE: NOTE: When removing rear wheel speed sensor from vehicle, access to the wire harness connector is through the passenger compartment of the vehicle.

(1) Remove the rear seat cushion, and the rear seat back, from the interior of the car. Refer to Seats in the Body section of this manual for the required procedure to be used for this vehicle.

REMOVAL AND INSTALLATION (Continued)

(2) Disconnect the wheel speed sensor cable from the wire harness.

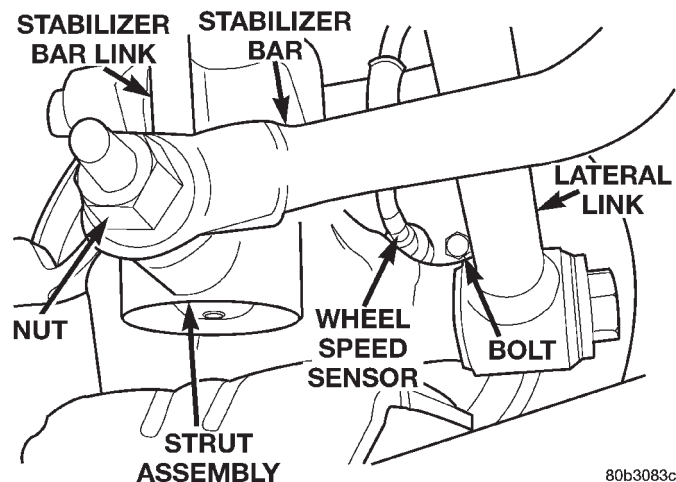
(3) Raise vehicle on jack stands or centered on a frame contact type hoist. See Hoisting in the Lubrication and Maintenance section of this manual for the required lifting procedure to be used for this vehicle.

(4) Remove the rear wheel and tire assembly from the vehicle.

(5) Remove the grommet from the floor pan, along with the end of the cable that fastens to the wire harness.

(6) Remove the sensor cable from the routing bracket attached to the strut tower flange.

(7) Remove the wheel speed sensor head and routing bracket from the disc brake caliper adapter by removing the bolt, then the sensor (Fig. 19).



80b3083c

Fig. 19 Wheel Speed Sensor At Adapter

INSTALL

(1) Install rear wheel speed sensor and routing bracket into brake caliper adapter. Install head attaching bolt (Fig. 19) and tighten to 7 N·m (60 in. lbs.).

(2) Install the sensor cable to the routing bracket attached to the strut tower flange.

(3) Guide the cable through the hole in the floor pan and install the grommet.

(4) Install wheel and tire assembly on vehicle. Then torque all wheel mounting stud nuts in proper sequence until all nuts are torqued to half specification. Then repeat tightening sequence to full specified torque of 129 N·m (95 ft. lbs.).

(5) Lower vehicle to the ground.

(6) Connect the sensor cable to the wiring harness.

(7) Reinstall the rear seat back and seat cushion.

(8) Road test vehicle to ensure proper operation of the base and ABS systems.

SPECIFICATIONS

SPEED SENSOR TONE WHEEL RUNOUT

The total indicator runout allowed for both the front and rear tone wheel measured using a dial indicator is 0.15 mm (.006 in.).

WHEEL SPEED SENSOR TO TONE WHEEL CLEARANCE**FRONT WHEEL**

Minimum Clearance 0.17 mm (0.007 in.)

Maximum Clearance 1.80 mm (0.072 in.)

REAR WHEEL

Minimum Clearance 0.37 mm (0.015 in.)

Maximum Clearance 1.50 mm (0.059 in.)

BRAKE FASTENER TORQUE SPECIFICATIONS

DESCRIPTION	TORQUE
BRAKE TUBES:	
Tube Nuts	17 N·m (145 in. lbs.)
ABS INTEGRATED CONTROL UNIT (ICU):	
Mounting Bracket Bolts	11 N·m (97 in. lbs.)
CAB To HCU Screws	2 N·m (17 in. lbs.)