

BRAKES

TABLE OF CONTENTS

	page		page
BASE BRAKE SYSTEM	1	ANTILOCK BRAKE SYSTEM	75

BASE BRAKE SYSTEM

TABLE OF CONTENTS

	page		page
DESCRIPTION AND OPERATION			
BASE BRAKE SYSTEM	2	BRAKE TUBES AND HOSES	35
BRAKE PEDAL	2	PROPORTIONING VALVE	35
MASTER CYLINDER	2	DISC BRAKE CALIPER (FRONT)	36
POWER BRAKE BOOSTER	4	DISC BRAKE SHOES (FRONT)	37
BRAKE TUBES AND HOSES	5	DISC BRAKE CALIPER (REAR)	40
PROPORTIONING VALVE	5	DISC BRAKE SHOES (REAR)	41
DISC BRAKES (FRONT)	6	DRUM BRAKE WHEEL CYLINDER (REAR)	44
DISC BRAKES (REAR)	7	DRUM BRAKE SHOES (REAR)	45
DRUM BRAKES (REAR)	8	BRAKE DRUM	48
PARKING BRAKES	8	DRUM BRAKE SUPPORT PLATE (REAR)	49
BRAKE LAMP SWITCH	9	PARKING BRAKE LEVER	51
BRAKE FLUID LEVEL SWITCH	10	PARKING BRAKE CABLE (REAR)	55
RED BRAKE WARNING LAMP	10	PARKING BRAKE SHOES (WITH REAR DISC BRAKES)	61
DIAGNOSIS AND TESTING		BRAKE LAMP SWITCH	62
BASE BRAKE SYSTEM DIAGNOSIS CHARTS	10	DISASSEMBLY AND ASSEMBLY	
POWER BRAKE BOOSTER	13	MASTER CYLINDER BRAKE FLUID RESERVOIR	63
PROPORTIONING VALVE	14	DISC BRAKE CALIPER (FRONT AND REAR)	64
BRAKE ROTOR	16	DRUM BRAKE WHEEL CYLINDER (REAR)	69
BRAKE DRUM	18	CLEANING AND INSPECTION	
DRUM BRAKE AUTOMATIC ADJUSTER	19	DISC BRAKES (FRONT)	70
BRAKE FLUID CONTAMINATION	19	DISC BRAKES (REAR)	70
BRAKE LAMP SWITCH	20	DRUM BRAKES (REAR)	70
SERVICE PROCEDURES		BRAKE TUBES AND HOSES	71
BRAKE FLUID LEVEL CHECKING	20	ADJUSTMENTS	
BASE BRAKE BLEEDING	20	DRUM BRAKE SHOES	71
MASTER CYLINDER BLEEDING	21	PARKING BRAKE	72
BRAKE TUBE REPAIR	22	BRAKE LAMP SWITCH	72
BRAKE ROTOR MACHINING	23	SPECIFICATIONS	
BRAKE DRUM MACHINING	24	BRAKE FLUID	73
REMOVAL AND INSTALLATION		BRAKE ACTUATING SYSTEM	73
SERVICE WARNINGS AND CAUTIONS	25	BRAKE FASTENER TORQUE SPECIFICATIONS	73
BRAKE PEDAL	25	SPECIAL TOOLS	
MASTER CYLINDER	27	BASE BRAKE SYSTEM	74
BRAKE FLUID LEVEL SWITCH	29		
POWER BRAKE BOOSTER (2.5L ENGINE)	30		

DESCRIPTION AND OPERATION

BASE BRAKE SYSTEM

DESCRIPTION

The base brake system consists of the following components:

- Brake pedal
- power brake booster
- brake tubes and hoses
- proportioning valves
- disc brakes
- drum brakes
- brake lamp switch
- brake fluid level switch
- parking brakes

Front disc brakes control the braking of the front wheels; rear braking is controlled by rear drum brakes as standard equipment. Rear disc brakes are optional.

The hydraulic brake system is diagonally split on both the non-antilock and antilock braking systems. This means the left front and right rear brakes are on one hydraulic circuit and the right front and left rear are on the other.

Vehicles equipped with the optional antilock brake system (ABS) use a system designated Mark 20i. This system shares most base brake hardware used on vehicles without ABS. A vehicle equipped with ABS, however, uses a different power brake booster, master cylinder, and brake tubes. Also included in the ABS system is an integrated control unit (ICU), four wheel speed sensors, and an electronic controller referred to as the controller antilock brake (CAB). These components are described in detail in the ANTILOCK BRAKE SYSTEM section in this group of the service manual.

OPERATION

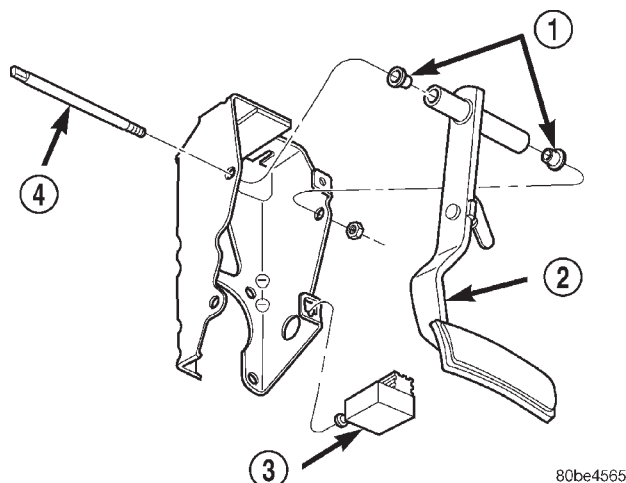
When a vehicle needs to be stopped, the driver applies the brake pedal. The brake pedal pushes the input rod of the power brake booster into the booster. The booster uses vacuum to ease pedal effort as force is transferred through the booster to the master cylinder. The booster's output rod pushes in the master cylinder's primary and secondary pistons applying hydraulic pressure through the chassis brake tubes and proportioning valves to the brakes at each tire and wheel assembly.

The parking brake is hand-operated. When applied, the parking brake lever pulls on cables that actuate brake shoes at each rear wheel.

BRAKE PEDAL

DESCRIPTION

A suspended type brake pedal is used on this vehicle (Fig. 1). The pedal pivots on a shaft mounted in the pedal support bracket under the instrument panel. The pedal also connects to the power brake booster input rod.



80be4565

Fig. 1 Brake Pedal

- 1 - BUSHINGS
- 2 - BRAKE PEDAL
- 3 - BRAKE LAMP SWITCH
- 4 - PIVOT SHAFT

OPERATION

When the brake pedal is depressed, it pushes in on the power brake booster input rod applying the brakes. At the same time, it allows the brake lamp switch's plunger to extend, thus applying the brake lamps.

MASTER CYLINDER

DESCRIPTION

This vehicle uses 2 differently designed master cylinder assemblies depending on whether the vehicle is or is not equipped with antilock brakes.

Vehicles not equipped with ABS use a standard compensating port master cylinder design, while vehicles equipped with ABS use a center valve design master cylinder.

On vehicles equipped with ABS brakes, the master cylinder is a two outlet design. On vehicles not equipped with ABS brakes, the master cylinder is a 4 outlet design. All vehicles are equipped with a master cylinder having a bore diameter of 22.2 mm.

DESCRIPTION AND OPERATION (Continued)

The master cylinder assembly (Fig. 2) consists of the following components. The body of the master cylinder is an anodized aluminum casting. It has a machined bore to accept the master cylinder piston and threaded ports with seats for hydraulic brake line connections. The brake fluid reservoir of the master cylinder assembly is made of a see through plastic.

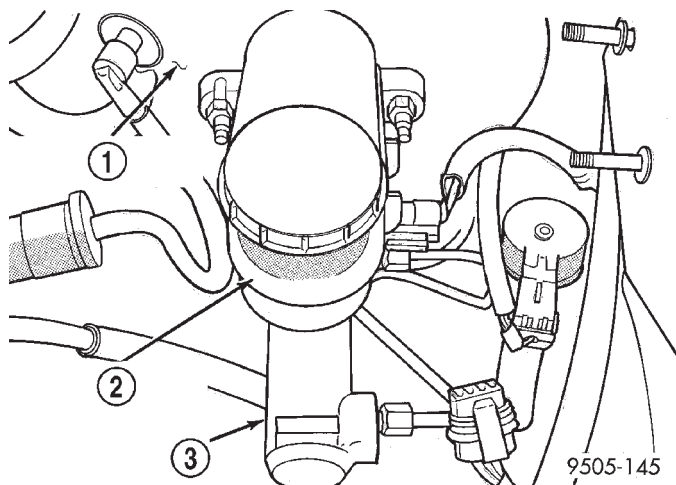


Fig. 2 Master Cylinder

- 1 - POWER BRAKE VACUUM BOOSTER
- 2 - MASTER CYLINDER FLUID RESERVOIR
- 3 - MASTER CYLINDER BODY

OPERATION

When the brake pedal is depressed, the master cylinder primary and secondary pistons apply brake pressure through the chassis brake tubes and proportioning valves to each brake assembly.

On Non-ABS master cylinders, the primary outlet ports (Fig. 3) supply hydraulic pressure to the right front and left rear brakes. The secondary outlet ports (Fig. 3) supply hydraulic pressure to the left front and right rear brakes.

On ABS master cylinders, the primary outlet port (Fig. 4) supplies hydraulic pressure to the right front and left rear brakes. The secondary outlet port (Fig. 4) supplies hydraulic pressure to the left front and right rear brakes.

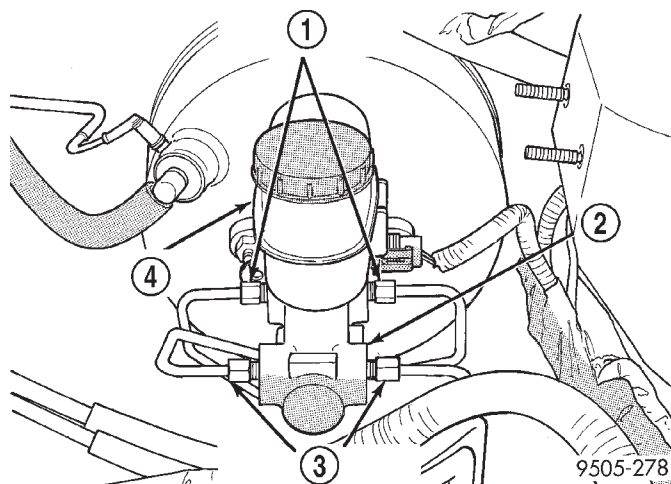


Fig. 3 Primary And Secondary Ports Without ABS

- 1 - MASTER CYLINDER PRIMARY PORTS
- 2 - MASTER CYLINDER
- 3 - MASTER CYLINDER SECONDARY PORTS
- 4 - MASTER CYLINDER FLUID RESERVOIR

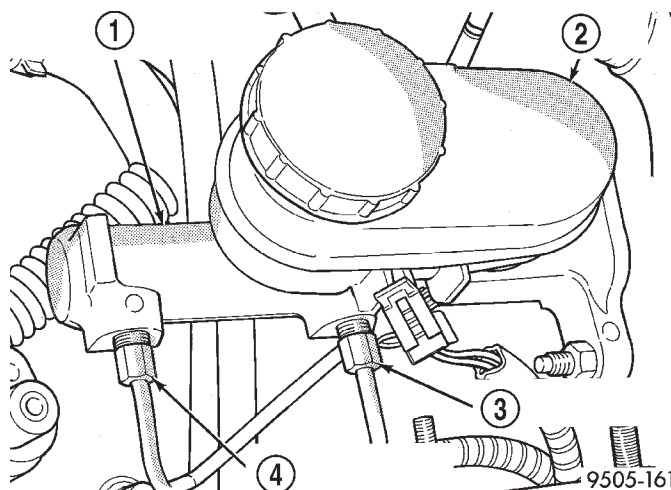


Fig. 4 Primary And Secondary Ports With ABS

- 1 - MASTER CYLINDER ASSEMBLY
- 2 - BRAKE FLUID RESERVOIR
- 3 - MASTER CYLINDER PRIMARY PORT
- 4 - MASTER CYLINDER SECONDARY PORT

DESCRIPTION AND OPERATION (Continued)

POWER BRAKE BOOSTER

DESCRIPTION

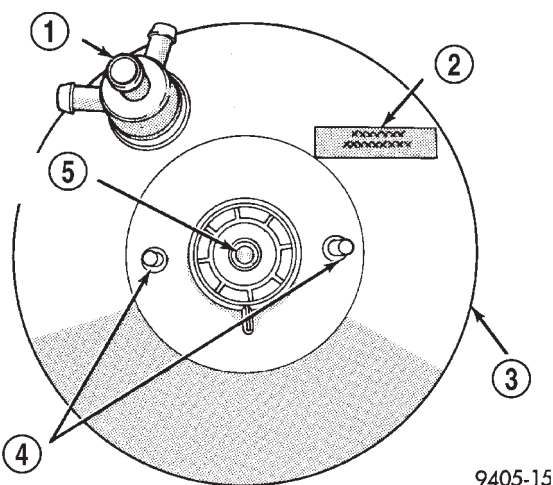
The power brake booster reduces the amount of force required by the driver to obtain the necessary hydraulic pressure to stop the vehicle.

The vacuum booster assembly mounts on the engine side of the dash panel. It is connected to the brake pedal by the input push rod (Fig. 6). A vacuum line connects the vacuum booster to the intake manifold. The master cylinder is bolted to the front of the vacuum booster assembly.

All vehicles use a 205 mm tandem diaphragm power brake vacuum booster. The vacuum booster though, may be unique for the type of brake system the vehicle is equipped with. For this reason, if the power brake vacuum booster requires replacement, be sure it is replaced with the correct part for the type of brake system that the vehicle is equipped with.

The booster can be identified if required, by the tag attached to the body of the booster (Fig. 5). This tag contains the following information: The production part number of the vacuum booster, the date it was built, and who manufactured it.

NOTE: The 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 vacuum booster check valve is not repairable but can be replaced as a component of the booster.



9405-15

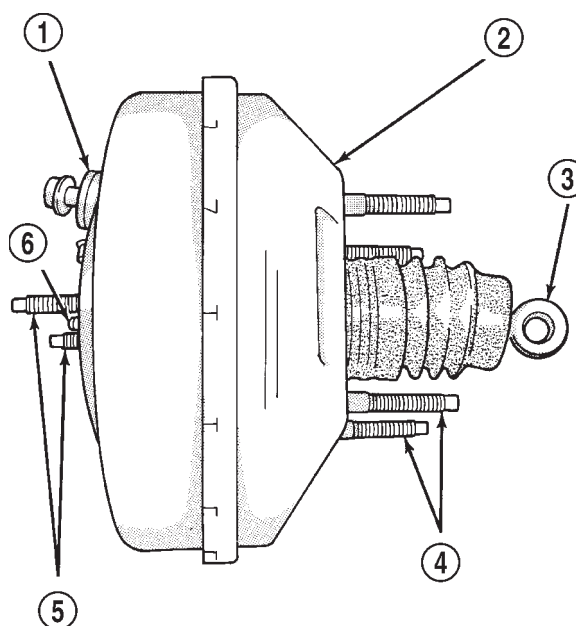
Fig. 5 Power Brake Booster Identification

- 1 - VACUUM CHECK VALVE
- 2 - PART IDENTIFICATION TAG
- 3 - POWER BRAKE BOOSTER ASSEMBLY
- 4 - MASTER CYLINDER MOUNTING STUDS
- 5 - MASTER CYLINDER PUSH ROD

OPERATION

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. 5).

As the brake pedal is depressed, the vacuum booster's input rod moves forward (Fig. 6). This opens and closes valves in the vacuum booster, allowing atmospheric pressure to enter on one side of a diaphragm. Engine vacuum is always present on the other side. This difference in pressure forces the output rod of the vacuum booster (Fig. 6) 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.



9405-16

Fig. 6 Power Brake Booster

- 1 - VACUUM CHECK VALVE
- 2 - POWER BRAKE BOOSTER ASSEMBLY
- 3 - INPUT ROD
- 4 - POWER BOOSTER ASSEMBLY TO DASH PANEL MOUNTING STUDS (4)
- 5 - MASTER CYLINDER MOUNTING STUDS (2)
- 6 - OUTPUT ROD

Different systems and engine combinations require different vacuum hose routings.

DESCRIPTION AND OPERATION (Continued)

BRAKE TUBES AND HOSES

DESCRIPTION

The chassis brake tubes are steel with a corrosion resistant coating applied to the external surfaces. The flex hoses are made of reinforced rubber.

OPERATION

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 flex hoses are made of rubber to allow for the movement of the vehicle's suspension.

PROPORTIONING VALVE

DESCRIPTION

This vehicle uses proportioning valves that are in-line with the rear brake tubes. The chassis brake tubes connect directly from the master cylinder or HCU (ABS models) to the rear brake flex hose. The non ABS brake system uses two proportioning valves in-line with each of the rear wheel chassis brake tubes. Vehicles not equipped with ABS have the proportioning valves located on the front suspension crossmember in the same area as the hydraulic unit mounts on ABS equipped vehicles (Fig. 7).

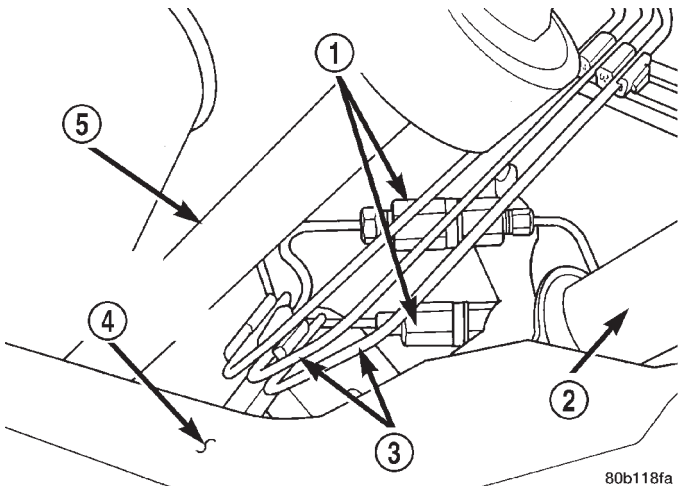


Fig. 7 Proportioning Valves For Non ABS Equipped Vehicles

- 1 – PROPORTIONING VALVES
- 2 – STEERING GEAR
- 3 – CHASSIS BRAKE TUBES
- 4 – FRONT SUSPENSION CROSSMEMBER
- 5 – RIGHT DRIVESHAFT

On vehicles equipped with antilock brakes, the proportioning valves are located under the vehicle on the passenger side just rearward of the passenger seat. (Fig. 8). The proportioning valves mount directly in the chassis brake tube going to each of the vehicles rear brakes (Fig. 8).

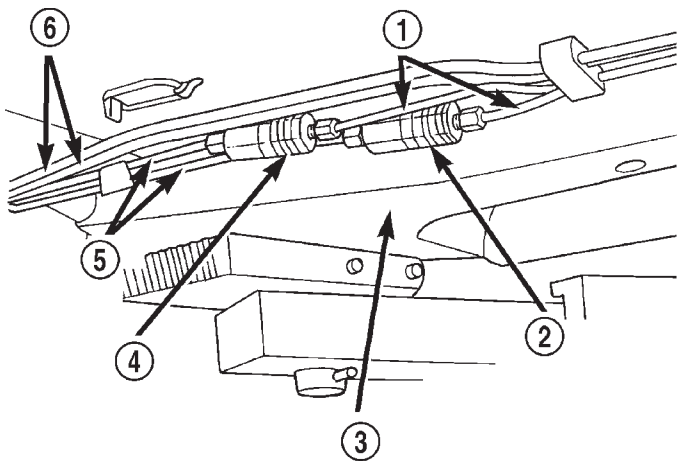


Fig. 8 Proportioning Valve Location For Antilock Brake Equipped Vehicles

- 1 – CHASSIS BRAKE TUBES
- 2 – RIGHT REAR BRAKE PROPORTIONING VALVE
- 3 – RIGHT FRAME RAIL
- 4 – LEFT REAR BRAKE PROPORTIONING VALVE
- 5 – CHASSIS BRAKE TUBES
- 6 – FUEL TUBES

For additional information and procedures on proportioning valves on vehicles with ABS, refer to the ANTILOCK BRAKE SYSTEM section.

There are two proportioning valve assemblies used in each vehicle. During any service procedures identify valve assemblies by supplier part number or the bar code label and stamp identification band (Fig. 9).

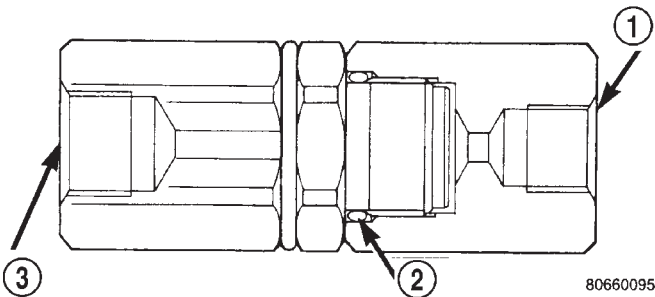


Fig. 9 Proportioning Valve Identification

- 1 – FROM MASTER CYLINDER
- 2 – O. RING SEAL
- 3 – TO REAR BRAKES

OPERATION

Proportioning valves balance front to rear braking by controlling at a given ratio, the increase in rear brake system hydraulic pressure above a preset level (split point). Under light pedal application, the proportioning valve allows full hydraulic pressure to be applied to the rear brakes.

This vehicle's brake system uses different calibrations for the proportioning valves depending on application.

DESCRIPTION AND OPERATION (Continued)

For specifications on valves for particular brake applications, refer to Diagnosis And Testing in this group.

DISC BRAKES (FRONT)

DESCRIPTION

The front disc brakes (Fig. 10) and (Fig. 11) consists of the following components:

- Braking disc (brake rotor)
- Caliper assembly - single piston, floating type
- Brake pads and linings

The front disc brakes used on this vehicle are double pin floating calipers.

The front disc brake double pin calipers are mounted directly to the steering knuckles and use no adapter. The caliper is mounted to the steering knuckle using bushings, sleeves and 2 guide pin bolts which thread directly into bosses on the steering knuckle (Fig. 10), (Fig. 11) and (Fig. 12).

The caliper is a one piece casting with the inboard side containing a single piston cylinder bore.

The front disc brake caliper piston (Fig. 11), is manufactured from a phenolic compound. The outside diameter of the caliper piston is 54 mm.

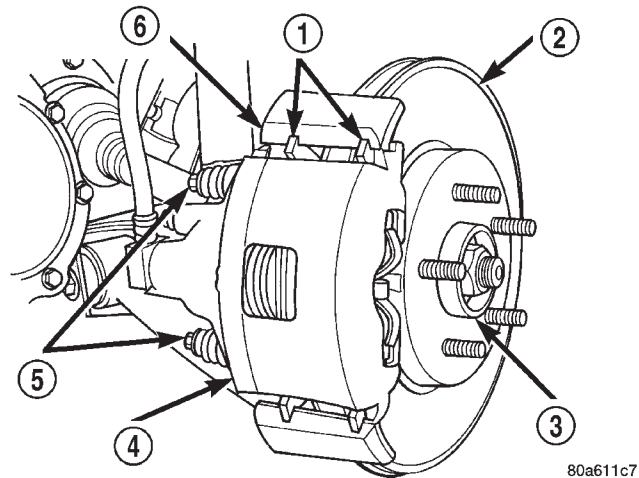


Fig. 10 Front Disc Brake Components

- 1 - BRAKE PADS AND LININGS
- 2 - BRAKE ROTOR
- 3 - DRIVING HUB
- 4 - CALIPER ASSEMBLY
- 5 - GUIDE PIN BOLTS
- 6 - STEERING KNUCKLE

80a611c7

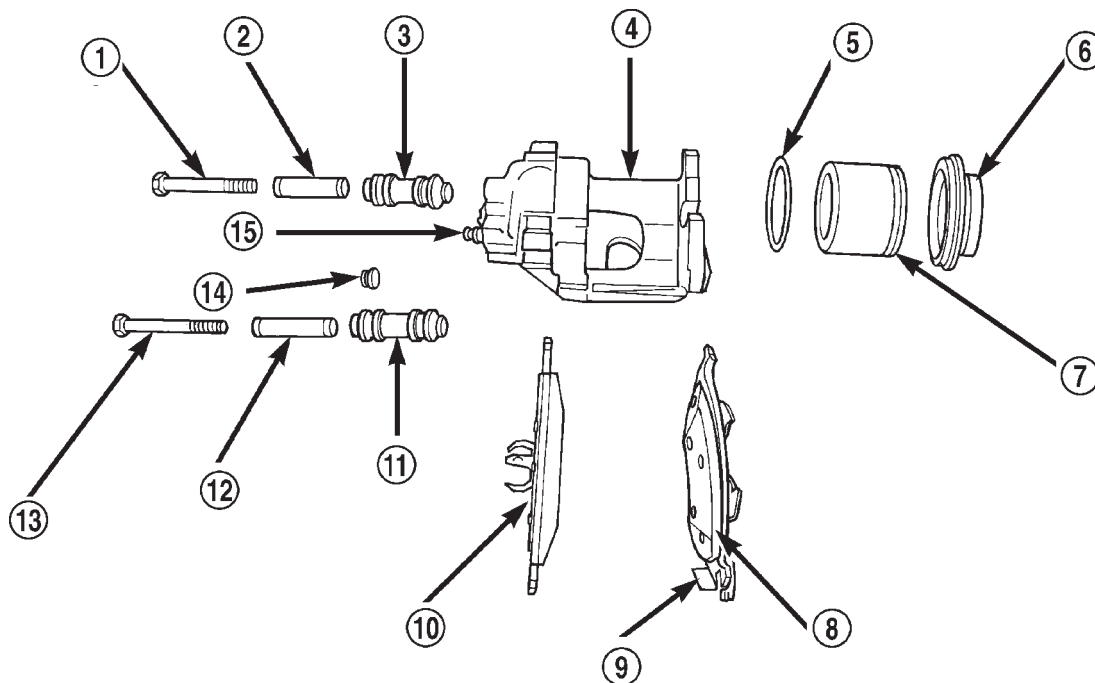
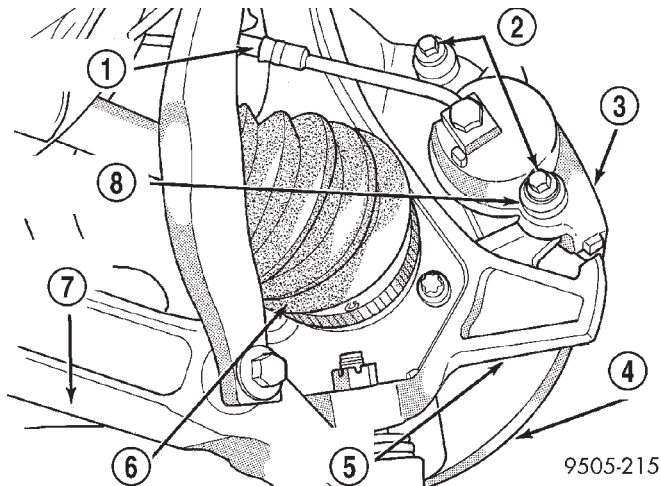


Fig. 11 Front Disc Brake Caliper (Exploded View)

- 1 - CALIPER GUIDE PIN BOLT
- 2 - SLEEVE
- 3 - BUSHING
- 4 - CALIPER
- 5 - PISTON SEAL
- 6 - DUST SEAL
- 7 - PISTON
- 8 - OUTBOARD BRAKE SHOE
- 9 - WEAR INDICATOR
- 10 - INBOARD BRAKE SHOE
- 11 - BUSHING
- 12 - SLEEVE
- 13 - CALIPER GUIDE PIN BOLT
- 14 - CAP
- 15 - BLEEDER SCREW

80a1104f

DESCRIPTION AND OPERATION (Continued)

**Fig. 12 Front Disc Brake Caliper Mounting**

- 1 - BRAKE FLEX HOSE
- 2 - GUIDE PIN BOLTS
- 3 - CALIPER ASSEMBLY
- 4 - ROTOR
- 5 - STEERING KNUCKLE
- 6 - DRIVESHAFT
- 7 - LOWER CONTROL ARM
- 8 - BUSHINGS AND SLEEVES

OPERATION

Two machined abutments on the steering knuckle position the caliper. The guide pin bolts, sleeves and bushings control the side to side movement of the caliper. The piston seal is designed to pull the piston back into the bore of the caliper when the brake pedal is released. This maintains the proper brake shoe to rotor clearance (Fig. 13).

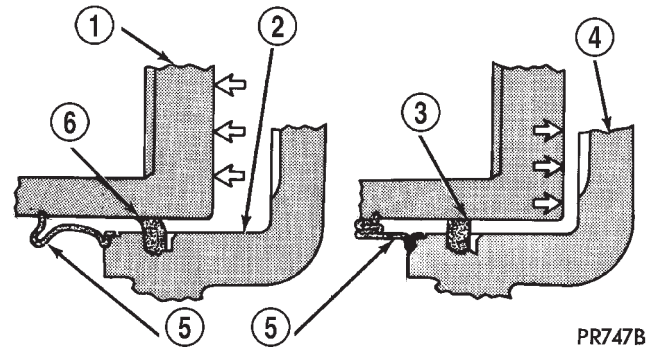
All the front brake forces generated during braking of the vehicle are taken up directly by the steering knuckles of the vehicle.

A square cut rubber piston seal is located in a machined groove in the caliper cylinder bore. This provides a hydraulic seal between the piston and the cylinder wall (Fig. 13).

A rubber dust boot is installed in the cylinder bore opening and in a groove in the piston (Fig. 13). This prevents contamination in the bore area.

As front disc brake linings wear, master cylinder reservoir brake fluid level will drop. Fluid level should be checked after replacing linings.

Front disc brakes are equipped with an audible wear sensor (Fig. 11) on the outboard brake pad. This sensor emits a sound when the brake lining may need inspection or replacement.

**Fig. 13 Piston Seal Function for Automatic Adjustment**

- 1 - PISTON
- 2 - CYLINDER BORE
- 3 - PISTON SEAL BRAKE PRESSURE OFF
- 4 - CALIPER HOUSING
- 5 - DUST BOOT
- 6 - PISTON SEAL BRAKE PRESSURE ON

DISC BRAKES (REAR)**DESCRIPTION**

The rear disc brakes are similar to the front disc brakes, however, there are several distinctive features that require different service procedures. The single piston, floating caliper rear disc brake assembly includes a hub and bearing assembly, adapter, brake rotor, caliper, brake pads/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.

Vehicles are equipped with a caliper assembly that has a 33.4 mm (1.31 in.) piston and uses a solid non-vented rotor.

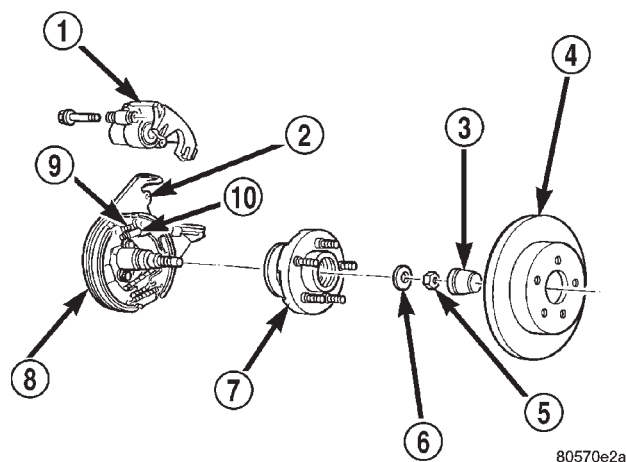
The caliper assembly on all applications float on rubber bushings using internal metal sleeves which are attached to the adapter using threaded guide pin bolts.

The adapter and rotor 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 pads for movement inboard and outboard (Fig. 14).

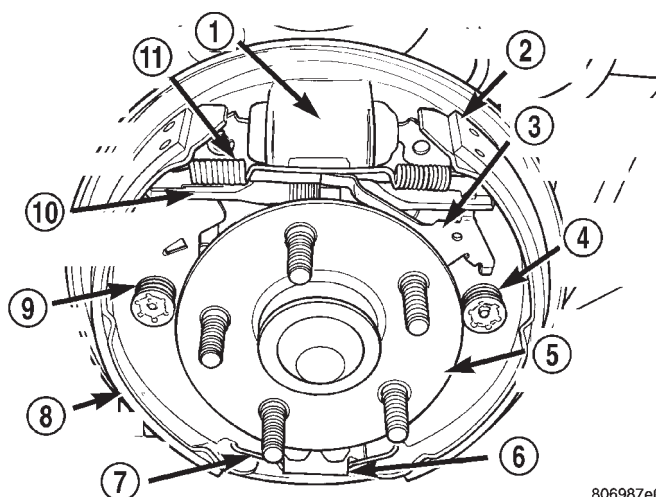
OPERATION

Rear disc brakes operate similarly to front disc brakes.

DESCRIPTION AND OPERATION (Continued)

**Fig. 14 Rear Disc Brake Exploded View**

- 1 - CALIPER ASSEMBLY
- 2 - ADAPTER
- 3 - DUST CAP
- 4 - DISC
- 5 - NUT
- 6 - WASHER
- 7 - HUB/BEARING ASSEMBLY
- 8 - PARKING BRAKE SHOES
- 9 - RETURN SPRING
- 10 - ADJUSTER

**Fig. 15 Rear Wheel Drum Brake Assembly**

- 1 - WHEEL CYLINDER
- 2 - LEADING BRAKE SHOE
- 3 - AUTOMATIC ADJUSTER LEVER
- 4 - HOLD DOWN SPRING
- 5 - HUB/BEARING ASSEMBLY
- 6 - BRAKE SHOE ANCHOR
- 7 - BRAKE SHOE LOWER RETURN SPRING
- 8 - TRAILING BRAKE SHOE
- 9 - HOLD DOWN SPRING
- 10 - AUTOMATIC ADJUSTER
- 11 - BRAKE SHOE UPPER RETURN SPRING

DRUM BRAKES (REAR)**DESCRIPTION**

This vehicle's rear wheel drum brakes are a two shoe leading/trailing internal expanding type, with an automatic self-adjuster mechanism (Fig. 15). The automatic self-adjuster mechanism used on this vehicle is a screw type adjuster. The automatic self-adjuster mechanism is located directly below the rear wheel cylinder (Fig. 15).

OPERATION

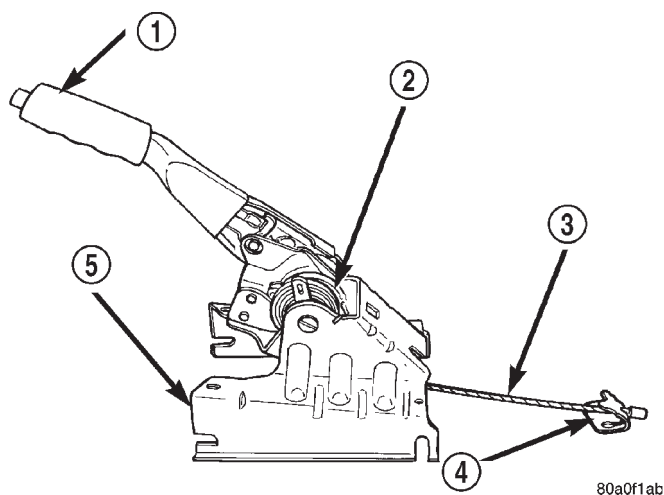
This vehicle's rear wheel drum brake shoes expand outward against the drum when applied. The automatic self-adjuster mechanism is actuated each time the vehicle's service brakes are applied.

PARKING BRAKES**DESCRIPTION**

All vehicles are equipped with a center mounted, hand operated parking brake lever (Fig. 16). This lever is an auto-adjust type.

On vehicles with rear drum brakes, the rear wheel service brakes act as the vehicle's parking brakes.

The parking brakes on vehicles equipped with rear disc brakes consist of a small duo-servo brake assembly mounted to the disc brake caliper adapter (Fig. 17). The hat (center) section (Fig. 18) of the rear

**Fig. 16 Park Brake Lever Assembly**

- 1 - HAND LEVER
- 2 - AUTOMATIC ADJUSTER MECHANISM
- 3 - OUTPUT CABLE
- 4 - PARK BRAKE LEVER ASSEMBLY

rotor serves as the braking surface (drum) for the parking brakes.

The parking brake lever has a short output cable that connects the lever to the rear cables. The parking brake lever output cable is not replaceable as a separate component of the parking brake lever.

DESCRIPTION AND OPERATION (Continued)

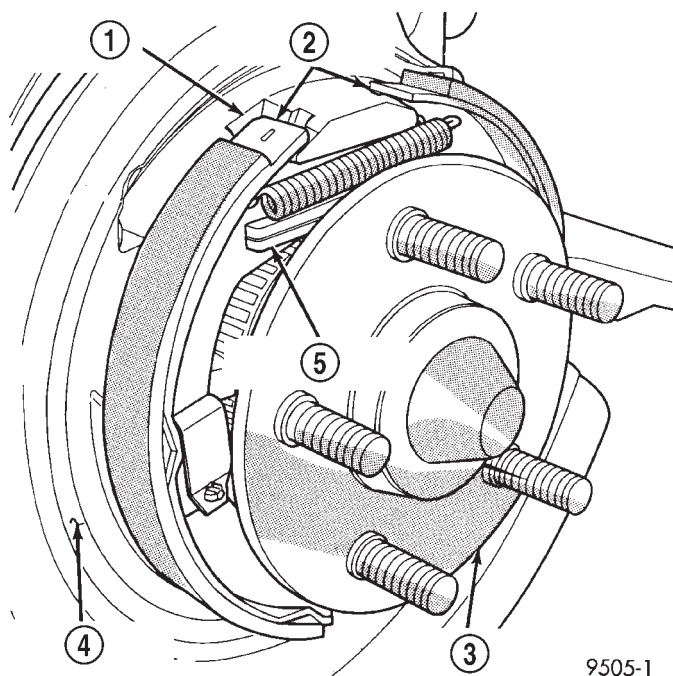


Fig. 17 Parking Brake Assembly With Rear Disc Brakes

- 1 - DISC BRAKE ADAPTER
- 2 - PARKING BRAKE BRAKE SHOES
- 3 - HUB/BEARING ASSEMBLY
- 4 - BRAKING DISC STONE SHIELD
- 5 - PARKING BRAKE ACTUATING STRUT

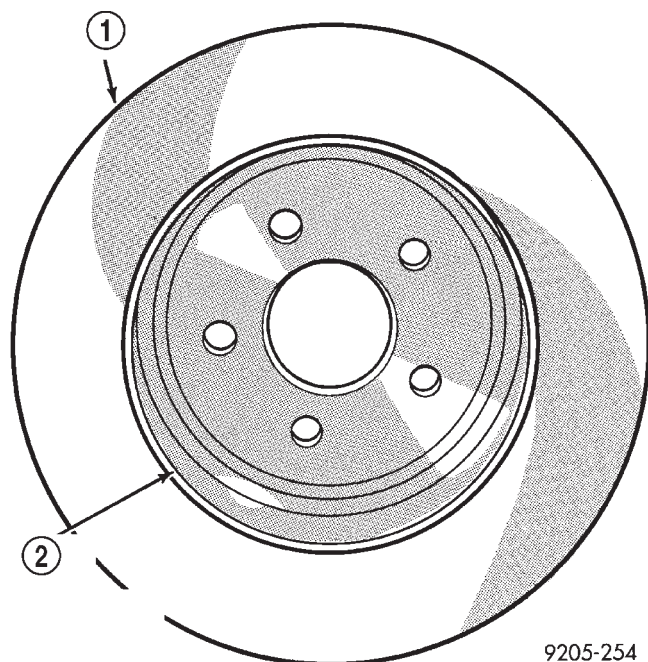


Fig. 18 Drum In Hat Rotor

- 1 - REAR BRAKING DISK ROTOR
- 2 - HAT SECTION OF REAR BRAKING DISC (PARKING BRAKE BRAKING SURFACE)

OPERATION

The parking brake lever is an auto-adjust type which continuously applies minimal tension to the parking brake cables to keep them in adjustment at all times. Due to this feature, the park brake cable system does not require adjustment. Proper parking brake system adjustment is obtained by proper rear drum brake shoe adjustment.

The rear drum brake shoes, when acting as parking brakes, are mechanically operated using an internal actuating lever and strut which is connected to a flexible steel cable. There is an individual park brake cable for each rear wheel, which are joined using a park cable equalizer before terminating at the floor mounted, hand operated park brake lever.

The parking brakes on vehicles equipped with rear disc brakes consist of a small duo-servo brake assembly mounted to the disc brake caliper adapter which expands its shoes outward against the hat (center) section of the disc brake rotor when applied (Fig. 17). This parking brake application uses the same operating cable configuration as the drum brake equipped vehicles, but different cables.

BRAKE LAMP SWITCH

DESCRIPTION

The brake lamp switch is located under the instrument panel at the brake pedal arm (Fig. 19). It controls operation of the vehicle's brake lamps. Also, if the vehicle is equipped with speed control, the brake lamp switch will deactivate speed control when the brake pedal is depressed.

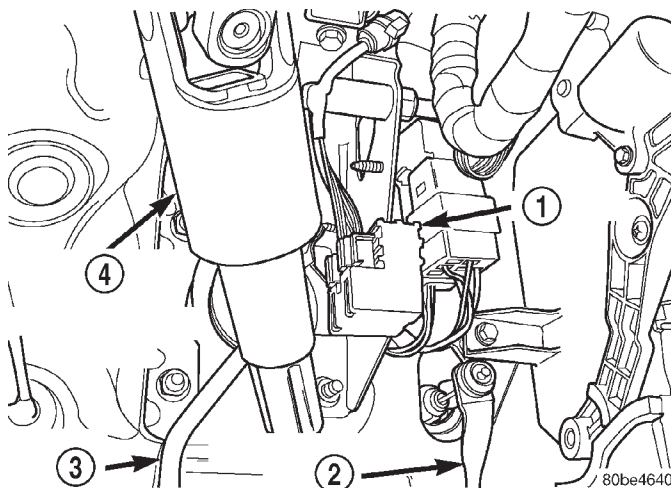


Fig. 19 Brake Lamp Switch

- 1 - SWITCH
- 2 - ACCELERATOR PEDAL
- 3 - BRAKE PEDAL
- 4 - STEERING COLUMN INTERMEDIATE SHAFT

DESCRIPTION AND OPERATION (Continued)

OPERATION

When the brake pedal is depressed, the plunger on the outside of the switch extends outward. This action closes the electrical contacts within the switch, completing the circuit to the brake lamps at the rear of the vehicle, thus illuminating the brake lamps and the center-high-mounted stop lamp (CHMSL).

BRAKE FLUID LEVEL SWITCH

DESCRIPTION

The brake fluid level switch is located in the brake fluid reservoir of the master cylinder assembly (Fig. 20). The purpose of the sensor is to provide the driver with an early warning that brake fluid level in master cylinder reservoir has dropped to below normal. This may indicate an abnormal loss of brake fluid in the master cylinder fluid reservoir resulting from a leak in the hydraulic system.

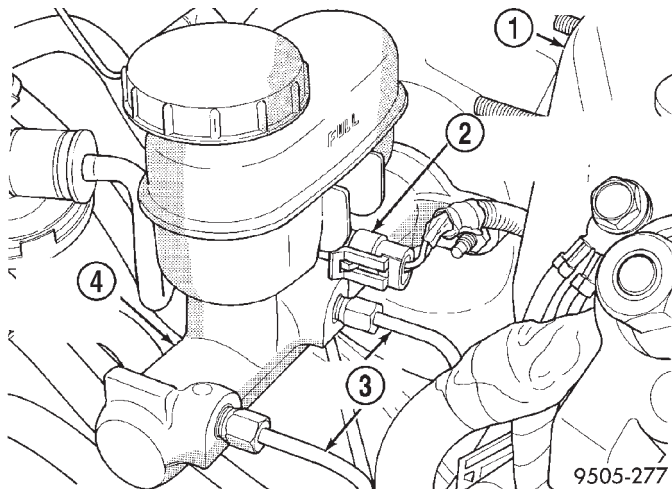


Fig. 20 Master Cylinder Fluid Level Switch

- 1 - LEFT SHOCK TOWER
- 2 - MASTER CYLINDER FLUID LEVEL SENSOR
- 3 - BRAKE TUBES
- 4 - MASTER CYLINDER ASSEMBLY

OPERATION

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

RED BRAKE WARNING LAMP

DESCRIPTION

The red BRAKE warning lamp is located in the instrument panel cluster and is used to indicate a low brake fluid condition, the parking brake being applied or that the antilock brake system has a fault but could not turn on the amber ABS warning lamp. 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.

OPERATION

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 fluid level switch in the master cylinder reservoir, the parking brake warning lamp switch mounted on the parking brake lever, the ignition switch when in the crank position or by the mechanical instrument cluster in the situation when the ABS CAB cannot illuminate the amber ABS warning lamp.

DIAGNOSIS AND TESTING

BASE BRAKE SYSTEM DIAGNOSIS CHARTS

NOTE: There are three diagnosis charts following that cover the RED BRAKE WARNING LAMP, BRAKE NOISE and OTHER BRAKE CONDITIONS.

DIAGNOSIS AND TESTING (Continued)

RED BRAKE WARNING LAMP

CONDITION	POSSIBLE CAUSES	CORRECTION
RED BRAKE WARNING LAMP ON	1. Parking brake lever not fully released. 2. Parking brake warning lamp switch on parking brake lever. 3. Brake fluid level low in reservoir. 4. Brake fluid level switch. 5. Mechanical instrument cluster (MIC) problem.	1. Release parking brake lever. 2. Inspect and replace switch as necessary. 3. Fill reservoir. Check entire system for leaks. Repair or replace as required. 4. Disconnect switch wiring connector. If lamp goes out, replace switch. 5. Refer to Chassis Diagnostic Procedures manual.

BRAKE NOISE

CONDITION	POSSIBLE CAUSES	CORRECTION
DISC BRAKE CHIRP	1. Excessive brake rotor runout. 2. Lack of lubricant on brake caliper slides.	1. Follow brake rotor diagnosis and testing. Correct as necessary. 2. Lubricate brake caliper slides.
DISC BRAKE RATTLE OR CLUNK	1. Broken or missing anti-rattle spring clips on shoes. 2. Caliper guide pins loose.	1. Replace brake shoes. 2. Tighten guide pins.
DISC BRAKE SQUEAK AT LOW SPEED (WHILE APPLYING LIGHT BRAKE PEDAL EFFORT)	1. Brake shoe linings.	1. Replace brake shoes.
DRUM BRAKE CHIRP	1. Lack of lubricant on brake shoe support plate where shoes ride. 2. Wheel cylinder out of alignment.	1. Lubricate shoe contact areas on brake shoe support plates. 2. Loosen wheel cylinder mounting bolts, realign wheel cylinder with brake shoes and tighten mounting bolts.
DRUM BRAKE CLUNK	1. Drum(s) have threaded machined braking surface.	1. Reface or replace brake drums as necessary.
DRUM BRAKE HOWL OR MOAN	1. Lack of lubricant on brake shoe support plate where shoes ride and at the anchor. 2. Rear brake shoes.	1. Lubricate shoe contact areas on brake shoe support plates and at the anchor. 2. Replace rear brake shoes.
DRUM BRAKE SCRAPING OR WHIRRING	1. ABS wheel speed sensor or tone wheel.	1. Inspect, correct or replace faulty component(s).
SCRAPING (METAL-TO-METAL).	1. Foreign object interference with brakes. 2. Brake shoes worn out.	1. Inspect brakes and remove foreign object. 2. Replace brake shoes. Inspect rotors and drums. Reface or replace as necessary.

DIAGNOSIS AND TESTING (Continued)

OTHER BRAKE CONDITIONS

CONDITION	POSSIBLE CAUSES	CORRECTION
BRAKES CHATTER	1. Rear brake drum out of round or disc brake rotor has excessive thickness variation.	1. Isolate condition as rear or front. Reface or replace brake drums or rotors as necessary.
BRAKES DRAG (FRONT OR ALL)	1. Contaminated brake fluid. 2. Binding caliper pins or bushings. 3. Binding master cylinder. 4. Binding brake pedal.	1. Check for swollen seals. Replace all system components containing rubber. 2. Replace pins and bushings 3. Replace master cylinder. 4. Replace brake pedal.
BRAKES DRAG (REAR ONLY)	1. Parking brake cables binding or froze up. 2. Parking brake cable return spring not returning shoes. 3. Service brakes not adjusted properly (rear drum brakes only). 4. Obstruction inside the center console preventing full return of the parking brake cables.	1. Check cable routing. Replace cables as necessary. 2. Replace cables as necessary. 3. Follow the procedure listed in the adjustment section. 4. Remove console and remove obstruction.
BRAKES GRAB	1. Contaminated brake shoe linings. 2. Improper power brake booster assist.	1. Inspect and clean, or replace shoes. Repair source of contamination. 2. Refer to power brake booster in the diagnosis and testing section.
EXCESSIVE PEDAL EFFORT	1. Obstruction of brake pedal. 2. Low power brake booster assist. 3. Glazed brake linings. 4. Brake shoe lining transfer to brake rotor.	1. Inspect, remove or move obstruction. 2. Refer to power brake booster in the diagnosis and testing section. 3. Reface or replace brake rotors as necessary. Replace brake shoes. 4. Reface or replace brake rotors as necessary. Replace brake shoes.
EXCESSIVE PEDAL TRAVEL (VEHICLE STOPS OK)	1. Air in brake lines. 2. Rear drum brake auto-adjuster malfunctioning.	1. Bleed brakes. 2. Inspect and replace drum brake components as necessary. Adjust rear brakes.
EXCESSIVE PEDAL TRAVEL (PEDAL GOES TO FLOOR - CAN'T SKID WHEELS)	1. Power brake booster runout (vacuum assist).	1. Check booster vacuum hose and engine tune for adequate vacuum supply. Refer to power brake booster in the diagnosis and testing section.
EXCESSIVE PEDAL TRAVEL (ONE FRONT WHEEL LOCKS UP DURING HARD BRAKING)	1. One of the two hydraulic circuits to the front brakes is malfunctioning.	1. Inspect system for leaks. Check master cylinder for internal malfunction.

DIAGNOSIS AND TESTING (Continued)

CONDITION	POSSIBLE CAUSES	CORRECTION
PEDAL PULSATES/ SURGES DURING BRAKING	1. Rear brake drum out of round or disc brake rotor has excessive thickness variation.	1. Isolate condition as rear or front. Reface or replace brake drums or rotors as necessary.
PEDAL IS SPONGY	1. Air in brake lines. 2. Power brake booster runout (vacuum assist).	1. Bleed brakes. 2. Check booster vacuum hose and engine tune for adequate vacuum supply. Refer to power brake booster in the diagnosis and testing section.
PREMATURE REAR WHEEL LOCKUP	1. Contaminated brake shoe linings. 2. Inoperative proportioning valve. 3. Improper power brake booster assist.	1. Inspect and clean, or replace shoes. Repair source of contamination. 2. Test proportioning valves following procedure listed in diagnosis and testing section. Replace valves as necessary. 3. Refer to power brake booster in the diagnosis and testing section.
STOP LAMPS STAY ON	1. Brake lamp switch out of adjustment. 2. Brake pedal binding. 3. Obstruction in pedal linkage. 4. Power Brake Booster not allowing pedal to return completely.	1. Adjust brake lamp switch. 2. Inspect and replace as necessary. 3. Remove obstruction. 4. Replace power brake booster.
VEHICLE PULLS TO RIGHT OR LEFT ON BRAKING	1. Frozen brake caliper piston. 2. Contaminated brake shoe lining. 3. Pinched brake lines. 4. Leaking piston seal. 5. Suspension problem.	1. Replace frozen piston or caliper. Bleed brakes. 2. Inspect and clean, or replace shoes. Repair source of contamination. 3. Replace pinched line. 4. Replace piston seal or brake caliper. 5. Refer to the Suspension group.
PARKING BRAKE - EXCESSIVE HANDLE TRAVEL	1. Rear drum brakes or parking brake shoes out of adjustment.	1. Adjust rear drum brake shoes, or rear parking brake shoes on vehicles with rear disc brakes.

POWER BRAKE BOOSTER**BASIC TEST**

(1) With engine off, depress and release the brake pedal several times to purge all vacuum from the power brake booster.

(2) Depress and hold the pedal with light effort (15 to 25 lbs. pressure), then start the engine.

The pedal should fall slightly, then hold. Less effort should be needed to apply the pedal at this time. If the pedal fell as indicated, perform the VACUUM LEAK TEST listed after the BASIC TEST. If the

pedal did not fall, continue on with this BASIC TEST.

(3) Disconnect the vacuum hose on the side of the vacuum check valve that leads to the speed control, then connect a vacuum gauge to the open vacuum port on the valve.

(4) Start the engine.

(5) When the engine is at warm operating temperature, allow it to idle and check the vacuum at the gauge.

If the vacuum supply is 12 inches Hg (40.5 kPa) or more, the power brake booster is defective and must be replaced. If the vacuum supply is below 12 inches, continue on with this BASIC TEST.

DIAGNOSIS AND TESTING (Continued)

- (6) Shut off the engine.
- (7) Connect the vacuum gauge to the vacuum reference port on the engine intake manifold.
- (8) Start the engine and observe the vacuum gauge.

If the vacuum is still low, check the engine tune and repair as necessary. If the vacuum is above 12 inches, the hose or check to the booster has a restriction or leak.

Once an adequate vacuum supply is obtained, repeat the BASIC TEST.

VACUUM LEAK TEST

(1) Disconnect the vacuum hose on the side of the power brake booster vacuum check valve that leads to the speed control, then connect a vacuum gauge to the open vacuum port on the valve.

(2) Remove the remaining hose on the vacuum check valve that is not the vacuum supply hose coming from the intake manifold. Cap off the open port on the check valve.

(3) Start the engine.

(4) Allow the engine to warm up to normal operating temperature and engine idle.

(5) Using vacuum line pliers, close off the vacuum supply hose near the booster and observe the vacuum gauge.

If the vacuum drop exceeds 1.0 inch Hg (3.3 kPa) in one minute, repeat the above steps to confirm the reading. The vacuum loss should be less than 1.0 inch Hg in one minute time span. If the loss is more than 1.0 inch Hg, replace the power brake booster. If it is not, continue on with this test.

(6) Remove the pliers from the hose temporarily.

(7) Apply light effort (approximately 15 lbs. of force) to the brake pedal and hold the pedal steady. Do not move the pedal once the pressure is applied or the test results may vary.

(8) Have an assistant reattach the pliers to the vacuum supply hose.

(9) Allow 5 seconds for stabilization, then observe the vacuum gauge.

If the vacuum drop exceeds 3.0 inches Hg (10 kPa) in 15 seconds, repeat the above steps to confirm the reading. The vacuum loss should be less than 3.0 inches Hg in 15 seconds time span. If the loss is more than 3.0 inches Hg, replace the power brake booster. If it is not, the booster is not defective.

PROPORTIONING VALVE

NOTE: The following procedure is for the diagnosis and testing of the proportioning valve(s) on a vehicle without ABS. For diagnosis and testing of proportioning valves on a vehicle equipped with ABS,

Refer to the ANTILOCK BRAKE SYSTEM section in this group.

If a condition of premature rear wheel skid occurs on a vehicle, the proportioning valve should always be tested prior to it being replaced. This is due to the fact that there are conditions other than a faulty proportioning valve which can cause a premature rear wheel skid.

One proportioning valve controls the right rear brake, and the other proportioning valve controls the left rear brake (Fig. 21). Therefore, a road test to determine which rear brake slides first is essential. Once the wheel which slides first is determined, use the following procedure to diagnose the proportioning valve.

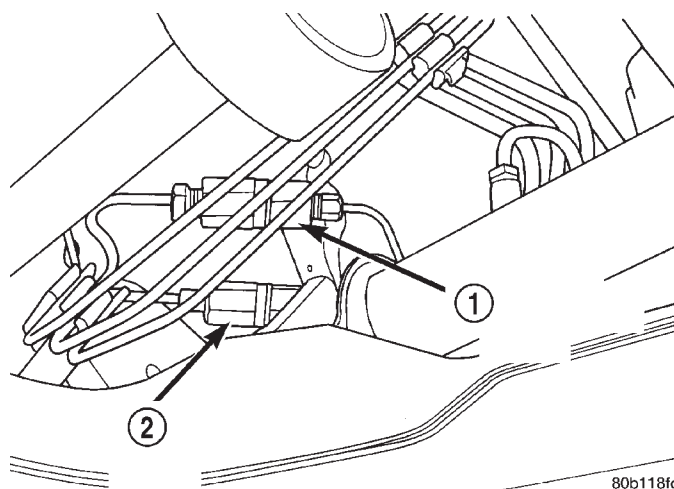


Fig. 21 Non-ABS Brake Proportioning Valve Location

- 1 – LEFT REAR PROPORTIONING VALVE
2 – RIGHT REAR PROPORTIONING VALVE

The test procedure for a premature rear wheel skid is the same for both rear wheel proportioning valves. After road testing vehicle to determine which wheel skids first, the proper test fittings required will have to be determined. Then follow the procedure below for testing the required proportioning valve.

(1) Road test the vehicle. Determine which rear wheel exhibits premature rear wheel skid, then refer to the figure (Fig. 21) to determine which proportioning valve needs to be tested.

(2) Remove hydraulic brake line (Fig. 21) from proportioning valve controlling the rear wheel of the vehicle which has premature wheel skid.

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

DIAGNOSIS AND TESTING (Continued)

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

(4) Install Pressure Test Fitting, Special Tool 8187 in the inlet port of the proportioning valve (Fig. 22). Install Pressure Test Fitting, Special Tool 8187-2 in the outlet port of the proportioning valve (Fig. 22). Tighten tube nuts to a torque of 17 N·m (145 in. lbs.).

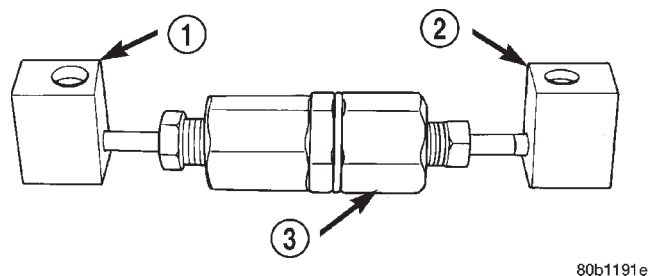


Fig. 22 Pressure Test Fitting Installed In Proportioning Valve

- 1 - SPECIAL TOOL 8187
- 2 - SPECIAL TOOL 8187-2
- 3 - PROPORTIONING VALVE

(5) Install the proportioning valve with the pressure test fittings installed, in the chassis brake tube (Fig. 23). Tighten both tube nuts to a torque of 17 N·m (145 in. lbs.).

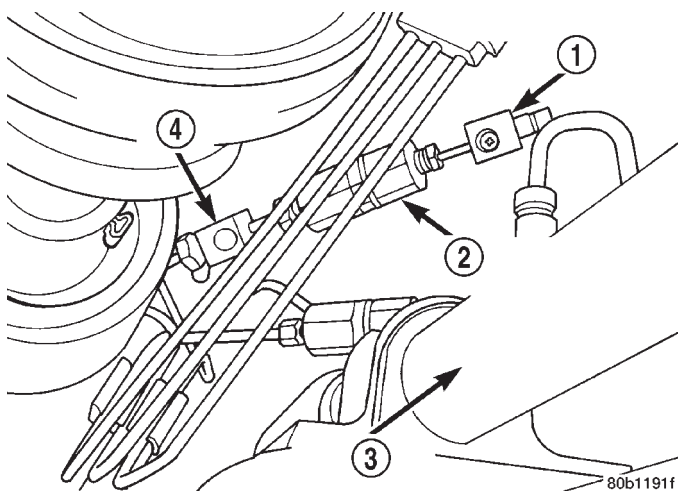


Fig. 23 Proportioning Valve With Pressure Test Fittings Installed

- 1 - SPECIAL TOOL 8187-2
- 2 - PROPORTIONING VALVE
- 3 - STEERING GEAR
- 4 - SPECIAL TOOL 8187

(6) Install a Pressure Gauge, Special Tool C-4007-A into each pressure test fitting (Fig. 24). Bleed air out of hose from pressure test fitting to pressure gauge, at pressure gauge to remove all trapped air. hose.

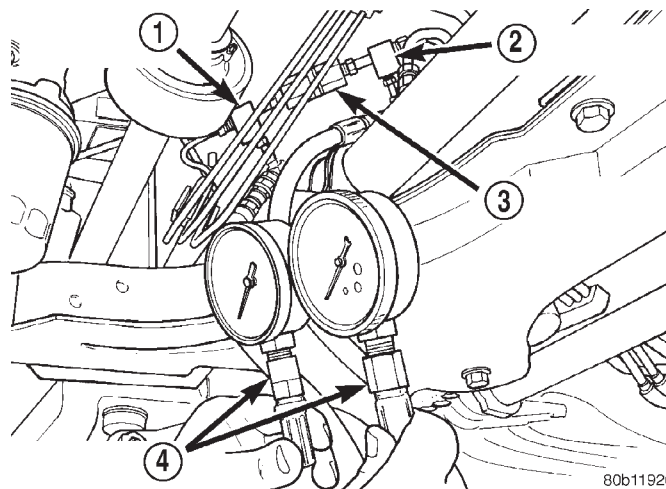


Fig. 24 Pressure Gauges Installed On Pressure Test Fittings

- 1 - PRESSURE TEST FITTING
- 2 - PRESSURE TEST FITTING
- 3 - PROPORTIONING VALVE
- 4 - SPECIAL TOOL C-4007-A

(7) 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, PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS. 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.

(8) Check 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.

(9) Install proportioning valve in rear brake line and hand tighten both tube nuts until they are fully seated in proportioning valve.

(10) Tighten both brake line tube nuts at the proportioning valve to a torque of 17 N·m (145 in. lbs.).

(11) Bleed the affected brake line. Refer to BASE BRAKE BLEEDING in the SERVICE PROCEDURES section.

DIAGNOSIS AND TESTING (Continued)

PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS

Sales Code	Brake System Type	Split Point	Slope	Identification	Inlet Pressure	Outlet Pressure
BRA	14" Disc/Drum	600 psi	0.59	Bar Code Label	1000 psi	800-900 psi
BRJ	14" Disc/Drum W/ABS	600 psi	0.59	Bar Code Label	1000 psi	800-900 psi
BRF	14" Disc/Disc W/ABS	500 psi	0.43	Bar Code Label	1000 psi	600-700 psi

BRAKE ROTOR

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

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

When diagnosing a brake noise or pulsation, the machined disc braking surface should be checked and inspected.

BRAKING SURFACE INSPECTION

Light braking surface scoring and wear is acceptable. If heavy scoring or warping is evident, the rotor must be refaced or replaced. Refer to SERVICE PROCEDURES in this section of this group for information on brake rotor machining.

Excessive wear and scoring of the rotor can cause improper lining contact on the rotor's braking surface. If the ridges on the rotor are not removed before new brake shoes are installed, improper wear of the shoes will result.

If a vehicle has not been driven for a period of time, the rotor's braking surface will rust in the areas not covered by the brake shoes at that time. Once the vehicle is driven, noise and chatter from the disc brakes can result when the brakes are applied.

Some discoloration or wear of the rotor surface is normal and does not require resurfacing when linings are replaced. If cracks or burned spots are evident, the rotor must be replaced.

ROTOR MINIMUM THICKNESS

Measure rotor thickness at the center of the brake shoe contact surface. Replace the rotor if it is worn below minimum thickness or if machining the rotor will cause its thickness to fall below specifications.

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

Minimum thickness specifications are cast on the rotor's unmachined surface (Fig. 25). Limits can also be found in the table at the end of this brake rotor information.

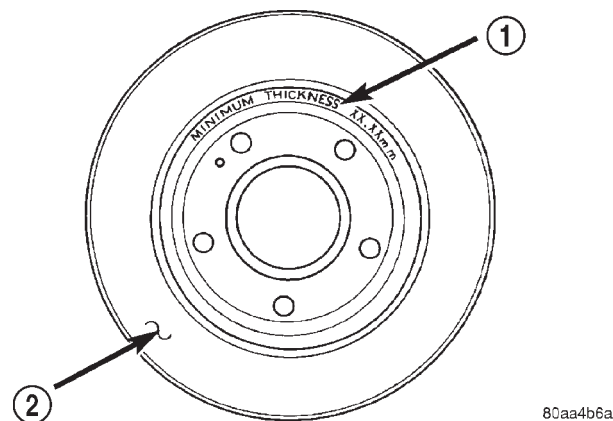


Fig. 25 Minimum Brake Rotor Thickness Markings (Typical)

- 1 – ROTOR MINIMUM THICKNESS MARKING
2 – ROTOR

ROTOR THICKNESS VARIATION

Thickness variation in a rotor's braking surface can result in pedal pulsation, chatter and surge. This can also be caused by excessive runout in the rotor or the hub.

Rotor thickness variation measurements should be made in conjunction with measuring runout. Measure thickness of the brake rotor at 12 equal points around the rotor braking surface with a micrometer at a radius approximately 25 mm (1 inch) from edge of rotor (Fig. 26). If thickness measurements vary by more than 0.013 mm (0.0005 inch), the rotor should be refaced or replaced. Refer to SERVICE PROCEDURES in this section of this group for information on brake rotor machining.

ROTOR RUNOUT

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).

DIAGNOSIS AND TESTING (Continued)

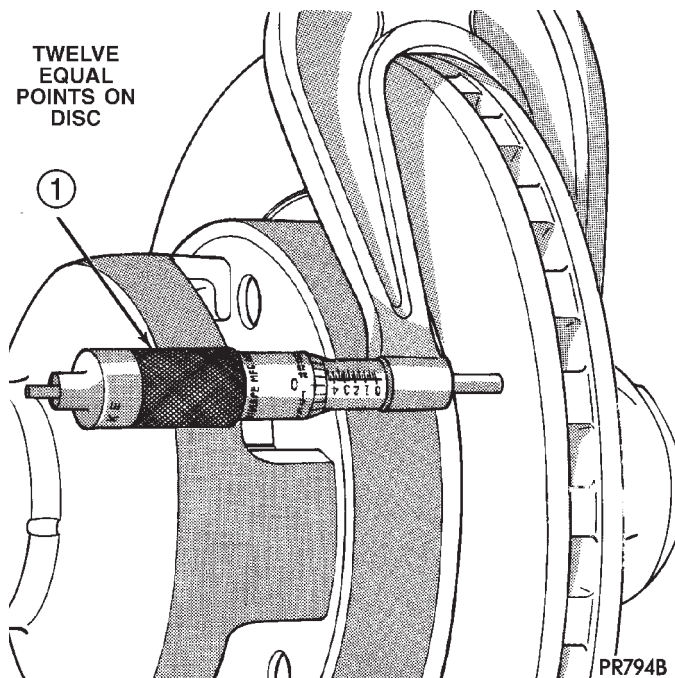


Fig. 26 Checking Rotor For Thickness

1 - CALIPER

To measure rotor runout on the vehicle, first remove the tire and wheel assembly. Reinstall the wheel mounting nuts on the studs, tightening the rotor to the hub. Mount the Dial Indicator, Special Tool C-3339, with Mounting Adaptor, Special Tool SP-1910 on steering arm. The dial indicator plunger should contact braking surface of rotor approximately 25 mm (one inch) from outer edge of rotor (Fig. 27). Check lateral runout on both sides of the rotor, marking the low and high spots on both. Runout limits can be found in the table at the end of this brake rotor information.

If runout is in excess of the specification, check the lateral runout of the hub face. Before removing the rotor from the hub, place a chalk mark across both the rotor and the one wheel stud closest to where the high runout measurement was taken. This way, the original mounting spot of the rotor on the hub is indexed (Fig. 28).

Remove the rotor from the hub.

NOTE: Clean the hub face surface before checking runout. This provides a clean surface to get an accurate indicator reading.

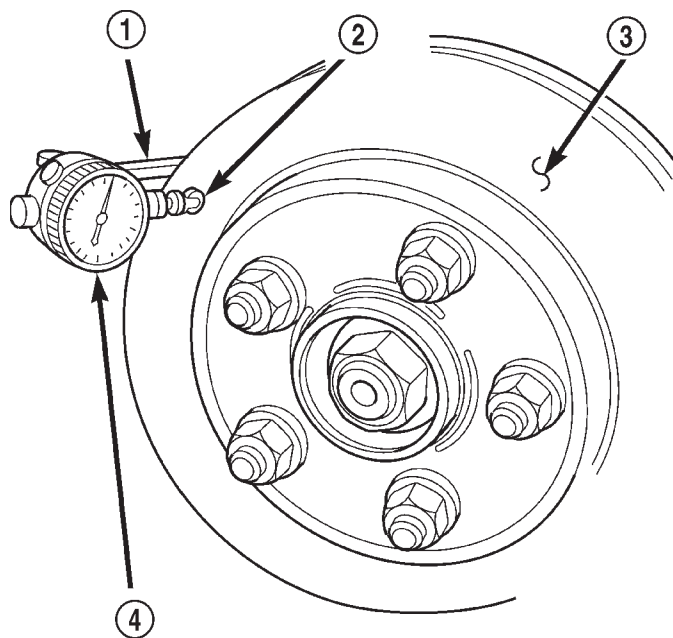


Fig. 27 Checking Rotor Runout

- 1 - SPECIAL TOOL SP-1910
- 2 - 25mm FROM EDGE
- 3 - DISC SURFACE
- 4 - SPECIAL TOOL C-3339

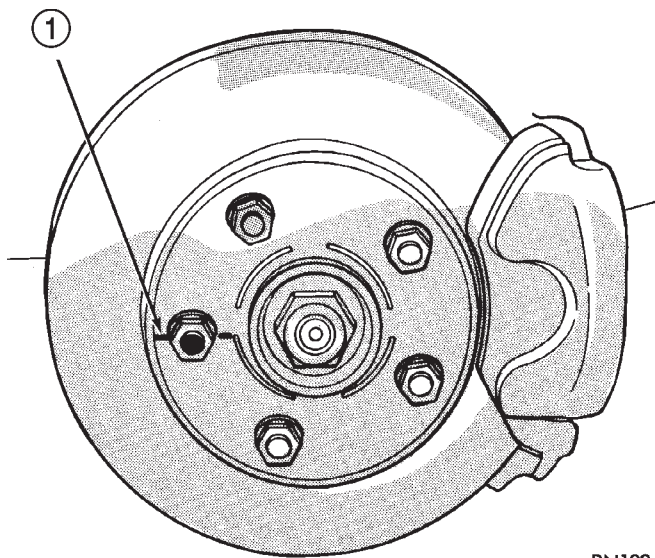
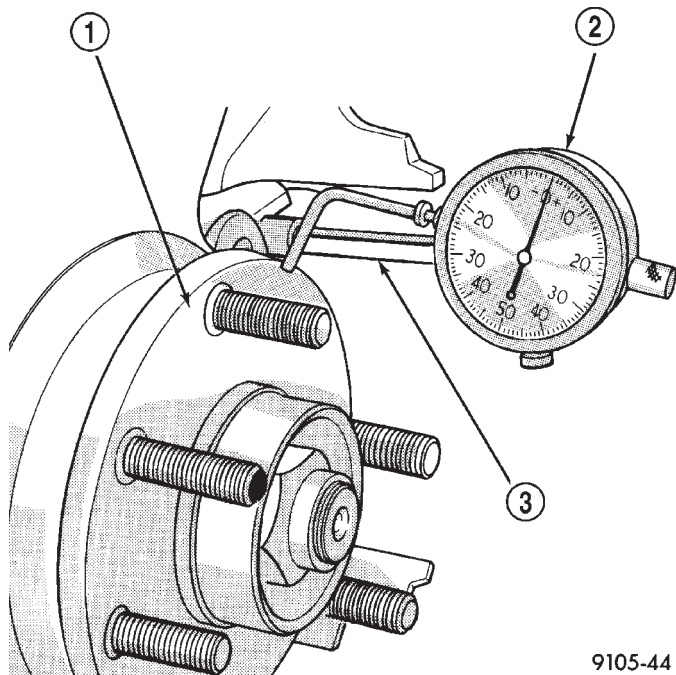


Fig. 28 Marking Rotor and Wheel Stud

- 1 - CHALK MARK

DIAGNOSIS AND TESTING (Continued)

Mount Dial Indicator, Special Tool C-3339, and Mounting Adaptor, Special Tool SP-1910, to the steering knuckle. Position the indicator stem so it contacts the hub face near the outer diameter. Care must be taken to position stem outside of the stud circle, but inside of the chamfer on the hub rim (Fig. 29).



9105-44

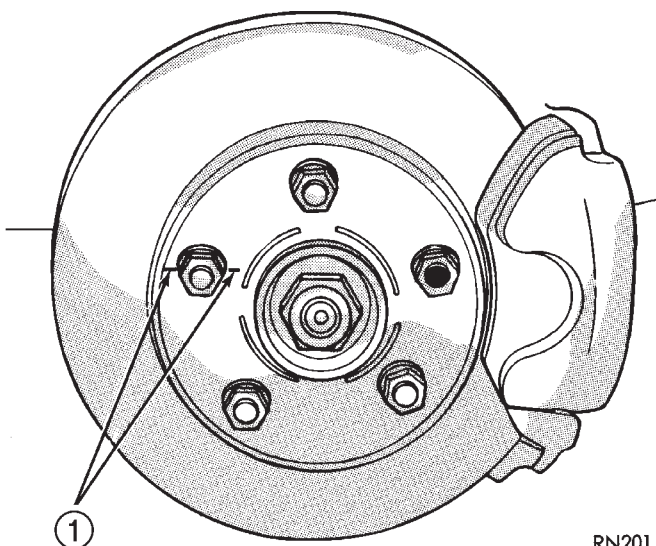
Fig. 29 Checking Hub Runout

- 1 - HUB SURFACE
- 2 - SPECIAL TOOL C-3339
- 3 - SPECIAL TOOL SP-1910

Hub runout should not exceed 0.08 mm (0.003 inch). If runout exceeds this specification, the hub

must be replaced. Refer to the SUSPENSION group in this service manual for the hub and bearing removal and installation procedure.

If the hub runout does not exceed this specification, install the rotor back on the hub, aligning the chalk marks on the rotor with a wheel mounting stud, two studs apart from the original stud (Fig. 30). Tighten nuts in the proper sequence and torque to specifications.



RN201

Fig. 30 Index Rotor And Wheel Stud

- 1 - CHALK MARK

Recheck brake rotor runout to see if the runout is now within specifications.

If runout is not within specifications, reface or replace the brake rotor. Refer to SERVICE PROCEDURES in this section of this group for information on brake rotor machining.

BRAKE ROTOR LIMITS

Braking Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Runout*	Rotor Micro Finish
Front Rotor	22.87-23.13 mm 0.900-0.911 in.	21.4 mm 0.843 in.	0.013 mm 0.0005 in.	0.13 mm 0.005 in.	15-80 RMS
Rear Rotor	8.87-9.13 mm 0.350-0.360 in.	7.25 mm 0.285 in.	0.013 mm 0.0005 in.	0.13 mm 0.005 in.	15-80 RMS
* TIR Total Indicator Reading (Measured On Vehicle)					

BRAKE DRUM

With the drum off the vehicle, measure the drum for diameter variation (oval shape). The diameter variation of the drum braking surface must not exceed either 0.0635 mm (0.0025 inch) in 30° or 0.0889 mm (0.0035 inch) in 360°.

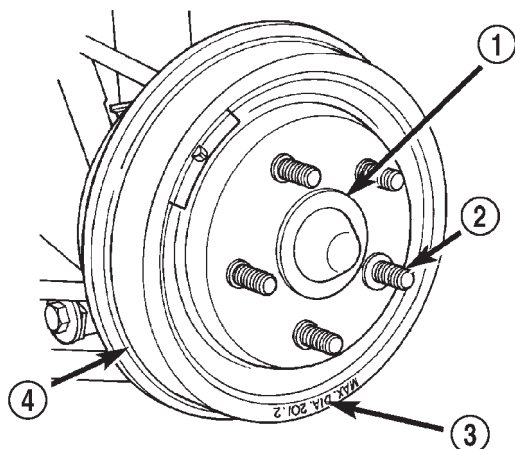
Measure brake drum runout. Brake drum runout should be checked with the drum mounted on a brake lathe. Brake drum runout should not exceed 0.1524 mm (0.006 inch).

If either of these measurements are not within specification, reface or replace the drum. Refer to

DIAGNOSIS AND TESTING (Continued)

BRAKE DRUM MACHINING in the SERVICE PROCEDURES section of this service manual group for refacing procedures.

Always replace the drum if machining will cause the diameter to exceed drum maximum diameter. All brake drums are marked with the maximum allowable brake drum diameter (Fig. 31).



80aa4b6b

Fig. 31 Brake Drum Maximum Diameter Identification

- 1 - HUB/BEARING ASSEMBLY
- 2 - WHEEL MOUNTING STUDS
- 3 - BRAKE DRUM MAXIMUM DIAMETER MARKING
- 4 - REAR BRAKE DRUM

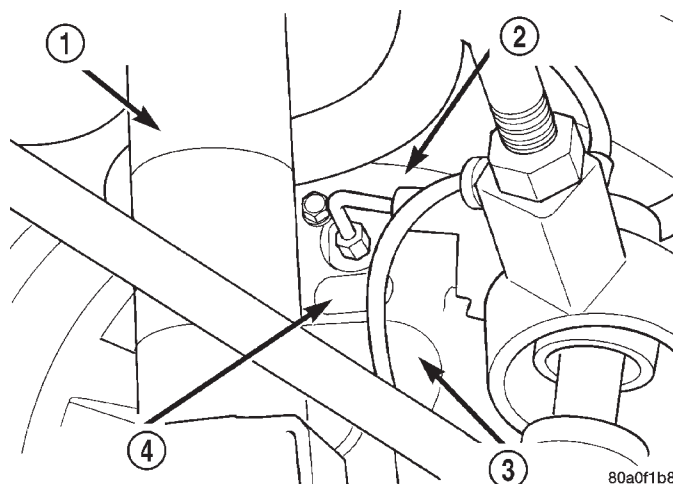
DRUM BRAKE AUTOMATIC ADJUSTER

Place the vehicle on a frame contact hoist with a helper in the driver's seat to apply the brakes. Raise the vehicle. Remove the adjuster access hole plug, from the rear brake support plate (Fig. 32). This will allow access to the star wheel on the automatic adjuster mechanism. Then, to eliminate the possibility of maximum adjustment, insert a small screwdriver through the access hole in the support plate (Fig. 33) and back off the adjuster star wheel approximately 10 notches. **It will be necessary to hold the adjuster lever away from the star wheel to perform this adjustment procedure.**

Fully apply the brake pedal which will cause the brake shoes to leave the anchor. Upon application of the brake pedal, the adjuster lever should move downward, turning the star wheel on the adjuster. Thus, a definite rotation of the adjuster star wheel can be observed if the automatic adjuster is working properly. If one or more adjusters do not function properly, the respective brake drum must be removed for servicing of the adjuster mechanism.

BRAKE FLUID CONTAMINATION

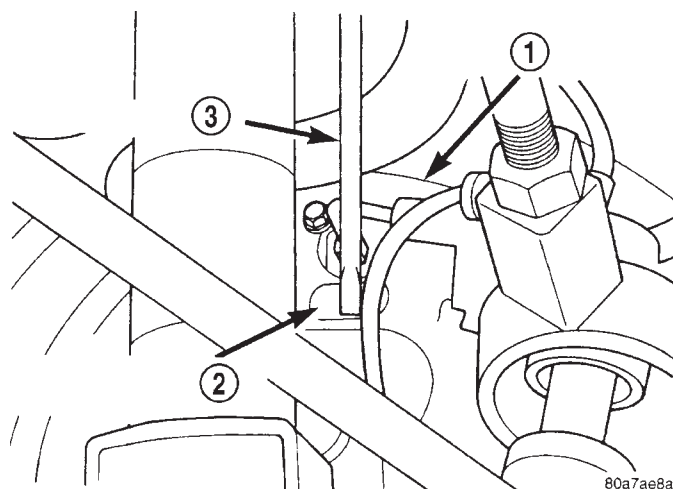
Indications of fluid contamination are swollen or deteriorated rubber parts.



80a0f1b8

Fig. 32 Adjuster Access Hole Plug

- 1 - SHOCK ABSORBER
- 2 - BRAKE SUPPORT PLATE
- 3 - KNUCKLE
- 4 - BRAKE ADJUSTER ACCESS HOLE PLUG



80a7ae8a

Fig. 33 Accessing The Automatic Adjuster

- 1 - BRAKE SUPPORT PLATE
- 2 - BRAKE ADJUSTER ACCESS HOSE
- 3 - SCREWDRIVER

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.

DIAGNOSIS AND TESTING (Continued)

BRAKE LAMP SWITCH

The required procedure for testing the brake lamp switch is covered in GROUP 8H - VEHICLE SPEED CONTROL SYSTEM in this service manual. The electrical circuit for brake lamps is covered in GROUP 8W - REAR LIGHTING in this service manual.

SERVICE PROCEDURES

BRAKE FLUID LEVEL CHECKING

Brake fluid level should be checked a minimum of twice a year.

Master cylinder reservoirs are marked, FULL and MIN, indicating the allowable brake fluid level range in the master cylinder brake fluid reservoir (Fig. 34).

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.

Although there is a range, the preferred level is FULL. If necessary, adjust the brake fluid level, bringing it to the FULL mark on the side of the master cylinder brake fluid reservoir.

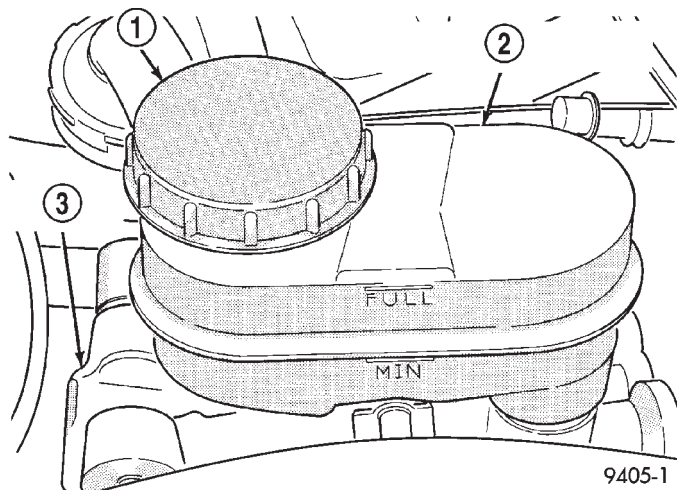


Fig. 34 Master Cylinder Fluid Level

- 1 - CAP
- 2 - MASTER CYLINDER BRAKE FLUID RESERVOIR
- 3 - MASTER CYLINDER

BASE BRAKE BLEEDING

NOTE: For bleeding the ABS hydraulic system, refer to ANTILOCK BRAKE SYSTEM BLEEDING in the ANTILOCK BRAKE SYSTEM section of this service manual group.

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

CAUTION: Use only Mopar® brake fluid or an equivalent from a fresh, tightly sealed container. Brake fluid must conform to DOT 3 specifications.

Do not pump the brake pedal at any time while having a bleeder screw open during the bleeding process. This will only increase the amount of air in the system and make additional bleeding necessary.

Do not allow the master cylinder reservoir to run out of brake fluid while bleeding the system. An empty reservoir will allow additional air into the brake system. Check the fluid level frequently and add fluid as needed.

The following wheel circuit sequence for bleeding the brake hydraulic system should be used to ensure adequate removal of all trapped air from the hydraulic system.

- Left rear wheel
- Right front wheel
- Right rear wheel
- Left front wheel

MANUAL BLEEDING

NOTE: To bleed the brakes manually, the aid of a helper will be required.

(1) Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose (Fig. 35).

(2) Have a helper pump the brake pedal three or four times and hold it in the down position.

(3) With the pedal in the down position, open the bleeder screw at least 1 full turn.

(4) Once the brake pedal has dropped, close the bleeder screw. After the bleeder screw is closed, release the brake pedal.

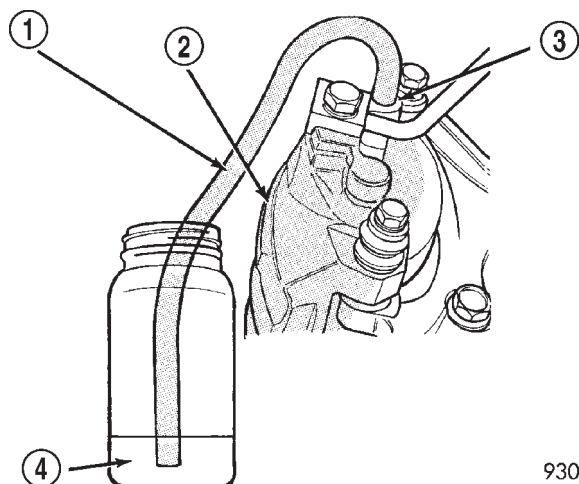
(5) Repeat the above steps until all trapped air is removed from that wheel circuit (usually four or five times).

(6) Bleed the remaining wheel circuits in the same manner until all air is removed from the brake system. Monitor the fluid level in the master cylinder reservoir to make sure it does not go dry.

(7) Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Rebleed the brakes as necessary.

(8) Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

SERVICE PROCEDURES (Continued)



9305-3

Fig. 35 Proper Method for Purging Air From Brake System (Typical)

- 1 - CLEAR HOSE
- 2 - BRAKE CALIPER
- 3 - BLEEDER SCREW
- 4 - CLEAN BRAKE FLUID

PRESSURE BLEEDING

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

Use bleeder tank, Special Tool C-3496-B, with master cylinder reservoir adapter, Special Tool 8224, to pressurize the hydraulic system for bleeding.

Following the same wheel circuit sequence as prescribed for manual bleeding.

(1) Attach a clear plastic hose to the bleeder screw and feed the hose into a clear jar containing enough fresh brake fluid to submerge the end of the hose (Fig. 35).

(2) Open the bleeder screw at least one full turn or more to obtain a steady stream of brake fluid.

(3) After approximately 4-8 ounces of fluid have been bled through the brake circuit and an air-free flow is maintained in the clear plastic hose and jar, close the bleeder screw.

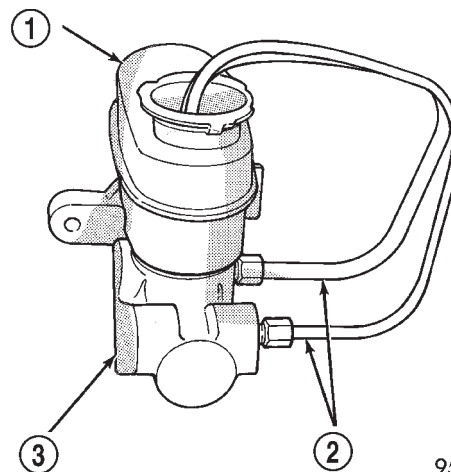
(4) Repeat this procedure at all the remaining bleeder screws.

(5) Check the brake pedal travel. If pedal travel is excessive or has not been improved, some air may still be trapped in the system. Rebleed the brakes as necessary.

(6) Test drive the vehicle to verify the brakes are operating properly and pedal feel is correct.

MASTER CYLINDER BLEEDING

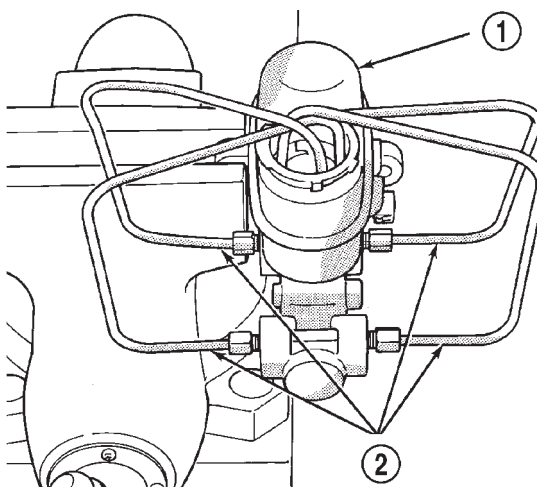
(1) Clamp the master cylinder in a vise. Attach Bleeding Tubes, Special Tool 6802 to the master cylinder outlet ports (Fig. 36) or (Fig. 37). Position bleeding tubes so the outlets of the bleeding tubes will be below the surface of the brake fluid when reservoir is filled to proper level.



9505-163

Fig. 36 Bleeding Tubes Attached To Master Cylinder With ABS

- 1 - MASTER CYLINDER FLUID RESERVOIR
- 2 - SPECIAL TOOL 6802
- 3 - MASTER CYLINDER



9505-279

Fig. 37 Bleeding Tubes Attached to Master Cylinder With Out ABS

- 1 - MASTER CYLINDER ASSEMBLY
- 2 - SPECIAL TOOL 6802

SERVICE PROCEDURES (Continued)

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

(3) Using a wooden dowel per (Fig. 38). Depress push rod slowly, and then allow pistons to return to the released position. Continue to repeat this step several times after no more air bubbles are expelled from bleed tubes to ensure all air is bled from the master cylinder.

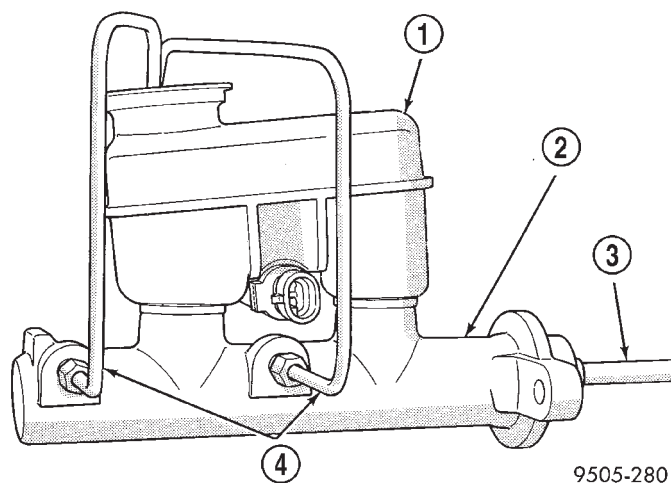


Fig. 38 Bleeding Master Cylinder

- 1 - BRAKE FLUID RESERVOIR
- 2 - MASTER CYLINDER
- 3 - WOODEN DOWEL
- 4 - SPECIAL TOOL 6802

(4) Remove bleeding tubes from master cylinder outlet ports, plug outlet ports and install fill cap on reservoir.

(5) Remove master cylinder from vise.

NOTE: Note: It is not necessary to bleed the brakes entire hydraulic system after replacing the master cylinder. However, the master cylinder must have been thoroughly bled and filled to the proper level upon installation on the power brake vacuum booster.

BRAKE TUBE REPAIR

This vehicle use two different size master cylinder brake tubes.

The master cylinder brake tubes used on this vehicle are different sizes. Vehicles that are not equipped with antilock brakes use double wall 4.75 mm (3/16 in.) brake tubes at all four port on the master cylinder. On vehicles equipped with antilock brakes, the master cylinder brakes tubes between the master cylinder and the antilock brake hydraulic control unit are 6.00 mm (1/4 in.).

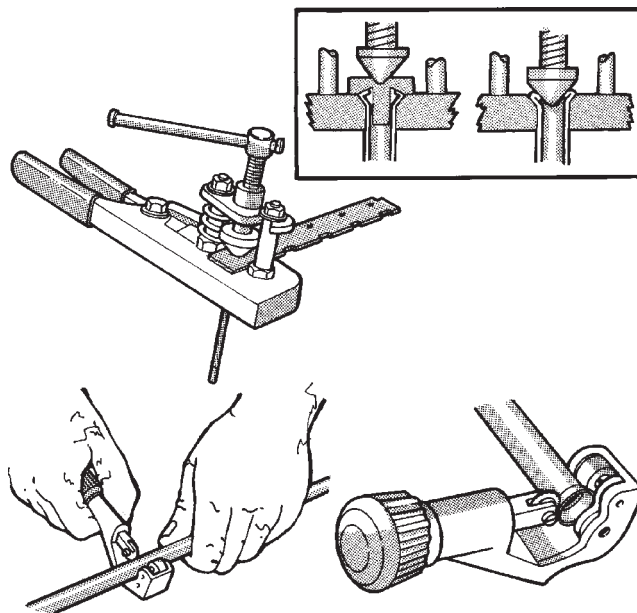
The chassis brake tubes used on all vehicles is double wall 4.75mm (3/16 in.) steel tubing.

When replacing or repairing chassis brake tubes on this vehicle be sure that the correct size and type of tube nuts are to be used for replacement of a hydraulic brake tube.

All chassis brake tubes used on this vehicle are coated with Al-rich/ZN-AL alloy coating to prevent corrosion of the brake tubes.

Care should be taken when repairing 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.

Using Tubing Cutter, Special Tool C-3478-A or equivalent, cut off damaged seat or tubing (Fig. 39). Ream out any burrs or rough edges showing on inside of tubing (Fig. 40). This will make the ends of tubing square (Fig. 40) and ensure better seating of flared end tubing. **PLACE TUBE NUT ON TUBING BEFORE FLARING THE TUBING.**



RH222

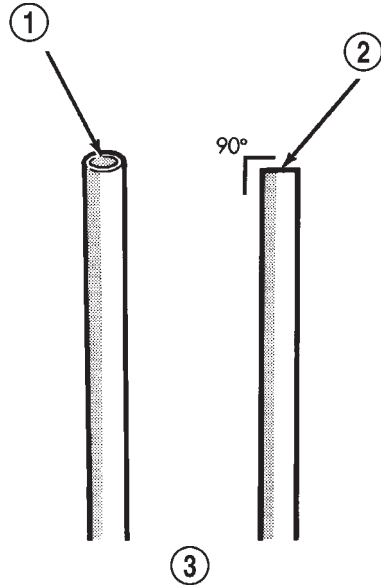
Fig. 39 Cutting And Flaring Of Brake Fluid Tubing

DOUBLE INVERTED TUBING FLARES

To make a double inverted tubing flare (Fig. 41) and (Fig. 42). Open handles of Flaring Tool, Special Tool C-4047 or equivalent. Then rotate jaws of tool until the mating jaws of tubing size are centered between vertical posts on tool. Slowly close handles with tubing inserted in jaws but do not apply heavy pressure to handle as this will lock tubing in place.

Place gauge (Form A) on edge over end of brake tubing. Push tubing through jaws until end of tubing contacts the recessed notch in gauge matching the

SERVICE PROCEDURES (Continued)

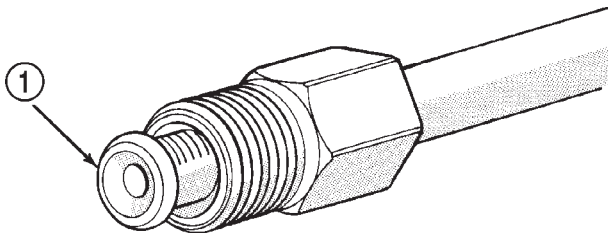


9205-175

Fig. 40 Brake Fluid Tube Preparation For Flaring

- 1 - BE SURE ALL BURRS ARE REMOVED FROM INSIDE OF TUBING
- 2 - BE SURE END OF TUBING IS SQUARE BEFORE FLARING TUBE
- 3 - HYDRAULIC BRAKE LINE TUBING

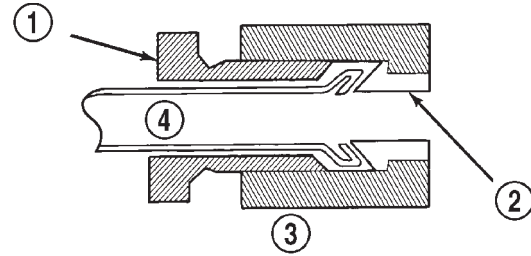
tubing size. Squeeze handles of flaring tool and lock tubing in place. Place the proper size plug in end of tubing. Swing compression disc over gauge and center tapered flaring screw in recess of disc. Screw in until plug gauge has seated on jaws of flaring tool. This action has started to invert the extended end of the tubing. Remove gauge and continue to screw down until tool is firmly seated in tubing. Remove tubing from flaring tool and inspect seat. Refer to tube routing diagrams for proper brake tube routing and clip locations. Replace any damaged tube routing clips.



9405-5

Fig. 41 Double Inverted Brake Line Tubing Flare

- 1 - DOUBLE INVERTED-STYLE FLARE



9405-6

Fig. 42 Double Wall Inverted Flare Connection

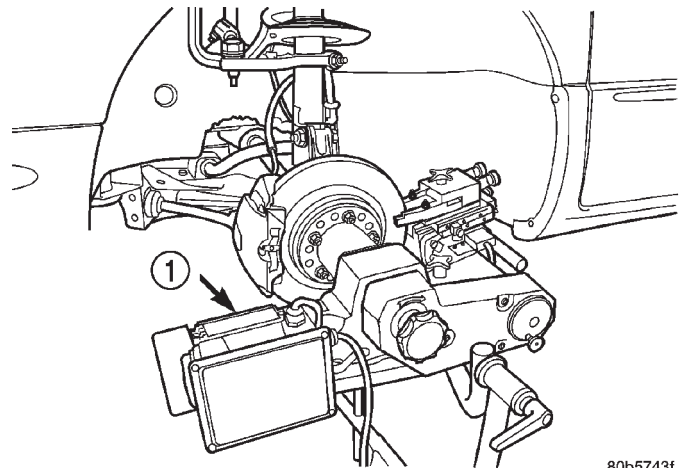
- 1 - INVERTED FLARE TUBE NUT
- 2 - SEAT
- 3 - INVERTED DOUBLE FLARE
- 4 - TUBE

BRAKE ROTOR MACHINING

NOTE: Refacing the rotor is not required each time the brake pads are replaced, only when the need is foreseen.

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. 43), or replaced.



80b5743f

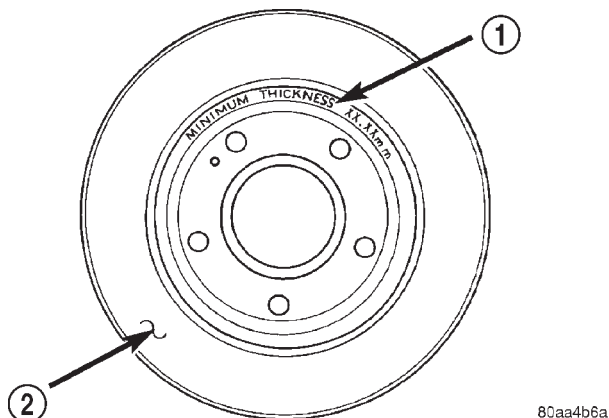
Fig. 43 On-Car Brake Lathe

- 1 - ON-CAR BRAKE LATHE

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.

SERVICE PROCEDURES (Continued)

NOTE: All rotors have markings for minimum allowable thickness cast on an un-machined surface of the rotor (Fig. 44).



80aa4b6a

Fig. 44 Minimum Brake Rotor Thickness Markings (Typical)

- 1 – ROTOR MINIMUM THICKNESS MARKING
2 – ROTOR

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.

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 TIR (Total Indicator Reading) and thickness variation limits **MUST BE MAINTAINED**. Extreme care in the operation of rotor turning equipment is required.

BRAKE ROTOR REFINISHING LIMITS

Braking Rotor	Rotor Thickness	Minimum Rotor Thickness	Rotor Thickness Variation	Rotor Run Out*	Rotor Micro Finish
Front Rotor	22.87–23.13 mm 0.900-0.911 in.	21.4 mm 0.843 in.	0.013 mm 0.0005 in.	0.13 mm 0.005 in.	15-80 RMS
Rear Rotor	8.87–9.13 mm 0.350-0.360 in.	7.25 mm 0.285 in.	0.013 mm 0.0005 in.	0.13 mm 0.005 in.	15-80 RMS

*

TIR Total Indicator Reading (Measured On Vehicle)

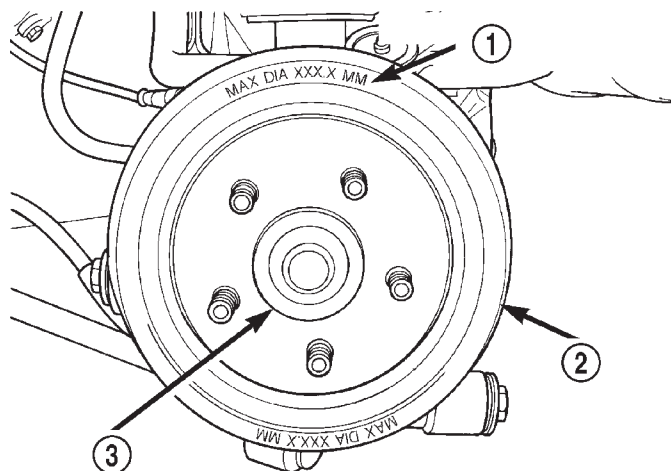
BRAKE DRUM MACHINING

If a brake drum is deeply scored or warped, it can be machined on a brake lathe equipped to machine brake drums. Follow the manufacturers instructions on the machining procedure.

Measure the brake drum diameter before machining. Refer to BRAKE DRUM in DIAGNOSIS AND TESTING in this section for further information. If machining the drum will cause the drum to exceed maximum diameter, do not machine the brake drum. It needs to be replaced.

All brake drums are marked with the maximum allowable brake drum diameter (Fig. 45).

When machining, make sure the final finish feed cut is fine in order to avoid a screw effect on the brake shoes when the brakes are applied. This final feed cut specification varies from lathe manufacturer to lathe manufacturer.



80a0f1a9

Fig. 45 Brake Drum Maximum Diameter Identification

- 1 – MAXIMUM DIAMETER MARKING
2 – REAR BRAKE DRUM
3 – HUB/BEARING ASSEMBLY

REMOVAL AND INSTALLATION

SERVICE WARNINGS AND CAUTIONS

WARNING: ALTHOUGH FACTORY INSTALLED BRAKE SHOE LININGS ARE MADE FROM ASBESTOS-FREE MATERIALS, SOME AFTERMARKET BRAKE SHOE LININGS MAY CONTAIN ASBESTOS. THIS SHOULD BE TAKEN INTO ACCOUNT WHEN SERVICING A VEHICLE'S BRAKE SYSTEM. IT IS POSSIBLE THAT AFTERMARKET BRAKE SHOES MAY HAVE BEEN INSTALLED ON THE VEHICLE. ALWAYS WEAR A RESPIRATOR WHEN CLEANING BRAKE COMPONENTS; ASBESTOS CAN CAUSE SERIOUS BODILY HARM SUCH AS ASBESTOSIS AND 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 THE BRAKE LININGS WHEN SERVICING A VEHICLE. DISPOSE OF ALL DUST AND DIRT SUSPECTED OF CONTAINING ASBESTOS FIBERS. USE ONLY SEALED AIRTIGHT 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 DISPOSING OF PRODUCTS CONTAINING ASBESTOS.

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.

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

CAUTION: During service procedures, grease or any other foreign material must be kept off the caliper assembly, surfaces of the brake rotor and external surfaces of the hub. Avoid deformation, scratching or nicking of the brake rotor and brake shoe linings.

CAUTION: When handling the brake rotor and caliper, be careful to avoid damaging the rotor and caliper, and scratching or nicking the brake shoe lining.

BRAKE PEDAL

REMOVAL

(1) Remove the remote ground cable from the ground stud located on the left strut tower (Fig. 46). Correctly isolate remote ground by installing the ground cable insulator on the strut tower ground stud as shown (Fig. 47)

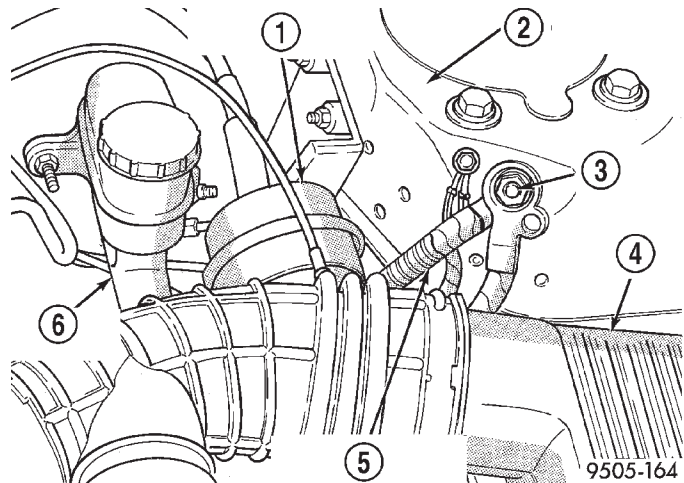


Fig. 46 Ground Cable Attachment At Strut Tower

- 1 - SPEED CONTROL SERVO
- 2 - LEFT STRUT TOWER
- 3 - GROUND STUD
- 4 - AIR CLEANER
- 5 - REMOTE GROUND CABLE
- 6 - MASTER CYLINDER

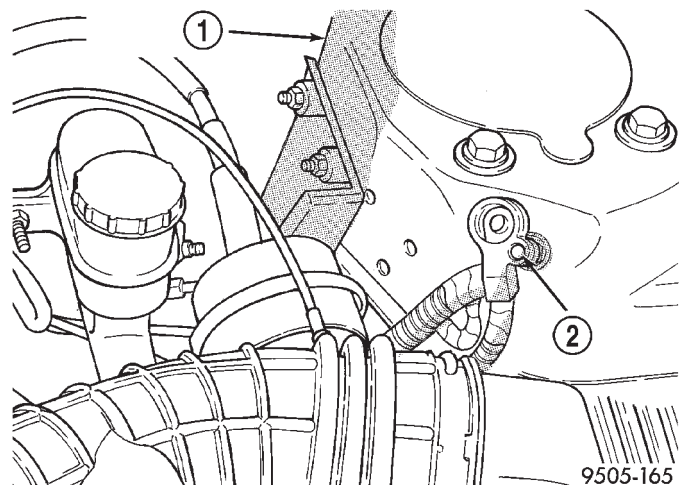
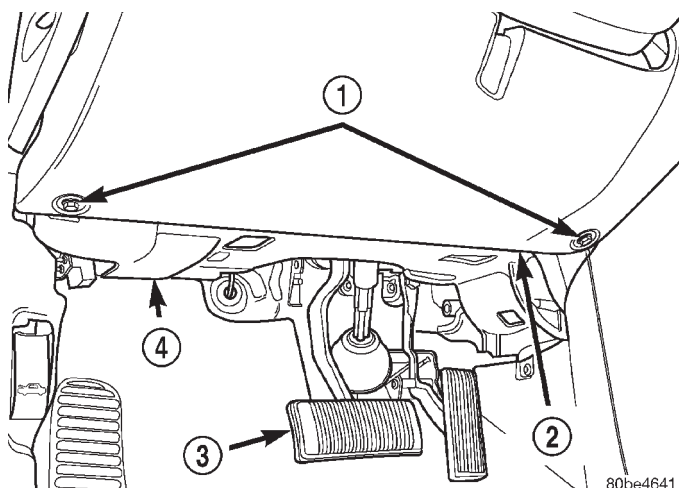


Fig. 47 Correctly Isolated Remote Ground Cable

- 1 - LEFT STRUT TOWER
- 2 - GROUND STUD

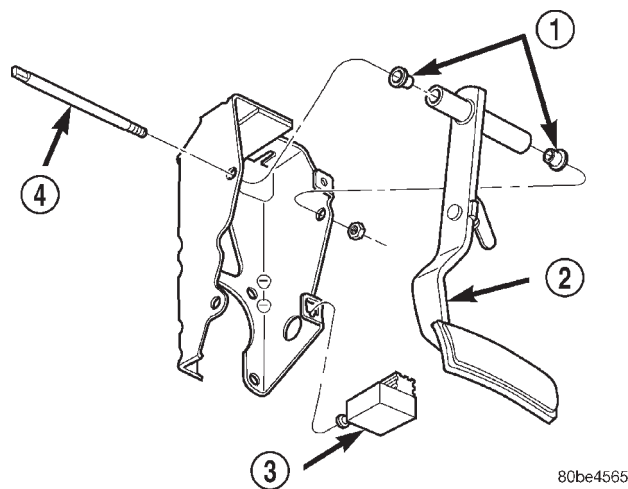
(2) Remove the two screw securing the bottom of the knee bolster below the steering column in place (Fig. 48).

REMOVAL AND INSTALLATION (Continued)

**Fig. 48 Knee Bolster Screws**

- 1 - SCREWS
- 2 - KNEE BOLSTER
- 3 - BRAKE PEDAL
- 4 - HEAT DISTRIBUTION DUCT

- (3) Remove the heat distribution duct (Fig. 48).
- (4) Remove the brake lamp switch from its bracket (Fig. 49). The brake lamp switch is removed by depressing and holding the brake pedal while rotating brake lamp switch in a counter-clockwise direction approximately 30 degrees.

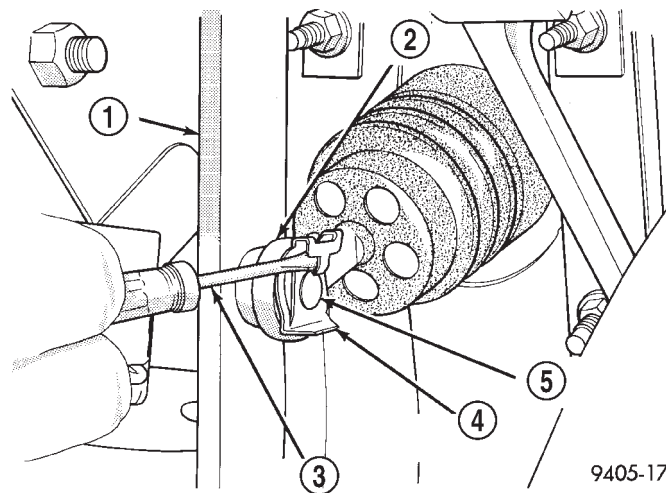
**Fig. 49 Brake Pedal Mounting**

- 1 - BUSHINGS
- 2 - BRAKE PEDAL
- 3 - BRAKE LAMP SWITCH
- 4 - PIVOT SHAFT

- (5) Pull the switch rearward and remove it from its mounting bracket.

- (6) Remove the retaining clip from the brake pedal pin securing the power booster to the pedal using following procedure (Fig. 50). Position a small screwdriver between the center tang on the retaining clip

and the brake pedal pin. Rotate blade of screwdriver enough so center tang on retaining clip can pass over end of brake pedal pin, then pull retaining clip off brake pedal pin.

**Fig. 50 Brake Pedal Retaining Clip**

- 1 - BRAKE PEDAL
- 2 - INPUT ROD
- 3 - SCREWDRIVER
- 4 - RETAINING CLIP
- 5 - BRAKE PEDAL PIN

- (7) Remove the booster input rod from the brake pedal pin.

- (8) Remove the nut from the brake pedal pivot shaft (Fig. 49). The pivot shaft has a flat on it to hold while the nut is removed.

- (9) Remove the brake pedal pivot shaft from the brake pedal and pedal mounting bracket.

- (10) Remove the brake pedal with bushings from mounting bracket (Fig. 49).

NOTE: The bushings can be easily removed from the pedal by pulling them straight out each side.

INSTALL

- (1) Make sure the pedal has a properly installed bushing on each side of the pedal (Fig. 49)

- (2) Lubricate the brake pedal pivot shaft and brake pedal bushings using Mopar Lubriplate or an equivalent.

- (3) Install the brake pedal in the pedal bracket (Fig. 49). Align the hole in brake pedal with the pivot shaft holes in the pedal bracket.

- (4) Install the brake pedal shaft (Fig. 49).

- (5) Install the nut on the end of the brake pedal pivot shaft. Tighten the nut to a torque of 34 N·m (25 ft. lbs.).

- (6) Install the power brake booster input rod on the brake pedal pin.

REMOVAL AND INSTALLATION (Continued)

CAUTION: When installing the retaining clip on the brake pedal pin a **NEW** retaining clip must be used to ensure the retention of the vacuum booster push rod.

(7) Install a **new** retaining clip (Fig. 50) on the brake pedal pin.

(8) Using Mopar Lubriplate or an equivalent, lightly lubricate the surface of the brake pedal striker where the plunger of the brake lamp switch contacts it.

NOTE: Prior to installing the brake lamp switch into its bracket, the plunger must be moved to its fully extended position using the procedure in Step 9.

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

(10) Install the brake lamp switch in the brake pedal bracket (Fig. 49). Install it using the following procedure. Depress the brake pedal as far down as possible. Then while holding brake pedal down, align the index key on switch with slot in square hole of mounting bracket. When switch is fully installed into the bracket, rotate stop lamp switch in a clockwise direction approximately 30 degrees until it is aligned straight up and down (Fig. 51).

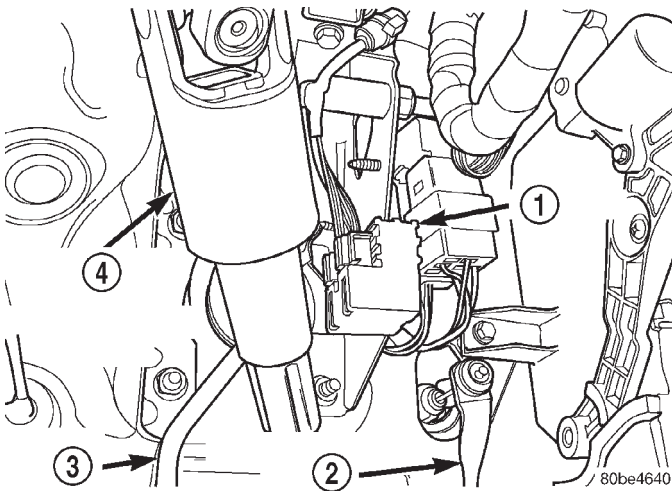


Fig. 51 Brake Lamp Switch

- 1 - SWITCH
- 2 - ACCELERATOR PEDAL
- 3 - BRAKE PEDAL
- 4 - STEERING COLUMN INTERMEDIATE SHAFT

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

(11) Gently release/pull back the brake pedal until it stops moving. This will cause the switch plunger to ratchet back to its correctly adjusted position.

(12) Install the heat distribution duct.

(13) Install the two screws securing the bottom of the knee bolster below the steering column in place (Fig. 48).

(14) Connect the remote ground cable for the battery on the ground post located on left shock tower (Fig. 46).

MASTER CYLINDER

REMOVE

(1) Remove wiring harness connector from brake fluid level sensor in master cylinder brake fluid reservoir (Fig. 52).

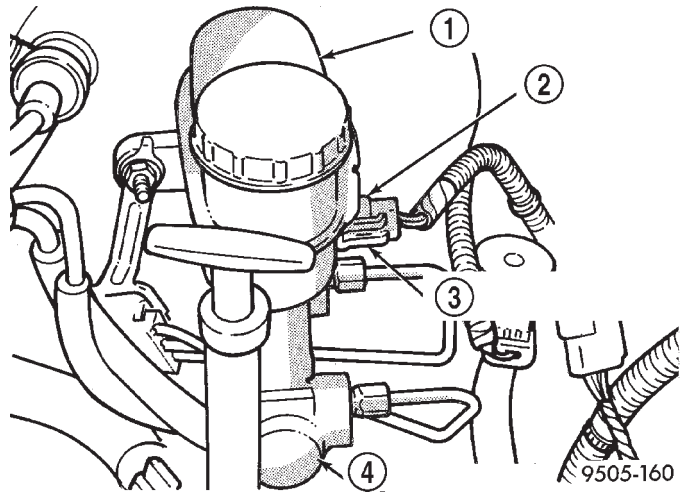


Fig. 52 Master Cylinder Fluid Level Sensor

- 1 - BRAKE FLUID RESERVOIR
- 2 - BRAKE FLUID LEVEL SENSOR
- 3 - WIRING HARNESS CONNECTOR
- 4 - MASTER CYLINDER

(2) Disconnect the primary and secondary brake tubes from the master cylinder outlet ports (Fig. 53) (Fig. 54). Install plugs at all open brake tube outlets on master cylinder assembly.

(3) Using Mopar, Brake Parts Cleaner or an equivalent, clean the area where the master cylinder attaches to the vacuum booster.

(4) Remove the 2 nuts (Fig. 55) attaching the master cylinder to the vacuum booster.

CAUTION: When removing the routing clip and brake tubes from the mounting stud, do not bend or kink the chassis brake line tubes.

(5) Remove the routing clip and chassis brake tubes (Fig. 55)(as an assembly) from the mounting stud for the master cylinder.

REMOVAL AND INSTALLATION (Continued)

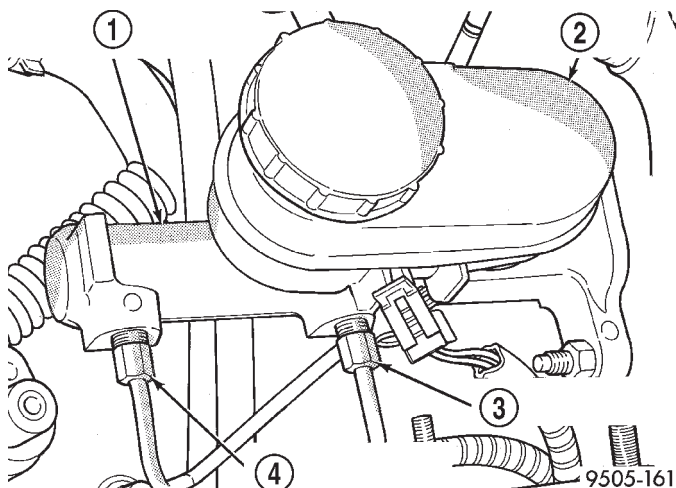


Fig. 53 Master Cylinder Primary And Secondary Ports With ABS

- 1 - MASTER CYLINDER ASSEMBLY
- 2 - BRAKE FLUID RESERVOIR
- 3 - MASTER CYLINDER PRIMARY PORT
- 4 - MASTER CYLINDER SECONDARY PORT

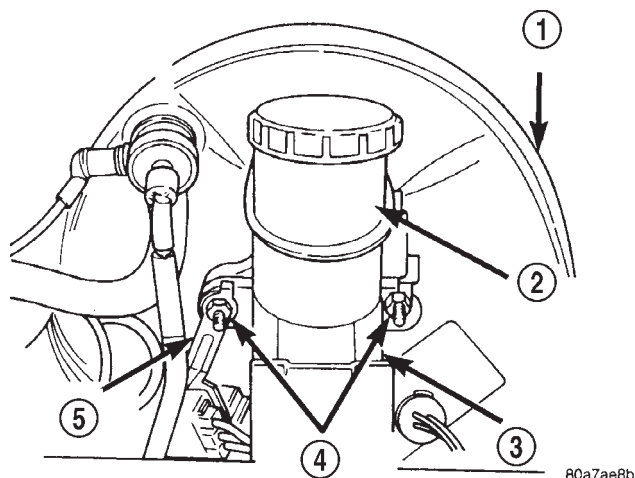


Fig. 55 Master Cylinder Mounting To Vacuum Booster

- 1 - BRAKE VACUUM BOOSTER
- 2 - BRAKE FLUID RESERVOIR
- 3 - MASTER CYLINDER
- 4 - MOUNTING NUTS
- 5 - ROUTING CLIP

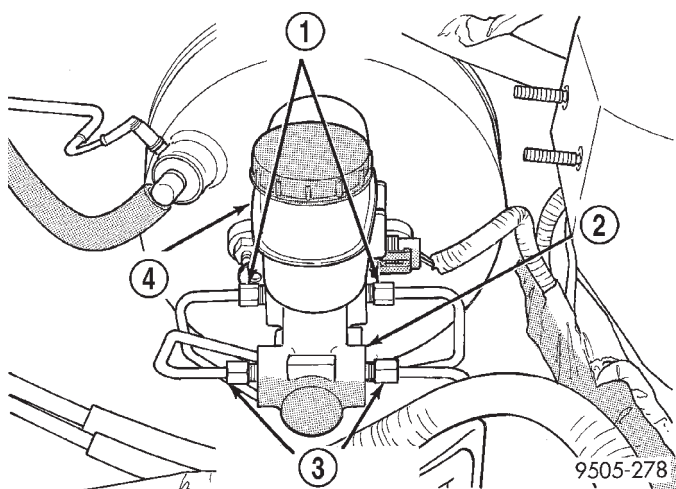


Fig. 54 Master Cylinder Primary And Secondary Ports Without ABS

- 1 - MASTER CYLINDER PRIMARY PORTS
- 2 - MASTER CYLINDER
- 3 - MASTER CYLINDER SECONDARY PORTS
- 4 - MASTER CYLINDER FLUID RESERVOIR

(6) Slide the master cylinder straight off its mounting studs on the vacuum booster.

BLEEDING MASTER CYLINDER

(1) Clamp the master cylinder in a vise. Attach Bleeding Tubes, Special Tool 6802 to the master cylinder outlet ports (Fig. 56) (Fig. 57). **Position the bleeding tubes so outlets of the tubes will be below the surface of the brake fluid when reservoir is filled to the proper level.**

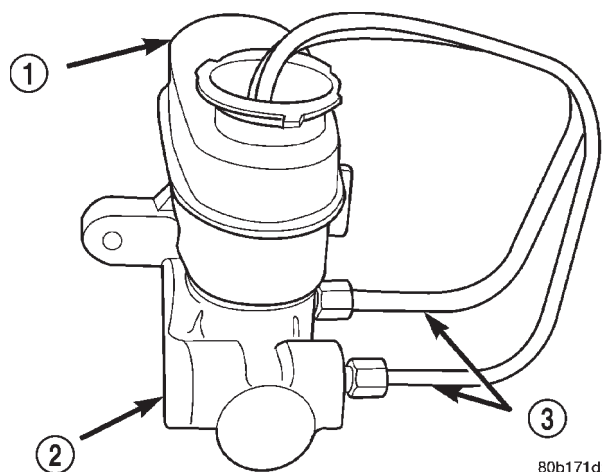


Fig. 56 Bleeding Tubes Attached to ABS Master Cylinder

- 1 - MASTER CYLINDER FLUID RESERVOIR
- 2 - MASTER CYLINDER
- 3 - SPECIAL TOOL 8129

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

(3) Insert an appropriate size wooden dowel in the end of the master cylinder piston (Fig. 58). Using the dowel, slowly depress the piston to the full extent of its travel and then allow the piston to return to its released position. Continue to repeat this step until bubbles no longer appear in the brake fluid. After no more air bubbles are expelled from the bleed tubes repeat the above procedure several more times to ensure all air is bled from master cylinder.

REMOVAL AND INSTALLATION (Continued)

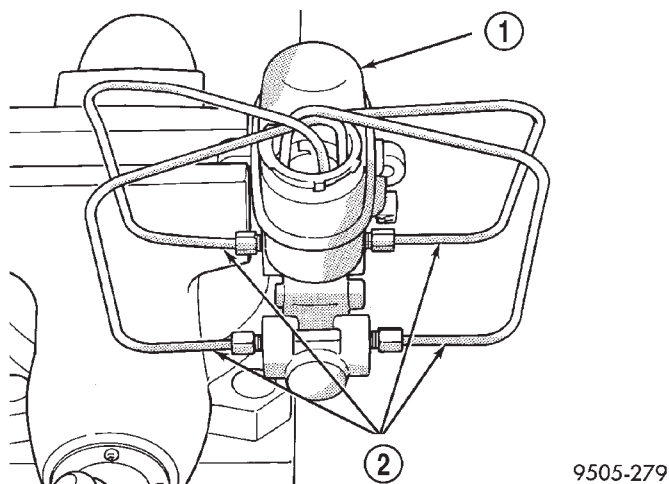


Fig. 57 Bleeding Tubes Attached to Non-ABS Master Cylinder

- 1 - MASTER CYLINDER ASSEMBLY
2 - SPECIAL TOOL 6802

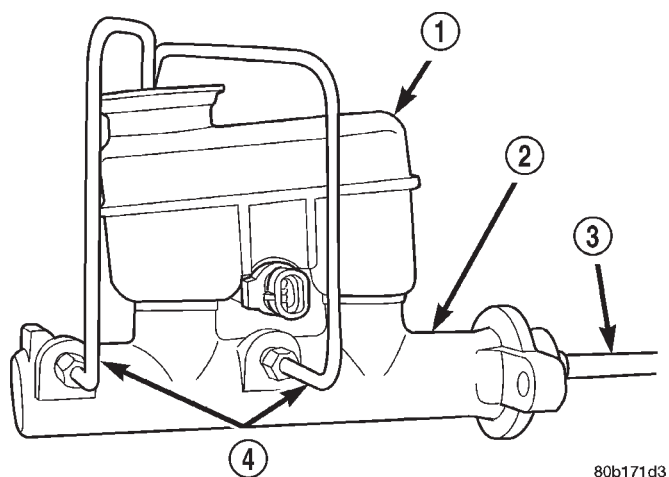


Fig. 58 Bleeding Master Cylinder

- 1 - BRAKE FLUID RESERVOIR
2 - MASTER CYLINDER
3 - WOODEN DOWEL
4 - SPECIAL TOOL 8129

(4) Remove the bleeding tubes from the outlet ports of the master cylinder.

(5) Plug outlet ports of master cylinder and install the cap on the reservoir.

(6) Remove the master cylinder from the vise.

NOTE: Note: It is not necessary to bleed the entire hydraulic system after replacing the master cylinder. However, the master cylinder must have been bled and filled upon installation.

INSTALL

(1) Position master cylinder assembly on studs of power brake unit, aligning push rod on power brake vacuum booster with piston of master cylinder.

CAUTION: When installing the routing clip and brake tubes on the mounting stud, do not bend or kink the chassis brake line tubes. Be sure the chassis brake tubes are routed correctly. The chassis brake tubes can not touch each other or other components or the body of the vehicle.

(2) Install the routing clip and chassis brake tubes (Fig. 55) on the inboard mounting stud for the master cylinder.

(3) Install the 2 master cylinder to power brake vacuum booster mounting nuts (Fig. 55). Tighten both nuts to a torque of 28 N·m (250 in. lbs.).

(4) Connect brake tubes to master cylinder primary and secondary ports (Fig. 53). Then tighten the tube nuts to a torque of 17 N·m (145 in. lbs.).

(5) Install the connector from the vehicle wiring harness on the fluid level sensor in the master cylinder fluid reservoir (Fig. 52)

BRAKE FLUID LEVEL SWITCH

The master cylinder or brake fluid reservoir does not have to be removed from the vehicle for replacement of the brake fluid level sensor.

(1) Remove wiring harness connector from brake fluid reservoir level sensor (Fig. 59).

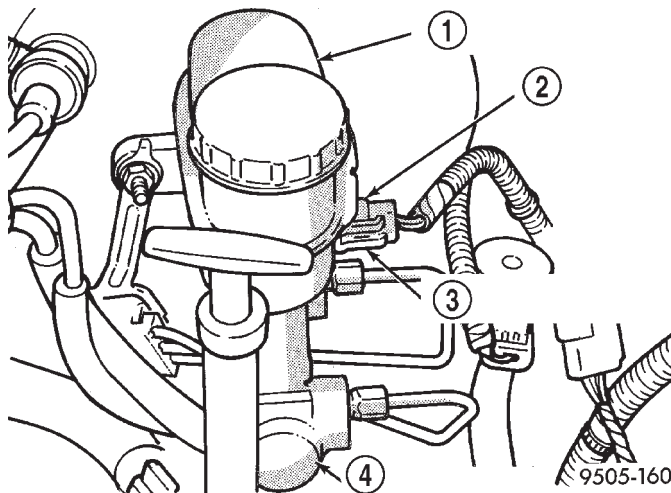


Fig. 59 Master Cylinder Fluid Level Sensor

- 1 - BRAKE FLUID RESERVOIR
2 - BRAKE FLUID LEVEL SENSOR
3 - WIRING HARNESS CONNECTOR
4 - MASTER CYLINDER

REMOVAL AND INSTALLATION (Continued)

(2) Compress the retaining tabs (Fig. 60) on the end of the brake fluid level sensor.

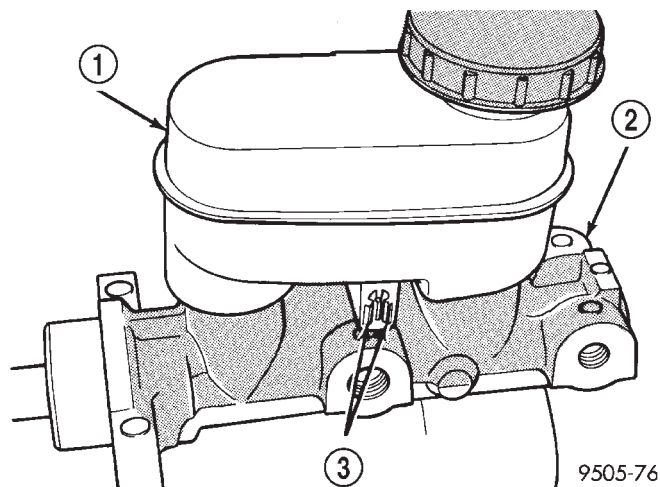


Fig. 60 Brake Fluid Level Switch Retaining Tabs

- 1 - MASTER CYLINDER BRAKE FLUID RESERVOIR
- 2 - MASTER CYLINDER
- 3 - FLUID LEVEL SWITCH RETAINING TABS

(3) While compressing retaining tabs, grasp opposite end of brake fluid level sensor and pull it out of master cylinder fluid reservoir (Fig. 61).

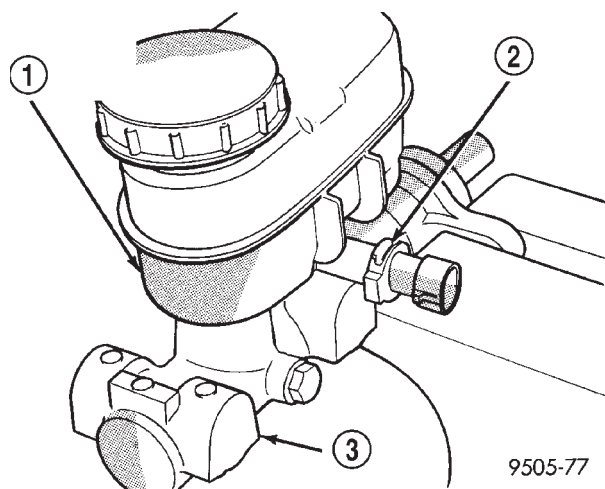


Fig. 61 Removing Fluid Level Switch From Reservoir

- 1 - MASTER CYLINDER BRAKE FLUID RESERVOIR
- 2 - BRAKE FLUID LEVEL SWITCH
- 3 - MASTER CYLINDER

POWER BRAKE BOOSTER (2.5L ENGINE)

REMOVAL

(1) Remove the remote ground cable from the ground stud located on the left shock tower (Fig. 62).

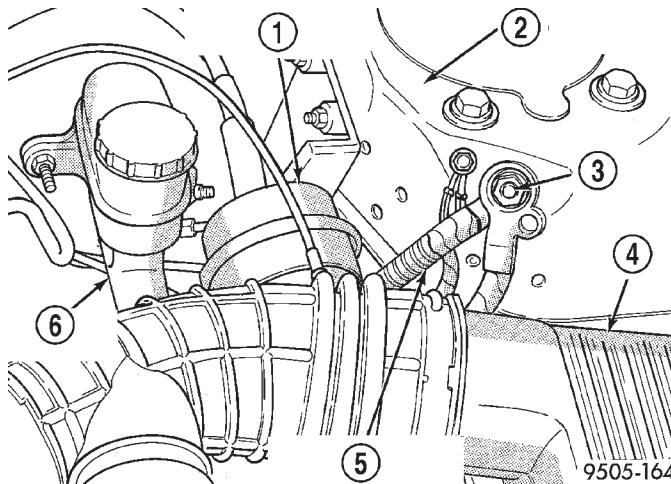


Fig. 62 Ground Cable Attachment To Strut Tower

- 1 - SPEED CONTROL SERVO
- 2 - LEFT STRUT TOWER
- 3 - GROUND STUD
- 4 - AIR CLEANER
- 5 - REMOTE GROUND CABLE
- 6 - MASTER CYLINDER

(2) Correctly isolate remote ground cable when servicing vehicle by installing the ground cable insulator on the strut tower ground stud as shown (Fig. 63). **This will prevent accidental grounding of the remote ground cable.**

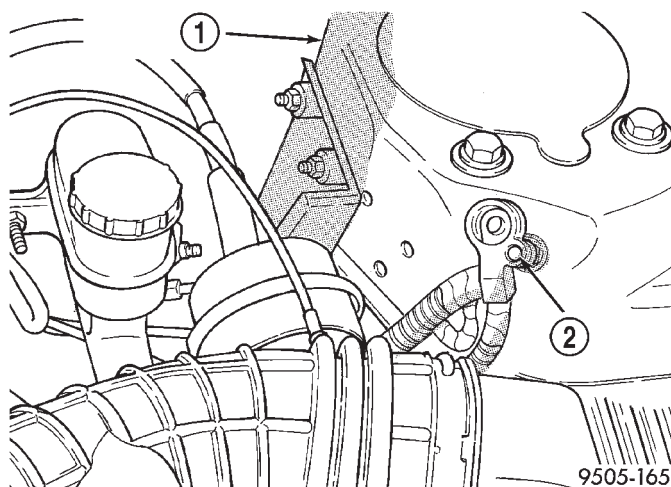


Fig. 63 Correctly Isolated Remote Ground Cable

- 1 - LEFT STRUT TOWER
- 2 - GROUND STUD

REMOVAL AND INSTALLATION (Continued)

(3) Remove the PCV hose (Fig. 64) from the air chamber located on the front of the intake manifold. Remove bolt (Fig. 64) attaching the air chamber to the intake manifold. Then unlatch lid of air cleaner from air cleaner housing and loosen clamp attaching air inlet hose to throttle body (Fig. 64). Remove the air cleaner lid, air inlet hose and air chamber (Fig. 64) as an assembly from the engine.

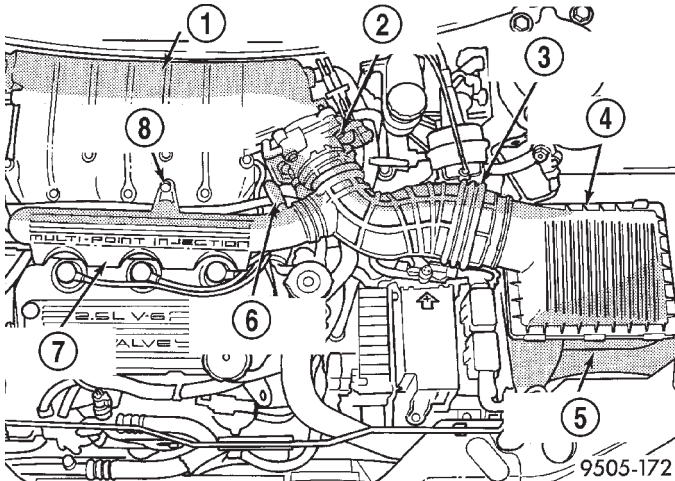


Fig. 64 Engine Air Intake System Components

- 1 - INTAKE MANIFOLD
- 2 - THROTTLE BODY
- 3 - AIR INLET HOSE
- 4 - AIR CLEANER LID
- 5 - AIR CLEANER HOUSING
- 6 - PCV HOSE
- 7 - AIR CHAMBER
- 8 - ATTACHING BOLT

(4) Remove the throttle cable and if equipped the speed control cable from the throttle body (Fig. 65). Remove the vacuum hose (Fig. 65) from the throttle body. Remove the wiring harness connectors from AIS motor and the Throttle Position Sensor (Fig. 65) on the throttle body. Then, remove the 4 bolts (Fig. 65) attaching the throttle body to the intake manifold and remove it from intake manifold.

(5) Without removing cables from bracket, remove the throttle and speed control cable mounting bracket (Fig. 65) from the intake manifold.

(6) Remove the EGR tube (Fig. 66) from the intake manifold and EGR valve.

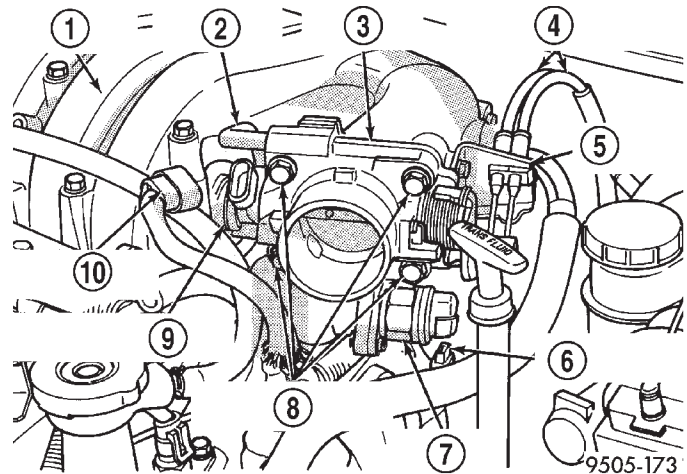


Fig. 65 Throttle Body Attachment To Intake Manifold

- 1 - INTAKE MANIFOLD
- 2 - VACUUM HOSE
- 3 - THROTTLE BODY
- 4 - SPEED CONTROL AND THROTTLE CABLE
- 5 - CABLE BRACKET
- 6 - ELECTRICAL CONNECTOR
- 7 - AIS MOTOR
- 8 - THROTTLE BODY MOUNTING BOLTS
- 9 - THROTTLE POSITION SENSOR
- 10 - ELECTRICAL CONNECTOR

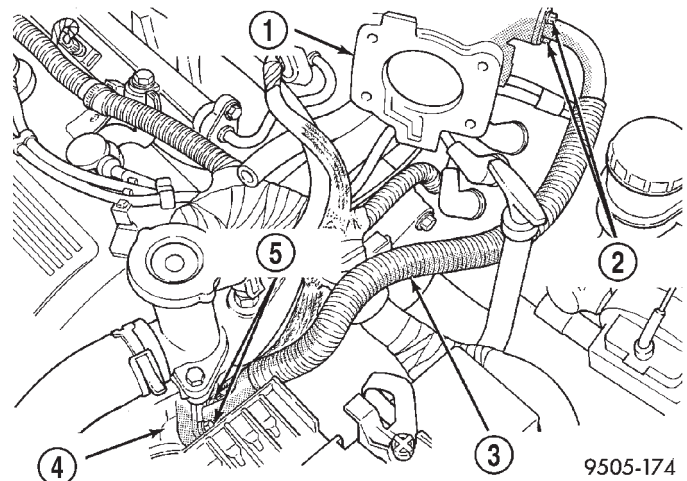


Fig. 66 EGR Tube Attachment To Intake Manifold And EGR Valve

- 1 - INTAKE MANIFOLD
- 2 - MOUNTING BOLTS
- 3 - EGR TUBE ASSEMBLY
- 4 - EGR VALVE
- 5 - MOUNTING BOLTS

REMOVAL AND INSTALLATION (Continued)

(7) If equipped, remove the vehicle's wiring harness connector from the speed control servo. Remove the 2 speed control servo mounting bracket to strut tower attaching nuts (Fig. 67). Without removing speed control cable from servo, move speed control servo out of the way.

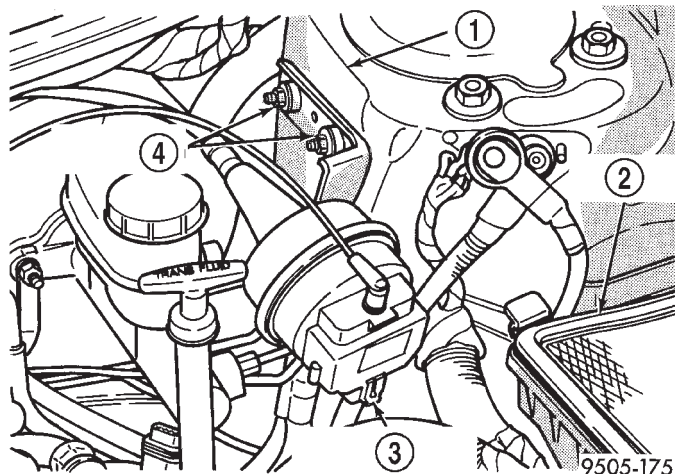


Fig. 67 Speed Control Servo Attachment To Strut Tower

- 1 - STRUT TOWER
- 2 - AIR CLEANER
- 3 - SPEED CONTROL SERVO
- 4 - MOUNTING NUTS

(8) Remove the wiring harness connector from the brake fluid level sensor in the master cylinder fluid reservoir (Fig. 68).

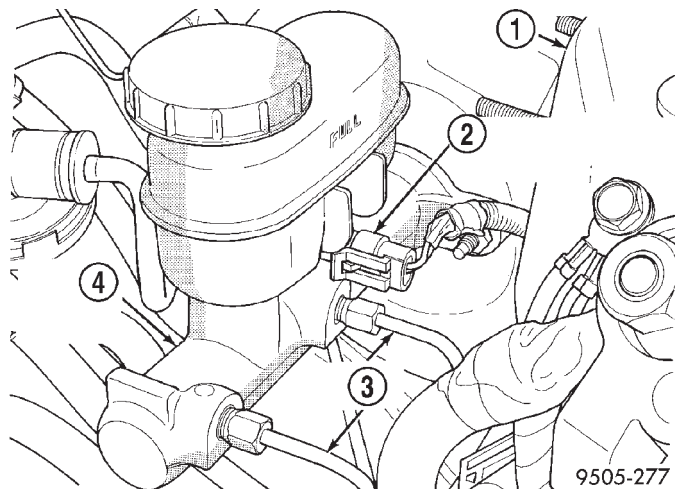


Fig. 68 Master Cylinder Brake Fluid Level Sensor

- 1 - LEFT SHOCK TOWER
- 2 - MASTER CYLINDER FLUID LEVEL SENSOR
- 3 - BRAKE TUBES
- 4 - MASTER CYLINDER ASSEMBLY

(9) Remove the primary and secondary brake tubes (Fig. 69) or (Fig. 70) from the master cylinder.

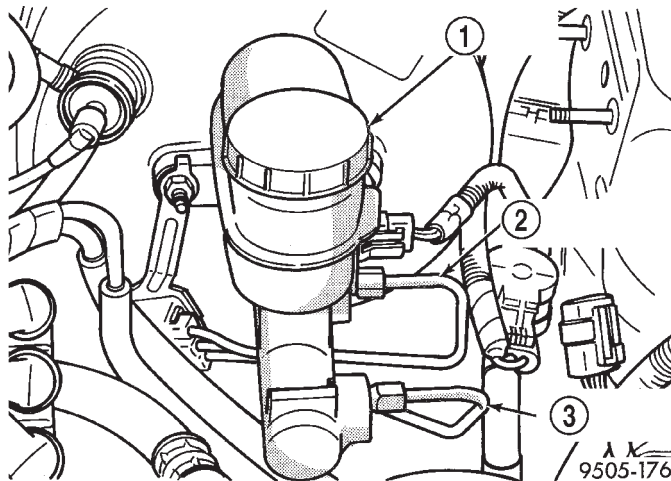


Fig. 69 Primary And Secondary Brake Tubes With Antilock Brakes

- 1 - MASTER CYLINDER ASSEMBLY
- 2 - PRIMARY BRAKE TUBE
- 3 - SECONDARY BRAKE TUBE

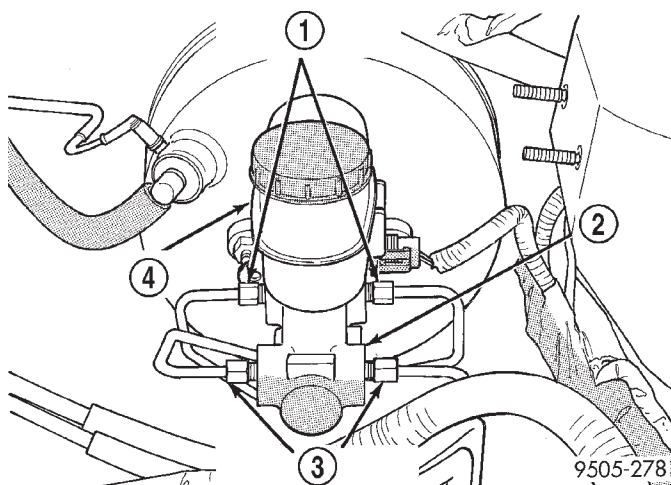


Fig. 70 Primary And Secondary Brake Tubes Without Antilock Brakes

- 1 - MASTER CYLINDER PRIMARY PORTS
- 2 - MASTER CYLINDER
- 3 - MASTER CYLINDER SECONDARY PORTS
- 4 - MASTER CYLINDER FLUID RESERVOIR

(10) Remove the 2 nuts (Fig. 71) attaching the master cylinder assembly to the power brake vacuum booster.

CAUTION: When removing the routing clip and brake tubes from the mounting stud do not bend or kink the chassis brake line tubes.

REMOVAL AND INSTALLATION (Continued)

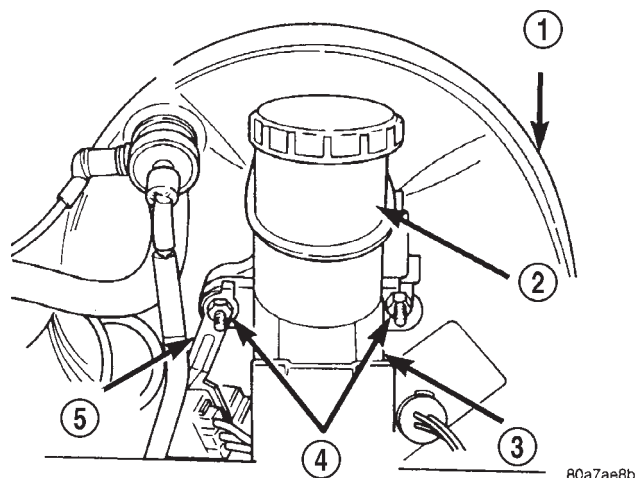


Fig. 71 Master Cylinder Mounting To Vacuum Booster

- 1 - BRAKE VACUUM BOOSTER
- 2 - BRAKE FLUID RESERVOIR
- 3 - MASTER CYLINDER
- 4 - MOUNTING NUTS
- 5 - ROUTING CLIP

(11) Remove the routing clip and chassis brake tubes (Fig. 71) (as an assembly) from the mounting stud for the master cylinder.

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

(13) Remove the vacuum harness connector and electrical connector from the purge solenoid (Fig. 72). Remove bracket and purge solenoid as an assembly from the vehicle.

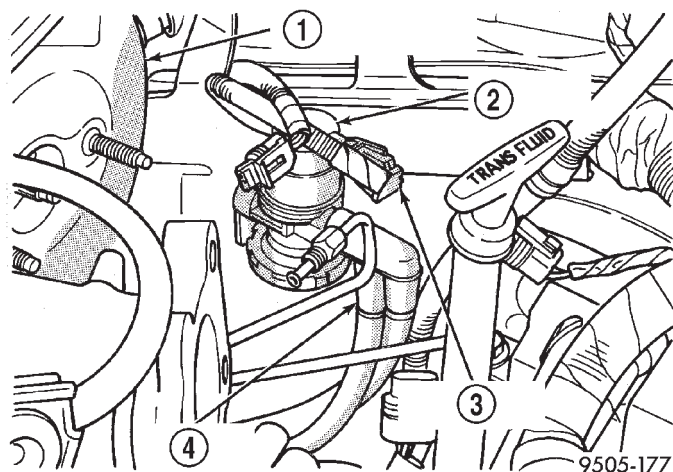


Fig. 72 Purge Control Solenoid

- 1 - POWER BRAKE VACUUM BOOSTER
- 2 - PURGE SOLENOID
- 3 - ELECTRICAL CONNECTOR
- 4 - VACUUM HARNESS

(14) Remove dipstick tube attaching bolt (Fig. 73). Then remove the dipstick tube and dipstick (Fig. 73) as an assembly from the transaxle.

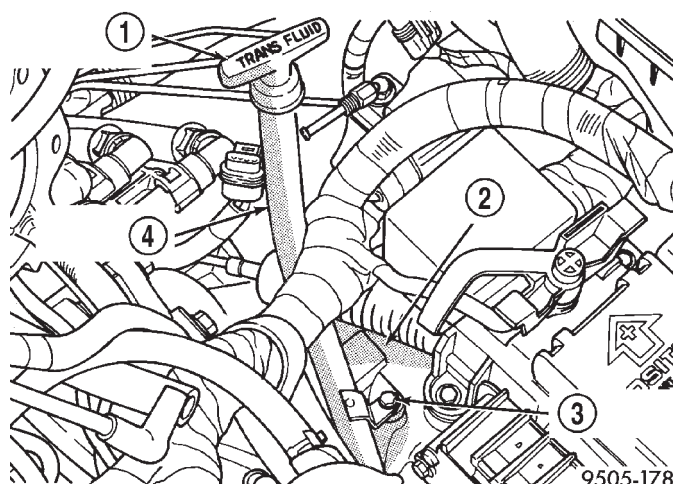


Fig. 73 Transaxle Dipstick Tube

- 1 - TRANSAXLE DIPSTICK
- 2 - TRANSAXLE
- 3 - ATTACHING BOLT
- 4 - DIPSTICK TUBE

(15) Remove the vacuum hoses from the check valve located on the power brake vacuum booster.

(16) Locate the power brake vacuum booster input rod to brake pedal attachment under instrument panel. Position a small screwdriver between the center tang on the power brake booster input rod to brake pedal pin retaining clip (Fig. 74). Rotate screwdriver enough to allow retaining clip center tang to pass over end of brake pedal pin. Then pull retaining clip off brake pedal pin. **Discard retaining clip. Replace only with a new retaining clip when assembled.**

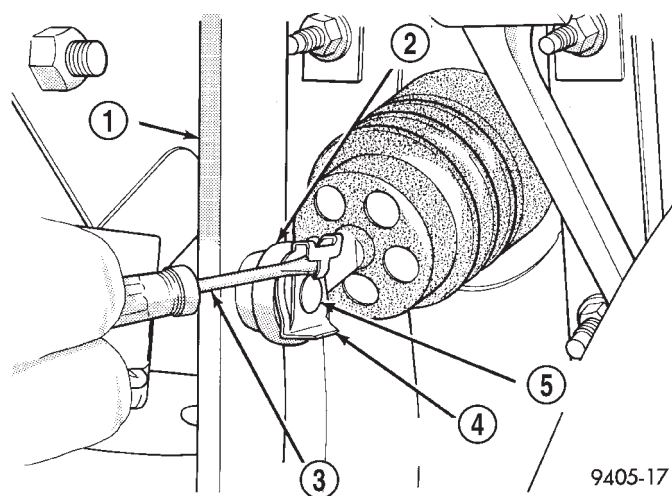


Fig. 74 Input Rod Retaining Pin

- 1 - BRAKE PEDAL
- 2 - INPUT ROD
- 3 - SCREWDRIVER
- 4 - RETAINING CLIP
- 5 - BRAKE PEDAL PIN

REMOVAL AND INSTALLATION (Continued)

(17) Remove the 4 nuts attaching the vacuum booster to the dash panel. Nuts are accessible from under dash panel in area of the steering column and pedal bracket assembly (Fig. 75).

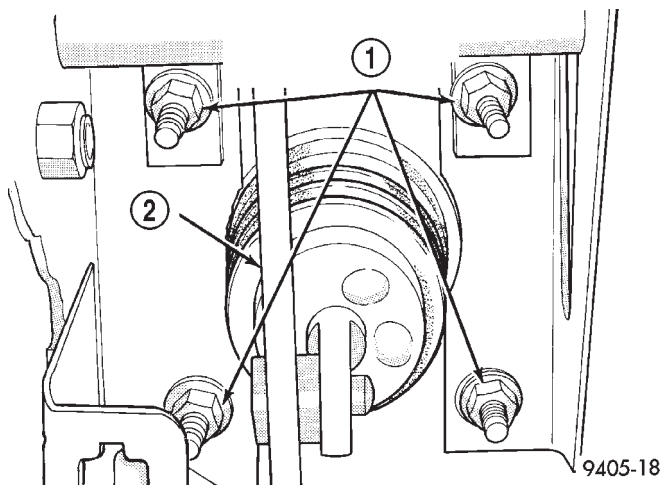


Fig. 75 Vacuum Booster Mounting

- 1 - POWER BRAKE BOOSTER MOUNTING NUTS
2 - BRAKE PEDAL

(18) Slide the vacuum booster straight forward until mounting studs clear dash panel. Then lift the vacuum booster straight up to remove it from the vehicle (Fig. 76).

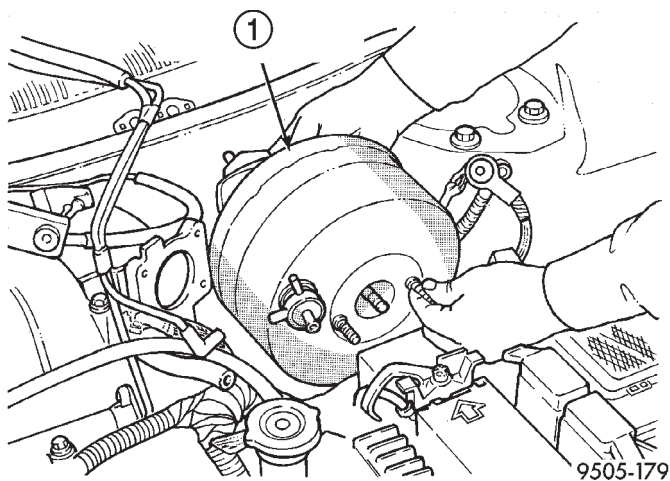


Fig. 76 Power Brake Vacuum Booster Removal

- 1 - POWER BRAKE VACUUM BOOSTER

CAUTION: Do not attempt to disassemble the power brake vacuum booster it is to be serviced **ONLY** as a complete assembly.

INSTALLATION

(1) Position power brake booster onto dash panel.

(2) Install and torque the 4 power brake vacuum booster mounting nuts (Fig. 75) to 37 N·m (27 ft. lbs.) torque.

(3) Using lubriplate, or an equivalent, coat the surfaces of the brake pedal pin that contact the power brake vacuum booster input rod.

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

(5) Install the dipstick tube in transaxle (Fig. 73). Install dipstick tube attaching bolt and securely tighten (Fig. 73).

(6) Install the vacuum hoses on the check valve in the power brake vacuum booster.

(7) Position purge control solenoid (Fig. 72) on left front strut tower and install and securely tighten attaching bolt. Then correctly route and install the vacuum harness connector and electrical connector (Fig. 72) on the purge control solenoid.

(8) Position master cylinder on vacuum booster, aligning push rod on vacuum booster with the piston of the master cylinder.

CAUTION: When installing the routing clip and brake tubes on the mounting stud, do not bend or kink the chassis brake line tubes. Be sure the chassis brake tubes are routed correctly. The chassis brake tubes can not touch each other or other components or the body of the vehicle.

(9) Install the routing clip and chassis brake tubes on the inboard mounting stud for the master cylinder.

(10) Install the 2 master cylinder to power brake unit mounting nuts (Fig. 71). Tighten the 2 mounting nuts to a torque of 28 N·m (250 in. lbs.).

(11) Install the primary and secondary brake tubes (Fig. 69) in the outlet ports of the master cylinder. Tighten the tube nuts to a torque of 17 N·m (145 in. lbs.).

(12) Install the vehicle's wiring harness connector on the master cylinder brake fluid level sensor (Fig. 68).

(13) If equipped, install speed control servo on the mounting studs in the left strut tower (Fig. 67). Install the 2 speed control servo bracket mounting nuts (Fig. 67). Tighten the 2 mounting nuts to a torque of 6 N·m (55 in. lbs.). Install electrical connector on speed control servo.

(14) Install the EGR tube with **NEW** gaskets on the intake manifold and EGR valve (Fig. 66). Install the 4 mounting bolts and tighten to a torque of 11 N·m (95 in. lbs.).

(15) Install the throttle body and a **NEW** gasket on the intake manifold. Install the 4 throttle body

REMOVAL AND INSTALLATION (Continued)

attaching bolts (Fig. 65) and tighten to a torque of 22 N·m (200 in. lbs.).

(16) Install the vacuum hose (Fig. 65) on the throttle body. Install the wiring harness connectors on the AIS motor and the Throttle Position Sensor (Fig. 65) located on the throttle body.

(17) Install the mounting bracket for the throttle cable and speed control cable onto the intake manifold and securely tighten the mounting bolts.

(18) Install the throttle cable, and if equipped, the speed control cable on the cam of the throttle body assembly.

(19) Install the air cleaner lid, air inlet hose and air chamber (Fig. 64) as an assembly on the engine. Latch lid of air cleaner to air cleaner housing. Securely tighten the clamp attaching the air inlet hose to the throttle body (Fig. 64). Install and securely tighten the bolt attaching the air chamber to the intake manifold (Fig. 64).

(20) Install the remote ground cable (Fig. 62) on the ground stud located on the left strut tower (Fig. 62). Install and securely tighten the ground cable attaching nut.

(21) Check brake light switch for correct adjustment. If required, adjust stop lamp switch as necessary. See required procedure in the Service Adjustments Section in this group of the service manual.

(22) Road test vehicle to ensure proper operation of the vehicles brake system.

BRAKE TUBES AND HOSES

Always use Mopar replacement brake hose assemblies 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. **Hose assemblies for each brake are unique and not interchangeable.**

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 disc brake caliper. After routing the flex hose around the strut, hand start the chassis brake tube nut into the end of the flex hose. Following this procedure will prevent twisting of the flex hose when the flex hose bracket is attached to the front frame rail. Then tighten all brake line fitting to the specified torques.

On vehicles equipped with rear drum brakes, loosely connect the flex hose tube nut to the wheel cylinder, and then secure the flex hose bracket to the brake support plate. After the flex hose bracket is secured to the brake support plate, tighten the flex hose to wheel cylinder tube nut to the specified

torque. Then hand start the chassis tube nut to the opposite end of the flex hose. After chassis tube nut is hand started into flex hose attach the flex hose bracket to the rear frame rail. Then tighten the nut on the chassis brake tube to the specified torque. Following this procedure will reduce the potential for twisting the flex hose during the installation procedure.

Only double wall 4.75 mm (3/16 in.) steel brake line tubing, with Al-Rich/ZN-AL alloy coating should be used for replacement. Care must 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.

PROPORTIONING VALVE

NOTE: The following procedure is for removal and installation of the proportioning valve(s) on vehicles without antilock brakes. For the procedure to remove and install the proportioning valve(s) on vehicles with antilock brakes refer to **ANTILOCK BRAKE SYSTEM** in this group.

REMOVAL

(1) Remove hydraulic brake line (Fig. 77) from proportioning valve controlling the rear wheel of the vehicle which has premature wheel skid.

(2) Then remove the proportioning valve from the rear brake line.

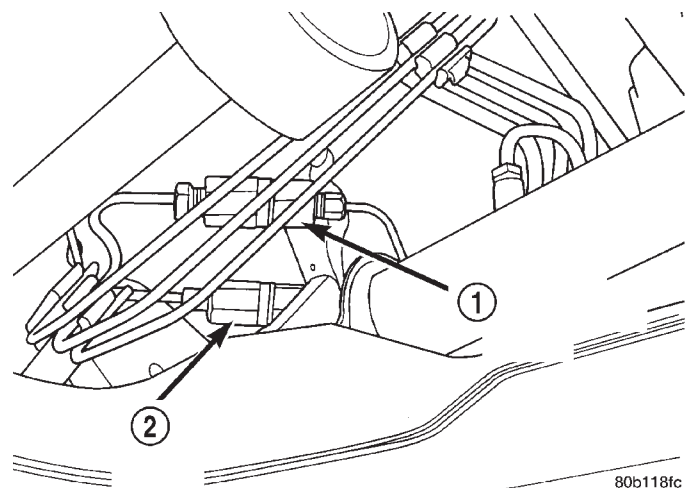


Fig. 77 Non-ABS Brake Proportioning Valve Location

- 1 - LEFT REAR PROPORTIONING VALVE
- 2 - RIGHT REAR PROPORTIONING VALVE

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Install proportioning valve in rear brake line and hand tighten both tube nuts until they are fully seated in proportioning valve (Fig. 77).

(2) Tighten both brake line tube nuts at the proportioning valve to a torque of 17 N·m (145 in. lbs.).

(3) Bleed the affected brake line. Refer to BASE BRAKE BLEEDING in SERVICE PROCEDURES in this section.

DISC BRAKE CALIPER (FRONT)

NOTE: Before proceeding, review **SERVICE WARNINGS AND CAUTIONS** at the beginning of **REMOVAL AND INSTALLATION** in this section.

REMOVAL

(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 to steering knuckle guide pin bolts (Fig. 78).

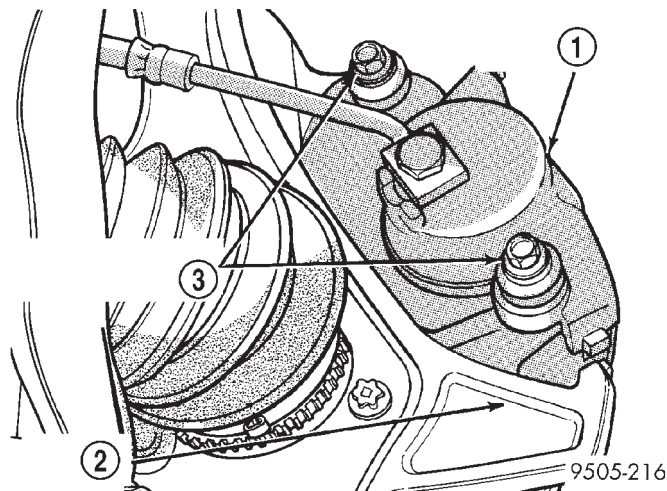


Fig. 78 Removing Caliper Guide Pin Bolts

- 1 - DISC BRAKE CALIPER ASSEMBLY
- 2 - STEERING KNUCKLE
- 3 - CALIPER ASSEMBLY GUIDE PIN BOLTS

(4) Remove brake caliper from steering knuckle, by first rotating bottom end of caliper away from steering knuckle. Then slide top of caliper down from the machined abutment on steering knuckle (Fig. 79).

(5) **Support caliper from upper control arm to prevent weight of caliper from being supported by brake flex hose. Supporting disc brake caliper from flex hose can damage the hose (Fig. 80).**

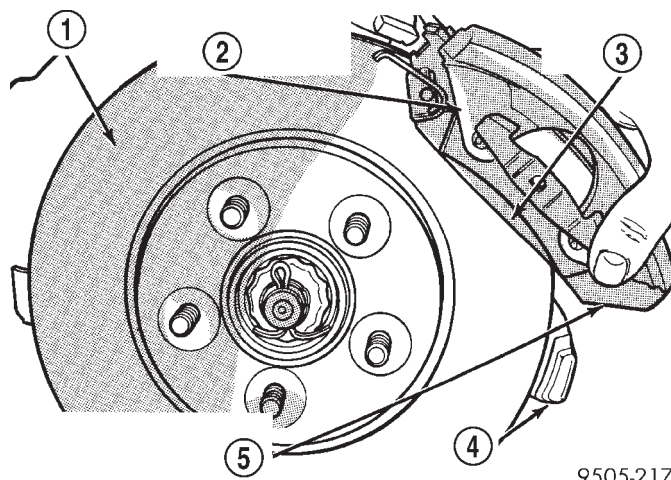


Fig. 79 Removing / Installing Brake Caliper

- 1 - ROTOR
- 2 - DISC BRAKE CALIPER ASSEMBLY
- 3 - OUTBOARD BRAKE SHOE
- 4 - STEERING KNUCKLE
- 5 - LIFT THIS END OF CALIPER AWAY FROM STEERING KNUCKLE FIRST

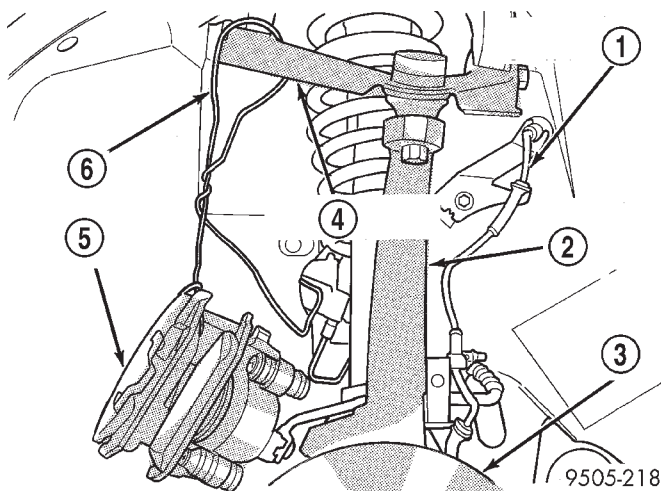


Fig. 80 Storing Caliper

- 1 - ABS SPEED SENSOR CABLE
- 2 - STEERING KNUCKLE
- 3 - ROTOR
- 4 - UPPER CONTROL ARM
- 5 - DISC BRAKE CALIPER ASSEMBLY
- 6 - WIRE HANGER

INSTALLATION

(1) Lubricate both steering knuckle abutments with a liberal amount of Mopar® Multipurpose Lubricant, or equivalent.

(2) If removed, install the front rotor on the hub, making sure it is squarely seated on face of hub.

REMOVAL AND INSTALLATION (Continued)

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

(3) Carefully position caliper and brake shoe assemblies over brake rotor by first hooking top of brake shoes on the machined abutment on upper steering knuckle (Fig. 79). Then rotate the bottom of the brake caliper into position on the steering knuckle. **Make sure that caliper guide pin bolts, bushings and sleeves are clear of the steering knuckle bosses.**

NOTE: When being installed, extreme caution must be taken not to cross thread the caliper guide pin bolts.

(4) Install the brake caliper guide pin bolts (Fig. 78). Then tighten the guide pin bolts to a torque of 22 N·m (16 ft. lbs.).

(5) Install the wheel and tire assembly.

(6) 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 135 N·m (100 ft. lbs.).

(7) Remove jackstands or lower hoist.

(8) Check and adjust brake fluid level as necessary.

NOTE: Before vehicle is moved after any brake service work, pump the brake pedal several times to insure the vehicle has 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 shoes.

DISC BRAKE SHOES (FRONT)

NOTE: Before proceeding, review **SERVICE WARNINGS AND CAUTIONS** at the beginning of **REMOVAL AND INSTALLATION** in this section.

REMOVAL

(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.

CAUTION: When prying the piston back into the bore of the caliper do not use a hard pry bar. The use of a hard pry bar will damage the braking surface of the rotor.

(3) Slightly pry the piston back into the bore of the disc brake caliper. The piston is to be pryed back by inserting a soft tool (such as a trim stick) between the inboard brake shoe and the rotor and prying against the inboard brake shoe. This will force the piston back into the caliper.

(4) Remove the 2 brake caliper to steering knuckle guide pin bolts (Fig. 81).

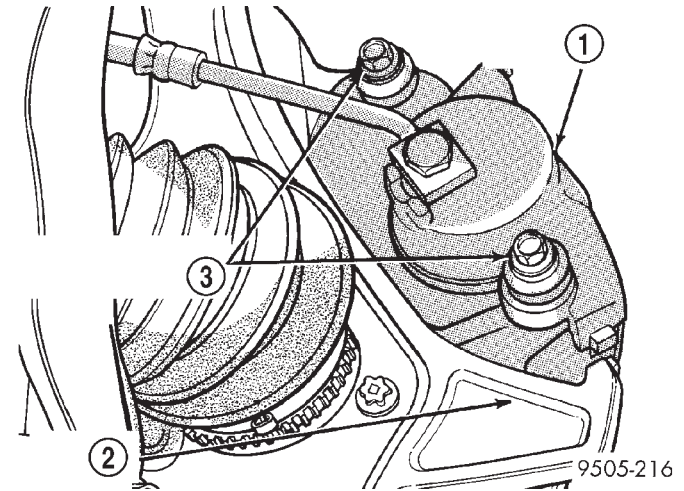


Fig. 81 Removing Caliper Guide Pin Bolts

1 - DISC BRAKE CALIPER ASSEMBLY

2 - STEERING KNUCKLE

3 - CALIPER ASSEMBLY GUIDE PIN BOLTS

(5) Remove brake caliper from steering knuckle, by first rotating bottom of brake caliper away from the steering knuckle. Then slide top of brake shoes down and out from the top machined abutment on steering knuckle (Fig. 82).

(6) **Support brake caliper from upper control arm to prevent weight of caliper from being supported by brake flex hose. Supporting disc brake caliper from flex hose can damage the hose (Fig. 83).**

(7) Remove the brake rotor from the front hub (Fig. 84).

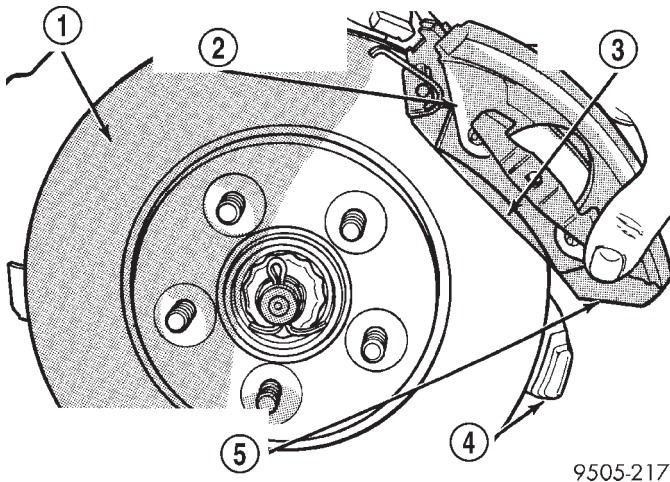
(8) Remove outboard brake shoe by pushing the brake shoe inward until retaining pins on brake shoe can be removed from holes in caliper (Fig. 85). Then slide the brake shoe off the caliper.

(9) Pull inboard brake shoe away from piston until retaining clip is free from cavity in piston (Fig. 86).

CALIPER INSPECTION

Check caliper 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 and install a new seal and 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.

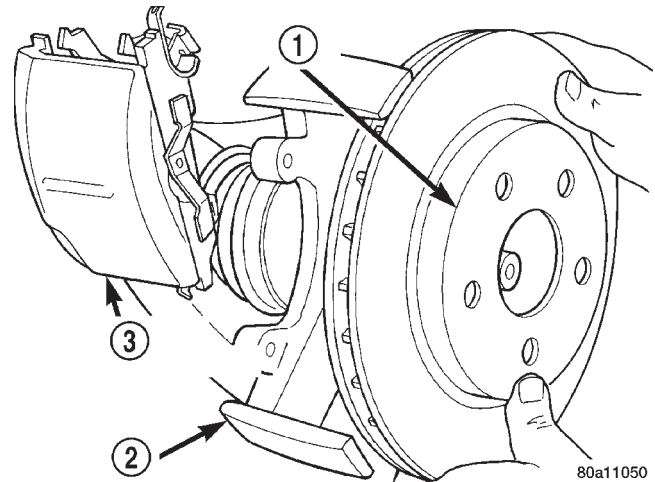
REMOVAL AND INSTALLATION (Continued)



9505-217

Fig. 82 Removing Brake Caliper

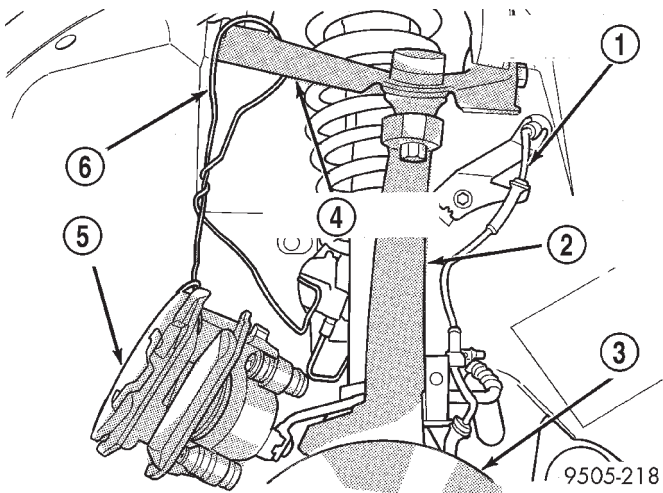
- 1 - ROTOR
- 2 - DISC BRAKE CALIPER ASSEMBLY
- 3 - OUTBOARD BRAKE SHOE
- 4 - STEERING KNUCKLE
- 5 - LIFT THIS END OF CALIPER AWAY FROM STEERING KNUCKLE FIRST



80a11050

Fig. 84 Removing / Installing Brake Rotor

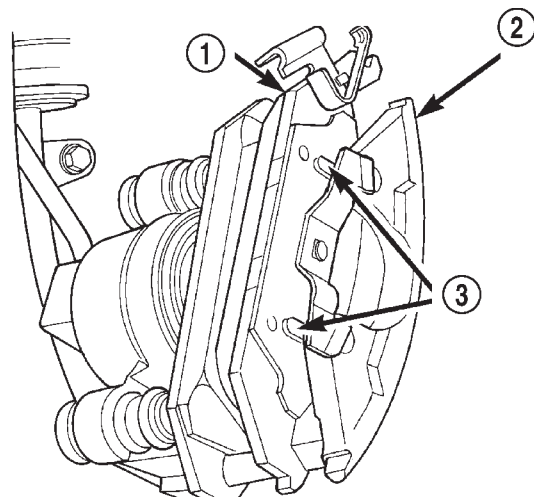
- 1 - BRAKING DISC
- 2 - STEERING KNUCKLE
- 3 - DISC BRAKE CALIPER ASSEMBLY (STORED)



9505-218

Fig. 83 Storing Caliper

- 1 - ABS SPEED SENSOR CABLE
- 2 - STEERING KNUCKLE
- 3 - ROTOR
- 4 - UPPER CONTROL ARM
- 5 - DISC BRAKE CALIPER ASSEMBLY
- 6 - WIRE HANGER

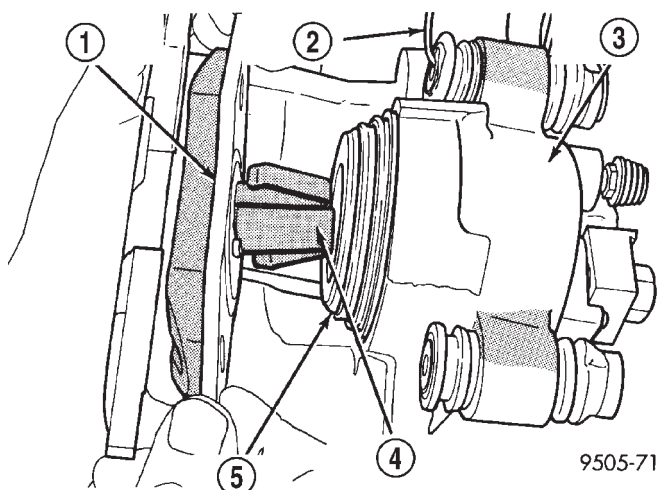


80a1105*

Fig. 85 Removing / Installing Outboard Brake Shoe

- 1 - OUTBOARD BRAKE SHOE
- 2 - BRAKE CALIPER
- 3 - BRAKE SHOE RETAINING PINS

REMOVAL AND INSTALLATION (Continued)

**Fig. 86 Removing Inboard Brake Shoe**

- 1 - INBOARD BRAKE SHOE
- 2 - HANGER WIRE
- 3 - CALIPER ASSEMBLY
- 4 - RETAINING CLIP
- 5 - PISTON

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 Guide Pin Bushing Service in Disc Brake Caliper Service in this section of the service manual.

INSTALLATION

(1) Completely retract caliper piston back into piston bore of caliper assembly. This is required for caliper installation with new brake shoe assemblies.

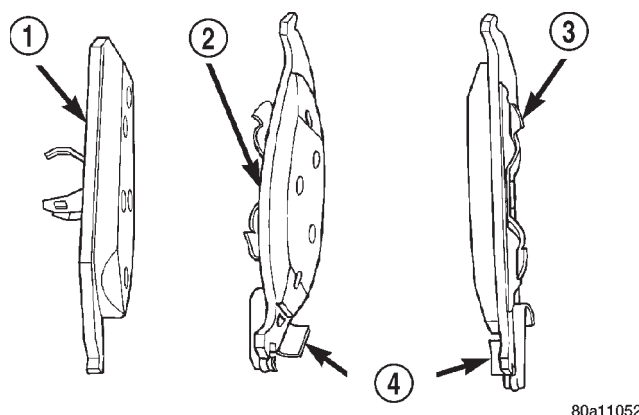
(2) Lubricate both steering knuckle abutments with a liberal amount of Mopar® Multipurpose Lubricant, or equivalent.

(3) Install the front rotor on the hub, making sure it is squarely seated on face of hub (Fig. 84).

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

NOTE: Note: The inboard and outboard brake shoes are not common (Fig. 87). Be sure the correct outer brake shoe is installed in the correct caliper. The left and right outer brake shoes are different and must be installed correctly. The wear sensor (Fig. 87) and the hold down clip must be on the upper end of the caliper when the caliper and brake shoes are installed on the steering knuckle.

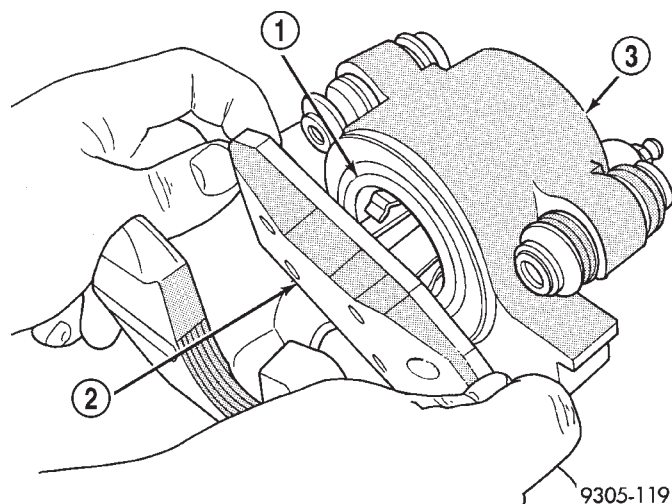
(5) Install the new inboard brake shoe assembly into the caliper piston by firmly pressing into piston bore (Fig. 88). Be sure inboard brake shoe assembly is positioned squarely against face of caliper piston.



80a11052

Fig. 87 Front Brake Shoe Assembly Identification

- 1 - INBOARD BRAKE SHOE
- 2 - LEFT OUTBOARD BRAKE SHOE
- 3 - RIGHT OUTBOARD BRAKE SHOE
- 4 - WEAR INDICATOR

**Fig. 88 Installing Inboard Brake Shoe Assembly**

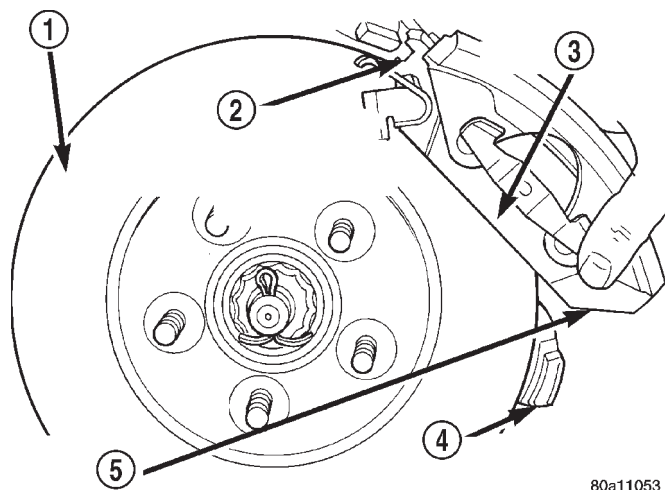
- 1 - PISTON
- 2 - BRAKE SHOE
- 3 - CALIPER ASSEMBLY

(6) Slide the new outboard brake shoe assembly onto the caliper assembly (Fig. 85).

CAUTION: Use care when installing the caliper assembly onto the steering knuckle so the seals on the caliper guide pin bushings do not get damaged by the steering knuckle bosses. Also, make sure that caliper guide pin bushings and sleeves are clear of the steering knuckle bosses

(7) Carefully position brake caliper and brake shoes over brake rotor by first hooking top of brake shoes onto upper abutment on steering knuckle (Fig. 89). Then rotate caliper into position at bottom of steering knuckle.

REMOVAL AND INSTALLATION (Continued)



80a11053

Fig. 89 Installing Brake Caliper

- 1 - ROTOR
- 2 - INSTALL THIS END OF CALIPER UNDER STEERING KNUCKLE FIRST
- 3 - OUTBOARD BRAKE SHOE
- 4 - STEERING KNUCKLE
- 5 - DISC BRAKE CALIPER

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

(8) Install the caliper guide pin bolts (Fig. 81) and tighten to a torque of 22 N·m (16 ft. 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 135 N·m (100 ft. lbs.).

(11) Remove jackstands or lower hoist.

(12) Check brake fluid level.

NOTE: Before vehicle is moved after any brake service work, pump the brake pedal several times to insure the vehicle has a firm brake pedal.

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

DISC BRAKE CALIPER (REAR)

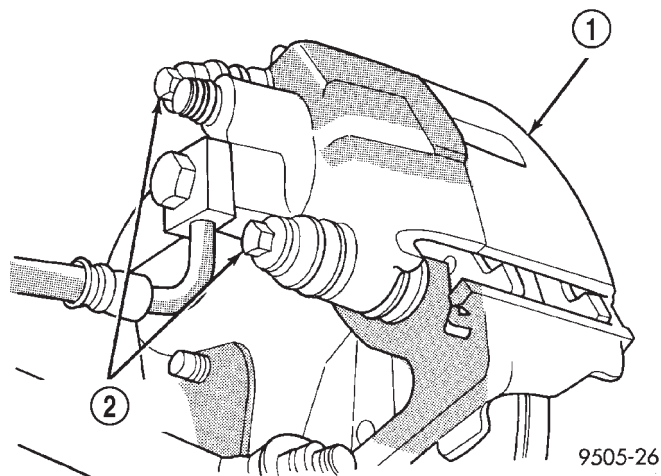
NOTE: Before proceeding, review **SERVICE WARNINGS AND CAUTIONS** at the beginning of **REMOVAL AND INSTALLATION** in this section.

REMOVAL

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

(2) Remove rear wheels and tires from vehicle.

(3) Remove the 2 guide pin bolts mounting the caliper to the adapter (Fig. 90).

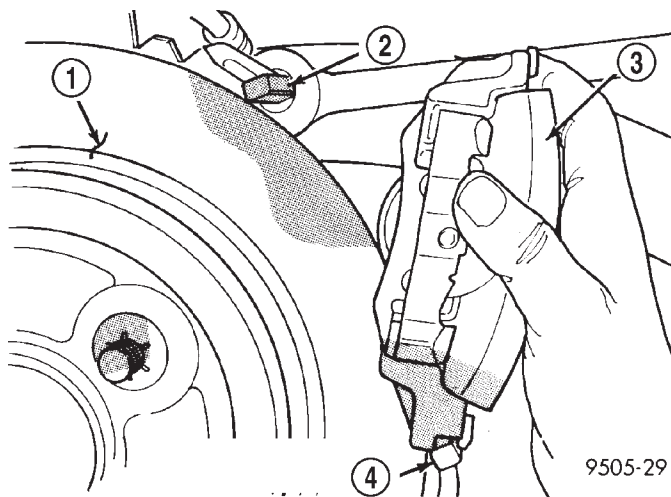


9505-26

Fig. 90 Caliper Guide Pin Bolts

- 1 - DISC BRAKE CALIPER
- 2 - CALIPER GUIDE PIN BOLTS

(4) Remove caliper from adapter and rotor by first rotating top of caliper away from the adapter, and then lifting the caliper off lower machined abutment on adapter (Fig. 91).



9505-29

Fig. 91 Removing Caliper From Adapter

- 1 - BRAKING DISC
- 2 - CALIPER ADAPTER
- 3 - CALIPER
- 4 - LOWER MACHINED ADAPTER ABUTMENT

REMOVAL AND INSTALLATION (Continued)

(5) Support the caliper from the rear strut to prevent weight of caliper from damaging the flexible brake hose (Fig. 92).

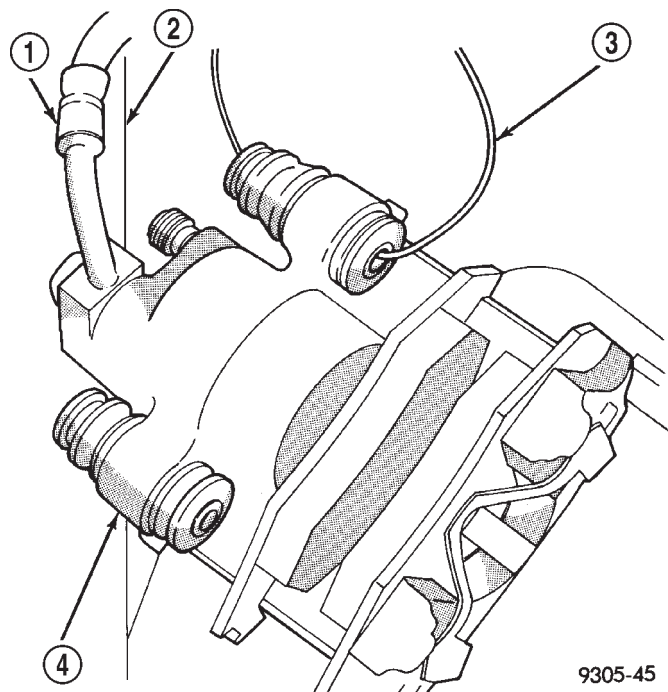


Fig. 92 Storing Caliper

- 1 - FLEX HOSE
- 2 - STRUT
- 3 - WIRE HANGER
- 4 - CALIPER ASSEMBLY

INSTALLATION

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) If removed, install the rotor on the hub making sure it is squarely seated on the face of the hub (Fig. 93).

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

- (4) Carefully lower caliper and brake shoes over rotor reversing the removal procedure (Fig. 91). Make sure that the caliper guide pin bolts, bushings and sleeves are clear of the adapter bosses.

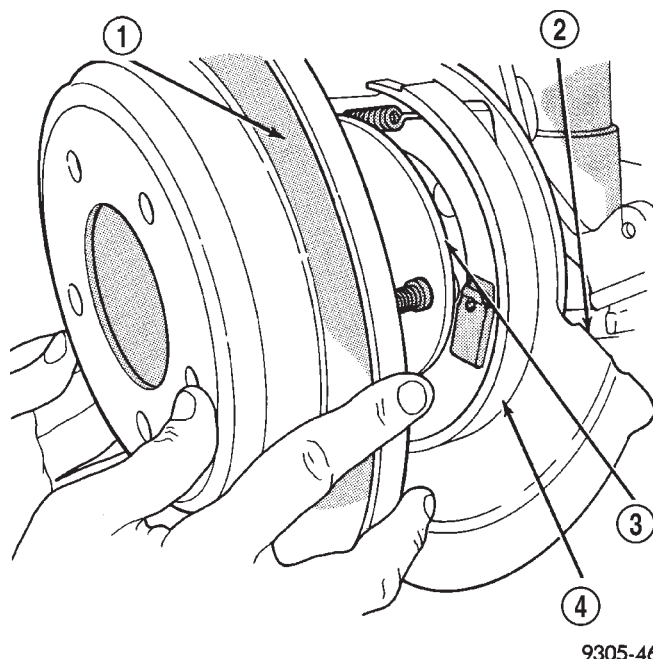


Fig. 93 Installing Rear Rotor

- 1 - BRAKING DISC
- 2 - DISC SHIELD
- 3 - HUB
- 4 - DRUM-IN-HAT PARKING BRAKE

CAUTION: Extreme caution should be taken not to cross thread the caliper guide pin bolts when they are installed.

- (5) Install the caliper guide pin bolts (Fig. 90). Tighten the caliper guide pin bolts to a torque of 22 N·m (192 in. lbs.).
- (6) Install wheels and tires.
- (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 135 N·m (100 ft. lbs.).
- (8) Remove jackstands or lower hoist.
- (9) Check brake fluid level.

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

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

DISC BRAKE SHOES (REAR)

NOTE: Before proceeding, review SERVICE WARNINGS AND CAUTIONS at the beginning of REMOVAL AND INSTALLATION in this section.

REMOVAL AND INSTALLATION (Continued)

REMOVAL

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

(2) Remove rear wheels and tires from vehicle.

(3) Remove the 2 guide pin bolts mounting the caliper to the adapter (Fig. 94).

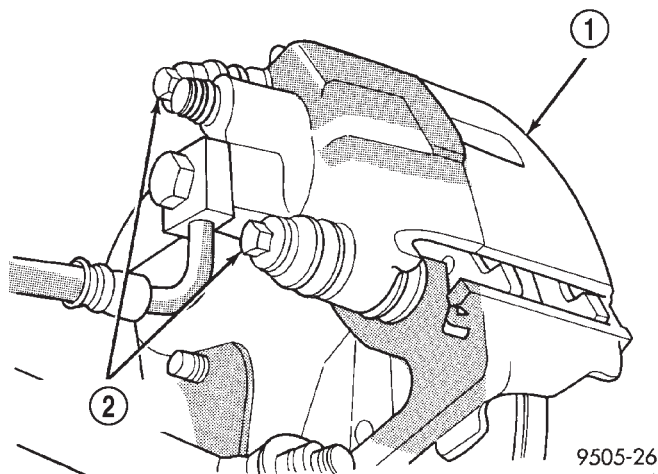


Fig. 94 Caliper Guide Pin Bolts

- 1 - DISC BRAKE CALIPER
- 2 - CALIPER GUIDE PIN BOLTS

(4) Remove caliper from adapter and rotor by first rotating the top of the caliper away from adapter, and then lifting the caliper off the lower machined abutment on adapter (Fig. 95).

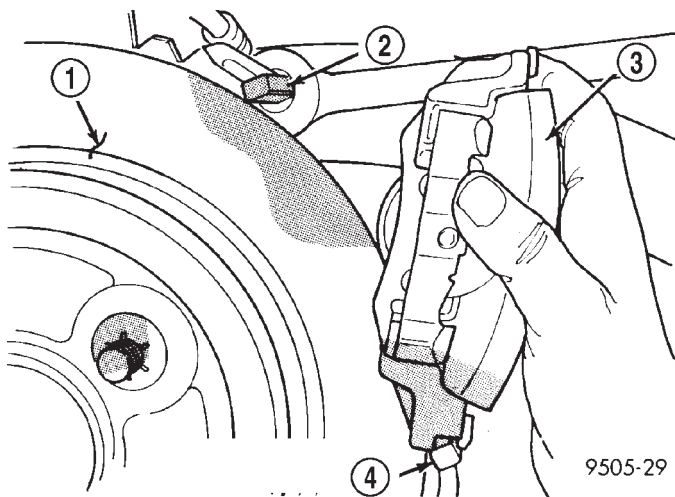


Fig. 95 Caliper Removal/Installation

- 1 - BRAKING DISC
- 2 - CALIPER ADAPTER
- 3 - CALIPER
- 4 - LOWER MACHINED ADAPTER ABUTMENT

(5) Support caliper from rear strut to prevent weight of caliper from damaging the flexible brake hose (Fig. 96).

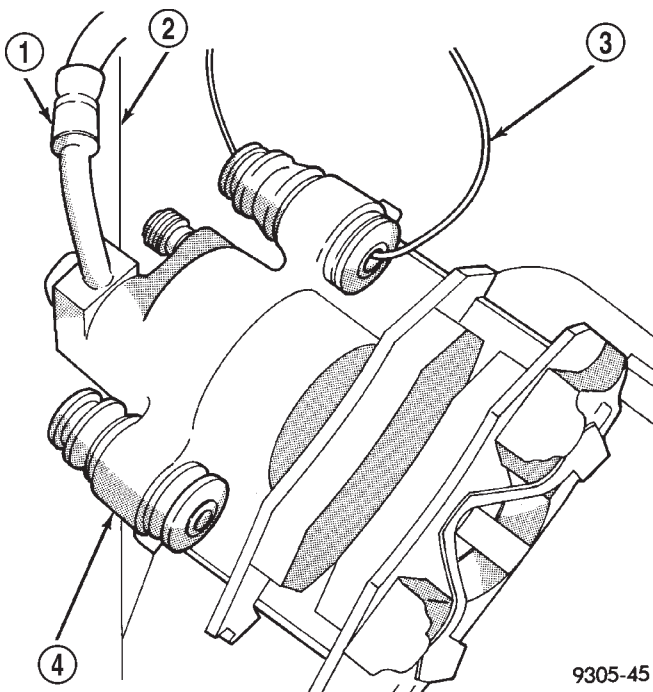


Fig. 96 Storing Caliper

- 1 - FLEX HOSE
- 2 - STRUT
- 3 - WIRE HANGER
- 4 - CALIPER ASSEMBLY

(6) Remove rear rotor from hub/bearing (Fig. 97). Then inspect drum-in-hat parking brake shoes and parking brake braking surface on rotor for any signs of excessive wear or damage. Replace parking brake shoes if required.

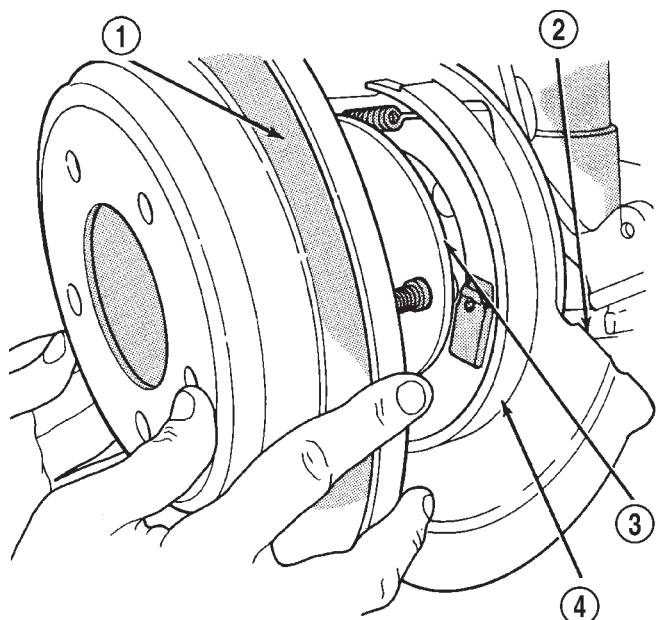
(7) Remove outboard brake pad from caliper by prying brake pad retaining clip over raised area on caliper. Then slide brake pad down and off the caliper (Fig. 98).

(8) Pull inboard brake pad away from caliper piston, until retaining clip is free from cavity in piston. (Fig. 99).

CALIPER INSPECTION

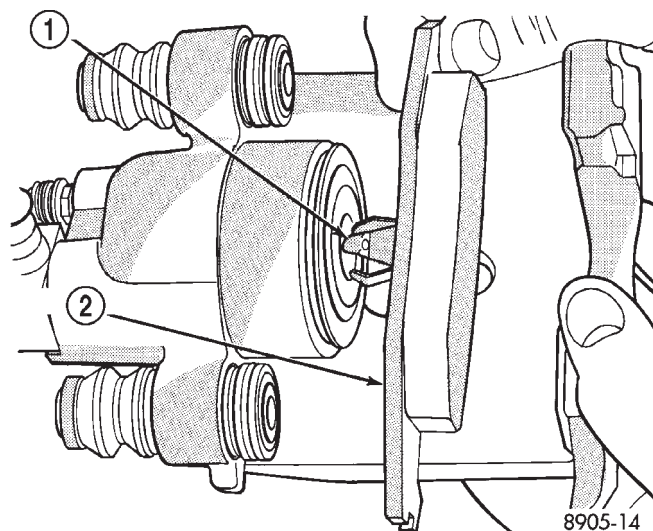
Check caliper for piston seal leaks (brake fluid in and around boot area and inboard lining) and for any ruptures of the piston dust boot. If boot is damaged, or fluid leak is visible, disassemble caliper and install a new seal and boot, (and piston if scored). Refer to Caliper Disassembly And Re-Assembly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

REMOVAL AND INSTALLATION (Continued)

**Fig. 97 Rear Brake Rotor**

- 1 - BRAKING DISC
2 - DISC SHIELD
3 - HUB
4 - DRUM-IN-HAT PARKING BRAKE

9305-46

**Fig. 99 Removing Inboard Brake Pad**

- 1 - RETAINING CLIP
2 - INBOARD SHOE

8905-14

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.

INSTALLATION

(1) Completely retract the caliper piston back into the piston bore of the caliper. This is required for caliper installation when new brake pad assemblies are installed on caliper.

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

(3) Install rear rotor on hub making sure it is squarely seated on face of hub (Fig. 97).

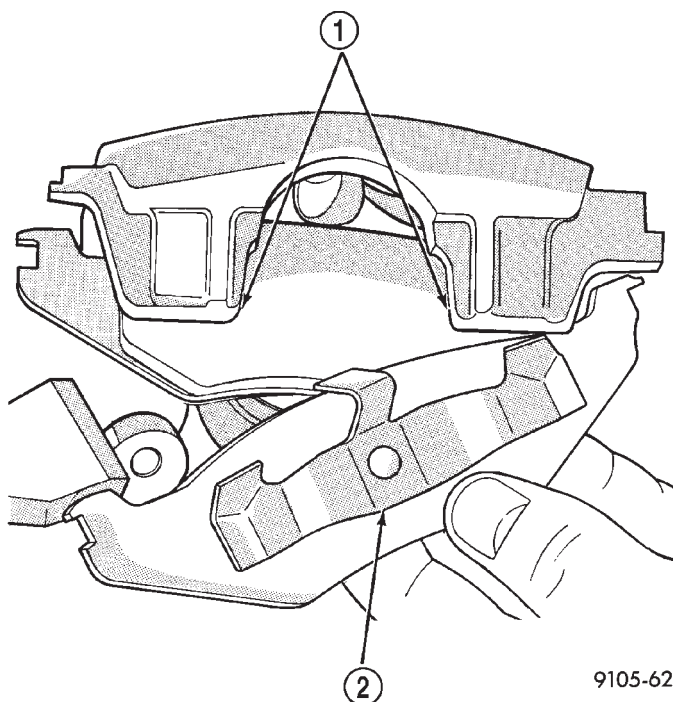
(4) Remove protective paper from noise suppression gasket on both inner and outer brake pad assemblies (if equipped).

(5) Install new inboard brake pad into caliper piston by firmly pressing it into bore of piston using thumbs (Fig. 98). **Be sure inboard brake shoe is positioned squarely against face of piston.**

(6) Slide new outboard brake pad onto the caliper (Fig. 98). Be sure retaining clip is squarely seated in the depressed areas on the caliper.

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

(7) Carefully lower caliper and brake shoes over rotor reversing the required removal procedure (Fig. 95). Make sure that caliper guide pin bolts, bushings and sleeves are clear of the adapter bosses.

**Fig. 98 Removing Outboard Brake Pad**

- 1 - CALIPER FINGERS
2 - RETAINING CLIP

9105-62

REMOVAL AND INSTALLATION (Continued)

CAUTION: Extreme caution should be taken not to cross thread the caliper guide pin bolts when they are installed.

(8) Install caliper guide pin bolts into adapter. (Fig. 94). Tighten the guide pin bolts to a torque of 22 N·m (192 in. lbs.).

(9) Install the wheels and tires.

(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 135 N·m (100 ft. lbs.).

(11) Remove jackstands or lower hoist.

(12) Check brake fluid level.

NOTE: Before vehicle is moved after any brake service work, pump the brake pedal several times to insure the vehicle has a firm brake pedal.

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

DRUM BRAKE WHEEL CYLINDER (REAR)

NOTE: Before proceeding, review **SERVICE WARNINGS AND CAUTIONS** at the beginning of **REMOVAL AND INSTALLATION** in this section.

REMOVAL

With brake drums removed, inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears, or heat cracks. If any of these conditions exist, the wheel cylinders should be completely cleaned, inspected and new parts installed.

(1) In case of a leak, remove brake shoes (replace if soaked with grease or brake fluid.)

(2) Disconnect rear brake flex hose tube from wheel cylinder and remove the flex hose routing bracket from the brake support plate (Fig. 100).

(3) Remove rear wheel cylinder attaching bolts (Fig. 101). Then pull wheel cylinder assembly off brake support plate.

INSTALLATION

(1) Apply a small bead of silicone sealer around the mating surface of the wheel cylinder to brake support plate.

(2) Install wheel cylinder onto brake support plate. Tighten the attaching bolts (Fig. 101) to a torque of 13 N·m (115 in. lbs.).

(3) Hand start the hydraulic brake hose tube fitting into the wheel cylinder (Fig. 100). Tighten the tube nut to a torque of 17 N·m (145 in. lbs.).

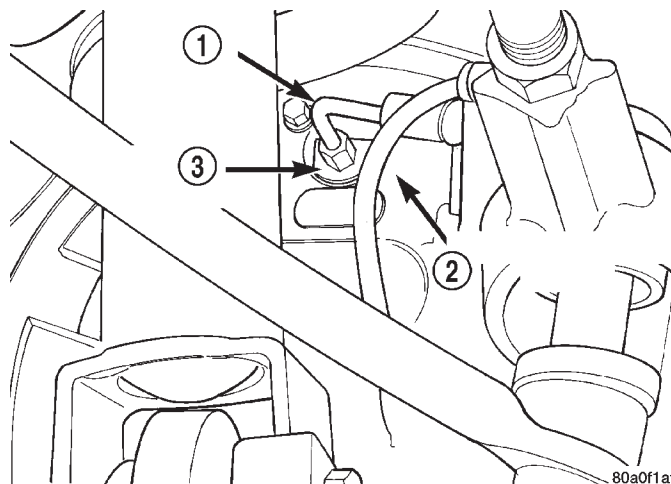


Fig. 100 Brake Flex Hose At Wheel Cylinder

- 1 - FLEX HOSE TUBE
- 2 - BRAKE SUPPORT PLATE
- 3 - WHEEL CYLINDER

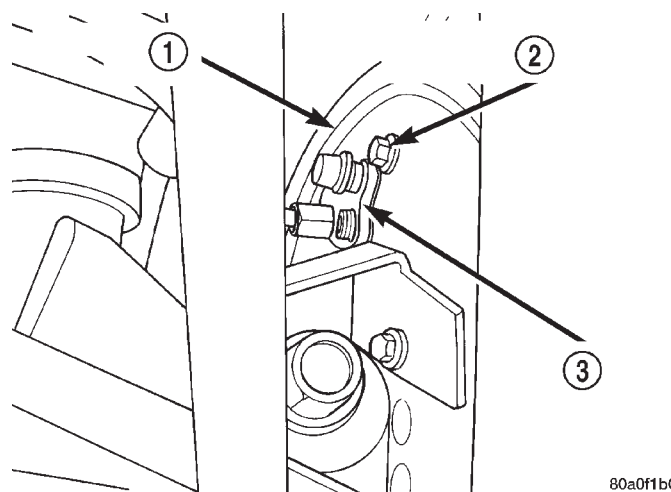


Fig. 101 Wheel Cylinder Attaching Bolts

- 1 - BRAKE SUPPORT PLATE
- 2 - WHEEL CYLINDER ATTACHING BOLTS (2)
- 3 - WHEEL CYLINDER

(4) Install brake shoes on support plate. Follow procedure for Installing Brake Shoe Assemblies in this section of the service manual.

(5) Install rear brake drum onto rear hub.

(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.).

(7) Adjust the rear brakes. See Adjusting Service Brakes in Service Adjustments section in this group of the service manual.

REMOVAL AND INSTALLATION (Continued)

(8) Bleed the entire brake system. See Bleeding Brake System in Service Adjustments section in this group of the service manual.

DRUM BRAKE SHOES (REAR)

NOTE: Before proceeding, review **SERVICE WARNINGS AND CAUTIONS** at the beginning of **REMOVAL AND INSTALLATION** in this section.

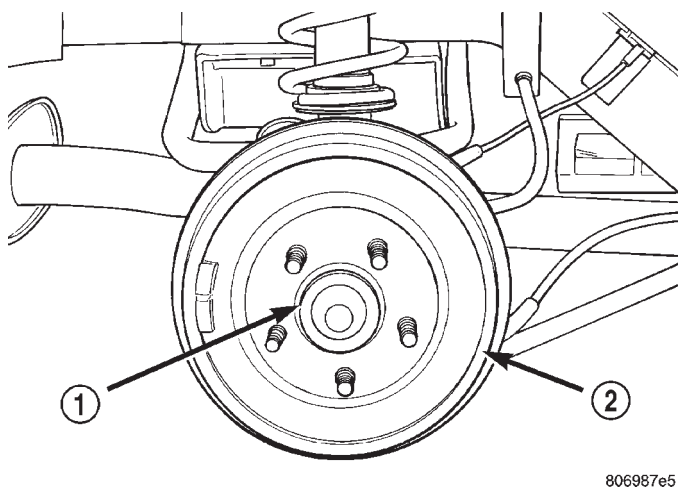
NOTE: When replacing the rear brake shoes on this vehicle, remove the brake shoes from only one side of the vehicle at a time. This is due to the automatic adjustment feature of the park brake system. If the brake shoe assemblies are removed from both rear wheels at the same time the adjuster will remove all the slack from the park brake cables, making installation of the brake shoes extremely difficult.

REMOVAL

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

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

(3) Remove rear brake drum to hub retaining clips (if equipped). Then remove rear brake drum from hub and bearing assembly (Fig. 102).

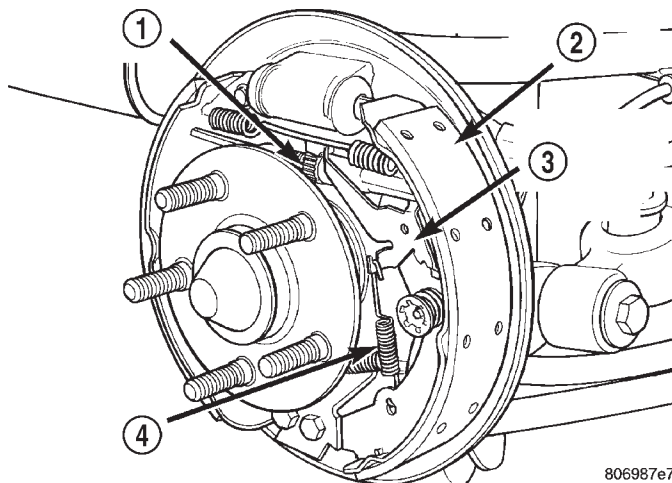


806987e5

Fig. 102 Rear Brake Drum Assembly

- 1 - HUB/BEARING ASSEMBLY
- 2 - BRAKE DRUM

(4) Remove the automatic adjuster lever actuating spring from the leading brake shoe (Fig. 103). Then remove the automatic adjuster actuating lever from the leading brake shoe (Fig. 103).

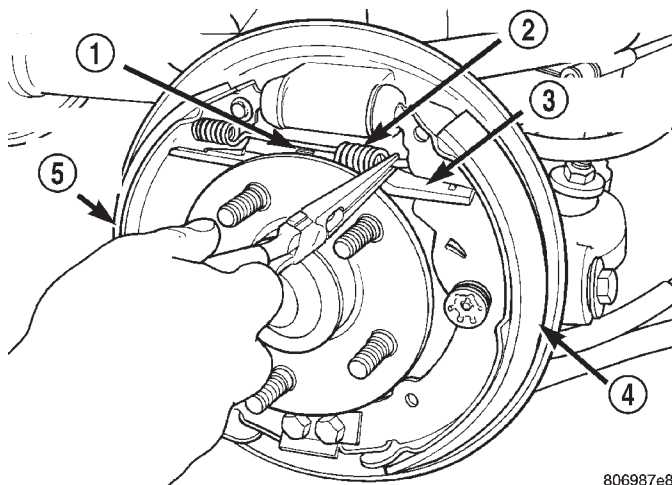


806987e7

Fig. 103 Automatic Adjuster Actuating Spring And Lever

- 1 - AUTOMATIC ADJUSTER
- 2 - LEADING BRAKE SHOE
- 3 - AUTOMATIC ADJUSTER ACTUATING LEVER
- 4 - AUTOMATIC ADJUSTER ACTUATING SPRING

(5) Thread the automatic adjuster star wheel (Fig. 104) all the way into the adjuster, removing all tension from the adjuster. Then remove the upper return spring (Fig. 104) from the brake shoes.



806987e8

Fig. 104 Brake Shoe Upper Return spring

- 1 - ADJUSTER STAR WHEEL
- 2 - UPPER RETURN SPRING
- 3 - AUTOMATIC ADJUSTER
- 4 - LEADING BRAKE SHOE
- 5 - TRAILING BRAKE SHOE

REMOVAL AND INSTALLATION (Continued)

(6) Remove the brake shoe lower return spring (Fig. 105).

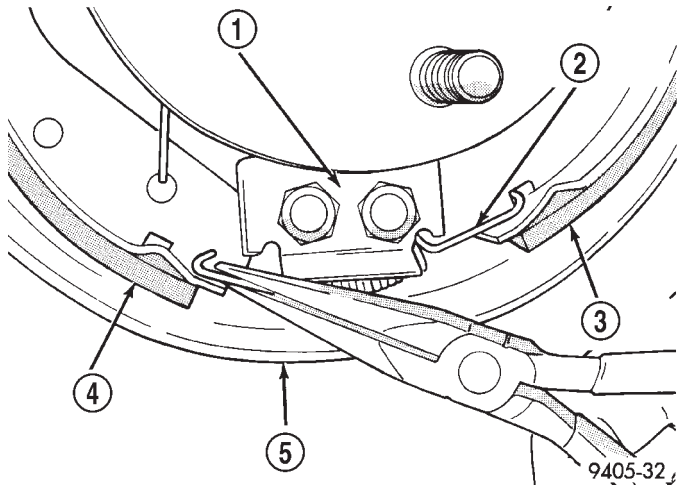


Fig. 105 Brake Shoe Lower Return Spring

- 1 - ANCHOR PLATE
- 2 - LOWER BRAKE SHOE RETURN SPRING
- 3 - REAR BRAKE SHOE
- 4 - FRONT BRAKE SHOE
- 5 - BRAKE SUPPORT PLATE

(7) Remove the hold down spring and attaching pin (Fig. 106) from the leading brake shoe.

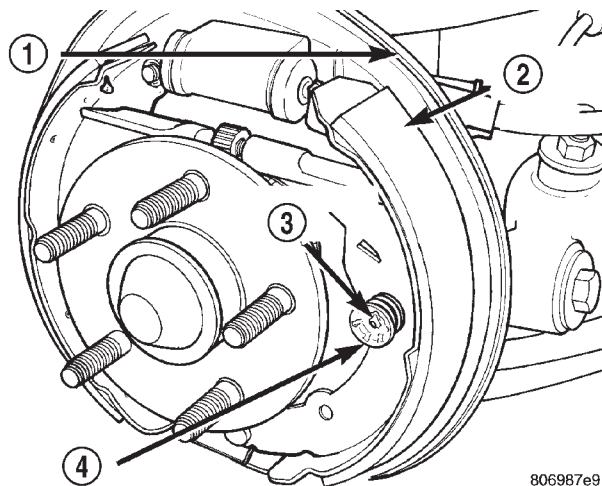


Fig. 106 Hold Down Spring And Pin

- 1 - BRAKE SUPPORT PLATE
- 2 - LEADING BRAKE SHOE
- 3 - ATTACHING PIN
- 4 - HOLD DOWN SPRING

(8) Remove the leading brake shoe from the brake support plate.

(9) Remove the automatic adjuster (Fig. 107) from the trailing brake shoe and park brake actuating lever.

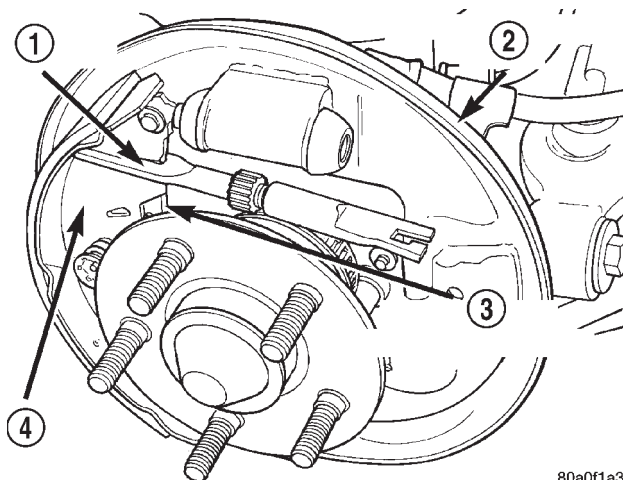


Fig. 107 Automatic Adjuster

- 1 - AUTOMATIC ADJUSTER
- 2 - BRAKE SUPPORT PLATE
- 3 - PARK BRAKE ACTUATING LEVER
- 4 - TRAILING BRAKE SHOE

(10) Remove the retaining clip (Fig. 108) holding the park brake actuating lever to the trailing brake shoe.

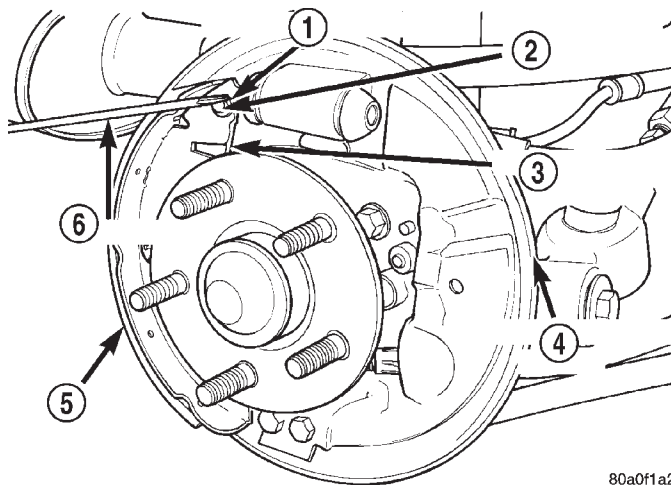


Fig. 108 Park Brake Lever Retaining Clip

- 1 - RETAINING CLIP
- 2 - PARK BRAKE LEVER PIN
- 3 - PARK BRAKE LEVER
- 4 - BRAKE SUPPORT PLATE
- 5 - TRAILING BRAKE SHOE
- 6 - SCREWDRIVER

REMOVAL AND INSTALLATION (Continued)

(11) Remove the hold down spring and attaching pin (Fig. 109) from the trailing brake shoe.

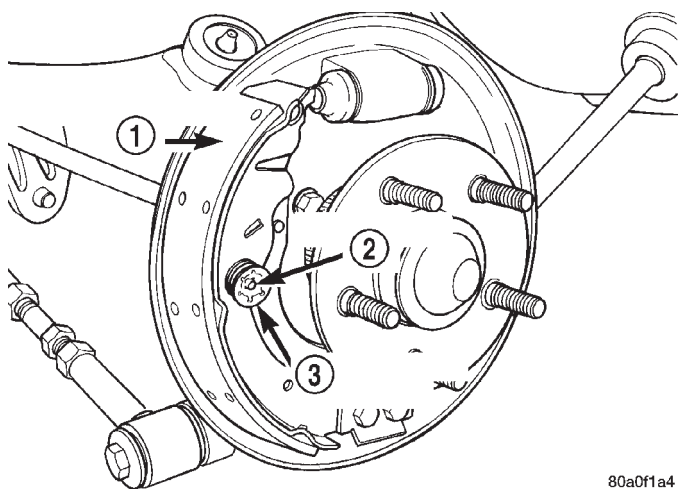


Fig. 109 Hold Down Spring And Pin

- 1 - TRAILING BRAKE SHOE
- 2 - ATTACHING PIN
- 3 - HOLD DOWN SPRING

(12) Remove the trailing brake shoe from the brake support plate and the park brake actuating lever (Fig. 110).

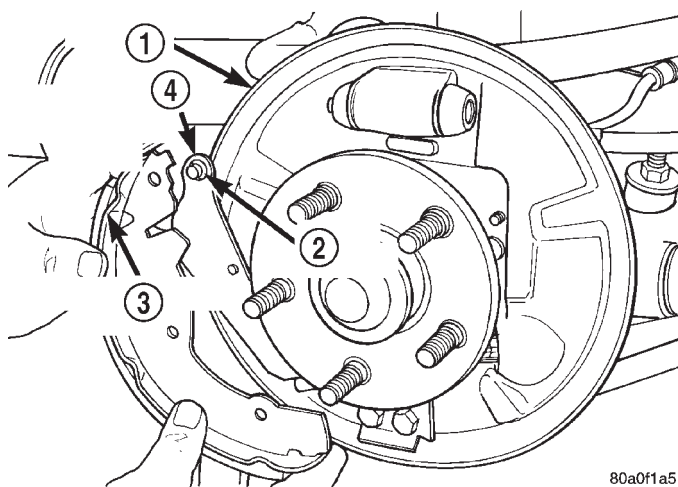


Fig. 110 Remove /Install Trailing Brake Shoe

- 1 - BRAKE SUPPORT PLATE
- 2 - WAVE WASHER
- 3 - TRAILING BRAKE SHOE
- 4 - PARK BRAKE ACTUATING LEVER

CLEANING AND INSPECTION

Clean metal portion of brake shoes. Check to see if shoes are bent.

Brake shoe lining should show contact across its entire width and from the heel to the toe of the lining, otherwise replace.

Shoes with lack of contact at toe or heel may be improperly ground.

Clean and inspect support and adjusting screws. Apply a thin coat of Mopar Multi-Purpose Lubricant or equivalent to the threads of the self adjuster (Fig. 111). Replace adjusting screw if corroded.

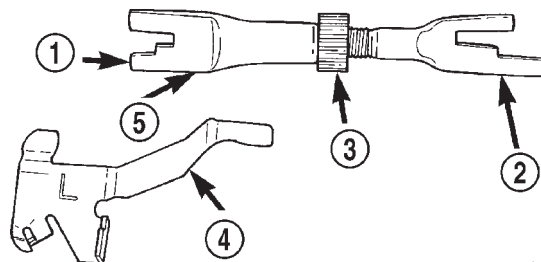


Fig. 111 Adjuster Screw and Lever (Typical)

- 1 - OUTBOARD FORWARD
- 2 - OUTBOARD REAR
- 3 - STAR WHEEL
- 4 - SELF ADJUSTER ACTUATING LEVER
- 5 - SELF ADJUSTER

If old springs have overheated or are damaged, replace. Overheating indications are paint discoloration or distorted end coils.

INSTALLATION

(1) Lubricate the six brake shoe contact areas on the brake support plate and the brake shoe contact points on the brake shoe anchor (Fig. 112) using Mopar Multi-Purpose Lubricant or equivalent.

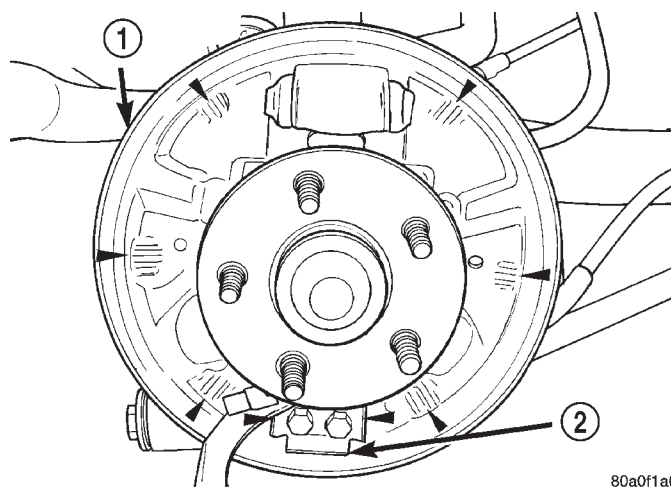


Fig. 112 Brake Shoe Contact Areas on Support Plate

- 1 - BRAKE SUPPORT PLATE
- 2 - BRAKE SHOE ANCHOR

REMOVAL AND INSTALLATION (Continued)

(2) Install the wave washer on the pin of the park brake actuating lever (Fig. 113).

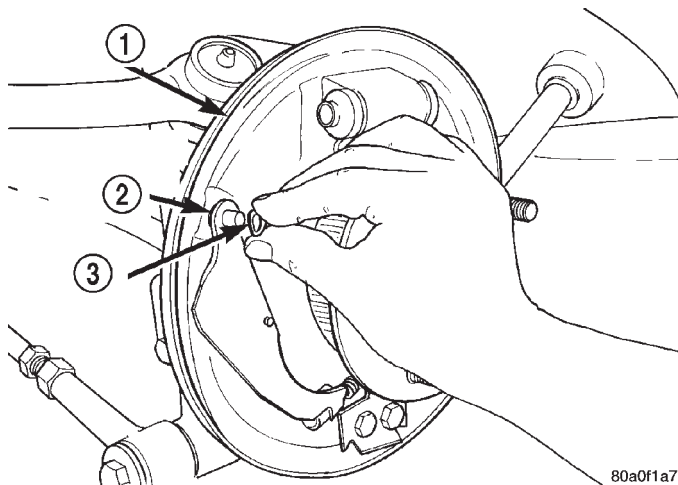


Fig. 113 Wave Washer Installation

- 1 - BRAKE SUPPORT PLATE
- 2 - PARK BRAKE ACTUATING LEVER
- 3 - WAVE WASHER

(3) Install the trailing brake shoe on the park brake actuating lever (Fig. 110)

(4) Install the trailing brake shoe on the brake support plate. Install the attaching pin and hold down spring for the trailing brake shoe (Fig. 109).

(5) Install the retaining clip attaching the park brake actuating lever to the trailing brake shoe (Fig. 114).

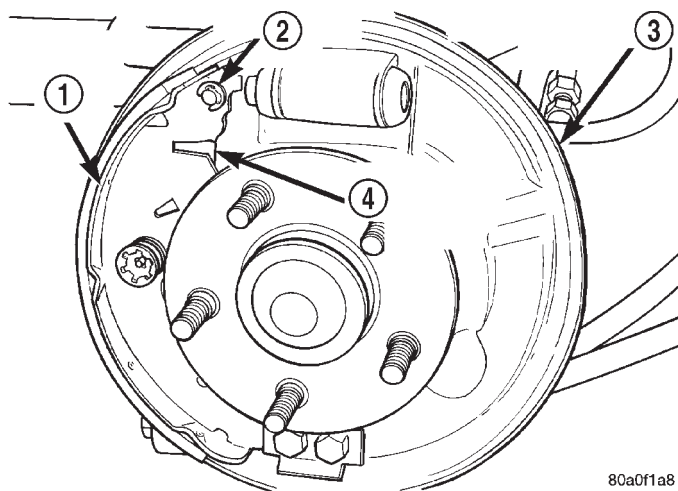


Fig. 114 Park Brake Actuating Lever Retaining Clip Installed

- 1 - TRAILING BRAKE SHOE
- 2 - RETAINING CLIP
- 3 - BRAKE SUPPORT PLATE
- 4 - PARK BRAKE ACTUATING LEVER

(6) Install the automatic adjuster on the trailing brake shoe and park brake actuating lever (Fig. 107).

(7) Install the leading brake shoe on the brake support plate. Then install the attaching pin and hold down spring for the leading brake shoe (Fig. 106).

(8) Install the brake shoe lower return spring (Fig. 105).

(9) Install the upper return spring on the brake shoes (Fig. 104)

(10) Install the automatic adjuster actuating lever and the actuating spring on the leading brake shoe (Fig. 103).

(11) Manually adjust the brake shoes assemblies out as far as possible but not so as to interfere with brake drum installation.

(12) Install the rear brake drums on the hubs.

(13) Adjust rear brake shoes per Adjusting Rear Brakes procedure in the service adjustments section of the service manual.

(14) Install the wheel and tire assembly.

(15) 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 135 N·m (100 ft. lbs.).

(16) Road test vehicle. The automatic adjuster will continue the brake adjustment during the road test of the vehicle.

BRAKE DRUM

NOTE: Before proceeding, review **SERVICE WARNINGS AND CAUTIONS** at the beginning of **REMOVAL AND INSTALLATION** in this section.

REMOVAL

NOTE: If the vehicle has high mileage, the brake drums may have a ridge worn in them by the brake shoes. This ridge causes the brake drum to interfere with the brake shoes thus, not allowing the brake drum to be removed. Further clearance can be obtained by backing off the brakes automatic self-adjuster mechanism, using the following procedure in steps (1) and (2).

(1) Remove the rubber plug from the brake support plate (Fig. 115).

(2) Insert a screwdriver, through the automatic adjuster access hole, in the rear brake support plate (Fig. 116). Engage screwdriver with the teeth on the adjuster mechanism quadrant. Then rotate quadrant so that the teeth on the quadrant are moved toward the front of the vehicle (Fig. 116). This will back off the adjustment of the rear brake shoes.

REMOVAL AND INSTALLATION (Continued)

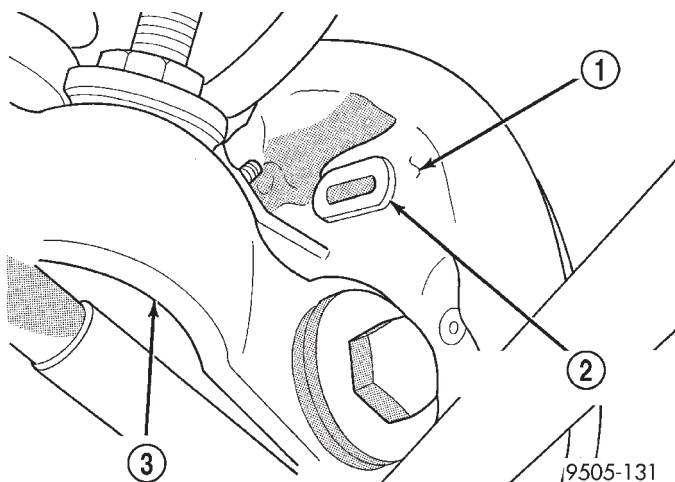


Fig. 115 Automatic Adjuster Access Hole Plug

- 1 - REAR BRAKE SUPPORT PLATE
- 2 - AUTOMATIC ADJUSTER ACCESS HOLE PLUG
- 3 - REAR SUSPENSION LATERAL LINK

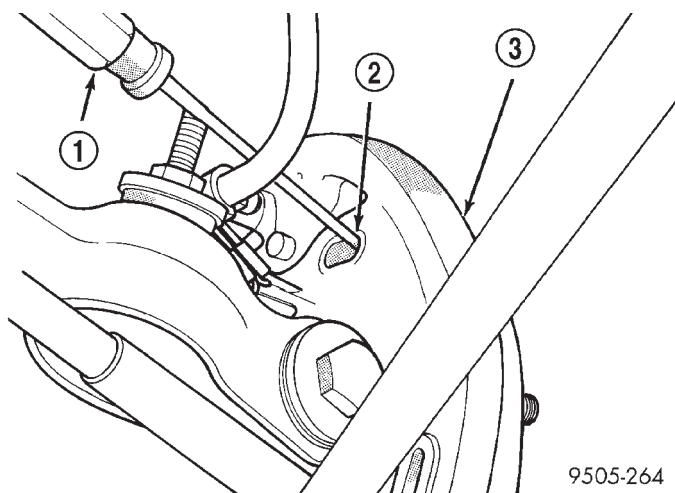


Fig. 116 Backing Off Rear Brake Shoe Adjustment

- 1 - SCREWDRIVER
- 2 - ACCESS HOLE
- 3 - BRAKE SUPPORT PLATE

(3) Remove any drum retainer clips from the wheel mounting studs.

(4) Remove rear brake drum from the rear hub and bearing assembly by pulling it straight off the wheel mounting studs (Fig. 117).

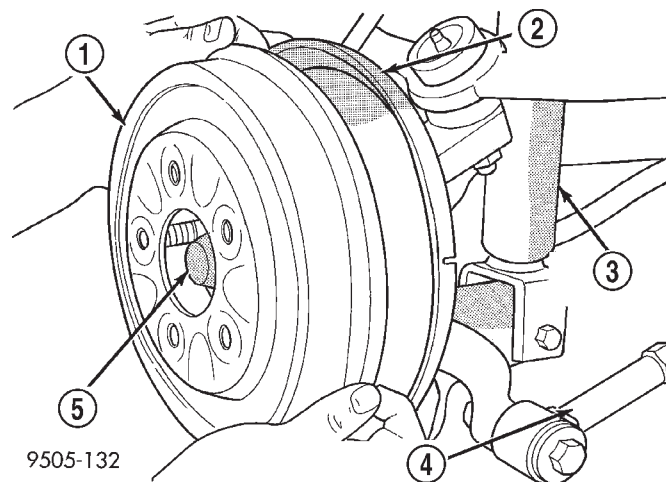


Fig. 117 Brake Drum Removal

- 1 - REAR BRAKE DRUM
- 2 - REAR BRAKE SUPPORT PLATE
- 3 - SHOCK ASSEMBLY
- 4 - REAR LATERAL ARM
- 5 - HUB/BEARING ASSEMBLY

INSTALLATION

(1) Slide the drum onto the mounting studs and install rear brake drum on the rear hub and bearing assembly.

(2) Install the wheel and tire assembly.

(3) 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 135 N·m (100 ft. lbs.).

(4) Adjust rear brakes. The rear brakes on this vehicle are adjusted by depressing the brake pedal as far as possible 2 or 3 times.

DRUM BRAKE SUPPORT PLATE (REAR)

NOTE: Before proceeding, review **SERVICE WARNINGS AND CAUTIONS** at the beginning of **REMOVAL AND INSTALLATION** in this section.

REMOVAL AND INSTALLATION (Continued)

REMOVAL

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

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

(3) Remove the dust cap from the rear hub and bearing assembly (Fig. 118).

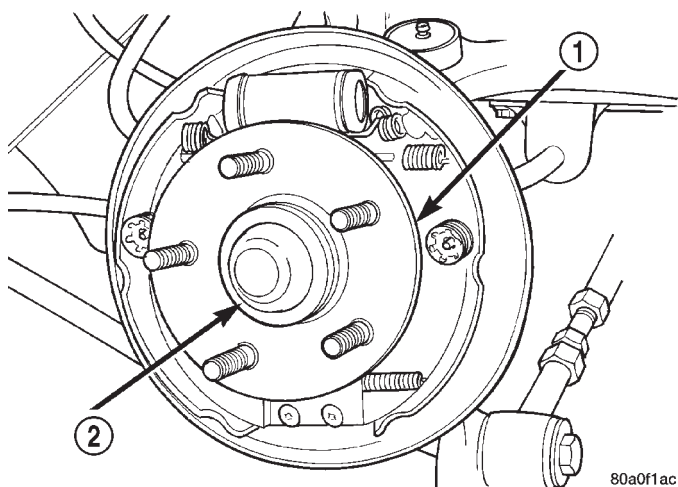


Fig. 118 Hub And Bearing Dust Cap

- 1 - HUB/BEARING ASSEMBLY
- 2 - DUST CAP

(4) Remove the rear hub and bearing assembly retaining nut (Fig. 119). Then remove the hub and bearing assembly from the rear knuckle.

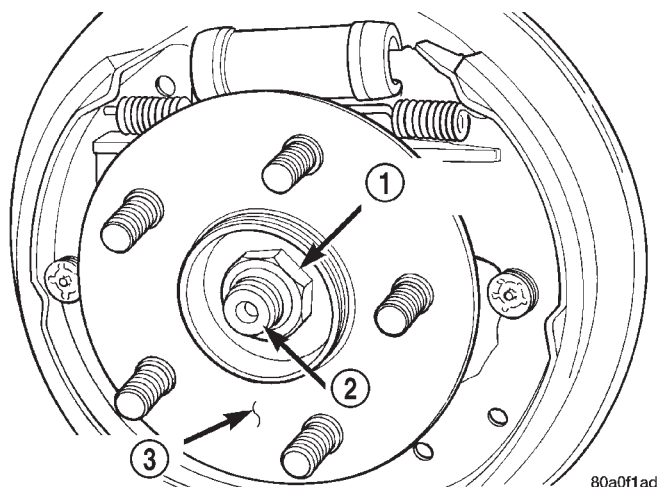


Fig. 119 Hub And Bearing Retaining Nut

- 1 - RETAINING NUT
- 2 - SPINDLE
- 3 - HUB/BEARING ASSEMBLY

(5) Remove the rear brake shoes from the brake support plate. Refer to Rear Brake Shoes in the Removal And Installation Section in this group of the

service manual for the proper brake shoe assembly removal procedure.

(6) Disconnect rear brake flex hose tube from wheel cylinder and remove the brake flex hose bracket from the brake support plate (Fig. 120).

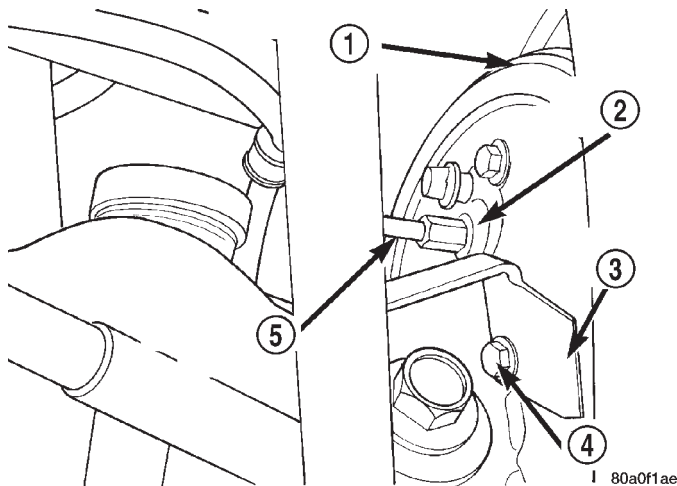


Fig. 120 Brake Flex Hose Tube At Wheel Cylinder

- 1 - BRAKE SUPPORT PLATE
- 2 - WHEEL CYLINDER
- 3 - FLEX HOSE BRACKET
- 4 - BOLT
- 5 - FLEX HOSE TUBE

(7) Position a 1/2 wrench over the retainer fingers on the end of the parking brake cable (Fig. 121). Compress cable housing retaining fingers and start cable housing out of support plate (Fig. 121). Remove wrench when retainer is free from the park brake cable mounting hole in the rear brake support plate. Alternate method is to use a aircraft type hose clamp over cable housing end fitting compressing the three fingers.

(8) Remove the 4 bolts attaching the brake support plate to the knuckle. Separate brake support plate from rear suspension knuckle.

INSTALLATION

(1) Install the gasket and brake support plate on rear suspension knuckle. Torque the brake support plate to knuckle attaching bolts to 75 N·m (55 ft. lbs.).

(2) Insert parking brake cable end fitting into brake support plate.

(3) Hand start hydraulic brake hose tube fitting to wheel cylinder. Tighten tube nut to a torque of 17 N·m (145 in. lbs.).

(4) Install rear brake shoe assemblies on the brake support plate. Refer to Rear Brake Shoes in the Removal And Installation Section in this group of the service manual for the proper brake shoe assembly installation procedure.

REMOVAL AND INSTALLATION (Continued)

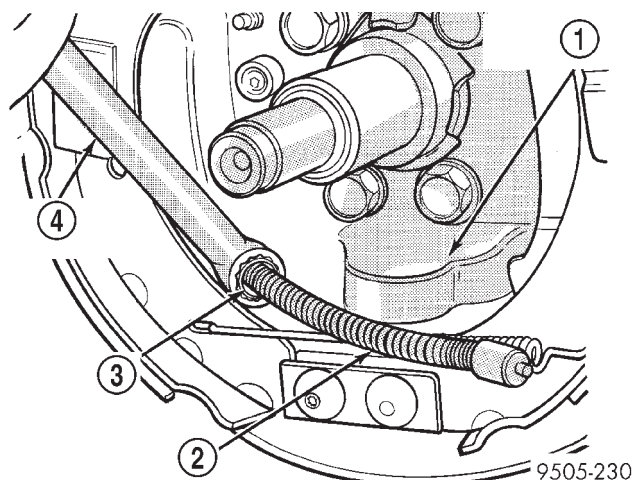


Fig. 121 Removing Park Brake Cable From Support Plate

- 1 - REAR BRAKE SUPPORT PLATE
- 2 - PARK BRAKE CABLE
- 3 - PARK BRAKE CABLE RETAINER
- 4 - 1/2" BOX END WRENCH

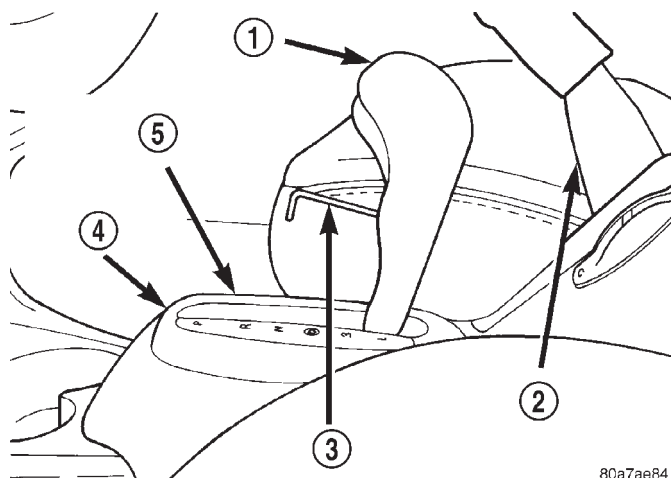


Fig. 122 Shift Knob Retaining Screw

- 1 - SHIFT KNOB
- 2 - PARK BRAKE LEVER
- 3 - ALLEN WRENCH
- 4 - CENTER CONSOLE
- 5 - TRANSMISSION RANGE INDICATOR

(5) Install rear hub and bearing assembly on rear knuckle. Install a **NEW** hub and bearing assembly retaining nut (Fig. 119). Tighten the hub and bearing assembly retaining nut to a torque of 250 N·m (185 ft. lbs.). Install dust cap.

(6) Adjust brake shoes assemblies so as not to interfere with brake drum installation.

(7) Install brake drum on rear hub/bearing assembly.

(8) Bleed the vehicle's base brakes hydraulic system.

(9) After brake drums are installed, pump brake pedal several times to do final adjustment of the brake shoe assemblies.

(10) 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.).

(2) Remove the 3 screws (Fig. 123) attaching the rear of the center console to the console bracket.

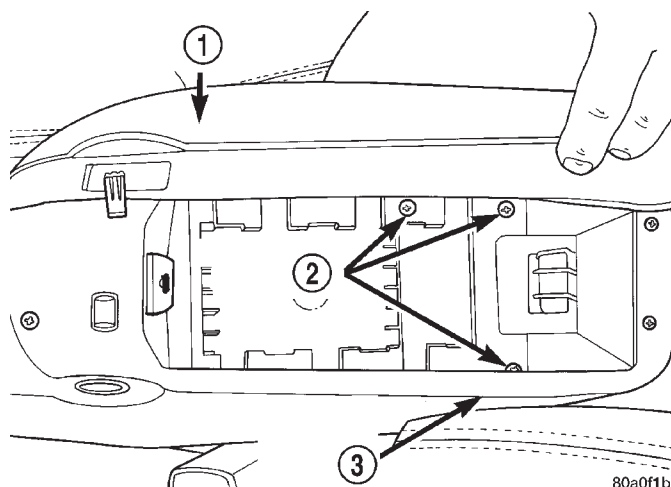


Fig. 123 Center Console Rear Attaching Screws

- 1 - CENTER CONSOLE COVER
- 2 - ATTACHING SCREWS
- 3 - CENTER CONSOLE

PARKING BRAKE LEVER

REMOVAL

(1) Remove the shift knob from the shifter. **The shift knob is attached to the shifter using a set screw (Fig. 122). Access to the set screw is from the front of the shift knob and is removed using a 2 mm allen wrench.**

REMOVAL AND INSTALLATION (Continued)

(3) Remove the shift range indicator from the center console. The shift range indicator is attached to the center console using retaining clips. It is removed by carefully prying it off the center console. The shift range indicator covers the 2 screws attaching the center console to the shifter mechanism. (Fig. 124).

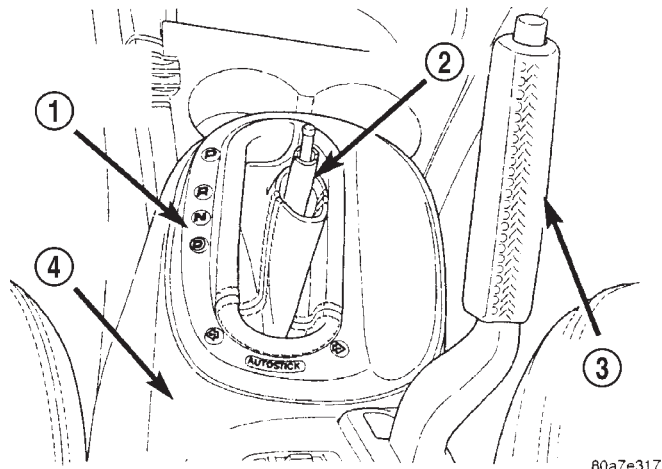


Fig. 124 Shift Range Indicator

- 1 - SHIFT RANGE INDICATOR
- 2 - SHIFTER
- 3 - PARK BRAKE LEVER
- 4 - CENTER CONSOLE

(4) Remove the 2 screws (Fig. 125) attaching the center console to the shifter.

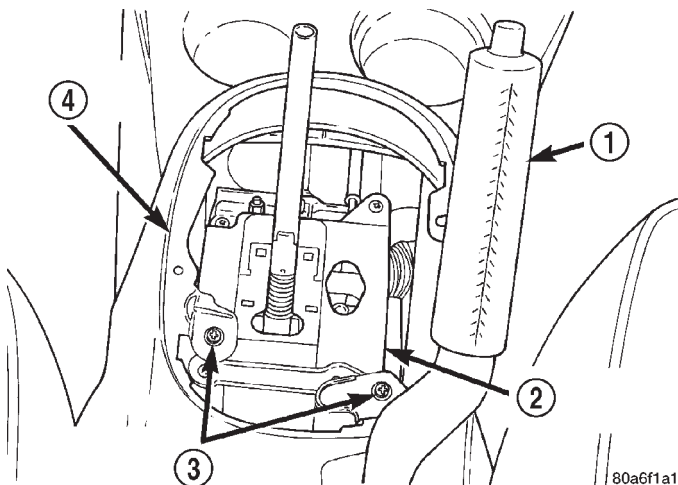


Fig. 125 Center Console Front Attaching Screw

- 1 - PARK BRAKE HAND LEVER
- 2 - GEARSHIFT MECHANISM
- 3 - ATTACHING SCREWS
- 4 - CENTER CONSOLE

(5) Raise the park brake hand lever to approximately a 45° angle. This is for the required clearance to remove the center console.

(6) Raise the rear of the center console high enough to access the center console wiring harness connector (Fig. 126). Disconnect the center console wiring harness connector from the vehicle wiring harness 10 way connector (Fig. 126).

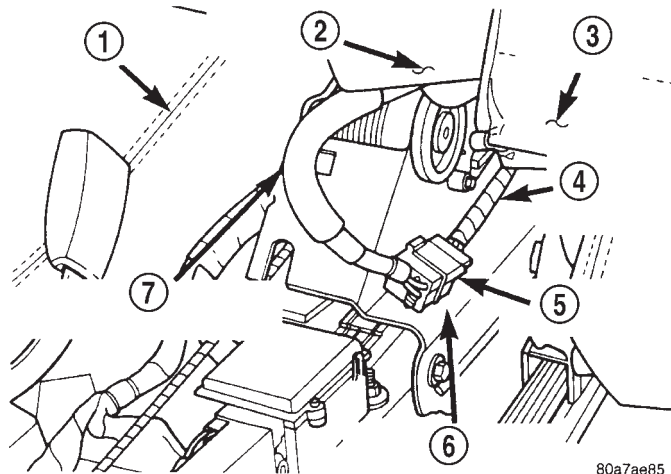


Fig. 126 Console Wiring Harness Connector

- 1 - DRIVER SEAT
- 2 - CENTER CONSOLE
- 3 - PASSENGER SEAT
- 4 - VEHICLE WIRING HARNESS
- 5 - 10-WAY CONNECTOR
- 6 - PARK BRAKE LEVER ASSEMBLY
- 7 - CENTER CONSOLE WIRING HARNESS

- (7) Remove the center console from the vehicle.
- (8) Lower park brake lever handle.

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT RELEASE THE PARK BRAKE CABLES FROM THE EQUALIZER UNTIL THE AUTO ADJUSTER IS RELOADED. FAILURE TO RELOAD THE ADJUSTER MECHANISM BEFORE REMOVING PARK BRAKE CABLES FROM EQUALIZER COULD RESULT IN SERIOUS INJURY.

(9) Reload the adjuster mechanism on the park brake lever using the following procedure.

- Ensure the park brake lever is in the **full down position** when attempting to pull on park brake lever output cable (Fig. 127).
- Grasp the park brake lever output cable (Fig. 127) by hand and pull upward.
- Continue to pull upward on cable until a 15/64 drill bit can be inserted in the adjuster mechanism as shown in (Fig. 127). This will lock-out the auto adjuster mechanism removing the tension from the park brake lever output cable. This will then allow the rear park brake cables to be easily removed from the equalizer.

REMOVAL AND INSTALLATION (Continued)

NOTE: If the output cable of the park brake mechanism will not move when pulled on, first, be sure the park brake lever is in the full down position. If park brake lever is in the full down position and the output cable will not move, use the following procedure to reload the adjuster mechanism.

Using a screw driver (Fig. 128) push down on the end of the clutch spring where shown (Fig. 128). While end of clutch spring is held down, pull outward on park brake mechanism output cable.

If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 128) to assist in pulling on cable.

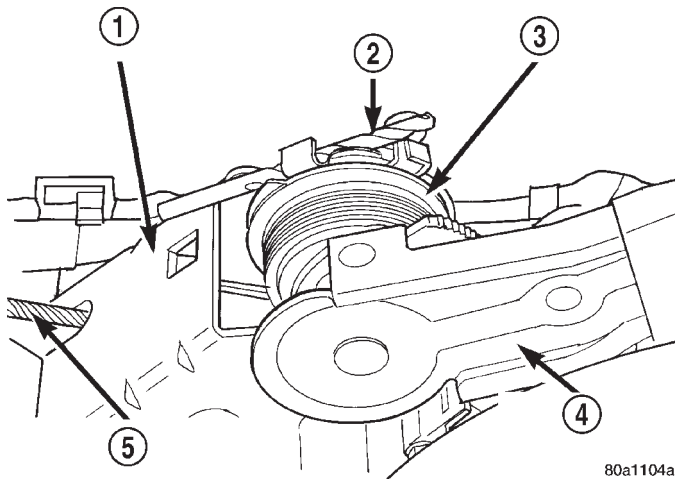


Fig. 127 Park Brake Lever Correctly Reloaded

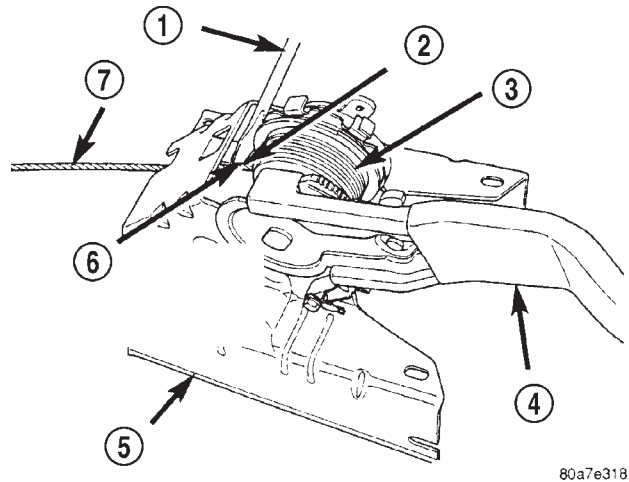
- 1 - PARK BRAKE LEVER ASSEMBLY
- 2 - 15/64 DRILL BIT
- 3 - AUTOMATIC ADJUSTER MECHANISM
- 4 - PARK BRAKE HAND LEVER
- 5 - PARK BRAKE LEVER OUTPUT CABLE

(10) Remove the rear wheel park brake cables from the park brake cable tension equalizer (Fig. 129).

NOTE: If auto adjuster was not reloaded before removing the tension equalizer from both rear park brake cables, (Fig. 128) the park brake lever output cable (Fig. 128) will be pulled into the park brake mechanism.

If this happens the auto adjuster can be reloaded using the following procedure.

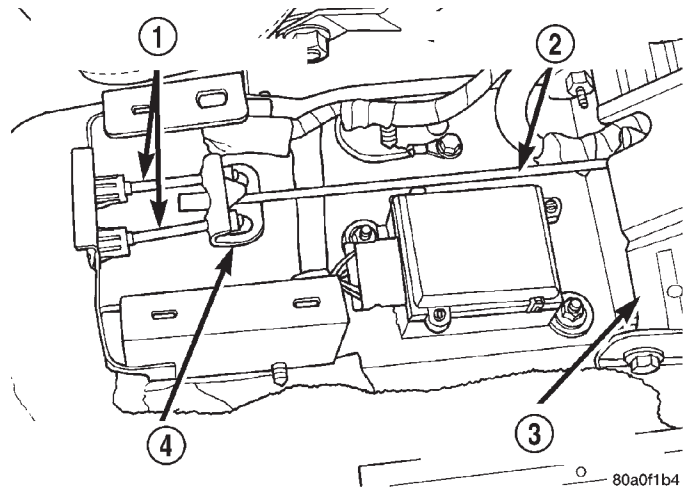
Using a screw driver (Fig. 128) push down on the end of the clutch spring where shown (Fig. 128). While the end of the clutch spring is held down, pull outward on park brake mechanism output cable. If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 128) to assist in pulling on cable.



80a7e318

Fig. 128 Releasing Clutch Spring

- 1 - SCREWDRIVER
- 2 - CLUTCH SPRING END
- 3 - CLUTCH SPRING
- 4 - PARK BRAKE HAND LEVER
- 5 - PARK BRAKE LEVER MECHANISM
- 6 - USING SCREWDRIVER PUSH DOWNWARD ON END OF CLUTCH SPRING HERE.
- 7 - PARK BRAKE LEVER OUTPUT CABLE



80a0f1b4

Fig. 129 Park Brake Cables At Tension Equalizer

- 1 - REAR WHEEL PARK BRAKE CABLES
- 2 - PARK BRAKE LEVER OUTPUT CABLE
- 3 - PARK BRAKE LEVER ASSEMBLY
- 4 - PARK BRAKE CABLE TENSION EQUALIZER

(11) Disconnect the wiring harness from the ground switch on the park brake lever (Fig. 130).

(12) Remove the wiring harness routing clips from both sides of the park brake mechanism bracket. Move the wiring harnesses out of the way.

NOTE: The mounting holes in the park brake lever bracket are slotted, which requires the mounting bolts to only be loosened but not removed.

REMOVAL AND INSTALLATION (Continued)

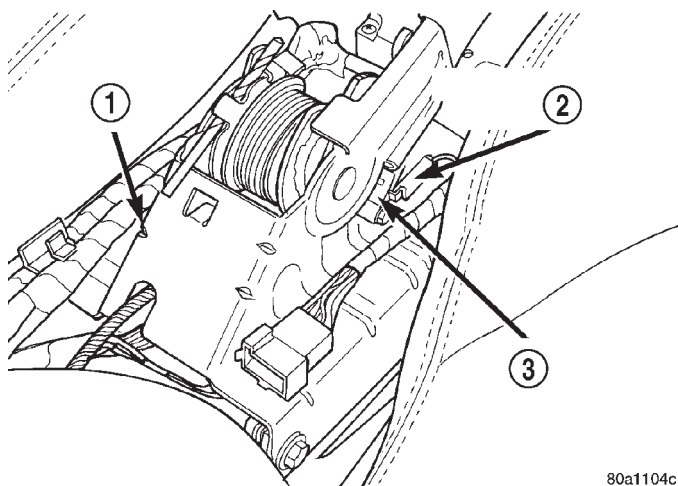


Fig. 130 Wiring Harness Connection To Ground Switch

- 1 - PARK BRAKE LEVER
2 - WIRING HARNESS CONNECTOR
3 - GROUND SWITCH

(13) Loosen **but do not remove** the 4 bolts attaching the park brake lever to the console bracket (Fig. 131).

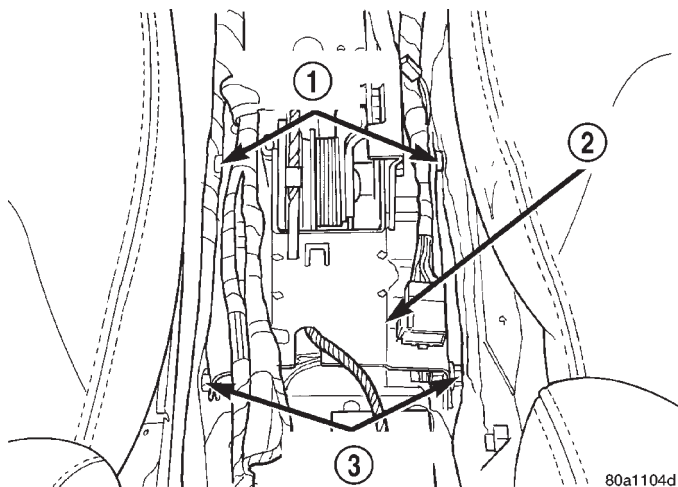


Fig. 131 Park Brake Lever Attaching Bolts

- 1 - MOUNTING BOLTS
2 - PARK BRAKE LEVER
3 - MOUNTING BOLTS

(14) Remove the park brake lever assembly from console bracket using the following procedure. First rotate the back of the lever bracket upward off the 2 rear mounting bolts, then slide the lever bracket rearward off the front mounting bolts.

INSTALLATION

NOTE: If the parking brake lever mounting bolts are not installed in the console bracket install them before installing the park brake lever on the console bracket.

(1) Install the parking brake lever on the console bracket using the following procedure. First slide the front of the park brake lever bracket on the 2 forward mounting bolts, then rotate the rear of the bracket downward onto the 2 rear mounting bolts. Tighten the 4 attaching bolts (Fig. 131) to a torque of 24 N·m (20 ft. lbs.).

(2) Install the rear park brake cables on the park brake cable tension equalizer (Fig. 129).

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT UNLOAD THE ADJUSTER MECHANISM USING A PROCEDURE OTHER THEN THE PROCEDURE IN Step 3 FAILURE TO UNLOAD THE ADJUSTER MECHANISM USING AN ALTERNATE PROCEDURE COULD RESULT IN SERIOUS INJURY.

(3) Unload the adjuster mechanism on the park brake lever using the following procedure.

- Ensure the park brake lever is in the **full down position** when attempting to pull on park brake lever output cable (Fig. 127).

- Grasp the park brake lever output cable by hand and pull upward until all tension is removed from the drill bit used to reload the adjuster mechanism (Fig. 127).

- Remove the drill bit from the adjuster mechanism of the park brake lever (Fig. 127).

- Slowly release the park brake lever output cable until all slack is removed from the cable.

(4) Clip the wiring harness to the park brake lever bracket.

(5) Install the wiring harness connector on the ground switch of the park brake lever (Fig. 130).

(6) Cycle the park brake lever once from the released position to the fully applied position and then back to the released position. This will position the park brake cables and fully adjust them to their proper tension.

(7) Check the rear wheels of the vehicle with the park brake lever fully released, they should rotate freely without dragging.

(8) Raise the park brake hand lever to approximately a 45° angle. This is necessary for the required clearance to install the center console.

(9) Install the center console back in the vehicle.

(10) Install the wiring harness connector for the center console into the vehicle wiring harness (Fig. 126).

(11) Install the 2 screws attaching the front of the center console to the shifter. (Fig. 125).

(12) Install the 3 screws attaching the rear of the console to the console bracket (Fig. 123).

(13) Install the transmission range indicator (Fig. 124) in the center console.

REMOVAL AND INSTALLATION (Continued)

(14) Install the shift knob on the shifter. Install and securely tighten the shift knob retaining screw (Fig. 132).

PARKING BRAKE CABLE (REAR)

NOTE: Remove only one rear parking brake cable from the vehicle at a time. Failure to do so will result in high efforts required to connect the parking brake cables to the tension equalizer and the parking brake lever at the rear wheel brakes.

For servicing of either the left or right rear parking brake cable, follow the procedure as listed below.

REMOVAL

(1) Remove the shift knob from the shifter. **The gear shift knob is attached to the shifter using a set screw (Fig. 132). Access to the set screw is from the front of the shift knob and is removed using a 2 mm allen wrench.**

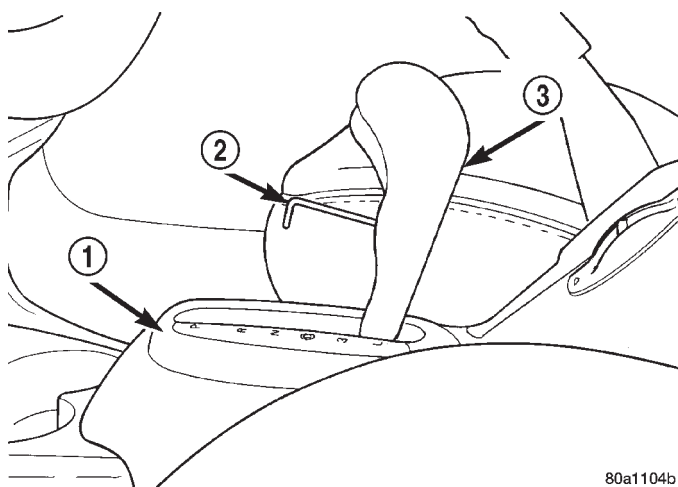


Fig. 132 Shift Knob Retaining Screw

- 1 - CENTER CONSOLE
- 2 - ALLEN WRENCH
- 3 - SHIFT KNOB

(2) Remove the shift range indicator (Fig. 133) from the center console. The shift range indicator is attached to the center console using retaining clips. It is removed by carefully prying it off the center console. The shift range indicator covers the 2 attaching screws for the center console.

(3) Remove the 2 screws (Fig. 134) attaching the center console to the shifter.

(4) Remove the 3 screws attaching the rear of the center console to the console bracket (Fig. 135).

(5) Raise the park brake lever to a 45° angle. This is required for clearance to remove the center console.

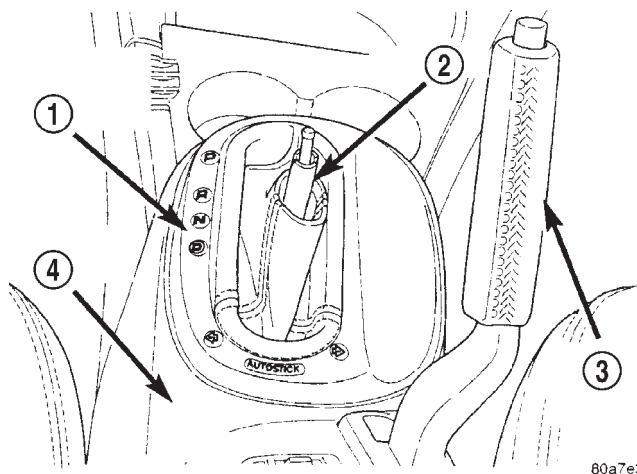


Fig. 133 Shift Range Indicator

- 1 - SHIFT RANGE INDICATOR
- 2 - SHIFTER
- 3 - PARK BRAKE LEVER
- 4 - CENTER CONSOLE

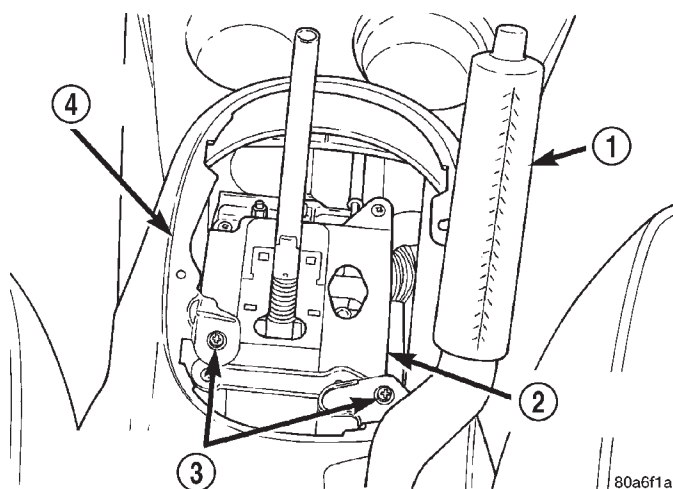


Fig. 134 Center Console Front Attaching Screw

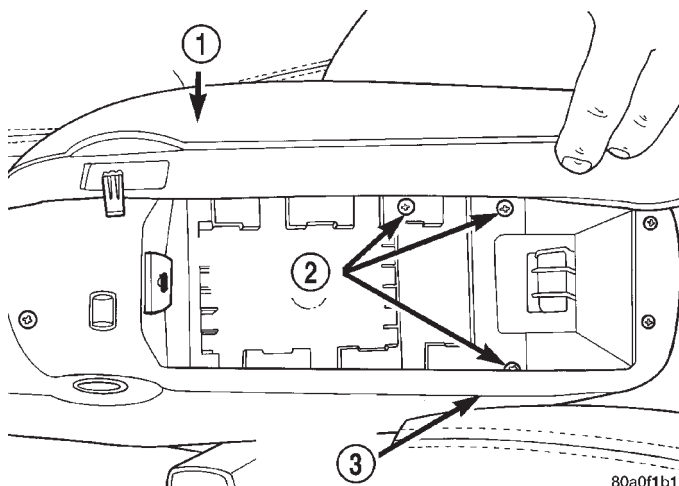
- 1 - PARK BRAKE HAND LEVER
- 2 - GEARSHIFT MECHANISM
- 3 - ATTACHING SCREWS
- 4 - CENTER CONSOLE

(6) Raise the rear of the center console high enough to access the center console wiring harness connector (Fig. 136). Disconnect the center console wiring harness connector from the vehicle wiring harness 10-way connector (Fig. 136).

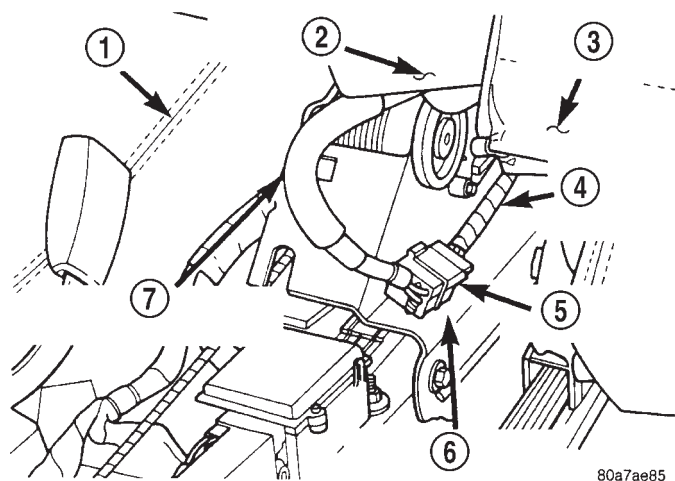
(7) Remove the center console from the vehicle.

(8) Lower the park brake lever to its fully released position.

REMOVAL AND INSTALLATION (Continued)

**Fig. 135 Center Console Rear Attaching Screws**

- 1 - CENTER CONSOLE COVER
- 2 - ATTACHING SCREWS
- 3 - CENTER CONSOLE

**Fig. 136 Console Wiring Harness Connector**

- 1 - DRIVER SEAT
- 2 - CENTER CONSOLE
- 3 - PASSENGER SEAT
- 4 - VEHICLE WIRING HARNESS
- 5 - 10-WAY CONNECTOR
- 6 - PARK BRAKE LEVER ASSEMBLY
- 7 - CENTER CONSOLE WIRING HARNESS

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT RELEASE THE PARK BRAKE CABLES FROM THE EQUALIZER UNTIL THE AUTO ADJUSTER IS RELOADED. FAILURE TO RELOAD THE ADJUSTER MECHANISM BEFORE REMOVING PARK BRAKE CABLES FROM EQUALIZER COULD RESULT IN SERIOUS INJURY.

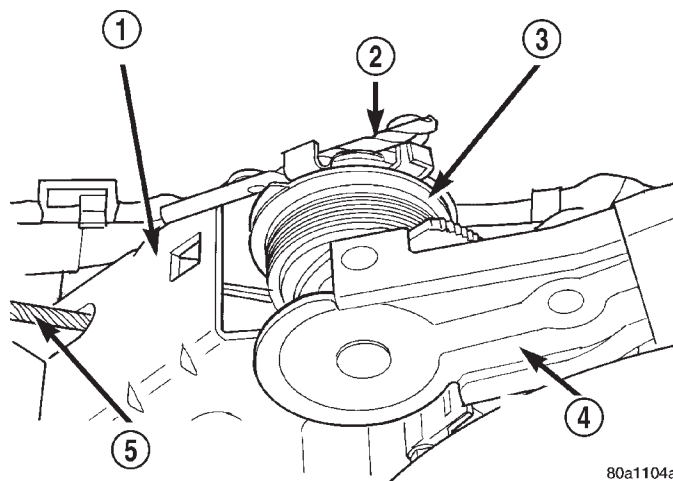
(9) Reload the adjuster mechanism on the park brake lever using the following procedure.

- Ensure the park brake lever is in the **full down position** when attempting to pull on park brake lever output cable (Fig. 137).
- Grasp the park brake lever output cable (Fig. 137) by hand and pull upward.
- Continue to pull upward on cable until a 15/64 drill bit can be inserted in the adjuster mechanism as shown in (Fig. 137). This will lock-out the auto adjuster mechanism removing the tension from the park brake lever output cable. This will then allow the rear park brake cables to be easily removed from the equalizer.

NOTE: If the output cable of the park brake mechanism will not move when pulled on, first, be sure the park brake lever is in the full down position. If park brake lever is in the full down position and the output cable will not move, use the following procedure to reload the adjuster mechanism.

Using a screw driver (Fig. 138) push down on the end of the clutch spring where shown (Fig. 138). While end of clutch spring is held down, pull outward on park brake mechanism output cable.

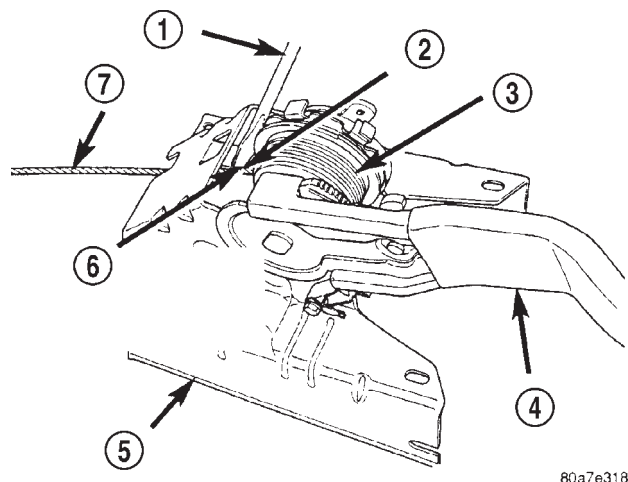
If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 138) to assist in pulling on cable.

**Fig. 137 Park Brake Lever Correctly Reloaded**

- 1 - PARK BRAKE LEVER ASSEMBLY
- 2 - 15/64 DRILL BIT
- 3 - AUTOMATIC ADJUSTER MECHANISM
- 4 - PARK BRAKE HAND LEVER
- 5 - PARK BRAKE LEVER OUTPUT CABLE

(10) Remove both rear wheel park brake cables from the park brake cable tension equalizer (Fig. 139).

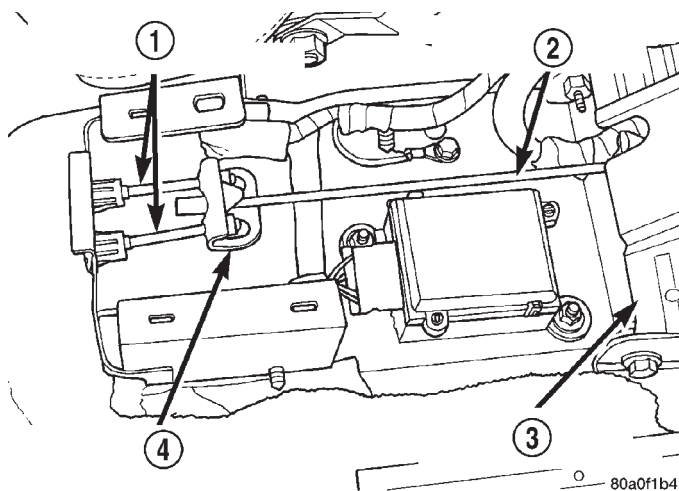
REMOVAL AND INSTALLATION (Continued)



80a7e318

Fig. 138 Releasing Clutch Spring

- 1 - SCREWDRIVER
- 2 - CLUTCH SPRING END
- 3 - CLUTCH SPRING
- 4 - PARK BRAKE HAND LEVER
- 5 - PARK BRAKE LEVER MECHANISM
- 6 - USING SCREWDRIVER PUSH DOWNWARD ON END OF CLUTCH SPRING HERE.
- 7 - PARK BRAKE LEVER OUTPUT CABLE



80a0f1b4

Fig. 139 Park Brake Cables At Tension Equalizer

- 1 - REAR WHEEL PARK BRAKE CABLES
- 2 - PARK BRAKE LEVER OUTPUT CABLE
- 3 - PARK BRAKE LEVER ASSEMBLY
- 4 - PARK BRAKE CABLE TENSION EQUALIZER

NOTE: If auto adjuster was not reloaded before removing the tension equalizer from both rear park brake cables, (Fig. 139) the park brake lever output cable (Fig. 139) will be pulled into the park brake mechanism.

If this happens the auto adjuster can be reloaded using the following procedure.

Using a screw driver (Fig. 138) push down on the end of the clutch spring where shown (Fig. 138).

While end of clutch spring is held down, pull outward on park brake mechanism output cable. If output cable can not be pulled out of park brake mechanism, by pulling directly on output cable, use a screwdriver inserted in tension equalizer (Fig. 138) to assist in pulling on cable.

(11) Remove the rear seat lower cushion from the vehicle.

(12) Remove scuff plates from right and left door sills. Scuff plates are attached to door sills using clips on bottom of scuff plates. Remove by carefully prying scuff plate retaining clips out of door sills.

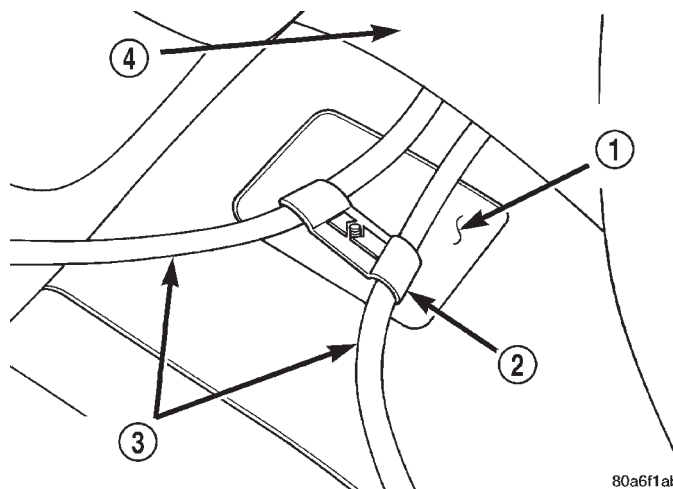
(13) Remove the quarter trim panel from both sides of the vehicle. Refer to Group 23 Body in this group of the service manual for the required removal procedure.

(14) Remove the 2 wiring harness routing clips from the cross car beam.

(15) Remove the 2 clips attaching the carpeting to the cross car beam.

(16) Fold rear carpeting forward to expose park brake cables.

(17) Remove the routing clip (Fig. 140) attaching the rear park brake cables to the floor pan.



80a6f1ab

Fig. 140 Park Brake Cable Attachment To Floor Pan

- 1 - FLOOR PAN
- 2 - ROUTING CLIP
- 3 - REAR PARK BRAKE CABLES
- 4 - VEHICLE CARPETING

(18) Install the box end of a 1/2 in. wrench over the park brake cable retainer as indicated in (Fig. 141). This will compress tabs on park brake cable retainer, allowing cable to be removed from console bracket. From under carpet, grasp park brake cable housing and pull cable straight out of console bracket.

(19) Raise vehicle on jackstands or centered on a frame contact type hoist. See Hoisting in the Lubri-

REMOVAL AND INSTALLATION (Continued)

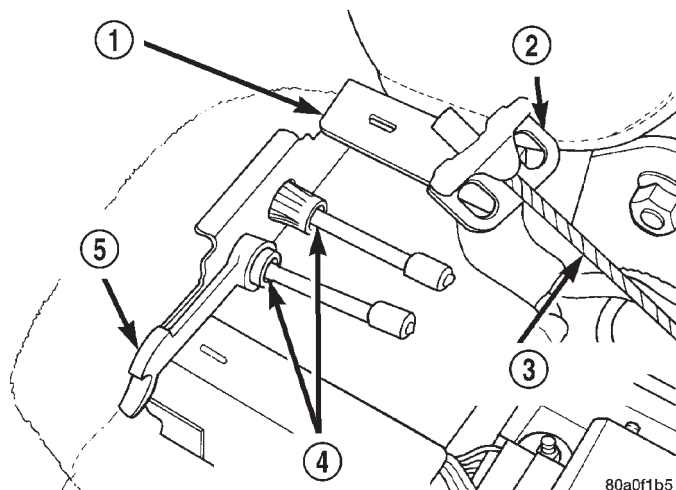


Fig. 141 Compressing Park Brake Cable Retaining Tabs

- 1 - CONSOLE BRACKET
- 2 - PARK BRAKE CABLE TENSION EQUALIZER
- 3 - PARK BRAKE LEVER OUTPUT CABLE
- 4 - REAR PARK BRAKE CABLES
- 5 - 1/2" BOX END WRENCH

cation and Maintenance section of this manual for the required lifting procedure to be used for this vehicle.

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

(21) Remove the rear brake drum (Fig. 142) from the rear hub/bearing assembly.

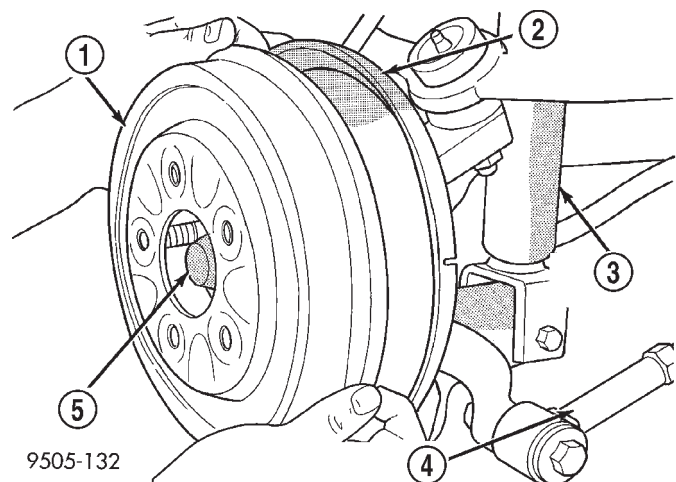


Fig. 142 Rear Brake Drum

- 1 - REAR BRAKE DRUM
- 2 - REAR BRAKE SUPPORT PLATE
- 3 - SHOCK ASSEMBLY
- 4 - REAR LATERAL ARM
- 5 - HUB/BEARING ASSEMBLY

(22) Remove the dust cap (Fig. 143) from the rear hub/bearing assembly.

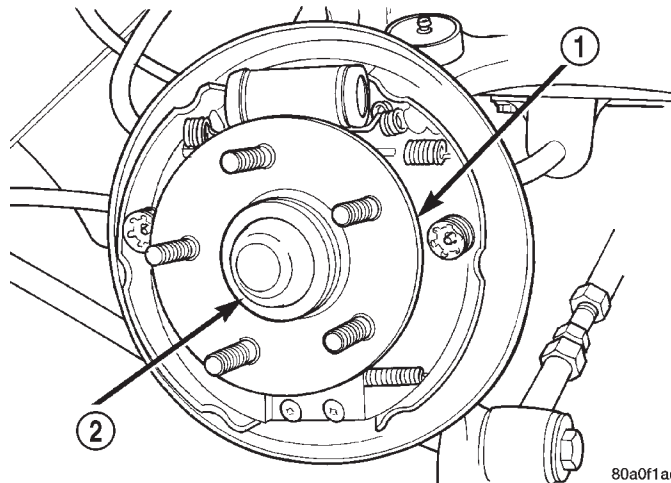


Fig. 143 Rear Hub/Bearing Dust Cap

- 1 - HUB/BEARING ASSEMBLY
- 2 - DUST CAP

(23) Remove the rear hub/bearing retaining nut (Fig. 144).

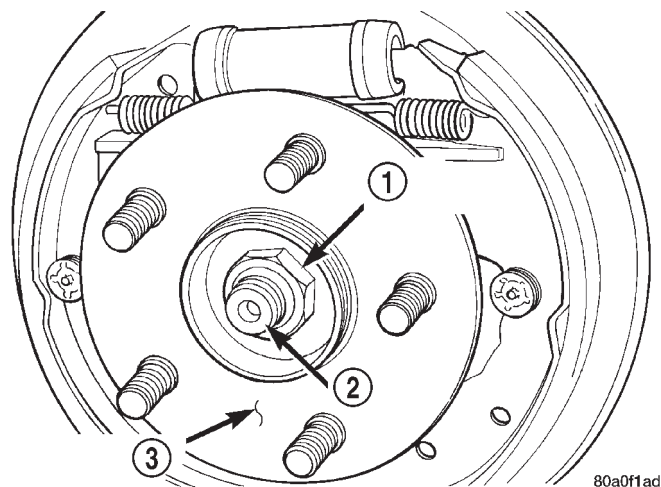


Fig. 144 Hub/Bearing Retaining Nut

- 1 - RETAINING NUT
- 2 - SPINDLE
- 3 - HUB/BEARING ASSEMBLY

(24) Remove the hub/bearing from the spindle.

(25) Remove the park brake cable from the park brake actuating lever on the trailing brake shoe (Fig. 145).

(26) Remove park brake cable (Fig. 146) from rear brake support plate. Park brake cable is removed from brake support plate using a 1/2 in. wrench as shown in (Fig. 146) to compress locking tabs on park brake cable retainer.

(27) Raise vehicle.

REMOVAL AND INSTALLATION (Continued)

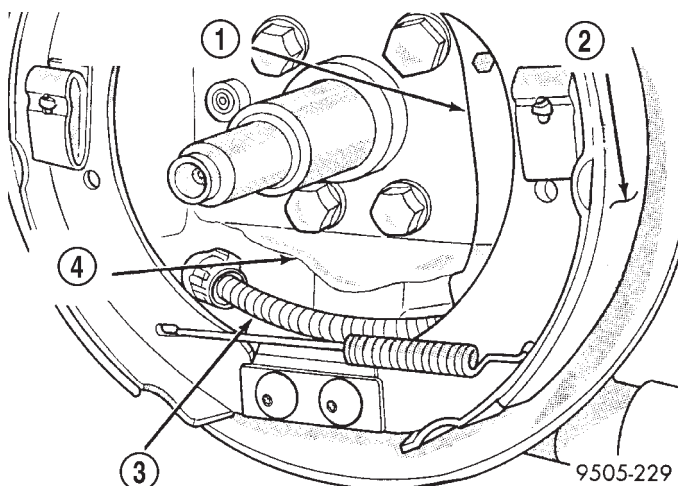


Fig. 145 Rear Park Brake Cable At Actuating Lever

- 1 - PARK BRAKE ACTUATING LEVER
- 2 - TRAILING BRAKE SHOE
- 3 - PARK BRAKE CABLE
- 4 - BRAKE SUPPORT PLATE

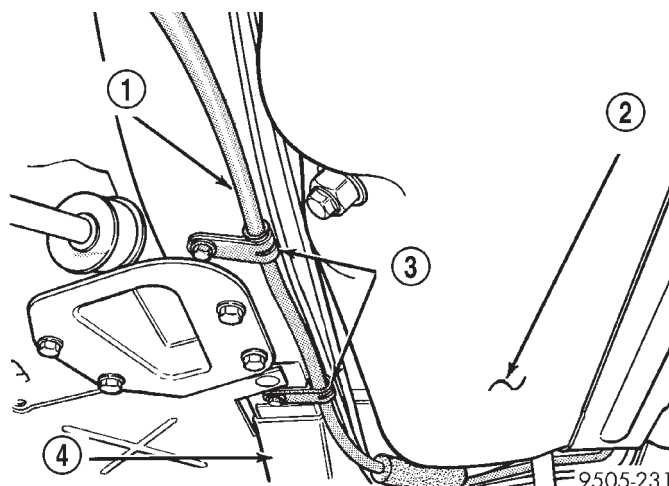


Fig. 147 Park Brake Cable Routing Brackets

- 1 - PARK BRAKE CABLE
- 2 - FUEL TANK
- 3 - ROUTING BRACKETS
- 4 - FRAME RAIL

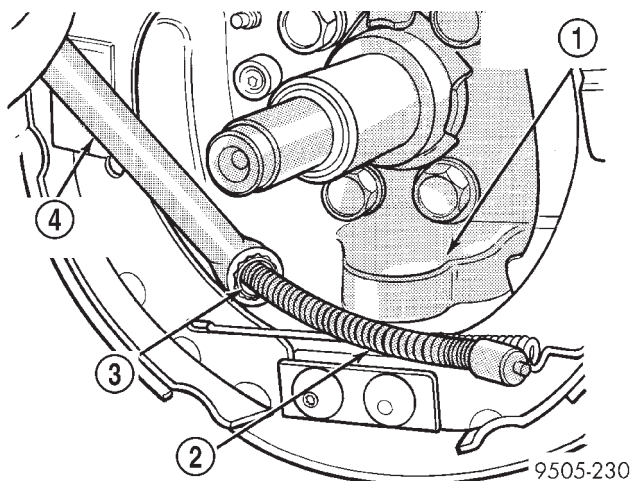


Fig. 146 Park Brake Cable Removal From Brake Support Plate

- 1 - REAR BRAKE SUPPORT PLATE
- 2 - PARK BRAKE CABLE
- 3 - PARK BRAKE CABLE RETAINER
- 4 - 1/2" BOX END WRENCH

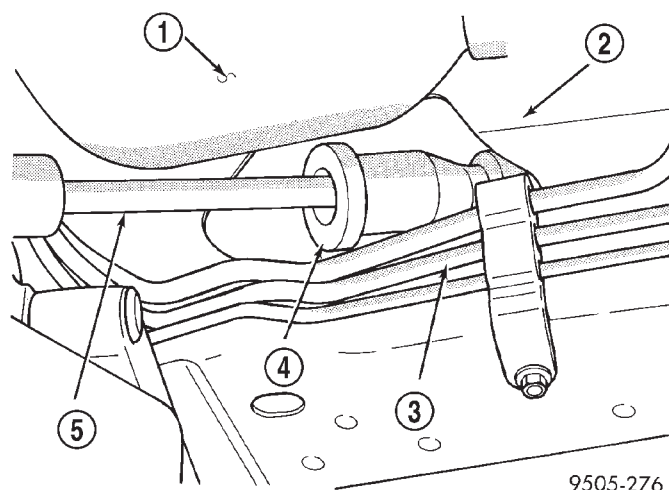


Fig. 148 Park Brake Cable Removal / Installation At Floor Pan

- 1 - FUEL TANK
- 2 - VEHICLE FLOOR PAN
- 3 - FUEL LINES
- 4 - SEALING GROMMET
- 5 - PARK BRAKE CABLE

(28) Remove the 2 routing brackets (Fig. 147) attaching the park brake cable to the vehicle frame rail.

(29) Remove the park brake cable and sealing grommet (Fig. 148) from the floor pan of the vehicle.

INSTALLATION

(1) Install the parking brake cable into the floor pan. Make sure sealing grommet on park brake cable (Fig. 148) is installed in floor pan as far as possible to insure a proper seal.

(2) Install the 2 parking brake cable routing brackets (Fig. 147) on the frame rail. Install and securely tighten the routing bracket attaching bolts.

(3) Install the park brake cable into the rear brake support plate **but do not** lock the locking tabs on the cable attachment retainer into the brake support plate.

(4) Install the park brake cable on the park brake actuating lever of the trailing brake shoe (Fig. 145).

REMOVAL AND INSTALLATION (Continued)

Be sure the end of the spring is under the lip on the park brake actuating lever.

(5) Push the park brake cable fully into the rear brake support plate. Be sure locking tabs on cable retainer are expanded to ensure park brake cable is securely held in the support plate.

(6) Install hub/bearing assembly on rear spindle. Then install **a new** rear hub/bearing assembly retaining nut (Fig. 144). Torque hub/bearing assembly to spindle retaining nut to 250 N·m (185 ft. lbs.).

(7) Install hub/bearing assembly dust cap, (Fig. 143) using a soft faced hammer.

(8) Install the rear brake drum on the hub/bearing assembly (Fig. 142).

(9) Install rear wheel and tire assembly on vehicle. Tighten all wheel stud nuts in criss cross pattern to one-half specified torque. Then repeat pattern, fully tightening stud nuts to 135 N·m (100 ft. lbs.).

(10) Lower vehicle.

(11) Grasp park brake cable to floor pan seal grommet by hand and pull it into the floor pan to ensure seal grommet is fully seated into the floor pan.

(12) Route park brake cable under carpeting and up to park brake cable hole in console bracket on floor pan. Then install park brake cable into console bracket (Fig. 149). Be sure tabs (Fig. 149) on park brake cable retainer, have expanded out to hold park brake cable in console bracket.

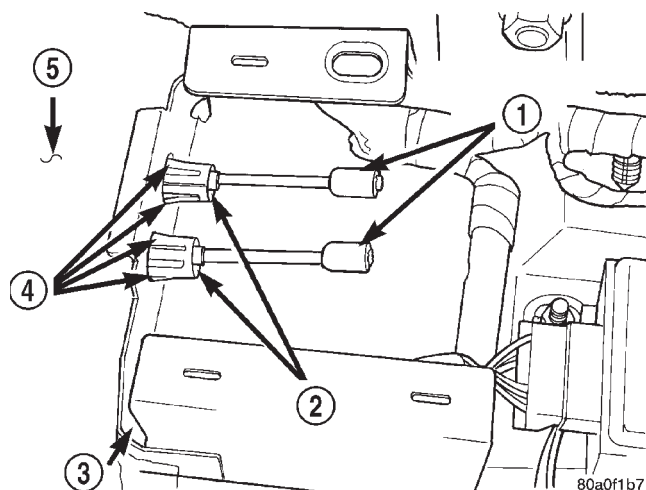


Fig. 149 Park Brake Cables Installed In Console Bracket

- 1 - PARK BRAKE CABLES
- 2 - PARK BRAKE CABLE RETAINERS
- 3 - CONSOLE BRACKET
- 4 - RETAINING TABS
- 5 - CARPETING

(13) Install the routing bracket holding park brake cables to the floor pan of the vehicle (Fig. 140).

WARNING: THE AUTO ADJUSTING FEATURE OF THIS PARK BRAKE LEVER CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 20 POUNDS. DO NOT UNLOAD THE ADJUSTER MECHANISM USING A PROCEDURE OTHER THEN THE PROCEDURE IN Step 14 FAILURE TO UNLOAD THE ADJUSTER MECHANISM USING AN ALTERNATE PROCEDURE COULD RESULT IN SERIOUS INJURY.

(14) Unload the adjuster mechanism on the park brake lever using the following procedure. Grasp the park brake lever output cable by hand and pull upward until all tension is removed from the drill bit (Fig. 137). used to reload the adjuster mechanism. Remove the drill bit from the clock spring of the park brake lever adjuster mechanism. Then, slowly release the park brake lever output cable until all slack is removed from the cable.

(15) Clip the wiring harness to the park brake lever bracket.

(16) Install the wiring harness connector on the ground switch of the park brake lever.

(17) Cycle the park brake lever once from the released position to the fully applied position and then back to the released position. This will position the park brake cables and fully adjust them to thier proper tension.

(18) Check the rear wheels of the vehicle with the park brake lever fully released, they should rotate freely without dragging.

(19) Raise the park brake hand lever to approximately a 45° angle. This is necessary for the required clearance to install the center console.

(20) Install the center console back in the vehicle.

(21) Install the wiring harness connector for the center console into the vehicle wiring harness (Fig. 136).

(22) Install the 2 screws attaching the front of the center console to the shifter (Fig. 134). Install the screw hole garnish cap and the PRNDL strip on the center console.

(23) Install the 3 screws attaching the rear of the center console to the console bracket (Fig. 135).

(24) Install the transmission range indicator (Fig. 133) in the center console.

(25) Install the shift knob on the shifter. Install and securely tighten the shift knob retaining screw.

(26) Fold the carpeting back into position on the rear floor of the vehicle.

(27) Install the 2 clips attaching the carpeting to the cross car beam.

(28) Install the 2 wiring harness routing clips on the cross car beam.

(29) Install the quarter trim panels. Refer to Group 23 Body in this service manual for the required installation procedure.

REMOVAL AND INSTALLATION (Continued)

(30) Install both door sill plate scuff moldings, by snapping them onto the door sills.

(31) Install lower rear seat cushion. Be sure lower seat cushion is fully installed in retainers on floor pan of vehicle.

PARKING BRAKE SHOES (WITH REAR DISC BRAKES)

REMOVAL

(1) Remove disc brake caliper from adapter and rotor (See Disc Brake Shoe Removal).

(2) Remove rotor from hub/bearing.

(3) Remove dust cap from hub/bearing.

(4) Remove hub/bearing rear retaining nut and washer.

(5) Remove hub/bearing from knuckle.

(6) Remove hold down clip from rear park brake shoe (Fig. 150).

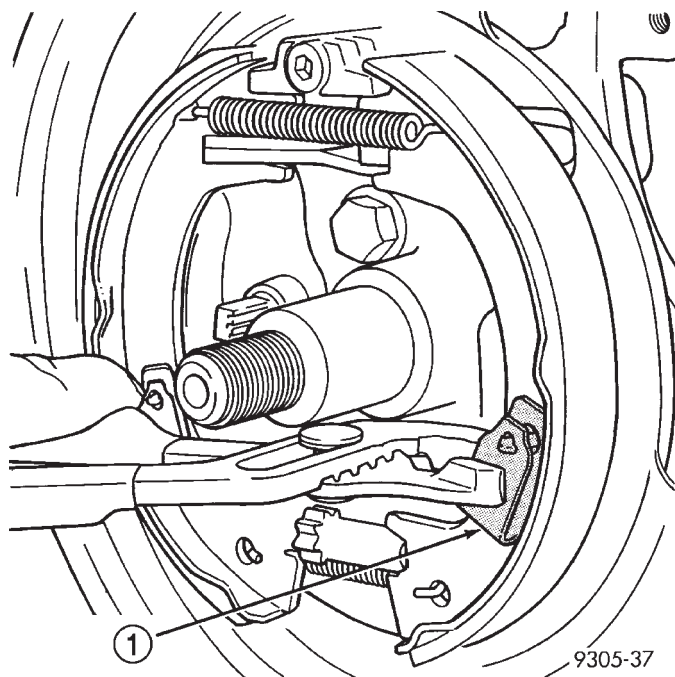


Fig. 150 Rear Park Brake Shoe Hold-Down Clip

1 - HOLD DOWN CLIP

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

(8) Remove the park brake shoe adjuster from the park brake shoes (Fig. 151).

(9) Remove the lower return spring (Fig. 152) between the park brake shoes.

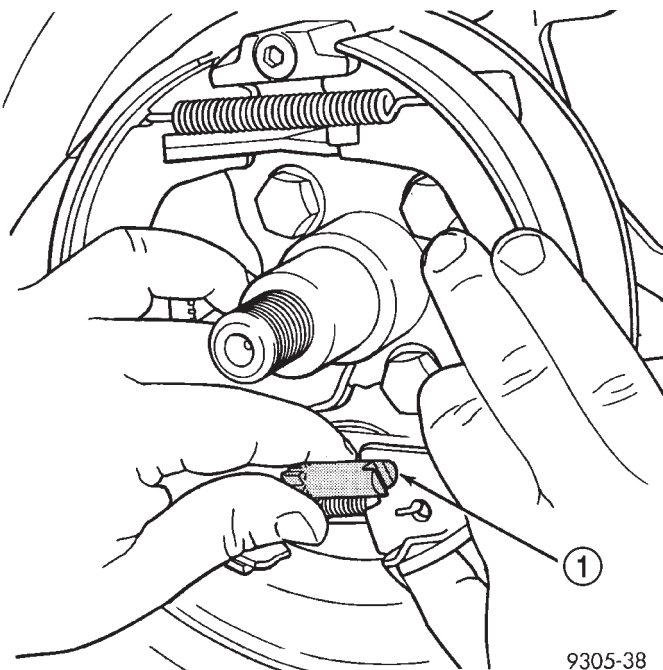


Fig. 151 Park Brake Shoe Adjuster

1 - ADJUSTER

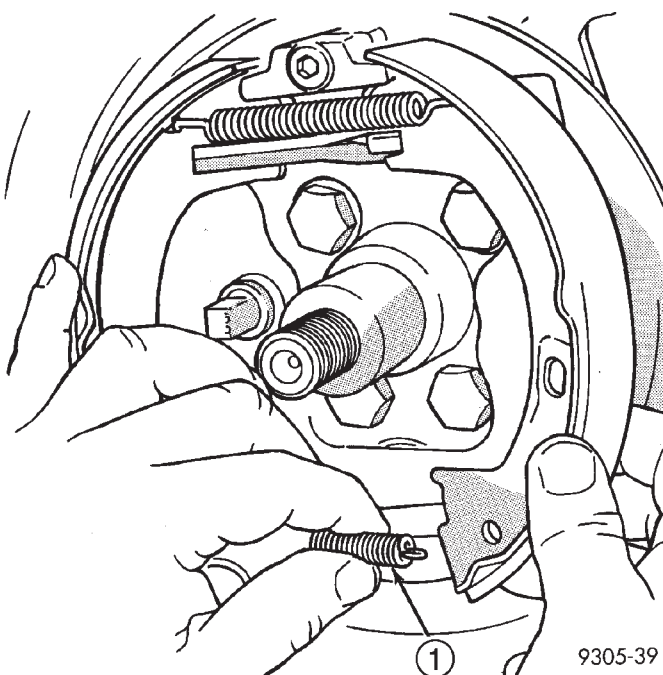


Fig. 152 Brake Shoe Lower Return Spring

1 - LOWER SPRING

REMOVAL AND INSTALLATION (Continued)

(10) Pull the rear park brake shoe away from the caliper adapter (Fig. 153). Remove the upper return spring (Fig. 153) from between the park brake shoes.

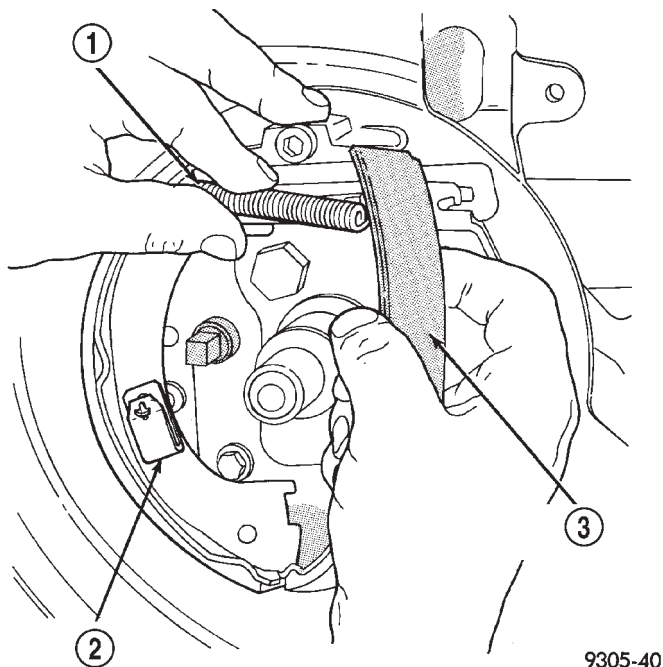


Fig. 153 Brake Shoe and Upper Spring

- 1 - UPPER SPRING
- 2 - HOLD DOWN CLIP
- 3 - REAR PARKING BRAKE SHOE

(11) Remove the hold-down clip from the front park brake shoe (Fig. 154). Then remove front park brake shoe.

INSTALLATION

- (1) Install front brake shoe and hold down clip (Fig. 154).
- (2) Install the rear park brake shoe and the park brake shoe upper return spring (Fig. 153).
- (3) Pull rear brake shoe over anchor block until properly located on adapter.
- (4) Install the park brake lower return spring (Fig. 152).
- (5) Install the adjuster between the park brake shoes. Adjuster must be installed with the star wheel toward the rear of the vehicle (Fig. 151).
- (6) Install hold down clip on rear park brake shoe (Fig. 150).
- (7) Adjust park brake shoes to an outside diameter of 171 mm (6.75 inch).
- (8) Install hub/bearing on knuckle.
- (9) Install **A NEW** hub/bearing retaining nut. Tighten the hub/ bearing retaining nut to a torque of 250 N·m (185 ft. lbs.).
- (10) Install dust cap on hub/bearing.
- (11) Install rotor.

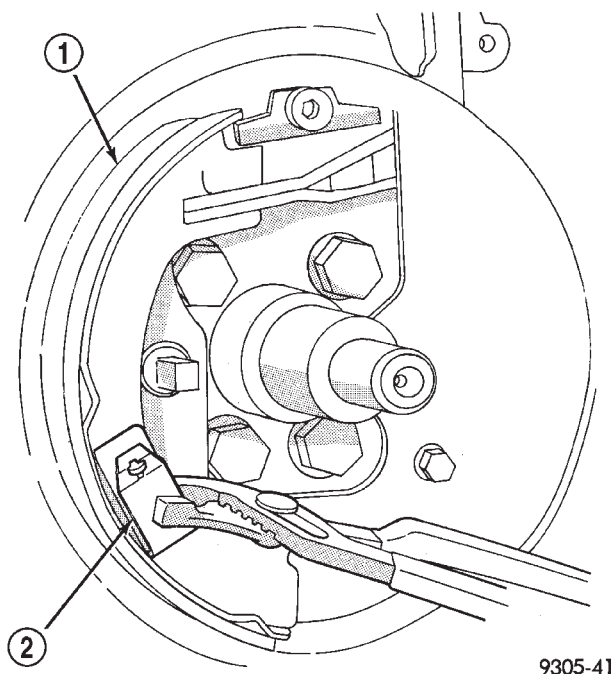


Fig. 154 Front Park Brake Shoe Hold Down Clip

- 1 - FRONT BRAKE SHOE ASSEMBLY
- 2 - HOLD DOWN CLIP

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

(13) Install wheel and tire.

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

BRAKE LAMP SWITCH

REMOVAL

(1) Remove the brake lamp switch from its bracket (Fig. 155). The brake lamp switch is removed by depressing and holding the brake pedal while rotating brake lamp switch in a counter-clockwise direction approximately 30 degrees. Pull the switch rearward and remove it from its mounting bracket.

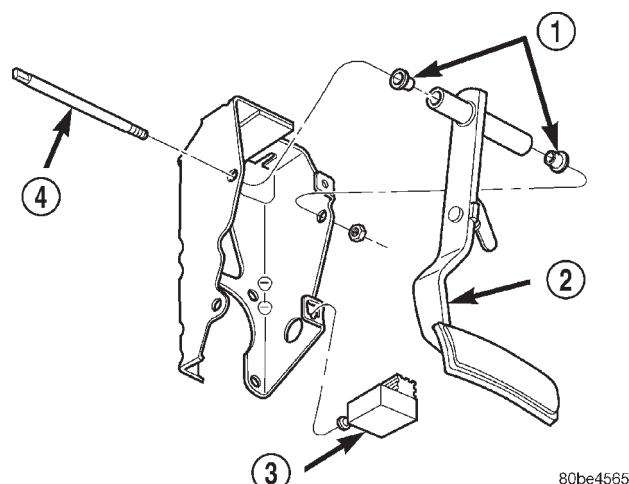
(2) Disconnect the wiring harness connector from the switch.

INSTALLATION

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

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

REMOVAL AND INSTALLATION (Continued)

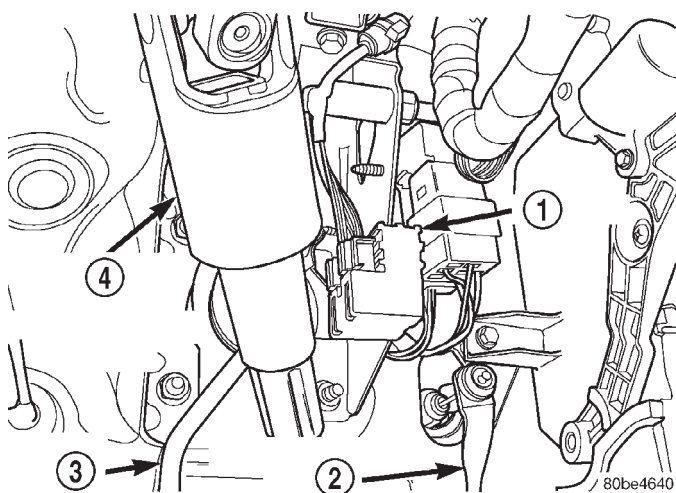
**Fig. 155 Switch And Bracket**

- 1 - BUSHINGS
2 - BRAKE PEDAL
3 - BRAKE LAMP SWITCH
4 - PIVOT SHAFT

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

(3) Install the brake lamp switch in the brake pedal bracket (Fig. 155). Install it using the following procedure:

- Depress the brake pedal as far down as possible.
- Install the switch in its bracket by aligning the index tab on the switch with the slot in the mounting bracket.
- When the switch is fully seated in its bracket, rotate the switch clockwise approximately 30° to lock the switch into place. It should be aligned straight up and down (Fig. 156).

**Fig. 156 Brake Lamp Switch**

- 1 - SWITCH
2 - ACCELERATOR PEDAL
3 - BRAKE PEDAL
4 - STEERING COLUMN INTERMEDIATE SHAFT

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

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

(5) Check the brake lamps to verify they are operating properly and not staying on when the pedal is in the released position.

DISASSEMBLY AND ASSEMBLY

MASTER CYLINDER BRAKE FLUID RESERVOIR

NOTE: To replace the master cylinder brake fluid reservoir on this vehicle, it is not necessary to remove the master cylinder from the power brake booster.

DISASSEMBLY

(1) Remove master cylinder from vehicle. Refer to REMOVAL AND INSTALLATION in this section.

(2) Using Mopar, Brake Parts Cleaner or an equivalent, thoroughly clean the master cylinder and brake fluid reservoir.

(3) Remove the brake fluid reservoir filler cap.

(4) Using a syringe or equivalent type tool, empty as much brake fluid as possible from the reservoir.

CAUTION: Do not pry fluid reservoir off master cylinder using a tool, damage to the reservoir or master cylinder can result.

(5) Remove brake fluid reservoir from master cylinder by rocking the reservoir from side to side while pulling upward on the fluid reservoir.

(6) Remove master cylinder housing to brake fluid reservoir sealing grommets (Fig. 157).

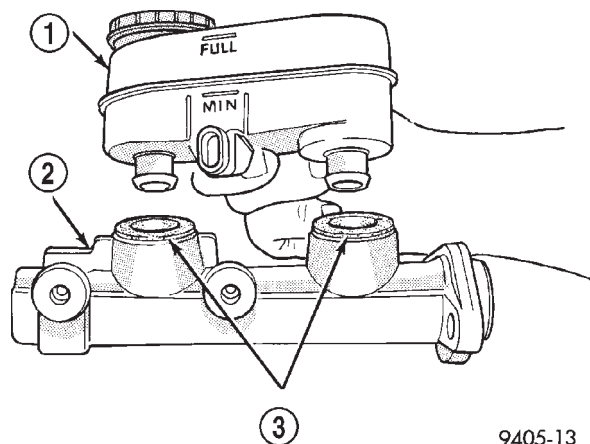
ASSEMBLY

CAUTION: To ensure a leak proof seal when installing a fluid reservoir, never reuse the original fluid reservoir to master cylinder sealing grommets.

(1) Install new master cylinder housing to brake fluid reservoir sealing grommets (Fig. 157) in master cylinder housing.

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

DISASSEMBLY AND ASSEMBLY (Continued)



9405-13

Fig. 157 Removing Fluid Reservoir From Master Cylinder

- 1 - FLUID RESERVOIR
- 2 - MASTER CYLINDER
- 3 - GROMMET

- (3) Be sure reservoir is positioned properly.
- (4) Make sure bottom of fluid reservoir touches top of both sealing grommets.
- (5) Reinstall the master cylinder on the vehicle. Refer to REMOVAL AND INSTALLATION in this section.

DISC BRAKE CALIPER (FRONT AND REAR)

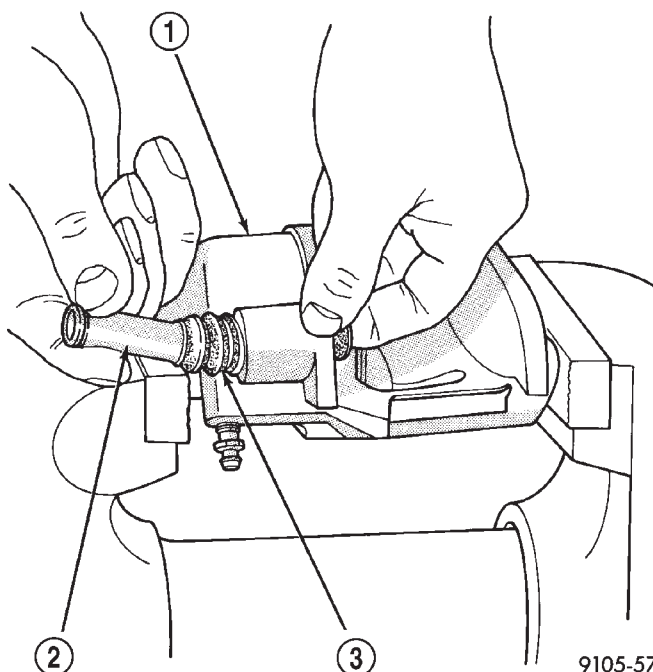
Before disassembling the brake caliper, clean and inspect it. Refer to CLEANING AND INSPECTION in this section of this service manual group.

CALIPER GUIDE PIN BUSHING

REMOVAL

(1) With one hand, push the guide pin bushing sleeve towards the back of the caliper, and at the same time, pull the sleeve out the back of the caliper and bushing (Fig. 158).

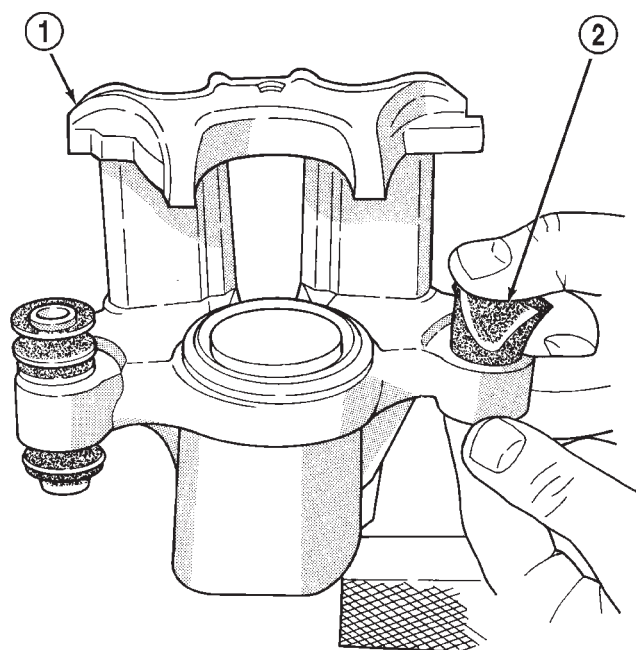
(2) Using your fingers, collapse one side of the rubber guide pin bushing. Pull the guide pin bushing out the other side of the brake caliper mounting boss (Fig. 159).



9105-57

Fig. 158 Removing Sleeve From Bushing

- 1 - CALIPER
- 2 - SLEEVE
- 3 - BUSHING



9105-58

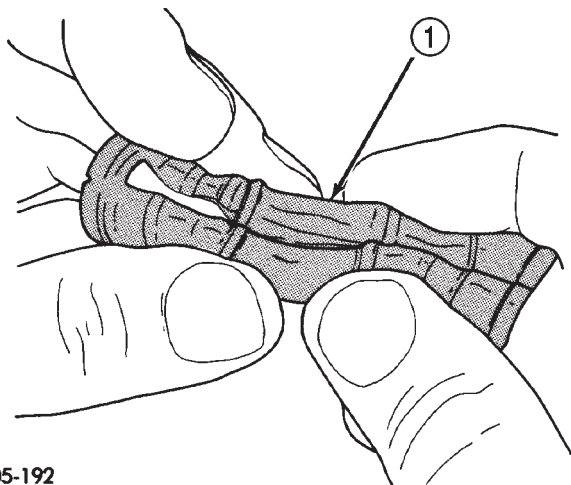
Fig. 159 Removing Bushing From Caliper

- 1 - CALIPER
- 2 - BUSHING

DISASSEMBLY AND ASSEMBLY (Continued)

INSTALLATION

(1) Fold the guide pin bushing in half lengthwise at the solid middle section (Fig. 160).



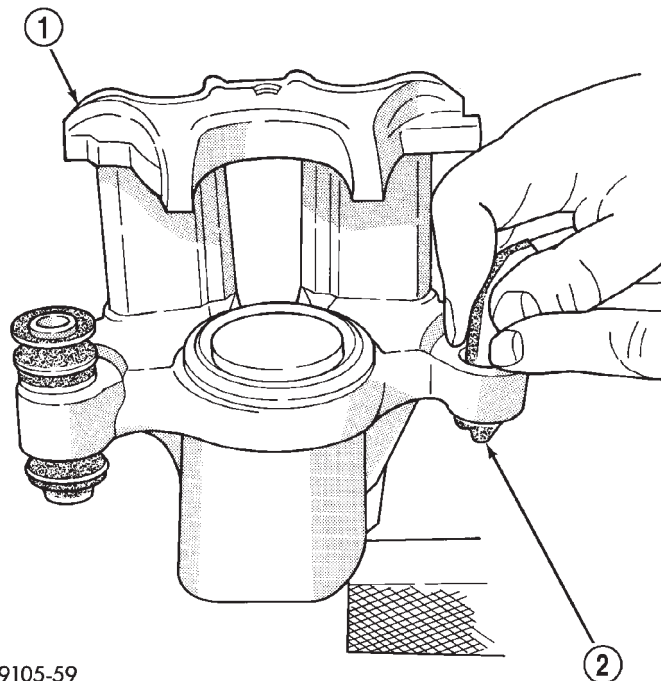
9205-192

Fig. 160 Folded Caliper Guide Pin Bushing

1 - CALIPER GUIDE PIN BUSHING

NOTE: To avoid damage to the bushing, do not use a sharp object to install the guide pin bushing.

(2) Insert the folded bushing into the caliper mounting boss using your fingers (Fig. 161).

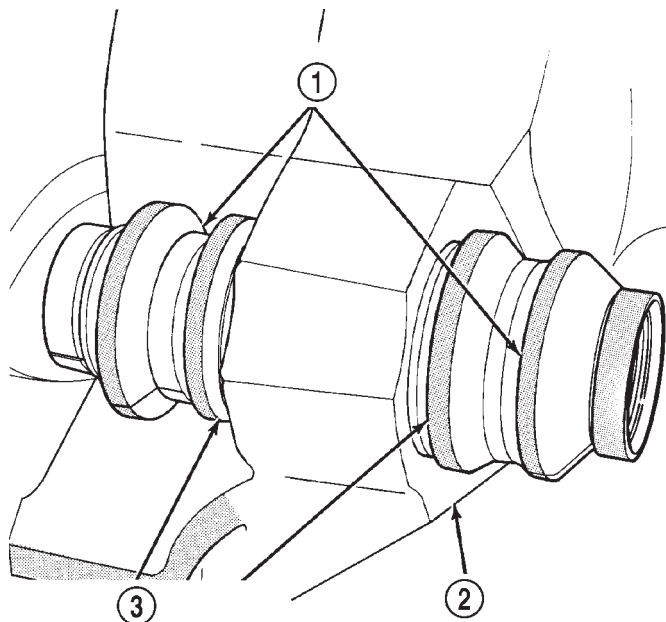


9105-59

Fig. 161 Installing Caliper Guide Pin Bushing

1 - CALIPER
2 - BUSHING

(3) Unfold the bushing using your fingers or a wooden dowel until the bushing is fully seated into the caliper housing. The bushing flanges should be seated evenly on both sides of the bushing hole (Fig. 162).



9205-193

Fig. 162 Bushing Correctly Installed In Caliper

1 - BUSHING
2 - CALIPER
3 - BE SURE BOTH BUSHING FLANGES ARE FULLY SEATED AROUND CALIPER BUSHING BORES.

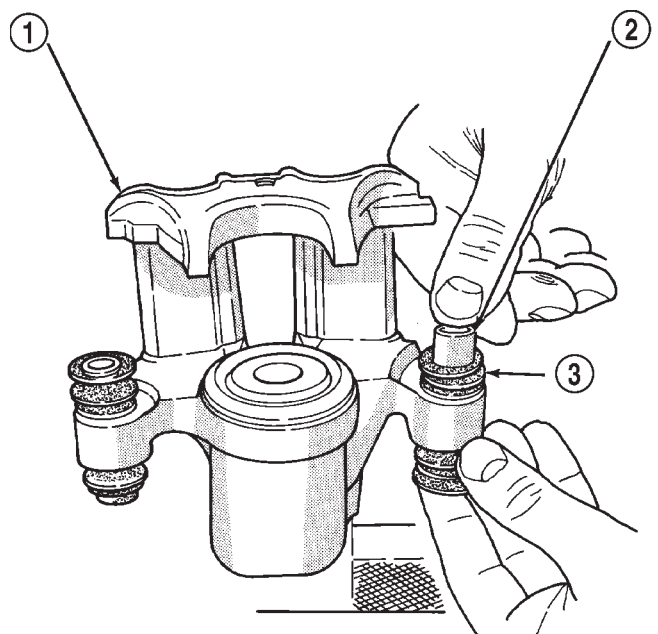
(4) Lubricate the inside surfaces of the bushing using Mopar Dielectric Grease or an equivalent.

(5) Install the guide pin sleeve into one end of bushing until the seal area of bushing is past the seal groove in the sleeve (Fig. 163).

(6) Holding the convoluted boot on the opposite end of the bushing, push the steel sleeve through the bushing until the bushing boot is fully seated into the seal groove on that end of sleeve (Fig. 163). Install the other end bushing boot into the groove on that end of the bushing sleeve.

(7) Verify both ends of the bushing are seated in the sleeve grooves (Fig. 164). When the sleeve is seated properly into the bushing, the sleeve/bushing can be held between your fingers and easily slid back and forth without the bushing unseating from the sleeve groove.

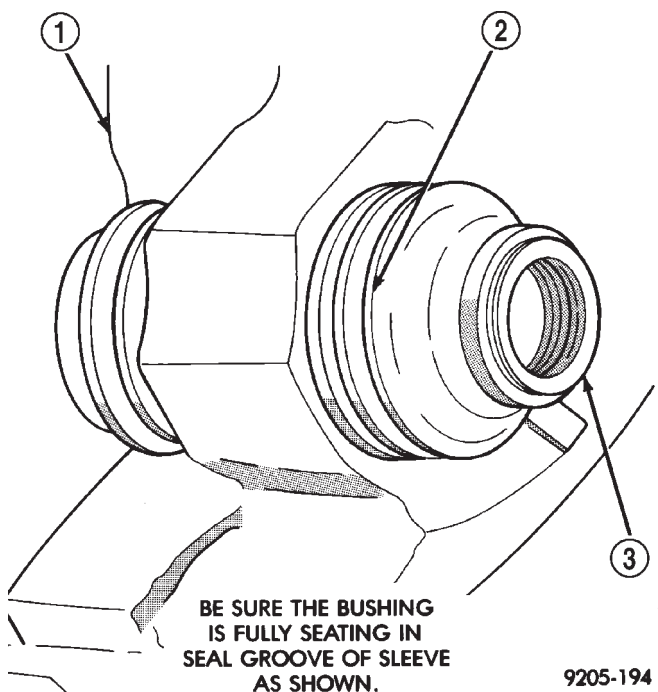
DISASSEMBLY AND ASSEMBLY (Continued)



9105-60

Fig. 163 Installing Sleeve In Bushing

- 1 - CALIPER
- 2 - SLEEVE
- 3 - BUSHING



9205-194

Fig. 164 Correctly Installed Guide Pin Sleeve And Bushing

- 1 - CALIPER
- 2 - BUSHING
- 3 - SLEEVE

CALIPER PISTON AND SEALS**CALIPER PISTON REMOVAL**

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

NOTE: The safest way to remove the piston from the caliper bore is to use the hydraulic pressure of the vehicle's brake system.

(1) Following the removal procedure in DISC BRAKE SHOES found in this section, remove the caliper from the brake rotor and hang the assembly on a wire hook away from rotor and body of the vehicle so brake fluid cannot get on these components. Remove the brake shoes, and place a small piece of wood between the piston and caliper fingers.

(2) Carefully depress the brake pedal to hydraulically push piston out of its bore. Once completed, apply and hold down the brake pedal to any position beyond the first inch of pedal travel using a brake pedal holding tool. This will prevent the fluid in the master cylinder reservoir from completely draining out.

(3) Disconnect the brake fluid flex hose from the caliper assembly and remove it from the vehicle.

CALIPER SEAL REMOVAL

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

(1) To disassemble the caliper, mount it in a vise equipped with protective jaws.

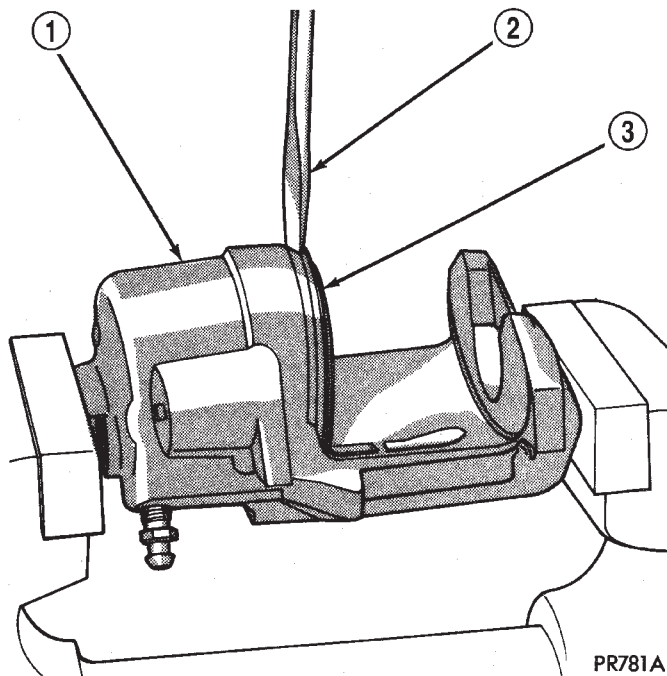
(2) Remove the piston dust boot from the caliper and discard (Fig. 165).

NOTE: Do not use a screw driver or other metal tool for seal removal. Using such tools can scratch the bore or leave burrs on the seal groove edges.

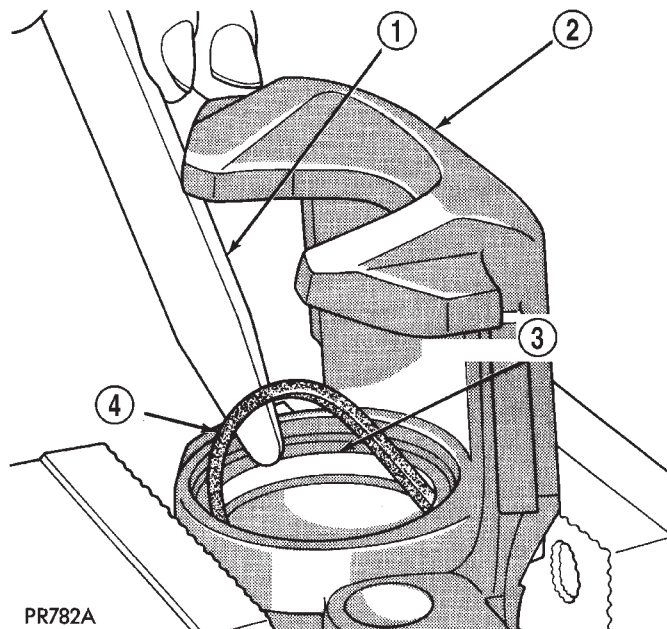
(3) Using a soft tool such as a plastic trim stick, work the piston seal out of its groove in caliper piston bore (Fig. 166). Discard the old seal.

(4) Clean the piston bore and drilled passage ways using alcohol or a suitable solvent. Wipe it dry using only a lint-free cloth.

DISASSEMBLY AND ASSEMBLY (Continued)

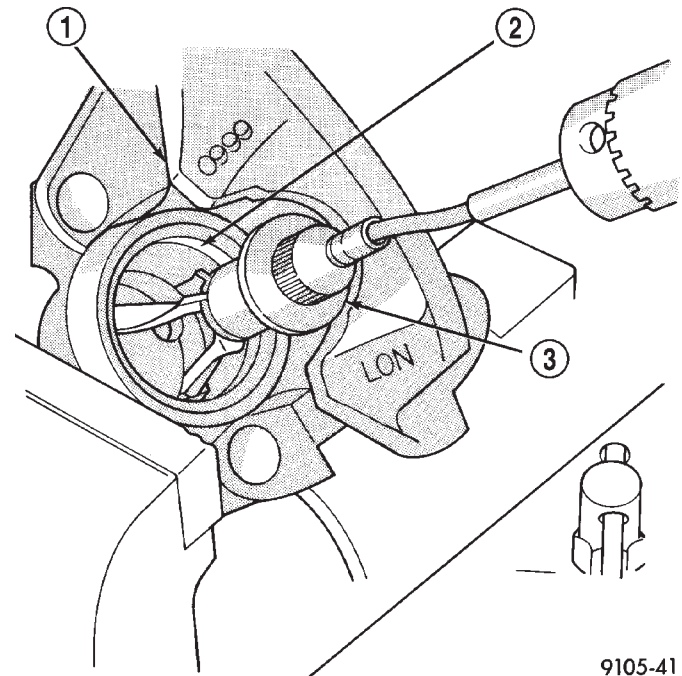
**Fig. 165 Removing Caliper/Piston Dust Boot**

- 1 - CALIPER
- 2 - SCREWDRIVER
- 3 - BOOT

**Fig. 166 Removing Piston Seal**

- 1 - PLASTIC TRIM STICK
- 2 - CALIPER
- 3 - PISTON SEAL GROOVE
- 4 - PISTON SEAL

(5) 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 the equivalent to hone the bore. Do not over-hone the bore. Do not increase the diameter of the bore more than 0.0254 mm (0.001 inch) (Fig. 167). If the bore does not clean up within this specification, a new caliper housing should be installed.

**Fig. 167 Honing Brake Caliper Piston Bore**

- 1 - CALIPER
- 2 - CALIPER BORE
- 3 - SPECIAL TOOL C-4095

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

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

CALIPER SEAL AND PISTON INSTALLATION

NOTE: Never use an old piston seal.

DISASSEMBLY AND ASSEMBLY (Continued)

(1) Dip the new piston seal in clean brake fluid and install it in the groove of the caliper bore. The seal should be started at one area of the groove and gently worked around and into the groove (Fig. 168) using only your clean fingers to seat it.

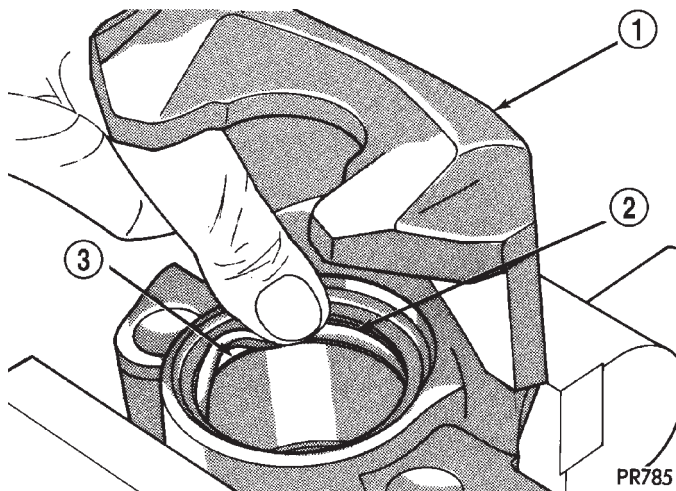


Fig. 168 Installing New Piston Seal

- 1 - CALIPER
- 2 - PISTON SEAL
- 3 - SEAL GROOVE

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

(3) Position the dust boot over the piston after coating it with brake fluid.

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

(4) Install piston into caliper bore pushing it past the piston seal until it bottoms in the caliper bore (Fig. 169).

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

(6) Using a hammer and Installer, Special Tool C-4689, and Handle, Special Tool C-4171, drive the boot into the counterbore of the caliper (Fig. 170).

(7) Install the brake shoes.

(8) Reinstall the caliper on the vehicle and bleed the brakes as necessary. Follow the installation procedure found in DISC BRAKE CALIPER in the REMOVAL AND INSTALLATION section in this section of this service manual group.

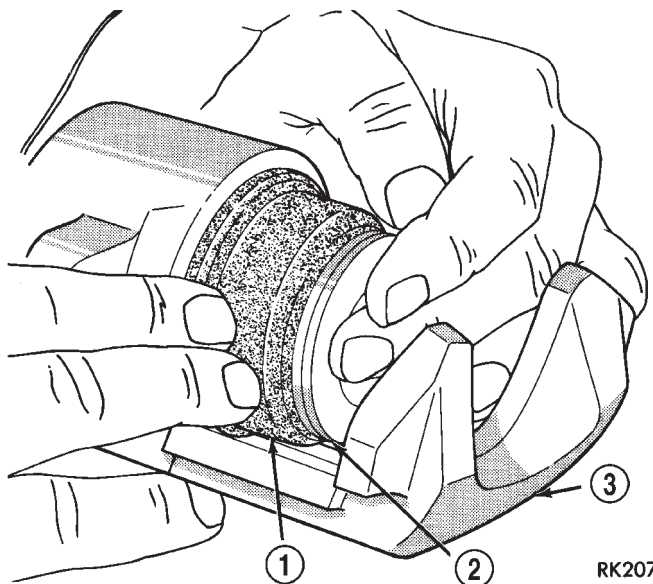


Fig. 169 Installing Piston Into Caliper Bore

- 1 - BOOT
- 2 - PISTON
- 3 - CALIPER

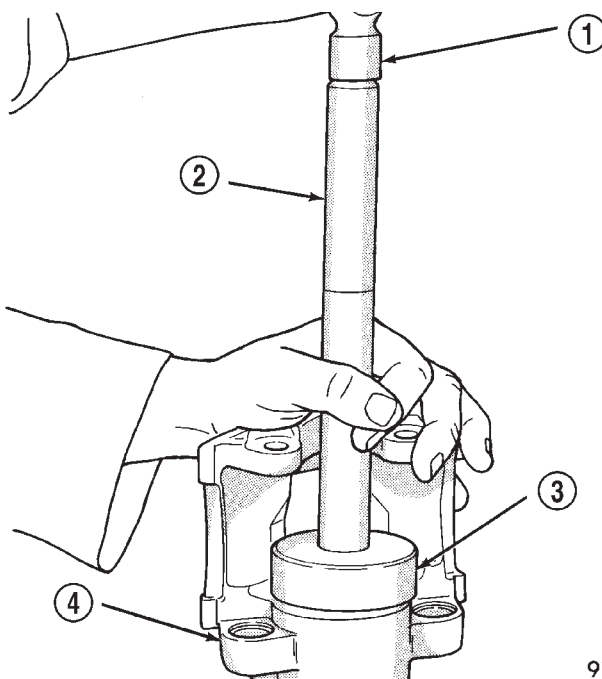
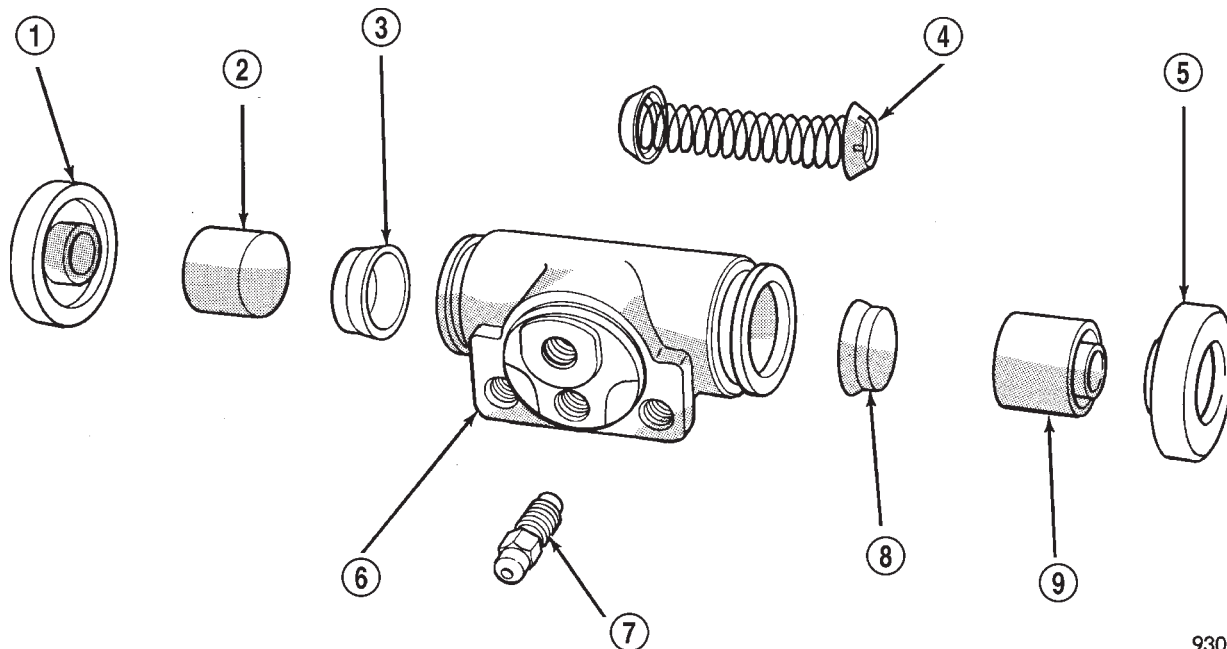


Fig. 170 Installing Dust Boot In Caliper Counterbore

- 1 - HAMMER
- 2 - SPECIAL TOOL C-4171
- 3 - SPECIAL TOOL C-4689
- 4 - CALIPER

DISASSEMBLY AND ASSEMBLY (Continued)



9305-172

Fig. 171 Rear Wheel Cylinder (Exploded View)

- 1 - PUSH-ON BOOT
- 2 - PISTON
- 3 - CUP
- 4 - CUP EXPANDERS AND SPRING
- 5 - PUSH-ON BOOT

- 6 - CYLINDER
- 7 - BLEEDER SCREW
- 8 - CUP
- 9 - PISTON

DRUM BRAKE WHEEL CYLINDER (REAR)**DISASSEMBLY**

To disassemble the wheel cylinders, proceed as follows:

(1) Pry boots away from cylinders and remove (Fig. 171).

(2) Press **IN** on one piston to force out opposite piston, cup and spring (Fig. 171). Then using a soft tool such as a dowel rod, press out the cup and piston that remain in the wheel cylinder.

(3) Wash wheel cylinder, pistons, and spring (Fig. 171) in clean brake fluid or alcohol; **(DO NOT USE ANY PETROLEUM BASE SOLVENTS)** clean thoroughly and blow dry with compressed air. Inspect cylinder bore and piston for scoring and pitting. (Do not use a rag as lint from the rag will stick to bore surfaces.)

(4) Wheel cylinder bores and pistons that are badly scored or pitted should be replaced. Cylinder walls that have light scratches, or show signs of corrosion, can usually be cleaned with crocus cloth,

using a circular motion. Black stains on the cylinder walls are caused by piston cups and will not impair operation of cylinder.

ASSEMBLY

Before assembling the pistons and new cups in the wheel cylinders, dip them in clean brake fluid. If the boots are deteriorated, cracked or do not fit tightly on the pistons or the cylinder casting, install new boots.

(1) Coat cylinder bore with clean brake fluid.

(2) Lightly coat the sealing lip and outer surfaces of the wheel cylinder cups with Mopar Protect-A-Cup Lubricant.

(3) Install expansion spring with cup expanders in cylinder. Install cups in each end of cylinder with open end of cups facing each other (Fig. 171).

(4) Install piston in each end of cylinder having the flat face of each piston contacting the flat face of each cup, already installed (Fig. 171).

(5) Install a boot over each end of cylinder (Fig. 171). **Be careful not to damage boot during installation.**

CLEANING AND INSPECTION

DISC BRAKES (FRONT)

BRAKE SHOE (PAD) LINING WEAR

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

Remove the front brake shoes. (See Brake Shoe Removal paragraph).

Combined front brake shoe 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 9.0 mm (3/8 inch) they should be replaced.

Replace both brake shoes (inboard and outboard) on both front sides of the vehicle.

If the front disc brake shoes do not require replacement, reinstall, the brake shoes making sure each brake shoe is returned to the original position on the vehicle it was removed from. (See Brake Pad Installation).

CALIPER INSPECTION

Check caliper 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 and install a new seal and 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 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 Guide Pin Bushing Service in Disc Brake Caliper Service in this section of the service manual.

DISC BRAKES (REAR)

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 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 3.0 mm 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.

DRUM BRAKES (REAR)

Clean metal portion of brake shoes. Check to see if shoes are bent.

Lining should show contact across entire width and from heel to toe, otherwise replace.

Shoes with lack of contact at toe or heel may be improperly ground.

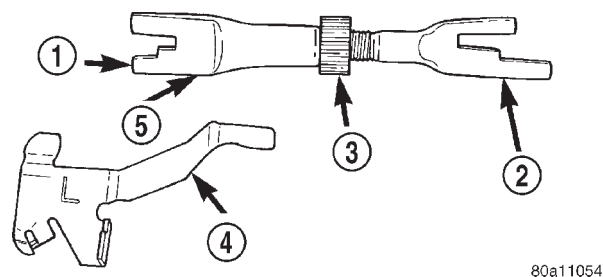
Clean and inspect the brake support plate and the automatic self adjusting mechanism.

Visually examine the adjuster assembly to ensure it is functioning correctly by checking for the following operation.

- Be sure the star wheel on the adjuster (Fig. 172) is free to rotate throughout its entire adjustment range.
- Ensure that the adjuster actuating lever is free to move on the brake shoe.
- Inspect the adjuster actuating spring (Fig. 172) for any signs of excessive wear or damage.
- Ensure that the teeth on the star wheel are not damaged (Fig. 172).
- Overall, examine the adjuster mechanism for excessive wear or damage and replace if necessary.

If the adjuster mechanism is re-useable, apply a light coat of Mopar Multi-Purpose Lubricant or equivalent, on the threads of the adjuster mechanism (Fig. 172).

CLEANING AND INSPECTION (Continued)



80a11054

Fig. 172 Automatic Self Adjuster Mechanism And Actuating Lever

- 1 - OUTBOARD FORWARD
- 2 - OUTBOARD REAR
- 3 - STAR WHEEL
- 4 - SELF ADJUSTER ACTUATING LEVER
- 5 - SELF ADJUSTER

If any return, hold down, or actuating springs have overheated or are damaged, replace them. Overheating indications are paint discoloration or distorted end coils.

DRUM BRAKE WHEEL CYLINDER (REAR)

With brake drums removed, inspect the wheel cylinder boots for evidence of a brake fluid leak. Visually check the boots for cuts, tears, or heat cracks. If any of these conditions exist, the wheel cylinders should be completely cleaned, inspected and new parts installed.

If a wheel cylinder is leaking and the brake lining material is saturated with brake fluid, the brake shoes must be replaced.

BRAKE 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.

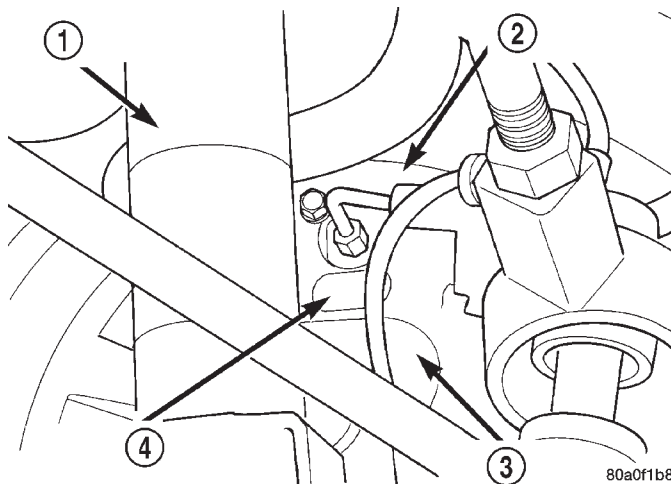
ADJUSTMENTS

DRUM BRAKE SHOES

NOTE: Normally, self adjusting drum brakes will not require manual brae shoe adjustment. Although in the event that the rear brake shoes are replaced it is advisable to make the initial adjustment manually to speed up the initial adjustment time.

(1) Raise vehicle using a frame contact type hoist or supported as required using jack stands. See moisting in the Lubrication And Maintenance group of this service manual for the required hoisting or jacking procedure to be used for this vehicle.

(2) Remove the rubber plug (Fig. 173) from the brake adjuster access hole in the brake support plate.



80a0f1b8

Fig. 173 Brake Adjuster Access Hole Plug

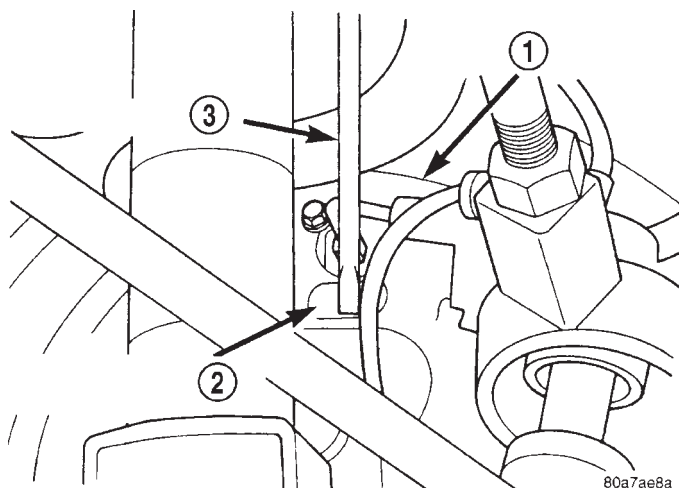
- 1 - SHOCK ABSORBER
- 2 - BRAKE SUPPORT PLATE
- 3 - KNUCKLE
- 4 - BRAKE ADJUSTER ACCESS HOLE PLUG

(3) **Be sure parking brake lever is fully released.**

(4) Insert a thin screwdriver through the adjuster access hole in the brake support plate (Fig. 174). Engage the tip of the screwdriver with the star wheel on the automatic adjuster. Move the handle of the screwdriver downward (toward the ground). Repeat the above procedure until drag is felt when rear wheel is rotated.

CAUTION: When performing the procedure in Step 5, care must be taken not to bend the adjuster actuating lever or distort the lever actuating spring.

ADJUSTMENTS (Continued)

**Fig. 174 Rear Brake Shoe Adjustment**

- 1 - BRAKE SUPPORT PLATE
2 - BRAKE ADJUSTER ACCESS HOSE
3 - SCREWDRIVER

(5) Insert a thin screwdriver or a piece of welding rod through the adjuster access hole. Carefully push the adjuster actuating lever out of engagement with the adjuster star wheel. While holding the adjuster actuating lever away from the star wheel insert a second screwdriver in access hole and engage it with the star wheel on the adjuster. Back off the adjuster star wheel until no drag is present when rotating the wheel.

(6) Repeat the above adjustment procedure at the other rear wheel.

(7) Apply and release the park brake lever one time after the rear brake shoes are adjusted. This will correctly adjust the tension of the park brake cables.

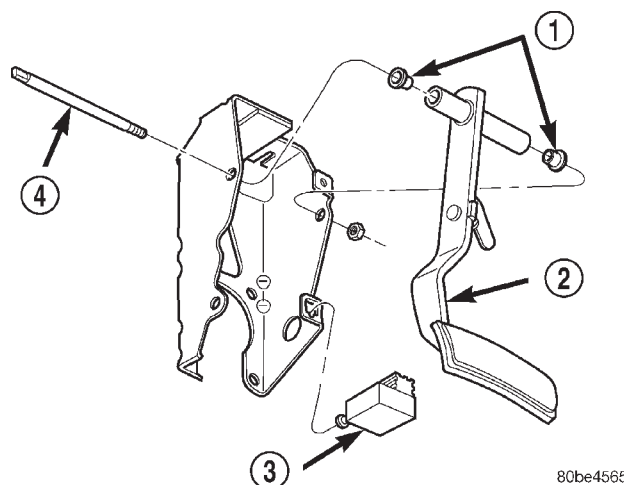
(8) Install the rubber plugs into the adjuster access holes in the brake support plates (Fig. 173).

PARKING BRAKE

Due to the automatic adjustment feature of the parking brake system used on this vehicle, manual adjustment of the parking brakes is not required. Proper adjustment of the parking brakes on this vehicle relies on the proper adjustment of the rear drum brake shoes. See Rear Brake Adjustment in the Service Adjustments Section in this group of the service manual for the required rear brake shoe adjustment procedure.

BRAKE LAMP SWITCH

(1) Remove the brake lamp switch from its bracket (Fig. 175). The brake lamp switch is removed by depressing and holding the brake pedal while rotating brake lamp switch in a counter-clockwise direction approximately 30 degrees. Pull the switch rearward and remove it from its mounting bracket.

**Fig. 175 Switch And Bracket**

- 1 - BUSHINGS
2 - BRAKE PEDAL
3 - BRAKE LAMP SWITCH
4 - PIVOT SHAFT

(2) Disconnect the wiring harness connector from the switch if necessary.

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

(4) Connect the wiring harness connector to the brake lamp switch if previously disconnected.

(5) Install the brake lamp switch in the brake pedal bracket (Fig. 175). Install it using the following procedure:

- Depress the brake pedal as far down as possible.
- Install the switch in its bracket by aligning the index tab on the switch with the slot in the mounting bracket.
- When the switch is fully seated in its bracket, rotate the switch clockwise approximately 30° to lock the switch into place. It should be aligned straight up and down (Fig. 176).

ADJUSTMENTS (Continued)

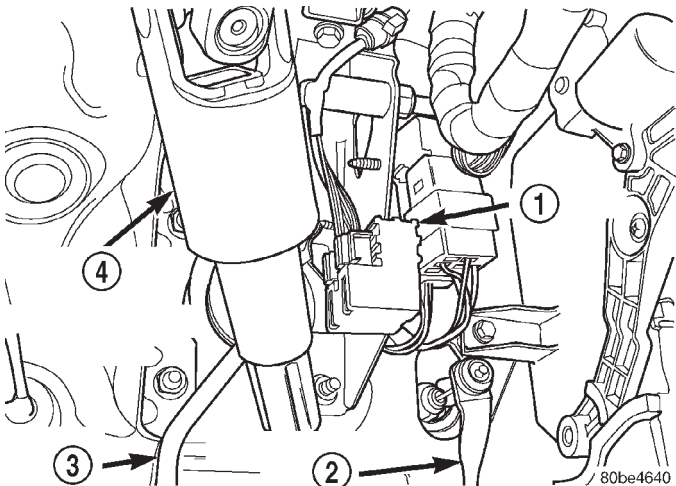


Fig. 176 Brake Lamp Switch

- 1 - SWITCH
- 2 - ACCELERATOR PEDAL
- 3 - BRAKE PEDAL
- 4 - STEERING COLUMN INTERMEDIATE SHAFT

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

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

(7) Check the brake lamps to verify they are operating properly and not staying on when the pedal is in the released position.

SPECIFICATIONS

BRAKE FLUID

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

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

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

BRAKE ACTUATING SYSTEM

ACTUATION:

Vacuum Operated Power Brakes Standard
Hydraulic System Dual-Diagonally Split

MASTER CYLINDER ASSEMBLY:

Supplier Bosch
Type Center Valve Design
Body Material Anodized Aluminum
Reservoir Material Polypropelene

MASTER CYLINDER BORE /

STROKE AND SPLIT:

ABS 22.2 mm x 33.4 mm (.874 in. x 1.32 in.)
Displacement Split 50 / 50

MASTER CYLINDER FLUID OUTLET PORTS:

ABS Primary 7/16–24 Secondary 7/16–24
Non ABS . . . Primary Inboard And Outboard 7/16–24
Non ABS . . . Secondary Inboard And Outboard 3/8–23
Outlet Fitting Type . . . Double Wall Inverted Flare

ABS HYDRAULIC CONTROL UNIT:

Hydraulic Tube Fitting Type . . . Double Wall Inverted
Flare

BOOSTER:

Make/Type Bosch Vacuum Assist
Mounting Studs M8 x 1.25
Type 205 mm Tandem
Boost At 20 inches Of Manifold Vacuum . . 4690 All

SCREW IN PROPORTIONING VALVE:

Material Aluminum
Function Hydraulic Pressure Proportioning

BRAKE PEDAL

Pedal Ratio 3.32

BRAKE FASTENER TORQUE SPECIFICATIONS

DESCRIPTION TORQUE

MASTER CYLINDER:

Booster Mounting Nut 28 N·m (250 in. lbs.)

BRAKE BOOSTER:

Dash Panel Mounting Nuts . . 37 N·m (27 ft. lbs.)

BRAKE PEDAL

Dash Panel Plenum Mounting Nut 37 N·m
(27 ft. lbs.)

Shaft To Brake Pedal Bracket Nut 34 N·m
(25 ft. lbs.)

BRAKE TUBES:

Tube Nuts 20 N·m (180 in. lbs.)

BRAKE HOSE:

Caliper Banjo Bolt 48 N·m (35 ft. lbs.)
Rear Intermediate Bracket . 11 N·m (100 in. lbs.)
Front And Rear Brackets
To Frame Rails 10 N·m (95 in. lbs.)

DISC BRAKE CALIPER:

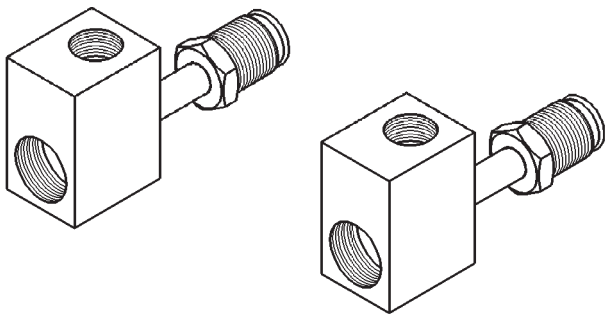
Guide Pin Bolts 22 N·m (16 ft. lbs.)
Bleeder Screw 20 N·m (15 ft. lbs.)

SPECIFICATIONS (Continued)

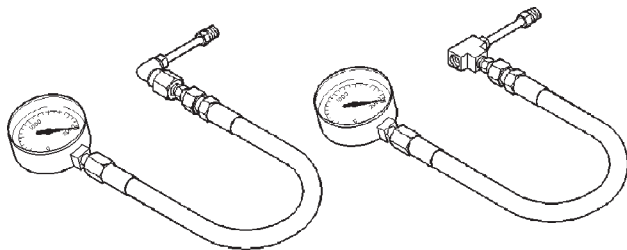
DESCRIPTION	TORQUE
REAR WHEEL CYLINDER:	
To Support Plate Mounting Bolts	13 N·m (115 in. lbs.)
Bleeder Screw	10 N·m (90 in. lbs.)
BRAKE SUPPORT PLATE:	
To Axle Mounting Bolts	75 N·m (55 ft. lbs.)
INTEGRATED CONTROL UNIT (HCU AND CAB):	
To Mounting Bracket Bolts	28 N·m (250 in. lbs.)
Bracket To Crossmember Mounting Bolts	28 N·m (250 in. lbs.)
PARKING BRAKE:	
Lever Mounting Nuts	24 N·m (18 ft. lbs.)
REAR HUB AND BEARING:	
To Knuckle Retaining Nut . . .	250 N·m (185 ft. lbs.)
Stud Lug Nut	115–155 N·m (85–115 ft. lbs.)

SPECIAL TOOLS

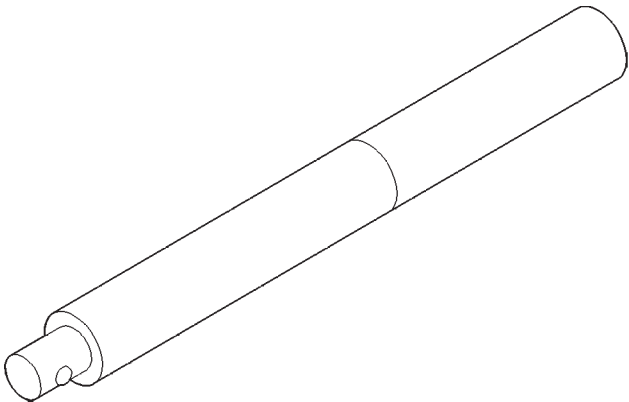
BASE BRAKE SYSTEM



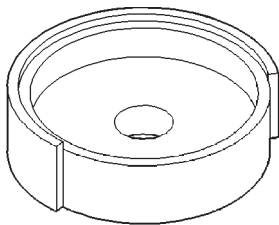
Adapters, Brake Pressure Test 8187



Gauge Set C-4007-A

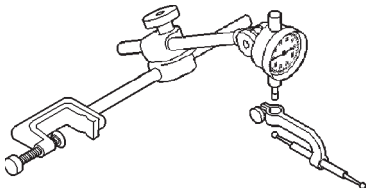


Handle, Universal C-4171



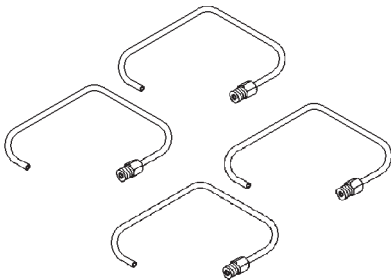
8011d811

Installer, Dust Boot C-4689



8011d42b

Dial Indicator C-3339



Tubes, Master Cylinder Bleeding 6802

ANTILOCK BRAKE SYSTEM

TABLE OF CONTENTS

	page		page
DESCRIPTION AND OPERATION		ANTILOCK BRAKE SYSTEM BLEEDING	93
ANTILOCK BRAKE SYSTEM	75	REMOVAL AND INSTALLATION	
ANTILOCK BRAKE SYSTEM COMPONENTS	76	SERVICE WARNINGS AND CAUTIONS	94
TRACTION CONTROL SYSTEM	82	INTEGRATED CONTROL UNIT	94
HYDRAULIC CIRCUITS AND VALVE		PROPORTIONING VALVE	100
OPERATION	82	WHEEL SPEED SENSOR (FRONT)	101
DIAGNOSIS AND TESTING		WHEEL SPEED SENSOR (REAR)	103
SERVICE WARNINGS AND CAUTIONS	88	DISASSEMBLY AND ASSEMBLY	
ABS GENERAL DIAGNOSTICS INFORMATION . .	88	INTEGRATED CONTROL UNIT	104
ABS WIRING DIAGRAM INFORMATION	88	SPECIFICATIONS	
ABS VEHICLE TEST DRIVE	88	TONE WHEEL RUNOUT	105
ABS ELECTRONIC DIAGNOSIS	89	WHEEL SPEED SENSOR-TO-TONE WHEEL	
TONE WHEEL	90	CLEARANCE	105
PROPORTIONING VALVE	91	WHEEL SPEED SENSOR RESISTANCE	105
BRAKE FLUID CONTAMINATION	93	BRAKE FASTENER TORQUE	
SERVICE PROCEDURES		SPECIFICATIONS	105
BRAKE FLUID LEVEL CHECKING	93		

DESCRIPTION AND OPERATION

ANTILOCK BRAKE SYSTEM

DESCRIPTION

This section covers the physical and operational descriptions and the on-car service procedures for the Mark 20i Antilock Brake System and the Mark 20i Antilock Brake System with traction control.

The purpose of the antilock brake system (ABS) is to prevent wheel lockup under braking conditions on virtually any type of road surface. Antilock braking is desirable because a vehicle that is stopped without locking the wheels retains directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during braking.

OPERATION

There are a few performance characteristics of the Mark 20i Antilock Brake System that may at first seem abnormal, but in fact are normal. These characteristics are described below.

NORMAL BRAKING

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

ABS BRAKING

ABS operation is available at all vehicle speeds above 3–5 mph. If a wheel locking tendency is detected during a brake application, the brake system enters 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 and each wheel receives its own separate electrical signal. Wheel lockup may be perceived at the very end of an ABS stop and is considered normal.

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.

DESCRIPTION AND OPERATION (Continued)

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).

NOISE AND BRAKE PEDAL FEEL

During ABS braking, some brake pedal movement may be felt. In addition, ABS braking will create ticking, popping, or groaning noises heard by the driver. This is normal and is 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 is 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 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 activates ABS because of the wheel hop caused by the bumps.

TIRE NOISE AND MARKS

Although the ABS system prevents complete wheel lockup, 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 25–30 percent. This means that the wheel rolling velocity is 25–30 percent 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 lockup.

Complete wheel lockup normally leaves black tire marks on dry pavement. The ABS will not leave dark black tire marks since the wheel never reaches a fully locked condition. However, tire marks may 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. The ABS warning lamp will also be on for up to 5 seconds after the ignition is turned on. When the vehicle is first driven off, a humming may be heard or felt by the driver at approximately 25–40 kph (15–25 mph). All of these conditions are a normal function of ABS as the system is performing a diagnosis check.

PREMATURE ABS CYCLING

Symptoms of premature ABS cycling include: clicking sounds from the solenoid valves; pump/motor running; and pulsations in the brake pedal. Premature ABS cycling can occur at any braking rate of the vehicle and on any type of road surface. Neither the red BRAKE warning lamp, nor the amber ABS warning lamp, illuminate and no fault codes are stored in the CAB.

Premature ABS cycling is a condition that needs to be correctly assessed when diagnosing problems with the antilock brake system. It may be necessary to use a DRB scan tool to detect and verify premature ABS cycling.

Check the following common causes when diagnosing premature ABS cycling: damaged tone wheels; incorrect tone wheels; damaged steering knuckle wheel speed sensor mounting bosses; loose wheel speed sensor mounting bolts; excessive tone wheel runout; or an excessively large tone wheel-to-wheel speed sensor air gap. Give special attention to these components when diagnosing a vehicle exhibiting premature ABS cycling.

After diagnosing the defective component, repair or replace it as required. When the component repair or replacement is completed, test drive the vehicle to verify that premature ABS cycling has been corrected.

ANTILOCK BRAKE SYSTEM COMPONENTS

The following is a detailed description of the antilock brake system components. For information on servicing base brake system components used in conjunction with these components, see the BASE BRAKE SYSTEM found at the beginning of this service manual group.

MASTER CYLINDER**DESCRIPTION**

A vehicle equipped with ABS uses a different master cylinder (Fig. 1) than a vehicle that is not equipped with ABS. Vehicles equipped with ABS use a center port master cylinder while vehicles not equipped with ABS use a compensating port master cylinder.

The brake tubes from the primary and secondary outlet ports on the master cylinder go directly to the hydraulic control unit (HCU).

The power brake booster used on a vehicle equipped with ABS is the same as a vehicle not equipped with ABS.

Refer to the BASE BRAKE SYSTEM at the beginning of this service manual group for further information and procedures on master cylinders.

DESCRIPTION AND OPERATION (Continued)

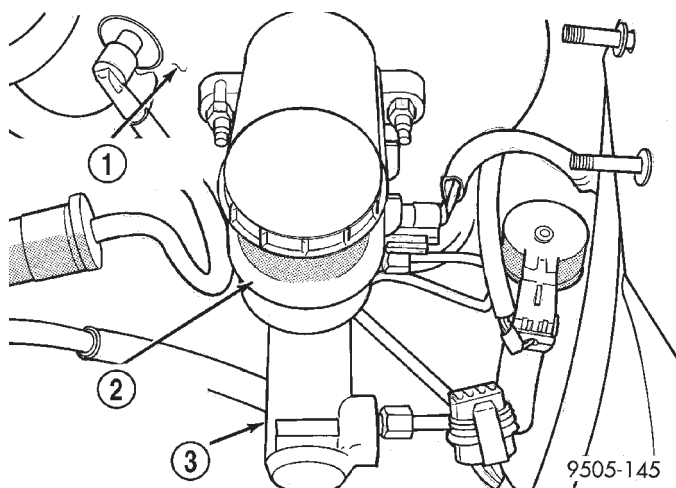


Fig. 1 Master Cylinder

- 1 - POWER BRAKE VACUUM BOOSTER
- 2 - MASTER CYLINDER FLUID RESERVOIR
- 3 - MASTER CYLINDER BODY

When the brake pedal is depressed, the master cylinder primary and secondary pistons apply brake pressure through the chassis brake tubes, ABS hydraulic control unit, and proportioning valves to each brake assembly. On ABS master cylinders, the primary outlet port supplies hydraulic pressure to the right front and left rear brakes. The secondary outlet port supplies hydraulic pressure to the left front and right rear brakes.

Refer to the BASE BRAKE SYSTEM at the beginning of this service manual group for further information.

OPERATION

When the brake pedal is depressed, the master cylinder primary and secondary pistons apply brake pressure through the chassis brake tubes, ABS hydraulic control unit, and proportioning valves to each brake assembly. On ABS master cylinders, the primary outlet port supplies hydraulic pressure to the right front and left rear brakes. The secondary outlet port supplies hydraulic pressure to the left front and right rear brakes.

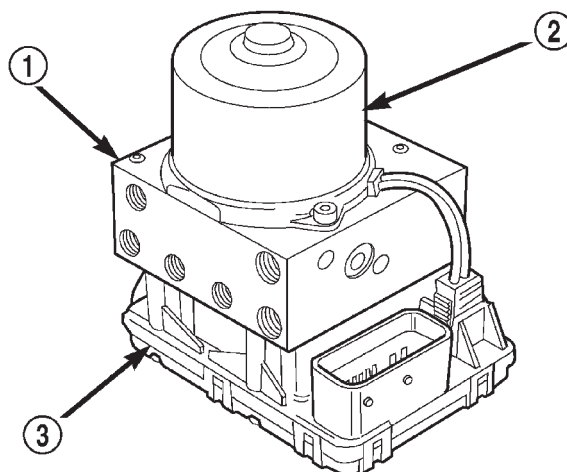
Refer to the BASE BRAKE SYSTEM at the beginning of this service manual group for further information.

INTEGRATED CONTROL UNIT (ICU)

DESCRIPTION

The hydraulic control unit (HCU) and the controller antilock brake (CAB) used with this antilock brake system are combined (integrated) into one unit, which is called the integrated control unit (ICU) (Fig. 2). The ICU is located on the passenger's side of

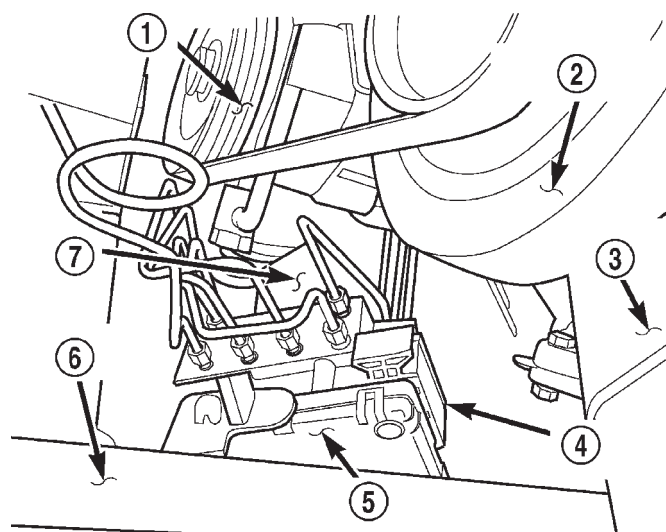
the vehicle, and is mounted on top of the front suspension crossmember (Fig. 3). It can be accessed from under the vehicle.



80ae846a

Fig. 2 Integrated Control Unit (ICU)

- 1 - HCU
- 2 - PUMP/MOTOR
- 3 - CAB



NOTE: SHOWN FROM UNDER VEHICLE

80afb5c7

Fig. 3 ICU Mounting Location

- 1 - POWER STEERING PULLEY
- 2 - ENGINE CRANKSHAFT PULLEY
- 3 - ENGINE OIL PAN
- 4 - CAB CONNECTOR
- 5 - CONTROLLER ANTILOCK BRAKE (CAB)
- 6 - RIGHT HALF SHAFT
- 7 - PUMP MOTOR

Two different HCU's and CAB's are used on this vehicle depending on whether or not the vehicle is equipped with traction control. The HCU on a vehicle

DESCRIPTION AND OPERATION (Continued)

equipped with ABS and traction control has a valve block housing that is approximately 1 inch longer on the low pressure fluid accumulators side than a HCU on a vehicle that is equipped with only ABS.

The ABS-only ICU consists of the following components: the CAB, eight (build/decay) solenoid valves (four inlet valves and four outlet valves), valve block, fluid accumulators, a pump, and an electric motor.

The ABS-with traction control ICU consists of the following components: the CAB, eight (build/decay) solenoid valves (four inlet valves and four outlet valves), two hydraulic shuttle valves, two ASR valves, valve block, fluid accumulators, a pump, and an electric pump/motor. On vehicles with traction control, the ICU contains 10 solenoid valves. The two ASR valves and solenoids are used to isolate the brake system during traction control operation.

The replaceable components of the ICU are the HCU and the CAB. No attempt should be made to service any individual components of the HCU or CAB.

OPERATION

For information on the operation of the ICU, refer to the individual components:

- CONTROLLER ANTILOCK BRAKE (CAB)
- HYDRAULIC CONTROL UNIT (HCU)

For information on the ICU's hydraulic circuits, refer to HYDRAULIC CIRCUITS AND VALVE OPERATION which can be found elsewhere in this section.

CONTROLLER ANTILOCK BRAKE (CAB)**DESCRIPTION**

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. 2). 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 CCD bus.

OPERATION

The primary functions of the CAB are to:

- (1) monitor the antilock brake system for proper operation.
- (2) detect wheel locking or wheel slipping tendencies by monitoring the speed of all four wheels of the vehicle.
- (3) control fluid modulation to the wheel brakes while the system is in an ABS mode or the traction control system is activated.

- (4) store diagnostic information.

- (5) provide communication to the DRB scan tool while in diagnostic mode.

The CAB constantly monitors the antilock brake system for proper operation. If the CAB detects a fault, it will turn on the amber ABS warning lamp and disable the antilock braking system. The normal base braking system will remain operational.

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 actuates its solenoids. This actuation opens and closes the valves in the HCU thereby modulating brake fluid pressure in the hydraulic circuits. The CAB continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present.

The CAB contains a self-diagnostic program that monitors the antilock brake system for system faults. When a fault is detected, the amber ABS warning lamp is turned on and the fault diagnostic trouble code (DTC) is then stored in a diagnostic program memory. These DTC's will remain in the CAB memory even after the ignition has been turned off. The DTC's can be read and cleared from the CAB memory by a technician using the DRB scan tool. If not cleared with a DRB scan tool, the fault occurrence and DTC will be automatically cleared from the CAB memory after the identical fault has not been seen during the next 3,500 miles.

CONTROLLER ANTILOCK BRAKE INPUTS

- wheel speed sensors (four)
- stop lamp switch
- ignition switch
- system voltage
- ground
- traction control switch (if equipped)
- diagnostic communication (CCD)

CONTROLLER ANTILOCK BRAKE OUTPUTS

- amber ABS warning lamp actuation
- instrument cluster (MIC)
- traction control lamps (if equipped)
- diagnostic communication (CCD)

HYDRAULIC CONTROL UNIT (HCU)**DESCRIPTION**

The hydraulic control unit (HCU) is mounted to the CAB as part of the ICU (Fig. 4). The ICU is located on the passenger's side of the vehicle, and is mounted on top of the front suspension crossmember (Fig. 3). It can be accessed from under the vehicle.

DESCRIPTION AND OPERATION (Continued)

The HCU controls the flow of brake fluid to the brakes using a series of valves and accumulators. A pump/motor is mounted on the HCU to supply build pressure to the brakes during an ABS stop.

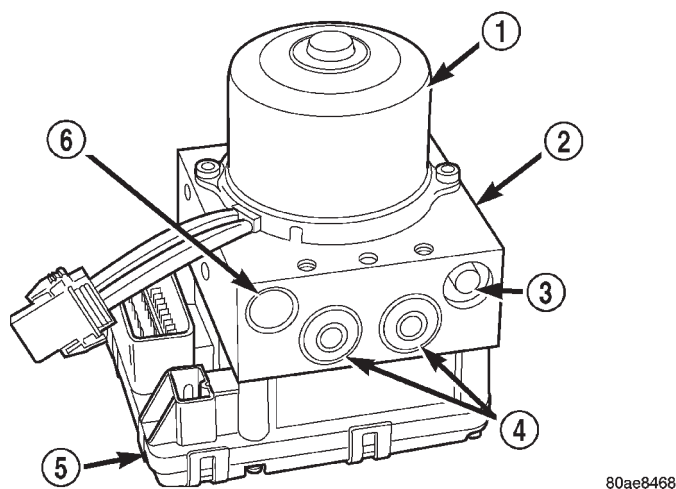


Fig. 4 Integrated Control Unit (ICU)

- 1 - PUMP MOTOR
- 2 - HYDRAULIC CONTROL UNIT (HCU)
- 3 - NOISE DAMPENING CHAMBER
- 4 - LOW PRESSURE FLUID ACCUMULATORS
- 5 - CAB
- 6 - LIP SEAL SAVER

The HCU on a vehicle equipped with ABS and traction control has a valve block housing that is approximately 1 inch longer on the low pressure fluid accumulators side than a HCU on a vehicle that is equipped with only ABS.

For more information, see INTEGRATED CONTROL UNIT in this section.

OPERATION

The operation of the HCU can be found in HYDRAULIC CIRCUITS AND VALVE OPERATION which can be found elsewhere in this section. The following topics explain how the different components within the HCU operate.

VALVES AND SOLENOIDS

The valve block contains four inlet valves and four outlet valves. The inlet valves are spring-loaded in the open position and the outlet valves are spring-loaded in the closed position during normal braking. The fluid is allowed to flow from the master cylinder to the wheel brakes.

During an ABS stop, these valves cycle to maintain the proper slip ratio for each wheel. The inlet valve closes preventing further pressure increase and the outlet valve opens to provide a path from the wheel brake to the HCU accumulators and pump/motor. This releases (decays) pressure from the wheel brake,

thus releasing the wheel from excessive slippage. Once the wheel is no longer slipping, the outlet valve is closed and the inlet valve is opened to reapply (build) pressure.

On vehicles with traction control, there is an extra set of valves and solenoids. The ASR valves, mounted in the HCU valve block, are normally in the open position and close only when the traction control is applied.

These isolator valves are used to isolate the rear (non-driving) wheels of the vehicle from the hydraulic pressure that the HCU pump/motor is sending to the front (driving) wheels when traction control is being applied. The rear brakes need to be isolated from the master cylinder when traction control is being applied so the rear wheels do not drag. For more information, see TRACTION CONTROL SYSTEM in this section.

BRAKE FLUID ACCUMULATORS

There are two fluid accumulators in the HCU—one for the primary hydraulic circuit and one for the secondary hydraulic circuit (Fig. 4). Each hydraulic circuit uses a 5 cc accumulator.

The fluid accumulators temporarily store brake fluid that is removed from the wheel brakes during an ABS cycle. This stored fluid is used by the pump/motor to provide build pressure for the brake hydraulic system. When the antilock stop is complete, the accumulators are drained by the pump/motor.

On ABS-only vehicles, there is a mini-accumulator on the secondary hydraulic circuit that protects the master cylinder seals during an ABS stop, and there is a noise dampening chamber on the primary circuit.

On ABS with traction control vehicles, there are two noise dampening chambers in the HCU.

PUMP/MOTOR

There are two pump assemblies in the HCU—one for the primary hydraulic circuit and one for the secondary hydraulic circuit. Both pumps are driven by a common electric motor (Fig. 4). This DC-type motor is integral to the HCU and is controlled by the CAB.

The pump/motor provides the extra amount of brake fluid needed during antilock braking. Brake fluid is released to the accumulators when the outlet valve is opened during an antilock stop. The pump mechanism consists of two opposing pistons operated by an eccentric camshaft. In operation, one piston draws fluid from the accumulators, and the opposing piston pumps fluid to the master cylinder circuits. When the antilock stop is complete, the pump/motor drains the accumulators.

The CAB may turn on the pump/motor when an antilock stop is detected. The pump/motor continues to run during the antilock stop and is turned off after

DESCRIPTION AND OPERATION (Continued)

the stop is complete. Under some conditions, the pump/motor runs to drain the accumulators during the next drive-off.

The pump/motor is not a serviceable item; if it requires replacement, the HCU must be replaced.

PROPORTIONING VALVE

DESCRIPTION

There are two proportioning valves (Fig. 5) used in the antilock brake system. One proportioning valve is located in the chassis brake tube leading to each rear wheel brake hydraulic circuit. They can be found to the inside of the right frame rail (Fig. 6). The proportioning valve can be identified by its bar code label and stamp. Be sure a replacement proportioning valve has the same stamp as the proportioning valve being replaced.

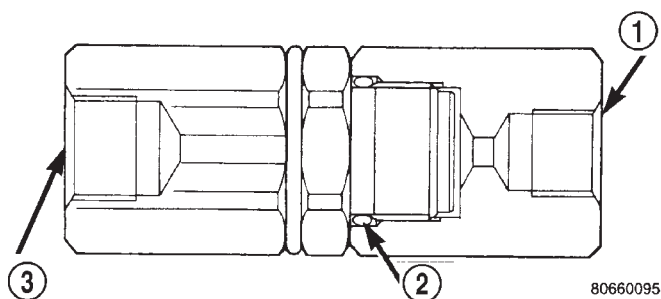


Fig. 5 Proportioning Valve

- 1 - FROM MASTER CYLINDER
- 2 - O. RING SEAL
- 3 - TO REAR BRAKES

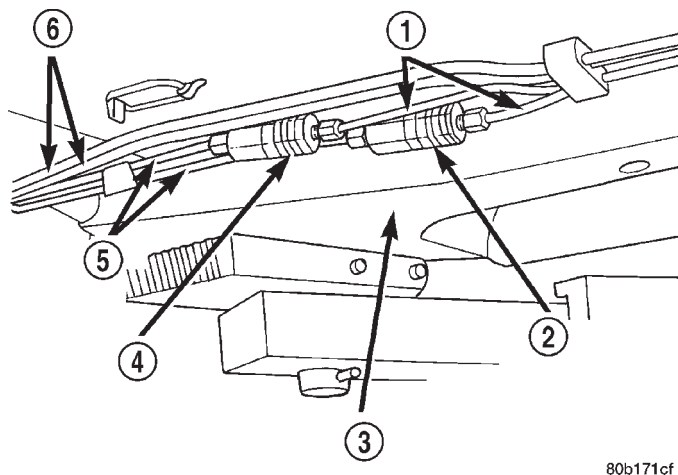


Fig. 6 Proportioning Valve Location In Vehicle

- 1 - CHASSIS BRAKE TUBES
- 2 - RIGHT REAR BRAKE PROPORTIONING VALVE
- 3 - RIGHT FRAME RAIL
- 4 - LEFT REAR BRAKE PROPORTIONING VALVE
- 5 - CHASSIS BRAKE TUBES
- 6 - FUEL TUBES

OPERATION

The ABS proportioning valves function the same as the proportioning valves in the base brake system.

ABS FUSES

DESCRIPTION

The ABS fuses and the ABS pump/motor fuse are located in the power distribution center (PDC). Refer to the sticker on the inside of the PDC cover for the location of these fuses or use the following figure (Fig. 7). The PDC is located on the driver's side of the engine compartment between the radiator and the brake master cylinder.

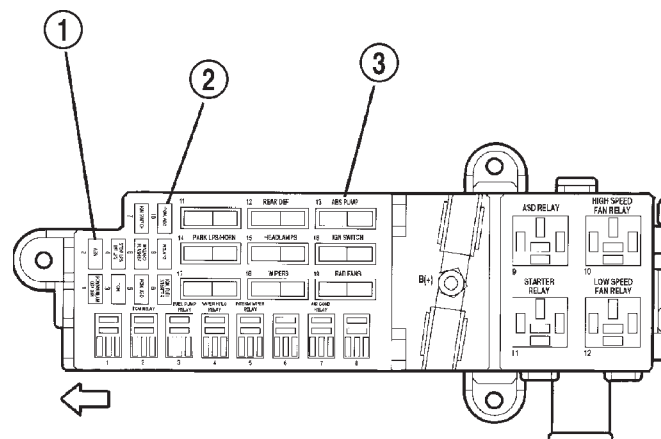


Fig. 7 Fuse Location

- 1 - ABS FUSE
- 2 - PCM, ABS FUSE
- 3 - ABS PUMP FUSE

ABS RELAYS (SOLID STATE)

DESCRIPTION

Two internal relays are used to control the antilock brake system. The two relays are the pump/motor relay and the system relay. The pump/motor relay and the system relay are located in the CAB. If either the pump/motor relay or the system relay is diagnosed as not functioning properly, the CAB must be replaced. Refer to INTEGRATED CONTROL UNIT in the DISASSEMBLY AND ASSEMBLY section in this section of this service manual group for the procedure to remove the CAB from the HCU.

DESCRIPTION AND OPERATION (Continued)

AMBER ABS WARNING LAMP

DESCRIPTION

The amber ABS warning lamp is located on the left side of the instrument cluster. The purpose of the warning lamp is discussed in detail below.

OPERATION

When the ignition key is turned to the ON position, the amber ABS warning lamp is lit until the CAB completes its self-tests and turns off the lamp (approximately 4 seconds). The amber ABS warning lamp will illuminate when the CAB detects a condition that results in the shutdown of ABS function or when the mechanical instrument cluster (MIC) does not receive messages from the CAB. The CAB turns on the amber ABS warning lamp by grounding the circuit.

Under most conditions, when the amber ABS warning lamp is on, only the ABS function of the brake system is affected; the base brake system and the ability to stop the vehicle are not affected.

WHEEL SPEED SENSOR (WSS) AND TONE WHEEL

DESCRIPTION

One wheel speed sensor (WSS) and one tone wheel are located at each front (Fig. 8) and rear (Fig. 9) (Fig. 10) wheel. Each front wheel speed sensor is attached to a boss in the steering knuckle. The front tone wheel is part of the outboard constant velocity joint. The rear wheel speed sensor on rear drum brake applications is mounted to the brake support plate. The rear wheel speed sensor on rear disc brake applications is mounted to the rear disc brake adapter. The rear tone wheel is an integral part of the rear wheel hub and bearing.

OPERATION

The wheel speed sensor sends a small AC signal to the CAB. This signal is generated by magnetic induction created when a toothed sensor ring (tone wheel) (Fig. 8) (Fig. 9) (Fig. 10) passes the stationary magnetic wheel speed sensor. The CAB converts the AC signal 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.

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

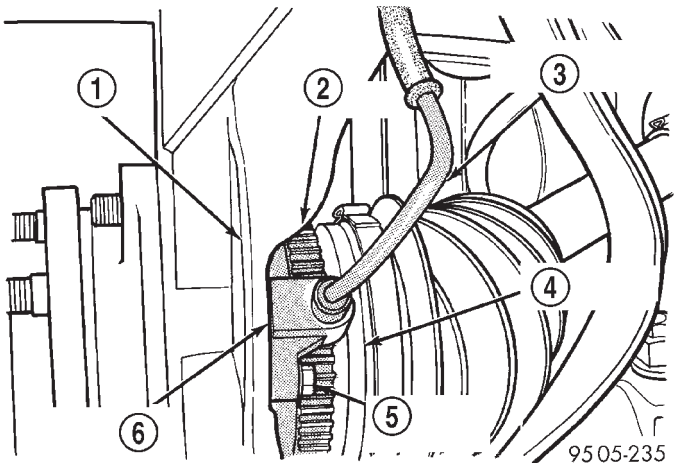


Fig. 8 Front Wheel Speed Sensor

- 1 – STEERING KNUCKLE
- 2 – TONE WHEEL
- 3 – WHEEL SPEED SENSOR CABLE
- 4 – DRIVESHAFT
- 5 – ATTACHING BOLT
- 6 – WHEEL SPEED SENSOR

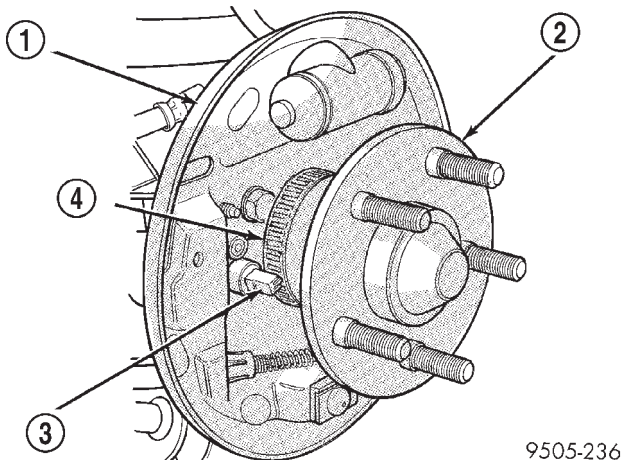
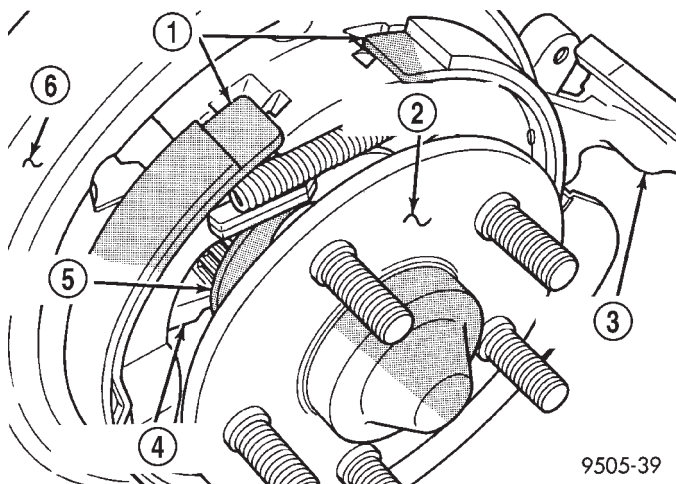


Fig. 9 Rear Wheel Speed Sensor With Drum Brakes

- 1 – BRAKE SUPPORT PLATE
- 2 – HUB/BEARING ASSEMBLY
- 3 – WHEEL SPEED SENSOR
- 4 – TONE WHEEL

Improper speed sensor-to-tone wheel clearance can cause erratic speed sensor signals. The speed sensor air gap is not adjustable, but should be checked when applicable. Wheel speed sensor-to-tone wheel clearance specifications can be found in the SPECIFICATIONS section in this section of this service manual group.

DESCRIPTION AND OPERATION (Continued)



9505-39

Fig. 10 Rear Wheel Speed Sensor With Disc Brakes

- 1 - PARKING BRAKE SHOES
- 2 - HUB/BEARING ASSEMBLY
- 3 - DISC BRAKE ADAPTER
- 4 - WHEEL SPEED SENSOR
- 5 - TONE WHEEL
- 6 - DISC SHIELD

TRACTION CONTROL SYSTEM**DESCRIPTION**

Traction control reduces wheel slip and maintains traction at the driving wheels at speeds below 80 kph (50 mph) when road surfaces are slippery. The traction control system reduces wheel slip by braking the wheel that is losing traction.

TRACTION CONTROL FUNCTION LAMP

The traction control function lamp illuminates during a traction control cycle, displaying TRAC on the instrument panel signifying the ABS is in traction control mode.

OPERATION

The CAB monitors wheel speed. During acceleration, if the CAB detects front (drive) wheel slip and the brakes are not applied, the CAB enters traction control mode. Traction control operation proceeds in the following order:

- (1) Close the normally open traction control (TC) ASR valves.
- (2) Start the pump/motor and supply volume and pressure to the front (drive) hydraulic circuit. (The

pump/motor runs continuously during traction control operation.)

- (3) Open and close the build and decay solenoid valves to maintain minimum wheel slip and maximum traction.

The cycling of the build and decay valves during traction control is similar to that during antilock braking, except the valves work to control wheel spin by applying the brakes, whereas the ABS function is to control wheel skid by releasing the brakes.

The traction control system is enabled at each ignition cycle. It may be turned off by depressing the traction control switch button.

TRACTION CONTROL FUNCTION LAMP

The traction control function lamp illuminates during a traction control cycle, displaying TRAC on the instrument panel.

The traction control function lamp (TRAC OFF) illuminates immediately upon depressing the TRAC OFF button. Pressing this button again, or turning off and restarting the vehicle will enable the traction control system.

If the CAB calculates that the brake temperatures are high, the traction control system becomes inoperative until a cool-down period has elapsed. During this "thermo-protection mode," the traction control function lamp illuminates TRAC OFF; note that no trouble code is registered.

HYDRAULIC SHUTTLE VALVES

Two pressure relief shuttle valves allow pressure and volume to return to the master cylinder reservoir when not consumed by the build and decay valves. These valves are necessary because the pump/motor supplies more volume than the system requires.

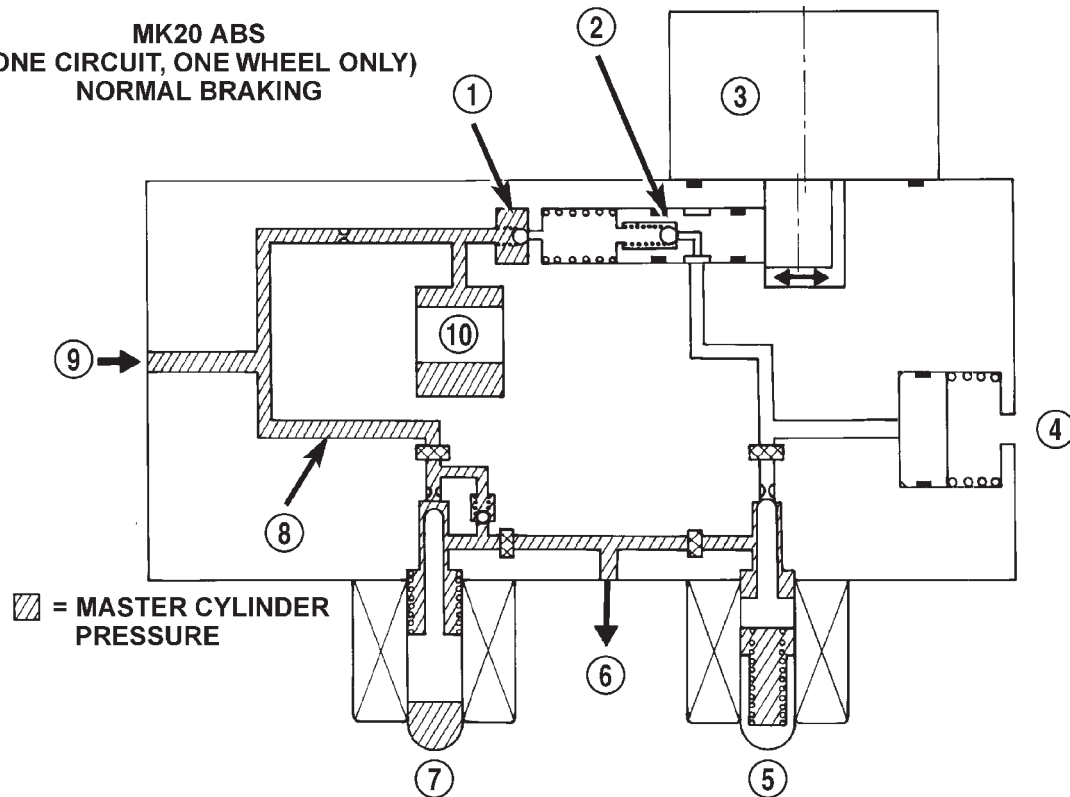
If the brakes are applied at anytime during a traction control cycle, the brake lamp switch triggers the control module to switch off traction control.

HYDRAULIC CIRCUITS AND VALVE OPERATION

The hydraulic fluid control valves control the flow of pressurized brake fluid to the wheel brakes during the different modes of ABS braking. The following paragraphs explain how this works. For purposes of explanation only, it is assumed that only the right front wheel is experiencing antilock braking; the following diagrams show only the right front wheel in an antilock braking operation.

DESCRIPTION AND OPERATION (Continued)

**MK20 ABS
(ONE CIRCUIT, ONE WHEEL ONLY)
NORMAL BRAKING**



80a89435

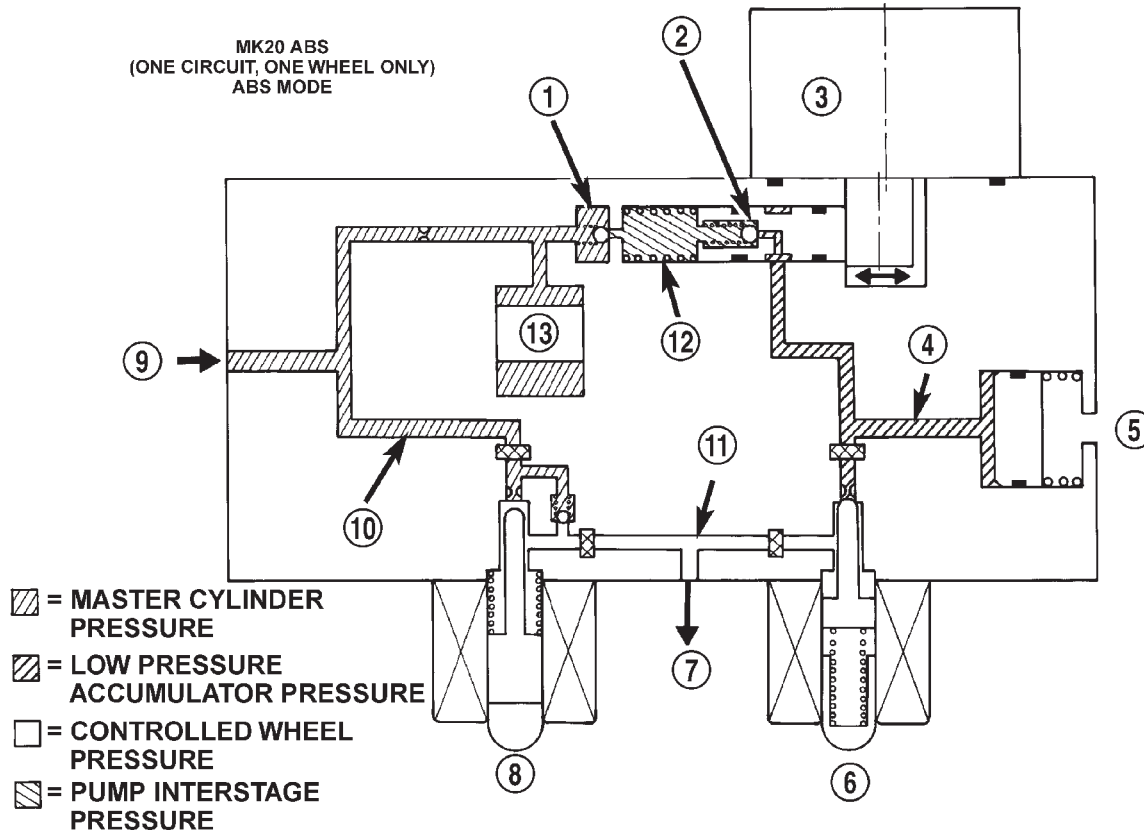
Fig. 11 Normal Braking Hydraulic Circuit

- | | |
|---------------------------------|-------------------------------|
| 1 – OUTLET VALVE | 6 – TO RIGHT FRONT WHEEL |
| 2 – PUMP PISTON | 7 – NORMALLY OPEN VALVE (OFF) |
| 3 – PUMP MOTOR (OFF) | 8 – MASTER CYLINDER PRESSURE |
| 4 – LOW PRESSURE ACCUMULATOR | 9 – FROM MASTER CYLINDER |
| 5 – NORMALLY CLOSED VALVE (OFF) | 10 – NOISE DAMPER CHAMBER |

NORMAL BRAKING HYDRAULIC CIRCUIT AND SOLENOID VALVE FUNCTION

The hydraulic diagram (Fig. 11) shows the vehicle in the normal braking mode of the base brake hydraulic system. The diagram shows no wheel spin or slip occurring relative to the speed of the vehicle. The driver is applying the brake pedal which builds pressure in the brake hydraulic system to engage the brakes and stop the vehicle.

DESCRIPTION AND OPERATION (Continued)



80a89436

Fig. 12 ABS Without Traction Control - ABS Mode Hydraulic Circuit

- | | |
|--|--------------------------------------|
| 1 - OUTLET VALVE | 8 - NORMALLY OPEN VALVE (MODULATING) |
| 2 - PUMP PISTON | 9 - FROM MASTER CYLINDER |
| 3 - PUMP MOTOR (ON) | 10 - MASTER CYLINDER PRESSURE |
| 4 - LOW PRESSURE ACCUMULATOR PRESSURE | 11 - CONTROLLED WHEEL PRESSURE |
| 5 - LOW PRESSURE ACCUMULATOR | 12 - PUMP INTERSTAGE PRESSURE |
| 6 - NORMALLY CLOSED VALVE (MODULATING) | 13 - NOISE DAMPER CHAMBER |
| 7 - TO RIGHT FRONT WHEEL | |

ABS HYDRAULIC CIRCUIT AND SOLENOID VALVE FUNCTION (ABS WITHOUT TRACTION CONTROL)

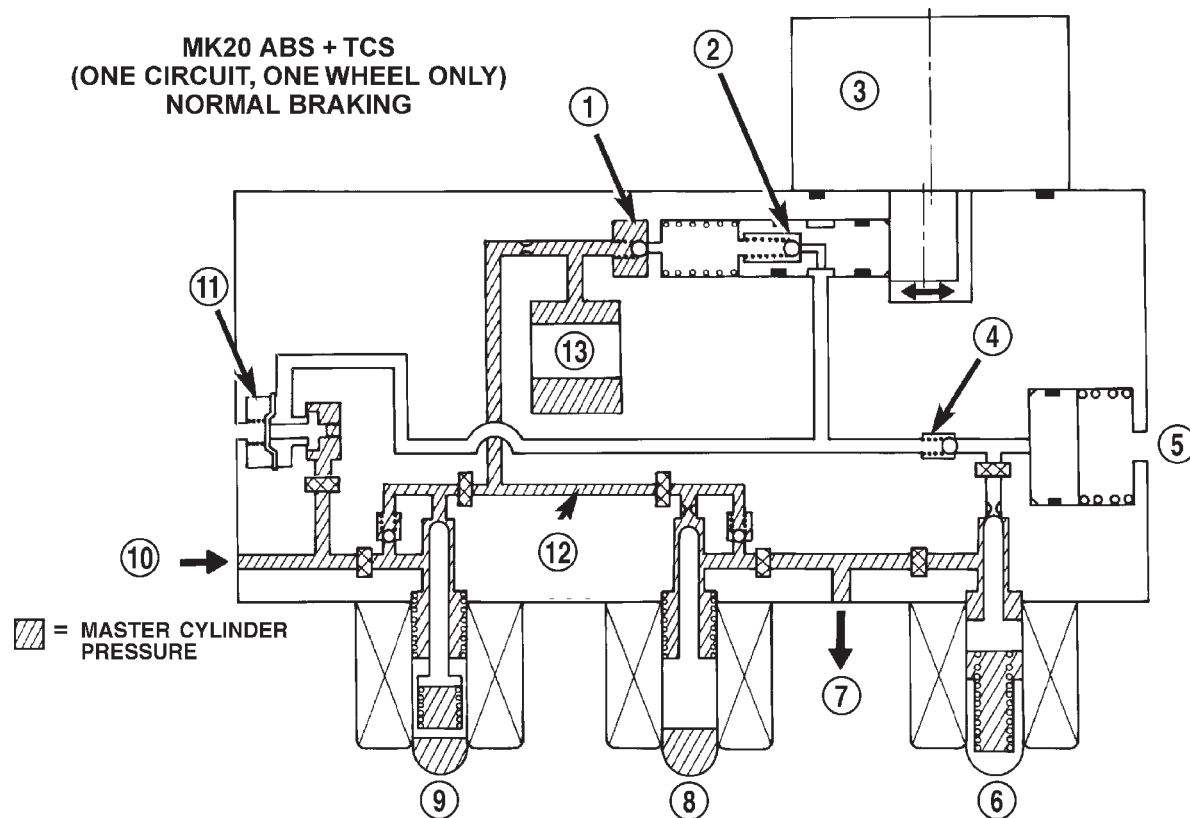
The hydraulic diagram (Fig. 12) shows the vehicle in the ABS braking mode. The diagram shows one wheel is slipping because the driver is attempting to stop the vehicle at a faster rate than is allowed by the surface on which the tires are riding.

- The normally open and normally closed valves modulate (build/decay) 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 is routed to either the master cylinder or the wheel brake depending on the position of the normally open valve.

DESCRIPTION AND OPERATION (Continued)



80a89438

Fig. 13 ABS With Traction Control - Normal Braking Hydraulic Circuit

- | | |
|---------------------------------|-----------------------------------|
| 1 - OUTLET VALVE | 8 - NORMALLY OPEN VALVE (OFF) |
| 2 - PUMP PISTON | 9 - NORMALLY OPEN ASR VALVE (OFF) |
| 3 - PUMP MOTOR (OFF) | 10 - FROM MASTER CYLINDER |
| 4 - SUCTION VALVE | 11 - HYDRAULIC SHUTTLE VALVE |
| 5 - LOW PRESSURE ACCUMULATOR | 12 - MASTER CYLINDER PRESSURE |
| 6 - NORMALLY CLOSED VALVE (OFF) | 13 - NOISE DAMPER CHAMBER |
| 7 - TO RIGHT FRONT WHEEL | |

NORMAL BRAKING HYDRAULIC CIRCUIT, SOLENOID VALVE, AND SHUTTLE VALVE FUNCTION (ABS WITH TRACTION CONTROL)

The hydraulic diagram (Fig. 13) shows a vehicle with traction control in the normal braking mode. The diagram shows no wheel spin or slip occurring

relative to the speed of the vehicle. The driver is applying the brake pedal which builds pressure in the brake hydraulic system to engage the brakes and stop the vehicle. the hydraulic shuttle valve closes with every brake pedal application so pressure is not created at the inlet to the pump/motor.

DESCRIPTION AND OPERATION (Continued)

ABS BRAKING HYDRAULIC CIRCUIT, SOLENOID VALVE, AND SHUTTLE VALVE FUNCTION (ABS WITH TRACTION CONTROL)

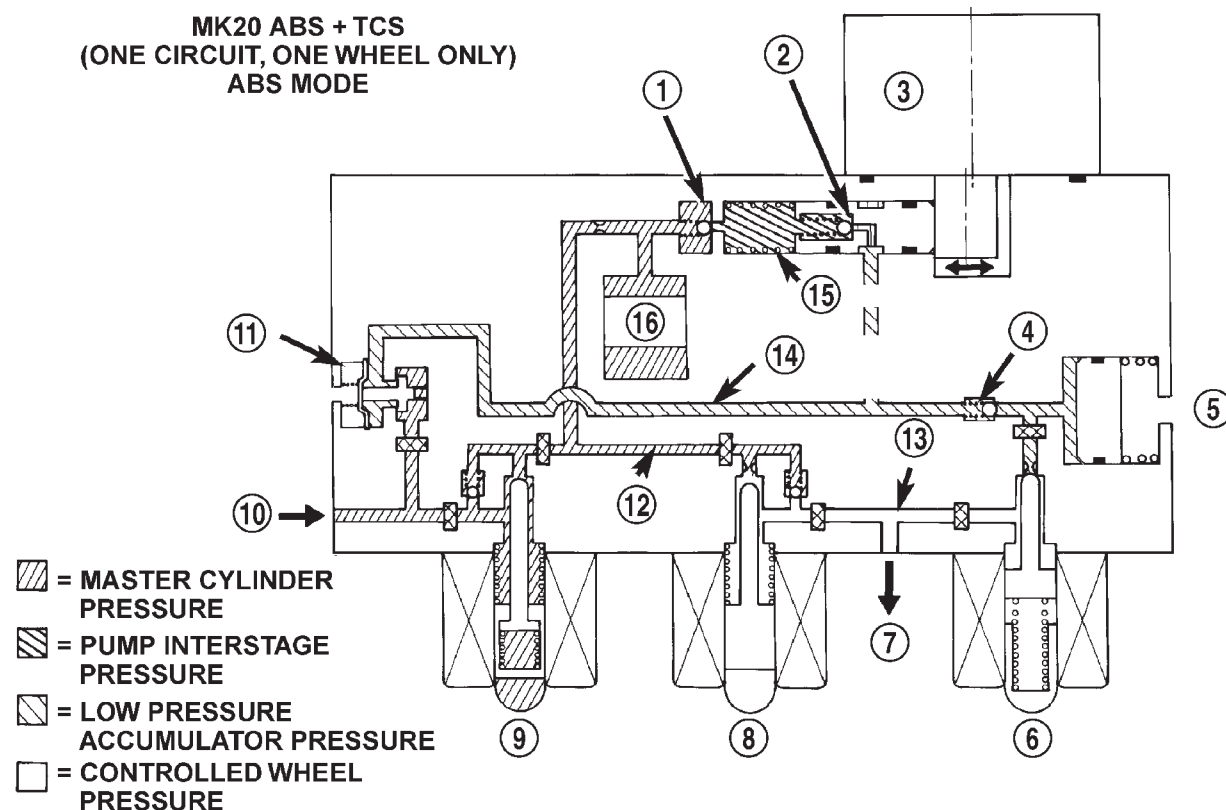
The hydraulic diagram (Fig. 14) shows the vehicle in the ABS braking mode. The diagram shows one wheel is slipping because the driver is attempting to stop the vehicle at a faster rate than is allowed by the surface on which the tires are riding.

- The hydraulic shuttle valve closes upon brake application so that the pump/motor cannot siphon brake fluid from the master cylinder.

- The normally open and normally closed valves modulate (build/decay) 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 is routed to either the master cylinder or the wheel brake depending on the position of the normally open valve.



80a89439

Fig. 14 ABS With Traction Control - ABS Mode Hydraulic Circuit

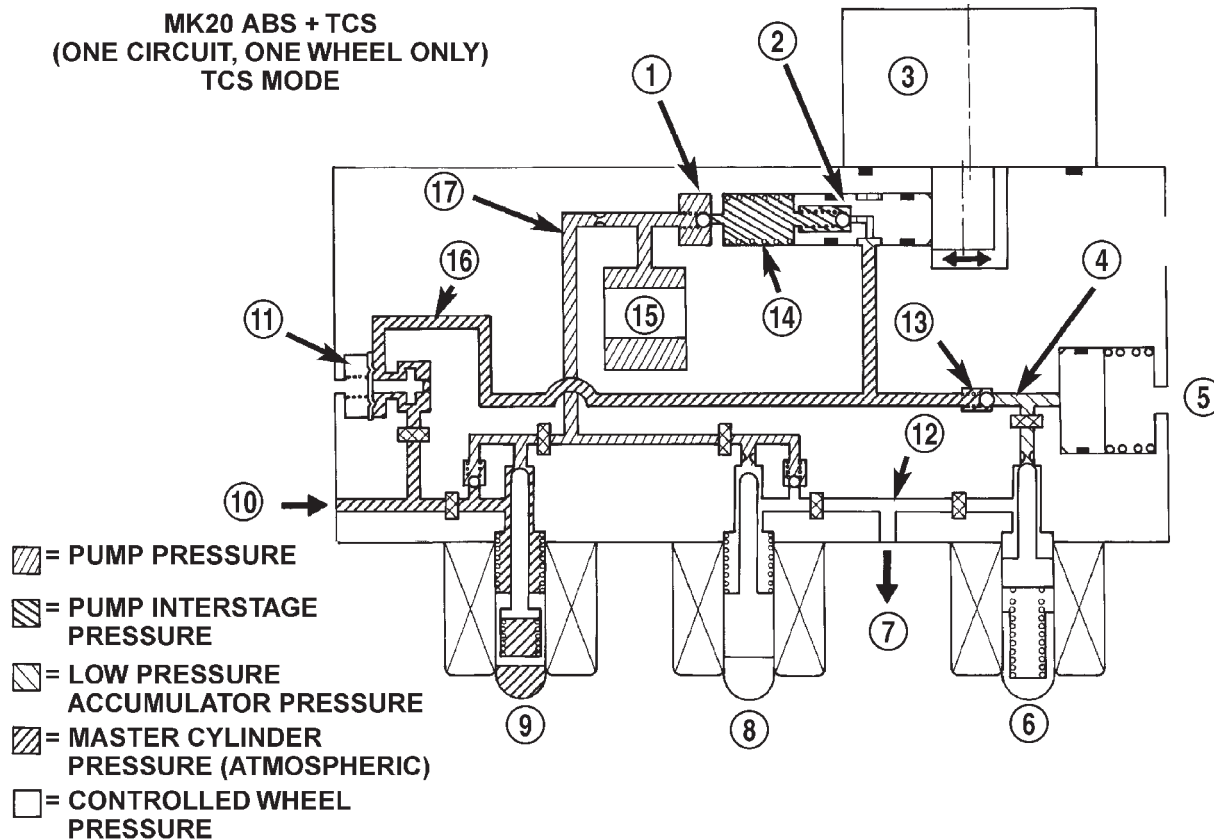
- | | |
|--|--|
| 1 - OUTLET VALVE | 9 - NORMALLY OPEN ASR VALVE (OFF) |
| 2 - PUMP PISTON | 10 - FROM MASTER CYLINDER |
| 3 - PUMP MOTOR (ON) | 11 - HYDRAULIC SHUTTLE VALVE |
| 4 - SUCTION VALVE | 12 - MASTER CYLINDER PRESSURE |
| 5 - LOW PRESSURE ACCUMULATOR | 13 - CONTROLLED WHEEL PRESSURE |
| 6 - NORMALLY CLOSED VALVE (MODULATING) | 14 - LOW PRESSURE ACCUMULATOR PRESSURE |
| 7 - TO RIGHT FRONT WHEEL | 15 - PUMP INTERSTAGE PRESSURE |
| 8 - NORMALLY OPEN VALVE (MODULATING) | 16 - NOISE DAMPER CHAMBER |

DESCRIPTION AND OPERATION (Continued)

ABS TRACTION CONTROL HYDRAULIC CIRCUIT, SOLENOID VALVE, AND SHUTTLE VALVE FUNCTION (ABS WITH TRACTION CONTROL)

The hydraulic diagram (Fig. 15) shows the vehicle in the ABS braking mode. The diagram shows a drive wheel is spinning and brake pressure is required to reduce its speed.

- The normally open ASR valve is energized to isolate the brake fluid being pumped from the master cylinder and to isolate the driven wheel.
- 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 modulate (build/decay) the brake pressure as required to the spinning wheel.



80a91010

Fig. 15 Traction Control Hydraulic Circuit

- | | |
|---|--------------------------------|
| 1 - OUTLET VALVE | 10 - FROM MASTER CYLINDER |
| 2 - PUMP PISTON | 11 - HYDRAULIC SHUTTLE VALVE |
| 3 - PUMP MOTOR (ON) | 12 - CONTROLLED WHEEL PRESSURE |
| 4 - LOW PRESSURE ACCUMULATOR PRESSURE | 13 - SUCTION VALVE |
| 5 - LOW PRESSURE ACCUMULATOR | 14 - PUMP INTERSTAGE PRESSURE |
| 6 - NORMALLY CLOSED VALVE (MODULATING) | 15 - NOISE DAMPER CHAMBER |
| 7 - TO RIGHT FRONT WHEEL (SPINNING) | 16 - MASTER CYLINDER PRESSURE |
| 8 - NORMALLY OPEN VALVE (MODULATING) | 17 - PUMP PRESSURE |
| 9 - NORMALLY OPEN ASR VALVE ON (REGULATING) | |

DIAGNOSIS AND TESTING

SERVICE WARNINGS AND CAUTIONS

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.

CAUTION: 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.

CAUTION: These circuits should only be tested using a high impedance multi-meter or the DRB scan tool 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 GENERAL DIAGNOSTICS INFORMATION

This section contains information necessary to diagnose the antilock brake system. Specifically, this section should be used to help diagnose conditions which result in any of the following:

- (1) amber ABS warning lamp turned on.
- (2) brakes lock-up on hard application.

Diagnosis of base brake conditions that are obviously mechanical in nature should be directed to BASE BRAKE SYSTEM at the beginning of this group.

Many ABS conditions judged to be a problem by the driver may be normal operating conditions. See ABS OPERATION in the DESCRIPTION AND OPERATION section of this group to become familiarized with the normal characteristics of this antilock brake system.

ABS WIRING DIAGRAM INFORMATION

During the diagnosis and testing 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 GROUP 8W of this service manual. It will provide you with the wiring diagrams and the circuit description and operation information covering the antilock brake system.

ABS VEHICLE TEST DRIVE

Most ABS complaints will require a test drive to properly duplicate and diagnose the condition.

WARNING: CONDITIONS THAT RESULT IN TURNING ON THE RED BRAKE WARNING LAMP MAY INDICATE REDUCED BRAKING ABILITY.

Before test driving a brake complaint vehicle, note whether the red BRAKE warning lamp, amber ABS warning lamp, or both are turned on. If it is the red BRAKE warning lamp, there is a brake hydraulic problem that must be corrected before driving the vehicle. Refer to the BASE BRAKE SYSTEM for diagnosis of the red BRAKE warning lamp. If the red brake warning lamp is illuminated, there is also a possibility that there is an ABS problem and the amber ABS warning lamp is not able to illuminate, so the CAB turns on the red Brake warning lamp by default.

If the amber ABS warning lamp is on, test drive the vehicle as described below. While the amber ABS warning lamp is on, the ABS is not functional. The ability to stop the car using the base brake system should not be affected.

If a functional problem of the ABS is determined while test driving the vehicle, refer to the Chassis Diagnostic Procedures manual.

(1) Turn the key to the OFF position and then back to the ON position. Note whether the amber ABS warning lamp continues to stay on. If it does, refer to the diagnostic manual.

(2) If the amber ABS warning lamp goes out, shift into gear and drive the car to a speed of 25 kph (15 mph) to complete the ABS start-up and drive-off cycles (see ABS ELECTRONIC DIAGNOSIS). If at this time the amber ABS warning lamp comes on, refer to the diagnostic manual.

(3) If the amber ABS warning lamp remains out, drive the vehicle a short distance. Accelerate the vehicle to a speed of at least 40 mph. Bring the vehicle to a complete stop, braking hard enough to cause the ABS to cycle. Again accelerate the vehicle past 25 mph. Refer to the diagnostic manual for further testing of the antilock brake system.

DIAGNOSIS AND TESTING (Continued)

ABS ELECTRONIC DIAGNOSIS

The following information is presented to give the technician a general background on the diagnostic capabilities of the ABS system. Complete electronic diagnosis of the ABS system used on this vehicle is covered in the Chassis Diagnostics Procedures manual.

Electronic diagnosis of the ABS used on this vehicle is performed using the DRB scan tool. The vehicle's scan tool diagnostic connector is located under the instrument panel, directly next to the left side kick panel (Fig. 16).

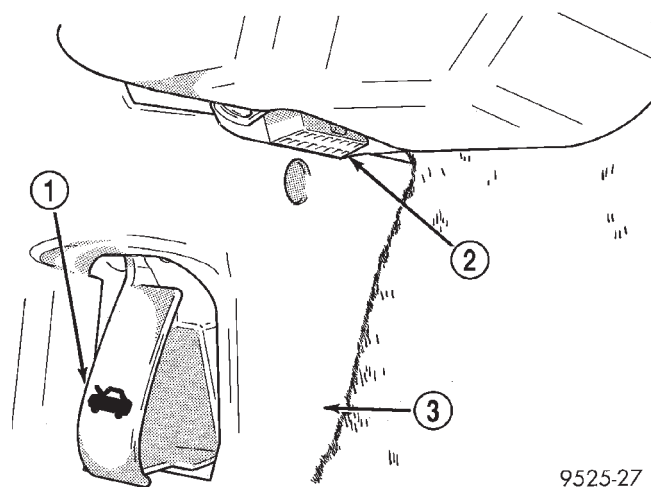


Fig. 16 ABS System Diagnostic Connector Location

- 1 - HOOD RELEASE
- 2 - DIAGNOSTIC CONNECTOR
- 3 - DRIVER'S SIDE KICK PANEL

ABS SELF-DIAGNOSIS

The ABS system is equipped with a self-diagnosis capability, which may be used to assist in the isolation of ABS faults. The features are described below.

START-UP CYCLE

The self-diagnosis ABS start-up cycle begins when the ignition switch is turned to the ON position. Electrical checks are completed on ABS components, including the CAB, system power, wiring and wheel speed sensors. During this check the amber ABS warning lamp is turned on for approximately 5 seconds and the brake pedal may emit a popping sound, moving slightly when the solenoid valves are checked.

DRIVE-OFF CYCLE

The first time the vehicle is set in motion after an ignition off/on cycle, the drive-off cycle occurs. This cycle is performed when the vehicle reaches a speed of approximately 25 kph (15 mph.). If the brakes are in a state of application as the vehicle reaches and surpasses the speed of 25 kph (15 mph.), the drive-off cycle will occur when the vehicle reaches a speed of

approximately 40 kph (24 mph.) regardless of brake (or brake pedal) application.

- The pump/motor is briefly activated to verify function. When the pump/motor is briefly activated, a whirling or buzzing sound may be heard by the driver. This sound is normal, indicating the pump/motor is running.
- The wheel speed sensor output correct operating range is verified.

ONGOING TESTS

While the system is operating, these tests are performed on a continuous basis:

- solenoid continuity
- wheel speed sensor continuity
- wheel speed sensor output
- system voltage
- CAB self-diagnosis
- CCD monitor

DIAGNOSTIC TROUBLE CODES (DTC's)

Diagnostic trouble codes (DTC's) are kept in the controller's memory until either erased by the technician using the DRB, or erased automatically after 3500 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. When accessed, the number of occurrences and the DTC that is stored are displayed. Most functions of the CAB and the ABS system can be accessed by the technician for testing and diagnostic purposes using the DRB.

LATCHING VERSUS NON-LATCHING DIAGNOSTIC TROUBLE CODES

Some DTC's detected by the CAB are "latching" codes. 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 lamps that are turned on are only turned on as long as the DTC condition exists; as soon as the condition goes away, the amber ABS warning lamp is turned off, although, in most cases, a DTC is set.

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. A visual inspection should be done before trying to diagnose or service the antilock brake system; this will eliminate unnecessary diagnosis and testing time. Perform a visual inspection for loose, disconnected, damaged, or misrouted wires or connectors; include the following components and areas of the vehicle in the inspection.

DIAGNOSIS AND TESTING (Continued)

(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.

(2) Inspect the 25-way electrical connector at the CAB for damaged, spread, or backed-out wiring terminals. Verify that the 25-way connector is fully inserted in the socket of 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) Look for poor mating of connector halves or terminals not fully seated in the connector body.

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

(6) Look for poor terminal-to-wire connections. This requires removing the terminal from the connector body to inspect it.

(7) Verify pin presence in the connector assembly

(8) Check for proper ground connections. Check all ground connections for signs of corrosion, loose fasteners, or other potential defects. Refer to the wiring diagrams for ground locations.

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

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

Most failures of the ABS disable the ABS function for the entire ignition cycle even if the fault clears before key-off. There are some failure conditions, however, that allow ABS operation to resume during the ignition cycle in which the trouble occurred even if the trouble conditions are no longer present.

The following trouble conditions may result in intermittent illumination of the amber ABS warning lamp.

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

Additional possible causes that may result in the illumination of the amber ABS warning lamp are as follows:

- High system voltage. If high system voltage is detected by the CAB, the CAB will turn on the Amber ABS Warning Lamp. If the ignition key is cycled and normal voltage is again detected by the

CAB, normal ABS operation resumes and the lamp remains off.

- Any condition that interrupts electrical current to the CAB may cause the amber ABS warning lamp to turn on intermittently.

- If CCD communication between the mechanical instrument cluster (MIC) and the CAB is interrupted, the MIC can turn on the amber ABS warning lamp.

tone wheel

Tone wheels can cause erratic wheel speed sensor signals. Inspect tone wheels for the following possible causes:

- missing, chipped, or broken teeth
- contact with the wheel speed sensor
- wheel speed sensor to tone wheel alignment
- wheel speed sensor to tone wheel clearance
- excessive tone wheel runout
- tone wheel loose on its mounting surface

If a front tone wheel is found to need replacement, the drive shaft must be replaced. No attempt should be made to replace just the tone wheel. Refer to the DIFFERENTIAL AND DRIVELINE group in this service manual for removal and installation.

If a rear tone wheel is found to need replacement, the rear hub and bearing must be replaced. No attempt should be made to replace just the tone wheel. Refer to the SUSPENSION group in this service manual for removal and installation.

If wheel speed sensor to tone wheel contact is evident, determine the cause and correct it before replacing the wheel speed sensor or tone wheel.

Check the gap between the speed sensor head and the tone wheel to ensure it is within specifications. Refer to SPECIFICATIONS in this section of the service manual for the minimum and maximum wheel speed sensor to tone wheel clearance.

Excessive wheel speed sensor runout can cause erratic wheel speed sensor signals. Refer to SPECIFICATIONS in this section of the service manual for the maximum allowed tone wheel runout. If tone wheel runout is excessive, determine if it is caused by a defect in the driveshaft assembly or hub and bearing. Replace as necessary.

Tone wheels are pressed onto their mounting surfaces and should not rotate independently from the mounting surface. Replacement of the front driveshaft or rear hub and bearing is necessary.

DIAGNOSIS AND TESTING (Continued)

PROPORTIONING VALVE

NOTE: The following procedure is for the diagnosis and testing of the proportioning valve(s) on a vehicle equipped with ABS. For diagnosis and testing of proportioning valves on a vehicle without ABS, Refer to the BASE BRAKE SYSTEM section in this group.

If a condition of premature rear wheel skid occurs on a vehicle, the proportioning valve should always be tested prior to it being replaced. This is due to the fact that there are conditions other than a faulty proportioning valve which can cause a premature rear wheel skid.

One proportioning valve controls the right rear brake, and the other proportioning valve controls the left rear brake (Fig. 17). Therefore, a road test to determine which rear brake slides first is essential. Once the wheel which is skidding first is determined, use the following procedure to diagnose the proportioning valve.

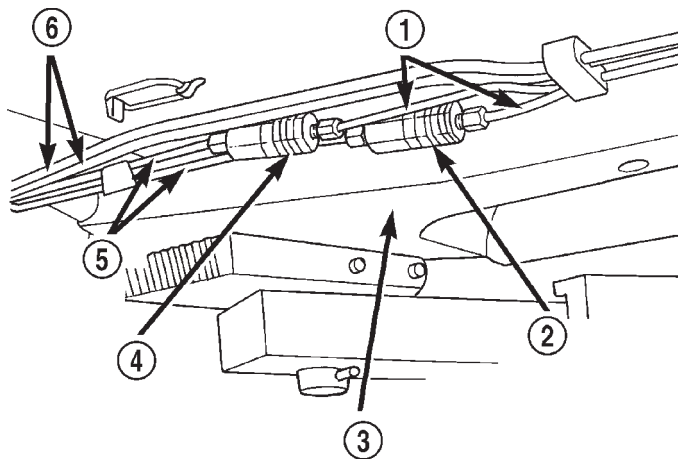


Fig. 17 Proportioning Valve Location

- 1 - CHASSIS BRAKE TUBES
- 2 - RIGHT REAR BRAKE PROPORTIONING VALVE
- 3 - RIGHT FRAME RAIL
- 4 - LEFT REAR BRAKE PROPORTIONING VALVE
- 5 - CHASSIS BRAKE TUBES
- 6 - FUEL TUBES

The test procedure is the same for both rear wheel proportioning valves. After road testing vehicle to determine which wheel skids first, follow the procedure below for testing the required proportioning valve.

(1) Remove the cover (Fig. 18) securing the chassis brake tubes and the fuel lines to the vehicle floor pan.

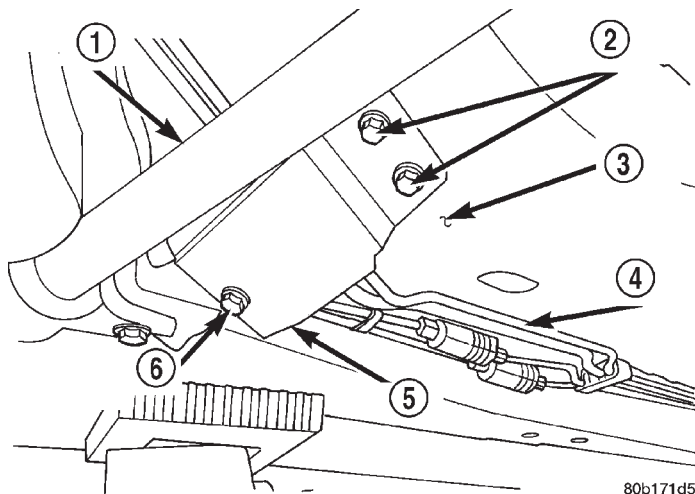


Fig. 18 Tube Bundle Cover

- 1 - STABILIZER BAR
- 2 - MOUNTING BOLTS
- 3 - FLOOR PAN
- 4 - TUBE BUNDLE
- 5 - COVER
- 6 - MOUNTING BOLT

(2) Remove the chassis brake tubes (Fig. 17) from the proportioning valve controlling the rear wheel of the vehicle which has premature wheel skid.

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

(4) Remove the routing clips for the chassis brake tubes and fuel lines from the floor pan.

CAUTION: The chassis brake tube must be removed from the routing clips. This is to prevent the chassis brake tube from having to be bent when installing the proportioning valve with the pressure test fittings.

(5) Remove the chassis brake tube that requires testing of its proportioning valve from the routing clips.

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

DIAGNOSIS AND TESTING (Continued)

(6) Install Pressure Test Fitting, Special Tool 6833-1 in the inlet port of the proportioning valve (Fig. 19). Install Pressure Test Fitting, Special Tool 8187-2 in the outlet port of the proportioning valve (Fig. 19). Tighten tube nuts to a torque of 17 N·m (145 in. lbs.).

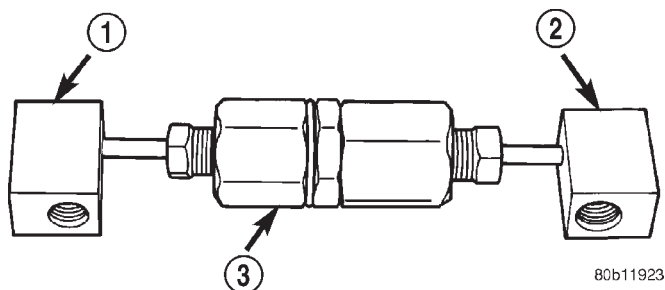


Fig. 19 Pressure Test Fittings Installed On Proportioning Valve

- 1 - SPECIAL TOOL 8187-2
- 2 - SPECIAL TOOL 6833-1
- 3 - PROPORTIONING VALVE

(7) Install the proportioning valve with the pressure test fittings installed, in the chassis brake tube (Fig. 20). Tighten both tube nuts to a torque of 17 N·m (145 in. lbs.).

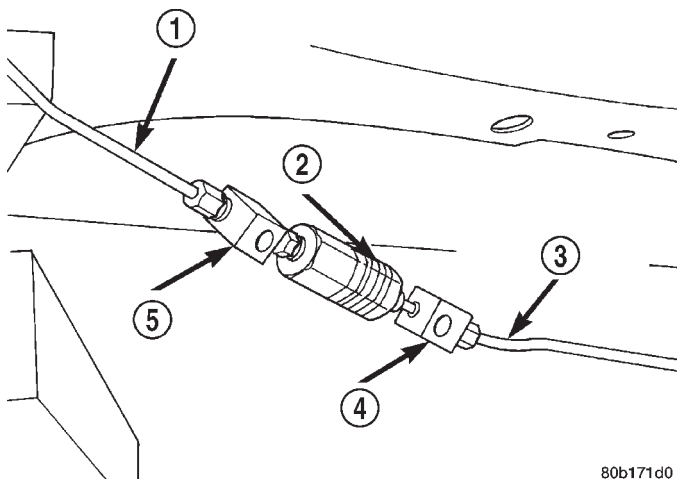


Fig. 20 Proportioning Valve With Pressure Test Fittings Installed

- 1 - CHASSIS BRAKE TUBE FROM HCU
- 2 - PROPORTIONING VALVE
- 3 - CHASSIS BRAKE TUBE TO REAR BRAKE
- 4 - SPECIAL TOOL 8187-2
- 5 - SPECIAL TOOL 6833-1

(8) Install a Pressure Gauge, Special Tool C-4007-A into each pressure test fitting (Fig. 21). Bleed air out of hose from pressure test fitting to pressure gauge, at pressure gauge to remove all trapped air.

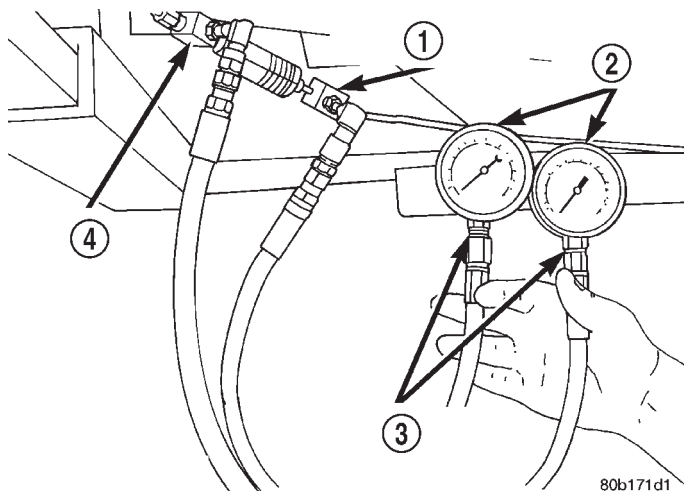


Fig. 21 Pressure Gauges Installed On Pressure Test Fittings

- 1 - PRESSURE TEST FITTING
- 2 - SPECIAL TOOL C-4007-A
- 3 - BLEED AIR FROM BOTH PRESSURE GAUGES HERE
- 4 - PRESSURE TEST FITTING

(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, PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS. 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) Check 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.

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

(12) Install brake tube on proportioning valve. Torque tube nut to 17 N·m (145 in. lbs.) torque.

(13) Bleed the affected brake line. Refer to BASE BRAKE BLEEDING in the SERVICE PROCEDURES section.

DIAGNOSIS AND TESTING (Continued)

PROPORTIONING VALVE APPLICATIONS AND PRESSURE SPECIFICATIONS

Sales Code	Brake System Type	Split Point	Slope	Identification	Inlet Pressure	Outlet Pressure
BRA	14" Disc/Drum	600 psi	0.59	Bar Code Label	1000 psi	800-900 psi
BRJ	14" Disc/Drum W/ABS	600 psi	0.59	Bar Code Label	1000 psi	800-900 psi
BRF	14" Disc/Disc W/ABS	500 psi	0.43	Bar Code Label	1000 psi	600-700 psi

BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts. Swelling indicates 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 the fluid separates into layers, there is mineral oil or other fluid contamination of the brake fluid.

If the brake fluid is contaminated, drain and thoroughly flush the brake system. Replace all the rubber parts or components containing rubber coming into contact with the brake fluid including: the master cylinder; proportioning valves; caliper seals; wheel cylinder seals; ABS hydraulic control unit; and all hydraulic fluid hoses.

SERVICE PROCEDURES**BRAKE FLUID LEVEL CHECKING**

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.

Refer to SERVICE PROCEDURES in the BASE BRAKE SYSTEM section in this group for the proper procedure to check and adjust the brake fluid level in the master cylinder fluid reservoir.

ANTILOCK BRAKE SYSTEM BLEEDING

The base brake's hydraulic system must be bled anytime air enters the hydraulic system. The ABS though, particularly the ICU (HCU), should only be bled when the HCU is replaced or removed from the vehicle. The ABS must always be bled anytime it is suspected that the HCU 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 ABS must be bled as two independent braking systems. The non-ABS portion of the brake system with ABS is to be bled the same as any non-ABS system.

The ABS portion of the brake system must be bled separately. Use the following procedure to properly bleed the brake hydraulic system including the ABS.

BLEEDING

When bleeding the ABS system, the following bleeding sequence must be followed to insure complete and adequate bleeding.

(1) Make sure all hydraulic fluid lines are installed and properly torqued.

(2) Connect the DRB scan tool to the diagnostics connector. The diagnostic connector is located under the lower steering column cover to the left of the steering column.

(3) Using the DRB, check to make sure the CAB does not have any fault codes stored. If it does, clear 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 YOURSELF AND THE PAINTED SURFACES OF THE VEHICLE. BRAKE FLUID AT HIGH PRESSURE MAY COME OUT OF THE BLEEDER SCREWS WHEN OPENED.

SERVICE PROCEDURES (Continued)

(4) Bleed the base brake system using the standard pressure or manual bleeding procedure as outlined in SERVICE PROCEDURES in the BASE BRAKE SYSTEM section at the beginning of this group.

(5) Using the DRB, select ANTILOCK BRAKES, followed by MISCELLANEOUS, then BLEED BRAKES. Follow the instructions displayed. When the scan tool displays TEST COMPLETED, disconnect the scan tool and proceed.

(6) Bleed the base brake system a second time. Check brake fluid level in the reservoir periodically to prevent emptying, causing air to enter the hydraulic system.

(7) Fill the master cylinder reservoir to the full level.

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

REMOVAL AND INSTALLATION

SERVICE WARNINGS AND CAUTIONS

Review this entire section prior to performing any mechanical work on a vehicle equipped with ABS. 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: An attempt 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.

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.

CAUTION: 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.

CAUTION: 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.

INTEGRATED CONTROL UNIT

NOTE: Before proceeding, review SERVICE WARNINGS AND CAUTIONS at the beginning of this REMOVAL AND INSTALLATION section.

REMOVAL

(1) Remove the remote ground cable from the ground stud on the left strut tower (Fig. 22).

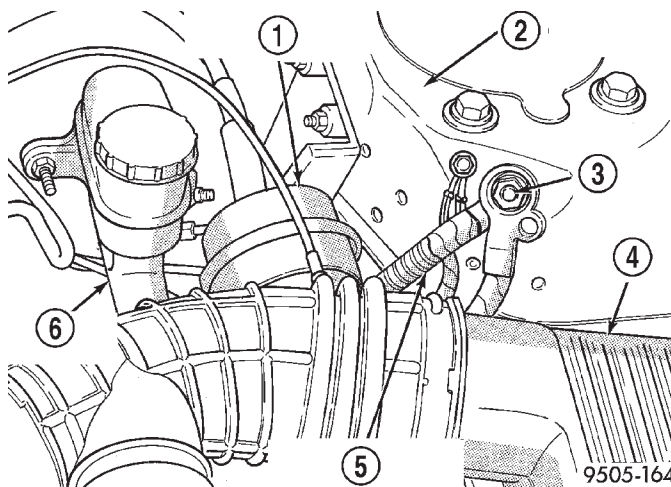


Fig. 22 Remote Ground Cable Attachment To Strut Tower

- 1 - SPEED CONTROL SERVO
- 2 - LEFT STRUT TOWER
- 3 - GROUND STUD
- 4 - AIR CLEANER
- 5 - REMOTE GROUND CABLE
- 6 - MASTER CYLINDER

REMOVAL AND INSTALLATION (Continued)

(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. 23) and installing the nut on the stud. **This will prevent accidental grounding of the remote ground cable.**

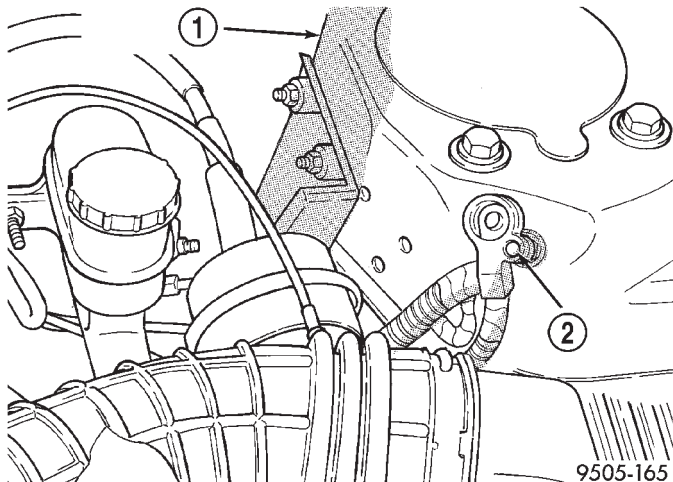


Fig. 23 Correctly Isolated Remote Ground Cable

- 1 - LEFT STRUT TOWER
- 2 - GROUND STUD

(3) Using a brake pedal positioning tool such as shown in (Fig. 24) 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.

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

(5) Remove the splash shield (Fig. 25) from the right side of the engine compartment.

(6) Remove entire exhaust system from the vehicle as a complete assembly using the following steps.

(a) Disconnect the oxygen sensor wiring harnesses from the vehicle wiring harness.

(b) Remove the ground strap between the frame and muffler at the muffler bracket.

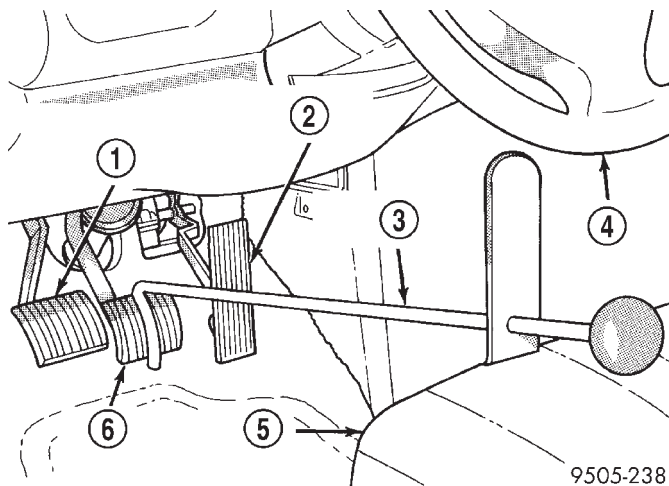


Fig. 24 Brake Pedal Holding Tool Installed

- 1 - CLUTCH PEDAL (IF EQUIPPED WITH MANUAL TRANSAXLE)
- 2 - THROTTLE PEDAL
- 3 - BRAKE PEDAL HOLDING TOOL
- 4 - STEERING WHEEL
- 5 - DRIVER'S SEAT
- 6 - BRAKE PEDAL

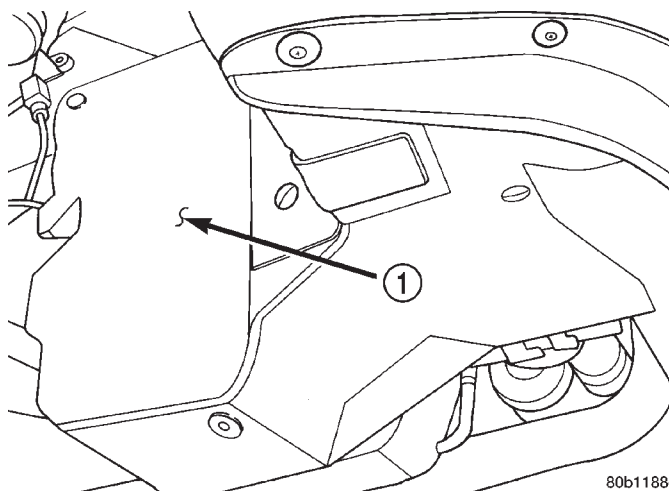
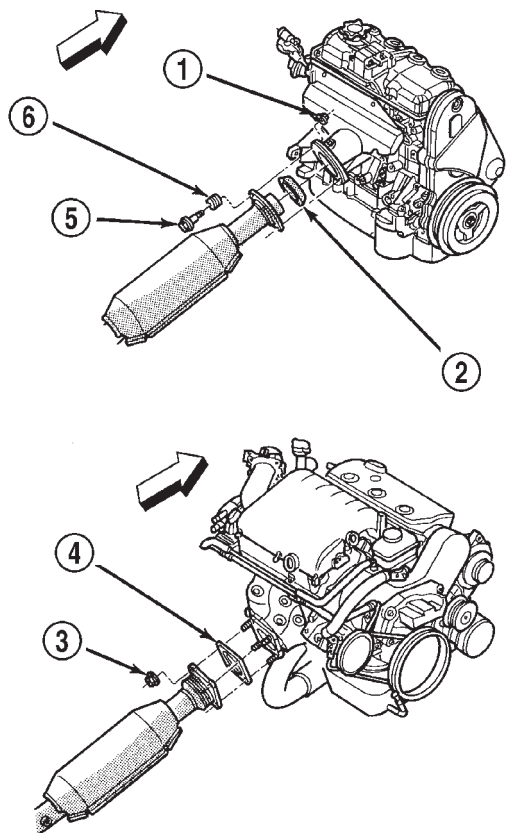


Fig. 25 Right Side Splash Shield

- 1 - SPLASH SHIELD

REMOVAL AND INSTALLATION (Continued)

(c) Remove attaching bolts from exhaust pipe at exhaust manifold on engine (Fig. 26).



9511-33

Fig. 26 Exhaust Pipe Mounting To Exhaust Manifold

- 1 - NUTS
- 2 - SEAL RING
- 3 - NUTS 32 N·M (24 FT. LBS.)
- 4 - GASKET
- 5 - SHOULDER BOLT 28 N·M (250 IN. LBS.)
- 6 - SPRING

(d) Remove all exhaust system support/isolators from the vehicle's exhaust system (Fig. 27). Remove support/isolators from brackets on exhaust system components and leave attached to body of vehicle.

(e) Lower exhaust system as a complete assembly away from the underbody of the vehicle.

(7) Remove the heat shield for the HCU from the HCU mounting bracket (Fig. 28).

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

(9) Remove the 4 chassis brake tubes from the outlet ports on the HCU (Fig. 29).

(10) Remove the primary and secondary brake tubes coming from the master cylinder from the HCU inlet ports (Fig. 30).

(11) Remove the bolt (Fig. 31) attaching the front leg of the HCU mounting bracket to the front suspension crossmember.

(12) Remove the 2 bolts (Fig. 32) attaching the back legs of the HCU mounting bracket to the front suspension crossmember.

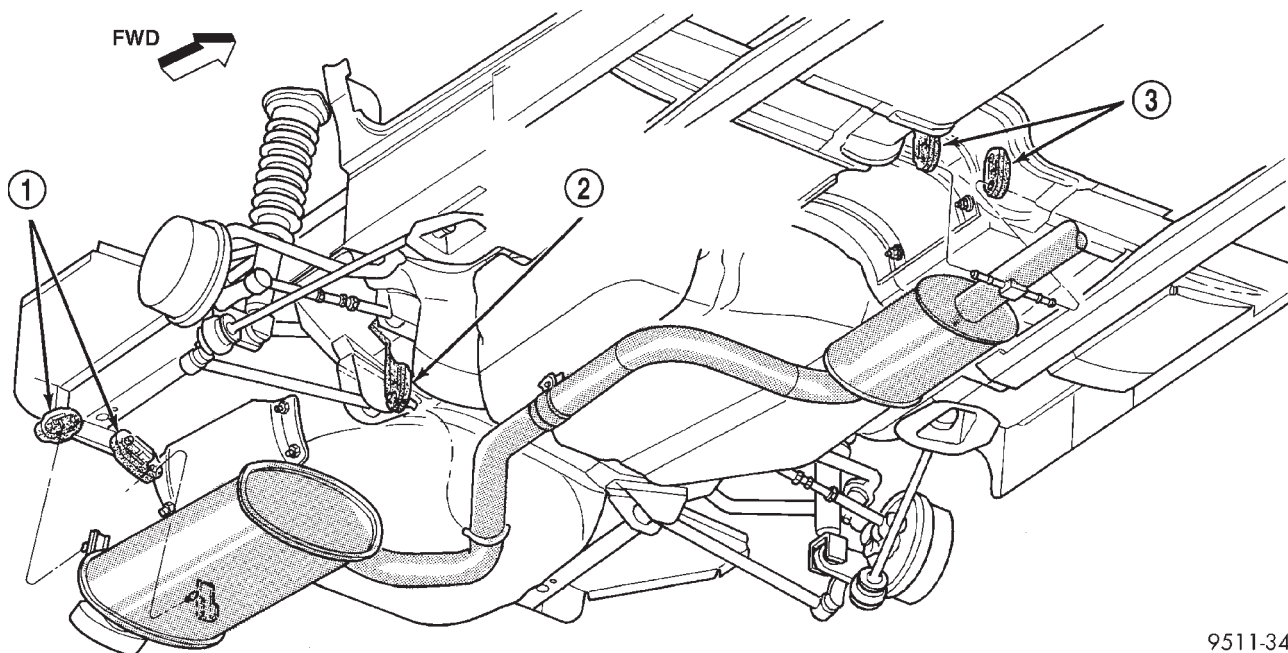
(13) Remove bolt (Fig. 33) attaching the side of the HCU to the mounting bracket.

(14) Remove the 2 bolts (Fig. 34) attaching the top of the HCU to the mounting bracket.

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

(15) Disconnect the 25-way wiring harness connector from the CAB using the following procedure. Grasp the lock on the 25-way connector and pull it out from the connector as far as possible (Fig. 35). This will unlock and raise the 25-way connector out of the socket on the CAB.

REMOVAL AND INSTALLATION (Continued)

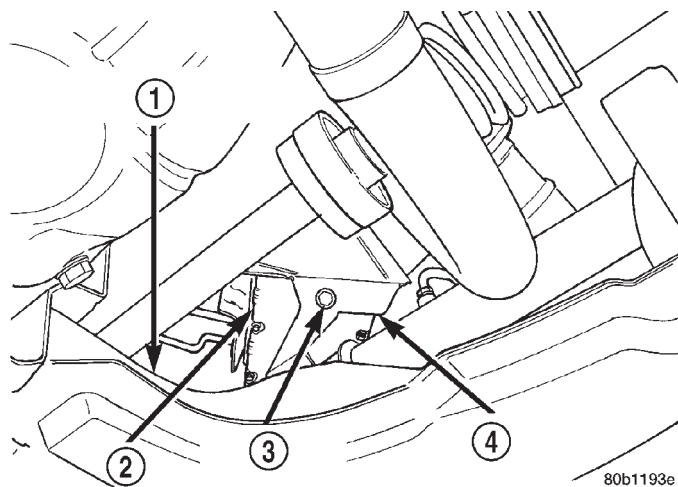


9511-34

Fig. 27 Exhaust System Support/Isolator Locations

- 1 - REAR MUFFLER SUPPORT ISOLATORS
2 - FRONT MUFFLER SUPPORT ISOLATOR

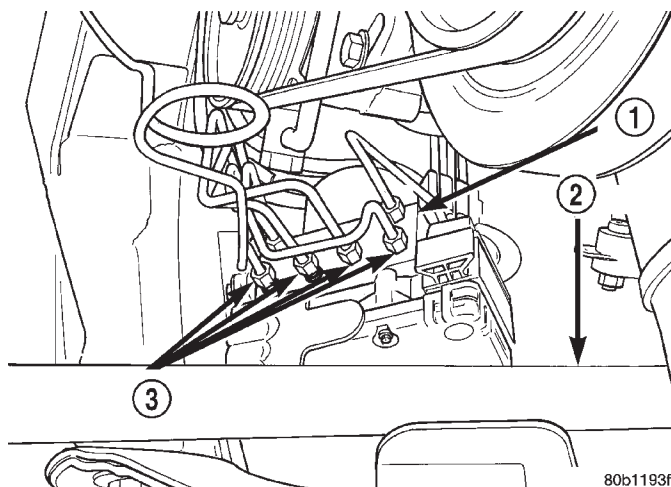
- 3 - RESONATOR SUPPORT ISOLATORS



80b1193e

Fig. 28 HCU Heat Shield

- 1 - FRONT SUSPENSION CROSSMEMBER
2 - HCU
3 - BOLT
4 - HEAT SHIELD



80b1193f

Fig. 29 Chassis Brake Tube Connections To HCU

- 1 - HCU
2 - DRIVESHAFT
3 - CHASSIS BRAKE TUBES

REMOVAL AND INSTALLATION (Continued)

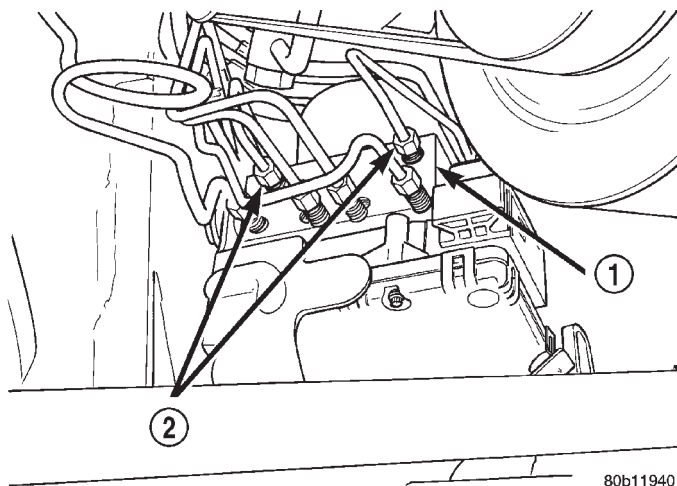


Fig. 30 Master Cylinder Brake Tube Connections To HCU

- 1 - HCU
- 2 - MASTER CYLINDER BRAKE TUBES

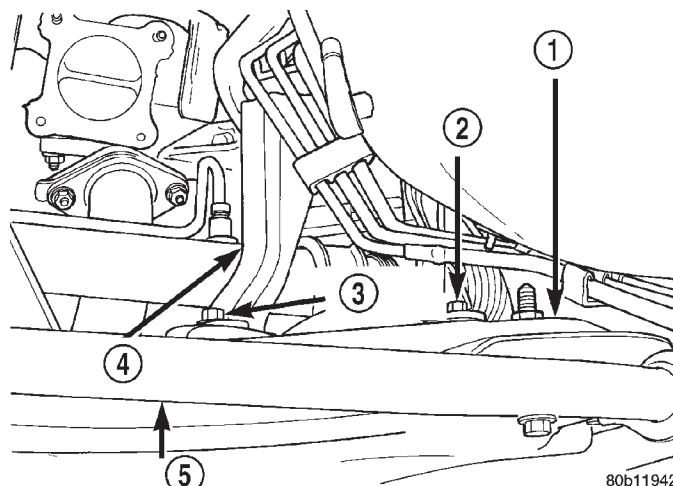


Fig. 32 HCU Mounting Bracket Rear Bolts

- 1 - FRONT SUSPENSION CROSSMEMBER
- 2 - MOUNTING BOLT
- 3 - MOUNTING BOLT
- 4 - HCU MOUNTING BRACKET
- 5 - STABILIZER BAR

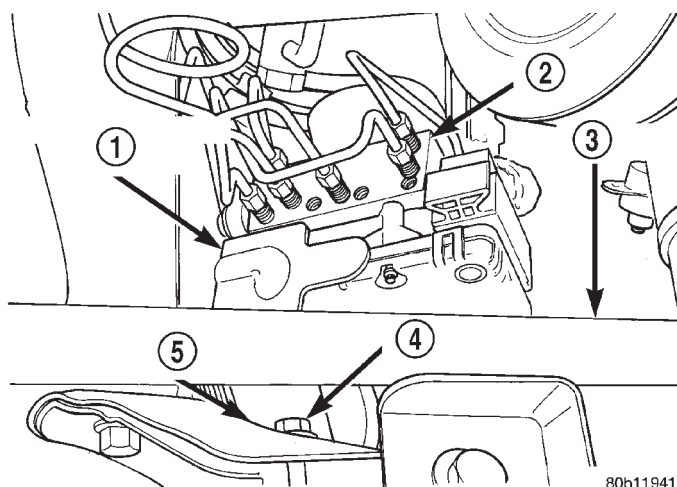


Fig. 31 HCU Mounting Bracket Front Bolt

- 1 - HCU MOUNTING BRACKET
- 2 - HCU
- 3 - DRIVESHAFT
- 4 - BOLT
- 5 - FRONT SUSPENSION CROSSMEMBER

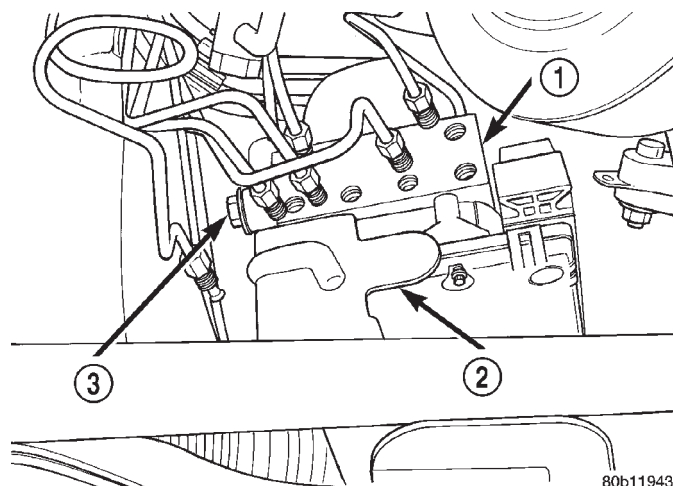


Fig. 33 HCU To Bracket Mounting Bolt

- 1 - HCU
- 2 - MOUNTING BRACKET
- 3 - MOUNTING BOLT

(16) Remove the ICU from its mounting bracket. Then remove the ICU from the vehicle by pulling it out through the area between the right drive shaft and frame rail (Fig. 36).

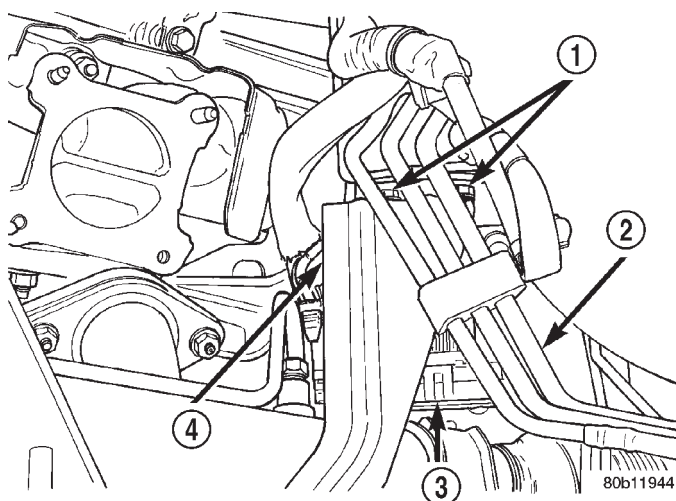
(17) Refer to INTEGRATED CONTROL UNIT in DISASSEMBLY AND ASSEMBLY within this section to separated the CAB from the HCU.

INSTALLATION

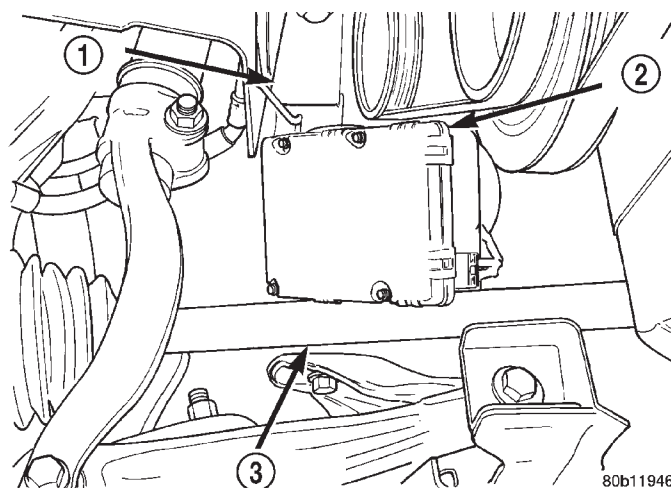
(1) Install the ICU back in the vehicle and on its mounting bracket using the reverse order of its removal.

(2) Install isolators, washers and attaching bolts, mounting the ICU to its mounting bracket (Fig. 33) and (Fig. 34).

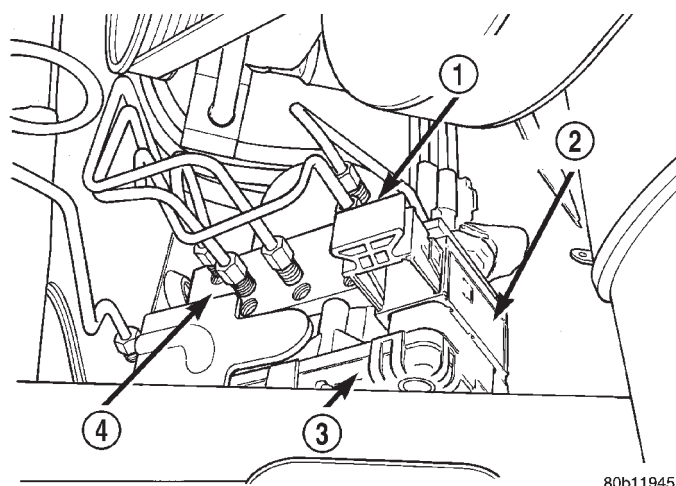
REMOVAL AND INSTALLATION (Continued)

**Fig. 34 HCU To Bracket Mounting Bolt**

- 1 – MOUNTING BOLTS
- 2 – FUEL LINES
- 3 – HCU
- 4 – HCU MOUNTING BRACKET

**Fig. 36 ICU Remove And Install**

- 1 – FRAME RAIL
- 2 – ICU
- 3 – DRIVESHAFT

**Fig. 35 Unlocked CAB Connector**

- 1 – CONNECTOR LOCK
- 2 – CAB CONNECTOR
- 3 – CAB
- 4 – HCU

(3) Tighten the 3 HCU mounting bolts to a torque of 11 N·m (97 in. lbs.).

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

(4) 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 down as far as it will go. When connector is fully seated into the

CAB socket push in the connector lock (Fig. 35) as far as it will go. This will pull the 25-way connector into the socket on the CAB and lock it in the installed position.

(5) Install the 2 bolts (Fig. 32) attaching the back legs of the HCU mounting bracket to the front suspension crossmember.

(6) Install the bolt (Fig. 31) attaching the front leg of the HCU mounting bracket to the front suspension crossmember.

(7) Tighten the 3 bolts mounting the HCU mounting to the front suspension crossmember to a torque of 28 N·m (250 in. lbs.).

(8) Install the primary and secondary brake tubes coming from the master cylinder in the HCU inlet ports (Fig. 30).

(9) Install the 4 chassis brake tubes in the outlet ports on the HCU (Fig. 29).

(10) Using a crow foot (Fig. 37) and (Fig. 38) tighten all of the brake tube nuts to a torque of 17 N·m (145 in. lbs.).

(11) Install the HCU heat shield (Fig. 28) on the HCU mounting bracket. Install and securely tighten the attaching bolt.

(12) Install exhaust system in vehicle using the reverse steps of its removal.

(13) Install right side engine compartment splash shield (Fig. 25) back on the vehicle.

(14) Lower vehicle.

(15) Remove brake pedal holding tool.

(16) Install the remote ground cable onto the ground stud located on left shock tower (Fig. 22). Install the remote ground cable attaching nut and tighten to a torque of 28 N·m (250 in. lbs.).

REMOVAL AND INSTALLATION (Continued)

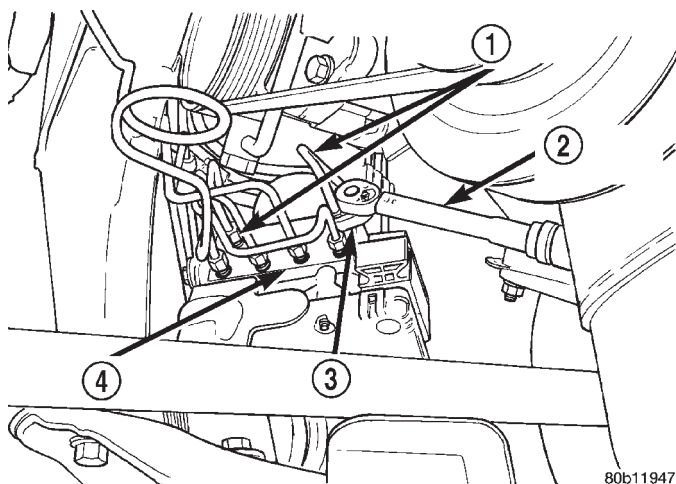


Fig. 37 Torquing Primary And Secondary Brake Tube Nut

- 1 - PRIMARY AND SECONDARY BRAKE TUBES
- 2 - TORQUE WRENCH
- 3 - CROW FOOT
- 4 - HCU

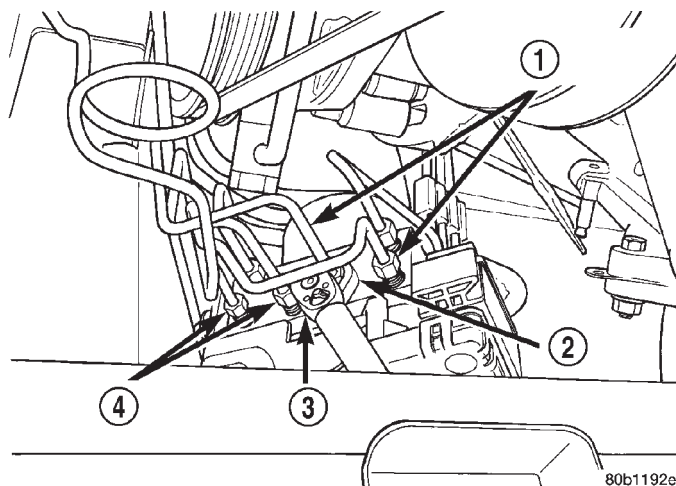


Fig. 38 Torquing Chassis Brake Tube Nuts

- 1 - CHASSIS BRAKE TUBES
- 2 - CROW FOOT
- 3 - TORQUE WRENCH
- 4 - CHASSIS BRAKE TUBES

(17) 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.

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

PROPORTIONING VALVE

NOTE: The following procedure is for the removal and installation of one of two proportioning valves on a vehicle equipped with ABS. For removal and installation of proportioning valves on a vehicle without ABS, Refer to the BASE BRAKE SYSTEM section in this group.

REMOVAL

(1) Remove the chassis brake tubes (Fig. 39) from the proportioning valve controlling the rear wheel of the vehicle which has premature wheel skid.

(2) Remove the proportioning valve from the rear brake chassis tube.

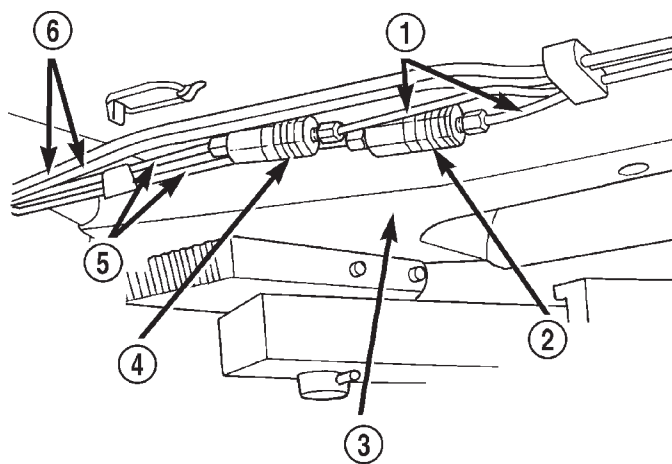


Fig. 39 Proportioning Valve Location

- 1 - CHASSIS BRAKE TUBES
- 2 - RIGHT REAR BRAKE PROPORTIONING VALVE
- 3 - RIGHT FRAME RAIL
- 4 - LEFT REAR BRAKE PROPORTIONING VALVE
- 5 - CHASSIS BRAKE TUBES
- 6 - FUEL TUBES

INSTALLATION

(1) Install the proportioning valve in the chassis brake tube.

(2) Tighten both tube nuts on the chassis brake tubes into the proportioning valve to a torque of 17 N·m (145 in. lbs.).

(3) Bleed the affected brake line. See BRAKE SYSTEM BLEEDING in the SERVICE PROCEDURES section of the BASE BRAKE SYSTEM section of this group.

REMOVAL AND INSTALLATION (Continued)

WHEEL SPEED SENSOR (FRONT)

This procedure is for the removal and installation of one of the two front wheel speed sensors.

REMOVAL

(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 the speed sensor cable routing bracket (Fig. 40) from the steering knuckle. Remove the wiring harness sealing grommet retainer and speed sensor routing bracket from the inner fender.

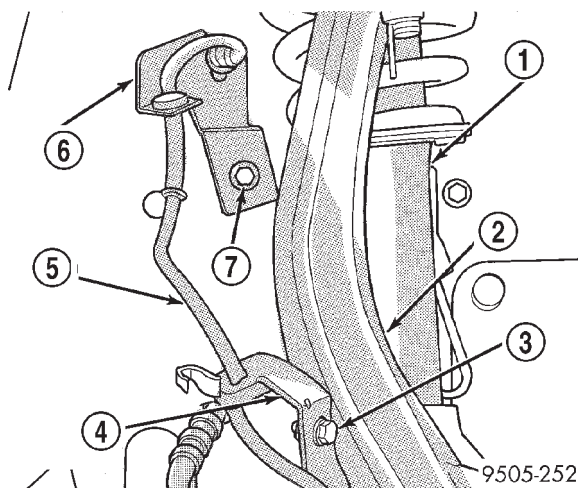


Fig. 40 Speed Sensor Cable Routing Brackets

- 1 - SHOCK ABSORBER
- 2 - STEERING KNUCKLE
- 3 - BOLT
- 4 - SPEED SENSOR ROUTING BRACKET
- 5 - WHEEL SPEED SENSOR CABLE
- 6 - GROMMET RETAINER AND CABLE ROUTING BRACKET
- 7 - BOLT

(4) Remove speed sensor sealing grommet from the inner fender (Fig. 41). Then unplug the speed sensor cable from the vehicle wiring harness (Fig. 41).

(5) Remove bolt (Fig. 42) attaching speed sensor to steering knuckle. Then remove speed sensor head from steering knuckle

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.

(6) If speed sensor head can not be removed from steering knuckle by hand, the locating pin on the

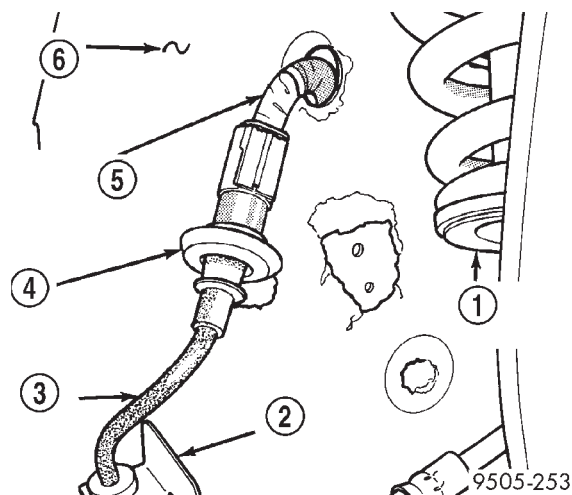


Fig. 41 Wheel Speed Sensor Connection To Vehicle Wiring Harness

- 1 - FRONT SHOCK ABSORBER
- 2 - GROMMET RETAINING BRACKET
- 3 - WHEEL SPEED SENSOR CABLE
- 4 - SEALING GROMMET
- 5 - VEHICLE WIRING HARNESS
- 6 - INNER FENDER

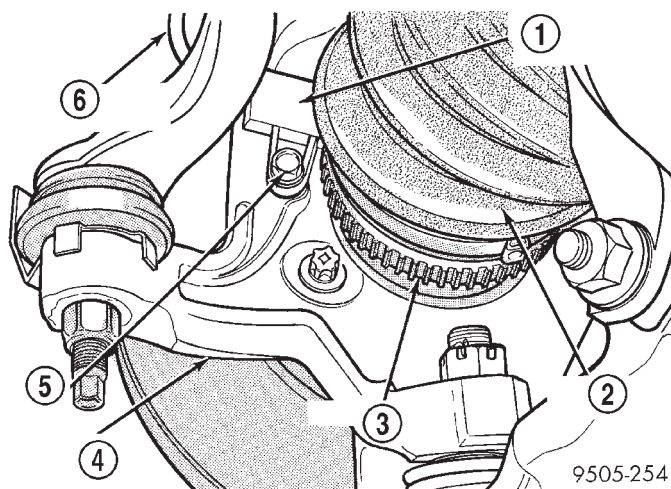


Fig. 42 Speed Sensor Head Attachment To Steering Knuckle

- 1 - SPEED SENSOR HEAD
- 2 - DRIVESHAFT
- 3 - TONE WHEEL
- 4 - STEERING KNUCKLE
- 5 - BOLT
- 6 - SPEED SENSOR CABLE

speed sensor head has seized to the steering knuckle do to corrosion. Remove speed sensor head from steering knuckle using the following procedure. Remove disc brake caliper from steering knuckle, and remove brake rotor from hub/bearing assembly. Then insert a pin punch through hole in front steering

REMOVAL AND INSTALLATION (Continued)

knuckle (Fig. 43) and tap speed sensor head locating pin out of steering knuckle.

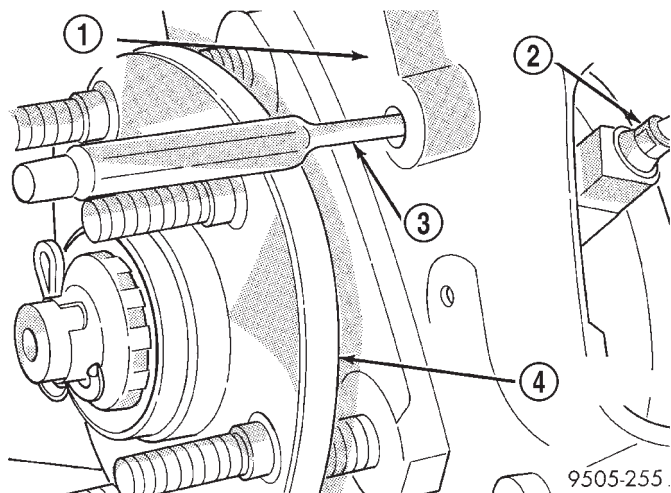


Fig. 43 Speed Sensor Head Removal From Steering Knuckle

- 1 - STEERING KNUCKLE
- 2 - SPEED SENSOR HEAD
- 3 - PIN PUNCH
- 4 - HUB/BEARING

INSTALLATION

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 (Fig. 41).

(2) Install the speed sensor cable assembly grommet into the front inner fender (Fig. 41). Install speed sensor cable grommet retainer/routing bracket on the inner fender of the vehicle and install and securely tighten attaching bolt (Fig. 40).

CAUTION: When installing the wheel speed sensor cable routing bracket on the steering knuckle, (Fig. 40) the speed sensor cable must be looped toward the shock absorber as shown in (Fig. 44). If speed sensor cable is not routed in this direction it will rub against the tire or wheel, 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.)

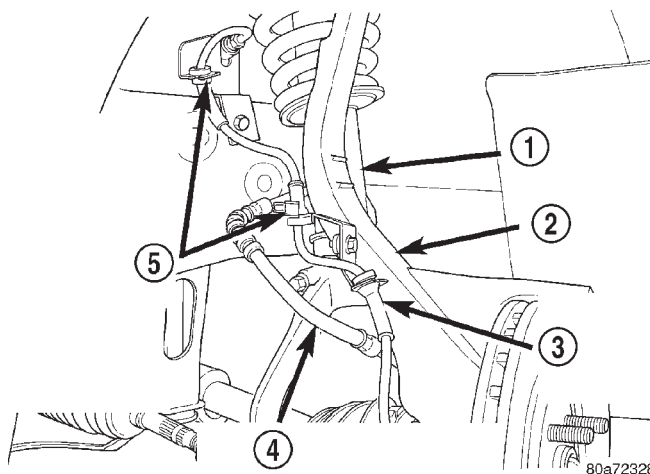


Fig. 44 Correct Front Wheel Speed Sensor Cable Routing

- 1 - SHOCK ABSORBER
- 2 - STEERING KNUCKLE
- 3 - WHEEL SPEED SENSOR CABLE
- 4 - BRAKE FLEX HOSE
- 5 - WHEEL SPEED SENSOR CABLE MUST BE LOOPED TOWARD SHOCK ABSORBER BETWEEN THESE ROUTING BRACKETS.

(4) Install speed sensor head on steering knuckle (Fig. 45). When installing speed sensor head on steering knuckle, apply a small amount of grease on speed sensor locating pin (Fig. 45). Use Mopar, Multi-Purpose Grease or an equivalent on speed sensor head locating pin. Install the speed sensor head attaching screw and tighten to a torque of 6 N·m (55 in. lbs.).

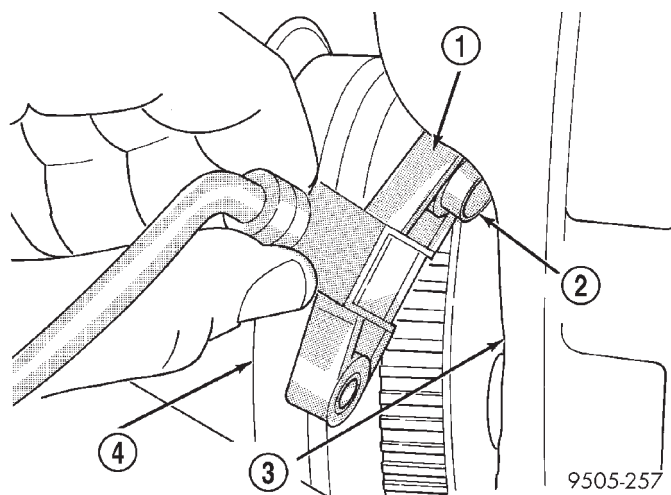


Fig. 45 Installing Speed Sensor Head In Steering Knuckle

- 1 - SPEED SENSOR HEAD
- 2 - LOCATING PIN
- 3 - STEERING KNUCKLE
- 4 - DRIVESHAFT

REMOVAL AND INSTALLATION (Continued)

- (5) Install the wheel and tire assembly on vehicle.
- (6) Road test vehicle to ensure proper operation of the base and ABS systems.

WHEEL SPEED SENSOR (REAR)

This procedure is for the removal and installation of one of the two rear wheel speed sensors.

REMOVAL

- (1) Remove the rear seat cushion and back, then disconnect the wheel speed sensor cable connector from the vehicle wiring harness (Fig. 46).

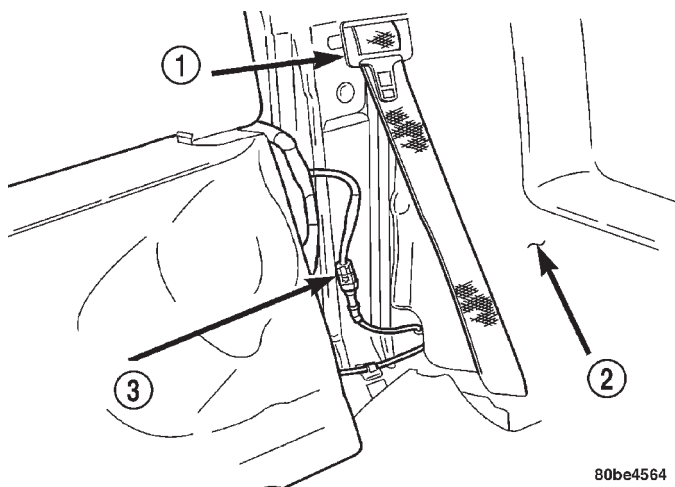


Fig. 46 Connection At Vehicle Wiring Harness

- 1 - OUTER SEAT BELT
- 2 - QUARTER TRIM PANEL
- 3 - CONNECTOR

- (2) 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.

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

- (4) Remove speed sensor cable sealing grommet retainer (Fig. 47) from the rear frame rail of the vehicle. Then remove speed sensor cable sealing grommet and cable from hole in body of vehicle.

- (5) Remove speed sensor routing clips from the rear upper control arm and brake flex hose routing bracket (Fig. 48).

- (6) Remove the rear speed sensor from the rear brake support plate (Fig. 49).

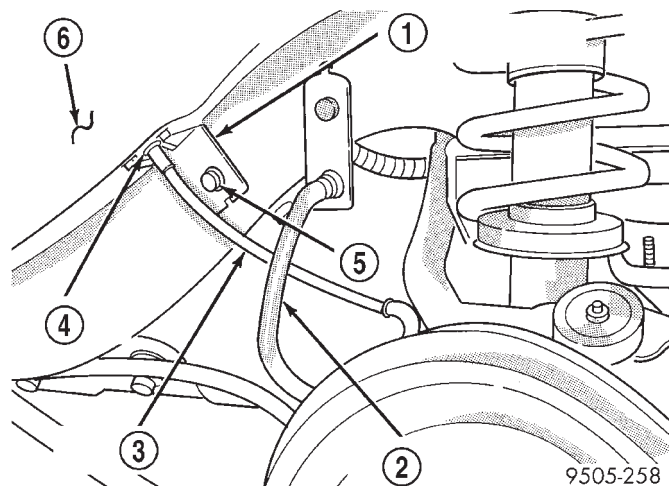


Fig. 47 Rear Speed Sensor Cable Attachment To Body

- 1 - SEALING GROMMET RETAINER
- 2 - BRAKE FLEX HOSE
- 3 - SPEED SENSOR CABLE
- 4 - SEALING GROMMET
- 5 - BOLT
- 6 - REAR INNER FENDER

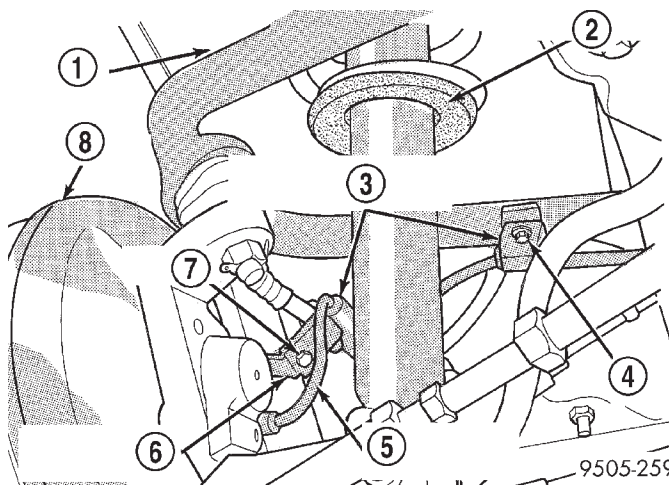


Fig. 48 Speed Sensor Cable Attachment To Rear Suspension

- 1 - UPPER CONTROL ARM
- 2 - SHOCK ABSORBER
- 3 - SPEED SENSOR CABLE ROUTING CLIPS
- 4 - BOLT
- 5 - SPEED SENSOR CABLE
- 6 - BRAKE FLEX HOSE BRACKET
- 7 - BOLT
- 8 - BRAKE DRUM

REMOVAL AND INSTALLATION (Continued)

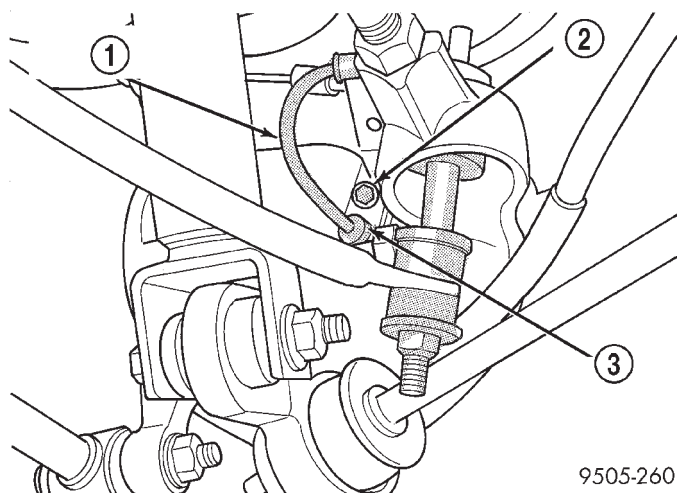


Fig. 49 Rear Speed Sensor Head Attachment To Brake Support Plate

- 1 - SPEED SENSOR CABLE
- 2 - BOLT
- 3 - SPEED SENSOR HEAD

INSTALLATION

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) Install speed sensor head into brake support plate (Fig. 49).

(2) Install wheel speed sensor attaching bolt (Fig. 49). Tighten the speed sensor head attaching bolt to 8 N·m (75 in. lbs.).

(3) Install speed sensor cable routing clips (Fig. 48) on the brake flex hose bracket and the bracket on the upper control arm. Install and securely tighten the routing clip attaching bolts.

(4) Install connector end of speed sensor cable through hole in inner fender and into trunk of vehicle.

(5) Install speed control sealing grommet into hole in inner fender. Install the sealing grommet retainer and attaching bolt (Fig. 47) on rear frame rail. Securely tighten retainer attaching bolt.

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

(7) Lower vehicle.

(8) Reconnect the wheel speed sensor cable connector to the vehicle wiring harness (Fig. 46), install any removed foam tape back around connectors, then reinstall the rear seat back and cushion.

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

DISASSEMBLY AND ASSEMBLY

INTEGRATED CONTROL UNIT

REMOVAL

NOTE: To replace the hydraulic control unit (HCU) or the controller antilock brake (CAB) on this vehicle, the entire integrated control unit (ICU) needs to be removed from the vehicle. 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 INTEGRATED CONTROL UNIT in the REMOVAL AND INSTALLATION section in this section of the service manual.

(2) Disconnect the pump/motor wiring harness (Fig. 50) from the CAB.

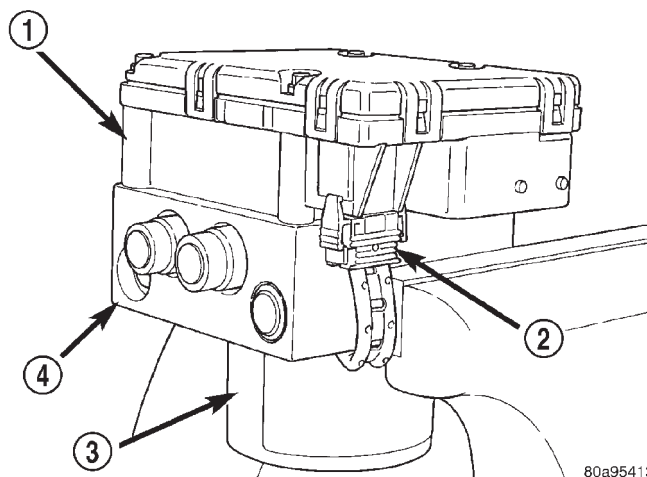


Fig. 50 Pump/Motor To CAB Wiring Harness

- 1 - CAB
- 2 - PUMP MOTOR WIRING HARNESS
- 3 - PUMP MOTOR
- 4 - HCU VALVE BLOCK

(3) Remove the 4 bolts (Fig. 51) attaching the CAB to the HCU.

(4) Remove the CAB from the HCU (Fig. 52).

INSTALLATION

(1) Install the CAB (Fig. 52) on the HCU.

(2) Install the 4 bolts mounting the CAB (Fig. 51) 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. 50).

(4) Install the ICU in the vehicle.

(5) Bleed the base and ABS hydraulic systems. Refer to ANTILOCK BRAKE SYSTEM BLEEDING in this section of this service manual group.

DISASSEMBLY AND ASSEMBLY (Continued)

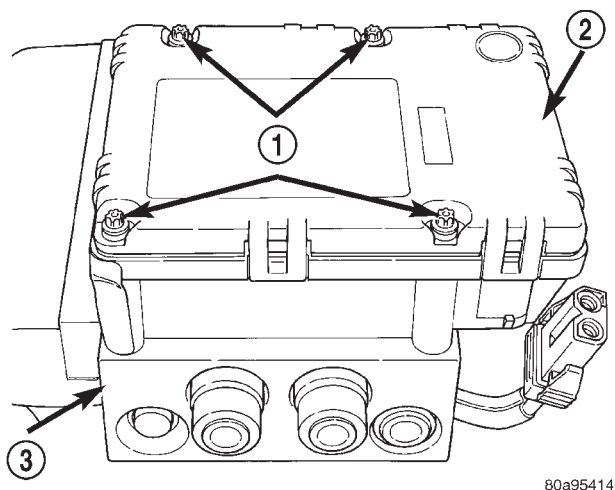


Fig. 51 CAB Attaching Bolts

- 1 - MOUNTING BOLTS
- 2 - CAB
- 3 - HCU VALVE BLOCK

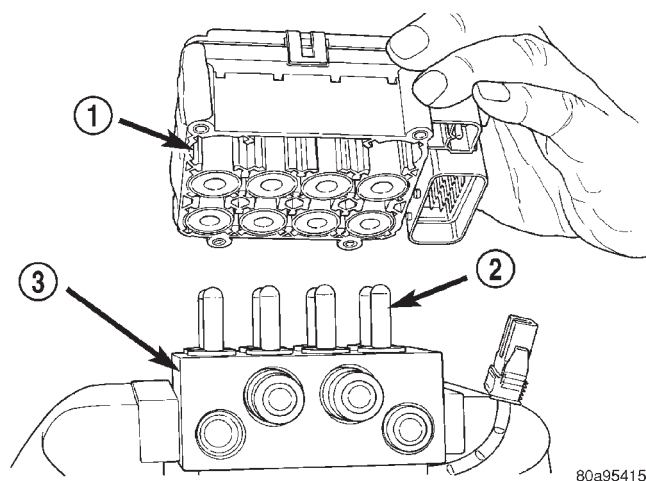


Fig. 52 Remove/Install CAB

- 1 - CAB
- 2 - HCU VALVES
- 3 - HCU VALVE BLOCK

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

SPECIFICATIONS

WHEEL SPEED SENSOR-TO-TONE WHEEL CLEARANCE

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.)

WHEEL SPEED SENSOR RESISTANCE

ALL:

Allowable Resistance 2160 - 2640 ohms

BRAKE FASTENER TORQUE SPECIFICATIONS

DESCRIPTION TORQUE

MASTER CYLINDER:

To Vacuum Booster Mounting Nut 28 N·m
(250 in. lbs.)

BRAKE BOOSTER:

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

BRAKE TUBES:

Tube Nuts 17 N·m (145 in. lbs.)

BRAKE HOSE:

Caliper Banjo Bolt 48 N·m (35 ft. lbs.)
Intermediate Bracket 23 N·m (17 ft. lbs.)

DISC BRAKE CALIPER:

Guide Pin Bolts 22 N·m (192 in. lbs.)
Bleeder Screw 20 N·m (15 ft. lbs.)

REAR WHEEL CYLINDER:

To Support Plate Mounting Bolts 11 N·m
(97 in. lbs.)
Bleeder Screw 8 N·m (75 in. lbs.)

BRAKE SUPPORT PLATE:

To Axle Mounting Bolts 63 N·m (46 ft. lbs.)

INTEGRATED CONTROL UNIT (HCU AND CAB):

To Mounting Bracket Bolts 11 N·m (97 in. lbs.)
Bracket To Crossmember Mounting Bolts 28 N·m
(250 in. lbs.)

CAB To HCU Mounting Bolts 2 N·m (17 in. lbs.)

PARKING BRAKE:

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

REAR HUB AND BEARING:

To Knuckle Retaining Nut 250 N·m (185 ft. lbs.)
Stud Lug Nut 109-150 N·m (80-110 ft. lbs.)

FRONT TONE WHEEL:

Maximum Runout 0.25 mm (0.009 in.)

REAR TONE WHEEL:

Maximum Runout 0.25 mm (0.009 in.)

