



BRAKES

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GENERAL INFORMATION

Throughout this group, references may be made to a particular L.H. platform vehicle by letter or number designation. A chart showing the break down of these designations is included in the Introduction Section at the front of this service manual.

The L.H. platform vehicles are available with 4 different types of brake systems. The standard brake system consists of front disc brakes and rear drum brakes which are not available with Anti-Lock. The second optional brake system is 4 wheel disc brakes without Anti-Lock. The third optional brake system is Anti-Lock brakes, which is only available with front and rear disc brakes. The fourth optional brake system is 4 wheel disc brakes with traction control. The traction control system is dependent on the Anti-Lock system and is not available without Anti-Lock.

Standard brake equipment consists of:

- Double pin floating caliper front disc brakes.
- Rear automatic adjusting drum brakes.
- Proportioning valve on non Anti-Lock brakes.
- Master cylinder.
- Vacuum power booster.
- Double pin floating caliper rear disc brakes are available on some models and standard with Anti-Lock.

The Anti-Lock braking system, uses the standard power brake system caliper assemblies, braking discs, pedal assembly, brake lines and hoses. The unique parts of the Anti-Lock braking system consists of the following components. Unique proportioning valves, wheel speed sensors, tone wheels, electronic control unit, hydraulic control unit and the conventional master cylinder and power booster.

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

The front disc brake shoes have non-asbestos semi-metallic linings.

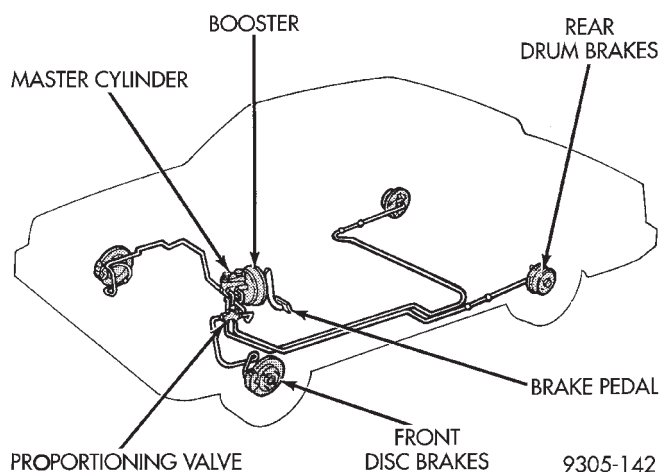
The hydraulic brake system (Fig. 1 2 and 3) is diagonally split on both the Non-ABS and ABS braking system. With the left front and right rear brakes on one hydraulic system and the right front and left rear on the other.

All available brake systems on the L.H. platform vehicles, except rear drum brakes use the same type of brake line fittings and tubing flares. The brake line and fittings used is double wall tubing with ISO style tubing flares and fittings at all tubing joint locations. See (Figs. 2 and 3) for specific joint locations and tube fitting size.

Vehicles equipped with rear drum brakes. Use conventional double inverted style flares at the brake flex hose to wheel cylinder connections.

Avoid scuffing the brake tubes when servicing. Scuffing the brake tubes will scrape off the anti-corrosion coating on the brake tubes.

The L.H. platform front disc brakes, use a double pin, single piston floating caliper design supplied by Kelsey-Hayes. The front disc brake caliper assembly mounts directly to rails on the steering knuckle and is secured to the steering knuckle using 2 bolts.



CAUTION: Caliper pistons, boots and seals for the different caliper assemblies used on the front and rear disc brake assemblies are not interchangeable. Misusage could result in a complete brake system failure. Be sure that the parts are replaced with the correct replacement parts, refer to the parts book for the type and model year of the vehicle being worked on.

The master cylinder is anodized, lightweight aluminum, with a bore size of 23.8mm (15/16 in.).

Fig. 1 Diagonally Split Braking System (Typical Non-ABS System)

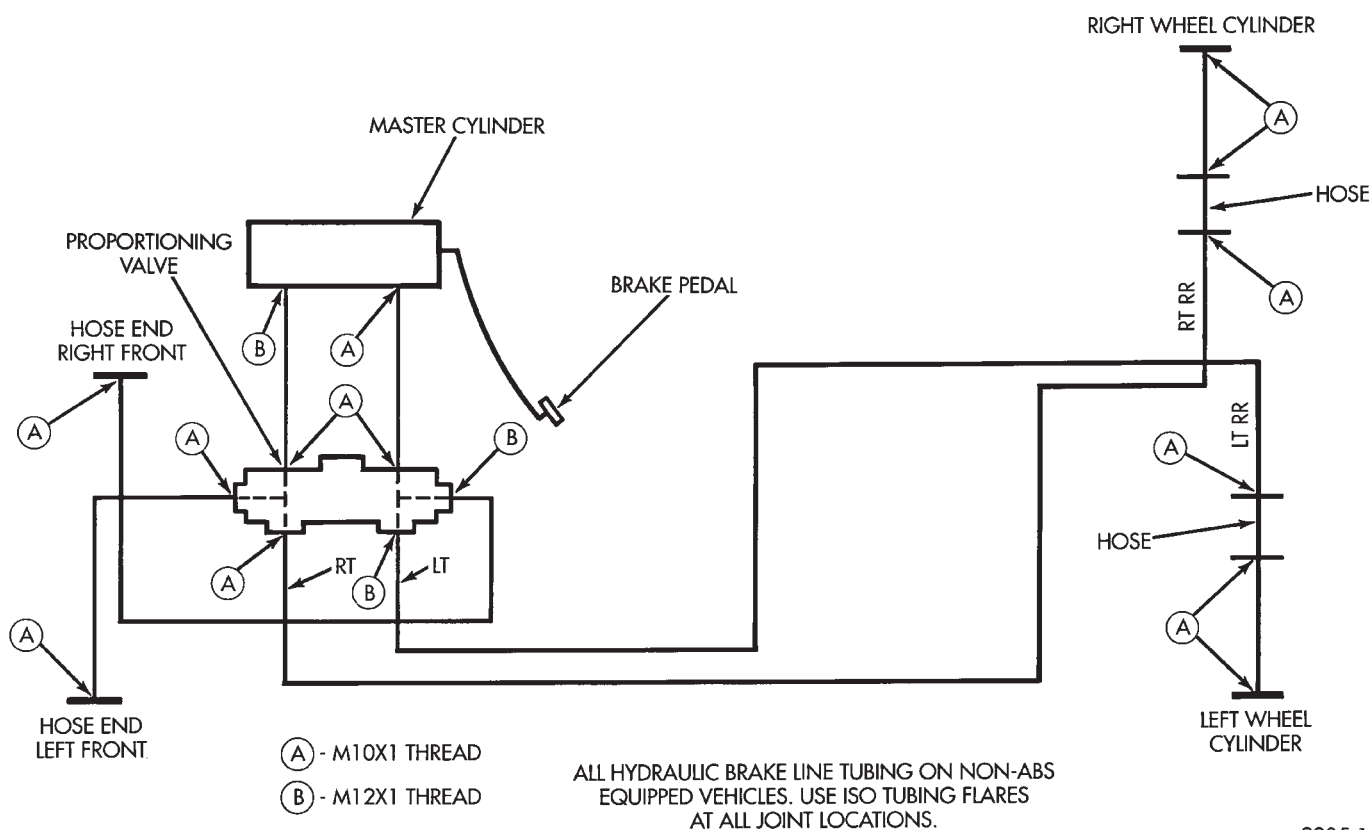
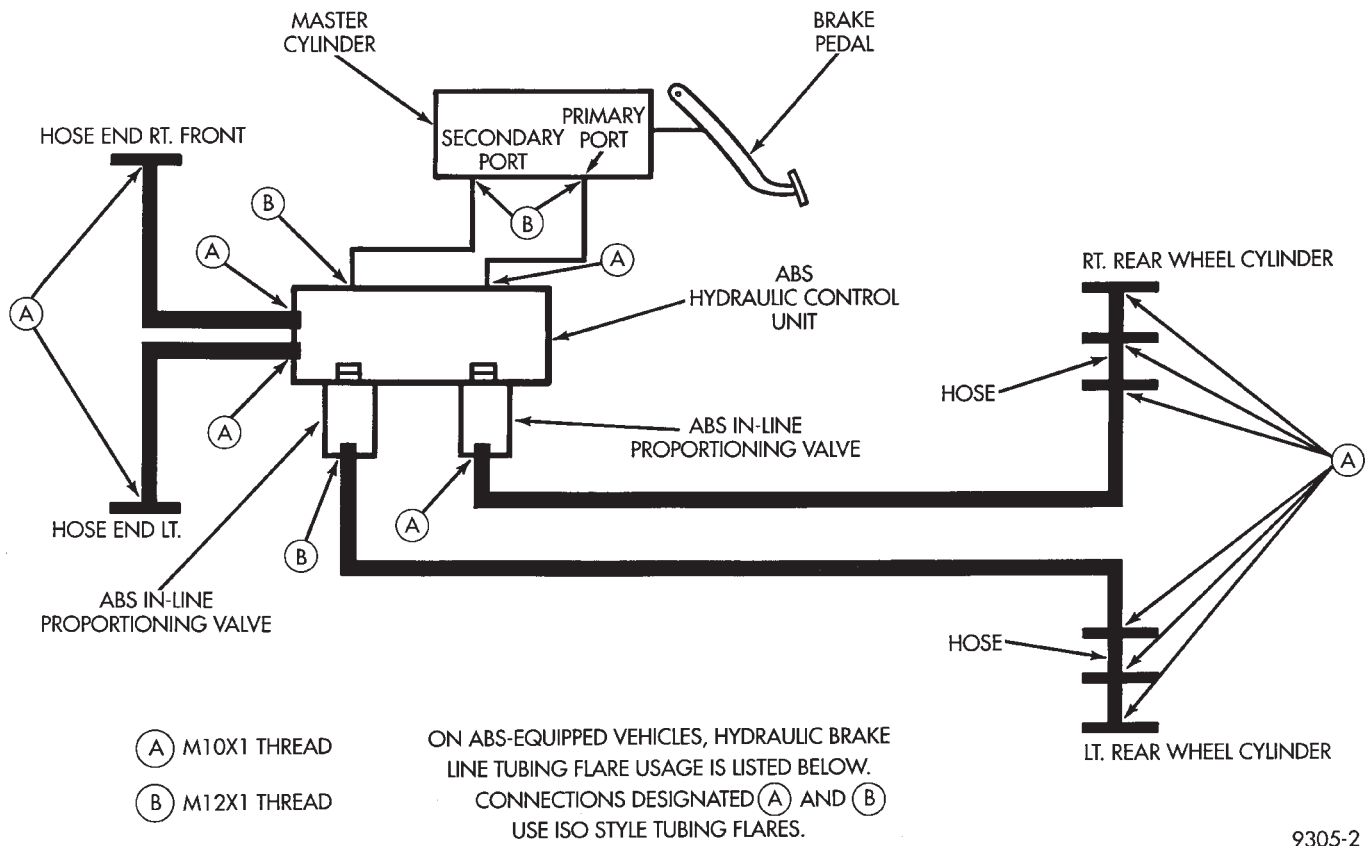


Fig. 2 Proper Nut Thread Size And Tube Routing (Non-ABS Equipped)

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Fig. 3 Proper Nut Thread Size And Tube Routing (ABS Equipped)



SERVICE ADJUSTMENTS

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MASTER CYLINDER FLUID LEVEL

NON-ABS AND ABS BRAKES

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

Master cylinder brake fluid reservoirs used on all L.H. platform vehicles include a brake fluid level sensor. The brake fluid level sensor location is in the body of the brake fluid reservoir (Fig. 1). In the event of low brake fluid level in the brake fluid reservoir, the RED brake warning light in the instrument panel will turn on.

Master cylinder assembly, brake fluid reservoirs on both standard and Anti-Lock brake systems. Are marked with a MAX fill line indicating the brake fluid reservoirs proper fluid level (Fig. 1).

When filling brake fluid reservoir, use only Mopar® brake fluid or an equivalent stored in a tightly sealed container. Brake fluid must conform to DOT 3, specifications.

If necessary, add brake fluid to brake fluid reservoir, bringing brake fluid level to the MAX fill line shown on fluid reservoir (Fig. 1).

DO NOT use brake fluid with a lower boiling point than DOT 3, as brake failure could result during prolonged hard braking.

DO NOT use petroleum-based fluid because seal damage in the brake system will result.

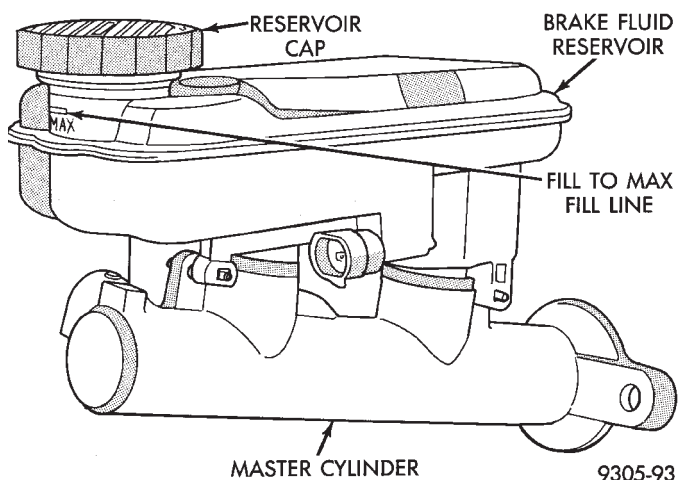


Fig. 1 Master Cylinder Fluid Level (ABS And Non-ABS)

ADJUSTING REAR SERVICE BRAKES

Normally, self adjusting drum brakes will not require manual brake shoe adjustment. Although in the event of a brake reline it is advisable to make the initial adjustment manually to speed up the adjusting time.

(1) Raise the vehicle so all wheels are free to turn. See Hoisting Recommendations in the Lubrication And Maintenance Section, at the front of this service manual.

(2) Remove rear brake adjusting hole rubber plug (Fig. 1), from the rear brake shoe support plate.

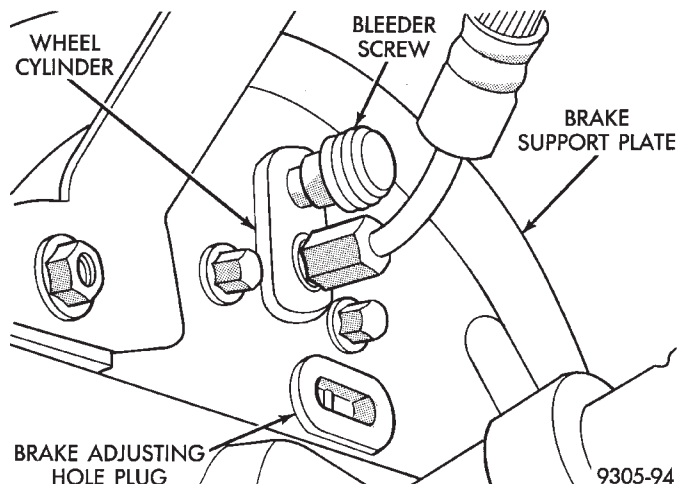


Fig. 1 Brake Adjusting Hole Plug

(3) **Be sure parking brake lever is fully released.**

(4) Insert a medium blade screwdriver (Fig. 2) or equivalent through the adjusting hole in support plate and against star wheel of adjusting screw. Move handle of tool downward until a slight drag is felt when the road wheel is rotated.

(5) Insert a thin screwdriver or piece of welding rod into brake adjusting hole (Fig. 2). Push adjusting lever out of engagement with star wheel. **Care should be taken so as not to bend adjusting lever or distort lever spring.** While holding adjusting lever out of engagement with star wheel, back off star wheel to ensure a free wheel with no brake shoe drag.

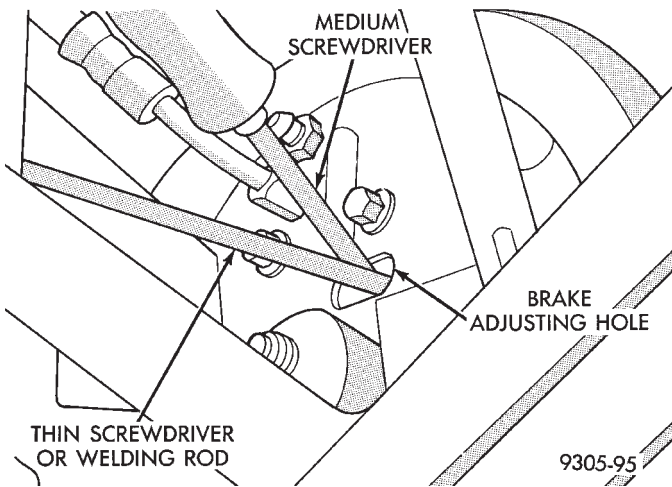


Fig. 2 Rear Brake Shoe Adjustment

(6) Repeat above adjustment at the other rear wheel. Install adjusting hole rubber plugs (Fig. 1) in rear brake supports.

TESTING APPLICATION ADJUSTER OPERATION

Place the vehicle on a hoist with a helper in the driver's seat to apply the brakes. Remove the access plug from the rear adjustment slot in each brake support plate (Fig. 1) to provide visual access to brake adjuster star wheel. Then, to eliminate the possibility of maximum adjustment, where the adjuster does not operate because the closest possible adjustment has been reached. Back the star wheel off approximately 30 notches. It will be necessary to hold the adjuster lever away from the star wheel to permit this adjustment.

Spin the wheel and brake drum in the forward direction, and with a greater than normal force apply the brakes suddenly. This sudden application of force will cause the leading brake shoe to leave the anchor. The wrap up effect will move the leading shoe, and the spring will pull the adjuster lever down. Upon application of the brake pedal, the lever should move down, turning the star wheel. 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 drum must be removed for adjuster servicing.

BLEEDING BRAKE SYSTEM

CAUTION: For bleeding the L.H. platform Anti-Lock brakes hydraulic system, see the Anti-Lock Brake system service procedures in this group of the service manual. It describes in detail the required procedure which needs to be followed when bleeding the Anti-Lock brake system.

PRESSURE BLEEDING

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

CAUTION: Use bleeder tank Special Tool C-3496-B or equivalent, with Snap-On adapter BB400-9A or equivalent (Fig. 1 and 2), to pressurize the brake hydraulic system for bleeding.

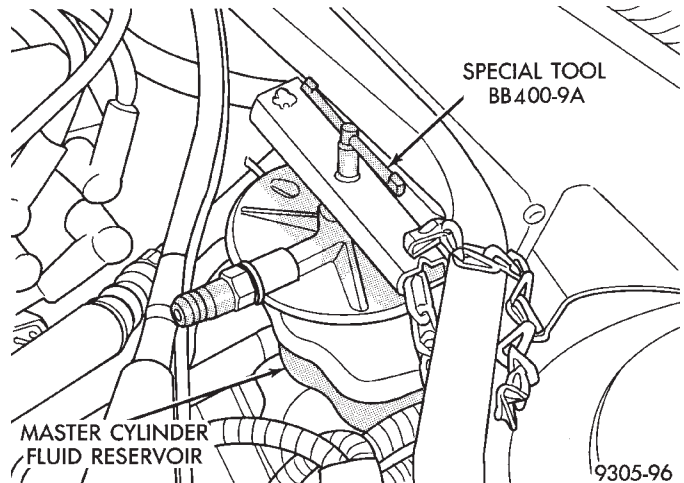


Fig. 1 Pressure Bleeding Adapter Mounted On Fluid Reservoir

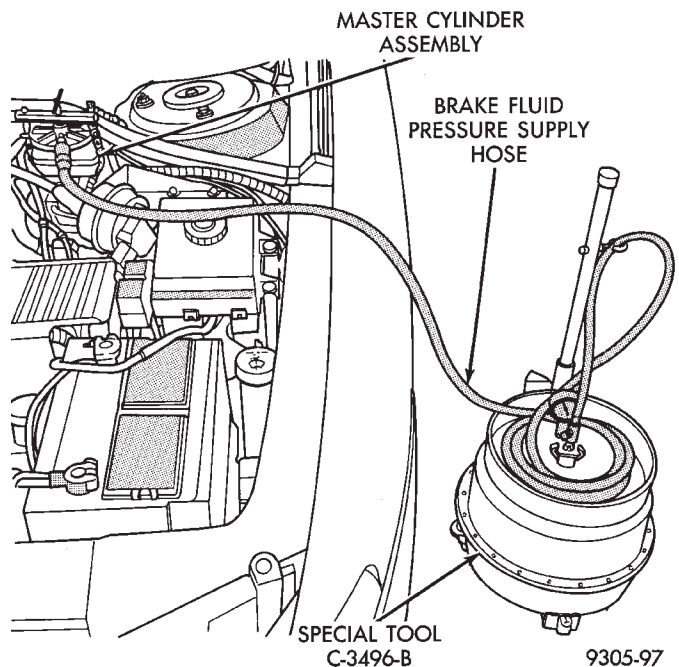


Fig. 2 Pressure Bleeding Vehicle Brake System

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

When bleeding the brake system. Some air may be trapped in the brake lines or valves far upstream. As much as ten feet from the bleeder screw (Fig. 3). Therefore, it is essential to have a fast flow of a large



volume of brake fluid when bleeding the brakes. This will ensure all the air is bled from the brakes hydraulic system.

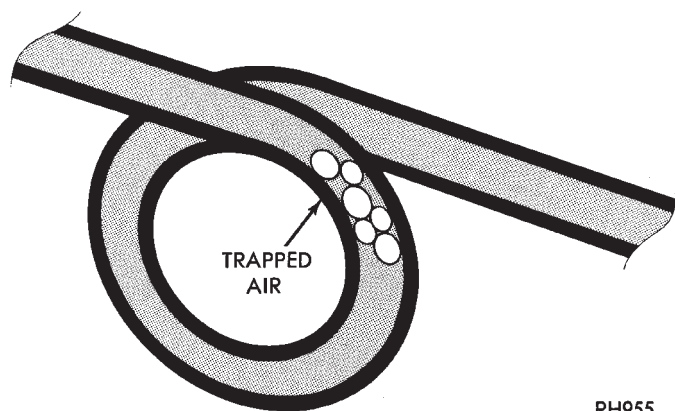


Fig. 3 Trapped Air in Brake Line

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

(2) Attach a clear hose to the bleeder screw at one wheel and feed the hose into a clear jar containing fresh brake fluid (Fig. 4).

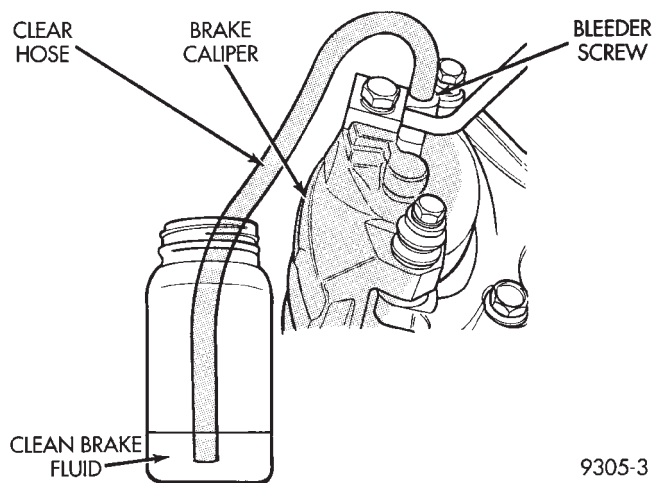


Fig. 4 Proper Method for Purging Air From Brake System (Typical)

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

(3) Open bleeder screw (Fig. 4) on caliper assembly or wheel cylinder, at least **one full turn** or more to obtain an adequate flow of brake fluid.

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

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

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

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

BLEEDING WITHOUT A PRESSURE BLEEDER

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

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

(2) Attach a clear hose to the bleeder screw at one wheel and feed the hose into a clear jar containing fresh brake fluid (Fig. 4).

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

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

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

(6) Repeat steps 1 through 3, four or five times at each bleeder screw. This should pass a sufficient amount of fluid to expel all the trapped air from the brakes hydraulic system. Be sure to monitor brake fluid level in master cylinder fluid reservoir, to ensure it stays at a proper level. This will ensure air does not re-enter brake hydraulic system through master cylinder.

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

(8) Replace all 4 bleeder screw dust caps.

TESTING FOR BRAKE FLUID CONTAMINATION

Indications of fluid contamination are swollen or deteriorated rubber parts.

Swollen rubber parts indicate the presence of a petroleum based fluid mixed in with the brake fluid.

To test for contamination, put small amount of drained brake fluid in clear glass jar. If fluid separates into layers, there is petroleum based fluid contamination of the brake fluid.

If contaminated, drain and thoroughly flush system. Replace master cylinder, proportioning valve, caliper seals, wheel cylinder seals and all hoses.

ROAD WHEEL STUD NUT TIGHTENING

(1) Install the wheel and tire assembly.

(2) Tighten the wheel mounting stud nuts in proper sequence (Fig. 5) until all nuts are torqued to half specification.

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

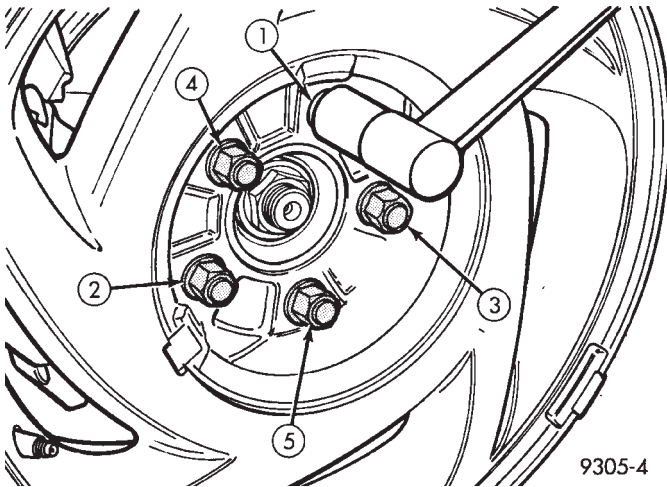


Fig. 5 Tightening Wheel Nuts

BRAKE HOSE AND TUBING

INSPECTION OF BRAKE HOSE AND TUBING

Flexible rubber hose is used at both the front brakes 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, or worn spots. Should the fabric casing of the rubber hose be 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 and wheel, tire or chassis interference.

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

The L.H. platform vehicles equipped with Anti-Lock brakes, uses flexible hose to connect the master cylinder to the hydraulic control unit (HCU) (Fig. 1). These hoses have a flexible stainless steel braid over the brake hose and tube assemblies. These hoses also must be inspected as noted above for any signs of damage or deterioration.

INSTALLATION OF BRAKE HOSE

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

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

The flexible front hydraulic brake hose should always be installed on the vehicle by first attaching

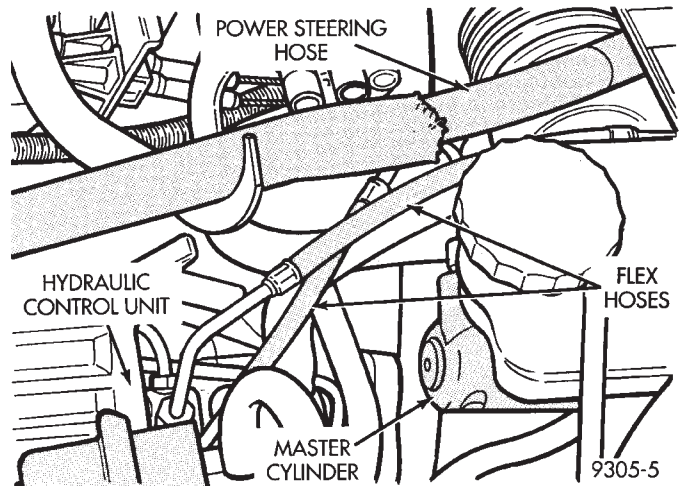


Fig. 1 Anti-Lock Equipped Vehicle Flex Hoses

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

On vehicles equipped with rear drum brakes, first install rear brake flex hose into wheel cylinder then attach bracket to brake support plate. Then attach brake hose end bracket to vehicle frame to minimize hose twisting. Then hand start the steel brake tube fitting into the hose end fitting. Tighten all attachment screws and tube fittings to their specified torque (See Specifications Section) at the end of this group for the required fitting torques.

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

REPAIR AND INSTALLATION OF BRAKE TUBING

Only double wall 4.75mm (3/16 in.) steel tubing should be used for replacement. **L.H. platform brake tubes are coated with a zinc alloy and aluminum rich coating referred to as Prokote 2000. If brake line tubing requires replacement, brake line tubing with this same coating should only be used as a service replacement.** Care should be taken when replacing brake tubing, to be sure the proper bending and flaring tools and procedures are used, to avoid kinking. Do not route the tubes against sharp edges, moving components or into hot



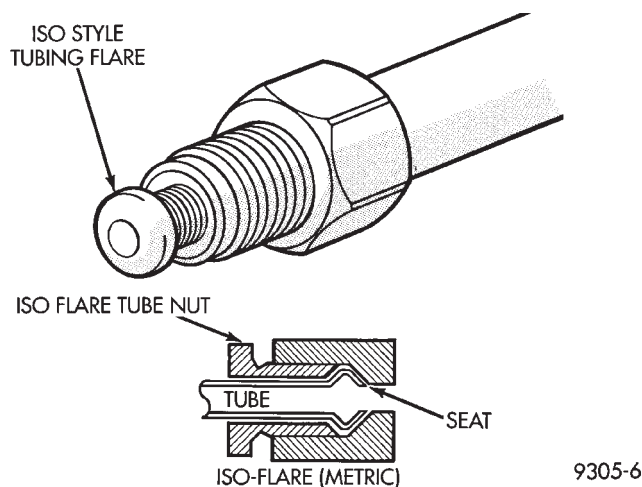
areas. All tubes should be properly attached with recommended retaining clips.

Care must be taken during the removal and replacement of components on a vehicle equipped with Anti-Lock brakes. To avoid damage to the flexible stainless steel hoses between the master cylinder and Anti-Lock hydraulic control unit.

HYDRAULIC BRAKE LINE TUBING FLARES

All available brake systems used on L.H. platform vehicles use **ONLY ISO STYLE TUBING FLARES (FIG. 2)** at all hydraulic tubing to component locations. **Except the rear drum brake flex hose to wheel cylinder connection.**

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



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Fig. 2 I.S.O. Style Tubing Flare And Fitting Connection

TO REPAIR OR FLARE TUBING (I.S.O. STYLE)

Using Tubing Cutter, Special Tool C-3478-A or equivalent, cut off damaged seat on tubing (Fig. 3). Ream out any burrs or rough edges showing on inside of tubing. This will make the ends of tubing square (Fig. 4) and ensure better seating of flared end tubing. **PLACE TUBE NUT ON TUBING BEFORE FLARING THE TUBING.**

ISO TUBING FLARE

CAUTION: All ISO style tubing flares (Fig. 2) are of metric dimensions. When performing any service procedures on a vehicle using ISO style tubing flares, metric size tubing of 4.75 mm MUST be used with metric ISO tube flaring equipment.

To create a (metric) ISO style tubing flare, Use

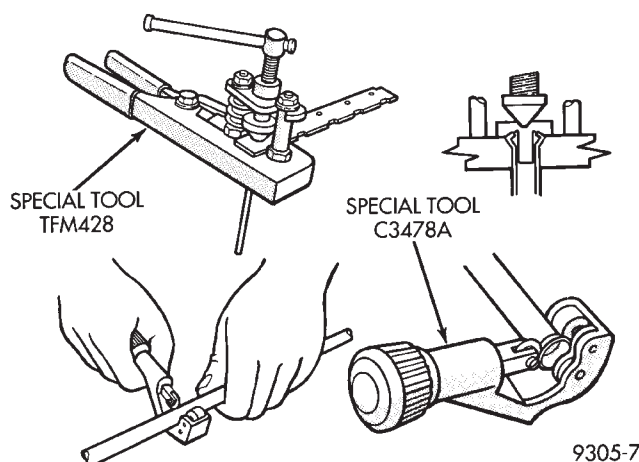
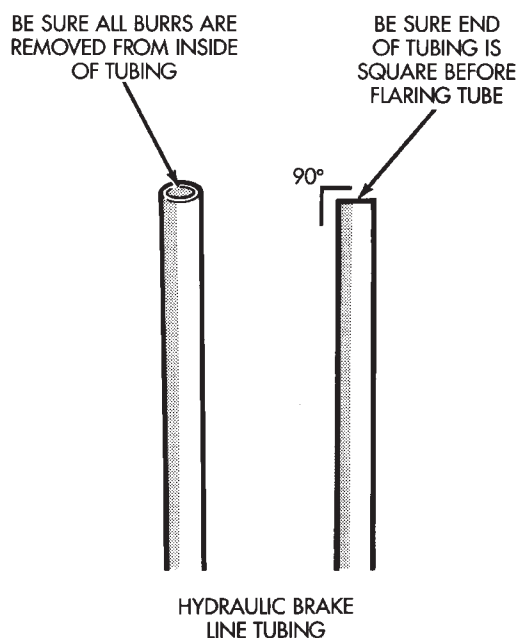


Fig. 3 Cutting and Flaring of Brake Line Tubing



9205-175

Fig. 4 Brake Tube Preparation For Flaring

Snap-On Flaring Tool TFM-428, (Fig. 3) or equivalent. See (Fig. 5) and proceed with the steps listed below. **Be sure to place the tubing nut on tube before proceeding to flare the tubing.**

(1) Carefully prepare the end of the tubing to be flared. Be sure the end of the tubing to be flared is square and all burrs on the inside of the tubing are removed (Fig. 4). **This preparation is essential to obtain the correct form of a (metric) ISO tubing flare.**

(2) Open the jaws of the Flaring Tool. Align the mating size jaws of the flaring tool around the size of the tubing to be flared. Close the jaws of the Flaring Tool around the tubing to keep it from sliding out of the flaring tool, but do not lock the tubing in place. See (Fig. 3 and 5)

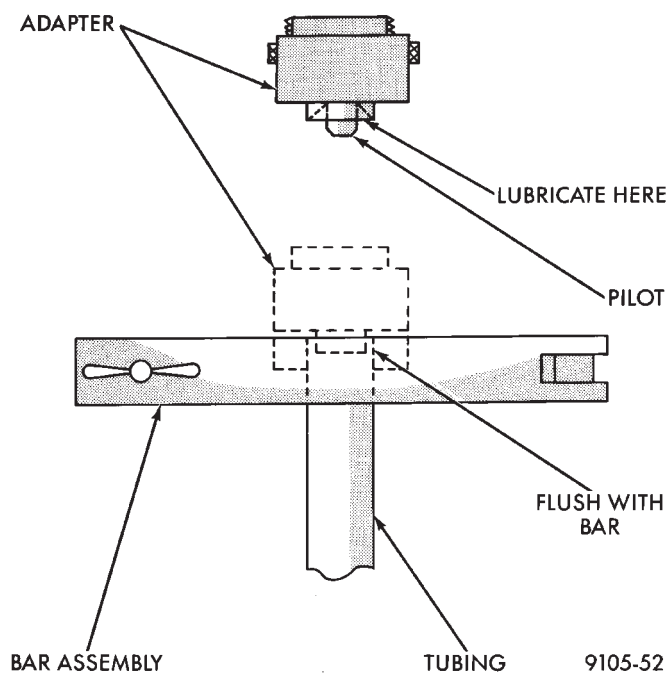


Fig. 5 ISO Tubing Flare Process

(3) Position tubing in jaws of the Flaring Tool so that it is flush with top surface of flaring tool bar assembly. (See Fig. 5).

(4) Install the correct size adaptor for the brake tubing being flared, on the feed screw of the yoke assembly. Center the yoke and adapter over the end of the tubing. Apply lubricant to the adapter area that contacts brake tubing. Making sure the adapter pilot is fully inserted in the end of the brake tubing.

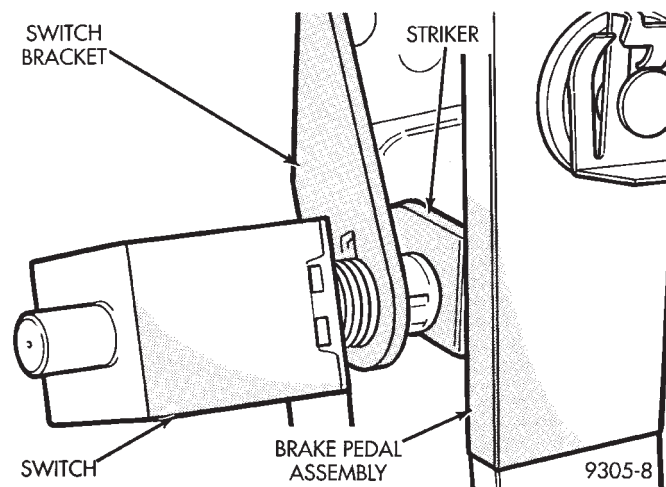


Fig. 6 Stop Lamp Switch

Screw in the feed screw of the yoke assembly until the adaptor has seated squarely on the surface of the bar assembly (Fig. 5). This process has created the (metric) ISO tubing flare.

STOP LAMP SWITCH ADJUSTMENT

The stop lamp switch incorporates a self adjusting feature. If adjustment or replacement is required, proceed as follows: Install the switch in the retaining bracket and push the switch forward as far as it will go. The brake pedal will move forward slightly (Fig. 6). Gently pull back on the brake pedal bringing the striker back toward the switch until the brake pedal will go back no further. This will cause the switch to ratchet backward to the correct position. Very little movement is required, and no further adjustment is necessary.

BASIC DIAGNOSIS GUIDE

SYMPTOM	CHART 1 MISC. COND.	CHART 2 WARNING LIGHT	CHART 3 POWER BRAKES	CHART 4 BRAKE NOISE	CHART 5 WHEEL BRAKES
BRAKE WARNING LIGHT ON		X	NO		
EXCESSIVE PEDAL TRAVEL	6	X	NO		O
PEDAL GOES TO FLOOR	6	X			
STOP LIGHT ON WITHOUT BRAKES	3				
ALL BRAKES DRAG	5				
REAR BRAKES DRAG	2	NO	NO		
GRABBY BRAKES			O		X
SPONGY BRAKE PEDAL		X	NO		
PREMATURE REAR LOCKUP	4	NO	NO		O
EXCESSIVE PEDAL EFFORT	1		O		
ROUGH ENGINE IDLE		NO	O		
BRAKE CHATTER (ROUGH)		NO	NO		X
SURGE DURING BRAKING		NO	NO		X
NOISE DURING BRAKING		NO	NO	X	
RATTLE OR CLUNKING NOISE		NO	NO	X	
PEDAL PULSATES DURING BRAKING		NO	NO		X
PULL TO RIGHT OR LEFT		NO	NO		X

NO: NOT POSSIBLE CAUSE

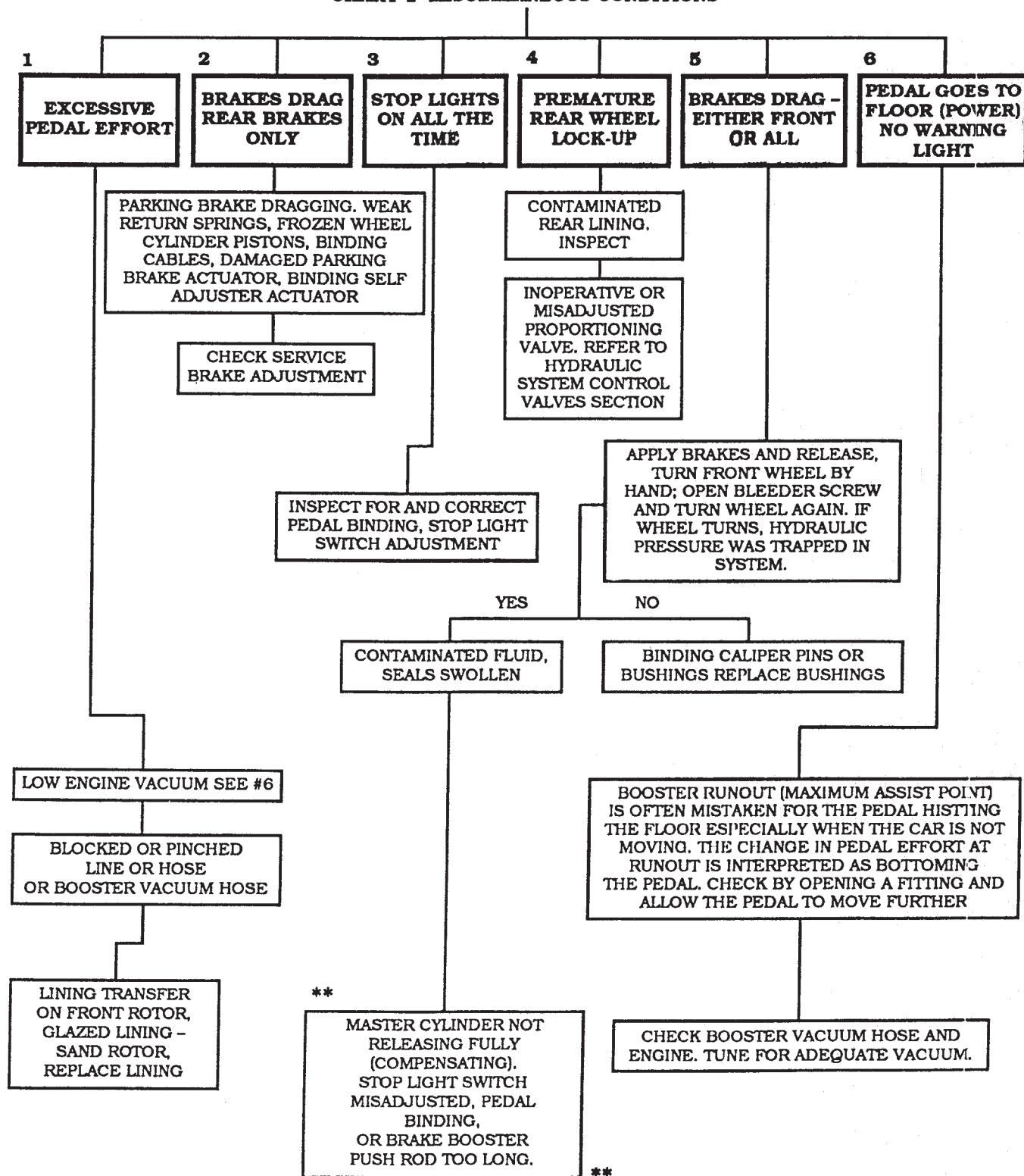
X: MOST LIKELY CAUSE

O: POSSIBLE CAUSE



BRAKE SYSTEM DIAGNOSTICS

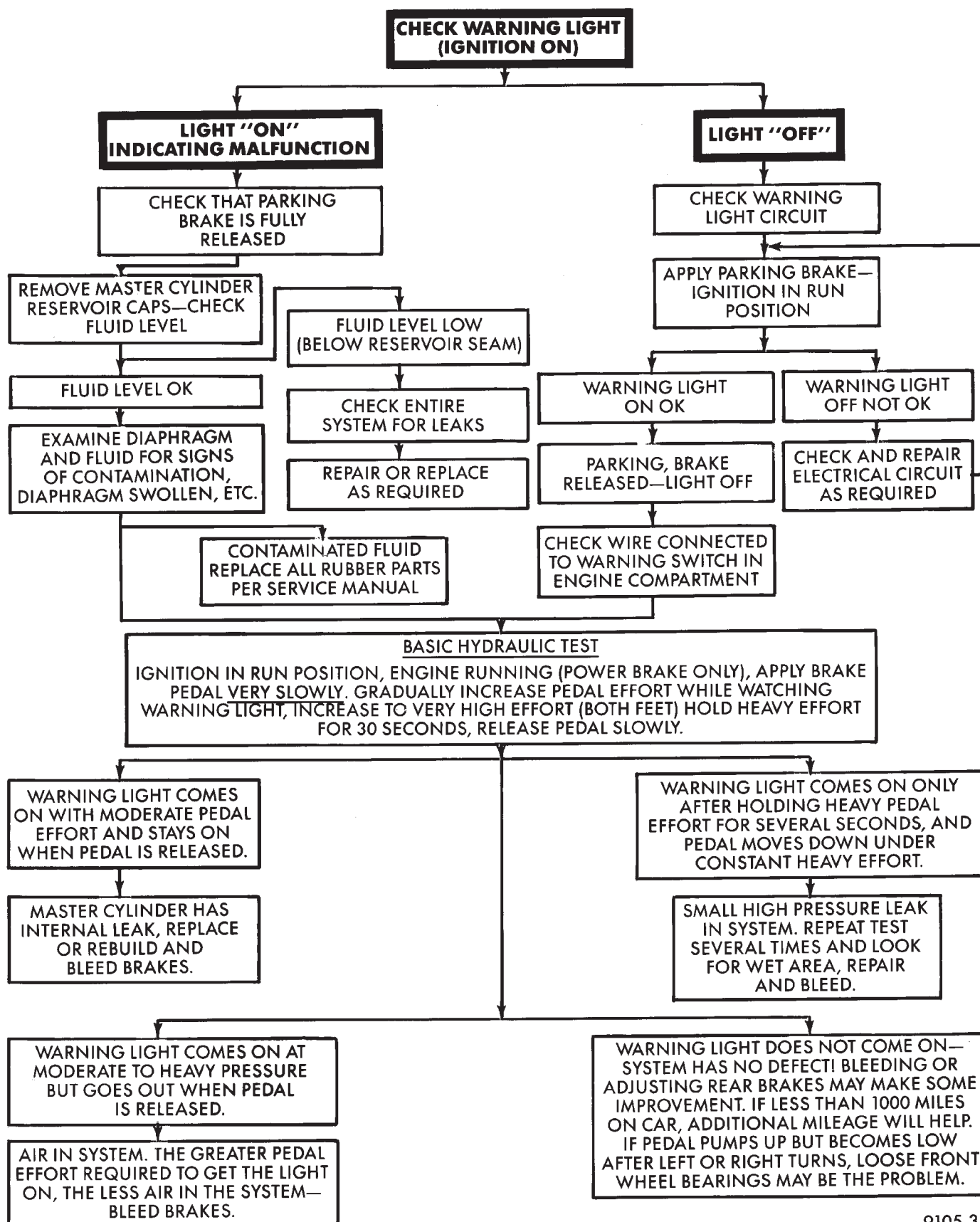
CHART 1 MISCELLANEOUS CONDITIONS





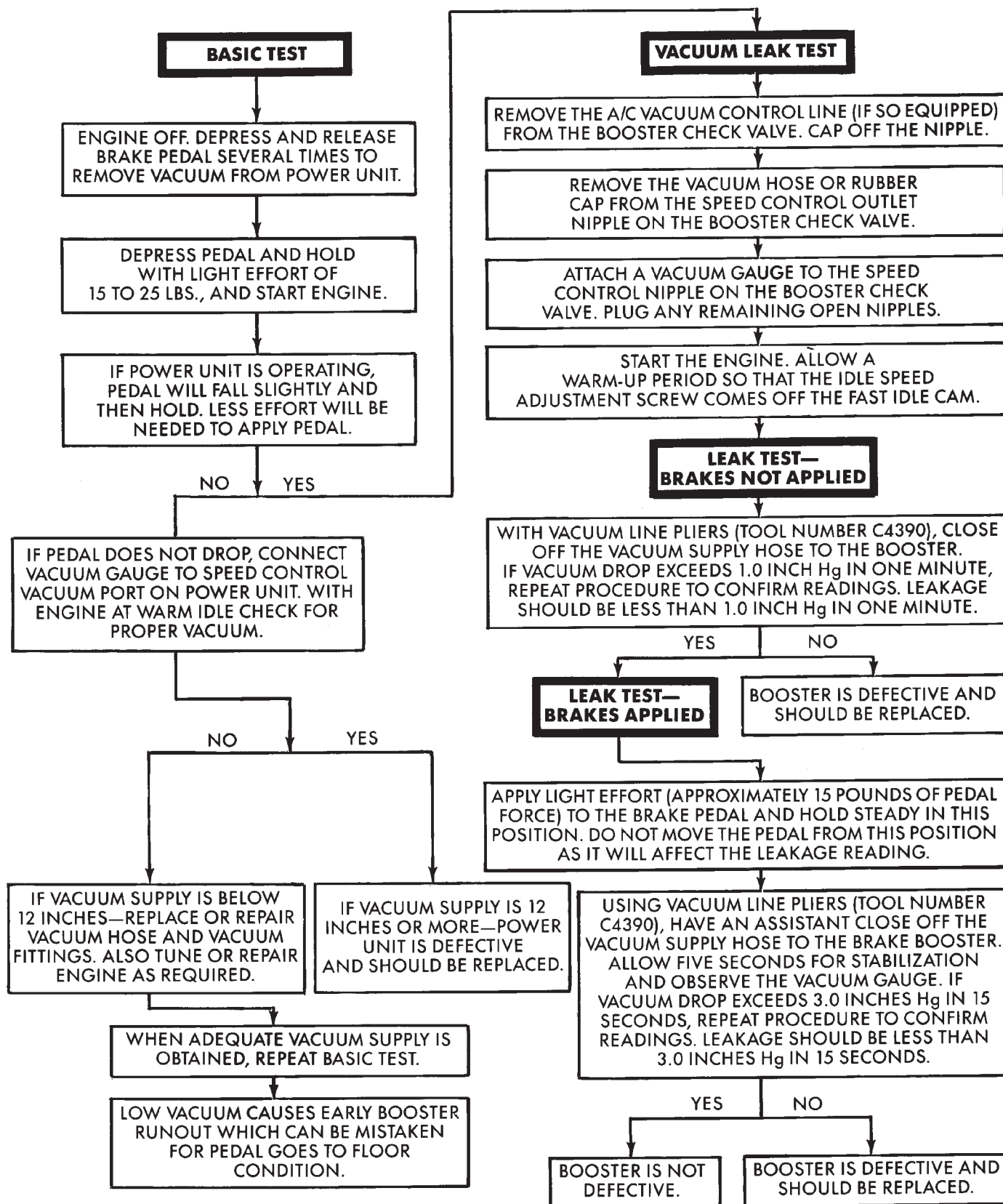
BRAKE SYSTEM DIAGNOSTICS

CHART 2 ACTUATION





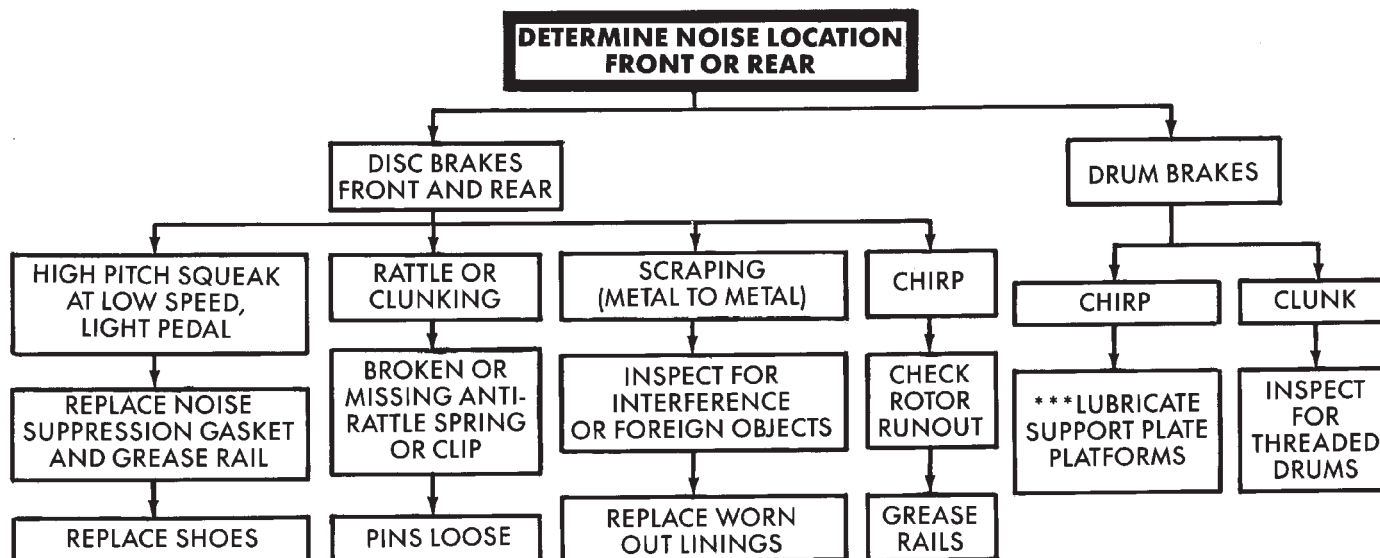
BRAKE SYSTEM DIAGNOSTICS

CHART 3 POWER BRAKES



BRAKE SYSTEM DIAGNOSTICS

CHART 4 BRAKE NOISE

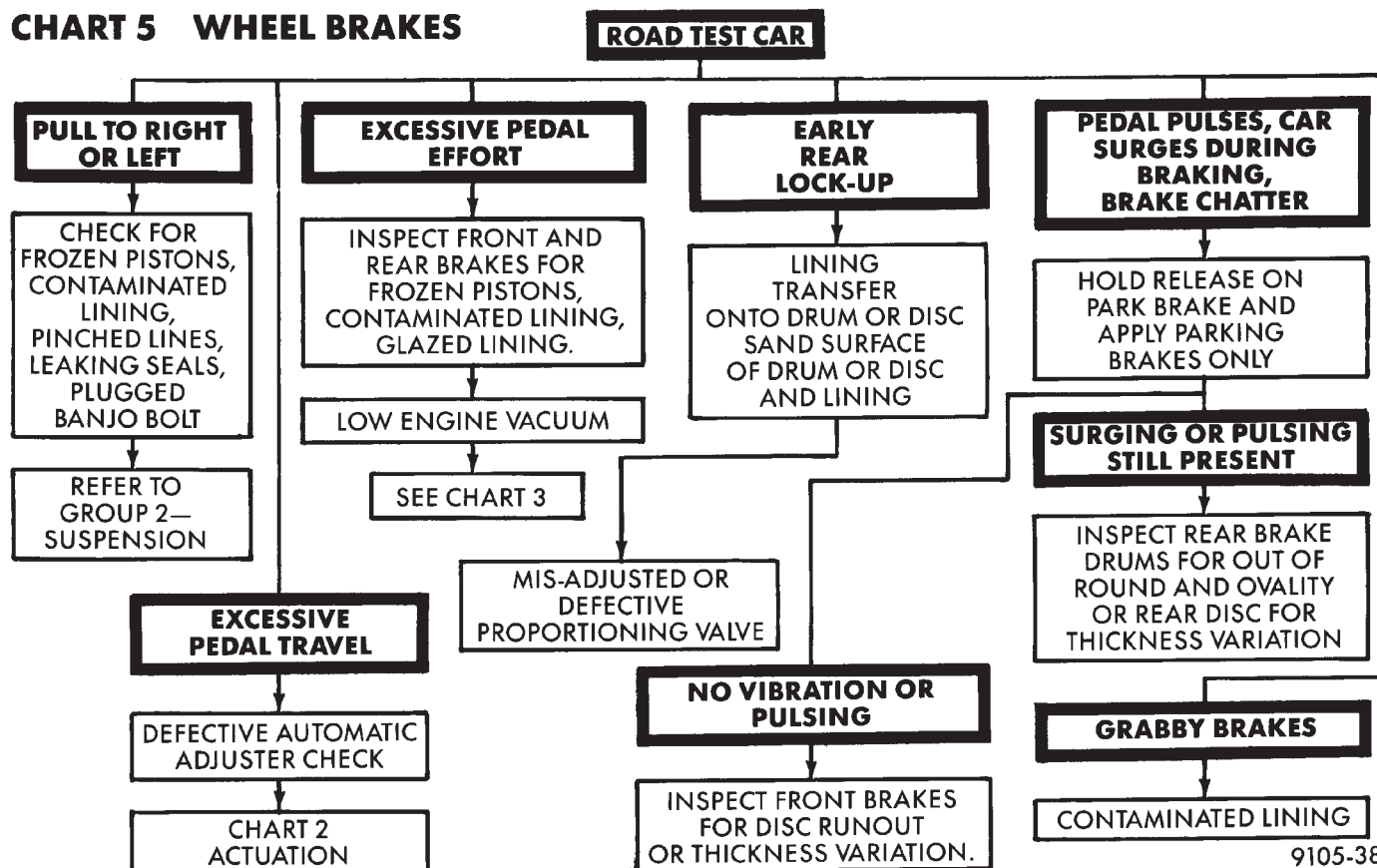


***MOPAR MULTIPURPOSE LUBRICANT, OR EQUIVALENT.

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BRAKE SYSTEM DIAGNOSTICS

CHART 5 WHEEL BRAKES



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REAR WHEEL DRUM BRAKES

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Brake Shoe Assemblies	14	Service Procedures	14

DESCRIPTION

Rear wheel drum brakes (Fig. 1) are two shoe, internal expanding type with an automatic adjuster screw assembly that is activated each time the brakes are applied. The automatic adjuster screw is located directly below the wheel cylinder as shown in figure (Fig. 1).

WARNING: DUST AND DIRT ON BRAKE PARTS GENERATED DURING THE NORMAL USE AND WEAR OF MOTOR VEHICLE BRAKE SYSTEMS CAN CONTAIN ASBESTOS FIBERS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM, SUCH AS ASBESTOSIS AND CANCER. EXTREME CARE SHOULD BE EXERCISED WHILE SERVICING BRAKE ASSEMBLIES OR COMPONENTS.

DO NOT CLEAN BRAKE ASSEMBLIES OR COMPONENTS WITH COMPRESSED AIR OR BY DRY BRUSHING; USE A VACUUM CLEANER SPECIFICALLY RECOMMENDED FOR USE WITH ASBESTOS FIBERS. IF A SUITABLE VACUUM CLEANER IS NOT AVAILABLE, CLEANING SHOULD BE DONE WET USING A WATER DAMPENED CLOTH.

DO NOT CREATE DUST BY SANDING, GRINDING, AND/OR SHAVING BRAKE LININGS OR PADS UNLESS SUCH OPERATION IS DONE WHILE USING PROPERLY EXHAUST VENTILATED EQUIPMENT.

DISPOSE OF ALL DUST AND DIRT SUSPECTED TO CONTAIN ANY ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS TO MINIMIZE DUST EXPOSURE TO YOURSELF AND OTHERS.

FOLLOW ALL RECOMMENDED PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY. FOR THE HANDLING, PROCESSING, AND DISPOSITION OF DUST OR DIRT WHICH MAY CONTAIN ASBESTOS FIBERS.

SERVICE PROCEDURES

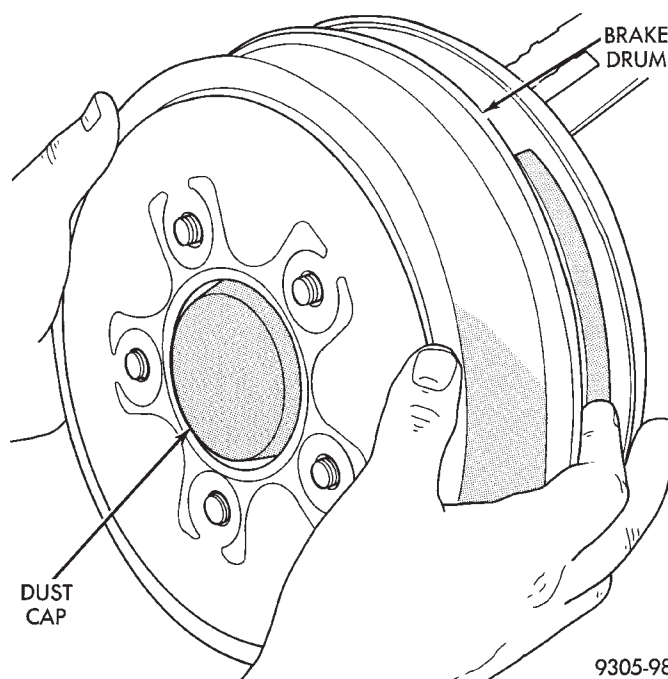
REAR BRAKE DRUM REMOVAL

Further clearance can be obtained by backing off the brake automatic adjuster screw. Remove rubber plug from top of brake support plate. Rotate automatic adjuster screw assembly with an upward mo-

tion, using a medium size screwdriver.

See adjusting rear service brakes in the Service Adjustments section in this group of the service manual for the specific adjustment procedure.

(1) Remove rear brake drum from rear hub and bearing assembly (Fig. 1).



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Fig. 1 Rear Brake Drum Removal

Inspect brake linings for wear, shoe alignment and contamination.

BRAKE DRUM INSTALLATION

(1) Install rear brake drum assembly on rear hub and bearing assembly.

(2) Install the wheel and tire assembly.

(3) Tighten the wheel mounting stud nuts in proper sequence (Fig. 2) 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.).

BRAKE SHOE ASSEMBLIES

All L.H. platform vehicles equipped with rear drum brakes have original equipment brakes supplied by Varga (Fig. 3). Varga brake shoes are HANDED for right or left side.

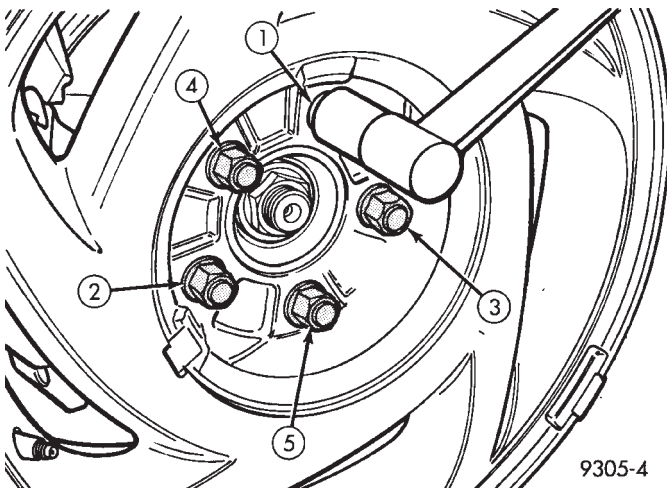


Fig. 2 Tightening Wheel Nuts

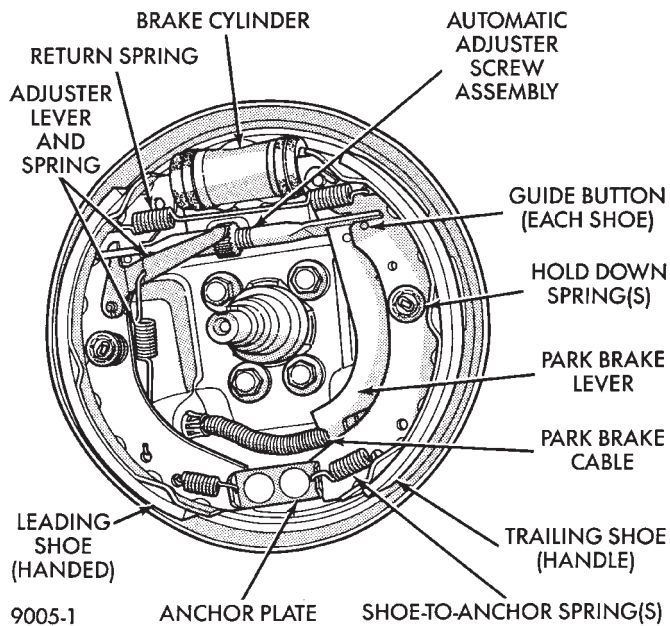


Fig. 3 Varga Rear Wheel Brake (Left Side Of Vehicle Shown)

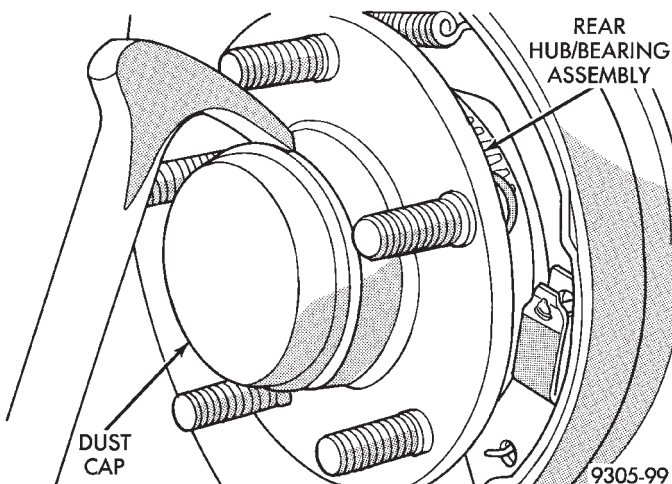


Fig. 4 Rear Hub And Bearing Dust Cap Removal

REMOVE

(1) Remove rear hub and bearing assembly dust cap (Fig 4). Then remove cotter pin and nut lock from spindle.

(2) Remove the rear hub and bearing assembly retaining nut and washer (Fig. 5). Remove rear hub and bearing assembly from spindle.

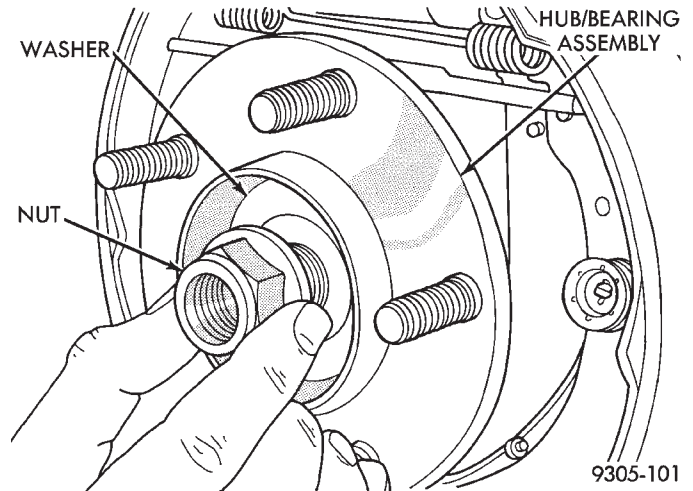


Fig. 5 Rear Hub And Bearing Retaining Nut Removal

(3) Remove automatic adjuster spring from automatic adjuster lever (Fig. 6).

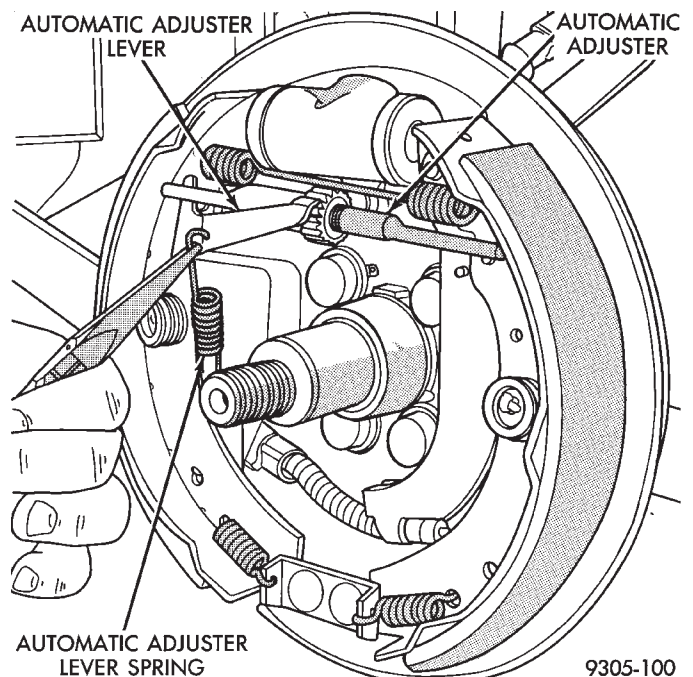


Fig. 6 Remove or Install Automatic Adjuster Lever Spring



(4) Rotate the automatic adjuster screw assembly so that each shoe assembly moves out far enough to be free from the wheel cylinder boots (Fig. 7).

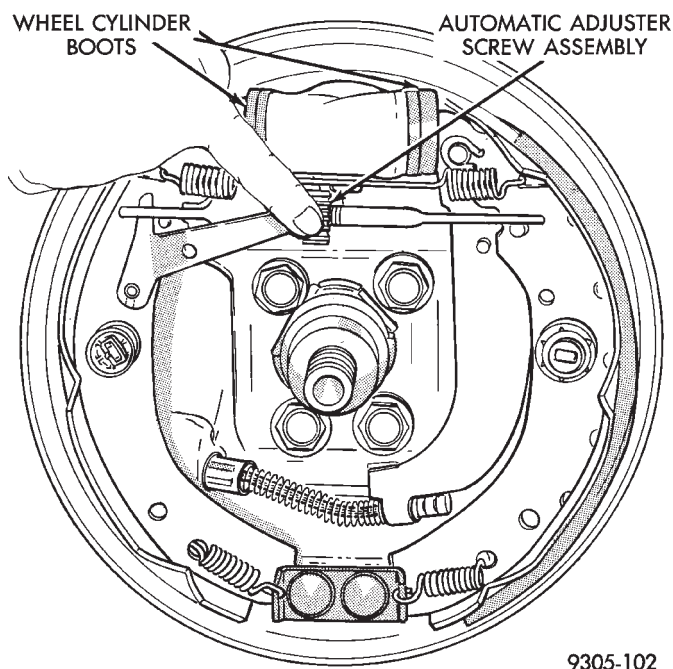


Fig. 7 Expand or Retract Adjuster Screw

(5) Disconnect parking brake cable from parking brake lever (Fig. 8). **Note: Only disconnect the park brake cable on one side of the vehicle at a time. Failure to do so will result in high efforts required to connect park brake cables to equalizer or park brake lever.**

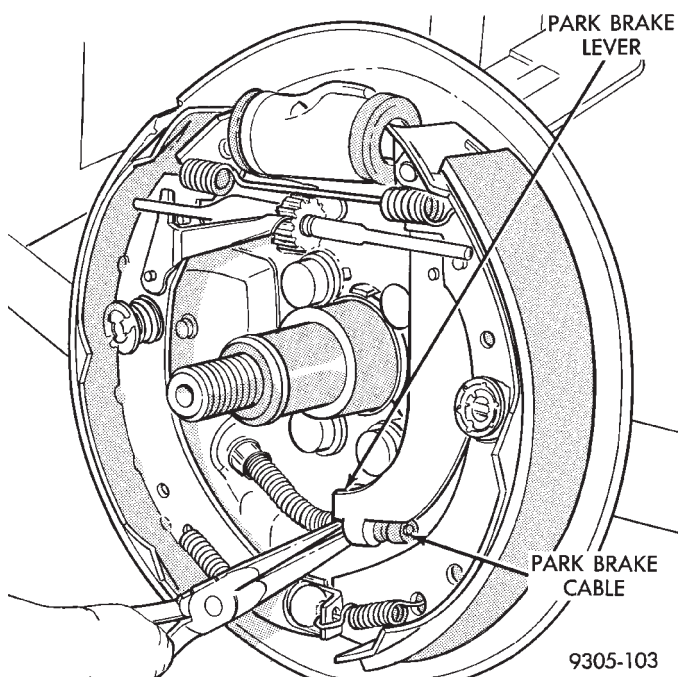


Fig. 8 Disconnect Parking Brake Cable

(6) Remove both lower brake shoe assembly to anchor plate springs (Fig. 9).

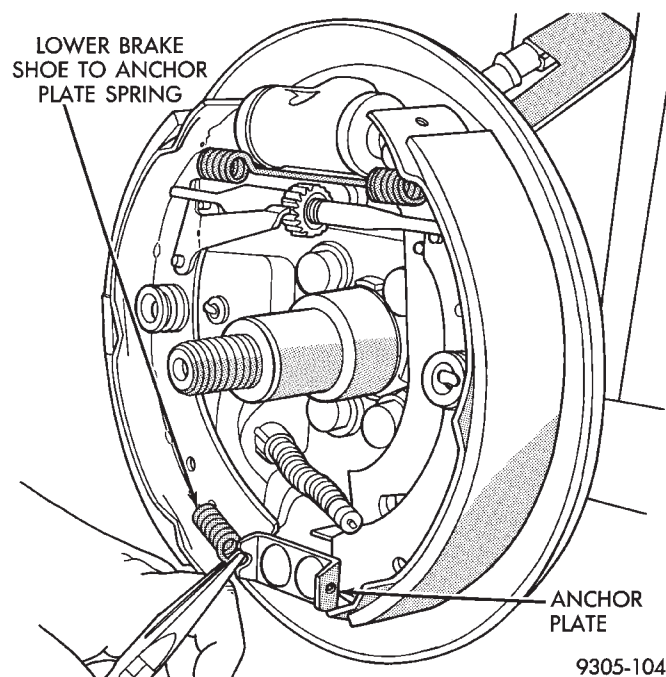


Fig. 9 Lower Brake Shoe To Anchor Plate Spring

(7) Remove the 2 brake shoe assembly to support plate hold down springs from brake shoe assemblies (Fig. 10).

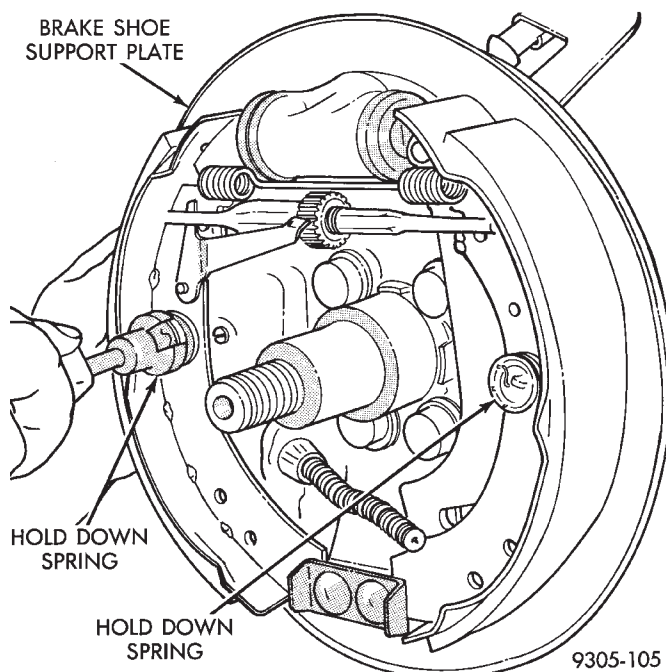


Fig. 10 Remove or Install Holddown Springs

(8) Remove brake shoe assemblies, upper shoe to shoe return spring, automatic adjuster and adjuster lever from brake shoe support plate as an assembly (Fig. 11)

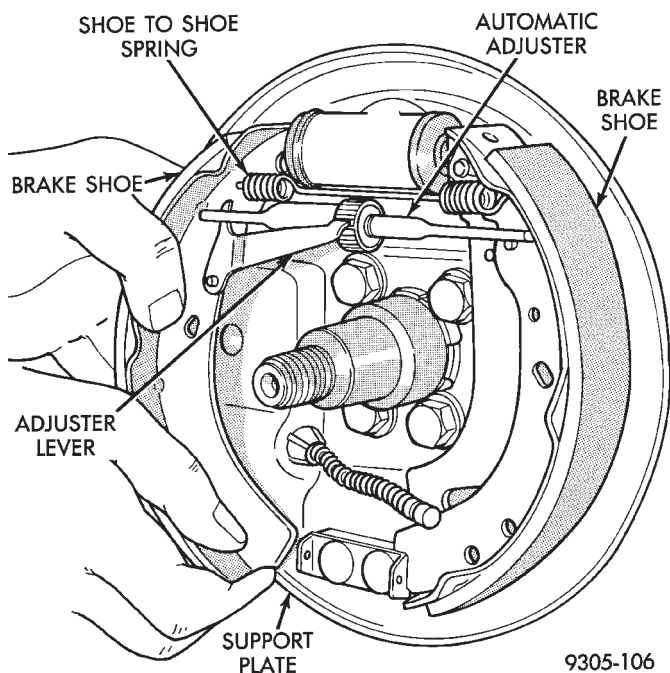


Fig. 11 Remove or Install Brake Shoe Assemblies

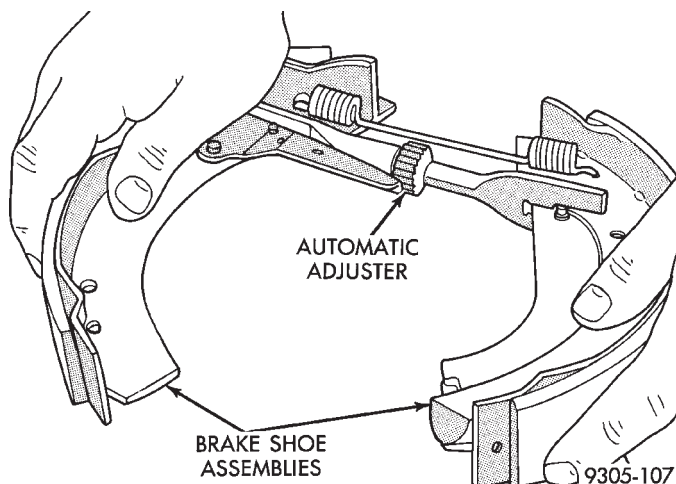


Fig. 12 Remove Brake Shoe Assemblies From Adjuster

(9) After brake shoe assemblies are removed from brake support plate. Separate brake shoe assemblies from automatic adjuster mechanism (Fig. 12).

(10) Remove brake shoe automatic adjuster lever from leading brake shoe assembly (Fig. 13)

CLEANING AND INSPECTION

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 maybe improperly ground.

Clean and inspect support and adjusting screws. Apply a thin coat of Mopar Multi-Purpose Lubricant

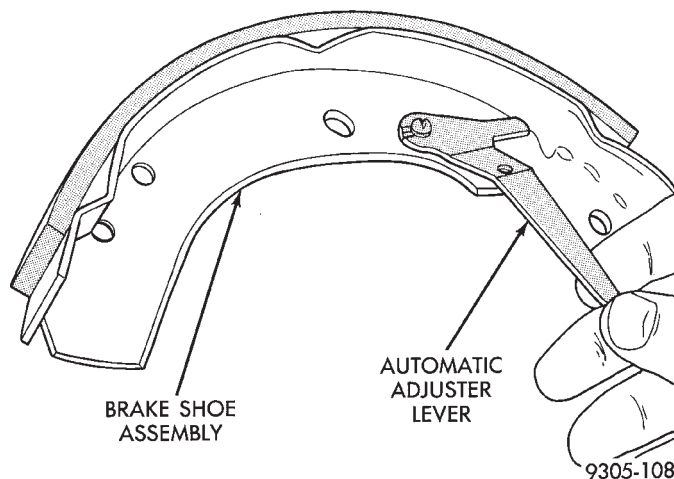


Fig. 13 Automatic Adjuster Lever

or equivalent to the threads of the self adjuster. Replace adjusting screw if corroded.

If old springs have overheated or are damaged, replace them. Overheating indication is distorted end coils.

INSTALL

(1) Lubricate the eight shoe contact areas on the support plate and anchor using Mopar Multi-Purpose Lubricant or equivalent (Fig. 15).

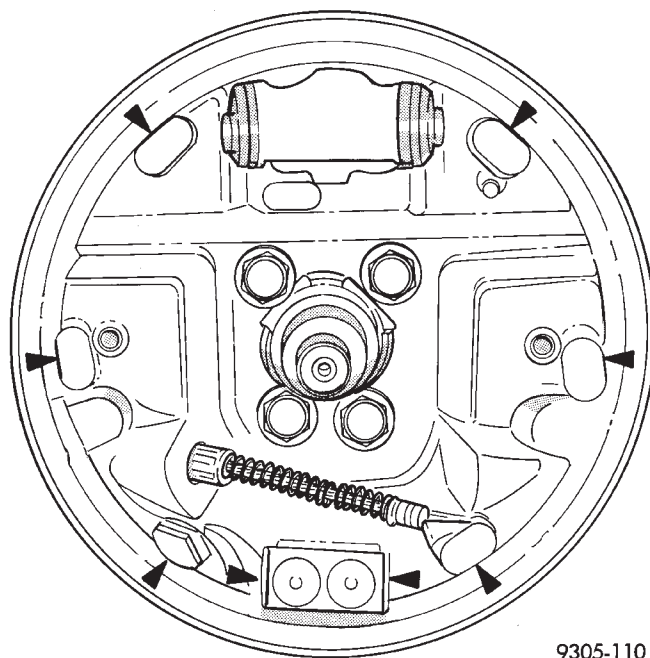


Fig. 15 Brake Shoe Assembly Contact Areas on Support Plate

(2) Assemble leading and trailing brake shoe assemblies, top shoe to shoe spring, automatic adjuster lever and automatic adjuster (Fig. 16), before mount-



ing on vehicle. Be sure automatic adjuster ends are above extruded pins in web of brake shoes as shown in (Fig. 16).

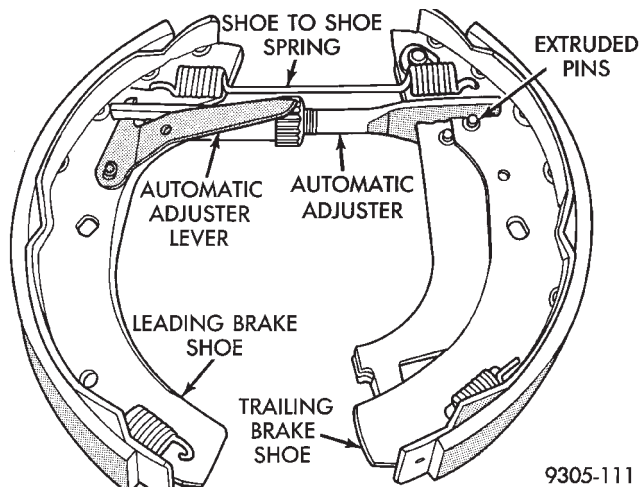


Fig. 16 Rear Brake Shoes Assembled (Left Rear Shown)

(3) Install the pre-assembled brake shoe assembly on the brake support plate (Fig. 11).

(5) Install the brake shoe assembly to brake support plate hold down springs (Fig. 10).

(6) Install both lower brake shoe assembly to anchor plate return springs (Fig. 9)

(7) Install park brake cable in park brake lever of trailing shoe (Fig. 8).

(8) Rotate serrated adjuster nut to remove free play from the adjuster assembly (Fig. 7).

(9) Install automatic adjuster lever spring, on leading brake shoe assembly and automatic adjuster lever (Fig. 6).

(10) Install rear hub and bearing assembly on rear spindle. Install hub and bearing assembly washer and retaining nut (Fig. 5). Torque hub and bearing assembly retaining nut to 168 N•m (124 ft.lbs.). Install nut lock and cotter pin on spindle and dust cap on hub.

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

(12) Install the rear brake drums on the hubs. **After brake drums are installed pump brake pedal several times to partially adjust the brake shoe assemblies. When park brake pedal is released assure that both rear brakes are not dragging. This will verify proper operation of the self-adjust parking brake.**

(13) Install the wheel and tire assembly.

(14) Tighten the wheel mounting stud nuts in proper sequence (Fig. 17) 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.).

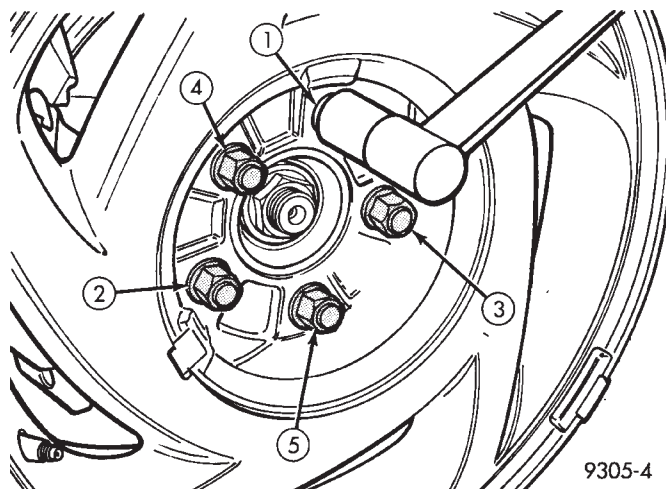


Fig. 17 Tightening Wheel Nuts

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

BRAKE DRUM REFACING

Measure drum runout and diameter. If not to specification, reface drum. (Runout should not exceed 0.1524 mm or 0.006 inch). The diameter variation (oval shape) 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°.

All drums will show markings of maximum allowable diameter (Fig. 16).

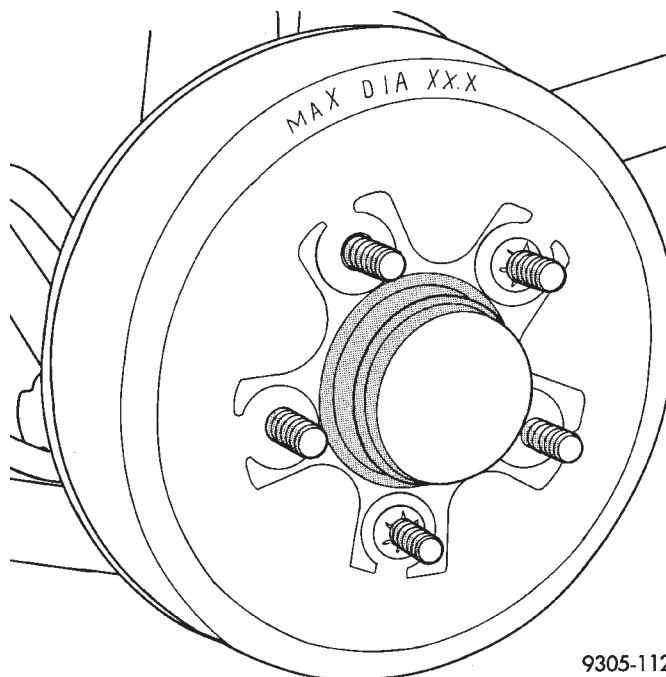


Fig. 16 Maximum Drum Diameter Identification



WHEEL CYLINDERS

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Installing Wheel Cylinders	20		

GENERAL INFORMATION

The piston boots are of the push-on type and prevent moisture from entering the wheel cylinder.

To perform service operations or inspections of the rear wheel brake cylinders. It will be necessary to remove the cylinders from the support plate and disassemble on the bench.

CAUTION: Wheel cylinders with cup expanders must have cup expanders after any service procedures (reconditioning or replacement).

SERVICE PROCEDURES**REMOVING WHEEL CYLINDERS FROM BRAKE SUPPORT PLATES**

With brake drums removed, inspect the wheel cylinder boots for evidence of a brake fluid leak. Then block the brake pedal in the stroke position, and 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. (A slight amount of fluid on the boot may not be a leak, but maybe preservative fluid used at assembly.)

- (1) In case of a leak, remove brake shoes, (replace if soaked with grease or brake fluid.)
- (2) Remove brake hose bracket from rear brake support plate (Fig. 1).
- (3) Disconnect brake hose tube from wheel cylinder (Fig. 1).
- (4) Remove rear wheel cylinder attaching bolts (Fig. 1). Then pull wheel cylinder assembly off brake support plate (Fig. 2).

DISASSEMBLING WHEEL CYLINDERS

To disassemble the wheel cylinders, (Fig. 3) proceed as follows:

- (1) Pry boots away from cylinders and remove.
- (2) Press **IN** on one piston to force out opposite piston, cup and spring (with cup expanders). 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 in clean brake fluid or alcohol; **(DO NOT USE ANY PETROLEUM BASE SOLVENTS)** clean thoroughly and blow dry with compressed air. Inspect

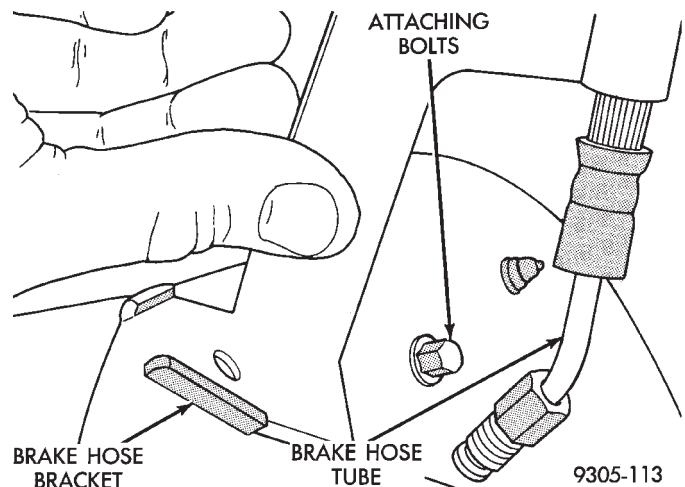


Fig. 1 Brake Hose Bracket And Tube Disconnected

cylinder bore and piston for scoring and pitting. (Do not use a rag as lint from the rag will stick to bore surfaces.)

Wheel cylinder bores and pistons that are badly scored or pitted should be replaced. Cylinder walls

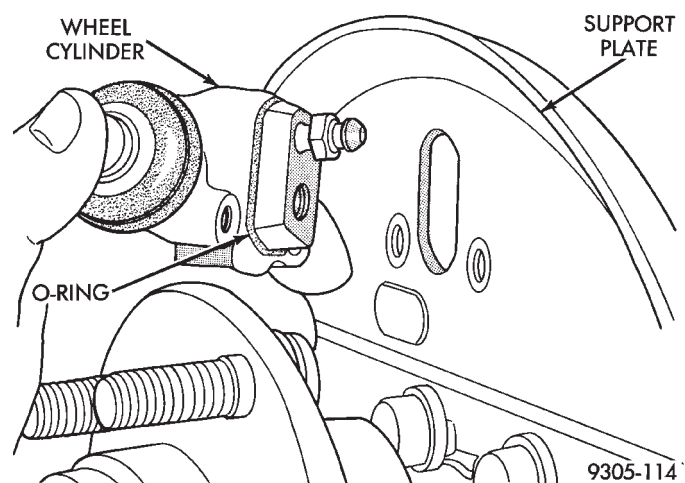


Fig. 2 Remove or Install Wheel Cylinder

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.

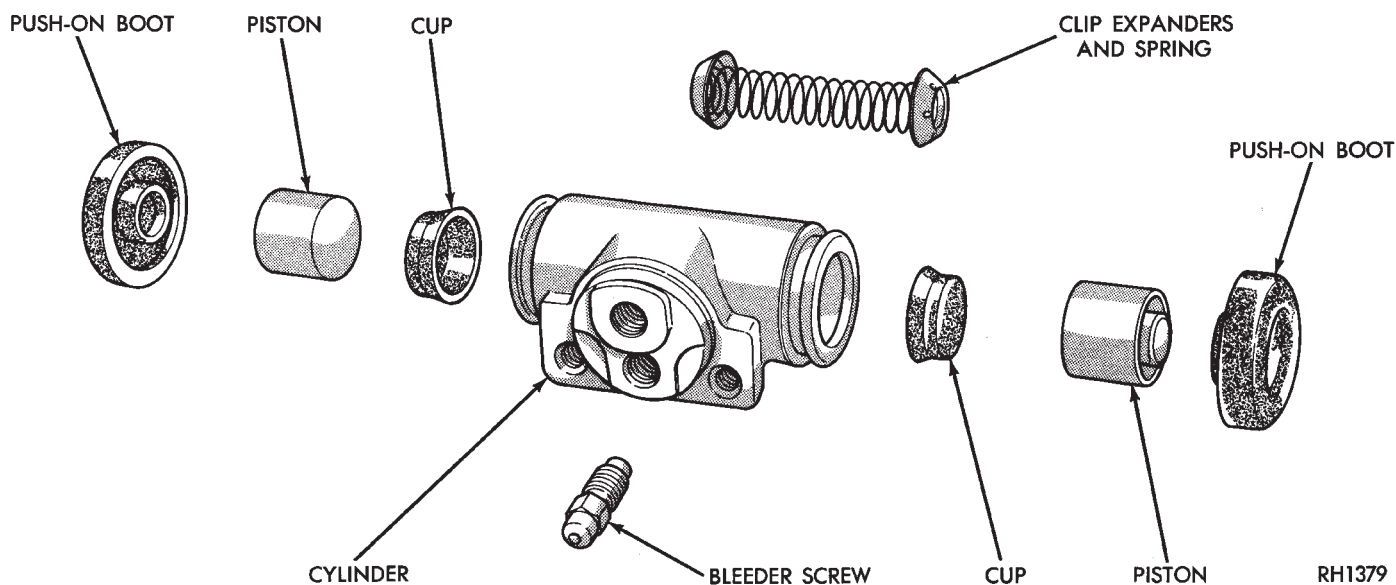


Fig. 3 Rear Wheel Cylinder

ASSEMBLING WHEEL CYLINDERS

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) Install expansion spring with cup expanders in cylinder. Install cups in each end of cylinder with open end of cups facing each other (Fig. 3).
- (3) Install piston in each end of cylinder having the flat face of each piston contacting the flat face of each cup, already installed (Fig. 3).
- (4) Install a boot over each end of cylinder. **Be careful not to damage boot during installation.**

INSTALLING WHEEL CYLINDERS

- (1) Install O-Ring on wheel cylinder as shown in (Fig. 2).
- (2) Install wheel cylinder onto brake support plate. Tighten the wheel cylinder to brake support plate attaching bolts to 8 N•m (75 in. lbs.).
- (3) Hand start hydraulic brake hose tube fitting to wheel cylinder. Attach brake hose bracket to support plate (Fig. 1). Tighten tube to wheel cylinder fitting to 17 N•m (145 in. lbs.).
- (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 (Fig. 4) 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.).

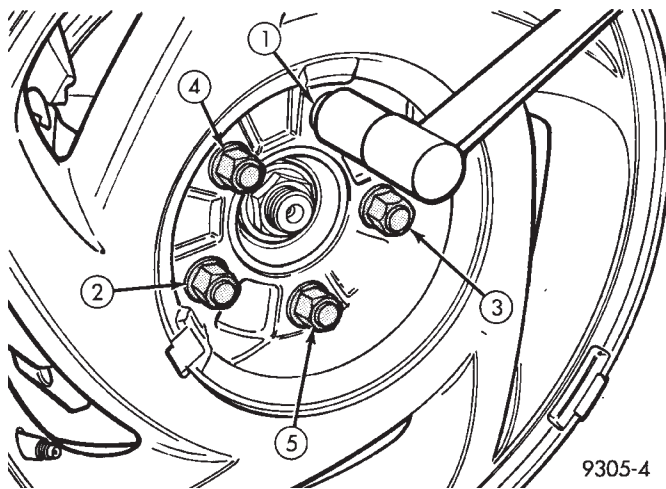


Fig. 4 Tightening Wheel Nuts

- (7) Adjust the rear brakes, (See Adjusting Service Brakes) in Service Adjustments section in this group of the service manual.
- (8) Bleed the entire brake system. See (Bleeding Brake System) in Service Adjustments section in this group of the service manual.



BRAKE SUPPORT ASSEMBLY

REMOVAL

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

(2) Remove rear hub and bearing assembly dust cap (Fig 5). Then remove cotter pin and nut lock from spindle.

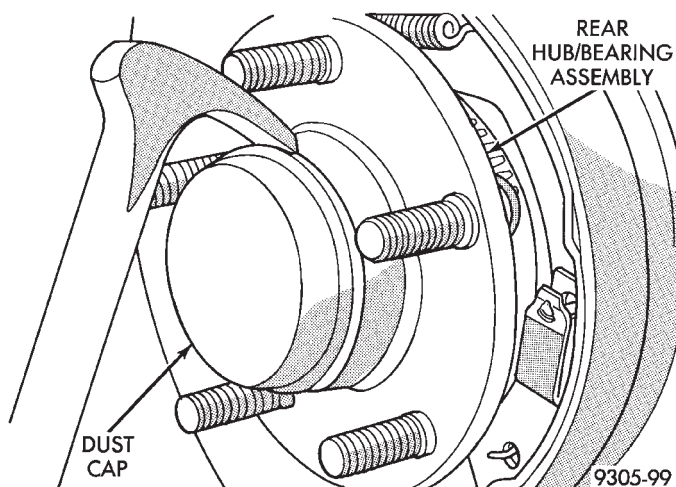


Fig. 5 Rear Hub And Bearing Dust Cap Removal

(3) Remove the rear hub and bearing assembly retaining nut and washer (Fig. 6). Remove rear hub and bearing assembly from spindle.

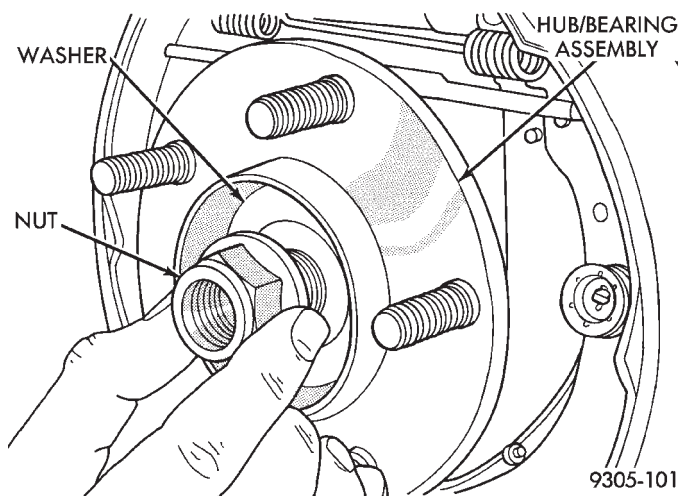


Fig. 6 Rear Hub And Bearing Retaining Nut Removal

(4) Remove automatic adjuster spring from automatic adjuster lever (Fig. 7).

(5) Position a 1/2 wrench over the retainer fingers on the end of the parking brake cable (Fig. 8). Com-

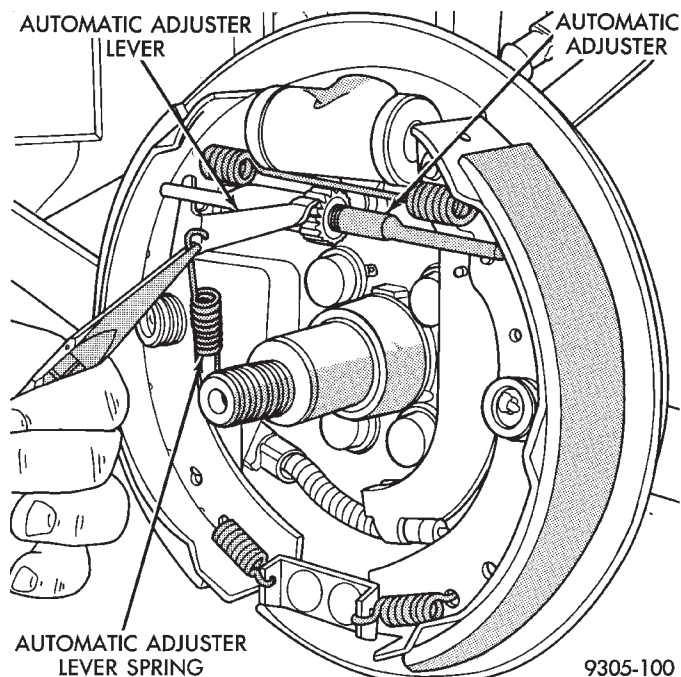


Fig. 7 Remove or Install Automatic Adjuster Lever Spring

press cable housing retaining fingers and start housing out of support plate (Fig. 8). 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.

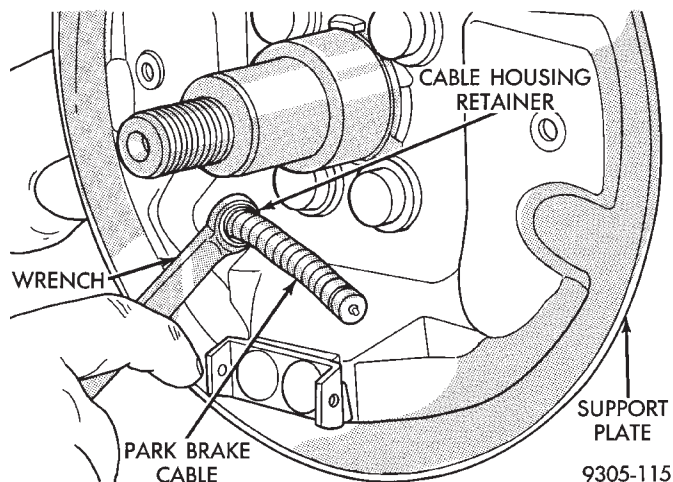


Fig. 8 Removing Park Brake Cable From Support Plate

(6) Remove attaching bolt and washer assemblies. Separate brake support plate from rear suspension knuckle casting.



INSTALLATION

(1) Insert parking brake cable and housing end fitting into brake support plate.

(2) Install support plate and gasket on rear suspension knuckle casting. Torque support plate to knuckle casting attaching bolts to 115 N•m (85 ft. lbs.).

(3) Attach cable to parking brake lever.

(4) Connect brake hose tube to wheel cylinder and attach bracket to support plate. Tighten brake tube to wheel cylinder fitting to 17 N•m (145 in. lbs.).

(5) Install brake drum and wheel. Adjust and bleed service brakes. Adjust parking brake.

(6) Install rear hub and bearing assembly on rear spindle. Install hub and bearing assembly washer and retaining nut (Fig. 6). Torque hub and bearing assembly retaining nut to 168 N•m (124 ft.lbs.). Install dust cap.

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

(8) Install rear brake drum on the hub. **After brake drums are installed pump brake pedal several times to partially adjust the brake shoe assemblies.**

(9) Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence (Fig. 9) until all nuts are torqued to half specification. This is important. Then repeat the tightening sequence to the full specified torque of 129 N•m (95 ft. lbs.).

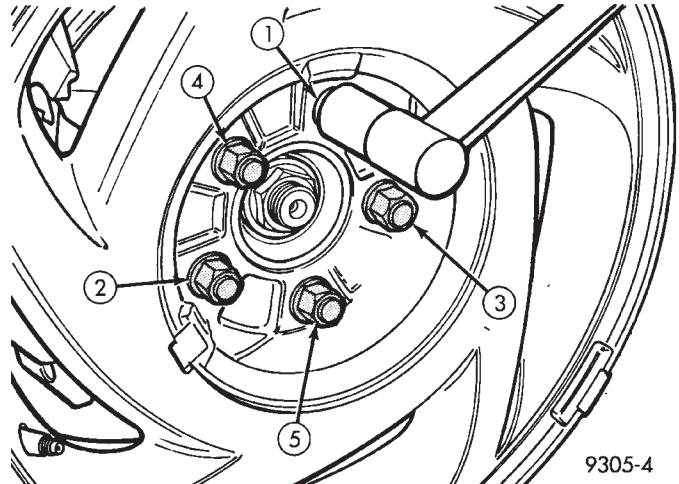


Fig. 9 Tightening Wheel Nuts



HYDRAULIC SYSTEM CONTROL VALVES

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GENERAL INFORMATION

All L.H. platform vehicles not equipped with Anti-Lock brakes, have a proportioning hydraulic system control valve in the brakes hydraulic system (Fig. 1 and 2). The valve is attached to the frame rail below the master cylinder.

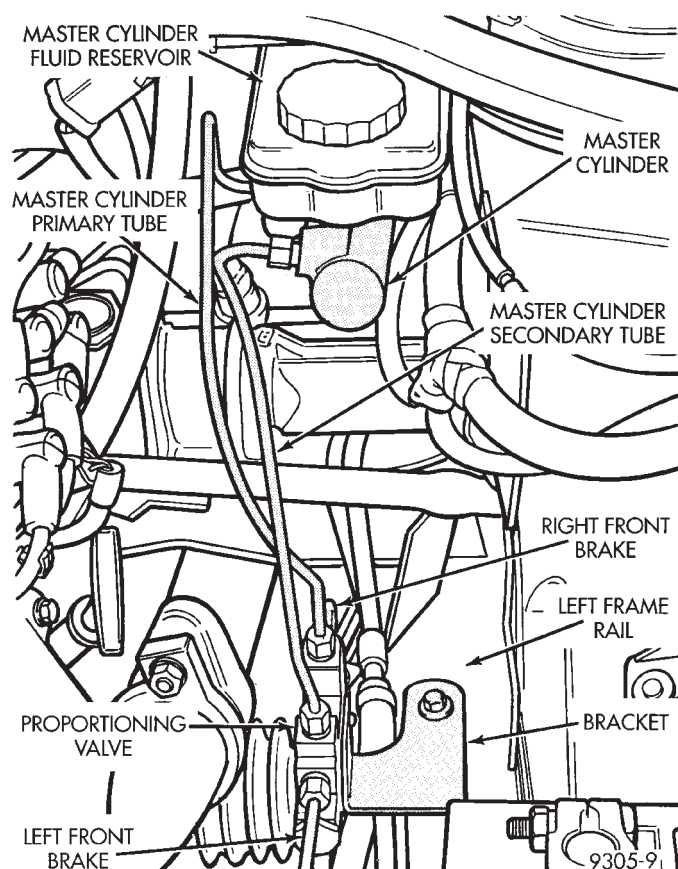


Fig. 1 Brake Proportioning Valve Location

The proportioning valve balances front to rear braking by controlling at a given ratio, the increase in rear system hydraulic pressure above a preset level. Under light pedal application, the valve allows full hydraulic pressure to the rear brakes.

There is only one valve assembly in each vehicle which is not equipped with Anti-Lock, see Valve Application Chart. During any service procedures identify valve assemblies by part number as well as split point (PSI) and slope.

The hydraulic brake system, on non-ABS vehicles, is split diagonally. The left front and right rear brakes are part of one system. The right front and left rear are part of another. Both systems are routed through, but hydraulically separated by the proportioning valve.

However, since the brake systems are split diagonally the vehicle will retain 50% of its stopping capability in the event of a failure in either half.

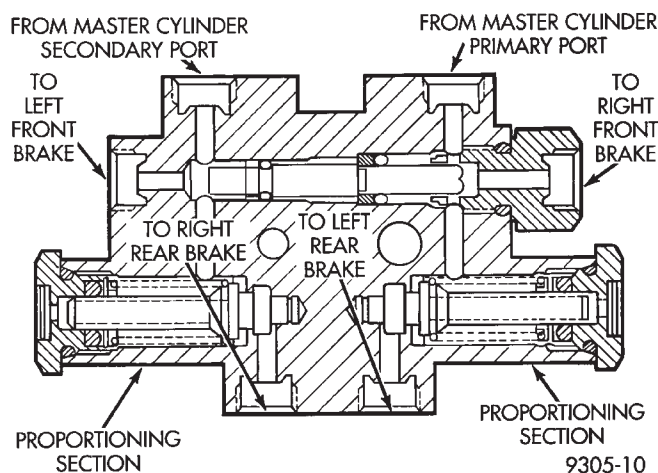


Fig. 2 Proportioning Valve Assembly

NON-ABS PROPORTIONING UNIT OPERATION

The proportioning valve section operates by transmitting full input pressure to the rear brakes up to a certain point. This is called the split point. Beyond this point it reduces the amount of pressure increase to the rear brakes according to a certain ratio.

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

ABS BRAKE PROPORTIONING VALVE OPERATION

On vehicles using the ABS braking system, screw in proportioning valves (Fig. 3) are used in place of the conventional differential pressure/proportioning valve.



Each rear brake circuit has its own screw-in proportioning valve which is attached to the rear brake outlet ports of the hydraulic control unit (HCU). The valves limit brake pressure to rear brakes after a certain pressure is reached. This improves front to rear brake balance during normal braking.

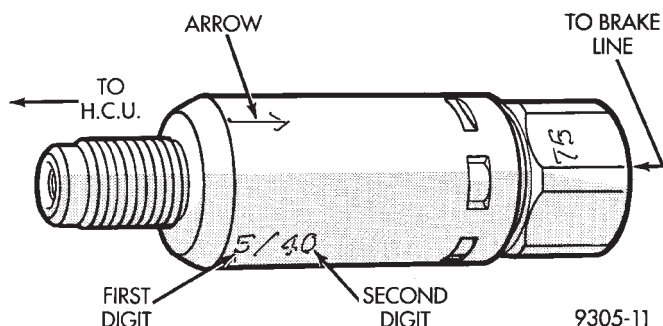


Fig. 3 ABS PROPORTIONING VALVE IDENTIFICATION

Screw in proportioning valves can be identified by the numbers stamped on the body of the valve. The first digit represents the slope, the second digit represents the split (cut-in) point, and the arrow represents the flow direction of the valve. **Be sure that the numbers listed on the replacement valve are the same as on the valve that is being removed.** See (Fig. 3) for detail of the valve identification.

HYDRAULIC SYSTEM SERVICE PROCEDURES

BRAKE WARNING SYSTEM

CHECKING BRAKE WARNING SWITCH UNIT

The Red Brake Warning light will come on when the parking brake is applied with the ignition key turned ON. The same light will also illuminate should one of the two service brake hydraulic systems fail.

PROPORTIONING VALVES

TESTING PROPORTIONING VALVE UNIT

If premature rear wheel skid occurs on hard brake application, it could be an indication that a malfunction has occurred with the proportioning valve unit.

The proportioning valve is designed with two **separate** systems. One half controls the right rear brake, and the other half controls the left rear brake. Therefore, a road test to determine which rear brake slides first is essential.

RIGHT REAR WHEEL SLIDES FIRST

CAUTION: All brake line fittings used on the L.H. platform vehicle use ISO style tubing flares. Ensure that when fabricating adapter tubes required to test proportioning valve operation. That only ISO style tubing flares are used at proportioning valve connections. Failure to use ISO style tubing flares at the proportioning valve connections, will destroy tubing seats in proportioning valve.

NON-ABS AND ABS PROPORTIONING VALVE APPLICATIONS

NON-ANTI-LOCK BRAKES

VEH FAM	VALVE FUNCTION	MATERIAL	PROPORTIONING		IDENT.
			SPLIT	SLOPE	
LH	DISC-DISC PROPORTIONAL	ALUMINUM	430 PSI	.43	BLACK TAG
LH	DISC-DRUM PROPORTIONAL	ALUMINUM	500 PSI	.43	WHITE TAG

ANTI-LOCK BRAKES

VEH FAM	VALVE FUNCTION	MATERIAL	PROPORTIONING		IDENT.
			SPLIT	SLOPE	
LH	DISC-DISC SCREW IN PROPORTIONING	GREY STEEL	30 BAR 435 PSI	.45	30/45

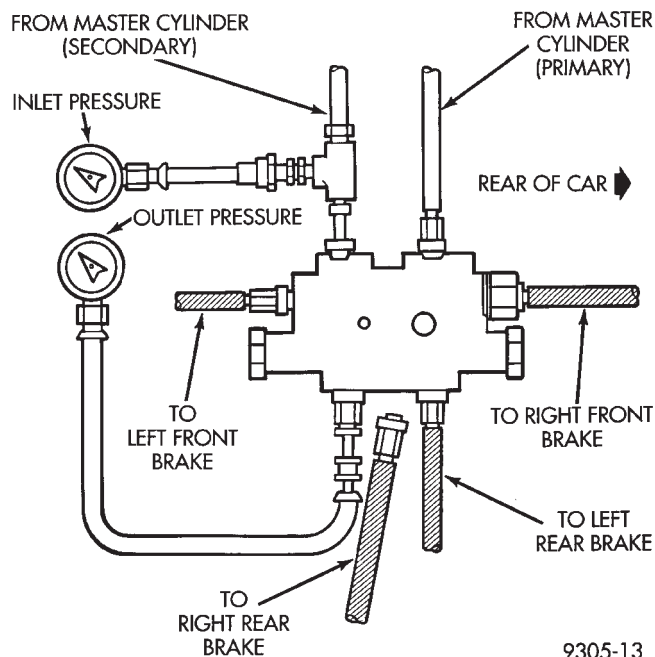


To test the proportioning valve when the right rear wheel slides first, leave the front brakes connected to the valve, and proceed as follows:

(1) Install one gauge and (TEE) of set C-4007-A between the brake line from the master cylinder secondary port and the brake valve assembly (Fig. 1).

(2) Install the second gauge of set C-4007-A to the right rear brake outlet port (Fig. 1). Gauge to be attached using an adapter tube, made from a short piece of brake tube and (1) 3/8 x 24 tube nut, and (1) M10x1 tube nut. Connect the hose to the valve. Bleed the hose and gauge.

(3) Have a helper exert pressure on the brake pedal (holding pressure) to get a reading on the valve inlet gauge and check the reading on the outlet gauge. If the inlet and outlet pressures do not agree with the values on the following chart, replace the valve.



9305-13

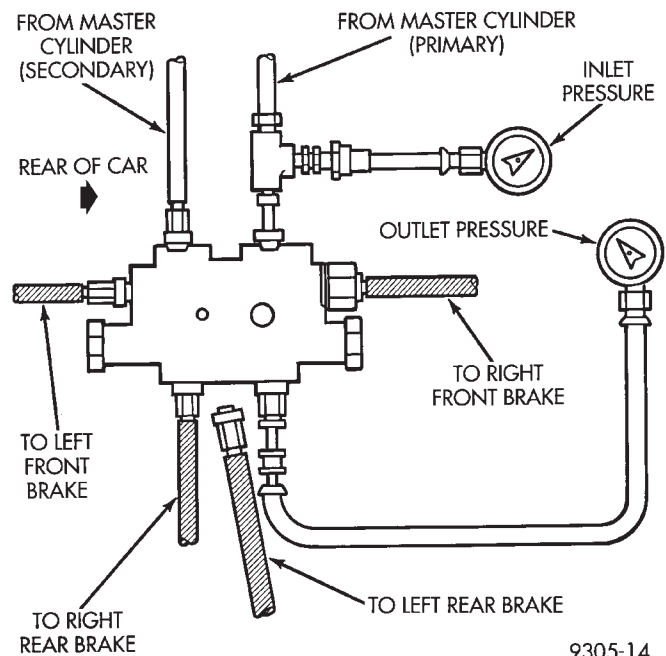
Fig. 1 Tube Connection For Right Rear Skidding
LEFT REAR WHEEL SLIDES FIRST

To test the proportioning valve when the left rear wheel slides first, leave the front brakes connected to the valve, and proceed as follows:

(1) Install one gauge and (TEE) of set C-4007-A between brake line from master cylinder primary port and brake valve assembly (Fig. 2).

(2) Install the second gauge of set C-4007-A to the left rear brake outlet port (Fig. 2). An adapter tube, made up from a M12x1 tube nut, a short piece of brake tube and 3/8 x 24 tube nut, will be required to connect hose to valve. Bleed the gauge and hose.

(3) Have a helper exert pressure on the brake pedal. Hold pressure steady to get a reading on the valve inlet gauge and check the reading on the outlet gauge. If the inlet and outlet pressures do not agree



9305-14

Fig. 2 Tube Connection For Left Rear Skidding

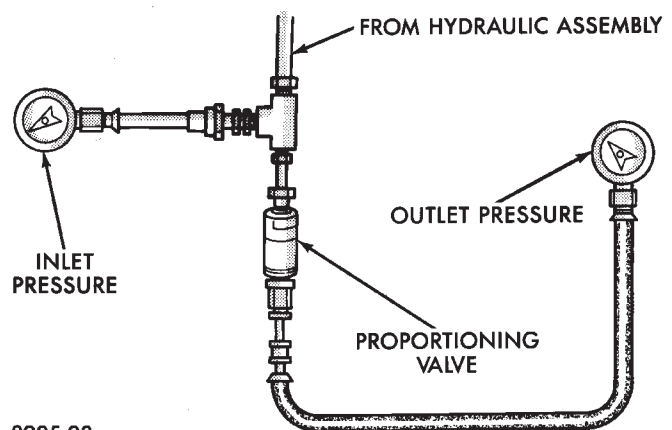
with the values on the following chart, replace the valve.

TESTING ABS PROPORTIONING VALVES

All ABS components use an ISO type tubing flare. Use the correct adapters with ISO type tubing flares when installing gauges to test ABS proportioning valves.

(1) Install one gauge and (TEE) between the hydraulic assembly and the male end (Inlet) of the valve.

(2) Install the second gauge at the female end (Outlet) of the valve (Fig. 3).



8905-23

Fig. 3 Tube Connections for ABS

(3) Have a helper exert pressure on the brake pedal (holding pressure) to get a reading on the valve inlet gauge.

(4) Check the reading on the outlet gauge. If the inlet and outlet pressures do not agree with the fol-



lowing chart, replace the valve. See (Fig. 4) for proportioning valve identification.

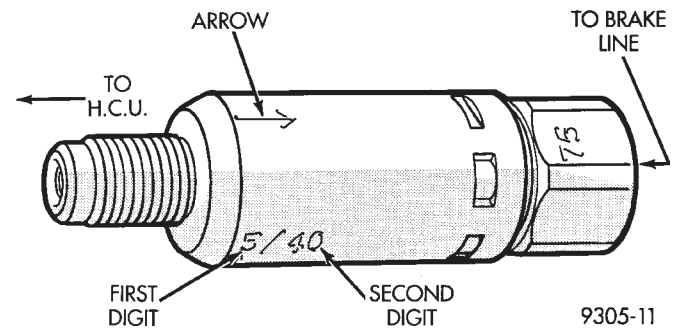


Fig. 4 ABS PROPORTIONING VALVE IDENTIFICATION

PROPORTIONING VALVE PRESSURES NON-ABS BRAKES

PROPORTIONING VALVE NON-ABS BRAKE SYSTEM	SLOPE	INLET PRESSURE PSI	OUTLET PRESSURE PSI
430 PSI	.43	1000 PSI	525-600 PSI
500 PSI	.43	1000 PSI	725-850 PSI

9305-144

PROPORTIONING VALVE PRESSURES ABS-BRAKES

PROPORTIONING VALVE ABS BRAKE SYSTEM	SLOPE	INLET PRESSURE PSI	OUTPUT PRESSURE PSI
30 BAR	.45	1000 PSI	640-720 PSI
35 BAR	.45	1000 PSI	685-765 PSI
40 BAR	.45	1000 PSI	725-805 PSI
45 BAR	.45	1000 PSI	765-845 PSI
20 BAR	.3	1000 PSI	460-540 PSI
25 BAR	.3	1000 PSI	510-590 PSI
30 BAR	.3	1000 PSI	560-640 PSI

WHERE 1 BAR IS EQUAL TO 14.7 PSI

9105-49



FRONT DISC BRAKES

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GENERAL INFORMATION

The single piston, floating caliper disc brake assembly (Fig. 1) used on the L.H. platform vehicle consists of the following components.

- The driving hub and bearing assembly
- Braking disc (rotor)
- Caliper assembly
- Shoes and linings
- **WARNING: THE PISTONS THAT ARE USED IN THE FRONT AND REAR DISC BRAKE CALIPER ASSEMBLIES ARE UNIQUE TO THE CALIPER THEY ARE USED IN. THE DIMENSIONS OF THESE PISTONS ARE DIFFERENT, DO NOT INTERCHANGE THE CALIPER PISTONS. IMPROPER USE COULD CAUSE A COMPLETE FAILURE OF THE BRAKE SYSTEM.**

The double pin Kelsey-Hayes Family Calipers, used on the L.H. platform are mounted directly to the steering knuckles and use no adapter. The caliper is mounted to the steering knuckle using bushings, sleeves and 2 through bolts which thread directly into bosses on the steering knuckle (Fig. 2).

Two machined abutments on the steering knuckle,

(Fig. 2) position and align the caliper fore and aft. The guide pin bolts, sleeves and bushings control the float, 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 will help in maintaining proper brake shoe to rotor clearance (Fig. 4).

Vehicles equipped with the Kelsey-Hayes double pin family caliper. Have anti-rattle clips attached to the inner and outer brake shoe and lining assemblies (Fig. 1).

All of the braking force is taken up directly by the steering knuckle of the vehicle.

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

The front disc brake caliper phenolic piston is 60 mm (2.36 inch) in diameter.

A square cut rubber piston seal is located in a machined groove in the cylinder bore. This provides a hydraulic seal between the piston and the cylinder wall (Fig. 4).

A molded rubber dust boot installed in a groove in the cylinder bore and piston, keeps contamination from the cylinder wall and piston.

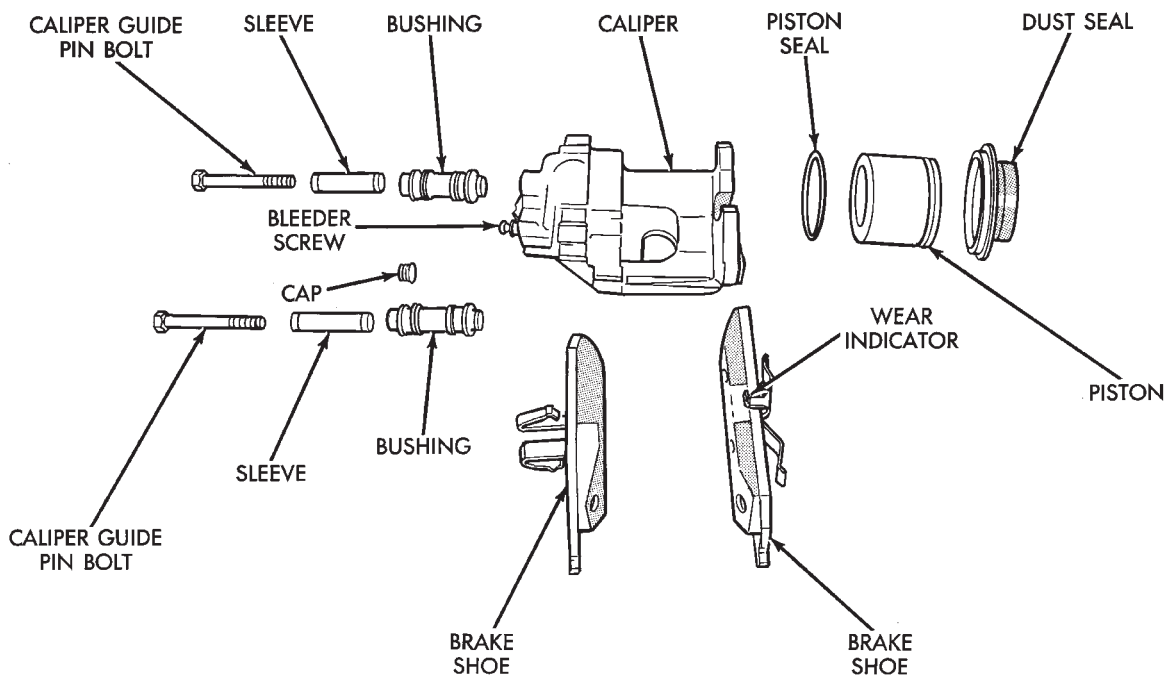
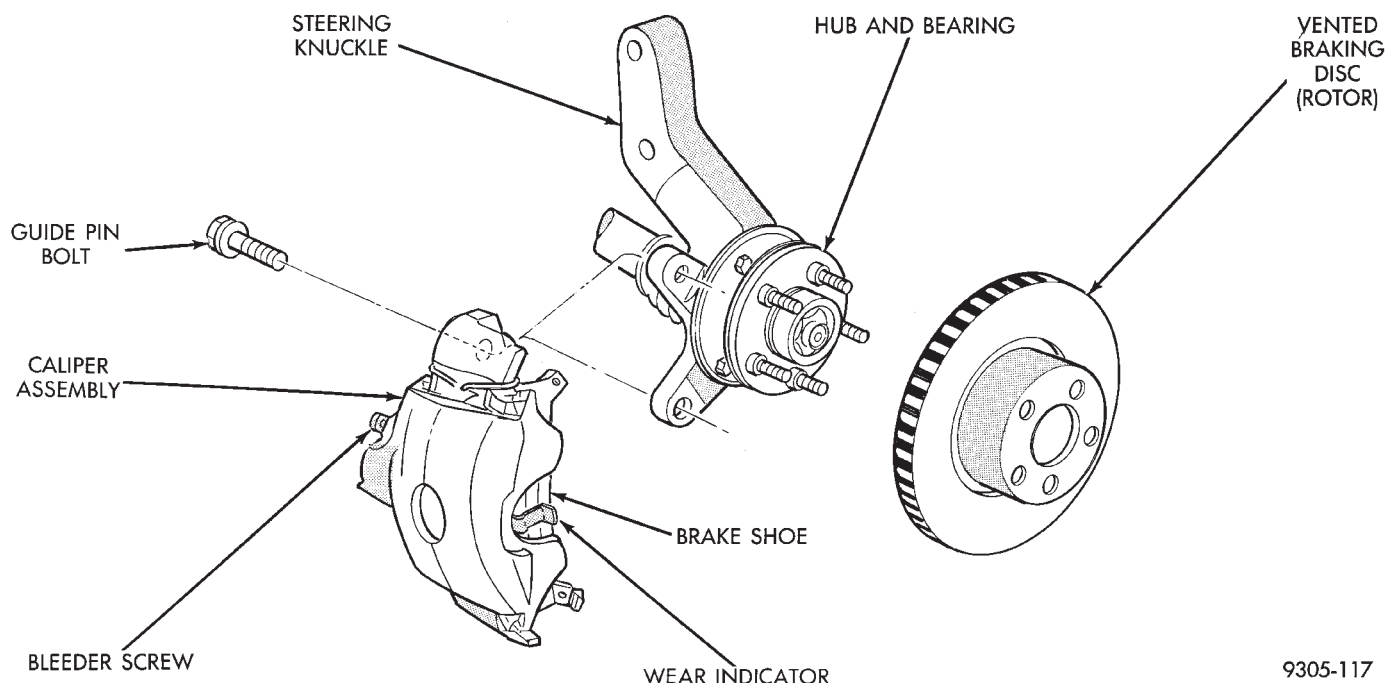
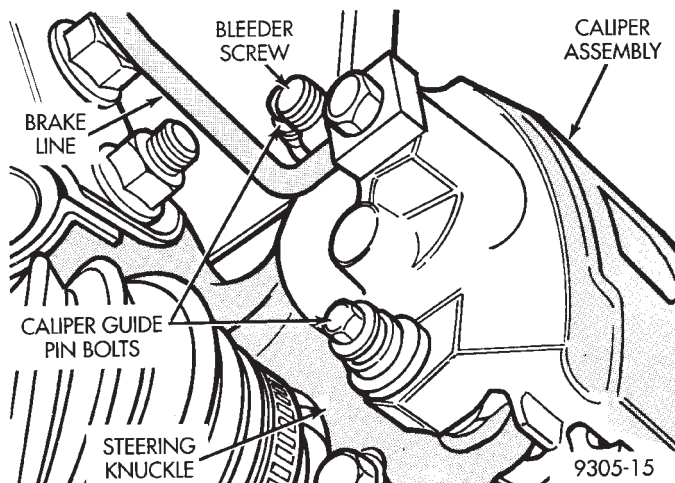


Fig. 1 Front Disc Brake Assembly



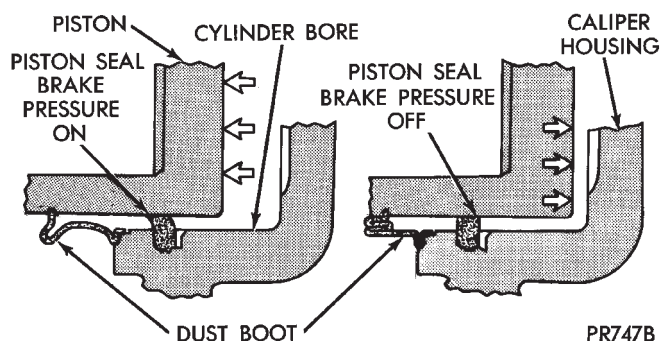
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Fig. 2 Disc Brake Caliper Mounting (Exploded View)



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Fig. 3 Disc Brake Caliper Mounting



PR747B

Fig. 4 Piston Seal Function for Automatic Adjustment

The boot mounts in the cylinder bore opening and in a groove in the piston (Fig. 4). This prevents contamination in the bore area.

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

All L.H. platform vehicles, are equipped with an audible wear sensor (Fig. 1) on the outboard pad of the front disc brake assemblies. This sensor when emitting a sound signals that brake lining may need inspection and/or replacement.

SHOE AND LINING WEAR

If a visual inspection does not adequately determine condition of 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 shoe and lining assemblies. (See Brake Shoe Removal paragraph).

Combined shoe and lining thickness should be measured at the thinnest part of the assembly.

When a shoe and lining assembly is worn to a thickness of approximately 7.95 mm (5/16 inch) it should be replaced.

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

If the brake shoe assemblies do not require replacement. Reinstall, brake shoe assemblies making sure each shoe assembly is returned to the original position on the vehicle. (See Brake Shoe Installation).



SERVICE PRECAUTIONS

WARNING: DUST AND DIRT ON BRAKE PARTS GENERATED DURING THE NORMAL USE AND WEAR OF MOTOR VEHICLE BRAKE SYSTEMS CAN CONTAIN ASBESTOS FIBERS. BREATHING EXCESSIVE CONCENTRATIONS OF ASBESTOS FIBERS CAN CAUSE SERIOUS BODILY HARM, SUCH AS ASBESTOSIS AND CANCER. EXTREME CARE SHOULD BE EXERCISED WHILE SERVICING BRAKE ASSEMBLIES OR COMPONENTS.

DO NOT CLEAN BRAKE ASSEMBLIES OR COMPONENTS WITH COMPRESSED AIR OR BY DRY BRUSHING; USE A VACUUM CLEANER SPECIFICALLY RECOMMENDED FOR USE WITH ASBESTOS FIBERS. IF A SUITABLE VACUUM CLEANER IS NOT AVAILABLE, CLEANING SHOULD BE DONE WET USING A WATER DAMPENED CLOTH.

DO NOT CREATE DUST BY SANDING, GRINDING, AND/OR SHAVING BRAKE LININGS OR PADS UNLESS SUCH OPERATION IS DONE WHILE USING PROPERLY EXHAUST VENTILATED EQUIPMENT.

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SURE TO YOURSELF AND OTHERS.

FOLLOW ALL RECOMMENDED PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY. FOR THE HANDLING, PROCESSING, AND DISPOSITION OF DUST OR DIRT WHICH MAY CONTAIN ASBESTOS FIBERS.

Grease or any other foreign material must be kept off brake caliper assembly, surfaces of braking disc and external surfaces of hub, during service procedures.

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

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

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

Before vehicle is moved after any brake service work, be sure to obtain a firm brake pedal.



KELSEY HAYES DOUBLE PIN CALIPER ASSEMBLY

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Caliper Assembly Inspection	30		

BRAKE SHOE SERVICE PROCEDURES

BRAKE SHOE 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 assembly to steering knuckle guide pin bolts (Fig. 1).

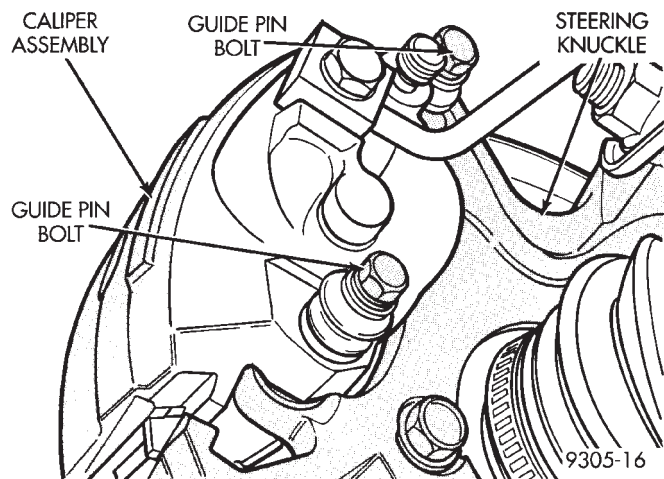


Fig. 1 Removing Caliper Assembly Guide Pin Bolts

(4) Remove caliper assembly from steering knuckle and braking disc, by first rotating top of caliper assembly away from steering knuckle. Then lifting caliper assembly off bottom machined abutment on steering knuckle (Fig. 2).

(5) Support caliper firmly to prevent weight of caliper from damaging the flexible brake hose (Fig. 3).

(6) Remove front braking disk (rotor) from hub, by pulling it straight off wheel mounting studs (Fig. 4).

(7) Remove outboard brake shoe, by prying the shoe retaining clip over raised area on caliper. Then slide the shoe down and off the caliper (Fig. 5).

(8) Pull inboard brake shoe away from piston, until retaining clip is free from cavity in piston. (Fig. 6).

CALIPER ASSEMBLY INSPECTION

Check for piston seal leaks (brake fluid in and around boot area and inboard lining) and for any ruptures of the piston dust boot. If boot is damaged, or fluid leak is visible, disassemble caliper assembly

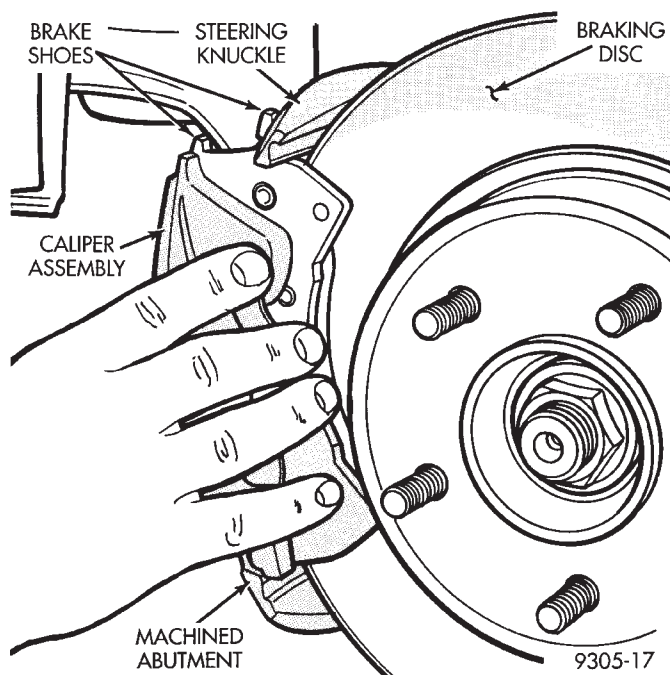


Fig. 2 Removing Caliper Assembly From Steering Knuckle And Rotor

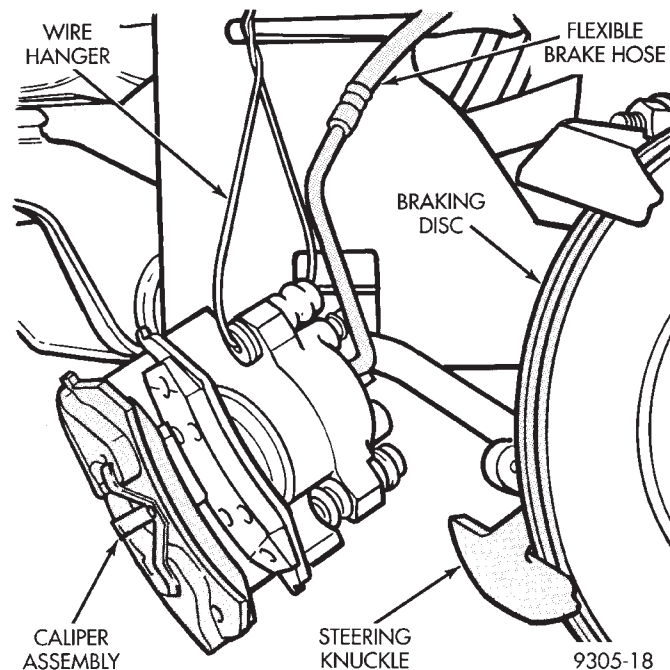


Fig. 3 Storing Caliper

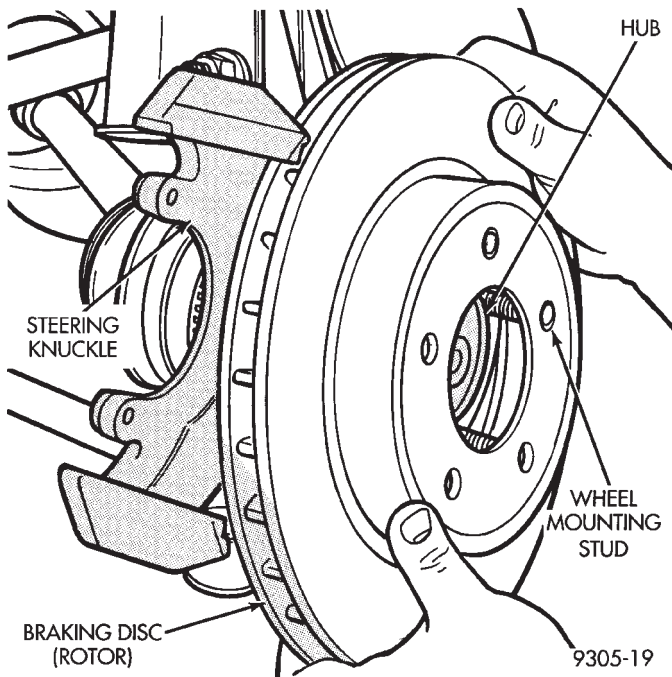


Fig. 4 Removing or Installing Braking Disc

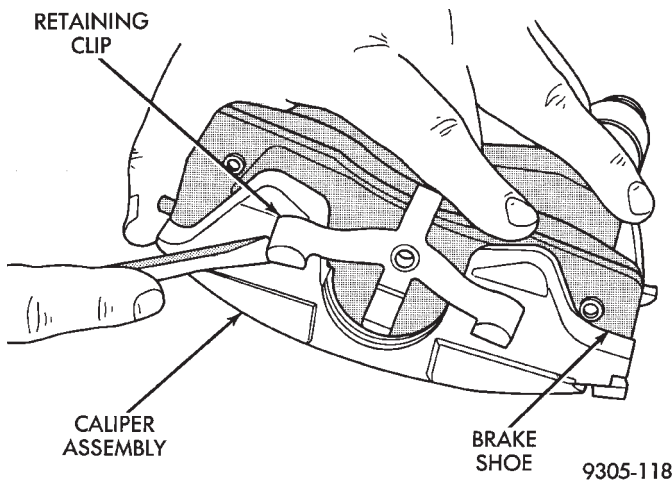


Fig. 5 Removing Outboard Brake Shoe

and install a new seal and boot,(and piston if scored). Refer to procedures titled Disc Brake Caliper Disassembly.

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

BRAKE SHOE 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.

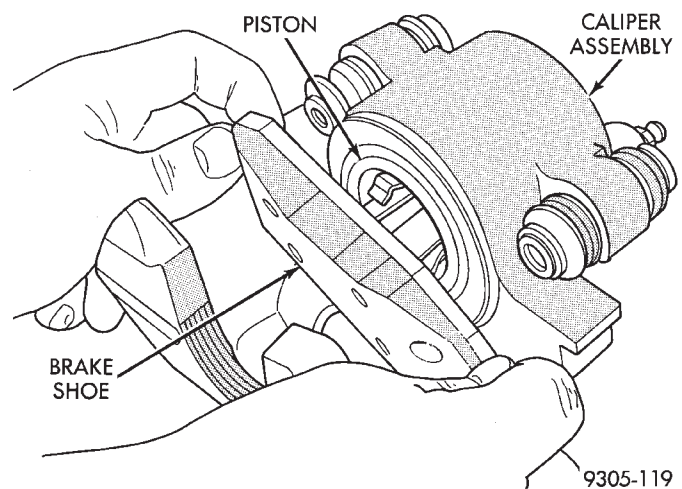


Fig. 6 Removing Inboard Brake Shoe

(3) Install the front braking disc (rotor) on the hub, making sure it is squarely seated on face of hub (Fig. 4).

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

Note: The inboard and outboard brake shoes are common, unhandled refer to (Fig. 7) for inboard and outboard brake shoe assembly identification.

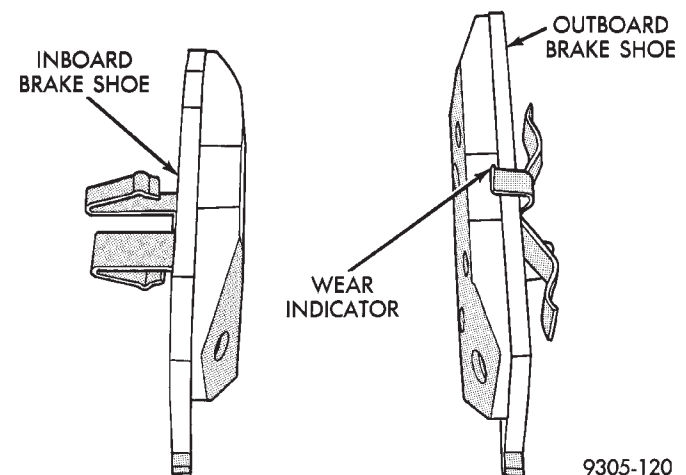


Fig. 7 Front Brake Shoe Assembly Identification

(5) Install the new inboard brake shoe assembly into the caliper piston by firmly pressing into piston bore with thumbs (Fig. 8). Be sure inboard brake shoe assembly is positioned squarely against face of caliper piston.

(6) Slide the new outboard brake shoe assembly onto the caliper assembly (Fig. 9).

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

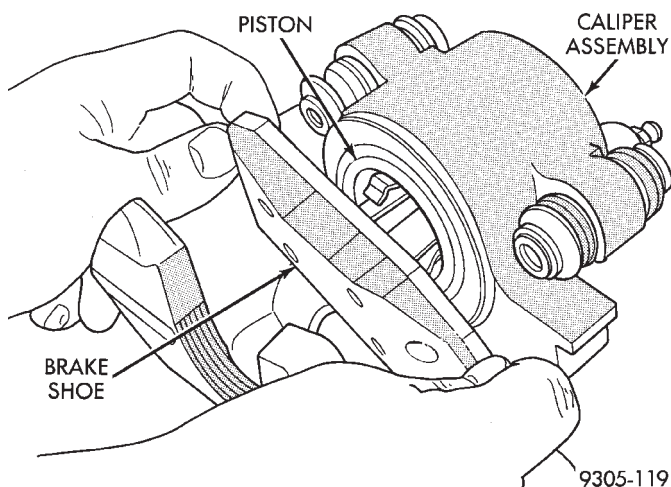


Fig. 8 Installing Inboard Brake Shoe Assembly

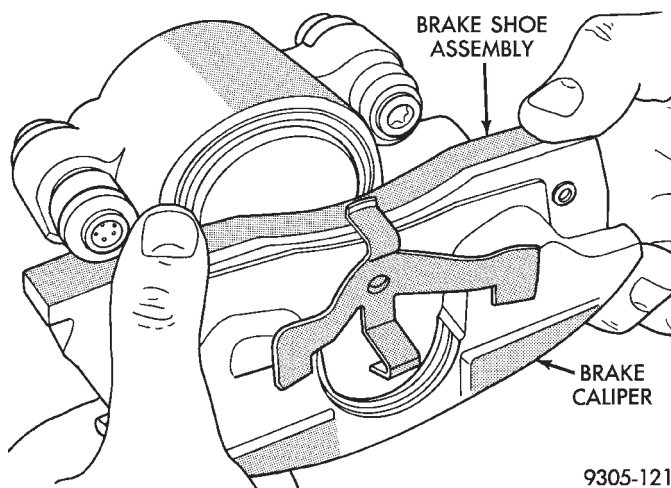


Fig. 9 Installing Outboard Brake Shoe Assembly

(7) Carefully position caliper and brake shoe assemblies over braking disc (rotor) using the reversed required removal procedure (Fig. 10). Make sure that caliper guide pin bolts, bushings and sleeves are clear of the steering knuckle bosses.

(8) Install the caliper guide pin bolts and tighten to 18 to 20 N•m (192 in. lbs.). **Extreme caution should be taken not to cross the threads of the caliper guide pin bolts.**

(9) Install the wheel and tire assembly.

(10) Tighten the wheel mounting stud nuts in proper sequence (Fig. 11) until all nuts are torqued to half specification. Then repeat the tightening sequence to the full specified torque of 129 N•m (95 ft. lbs.).

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

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

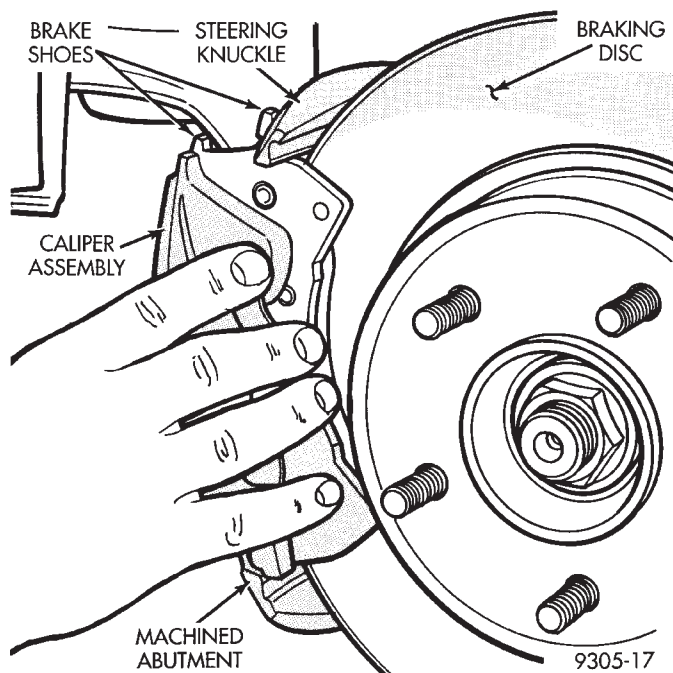


Fig. 10 Installing Caliper Assembly On Steering Knuckle And Rotor

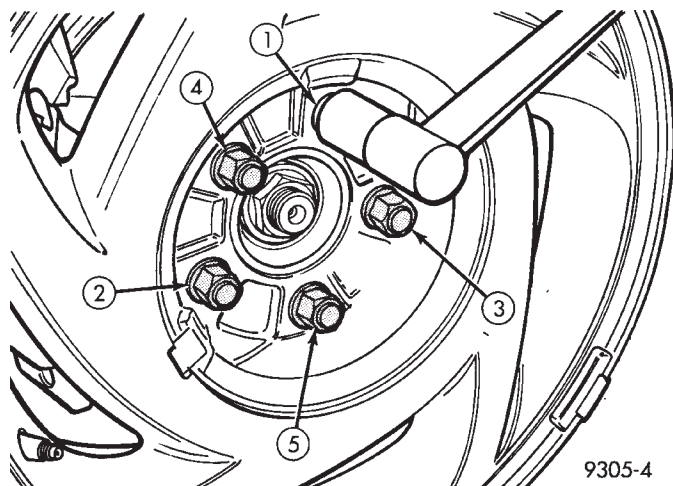


Fig. 11 Tightening Wheel Nuts

DISC BRAKE CALIPER SERVICE

DISASSEMBLY

(1) Remove caliper from braking disc (See Brake Shoe Removal). Hang assembly on a wire hook away from braking disc, so hydraulic fluid cannot get on braking disc (See Fig. 3 in Brake Shoe Removal). Place a small piece of wood between the piston and caliper fingers.

(2) **Carefully** depress brake pedal to hydraulically push piston out of bore. (Brake pedal will fall away when piston has passed bore opening.) Then prop up the brake pedal to any position below the first inch of pedal travel, this will prevent loss of brake fluid from the master cylinder.

(3) If both front caliper pistons are to be removed. Disconnect steel brake tube fitting from flexible brake line at frame bracket after removing piston.



Plug brake tube and remove piston from opposite caliper. Using the same process as above for the first piston removal.

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

(4) Disconnect brake flexible hose from the caliper. To disassemble, mount caliper assembly in a vise equipped with protective jaws.

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

(5) Clamp caliper in vise (with protective caps on vise jaws).

(6) Remove dust boot from the brake caliper and discard (Fig. 1).

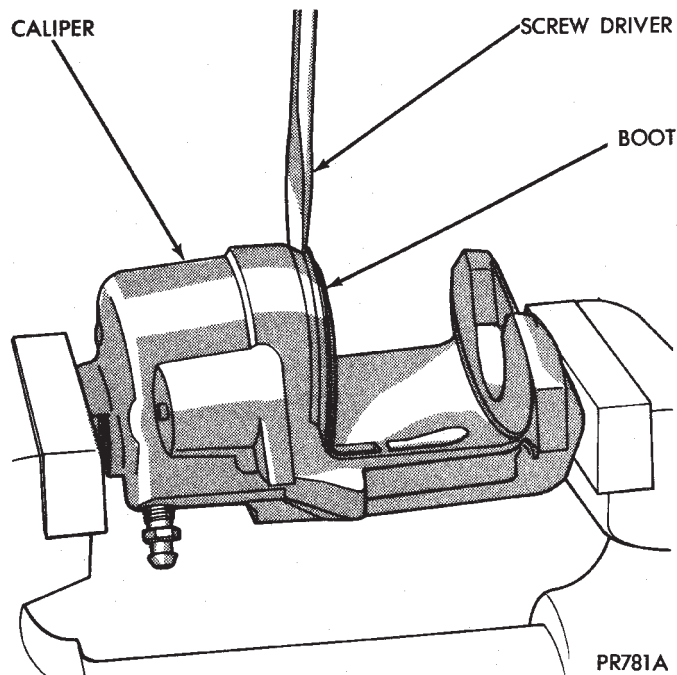


Fig. 1 Removing Piston Dust Boot

(7) Using a plastic trim stick, work piston seal out of its groove in caliper piston bore (Fig. 2). Discard old seal. **Do not use a screwdriver or other metal tool for this operation, because of the possibility of scratching piston bore or burring edges of seal groove.**

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

(1) Push out and then pull the inner sleeve from inside of the bushing using your fingers as shown in (Fig. 3)

(2) Using your fingers collapse one side of the bushing. Then pull on the opposite side to remove the bushing from the brake caliper assembly (Fig. 4).

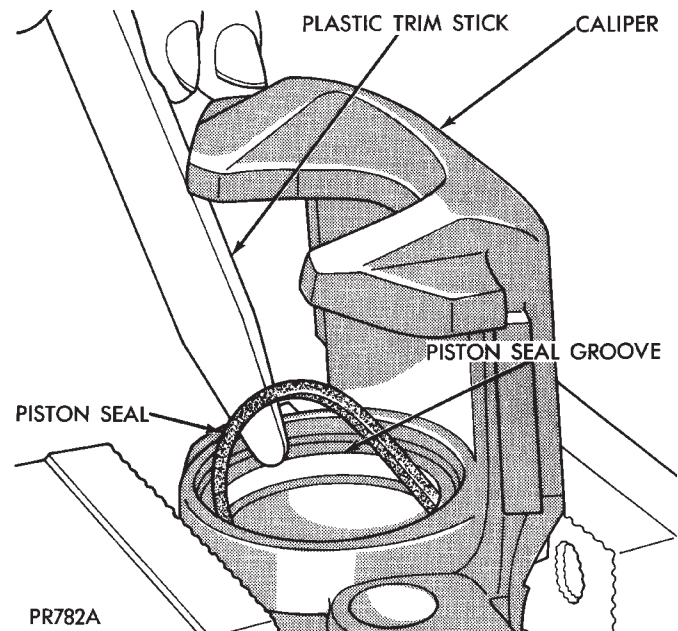


Fig. 2 Removing Piston Seal

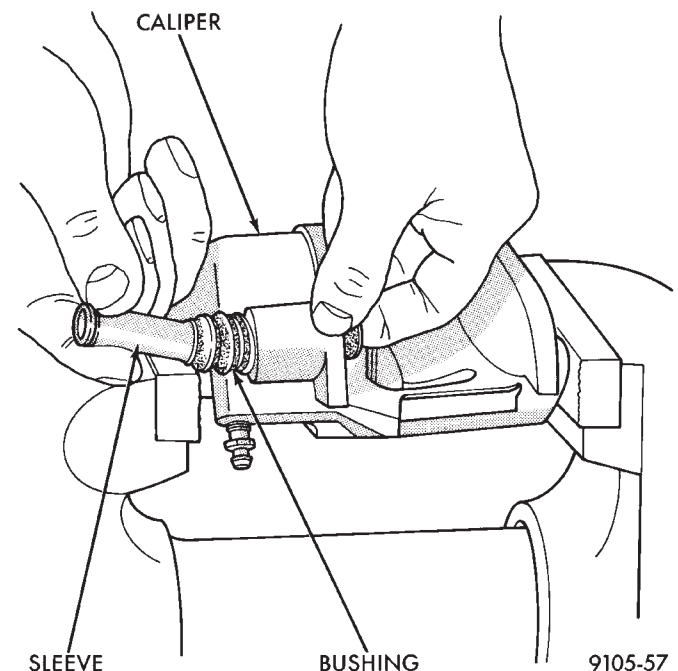


Fig. 3 Removing Inner Sleeve

CLEANING AND INSPECTION OF BRAKE CALIPER

(1) Clean all parts using alcohol or a suitable non petroleum base solvent and wipe dry. Clean out all drilled passages and bores. **(Whenever a caliper has been disassembled, a new boot and seal must be installed at assembly).**

(2) 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.

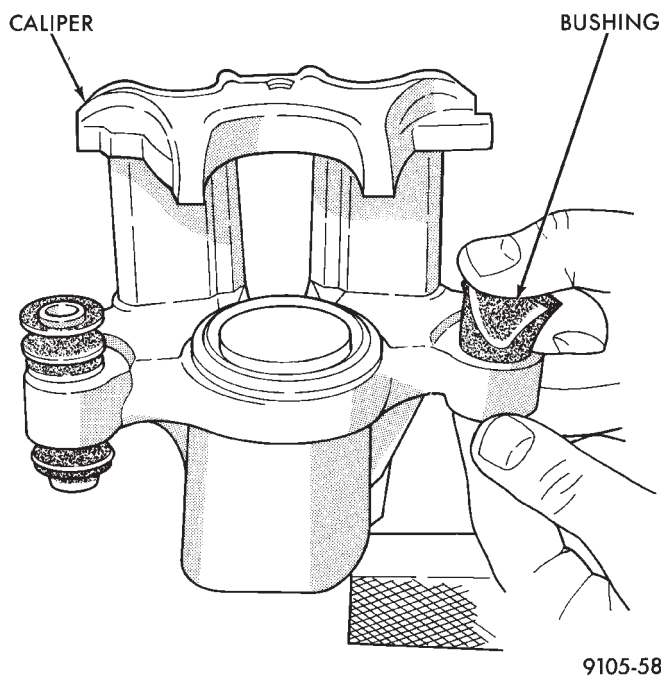


Fig. 4 Removing Bushings From Caliper

(3) Bores that have deep scratches or scoring should be honed. Use Caliper Hone, Special Tool C-4095, or equivalent providing the diameter of the bore is not increased more than 0.0254 mm (0.001 inch) (Fig. 5).

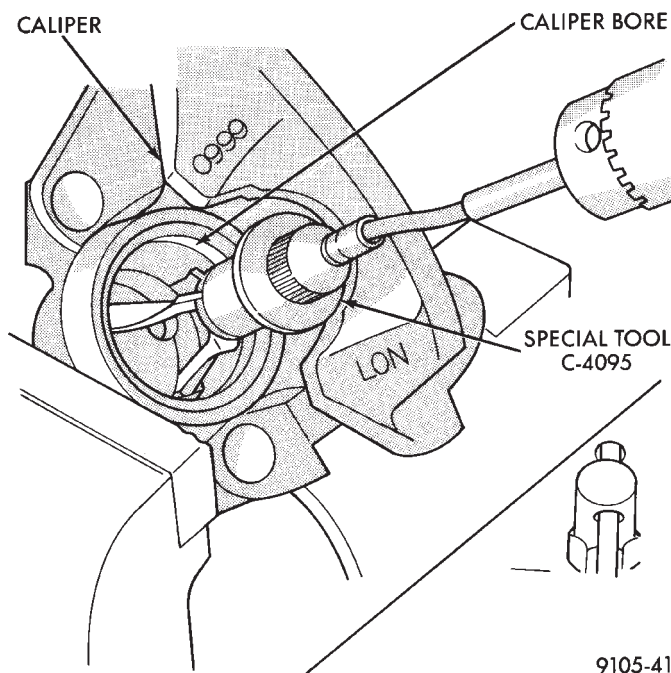


Fig. 5 Honing Piston Bore

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

When using Caliper Honing Tool, Special Tool C-4095, coat the stones and bore with brake

fluid. After honing the bore, carefully clean the seal and boot grooves with a stiff non-metallic rotary brush.

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

ASSEMBLY

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

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

(2) Dip new piston seal in clean brake fluid and install in the groove of the caliper bore. Seal should be positioned at one area in groove and gently worked around the groove (Fig. 1), using only your fingers until properly seated.

NEVER USE AN OLD PISTON SEAL. (Be sure that fingers are clean and seal is not twisted or rolled) (Fig. 1).

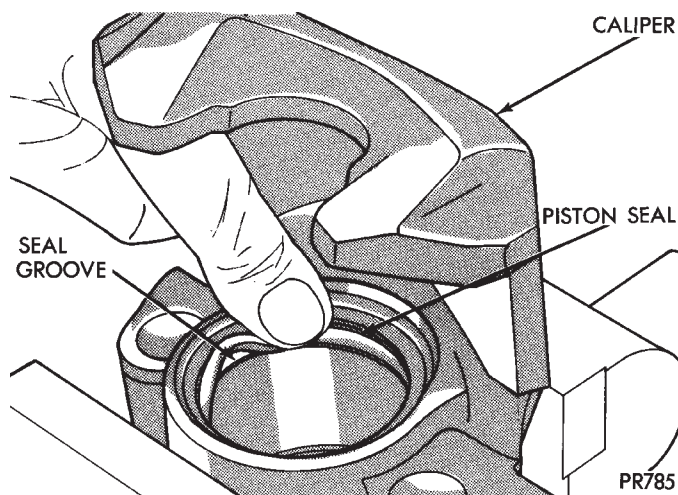


Fig. 1 Installing New Piston Seal

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

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

(5) Install piston into caliper bore pushing it past the piston seal until it bottoms in the caliper bore (Fig. 2).

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

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

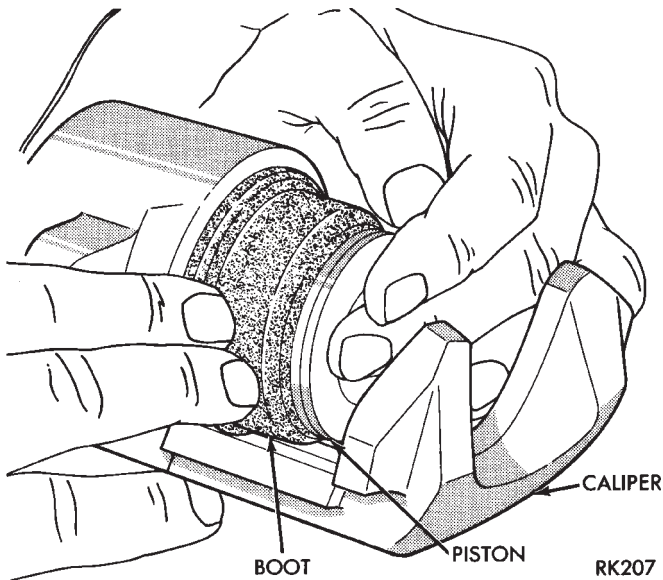


Fig. 2 Pushing Piston into Bore

(7) Using a hammer and Installer Piston Caliper Boot, Special Tool C-4689 and Handle, Special Tool C-4171, drive boot into counterbore of the caliper (Fig. 3).

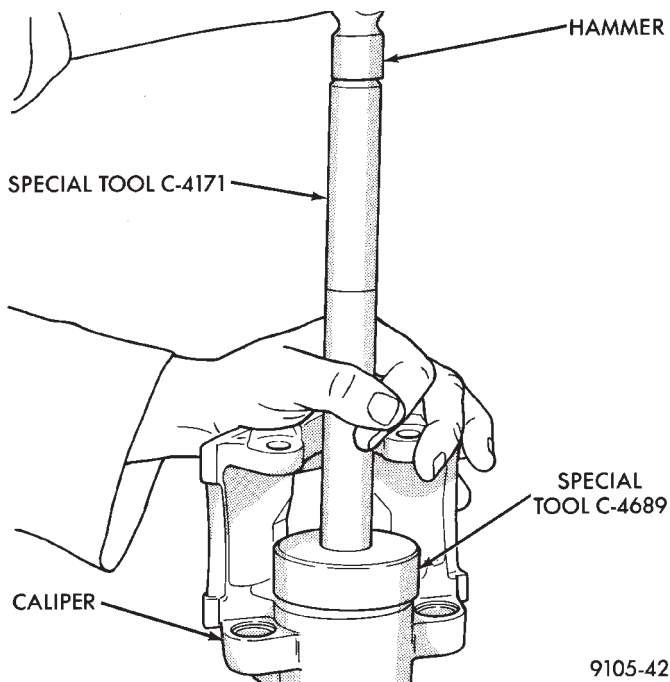


Fig. 3 Installing Dust Boot in Caliper Counterbore

Use the following steps, to install the Guide Pin Sleeve Bushings into the caliper assembly.

(1) Fold the bushing in half lengthwise at the solid middle section of the bushing (Fig. 4).

(2) Using your fingers insert the folded bushing into the caliper assembly (Fig. 5). **Do not use a sharp object to perform this step do to possible damage to the bushing.**

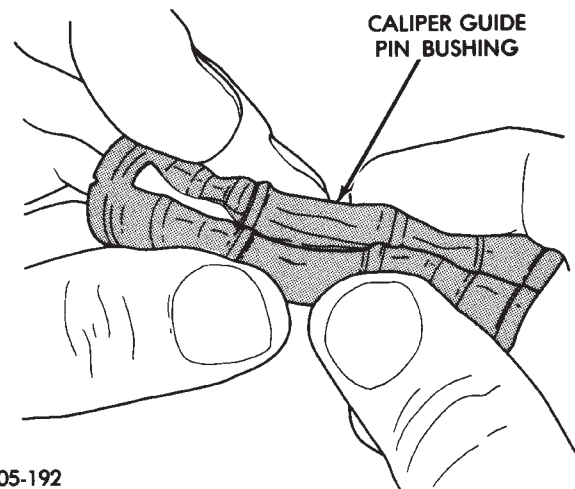


Fig. 4 Folded Caliper Guide Pin Bushing

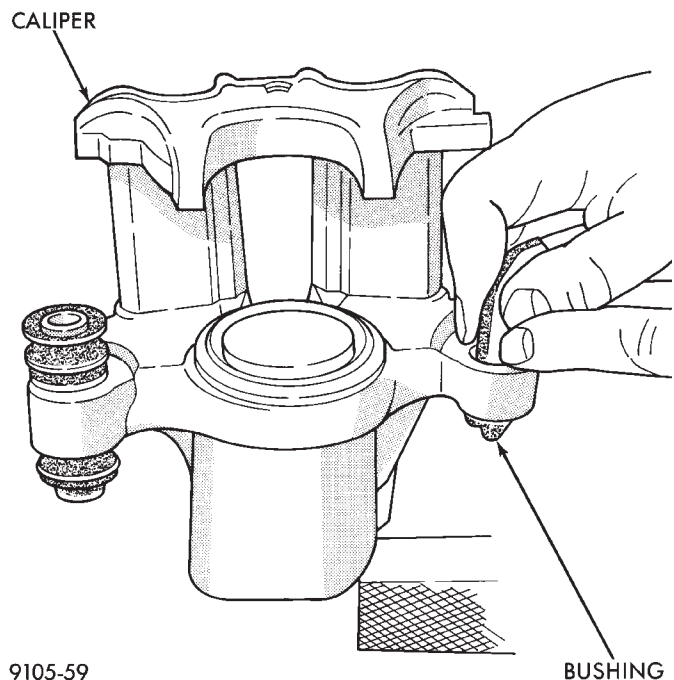


Fig. 5 Installing Caliper Guide Pin Sleeve Bushings

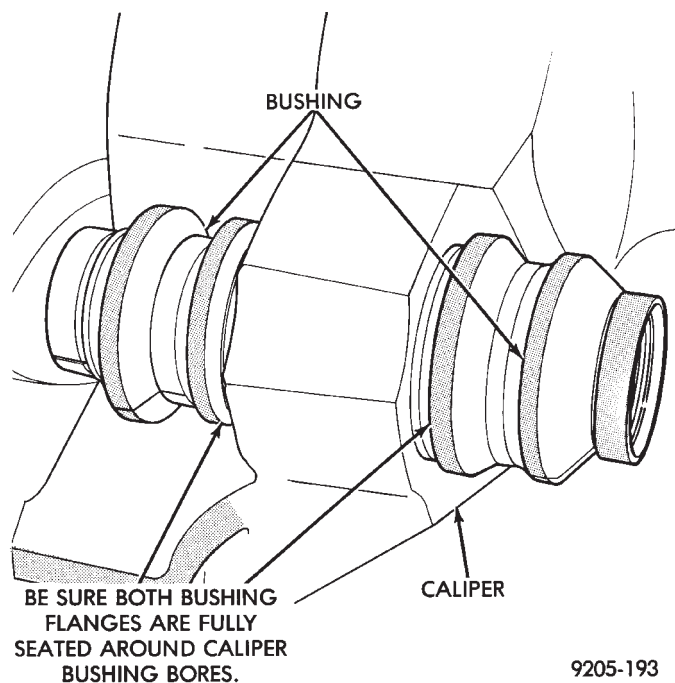
(3) Unfold the bushing using your fingers or a wooden dowel until the bushing is fully seated into the caliper assembly. Flanges should be seated evenly on both sides of the bushing hole in the caliper assembly (Fig. 6).

Install the Guide Pin Sleeve into the guide bushing using the following procedure.

(1) Install the sleeve into one end of the bushing until the seal area of the bushing is past the seal groove in the sleeve (Fig. 7).

(2) Holding the convoluted end of the bushing with one hand. Push the sleeve through the bushing (Fig. 7) until the one end of the bushing is fully seated into the seal groove on the one end of the sleeve.

(3) Holding the sleeve in place work the other end of the bushing over the end of the sleeve and into the



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Fig. 6 Bushing Correctly Installed In Caliper

seal groove (Fig. 8). Be sure the other end of the bushing did not come out of the seal groove in the sleeve.

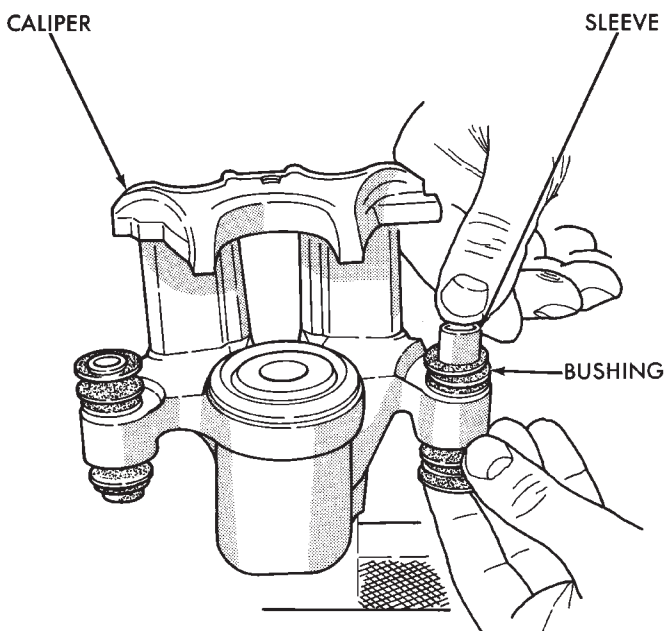
(4) When the sleeve is seated properly into the bushing. The sealed for life bushing can be held between your fingers and easily slid back and forth without the bushing seal unseating from the sleeve.

(5) Install the inboard and outboard brake shoe assemblies onto the caliper assembly.

(6) Before installing caliper assembly on vehicle, inspect braking disc. If any conditions as described in Checking Braking Disc for Runout and Thickness are present the braking disc, must be replaced or refaced. If the braking disc does not require any servicing, install caliper assembly.

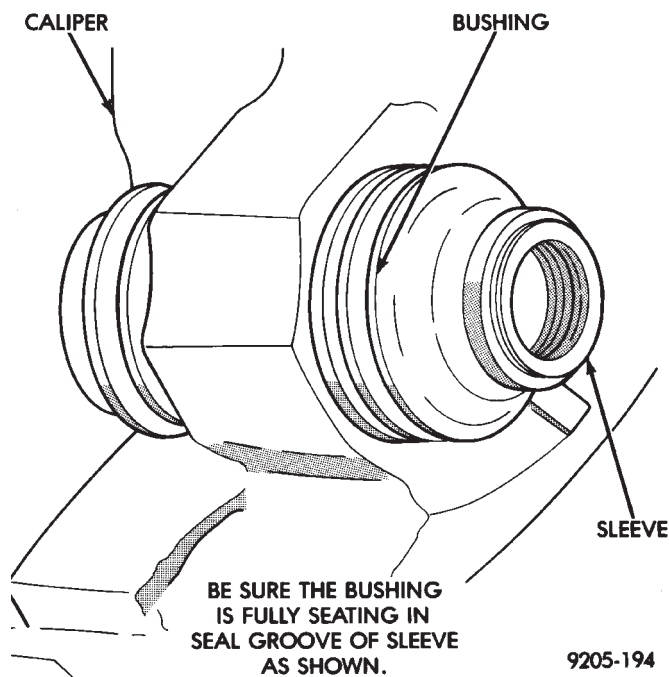
(7) Install brake hose onto caliper using banjo bolt. Torque the brake hose to caliper assembly banjo bolt to 33 N•m (24 ft. lbs.). **New seal washers MUST always be used when installing brake hose to caliper.**

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



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Fig. 7 Installing Caliper Sleeves



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Fig. 8 Installed Caliper Bushing Sleeve



REAR DISC BRAKES

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GENERAL INFORMATION

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

The L.H. platform vehicles are equipped with a caliper assembly that has a 34 mm (1.43 in.) piston and uses a 14 inch solid braking disc (rotor).

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

The adapter and disc shield are mounted to the rear suspension knuckles of vehicle. The adapter is

used to mount the brake shoes and actuating cables for the parking brake system. The adapter also mounts the rear caliper assembly to the vehicle. The adapter has two machined abutments which are used to position and align the caliper and brake shoes for movement inboard and outboard (Fig. 1).

LINING WEAR

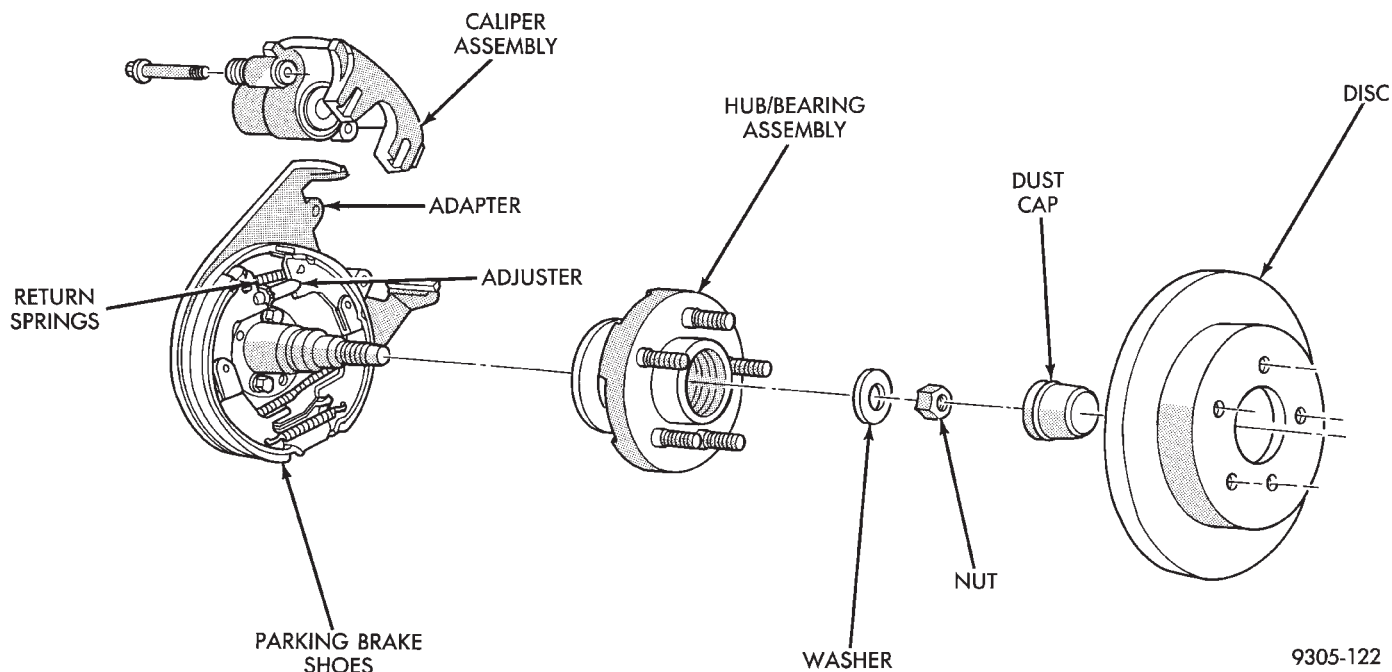
To check the amount of lining wear, remove the wheel and tire assemblies. If a visual inspection does not adequately determine the condition of the lining, removal will be necessary. Remove the shoe and lining assemblies (see Brake Shoe Removal).

Combined shoe and lining thickness should be measured at the thinnest part of the assembly.

When the combined brake shoe and lining assembly is worn to a thickness of approximately 7.0 mm (9/32 inch) it **MUST** be replaced.

Replace both brake shoe assemblies (inboard and outboard) on both wheels whenever the brake shoe assemblies on either side are replaced.

If a brake shoe assembly does not require replacement. Reinstall it, making sure each shoe assembly



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Fig. 1 Rear Disc Brake Assembly



is returned to its original position on the wheel of the vehicle from which it was removed. (See Brake Shoe Installation).

SERVICE PRECAUTIONS

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DO NOT CREATE DUST BY SANDING, GRINDING, AND/OR SHAVING BRAKE LININGS OR PADS UNLESS SUCH OPERATION IS DONE WHILE USING PROPERLY EXHAUST VENTILATED EQUIPMENT.

DISPOSE OF ALL DUST AND DIRT SUSPECTED TO CONTAIN ANY ASBESTOS FIBERS IN SEALED BAGS OR CONTAINERS TO MINIMIZE DUST EXPOSURE TO YOURSELF AND OTHERS.

FOLLOW ALL RECOMMENDED PRACTICES PRESCRIBED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION AND THE ENVIRONMENTAL PROTECTION AGENCY. FOR THE HANDLING, PROCESSING, AND DISPOSITION OF DUST OR DIRT WHICH MAY CONTAIN ASBESTOS FIBERS.

Grease or any other foreign material must be kept off the caliper assembly, surfaces of the braking disc and external surfaces of the hub, during service procedures.

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

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

Before vehicle is moved after any brake service work, be sure to obtain a firm brake pedal.

SERVICING BRAKE SHOE ASSEMBLIES

BRAKE SHOE 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 wheel and tire assemblies from vehicle.

(3) Remove the 2 caliper assembly to adapter guide pin bolts (Fig. 1).

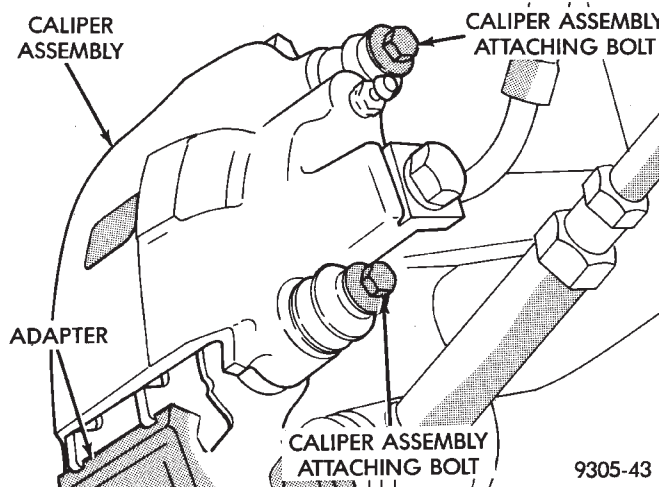


Fig. 1 Removing Caliper Assembly Guide Pin Bolts

(4) Remove caliper assembly from adapter and braking disc, by first rotating top of caliper assembly away from adapter. Then lift caliper assembly off bottom machined abutment on adapter and lift caliper away from adapter and braking disc (Fig. 2).

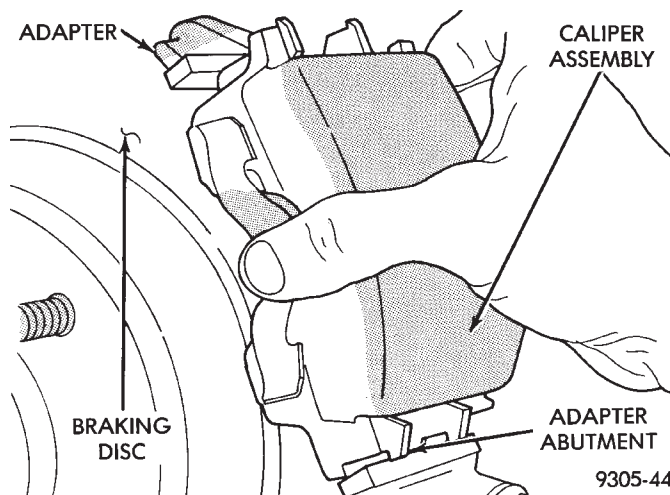


Fig. 2 Removing Caliper Assembly From Adapter And Rotor

(5) Support caliper assembly firmly from rear strut to prevent weight of caliper from damaging the flexible brake hose (Fig. 3).

(6) Remove the rear braking disc (rotor) from hub, by pulling it straight off the wheel mounting studs (Fig. 4).

(7) Remove outboard brake shoe, by prying brake shoe retaining clip over raised area on caliper. Then slide the shoe down and off the caliper (Fig. 5).

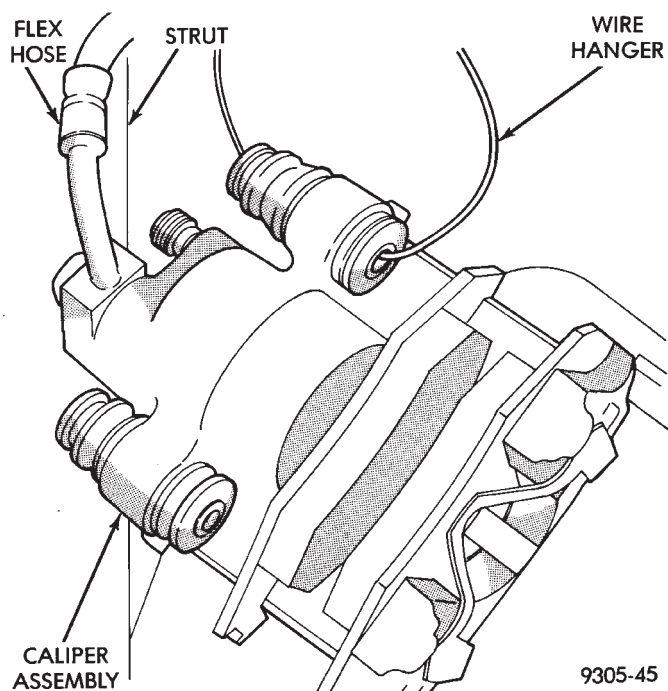


Fig. 3 Storing Caliper

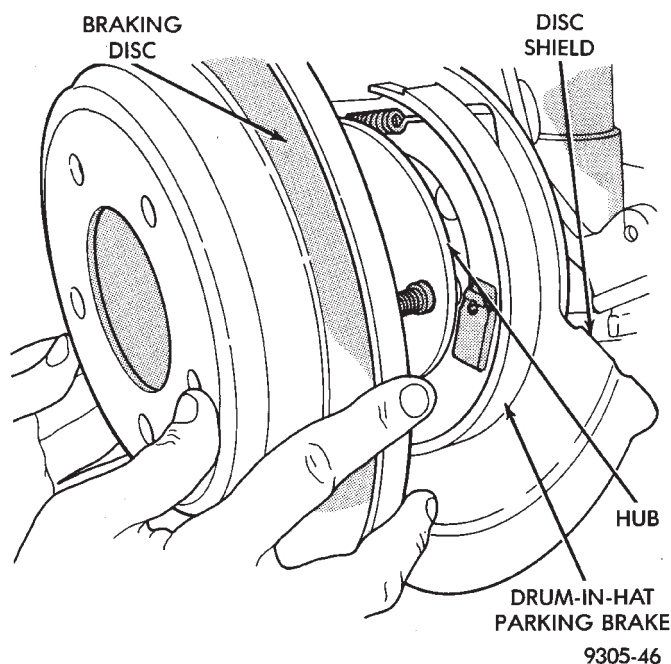


Fig. 4 Removing Rear Braking Disc

(8) Pull inboard shoe away from piston, until the retaining clip is free from the cavity in the piston. (Fig. 6).

CALIPER ASSEMBLY INSPECTION

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

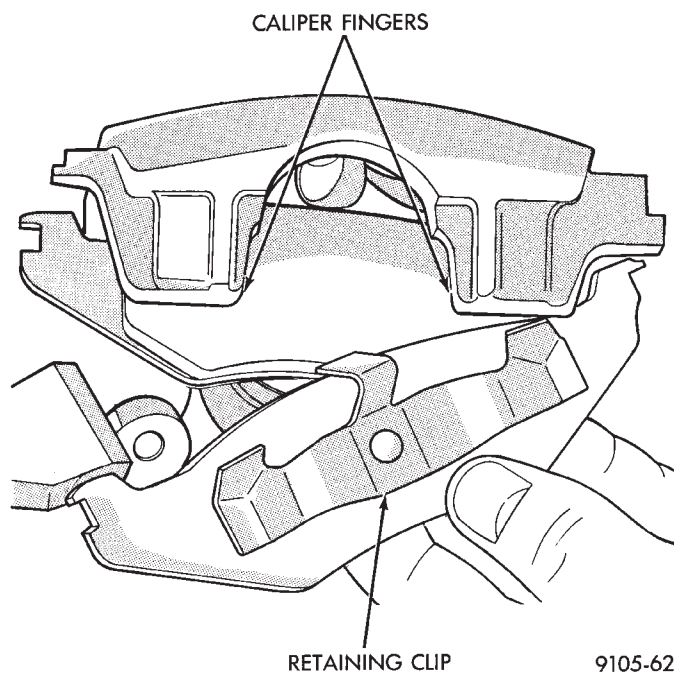


Fig. 5 Removing Outboard Shoe

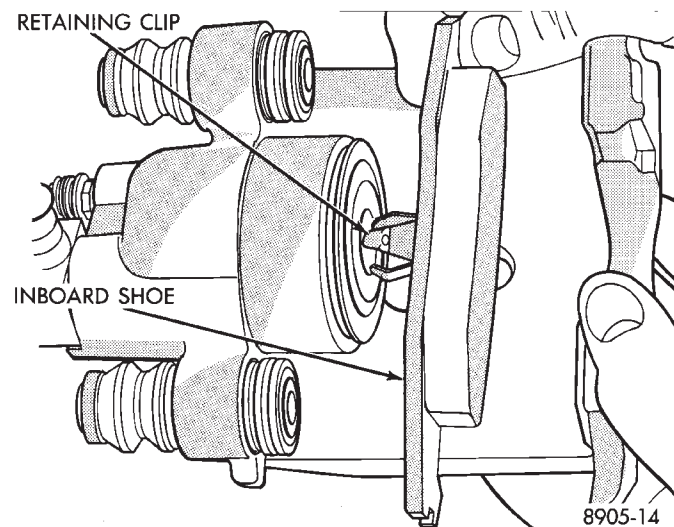


Fig. 6 Removing Inboard Shoe

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

BRAKE SHOE 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 adapter abutments with a liberal amount of Mopar® Multipurpose Lubricant, or equivalent.

(3) Install the rear braking disc (rotor) on the hub, making sure it is squarely seated on face of hub (Fig. 7).

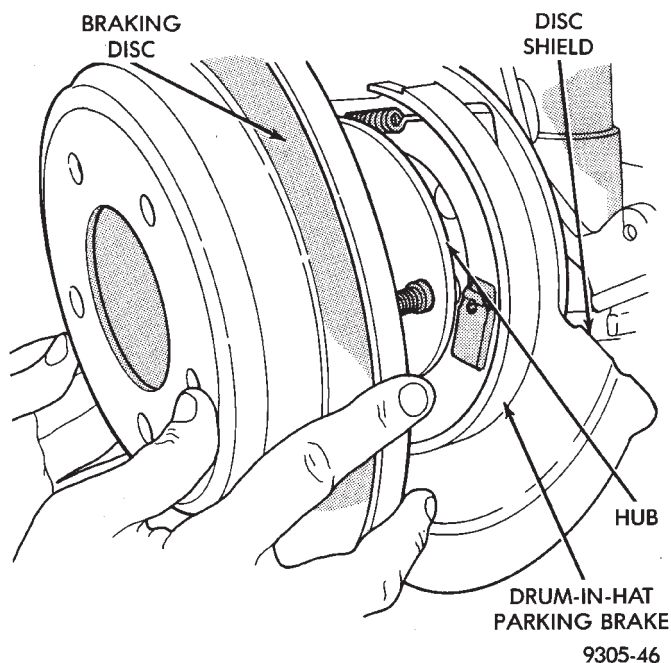


Fig. 7 Installing Rear Braking Disc

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

(5) Install the new inboard brake shoe assembly into the caliper piston by firmly pressing into piston bore with thumbs (Fig. 8). Be sure inboard brake shoe assembly is positioned squarely against face of caliper piston.

(6) Slide the new outboard brake shoe assembly onto the caliper assembly (Fig. 9).

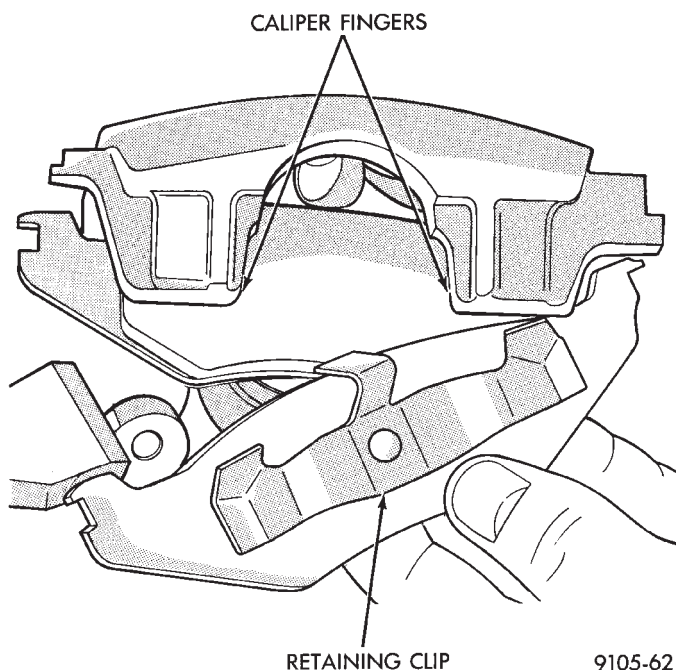


Fig. 9 Installing Outboard Brake Shoe Assembly

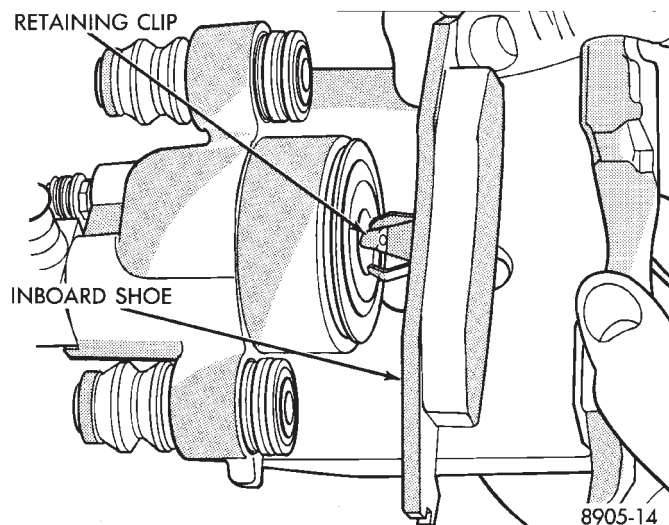


Fig. 8 Installing Inboard Brake Shoe Assembly

CAUTION: Use care when installing the caliper assembly onto the adapter. So the seal on the caliper sealed for life guide pin bushings do not get damaged by the mounting bosses.

(7) Carefully lower caliper and brake shoe assemblies over braking disc (rotor) reversing the required removal procedure (Fig. 10). Make sure that caliper guide pin bolts, bushings and sleeves are clear of the adapter bosses.

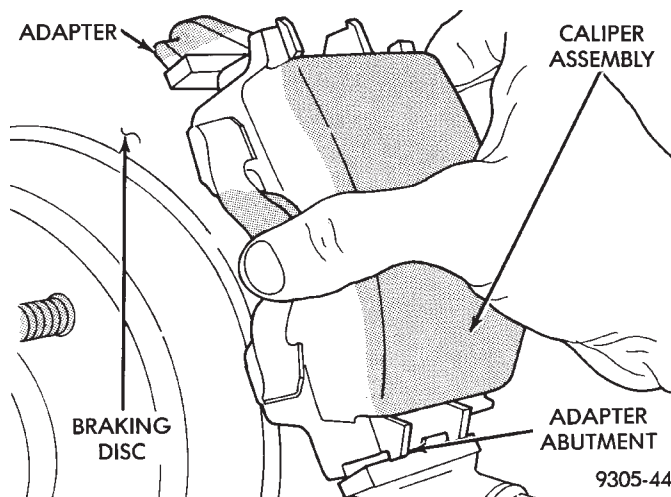


Fig. 10 Installing Caliper Assembly On Adapter And Rotor

(8) Install the caliper guide pin bolts and tighten to 22 N•m (192 in. lbs.). **Extreme caution should be taken not to cross the threads of the caliper guide pin bolts.**

(9) Install the wheel and tire assembly.

(10) Tighten the wheel mounting stud nuts in proper sequence (Fig. 11) 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.).

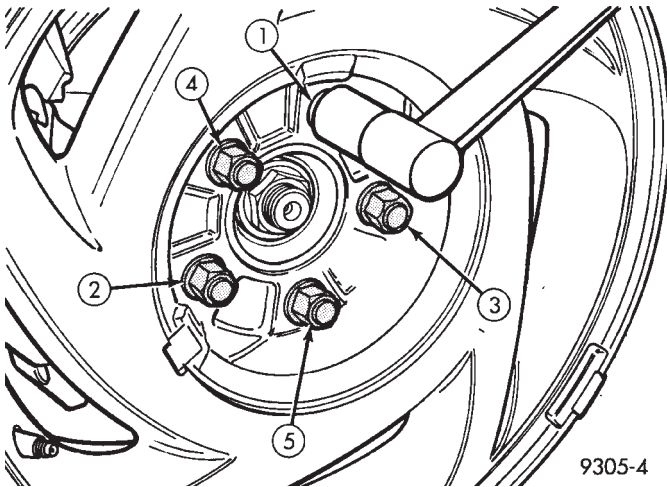


Fig. 11 Tightening Wheel Nuts

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

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

DISASSEMBLING REAR CALIPER ASSEMBLY

CLEANING AND INSPECTION

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

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

(1) Remove caliper from braking disc (See Brake Shoe Removal). Hang assembly on a wire hook away from braking disc, so hydraulic fluid cannot get on braking disc (See Fig. 3 in Brake Shoe Removal). Place a small piece of wood between the piston and caliper fingers.

(2) **Carefully** depress brake pedal to hydraulically push piston out of bore. (Brake pedal will fall away when piston has passed bore opening.) Then prop up the brake pedal to any position below the first inch of pedal travel, this will prevent loss of brake fluid from the master cylinder.

(3) If both rear caliper pistons are to be removed from calipers. Disconnect steel brake tube fitting from flexible brake line at frame bracket after removing piston. Plug brake tube and remove piston from opposite caliper. Using the same process as above for the first piston removal.

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

(4) Disconnect brake flexible hose from the caliper. To disassemble, mount caliper assembly in a vise equipped with protective jaws.

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

(5) Support rear caliper assembly in a vise. Then remove caliper to piston dust boot and discard (Fig. 1).

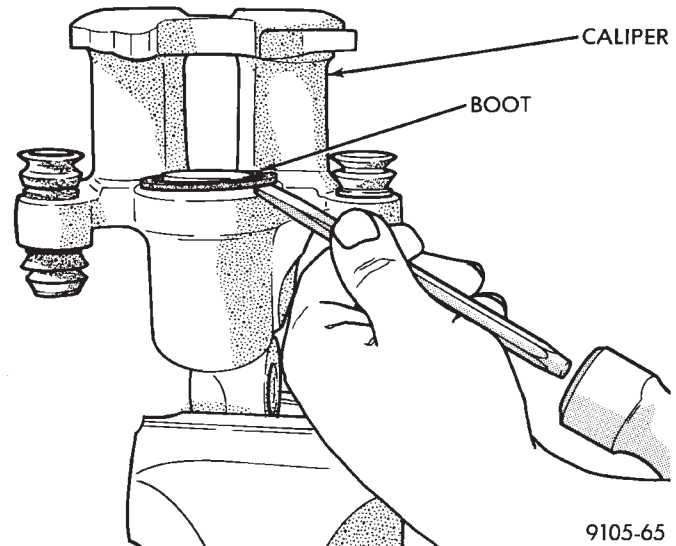


Fig. 1 Removing Piston Dust Boot

(6) Using a plastic trim stick, work piston seal out of its groove in caliper piston bore (Fig. 2). Discard old seal. **Do not use a screwdriver or other metal tool for this operation, because of the possibility of scratching piston bore or burring edges of seal groove.**

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

(1) Using your fingers push on one end the inner sleeve until it pops out of the bushing. Then grasp the inner sleeve with your fingers and pull the inner sleeve out from the inside of the bushing (Fig. 3).

(2) Using your fingers collapse one side of the bushing. Then pull on the opposite side to remove the bushing from the caliper assembly (Fig. 4).

CLEANING AND INSPECTION

Clean all parts using alcohol or a suitable non-petroleum based solvent and wipe dry. Clean out all drilled passages and bores on the caliper assembly

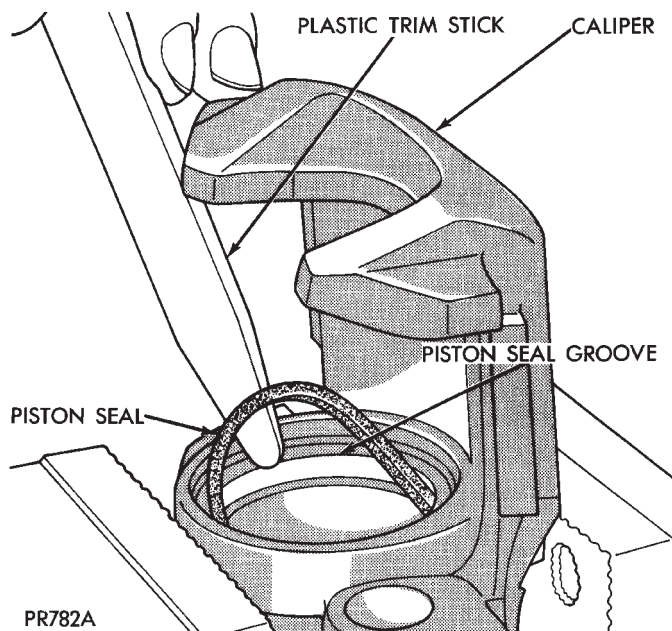


Fig. 2 Removing Piston Seal

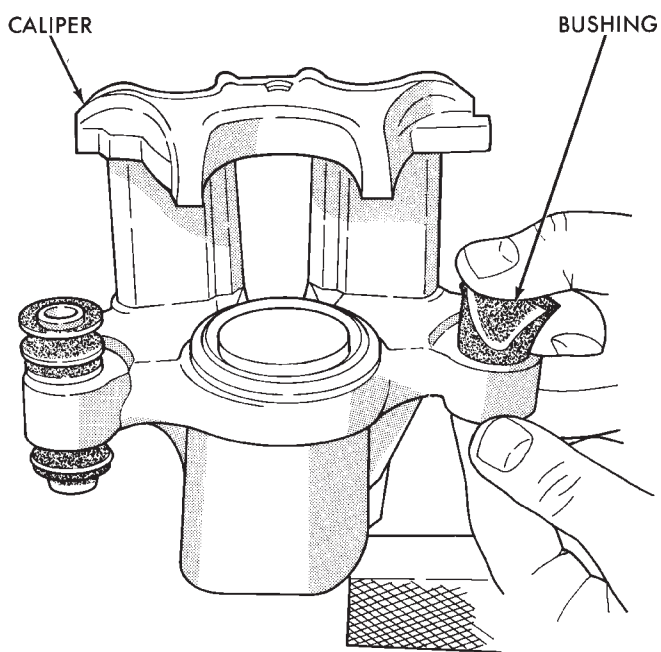


Fig. 4 Removing Bushings From Caliper

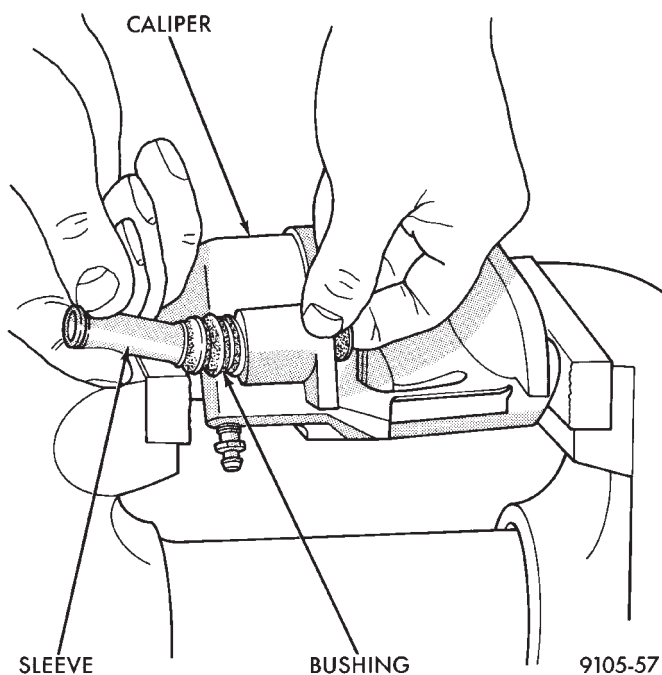


Fig. 3 Removing Inner Sleeve From Bushing

body. **(Whenever a caliper has been disassembled, a new boot and seal must be installed at assembly).**

Inspect the caliper assembly piston bore for scoring or pitting. Bores that show light scratches or corrosion, can usually have the scratches or corrosion removed using crocus cloth.

Bores that have deep scratches or scoring should be honed. Use Caliper Hone, Special Tool C-4095, or equivalent providing the diameter of the bore is not increased more than 0.0254 mm (0.001 inch) (Fig. 5).

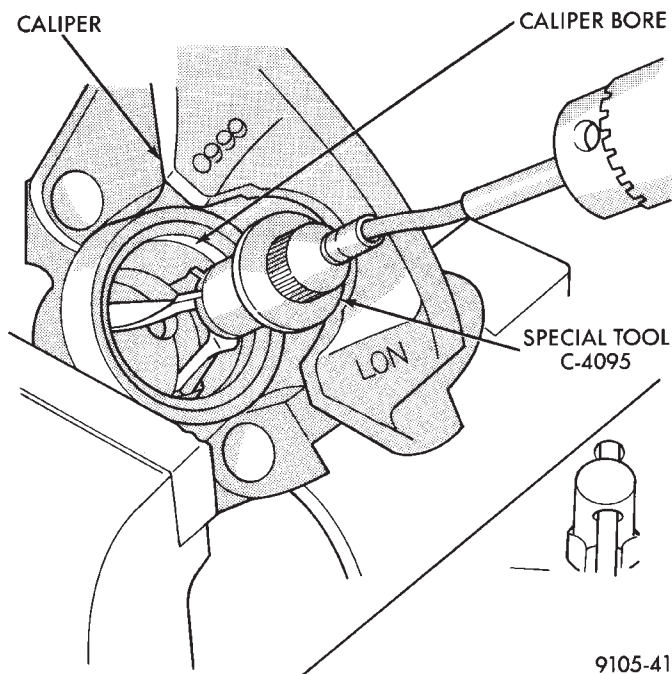


Fig. 5 Honing Piston Bore

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

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

Use extreme care in cleaning the caliper after honing. Remove all dirt and grit by flushing the



caliper with brake fluid; wipe dry with a clean, lint free cloth and then clean a second time.

ASSEMBLING REAR DISC BRAKE CALIPER

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

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

(2) Dip new piston seal in clean brake fluid and install in the groove of the caliper bore. Seal should be positioned at one area in groove and gently worked around the groove (Fig. 6), using only your fingers until properly seated.

NEVER USE AN OLD PISTON SEAL. (Be sure that fingers are clean and seal is not twisted or rolled) (Fig. 6).

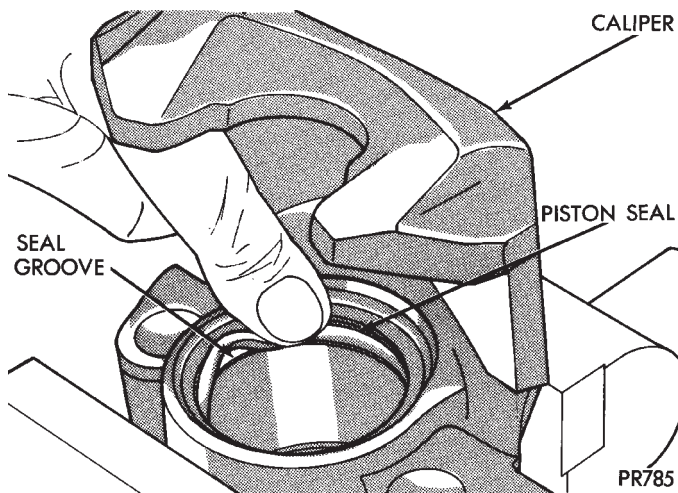


Fig. 6 Installing New Piston Seal

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

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

(5) Install piston into caliper bore pushing it past the piston seal until it bottoms in the caliper bore (Fig. 7).

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

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

(7) Using a hammer and Installer Piston Caliper Boot, Special Tool C-4383-7 and Handle, Special Tool C-4171, drive boot into counterbore of the caliper (Fig. 8).

Use the following steps, to install the Guide Pin Sleeve Bushings into the caliper assembly.

(1) Fold the bushing in half lengthwise at the solid middle section of the bushing (Fig. 9).

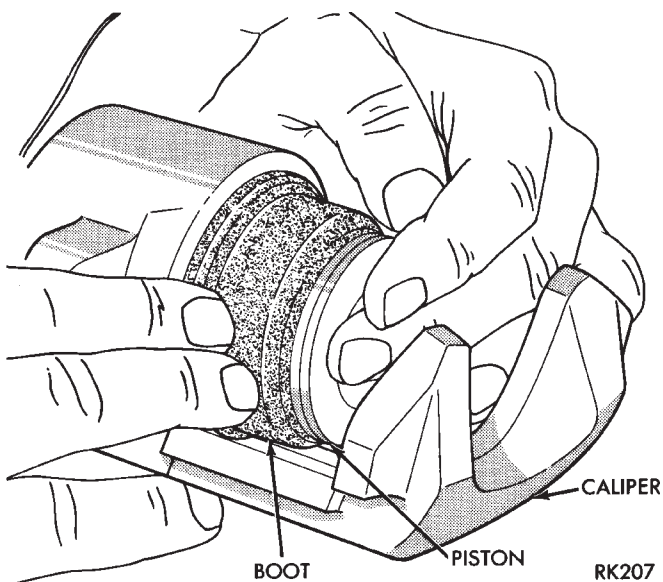


Fig. 7 Pushing Piston into Bore

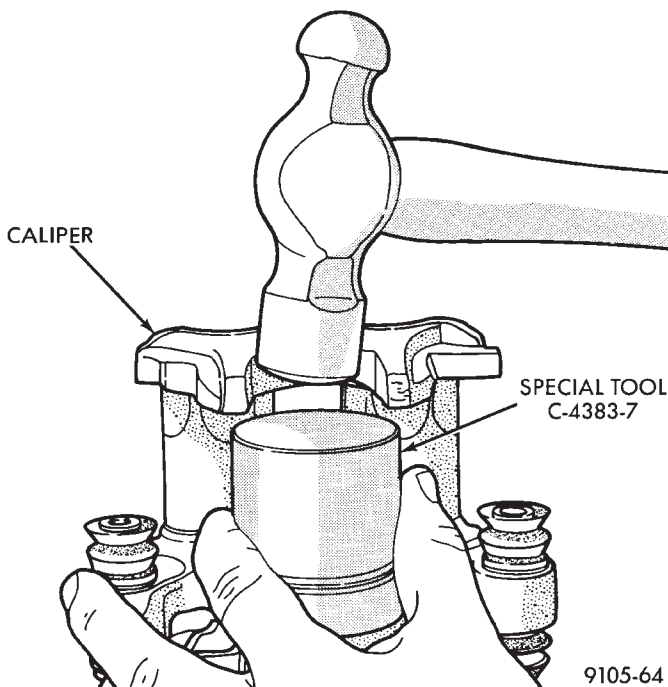
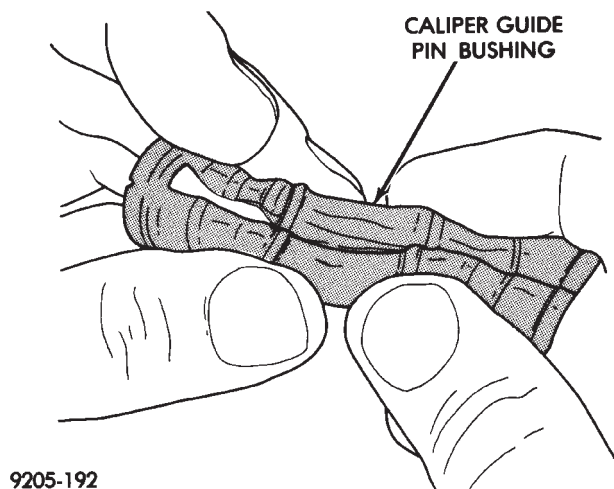


Fig. 8 Installing Boot in Caliper

(2) Using your fingers insert the folded bushing into the caliper assembly (Fig. 10). **Do not use a sharp object to perform this step do to possible damage to the bushing.**

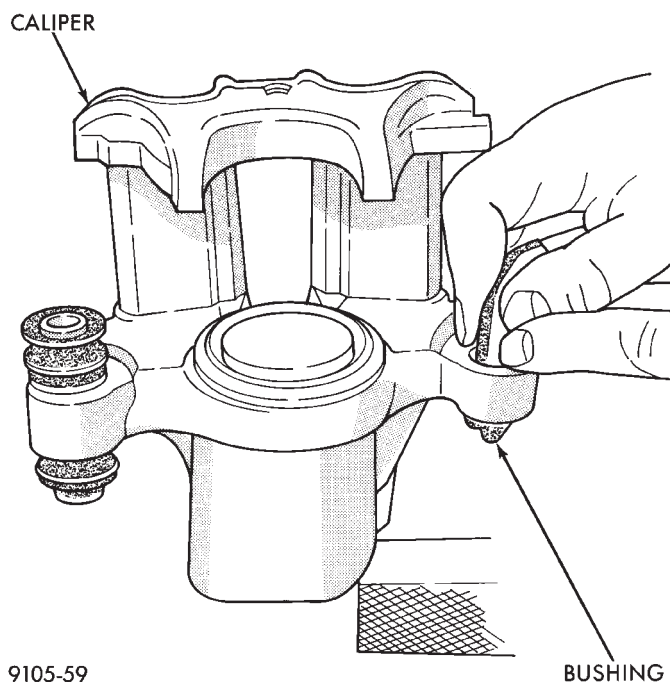
(3) Unfold the bushing using your fingers or a wooden dowel until the bushing is fully seated into the caliper assembly. Flanges should be seated evenly on both sides of the bushing hole in the caliper assembly (Fig. 11).

Install the Guide Pin Sleeve into the guide bushing using the following procedure.



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Fig. 9 Folded Caliper Guide Pin Bushing



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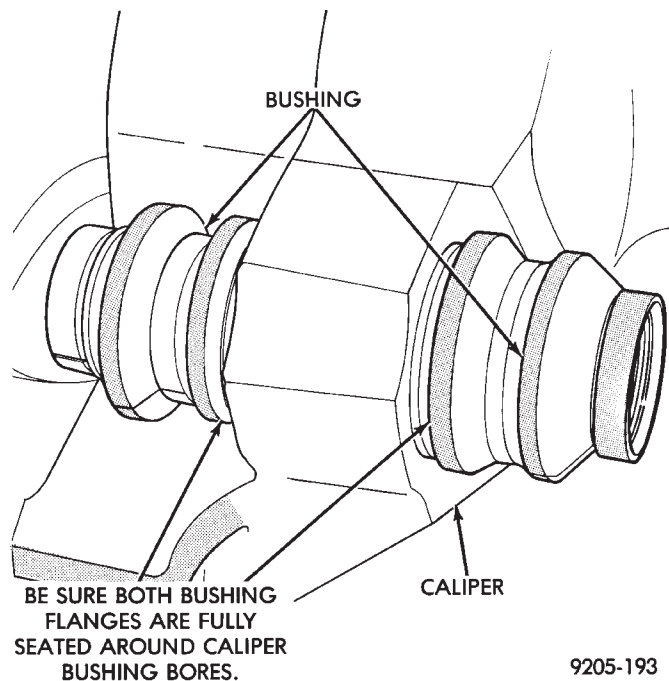
Fig. 10 Installing Caliper Guide Pin Sleeve Bushings

(1) Install the sleeve into one end of the bushing until the seal area of the bushing is past the seal groove in the sleeve (Fig. 12).

(2) Holding the convoluted end of the bushing with one hand. Push the sleeve through the bushing (Fig. 13) until the one end of the bushing is fully seated into the seal groove on the one end of the sleeve.

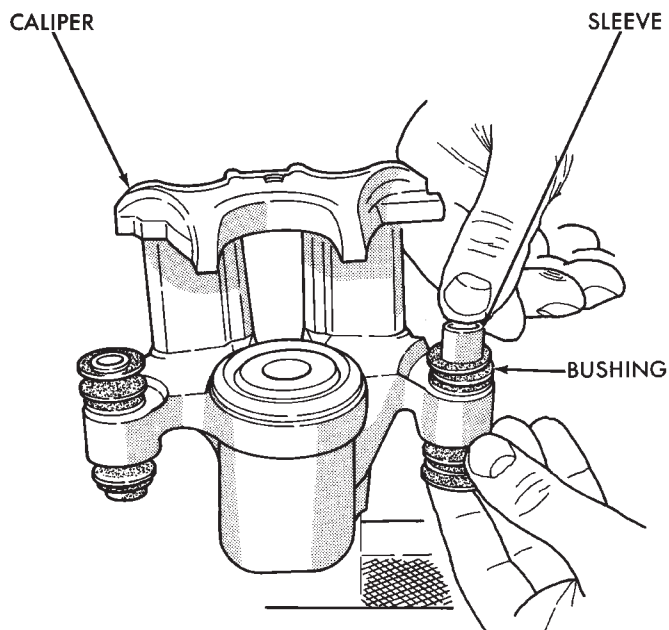
(3) Holding the sleeve in place work the other end of the bushing over the end of the sleeve and into the seal groove (Fig. 13). Be sure the other end of the bushing did not come out of the seal groove in the sleeve.

(4) When the sleeve is seated properly into the bushing. The sealed for life bushing can be held between your fingers and easily slid back and forth without the bushing seal unseating from the sleeve.



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Fig. 11 Bushing Correctly Installed In Caliper



9105-60

Fig. 12 Installing Caliper Sleeves

(5) Install the inboard and outboard brake shoes onto the caliper assembly.

(6) Before installing caliper assembly on vehicle, inspect braking disc. If any conditions as described in Checking Braking Disc for Runout and Thickness are present the braking disc, must be replaced or refaced. If the braking disc does not require any servicing, install caliper assembly.

(7) Install brake hose onto caliper using banjo bolt. Torque the brake hose to caliper assembly banjo bolt

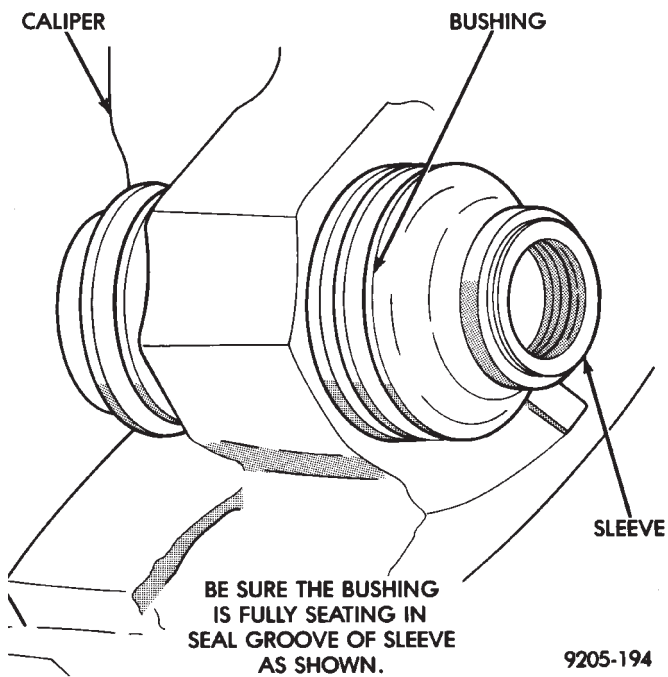


Fig. 13 Installed Caliper Bushing Sleeve

to 33 N•m (24 ft. lbs.). **New seal washers MUST always be used when installing brake hose to caliper.**

(8) Bleed the brake system (see Bleeding Brake System). Pump the brake pedal several times to be sure that the vehicle has a firm pedal, before the vehicle is moved or driven.



BRAKE DISC (ROTOR)

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GENERAL INFORMATION

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

CAUTION: If the braking disc (rotor) needs to be replaced with a new part. The protective coating (if present) on the braking surfaces of the rotor MUST BE REMOVED with an appropriate solvent, to avoid contamination of the brake shoe linings.

When replacing a rotor with a new part do NOT reface the new rotor. New rotor already has the required micro finish when manufactured, only remove the protective coating.

INSPECTION DIAGNOSIS

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

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

Excessive lateral rotor runout or wobble.

Thickness variation (Parallelism).

Dishing or distortion (Flatness).

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

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

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

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

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

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

SERVICE PROCEDURES

CHECKING BRAKING DISC FOR RUNOUT AND THICKNESS

On vehicle, braking disc (rotor) runout is the combination of the individual runout of the hub face and the runout of the disc. (The hub and disc are separable). To measure runout on the vehicle, remove the wheel and reinstall the lug nuts tightening the disc to the hub. Mount Dial Indicator, Special Tool C-3339 with Mounting Adaptor, Special Tool SP-1910 on steering arm. Dial indicator plunger should contact disc (braking surface) approximately one inch from edge of disc (See Fig. 1). Check lateral runout (both sides of disc) runout should not exceed 0.08 mm (0.003 inch).

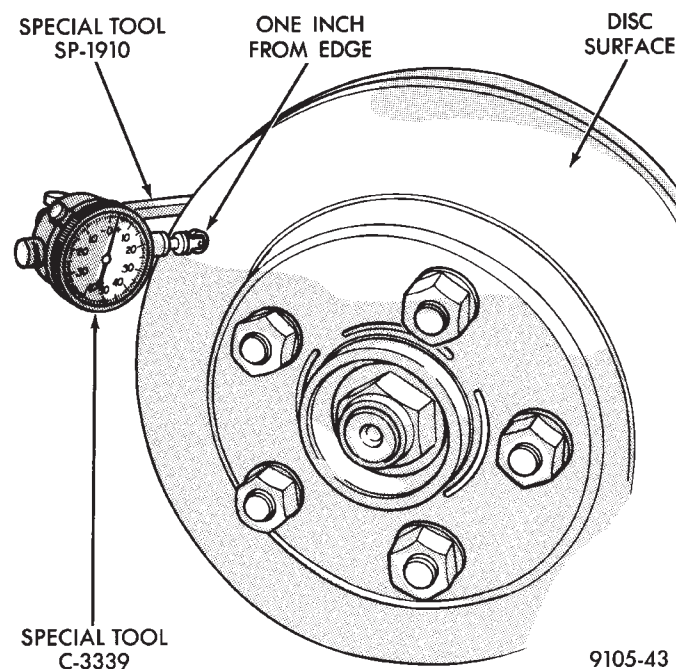


Fig. 1 Checking Braking Disc for Runout

If runout is in excess of the specification, check the lateral runout of the hub face. Before removing disc from hub, make a chalk mark across both the disc and one wheel stud on the high side of runout. So you'll know exactly how the disc and hub was originally mounted (Fig. 2). Remove disc from hub.

Install Dial Indicator, Special Tool C-3339 and Mounting Adaptor, Special Tool SP-1910 on steering

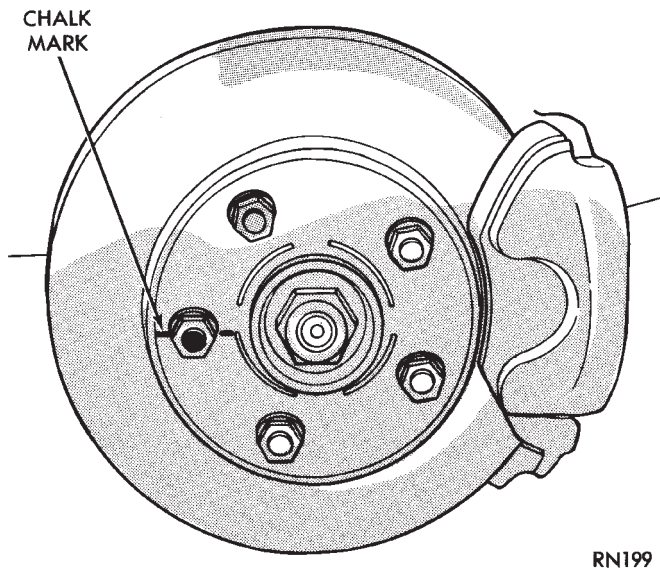


Fig. 2 Marking Braking Disc and Wheel Stud

knuckle. Position stem so it contacts hub face near outer diameter (Fig. 3). Care must be taken to position stem outside the stud circle but inside the chamfer on the hub rim. **Clean hub surface before checking.**

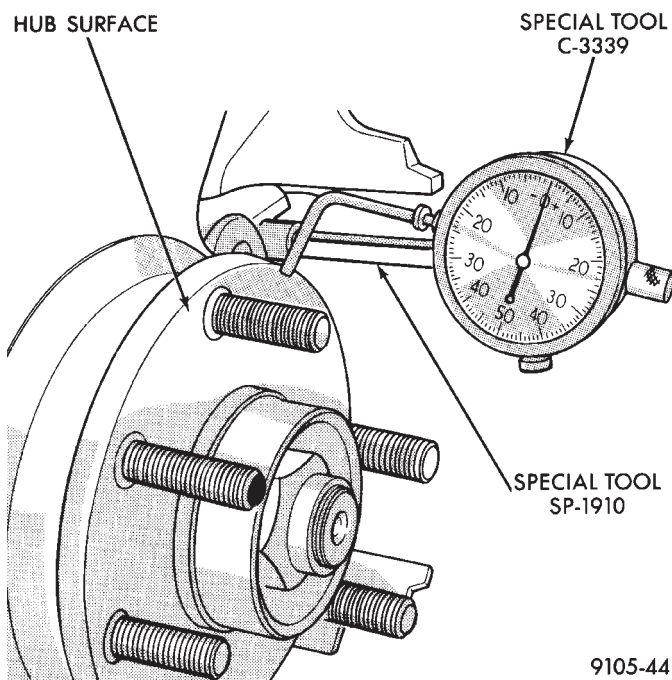


Fig. 3 Checking Hub for Runout

Runout should not exceed 0.05 mm (0.002 inch). If runout exceeds this specification, hub must be replaced. See Suspension Group 2. If hub runout does not exceed this specification, install disc on hub with chalk marks two wheel studs apart (Fig. 4). Tighten nuts in the proper sequence and torque to specifications. Finally, check runout of disc to see if runout is now within specifications.

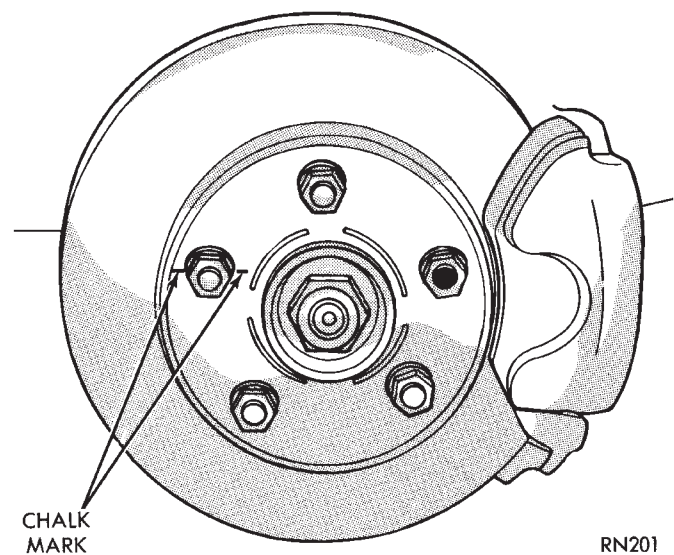


Fig. 4 Index Braking Disc and Wheel Stud

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

Thickness variation measurements of disc should be made in conjunction with runout. Measure thickness of disc at 12 equal points with a micrometer at a radius approximately 25.4 mm (1 inch) from edge of disc (Fig. 5). If thickness measurements vary by more than 0.013 mm (0.0005 inch) disc should be removed and resurfaced (Figs. 6 and 7), or a new disc installed. If cracks or burned spots are evident in the disc, disc must be replaced.

Light scoring and/or wear is acceptable. If heavy scoring or warping is evident, the disc must be refinished or replaced (See Refinishing/Refacing Braking Disc). If cracks are evident in the disc, replace the disc.

BRAKING DISC REMOVAL

(1) Raise vehicle on hoist or jackstands. Remove wheel and tire assembly.

(2) Remove caliper assembly, as described under Brake Shoe Removal in this Group, (do not disconnect brake line). Suspend caliper from wire hook or loop to avoid strain on flexible brake hose.

(3) Remove braking disc from hub.

INSTALLING BRAKING DISC

(1) Clean both sides of braking disc with alcohol or suitable solvent. Slide braking disc on hub.

(2) Install caliper assembly, as described in Brake Shoe Installation paragraph.

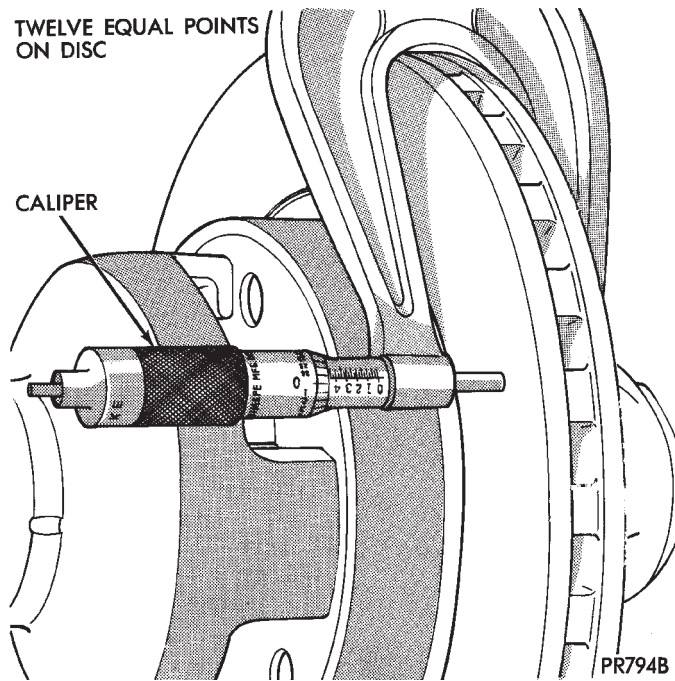


Fig. 5 Checking Disc for Thickness

REFINISHING BRAKING DISC

REFACING BRAKING DISC

Refacing of the braking disc is not required each time the shoe assemblies are replaced.

If the braking disc surface is deeply scored or warped or there is a complaint of brake roughness or brake pedal pulsation the rotor should be resurfaced or refaced (Figs. 6 and 7).

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

The collets, shafts and adapters used on the brake lathe and the bearing cups in the rotor **MUST** be clean and free from any chips or contamination.

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

If the disc is not mounted properly the run-out will be worse after refacing than before refacing.

The use of a double straddle cutter (Fig. 6) that machines both sides of the disc at the same time is highly recommended.

RESURFACING BRAKING DISC

This operation can be used when the disc surface is rusty or has lining deposits.

A sanding disc attachment will remove surface contamination without removing much braking disc material.

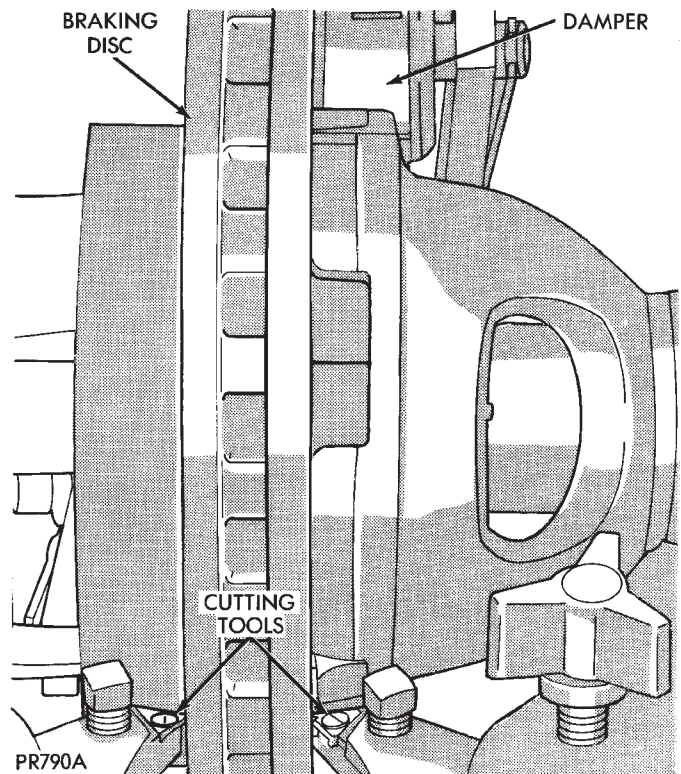


Fig. 6 Refacing Braking Disc

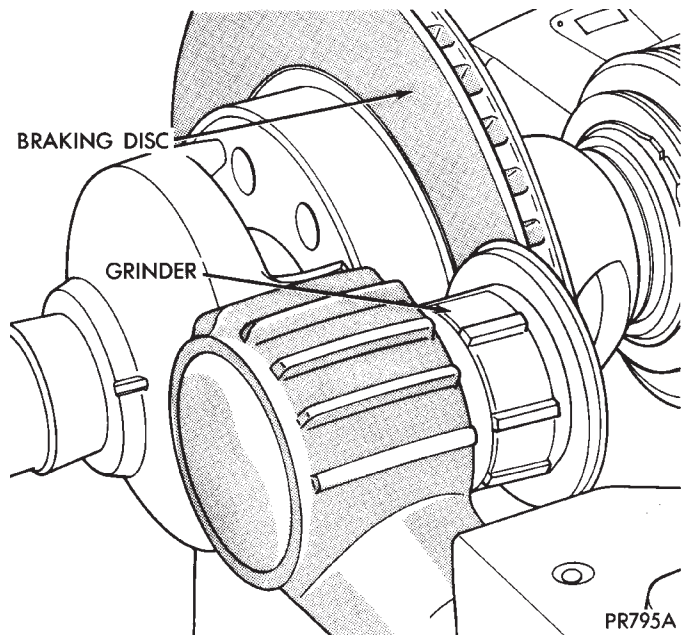


Fig. 7 Resurfacing Braking Disc (Final Finish)

It will generally follow variations in thickness that are in the disc.

The following chart shows the location of measurements and specifications when servicing the braking disc.

All front braking discs have markings for minimum allowable thickness cast on an unmachined surface of the braking disc (Fig. 8). The



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TSB 05-12-94 June 10, 1994

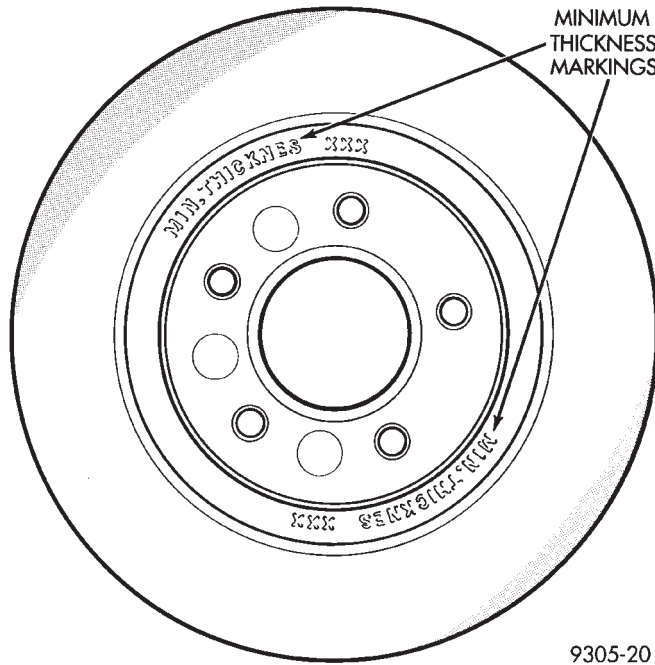


Fig. 8 Front Braking Disc Minimum Thickness Markings

thickness markings may be located on the disc as shown in (Fig. 8) or on an alternate surface.

All rear braking discs have markings for minimum allowable thickness and maximum allowable diameter cast on an un-machined surface of

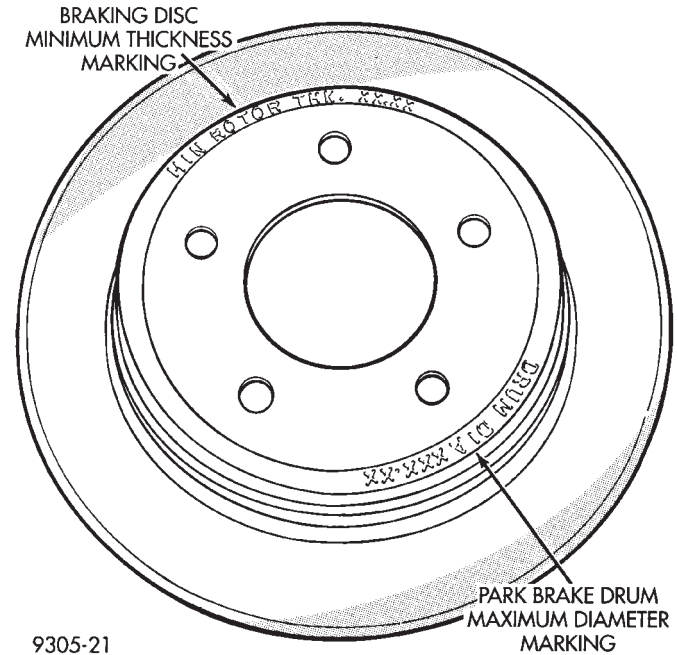


Fig. 9 Rear Braking Disc Minimum Thickness Markings

the braking disc (Fig. 9). The thickness markings may be located on the disc as shown in (Fig. 9) or on an alternate surface.

This marking includes 0.76 mm (0.030 inch) allowable disc wear beyond the recommended 0.76 mm(0.030 inch) of disc refacing.

BRAKING DISC (ROTOR) REFINISHING LIMITS

	Thickness	Minimum Thickness	Thickness Variation	Disc Runout*	Micro Finish
Braking Disc	24.13-23.87 mm (.950-.940 in.)	**22.4 mm (.882 in.)**	.013 mm (.0005 in.)	.08 mm (.003 in.)	15-80 RMS

*TIR - Total Indicator Reading (measured on vehicle)

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PARKING BRAKES

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GENERAL INFORMATION

The parking brake mechanism on vehicles with rear disc brake applications. Consists of a small duo-servo brake which is mounted to the adapter. The hat (center) section (Fig. 1) of the rear rotor serves as the braking surface (drum) for the parking brakes. On the vehicles with rear disc brake applications, the parking brake cables are single unit assemblies.

On non-rear wheel disc brake applications, the rear wheel service brakes also act as parking brakes. The rear drum brake shoes are mechanically operated by an internal lever and strut connected to a flexible steel cable. The wheel brake cables are joined at an equalizer which is attached to the front cable leading to the foot lever (Fig. 2).

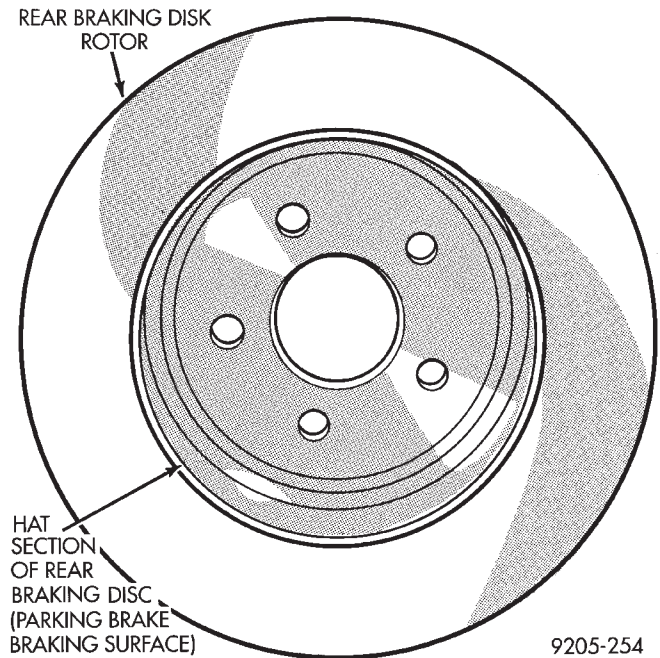


Fig. 1 Drum In Hat Braking Disc



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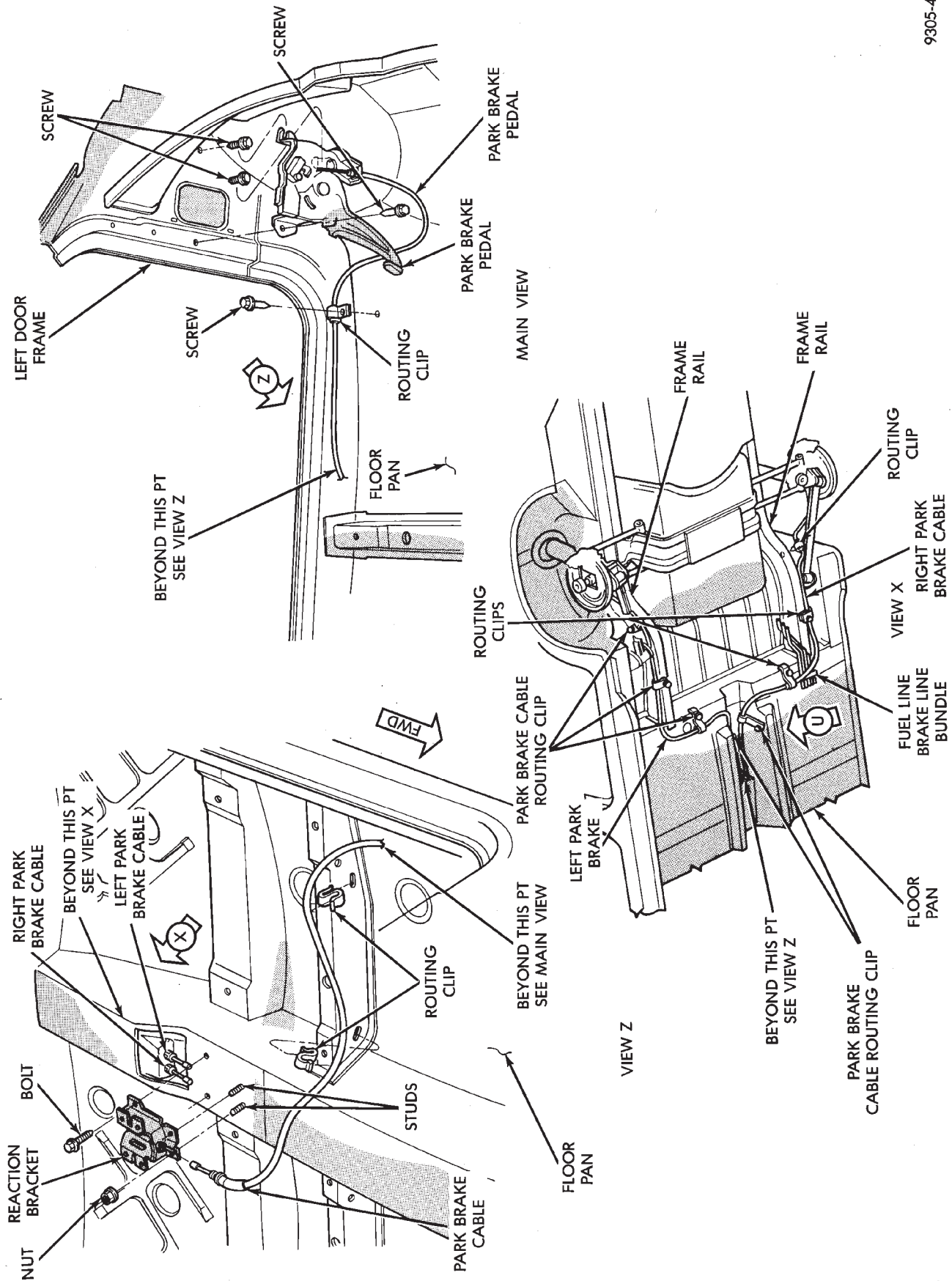


FIG. 2 PARKING BRAKE CABLE ROUTING



SERVICE PROCEDURES

ADJUSTING PARKING BRAKE

The parking brake foot lever assembly used on all L.H. platform vehicles, with and without rear disc brakes contains a self adjuster for the cable system. Routine parking brake cable adjustment on all L.H. platform vehicles is not required.

WARNING: THE SELF ADJUSTING FEATURE OF THIS PARKING BRAKE LEVER ASSEMBLY CONTAINS A CLOCK SPRING LOADED TO APPROXIMATELY 8 POUNDS. CARE MUST BE TAKEN TO PREVENT EXCESSIVE JARRING OF THE ASSEMBLY. DO NOT RELEASE THE SELF ADJUSTER LOCKOUT DEVICE BEFORE INSTALLING CABLES INTO THE EQUALIZER. KEEP HANDS OUT OF SELF ADJUSTER SECTOR AND PAWL AREA. FAILURE TO OBSERVE CAUTION IN HANDLING THIS MECHANISM COULD LEAD TO SERIOUS INJURY.

When repairs to the foot lever assembly or front cable are required the self adjuster must be reloaded and locked out.

SELF ADJUSTING PROCEDURES

RELOADING SELF ADJUSTER

To gain access to park brake lever mechanism to perform any service to mechanism, park brake cable or for replacement of park brake mechanism or cable. The complete lower dash panel must be removed from the vehicle. Refer to group 23 Body and group 8 Electrical in this service manual for required procedure to remove lower dash panel and center console.

(1) Remove shift knob from floor shifter (if equipped). Shift knob is removed by removing 3/32 in. allen head set screw located on drivers side of shift knob and then pulling strait up on shift knob.

(2) Remove upper center console cover from vehicle if equipped. Refer to group 23 Body in this service manual for required procedure to remove center console.

(3) Remove the entire lower dash panel assembly from vehicle. Refer to group 8 Electrical in this service manual for required procedure to remove lower dash panel.

(4) Insert a 1/4 in. drive ratchet and extension into 1/4 in. square hole located in sector of park brake pedal mechanism (Fig. 3).

(5) Pull on ratchet and extension, rotating sector toward rear of vehicle until ratchet extension contacts back of park brake pedal. This will fully wind sector spring (Fig. 3).

(6) Insert a pin or drill bit into park brake lever mechanism to lock sector in place (Fig. 4). Pin used

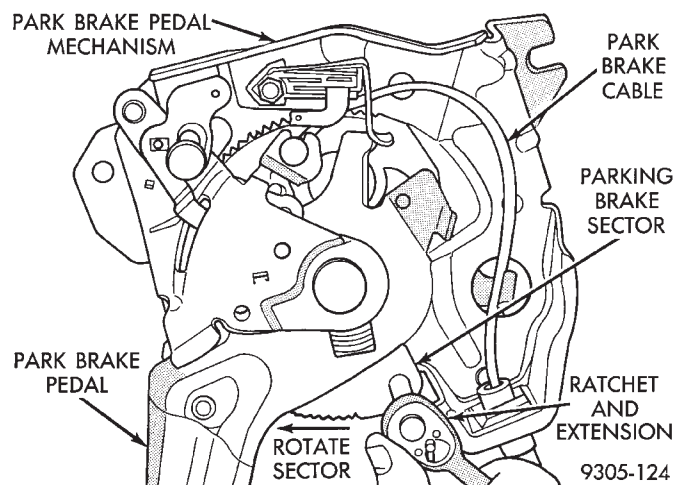


Fig. 3 Winding Park Brake Sector Spring

to lock sector, should be 1/8 in. in diameter by 2 inches long to go through both sides of park brake mechanism.

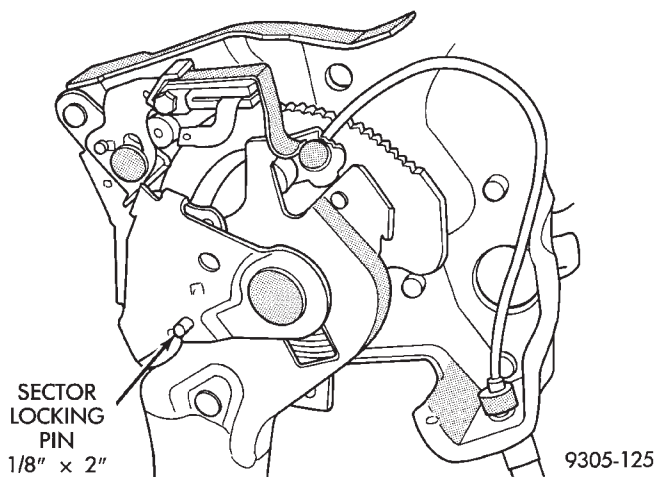


Fig. 4 Locking Pin Installed In Park Brake Mechanism

When repairs are complete, adjust rear brakes before adjusting parking brake. On drum-in-hat type of rear disc brake adjust shoe diameter to 171.5 mm (6.75 inch).

PARKING BRAKE ADJUSTING PROCEDURE

Be sure that all 3 park brake cables are properly assembled to the equalizer bracket prior to cable adjustment.

Be sure park brake cable is properly seated on the park brake mechanism cam surface (Fig. 5).

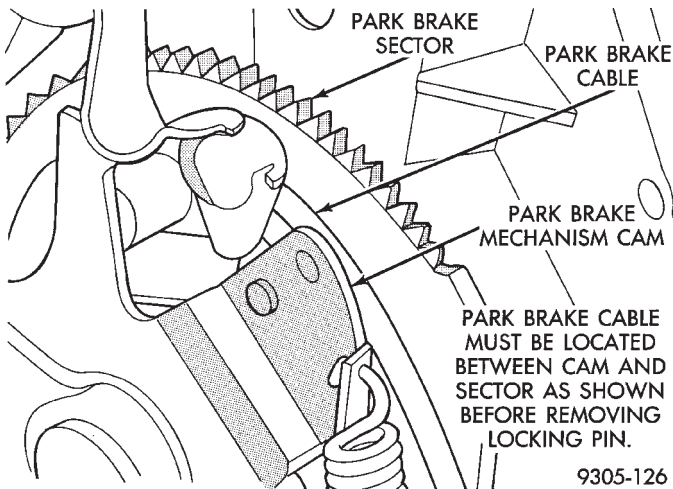


Fig. 5 Park Brake Cable Routing In Pedal Assembly

Note: The parking brake pedal must be in the fully released position when releasing self adjuster.

Using a pair of pliers, firmly grasp lock pin previously installed in park brake mechanism. Remove lock pin from park brake pedal mechanism, by pulling it firmly and rapidly from the park brake mechanism.

Apply and release the park brake lever several times. The rear wheels should rotate freely without dragging.

PARK BRAKE PEDAL MECHANISM

REMOVE

To gain access to park brake lever mechanism to perform any service to mechanism, park brake cable or for replacement of park brake mechanism or cable. The complete lower dash panel must be removed from the vehicle. Refer to group 23 Body and group 8 Electrical in this service manual for required procedure to remove lower dash panel and center console.

(1) Remove shift knob from floor shifter (if equipped). Shift knob is removed by removing 3/32 in. allen head set screw located on drivers side of shift knob and then pulling strait up on shift knob.

(2) Remove upper center console cover from vehicle if equipped. Refer to group 23 Body in this service manual for required procedure to remove center console.

(3) Remove the entire lower dash panel assembly from vehicle. Refer to group 8 Electrical in this service manual for required procedure to remove lower dash panel.

(4) Reload parking brake mechanism self adjuster using steps 3, 4, 5 and 6 listed under Reloading Self Adjuster in this section of the service manual.

(5) Remove the brake warning light wire from the park brake mechanism switch (Fig. 6).

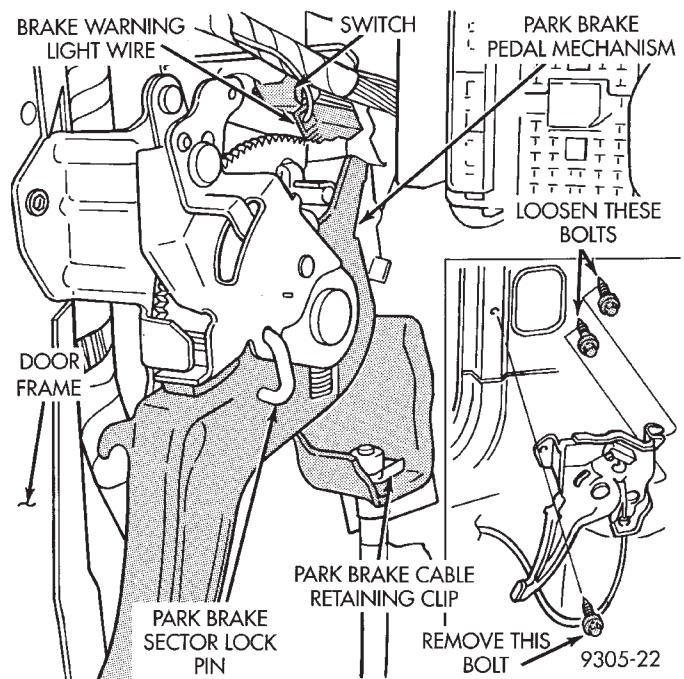


Fig. 6 Park Brake Pedal Mechanism

(6) Using a screw driver, pry the park brake cable retaining clip (Fig. 6) from the park brake cable.

(7) Remove the 1 bolt holding park brake pedal assembly to door frame (Fig. 6). Loosen but do not remove the 2 bolts attaching park brake pedal mechanism to inner body panel (Fig. 6).

(8) Remove park brake pedal mechanism and cable as an assembly from body of vehicle.

(9) After park brake pedal assembly is removed from vehicle body. Rotate park brake cable to align cable with notch in cable attaching hole on park brake pedal mechanism (Fig. 7). Lift lead slug of park brake cable, out of retaining hole in park brake mechanism, then remove park brake cable from park brake mechanism.

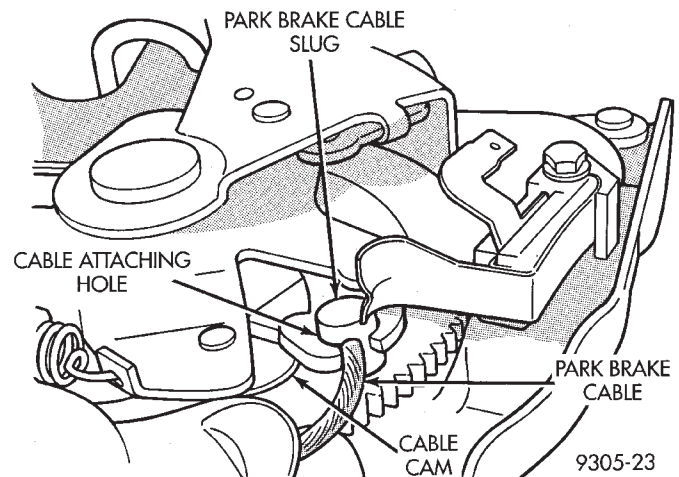


Fig. 7 Park Brake Cable Removal From Park Brake Mechanism



REPLACE

(1) Install park brake cable assembly, through cable mounting in park brake pedal mechanism.

(2) Align park brake cable slug with attaching hole on park brake assembly (Fig. 7). Install park brake cable into cable attaching hole in park brake assembly, and rotate cable into place. Be sure cable is properly seated in the cam surface track in the foot lever assembly (Fig. 7).

(3) Install park brake cable to park brake pedal mechanism retaining clip (Fig. 8). Be sure retaining clip is fully installed on park brake cable. Install park brake pedal return spring (Fig. 8) before installing park brake pedal assembly back in vehicle.

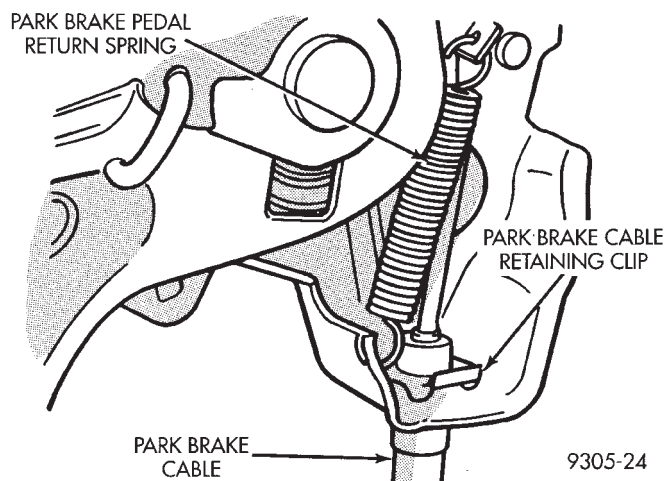


Fig. 8 Park Brake Cable Installed In Mechanism

(4) Install park brake pedal mechanism onto the 2 loosened mounting bolt on inner body panel (Fig. 9). Install the park brake pedal assembly retaining bolt into door frame (Fig. 9). Torque all 3 park brake assembly mounting bolts to 27 N•m (19 ft. lbs.).

(5) Connect the brake warning light wire from vehicles wiring harness, onto switch located on park brake pedal mechanism (Fig. 9).

(6) Ensure that park brake cable is properly routed in cam surface track of park brake pedal assembly (Fig. 7). Using a pair of pliers, firmly grasp lock pin installed in park brake mechanism. Remove lock pin from park brake pedal mechanism, using a firm and rapid pull. When locking pin is removed from park brake pedal mechanism, the park brake mechanism and park brake cables will automatically adjust. **See parking brake adjustment procedure in this section of the service manual for complete parking brake adjustment procedure.**

(7) Install lower dash panel assembly in vehicle. Refer to group 8 Electrical in this service manual for required procedure for installation of lower dash panel assembly.

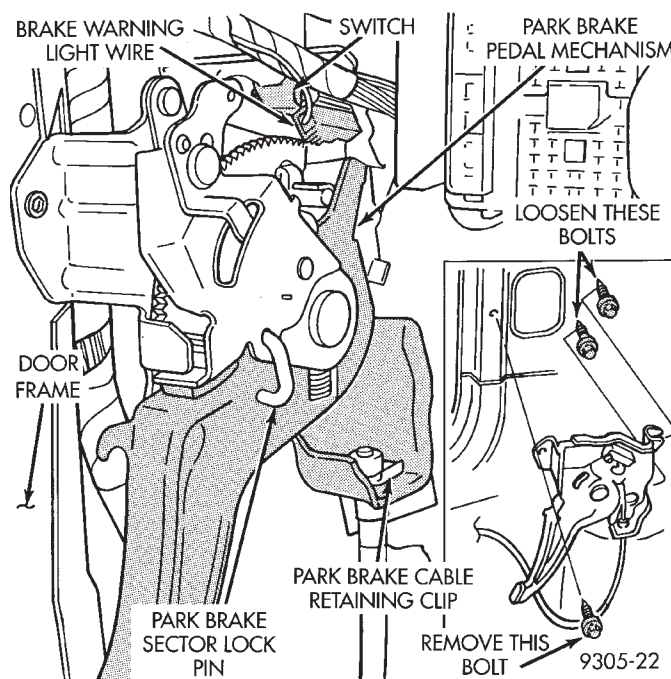


Fig. 9 Park Brake Pedal Mechanism

(8) Install upper center console cover back in vehicle if equipped. Refer to group 23 Body in this service manual for required procedure to install center console.

(9) Install shift knob on floor shifter (if equipped). Shift knob is installed by pushing shift knob down shift shaft until fully bottomed. Then install and tighten 3/32 in. allen head set screw located on drivers side of shift knob.

(10) **When repairs are complete, adjust rear brakes before adjusting parking brake. On drum-in-hat type of rear disc brake adjust shoe diameter to 171.5 mm (6.75 inch).**

FRONT PARK BRAKE CABLE SERVICE

REMOVE

To gain access to park brake lever mechanism to perform any service to mechanism, park brake cable or for replacement of park brake mechanism or cable. The complete lower dash panel must be removed from the vehicle. Refer to Group 23 Body and Group 8 Electrical in this service manual for required procedure to remove lower dash panel and center console.

5 PASSENGER MODELS

(1) Remove drivers seat assembly from vehicle. Refer to Group 23 Body in this service manual for required seat, removal procedure.

(2) Remove shift knob from floor shifter. Shift knob is removed by removing 3/32 in. allen head set screw located on drivers side of shift knob and pulling straight up on shift knob.



(3) Remove upper center console cover from vehicle if equipped. Refer to Group 23 Body in this service manual for required procedure to remove center console.

(4) Remove the entire lower dash panel assembly from vehicle. Refer to Group 8 Electrical in this service manual for required procedure to remove lower dash panel.

(5) Remove drivers side door opening sill molding. Remove drivers side cowl kick molding to expose park brake pedal mechanism (Fig. 11).

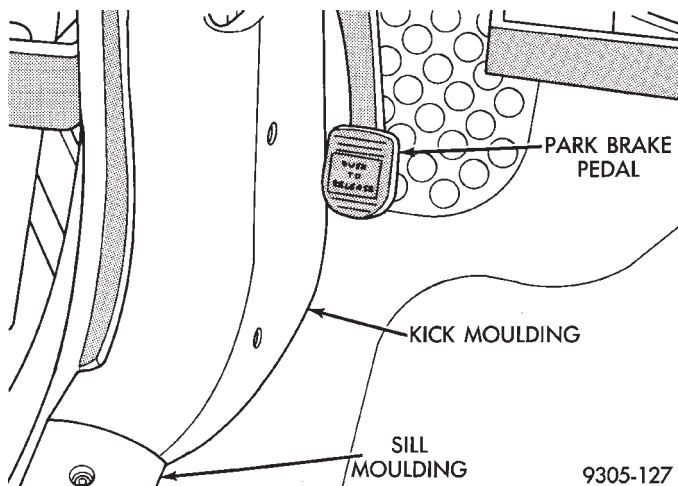


Fig. 11 Sill Molding And Cowl Area Molding

(6) Remove rear console mounting bracket (Fig. 12) from park brake cable reaction bracket. Remove rear passenger compartment heat duct (Fig. 12) from vehicle, for access to park brake cables.

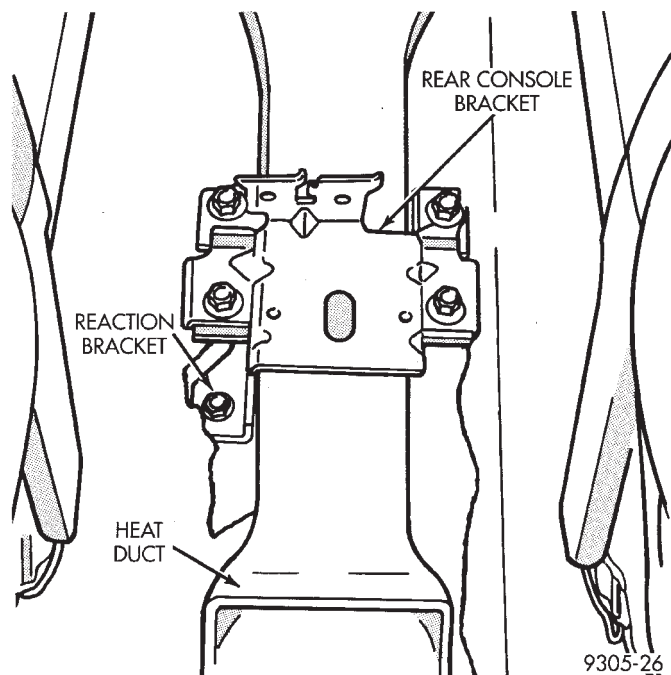


Fig. 12 Console Mounting Bracket And Heat Duct

(7) Fold back carpeting to expose front park brake cable and routing clips. **Note: The throttle pedal and bracket have to be removed from the dash panel to allow carpet to be folded back..**

6 PASSENGER MODELS

(1) Remove drivers seat assembly from vehicle. Refer to Group 23 Body in this service manual for required seat, removal procedure.

(2) Remove rear seat lower cushion from vehicle. Refer to Group 23 Body in this service manual for required lower seat cushion, removal procedure.

(3) Remove the entire lower dash panel assembly from vehicle. Refer to group 8 Electrical in this service manual for required procedure to remove lower dash panel.

(4) Remove drivers side door opening sill molding. Remove drivers side cowl kick molding to expose park brake pedal mechanism (Fig. 11).

(5) Fold back carpeting to expose front park brake cable, reaction bracket cover and equalizer. **Note: The throttle pedal and bracket have to be removed from the dash panel to allow carpet to be folded back..** Remove equalizer cover from reaction bracket (Fig. 13).

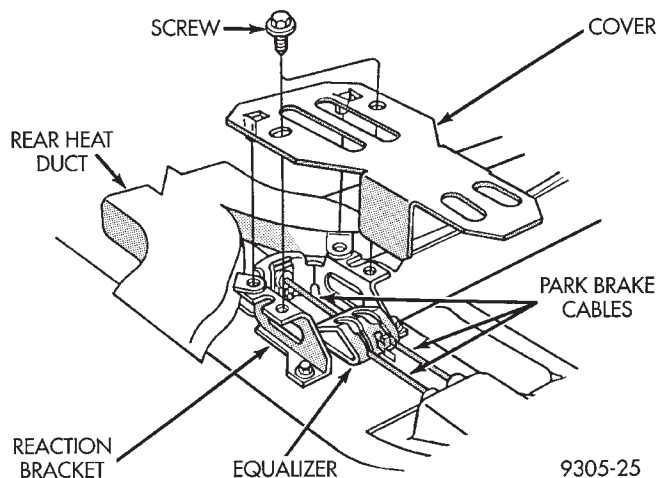


Fig. 13 Park Brake Equalizer And Cover

ALL MODELS

WARNING: PARK BRAKE PEDAL MECHANISM SELF ADJUSTER MUST BE RELOADED AND LOCKED TO REMOVE SPRING TENSION. BEFORE ATTEMPTING TO REMOVE FRONT PARK BRAKE CABLE FROM PARK BRAKE PEDAL ASSEMBLY OR EQUALIZER. FAILURE TO DO THIS WILL MAKE ASSEMBLY EXTREMELY DIFFICULT AND COULD LEAD TO SERIOUS INJURY.

(1) Reload park brake assembly self adjuster, using procedure listed under Reloading Self Adjuster in this section of the service manual.



(2) Remove front park brake cable from park brake cable equalizer (Fig. 14).

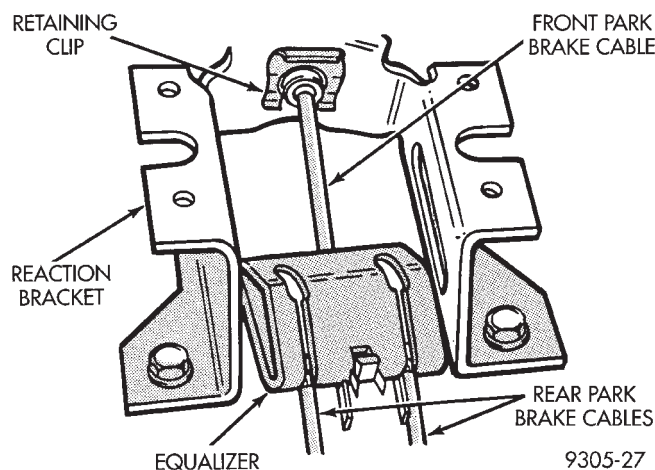


Fig. 14 Front Park Brake Cable Connection At Equalizer

(3) Remove the front park brake cable to reaction bracket retaining clip, by prying it off cable using a screwdriver (Fig. 15).

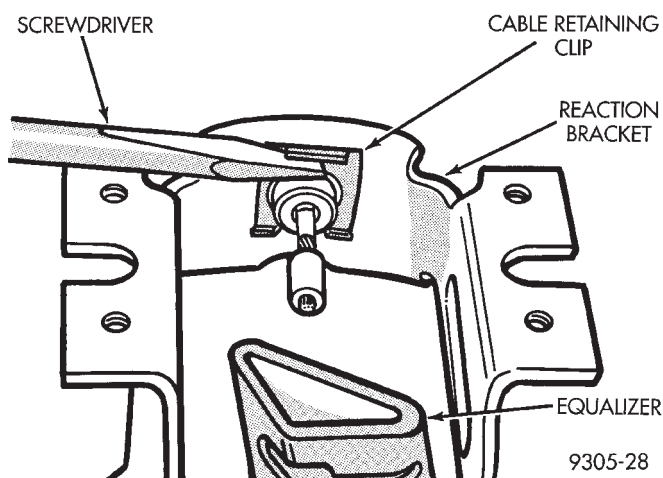


Fig. 15 Front Park Brake Cable Retaining Clip

(4) Remove front park brake cable from reaction bracket (Fig. 16). Remove screw, attaching park brake cable routing clip to left front floor pan (Fig. 16). Remove front park brake cable from the 2 routing clips attached to the floor pan crossmember (Fig. 16).

(5) Remove the bolt (Fig. 17) attaching park brake pedal assembly to left front door frame. Loosen but do not remove the 2 bolts (Fig. 17) attaching park brake pedal assembly to cowl panel. Unplug the brake warning light connector from switch on park brake pedal assembly. Remove park brake pedal mechanism and front park brake cable as an assembly.

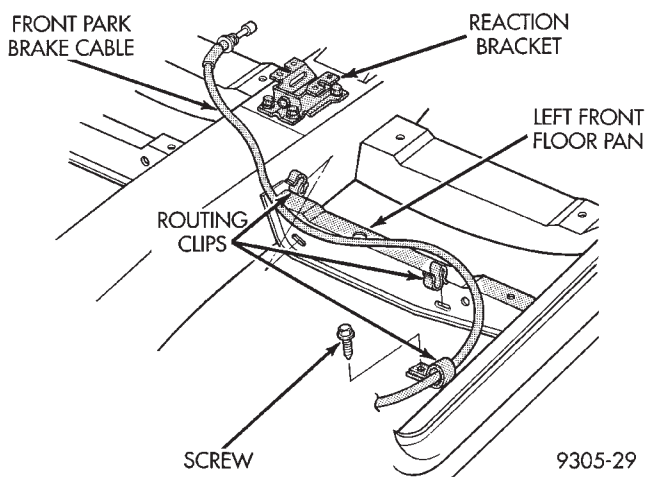


Fig. 16 Front Park Brake Cable Routing And Clipping

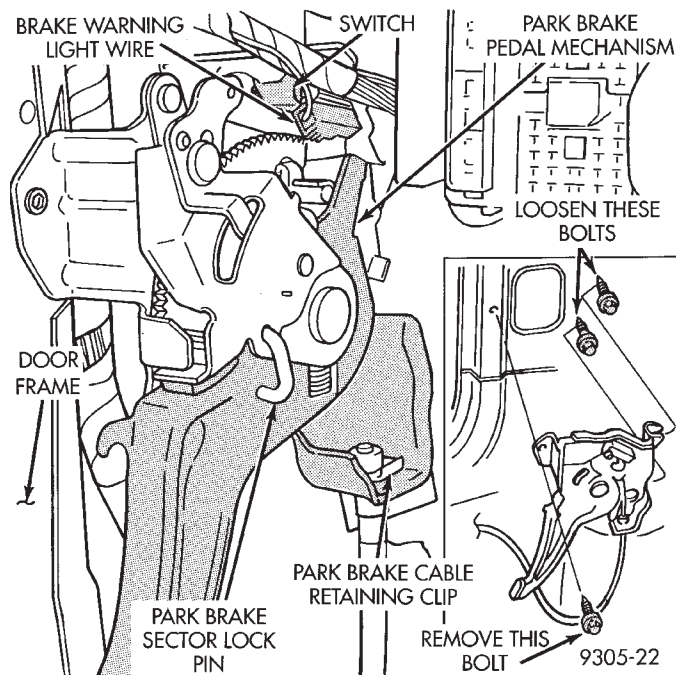


Fig. 17 Park Brake Mechanism Mounting

(6) Mount park brake pedal assembly in a vise. Remove front park brake cable to park brake assembly retaining clip (Fig. 18).

(7) After park brake pedal assembly is removed from vehicle body. Rotate park brake cable to align cable with notch in cable attaching hole on park brake pedal mechanism (Fig. 19). Lift lead slug of park brake cable, out of retaining hole in park brake mechanism, then remove park brake cable from park brake mechanism.

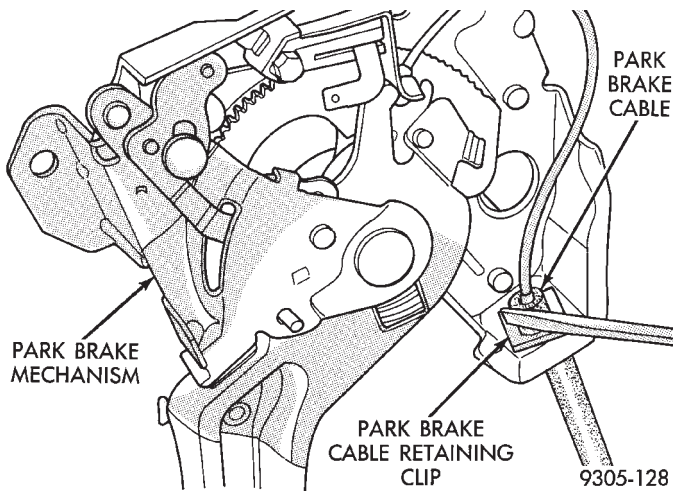


Fig. 18 Park Brake Cable Retaining Clip

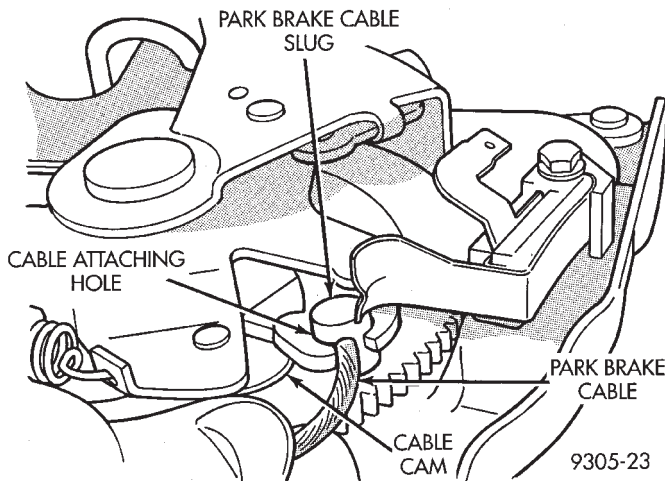


Fig. 19 Park Brake Cable Removal From Park Brake Mechanism

REPLACE

(1) Install park brake cable assembly, through cable mounting in park brake pedal mechanism.

(2) Align park brake cable slug with attaching hole on park brake assembly (Fig. 20). Install park brake cable into cable attaching hole in park brake assembly, and rotate cable into place. Be sure cable is properly seated in the cam surface track of foot lever assembly (Fig. 20).

(3) Install park brake cable to park brake pedal mechanism retaining clip (Fig. 21). Be sure retaining clip is fully installed on park brake cable.

(4) Install park brake pedal mechanism onto the 2 loosened mounting bolt on cowl panel (Fig. 22). Install the park brake pedal assembly retaining bolt into door frame (Fig. 22). Torque all 3 park brake assembly mounting bolts to 27 N•m (19 ft. lbs.).

(5) Connect the brake warning light wire from vehicles wiring harness, onto switch located on park brake pedal mechanism (Fig. 22).

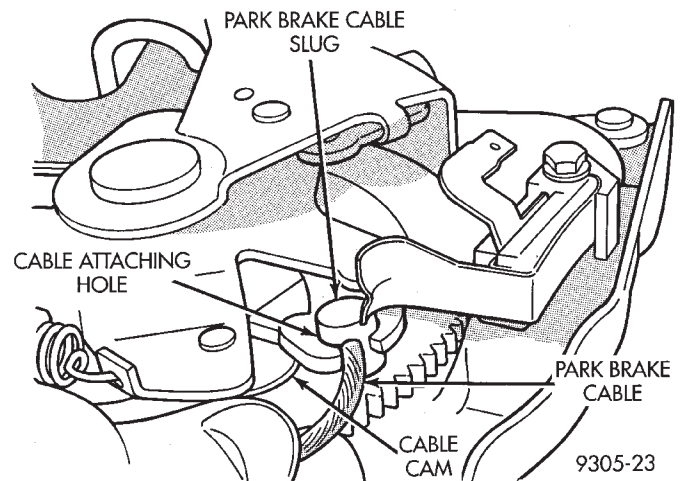


Fig. 20 Park Brake Cable Installed On Pedal Assembly

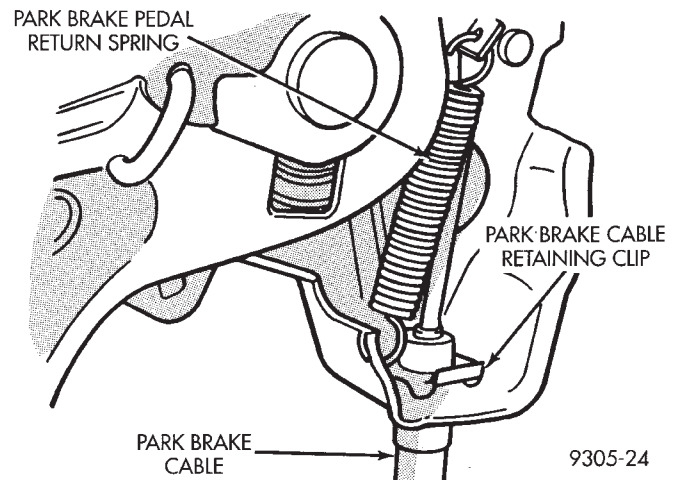


Fig. 21 Park Brake Cable Installed In Mechanism

(6) Route front park brake cable along floor of vehicle. Install end of front park brake cable into mounting hole in reaction bracket. Install front park brake cable to reaction bracket retaining clip. Tap retaining clip with hammer until fully installed on cable. Install front park brake cable into equalizer (Fig. 23).

(7) Install the park brake cable routing clip to floor pan attaching screw (Fig. 24). Torque the routing clip to floor pan attaching screw to 4 N•m (35 in. lbs.). Install front park brake cable into routing clips on floor pan crossmember.

(8) Ensure that park brake cable is properly routed in cam surface track of park brake pedal assembly (Fig. 25). Using a pair of pliers, firmly grasp lock pin previously installed in park brake mechanism. Remove lock pin from park brake pedal mechanism, using a firm and rapid pull. When locking pin is removed from park brake pedal mechanism, the park brake mechanism and park brake cables will automatically adjust. **See parking brake adjustment**

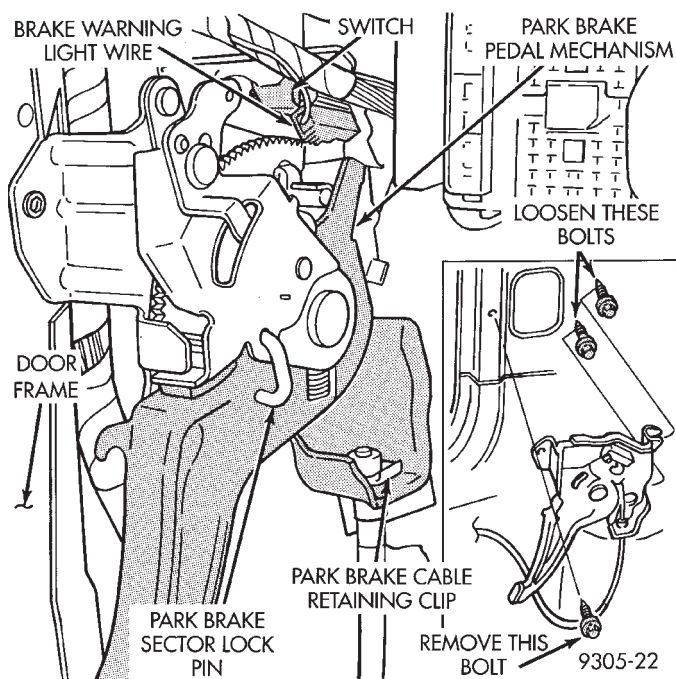


Fig. 22 Park Brake Pedal Mechanism

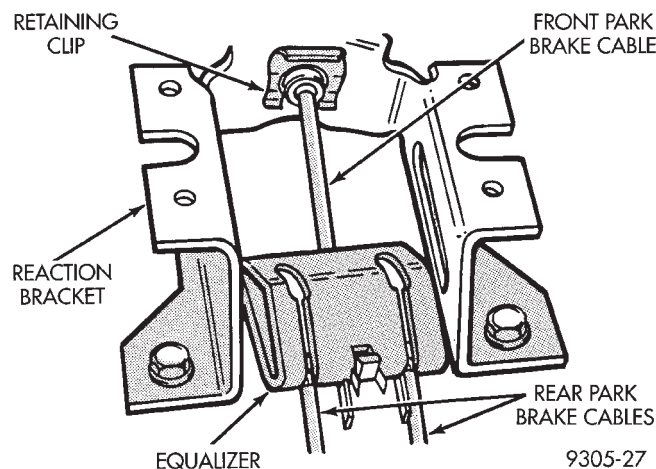


Fig. 23 Correctly Installed Retaining Clip And Assembled Cable

procedure in this section of the service manual for complete parking brake adjustment procedure.

5 PASSENGER MODELS

(1) Fold carpeting back into position on left floor pan of vehicle. Install throttle pedal and bracket back on dash panel studs and install attaching nuts.

(2) Install rear passenger compartment heat duct (Fig. 26) back into vehicle. Install rear console assembly mounting bracket (Fig. 26) on park brake cable reaction bracket. Torque rear console assembly mounting bracket to reaction bracket mounting bolts to 10 N•m (88 in. lbs.).

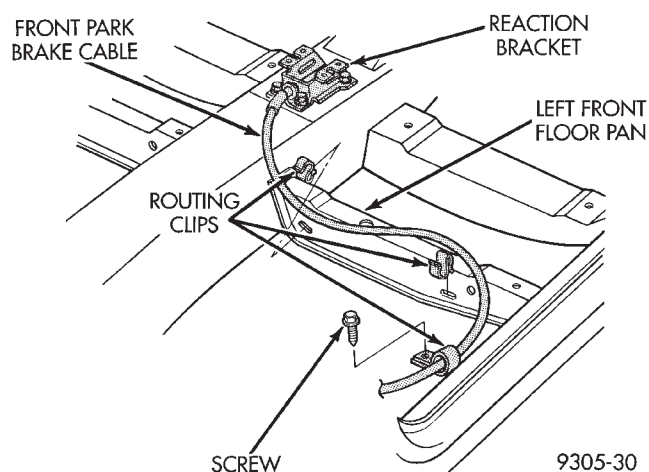


Fig. 24 Front Park Brake Routing And Clipping Locations

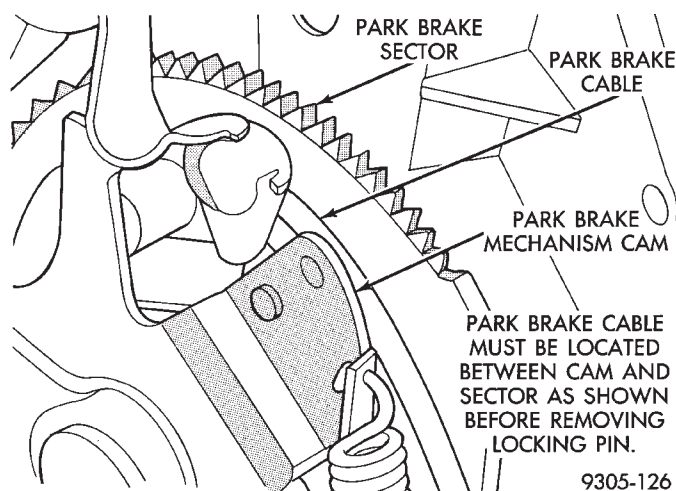


Fig. 25 Correct Park Brake Cable Routing At Pedal Assembly

(3) Install drivers side cowl kick molding (Fig. 27). Install drivers side door opening sill molding (Fig. 27).

(4) Install lower dash panel assembly back in vehicle. Refer to Group 8 Electrical in this service manual for required procedure to install lower dash panel.

(5) Install upper center console cover assembly back in vehicle. Refer to Group 23 Body in this service manual for required procedure to install upper center console.

(6) Install shift knob on floor shifter (if equipped). Shift knob is installed by pushing shift knob down shift shaft until fully bottomed. Then install and tighten 3/32 in. allen head set screw located on drivers side of shift knob.

(7) Install drivers side seat assembly back in vehicle. Refer to Group 23 Body in this service manual for required seat, installation procedure.

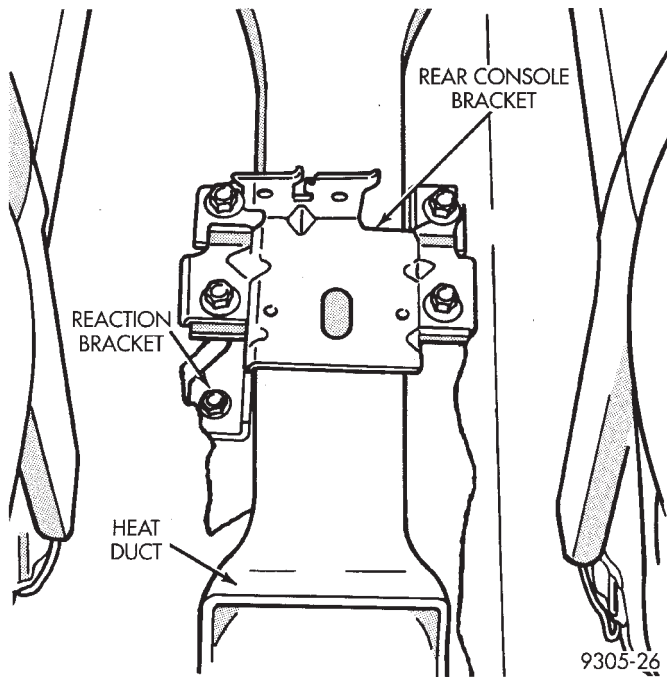


Fig. 26 Console Mounting Bracket And Heat Duct

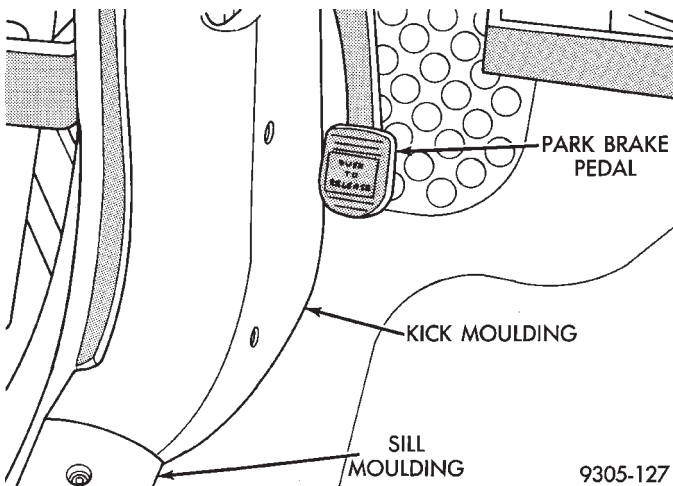


Fig. 27 Sill Molding And Cowl Area Molding

(8) When repairs are complete, adjust rear brakes before adjusting parking brake. See parking brake adjustment procedure in this section of the service manual for complete parking brake adjustment procedure. On drum-in-hat type of rear disc brake adjust shoe diameter to 171.5 mm (6.75 inch).

6 PASSENGER MODELS

(1) Install equalizer cover back on reaction bracket (Fig. 28). Torque equalizer cover to reaction bracket mounting bolts to 10 N•m (88 in. lbs.). Fold carpeting back into position on left floor pan of vehicle. Install throttle pedal and bracket back on dash panel studs and install attaching nuts.

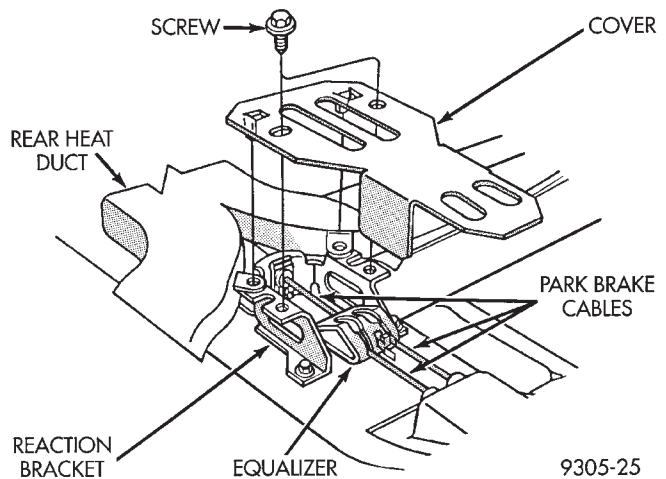


Fig. 28 Park Brake Equalizer And Cover

(2) Install drivers side cowl area kick molding back in vehicle. Install drivers side door opening sill molding (Fig. 27).

(3) Install lower dash panel assembly back in vehicle. Refer to Group 8 Electrical in this service manual for required procedure to install lower dash panel.

(4) Install rear seat lower cushion back in vehicle. Refer to Group 23 Body in this service manual for required lower seat cushion, installation procedure.

(5) Install drivers side seat assembly back vehicle. Refer to Group 23 Body in this service manual for required seat, installation procedure.

(6) **When repairs are complete, adjust rear brakes before adjusting parking brake. See parking brake adjustment procedure in this section of the service manual for complete parking brake adjustment procedure.** On drum-in-hat type of rear disc brake adjust shoe diameter to 171.5 mm (6.75 inch).

REAR PARK BRAKE CABLE SERVICE

DRUM BRAKES

Note: Remove only one rear park brake cable from rear brakes at a time. Failure to do so will result in high efforts required, to connect park brake cables to equalizer or park brake lever.

Should it become necessary to remove either parking brake cable for installation of a new cable, proceed as follows:

With vehicle jacked up on a suitable hoist, remove wheel and tire assembly.

REMOVE

(1) Disconnect park brake cable from park brake lever on rear brake assembly (Fig. 1).

(2) Position a 1/2 wrench over the retainer on the end of the parking brake cable (Fig. 2). Compress ca-

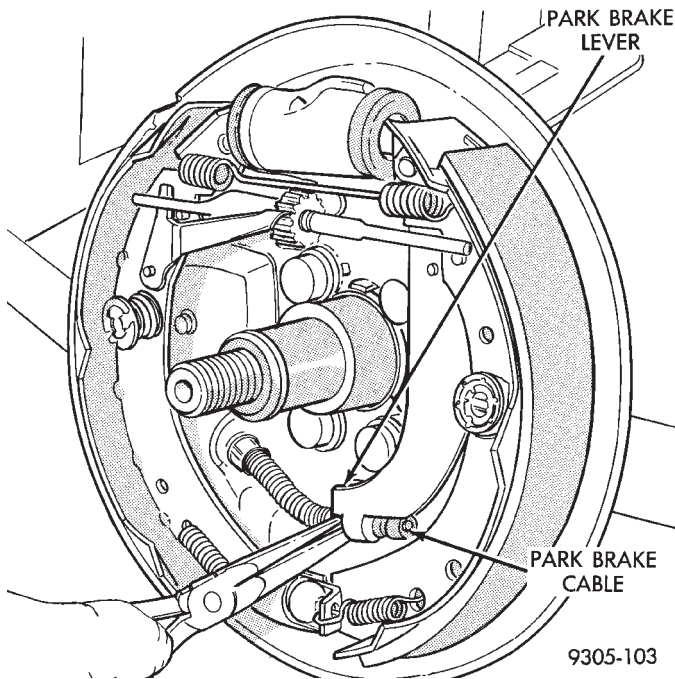


Fig. 1 Removing Brake Cable From Park Brake Lever

ble housing retaining fingers and start housing out of support plate (Fig. 2). 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 housing end fitting compressing the three fingers.

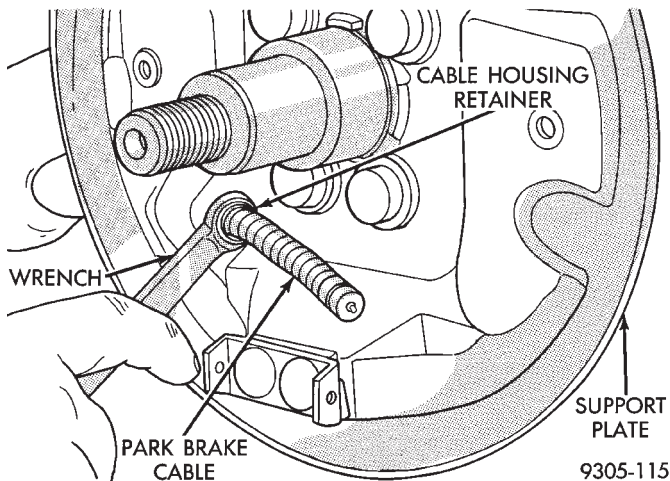


Fig. 2 Removing Park Brake Cable From Support Plate

(3) Remove the 4 routing clips attaching rear park brake cable to floor pan and frame of vehicle (Fig. 3).

5 PASSENGER MODELS

(4) Remove shift knob from floor shifter. Shift knob is removed by removing 3/32 in. allen head set screw located on drivers side of shift knob and pulling straight up on shift knob.

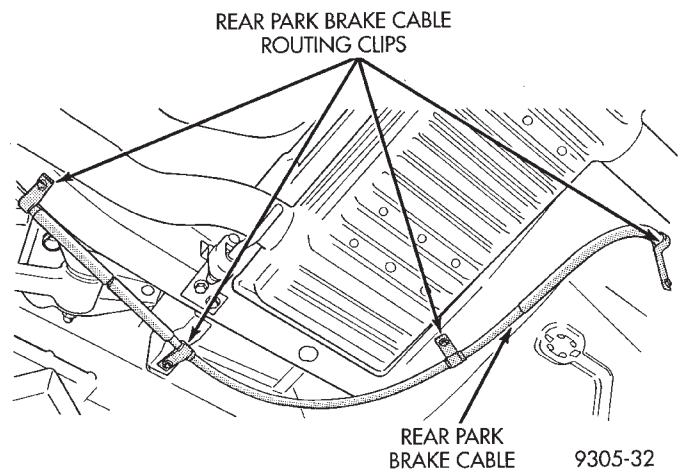


Fig. 3 Park Brake Cable Routing Clip Locations

(5) Remove upper center console cover from vehicle. Refer to group 23 Body in this service manual for required procedure to remove center console.

(6) Remove rear console mounting bracket (Fig. 4) from park brake cable reaction bracket. Remove rear passenger compartment heat duct (Fig. 4) from vehicle, for access to park brake cables.

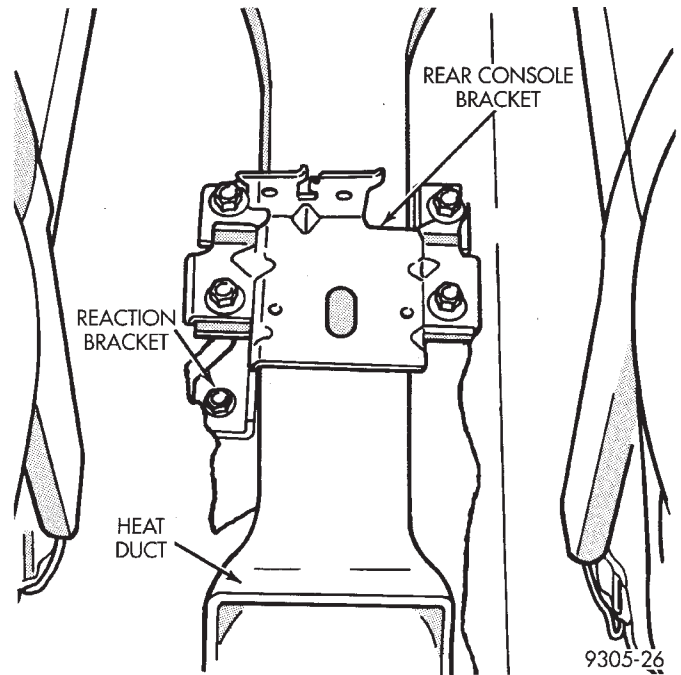


Fig. 4 Console Mounting Bracket And Heat Duct

Note: Remove only one rear park brake cable from rear brakes at a time. Failure to do so will result in high efforts required, to connect park brake cables to equalizer or park brake lever.

(7) Remove rear park brake cable from vehicle floor pan using the following procedure. Disconnect rear park brake cable requiring replacement from equalizer (Fig. 5). Slip the box end of a 1/2 inch over end of park brake cable (Fig. 5). This will compress



retaining tabs on end of park brake cable housing. Using a screw driver, press on end of park brake cable housing to remove cable from floor pan of vehicle.

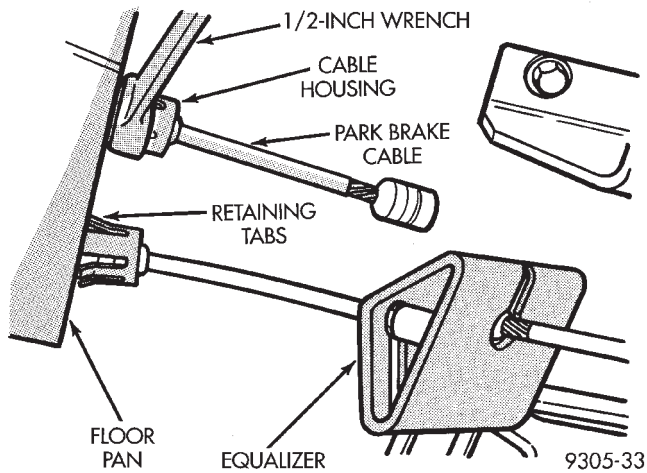


Fig. 5 Park Brake Cable Removal From Floor Pan

Note: Do not remove the second rear park brake cable from the equalizer. Until the new replacement park brake cable is installed and connected at the equalizer and wheel brake, park brake lever.

6 PASSENGER MODELS

(8) Move front passenger side seat to its full forward position.

(9) Remove the drivers side front seat assembly from the vehicle. Refer to group 23 Body in this service manual for required procedure for front seat assembly removal.

(10) Remove rear seat lower cushion from vehicle. Refer to group 23 Body in this service manual for required lower seat cushion, removal procedure.

(11) Remove both lower rear door opening sill moldings to allow rear section of carpeting to be folded forward. This will expose the equalizer cover which is attached to the park brake cable reaction bracket (Fig. 6).

(12) Remove the park brake equalizer cover from the reaction bracket (Fig. 6).

Note: Remove only one rear park brake cable from rear brakes at a time. Failure to do so will result in high efforts required, to connect park brake cables to equalizer or park brake lever.

(13) Remove rear park brake cable from vehicle floor pan using the following procedure. Disconnect rear park brake cable requiring replacement from equalizer (Fig. 7). Slip the box end of a 1/2 inch over end of park brake cable (Fig. 7). This will compress retaining tabs on end of park brake cable housing. Using a screw driver, press on end of park brake cable housing to remove cable from floor pan of vehicle.

Note: Do not remove the second rear park brake cable from the equalizer. Until the new re-

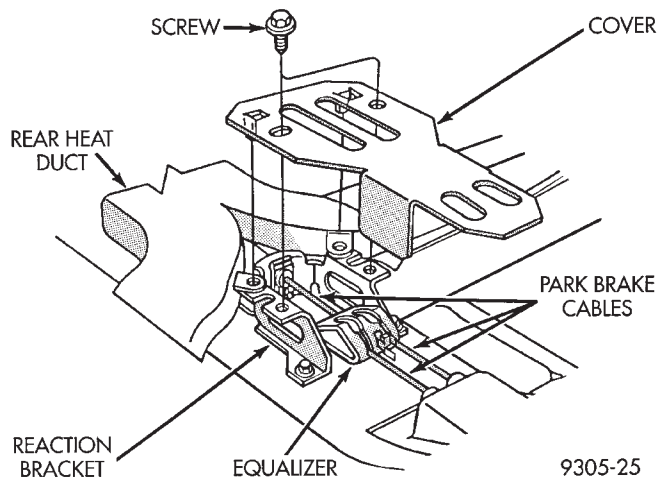


Fig. 6 Park Brake Equalizer Bracket

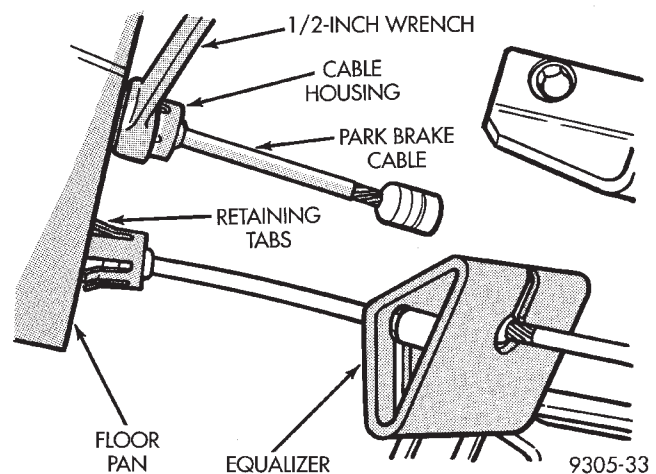


Fig. 7 Park Brake Cable Removal From Floor Pan

placement park brake cable is installed and connected at the equalizer and wheel brake, park brake lever.

INSTALL

(1) Install parking brake cable into rear brake support plate. Be sure the retainers are expanded around mounting hole in brake support plate and connect parking brake cable end to brake shoe lever.

(2) Install parking brake cable into cable mounting hole in floor pan of vehicle. Be sure that cable retainers are expanded around mounting hole in floor pan.

(3) Install the 4 routing clips attaching rear park brake cable to floor pan and frame of vehicle (Fig. 8).

(4) Connect the replacement park brake cable to the park brake cable equalizer (Fig. 9). **Note:** The equalizer can be moved rearward to allow connection of the rear cable to the equalizer.

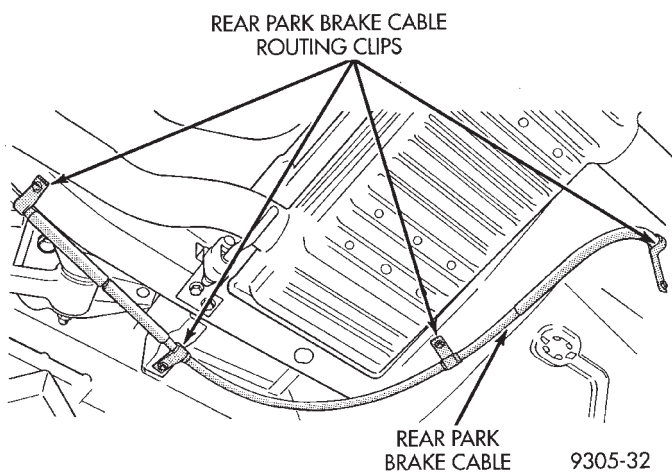


Fig. 8 Park Brake Cable Routing Clip Locations

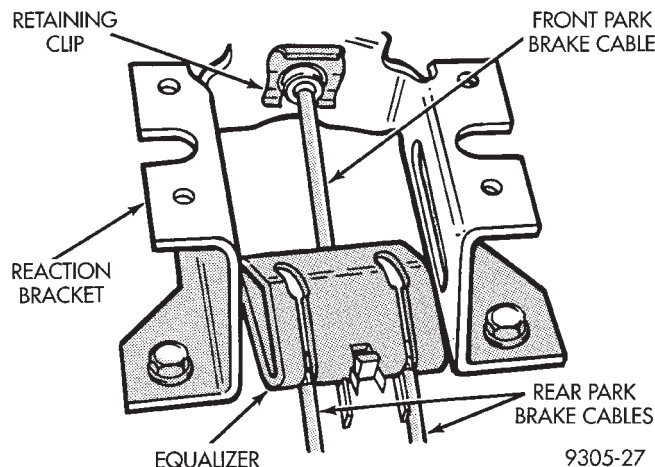


Fig. 9 Park Brake Cables Connected To Equalizer

5 PASSENGER MODELS

(5) Install upper center console cover assembly back in vehicle. Refer to group 23 Body in this service manual for required procedure to install upper center console.

(6) Install shift knob on floor shifter (if equipped). Shift knob is installed by pushing shift knob down shift shaft until fully bottomed. Then install and tighten 3/32 in. allen head set screw located on drivers side of shift knob.

(7) Install brake drum, and wheel and tire assembly.

(8) **When repairs are complete, adjust rear brakes before adjusting parking brake. See parking brake adjustment procedure in this section of the service manual for complete parking brake adjustment procedure.**

6 PASSENGER MODELS

(9) Install equalizer cover back on reaction bracket (Fig. 10). Torque equalizer cover to reaction bracket mounting bolts to 10 N•m (88 in. lbs.).

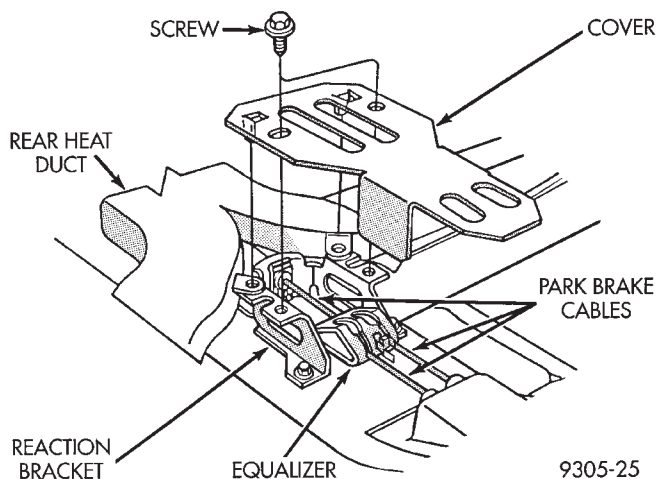


Fig. 10 Park Brake Equalizer And Cover

(10) Fold rear passenger compartment carpeting back into position on floor pan of vehicle.

(11) Install both lower rear door opening sill moldings.

(12) Install the rear seat lower cushion back in vehicle. Refer to Group 23 Body in this service manual for required lower seat cushion, installation procedure.

(13) Install drivers side seat assembly back in vehicle.

(14) Return the driver and passenger side seats back to their original positions.

(15) Install brake drum, and wheel and tire assembly.

(16) When repairs are complete, adjust rear brakes before adjusting parking brake. See parking brake adjustment procedure in this section of the service manual for complete parking brake adjustment procedure.

DISC BRAKES

Note: Remove only one rear park brake cable from rear brakes at a time. Failure to do so will result in high efforts required, to connect park brake cables to equalizer or park brake lever.

Should it become necessary to remove either parking brake cable for installation of a new cable, proceed as follows:

With vehicle jacked up on a suitable hoist, remove wheel and tire assembly.

REMOVE

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

(2) Remove rear disc brake caliper from adapter and braking disc (rotor) from rear hub.

(3) Remove parking brake shoe assemblies from the rear disc brake adapter. See Removal And Instal-



lation Parking Brake Shoes in this section of the service manual for the parking brake shoe assembly removal procedure.

(4) Disconnect park brake cable from park brake actuator lever (Fig. 1).

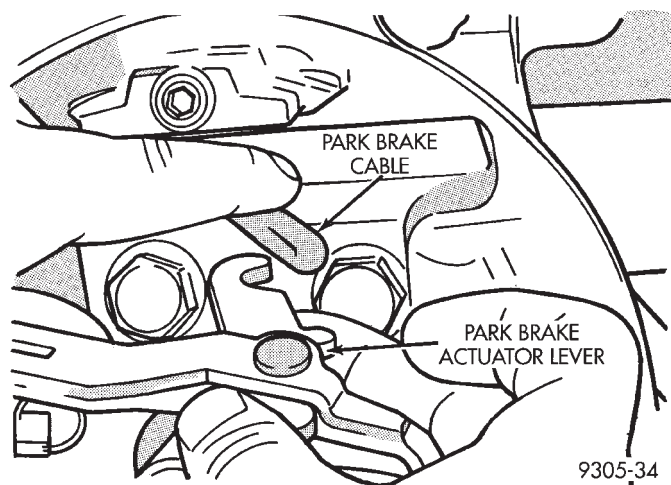


Fig. 1 Removing Park Brake Cable From Park Brake Lever

(5) Remove park brake cable from adapter using the following procedure. Compress retaining tabs on park brake cable housing using a small screwdriver (Fig. 2) while pulling and rotating park brake cable until cable is removed from cable mounting hole in adapter.

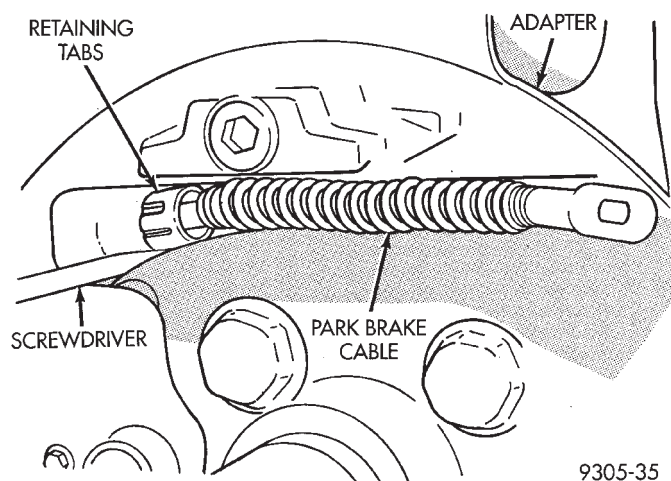


Fig. 2 Removing Park Brake Cable From Adapter

(6) Remove the 4 routing clips attaching rear park brake cable to floor pan and frame of vehicle (Fig. 3).

5 PASSENGER MODELS

(7) Remove shift knob from floor shifter. Shift knob is removed by removing 3/32 in. allen head set screw located on drivers side of shift knob and pulling straight up on shift knob.

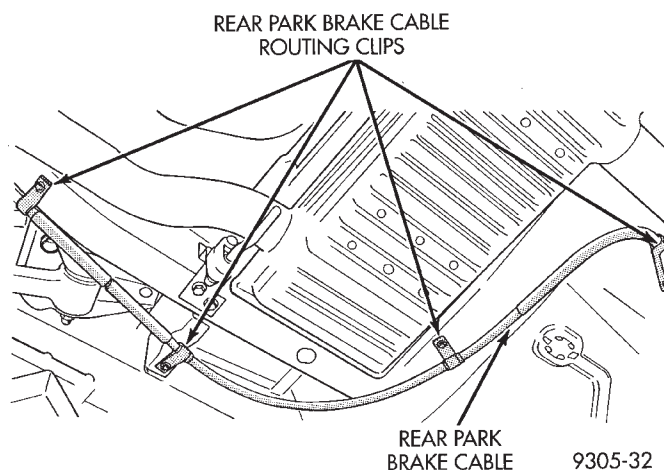


Fig. 3 Park Brake Cable Routing Clip Locations

(8) Remove upper center console cover from vehicle. Refer to Group 23 Body in this service manual for required procedure to remove center console.

(9) Remove rear console mounting bracket (Fig. 4) from park brake cable reaction bracket. Remove rear passenger compartment heat duct (Fig. 4) from vehicle, for access to park brake cables.

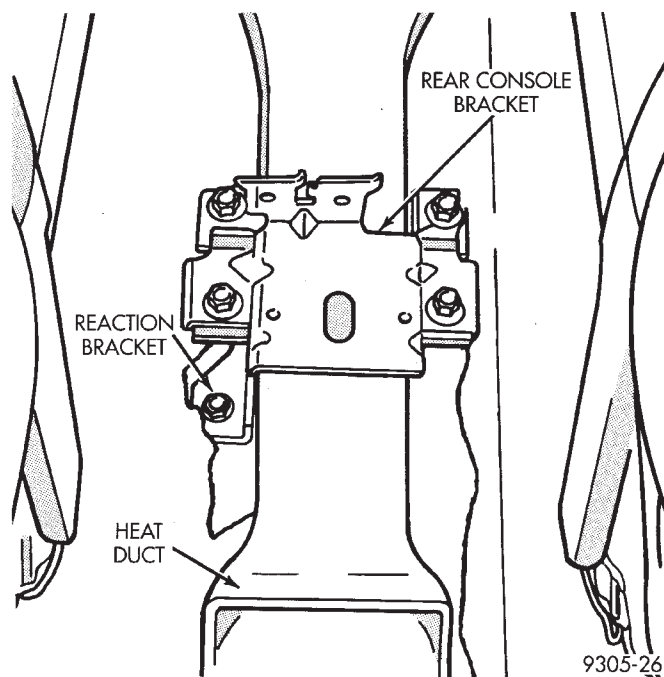


Fig. 4 Console Mounting Bracket And Heat Duct

Note: Remove only one rear park brake cable from rear brakes at a time. Failure to do so will result in high efforts required, to connect park brake cables to equalizer or park brake lever.

(10) Remove rear park brake cable from vehicle floor pan using the following procedure. Disconnect rear park brake cable requiring replacement from equalizer (Fig. 5). Slip the box end of a 1/2 inch over end of park brake cable (Fig. 5). This will compress



retaining tabs on end of park brake cable housing. Using a screw driver, press on end of park brake cable housing to remove cable from floor pan of vehicle.

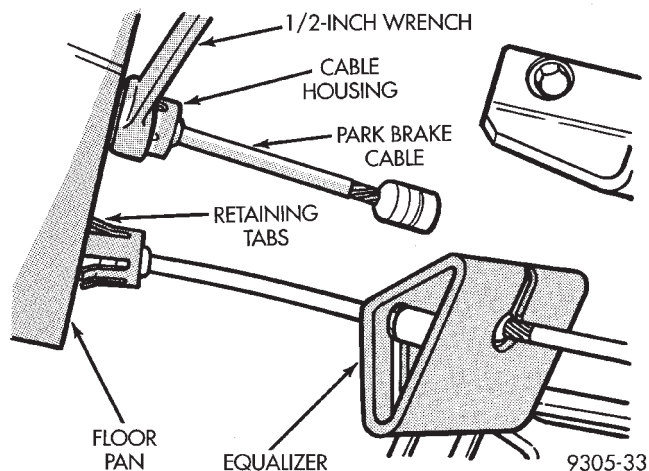


Fig. 5 Park Brake Cable Removal From Floor Pan

Note: Do not remove the second rear park brake cable from the equalizer. Until the new replacement park brake cable is installed and connected at the equalizer and wheel brake, park brake lever.

6 PASSENGER MODELS

(11) Move front passenger side seat to the full forward positions.

(12) Remove the drivers side front seat assembly from the vehicle. Refer to Group 23 Body in this service manual for required procedure for front seat assembly removal.

(13) Remove rear seat lower cushion from vehicle. Refer to Group 23 Body in this service manual for required lower seat cushion, removal procedure.

(14) Remove both lower rear door opening sill moldings to allow rear section of carpeting to be folded forward. This will expose the equalizer cover which is attached to park brake cable reaction bracket (Fig. 6).

(15) Remove the park brake equalizer cover from the reaction bracket (Fig. 6).

Note: Remove only one rear park brake cable from rear brakes at a time. Failure to do so will result in high efforts required, to connect park brake cables to equalizer or park brake lever.

(16) Remove rear park brake cable from vehicle floor pan using the following procedure. Disconnect rear park brake cable requiring replacement from equalizer (Fig. 7). Slip the box end of a 1/2 inch over end of park brake cable (Fig. 7). This will compress retaining tabs on end of park brake cable housing. Using a screw driver, press on end of park brake cable housing to remove cable from floor pan of vehicle.

Note: Do not remove the second rear park brake cable from the equalizer. Until the new re-

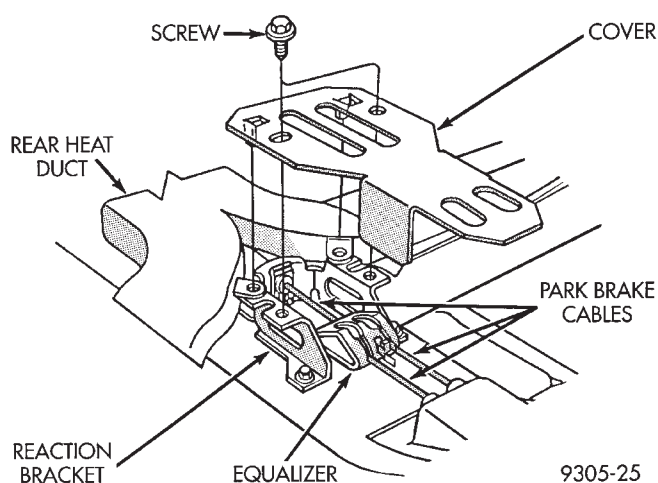


Fig. 6 Park Brake Equalizer Bracket

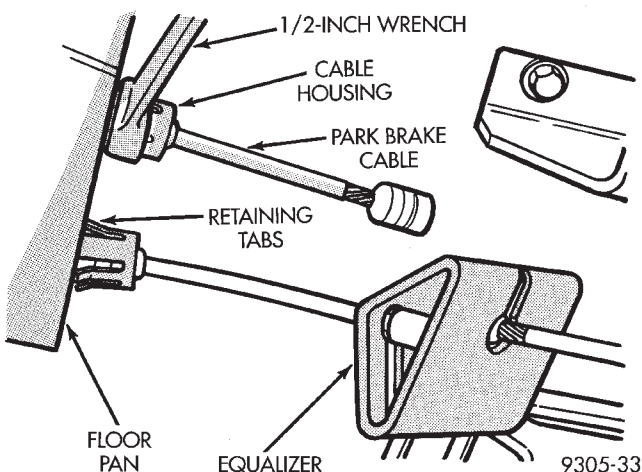


Fig. 7 Park Brake Cable Removal From Floor Pan

placement park brake cable is installed and connected at the equalizer and wheel brake, park brake lever.

INSTALL

(1) Install parking brake cable into rear disc brake adapter cable mounting hole. Be sure the cable retaining tabs are expanded around mounting hole in brake adapter. Connect parking brake cable end to brake shoe assembly actuator lever (Fig. 8).

(2) Install parking brake cable into cable mounting hole in floor pan of vehicle. Be sure that cable retainers are expanded around mounting hole in floor pan.

(3) Install the 4 routing clips attaching rear park brake cable to floor pan and frame of vehicle (Fig. 9).

(4) Connect the replacement park brake cable to the park brake cable equalizer (Fig. 10). **Note:** The equalizer can be moved rearward to allow connection of the rear cable to the equalizer.

(5) Install parking brake shoe assemblies on the rear disc brake adapter. See Removal And Installa-

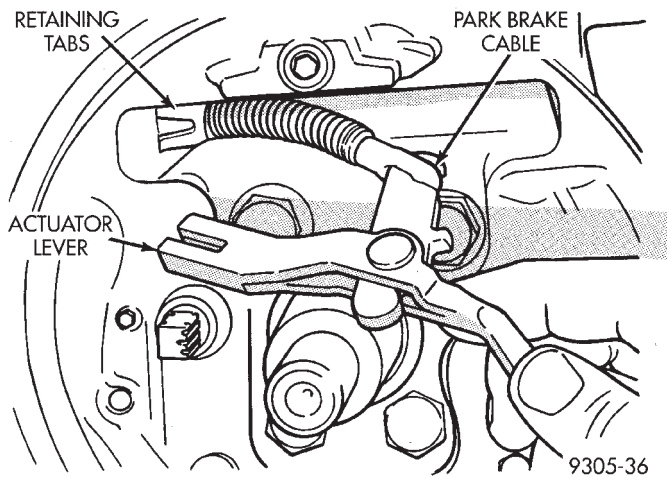


Fig. 8 Park Brake Cable And Actuator Installation.

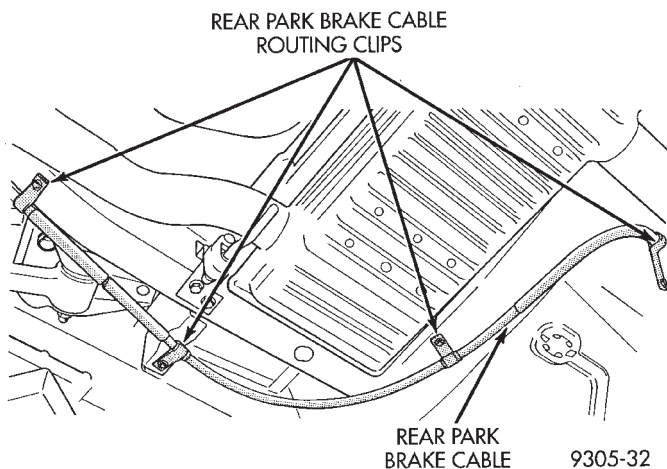


Fig. 9 Park Brake Cable Routing Clip Locations

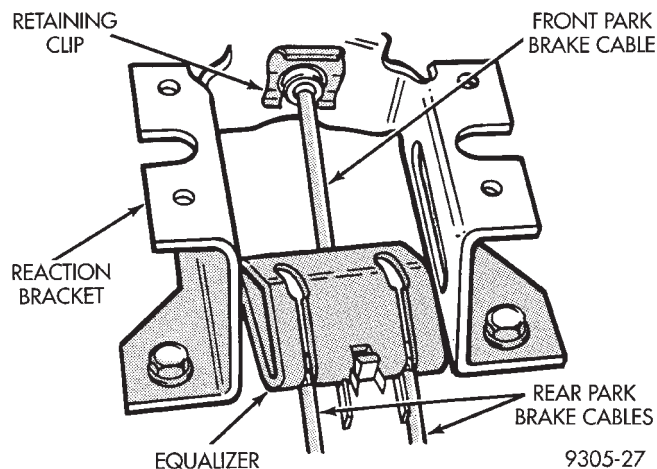


Fig. 10 Park Brake Cables Connected To Equalizer
tion Parking Brake Shoes in this section of the service manual for the parking brake shoe assembly installation procedure.

(6) Install rear braking disc (rotor) on the rear hub assembly. Install rear disc brake caliper assembly on adapter.

(7) Install rear tire and wheel assembly on vehicle.

5 PASSENGER MODELS

(8) Install upper center console cover assembly back in vehicle. Refer to group 23 Body in this service manual for required procedure to install upper center console.

(9) Install shift knob on floor shifter (if equipped). Shift knob is installed by pushing shift knob down shift shaft until fully bottomed. Then install and tighten 3/32 in. allen head set screw located on drivers side of shift knob.

(10) Install brake drum, and wheel and tire assembly.

(11) **When repairs are complete, adjust rear brakes before adjusting parking brake. See parking brake adjustment procedure in this section of the service manual for complete parking brake adjustment procedure.**

6 PASSENGER MODELS

(12) Install equalizer cover back on reaction bracket (Fig. 11). Torque equalizer cover to reaction bracket mounting bolts to 10 N•m (88 in. lbs.).

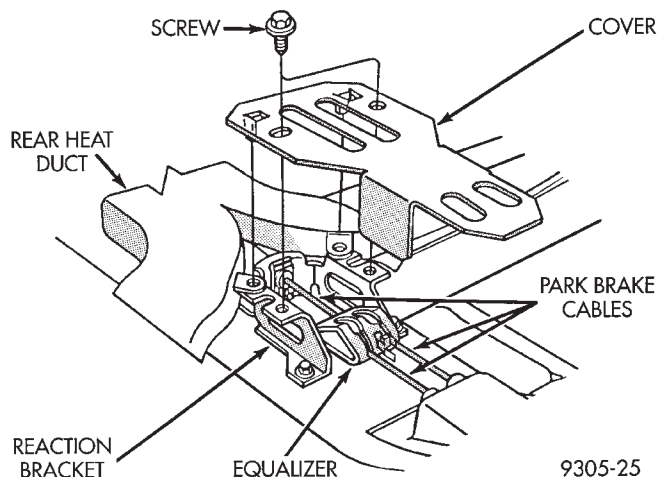


Fig. 11 Park Brake Equalizer And Cover

(13) Fold rear passenger compartment carpeting back into position on floor pan of vehicle.

(14) Install both lower rear door opening sill moldings.

(15) Install the rear seat lower cushion back in vehicle. Refer to Group 23 Body in this service manual for required lower seat cushion, installation procedure.

(16) Install drivers side seat assembly back in vehicle.

(17) Return the driver and passenger side seats back to their original positions.



(18) When repairs are complete, adjust rear brakes before adjusting parking brake. **See parking brake adjustment procedure in this section of the service manual for complete parking brake adjustment procedure.** On drum-in-hat type rear disc brakes adjust brake shoe diameter to 171.5 mm (6.75 in.).

PARKING BRAKE SHOE SERVICE WITH REAR DISC BRAKES

REMOVE

- (1) Remove rear disc brake caliper assembly from adapter and braking disc (See Disc Brake Shoe Removal).
- (2) Remove rear braking disc from rear hub (See Removing Braking Disk).
- (3) Remove dust cap from rear hub. Remove cotter pin and nut lock from rear spindle.
- (4) Remove rear hub and bearing assembly retaining nut and washer.
- (5) Remove rear hub and bearing assembly from rear spindle.
- (6) Remove rear brake shoe assembly hold down clip (Fig. 1).

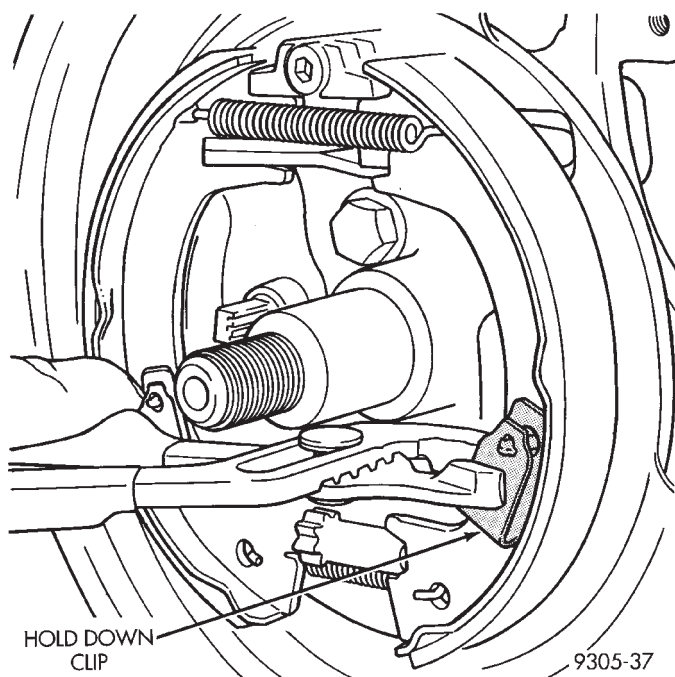


Fig. 1 Removing Rear Brake Shoe Hold-Down Clip

- (7) Turn parking brake, brake shoe adjuster wheel until adjuster is at shortest length.
- (8) Remove parking brake, shoe adjuster assembly from the parking brake shoe assemblies (Fig. 2).
- (9) Remove lower parking brake, shoe to shoe spring (Fig. 3).
- (10) Pull rear parking brake shoe assembly, away from anchor. Then remove rear parking brake shoe and upper spring (Fig. 4).

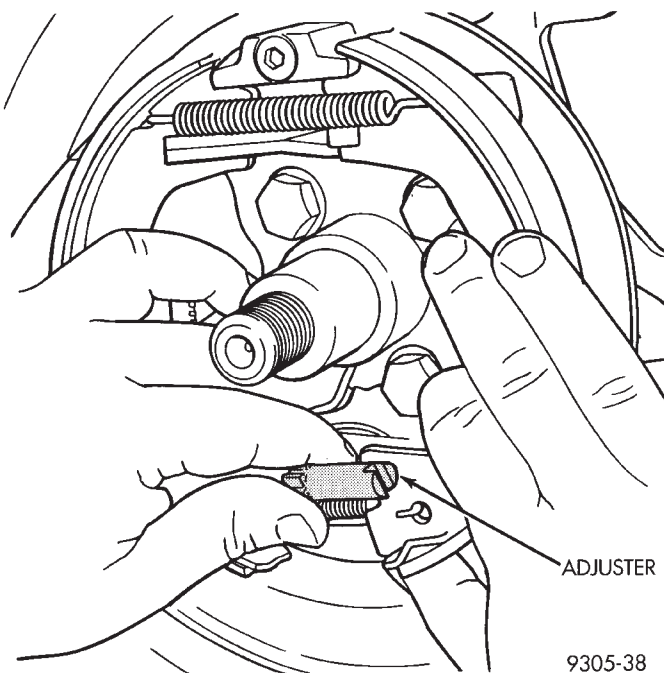


Fig. 2 Removing Adjuster Assembly

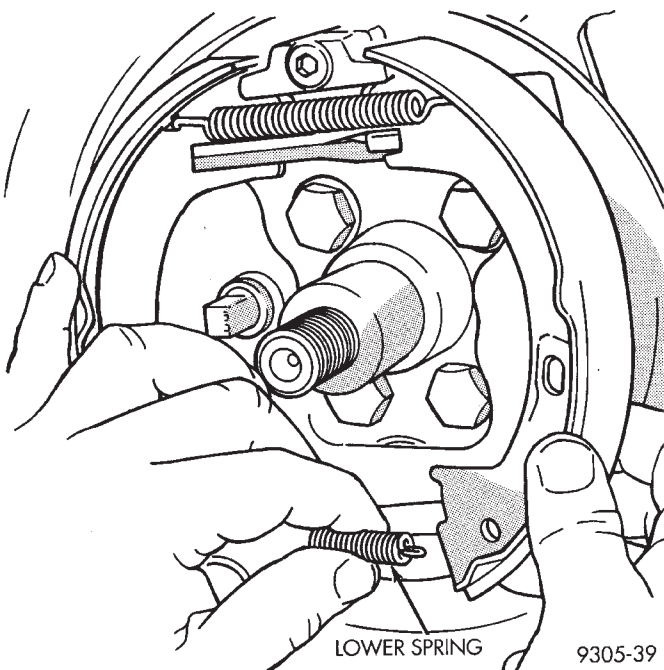


Fig. 3 Removing Lower Spring

- (11) Remove front parking brake shoe hold-down clip. Then remove front parking brake shoe assembly (Fig. 5).

INSTALLING PARKING BRAKE SHOES

- (1) Install front parking brake shoe and hold-down clip (Fig. 5).
- (2) Install rear park brake shoe and upper parking brake, shoe to shoe return spring (Fig. 6).
- (3) Pull rear parking brake shoe over anchor block until properly located on adapter.

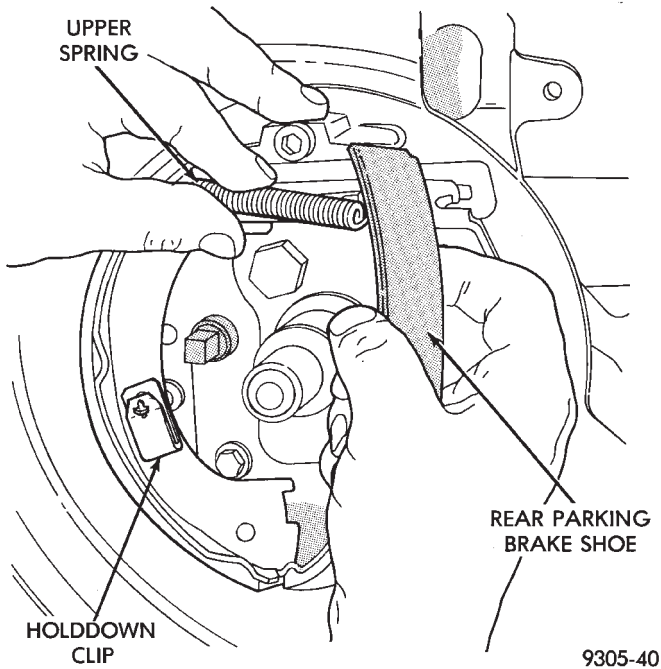


Fig. 4 Removing Shoe and Upper Spring

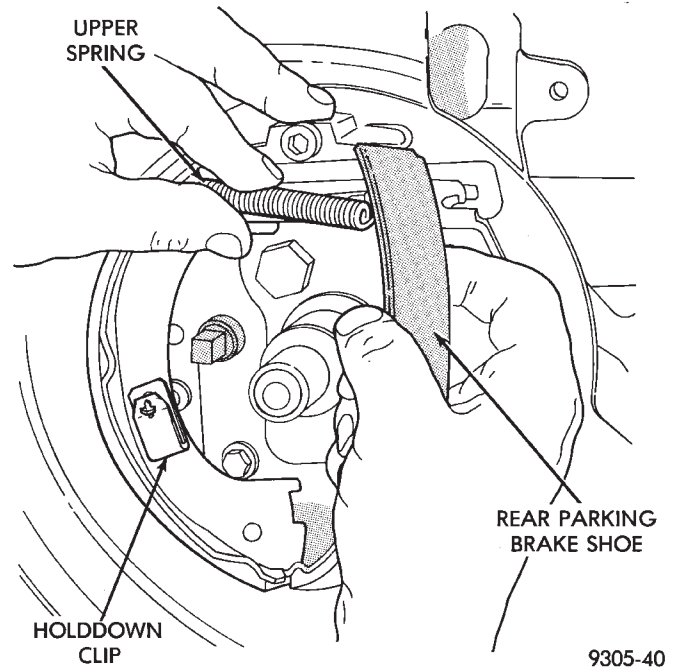


Fig. 6 Installing Upper Spring

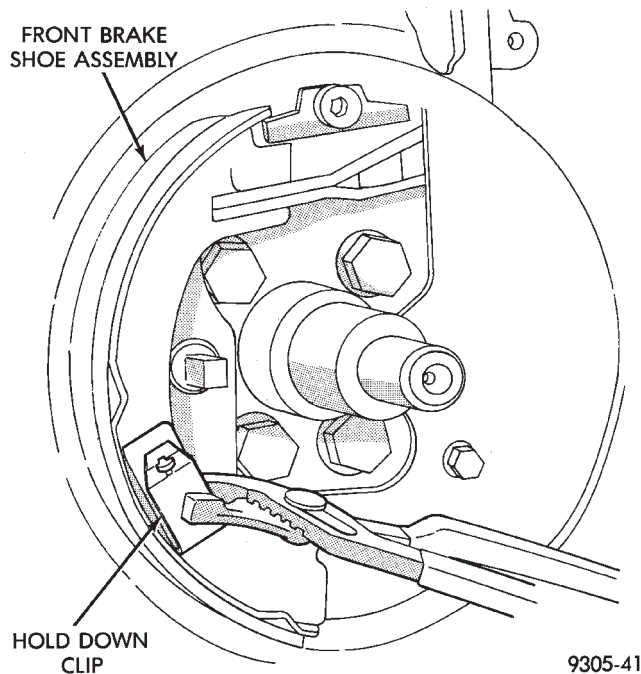


Fig. 5 Removing Front Holddown Clip And Shoe

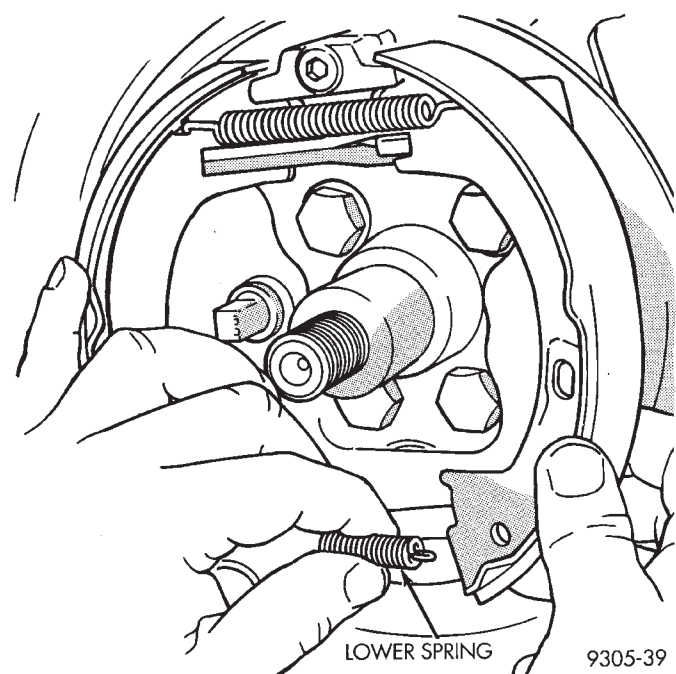


Fig. 7 Installing Lower Spring

(4) Install lower parking brake, shoe to shoe return spring (Fig. 7).

(5) Install parking brake shoe adjuster assembly with star wheel rearward (Fig. 8).

(6) Install rear, parking brake shoe holddown clip (Fig. 9).

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

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

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

(10) Install the nut lock and cotter pin on the rear spindle. Then install hub and bearing assembly dust cap.

(11) Install rear braking disc.

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

(13) Install wheel and tire assemblies.

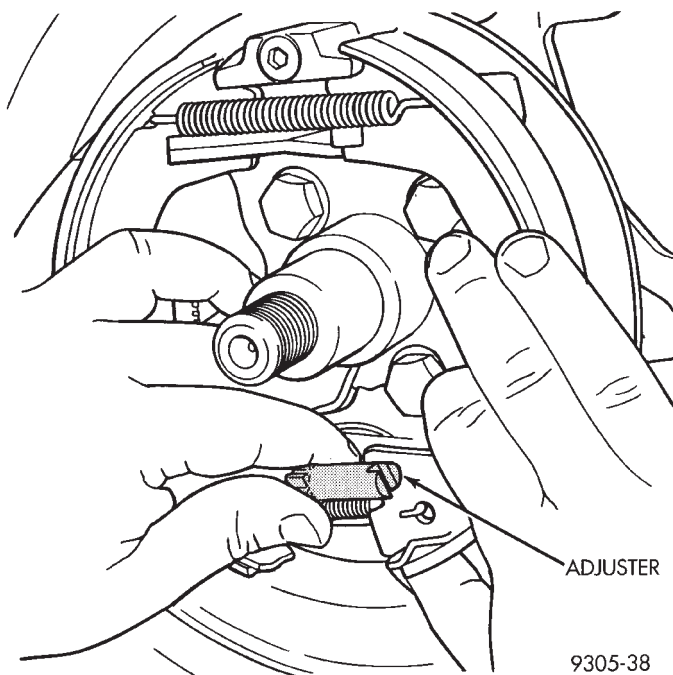


Fig. 8 Installing Adjuster Assembly

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

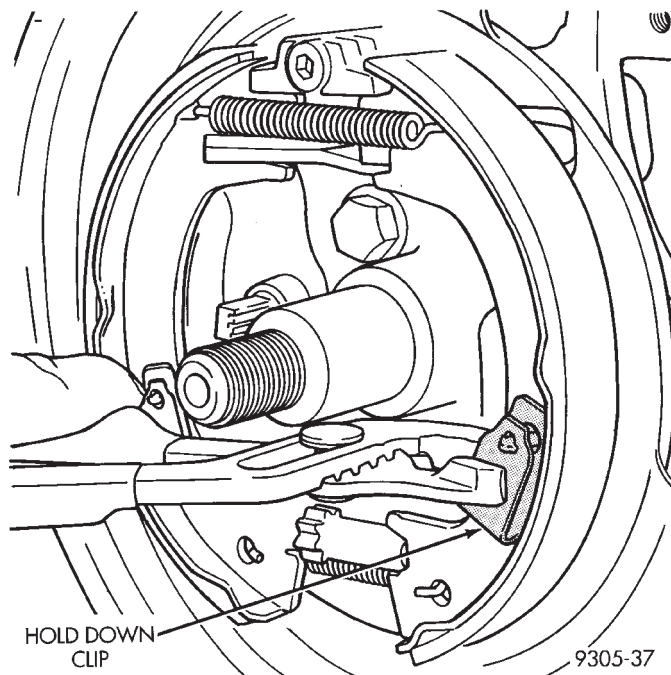


Fig. 9 Installing Rear Parking Brake Shoe Hold-Down Clip



MASTER CYLINDER

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General Information	69	Testing the Master Cylinder	69

GENERAL INFORMATION

The standard brake system tandem master cylinder and ABS master cylinder (Fig. 1) have see through nylon reservoirs and an anodized aluminum bodies.

The master cylinder used with Anti-Lock brakes and traction control are functionally unique to these systems. It is a center feed design. The primary and secondary pistons each contain a central valve which is a unique design. The valves are used in place of the conventional piston and seal assemblies. The valves close and open the cylinder pressure chambers during brake application and release.

The only serviceable components on both master cylinder assemblies are the reservoir and sealing grommets. Neither of the master cylinder assemblies can be serviced, and must be replaced as assemblies if found to be defective.

The reservoir is indexed to prevent installation in the wrong direction (Fig. 2). The cap diaphragm is slit to allow atmospheric pressure to equalize on both sides of the diaphragm.

The primary and secondary outlet tubes from the master cylinder are connected to the proportioning valve or the Anti-Lock Brake system (HCU). The front part of this block connects to the secondary outlet tube and supplies the right rear and left front brakes. The rear portion of the block connects to the primary outlet tube and supplies the right front and left rear brakes.

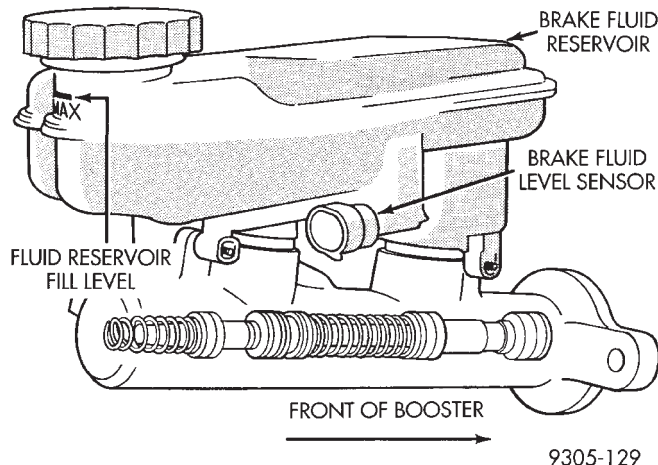


Fig. 1 Aluminum Master Cylinder (Cutaway View)

BRAKE FLUID LEVEL SENSOR

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

The brake fluid level sensor used on the L.H. platform master cylinder is internal to the master cylinder fluid reservoir (Fig. 2). The vehicle wiring harness has a connector which plugs directly into the brake fluid reservoir.

As the fluid drops below the design level the sensor closes the Red Brake Warning Light circuit.

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

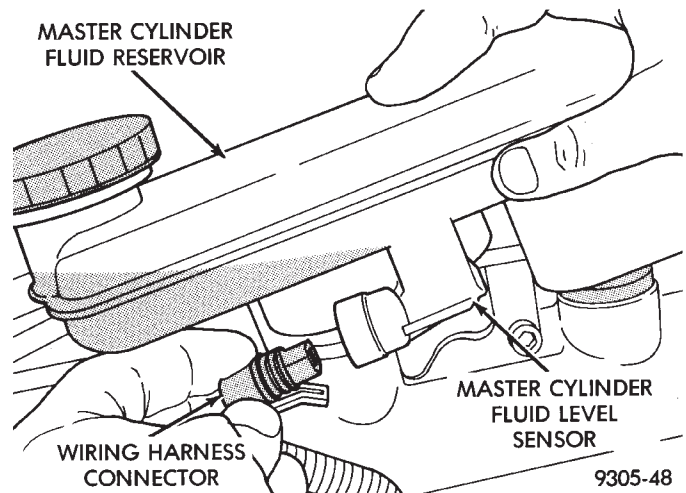


Fig. 2 Master Cylinder Brake Fluid Level Sensor

TESTING THE MASTER CYLINDER

Be sure master cylinder vents at both ports.

Apply pedal lightly with engine running and look for fluid squirting or swirling into reservoirs.

In this master cylinder, a special baffle reduces the amount of fluid entering the secondary reservoir only a small disturbance may be seen.

MASTER CYLINDER SERVICE PROCEDURES

MASTER CYLINDER REMOVAL

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



(2) Remove 2 nuts (Fig. 3) attaching master cylinder housing to power brake booster unit.

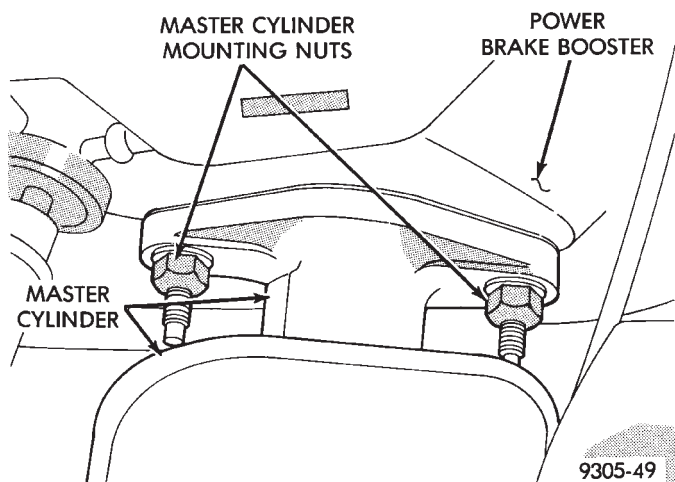


Fig. 3 Master Cylinder Mounting

(3) Slide master cylinder straight out, and away from power brake booster unit.

BRAKE FLUID RESERVOIR REPLACEMENT

(1) Clean master cylinder housing and brake fluid reservoir.

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

(3) Position master cylinder in vise.

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

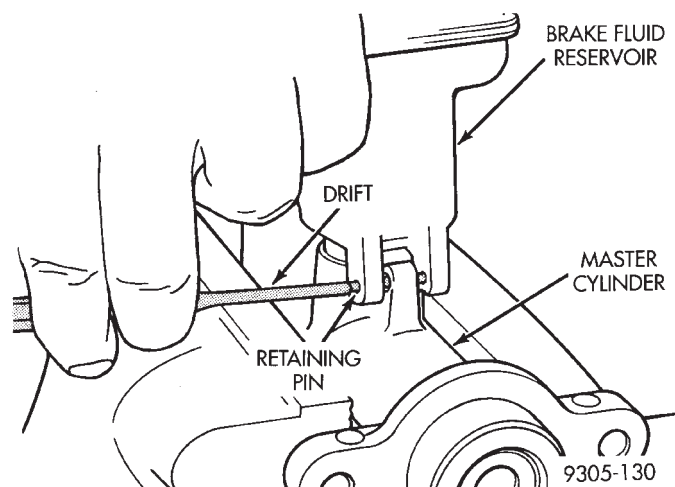


Fig. 4 Reservoir Retaining Pins

(5) Rock reservoir from side to side and remove from master cylinder housing (Fig. 5).

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

(6) Remove housing-to-reservoir grommets (Fig. 6).

(7) Install new housing-to-reservoir grommets in master cylinder housing (Fig. 6).

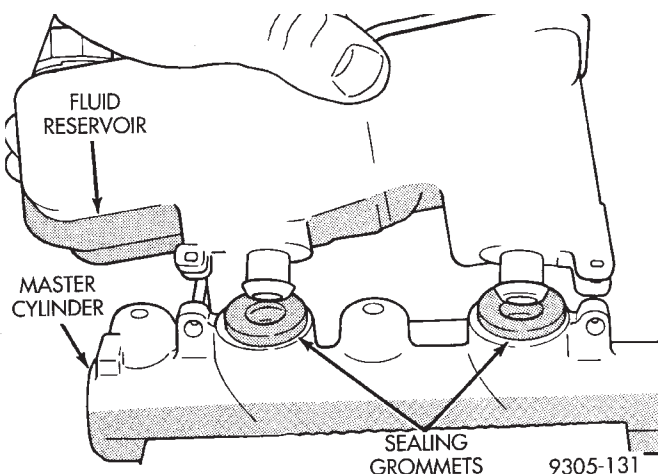


Fig. 5 Removing Reservoir

(8) Lubricate brake fluid reservoir mounting area with clean brake fluid. Place reservoir in position over grommets. Seat reservoir with a rocking motion into master cylinder housing.

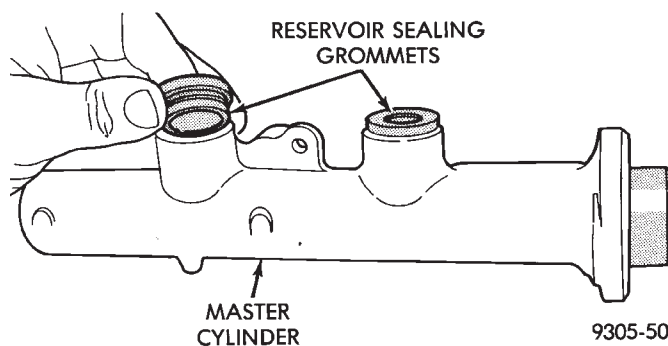


Fig. 6 Removing Reservoir Sealing Grommets

(9) Make sure bottom of reservoir touches top of grommet.

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

BLEEDING MASTER CYLINDER

The master cylinder used on the L.H. platform vehicles. Use ISO style flares and metric threads on the master cylinder outlet ports. When bleeding master cylinder, it will be necessary to fabricate bleeding tubes with correct style flares and metric tube nuts.

(1) Clamp the master cylinder in a vise. Attach Bleeding Tubes to master cylinder (Fig. 7). Position tubes so the outlet of the Bleeding Tubes will be below the surface of the brake fluid when the reservoir is filled to the proper level.

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

(3) Using a wooden dowel per (Fig. 7). Depress master cylinder pistons slowly, and then allow pistons to return to released position. Repeat several times until all air bubbles are expelled (Fig. 7).



Remove bleeding tubes from cylinder, plug outlets and install caps.

Remove master cylinder from vise and install on power brake vacuum booster.

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

INSTALLING MASTER CYLINDER

(1) Position master cylinder over studs of power brake unit, align push rod with master cylinder piston.

(2) Install the master cylinder to power brake unit mounting nuts (Fig. 3) and tighten to 28 N•m (250 in. lbs.) torque.

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

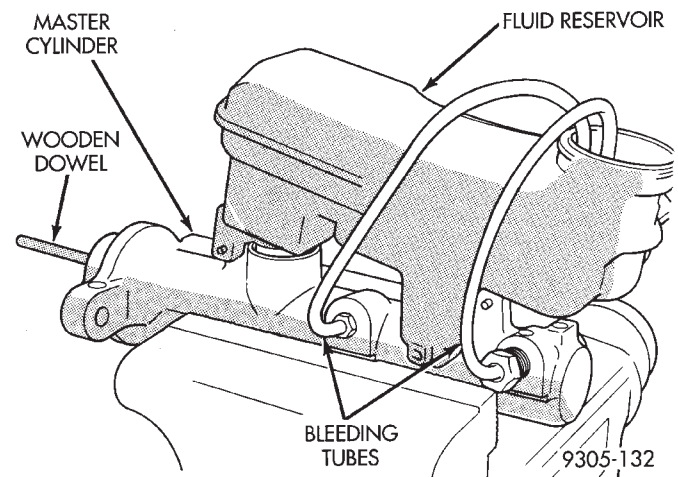


Fig. 7 Bleeding Master Cylinder



POWER BRAKES

GENERAL INFORMATION

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

The power brake booster can be identified if required, by the tag attached to the body of the booster assembly (Fig. 1). This tag contains the following information. The production part number of the power booster assembly, the date it was built and who manufactured it.

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

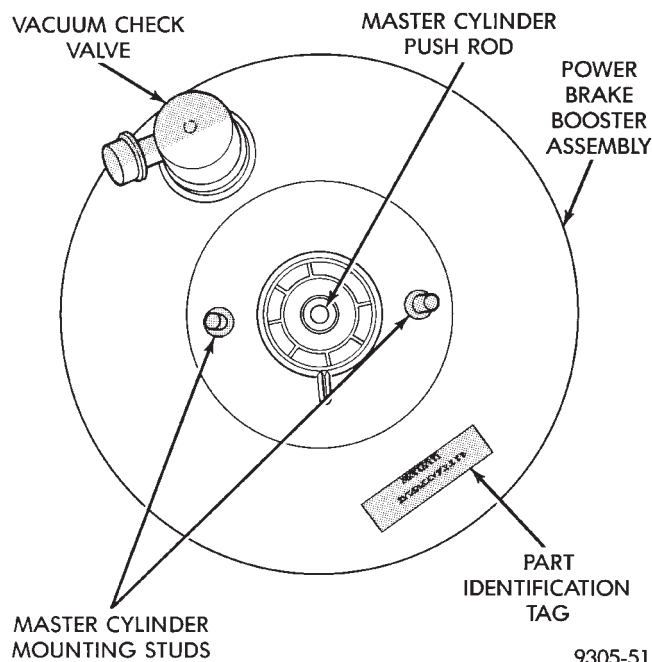


Fig. 1 Power Brake Booster Identification

The power brake booster in vacuum operated. The vacuum is supplied from the intake manifold on the engine through the power brake booster check valve (Fig. 1).

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

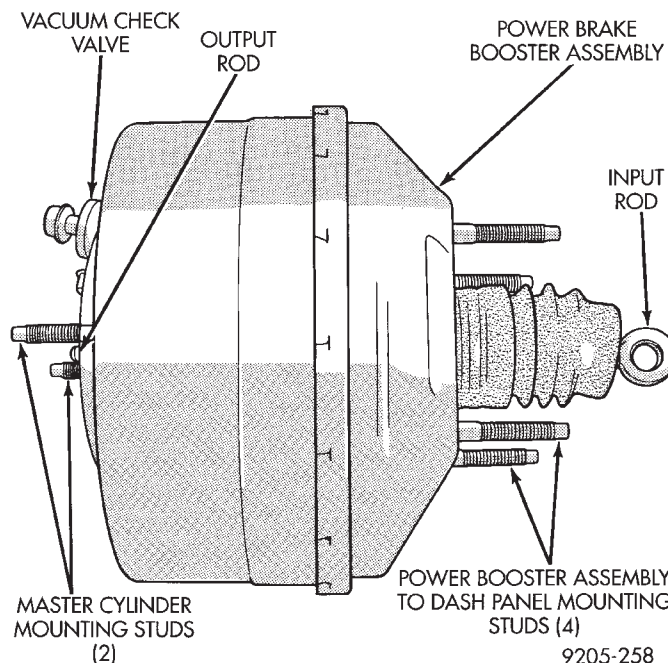


Fig. 2 Power Brake Booster Assembly

Different systems and engine combinations require different vacuum hose routings.

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

SERVICE PROCEDURES

POWER BRAKE BOOSTER ASSEMBLY

REMOVE

- (1) Remove both wiper arm assemblies.
- (2) Remove cowl panel cover from cowl to expose windshield wiper module.
- (3) Remove the 5 screws attaching the windshield wiper module to the dash panel. Remove the windshield wiper module from dash panel.
- (4) Remove the 2 nuts (Fig. 3) attaching master cylinder assembly to power brake unit.
- (5) Carefully slide master cylinder off mounting studs with brake lines attached, and allow the assembly to rest against left shock tower.
- (6) Disconnect vacuum hose from power brake booster check valve (Fig. 1). **DO NOT REMOVE CHECK VALVE FROM POWER BRAKE BOOSTER.**

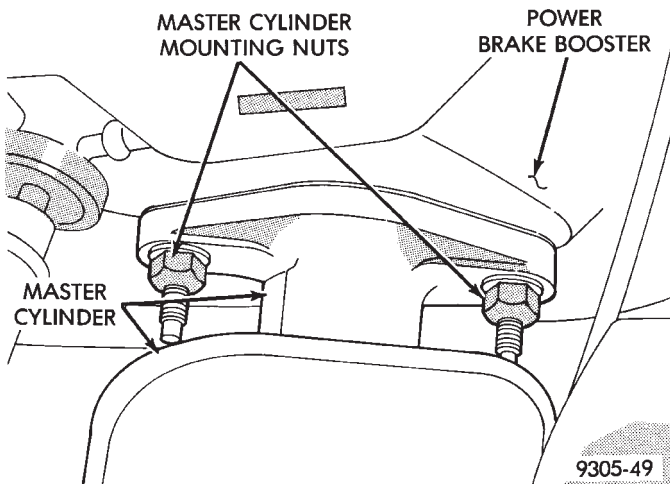


Fig. 3 Master Cylinder Mounting

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

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

(9) Remove the four nuts that attach the power brake booster to the vehicle dash panel. Nuts are accessible from under the dash panel in the area of the steering column and pedal bracket (Fig. 4).

(10) Slide the power brake unit up and to the right (mounting holes are slotted) on the dash panel, then tilt outboard and up to remove (Fig. 5).

CAUTION: Do not attempt to disassemble power brake unit as this booster is serviced ONLY as a complete assembly.

INSTALL

- (1) Position power brake booster onto dash panel.
- (2) Install and tighten the 4 power brake booster to dash panel mounting nuts (Fig. 4) to 29 N•m (250 in. lbs.) torque.
- (3) Carefully position master cylinder on power brake unit.
- (4) Install and tighten the 2 master cylinder to power booster mounting nuts (Fig. 3) to 29 N•m (250 in. lbs.) torque.
- (5) Connect vacuum hose onto the check valve, located on the power brake unit.
- (7) Using lubriplate, or equivalent, coat the bear-

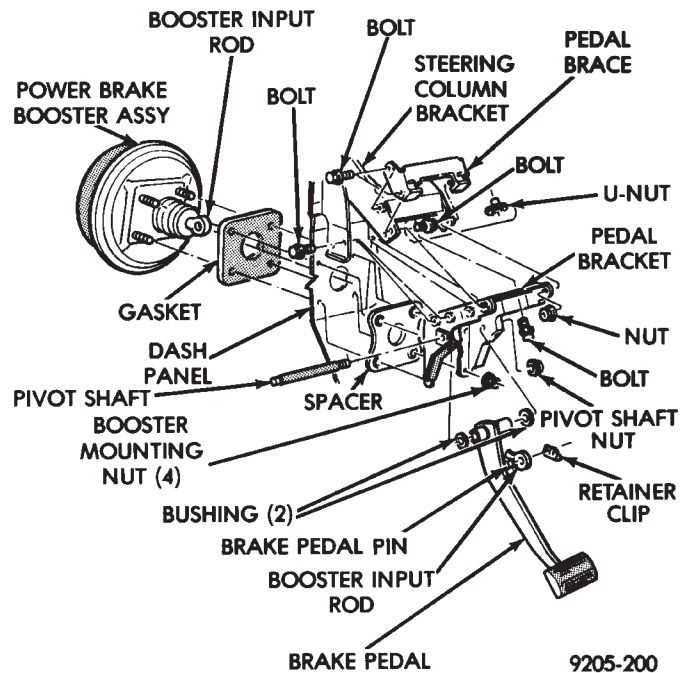


Fig. 4 Power Brake Booster Mounting

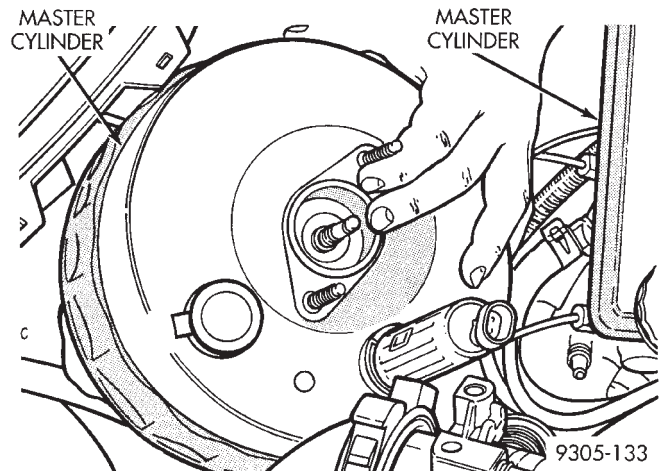


Fig. 5 Removing Power Brake Booster

ing surface of pedal pin (Fig. 4).

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

(9) Check stop light operation.

(10) Install the windshield wiper module back into the dash panel opening. Install the 5 windshield wiper module attaching bolts and securely tighten.

(11) Install cowl panel cover.

(12) Install the windshield wiper arm assemblies back on pivots. Connect windshield washer hoses.



WHEEL BEARINGS

FRONT WHEEL BEARINGS

Front wheel drive vehicles are equipped with permanently sealed front wheel bearings. There is no periodic lubrication or maintenance recommended for these units. However if during servicing of the brake system, service to the front wheel bearing is required refer to Group 2, Suspension in this service manual.

REAR WHEEL BEARINGS

The L.H. platform vehicles are equipped with permanently lubricated and sealed rear wheel bearings. There is no periodic lubrication or maintenance recommended for these units. However if servicing of a rear wheel bearing is required. Refer to procedures below for the inspection, removal and replacement of rear wheel bearing.

INSPECTION

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

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

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

REMOVE

(1) Remove rear hub and bearing assembly dust cap (Fig 1). Remove cotter pin and nut lock from rear spindle.

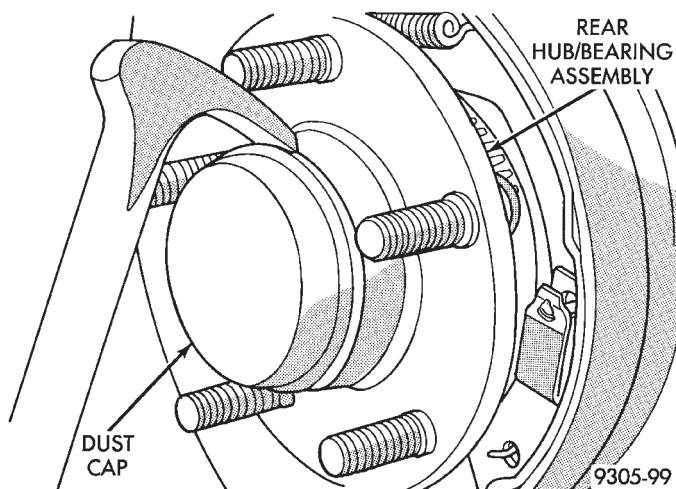


Fig. 1 Rear Hub And Bearing Dust Cap Removal

(2) Remove the rear hub and bearing assembly retaining nut and washer (Fig. 2). Remove rear hub and bearing assembly from spindle.

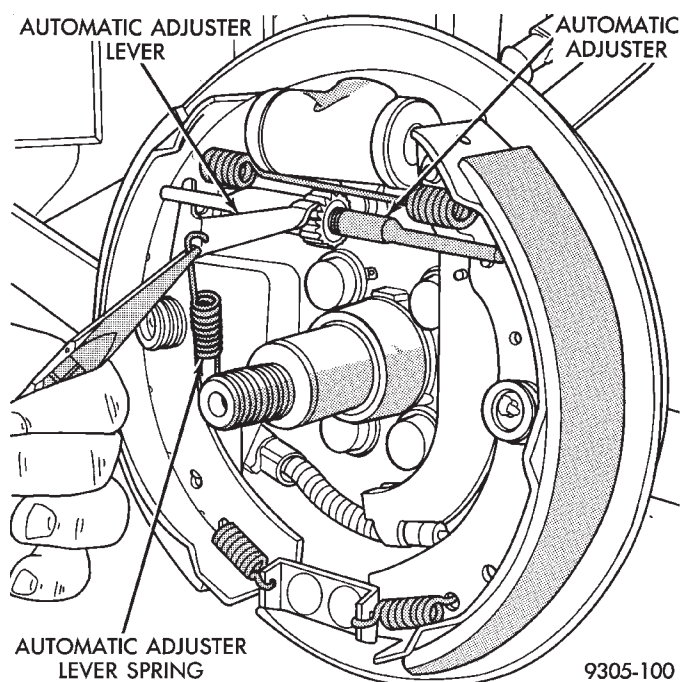


Fig. 2 Rear Hub And Bearing Retaining Nut Removal

REPLACE

(1) Install rear hub and bearing assembly on rear spindle. Install hub and bearing assembly washer and retaining nut (Fig. 2). Torque hub and bearing assembly retaining nut to 168 N•m (124 ft.lbs.). Install nut lock and cotter pin on spindle.

(2) Install rear hub and bearing duct cap (Fig. 1).

(3) Install rear brake drum or rotor on hub.

(4) Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence (Fig. 3) 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.).

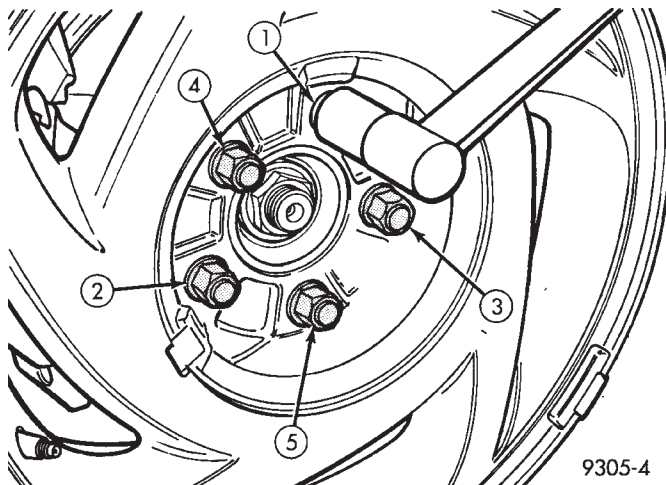


Fig. 3 Tightening Wheel Nuts



ANTI-LOCK BRAKE SYSTEM—TEVES MARK IV SYSTEM

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GENERAL INFORMATION

The purpose of the Anti-Lock Brake System (ABS) is to prevent wheel lock-up under heavy braking conditions on virtually any type of road surface. Anti-Lock Braking is desirable because a vehicle which is stopped without locking the wheels will retain directional stability and some steering capability. This allows the driver to retain greater control of the vehicle during heavy braking.

This section of the service manual covers the description, diagnostics, and on car service of the Teves Mark IV Anti-Lock Brake system used on the 1993 L.H. vehicles.

The Mark IV system has several unique design features. It can function as an Anti-Lock System only, or as an Anti-lock and traction control system combined. It contains two separate fluid reservoirs, each with its own fluid level sensor.

The traction control feature is designed to operate at speeds below 40 KM/H (25 MPH). Traction control can be deactivated via the traction control switch located on the instrument panel.

An electronic control module is used to monitor wheel speeds and to modulate (control) hydraulic pressure in each brake channel. The hydraulic pressure is used to prevent wheel lock up during braking, and to maintain traction at the driven wheels by reducing wheel spin.

The Teves Mark IV system uses a diagonal split hydraulic brake system. In the standard brake mode the master cylinder primary circuit supplies pressure to the right front and left rear wheel brakes. The master cylinder secondary circuit supplies pressure to the left front and right rear wheel brakes.

During an Anti-lock stop the Mark IV system uses four channel operation. This means that during Anti-lock operation each wheel brake is independently controlled. By using separate hydraulic channels for stopping each wheel. The system is able to retain di-

rectional stability and steering control while applying maximum braking. The system provides maximum braking even when road conditions vary.

During an Anti-Lock stop, "wheel lock-up" does not necessarily mean that the wheel has stopped turning. It only means that the wheel is turning slower than the vehicle speed. This is called "wheel slip" and is indicated in percent. 0

slip means that the wheel is rolling free and 100

slip means that the wheel is locked. The Anti-lock System maintains an average of approximately 15 to 20

wheel slip.

ANTI-LOCK BRAKE SYSTEM DEFINITIONS

In this section of the manual several abbreviations are used for the components that are in the Anti-Lock Braking System. They are listed below for your reference.

- HCU—Hydraulic Control Unit
- CAB—Controller Anti-Lock Brake
- ABS—Anti-Lock Brake System
- PSI—Pounds per Square Inch (pressure)
- WSS—Wheel Speed Sensor

NORMAL BRAKING SYSTEM FUNCTION

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

If a wheel locking tendency is detected during a brake application, the system will enter Anti-Lock mode. During Anti-Lock 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 electrical valves and hydraulic line to provide modulation, although for vehicle stability, both rear wheel valves receive the same electrical signal. The system can hold, build and reduce



hydraulic pressure at each wheel brake. Depending on signals generated by the wheel speed sensors (WSS) at each wheel and received at the Controller Anti-Lock Brake (CAB).

MAJOR COMPONENTS

The following is a list of major system components. Details of all components can be found later in this section.

Anti-lock brake system without traction control.

CONTROLLER ANTI-LOCK BRAKE SYSTEM (CAB)

The Anti-Lock Brake Controller (CAB) (Fig. 1) is a microprocessor based device which monitors wheel speeds and controls the Anti-Lock and Traction Control functions. The (CAB) contains two microprocessors which receive identical sensor signals and then independently process the information. The results are then compared to make sure that they agree otherwise the (CAB) will turn off the Anti-lock and Traction Control function and turn on the warning lights.

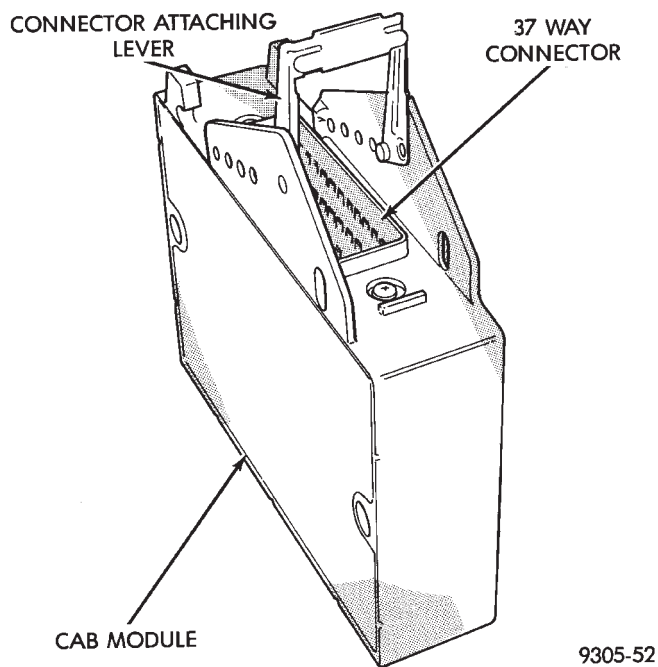


Fig. 1 Controller Anti-Lock Brakes

VACUUM BOOSTER (W/INTEGRATED PEDAL TRAVEL SENSOR - PTS)

The Teves Mark IV Anti-lock Brake System uses a special vacuum booster and master cylinder.

The vacuum booster (Fig. 2) used with the Teves Mark IV Anti-Lock Brake System. Is the new "0" lost travel reaction disc type booster with the addition of a Pedal Travel Sensor.

The Pedal Travel Sensor (PTS) (Fig. 2) is a Linear Variable Displacement Transducer with seven steps which provide brake pedal position information to the (CAB).

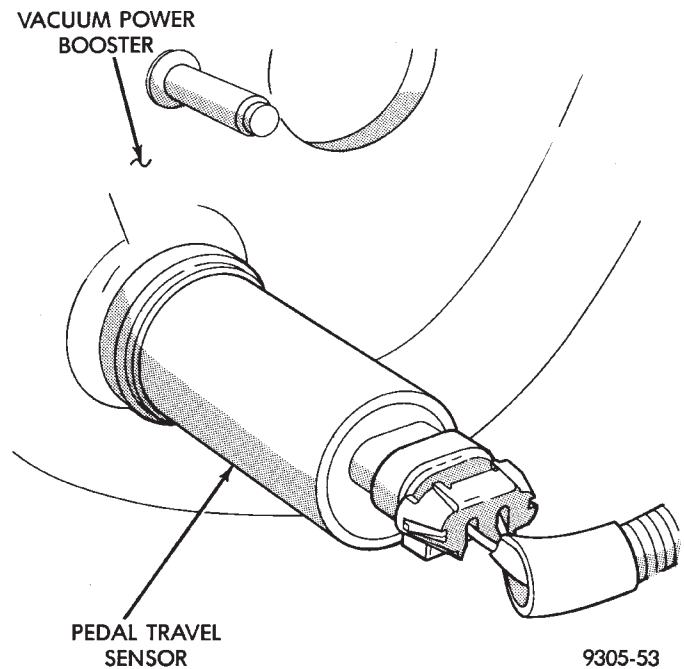


Fig. 2 Power Brake Booster And Pedal Travel Sensor

MASTER CYLINDER (W/CENTER VALVES AND FLUID LEVEL SWITCH - FLS-1)

The master cylinder (Fig. 3) is a standard tandem design except that central valves are used in conjunction with the traditional compensation ports. The center valve is a spring loaded ball and seat design which is unseated by a stop in the master cylinder when the brakes are released.

A fluid level switch is located in the master cylinder fluid reservoir (Fig. 3). The switch closes when a low fluid level is detected. The FLS-1 turns on the Brake Warning Lamp by grounding the lamp circuit. This switch does not disable the ABS system.

HYDRAULIC CONTROL UNIT (HCU)

The Hydraulic Control Unit (HCU) (Fig. 4) contains the valve block assembly, the pump/motor assembly, and a fluid reservoir with a fluid level switch. On the LH the HCU is located on the left frame rail, forward of the master cylinder.

There are two Hydraulic Control Units. One is used for ABS only. The other is used for ABS and Traction Control combined. Each has a different part number. If the wrong H.C.U. is installed, with the wrong type of (CAB), the system operation will be disabled and a fault code will be stored.

The valve block assembly (Fig. 4) contains eight/ten valve/solenoids; four inlet valves and four outlet valves. (2 isolation valves are pressure switch for

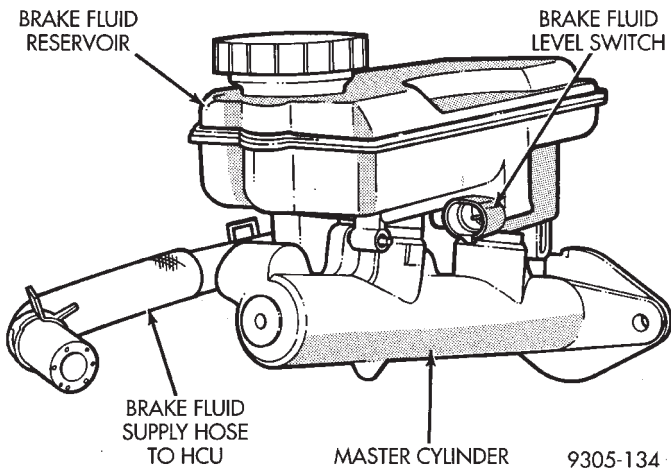


Fig. 3 ABS Master Cylinder And Fluid Reservoir FLS-1

traction control). The inlet valves are spring loaded in the open position and the outlet valves are spring loaded in the closed position. During an anti-lock stop these valves are cycled to maintain the proper slip ratio for each channel. If a wheel locks, the inlet valve is closed to prevent any further pressure increase. Then the outlet valve is opened to release the pressure back to the reservoir until the wheel is no longer slipping. Once the wheel is no longer slipping the outlet valve is closed and the inlet valve is opened to reapply pressure. If the wheel is decelerating within its predetermined limits (proper slip ratio), both valves will close to hold the pressure constant. During the stop, the build pressure is initially supplied by the master cylinder. When the build pressure is reapplied, fluid comes from the master cylinder which causes the brake pedal to drop. The pedal continues to drop until the Pedal Travel Sensor signals the (CAB) to turn on the pump/motor. The pump/motor then pumps fluid from the reservoir into the brake system. The master cylinder pistons and brake pedal are then moved back until the Pedal Travel Sensor signals the (CAB) to turn off the pump/motor.

On vehicles equipped with traction control, the valve block assembly also contains the two Traction Control (Isolation) valves and a pressure switch. The valves are spring loaded in the open position. During traction control operation the traction control valves are closed by the (CAB). This hydraulically isolates the front brake channels from the master cylinder, and the rear brake channels. The (CAB) activates the motor/pump to run continuously by grounding the motor/pump relay coil. By opening and closing the inlet and outlet valves the (CAB) can apply and release the drive wheel calipers as needed to control wheel spin. Two pressure relief valves allow unused fluid volume/pressure to return to the reservoir. The

relief valves are needed because the pump can supply more volume than the system requires.

The pump/motor assembly (Fig. 4) consists of an electric motor with a rotation sensor and a dual piston pump. The motor shaft inside the pump is designed as a cam in order to drive both pistons. The rotation sensor is an inductive pick-up used by the (CAB) to monitor pump/motor operation.

The reservoir at the H.C.U. (Fig. 4) includes a fluid level switch (FLS2). This reservoir is connected to the master cylinder reservoir by a low pressure hydraulic tube. The (CAB) monitors the fluid level via the fluid level switch (FLS2). When the reservoir is properly filled the fluid level switch is closed. If the fluid level falls below an acceptable level, the fluid level switch will open. When the (CAB) detects a low fluid condition (FLS2 OPEN) it will inhibit the anti-lock and traction control function, and turn on the ABS and Traction Control warning lamps.

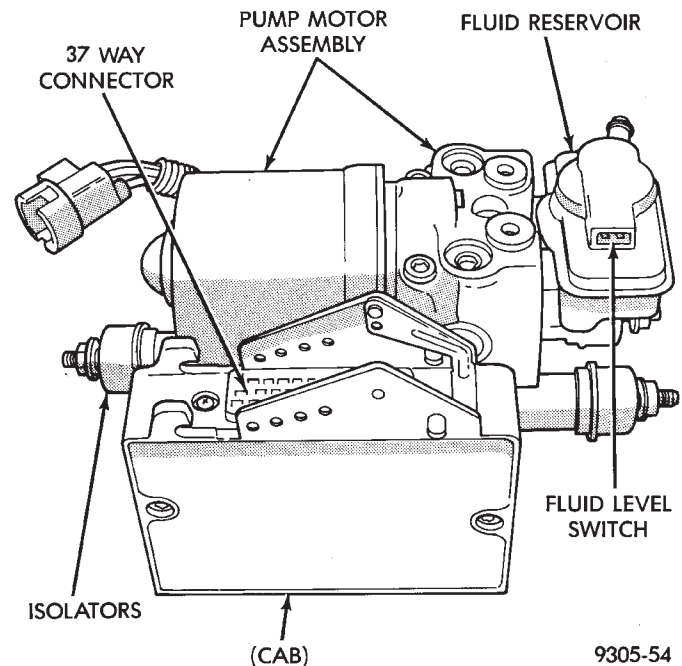


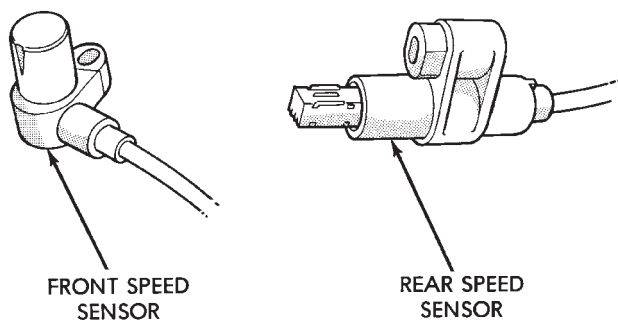
Fig. 4 Hydraulic Control Unit (HCU)

WHEEL SPEED SENSORS

A Wheel speed sensor (Fig. 5) is located at each wheel to transmit road wheel speed information to the Controller Anti-Lock Brake (CAB).

ANTI-LOCK BRAKES OPERATION AND PERFORMANCE

This Anti-Lock Brake System represents current state-of-the-art in vehicle braking systems. It offers the driver increased safety and vehicle control during hard braking. This is accomplished by a sophisticated system of electrical and hydraulic components. As a result, there are a few performance characteristics that may at first seem different but should be consid-



9305-55

Fig. 5 Wheel Speed Sensor

ered normal. These characteristics are discussed below. More technical details are discussed further in this section.

PEDAL FEEL

Since the Teves Mark IV Anti-Lock braking system uses the conventional booster/master Cylinder. The brake pedal feel during normal braking is the same as conventional Non ABS equipped cars.

When Anti-Lock is activated during hard braking due to a wheel lockup tendency. Brake pedal effort will increase do to the master cylinder pressure being isolated from the brake system. Some brake pedal movement and associated noises may be felt and heard by the driver. This is normal of a Anti-Lock Braking System due to pressurized fluid being transferred to and from the wheel brakes.

ANTI-LOCK BRAKE SYSTEM OPERATION

During Anti-Lock Braking, brake pressures are modulated by cycling electric solenoid valves. The cycling of these valves can be faintly heard as a series of popping or ticking noises. In addition, the cycling may be felt as a pulsation in the brake pedal. If Anti-Lock 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.

Although ABS operation is available at virtually all vehicle speeds. It will automatically turn off at speeds below 3 to 5 mph. Wheel lockup may be perceived at the very end of an anti lock stop and is considered normal.

TIRE NOISE & MARKS

Although the ABS system prevents complete wheel lock-up, some wheel slip is desired in order to achieve optimum braking performance. During brake pressure modulation, as brake pressure is increased, wheel slip is allowed to reach up to 30%. This means that the wheel rolling velocity is 30% less than that

of a free rolling wheel at a given vehicle speed. This slip may result in some tire chirping, depending on the road surface. This sound should not be interpreted as total wheel lock-up.

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

VEHICLE PERFORMANCE

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

SYSTEM DIAGNOSTIC FEATURES

The Teves Mark IV Anti-Lock brake system has been designed with the following self diagnostics capability.

The (CAB) uses two microprocessors housed in the controller to monitor and control the Anti-Lock and Traction Control systems. The microprocessors operate independently, and compare their results.

Fault messages are retained in a non-volatile memory until erased using the DRBII scan tool or automatically erased after 50 ignition key cycles. More than one fault can be stored in the memory at a time. The number of faults stored is displayed by the DRBII scan tool when Read Faults is selected.

SYSTEM INITIALIZATION

System initialization starts when the ignition switch is turned to the run position. At this point the (CAB) performs a complete self check of all electrical components in the Anti-Lock and Traction Control systems. Momentarily the build, decay and isolation valves are cycled. If the driver has his their foot on the brake pedal, they may feel the test through brake pedal pulsations. This is a normal condition.

DYNAMIC TEST

Between 5 - 10 mph the pump/motor is momentarily turned on.

If any component exhibits a fault during system initialization or dynamic check, the (CAB) will illuminate the Anti-Lock warning lamp and Traction Control Function Lamp. At this time both systems are disabled.



DIAGNOSTIC MODE

To enter diagnostic mode, vehicle must be below 10 MPH. If vehicle speed is not below 10 MPH a no response message is displayed by the DRB II scan tool. The following are characteristics of the diagnostic mode.

The amber Anti-Lock warning lamp and brake warning lamp flash. If a hard fault, such as an Inlet or Outlet Valve fault or Main Relay Power Circuit failure fault is present. The warning lamps illuminate without blinking and no diagnostic operations are available until the fault condition is cleared.

Anti-Lock and Traction control operation are disabled.

The valves in the valve body cannot be actuated when vehicle speed is above 5 MPH. If valve actuation is attempted above 5 MPH a vehicle in motion message is displayed by the DRBII scan tool.

ANTI-LOCK SYSTEM FAULT DIAGNOSTICS

Faults detected by the (CAB) fall into one of four categories: Locked, Latching, Non-Latching, or Non-Erasable.

LOCKED FAULT

If a fault is Locked; the ANTI-LOCK and TRACTION CONTROL warning lights will be illuminated and will remain illuminated until the fault code has been erased from the (CAB) memory using a DRB II.

LATCHED FAULT

If a fault is Latched; the ANTI-LOCK and TRACTION CONTROL warning lights will be illuminated and will remain illuminated until the next ignition reset, even if the fault has disappeared.

NON-LATCHING FAULT

If the fault is Non-Latching; the ANTI-LOCK and TRACTION CONTROL warning lights will only be illuminated as long as the fault condition exists. As soon as the fault condition goes away, the warning lights are turned off, although a fault code will be stored.

NON-ERASABLE FAULT

This type of fault cannot be erased with a DRB II or by cycling the ignition switch. The Anti-lock and Traction Control warning lights will remain illuminated until proper system operation is restored by replacing the defective component.

LOCKED FAULTS

- Hydraulic Failure

LATCHING FAULTS

- Main Relay/Power Circuit Failure
- Pump Motor Circuit Not Working Properly
- Pump Motor Running Without Command
- Pedal Travel Sensor Circuit

- Valve Fault (8/10)
- FLS 2 Not processable
- Pressure Switch/Brake Switch Circuits (Disables Traction Control Only)
- Sensor Circuit Failure (4)
- Signal Missing (4)
- Wheel Speed Compare (4)
- Wheel Speed Continuity
- Wheel Speed Continuity 25 MPH (4)

NON-LATCHING FAULTS

- FLS 2 Open

NON-ERASABLE FAULTS

- Controller Failure

When either the Anti-lock or Traction Control warning lamp is on, that system function has been turned off. An Anti-lock warning lamp circuit failure will cause the (CAB) to store an Anti-lock Warning Lamp message. In the event that the Anti-lock Warning Lamp is inoperative and another ABS fault has occurred, the (CAB) will illuminate the red brake warning lamp. If battery voltage falls below 9 volts, the (CAB) will turn on the warning lamp and inhibit system function. However, no fault codes will be stored.

FAULT DIAGNOSTICS

The friction that occurs when the brakes are applied causes the lining temperature to increase. The (CAB) has the ability to mathematically calculate lining temperature. If Anti-lock and/or Traction Control operation occurs frequently enough during a given period of time, it could cause the brake pads to become too hot. If the (CAB) calculations indicate that pad temperatures exceed its preprogrammed limits the (CAB) will turn off the Traction Control function and illuminate the Traction Control Warning Lamp. When the brakes have had time to cool off, the (CAB) will turn off the Warning Lamp and restore Traction Control operation. The actuation of this "thermal mathematical model" will not cause a fault code to be stored in the (CAB) memory or effect ABS operation.

WARNING SYSTEMS OPERATION

ANTI-LOCK WARNING LAMP

The amber ANTI-LOCK Warning Lamp is located in the Message Center. It is used to inform the driver that the anti-lock function has been turned off. The warning lamp is controlled by the (CAB) and/or the Main Relay through an in harness diode. The (CAB) controls the lamp by directly grounding the circuit. The Main Relay grounds the lamp circuit when it is de-energized.



BRAKE WARNING LAMP

The red BRAKE Warning Lamp is located in the Instrument Panel. It can be activated in several ways. Application of the parking brake or a low fluid signal from the fluid level switch located in the master cylinder reservoir will cause the lamp to come on. The (CAB) will also activate the brake warning lamp if there is a fault in the ABS system, and the amber anti-lock lamp fails to operate. Both the red and the amber lamps will flash when the system is placed in the diagnostic mode with the DRB II. ABS operation is disabled while in the diagnostics mode.

TRACTION CONTROL FUNCTION LAMP

The Green Traction Control Function Lamp is located in the message center. It is used to inform the driver that the system has entered the traction control mode. The lamp is controlled by the (CAB). The (CAB) turns on the lamp by directly grounding the circuit.

TRACTION CONTROL WARNING LAMP

The Amber Traction Control Warning Lamp is also located in the message center. It is used to inform the driver that the Traction Control function has been turned off by the (CAB). This lamp will also come on if the traction control switch is in the off position and the ignition is on.

NORMAL OPERATION OF WARNING LAMP

With the ignition in the Crank position, the Red Brake Warning Lamp will turn on as a bulb check. The Amber Anti-Lock Warning Lamp and the Traction Control Lamps will stay on for 1-2 seconds then turn off, once verification of the self diagnosis is completed.

ANTI-LOCK BRAKE SYSTEM COMPONENTS

The following is a detailed description of the Anti-Lock Brake System components. For information on servicing the Four Wheel Disk Brake System, see the standard Brake section of this Service Manual.

HYDRAULIC CONTROL UNIT (HCU)

WARNING: ONLY THE FOLLOWING COMPONENTS OF THE (HCU) (FIG. 1) ARE SERVICEABLE. THE BRAKE FLUID RESERVOIR, PROPORTIONING VALVES AND MOUNTING ISOLATORS. THE REMAINING COMPONENTS OF THE (HCU) ARE NOT SERVICEABLE ITEMS AND NO ATTEMPT IN ANY WAY SHOULD BE MADE TO REMOVE OR SERVICE ANY OTHER PARTS OF THE (HCU).

The (HCU) (Fig. 1 and 2) is located in the engine compartment on the left frame rail forward of the master cylinder and is covered by a heat shield. The Hydraulic Control Unit (HCU) contains the valve

block assembly, the pump/motor assembly, and a fluid reservoir with a fluid level switch.

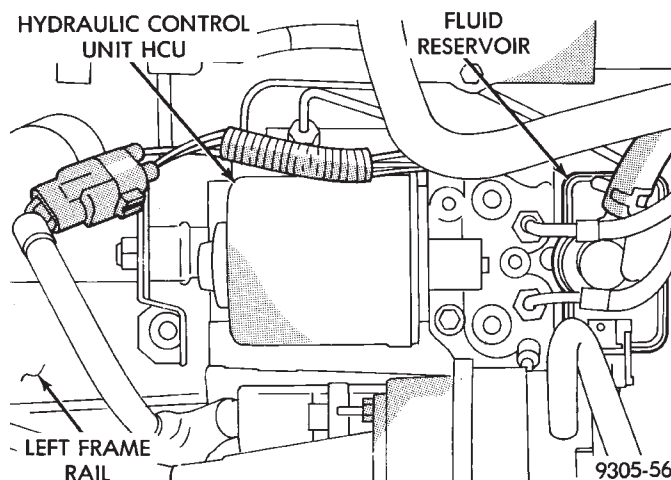


Fig. 1 Hydraulic Control Unit (HCU) Mounting Location

There are two Hydraulic Control Units. One is used for ABS only. The other is used for ABS and Traction Control combined. Each has a different part number. If the wrong H.C.U. is installed, the system operation will be disabled and a fault code will be stored.

VALVE BLOCK ASSEMBLY

The valve block assembly (Fig. 2) contains eight/ten valve/solenoids; four inlet valves and four outlet valves. (2 isolation valves for traction control pressure switch only.) The inlet valves are spring loaded in the open position and the outlet valves are spring loaded in the closed position. During an anti-lock stop these valves are cycled to maintain the proper slip ratio for each channel. If a wheel locks, the inlet valve is closed to prevent any further pressure increase. Then the outlet valve is opened to release the pressure back to the reservoir until the wheel is no longer slipping. Once the wheel is no longer slipping the outlet valve is closed and the inlet valve is opened to reapply pressure. If the wheel is decelerating within its predetermined limits (proper slip ratio), both valves will close to hold the pressure constant. During the stop, the build pressure is initially supplied by the master cylinder. When the build pressure is reapplied, fluid comes from the master cylinder which causes the brake pedal to drop. The pedal continues to drop until the Pedal Travel Sensor signals the (CAB) to turn on the pump/motor. The pump/motor then pumps fluid from the reservoir into the brake system. The master cylinder pistons and brake pedal are then moved back until the Pedal Travel Sensor signals the (CAB) to turn off the pump/motor.

On vehicles equipped with traction control, the valve block assembly also contains the two Traction



Control (Isolation) valves and a pressure switch. The valves are spring loaded in the open position. During traction control operation the traction control valves are closed by the (CAB). This hydraulically isolates the front brake channels from the master cylinder, and the rear brake channels. The (CAB) activates the motor/pump by grounding the motor/pump relay coil. By opening and closing the inlet and outlet valves the (CAB) can apply and release the drive wheel calipers as needed to control wheel spin. Two pressure relief valves allow unused fluid volume/pressure to return to the reservoir. The relief valves are needed because the pump can supply more volume than the system requires.

A bleeding procedure using the DRB II scan tool must be used to remove air that has become trapped in the H.C.U.

PUMP/MOTOR ASSEMBLY

The pump/motor assembly (Fig. 2) consists of an electric motor with a rotation sensor and a dual piston pump. The motor shaft inside the pump is designed as a cam in order to drive both pistons. The rotation sensor is an inductive pick-up used by the (CAB) to monitor pump/motor operation.

FLUID RESERVOIR AND FLUID LEVEL SWITCH - FLS2

The fluid reservoir at the H.C.U. (Fig. 2) includes a fluid level switch (FLS2). This reservoir is connected to the master cylinder reservoir by a low pressure hydraulic tube. The (CAB) monitors the fluid level via the fluid level switch (FLS2). When the reservoir is properly filled the fluid level switch is closed. If the fluid level falls below an acceptable level, the fluid level switch will open. When the (CAB) detects a low fluid condition (FLS2 OPEN) it will inhibit the anti-lock and traction control function, and turn on the ABS and Traction Control warning lamps.

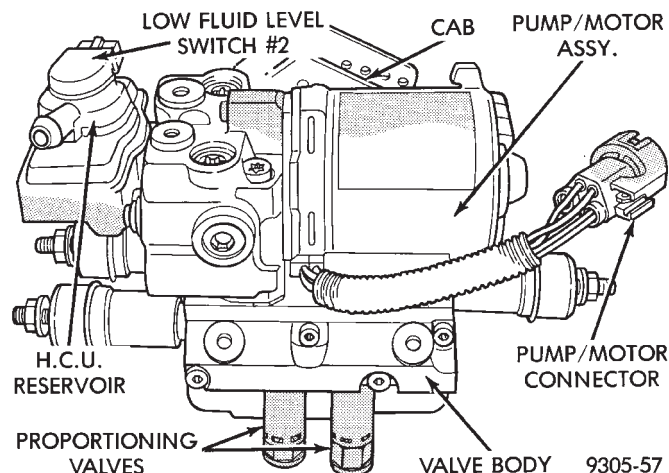


Fig. 2 Hydraulic Control Unit Component Locations

PROPORTIONING VALVES

Two Proportioning Valves (Fig. 2 and 3) are used in the system, one for each rear brake hydraulic circuit. The Proportioning Valves function the same as in a standard brake system. The Proportioning Valves are located on the bottom of the (HCU) (Fig. 1). The proportioning valves are not serviceable but are a replaceable component of the (HCU). Replacement of the proportioning valves will be covered later in this section of the service manual.

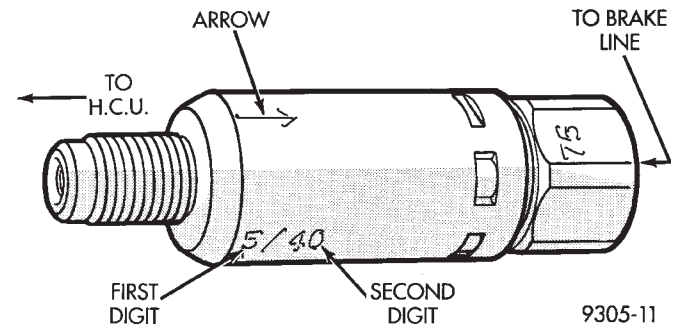


Fig. 3 Anti-Lock Proportioning Valve Identification

WHEEL SPEED SENSORS

One wheel speed sensor (WSS) is located at each wheel (Fig. 4) and sends a small AC signal to the control module (CAB). This voltage is generated by magnetic induction when a toothed sensor ring (tone-wheel) (Fig. 5) passes by a stationary magnetic sensor (WSS). The (CAB) converts the AC signals into digital signals for each wheel.

The front wheel sensor (Fig. 4) is attached to a boss in the steering knuckle. The tonewheel is an integral part of the front axle shaft (Fig. 5). The rear speed sensor (Fig. 4) is mounted in the caliper adapter plate and the rear tonewheel is an integral part of the rear rotor hub (Fig. 5). The wheel speed sensor air gap is NOT adjustable. The correct wheel speed sensor air gap is from 0.52 to 1.64mm for the front sensors, and from 0.45 to 1.21mm for the rear sensors. All wheel speed sensors have a resistance between 950 and 1250 ohms.

The four wheel speed sensors are serviced individually. The front tonewheels are serviced as an assembly with the outer C.V. Joint Housing. The rear tonewheels are serviced as an assembly with the rotor hub (Fig. 5).

Correct Anti-Lock and Traction Control system operation is dependent on wheel speed signals from the wheel speed sensors. The vehicles' wheels and tires should all be the same size and type to generate accurate signals. In addition, the tires should be inflated to the recommended pressures for optimum system operation. Variations in wheel and tire size or significant variations in inflation pressure can



produce inaccurate wheel speed signals. However, the system will continue to function correctly when using the mini-spares.

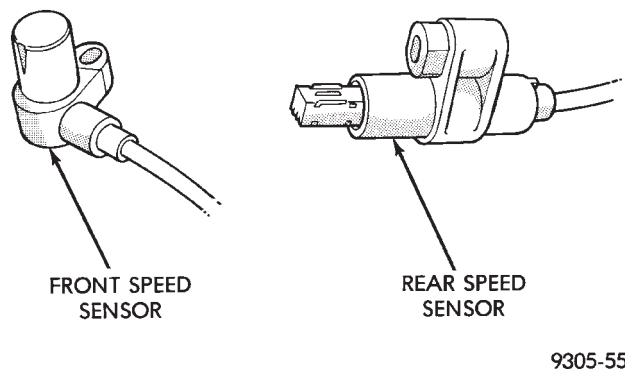


Fig. 4 Wheel Speed Sensors

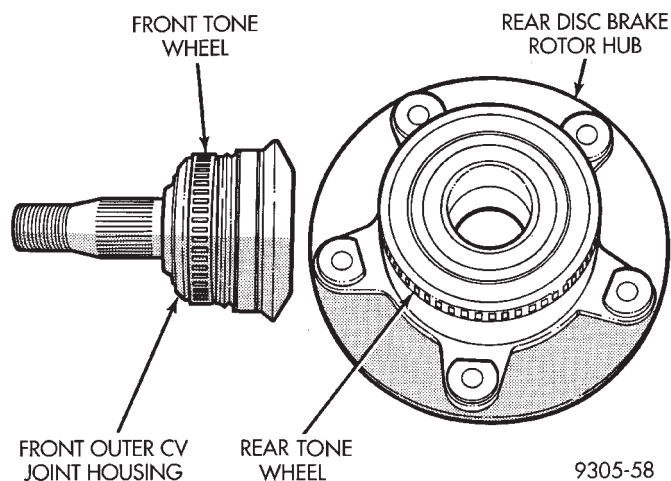


Fig. 5 Front And Rear Tone Wheels

CONTROLLER ANTI-LOCK BRAKE (CAB)

The Anti-Lock Brake Controller (CAB) (Fig. 6) is a microprocessor based device which monitors wheel speeds and controls the Anti-Lock and Traction Control functions. The (CAB) contains two microprocessors which receive identical sensor signals and then independently process the information. The results are then compared to make sure that they agree otherwise the (CAB) will turn off the Anti-lock and Traction Control function and turn on the warning lights.

There are two controllers. One is used for A.B.S. only, and one is used for A.B.S. and Traction Control combined. Although they both look the same they are functionally different. If the wrong controller is installed the system will be disabled and a fault code will be stored. The ABS controller will have a white

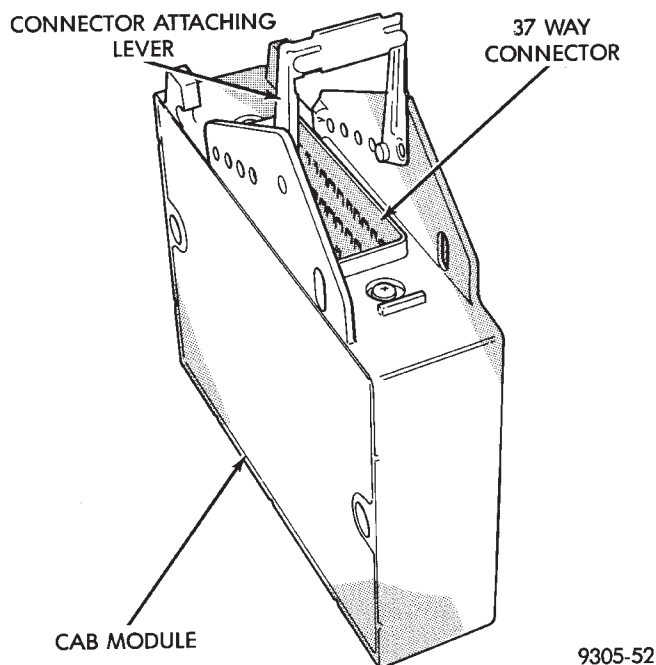


Fig. 1 Controller Anti-Lock Brakes

part label. The ABS and Traction Control controller will have a blue part label. The part numbers are also different.

The (CAB) on the LH is located in the engine compartment, on the left front inner frame rail (Fig. 6). The (CAB) is connected directly to the (HCU) by a 14 way electrical connector. To remove the (CAB) from the (HCU) it is necessary to remove the (HCU) from the vehicle. The (CAB) diagnostic connector is located under the dash, to the left of the steering column. This is the C2D diagnostics connector.

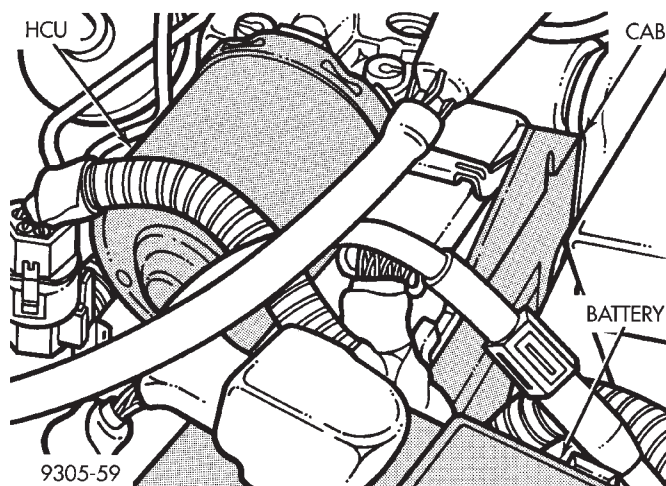


Fig. 6 Location Controller Anti-Lock Brakes (CAB)

The primary function of the (CAB) is to:

- Detect wheel spin tendencies
- Detect wheel locking tendencies.
- Control fluid pressure modulation to the brakes



- during Anti-Lock stop and traction control operation.
- Monitor the system for proper operation.
- Provide communication to the DRB II while in diagnostic mode.
- Store diagnostic information in non-volatile memory.

The (CAB) continuously monitors the speed of each wheel. When a wheel locking tendency is detected, the (CAB) will command the appropriate valve to modulate brake fluid pressure in its hydraulic circuit. In order to increase pressure at the wheel brake again, the inlet valve in the (HCU) is opened to the wheel brake which causes the pedal to drop. During an anti-lock stop, the brake pedal position is maintained within a controlled region by the Pedal Travel Sensor (PTS) and the pump/motor. The PTS has seven resistance steps. Once an anti-lock control cycle has been initiated, the (CAB) will activate the pump/motor when the PTS level increases one step. The (CAB) will again turn off the pump/motor once the original position is reached again. The (CAB) continues to control pressure in individual hydraulic circuits until a wheel locking tendency is no longer present.

On traction control equipped vehicles ONLY, the (CAB) is continuously monitoring wheel speed, it can also detect wheel spin (traction loss) conditions. If the (CAB) detects drive wheel spin and the brakes are not applied it will enter the Traction Control mode. When a wheel spin condition is detected the (CAB) will close the normally open Traction Control Valves. When the Traction Control valves are closed the master cylinder primary and secondary chambers, and the rear brake channels are isolated from the drive wheel brake channels. The pump motor is started to supply fluid volume/pressure to the drive wheel brake channels. The pump runs continuously during traction control operation. The inlet and outlet valves are opened and closed to modulate the hydraulic pressure in the appropriate brake channel. By cycling the inlet and outlet valves, the (CAB) can control wheel spin by applying the brakes on the wheel that has lost traction.

The Anti-Lock Brake and Traction Control Systems are constantly monitored by the (CAB) for proper operation. If the (CAB) detects a fault, it can disable the Anti-Lock and Traction Control function and turn on the warning lamps. If the Anti-Lock function is disabled, the system will revert to standard base brake system operation.

The (CAB) Inputs include the following:

- Four Wheel Speed Sensors
- Stop Lamp Switch
- Pedal Travel Sensor
- Ignition Switch
- Main Relay Voltage

- Pump/Motor Sensor Signal
- Diagnostic Communication (C2D)
- Fluid Level Switch #2
- Traction Control Switch
- Pressure Switch
- ABS Warning Lamp Voltage

The (CAB) Outputs include the following:

- Eight Valve/Solenoid Drivers (Ten with Traction Control)
- Main Relay Actuation
- Pump/Motor Relay Actuation
- Anti-lock Light Actuation
- Brake Warning Light Actuation
- Traction Control Warning Lamp Actuation
- Traction Control Function Lamp Actuation
- Diagnostic Communication (C2D)

DIAGNOSTIC CONNECTOR

On the L.H. platform, the Teves Mark IV diagnostic connector is located under the lower instrument panel to the right side of the steering column. The diagnostics connector is a blue 6 way connector see (Fig. 7).

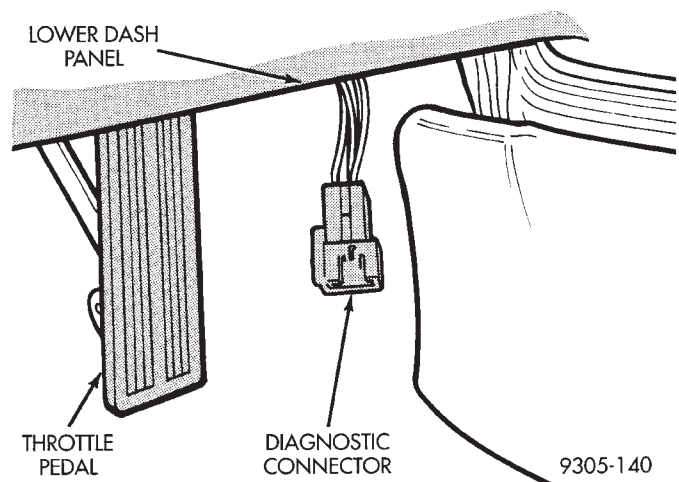


Fig. 7 ABS Diagnostic Connector Location

ANTI-LOCK SYSTEM RELAYS AND WARNING LAMPS

SYSTEM RELAY

The System Relay (Fig. 8) is attached to the outside of the Power Distribution Center. The System Relay has two functions. First, when the relay is energized, it supplies power to the solenoid valves in the Valve Block Assembly and the pump/motor relay coil. Second, when the relay is de-energized, it supplies a ground to turn on the ANTI-LOCK warning light. The System Relay is controlled by the (CAB). The (CAB) energizes the System Relay when it receives an ignition input signal.

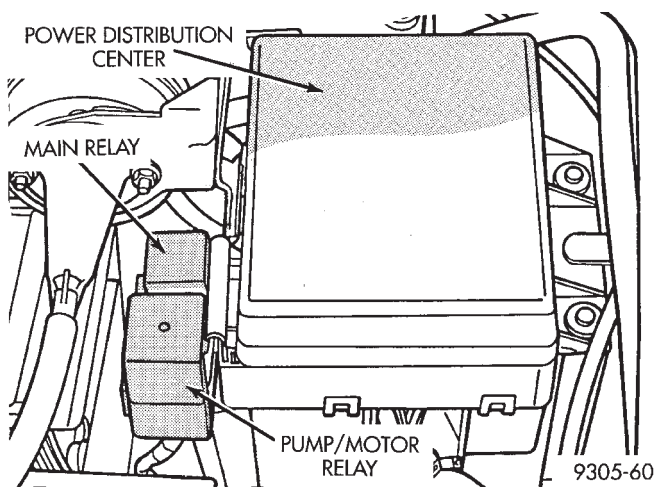


Fig. 8 Main Relay And Pump/Motor Relay

PUMP/MOTOR RELAY

The Pump/Motor Relay (Fig. 8) supplies power to the pump/motor. It is attached to the outside of the Power Distribution Center (PDC). The relay coil is powered by the System Relay and the coil ground is controlled by the (CAB).

The Pump/Motor Relay is a special four terminal relay and should not be replaced with a standard relay. If either relay is defective both relays must be replaced. They are serviced as an assembly.

HYDRAULIC CIRCUITS AND VALVE OPERATION

Through the following operation descriptions and diagrams. The function of the various hydraulic control valves in the ABS system will be described. The fluid control valves mentioned below, control the flow of pressurized brake fluid to the wheel brakes during the different modes of Anti-Lock braking.

The following hydraulic circuit drawings are only a representation of the actual hydraulic circuits. Note that only the valves for the right front wheel brake are shown actuated for the various modes.

BRAKES RELEASED

When the brake pedal is released, all pressures in the system are the same (Fig. 1) (at atmospheric pressure).

BASELINE BRAKES

The Baseline Brake System is a diagonal split brake system. In a diagonal split brake system the master cylinder primary circuit supplies pressure to the right front and left rear wheel brakes. The master cylinder secondary circuit supplies pressure to the left front and right rear wheel brakes (Fig. 2).

ABS BRAKING-PRESSURE HOLD

During an Anti-Lock stop, if a wheel speed sensor indicates a wheel locking tendency. The normally open inlet valve (Fig. 3) is cycled closed by the (CAB). This will prevent any additional pressure from being applied to the wheel brake.

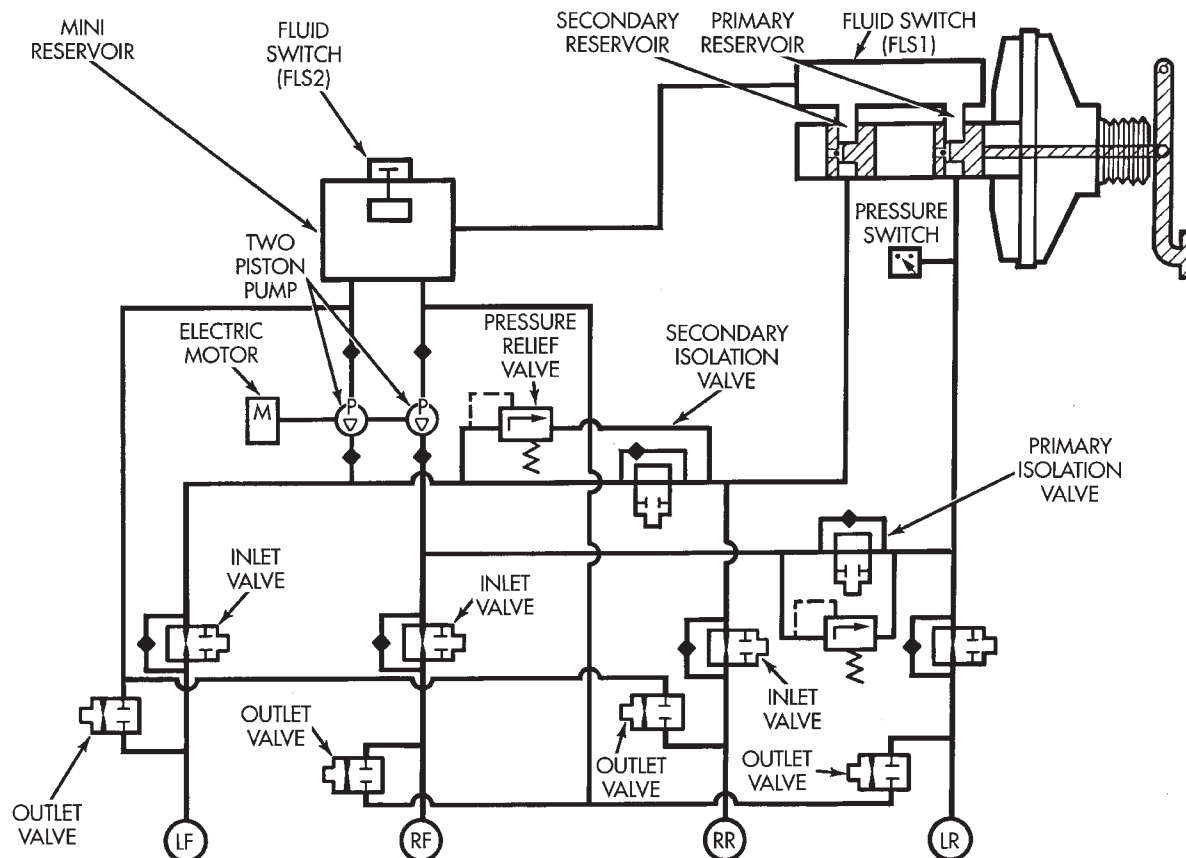
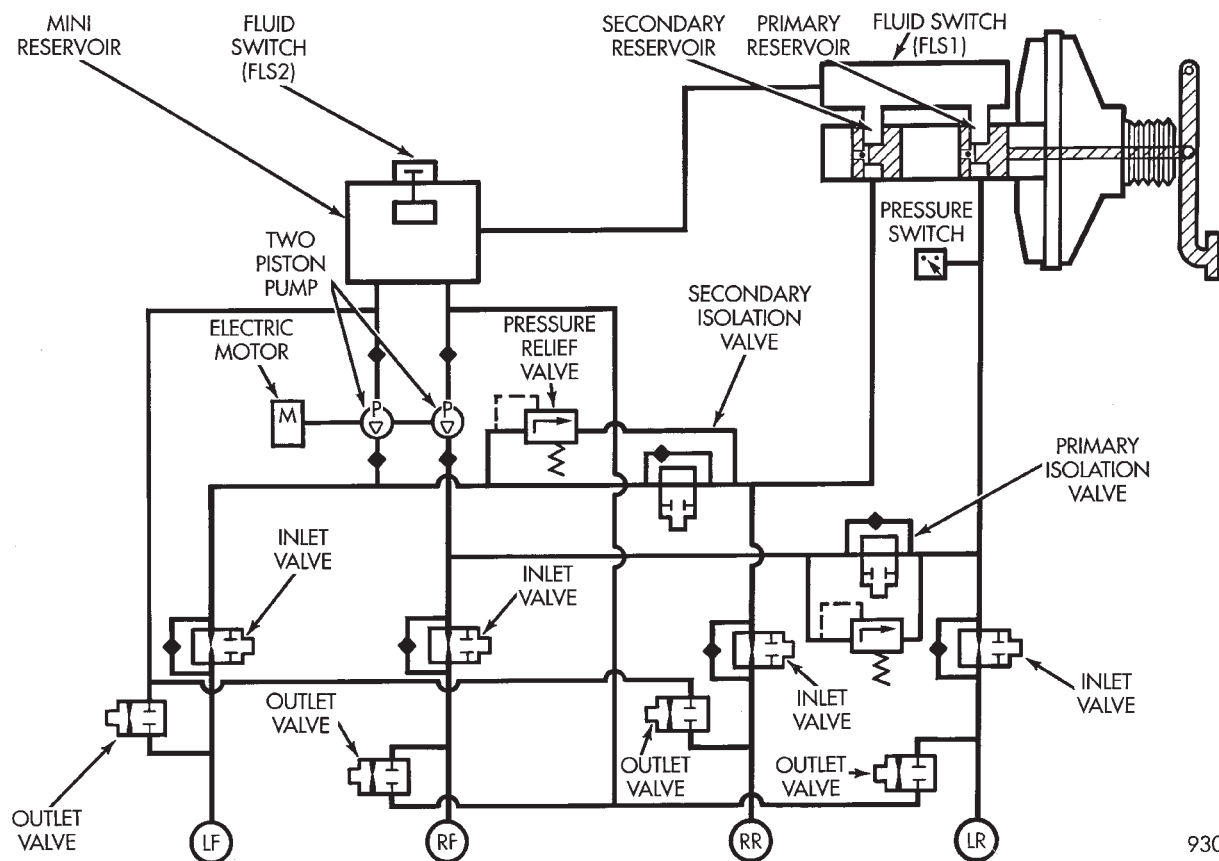
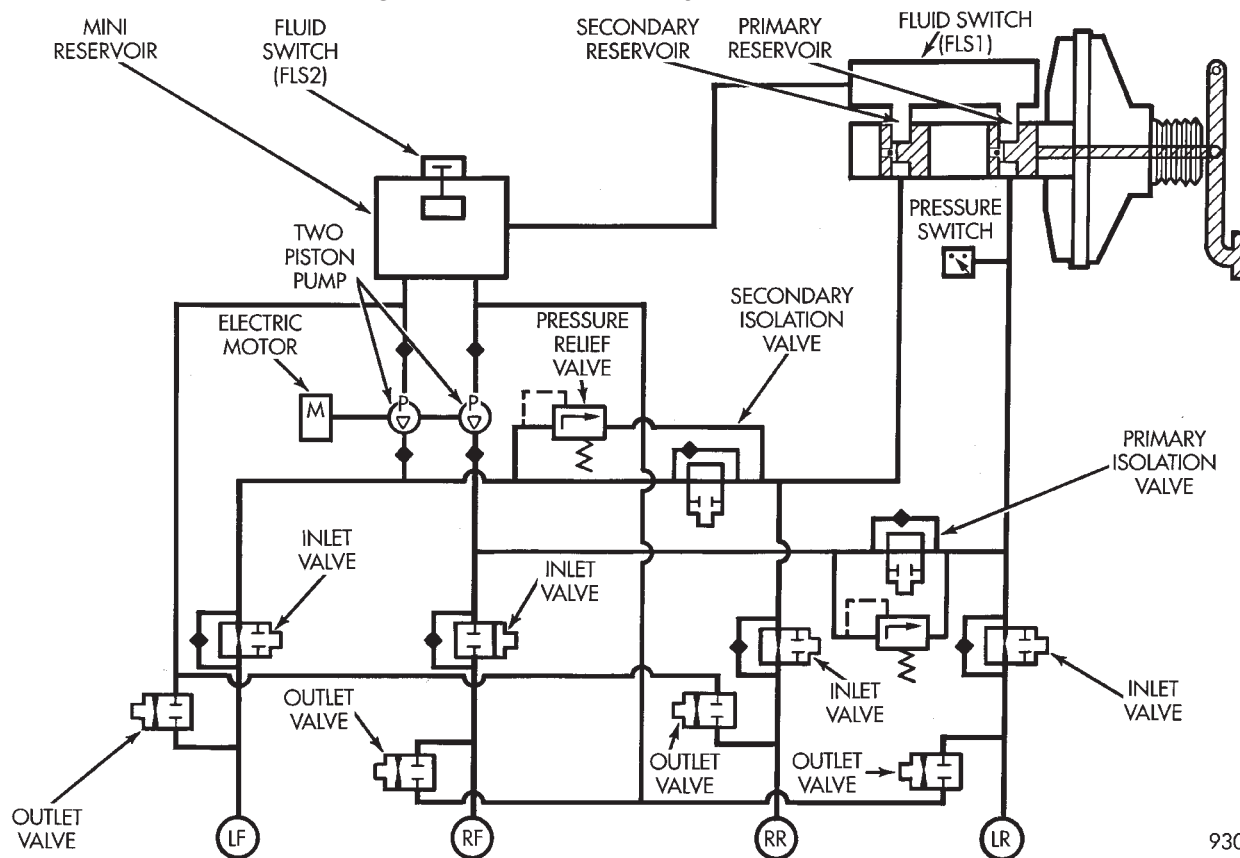


Fig. 1 Brakes Released - Hydraulic Control

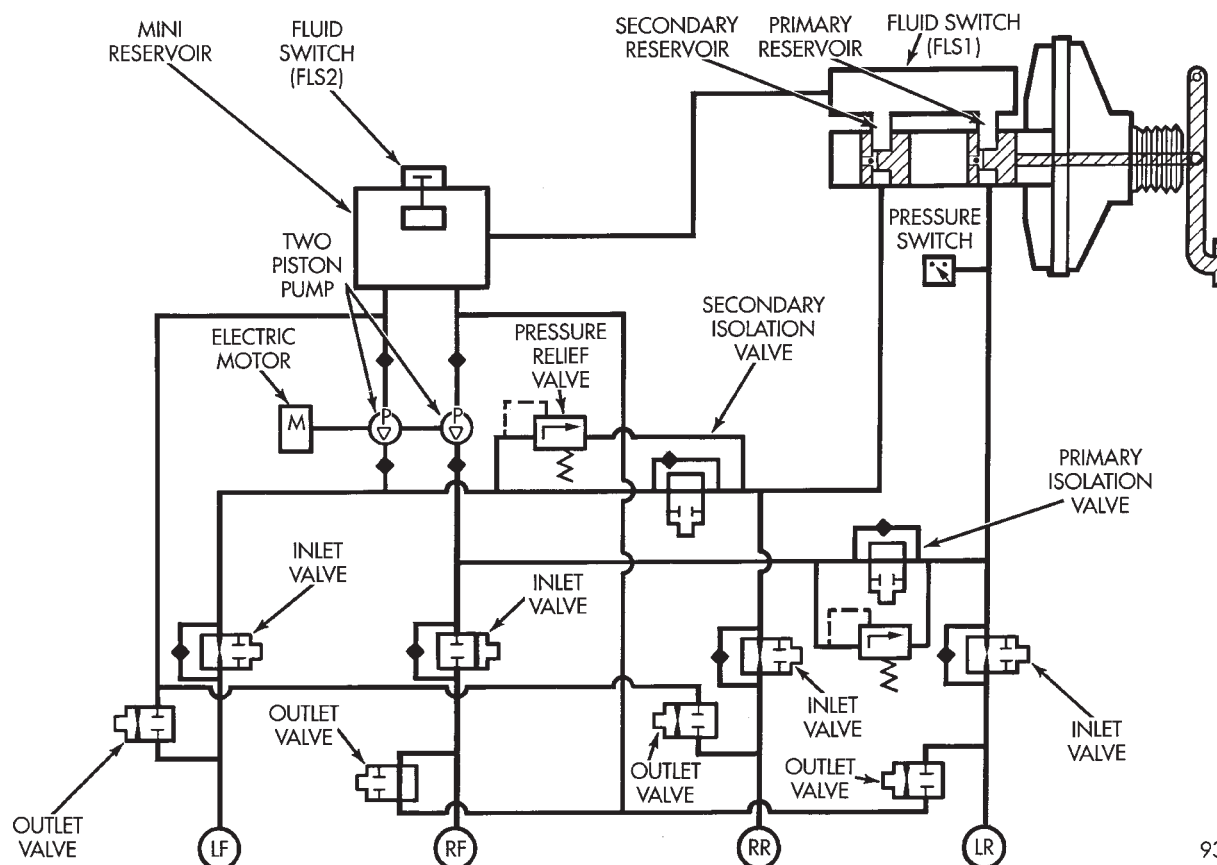


9305-62

Fig. 2 Baseline Brakes - Hydraulic Control

9305-63

Fig. 3 Pressure Hold - Hydraulic Control



9305-64

Fig. 4 Pressure Decay - Hydraulic Control

ABS BRAKING-PRESSURE DECAY

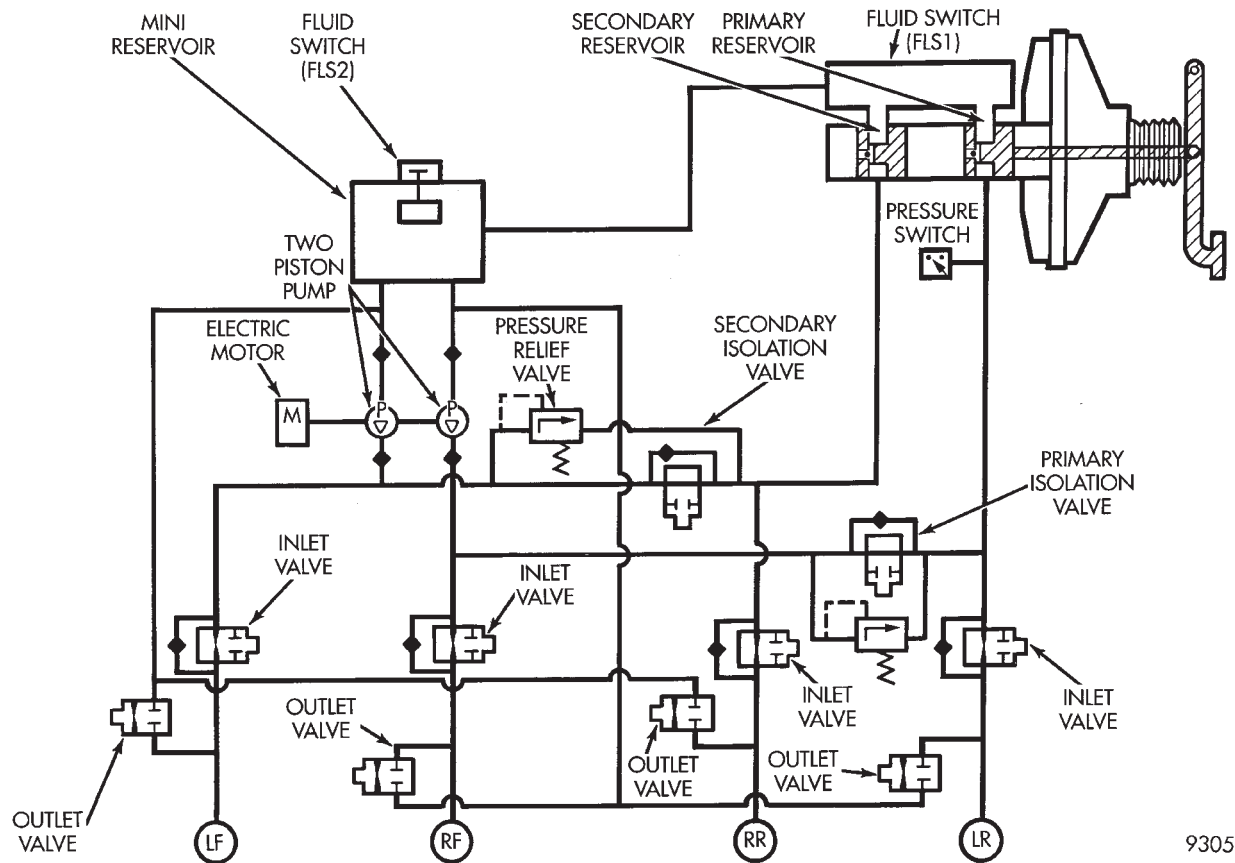
If the wheel locking tendency continues, the (CAB) releases the pressure by opening the normally closed outlet valve (Fig. 4). With the outlet valve open. Fluid will flow back to the reservoir at the H.C.U.

ABS BRAKING-PRESSURE BUILD

Once the wheel begins to accelerate the (CAB) closes the outlet valve and opens the inlet valve (Fig. 5) in order to rebuild the wheel brake pressure. The pressure is reapplied from the master cylinder which causes the brake pedal to drop. If the Pedal Travel Sensor moves to it's next step, the pump/motor is turned on by the (CAB). Once the Pedal Travel Sensor moves back to it's original step, the (CAB) turns off the pump/motor.

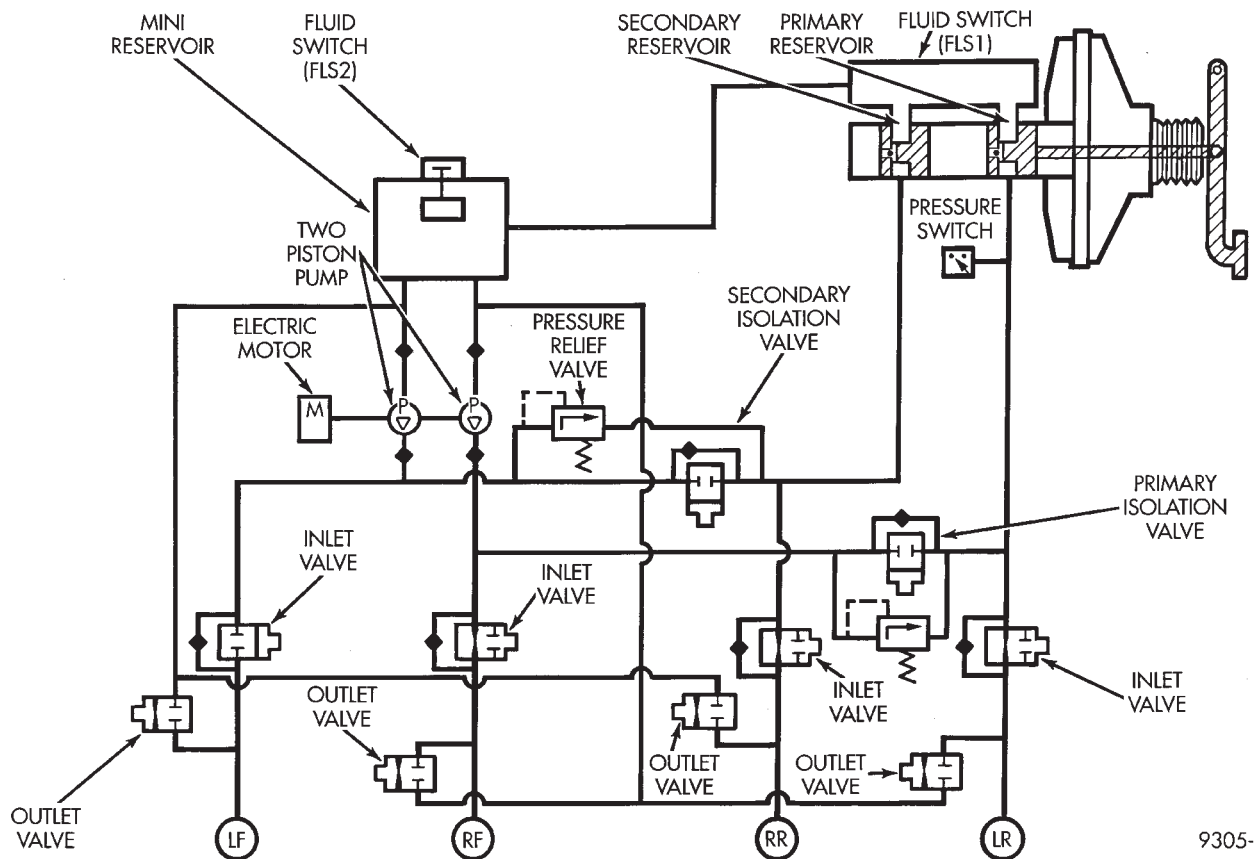
TRACTION CONTROL-PRESSURE BUILD

If a wheel speed sensor indicates a wheel spin (traction loss) tendency and Traction Control function has not been switched off by the driver. The system will begin traction control operation. The normally open Traction Control valves (Fig. 6) are closed to isolate the drive wheel brake channels from the master cylinder and the rear brake channels. The (CAB) will also turn on the pump and close the inlet valves (Fig. 6) to the brake channel it does not need to apply. For example: if a traction loss condition is detected at the right front wheel only, the (CAB) will close the left front inlet valve to prevent unneeded application of the brake at that wheel. Fluid pressure/volume from the pump will be applied to the right front brake caliper via the normally open inlet valve.



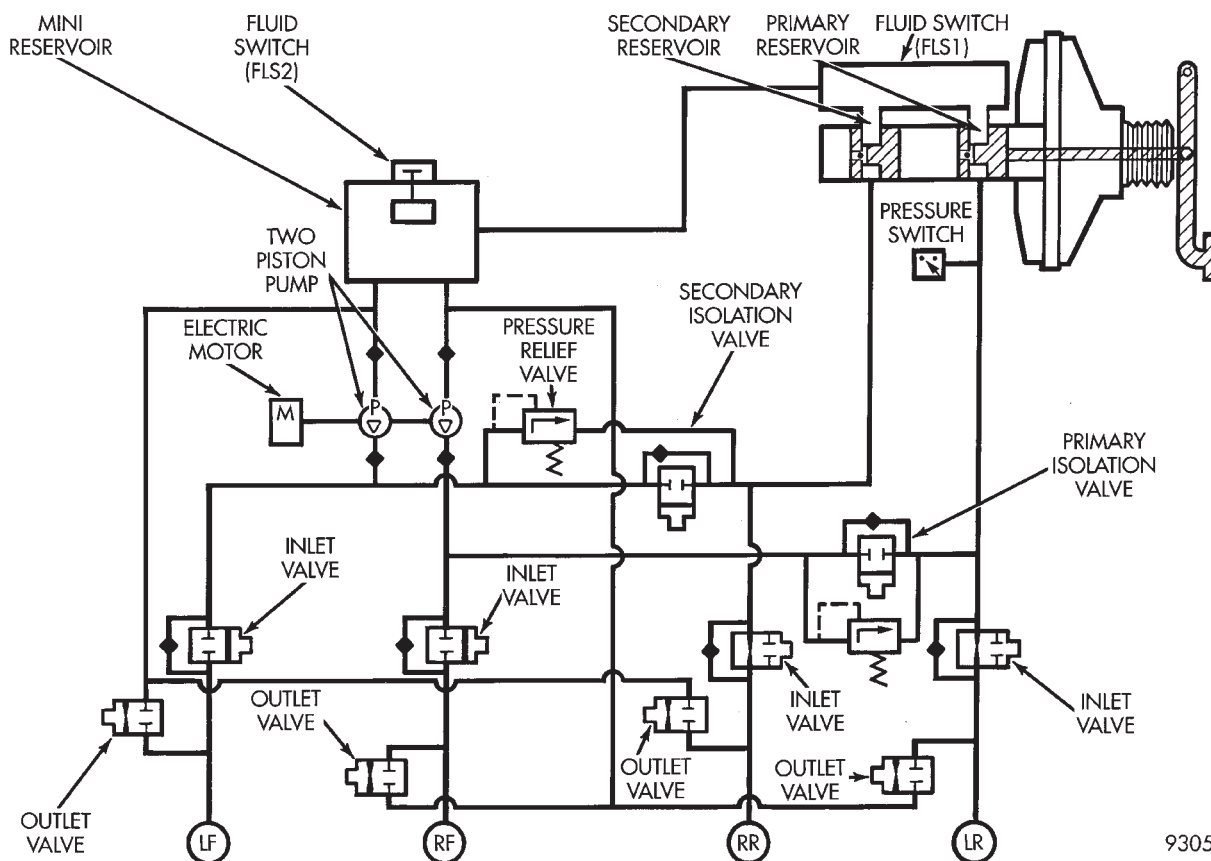
9305-65

Fig. 5 Pressure Build - Hydraulic Control



9305-66

Fig. 6 Traction Control Pressure Build - Hydraulic Control



9305-67

Fig. 7 Traction Control Pressure Hold - Hydraulic Control

TRACTION CONTROL-PRESSURE HOLD

As soon as the traction loss at the spinning wheel has been braked down to acceptable limits. The (CAB) will close the normally open inlet valve (Fig. 7) to prevent any additional pressure from being applied at the wheel brake. Since the pump can produce more volume than required for traction control operation. Pressure relief valves in the HCU will direct the excess fluid volume to the master cylinder primary and secondary circuits. This fluid will enter the reservoir through the open center valves in the primary and secondary pistons.

TRACTION CONTROL-PRESSURE DECAY

When the wheel spin tendency is no longer detected, the (CAB) will open the outlet valve (Fig. 8) to lower the pressure in the brake channel. When the outlet valve is opened, fluid from the brake channel is permitted to flow back to the reservoir at the HCU.

ABS BRAKE SYSTEM DIAGNOSIS

GENERAL INFORMATION

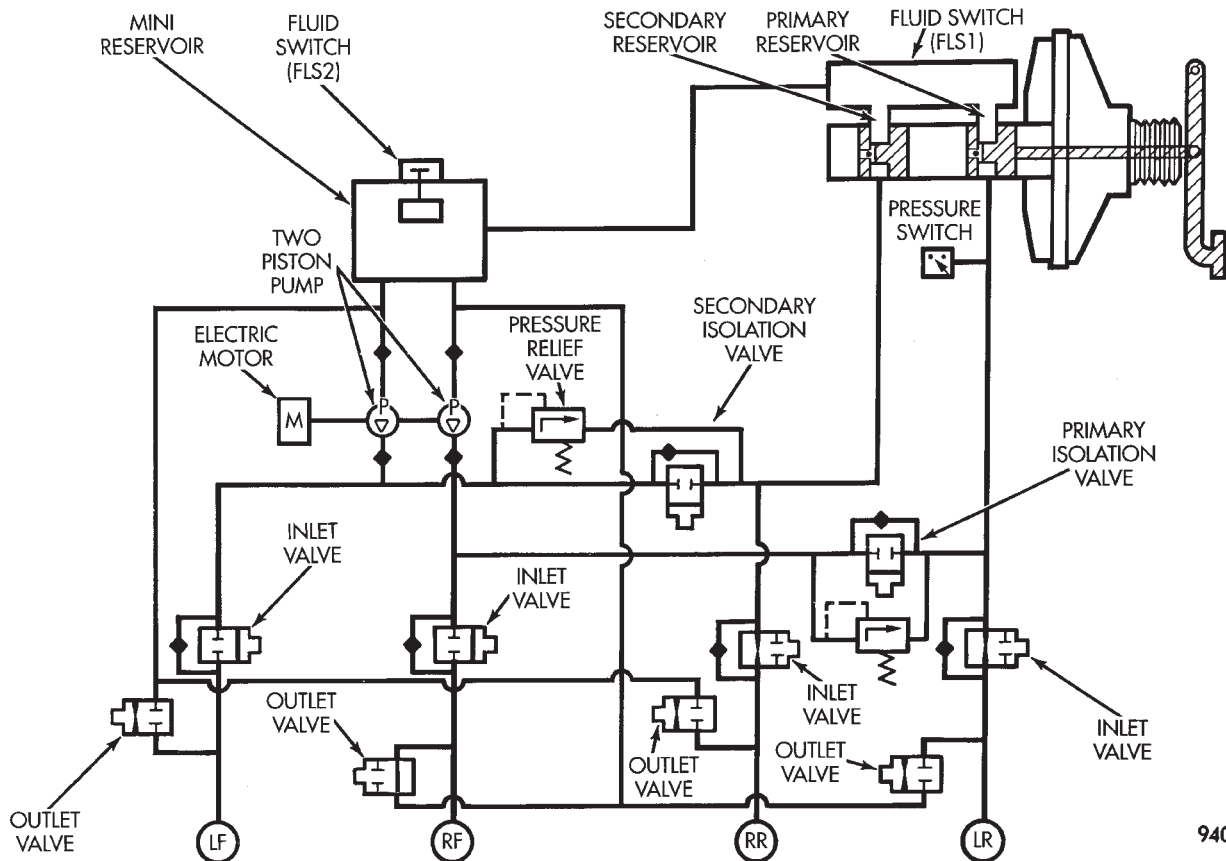
WARNING: SOME OPERATIONS IN THIS SECTION REQUIRE THAT HYDRAULIC TUBES, HOSES AND FITTINGS BE DISCONNECTED FOR INSPECTION OR TESTING PURPOSES.

CAUTION: REVIEW THIS ENTIRE SECTION PRIOR TO PERFORMING ANY MECHANICAL WORK ON A VEHICLE EQUIPPED WITH THE TEVES MARK IV ANTI-LOCK BRAKE SYSTEM. THIS SECTION CONTAINS THE INFORMATION ON PRECAUTIONS PERTAINING TO POTENTIAL COMPONENT DAMAGE, VEHICLE DAMAGE AND PERSONAL INJURY WHICH COULD RESULT WHEN SERVICING AN ABS EQUIPPED VEHICLE.

CAUTION: Certain components of the Anti-Lock Brake System (ABS) are not intended to be serviced individually. Attempting to remove or disconnect certain system components, may result in personal injury and/or improper system operation. Only those components with approved removal and installation procedures in this manual should be serviced.

This section contains information necessary to diagnosis mechanical conditions which can affect operation of the Teves Mark IV Anti-Lock Brake System. Specifically, this section should be used to help diagnose mechanical conditions which result in any of the following.

- (1) Anti-Lock Warning Lamp turned on.
- (2) Brakes Lock on Hard Application



9405-164

Fig. 8 Traction Control Pressure Decay - Hydraulic Control

Diagnosis of conditions which are obviously mechanical in nature. Such as brake noise, brake pulsation, lack of power assist, turning on of the Red Brake Warning Lamp or vehicle vibration during normal braking. Should be directed to Group 5 Brakes in this service manual. This also pertains to problems involving the parking brake system.

In order to effectively diagnose an Anti-Lock Brake System (ABS) condition. It is important to read Anti-Lock Brake System Description. And to follow the diagnostic procedures outlined in this section.

Many conditions that generate customer complaints may be normal operating conditions, but are judged to be a problem due to not being familiar with the ABS system. These conditions can be recognized without performing extensive diagnostic work. Given adequate understanding of the operating principles and performance characteristics of the ABS system. See Section 1 of this manual to familiarize yourself with the operating principles of the ABS system.

DEFINITIONS

Several abbreviations are used in this manual. They are presented here for reference.

- HCU—Hydraulic Control Unit
- CAB—Controller Anti-Lock Brake
- ABS—Anti-Lock Brake System
- PSI—Pounds per Square Inch (pressure)

- WSS—Wheel Speed Sensor

ABS COMPUTER SYSTEM SERVICE PRECAUTIONS

The ABS system uses an electronic control module, the (CAB). This module is designed to withstand normal current draws associated with vehicle operation. However care must be taken to avoid overloading the (CAB) circuits. **In testing for open or short circuits, do not ground or apply voltage to any of the circuits unless instructed to do so by the appropriate diagnostic procedure.** These circuits should only be tested using a high impedance multi-meter, special tools or the DRB II 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.

ABS GENERAL SERVICE PRECAUTIONS

TEST DRIVING ABS COMPLAINT VEHICLES

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

Remember conditions that result in the turning on of the Red Brake Warning Lamp may in-



dicade reduced braking ability. The following procedure should be used to test drive an ABS complaint vehicle.

Before test driving a brake complaint vehicle, note whether the Red or Amber Brake Warning Lamp is turned on. If it is the Red Brake Warning Lamp, refer to the standard brake, Control Valves Section in the brake group of this manual. If the Amber Anti-Lock Warning light was/is on, read record and erase the fault. While the Amber ABS Warning Lamp is on the ABS system is not functional. When the Amber Anti-Lock Warning Lamp is on only the Anti-Lock function of the brake system is affected. The standard brake system and the ability to stop the car is not affected if only the Amber Anti-Lock Warning Lamp is on.

(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 1993 M.Y. Teves Mark IV Anti-Lock Brakes Diagnostic Manual for the required test procedures.

(2) If the Amber ABS Warning Lamp goes out, shift into gear and drive the car to a speed of 10 mph to complete the ABS start up cycle. If at this time the Amber ABS Warning Lamp goes on refer to the 1993 M.Y. Teves Mark IV Anti-Lock Brakes Diagnostic Manual.

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

(4) If a functional problem with the A.B.S. system is determined while test driving a vehicle. Refer to the 1993 M.Y. Teves Mark IV Anti-Lock Brakes Diagnostics Manual for required test procedures and proper use of the DRB II scan tool.

ABS BRAKE SYSTEM ON VEHICLE SERVICE

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

(1) If welding work is to be performed on a vehicle using an arc welder, the (CAB) should be disconnected before the welding operation begins.

(2) The (CAB) connector should never be connected or disconnected with the ignition in the on position.

(3) Some components of the ABS system are not serviced separately and must be serviced as complete assemblies. Do not disassemble any component which is designated as non-serviceable.

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

WHEEL SPEED SENSOR CABLES

Proper installation of the Wheel Speed Sensor Cables is critical to continued system operation. Be sure that cables are installed, routed and clipped properly. Failure to install speed sensor cables as shown in the on car service section of this manual. May result in contact with moving parts or over extension of cables, resulting in component failure and an open circuit.

MECHANICAL DIAGNOSTICS AND SERVICE PROCEDURES

SPECIAL SERVICE TOOL

Some diagnostic procedures in this section require the use of the DRB II scan tool. Refer to the DRB II scan tool operators manual for its proper operational information.

INTERMITTENT FAULTS

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

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

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

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

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

(4) Pin presence in the connector assembly

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

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

(1) Low system voltage. If Low System Voltage (9 volts or less) is detected by the (CAB), the (CAB) will turn on the Amber Anti-Lock Warning Lamp until normal system voltage is achieved. Once normal voltage is seen at the (CAB), normal operation resumes.



(2) Main Relay. If the relay fails to make the ground circuit connection or is an intermittent ground. The (CAB) will turn on the Amber Anti-Lock Warning Light.

Additionally, any condition which results in interruption of power to the (CAB) or (HCU) assembly may cause the Amber Anti-Lock Warning Lamp to turn on intermittently.

ABS BRAKE SYSTEM DIAGNOSTIC FEATURES

SYSTEM INITIALIZATION

System initialization starts when the ignition switch is turned to the run position. At this point the (CAB) performs a complete self check of all electrical components in the Anti-Lock and Traction Control systems. Momentarily the build, decay and isolation valves are cycled. If the driver has his foot on the brake pedal, they may feel the test through brake pedal pulsations. This is a normal condition.

DYNAMIC TEST

Between 5 - 10 mph the pump/motor is momentarily turned on.

If any component exhibits a fault during system initialization or dynamic check, the (CAB) will illuminate the Anti-Lock warning lamp and Traction Control Function Lamp. At this time both systems are disabled.

DIAGNOSTIC MODE

To enter diagnostic mode, vehicle must be below 10 MPH. If vehicle speed is not below 10 MPH a no response message is displayed by the DRB II scan tool. The following are characteristics of the diagnostic mode.

The amber Anti-Lock warning lamp and brake warning lamp flash. If a hard fault, such as an Inlet or Outlet Valve fault or Main Relay Power Circuit failure fault is present. The warning lamps illuminate without blinking and no diagnostic operations are available until the fault condition is cleared.

Anti-Lock and Traction control operation are disabled.

The valves in the valve body cannot be actuated when vehicle speed is above 5 MPH. If valve actuation is attempted above 5 MPH a vehicle in motion message is displayed by the DRBII scan tool.

CONTROLLER ANTI-LOCK BRAKE (CAB)

Fault codes are kept in a Non-Volatile memory until either erased by the technician using the DRB II scan tool or automatically after 50 ignition cycles (key cycles). The only fault that will not be erased after 50 (KEY CYCLES) is the (CAB) fault. A (CAB) fault can only be erased by the technician using the DRB II scan tool. More than one fault can be stored at a time. The number of key cycles since the most

recent fault was stored is also displayed. Most functions of the (CAB) and ABS system can be accessed by the technician for testing and diagnostic purposes by using the DRB II.

LATCHING VERSUS NON-LATCHING ABS FAULTS

Some faults detected by the (CAB) are latching; the fault is latched and (ABS) is disabled until the ignition switch is reset. Thus ABS is disabled even if the original fault has disappeared. Other faults are non-latching; any warning lights that are turned on, are only turned on as long as the fault condition exists. As soon as the condition goes away, the Anti-Lock Warning Light is turned off. Although a fault code will be set in most cases.

TEVES MARK IV ELECTRONIC SYSTEMS DIAGNOSTICS

The Teves Mark IV Anti-Lock Brake System Diagnostics, beyond the basic mechanical diagnostics, systems and components covered earlier in this section. Are accomplished by the use of the DRB II scan tool. See testing procedures outlined in the Teves Mark IV Anti-Lock Brakes Diagnostics Manual for 1993 M.Y. vehicles.

Please refer to the above mentioned manual for any further electronic diagnostics and service procedures that are required on the Teves Mark IV Anti-Lock Brake System.

ON-CAR ABS BRAKE SYSTEM SERVICE

GENERAL SERVICE PRECAUTIONS

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

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

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

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



CHECKING BRAKE FLUID LEVEL

CAUTION: Only use brake fluid conforming to DOT 3 specifications, such as Mopar or Equivalent. Do not use any fluid which contains a petroleum base. Do not use a container which has been used for petroleum based fluids or a container which is wet with water. Petroleum based fluids will cause swelling and distortion of rubber parts in the hydraulic brake system. Water will mix with brake fluid, lowering the fluid boiling point. Keep all brake fluid containers capped to prevent contamination. Remove the front cap of the master cylinder reservoir and fill to the bottom of the split ring.

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

BLEEDING TEVES MARK IV ANTI-LOCK BRAKE SYSTEM

The Anti-Lock Brake System must be bled anytime air is permitted to enter the hydraulic system, due to disconnection of brake lines, hoses or components.

If the (HCU) is removed from the vehicle, both the Base Brake System and the Anti-Lock Brake System must be bled using the appropriate procedure. It is important to note that excessive air in the brake system will cause a soft or spongy feeling brake pedal.

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

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

The Anti-Lock portion of brake system **MUST** be bled separately. This bleeding procedure requires the use of the DRB II Diagnostic tester and the bleeding sequence procedure outlined below.

BLEEDING PROCEDURE

The brake bleeding procedure used for the Teves Mark IV Anti-Lock brake system is a three step process. First step is a conventional bleeding procedure using a pressure bleeder or manual procedure. Second step is bleeding the (HCU) assembly using the DRBII scan tool. Third step is to repeat the conventional pressure or manual bleeding procedure. Follow the procedure below to ensure adequate bleeding of the Anti-Lock brakes hydraulic system.

(1) Connect pressure bleeding equipment to master cylinder. Refer to Bleeding Brake System in the Service Adjustment section of this service manual.

(2) Fully bleed the brakes hydraulic system in the following sequence. Right rear wheel, left rear wheel, right front wheel and left front wheel.

(3) Locate diagnostics connector under dash panel to the right of the steering column.

(4) Connect the DRBII scan tool to the vehicle diagnostics connector. Install cartridge into the DRBII scan tool containing correct software for bleeding the Teves Mark IV Anti-Lock Brake system.

(5) Perform Bleed Brake procedure using the DRBII scan tool. Procedure is described in the DRBII scan tool information and diagnostic manual.

(6) Repeat the conventional pressure bleeding or manual bleeding procedure in the sequence outlined in step 2 above.

(7) Remove pressure bleeding equipment from vehicle if used.

(8) Fill master cylinder fluid reservoir to the correct fill level if required.

(9) Road test vehicle to verify proper operation of the vehicles brake system.

PUMP/MOTOR SERVICE

On the Teves Mark IV Anti-Lock Brake System the Pump/Motor assembly can only be serviced as part of hydraulic control unit (HCU).

HYDRAULIC CONTROL UNIT (HCU)

REMOVE

(1) Center vehicle on hoist, or raise front of vehicle on jack stands. Remove left front wheel and tire assembly from vehicle.

(2) Disconnect battery cables from battery and remove battery from battery tray. Remove the 4 fasteners attaching battery tray to vehicle and remove battery tray (Fig. 1).

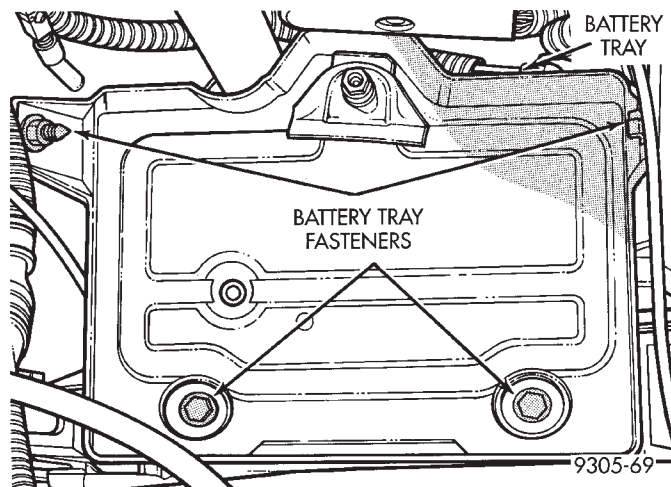


Fig. 1 Battery Tray Attaching



(3) Disconnect the pump motor and fluid level sensor electrical connectors from the (HCU) (Fig. 2).

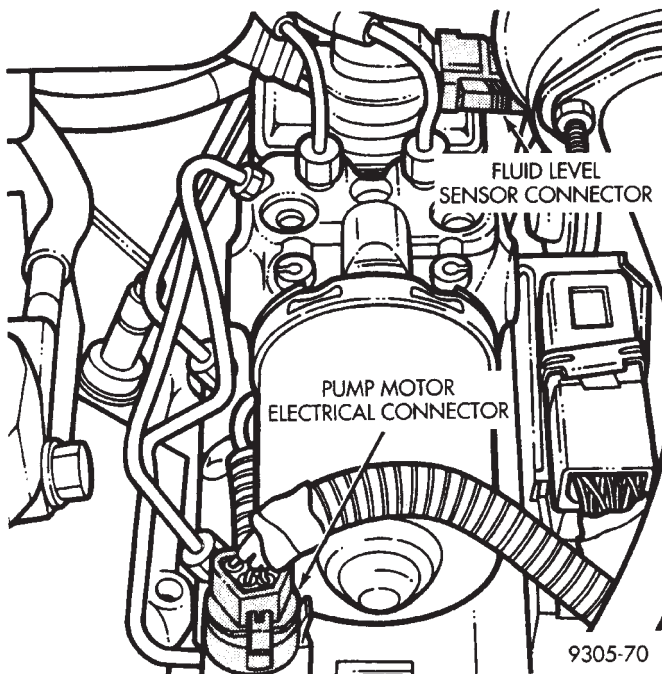


Fig. 2 (HCU) Electrical Connections

(4) **VERIFY THAT THE VEHICLE IGNITION IS OFF BEFORE REMOVING THE 37 WAY CONNECTOR.** Disconnect the 37 way connector from the (CAB) using the following procedure. Using a screwdriver, lift connector latch away from connector (Fig. 3) and rotate connector latch all the way back against (CAB). This will lift the (CAB) connector away from (CAB) terminals.

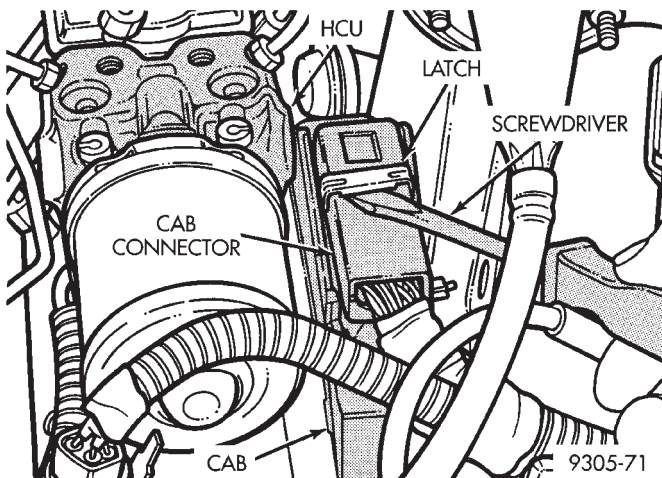


Fig. 3 (CAB) Connector Locking Latch.

(5) Grasp connector and rotate rear of connector up until it clears connector pins on (CAB) (Fig. 4). Then remove (CAB) connector pin from latch on (CAB) (Fig. 4), and position connector out of the way.

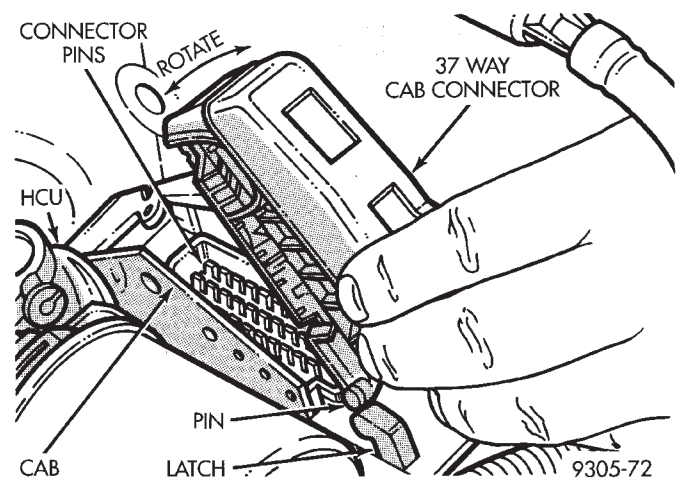


Fig. 4 (CAB) Connector Removal From (CAB)

(6) Disconnect the 2 brake tubes from the proportioning valves (Fig. 5) located on the bottom of the (HCU).

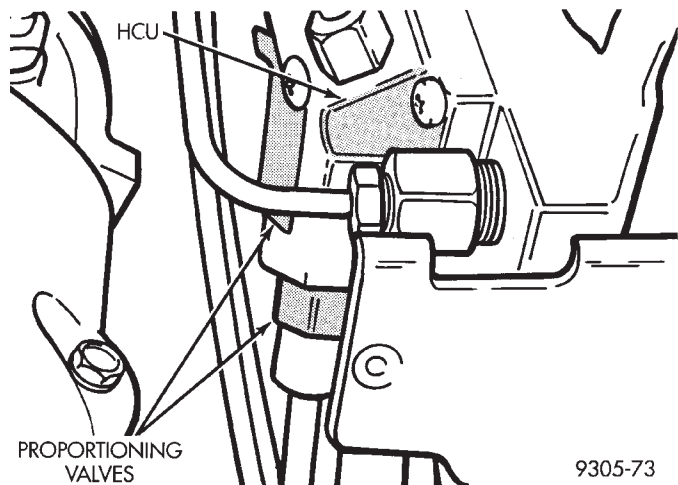


Fig. 5 Brake Tube Connections At Proportioning Valves

(7) Disconnect the 2 brake fluid supply tubes from the master cylinder at the (HCU) (Fig. 6). Disconnect the 2 brake fluid output tubes from the valve block on the (HCU) (Fig. 6). Disconnect the brake fluid supply hose from the master cylinder reservoir to the (HCU) reservoir, at the (HCU) reservoir. Plug end of supply hose to keep brake fluid from draining out of master cylinder reservoir.

(8) Remove the (HCU) bracket to left inner fender attaching bolt (Fig. 7). Remove the 2 (HCU) bracket to left frame rail mounting bolts (Fig. 8).

(9) Remove (HCU) and mounting bracket from vehicle as an assembly.

(10) Transfer the (CAB) module from the failed (HCU) to the replacement (HCU). Refer to Controller Anti-Lock Brakes removal and installation in this section of the service manual, for the require procedure to replace module.

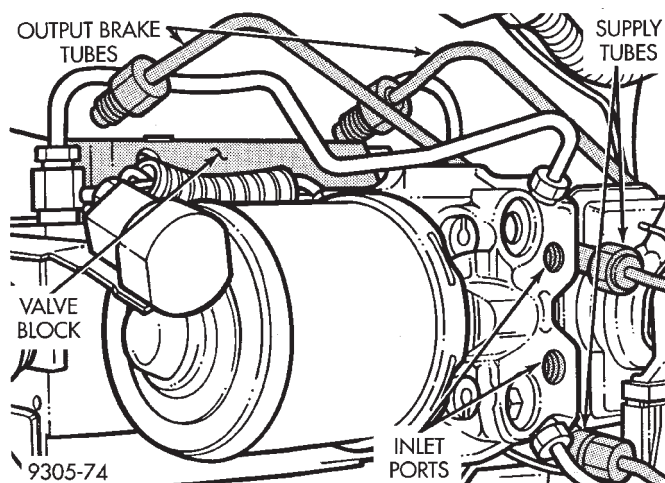


Fig. 6 Brake Fluid Tube Connections At (HCU)

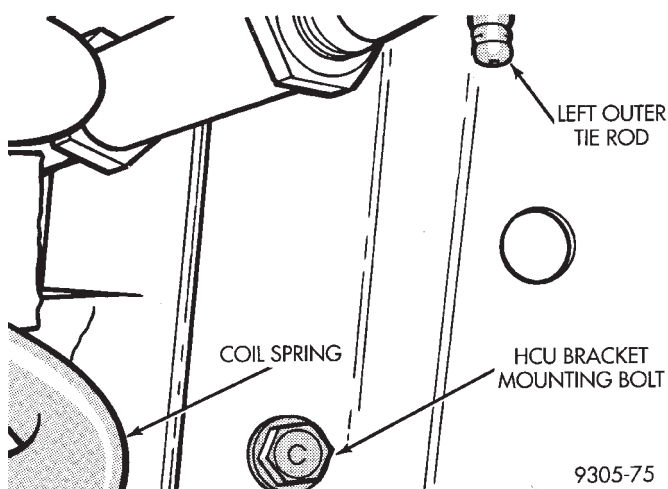


Fig. 7 (HCU) To Inner Fender Mounting Bolt

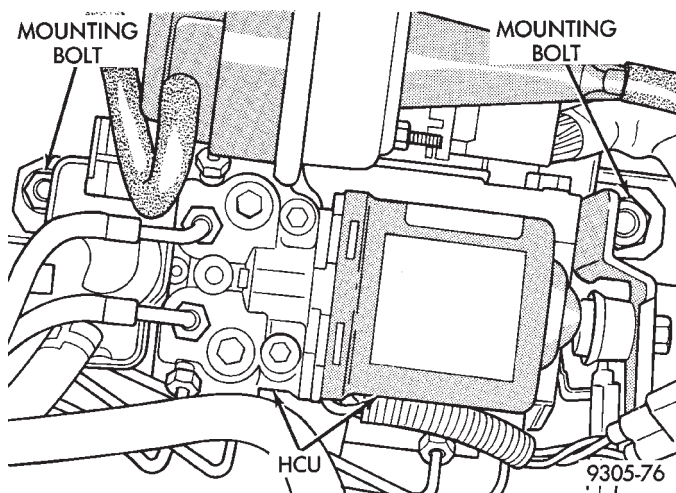


Fig. 8 (HCU) To Frame Rail Mounting Bolts

INSTALL

(1) Install (HCU) and bracket as an assembly back on left frame rail of vehicle. Install but do not tighten the 2 (HCU) bracket to frame rail mounting bolts (Fig. 8). Install the (HCU) bracket to inner

fender mounting bolt (Fig. 7). Torque the 2 (HCU) bracket to frame rail attaching bolts to 19 N•m (14 ft. lbs.). The torque bracket to inner fender bolt to 2 N•m (18 in. lbs.).

(2) Connect the 2 brake fluid supply tubes from the master cylinder onto the inlet ports of the (HCU) (Fig. 9). Connect the 2 brake fluid output tubes to the ports on the (HCU) valve block (Fig. 9). Torque all 4 brake tube fitting nuts to 19 N•m (14 ft. lbs.).

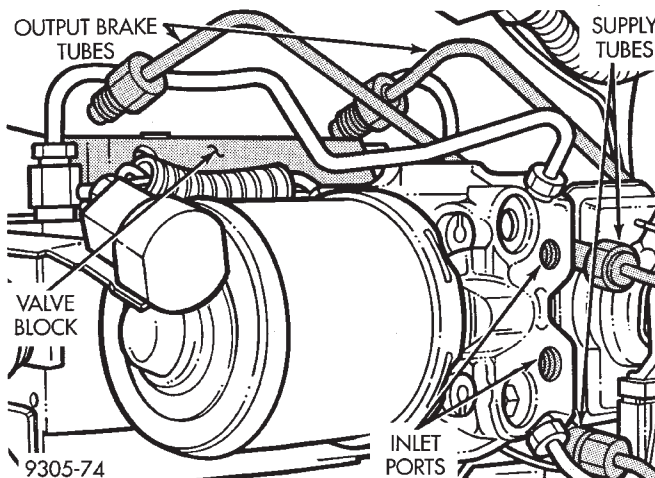


Fig. 9 Brake Fluid Tube Connections At (HCU)

(3) Connect the 2 rear brake tubes onto the proportioning valves located on valve block of hydraulic assembly (Fig. 10). Torque the 2 brake tube fitting nuts at proportioning valves to 19 N•m (14 ft. lbs.).

(4) Remove plug from end of brake fluid supply hose going to reservoir at (HCU). Connect supply hose on (HCU) reservoir nipple and install hose clamp on hose. Be sure clamp is past bead on nipple of (HCU) fluid reservoir.

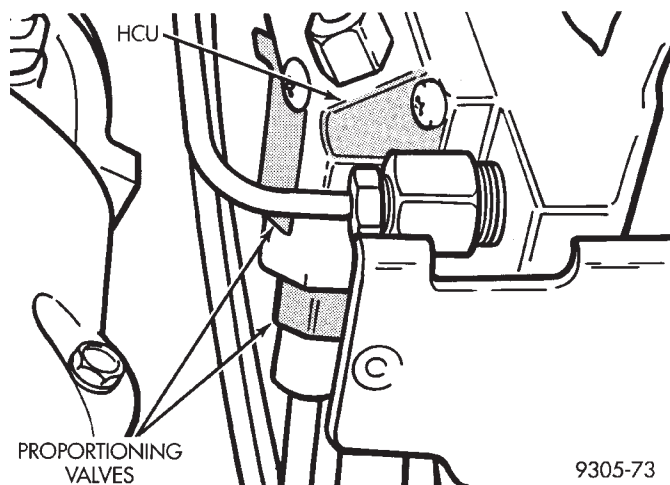


Fig. 10 Brake Tube Connections At Proportioning Valves

(5) **VERIFY THAT THE VEHICLE IGNITION IS OFF BEFORE CONNECTING THE 37 WAY CONNECTOR.** Connect the wiring harness 37 way



connector to the (CAB) using the following procedure. Install connector onto (CAB) with the connector pins located in latch first (Fig. 11). Then rotate rear of connector down onto (CAB) until fully seated onto connector pins on (CAB) (Fig. 11). Rotate connector latch forward and down until seated on the top of the (CAB) connector.

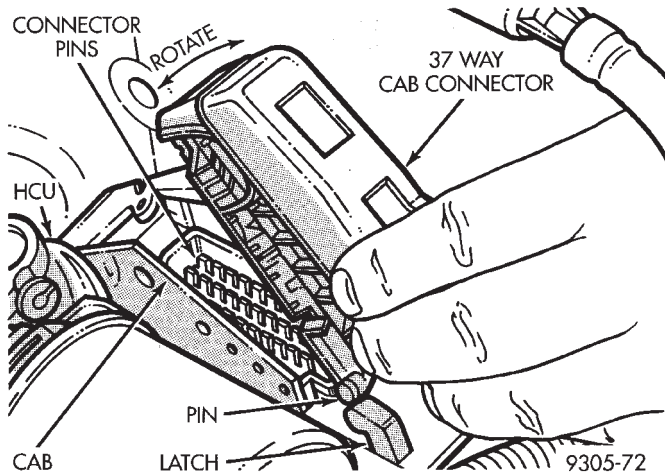


Fig. 11 (CAB) Connector Installation On (CAB)

(6) Connect the pump motor and fluid level sensor, vehicle wiring harness connectors back onto the their connections on the (HCU) (Fig. 12).

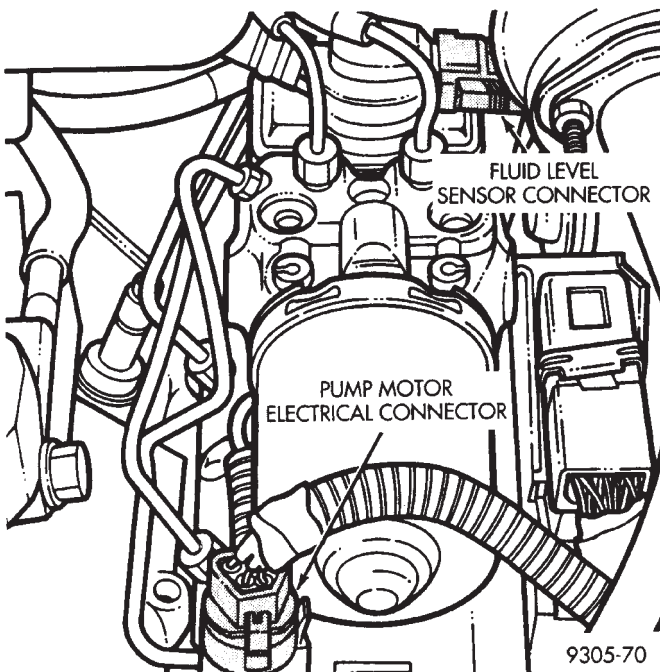


Fig. 12 (HCU) Electrical Connections

(7) Install battery tray back in vehicle and install and tighten the 4 battery tray to vehicle attaching fasteners (Fig. 13).

(8) Bleed the air from brake hydraulic system. Refer to the Bleeding Teves Mark IV Anti-Lock Brake System in this section of the manual for proper

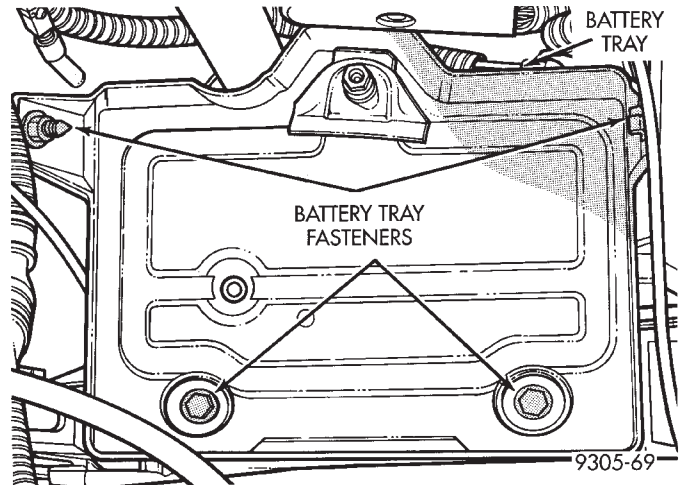


Fig. 13 Battery Tray Attaching

bleeding procedure. **When bleeding brake system visually inspect all line fittings previously disconnected for any signs of leakage.**

(9) Install the left front tire and wheel assembly on vehicle.

Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence (Fig. 14) 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.).

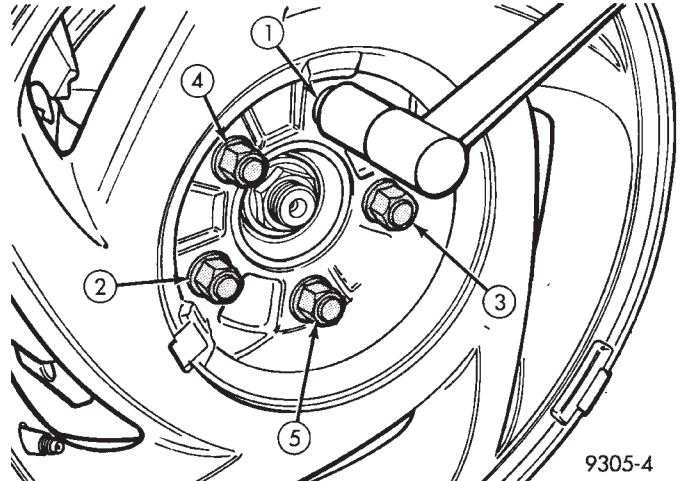


Fig. 14 Tightening Wheel Nuts

(10) Lower vehicle.

CAUTION: Heat shield MUST be installed when servicing of (HCU) is completed. Failure to install heat shield could result in a failure of the (CAB) due to high temperature.

(11) Install heat shield back on (HCU) mounting bracket.



HYDRAULIC CONTROL UNIT FLUID RESERVOIR (FLS2)

The reservoir at the H.C.U. (Fig. 1) includes the (FLS2) fluid level switch. This reservoir is connected to the master cylinder reservoir by a low pressure hydraulic tube.

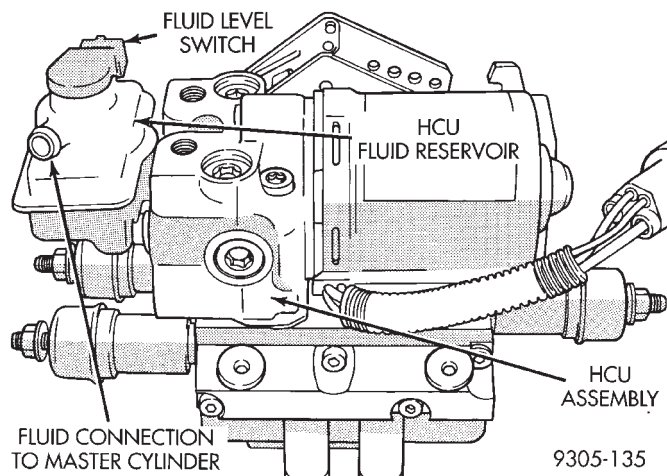


Fig. 1 HCU Fluid Reservoir And Fluid Level Switch

REMOVE

(1) Remove the (HCU) assembly from the vehicle. Refer to Hydraulic Control Unit Removal, in this section of the service manual for the required removal procedure.

(2) Drain brake fluid from (HCU) fluid reservoir.

(3) Using a 1/8 in. pin punch, drive (HCU) fluid reservoir retaining roll pin down until it is below hole in fluid reservoir (Fig. 2). Note: If replacing reservoir on a (HCU) with traction control, drive pin completely out of pump housing.

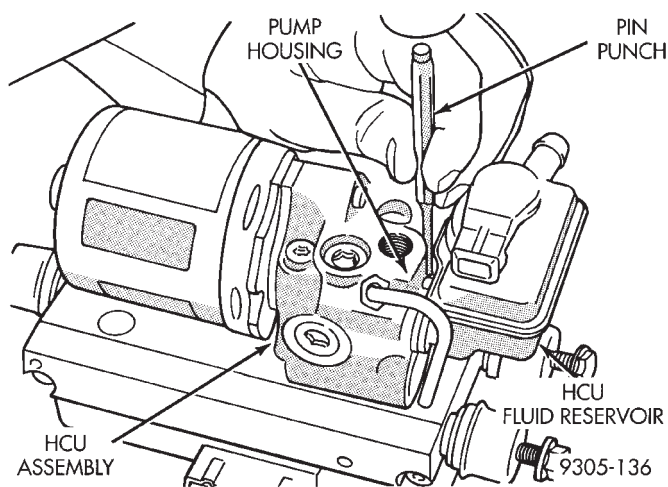


Fig. 2 Removing (HCU) Reservoir Retaining pin

(4) Insert a screwdriver between pump housing and reservoir (Fig. 3). Carefully pry fluid reservoir off of (HCU) assembly.

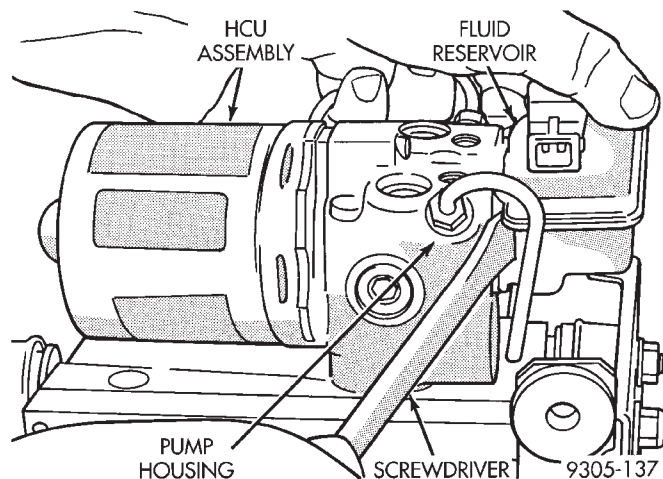


Fig. 3 Remove Fluid Reservoir From (HCU)

INSTALL

(1) Lubricate the (HCU) grommets and reservoir nipples with fresh clean brake fluid (Fig. 4).

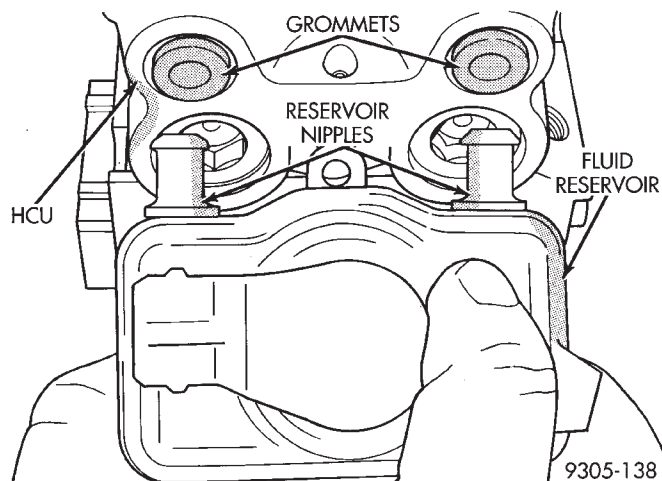


Fig. 4 Installing (HCU) Fluid Reservoir

(2) Place reservoir nipples against grommets. Rock reservoir up and down while pushing on reservoir until reservoir is fully seated into grommets. Reservoir is fully installed, when hole in reservoir is in line with retaining pin hole in pump housing.

(3) From bottom side of (HCU), drive reservoir retaining pin up until it extends up above retaining hole in fluid reservoir (Fig. 5).

Note: If the (HCU) reservoir being replaced is on a (HCU) for a vehicle equipped with traction control. Reservoir retaining will have to be replaced from the top.

(4) Install (HCU) assembly back in the vehicle. Refer to Hydraulic Control Unit Installation, in this section of the service manual for the required installation procedure.

(5) Bleed the air from brake hydraulic system. Refer to Bleeding Teves Mark IV Anti-Lock Brake System in this section of the manual for proper bleeding

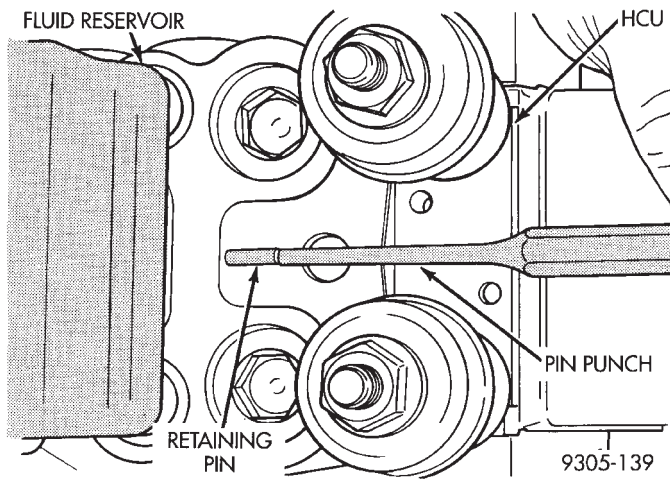


Fig. 5 Installing (HCU) Fluid Reservoir Retaining Pin procedure. When bleeding brake system visually inspect all line fittings previously disconnected for any signs of leakage.

PEDAL TRAVEL SENSOR

The pedal travel sensor (Fig. 1) provides information to the (CAB) on the position of the brake pedal while stopping the vehicle. It is an input which is used by the Anti-Lock brake system to control pump motor operation.

The pedal travel sensor may be serviced without requiring removal of the vacuum booster from the vehicle.

If the pedal travel sensor is removed from the vacuum booster for testing or replacement. The vacuum booster must be bled of all stored vacuum before pedal travel sensor can be removed. Failure to do this may result in the pedal travel sensor, sealing O-Ring being sucked into the brake vacuum booster. If the pedal travel sensor sealing O-Ring falls into the vacuum booster the booster will need to be replaced.

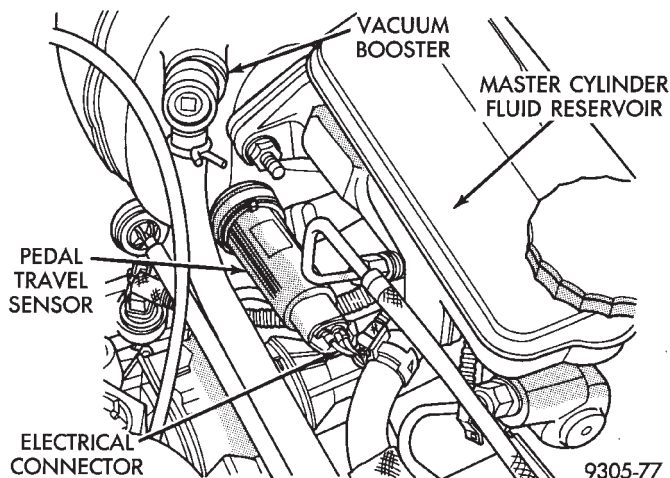


Fig. 1 Pedal Travel Sensor Location

REMOVE

(1) Pump the brake pedal approximately 20 times to evacuate all stored vacuum from the vacuum booster.

(2) Remove the wiring harness electrical connector (Fig. 1) from the end of the pedal travel sensor.

(3) Using a small screwdriver, lift pedal travel sensor retaining ring from notch (Fig. 2) in vacuum booster. Then remove retaining ring from pedal travel sensor mounting grommet in vacuum booster.

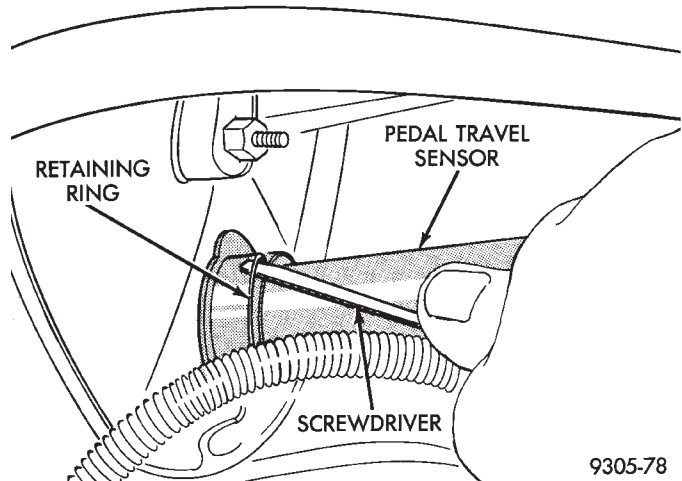


Fig. 2 Pedal Travel Sensor Retaining Ring Removal

(4) Remove pedal travel sensor from vacuum booster by pulling sensor straight out of power booster. After pedal travel sensor is removed from power booster be sure O-Ring is either on pedal travel sensor or remained in the travel sensor mounting grommet (Fig. 3).

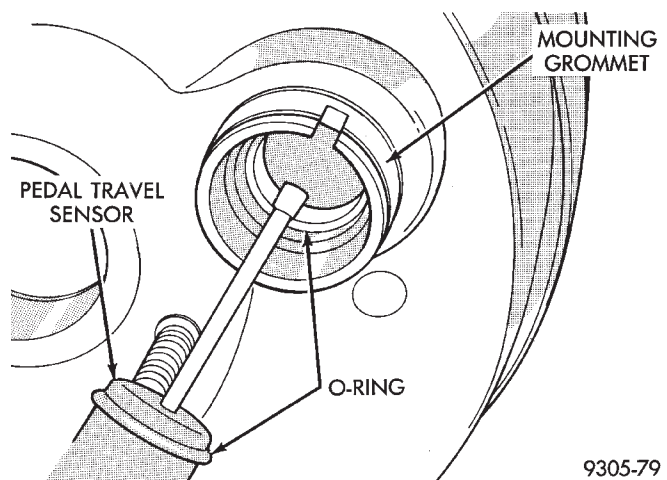


Fig. 3 Pedal Travel Sensor O-Ring Locations

INSTALL

(1) Install pedal travel sensor, retaining ring on travel sensor mounting grommet in the vacuum booster (Fig. 4). Tab on retaining ring should be located in top notch of mounting grommet.

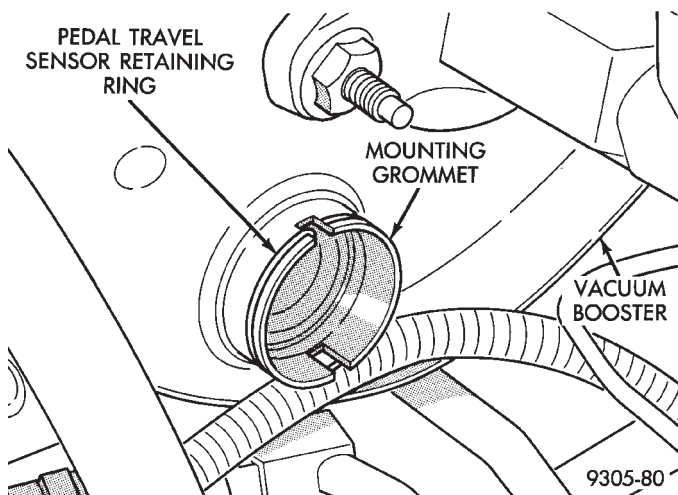


Fig. 4 Retaining Ring Mounted On Grommet

(2) Sparingly lubricate pedal travel sensor sealing O-Ring with fresh clean brake fluid. Then install pedal travel sensor sealing O-Ring in pedal travel sensor mounting grommet as shown in (Fig. 5).

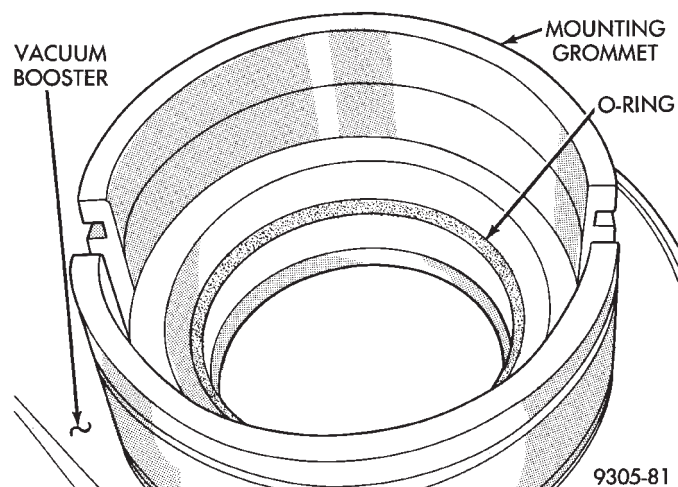


Fig. 5 Sealing O-Ring Location In Mounting Grommet

(3) Sparingly coat end of pedal travel sensor with clean fresh brake fluid. Install pedal travel sensor into mounting grommet by pushing it straight into mounting grommet on vacuum booster. Be sure travel sensor is inserted into grommet until tab on travel sensor is past retaining ring, locking travel sensor into grommet.

(4) Install vehicle wiring harness connector back on pedal travel sensor (Fig. 1). Make sure lock on connector is engaged with tab on pedal travel sensor.

(5) Test drive vehicle to ensure proper operation of the pedal travel sensor and vacuum booster.

MASTER CYLINDER AND POWER BOOSTER

REMOVAL AND INSTALLATION

The power booster used on this vehicle with Anti-Lock is the same as the base brake system, in the way it is mounted and removed from the vehicle.

If the master cylinder or the power booster need to be serviced or replaced. Refer to Master Cylinder or Power Brake Service section in this group of the service manual.

After servicing the master cylinder or power booster. Refer back to this section of the service manual. For the appropriate procedure and sequence, used to bleed the base and Anti-Lock portion of the brakes hydraulic system.

PROPORTIONING VALVES (FIG. 6)

CAUTION: Proportioning valves should never be disassembled.

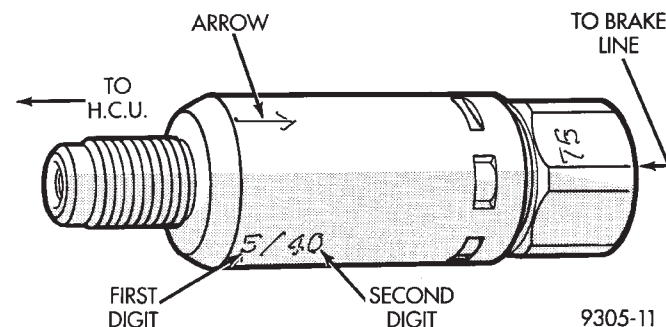


Fig. 6 ABS Proportioning Valve Identification

REMOVAL

(1) Remove the (HCU) assembly from the vehicle. Refer to Hydraulic Control Unit Removal, in this section of the service manual for the required removal procedure.

(2) Remove required proportioning valve from valve block of (HCU) (Fig. 7).

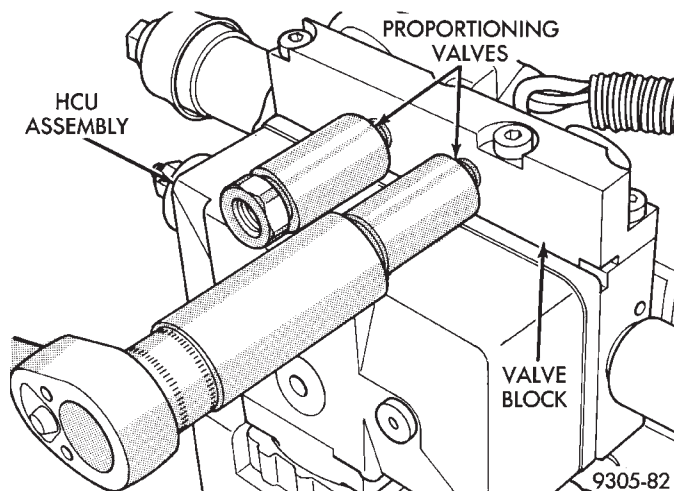


Fig. 7 Proportioning Valve Removal And Replacement

INSTALLATION

(1) Install proportioning valve into valve block on (HCU) (Fig. 7). Torque proportioning valve into valve body to 12 N•m (106 in. lbs.).



(2) Install (HCU) assembly back in the vehicle. Refer to Hydraulic Control Unit Installation, in this section of the service manual for the required installation procedure.

(3) Install brake tube on proportioning valve. Tighten tube nut to 15 N•m (11 ft. lbs.) torque.

(4) Bleed the air from brake hydraulic system. Refer to Bleeding Teves Mark IV Anti-Lock Brake System in this section of the manual for proper bleeding procedure. **When bleeding brake system visually inspect all line fittings previously disconnected for any signs of leakage.**

ELECTRONIC COMPONENTS

CONTROLLER ANTI-LOCK BRAKE (CAB)

REMOVAL

The (CAB) used on the Teves Mark IV Anti-Lock brake system is mounted and electrically connected directly to the (HCU) assembly (Fig. 1).

To remove the (CAB) from the (HCU) for replacement, it is necessary to remove the entire (HCU) and (CAB) from the vehicle as an assembly. There is not enough clearance to remove the (CAB) connector from the (HCU) with the assembly in the vehicle.

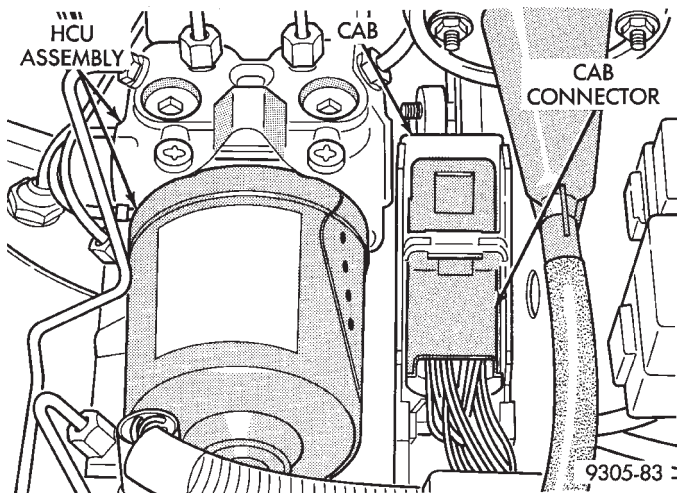


Fig. 1 Controller Anti-Lock Brakes (CAB) Location

(1) Turn vehicle ignition switch to the off position and remove the key.

(2) **VERIFY THAT THE VEHICLE IGNITION IS OFF BEFORE REMOVING THE (HCU) FROM THE VEHICLE.** Remove the (HCU) assembly from the vehicle. Refer to Hydraulic Control Unit Removal, in this section of the service manual for the required removal procedure.

(3) Remove the 2 (CAB) module to (HCU) assembly mounting bolts (Fig. 2). Then press down on (CAB) to (HCU) retaining clip (Fig. 3) to allow for removal of the (CAB) from the (HCU).

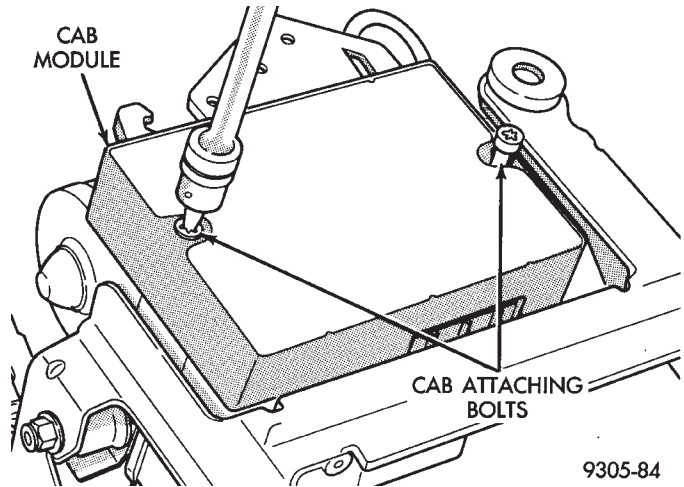


Fig. 2 (CAB) Removal And Installation At (HCU)

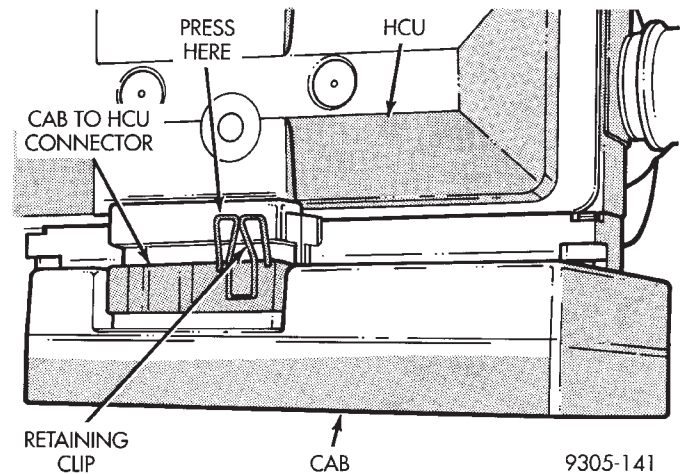


Fig. 3 (CAB) to (HCU) retaining clip

(4) Remove the (CAB) module from the (HCU) assembly by pulling it straight out of the connector on the (HCU) **DO NOT TWIST.**

INSTALLATION

(1) Install the (CAB) module by pushing it straight into the connector on the (HCU) until fully seated and retaining clip is latched.

(Fig. 3).

(2) Install the 2 (CAB) module to (HCU) assembly attaching bolts (Fig. 2). Torque the 2 (CAB) module to (HCU) mounting bolts to 12 N•m (106 in. lbs.).

(3) Install (HCU) assembly back in the vehicle. Refer to Hydraulic Control Unit Installation, in this section of the service manual for the required installation procedure.

(4) Bleed the air from brake hydraulic system. Refer to the Bleeding Teves Mark IV Anti-Lock Brake System in this section of the manual for proper bleeding procedure. **When bleeding brake system visually inspect all line fittings previously disconnected for any signs of leakage.**



(5) Install the left front tire and wheel assembly on vehicle. Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence (Fig. 4) 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.).

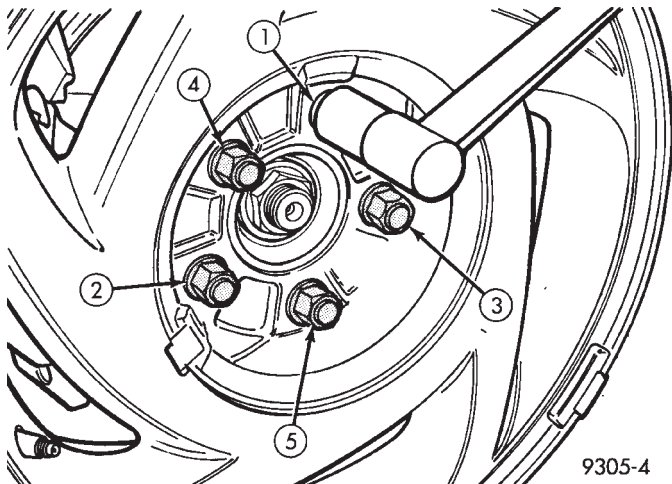


Fig. 4 Tightening Wheel Nuts

(6) Lower vehicle.

CAUTION: Heat shield **MUST** be installed when servicing of (HCU) is completed. Failure to install heat shield could result in a failure of the (CAB) due to high temperature.

(7) Install heat shield back on (HCU) mounting bracket.

MAIN RELAY AND PUMP MOTOR RELAY

The main relay and pump motor relay are both serviced together as an assembly, with the relay mounting bracket. They are mounted to a bracket that is attached to the side of the power distribution center (PDC) (Fig. 4).

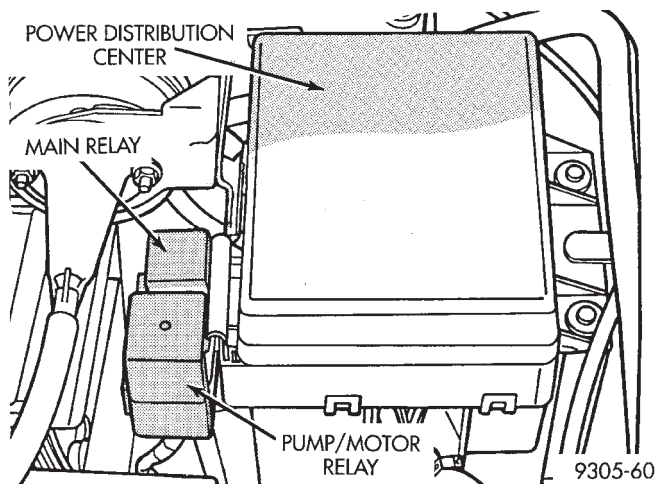


Fig. 4 System Relay/Warning Lamp Relay Location

REMOVE

(1) Hold the relays with one hand, and pull straight down on wiring harness connectors, until connectors are free from the relays (**do not twist connectors**).

(2) Remove the relays and bracket as an assembly from the side of the (PDC).

INSTALL

(1) Mount the relays and bracket assembly to the side of the (PDC), making sure that the relay bracket is securely latched to the (PDC).

(2) Holding the relays with one hand, push the wiring harness connector straight onto the terminals of the relay. Make sure the connector is fully seated onto the terminals of the relay.

WHEEL SPEED SENSORS

INSPECTION

Inspect tonewheel for missing or broken teeth, this can cause erratic sensor signals.

Tonewheel should show no evidence of contact with the wheel speed sensor. If contact was made, determine cause and correct.

Excessive runout of the tonewheel can cause erratic wheel speed sensor. Replace assembly if runout exceeds approximately 0.25 mm (0.010 inch).

FRONT WHEEL SPEED SENSOR

REMOVAL

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

(2) Remove screw from grommet retainer clip that holds cable grommet into fender shield (Fig. 5).

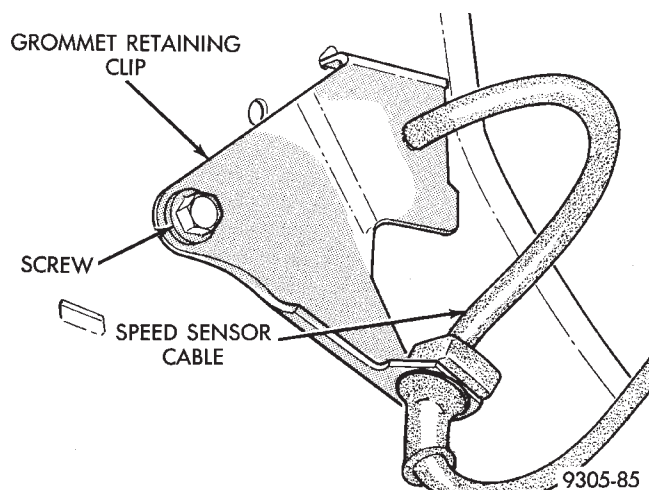


Fig. 5 Front Speed Sensor Cable Retaining Clip

(3) Carefully, pull sensor assembly grommet from fender shield.

(4) Unplug speed sensor connector from vehicle wiring harness connector (Fig. 6).

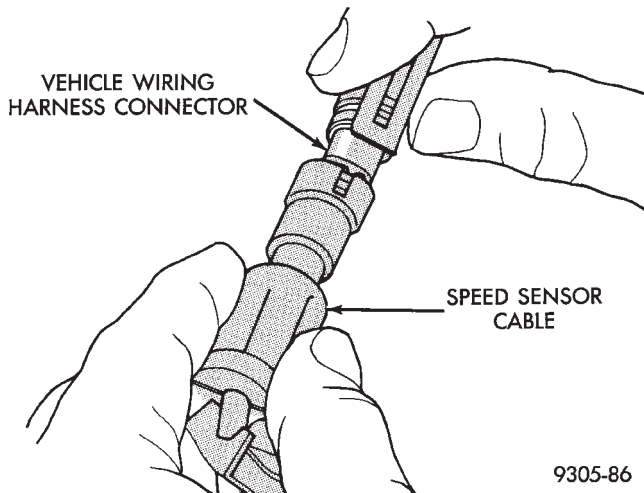


Fig. 6 Speed Sensor Cable To Wiring Harness Connection

(5) Remove the speed sensor cable routing bracket from the front strut assembly (Fig. 7).

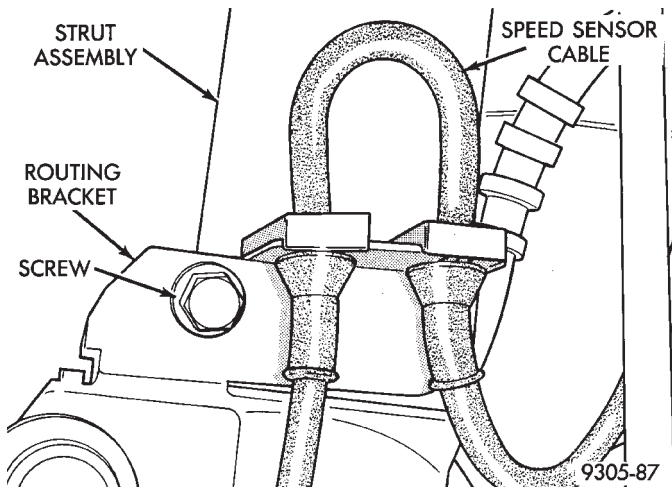


Fig. 7 Speed Sensor Cable To Strut Assembly Routing Clip

(6) Remove screw attaching speed sensor head to steering knuckle.

(7) Carefully, remove sensor head from steering knuckle. If the sensor has seized, due to corrosion, **DO NOT USE PLIERS ON SENSOR HEAD**. Use a hammer and punch (Fig. 8) to tap edge of sensor ear, rocking sensor side to side until free.

INSTALLATION

(1) Coat speed sensor head with High Temperature Multi-purpose E.P. Grease before installing into the steering knuckle. Install speed sensor head into steering knuckle. Install screw tighten to 7 N•m (60 in. lbs.)

CAUTION: Proper installation of wheel speed sensor cables is critical to continued system operation. Be sure that cables are installed in retainers. Fail-

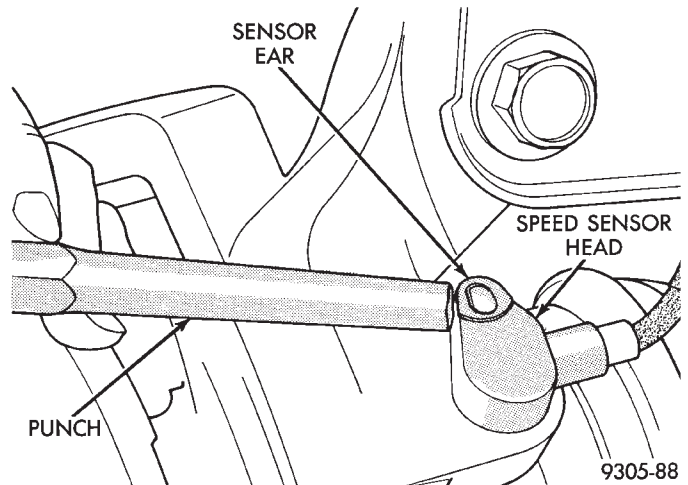


Fig. 8 Speed Sensor Head Removal (Typical)

ure 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.

(2) Correctly route the speed sensor cable up to the strut assembly (Fig. 7). Install speed sensor cable routing bracket on strut assembly. Then install and tighten routing bracket attaching screw (Fig. 7).

(3) Connect speed sensor cable connector, to vehicles wiring harness connector (Fig. 6). Be sure locking tab on connector is securely latched.

(4) Push speed sensor cable grommet into hole in fender shield. Install grommet retaining clip and screw (Fig. 5).

(5) Install wheel and tire assembly on vehicle. Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence (Fig. 9) 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.).

(6) Lower vehicle.

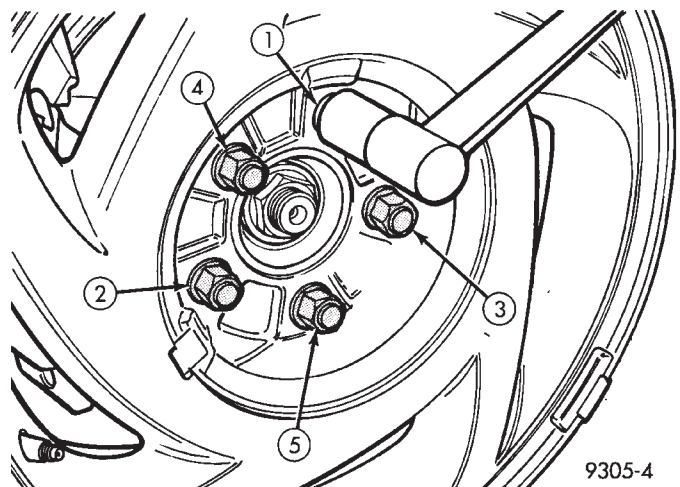


Fig. 9 Tightening Wheel Nuts



REAR WHEEL SPEED SENSOR

REMOVE

(1) Remove the rear seat lower cushion and seat back cushion from vehicle. Refer to group 23 Body in this service manual for required rear seat cushion removal procedure.

(2) Lift edge of sound insulation on rear bulkhead (Fig. 10). Locate speed sensor cable to vehicle wiring harness connector (Fig. 10). Disconnect speed sensor cable from vehicle wiring harness.

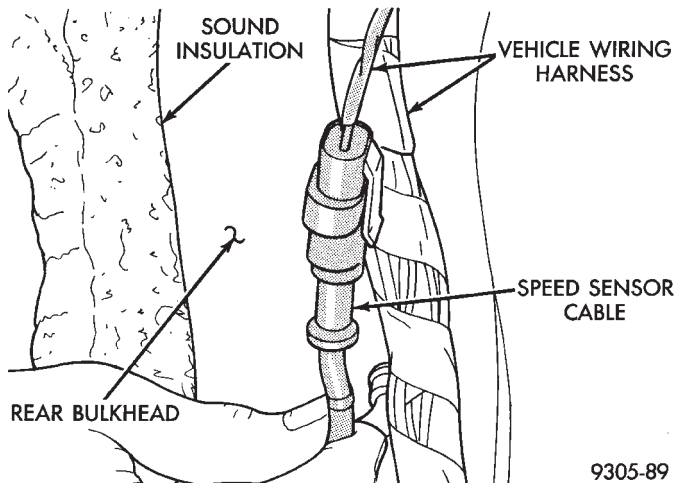


Fig. 10 Rear Speed Sensor Cable To Vehicle Wiring Harness Connection

(3) Raise vehicle and remove rear wheel and tire assembly.

(4) Remove speed sensor cable grommet retaining clip (Fig. 11) from rear inner fender. Carefully pull speed sensor cable and grommet from hole in fender well.

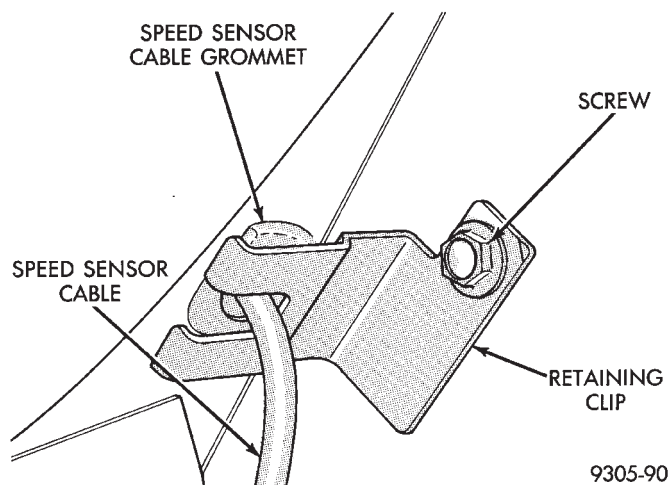


Fig. 11 Rear Speed Sensor Cable Retaining Clip

(5) Remove speed sensor head, attaching bolt from rear adapter (Fig. 12). Then remove rear speed sensor head from adapter. If the sensor has seized, due to corrosion, **DO NOT USE PLIERS ON SENSOR**

HEAD. Use a hammer and punch (Fig. 13) to tap edge of sensor ear, rocking sensor side to side until free.

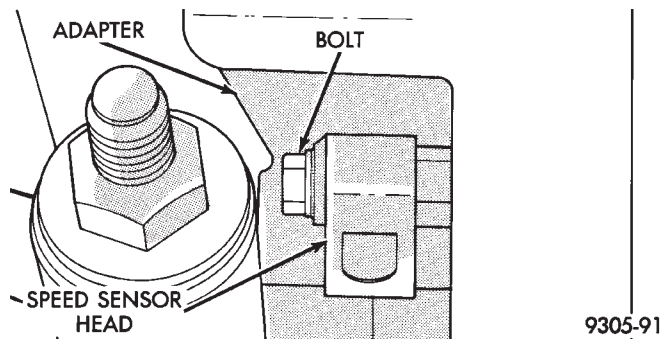


Fig. 12 Speed Sensor Head Attachment To Adapter

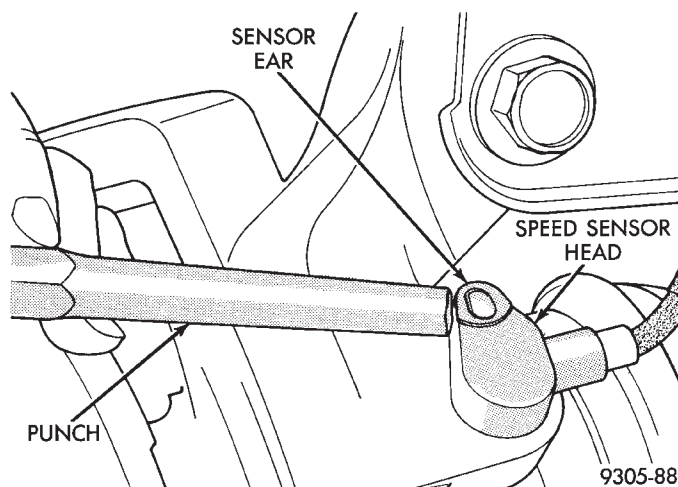


Fig. 13 Speed Sensor Head Removal (Typical)

(6) Remove screws attaching speed sensor cable mounting tube to inboard side of trailing arm (Fig. 14). Remove speed sensor cable routing brackets from rear fender well and trailing arm bracket at rear knuckle (Fig. 14).

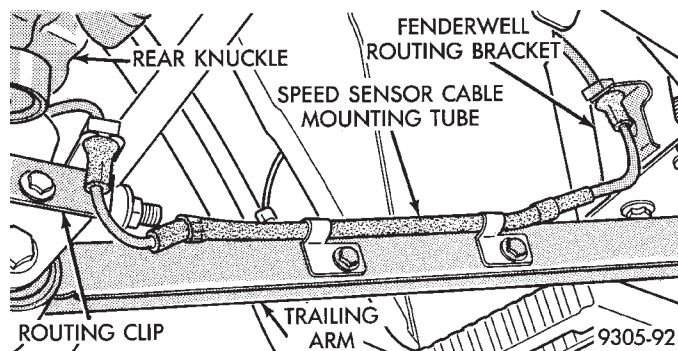


Fig. 14 Rear Speed Sensor Cable Attaching

(7) Remove speed sensor cable assembly from vehicle.

**INSTALLATION**

(1) Coat speed sensor where it slides into adapter with high temperature multi-purpose E.P. Grease before installing into adapter. Install speed sensor head into adapter. Install speed sensor to adapter attaching screw. Torque the speed sensor attaching screw to 7N•m (60 in. lbs.).

(2) Install speed sensor cable mounting tube on trailing arm. Install speed cable routing tube to trailing arm attaching screws (Fig. 14). Install speed sensor cable routing brackets at rear fender well and rear knuckle (Fig. 14).

(3) Insert speed sensor cable and grommet back in hole in rear inner fender. Install speed sensor cable grommet retaining bracket and securely tighten attaching screw (Fig. 11).

(4) Install rear wheel and tire assembly back on vehicle. Install the wheel and tire assembly. Tighten the wheel mounting stud nuts in proper sequence (Fig. 15) 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.).

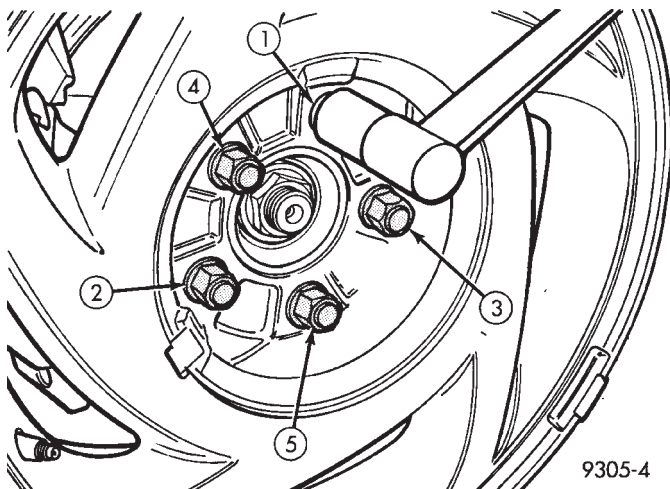


Fig. 15 Tightening Wheel Nuts

(5) Lower vehicle.

(6) Connect rear speed sensor cable connector, to vehicles wiring harness connector (Fig. 9). Be sure locking tab on connector is securely latched.

(7) Install the rear seat back cushion and seat lower cushion back into vehicle. Refer to group 23 Body in this service manual for required rear seat cushion removal procedure.

SPECIFICATIONS**SPECIFICATIONS METRIC****FRONT BRAKES – DISC**

Type	Single Piston-Dual Pin Slider
Caliper Bore Diameter	60mm
Adjustment	Automatic
Piston Material	Glass Filled Phenolic
Piston Boot Type	Press In EPDM Rubber
Disc Type All Bodies	Vented
Disc Diameter-Outside	282 mm std.
Runout – Maximum Allowable T.I.R.* ..	.05 mm (.0019 in.)
Parallelism-Total Variation in Thickness in 360 of Rotation	.013 mm (.0005 in.)
Brake Shoes and Linings	Rivited

*Measured On The Vehicle

REAR BRAKES – DISC WITH SEPARATE PARKING BRAKE

Type	Single Piston With Internal Park Brake (Drum In Hat)
Caliper Bore Diameter	34mm 15 in. Wheel
Adjustment	Disc Brake-Automatic Parking Brake-Manual
Piston Material	Glass Filled Phenolic
Piston Boot Type	Press In EPDM Rubber
Disc Type	Solid-15 in. Wheel
Disc Diameter-Outside	286 mm-15 in. Wheel
Diameter-Parking Brake Drum	171.9 mm to 172.15 mm

REAR BRAKES – DRUM

Type	Leading Trailing
Adjustment	Automatic
Drum Diameter	220 mm (8 in.)
Wheel Cylinder Diameter	18.4 mm
Brake Shoes and Linings	Rivited

9305-145



BRAKE ACTUATION SYSTEM

Actuation: Power Brakes Standard
Hydraulic System Dual-Diagonally Split

Master Cylinder:

Type Dual-Tandem-Chrysler
Body Material Anodized Aluminum
Reservoir Material Glass Reinforced Nylon
Bore and Stroke 23.8 mm x 39.5 mm
Displacement Split 50/50
Outlet Port Threads ABS M-12 Pri. and Sec.
..... W/O ABS M-12 Sec.
..... M-10 Pri.

Outlet Fitting Type ISO Flare
ABS Hydraulic Assembly Fitting
Type ISO Style Flare
Pedal Ratio 3.28

Booster:

Make Bendix Vacuum/Hyd.
..... W/O ABS
..... Teves Vacuum/Hyd.
..... W/ABS
Mounting Studs M8 x 1.25
Type 205mm W/O ABS
..... 200mm W/ABS
Boost @ 20" HG 4690 N·m

Hydraulic Valve

Material Aluminum
Function Proportioning Valve
9305-146

TIGHTENING REFERENCE

DESCRIPTION	TORQUE
Hydraulic Brake Tubes To All Fittings (If Not Specified) ..	17 N·m (143 in. lbs.)
Brake Hoses To Calipers (Banjo Bolts)	48 N·m (35 ft. lbs.)
Brake Hose Intermediate Bracket	12 N·m (105 in. lbs.)
Master Cylinder To Brake Booster Mounting Nuts	28 N·m (250 in. lbs.)
Brake Booster Assembly To Dash Panel	28 N·m (250 in. lbs.)
Wheel Cylinder To Rear Brake Support Plate	8 N·m (75 in. lbs.)
Wheel Cylinder Bleed Screw ...	10 N·m (80 in. lbs.)
Brake Support Plate To Rear Axle Mounting Bolts	109 N·m (80 ft. lbs.)
Wheel Stud Lug Nuts	110-135 N·m (85-115 ft. lbs.)
Caliper To Steering Knuckle Mounting Bolts	20 N·m (192 in. lbs.)
Caliper Guide Pin Bolts	41 N·m (30 ft. lbs.)
Bearing Retainer Mounting Bolt	168 N·m (124 ft. lbs.)
Caliper Bleed Screw	15 N·m (125 in. lbs.)
Brake Light Switch Mounting Bracket Screw	8 N·m (75 in. lbs.)
Parking Brake Assembly Mounting	28 N·m (250 in. lbs.)
CAB Screw to Hcu	12 N·m (106 in. lbs.)

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