BRAKES AND WHEELS

BRAKE DIAGNOSIS

GENERAL

In most instances, the owner will describe the difficulty as one or more of the conditions listed in the diagnosis charts. Road test the vehicle with the customer to confirm the difficulty and obtain additional information. Follow procedures listed in the brake diagnosis charts to pinpoint the cause of the problem.

ADJUSTMENTS

Brake Pedal and Linkage

The one-piece suspended brake pedal is connected to the support bracket by the brake pedal shaft. The shaft serves both as an attaching part and as a pivot for the brake pedal.

The brake pedal linkage should be lubricated and inspected regularly for binding, looseness, or excessive play. Binding can cause improper pedal release which may result in brake drag and rapid lining wear. Worn pedal linkage may cause a low pedal condition or frequent need for brake adjustment.

Pedal free play should be 1/16 to 1/4 inch. Inadequate free play can result in brake drag or grab. Excessive free play can result in a low brake pedal. Pedal free play on models with nonpower brakes is governed by the brake pedal push rod length which is preset at manufacture. Push rod length is not adjustable on these models and, under normal circumstances, should not require further attention. Power brake equipped vehicles utilize a single push rod in the power unit which is not adjustable. When replacing power brake units, use the push rod supplied with the replacement power unit as it has been properly gauged and preset for use with the replacement unit. Pedal free play for power brake equipped vehicles is the same as for vehicles with manual brakes (1/16 inch to 1/4 inch).

Parking Brake Adjustment—All Models

NOTE: *Wheel brakes must be adjusted before adjusting parking brakes.*

(1) Release parking brake.
(2) Loosen locknuts at equalizer and relieve tension on cables.
(3) Inspect all cables for binds, kinks, or frayed condition. Replace defective cables.
(4) Tighten cables until slight drag is produced at wheels.
(5) Loosen cables until wheels rotate freely and brake drag is eliminated.
(6) Tighten locknuts at equalizer.
(7) Check operation of parking brake.

Stoplamp Switch—All Models

The stoplamp switch is mounted on a flange attached to the brake pedal support bracket. A spring-loaded plunger in the switch opens and closes the stoplamp circuit.

When the brake pedal is in the released position, the pedal arm contacts the switch plunger, holding it in the off position. When the brake pedal is depressed, the spring-loaded plunger extends with brake pedal movement until the switch is in the on position.

Switch Adjustment

(1) On CJ models with air conditioning, remove screws attaching evaporator housing to instrument panel and lower housing.

(2) Press and hold brake pedal in applied position.

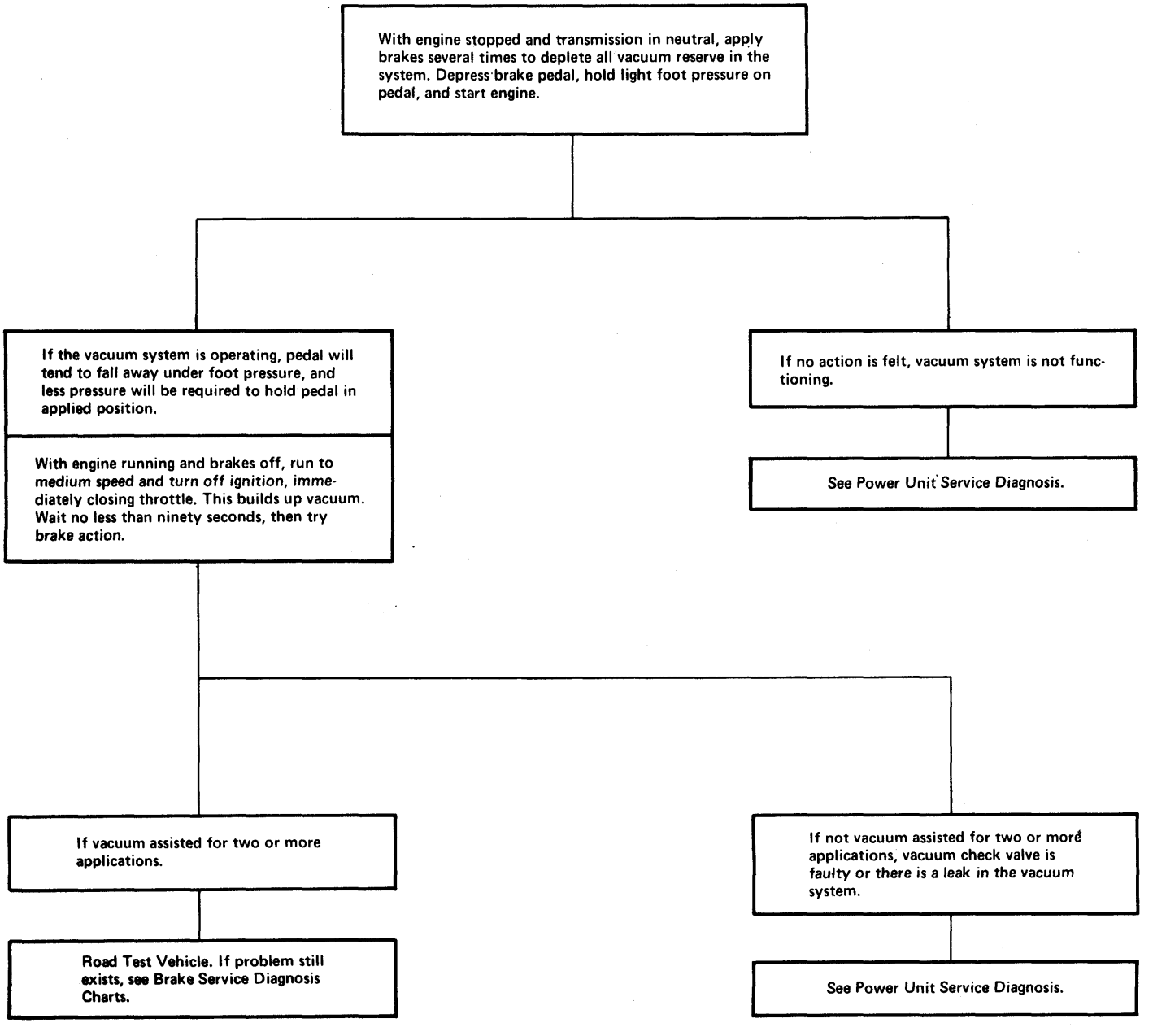
(3) Push stoplamp switch through mounting bracket until it stops against brake pedal bracket.

(4) Release brake pedal to set switch in proper position.

(5) Check switch position. Switch plunger should be in ON position and activate stoplamps after 3/8 to 5/8 inch of brake pedal travel. Measure pedal travel from center of brake pedal pad.

(6) On CJ models with air conditioning, reposition evaporator housing and install housing attaching screws.

Power Brake Diagnosis Procedure



Power Unit Service Diagnosis

Condition	Possible Cause	Correction
HARD PEDAL (NO POWER ASSIST)	(1) Refer to EXCESSIVE PEDAL EFFORT.	(1) Refer to EXCESSIVE PEDAL EFFORT.
	(2) Loss of vacuum to power unit.	(2) Check for loose hose or check valve seal. Check for collapsed or damaged hose. Inspect vacuum check valve for damage or leak. Replace parts as required.
	(3) Internal malfunction in power unit.	(3) Replace power unit.
SLOW RETURN OF BRAKE PEDAL	(1) Bellcrank pivot pins binding (CJ only) or, pedal linkage binding. See PULLS and GRABBING BRAKES in Brake Service Diagnosis Charts.	(1) Lube all pedal pivot points. Remove, clean, lube and install pivot pins.
	(2) Internal malfunction in power unit.	(2) Replace power unit.
GRABBING OR DRAGGING BRAKES	(1) Bellcrank pivot pins binding (CJ only).	(1) Remove, clean, lubricate, and install pivot pins.
	(2) Refer to PULLS and GRABBING BRAKES in Brake Service Diagnosis Charts.	(2) See PULLS and GRABBING BRAKES in Brake Service Diagnosis Charts.
	(3) Push rod (in power unit) binding due to corrosion or burrs on push rod.	(3) Check and correct as required. Do not lube push rod. Clean push rod with brake fluid and clean cloth only.
	(4) Internal malfunction in power unit.	(4) Replace power unit.

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Drum Brake Service Diagnosis—All Models

LOW PEDAL OR PEDAL GOES TO TOE BOARD	(1) Low fluid level.	(1) Fill reservoir with approved brake fluid.
	(2) Excessive clearance between lining and drums.	(2) Adjust brakes.
	(3) Automatic adjusters not working.	(3) Make forward and reverse stops; if pedal stays low, repair faulty adjusters.
	(4) Leaking brake lines.	(4) Repair or replace faulty parts.

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Drum Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
LOW PEDAL OR PEDAL GOES TO TOE BOARD (Continued)	(5) Leaking wheel cylinders.	(5) Overhaul wheel cylinder.
	(6) Internal leak in master cylinder.	(6) Overhaul master cylinder.
	(7) Air in system.	(7) Bleed system.
	(8) Improper brake fluid.	(8) Flush system and refill with approved fluid.
SPRINGY, SPONGY PEDAL	(1) Air trapped in hydraulic system.	(1) Remove air by bleeding.
	(2) Improper brake fluid.	(2) Flush and bleed system; use approved brake fluid.
	(3) Improper lining thickness or location.	(3) Install new lining or replace shoe and lining.
	(4) Drums worn too thin, (beyond 0.060 inch oversize specification)	(4) Replace drum(s) as required.
	(5) Master cylinder filler vent clogged	(5) Clean vent or replace cap; bleed brakes.
	(6) Hoses-lines collapsed, kinked, leaking.	(6) Replace as required.
	(7) Master cylinder compensator port blocked.	(7) Disassemble master cylinder. Repair as required.
EXCESSIVE PEDAL PRESSURE REQUIRED TO STOP VEHICLE	(1) Brake adjustment not correct.	(1) Adjust brakes.
	(2) Incorrect lining.	(2) Install new linings.
	(3) Grease or fluid-soaked lining.	(3) Repair grease seal or wheel cylinder. Install new linings.
	(4) Improper fluid.	(4) Flush system; use approved brake fluid.
	(5) Frozen master or wheel cylinder pistons.	(5) Overhaul master or wheel cylinders.
	(6) Brake pedal binding on shaft.	(6) Lubricate pivot points.
	(7) Linings watersoaked.	(7) Drive with brakes lightly applied to dry linings.
	(8) Glazed linings.	(8) Replace linings.
	(9) Bell-mouthed, barrel-shaped, or scored drums.	(9) Replace or resurface drums in left and right hand pairs.

Drum Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
LIGHT PEDAL PRESSURE-BRAKES TOO SEVERE	(1) Brake adjustment not correct.	(1) Adjust brakes.
	(2) Loose support plates.	(2) Tighten support plates.
	(3) A small amount of grease or fluid on linings.	(3) Replace the linings.
	(4) Pedal linkage binding, or power unit bellcrank pivot pins binding (CJ only).	(4) Lube linkage and bellcrank pivot pins.
	(5) Internal bind in power unit.	(5) Replace power unit.
	(6) Incorrect lining.	(6) Install new linings.
	(7) Lining loose on shoe.	(7) Replace lining or shoe and lining.
	(8) Bell-mouthed, barrel-shaped, or scored drums.	(8) Turn drums in pairs or replace.
	(9) Combination valve faulty.	(9) Replace combination valve.
PULSATING BRAKE PEDAL	(1) Drums out-of-round.	(1) Refinish or replace drums.
	(2) Loose brake drum on hub.	(2) Tighten.
	(3) Worn or loose wheel bearings.	(3) Replace or adjust.
	(4) Bent shoes or linings.	(4) Replace shoe-lining assembly as required.
	(5) Bent rear axle shaft.	(5) Replace axle shaft.
	(6) Loose or bent support plate.	(6) Tighten or replace support plate.
BRAKE FADE	(1) Incorrect lining.	(1) Replace lining.
	(2) Air in lines or improper brake fluid.	(2) Bleed system. Drain and flush if fluid is improper type.
	(3) Master cylinder primary piston worn, or bore scored, corroded.	(3) Disassemble master cylinder. Repair as required.
ALL BRAKES DRAG (ADJUSTMENT IS KNOWN TO BE CORRECT)	(1) Pedal bellcrank pivot pins binding (CJ only).	(1) Lubricate pedal pivot or bellcrank pivot pins.
	(2) Improper fluid.	(2) Replace rubber parts and fill.
	(3) On power brakes (CJ only) push rod height is incorrect.	(3) Adjust push rod height.

Drum Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
ALL BRAKES DRAG (ADJUSTMENT IS KNOWN TO BE CORRECT (Continued)	(4) Compensating or bypass port of master cylinder closed.	(4) Open with compressed air.
	(5) Use of inferior hydraulic fluid or rubber parts. (Swollen cups, corroded wheel or master cylinder bores.	(5) Overhaul wheel and/or master cylinder.
BRAKE PEDAL TRAVEL DE-CREASING	(1) Master cylinder compensating port plugged.	(1) Use compressed air to unplug.
	(2) Power bellcrank pivot pins binding (CJ only) or pedal pivot binding on manual brakes.	(2) Lube pedal pivot or pivot pins.
	(3) Swollen cup in master cylinder.	(3) Replace rubber parts. Flush system.
	(4) Master cylinder piston not returning.	(4) Overhaul master cylinder.
	(5) Wheel cylinder pistons sticking.	(5) Overhaul wheel cylinder.
ONE WHEEL DRAGS	(1) Weak or broken brake shoe retracting springs.	(1) Replace the defective brake shoe springs and lubricate the brake shoe ledges.
	(2) Power unit bellcrank pivot pins binding (CJ only) or pedal pivot binding.	(2) Lube pedal pivot or pivot pins.
	(3) Insufficient brake shoe-to-drum clearance.	(3) Adjust brakes. Repair automatic adjusters if necessary.
	(4) Loose wheel bearings.	(4) Adjust wheel bearings.
	(5) Wheel cylinder piston cups swollen and distorted.	(5) Overhaul wheel cylinders.
	(6) Pistons sticking in wheel cylinder.	(6) Clean or replace pistons; clean cylinder bore.
	(7) Restriction in brake line.	(7) Clean out or replace.
	(8) Loose anchor pin.	(8) Adjust and tighten lock nut.
	(9) Parking brake components seized or incorrectly adjusted.	(9) Repair or replace parts as necessary.
ONE WHEEL LOCKS	(1) Contaminated linings.	(1) Replace the linings.
	(2) Worn tire treads.	(2) Replace tire or, match up tire treads from side to side.

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Drum Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
BRAKES GRAB OR WON'T HOLD IN WET WEATHER	(1) Linings water-soaked.	(1) Dry out linings by driving with brakes lightly applied.
	(2) Dirt, water in drums.	(2) Clean drums.
	(3) Bent support plate allowing excessive water to enter drum.	(3) Replace support plate.
	(4) Scored drums.	(4) Replace or resurface in pairs.
BRAKES SQUEAK	(1) Support plate bent or shoes twisted.	(1) Replace damaged parts.
	(2) Metallic particles or dust imbedded in lining.	(2) Sand the surfaces of the linings and drums. Remove all particles of metal that may be found in the surface of the linings.
	(3) Lining rivets loose or lining not held tightly against the shoe at the ends.	(3) Replace rivets. Replace shoe lining assemblies if damaged.
	(4) Drums distorted.	(4) Turn or replace drums.
	(5) Shoes scraping on support plate ledges.	(5) Lubricate.
	(6) Weak or broken hold-down springs.	(6) Replace defective parts.
	(7) Loose wheel bearings.	(7) Adjust bearings.
	(8) Charred lining.	(8) Replace lining.
	(9) Loose support plate, anchor, drum, or wheel cylinder.	(9) Tighten.
	(10) Linings located wrong on shoes.	(10) Install linings correctly.
REAR BRAKES DRAG	(1) Adjustment not correct.	(1) Adjust brake shoes and parking brake mechanism.
	(2) Parking brake cables frozen.	(2) Lubricate or replace as required.
	(3) Dirty lining.	(3) Replace lining.
	(4) Wheel cylinder cups swollen or piston sticking.	(4) Overhaul cylinders.
	(5) Weak retracting springs.	(5) Replace springs.
	(6) Shoes binding on support plate.	(6) Lubricate support plate ledges.

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Drum Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
VEHICLE PULLS TO ONE SIDE	(1) Grease or fluid-soaked lining.	(1) Locate and correct leakage; replace linings.
	(2) Adjustment not correct.	(2) Adjust the brakes.
	(3) Loose wheel bearings, loose support plate(s) or loose spring bolts.	(3) Adjust wheel bearing; tighten support plate(s) and tighten spring bolts.
	(4) Linings not of specified kind or primary and secondary shoes reversed.	(4) Install new linings.
	(5) Power unit bellcrank pivot pins binding (CJ only).	(5) Lube pivot pins.
	(6) Tires not properly inflated or unequal wear of tread. Different tread design side to side.	(6) Inflate the tires to recommended pressures. Rotate tires so that tread surfaces of similar design and equal wear will be installed on the front wheels.
	(7) Water, mud, or foreign matter in brakes.	(7) Remove foreign material from brake parts and inside of the drums. Lubricate the shoe ledges and the rear brake cable ramps.
	(8) Wheel cylinder sticking.	(8) Overhaul or replace wheel cylinder.
	(9) Weak or broken retracting springs.	(9) Check springs. Replace bent, opencoiled or cracked springs.
	(10) Out-of-round drums.	(10) Resurface or replace drums in left and right hand pairs (both front and both rear).
	(11) Brake dragging.	(11) Check for loose lining. Repair or replace as required.
	(12) Broken spring or loose U-bolts.	(12) Replace spring or tighten U-bolts.
	(13) Loose steering components.	(13) Tighten or repair and adjust as required.
	(14) Unequal camber.	(14) Replace axle housing.
	(15) Clogged or crimped brake line.	(15) Repair or replace line.
	(16) Wheel cylinder incorrect size.	(16) Replace with correct cylinders.
	(17) Worn steering knuckle bearings.	(17) Replace.

Drum Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
BRAKES CHATTER	(1) Incorrect lining-to-drum clearance.	(1) Adjust to recommended clearances.
	(2) Loose brake support plate.	(2) Tighten support plate.
	(3) Grease, fluid, road dust on lining.	(3) Clean out dust; replace grease and fluid-soaked lining.
	(4) Weak or broken retractor spring.	(4) Replace.
	(5) Loose wheel bearings.	(5) Adjust.
	(6) Drums out-of-round.	(6) Turn or replace drums in pairs.
	(7) Cocked or distorted shoes.	(7) Straighten or replace.
	(8) Tapered or barrel-shaped drums.	(8) Turn or replace drums in pairs.
SHOE CLICK	(1) Shoes lift off support plate and snap back.	(1) Change drums side to side or turn drums (in pairs).
	(2) Holddown springs weak.	(2) Replace springs.
	(3) Shoe bent.	(3) Replace shoes on both sides.
	(4) Grooves in support plate ledges.	(4) Replace support plate.
SNAPPING NOISE IN FRONT END	(1) Grooved support plate ledges.	(1) Replace support plate.
	(2) Lack of lubrication on support plate ledges.	(2) Lubricate ledges.
	(3) Loose drums or support plates.	(3) Tighten.
	(4) Loose or worn front end parts.	(4) Tighten or replace defective parts.

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Disc Brake Service Diagnosis

Condition	Possible Cause	Correction
BRAKE CHATTER OR ROUGHNESS. BRAKE PEDAL PULSATES	(1) Excessive rotor lateral runout.	(1) Check rotor runout. Refinish if not to specs (refer to Rotor Measurements).Replace if unable to refinish.
	(2) Excessive thickness variation.	(2) Check thickness variation. Refinish if out of spec. Replace if unable to refinish.
	(3) Loose or worn wheel bearings.	(3) Adjust to specs. Replace if worn or damaged.

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Disc Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
BRAKE CHATTER OR ROUGHNESS. BRAKE PEDAL PULSATES (Continued)	(4) Rear drums out-of-round.	(4) Check runout. If not to specs turn drum. Do not remove more than .060 inch.
	(5) Disc brake shoes reversed (steel side of shoe riding on rotor).	(5) Replace rotor and shoes.
	(6) Shoes bent or linings worn.	(6) Replace shoes.
EXCESSIVE PEDAL EFFORT REQUIRED	(1) Malfunction in power brake unit.	(1) Check operation. Refer to Power Brake Units.
	(2) Malfunction in front or rear brake system (dual master cylinder) such as: wheel cylinder leaks, defective brake lines, caliper piston seal leak, master cylinder piston cups not holding pressure.	(2) Check both brake systems and correct as required. Check for failed brake warning light if brake failure occurred and light did not operate.
	(3) Lining worn.	(3) Check and replace linings as required.
	(4) Caliper piston sticking.	(4) Rebuild caliper.
	(5) Brake fade caused by incorrect or non-recommended linings.	(5) Replace with correct or recommended lining.
	(6) Incorrect master cylinder.	(6) Check and replace if required.
EXCESSIVE PEDAL TRAVEL	(1) Low fluid level.	(1) Add fluid as required.
	(2) Leak in system.	(2) Inspect and correct as required.
	(3) Air in system.	(3) Bleed brakes.
	(4) Rear brakes not adjusting properly.	(4) Adjust rear brakes and repair automatic adjusters.
	(5) Worn lining.	(5) Replace linings. If wear is excessive or premature, check for incorrect lining, sticking caliper pistons, binding park brake cables, shoe drag on support plate, weak return springs on drum brakes, improper rear brake adjustment.
	(6) Bent or broken shoe.	(6) Replace as required.
	(7) Master cylinder mounting bolts loose.	(7) Check and retighten.
	(8) Rotor thickness or drum diameter below specification.	(8) Inspect, measure and replace as required.

Disc Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
DRAGGING BRAKES NOTE: A very light drag occuring after releasing the brake pedal is a characteristic of disc brakes.	(1) Master cylinder pistons not returning properly.	(1) Remove cover, check for spurt of fluid at compensator holes as brake pedal is depressed. Rebuild master cylinder if fluid spurt is not observed. Inspect compensator ports for blockage, use compressed air to clear passages.
	(2) Restrictions in brake lines or hoses.	(2) Check for kinks or dents in steel lines . Check rubber hoses for swelling or restrictions inside hose.
	(3) Incorrect parking brake adjustment.	(3) Check and readjust to specification. Inspect cables for bind or frayed conditions.
	(4) Rear shoes not returning to normal position.	(4) Return springs weak. Shoes dragging on support plate due to lack of lube or ridges on support plate ledges. Wheel cylinder cups swollen or pistons sticking. Repair or replace faulty parts as required.
	(5) Caliper pistons not releasing. Pistons stuck due to piston scoring or corrosion or piston cocking in bore.	(5) Repair or replace pistons or caliper as required.
	(6) Lines to combination valve installed incorrectly.	(6) Check and correct as required. Port marked inlet goes to master cylinder; port marked outlet goes to calipers.
	(7) Bind in brake pedal or power unit bellcrank pivot pins (CJ only)	(7) Lube pedal pivot or pivot pins.
	(8) Check valve installed in master cylinder outlet port.	(8) Check outlet. Remove valve if present. Bleed brakes.
GRABBING BRAKES	(1) Refer to all conditions listed under PULLS WHEN BRAKES ARE APPLIED.	(1) See PULLS WHEN BRAKES ARE APPLIED.
	(2) Power brake unit malfunction or bellcrank pivot pins binding (CJ only).	(2) Check operation and replace or repair as required. Refer to POWER UNIT SERVICE DIAGNOSIS Chart.
	(3) Combination valve malfunction.	(3) Replace valve and bleed system.
	(4) Incorrect power unit.	(4) Check and replace as required.

Disc Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
PULLS WHEN BRAKES ARE APPLIED	(1) Incorrect tire pressures.	(1) Inflate to spec.
	(2) Mismatched tires on same axle.	(2) Install equal size, type tires.
	(3) Wheel bearings misadjusted or worn.	(3) Adjust or replace as required.
	(4) Malfunction in caliper.	(4) Check for stuck piston.
	(5) Damaged or contaminated shoe and lining (grease on lining or bent shoe).	(5) Replace shoe and lining on both sides. Replace axle seals, wheel cylinder cups, or caliper piston seals, if leaking.
	(6) Rear brake problem: automatic adjusters inoperable, contaminated lining, defective wheel cylinders, seized or improperly adjusted park brake cables, shoes binding on support plate, linings worn, linings charred or cracked, bent support plate, weak retracting springs, drums out-of-round.	(6) Inspect and repair or replace malfunctioning parts. Check for equal size wheel cylinders on rear brakes.
	(7) Loose calipers.	(7) Check mounting bolt torque, inspect threads on bolts for galling or stripped threads, check support plate for broken welds.
	(8) Loose suspension parts.	(8) Inspect and correct as required.
	(9) Front end out of alignment.	(9) Check and correct as required.
	(10) Lining soaked with water after operation in heavy rains, or flooding conditions.	(10) Allow lining to air dry, or while driving, keep brakes lightly applied to warm up lining and evaporate water.
	(11) Disc brake rotor out of tolerance.	(11) Check and refinish or replace as required.
REAR DRUM BRAKES SKID PREMATURELY ON HARD BRAKE APPLICATION	(1) Combination valve proportioner section malfunctioning.	(1) Replace valve and bleed brakes.
	(2) Check items listed under PULLS and GRABBING.	(2) See PULLS and GRABBING.
SPONGY PEDAL	(1) Air in system.	(1) Bleed brakes. Inspect for broken lines, loose fittings, leaking caliper pistons, or wheel cylinders; check rubber seal on master cylinder cover. Check cover itself for distortion or cracks, check all bleed valves for proper torque.
	(2) Rear drums thin or cracked.	(2) Inspect and correct as required.

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Disc Brake Service Diagnosis (Continued)

Condition	Possible Cause	Correction
SPONGY PEDAL (Continued)	(3) Calipers loose.	(3) Check mounting bolt torque.
	(4) Loose master cylinder or brake booster attaching parts.	(4) Check and correct as required.
	(5) Compensator port blocked in master cylinder.	(5) Check and correct as required.
	(6) Improper (low quality) brake fluid in system. Fluid boils and becomes aerated.	(6) Drain and flush system.

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HYDRAULIC SYSTEM

GENERAL

When servicing the hydraulic system, prevent the entry of contaminants by capping all lines and ports, and by avoiding the use of mineral-oil based fluids for cleaning system components.

CAUTION: *Never use gasoline, kerosene, carbon tetrachloride, paint thinner, alcohol, nor any other fluid containing mineral oil, to clean or lubricate hydraulic system components. These materials will cause swelling, deterioration, and premature aging of rubber parts. Use brake fluid or brake cleaning solvent only.*

To determine if dirt, moisture, or mineral-oil based cleaners have contaminated the hydraulic fluid, drain off a sample and check for suspended particles, discoloration, or separation of the fluid into distinct layers. Layering indicates the presence of water or mineral oil content. If system contamination should occur, drain and flush the system with an approved brake fluid only.

Approved Brake Fluids

Whenever the hydraulic system is filled, use Jeep Brake Fluid or equivalent marked SAE J1703.

CAUTION: *Never fill the hydraulic system with used or reclaimed fluid.*

Master Cylinder Fill Level

The master cylinder fluid level should be checked at least four times a year or every 5,000 miles. Refer to the Mechanical Maintenance Schedule for details. The master cylinder fluid reservoirs should be filled to within 1/4 inch of rim of each reservoir.

When checking fluid level, the rubber diaphragm seal on the master cylinder cover should be inspected for cracks, cuts, distortion, or any other condition that might allow air or foreign material to enter the master cylinder. When the cover is removed for any reason, do not allow the rubber diaphragm seal to come in contact with dirt, grease, or other foreign material.

Hydraulic System Inspection

(1) Check master cylinder cover retaining spring for proper tension and fit. Spring should provide enough tension on cover to maintain airtight seal.

(2) Inspect rubber diaphragm seal for cracks and distortion.

(3) Check master cylinder fill level.

(4) Check for dirt and foreign material in reservoirs. Drain off sample of brake fluid into clean glass container and test for contamination as outlined above.

(5) Inspect all fittings and brake lines for leakage, kinks, or other damage.

(6) Inspect condition of front brake hoses. Replace if cut, cracked, swollen, or leaking.

(7) Check for evidence of fluid leakage at all wheel cylinders and front calipers (if equipped with disc brakes).

POWER BRAKE UNITS

A tandem-diaphragm unit (fig. 9-1) is used on CJ models equipped with power brakes while Cherokee, Wagoneer, and J-10 Truck models have a 9-1/2-inch single diaphragm power unit (fig. 9-2); J-20 truck models (6800 GVW and up) use a 9-1/2-inch tandem-diaphragm power unit.

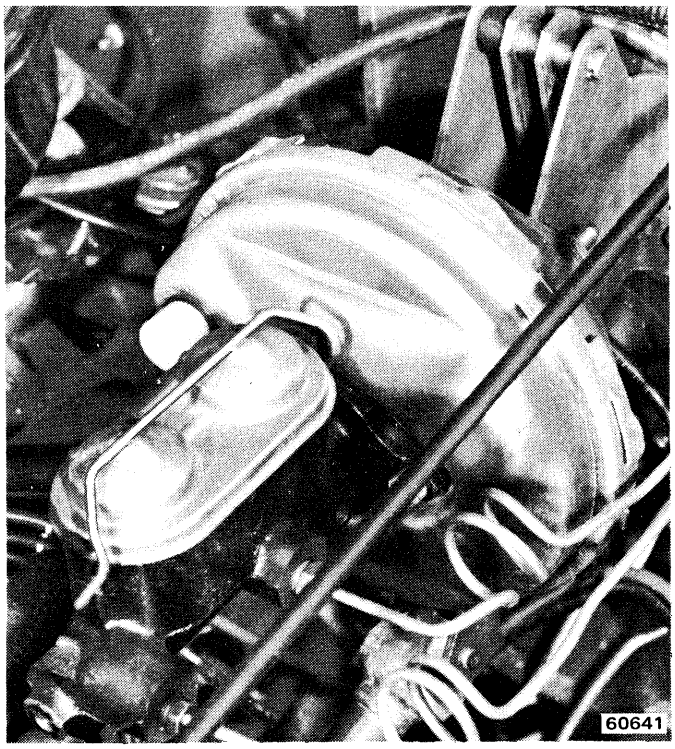

Fig. 9-1 Power Brake Unit—CJ Models

Power Unit Service

All power brake units are serviced as an assembly. When diagnosis indicates a unit is defective, it should be replaced, not overhauled. The single and tandem diaphragm units have a single push rod of a preset, non-adjustable length (fig. 9-3). When replacing a power unit, use the push rod supplied with the replacement power unit. This push rod has been correctly gauged and preset to the replacement unit.

MASTER CYLINDER

A dual reservoir master cylinder is used on all Jeep vehicles. The hydraulic system for the front brakes is completely separate from the rear brakes. In the event

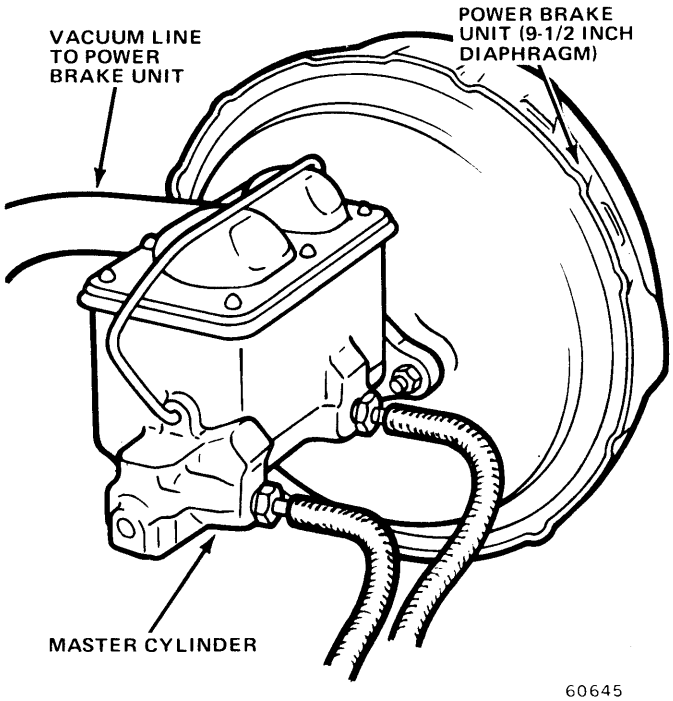

Fig. 9-2 Power Brake Unit—9-1/2-Inch Diaphragm —Cherokee-Wagoneer-Truck

of hydraulic brake failure in the front system, the rear hydraulic brakes will still operate. If a failure occurs in the rear brakes, the front brakes will still operate.

The dual master cylinder has two outlet ports, two fluid reservoirs, and two hydraulic pistons which are operated in tandem by a single push rod.

When the master cylinder fluid reservoirs are filled and the front and rear brake systems purged of air, there is a solid column of fluid on the forward side of both the primary and secondary pistons.

Upon application of the brakes, fluid is displaced by the pistons into the caliper wheel cylinders to activate the brakes. Upon release of the brakes, fluid returns from the cylinders to the master cylinder reservoirs.

Master Cylinder Service—All Models

Removal

(1) Disconnect brake lines at master cylinder. Cap or tape outlet ports in master cylinder and open ends of brake lines to prevent entry of dirt.

(2) On vehicles with manual brakes, disconnect master cylinder push rod at brake pedal.

(3) Remove bolts or nuts attaching master cylinder to cowl or power unit and remove master cylinder.

Disassembly

(1) Remove cover and diaphragm seal and drain fluid from master cylinder. Mount master cylinder in vise.

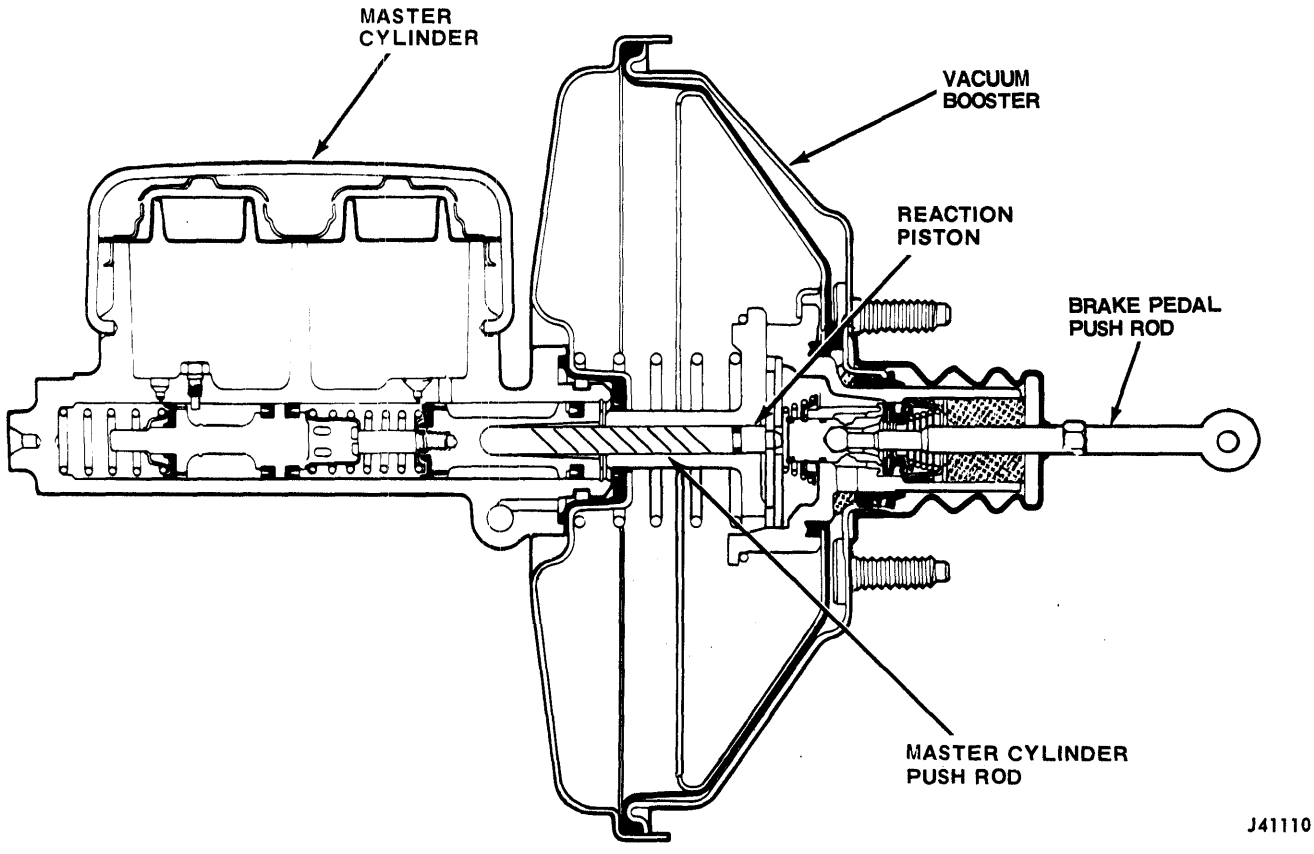

Fig. 9-3 Single Diaphragm Power Unit (Typical)

(2) On vehicles with manual brakes, remove boot, push rod, and push rod retainer (fig. 9-4 and 9-5). On CJ models, remove retainer by straightening lock tab in side of retainer.

(3) Push primary piston inward with phillips screwdriver and remove snap ring from groove in master cylinder bore. Remove primary and secondary piston assemblies. Air pressure applied through compensator port in front reservoir will aid in removal of secondary piston assembly.

(4) Remove piston seal and piston cups from secondary piston. It is not necessary to disassemble primary piston assembly. Primary piston is supplied as complete assembly in repair kit.

(5) Clean and inspect master cylinder. Replace if bore is severely scored, corroded, or pitted. Replace if body is cracked, porous, or has sustained other damage. Check compensator and bypass ports in reservoirs. If plugged or dirty, open them using brake cleaning solvent and air pressure only. Do not use wire as wire may raise a burr in port or push burr into cylinder bore.

CAUTION: *Clean the master cylinder with brake fluid or an approved brake cleaning solvent only. Do not use any solvent containing mineral oil such as gasoline, kerosene, alcohol, or carbon tetrachloride. Mineral oil is very harmful to the rubber piston cups and seals.*

(6) Inspect tube seats in outlet ports. Replace seats only if cracked, scored, cocked in bore, or loose. If replacement is necessary, remove seats as follows:

(a) On Cherokee, Wagoneer, and Truck models, thread 6-32 x 5/8-inch long self-tapping screw into tube seat. Using two screwdrivers, pry up on screw to remove seat. Remove chips using brake cleaning solvent.

(b) On CJ models, enlarge hole in tube seats using 13/64-inch drill. Place flat washer on each outlet port and thread 1/4-20 x 3/4-inch long screw into seat. Tighten screw until seat is loosened. Remove seat, screw, and washer. Remove chips using brake cleaning solvent and compressed air.

Assembly

(1) Install replacement tube seats (if removed) using spare tube fitting nuts to press seats into place. Do not allow seats to become cocked during installation. Be sure seats are bottomed. Remove tube fitting nuts and check for burrs or chips. Remove burrs or chips. Rinse master cylinder in brake cleaning solvent and blow out all passages with compressed air.

(2) Install piston cups on secondary piston. Piston cup installed in groove at end of piston should have lip facing away from piston. Install next cup so lip faces piston (fig. 9-4 and 9-5).

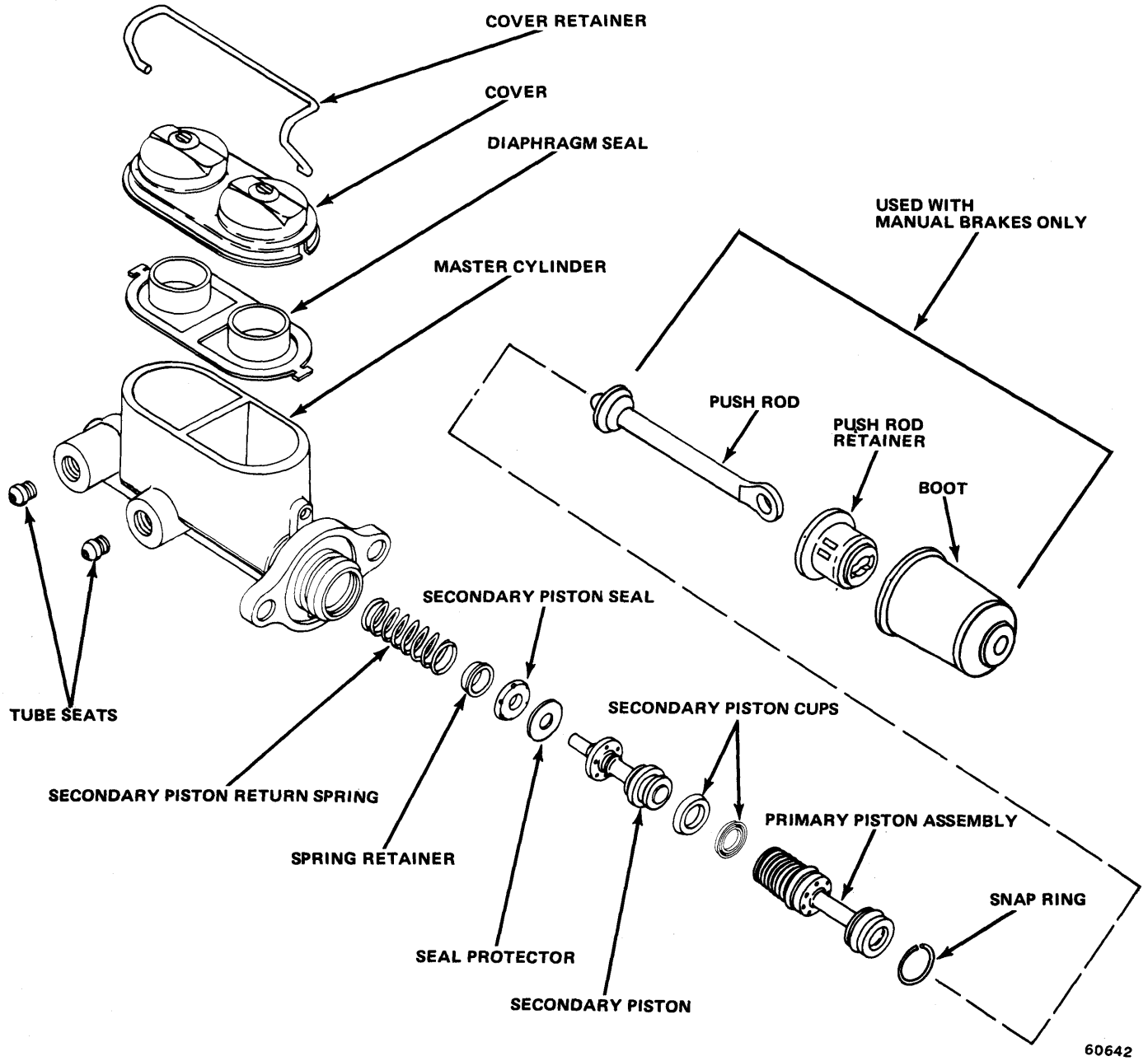

Fig. 9-4 Master Cylinder—CJ Models

(3) Install seal protector, piston seal, spring retainer, and return spring on secondary piston (fig. 9-4 and 9-5). Install piston seal so lip faces interior of master cylinder bore when assembly is installed. Be sure return spring seats against retainer and that retainer is located inside lip of piston seal.

(4) Lubricate master cylinder bore and secondary piston seal and cups with brake fluid and install secondary piston assembly in cylinder bore.

(5) Lubricate seals on primary piston assembly with brake fluid and install assembly in master cylinder bore.

(6) Push primary piston inward with phillips screwdriver and install snap ring in groove of master cylinder bore.

(7) On all vehicles with manual brakes, install push rod, push rod retainer, and boot. On CJ models only, bend small lock tab in side of retainer into groove at end of master cylinder and install boot.

CAUTION: *Do not install the push rod, boot, and retainer on vehicles equipped with power brakes.*

(8) Install diaphragm seal on master cylinder cover.

Installation

(1) Position master cylinder on cowl or power unit

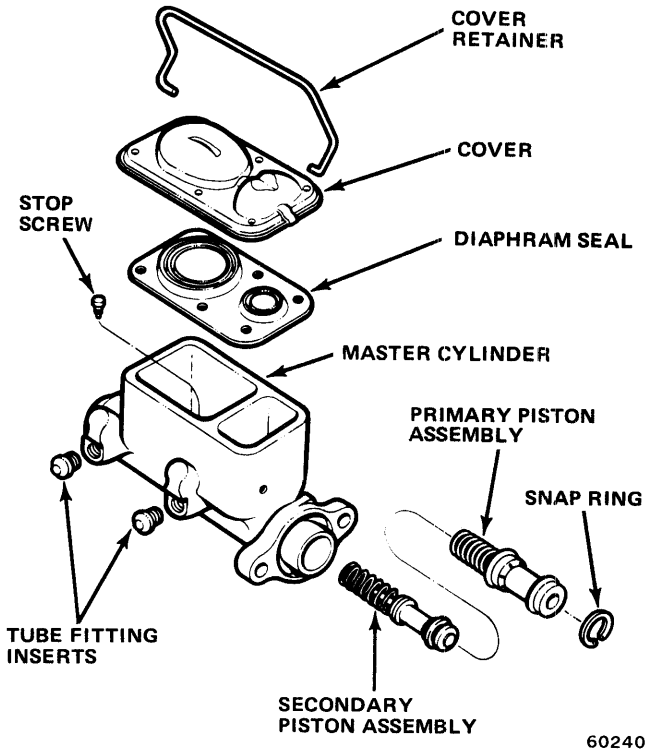

Fig. 9-5 Master Cylinder—Cherokee-Wagoneer-Truck Models

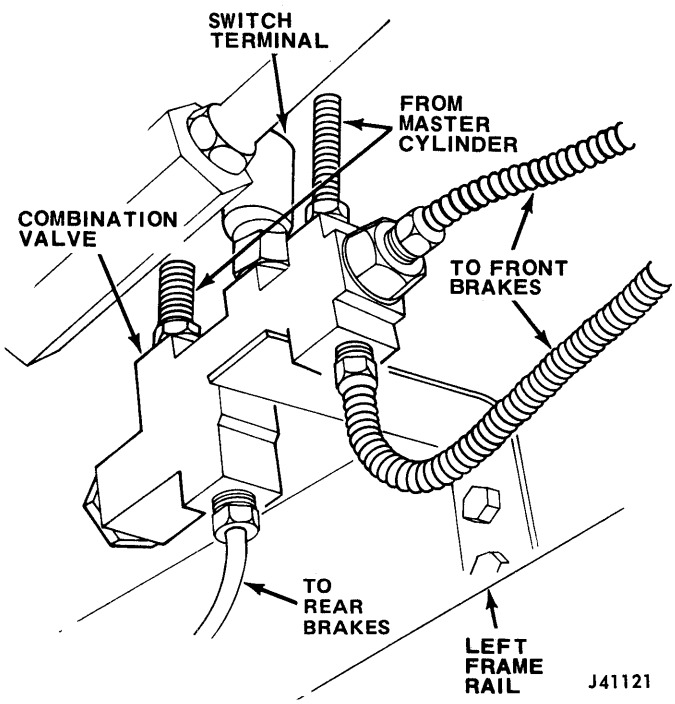

Fig. 9-6 Combination Valve—CJ Models with Drum Brakes

and install attaching parts. Tighten nuts or bolts to 30 foot-pounds torque.

(2) Connect brake lines to master cylinder.

(3) Fill master cylinder reservoirs to within 1/4-inch of rim with Jeep Brake Fluid or equivalent and install cover and diaphragm seal.

(4) On vehicles with manual brakes, connect push rod to brake pedal.

(5) Bleed brake systems as outlined under Brake System Bleeding.

COMBINATION VALVE—CJ MODELS WITH DRUM BRAKES

The combination valve used on CJ models with drum brakes contains a pressure differential warning valve section and a proportioning valve section which are combined into a single assembly. The valve also serves as the front junction block for the brake system. The valve is mounted on the left frame rail (fig. 9-6).

The warning valve section contains a switch which is activated when a hydraulic pressure loss occurs in either the front or rear brake systems. The plunger-type switch is activated by a piston in the combination valve. When the switch is activated, it completes the electrical circuit to the brake warning light on the dash.

Should a failure occur in the rear brake system, the switch piston is forced to the rear of the valve by pressure from the front brake system. As the piston moves, the piston ramp contacts the switch pin forcing it up into the switch, making contact, and completing the electrical circuit to the warning light on the dash. In the event of front brake failure, the switch is activated in the same manner except that the switch piston moves in the opposite direction.

NOTE: *The presence of air in either the front or rear hydraulic system can produce a pressure differential causing the switch to activate the warning light on the dash. Bleeding the system will correct this condition.*

The proportioner valve section provides balanced front-to-rear braking during high speed stops. At high deceleration, rear weight is transferred to the front wheels and must be compensated for to avoid early rear wheel skid. The proportioner section of the valve reduces initial line pressure to the rear wheels, delaying rear brake lockup and avoiding early rear wheel skid.

The proportioner does not operate during normal or light brake application.

Service

The valve is not repairable. If any section of the valve is found defective, the entire assembly must be replaced.

When bleeding the brake system, the pressure differential switch wire, switch terminal, and contact plunger-type assembly must be reoved. Refer to Brake System Bleeding.

NOTE: *If any leakage is evident at the switch terminal after reinstallation following brake bleeding, replace the entire valve assembly.*

COMBINATION VALVE—CJ MODELS WITH DISC BRAKES

The combination valve used on CJ models with disc brakes contains a pressure differential warning valve section and a front brake metering valve section.The two sections are combined into a single assembly (fig. 9-7). The combination valve is mounted on the left frame rail.

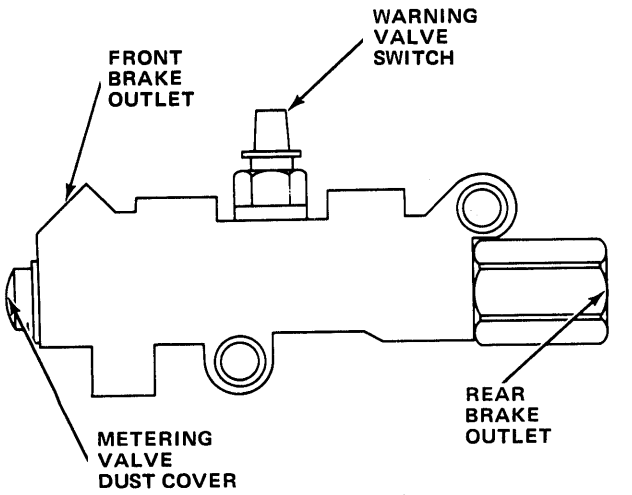

Fig. 9-7 Combination Valve—CJ Models with Disc Brakes

The metering valve section provides balanced front-to-rear braking. The valve momentarily delays application of full system pressure to the front disc brakes until the rear drum brakeshoes overcome return spring tension and contact the drums.

When bleeding the front brakes on CJ models with disc brakes, the metering section valve stem must be held inward using Tool J-26869 (fig. 9-8).

The presure differential warning valve section activates the brake warning light if a pressure loss in the front or rear hydraulic systems should ever occur.

The warning valve section contains a piston and plunger-type switch. If a pressure loss in either system occurs, a pressure differential of 70 to 300 psi will cause the piston to shuttle toward the low pressure side of the valve. As the piston moves, ramps on the piston push the switch contact plunger upward closing the switch contacts. This action completes the circuit between the switch and warning light on the dash.

NOTE: *The presence of air in either the front or rear hydraulic system can produce a pressure differential causing the switch to activate the warning light. Bleeding the system will correct this condition.*

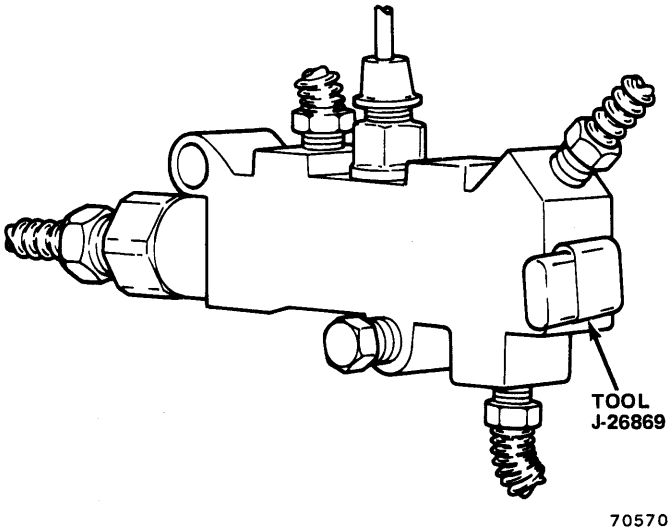

Fig. 9-8 Metering Valve Tool Installed—CJ Models with Disc Brakes

Service

The combination valve is serviced as an assembly only. Do not attempt to disassemble or repair any combination valve.

When bleeding the brake system, the metering section valve stem must be held inward using Tool J-26869 (fig. 9-8).

COMBINATION VALVE—CHEROKEE-WAGONEER-TRUCK

All models are equipped with a combination valve (fig. 9-9) which is attached to the inner side of the left frame rail.

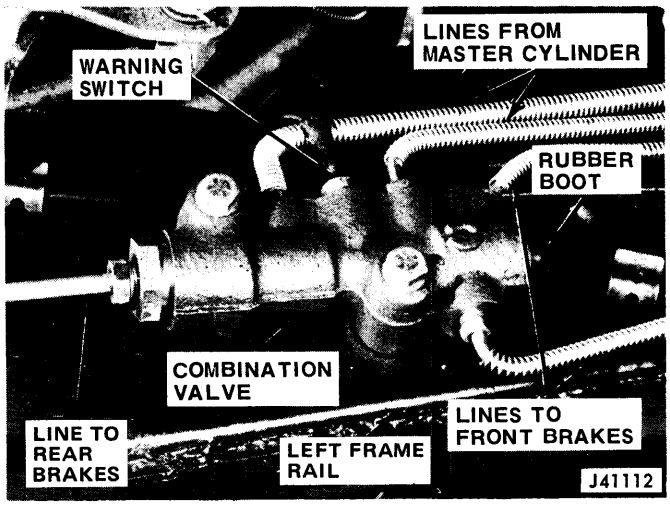

Fig. 9-9 Combination Valve—Cherokee-Wagoneer-Truck

The combination valve used on Cherokee, Wagoneer, and Truck models (fig. 9-10) contains a metering valve section, a pressure differential warning switch section,

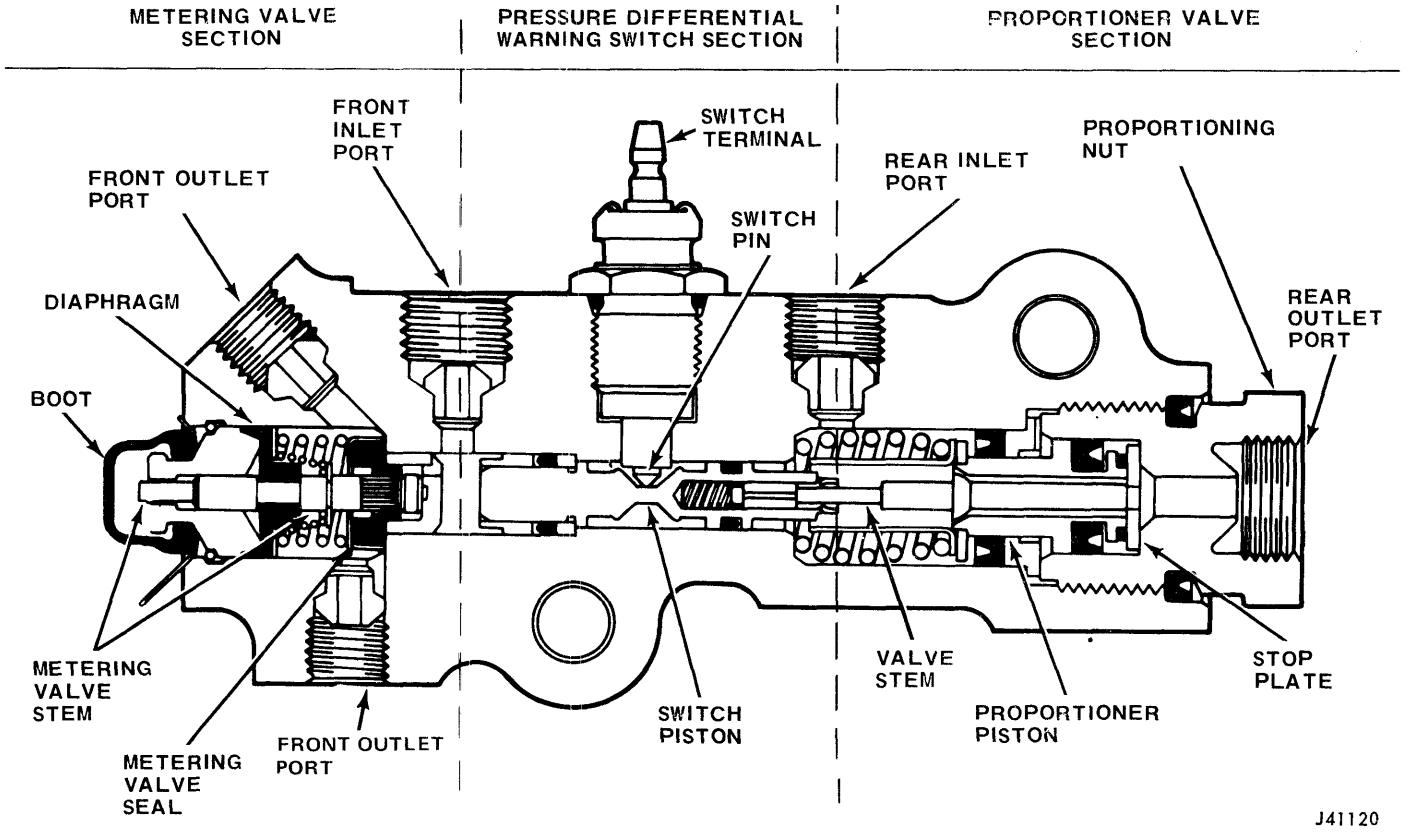

Fig. 9-10 Combination Valve Cross Section—Cherokee-Wagoneer-Truck

and a proportion valve section. The combination valve also services as the front junction block for the brake system.

The metering valve holds off (delays) full hydraulic fluid pressure to the front brakes until the rear brakes overcome retracting-spring tension and the rear linings make contact with the rear drums.

When the brakes are not applied, the metering valve permits free flow of brake fluid. This feature allows the fluid to expand and contact with changes in temperature.

The warning switch in the valve is activated when a hydraulic pressure loss occurs in either the front or rear brake systems, and when activated, completes the electrical circuit to the brake warning light on the dash.

Should a failure occur in the rear brake system, the switch piston is forced to the right (toward the rear brake outlet port in the valve) by pressure from the good front system. As the piston moves, the piston ramp forces the switch pin up into the switch, making contact and completing the electrical circuit which activates the dash light. In the event of a front brake system failure, the switch is activated in the same manner except that the switch piston will move forward.

The proportioner section provides balanced front-to-rear braking action during high pedal pressure stops. During light pedal pressure application, the proportioner does not operate. Brake fluid normally flows into the proportioner through the space between the piston center hole and valve stem, then through the stop plate and the rear brakes. Spring pressure loads the piston, holding it against the stop plate for normal brake pressures.

Service

The combination valve is not repairable. If any section of the valve is found defective, the entire valve assembly must be replaced.

When bleeding the brake system, the metering section of the valve must be held open (fig. 9-11). Refer to Brake System Bleeding for procedure.

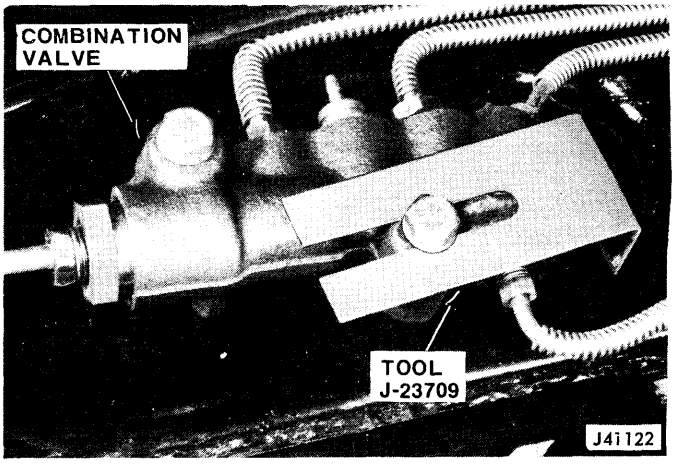

Fig. 9-11 Metering Valve Tool Installed—Cherokee-Wagoneer-Truck

BRAKE SYSTEM BLEEDING

General

The hydraulic system must be bled whenever a line has been disconnected or if air has entered the system. In most cases, it will be necessary to bleed only that portion of the hydraulic system (front or rear) being serviced. However, if a firm brake pedal cannot be obtained, or if diagnosis indicates the need, the complete system must be bled. Brake system bleeding can be performed manually or with pressure equipment. Bleeder screws are provided at the calipers and wheel cylinders.

Manual Bleeding Procedure

(1) Clean any accumulated dirt from master cylinder cover.

(2) Remove master cylinder cover.

(3) Fill master cylinder if required and reinstall cover.

(4) On Cherokee, Wagoneer, and Truck models, hold combination metering valve open as follows: loosen front mounting bolt on combination valve and insert slotted end of Tool J-23709 under mounting bolt. Push in on metering valve stem to open it and retighten mounting bolt to hold Tool J-23709 in place (fig. 9-11).

(5) On CJ models with disc brakes, hold metering valve section open as follows: Remove dust cover from metering valve stem and install Tool J-26869 on stem to hold vave open (fig. 9-8).

(6) Bleed brake system in following sequence:
- (a) left front wheel
- (b) right front wheel
- (c) left rear wheel
- (d) right rear wheel

NOTE: *Correct bleeding procedure is as follows: Place wrench on bleeder screw. Install rubber hose on screw with free end of hose* **submerged** *in a transparent container partially filled with clean brake fluid. Open screw 3/4 turn. Have helper depress brake pedal. Close bleeder screw before pedal reaches end of travel. Have helper pump up pedal each time bleeder screw is closed to ensure a good surge of fluid at the bleeder screw when valve is reopened. Repeat bleed process until fluid comes out in a solid stream without the presence of air bubbles.*

CAUTION: *Do not allow master cylinder to exhaust its supply of brake fluid. Check fluid level frequently while bleeding, and refill as required. Do not bleed two wheels at a time, and do not bleed system with calipers or drums not in place.*

(7) Remove master cylinder cover and refill as required. Fill reservoir to within 1/4 inch of reservoir rim. Install cover. Make sure cover retainer is in place.

(8) For Cherokee, Wagoneer, and Truck, remove combination valve tool. On CJ models, reinstall plunger, spring, and terminal in valve.

(9) Test brake operation before moving vehicle.

Pressure Bleeding Procedure

(1) Clean any accumulated dirt from master cylinder cover.

(2) Remove cover and rubber diaphragm seal. Place cover on work bench or on lint-free cloth. Do not allow diaphragm to contact dirt or foreign material.

(3) Fill master cylinder if required.

(4) Install brake bleeder adapter cover on master cylinder (fig. 9-12). Connect hose from pressure bleeder to fitting on adapter and open release valve on pressure bleeder.

(5) On Cherokee, Wagoneer, and Truck models, hold metering valve section open. Install Tool J-23709 as described in step (4) of Manual Bleeding Procedure (fig. 9-11).

(6) On CJ models with disc brakes, hold metering valve section open using Tool J-26869 (fig. 9-8). Remove dust cover before installing tool.

(7) Bleed brake system in following sequence:
- (a) left front wheel
- (b) right front wheel
- (c) Left rear wheel
- (d) right rear wheel

NOTE: *When using pressure equipment, the bleeding procedure is the same as outlined in step (5) of Manual Bleeding Procedure except that a helper is not required to apply the brake pedal. The pressure bleeder develops enough system pressure to permit bleeding without the use of the brake pedal.*

(8) When system has been purged of all air, turn off

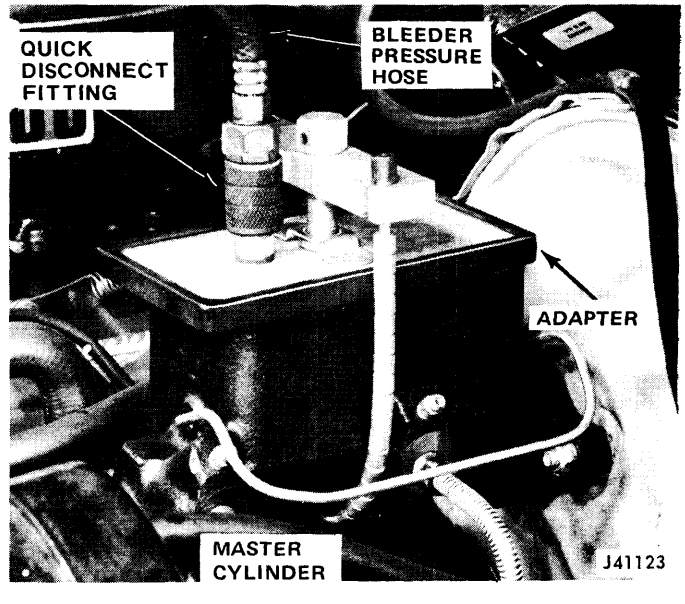

Fig. 9-12 Pressure Bleeder Adapter Installation (Typical)

pressure bleeder and close bleeder fluid release valve.

(9) Disconnect pressure bleeder hose at adapter fitting and remove master cylinder cover adapter.

(10) Refill master cylinder reservoirs to within 1/4 inch of reservoir rim.

(11) Install cover and rubber diaphragm. Make sure cover retainer is in place.

(12) On Cherokee, Wagoneer, and Truck, remove combination valve metering section hold-out tool and tighten mounting bolt. On CJ models, remove metering section hold-out tool and install dust cover over valve stem.

(13) Test brake operation before moving vehicle.

DRUM BRAKES

GENERAL

The drum brake units consist of a support plate, two brakeshoes, brakeshoe return springs, an adjusting screw assembly, holddown springs, automatic adjuster components, and a wheel cylinder (fig. 9-13).

The automatic adjuster continuously maintains correct operating clearance between the brake linings and the drums by adjusting the brakes in small increments in direct proportion to lining wear. This continuous adjustment prevents gradual increase in the brake pedal

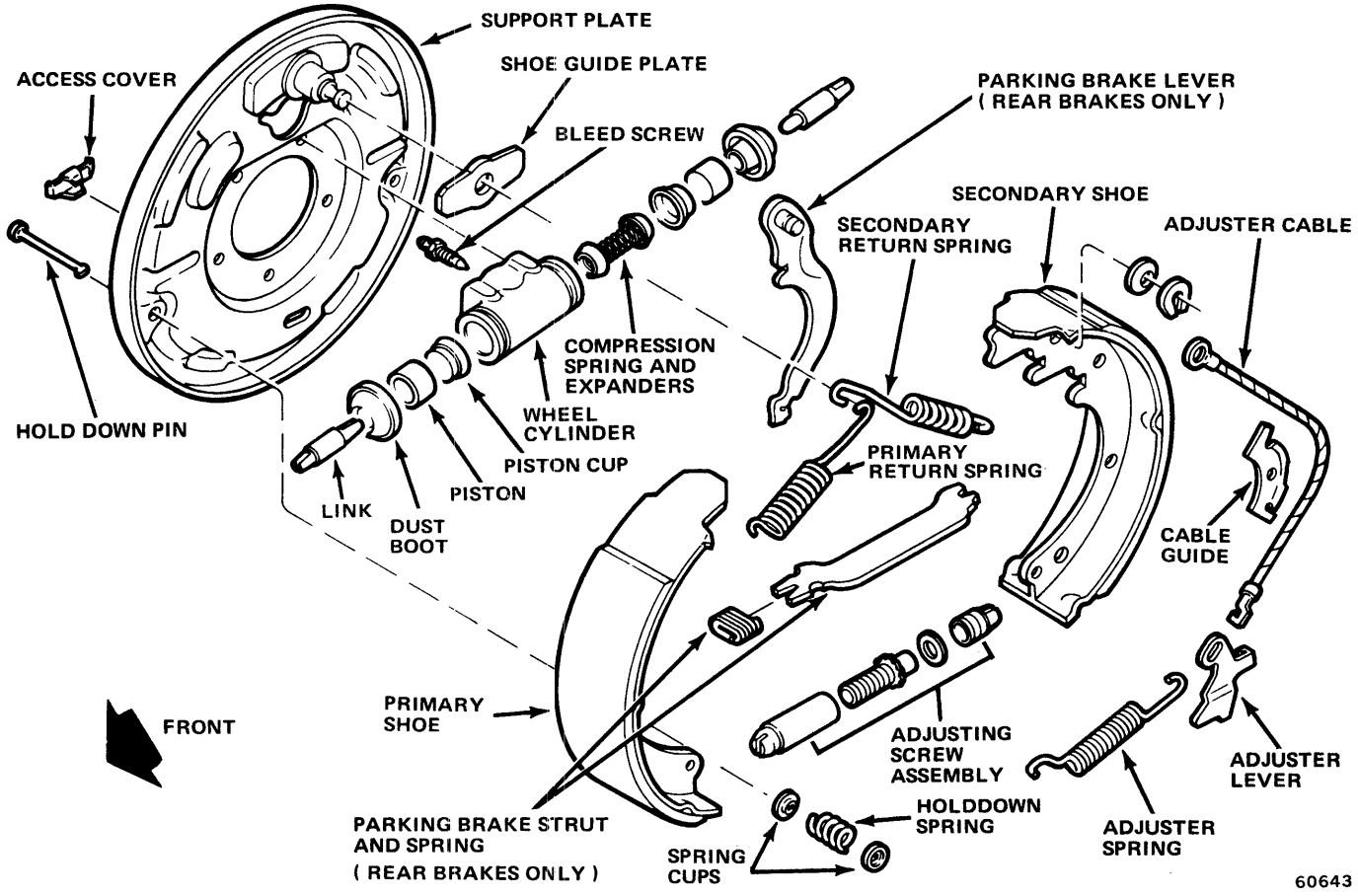

Fig. 9-13 Drum Brake Assembly—CJ Models

travel as the linings wear. The adjuster adds the safety feature of maintaining adequate pedal reserve during the service life of the lining.

After the lining wears enough to require adjustment, the adjusting cable (CJ models) or actuating lever (Cherokee, Wagoneer, and Truck models) will lift the lever into engagement with the next tooth of the adjusting screw when the brakes are applied. When the brake is released, the shoes return to the anchor.

The automatic-adjuster utilizes movement of the secondary shoes in a reverse brake application to actuate the adjuster mechanism.

This action will repeat on subsequent brake applications until the shoe-to-lining clearance is reduced to a point at which the shoe movement is not enough to cause the automatic adjuster to lift the lever to the next tooth.

The adjusting lever and adjusting screw assembly are left- or right-hand parts **and are not interchangeable.**

SERVICE—CJ MODELS

Disassembly

(1) Raise vehicle.

(2) Remove wheels and drums.

(3) Grasp adjusting lever with pliers and remove lever tang from hole in secondary shoe.

(4) Place Brake Cylinder Clamps J-8002 over wheel cylinders to hold pistons in place while shoes are removed.

(5) Remove return springs using Brake Spring Remover Tool J-8057.

(6) Remove secondary return spring, adjuster cable, primary return spring, cable guide, adjuster lever, and adjuster springs.

(7) Remove holddown springs and brakeshoes. On rear brakes, disengage parking brake cable from parking brake lever (parking brake strut is removed with brakeshoe assemblies).

Cleaning and Inspection

Cleaning

For grease contamination, clean all parts, except brake drums, with brake cleaning solvent. Clean brake drums with a soap and water solution only.

For brake fluid contamination, clean all parts, except the brakelining, with alcohol. Replace contaminated brake lining.

Inspection

Pull back wheel cylinder dust boot to inspect for leakage. If evidence of leakage is observed, the cylinder should be disassembled and inspected as described in Wheel Cylinder.

Polish ledges of the brake support plate with fine sandpaper or emery cloth. If grooves which may restrict shoe movement still exist after polishing, the brake support plate must be replaced. Attempting to remove grooves by grinding may result in improper shoe-to-drum contact.

Inspect the lining wear pattern. If the wear across the width of the lining is uneven, check drums for bell-mouthed condition, inspect drums for correct position, and inspect support plate for distortion. Inspect all springs for evidence of overheating (discoloration) and fractures. The self-adjusting cable should be inspected for kinks, fraying and an elongated eyelet.

Inspect the adjusting screw for freedom of rotation and the adjuster lever for wear and distortion.

Wheel Cylinders

(1) Inspect for evidence of leakage. Pull back dust boot and inspect condition of rubber piston cups and cylinder bore.

(2) Inspect bleeder screw and hydraulic line connection for evidence of leakage. Check brake lines for swelling, distortion, kinks, and cracks.

(3) If wheel cylinders require overhaul proceed to step (4).

(4) Disconnect brake line. Do not bend line away from wheel cylinder. When cylinder is removed from support plate, line will separate from cylinder easily.

(5) Remove cylinder mounting bolts and remove cylinder.

(6) Remove links and dust boots. Remove piston cups, pistons, and compression spring from cylinder bore. Clean all metal parts with brake fluid.

(7) If bore is corroded or pitted, replace wheel cylinder. If bore is only stained or discolored, it may be polished with crocus cloth. Do not polish in a lengthwise direction; polish by rotating cylinder around crocus cloth supported on fingers.

CAUTION: *Do not hone wheel cylinders.*

(8) If polishing was performed, clean cylinder thoroughly with brake fluid only.

(9) Inspect pistons. If scored or worn replace. If discolored or stained, pistons may be lightly polished with crocus cloth. Clean pistons thoroughly if they were polished.

(10) Coat cylinder bore with clean brake fluid. Do not lubricate pistons or cups. Assemble wheel cylinder components.

CAUTION: *Piston cups should have flat side facing open ends of cylinder and flared side facing interior of cylinder.*

(11) Clean wheel cylinder mounting surface on support plate. Clean brake line fitting and threads.

(12) Start brake line fitting in wheel cylinder. Attach wheel cylinder to support plate and tighten brake line fitting. Tighten cylinder mounting bolts to 18 foot-pounds torque.

Support Plate

(1) Remove dirt using compressed air or cloth. Polish anchor pin with crocus cloth.

(2) Polish ledges of brake support plate with fine sandpaper or emery cloth. If grooves, which may restrict shoe movement, still exist after polishing, replace support plate.

CAUTION: *Attempting to remove grooves by grinding may result in improper shoe-to-drum contact. Do not attempt to reduce ridges or grooves by grinding.*

(3) Inspect support plate for warpage or cracks.

(4) Check torque of support plate-to-axle flange bolts.

(5) Check anchor pin for wear or being loose.

(6) Replace support plate if inspection reveals nonrepairable defect.

Brake Drums

(1) Clean dirt from drums. Use compressed air and clean cloth. If drums require further cleaning, use soap and water solution only.

CAUTION: *Do not use brake fluid, gasoline, kerosene, or similar solvents to clean drums.*

(2) Inspect for scoring, cracks, heat checking, hard spots, and distortion.

(3) Check drum for excess runout or bell-mouthed condition. Perform this check with drums mounted on brake lathe. Use dial indicator to obtain readings.

NOTE: *Brake drum radial runout must not exceed 0.005 inch.*

(4) Based on findings of steps (1) through (3), replace or recondition drum as required.

CAUTION: *When machining drums, do not remove more than 0.030 inch. Maximum allowable oversize for any drum is 0.060 inch over original diameter. In addition, do not attempt to refinish drums with hard spots. Replace drums with this condition.*

Assembly and Adjustment

NOTE: *When necessary to replace brakelining on one wheel, the brakelining should also be replaced on the opposite wheel to maintain braking balance.*

(1) Lubricate support plate ledges, anchor pin, self-adjusting cable guide adjuster screw threads, and pivot with molydisulphide grease or chassis lubricant. If servicing rear brakes, lubricate parking brake cable lever located on secondary shoes.

(2) Position brakeshoes on the brake support plate and install holddown springs. On rear brakes, install parking brake lever. Install parking brake cable on lever and install strut and spring.

(3) Place adjuster cable eyelet on anchor pin.

(4) Install primary return spring.

(5) Install cable guide and install secondary return spring (fig. 9-13).

(6) Install adjusting screw assembly. Place small hooked end of adjuster spring in large hole in primary shoe and place large hooked end of adjuster spring in adjuster lever.

(7) Place hooked end of adjuster cable over cable guide (fig. 9-14).

(8) Grasp adjuster lever with pliers and hook adjuster lever tang in large hole in bottom of secondary shoe.

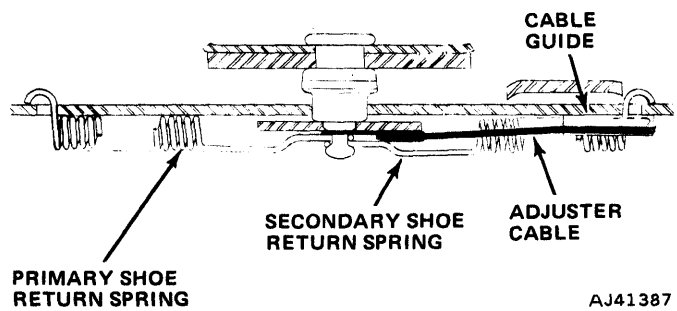

Fig. 9-14 Brakeshoe Spring Installation

(9) Perform initial brake adjustment using clearance gauge or initially adjust adjusting screw assemblies so that approximately 3/8 inch of thread is exposed between adjuster screw and adjuster screw nut.

(10) Install drums.

CAUTION: *Do not attempt to back off the adjuster screw without holding the adjuster lever away from the screw or the adjuster may be damaged.*

(11) If any brake lines were disconnected, bleed brakes as described in Brake System Bleeding.

(12) Install wheels and tires and lower vehicle.

(13) After initial adjustment and final assembly, check brake pedal height to ensure brake operation before moving vehicle.

(14) Drive vehicle in reverse and forward, making 10 to 15 brake applications, before road testing, alternating reverse and foward brake stops. This procedure balances adjustment of all brake units and raises brake pedal to satisfactory height.

NOTE: *If drums were installed before making initial adjustment, adjustment may be made manually by removing access slot cover and using a brake adjusting tool or screwdriver to rotate adjusting screw until wheel is locked (fig. 9-15). To tighten, rotate adjusting screw in clockwise direction. Then back off adjusting screw at least 15 to 20 notches (clicks). To back off adjusting screw, insert ice pick or thin blade screwdriver in screw access slot to hold lever away from screw. Back off adjusting screw until wheel and drum turn freely. Replace adjusting hole cover.*

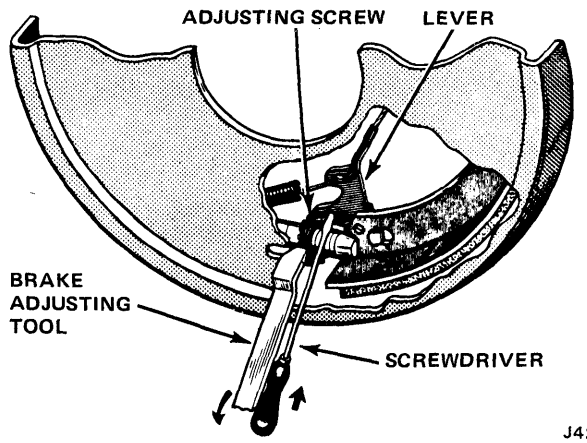

Fig. 9-15 Brakeshoe Adjustment

SERVICE—CHEROKEE-WAGONEER-TRUCK

Disassembly

(1) Raise vehicle.
(2) Remove necessary wheels and drums.
(3) Release parking brake and loosen locknuts at parking brake equalizer to relieve cable tension before removing rear drums.

NOTE: *On trucks with Model 60 full-floating rear axle, remove two screws that locate rear drums on hubs (fig. 9-17).*

(4) Remove primary shoe return spring (fig. 9-16). Remove automatic adjuster actuating spring and sec-

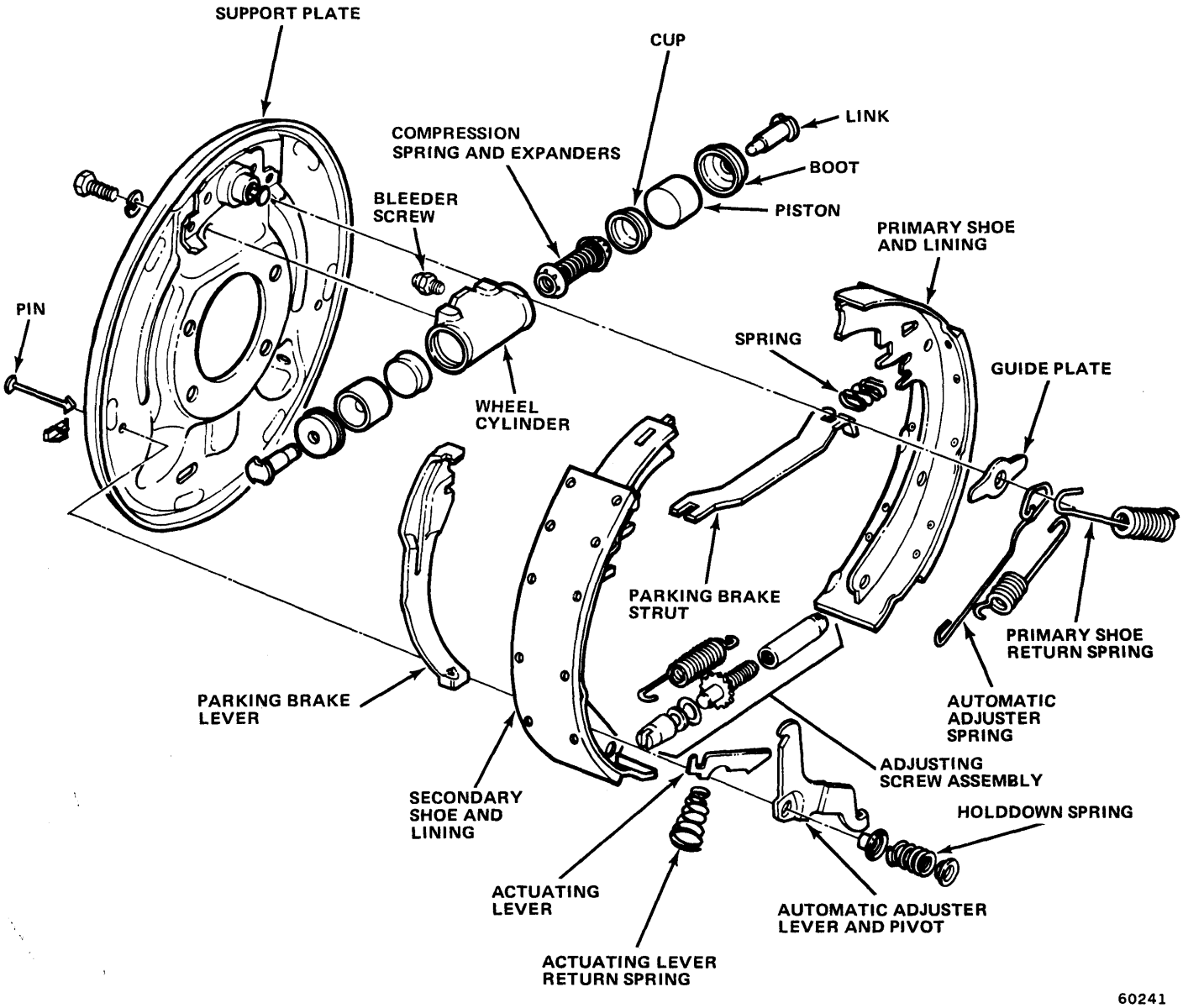

Fig. 9-16 Drum Brake Assembly—Cherokee-Wagoneer-Truck

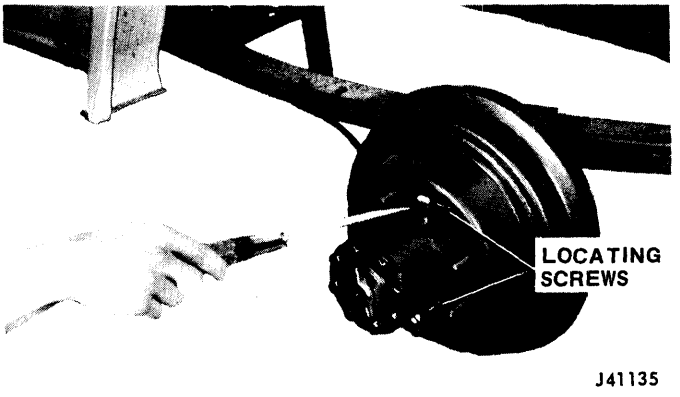

Fig. 9-17 Locating Screw Removal—Model 60 Axle

ondary shoe return spring using Spring Remover Tool J-8057.

(5) Remove holddown springs and remove brakeshoe assemblies. On rear brakes, disengage parking brake cable from parking brake lever. Parking brake strut is removed with brakeshoe assemblies (fig. 9-16).

(6) Place Wheel Cylinder Clamps J-8002 over wheel cylinders to retain pistons (fig. 9-18).

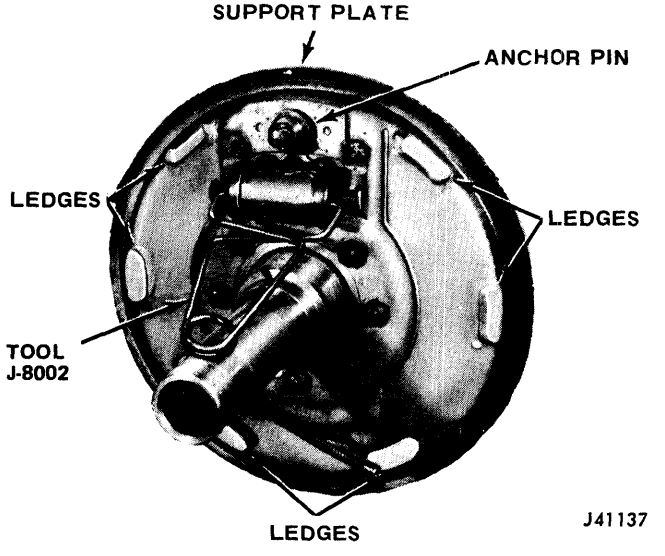

Fig. 9-18 Wheel Cylinder Clamp Installed

Cleaning and Inspection

Brakeshoe Assembly

(1) Inspect lining wear. If worn to within 1/32 inch of rivet head, replace lining.

(2) Inspect lining wear pattern. If wear is uneven across width of lining, replace lining and check drum for bell-mouthed condition.

(3) Inspect lining for cracks, charred surface, or broken rivets.

(4) Replace linings if contaminated with brake fluid, axle lubricant, or similar contaminants.

(5) Inspect adjusting screw spring, return springs, holddown springs, actuating lever return spring, and automatic adjuster spring. Replace springs if weaken, broken, or discolored (evidence of overheating causing tension loss).

(6) Inspect parking brake lever, automatic adjuster lever and pivot, and actuating lever for wear and defects. Replace levers if bent, broken, or excessively worn.

(7) Inspect adjusting screw for free operation. Screw must rotate freely. Inspect screw serrations for excessive wear which could effect automatic adjustment.

(8) Inspect parking brake cables for frayed condition. Check for missing or loose cable end retainer button. Inspect parking brake lever for distortion, worn pivot pin, proper cable retention, and proper cable operation.

Wheel Cylinders

(1) Inspect for evidence of leakage. Pull back dust boot and inspection condition of rubber piston cups and cylinder bore.

(2) Inspect bleeder screw and hydraulic line connection for evidence of leakage. Check brake lines for swelling, distortion, kinks, or cracks.

(3) If wheel cylinders require overhaul, proceed to step (3).

(4) Disconnect brake line. Do not bend line away from wheel cylinder. When cylinder is removed, line will separate from cylinder.

(5) Remove cylinder mounting bolts and remove cylinder.

(6) Remove links and dust boots. Remove piston cups, pistons, and compression spring and expanders from cylinder bore. Clean all metal parts with brake fluid.

(7) If bore is corroded or pitted, replace wheel cylinder. If bore is only stained or discolored, it may be polished with crocus cloth. Do not polish in a lengthwise direction; polish by rotating cylinder around crocus cloth wrapped around fingers.

CAUTION: *Do not hone wheel cylinders. If polishing was performed, clean the cylinder thoroughly with brake fluid only.*

(8) Inspect pistons. If scored or worn replace. Pistons may be polished lightly with crocus cloth if discolored or stained. Clean pistons thoroughly if they were polished.

(9) Coat cylinder bore with clean brake fluid. Do not lubricate pistons or cups. Assemble wheel cylinder.

CAUTION: *Piston cups should have flat sides facing open ends of cylinder and flared sides facing interior of cylinder.*

(10) Clean wheel cylinder mounting surface on support plate. Clean brake line fitting and threads.

(11) Start brake line fitting in wheel cylinder. Attach wheel cylinder to support plate and tightening brake line fitting. Tighten cylinder mounting bolts to 18 foot-pounds.

Support Plate

(1) Remove dirt using compressed air or cloth. Polish anchor pin with crocus cloth (fig. 9-18).

(2) Polish support plate ledges (fig. 9-18) with emery cloth. If ledges have deep grooves or ridges which might restrict shoe movement, the support plate should be replaced. Do not attempt to reduce ridges or grooves by grinding.

(3) Inspect support plate for warpage or cracks.

(4) Check torque of support plate-to-axle flange bolts.

(5) Check anchor pin for wear or being loose.

(6) Replace support plate if inspection reveals non-repairable defect.

Brake Drums

(1) Clean dirt from drums. Use compressed air and clean cloth. If drums require further cleaning, use soap and water solution only.

CAUTION: *Do not use brake fluid, gasoline, kerosene, or similar solvents to clean drums.*

(2) Inspect for scoring, cracks, heat checking, hard spots, and distortion.

(3) Check drum for excess runout or bell-mouthed condition. Perform this check with drum mounted on brake lathe. Use a dial indicator to obtain readings.

NOTE: *Brake drum radial runout must not exceed 0.005 inch.*

(4) Based on findings of steps (1) through (3), replace or recondition drum as required.

CAUTION: *When machining drums, do not remove more than 0.030 inch. Maximum allowable oversize for any drum is 0.060 inch over original diameter. In addition, do not attempt to machine drums with hard spots. Replace drums with this condition.*

Assembly and Adjustment

(1) Apply thin film of molydisulphide grease, or chassis lubricant to following parts (fig. 9-16): support plate ledges, anchor pin, adjusting screw threads and pivot, adjuster lever-to-secondary brakeshoe contact surface.

(2) When assembling rear brakes, lubricate parking brake lever pivot and portion of lever that contacts secondary brakeshoe.

(3) On rear brakes, attach parking brake cable to parking brake lever on secondary shoe.

NOTE: *When installing parking brake lever on replacement shoe, pinch C-clip to retain lever on shoe.*

(4) Install secondary shoe and automatic adjuster lever and pivot as an assembly. Secure assembly to support plate with holddown spring.

(5) Install actuating lever and adjusting lever. Install return spring on actuating lever tang. Large end of tapered spring rests on brakeshoe.

(6) Install primary shoe and holddown spring. Install guide plate on anchor pin.

(7) On rear brakes, install parking brake strut.

(8) Install adjusting screw and spring. Short hooked end of spring goes on primary shoe. Long hooked end goes on secondary shoe (fig. 9-16).

(9) Install return springs and adjuster spring in following sequence (fig. 9-16).

(a) adjuster spring.

(b) secondary shoe return spring (to shoe and adjuster spring).

(c) primary shoe return spring.

NOTE: *After springs are installed, be sure shoes are properly located on anchor pin.*

(10) Perform initial brake adjustment as follows:

(a) Determine drum diameter with drum-to-brakeshoe clearance gauge (fig. 9-19).

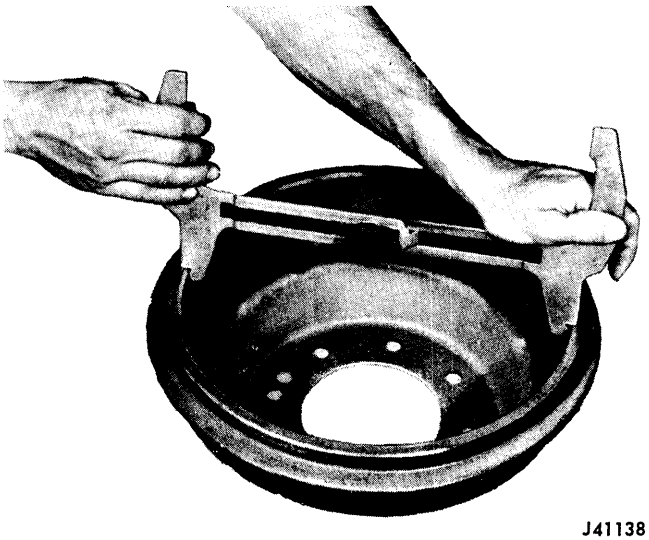

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Fig. 9-19 Using Drum-to-Lining Clearance Gauge

(b) Reverse gauge and place on brake linings (fig. 9-20). Turn adjusting screw until gauge just slides over brakelining surface.

(c) Rotate gauge around lining surface to ensure adequate clearance.

(11) If drum-to-shoe gauge is not available, initial brake adjustment may be performed as follows:

(a) Turn adjusting screw until drum slides over shoes with slight drag.

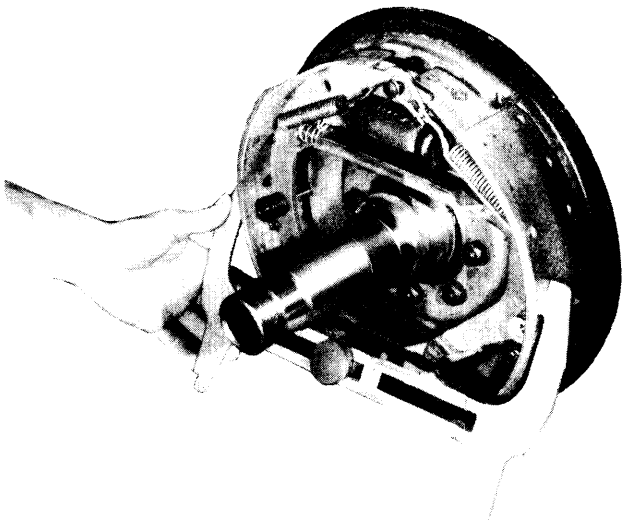

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Fig. 9-20 Checking Lining-to-Drum Clearance

(b) With drum in place, back off adjusting screw 30 notches. Use brake adjusting tool to turn screw. Use screwdriver to push automatic adjuster lever away from adjusting screw serrations. If access hole in support plate has a metal plug in it, knock out plug to perform adjustment. Be sure to remove loose plug from drum and install rubber or metal plug in access hole to prevent brake contamination after adjustment is completed.

(12) Install brake drums.

(13) If brake lines were disconnected, bleed brakes as described in Brake System Bleeding.

(14) Install wheels and tires and lower vehicle.

(15) Test brake operation before moving vehicle.

(16) Perform final brake adjustment by making 10 to 15 forward and reverse stops until satisfactory brake pedal height is obtained.

CAUTION: *If vehicle has automatic transmission, do not use forward range to halt reverse motion of vehicle. This procedure will prevent the automatic adjusters from operating properly, resulting in unsatisfactory pedal heights. All stops must be completed.*

DISC BRAKES—CHEROKEE—WAGONEER—TRUCK

GENERAL

Floating caliper-type front disc brakes are used on all models with disc brakes (fig. 9-21). A common disc brake caliper and 12.0-inch rotor are used. However, heavy-duty Trucks are equipped with a 12.5 inch disc brake rotor.

The disc brake system consists of a caliper assembly, a hub and rotor assembly, and a support and shield assembly. The caliper (fig. 9-22) is a one-piece casting containing a single piston, a piston bore, a bleeder screw and fluid inlet ports.

The piston bore contains the piston, piston seal, and dust boot. A groove is machined in the sidewall of the piston bore to accept the piston seal. This groove is slightly tapered, and is narrower at the bottom than at the top. Tapering the groove puts more compression on the edge of the square-cut seal that is exposed to brake fluid pressure (fig. 9-23).

The upper edge of the piston bore is counterbored to accept the dust boot seal retainer. The metal retainer part of the seal is pressed into the counterbore. The lip portion of the seal fits in a groove machined in the piston outer surface.

The caliper assembly has two mounting ears at each end. Holes are machined in these ears. The holes in the inboard ears are larger than those in the outboard ears. A groove is machined in the inside diameter of each hole to accommodate rubber bushings. A sleeve is installed through each of the larger holes in the inboard ears (fig. 9-22). The caliper assembly is attached to a bracket which is welded to, and is part of, the support shield. The support shield is bolted to the steering knuckle assembly.

Two Allen head support bolts attach the caliper to the support shield. The bolts are inserted through sleeves in

The exterior surface of the steel piston is precision ground and nickle-chrome plated to provide a hard, durable surface.

CAUTION: *Do not sandpaper or machine the outer surface of the piston. Removal of the protective plating or altering the diameter could cause pitting, rusting, and eventual cocking of the piston in the bore.*

The piston bore does not contain a return spring. Lining wear is compensated for by the lateral sliding movement of the caliper and by increased piston extension (fig. 9-24).

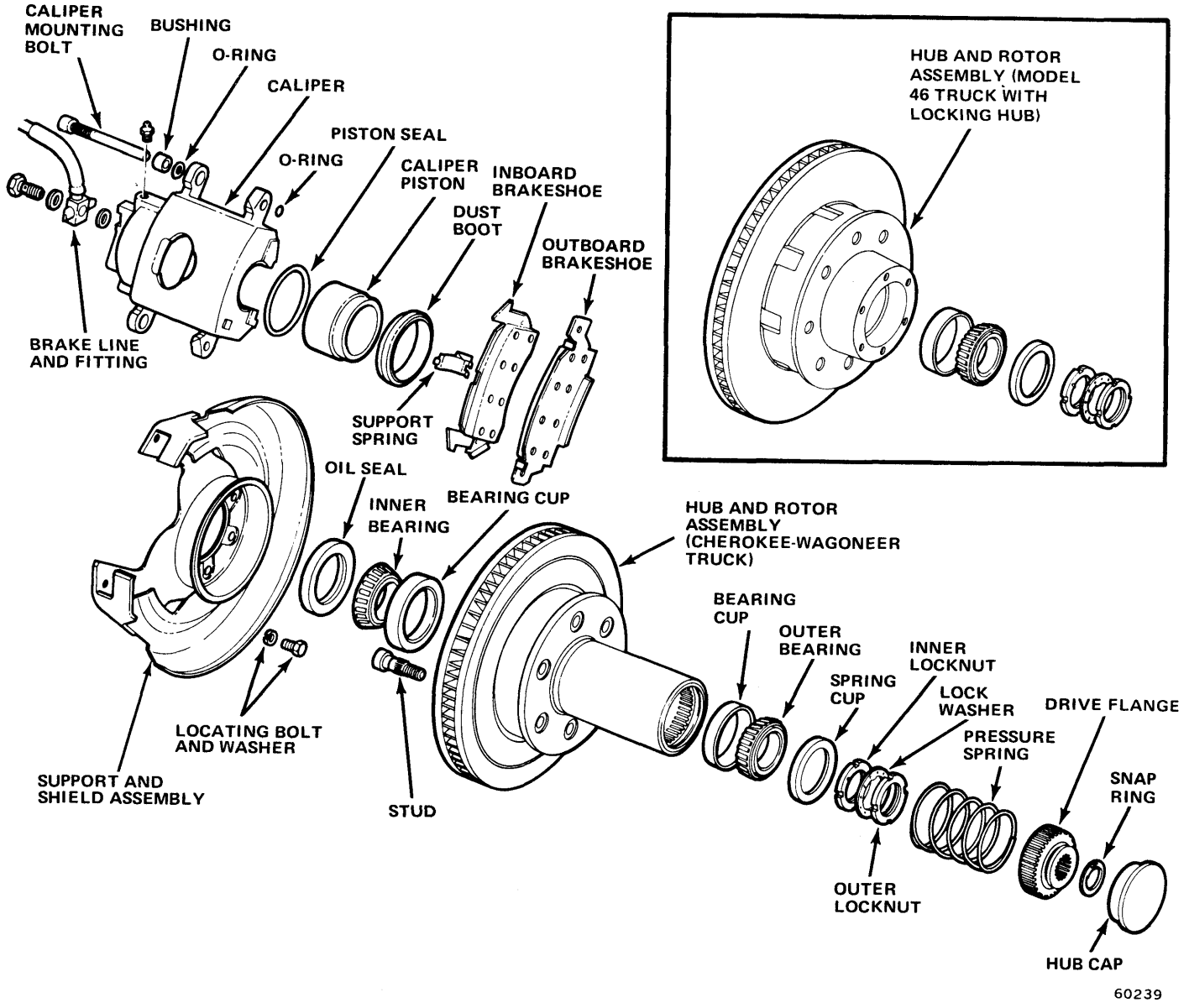

Fig. 9-21 Disc Brake Assembly—Cherokee-Wagoneer-Truck

the inboard mounting ear holes of the caliper, under the ears of the inboard shoe, and through the outboard ears of the caliper. The threaded portion of the bolt heads are tightened against the sleeve ends. The caliper slides on the sleeves in the inboard ears and on the unthreaded portion of the bolt that fits in the outboard ears.

Each caliper contains two shoe and lining assemblies, each assembly consisting of a stamped metal shoe and riveted lining.

When installed in the caliper, the shoe and lining assemblies straddle the disc brake rotor. The inboard and outboard lining differ as follows:

(a) Inboard shoe and lining are slightly thicker.

(b) Outboard shoe has flanged mounting ears at top.

(c) Outboard shoes have a lip at the bottom of the shoe, which is bent at right angles to the shoe.

(d) Inboard shoe has mounting ears on top which fit over retaining bolts.

(e) Inboard shoe has a notch at the top for the supporting spring.

A brakelining wear warning sensor is attached to the back of all disc brakeshoes. The sensor consists of a strip of flanged metal. When brakelining wears to the point of replacement, the sensor contacts the rotor surface making a screeching or scraping noise to warn the driver that the brakelining assemblies are in need of replacement (fig. 9-25).

An inspection port is provided at the top center of the caliper casting for visual inspection of lining condition (fig. 9-26).

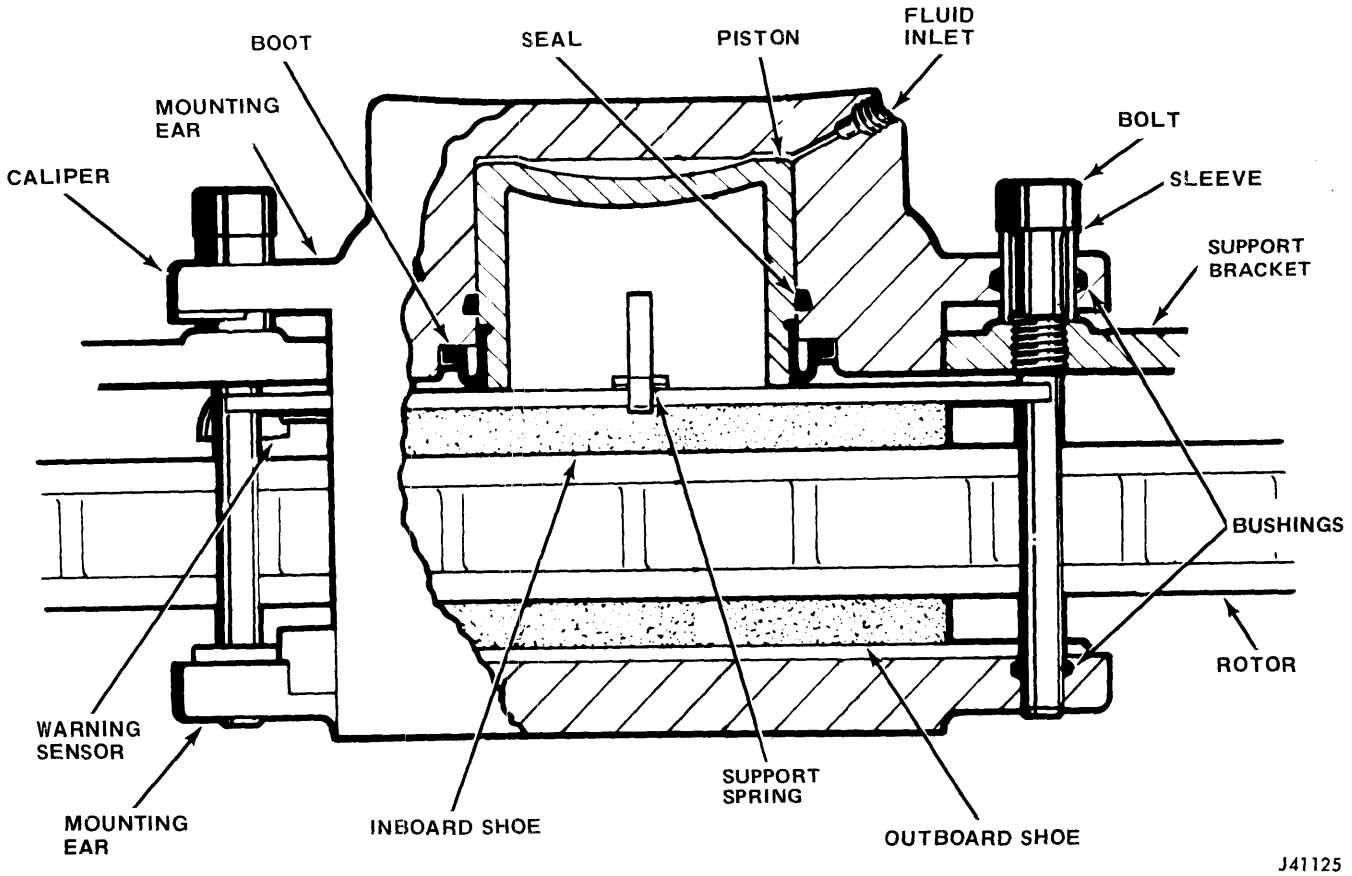

Fig. 9-22 Caliper and Rotor—Single Piston

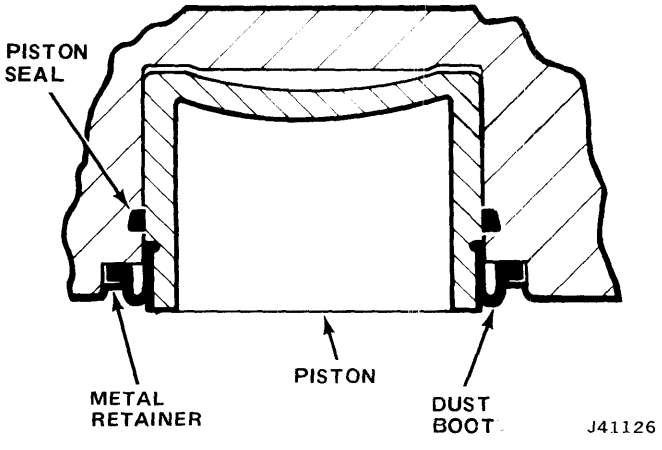

Fig. 9-23 Cross Section of Caliper Piston Bore and Piston

Operation

The significant feature of the single-piston caliper operation is that it is free to slide laterally on the two mounting bolts threaded into the support shield.

Figure 9-27 shows a simplified cross section of the floating caliper and the forces at work when the brakes are applied. During brake application, fluid pressure behind the piston increases. This pressure is exerted equally against the bottom surface of the piston and against the bottom surface of the piston bore.

Pressure applied to the piston is transmitted to the inboard shoe and lining, pressing the lining against the inboard rotor surface. Pressure applied to the bottom of the piston bore forces the caliper to slide on the mounting bolts, toward the inboard side. This inward movement of the caliper causes the outboard section of the caliper to press the outboard shoe and lining assembly against the rotor surfaces.

Any application or release of pressure on the brake pedal causes only a very slight movement of the piston and caliper. Upon release of the pedal, the piston and caliper return to an at-rest position; the brake lining does not retract any appreciable distance from the rotor. This provides the advantages of improved brake response, and reduced pedal travel. The disc brakeshoes operate at a zero clearance and continually wipe the rotor free of foreign matter.

As the linings wear, the piston extends farther out of the caliper bore, and the caliper repositions itself on the mounting bolts to maintain proper lining-to-rotor relationship. The caliper bore receives additional brake fluid to compensate for lining wear and increased piston extension (fig. 9-24).

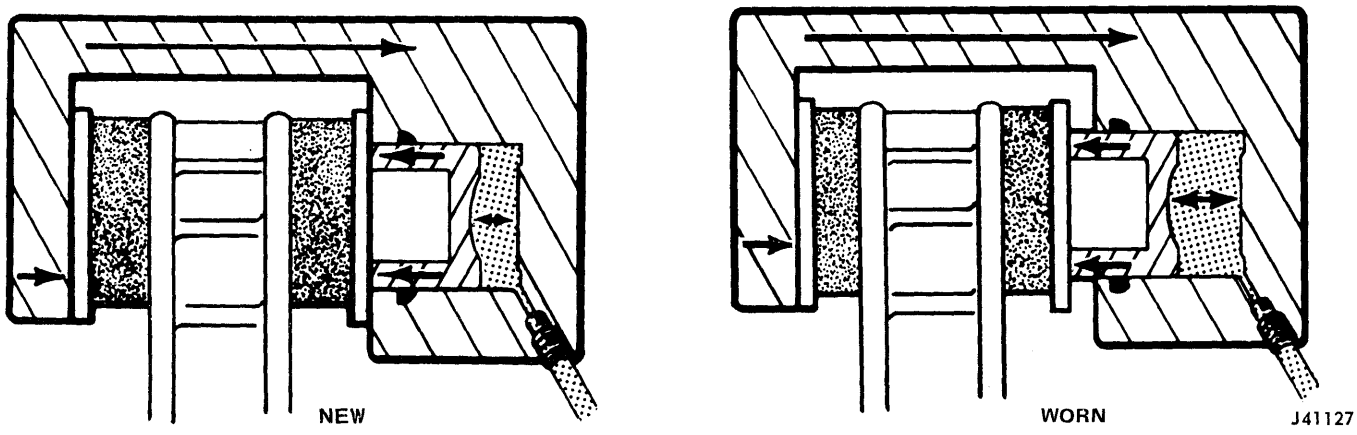

Fig. 9-24 Piston Travel—New and Worn Linings

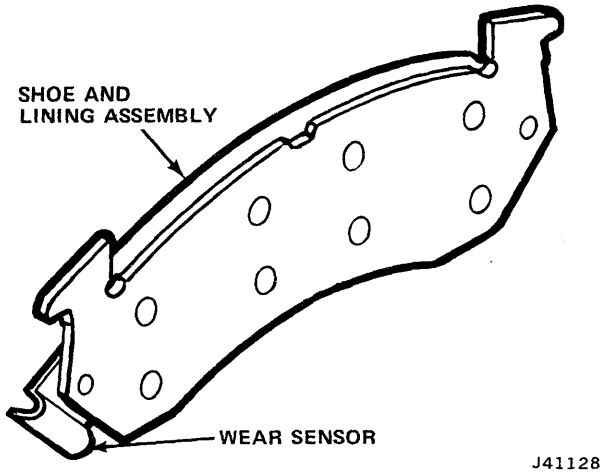

Fig. 9-25 Wear Sensor Location

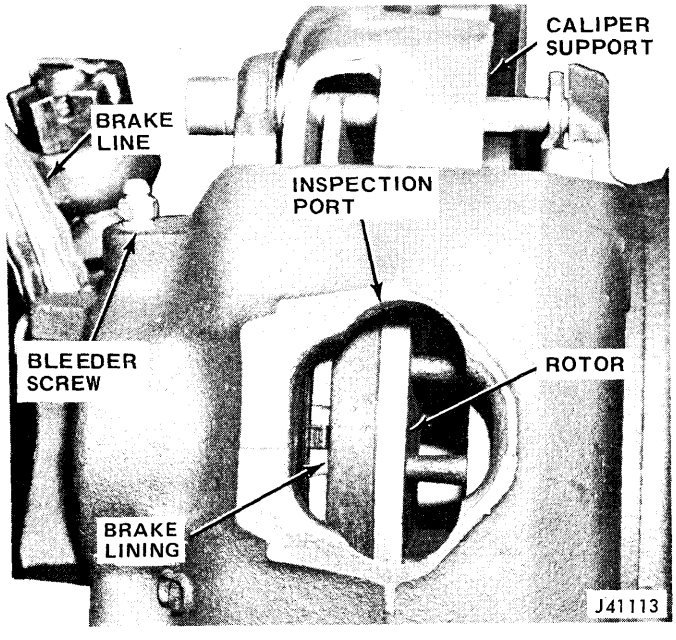

Fig. 9-26 Caliper Inspection Port

SERVICE

Disc Brakeshoe Replacement

(1) Remove two-thirds of brake fluid from front reservoir.

(2) Raise vehicle.

(3) Remove front wheel and tire assemblies.

(4) Insert screwdriver between calipet piston and inboard shoe and pry piston back into bore until it bottoms.

(5) Remove allen head mounting bolts (fig. 9-28), and remove caliper (fig. 9-29). Place caliper on front spring or other suitable support. Do not allow brake hose to support weight of caliper.

(6) Remove both shoe and lining assemblies. Remove support spring from inboard shoes. Note spring position for correct installation later (fig. 9-29).

(7) Remove sleeves from inboard ears of caliper. Remove rubber bushings from all holes in caliper ears.

(8) Clean all mounting holes and bushing grooves in caliper ears. Clean mounting bolts. Replace bolts if corroded or threads are damaged.

NOTE: *Do not use abrasives on bolts as they will destroy the protective plating on the bolts.*

(9) Wipe inside of caliper clean, including exterior of dust boot. Inspect dust boot for cuts, cracks, and for proper seating in piston bore. If evidence of fluid leakage is noted during inspection, caliper should be overhauled.

NOTE: *Do not use compressed air to clean inside of caliper as it may unseat the dust boot seal.*

(10) Lubricate replacement bushings, sleeves, bushing grooves, and small ends of mounting bolts with silicone lubricant. Install rubber bushings in all caliper mounting ears.

CAUTION: *Do not use old bushings and sleeves. Use replacement parts only.*

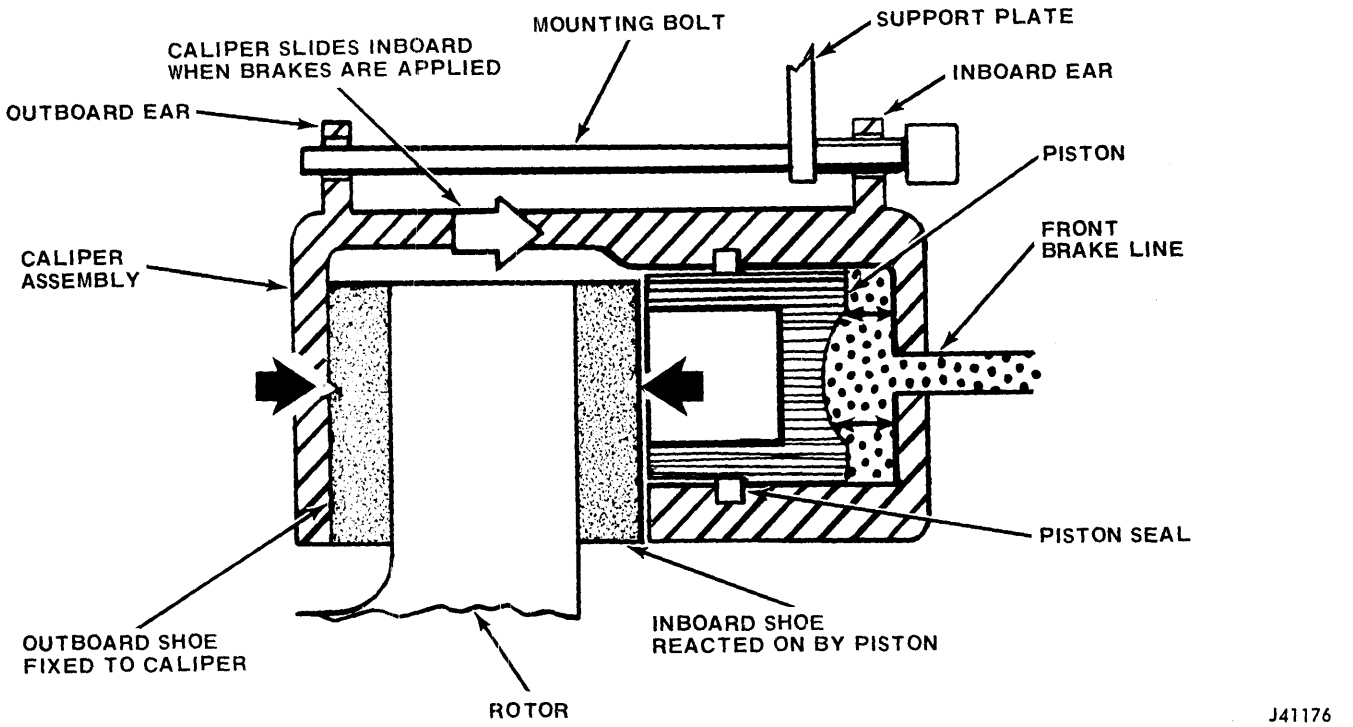

Fig. 9-27 Disc Brake Operation

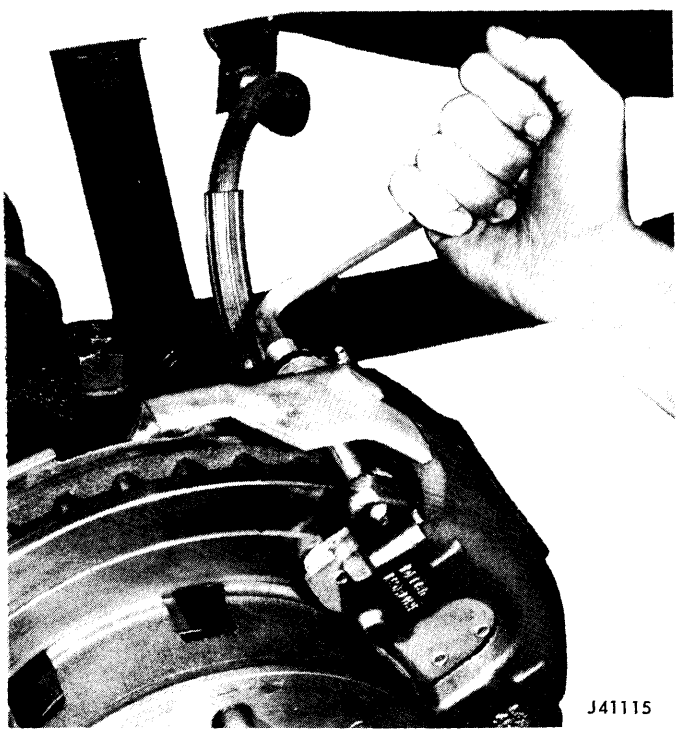

Fig. 9-28 Removing Caliper Mounting Bolts

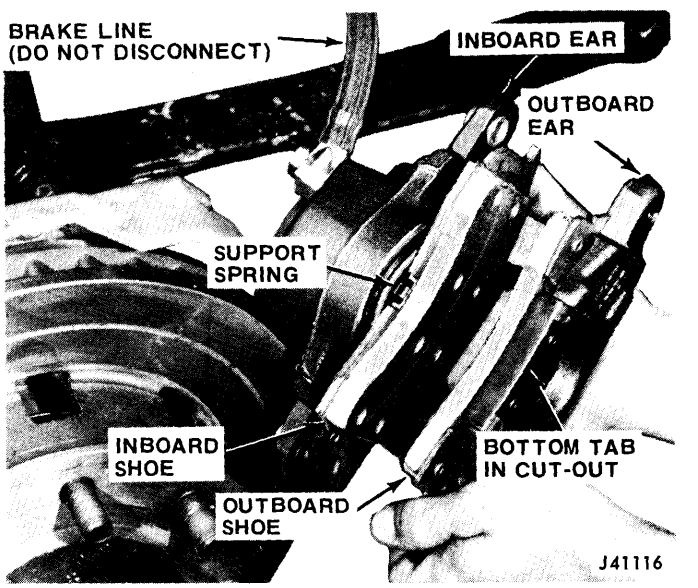

Fig. 9-29 Caliper Removal

(11) Install sleeves in inboard mounting ears. Position sleeves so that sleeve end facing shoe and lining is flush with machined surface of mounting ear.

(12) Install support spring on inboard shoe. Place single tang end of spring over notch in shoe (fig. 9-30).

(13) Install inboard shoe in caliper (fig. 9-31). Shoe must lay flat against piston. Be sure support spring is fully seated in piston (fig. 9-31).

(14) Install outboard shoe. Ears on shoe should rest on top of ears in caliper. Bottom tab on shoe fits in cutout in caliper. Be sure shoe is fully seated.

(15) Install shoes and position caliper over rotor. Align mounting holes in caliper and support bracket and install mounting bolts. Be sure bolts pass under retaining ears on inboard shoes. Push bolts through untily

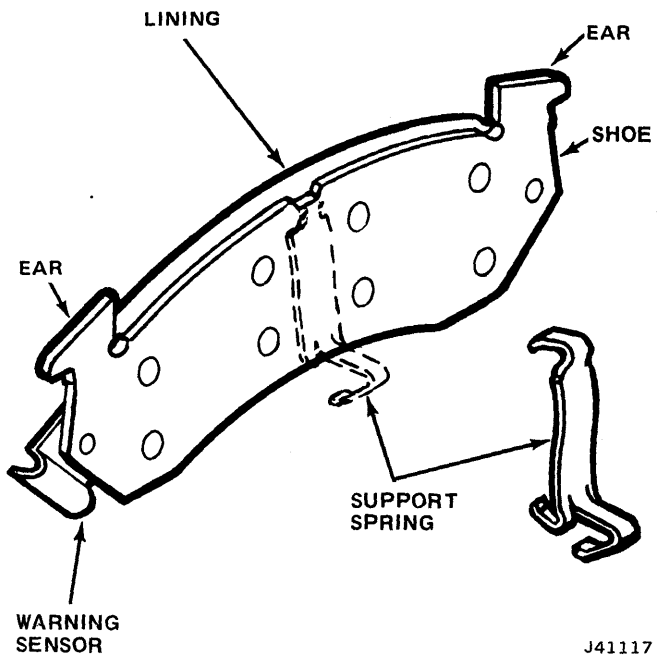

Fig. 9-30 Support Spring Installation

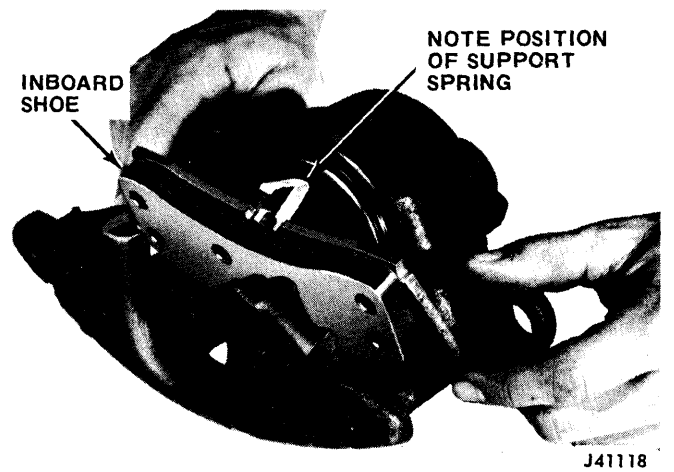

Fig. 9-31 Installing Inboard Brakeshoes

engage holes of outboard shoe and caliper ears. Thread bolts into support bracket and tighten to 35 foot-pounds torque.

(16) Fill master cylinder with brake fluid and pump brake pedal to seat shoes.

(17) Use channel-lock pliers to clinch both upper ears of outboard shoe until radial clearance between shoe and caliper is eliminated.

NOTE: *Outboard shoes with formed ears are designed for original installation only and are fitted to the caliper. These shoes should never be relined or reconditioned for installation.*

(18) Install wheel and tire assemblies and lower vehicle.

(19) Check master cylinder fluid level. Add fluid as required to fill master cylinder to within 1/4 inch of reservoir rim.

(20) Apply brakes several times to seat brakeshoes and check and correct master cylinder fluid level as necessary.

(21) Test brake operation before moving vehicle.

Caliper Overhaul

(1) Remove two-thirds of brake fluid from front reservoir.

(2) Raise vehicle.

(3) Remove wheel and tire assemblies.

(4) Bottom caliper piston using screwdriver.

(5) Clean brake hose-to-caliper connection thoroughly. Remove hose-to-caliper bolt and copper gaskets. Cap or tape open connections to keep out dirt. Discard copper gaskets.

(6) Remove caliper assembly and remove shoes from caliper.

NOTE: *Work on one caliper at a time only. If shoes are to be reused, mark their location in caliper.*

(7) Wash caliper exterior with clean brake fluid. Drain residual fluid from caliper. Place caliper on clean work surface.

WARNING: *Caliper piston removal requires the use of compressed air. Do not, under any circumstances, place fingers in front of the piston in an attempt to catch or protect it when applying compressed air to remove the piston.*

(8) Pad interior of caliper with clean shop towels. Insert air nozzle into inlet hole in caliper and slowly apply air pressure against piston to push it out of bore (fig. 9-32).

CAUTION: *To avoid possible piston damage, use only enough air pressure to ease piston out of bore. Do not blow piston out of bore.*

(9) Pry dust boot out of bore with screwdriver (fig. 9-33). Do not scratch bore. Discard dust boot.

(10) Remove piston seal from piston bore using pencil (fig. 9-34) and discard seal.

CAUTION: *Use only nonscratching implements such as a pencil, wooden stick, or piece of plastic to remove the seal. Do not use a metal tool or similar object to remove the seal as the bore may be scratched.*

(11) Remove bleeder screw. Remove and discard sleeves and rubber bushings from mounting ears.

(12) Wash all parts in clean brake fluid. Blow out all passages in caliper and bleeder valve using dry, filtered compressed air. Replace mounting bolts if corroded or if threads are damaged.

CAUTION: *Do not attempt to clean the bolts with abrasives, as the protective plating will be removed.*

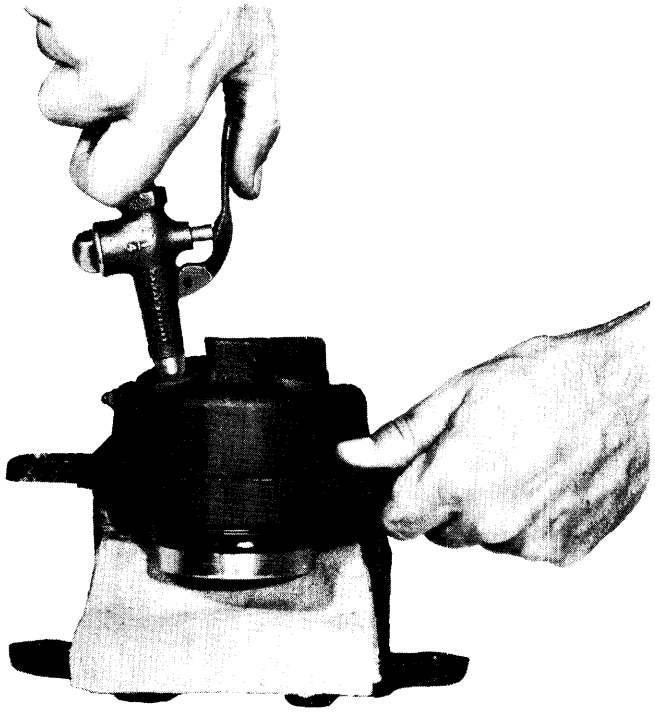

Fig. 9-32 Piston Removal

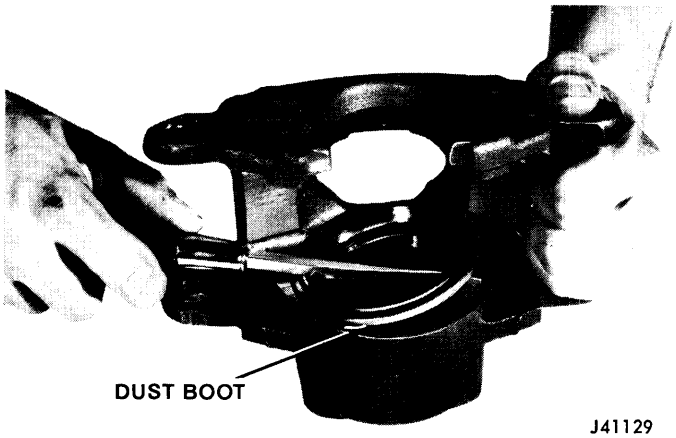

Fig. 9-33 Dust Boot Removal

(13) Inspect caliper piston. Replace piston if nicked, scratched, corroded, or protective plating has worn off.

CAUTION: *Do not attempt to refinish the piston in any way. The outside diameter is the sealing surface and is manufactured to very close tolerances. Removal of the nickel-chrome plating will lead to pitting, rusting, and eventual cocking of the piston in the piston bore.*

(14) Inspect caliper piston bore. Replace caliper if bore is nicked, scratched, corroded, worn, or cracked. The bore is not plated and minor stains or corrosion can be polished with crocus cloth.

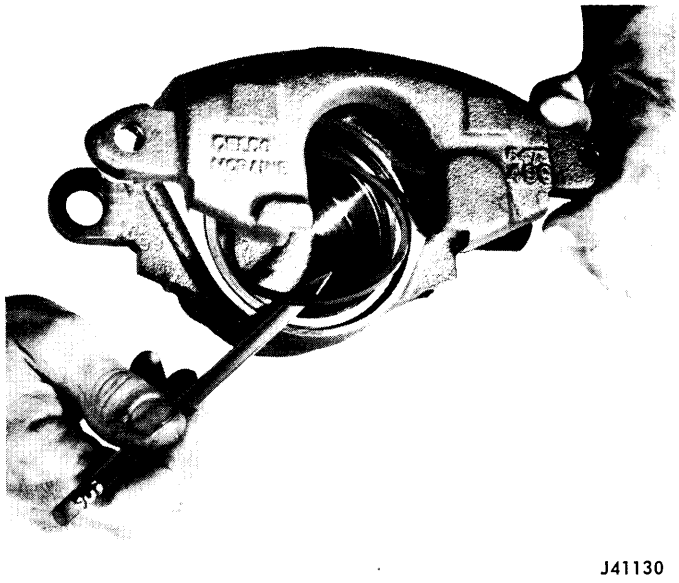

Fig. 9-34 Piston Seal Removal

CAUTION: *Do not use emery cloth or similar abrasives on piston bore. If bore does not clean up with crocus cloth, replace caliper. Clean caliper thoroughly with brake fluid if bore was polished with crocus cloth.*

(15) Lubricate bore and replacement seal with brake fluid and install seal in groove.

(16) Lubricate piston with brake fluid and install replacement dust boot on piston. Install dust boot in piston groove so that fold in boot faces open end of piston. Slide metal retainer portion of dust boot over open end of piston and push retainer toward back of piston until lip on fold seats in piston groove (fig. 9-35). Push retainer portion of boot forward until boot is flush with rim at open end of piston and snaps into place (fig. 9-36).

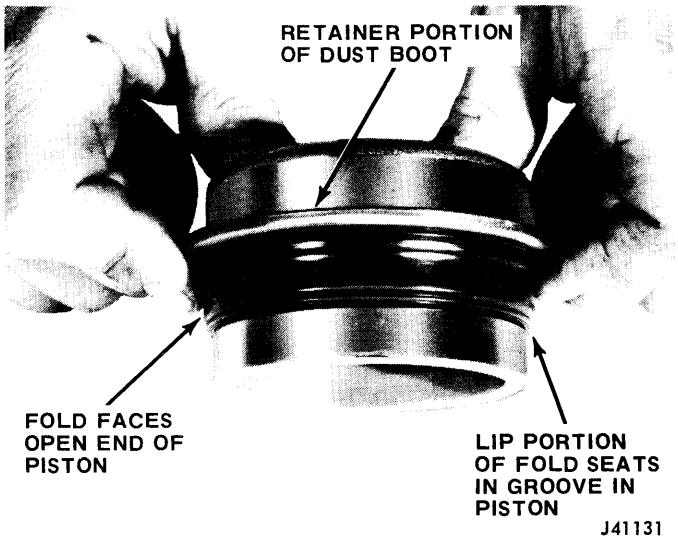

Fig. 9-35 Installing Dust Boot on Piston

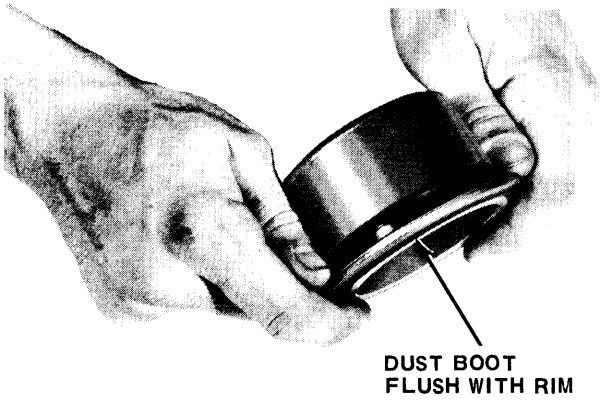

Fig. 9-36 Snapping Dust Boot into Place

(17) Insert piston in bore. Do not unseat piston seal. It requires 50 to 100 pounds of force to bottom piston.

(18) Install dust boot retainer in counterbore at top of piston bore. Seat dust boot retainer using Tool J-22904 (fig. 9-37).

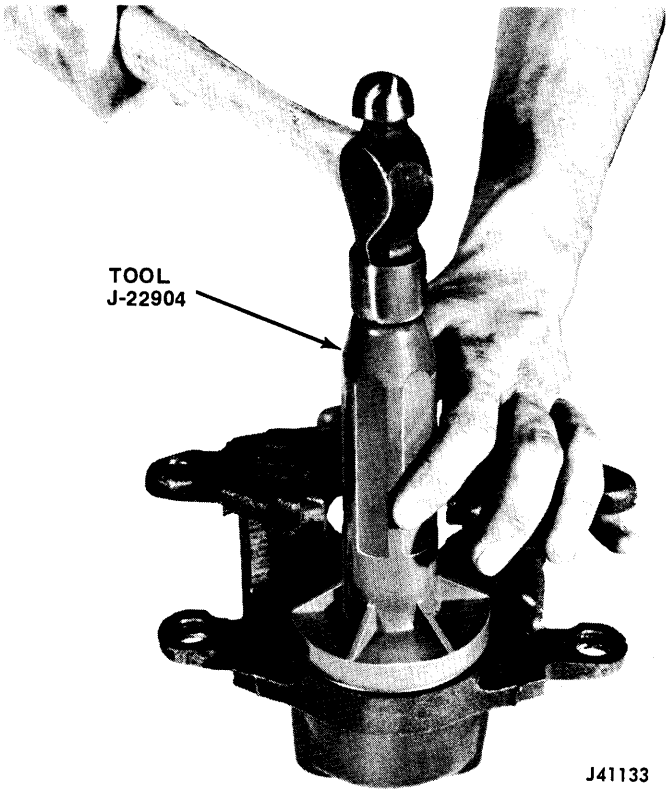

Fig. 9-37 Seating Dust Boot Retainer

CAUTION: *Metal retainer portion of boot must be evenly seated in counterbore and fit below the face of the caliper.*

(19) Install bleeder screw. Tighten to 90 inch-pounds torque.

(20) Connect brake line to caliper using replacement copper gaskets. Tighten bolt 160 inch-pounds torque.

(21) Install shoes, sleeves, and rubber bushings as outlined in Disc Brakeshoe Replacement.

(22) Install caliper over rotor. Attach caliper to support bracket. Tighten mounting bolts to 35 foot-pounds torque.

(23) Bleed brakes as outlined in Brake System Bleeding.

(24) Install wheel and tire assemblies and lower vehicle.

(25) Test brake operation before driving vehicle.

Rotor Service

Rotor service is extremely important because rotor tolerances must be accurate to ensure proper brake operation. Rotor service involves the following steps: inspection, measurement, refinishing, and replacement where indicated.

Inspection

(1) Raise vehicle and remove wheels.

(2) If rotor braking surfaces are heavily rusted or scaled, clean surfaces with flat sanding disc (while turning rotor) before attempting inspection or measurement.

(3) Check braking surfaces for cracks, nicks, broken cooling fins, and scoring. Some scoring of surfaces may occur during normal use, however, scoring that is 0.015-inch deep or less is not detrimental to brake operation. Replace rotor if cracked or broken.

Measurement

(1) Tighten wheel bearing adjusting nut enough to remove all end play from wheel bearings.

(2) Check Lateral Runout: Lateral (face) runout of rotor, as measured at outboard braking surface, must not exceed 0.005 inch (fig. 9-38). Lateral runout will cause rotor wobble resulting in chatter vibration, pedal pulsation, and excessive pedal travel (brakeshoes knock pistons back into caliper bore).

(a) Check runout by mounting dial indicator on pedestal-type stand or on spindle with indicator stylus contacting outboard braking surface one inch from edge of rotor (fig. 9-38).

(b) Turn rotor full 360 degrees and observe reading. If runout exceeds tolerance, refinish rotor.

(3) Check Thickness Variation: Thickness of rotor, as measured at four or more equally spaced points, must not exceed 0.0005 inch. Thickness variations can cause pedal pulsation and vibration when applying brakes.

(a) Check variation by measuring thickness of rotor at four or more equally spaced points around circumference of rotor (fig. 9-39). Use micrometer or two dial indicators to perform measurement and measure thickness at same distance in from edge of rotor at all points.

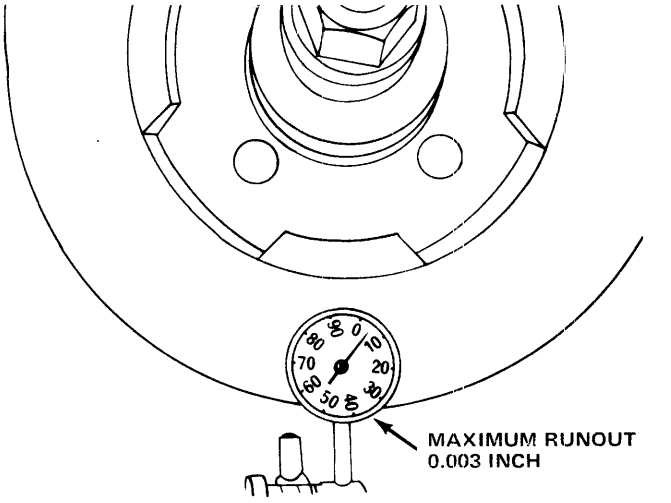

Fig. 9-38 Checking Lateral Runout

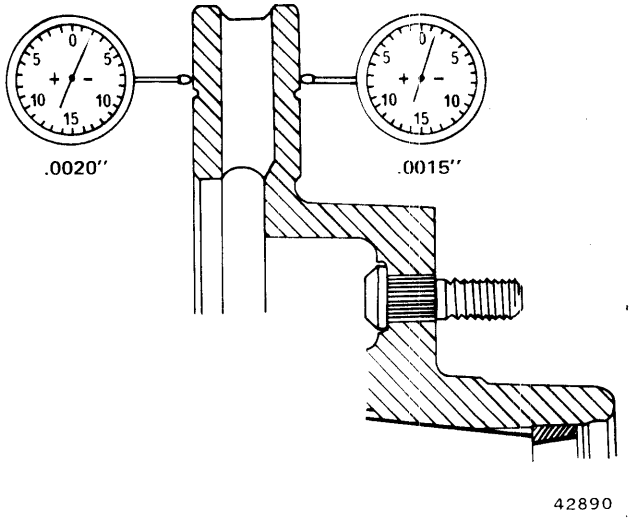

Fig. 9-39 Checking Thickness Variation

(b) If variation exceeds tolerance, refinish rotor.

(4) Check Hub-to-Bore Runout: Wheel mounting surface of hub must be square with centerline of bearing cup bore to within 0.010 inch (fig. 9-40).

NOTE: *Although hub-to-bore runout does not affect brake operation or action, it can cause a mechanical-type vibration at high speed. Measure hub-to-bore runout only if car has unexplained high speed vibration or excessive lateral runout of rear wheel(s). Refer to Tire and Wheel Runout in this section.*

(a) Mount dial indicator on spindle with indicator stylus contacting wheel mounting surface of hub.

(b) Rotate hub and observe reading.

(c) Replace hub and rotor if runout exceeds tolerance.

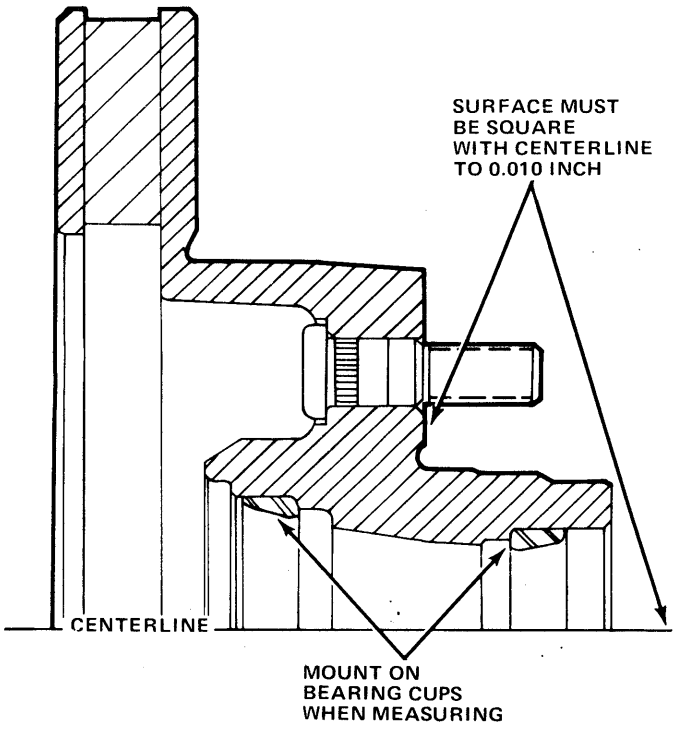

Fig. 9-40 Checking Hub-to-Bore Runout

NOTE: *If rotor braking surfaces are not scored or otherwise damaged and all measurements were within tolerance, rotor can be reused without servicing.*

Rotor Refinishing

Resurface rotor on brake lathe using flat sanding discs only if scoring is light (0.015-inch deep or less), if rotor surfaces have heavy rust and scale, and only if rotor meets all measurement specifications listed under Rotor Measurement.

Refinish rotor on disc brake lathe if scoring is deeper than 0.015 inch, or if runout, thickness variation, and hub-to-bore runout exceed specifications in Rotor Measurement.

NOTE: *Rotor finish should be 20 to 60 micro-inches and not be directional. After turning the rotor in disc brake lathe, flat sanding discs should be used as a final step in the refinishing procedure to provide the desired microfinish and cross-hatch pattern on the rotor surface (fig. 9-41).*

Replace the rotor if refinishing will cause the rotor to fall below the minimum thickness specification (after refinishing) of 1.215 inches.

Rotor Replacement

Removal

(1) Remove two-thirds of brake fluid from master cylinder front reservoir. Discard removed fluid.

(2) Remove wheel cover, if equipped.

(3) Loosen wheel nuts.

(4) Raise and support front of vehicle.

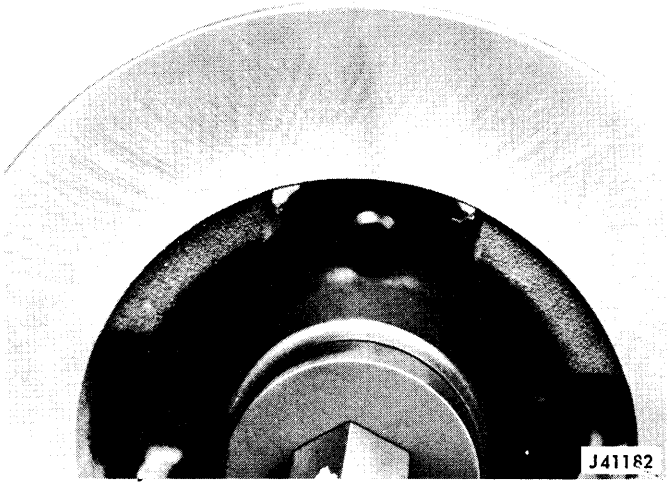

Fig. 9-41 Correct Surface Finish—Nondirectional Cross-Hatch Pattern

(5) Remove wheel nuts and wheel.
(6) Remove caliper mounting bolts (fig. 9-28).
(7) Lift caliper off rotor and place it on front spring. Do not allow brake hose to support weight of caliper
(8) Remove rotor hub cap.
(9) Remove drive flange snap ring (fig. 9-21).
(10) Remove spring cup.
(11) Remove outer locknut and lockwasher using Tool J-6893
(12) Remove bearing adjuster inner locknut (fig. 9-21).
(13) Remove rotor and remove wheel bearings from rotor.

Installation

(1) Lubricate wheel bearings with an EP-type, waterproof wheel bearing grease.
(2) Install inner wheel bearing and replacement oil seal in rotor.
(3) Mount rotor on spindle and install outer bearing and bearing adjuster inner locknut using Tool J-6893.

CAUTION: *The bearing adjuster inner locknut has a peg on one side. This peg must face away from the vehicle when installed.*

(4) Tighten inner locknut to 50 foot-pounds torque. Turn rotor while tightening locknut.
(5) Loosen bearing adjuster inner locknut 1/3 turn.
(6) Install lockwasher on bearing adjuster inner locknut. Be sure peg on inner locknut engages in one of the holes in lockwasher.
(7) Install outer locknut and tighten locknut to 50 foot-pounds torque.
(8) Install pressure spring cup.

CAUTION: *The recessed side of the cup must face the outer bearing and the flat side of the cup must face the pressure spring.*

(9) Install pressure spring, drive flange, snap ring, and hub cap.
(10) Install caliper and caliper mounting bolts. Tighten bolts to 35 foot-pounds torque. Be sure bolts pass under retaining ears on inboard brakeshoe.
(11) Install wheel and wheel nuts.
(12) Remove supports and lower vehicle.
(13) Tighten wheel nuts to 75 foot-pounds torque on Cherokee, Wagoneer, and J-10 truck models. Tighten nuts to 130 foot-pounds torque on 8400 GVWR J-20 truck models.
(14) Install wheel cover, if equipped.
(15) Fill master cylinder to within 1/4 inch of reservoir rims.
(16) Apply brakes several times to seat brakeshoes and recheck master cylinder fluid level. Add fluid if required.

DISC BRAKES—CJ MODELS

GENERAL

The front disc brake assembly consists of an integral hub and rotor, a caliper assembly, two shoe and lining assemblies, a splash shield, an adapter, and a caliper anchor plate (fig. 9-42).

The one-piece cast iron hub and rotor assembly has integrally cast cooling fins between the two braking surfaces of the rotor. These fins ventilate and cool the rotor by circulating air between the braking surfaces. the rotor braking surfaces are protected from road spash by the wheel and tire on the outboard side and the splash shield on the inboard side.

The caliper used on CJ models has a 3.1-inch diameter piston.

The caliper is positioned in, and slides on, abutment surfaces machined into the forward and rear ward edges

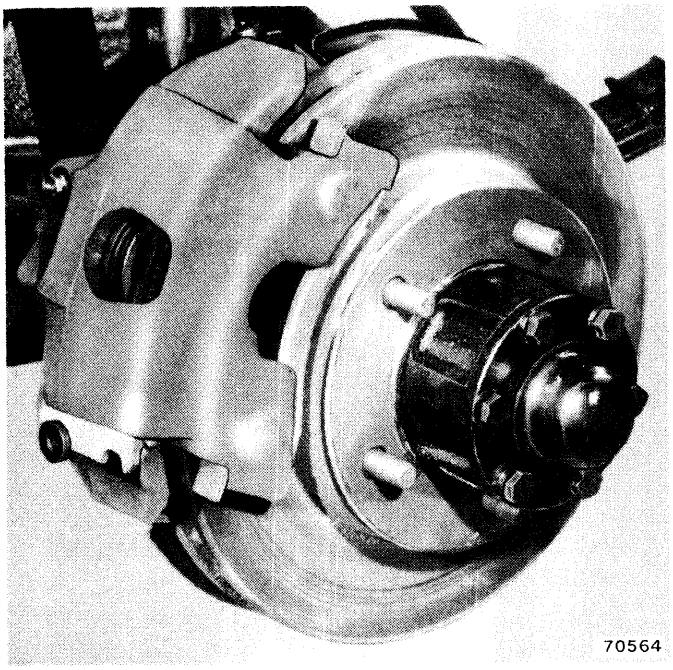

Fig. 9-42 Disc Brake Assembly—CJ Models

of the caliper anchor plate. A caliper support key is installed between the forward edge of the caliper and abutment surface of the caliper anchor plate and caliper to maintain tension on the support key. The caliper support key is held in position by the support key retaining screw.

The caliper is a one-piece casting containing the piston bore, caliper piston, piston seal, and dust seal. A groove is machined in the piston bore to hold the square cut piston seal which provides the hydraulic seal between the caliper piston and piston bore. The dust seal seats in a recess machined into the top of the piston bore and into a groove machined in the caliper piston. The dust seal protects the piston bore and caliper piston from road splash and contamination which could impair piston operation. A bleeder screw is located above the piston bore to bleed air from the system when necessary.

The inboard shoe is located in the caliper anchor plate. The inboard shoe anti-rattle spring is positioned between the rear edge of the shoe and the caliper anchor plate. The outboard show is located in the caliper with the shoe flanges bearing against the outboard shoe location surfaces of the caliper. Brakeshoe linings are riveted to the shoes. The inboard and outboard shoes are not interchangeable.

Operation

When the brakes are applied, fluid pressure developed by the master cylinder is exerted equally against the piston and the bottom of the piston bore in the caliper. The pressure applied to the piston is transmitted to the inboard shoe, forcing the lining against the rotor inboard surface. The pressure applied to the bottom of the piston bore forces the caliper assembly to slide inboard on the caliper anchor plate. Since the caliper is a one-piece assembly, this movement causes the outboard section of the caliper to apply pressure against the outboard shoe forcing the lining against the rotor outboard surface. As hydraulic pressure increases, the shoe and lining assemblies press against the rotor surfaces with increasing force to develop braking action.

Wear Compensation

The piston seal maintains operating clearance between the rotor and linings and adjusts for wear during each application. When the brakes are applied, the seal is deflected by hydraulic pressure and by friction between the seal and piston. When hydraulic pressure is released, the seal reverts to its original shape and retracts the piston just enough to provide the necessary operating clearance.

As the linings wear, piston travel tends to exceed the deflection limit of the seal. The piston is then moved outward through the seal just enough to compensate for lining wear (fig. 9-43).

Lining Inspection

Inspect the brake linings any time that the wheels are removed (tire rotation, etc.). Check both ends of the outboard lining by looking in at each end of the caliper. These are the points at which the highest rate of wear normally occurs. At the same time, check the lining thickness of the inboard shoe to make sure that it has not worn prematurely. Look down through the inspection port to view the inboard shoe and lining (fig. 9-42). Whenever the thickness of any lining is worn to the approximate thickness of the metal shoe, all shoe and lining assemblies on both brakes should be replaced.

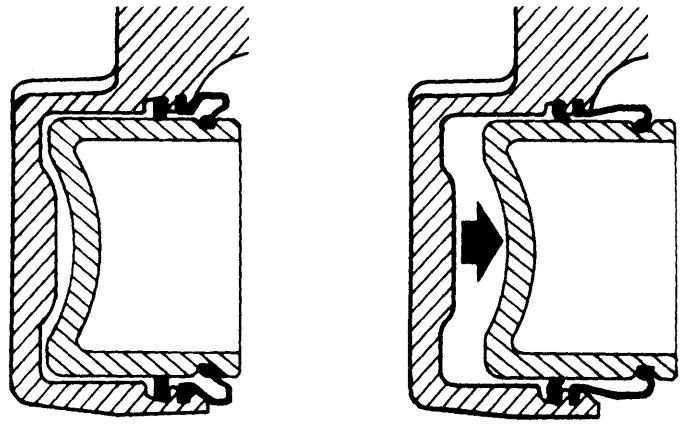

Fig. 9-43 Piston and Seal Movement

SERVICE

Brakeshoe Replacement

(1) Remove and discard two-thirds of brake fluid from master cylinder reservoir serving front disc brakes.

NOTE: *The largest reservoir in the master cylinder supplies the front brakes.*

(2) Remove hub cap and loosen wheel retaining nuts.

(3) Raise and support vehicle.

(4) Remove front wheels.

(5) Work on one caliper at a time only.

(6) Press caliper piston to bottom of piston bore using screwdriver (fig. 9-44).

(7) Remove support key retaining screw using 1/14-inch hex or Allen wrench (fig. 9-45).

(8) Remove caliper support key and support spring using punch and hammer (fig. 9-46).

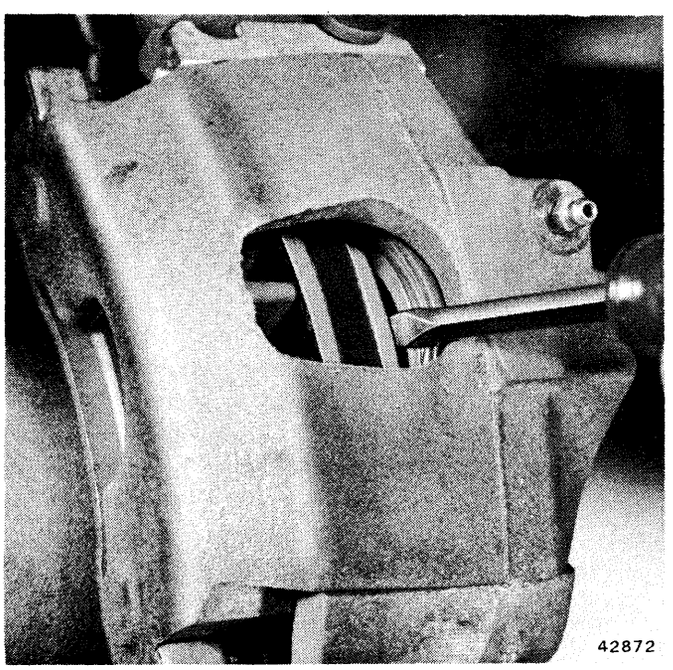

Fig. 9-44 Bottoming Caliper Piston

(9) Lift caliper assembly out of anchor plate and off rotor (fig. 9-47).

(10) Place caliper on spring. Do not let brake hose support weight of caliper.

(11) Remove inboard brakeshoe from anchor plate (fig. 9-48).

(12) Remove inboard brakeshoe anti-rattle spring from inboard shoe (fig. 9-48). Note position of anti-rattle spring for assembly reference.

(13) Remove outboard brakeshoe from caliper.

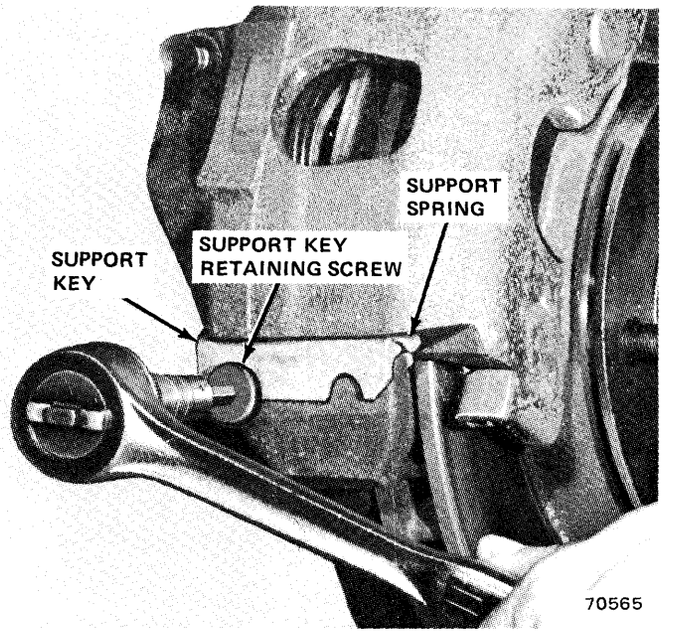

Fig. 9-45 Removing Support Key Retaining Screw

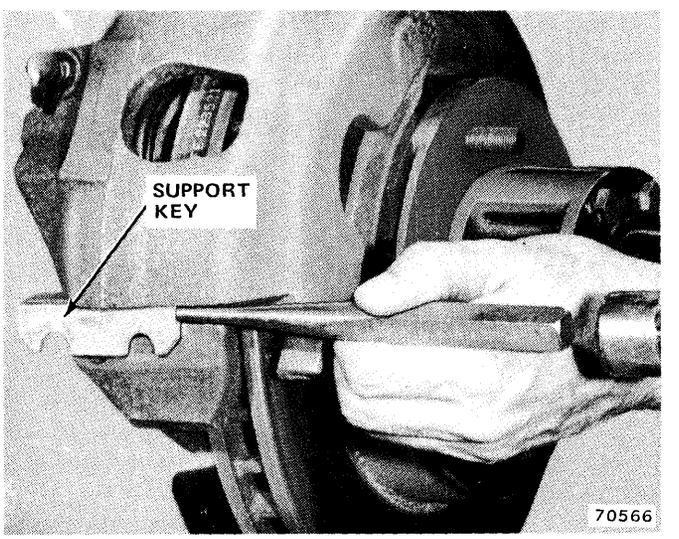

Fig. 9-46 Removing Support Key and Support Spring

Cleaning and Inspection

Wipe the inside of the caliper with a clean, dry shop cloth only.

CAUTION: *Do not use compressed air to clean the inside of the caliper. Compressed air will dislodge or damage the dust boot.*

Inspect the caliper for evidence of leakage from the piston bore. If leakage is evident, overhaul the caliper as described under Caliper Overhaul.

Inspect the abutment (sliding) surfaces of the caliper and anchor plate for rust or corrosion. Clean these surfaces using a wire brush and fine grit sandpaper and lubricate them with a molydisulphide grease (fig. 9-49).

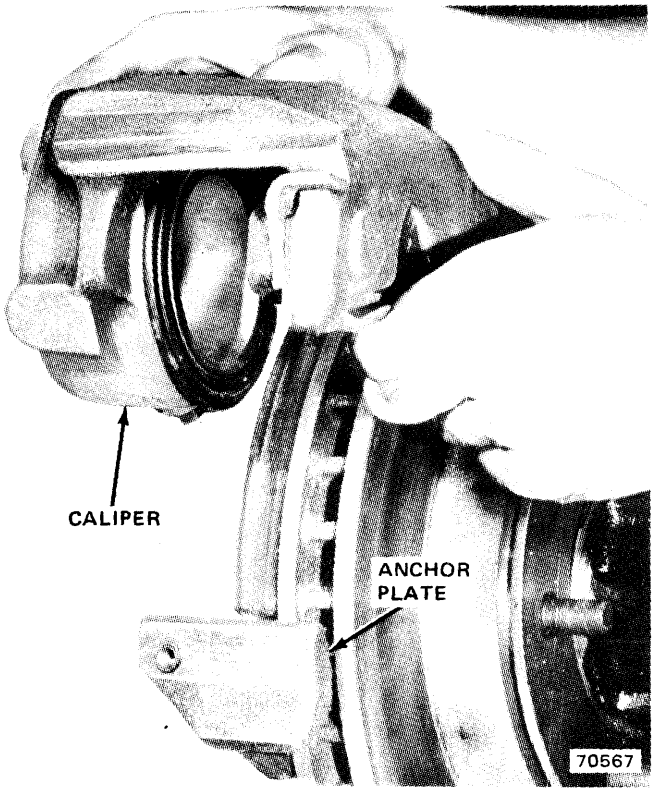

Fig. 9-47 Removing—Installing Caliper

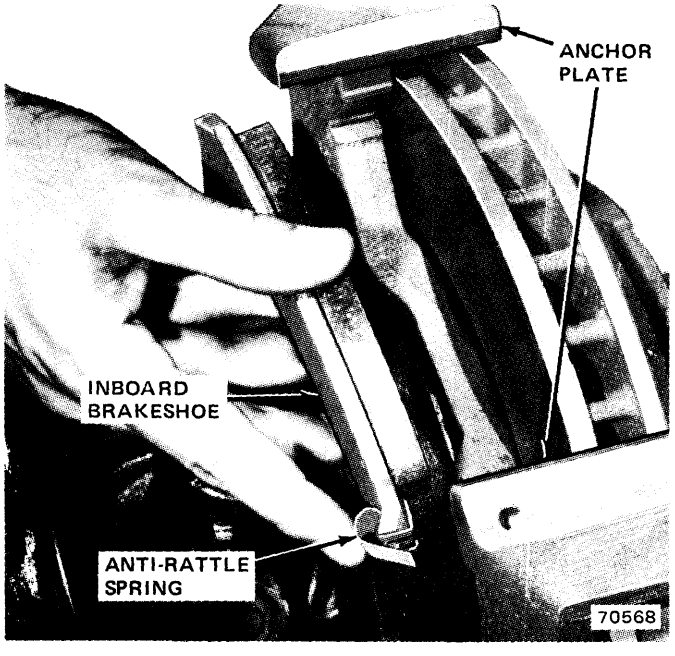

Fig. 9-48 Removing Inboard Brakeshoe and Anti-Rattle Spring

CAUTION: *It is important that the abutment surfaces of the caliper and anchor plate be clean, smooth, and lubricated with molydisulfide grease. Rust, corrosion, or foreign material on the abutment surfaces will impair the sliding motion of the caliper in the anchor plate.*

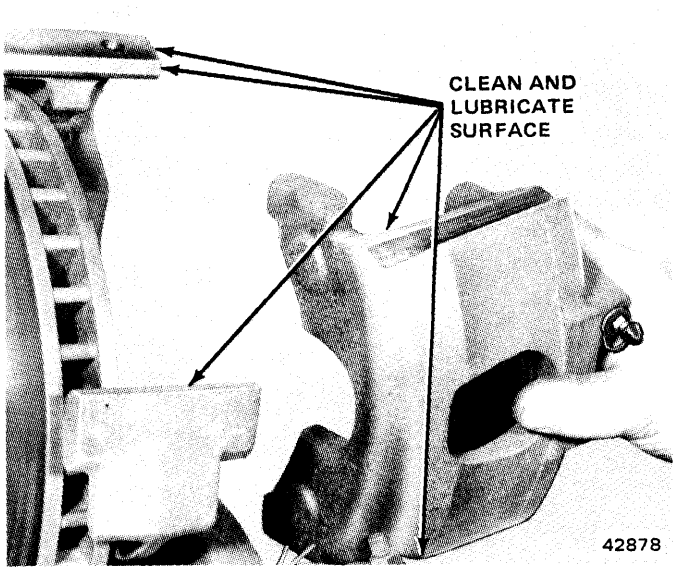

Fig. 9-49 Abutment Surfaces

Caliper Installation

(1) Install inboard brakeshoe anti-rattle spring on rear flange of inboard brakeshoe. Be sure looped section of spring faces away from rotor (fig. 9-50).

(2) Install assembled inboard brakeshoe and anti-rattle spring in caliper anchor plate (fig. 9-48). Do not dislodge anti-rattle spring during shoe installation.

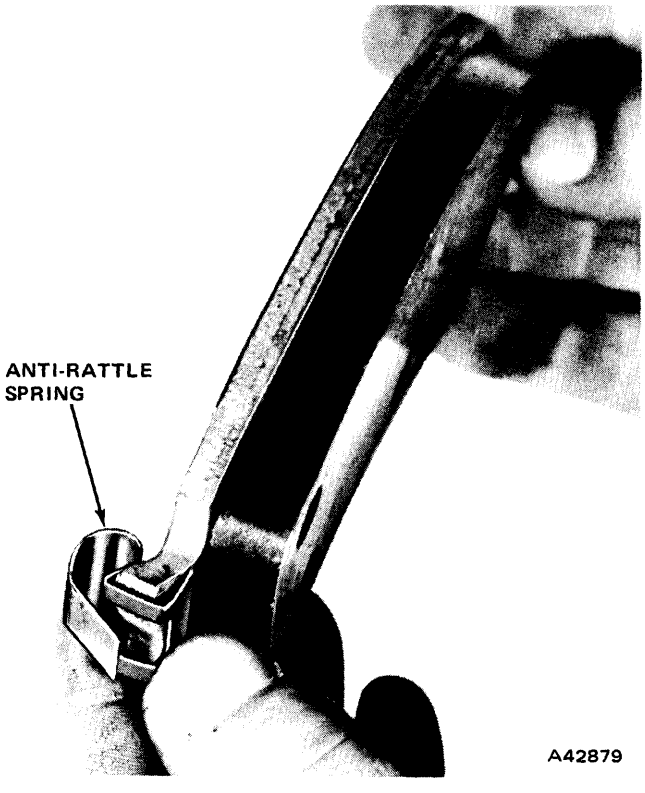

Fig. 9-50 Installing Anti-Rattle Spring On Inboard Brakeshoe

(3) Install outboard brakeshoe in caliper (fig. 9-51).

(4) Install caliper over rotor and into position in anchor plate (fig. 9-47).

CAUTION: *Be very careful to avoid tearing or dislodging the dust boot when installing the caliper. A damaged boot will expose the caliper piston to road splash resulting in corrosion and eventual piston seizure.*

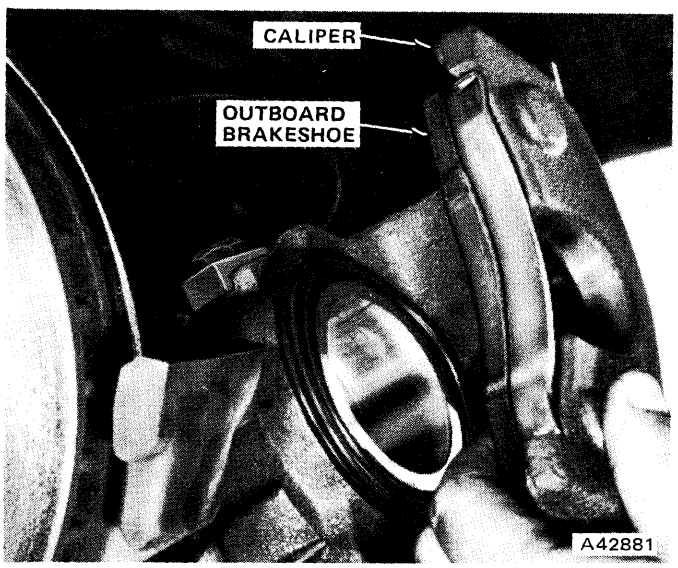

Fig. 9-51 Installing Outboard Brakeshoe

(5) Align caliper with anchor plate abutment surfaces and insert support key and support spring between abutment surfaces at trailing end of caliper and anchor plate (fig. 9-52).

(6) Complete installation of support key and support spring using hammer and punch.

(7) Install support key retaining screw and tighten it to 15 foot-pounds torque. Be sure screw is properly seated.

(8) Fill master cylinder reservoirs to within 1/4 inch of rims.

(9) Press firmly on brake pedal several times to seat shoes.

(10) Install wheels and tires and lower vehicle.

(11) Check fluid level in master cylinder and correct if necessary.

CAUTION: *Check for firm brake pedal and proper brake operation before moving the car.*

Caliper Overhaul

Removal

(1) Remove and discard two-thirds of brake fluid from master cylinder reservoir serving front disc brakes.

(2) Remove hub cap and loosen wheel retaining nuts.

(3) Raise and support vehicle.

(4) Remove front wheels.

(5) Work on one caliper at a time.

(6) Wipe all dirt and grease from caliper brake hose fitting.

(7) Disconnect brake line at caliper and discard hose fitting washer. Cover open end of hose with tape or clean shop cloth.

(8) Remove caliper and brakeshoes as outlined in Brakeshoe Replacement.

Disassembly

NOTE: *Refer to figure 9-52 for parts nomenclature during overhaul operations.*

(1) Drain fluid from caliper.

(2) Pad interior of caliper with shop cloths (fig. 9-53).

(3) Remove caliper piston using compressed air. Insert air nozzle in fluid inlet port and apply only enough air pressure to ease piston out of bore (fig. 9-53).

WARNING: *Do not use an excessive amount of air pressure to remove the piston. Excessive pressure can literally blow the piston out with enough force to cause personal injury. In addition, never attempt to catch the piston by hand as it comes out of the bore.*

(4) Remove dust seal from piston.

(5) Remove piston seal from piston bore using plastic or wooden tool only.

CAUTION: *Do not use any type of metal tool to remove the seal from the bore. Metal tools may scratch or score the piston bore or seal groove.*

(6) Remove bleeder screw and plastic cap.

Cleaning and Inspection

Remove rust and corrosion from the abutment surfaces of the caliper and anchor plate using a wire brush and fine grit sandpaper. Lubricate these surfaces with molydisulfide grease (fig. 9-49).

Clean the caliper and piston with brake fluid or brake cleaning solvent only. Use filtered compressed air to clean and dry the caliper, piston, and all grooves and passages in the caliper.

Inspect the caliper piston for damage and wear. Replace the piston if worn, scored, pitted or corroded.

Inspect the caliper for wear or damage. Replace the caliper if the piston bore, piston seal groove, or dust seal groove is worn, scored, nicked, pitted or heavily corroded. Light corrosion in the piston bore may be removed with a fiber brush only.

Inspect the anti-rattle spring, caliper support key, support spring, and support key retaining screw. Replace these parts if damaged or worn.

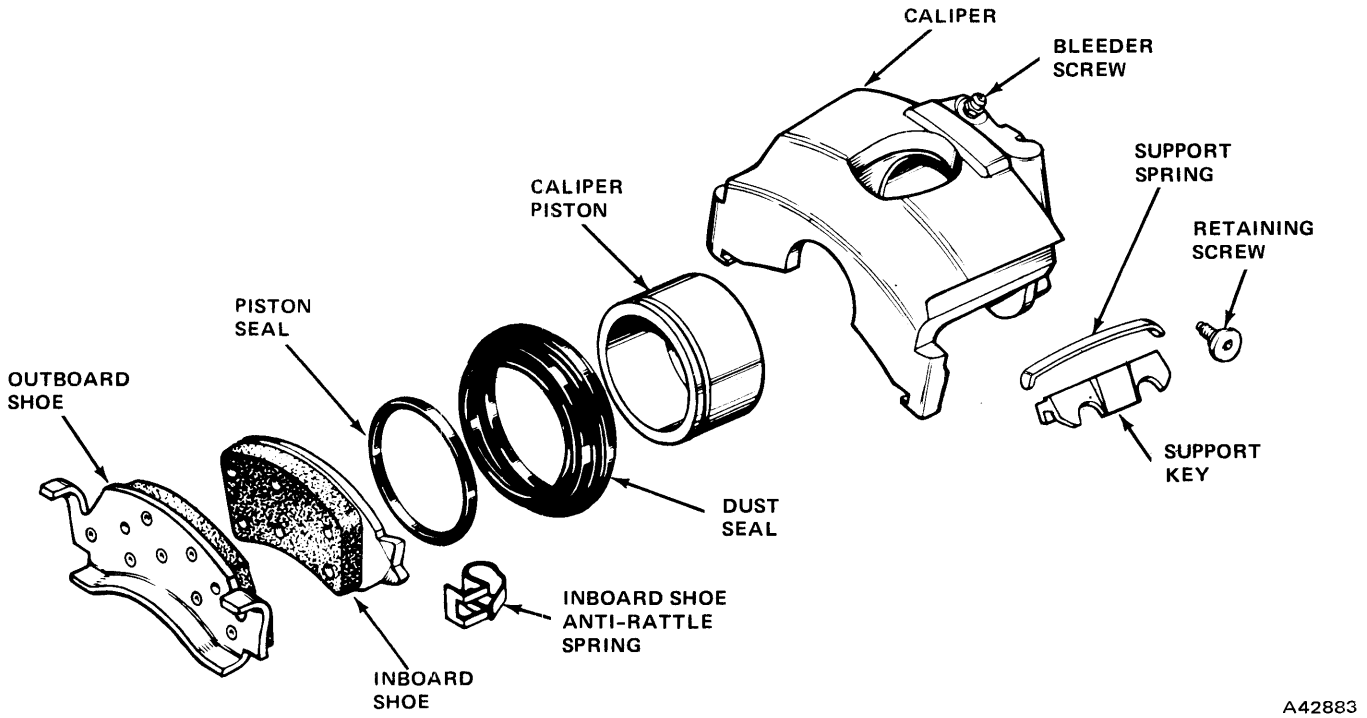

Fig. 9-52 Caliper Assembly—Exploded View

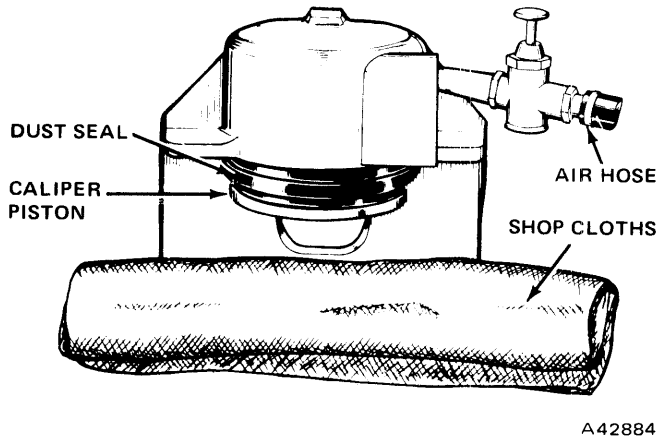

Fig. 9-53 Removing Caliper Piston

Replace the anti-rattle spring and support spring if they are distorted or lack tension. Replace the support spring if it is distorted or flattened.

Assembly

(1) Lubricate piston seal with clean brake fluid and install seal in piston bore groove. Work seal into groove using fingers.

(2) Install bleeder screw and plastic cap.

(3) Install caliper piston and dust seal using Installer Tool J-24837 as outlined under Piston and Seal Installation—With Installer Tool.

(4) If caliper piston installer tool is not available, refer to Piston and Seal Installation—Without Installer Tool.

Piston and Seal Installation—With Installer Tool

(1) Lubricate dust seal and installer tool with clean brake fluid.

(2) Mount dust seal on installer tool (fig. 9-54). Allow approximately 1/4 inch of installer tool to extend beyond small lip of dust seal.

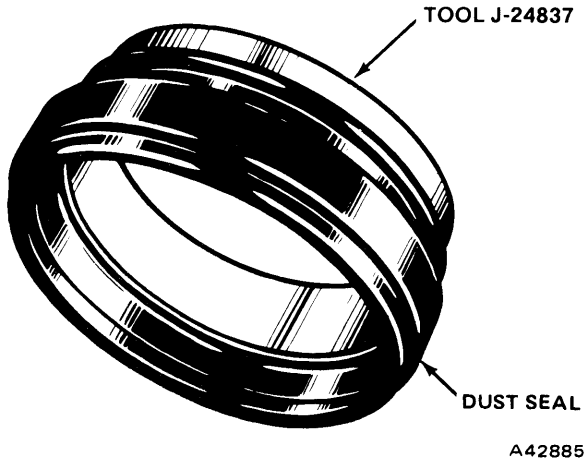

Fig. 9-54 Installing Dust Seal On Installer Tool

(3) Position assembled dust seal and installer tool over piston bore. Reach inside installer tool and work

large lip of dust seal into seal groove at top of piston bore in caliper (fig. 9-55). Be sure dust seal is completely seated in groove.

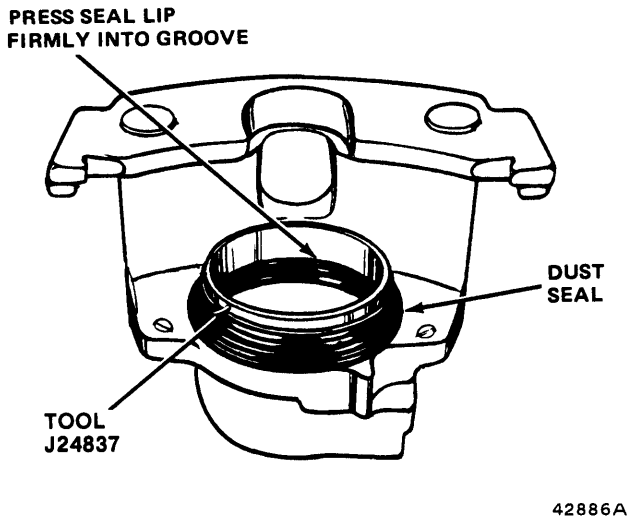

Fig. 9-55 Installing Dust Seal

(4) Lubricate caliper piston with brake fluid.

(5) Insert piston through installer tool and center piston in bore.

(6) Using hammer handle, apply steady pressure to piston until it is installed halfway into bore (fig. 9-56). do not strike hammer handle or piston during installation. Piston must be pressed into bore only.

(7) Remove installer tool and seat small lip of dust-seal in caliper piston groove.

(8) Press piston to bottom to bore using hammer handle.

(9) Check rotor for face runout, thickness variation, deep scores, cracks, and broken ventilating ribs. Refer to Rotor Service for procedures.

(10) Install brakeshoes and caliper as outlined under Brakeshoe Replacement and Caliper Installation.

(11) Install replacement washer on brake hose fitting and connect hose to caliper. Tighten fitting to 25 foot-pounds torque.

(12) Fill master cylinder to within 1/4 inch of reservoir rims and bleed brakes as outlined under Brake System Bleeding.

(13) After bleeding, press brake pedal firmly several times to seat brakeshoes. Recheck master cylinder fluid level and correct if necessary.

(14) Install wheels and tighten retaining nuts.

(15) Lower vehicle.

CAUTION: *Check for a firm brake pedal and proper brake operation before moving the vehicle.*

Piston and Seal Installation—Without Installer Tool

(1) Position dust seal on piston bore. Do not lubricate seal.

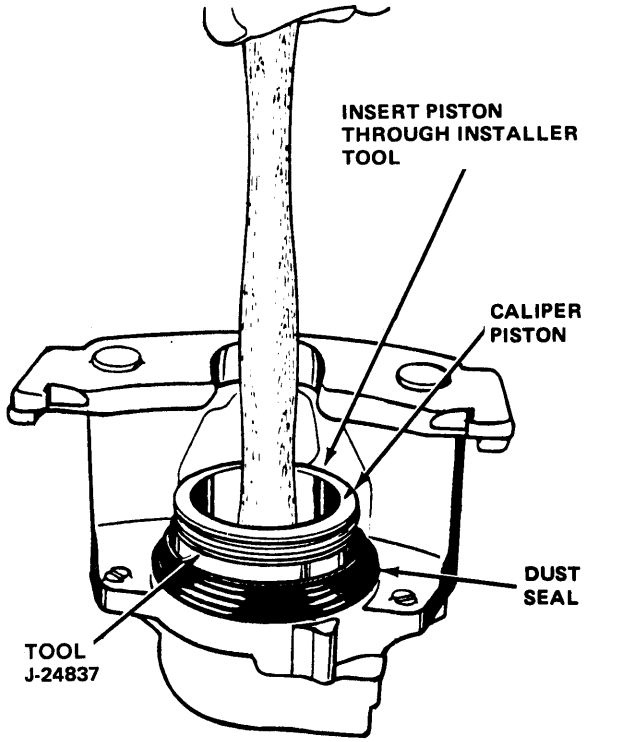

Fig. 9-56 Installing Caliper Piston

(2) Reach through top of seal and work large lip of seal into seal groove at top of piston bore. Be sure seal is completely seated in groove.

(3) Lubricate caliper piston and small lip of dust seal with brake fluid and position piston over seal lip.

(4) Hold piston in place on dust seal and direct reduced pressure compressed air into caliper brake fluid inlet port.

NOTE: *Reduce compressed air pressure to a maximum of 15 psi by closing air valve completely; then opening it approximately 1/4 to 1/2 turn.*

(5) As air pressure expands dust seal, carefully work caliper piston into dust seal until small lip of seal seats in caliper piston groove.

(6) When seal is seated in piston groove, release air pressure and press piston to bottom of bore using hammer handle.

(7) Check rotor for face runout, thickness variation, deep scores, cracks, and broken ventilating ribs. Refer to Rotor Service for procedures.

(8) Install brakeshoes and caliper as outlined under Brakeshoe Replacement and Caliper Installation.

(9) Install replacement washer on brake hose fitting and connect hose to caliper. Tighten hose fitting to 25 foot-pounds torque.

(10) Fill master cylinder to within 1/4 inch of reservoir rim and bleed brakes as outlined under Brake Bleeding.

(11) After bleeding, press brake pedal firmly several times to seat brakeshoes. Recheck fluid level in master cylinder and correct if necessary.

(12) Install wheels and retaining nuts.

(13) Lower vehicle.

Hub and Rotor

The hub and rotor are cast as a single unit. The hub section contains the wheel bearings and wheel mounting studs. The rotor section is hollow cast, with integral cooling fins, and provides the contact surfaces against which the brakeshoes are applied. The integral hub and rotor are serviced as an assembly only. If either section is defective or seriously damaged, replace the entire assembly.

Rotor Service

Rotor service is extremely important because rotor tolerances must be accurate to ensure proper brake operation. Rotor service involves the following steps: inspection, measurement, refinishing, and replacement where indicated.

Inspection

(1) Raise vehicle and remove wheels.

(2) If rotor braking services are heavily rusted or scaled, they must be cleaned before attempting inspection or measurement.

(a) Remove rotor and mount it in brake lathe.

(b) Clean surfaces using flat sanding discs while turning rotor in brake lathe.

(c) Reinstall rotor.

(3) Check braking surfaces for cracks, nicks, broken cooling fins, and scoring. Some scoring of surfaces may occur during normal use, however, scoring that is 0.009 inch deep or less is not detrimental to brake operation.

(4) Replace rotor if cracked or broken.

Rotor Measurement

(1) Tighten wheel bearing adjusting nut enough to remove all end play from wheel bearings.

(2) Measure lateral (face) runout of rotor.

(3) Mount dial indicator on support stand or wheel spindle with indicator stylus contacting outboard surface one inch from outer edge of rotor (fig. 9-38).

(4) Turn rotor 360 degrees and note indicator reading.

(5) Lateral runout must not exceed 0.003 inch. Lateral runout will cause rotor wobble, resulting in chatter, vibration, pedal pulsation, and excessive pedal travel (brakeshoes knock pistons back into caliper bore).

(6) If lateral runout exceeds tolerance, replace or refinish rotor.

(7) Measure thickness variation of rotor by measuring thickness at four or more equally spaced points around circumference of rotor (fig. 9-39).

(8) Using micrometer or two dial indicators, measure thickness at four equally spaced points around rotor and one inch in from outer edge of rotor (fig. 9-39).

(9) Thickness variation must not exceed 0.005 inch. Thickness variations can cause pedal pulsation and vibration when applying brakes.

(10) If thickness variation exceeds tolerance, replace or refinish rotor.

(11) Check hub-to-bore runout. Wheel mounting surface of hub must be square with centerline of bearing cup bore to within 0.010 inch (fig. 9-40).

NOTE: *Although hub-to-bore runout does not affect brake operation or action, it can cause a mechanical-type vibration at high speed. Measure hub-to-bore runout only if the car has an unexplained high speed vibration or if there is excessive lateral runout of the front wheels.*

(12) Mount dial indicator on spindle with indicator stylus contacting wheel mounting surfaces of hub.

(13) Rotate hub and observe reading.

(14) Replace hub and rotor if runout exceeds tolerance.

NOTE: *If rotor braking surfaces are not scored or otherwise damaged and all measurements were within tolerance, rotor can be reused without further servicing.*

Rotor Refinishing

Resurface the rotor on a brake lathe using flat sanding discs only, if scoring is light (0.009 inch deep or less), if rotor surfaces have heavy rust and scale, and only if the rotor meets all of the specifications outlined under Rotor Measurement. Be sure to follow the manufacturer's instructions when using the brake lathe. Rotor finish should be 15 to 80 micro inches and not be directional. After resurfacing the rotor in a disc brake lathe, flat sanding discs should be used as a final step in the refinishing procedure to provide the desired microfinish and crosshatch pattern on the rotor surface (fig. 9-41).

Replace the rotor if refinishing will cause the rotor to fall below the minimum thickness specifications of 1.120 inches.

Rotor Replacement

Removal

(1) Raise and support front of vehicle.

(2) Remove caliper as outlined under Caliper Removal.

(3) Remove hub cap.

(4) Remove rotor hub bolts and remove hub cover and gasket.

(5) Remove drive flange snap ring.

(6) Straighten lip of lockwasher and remove outer locknut, lockwasher, and inner locknut and lockwasher.

(7) Remove outer wheel bearing and remove rotor.

Installation

(1) Install rotor and outer wheel bearing.

(2) Install inner lockwasher and locknut. Tighten inner locknut to 50 foot-pounds torque using Tool J-25103 then back off nut 1/3 turn.

(3) Install outer lockwasher and nut. Tighten nut to 50 foot-pounds torque and bend lip of lockwasher over nut.

(4) Install drive flange and snap ring.

(5) Install rotor hub cover, gasket, and bolts.

(6) Install hub cap and lower vehicle.

WHEELS AND TIRES

WHEELS

Wheel Balancing

Wheel balancing with the wheel on the vehicle is recommended in all cases except as follows:

- If the vehicle is equipped with a Trac-Lok axle, remove wheels and balance off of the vehicle.
- When balancing with the wheel on a vehicle equipped with the Model 20 transfer case, shift the transmission and transfer case into the neutral position.
- When balancing with the wheels on a vehicle equipped with Quadra-Trac, disconnect the front or rear propeller shafts (as required).

Wheel Bearing Service

Adjustment of the wheel bearings is critical because it establishes the operating clearance of the wheel bearings. Wheel bearing adjustment that is too tight preloads the bearings and causes them to overheat. Loose wheel bearings permit the hub to shift position on the bearings as thrust load varies during acceleration, braking, and cornering.

Loose bearings also cause erratic braking. when checking wheel bearing adjustment, the brakes must be fully released.

Front Wheel Bearing Adjustment—CJ Models

With vehicle on hoist or jack, use the following procedure to adjust front wheel bearings on four-wheel drive vehicles.

(1) Remove hubcap, snap ring, capscrews, and washers that attach driving flange to hub (fig. 9-57).

(2) Using Front Axle Shaft Drive Flange Puller J-25133, remove driving flange.

(3) Unseat lip of lockwasher and remove locknut and lockwasher.

(4) Rotate wheel and tighten adjustment nut to 50 foot-pounds torque using Tool J-25103.

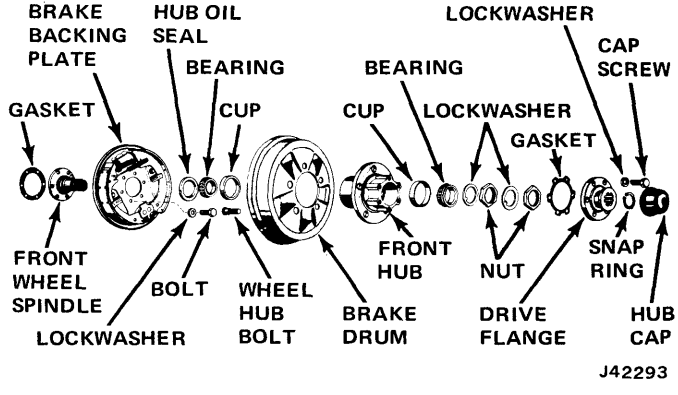

Fig. 9-57 Front Wheel and Hub Assembly—CJ Models with Drum Brakes

NOTE: *Front tire and wheel must be rotated by hand as the adjusting nut is tightened to ensure positive seating of the bearing.*

(5) Back off adjusting nut about 1/3 turn. Be sure wheel rotates freely without lateral shake.

(6) Install lockwasher and locknut and bend lockwasher lip.

(7) Check adjustment.

(8) Install driving flange and hub cap. Be sure gasket is installed between hub and flange.

Front Wheel Bearing Adjustment—Cherokee, Wagoneer, Truck

(1) Raise vehicle and remove hubcap, snap ring, drive flange, pressure spring, outer locknut, and lockwasher.

(2) Loosen inner wheel bearing adjusting nut (nut has peg on side).

(3) Tighten inner wheel bearing adjusting nut to 50 foot-pounds torque using Wheel Bearing Wrench J-6893. Rotate wheel while nut is being tightened.

(4) Rotate hub, then back off inner wheel bearing adjusting nut 1/4 turn (maximum).

(5) Install lockwasher with inner tab aligned with keyway in spindle and turn inner wheel bearing adjusting nut until peg engages nearest hole in lockwasher.

(6) Install outer locknut and tighten to 50 foot-pounds torque (minimum) using Wheel Bearing Wrench J-6893-02.

(7) Install pressure spring, drive flange, snap ring and hub cap and lower vehicle.

Rear Wheel Bearing

Adjustment—Tapered and Flanged Axle—All Models (Except 8400 GVWR Truck)

Vehicles equipped with the tapered or flanged type rear axle (fig. 9-58) shafts require no wheel bearing adjustment. These axle shafts are equipped with a taperd-type roller bearing capable of accepting thrust in either direction. However, on tapered axle shafts used in CJ models, axle shaft end play must be correct to obtain proper bearing operating clearance. Refer to Section 9—Axle and Propeller Shaft for end play inspection and adjustment.

Adjustment—Full-Floating Axle (8400 GVWR Truck)

(1) Remove axle shaft (fig. 9-59).

(2) Bend lip of lockwasher and remove locknut and lockwasher.

(3) Raise vehicle.

(4) Rotate wheel and tighten adjusting nut with Tool J-25106 to 50 foot-pounds torque. Back off nut about 1/6-turn or until wheel rotates freely without lateral shake.

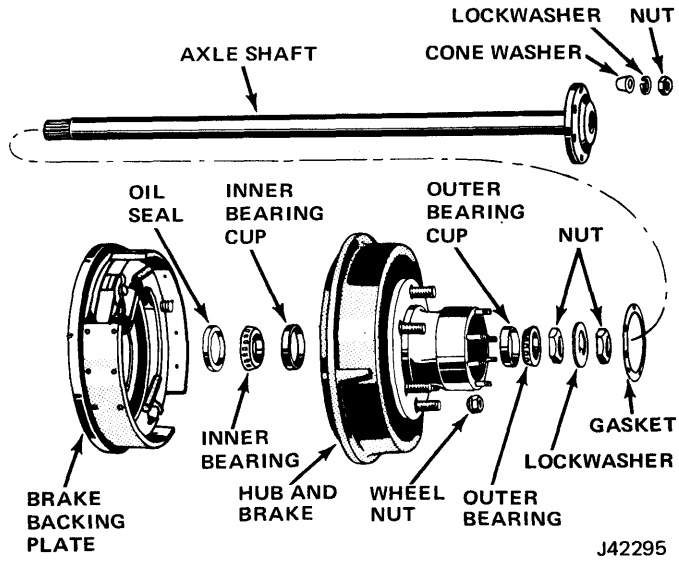

Fig. 9-59 Rear Wheel Attaching Parts—Full-Floating Axle

(5) Install locknut. Tighten locknut to 50 foot-pounds torque, and bend lockwasher lip over locknut.

(6) Check adjustment and correct if necessary.

(7) Install axle shaft and lower vehicle.

TIRES

Tire Service

Tire maintenance is one of the most important factors of safe vehicle operation. Tires must sustain the weight of a loaded vehicle, withstand more than ordinary rough service, and provide maximum safety over all types of

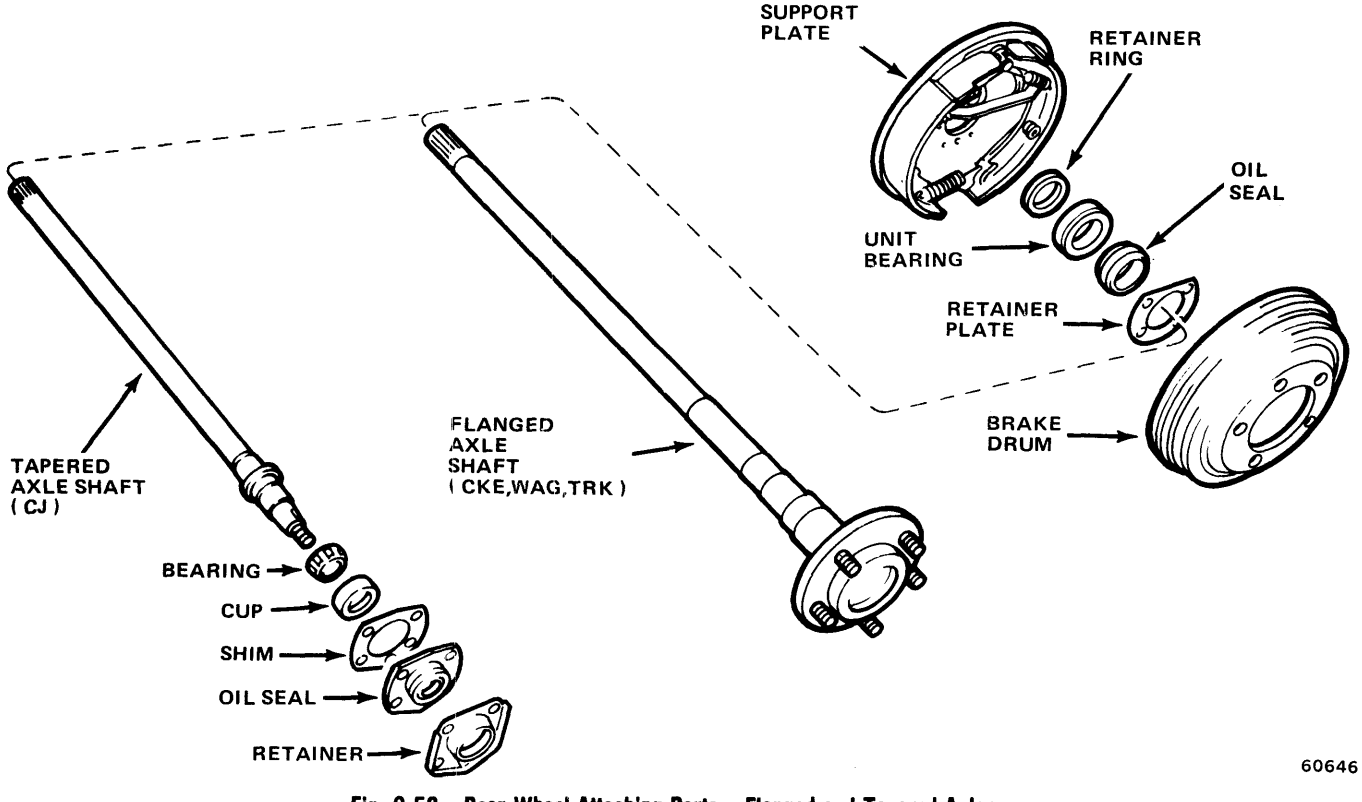

Fig. 9-58 Rear Wheel Attaching Parts—Flanged and Tapered Axles

terrain. Although there are other elements of tire service, inflation maintenance is the most important and in many instances the most neglected. Correct tire pressure should be maintained for safe operation. An underinflated tire is subject to severe flexing which could damage the casing. Overinflation will cause a harsh ride and may in time cause a blowout.

Incorrect front wheel alignment, wheel balance, dragging brakes, poor driving habits, and fast cornering, all contribute to the wear.

Underinflation

Underinflation distorts the normal contour of the tire body and the tire bulges or bellies out with an extreme flexing action. This wears the tread at the edges more than the center and generates excessive internal heat. This weakens the cords resulting in bruises, broken cords, or ply separation. Underinflation also leads to rim bruises as insufficient resistance is provided to protect the tire from being jammed against the rim and crushed or cut when the tire strikes a curb, rock, or rut.

Overinflation

When a tire is overinflated, increased tension caused by excessive pressure prevents proper sidewall flexing. This results in wear in the center of the tread and the tire also loses its ability to absorb road shocks. Under this increased strain, cords in the tread area may break under impact, causing casing damage.

Misalignment

Excessive wheel camber can result in excessive wear on one side of the tire tread.

Front wheels require a specified amount of toe-in. However, excessive toe-in or toe-out will cause the tires to "scrub" when the vehicle is moving straightahead, resulting in excessive tread wear. The tires will show a feathered edge with excessive toe-in or toe-out.

Balance

Cupping or bald spotting of tires is associated with wear on a vehicle driven mostly at highway speeds without the recommended tire rotation, inflation or balance.

Tire Care

CAUTION: *For satisfactory operation, all four-wheel drive vehicles MUST be equipped with the same size tires of equal circumference on all four wheels. The tires must be inflated to proper factory recommended pressures at all times. The intermixing of tires of different construction or size can cause unusual handling, road noise, and damage to drive train components.*

Correct tire pressures depend on tire size, tire ply, gross vehicle weight rating (GVWR), vehicle load, and the type of driving.

Tire inflation should be checked and adjusted to recommended pressures periodically (at least monthly), especially when extreme variation (20°F) in average seasonal temperature occur. Tire inflation pressures should be checked and adjusted when the tires are cold or driven less than two miles at moderate speeds of less than 40 mph after the vehicle has been at rest for at least six hours.

Do not reduce inflation pressure if the tires are hot or driven over 10 miles in excess of 60 mph. Hot tire pressure may increase as much as 6 psi over cold pressures. If tire pressure must be adjusted while hot, temporarily set pressure at 6 psi (10 psi for sustained high speeds) greater than those specified until such time as cold inflation pressure can be checked and adjusted.

The correct tire inflation pressures for any given set of driving conditions may be determined by referring to the Tire Inflation Pressure (PSI) Chart.

Tire Rotation

Rotate tires every 5,000 miles. See figure 9-60 for rotation sequence.

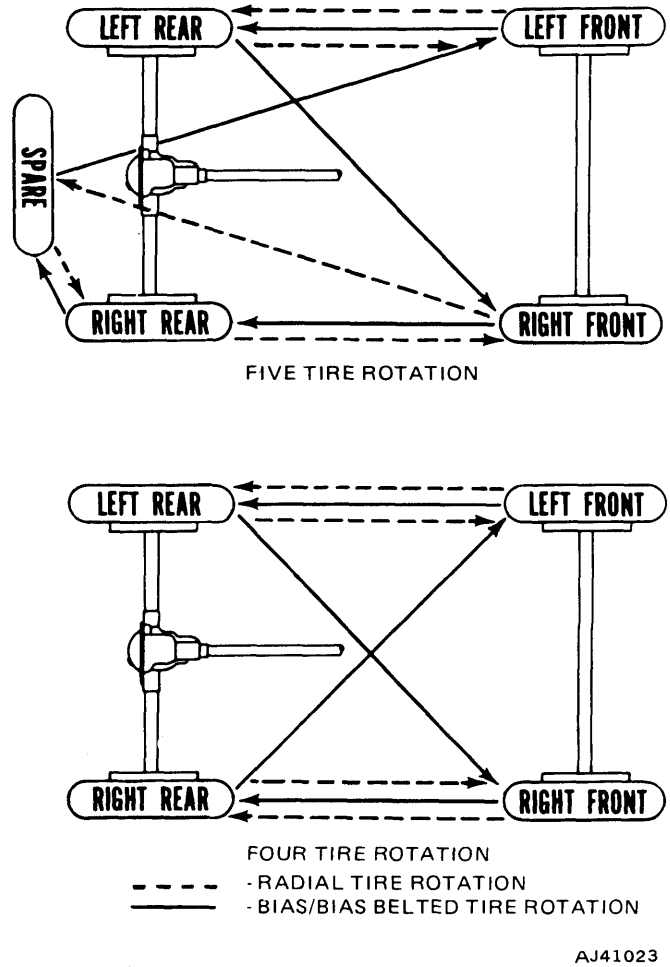

Fig. 9-60 Tire Rotation

SPECIFICATIONS

Brake Size and Application Chart*

Model	Master Cylinder Bore Diameter	Front Brakes		Rear Brakes		Power Brakes③ (Booster Type)
		Brake Size and Type	Caliper Piston or Wheel Cyl. Dia.	Brake Size and Type	Wheel Cyl. Diameter	
CJ-5/CJ-7	1.00	11 x 2 Drum	1-1/8 Wheel Cyl.	11 x 2 Drum	15/16	Tandem Diaphragm 7-3/4
CJ-5/CJ-7	1.00	11.7 x 1.2 Disc	3.1 Single Piston	11 x 2 Drum	15/16	Tandem Diaphragm 7-3/4
Cherokee①	1.00	11 x 2 Drum	1-1/8 Wheel Cyl.	11 x 2 Drum	15/16	Single Diaphragm 9-1/2
Wagoneer	1-1/8	12.0 Disc	2-15/16 Single Piston	11 x 2 Drum	15/16	Single Diaphragm 9-1/2
Truck 6025 GVW① 120" W.B.	1.00	11 x 2 Drum	1-1/8 Wheel Cyl.	11 x 2 Drum	15/16	Single Diaphragm① 9-1/2
6025 GVW② 132" W.B.	1.00	11 x 2 Drum	1-1/8 Wheel Cyl.	11 x 2 Drum	15/16	Single Diaphragm② 9-1/2
6800 GVW	1-1/8	12.5 Disc	2-15/16 Single Piston	12 x 2.5 Drum	1-1/8	Tandem Diaphragm 9-1/2
7600 GVW	1-1/8	12.5 Disc	2-15/16 Single Piston	12 x 2.5 Drum	1-1/8	Tandem Diaphragm 9-1/2
8400 GVW	1-1/8	12.5 Disc	2-15/16 Single Piston	12.x 2.5 Drum	1-1/8	Tandem Diaphragm 9-1/2

*All dimensions are in inches.
①12.0 disc brake optional on these models.
②Single Diaphragm type booster used with optional power disc brake application.
③Models equipped with power booster.

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Tire Inflation Pressure (PSI) Chart

Model	GVW Rating	Tire Size	Load Range	Normal Load (1)				Maximum Load (2)				Wheel Size
				Sustained Driving Over 65 mph (3)		Under 65 mph		Sustained Driving Over 65 mph (3)		Under 65 mph		
				Front	Rear	Front	Rear	Front	Rear	Front	Rear	
CJ-5 & CJ-7	3750 & 4150	F78x15	B	24	24	20	20	32*	32*	32	32	15 x 6
		H78x15	B & D	24	24	20	20	28	28	24	24	15 x 6
		HR78x15	B	24	24	20	20	28	28	24	24	15 x 6
		6.00x16	C	40	40	30	30	50	50	40	40	16 x 6
Wagoneer & Cherokee	6025	H78x15	B	26	26	22	22	32	32	32	32	15 x 6 (Aluminum Wheel is 15 x 7)
		H78x15	D	26	26	22	22	36	36	32	32	15 x 6
		HR78x15	B	26	26	22	22	32*	32*	32	32	15 x 6
		10.00x15	B	30	30	20	20	40	40	30	30	15 x 8
Truck J-10	6025	H78x15	B	28	28	24	24	32	32	32	32	15 x 6
		H78x15	D	28	28	24	24	36	36	32	32	15 x 6
		HR78x15	B	26	26	22	22	32*	32*	32	32	15 x 6
		10.00x15	B	30	30	20	20	40	40	30	30	15 x 8
Truck J-20	6800	8.00x16.5	D	45	45	35	35	55	70	45	60	16.5 x 6
		7.50x16	C	40	40	30	30	45	55	35	45	16.0 x 6
	7600	9.50x16.5	D	45	45	35	35	55	70	45	60	16.5 x 6.75
		7.50x16	E	40	40	30	30	55	85	45	75	16.0 x 6
	8400	9.50x16.5	D	45	45	35	35	55	70	45	60	16.5 x 6.75
		7.50x16	E	40	40	30	30	55	85	45	75	16.0 x 6

NOTE: Inflate tires while cold, before running. Do not reduce pressures if tires are warm.
***Speed limited to 75 mph.**
(1) Normal Load—Frequently selected accessories, plus driver and two passengers. For CJ models, driver and one passenger.
(2) Maximum Load—Gross Vehicle Weight Rating (GVWR).
(3) Sustained driving over 75 mph for Cherokee and Wagoneer.

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Torque Specifications

Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	Service In-Use Recheck Torque
Bleeder Screw, Wheel Cylinder 1/4-28	30-90 in-lbs
Bleeder Screw, Wheel Cylinder 5/16-24	40-140 in-lbs
Brake Shoe or Tube-to-Wheel Cylinder 3/8-24	120-200 in-lbs
Brake Support Plate Mounting Bolt Front (Cherokee, Wagoneer, Truck)	20-30
Brake Support Plate Mounting Bolt and Nut, Rear (8400 GVWR Truck)	45-55
Brake Support Plate Mounting Bolt and Nut, Rear (Cherokee, Wagoneer, Truck)	35-55
Front Brake Support Plate Mounting Bolt and Nut (CJ Models)	35-55
Power Brake Unit to Spacer and Firewall (Cherokee, Wagoneer, Truck)	18-25
Wheel-to-Hub Nuts	
CJ Models	65-90
Cherokee, Wagoneer, Truck	65-80
8400 GVWR Truck	110-150
Master Cylinder to Power Unit Nuts	16-30

All Torque values given in foot-pounds with dry fits unless otherwise specified.

Refer to the Standard Torque Specifications and Capscrew Markings Chart in Section A of this manual for any torque specifications not listed above.

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Torque Specifications

Service Set-To Torques should be used when assembling components.

Service In-Use Recheck Torques should be used for checking a pre-torqued item.

	Service Set-To Torque	Service In-Use Recheck Torque
Caliper Anchor Plate Mounting Bolts	80	80-90
Caliper Anchor Plate and Adapter Bracket Bolts (01-40-60)	55	55-65
Caliper Support Key Retaining Screw	15	15-18
Caliper Brake Hose Fitting		
Pacer	100 in-lb	100-115 in-lb
Gremlin, Hornet, Matador	25	25-28
Wheel-to-Hub Nut (Lug Nut)	75	75-90

All Torque values given in foot-pounds with dry fits unless otherwise specified.

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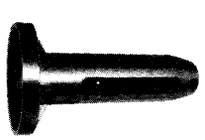
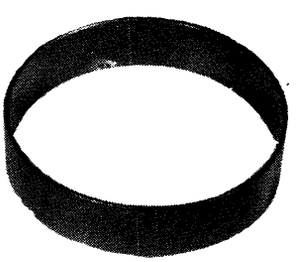


J-22904
DUST BOOT INSTALLER TOOL

J-2533
FRONT AXLE SHAFT
DRIVE FLANGE PULLER

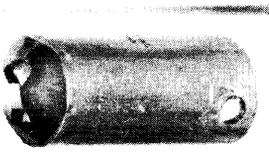


J-24837
CALIPER PISTON
INSTALLER TOOL

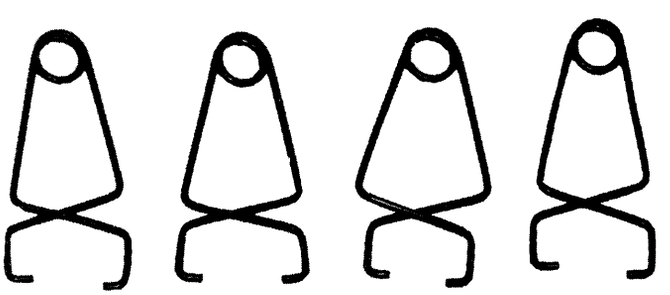
J-26869
METERING VALVE
TOOL (CJ WITH DISC)

J-23709
METERING VALVE
TOOL
(CKE-WAG-TRK)

J-8057
BRAKESHOE RETURN SPRING
REMOVER & INSTALLER



J-25103 WHEEL BEARING ADJUSTING NUT WRENCH 2-1/16 INCHES
J-25106 WHEEL BEARING ADJUSTING NUT WRENCH 2-3/8 INCHES
J-25107 WHEEL BEARING ADJUSTING NUT WRENCH 2-1/2 INCHES
HEXAGON AND 2-3/4 OCTAGON



J-8002
BRAKE CYLINDER PISTON
RETAINING CLAMPS

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Fig. 9-61 Special Tools