BRAKES AND WHEELS

BRAKE DIAGNOSIS CHARTS

In most instances, the customer will describe the difficulty as one or more of the conditions listed in the Brake Diagnosis Chart. Road test the vehicle with the customer to confirm the difficulty and obtain additional information.

Vibration Diagnosis

Vibrations can be divided into two categories: mechanical and audible. Mechanical vibrations are those which are felt through seats, floorpan, or steering wheel or which may also be visible and sensed by fender, mirror, or dash panel motion. Audible vibrations are heard above normal background noise and may or may not be accompanied by a mechanical vibration.

Mechanical and audible vibrations are torque sensitive, vehicle speed sensitive, or engine speed sensitive:

Torque Sensitive means that the condition can be made better or worse when accelerating, decelerating, coasting, or maintaining a steady speed.

Vehicle Speed Sensitive vibrations occur at the same speed regardless of which transmission gear is selected or how much torque is applied.

Engine Speed Sensitive vibrations occur at different car speeds when a different transmission gear is selected, and can sometimes be isolated by increasing or decreasing engine speed with the transmission in neutral or by stall-testing with the transmission in gear.

Road Test

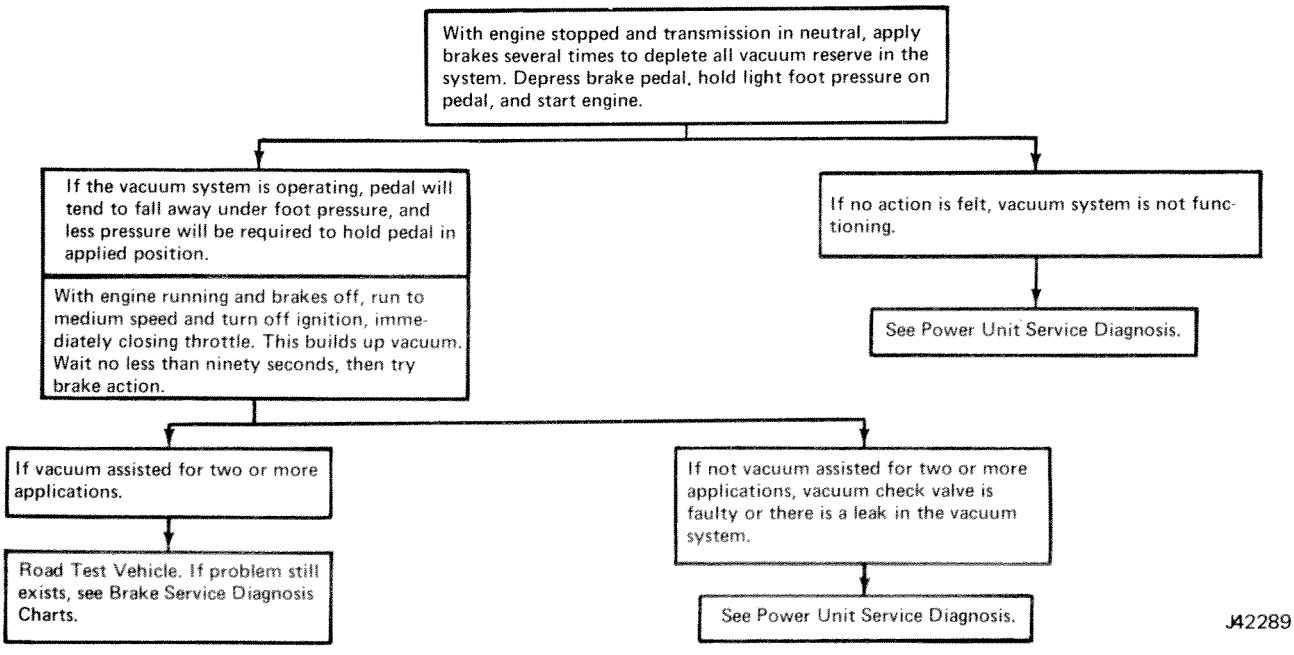
Road test vehicle on a smooth road. If vibration is apparent:

(1) Determine speed ranges at which disturbance occurs.

(2) At each speed range, determine whether vibration is mechanical or audible.

(3) At each speed range, determine whether vibration is torque sensitive, speed sensitive, or engine speed sensitive.

POWER BRAKE DIAGNOSIS PROCEDURE



POWER UNIT SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
HARD PEDAL (NO BOOST)	(1) Refer to EXCESSIVE PEDAL EFFORT.	(1) Refer to EXCESSIVE PEDAL EFFORT.
	(2) Loss of vacuum to booster.	(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 booster.	(3) Replace booster.
SLOW RETURN OF BRAKE PEDAL	(1) Pedal linkage bind. See PULLS and GRABBING BRAKES in Drum or Disc Brake Service Diagnosis Chart.	(1) Check and correct as required. Lube all pivot points.
	(2) Internal malfunction in booster.	(2) Replace booster.
GRABBING OR DRAGGING BRAKES	(1) Refer to PULLS and GRABBING BRAKES in Brake Service Diagnosis Charts.	(1) See PULLS and GRABBING BRAKES in Brake Service Diagnosis Charts.
	(2) Push rod (in power unit) binding due to corrosion or burrs on push rod.	(2) Check and correct as required. Do not lube push rod. Clean push rod with brake fluid and clean cloth only.
	(3) Incorrect push rod height (CJ model power unit only)	(3) Check and adjust as required.
	(4) Internal malfunction in booster.	(4) Replace booster.

DRUM BRAKES SERVICE DIAGNOSIS – ALL MODELS

Condition	Possible Cause	Correction
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.
	(5) Leaking wheel cylinders.	(5) Overhaul wheel cylinder.

DRUM BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
LOW PEDAL OR PEDAL GOES TO TOEBOARD (Continued)	(6) Leaking master cylinder.	(6) Overhaul master cylinder.
	(7) Air in system.	(7) Bleed system.
	(8) Power unit push rod improperly adjusted (CJ models only)	(8) Adjust push rod height.
	(9) Plugged master cylinder filler cap.	(9) Clean filler cap vent holes; bleed system.
	(10) Drums thin, cracked, beyond 0.060 inch oversize specification.	(10) Replace drum(s) as required.
	(11) Improper brake fluid.	(11) 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) Check valve in master cylinder outlet port faulty, or 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.

DRUM BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
EXCESSIVE PEDAL PRESSURE REQUIRED	(7) Glazed linings.	(7) Sand surface of linings.
	(8) Bell-mouthed, barrel-shaped, or scored drums.	(8) Replace or resurface drums in left and right hand pairs.
	(9) Support plate ledges rusted or grooved.	(9) Polish and lubricate ledges if rusty. Replace support plate if ledges are grooved.
LIGHT PEDAL PRESSURE-BRAKES TOO SEVERE	(1) Brake adjustment not correct.	(1) Adjust the brakes.
	(2) Loose support plate on front axle.	(2) Tighten plates.
	(3) A small amount amount of grease or fluid on linings.	(3) Replace the linings.
	(4) Pedal linkage binding.	(4) Lube linkage and pivot points.
	(5) Charred linings.	(5) Replace the linings.
	(6) Incorrect lining.	(6) Install new linings.
	(7) Wheel bearings loose.	(7) Adjust wheel bearings.
	(8) Lining loose on shoe.	(8) Replace lining or shoe and lining.
	(9) Excessive dust and dirt in drums.	(9) Clean and sand drums and linings.
	(10) Bell-mouthed, barrel-shaped, or scored drums.	(10) Turn drums in pairs or replace.
	(11) Combination valve faulty.	(11) Replace combination valve.
PULSATING BRAKE PEDAL	(1) Drums out-of-round.	(1) Refinish 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.	(5) Replace axle.
	(6) Loose or bent support plate.	(6) Tighten or replace support plate.
BRAKES FADE	(1) Incorrect lining.	(1) Replace with new lining.
	(2) Thin drum.	(2) Replace drums.
	(3) Air in lines or improper brake fluid.	(3) Bleed system. Drain and flush if fluid is improper type.

DRUM BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
BRAKES FADE (Continued)	(4) Master cylinder primary piston worn, or bore scored, corroded.	(4) Disassemble master cylinder. Repair as required.
ALL BRAKES DRAG (ADJUSTMENT IS KNOWN TO BE CORRECT)	(1) Pedal linkage or power unit linkage binding (if equipped with power brakes).	(1) Lubricate linkage, pivot points.
	(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.
	(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 DECREASING	(1) Master cylinder compensating port plugged.	(1) Use compressed air to unplug.
	(2) Power unit linkage binding or pedal linkage binding on manual brakes.	(2) Lube linkage.
	(3) Swollen cup in master cylinder.	(3) Replace rubber parts. Flush system.
	(4) Master cylinder piston not returning.	(4) Overhaul master cylinder.
	(5) Weak shoe retracting springs.	(5) Replace springs.
	(6) Wheel cylinder pistons sticking.	(6) Overhaul wheel cylinder.
ONE WHEEL DRAGS	(1) Weak or broken shoe retracting.	(1) Replace the defective brake shoe springs and lubricate the brake shoe ledges.
	(2) Power unit linkage binding, or pedal linkage binding (on manual brakes).	(2) Lube linkage, pivot points.
	(3) Brake shoe-to-drum clearance too small or the brake shoe eccentric is not adjusted properly.	(3) Adjust.
	(4) Loose wheel bearings.	(4) Adjust wheel bearings.

DRUM BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
ONE WHEEL DRAGS (Continued)	(5) Wheel cylinder pistons cups swollen and distorted or brake shoe pistons stuck.	(5) Overhaul cylinders.
	(6) Pistons sticking in wheel cylinder.	(6) Clean or replace pistons; clean cylinder.
	(7) Drum out-of-round.	(7) Grind or turn drum.
	(8) Restriction in line.	(8) Clean out or replace.
	(9) Loose anchor pin.	(9) Adjust and tighten lock nut.
	(10) Distorted shoe.	(10) Replace.
	(11) Defective lining.	(11) Replace with new lining.
ONE WHEEL LOCKS	(1) Contaminated linings.	(1) Replace the linings.
	(2) Tire tread slick.	(2) Replace tire or, match up tire treads from side to side.
BRAKES GRAB OR WON'T HOLD IN WET WEATHER	(1) Linings water-soaked.	(1) Dry out linings by driving with brakes lightly applied.
	(2) Dirty brakes.	(2) Clean.
	(3) Bent support plate opening allowing excessive water to enter drum.	(3) Replace support plate.
	(4) Scored drums.	(4) Grind or turn 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 not square or distorted.	(4) Turn, grind, 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) Tighten to proper setting.

DRUM BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
BRAKES SQUEAK (Continued)	(8) Loose shoe links.	(8) Tighten.
	(9) Loose support plate, anchor, drum wheel cylinder.	(9) Tighten.
	(10) Linings located wrong on shoes.	(10) Install linings correctly.
REAR BRAKES DRAG	(1) Maladjustment.	(1) Adjust brake shoes and parking brake mechanism.
	(2) Parking brake cables frozen.	(2) Lubricate or replace as required.
	(3) Dirty lining.	(3) Clean lining.
	(4) Wheel cylinder caps swollen or pistons sticking.	(4) Overhaul cylinders.
	(5) Weak retracting springs.	(5) Replace springs.
	(6) Shoes binding on support plate.	(6) Lubricate support plate ledges.
VEHICLE PULL TO ONE SIDE	(1) Grease or fluid-soaked lining.	(1) Locate and correct leakage; replace with new linings.
	(2) Adjustment not correct.	(2) Adjust the brakes.
	(3) Loose wheel bearings, loose support plate on rear axle or loose spring bolts.	(3) Adjust the wheel bearing; tighten the rear and front axles and tighten spring bolts.
	(4) Linings not of specified kind or primary and secondary shoes reversed.	(4) Install new linings.
	(5) Power unit linkage or pedal linkage (on manual brakes) binding.	(5) Lube linkage, pivot points.
	(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 a pair of non-skid tread surfaces of similar design and equal wear will be installed on the front wheels.
	(7) Linings charred.	(7) Replace with new lining.
	(8) Water, mud, or foreign matter in brakes.	(8) Remove any foreign material from all of the brake parts and the inside of the drums. Lubricate the shoe ledges and the rear brake cable ramps.

DRUM BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
VEHICLE PULLS TO ONE SIDE (Continued)	(9) Wheel cylinder sticking.	(9) Overhaul or replace wheel cylinder.
	(10) Weak or broken retracting springs.	(10) Check springs. Replace bent, open-coiled or cracked springs.
	(11) Out-of-round drums.	(11) Resurface or replace drums in left and right hand pairs (both front and both rear).
	(12) Brake dragging.	(12) Check for loose lining. Repair or replace as required.
	(13) Weak chassis springs or loose U-bolts.	(13) Replace springs or tighten U-bolts.
	(14) Loose steering.	(14) Repair and adjust.
	(15) Unequal camber.	(15) Replace axle housing.
	(16) Clogged or crimped hydraulic line.	(16) Repair or replace line.
	(17) Wheel cylinder incorrect size.	(17) Replace with correct cylinders.
	(18) Worn steering knuckle bearings.	(18) Replace.
	(19) Bad drum.	(19) Refinish drums in pairs.
BRAKES CHATTER	(1) Incorrect lining-to-drum clearance.	(1) Readjust to recommended clearances.
	(2) Loose support plate.	(2) Tighten securely.
	(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) Readjust.
	(6) Drums out-of-round.	(6) Grind or turn drums in pairs.
	(7) Cocked or distorted shoes.	(7) Straighten or replace.
	(8) Tapered or barrel-shaped drums.	(8) Grind or turn in pairs.
SHOE CLICK	(1) Shoes lift off support plate and snap back.	(1) Change drums side to side or grind 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.

DRUM BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
SNAPPING NOISE IN FRONT END	(1) Grooved support plate ledges.	(1) Replace support plate.
	(2) Lack of lubrication on moving parts.	(2) Lubricate all rubbing points.
	(3) Loose drums or support plates.	(3) Tighten.
	(4) Loose or worn front end parts.	(4) Tighten or replace defective parts.
THUMPING NOISE WHEN BRAKES ARE APPLIED	(1) Too much clearance between shoes and anchors.	(1) Adjust.
	(2) Retractor springs unequal or weak.	(2) Replace springs.

DISC BRAKES SERVICE DIAGNOSIS – CHEROKEE, WAGONEER, TRUCK

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) Rotor out-of-parallel.	(2) Check parallelism. 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.
	(4) Rear drums out-of-round.	(4) Check runout. If not to specs turn drum. Do not remove more than .060 inch.
	(5) 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 booster.	(1) Check booster operation. Refer to Power Brake Units.
	(2) Failure 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) Excessive lining wear.	(3) Check and replace linings as required.

DISC BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
EXCESSIVE PEDAL EFFORT REQUIRED (Continued)	(4) Caliper piston(s) sticking.	(4) Rebuild caliper(s).
	(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 due to failure in front or rear brake 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 or 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 spec.	(8) Inspect, measure and replace as required.
	NOTE: *A very light drag occurring after releasing the brake pedal is a characteristic of disc brakes.*	
DRAGGING 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 spec. Inspect cables for bind or frayed conditions.

DISC BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
DRAGGING BRAKES (Continued)	(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 and booster linkage.	(7) Check and correct as required.
	(8) Push rods too long.	(8) Replace with proper parts.
	(9) Check valve installed in master cylinder outlet to disc brake calipers.	(9) 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.	(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) Brake pedal or power unit linkage binding.	(4) Check and correct as required. Lube all pivot points.
	(5) Incorrect power unit.	(5) Check and replace as required.
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.

DISC BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
PULLS WHEN BRAKES ARE APPLIED (Continued)	(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.
	(3) Calipers loose.	(3) Check mounting bolt torque.
	(4) Loose master cylinder or brake booster attaching parts.	(4) Check and correct as required.

DISC BRAKES SERVICE DIAGNOSIS (Continued)

Condition	Possible Cause	Correction
SPONGY PEDAL (Continued)	(5) Brake hoses expanding under pressure.	(5) Hoses soft and weak.
	(6) Compensator port blocked in master cylinder.	(6) Check and correct as required.
	(7) Improper (low quality) brake fluid in system. Fluid boils and becomes aerated.	(7) Drain and flush system.

HYDRAULIC SYSTEM

Test for Contamination

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 ageing of rubber parts.*

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 must be flushed, or when filling the system, use only fluids marked SAE J1703 or those conforming to:

- Federal Specification VV-B-680, Brake Fluid, Automotive
- Federal Safety Standrd No. 116, Motor Vehicle Hydraulic Brake Fluid conforms to all of the above specifications and is available in quart and gallon containers.

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

Hydraulic System Inspection Procedure

(1) Check master cylinder cover retaining spring (bail wire) for proper tension and fit. The spring should provide enough tension on the cover to maintain an airtight seal.

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

(3) Check master cylinder fill level.

(4) Check for dirt and foreign material in reservoirs. Drain off a sample of brake fluid into a 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).

Master Cylinder Fill Level

Master cylinder fluid level should be checked at least four times a year or every 5,000 miles. **The master cylinder fluid reservoirs should be filled to within 1/4 inch of the 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 or any reason, do not allow the rubber diaphragm seal to come in contact with dirt, grease, or other foreign material.

POWER BRAKE UNITS

A 7-3/4 inch tandem-diaphragm unit (fig. 9-1) is used on CJ models equipped with power brakes while Chero-

kee, Wagoneer, and J-10 Truck models have a 9-1/2 inch single diaphragm power unit (fig. 9-2); J-20 truck models (6500 GVW and up) use a 9-1/2 inch tandem-diaphragm power unit.

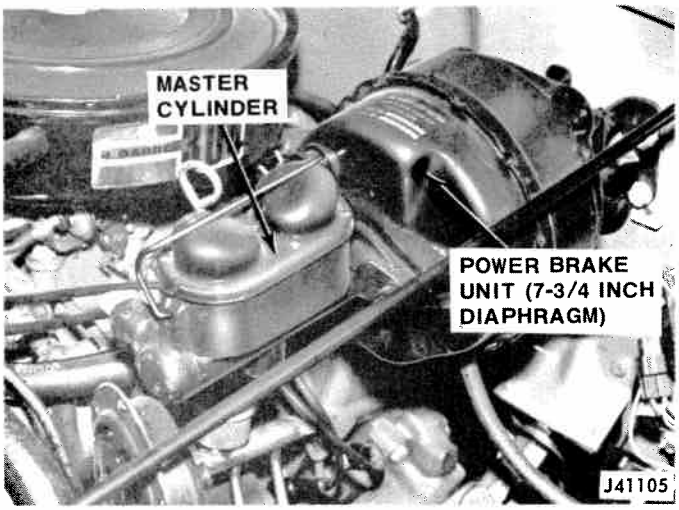


Fig. 9-1 Power Brake Unit, 7-3/4 Inch Diaphragm CJ Models

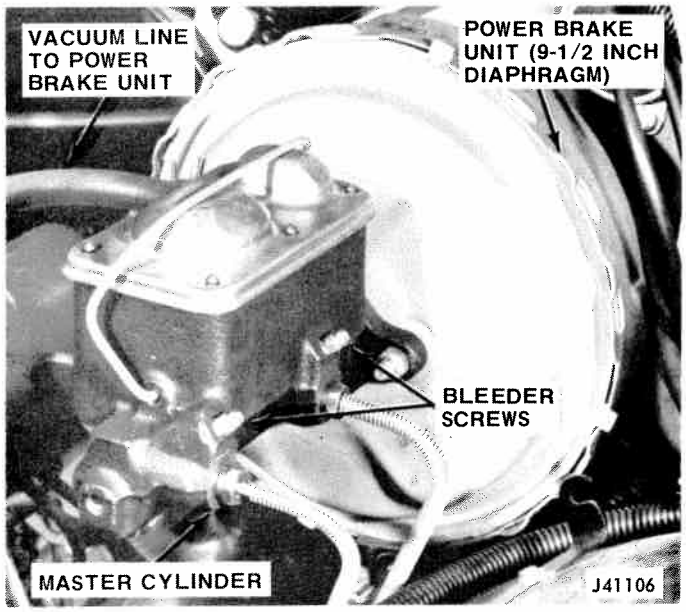


Fig. 9-2 Power Brake Unit, 9-1/2 Inch Diaphragm Cherokee, Wagoneer, Truck

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.

Push Rod Adjustment - 7-3/4 Inch Tandem, Diaphragm- CJ Models

The power unit push rod height must be checked or adjusted whenever the master cylinder and power units are separate, or when adjustment is indicated through diagnosis.

Push rod adjustment is very important as it ensures that the compensating ports in the master cylinder are kept open when the power unit is in the released position.

To check push rod height, a push rod height gauge must be made according to the dimensions given in figure 9-3.

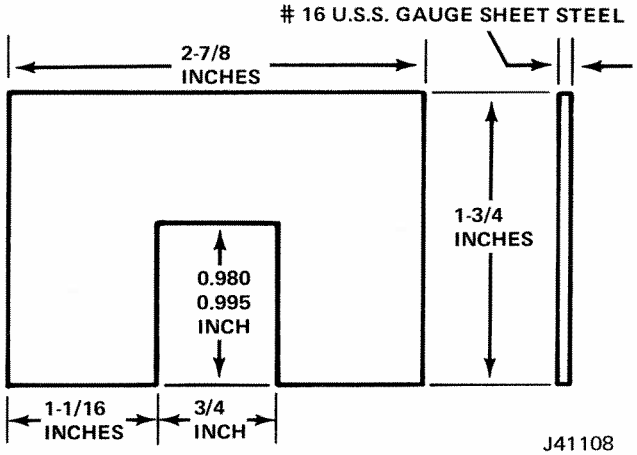


Fig. 9-3 Push Rod Height Gauge Dimensions

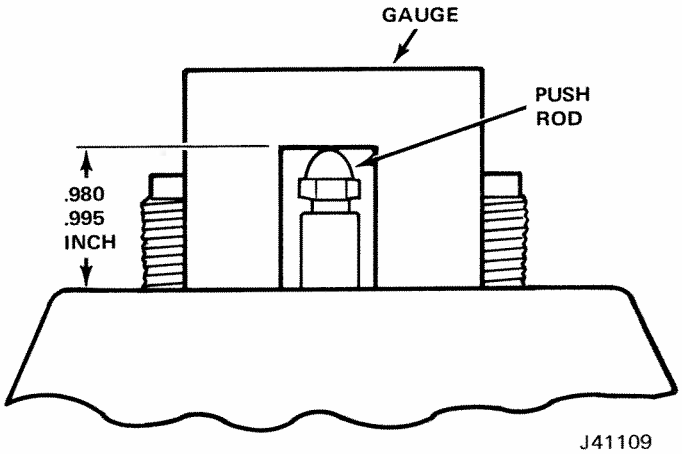


Fig. 9-4 Checking Push Rod Height with Gauge

The push rod length may increased or decreased by holding the rod serrations with pliers and turning the adjusting screw in or out to the desired length (fig. 9-5).

NOTE: *The 9-1/2 inch single and tandem power units have a single push rod (fig. 9-6) of a non-adjustable, preset length. When replacing a power unit, use the push rod supplied with the new power unit as it has been properly gauged and preset to the new power unit.*

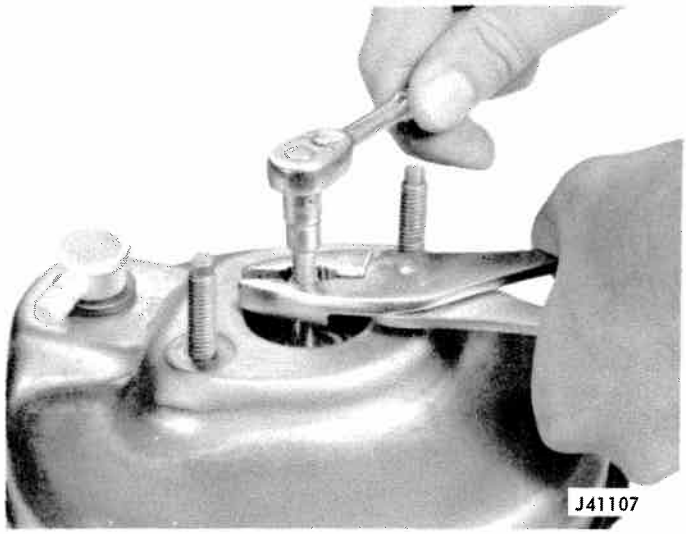


Fig. 9-5 Adjusting Push Rod Length

DUAL MASTER CYLINDER-DOUBLE SAFETY BRAKES-ALL MODELS

In the Double-Safety brake system the hydraulic system for the front brakes is completely separate from the rear brakes. In the event 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.

A double hydraulic cylinder with two outlets, two fluid reservoirs, and two hydraulic pistons (a primary and secondary) is operated in tandem by a single hydraulic push rod.

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

Upon application of the brakes, fluid is displaced by the pistons into the wheel cylinders to activate both front and rear brakes. Upon release of the brakes, fluid returns from the wheel cylinders through the residual check valve to the master cylinder bore.

MASTER CYLINDER - CJ MODELS

Disassembly and Overhaul Procedure

(1) Remove master cylinder from vehicle.

(2) Remove filler cap and empty all fluid.

(3) Remove primary piston stop, located in bottom center of master cylinder.

(4) On non-power brake vehicles, remove actuating

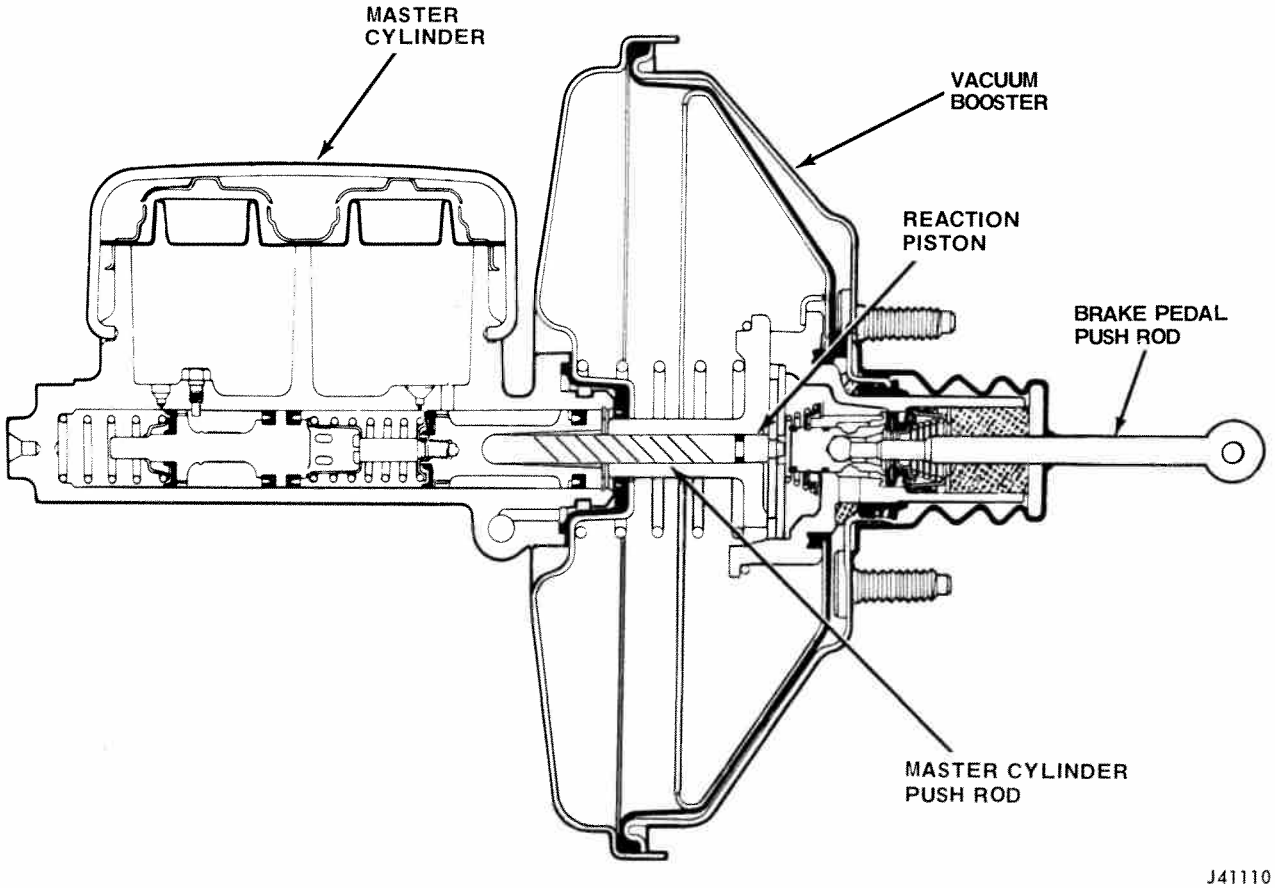


Fig. 9-6 Single Diaphragm Power Brake Unit

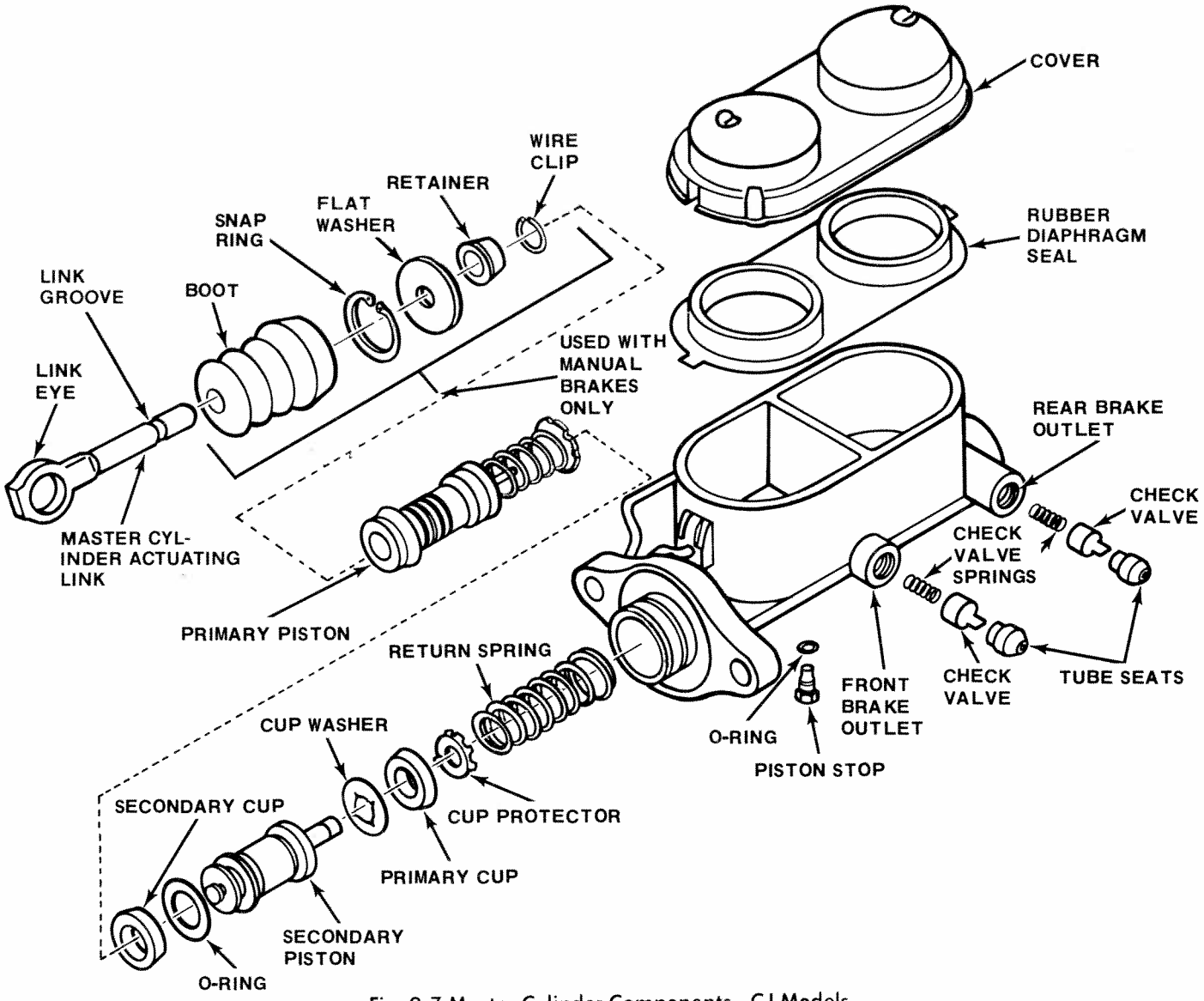


Fig. 9-7 Master Cylinder Components - CJ Models J41111

link snap ring, flat washer, retainer, and primary and secondary piston assemblies (fig. 9-7). Air pressure applied through compensator port in front reservoir will facilitate removal of secondary piston assembly.

(5) A residual check valve is located under both front and rear fluid outlet tube seats on manual and power drum brakes. To gain access to check valves, tube seats must be removed with self-tapping screws supplied in repair kit. Install self-tapping screws into tube seats and place two screwdriver tips under screw head. Pry the screw upward as shown in figure 9-8.

(6) Remove return spring, cup protector, primary cup, primary cup washer, secondary cup and O-ring from secondary piston. Discard all old rubber parts.

NOTE: *The primary piston assembly is supplied in repair kit, therefore, it will not be necessary to retain original primary piston.*

(7) Clean and inspect master cylinder.

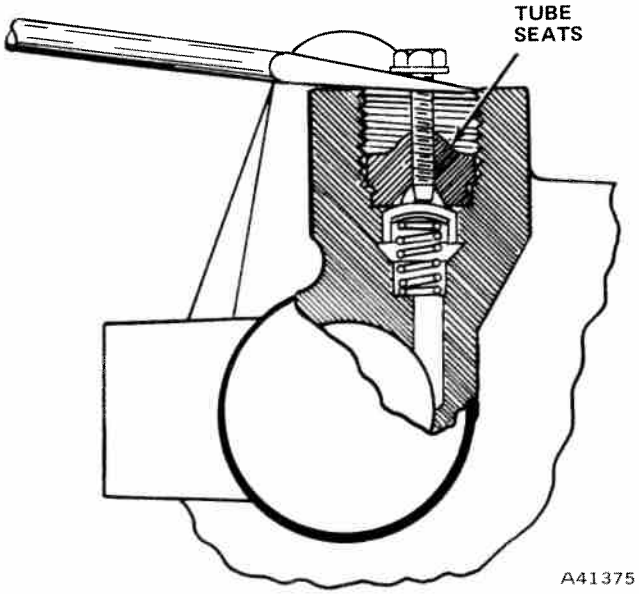


Fig. 9-8 Removing Tube Seats

CAUTION: *Clean all metal parts in clean brake fluid or an approved brake system cleaner..Only use air pressure to remove dirt and cleaning solvent from recesses and internal passages.*

When overhauling a master cylinder, use all parts furnished in repair kit (except push rod boot on vehicles equipped with power brake units).

After cleaning, place all hydraulic system parts on clean paper or in a clean pan.

(8) Inspect all parts for damage or excessive wear. Replace any damaged, worn, or chipped parts. Master cylinder must be replaced if hydraulic bore shows signs of scoring, rust, pitting or etching.

Assembly

(1) Prior to assembly of master cylinder, coat all components with clean brake fluid.

(2) Place primary cup washer, primary cup protector and return spring on secondary piston.

(3) Install O-ring and secondary cup on secondary piston.

NOTE: *Install primary and secondary piston with flat sides of cups facing each other.*

(4) Coat cylinder bore and piston assemblies with clean brake fluid before installing pistons in master cylinder.

(5) Install secondary piston assembly spring end first. Install primary piston assembly which is supplied in repair kit.

(7) Secure pistons in bore with snap ring.

(8) Place new O-ring on primary piston stop and install the piston stop in master cylinder.

(9) Place new rubber check valves over check valve springs and install in fluid outlet holes, spring end first.

(10) Install tube seats and press into place with tube nuts.

(11) On vehicles equipped with non-power brakes the correct assembly sequence for the actuating link retaining parts is as follow(see fig. 9-7):

(a) Install rubber dust boot on link.

(b) Install snap ring on link.

CAUTION: *Be sure that sharp edge of snap ring faces out and toward eye of link.*

(c) Install flat washer on link.

(d) Install cone-shaped retainer on link.

CAUTION: *Large end of retainer must face toward eye of link or away from master cylinder.*

(e) Install retaining clip in groove of link.

(f) Install link; be sure snap ring is fully seated in master cylinder groove.

NOTE: *Vehicles equipped with power brakes use the flat washer and snap ring only. (See fig. 9-7).*

(12) If the complete master cylinder is to be replaced on a vehicle equipped with non-power brakes, the original actuating link must be used. The service replacement master cylinder will have the snap ring, washer, retainer, and retainer clip already installed.Remove these parts and install them on the link in the assembly sequence described above.

CAUTION: *Vehicles equipped with power brakes use a different master cylinder. Be sure that correct master cylinder is installed when replacement is required.*

(13) Bleed master cylinder as follows:

(a) Support cylinder assembly in a vise and fill both fluid reservoirs with approved brake fluid.

(b) Fabricate two bleeding tubes as shown in figure 9-9. Use wooden dowel or actuating link to depress piston assembly slowly. Allow pistons to return under pressure of springs.

(c) Repeat until all air bubbles cease to appear.

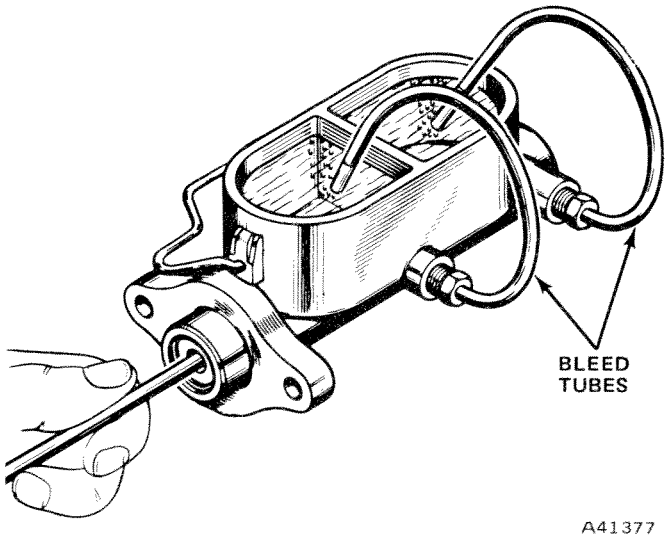


Fig. 9-9 Bleeding Master Cylinder

(14) Install master cylinder on vehicle. Fill reservoirs to within 1/4 inch of reservoir rim.

(15) Bleed Brake system as outlined under Brake system Bleeding

MASTER CYLINDER - CHEROKEE- WAGONEER-TRUCK

A dual master cylinder is used on Cherokee, Wagoneer, and Truck models (fig. 9-10) . The large front reservoir controls the front brakes and the smaller rear

reservoir controls the rear brakes. a bleeder screw is provided at each reservoir outlet to facilitate master cylinder bleeding. The master cylinder used on Cherokee and J-10 Truck models with drum brakes has a 1-inch bore. On Wagoneer and J-20 Truck models with disc brakes, the master cylinder has a 1-1/8 inch bore. The outlet ports on both of these master cylinders do not have check valves.

Disassembly and Overhaul Procedure

(1) Remove master cylinder from vehicle.

(2) Remove cover and empty all fluid. Remove rubber diaphragm seal from cover.

(3) Remove piston stop from bottom of front reservoir. A 5/16-inch socket is required for removal.

(4) Place master cylinder in vise. Use only enough tension to hold cylinder in vise. Push in on primary piston with phillips screwdriver to relieve spring tension on piston, and remove snap ring. Remove both piston assemblies.

NOTE: *Remove secondary piston by applying pressure on piston through piston through piston stop hole in bottom of reservoir.*

(5) Clean and inspect master cylinder. Replace if bore is scored, corroded, or pitted. Replace if cylinder body is cracked, porous, or has sustained other damage. Ensure that bypass and compensating ports in bottom of reservoirs are clean and open. Use air pressure to perform this check. Do not use wire as the wire may raise a burr in the port or push a burr into the cylinder bore.

CAUTION: *Clean master cylinder with brake fluid or approved 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 the brass tube fitting inserts in the outlet ports. **Do not replace** these inserts unless they are loose, cocked in the outlet bore, badly scored, cracked, or damaged in some other fashion. If removal is required proceed as follows:

(a) Thread a 6-32 x 5/8-inch long self-tapping screw into the insert.

(b) Remove insert by prying on self-tapping screw with a claw hammer.

(7) Discard all rubber piston cups and seals, and discard the master cylinder cover seal if damaged or defective.

Assembly

(1) Place master cylinder in vise. Do not overtighten. If tube-fitting inserts were removed, install new inserts as follows:

(a) Place new inserts in outlet ports.

(b) Thread a spare brake line tube nut into outlet. Be sure new inserts are not cocked in outlet bore.

(c) Turn brake line tube nut down until inserts are bottomed.

(d) Remove nut and inspect threaded hole in outlet. Remove any brass particles or burrs that may have been raised during installation of inserts. Reclean master cylinder with brake fluid and blow out all passages with dry, filtered compressed air.

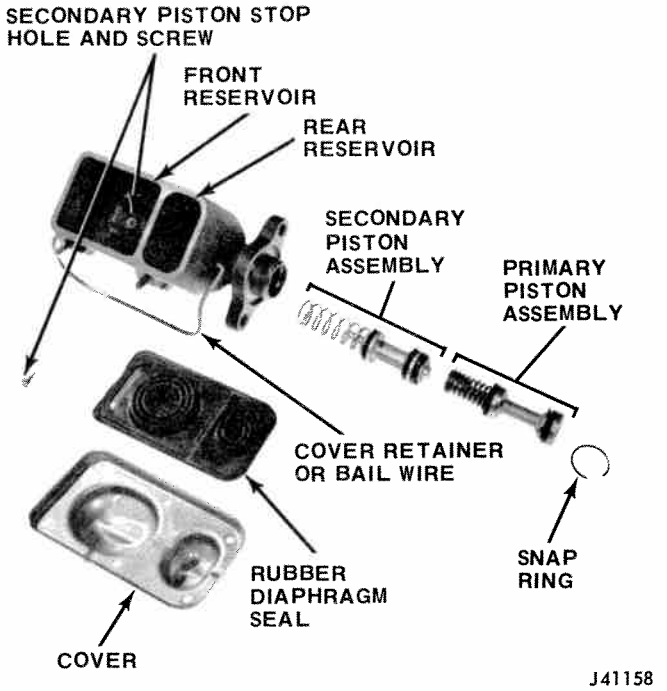


Fig. 9-10 Master Cylinder Components - Cherokee, Wagoneer, Truck

(2) Lubricate all parts thoroughly with clean brake fluid, particularly the master cylinder bore, and piston seals.

(3) Install both piston assemblies in cylinder bore in reverse order of disassembly. Be careful not to cut or crimp piston cups and seals during installation.

(4) Use phillips screwdriver to depress primary piston and install snap ring. Be sure snap ring is fully seated in its groove.

(5) Depress both pistons and install piston stop in front reservoir. Make sure secondary piston is pushed back far enough to clear the piston stop. Tighten stop to 25 to 40 inch-pounds torque.

(6) Install rubber diaphragm seal on reservoir cover.

(7) Install master cylinder on vehicle. Fill reservoirs to within 1/4 inch of rim and install cover.

(8) Bleed brake system as outlined under Brake System Bleeding.

COMBINATION VALVE

All models are equipped with a combination valve (figs. 9-11 and 9-12 which is attached to the inner side of the left frame rail.

Description and Operation - CJ Models

The combination valve used on CJ models contains a brake pressure differential warning section and a proportioning section which are combined into a single assembly. The valve also serves as the front junction block for the brake system.

Pressure Differential Warning Switch Section

The switch in the valve is activated when a hydraulic pressure loss occurs in either the front or rear brake systems. 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 form the good 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 piston moves in the opposite direction.

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

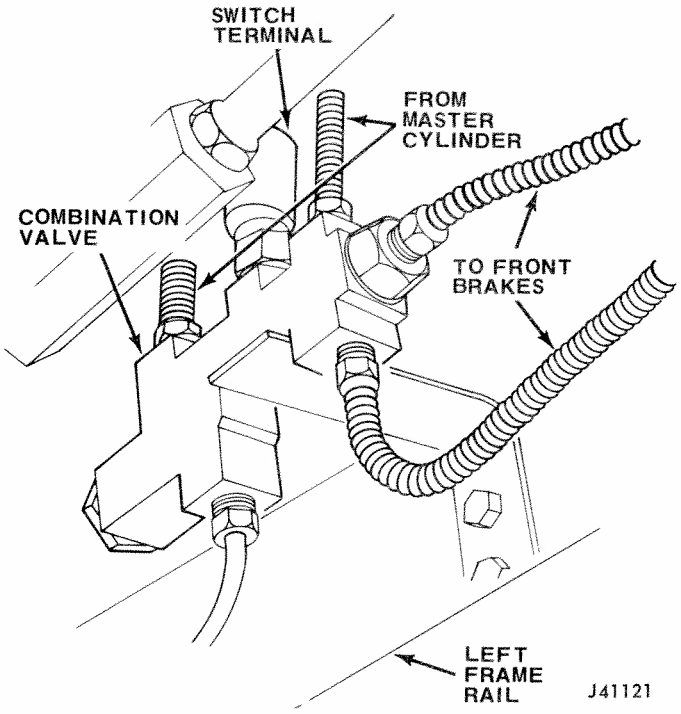


Fig. 9-11 Combination Valve - CJ Models

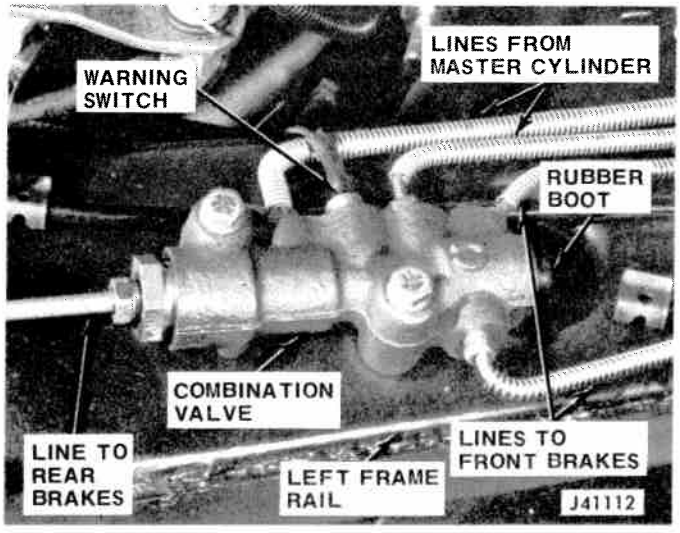


Fig. 9-12 Combination Valve - Cherokee, Wagonee, Truck

Proportioner Section

The proportioner 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 conpensated 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.

Combination Valve Service - CJ Models

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-spring assembly must be removed. 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.*

Description and Operation - Cherokee, Wagoneer, Truck

The combination valve used on Cherokee, Wagoneer, and Truck models (fig. 9-13) contains a metering valve section, a pressure differential warning switch section, and a proportioner valve section. The combination valve also serves as the front junction block for the brake system.

Metering Valve Section

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

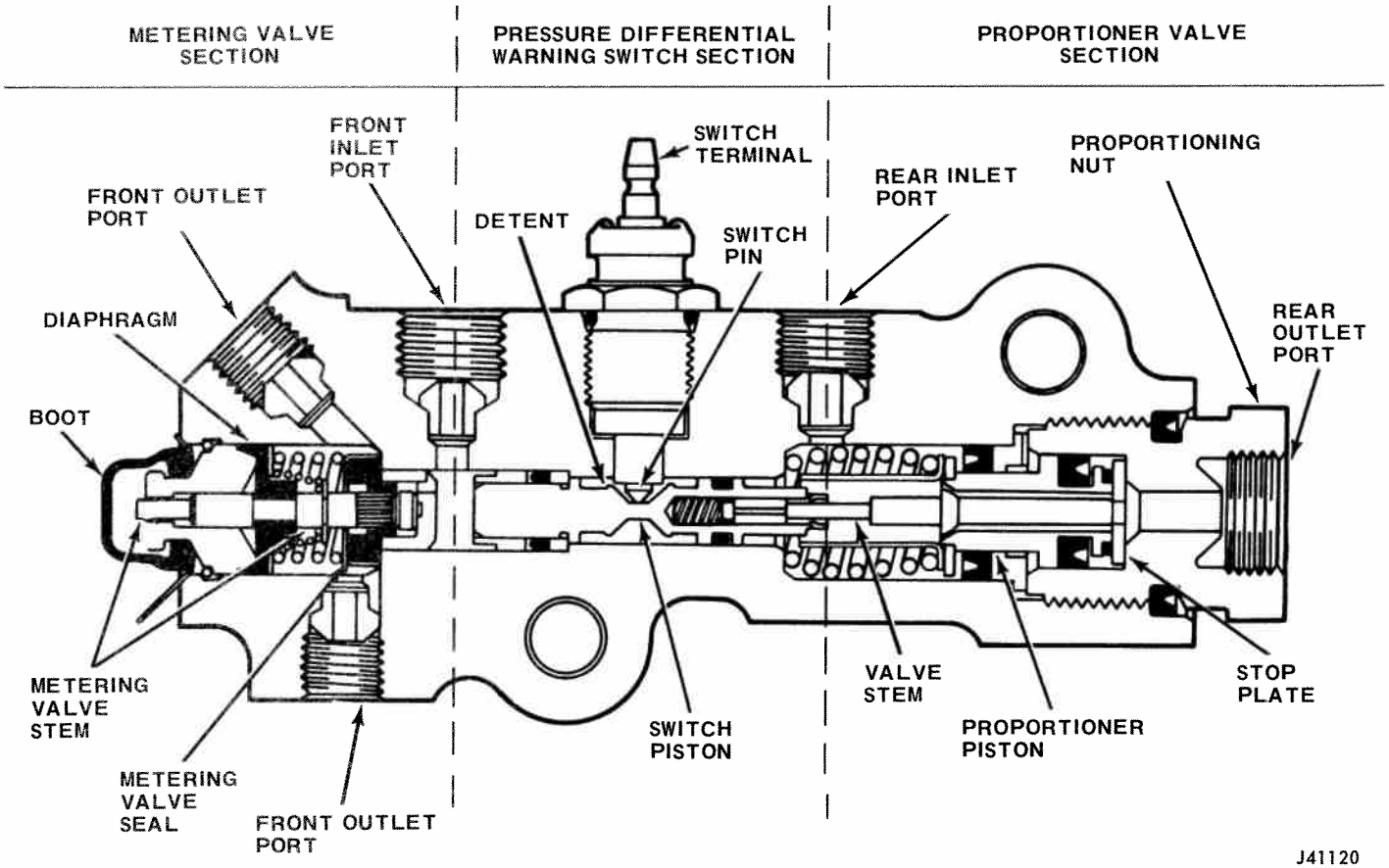


Fig. 9-13 Combination Valve Cross Section - Cherokee, Wagoneer, Truck

When the brakes are not applied (fig. 9-14) the metering valve permits free flow of brake fluid. This feature allows the fluid to expand and contract with changes in temperature (fig. 9-14)

During initial application of the brakes, the metering valve stem is moved to the left by hydraulic line pressure. At 4 to 30 psi, the smooth end of the stem will seal against the metering valve seal lip. When this seal is completed, the metering valve has reached its shut-off point (fig. 9-15).

After reaching the shut-off point on initial brake application, the metering valve stem continues to the left until it stops at the knurl at the metal reatiner. The metering valve spring then holds the retainer against the seal until a predetermined fluid pressure is developed at the valve inlet.

When the pressure at the valve inlet becomes great enough, it overcomes the metering valve spring tension and allows fluid pressure to flow through the valve to the front brakes. This step in valve operation is referred to as the hold-off and blend pressure point(fig. 9-16).

As fluid pressure into the valve is increased, it is metered through the valve seal to the front brakes and produces an increased force on the diaphragm (fig. 9-16).

The diaphragm then pulls the pin, which in turn pulls the retainer, thereby decreasing spring load on the metering valve seal. When pressure on the diaphragm reaches the point where the sping is pulled away completely, fully pressurized fluid passes unrestricted through the valve seal and to the front brakes.

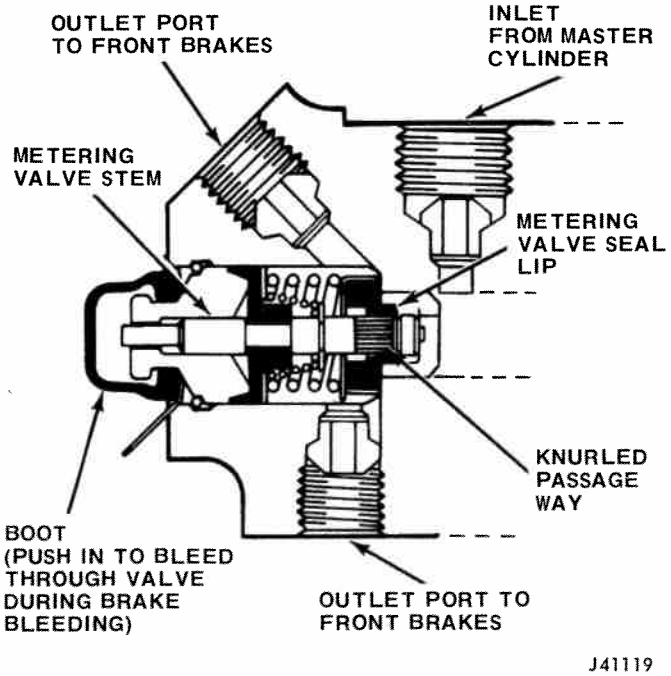


Fig. 9-14 Brakes Not Applied

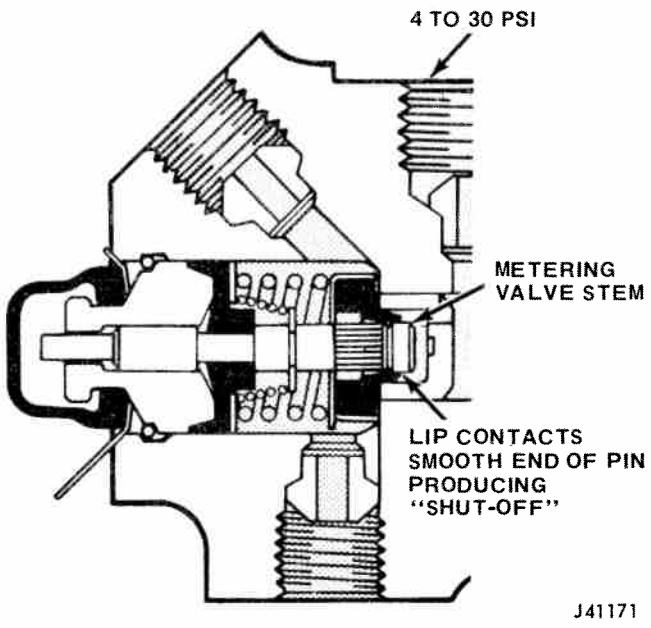


Fig. 9-15 Shut-Off Point

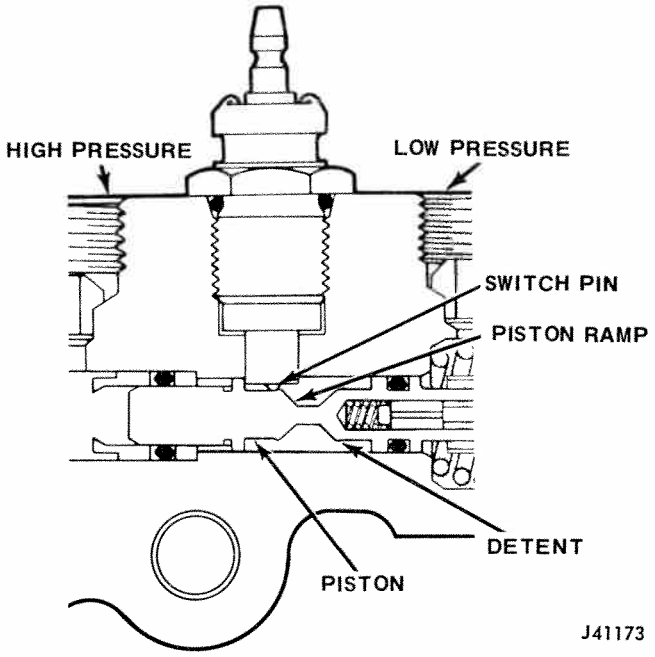


Fig. 9-17 Rear System Failure

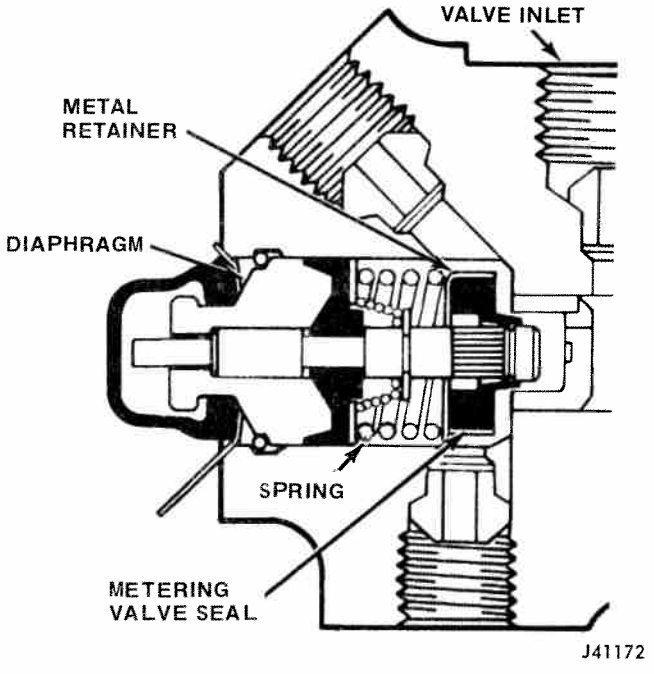


Fig. 9-16 Holdoff and Blend Pressure

Pressure Differential Warning Switch Section

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 (fig. 9-17), 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 pistons will move to the left.

Proportioner Section

The proportioner section provides balanced front-to-rear braking action during high pedal pressure stop. During light pedal pressure application, the proportioner does not operate (fig. 9-18). 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.

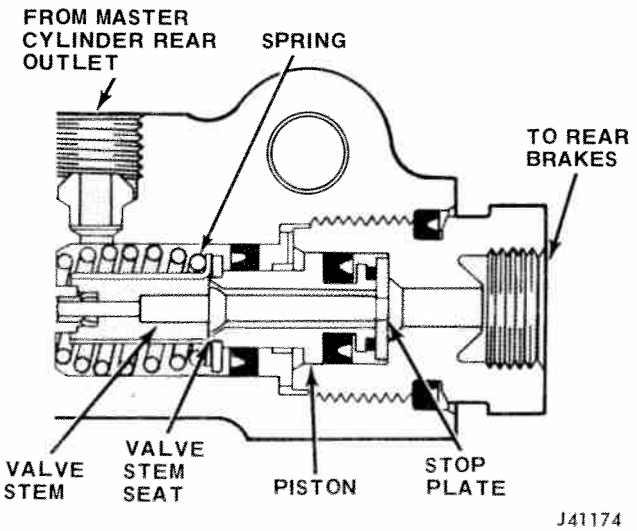


Fig. 9-18 Light Pedal Pressure Application

During high pedal pressure application, pressure developed within the valve pushes against the large end of the piston. When this pressure becomes high enough, it overcomes spring pressure on the piston and moves the piston to the left. The piston contacts the valve stem seat and begins proportionally by restricting fluid pressure through the valve and to the rear brakes (fig. 9-19).

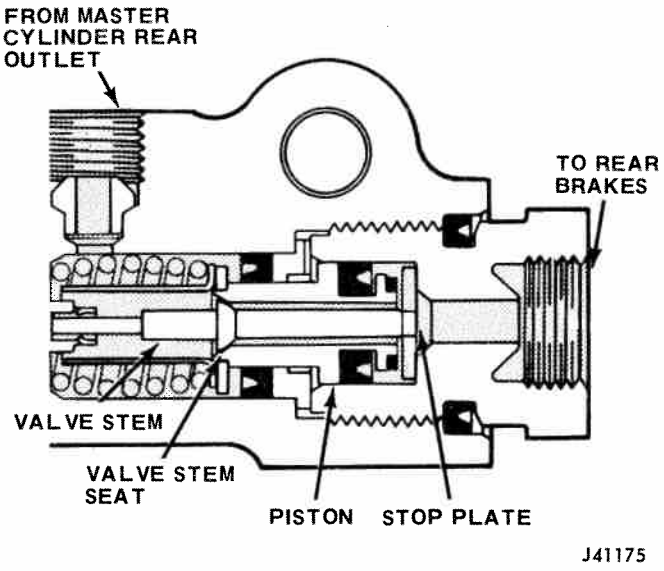


Fig. 9-19 High Pedal Pressure Application

Combination Valve Service - Cherokee, Wagoneer, Truck

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. Refer to Brake System Bleeding for procedure.

BRAKE SYSTEM BLEEDING

All Models

The hydraulic system must be bled whenever a line has been disconnected or if air has entered the system. Brake system bleeding can be performed manually or with pressure equipment. Bleeder screws are provided at the calipers, wheel cylinders, and at the master cylinder on Cherokee, Wagoneer, and Truck models.

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) Hold combination metering valve open as follows: on Cherokee, Wagoneer, and Truck models, loosen the front mounting bolt on the combination valve and insert the slotted end of tool J-23709 under the mounting bolt. Push in on the metering valve pin to hold it open and retighten the mounting bolt to hold tool J-23709 in (fig. 9-20). On CJ models, remove the brake warning switch wire, switch terminal, plunger and spring from the combination valve.

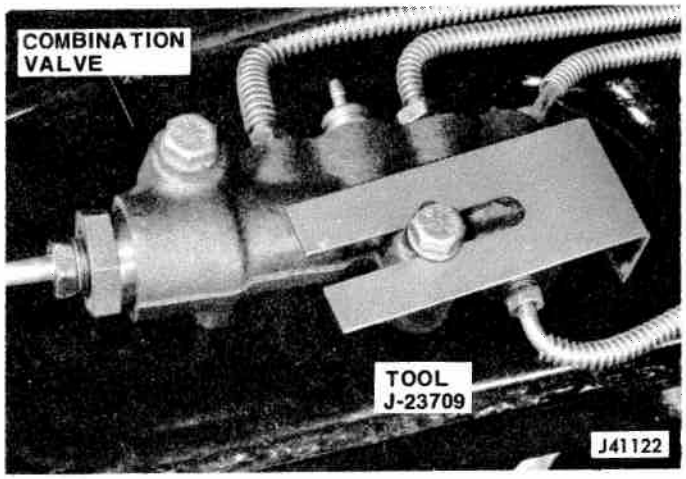


Fig. 9-20 Metering Section Hold-Open Tool Installed

(5) Bleed brake system in following sequence:
(a) Master cylinder (Cherokee - Wagoneer - Truck)
(b) Left front wheel
(c) Right front wheel
(d) Left rear wheel
(e) 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 that is partially filled with clear brake fluid. Open screw 3/4 of a 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.*

(6) 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.

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

(8) 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. 9-21). Connect hose from pressure bleeder to fitting on adapter and open release valve on pressure bleeder.

(5) Hold combination metering valve open. On Cherokee, Wagoneer, and Truck models, install tool J-23709 as described in step (4) of Manual Bleeding Procedure (fig. 9-20). On CJ models, remove the brake warning switch wire, switch terminal, plunger, and spring from the combination valve.

(6) Bleed brake system in folling sequence.

(a) Master cylinder (Cherokee—Wagoneer—Truck).

(b) Left front wheel

(c) Right front wheel

(d) Left rear wheel

(e) Right rear wheel

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

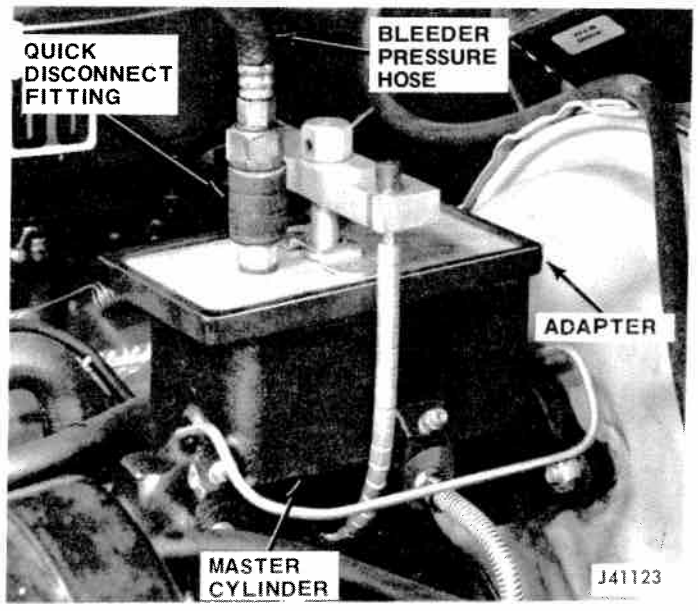


Fig. 9-21 Pressure Bleeder Adapter Installed

(7) When the system has been purged of all air, turn off the pressure bleeder and close the release valve.

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

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

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

(11) On Cherokee, Wagoneer, and Truck remove combination valve tool and tighten mounting bolt. On CJ models reinstall plunger, spring, and terminal in valve.

(12) Test brake operation before moving vehicle.

DRUM BRAKES: ALL MODELS

Description:

The drum brake units consist of a support plate, two brake shoes, brake shoe return springs, adjuster operation parts, and a wheel cylinder (fig. 9-22, -23, -26).

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 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 (J-models) will lift the lever into engagement with the next tooth of the star wheel 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 hand or right hand parts, **not** interchangeable, and **must** be kept separated.

DRUM BRAKE SERVICE-CJ MODELS

Disassembly

(1) Raise vehicle with hoist or floor jack. Support vehicle with frame stands if floor jack is used.

(2) Remove wheels and drums.

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

(4) Place Brake Cylinder Clamps C-416 over wheel cylinders to hold pistons in place while shoes are being removed.

(5) Remove return springs with brake spring remover, Tool C-3785.

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

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

CLEANING AND INSPECTION

Cleaning

For grease contamination, clean all parts, except the brake drums, with a suitable solvent.

For brake fluid contamination clean all parts with alcohol.

If type of contamination cannot be determined clean first with mineral spirits and then with alcohol. Final cleaning of all parts, especially the brake drums, should be done with a soap and water solution.

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. After polishing, if grooves exist which may restrict shoe movement, the brake support plate must be replaced. An attempt to remove the grooves by grinding may result in improper shoe to drum contact.

Inspect the lining wear pattern. If the wear accross the width of the lining is uneven, the drums should be checked for bell-mouthed condition, shoes inspected for correct positioning, and the support plate inspected 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 self-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, cracks.

(3) If wheel cylinders require overhaul proceed as follows:

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

(b) Remove cylinder mounting bolts and remove cylinder.

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

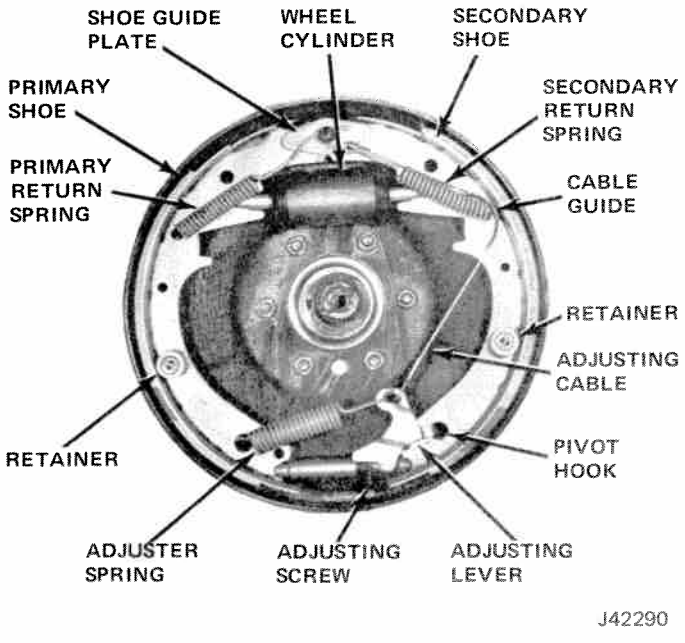


Fig. 9-22 Brake Assembly Components - Left Front

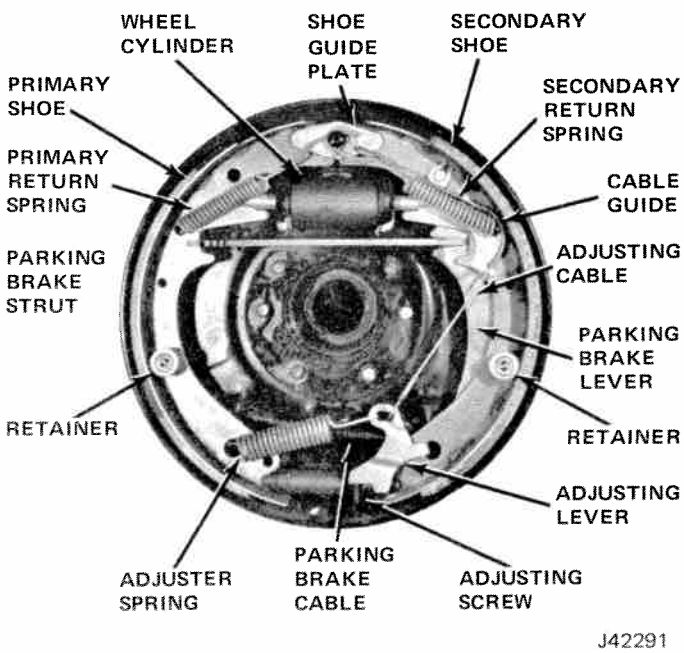


Fig. 9-23 Brake Assembly Components - Left Rear

(d) 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. If polishing was performed, clean the cylinder thoroughly with brake fluid only.*

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

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

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

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

(h) Start brake line fitting into wheel cylinder. Secure wheel cylinder to support plate and finish tightening brake line fitting. Tighten cylinder mounting bolts to 15 to 20-foot-pounds torque.

Support Plate

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

(2) Polish support plate ledges with emery cloth. If ledges have deep grooves or ridges which can 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 loose attaching part.

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

Brake Drums

(1) Clean dirt from drums. Compressed air and clean cloth may be used. Should drums require further cleaning, use soapy 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, distortion.

(3) Check drum for excess runout or bell-mouth 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. Lateral runout must not exceed 0.035 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 0.060 inch. Maximum allowable oversize for any drum is 0.060 inch over original diameter.*

NOTE: *Hard spots in a drum should be removed by grinding. The normal cutting tool will ride over hard spots dulling the tool and leaving high spots on the surface.*

Assembly and Adjustment

IMPORTANT: *When it is necessary to replace brake shoes and linings on one wheel, the shoes and linings should be replaced on the opposite side (wheel) to maintain proper braking balance.*

(1) Before assembly lubricate support plate ledges, anchor pin, self-adjusting cable guide adjuster screw threads, and pivot with molydisulphide grease or chassis lubricant NLGI No. 2. Lubricate the parking brake cable lever located on the rear wheel secondary shoes.

(2) Position brake shoes on the brake support plate and install hold down springs.

(3) Place adjuster cable eyelet on anchor pin.

(4) Install primary return spring.

(5) Position cable guide and install secondary return spring (fig. 9-24).

(6) Install adjuster 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. 9-22, -23).

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

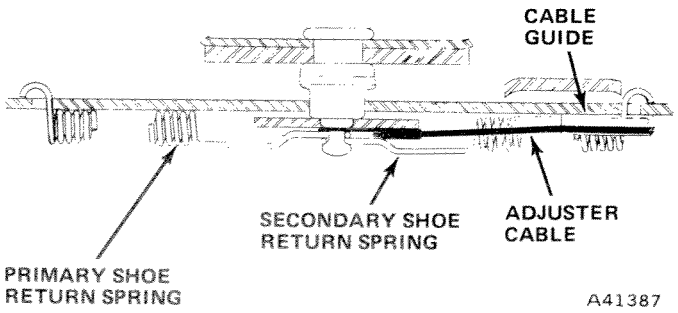


Fig. 9-24 Brake Shoe Spring Installation

(9) Perform initial brake adjustmant as follows: When the brake parts have been installed in their correct position, initially adjust adjusting screw assemblies so that approximately 3/8-inch of threads are exposed between star wheel and star wheel nut.

(10) Install Drums.

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 screw driver to rotate star wheel until wheel is in locked position (fig. 9-25). To tighten, rotate star wheel in clockwise direction. Then back off star wheel at least 15 to 20 notches (clicks).*

To back off star wheel on brake, insert ice pick or thin blade screw driver in adjusting screw slot to hold lever away from adjusting screw. Back off on adjusting screw until wheel and drum turn freely. Replace adjusting hole cover.

CAUTION; *DO NOT attempt to back off on adjusting screw without holding adjuster lever away from screw as adjuster will 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 car in reverse and forward, making 10 to 15 brake applications prior to road testing. This action balances the adjustment of the four brake units and raises the brake pedal to satisfactory height.

DRUM BRAKE SERVICE -Cherokee - Wagoneer - Truck

Disassembly

(1) Raise vehicle with hoist or floor jack. Support vehicle with frame stands if jack is used.

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

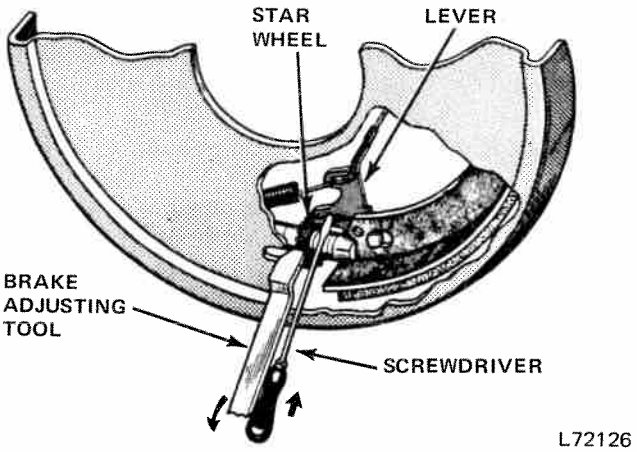


Fig. 9-25 Brake Shoe Adjustment

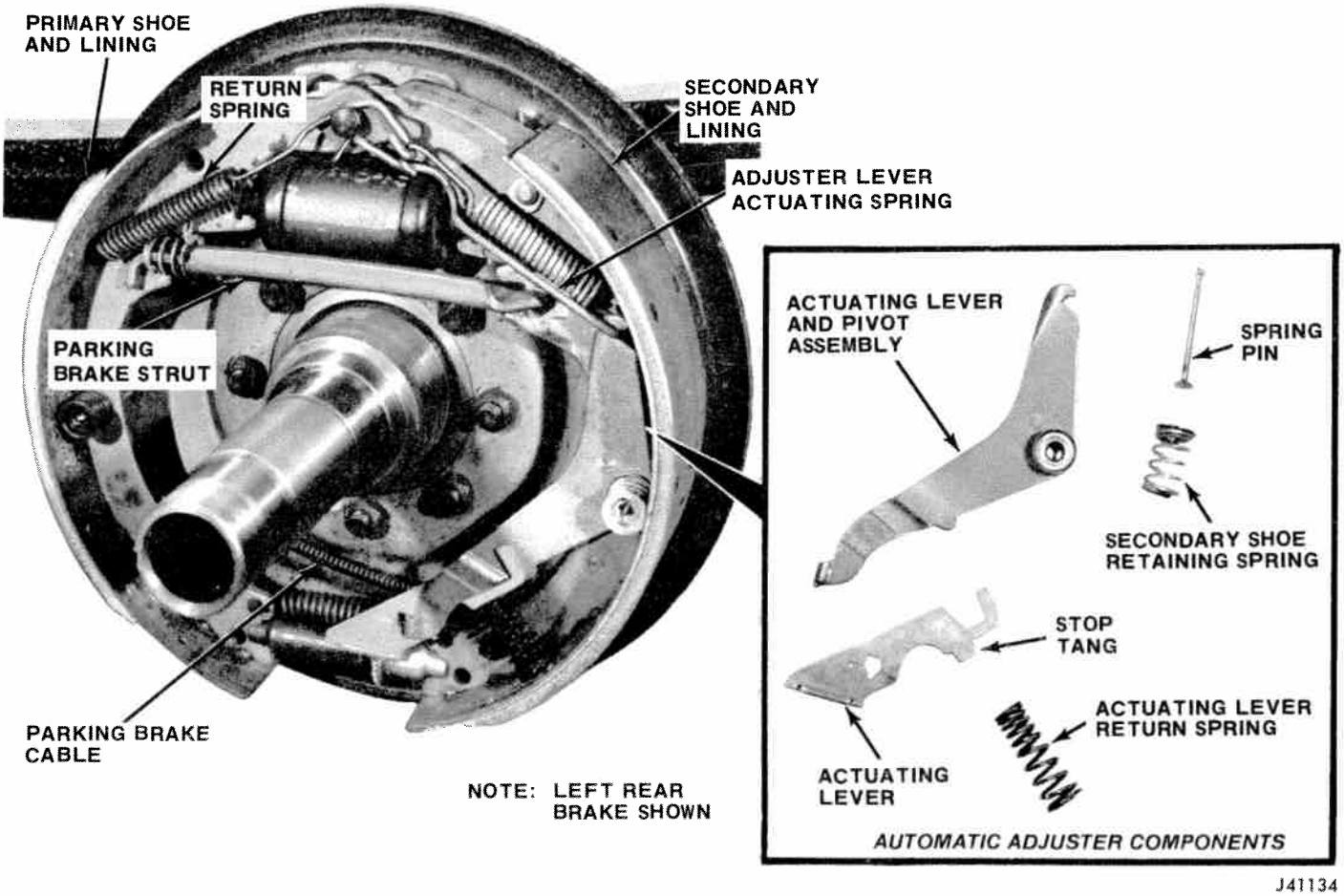


Fig. 9-26 Typical Drum Brake Assembly Cherokee, Wagoneer, Truck

NOTE: *On trucks with Model 60 full float rear axle, the two screws that locate rear drums on hubs must be removed (fig. 9-27).*

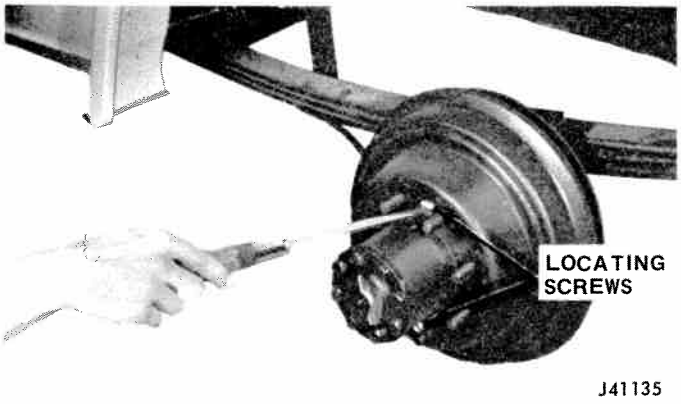


Fig. 9-27 Locating Screw Removal - Model 60 Full Floating Axle

Remove primary shoe return spring (fig. 9-26, and 9-28). Remove automatic adjuster actuating spring and secondary shoe return spring with spring remover tool C-3785.

(4) Remove holddown springs and remove brake shoe assemblies. On rear brakes, disengage parking brake cable from parking brake lever. (Parking brake strut is removed with brake shoe assemblies) fig. 9-28.

(5) Place wheel cylinder clamps C-416 over wheel cylinders to retain pistons fig. 9-29).

Cleaning and Inspection

Brake Shoe Assembly

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

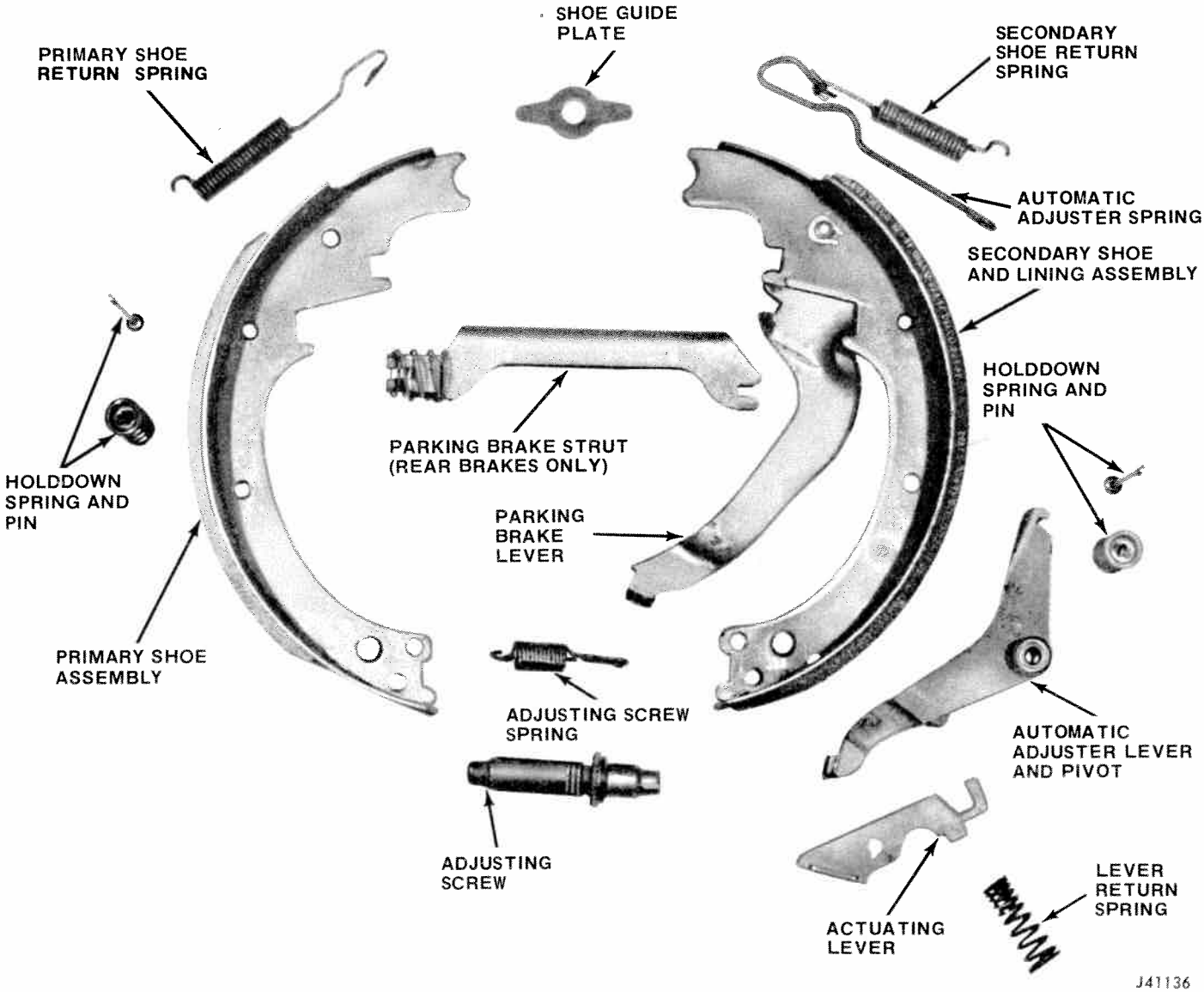


Fig. 9-28 Disassembled Drum Brake Assembly - Cherokee, Wagoneer, Truck (Rear Brake Shown)

(2) Inspect lining wear pattern. If wear is uneven across width of lining, replace lining and check drum for bell-mouthed condition. If wear is uneven from top to bottom, replace lining and check drum excess run-out.

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

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

NOTE: *Light surface contamination on reusable linings can be removed with alcohol (only).*

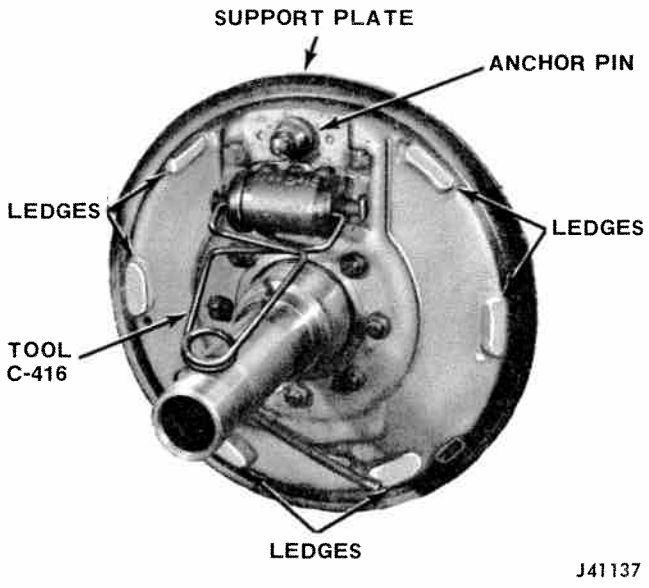


Fig. 9-29 Wheel Cylinder Clamp Installed

(5) Inspect adjusting screw spring, return springs, hold down springs, actuating lever return spring, and automatic adjuster spring. Replace springs if weak, 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 adjuster screw for free operation. Screw should rotate freely. Inspect serrations on star wheel for excessive wear (which could effect proper 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 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, cracks.

(3) If wheel cylinders require overhaul proceed as follows:

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

(b) Remove cylinder mounting bolts and remove cylinder.

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

(d) 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. If polishing was performed, clean the cylinder thoroughly with brake fluid only.*

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

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

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

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

(h) Start brake line fitting into wheel cylinder. Secure wheel cylinder to support plate and finish tightening brake line fitting. Tighten cylinder mounting bolts to 15 to 20 foot-pounds torque.

Support Plate

(1) Remove dirt using compressed air or cloth. Polish anchor pin with crocus cloth (fig. 9-29).

(2) Polish support plate ledges (fig. 9-29) with emery cloth. If ledges have deep grooves or ridges which can 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 loose attaching part.

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

Brake Drums

(1) Clean dirt from drums. Compressed air and clean

cloth may be used. Should drums require further cleaning, use soapy 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, distortion.

(3) Check drum for excess runout or bell-mouth 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. Lateral runout must not exceed 0.035 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 0.060 inch. Maximum allowable oversize for any drum is 0.060 inch over original diameter.*

NOTE: *Hard spots in a drum should be removed by grinding. The normal cutting tool will ride over hard spots dulling the tool and leaving high spots on the surface.*

Assembly and Adjustment

(1) Apply thin film of molydisulphide grease, or NLGI No. 2 chassis lubricant or lithium base lubricant to following parts (see fig. 9-28 and 9-29).

(a) Support plate ledges.

(b) Anchor pin.

(c) Adjuster screws threads and pivot

(d) Adjuster lever-to-secondary brake shoe contact surface.

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

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

NOTE: *When installing parking brake lever on new shoe, deform (pinch) C-clip to retain lever on shoe.*

(3) Install secondary shoe and automatic adjuster lever and pivot as assembly. Secure assembly to support plate with hold-down spring.

(4) Install actuating lever and adjusting lever. Install return spring on actuating lever tang. Large end of tapered spring rests on brake shoe.

(5) Install primary shoe. Secure to support plate with holddown spring. Install guide plate on anchor pin.

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

(7) Install adjusting screw and spring. Short hooked end of springs goes on primary shoe; long hooked end goes on secondary shoe (fig. 9-26).

(8) Install return springs and adjuster spring in the following sequence (figs. 9-26 and 9-28).

(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.*

(9) Perform initial brake adjustment as follows:

(a) Determine drum diameter with drum-to-brake shoe clearance gauge (fig. 9-30).

(b) Reverse gauge and place on brake linings (fig. 9-31). To adjust, turn star wheel on adjuster screw until gauge just slides over lining surface.

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Fig. 9-30 Using Drum-to-Shoe Clearance Gauge

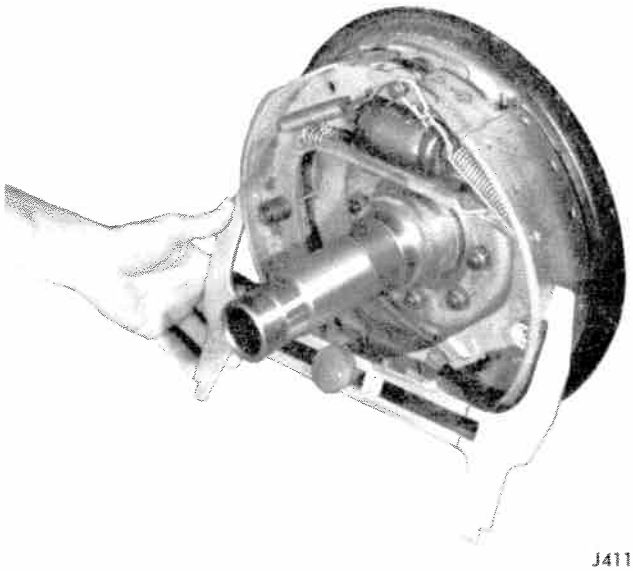

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Fig. 9-31 Checking Brake Shoe Lining Clearance

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

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

(a) Turn star wheel until drum slides over shoes with slight drag.

(b) With drum in place, back off star wheel 30 notches. Use brake adjusting tool to turn star wheel. Use screwdriver to push automatic adjuster lever away from wheel while adjusting. If access hole in support plate has a metal plug in it, knock out the 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.

(11) Install brake drums.

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

(13) Install wheels and tires and lower vehicle.

(14) Test brake operation before moving vehicle.

(15) Perform final brake adjustment by making a number of forward and reverse stops (using firm pedal effort) until a 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.*

PARKING BRAKE ADJUSTMENT - All Models

NOTE: *Wheel brakes must be adjusted prior to adjusting parking brakes.*

(1) Release parking brake.

(2) Loosen lock nuts 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 no drag is felt.

(6) Tighten locknuts at equalizer.

(7) Check operation of parking brake.

DISC BRAKES

Model Application

Floating caliper type front disc brakes (fig. 9-32) are standard on Wagoneer and heavy-duty (J-20) Trucks and are optional for Cherokee and light-duty (J-10) Trucks. A common disc brake caliper and 12.0-inch rotor are used on all models except that heavy-duty Trucks are equipped with a 12.5-inch disc brake rotor.

Description

The disc brake system consists of three assemblies: the caliper assembly, the hub and rotor assembly, and the support and shield assembly. The caliper (fig. 9-33) is a one-piece casting with the inboard side containing the single piston, the piston bore, and the bleeder screw and fluid inlet holes.

The piston bore contains the large single piston, the piston seal, and a dust boot. A groove is machined in the sidewall of the piston bore to accept the piston seal. This groove is slightly tapered, being shallower toward the bottom of the groove than at the top. The purpose of tapering the groove is to put more compression on the edge of the square-cut seal that is exposed to brake fluid pressure (fig. 9-34).

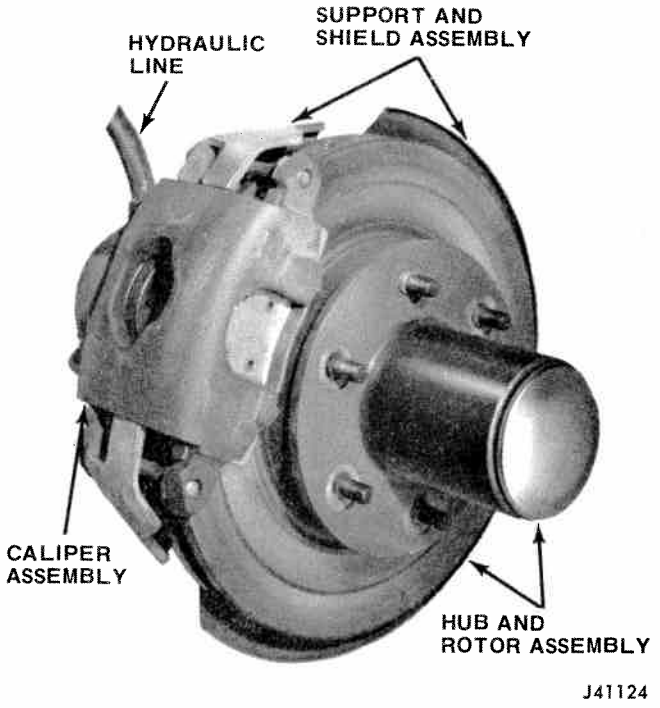


Fig. 9-32 Disc Brake Assembly

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

The steel piston is hollow and its exterior surface is precision ground and nickle-chrome plated to provide a hard and 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 automatically compensated for by the later-

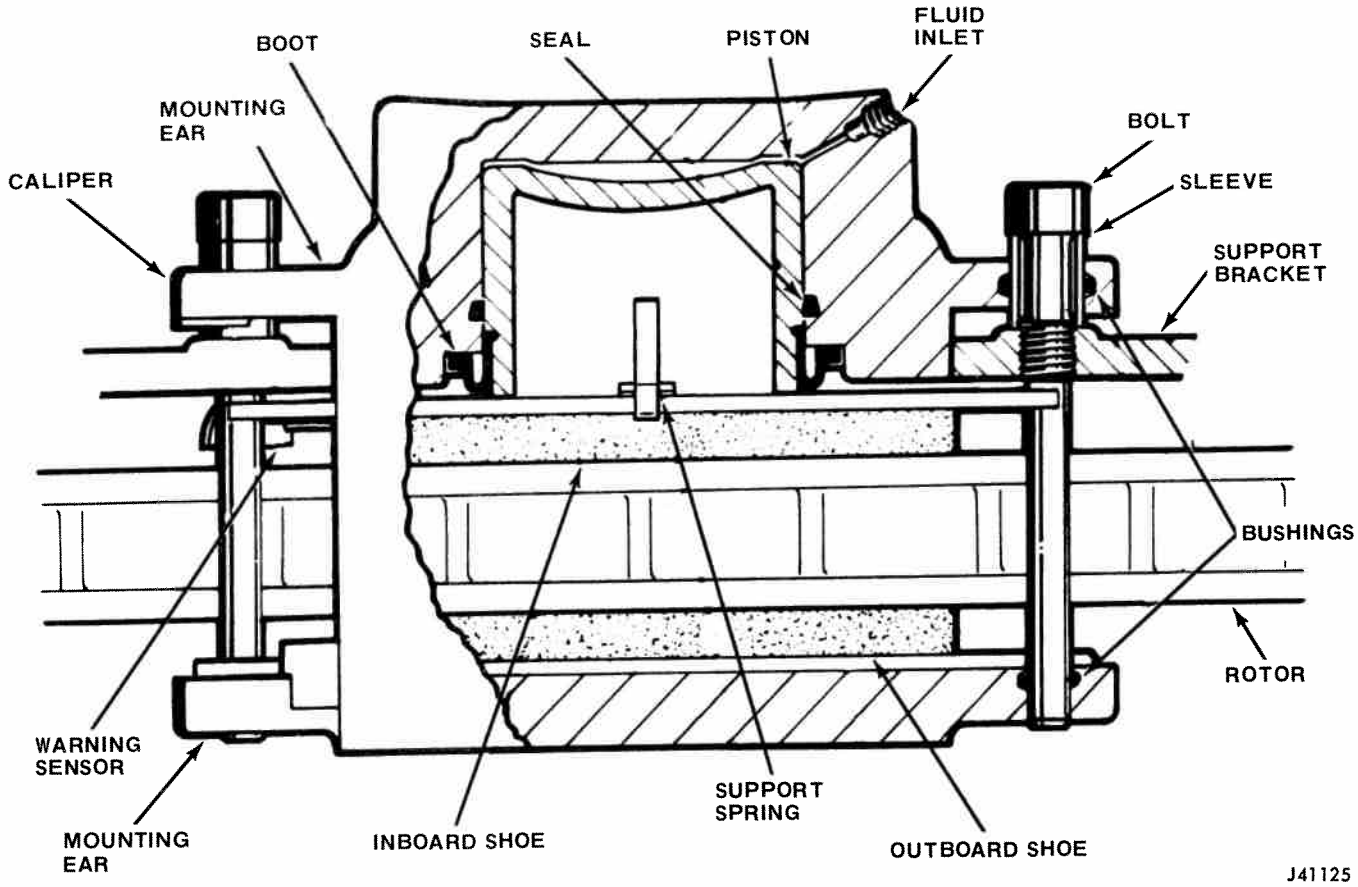


Fig. 9-33 Caliper and Rotor - Single Piston

al sliding movement of the caliper and increased piston extension (fig. 9-35).

The caliper assembly has two mounting ears at each end. Holes are machined into each of the ears, with the holes in the inboard ears being larger than the holes in the outboard ears. A groove is machined in the inside diameter of each hole to accommodate rubber bushings. A sleeve is assembled through each of the larger holes in the inboard ears (fig. 9-33). The caliper assembly is attached to the support bracket which is welded to, and is a part of, the disc brake shield. The disc brake shield and integral support bracket are bolted to the steering assembly.

Two special allen head support bolts are used to attach the caliper to the support bracket. The bolts are inserted through the sleeves (in the inboard mounting ear holes of the caliper), under the ears on the inboard shoe, and then through the outboard ears on the caliper. The threaded portion of the bolts heads are tightened against the sleeve ends. The caliper is then free to slide on the sleeves in the inboard ears and on the unthreaded portion of the bolt that fits in the outboard ears (fig. 9-33).

Each caliper contains a set of two shoe and lining assemblies, each assembly consisting of a stamped metal shoe and a lining riveted to the shoe (fig. 9-33).

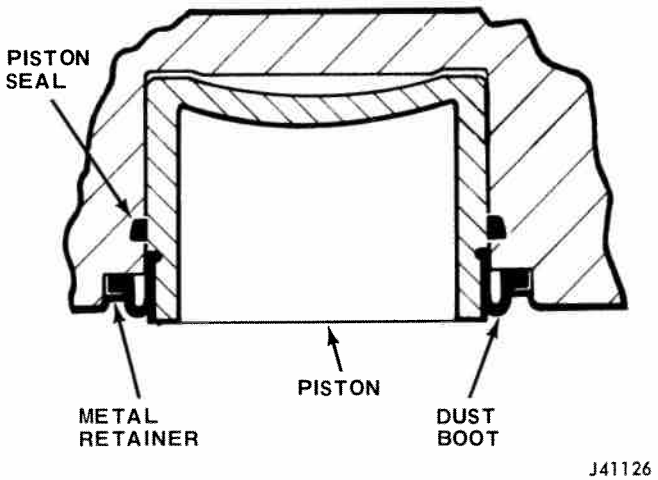


Fig. 9-34 Cross-Section of Caliper Cylinder and Piston

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

(1) Inboard shoe and lining are slightly thicker.

(2) Outboard shoes have bent-over ears at top ends.

(3) Outboard shoes have large tab at bottom of shoe, bent at right angle to shoe.

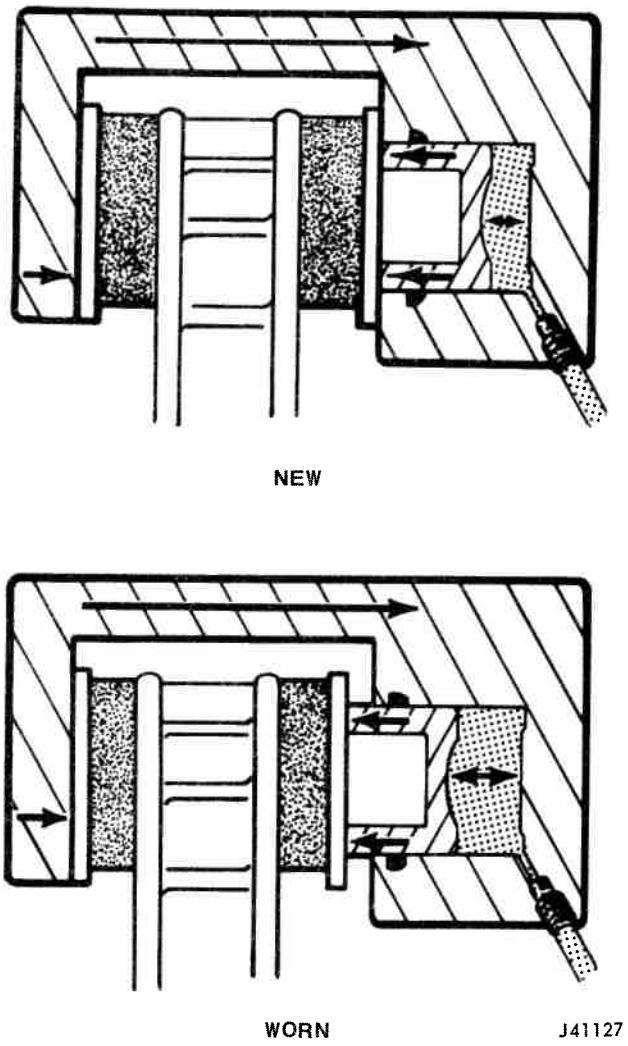


Fig. 9-35 Piston Travel - New and Worn Linings

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

(5) Inboard shoe has notch at top for support spring.

A warning (wear) sensor, a strip of flanged metal, is attached to the back of all disc brake shoes. When the lining has worn to the point of replacement, the sensor contacts the rotor surface and makes a highpitched screeching or scraping noise warning the driver that the shoe and lining assemblies are in need of replacement (fig. 9-36).

An inspection port is provided at the top middle of the caliper casting to facilitate visual inspection of lining condition and lining-to-rotor alignment (fig. 9-37).

Operation

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

Figure 9-38 shows a simplified cross-section of the floating caliper, and the forces at work when the brakes are applied. Upon application of the brakes, the fluid

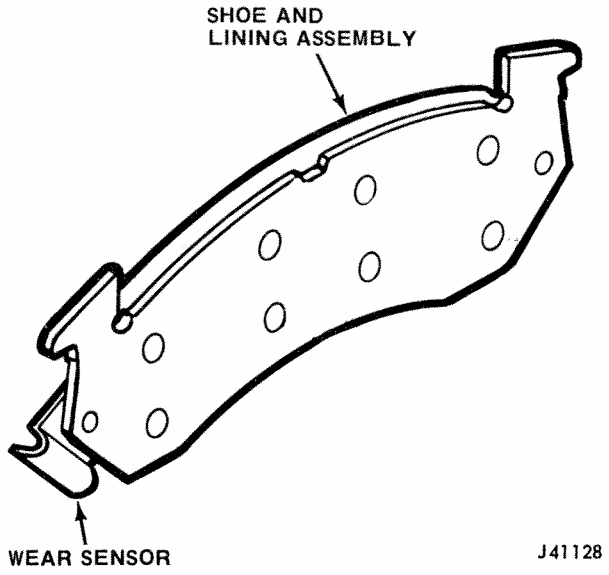


Fig. 9-36 Wear Sensor Location

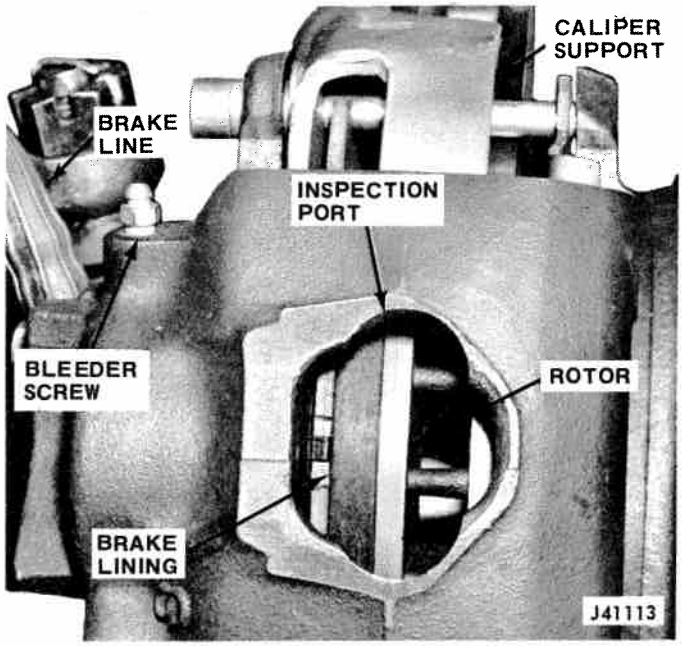


Fig. 9-37 Caliper Inspection Port

pressure behind the piston increases. Pressure is exerted equally against the bottom surface of the piston and also against the bottom surface of the piston bore.

The pressure applied to the piston is transmitted to the inboard shoe and lining, forcing the lining against the inboard rotor surface. The pressure applied to the bottom of the piston bore forces the caliper to slide on the mounting bolts, toward the inboard side. This inward (toward the vehicle) movement of the caliper causes the outboard section of the caliper to apply pressure against the back of the outboard shoe and lining assembly, forcing the lining against the rotor surfaces with increasing force, bringing the vehicle to a stop.

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

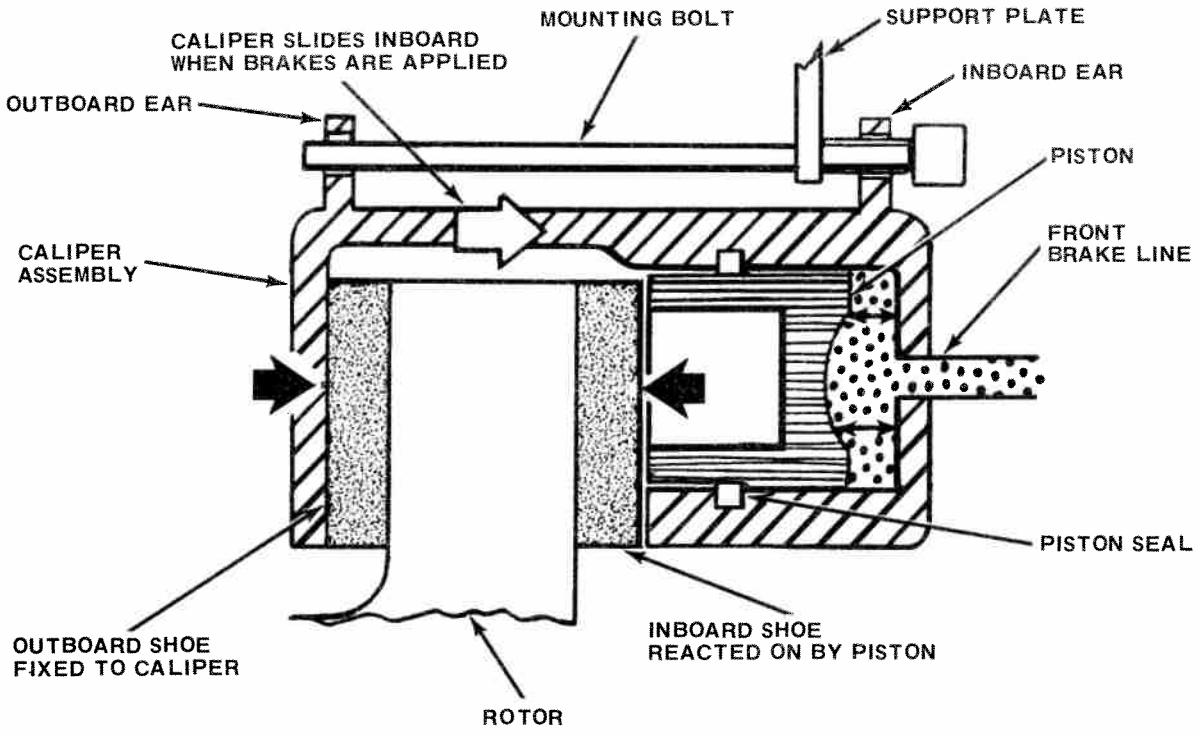


Fig. 9-38 Disc Brake Operation

caliper return to a rest position; the pads do not retract any appreciable distance from the rotor. This provides the advantages of improved brake response, reduced pedal travel, and faster generation of line pressure. Disc brakes also provide good fade resistance with fast recovery, and the shoes, being at zero clearance, wipe the rotor free of any 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 the linings in proper relationship with the rotor. The caliper bore receives additional brake fluid to compensate for lining wear and the resulting longer extension of the piston (fig. 9-35). In this manner the caliper assembly maintains the inboard and outboard shoe and lining in the proper relationship with the rotor surface throughout the full life of the linings.

DISC BRAKE SERVICE

Disc Brake Shoe Replacement

(1) Drain two-thirds of the brake fluid out of front reservoir. Use bleeder screw at the front outlet port to drain fluid.

(2) Raise vehicle with hoist or floor jack. If floor jack is used, support vehicle with frame stands.

(3) Remove front wheel and tire assemblies.

(4) Place C-clamp on caliper (fig. 9-39). Solid end of clamp should contact back of caliper. Screw end should contact metal part of outboard shoes. Tighten clamp until caliper moves far enough to force piston to bottom of bore (this will back shoes off rotor surface, easing lining removal and installation). Remove C-clamp.

(5) Remove both allen head mounting bolts (fig. 9-40) and lift caliper off rotor. Rest caliper on front spring or other suitable support. Do not allow brake hose to support weight of caliper.

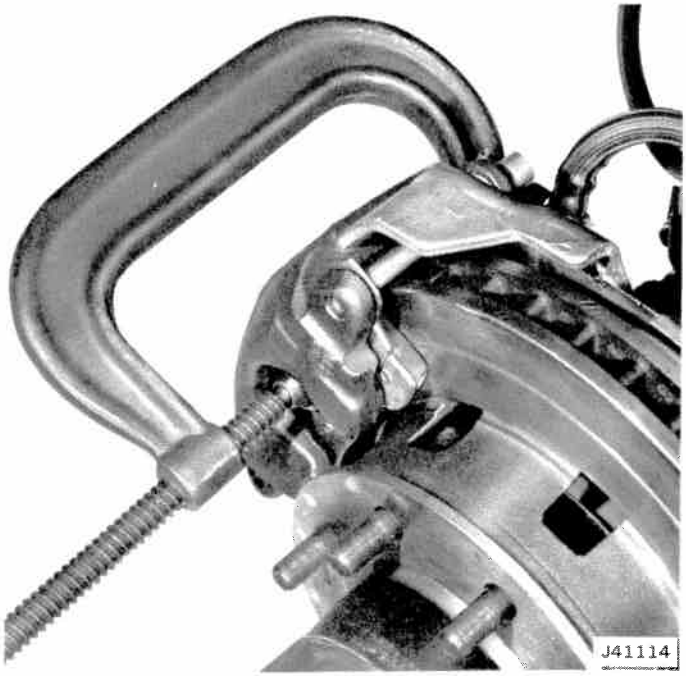


Fig. 9-39 Bottoming Piston with C-Clamp

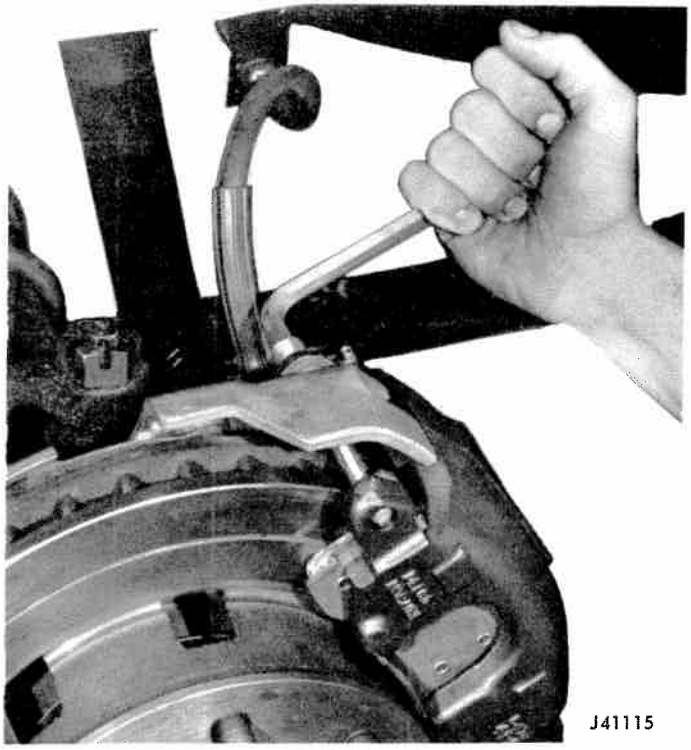


Fig.9-40 Removal of Caliper Mounting Bolts

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

(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 the caliper ears. Clean mounting bolts. Replace bolts if corroded or threads are damaged.

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

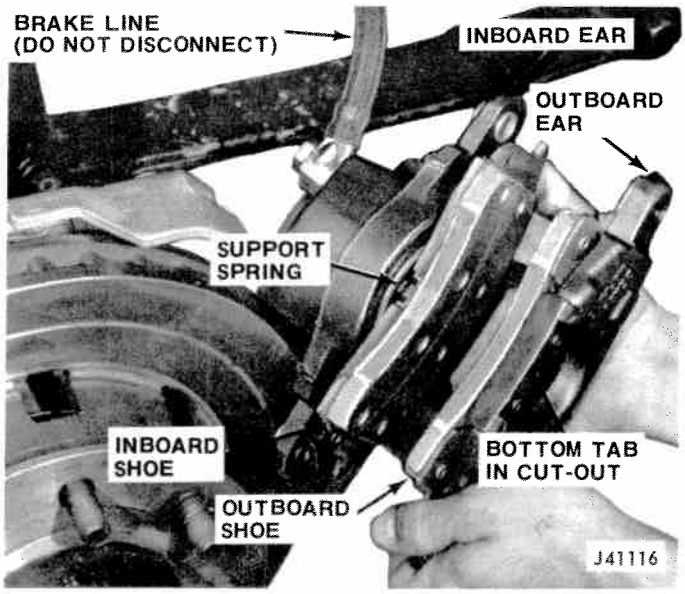


Fig. 9-41 Caliper Removal

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, the caliper should be overhauled.

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

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

CAUTION: *Do not reuse old bushings and sleeves. Only new parts should be used to ensure that the caliper will operate properly.*

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

(11) Install support spring on inboard shoe. Place the single tang end of the spring over the notch in the shoe (fig. 9-42).

(12) Install inboard shoe in caliper (fig. 9-43). Shoe must lay flat against piston. Be sure support spring is fully seated in piston (fig. 9-41).

(13) Install outboard shoe in caliper. The ears on the shoe should rest on top of the ears in the caliper. The bottom tab on the shoe fits in the cutout in the caliper. Be sure shoe is fully seated (fig. 9-41).

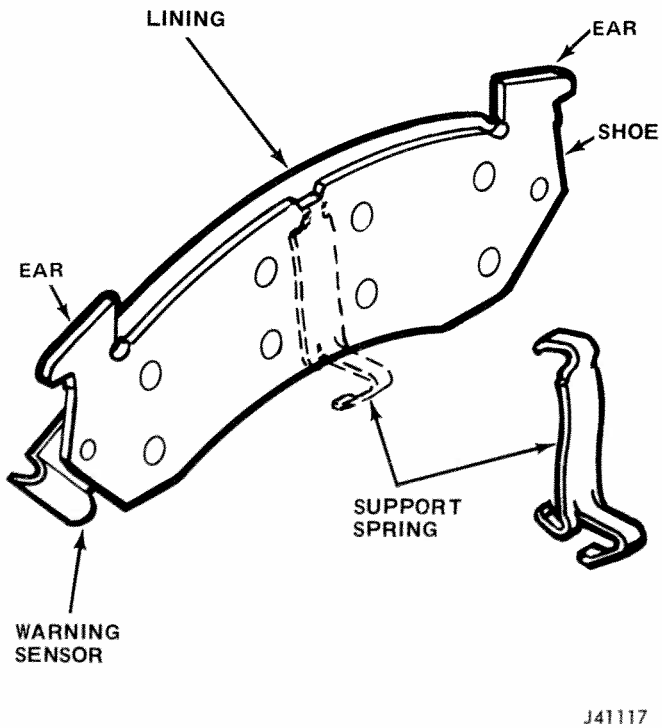


Fig. 9-42 Support Spring Installation

(14) With shoes installed, position caliper over rotor. Line up mounting holes in caliper and support bracket and insert mounting bolts. Make sure bolts pass under retaining ears on inboard shoes. Push the bolts through until they engage holes of outboard shoe and caliper ears. Thread bolts into support bracket and tighten to 35 foot-pounds of torque.

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

(16) Use channel-lock pliers to bend (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 caliper. The shoes should never be relined or reconditioned for installation.*

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

(18) Check fill level on master cylinder. Add fluid as required to fill master cylinder to within 1/4 inch of rim on reservoir. Test brake operation before moving vehicle.

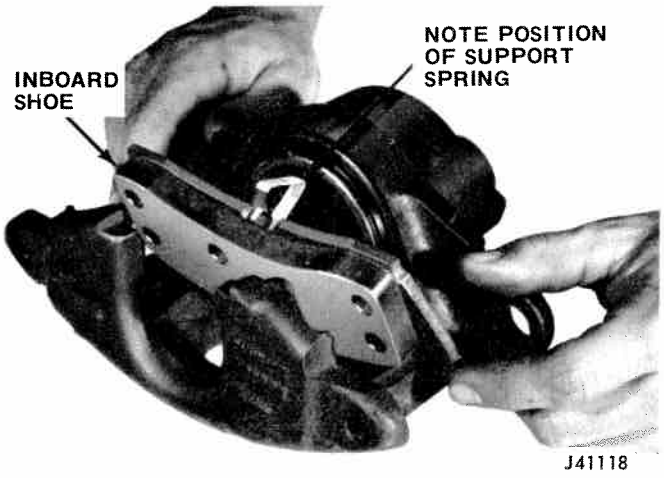


Fig. 9-43 Installation of Inboard Shoe

Caliper Overhaul

(1) Drain two-thirds of the brake fluid out of front reservoir. Use bleeder screw at outlet to drain.

(2) Raise vehicle with hoist or floor jack. If floor jack is used support vehicle with frame stands.

(3) Remove wheel/tire assemblies.

(4) Bottom caliper piston with C-clamp (fig. 9-39).

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

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

CAUTION: *If shoes are to be reused, mark location in caliper.*

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

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

(8) Pad the interior of the caliper with clean shop towels. Insert air nozzle into inlet hole in caliper and gently apply air pressure on piston to push it out of the bore (fig. 9-44).

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

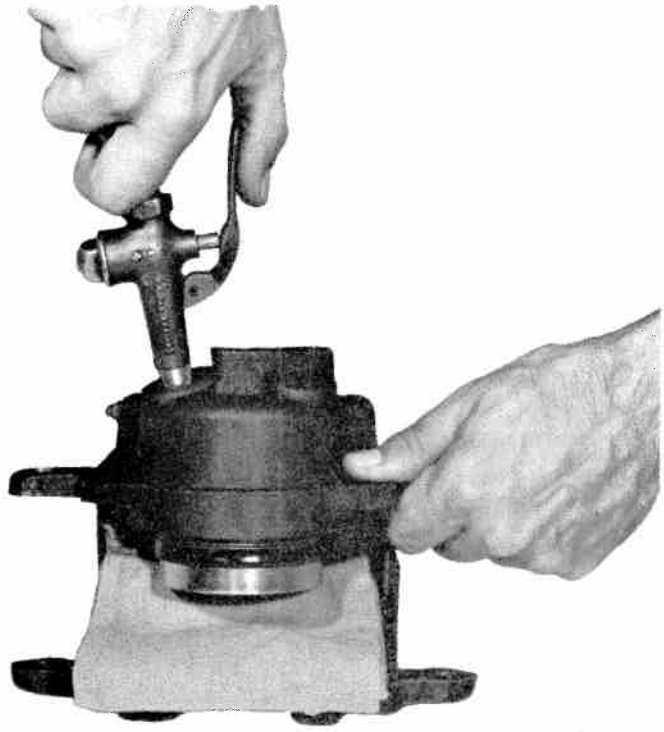


Fig. 9-44 Piston Removal

(9) Pry dust boot out of bore with screwdriver (fig. 9-45). Use caution during this operation to prevent scratching bore. Discard dust boot.

(10) Remove piston seal from piston bore and discard seal. Use only non-scratching implements such as a pencil, wooden stick, or piece of plastic to remove seal (fig. 9-46). Do not use a metal tool or similar object to remove seal as bore may be scratched.

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

(12) Clean all parts with clean brake fluid. Blow out all passages in caliper and bleeder valve. Use only dry

and filtered compressed air. Replace mounting bolts if corroded or if threads are damaged.

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

Examine piston for defects. Replace piston if nicked, scratched, corroded, or protective plating has worn off.

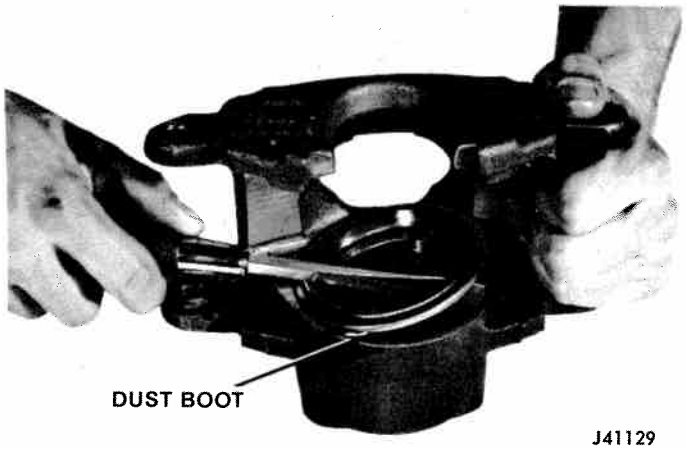


Fig. 9-45 Dust Boot Removal

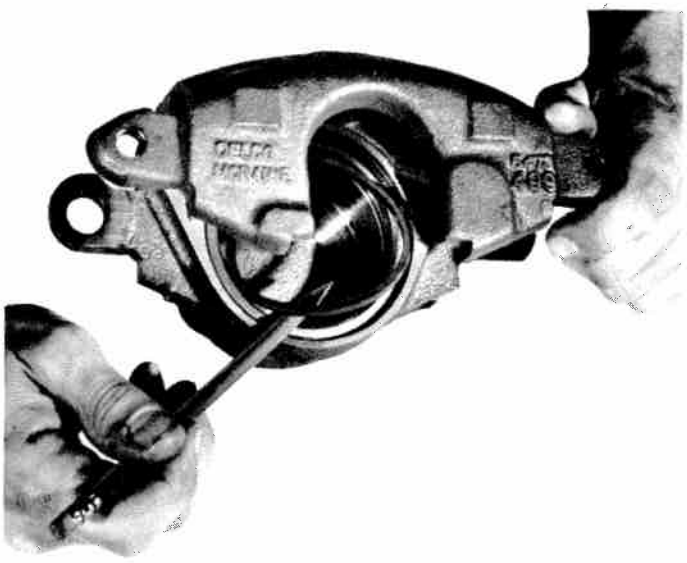


Fig. 9-46 Piston Seal Removal

CAUTION: *Do not attempt to refinish 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.*

Examine the caliper piston bore for the same defects as the piston. The bore is not plated, and minor stains or corrosion can be polished with crocus cloth.

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.*

(13) Lubricate bore and new seal with brake fluid and install seal in groove.

(14) Lubricate piston with brake fluid and install new dust boot on piston. Assemble dust boot into 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. 9-47). Then push retainer portion of boot forward until boot is flush with rim at open end of piston and snaps into place (fig. 9-48).

(15) Insert piston in bore being careful not to unseat the piston seal. Push piston to bottom of bore (requires 50 to 100 pounds of force to bottom piston).

(16) Position dust boot retainer in counterbore at top of piston bore. Seat dust boot retainer with tool J-22904 (fig. 9-49).

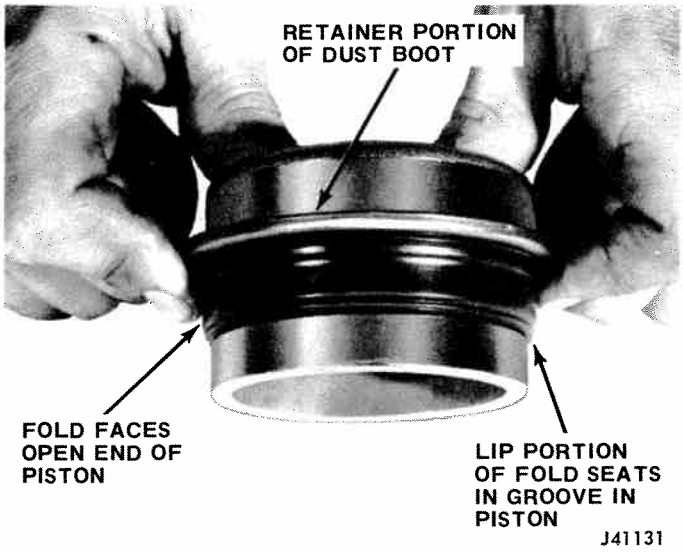


Fig. 9-47 Installing Dust Boot on Piston

Fig. 9-48 Snapping Dust Boot into Place

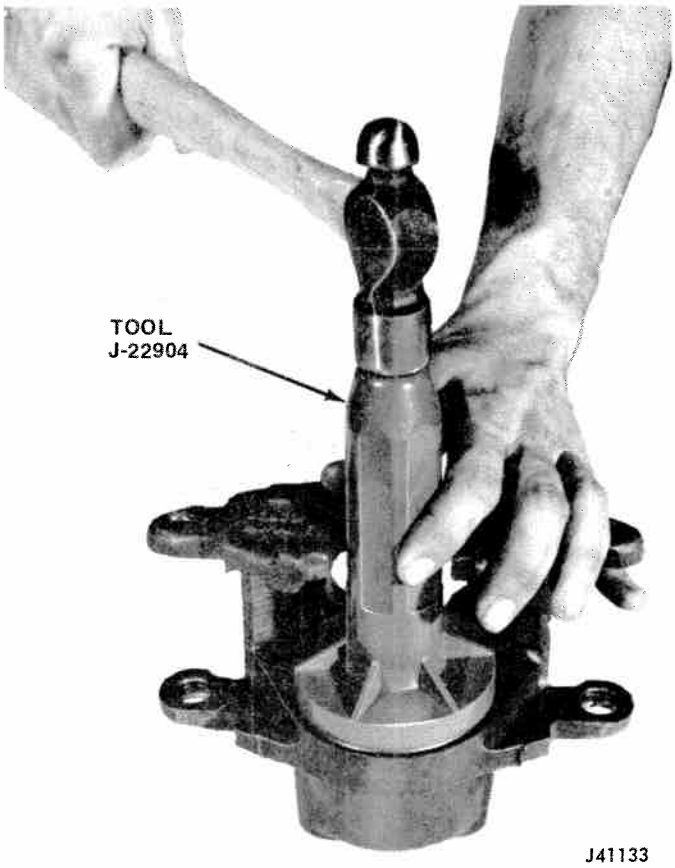


Fig. 9-49 Seating Dust Boot Retainer

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

(17) Install bleeder screw. Tighten to 40 to 140 inch - pounds torque.

(18) Connect brake line to caliper using new copper gaksets. Tighten bolt 120 to 200 inch-pounds torque.

(19) Install shoe, sleeves, and rubber bushings as outlined under Disc Brake Shoe Replacement.

(20) Install caliper over rotor. Secure caliper to support bracket as outlined under Disc Brake Shoe Replacment. Tighten mounting bolts to 35 foot-pounds torque.

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

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

(23) Test brake operation before driving vehicle.

Hub and Rotor Assembly

The hub and rotor assembly is 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 surface against which the disc brake shoes are applied. The integral hub and rotor are serviced as an assembly; if either section is found to be defective, the complete assembly should be replaced.

Rotor Service

Rotor service is of extreme importance since rotor tolerances must be accurate to ensure proper brake operation. Service procedure involves three basic steps:

- Inspection
- Measurement
- Refinishing (or replacement where indicated)

Rotor Inspection

Check rotor for surfaces cracks, nicks, broken cooling fins, and scoring of both contact surfaces.

NOTE: *Some scoring of the surface may occur during normal use. Scoring that is 0.015 inch deep or less is not detrimental to brake operation.*

Rotor Measurement

The rotor surfaces must meet the following specifications.

NOTE: *If rotor brake surfaces is heavily rusted or scaled, clean both surfaces on a disc brake lathe, using flat sanding discs, before attempting measurements.*

(1) **Hub-to-Rotor Squareness.** Both surfaces must be square with bearing cup centerline within 0.003 inch (total), dial indicator reading. To check, mount hub and rotor to lathe using bearing cups (fig. 9-50).

CAUTION: Do not *mount on hub surfaces.*

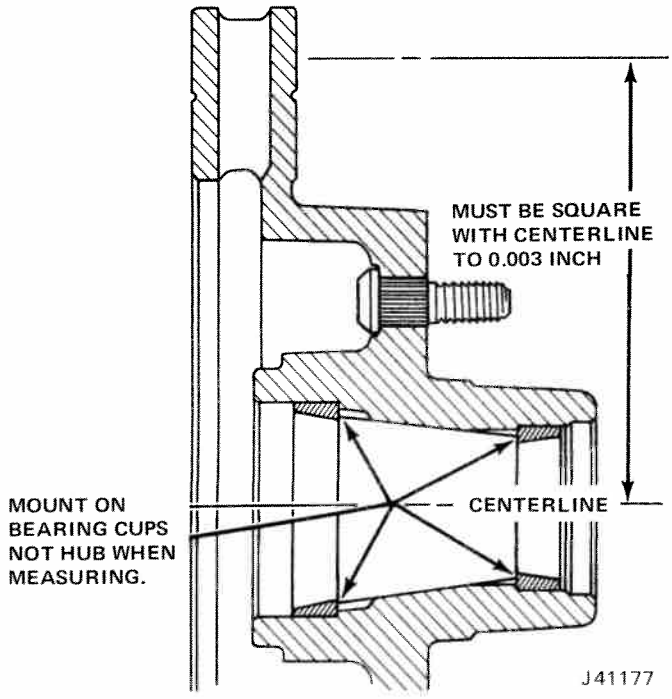


Fig. 9-50 Checking Surface Parallelism

(2) **Surface Flatness (Taper Variation).** Both surfaces must be flat within 0.003 inch (total) dial indicator runout. Failure to meet this specification indicates surface tapering, which can cause shoes to wear on an angle (fig. 9-51).

(3) **Parallelism.** Surfaces must be parallel within .003 inch (total), dial indicator runout. Rotor surfaces not parallel within specification will cause shoes to wear on an angle (fig. 9-52).

(4) **Lateral Runout.** Lateral runout must not exceed 0.005 inch (total). Dial indicator runout, with maximum rate of change not to exceed 0.001 inch in 30 degrees (fig. 9-53).

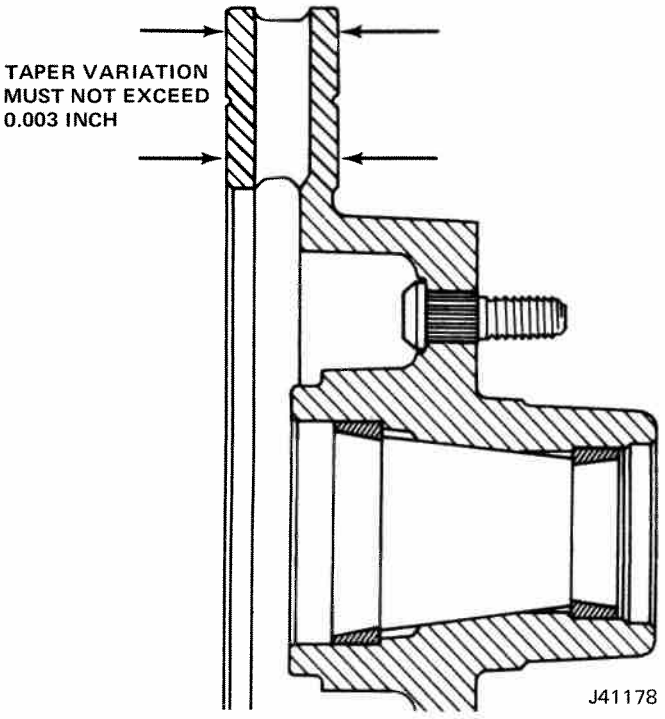


Fig. 9-51 Checking Surface Flatness (Taper Variation)

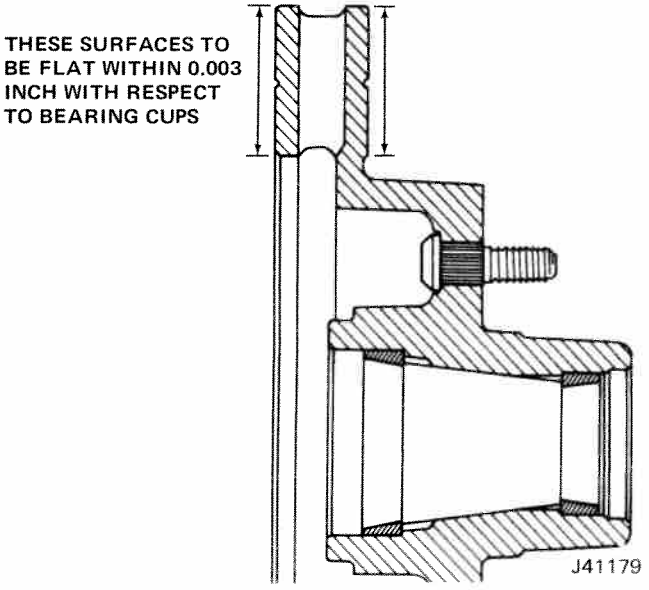


Fig. 9-52 Checking Surface Parallelism

Excessive runout will cause the rotor to wobble and knock piston back into caliper causing increased pedal travel, and also cause noise and vibration. When checking lateral runout, be sure all play is removed from wheel bearings; this applies if check is performed on vehicle or on disc brake lathe.

(5) **Thickness Variation.** Total thickness variation at any radius must not exceed .001 inch in 360 degrees. Use pair of dial indicators or micrometer to obtain reading.

Variations in rotor thickness will cause pedal pulsation. Thickness must be checked at a minimum of four points around the circumference of the rotor. All measurements must be made at same distance in from edge of rotor. See figure 9-54.

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.

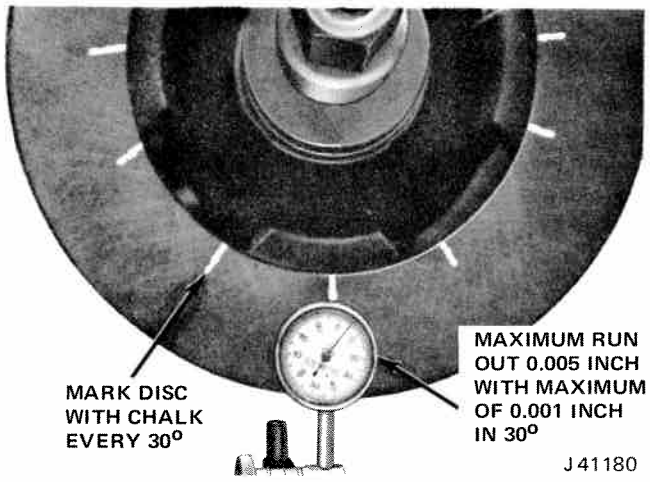


Fig. 9-53 Checking Lateral Runout

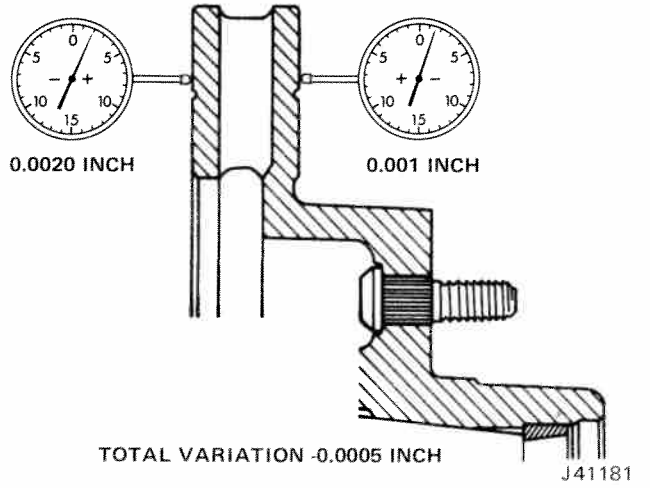


Fig. 9-54 Checking Thickness Variation

Refinish rotor on disc brake lathe if scoring is deeper than 0.015 inch, or if runout, flatness, parallelism and thickness variation exceed specifications listed under Rotor Measurement.

NOTE: *Rotor finish should be 20 to 60 micro-inches and not be directional. After turning the rotor is a 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. 9-55).*

Fig. 9-55 Correct Surface Finish - Non-Directional Cross-Hatch Pattern

Replace The rotor if refinishing will cause the rotor to fall below the minimum thickness specifications as follows:

Minimum Thickness after Refinishing	Replacement Thickness Specification
1.230 inch (Acceptable)	1.215 inch (Discard)

STOPLIGHT SWITCH-CJ MODELS

The stoplight switch is attached at the pedal lever end of the master cylinder or power unit push rod and cannot be adjusted. If, after normally releasing the pedal, the switch remains on, check for binding linkage or pivot pins. If switch is defective, replace switch as an assembly. Do not attempt to repair.

STOPLIGHT SWITCH - Cherokee, Wagoneer, Truck

The stoplight switch is mounted on a flange attached to the brake pedal support bracket (fig. 9-56). A spring-loaded plunger in the switch makes and breaks the stoplight circuit.

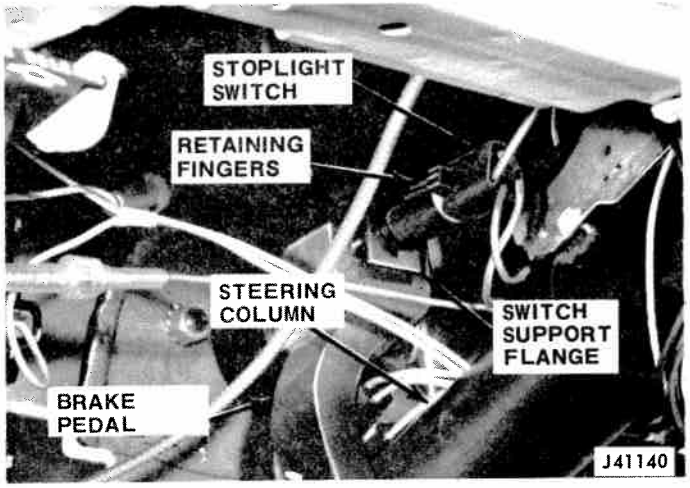


Fig. 9-56 Stoplight Switch Location

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 (fig. 9-57).

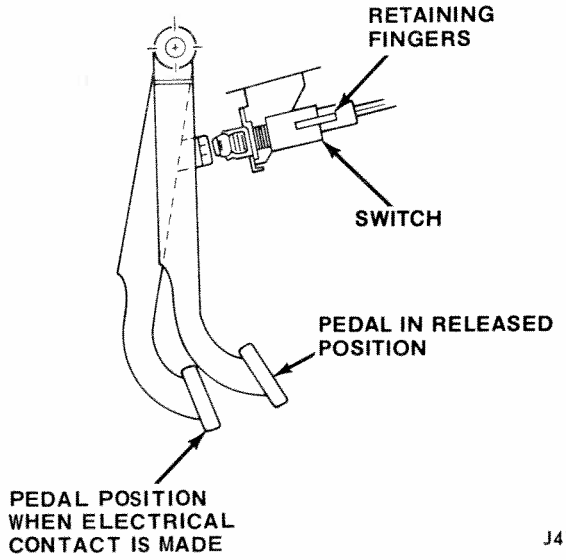


Fig. 9-57 Stoplight Switch Operation

Switch Adjustment

(1) Release brake pedal to its normal position. Unhook retaining fingers that secure wire harness plug to switch and disconnect wire harness plug ar rear of switch.

(2) Adjust switch by turning in or out of mounting bracket. Switch plunger should be in ON position and activate stop lamps after 3/8 to 5/8 inch of brake pedal travel. Measure pedal travel from center of pedal pad.

(3) Connect wire harness plug.

BRAKE PEDAL AND LINKAGE - All Models

The one-piece suspended brake pedal is connected to the under-dash 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 to the master cylinder piston (or brake booster push rod, if equipped with power brakes) should be lubricated and inspected regularly for binding, looseness, or excess play. Lack of lubrication can cause binding and improper pedal release which can result in brake drag and rapid lining wear. Worn pedal linkage can cause low pedal or frequent need for brake adjustment.

Pedal free play should be 1/16 to 1/4 inch for standard height pedal. Too little free play can result in brake drag or grab conditions; too much free play can result in a low pedal. Pedal free play on CJ, Cherokee, Wagoneer and Truck models with non-power 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 adjustable on some CJ models and non-adjustable on Cherokee, Wagoneer, and Truck models having a preset length. When replacing power brake booster units, use the push rod supplied with the new power booster unit as it has been properly gauged and preset for use with the new power unit. Pedal free play for power brake-equipped vehicle is the same, at 1/16 to 1/4 inch, as for manual brake vehicles.

WHEELS AND TIRES

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, wheels on this type axle must be removed and balanced off 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- All Models

Adjustment of the wheel bearings is critical because it establishes the running clearance of the wheel bearings. Wheel bearing adjustment that is too tight preloads the bearings and causes them to run hot. Loose wheel bearings permit the drum hub to shift its position on the bearings as thrust loads vary with acceleration, braking, and cornering.

Loose bearings also cause erratic braking. To check the wheel bearings for adjustment, brakes must be free and in fully released position.

Checking Front Wheel - All Models

Bearings

(1) Raise front end of vehicle with jack so that tires clear floor.

(2) Grip tire and test sideways shake of wheel. If bearings are correctly adjusted, shake of the wheel will be just perceptible and wheel will turn freely with no drag.

(3) If bearing adjustment is too tight, rollers may break or become over-heated. Loose bearings may cause excessive wear and noise.

(4) If this test indicates bearing adjustment is necessary, follow procedure given below.

(5) Loose bearings will cause a side-ways shake that is evident around entire circumference of wheel. A shake that is evident only when gripping wheels in a plane parallel to ground, but not evident around entire circumference, probably indicates looseness in steering linkage.

Front Wheel Bearing Adjustment - CJ Models

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

(1) Remove hub cap, snap ring, capscrews, and washers that attach driving flange to the hub (fig. 9-58).

(2) Using Front Axle Shaft Drive Flange Puller W-163, pull driving flange.

(3) Bend lip of lockwasher so that locknut and lockwasher may be removed.

(4) Using Tool W-144 or DD-1241, rotate wheel and tighten adjustment nut until wheel binds.

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 one-sixth turn making sure that wheel rotates freely without side-wise shake.

(6) Replace lockwasher and locknut, bend lockwasher lip.

(7) Check adjustment.

(8) Assemble driving flange and hub cap. Make certain gasket is properly installed between hub and flange.

Front Wheel Bearing Adjustment - Cherokee, Wagoneer, Truck

(1) Remove hubcap, snap ring, drive gear, 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 with wheel bearing wrench W-372.

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

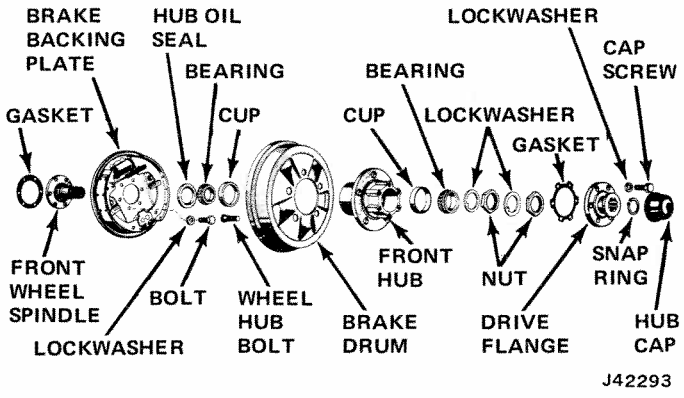


Fig. 9-58 Front Wheel Attaching Parts, CJ Models

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

(6) Install outer locknut and tighten to 50 foot-pounds torque (minimum) using wheel bearings wrench W-372.

Checking Rear Wheels - All Models

Place a jack under the axle housing. Shake the wheel. If bearings are correctly adjusted, shake will be just perceptible and the wheel will turn freely.

Rear Wheel Bearing

Adjustment - Flanged Axle - All Models (Except 8000 GVW Truck)

Flanged Axle Shaft - Semi-Float Axles

Vehicles equipped with the flange type rear axle (fig. 9-59) shaft require no wheel bearing adjustment. The flanged axle shaft is equipped with a single row, preadjusted, tapered roller unit-bearing capable of accepting thrust in either direction. The unit-bearing adjustment is built in at the factory making shimming or bearing adjustment unnecessary. Refer to Fig. 9-61.

(1) Remove axle shaft (fig. 9-60).

(2) Bend lip of lockwasher so that locknut and lockwasher may be removed.

(3) Jack up wheel so it can be rotated. Use an axle stand under axle.

(4) Rotate wheel and tighten adjusting nut with Tool DD-1245 until wheel binds. Then back off about one-sixth turn until wheel rotates freely without side shake.

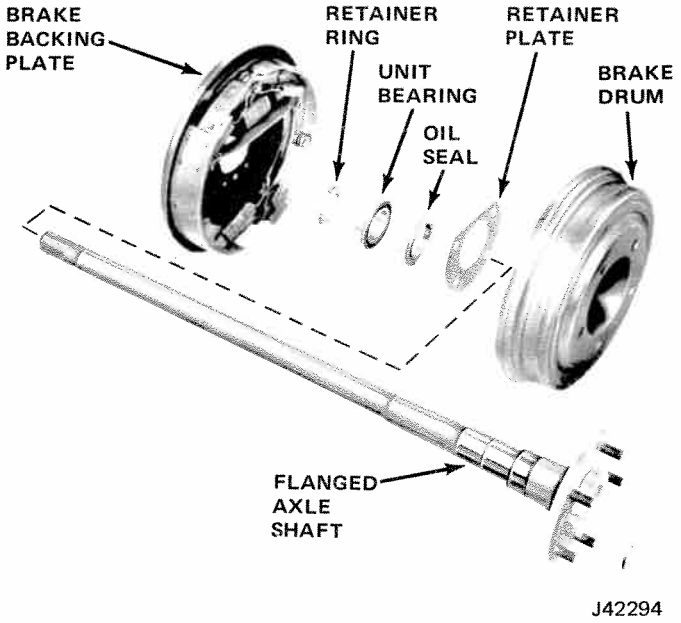


Fig. 9-59 Rear Wheel Attaching Parts - Flanged Axle

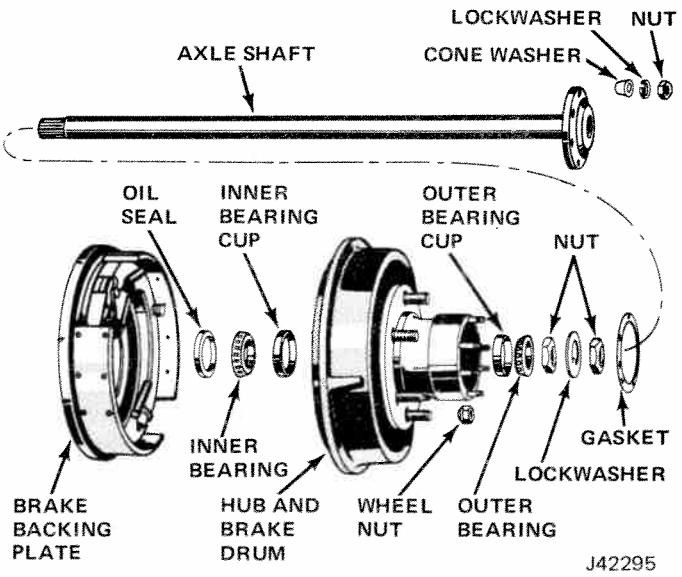


Fig. 9-60 Rear Wheel Attaching Parts - Full-Float Axle-(8000 GVW Truck)

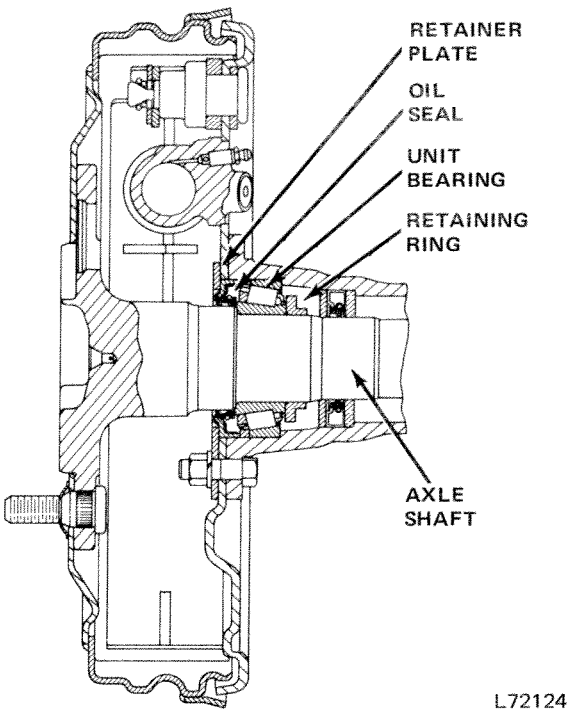


Fig. 9-61 Rear Wheel, Flanged Axle and Bearing Assy.

(5) Replace locknut and bend lockwasher lip.
(6) Recheck adjustment.
(7) Install axle shaft.

TIRES

Tire Service

One of the most important factors of safe vehicle operation is systematic and correct tire maintenance. Tires must sustain the weight of a loaded vehicle, withstand more than ordinary rough service, provide maximum safety over all types of terrain, and furnish the medium on which the vehicle can be maneuvered with ease. Although there are other elements of tire service, inflation maintenance is the most important and in many instances the most neglected. The tire pressure should be maintained for safe operation. An underinflated tire is dangerous as too much flexing can cause breakage of the casing. Overinflation will cause a harsh ride and may in time cause a blowout.

Upon careful inspection of tires, it may be found that improper wheel alignment, balance, grabbing brakes, poor driving habits, fast cornering, or other conditions are the cause of wear. Such conditions should be corrected.

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, weakening the cords and resulting in bruises, broken cords, or ply separation. Underinflation also leads to rim bruises as insufficient resistance is provided to prevent 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 deflection of the sidewalls. 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 eventually snap under impact, causing a casing break.

Misalignment

Excessive wheel camber causes the tires to run at an angle to the road and results in excessive wear on one side of the tire tread.

Front wheels should be straight ahead or with a very slight toe-in. When there is excessive toe-in or any toe-out, tires will revolve with a side motion and scrape the tread off. Front tires will show wear on the outside with too great a toe-in condition and on the inside with a toe-out condition. Improper toe will also cause a featheredge to develop across the tread surface.

Balance

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

Tire Removal and Installation

To remove a tire from a drop center rim, first deflate completely and then force the tire away from the rim throughout the entire circumference until the bead falls into the center of the wheel rim. If the vehicle is equipped with tires that use an inner tube, carefully remove the inner tube. With the inner tube removed, or on tubeless tires, a tire removing tool should be used to remove the tire from the rim.

Installation of the tire is made in the same manner first dropping one side of the tire into the center of the rim and with a tire tool raise the bead over the wheel rim. The inner tube can now be installed on vehicles so equipped.

When mounting the wheel, alternately tighten opposite stud nuts. After the nuts have been tightened with the wheel jacked up, lower the jack so wheel rests on the floor and retighten nuts. Tighten nuts to 65 to 90 foot-pounds torque.

Tire Care

CAUTION: *For satisfactory operation, all 4-wheel drive vehicles MUST be equipped with the same size tires of equal circumference on all four wheels. The tires must then be inflated to proper factory recommended pressures at all times. The intermixing of different types of tires could cause unusual road noises or damage to drive train components.*

Tire pressure, tire rotation, wheel balance, and wheel alignment are the four vital factors that influence the extent of tire life and the ease and safety of vehicle control. Four of the most common tire troubles are:

(1) Excessive wear around the outer edges resulting from underinflation.

(2) Excessive wear around the outer edges resulting from overinflation.

(3) Tire tread worn on one side indicating wheels need realigning.

(4) Cuplike depressions on one side of the tread undicating wheels need balancing.

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

Tire inflation should be checked and adjusted to recommended pressures periodically (at least monthly) especially when extreme changes (20 degrees F) in average seasonal changes occur. Tire inflation pressures should be checked and adjusted when the tires are cold or driven less than 2 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 now be determined by referring to the Tire Inflation Pressure (PSI) Chart. Cold inflation pressures are those measured with the tires at approximately the prevailing atmospheric temperature, and do not include any inflation build-up caused by heat from vehicle operation. Pressures specified are precisely measured for the tire sizes recommended for each Jeep vehicle model at the GVW rating.

Sustained driving above 60 mph requires, in all instances, a tire pressure different from that required for slower, intermittent driving.

Tire Rotation

Rotate tires every 5,000 miles. see Fig. 9-62 for rotation sequence.

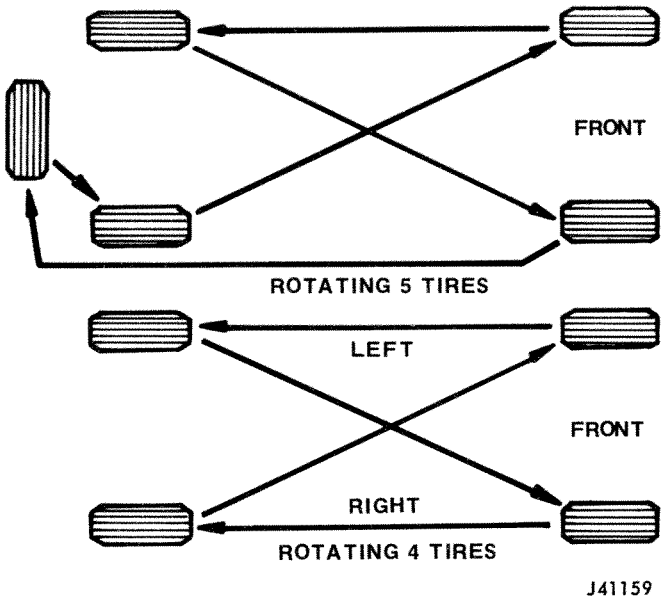


Fig. 9-62 Tire Rotation

TORQUE SPECIFICATIONS

Brake System Components

	Inch-Pounds
Bleeder Screw, Wheel Cylinder 1/4-28	30-90
Bleeder Screw, Wheel Cylinder 5/16-24	40-140
Brake Shoe or Tube-to-Wheel Cylinder 3/8-24	120-200
	Foot-Pounds
Front Brake Support Plate Mounting Bolt and Nut (CJ Models)	35-55
Brake Support Plate Mounting Bolt Front (Cherokee, Wagoneer, Truck)	20-30
Brake Support Plate Mounting Bolt and Nut, Rear (8000 GVW Truck)	45-55
Brake Support Plate Mounting Bolt and Nut, Rear (Cherokee, Wagoneer, Truck)	35-55
Power Brake Unit (Booster) to Spacer and Firewall (Cherokee, Wagoneer, Truck)	18-25
Power Brake Unit (Booster) to Spacer and Firewall (CJ Models)	20-25

Wheel-To-Hub Nuts

CJ Models	65-90
Cherokee, Wagoneer, Truck	65-80
8000 GVW Truck	110-125

SAE Inverted Flared Brass Tube Fittings

Fitting Size	Tube Size (Inch)	Half-Hard Copper Tubing (Inch-Pounds)	Double Flared Bundy Tubing (Inch-Pounds)
2	1/8	45	50
3	3/16	55	75
4	1/4	65	100
5	5/16	80	120
6	3/8	125	175
8	1/2	250	350

TIRE INFLATION PRESSURE (PSI) CHART

Jeep Model	Model Code	GVW Rating	Tire Size	Ply Rating	Load Range	Normal Speed Driving				Sustained High Speeds (Above 60 MPH)				Wheel Size and No. of Bolts
						Normal Load		Maximum Load		Normal Load		Maximum Load		
						Front	Rear	Front	Rear	Front	Rear	Front	Rear	
CJ-5	83	3750	F78 x 15	4	B	20	20	24	24	32	32	32	32	15 x 6 5
CJ-6	84	3900	F78 x 15	4	B	20	20	24	24	32	32	32	32	15 x 6 5
CJ-5 Renegade	83	3750	H78 x 15	4	B	20	20	24	24	32	32	32	32	15 x 7 (Alum.) 5
CJ-5/6 (Opt. Tire)	83 & 84		7.00 x 15	8	D	30	30	35	35	45	45	45	45	15 x 6 5
Cherokee	16	5600	F78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 6 6
Cherokee "S"	17	5600	F78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 7 (Alum.) 6
Cherokee (Opt. Tire)	16 & 17	5600	H78 x 15	4	B	22	22	24	24	26	26	28	28	15 x 6 6
Cherokee (Opt. Tire)	16	5600	G78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 6 6
Wagoneer	14	5600	F78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 6 6
Wagoneer Custom	15	5600	F78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 6 6
Wagoneer (Opt. Tire)	14 & 15	5600/6000	H78 x 15	4	B	2[illegible]	22	28	28	26	26	32	32	15 x 6 6
Wagoneer (Opt. Tire)	14 & 15	5600	G78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 6 6
J-10 Truck (120" W.B.)	25	5200	G78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 6 6
J-10 Truck (120" W.B.)	25	5600	H78 x 15	4	B	24	24	28	28	26	26	32	32	15 x 6 6
J-10 Truck (132" W.B.)	45	5200	G78 x 15	4	B	28	28	32	32	32	32	32	32	15 x 6 6
J-10 Truck (132" W.B.)	45	5600	H78 x 15	4	B	24	24	28	28	26	26	32	32	15 x 6 6
J-10 Truck (Opt. Tire)	25 & 45	5200/5600	7.00 x 15	8	D	35	35	35	35	45	45	45	45	15 x 6 6
J-20 Truck (132" W.B.)	46	6500	8.00 x 16.5	8	D	35	35	45	60	45	45	55	65	16.5 x 6.0 8
J-20 Truck (132" W.B.)	46	7200	8.75 x 16.5	8	D	35	35	45	60	45	45	65	70	16.5 x 6.75 8
J-20 Truck (132" W.B.)	46	8000	9.50 x 16.5	8	D	35	35	45	60	45	45	55	70	16.5 x 6.75 8
J-20 Truck (Opt. Tire)	46	6500	7.50 x 16	6	C	30	30	35	45	40	40	45	55	16.0 x 6.0 8
J-20 Truck (Opt. Tire)	46	7200	7.50 x 16	8	D	30	30	45	60	40	40	55	70	16.0 x 6.0 8
J-20 Truck (Opt. Tire)	46	8000	7.50 x 16	10	E	30	30	45	75	40	40	55	85	16.0 x 6.0 8

- Check pressures only when tires are cold
- Do Not reduce pressures of warm tires
- For loads not listed consult tire sticker in glove box.

J41160

BRAKE SIZE AND APPLICATION CHART ①

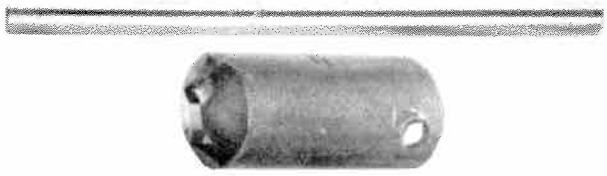
Model	Master Cylinder Bore Diameter	Front Brakes		Rear Brakes		Power Brake ④ (Booster Type)
		Brake Size and Type	Caliper Piston or Wheel Cyl. Dia.	Brake Size and Type	Wheel Cyl. Dia.	
CJ-5/CJ-6	1	11 x 2 Drum	1-1/8 Wheel Cyl.	11 x 2 Drum	15/16	Tandem Diaphragm ⑤ 7-3/4
Cherokee ②	1	11 x 2 Drum	1-1/8 Wheel 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: 5200 GVW ②	1	11 x 2 Drum	1-1/8 Wheel Cyl.	11 x 2 Drum	15/16	Single Diaphragm ② 9-1/2
5600 GVW ③	1	11 x 2 Drum	1-1/8 Wheel Cyl.	11 x 2 Drum	15/16	Single Diaphragm ③ 9-1/2
6500 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
7200 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
8000 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

① All dimensions are in inches.
② 12.0 disc brake optional on these models.
③ Single diaphragm type booster used with optional power disc brake application.
④ Models equipped with power booster.
⑤ Power available only on CJ-5 with V-8

J41102

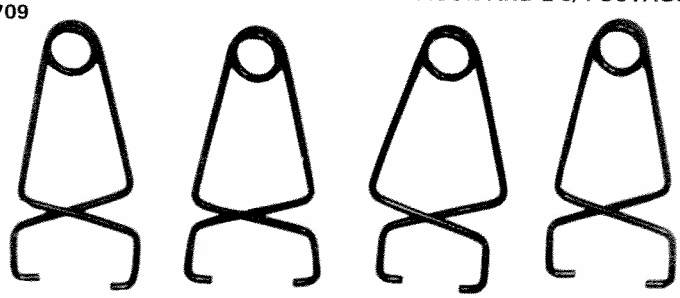
DUST BOOT INSTALLER TOOL J-22904

COMBINATION VALVE METERING VALVE HOLD OPEN TOOL J-23709

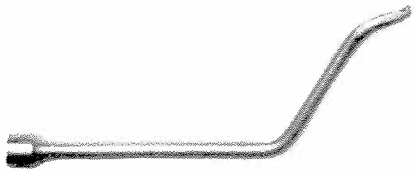


W-144 WHEEL BEARING ADJUSTING NUT WRENCH 2-1/16 INCHES
DD-1245 WHEEL BEARING ADJUSTING NUT WRENCH 2-3/8 INCHES
DD-1241 WHEEL BEARING ADJUSTING NUT WRENCH 2-1/2 INCHES HEXAGON AND 2-3/4 OCTAGON

W-163 FRONT AXLE SHAFT DRIVE FLANGE PULLER



C-416 or J-8002 BRAKE CYLINDER PISTON RETAINING CLAMPS (FOUR)



C-3785 or J-8049 BRAKESHOE RETURN SPRING REMOVER & INSTALLER

J42297

Fig. 9-63 Brake and Wheel Service Tools

TECHNICAL SERVICE LETTER REFERENCE

Date	Letter No.	Subject	Changes Information on Page No.