

BRAKE SYSTEM

1986 Isuzu Trooper II

1986 Brakes
ISUZU P'UP & TROOPER II

DESCRIPTION

The hydraulic brake system uses a tandem master cylinder with a single reservoir and a vacuum power brake unit. The front brakes are single piston, floating caliper, ventilated disc type. The rear drum brakes are leading/trailing shoe type.

The parking brake is cable actuated with internal expanding shoes at the rear wheels. The rear brakes self-adjust when parking brake is set and released. The front brakes self-adjust when vehicle is moved slowly back and forth while applying service brakes. No in-service adjustment is required.

A combination proportioning and by-pass valve, equipped with a fail indicator switch, is used. If the hydraulic pressure varies between front and rear systems, a warning light on the instrument panel will come on. The brake master cylinder is equipped with a fluid level sensor. When the fluid is low, the warning light will glow.

TESTING

BRAKE WARNING LIGHT

1) A dual warning light is mounted on the instrument panel. With ignition on, warning light should glow when parking brake lever is pulled one notch and go off when lever is fully released.

2) To check circuit warning sensor, release parking brake. With ignition on, warning light should be off. Open bleed screw on one wheel and depress brake pedal. Light should glow. Close bleed screw without releasing pedal. Check fluid level in reservoir.

ADJUSTMENTS

REAR DRUM BRAKE SHOES

NOTE: Initial adjustment must be made after changing brake linings or if adjuster setting has been changed.

Initial Adjustment

1) To check initial adjustment, raise and support vehicle. Remove rear wheels and brake drums. Measure drum inside diameter with Brake Drum/Shoe Gauge (J-21177). Transfer gauge to brake lining.

2) If linings' outside diameter does not match gauge, adjust star wheel until gauge just slides over linings. Install drums and wheels. Lower vehicle. Drive vehicle and alternate forward and reverse brake applications until pedal height remains constant.

Final Adjustment

1) After rear brake overhaul and initial adjustment, move parking brake handle to fully released position. Raise and support vehicle. Loosen second relay lever rod lock nut. While firmly holding second relay lever rod, rotate adjusting nut until all slack disappears from cable. See Fig. 1.

2) Apply 66 lbs. (30 kg) of force, 3 or 4 times, to parking brake handle to move it to fully set position. If lever is properly adjusted, travel range (between fully disengaged and fully engaged

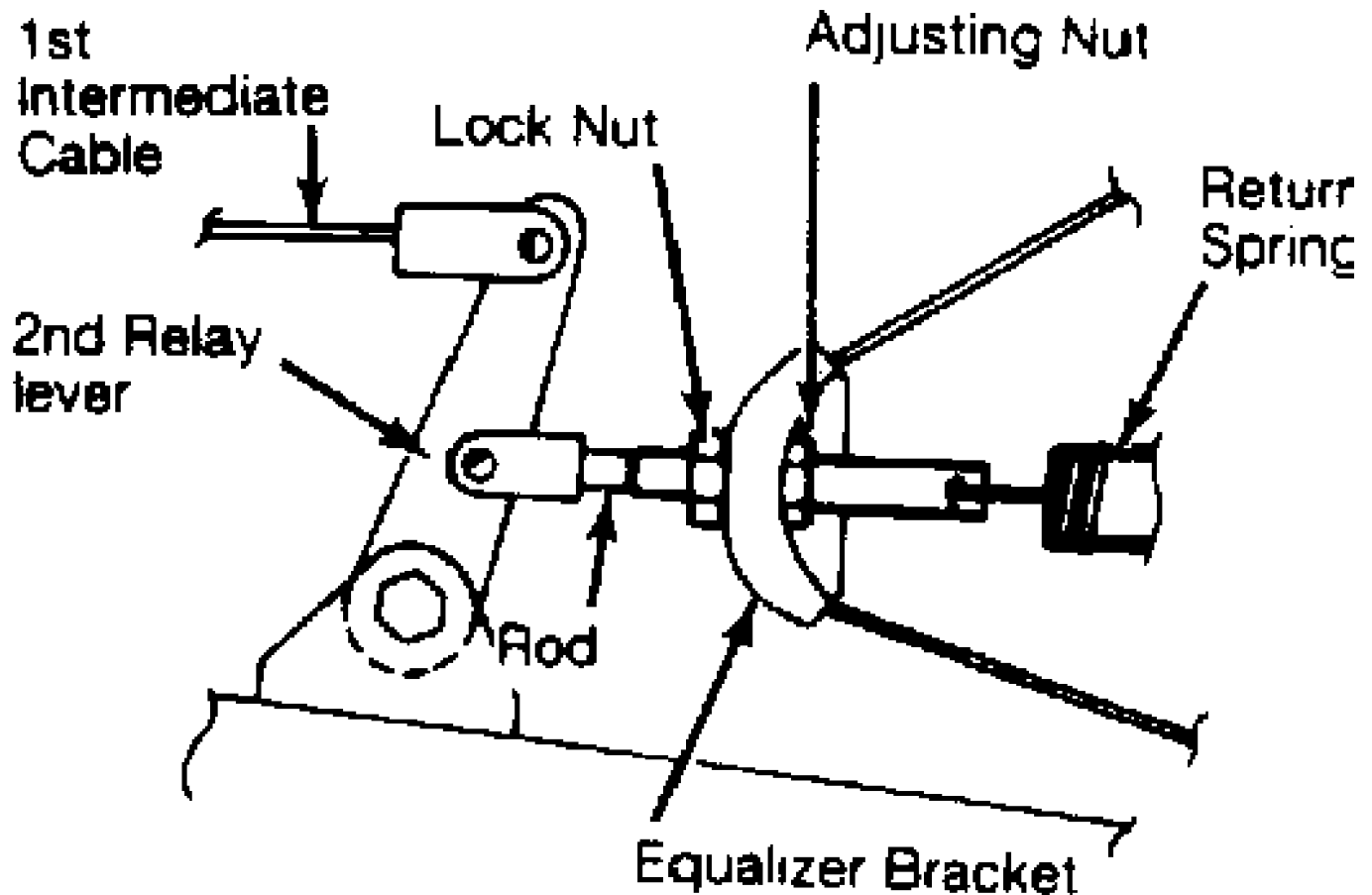
position) will be 12-14 notches. Reset adjusting nut if travel range is not within limits.

PARKING BRAKE

NOTE: Service brake must be properly adjusted prior to parking brake adjustment.

1) Move parking brake handle to fully released position. Raise and support vehicle. Loosen second relay lever rod lock nut. While firmly holding second relay lever rod, rotate adjusting nut until all slack disappears from cable. See Fig. 1.

2) Apply 66 lbs. (30 kg) of force (3 or 4 times), to parking brake handle to move it to fully set position. If lever is properly adjusted, travel range (between fully disengaged and fully engaged position) will be 12-14 notches. Reset adjusting nut if travel range is not within limits.



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Fig. 1: Parking Brake Cable & Adjustment Components
Courtesy of Isuzu Motor Co.

PEDAL HEIGHT & FREE PLAY

NOTE: The push rod serves as the brake pedal stopper when pedal is fully released.

1) With brake pedal fully returned by spring, measure pedal

height. Pedal height (measured from upper foot rest portion of pedal pad to floorboard) should be 6.5-6.9" (164-174 mm) for P'UP and 7.8-8.2" (198-208 mm) for Trooper II.

2) To adjust, disconnect negative battery cable and stoplight switch electrical lead. Remove stoplight switch from bracket. Loosen lock nut on push rod, then rotate push rod to obtain proper pedal height.

3) Ensure pedal free play is .24-.35" (6-9 mm) for P'UP and .28-.39" (7-10 mm) for Trooper II. After adjustment, tighten lock nut to 13-16 ft. lbs. (18-22 N.m). Install and adjust stoplight switch. Connect electrical leads.

STOPLIGHT SWITCH

Stoplight switch is located under dash, above brake pedal. Loosen lock nut and adjust clearance between switch housing (not actuating pin) and brake pedal tab to .02-.04" (.5-1.0 mm) on all models. Tighten lock nut.

WHEEL BEARING PRELOAD

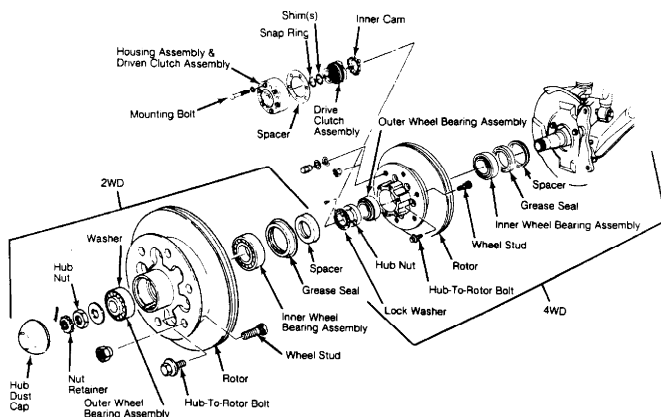
Front Wheel Bearing

1) On 2WD P'UP, raise and support vehicle. Remove front wheels. Remove caliper and hang out of way with wire. Remove hub dust cap, cotter pin and pin retainer. See Fig. 2. Tighten spindle nut to 22 ft. lbs. (30 N.m). Turn hub 2 or 3 times, then loosen nut until finger tight and rotor has no free play.

2) On 4WD P'UP and Trooper II, shift transfer case lever to "2H" position and move vehicle back and forth several feet. Raise vehicle. Remove front wheels. Detach 6 driven clutch housing assembly mounting bolts (10 mm) from hub.

NOTE: Check drive and driven clutch components position and alignment for reassembly reference. Ensure drive clutch assemblies are marked "L" for left or "R" for right.

3) Remove driven clutch assembly, housing assembly and spacer. Then separate components if necessary. Detach snap ring and remove shim(s), drive clutch assembly, inner cam and lock washer plate. See Fig. 2. Using Hub Nut Wrench (J-29020-A), tighten hub nut slightly while turning rotor, to seat bearings. Loosen nut until finger tight. Ensure rotor has no free play.



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Fig. 2: Exploded View Of Front Hub, Rotor & Wheel Bearing Assemblies

Ensure wheel bearing preload is within specifications or premature bearing wear will result. Courtesy of Isuzu Motor Co.

4) On all models, install spring scale with hook attached to wheel stud. Tighten hub nut (while pulling on scale) until scale reads preload of no more than 3.31 lbs. (1.5 kg) for 4WD and 2.20 lbs. (1.0 kg) for 2WD.

5) If rotor does not turn smoothly or preload will not adjust to specification, remove rotor and inspect wheel bearings for damage or wear. Replace inner and/or outer wheel bearings and races as necessary. Recheck and adjust bearing preload if new wheel bearings are installed. On 2WD models, install nut retainer, new cotter pin and dust cap.

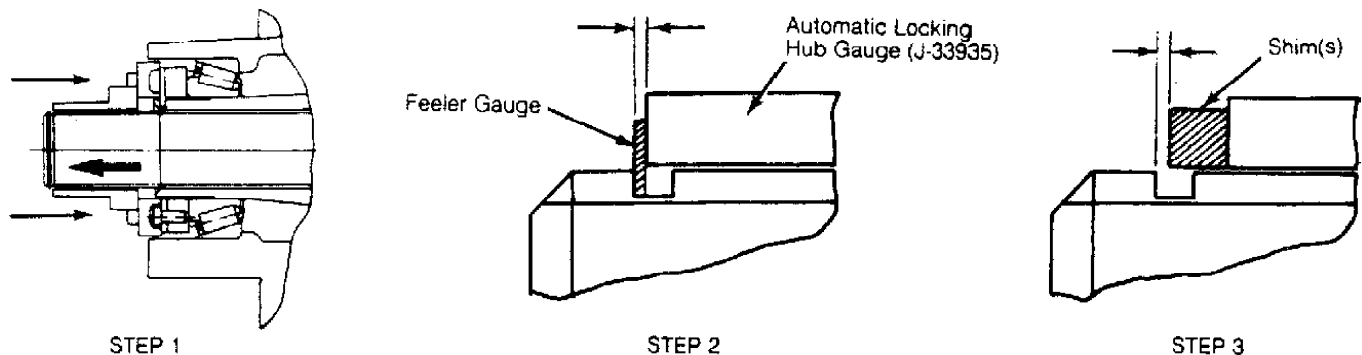
6) On 4WD models, when installing lock washer plate over hub nut, check that driven clutch assembly mounting bolt holes align. If not, reverse lock washer plate. If holes are still out of alignment, turn in nut only enough to obtain alignment.

7) Clean hub flange, threaded holes, lock washer plate surface and axle shaft splines. Ensure transfer case lever is in "2H" position. Install inner cam by aligning keyway of inner cam with groove in knuckle. Tap inner cam lightly with plastic hammer to ensure contact with lock washer plate.

8) Using Automatic Locking Hub Gauge (J-33935) and feeler gauge, select proper shim(s). Hold CV joint part of axle shaft and push it outward as much as possible. Hold inner cam with other hand so as not to move it. See Fig. 3, Step 1.

9) Install gauge onto axle shaft until it comes in contact with lock washer plate. See Fig. 3, Step 1. Measure clearance "T" between special tool and axle shaft snap ring groove with feeler gauge. See Fig. 3, Step 2.

10) If clearance "T" is larger than snap ring groove, select proper shim(s). See Fig. 3, Step 3. Ensure shim(s) selected allows "T" clearance of .004" (.10 mm). Remove gauge and leave inner cam in position. Apply multipurpose grease to axle shaft splines, drive clutch outer groove and inner cam face and driven clutch inner circumference.



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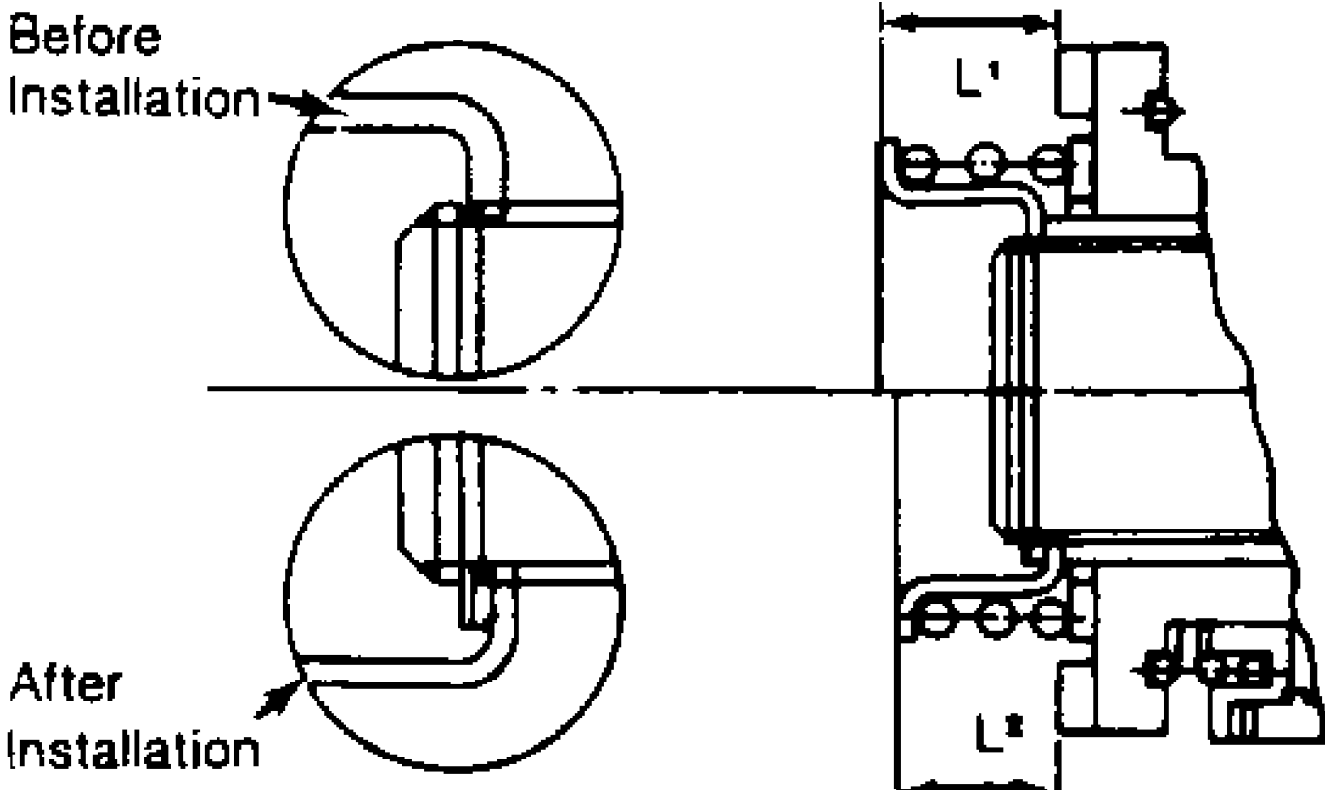
Fig. 3: Automatic Locking Hub Gauge Installation & Shim Selection
Ensure that when gauge is installed on axle shaft, contact is made with lock washer plate. Courtesy of Isuzu Motor Co.

11) As viewed from spring side, align cut part of holdout ring and cam convex part of drive clutch assembly by turning holdout ring clockwise. Align cut part of holdout ring with inner cam tab. Engage drive clutch assembly cam teeth to inner cam by turning axle shaft.

12) Measure dimension "L(1)" between retainer surface and clutch surface to ensure proper installation. See Fig. 4. Record dimension. Install selected shims and new snap ring using Snap Ring Installer (J-33934).

13) With snap ring and shim(s) installed on tool, place

center projection of tool into axle shaft center hole. Tap tool by hand to force on snap ring. Do not use hammer. After installing snap ring and shim(s), check fit of snap ring by measuring dimension "L(2)" between clutch surface and retainer surface to ensure the proper shim thickness. See Fig. 4. If difference between measurement "L(1)" and "L(2)" is larger than .028" (.70 mm), the shim thickness is correct.



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Fig. 4: Measuring Drive Clutch Assembly Installed Position For Shim Installation
Courtesy of Isuzu Motor Co.

14) Measure dimension "D" between hub flange surface and drive clutch surface. See Fig. 5. If "D" = 1.00-1.03" (25.4-26.2 mm), do not use a spacer. If "D" = 1.04-1.07" (26.3-27.2 mm), use a .04" (1 mm) thick spacer. If "D" = 1.07-1.11" (27.3-28.1 mm), use a .08" (2 mm) thick spacer.

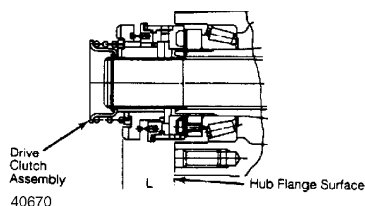


Fig. 5: Measuring Drive Clutch-To-Hub Flange Surfaces For Spacer Installation
Courtesy of Isuzu Motor Co.

NOTE: Ensure spring washers are installed on both driven clutch

assembly and driven clutch housing assembly mounting bolts.

15) Apply Loctite 515 to both sides of spacer and to flange side of driven clutch assembly. If separated, assemble driven clutch assembly to driven clutch housing assembly and tighten mounting bolts (8 mm) to 17-22 ft. lbs. (23-30 N.m).

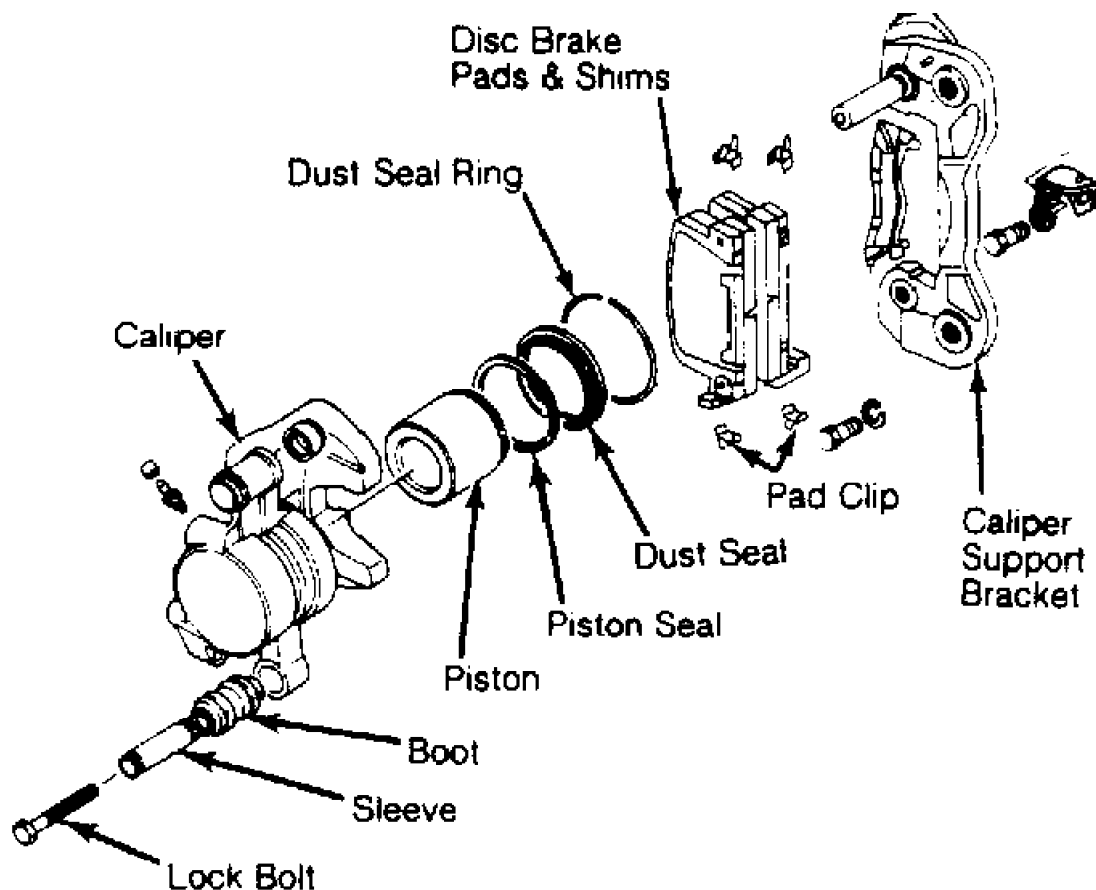
16) Apply Loctite 515 to driven clutch housing assembly flange surface. Check that housing assembly turns smoothly to ensure spacer selected in step 14) was correct. Tighten driven clutch housing assembly mounting bolts to 40-47 ft. lbs. (54-64 N.m). On all models, install calipers and wheels. Lower vehicle.

REMOVAL & INSTALLATION

DISC BRAKE PADS

Removal

1) Raise and support vehicle on safety stands. Remove front wheels. Remove lower caliper lock bolt, rotate caliper upward on support pivot (guide pin) and hang with wire. DO NOT damage flex hose by twisting or hanging caliper from it. See Fig. 6.



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Fig. 6: Exploded View Of Front Disc Brake Pads, Caliper & Support Assembly
Courtesy of Isuzu Motor Co.

2) Remove disc pads and pad shims. Mark locations if pads

are reusable. Remove disc pad clips from caliper support and discard.

Inspection

Check brake pads for excessive and/or uneven wear. Standard pad thickness is .413" (10.50 mm). Replace pads when pad wear indicator makes a squealing noise or if less than .04" (1 mm) lining is left. Always replace pads in axle sets. Inspect inside of caliper for fluid leakage. Repair as necessary.

Installation

1) To install, reverse removal procedure. Install new pad clips and shims. Apply high temperature grease (Delco Brake Lube No. 5450032) to shims and caliper sliding surfaces.

2) Used pads must be installed in original position. Install pads to caliper supports with wear indicators facing LOWER SIDE of support.

DISC BRAKE CALIPER

Removal

1) Raise and support vehicle. Remove front wheels. Remove lower lock bolt retaining caliper to support. Disconnect hydraulic flex hose from caliper and plug openings. Disengage guide pin dust boot from guide pin.

2) Pivot caliper up and off disc pads and rotor, then remove caliper from guide pin (built into support). Replace disc pads and resurface (or replace) rotor as necessary. Inspect caliper for leakage and repair or replace as needed.

NOTE: Resurface or replace brake rotors in axle sets only (both fronts).

Installation

1) To install, reverse removal procedure. Apply rubber grease to pad shims, caliper sliding surfaces and inside rubber boots. Install sleeve dust boot on caliper and insert sleeve into dust boot.

2) Apply rubber grease into guide pin fitting hole in caliper. Install guide pin dust boot on caliper. Clean sliding surface of guide pin and lubricate with multipurpose grease. Install caliper and dust boot on guide pin.

3) Secure caliper to support by installing and tightening lock bolt. Flex hose identification stripe must follow a straight line without binding. Hose must not contact moving or vibrating parts. Install wheels. With engine running, bleed hydraulic system.

DISC BRAKE ROTOR

NOTE: Check disc brake rotor runout before removal.

Removal

1) On 2WD models, raise and support vehicle. Remove front wheels. Detach caliper support mounting bolts, then remove caliper support with caliper. Suspend caliper and support from frame with wire. Do not hang by flexible brake hose.

2) Remove dust cap, cotter pin, nut retainer and hub nut. See Fig. 2. Remove hub and rotor assembly and index mark before disassembly. Separate only if replacing either component. Remove and inspect wheel bearings and grease seal. Replace components as necessary.

3) On 4WD models, shift transfer case lever to "2H" position and move vehicle back and forth several feet. Raise and support vehicle. Remove front wheels. Detach caliper support mounting bolts,

then remove caliper support with caliper. Suspend caliper and support from frame with wire. DO NOT hang caliper by flexible brake hose. Detach 6 driven clutch housing assembly mounting bolts (10 mm) from hub.

NOTE: Check and mark drive and driven clutch components position and alignment for reassembly reference. Ensure drive clutch assemblies are marked "L" for left or "R" for right.

4) Remove driven clutch assembly, housing assembly and spacer. Then separate components if necessary. Detach snap ring and remove shim(s), drive clutch assembly, inner cam and lock washer plate. See Fig. 2. Using Hub Nut Wrench (J-29020-A), remove hub nut. Remove outer wheel bearing. Remove hub and rotor assembly and index mark before disassembly. Separate only if replacing either component.

Inspection

NOTE: Resurface or replace brake rotors in axle sets only (both fronts).

1) With rotor installed and correct wheel bearing preload set, check disc runout. Mount dial indicator with pointer positioned at center of disc pad contact area of rotor. Check runout while slowly rotating rotor by hand.

2) Standard brake rotor runout is .005" (.13 mm) or less. If runout is beyond specification, repair or replace as necessary. If rotor is in good condition, resurface to no less than minimum thickness specification.

3) Check rotor for proper thickness and parallelism. Using a micrometer, measure rotor thickness at 12 points, about 30 degrees apart, at the circumference of a 8" (204 mm) diameter circle. Replace rotor if worn less than discard specification.

NOTE: When taking rotor thickness measurements, the difference between any 2 measurements should not be more than .001" (.03 mm). If parallelism is not within specification, resurface rotor to no less than minimum thickness.

Installation

1) To install, reverse removal procedure. If rotor and hub are separated, align index mark and tighten mounting bolts to 51-58 ft. lbs. (69-79 N.m).

2) On 2WD models, replace inner and outer bearing races and grease seal using hammer and drift. On 4WD models, if inner wheel bearing outer race is replaced, install race in hub using Driver (J-8092) and Bearing Race Installer (J-29016).

3) If outer wheel bearing race is replaced, install race using driver and Race Installer (J-29015). Replace grease seal using driver and Seal Installer (J-29017), then install retaining ring.

4) On all models, adjust wheel bearing preload. See ADJUSTMENTS. Install caliper and support assembly and tighten caliper support mounting bolts. If necessary, bleed hydraulic system (with engine running).

BRAKE SHOES

Removal

1) Remove brake drum. If reusable, mark linings for reassembly reference. Remove hold-down springs with cups and pins. Detach upper and lower return springs. Remove primary shoe and automatic adjuster assembly.

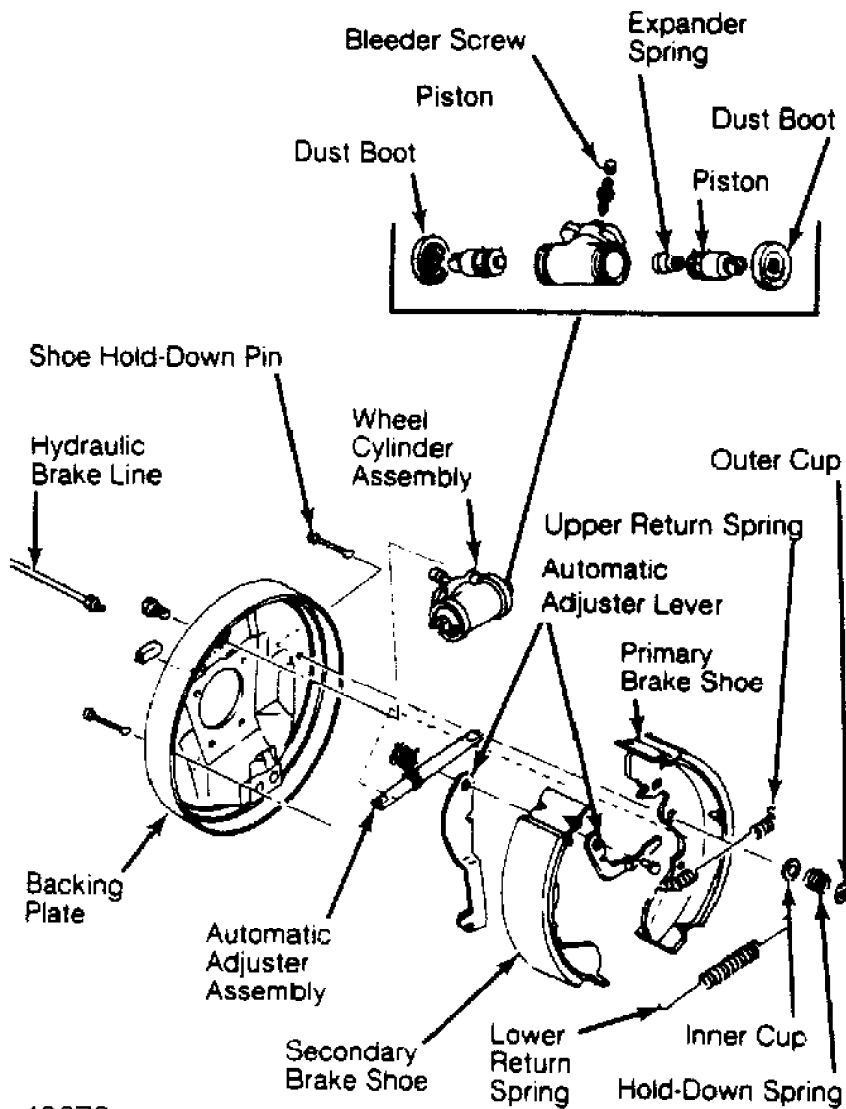
2) Detach parking brake cable end from automatic adjuster

lever. Remove secondary shoe from backing plate. Remove clip and wave washer, then separate adjuster lever components from secondary shoe. See Fig. 7.

3) Check behind wheel cylinder boots for excessive leakage. Presence of some fluid is normal and acts as piston lubricant. Repair as necessary. Wash brake dust from backing plate (using water and a mild detergent only).

NOTE: DO NOT remove wheel cylinder unless replacement is necessary. Disassembly, inspection and overhaul may be done while mounted to backing plate.

CAUTION: DO NOT use compressed air to blow off parts. DO NOT breath air-born asbestos dust. DO NOT use any solvent containing mineral oil or damage to rubber parts will result.



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Fig. 7: Exploded View Of Rear Drum Brake Assembly
Courtesy of Isuzu Motor Co.

Inspection

1) Inspect brake shoes for distortion, looseness, nicks or

oil-soaked linings. Minimum rear brake lining thickness is .04" (1 mm). Repair or replace as necessary.

NOTE: If brake linings are replaced, ensure that the new linings are arc-ground for proper lining-to-drum inner diameter contact.

2) Inspect brake drum inner friction surface for cracks, scores, grooves, hot spots and out of round. Replace brake drum if cracked or if inside diameter is beyond maximum limit after machining.

3) Check and replace tension springs if rusted or weak. Using spring scale and spring compression tester, check springs for proper tension, free length and set length. See BRAKE SPRING TENSION table. Replace as needed.

BRAKE SPRING TENSION

Application	Free Length in. (mm)	Set Length in. (mm)	Set Load lbs. (kg)
Brake Shoe			
Hold-Down Spring	0.591 (15.0)	0.441 (11.2)	20.10-24.50 (9.1-11.1)
Return Spring			
Upper	4.839 (122.9)	5.311 (134.9)	21.90-26.70 (9.9-12.1)
Lower	6.583 (167.2)	7.488 (190.2)	55.30-68.10 (25.2-30.8)
Wheel			
Cylinder			
Spring	1.472 (37.4)	0.315 (8.0)	2.00-2.40 (.9-1.1)

Installation

1) Apply high temperature grease to sliding surfaces of backing plate, wheel cylinder piston shoe slots and anchors. Install automatic adjuster levers to secondary shoe and parking brake cable to actuator lever. Connect brake shoes together with upper return spring.

2) Place adjuster assembly into position (with star wheel nearest secondary shoe). Fit shoes to wheel cylinder piston slots. Install hold-down springs and cups. Attach lower return spring. Install brake drum and adjust brakes. See ADJUSTMENTS. With engine running, bleed hydraulic system.

REAR AXLE SHAFT, BEARING & OIL SEAL

Removal

1) Raise and support vehicle. Remove rear wheel and brake drum. Disconnect parking brake rear cable from actuator lever. Disconnect brake line at wheel cylinder. Plug brake line opening.

NOTE: DO NOT strike backing plate with hammer to remove axle shaft. Use slide hammer and adapter if shaft cannot be removed by hand.

2) Remove 4 nuts from bearing holder through bolts (located inside of backing plate). Using Slide Hammer (J-2619-01) and Axle

Flange Adapter (J-21579), pull out axle shaft assembly (including backing plate).

3) Flatten locking tab on convex lock washer. Mount axle shaft in vise, clamping jaws around lock nut. Do not tighten excessively. Install Lock Nut Remover/Installer (J-24246) on flange studs. Lock in position with 2 wheel nuts and turn axle shaft loose from lock nut.

4) Using a hydraulic press (with light pressure), press lock nut, washer, bearing and holder and backing plate from axle shaft. Supporting backing plate solidly and hold axle shaft to prevent it from falling once bearing assembly is removed.

5) Remove oil seal from outboard side of bearing holder and discard. Drive off bearing outer race with a drift. Pry oil seal from axle case and discard.

Inspection

1) Install dial indicator with pointer positioned 13.78" (350 mm) from splined end. Check axle shaft for bent condition. Replace if runout exceeds .04" (1 mm). Never use heat to correct bent condition.

2) Check axle flange runout. Mount dial indicator (parallel to axle) with pointer (at 90 degrees to flange) at the circumference of a 6.3" (160 mm) diameter circle. Rotate axle shaft slowly while observing dial. Replace shaft if runout exceeds .003" (.08 mm).

3) Inspect axle shaft splines and replace if distorted or if step wear is noticed. Slight step wear may be corrected with pencil grinder. Check all other parts for wear, separation, cracks or seizure.

4) Wash bearing in solvent and inspect for rough rotation or damage. Replace bearing as necessary. Check threaded area of wheel stud bolts for damage and elongation. If damaged, remove stud bolts from axle flange using Stud Remover (J-6627-A).

Installation

1) Replace oil seal in axle case using Axle Case Seal Installer (J-24254). Install new bearing outer race into bearing holder using Driver (J-8092) and Axle Bearing Race Installer (J-24259). Install new grease seal into bearing holder using Bearing Holder Seal Installer (J-24255).

2) If necessary, press new wheel bolts into flange of axle shaft. Apply wheel bearing grease to bearing inner race and inner face of rear axle case. Install 4 through bolts into backing plate. With oil seal side of bearing holder against backing plate, install bearing holder to backing plate.

3) Install assembly onto axle shaft. Using Bearing Installer (J-8609-01), install bearing over axle shaft and press into holder. Install new lock washer with its dished side away from bearing. Thread lock nut onto axle shaft.

4) Secure lock nut tightly in vise. Install lock nut remover/installer onto flange studs, chamfered side first. Secure with 2 wheel nuts and tighten lock nut. Bend over portion of lock washer opposite to locating tab to prevent lock nut from loosening.

5) If only one shaft has been serviced, begin axle shaft installation with step 7). If both axles have been serviced, proceed with step 6).

6) Insert .08" (2 mm) shim between bearing holder and axle case flange. Insert axle shaft assembly into axle case. Tighten 4 bearing holder-to-backing plate bolts to 51-58 ft. lbs. (69-79 N.m).

7) Insert remaining axle shaft (assembled without shims), into axle case until it comes in contact with differential thrust block. Measure clearance between bearing holder (backing plate) and axle case flange. Proper shim size is determined by adding .012" (.30 mm) to this measurement.

8) For example, if measured clearance is .081" (2.05 mm), correct shim size is $.081" + .012" = .093"$ (2.05 + .30 = 2.35 mm). Select shim or combination of shims of proper size.

NOTE: Axle shaft shims are available in thicknesses of .002" (05 mm), .003" (.076 mm), .005" (.13 mm), .026" (.66 mm) and .04" (1 mm).

9) Remove axle. Install shim(s) between bearing holder and backing plate face. Tighten 4 through bolts to 51-58 ft. lbs. (69-79 N.m). Complete axle installation. Connect brake line. Install parking brake rear cable, brake drum and wheel. With engine running, bleed hydraulic system. Adjust rear brakes and parking brake tension. See ADJUSTMENTS.

MASTER CYLINDER

Removal

Disconnect fluid level electrical connector wires. Disconnect hydraulic lines at master cylinder and plug ends to prevent entry of dirt. Remove 2 nuts retaining cylinder to power brake unit. Remove master cylinder and gasket from power unit.

NOTE: Master cylinder should be bench-bled before installation. Once remounted, bleed hydraulic system with engine running to prevent damage to push rod seal.

Installation

To install, reverse removal procedure. Tighten master cylinder mounting nuts to 8-11 ft. lbs. (11-15 N.m). Tighten brake line nuts to 6.5-11 ft. lbs. (9-15 N.m). With engine running, bleed hydraulic system. Monitor fluid level to prevent reservoir from running dry. Adjust pedal height if necessary. See ADJUSTMENTS.

POWER BRAKE UNIT

Removal

1) Disconnect battery ground cable. Disconnect fluid level electrical connector wires from master cylinder. Remove hydraulic lines at master cylinder, covering ends to prevent entry of dirt.

2) Detach clamp and remove vacuum hose (with check valve) from power brake unit. Note installed direction for proper check valve operation (arrow on hose label faces engine). Disconnect brake pedal return spring. Remove clip and brake pedal pin that connects push rod clevis.

3) From inside vehicle, remove 4 nuts attaching power brake unit to firewall. Remove power brake unit and master cylinder as an assembly. Remove and discard gasket(s). Detach master cylinder as necessary.

Installation

To install, reverse removal procedure. Ensure new gasket (Trooper II has 4 gaskets) is installed between power unit and firewall and sealer is applied to firewall fitting face. If master cylinder was removed, check push rod projection. See OVERHAUL. With engine running, bleed hydraulic system. If necessary, adjust pedal height.

OVERHAUL

DISC BRAKE CALIPER

Disassembly

1) Remove sleeve dust boot and guide pin dust boot. Using a blunt-pointed instrument, remove dust seal ring and dust seal. See Fig. 6.

2) Place wood block between piston and caliper cavity wall. Apply compressed air to force piston from caliper bore. Remove piston ring seal. Remove bleeder screw. Discard all rubber parts.

Inspection

1) Wash all parts in clean brake fluid and dry with filtered, dry, compressed air. Check caliper bore and piston for wear, scuffing or corrosion. Replace components as necessary.

2) Minor imperfections can be removed from caliper bore with crocus cloth or fine emery cloth. Replace dust seal, dust boots and piston square ring seal during overhaul.

NOTE: DO NOT polish piston outer surfaces with abrasive. If damaged or badly corroded, replace piston. Brake fluid must be DOT 3 rating or better.

Reassembly

1) Lubricate new piston square ring seal with brake fluid or rubber grease. Insert seal into caliper bore. Carefully insert piston into caliper assembly with finger pressure.

2) Apply rubber grease to piston, then install new dust seal on piston and caliper. Fit seal ring into dust seal. Install bleeder screw and tighten to 78 INCH lbs. (9 N.m). Reverse removal procedure to complete installation. With engine running, bleed hydraulic system.

WHEEL CYLINDER

Disassembly

Before disassembly, inspect wheel cylinder for excessive leakage behind dust boots. Remove rubber dust boots from cylinder. Remove piston assemblies and expander spring. Note installed direction for each cup. Then remove cups from pistons. Discard boots and cups.

Inspection

1) When wheel cylinder is disassembled, wash parts only in clean brake fluid. Inspect cylinder bore and pistons for rust, corrosion or damage. Hone cylinder bore to clean up light corrosion or rust.

2) Check piston-to-cylinder bore clearance. Maximum clearance is .006" (.15 mm). If clearance is excessive, replace wheel cylinder assembly.

3) Check spring for proper tension. See BRAKE SPRING TENSION table. If wheel cylinders are rebuilt, install new rubber cups and boots. Apply silicone grease (Delco Lube No. 5459912) to pistons and inner face of boots.

Reassembly

Lubricate cylinder bore with brake assembly fluid. Install spring expander. Place new piston cups on piston with flare facing center of cylinder, then install piston assemblies into cylinder. Press new boots onto cylinder.

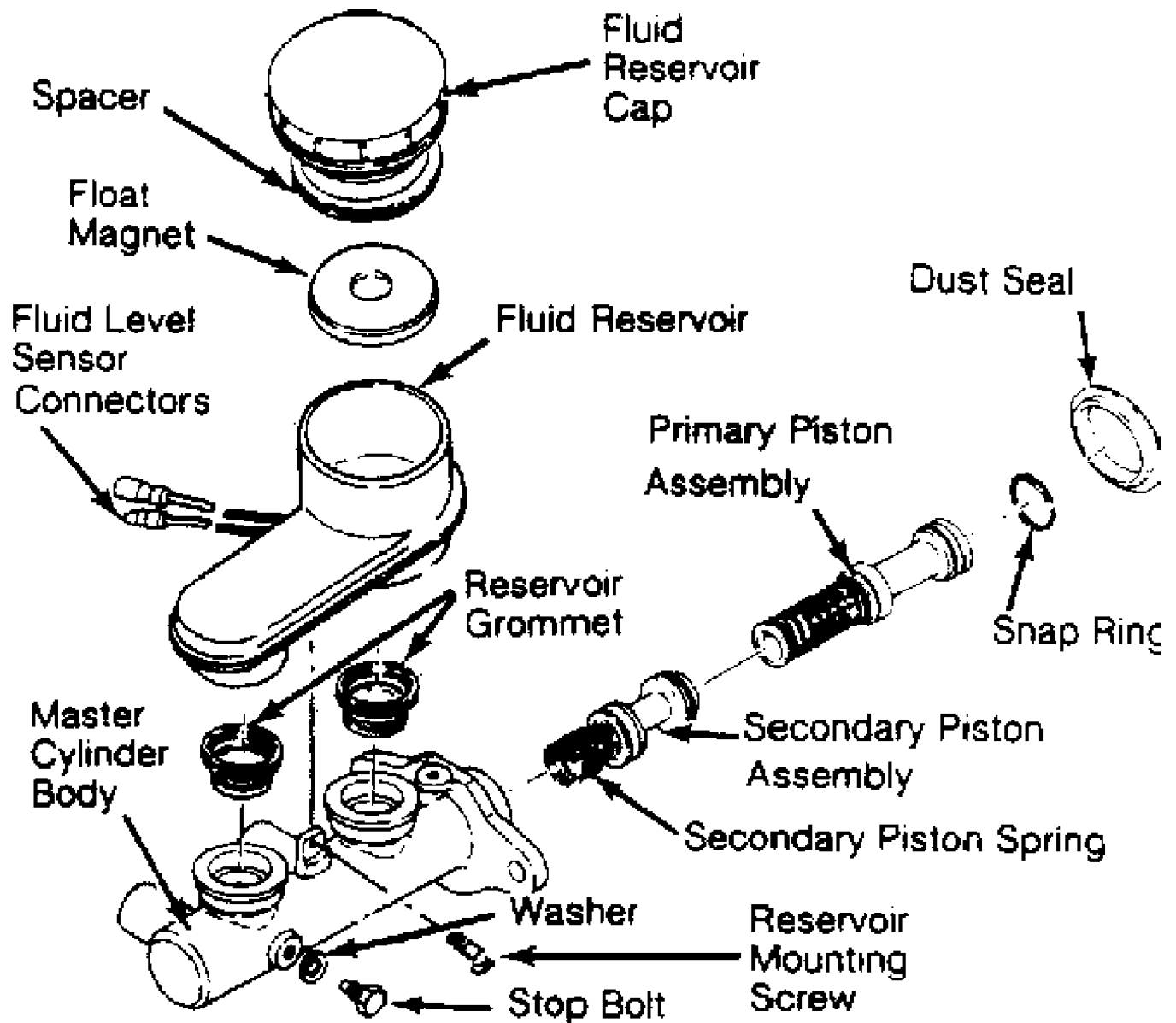
MASTER CYLINDER

Disassembly

1) Remove fluid reservoir cap, seal and float magnet. Drain brake fluid. Place master cylinder in vise. Push primary piston in and remove stop bolt and gasket on left side of master cylinder.

2) Detach dust seal, then remove primary piston snap ring. Remove primary and secondary piston assemblies from cylinder bore. See Fig. 8.

NOTE: DO NOT remove reservoir assembly unless it is to be replaced.



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Fig. 8: Exploded View Of Tandem Master Cylinder Assembly
Courtesy of Isuzu Motor Co.

NOTE: If fluid contamination or corrosion is found, replace all rubber parts. Use clean brake fluid to bench-bleed master cylinder. DO NOT use any cleaner containing mineral oil or damage to rubber parts will result.

Inspection

1) Wash parts in denatured alcohol (or clean brake fluid). Using compressed air, dry parts. Blow out passages, orifices and valve holes. If slight rust is found, polish clean with crocus cloth or fine emery cloth. Rewash master cylinder and blow dry.

2) Inspect cylinder bore for scoring, pitting or other damage. Check cylinder bore-to-piston clearance. Standard clearance is .0016-.0049" (.040-.125 mm). If clearance exceeds .006" (.15 mm), replace master cylinder. Replace all rubber parts and gaskets during overhaul.

Reassembly

1) To reassemble, reverse disassembly procedure. Lubricate cylinder bore and parts with clean brake fluid or rubber grease. If removed, install secondary spring onto secondary piston.

2) Using a gentle twisting, rotating motion to avoid damage to new rubber seals, install secondary piston assembly, primary piston assembly and snap ring. Depress primary piston, then install piston stopper bolt (with new gasket) and tighten to 12-14 ft. lbs. (16-19 N.m).

3) Before installing, bench-bleed master cylinder. Install plugs in outlet ports of cylinder and fill reservoir with clean brake fluid. Press in and out on primary piston until air bubbles are no longer seen in fluid and pressure is felt when primary piston is depressed. Remove plugs.

4) If reservoir grommets were removed, lubricate with rubber grease and install grommets with flared side toward cylinder body. Install cylinder body dust seal with groove turned downward. Install master cylinder on power brake unit. With engine running, bleed hydraulic system.

POWER BRAKE UNIT

Disassembly

1) Remove master cylinder reservoir cover, seal and float magnet. Drain brake fluid from reservoir. Remove 2 nuts and lock washers. Separate master cylinder from power unit front shell. Remove and discard gasket. Install Fixing Stand (J-22805-01) onto master cylinder mount studs of front shell and tighten nuts.

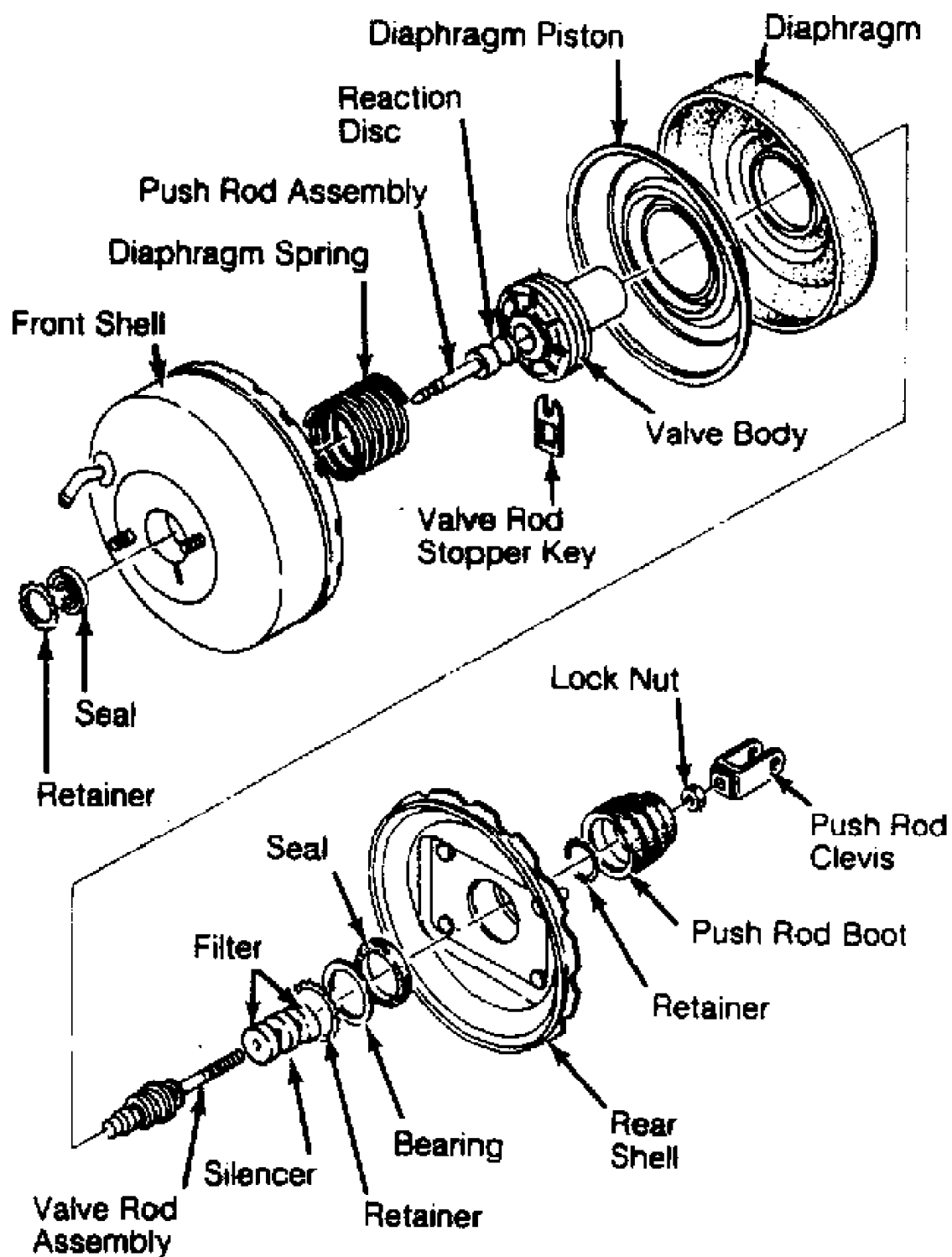
2) Place fixing stand in vise with power unit rear shell up. Scribe alignment marks on front and rear shells to ensure reassembly in original position. Remove push rod clevis and lock nut from valve rod assembly. Remove push rod boot from rear shell.

CAUTION: When separating front and rear shell assemblies, maintain pressure on spanner wrench as rear shell is under spring pressure.

3) Place Spanner Wrench (J-9504-01) over rear shell studs and attach mounting nuts. To separate both shells, press down on wrench, while carefully rotating rear shell counterclockwise. Detach retainer and remove rear shell from valve rod assembly.

4) Remove front shell assembly from vise and detach fixing stand. Attach Diaphragm Remover (J-34350) to front shell. Tighten diaphragm remover bolt to press diaphragm plate and diaphragm (with push rod assembly, valve body and valve rod assembly) from front shell. Separate diaphragm, plate and valve body as necessary.

5) Detach diaphragm remover from shell. Push in on valve rod assembly and detach valve rod stopper key, then remove valve rod assembly from valve body. Remove reaction disc from valve body. Remove push rod assembly and return spring from front shell. See Fig. 9.



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Fig. 9: Exploded View Of Vacuum Power Brake Assembly
Courtesy of Isuzu Motor Co.

NOTE: DO NOT disassemble valve rod assembly. If defective, replace complete assembly.

6) Before removing seals, note installed direction and depth. To remove defective rear shell seal, pry out seal retainer. Remove bearing and seal assembly. If front shell seal is defective, pry out retainer and remove seal. If vacuum check valve is defective, remove hose and replace with a new assembly.

NOTE: DO NOT clean parts with a mineral-based solvent or damage to rubber parts will result.

Inspection

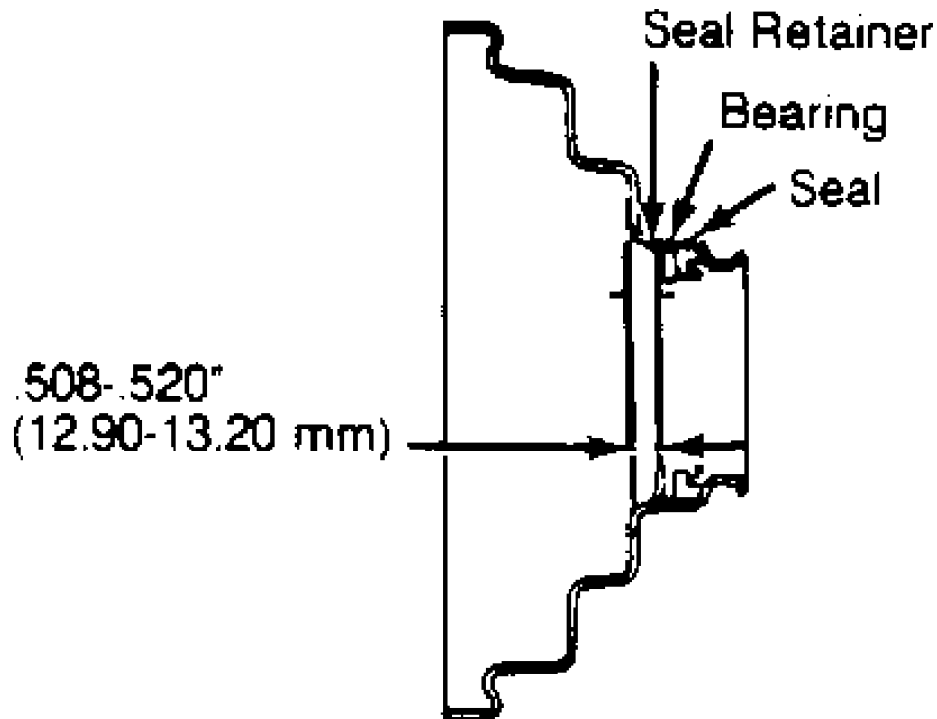
1) Wash all parts in denatured alcohol. Blow dry with compressed air. Inspect inner surface of both shells for wear or damage. Slight rust can be removed with crocus cloth or fine emery cloth.

2) Inspect all parts for cracks, nicks, distortion or other damage. Check rubber diaphragm for deterioration. Replace parts as necessary.

Reassembly

1) Apply silicone grease to sliding surfaces of all parts. If front shell seal was removed, apply rubber grease to new seal and seal area of shell. Install seal and retainer in shell with lip of seal facing forward.

2) If rear shell seal was removed, apply rubber grease to rear shell seal area. Insert seal into rear shell with lip of seal facing forward. Install bearing and retainer. Set retainer to a depth of .508-.520" (12.90-13.20 mm) into rear shell seal area. See Fig. 10.



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Fig. 10: Installing Power Brake Unit
Rear Shell Seal, Bearing & Retainer
Courtesy of Isuzu Motor Co.

3) To complete reassembly, reverse disassembly procedure.

Mount fixing stand onto front shell and install assembly in vise. Using spanner wrench, compress spring and lock rear shell to front shell, ensuring marks made at disassembly are aligned.

CAUTION: Before releasing pressure on spanner wrench, make certain rear shell is locked in place at all tabs.

4) Assemble push rod boot to rear shell. Ensure boot is fully installed on retainer. Install push rod clevis lock nut and clevis. Remove assembly from vise and detach fixing stand. Position power unit in vise with push rod up (DO NOT clamp tightly). Check distance from master cylinder flange face of booster to end of push rod.

NOTE: Push rod must be bottomed in power unit before making adjustment. If necessary, apply 20 in. Hg vacuum at power unit to bottom push rod assembly.

5) Push rod end should be .709-.717" (18.00-18.20 mm) away from master cylinder mounting surface. If rod must be adjusted, hold rod at serrated portion and turn threaded end.

6) After adjustment, tighten lock nut to 13-16 ft. lbs. (18-22 N.m). Bench-bleed master cylinder, then install unit on booster. Install assembly and adjust pedal height if necessary. See ADJUSTMENTS. With engine running, bleed hydraulic system.

TORQUE SPECIFICATIONS

TIGHTENING SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Brake Caliper	
Lock Bolt	22-25 (30-34)
Support Bracket Mounting Bolt	62-65 (84-88)
Flexible Hose-to-Caliper	24-27 (33-37)
Master Cylinder	
Push Rod Lock Nut	13-16 (18-22)
Stopper Bolt	12-14 (16-19)
Power Unit-To-Dash Panel Stud Nut	18-21 (24-29)
Rear Axle Bearing Holder	
To-Backing Plate	51-58 (69-79)
Rear Axle Bearing Lock Nut	188-195 (255-264)
Rotor-to-Hub Mounting Bolt	51-58 (69-79)
Wheel Lug Nut	58-80 (79-109)
	INCH Lbs. (N.m)
Brake Caliper Bleeder Screw	
P'UP	78 (9)
Trooper II	60-104 (7-12)
Master Cylinder Brake Line Nut	
P'UP	78-132 (9-15)
Trooper II	120-156 (14-18)
Master Cylinder	
To-Power Brake Unit Mounting Nut	96-132 (11-15)
Wheel Cylinder	
To-Backing Plate Bolt	70-104 (8-12)
Brake Line Nut	120-156 (14-18)
Bleeder Screw	70-86 (8-10)

DISC SPECIFICATIONS

DISC BRAKE ROTOR SPECIFICATIONS TABLE

Application	Specifications
P'UP & Trooper II	
Disc. Diameter In. (mm)
Lateral Runout In. (mm)	0.005 (0.13)
Parallelism In. (mm)	0.001 (0.03)
Original Thickness In. (mm)	0.705 (18.00)
Min. Refinish Thickness In. (mm)	0.668 (16.97)
Discard Thickness In. (mm)	0.654 (16.60)

DRUM SPECIFICATIONS

DRUM BRAKE SPECIFICATIONS TABLE

Application	Specifications
P'UP & Trooper II	
Drum Diameter in. (mm)	10.0 (254)
Drum Width in. (mm)
Max. Drum Refinish Diam. in. (mm) (1)	10.06 (255.5)
Wheel Cyl. Diameter in. (mm) (2)	8.75 (22.22)
Master Cyl. Diameter in. (mm)	8.74 (22.20)
(1) - Maximum Brake drum runout is 0.006" (0.15 mm).	
(2) - Cylinder piston-to-bore clearance is 0.006" (0.15 mm).	