

BRAKE SYSTEM

1991 Mitsubishi Montero

1991 BRAKES
Disc & Drum

Chrysler Motors: Ram-50;
Mitsubishi: Montero, Pickup

DESCRIPTION

Brake system consists of a master cylinder, vacuum power brake unit, proportioning valve and self-adjusting assembly. Pickup and Ram-50 models have a Load-Sensing Proportioning Valve (LSPV). All models are equipped with front disc brakes and rear drum brakes. Parking brake assembly activates rear brakes.

BLEEDING BRAKE SYSTEM

BLEEDING PROCEDURES

Montero

Bleed brake system in following order: right rear, right front and left front (one circuit handles both rear brakes).

Pickup & Ram-50

Bleed brake system in following order: right rear, left rear, LSPV, right front and left front.

ADJUSTMENTS

BRAKE PEDAL HEIGHT & FREE PLAY

1) Separate connector from stoplight switch, and loosen lock nut. Position switch so it does not contact brake pedal arm. Adjust brake pedal height by rotating master cylinder push rod (yoke, if equipped) until distance from top of brake pedal to floor board is correct. See BRAKE PEDAL SPECIFICATIONS table.

2) DO NOT depress push rod. Tighten lock nut, and ensure brake pedal height is within specification. Start engine to evacuate brake booster chamber. Stop engine, and apply brake several times to remove vacuum from brake booster.

3) Using hand pressure, depress brake pedal to measure free play before resistance is felt. If distance is incorrect, bleed the brake hydraulic system, and check for misadjusted brakes. Refer to the BRAKE PEDAL SPECIFICATIONS table.

BRAKE PEDAL SPECIFICATIONS TABLE

Application	Free Play In. (mm)	Pedal Height In. (mm)
Montero .....	.12-.31 (3-8)	7.5-7.7 (191-196)
Pickup & Ram-50 ....	.12-.31 (3-8)	6.5 (166)

LOAD-SENSING PROPORTIONING VALVE (LSPV) (Pickup & Ram-50)

Park vehicle on level surface. Remove all luggage and passengers. Ensure lever is not against stopper bolt. Check spring

length. If spring length is not 6.97-7.09 in. (177-180 mm), adjust cable or support until correct length is obtained. See Fig. 1.

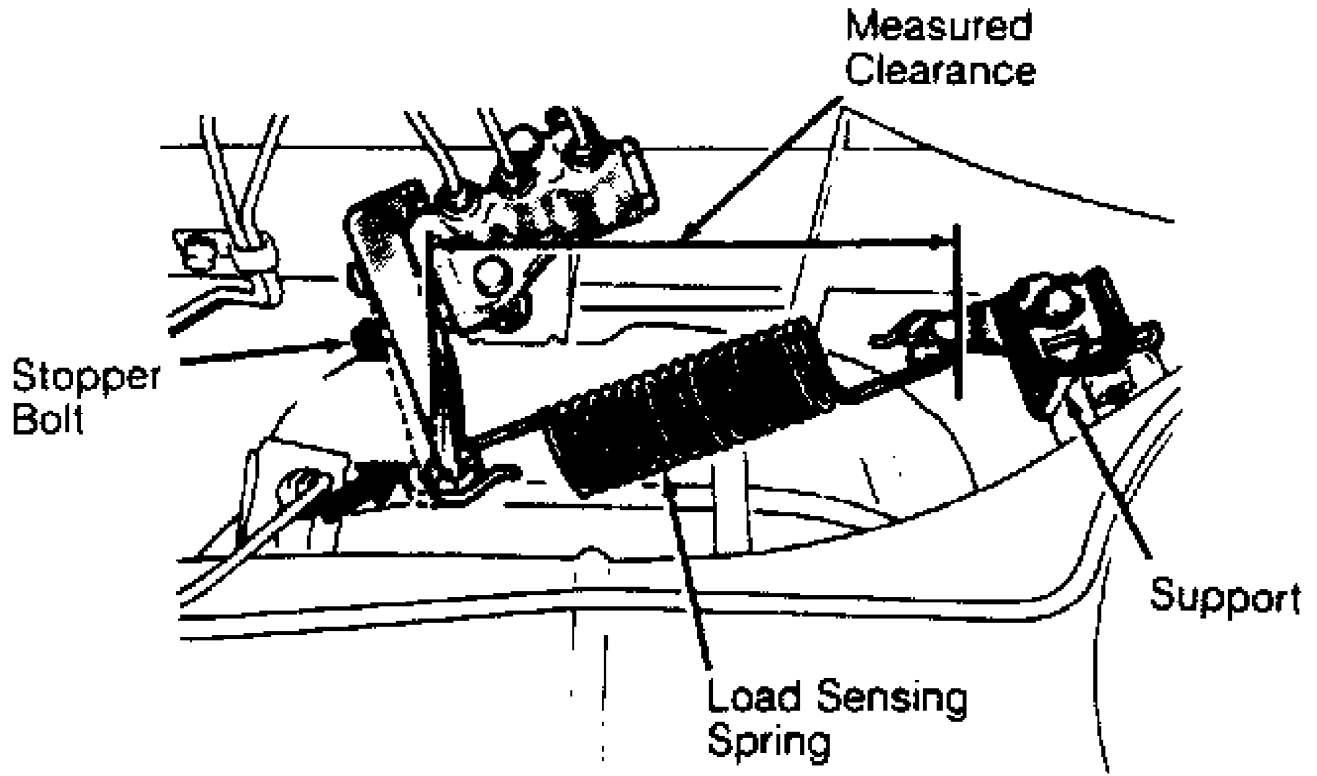
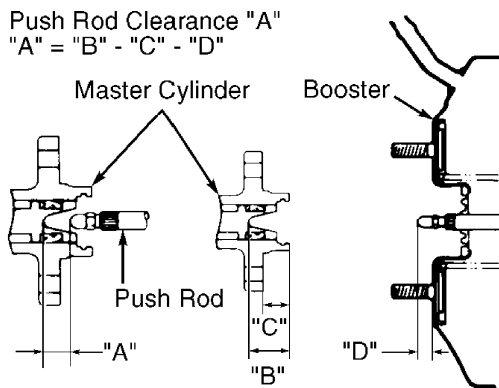


Fig. 1: Testing LSPV Spring Length (Pickup & Ram-50)
 Courtesy of Mitsubishi Motor Sales of America.

MASTER CYLINDER PUSH ROD

Check and adjust clearance between back of master cylinder piston and power brake push rod. See PUSH ROD CLEARANCE SPECIFICATIONS table. See Fig. 2. After adjusting push rod clearance, adjust pedal height, and bleed brake system.



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 Fig. 2: Adjusting Push Rod Clearance
 Courtesy of Mitsubishi Motor Sales of America.

PUSH ROD CLEARANCE SPECIFICATIONS TABLE

Application	In. (mm)
Montero .....	.004-.020 (0.1-0.5)
Pickup & Ram-50 .....	.028-.043 (0.7-1.09)

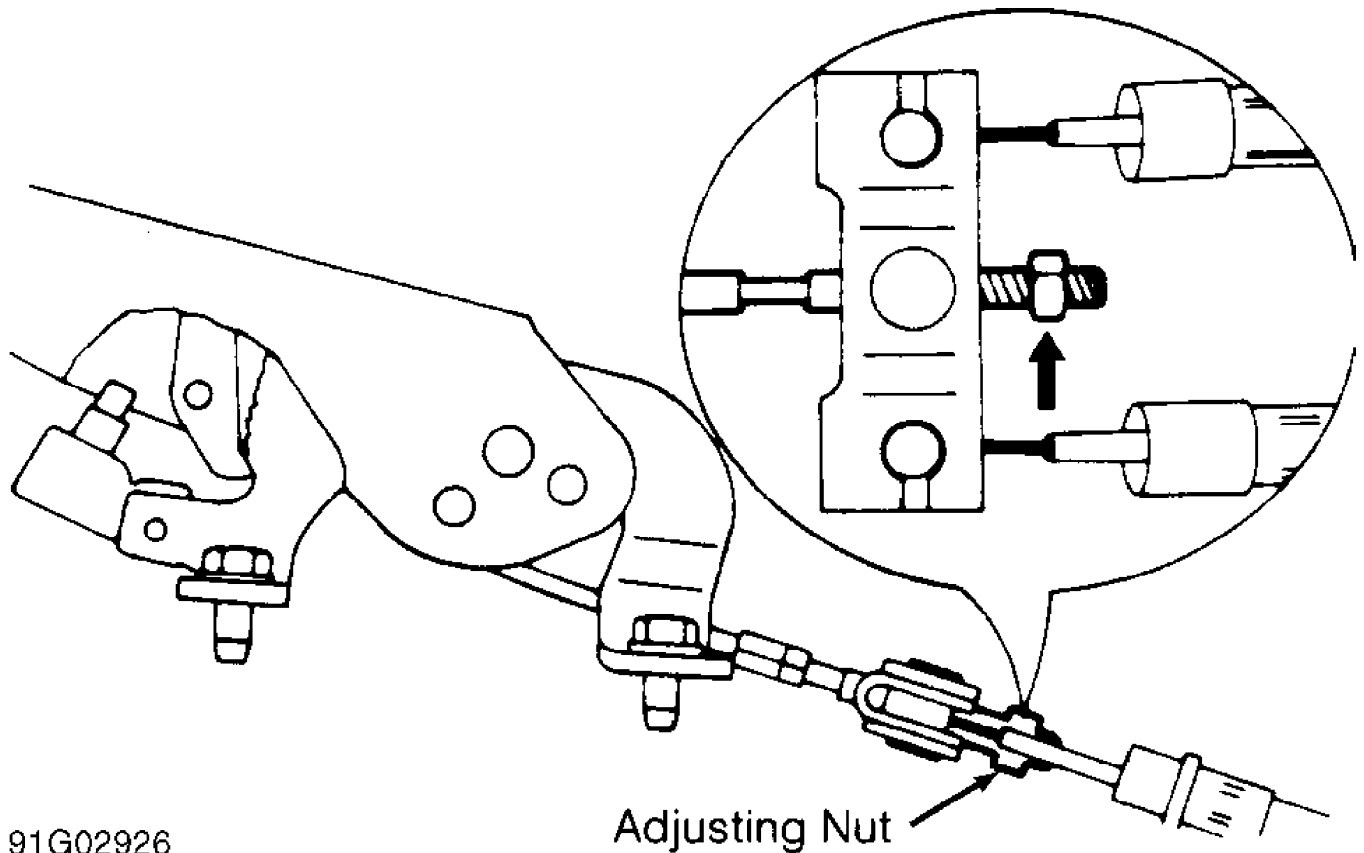
PARKING/EMERGENCY BRAKE

NOTE: Adjust service brake before adjusting parking brake.

Montero

1) Start engine, and apply brake pedal. Pull parking brake lever with a force of 44-45 lbs. (20.0-20.4 kg). Parking brake lever should move up 4-6 notches.

2) If necessary, turn adjusting cable nut located under console or at end of cable rod. See Fig. 3.



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Adjusting Nut

Fig. 3: Adjusting Parking/Emergency Brake (Typical)
 Courtesy of Mitsubishi Motor Sales of America.

Pickup & Ram-50

Fully release parking brake, and allow slack in rear cable to prevent brake shoe drag. Adjust turnbuckle for 2WD models (turn adjusting nut on equalizer for 4WD models) to obtain a brake lever stroke of 16-17 notches with a force of 66 lbs. (29.9 kg). Ensure equalizer is at right angle to joint.

REAR DRUM BRAKE SHOES

Set adjustment assembly so brake shoes outside diameter is 9.97-9.98 in. (253.2-253.5 mm). After brake drum installation, depress

brake pedal to center shoes, and check pedal travel. Rotate brake drum to verify free movement.

STOPLIGHT SWITCH

Loosen lock nut, and adjust switch-to-pedal arm clearance to .02-.04" (.5-1.0 mm). Tighten lock nut. DO NOT depress master cylinder push rod during stoplight switch adjustment.

TESTING

POWER BRAKE UNIT

Check Valve Inspection

Remove vacuum hose from power brake unit. Remove check valve from hose (if possible). Using a vacuum pump, ensure airflow is in direction of intake manifold only.

System Check

1) Run engine for 2 minutes, and shut it off. Depress brake pedal several times with normal pressure. If pedal height gradually becomes higher with successive applications, power brake unit is okay. If pedal height remains steady, power brake unit is faulty.

2) With engine stopped, depress brake pedal repeatedly until it's height no longer falls. Hold brake pedal down, and start engine. If pedal moves downward slightly, power brake unit is okay. If pedal height does not change, power brake unit is faulty.

3) With engine running, press and hold brake pedal and shut off engine. Hold brake pedal for 30 seconds. Brake pedal height should not change. If pedal height falls, power brake unit is faulty.

LOAD-SENSING PROPORTIONING VALVE (LSPV) (PICKUP & RAM-50)

1) Before diagnosing Load-Sensing Proportioning Valve (LSPV), ensure all other brake components are operating properly. When all other brake system components are determined to be okay, perform LSPV test beginning with next step.

2) Ensure unladen vehicle is on level ground. Ensure lever is not contacting stopper bolt. See Fig. 1.

3) When lever is pushed toward valve, distance from LSPV lever hole and support hole must be 6.97-7.09 in. (177-180 mm). If measured distance is not within specification, loosen support bolt. Adjust support until measured distance is within specification.

4) After measured distance is within specification, connect pressure gauges to input and output ports of LSPV. See Fig. 4. Bleed brake system. See BLEEDING BRAKE SYSTEM.

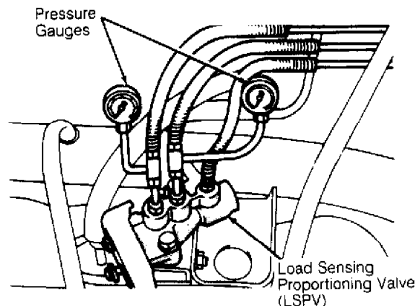


Fig. 4: Connecting Pressure Gauges to LSPV (Pickup & Ram-50)
Courtesy of Mitsubishi Motor Sales of America.

5) Remove the LSPV load-sensing spring. Slowly depress the brake pedal. Check the readings on the pressure gauges. Refer to the LSPV PRESSURE SPECIFICATIONS table.

6) Install LSPV load-sensing spring. Load weight into rear of vehicle until measured spring length distance is 7.0" (178 mm) with lever slightly pressed in. See Fig. 1.

7) Slowly depress brake pedal. Check readings on pressure gauges. See LSPV PRESSURE SPECIFICATIONS table. If fluid pressure is not within specification, ensure all other brake system components are okay. If other components are okay, replace LSPV assembly.

LSPV PRESSURE SPECIFICATIONS (PICKUP & RAM-50)

Application	Inlet Pressure psi (kg/cm ²)	Outlet Pressure psi (kg/cm ²)
Load-Sensing Spring		
Removed	853 (60)	242-327 (17-23)
Installed	1991 (140)	(1) 299-583 (21-40)

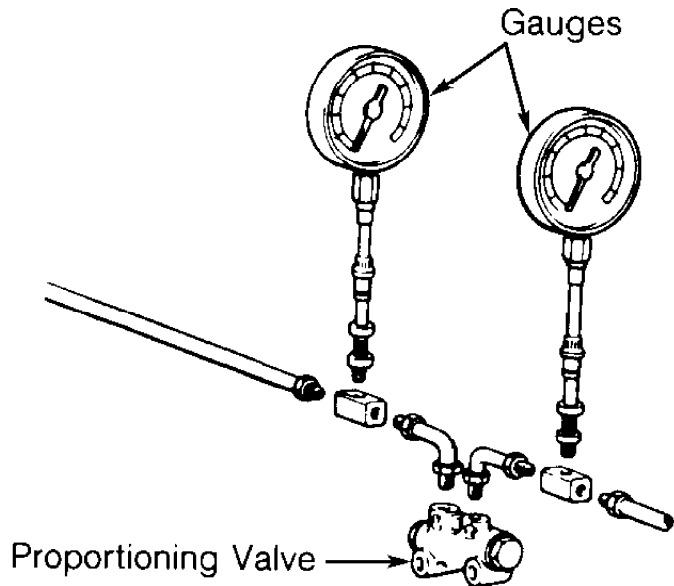
(1) - On vehicles with 2WD and heavy-duty suspension, outlet pressure is 526-697 psi (37-49 kg/cm²).

PROPORTIONING VALVE (NON-LOAD-SENSING) (MONTERO)

Pressure Test

1) Connect pressure gauges to input and output ports of the proportioning valve. See Fig. 5. Bleed brake hydraulic system. Refer to BLEEDING BRAKE SYSTEM.

2) Slowly depress brake pedal. Check readings on pressure gauges. See the PROPORTIONING VALVE PRESSURE SPECIFICATIONS table. If fluid pressures are not within specification, replace proportioning valve.



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Fig. 5: Connecting Pressure Gauges to Proportioning Valve (Typical)
Courtesy of Mitsubishi Motor Sales of America.

PROPORTIONING VALVE PRESSURE SPECIFICATIONS (MONTERO)

Application	Inlet Pressure psi (kg/cm ²)	Outlet Pressure psi (kg/cm ²)
2.6L		
Test 1	853 (59)	473-526 (33-37)
Test 2	1280 (88)	672-757 (46-52)
3.0L		
2-Door Model		
Test 1	853 (59)	473-526 (33-37)
Test 2	1565 (108)	768-865 (54-60)
4-Door Model		
Test 1	597 (41)	569-626 (39-43)
Test 2	1377 (95)	843-928 (58-64)

(1) - Maximum side-to-side pressure differential is 57 psi (4kg/cm²).

REMOVAL & INSTALLATION

FRONT BRAKE PADS

CAUTION: DO NOT remove or contaminate special grease coating on lock pins.

Removal

- 1) Raise and support vehicle. Remove front wheel(s). Remove lower lock pin or sleeve bolt. See Fig. 6. Lift caliper body upward.
- 2) Support caliper using wire. Remove shim(s), shim holder (if equipped), anti-squeak shim and pad assembly from support mounting. Remove pad clips.

Installation

If installing new pads, compress piston to bottom of bore. Install retaining clips, pad assembly, shim(s), shim holder (if equipped) and anti-squeak shim onto support mounting.

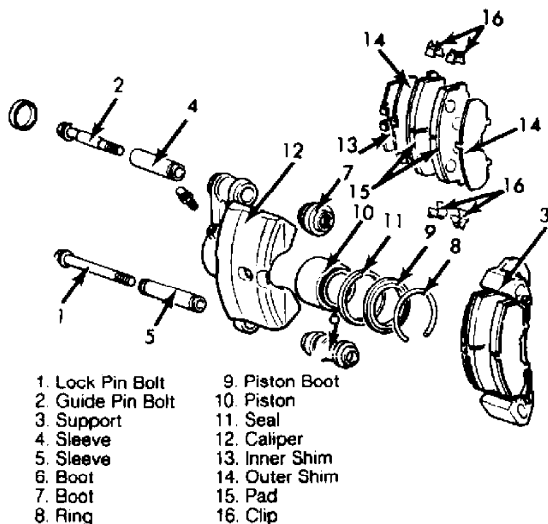


Fig. 6: Exploded View of Front Disc Brake Assembly (Typical)
Courtesy of Chrysler Motors.

FRONT BRAKE CALIPER

Removal

1) Raise and support vehicle. Remove front wheel(s). Separate rubber flex hose from hydraulic line at brake hose mount, located on strut housing. Secure end of hydraulic line to prevent spillage of brake fluid.

2) Remove hose clip from brake hose mount. Disconnect brake hose from caliper. Remove upper and lower caliper-to-steering knuckle bolts. Lift caliper body upward. Remove caliper.

Installation

To install, reverse removal procedure. Tighten bolts to specification. See the TORQUE SPECIFICATIONS table. Bleed brake system. See BLEEDING BRAKE SYSTEM.

FRONT BRAKE ROTOR

Removal (Montero, Pickup 4WD & Ram-50 4WD)

Raise and support vehicle. Remove and support brake calipers. Place hub in free-wheeling position. Remove drive hub cover using an oil filter wrench and protective cloth. Remove snap ring, shim and free-wheeling hub from drive axle. See Fig. 7. Remove lock washer. Remove lock nut using Lock Nut Wrench (MB990954). Remove front hub assembly.

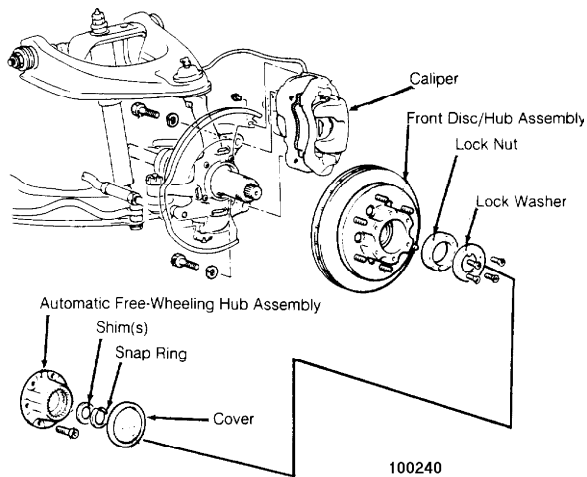


Fig. 7: Exploded View of Front Brake Assembly (4WD)
Courtesy of Mitsubishi Motor Sales of America.

Installation

1) Install front hub assembly. Install and tighten lock nut to 94-145 ft. lbs. (127-197 N.m), and then loosen and retighten to 18 ft. lbs. (24 N.m). Loosen lock nut 30-40 degrees. Reverse removal procedure for remaining components. After installation is complete, check drive axle end play. Adjust end play if not .002" (.05 mm) or less. Rotate drive axle forward and rearward until maximum end play is obtained.

2) If adjusting axle shaft end play, use proper shim to obtain desired end play. Shim is located behind snap ring on end of drive axle. Install shim, and recheck axle end play.

Removal (Pickup 2WD & Ram-50 2WD)

Raise and support vehicle. Remove front caliper. Remove hub (dust) cap, cotter pin and nut. Remove washer and outer wheel bearing. Remove front hub assembly. Remove bolts attaching rotor to front hub, and separate assemblies.

Installation

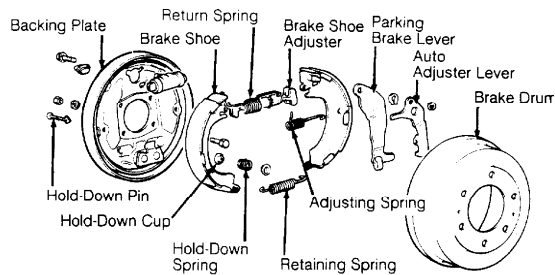
To install, reverse removal procedure. Tighten wheel bearings to 22 ft. lbs. (30 N.m). Loosen nut, and then retighten to 72 INCH lbs. (8 N.m). Install cotter pin. If pin does not align, loosen nut up to a maximum of 30 degrees.

REAR BRAKE DRUM & SHOES

Removal

1) Raise and support vehicle. Remove wheel and brake drum. Remove shoe return spring and brake shoe adjuster. See Fig. 8. Remove adjusting spring, shoe retaining spring and shoe hold-down pins.

2) Remove shoe and lining assembly with parking brake lever. Remove cable from parking lever. Remove parking brake lever snap ring, and disengage lever from brake shoe.



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Fig. 8: Exploded View of Rear Brake Assembly
Courtesy of Mitsubishi Motor Sales of America.

Installation

1) To install, reverse removal procedure. Apply Lubriplate to backing plate bosses, adjuster assembly threads and parking brake lever pin.

2) Set adjustment assembly so brake shoes lightly contact brake drum. Depress brake pedal to center shoes, and check pedal travel. Rotate brake drum to ensure free movement.

WHEEL CYLINDERS

Removal & Installation

Raise and support vehicle. Remove rear brake drum and shoes. See REAR BRAKE DRUM & SHOES under REMOVAL & INSTALLATION. Remove wheel cylinder and seal assembly. To install, reverse removal procedure. Bleed brakes.

MASTER CYLINDER

Removal

Drain brake fluid from master cylinder. Remove sensor connector (if equipped). Disconnect brake lines from master cylinder, and install plugs to prevent brake fluid spillage. Remove master cylinder from booster unit and separate reservoirs from housing (if necessary).

Installation

To install, reverse removal procedure. Before installation, check and adjust clearance between back of master cylinder piston and power brake push rod. Refer to MASTER CYLINDER PUSH ROD under ADJUSTMENTS. After installation, adjust the brake pedal height. Refer to BRAKE PEDAL HEIGHT & FREE PLAY under ADJUSTMENTS. Bleed brake system. See BLEEDING BRAKE SYSTEM.

POWER BRAKE UNIT CHECK VALVE

NOTE: To test check valve before removal, stop engine, and apply service brake to ensure air flows only toward intake manifold.

Removal & Installation

Loosen hose clamps, and remove check valve. Before installation, coat both ends of check valve with sealant, and install valve with arrow (identification mark) pointing toward intake manifold. Install check valve clamp, and secure hose clamps.

POWER BRAKE UNIT

Removal

Remove brake master cylinder. Disconnect vacuum hose from power brake unit. Disconnect clevis pin attaching brake pedal to power brake unit push rod. From inside vehicle, remove 4 nuts attaching power brake unit to firewall. Remove power brake unit.

Installation

To install, reverse removal procedure. Install master cylinder. Bleed brake system if necessary.

REAR AXLE BEARINGS & OIL SEAL

Removal (Montero)

1) With drum removed, disconnect brake line from wheel cylinder. Disconnect bearing case from axle housing end. Remove brake backing plate, bearing case and axle shaft as an assembly. If axle shaft binds, use slide hammer with puller to remove.

2) Remove "O" ring and shims for preloading wheel bearing (if equipped). Retain shims for reassembly. To remove oil seal, use slide hammer and hook.

3) To remove wheel bearing, straighten lock washer tabs. See Fig. 9. Remove lock nut using spanner wrench. Remove lock washer. Install lock nut 3 turns on axle shaft. Install Puller (MB990787-01) to remove axle shaft from bearing case. Rotate nuts with equal force to remove axle shaft. Remove bearing outer race using a hammer and drift.

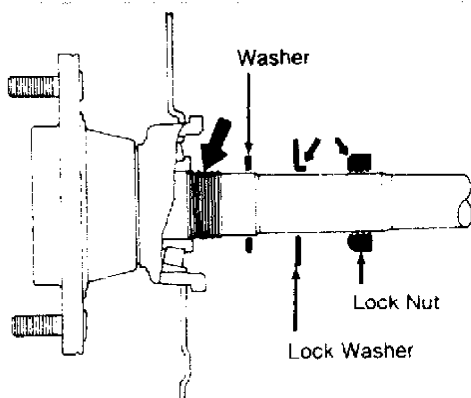


Fig. 9: Removing Rear Axle Bearing (Montero)
Courtesy of Mitsubishi Motor Sales of America.

Installation

1) Apply Multipurpose Grease (SAE J310) to oil seal. Install

oil seal using seal driver. Apply grease to outside circumference of bearing outer race. Apply grease to lip of oil seal and to roller surfaces of bearing inner race.

2) Press bearing onto axle shaft. Install rear brake assembly and bearing case. Pack bearing case and axle threads with grease. Install lock washer (tab aligned with axle slot) and lock nut (chamfer toward lock washer). Tighten lock nut to 130-159 ft. lbs. (176-216 N.m).

3) Bend tabs on lock washer into slots of lock nut. Apply grease to oil seal area of rear axle housing. Adjust clearance between bearing case and rear axle by inserting .04" (1.0 mm) shim and "O" ring into left rear axle housing.

4) Apply semi-drying sealant to mating surface of bearing case. Install left axle shaft into rear housing. Tighten nuts diagonally to 36-43 ft. lbs. (49-58 N.m).

5) Install right axle shaft without shims and "O" ring. Temporarily tighten to about 53 INCH lbs. (6 N.m). Using a feeler gauge, measure clearance between bearing case and rear axle housing.

6) Remove right axle shaft. Install shims to equal bearing case-to-axle housing clearance plus .002-.008" (.05-.20 mm). Install "O" ring to right rear axle housing. Apply sealant to mating surfaces of bearing case and shim. See Fig. 10.

7) Install axle into housing, tightening nuts diagonally to 36-43 ft. lbs. (50-58 N.m). Check axle shaft for .002-.008" (.05-.20 mm) end play using dial indicator.

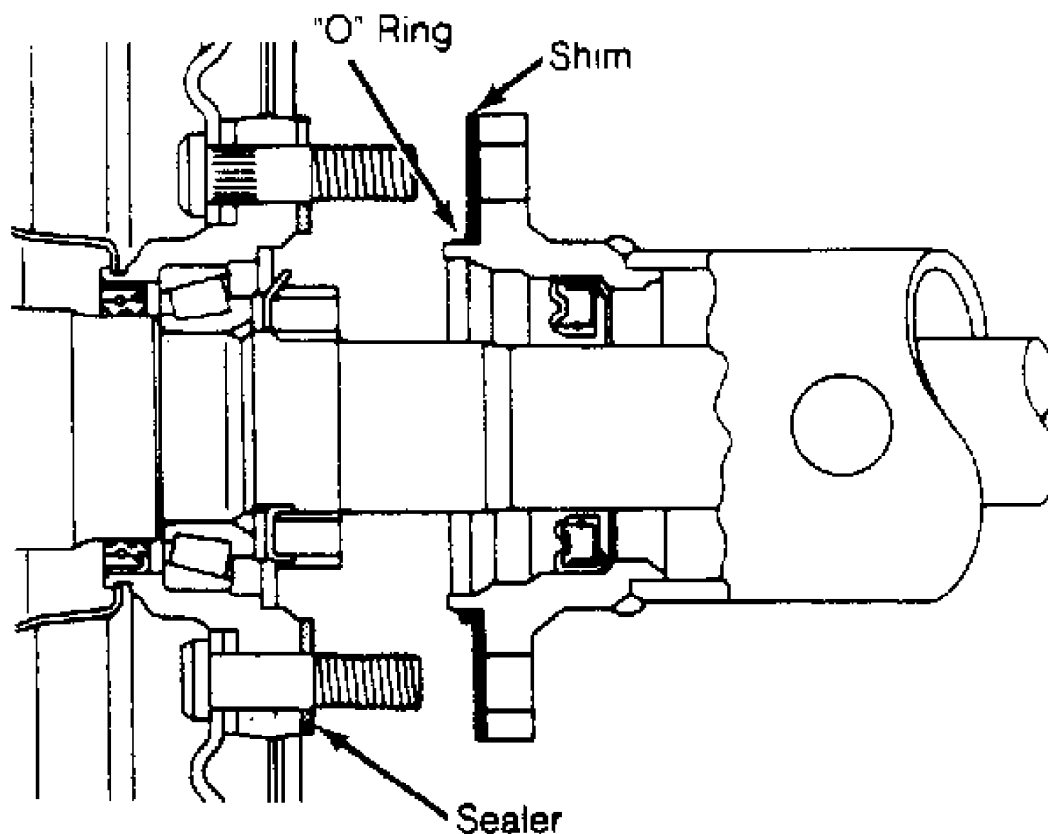


Fig. 10: Applying Sealant (Montero, Pickup & Ram-50)
Courtesy of Mitsubishi Motor Sales of America.

Removal (Pickup & Ram-50)

1) With drum removed, disconnect brake line from wheel

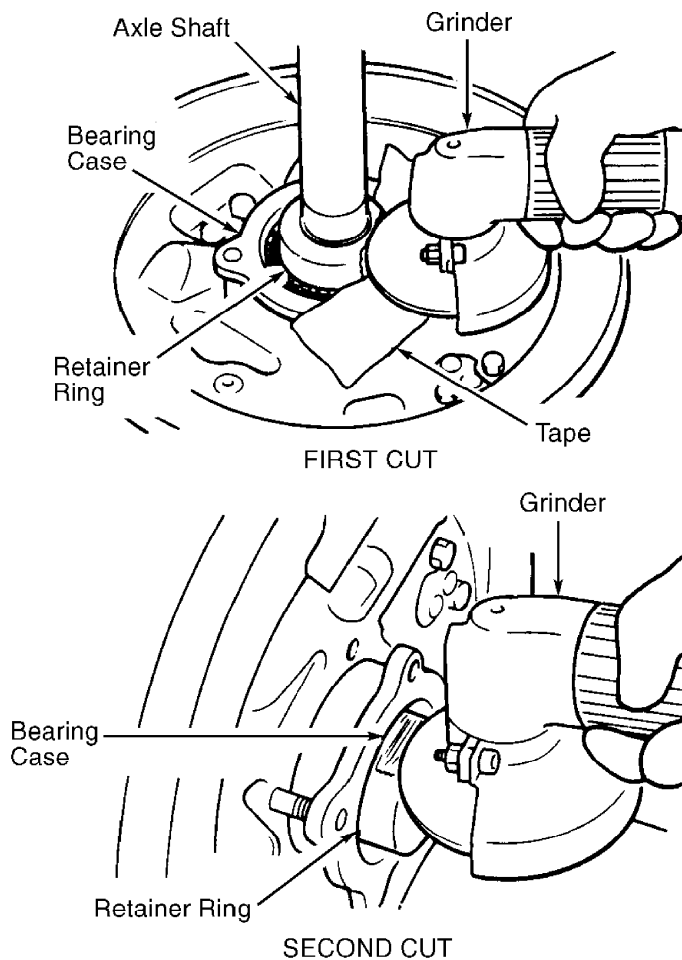
cylinder. Disconnect parking brake cable end, and remove cable attaching bolts. Remove brake backing plate, bearing case and axle shaft as an assembly. If axle shaft binds, use slide hammer with puller to remove.

2) Remove shims, "O" ring and snap ring. Retain shims for reassembly. Secure axle shaft assembly in a vise, and remove one retainer bolt from backing plate. Push bearing case completely to side of dust cover. Place adhesive tape around edge of bearing case at retainer bolt hole to prevent damage.

3) Secure axle shaft, and grind retainer ring until retainer ring wall thickness is .04-.06" (1.0-1.5 mm) on axle shaft side and retainer ring wall thickness is .08" (2.0 mm) on bearing side. See Fig. 11.

CAUTION: DO NOT damage bearing case or axle shaft when grinding or chiseling retainer ring.

4) Change angle of grind, and remove remaining .08" (2.0 mm) of retainer ring wall on bearing side. See Fig. 11. Using a chisel, cut retainer ring, and remove. DO NOT damage axle shaft.



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Fig. 11: Grinding Bearing Retainer Ring (Pickup & Ram-50)
Courtesy of Mitsubishi Motor Sales of America.

5) Install Puller (MB990787-01) to remove bearing case from axle shaft. Rotate nuts with equal force to remove wheel bearing.

Remove bearing outer race using a hammer and drift. Remove oil seal from axle housing using a slide hammer and hook.

Installation

1) Apply Multipurpose Grease (SAE J310) to oil seal. Install oil seal using seal driver. Apply grease to outside circumference of oil seal lip. Install backing plate and bearing case. Apply grease to oil seal.

2) Press new oil seal into bearing case until it is flush with face of bearing case. Apply grease to lip of oil seal and to external surfaces of bearing outer race. Press bearing outer race into bearing case.

3) Apply grease to roller surfaces of bearing inner race. Install rear brake assembly and bearing case. Pack bearing case and axle threads with grease. Install new retainer ring.

4) Adjust clearance between bearing case and rear axle by inserting .04" (1.0 mm) shim and "O" ring into left rear axle housing. Apply semi-drying sealant to mating surface of bearing case. Install left axle shaft into rear housing. Tighten nuts diagonally to 36-43 ft. lbs. (50-58 N.m).

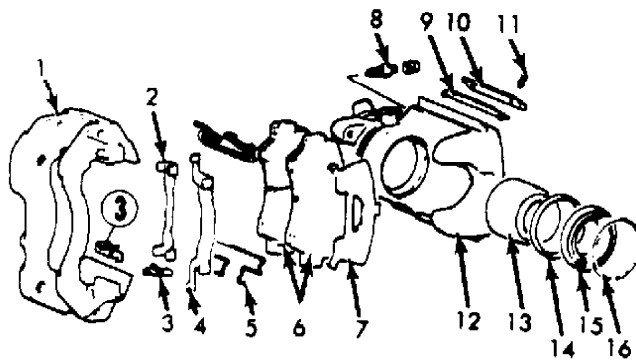
5) Install right axle shaft without shims and "O" ring. Temporarily tighten to about 53 INCH lbs. (6 N.m). Using a feeler gauge, measure clearance between bearing case and rear axle housing.

6) Remove right axle shaft. Install shims to equal bearing case-to-axle housing clearance plus .002-.008" (.05-.20 mm). Install "O" ring to right rear axle housing. Apply sealant to mating surface of bearing case. See Fig. 10.

7) Install axle into housing, tightening nuts diagonally to 36-43 ft. lbs. (49-58 N.m). Check axle shaft for .002-.008" (.05-.20 mm) end play using dial indicator.

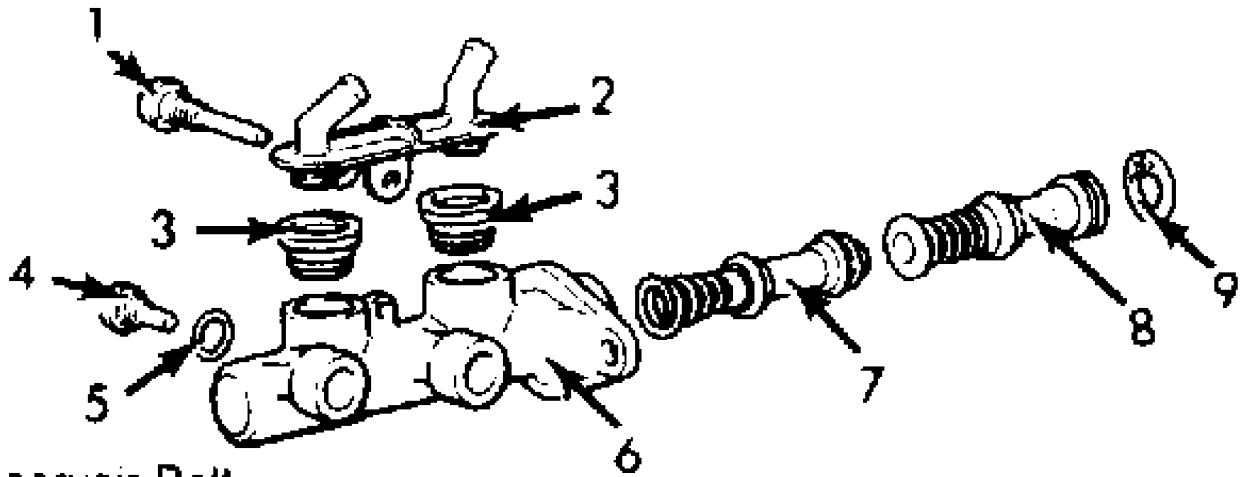
OVERHAUL

NOTE: For exploded views of front disc brake caliper, see Fig. 12.
For exploded view of master cylinder, see Fig. 13.



- | | |
|-----------------------|----------------------|
| 1. Caliper Support | 9. Pad Support Plate |
| 2. Inner Pad Clip | 10. Stopper Plug |
| 3. Pad Clip B | 11. Spigot Pin |
| 4. Outer Pad Clip | 12. Caliper Body |
| 5. Anti Rattle Spring | 13. Piston |
| 6. Brake Pad | 14. Piston Seal |
| 7. Anti Squeak Shim | 15. Dust Boot |
| 8. Bleeder Screw | 16. Boot Ring |

Fig. 12: Exploded View of Front Disc Brake Caliper (Typical)
Courtesy of Mitsubishi Motor Sales of America.



- 1. Reservoir Bolt
- 2. Nipple or Reservoir
- 3. Seal
- 4. Stopper Bolt
- 5. Gasket
- 6. Master Cylinder
- 7. Secondary Piston
- 8. Primary Piston
- 9. Snap Ring

Fig. 13: Exploded View of Master Cylinder (Typical)
 Courtesy of Mitsubishi Motor Sales of America.

DISC BRAKE SPECIFICATIONS

DISC BRAKE SPECIFICATIONS TABLE

Application	In. (mm)
Disc Diameter	
Montero	
2.6L	10.2 (259)
3.0L	10.9 (277)
Pickup & Ram-50	
2WD	10.2 (259)
4WD	10.9 (277)
Lateral Runout .....	.006 (.15)
Parallelism	(1)
Original Thickness .....	.87 (22)
Master Cylinder Diameter .....	.938 (23.83)
Minimum Refinish Thickness .....	.80 (20.4)
Discard Thickness .....	.78 (19.8)

(1) - Information is not available.

DRUM BRAKE SPECIFICATIONS

DRUM BRAKE SPECIFICATIONS TABLE

Application	In. (mm)
Drum Diameter	10.0 (254)
Drum Width	(1)
Master Cylinder Diameter .....	.938 (23.83)

Maximum Refinish Diameter	10.1	(257)
Wheel Cylinder Diameter		
Montero .....	.875	(22.22)
Pickup & Ram-50		
2WD .....	.937	(23.80)
4WD .....	.875	(22.22)
Discard Diameter	10.12	(257.0)

(1) - Information is not available.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)	
Caliper Guide or Lock Pin Bolt		
Guide Pin Bolt	29-36	(40-49)
Lock Pin Bolt	23-30	(31-41)
Caliper Mounting Bolts	58-72	(79-98)
Front Wheel Bearing Nut		(1)
Rotor-To-Hub Bolts Or Nuts		
Pickup (2WD)	34-38	(46-52)
All Others	36-43	(49-58)
	INCH Lbs. (N.m)	
Master Cylinder-To-Power Brake Unit Nut	72-108	(8-12)

(1) - See FRONT BRAKE ROTOR under REMOVAL & INSTALLATION.
