BRAKE SYSTEM

1993 Mitsubishi Montero

1993 BRAKES
Mitsubishi- Brake System

Montero

INTRODUCTION

This article contains information on repair and service of basic hydraulic brake system. If vehicle is equipped with anti-lock brakes, also see ANTI-LOCK BRAKE SYSTEM article in the BRAKES section.

DESCRIPTION

Brake system consists of a master cylinder, vacuum power brake unit, proportioning valve and self-adjusting assembly. Montero has a Load-Sensing Proportioning Valve (LSPV) and is equipped with front disc brakes and either rear disc or drum brakes. Parking brake assembly activates rear brakes.

BLEEDING BRAKE SYSTEM

BLEEDING PROCEDURES

Bleed brakes whenever hydraulic lines are opened or pedal feels spongy. Bleed system in appropriate sequence. See BRAKE LINE BLEEDING SEQUENCE table.

BRAKE LINE BLEEDING SEQUENCE TABLE

Application	Sequence
Montero	RR, LR, LSPV, RF, LF

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, with pedal released, is within specification. 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. Free play distance is .12-.31" (3.0-7.9 mm). If distance is not within specification, bleed system and check for misadjusted brakes.

BRAKE PEDAL SPECIFICATIONS TABLE

Application	Pedal Height In. (mm)

Montero	7.3-7.7 (185-196)

LOAD-SENSING PROPORTIONING VALVE (LSPV)

Park vehicle on level surface. Remove excess weight from vehicle. Ensure lever is not against stopper bolt. Check spring length. If spring length is not within specification, adjust cable or support until correct length is obtained. See LOAD-SENSING SPRING LENGTH table. See Fig. 1.

LOAD-SENSING SPRING LENGTH TABLE

Application	In. (mm)
Montero	8.8-9.0 (224-229)

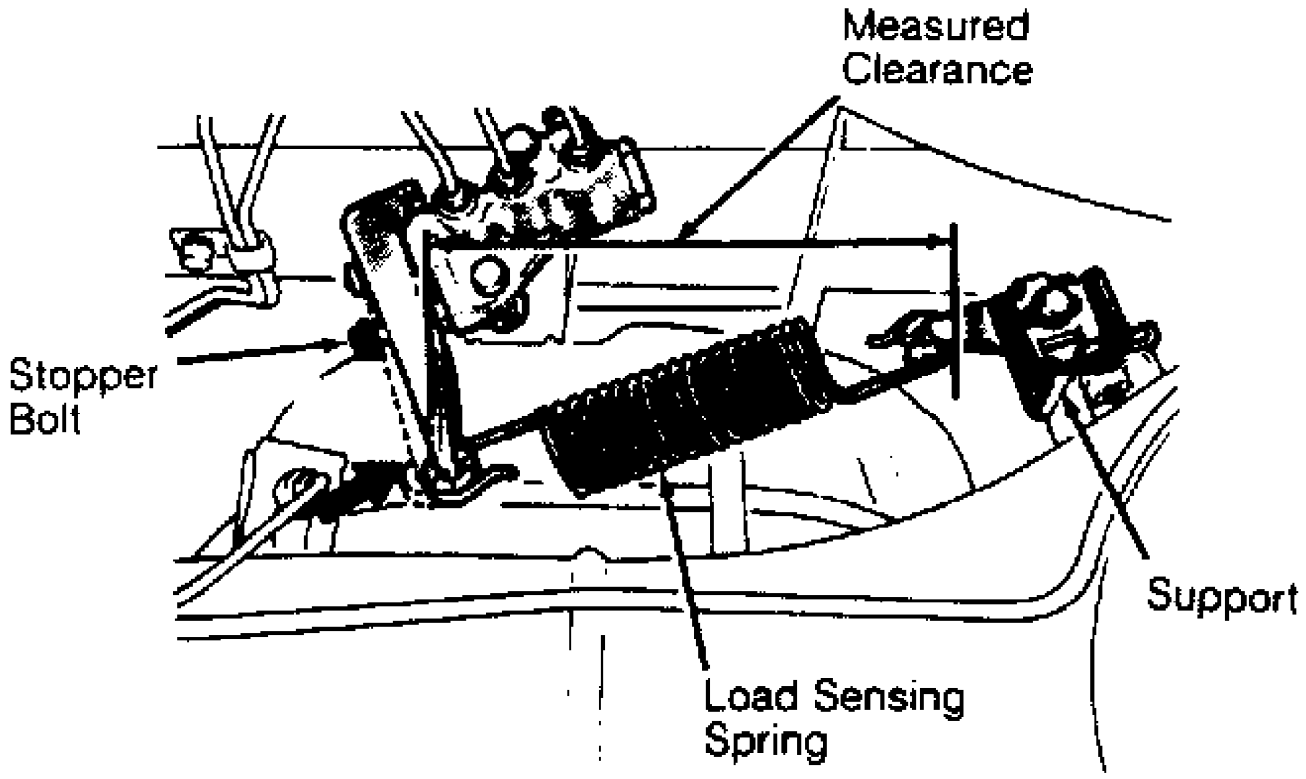


Fig. 1: Adjusting Load-Sensing Proportioning Valve Spring
Courtesy of Mitsubishi Motor Sales of America.

MASTER CYLINDER PUSH ROD

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

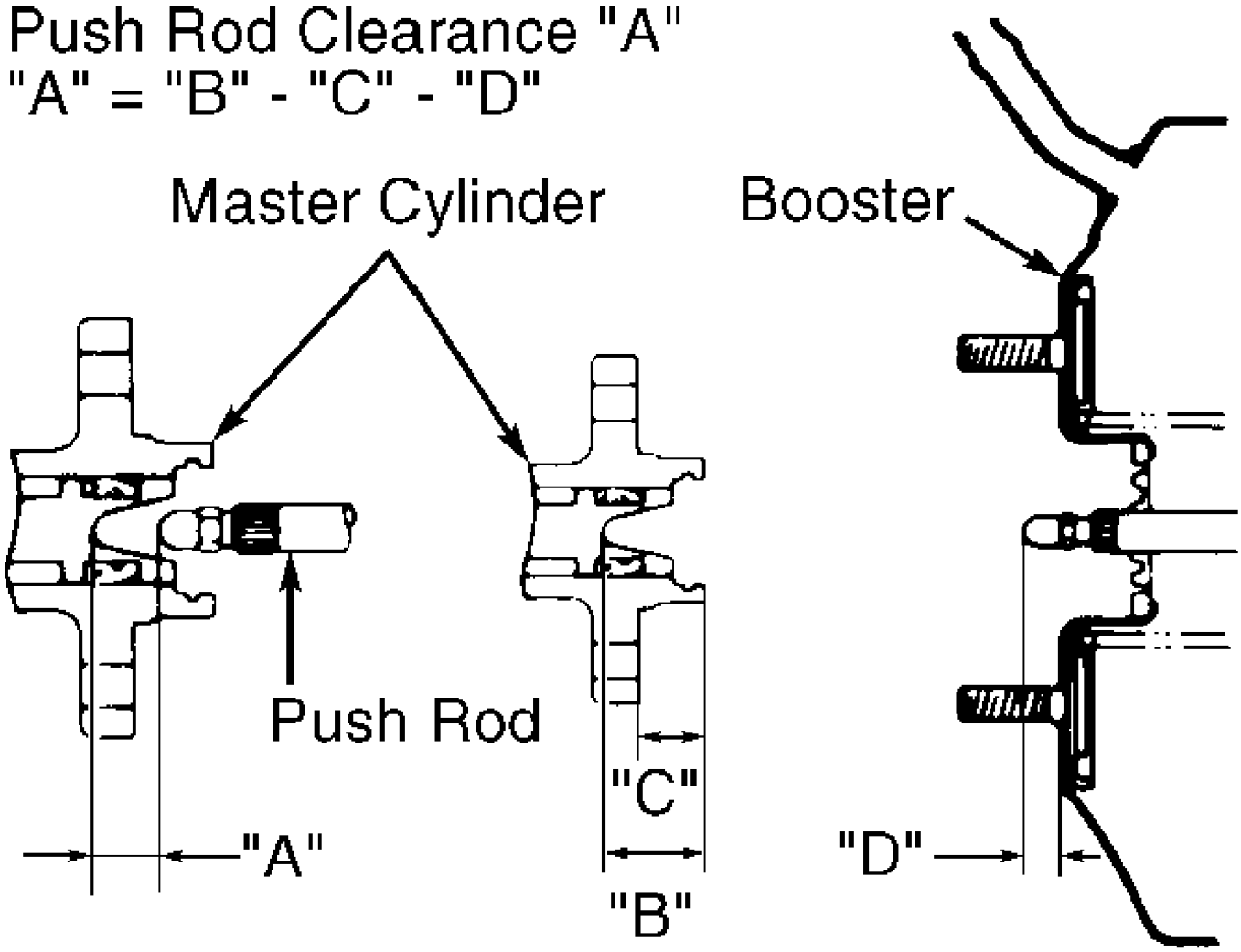


Fig. 2: Adjusting Push Rod Clearance
Courtesy of Mitsubishi Motor Sales of America.

PUSH ROD CLEARANCE SPECIFICATIONS TABLE

Application (1)	In. (mm)
Montero	.026-.035 (0.66-0.89)

(1) - Front half-shell is smaller than rear half-shell on models using boosters with 2 diameters.

PARKING/EMERGENCY BRAKE

NOTE: Adjust service brake before adjusting parking brake.

Except Pickup & Ram-50

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

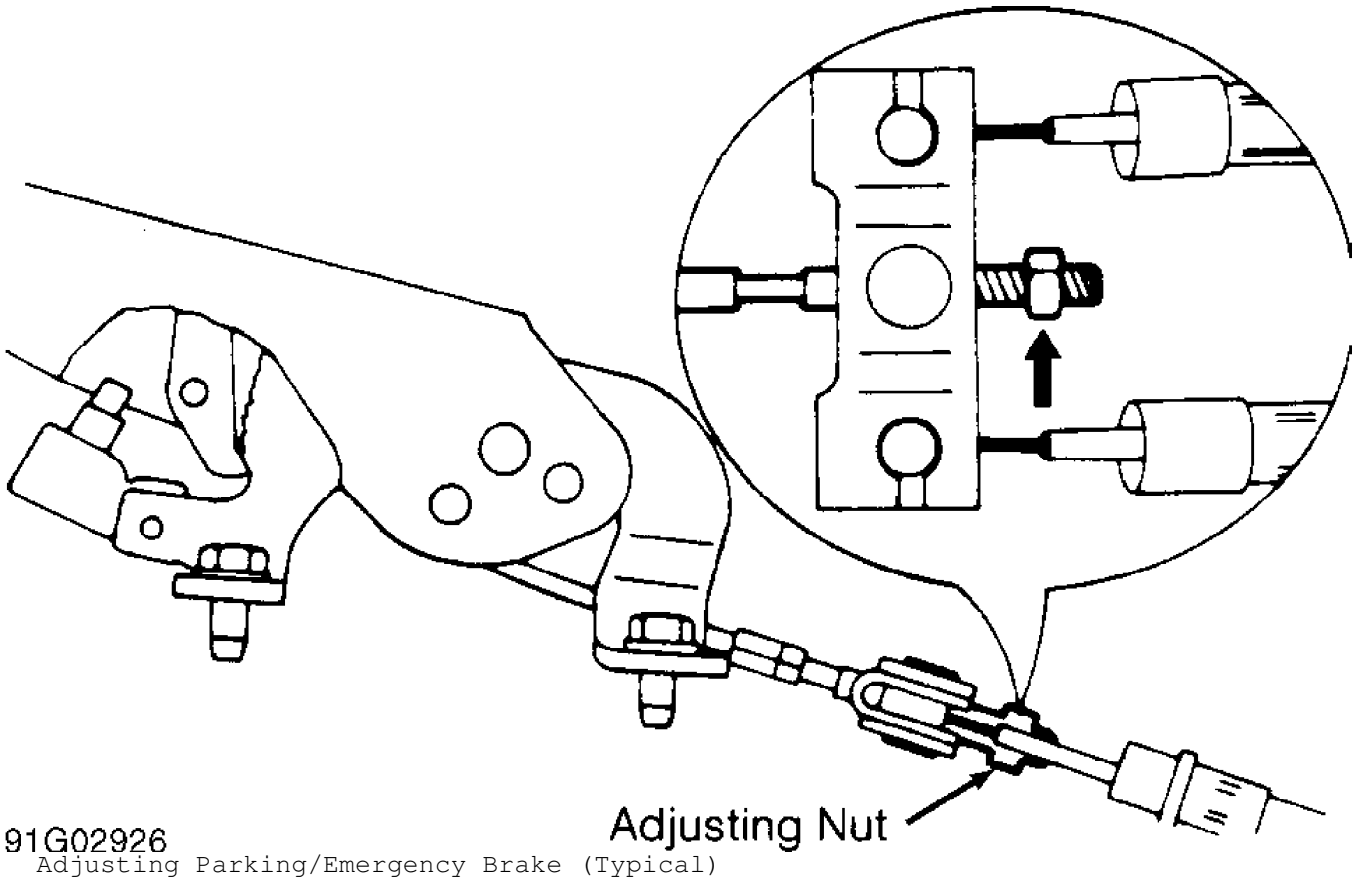


Fig. 3: Adjusting Parking/Emergency Brake (Typical)
Courtesy of Mitsubishi Motor Sales of America.

REAR BRAKE SHOES

To facilitate adjustment of brake shoe clearance, set adjustment assembly so brake shoes lightly contact brake drum. With brake drum installed, fully release parking brake and depress brake pedal several times to center shoes and adjust brake shoe clearance. Adjust parking brake, 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" (0.5-1.0 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. Using a vacuum pump, ensure airflow is in direction of intake manifold only.

System Check

1) Run engine for 2 minutes. Shut engine off, and 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 pedal 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. 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)

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, ensure LSPV spring length is within specification. See Fig. 1. See LOAD-SENSING PROPORTIONING VALVE (LSPV) under ADJUSTMENTS.

2) After spring length is determined to be within specification, connect pressure gauges to input and output ports of LSPV. See Fig. 4. Bleed brake system. See BLEEDING BRAKE SYSTEM.

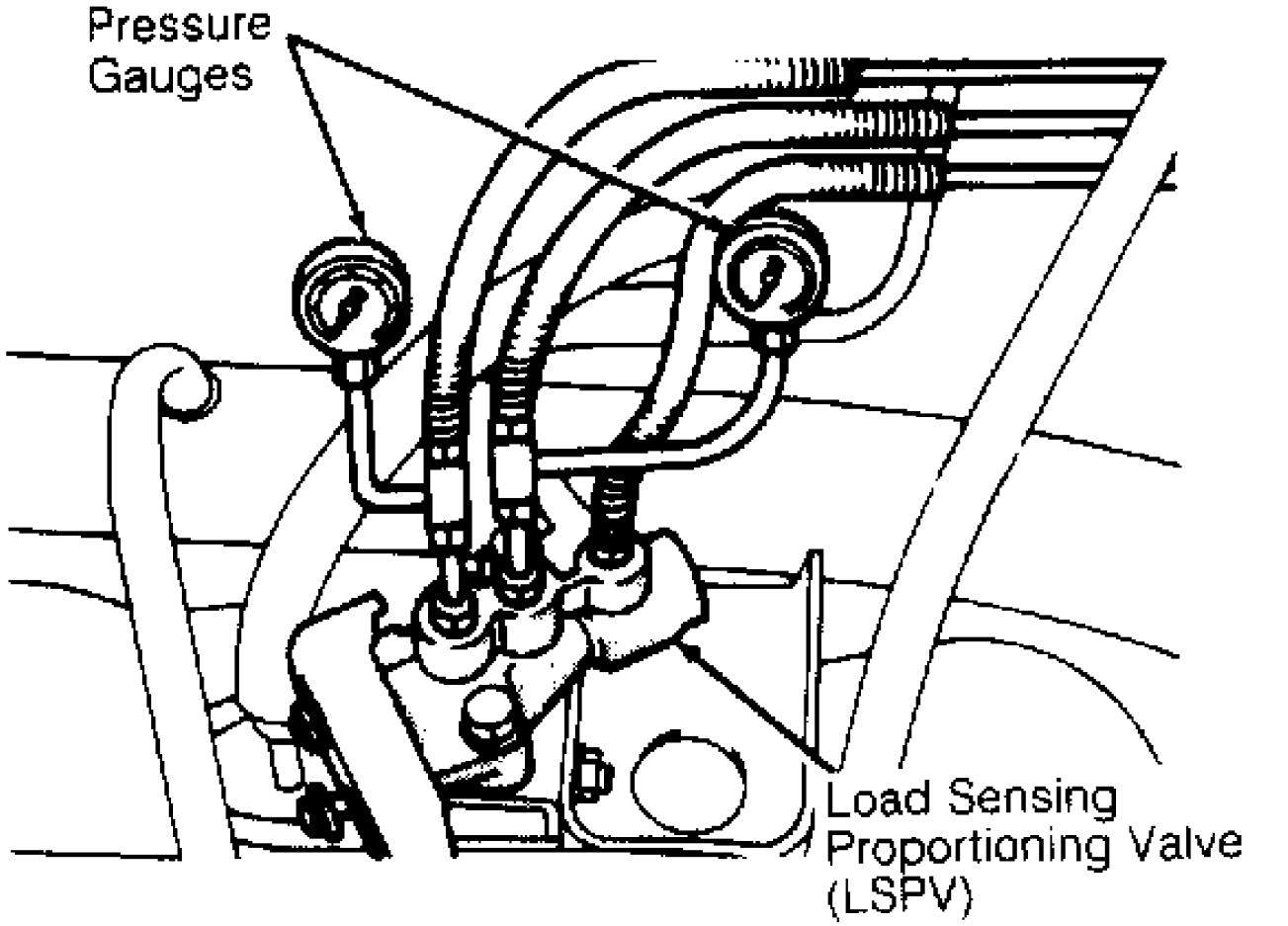


Fig. 4: Connecting Pressure Gauges To LSPV
Courtesy of Mitsubishi Motor Sales of America.

3) Disconnect spring at support and pull spring and lever toward support until spring length is 8.9" (226 mm). See Fig. 1.

Without depressing brake pedal, check readings on pressure gauges. See LSPV PRESSURE SPECIFICATIONS table. Push lever away from support until spring length is 10.1" (257 mm). Without depressing brake pedal, check readings on pressure gauges. If fluid pressure is not within specification, replace LSPV assembly.

4) Slowly depress brake pedal. Check readings on pressure gauges. See LSPV PRESSURE SPECIFICATIONS table. If fluid pressure is not within specification, replace LSPV assembly.

LSPV PRESSURE SPECIFICATIONS TABLE

Application	Inlet Pressure psi (kg/cm²)	Outlet Pressure psi (kg/cm²)
LSPV Spring Pulled		
Test 1	1422 (100)	873-1002 (61-70)
Test 2	2560 (180)	1129-1314 (79-92)
LSPV Lever Pushed	2560 (180)	(1) 1863-2148 (131-151)

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

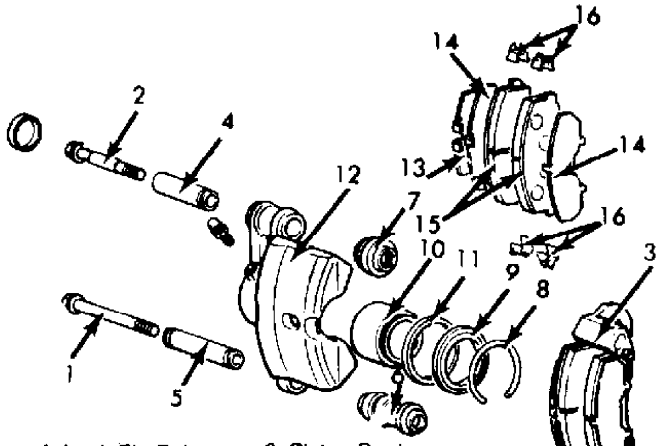
REMOVAL & INSTALLATION

FRONT DISC 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. 5. Lift caliper body upward.



1. Lock Pin Bolt
2. Guide Pin Bolt
3. Support
4. Sleeve
5. Sleeve
6. Boot
7. Boot
8. Ring
9. Piston Boot
10. Piston
11. Seal
12. Caliper
13. Inner Shim
14. Outer Shim
15. Pad
16. Clip

Fig. 5: Exploded View Of Front Disc Brake Assembly (Typical Single Piston)
Courtesy of Mitsubishi Motor Sales of America.

2) Support caliper aside. 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. Start engine. Depress brake pedal several times to expand caliper piston. Check brake fluid level.

FRONT BRAKE CALIPER

Removal

1) Raise and support vehicle. Remove front wheel(s). Separate rubber flexhose 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 TORQUE SPECIFICATIONS. Bleed brake system. See BLEEDING BRAKE SYSTEM.

FRONT BRAKE ROTOR

Removal

Raise and support vehicle. Remove and support brake calipers. Remove drive hub cover. Remove snap ring, shim and hub from drive axle. See Fig. 6. Remove lock washer. Remove lock nut using Lock Nut Wrench (MB990954). Remove front hub assembly.

Installation

1) Install front hub assembly. Install lock nut, and tighten it to 119 ft. lbs. (165 N.m). Loosen lock nut, and retighten it to 18 ft. lbs. (24 N.m). Loosen lock nut 30-40 degrees. Reverse removal procedure for remaining components.

2) After installation is complete, check drive axle-to-hub clearance. Using feeler gauge, clearance should be .016-.028" (.4-.7 mm). Use appropriate shim to obtain correct clearance. Shim is located behind snap ring on end of drive axle. Install shim, and recheck clearance.

PARKING BRAKE SHOES

Removal

1) Raise and support vehicle. Remove rear wheel(s). Disconnect rear speed sensor. Remove rear disc brake calipers and rotors. See Fig. 6.

2) Remove rear hub/bearing assembly. Remove adjusting wheel spring. Remove shoe hold-down cup, spring and pin. Note how shoe-to-anchor spring is installed, and then remove adjuster and shoe-to-anchor spring. Remove strut and return spring. Remove clip and shoe and lining assembly.

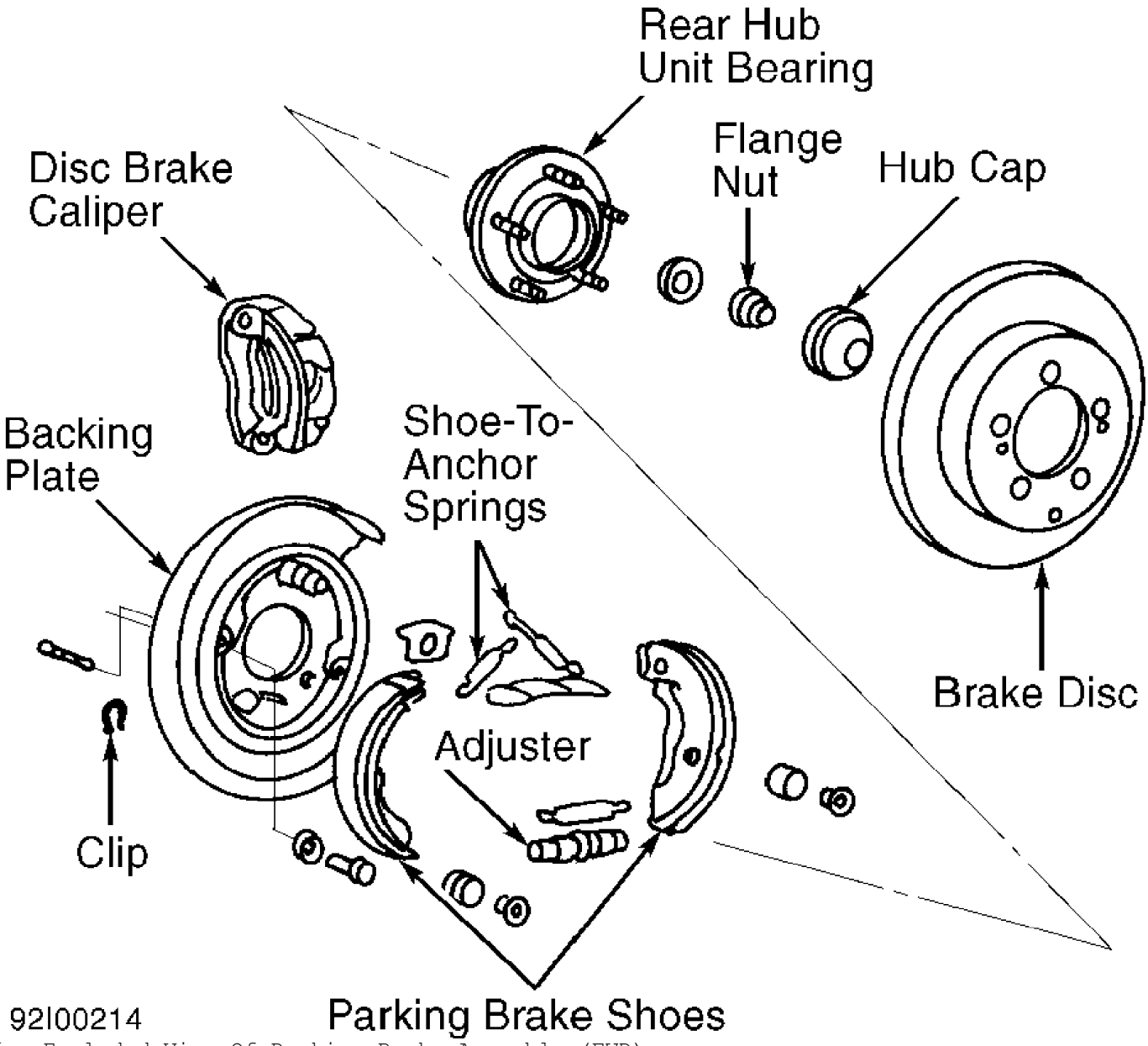


Fig. 6: Exploded View Of Parking Brake Assembly (FWD)
Courtesy of Mitsubishi Motor Sales of America.

CAUTION: Shoe-to-anchor spring must be installed correctly for proper functioning of parking brakes.

Installation

1) To install, reverse removal procedure. When installing shoe-to-anchor spring, ensure spring is installed correctly. When installing adjuster, install left adjuster with adjusting bolt facing vehicle front and right adjuster with adjusting bolt facing vehicle rear.

2) After installing speed sensor, ensure gap between rotor teeth and sensor pole piece is .008-.028" (0.20-0.71 mm).

REAR DISC BRAKE PADS

NOTE: Replace inner and outer pads at same time.

Removal

Raise and support vehicle. Remove rear wheel(s), and disconnect parking brake cable. Remove lower lock pin bolt. Lift caliper body upward. Using a wire, support caliper from underbody. Remove inner shim(s), anti-squeak shim and pad assembly from support mounting. Remove pad clips.

Installation

Rotate piston to align notches in piston projection on back of pads (if equipped). Install retaining clips, pad assembly, inner shim(s) and anti-squeak shim onto support mounting. Lower caliper body, and install lock pin.

REAR BRAKE CALIPER

Removal

Raise and support vehicle. Remove rear wheel(s). Disconnect parking brake cable connection. Disconnect brake hose from caliper. Secure end of hydraulic line to prevent spillage of brake fluid. Remove upper and lower caliper mounting bolts. Lift caliper body upward. Remove caliper.

Installation

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

REAR BRAKE ROTOR

Removal & Installation

Raise and support vehicle. Remove rear caliper and rotor. To install, reverse removal procedure.

WHEEL CYLINDERS

Removal & Installation

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

MASTER CYLINDER

Removal

Drain brake fluid from master cylinder. Remove sensor connector (if equipped). Disconnect brakelines 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. See MASTER CYLINDER PUSH ROD under ADJUSTMENTS. After installation, adjust pedal height. See BRAKE PEDAL HEIGHT & FREE PLAY under ADJUSTMENTS. Bleed brake system.

POWER BRAKE UNIT

Removal

Remove brake master cylinder. See 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.

POWER BRAKE UNIT CHECK VALVE

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

Removal & Installation

Remove vacuum hose with check valve from power brake unit. Coat end(s) of check valve with sealant before installation. Install valve with arrow (identification mark) pointing toward intake manifold.

REAR AXLE BEARINGS & OIL SEAL

Removal

1) With disc or drum removed, disconnect brakeline 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 and puller to remove.

2) Remove shims, "O" ring and snap ring. Retain shims for installation. 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.

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

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 .08" (2.0 mm) on bearing side. See Fig. 7.

4) Change angle of grind, and remove remaining .08" (2.0 mm) of retainer ring wall on bearing side. See Fig. 7. Using a chisel, cut retainer ring. Remove ring. DO NOT damage axle shaft.

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.

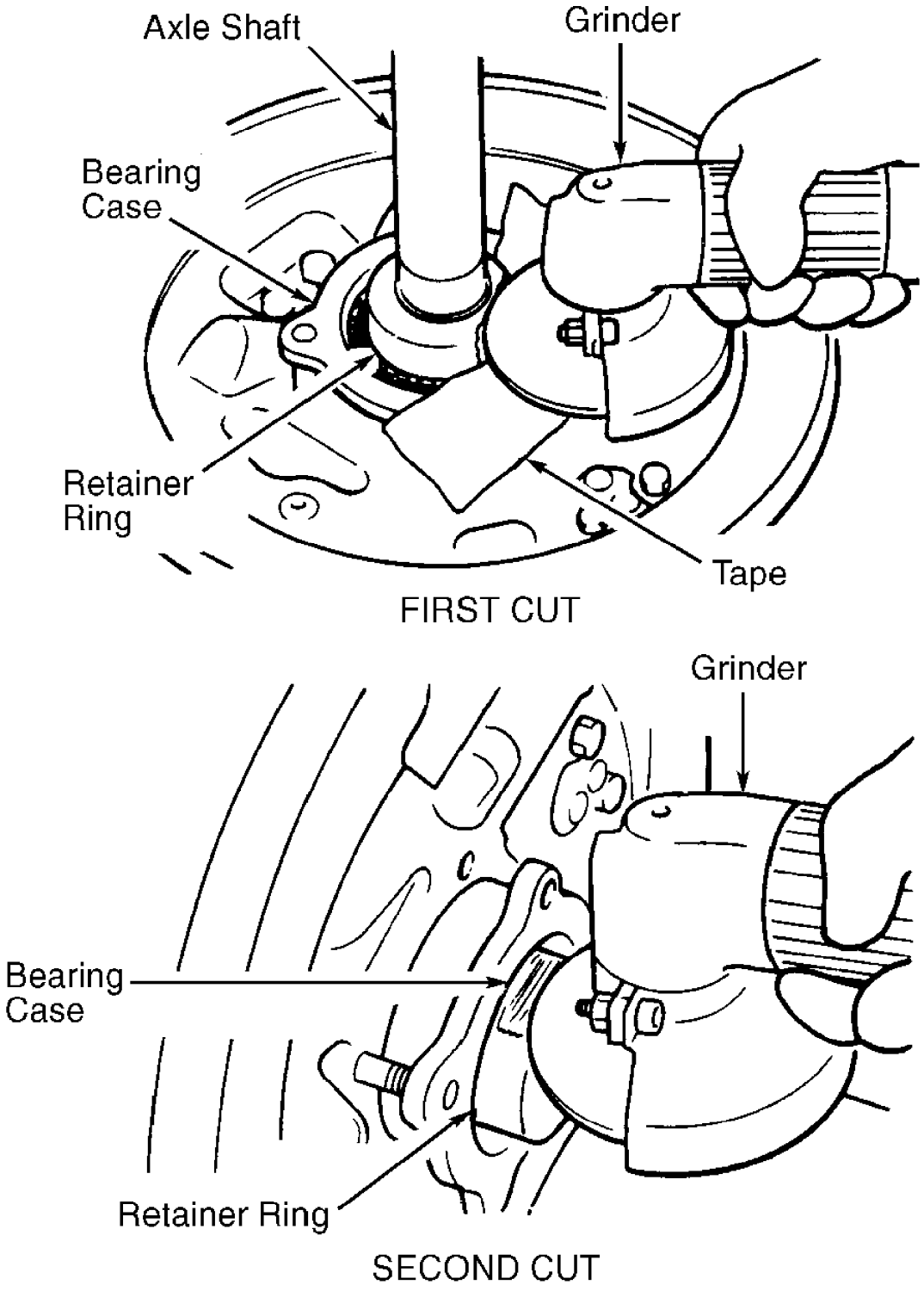


Fig. 7: Grinding Bearing Retainer Ring
Courtesy of Mitsubishi Motor Sales of America.

Installation
1) Apply Multipurpose Grease (SAE J310) to oil seal, oil seal

cavity and contact surfaces. Install oil seal using seal driver. Press new oil seal into bearing case until it is flush with face of bearing case. Install backing plate and bearing case.

2) Apply grease to external surfaces of bearing outer race. Press bearing outer race into bearing case. Install rear brake assembly and bearing case. Pack bearing case and axle threads with grease. Install new retainer ring and snap ring.

3) Using a feeler gauge, measure clearance between snap ring and new retainer ring. Clearance should be less than .0065" (.166 mm). If clearance exceeds specification, install a new snap ring to bring clearance to specification. See SNAP RING THICKNESS SPECIFICATION table.

SNAP RING THICKNESS SPECIFICATION TABLE

Thickness In. (mm)	Color
.060 (1.52)	Red
.067 (1.70)	Purple
.073 (1.85)	Blue
.079 (2.01)	Yellow
.085 (2.16)	Neutral

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, and tighten nuts diagonally to 36-43 ft. lbs. (49-58 N.m).

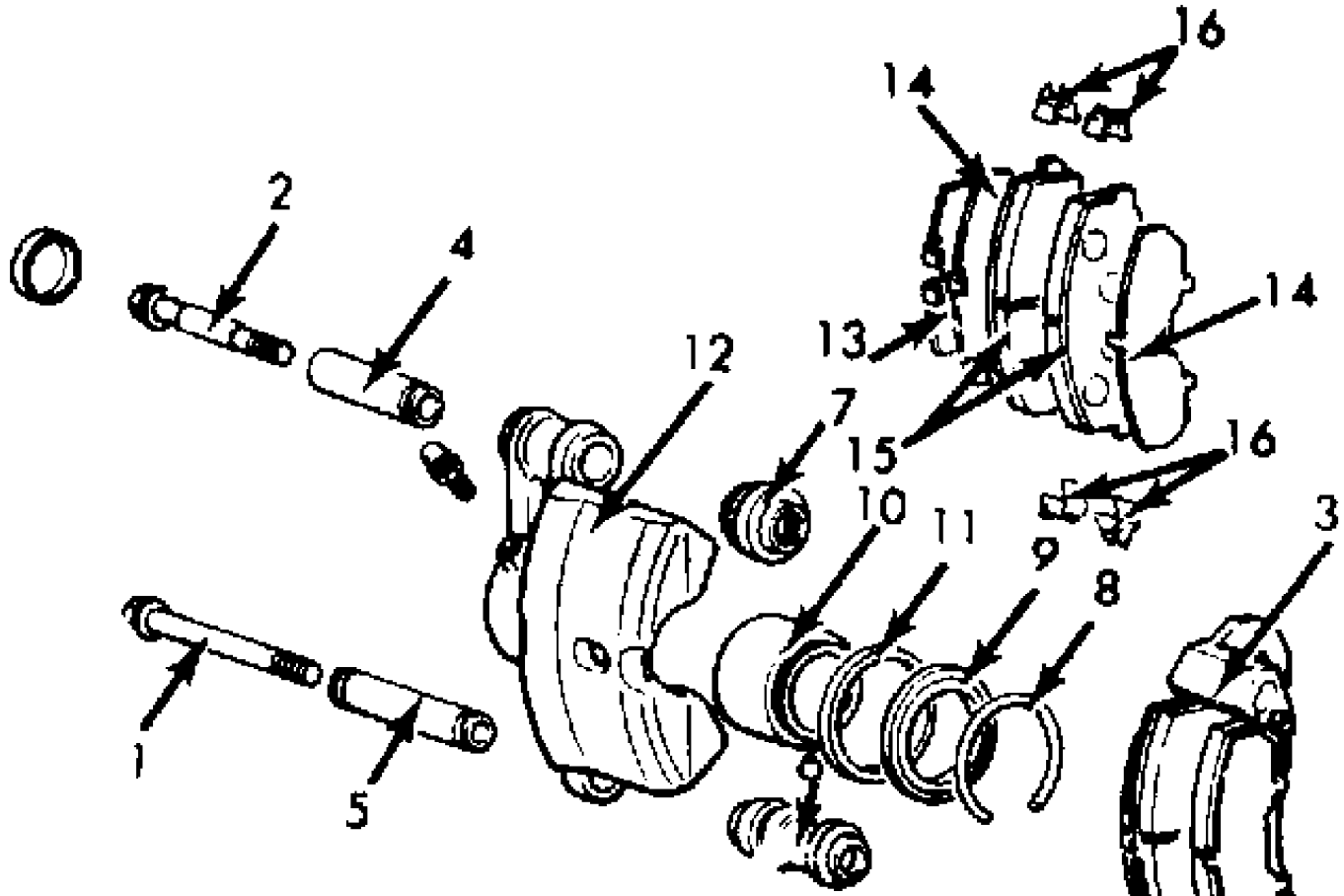
5) Install right axle shaft without shims and "O" ring. Temporarily tighten axle shaft nuts to about 53 INCH lbs. (6 N.m). Using a feeler gauge, measure clearance between bearing case and rear axle housing.

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.

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. If end play is not within specification, change shims to obtain correct end play. To install remaining components, reverse removal procedure. Adjust parking brake, and bleed brake system. See BLEEDING BRAKE SYSTEM.

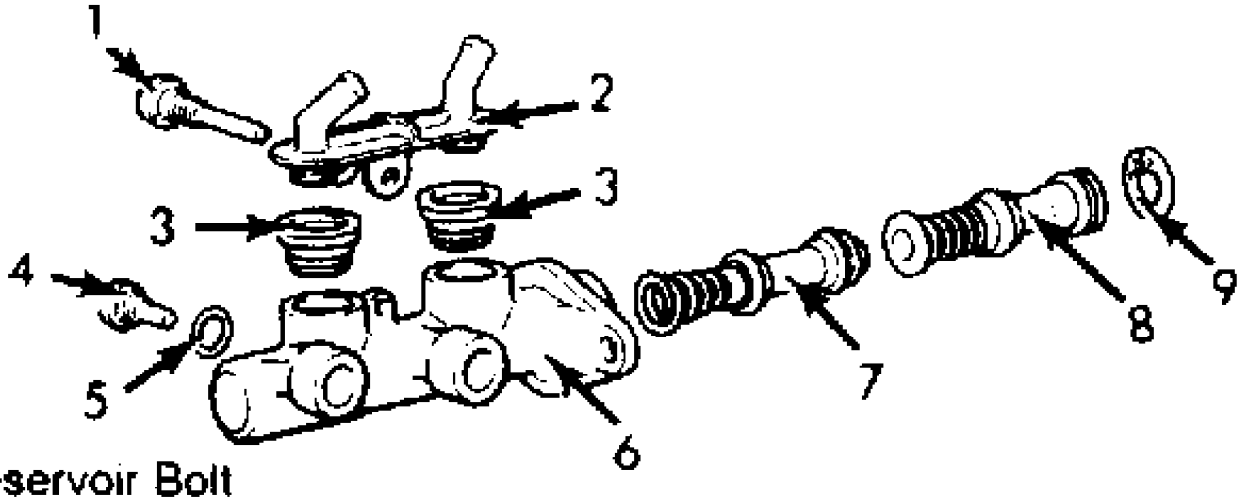
OVERHAUL

NOTE: For exploded views of front disc brake calipers, see Fig. 5
For exploded views of rear brake calipers, see Fig. 9.
For exploded view of master cylinder, see Fig. 8.



1. Lock Pin Bolt
2. Guide Pin Bolt
3. Support
4. Sleeve
5. Sleeve
6. Boot
7. Boot
8. Ring
9. Piston Boot
10. Piston
11. Seal
12. Caliper
13. Inner Shim
14. Outer Shim
15. Pad
16. Clip

Fig. 8: Exploded View Of Front Disc Brake Assembly (Typical Single Piston)
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. 9: Exploded View Of Master Cylinder (Typical)
Courtesy of Mitsubishi Motor Sales of America.

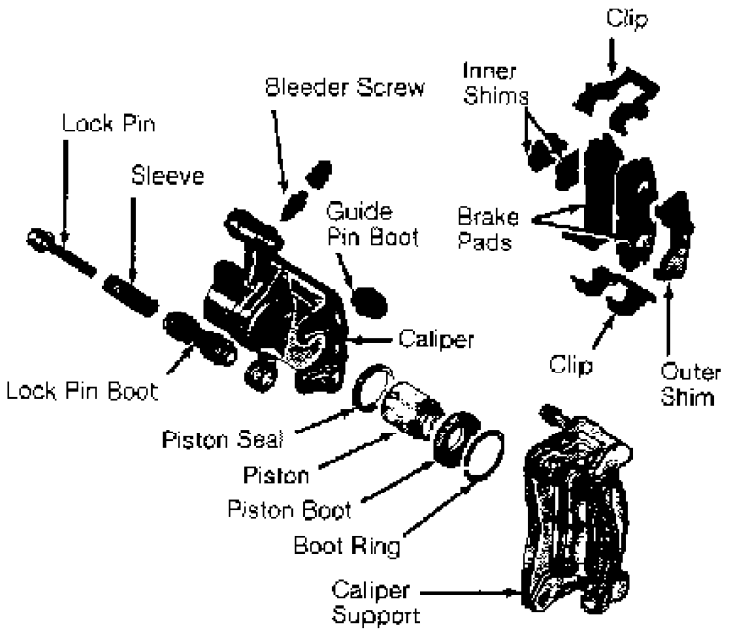


Fig. 10: Exploded View Of Rear Disc Brake Caliper Assembly
Courtesy of Mitsubishi Motor Sales of America.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Caliper Guide Or Lock Pin Bolt	54 (73)
Caliper Mounting Bolts	65 (90)
Front Wheel Bearing Nut	
FWD	144-188 (195-254)
RWD & 4WD	(1)
Locking or Full-Time Hub Bolt	36-43 (49-60)
Rear Wheel Bearing Nut	(1)
Rotor-To-Hub Bolts Or Nuts	36-43 (49-60)
Wheel Lug Nut	72-87 (98-118)
	INCH Lbs. (N.m)
Master Cylinder-To-Power Brake Unit Nut	72-108 (8-12)

(1) - See REAR AXLE HUB BEARINGS or FRONT BRAKE ROTOR under REMOVAL & INSTALLATION.

DISC BRAKE SPECIFICATIONS

DISC BRAKE SPECIFICATIONS TABLE

Application	In. (mm)
Disc Diameter	9.0 (229)
Lateral Runout	.006 (.15)
Parallelism	(1)
Original Thickness	
Front	.94 (24)
Rear	.71 (18)
Master Cylinder Diameter	.938 (23.83)
Minimum Refinish Thickness	
Front	.88 (22.4)
Rear	.65 (16.5)
Discard Thickness	(1)

(1) - Information is not available from manufacturer.

DRUM BRAKE SPECIFICATIONS

DRUM BRAKE SPECIFICATIONS TABLE

Application	In. (mm)
Drum Width	(1)
Master Cylinder Diameter	(2)
Drum Discard Diameter	(1)

(1) - Information is not available from manufacturer.
(2) - See DISC BRAKE SPECIFICATIONS table under DISC BRAKE SPECIFICATIONS.