# DIFFERENTIAL & AXLE SHAFTS - FRONT

1993 Mitsubishi Montero

1993 Drive Axles - Differentials & Axle Shafts - Front

Ram-50 4WD, Montero, Pickup 4WD

## DESCRIPTION & OPERATION

Front axle assembly consists of differential carrier, housing tube, inner shaft and drive axles. See Fig. 1. A full-floating axle design is used. Drive axles are flexible assemblies made up of inner and outer CV joints. Birfield Joints (BJ) and Double Offset Joints (DOJ) are used at opposite ends of each drive axle.

## AXLE RATIO & IDENTIFICATION

AXLE RATIO SPECIFICATIONS TABLE

| Application | Ratio |
|---|---|
| Montero | |
| LT31X10.50R15 Tire | 4.88:1 |
| P235/75R15 Tire | 4.63:1 |
| Pickup & Ram-50 | 4.22:1 |

## LUBRICATION

### CAPACITY

DIFFERENTIAL FLUID CAPACITY TABLE

| Application | Specification |
|---|---|
| Montero | 2.6 Pts. (1.2L) |
| Pickup & Ram-50 | 2.3 Pts. (1.1L) |

### FLUID TYPE

All models use fluid type SAE 80W-90/API GL-5.

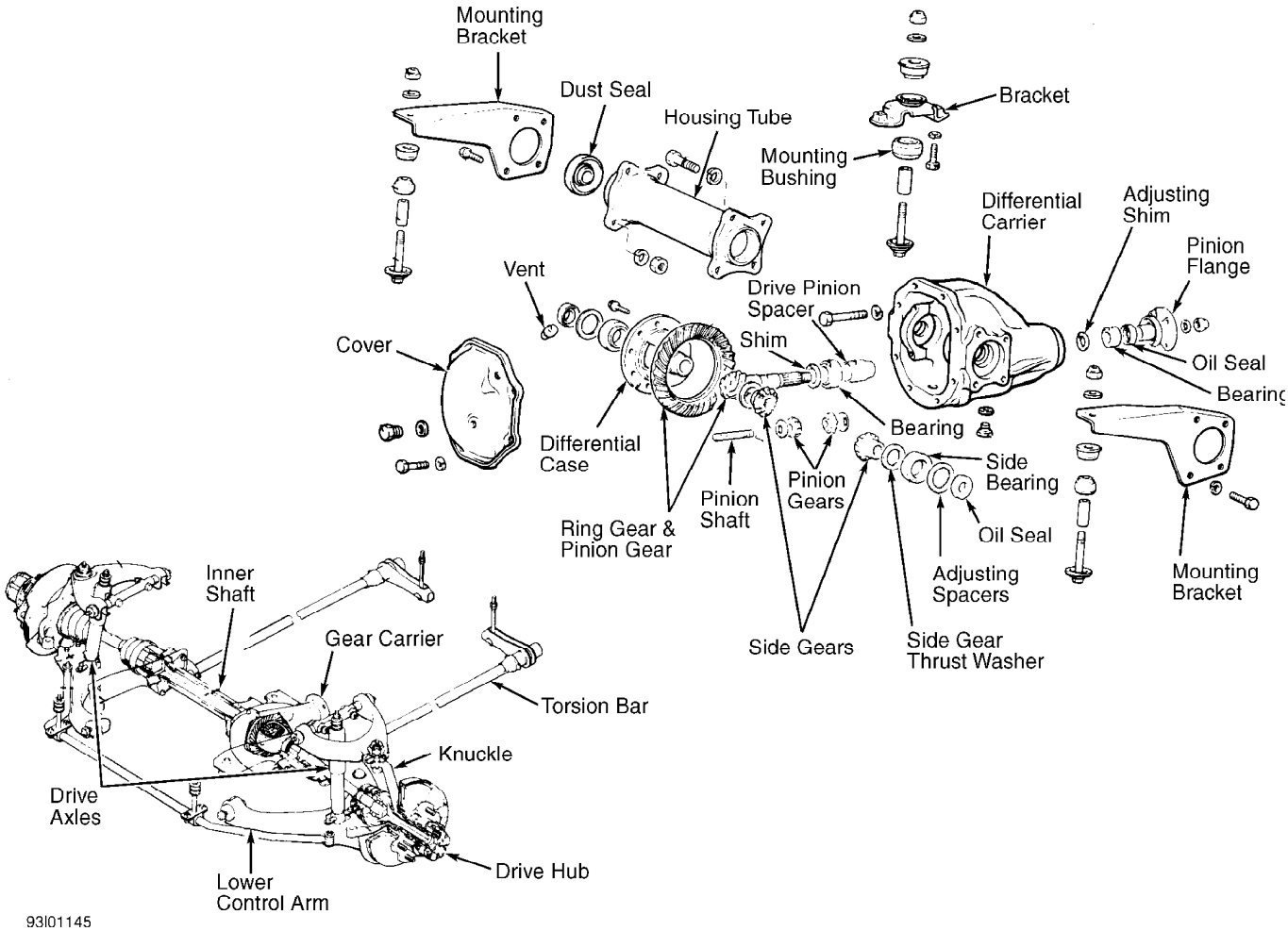



Fig. 1: View Of Front Differential Assembly & Suspension Components
Courtesy of Mitsubishi Motor Sales of America.

## TROUBLE SHOOTING

See TROUBLE SHOOTING - BASIC PROCEDURES article in GENERAL INFORMATION section.

## REMOVAL & INSTALLATION

### DRIVE AXLES

Removal

1) Raise and support vehicle. Remove wheels and undercover. Ensure hub is in free-wheeling position. Place transfer case in 2H position. Remove drive hub cover, snap ring and shim from drive axle. See Fig. 2. Remove brake calipers and support aside.

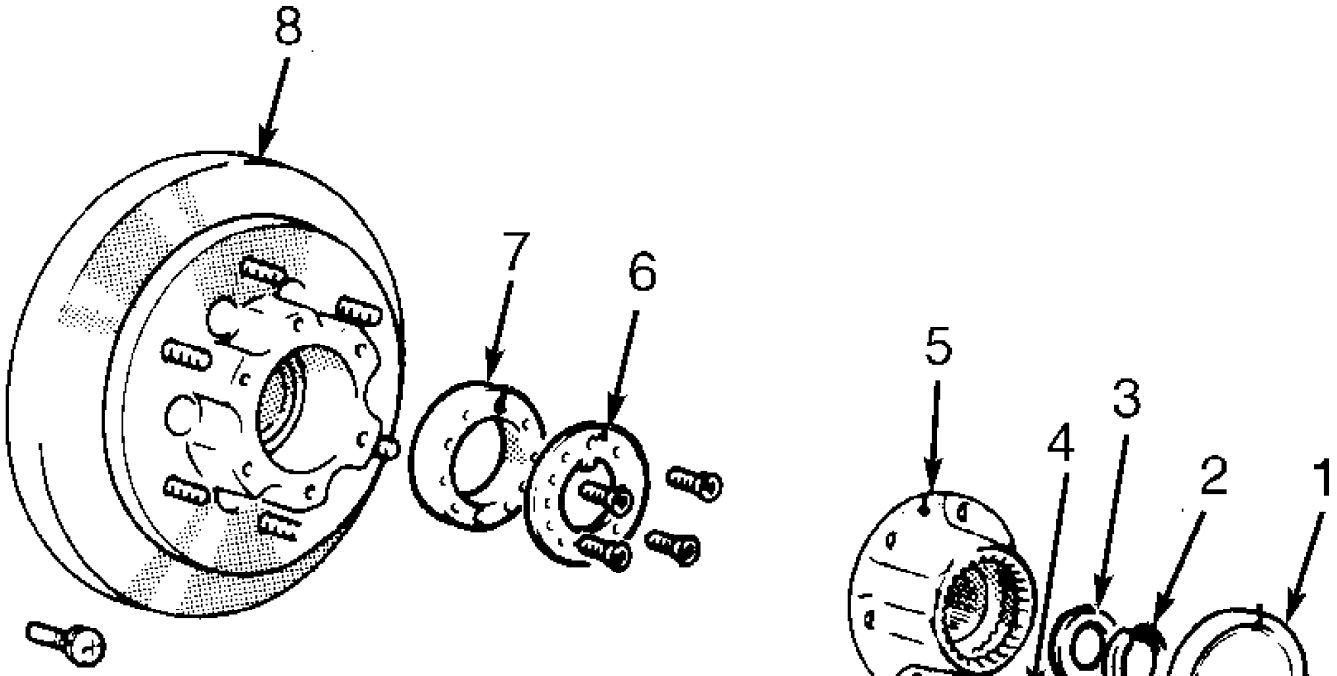
2) Disconnect tie rod assembly. Support lower control arm with jack. Separate ball joints from knuckle. Remove knuckle and front hub assembly. Using flat-blade pry bar, carefully remove left drive axle from differential carrier. DO NOT damage oil seal. On right drive axle, remove drive axle-to-inner shaft flange retaining bolts. Remove right drive axle.

CAUTION: Replace circlips on BJ/DOJ splined shaft end.

Installation

1) Install right drive axle on inner shaft flange. Install new circlip on DOJ side of left drive axle. Carefully install left drive axle into differential. DO NOT damage oil seal.

2) Reinstall knuckle with front hub assembly. To complete installation, reverse removal procedure. Install shim and snap ring. Check axle end play. See Figs. 3 and 4. End play should be .016-.028" (.4-.7 mm) on Montero, .008-.020" (.2-.5 mm) on Pickup and Ram-50. If end play is not within specification, install correct shim.




1. Hub Cover
2. Snap Ring
3. Shim
4. Bolt
5. Free Wheel Hub Assembly
6. Lock Washer
7. Lock Nut
8. Hub & Disc Assembly

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Fig. 2: Exploded View Of Auto-Locking Hub Assembly (Pickup & Ram-50 Shown, Montero Similar)
Courtesy of Mitsubishi Motor Sales of America.

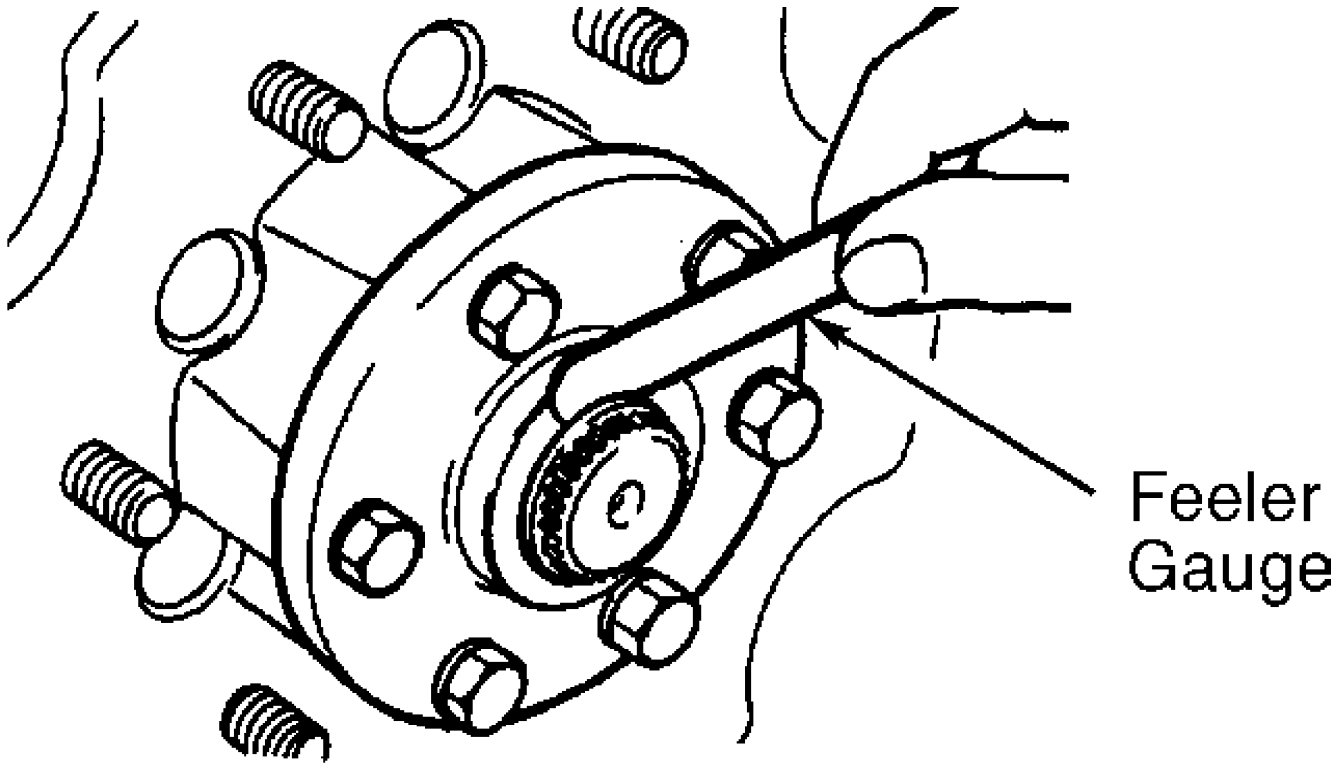



Fig. 3: Measuring Axle Shaft End Play (Montero)
Courtesy of Mitsubishi Motor Sales of America.

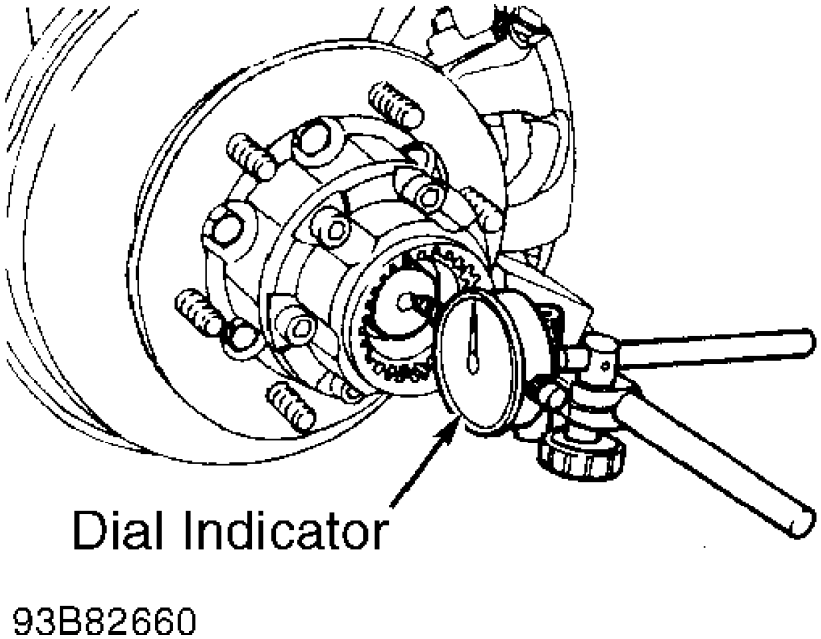



Fig. 4: Measuring Axle Shaft End Play (Pickup & Ram-50)
Courtesy of Mitsubishi Motor Sales of America.

DIFFERENTIAL CARRIER ASSEMBLY

Removal

1) Raise and support vehicle. Drain gear oil. Support differential carrier. Remove the drive axles and inner shaft. See DRIVE AXLES and INNER SHAFT & BEARING under REMOVAL & INSTALLATION. Place alignment mark on drive shaft and pinion companion flange for reassembly reference.

2) Remove drive shaft. Remove differential mounting brackets at differential and frame. See Fig. 1. Disconnect front crossmember from frame. Remove differential carrier assembly and front crossmember. Remove differential carrier from front crossmember.

Installation

To install, reverse removal procedure. Align marks on drive shaft and pinion companion flange.

### INNER SHAFT & BEARING

Removal

Remove right drive axle. See DRIVE AXLES under REMOVAL & INSTALLATION. Using slide hammer, remove inner shaft from differential carrier. If dust seal replacement is required, pry dust seal from housing tube assembly using a screwdriver. See Fig. 1. To remove bearing, bend outer area of dust cover inward on inner shaft. Press shaft out of bearing. Remove dust cover from shaft.

Inspection

Inspect inner shaft for damaged splines or threads. Inspect bearing for roughness or damage.

Installation

1) Install housing tube. Using Seal Installer (MB990955) and Handle (C-4171), install new dust seal in housing tube. Dust seal must be even with housing tube. Coat seal lip with grease.

2) Using a pipe with O.D. of 2.95" (74.3 mm), wall thickness of .16" (4.0 mm) and overall length of 1.97" (50.0 mm), install dust cover on shaft. Coat inside of dust cover with grease. Press bearing on shaft. Install new circlip on inner shaft. Carefully drive inner shaft into differential. DO NOT damage oil seal. To complete installation, reverse removal procedure.

## OVERHAUL

### DRIVE AXLES & BEARINGS

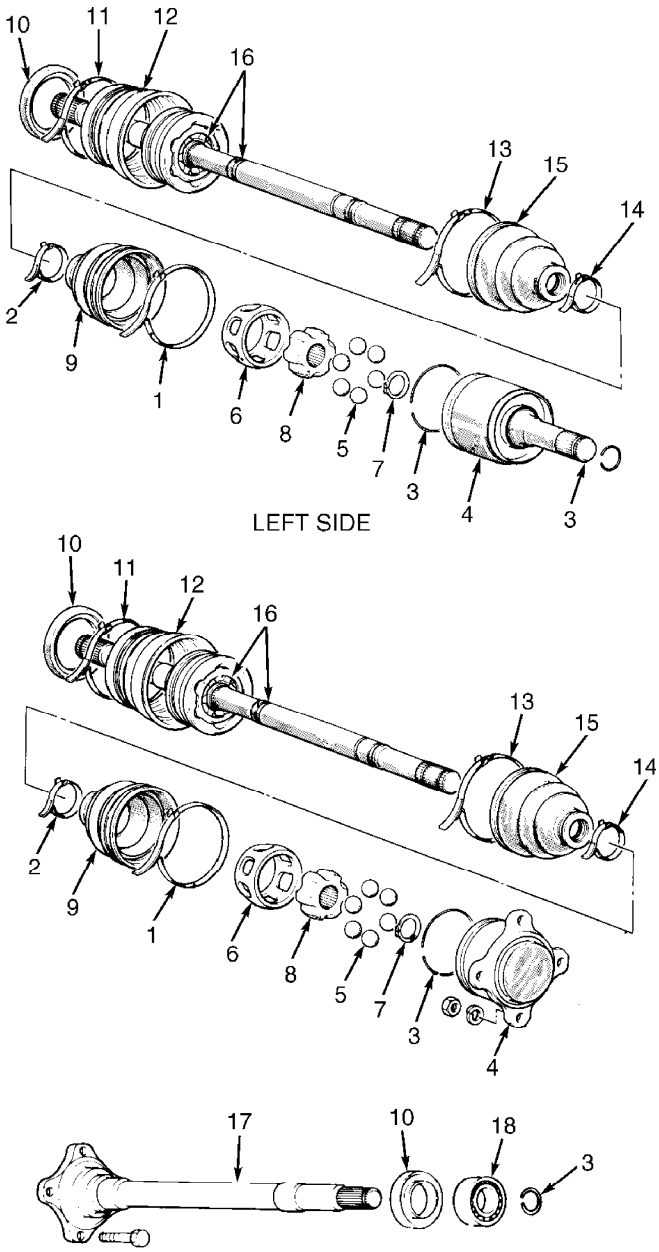
NOTE: References to BJ and DOJ refer to Birfield Joint and Double Offset Joint, respectively.

Disassembly

1) Remove boot bands. Remove circlip from DOJ outer race. Separate drive axle from DOJ outer race. Remove balls from DOJ cage. Remove DOJ cage from DOJ inner race in direction of BJ. See Fig. 5.

2) Remove snap ring from drive axle shaft. Remove DOJ inner race from shaft. Remove circlip from shaft. Wrap tape around splines of shaft to prevent boot damage during removal. Remove DOJ boot. Note size of boot. Remove dust cover from shaft. Move boot protector toward BJ side of shaft and remove. Remove BJ boot.

CAUTION: Drive axle and BJ are serviced as a unit. DO NOT attempt to disassemble BJ and drive axle.




1. Boot Band
2. Boot Band
3. Circlip
4. DOJ Outer Race
5. Balls
6. DOJ Cage
7. Snap Ring
8. DOJ Inner Race
9. DOJ Boot
10. Dust Cover
11. Boot Protector Band
12. Boot Protector
13. Boot Band
14. Boot Band
15. BJ Boot
16. Drive Shaft & BJ Assembly
17. Inner Shaft
18. Bearing

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Fig. 5: Exploded View Of Drive Axles
Courtesy of Mitsubishi Motor Sales of America.

Reassembly

1) Coat shaft with light coat of grease. Wrap splines with

tape. Install BJ boot, bands and DOJ boot on shaft. Ensure correct size boot is installed in proper location.

2) Pack proper amount of grease in the BJ and BJ boot. See CV JOINT GREASE CAPACITY table. Boot bands must be installed so lever is pulled toward rear of vehicle when band is tightened.

3) Place DOJ cage on shaft with smaller diameter installed first. Install circlip, DOJ inner race and snap ring on shaft. Apply grease to DOJ inner race and cage. Install balls into cage. Apply proper amount of grease to outer DOJ race. See CV JOINT GREASE CAPACITY table. Install shaft into DOJ outer race. Install circlip.

4) Place DOJ boot over DOJ outer race. Install boot bands so lever is pulled toward rear of vehicle when band is tightened. Adjust DOJ boot bands to have proper distance between center line of boot bands. See BOOT BAND SPECIFICATIONS table. This distance is necessary to control air in DOJ boot. Tighten boot bands. Install boot protector and band. Install dust cover on shaft.

CV JOINT GREASE CAPACITY TABLE

| Application | Ozs. (g) |
|---|---|
| BJ Boot | |
| Montero | (1) |
| Pickup & Ram-50 | (1) |
| DOJ Outer Race | |
| Montero | 3.5 (100) |
| Pickup & Ram-50 | 3.9 (110) |

(1) - Boots, bands and grease are packaged as a kit. No specifications given by manufacturer.

BOOT BAND SPECIFICATIONS TABLE

| Application | In. (mm) |
|---|---|
| All Models | 3.03-3.27 (76.9-83.0) |

## DIFFERENTIAL ASSEMBLY

Disassembly

1) Remove the differential carrier from vehicle. See DIFFERENTIAL CARRIER ASSEMBLY under REMOVAL & INSTALLATION. Remove cover. Mark bearing caps for reassembly reference. Remove bearing caps. Remove differential case assembly from carrier.

CAUTION: Ensure adjusting spacers, bearing caps, gears and side bearings are marked for reassembly reference. Components must be installed in original location.

2) Using bearing puller, remove differential case side bearings. Loosen ring gear retaining bolts in diagonal sequence. Remove ring gear. Remove drive pinion shaft lock pin from ring gear side. Remove pinion shaft and pinion gears. Remove side gears and thrust spacers.

Drive Pinion Removal

Remove pinion flange nut. Scribe alignment mark on pinion companion flange and drive pinion. Remove flange. Using soft-faced hammer, drive out pinion. Remove rear bearing and oil seal from carrier. Remove rear adjusting shim from pinion. See Fig. 1. Press front bearing from pinion. Remove front adjusting shim and spacer from

pinion.

Cleaning & Inspection

Use cleaning solvent to rinse gears and components. Check bearings for wear or discoloration. Check gear carrier for cracks or damage. Check pinion, side gear and flange splines for excessive wear. Check ring gear, pinion and side gears for wear or damage. Replace components as necessary.

Reassembly & Adjustments

1) Place side gear thrust spacers behind side gears in original position. Assemble side gears in differential case. Install pinion gears and washers. Rotate pinion gears to mesh with side gears.

2) Install pinion shaft without lock pin. Check pinion and side gear backlash. Install wooden wedge to lock side gears. Using dial indicator, measure gear backlash. See Fig. 6.

3) Backlash must be within specification. See PINION & SIDE GEAR BACKLASH SPECIFICATIONS table. Adjust backlash by using different side gear spacers. Ensure both sides are equally shimmed. If backlash cannot be adjusted within specifications, replace side and pinion gears as matched set.

4) Install pinion shaft lock pin. Using a punch, securely stake lock pin in 2 places. Ensure adhesive is removed from ring gear mounting bolts and gear mounting surface. Clean internal threads with tap.

5) Install ring gear on differential case. Ensure alignment marks on differential case and ring gear are aligned. Apply Loctite 271 to bolts and install bolts. Tighten bolts alternately in diagonal sequence to specification. See TORQUE SPECIFICATIONS table.

PINION & SIDE GEAR BACKLASH SPECIFICATIONS TABLE

| Application | In. (mm) |
|---|---|
| Standard ..... | .003 (.08) |
| Wear Limit ..... | .008 (.20) |

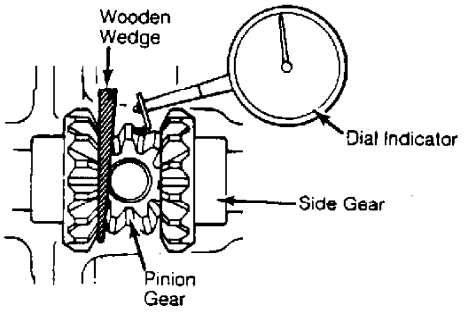


Fig. 6: Checking Pinion & Side Gear Backlash
Courtesy of Mitsubishi Motor Sales of America.

Drive Pinion Depth

1) Install pinion bearing races in carrier housing. Ensure

races are fully seated. Install Pinion Height Gauge (MB990901-01) with pinion bearings. See Fig. 7. DO NOT install oil seal.

2) Using INCH-lb. torque wrench, measure pinion rotating torque. Gradually tighten pinion height gauge to increase rotating torque to proper specification. See PINION ROTATING TORQUE SPECIFICATIONS table. Install Cylinder Gauge (MB990903-01). Ensure flat areas are aligned and gauge contacts carrier bearing bores firmly. See Fig. 7.

3) Select adjusting shim with same thickness as gap between cylinder gauge and pinion height gauge. Use minimum amount of adjusting shims. Install selected adjusting shims between drive pinion gear and rear drive pinion bearing. Using Bearing Installer (MB990802-01), install rear pinion bearing.

PINION ROTATING TORQUE SPECIFICATIONS TABLE

| Application | INCH Lbs. (N.m) |
|---|---|
| Oil Seal Not Installed | |
| With Lubrication ..... | 1.3-2.2 (.15-.25) |
| Without Lubrication ..... | 2.6-4.3 (.30-.50) |
| Oil Seal Installed | |
| With Lubrication ..... | 3.1-3.9 (.35-.45) |
| Without Lubrication ..... | 4.3-6.1 (.50-.70) |

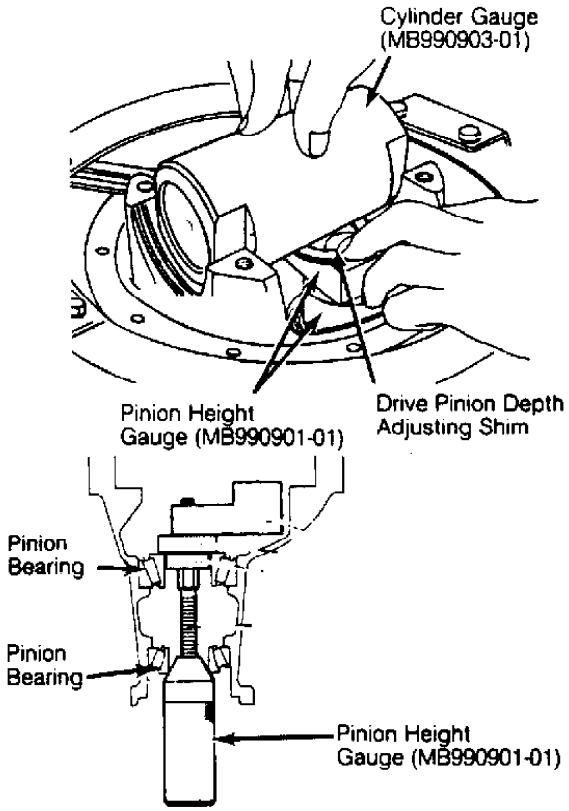


Fig. 7: Setting Drive Pinion Depth
Courtesy of Mitsubishi Motor Sales of America.

Drive Pinion Preload

1) Install drive pinion in differential carrier. Install

spacer, pinion front shim(s) and front pinion bearing. DO NOT install oil seal at this time. Install pinion companion flange, washer and retaining nut. Tighten nut to 137 ft. lbs. (190 N.m).

2) Using INCH-lb. torque wrench, check pinion rotating torque without pinion oil seal. See PINION ROTATING TORQUE SPECIFICATIONS table. Adjust rotating torque by replacing drive pinion front shims or spacer. Once correct rotating torque is obtained, install oil seal. Coat seal lip with grease.

3) Install pinion flange so alignment marks are correct. Apply light coat of grease to flange washer contact area. Install new retaining nut. Check pinion rotating torque with pinion oil seal installed. Rotating torque must be within proper specification. See PINION ROTATING TORQUE SPECIFICATIONS table.

Side Bearing Installation

1) Using Bearing Installer (MB990802-01), install bearings on differential case. Select 2 side bearing adjusting shims thinner than those removed. Shims must be equal in thickness on both sides. Install shims on each side of case assembly. Install case assembly in differential carrier housing.

2) Push case assembly fully to one side of carrier. Using 2 feeler gauges (feeler gauges 180 degrees opposed), measure clearance between carrier and side bearing. Remove shims from one side of differential carrier.

3) Measure thickness of shims removed. Add .002" (.05 mm) to 50% of measured clearance and then add thickness measurement of removed shim. This is thickness of new shim that should be installed on each side of case. Install equal thickness shims on each side of case assembly.

NOTE: Ensure zero clearance exists between gear carrier and adjusting shim.

4) Install side bearing shims and differential case assembly in differential carrier. Using brass drift, tap shims to fit them to side bearing outer race. Install bearing caps. Tighten bolts to specification. See TORQUE SPECIFICATIONS table. Check ring gear backlash.

Ring Gear Backlash

1) Lock drive pinion in place. Using dial indicator, check ring gear backlash at heel of ring gear tooth. Measure at 4 locations of ring gear. Gear backlash should be .004-.006" (.10-.15 mm).

2) If backlash is not within specification, change side bearing adjusting shims and recheck backlash. See GEAR TOOTH CONTACT PATTERNS article in GENERAL INFORMATION. Check gear tooth contact using Prussian Blue.

CAUTION: When changing shims, total thickness of all shims must remain constant to ensure correct bearing preload.

Ring Gear Runout

Using dial indicator, measure runout at back side of ring gear. Runout should be .002" (.05 mm). If runout is excessive, change ring gear-to-differential case mounting position. Ensure ring gear mounting bolts are tightened to correct specification. Recheck runout. Install cover and gasket.

## TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

| Application | Ft. Lbs. (N.m) |
|---|---|
| Brake Caliper Bolt | 58-72 (79-98) |
| Carrier-To-Housing Tube Bolt | 58-72 (79-98) |
| Cover Bolt | 11-16 (15-22) |
| Drain Plug | 43-51 (58-69) |
| Drive Shaft Flange Bolt | 36-43 (49-58) |
| Fill Plug | 29-43 (39-58) |
| Front Crossmember Bolt | 72-87 (98-118) |
| Hub Cover Bolt | 13-25 (18-34) |
| Knuckle-To-Ball Joint Nut | |
| Upper | 43-65 (58-88) |
| Lower | 87-130 (118-176) |
| Mounting Bracket-To-Frame Bolt | 58-80 (79-108) |
| Mounting Bracket-To-Housing Tube Bolt | 58-72 (79-98) |
| Pinion Flange Nut | 137-159 (186-220) |
| Right Drive Axle-To-Inner Shaft Bolt | 36-43 (49-58) |
| Ring Gear-To-Case Bolt | 58-65 (79-88) |
| Side Bearing Cap Bolt | 40-47 (54-64) |
| Tie Rod-To-Knuckle Nut | 33 (45) |
| Wheel Lug Nuts | |
| Montero | 72-87 (98-118) |
| Pickup & Ram-50 | 87-101 (118-137) |
| | INCH Lbs. (N.m) |
| Undercover-To-Frame Bolts (Montero) | 84-108 (9.5-12.2) |