

# DRIVE AXLE - STANDARD

1988 Jeep Cherokee

1988 DRIVE AXLES  
Jeep 7 9/16" & 8 7/8" Ring Gear

All Models

## DESCRIPTION

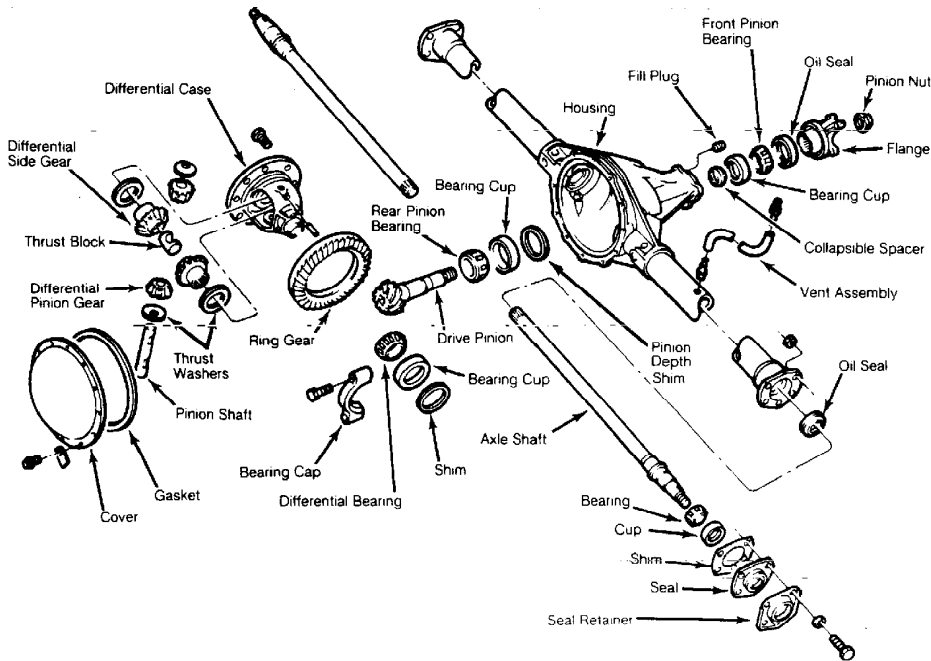
The rear axle assembly is a hypoid gear type with integral carrier housing. The standard axle uses a 7 9/16" (192 mm) diameter ring gear. The heavy duty axle uses an 8 7/8" (225 mm) diameter ring gear. See Fig. 1.

## IDENTIFICATION

Axle assembly has 10-bolt rear cover. The axle ratio and ring and pinion gear tooth combinations are stamped on a tag attached to differential housing cover.

### AXLE RATIO IDENTIFICATION

Axle Ratio	Tooth Combinations	Ring Gear Diameter
3.31:1	13/43	7 9/16" (192 mm)
3.54:1	13/46	7 9/16" (192 mm)
4.11:1	9/37	7 9/16" (192 mm)
4.10:1	10/41	8 7/8" (225 mm)



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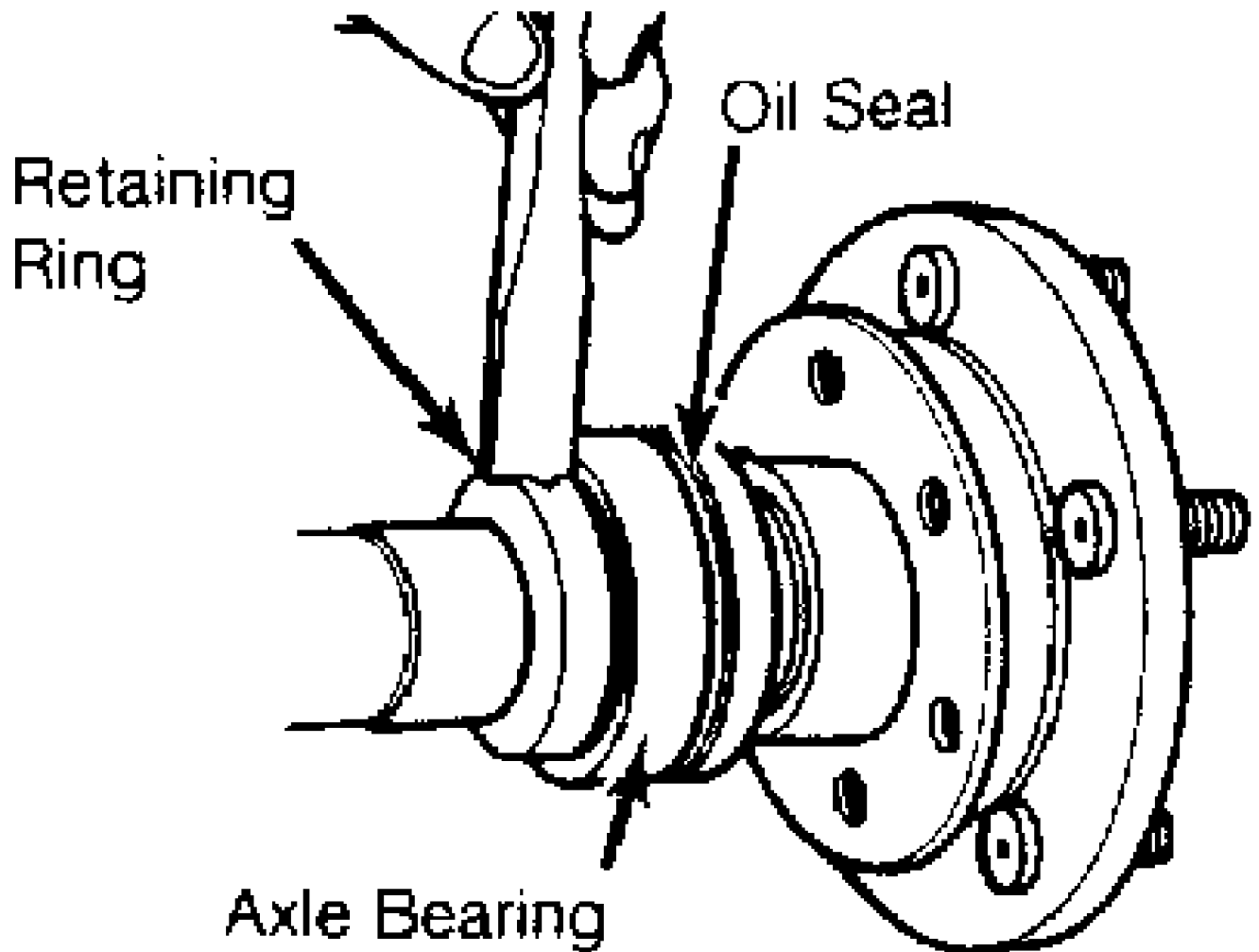
Fig. 1: Exploded View of Rear Axle Assembly

## REMOVAL & INSTALLATION

## AXLE SHAFTS & BEARINGS

1) Raise and support vehicle. Remove rear wheel and brake drum. Remove axle shaft retaining nuts. Remove axle shaft from axle tube and mount in vise. Drill a 1/4" hole 3/4 of the way through retaining ring. Use care not to drill into axle shaft.

2) Cut the ring with a chisel and remove it from the shaft. Remove bearing from axle shaft using arbor press. Remove axle seal. See Fig. 2.



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Fig. 2: Removing Axle Bearing Retaining Ring

### Installation

1) Pack wheel bearing with grease. Coat inner axle shaft seal with axle grease and outer portion of seal with gasket sealant.

2) Ensure components are correctly placed upon axle. Using Bearing Installer (J-22912-01), press axle shaft bearing and new retainer ring on axle shaft. Ensure bearing and retainer ring are seated against axle shaft shoulder. Apply a thin coat of bearing

lubricant to axle flange bearing bore and install axle.

## YOKE & PINION OIL SEAL

### Removal

1) Raise and support vehicle. Remove wheels and brake drums. Mark and remove drive shaft. Using an INCH lb. torque wrench, record torque required to rotate pinion several revolutions.

2) Hold yoke from turning and remove pinion nut. Mark drive pinion shaft and yoke for reassembly reference. Remove yoke and pinion oil seal.

### Installation

1) Coat new seal with rear axle lubricant and install. Align marks made at disassembly and install yoke. Install new pinion nut and tighten just enough to remove end play.

CAUTION: DO NOT overtighten pinion nut. If desired preload is exceeded, a new collapsible pinion spacer sleeve must be installed and drive pinion preload reset.

2) Using an INCH lb. torque wrench, check torque required to turn pinion. Refer to torque reading recorded during disassembly and add 5 INCH lbs. (.6 N.m) for correct preload. Tighten pinion nut slightly and recheck preload. Repeat procedure until desired preload is obtained.

## REAR AXLE ASSEMBLY

### Removal

1) Raise and support vehicle. Remove wheels and brake drums. Disconnect brake hose-to-axle connection and plug line.

2) Disconnect parking brake cable at brake equalizer. Mark and remove drive shaft. Disconnect track bar at axle bracket (if equipped). Remove axle vent tube at axle. Support axle assembly. Remove spring "U" bolts and tie plates.

3) Loosen, but do not remove, bolts which attach front of rear spring to frame brackets. Lift axle to relieve axle weight from springs and remove bolts retaining springs to shackles. Lower springs to floor. Lower jack and remove axle assembly.

NOTE: Factory axles are shipped without lubricant. When adding lubricant, position axle horizontally with yoke end of pinion housing facing downward. Turn pinion shaft several times to lubricate bearings.

### Installation

1) To install, support axle assembly with jack and slide axle into place. Raise, align and install spring-to-frame and shackle bolts. Tighten spring-to-frame and shackle bolts to 111 ft. lbs. (150 N.m). Install brake hose, axle vent tube and parking brake cable. Align and connect drive shaft.

2) Bleed hydraulic system and adjust parking brake cable. Ensure axle is filled with 75-90W gear lubricant. Ensure spring centering bolt heads are seated in axle spring seat before tightening "U" bolts.

## OVERHAUL

### DISASSEMBLY

NOTE: It is not necessary to remove axle assembly from vehicle to

perform overhaul.

1) Raise and support rear of vehicle. Remove rear cover and drain lubricant. Remove wheels, brake drums, hubs and axle shafts.

2) Mark differential bearing caps for reassembly reference and loosen them until a few threads remain engaged. Pry differential loose and remove bearing caps and differential from housing.

3) Mark bearing caps, races and shims for reassembly reference. Remove differential side bearings with a puller. Remove differential and ring gear from case. Remove pinion shaft lock pin.

4) Using 2 feeler gauges, measure differential side gear clearance. Insert an equal distance feeler gauge between each side gear and case. Continue checking clearance until each feeler gauge is a tight drag fit. Ensure side clearance does not exceed .007" (.18 mm) on either side. If side gear clearance exceeds specification, replace side gear thrust washers.

5) Remove pinion yoke and nut. Retain pinion nut for pinion depth adjustment during reassembly. Tap pinion gear end with a soft faced mallet to release it from front bearing. Remove pinion gear, pinion bearings and preload collapsible spacer. Discard collapsible spacer.

6) Remove pinion seal and pinion rear bearing cup. Remove and retain pinion depth shim located under rear bearing cup. Remove pinion front bearing cup. Using a press, remove pinion gear rear bearing.

## CLEANING & INSPECTION

Clean all components in solvent and dry with compressed air. Inspect all components for excessive wear or damage and replace as necessary.

## REASSEMBLY

NOTE: Ensure correct shims have been chosen to obtain proper ring gear backlash and bearing preload before reassembly. See ADJUSTMENTS in this article.

### Drive Pinion

1) Press rear bearing on pinion stem with large diameter of roller cage toward gear. Clean housing bearing bores. Place shim in rear bearing bore and install rear bearing cup.

NOTE: When installing a new gear set, use original depth shim as a starting point. Chamfered side of shim must be installed to bottom side of rear bearing cup bore.

2) Install front bearing cup into housing. Install drive pinion through rear bearing cup. Install front bearing, yoke and original pinion nut. Tighten nut to remove bearing end play only.

NOTE: A new nut and collapsible spacer are not installed at this time, as pinion will be removed after a depth measurement.

### Differential Case

1) Assemble side gears and thrust washers and install into differential case. Ensure side gear thrust washers were replaced in clearance measured at disassembly was greater than .007" (.18 mm).

2) Install differential pinions and thrust washers in case. Ensure pinions are aligned with shaft bores. Recheck side gear clearance. If clearance exceeds .007" (.18 mm), side gears must be replaced.

3) Install differential pinion shaft and lockpin. Using Remover (J-22912-01), remove differential bearings. Install correct

size end play shims on each side of differential case. Position and install ring gear on differential case. Install replacement ring gear bolts and tighten standard axle ring gear bolts to 70-90 ft. lbs. (95-122 N.m). Tighten heavy duty drive axle bolts to 105 ft. lbs. (142 N.m).

4) Check ring gear backlash. See RING GEAR BACKLASH in ADJUSTMENTS. Lightly lubricate differential bearings, cups, gears and thrust washers with axle lubricant. Install bearing cups on differential bearings. Install differential in axle housing.

5) Using a soft faced hammer, tap outer edges of differential bearing cups to seat them in housing. Install differential bearings caps and tighten cap bolts to 57 ft. lbs. (77 N.m).

6) Recheck and verify ring gear backlash has not changed. Install axle housing cover. Tighten cover bolts to 14 ft. lbs. (19 N.m). Refill axle with 75-90W gear lubricant.

## ADJUSTMENTS

### DRIVE PINION DEPTH

1) Check numbers painted on drive pinion and ring gear. First number on pinion must match number on ring gear. Second number on pinion is pinion depth variance. If number is preceded by a plus sign, add that number to standard pinion depth. If number is preceded by a minus sign, subtract that amount from standard pinion depth. This will give desired pinion depth. Record this measurement for future reference.

2) If numbers painted on drive gear and ring gear do not match, gears are not a matched set and should not be used. Some factory installed sets may have .01" (.25 mm) or .02" (.50 mm) machined off pinion end face.

3) Identifying numbers will appear as "+23". Number "2" indicates .02" (.50 mm) was removed from end face and number "3" is pinion depth variance. If marked "+16", number "1" indicates .010" (.25 mm) was removed from end face and number "6" is pinion depth variance.

4) Standard pinion depth on standard drive axle is 2.095" (53.21 mm). Standard pinion depth on heavy duty drive axle is 2.547" (64.69 mm).

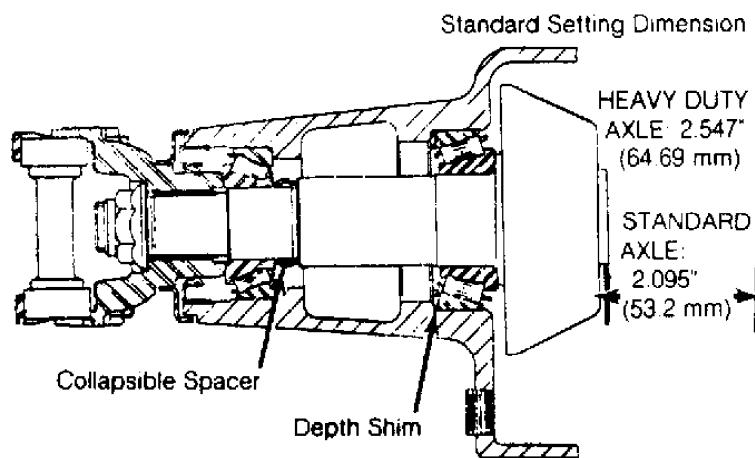


Fig. 3: Pinion Depth & Preload Shim Location

5) Measure thickness of original pinion depth shim. Note pinion depth variance numbers marked on old and new pinion gears. Refer to PINION DEPTH SHIM ADJUSTMENT SPECIFICATIONS at end of this

article and determine amount to be added or subtracted from original shim thickness to obtain starter shim thickness. DO NOT use starter shim thickness as a final shim setting.

6) Install rear bearing on pinion gear. On heavy duty rear axle, large end of bearing faces gear end of pinion. Press bearing against rear face of gear.

7) On all axles, clean pinion bearing bores in axle housing to ensure accurate measurement. Install and center starter shim in housing bearing cup bore. If shim is chamfered, ensure chamfered side faces bottom of bearing cup bore.

8) Install pinion rear and front bearing cups. Install pinion gear in rear bearing cup and install pinion front bearing and yoke on pinion gear. DO NOT install oil seal or collapsible spacer at this time. Install and tighten original pinion nut only enough to remove end play. Determine depth variance marked on pinion gear.

9) Install Arbor (J-5223-4) and Discs (J-5223-23) in differential bearing cup bores. Ensure discs are fully seated in bearing cup bores. Install bearing caps over discs and install bearing cap bolts. Tighten bolts, but not to specified torque.

10) Position Gauge Block (J-5223-20) against end of drive pinion with Clamp (J-5223-24) and Bolt (J-5223-29). See Fig. 4. Extend clamp bolt until it presses against gauge block enough to prevent gauge block from moving.

11) Loosen thumbscrew in end of gauge block to allow plunger to contact arbor. When plunger contacts arbor, tighten thumbscrew, taking care not to disturb plunger position.

12) Remove gauge block and measure distance from end of anvil to top of plunger head, using a 2-3" (51-76 mm) micrometer. Record this measured pinion depth for future reference.

13) Remove gauging tools, drive pinion and rear bearing cup. Remove drive pinion depth shim and record thickness. Add shim thickness to measured pinion depth. From this total subtract desired pinion depth. For an example, see DETERMINING CORRECT SHIM THICKNESS table.

DETERMINING CORRECT SHIM THICKNESSES

Application	In. (mm)
<b>Standard Drive Axle</b>	
Standard Pinion Depth .....	2.095 (53.21)
Pinion Depth Variance .....	- .004 (.10)
Desired Pinion Depth .....	=2.091 (53.11)
Measured Pinion Depth .....	2.100 (53.34)
Starting Shim Thickness .....	+ .096 (.096)
Total Measured Thickness Depth .....	=2.196 (55.77)
Total Measured Pinion Depth .....	2.196 (55.77)
Desired Pinion Depth .....	-2.091 (53.11)
Correct Shim Thickness .....	=.105 (2.66)
<b>Heavy Duty Drive Axle</b>	
Standard Pinion Depth .....	2.547 (64.69)
Pinion Depth Variance .....	+ .007 (.18)
Desired Pinion Depth .....	=2.554 (64.87)
Measured Pinion Depth .....	2.550 (64.77)
Starting Shim Thickness .....	+ .098 (2.49)
Total Measured Pinion Depth .....	=2.648 (67.26)
Total Measured Pinion Depth .....	2.648 (67.26)
Desired Pinion Depth .....	-2.554 (64.87)
Correct Shim Thickness .....	=.094 (2.39)

14) The result represents correct shim thickness to be installed. Install correct thickness shim in rear bearing bore and

install rear bearing cup. See Fig. 3.

NOTE: Replacement pinion gears marked more than .009" (.23 mm) should not be used.

15) See PINION DEPTH SHIM ADJUSTMENT SPECIFICATIONS to determine appropriate starter shim thickness when installing NEW gear sets. Note pinion variance numbers on new and old gear. Follow old pinion marking line across to new pinion marking column.

16) The number in box indicates change in shim thickness from original. For example, old pinion marked "-3" and new pinion marked "+2". Intersecting box shows  $-.005$ " (.13 mm) to be subtracted from original shim thickness.

17) Starter shim thickness must not be used as a final shim setting. An actual pinion depth measurement must be made and final shim thickness should be adjusted as necessary.

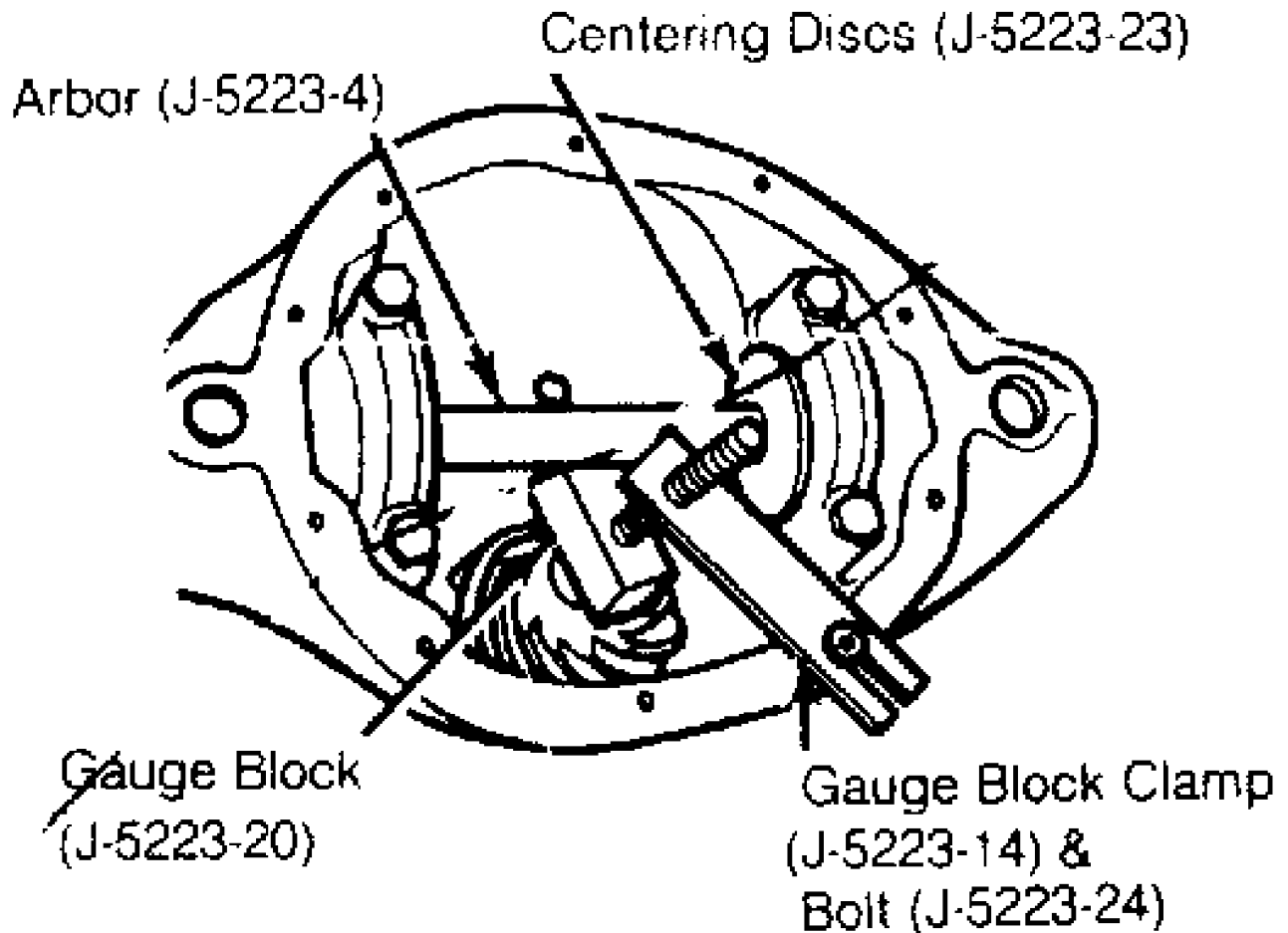


Fig. 4: Measuring Pinion Depth

#### DRIVE PINION BEARING PRELOAD

1) Install new collapsible spacer and front bearing on drive pinion. Install oil seal, yoke and nut. Tighten pinion nut only enough to remove bearing end play.

CAUTION: Never reuse collapsible spacer.

2) Slowly tighten pinion nut until torque required to rotate pinion gear is 15-25 INCH lbs. (2-3 N.m). Check torque frequently and only tighten nut in small amounts.

CAUTION: DO NOT overtighten pinion nut. If preload torque is exceeded, collapsible spacer must be replaced and preload reset.

### DIFFERENTIAL BEARING END PLAY

1) Place bearing cup over each differential bearing. Install differential case assembly (without drive gear) in axle housing. On standard drive axles, install a .142" (3.60 mm) shim on each side of differential bearing cup and housing. On heavy duty drive axles, install a .080" (2.03 mm) shim on each side of differential bearing cup and housing.

2) Install bearing caps and tighten bolts finger tight. Mount dial indicator to housing so indicator button touches ring gear face of differential case. Prying between shims and housing, move assembly to one side. Zero dial indicator, then pry assembly to opposite side. Read and record indicator reading. DO NOT zero or read indicator while prying.

3) Amount read on indicator is shim thickness which must be added in order to arrive at a no preload or end play condition. Shims are available in thicknesses of .142" (3.60 mm) to .174" (4.41 mm) in .002" (.050 mm) increments.

4) When all side play is eliminated, check drive gear face of case for runout. Runout should not exceed .002" (.050 mm). Remove case from housing and retain shims used to eliminate side play. See Fig. 5.

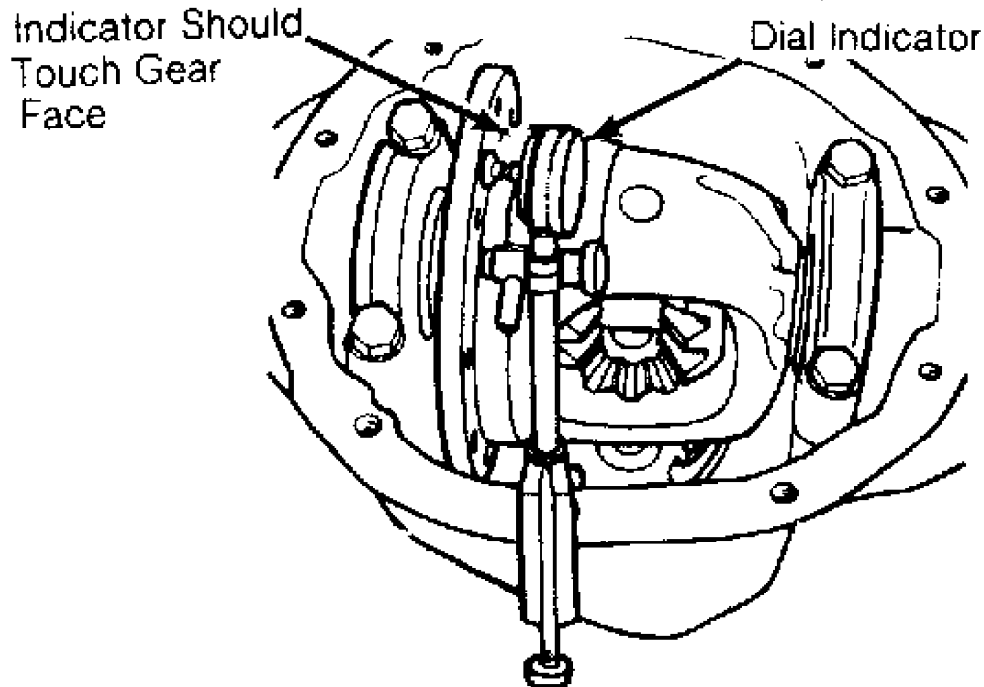


Fig. 5: Differential Bearing End Play & Runout Measurement

### RING GEAR BACKLASH ADJUSTMENT

1) Install differential and ring gear assembly in housing



using shims selected to remove end play. Tighten bearing cap bolts evenly to 57 ft. lbs. (77 N.m) for standard drive axle and 85 ft. lbs. (115 N.m) for heavy duty drive axle. Attach a dial indicator to housing so button of indicator contacts drive side of a tooth of ring gear, at a right angle to tooth. See Fig. 6. Rock ring gear and note movement on dial indicator.

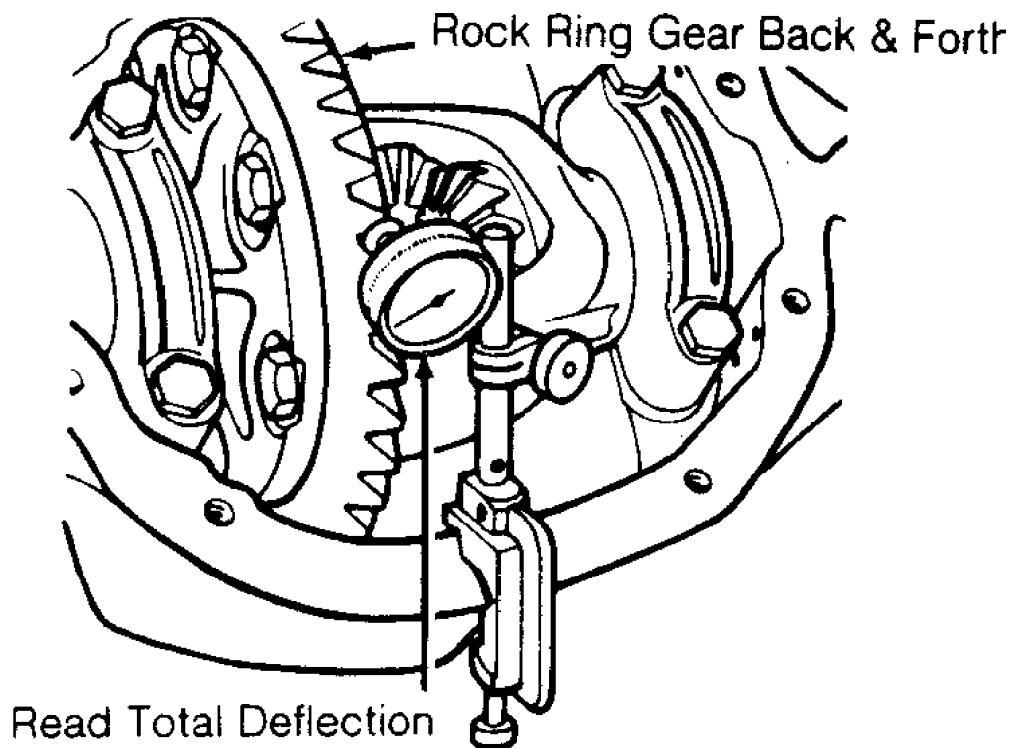
2) Backlash should be .005-.009" (.13-.23 mm) with .008" (.20 mm) desired. To increase backlash, install thinner shim on ring gear side of case and a thicker shim on opposite side of case. To decrease backlash, reverse placement of shims. DO NOT change total shim thickness, alter positions only.

### DIFFERENTIAL BEARING PRELOAD

1) Differential bearings are preloaded by increasing existing shim thickness by .004" (.10 mm). Install differential bearing shims in axle housing bearing bore. DO NOT distort shims by hammering them into housing.

2) Assemble bearing cups on bearings (cups should completely cover rollers). Position differential so bearings just start to enter in axle housing bearing bores. Keep assembly square in housing and push in as far as possible.

3) Using a soft hammer, tap outer edge of bearing cups until seated in housing. Install bearing caps, aligning marks made at disassembly. Install and tighten bolts. Preloading differential bearings may change backlash setting so recheck backlash and correct as necessary.



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Fig. 6: Checking Ring Gear Backlash

4) After all adjustments, check gear tooth pattern. See the GEAR TOOTH CONTACT PATTERNS article in this section.

AXLE ASSEMBLY SPECIFICATIONS TABLE

Application	Specification
Axle Shaft End Play	.004-.008" (.10-.20 mm)
Differential Bearing Preload	.008" (.20 mm)
Differential Case Face Runout	.002" (.05 mm)
Differential Side Gear Case Clearance	0-.007" (0-.18 mm)
Oil Capacity	
Standard Drive Axle	2.5 pts. (1.2L)
Heavy Duty Drive Axle	4.7 pts (2.2L)
Pinion Bearing Preload	15-25 INCH lbs. (2.3 N.m)
Pinion Gear Depth (Standard)	
Standard Drive Axle	2.095" (53.21 mm)
Heavy Duty Drive Axle	2.547" (64.7 mm)
Ring Gear	
Backlash	.005-.009" (.13-.23 mm)
Preferred	.008" (.20 mm)

**TORQUE SPECIFICATIONS**

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Axle Housing Cover	14 (19)
Axle-to-Leaf Spring "U" Bolts	52 (70)
Brake Support Plate Bolts	32 (43)
Differential Bearing Bolts	
Standard Drive Axle	57 (77)
Heavy Duty Drive Axle	85 (115)
Rear Axle Filler Plug	
Standard Drive Axle	25 (34)
Heavy Duty Drive Axle	15 (20)
Rear Spring Front Bolt	111 (150)
Rear Spring Rear Shackle Nuts	111 (150)
Ring Gear Bolts	
Standard Drive Axle	70-90 (95-122)
Heavy Duty Drive Axle	105 (142)
Shock Absorber-to-Axle Nut	44 (60)
Universal Joint Clamp Strap Bolts	14 (19)
Wheel Lug Nuts	75 (102)

**PINION DEPTH SHIM ADJUSTMENT SPECIFICATIONS**

PINION DEPTH SHIM ADJUSTMENT CHART (INCHES)

Old Pinion Marking	Specification
+4	
New Pinion Marking	
-4	+0.008
-3	+0.007
-2	+0.006
-1	+0.005
0	+0.004
+1	+0.003
+2	+0.002
+3	+0.001
+4	0

+3  
 New Pinion Marking

-4	.....	+0.007
-3	.....	+0.006
-2	.....	+0.005
-1	.....	+0.004
0	.....	+0.003
+1	.....	+0.002
+2	.....	+0.001
+3	.....	0
+4	.....	-0.001

+2  
 New Pinion Marking

-4	.....	+0.006
-3	.....	+0.005
-2	.....	+0.004
-1	.....	+0.003
0	.....	+0.002
+1	.....	+0.001
+2	.....	0
+3	.....	-0.001
+4	.....	-0.002

+1  
 New Pinion Marking

-4	.....	+0.005
-3	.....	+0.004
-2	.....	+0.003
-1	.....	+0.002
0	.....	+0.001
+1	.....	0
+2	.....	-0.001
+3	.....	-0.002
+4	.....	-0.003

0  
 New Pinion Marking

-4	.....	+0.004
-3	.....	+0.003
-2	.....	+0.002
-1	.....	+0.001
0	.....	0
+1	.....	-0.001
+2	.....	-0.002
+3	.....	-0.003
+4	.....	-0.004

-1  
 New Pinion Marking

-4	.....	+0.003
-3	.....	+0.002
-2	.....	+0.001
-1	.....	0
0	.....	-0.001
+1	.....	-0.002
+2	.....	-0.003
+3	.....	-0.004
+4	.....	-0.005

-2  
 New Pinion Marking

-4	.....	+0.002
-3	.....	+0.001
-2	.....	0
-1	.....	-0.001
0	.....	+0.001
+1	.....	+0.002

+2	.....	+0.003
+3	.....	+0.003
+4	.....	+0.004
-3		
New Pinion Marking		
-4	.....	+0.001
-3	.....	+0.002
-2	.....	+0.001
-1	.....	0
0	.....	-0.001
+1	.....	-0.002
+2	.....	-0.003
+3	.....	-0.004
+4	.....	-0.005
-4		
New Pinion Marking		
-4	.....	0
-3	.....	-0.001
-2	.....	-0.002
-1	.....	-0.003
0	.....	-0.004
+1	.....	-0.005
+2	.....	-0.006
+3	.....	-0.007
+4	.....	-0.008

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PINION DEPTH SHIM ADJUSTMENT CHART (MILLIMETERS)

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Old Pinion Marking	Specifications
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+10		
New Pinion Marking		
-10	.....	+0.20
-8	.....	+0.18
-5	.....	+0.15
-3	.....	+0.13
0	.....	+0.10
+3	.....	+0.08
+5	.....	+0.05
+8	.....	+0.03
+10	.....	0

+8		
New Pinion Marking		
-10	.....	+0.18
-8	.....	+0.15
-5	.....	+0.13
-3	.....	+0.10
0	.....	+0.08
+3	.....	+0.05
+5	.....	+0.03
+8	.....	0
+10	.....	-0.03

+5		
New Pinion Marking		
-10	.....	+0.15
-8	.....	+0.13
-5	.....	+0.10
-3	.....	+0.08
0	.....	+0.05
+3	.....	+0.03
+5	.....	0
+8	.....	-0.03

	+10	.....	-0.05
+3	New Pinion Marking		
	-10	.....	+0.13
	-8	.....	+0.10
	-5	.....	+0.08
	-3	.....	+0.05
	0	.....	+0.03
	+3	.....	0
	+5	.....	-0.03
	+8	.....	-0.05
	+10	.....	-0.08
0	New Pinion Marking		
	-10	.....	+0.10
	-8	.....	+0.08
	-5	.....	+0.05
	-3	.....	+0.03
	0	.....	0
	+3	.....	-0.03
	+5	.....	-0.05
	+8	.....	-0.08
	+10	.....	-0.10
-3	New Pinion Marking		
	-10	.....	+0.08
	-8	.....	+0.05
	-5	.....	+0.03
	-3	.....	0
	0	.....	-0.03
	+3	.....	-0.05
	+5	.....	-0.08
	+8	.....	-0.10
	+10	.....	-0.13
-5	New Pinion Marking		
	-10	.....	+0.05
	-8	.....	+0.03
	-5	.....	0
	-3	.....	-0.03
	0	.....	-0.05
	+3	.....	-0.08
	+5	.....	-0.10
	+8	.....	-0.13
	+10	.....	-0.15
-8	New Pinion Marking		
	-10	.....	+0.03
	-8	.....	0
	-5	.....	-0.03
	-3	.....	-0.05
	0	.....	-0.08
	+3	.....	-0.10
	+5	.....	-0.13
	+8	.....	-0.15
	+10	.....	-0.18
-10	New Pinion Marking		
	-10	.....	0
	-8	.....	-0.03
	-5	.....	-0.05
	-3	.....	-0.08
	0	.....	-0.10

+3	.....	-0.13
+5	.....	-0.15
+8	.....	-0.18
+10	.....	-0.20

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