

## GENERAL MOTORS INTEGRAL HOUSING

**Buick  
Cadillac  
Chevrolet  
Oldsmobile  
Pontiac**

### DESCRIPTION

Semi-floating hypoid gear type axle with integral housing. Centerline of pinion is set below centerline of ring gear. A removable steel cover, bolted to rear of housing, permits servicing the differential case without removing complete axle assembly from vehicle.

**NOTE** — Some models are equipped with Borg-Warner, Dana, Eaton or General Motors design positive traction differentials. For testing and overhaul procedures for these units, see Positive Traction Differential articles in this section.

### AXLE RATIO & IDENTIFICATION

Rear axle identification information is stamped on the forward side of left or right axle tube on all models except Cadillac. On Cadillac, 3 different locations are used. An identification code is stamped on the rear of the right axle tube approximately 3" from differential housing and on outside of right brake drum or backside of right caliper support plate.

#### ① Axle Ratio Identification

Ratio	Code
2.14:1	AK, AR, CA, CF, RH, RR
2.29:1	AH, AJ, AN, AT, CBB, CG, GC, HC, RA, RT
2.39:1	AP, GH, HH, RJ
2.41:1	AM, AZ, BM, CC, CH, CK, FA, FX, GF, HF, LA, RB, RZ, TT, UF, UY, VC, WP, WT, YC, YL, YQ,, ZC, ZT
2.56:1	AA, AY, BY, CE, CI, CL, GA, HA, RC, RY, TU, YD, YM, YR
2.73:1	AB, AL, AX, BL, CD, CJ, CM, FC, FY, GB, HB, JE, JW, KE, MC, PE, RD, TW, WQ, YE, YN, YS, ZE, ZF, ZW
2.93:1	AG, AW, FB, FZ, GG, HG, KF, MD, PF, PY, RE, RW, TX, UA, UP, VF, WN, YF, YG, YP, YX
3.08:1	AC, AV, JG, KG, LE, PG, RF, RV, TJ, TY, WJ, XJ, XY, XJ, YY, ZJ, ZY
3.15:1	ME
3.23:1	AD, AE, AU, JH, JZ, KH, LF, PH, RG, RU, TK, TZ, VK, WK, WZ, YK
3.36:1	MK, QM, QU
3.42:1	JJ, KJ, VL, VM
3.62:1	QN, QT
3.73:1	FD

① — Ratios and codes cover all General Motors cars as listed by the manufacturer. Some ratios are not available on all models.

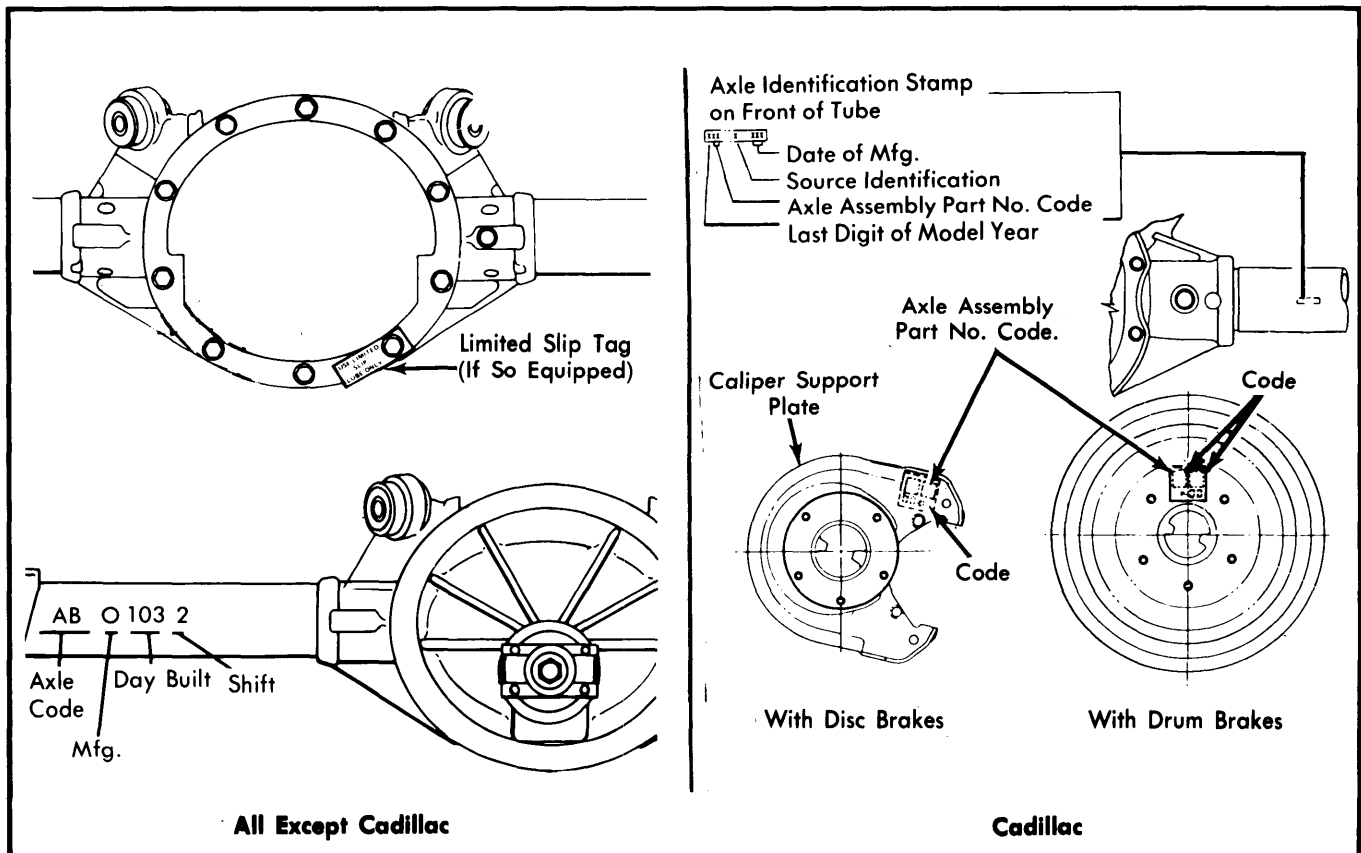


Fig. 1 Axle Ratio Code Locations

## GENERAL MOTORS INTEGRAL HOUSING (Cont.)

## REMOVAL &amp; INSTALLATION

## AXLE SHAFTS

**Removal** — Remove rear wheels and either brake drums or disc calipers and rotors. Support calipers from vehicle frame. Drain lubricant from differential by removing cover. Remove pinion shaft lock bolt and pinion shaft. Push axle shaft toward center of vehicle, remove "C" lock from inner end of shaft, and carefully remove axle shaft from housing.

**NOTE** — When removing axle shaft from housing, make sure axle shaft or splines do not rest on or tear axle seal.

**Installation** — Reverse removal procedure and note the following: Axle shaft must be pushed outward after installing "C" lock to seat lock in counterbore of axle side gear.

## COMPANION FLANGE &amp; OIL SEAL

**Removal (All Models, Exc. Chevette & T1000)** — Raise and support vehicle. Remove propeller shaft, marking parts for reassembly reference. Scribe an alignment mark on companion flange, pinion and pinion nut for reassembly. Remove pinion nut, washer and using a puller, remove companion flange. Pry seal out of housing using a screwdriver or chisel.

**Installation** — Pack seal lip of new seal with lithium base extreme pressure lubricant, then install seal into housing until it seats against shoulder. Install companion flange, washer and pinion nut. Tighten pinion nut until all end play is removed. Continue tightening nut up to  $\frac{1}{8}$  turn beyond alignment mark

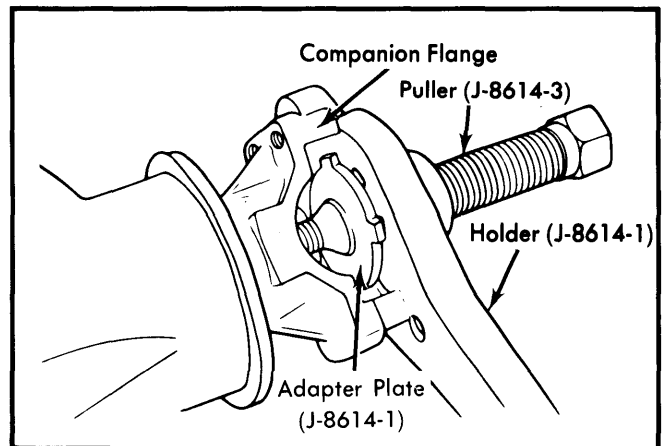


Fig. 3 Removal of Companion Flange

made at disassembly, checking to make sure original preload is not exceeded by more than 5 INCH lbs. Install propeller shaft.

**Removal (Chevette & T1000)** — 1) Raise and support vehicle. Disconnect propeller shaft from companion flange and remove shaft from transmission.

**NOTE** — As Chevette rear axle has an extension housing and an extension shaft coupled to front of axle housing, the companion flange is attached to forward end of extension shaft. Instead of companion flange, there is a drive coupling on end of pinion shaft. Axle housing oil seal contacts extension shaft instead of companion flange.

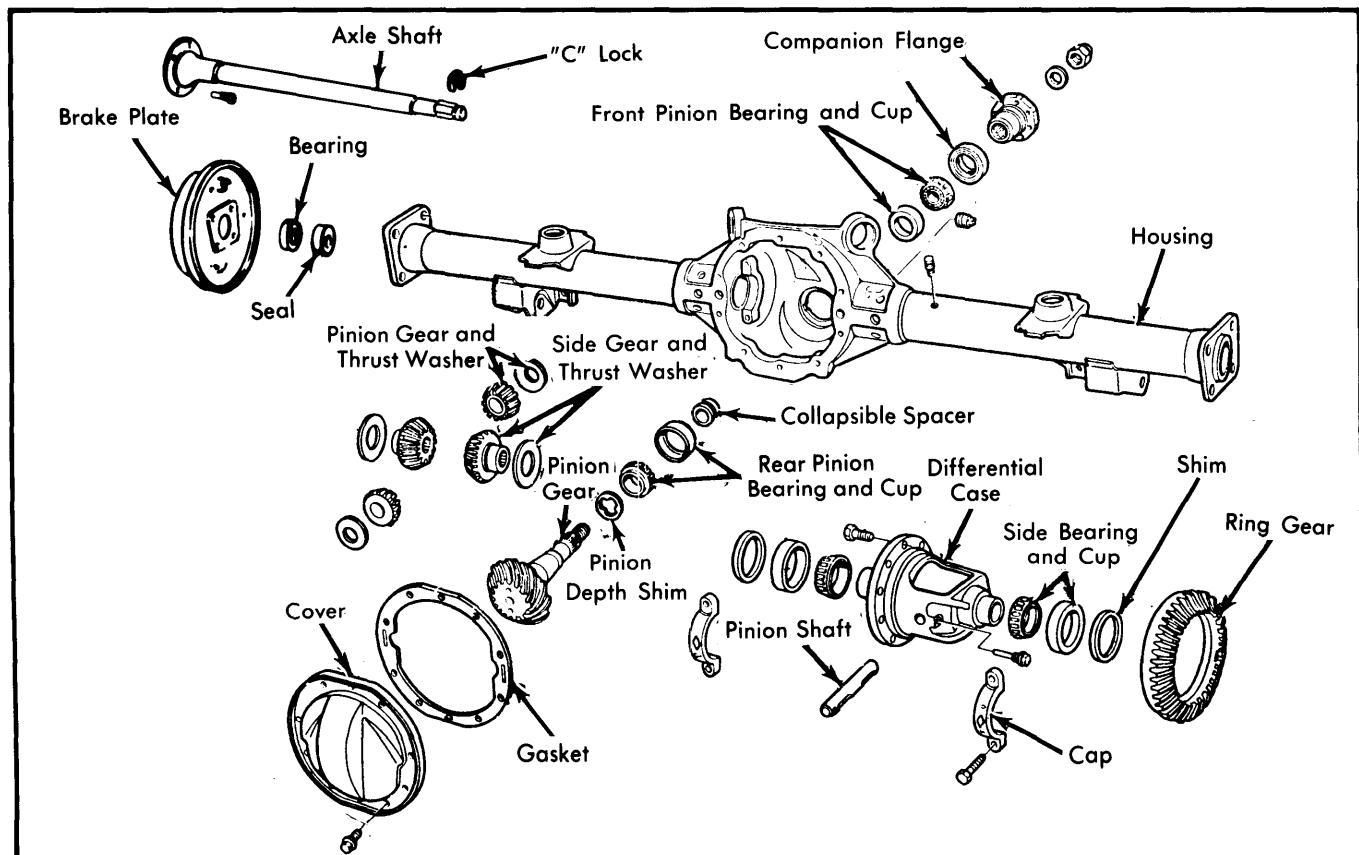


Fig. 2 Exploded View of General Motors Integral Rear Axle Assembly (Exc. Corvette)

## GENERAL MOTORS INTEGRAL HOUSING (Cont.)

2) Place a floor stand under front of rear axle housing. Support extension housing and disconnect center support bracket from underbody. Remove bolts attaching extension housing to axle housing and separate them, using a screwdriver if necessary. Pry oil seal out of housing with a screwdriver.

**Installation** — Using tool (J-25597), drive oil seal into axle housing. Making sure thrust washer is in place between extension shaft and pinion shaft, slide extension shaft over drive coupling and support front end with a floor stand. Install flange-to-axle housing bolts and connect center support bracket to underbody. Install propeller shaft, being sure thrust spring is in place. Remove floor stands and lower vehicle.

### REAR AXLE ASSEMBLY

**NOTE** — Removal and installation procedures are general for all models. Some steps may not apply to all models.

**Removal** — 1) Raise vehicle and support at frame. Remove wheels and tires. Position a jack under rear axle and raise axle only enough to support. Remove brake hose, junction block and axle vent tube from axle. Plug all openings in brake lines to prevent contamination of brake system. Remove brake drums or calipers and rotors. Remove axle shafts as previously outlined.

2) Disconnect brake lines and remove brake backing plates. Support backing plates and calipers from vehicle frame. Disconnect level control switch link, if equipped. Remove shock absorbers from axle and support out of way.

3) Scribe an alignment mark on driveshaft and companion flange for reassembly. Remove driveshaft from axle and support out of way. On Chevette and T1000 models, support axle extension and remove center support bracket bolts. On all models, remove track rod and stabilizer rod (if equipped) from axle housing.

**NOTE** — Use caution when removing axle. Improper placement of supporting devices or uncontrolled expansion of coil springs could cause bodily injury or damage to vehicle.

4) On Chevette and T1000 models, remove lower control arm pivot bolts at axle and carefully lower axle until spring tension is released before removing axle from vehicle.

5) On Camaro and Firebird models, lower axle, remove springs, disconnect lower control arms and torque arm from axle and remove axle from vehicle.

6) On all other models, disconnect upper control arms from axle, lower axle and remove springs, disconnect lower control arms from axle and remove axle from vehicle.

**Installation** — Reverse removal procedure and note the following:

- Use care when installing axle shafts to avoid damaging seals.
- Use a new cover gasket when reinstalling cover.
- Refill axle housing with lubricant.
- Bleed and adjust brakes.

### OVERHAUL

#### DISASSEMBLY

1) Remove axle shafts. Check ring and pinion gear backlash and pinion bearing preload. This will indicate gear or bearing

wear or an error in backlash or preload setting. Mark differential bearing caps and housing for reassembly reference. Remove caps and pry differential case from housing. Remove bearing cups and shims and keep each set with proper bearing cap for each reassembly reference.

2) Remove differential pinion shaft, gears, and side gears with thrust washers keeping them in order for reassembly. Remove ring gear bolts (*Left Hand Threads*) and tap gear from case using soft drift and hammer.

**NOTE** — For positive traction differential overhaul procedures, see *Positive Traction Differentials in this section*.

3) Remove pinion nut and companion flange (drive coupling on Chevette), then remove pinion shaft and front bearing. If necessary, remove pinion bearing cups from housing using a brass drift. Press pinion shaft out of rear bearing and note thickness of pinion depth shim pack.

#### REASSEMBLY

**Pinion Depth Adjustment** — 1) Drive pinion rear bearing shim thickness, controlling pinion depth of mesh with ring gear, must be determined whenever a new axle housing, ring and pinion set or pinion bearings and races are installed. Depth of mesh is determined using suitable Pinion Setting Gauge tool set.

**NOTE** — Checking procedure for different axle sizes is the same; however, tool component combinations vary between axles. See Fig. 5 and Tool Application Table for tool numbers and location of components used.

2) If removed, install pinion bearing races, then install lubricated pinion bearings. Position gauge plate and rear pinion bearing pilot (if used) on preload stud, then install through far pinion bearing and through front pinion bearing and front pinion bearing pilot. Install hex nut until snug, then rotate bearings to insure proper seating. Hold preload stud stationary with a wrench on flats, then tighten hex nut until 20 INCH Lbs. are required to rotate bearings.

3) Mount side bearing gauging discs on ends of arbor, then place arbor into carrier making sure discs are properly seated. Install side bearing caps and bolts, then tighten bolts to avoid movement. Position dial indicator on mounting post of arbor, with contact button resting on top surface of plunger. Preload dial indicator one-half revolution, then tighten in this position.

4) Place plunger onto gauging area of gauge plate. Rock plunger rod slowly back and forth across gauging area until dial indicator reads greatest deflection, then set indicator to zero. Repeat rocking action several times to verify setting. Once zero reading is obtained, swing plunger until it is removed from gauging area. Dial indicator will now read required pinion shim thickness for a "nominal pinion". Record this reading.

5) Check drive pinion for painted or stamped markings on pinion stem, or a stamped code number on small end of pinion gear. If marking is found to be a plus or minus number (for instance +2 or -5), add or subtract that many thousandths from indicator reading. This will then be thickness of rear pinion bearing shim pack.

**NOTE** — If no markings are found on pinion, use dial indicator reading as shim thickness.

## GENERAL MOTORS INTEGRAL HOUSING (Cont.)

6) Remove bearing caps and gauging tools from housing. Place selected shim pack on drive pinion. Install lubricated pinion bearing onto pinion shaft using a suitable press.

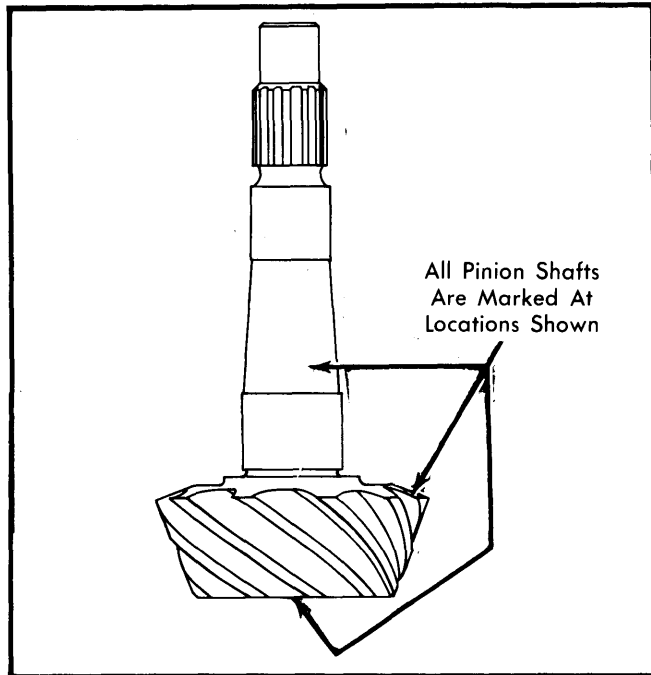


Fig. 4 Pinion Marking Locations

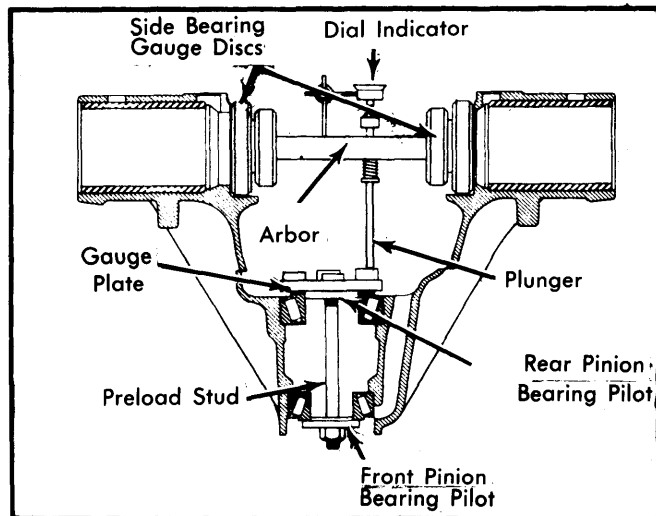


Fig. 5 Pinion Depth Gauge Set

**Case Reassembly** — Place ring gear onto case, install new bolts, then alternately tighten bolts to pull ring gear into position on case. Place side gear thrust washers over side gear hubs, then install assemblies into case in their original position. Install pinions and thrust washers into case, then install pinion shaft and lock bolt. Using suitable installing tools, install side bearings onto differential case.

**Differential Shim Selection** — 1) Measure thickness of original side bearing preload shims. Select a service spacer (.160" for 6½" ring gear and .170" for 7½", 8½" and 8¾" ring gear) and service shims with a total thickness slightly less than original shims. Install differential case in housing. Install

## Tool Application

Tool Name	Tool Number
Front Pinion Bearing Pilot	
6½" Axle .....	J-23597-21
7½", 8½", 8¾" Axle .....	J-21777-42
Preload Stud	
6½", 7½", 8½", 8¾" Axle .....	J-21777-43
Rear Pinion Bearing Pilot	
6½" Axle .....	Not Used
7½" Axle .....	J-21777-40
8½", 8¾" Axle .....	J-21777-35
Gauge Plate	
6½" Axle .....	J-23597-20
7½" Axle .....	J-23597-11
8½", 8¾" Axle .....	①J-21777-29
Arbor	
6½" Axle .....	J-23597-6
7½" Axle .....	J-23597-1
8½", 8¾" Axle .....	J21777-1
Side Bearing Gauge Discs	
6½" Axle .....	J-23597-4
7½", 8½", 8¾" Axle .....	J-21777-45

① — On 8¾" axle, use pad on plate marked 8⅞".

spacer between each bearing cup and housing with chamfered edge of spacer against housing. Install left bearing cap loosely so that differential case is free to move.

2) With left bearing race and spacer against housing, install both left and right service shims previously selected between right bearing race and service spacer. Insert progressively larger feeler gauges between right service spacer and shim pack until a noticeable drag is felt. Remove differential case, shims and spacers from axle housing.

**Pinion Installation & Preload Adjustment** — Install a new collapsible spacer over pinion stem, then position pinion in housing. While holding pinion forward, carefully drive front pinion bearing onto pinion shaft until a few threads are exposed. Install new oil seal, then drive coupling (Chevette) or companion flange (all others), washer and nut, and tighten until end play is removed. Rotate pinion several times to seat bearings, then check preload using an INCH Lb. torque wrench. Continue tightening nut and checking preload until proper preload is obtained (see specifications).

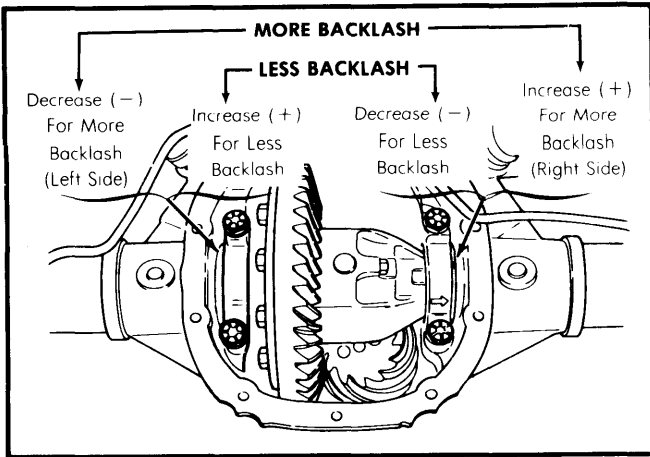
**CAUTION** — Do not back off nut to lessen preload. If preload is exceeded, a new collapsible spacer must be installed and nut retightened until proper preload is obtained.

**Ring & Pinion Gear Backlash** — 1) With pinion depth set and pinion installed, place differential case and ring gear assembly into axle housing. Select 2 shims with a combined thickness equal to that of service shims and feeler gauge used in shim selection procedure. Install shims and spacers between bearing cups and housing. Install differential bearing caps and tighten cap bolts to specification.

2) Rotate differential case several times to seat bearings and then check backlash using a dial indicator. Increase or decrease shim size where necessary to correct backlash reading. See Fig. 6. Recheck backlash at 4 points, equally

## GENERAL MOTORS INTEGRAL HOUSING (Cont.)

spaced around ring gear, making sure that variation between points does not exceed .002".



**Fig. 6 Backlash Adjustment**

**Differential Bearing Preload** — Remove differential bearing caps and increase both left and right shim sizes .004" (.008" total for both sides). Gentle tapping may be necessary to install second shim. Make sure shims are seated and differential turns freely. Using gear marking compound, check gear tooth contact pattern to verify proper assembly and adjustment.

**NOTE** — Do not attempt to reinstall the original production shims as they will break when tapped into place. Previously installed SERVICE shims may be re-used.

### ADJUSTMENT SPECIFICATIONS

Application	Specification
Pinion Bearing Preload <sup>①</sup>	
Chevette & T1000	
New Bearings .....	10-20 INCH Lbs.
Used Bearings .....	5-15 INCH Lbs.
All Others	
New Bearings .....	20-30 INCH Lbs.
Used Bearings .....	5-15 INCH Lbs.
Ring Gear Backlash .....	.005-.009"
Side Bearing Preload .....	Slip Fit Plus .008" <sup>②</sup>

- ① — Measured with new seal without ring gear installed.
- ② — Add .004" to each side to preload bearings.

### DRIVE AXLE CAPACITIES

Application	Capacity (Pts.)
Buick	
7 1/2" Gear .....	3.5
Cadillac	
8 3/4" Gear .....	4.2
Chevrolet	
7 1/2" Gear .....	3.5
8 3/4" Gear .....	5.4
Chevette .....	1.7
Oldsmobile	
7 1/2" Gear .....	3.5
8 1/2" Gear .....	4.3
8 3/4" Gear .....	4.3
Pontiac	
7 1/2" Gear .....	3.5
T1000 .....	1.7

### TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N·m)
Ring Gear-to-Case Bolt	
Chevette & T1000 .....	45-50 (61-68)
All Others .....	80-90 (108-122)
Bearing Cap Bolt .....	55-65 (75-88)
Pinion Shaft Lock Bolt	
Chevette & T1000 .....	10-15 (14-20)
All Others .....	15-25 (20-34)
Housing Cover Bolts .....	20-30 (27-41)
Universal Joint Flange-to-Piston Flange	
Cadillac .....	65-75 (88-102)