G.M. FRONT WHEEL FINAL DRIVE

Buick Riviera
Cadillac Eldorado
Oldsmobile Toronado

DESCRIPTION

Front wheel final drive assembly is mounted on and splined directly to the automatic transmission. Unit consists of a pinion drive gear, ring gear and differential case assembly. Torque from final drive unit is transmitted to output shafts, which are connected to drive axles. Output shafts are splined to final drive side gears. Drive axles are flexible assemblies consisting of axle shafts and inner and outer constant velocity joints.

AXLE RATIO & IDENTIFICATION

Axle ratio code and build date are stamped on left side of housing cover mounting surface. Ratio is identified by the 2 letters following the number "4".

Axle Ratio Identification

Axle Ratio	Code	Ring Gear Diam. Inches
2.19:1	MA	8
2.41:1	MB	8
2.73:1 Riviera	MC	8
2.93:1 Riviera	MD	8

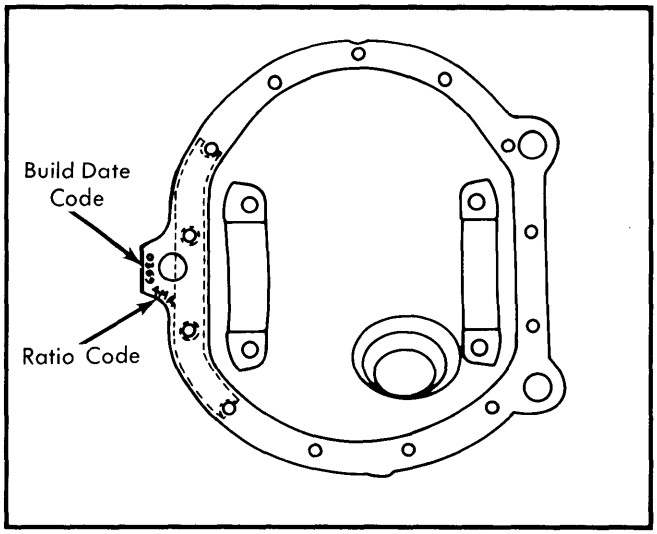

Fig. 1 Axle Ratio Code Location

REMOVAL & INSTALLATION

DRIVE AXLES

Removal (Right or Left) – 1) Disconnect negative battery cable. Raise vehicle and support under front frame horns and lower front post. Remove wheel.

2) Remove cotter pin, nut and shield from tie rod pivot. Use suitable puller (J-24319) to remove tie rod end from steering

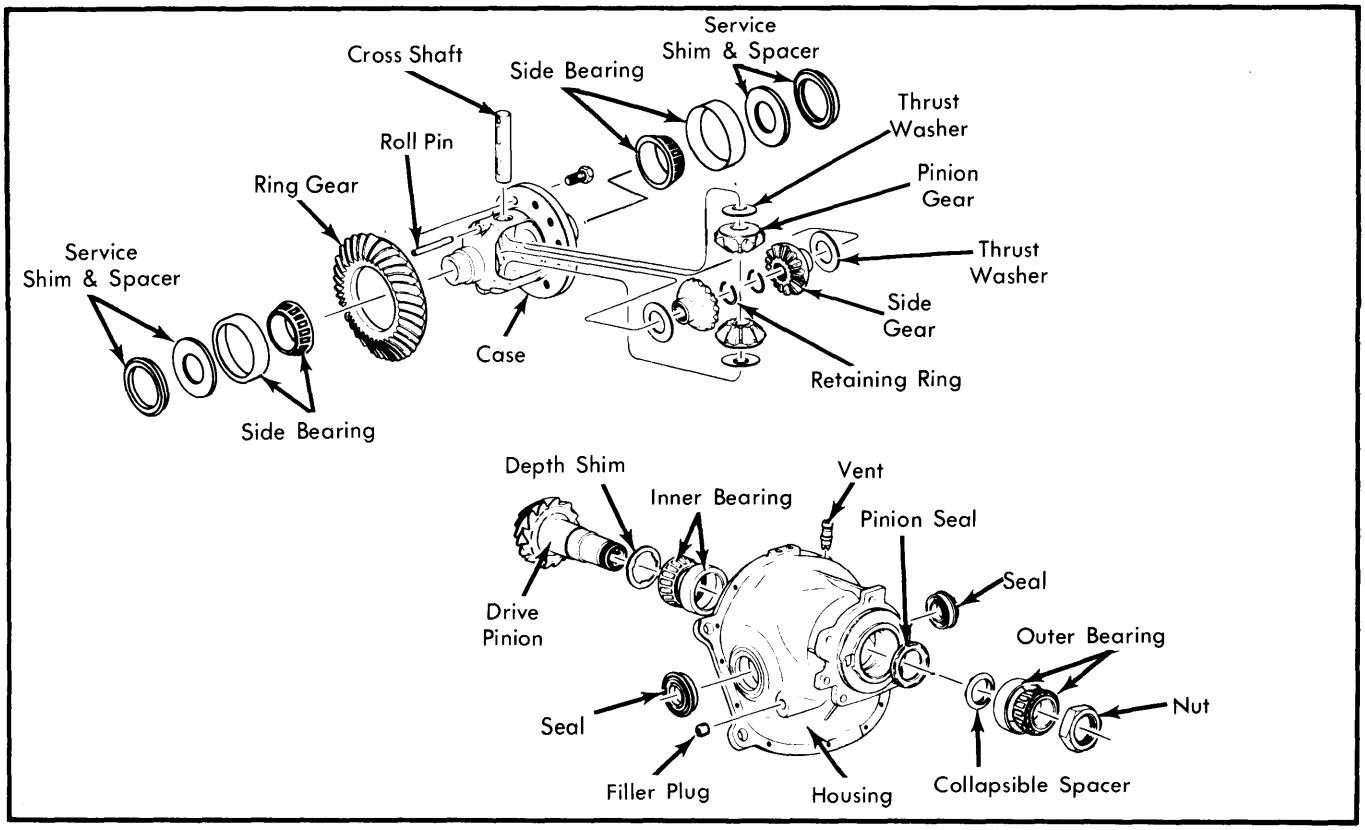

Fig. 2 Exploded View of General Motors Front Wheel Final Drive Assembly

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knuckle. Install drive axle boot seal protectors (J-28712) over rubber boots. After inserting a drift through opening in top of brake caliper and into vane of brake rotor to keep axle from turning, remove cotter pin, retainer, nut and washer from drive axle.

3) Remove drive axle-to-output shaft attaching bolts. Remove cotter pin and nut from upper ball joint, pushing drive axle inward to gain access to nut. Pull brake hose clip off of ball joint stud and loosely reinstall nut.

4) Using hammer and brass drift, pound downward on steering knuckle to unseat ball joint stud. It may be necessary to pry upward on upper control arm. Remove nut and separate upper ball joint from steering knuckle. Guide drive axle out of knuckle and remove from vehicle.

CAUTION – *Take care not to strech or damage brake hose.*

Installation – To install, reverse removal procedure.

OUTPUT SHAFTS

NOTE – *If both right and left output shafts and/or seals are to be removed or replaced, final drive assembly should be removed from vehicle.*

Removal (Right) – 1) Remove drive axle. Remove 2 bolts attaching battery cable retainer to support and 2 bolts attaching output shaft support to engine. Remove front nut and bolt from right frame brace, and rotate brace outward for access.

2) Remove output shaft and support assembly by using a soft metal hammer to pound on flanged end of shaft until it "pops" out of retaining ring. Carefully guide shaft out of vehicle. Use suitable pry bar to remove shaft seal from housing and discard seal.

NOTE – *Pry seal at 2 or 3 different locations to avoid cocking seal and damaging housing.*

Installation – 1) Install new output shaft seal using suitable installer and handle (J-28518 and J-8092), and apply clean wheel bearing grease between seal lips. Being careful not to damage seal, index output shaft splines with side gear splines and use a soft hammer to tap on center of flanged end of shaft until shaft "snaps" into place.

NOTE – *Check spline fit to ensure there will be no drive line clunk. Do not let shaft and support assembly hang in final drive unit or align shaft off center in seal, as seal may be damaged.*

2) Align shaft support with holes in engine block, loosely install bolts and washers and move flanged end of shaft up and down and back and forth to find center location. Fully tighten bolts. Install 2 bolts attaching battery cable retainer to support. Install drive axle. Restore frame brace to original position.

Removal (Left) – Remove drive axle. Remove front bolt and nut from left frame brace, and rotate brace outward for access. Use a hammer and large brass drift to tap on flanged end of output shaft until it "pops" out of retaining ring. Carefully guide shaft out of vehicle. Use suitable pry bar to remove shaft seal from housing and discard seal.

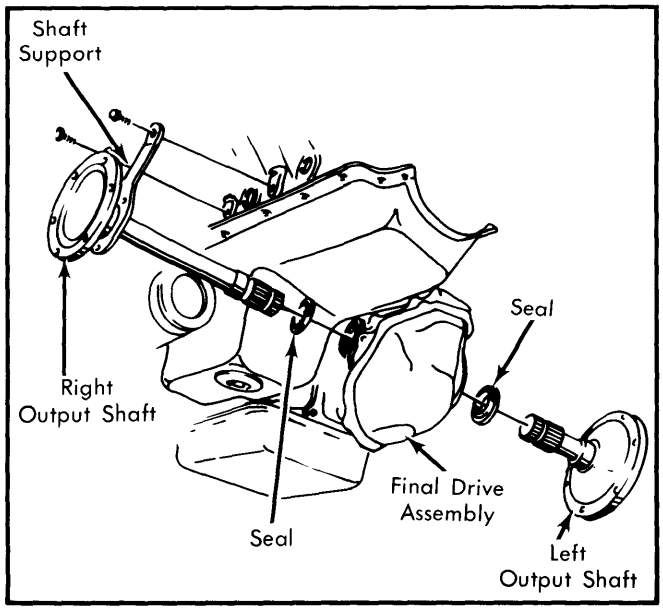

Fig. 3 Output Shafts and Related Components

NOTE – *Pry seal at 2 or 3 different locations to avoid cocking seal and damaging housing.*

Installation – Install new output shaft seal using suitable installer and handle (J-28518 and J-8092), and apply clean wheel bearing grease between seal lips. Being careful not to damage seal, index output shaft splines with side gear splines and use a soft hammer to tap on center of flanged end of shaft until shaft "snaps" into place. Install drive axle. Restore frame brace to original position.

NOTE – *Check spline fit to ensure there will be no drive line clunk.*

RIGHT OUTPUT SHAFT SUPPORT BEARING

Removal – Remove right output shaft and support assembly from vehicle. Remove 3 self-tapping bolts attaching bearing retainer to support. Slide split halves of suitable bearing remover (J-22912) between flanged end of output shaft and flat area of shaft support and tighten bolts. Press shaft support, bearing, retainer and slinger off of output shaft as an assembly.

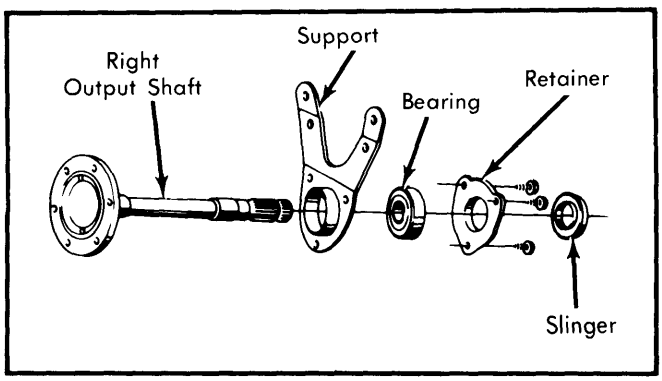

Fig. 4 Exploded View of Right Output Shaft and Support Bearing Assembly

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Installation – Pack bearing with wheel bearing grease and install in output shaft support. Install retainer and secure with 3 self-tapping bolts. Place assembled parts and slinger on output shaft. Using suitable installer (J-23042) or a standard 1¼" I.D. pipe around shaft as a press tool, press bearing and assembled parts on shaft until seated. Check for free bearing rotation and install output shaft and support on vehicle.

FINAL DRIVE ASSEMBLY

Removal – 1) Disconnect negative battery cable. Raise vehicle and support under front frame horns and lower front post. Remove right and left frame brace front attaching bolts and rotate braces outward to gain access. Loosen final drive cover bolts to drain lubricant; then, remove bolts and cover. Install drive axle boot seal protectors (J-28712).

2) Remove drive axle-to-output shaft attaching bolts and separate output shaft and drive axle flanges to provide clearance for final drive removal. Remove 2 bolts attaching battery cable retainer to right output shaft support and 2 bolts attaching support to engine. Rotate support downward for removal clearance.

3) Remove final drive-to-transmission bolt attaching rear of final drive shield to transmission and loosen final drive support bracket screw attaching front of shield to final drive. Then, slide shield outward and forward and remove from vehicle.

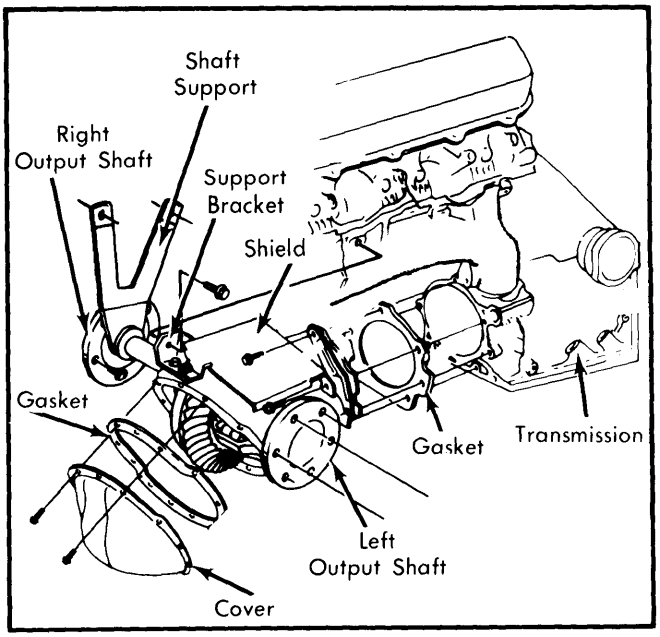

Fig. 5 Attachment of Final Drive Assembly

4) Remove final drive support bracket-to-engine block bolt and 5 remaining final drive-to-transmission bolts. Using suitable puller (J-24319), separate steering linkage intermediate shaft from pitman and idler arms, and push linkage toward front of vehicle. With aid of helper or transmission jack, slide final drive assembly forward, off of splined shaft and remove from vehicle with output shafts attached.

NOTE – *Do not use output shafts as "handles" to maneuver or support final drive assembly, as splines or seals could be damaged.*

Installation – Reverse removal procedures and note the folllowing:

- Coat final drive-to-transmission gasket with petroleum jelly to hold in position. Use no grease, oiler or sealant on gasket.
- Do not allow right output shaft and support to hang in final drive unit, as seals may be damaged.
- To ensure proper alignment of right output shaft, loosely install support bolts, move output shaft flanged end up and down and back and forth to find central location, and fully tighten bolts.
- RTV sealant may be used in place of a new housing cover gasket if desired.

OVERHAUL

CONSTANT VELOCITY JOINTS

NOTE – *There is both an early and a late type drive axle assembly. They differ mainly in the location of inboard joint spider and outboard joint inner race retaining grooves on the axle shaft. Type can be easily identified with drive axle assembled. On early type, a groove is visible on axle shaft; on late type, no groove is visible.*

Disassembly (Outer Joint) – 1) Clamp mid-part of axle shaft in a vise. Use cutters to remove seal retaining clamp. Using a hammer and brass drift, tap lightly and evenly all around seal retainer to remove it from joint assembly and slide seal down shaft.

2) Remove joint assembly from shaft as follows:

- On early type, use suitable snap ring pliers to slide spacer ring back. Push joint assembly onto shaft until it bottoms; then, pull it back and off of shaft. Use a small, pointed tool to remove retaining ring from inner race.
- On late type, use suitable snap ring pliers to spread retaining ring ears apart and pull shaft out of joint assembly.

3) Using a hammer and brass drift, gently tap on cage until tilted enough to remove one ball. Continue until all balls are removed. Pivot cage and inner race 90°, align cage windows with lands of outer race and lift out cage and inner race. Pivot inner race 90° in cage, align lands with cage windows and remove inner race from cage.

Reassembly – 1) Put a light coat of grease on ball grooves of inner and outer races. Reverse disassemby procedure to install inner race in cage, cage in outer race and ball bearings in cage.

NOTE – *Install inner race with raised boss facing inward (toward outer race).*

2) Slide seal retaining clamp, seal and seal retainer onto shaft. Install joint assembly on shaft as follows:

- On early type, slide spacer ring over first shaft groove and feed retaining ring into same groove **under** spacer ring. Push joint assembly onto shaft until spacer ring is seated in groove.

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- On late type, push joint assembly onto shaft until race retaining ring is seated in groove.

3) Coat inside of seal lip with grease and slide lip into seal retainer. Repack joint assembly with approximately half of grease provided with new seal and put remainder in seal. Place suitable support blocks under edge of seal retainer and press joint assembly into retainer. Position seal end in groove on shaft and, using suitable tool (J-22610), secure seal retaining clamp on seal.

Disassembly (Inner Joint) – 1) Clamp mid-part of axle shaft in a vise. Use cutters to remove seal retaining clamp. Using a hammer and brass drift, tap lightly and evenly all around seal retainer to remove it from housing and slide seal down shaft. Pull housing off of shaft.

2) Remove spider assembly from shaft as follows:

- On early type, use suitable snap ring pliers to slide spacer ring back. Push spider assembly onto shaft until it bottoms; then, pull it back and off of shaft. Use a small, pointed tool to remove retaining ring from spider assembly.
- On late type, use suitable snap ring pliers to slide spacer ring back. Then, slide spider assembly back to expose shaft retaining ring, remove ring and pull spider assembly off of shaft.

Reassembly – 1) Slide seal retaining clamp, seal and seal retainer onto shaft. Repack housing with approximately half of grease provided with new seal and put remainder in seal. Install spider assembly on shaft as follows:

- On early type, slide spacer ring over first shaft groove and feed retaining ring into same groove **under** spacer ring. Hold spider assembly with raised ring facing toward shaft and push assembly onto shaft until spacer ring is seated in groove.
- On late type, slide spacer ring onto shaft about 4". Hold spider assembly with counterbore facing away from shaft and slide assembly onto shaft beyond shaft retaining ring groove on end of shaft. Install shaft retaining ring in groove; then, slide spider assembly back toward end of shaft until it locks in place over retaining ring. Slide spacer ring toward end of shaft until it contacts spider and seat it in groove.

2) Slide housing over spider assembly. Coat inside of seal lip with grease and slide lip into seal retainer. Repack joint assembly with approximately half of grease provided with new seal and put remainder in seal. Place suitable support blocks under edge of seal retainer and press housing into retainer. Position seal end in groove on shaft and, using suitable tool (J-226010), secure retaining clamp on seal.

NOTE – *For left axle on Riviera models: Restake seal retainer to housing at 3 staking flats located on outer circumference of housing.*

FINAL DRIVE DISASSEMBLY

1) Remove final drive assembly from vehicle. Mount assembly on suitable holding fixture (J-23320-A).

NOTE – *Before disassembling unit, check and record ring gear-to-pinion backlash.*

2) Mark bearing caps for reassembly reference; then, remove cap bolts and bearing caps. Using suitable pry bar, remove differential case by prying against ring gear bolt. Mark shims for reassembly reference.

3) If differential side bearings are to be replaced, remove them using suitable puller or press. Remove differential pinion shaft, gears and side gears and thrust washers, keeping them in order for reassembly. Remove all but 2 ring gear-to-case bolts, leaving them loosely installed 180° apart. Remove ring gear by alternately tapping on these bolts.

4) Check pinion bearing preload using spline adapter (J-28513) and suitable torque wrench. Record reading. To

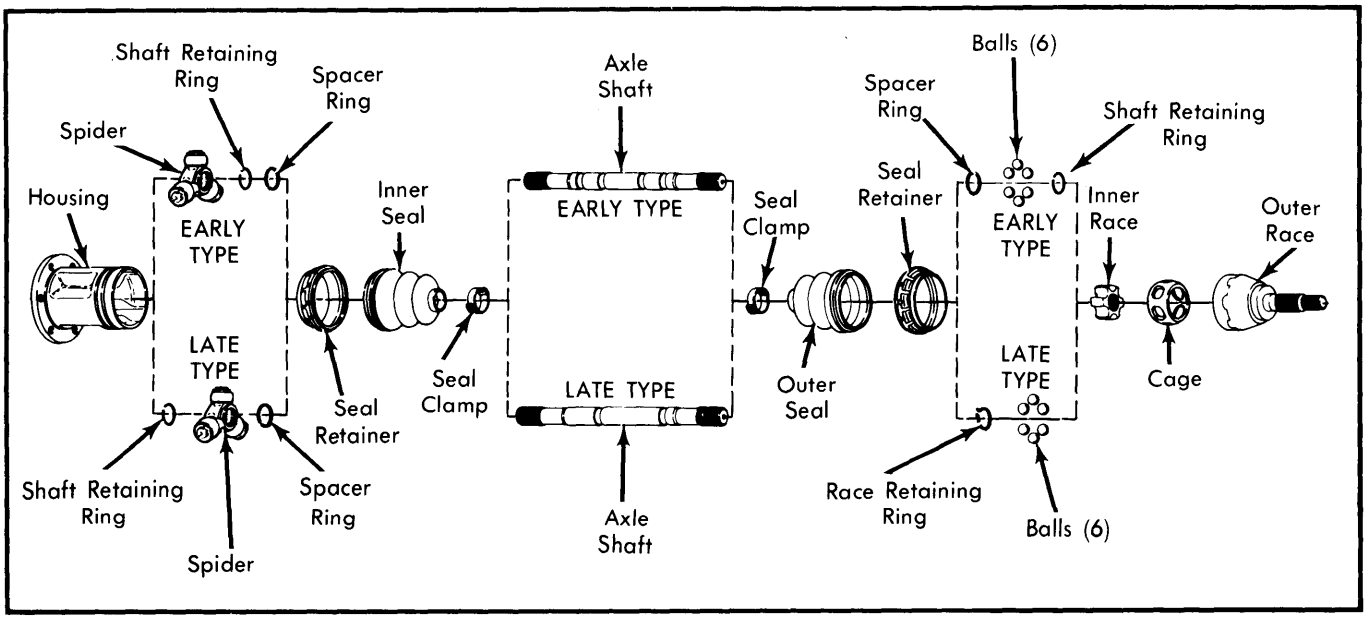

Fig. 6 Exploded View of Front Drive Axle Assembly

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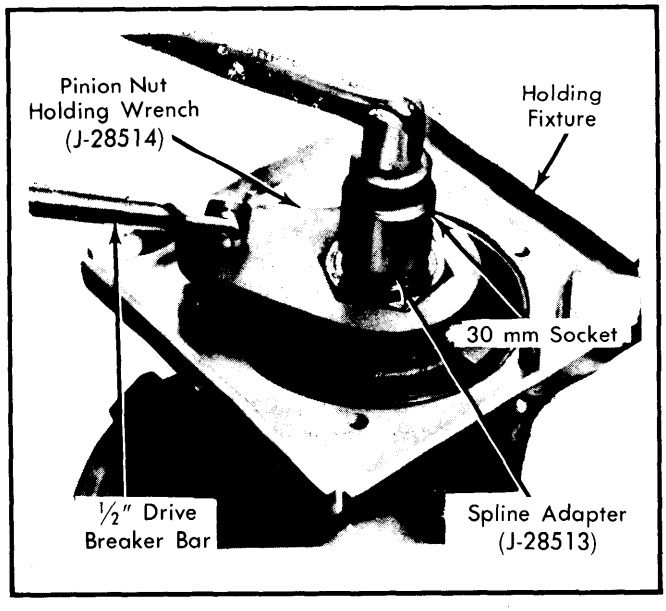

Fig. 7 Removing or Installing Pinion Nut

remove pinion nut, use suitable wrench (J-28514) to hold nut while turning pinion **clockwise** with spline adapter (J-28513).

5) Thread nut loosely on pinion and tap on nut with hammer to free pinion. Remove nut, outer bearing, collapsible spacer and pinion. Using hammer and suitable drift, remove pinion seal by driving toward inside of housing. Then, drive outer bearing race out from inside of housing.

6) Remove inner bearing race by installing suitable remover (J-28512) between housing bore and race and tapping out with slide hammer. Using suitable bearing remover (J-9746-02), press pinion shaft out of inner bearing and note thickness of pinion depth shim.

CLEANING & INSPECTION

Wash all parts in solvent or mineral spirits; then, dry thoroughly using dry, compressed air. Using a clean cloth, wipe inside of housing clean. Inspect all parts for chips, nicks, and excessive wear. Replace parts as necessary.

REASSEMBLY

Pinion Depth Setting – 1) If original ring gear, pinion and inner pinion bearing are to be reinstalled, the original shim thickness may be used. If installing new components, perform the following procedure.

NOTE – *Use pinion gauge set J-21777-75 to obtain proper pinion depth setting.*

2) Clean housing assembly and all gauge parts to ensure accurate measurements. If removed, install pinion bearing races; then, install lubricated pinion bearings in their races. Position inner bearing pilot (J-21777-8) on short threaded end of preload stud (J-2177-43). Then, thread gauge plate (J-21777-77) on stud and tighten against pilot. Insert stud through inner and outer bearings, install outer bearing pilot (J-21777-78) and nut and rotate bearings to ensure proper seating. Tighten nut until 20 INCH lbs. are required to rotate bearings.

3) Mount side bearing gauging discs (J-21777-45) on ends of arbor (J-21777-1) with smaller steps out. Place assembly in housing, making sure discs are properly seated, and install bearing caps and bolts finger-tight to prevent movement. Position dial indicator on mounting post of arbor with contact button resting on top surface of plunger. Preload dial indicator one-half revolution and tighten in this position.

4) Rotate gauge plate until plunger rests squarely on flat surface of plate. Rock plunger rod slowly back and forth across plate until 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 gauge plate. Dial indicator will now read required shim thickness for a "nominal pinion". Record this reading.

5) Check inner face of drive pinion for a stamped code number. If pinion is stamped with a plus number (for example, "+2"), add that many thousandths to dial indicator reading to determine shim thickness. If pinion is stamped with a minus number (for example, "-5"), subtract that many thousandths to determine shim thickness. If no code is present, use dial indicator reading as shim thickness.

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

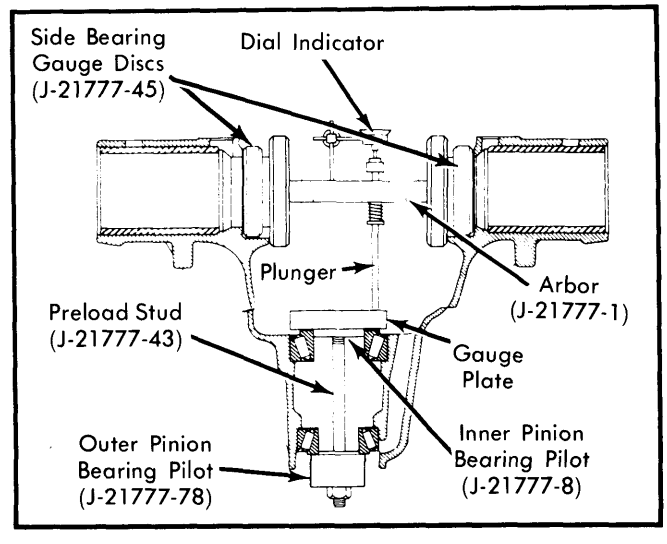

Fig. 8 Pinion Depth Gauge Set

Pinion Installation & Preload Adjustment – 1) Install pinion seal in housing and lubricate with transmission fluid. Lubricate inner bearing with differential lube, install suitable seal protector on pinion, and position pinion in housing. Lubricate outer pinion bearing with transmission fluid and install new collapsible spacer, outer pinion bearing and nut (finger-tight) on pinion shaft.

2) Using spline adapter (J-28513) and suitable wrench (J-28514), tighten pinion nut until end play begins to be taken up. *Fig. 7.* When no further end play is felt, use spline adapter (J-28513) and suitable torque wrench to check preload. Continue tightening nut and checking preload until specified preload is obtained.

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

Case Reassembly – Place ring gear onto case, install new bolts and tighten to pull ring gear into position on case. Place side gear thrust washers over side gear hubs. Then, install assemblies into case in original positions. Install pinions and thrust washers into case; then, install pinion shaft and roll pin. If removed, install side bearings onto case.

Side Bearing Preload – 1) This adjustment is to be made before pinion is installed. If pinion is installed, remove ring gear from case. Measure thickness of original side bearing preload shims. Select a service spacer (.170") and service shims with a total thickness slightly less than the orignial shims. Install differential case in housing. Install service spacer between each bearing race and housing with chamfered edges of spacer against housing.

2) With right (ring gear side) bearing race and spacer against housing, install both right and left service shims previously selected between left (opposite ring gear) bearing race and service spacer. Insert progressively larger feeler gauges until a noticeable drag is felt.

NOTE – *To obtain correct reading, push feeler gauge downward until end of gauge contacts housing bore.*

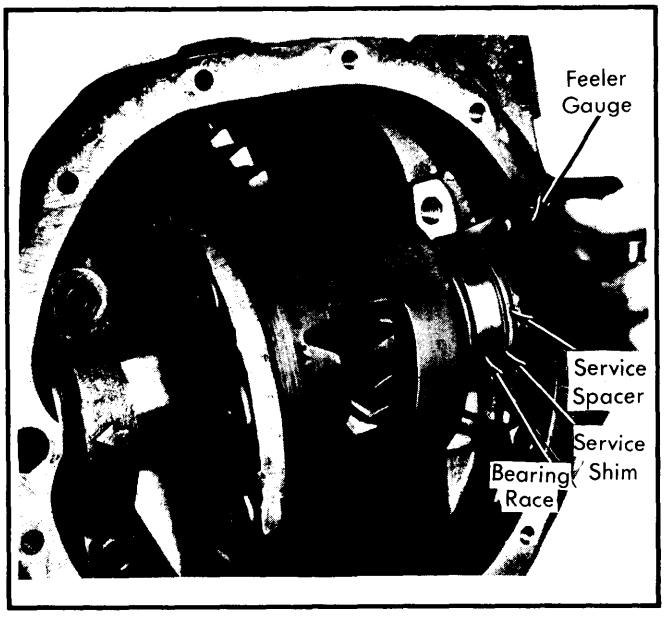

Fig. 9 Determining Side Bearing Shim Requirements

3) Remove differential case and install ring gear (if removed). Remove service shims from left side. Select 2 shims of equal thickness with a total thickness equal to service shim thickness plus feeler gauge reading. Install case in housing. Insert selected shims between bearing race and service spacer on both right and left sides. Adjust differential backlash. Then, preload bearings by replacing right and left service shims with shims .003" (total .006") thicker on Eldorado and Riviera, .004" (total .008") thicker on Toronado.

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

Ring Gear and Pinion Backlash – 1) Mount dial indicator on axle housing and check backlash at 4 locations around ring gear. Variation should not exceed .002". Backlash for new gears should be as specified. If original gears have been reinstalled, backlash should be reset to reading recorded before disassembly.

2) To adjust backlash, increase thickness of one shim and decrease thickness of other shim by an equal amount until correct reading is obtained. Install bearing caps, recheck backlash and readjust if necessary.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Drive Axle-to-Output Shaft Bolts	65
Drive Axle Nut	
Eldorado	130
Riviera & Toronado	175
Output Shaft Support-to-Engine Bolts	50
Final Drive Support Bracket to Engine	50
Final Drive Support Bracket to Housing	34
Final Drive-to-Transmission Bolts	30
Upper Ball Joint Stud Nut	
Eldorado & Riviera	60
Toronado	90
Lower Ball Joint Stud Nut	
Eldorado & Riviera	85
Toronado	65
Tie Rod-to-Steering Knuckle Nut	
Eldorado & Riviera	44
Toronado	35
Ring Gear-to-Case Bolts	
Eldorado	95
Riviera	90
Toronado	80
Bearing Cap Bolts	40
Housing Cover Bolts	7

SPECIFICATIONS

Application	Clearance or Torque
Side Bearing Preload	
Eldorado & Riviera	①Slip Fit Plus .006"
Toronado	②Slip Fit Plus .008"
Pinion Bearing Preload	
Used Bearings	③
New Bearings	18-24 INCH lbs.
Ring Gear-to-Pinion Backlash	
Used Gears	④
New Gears	
Eldorado & Riviera	.005-.009"
Toronado	.005-.007"

① – Add .003" to each side after backlash set.
② – Add .004" to each side after backlash set
③ – Pre-disassembly reading plus 5 INCH lbs.
④ – Restore to pre-disassembly reading.