

# Dana Model 44 and 50 Front Drive Axles

## SECTION 15-34

APPLIES TO F-150 — F-350 (4x4) AND BRONCO

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### DESCRIPTION AND OPERATION

Three types of Dana front-drive axles are available for Ford light truck application. The Dana 44-IFS (Independent Front Suspension) is available on Bronco and F-150 (4x4) (Fig. 1). The Dana 44-IFS-HD (Independent Front Suspension—Heavy Duty) is available on F-250 (4x4) (Fig. 2). The Dana 50-IFS (Independent Front Suspension) is available on F-250—F-350 (4x4) (Fig. 3).

All axles are basically alike with only minor differences between the three. The 44-IFS (Fig. 1) is on vehicles equipped with front coil springs. The 44IFS HD and 50 IFS are on vehicles equipped with front leaf springs.

The 44-IFS (Fig. 1) is equipped with manual or automatic hubs. The 44-IFS-HD (Fig. 2) and 50-IFS (Fig. 3) axles equipped with manual locking hubs only.

The differential carrier is mounted to the left hand axle arm. Adjustment of the differential bearings is accomplished by means of shims placed between the bearings and the differential case. The differential bearings are preloaded by the squeezing action of the carrier housing. A spreader must be used on the axle housing to relieve the tension on the differential bearings and permit removal or installation of the differential.

The front axle is of the integral carrier-housing, hypoid-gear type, in which the centerline of the drive pinion is mounted above the centerline of the ring gear.

The integral drive pinion gear and shaft is supported by two opposed tapered roller bearings which are assembled in the carrier housing. Pinion locating shims,

installed between the inner bearing cup and the cup seat, control the drive pinion depth adjustment. The pinion bearing preload is controlled by shims located between the pinion outer bearing and the shoulder on the drive pinion shaft.

The differential case assembly is supported by two opposed tapered roller bearings and cups, which are retained in the housing by removable caps. Shims, installed between each differential bearing and the shoulder on the case, perform three functions: they take up the differential case side clearance; they adjust the backlash between ring gear and drive pinion, and they establish differential side bearing preload.

The cover on the front of the carrier housing is integral with the left hand axle arm assembly. A metal tag, stamped with the gear ratio and part number is secured to the housing by one of the carrier mounting bolts (Section 15-01, General Driving Axle and Driveshaft Service).

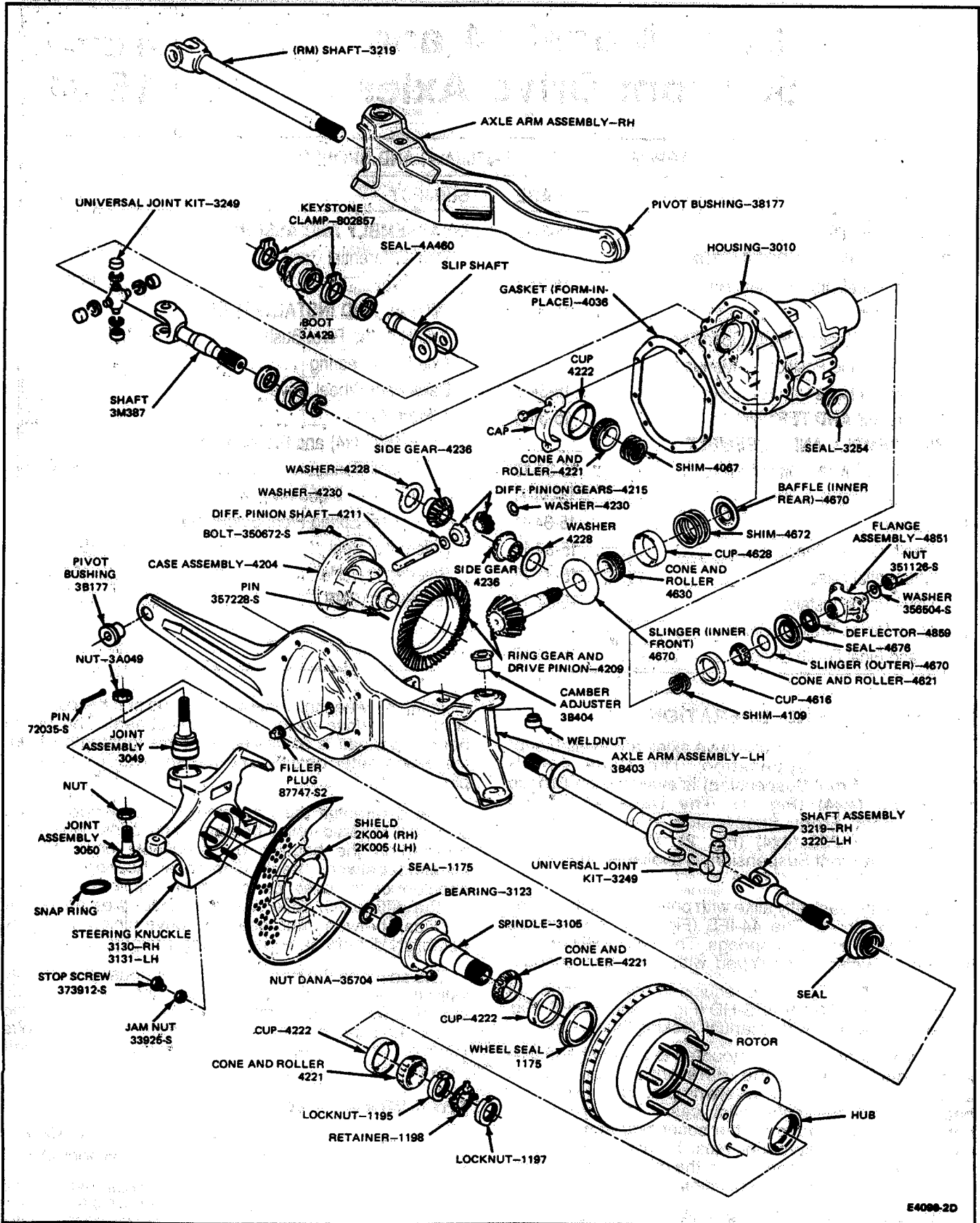
### Front-Wheel Drive Manual Hub

For service procedures on front hubs, refer to Section 11-12 Wheel Hubs and Bearings Front Wheel Drive.

The manual locking hub is standard equipment for the Dana front axle of the Bronco and F-150—F-250 (4x4). It is the internal locking type. The automatic locking hubs are optional on F-150 (4x4) and Bronco.

### Lock Position

Refer to Fig. 4.



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FIG. 1 Dana 44-IFS Front Drive Axle Bronco and F-150 (4x4)

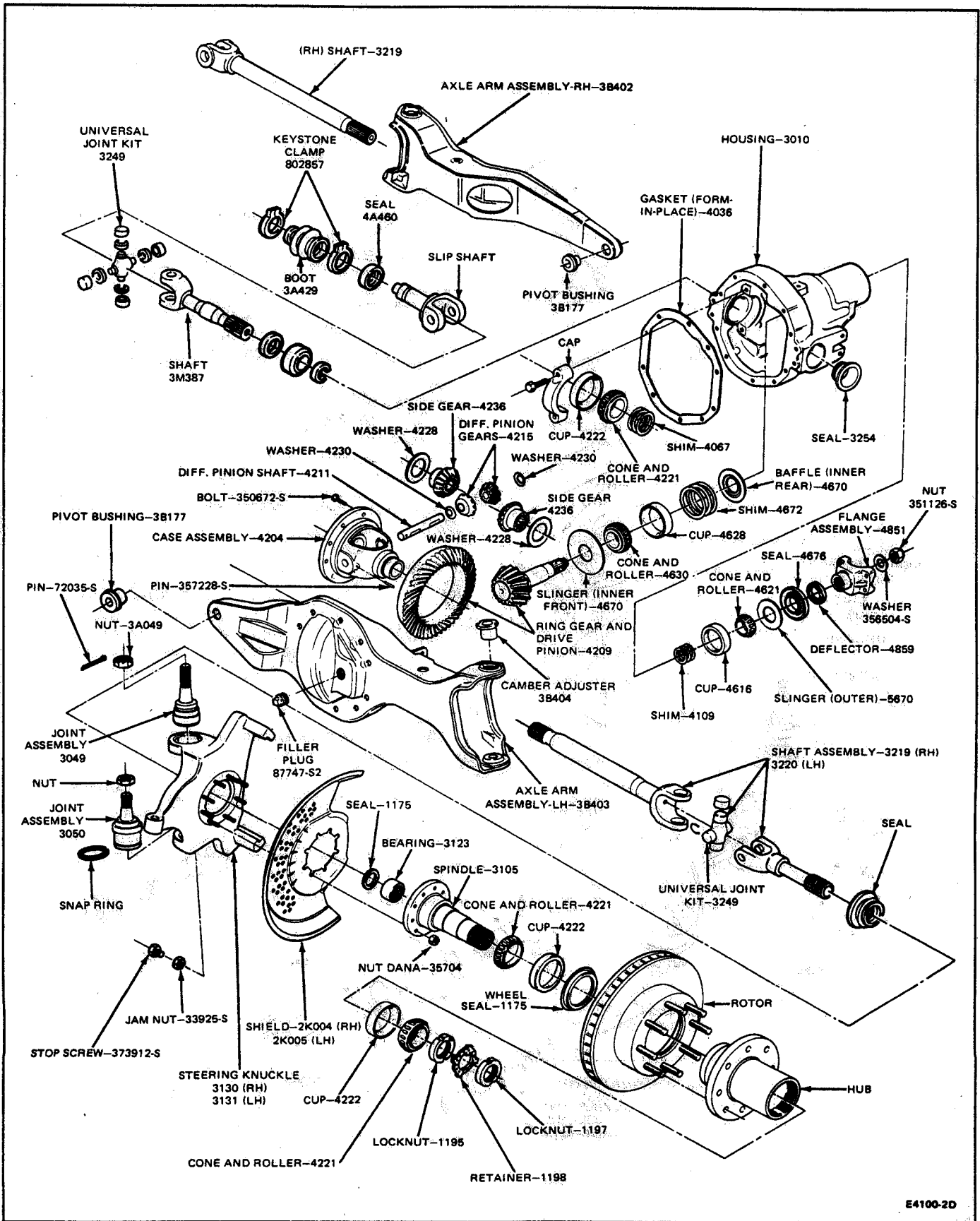


FIG. 2 Dana 44-IFS-HD-Front Driving Axle F-250 (4x4)

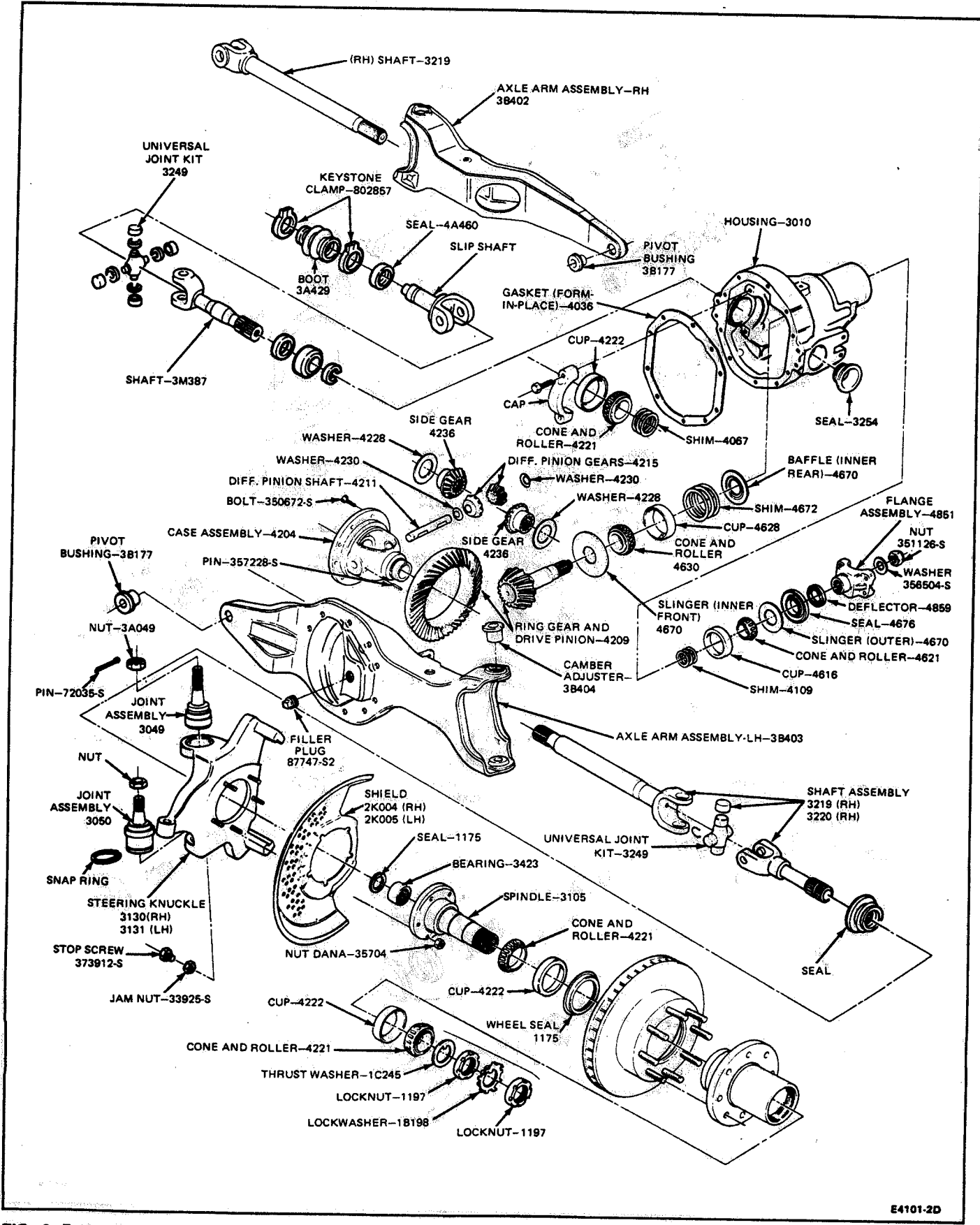


FIG. 3 Dana 50-IFS-Front Drive Axle F-250-F-350 (4x4)

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When the transfer case is to be shifted into the position for driving the front axle, the pointer on the center bar of the hub must point to the pointer over the word LOCK on the Hub Lock Cap. If the clutch teeth do not engage with the knob turned to this position, the clutch teeth are butted and a slight movement of the wheel in either direction will complete the lock. The front axle will now drive the wheels. Do not operate in four-wheel drive with the hubs disengaged.

#### Free Running Position—Manual Locking Hubs

When the transfer case is to be shifted into the position for driving the rear axle only, turn the pointer on the center bar of the hub so it points to the pointer over the word FREE on the Hub Lock Cap. This will disengage the clutch teeth and thus unlock the wheel hubs from the axle shafts. The wheels will turn freely on the axles.

**Be certain that the transfer case is shifted into two-wheel drive position before disengaging the free running hubs.**

If difficulty is experienced in disengagement of the free running hubs, a slight movement of the vehicle in either direction with the transfer case in 2 wheel drive position, will reduce driveline wrap-up and ease disengagement.

#### Automatic Locking Hubs Operation (Optional on Bronco and F-150/F-250 4x4)

**Four-Wheel Drive**—The vehicle must be stopped when you first shift into four-wheel drive. Place the transmission in neutral and the transfer case selector in the 4H or 4L position. The hublocks will automatically engage when the vehicle is driven. The transfer case may then be shifted between 2H and 4H with the vehicle moving, as long as the automatic hub locks remain engaged. The hubs will remain engaged until the disengage sequence is performed.

**Two-Wheel Drive**—Place the transfer case in the 2H position. To disengage the automatic hub locks, shift the transmission to move the vehicle in the opposite direction (forward or reverse) and drive a minimum of 10 ft. (30 m) in a straight line.

**CAUTION**—Never shift from 2H to 4H with the automatic hub locks disengaged while the vehicle is in motion. If it is necessary to shift to or from 4L, bring the vehicle to a full stop before doing so.

#### DIAGNOSIS AND TESTING

Refer to Section 15-01, General Driving Axle and Driveshaft Service Under Diagnosis and Testing.

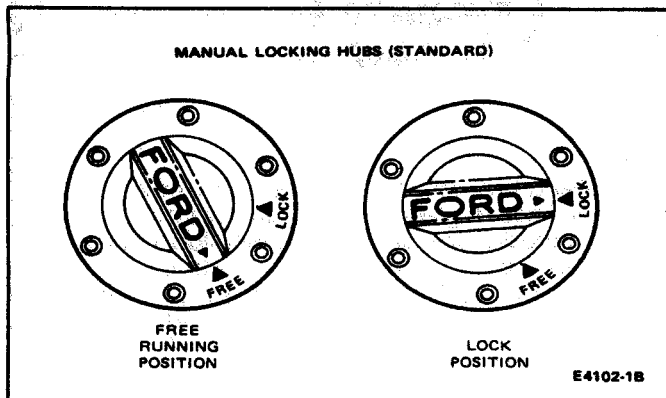


FIG. 4 Four Wheel Drive Wheel Hubs

#### ADJUSTMENTS

Refer to Section 14-01, General Suspension Service for alignment procedures.

#### REMOVAL AND INSTALLATION

##### Dana Four Wheel Drive Front Axle

##### F-150 (4x4) and Bronco With Coil Springs (Fig. 5)

#### Removal

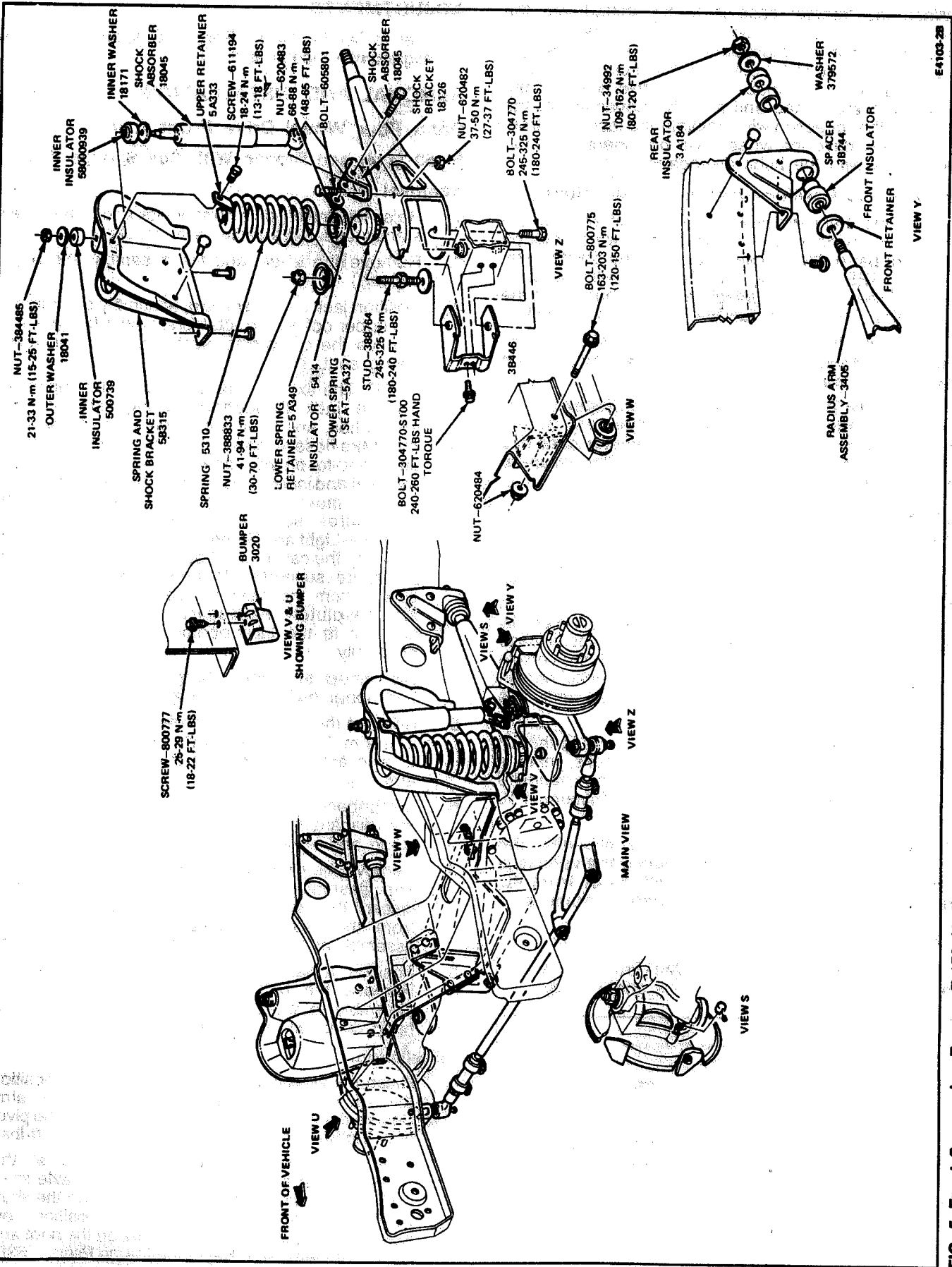
1. Raise the vehicle on a hoist or jack and install safety stands under the radius arm brackets.
2. Remove the wheel and tire assembly and brake caliper.
3. Position jack under axle arm assembly and remove the upper coil spring retainers. Lower the jack and remove the coil spring, spring cushion and lower spring seat.

**NOTE:** The axle arm assembly must be supported on the jack throughout spring removal and installation, and must not be permitted to hang by the brake hose. If the length of the brake hose is not sufficient to provide adequate clearance for the removal and installation of the spring, the disc brake caliper must be removed according to the procedures specified in Section 12-24, Disc Brakes—Light and Heavy Duty Sliding Caliper. After removal, the caliper must be placed on the frame or otherwise supported to prevent suspending the caliper from the caliper hose. These precautions are absolutely necessary to prevent serious damage to the tube portion of the caliper hose assembly.

4. Disconnect the shock absorber at the radius arm and upper mounting bracket.
5. Remove the stud and spring seat at radius arm and axle arm. Remove bolt securing upper attachment to axle arm radius arm to lower attachment axle arm.
6. Disconnect the vent tube at the differential housing and discard the hose clamps. Remove the vent fitting and install a 1/8 inch pipe plug.
7. Remove the pivot bolt securing the right hand axle arm assembly to crossmember. Remove and discard the keystone clamps and remove the boot from the shaft. Remove the right drive axle assembly and pull the axle shaft from the slip shaft.
8. Position a jack under the differential housing. Remove the bolt securing the left hand axle assembly to the crossmember. Remove the left hand drive axle assembly.

#### Installation

1. Raise the vehicle on a hoist or a jack and position the left drive axle assembly at the radius arm. Secure the drive axle to crossmember with the pivot bolt. Tighten bolt to 163-203 N·m (120-150 ft-lbs).
2. Position the right hand axle assembly at the crossmember and radius arm. Align the axle shaft and install in slip shaft. Install the boot on the shaft so the boot seats in the grooves. Position new Keystone Clamps over the grooves on the boot and crimp the clamp with Keystone Clamp Pliers, T63P-9171-A. Secure axle assembly to crossmember with pivot bolt. Tighten to 163-203 N·m (120-150 ft-lbs).



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FIG. 5 Front Suspension Bronco F-150 (4x4)

3. Install vent fitting in differential housing. Connect vent tube to vent fitting using new hose clamps.
4. Position spring seat and install a new stud at axle arm and upper radius arm. Install new bolt at axle assembly and lower radius arm. Tighten bolts to 245-325 N·m (180-240 ft-lbs).
5. Position coil spring insulator and coil spring on lower spring seat. Install nut and tighten to 41-94 N·m (30-70 ft-lbs). Position jack under axle assembly and raise coil spring into position. Install upper spring retainer and screw. Tighten to 18-24 N·m (13-18 ft-lbs).
6. Lower the jack.
7. Connect shock absorbers to upper and lower frame brackets.
8. Install brake caliper and wheel and tire assembly.
9. Lower the vehicle and check and adjust camber and toe-in according to Section 14-01, General Suspension Service.

### F-250—F-350 (4x4)—Leaf Spring Front Suspension

Refer to Fig. 6.

#### Removal

1. Raise vehicle on a hoist or jack and install safety stands.
2. Remove the wheel and tire assemblies, and brake calipers.  
NOTE: Do not let the caliper hang with its weight on the brake hose or the hose may become stretched or twisted.
3. Position jack under right hand axle assembly. Remove the two U-bolts securing the shock absorber mounting plate and leaf springs to tube and yoke assembly.
4. Disconnect the vent tube at the differential housing. Remove the vent fitting and install a 1/8 inch pipe plug.
5. Remove the pivot bolt that secures the right hand axle assembly to crossmember. Remove the RH axle assembly. Remove and discard the keystone clamps and remove the boot from the shaft. Pull the axle shaft out of the slip shaft.
6. Position the jack under the left hand axle assembly. Remove the two U-bolts securing the shock absorber mounting plate and leaf spring to tube and yoke assembly.
7. Position a jack under the differential housing.
8. Remove the pivot bolt securing the left hand axle assembly to crossmember. Remove the left axle assembly.

#### Installation

1. Raise vehicle on a hoist or a jack and position left hand axle assembly at leaf spring assembly. Install the pivot bolt that secures the axle assembly to the crossmember. Secure the shock absorber mounting plate to the leaf spring and axle assembly with the two U-bolts. Tighten bolts to 116-162 N·m (85-120 ft-lbs).
2. Position the right hand axle assembly at crossmember. Install the boot on the shaft so the boot seats in the grooves. Position new Keystone

Clamps over the grooves on the boot and crimp the clamp with Keystone Clamp Pliers, T63P-9171-A. Align the axle shaft and install in slip shaft. Install the pivot bolt that secures the axle assembly to crossmember. Tighten bolt to 123-203 N·m (120-150 ft-lbs). Install shock absorber mounting plate, leaf spring and axle assembly using two U-bolts. Tighten bolts to 116-162 N·m (85-120 ft-lbs).

3. Install vent fitting to differential housing and connect vent tube to vent using a new hose clamp.
4. Install brake caliper and wheel and tire assembly.
5. Check and adjust caster, camber and toe-in.

### Steering Knuckle

#### Removal

Refer to Fig. 7

1. Remove spindle nuts and remove spindle. It may be necessary to tap the spindle with a rawhide or plastic hammer to break the spindle loose. Remove spindle, splash shield and axle shaft assembly.
2. Remove the seal on top of the needle bearing. Place the Spindle in a vise on the second step of the spindle with a shop towel around the spindle or in a brass-jawed vise to protect the spindle from damage. Using a slide hammer D79P-100-A, and D80L-100-B, Forcing Screw, and D80L-100-T, Collet—1 1/4 to 1 1/2 inch from D80L-100-A Blind Hole Puller Set, remove the needle bearing and bearing seal from the spindle bore.
3. If the tie rod has not been removed, then remove cotter pin from the tie rod nut and then remove nut. Tap on the tie rod stud to free it from the steering arm.
4. Remove the cotter pin from the top ball joint stud. Loosen the nut on the top stud and the bottom nut inside the knuckle (Fig. 8). Remove the top nut.
5. Sharply hit the top stud with a plastic or rawhide hammer to free the knuckle from the axle arm. Remove and discard bottom nut. Use new nut upon assembly.
6. Remove camber adjuster by hand or if difficulty is encountered use Pitman arm puller T64P-3590-F (Fig. 9).

**Note the orientation of the camber adjuster to assure the same camber setting.**

7. Place knuckle in vise and remove snap ring from bottom ball joint socket if so equipped.
8. Remove plug from C-Frame Assembly (T74P-4635-C) and replace with Plug (T80T-3010-A4). (View A, Fig. 10.)
9. Assemble C-Frame assembly and receiving cup (T80T-3010-A2 for F-350 or D79T-3010-BG for F-150 and F-250) as shown in View B, Fig. 10.
10. Turn forcing screw clockwise until ball joint is removed from steering knuckle.
11. Assemble C-Frame assembly and receiving cup (D79P-3010-BG) on upper ball joint and turn forcing screw clockwise until ball joint is removed.

NOTE: Always remove bottom ball joint first.

#### Installation

1. Clean steering knuckle bore and insert lower ball joint as straight as possible.

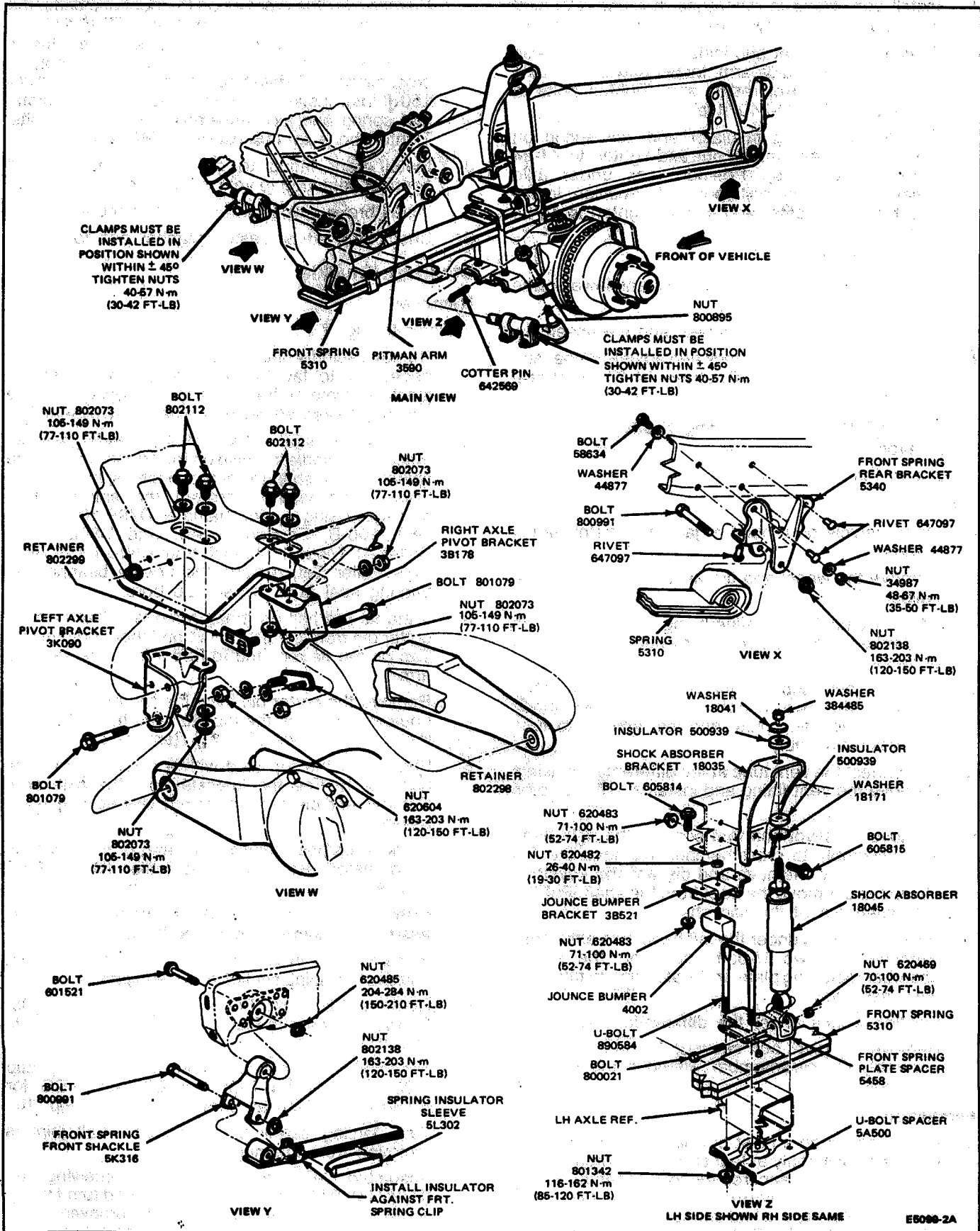
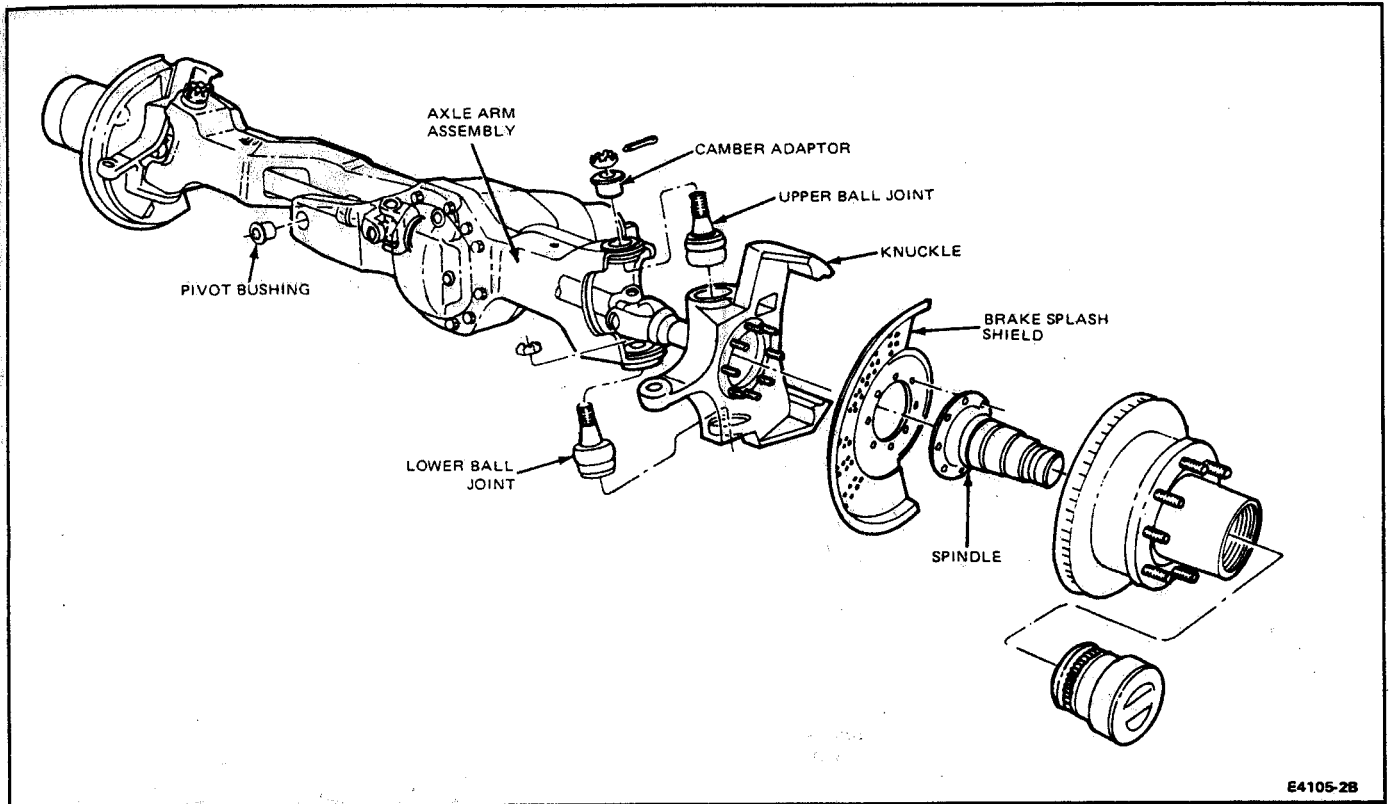


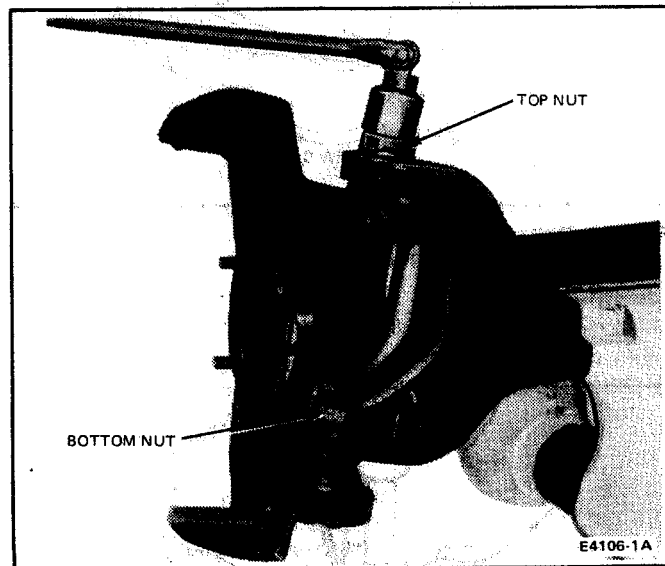
FIG. 6 Front Driving Axle—F-250-F-350 (4x4)





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**FIG. 7 Knuckle and Spindle—Exploded View**

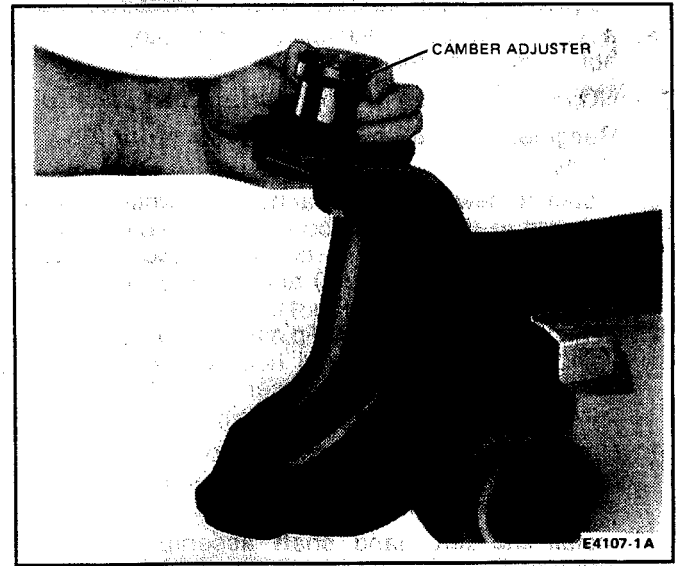


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**FIG. 8 Removing Steering Knuckle Nut**

2. Assemble C-Frame assembly, ball joint receiving cup (T80T-3010-A3) and installing cup (D79T-3010-BF) as shown in View A, Fig. 11 to replace the lower ball joint on the F-150—F-250 and Bronco (Dana 44).
3. Assemble C-Frame, receiving cup (T80T-3010-A3) and receiving cup (D79T-3010-BG) as shown in View B, Fig. 11 to replace the lower ball joint on the F-350 (Dana 50).
4. Turn forcing screw clockwise until ball joint is firmly seated.

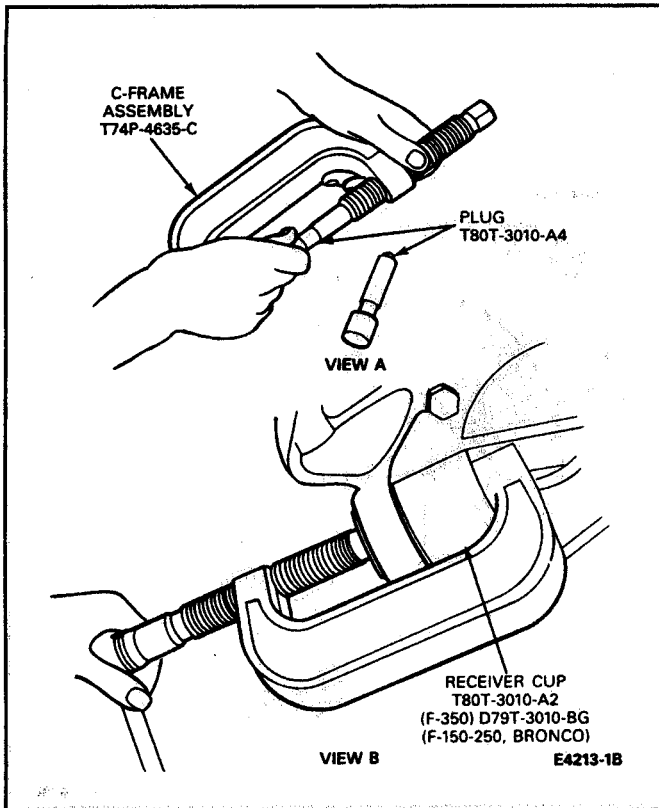
**NOTE:** If ball joint cannot be installed to the proper depth, realignment of receiving cup (T80T-3010-



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**FIG. 9 Removing Camber Bushing**

- A3) will be necessary. Install the snap ring on the lower ball joint.
5. To install upper ball joint on the F-150, F-250, F-350 and Bronco assemble the C-Frame, Receiving Cup (T80T-3010-A3) and Replacer (T80T-3010-A1) as shown in View C, Fig. 11 and repeat Step 4.
6. Assemble knuckle to axle arm assembly. Install Camber adjuster on top ball joint stud with the arrow pointing outboard for "positive" camber, pointed inboard for "negative" camber.
7. Install new nut on bottom socket finger tight. Install and tighten nut on top socket finger tight. Tighten bottom nut to 109 N·m (80 ft-lbs).



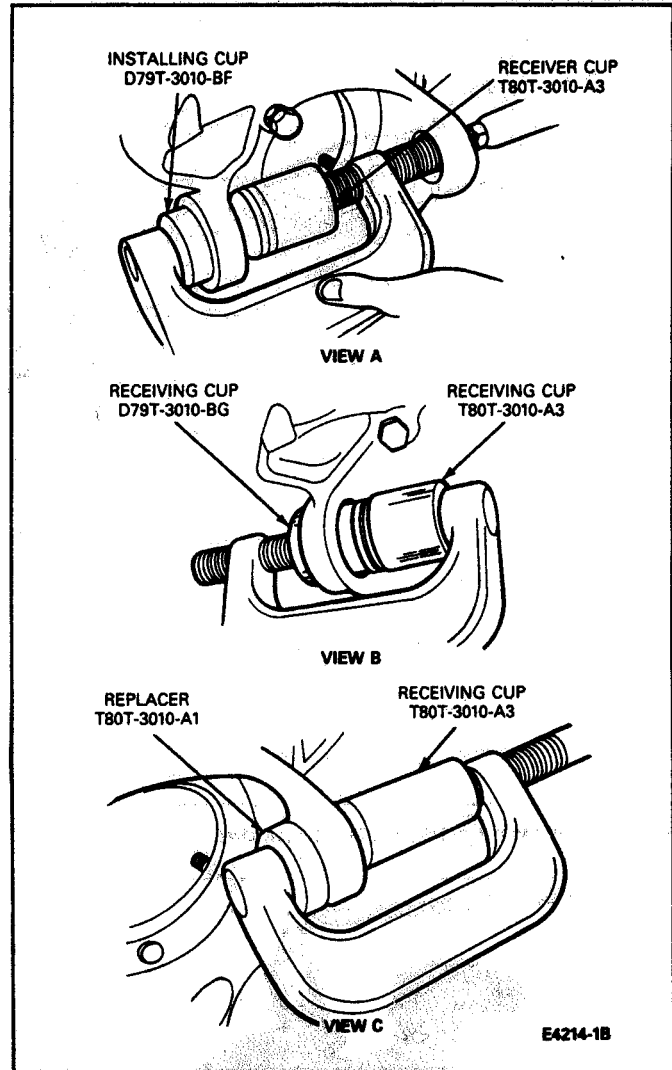
**FIG. 10 Upper Ball Joint Removal**

8. Tighten top nut to 136 N·m (100 ft-lbs), then advance nut until castellation aligns with cotter pin hole. Install cotter pin.  
NOTE: Do not loosen top nut to install cotter pin.
9. Retighten bottom nut to 123-150 N·m (90-110 ft-lbs).
10. Install a new needle bearing with writing facing outward in the spindle bore with Spindle Bearing Replacer, T80T-4000-R on the F-350 or T80T-4000-S for F-150—F-250 and Bronco, and Driver Handle T80T-4000-W (Fig. 12). Install a new needle bearing seal with the seal lip directed away from the spindle. Pack bearing and hub seal with grease. Install seal with Seal Replacer T80T-4000-T, and Driver Handle T80T-4000-W, (Fig. 13).
11. Remove and install the seal on top of the needle bearing. Apply coating of grease to leading edge of seal lip. Place the thrust washer on the axle shaft.
12. Install the left hand shaft assembly into the differential side gear. Install the right hand shaft assembly into the slip yoke, giving special attention that the wide tooth space in the slip yoke spline is aligned with the wide tooth on the axle shaft spline. Lubricate splines with Multi-Purpose Long-Life Lubricant, C1AZ-19590-B (ESA-M1C75-B) or equivalent.
13. Install the splash shield and spindle. Install and tighten the spindle attaching nuts to 68-81 N·m (50-60 ft-lbs).

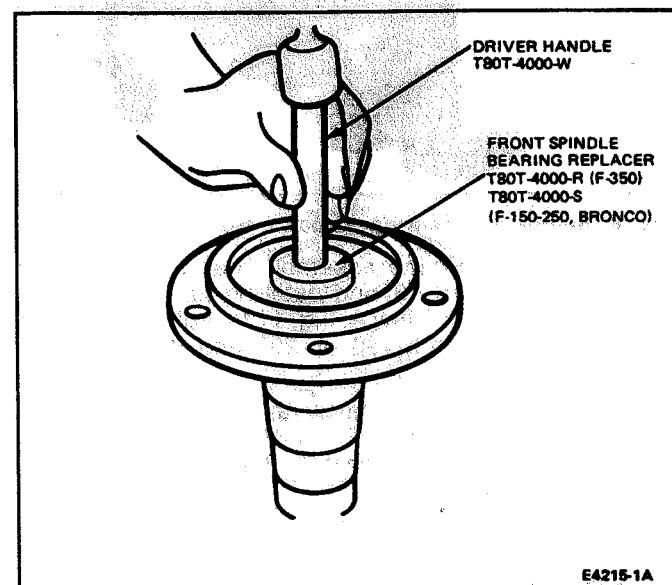
### Differential Seal

#### Removal

1. Pull out the seal with the appropriate puller tool T58L-101-A or equivalent. Remove and discard seal.



**FIG. 11 Ball Joint Installation**



**FIG. 12 Spindle Needle Bearing Installation**

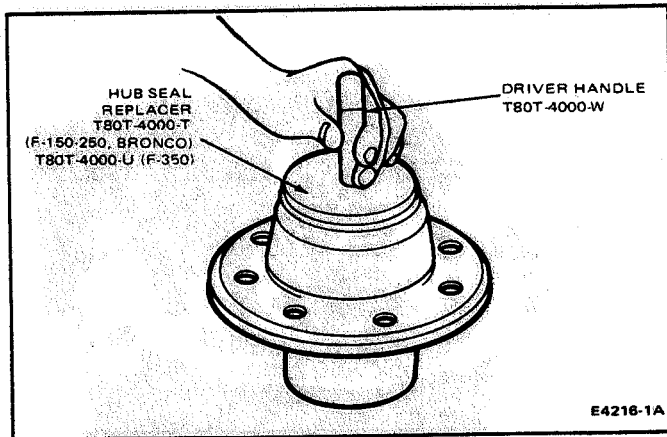


FIG. 13 Spindle Seal Installation

**Installation**

1. Install a new seal on the Differential Seal Replacer Tool T80T-4000-H (Fig. 14).
2. Slide the seal and tool into the carrier housing bore. Seat the seal with a plastic or rawhide hammer.

**Axle Shaft Bearing****Removal**

1. Remove the axle shaft assembly as described under Steering Knuckle Removal.
2. Remove screws from carrier to cover support arm. Drain lube by separating carrier assembly from support arm.
3. Place carrier assembly in a fixture. Rotate axle shaft so that open side of snap ring is exposed. Hold one side of snap ring firmly with a screwdriver, while pushing on other side. Remove snap ring.
4. Pull slip yoke/shaft assembly from unit.
5. Remove right hand trunnion axle shaft seal from housing. Pry seal out and discard. When removing a seal, be careful so as to avoid nicking or denting housing.
6. Remove the right hand trunnion axle shaft bearing.
 

NOTE: The bearing bore must be free from nicks and burrs. Clean bore out with standard metal cleaning solvent.

**Installation**

1. Install bearing assembly into bearing bore of right hand trunnion, with bearing name and part number facing outward towards installing tool T80T-4000-N. The tool will stop against housing when bearing is seated to proper depth.
2. Apply a light coat of grease on the lip of the seal and assembly into trunnion of the carrier.

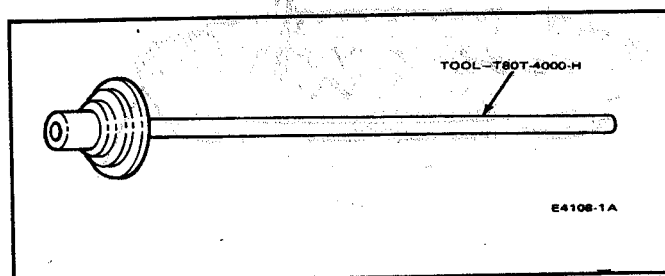


FIG. 14 Inner Axle Seal Installation Tool

3. Install slip yoke/shaft assembly into carrier and through side gear spline exposing snap ring groove inside differential.
4. Place the snap ring in the groove. Force the snap ring into place using two screwdrivers or other suitable tools.
5. Locate shaft and joint assembly in a heavy duty vise. Install a new spindle seal on outboard yoke shaft.

**Axle Housing Pivot Bushing****Removal**

Refer to Fig. 15.

1. Remove axle as described in this Section under Front Drive Axle Removal and Installation.
2. Install Forcing Screw (T78P-5638-A1), Bushing Remover (T80T-5638-A1) and Receiver Cup (T78P-5638-A3), or equivalent onto the pivot bushing. Turn the forcing screw and remove the pivot bushing.

**Installation**

Refer to Fig. 16.

1. Place pivot bushing in axle housing. Install Receiver Cup, (T78P-5638-A2), Forcing Screw (T78P-5638-A1) and Bushing Replacer (T80T-5638-A2), or equivalent into housing and install bushing.
2. Install the axle as described in this Section under Front Driving Axle-Installation.

**DISASSEMBLY AND ASSEMBLY****Cardan Type U-Joints**

For disassembly and assembly procedures for cardan-type U-joints refer to Section 15-66, Driveshaft Single Snap Ring Type U-Joint.

**Carrier**

NOTE: When changing ratios on the 44 Series front drive axle, it may be necessary to change the differential case along with the ring gear and drive pinion. Ratios 2.72 to 1 up to 3.73 to 1 incorporate a thick differential case flange and a thin ring gear (Fig. 17). Ratios 3.92 to 1 up to 4.56

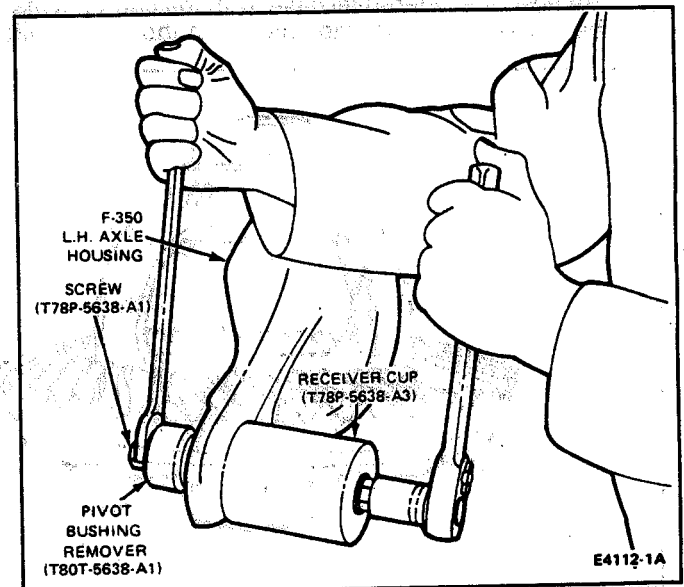


FIG. 15 Removing Axle Pivot Bushing

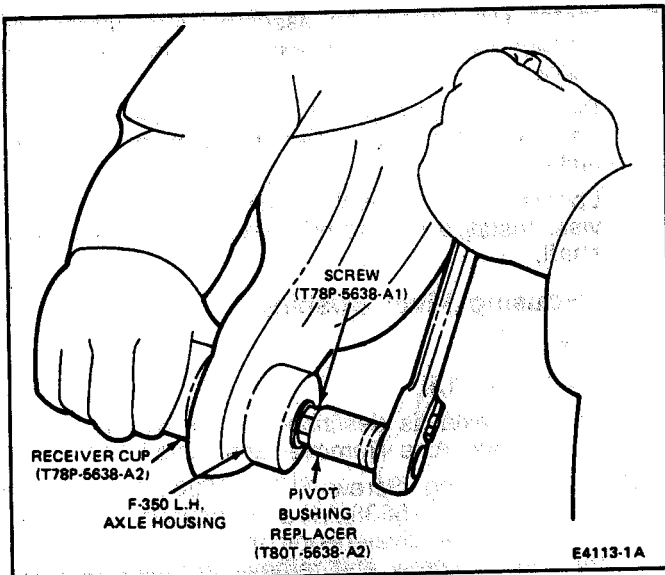


FIG. 16 Installing Axle Pivot Bushing

to 1 incorporate a thin differential case flange and a thick ring gear (Fig. 17).

#### Disassembly

1. Remove the left hand axle arm assembly as described in this Section under Removal and Installation.
2. Loosen the bolts retaining the carrier to the axle arm and drain lubricant. Remove the bolts retaining the support arm to the carrier and remove the carrier.
3. Place the carrier in a holding fixture, remove and clean all gasket surfaces and remove the bearing caps (Fig. 18). Note the matched numbers or letters stamped on the cap and carrier. These numbers or letters must be matched upon assembly.
4. Mount Spreader Tool 4000-E and Spreader Adapter T80T-4000-B on carrier. Place a dial indicator, TOOL-4201-C or equivalent, on the carrier and spread the housing (Fig. 19). **Do not spread the carrier over 0.25mm (0.010 inch).**
5. Remove the differential case from the carrier. It may be necessary to pry the case from the carrier with

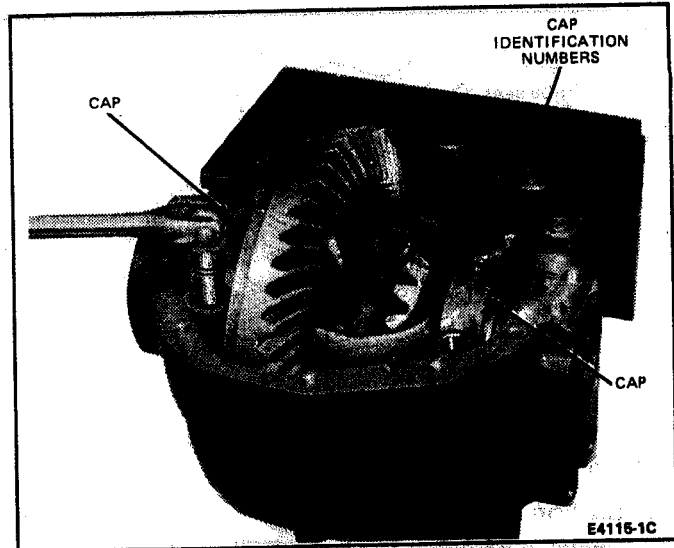


FIG. 18 Removing Bearing Caps

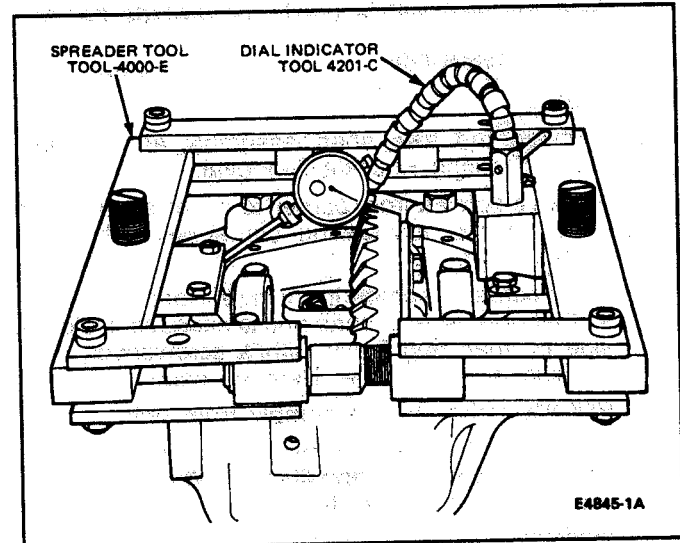


FIG. 19 Installing Spreader

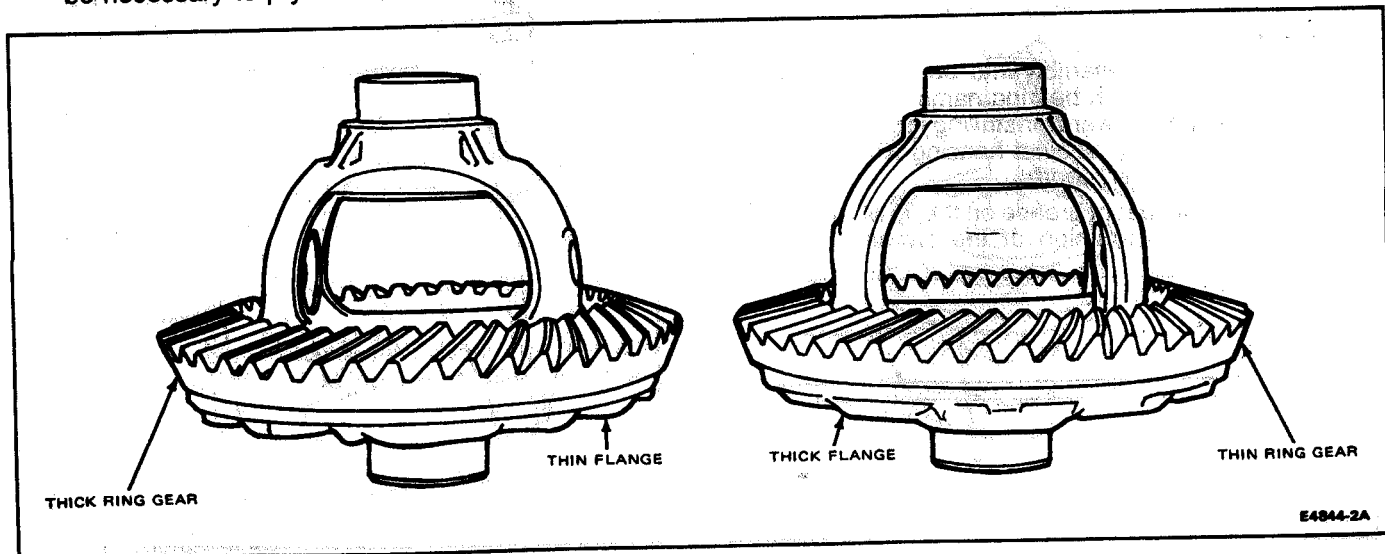


Fig. 17 Differential Cases and Ring Gear

pry bars. Use caution to avoid damaging any machined surfaces. Remove and tag bearing cups to indicate from which side of the carrier they were removed. Remove the spreader tool.

6. Turn the nose of the carrier up. Hold the end yoke with Holding Tool T78P-4851-A or equivalent and remove the pinion nut and washer from the pinion shaft.
7. Remove the end yoke with T65L-4851-B, Yoke Remover. If the yoke shows any signs of wear in the area of seal contact, replace the yoke.
8. Remove the drive pinion by tapping on the drive pinion shaft with a rawhide or plastic hammer. Catch the pinion to prevent damage to the pinion.

**CAUTION: Be careful not to damage the pinion bearing preload shims located on the splined end of the pinion. If damaged, replace with shims of equal thickness. Do not lose the shims.**

9. Remove the drive pinion oil seal from the carrier bore by using Bearing Cup Puller, T77F-1102-A, and Slide Hammer, T50T-100-A (Fig. 20). Replace the oil seal with a new seal during assembly.
10. Remove the outer pinion bearing and the oil slinger from the carrier input bore.

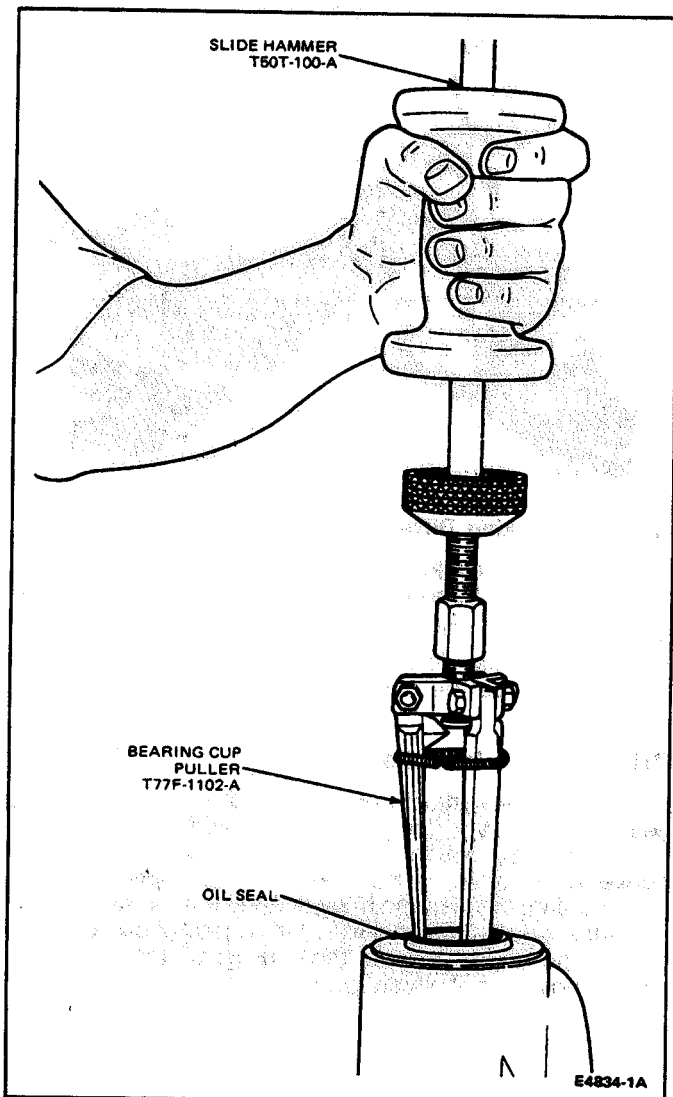


FIG. 20 Oil Seal Removal

Remove the pinion bearing preload shims. Make sure all shims are removed from the carrier. Replace any damaged shims. Shims are available in thicknesses of 0.08, 0.13, 0.25 and 0.76mm (0.003, 0.005, 0.010 and 0.030 inch).

11. Remove the inner pinion bearing cup and baffle using Pinion Bearing Cup Remover, D81T-4628-C (Model 44 axles) or D81T-4628-D (Model 50 axles) and Driver Handle, D81L-4000-A (Fig. 21). Drive the bearing cup out of the bore.

NOTE: Oil baffle and shims are located between the inner bearing cup and carrier bore. Be careful not to damage the shims when removing the bearing cup. If any shims are damaged, measure the thickness and replace with shims of equal thickness.

12. Turn the nose of the carrier down and remove the outer pinion bearing cup. Drive the cup from the carrier using Pinion Bearing Cup Remover D81T-4628-D (Model 44 and 50 axles) and Driver Handle D81L-4000-A (Fig. 21).
13. Remove the differential case bearings and shims from the case. Place Step Plate, D80L-630-5 under bearing to protect the bearing. Install Universal Bearing Remover, D81L-4220-A and remove the bearing as shown in Fig. 22. Turn the case over and remove the other bearing.

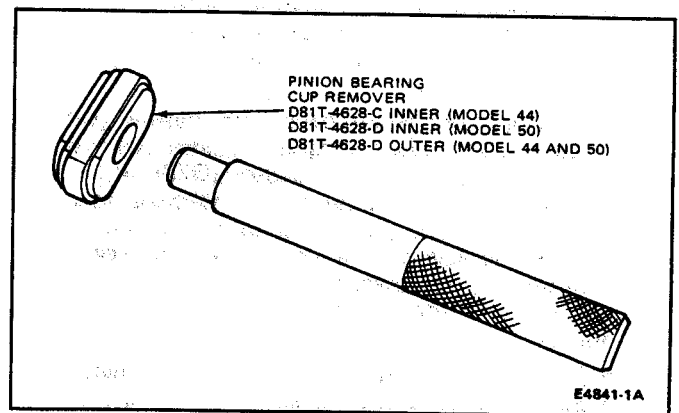


FIG. 21 Bearing Cup Removal

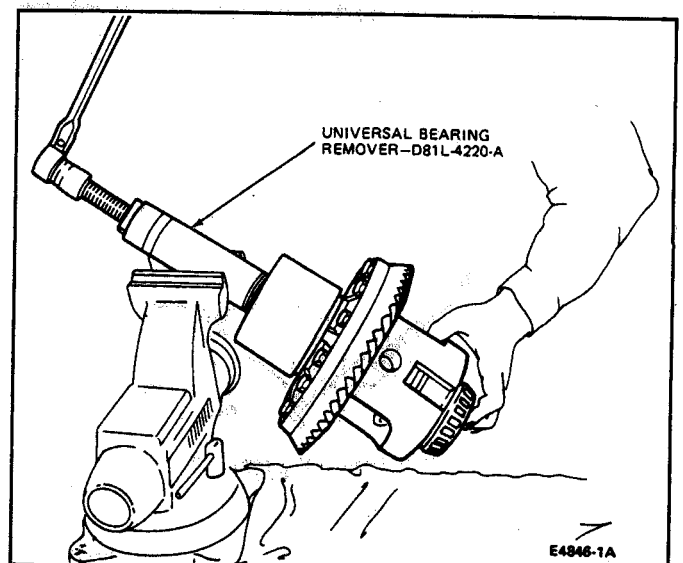


FIG. 22 Differential Side Bearing Removal

14. Wire the shims, bearing cup and cone together and identify from which side of the differential case they were removed. If any shims are damaged, replace with new shims upon assembly.

15. Place a few shop towels over the vise to prevent the ring gear teeth from being nicked, after it is free from the case. Place the case in a vise. Remove the ring gear bolts. Tap the ring gear with a rawhide hammer to free it from the case. Remove the case and ring gear from the vise.

NOTE: Whenever removing the ring gear bolts, discard the bolts and replace with new bolts upon assembly.

16. Remove the bearing and oil slinger from the drive pinion with Universal Bearing Remover, D81L-4220-A (Fig. 23).

17. Inspect all parts for damage and replace as required.

### Total Differential Case Endplay

#### Assembly

1. Attach the ring gear to the differential case using new bolts. Tighten bolts alternately and evenly to 68-81 N·m (50-60 ft-lbs).

2. Clean the trunnions on the differential and install the master differential bearings D81T-4222-B for Model 44 axles or D81T-4222-C for Model 50 axles (Fig. 24) onto the differential case. Remove all burrs and nicks from hubs so master bearings rotate freely.

3. Place the differential case into carrier (without pinion). The differential case should move freely in the carrier. Mount dial indicator (D78P-4201-B or Tool 4201-C) against the differential case flange as shown in Fig. 25. Locate the tip of the indicator on the flat surface of one ring gear bolt. Force the differential case toward the dial indicator as far as possible and zero the dial indicator with force still applied.

NOTE: Dial indicator should have a minimum of 5.08mm (0.200 inch) travel.

4. Force the differential case away from the dial indicator as far as it will go. Repeat this procedure until the same reading is obtained. Record the dial indicator reading. This reading indicates the amount of shims needed behind the differential side

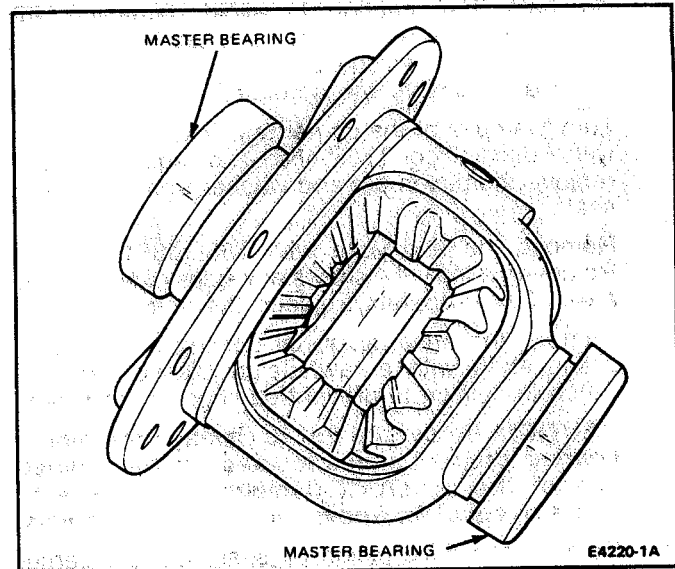


FIG. 24 Master Bearing Installation

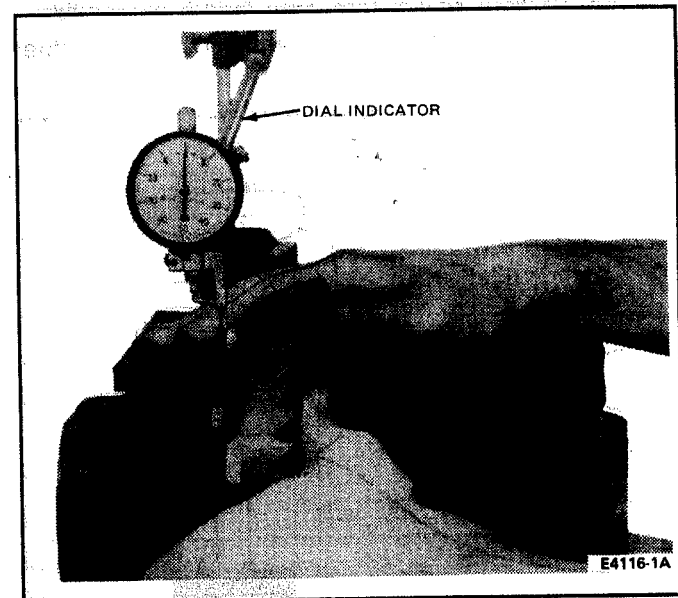


FIG. 25 Checking Differential Case Endplay

bearings to take up total clearance between the differential bearing and case. This reading will be used under Pinion and Ring Gear Backlash.

5. Remove the differential case from the carrier. Do not remove the master differential bearings at this time.

### Drive Pinion Installation

Two separate adjustments affect drive pinion and ring gear tooth contact. They are pinion depth (location) and backlash. The pinion locating shim pack is installed between the drive pinion inner bearing cup and carrier housing (Fig. 26). This shim pack and inner oil slinger and oil baffle controls the position of the pinion. Adding shims moves the pinion toward the ring gear and removing shims moves the pinion away from the ring gear.

Ring gears and pinions are supplied in matched sets with standard or metric markings (Fig. 27).

On the button of each drive pinion is marked a plus figure (+), a minus figure (-) or a zero (0). These figures indicate the position for each gear set. The position is

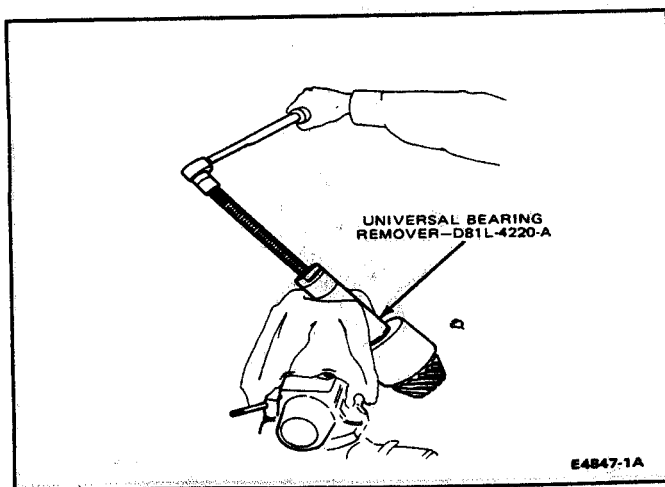


FIG. 23 Drive Pinion Bearing Removal

determined by the amount of shims between the inner pinion bearing cup and carrier bearing bore. Refer to the charts in Figs. 28 and 29.

For example, if a new pinion is marked 'positive' +3 (+8-metric) and an old pinion is marked 'O', shims measuring (0.003 inch) 0.08mm must be removed

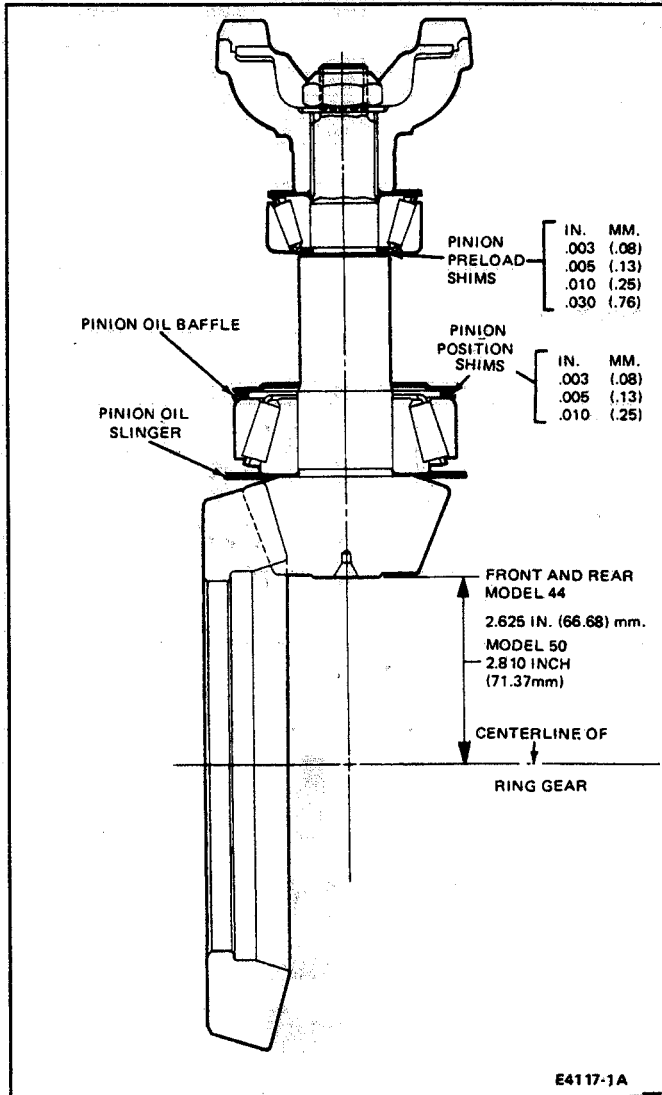


FIG. 26 Ring Gear and Tooth Contact

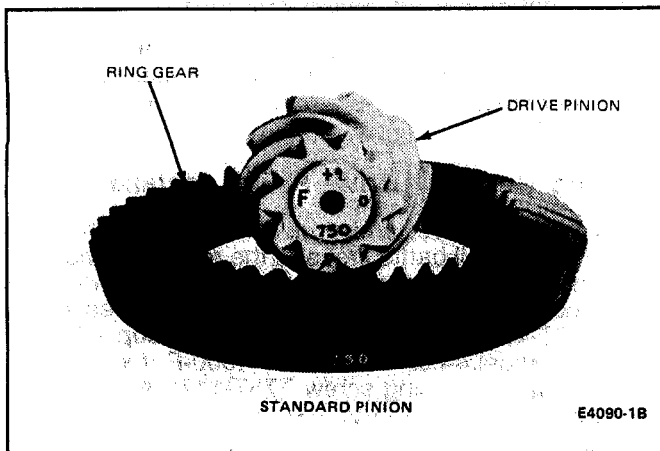


FIG. 27 Ring Gear and Drive Pinion—Standard and Metric

between the drive pinion and inner bearing cup and retainer.

If the old ring and pinion shim pack is used, measure the slinger and baffle and each shim separately and add each shim measurement to total the original measurement. Replace the old shims with new shims that equal this measurement.

If a new ring and pinion is being installed, note the plus (+), minus (-) or zero (0) marking on the button of the pinion. Refer to the chart in Fig. 28 or Fig. 29. Add or subtract shims, according to the chart to compensate for differences between the old and new pinion.

A new ring gear and drive pinion is always installed as a matched set and never separately. **Be sure that the same matching number appears on both the drive pinion and ring gear.**

Install the correct shim pack of the drive pinion and place the pinion in the carrier. Check pinion depth.

### Depth Gauge Check

1. Refer to Fig. 30 for the correct tools for the particular axles.

NOTE: If any of the gauge surfaces become nicked, the high spots must be removed with a medium India oilstone to ensure no erroneous readings.

2. Install inner and outer pinion cups with Forcing Screw T75T-1176-A and Pinion Bearing Cup Replacers, T80T-4000-D, (inner cup) and T80T-4000-E (outer cup) (Fig. 31).
3. Place a new rear pinion bearing over the proper aligning adapter and insert into the pinion bearing retainer assembly. Place the front pinion bearing (new or used if in good condition) into the bearing cup in the carrier and assemble the handle onto the screw and hand tighten. Note the 3/8" square drive in the handle to be used for obtaining the proper pinion bearing preload.
4. Center the proper gauge tube into the differential bearing bore. Install the bearing caps and tighten to proper specifications. To preload the bearing, tighten the handle to 2.3-4.5 N·m (20-40 in-lbs).
5. Using a feeler gauge tool or shims, select the thickest feeler shim that will enter between the gauge tube and the gauge block. Insert the feeler gauge or shims directly along the gauge block to insure a correct reading. The feeler gauge fit between the gauge tube and the gauge block should be a slight drag-type feeling.
6. After the correct shims or feeler gauge feel is obtained, check the reading and this is the thickness of shim(s) required providing that upon inspection of the service pinion gear, the button is etched "O".

NOTE: If the service pinion gear is marked with a plus (+) reading, this amount must be subtracted from the thickness dimension obtained in step 5 (Example: +2 (-0.002)).

If the service pinion gear is marked with a minus (-) reading, this amount must be added to the thickness dimension obtained in step 5 (Example: -2 (+0.002)).

In addition you must use the exact same new rear pinion bearing that was used in the previous steps.

Old Pinion Marking	New Pinion Marking									
	-4	-3	-2	-1	0	+1	+2	+3	+4	
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008	-0.009

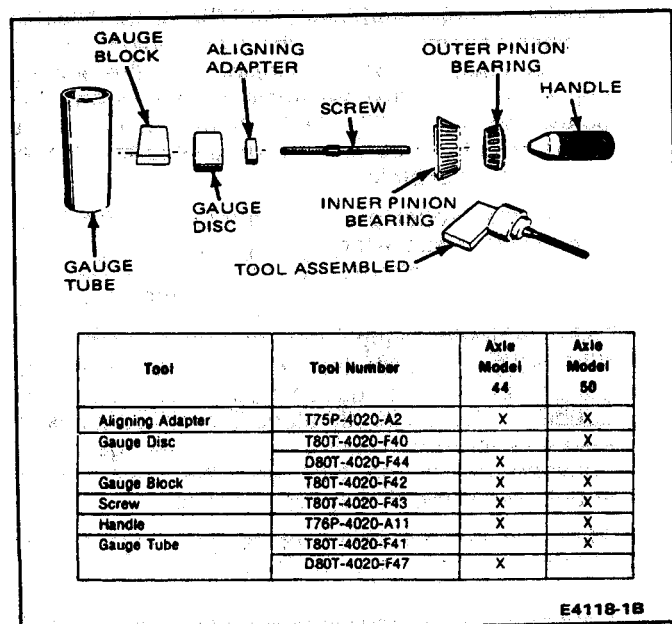
E4091-2A

FIG. 28 Shim Adjustment for Pinion Replacement—Standard

Old Pinion Marking	New Pinion Marking									
	-10	-8	-5	-3	0	+3	+5	+8	+10	
+10	+20	+18	+15	+13	+10	+8	+5	+3	0	
+8	+18	+15	+13	+10	+8	+5	+3	0	-3	
+5	+15	+13	+10	+8	+5	+3	0	-3	-5	
+3	+13	+10	+8	+5	+3	0	-3	-5	-8	
0	+10	+8	+5	+3	0	-3	-5	-8	-10	
-3	+8	+5	+3	0	-3	-5	-8	-10	-13	
-5	+5	+3	0	-3	-5	-8	-10	-13	-15	
-8	+3	0	-3	-5	-8	-10	-13	-15	-18	
-10	0	-3	-5	-8	-10	-13	-15	-18	-20	

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FIG. 29 Shim Adjustment for Pinion Replacement—Metric

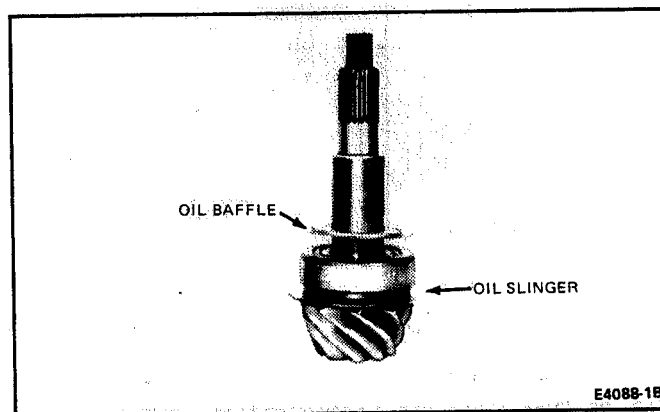


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FIG. 30 Depth Gauge Tool Selection

7. Measure shims with a micrometer to verify the shim size. Place the oil slinger (if used) (Fig. 31) on the pinion and press on the bearing using Tool T70P-4625, Pinion Bearing Replacer for Model 50 Axles or T53T-4621-B, Pinion Bearing Cone Replacer for Model 44 Axles and T75L-1165-B, Axle Bearing/Seal Plate as shown in Fig. 32.

NOTE: If a baffle and/or slinger is used, replace with a new one upon assembly and measure as part of the shim stack.



E4088-1B

FIG. 31 Baffle and Oil Slinger Positions

8. After following these procedures, continue to build the remaining components with proper pinion and differential bearing preload torques and ring gear backlash.

### Bearing Cup and Drive Pinion Installation

- Clean the bore, and if installed, remove the cup. Place the oil baffle first and the required amount of shims in the inner pinion bearing bore and drive the inner pinion bearing cup in place with special Tool T80T-4000-D, Inner Pinion Bearing Cup Replacer (for Model 44 axles) or T80T-4000-F (for Model 50 axles) and forcing screw T75T-1176-A. Be careful not to cock the cup.
- Place the outer pinion cup into the carrier and drive in place with special Tool T80T-4000-E. For Model 44 and 50 axles Outer Pinion Cup Replacer, install



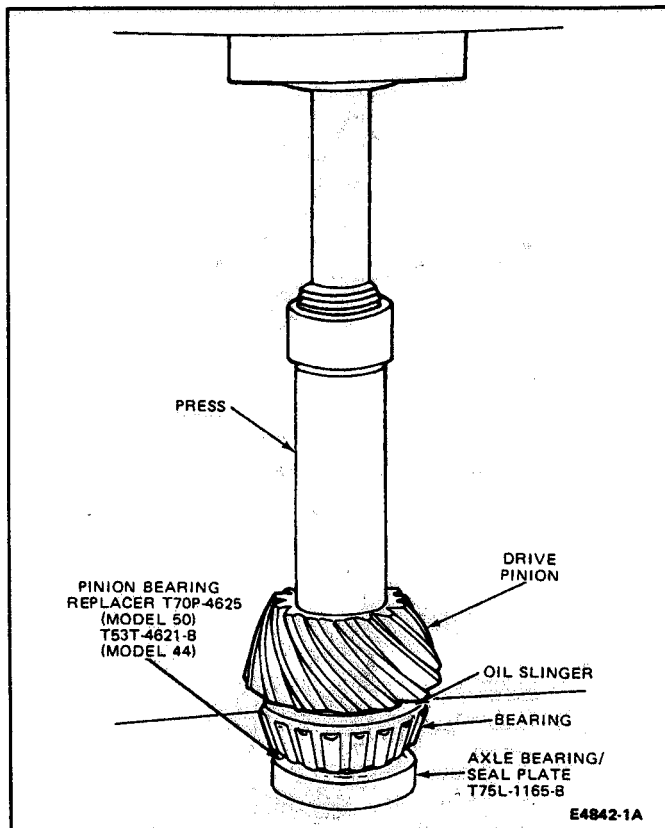


FIG. 32 Drive Pinion Bearing Installation

Forcing Screw T75T-1176-A and draw the cups into the bore (Fig. 33).

3. Lubricate the ends of outer pinion bearings rollers with Multi-Purpose Long Life Lubricant, C1AZ-19590-B (ESA-M1C175-B) or equivalent. Install the outer bearing cone in place in outer bearing cup.
4. Install the inner bearing cone and slinger on the pinion. Drive the bearing on the pinion shaft until fully seated using Pinion Bearing Replacer, T70P-4625 (Model 50 axles) or T53T-4621-B (Model 44 axles) and Axle Bearing/Seal Plate, T75L-1165-B as shown in Fig. 32.

### Drive Pinion Preload Check and Final Depth Check

1. Measure original preload shims and replace with new shims of equal size.
2. Install the pinion into the carrier.
3. Install new preload shims over the pinion. Install the outer pinion bearing cone and oil slinger.
4. Assemble end yoke, washer, deflector, and slinger on pinion shaft and align with special Tool T80T-4000-G and T78P-4851-A, Companion Flange Holder to seat the yoke (Fig. 37). Install a new pinion nut and tighten nut to 271-298 N·m (200-220 ft. lb).
5. Rotate pinion nut with an inch-pound torque wrench. Rotating torque should be 2.25-2.43 N·m (20-40 in-lbs). To increase preload, remove shims. To decrease preload, add shims.
6. Install the Gauge Tube, D80T-4020-F47 (for Model 44 axles) or T80T-4020-F41 (for Model 50 axles)

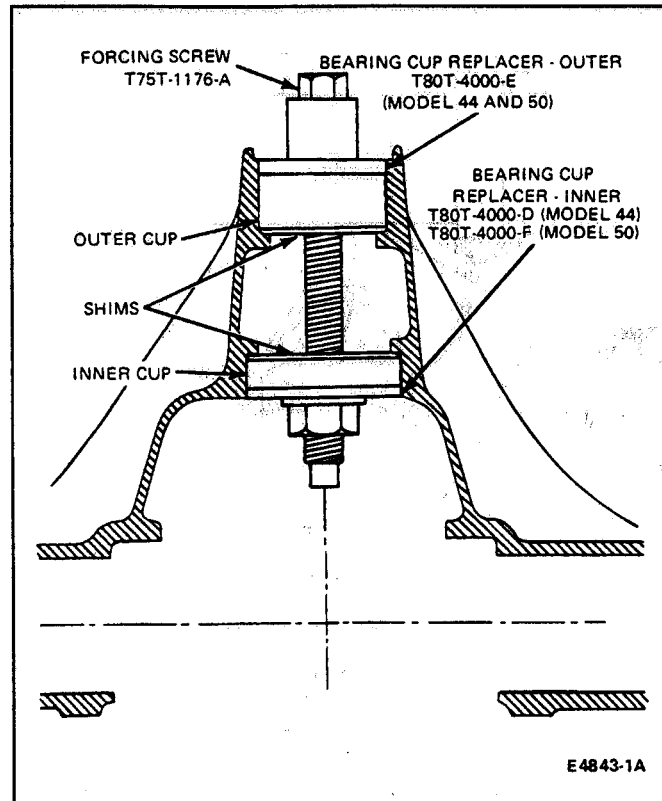


FIG. 33 Pinion Inner and Outer Cup Installation

(Fig. 34). Install bearing caps and tighten to 108-122 N·m (80-90 ft-lbs).

7. Insert the final check gauge block, D81T-4020-F52 (for Model 44 axles) or D81T-4020-F53, (for Model 50 axles) (Fig. 34) on top of the pinion button under the gauge tube. Place the thumb on the gauge block to make sure the block is level (Fig. 35).

Insert feeler gauges between the Gauge Tube and the Final Check Gauge Block until a slight drag is felt.

The reading should be 0.50mm (0.020 inch) added to the drive pinion etching, which could be 'plus' (+) or 'minus' (-) with a tolerance of 0.050mm (.002 inch).

For example a drive pinion with an etching of '+2' would have a 0.55mm (0.022 inch) distance and a tolerance of 0.050mm (0.002 inch) would require 0.50-0.60mm (0.020-0.024 inch) amount of shims.

If the distance must be increased, remove shims from beneath the inner pinion bearing cup. If the distance must be decreased, add shims beneath the inner pinion bearing cup.

8. With the drive pinion at the correct depth, remove the yoke with Holding Tool, T78P-4851-A and Yoke Remover, T65L-4851-B. Remove the yoke, nut and washer.
9. Coat the oil seal with Hypoid Gear Lubricant, C6AZ-19580-E (ESW-M2C105-A) or equivalent. Install the drive pinion oil seal with T80T-4000-C, Oil Seal Replacer (Fig. 36). After installation, make sure the garter spring didn't pop out. If the garter spring pops out, remove and replace the seal.
10. Install the yoke with Companion Flange Replacer, T80T-4000-G (Fig. 37). Install washer and nut and tighten nut to 271-298 N·m (200-220 ft-lbs).

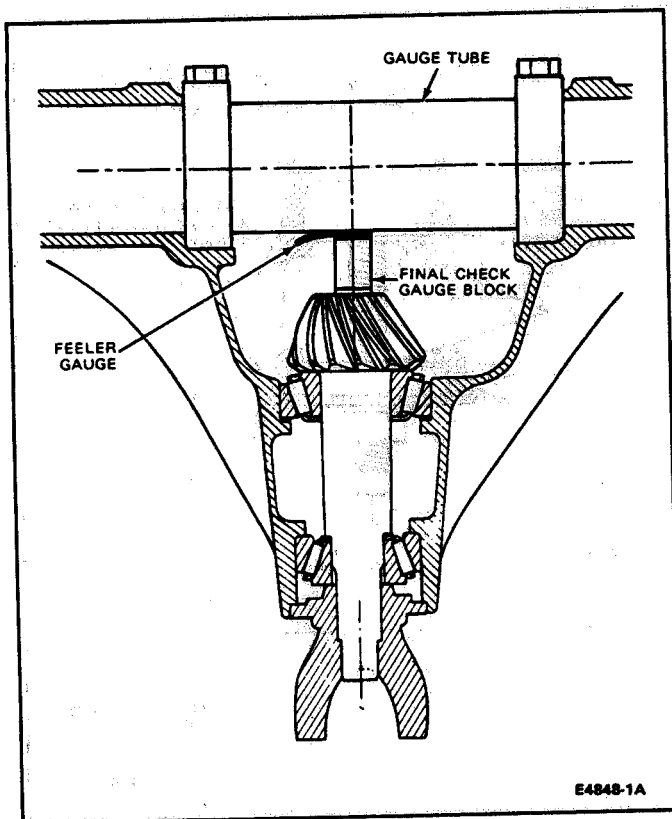


FIG. 34 Final Pinion Depth Check

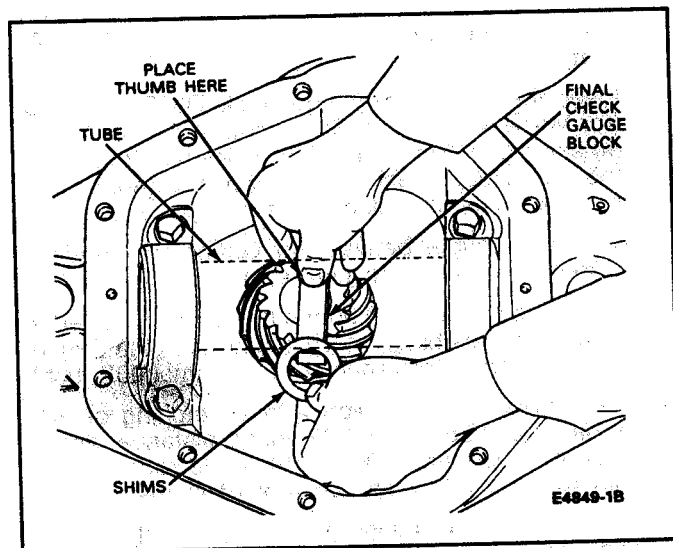


FIG. 35 Checking Final Pinion Depth

### Differential Case

#### Disassembly

1. Place differential case in vise and drive out lock pin that retains the pinion mate shaft to case (Fig. 38).
2. Remove drive pinion mate shaft with a drift (Fig. 39).
3. Rotate the pinion mate gears and side gears until the pinion mate gears turn to the windows of the case. Remove pinion mate gears and spherical washers (Fig. 40).
4. Lift side gears and thrust washers from case.
5. Insert lock pin. Peen some metal of the case over the pin to lock it in place.

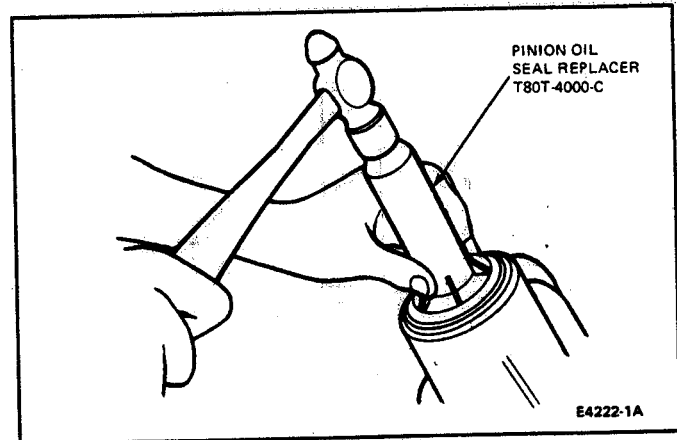


FIG. 36 Pinion Oil Seal Installation

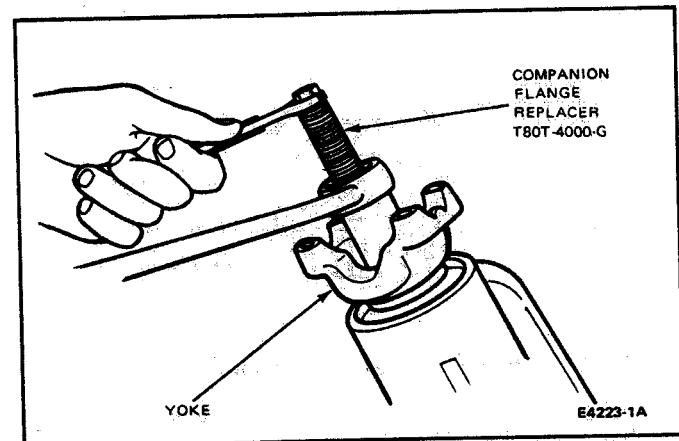


FIG. 37 End Yoke Installation

#### Assembly

1. Inspect case parts for signs of wear. If wear exists on all parts, replace the entire differential case assembly. If one gear shows signs of wear, replace both pinion mate and side gears as a set.
2. Apply grease Multi-Purpose Long-Life Lubricant, C1AZ-19590-B (ESA-M1C75-B) or equivalent to side gear thrust washers, hub and thrust face of side gears. Lubricate pinion mate gears and

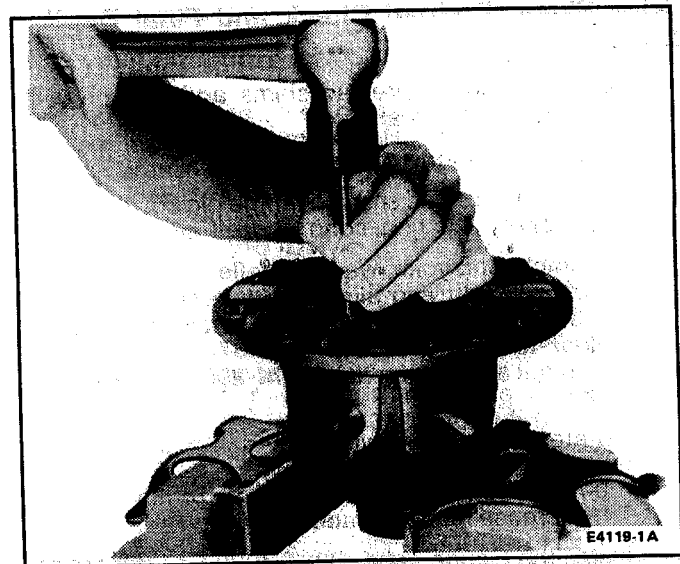


FIG. 38 Removing Lock Pin

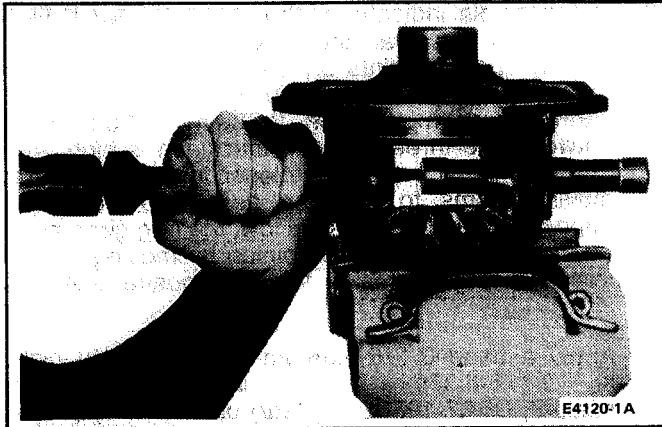


FIG. 39 Removing Mate Shaft

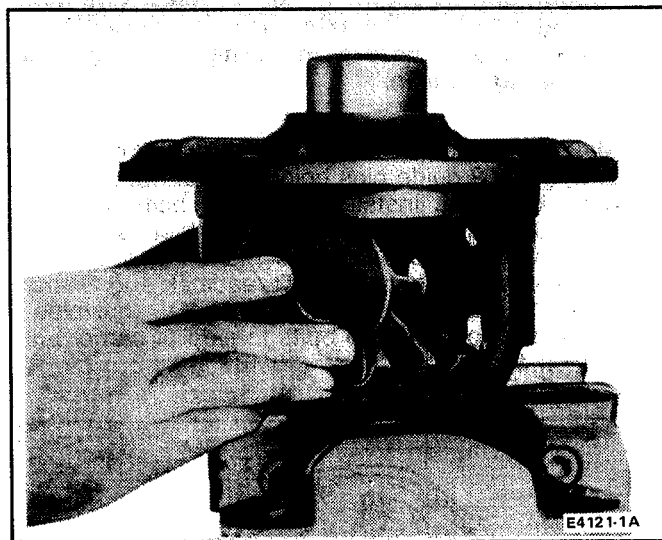


FIG. 40 Removing Pinion Mate Gears

spherical washer with Multi-Purpose Long-Life Lubricant, C1AZ-19590-B (ESA-M1C75B) or equivalent.

3. Hold side gears in place in case with one hand and install pinion mate gears and spherical washers with other hand. Rotate the side gears and pinion mate gears until the holes in the washers and pinion mate gears line up exactly with the holes in the case.
4. Insert the pinion mate shaft in the case. Make sure the lock pin hole in the shaft lines up with the lock pin holes in the case.

### Differential Case

#### Assembly to Carrier

#### Pinion and Ring Gear Backlash

1. Assemble ring gear to differential case. Use new bolts and tighten alternately and evenly to 61-81 N·m (45-60 ft. lb).
2. Place the differential case into position in the carrier. (Master bearings should still be installed.)
3. Force the differential case away from the drive pinion gear, until it is completely seated against the cross bore face of the carrier. Position a dial indicator so the indicator tip rests on a differential case bolt as shown in Fig. 25. Zero the dial indicator.

4. Force ring gear against pinion gear. Rock ring gear slightly to make sure gear teeth are in contact. Then, force ring gear away from drive pinion gear, making sure the dial indicator returns to zero. Repeat this procedure until the dial indicator reading is the same. This reading reveals the amount of shims necessary between the differential case and differential bearing on the ring gear side.
5. Remove the differential case from the carrier and remove the master bearings from the case.
6. As determined in step 4, place the required amount of shims on the ring gear hub of the differential case. For example: If the reading in step 4 was 1.14mm (0.045 inch), place 1.14mm (0.045 inch) amount of shims on the hub of the ring gear side of the differential case.
7. Install the bearing cone on the hub of the ring gear side of the differential case. Drive the bearing onto the hub using Differential Side Bearing Replacer, T80T-4000-J as shown in Fig. 41.
8. To determine the correct amount of shims to be placed on the hub of the drive pinion side of the differential case, subtract the reading obtained in step 4 from the Differential Total Case Endplay. Total Case Endplay was determined in steps 3 and 4 of Differential Total Case Endplay. When this amount is determined, add 0.26mm (0.010 inch) to the amount. This is the required amount of shims to be placed on the hub of the drive pinion side of the differential case.

For example: Total Case Endplay was 2.30mm (0.091 inch). The reading in step 4 was 1.14mm (0.045 inch), and when subtracted from 2.30mm (0.091 inch) gives 1.16mm (0.046 inch), 0.26mm (0.010 inch) is added to give 1.42mm (0.056 inch) amount of shims to be placed on the hub of the drive pinion side of the differential case.

9. Place the required amount of shims on the hub of the drive pinion side of the differential case.
10. Install the bearing cone on the hub of the drive pinion side of the differential case. Place Step Plate, D80L-630-5 on the ring gear side bearing to protect the bearing. Drive the bearing onto the hub of the

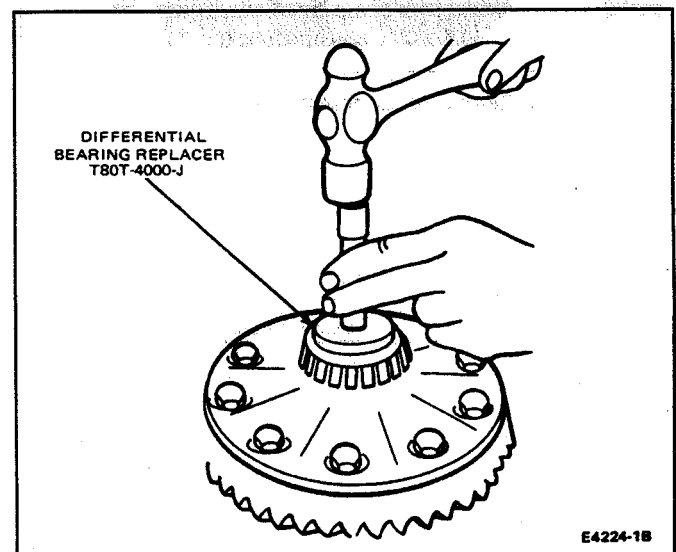


FIG. 41 Differential Side Bearing Installation

- drive pinion side of the differential case using Differential Side Bearing Replacer, T80T-4000-J.
11. Install bearing cone on the pinion side of the differential case with special Tools T80T-4000-J, Differential Bearing Replacer (Fig. 41). Place the Pinion Bearing Cone Replacer, T53T-4621-C, on the ring gear bearing to prevent damage.
  12. Install the differential bearing cups on the bearing cones.
  13. **With the spreader and dial indicator installed on the case, spread the carrier housing but do not exceed 0.25mm (0.015 inch).**
  14. Install the differential case in the carrier. If necessary use a rawhide or plastic hammer to seat the differential case into the carrier housing cross bore. With partial and non-hunting/partial ring gear and pinion sets, align the marks on the ring gear and drive pinion. Be careful to not nick the teeth of the ring gear or pinion. Remove the spreader and dial indicator from the case.
  15. Install bearing caps and bolts. Make sure the letters or numbers stamped on the caps correspond in both position and direction with the letters or numbers stamped into the carrier. Tighten bolts to 108-122 N·m (80-90 ft. lb).

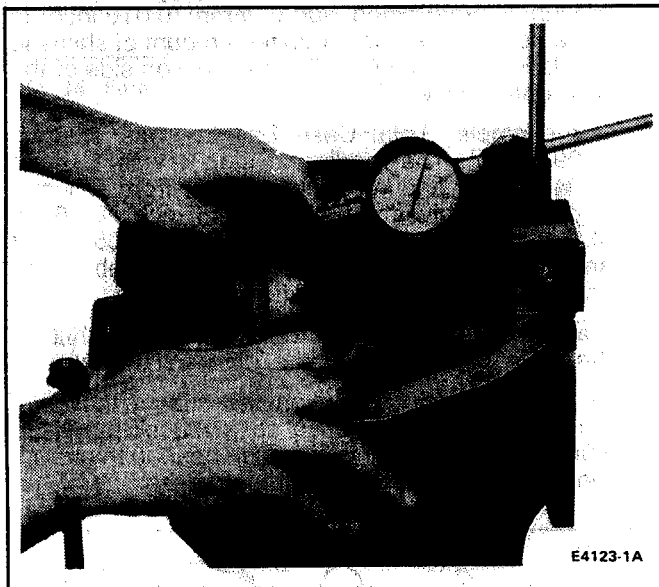


FIG. 42 Ring Gear and Backlash Check

16. Install the dial indicator on the case as shown in Fig. 42. Check ring gear and pinion backlash at three equally spaced points on the ring gear. Backlash tolerance is 0.13-0.23mm (0.005-0.009 inch) and cannot vary more than 0.08mm (0.003 inch) between the three points. If backlash is high, the ring gear must be moved closer to the pinion, by moving shims to the ring gear side from the opposite side. If backlash is low, the ring gear must be moved away from the pinion by moving shims from the ring gear side to the opposite side.
17. Apply a bead 3.175-6.35mm (1/8-1/4 inch) high and 3.175-6.35mm (1/4-1/2 inch) wide of RTV sealant, D6AZ-19562-A (clear) or -B (black) (ESB-M4G92-A and ESE-M4G195-A) or equivalent on the mating surfaces of the carrier mounting face support arm as shown in Fig. 43. **Allow one hour curing time after the axle carrier is assembled to the axle arm before installing lubricant and operating vehicle.**
18. Mount the differential assembly to the left hand axle arm, using 2 guide pins being careful not to smear gasket sealant. Install and tighten bolts to 41-54 N·m (30-40 ft. lb). Use new bolts with encapsulated adhesive or wire brush the old bolts and apply thread-locking compound, Threadlock and Sealer, E0AZ-19554-A (ESE-M4G204-A) or equivalent. Install support arm tab bolts to side of carrier and tighten to 115-136 N·m (85-100 ft-lbs).

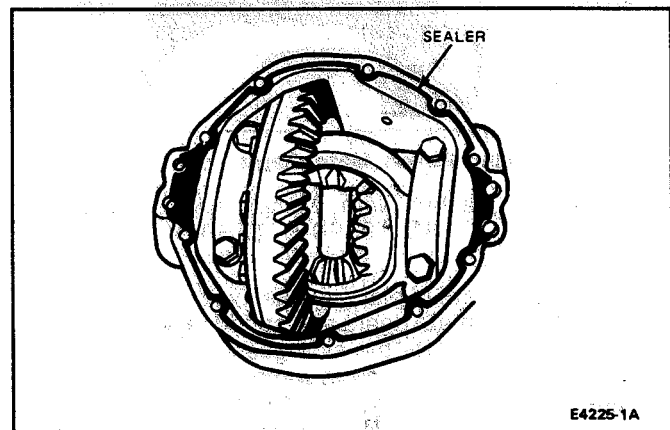


FIG. 43 Bead Surface

## SPECIFICATIONS

## SPECIAL SERVICE TOOLS

Number	Description	Application
T50T-100-A	Slide Hammer	Oil Seal Removal
D79P-100-A	Slide Hammer	Needle Bearing Removal
D80L-100-A	Blind Hole Puller Set	Universal
D80L-100-B	Forcing Screw	Needle Bearing Removal
D80L-100-T	Collet — 1-1/4 — 1-1/2 Inch	Needle Bearing Removal
T58L-101-A	Sealer Puller	Universal
D80L-830-5	Step Plate	Differential Side Bearing Removal
T77F-1102-A	Bearing Cup Puller	Oil Seal Removal
T75L-1165-B	Axle Bearing/Seal Plate	Drive Pinion Bearing Installation
T75T-1176-A	Forcing Screw	Bearing Cup Installation
D79T-3010-B	Ball Joint Set	Ball Joint Removal and Installation
T80T-3010-A1	Replacer	Upper Ball Joint Installation
T80T-3010-A3	Receiving Cup	Ball Joint Installation
T80T-3010-A4	Plug	Ball Joint Removal
D79T-3010-BF	Installing Cup	Ball Joint Installation — F-150-F-250
D79T-3010-BG	Receiving Cup	Ball Joint Removal — F-150-F-250
T64P-3590-F	Pitman Arm Puller	Pitman Arm Removal
D81L-4000-A	Driver Handle	Cup Removal
T80T-4000-B	Spreader Adapter	Differential Case Removal and Installation
T80T-4000-C	Oil Seal Replacer	Oil Seal Installation
TOOL-4000-E	Spreader Tool	Differential Case Removal and Installation
T80T-4000-D	Bearing Cup Replacer	Inner Bearing Cup Installation — Model 44
T80T-4000-E	Bearing Cup Replacer	Outer Bearing Cup Installation — Model 44 and 50
T80T-4000-F	Bearing Cup Replacer	Inner Bearing Cup Installation — Model 50
T80T-4000-G	Companion Flange Replacer	Yoke Installation
T80T-4000-H	Differential Seal Replacer	Differential Seal Installation
T80T-4000-J	Differential Bearing Replacer	Differential Side Bearing Installation
T80T-4000-L	Sieve	Axle Bearing Removal
T80T-4000-M	Axle Bearing Remover	Axle Bearing Removal
T80T-4000-N	Axle Bearing Replacer	Axle Bearing Installation
T80T-4000-S	Spindle Bearing Replacer	Needle Bearing Installation — Bronco — F-150-F-250
T80T-4000-T	Seal Replacer	Seal Installation — Bronco — F-150-F-250
T80T-4000-U	Seal Replacer	Seal Installation — F-350
T80T-4000-W	Driver Handle	Bearing and Seal Installation
T75P-4020-A2	Aligning Adapter	Axle Adjustments
T76P-4020-A11	Handle	Axle Adjustments
T80T-4020-A	Pinion Depth Gauge	Truck
T80T-4020-F40	Gauge Disc	Axle Adjustments — Model 50
T80T-4020-F41	Gauge Tube	Axle Adjustments — Model 50
T80T-4020-F42	Gauge Block	Axle Adjustments
T80T-4020-F43	Screw	Axle Adjustments
D80T-4020-F44	Gauge Disc	Axle Adjustments — Model 44
D80T-4020-F47	Gauge Tube	Axle Adjustments — Model 44
D80T-4020-F49	Gauge Tube	Axle Adjustments
D81T-4020-FX	Final Check Pinion Depth Gauge	Truck
D81T-4020-F52	Final Check Gauge Block	Axle Adjustments — Model 44
D81T-4020-F53	Final Check Gauge Block	Axle Adjustments — Model 50
TOOL-4201-C	Dial Indicator	Axle Adjustments

## SPECIAL SERVICE TOOLS (Cont'd.)

Number	Description	Application
D78P-4201-B	Dial Indicator	Magnetic Base
D81L-4220-A	Universal Bearing Remover	Bearing Removal
D81T-4222-B	Master Bearings	Axle Adjustments — Model 44
D81T-4222-C	Master Bearings	Axle Adjustments — Model 50
T53T-4621-B, C	Pinion Bearing Cone Replacer	Drive Pinion Bearing Installation — Model 44
T71P-4621-B	Pinion Bearing Cone Remover	Axle Bearing Installation
T70P-4625	Pinion Bearing Replacer	Drive Pinion Bearing Installation — Model 50
D81T-4628-C	Pinion Bearing Cup Remover	Inner Bearing Cup Removal — Model 44
D81T-4628-D	Pinion Bearing Cup Remover	Inner Bearing Cup Removal — Model 50 Outer Bearing Cup Removal — 44 and 50
T74P-4635-C	C-Frame Assembly	—
T65L-4851-B	Yoke Remover	—
T78P-4851-A	Holding Tool	Yoke Removal and Installation
T78P-5638-A1	Forcing Screw	Bushing Removal and Installation
T80T-5638-A1	Bushing Remover	Bushing Removal
T78P-5638-A2	Receiver Cup	Bushing Installation
T80T-5638-A2	Bushing Replacer	Bushing Installation
T78P-5638-A3	Receiver Cup	Bushing Removal
T78P-5638-A4	Receiver Cup	Bushing Removal
T57L-500-B	Bench Mounted Holding Fixture	Universal
T80T-4000-K	Differential Bearing Remover	—
T80T-4000-P	Inner Hub Bearing Cup Replacer	F150, Bronco
T80T-4000-Q	Inner Hub Bearing Cup Replacer	F-250
T80T-4000-V	Automatic Hub Locknut Wrench	—
T63P-9171-A	Keystone Clamp Pliers	—

CE5103-2C

## TORQUE SPECIFICATIONS — DANA FRONT DRIVE AXLE

Description	Torque	
	N·m	(ft-lbs)
Bottom Ball Joint Nut	122-149	90-110
Top Ball Joint Nut	135 (Minimum)	100 (Minimum)
End Yoke Nut	271-298	200-220
Bearing Cap Bolts	108-122	80-90
Differential Retaining Bolts	41-54	30-40
Ring Gear Bolts	61-81	50-60
Support Arm Tabs to Carrier Bolts	115-136	85-100

## DANA AXLE ADJUSTMENTS

Description	Specification
Drive Pinion Preload	2.25-2.43 N·m (20-40 in-lbs)
Ring Gear Backlash	0.13-0.23mm (0.005-0.009 inch) No more than 0.08mm (0.003 inch) variation in any three places

## LUBRICANT CAPACITY ①

Axle Model	Approximate Capacity		
	U.S. Pints	Imperial Pints	Liters
Dana 44 — IFS	3.9	3.2	1.7
Dana 50 — IFS	4.1	3.4	1.8

① Use Hypoid Gear Lubricant, C6AZ-19580-E (ESW-M2C105-A) or equivalent.

CE4125-1D