

Differential Assembly: Service and Repair

Disassembly

When changing ratios on the model 44 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 3.37 to 1 incorporate a thick differential case flange and a thin ring gear. Ratios 3.92 to 1 and up to 4.56 to 1 incorporate a thin differential case flange and a thick ring gear.

1. Remove axle assembly from vehicle, Figs. 1 through 6.
2. Drain fluid from axle.
3. Remove lefthand axle arm assembly.
4. Loosen bolts attaching carrier to axle arm. Remove bolts attaching support arm to the carrier, then the carrier assembly.
5. Place carrier into a suitable holding fixture, then remove and clean all gasket surfaces. Remove bearing caps. Note matched numbers or letters stamped on the cap and carrier assembly. These numbers or letters must be matched during assembly. These numbers may either be stamped vertically, horizontally or in some instances both vertically or horizontally.
6. Mount suitable spreader and adapter tools on to carrier assembly.
7. Position a suitable dial indicator on to carrier, then spread the housing. **Do not spread the housing more than .005 inch on 1980 models, .015 inch on 1981 models, or .010 inch on 1982--86 models or .015 inch on 1987 models, except model 28 and 60 monobeam axles. On model 60 monobeam axle, do not spread the carrier more than .015 inch. On model 28 axles, do not spread housing more than .010 inch.**
8. Remove differential case from the carrier. It may be necessary to pry the case from the carrier with suitable pry bars.
9. Remove and tag bearing cups to indicate from which side of the carrier they were removed. Remove spreader tool from case.
10. Turn nose of carrier upward. Hold end yoke with a suitable holding tool and remove pinion nut and washer from pinion assembly.
11. Using a suitable tool, remove end yoke. If the yoke shows any sign of wear in the seal contact area, replace yoke.
12. Remove drive pinion by tapping on the drive pinion shaft. **Do not damage pinion bearing preload shims located on the splined end of the pinion. If damaged, replace with shims of equal thickness, do not loosen the shims.**
13. Using a suitable bearing cup puller and slide hammer, remove drive pinion oil seal from carrier.
14. Remove outer pinion bearing and the oil slinger from the carrier input bore.
15. Remove pinion bearing preload shims. Ensure all shims are removed from the carrier. Replace any damaged shims. Shims are available in thicknesses of .003, .005, .010 and .030 inch.
16. Remove inner pinion bearing cup and baffle. Drive bearing cup out of bore. **Oil baffle and shims are located between the inner bearing cup and carrier bore. Do not damage the shims when removing the bearing cup. If any shims are damaged, measure the thickness and replace with shims of equal thickness.**
17. Turn nose of carrier downward and remove outer pinion bearing cup. Drive cup from the carrier.
18. Remove differential case bearings and shims from case. Position a suitable step plate under bearing, then install a universal bearing removal tool and remove bearing. Turn case over and remove other bearing in the same manner.
19. Wire 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.
20. Place a few shop towels over a vise to prevent the ring gear teeth from being nicked after it is free from the case assembly. Remove the ring gear bolts. Tap ring gear to free it from case. Remove case and ring gear from vise. **Whenever removing the ring gear bolts, discard and replace with new bolts upon assembly.**
21. Remove bearing and oil slinger from the drive pinion.
22. Inspect all parts for damage and replace as required.

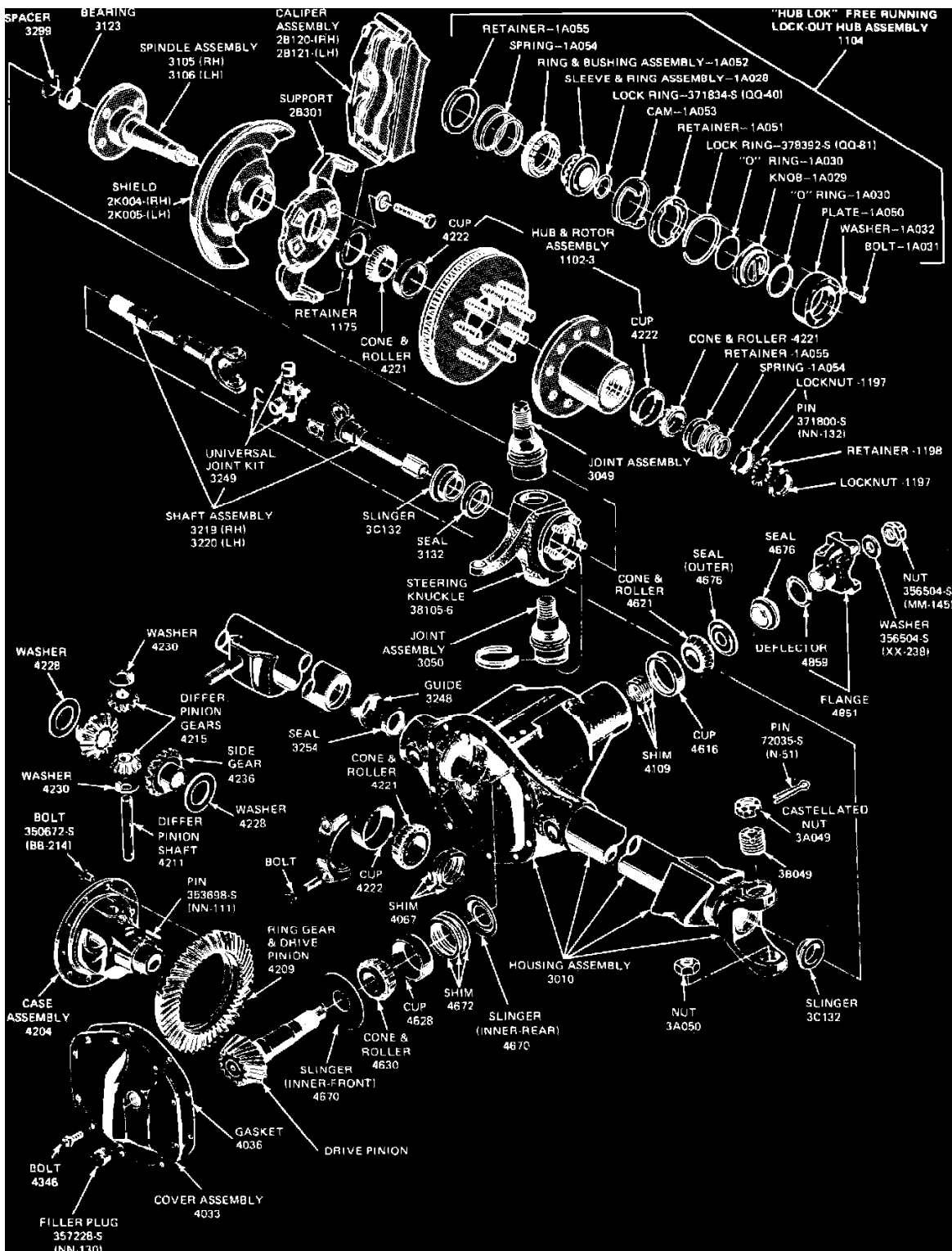


Fig. 1 Disassembled view of Dana/Spicer model 44-9F front drive axle

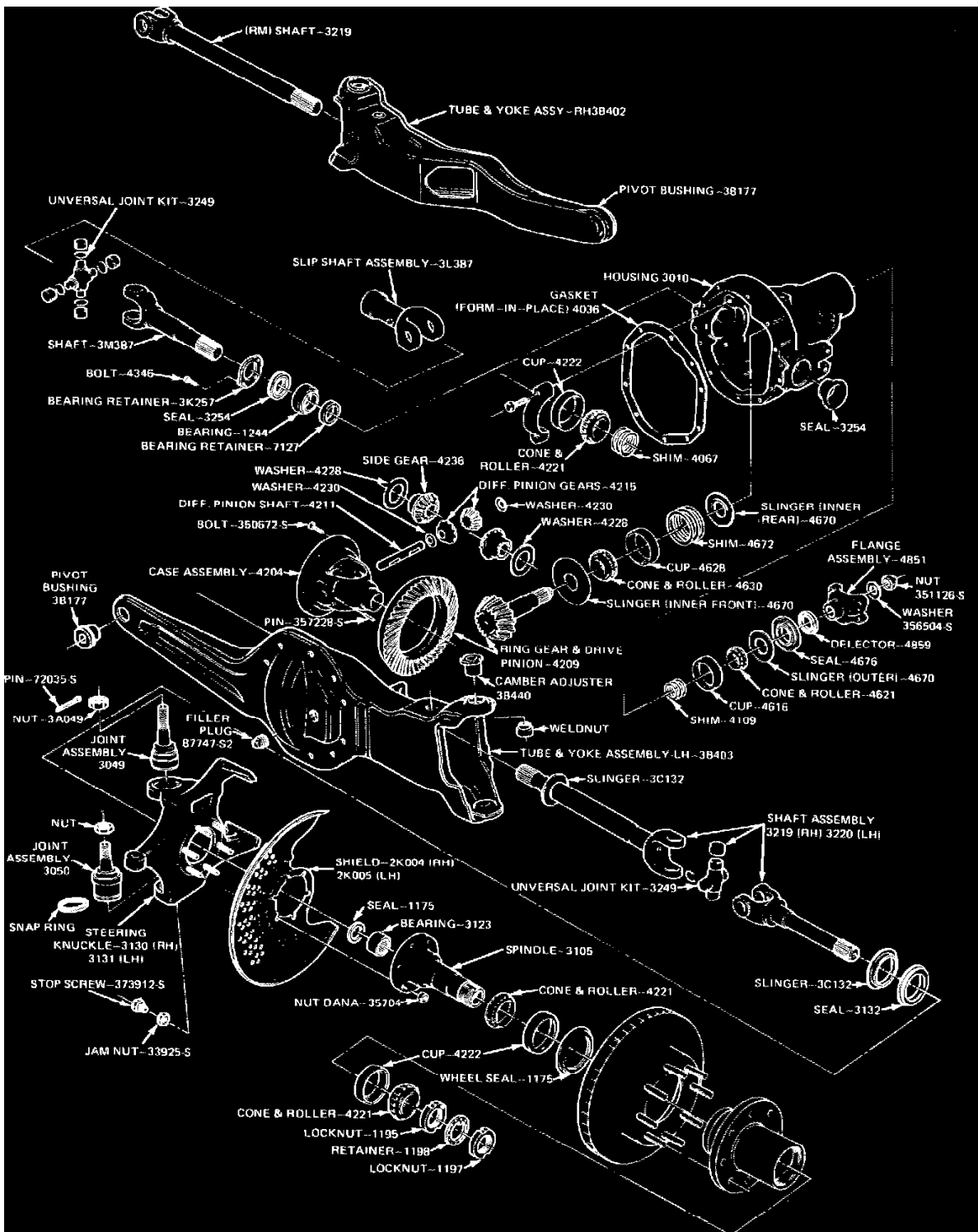


Fig. 2 Disassembled view of Dana/Spicer model 44-1FS front drive axle



Fig. 4 Disassembled view of Dana/Spicer model 50-1FS front drive axle

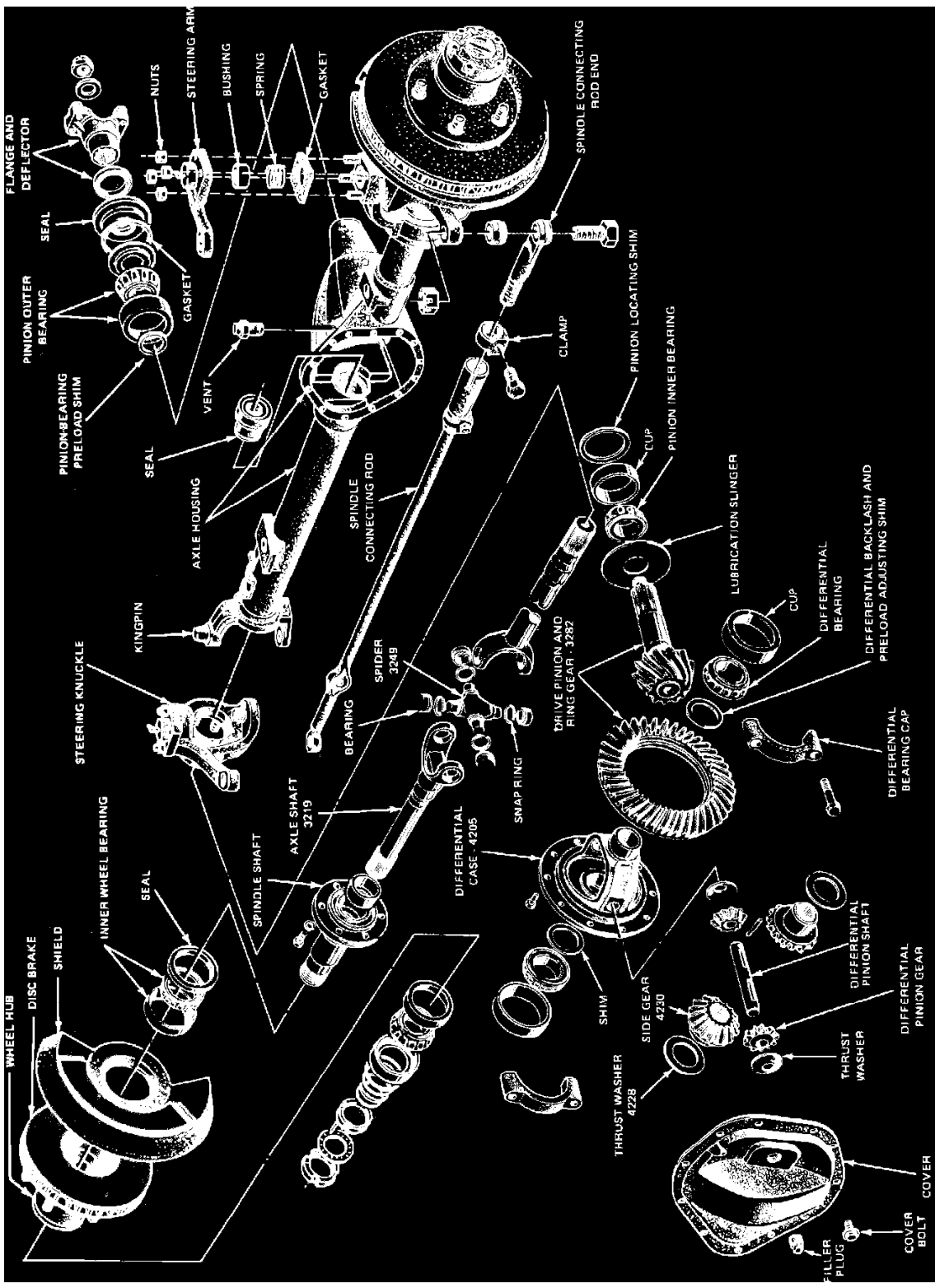


Fig. 5 Disassembled view of Dana/Spicer model 60 front drive axle

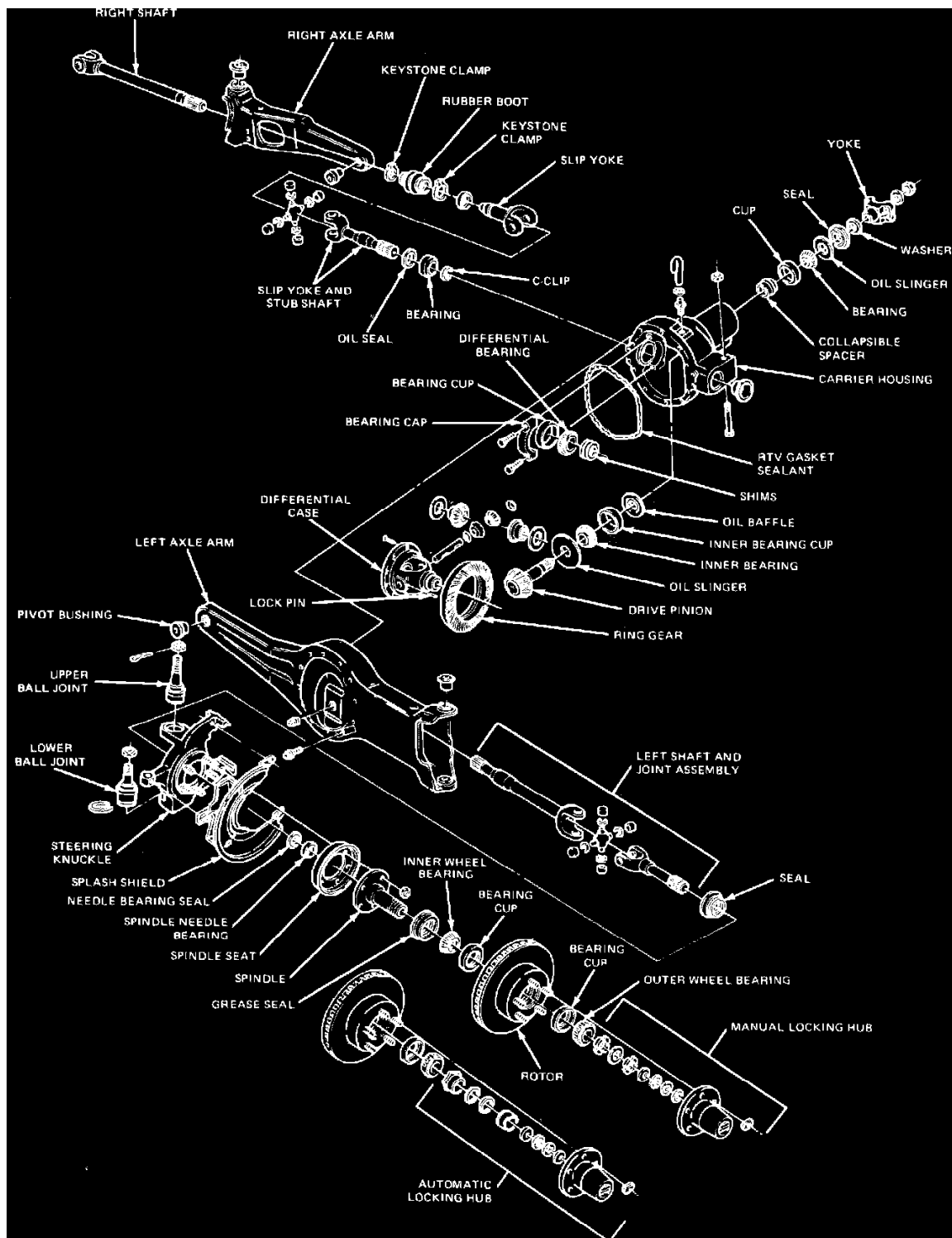


Fig. 6 Disassembled view of Dana/Spicer model 28 front drive axle

Assembly

PINION & RING GEAR BACKLASH

1. Assemble ring gear to differential case. Using new bolts torque alternately and evenly to 45---60 ft. lbs on model 44 and 50 axles or 50---60 ft. lbs. on model 28 axles. **On model 60 monobeam axle, note specifications given in step 14.**
2. Place differential case into position in the carrier (master bearing should still be installed).
3. Force 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. Zero dial indicator. Force ring gear against pinion gear. Rock ring gear slightly to ensure 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 differential case and differential bearing on ring gear side. Remove differential case from the carrier and master bearings from case. As determined previously, place required amount of shims on the ring gear hub of the differential case.
4. Install bearing cone onto hub of the ring gear side of the differential case. Drive bearing onto hub.

5. To determine the correct amount of shims to be placed on the hub of the drive pinion side of the differential case, subtract reading obtained previously from the differential total case endplay. When this amount is determined, add .010 inch on model 44 and 50 axles or .015 inch on model 60 axle or .003 inch on model 28 axles to this amount. This is the required amount of shims to be placed on the hub of the drive pinion side of the differential case.
6. Place required amount of shims onto hub of the drive pinion side of the differential case. Install bearing cone onto hub of the drive pinion side of the differential case. Place suitable step plate tool onto ring gear side bearing to protect the bearing. Drive bearing onto hub of the drive pinion side of differential case. Place required amount of shims on the hub of drive pinion side of the differential case.
7. Install bearing cone onto hub of the drive pinion side of the differential case. Place step plate tool onto ring gear side bearing to protect bearing. Drive bearing onto hub of the drive pinion side of the differential case. Install bearing cone onto pinion side of differential case. Place pinion bearing cone replacer tool onto ring gear bearing to prevent damage.
8. Install differential bearing cups onto bearing cones. With spreader and dial indicator installed on case, spread carrier housing but do not exceed amount(s) specified previously. Install differential case into carrier. If necessary use a suitable mallet to seat the differential case into the carrier. With partial and non-hunting/partial ring gear and pinion sets, align marks on the ring gear and drive pinion. Ensure not to nick the teeth of the ring gear or pinion. Remove spreader and dial indicator from case.
9. Install bearing caps and bolts. Ensure letters or numbers stamped on the caps correspond in both position and direction with the letters or numbers stamped into the carrier assembly.
10. Install dial indicator onto case. Check ring gear and pinion backlash at three equally spaced points on ring gear. Backlash tolerance is .005---.009 inch on except model 28 axles or .005---.008 inch on model 28 axles and cannot vary by more than .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.
11. Apply a suitable bead of sealant onto mating surfaces of the carrier mounting face support arm. **Allow one hour curing time after axle carrier is assembled to the axle arm before installing lubricant and operating vehicle.**
12. Mount differential assembly to the lefthand axle arm, using 2 guide pins and being careful not to smear gasket sealant.
13. On except model 60 monobeam axles, install and torque bolts to 30---40 ft. lbs on except model 28 axles or 40---50 ft. lbs on model 28 axles. Install support arm tab bolts to side of carrier and torque to 82---100 ft. lbs on except model 28 axle or 75---95 ft. lbs (carrier shear bolt) on model 28 axle.
14. On model 60 monobeam type axle, torque the following bolts to specification as follows:
 - a. Torque pinion shaft nut to 240---300 ft. lbs.
 - b. Torque differential bearing cap screws to 80---90 ft. lbs.
 - c. Torque ring gear attaching bolts to 100---120 ft. lbs.
 - d. Torque cover to housing bolts to 30---40 ft. lbs.
 - e. Torque tracking bar nut and bolt to 163---203 ft. lbs.

Disassembly

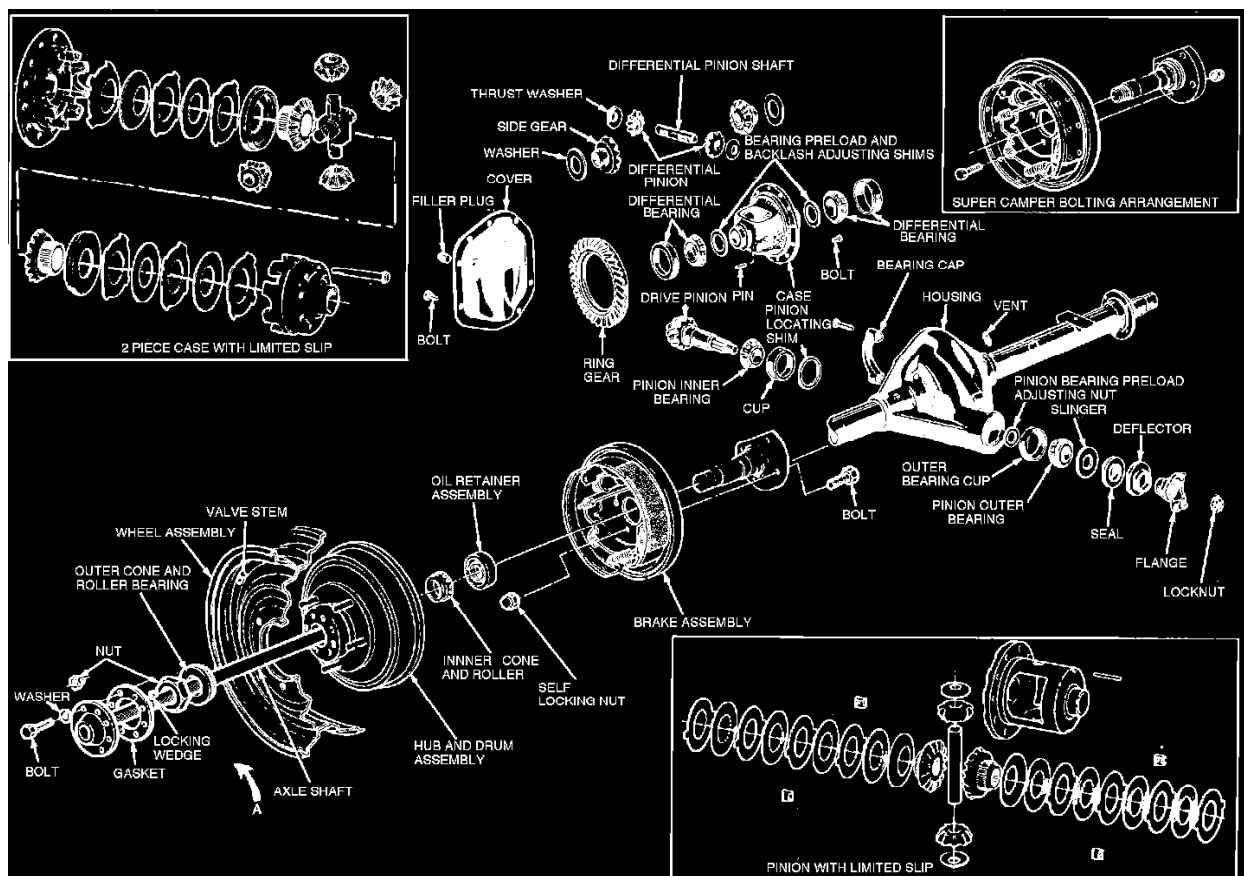


Fig. 1 Dana/Spicer full floating rear axle

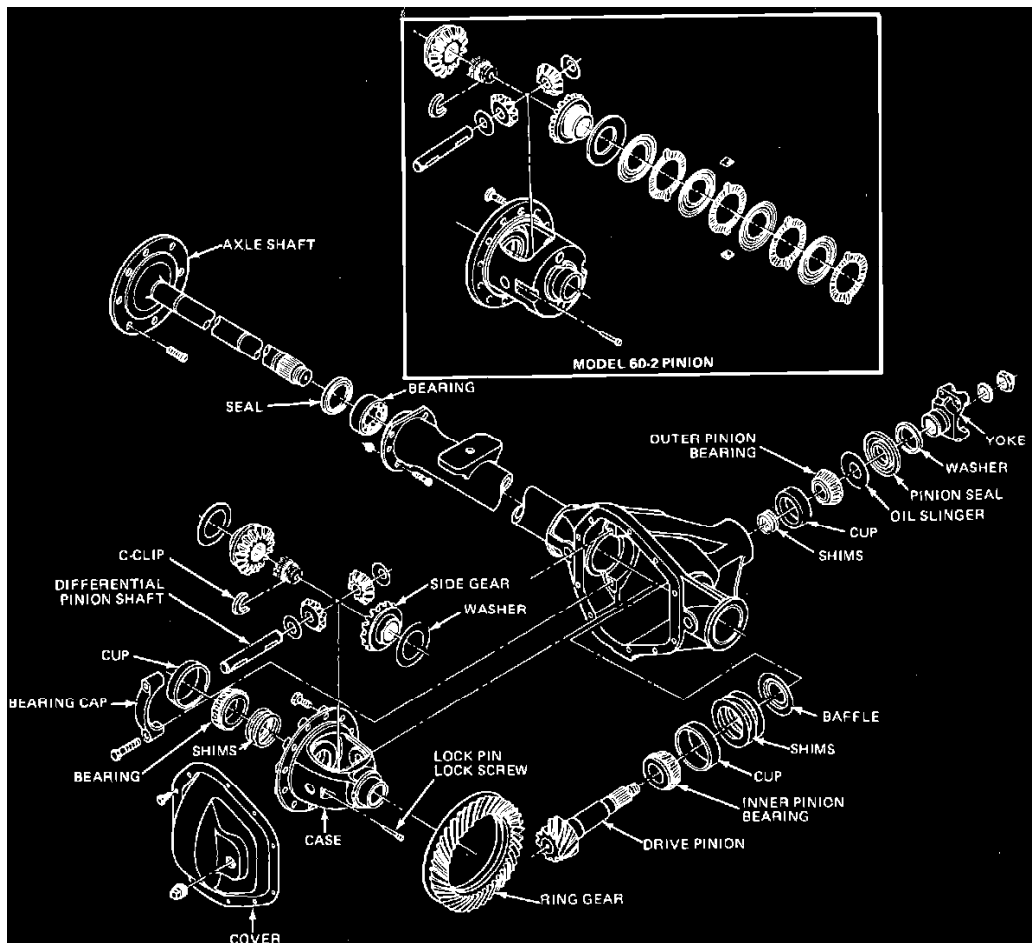


Fig. 2 Dana/Spicer semi-floating rear axle

When changing ratios on the different series of rear axles, it may be necessary to change the differential case along with the ring gear and drive pinion.

1. Remove axle from vehicle, Figs. 1 and 2.
2. Remove cover plate and drain lubricant from axle. The lubricant will drain out as the cover plate attaching screws are removed.
3. Clean cover face of carrier, ensuring it is free from any nicks, then remove old gasket material.
4. Mark differential bearing caps and axle housing, then remove bearing cap attaching screws and bearing caps.
5. Pull axle shafts out far enough for clearance when removing differential.
6. Install differential housing spreader tool No. 4000-E or equivalent on the case, then a suitable dial indicator on carrier housing. Ensure housing is not spread more than .015 inch.
7. Pry differential case from carrier using two pry bars, then remove spreader tool. Use caution to avoid damage to ring gear and pinion.
8. Disassemble standard differential assembly as follows: (for limited slip and locking differential assemblies, refer to "Ford Drive Axle w/Integral Carrier" section)
 - a. Remove differential bearings using a suitable tool. Wire shims, bearing cups and bearing cones together to ensure correct position during assembly.
 - b. Inspect shims for wear and damage. Replace as required.
 - c. Install differential assembly in suitable vise, then remove ring gear attaching bolts.
 - d. Tap ring gear using suitable hammer, then remove ring gear from case.
 - e. Remove lock pin which secures the pinion mate shaft using a suitable drift punch and hammer. **The semi-float shaft riding bearing type axle has a lock pin which can be removed using a suitable socket.**
 - f. Remove differential pinion mate shaft using a suitable drift punch and hammer.
 - g. Remove differential side gears and pinion mate gears by rotating the side gears. This will allow pinion mate gears to turn to opening of case.
 - h. Remove washers from behind the gears, then inspect all parts of the differential and machined surfaces of the case. If excessive wear is visible on all parts, replace complete differential assembly. If any of the gears are to be replaced, they should be replaced as a set.
9. Turn nose of carrier in a horizontal position, then remove pinion nut and washer using suitable tools.
10. Remove end yoke or flange using suitable yoke remover tool. If end yoke or flange shows wear in the area of the seal contact, it should be replaced.
11. Remove pinion from case using a suitable hammer. Use caution not to damage pinion. **On the splined end of the pinion, there are bearing preload shims. These shims may stick to pinion or bearings. Ensure shims do not get damaged during pinion removal.**

12. Remove pinion seal using a suitable puller, then the bearing cone and outer oil slinger.
13. Turn nose of carrier down, then remove outer pinion bearing cup using a suitable puller. **Use caution not to nick carrier bore.**
14. Remove inner bearing cup using a suitable tool. **Shims are located between the bearing cup and carrier bore and may also include an oil baffle. If shims and baffles are bent or nicked, replace at time of assembly.**
15. Remove bearing from pinion using suitable bearing remover tool. Both baffle and slinger are part of the pinion adjustment shims and should be retained for assembly.

Bearing Cups

Check bearing cups for rings, spalling, galling or erratic wear patterns. The bearing cups must be solidly seated. Check by attempting to insert .0015 inch feeler gauge between cups and bottoms of bores.

Carrier Housing

Inspect visually for damage. Ensure that differential bearing bores are smooth and that threads are not damaged. Remove any nicks or burrs from mounting surfaces of housing. Only repairs to cast axle housing and the "puddle-welded" area of the housing are approved. They should be made as follows:

1. Clean surfaces to be repaired by grinding or rotary filing to a clean bright metal finish. Clean repair area thoroughly. Metallic plastic will not stick to a dirty or oily surface. Chamfer or undercut the hole or porosity to a greater depth than the rest of the cleaned surface. Solid metal must surround the hole. Openings larger than 1/4 inch should not be repaired with metallic plastic. They can be drilled, tapped and plugged using common tools.
2. Mix metallic plastic base and hardener according to manufacturer's instructions. Stir thoroughly until uniform.
3. Apply repair mixture with suitable clean tool, forcing epoxy into hole or porosity.
4. Allow repair mixture to harden. Heat cure with a 250 watt lamp placed 10 inches from repaired surface, or air dry for 10 to 12 hours at temperatures above 50° F.
5. Sand or grind repaired area to blend with general contour of surrounding surface.
6. Paint the surface to match the rest of the axle housing.

Companion Flange

Be sure that flat machined surfaces and the bearing cup sockets of the flange have not been damaged in removing driveshaft or in removing flange from axle. The edge of the flange that contacts the oil slinger or pinion front bearing must be smooth. Roughness aggravates backlash noises and causes wear on the slinger with a resultant loss in drive pinion bearing preload. The seal surface should be perfectly smooth or leakage will result.

Cone & Roller Assemblies

When operated in the cups, the cone and roller assemblies must turn without any roughness. Examine roller ends for wear.

Differential Bearing Adjusters

Test fit of bearing adjusters in their threads with bearing caps installed. Ensure that bearing caps are on sides that they were machined to fit. The faces of the adjusters that contact the bearing cups must be smooth and square. Examine threads in carrier if their fit is not proper and replace any adjuster with a damaged face or threads.

Differential Case

Ensure that hubs where bearings mount are smooth. Check fit of differential gears in the counterbores. Carefully examine thrust washers, which may be damaged when bearings are removed. If differential bearing assemblies do not seat firmly on hubs, failure is certain. Ensure that mating surfaces of the two parts of case and the face of the ring gear attaching flange are smooth and free from nicks and burrs.

Gears

Examine drive pinion and ring gear teeth for scoring or signs of excessive wear. Worn gears cannot be rebuilt to correct a noisy condition. Gear scoring and flaking are the result of excessive shock loading or the use of improper lubricant. Scored gears cannot be reused.

Examine teeth and thrust surfaces of differential gears. Wear on hub of differential side gears may cause a chucking noise known as chuckle, when the vehicle is operated at low speeds. Wear of splines, thrust surfaces or thrust washers may contribute to excessive drive line backlash.

General Information

Thoroughly clean all parts. Do not soak or wash synthetic seals in cleaning solvents. Use only clean solvent to wash bearings. Oil bearings immediately

after cleaning to prevent rusting. A visual inspection of parts will detect any major wear or damage. Clean inside of carrier and carrier housing before rebuilding and assembling parts.

Pinion Retainer

Inspect visually for damage. Ensure that pinion bearing cups are seated. Ensure that there are no chips or burrs on mounting flange. Clean all lubricant passages. If pinion bearing cups were removed, examine bores in retainer carefully. Any nicks or burrs in these bores must be removed to permit proper seating of cups.

Ring Gear Runout

1987 models equipped with anti-lock brakes incorporate a multi-tooth exciter ring which is pressed on the differential case located behind the ring gear assembly. Do not remove exciter ring to measure ring gear runout. A space is provided between the exciter ring and ring gear to measure ring gear runout.

If ring gear runout during disassembly exceeded specifications, the condition may be caused by a warped gear, or distorted or damaged case or foreign matter trapped between differential case halves or under ring gears.

To determine cause of excessive runout, assemble differential case without ring gear, then check as described below.

Install case in differential carrier without ring gear attached. Install bearing caps and adjuster nuts and tighten cap bolts to specifications. Tighten adjuster nuts to center differential side bearing. Mount a dial indicator and check runout of case flange and ring gear pilot. If runout at either point is excessive, install a new differential case. If runout is within specification, the ring gear is out of specification. When performing this check on a locking differential case the four compression springs within the case should be temporarily removed. This will prevent a false runout reading due to distortion caused by the springs forcing the case apart.

Differential Case Assembly

For limited slip & locking differential assemblies, refer to "Ford Drive Axle w/Integral Carrier" section for assembly procedures. For adjustment procedures on these differentials, refer to step 9 in this procedure.

1. Install differential case in a vise, then apply suitable lubricant to side gear thrust washers and to hubs and thrust face of the new side gears.
2. Assemble both side gears and apply suitable lubricant to the spherical washers and pinion mate gears, then assemble pinion mate gears and washers.
3. Install both side gears and thrust washers, then the pinion mate gears and washers to hold side gears in position.
4. Rotate side gears until holes of washers and pinion gears line up with holes of the case. If gears cannot be rotated by hand, install one of the axle shafts into the side gear spline and use a pipe wrench to turn shaft.
5. Line up gear holes with those of the differential case using a suitable drift, then install pinion mate shaft. Ensure lock pin hole of shaft is lined up with lock pin hole of case.
6. Install lock pin, thenpeen metal of case over pin to lock in position. **The semi-float shaft riding bearing design uses a locking pin that is installed using a suitable wrench. Use a new lock pin and assemble finger tight. This prevents differential side gears and differential pinion mate gears from rotating in the case and dropping out when servicing the carrier section. A new lock pin should be installed after assembling the axle shafts.**
7. Install ring gear to case, then the ring gear attaching screws. Torque ring gear attaching screws alternately to approximately 115 ft. lbs. on except model 30 axle or 45---60 ft. lbs on model 30 axle.
8. Install differential bearings onto case using suitable tool.
9. Install differential case assembly into carrier, less pinion, then mount suitable dial indicator on face of housing.
10. Locate tip of indicator on flat surface of one of the ring gear screw spot faces, then force differential assembly as far as possible in the direction towards the indicator. With force still applied, set indicator at zero.
11. Force differential assembly as far as it will go in the opposite direction. Repeat this step until the same reading is obtained, then record this reading. **This reading will be the total amount of shims required, less preload, and will be calculated later during assembly.**
12. Remove indicator and differential assembly from housing. **Do not remove bearings from differential case at this time.**

Assembly of Differential Into Housing

Ring Gear & Pinion Backlash

1. Position differential assembly, with pinion installed, into housing. Ensure master bearings are still assembled in case.
2. Install dial indicator on carrier housing in same location as when spreading case.
3. Force ring gear into mesh with pinion, then set dial indicator to "0" while maintaining force on differential case.
4. Force ring gear away from pinion gear and note dial reading. Repeat sequence until same indicator reading is obtained. This measurement indicates amount of shims needed between differential case and bearings on the ring gear side.
5. Remove dial indicator and differential case from carrier, then the master bearings from differential case.
6. Place shims determined in step 4 on ring gear hub of differential case.
7. Install bearing cone on ring gear side of differential case, then drive bearing into place.

8. To determine thickness of shims required on hub of drive pinion side of differential case, subtract thickness of shims installed in step 6 from total differential case endplay as measured in "Differential Case Assembly" procedure. To this figure, add .015 inch.
9. Place shims determined in step 8 on hub of drive pinion side of differential case.
10. Install bearing cone on hub of drive pinion side of differential case.
11. Position suitable step plate on ring gear side bearing to protect bearing.
12. Place bearing on drive pinion side hub and drive it into position.
13. Install spreader tool and dial indicator as previously described. Do not spread case more than .015 inch.
14. Assemble differential bearing cups to bearing cones, then install differential assembly into carrier.
15. Tap differential assembly into position in carrier using a soft-faced hammer, then remove spreader tool from case.
16. Install bearing caps in proper position, then torque cap screws to 80---90 ft. lbs. on except model 30 axle or 35---50 ft. lbs on model 30 axle.
17. Measure ring gear and pinion backlash at three equidistant points using a dial indicator. Backlash must measure .004---.009 inch on except model 30 axle or .005---.009 inch on model 30 axle and cannot vary more than .003 inch on except model 30 axle or .002 inch on model 30 axle between points checked. Backlash may be brought within specifications by switching shims from one side of differential case to the other. Move ring gear closer to pinion to correct high backlash, or further away from pinion to correct low backlash.
18. On except model 30 axle having a cover plate without a flat mounting surface, install cover plate, using a new gasket, and torque attaching bolts alternately and evenly to 30---40 ft. lbs. On model 30 axle, torque cover attaching bolts to 15---25 ft. lbs.
19. On units having a cover plate with a flat mounting surface, install cover as follows:
 - a. Clean flat surface of cover plate and carrier mating surface.
 - b. Apply suitable sealant to cover plate surface, ensuring bead of sealant is laid on inside of cover screw holes.
 - c. Install two attaching bolts into cover at 2 o'clock and 8 o'clock positions.
 - d. Position cover on carrier, then install remaining attaching bolts.
 - e. Torque all attaching bolts alternately and evenly to 30---40 ft. lbs.

Depth Gauge Check

If any of the gauge surfaces become nicked, the high spots should be removed using an oil stone.

1. Install a new rear pinion bearing over a suitable aligning adapter, then position into the pinion bearing retainer assembly.
2. Place front of pinion bearing into the bearing cup, then assemble the handle onto the screw and hand tighten. **The square drive in the handle of the tool is to be used for obtaining the proper pinion bearing preload. Set preload to 20---40 inch lbs.**
3. Center suitable gauge tube into the differential bearing bore, then install the differential bearing caps.
4. Using a feeler gauge tool or shims, select the thickest shim that will enter between the gauge tube and gauge block. Insert feeler gauge directly along the gauge block to ensure a correct reading. **If the service pinion gear is marked with a plus (+) reading, this amount should be subtracted from the thickness dimension obtained in step 4. If the service pinion gear is marked with a minus (-) reading, this amount should be added to the thickness dimension obtained in step 4.**
5. Remove inner pinion bearing cup and install the correct number of shims in the carrier bore.
6. Install bearing cup and oil slinger, if equipped, on the pinion, then press on bearing using a suitable tool. **If a baffle or slinger is used, replace with a new one during assembly.**

Differential Case Assembly

For limited slip & locking differential assemblies, refer to "Ford Drive Axle w/Integral Carrier" section for assembly procedures. For adjustment procedures on these differentials, refer to step 9 in this procedure.

1. Install differential case in a vise, then apply suitable lubricant to side gear thrust washers and to hubs and thrust face of the new side gears.
2. Assemble both side gears and apply suitable lubricant to the spherical washers and pinion mate gears, then assemble pinion mate gears and washers.
3. Install both side gears and thrust washers, then the pinion mate gears and washers to hold side gears in position.
4. Rotate side gears until holes of washers and pinion gears line up with holes of the case. If gears cannot be rotated by hand, install one of the axle shafts into the side gear spline and use a pipe wrench to turn shaft.
5. Line up gear holes with those of the differential case using a suitable drift, then install pinion mate shaft. Ensure lock pin hole of shaft is lined up with lock pin hole of case.
6. Install lock pin, then peen metal of case over pin to lock in position. **The semi-float shaft riding bearing design uses a locking pin that is installed using a suitable wrench. Use a new lock pin and assemble finger tight. This prevents differential side gears and differential pinion mate gears from rotating in the case and dropping out when servicing the carrier section. A new lock pin should be installed after assembling the axle shafts.**
7. Install ring gear to case, then the ring gear attaching screws. Torque ring gear attaching screws alternately to approximately 115 ft. lbs. on except model 30 axle or 45---60 ft. lbs on model 30 axle.
8. Install differential bearings onto case using suitable tool.
9. Install differential case assembly into carrier, less pinion, then mount suitable dial indicator on face of housing.
10. Locate tip of indicator on flat surface of one of the ring gear screw spot faces, then force differential assembly as far as possible in the direction towards the indicator. With force still applied, set indicator at zero.
11. Force differential assembly as far as it will go in the opposite direction. Repeat this step until the same reading is obtained, then record this reading. **This reading will be the total amount of shims required, less preload, and will be calculated later during assembly.**
12. Remove indicator and differential assembly from housing. **Do not remove bearings from differential case at this time.**

Drive Pinion Depth of Mesh Setting

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
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

Fig. 3 Shim setting chart

Ring gears and pinions are supplied in matched sets only. Matched numbers on both the pinion and ring gear are etched for verification. On the face of each pinion there is etched either a plus or a minus number, or "0," which indicates the best running position for each particular gear set. This dimension is controlled by shimming behind the inner pinion bearing cup. A pinion etched with a +3 would require .003 inch less shims than a pinion etched "0." A pinion etched -3 would require .003 inch more shims than a pinion etched "0." If the etched figure is "0" the shim pack will remain the same. Refer to chart, **Fig. 3**. Shims are available in thicknesses of .003 inch, .005 inch, .010 inch and .030 inch.

If old ring and pinion set is to be reused, measure the old shim pack and build a new shim pack to the same dimension. If a baffle is used in the axle assembly, it is considered a part of the shim pack. Measure each shim separately with a micrometer and add together to get the total shim pack thickness from the original build up.

If a new gear set is being used, notice the (+) or (-) etching on both the new and old pinion and adjust thickness of new shim pack to compensate for the difference of these two figures. For example, if the old pinion reads +2 and the new pinion is -2, add .004 inch shims to the original shim pack.

Pinion Bearing Cup Installation

1. Place inner and outer bearing cups into carrier bore.
2. Install suitable inner bearing cup replacer tool on the inner bearing cup.
3. Install suitable outer bearing cup replacer tool on the outer bearing cup.
4. Install suitable threaded draw bar into the replacer tools, then tighten the draw bar to install cups into carrier bore.

Pinion Bearing Preload & Final Depth Check

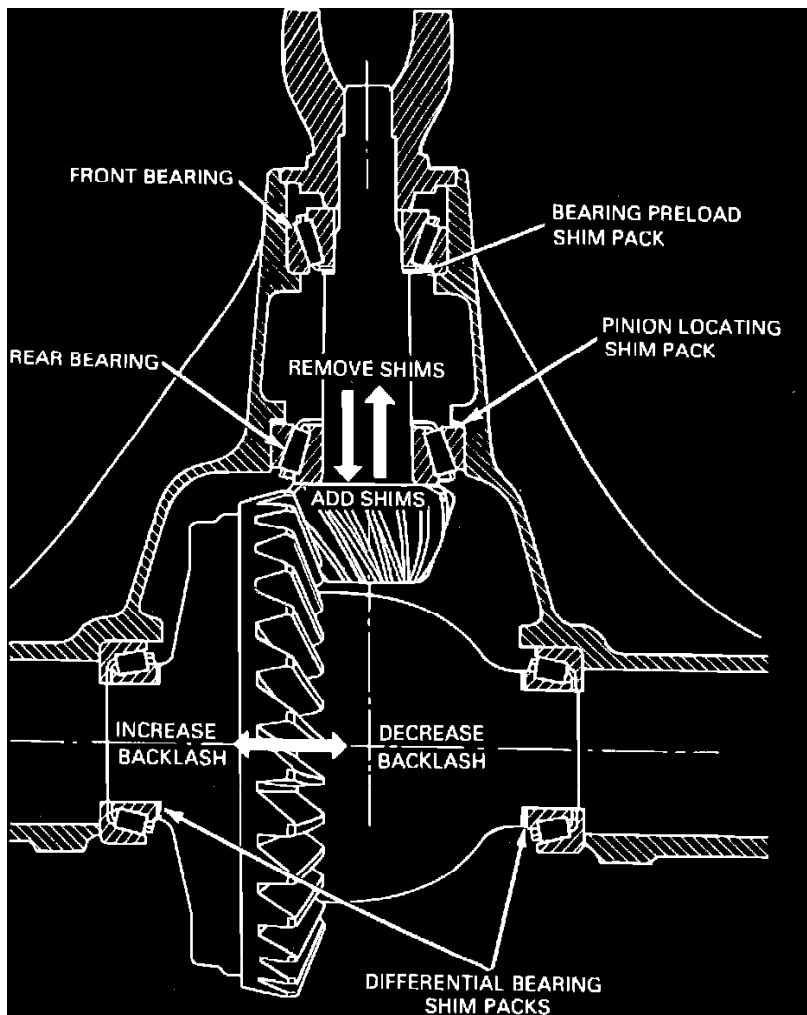


Fig. 4 Shim replacement for preload adjustment

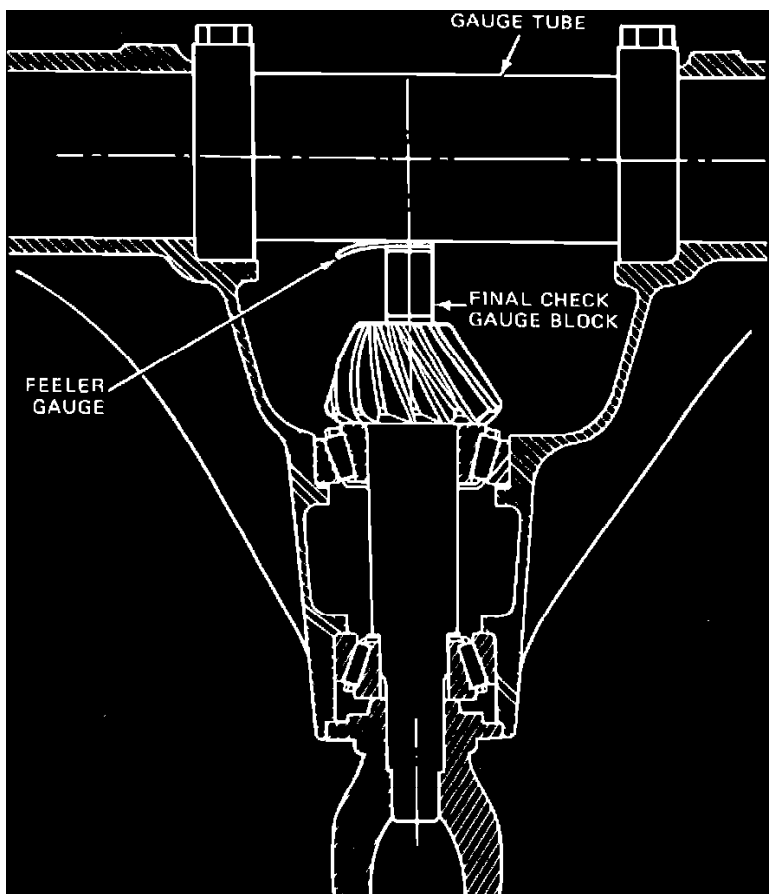


Fig. 5 Final pinion depth check

1. Install preload shims and slinger, if equipped, onto the pinion.
2. Install bearing cone assembly using suitable tool.
3. Install end yoke, washer and new pinion nut. Torque nut to approximately 250 ft. lbs. on except model 30 axle or 200---220 ft. lbs. on model 30 axle.
4. Rotate pinion using a suitable torque wrench. Rotating torque should be 20---40 inch lbs. To increase preload, remove shims from drive pinion. To decrease preload, add shims to pinion, **Fig. 4**.
5. Install suitable gauge tube in housing, then the bearing caps and cap attaching bolts, **Fig. 5**. Torque cap attaching bolts to 80---90 ft. lbs. on except model 30 axle or 35---50 ft. lbs. on model 30 axle.
6. Insert proper final check gauge block on top of pinion face under the gauge tube, **Fig. 5**. Place thumb on gauge block to ensure block is level.
7. Insert feeler gauge or shims between gauge tube and final check gauge block until slight drag is felt.
8. The reading in step 7 should be .020 inch added to the drive pinion etching, which could be plus (+) or minus (-) with a tolerance of .002 inch. 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.
9. With drive pinion at the correct depth, remove the yoke, nut and washer using a suitable tool.
10. Apply suitable lubricant to oil seal, then install drive pinion oil seal using a suitable installer. **Ensure seal spring is properly installed after seal installation.**
11. Install yoke using suitable tool, then the washer and nut. Torque nut to approximately 250 ft. lbs. on except model 30 axle or 200---220 ft. lbs. on model 30 axle.

Carrier Assembly Removal

1. Raise and support vehicle.
2. Remove axle shafts. Refer to individual truck chapter.
3. Mark relationship of driveshaft end yoke and axle companion flange for proper assembly, then disconnect driveshaft at rear axle universal joint.
4. Secure cups to spider with tape and mark relationship of cups to flange for proper assembly.
5. Remove driveshaft from transmission extension housing and install suitable tool to prevent transmission leakage.
6. Clean area around carrier to housing surfaces.
7. Remove carrier attaching nuts and washers, allow axle to drain into suitable container, and remove carrier assembly from axle housing.

Differential Carrier

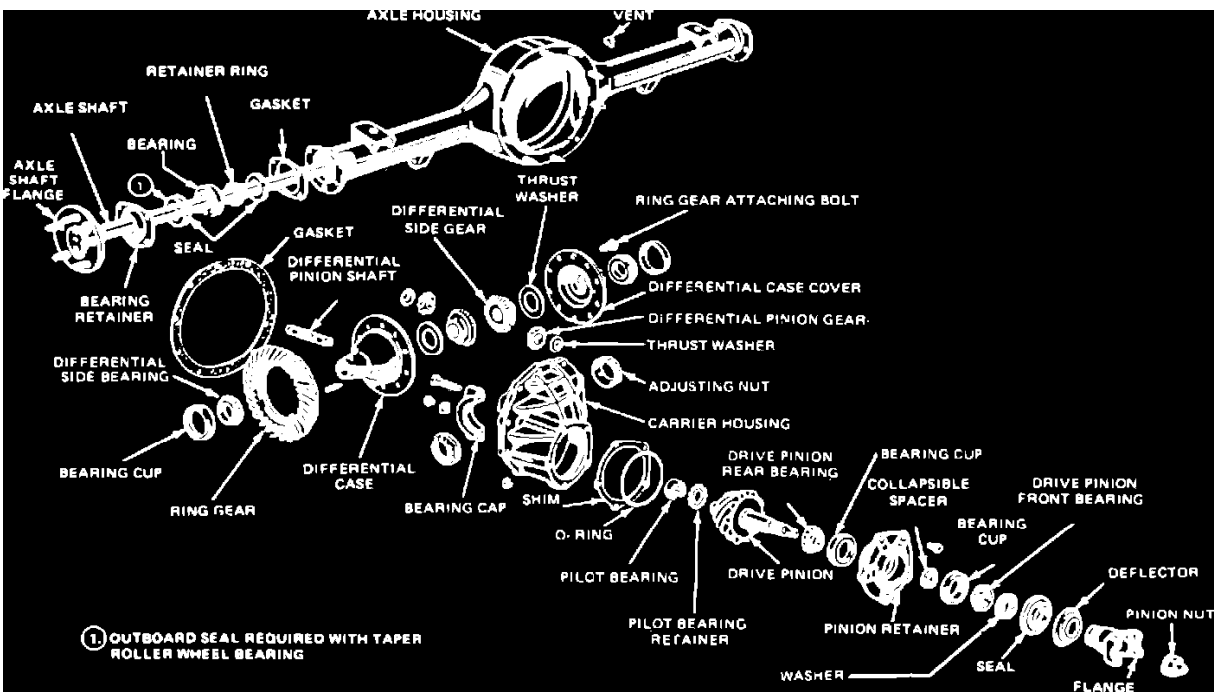


Fig. 1 Removable Carrier 9In. Ring Gear Axle Exploded View

Standard Differential

1. Mount carrier in suitable holding fixture.
2. Mark one differential bearing cap and the mating bearing support with punch marks for proper assembly.
3. Remove adjusting nut locks, bearing caps, and adjusting nuts, Fig. 1, then lift differential case assembly out of carrier.
4. Using suitable press, remove differential side bearings.
5. Mark differential case, cover, and ring gear for proper assembly.
6. Remove and discard ring gear to differential case attaching bolts, then press gear from case or tap gear off with soft faced hammer.
7. Separate differential case halves, then drive out differential pinion shaft lock pin with suitable drift.
8. Using brass drift, drive out differential pinion shaft.
9. Remove differential side gears, differential pinion gears, and thrust washers.

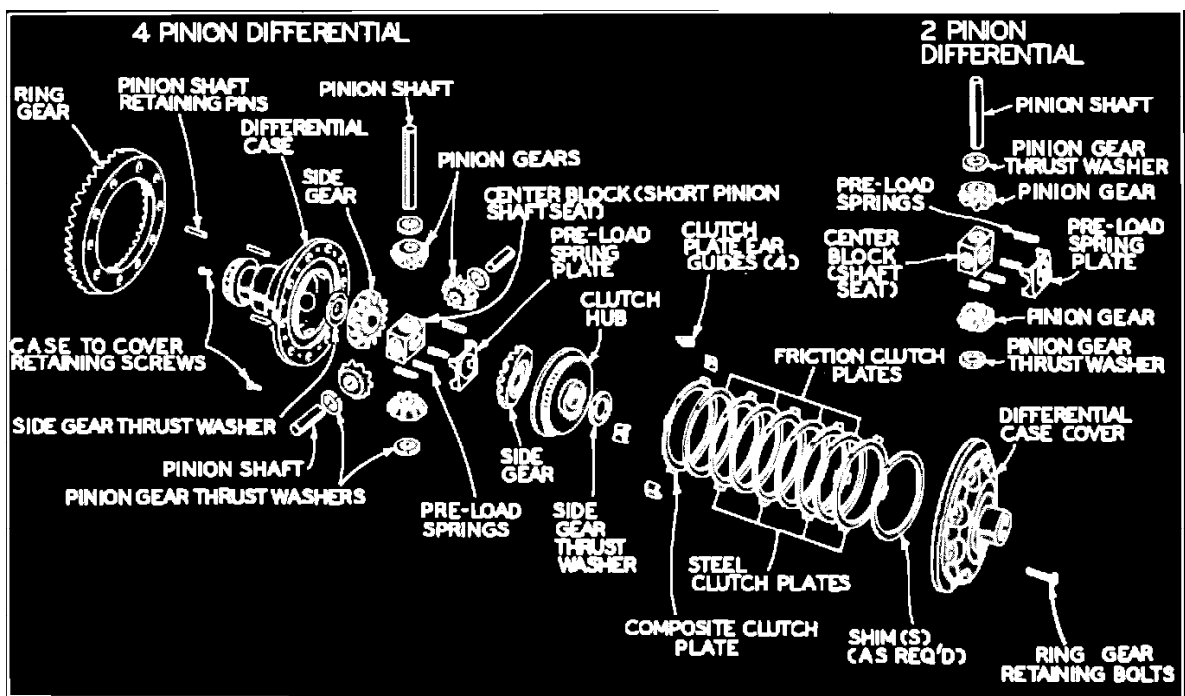


Fig. 2 Ford Traction-Lok Limited Slip Differential

Traction-Lok Differential

1. Referring to Fig. 2, remove ring gear to differential case bolts. Remove ring gear.
2. With case in press or using two bolts and nuts through ring gear mounting holes to compress case halves and overcome preload spring tension,

loosen two Allen or Phillips head screws until only a few threads of the screws are still engaged then remove case from press and tap cover to spring it loose. Remove screws.

3. With cover facing down, remove case, preload spring plate and springs.
4. From cover, remove side gear, clutch guides, hub and clutch discs.
5. Drive pinion shaft lock pins from case.
6. With brass drift, drive long pinion shaft from case, driving from end opposite lock pin hole.
7. Remove two short pinion shafts by driving each shaft from center outward. Lift out center block, pinion gears, thrust washers and side gear.
8. Remove differential bearings.

Drive Pinion & Bearing Retainer

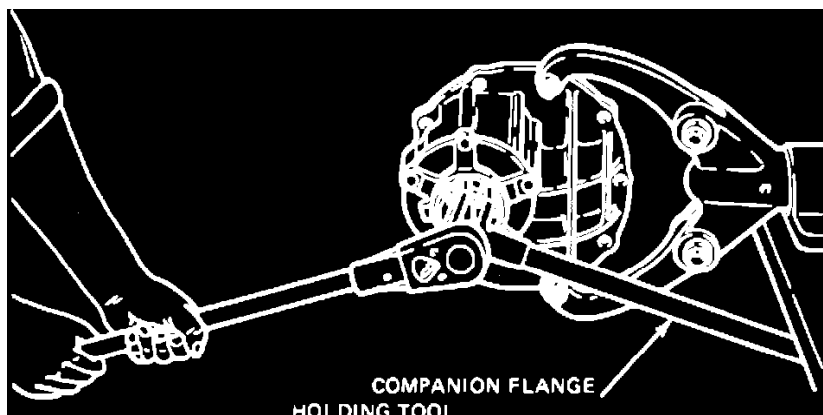


Fig. 3 Removing Pinion Shaft Nut

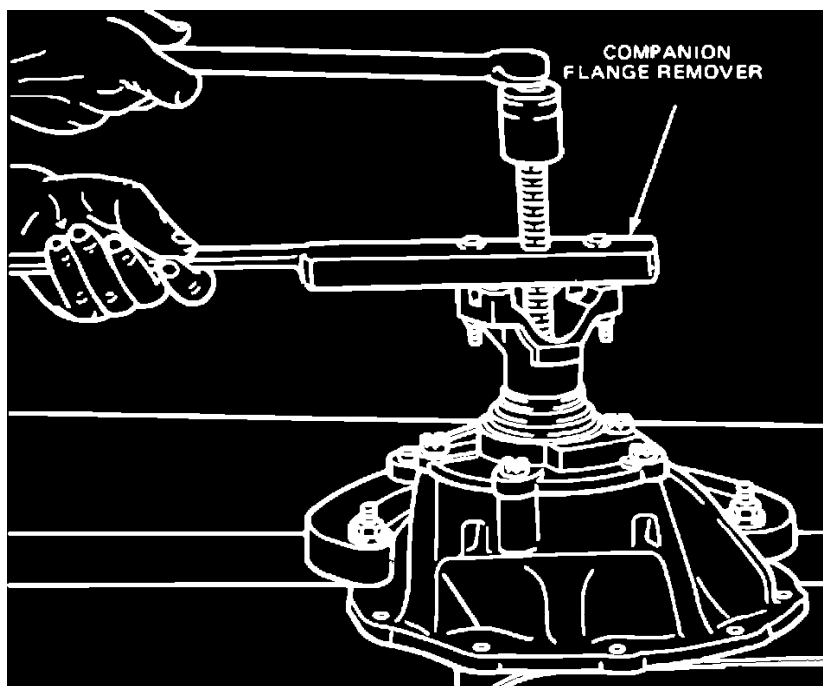


Fig. 4 Removing Companion Flange

1. Remove drive pinion shaft nut, **Fig. 3**.
2. Remove companion flange from drive pinion shaft, **Fig. 4**.
3. Using suitable puller, remove pinion seal.
4. Remove the pinion, bearing, and retainer assembly from carrier housing. **Extreme care must be taken not to damage mounting surfaces of retainer and carrier.**
5. Place protective sleeve on pinion pilot bearing surface and press drive pinion shaft out of pinion retainer.
6. Using tool T71P-4621-B or equivalent, press pinion shaft out of pinion rear bearing cone.
7. Clean and inspect all parts as described in "General Axle Service."

Pilot Bearing, Replace

1. Using suitable tool, drive out pilot bearing.
2. Using suitable tool, drive in new bearing until it is bottomed.
3. Using suitable tool, install new pilot bearing retainer, concave side up.

Pinion Bearing Cups, Replace

Do not remove drive pinion bearing cups from the retainer unless cups are worn or damaged.

1. Using suitable puller, remove bearing cups.
2. Using tool T71P-4616-A or equivalent, install new bearing cups.
3. Check seating of cups by attempting to insert a .0015 inch feeler gauge between cup and bottom of bore. **Cone and roller assemblies should be replaced whenever cups are replaced.**

Backlash & Differential Bearing Preload Adjustment

1. Remove adjusting nut locks and loosen differential bearing cap bolts, then torque cap bolts to approximately 20 ft. lbs. **Left adjusting nut is on ring gear side of carrier and right adjusting nut is on pinion side.**
2. Loosen right nut until it is away from cup and tighten left nut until ring gear is just forced into position with zero backlash, then rotate pinion several revolutions to ensure that no binding is evident.
3. Check right nut to ensure that it is still loose, then install dial indicator.
4. Tighten right nut until it just contacts bearing cup, then set dial indicator to zero and apply pressure to bearings by tightening right nut until indicator reads .008---.012 inch.
5. Turn pinion gear several times in each direction to seat bearings in cups and ensure that no binding is evident, then torque bearing caps to 70---80 ft. lbs.
6. Measure backlash on several teeth around ring gear.
7. If backlash varies by more than .004 inch between any two teeth, loosen one adjusting nut and tighten opposite nut an equal amount to move ring gear away from or toward pinion. Tightening left nut moves ring gear into pinion to decrease backlash while tightening right nut moves ring gear away. **When moving adjusting nuts, final movement should always be made in a tightening direction. Assuming left nut had to be loosened one notch, loosen nut two notches, then tighten one notch.**
8. Ensure that case spread remains within specifications as previously described.
9. Perform teeth pattern check as described under "General Axle Service." If backlash is correct and gross pattern error results, recheck pinion shim selection.

Differential Case

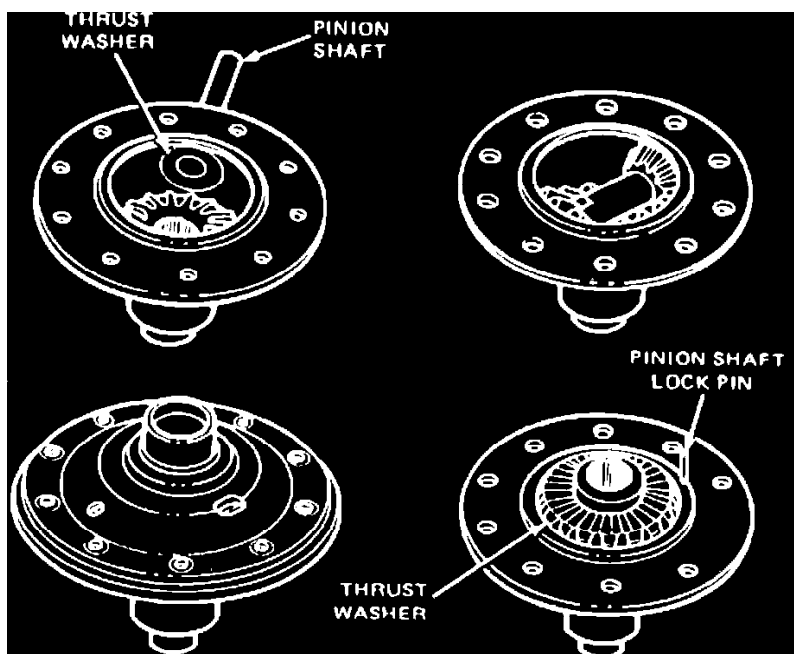


Fig. 10 Assembling differential case

Standard Differential

1. Place side gear thrust washer and side gear in differential case bore, **Fig. 10. Liberally lubricate all differential components with suitable lubricant during assembly.**
2. Using soft faced hammer, drive differential pinion shaft into case only far enough to retain pinion thrust washer and pinion gear.
3. Place second differential pinion and thrust washer in position and drive pinion shaft into place, carefully aligning pinion shaft lock pin holes.
4. Place second side gear and thrust washer in position and install pinion shaft lock pin and the cover on differential case then insert axle shaft spline

in side gear spline to check for free rotation of differential gears.

5. Using suitable solvent, clean tapped holes in ring gear.
6. Insert two 7/16 N. F. bolts two inches long through differential case flange and thread them three or four turns into ring gear as a guide for aligning ring gear bolts, then press or tap ring gear into position. **If new bolts show a green or yellow coating of at least 1/2 inch on threaded area, use as is. If bolts are not coated, apply small amount of suitable sealant to threads. Torque bolts to 70---80 ft. lbs. Never install used bolts.**
7. If differential bearings were removed, press them on using tool T57L-4221-A2 or equivalent.
8. Wipe thin coating of suitable lubricant on carrier differential bearing bores, then place cups on bearings and set differential case assembly in carrier.
9. Assemble differential case and ring gear assembly in carrier so that marked tooth on drive pinion indexes between marked teeth on ring gear.
10. Slide assembly along bores until a slight amount of backlash is felt between gear teeth.
11. Set adjusting nuts in bores so that they just contact bearing cups, engaging nuts approximately the same number of threads on both sides.
12. Carefully position differential bearing caps on carrier, matching alignment marks.
13. Ensure that adjuster nuts are properly threaded in cap and carrier and that they turn freely, then install bearing caps and alternately torque them to 70---80 ft. lbs.
14. If adjusting nuts do not turn freely as cap bolts are tightened, remove differential bearing caps and inspect for damaged threads or incorrectly positioned caps.
15. Adjust backlash and differential bearing preload.

Traction-Lok Differential

When new clutch plates are used, soak plates in suitable hypoid lubricant for approximately 30 minutes before installation. Lubricate all parts with suitable hypoid lubricant during assembly.

1. Mount differential case in suitable vise and place side gear thrust washer and side gear in counterbore of case.
2. Install differential pinion thrust washers and place pinion gears on side gear, aligning holes in washers and gears with holes in case.
3. Install center block so that shaft holes are aligned with holes in pinion gears and case.
4. Using brass drift, drive in long differential pinion shaft from outside of case, aligning lock pin holes in shaft with lock pin holes in case.
5. Position center block so that long shaft is driven through rough side and short shaft is driven through machined side.
6. Using suitable drift, install shaft lock pins, ensuring that differential pinion and side gears move freely.
7. Place four preload pins in holes provided in center block.
8. Position preload plate over four springs, ensuring that springs are properly seated. The preload plate straddles the center block over its narrower machined width.
9. Mount differential cover in suitable vise.
10. Insert shims .050 inch total thickness, in cover cavity.
11. Install composite plate on back side of clutch hub with friction material against hub, then install, in order, a friction plate, steel plate, friction plate, steel plate, friction plate and steel plate.
12. Place clutch hub with clutch plates into clutch gear cavities in differential cover, ensuring that splines on last friction plate are engaged on hub.
13. Obtain locally a 5/8 inch by 2-1/2 inch or 9/16 inch by 2-1/2 inch bolt, nut, and two 1-1/2 inch O.D. flat washers approximately 1/8 inch in thickness. Install flat washer on bolt and place bolt through clutch hub. Hold bolt in place and turn cover over. Place flat washer and bolt and install nut, torquing nut to 10---15 ft. lbs. while ensuring that washers remain centered.

Feeler Gauge Reading (Inches) (1)	Remove Shim(s) From Normal	Total Req'd. Shim Pack Thickness (Inches) (2)	Feeler Gauge Reading (Inches) (1)	Remove Shim(s) From Nominal	Total Req'd. Shim Pack Thickness (Inches) (2)
0.001-0.002	None	0.050	0.028-0.032	0.030	0.020
0.003-0.007	0.005	0.0045	0.033-0.037	0.035	0.015
0.008-0.012	0.010	0.040	0.038-0.042	0.040	0.010
0.013-0.017	0.015	0.035	0.043-0.047	0.045	0.005
0.018-0.022	0.020	0.030	0.048-0.050	0.050	0.000
0.023-0.027	0.025	0.025			

(1) With clutch hub, shims and clutch plates compressed 10-15 ft. lb.

(2) Service shims are available in 0.010 inch and 0.005 inch thicknesses.



Fig. 11 Shim pack thickness chart

14. Place shim template tool in clutch hub, **Fig. 11**. Some clearance should be observed between shim tool and cover to case mating surface. Determine exact amount of clearance using feeler gauge. The shim pack thickness chart, **Fig. 12**, will indicate correct amount of shims to subtract from .050 inch shims originally installed.
15. Remove bolt, nut and flat washers. Remove clutch hub and clutch plates as necessary to alter shim thickness.
16. Install selected shims in cover cavity, then reinstall components as described in steps 11 and 12.
17. Install four steel clutch ear guides and side gears.
18. Place both assemblies in press and press two halves together, then install two Allen head or Phillips head screws and tighten evenly until tight.
19. Install ring gear and ring gear bolts and washers. Torque bolts evenly and alternately across diameter of ring gear to 70---80 ft. lbs.
20. Using currently released locker tools, check torque required to rotate one side gear while other is held stationary. The initial breakaway torque may exceed 250 ft. lbs. The rotating torque required to keep the side gear turning with new clutch plates is 100---250 ft. lbs. With reused clutch plates, the minimum torque required is 40 ft. lbs. (Torque may fluctuate 10---40 ft. lbs.)

Drive Pinion & Bearing Retainer

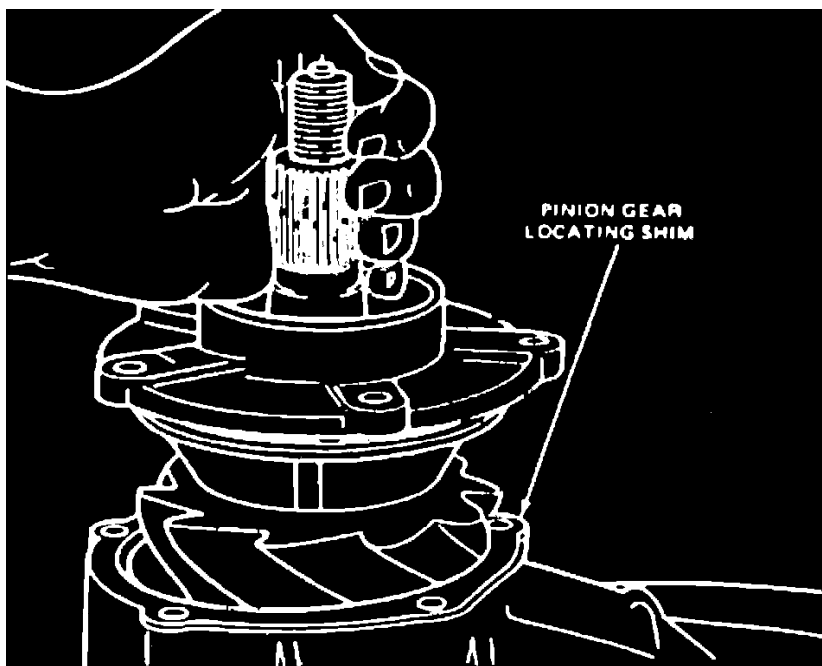


Fig. 7 Installing Pinion And Retainer Assembly

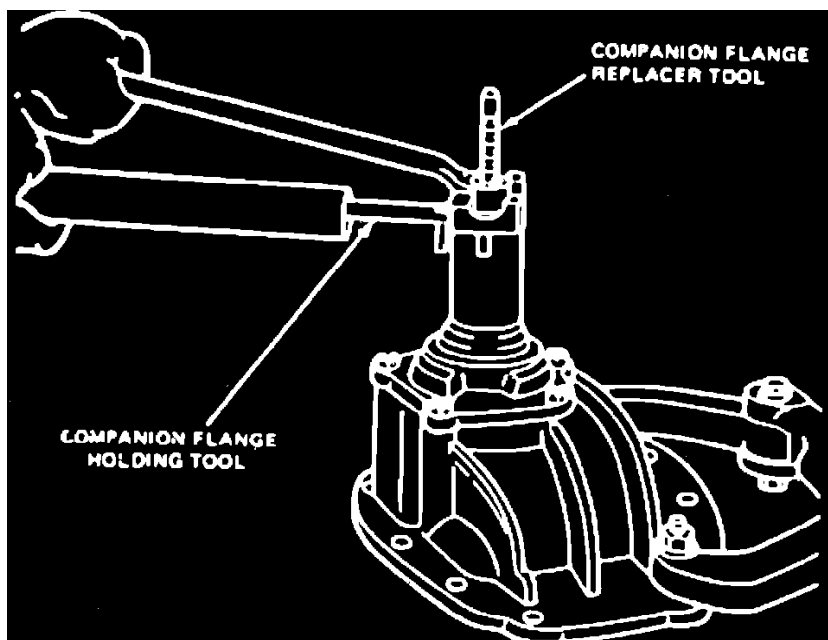


Fig. 8 Installing Companion Flange

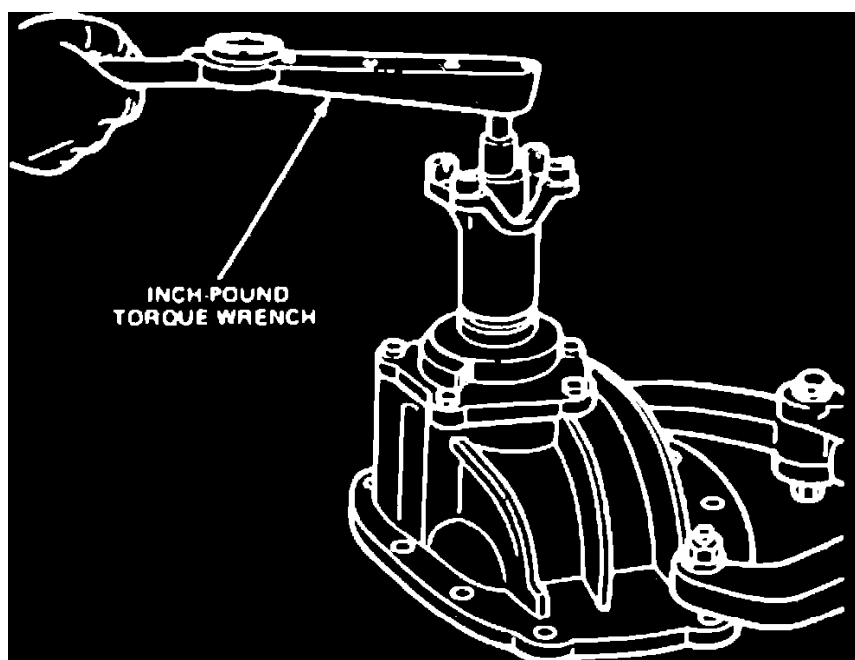


Fig. 9 Checking Pinion Bearing Preload

A new ring gear and drive pinion should always be installed as a matched set. Ensure that identifying numbers on ring gear and head of drive pinion are identical.

1. Using suitable tool, install pinion rear bearing cone on pinion shaft, then position new spacer on pinion shaft.
2. Place bearing retainer on drive pinion shaft and install front bearing cone and roller, then, using tool T57L-4621-B or equivalent, press bearing cone and roller into position, being careful not to crush collapsible spacer.
3. Lubricate O-ring with suitable lubricant, install into groove in pinion retainer, and snap into place. Then lubricate front and rear pinion bearings.
4. Position selected shim on carrier housing and install pinion and retainer assembly, being careful not to pinch O-ring, **Fig. 7**.
5. Install pinion retainer attaching bolts, torquing to 30---40 ft. lbs., then install oil slinger, if equipped.
6. Using suitable tool, install new pinion oil seal in bearing retainer.
7. Install companion flange, **Fig. 8**.
8. Apply small amount of suitable lubricant to flange side of new pinion nut and start nut on drive pinion shaft.
9. Hold flange with suitable tool and tighten flange nut.
10. Check pinion bearing preload, **Fig. 9**. Correct preload is obtained when torque required to rotate pinion in retainer is 8---14 inch lbs. for original bearing or 16---29 inch lbs. for new bearing. If torque required to rotate pinion is less than specified, tighten pinion shaft nut a little at a time until proper preload is obtained. **Do not over tighten nut. If excessive preload is obtained as a result of over tightening, replace collapsible bearing spacer. Do not back off pinion shaft nut to establish pinion bearing preload.**

Selecting Correct Pinion Shim

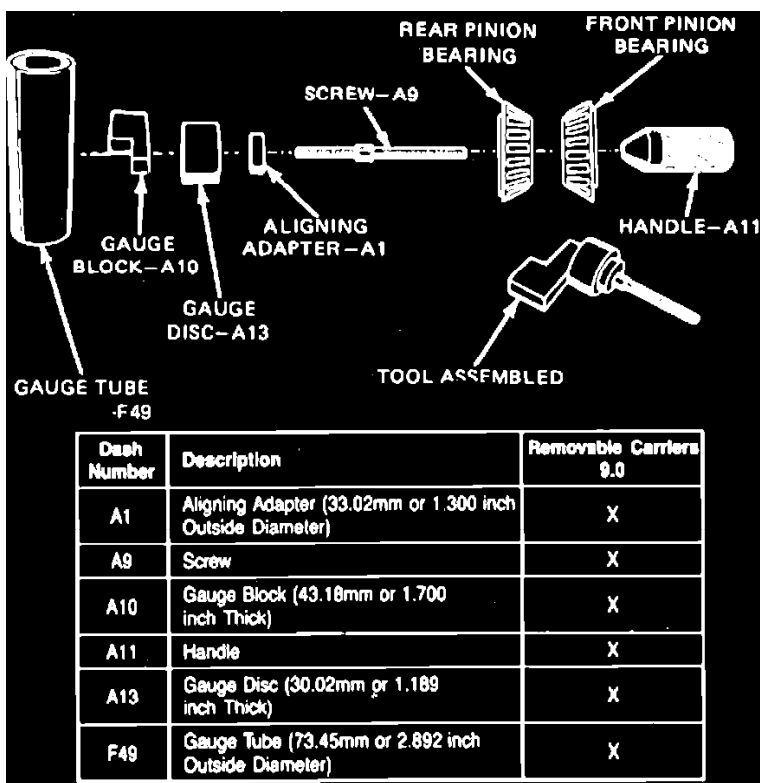


Fig. 5 Removable carrier 9 inch ring gear axle pinion depth tool gauge

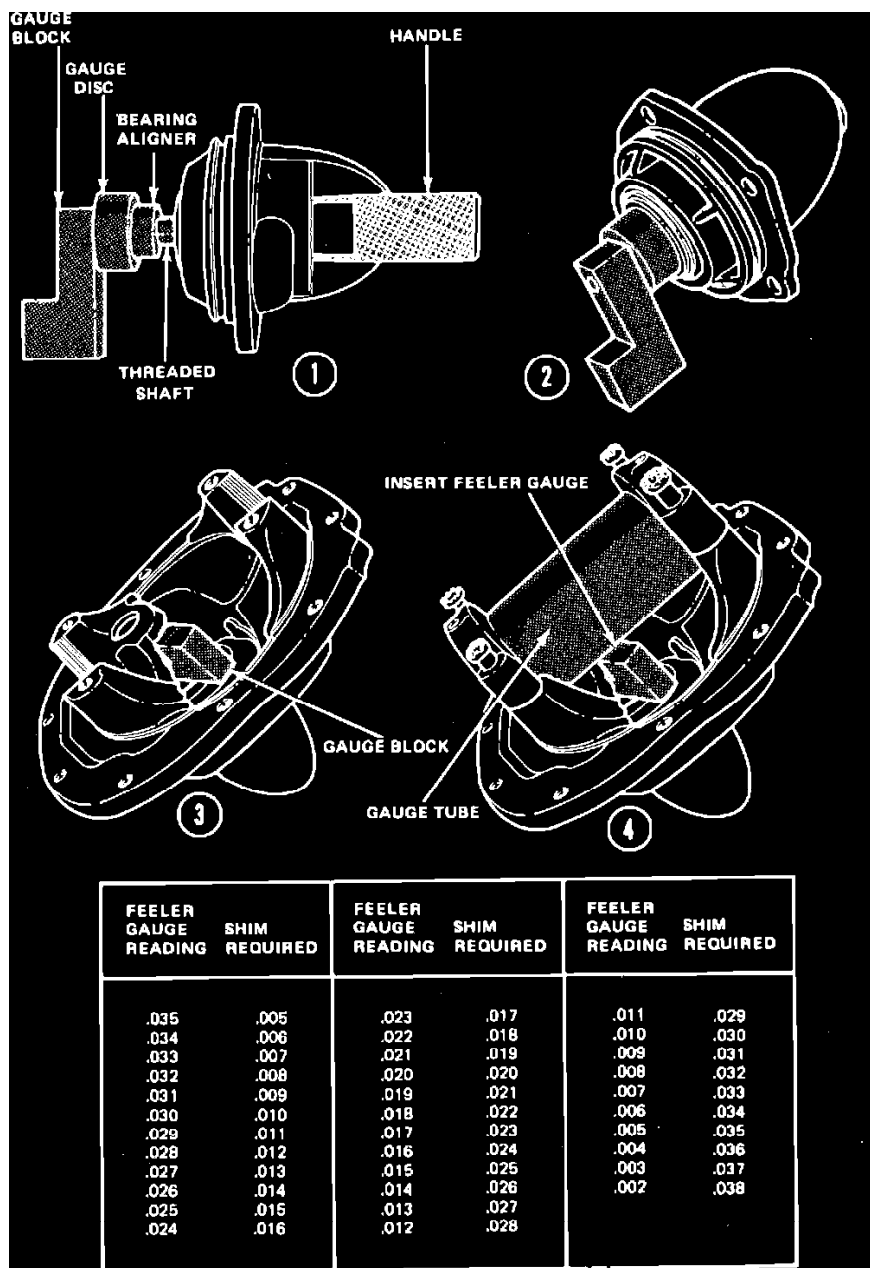


Fig. 6 Using pinion depth gauge tool

When the ring gear and drive pinion or pinion bearings are replaced, the correct pinion shim thickness must be determined using tool T79P-4020-A or equivalent.

1. Select proper rear pinion bearing aligning adapter and gauge disc and slide these adapters over screw or threaded shaft, Fig. 5.
2. Install gauge block on threaded shaft and tighten securely, Fig. 6 (1).
3. Place assembly and rear drive pinion bearing into pinion bearing retainer assembly, then install front pinion bearing and screw handle onto threaded shaft, tapered end into front pinion bearing, Fig. 6 (1) and (2). Flat end of handle has 3/8 inch hole cut in it so that an inch pound torque wrench may be used to obtain proper pinion bearing preload.
4. Install pinion bearing retainer assembly into carrier, less shim, torquing attaching bolts to 30---40 ft. lbs.
5. Rotate gauge block so that it rests against pilot boss, Fig. 6 (3).
6. Using feeler gauge, measure distance between gauge block and gauge tube, Fig. 6 (4). Insert blade directly along gauge block top to ensure a correct reading. Fit should be a slight drag-type feeling.
7. Select proper shim according to feeler gauge reading, Fig. 6.

Carrier Assembly Installation

Synthetic type wheel bearing seals must not be cleaned, soaked, or washed in cleaning solvent.

1. Clean axle housing and shafts using kerosene and swabs, being careful not to allow any solvent directly on wheel bearings, then clean mating surfaces of axle housing and carrier.
2. Position differential carrier on studs in axle housing with new gasket installed between carrier and housing. Apply bead of suitable sealant to gasket.

3. Install carrier to housing attaching nuts, torquing to 25---40 ft. lbs.
4. Install driveshaft and axle shafts. Refer to individual truck chapter.
5. Fill rear axle to bottom of fill hole with suitable lubricant.

Ford Integral Carrier, Clutch Type Trac-LOC, Rear

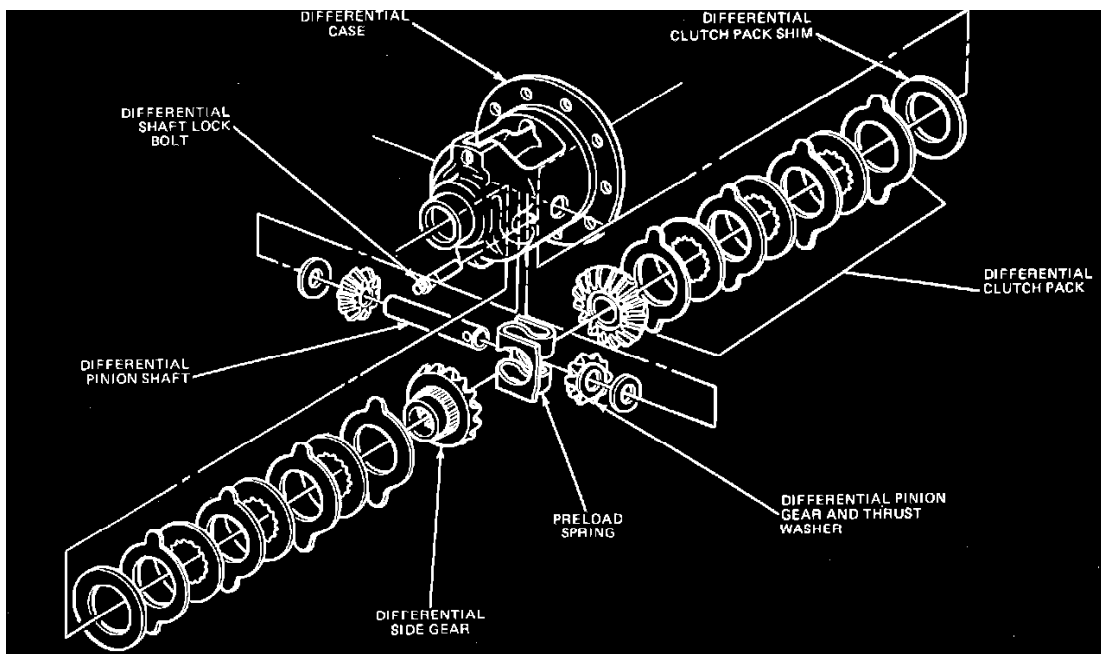


Fig. 5 Exploded view of clutch type Traction-Lok limited slip differential

Overhaul procedures for this limited slip differential, Fig. 5, are the same as for "Ford Traction-Lok Differential."

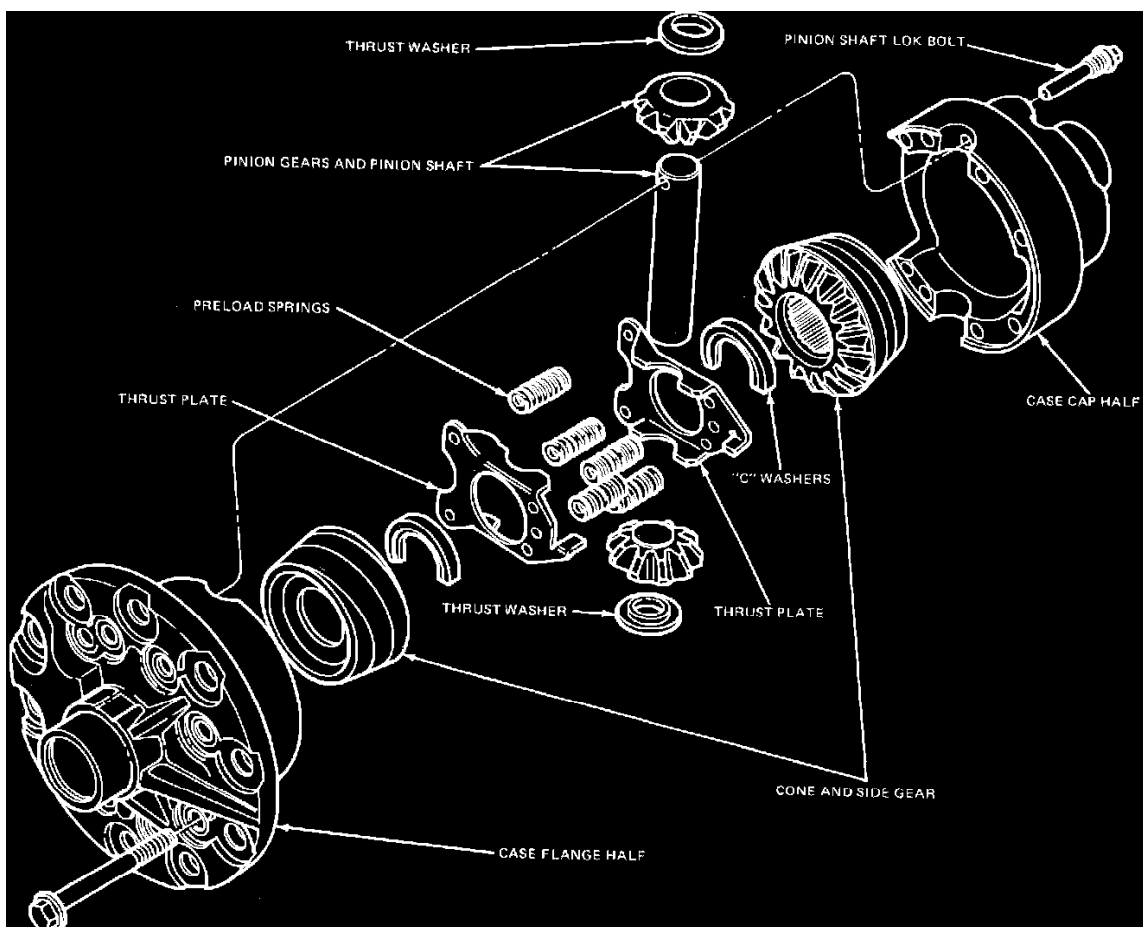
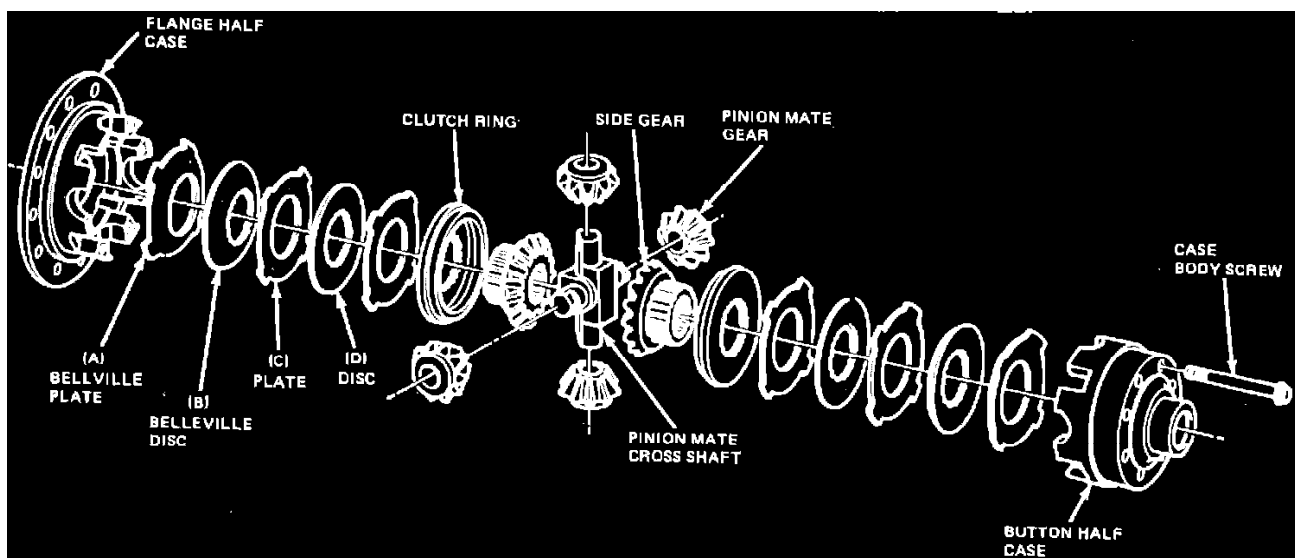


Fig. 6 Exploded view of cone type limited slip differential

CONE TYPE LIMITED SLIP DIFFERENTIAL

1. Place differential case, **Fig. 6**, in large vise to load case at bearing journals so that preload of springs is overcome.
2. Loosen case securing cap screws until only 3 or 4 threads are engaged, then loosen vise slightly and tap flange half of case to spring it loose.
3. Remove case assembly from vise, flange half up, then remove cap screws and lift off flange half.
4. Remove side gear and brake cone assemblies, thrust plates, preload springs, pinion shaft, pinion gears and thrust washers. **Note which cone comes from which half of case for proper assembly.**
5. Clean and inspect as described under "Cleaning and Inspection."
6. Place cap half of differential in vise with inside of case half facing up.
7. Install proper cone in case and set it in position.
8. Assemble thrust plates, preload springs, pinion gears, thrust washers and pinion shaft in proper order, then install second cone assembly.
9. Install flange half of case over cone in position.
10. Install two remaining bolts finger tight. **All oil must be removed from bolt and its mating surface before installation or a false torque reading will be obtained, possibly resulting in bolt breakage.**
11. Place differential case in vise to load case at bearing journals so that preload of springs is overcome.
12. Install remaining retaining bolts, torquing evenly to 34---39 ft. lbs.
13. Install pinion shaft lock bolt finger tight, then ensure that rotating torque is at least 30 ft. lbs.

Ford Integral Carrier, Dana Powr-LOK, Rear**Fig. 12 Dana Powr-Lok locking differential exploded view****Disassembly**

1. Scribe a mark between the differential case halves to be used during assembly. Also, mark the pinion mate shafts and corresponding ramps for assembly in original locations.
2. Clamp differential assembly in a soft jaw vise.
3. Loosen but do not remove the case half retaining bolts, **Fig. 12**.
4. Place assembly on bench with the ring gear half down and remove case half retaining screws.
5. Remove the cover half of the case.
6. Remove upper mate shaft, side gear, side gear ring and clutch pack. Retain parts with cover half of case so they can be installed in original position.
7. Remove lower mate shaft, side gear, side gear ring and clutch pack from drive gear case half.

Assembly

1. Place side gear ring from ring gear half of case on a pinion flange or other suitable fixture so the case is approximately 4 inches above bench.
2. Lubricate clutch plates and assemble clutch pack on side gear ring.
3. Place ring gear side of case over clutch pack and side gear ring. Ensure that the clutch plate lugs enter the slots in the case and that the case bottoms on the clutch pack.
4. Invert the assembly. Hold assembly together while inverting.
5. Install the ring gear case half side gear in side gear ring.
6. Install axle shaft spacer in cross shaft.
7. Install the ring gear case half pinion mate shaft and pinions on the side gear ring.
8. Install the cover half pinion mate shaft and pinions.
9. Place side gear on pinions, then the side gear ring on side gear.
10. Assemble clutch pack on side gear ring, aligning clutch pack lugs.

11. Install cover half of case over assembly, aligning the marks made during disassembly.
12. Install the case half retaining bolts, turning the bolts to engage a few threads only.
13. Insert axle shaft into assembly and align the splines of the side gears and side gear rings. With the axle shafts in position, torque case half retaining bolts to 65---70 ft. lbs.
14. Remove axle shafts.
15. If the differential has been assembled properly, each pinion mate cross shaft should be tight on its ramp. However, if clearance is present, it should not exceed .010 inch and be equal at all four cross shaft ends.

Ford Integral Carrier, Dana Trac-LOK, Rear

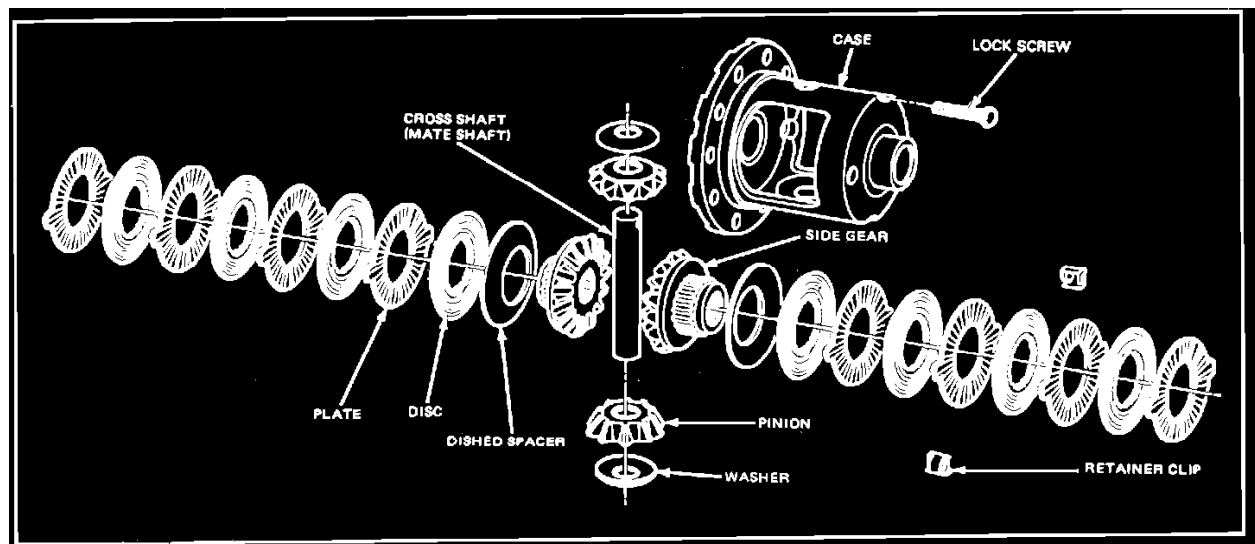


Fig. 13 Dana Trac-Lok locking differential exploded view

Disassembly

1. Place one axle shaft in vise, splined end up, so that splines do not extend more than three inches above jaws of vise.
2. Mount differential case on axle shaft.
3. Using suitable drift, remove roll pin retaining cross pin, then drive out cross pin with hammer and suitable drift, **Fig. 13**.
4. Position step plate into bottom side gear and lubricate centering hole of step plate.
5. Position gear rotating tool into top side gear.
6. Lubricate threads of forcing screw and thread screw into gear rotating tool, guiding forcing screw into step plate.
7. Tighten forcing screw securely, then, using a piece of .030 inch shim or gauge stock, push out differential spherical washers.
8. Loosen forcing screw momentarily, then tighten forcing screw until a very slight movement of the differential pinion gears is seen.
9. Slide pawl of gear rotating tool between two side gear teeth and pull handle so top side gear rotates, rotating differential pinion gears. Remove differential pinion gears through large openings in case. **When attempting to rotate side gear, it may be necessary to tighten or loosen forcing screw to permit gear movement.**
10. Manually hold top side gear and clutch pack in case and remove forcing screw, then the gear rotating tool.
11. Remove top side gear and clutch pack, keeping plates and discs in exact order.
12. Turn case so that ring gear side faces up, easing step plate, side gear, and clutch pack out of case.
13. Remove retainer clips from clutch packs, keeping discs and plates in exact order.

Assembly

1. Install side gears and thrust washers in correct order.
2. Lubricate thrust face of side gear and plates and discs with suitable lubricant and assemble plates and discs to side gear splines.
3. Assemble retainer clips to ears of plates, ensuring that clips are completely assembled or seated onto ears of plates.
4. Assemble clutch pack and side gear into case, ensuring that clutch pack stays assembled to side gear splines and that retainer clips are completely seated into pockets of case.
5. Manually retain clutch pack in case, position case on bench, and assemble step plate into side gear, applying small amount of lubricant into centering hole of step plate.
6. Assemble remaining clutch pack and side gear, ensuring that clutch pack stays assembled to side gear splines and that retainer clips are completely seated into pockets of case.
7. Position gear rotating tool into top side gear, manually hold side gear and rotating tool in position, insert forcing screw down through top of case, and thread screw into rotating tool until screw contacts step plate.
8. Position case onto axle shaft by aligning splines of side gear with splines of shaft.
9. Position differential pinion gears opposite one another through openings in case, ensuring that holes of gears are aligned, manually retain gears in position, and tighten forcing screw so that side gears move away from differential pinion gears.
10. Hold differential pinion gears in place and insert pawl of rotating tool between two side gear teeth, then pull on handle so that top side gear

rotates and allows differential pinion gears to rotate and enter into case. **It may be necessary to slightly tighten or loosen forcing screw to permit gear movement.**

11. Put on tool until handle hits case, then remove pawl from between gear teeth and position handle and pawl. Repeat this step until holes of differential pinion gears are perfectly aligned with holes of case.
12. Lubricate both sides of pinion spherical washers with suitable lubricant.
13. Apply torque to forcing screw to obtain installation clearance for spherical washers.
14. Install spherical washers, ensuring that holes of washers and gears are perfectly aligned with holes of case, then remove forcing screw, rotating tool, and step plate.
15. Install pinion shaft in differential case, then the cross shaft locking pin.

Ford Integral Carrier, Ford Trac-LOC, Rear

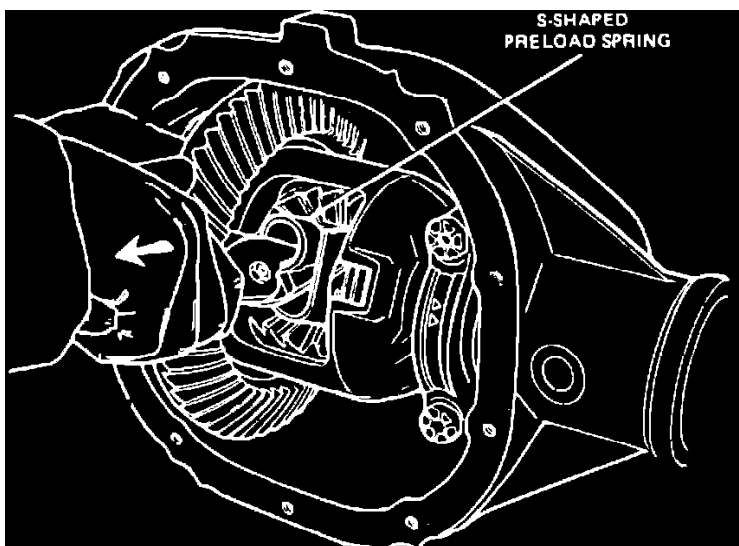


Fig. 7 Removing S-shaped preload spring

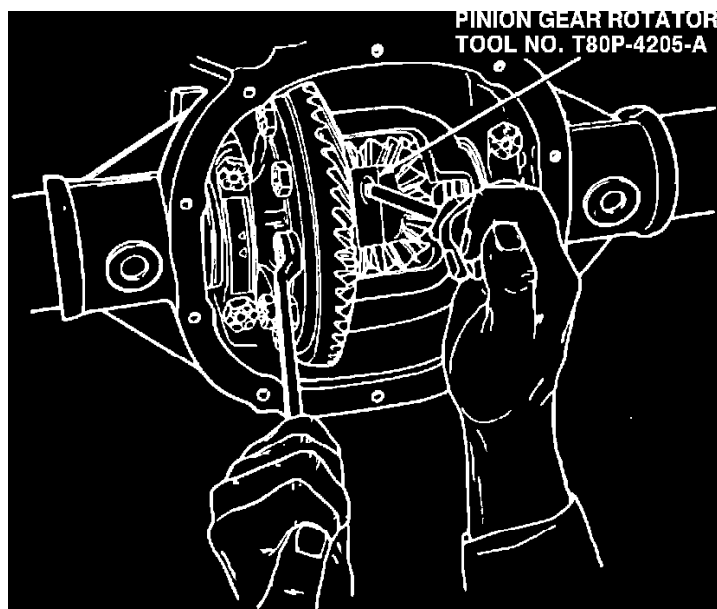


Fig. 8 Pinion gear removal & installation

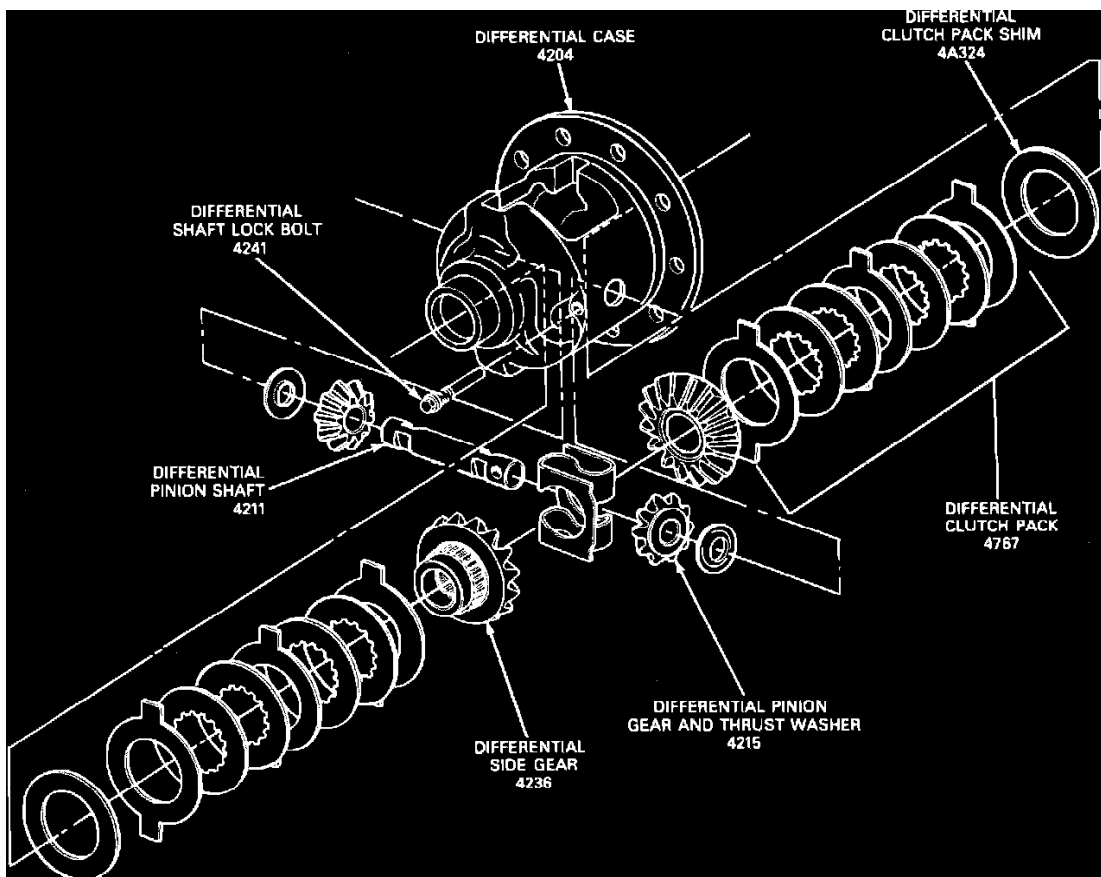


Fig. 9 Ford Traction-Lok locking differential exploded view

Disassembly

1. Remove pinion shaft lock screw and pinion shaft.
2. Push axle shafts inward and remove C-clips from axle shafts. Remove axle shafts.
3. Remove preloaded "S" shaped spring, **Fig. 7**. **Use caution when removing "S" shaped spring since it is under tension.**
4. Rotate pinion gears and thrust washers until they can be removed through access hole using 12 inch socket extension inserted into pinion gear rotator T80P-4205-A or equivalent, **Fig. 8**.
5. Remove left and right side gears, clutch packs and shims, **Fig. 9**. Note order of removal for reference during assembly.

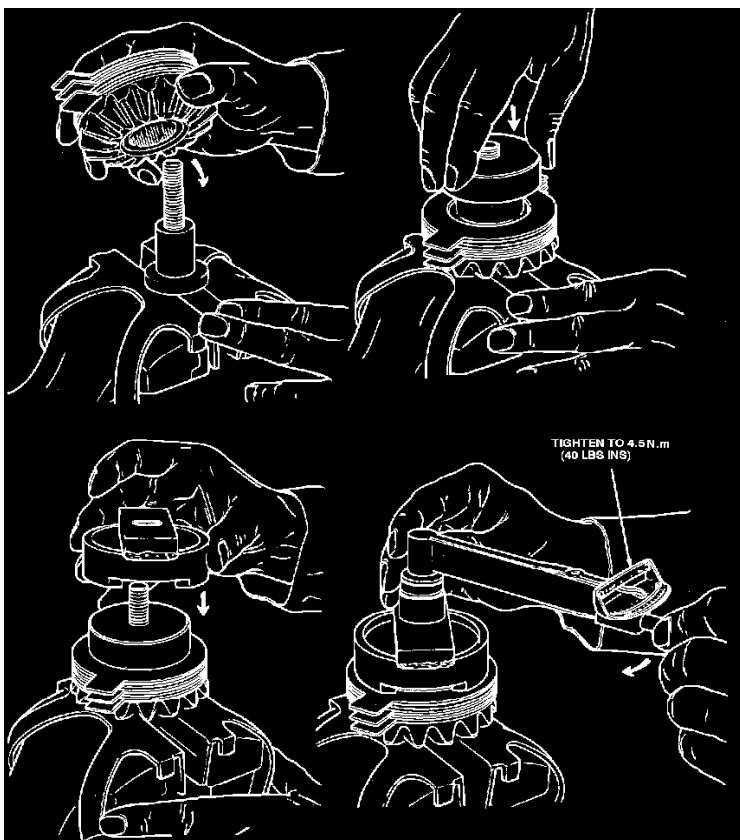


Fig. 7 Installing Tool T80P-4946- Or Equivalent To Measure Shim Thickness

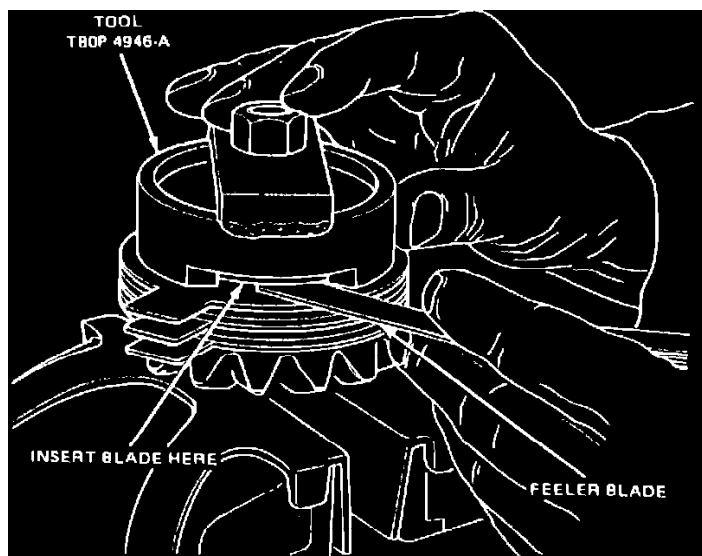


Fig. 11 Measuring shim thickness

Inspection

1. Visually inspect clutch packs, side gears, pinion gears and pinion shaft for damage or wear and replace as necessary.
2. Place each clutch pack without shims into tool T80P-4946-A or equivalent, **Fig. 10**. Torque nut to 40 inch lbs. Using feeler gauge, determine thickness of new shims by inserting thickest blade possible between clutch pack and tool, **Fig. 11**.

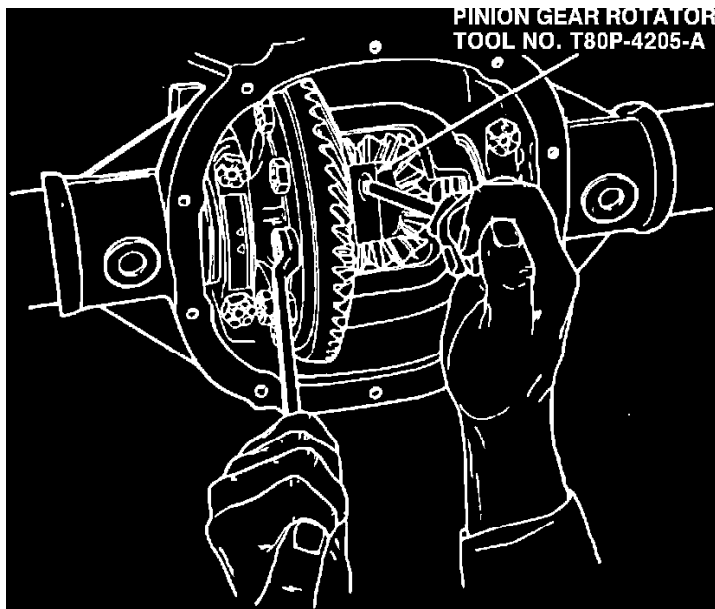


Fig. 8 Pinion gear removal & installation

Assembly

1. Apply suitable lubricant to clutch plates, then install left side gear, clutch pack and new shim into differential case. Repeat procedure for right hand side.
2. Install pinion gears and thrust washers 180° apart and in contact with side gears.
3. Align gears with pinion shaft bore, **Fig. 8**, using 12 inch socket extension inserted in pinion shaft rotator.
4. Install "S" shaped preload spring into differential using soft faced hammer.
5. Install axle shafts and secure with C-clip clip.
6. Install pinion shaft. Apply Loctite or equivalent onto pinion shaft lock bolt and torque to specifications.

Axle Disassembly

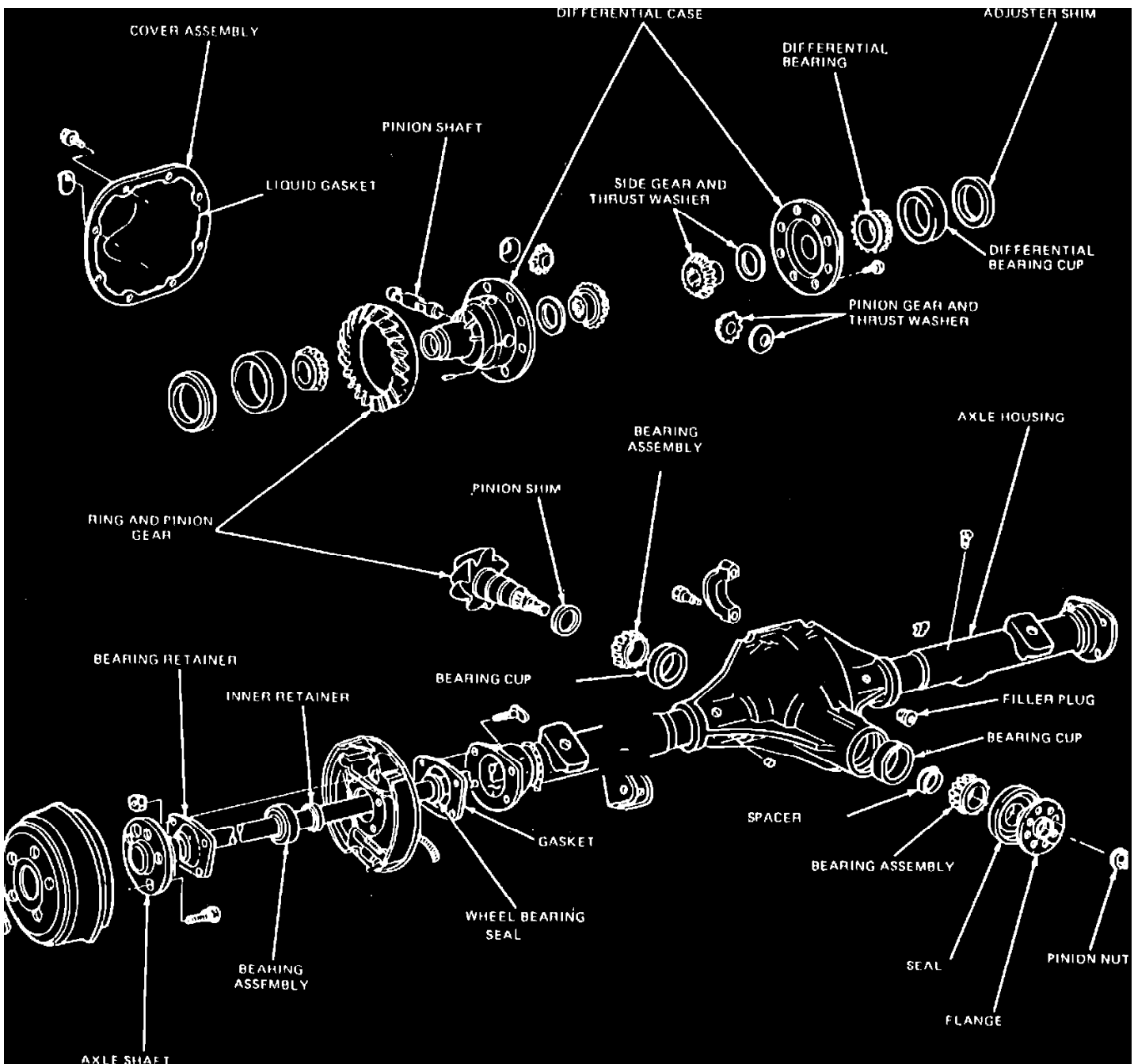




Fig. 1 Disassembled view of Ford 6 3/4 inch ring gear axle

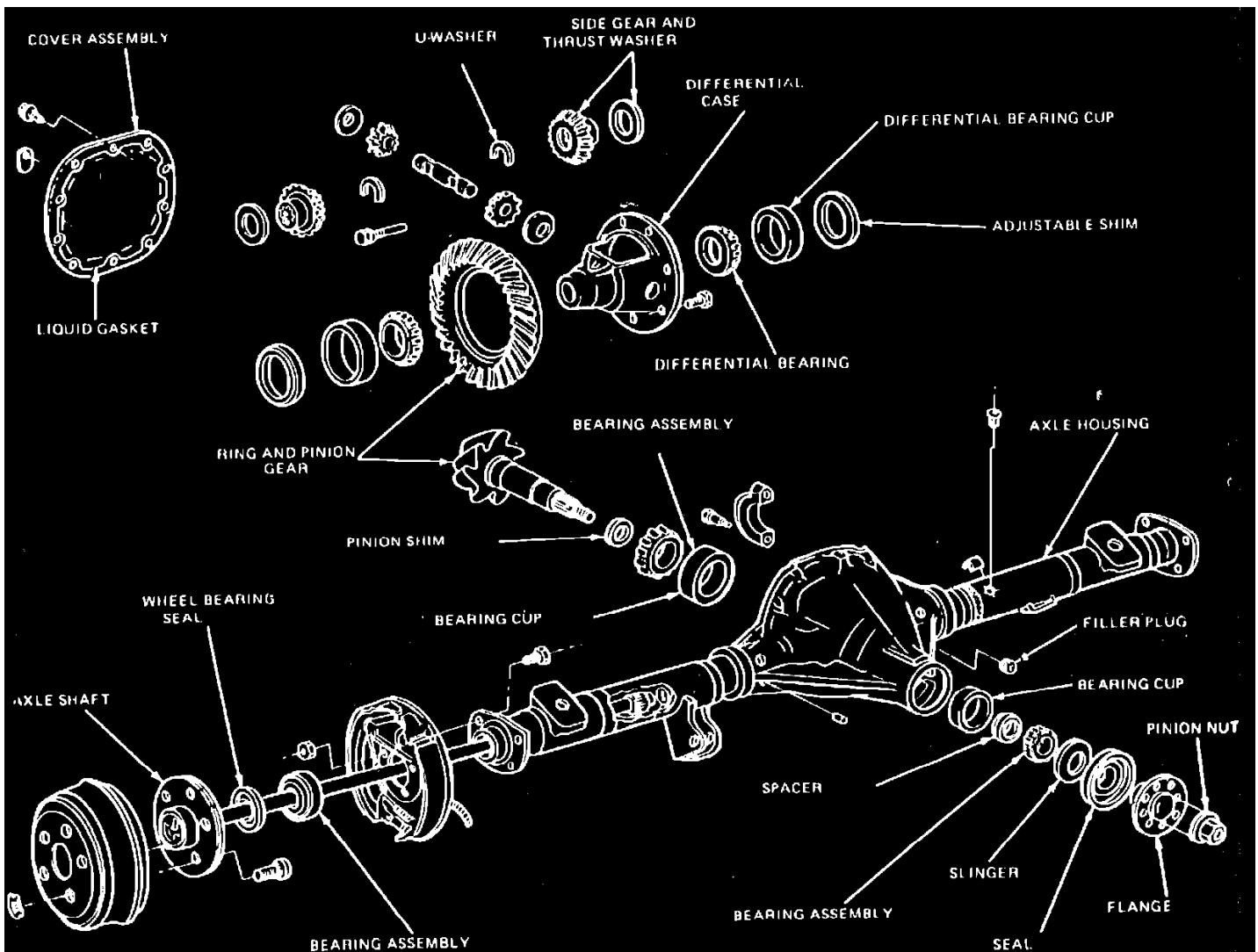
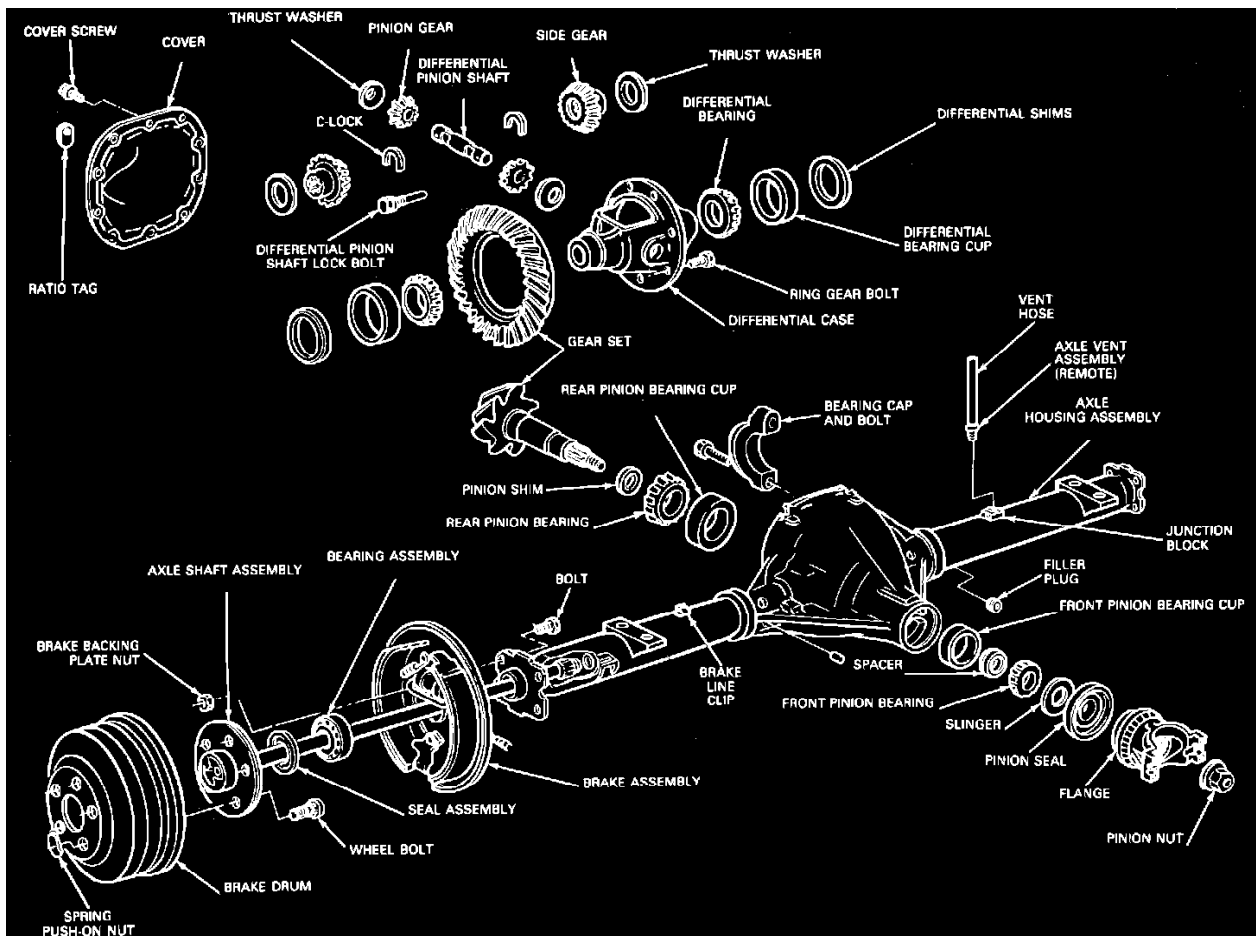


Fig. 2 Disassembled view of Ford 7 1/2 inch ring gear axle



Exploded view of 8.8 & 10.25 inch ring gear axles (except models w/anti-lock brakes). 8.8 inch ring gear axle shown, 10.25 inch ring gear axle si

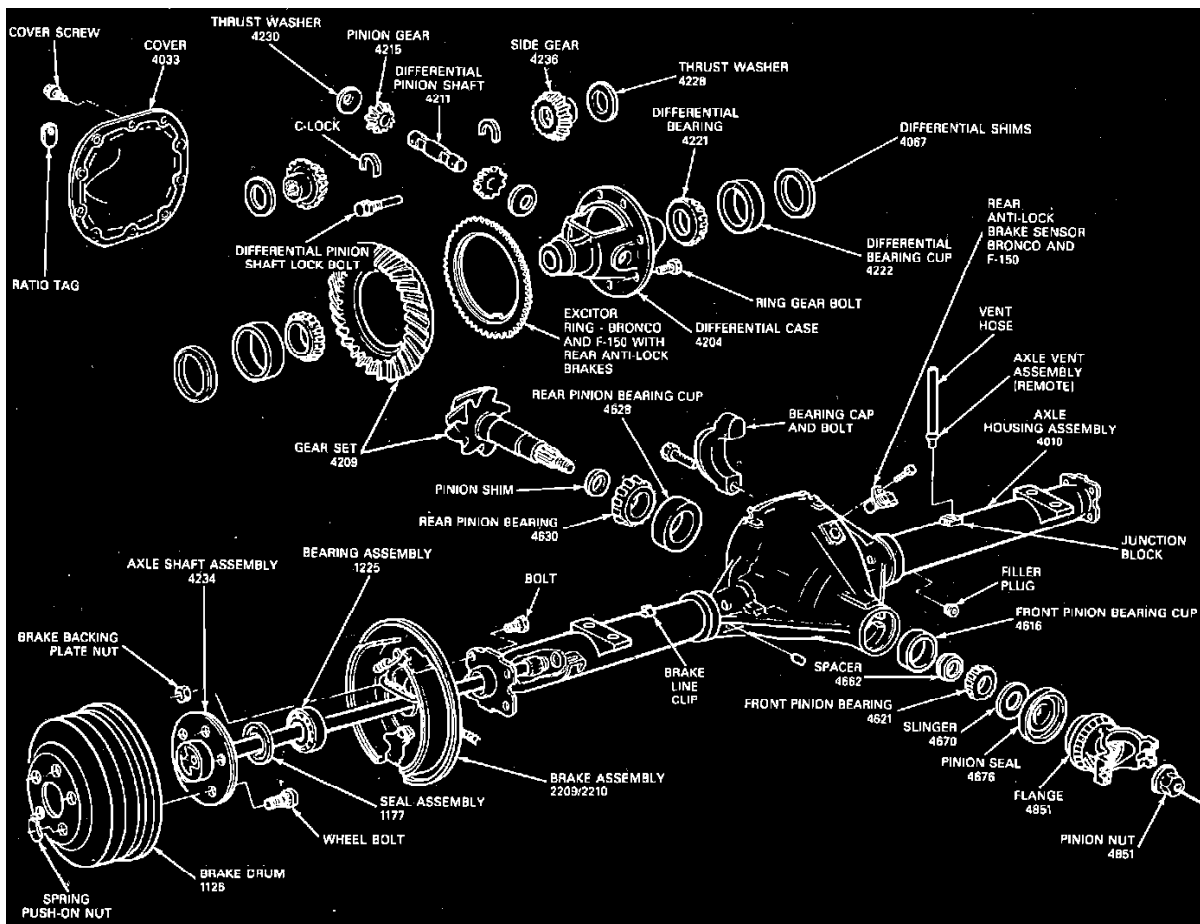


Fig. 4 Exploded view of 8.8 inch ring gear axles. Models w/anti-lock brakes

1. Remove axle cover, **Figs. 1 through 4**, then wipe lubricant from internal working parts and visually inspect parts for wear or damage.
2. Rotate gears to check for any roughness, which indicates damaged bearings or gears.
3. Check ring gear teeth for signs of scoring, abnormal wear, nicks or chips.
4. On models with 8.8 or 10.25 inch ring gear, proceed as follows:
 - a. Using dial indicator, check ring gear backlash and ring gear back face runout. Backlash should be .008---.015 inch and back face runout should be under .004 inch.
 - b. Do not use contact pattern as a guide to check for noise. Check for proper gear set assembly using pinion depth gauge tool to determine correct pinion shim required to ensure acceptable running condition.
5. On models with 6 3/4 or 7 1/2 inch ring gear, test ring gear runout as follows:
 - a. Install suitable dial indicator and zero indicator, then rotate ring gear and record reading.
 - b. If reading exceeds .003 inch, check for improper torque of ring gear bolts or dirt between ring and case.
6. If reading still exceeds .003 inch after step 5b, diagnose ring gear runout as follows:
 - a. Remove ring gear. 1987 Bronco II models with anti-lock brakes use an exciter ring located on the ring gear assembly. Removal of the exciter ring is not necessary when removing ring gear on this model.
 - b. On models with 6 3/4 inch ring gear, install left case on right and tap them together, then place differential cups on differential bearing cone and roller.
 - c. On all models, place differential assembly in carrier casting. **On models with 6 3/4 inch ring gear, two bolts and nuts must be installed to hold case halves together.**
 - d. Install .265 inch shim on left side as guide.
 - e. Install left bearing cap and tighten bolts finger tight.
 - f. Install progressively larger shims on right side until largest shim selected can be assembled with a slight drag feel. **Apply pressure toward left side to ensure that bearing cup is seated.**
 - g. Install right side bearing cap and torque differential bearing cap bolts to 70---80 ft. lbs., then rotate assembly to ensure free rotation.
 - h. Check runout of differential case flange with dial indicator. If runout is within .003 inch, install new ring and pinion gear. If runout exceeds specifications, trouble is due to either a damaged case or worn bearings.
 - i. Remove differential case from carrier and the differential bearings from case.
 - j. Install new differential bearings on case hubs and install differential assembly in carrier less ring gear.
 - k. Check case runout. If runout is within .003 inch, use new bearings for reassembly. If runout is still excessive, case is damaged and must be replaced.
7. Remove axle shafts.
8. Mark relationship of driveshaft end yoke and axle companion flange for proper assembly, then disconnect driveshaft at rear axle universal joint.
9. Install inch pound torque wrench on pinion nut and record torque required to maintain rotation of pinion through several turns.
10. Using suitable tools, hold companion flange and remove pinion nut.
11. Clean area around oil seal and place drain pan under seal.
12. Mark relationship of companion flange to pinion shaft for proper assembly, then, using suitable puller, remove companion flange.
13. Using suitable tool, remove pinion oil seal.
14. Mark one differential bearing cap to ensure proper positioning of caps during assembly. **Do not interchange left and right bearing caps.**
15. Loosen differential bearing cap bolts and bearing caps, noting direction of triangles on bearing caps for proper assembly.
16. Pry differential case, bearing cups and shims out until they are loose in bearing caps, then remove bearing caps and pry differential assembly from carrier. **When using pry bar, place a wood block between pry bar and axle housing to protect casting face from damage.**
17. Using suitable mallet, drive pinion out of front bearing cone and remove through rear of carrier casting.
18. Using suitable tools, remove pinion rear cone and roller bearing assembly, then, using micrometer, measure and record thickness of shim found under bearing cone.
19. Remove damaged pinion bearing cups from carrier by tapping alternately with brass drift on opposite sides of cups to prevent cups from cocking in casting.

Clutch Type Traction-LOK Limited Slip

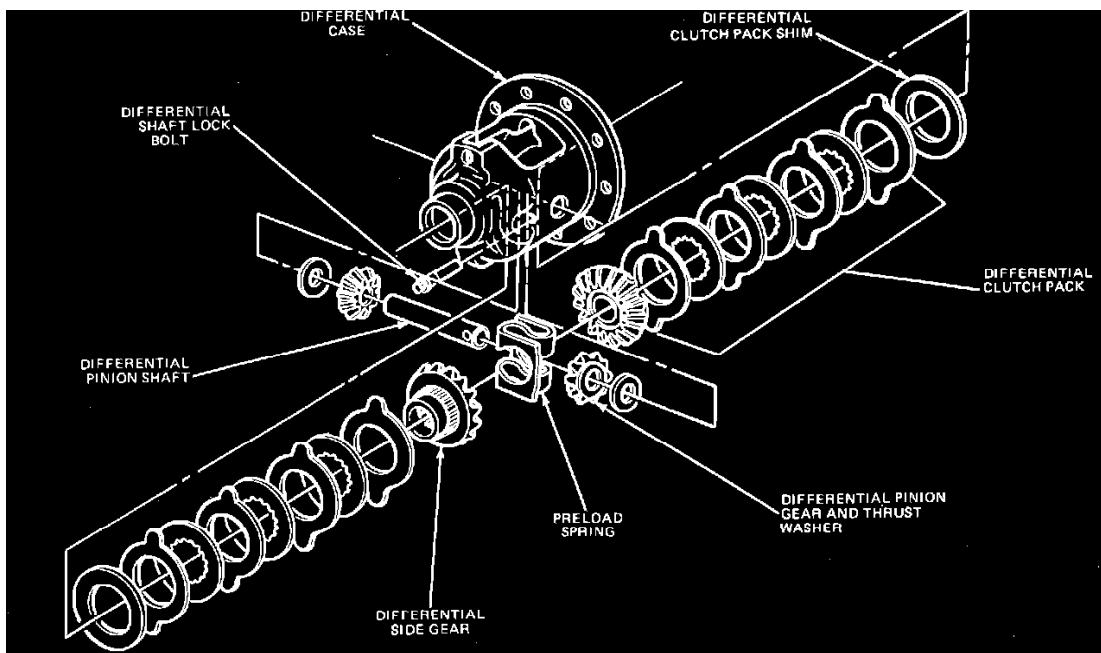


Fig. 5 Exploded view of clutch type Traction-Lok limited slip differential

Overhaul procedures for this limited slip differential, Fig. 5, are the same as for "Ford Traction-Lok Differential."

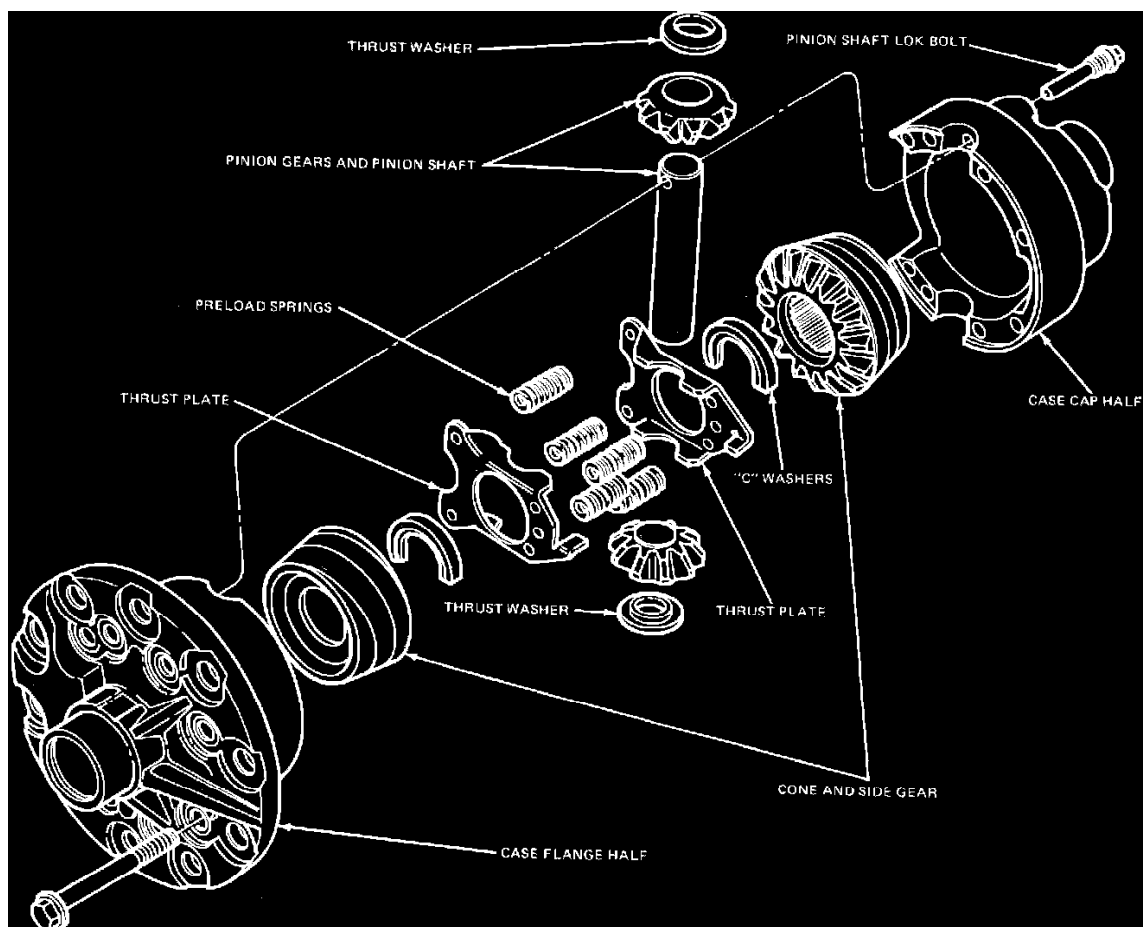


Fig. 6 Exploded view of cone type limited slip differential

CONE TYPE LIMITED SLIP DIFFERENTIAL

1. Place differential case, Fig. 6, in large vise to load case at bearing journals so that preload of springs is overcome.
2. Loosen case securing cap screws until only 3 or 4 threads are engaged, then loosen vise slightly and tap flange half of case to spring it loose.
3. Remove case assembly from vise, flange half up, then remove cap screws and lift off flange half.
4. Remove side gear and brake cone assemblies, thrust plates, preload springs, pinion shaft, pinion gears and thrust washers. **Note which cone**

comes from which half of case for proper assembly.

5. Clean and inspect as described under "Cleaning and Inspection."
6. Place cap half of differential in vise with inside of case half facing up.
7. Install proper cone in case and set it in position.
8. Assemble thrust plates, preload springs, pinion gears, thrust washers and pinion shaft in proper order, then install second cone assembly.
9. Install flange half of case over cone in position.
10. Install two remaining bolts finger tight. **All oil must be removed from bolt and its mating surface before installation or a false torque reading will be obtained, possibly resulting in bolt breakage.**
11. Place differential case in vise to load case at bearing journals so that preload of springs is overcome.
12. Install remaining retaining bolts, torquing evenly to 34---39 ft. lbs.
13. Install pinion shaft lock bolt finger tight, then ensure that rotating torque is at least 30 ft. lbs.

Dana Power-LOK

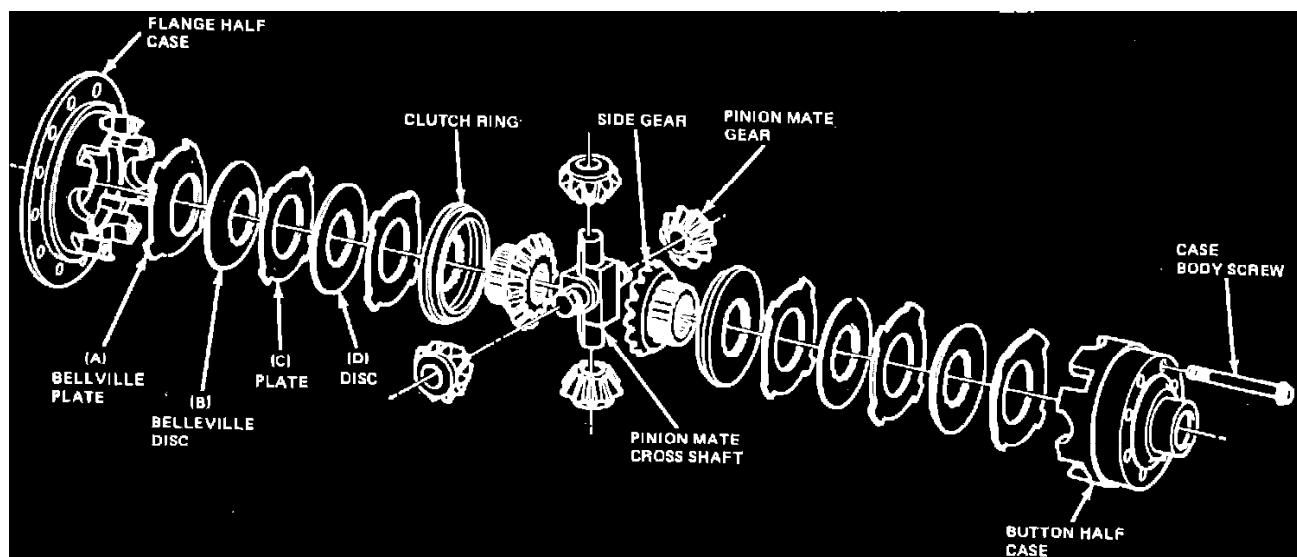


Fig. 12 Dana Power-Lok locking differential exploded view

Disassembly

1. Scribe a mark between the differential case halves to be used during assembly. Also, mark the pinion mate shafts and corresponding ramps for assembly in original locations.
2. Clamp differential assembly in a soft jaw vise.
3. Loosen but do not remove the case half retaining bolts, **Fig. 12**.
4. Place assembly on bench with the ring gear half down and remove case half retaining screws.
5. Remove the cover half of the case.
6. Remove upper mate shaft, side gear, side gear ring and clutch pack. Retain parts with cover half of case so they can be installed in original position.
7. Remove lower mate shaft, side gear, side gear ring and clutch pack from drive gear case half.

Assembly

1. Place side gear ring from ring gear half of case on a pinion flange or other suitable fixture so the case is approximately 4 inches above bench.
2. Lubricate clutch plates and assemble clutch pack on side gear ring.
3. Place ring gear side of case over clutch pack and side gear ring. Ensure that the clutch plate lugs enter the slots in the case and that the case bottoms on the clutch pack.
4. Invert the assembly. Hold assembly together while inverting.
5. Install the ring gear case half side gear in side gear ring.
6. Install axle shaft spacer in cross shaft.
7. Install the ring gear case half pinion mate shaft and pinions on the side gear ring.
8. Install the cover half pinion mate shaft and pinions.
9. Place side gear on pinions, then the side gear ring on side gear.
10. Assemble clutch pack on side gear ring, aligning clutch pack lugs.
11. Install cover half of case over assembly, aligning the marks made during disassembly.
12. Install the case half retaining bolts, turning the bolts to engage a few threads only.
13. Insert axle shaft into assembly and align the splines of the side gears and side gear rings. With the axle shafts in position, torque case half retaining bolts to 65---70 ft. lbs.
14. Remove axle shafts.
15. If the differential has been assembled properly, each pinion mate cross shaft should be tight on its ramp. However, if clearance is present, it

should not exceed .010 inch and be equal at all four cross shaft ends.

Dana Trac-LOK

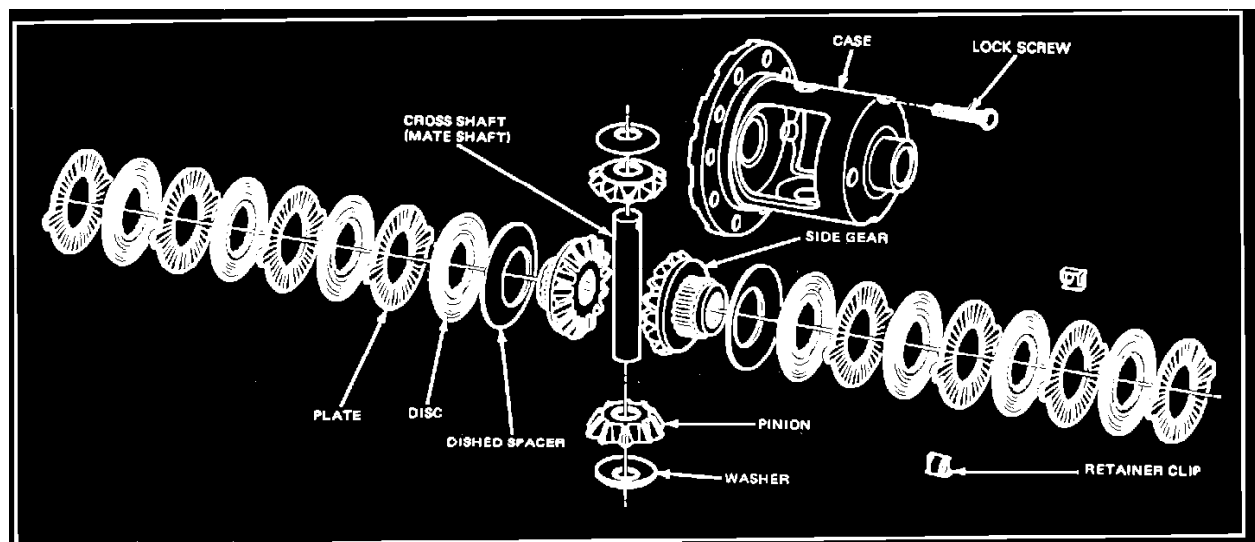


Fig. 13 Dana Trac-Lok locking differential exploded view

Disassembly

1. Place one axle shaft in vise, splined end up, so that splines do not extend more than three inches above jaws of vise.
2. Mount differential case on axle shaft.
3. Using suitable drift, remove roll pin retaining cross pin, then drive out cross pin with hammer and suitable drift, **Fig. 13**.
4. Position step plate into bottom side gear and lubricate centering hole of step plate.
5. Position gear rotating tool into top side gear.
6. Lubricate threads of forcing screw and thread screw into gear rotating tool, guiding forcing screw into step plate.
7. Tighten forcing screw securely, then, using a piece of .030 inch shim or gauge stock, push out differential spherical washers.
8. Loosen forcing screw momentarily, then tighten forcing screw until a very slight movement of the differential pinion gears is seen.
9. Slide pawl of gear rotating tool between two side gear teeth and pull handle so top side gear rotates, rotating differential pinion gears. Remove differential pinion gears through large openings in case. **When attempting to rotate side gear, it may be necessary to tighten or loosen forcing screw to permit gear movement.**
10. Manually hold top side gear and clutch pack in case and remove forcing screw, then the gear rotating tool.
11. Remove top side gear and clutch pack, keeping plates and discs in exact order.
12. Turn case so that ring gear side faces up, easing step plate, side gear, and clutch pack out of case.
13. Remove retainer clips from clutch packs, keeping discs and plates in exact order.

Assembly

1. Install side gears and thrust washers in correct order.
2. Lubricate thrust face of side gear and plates and discs with suitable lubricant and assemble plates and discs to side gear splines.
3. Assemble retainer clips to ears of plates, ensuring that clips are completely assembled or seated onto ears of plates.
4. Assemble clutch pack and side gear into case, ensuring that clutch pack stays assembled to side gear splines and that retainer clips are completely seated into pockets of case.
5. Manually retain clutch pack in case, position case on bench, and assemble step plate into side gear, applying small amount of lubricant into centering hole of step plate.
6. Assemble remaining clutch pack and side gear, ensuring that clutch pack stays assembled to side gear splines and that retainer clips are completely seated into pockets of case.
7. Position gear rotating tool into top side gear, manually hold side gear and rotating tool in position, insert forcing screw down through top of case, and thread screw into rotating tool until screw contacts step plate.
8. Position case onto axle shaft by aligning splines of side gear with splines of shaft.
9. Position differential pinion gears opposite one another through openings in case, ensuring that holes of gears are aligned, manually retain gears in position, and tighten forcing screw so that side gears move away from differential pinion gears.
10. Hold differential pinion gears in place and insert pawl of rotating tool between two side gear teeth, then pull on handle so that top side gear rotates and allows differential pinion gears to rotate and enter into case. **It may be necessary to slightly tighten or loosen forcing screw to permit gear movement.**
11. Put on tool until handle hits case, then remove pawl from between gear teeth and position handle and pawl. Repeat this step until holes of differential pinion gears are perfectly aligned with holes of case.
12. Lubricate both sides of pinion spherical washers with suitable lubricant.

13. Apply torque to forcing screw to obtain installation clearance for spherical washers.
14. Install spherical washers, ensuring that holes of washers and gears are perfectly aligned with holes of case, then remove forcing screw, rotating tool, and step plate.
15. Install pinion shaft in differential case, then the cross shaft locking pin.

Ford Traction-LOK Differential

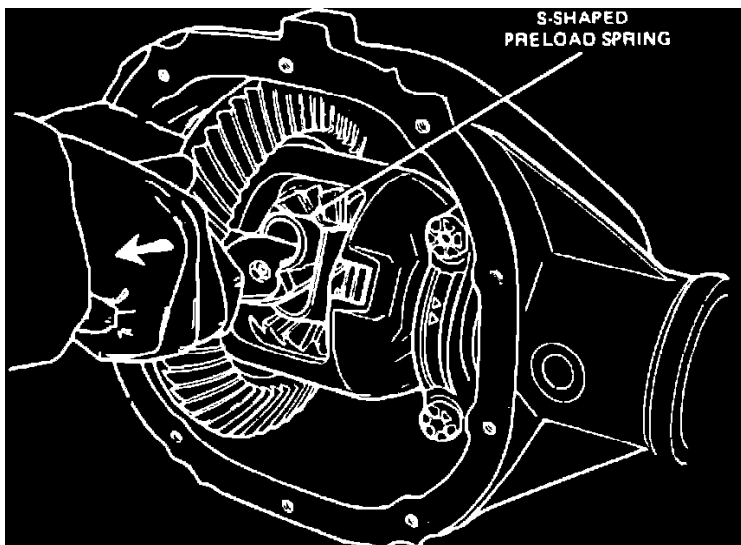


Fig. 7 Removing S-shaped preload spring

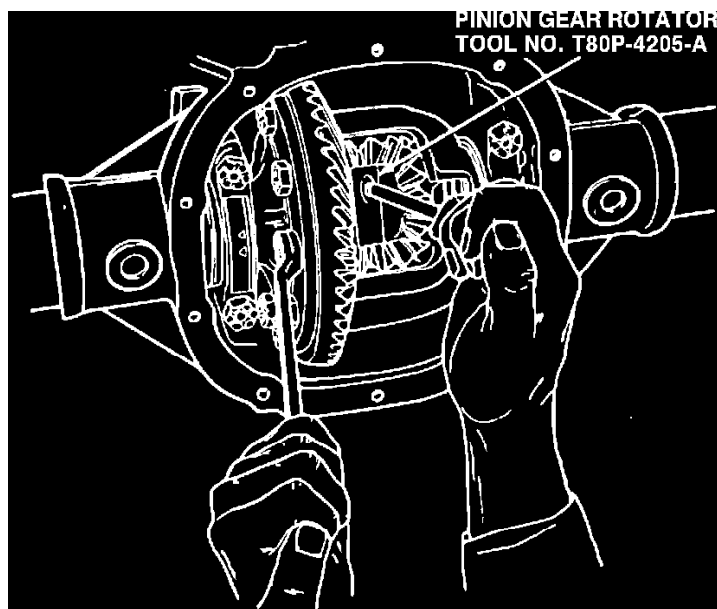


Fig. 8 Pinion gear removal & installation

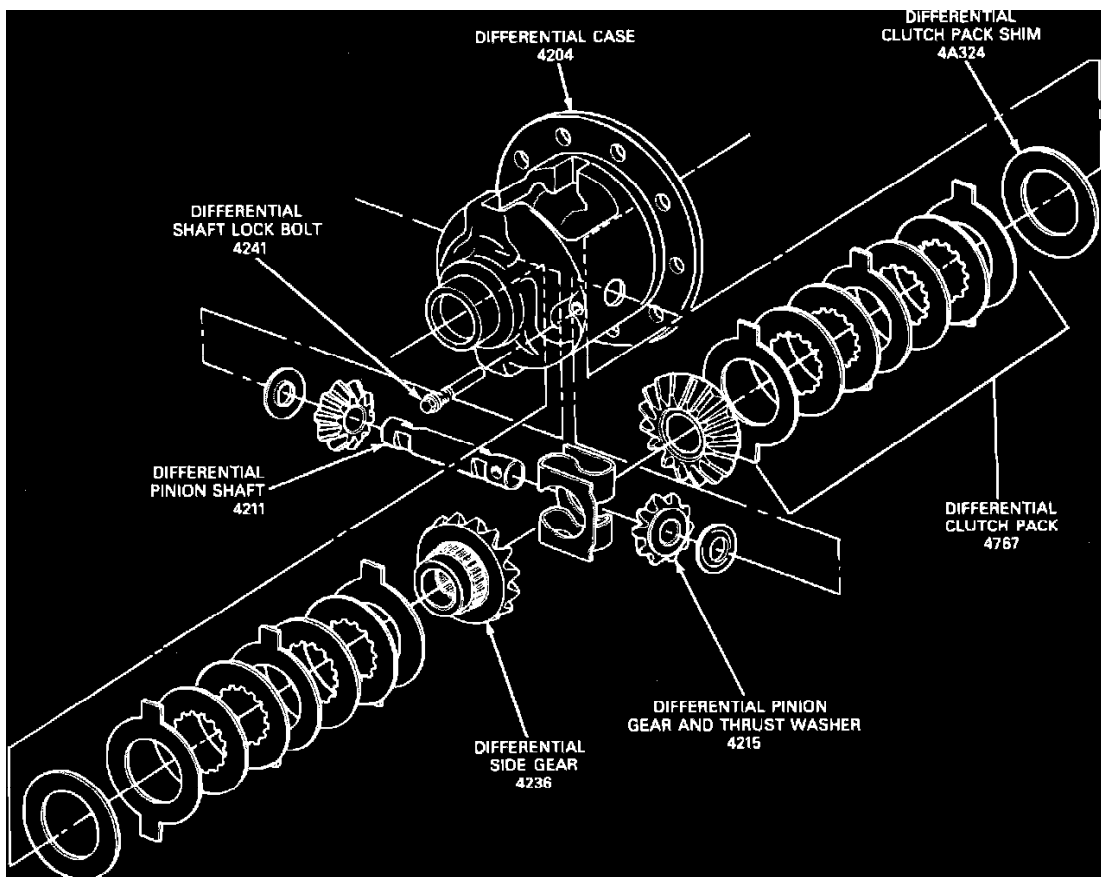


Fig. 9 Ford Traction-Lok locking differential exploded view

Disassembly

1. Remove pinion shaft lock screw and pinion shaft.
2. Push axle shafts inward and remove C-clips from axle shafts. Remove axle shafts.
3. Remove preloaded "S" shaped spring, **Fig. 7**. **Use caution when removing "S" shaped spring since it is under tension.**
4. Rotate pinion gears and thrust washers until they can be removed through access hole using 12 inch socket extension inserted into pinion gear rotator T80P-4205-A or equivalent, **Fig. 8**.
5. Remove left and right side gears, clutch packs and shims, **Fig. 9**. Note order of removal for reference during assembly.

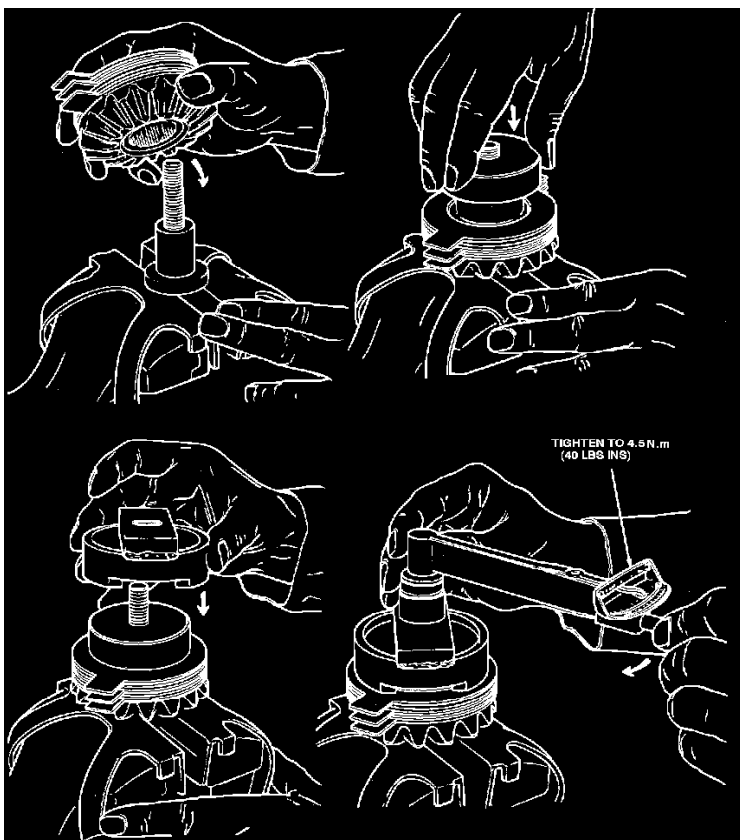


Fig. 7 Installing Tool T80P-4946- Or Equivalent To Measure Shim Thickness

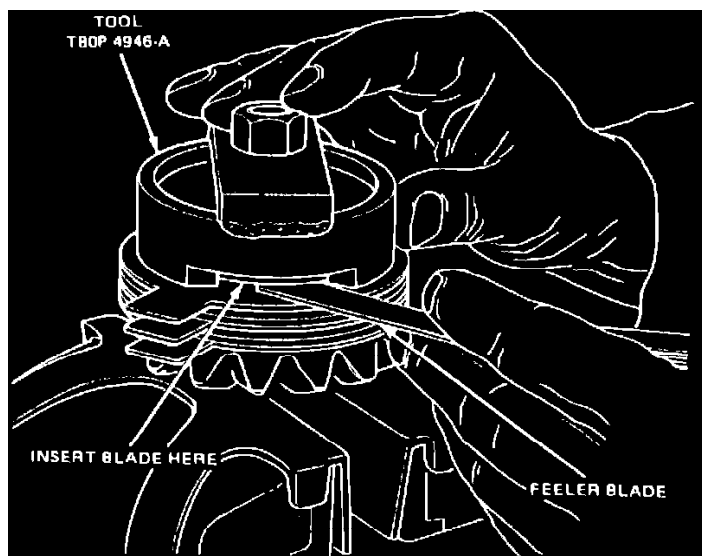


Fig. 11 Measuring shim thickness

Inspection

1. Visually inspect clutch packs, side gears, pinion gears and pinion shaft for damage or wear and replace as necessary.
2. Place each clutch pack without shims into tool T80P-4946-A or equivalent, **Fig. 10**. Torque nut to 40 inch lbs. Using feeler gauge, determine thickness of new shims by inserting thickest blade possible between clutch pack and tool, **Fig. 11**.

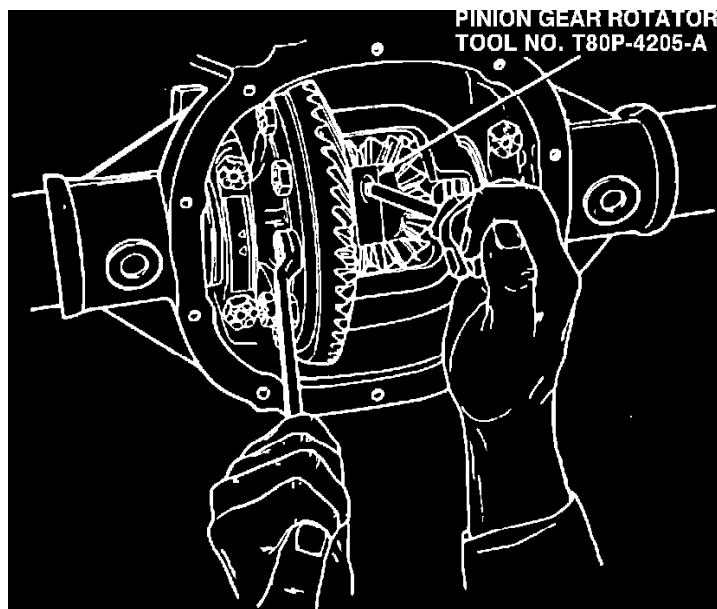


Fig. 8 Pinion gear removal & installation

Assembly

1. Apply suitable lubricant to clutch plates, then install left side gear, clutch pack and new shim into differential case. Repeat procedure for right hand side.
2. Install pinion gears and thrust washers 180° apart and in contact with side gears.
3. Align gears with pinion shaft bore, **Fig. 8**, using 12 inch socket extension inserted in pinion shaft rotator.
4. Install "S" shaped preload spring into differential using soft faced hammer.
5. Install axle shafts and secure with C-clip clip.
6. Install pinion shaft. Apply Loctite or equivalent onto pinion shaft lock bolt and torque to specifications.

Standard Differential, Exc. 6-3/4 Inch Ring Gear

1. Remove pinion gears and thrust washers, rotating as necessary to align with windows.
2. Remove side gears and thrust washers.
3. Remove and discard ring gear attaching bolts, then press ring gear off of case. 1987 models equipped with anti-lock brakes, incorporate an exciter ring located on the ring gear. Removal of this ring is not necessary when removing ring gear assembly.
4. Using suitable puller, remove differential bearings from case.
5. Using suitable press, install differential bearings on case.
6. Install ring gear on case, torquing bolts as follows:
 - a. On 7 1/2 and 8.8 inch ring gear, coat bolts with suitable locking compound and torque to 70---85 ft. lbs.
 - b. On 10.25 inch ring gear, coat bolts with suitable locking compound and torque to 100---120 ft. lbs.

6-3/4 Inch Ring Gear Standard Differential

1. Mark differential case, cover and ring gear to facilitate assembly.
2. Using suitable puller, remove differential side bearings.
3. Remove and discard ring gear attaching bolts, then press ring gear from case.
4. Remove left side of differential case.
5. Using suitable drift, drive out differential pinion shaft lock pin.
6. Using brass drift, drive out pinion shaft. Clean and inspect all parts as outlined under "Cleaning & Inspection," repairing or replacing parts as necessary.
7. Install differential side gears and thrust washers in their bores.
8. Install pinion shaft, aligning pinion gears and thrust washers.
9. Install left case on right and tap them together.
10. Install pinion shaft lock pin.
11. Using suitable press, install differential side bearings.

Final Assembly and Adjustment

1. If removed, install new bearing cups using suitable tool. Ensure that cups are properly seated in their bores. If a .0015 inch feeler gauge can be inserted between a cup and the bottom of its bore at any point around cup, the cup is not properly seated. Whenever cups are replaced, the cone

- and roller assembly should also be replaced.
2. Using proper rear axle pinion depth gauge tool, assemble appropriate aligning adapter, gauge disc and gauge block to screw.
 3. Place rear pinion bearing over aligning disc and insert it into rear pinion bearing cup and assemble tool handle to screw. Roll assembly back and forth a few times to seat bearings while tightening tool handle by hand. Torque tool handle to 20 ft. lbs. **The gauge block must be offset 45° to obtain accurate reading.**
 4. Center gauge tube into differential bearing bore, then install bearing caps, torquing bolts to 70---85 ft. lbs. Select thickest shim that will enter between gauge tube and gauge block. Insert shim directly along gauge block to insure a correct reading. The shim fit should be a slight drag-type feel. **Shims used for gauging must be flat to obtain correct feel.**
 5. Place selected shim(s) on pinion and press pinion bearing cone and roller assembly until it is firmly seated on shaft. **The same rear pinion bearing used in this procedure must be used in final assembly of axle. Ensure that press load is not applied to bearing cage.**
 6. Check splines on pinion shaft to be sure that they are free of burrs. If burrs are evident, remove them with a fine crocus cloth, working in a rotational motion, then wipe pinion clean.
 7. Place collapsible spacer on pinion shaft against rear bearing.
 8. Working from rear of axle housing, install drive pinion assembly into housing pinion shaft bore.
 9. Install front cone and roller and the oil slinger on pinion shaft.
 10. Clean oil seal seat surface, then, using suitable tool, install seal in carrier and pack lips of seal with suitable lubricant. **Installation without proper tool may result in early seal failure. If seal becomes cocked during installation, remove it and install new one.**
 11. Apply small amount of suitable lubricant to companion shaft splines, align mark on companion flange with mark on pinion shaft, install flange and install new nut on pinion shaft. **If a new companion flange is being installed, disregard scribe mark on pinion shaft. The companion flange must never be hammered on or installed with power tools.**
 12. Hold companion flange with suitable tool and tighten pinion nut to minimum torque of 160 ft. lbs., rotating pinion occasionally to insure proper bearing seating. Take frequent pinion bearing torque preload readings until original recorded preload reading is obtained.
 13. If original recorded preload is lower than 8---13 inch lbs. for original bearings, or less than 16---29 inch lbs. for new bearings, torque pinion nut to 140 ft. lbs. on 6-3/4 inch ring gear, 170 ft. lbs. on 7-1/2 inch ring gear, or 217 ft. lbs. on 8.8 and 10.25 inch ring gears. If preload is higher than specification, torque to original reading as recorded. **Under no circumstances should pinion nut be backed off to reduce preload. If reduced preload is required, a new collapsible pinion spacer and pinion nut must be installed.**
 14. Apply suitable lubricant to new wheel bearing and install bearing into housing using suitable tool.
 15. Pack lips of seal with suitable lubricant and install axle shaft seal using suitable tool. **Installation of bearing or seal assembly without proper tool may result in early bearing or seal failure. If seal becomes cocked in bore during installation, remove it and install new one.**
 16. Place differential case subassembly in carrier.
 17. Install a .265 inch shim on left side.
 18. Install left bearing cap and tighten bolts finger tight.
 19. Install progressively larger shims on right side until largest shim selected can be assembled with a slight drag feel. Apply pressure towards left side to ensure that bearing cup is seated.
 20. Install right side bearing cap and torque cap bolts to 70---85 ft. lbs.
 21. Rotate assembly to insure free rotation.
 22. Check ring gear and pinion backlash. If backlash is .008---.015 inch, proceed to step 29. If backlash is zero, proceed to step 23. If backlash is not zero and not .008---.015 inch, proceed to step 25.
 23. If backlash is zero, add .020 inch to right side and subtract .020 inch from left side.
 24. Recheck backlash. If backlash is not within specification, proceed to step 25. If backlash is within specification, proceed to step 26.
 25. If backlash is not within specification, correct backlash by increasing thickness of one shim and decreasing thickness of other shim by same amount.
 26. Install shim and bearing caps, torquing cap bolts to 70---85 ft. lbs.
 27. Rotate assembly several times to ensure proper seating of differential bearings.
 28. Recheck backlash. If backlash is within specification, proceed to step 29. If backlash is not within specification, proceed to step 25.
 29. Increase both left and right shim sizes by .006 inch and install for correct differential bearing preload. Ensure that shims are fully seated and assembly turns freely.
 30. Using white marking compound, obtain tooth mesh contact pattern. Pattern legibility can be improved by connecting driveshaft and rotating both tires in drive and coast direction. If gross pattern error is detected, recheck pinion shim selection.
 31. Install bearing caps and torque cap bolts to 70---85 ft. lbs. Recheck backlash. If backlash is not within specification, repeat step 25.
 32. Install axle shafts, then install differential cover and fill differential with suitable lubricant.

Ford Removable Carrier

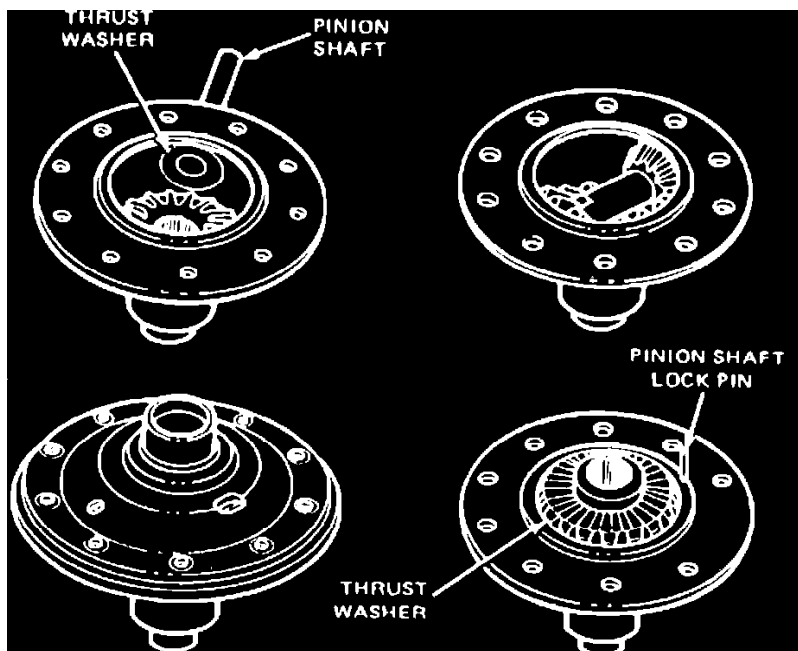


Fig. 10 Assembling differential case

Standard Differential

1. Place side gear thrust washer and side gear in differential case bore, **Fig. 10. Liberally lubricate all differential components with suitable lubricant during assembly.**
2. Using soft faced hammer, drive differential pinion shaft into case only far enough to retain pinion thrust washer and pinion gear.
3. Place second differential pinion and thrust washer in position and drive pinion shaft into place, carefully aligning pinion shaft lock pin holes.
4. Place second side gear and thrust washer in position and install pinion shaft lock pin and the cover on differential case then insert axle shaft spline in side gear spline to check for free rotation of differential gears.
5. Using suitable solvent, clean tapped holes in ring gear.
6. Insert two 7/16 N. F. bolts two inches long through differential case flange and thread them three or four turns into ring gear as a guide for aligning ring gear bolts, then press or tap ring gear into position. **If new bolts show a green or yellow coating of at least 1/2 inch on threaded area, use as is. If bolts are not coated, apply small amount of suitable sealant to threads. Torque bolts to 70---80 ft. lbs. Never install used bolts.**
7. If differential bearings were removed, press them on using tool T57L-4221-A2 or equivalent.
8. Wipe thin coating of suitable lubricant on carrier differential bearing bores, then place cups on bearings and set differential case assembly in carrier.
9. Assemble differential case and ring gear assembly in carrier so that marked tooth on drive pinion indexes between marked teeth on ring gear.
10. Slide assembly along bores until a slight amount of backlash is felt between gear teeth.
11. Set adjusting nuts in bores so that they just contact bearing cups, engaging nuts approximately the same number of threads on both sides.
12. Carefully position differential bearing caps on carrier, matching alignment marks.
13. Ensure that adjuster nuts are properly threaded in cap and carrier and that they turn freely, then install bearing caps and alternately torque them to 70---80 ft. lbs.
14. If adjusting nuts do not turn freely as cap bolts are tightened, remove differential bearing caps and inspect for damaged threads or incorrectly positioned caps.
15. Adjust backlash and differential bearing preload.

Traction-Lok Differential

When new clutch plates are used, soak plates in suitable hypoid lubricant for approximately 30 minutes before installation. Lubricate all parts with suitable hypoid lubricant during assembly.

1. Mount differential case in suitable vise and place side gear thrust washer and side gear in counterbore of case.
2. Install differential pinion thrust washers and place pinion gears on side gear, aligning holes in washers and gears with holes in case.
3. Install center block so that shaft holes are aligned with holes in pinion gears and case.
4. Using brass drift, drive in long differential pinion shaft from outside of case, aligning lock pin holes in shaft with lock pin holes in case.
5. Position center block so that long shaft is driven through rough side and short shaft is driven through machined side.
6. Using suitable drift, install shaft lock pins, ensuring that differential pinion and side gears move freely.
7. Place four preload pins in holes provided in center block.
8. Position preload plate over four springs, ensuring that springs are properly seated. The preload plate straddles the center block over its narrower machined width.
9. Mount differential cover in suitable vise.
10. Insert shims .050 inch total thickness, in cover cavity.
11. Install composite plate on back side of clutch hub with friction material against hub, then install, in order, a friction plate, steel plate, friction

plate, steel plate, friction plate and steel plate.

12. Place clutch hub with clutch plates into clutch gear cavities in differential cover, ensuring that splines on last friction plate are engaged on hub.
13. Obtain locally a 5/8 inch by 2-1/2 inch or 9/16 inch by 2-1/2 inch bolt, nut, and two 1-1/2 inch O.D. flat washers approximately 1/8 inch in thickness. Install flat washer on bolt and place bolt through clutch hub. Hold bolt in place and turn cover over. Place flat washer and bolt and install nut, torquing nut to 10---15 ft. lbs. while ensuring that washers remain centered.

Feeler Gauge Reading (Inches) (1)	Remove Shim(s) From Normal	Total Req'd. Shim Pack Thickness (Inches) (2)	Feeler Gauge Reading (Inches) (1)	Remove Shim(s) From Nominal	Total Req'd. Shim Pack Thickness (Inches) (2)
0.001-0.002	None	0.050	0.028-0.032	0.030	0.020
0.003-0.007	0.005	0.045	0.033-0.037	0.035	0.015
0.008-0.012	0.010	0.040	0.038-0.042	0.040	0.010
0.013-0.017	0.015	0.035	0.043-0.047	0.045	0.005
0.018-0.022	0.020	0.030	0.048-0.050	0.050	0.000
0.023-0.027	0.025	0.025			

(1) With clutch hub, shims and clutch plates compressed 10-15 ft. lb.

(2) Service shims are available in 0.010 inch and 0.005 inch thicknesses.



Fig. 11 Shim pack thickness chart

14. Place shim template tool in clutch hub, **Fig. 11**. Some clearance should be observed between shim tool and cover to case mating surface. Determine exact amount of clearance using feeler gauge. The shim pack thickness chart, **Fig. 12**, will indicate correct amount of shims to subtract from .050 inch shims originally installed.
15. Remove bolt, nut and flat washers. Remove clutch hub and clutch plates as necessary to alter shim thickness.
16. Install selected shims in cover cavity, then reinstall components as described in steps 11 and 12.
17. Install four steel clutch ear guides and side gears.
18. Place both assemblies in press and press two halves together, then install two Allen head or Phillips head screws and tighten evenly until tight.
19. Install ring gear and ring gear bolts and washers. Torque bolts evenly and alternately across diameter of ring gear to 70---80 ft. lbs.
20. Using currently released locker tools, check torque required to rotate one side gear while other is held stationary. The initial breakaway torque may exceed 250 ft. lbs. The rotating torque required to keep the side gear turning with new clutch plates is 100---250 ft. lbs. With reused clutch plates, the minimum torque required is 40 ft. lbs. (Torque may fluctuate 10---40 ft. lbs.)