Drive Axles

SPICER (DANA) FULL-FLOATING AXLES

Chrysler Corp., General Motors, Jeep; Front & Rear Axles & Ford; Rear Axle

NOTE: FRONT AXLE USAGE - With the exception of some C20/30 and K20/30 General Motors models and Ford (IFS) Spicer (Dana) front axles, all front drive axles are Spicer (Dana) Full-Floating front drive axles. All models may use other rear drive axles. See appropriate articles in this section.

NOTE: For removal and installation instructions on Locking Hubs and 4-Wheel drive Steering Knuckles. See appropriate article in this section.

DESCRIPTION

Spicer (Dana) axles come in different models for application in vehicle with a wide range of GVW ratings. Service and overhaul procedures for all full-floating axle models are the same, except for drive pinion depth and some torque specifications.

The axle assembly has an over-hung mounted drive pinion. The drive pinion depth, pinion bearing preload, and differential side bearing preload are all set by shims. Other than unique components required for front wheel drive units, front and rear axles are identical.

AXLE RATIO & IDENTIFICATION

Spicer (Dana) axles have a removable rear cover plate. The cover plate has a unique shape, that allows positive identification of Spicer (Dana) axles on any model vehicle. The axle model is often cast into the differential housing, or it can be determined by measuring the diameter of the ring gear. *See Model Identification Table.* To determine the drive axle ratio, *refer to Drive Axle Ratio Identification in this section.*

Fig. 1: Spicer (Dana) Housing Cover Gasket.

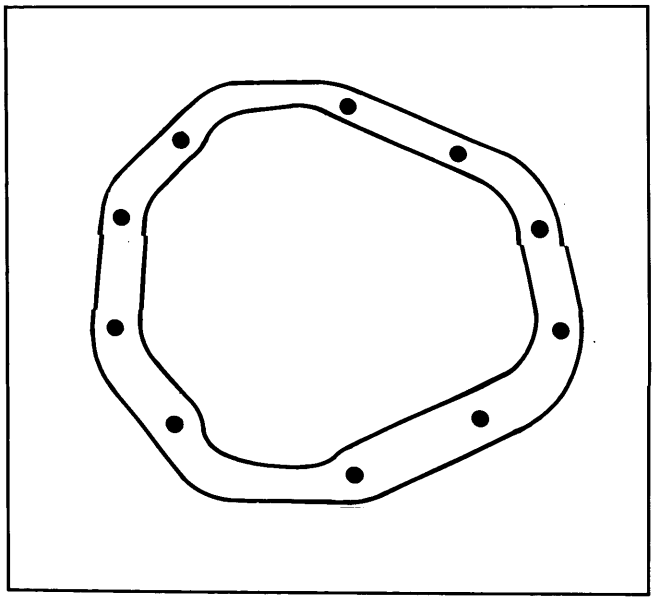

Illustration for identification purposes.

MODEL IDENTIFICATION BY RING GEAR SIZE

Model	Ring Gear Diameter
30	7.125"
44	8.50"
60	9.75"
61	9.75"
70	10.50"

REMOVAL & INSTALLATION

FRONT AXLE SHAFTS & BEARINGS

Removal Chrysler Corp., Model 44 Axle

1) Raise vehicle and support with safety stands. Remove wheel and brake caliper assemblies. If equipped with locking hubs, *see removal and installation instructions on Locking Hubs and 4-Wheel Drive Steering Knuckles in appropriate articles in this section.*

2) Remove dust cap and snap ring. Remove drive gear and pressure spring. Remove wheel bearing, lock nut, lock ring and bearing adjustment nut.

3) Remove hub and assembly. Spring retainer and outer wheel bearing will slide out when hub is removed. Remove hub grease seal and inner wheel bearing cone. Remove inner and outer wheel bearing cups.

4) Remove 6 torque prevailing nuts from brake disc shield. Remove retainer from steering knuckle. If necessary remove brake caliper adapter from steering knuckle. Position a pry bar behind inner axle shaft yoke.

5) Push bearing out of knuckle. Remove "O" ring from steering knuckle (if equipped). Carefully slide out axle shaft assembly. Remove axle seal and stone shield from shaft.

NOTE: Torque prevailing nuts should be discarded and replaced with new ones.

Installation

1) Apply RTV sealer to seal surface of axle shaft housing. Install lip seal on axle shaft stone shield. With lip toward axle spline.

2) Carefully insert axle shaft into housing so as not to damage differential seal at side gears. Install spindle and brake splash shield. Install 6 new nuts and tighten to specifications.

3) Install rotor, outer bearing nut, washer and lock nut onto spindle. Install brake adapter. Install inboard brake shoe on adapter. Slowly slide caliper over disc and into adapter.

4) Install anti-rattle springs and retaining clips and torque to specifications. Install wheel and hub dust cover. Test operation.

Removal Chrysler Corp. Model 60 Axle

1) Block brake pedal up. Raise vehicle and place on safety stand. Remove wheel and tire. If equipped with locking hubs, *see removal and installation instructions on Locking Hubs and 4-Wheel Drive Steering Knuckles in appropriate articles in this section.*

2) Remove brake caliper. Do not let caliper hang from brake line. Remove dust cap. Remove snap ring.

3) Remove flange nuts and lock washers. Remove drive flange and discard gasket. Straighten tang

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on lock ring. Remove outer lock nut, lock ring, inner lock nut and outer bearing.

4) Carefully slide hub and rotor off spline. Remove oil seal and inner bearing from hub. Remove bearing cups with a brass drift punch. Remove inner brake pad from adapter.

5) Remove rotor splash shield, brake adapter and spindle. Remove spindle from steering knuckle. Slide out inner and outer axle shaft with bronze spacer, seal and oil slinger.

Installation

1) Slide axle shaft into position. Place bronze spacer on axle shaft with chamfer side facing toward "U" joint. Install spindle, brake adapter and brake splash shield. Tighten nut to 50-70 ft.lbs. (68-95 N.m)

2) Drive in bearing cups using installer. Lubricate bearings. Install inner bearing in grease coated hub. Install new seal. Care must be taken not to damage seals.

3) Install hub and rotor assembly on spindle. Install outer wheel bearing and inner lock nut, tightening to 50 ft. lbs. (68 N.m). Back off, then retighten to 35 ft. lbs. (48 N.m).

4) Install outer lock nut and tighten to 65 ft. lb. (88 N.m). Install new gasket on hub. Install drive flange lock washers and nuts. Install snap ring and cap in hub. Install brake caliper, wheel and tire. Lower vehicle.

Removal General Motors

1) Raise vehicle and support on safety stands. Remove wheel and tire. Remove brake caliper. If equipped with locking hubs, *see removal and installation instructions on Locking Hubs and 4-Wheel Drive Steering Knuckles in appropriate articles in this section.*

2) Remove hub lock mechanism. Remove snap ring. Pry out driving hub and spring. Remove wheel bearing lock nut, lock ring and adjusting nut. Outer wheel bearing and retainer will come off with hub.

3) Remove inner bearing, cone and seal from hub using a brass drift punch. Remove inner and outer bearing cups (if necessary) using a brass punch. Remove spindle. Carefully pull axle shaft assembly through hole in steering knuckle.

Installation

1) Install axle shaft assembly in housing. Care must be taken not to damage seal. Install thrust washer with chamfered end toward slinger on axle. Install spindle using new nuts. Tighten bolts to 65 ft. lbs. (88 N.m).

2) Install inner and outer bearing cones in hub using drivers. Lubricate cones and bearings with wheel bearing lubricant. Install inner bearing in cone and install new seal. Install outer bearing and retainer in hub.

3) Position hub and rotor assembly on spindle. Install inner adjusting nut, tightening to 50 ft. lbs. (68 N.m), back off, then retighten to 35 ft. lbs. (47 N.m). Back off the inner adjusting nut again ⅜ turn maximum.

4)Assemble drag sleeve retainer washer over axle shaft against bearing adjusting nut. The tang on the inside diameter of this washer is assembled in the keyway of the spindle.

5) The pin on the inner nut must pass through 1 of the holes in the retainer washer. Assemble and tighten outer lock nut to 160-205 ft. lbs (218-279 N.m). Complete reassembly by reversing removal procedure.

Removal Jeep "CJ" & Scrambler

1) Raise vehicle and position on safety stands. Remove wheel and tire. If equipped with locking hubs, *see removal and installation instructions on Locking Hubs and 4-Wheel Drive Steering Knuckles in appropriate articles in this section.*

2) Remove disc brake caliper. Remove bolts attaching front hub to axle and remove hub body. Remove retaining ring from axle shaft. Straighten lip of lock washer. Remove outer lock nut, lock washer, inner lock nut, and tabbed washer.

3) Remove lock nut. Remove outer bearing and remove disc brake rotor. Remove axle spindle. Remove axle shaft and universal joint assembly.

Installation

1) Make sure all components are clean. Make sure drive flange bolt and bolt hole threads are clean. Install inner bearing and seal in hub.

2) Install axle shaft assembly taking care not to damage seal in axle housing. Install spindle and spindle bearing. Install disc brake caliper and splash shield.

3) Lubricate and install outer bearing in disc brake rotor. Install disc brake rotor on spindle. Install washer and adjusting nut and tighten to 50 ft. lbs. (68 N.m). Back off ⅙ turn. Install lock washer and outer lock nut to 50 ft. lbs. (68 N.m).

4) Bend lockwasher lip over lock nut. Install drive flange and gasket. Coat drive flange bolts with Adhesive-Sealant (Loctite 242 or equivalent). Install drive flange bolts.

5) Install drive flange snap ring in groove at outer end of axle shaft. Install disc brake caliper. Install hub grease cover. Install wheel assembly and lower vehicle.

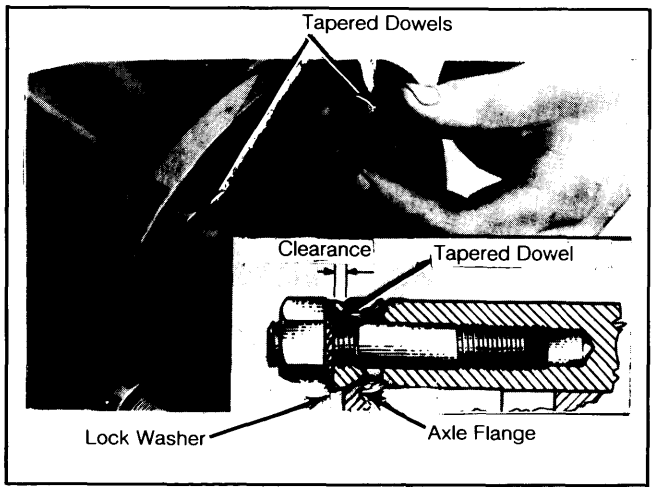
REAR AXLE SHAFTS & BEARINGS

Removal

1) Remove flange nuts from hub studs. Using heavy hammer, rap sharply on center of axle flange to loosen tapered dowels. *See Fig. 2.* Remove dowels. Rap center of flange again to cause flange and axle assembly to spring away from hub.

2) Remove axle without using prying devices which might damage axle flange and hub mating surfaces. To service bearings, remove locking devices and bearing adjusting nut. Pull wheel straight off axle housing using care to avoid dropping bearing cones.

Fig. 2: Detailed View of Tapered Dowels



With flange nuts removed, rap center flange to loosen tapered dowels.

Drive Axles

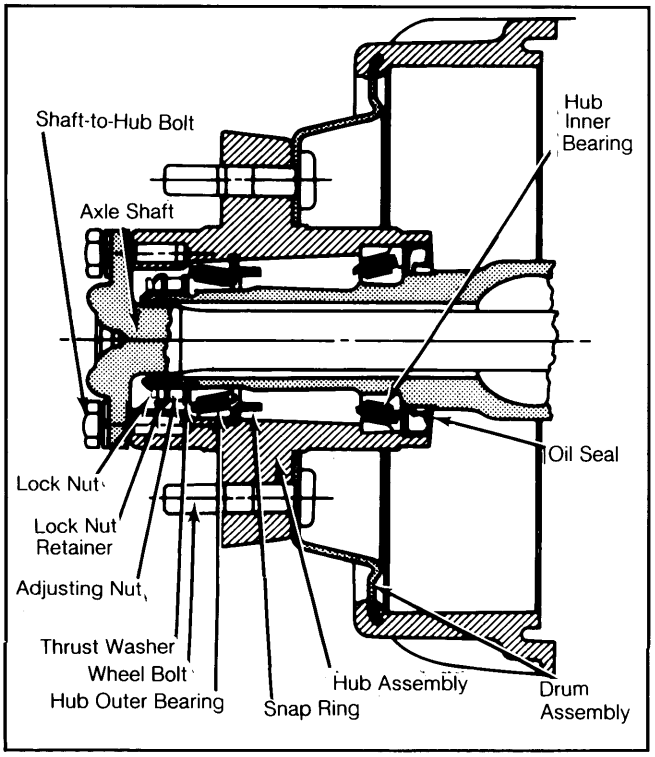
SPICER (DANA) FULL-FLOATING AXLES (Cont.)

NOTE: Close inspection of hub and axle type is necessary to determine which procedure applies.

3) Remove and discard seal(s). Remove bearing cones from hub or axle housing. There are 2 methods used to position outer bearing cup in hub. Seating cup against a machined shoulder, and seating cup against a removable snap ring set into a machined groove:

- To remove machined shoulder type, drive each bearing cup out of hub using a long drift.
- To remove snap ring type, remove inner cup with a long drift.
- Remove snap ring with pliers.
- Drive outer bearing and cup out of hub.

Fig. 3: Cutaway View of Axle Shaft and Bearings



Showing snap ring bearing retainer.

Installation

1) To install machined shoulder type, drive or press inner and outer bearing cups into place. Make sure that cups are firmly seated against shoulders in hub.

2) To install snap ring type, insert outer bearing cone into hub. Insert bearing cup into hub and drive beyond snap ring groove. Install snap ring.

3) Drive cone and cup assembly back against snap ring making sure that it is fully seated. Install inner bearing cup and cone. Install seals. Adjust wheel bearing. *See Rear Wheel Bearing Adjustment in WHEEL ALIGNMENT section.*

PINION FLANGE & SEAL

NOTE: Front and rear differentials are the same, except for an oil slinger on the front differential pinion shaft. Pinion seal can be serviced with axle assembly installed in vehicle.

Removal

Disconnect drive shaft, and scribe a line down pinion shaft, flange and nut. Remove nut and flange. Pry seal from bore using care not to damage machined surfaces.

CAUTION: Do not hammer flange off. Damage to pinion gear and bearing could result.

Installation

Lubricate cavity between seal lips with a high melting point lubricant. Install seal into bore, making sure that it bottoms against shoulder. Place flange on shaft and draw it down with pinion nut. Tighten pinion nut to specifications. Install drive shaft.

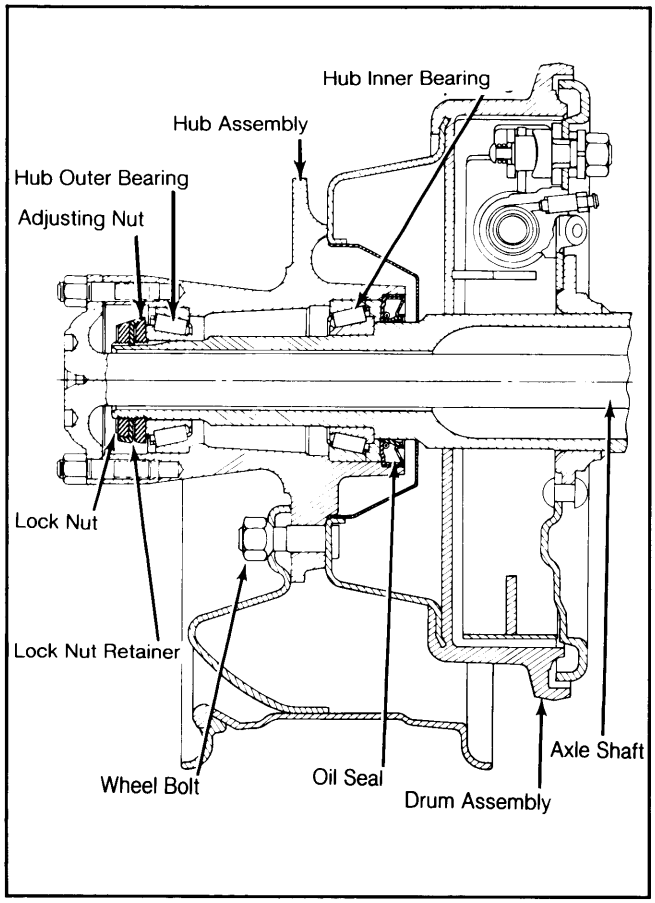
CAUTION: Failure to tighten pinion nut to full specifications will result in flange or pinion shaft failure.

AXLE ASSEMBLY

Removal

1) Raise vehicle on hoist and support axle assembly to take weight off spring. Disconnect drive shaft at pinion flange and tie out of the way. Remove hub and brake assembly.

Fig. 4: Cutaway View of Axle Shaft and Bearings



Showing machined shoulder bearing retainer.

2) Disconnect vent tube (if equipped), and disconnect parking brake cable(s) and service brake hydraulic lines. Disconnect shock absorbers at axle brackets. Disconnect springs and remove axle.

SPICER (DANA) FULL-FLOATING AXLES (Cont.)

Installation

Reverse removal procedure. Do not fully tighten shock absorber nut until assembly is completed. Bleed hydraulic lines and adjust parking brake before moving vehicle.

OVERHAUL

DISASSEMBLY

NOTE: Remove axle housing assembly before beginning overhaul.

1) Remove axles and housing cover. Be sure that side bearing caps are marked so that they can later be installed in their original positions. Remove bolt and side bearing caps. Use a housing spreader to spread differential housing .015-020" (.38-.51 mm).

2) Use a dial indicator to measure spread. Carefully pry differential case out of housing. Be careful not to damage machined surface of housing. Remove spreader immediately to prevent possibility of carrier taking set. *See Fig. 5.*

CAUTION: Do not spread housing more than .020" (.51 mm). Permanent damage to housing could result.

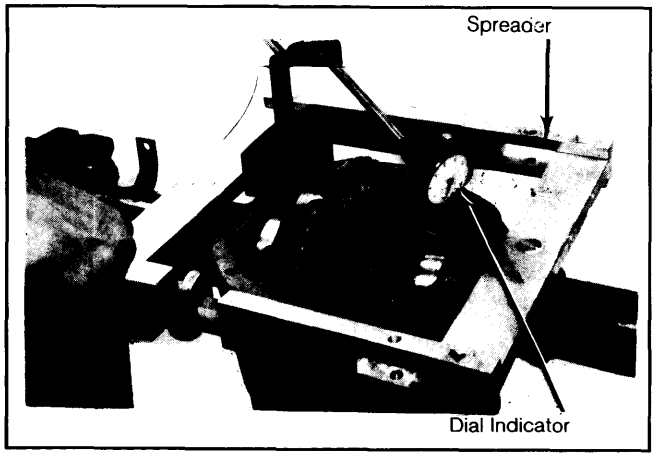
3) If differential case is 1 piece, proceed as follows:

- Remove bolts holding ring gear to differential case.
- Tap ring gear off with soft mallet.
- With a small punch, drive out lock pin.
- Remove differential shaft and thrust block.
- Remove differential pinion gears and thrust washers.

4) If differential case is 2 piece, proceed as follows:

- Remove bolts holding ring gear to differential case.
- Tap ring gear off with soft mallet.
- Mark differential case halves to aid reassembly.
- Remove bolts and separate case halves.
- Remove pinion gear spider, pinion gears, side gears, and all thrust washers.

Fig. 5: Correct Procedure for Spreading Housing



Do not leave differential spread or damage may result.

5) With puller remove pinion flange. Using a soft mallet, drive pinion shaft out of housing. Remove oil seal and bearing cone. If baffle or an oil slinger are also present, record the order in which they were removed.

NOTE: Pinion bearing adjusting shims may remain on pinion shaft, stick to bearing, or fall loose. Collect and save them for reassembly.

6) Discard seal. Remove inner bearing cone and press pinion bearing off pinion shaft. Using puller remove side bearings from differential case.

7) Often during removal of side bearings, shims between bearings and differential case are damaged. If so, shims must be individually measured and their thicknesses recorded, so that new shim packs can be obtained.

REASSEMBLY & ADJUSTMENT

Case Assembly

1) If differential case is 1 piece, proceed as follows:

- Place differential case in holding fixture or vise. Lubricate side and pinion gears and all thrust washers and install in case.
- Rotate side gears until holes in pinion gears and washers line up with holes in case. Install spacer block (if equipped) and differential pinion shaft.
- If old thrust washers are used, check for preload of side gears by measuring clearance between side gears and case. Clearance should be .000-.006" (.00-.15 mm); if not, shims can be installed in equal amounts on each side, or new thrust washers installed.
- Install lock pin and peen over hole to retain pin. Install ring gear and tighten bolts to specifications.

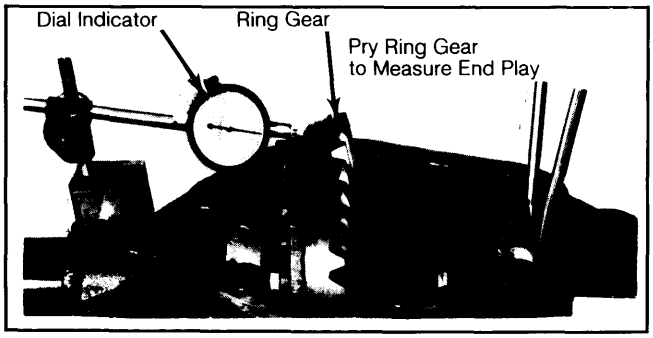
2) If differential case is 2 piece, proceed as follows:

- Lubricate all parts with differential lubricant. Install differential side gears and thrust washers, pinion gear spider, pinion gears, and thrust washers in case.
- Check for preload of side gears by measuring clearance between side gears and case. Clearance should be .000-.006" (.00-.15 mm); if not, shims can be installed in equal amounts on each side, or new thrust washers installed.
- Rejoin case halves using aligning marks made during disassembly. Tighten bolts to specifications.
- Install ring gear and tighten bolts to specifications.

3) Install differential side bearings. Assemble case in housing without shims. Install bearing caps and tighten bolts just enough to seat bearing cups. Mount dial indicator to read at back of differential flange.

4) Measure and record amount of side play of differential case by moving back and forth with a screwdriver. *See Fig. 6.* The measurement will be used

Fig. 6: Using Dial Indicator to Measure Differential End Play



Differential case is installed without shims, for test only.

Drive Axles

SPICER (DANA) FULL-FLOATING AXLES (Cont.)

later to determine proper shim pack dimension. Remove case from housing.

Pinion Depth & Bearing Preload

1) Pinion is adjusted by shims placed between inner bearing cup and housing, and by shims placed between pinion shaft shoulder and outer bearing. Shims behind inner bearing cup adjust position of pinion in relation to ring gear.

2) Shims behind outer bearing adjust pinion inner and outer bearing preload. If old pinion and ring gear assembly are used, preceed as follows:

- Install original shims and inner bearing cup. Install outer bearing cup. Press bearing cone onto pinion shaft and install shaft into housing.
- Install outer bearing cone, companion flange, and nut. Do not install outer shims or seal at this time. Tighten nut to obtain bearing preload of 10-30 ft. lb. (14-41 N.m).
- Use a gauge to measure distance from ring gear center to machined button on end of pinion gear.
- Add or subtract shims from under inner bearing cup to obtain nominal dimension listed in specifications.

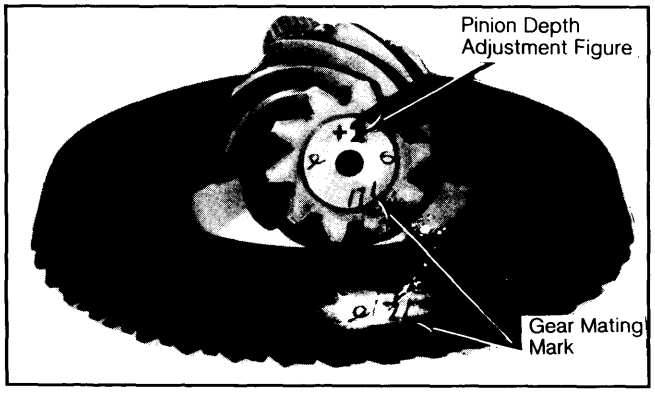
3) If new pinion and ring gear assembly is to be installed, proceed as follows:

- Determine pinion depth adjustment figure of old and new pinions and find shim adjustment figure from, *Pinion Depth Chart. See Fig. 7.*
- Adjust original shim pack accordingly and proceed as in step **2)**.

4) Remove pinion flange and nut, and remove front pinion bearing cone. Install original preload shim pack. Lubricate and install bearing cone. Install pinion flange and nut. Tighten to specifications while rotating pinion shaft.

5) Place housing in position so that pinion shaft is vertical (pointing up). Using an INCH lb. torque wrench, rotate shaft through several revolutions to measure rotating torque.

Fig. 7: Pinion and Ring Gear Markings Showing Pinion Depth Adjustment Figure



Numbers on ring gear and pinion must match.

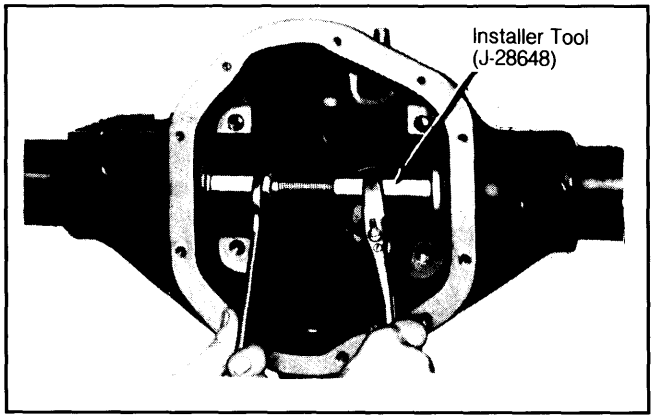
6) Check measurements against pinion bearing preload in specifications. To decrease preload, add shims; to increase preload, subtract shims. After adjustment is made, install oil seal and recheck pinion depth.

NOTE: Ignore torque needed to start shaft rotating.

7) Front axles only; check seals in axle housing bore. If condition is questionable, replace using installer. *See Fig. 8.*

NOTE: When installing front axle shaft, be sure that seals are not dislodged.

Fig. 8: Correct Procedure for Installing Inner Oil Seals



Installing oil seals in front axle housing using tool (J-28648).

Side Bearing Preload

1) With pinion installed in housing and depth and preload adjustments properly made. Install differential case into housing and set dial indicator so that it reads at back of ring gear. Leave bearing cap bolts loose enough to allow movement of case.

2) Insert screwdriver between bearing cap and housing at opposite end from ring gear. Jam case toward ring gear side and, with force still applied to case, set dial indicator to zero. Jam case the other way (making sure that ring and pinion gears mesh) and record reading.

3) Repeat several times until readings are the same. This reading is the amount of shims that will go between case and bearing on ring gear side. Install these shims. From the figure originally recorded under, *Case Assembly*.

4) Subtract amount of shims just installed on case. Add .015" (.38 mm) for bearing preload and install new shim pack on end of case opposite ring gear.

Example:

Original Recorded Side Play	+.070"
Side Play With Pinion Installed	-.032"
Amount Left From Original Side Play	=.038"
Additional Amount for Bearing Preload	+.015"
Amount Installed Opposite of Ring Gear	=.053"

5) Install spreader to housing, spread housing and install differential case. Remove spreader and install bearing caps. Make sure caps are in original position; then tighten caps evenly.

NOTE: Do not spread housing more than .020" (.51 mm). Permanent damage could result.

Backlash & Final Assembly

1) Mount dial indicator to housing and measure ring gear to pinion gear backlash in 3 places around ring gear. *See Specifications*. Variation between readings should not exceed .002" (.051 mm).

2) Adjust to specifications by moving shims from 1 side of differential case to the other, or by changing depth of pinion gear. Check tooth contact pattern. *See Tooth Contact Pattern in this section*. Install cover and tighten bolts to specifications.

SPICER (DANA) FULL-FLOATING AXLES (Cont.)

AXLE ASSEMBLY SPECIFICATIONS

Application	Specifications In. (mm)
Ring Gear Backlash	.005-.009 (.13-.23)
Side Bearing Preload	.015 (.38)
Pinion Gear Depth (Nominal Dimension)	
Model 30	2.250 (57.15)
Model 44	2.625 (66.68)
Model 60 & 61	3.125 (79.38)
Model 70	3.500 (88.90)
	INCH lbs. (N.m)
Pinion Bearing Preload	
New Bearings	20-40 (2.3-4.5)
Used Bearings	10-20 (1.1-2.3)

TIGHTENING SPECIFICATIONS

Applications	Ft. Lbs. (N.m)
Pinion Shaft Flange Nut	
Models 30, 44 & 70	210 (285)
Models 60 & 61	270 (367)
Side Bearing Cap	
Model 30	45 (61)
Models 44, 60, 61 & 70	80 (109)
Ring Gear-to-Case	
Models 30 & 44	55 (75)
Models 60, 61 & 70	110 (150)
Axle Flange-to-Hub	
Models 30 & 44	35 (48)
Models 60 & 61	55 (75)
Model 70	85 (116)

PINION DEPTH SHIM ADJUSTMENT CHART (INCHES)

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. 9: Exploded View of Spicer (Dana) Full-Floating Axle Assembly — 1 Piece Differential Shown