

DIFFERENTIAL & DRIVELINE

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PROPELLER SHAFT

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PROPELLER SHAFT

DIAGNOSIS AND TESTING

PROPELLER SHAFT VIBRATION

Tires that are out-of-round or wheels that are unbalanced, will cause a low frequency vibration.

Brake drums that are unbalanced will cause a harsh, low frequency vibration.

Driveline vibration can also result from loose or damaged engine mounts.

Propeller shaft vibration increases as the vehicle speed is increased. A vibration that occurs within a specific speed range is not usually caused by a propeller shaft being unbalanced. Defective universal joints or an incorrect propeller shaft angle are usually the cause of such a vibration.

PROPELLER SHAFT (Continued)

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
Propeller Shaft Noise	1) Undercoating or other foreign material on shaft. 2) Loose U-joint clamp screws. 3) Loose or bent U-joint yoke or excessive runout. 4) Incorrect driveline angularity. 5) Rear spring center bolt not in seat. 6) Worn U-joint bearings. 7) Propeller shaft damaged or out of balance. 8) Broken rear spring. 9) Excessive runout or unbalanced condition. 10) Excessive drive pinion gear shaft runout. 11) Excessive axle yoke deflection. 12) Excessive transfer case runout.	1) Clean exterior of shaft and wash with solvent. 2) Install new clamps and screws and tighten to proper torque. 3) Install new yoke. 4) Measure and correct driveline angles. 5) Loosen spring u-bolts and seat center bolt. 6) Install new U-joint. 7) Install new propeller shaft. 8) Install new rear spring. 9) Re-index propeller shaft, test, and evaluate. 10) Re-index propeller shaft and evaluate. 11) Inspect and replace yoke if necessary. 12) Inspect and repair as necessary.
Universal Joint Noise	1) Loose U-joint clamp screws. 2) Lack of lubrication.	1) Install new clamps and screws and tighten to proper torque. 2) Replace as U-joints as necessary.

PROPELLER SHAFT BALANCE

NOTE: Removing and re-indexing the propeller shaft 180° relative to the yoke may eliminate some vibrations.

If propeller shaft is suspected of being unbalanced, it can be verified with the following procedure:

- (1) Raise the vehicle.
- (2) Clean all the foreign material from the propeller shaft and the universal joints.
- (3) Inspect the propeller shaft for missing balance weights, broken welds, and bent areas. **If the propeller shaft is bent, it must be replaced.**
- (4) Inspect the universal joints to ensure that they are not worn, are properly installed, and are correctly aligned with the shaft.
- (5) Check the universal joint clamp screws torque.
- (6) Remove the wheels and tires. Install the wheel lug nuts to retain the brake drums or rotors.
- (7) Mark and number the shaft six inches from the yoke end at four positions 90° apart.

(8) Run and accelerate the vehicle until vibration occurs. Note the intensity and speed the vibration occurred. Stop the engine.

(9) Install a screw clamp at position 1 (Fig. 1).

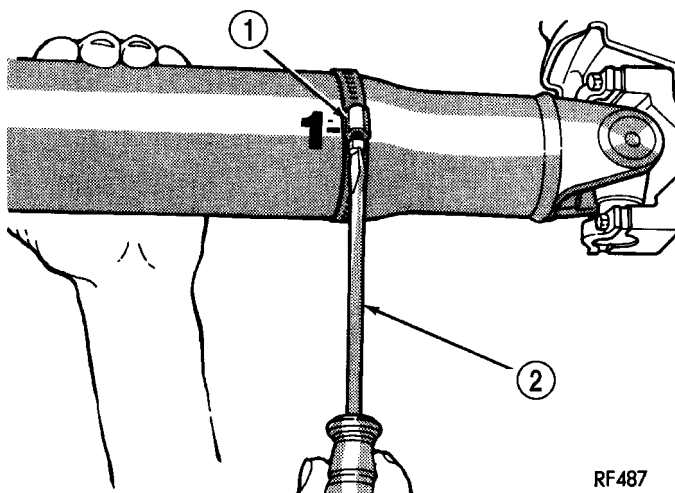
(10) Start the engine and re-check for vibration. If there is little or no change in vibration, move the clamp to one of the other three positions. Repeat the vibration test.

(11) If there is no difference in vibration at the other positions, the source of the vibration may not be propeller shaft.

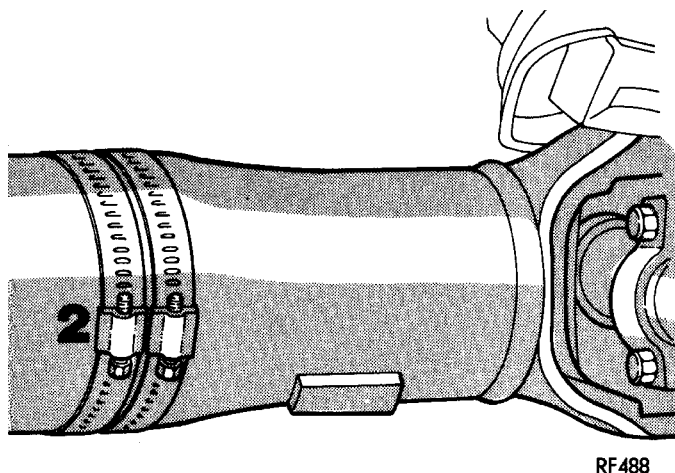
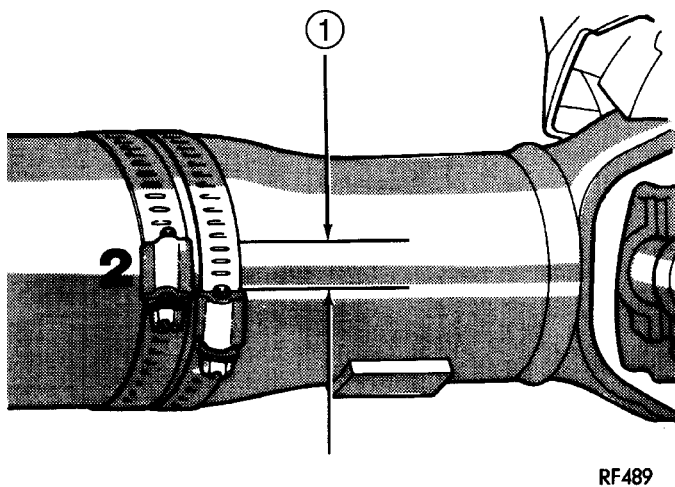
(12) If the vibration decreased, install a second clamp (Fig. 2) and repeat the test.

(13) If the additional clamp causes an additional vibration, separate the clamps (1/2 inch above and below the mark). Repeat the vibration test (Fig. 3).

(14) Increase distance between the clamp screws and repeat the test until the amount of vibration is at the lowest level. Bend the slack end of the clamps so the screws will not loosen.

PROPELLER SHAFT (Continued)**Fig. 1 CLAMP SCREW AT POSITION 1**

- 1 - CLAMP
2 - SCREWDRIVER

**Fig. 2 TWO CLAMP SCREWS****Fig. 3 CLAMP SCREWS SEPARATED**

- 1 - 1/2 INCH

(15) If the vibration remains unacceptable, apply the same steps to the front end of the propeller shaft.

(16) Install the wheel and tires. Lower the vehicle.

PROPELLER SHAFT RUNOUT

(1) Remove dirt, rust, paint and undercoating from the propeller shaft surface where the dial indicator will contact the shaft.

(2) The dial indicator must be installed perpendicular to the shaft surface.

(3) Measure runout at the center and ends of the shaft sufficiently far away from weld areas to ensure that the effects of the weld process will not enter into the measurements.

(4) Refer to Runout Specifications chart.

(5) If the propeller shaft runout is out of specification, remove the propeller shaft, index the shaft 180°, and re-install the propeller shaft. Measure shaft runout again.

(6) If the propeller shaft runout is now within specifications, mark the shaft and yokes for proper orientation.

(7) If the propeller shaft runout is not within specifications, verify that the runout of the transmission/transfer case and axle are within specifications. Correct as necessary and re-measure propeller shaft runout.

(8) Replace the propeller shaft if the runout still exceeds the limits.

RUNOUT SPECIFICATIONS

Front of Shaft	0.020 in. (0.50 mm)
Center of Shaft	0.025 in. (0.63 mm)
Rear of Shaft	0.020 in. (0.50 mm)
note: Measure front/rear runout approximately 3 inches (76 mm) from the weld seam at each end of the shaft tube for tube lengths over 30 inches. For tube lengths under 30 inches, the maximum allowed runout is 0.020 in. (0.50 mm) for the full length of the tube.	

STANDARD PROCEDURE**PROPELLER SHAFT ANGLE**

This procedure applies to both the front/rear propeller shafts. To obtain the front output angle (A) on the front propeller shaft, place the inclinometer the machined surface of the C/V joint.

(1) To check driveline alignment, raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn.

(2) Remove any external bearing snap rings, if equipped from universal joint so protractor base sits flat.

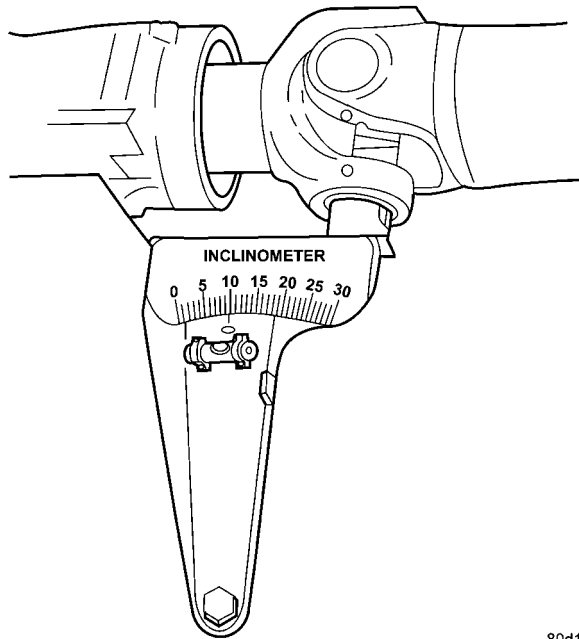
PROPELLER SHAFT (Continued)

(3) Rotate the shaft until transmission/transfer case output yoke bearing is facing downward.

NOTE: Always make measurements from front to rear and from the same side of the vehicle.

(4) Place Inclinator 7663 on yoke bearing (A) parallel to the shaft (Fig. 4). Center bubble in sight glass and record measurement.

This measurement will give you the transmission yoke Output Angle (A).



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Fig. 4 OUTPUT ANGLE (A)

(5) Rotate propeller shaft 90 degrees and place Inclinator on yoke bearing parallel to the shaft (Fig. 5). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

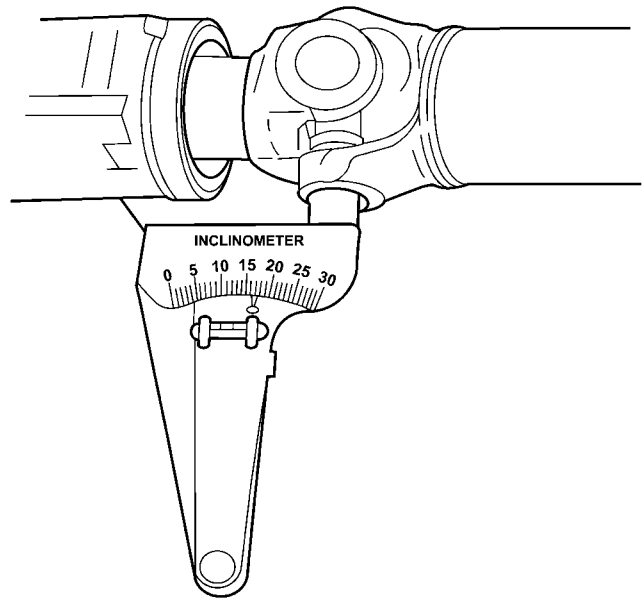
This measurement will give you the Propeller Shaft Angle (C).

(6) Rotate propeller shaft 90 degrees and place Inclinator on companion flange yoke bearing parallel to the shaft (Fig. 6). Center bubble in sight glass and record measurement.

This measurement will give you the pinion Companion Flange Input Angle (B).

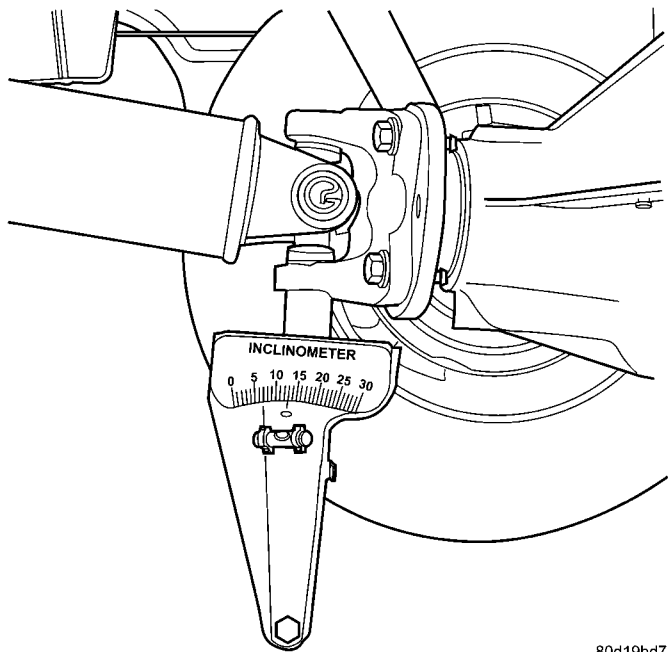
(7) Subtract smaller figure from larger (C minus A) to obtain Transmission/Transfer Case **Output Operating Angle**.

(8) Subtract smaller figure from larger (C minus B) to obtain axle **Input Operating Angle**.



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Fig. 5 PROPELLER SHAFT ANGLE (C)



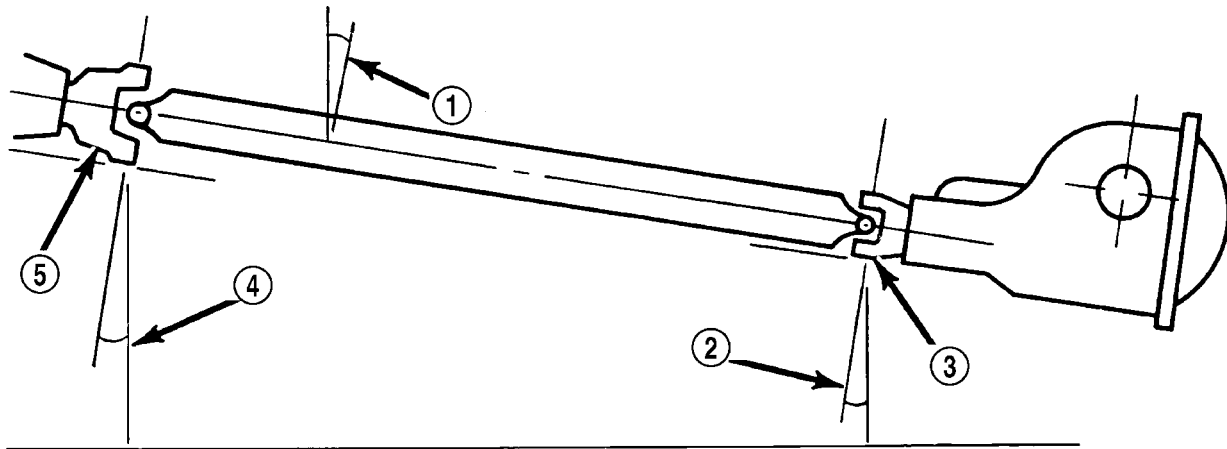
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Fig. 6 INPUT ANGLE (B)

Refer to rules given below and the example in (Fig. 7) for additional information.

- Good cancellation of U-joint operating angles should be within 1°.
- Operating angles should be less than 3°.
- At least 1/2 of one degree continuous operating (propeller shaft) angle.

PROPELLER SHAFT (Continued)



Horizontal Level

(A) Output Yoke = 3.0° or 4.9° (C) Prop. Shaft = 4.9° or -3.0°

Transmission Output	1.9°
Operating Angle	

(B) Axle Input Yoke = 3.2° or 4.9° (C) Prop. Shaft = 4.9° or -3.2°

Axle Input	1.7°
Operating Angle	

Trans. Output Operating Angle	1.9°
Axle Input Operating Angle	-1.7°

Amount of U-Joint Cancellation 0.2°

Fig. 7 UNIVERSAL JOINT ANGLE EXAMPLE

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1 - 4.9° Angle (C)
 2 - 3.2° Angle (B)
 3 - Input Yoke

4 - 3.0° Angle (A)
 5 - Output Yoke

TWO-PIECE PROPELLER SHAFT

The procedure to measure the propeller shaft angles involved with a two-piece (Fig. 8) propeller shaft is the same as those for a one-piece propeller shaft.

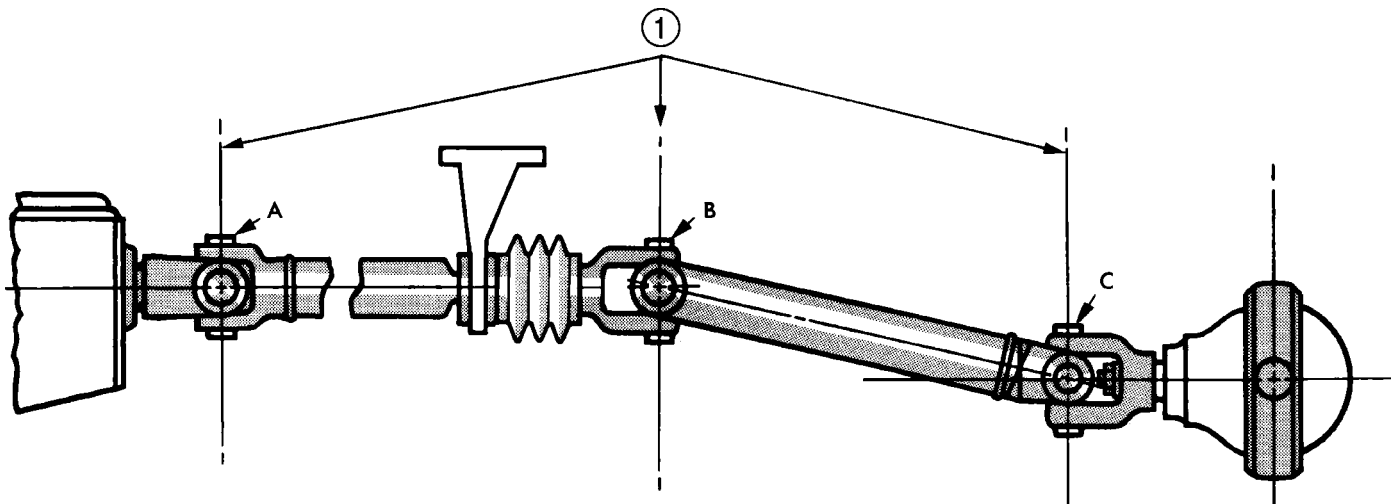


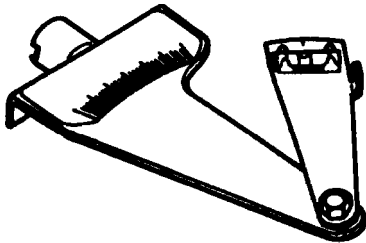
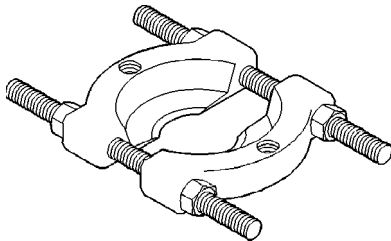
Fig. 8 UNIVERSAL JOINT ANGLE

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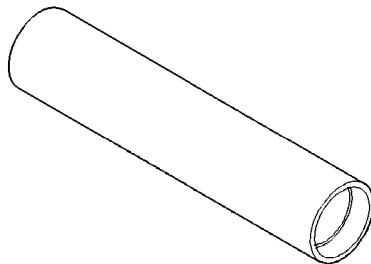
1 - YOKES MUST BE IN SAME PLANE

PROPELLER SHAFT (Continued)**SPECIFICATIONS****TORQUE SPECIFICATIONS**

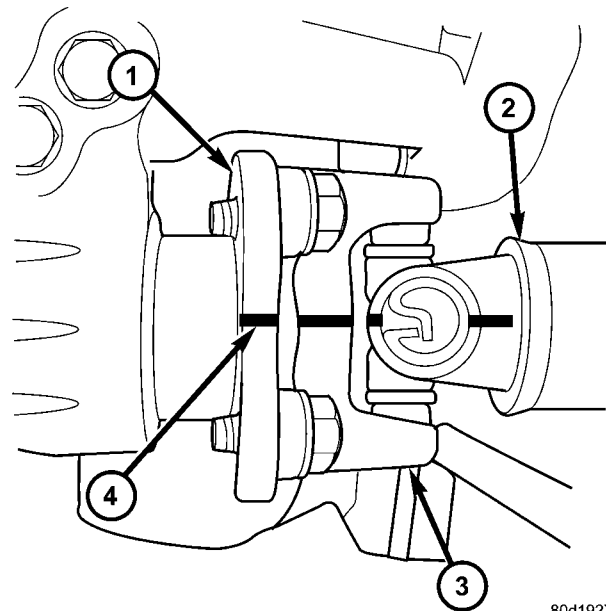
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Center Bearing Bolts	54	40	-
Front Pinion Flange Bolts	115	85	-
Rear Pinion Flange Bolts	115	85	-

SPECIAL TOOLS**INCLINOMETER 7663**

1130-00109ac2

Bearing Splitter 1130**INSTALLER 6052****FRONT PROPELLER SHAFT****REMOVAL**

- (1) Position transmission and transfer case into neutral.
- (2) Raise and support vehicle.
- (3) Remove exhaust crossover pipe.
- (4) Mark a line across the axle companion flange and propeller shaft flange yoke (Fig. 9) for installation reference.



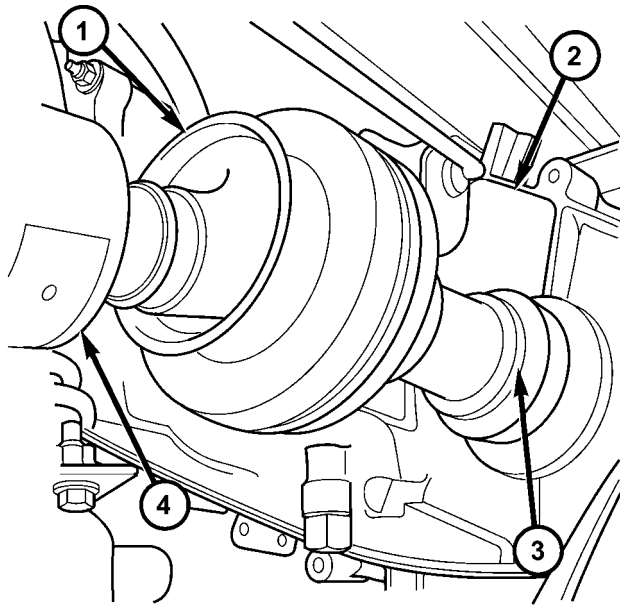
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Fig. 9 COMPANION FLANGE

- 1 - COMPANION FLANGE
- 2 - PROPELLER SHAFT
- 3 - FLANGE YOKE
- 4 - REFERENCE MARK

- (5) Remove companion flange bolts.
- (6) Remove dust boot clamp (Fig. 10) from the C/V joint end of the shaft.
- (7) Remove propeller shaft.

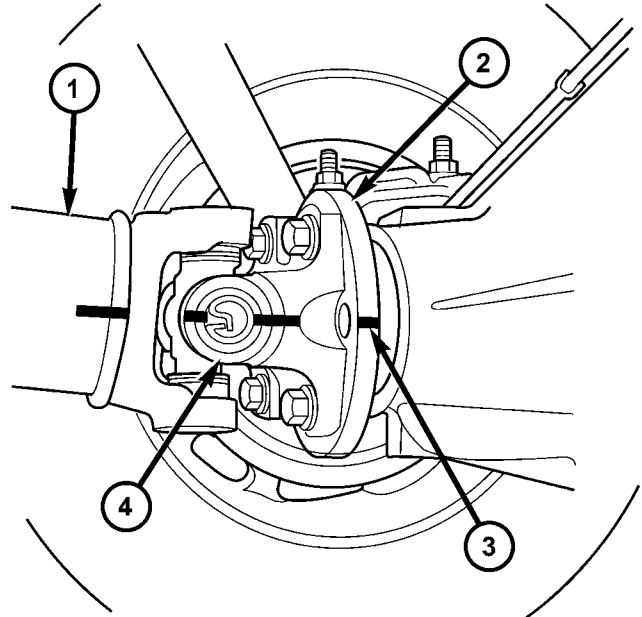
FRONT PROPELLER SHAFT (Continued)



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Fig. 10 DUST BOOT

- 1 - C/V JOINT
- 2 - TRANSFER CASE
- 3 - BOOT CLAMP
- 4 - PROPELLER SHAFT



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Fig. 11 COMPANION FLANGE

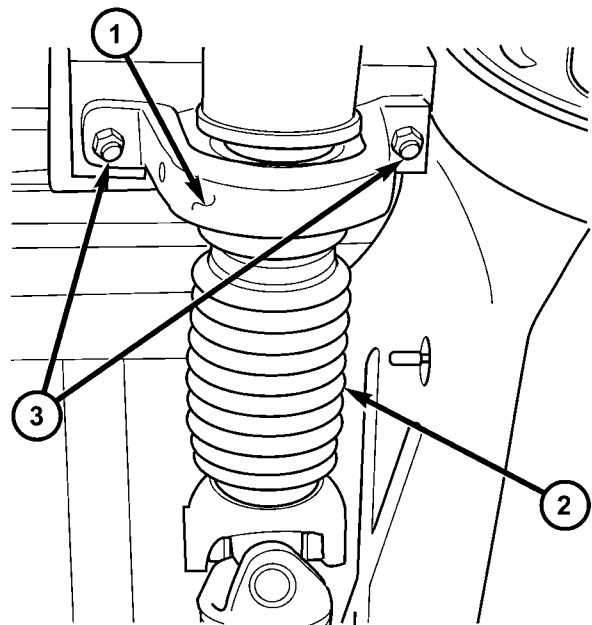
- 1 - PROPELLER SHAFT
- 2 - COMPANION FLANGE
- 3 - REFERENCE MARK
- 4 - SHAFT FLANGE YOKE

INSTALLATION

- (1) Install propeller shaft with with all reference marks aligned.
- (2) Install transfer case companion flange bolts and tighten to 30.5 N·m (22.5 ft. lbs.).
- (3) Install axle companion flange bolts and tighten to 108 N·m (80 ft. lbs.).
- (4) Install skid plate, if equipped.
- (5) Lower vehicle and road test to verify repair.

REAR PROPELLER SHAFT**REMOVAL**

- (1) Shift transmission into Neutral.
- (2) Raise and support vehicle.
- (3) Mark a line across the pinion companion flange and propeller shaft flange yoke (Fig. 11) for installation reference.
- (4) Mark the outline of the center bearing (Fig. 12) on the crossmember for installation reference, if equipped.
- (5) Remove center bearing mounting nuts, if equipped.
- (6) Remove pinion yoke companion flange bolts.
- (7) Slide slip yoke off of the transmission or transfer case output shaft and remove propeller shaft.



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Fig. 12 CENTER BEARING

- 1 - CENTER BEARING
- 2 - DUST BOOT
- 3 - MOUNTING NUTS

REAR PROPELLER SHAFT (Continued)

INSTALLATION

(1) Slide the slip yoke onto the transmission/trans-fer case output shaft.

(2) Align and install center bearing on crossmem-ber, if necessary and tighten nuts to 54 N·m (40 ft. lbs.).

(3) Align reference marks on the propeller shaft yoke and pinion companion flange (Fig. 13).

(4) Tighten pinion companion flange bolts to 115 N·m (85 ft. lbs.).

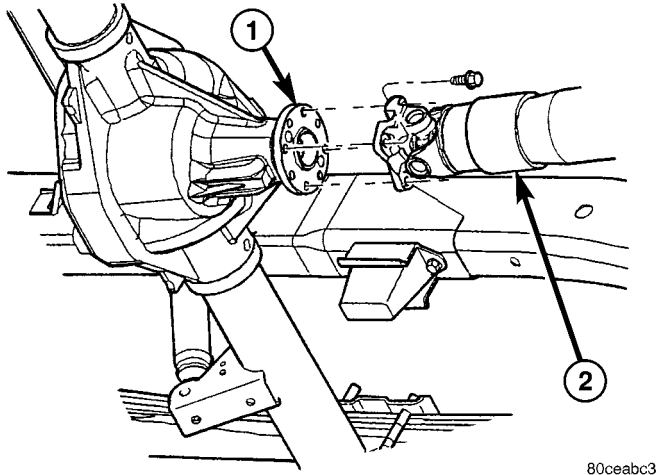


Fig. 13 REAR PROPELLER SHAFT

- 1 - COMPANION FLANGE
2 - PROPELLER SHAFT

(5) Lower the vehicle.

CENTER BEARING

REMOVAL

- (1) Remove rear propeller shaft.
- (2) Mark the two shafts (Fig. 14) for installation reference.
- (3) Remove slip joint boot clamp and separate the two shafts.
- (4) Use hammer and punch to tap slinger away from shaft to provide room for bearing splitter.
- (5) Position Bearing Splitter Tool 1130 between slinger and shaft.

CAUTION: Do not damage shaft spline during removal of center bearing.

(6) Set shaft in press and press bearing off the shaft.

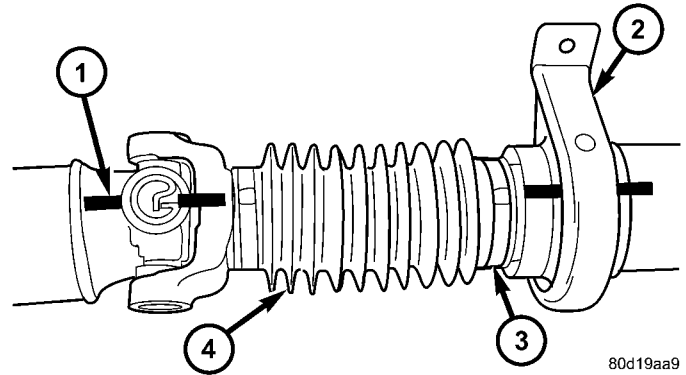


Fig. 14 REFERENCE MARKS

- 1 - REFERENCE MARK
2 - CENTER BEARING
3 - BOOT CLAMP
4 - DUST BOOT

INSTALLATION

NOTE: Two types of center bearings are used and are not interchangeable. Install the same type as the vehicle was built with.

- (1) Install new slinger on shaft and drive into position with appropriate installer tool.
- (2) Install new center bearing on shaft with Bearing Installer Tool 6052. Drive on shaft with hammer until bearing is seated.
- (3) Clean shaft splines and apply a coat of multi-purpose grease.
- (4) Align master splines and slide front and rear half-shafts together. Reposition slip yoke boot and install new clamp.
- (5) Install propeller shaft in vehicle.

ADJUSTMENTS

CENTER BEARING

Launch shudder is a vibration that occurs at first acceleration from a stop. Shudder vibration usually peaks at the engines highest torque output. Shudder is a symptom associated with vehicles using a two-piece propeller shaft. To decrease shudder, lower the center bearing in 1/8 inch increments. Use shim stock or fabricated plates. Plate stock must be used to maintain compression of the rubber insulator around the bearing. Do not use washers. Replace the original bolts with the appropriate increased length bolts.

SINGLE CARDAN UNIVERSAL JOINTS

DISASSEMBLY

NOTE: The following procedure is described for a propeller shaft equipped with only a cardan joint in the tube yoke. If the propeller shaft is equipped with a companion yoke, simply repeat the following steps to remove the cardan joint from the companion yoke after removing the cardan joint from the tube yoke.

Individual components of cardan universal joints are not serviceable. If worn or leaking, they must be replaced as an assembly.

- (1) Remove the propeller shaft.
- (2) Using a soft drift, tap the outside of the bearing cap assembly to loosen snap ring.
- (3) Remove snap rings from both sides of yoke (Fig. 15).

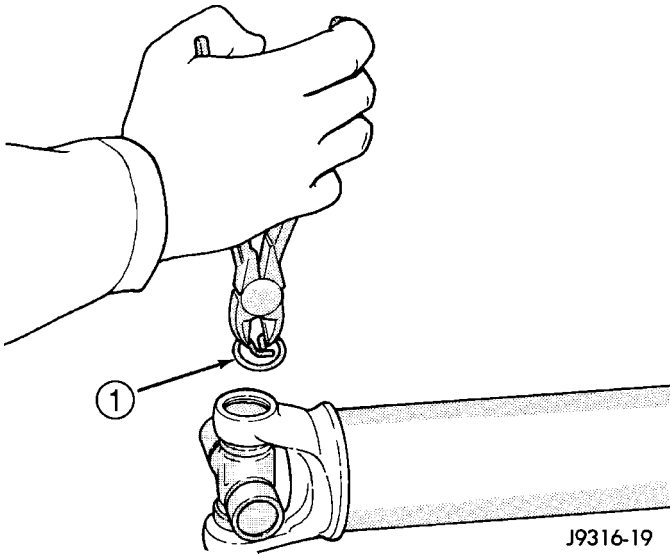


Fig. 15 Snap Ring

1 - SNAP RING

(4) Set the yoke in an arbor press or vise with a socket whose inside diameter is large enough to receive the bearing cap positioned beneath the yoke.

(5) Position the yoke with the grease fitting, if equipped, pointing up.

(6) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and press the cap through the yoke to release the lower bearing cap (Fig. 16).

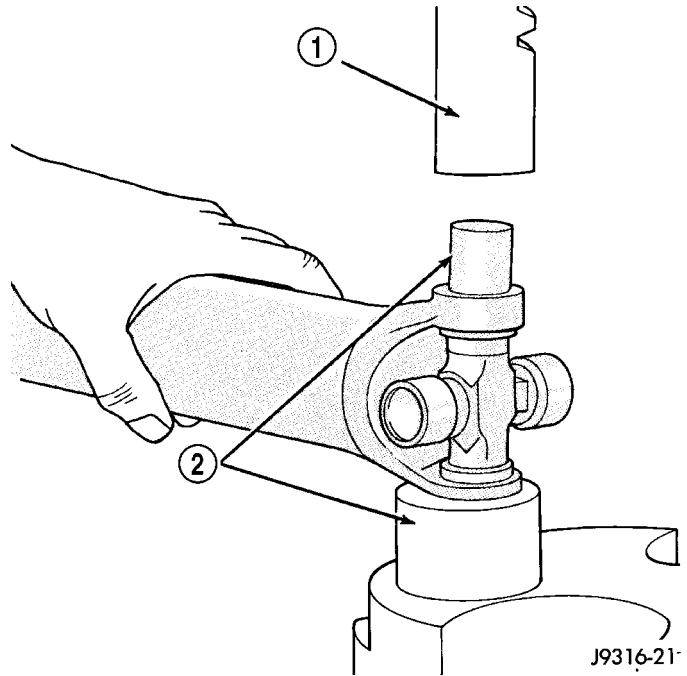


Fig. 16 Press Out Bearing

1 - PRESS
2 - SOCKET

(7) If the bearing cap will not pull out of the yoke by hand after pressing, tap the yoke ear near the bearing cap to dislodge the cap.

(8) To remove the opposite bearing cap, turn the yoke over and straighten the cross in the open hole. Then, carefully press the end of the cross until the remaining bearing cap can be removed (Fig. 17).

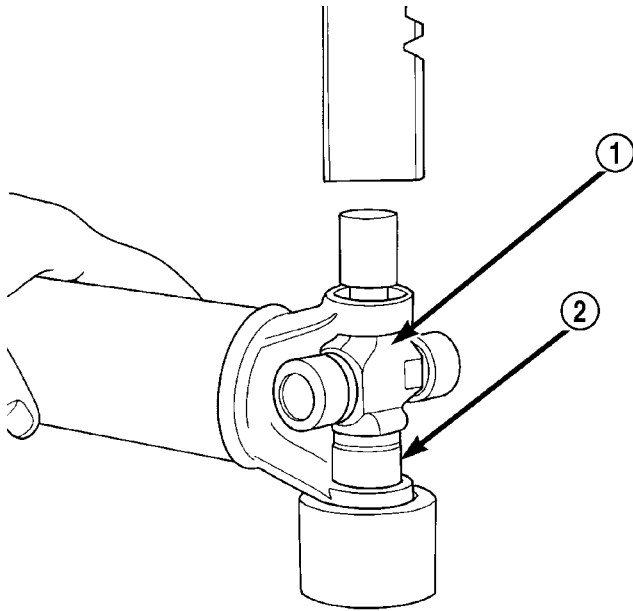
CAUTION: If the cross or bearing cap are not straight during installation, the bearing cap will score the walls of the yoke bore and damage can occur.

ASSEMBLY

NOTE: The following procedure is described for a propeller shaft equipped with only a cardan joint in the tube yoke. If the propeller shaft is equipped with a companion yoke, simply repeat the following steps to remove the cardan joint from the companion yoke after removing the cardan joint from the tube yoke.

- (1) Apply extreme pressure (EP) N.L.G.I. Grade 1 or 2 grease to inside of yoke bores to aid in installation.

SINGLE CARDAN UNIVERSAL JOINTS (Continued)

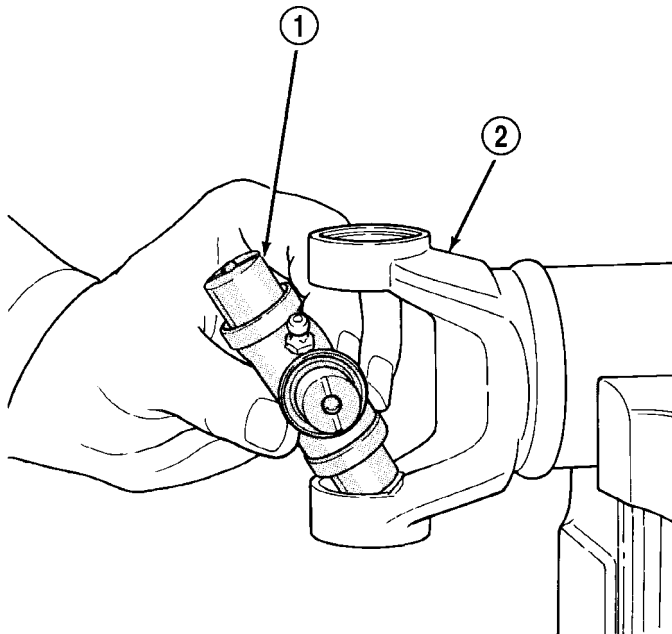


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Fig. 17 Press Out Remaining Bearing

- 1 - CROSS
2 - BEARING CAP

(2) Position the cross in the yoke with its lube fitting, if equipped, pointing up (Fig. 18).

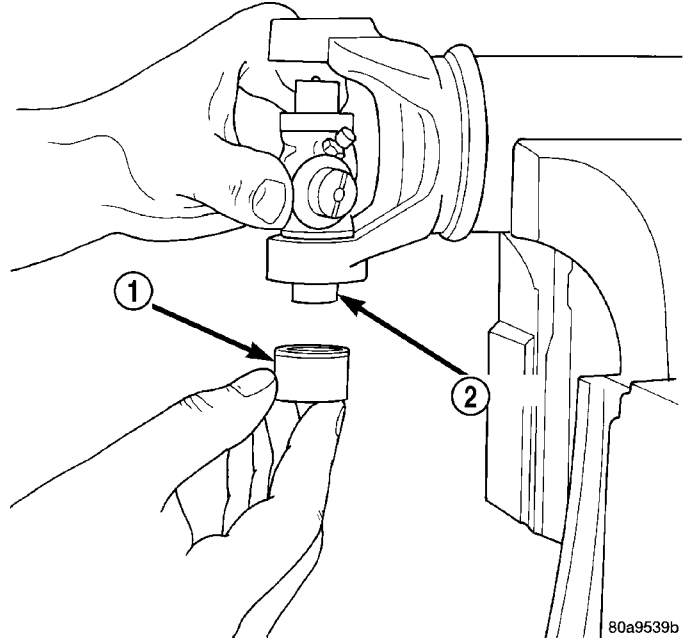


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Fig. 18 Cross In Yoke

- 1 - CROSS
2 - YOKE

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 19). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.



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Fig. 19 Install Bearing On Trunnion

- 1 - BEARING CAP
2 - TRUNNION

(4) Press the bearing cap into the yoke bore enough to install a snap ring.

(5) Install a snap ring.

(6) Repeat Step 3 and Step 4 to install the opposite bearing cap. If the joint is stiff or binding, strike the yoke with a soft hammer to seat the needle bearings.

(7) Add grease to lube fitting, if equipped.

(8) Install the propeller shaft.

HALF SHAFT

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HALF SHAFT

CAUTION

CAUTION:: Never grasp half shaft assembly by the boots. This may cause the boot to pucker or crease and reduce the service life of the boot.

Avoid over angulating or stroking the C/V joints when handling the half shaft.

Half shafts exposed to battery acid, transmission fluid, brake fluid, differential fluid or gasoline may cause the boots to deteriorate.

DIAGNOSIS AND TESTING

Check for grease at the inboard and outboard C/V joint. This is a sign of boot or boot clamp damage.

NOISE/VIBRATION IN TURNS

A clicking noise or a vibration in turns could be caused by a damaged outer C/V or inner tripod joint seal boot or seal boot clamps. This will result in the loss/contamination of the joint grease, resulting in inadequate lubrication of the joint. Noise could also be caused by another component of the vehicle coming in contact with the half shafts.

CLUNKING NOISE DURING ACCELERATION

This noise may be a result of a damaged or worn C/V joint. A torn boot or loose/missing clamp on the inner/outer joint which has allowed the grease to be lost will damage the C/V joint.

SHUDDER/VIBRATION DURING ACCELERATION

This problem could be a result of a worn/damaged inner tripod joint or a sticking tripod joint. Improper wheel alignment may also cause a shudder or vibration.

VIBRATION AT HIGHWAY SPEEDS

This problem could be a result of out of balance front tires or tire/wheel runout. Foreign material (mud, etc.) packed on the backside of the wheel(s) will also cause a vibration.

REMOVAL

- (1) Loosen lug nuts and hub nut while the with the vehicle brakes applied.
- (2) Raise and support the vehicle.
- (3) Remove wheel and tire assembly
- (4) Remove half shaft hub nut.
- (5) Remove brake caliper and rotor.
- (6) Position hydraulic jack under lower suspension arm and raise jack to unload rebound bumper.
- (7) Remove lower shock absorber bolt.
- (8) Remove upper ball joint nut and seperate ball with Remover 8677 (Fig. 1).

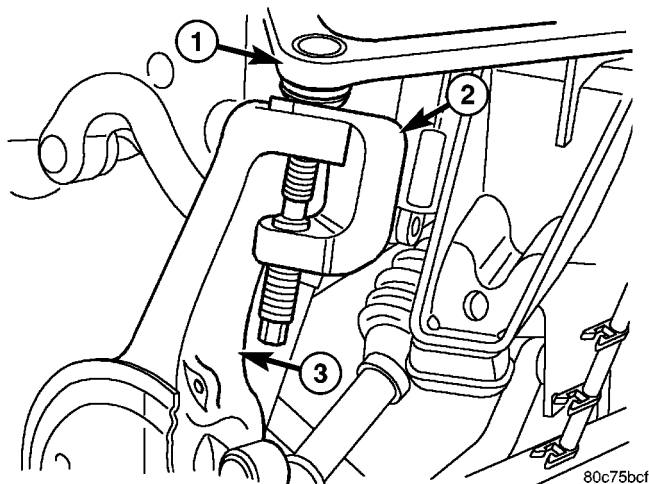


Fig. 1 UPPER BALL JOINT SEPARATION

- 1 - UPPER CONTROL ARM
- 2 - REMOVER
- 3 - STEERING KNUCKLE

HALF SHAFT (Continued)

(9) Disengage inner C/V joint from the axle shaft snap-ring by apply pressure with two pry bars between the C/V housing and axle housing.

(10) Tilt the knuckle out and push the half shaft out of the knuckle (Fig. 2).

CAUTION: Do not damage outer C/V threads while removing half shaft.

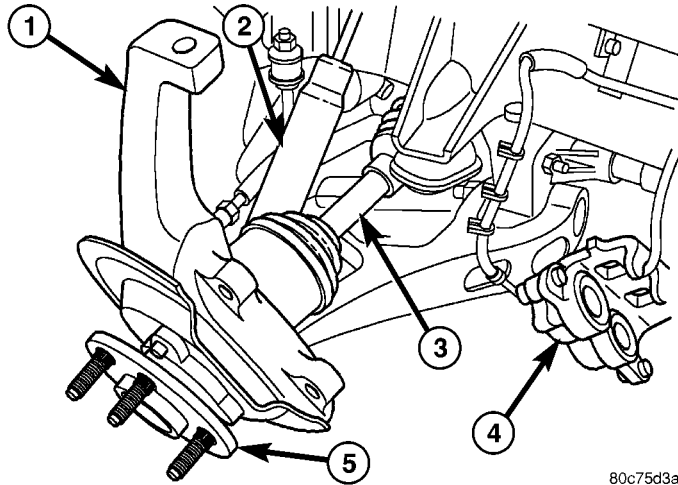


Fig. 2 STEERING KNUCKLE

- 1 - STEERING KNUCKLE
- 2 - SHOCK
- 3 - HALFSHAFT
- 4 - DISC BRAKE CALIPER
- 5 - HUB/BEARING

(11) Remove the half shaft from the vehicle.

INSTALLATION

(1) Clean hub bearing bore, hub bearing mating surface and half shaft splines.

(2) Apply a light coating of grease to the front axle shaft output splines.

(3) Install half shaft into the knuckle (Fig. 3).

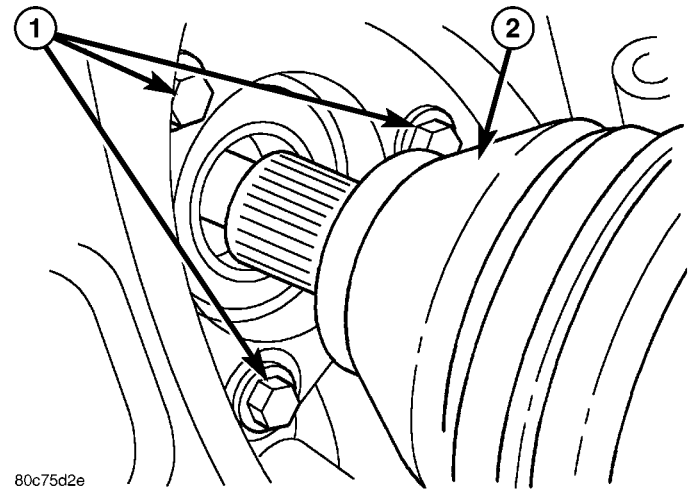


Fig. 3 HALF SHAFT AND HUB/BEARING

- 1 - HUB/BEARING MOUNTING NUTS
- 2 - HALF SHAFT

(4) Install half shaft on the axle output shaft. Push firmly to engage the axle output shaft snap ring into the inner C/V housing.

(5) Install upper ball joint into the knuckle.

(6) Install upper ball joint nut and tighten to specification.

(7) Install lower shock absorber bolt and tighten to specification.

(8) Install brake rotor and caliper.

(9) Install half shaft hub nut and tighten to 251 N·m (185 ft. lbs.).

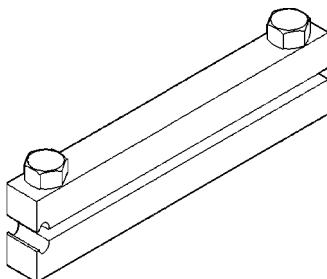
(10) Install the wheel and tire assembly.

SPECIFICATIONS

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Half Shaft Nut	251	185	-

SPECIAL TOOLS



CLAMP INSTALLER C-4975A

CV JOINT-OUTER

REMOVAL

(1) Clamp shaft in a vise (with soft jaws) and support C/V joint.

(2) Remove clamps with a cut-off wheel or grinder (Fig. 4).

CAUTION: Do not damage C/V housing or half shaft.

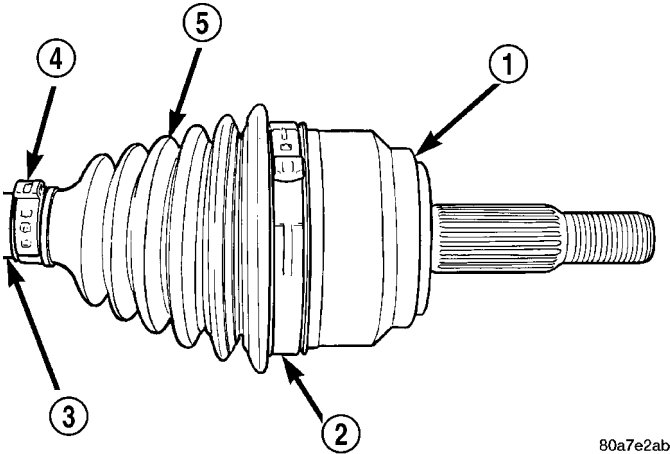


Fig. 4 BOOT CLAMP LOCATIONS

- 1 - C/V HOUSING
- 2 - CLAMP
- 3 - HALF SHAFT
- 4 - CLAMP
- 5 - C/V BOOT

- (3) Slide the boot down the shaft.
- (4) Remove lubricant to expose the C/V joint snap ring.
- (5) Spread snap ring and slide the joint off the shaft (Fig. 5).
- (6) Slide boot off the shaft and discard old boot.
- (7) Mark alignment marks on the inner race/hub, bearing cage and housing with dabs of paint (Fig. 6).
- (8) Clamp C/V joint in a vertical position in a soft jawed vise.
- (9) Press down one side of the bearing cage to gain access to the ball at the opposite side.

NOTE: If joint is tight, use a hammer and brass drift to loosen the bearing hub. Do not contact the bearing cage with the drift.

- (10) Remove ball from the bearing cage (Fig. 7).
- (11) Repeat step above until all six balls are removed from the bearing cage.
- (12) Lift cage and inner race upward and out from the housing (Fig. 8).
- (13) Turn inner race 90° in the cage and rotate the inner race/hub out of the cage (Fig. 9).

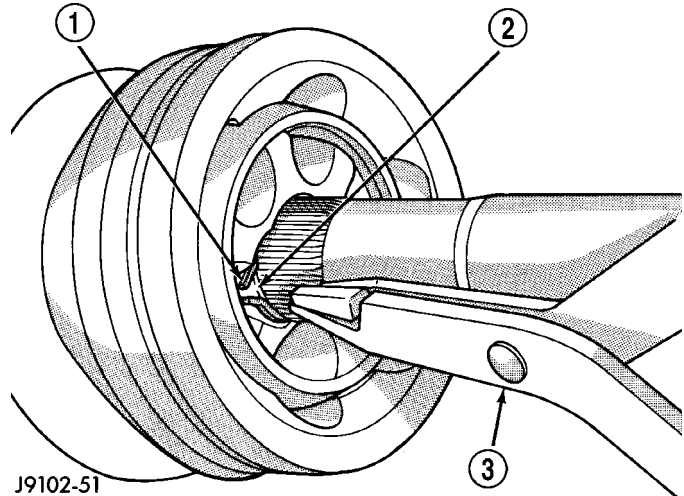


Fig. 5 OUTER C/V JOINT

- 1 - SNAP RING
- 2 - SNAP RING GROOVE
- 3 - SNAP RING PLIERS

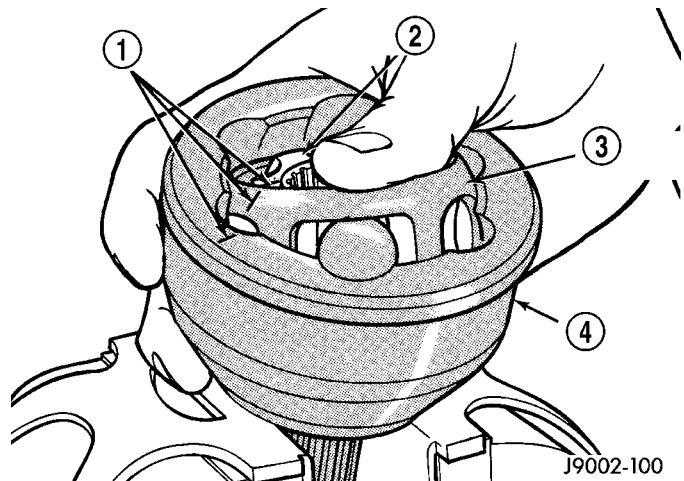


Fig. 6 BEARING ACCESS

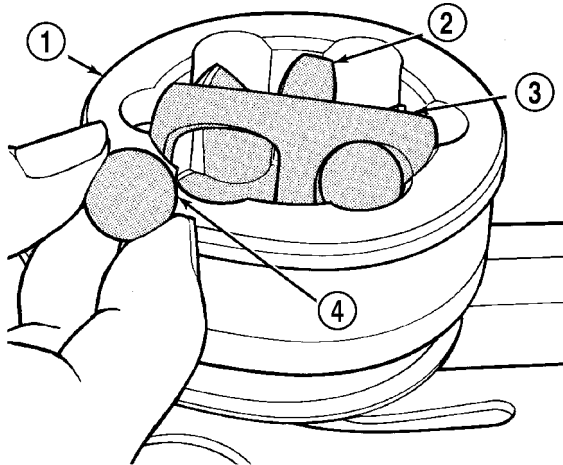
- 1 - ALIGNMENT MARKS
- 2 - BEARING HUB
- 3 - BEARING CAGE
- 4 - HOUSING

INSTALLATION

NOTE: If C/V joint is worn, replace entire C/V joint and boot.

- (1) Clean all C/V joint components and shaft.
- (2) Apply a light coat of grease supplied with the joint/boot to the C/V joint components before assembling them.
- (3) Align the inner race, cage and housing according to the alignment reference marks.
- (4) Insert the inner race into the cage (Fig. 10) and rotate race into the cage.
- (5) Rotate the inner race/hub in the cage (Fig. 11).

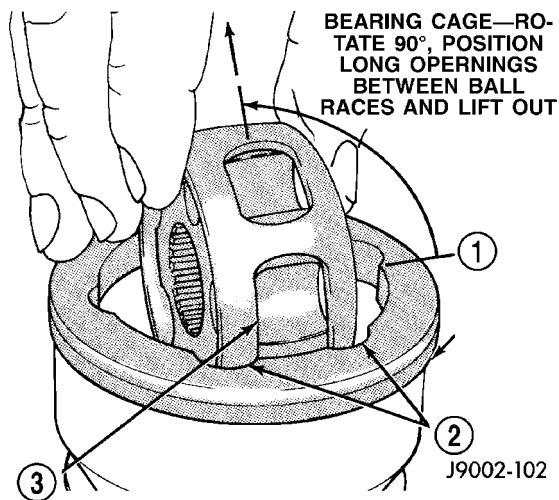
CV JOINT-OUTER (Continued)



J9002-101

Fig. 7 BEARING

- 1 - HOUSING
- 2 - INNER RACE/HUB
- 3 - BEARING CAGE
- 4 - BALL



J9002-102

Fig. 8 CAGE AND INNER RACE/HUB

- 1 - HOUSING
- 2 - INNER RACE
- 3 - CAGE WINDOW

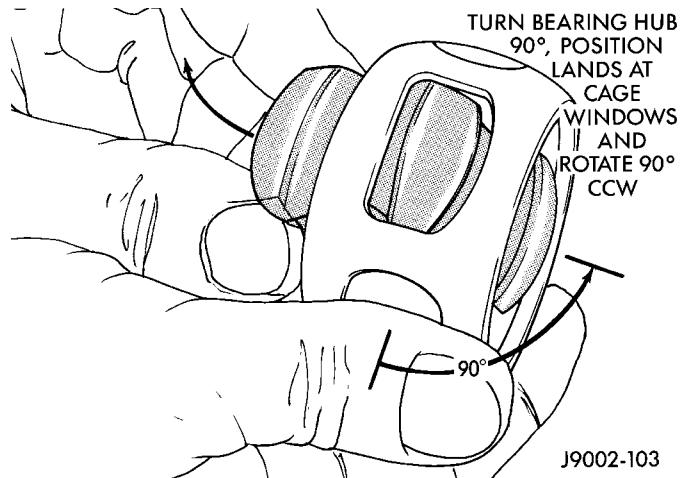
(6) Insert cage into the housing (Fig. 12). Rotate the cage 90° into the housing so the large bearing hub counterbore is facing outwards.

(7) Apply the grease supplied with the joint/boot to the ball races. Spread the grease equally between all the races.

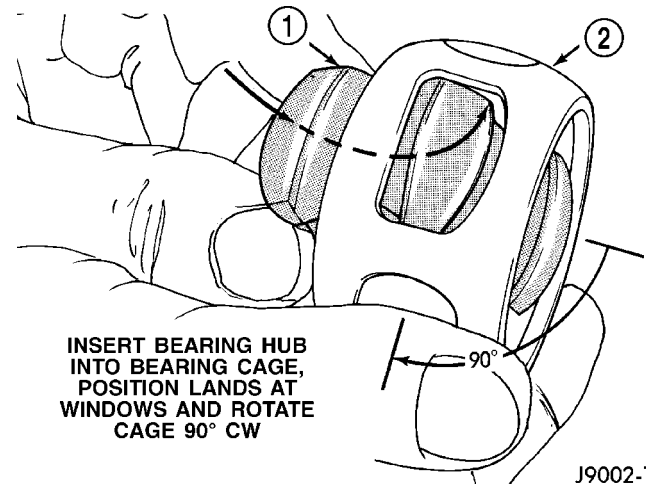
(8) Tilt inner race/hub and cage and install the balls (Fig. 13).

(9) Place new clamps onto new boot and slide boot onto the shaft to its original position.

(10) Apply the rest of grease to the C/V joint and boot.



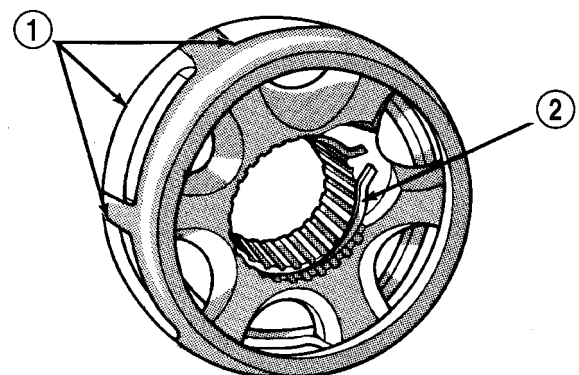
J9002-103

Fig. 9 INNER RACE/HUB

J9002-104

Fig. 10 INNER RACE/HUB

- 1 - INNER RACE/HUB
- 2 - BEARING CAGE



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Fig. 11 CAGE AND INNER RACE/HUB

- 1 - CAGE WINDOWS
- 2 - SNAP RING

CV JOINT-OUTER (Continued)

POSITION CAGE
WINDOWS
BETWEEN BALL
RACES, ROTATE
DOWN AND THEN
TURN 90°

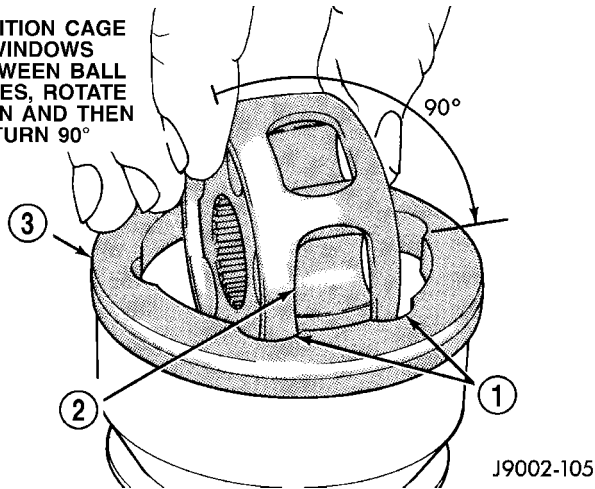


Fig. 12 BEARING CAGE AND HOUSING

- 1 - OUTER RACE
- 2 - BEARING CAGE WINDOW
- 3 - CV JOINT HOUSING

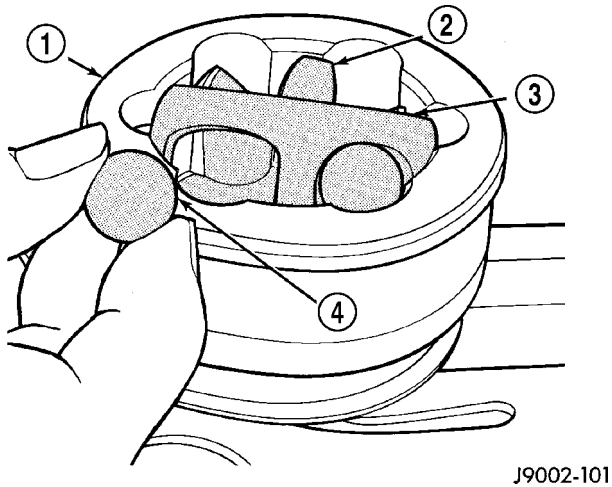


Fig. 13 BALL BEARING

- 1 - C/V HOUSING
- 2 - INNER RACE/HUB
- 3 - BEARING CAGE
- 4 - BEARING

(11) Install the joint onto the shaft. Push the joint onto the shaft until the snap ring seats in the groove (Fig. 14).

NOTE: Pull on the joint to verify the snap ring has engaged.

(12) Position the boot on the joint in its original position.

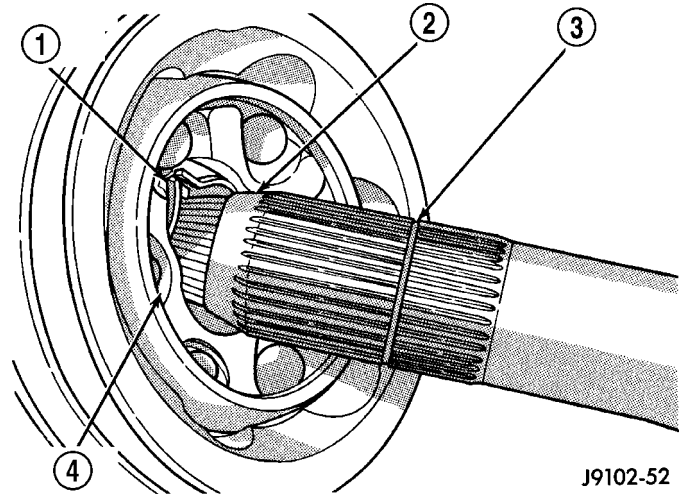


Fig. 14 OUTER C/V JOINT

- 1 - SNAP RING
- 2 - SHAFT TAPER
- 3 - SNAP RING GROOVE
- 4 - BEARING HUB

NOTE: Verify boot is not twisted and remove any excess air.

(13) Secure both boot clamps (Fig. 15) with Clamp Installer C-4975A. Place tool on clamp bridge and tighten tool until jaws of the tool are closed.

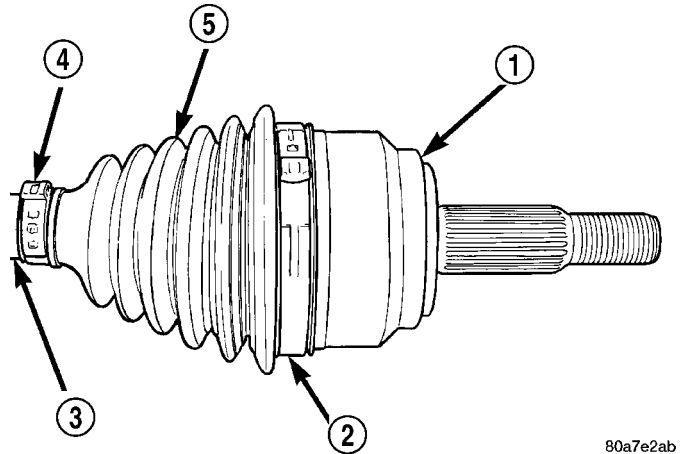


Fig. 15 BOOT CLAMP LOCATIONS

- 1 - C/V HOUSING
- 2 - CLAMP
- 3 - HALF SHAFT
- 4 - CLAMP
- 5 - C/V BOOT

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CV JOINT-INNER

REMOVAL

(1) Clamp shaft in a vise (with soft jaws) and support C/V joint.

(2) Remove clamps with a cut-off wheel or grinder (Fig. 16).

CAUTION: Do not damage C/V housing or half shaft with cut-off wheel or grinder.

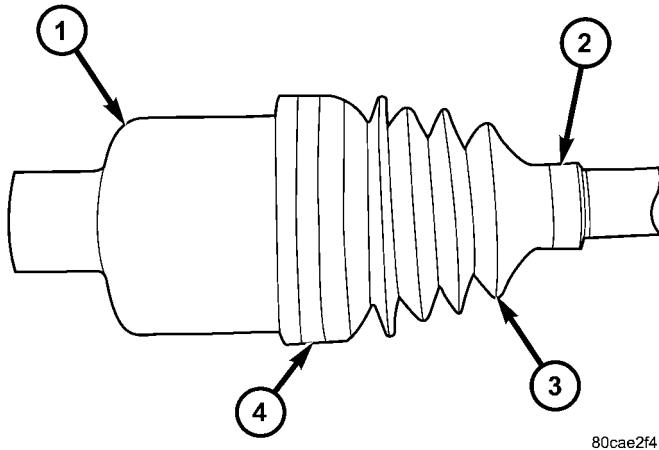


Fig. 16 BOOT CLAMP LOCATION

- 1 - C/V HOUSING
- 2 - CLAMP
- 3 - BOOT
- 4 - CLAMP

(3) Remove housing from the half shaft (Fig. 17) and slide boot down shaft.

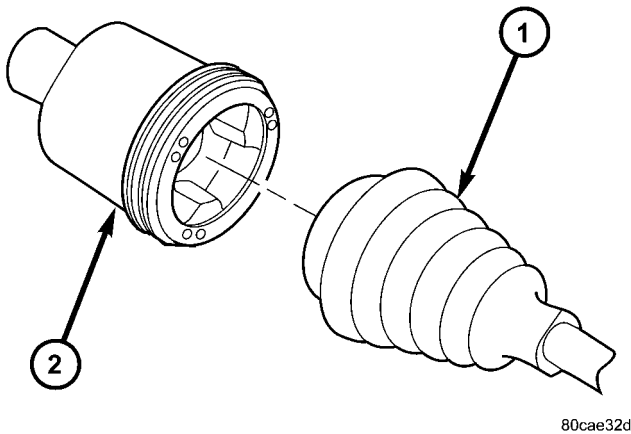


Fig. 17 C/V HOUSING

- 1 - BOOT
- 2 - HOUSING

(4) Remove housing bushing from the housing.
(5) Remove tripod snap ring (Fig. 18).

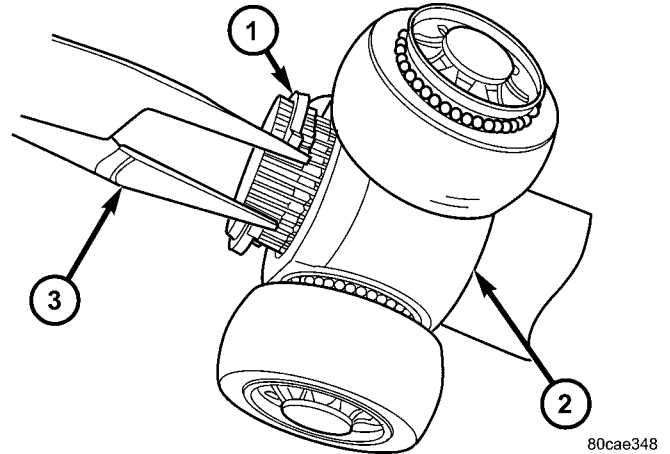


Fig. 18 TRIPOD SNAP RING

- 1 - SNAP RING
- 2 - TRIPOD
- 3 - PLIERS

(6) Remove tripod and boot from the half shaft.

(7) Clean and inspect C/V components for excessive wear and damage. Replace the tripod as a unit only if necessary.

INSTALLATION

(1) Clean all C/V joint components and shaft.

(2) Slide **new** boot down the half shaft.

(3) Install tripod and tripod snap ring on the half shaft (Fig. 19).

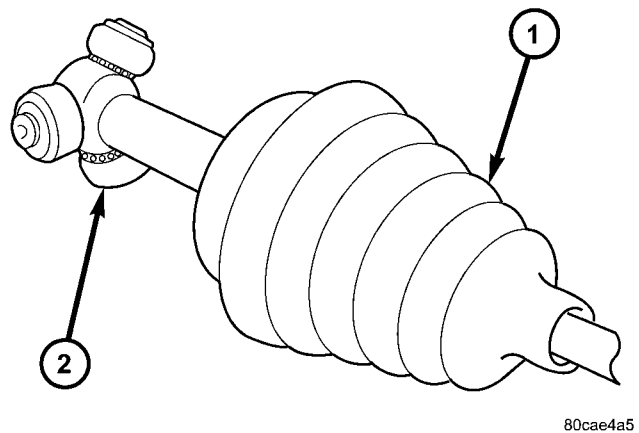


Fig. 19 C/V TRIPOD

- 1 - BOOT
- 2 - TRIPOD

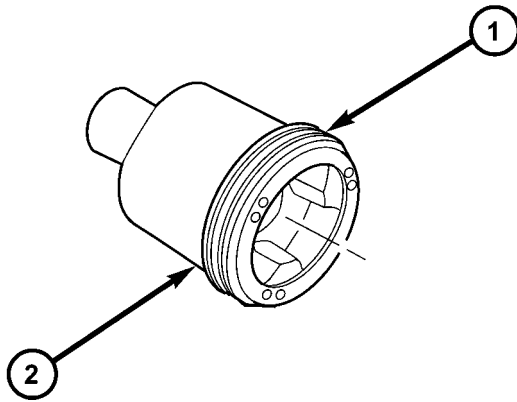
(4) Pack grease supplied with the joint/boot into the housing and boot.

(5) Coat tripod with supplied grease.

(6) Install **new** bushing (Fig. 20) onto the housing.

(7) Insert the tripod and shaft in the housing.

CV JOINT-INNER (Continued)



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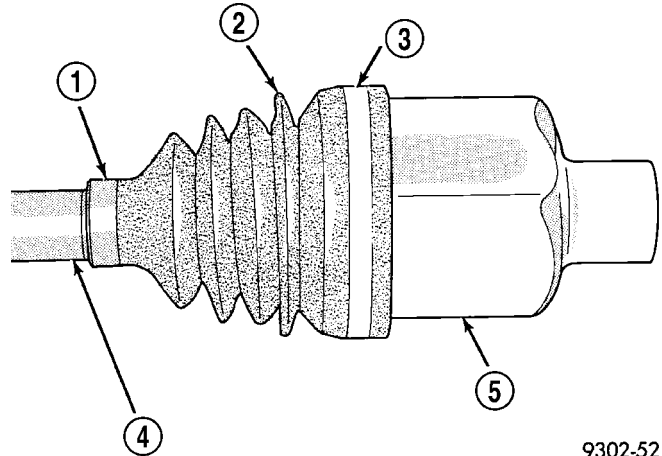
Fig. 20 HOUSING BUSHING

- 1 - BUSHING
- 2 - HOUSING

(8) Position the boot on the joint and shaft in it's original position (Fig. 21).

NOTE: Verify boot is not twisted and remove any excess air.

(9) Measure the distance from the end of the housing to the end of the boot on the shaft. This measurement should be 260 mm (10.25 in.).



9302-52

Fig. 21 INNER C/V BOOT

- 1 - CLAMP
- 2 - BOOT
- 3 - CLAMP
- 4 - SHAFT
- 5 - HOUSING

NOTE: If measurement is not correct, allow more or less air into the boot.

(10) Secure both boot clamps with Clamp Installer C-4975A. Place tool on clamp bridge and tighten tool until the jaws of the tool are closed.

FRONT AXLE - C205F

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FRONT AXLE - C205F

DESCRIPTION

The axle consists of an aluminum center section with an axle tube extending from one side. The tube is pressed into the differential housing. The power is transferred from the axle through two constant velocity (C/V) drive shafts to the wheel hubs. The drive shafts are identical and interchangeable.

OPERATION

The axle receives power from the propeller shaft. The propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differen-

FRONT AXLE - C205F (Continued)

tial bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out of balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front end components or engine/transmission mounts. These components can contribute to what appears to be a rear end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

(Refer to 22 - TIRES/WHEELS - DIAGNOSIS AND TESTING)

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged) can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube. 2. Bent or sprung axle shaft. 3. End-play in pinion bearings. 4. Excessive gear backlash between the ring gear and pinion. 5. Improper adjustment of pinion gear bearings. 6. Loose pinion yoke nut. 7. Scuffed gear tooth contact surfaces.	1. Inspect axle tube alignment. Correct as necessary. 2. Inspect and correct as necessary. 3. Refer to pinion pre-load information and correct as necessary. 4. Check adjustment of the ring gear and pinion backlash. Correct as necessary. 5. Adjust the pinion bearings pre-load. 6. Tighten the pinion yoke nut. 7. Inspect and replace as necessary.

FRONT AXLE - C205F (Continued)

Condition	Possible Causes	Correction
Axle Shaft Broke	1. Misaligned axle tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace the broken shaft after correcting tube mis-alignment. 2. Replace broken shaft and avoid excessive weight on vehicle. 3. Replace broken shaft and avoid or correct erratic clutch operation. 4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly. 2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly. 3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight. 4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Fill differential with the correct fluid type and quantity. 2. Replace scored gears. Fill differential with the correct fluid type and quantity. 3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high. 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn pinion seal. 5. Worn/scored yoke. 6. Axle cover not properly sealed.	1. Drain lubricant to the correct level. 2. Replace seals. 3. Repair as necessary. 4. Replace seal. 5. Replace yoke and seal. 6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low. 2. Improper grade of lubricant. 3. Bearing pre-loads too high. 4. Insufficient ring gear backlash.	1. Fill differential to correct level. 2. Fill differential with the correct fluid type and quantity. 3. Re-adjust bearing pre-loads. 4. Re-adjust ring gear backlash.

FRONT AXLE - C205F (Continued)

Condition	Possible Causes	Correction
Gear Teeth Broke	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavement. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation. 3. Replace gears and examine remaining parts for damage. 4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant. 2. Improper ring gear and pinion adjustment. 3. Unmatched ring gear and pinion. 4. Worn teeth on ring gear and/or pinion. 5. Loose pinion bearings. 6. Loose differential bearings. 7. Mis-aligned or sprung ring gear. 8. Loose differential bearing cap bolts. 9. Housing not machined properly.	1. Fill differential with the correct fluid type and quantity. 2. Check ring gear and pinion contact pattern. 3. Replace gears with a matched ring gear and pinion. 4. Replace ring gear and pinion. 5. Adjust pinion bearing pre-load. 6. Adjust differential bearing pre-load. 7. Measure ring gear run-out. Replace components as necessary. 8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued to the proper specification. 9. Replace housing.

REMOVAL

- (1) Place transmission in neutral.
- (2) Raise and support the vehicle.
- (3) Remove tire and wheel assemblies.
- (4) Remove axle half shafts.
- (5) Remove exhaust crossover.
- (6) Mark front propeller shaft and remove shaft.
- (7) Remove suspension crossmember mounting bolts (Fig. 1) and remove crossmember.
- (8) Support axle with hydraulic jack.
- (9) Remove axle housing pinion mounting bolts (Fig. 2).
- (10) Remove axle shaft tube mounting bolts (Fig. 3).
- (11) Remove differential housing mounting bolts (Fig. 4).
- (12) Lower axle from the vehicle.

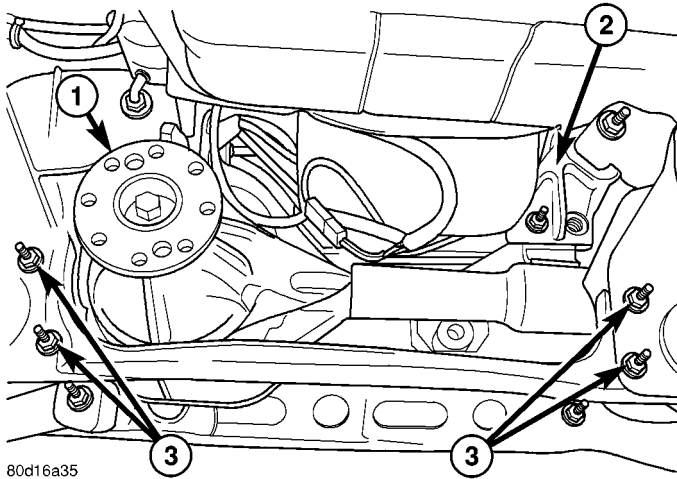
INSTALLATION

- (1) Raise axle into position.
- (2) Install axle mounting bolts and tighten nuts to 95 N·m (70 ft. lbs.).
- (3) Install suspension crossmember and bolts. Tighten crossmember nuts to 102 N·m (75 ft. lbs.).
- (4) Install front propeller shaft with reference marks aligned (Fig. 5) and tighten bolts to 115 N·m (85 ft. lbs.).
- (5) Install exhaust crossover.
- (6) Install axle half shafts.
- (7) Check the differential fluid level and add fluid if necessary.
- (8) Install tire and wheel assemblies.
- (9) Remove support lower the vehicle.

ADJUSTMENTS

Ring gear and pinion are supplied as matched sets only. The identifying numbers for the ring gear and

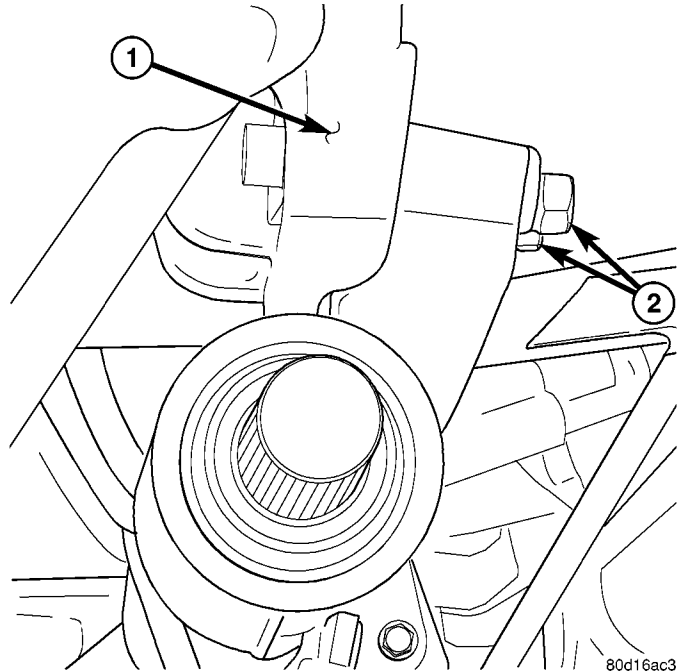
FRONT AXLE - C205F (Continued)



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Fig. 1 SUSPENSION CROSSMEMBER

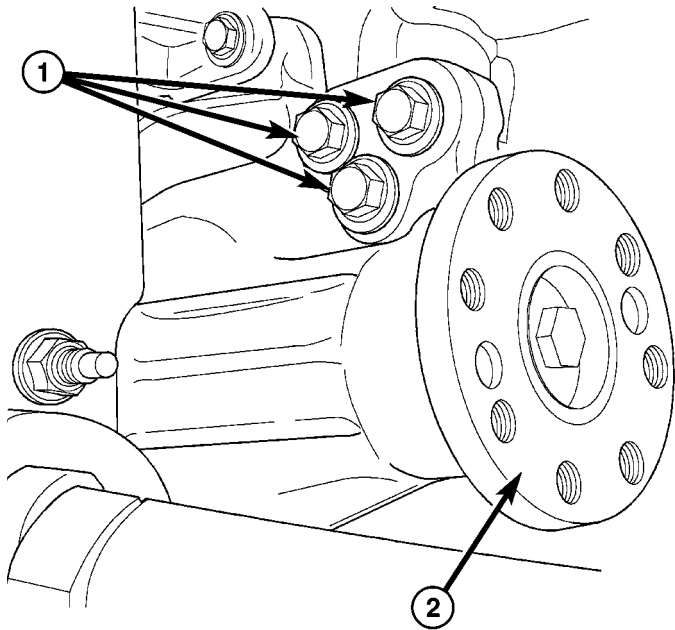
- 1 - PINION FLANGE
- 2 - AXLE TUBE MOUNTING BRACKET
- 3 - CROSSMEMBER BOLTS



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Fig. 3 AXLE TUBE MOUNT

- 1 - MOUNTING BOLTS
- 2 - BOLTS

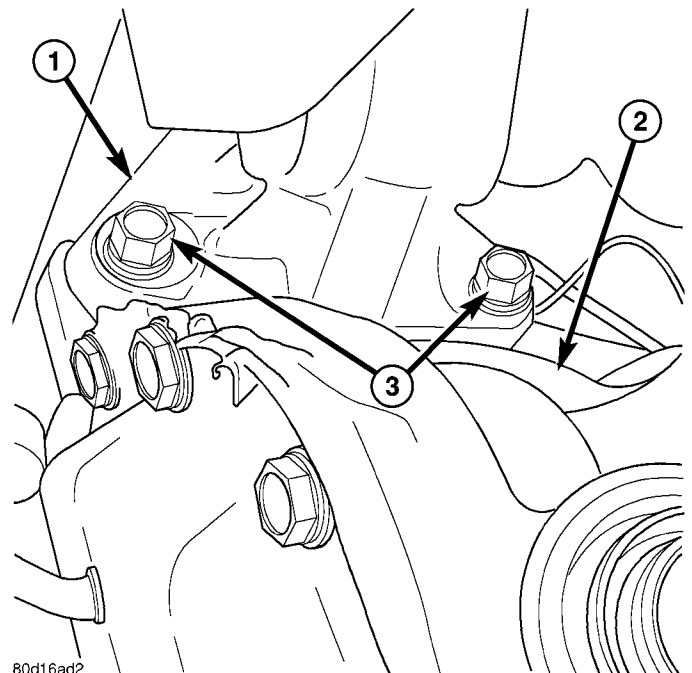


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Fig. 2 HOUSING PINION MOUNTING BOLTS

- 1 - MOUNTING BOLTS
- 2 - PINION FLANGE

pinion are painted onto the pinion gear shaft and the side of the ring gear. A plus (+) number, minus (-) number or zero (0) along with the gear set sequence number (01 to 99) is on each gear. This first number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion marked with a (0). The next two numbers are the sequence number of the gear set. The standard setting from the center line of the ring gear to the back



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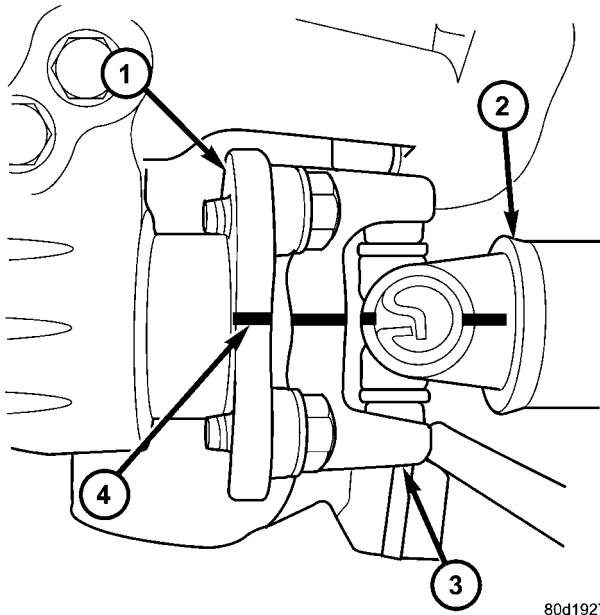
Fig. 4 DIFFERENTIAL MOUNT

- 1 - DIFFERENTIAL MOUNT
- 2 - DIFFERENTIAL HOUSING
- 3 - MOUNTING BOLTS

face of the pinion is 99.690 mm (3.925 in.). The standard depth provides the best teeth contact pattern.

Compensation for pinion depth variance is achieved with select shims. The shims are placed

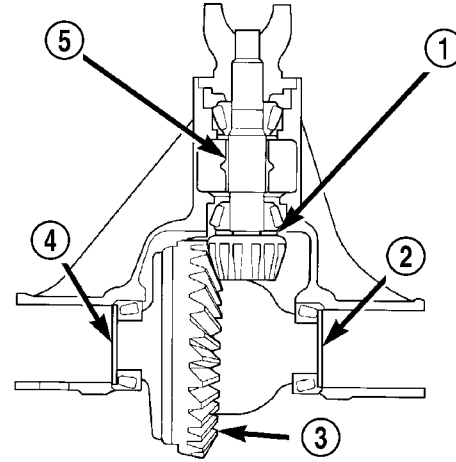
FRONT AXLE - C205F (Continued)

**Fig. 5 COMPANION FLANGE**

- 1 - COMPANION FLANGE
- 2 - PROPELLER SHAFT
- 3 - FLANGE YOKE
- 4 - REFERENCE MARK

between the rear pinion bearing cone and the pinion gear head. (Fig. 6).

If a new gear set is being installed, note the depth variance marked on both the original and replacement pinion. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Pinion Gear

**Fig. 6 ADJUSTMENT SHIM**

- 1 - PINION GEAR DEPTH SHIM
- 2 - DIFFERENTIAL BEARING PRELOAD SHIM
- 3 - RING GEAR
- 4 - DIFFERENTIAL BEARING PRELOAD SHIM
- 5 - COLLAPSIBLE SPACER

Depth Variance charts. Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus amount needed.

Note the painted number on the shaft of the drive pinion (-1, -2, 0, +1, +2, etc.). The numbers represent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shim(s). If the number is positive, subtract that value from the thickness of the depth shim(s). If the number is 0 no change is necessary.

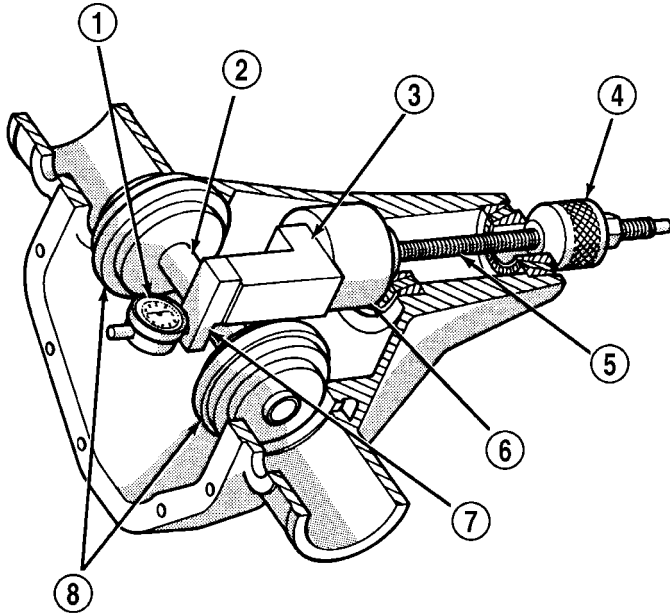
PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	New Pinion Gear Depth Variance								
	-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

FRONT AXLE - C205F (Continued)

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set, Pinion Block 8177, Arbor Discs 8541 and Dial Indicator C-3339 (Fig. 7).



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Fig. 7 PINION GEAR DEPTH GAUGE

- 1 - DIAL INDICATOR
- 2 - ARBOR
- 3 - PINION HEIGHT BLOCK
- 4 - CONE
- 5 - SCREW
- 6 - PINION BLOCK
- 7 - SCOOTER BLOCK
- 8 - ARBOR DISC

(1) Assemble Pinion Height Block 6739, Pinion Block 8177 and rear pinion bearing onto Screw 6741 (Fig. 7).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through the pinion bearing cups (Fig. 8).

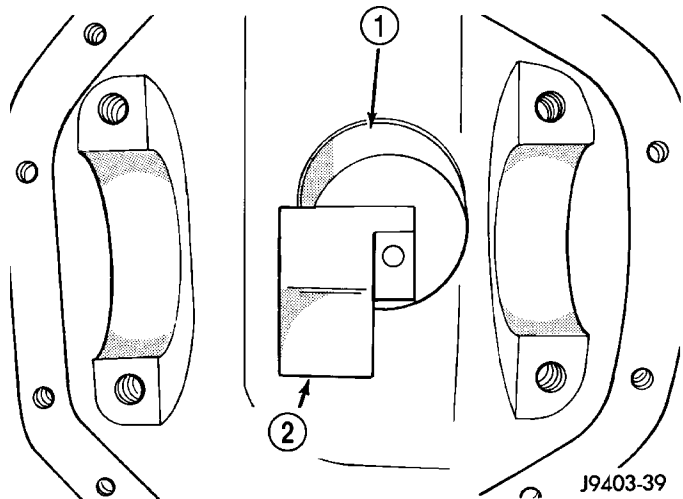
(3) Install front pinion bearing and Cone 6740 onto the screw hand tight (Fig. 7).

(4) Place Arbor Discs 8541 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 9). Install differential bearing caps on arbor discs and tighten cap bolts to specification.

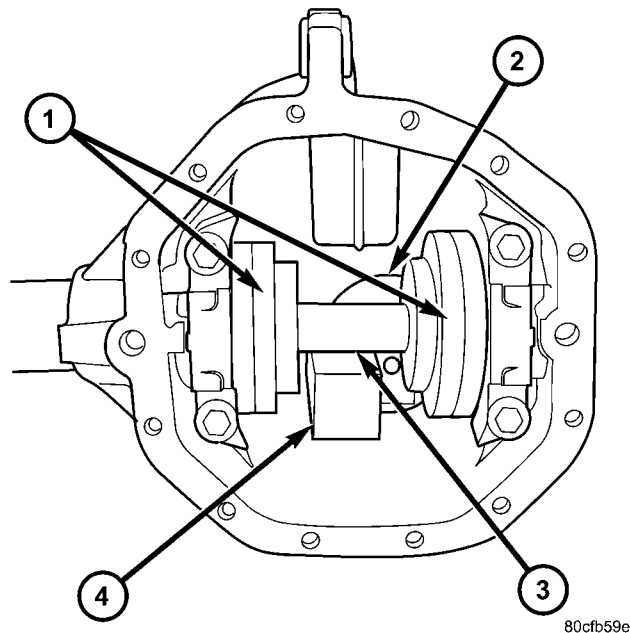
(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Place Scooter Block/Dial Indicator in position in the housing so dial probe and scooter block are flush against the surface of the pinion height block. Hold scooter block in place and zero the dial indicator. Tighten dial indicator face lock screw.

(7) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar

**Fig. 8 PINION HEIGHT BLOCK**

- 1 - PINION BLOCK
- 2 - PINION HEIGHT BLOCK

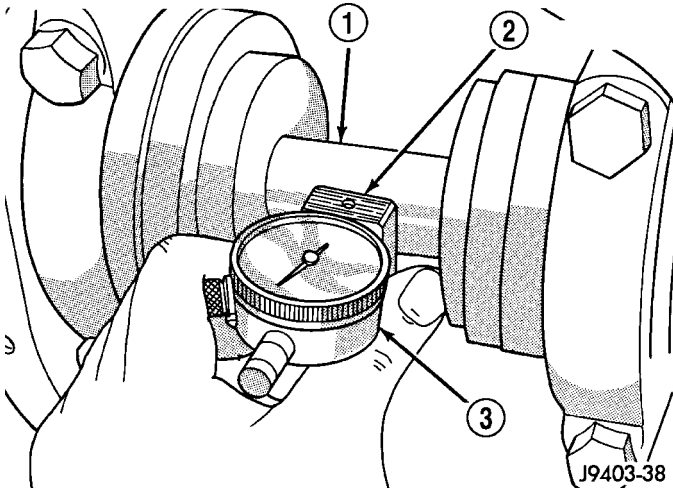
**Fig. 9 PINION GAUGE TOOLS**

- 1 - ARBOR DISC
- 2 - PINION BLOCK
- 3 - ARBOR
- 4 - PINION HEIGHT BLOCK

with the scooter block against the pinion height block (Fig. 10). Slide the dial probe to the crest of the arbor bar and record the highest reading.

(8) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number marked on the shaft of the pinion gear using the opposite sign on the variance number. For example, if the depth variance is -2, add +0.002 in. to the dial indicator reading.

FRONT AXLE - C205F (Continued)

**Fig. 10 PINION GEAR DEPTH MEASUREMENT**

- 1 - ARBOR
- 2 - SCOOTER BLOCK
- 3 - DIAL INDICATOR

(9) Remove the pinion depth gauge components from the housing

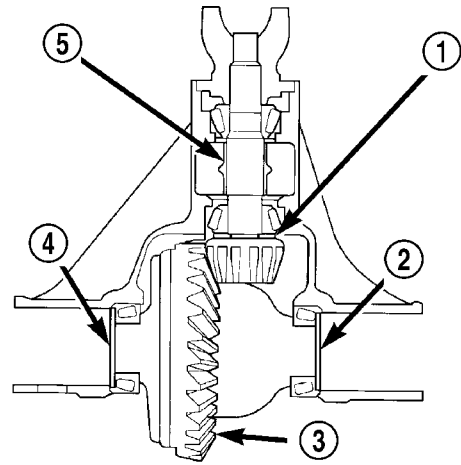
DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

Differential side bearing preload and gear backlash is achieved by selective shims inserted between the bearing cup and the housing. The proper shim thickness can be determined using slip-fit Dummy Bearings 8398 in place of the differential side bearings and a Dial Indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading, starting point shim thicknesses, and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion side of the differential (Fig. 11).

SHIM SELECTION

NOTE: It is difficult to salvage the differential side bearings during the removal procedure. Install replacement bearings if necessary.

- (1) Remove side bearings from differential case.

**Fig. 11 ADJUSTMENT SHIM**

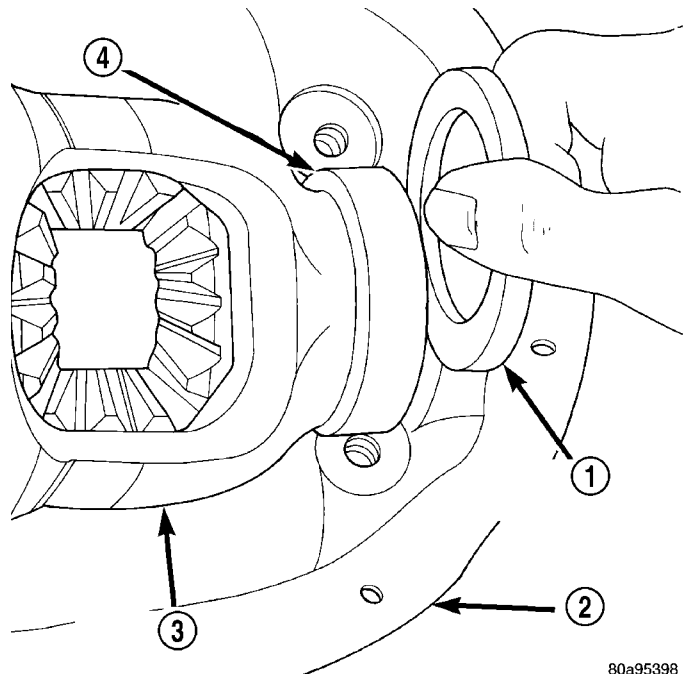
- 1 - PINION GEAR DEPTH SHIM
- 2 - DIFFERENTIAL BEARING PRELOAD SHIM
- 3 - RING GEAR
- 4 - DIFFERENTIAL BEARING PRELOAD SHIM
- 5 - COLLAPSIBLE SPACER

(2) Install ring gear if necessary, on differential case and tighten bolts to specification.

(3) Install Dummy Bearings 8398 on differential case.

(4) Install differential case in the housing.

(5) Insert Dummy Shims 8107 3.0 mm (0.118 in.) starting point shims between both dummy bearings and the housing (Fig. 12).

**Fig. 12 DUMMY SHIM**

- 1 - DUMMY SHIM
- 2 - DIFFERENTIAL HOUSING
- 3 - DIFFERENTIAL CASE
- 4 - DUMMY BEARINGS

FRONT AXLE - C205F (Continued)

(6) Install the marked bearing caps in their correct positions. Install and snug the bolts.

(7) Using a dead-blow hammer to seat the differential dummy bearings to each side of the differential housing (Fig. 13) and (Fig. 14).

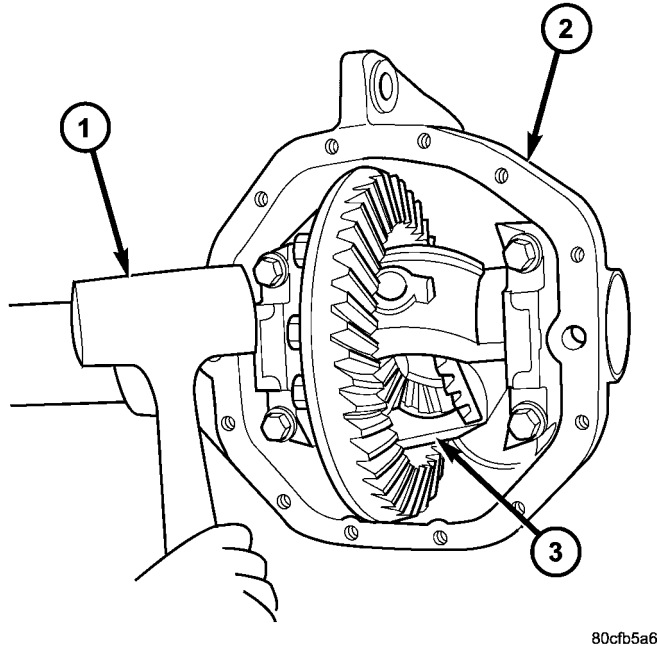


Fig. 13 SEAT PINION GEAR SIDE

- 1 - DEAD-BLOW HAMMER
- 2 - HOUSING
- 3 - PINION GEAR SIDE

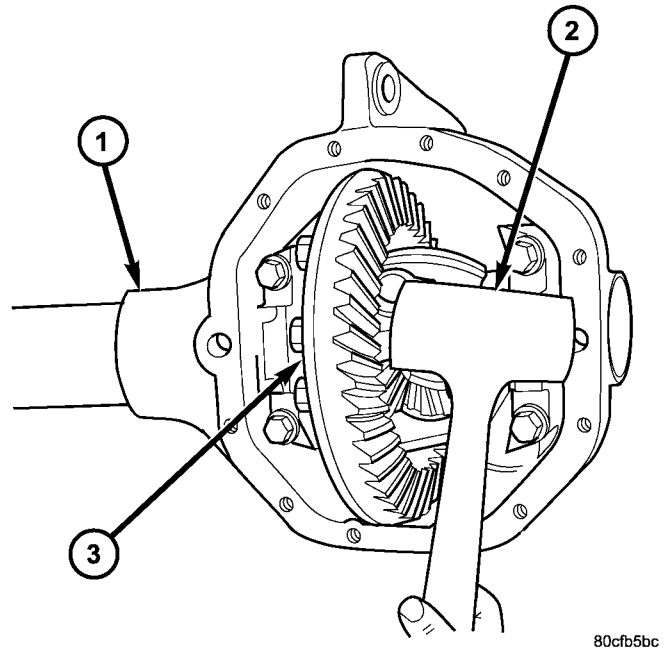


Fig. 14 SEAT RING GEAR SIDE

- 1 - HOUSING
- 2 - DEAD-BLOW HAMMER
- 3 - RING GEAR SIDE

(8) Install Pilot Stud C-3288-B in cover bolt hole below ring gear.

(9) Attach Dial Indicator C-3339 to post and position dial indicator plunger on a flat surface on a ring gear bolt head (Fig. 15).

(10) Push and hold differential to the pinion gear side of the housing (Fig. 16) and zero dial indicator.

(11) Push and hold differential case to the ring gear side and record dial indicator reading (Fig. 17).

(12) Add the dial indicator reading to the starting point shim thicknesses to determine the total shim thickness necessary to achieve zero differential end play.

(13) Add 0.2 mm (0.008 in) to the zero end play total. This new total represents the shims needed to preload the new differential case bearings.

(14) Rotate dial indicator out of the way on pilot stud.

(15) Remove differential case, dummy bearings and dummy shims from the housing.

(16) Install the pinion gear in the housing. Install the companion flange and establish the correct pinion rotating torque.

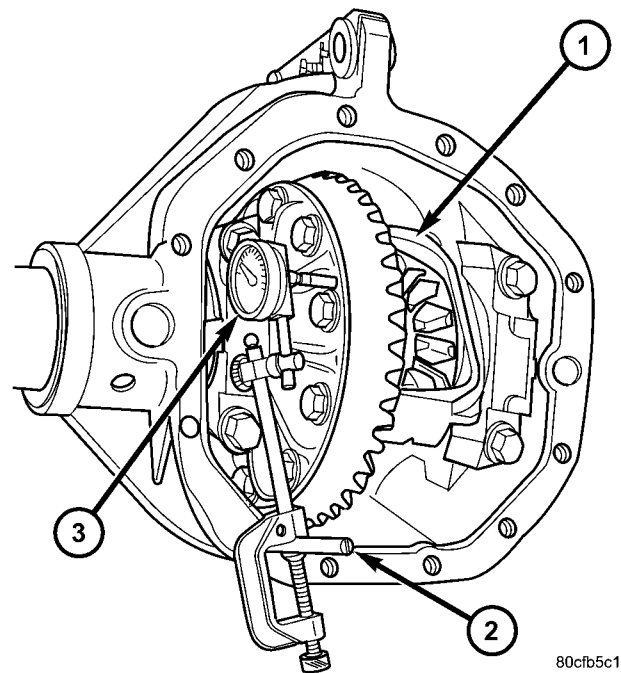
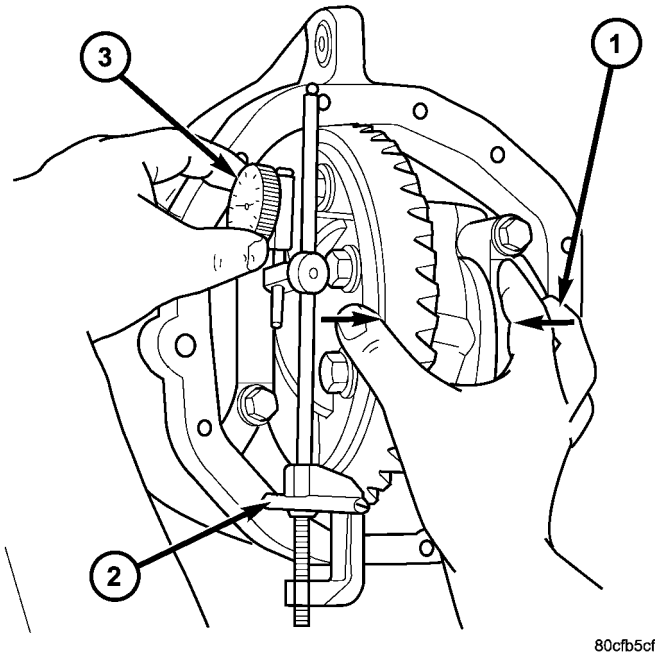


Fig. 15 DIFFERENTIAL SIDE PLAY

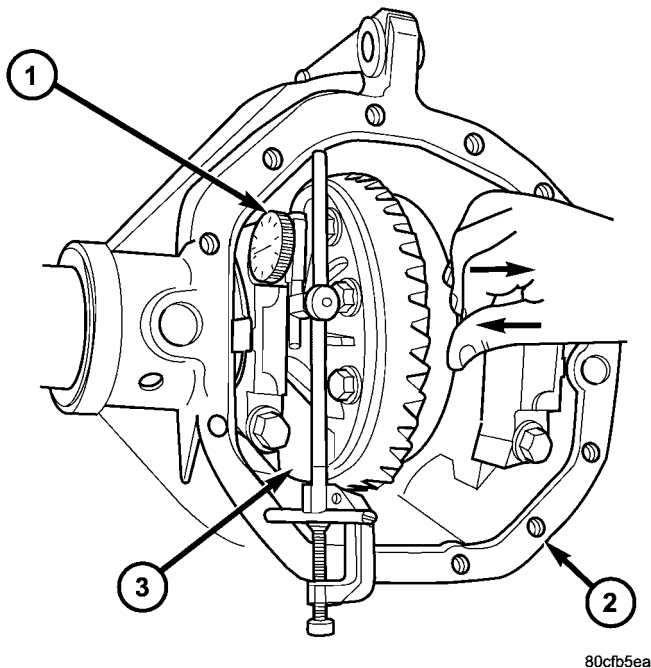
- 1 - DIFFERENTIAL
- 2 - PILOT STUD
- 3 - DIAL INDICATOR
- 4 - HOUSING

(17) Install differential case and Dummy Bearings in the housing with a single dummy shim on the ring gear side of the axle and tighten retaining cap bolts.

FRONT AXLE - C205F (Continued)

**Fig. 16 ZERO DIAL INDICATOR**

- 1 - PINION GEAR SIDE
- 2 - PILOT STUD
- 3 - DIAL INDICATOR

**Fig. 17 RECORD DIAL INDICATOR**

- 1 - DIAL INDICATOR
- 2 - HOUSING
- 3 - RING GEAR SIDE

(18) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 15).

(19) Push and hold differential case toward pinion.

(20) Zero dial indicator face to pointer.

(21) Push and hold differential case to ring gear side of the housing.

(22) Record dial indicator reading.

(23) Subtract 0.05 mm (0.002 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. Add the resulting measurement to the thickness of the single dummy shim. This is the thickness of shim required to achieve proper backlash.

(24) Subtract the backlash shim thickness from the total preload shim thickness. The remainder is the shim thickness required on the pinion side of the housing.

(25) Rotate dial indicator out of the way on pilot stud.

(26) Remove differential case, dummy bearings and dummy shim from the housing.

(27) Install new side bearing cones and cups on differential case.

(28) Install Spreader W-129-B and Adapter Plates 8142-A on the housing and spread open enough to receive differential case.

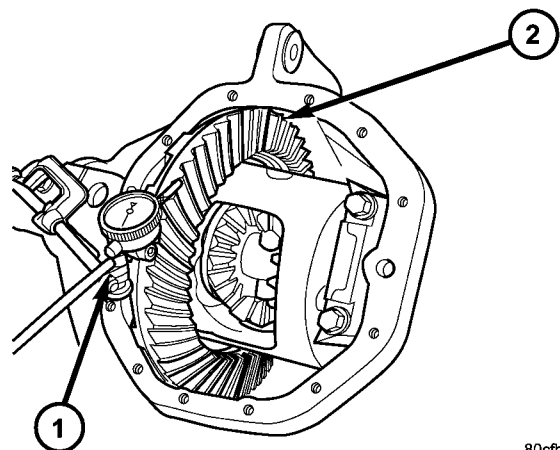
CAUTION: Never spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(29) Place the side bearing shims in the differential housing against the housing shoulder.

(30) Install the differential case in the housing.

(31) Rotate the differential case several times to seat the side bearings.

(32) Position the dial indicator plunger against a ring gear tooth (Fig. 18).

**Fig. 18 RING GEAR BACKLASH**

- 1 - RING GEAR
- 2 - DIAL INDICATOR

(33) Push and hold ring gear upward while not allowing the pinion gear to rotate.

FRONT AXLE - C205F (Continued)

(34) Zero dial indicator face to pointer.

(35) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the differential housing to the other (Fig. 19).

(36) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

After the proper backlash is achieved, perform the Gear Contact Pattern procedure.

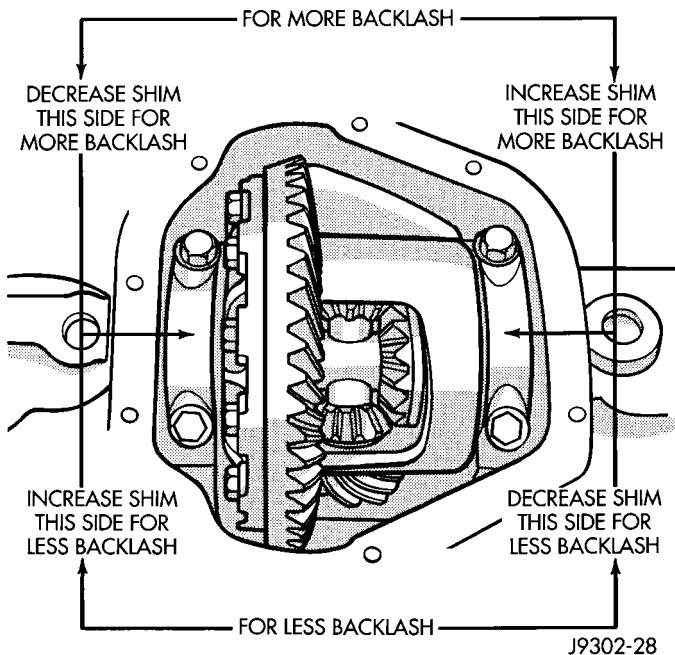


Fig. 19 BACKLASH SHIM ADJUSTMENT

GEAR CONTACT PATTERN

Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shortened gear life.

- (1) Wipe clean each tooth of the ring gear.
- (2) Apply gear marking compound to all of the ring gear teeth.
- (3) Verify bearing cap bolts are torque specification.
- (4) Apply the brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.
- (5) Rotate the pinion/pinion yoke 4 full revolutions in each directions.
- (6) Read gear tooth contact pattern:

- Gear contact pattern correct (Fig. 20). Backlash and pinion depth is correct.

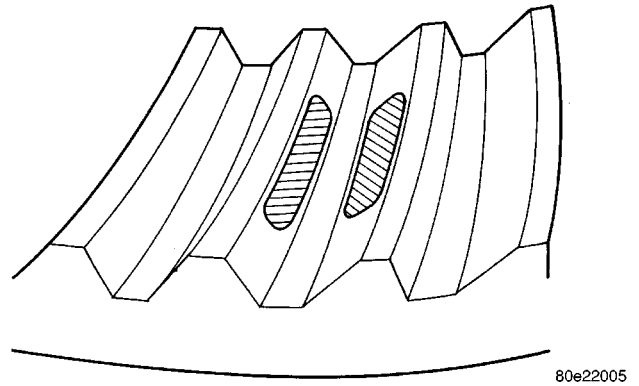


Fig. 20 CORRECT CONTACT PATTERN

- Ring gear too far away from pinion gear (Fig. 21). Decrease backlash by moving the ring closer to the pinion gear.

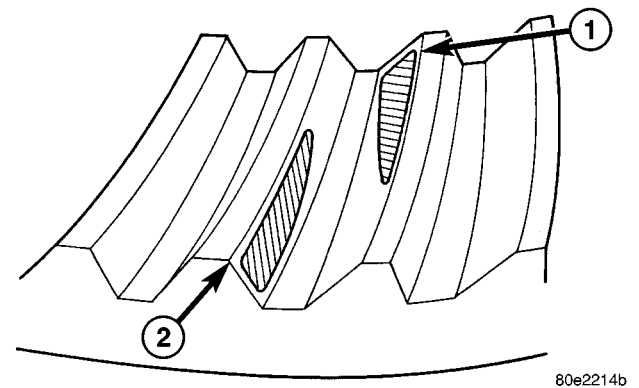


Fig. 21 INCORRECT BACKLASH

- 1 - COAST SIDE TOE
2 - DRIVE SIDE HEEL

- Ring gear too close to pinion gear (Fig. 22). Increase backlash, by moving the ring away from the pinion gear.

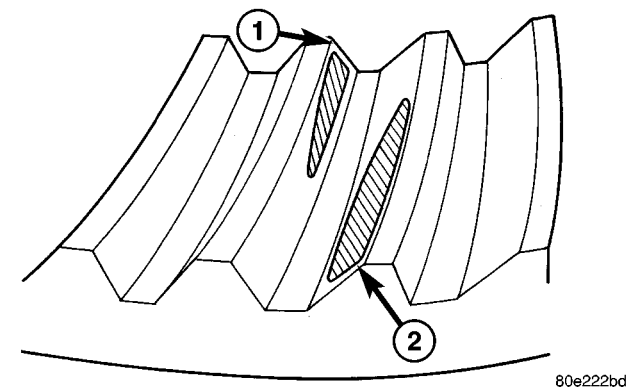
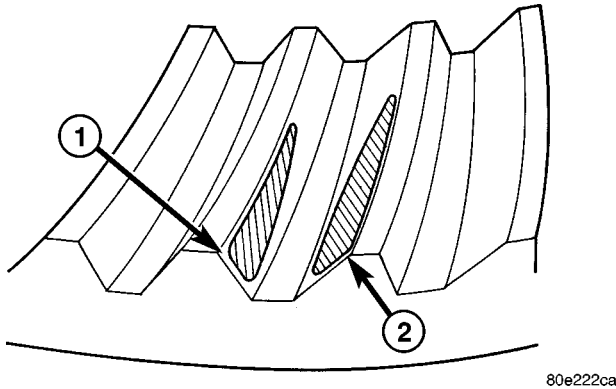


Fig. 22 INCORRECT BACKLASH

- 1 - DRIVE SIDE TOE
2 - COAST SIDE HEEL

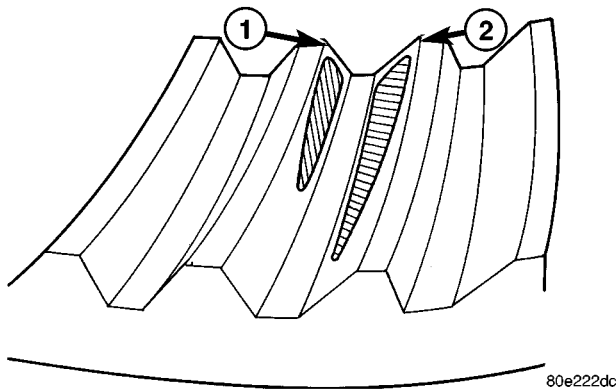
FRONT AXLE - C205F (Continued)

- Ring gear too far away from pinion gear (Fig. 23). Decrease backlash, by moving the ring closer to the pinion gear.

**Fig. 23 INCORRECT BACKLASH**

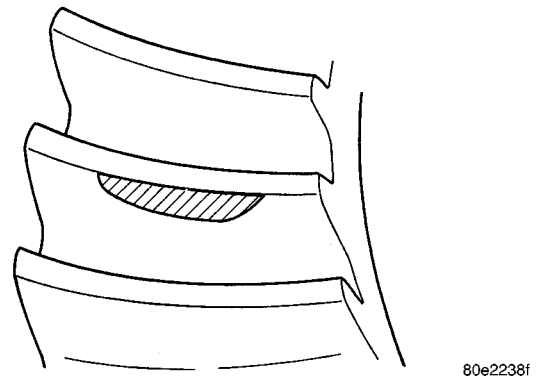
- 1 - DRIVE SIDE HEEL
2 - COAST SIDE HEEL

- Ring gear too close to pinion gear (Fig. 24). Increase backlash, by moving the ring away from the pinion gear.

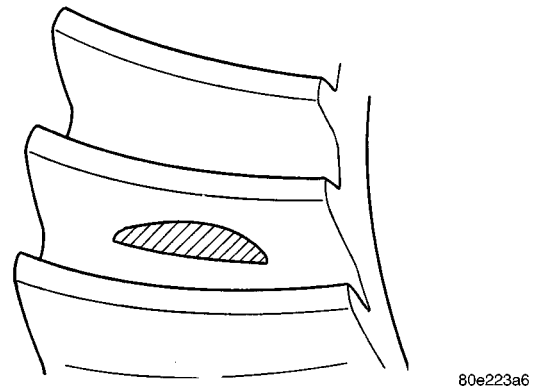
**Fig. 24 INCORRECT BACKLASH**

- 1 - DRIVE SIDE TOE
2 - COAST SIDE TOE

- Pinion gear set too low (Fig. 25). Increase pinion gear height, by increasing the pinion depth shim thickness.

**Fig. 25 LOW PINION HEIGHT**

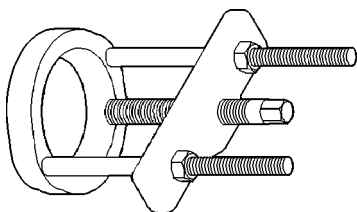
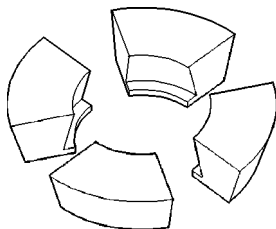
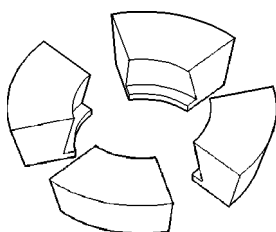
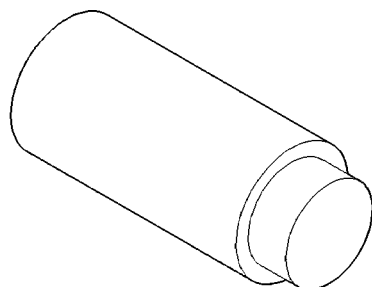
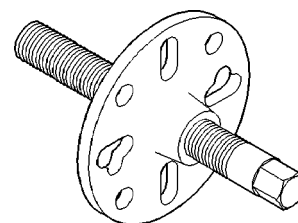
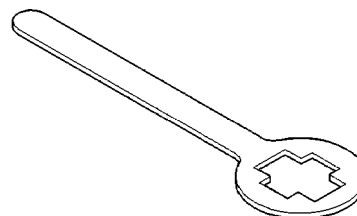
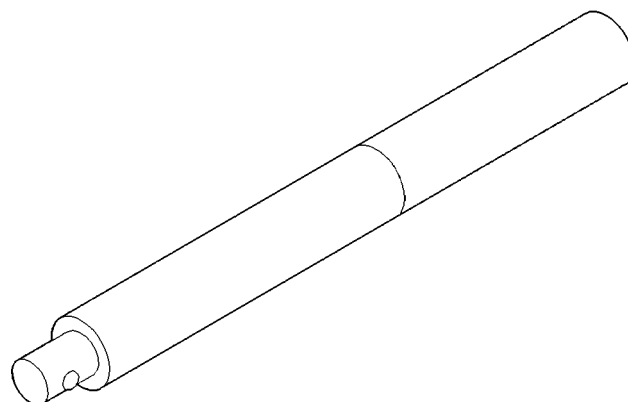
- Pinion gear set too high (Fig. 26). Decrease pinion depth, by decreasing the pinion depth shim thickness.

**Fig. 26 HIGH PINION HEIGHT****SPECIFICATIONS****AXLE SPECIFICATIONS**

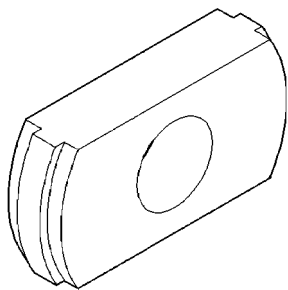
DESCRIPTION	SPECIFICATION
Axle Ratio	3.55, 3.92
Differential Case Flange Runout	0.076 mm (0.003 in.)
Differential Side Gear Clearance	0-0.15 mm (0-0.006 in.)
Ring Gear Diameter	205 mm (8.0 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Ring Gear Runout	0.12 mm (0.005 in.)
Pinion Bearing Preload - New Bearings	2.0-2.8 N·m (18-25 in. lbs.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)

FRONT AXLE - C205F (Continued)**TORQUE SPECIFICATIONS**

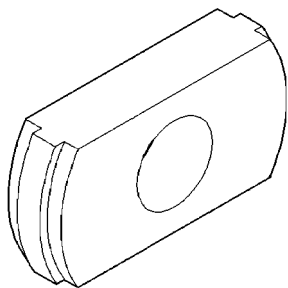
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Mounting Nuts	95	70	-
Differential Fill Hole Plug	34	25	-
Differential Cover Bolts	22	15	-
Bearing Cap Bolts	61	45	-
Ring Gear Bolts	108	80	-
Pinion Nut	271-475	200-350	-

SPECIAL TOOLS**PULLER C-293-PA****ADAPTER C-293-42****ADAPTER C-293-48****PLUG C-293-3****PULLER C-452****HOLDER 6719A****HANDLE C-4171**

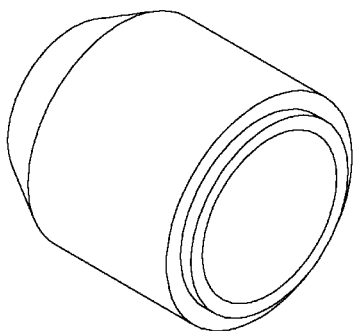
FRONT AXLE - C205F (Continued)



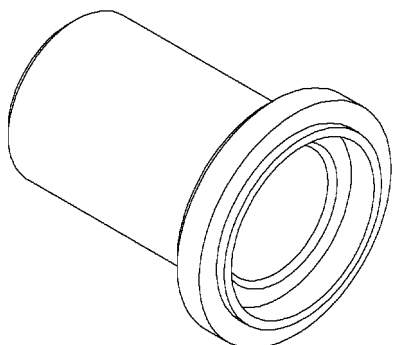
REMOVER 8401



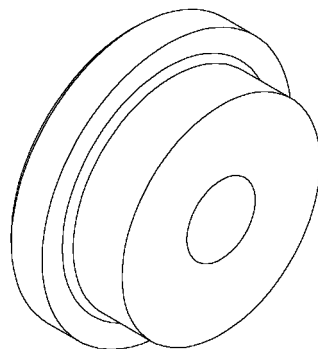
REMOVER 8831



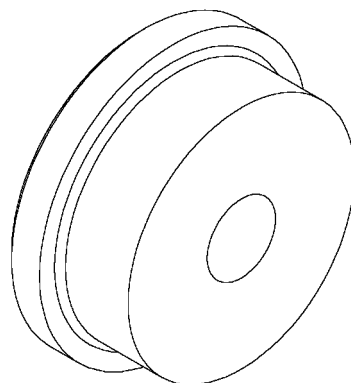
INSTALLER 8695



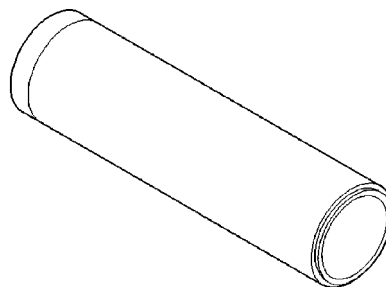
INSTALLER 8694



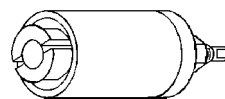
INSTALLER 8693



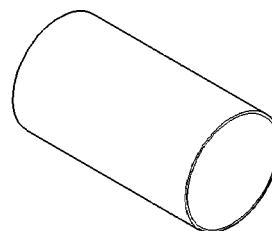
INSTALLER 8692



INSTALLER 6448

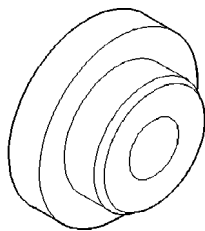


REMOVER C-4660-A

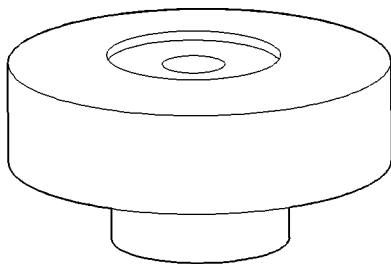


CUP 8150

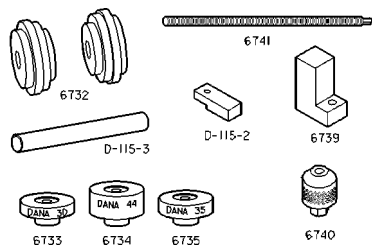
FRONT AXLE - C205F (Continued)



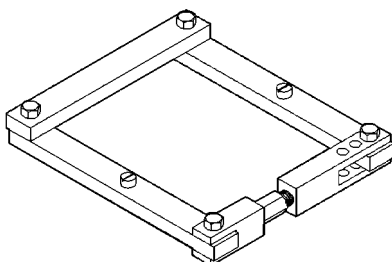
INSTALLER 5063



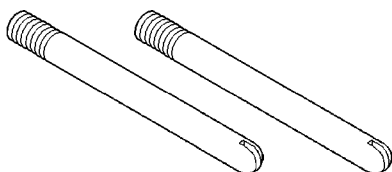
PINION BLOCK 8177



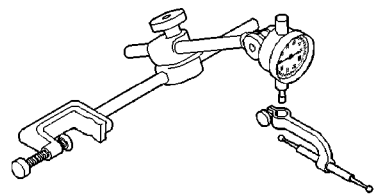
PINION DEPTH SET 6775



SPREADER W-129-B

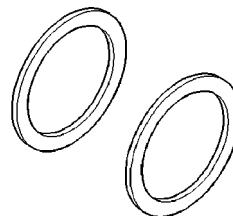


PILOTS C-3288-B

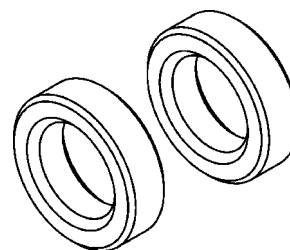


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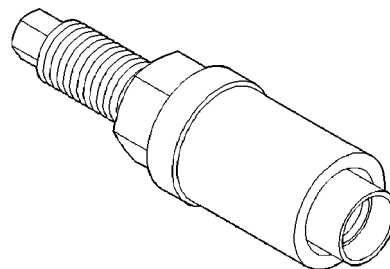
DIAL INDICATOR C-3339



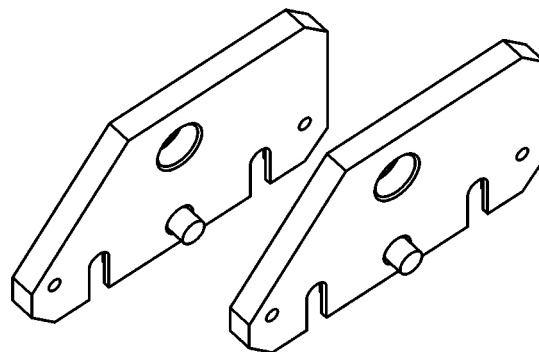
DUMMY SHIM 8107



DUMMY BEARING 8398



INSTALLER C-3718



ADAPTER PLATES 8142A

AXLE SHAFTS

REMOVAL

- (1) Remove half shaft from vehicle.
- (2) Remove skid plate, if equipped.
- (3) Clean axle seal area.
- (4) Remove snap ring from the axle shaft.
- (5) Remove axle with Remove 8420A Collar 8420-3 and Slide Hammer C-3752 (Fig. 27).

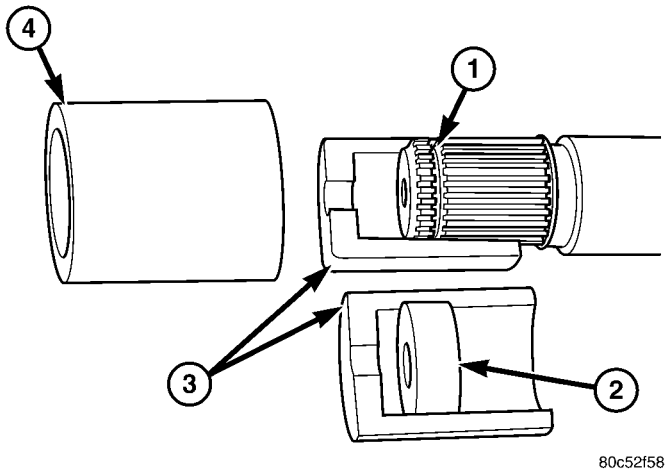


Fig. 27 AXLE SHAFT PULLER

- 1 - SNAP RING GROVE
- 2 - SLID HAMMER THREADS
- 3 - REMOVER BLOCKS
- 4 - REMOVER COLLAR

INSTALLATION

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip.

- (1) Lubricate bearing bore and seal lip with gear lubricant.
- (2) Insert axle shaft through seal, bearing, and engage it into side gear splines. Push firmly on the axle shaft to engage the snap-ring.
- (3) Check the differential fluid level and add fluid if necessary.
- (4) Install skid plate, if necessary.
- (5) Install half shaft.

AXLE SHAFT SEALS

REMOVAL

- (1) Remove half shaft from vehicle.
- (2) Remove skid plate, if equipped.
- (3) Clean axle seal area.
- (4) Remove axle shaft O-ring.
- (5) Remove axle shaft.
- (6) Remove axle shaft seal with a small pry bar.

INSTALLATION

- (1) Clean axle shaft bore clean.
- (2) Install a **new** axle shaft seal with Installer 8694 and Handle C-4171.
- (3) Lubricate seal lip with gear lubricant.
- (4) Insert axle shaft through seal, bearing, and engage it into side gear splines. Push firmly on the axle shaft to engage the snap-ring.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip.

- (5) Install axle shaft O-ring.
- (6) Check the differential fluid level and add fluid if necessary.
- (7) Install skid plate, if necessary.
- (8) Install half shaft.

AXLE BEARINGS

REMOVAL

- (1) Remove half shaft from vehicle.
- (2) Remove skid plate, if equipped.
- (3) Clean axle seal area.
- (4) Remove axle shaft O-ring.
- (5) Remove axle shaft.
- (6) Remove axle shaft seal.
- (7) Install axle shaft bearing Remover C-4660-A in the bearing (Fig. 28). Then tighten the nut to spread the remover in the bearing.

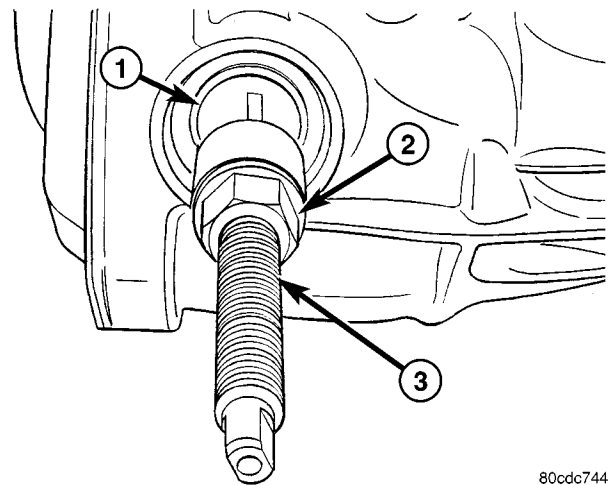
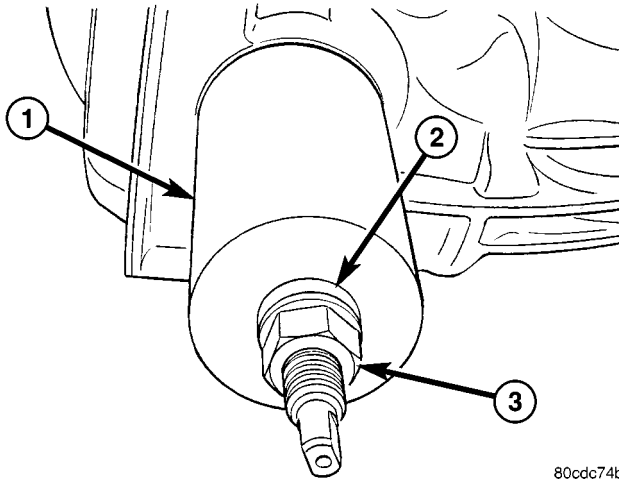


Fig. 28 BEARING REMOVER

- 1 - AXLE BEARING
- 2 - NUT
- 3 - REMOVER

- (8) Install the bearing remove cup, bearing and nut (Fig. 29). Then tighten the nut to draw the bearing out.

AXLE BEARINGS (Continued)



80cdc74b

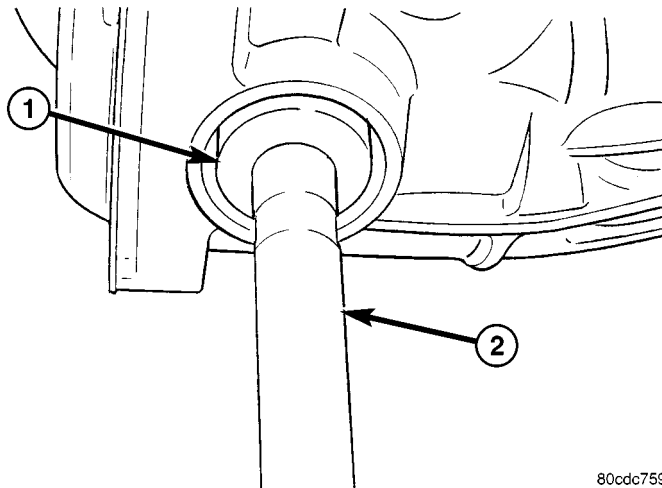
Fig. 29 BEARING REMOVER CUP

- 1 - REMOVER CUP
2 - BEARING
3 - NUT

(9) Inspect the axle shaft tube bore for roughness and burrs. Remove as necessary.

INSTALLATION

- (1) Wipe the axle shaft tube bore clean.
(2) Install axle shaft bearing with Installer 5063 and Handle C-4171 (Fig. 30).



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Fig. 30 BEARING INSTALLER

- 1 - INSTALLER
2 - HANDLE

(3) Install a **new** axle shaft seal with Installer 8694 and Handle C-4171.

(4) Lubricate seal lip with gear lubricant.

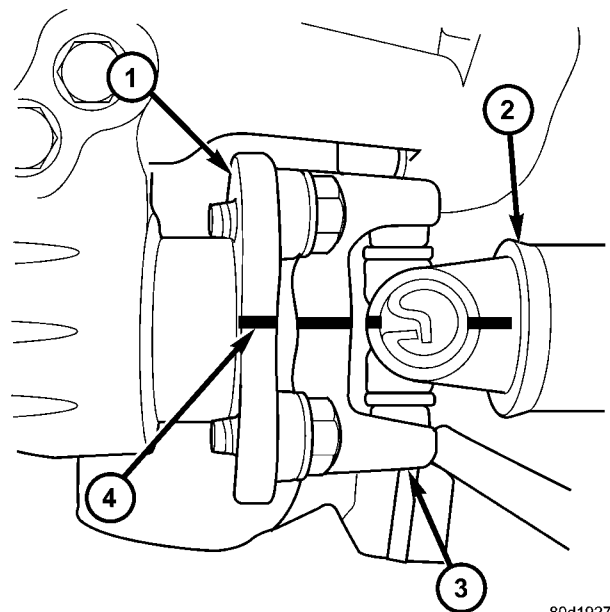
(5) Insert axle shaft through seal, bearing and engage it into side gear splines. Push firmly on the axle shaft to engage the snap-ring.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip.

- (6) Install axle shaft O-ring.
(7) Check the differential fluid level and add fluid if necessary.
(8) Install skid plate, if necessary.
(9) Install half shaft.

PINION SEAL**REMOVAL**

- (1) Remove skid plate, if equipped.
(2) Remove both half shafts.
(3) Mark the propeller shaft and pinion companion flange (Fig. 31) for installation reference.



80d19273

Fig. 31 COMPANION FLANGE

- 1 - COMPANION FLANGE
2 - PROPELLER SHAFT
3 - FLANGE YOKE
4 - REFERENCE MARK

- (4) Remove the front propeller shaft.
(5) Rotate the pinion gear three or four times and verify pinion rotates smoothly.

(6) Record pinion rotating torque with an inch pound torque wrench, for installation reference (Fig. 32).

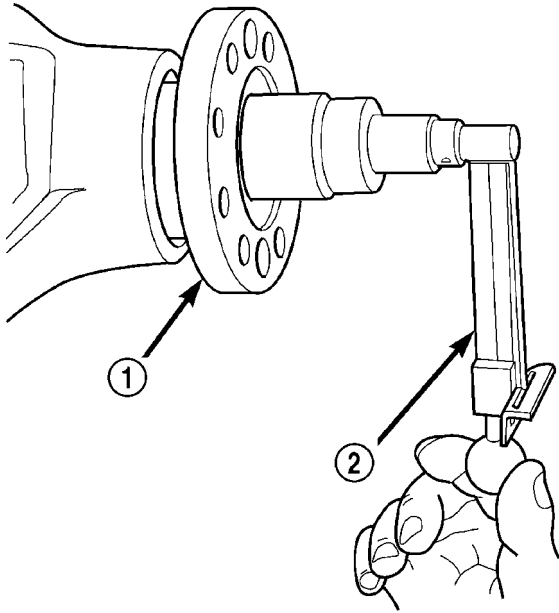
(7) Position Holder 6719 against the companion flange and install a four bolts and washers into the threaded holes and tighten the bolts.

(8) Remove the pinion nut.

(9) Remove the companion flange with Remover C-452 (Fig. 33).

(10) Remove pinion seal with a pry tool or a slide hammer mounted screw.

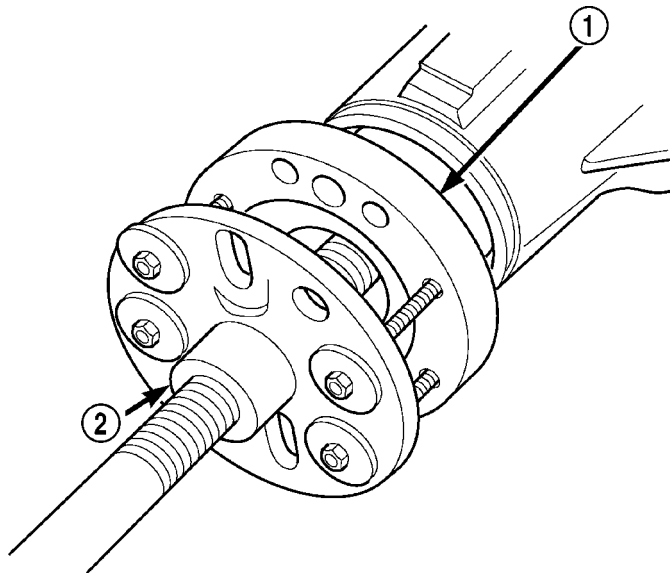
PINION SEAL (Continued)



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Fig. 32 PINION ROTATING TORQUE

- 1 - COMPANION FLANGE
2 - INCH POUND TORQUE WRENCH



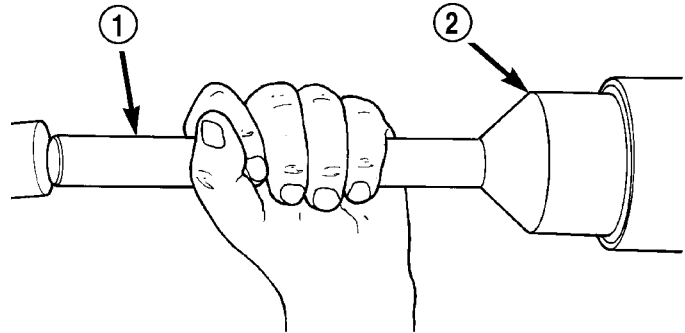
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Fig. 33 COMPANION FLANGE REMOVER

- 1 - COMPANION FLANGE
2 - PULLER TOOL

INSTALLATION

- (1) Apply a light coating of gear lubricant on the lip of pinion seal.
- (2) Install seal with Installer 8695 and Handle C-4171 (Fig. 34).
- (3) Install companion flange onto the pinion with Installer C-3718 and Holder 6719A.



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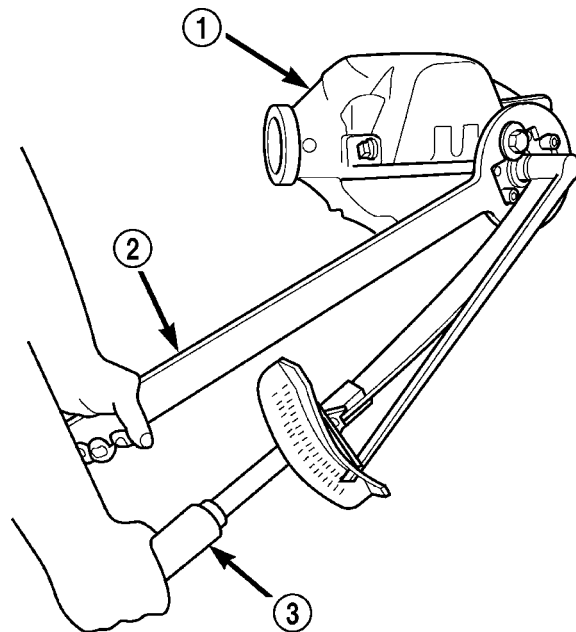
Fig. 34 PINION SEAL INSTALLER

- 1 - HANDLE
2 - INSTALLER

(4) Position holder against the companion flange and install four bolts and washers into the threaded holes. Tighten the bolt and washer so that the holder is held to the flange.

(5) Install a **new** pinion nut onto the pinion shaft and tighten the pinion nut until there is zero bearing end-play (Fig. 35).

CAUTION: Do not exceed 271 N·m (200 ft. lbs.) the minimum tightening torque when installing the companion flange at this point. Damage to the collapsible spacer or bearings may result.



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Fig. 35 COMPANION FLANGE HOLDER

- 1 - DIFFERENTIAL HOUSING
2 - COMPANION FLANGE HOLDER
3 - TORQUE WRENCH

PINION SEAL (Continued)

CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(6) Record pinion rotating torque using an inch pound torque wrench. The rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.) (Fig. 36).

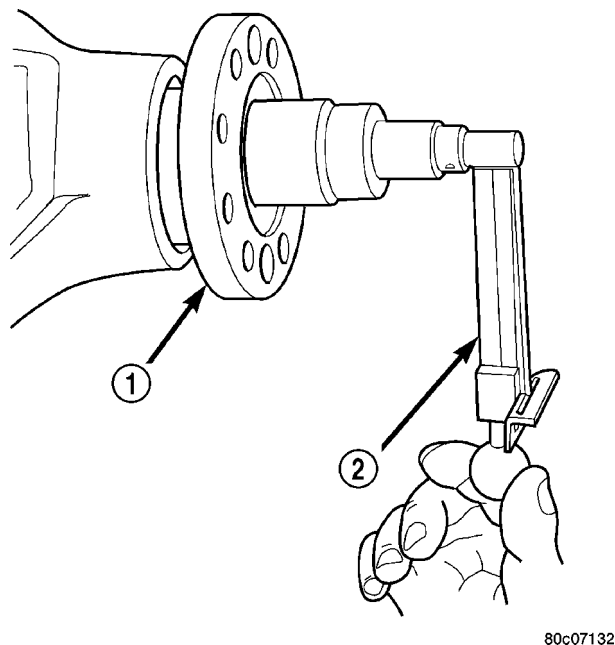


Fig. 36 PINION ROTATION TORQUE

- 1 - COMPANION FLANGE
2 - INCH POUND TORQUE WRENCH

(7) If rotating torque is low, tighten the pinion nut in 6.8 N·m (5 ft. lbs.) increments until the proper rotating torque is achieved.

CAUTION: If maximum tightening torque 475 N·m (350 ft. lbs.) is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

(8) Install propeller shaft with reference marks aligned.

(9) Add gear lubricant to differential housing if necessary.

(10) Install half shafts and skid plate if equipped.

DIFFERENTIAL

DESCRIPTION

The differential case is a one-piece design. The differential pinion shaft is retained with a snap ring. Differential bearing preload and ring gear backlash is adjusted by the use of adjusters. The adjusters are between the differential bearings and the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The stamped steel cover provides a means for inspection and servicing the differential.

OPERATION

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 37).

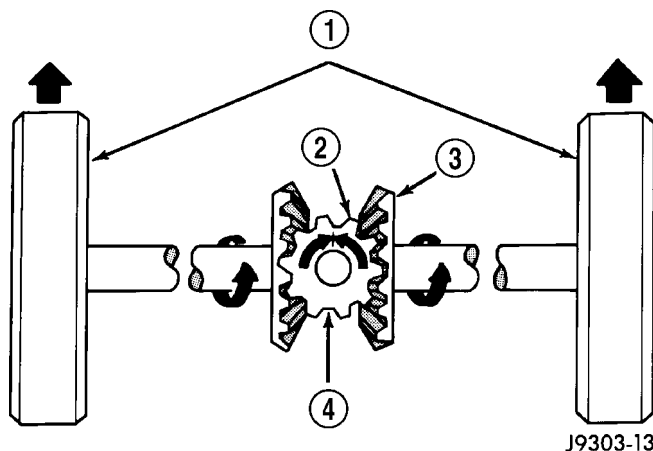


Fig. 37 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

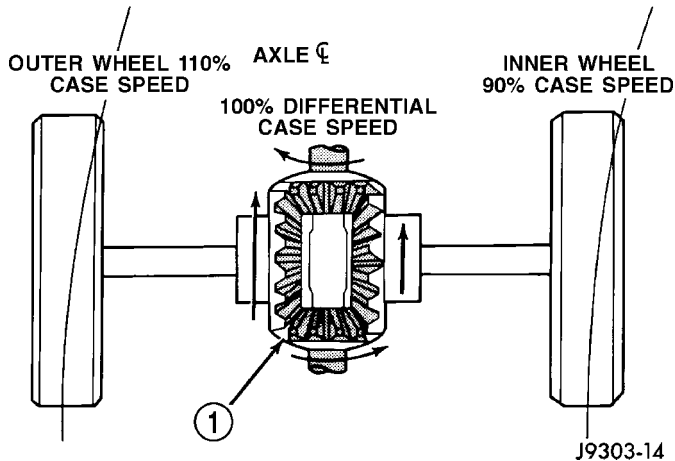
- 1 - IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 38). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

REMOVAL

(1) Remove differential housing cover and drain fluid.

DIFFERENTIAL (Continued)

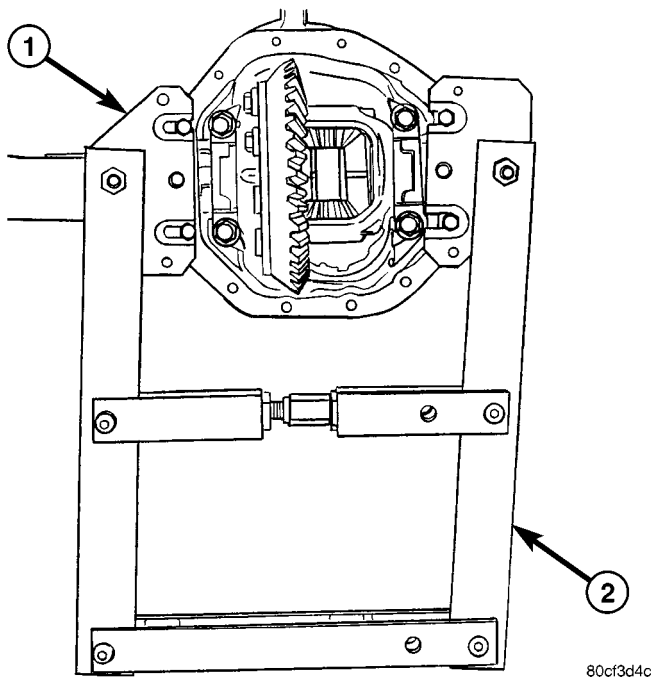
**Fig. 38 DIFFERENTIAL-ON TURNS**

1 - PINION GEARS ROTATE ON PINION SHAFT

- (2) Remove axle shafts.
- (3) Loosen bearing cap bolts.

NOTE: Differential bearing cap reference numbers are stamped on caps and machined flat on the housing. If reference numbers cannot be found, make new marks for later reference.

- (4) Install Adapter Plates 8142-A onto the housing.
- (5) Install Spreader W-129-B onto the adapter plates (Fig. 39) and tighten the turnbuckle finger-tight.

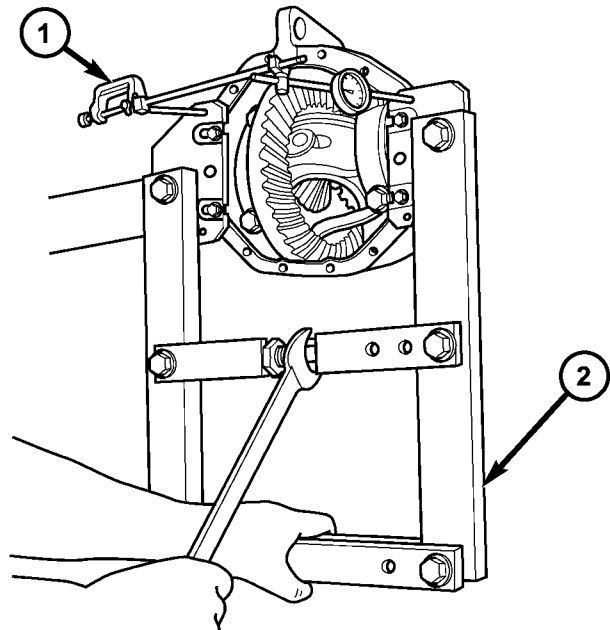
**Fig. 39 ADAPTER PLATES AND SPREADER**

1 - ADAPTER PLATE
2 - SPREADER

- (6) Install a Pilot Stud L-4438 at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing and zero the indicator.

- (7) Spread the housing to remove the differential case from the housing (Fig. 40). Measure the distance with the dial indicator.

CAUTION: Never spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

**Fig. 40 DIAL INDICATOR LOCATION**

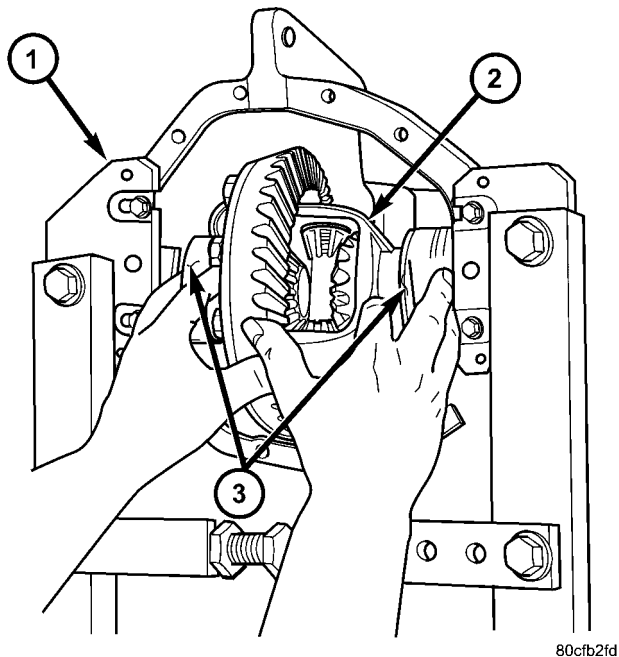
1 - DIAL INDICATOR
2 - SPREADER

- (8) Remove dial indicator.
- (9) While holding the differential case in position, remove bearing cap bolts and caps.
- (10) Remove differential from the housing (Fig. 41). Ensure differential bearing cups and shims remain in position on the differential bearings.
- (11) Tag differential bearing cups and shims to indicate their location.
- (12) Remove spreader from housing.

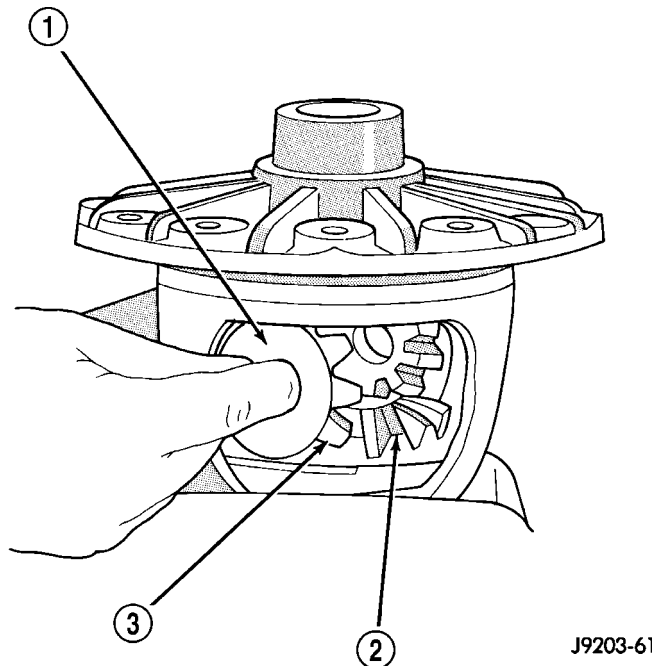
DISASSEMBLY

- (1) Remove ring gear.
- (2) Remove roll-pin holding mate shaft in housing.
- (3) Remove pinion gear mate shaft.
- (4) Rotate differential side gears and remove the pinion mate gears and thrust washers (Fig. 42).
- (5) Remove the differential side gears and thrust washers.

DIFFERENTIAL (Continued)

**Fig. 41 DIFFERENTIAL**

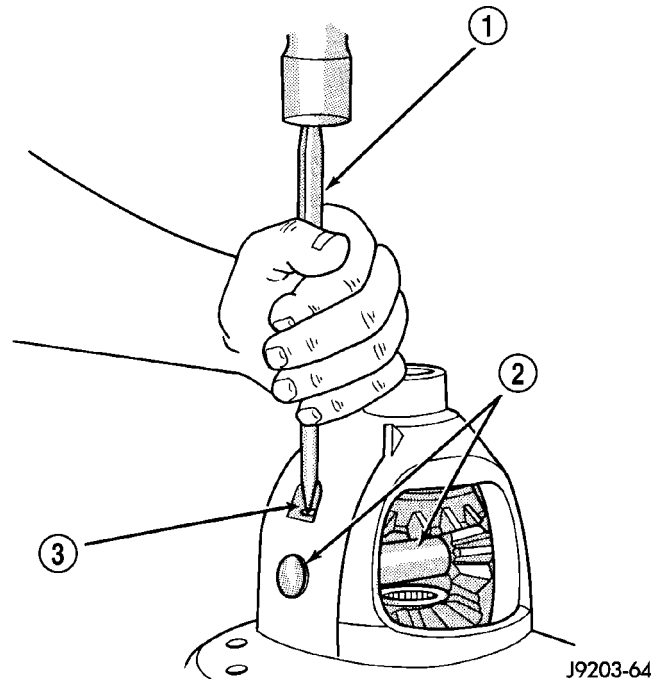
- 1 - HOUSING
- 2 - DIFFERENTIAL
- 3 - BEARING CUPS

**Fig. 42 PINION MATE GEAR**

- 1 - THRUST WASHER
- 2 - SIDE GEAR
- 3 - PINION MATE GEAR

ASSEMBLY

- (1) Install differential side gears and thrust washers.
- (2) Install pinion mate gears and thrust washers.
- (3) Install pinion gear mate shaft.
- (4) Align the hole in the pinion gear mate shaft with the hole in the differential case.
- (5) Install the roll-pin in the differential case a punch and hammer (Fig. 43). Peen the edge of the roll-pin hole in the differential case in two places 180° apart.
- (6) Lubricate all differential components with hypoid gear lubricant.
- (7) Install ring gear.

**Fig. 43 PINION MATE SHAFT ROLL-PIN**

- 1 - PUNCH
- 2 - PINION MATE SHAFT
- 3 - MATE SHAFT LOCKPIN

INSTALLATION

NOTE: If replacement differential bearings or differential case are replaced, Refer to adjustments for Differential Bearing Preload and Gear Backlash procedures.

- (1) Install Spreader W-129-B with the Adapter Plates 8142-A and install the safety holddown clamps. Tighten the tool turnbuckle finger-tight.
- (2) Install a Pilot Stud L-4438 at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load indicator plunger against the opposite side of the housing and zero the indicator.

DIFFERENTIAL (Continued)

(3) Spread housing and measure the distance with the dial indicator.

CAUTION: Never spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(4) Remove dial indicator.

(5) Install differential case in the housing. Ensure differential bearing cups remain in position on the bearings and the differential preload shims are seated in the housing. Tap differential case to ensure bearings cups are seated in the housing.

(6) Install bearing caps to their original locations and loosely install cap bolts.

(7) Remove housing spreader.

(8) Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.).

(9) Install axle shafts.

(10) Apply a bead of red Mopar Silicone Sealant or equivalent to the housing cover.

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

(11) Install cover and tighten bolts in a criss-cross pattern to 22 N·m (15 ft. lbs.).

(12) Fill differential with lubricant.

DIFFERENTIAL CASE BEARINGS

REMOVAL

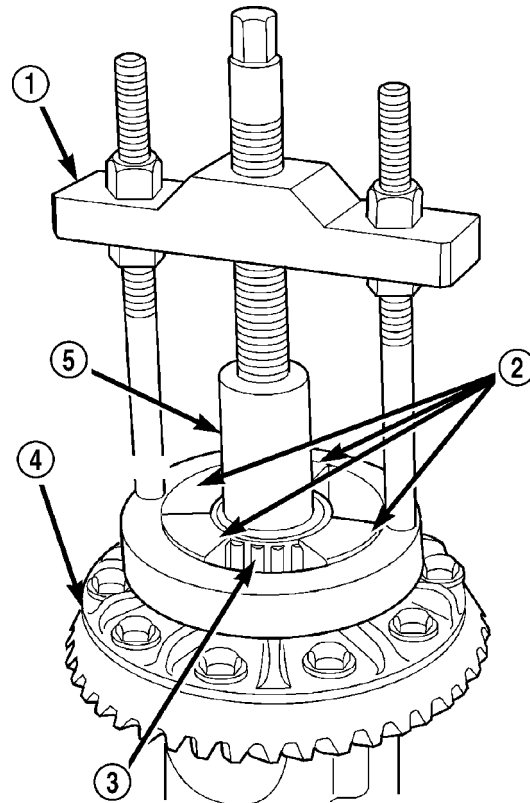
(1) Remove differential from housing.

(2) Remove bearings from the differential case with Puller/Press C-293-PA, Adapters C-293-48 and Plug C-293-3 (Fig. 44).

INSTALLATION

(1) Install differential case bearings with Installer C-3716-A and Handle C-4171 (Fig. 45).

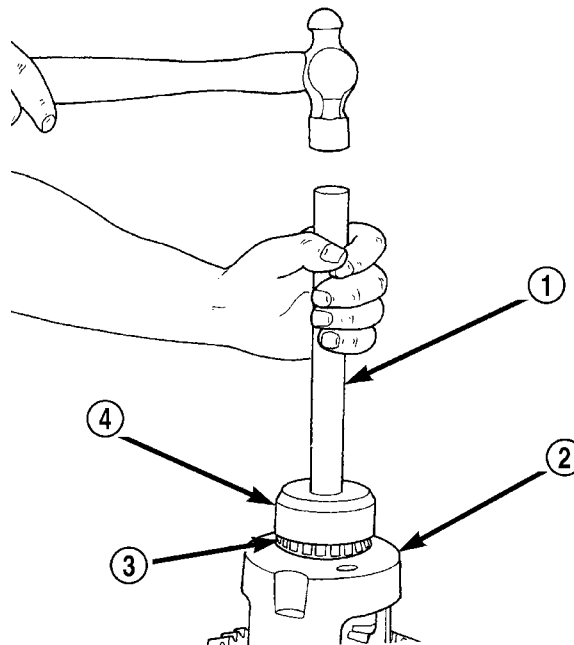
(2) Install differential into the housing.



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Fig. 44 DIFFERENTIAL CASE BEARING PULLER

- 1 - PULLER
- 2 - ADAPTERS
- 3 - BEARING
- 4 - DIFFERENTIAL
- 5 - PLUG



80a9539a

Fig. 45 DIFFERENTIAL CASE BEARINGS

- 1 - HANDLE
- 2 - DIFFERENTIAL
- 3 - BEARING
- 4 - INSTALLER

PINION GEAR/RING GEAR

REMOVAL

NOTE: The ring gear and pinion are serviced in a matched set. Never replace one without replacing the other.

- (1) Remove differential from housing.
- (2) Place differential case in a vise with soft jaw (Fig. 46).
- (3) Remove bolts holding ring gear to differential case.
- (4) Drive ring gear from differential case with a soft hammer (Fig. 46).

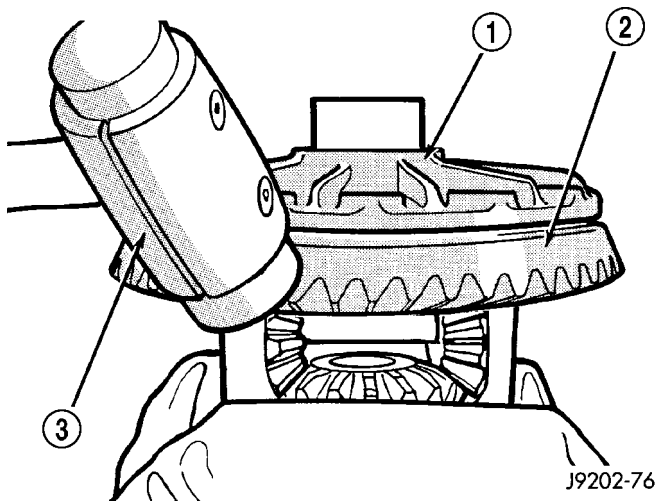


Fig. 46 RING GEAR

- 1 - DIFFERENTIAL CASE
- 2 - RING GEAR
- 3 - RAWHIDE HAMMER

- (5) Mark the companion yoke and companion flange for installation reference.

- (6) Remove companion flange bolts and tie the propeller shaft to the vehicle underbody.

- (7) Rotate companion flange three or four times and verify flange rotates smoothly.

- (8) Record pinion rotating torque an inch pound torque wrench for installation reference (Fig. 47).

- (9) Install bolts into two of the threaded holes in the companion flange 180° apart.

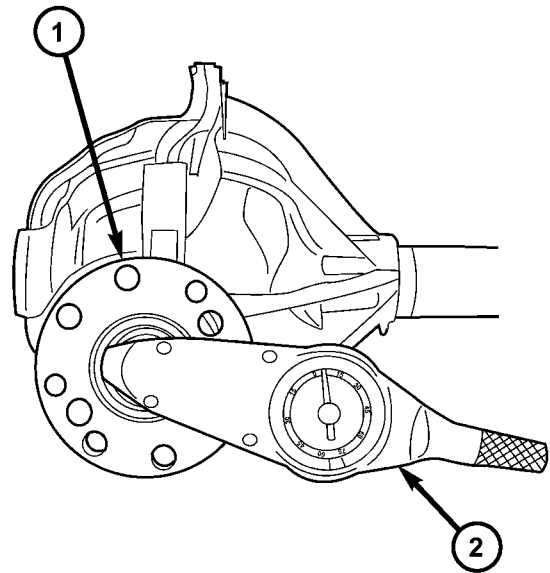
- (10) Position Holder 6719 against the companion flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so that the Holder 6719 is held to the flange.

- (11) Remove the pinion nut.

- (12) Remove the companion flange with Remover C-452 (Fig. 48).

- (13) Remove pinion from differential housing.

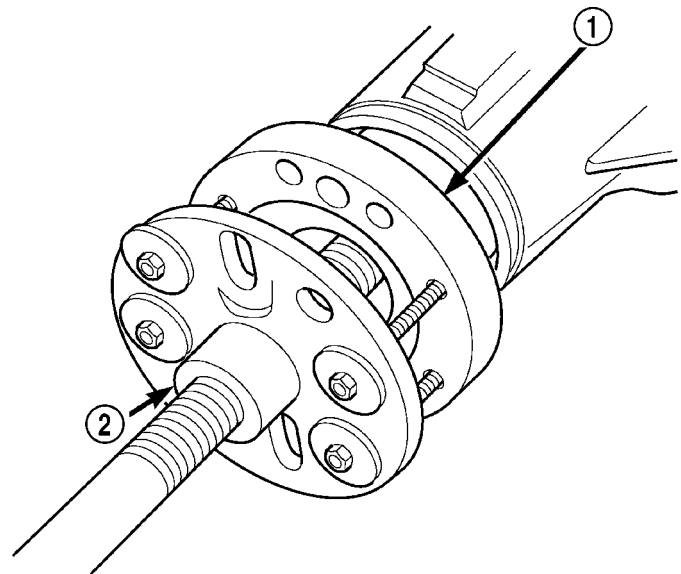
- (14) Remove pinion seal with a pry tool or a slide hammer mounted screw.



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Fig. 47 PINION ROTATING TORQUE

- 1 - PINION COMPANION FLANGE
- 2 - TORQUE WRENCH



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Fig. 48 COMPANION FLANGE REMOVER

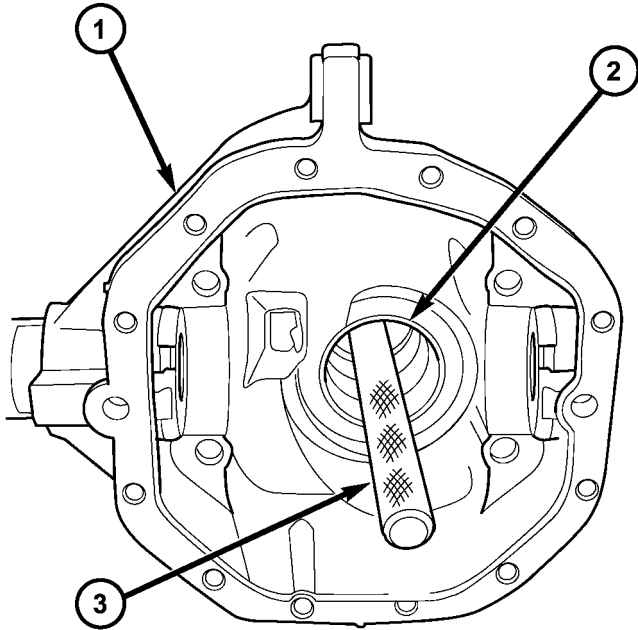
- 1 - COMPANION FLANGE
- 2 - PULLER TOOL

- (15) Remove oil slinger, if equipped and front pinion bearing.

- (16) Remove front pinion bearing cup with Remover 8831 and Handle C-4171 (Fig. 49).

- (17) Remove rear pinion bearing cup from housing (Fig. 50) with Remover 8401 and Handle C-4171.

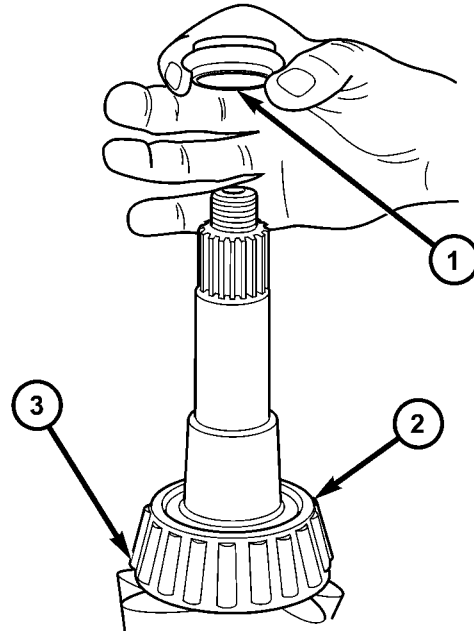
PINION GEAR/RING GEAR (Continued)



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Fig. 49 FRONT PINION BEARING CUP

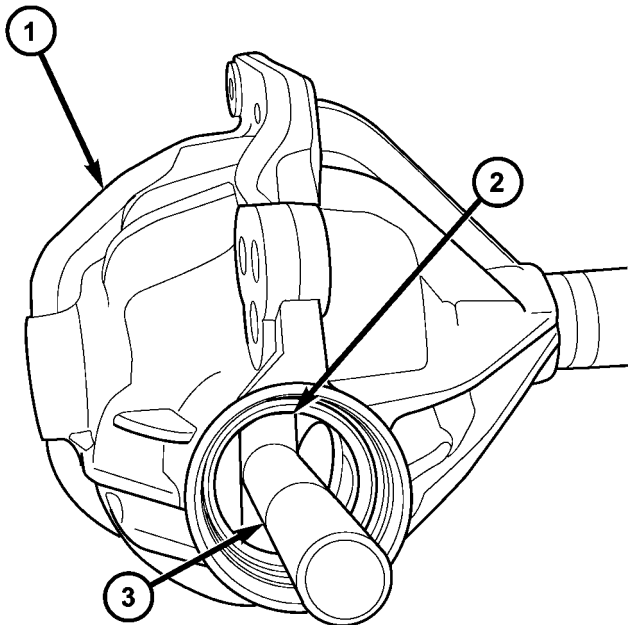
- 1 - HOUSING
- 2 - REMOVER
- 3 - HANDLE



80cfe262

Fig. 51 COLLAPSIBLE SPACER

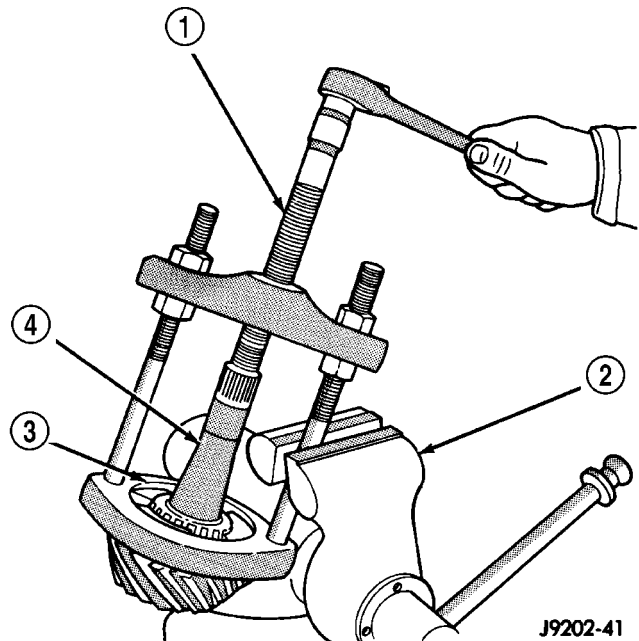
- 1 - COLLAPSIBLE SPACER
- 2 - REAR PINION BEARING
- 3 - PINION DEPTH SHIM



80cff103

Fig. 50 REAR PINION BEARING CUP

- 1 - HOUSING
- 2 - REMOVER
- 3 - HANDLE



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Fig. 52 REAR PINION BEARING

- 1 - PULLER
- 2 - VISE
- 3 - ADAPTERS
- 4 - DRIVE PINION GEAR SHAFT

(18) Remove collapsible preload spacer (Fig. 51).
 (19) Remove rear pinion bearing with Puller/Press C-293-PA and Adapters C-293-42 (Fig. 52).

(20) Remove depth shims from the pinion shaft and record thickness of shims.

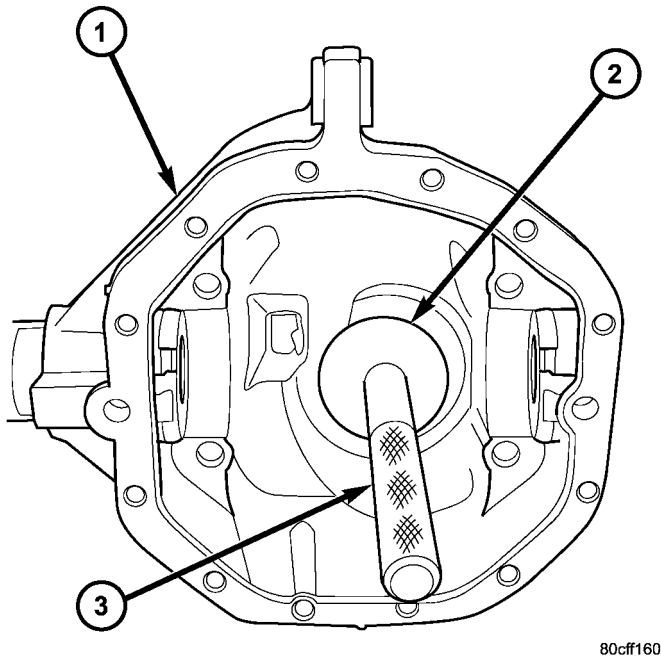
PINION GEAR/RING GEAR (Continued)

INSTALLATION

NOTE: The ring gear and pinion are serviced in a matched set. Never replace one gear without replacing the other matching gear. If ring and pinion gears or bearings are replaced, Refer to Adjustments for Pinion Gear Depth Setting.

(1) Apply Mopar Door Ease or equivalent lubricant to outside surface of the bearing cups.

(2) Install rear pinion bearing cup with Installer 8692 and Driver Handle C-4171 (Fig. 53) and verify cup is seated.

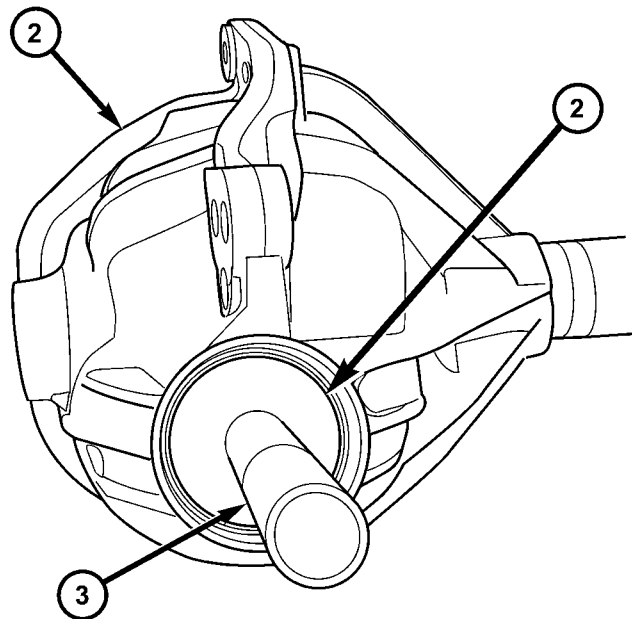


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Fig. 53 REAR PINION BEARING CUP

- 1 - HOUSING
- 2 - INSTALLER
- 3 - HANDLE

(3) Install front pinion bearing cup with Installer 8693 and Handle C-4171 (Fig. 54) and verify cup is seated.



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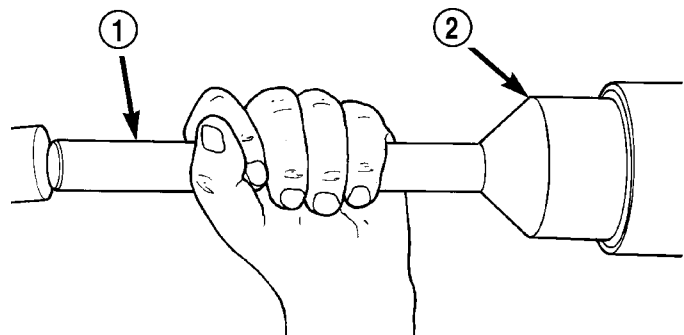
Fig. 54 FRONT PINION BEARING CUP

- 1 - HOUSING
- 2 - INSTALLER
- 3 - HANDLE

(4) Lubricate front pinion bearing and install bearing in the housing.

(5) Apply a light coating of gear lubricant on the lip of pinion seal.

(6) Install pinion seal with Installer 8695 and Handle C-4171 (Fig. 55).



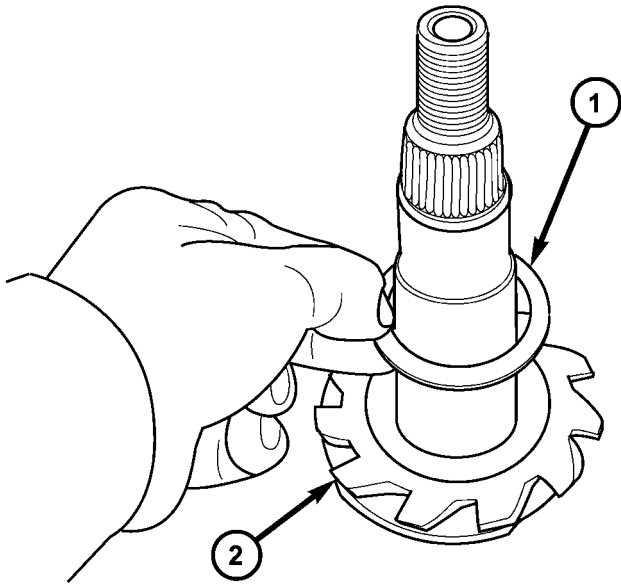
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Fig. 55 PINION SEAL

- 1 - HANDLE
- 2 - INSTALLER

PINION GEAR/RING GEAR (Continued)

(7) Place pinion depth shim (Fig. 56) on the pinion shaft.

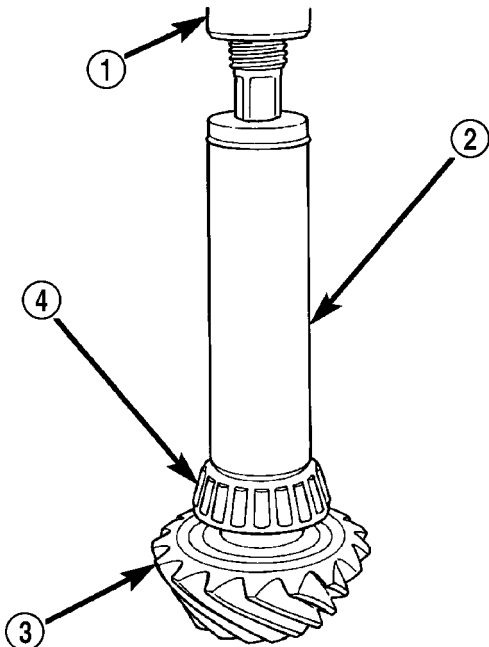


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Fig. 56 PINION DEPTH SHIM

- 1 - PINION DEPTH SHIM
2 - PINION GEAR

(8) Install rear pinion bearing onto the pinion shaft with Installer 6448 and a press (Fig. 57).

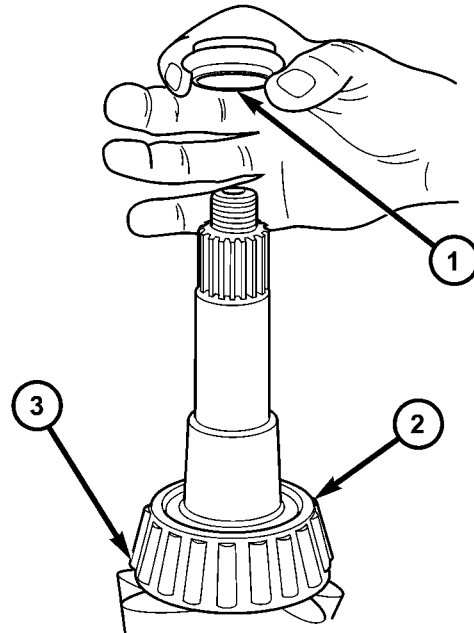


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Fig. 57 REAR PINION BEARING

- 1 - PRESS
2 - INSTALLER
3 - PINION GEAR
4 - REAR PINION BEARING

(9) Install **new** collapsible spacer onto the pinion shaft (Fig. 58).



80cfe262

Fig. 58 COLLAPSIBLE SPACER

- 1 - COLLAPSIBLE SPACER
2 - REAR PINION BEARING
3 - PINION DEPTH SHIM

(10) Lubricate rear pinion bearing and install the pinion gear in the housing.

(11) Install companion flange with Installer C-3718 and Holder 6719.

(12) Install **new** pinion nut and tighten to 271 N·m (200 ft. lbs.) (Fig. 59).

(13) Using Holder 6719 and a torque wrench set at 475 N·m (350 ft. lbs.). Tighten pinion nut until bearing end play is taken up.

(14) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until desired rotating torque is achieved. Measure rotating torque frequently to avoid over-crushing the collapsible spacer (Fig. 60). The pinion rotating torque should be:

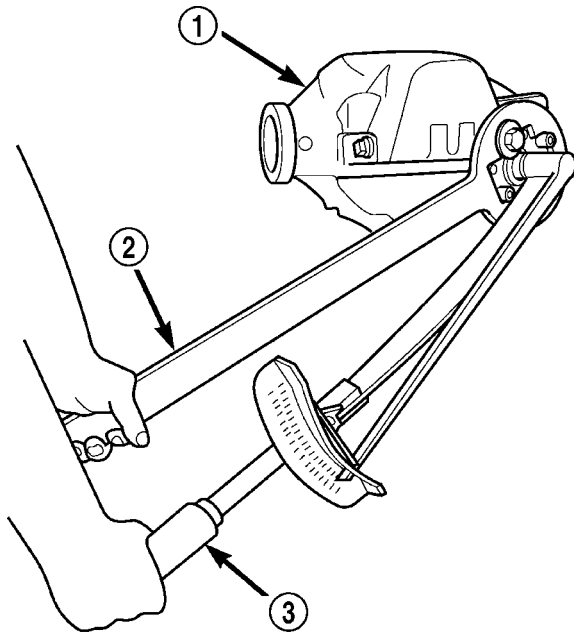
- Original Bearings: 1 to 2.5 N·m (10 to 20 in. lbs.)
- New Bearings: 2.0 to 2.8 N·m (18 to 25 in. lbs.)

CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(15) Invert differential case and start two ring gear bolts to provide ring gear bolt hole alignment.

(16) Invert differential case in the vise.

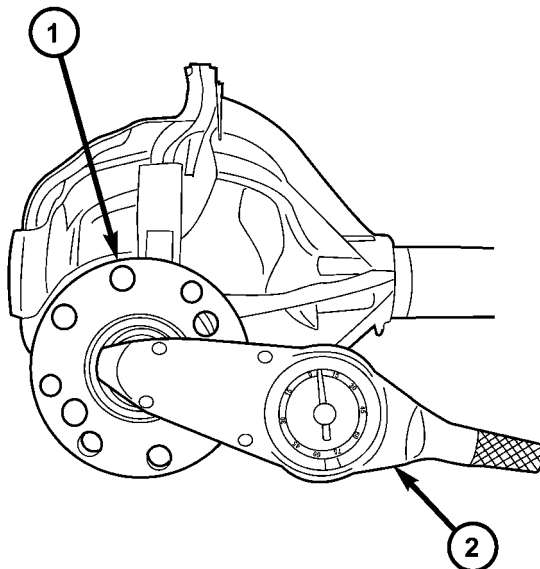
PINION GEAR/RING GEAR (Continued)



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Fig. 59 PINION NUT

- 1 - DIFFERENTIAL HOUSING
- 2 - COMPANION FLANGE HOLDER
- 3 - TORQUE WRENCH



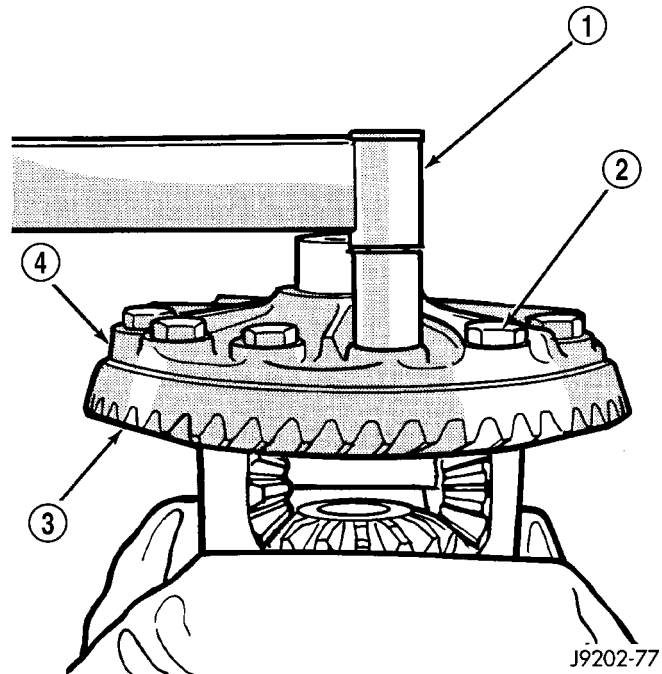
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Fig. 60 PINION ROTATING TORQUE

- 1 - PINION COMPANION FLANGE
- 2 - TORQUE WRENCH

(17) Install **new** ring gear bolts and alternately tighten to 108 N·m (80 ft. lbs.) (Fig. 61).

CAUTION: Never reuse the ring gear bolts. The bolts can fracture causing extensive damage.



J9202-77

Fig. 61 RING GEAR BOLTS

- 1 - TORQUE WRENCH
- 2 - BOLTS
- 3 - RING GEAR
- 4 - DIFFERENTIAL CASE

(18) Install differential in housing and verify gear mesh, backlash and contact pattern.

(19) Install differential cover and fill with gear lubricant.

FRONT AXLE - 9 1/4 AA

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FRONT AXLE - 9 1/4 AA

DESCRIPTION

The axle consists of a cast iron center casting differential housing with axle shaft tubes extending from each side. The tubes are pressed into the differential housing and welded. The design has the centerline of the pinion set above the centerline of the ring gear. The axle has full-floating axle shafts, meaning the shaft are supported by the hub bearings. The axle has a vent used to relieve internal pressure caused by lubricant vaporization and internal expansion.

OPERATION

The axle receives power from the front propeller shaft. The propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

DIAGNOSIS AND TESTING**GEAR NOISE**

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is

FRONT AXLE - 9 1/4 AA (Continued)

heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the front/rear of the vehicle is usually caused by:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out of balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).

- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front end components or engine/transmission mounts. These components can contribute to what appears to be a vibration. Do not overlook engine accessories, brackets and drive belts.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged) can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube. 2. Bent or sprung axle shaft. 3. End-play in pinion bearings. 4. Excessive gear backlash between the ring gear and pinion. 5. Improper adjustment of pinion gear bearings. 6. Loose pinion yoke nut. 7. Scuffed gear tooth contact surfaces.	1. Inspect axle tube alignment. Correct as necessary. 2. Inspect and correct as necessary. 3. Refer to pinion pre-load information and correct as necessary. 4. Check adjustment of the ring gear and pinion backlash. Correct as necessary. 5. Adjust the pinion bearings pre-load. 6. Tighten the pinion yoke nut. 7. Inspect and replace as necessary.

FRONT AXLE - 9 1/4 AA (Continued)

Condition	Possible Causes	Correction
Axle Shaft Broke	1. Misaligned axle tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace the broken shaft after correcting tube mis-alignment. 2. Replace broken shaft and avoid excessive weight on vehicle. 3. Replace broken shaft and avoid or correct erratic clutch operation. 4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly. 2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly. 3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight. 4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Fill differential with the correct fluid type and quantity. 2. Replace scored gears. Fill differential with the correct fluid type and quantity. 3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high. 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn pinion seal. 5. Worn/scored yoke. 6. Axle cover not properly sealed.	1. Drain lubricant to the correct level. 2. Replace seals. 3. Repair as necessary. 4. Replace seal. 5. Replace yoke and seal. 6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low. 2. Improper grade of lubricant. 3. Bearing pre-loads too high. 4. Insufficient ring gear backlash.	1. Fill differential to correct level. 2. Fill differential with the correct fluid type and quantity. 3. Re-adjust bearing pre-loads. 4. Re-adjust ring gear backlash.

FRONT AXLE - 9 1/4 AA (Continued)

Condition	Possible Causes	Correction
Gear Teeth Broke	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavement. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation. 3. Replace gears and examine remaining parts for damage. 4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant. 2. Improper ring gear and pinion adjustment. 3. Unmatched ring gear and pinion. 4. Worn teeth on ring gear and/or pinion. 5. Loose pinion bearings. 6. Loose differential bearings. 7. Mis-aligned or sprung ring gear. 8. Loose differential bearing cap bolts. 9. Housing not machined properly.	1. Fill differential with the correct fluid type and quantity. 2. Check ring gear and pinion contact pattern. 3. Replace gears with a matched ring gear and pinion. 4. Replace ring gear and pinion. 5. Adjust pinion bearing pre-load. 6. Adjust differential bearing pre-load. 7. Measure ring gear run-out. Replace components as necessary. 8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued to the proper specification. 9. Replace housing.

REMOVAL

- (1) Remove wheels and tires.
- (2) Remove brake calipers and rotors.
- (3) Disconnect ABS wheel speed sensors.
- (4) Disconnect axle vent hose.
- (5) Remove front propeller shaft.
- (6) Disconnect stabilizer bar links at the axle brackets.
- (7) Disconnect shock absorbers from axle brackets.
- (8) Disconnect track bar from the axle bracket.
- (9) Disconnect tie rod and drag link from the steering knuckles.
- (10) Position suitable lifting device under the axle assembly.
- (11) Secure axle to lifting device.
- (12) Mark suspension alignment cams for installation reference.
- (13) Disconnect upper and lower suspension arms from the axle bracket.

(14) Lower the axle. The coil springs will drop with the axle.

(15) Remove the coil springs from the axle bracket.

INSTALLATION

CAUTION: Suspension components with rubber bushings should be tightened with the weight of the vehicle on the suspension, at normal height. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur. Rubber bushings must never be lubricated.

- (1) Support the axle on a suitable lifting device.
- (2) Secure axle to lifting device.
- (3) Position the axle under the vehicle.
- (4) Install springs, retainer clip and bolts.
- (5) Raise axle and align it with the spring pads.

FRONT AXLE - 9 1/4 AA (Continued)

(6) Position upper and lower suspension arms in the axle brackets. Install bolts, nuts and align the suspension alignment cams to the reference marks. Do not tighten at this time.

(7) Connect track bar to the axle bracket and install the bolt. Do not tighten at this time.

(8) Install shock absorber and tighten bolts to 121 N·m (89 ft. lbs.).

(9) Install stabilizer bar link to the axle bracket. Tighten the nut to 68 N·m (50 ft. lbs.).

(10) Install drag link and tie rod to the steering knuckles and tighten the nuts to 108 N·m (80 ft. lbs.).

(11) Install ABS wheel speed sensors.

(12) Install rotors and brake calipers.

(13) Connect the axle vent hose.

(14) Install front propeller shaft.

(15) Check and add differential lubricant, if necessary.

(16) Install wheel and tire assemblies.

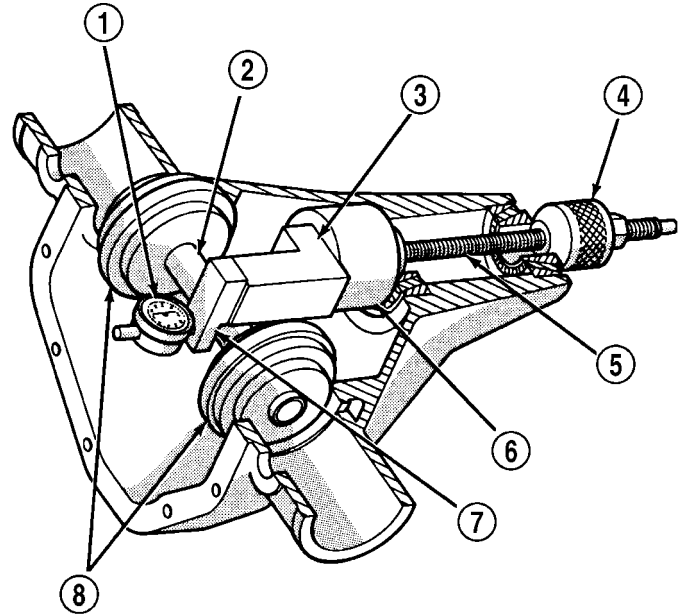
(17) Remove lower the vehicle.

(18) Tighten upper suspension arm nuts at axle to 149 N·m (110 ft. lbs.). Tighten upper suspension arm nuts at frame to 149 N·m (110 ft. lbs.).

(19) Tighten lower suspension arm nuts at axle to 190 N·m (140 ft. lbs.). Tighten the lower suspension arm nuts at frame to 190 N·m (140 ft. lbs.).

(20) Tighten track bar bolt at the axle bracket to 176 N·m (130 ft. lbs.).

(21) Check front wheel alignment.



J9403-45

Fig. 1 PINION GEAR DEPTH GAUGE TOOLS

- 1 - DIAL INDICATOR
- 2 - ARBOR
- 3 - PINION HEIGHT BLOCK
- 4 - CONE
- 5 - SCREW
- 6 - PINION BLOCK
- 7 - SCOOTER BLOCK
- 8 - ARBOR DISC

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. Compensation for pinion depth variance is achieved with a select shim. The shim is located between the rear pinion bearing and the pinion gear head.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

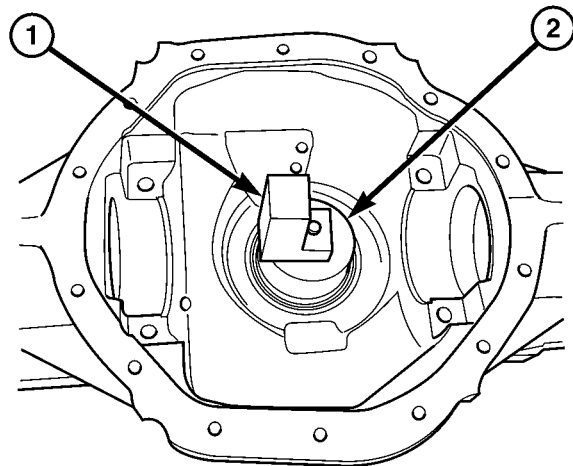
Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 1).

(1) Assemble Pinion Height Block 6739, Pinion Block 8878 and rear pinion bearing onto Screw 6741 (Fig. 1).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through pinion bearing cups (Fig. 2).

(3) Install front pinion bearing and install the Cone-nut 6740 hand tight. Then check tool rotating torque with an inch pound torque wrench. The rotating torque should be 1.7-2.26 N·m (15-20 in. lbs.).

(4) Place Arbor Disc 8289 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 3).



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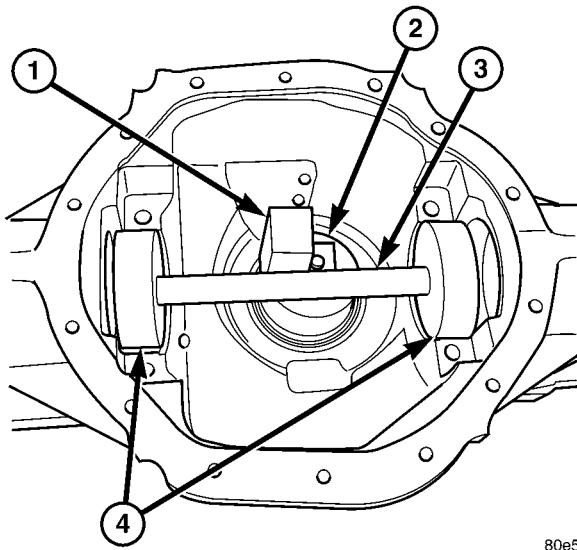
Fig. 2 PINION HEIGHT BLOCK

- 1. PINION HEIGHT BLOCK
- 2. PINION BLOCK

(5) Install differential bearing caps on arbor discs and snug the bearing cap bolts. Then cross tighten cap bolts to 85 N·m (63 ft. lbs.).

FRONT AXLE - 9 1/4 AA (Continued)

NOTE: Arbor should rotate freely in the arbor disc.



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Fig. 3 GAUGE TOOLS IN HOUSING

1. PINION HEIGHT BLOCK
2. PINION BLOCK
3. ARBOR
4. ARBOR DISCS

(6) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(7) Position Scooter Block/Dial Indicator flush on the pinion height block. Hold scooter block and zero the dial indicator.

(8) Slowly slide the scooter block across the pinion height block over to the arbor (Fig. 4). Move the scooter block till dial indicator crests the arbor, then record the highest reading.

(9) Select a shim equal to the dial indicator reading.

(10) Install the select shim between the rear pinion bearing and the pinion gear head.

DIFFERENTIAL CASE BEARING PRELOAD AND GEAR BACKLASH

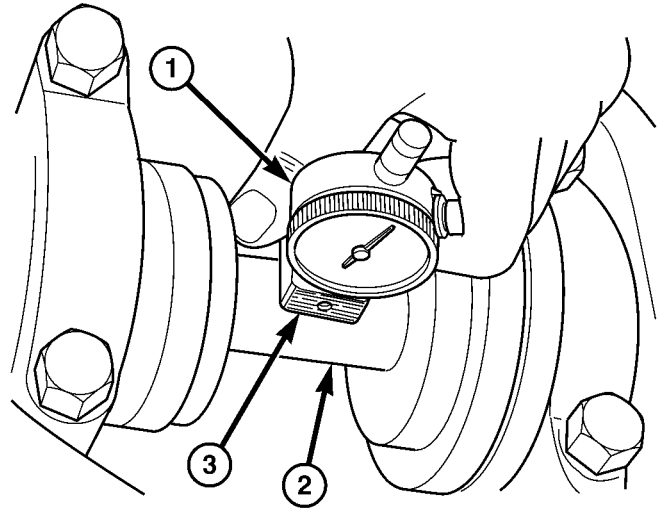
Backlash is adjusted by moving the adjusters in and out or both. By moving the adjusters the case/ring gear will move closer or further away from the pinion. In most cases this adjustment can be used to achieve the correct gear tooth pattern and set the case bearing preload.

(1) Remove adjuster lock bolts and adjuster locks (Fig. 5).

(2) Loosen the differential bearing caps.

(3) Slide differential case toward the pinion gear until the gears make contact/zero backlash. If zero backlash cannot be obtained, turn the pinion side adjuster until zero backlash is obtained.

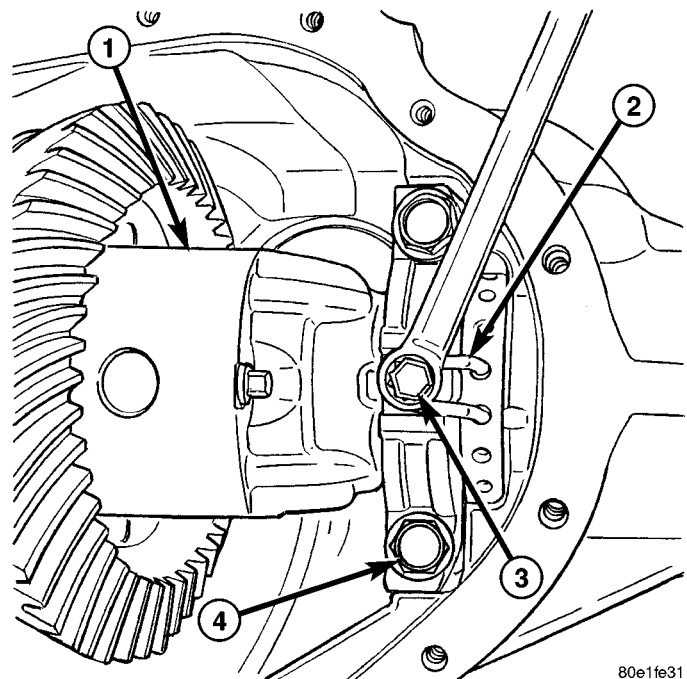
(4) Holding the differential case toward the pinion gear, turn bearing adjusters with Spanner Wrench



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Fig. 4 PINION DEPTH MEASUREMENT

1. DIAL INDICATOR
2. ARBOR
3. SCOOTER BLOCK



80e1fe31

Fig. 5 ADJUSTER LOCK BOLT

- 1 - DIFFERENTIAL CASE
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER LOCK BOLT
- 4 - BEARING CAP BOLT

8883 until they make contact with the differential bearings/cups.

(5) Back off the ring gear side adjuster 4 holes, to obtain initial ring gear backlash.

FRONT AXLE - 9 1/4 AA (Continued)

(6) Install ring gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(7) Tighten pinion gear side adjuster firmly against the differential case bearing cup.

(8) Rotate the pinion several times to seat the differential bearings.

(9) Loosen pinion gear side adjuster until it is no longer in contact with the bearing cup, then tighten it until it makes contact.

(10) Tighten pinion gear side adjuster an additional:

- **New Bearings:** 6 Adjuster Holes
- **Original Bearings:** 4 Adjuster Holes

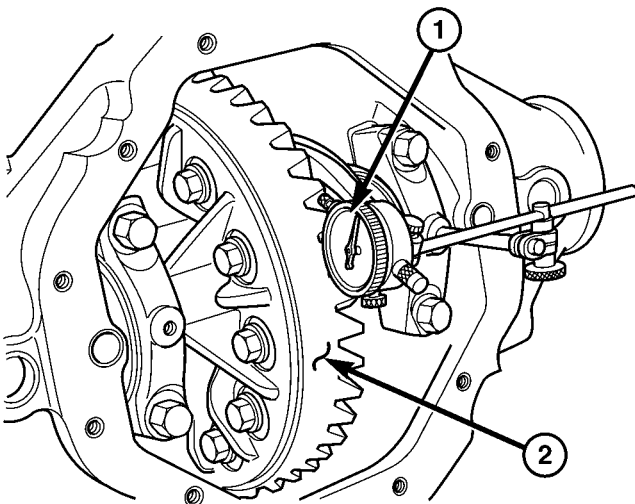
(11) Install pinion gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(12) Tighten bearing cap bolts to 85 N·m (63 ft. lbs.).

(13) Tighten adjuster lock bolts to 25 N·m (18 ft. lbs.).

(14) Measure ring gear backlash with a Dial Indicator C-3339 and Dial Indicator Stud L-4438 at eight points around the drive side of the ring gear (Fig. 6). The backlash should be 0.08-0.25 mm (0.003-0.010 in) with a preferred backlash of 0.13-0.18 mm (0.005-0.007 in).

NOTE: Backlash measurement should not vary more than 0.05 mm (0.002 in) between measuring points. If measurement does vary inspect the gears for burrs, the differential case flange and ring gear mounting.



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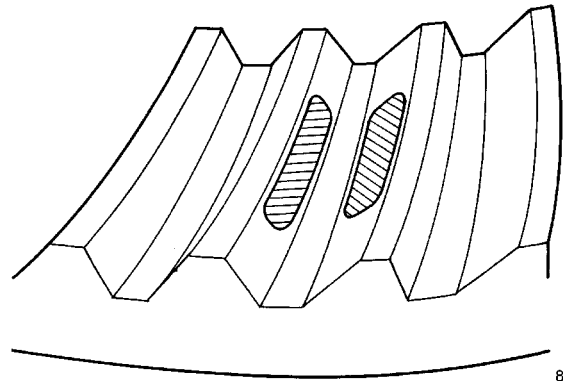
Fig. 6 RING GEAR BACKLASH

- 1 - DIAL INDICATOR
- 2 - RING GEAR

GEAR TOOTH CONTACT PATTERN

Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shortened gear life.

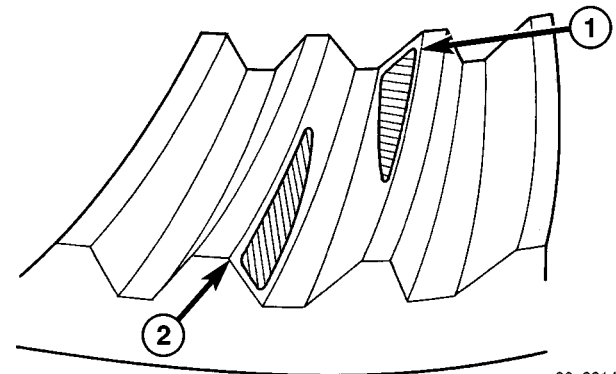
- (1) Wipe clean each tooth of the ring gear.
- (2) Apply gear marking compound to all of the ring gear teeth.
- (3) Verify bearing cap bolts are torque to specification.
- (4) Apply the brakes lightly to create a 14 N·m (10 ft. lbs.) pinion rotating torque.
- (5) Rotate the pinion/pinion yoke 4 full revolutions in each direction.
- (6) Read gear tooth contact pattern:
 - Gear contact pattern is correct (Fig. 7). Backlash and pinion depth is correct.



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Fig. 7 CORRECT CONTACT PATTERN

- Ring gear too far away from pinion gear (Fig. 8). Decrease backlash, by moving the ring closer to the pinion gear using the adjusters.



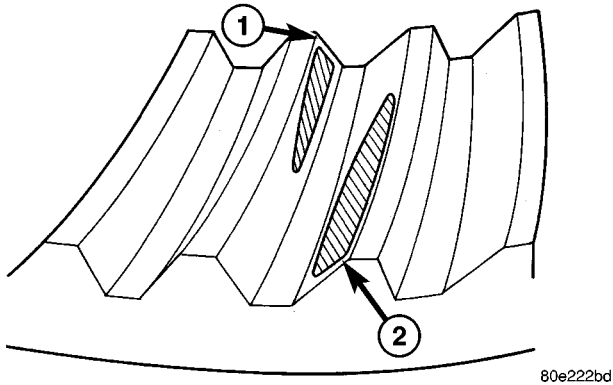
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Fig. 8 INCORRECT BACKLASH

- 1 - COAST SIDE TOE
- 2 - DRIVE SIDE HEEL

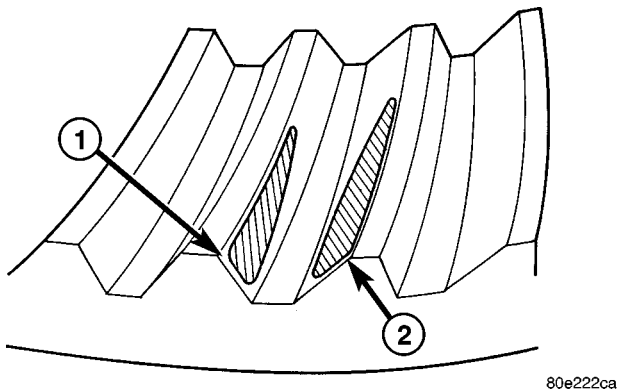
FRONT AXLE - 9 1/4 AA (Continued)

- Ring gear too close to pinion gear (Fig. 9). Increase backlash, by moving the ring away from the pinion gear using the adjusters.

**Fig. 9 INCORRECT BACKLASH**

- 1 - DRIVE SIDE TOE
- 2 - COAST SIDE HEEL

- Ring gear too far away from pinion gear (Fig. 10). Decrease backlash, by moving the ring closer to the pinion gear using the adjusters.

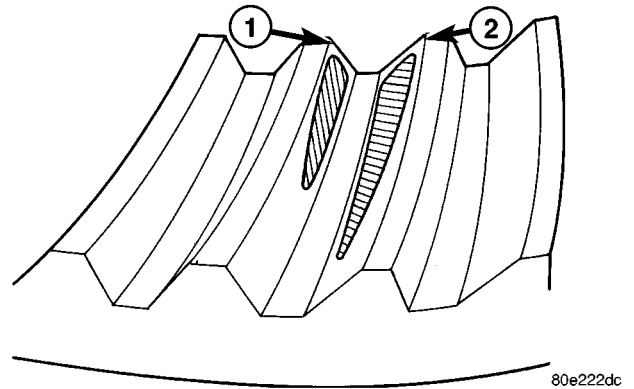
**Fig. 10 INCORRECT BACKLASH**

- 1 - DRIVE SIDE HEEL
- 2 - COAST SIDE HEEL

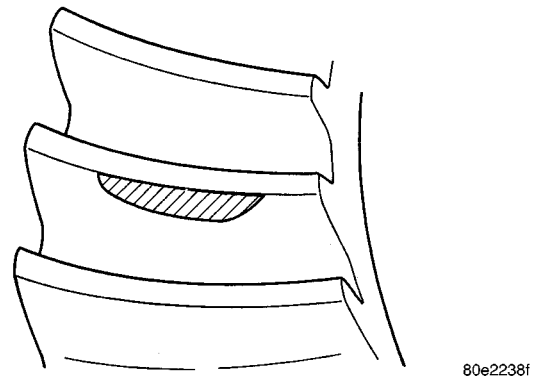
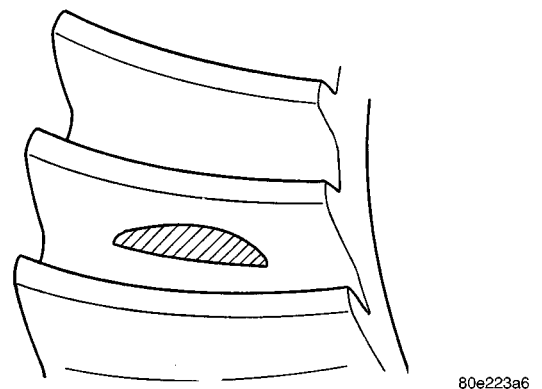
- Ring gear too close to pinion gear (Fig. 11). Increase backlash, by moving the ring away from the pinion gear using the adjusters.

- Pinion gear set too low (Fig. 12). Increase pinion gear height, by increasing the pinion depth shim thickness.

- Pinion gear set too high (Fig. 13). Decrease pinion depth, by decreasing the pinion depth shim thickness.

**Fig. 11 INCORRECT BACKLASH**

- 1 - DRIVE SIDE TOE
- 2 - COAST SIDE TOE

**Fig. 12 LOW PINION HEIGHT****Fig. 13 HIGH PINION HEIGHT**

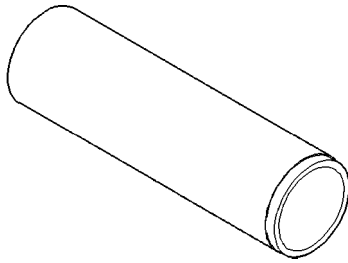
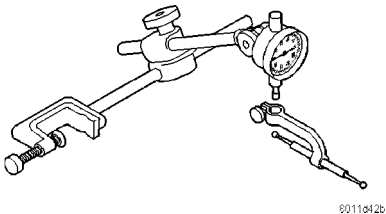
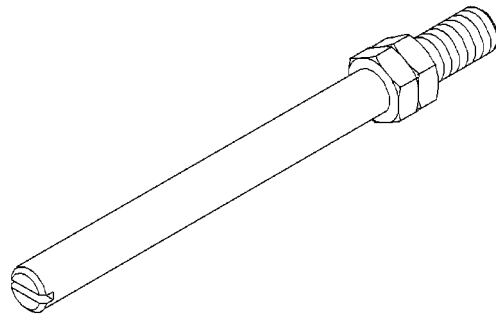
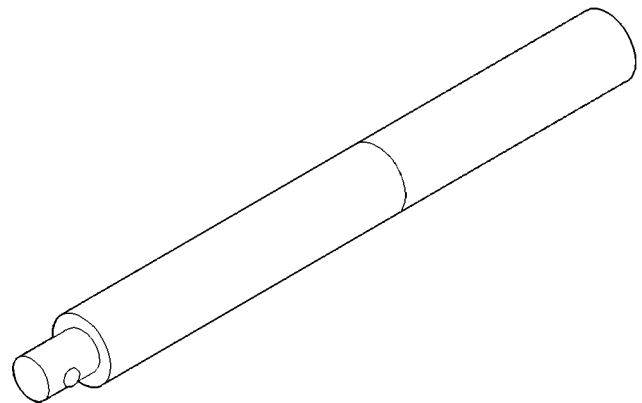
FRONT AXLE - 9 1/4 AA (Continued)

SPECIFICATIONS*AXLE SPECIFICATIONS*

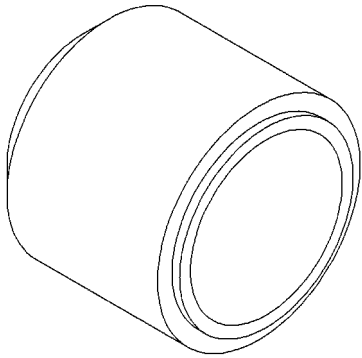
DESCRIPTION	SPECIFICATION
Axle Ratio	3.73, 4.10
Ring Gear Diameter	235 mm (9.25 in.)
Ring Gear Backlash	0.13-0.18 mm (0.005-0.007 in.)
Pinion Bearing Preload - New Bearing	1.7-2.8 N·m (15-25 in. lbs.)
Pinion Bearing Preload - Original Bearing	1.1-2.2 N·m (10-20 in. lbs.)
Pinion Bearing Preload + Differential Case Bearing Preload - New Bearing	3.4-5.6 N·m (30-50 in. lbs.)
Pinion Bearing Preload + Differential Case Bearing Preload - Original Bearing	2.8-5.1 N·m (25-45 in. lbs.)

TORQUE SPECIFICATIONS

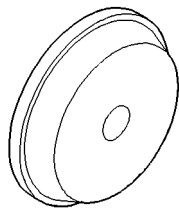
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fill Hole Plug	32	24	-
Differential Cover Bolts	40	30	-
Bearing Cap Bolts	85	63	-
Ring Gear Bolts	140	103	-
Axle Nut	356	263	-
Pinion Shaft Lock Bolt	52	38	-
Adjuster Lock Bolt	25	18	-

SPECIAL TOOLS**INSTALLER C-3095-A****DIAL INDICATOR SET C-3339****DIAL INDICATOR STUD L-4438****HANDLE C-4171**

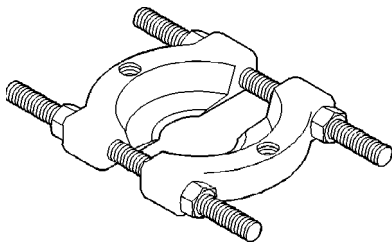
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SEAL INSTALLER 8882

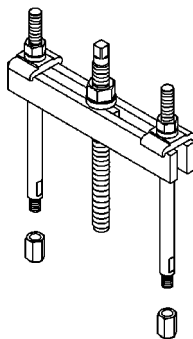


INSTALLER D-146

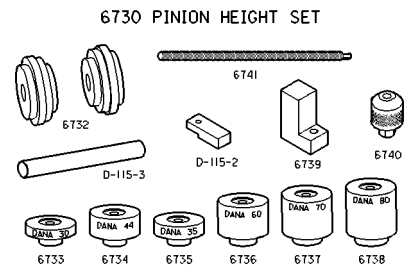


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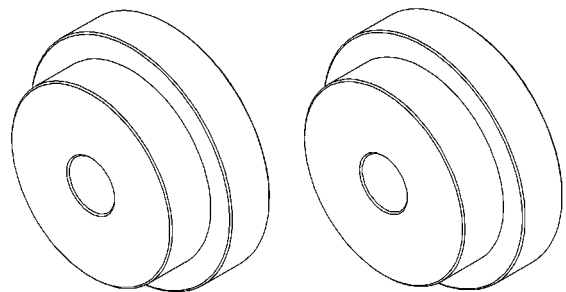
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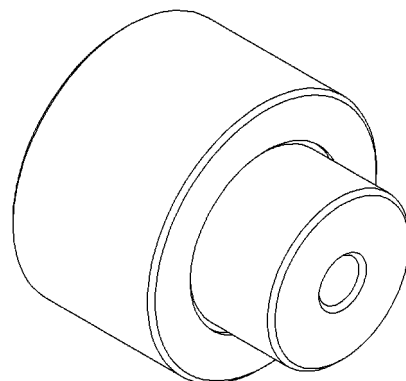
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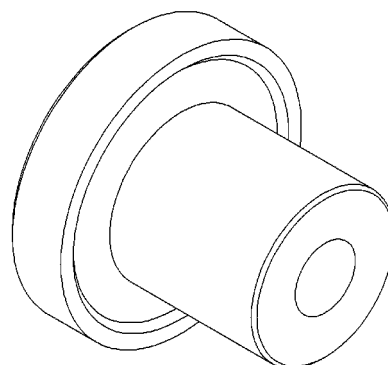
PINION DEPTH SET 6730



ARBOR DISCS 8289

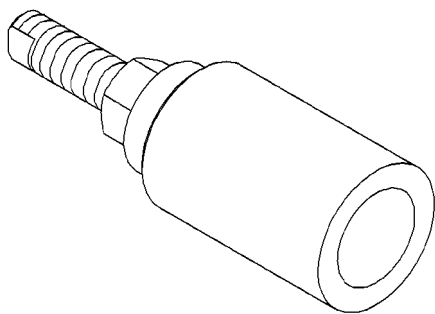


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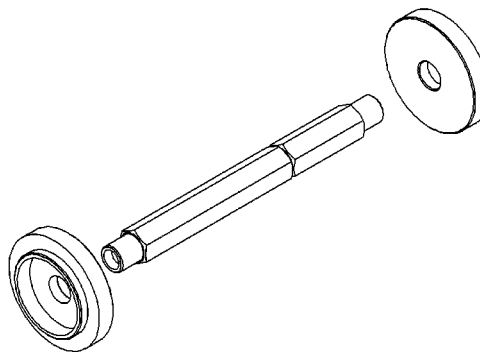


BEARING INSTALLER 8881

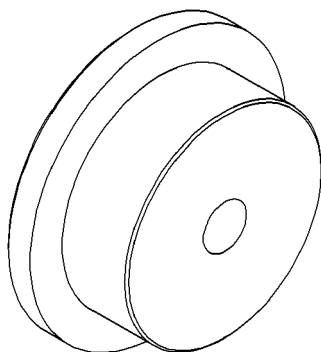
FRONT AXLE - 9 1/4 AA (Continued)



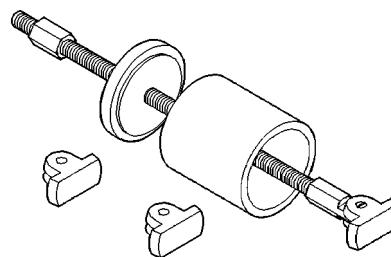
PINION INSTALLER 8982



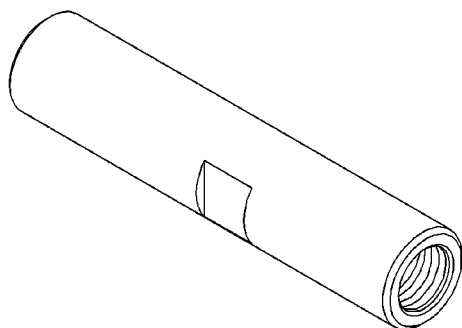
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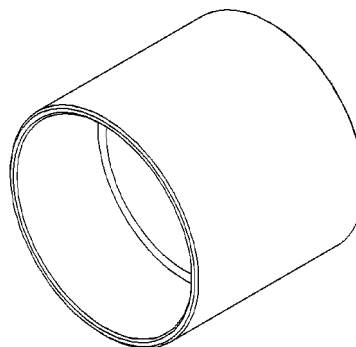
CUP INSTALLER 8886



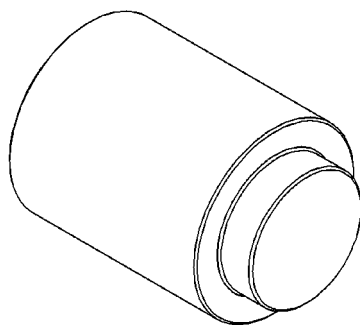
REMOVER/EXTRACTOR 6310



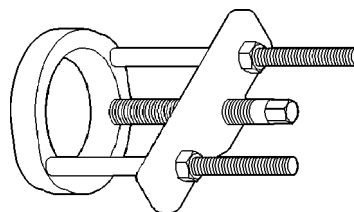
PINION DRIVER 8976



RECEIVER 8498

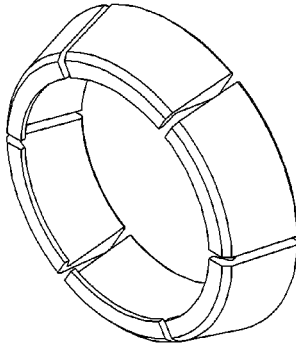
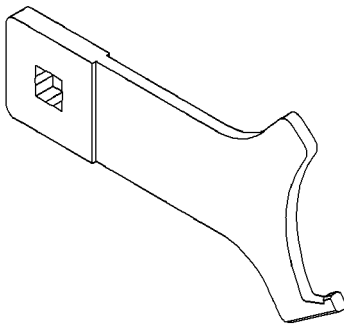
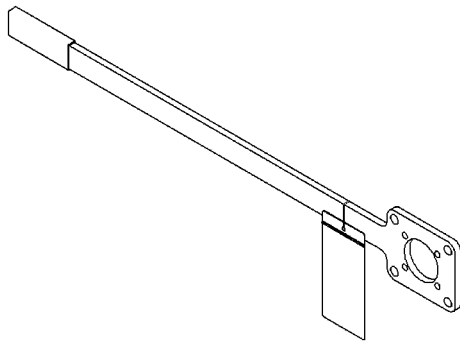
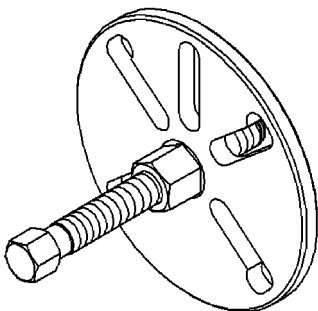


PLUG 8888

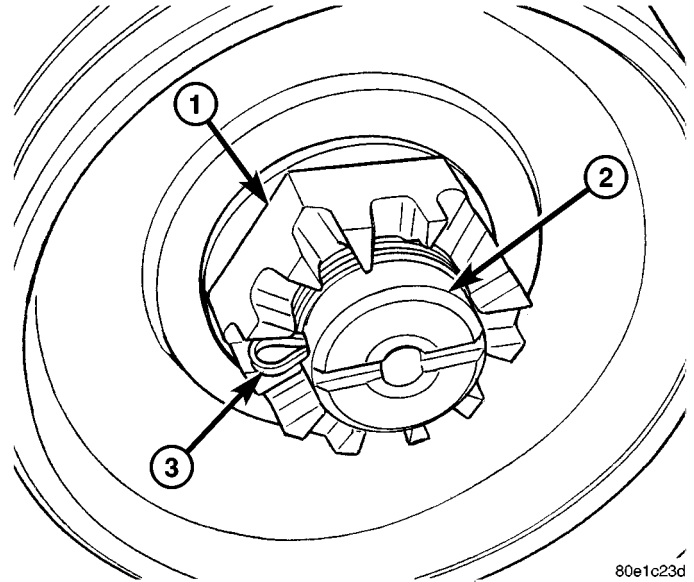


PULLER C-293-PA

FRONT AXLE - 9 1/4 AA (Continued)

**ADAPTERS 8879****ADJUSTER WRENCH 8883****FLANGE WRENCH 8979****FLANGE PULLER 8992****AXLE SHAFTS****REMOVAL**

- (1) Remove wheel and tire assembly.
- (2) Remove brake caliper, rotor and ABS wheel speed sensor if equipped.
- (3) Remove axle shaft cotter pin, hub nut and washer (Fig. 14).



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Fig. 14 AXLE NUT

- 1 - AXLE NUT
- 2 - AXLE
- 3 - COTTER PIN

- (4) Remove the four hub bearing bolts (Fig. 15) from the back of the steering knuckle.

- (5) Remove hub bearing from the steering knuckle.

- (6) Remove axle shaft (Fig. 16) from steering knuckle and axle housing.

DISASSEMBLY

Single cardan U-joint components are not serviceable. If defective they must be replaced as a unit.

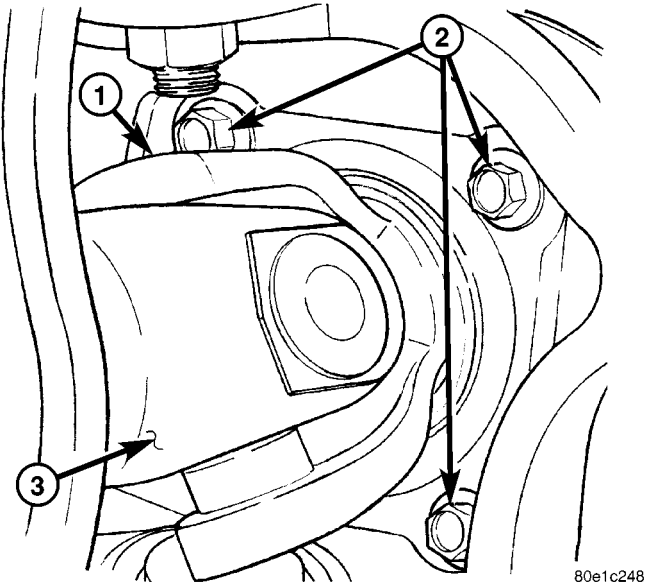
CAUTION: Clamp only the narrow forged portion of the yoke in the vise. To avoid distorting the yoke, do not over tighten the vise jaws.

- (1) Remove the bearing cap retaining snap rings (Fig. 17).

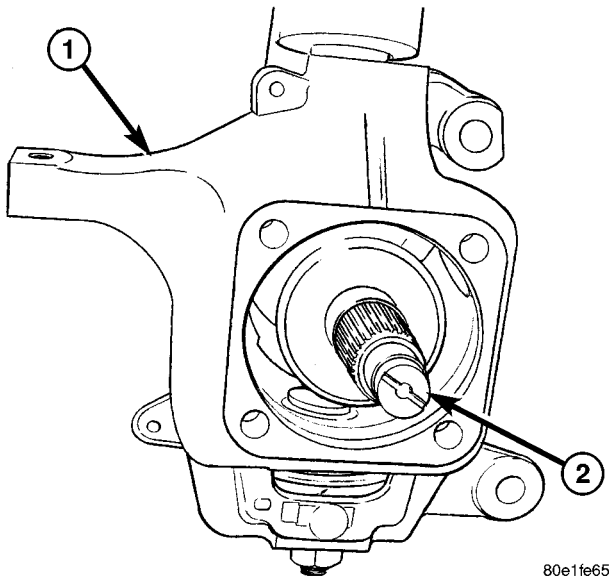
NOTE: Saturate the bearing caps with penetrating oil prior to removal.

- (2) Locate a socket with an inside diameter that is larger than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed.

AXLE SHAFTS (Continued)

**Fig. 15 HUB BEARING BOLTS**

- 1 - STUB SHAFT
- 2 - BEARING BOLTS
- 3 - AXLE SHAFT

**Fig. 16 STEERING KNUCKLE**

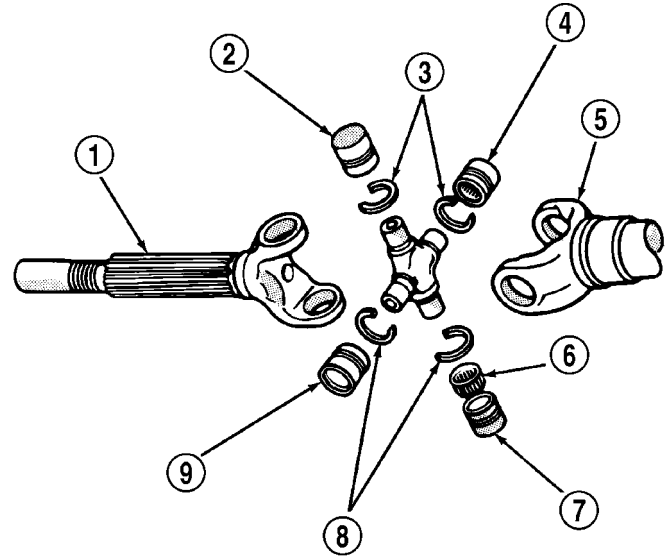
- 1 - KNUCKLE
- 2 - AXLE SHAFT

(3) Locate a socket with an outside diameter that is smaller than the bearing cap. Place the socket (driver) against the opposite bearing cap.

(4) Position the yoke with the sockets in a vise (Fig. 18).

(5) Tighten the vise jaws to force the bearing cap into the larger socket (receiver).

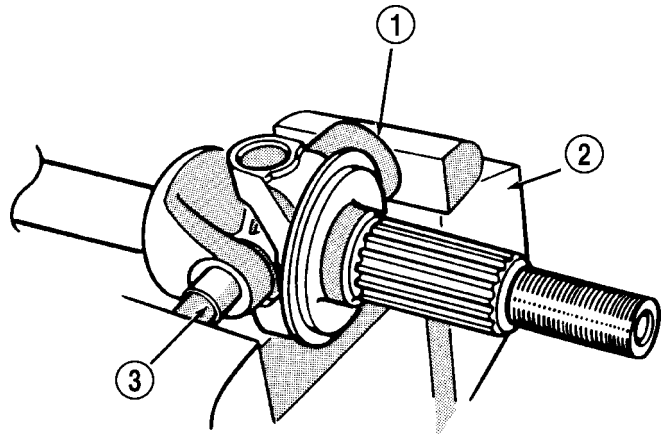
(6) Release the vise jaws. Remove the sockets and bearing cap that was partially forced out of the yoke.



J8902-15

Fig. 17 AXLE SHAFT OUTER U-JOINT

- 1 - SHAFT YOKE
- 2 - BEARING CAP
- 3 - SNAP RINGS
- 4 - BEARING CAP
- 5 - SPINDLE YOKE
- 6 - BEARING
- 7 - BEARING CAP
- 8 - SNAP RINGS
- 9 - BEARING CAP



J8902-16

Fig. 18 YOKE BEARING CAP

- 1 - LARGE-DIAMETER SOCKET WRENCH
- 2 - VISE
- 3 - SMALL-DIAMETER SOCKET WRENCH

(7) Repeat the above procedure for the remaining bearing cap and remove spider from the propeller shaft yoke.

AXLE SHAFTS (Continued)

ASSEMBLY

(1) Pack the bearing caps 1/3 full of wheel bearing lubricant. Apply extreme pressure (EP), lithium-base lubricant to aid in installation.

(2) Position the spider in the yoke. Insert the seals and bearings. Tap the bearing caps into the yoke bores far enough to hold the spider in position.

(3) Place the socket (driver) against one bearing cap. Position the yoke with the socket in a vise.

(4) Tighten the vise to force the bearing caps into the yoke. Force the caps enough to install the retaining clips.

(5) Install the bearing cap retaining clips.

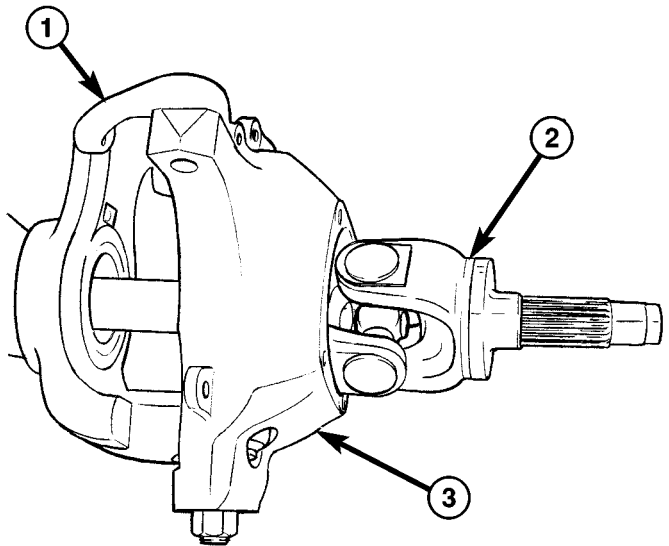
(6) Install axle shaft.

INSTALLATION

(1) Clean axle shaft and apply a thin film of Mopar Wheel Bearing Grease to the shaft splines and hub bore.

(2) Install axle shaft through the steering knuckle and into the differential side gears (Fig. 19).

CAUTION: Do not damage axle shaft seal during axle installation.



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Fig. 19 AXLE SHAFT

- 1 - AXLE YOKE
- 2 - AXLE SHAFT
- 3 - KNUCKLE

(3) Install hub bearing in the knuckle.

(4) Install hub bearing bolts and tighten to 202 N·m (149 ft. lbs.).

(5) Install ABS wheel speed sensor, brake rotor and caliper.

(6) Install axle washer and nut. Tighten axle nut to 179 N·m (132 ft. lbs.).

(7) Rotate axle several 5 to 10 times to seat the wheel bearing.

(8) Tighten axle nut to final torque of 356 N·m (263 ft. lbs.).

(9) Align nut to next cotter pin hole and install new cotter pin.

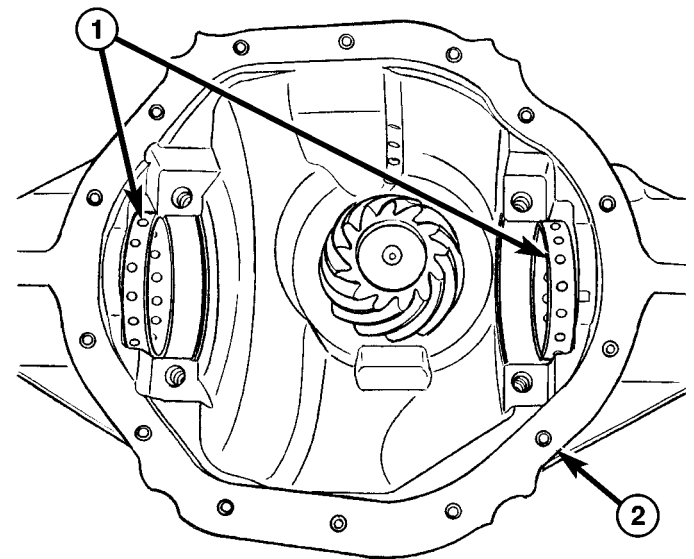
(10) Install wheel and tire assembly.

AXLE SHAFT SEALS**REMOVAL**

(1) Remove hub bearings and axle shafts.

(2) Remove differential from differential housing.

(3) Remove differential bearing adjusters (Fig. 20).



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Fig. 20 ADJUSTERS

- 1 - DIFFERENTIAL CASE BEARING ADJUSTERS
- 2 - DIFFERENTIAL HOUSING

(4) Remove axle seals (Fig. 21) located behind adjusters with Receiver 8498 and Extractor 6310.

(5) Install Receiver 8498 into the adjuster bore.

(6) Install Extractor Rod 6310 with Extractor Foot 6310-9 through the receiver and the axle seal (Fig. 22).

(7) Install Extractor Plate 6310-2 and Nut 6310-7 on the extractor rod.

(8) Tighten nut on the extractor rod (Fig. 23) and pull the seal out and into the receiver.

INSTALLATION

(1) Install axle seal on Installer Cups 8885-2 and position cups with seals into the housing.

NOTE: Seal are installed with the axle guide facing outward.

AXLE SHAFT SEALS (Continued)

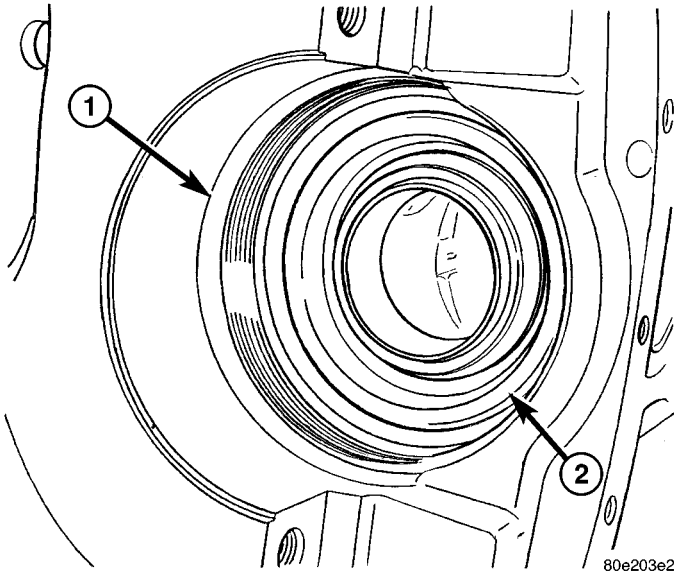


Fig. 21 AXLE SHAFT SEAL

- 1 - ADJUSTER THREADS
- 2 - SEAL

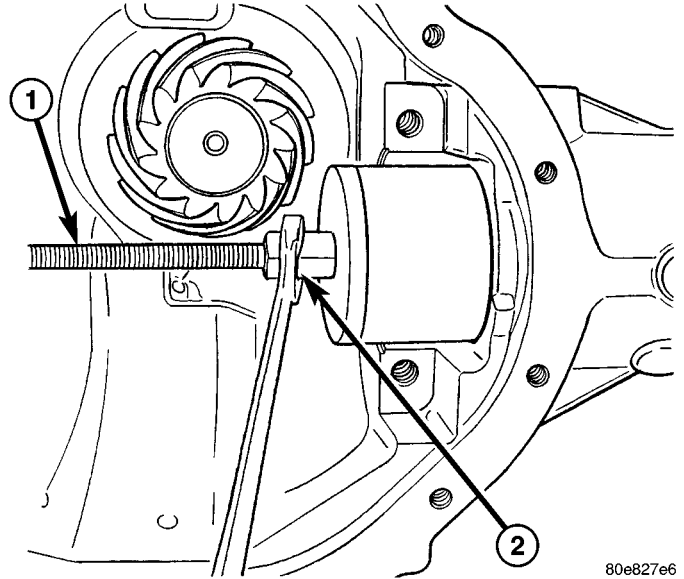


Fig. 23 SEAL EXTRACTOR

- 1 - EXTRACTOR ROD
- 2 - EXTRACTOR NUT

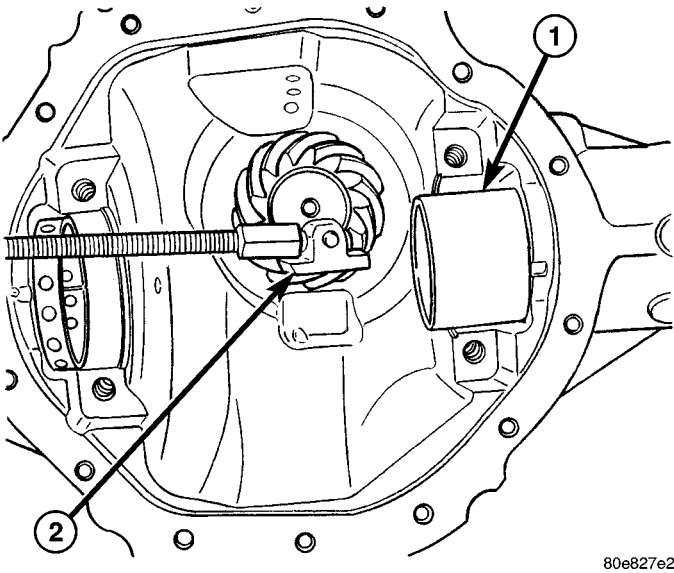


Fig. 22 SEAL RECEIVER

- 1 - RECEIVER
- 2 - EXTRACTOR FOOT

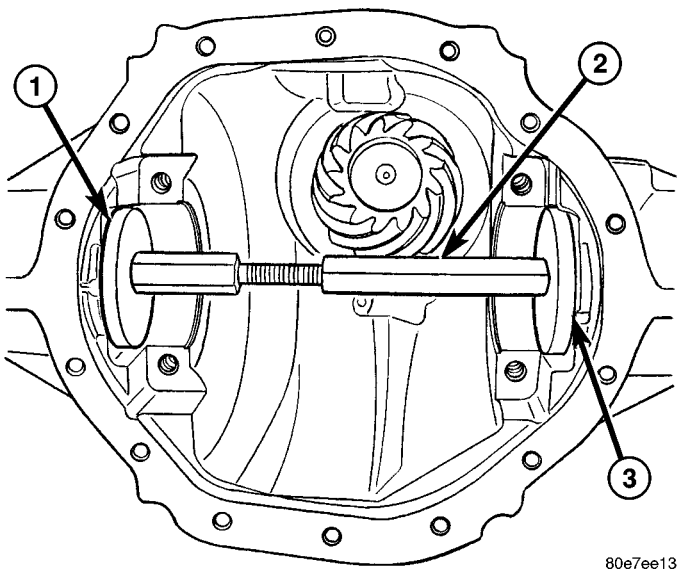


Fig. 24 AXLE SEAL INSTALLER

- 1 - INSTALLER CUP
- 2 - INSTALLER TURNBUCKLE
- 3 - INSTALLER CUP

(2) Install Turnbuckle 8885-1 (Fig. 24) into the installer cups and expand the turnbuckle until the seal bottom out in the housing.

(3) Install differential into the axle housing.

(4) Install axle shaft and hub bearings

PINION SEAL

REMOVAL

- (1) Mark the propeller shaft and pinion flange for installation reference.
- (2) Remove propeller shaft.
- (3) Remove hub bearings and axle shafts.
- (4) Rotate pinion gear three or four times.
- (5) Measure and record the torque necessary to rotate (Fig. 25) the pinion gear with an inch pound torque wrench.

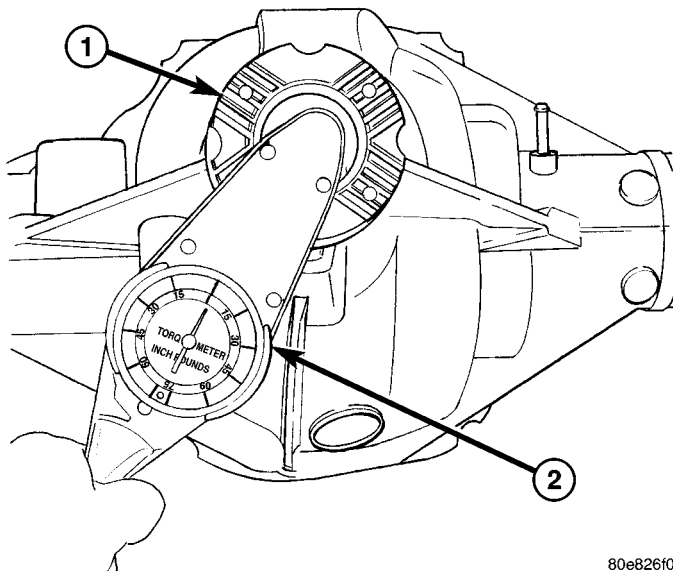


Fig. 25 PINION ROTATING TORQUE

- 1 - PINION FLANGE
- 2 - TORQUE WRENCH

- (6) Hold pinion flange with Flange Wrench 8979 (Fig. 26) and remove pinion flange nut and washer.

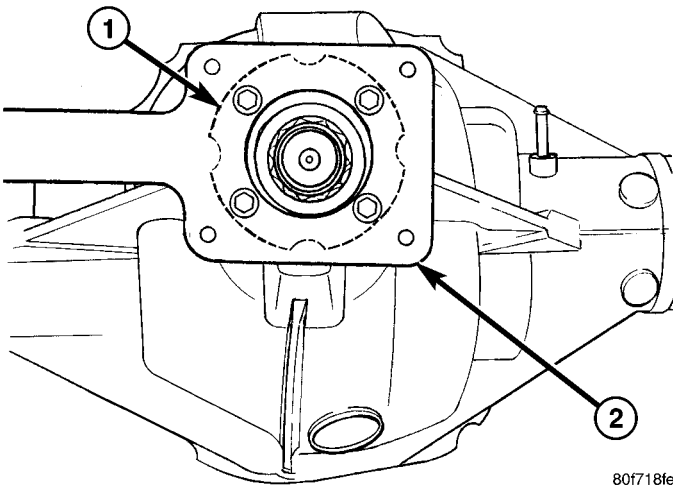
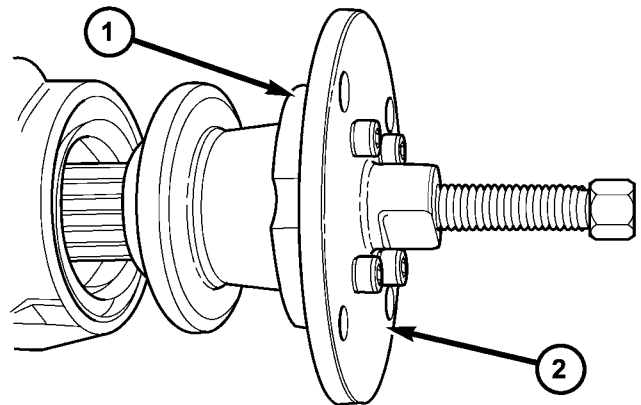


Fig. 26 FLANGE WRENCH

- 1 - PINION FLANGE
- 2 - WRENCH

- (7) Remove pinion flange with Pinion Flange Puller 8992 (Fig. 27).



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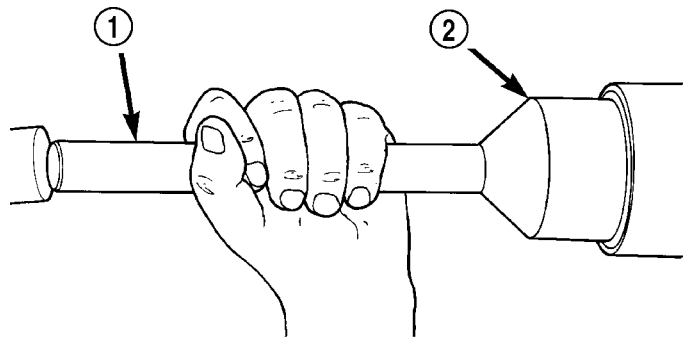
Fig. 27 PINION FLANGE PULLER

- 1 - PINION FLANGE
- 2 - PULLER

- (8) Remove pinion shaft seal with a pry tool or slide hammer mounted screw.

INSTALLATION

- (1) Install **new** pinion seal with Installer 8882 and Handle C-4171 (Fig. 28).



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Fig. 28 PINION SEAL INSTALLER

- 1 - HANDLE
- 2 - INSTALLER

- (2) Apply a light coat of teflon thread sealant to the pinion flange splines.
- (3) Lightly tap the pinion flange onto the pinion until a few threads are showing.
- (4) Install flange washer and **new** pinion nut.
- (5) Hold flange with Flange Wrench 8979 and tighten pinion nut until pinion end play is taken up.
- (6) Rotate pinion several times to seat bearings.
- (7) Measure pinion rotating torque with an inch pound torque wrench and compare it to recorded measurement. Tighten pinion nut in small incre-

PINION SEAL (Continued)

ments, until pinion rotating torque is 0.40-0.57 N·m (3-5 in. lbs.) greater than recorded measurement.

(8) Rotate pinion several times then verify pinion rotating torque again.

(9) Install axle shafts and hub bearings.

(10) Install propeller shaft with reference marks aligned.

DIFFERENTIAL

DESCRIPTION

The differential case is a one-piece design. The differential pinion shaft is retained with a snap ring. Differential bearing preload and ring gear backlash is adjusted by the use of adjusters. The adjuster are between the differential bearings and the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The stamped steel cover provides a means for inspection and servicing the differential.

OPERATION

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 29).

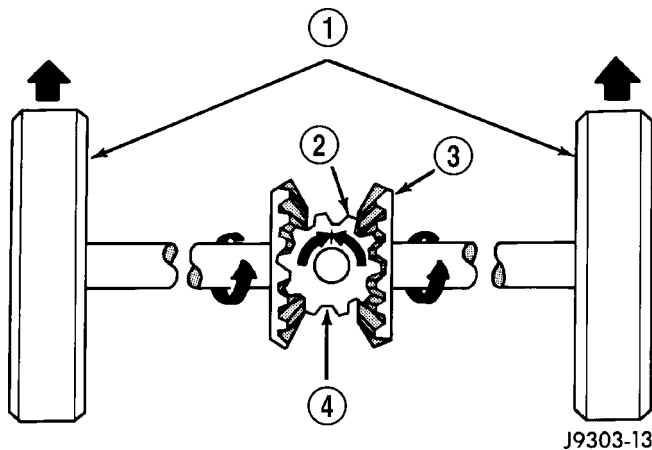


Fig. 29 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

- 1 - IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
- 2 - PINION GEAR
- 3 - SIDE GEAR
- 4 - PINION GEARS ROTATE WITH CASE

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 30). In this instance, the input torque applied to the

pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

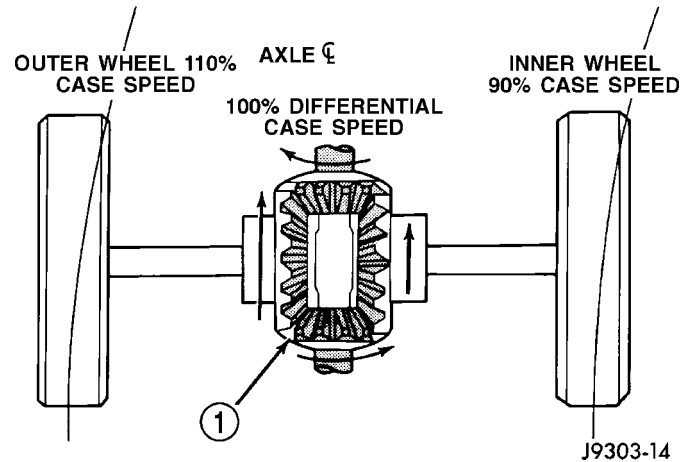


Fig. 30 DIFFERENTIAL-ON TURNS

- 1 - PINION GEARS ROTATE ON PINION SHAFT

REMOVAL

- (1) Remove differential housing cover and drain lubricant from the housing.
- (2) Remove hub bearings and axle shafts.
- (3) Remove adjuster lock bolts and adjuster locks (Fig. 31).

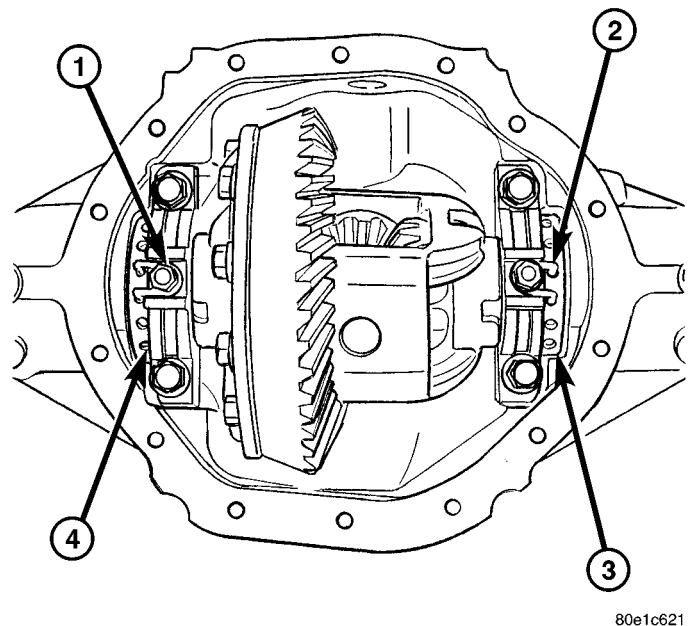


Fig. 31 ADJUSTERS AND LOCKS

- 1 - ADJUSTER LOCK BOLT
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER
- 4 - BEARING CAP

DIFFERENTIAL (Continued)

(4) Mark bearing caps left and right for installation reference.

(5) Remove bearing cap bolts and remove bearing caps.

(6) Loosen differential bearing adjusters (Fig. 32) with Spanner Wrench 8883.

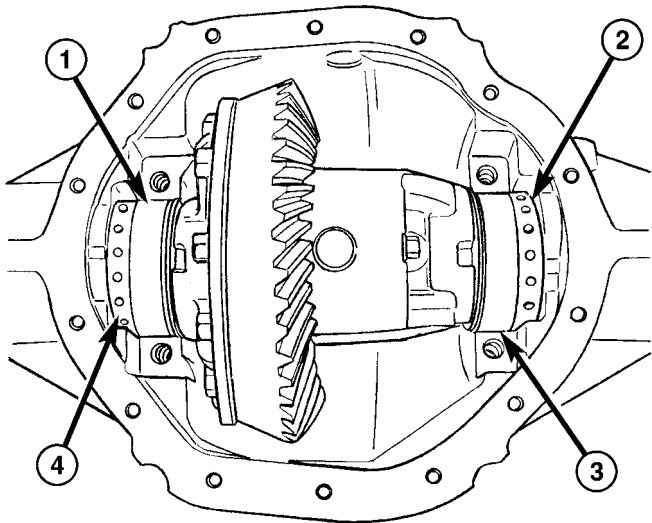


Fig. 32 ADJUSTERS

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- 1 - BEARING CUP
- 2 - ADJUSTER
- 3 - BEARING CUP
- 4 - ADJUSTER

(7) Remove differential case from the housing.

(8) Remove bearing cups and tag them left and right for installation reference.

DISASSEMBLY

(1) Remove pinion shaft lock bolt.

(2) Remove pinion shaft (Fig. 33).

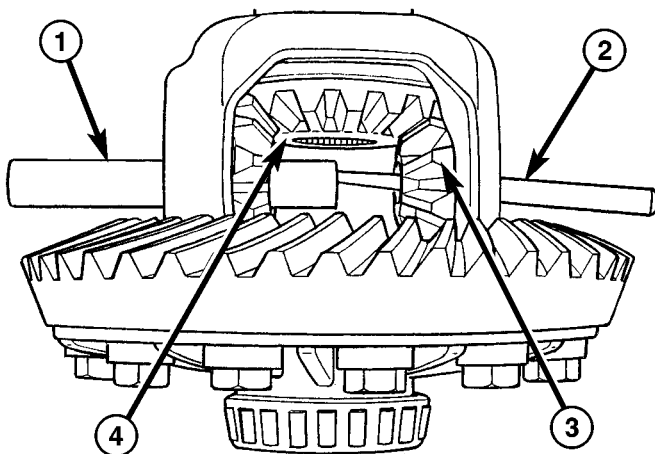
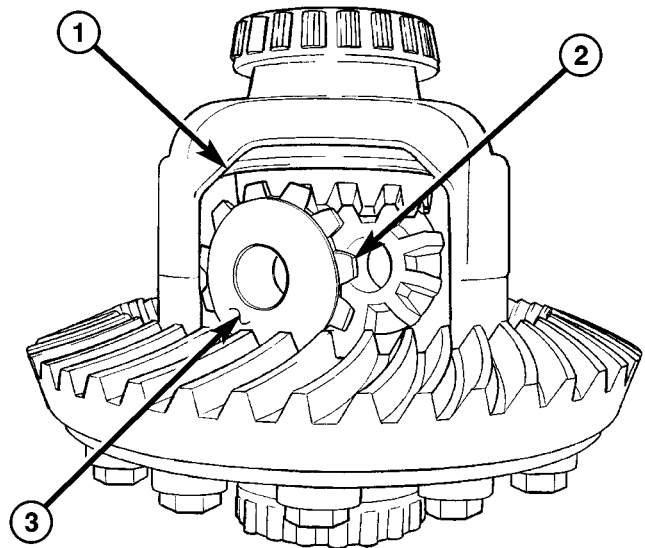


Fig. 33 PINION SHAFT

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- 1 - PINION SHAFT
- 2 - PUNCH
- 3 - PINION GEAR
- 4 - SIDE GEAR

(3) Rotate differential pinion gears to differential window and remove pinion gears and thrust washers (Fig. 34).

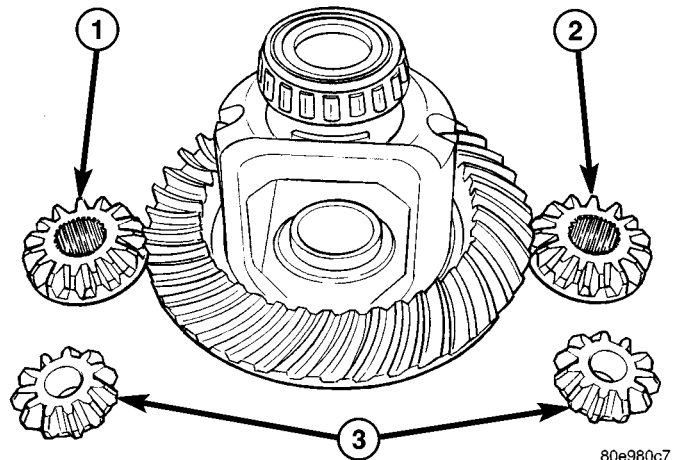


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Fig. 34 PINION GEAR

- 1 - DIFFERENTIAL WINDOW
- 2 - PINION GEAR
- 3 - THRUST GEAR

(4) Remove differential side gears and thrust washers (Fig. 35).



80e980c7

Fig. 35 SIDE GEARS

- 1 - SIDE GEAR
- 2 - SIDE GEAR
- 3 - PINION GEARS

DIFFERENTIAL (Continued)

ASSEMBLY

NOTE: If the same gears and thrust washers are being used, install them into their original locations.

(1) Lubricate all differential components with axle lubricant.

(2) Install differential side gears and thrust washers (Fig. 36).

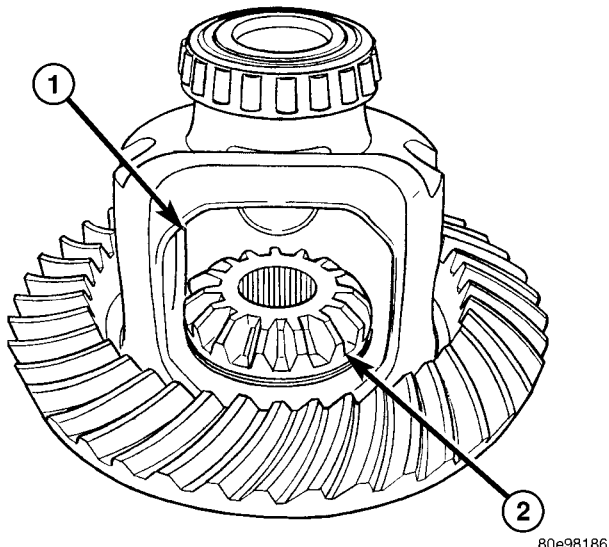


Fig. 36 SIDE GEARS

- 1 - DIFFERENTIAL WINDOW
2 - SIDE GEAR

(3) Rotate the one pinion gear with thrust washer into the differential case (Fig. 37). Then rotate the other pinion gear with thrust washer into the differential case.

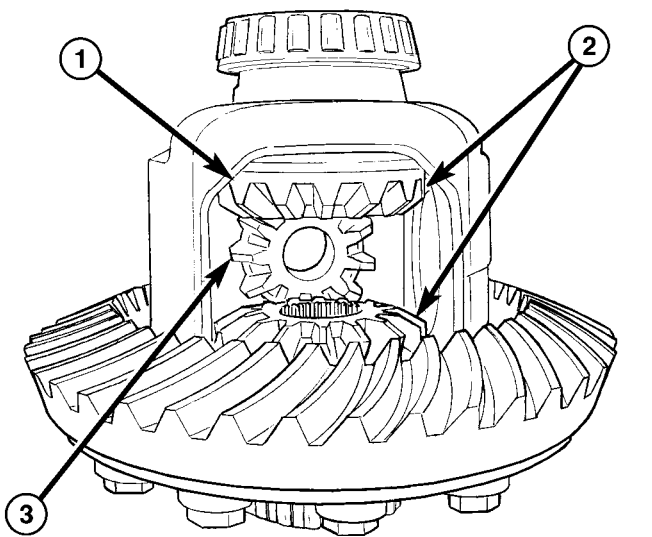


Fig. 37 PINION GEAR

- 1 - DIFFERENTIAL WINDOW
2 - SIDE GEARS
3 - PINION GEAR

(4) Align hole in the pinion gears with hole in the differential case.

(5) Install pinion shaft.

(6) Install **new** pinion shaft lock bolt and tighten to 52 N·m (38 ft. lbs.).

INSTALLATION

(1) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth.

CAUTION: Do not use water, steam, kerosene or gasoline for cleaning.

(2) Lubricate differential case bearing.

(3) Install differential case with bearings cups into the housing.

(4) Install bearing caps and bolts (Fig. 38). Tighten the bearing cap bolts finger-tight.

NOTE: Do not torque bearing cap and bolts at this time.

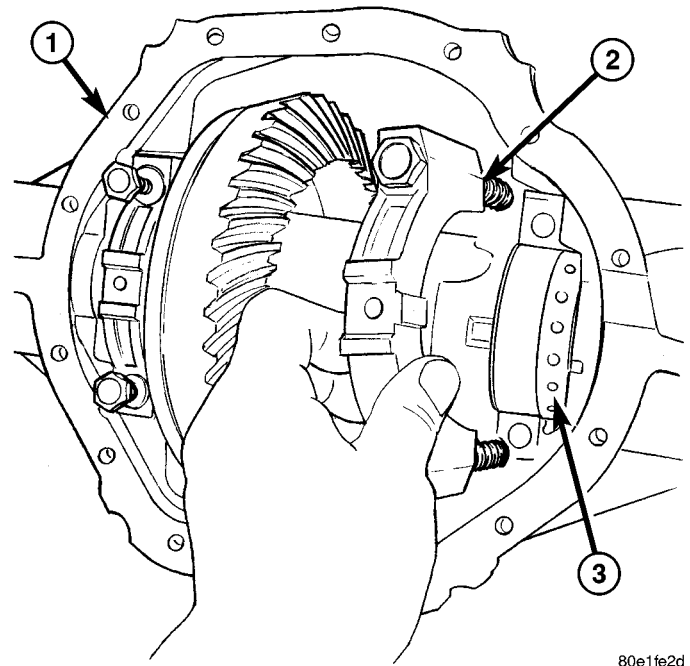


Fig. 38 CASE BEARING CAP

- 1 - DIFFERENTIAL HOUSING
2 - BEARING CAP
3 - ADJUSTER

(5) Slide differential case toward the pinion gear until the gears make contact/zero backlash. If zero backlash cannot be obtained, turn the pinion side adjuster until zero backlash is obtained.

(6) Holding the differential case toward the pinion gear, turn bearing adjusters with Spanner Wrench 8883 until they make contact with the differential bearings/cups.

DIFFERENTIAL (Continued)

(7) Back off the ring gear side adjuster 4 holes, to obtain initial ring gear backlash.

(8) Install ring gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(9) Tighten pinion gear side adjuster firmly against the differential case bearing cup.

(10) Rotate the pinion several times to seat the differential bearings.

(11) Loosen pinion gear side adjuster until it is no longer in contact with the bearing cup.

(12) Tighten pinion gear side adjuster until it just makes contact with the bearing cup.

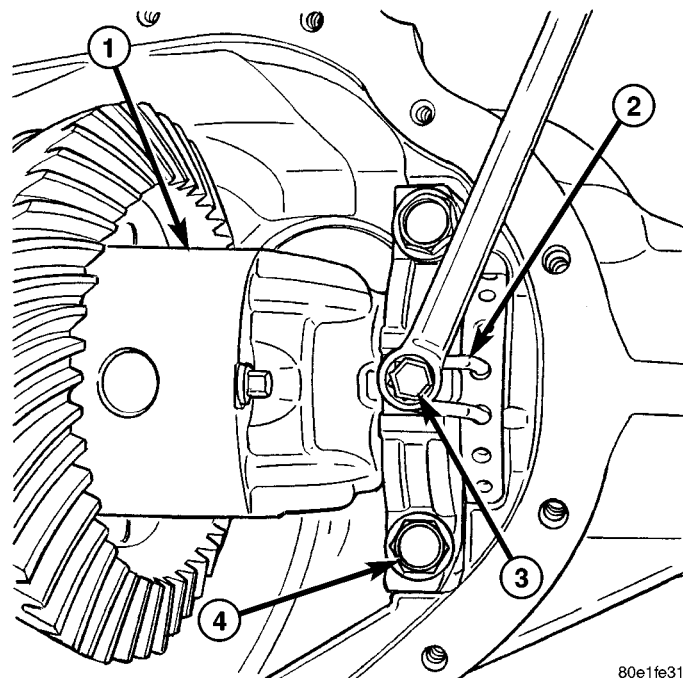
(13) Tighten pinion gear side adjuster an additional:

- **New Bearings:** 6 Adjuster Holes
- **Original Bearings:** 4 Adjuster Holes

(14) Install pinion gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(15) Tighten bearing cap bolts to 85 N·m (63 ft. lbs.).

(16) Tighten adjuster lock bolts to 25 N·m (18 ft. lbs.) (Fig. 39).



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Fig. 39 ADJUSTER LOCK BOLT

- 1 - DIFFERENTIAL CASE
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER LOCK BOLT
- 4 - BEARING CAP BOLT

(17) Measure ring gear backlash and check gear tooth contact pattern. Refer to Adjustments for procedure.

(18) Install axle shafts and hub bearings.

(19) Install differential housing gasket and cover. Tighten cover bolts to 40 N·m (30 ft. lbs.).

(20) Fill differential with lubricant, refer to Lubrication & Maintenance for capacity and lubricant type.

(21) Install fill plug and tighten to 32 N·m (24 ft. lbs.).

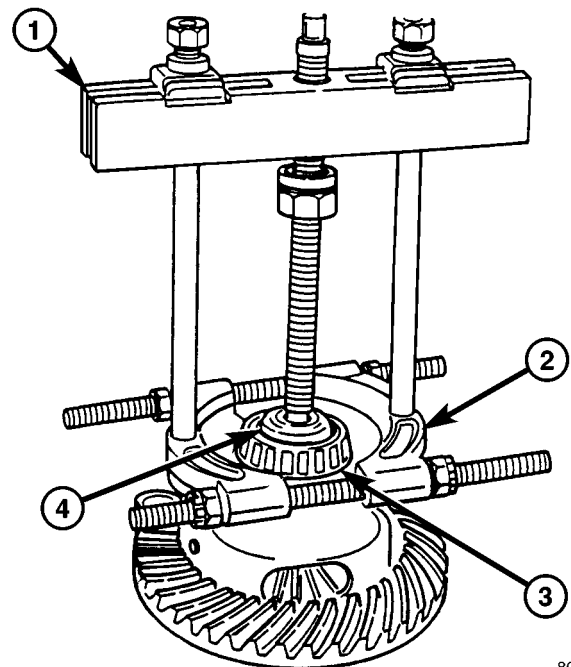
DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove the differential case from the housing.

(2) Install Plug 8888 into the end of the case.

(3) Remove differential case bearings with Bearing Splitter 1130 and Bridge 938 (Fig. 40).



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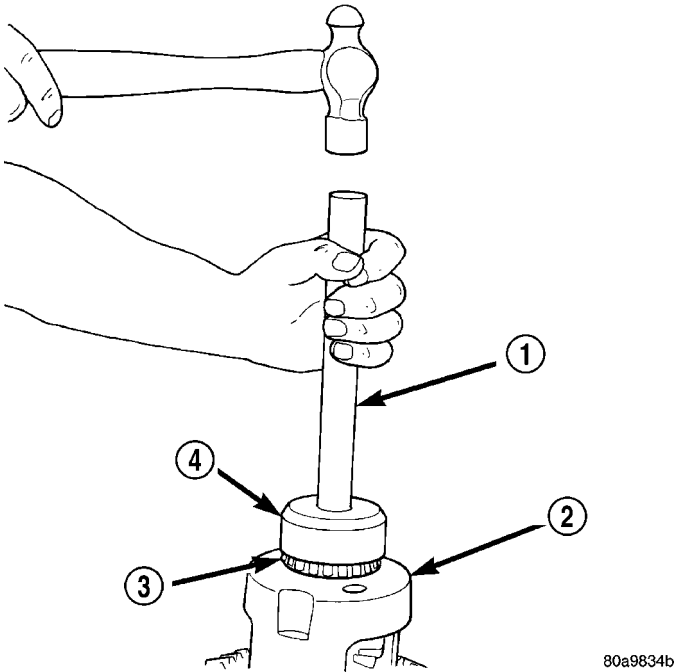
Fig. 40 DIFFERENTIAL CASE BEARING

- 1 - BRIDGE
- 2 - SPLITTER
- 3 - BEARING
- 4 - PLUG

DIFFERENTIAL CASE BEARINGS (Continued)

INSTALLATION

- (1) Set differential case on Plug 8888.
- (2) Install differential case bearings with Installer 8881 and Handle C-4171 (Fig. 41).

**Fig. 41 DIFFERENTIAL CASE BEARINGS**

- 1 - HANDLE
- 2 - DIFFERENTIAL CASE
- 3 - BEARING
- 4 - INSTALLER

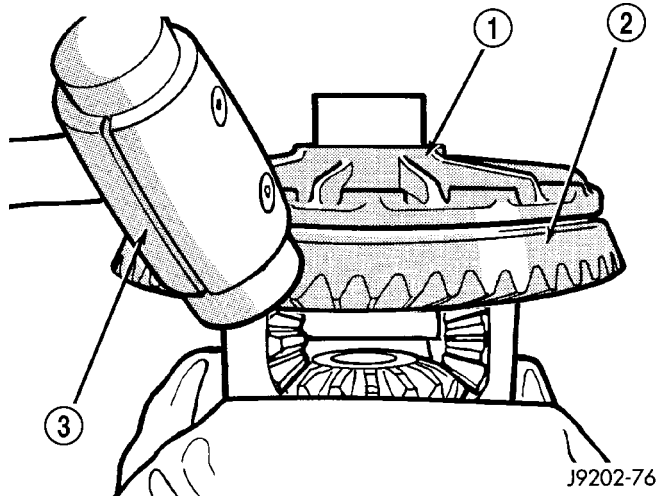
- (3) Install differential case into housing.

PINION GEAR/RING GEAR

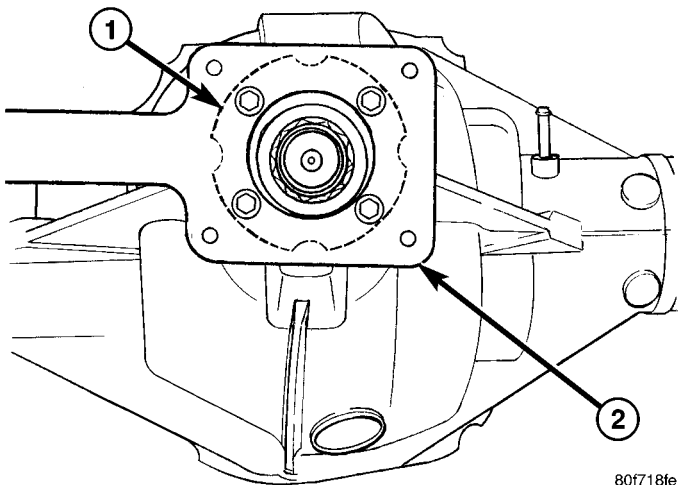
REMOVAL

NOTE: The ring and pinion gears are service in a matched set. Never replace the ring gear/pinion gear without replacing the other matching gear.

- (1) Mark pinion flange and propeller shaft for installation alignment.
- (2) Disconnect propeller shaft from pinion flange and remove propeller shaft.
- (3) Remove axle shafts.
- (4) Remove differential from housing.
- (5) Place differential case in a vise with soft metal jaw protectors
- (6) Remove bolts holding ring gear to differential case.
- (7) Drive ring gear from differential case with a soft hammer (Fig. 42).
- (8) Hold pinion flange with Flange Wrench 8979 (Fig. 43) and remove pinion flange nut and washer.

**Fig. 42 RING GEAR**

- 1 - DIFFERENTIAL CASE
- 2 - RING GEAR
- 3 - HAMMER

**Fig. 43 FLANGE WRENCH**

- 1 - PINION FLANGE
- 2 - WRENCH

- (9) Remove pinion flange from pinion with Pinion Flange Puller 8992 (Fig. 44).

- (10) Remove pinion gear from housing with Pinion Driver 8976 and a hammer (Fig. 45).

NOTE: Thread drive on shaft until it bottoms out.

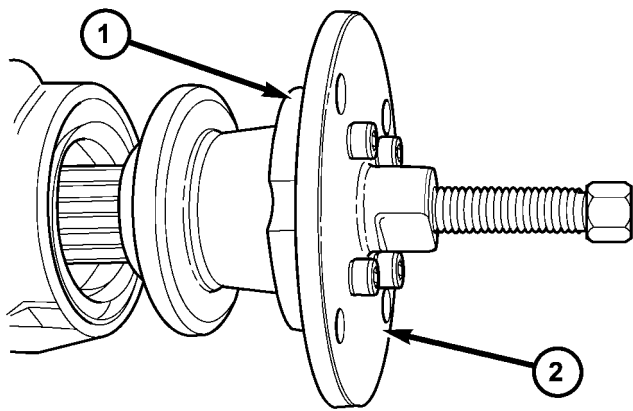
- (11) Remove pinion seal with a slide hammer or pry bar.

- (12) Remove and discard front pinion bearing

CAUTION: Do not reuse front pinion bearing/cup.

- (13) Remove collapsible spacer from the pinion shaft.

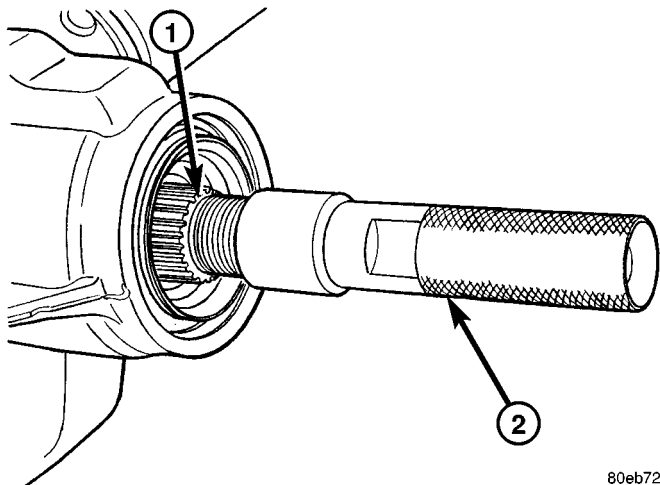
PINION GEAR/RING GEAR (Continued)



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Fig. 44 PINION FLANGE PULLER

- 1 - PINION FLANGE
2 - PULLER



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Fig. 45 PINION DRIVER

- 1 - PINION SHAFT
2 - PINION DRIVER

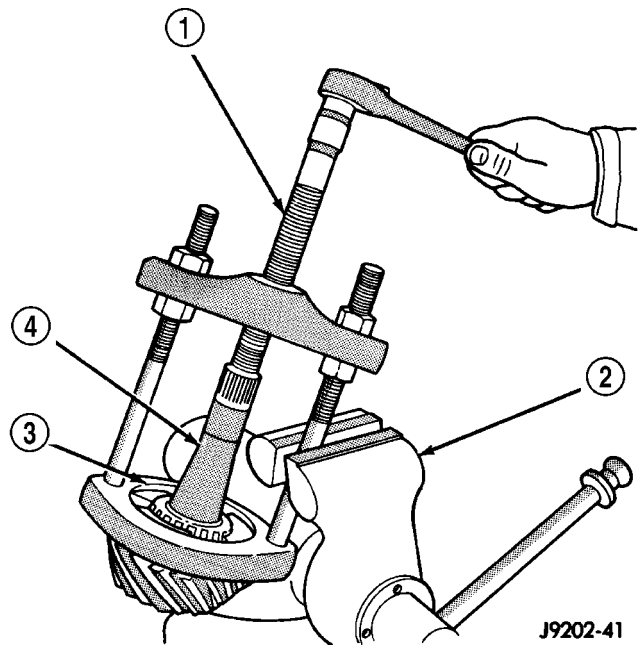
(14) Remove rear pinion bearing with Puller C-293-PA and Adapters 8879 (Fig. 46).

(15) Remove pinion depth shim from the pinion gear shaft and record thickness of the shims.

(16) Remove front pinion bearing cup from the housing with a punch and hammer and discard.

CAUTION: Do not reuse front pinion bearing/cup.

(17) Remove rear pinion bearing cup from the housing with a punch and hammer, if bearing is replaced.



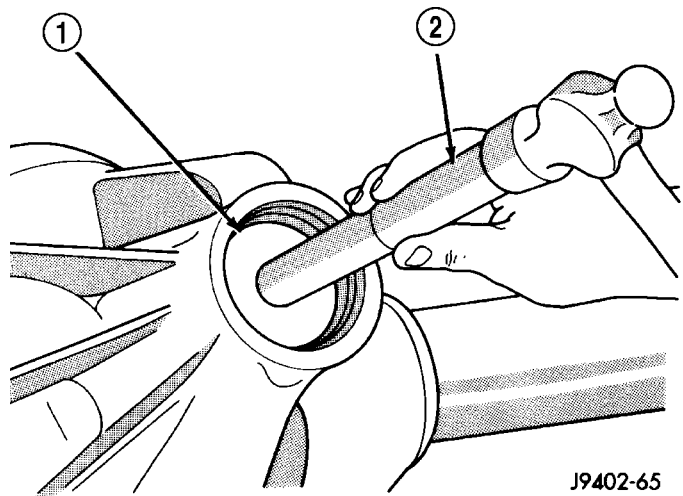
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Fig. 46 REAR PINION BEARING

- 1 - PULLER
2 - VISE
3 - PINION SHAFT
4 - ADAPTER BLOCKS

INSTALLATION

(1) Install front pinion bearing cup (Fig. 47) with Installer D-146 and Handle C-4171.



J9402-65

Fig. 47 FRONT PINION BEARING CUP

- 1 - INSTALLER
2 - HANDLE

PINION GEAR/RING GEAR (Continued)

(2) Install rear pinion bearing cup (Fig. 48) with Installer 8886 and Handle C-4171, if bearing is replaced.

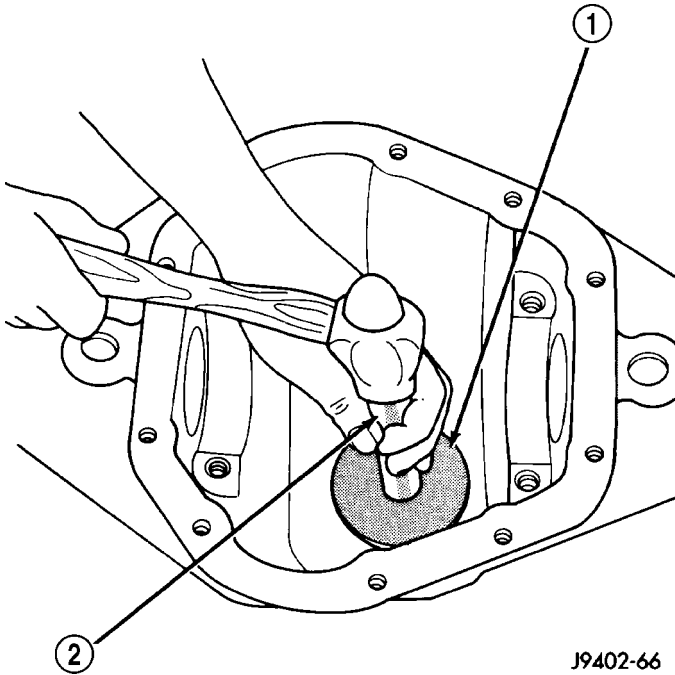


Fig. 48 REAR PINION BEARING CUP

- 1 - INSTALLER
2 - HANDLE

(3) Install pinion depth shim (Fig. 49) on the pinion gear shaft.

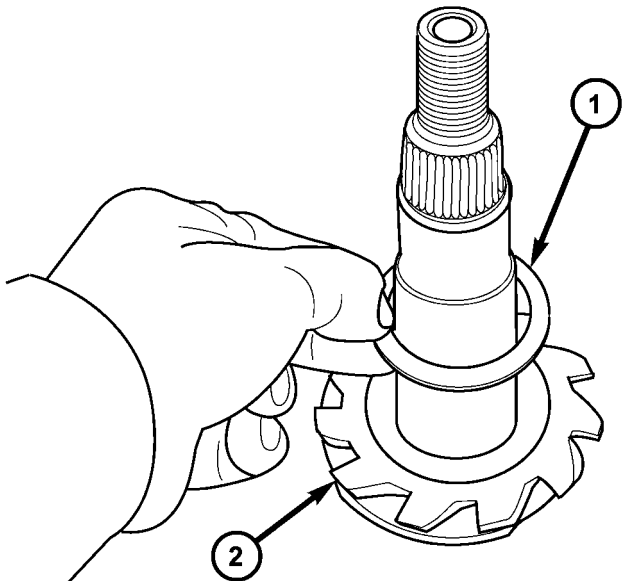


Fig. 49 PINION DEPTH SHIM

- 1 - PINION DEPTH SHIM
2 - PINION GEAR

(4) Install rear pinion bearing (Fig. 50) with Installer C-3095-A and a press.

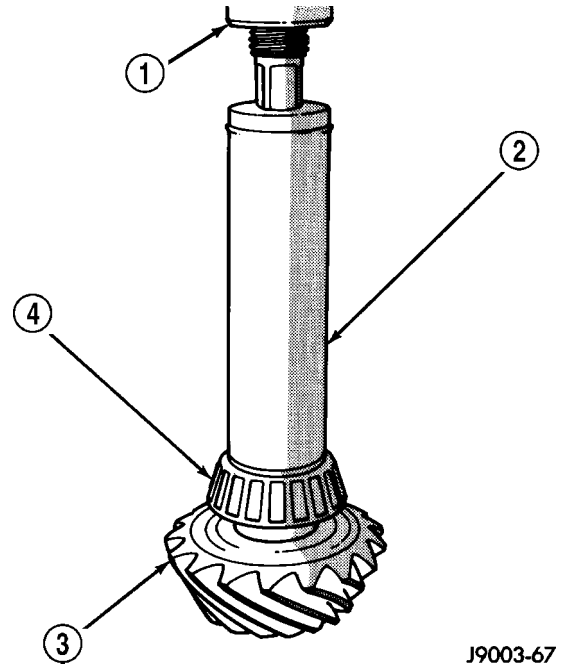


Fig. 50 REAR PINION BEARING

- 1 - PRESS
2 - INSTALLER
3 - PINION GEAR
4 - REAR PINION BEARING

(5) Install **new** collapsible spacer (Fig. 51).

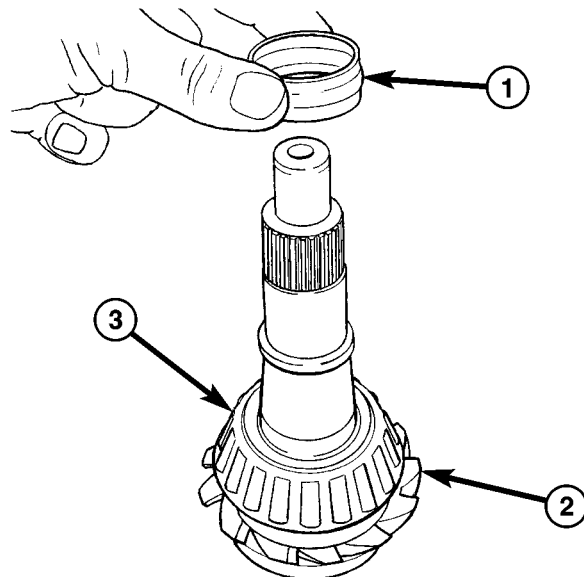


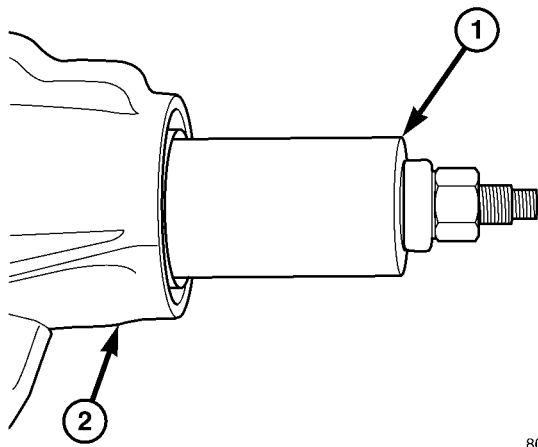
Fig. 51 COLAPSIBLE SPACER

- 1 - COLAPSIBLE SPACER
2 - PINION GEAR
3 - REAR PINION BEARING

(6) Lubricate pinion and bearings.

PINION GEAR/RING GEAR (Continued)

(7) Install pinion into the housing and place front pinion bearing onto the pinion shaft. Draw the pinion shaft into the front bearing with Installer 8982 (Fig. 52).

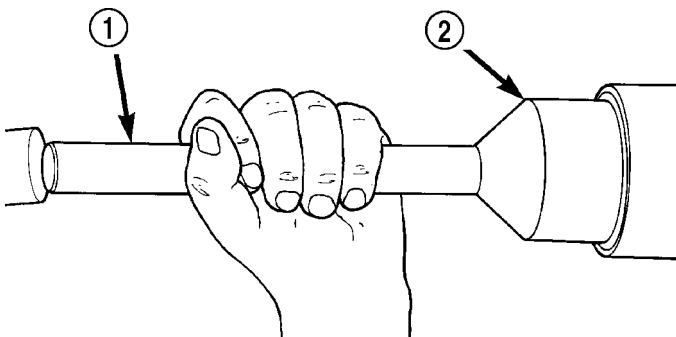


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Fig. 52 PINION GEAR INSTALLER

- 1 - INSTALLER
2 - DIFFERENTIAL HOUSING

(8) Install **new** pinion seal (Fig. 53) with Installer 8882 and Handle C-4171.



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Fig. 53 PINION SEAL INSTALLER

- 1 - HANDLE
2 - INSTALLER

(9) Apply a light coat of teflon sealant to the pinion flange splines.

(10) Hold pinion and lightly tap the pinion flange onto the pinion shaft, until a few threads are showing.

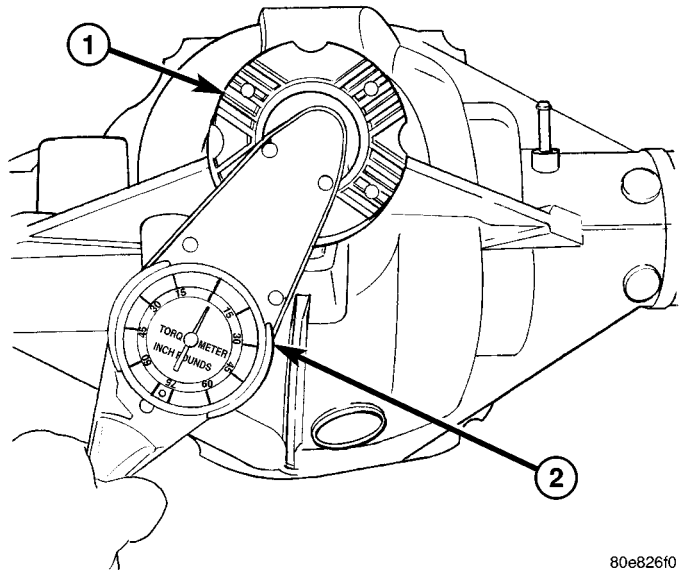
(11) Install pinion flange washer and **new** pinion nut.

(12) Hold pinion flange with Flange Wrench 8979 and tighten pinion nut until end play is taken up.

(13) Rotate pinion several times to seat bearings.

(14) Measure pinion rotating torque with an inch pound torque wrench (Fig. 54). Tighten pinion nut in small increments until pinion rotating torque is:

- **New Pinion Bearings:** 1.7-2.8 N·m (15-25 in. lbs.)
- **Original Pinion Bearings:** 1.1-2.2 N·m (10-20 in. lbs.)



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Fig. 54 PINION ROTATING TORQUE

- 1 - PINION FLANGE
2 - TORQUE WRENCH

(15) Rotate pinion several times then verify pinion rotating torque again.

(16) Position the ring gear on differential case and start two **new** ring gear bolts.

(17) Install the rest of the **new** ring gear bolts and tighten them alternately to seat the ring gear.

(18) Torque ring gear bolts to 140 N·m (103 ft. lbs.).

(19) Install differential in housing.

(20) Measure final rotating torque with an inch pound torque wrench. The final pinion rotating torque plus differential case bearing preload is:

- **New Bearings:** 3.4-5.6 N·m (30-50 in. lbs.)
- **Original Bearings:** 2.8-5.1 N·m (25-45 in. lbs.)

(21) Install axle shafts.

(22) Verify ring gear backlash and gear contact pattern.

(23) Install the propeller shaft with the reference marks aligned.

(24) Install differential cover with gasket and tighten to 40 N·m (30 ft. lbs.).

(25) Fill differential with fluid and tighten fill plug to 32 N·m (24 ft. lbs.).

REAR AXLE - 9 1/4

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REAR AXLE - 9 1/4

DESCRIPTION

The axle consist of a cast iron center section with axle tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing (Fig. 1). The axles are equipped with semi-floating axle shafts, meaning vehicle loads are supported by the axle shaft and bearings. The axle shafts are retained by C-locks in the differential side gears.

OPERATION

The axle receives power from the propeller shaft. The propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth

contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

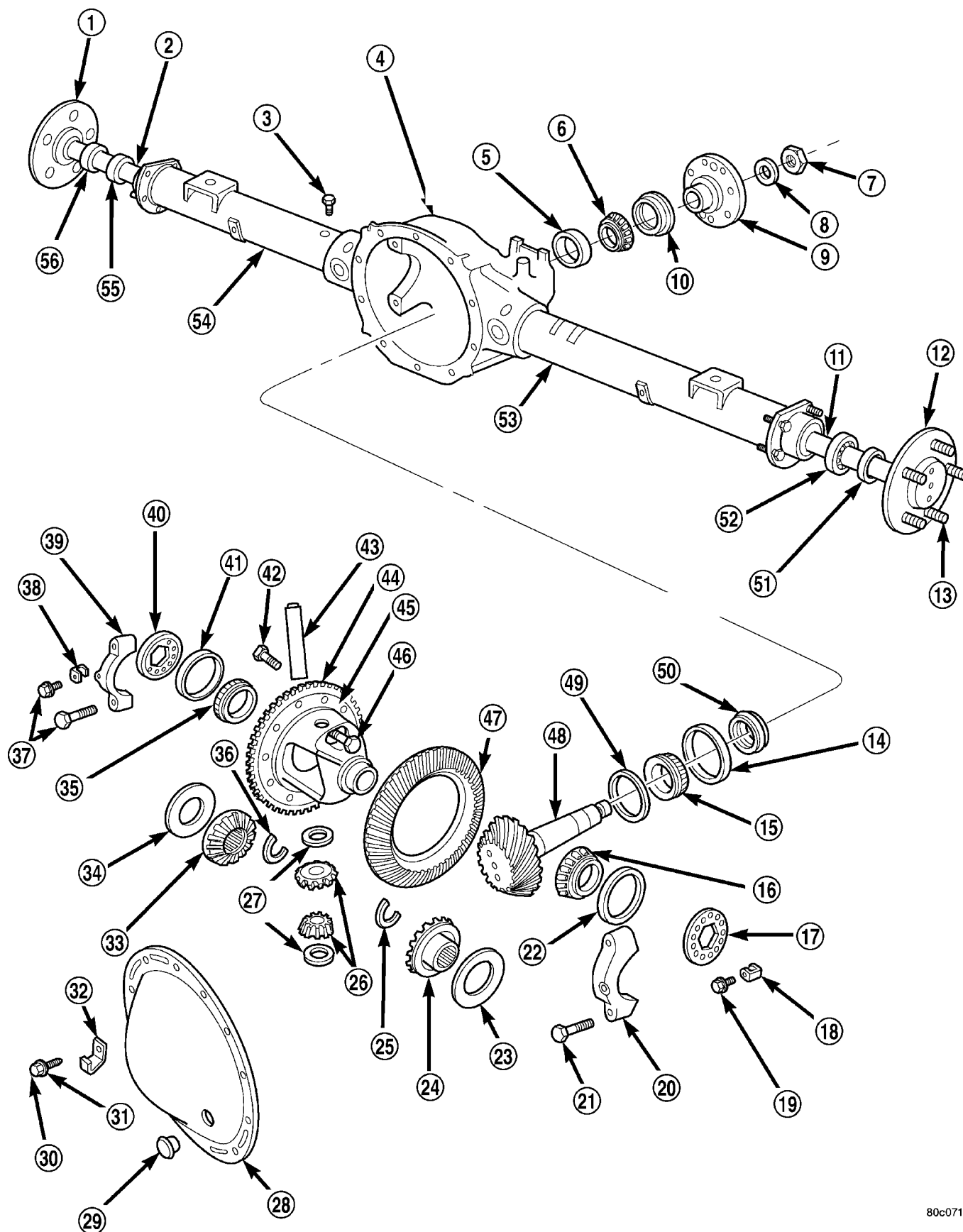
Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing

REAR AXLE - 9 1/4 (Continued)



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Fig. 1 9 1/4 AXLE

REAR AXLE - 9 1/4 (Continued)

1 - HUB	29 - PLUG
2 - AXLE SHAFT	30 - COVER BOLT
3 - VENT FITTING	31 - WASHER
4 - DIFFERENTIAL HOUSING	32 - CLIP
5 - CUP	33 - SIDE GEAR
6 - FRONT PINION BEARING CONE	34 - THRUST WASHER
7 - NUT	35 - DIFFERENTIAL BEARING CONE
8 - WASHER	36 - C-LOCK
9 - COMPANION FLANGE	37 - BOLT
10 - SEAL	38 - LOCK
11 - AXLE SHAFT	39 - BEARING CUP
12 - HUB	40 - ADJUSTER
13 - STUD	41 - BEARING CUP
14 - BEARING CUP	42 - BOLT
15 - REAR PINION BEARING CONE	43 - PINION MATE SHAFT
16 - DIFFERENTIAL BEARING	44 - EXCITER RING
17 - ADJUSTER	45 - DIFFERENTIAL CASE
18 - LOCK	46 - RING GEAR BOLT
19 - BOLT	47 - RING GEAR
20 - BEARING CAP	48 - PINION
21 - CAP BOLT	49 - PINION GEAR DEPTH SHIM
22 - BEARING CUP	50 - PRELOAD COLLAPSIBLE SPACER
23 - THRUST WASHER	51 - SEAL
24 - SIDE GEAR	52 - AXLE SHAFT BEARING
25 - C-LOCK	53 - AXLE SHAFT TUBE
26 - DIFFERENTIAL POSITIONS	54 - AXLE TUBE
27 - THRUST WASHER	55 - AXLE SHAFT BEARING
28 - COVER	56 - SEAL

noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).
- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).

- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

NOTE: All driveline components should be examined before starting any repair.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

REAR AXLE - 9 1/4 (Continued)
DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube. 2. Bent or sprung axle shaft.	1. Inspect axle tube alignment. Correct as necessary. 2. Inspect and correct as necessary.
Axle Shaft Broke	1. Misaligned axle tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace the broken shaft after correcting tube mis-alignment. 2. Replace broken shaft and avoid excessive weight on vehicle. 3. Replace broken shaft and avoid or correct erratic clutch operation. 4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly. 2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly. 3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight. 4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Fill differential with the correct fluid type and quantity. 2. Replace scored gears. Fill differential with the correct fluid type and quantity. 3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.

REAR AXLE - 9 1/4 (Continued)

Condition	Possible Causes	Correction
Loss Of Lubricant	1. Lubricant level too high. 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn pinion seal. 5. Worn/scored yoke. 6. Axle cover not properly sealed.	1. Drain lubricant to the correct level. 2. Replace seals. 3. Repair as necessary. 4. Replace seal. 5. Replace yoke and seal. 6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low. 2. Improper grade of lubricant. 3. Bearing pre-loads too high. 4. Insufficient ring gear backlash.	1. Fill differential to correct level. 2. Fill differential with the correct fluid type and quantity. 3. Re-adjust bearing pre-loads. 4. Re-adjust ring gear backlash.
Gear Teeth Broke	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavement. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation. 3. Replace gears and examine remaining parts for damage. 4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant. 2. Improper ring gear and pinion adjustment. 3. Unmatched ring gear and pinion. 4. Worn teeth on ring gear and/or pinion. 5. Loose pinion bearings. 6. Loose differential bearings. 7. Mis-aligned or sprung ring gear. 8. Loose differential bearing cap bolts. 9. Housing not machined properly.	1. Fill differential with the correct fluid type and quantity. 2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth. 3. Replace gears with a matched ring gear and pinion. 4. Replace ring gear and pinion. 5. Adjust pinion bearing pre-load. 6. Adjust differential bearing pre-load. 7. Measure ring gear run-out. Replace components as necessary. 8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued to the proper specification. 9. Replace housing.

REAR AXLE - 9 1/4 (Continued)

REMOVAL

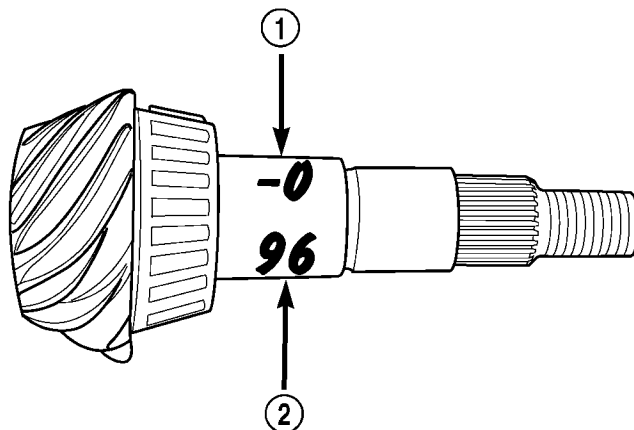
- (1) Raise and support the vehicle.
- (2) Position a lifting device under the axle.
- (3) Secure axle to device.
- (4) Remove wheels and tires assemblies.
- (5) Remove RWAL sensor from the differential housing.
- (6) Remove brake hose at the axle junction block.
- (7) Disconnect parking brake cables and cable brackets.
- (8) Remove brake calipers and rotors.
- (9) Remove axle vent hose.
- (10) Mark propeller shaft and companion flange for installation alignment reference.
- (11) Remove propeller shaft.
- (12) Remove shock absorbers from axle.
- (13) Remove U-bolts from axle.
- (14) Separate the axle from the vehicle.

INSTALLATION

- (1) Raise axle with lifting device and align to the leaf spring centering bolts.
- (2) Install axle U-bolts and tighten to 149 N·m (110 ft. lbs.).
- (3) Install shock absorbers to axle and tighten to specification.
- (4) Install the RWAL sensor to the differential housing.
- (5) Connect the parking brake cables and cable brackets.
- (6) Install brake rotors and calipers.
- (7) Connect brake hose to the axle junction block.
- (8) Install axle vent hose.
- (9) Align propeller shaft and pinion companion flange reference marks and tighten companion flange bolts to 115 N·m (85 ft. lbs.).
- (10) Install the wheels and tires.
- (11) Fill differential to specifications.
- (12) Remove lifting device from axle and lower the vehicle.

ADJUSTMENTS

Ring gear and pinion are supplied as matched sets only. The identifying numbers for the ring gear and pinion are painted onto the pinion gear shaft (Fig. 2) and the side of the ring gear. A plus (+) number, minus (–) number or zero (0) along with the gear set sequence number (01 to 99) is on each gear. This first number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion marked with a (0). The next two numbers are the sequence number of the gear set. The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern for additional information.

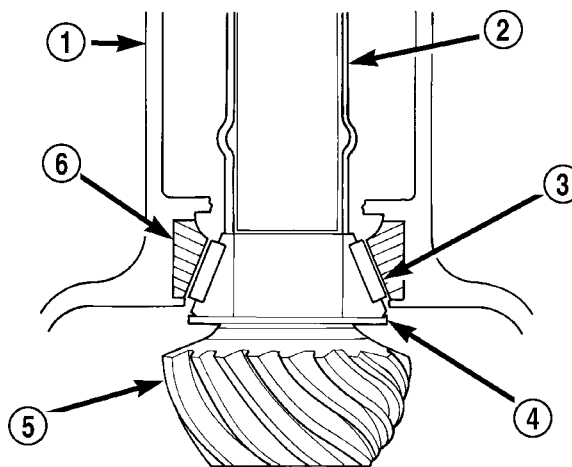


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Fig. 2 PINION ID NUMBER

- 1 - VARIANCE NUMBER
2 - SEQUENCE NUMBER

Compensation for pinion depth variance is achieved with select shims. The shims are placed behind the rear pinion bearing. (Fig. 3).



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Fig. 3 ADJUSTMENT SHIM LOCATIONS

- 1 - DIFFERENTIAL HOUSING
2 - COLLAPSIBLE SPACER
3 - PINION BEARING
4 - PINION DEPTH SHIM
5 - PINION GEAR
6 - BEARING CUP

If a new gear set is being installed, note the depth variance painted onto both the original and replacement pinion. Add or subtract the thickness of the original depth shims to compensate for the difference in the depth variances. Refer to the Depth Variance chart.

Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus the amount needed.

Note the painted number on the shaft of the drive pinion (–1, –2, 0, +1, +2, etc.). The numbers repre-

REAR AXLE - 9 1/4 (Continued)

sent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shims. If the number

is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-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

PINION DEPTH MEASUREMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 4).

(1) Assemble Pinion Height Block 6739, Pinion Block 8542 and rear pinion bearing onto Screw 6741 (Fig. 4).

(2) Insert assembled height gauge components, rear bearing, and screw into the housing through pinion bearing cups (Fig. 5).

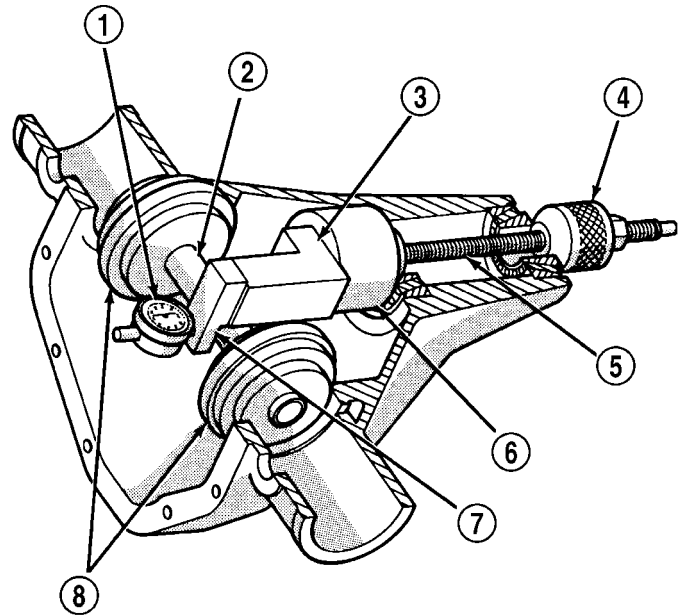
(3) Install front pinion bearing and Cone-Nut 6740 hand tight (Fig. 4).

(4) Place Arbor Disc 8541 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 6). Install differential bearing caps on arbor discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

NOTE: Arbor Discs 8541 has different step diameters to fit other axles. Choose proper step for axle being serviced.

(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(6) Place Scooter Block/Dial Indicator in position in axle housing so dial probe and scooter block are flush against the rearward surface of the pinion height block (Fig. 4). Hold scooter block in place and zero the dial indicator. Tighten dial indicator face lock screw.

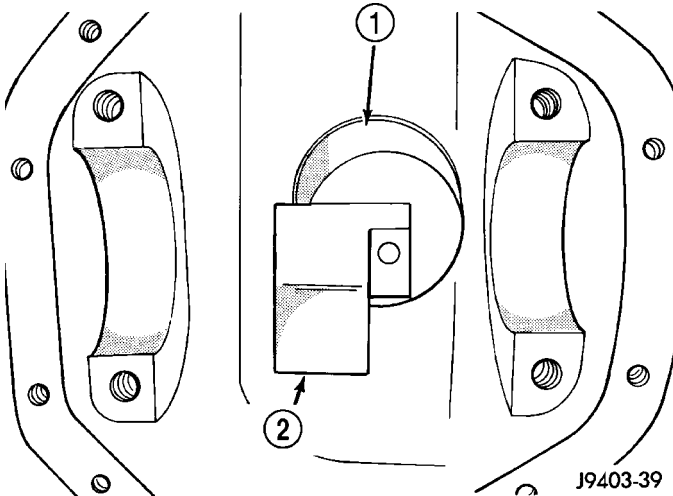


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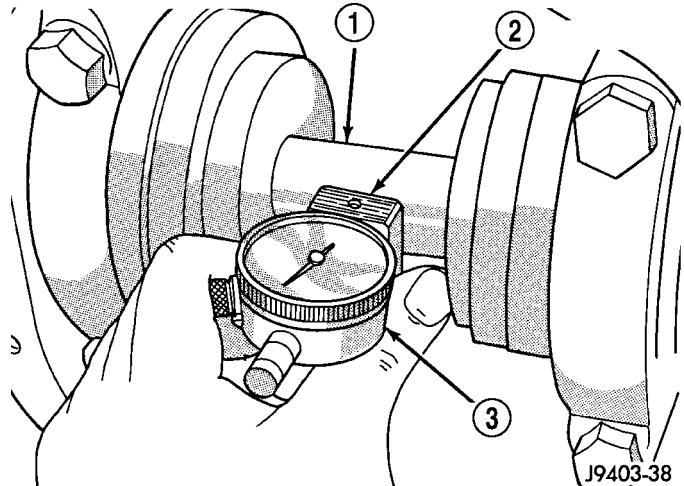
Fig. 4 PINION DEPTH GAUGE TOOLS

- 1 - DIAL INDICATOR
- 2 - ARBOR
- 3 - PINION HEIGHT BLOCK
- 4 - CONE
- 5 - SCREW
- 6 - PINION BLOCK
- 7 - SCOOTER BLOCK
- 8 - ARBOR DISC

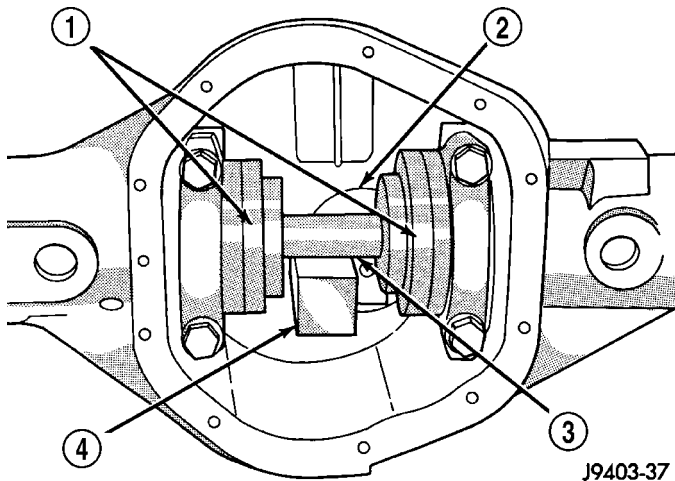
REAR AXLE - 9 1/4 (Continued)

**Fig. 5 PINION HEIGHT BLOCK**

- 1 - PINION BLOCK
2 - PINION HEIGHT BLOCK

**Fig. 7 PINION GEAR DEPTH MEASUREMENT**

- 1 - ARBOR
2 - SCOOTER BLOCK
3 - DIAL INDICATOR

**Fig. 6 PINION DEPTH TOOLS**

- 1 - ARBOR DISC
2 - PINION BLOCK
3 - ARBOR
4 - PINION HEIGHT BLOCK

(7) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 7). Continue moving the dial probe to the crest of the arbor bar and record the highest reading.

(8) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number marked on the shaft of the pinion. For example, if the depth variance is -2, add +0.002 in. to the dial indicator reading.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

The following must be considered when adjusting bearing preload and gear backlash:

- The maximum ring gear backlash variation is 0.076 mm (0.003 in.).
- Mark the gears so the same teeth are meshed during all backlash measurements.
- Maintain the torque while adjusting the bearing preload and ring gear backlash.
- Excessive adjuster torque will introduce a high bearing load and cause premature bearing failure. Insufficient adjuster torque can result in excessive differential case free-play and ring gear noise.
- Insufficient adjuster torque will not support the ring gear correctly and can cause excessive differential case free-play and ring gear noise.

NOTE: The differential bearing cups will not always immediately follow the threaded adjusters as they are moved during adjustment. To ensure accurate bearing cup responses to the adjustments:

- Maintain the gear teeth engaged (meshed) as marked.
- The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth.
- Do this five to ten times each time the threaded adjusters are adjusted.

(1) Through the axle tube use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated. Allow some ring gear backlash approximately 0.25 mm (0.01 in.) between the ring and pinion gear. Seat the bearing cups with the procedure described above.

(2) Install dial indicator and position the plunger against the drive side of a ring gear tooth (Fig. 8). Measure the backlash at 4 positions, 90 degrees apart around the ring gear. Locate and mark the area of minimum backlash.

REAR AXLE - 9 1/4 (Continued)

(3) Rotate the ring gear to the position of the least backlash. Mark the gear so that all future backlash measurements will be taken with the same gear teeth meshed.

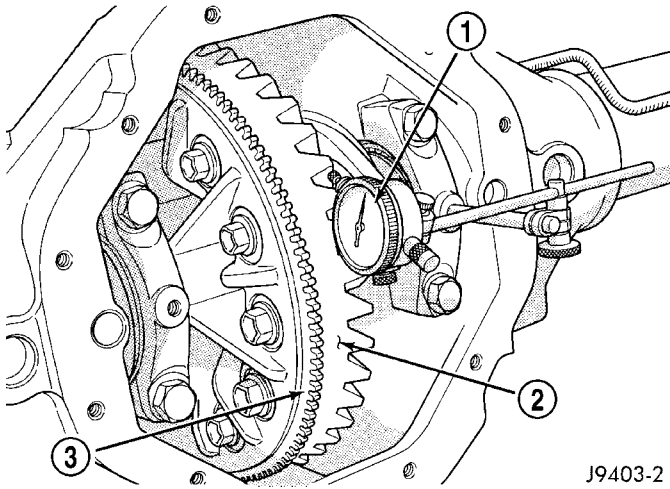


Fig. 8 RING GEAR BACKLASH

- 1 - DIAL INDICATOR
2 - RING GEAR
3 - EXCITER RING

(4) Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.076 to 0.102 mm (0.003-0.004 in.) with each adjuster tightened to 14 N·m (10 ft. lbs.). Seat the bearing cups with the procedure described above.

(5) Tighten the differential bearing cap bolts 136 N·m (100 ft. lbs.).

(6) Tighten the right-side threaded adjuster to 102 N·m (75 ft. lbs.). Seat the bearing cups with the procedure described above. Continue to tighten the right-side adjuster and seat bearing cups until the torque remains constant at 102 N·m (75 ft. lbs.).

(7) Measure the ring gear backlash. The range of backlash is 0.15 to 0.203 mm (0.006 to 0.008 in.).

(8) Continue increasing the torque at the right-side threaded adjuster until the specified backlash is obtained.

NOTE: The left-side threaded adjuster torque should have approximately 102 N·m (75 ft. lbs.). If the torque is considerably less, the complete adjustment procedure must be repeated.

(9) Tighten the left-side threaded adjuster until 102 N·m (75 ft. lbs.) torque is indicated. Seat the bearing rollers with the procedure described above. Do this until the torque remains constant.

(10) Install the threaded adjuster locks and tighten the lock screws to 10 N·m (90 in. lbs.).

GEAR CONTACT PATTERN

Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shortened gear life.

- (1) Wipe clean each tooth of the ring gear.
- (2) Apply gear marking compound to all of the ring gear teeth.
- (3) Verify bearing cap bolts are torque specification.
- (4) Apply parking brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.
- (5) Rotate the pinion/pinion yoke 4 full revolutions in each directions.
- (6) Read gear tooth contact pattern:
 - Gear contact pattern is correct (Fig. 9). Backlash and pinion depth is correct.

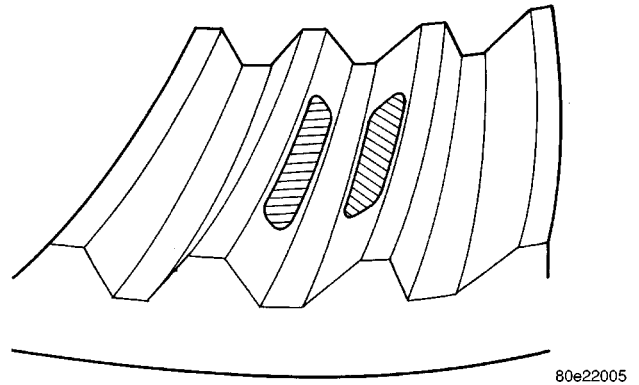


Fig. 9 CORRECT CONTACT PATTERN

- Ring gear too far away from pinion gear (Fig. 10). Decrease backlash, by moving the ring closer to the pinion gear using the adjusters.

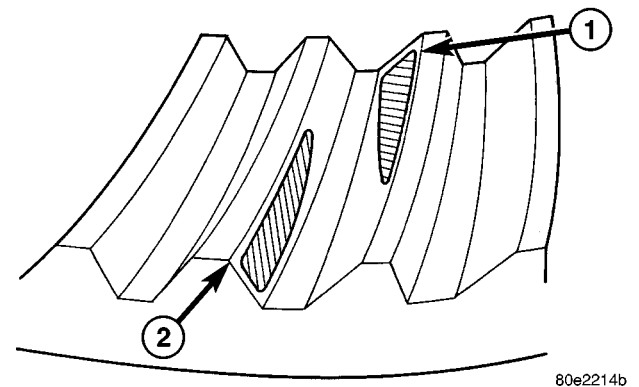
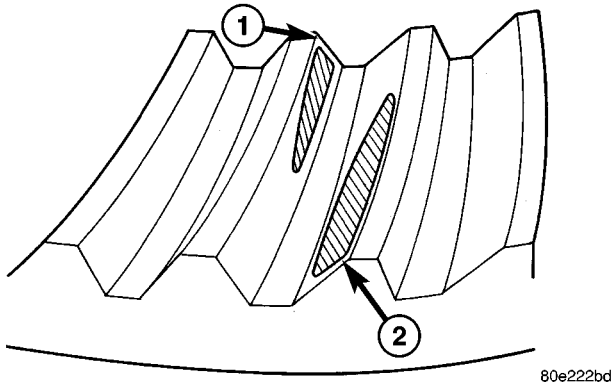


Fig. 10 INCORRECT BACKLASH

- 1 - COAST SIDE TOE
2 - DRIVE SIDE HEEL

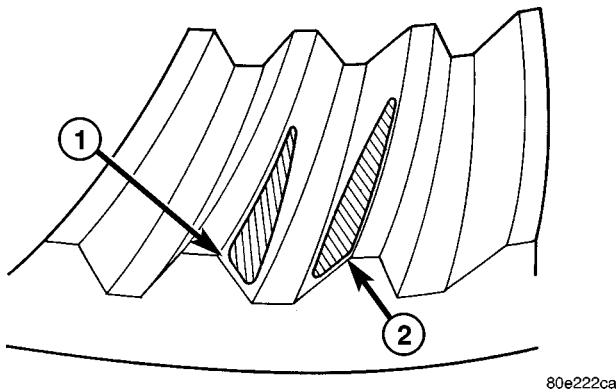
REAR AXLE - 9 1/4 (Continued)

- Ring gear too close to pinion gear (Fig. 11). Increase backlash, by moving the ring away from the pinion gear using the adjusters.

**Fig. 11 INCORRECT BACKLASH**

- 1 - DRIVE SIDE TOE
- 2 - COAST SIDE HEEL

- Ring gear too far away from pinion gear (Fig. 12). Decrease backlash, by moving the ring closer to the pinion gear using the adjusters.

**Fig. 12 INCORRECT BACKLASH**

- 1 - DRIVE SIDE HEEL
- 2 - COAST SIDE HEEL

- Ring gear too close to pinion gear (Fig. 13). Increase backlash, by moving the ring away from the pinion gear using the adjusters.

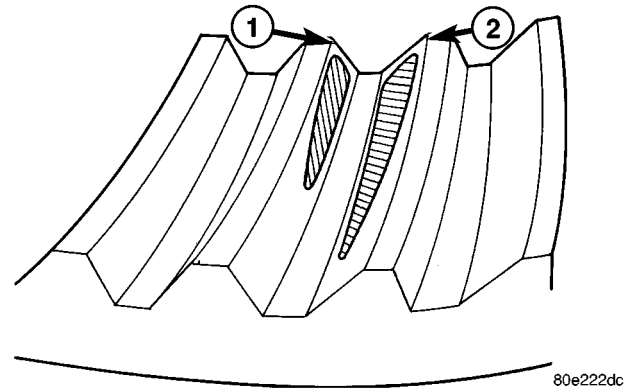
- Pinion gear set too low (Fig. 14). Increase pinion gear height, by increasing the pinion depth shim thickness.

- Pinion gear set too high (Fig. 15). Decrease pinion gear height, by decreasing the pinion depth shim thickness.

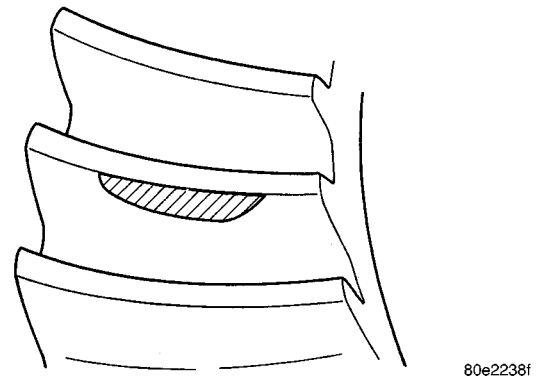
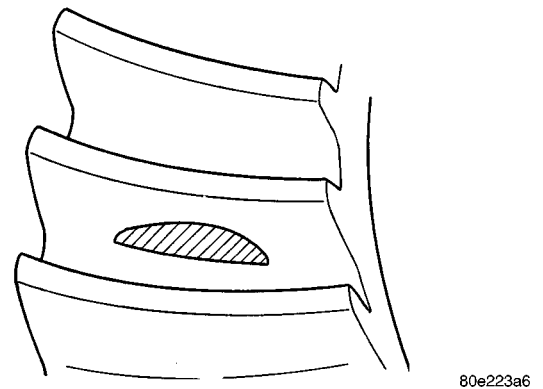
SIDE GEAR CLEARANCE

When measuring side gear clearance, check each gear independently. If it necessary to replace a side gear, replace both gears as a matched set.

- (1) Install the axle shafts and C-locks and pinion mate shaft.

**Fig. 13 INCORRECT BACKLASH**

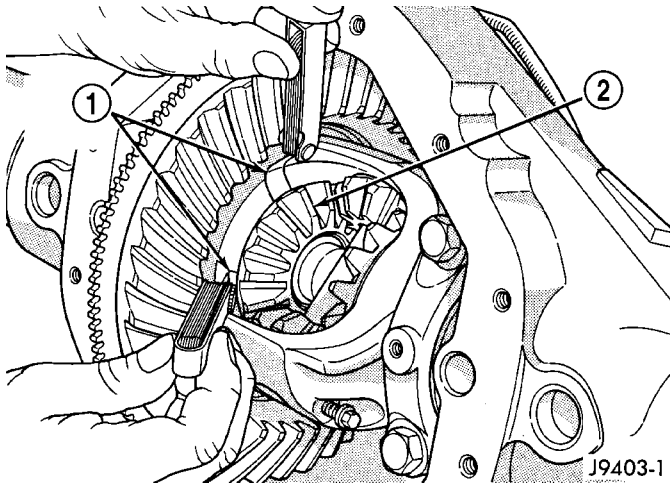
- 1 - DRIVE SIDE TOE
- 2 - COAST SIDE TOE

**Fig. 14 LOW PINION HEIGHT****Fig. 15 HIGH PINION HEIGHT**

- (2) Measure each side gear clearance. Insert a matched pair of feeler gauge blades between the gear and differential housing on opposite sides of the hub (Fig. 16).

- (3) If side gear clearances is no more than 0.005 inch. Determine if the axle shaft is contacting the pinion mate shaft. **Do not remove the feeler gauges, inspect the axle shaft with the feeler gauge inserted behind the side gear.** If the end of

REAR AXLE - 9 1/4 (Continued)

**Fig. 16 SIDE GEAR CLEARANCE**

- 1 - FEELER GAUGE
2 - SIDE GEAR

the axle shaft is not contacting the pinion mate shaft, the side gear clearance is acceptable.

(4) If clearance is more than 0.005 inch (axle shaft not contacting mate shaft), record the side gear clearance. Remove the thrust washer and measure its thickness with a micrometer. Add the washer thickness to the recorded side gear clearance. The sum of gear clearance and washer thickness will determine required thickness of replacement thrust washer (Fig. 17).

SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
TOTAL	0.040
REPLACEMENT WASHER THICKNESS	- 0.037
NEW SIDE GEAR CLEARANCE	0.003
	J9203-31

Fig. 17 SIDE GEAR CALCULATIONS

In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C-lock is preventing the side gear from sliding on the axle shaft.

(5) If there is no side gear clearance, remove the C-lock from the axle shaft. Use a micrometer to measure the thrust washer thickness. Record the thickness and re-install the thrust washer. Assemble the differential case without the C-lock installed and re-measure the side gear clearance.

(6) Compare both clearance measurements. If the difference is less than 0.012 inch (0.305 mm), add clearance recorded when the C-lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.

(7) If clearance is 0.012 inch (0.305 mm) or greater, both side gears must be replaced (matched set) and the clearance measurements repeated.

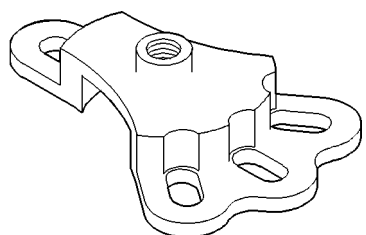
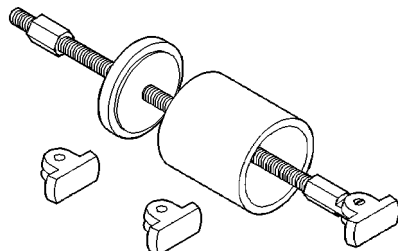
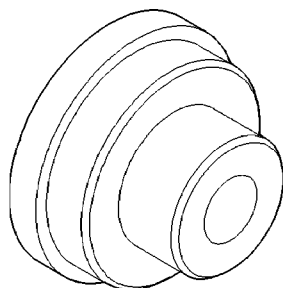
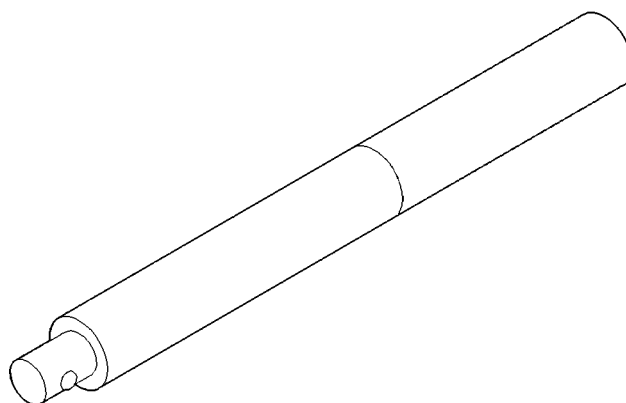
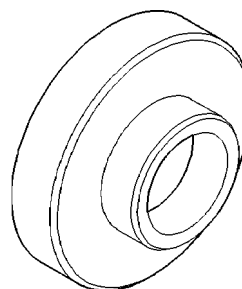
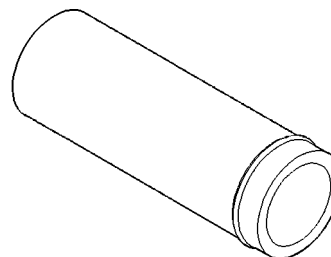
(8) If clearance (above) continues to be 0.012 inch (0.305 mm) or greater, the case must be replaced.

SPECIFICATIONS**AXLE SPECIFICATIONS**

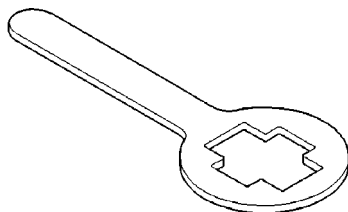
DESCRIPTION	SPECIFICATION
Axle Ratio	3.21, 3.55, 3.92
Differential Case Flange Runout	0.076 mm (0.003 in.)
Differential Case Clearance	0.12 mm (0.005 in.)
Ring Gear Diameter	235 mm (9.25 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Ring Gear Runout	0.12 mm (0.005 in.)
Pinion Bearing Preload - New Bearings	1.7-4 N·m (15-35 in. lbs.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)

REAR AXLE - 9 1/4 (Continued)
TORQUE SPECIFICATIONS

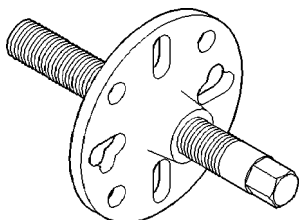
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Cover Bolts	41	30	-
Bearing Cap Bolts	136	100	-
Ring Gear Bolts	157	115	-
Pinion Nut Minimum	285	210	-
Adjuster Lock Screw	10	7.5	90
Backing Plate Bolts	65	48	-
Pinion Mate Shaft Lock Screw	11	8	-
Axle U-Bolt Nuts	149	110	-

SPECIAL TOOLS

PULLER 6790

REMOVER 6310

INSTALLER C-4198

HANDLE C-4171

INSTALLER C-4076-B

HANDLE C-4735-1

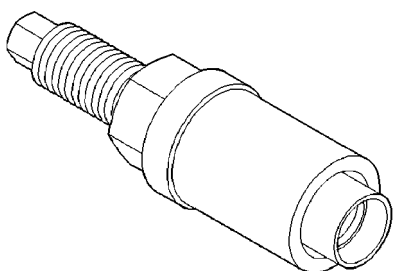
REAR AXLE - 9 1/4 (Continued)



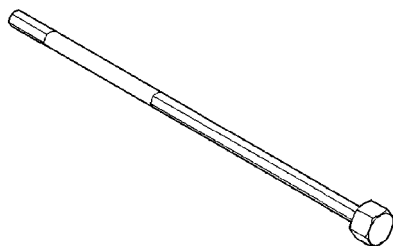
HOLDER 6719



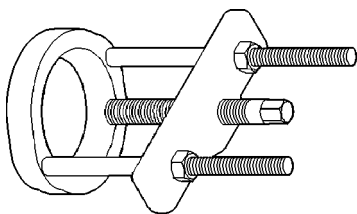
PULLER C-452



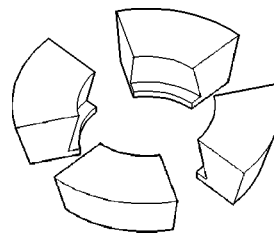
INSTALLER C-3718



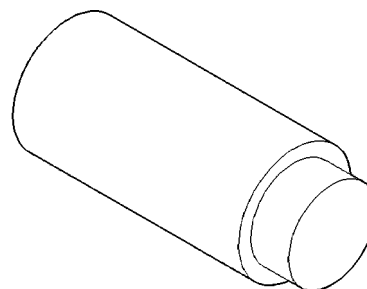
WRENCH C-4164



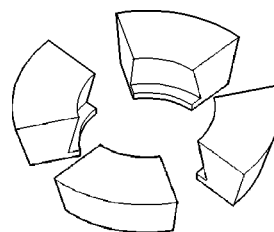
PULLER C-293-PA



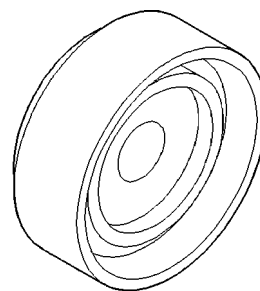
ADAPTERS C-293-37



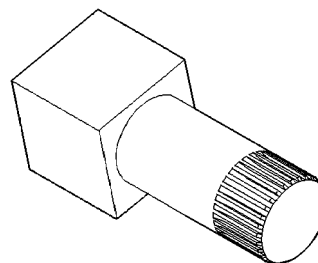
PLUG SP-3289



ADAPTERS C-293-47

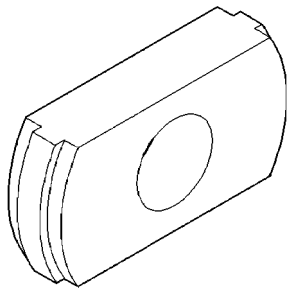


INSTALLER C-4340

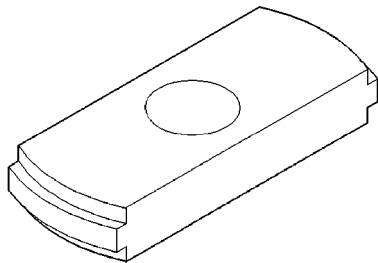


FIXTURE 8138

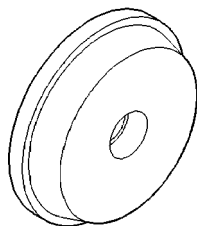
REAR AXLE - 9 1/4 (Continued)



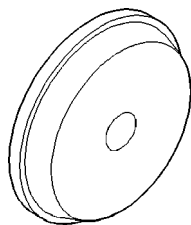
INSTALLER C-4345



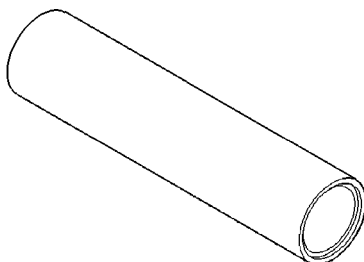
REMOVER C-4307



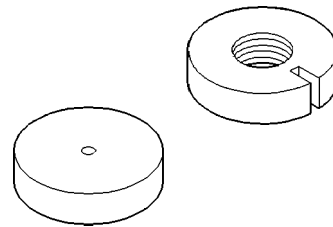
INSTALLER C-4308



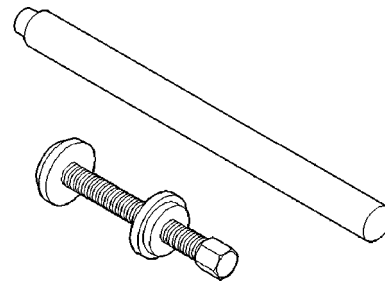
INSTALLER D-130



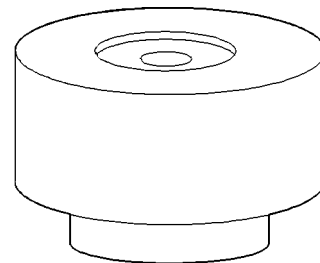
INSTALLER C-3095-A



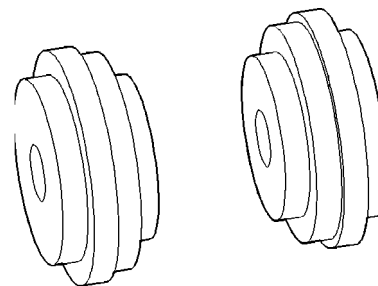
TRAC-LOK TOOLS 8140



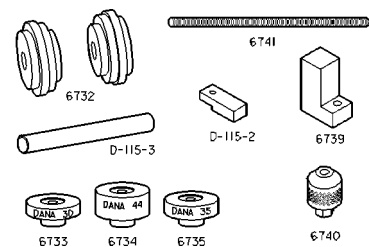
TRAC-LOK TOOLS 6960



PINION BLOCK 8540



ARBOR DISCS 8541



PINION GAUGE SET 6775

AXLE SHAFTS

REMOVAL

- (1) Place transmission in neutral.
- (2) Raise and support the vehicle.
- (3) Remove wheel and tire assembly.
- (4) Remove brake caliper, adapter and rotor (Fig. 18).

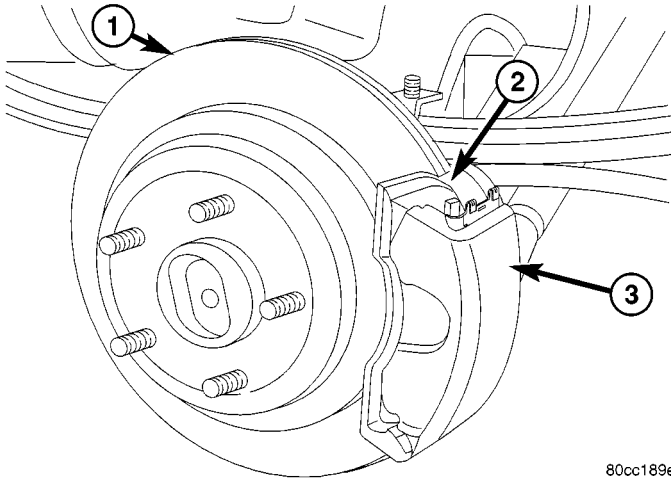


Fig. 18 REAR ROTOR

- 1 - ROTOR
- 2 - CALIPER ADAPTER
- 3 - CALIPER

(5) Remove differential housing cover and drain lubricant.

(6) Rotate differential case so pinion mate shaft lock screw is accessible. Remove lock screw and pinion mate shaft from differential case (Fig. 19).

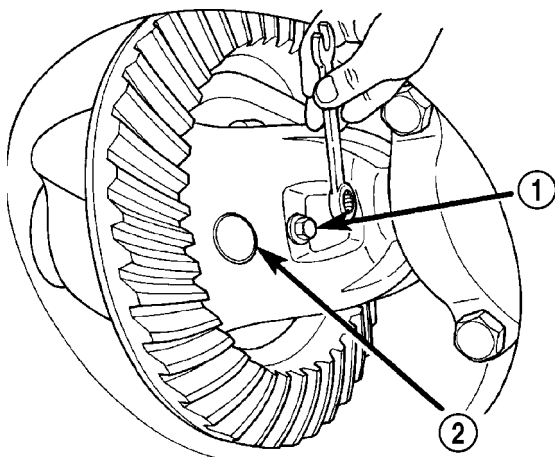
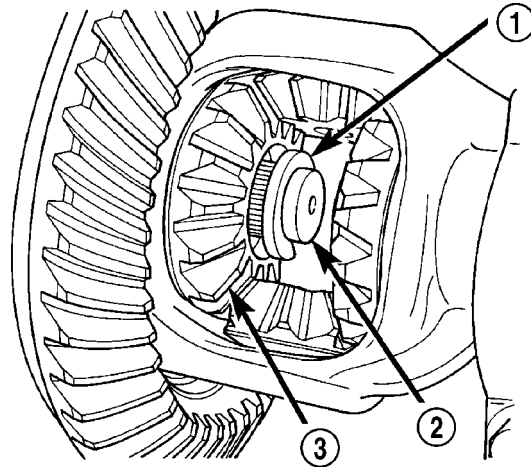


Fig. 19 PINION MATE SHAFT LOCK SCREW

- 1 - LOCK SCREW
- 2 - PINION MATE SHAFT

(7) Push axle shaft inward and remove axle shaft C-lock from the axle shaft (Fig. 20).

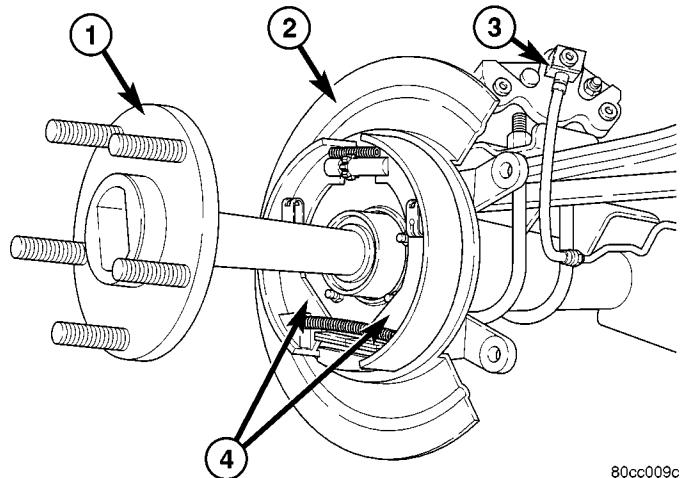


80be4603

Fig. 20 AXLE SHAFT C-LOCK

- 1 - C-LOCK
- 2 - AXLE SHAFT
- 3 - SIDE GEAR

(8) Remove axle shaft (Fig. 21) carefully to prevent damage to the shaft bearing and seal in the axle tube.



80cc009c

Fig. 21 AXLE SHAFT

- 1 - AXLE SHAFT
- 2 - SUPPORT PLATE
- 3 - CALIPER
- 4 - PARK BRAKE SHOE ASSEMBLY

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant.

(2) Install axle shaft and engage into side gear splines.

NOTE: Use care to prevent shaft splines from damaging axle shaft seal.

(3) Insert C-lock in end of axle shaft then push axle shaft outward to seat C-lock in side gear.

AXLE SHAFTS (Continued)

(4) Insert pinion shaft into differential case and through thrust washers and differential pinions.

(5) Align hole in shaft with hole in the differential case and install lock screw with Loctite® on the threads. Tighten lock screw to 11 N·m (8 ft. lbs.).

(6) Install differential cover and fill with gear lubricant to the bottom of the fill plug hole.

(7) Install brake rotor, caliper adapter and caliper.

(8) Install wheel and tire.

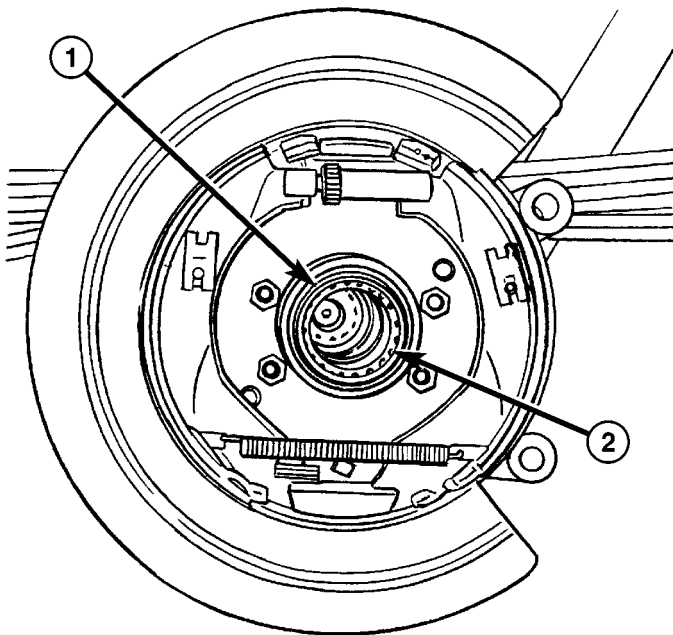
(9) Remove support and lower vehicle.

AXLE SHAFT SEALS

REMOVAL

(1) Remove axle shaft.

(2) Remove axle shaft seal (Fig. 22) from the axle tube with a small pry bar.



80d18a44

Fig. 22 AXLE SHAFT SEAL

- 1 - AXLE SEAL
- 2 - AXLE BEARING

INSTALLATION

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.

(2) Coat the lip of the **new** seal with axle lubricant and install a seal with Installer C-4076-B and Handle C-4735-1.

NOTE: When tool contacts the axle tube, the seal is installed to the correct depth.

(3) Install the axle shaft.

(4) Install differential cover and fill with gear lubricant to the bottom of the fill plug hole.

AXLE BEARINGS

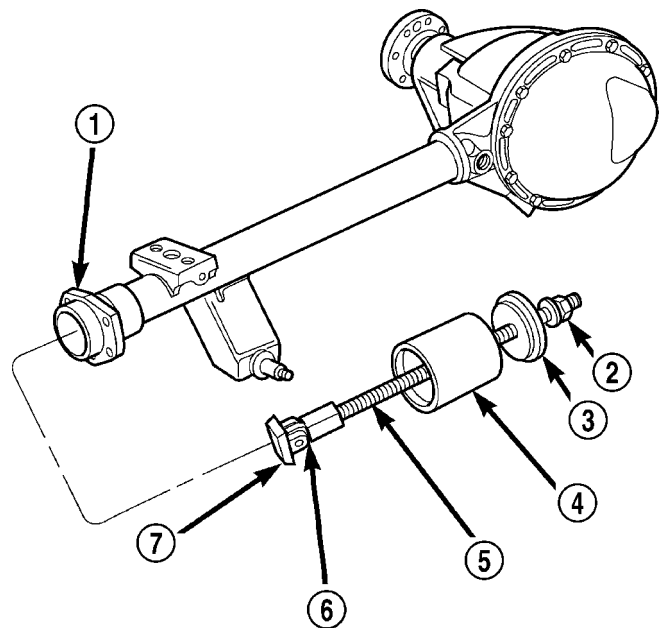
REMOVAL

(1) Remove axle shaft.

(2) Remove axle shaft seal from axle tube with a small pry bar.

NOTE: The seal and bearing can be removed at the same time with the bearing removal tool.

(3) Remove axle shaft bearing with Bearing Remover 6310 and Foot 6310-9 (Fig. 23).



80c0712f

Fig. 23 AXLE SHAFT BEARING REMOVER

- 1 - AXLE SHAFT TUBE
- 2 - NUT
- 3 - GUIDE PLATE
- 4 - GUIDE
- 5 - THREADED ROD
- 6 - ADAPTER
- 7 - FOOT

INSTALLATION

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.

(2) Install axle shaft bearing with Installer C-4198 and Handle C-4171. Drive bearing in until tool contacts the axle tube.

NOTE: Bearing is installed with the bearing part number against the installer.

AXLE BEARINGS (Continued)

(3) Coat the lip of the **new** axle seal with axle lubricant and install with Installer C-4076-B and Handle C-4735-1.

NOTE: When tool contacts the axle tube, the seal is installed to the correct depth.

(4) Install the axle shaft.

(5) Install differential cover and fill with gear lubricant to the bottom of the fill plug hole.

PINION SEAL

REMOVAL

(1) Mark universal joint, companion flange and pinion shaft for installation reference.

(2) Remove propeller shaft from the companion flange.

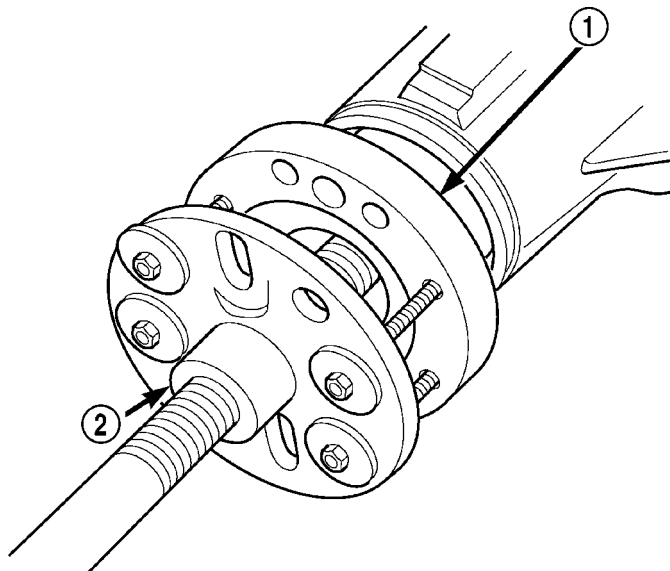
(3) Remove the brake rotors to prevent any drag.

(4) Rotate companion flange three or four times and record pinion rotating torque with an inch pound torque wrench.

(5) Install two bolts into the companion flange threaded holes, 180° apart. Position Holder 6719A against the companion flange and install and tighten two bolts and washers into the remaining holes.

(6) Hold the companion flange with Holder 6719A and remove pinion nut and washer.

(7) Remove companion flange with Remover C-452 (Fig. 24).



80c07130

Fig. 24 COMPANION FLANGE

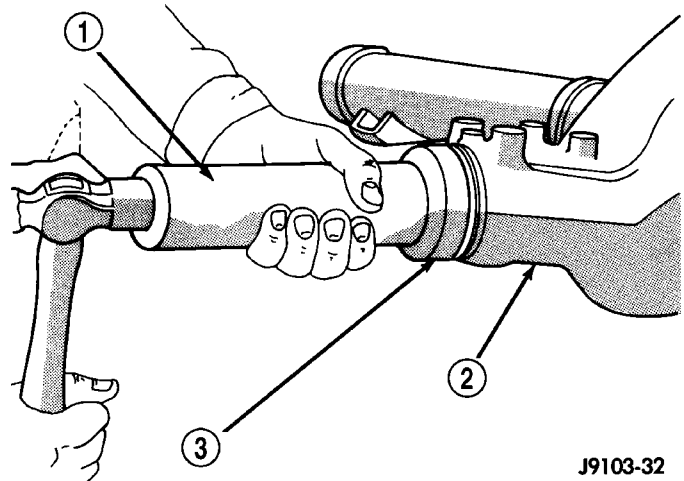
1 - COMPANION FLANGE
2 - PULLER

(8) Remove pinion seal with pry tool or slide-hammer mounted screw.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal.

(2) Install **new** pinion seal with Installer C-3860-A and Handle C-4171 (Fig. 25)



J9103-32

Fig. 25 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER
3 - HOUSING

(3) Install companion flange on the end of the shaft with the reference marks aligned.

(4) Install two bolts into the threaded holes in the companion flange, 180° apart.

(5) Position Holder 6719 against the companion flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so holder is held to the flange.

(6) Install companion flange on pinion shaft with Installer C-3718 and Holder 6719.

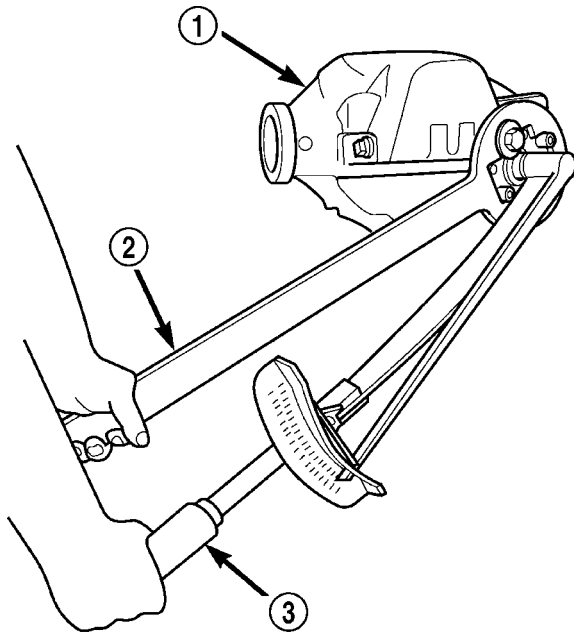
(7) Install pinion washer and a **new** pinion nut. The convex side of the washer must face outward.

CAUTION: Never exceed the minimum tightening torque 285 N·m (210 ft. lbs.) when installing the companion flange retaining nut at this point. Damage to collapsible spacer or bearings may result.

(8) Hold companion flange with Holder 6719 and tighten the pinion nut with a torque set to 285 N·m (210 ft. lbs.) (Fig. 26). Rotate pinion several revolutions to ensure the bearing rollers are seated.

(9) Rotate pinion with an inch pound torque wrench. Rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.) (Fig. 27).

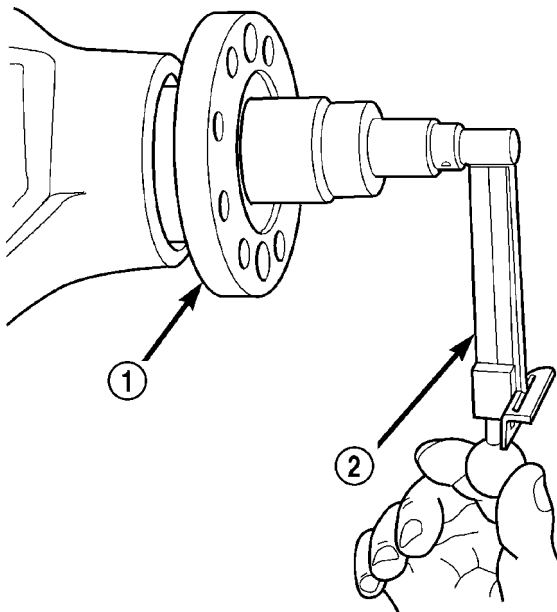
PINION SEAL (Continued)



80c07131

Fig. 26 TIGHTENING PINION NUT

- 1 - DIFFERENTIAL HOUSING
- 2 - COMPANION FLANGE HOLDER
- 3 - TORQUE WRENCH



80c07132

Fig. 27 PINION ROTATION TORQUE

- 1 - COMPANION FLANGE
- 2 - TORQUE WRENCH

CAUTION: Never loosen pinion nut to decrease pinion bearing rotating torque and never exceed specified preload torque. If rotating torque is exceeded, a new collapsible spacer must be installed.

(10) If rotating torque is low, use Holder 6719 to hold the companion flange and tighten pinion nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

NOTE: The bearing rotating torque should be constant during a complete revolution of the pinion. If the rotating torque varies, this indicates a binding condition.

NOTE: The seal replacement is unacceptable if the final pinion nut torque is less than 285 N·m (210 ft. lbs.).

(11) Install propeller shaft with the installation reference marks aligned.

(12) Tighten the companion flange bolts to 108 N·m (80 ft. lbs.).

(13) Install brake rotors.

(14) Check the differential lubricant level.

DIFFERENTIAL

DESCRIPTION

The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash are set and maintained by threaded adjusters at the outside of the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The removable differential cover provides a means for inspection and service.

OPERATION

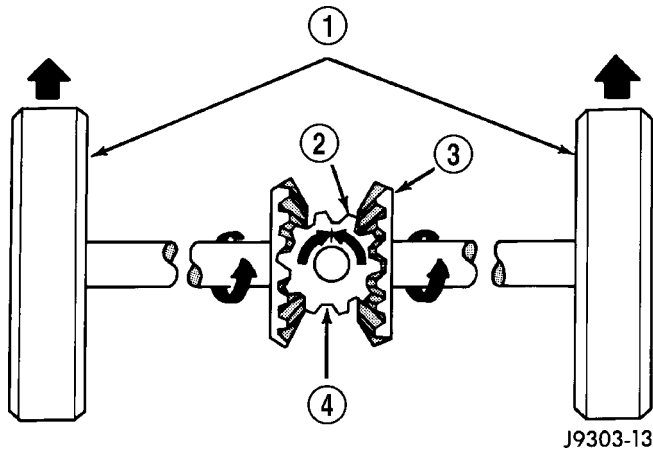
During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 28).

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 29). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

REMOVAL

- (1) Remove filler plug from the differential cover.

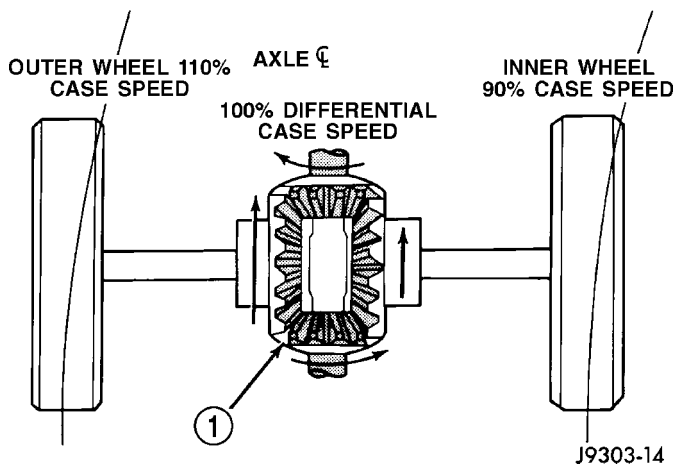
DIFFERENTIAL (Continued)



J9303-13

Fig. 28 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

- 1 - IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
- 2 - PINION GEAR
- 3 - SIDE GEAR
- 4 - PINION GEARS ROTATE WITH CASE



J9303-14

Fig. 29 DIFFERENTIAL-ON TURNS

- 1 - PINION GEARS ROTATE ON PINION SHAFT

(2) Remove differential cover and drain the lubricant.

(3) Clean housing cavity with flushing oil, light engine oil or a lint free cloth.

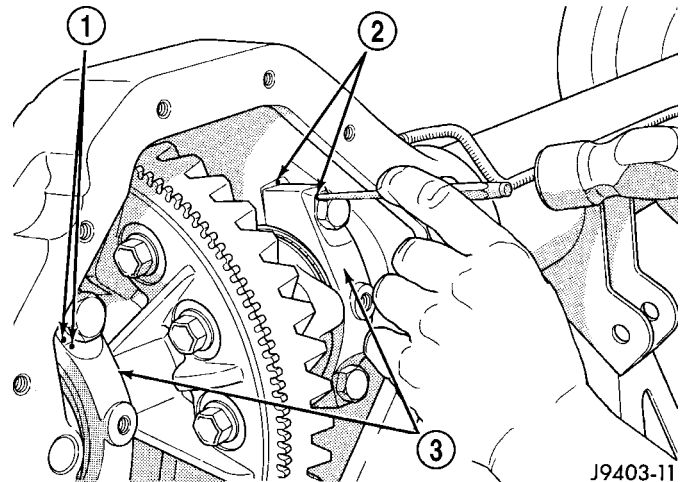
NOTE: Do not use steam, kerosene or gasoline to clean the housing.

(4) Remove axle shafts.

(5) Remove RWAL/ABS sensor from housing.

NOTE: Side play resulting from bearing races being loose on case hubs requires replacement of the differential case.

(6) Mark differential housing and bearing caps for installation reference (Fig. 30).



J9403-11

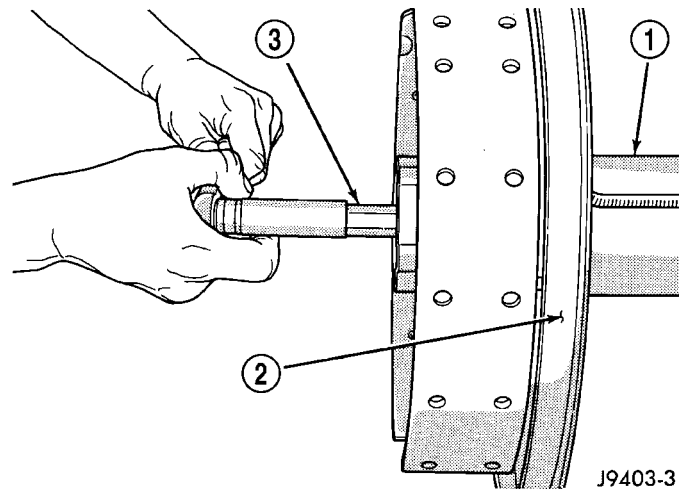
Fig. 30 REFERENCE MARKS

- 1 - REFERENCE MARKS
- 2 - REFERENCE MARK
- 3 - BEARING CAPS

(7) Remove bearing threaded adjuster lock from each bearing cap.

(8) Loosen differential bearing cap bolts.

(9) Loosen differential bearing adjusters through the axle tubes with Wrench C-4164 (Fig. 31).



J9403-3

Fig. 31 THREADED ADJUSTER TOOL

- 1 - AXLE TUBE
- 2 - BACKING PLATE
- 3 - THREAD ADJUSTER WRENCH

(10) Hold differential case while removing bearing caps and adjusters.

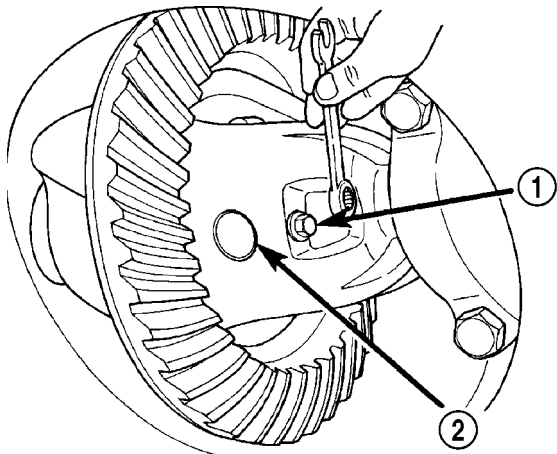
(11) Remove differential case.

NOTE: Tag the differential bearing cups and threaded adjusters to indicate their location.

DIFFERENTIAL (Continued)

DISASSEMBLY

- (1) Remove pinion shaft lock screw (Fig. 32).

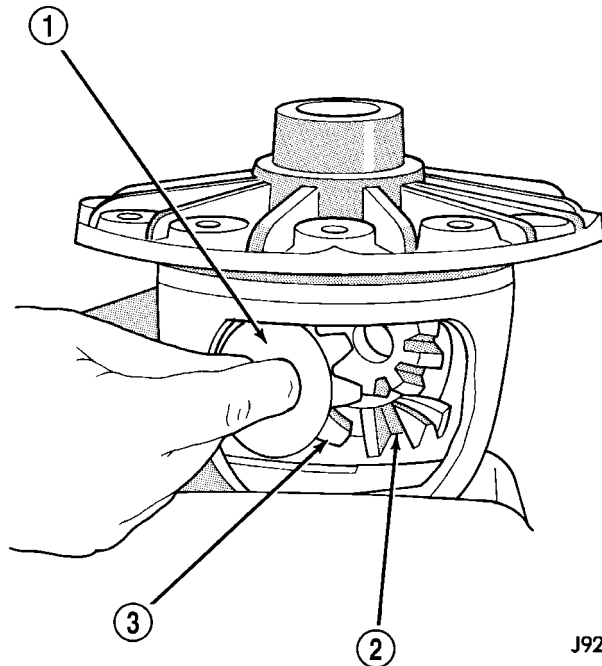


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Fig. 32 SHAFT LOCK SCREW

- 1 - LOCK SCREW
2 - PINION SHAFT

- (2) Remove pinion shaft.
(3) Rotate differential side gears and remove differential pinions and thrust washers (Fig. 33).



J9203-61

Fig. 33 DIFFERENTIAL GEARS

- 1 - THRUST WASHER
2 - SIDE GEAR
3 - DIFFERENTIAL PINION

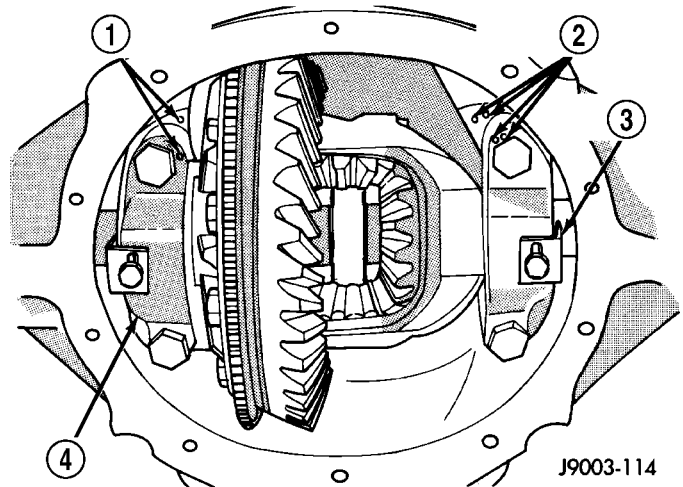
- (4) Remove differential side gears and thrust washers.

ASSEMBLY

- (1) Install differential side gears and thrust washers.
(2) Install differential pinion and thrust washers.
(3) Install the pinion shaft.
(4) Align the hole in the pinion shaft with the hole in the differential case and install the pinion shaft lock screw.
(5) Lubricate all differential components with hypoid gear lubricant.

INSTALLATION

- (1) Apply a coating of hypoid gear lubricant to the differential bearings, bearing cups, and threaded adjusters. A dab of grease can be used to keep the adjusters in position.
(2) Install differential assembly into the housing.
(3) Install differential bearing caps in their original locations (Fig. 34).



J9003-114

Fig. 34 BEARING CAPS

- 1 - REFERENCE MARKS
2 - REFERENCE MARKS
3 - ADJUSTER LOCK
4 - BEARING CAP

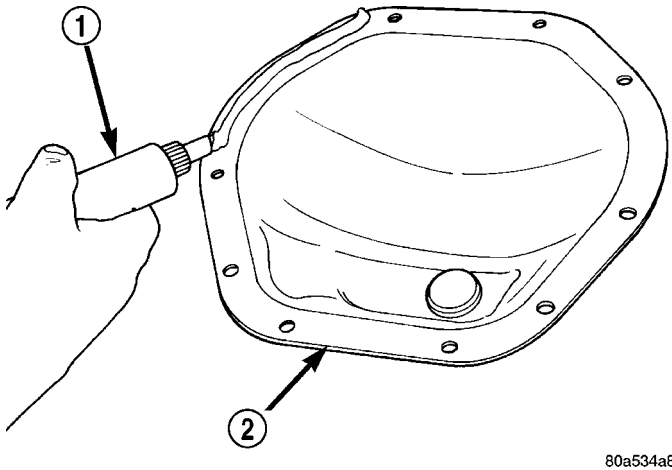
- (4) Install bearing cap bolts and tighten the upper bolts to 14 N·m (10 ft. lbs.). Tighten the lower bolts finger-tight until the bolt head is seated.

- (5) Perform the differential bearing preload and adjustment procedure.

NOTE: Be sure that all bearing cap bolts are tightened to their final torque of 136 N·m (100 ft.lbs.) before proceeding.

- (6) Install axle shafts.
(7) Apply a 1/4 inch bead of red Mopar Silicone Rubber Sealant or equivalent to the housing cover (Fig. 35).

DIFFERENTIAL (Continued)

**Fig. 35 COVER SEALANT**

- 1 - SEALANT
2 - DIFFERENTIAL COVER

CAUTION: If cover is not installed within 3 to 5 minutes, the cover must be cleaned and new RTV applied or adhesion quality will be compromised.

(8) Install the cover and any identification tag and tighten cover bolts to 41 N·m (30 ft. lbs.).

(9) Fill differential with lubricant to bottom of the fill plug hole. Refer to the Lubricant Specifications for the correct quantity and type.

NOTE: Trac-lok™ differential equipped vehicles should be road tested by making 10 to 12 slow figure-eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

DIFFERENTIAL-TRAC-LOK

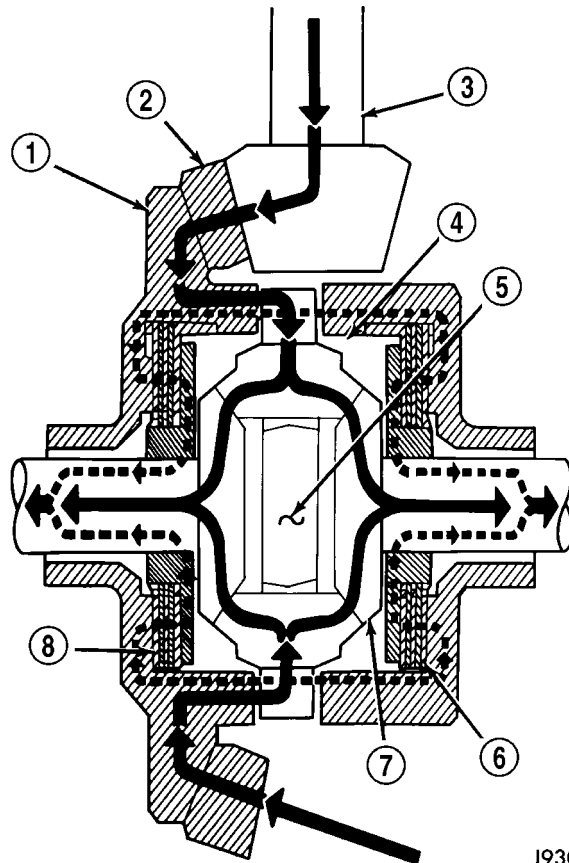
DESCRIPTION

The optional Trac-Lok® differential case has a one-piece design and the similar internal components as a standard differential, plus two clutch disc packs. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash are set and maintained by threaded adjusters at the outside of the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The removable differential cover provides a means for inspection and service.

OPERATION

This differential clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces gen-

erated by the side gears as torque is applied through the ring gear (Fig. 36).



J9303-15

Fig. 36 TRAC-LOK LIMITED SLIP DIFFERENTIAL

- 1 - CASE
2 - RING GEAR
3 - DRIVE PINION
4 - PINION GEAR
5 - MATE SHAFT
6 - CLUTCH PACK
7 - SIDE GEAR
8 - CLUTCH PACK

This design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel loses traction, the clutch packs transfer additional torque to the wheel having the most traction. This differential resists wheel spin on bumpy roads and provide more pulling power when one wheel loses traction. Pulling power is provided continuously until both wheels lose traction. If both wheels slip due to unequal traction, Trac-lok® operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

The most common problem is a chatter noise when turning corners. Before removing the unit for repair, drain, flush and refill the axle with the specified lubricant. A container of Mopar Trac-lok® Lubricant

DIFFERENTIAL-TRAC-LOK (Continued)

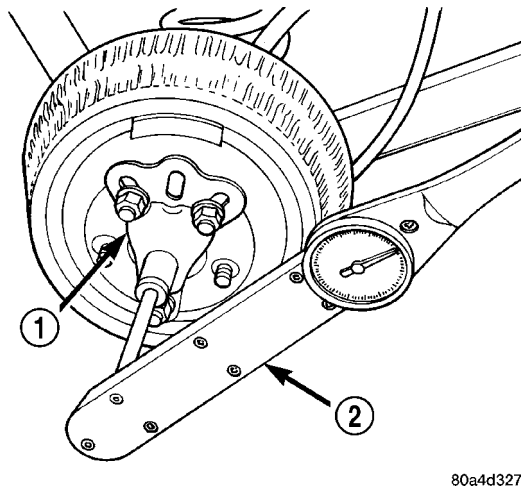
(friction modifier) should be added after repair service or during a lubricant change.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure-eight turns. This maneuver will pump lubricant through the clutches. This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

DIFFERENTIAL TEST

The differential can be tested without removing the differential case by measuring rotating torque. Make sure brakes are not dragging during this measurement.

- (1) Place blocks in front and rear of both front wheels.
- (2) Raise one rear wheel until it is completely off the ground.
- (3) Engine off, transmission in neutral, and parking brake off.
- (4) Remove wheel and bolt Special Tool 6790 or equivalent tool to studs.
- (5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 37).



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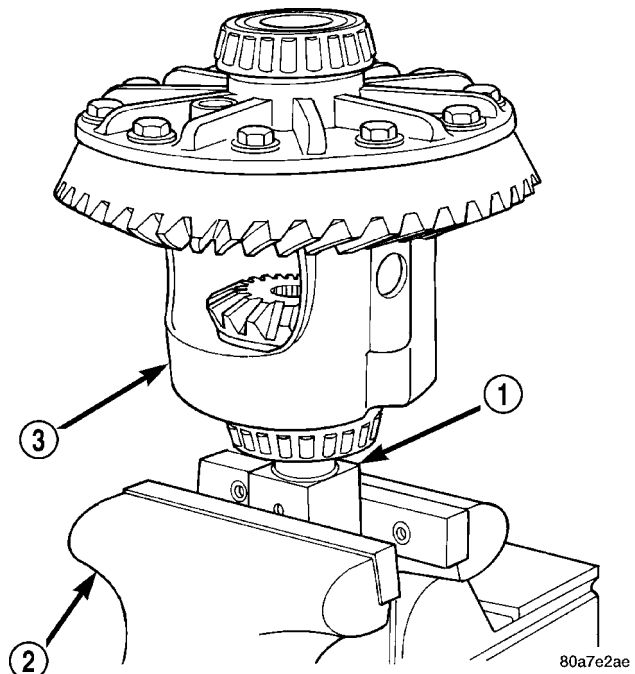
Fig. 37 ROTATING TORQUE TEST

- 1 - SPECIAL TOOL WITH BOLT IN CENTER HOLE
- 2 - TORQUE WRENCH

- (6) If rotating torque is less than 41 N·m (30 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

DISASSEMBLY

- (1) Clamp Fixture 6965 in a vise and position the differential case on the fixture (Fig. 38).
- (2) Remove ring gear if the ring gear is to be replaced.
- (3) Remove pinion gear mate shaft lock screw.
- (4) Remove pinion gear mate shaft with a drift and hammer.

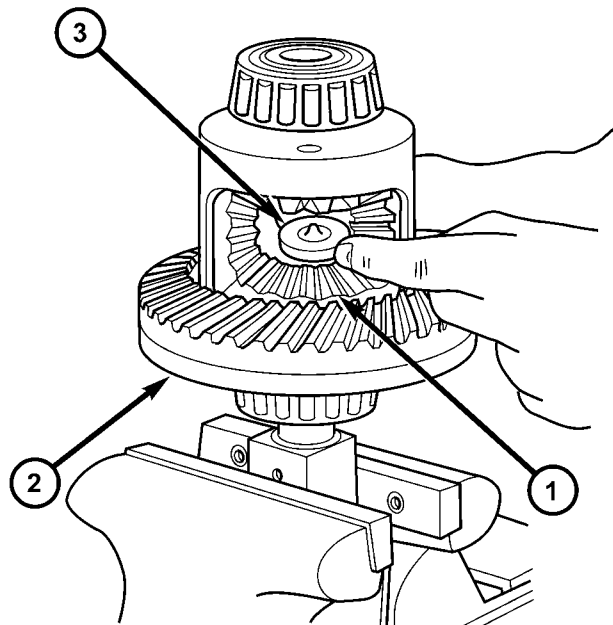


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Fig. 38 DIFFERENTIAL CASE FIXTURE

- 1 - HOLDING FIXTURE
- 2 - VISE
- 3 - DIFFERENTIAL

- (5) Install and lubricate Step Plate C-6960-3 (Fig. 39).



80bd202b

Fig. 39 STEP PLATE

- 1 - LOWER SIDE GEAR
- 2 - DIFFERENTIAL CASE
- 3 - DISC

- (6) Assemble Threaded Adapter C-6960-1 into top side gear. Thread Forcing Screw C-6960-4 into adapter until it becomes centered in adapter plate.

DIFFERENTIAL-TRAC-LOK (Continued)

(7) Position a small screw driver in slot of Threaded Adapter Disc C-6960-1 (Fig. 40) to prevent adapter from turning.

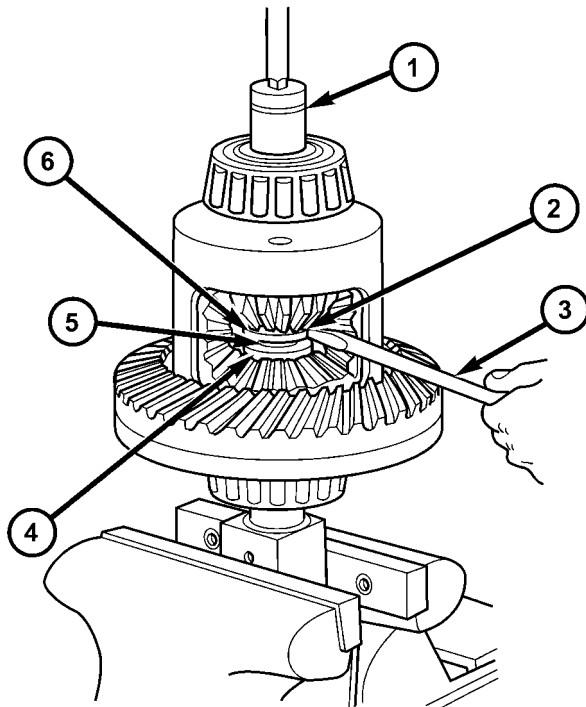


Fig. 40 THREAD ADAPTER DISC

- 1 - SOCKET
- 2 - SLOT IN DISC
- 3 - SCREWDRIVER
- 4 - LOWER DISC
- 5 - THREADED ROD
- 6 - UPPER DISC

(8) Install Forcing Screw C-6960-4 and tighten screw to 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 41).

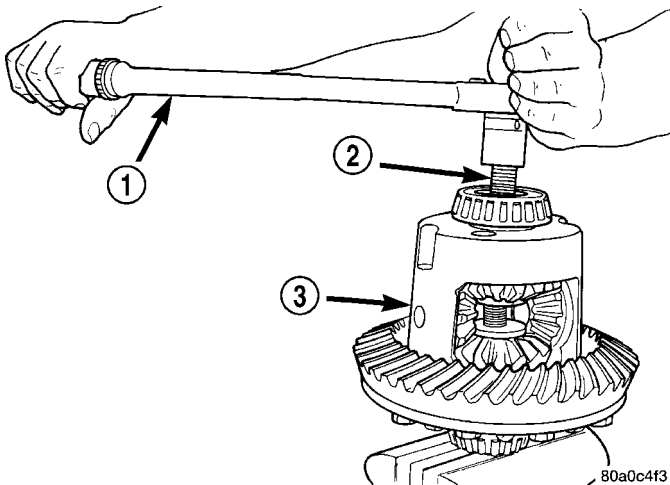
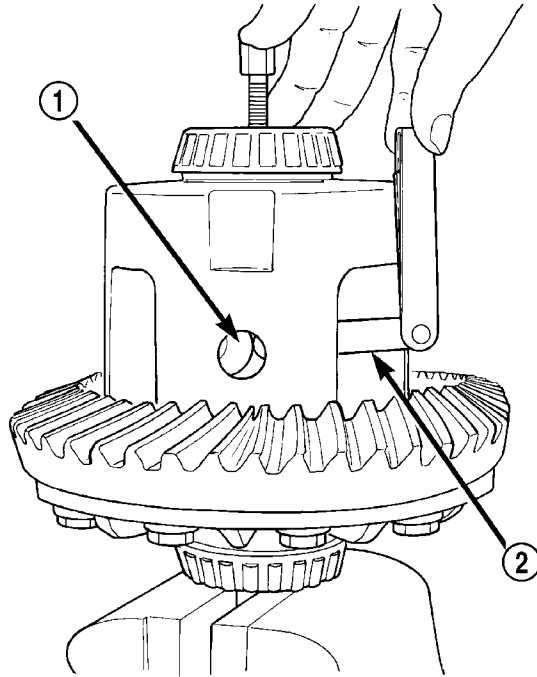


Fig. 41 COMPRESS BELLEVILLE SPRING

- 1 - TORQUE WRENCH
- 2 - FORCING SCREW
- 3 - DIFFERENTIAL CASE

(9) With a feeler gauge remove thrust washers from behind the pinion gears (Fig. 42).



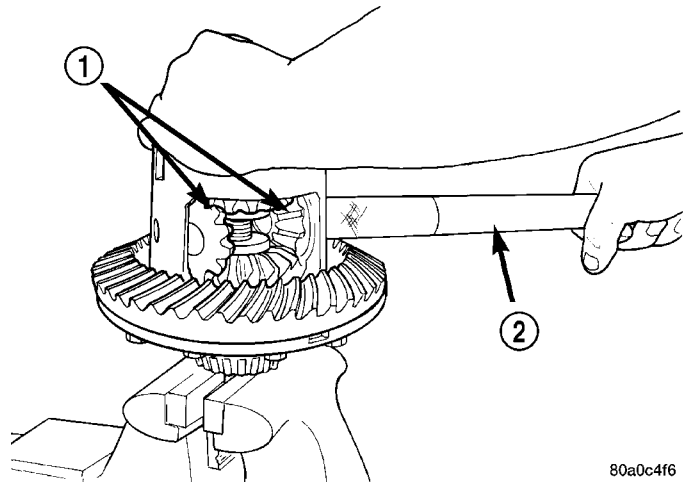
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Fig. 42 PINION GEAR THRUST WASHER

- 1 - THRUST WASHER
- 2 - FEELER GAUGE

(10) Insert Turning Bar C-6960-2 into the pinion mate shaft hole in the case.

(11) Loosen Forcing Screw in small increments until clutch pack tension is relieved. Then turn the case with the turning bar (Fig. 43).



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Fig. 43 TURNING BAR

- 1 - PINION GEARS
- 2 - TURNING BAR

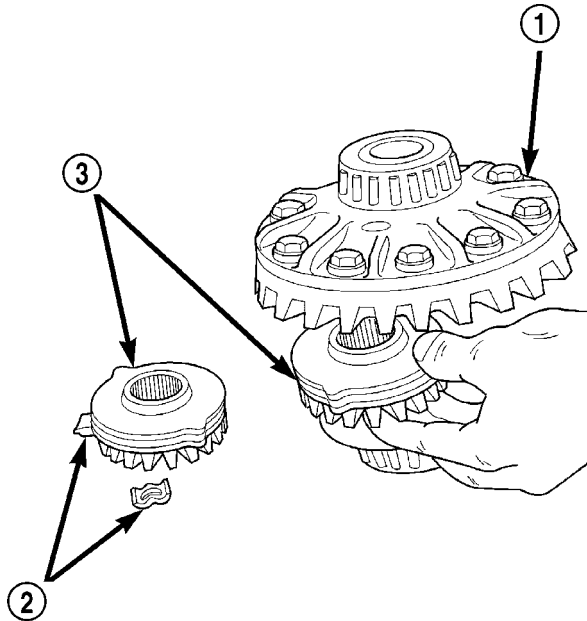
(12) Rotate differential case until the pinion gears can be removed.

(13) Remove pinion gears from differential case.

DIFFERENTIAL-TRAC-LOK (Continued)

(14) Remove Forcing Screw, Step Plate and Threaded Adapter.

(15) Remove top side gear, clutch pack retainer and clutch pack. Keep plates in correct order during removal (Fig. 44).



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Fig. 44 SIDE GEARS AND CLUTCH DISCS

- 1 - DIFFERENTIAL CASE
- 2 - RETAINER
- 3 - SIDE GEAR AND CLUTCH DISC PACK

(16) Remove differential case from the Holding Fixture. Remove side gear, clutch pack retainer and clutch pack. Keep plates in correct order during removal.

ASSEMBLY

NOTE: New Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

(1) Lubricate each component with gear lubricant before assembly.

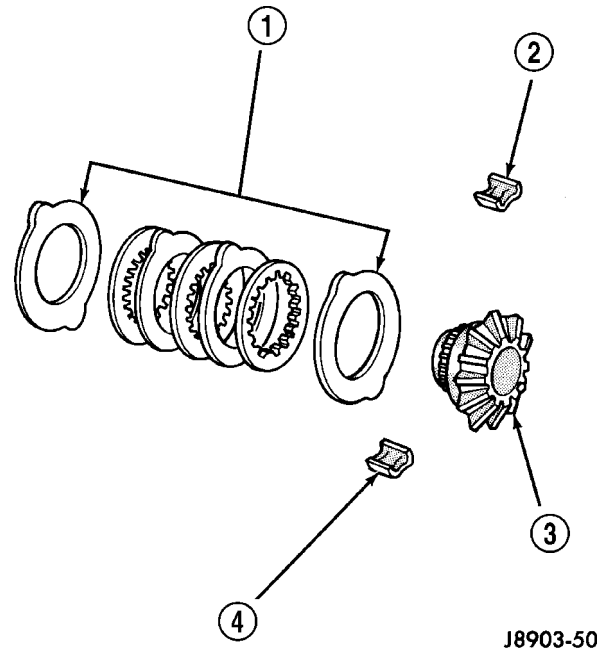
(2) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 45).

(3) Position assembled clutch disc packs on the side gear hubs.

(4) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 46).

NOTE: Verify clutch pack retaining clips are in position and seated in the case pockets.

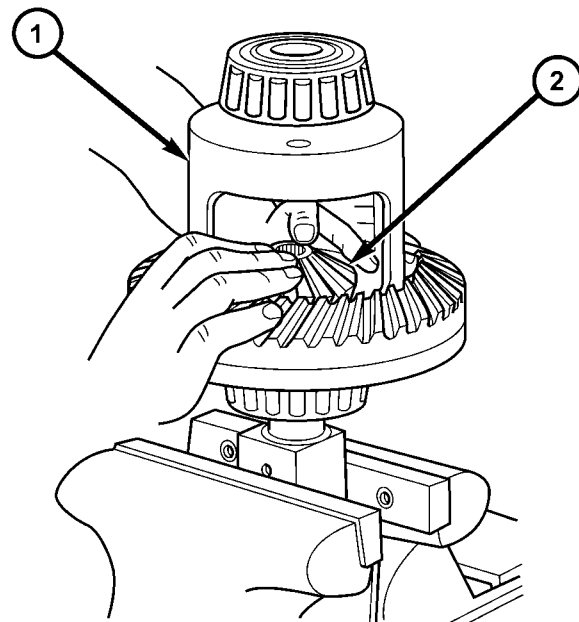
(5) Position case on the Fixture 6965.



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Fig. 45 CLUTCH DISC PACK

- 1 - CLUTCH PACK
- 2 - RETAINER
- 3 - SIDE GEAR
- 4 - RETAINER



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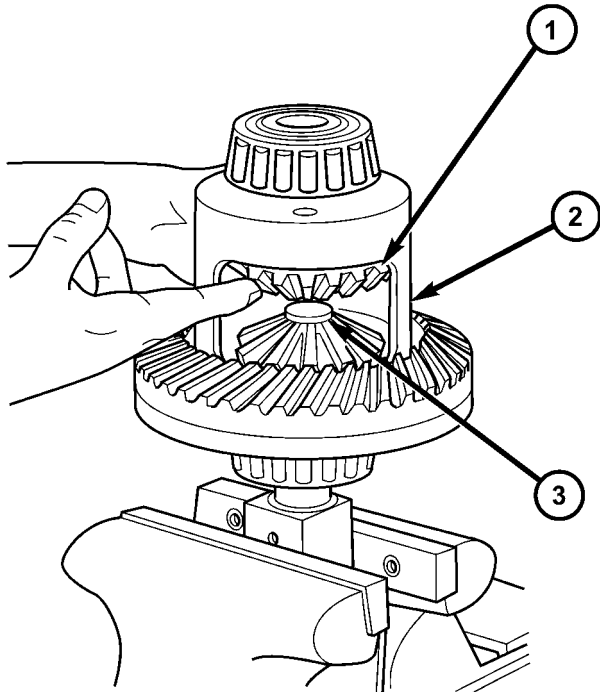
Fig. 46 CLUTCH PACK AND LOWER SIDE GEAR

- 1 - DIFFERENTIAL CASE
- 2 - LOWER SIDE GEAR AND CLUTCH PACK

DIFFERENTIAL-TRAC-LOK (Continued)

(6) Install lubricated Step Plate C-6960-3 in lower side gear.

(7) Install upper side gear and clutch disc pack (Fig. 47).



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Fig. 47 CLUTCH PACK AND UPPER SIDE GEAR

- 1 - SIDE GEAR AND CLUTCH PACK
- 2 - DIFFERENTIAL CASE
- 3 - LOWER DISC

(8) Hold assembly in position. Insert Threaded Adapter C-6960-1 into top side gear.

(9) Install Forcing Screw C-6960-4 and tighten screw to slightly compress clutch disc.

(10) Place pinion gears in side gears and verify pinion mate shaft hole is aligned.

(11) Rotate case with Turning Bar C-6960-2 until pinion mate shaft holes in pinion gears align with holes in case.

NOTE: If necessary, slightly tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove forcing screw, step plate and threaded adapter.

(15) Install pinion gear mate shaft and align holes in shaft and case.

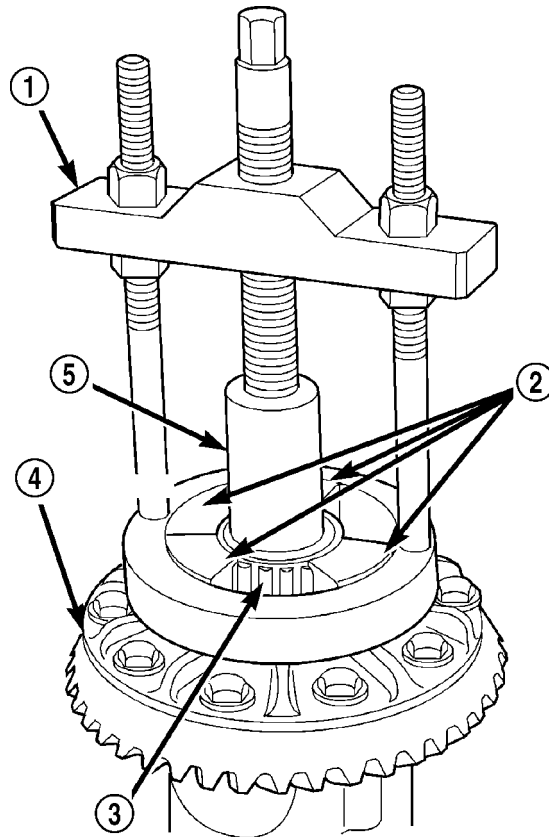
(16) Install pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(17) Lubricate all differential components with hypoid gear lubricant.

DIFFERENTIAL CASE BEARINGS**REMOVAL**

(1) Remove differential case from axle housing.

(2) Remove differential bearings from the case with Puller/Press C-293-PA and Adapters C-293-47 and Plug C-293-3 (Fig. 48).



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Fig. 48 DIFFERENTIAL BEARING PULLER

- 1 - PULLER
- 2 - ADAPTERS
- 3 - BEARING
- 4 - DIFFERENTIAL
- 5 - PLUG

DIFFERENTIAL CASE BEARINGS (Continued)

INSTALLATION

(1) Install differential side bearings with Installer C-4213 and Handle C-4171 (Fig. 49).

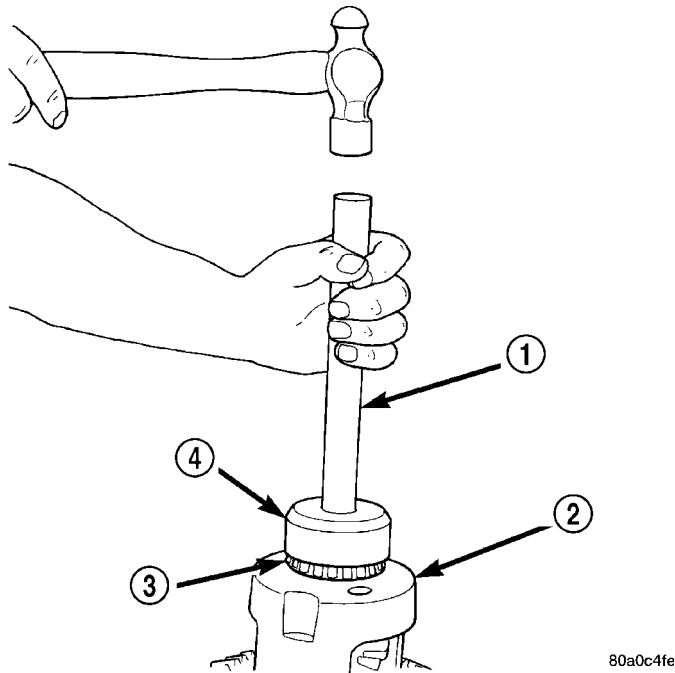


Fig. 49 DIFFERENTIAL CASE BEARING

- 1 - HANDLE
- 2 - DIFFERENTIAL
- 3 - BEARING
- 4 - INSTALLER

(2) Install differential case into housing.

PINION GEAR/RING GEAR/
TONE RING

REMOVAL

NOTE: The ring gear and pinion are serviced in a matched set. Never replace one gear without replacing the other matching gear.

- (1) Mark companion flange and propeller shaft for installation reference.
- (2) Disconnect propeller shaft from the companion flange and tie propeller shaft to underbody.
- (3) Remove axle shafts.
- (4) Remove differential from the differential housing.
- (5) Place differential case in a vise with soft metal jaw protectors..
- (6) Remove ring gear bolts from the differential case.
- (7) Drive ring gear off the differential case with a rawhide hammer (Fig. 50).

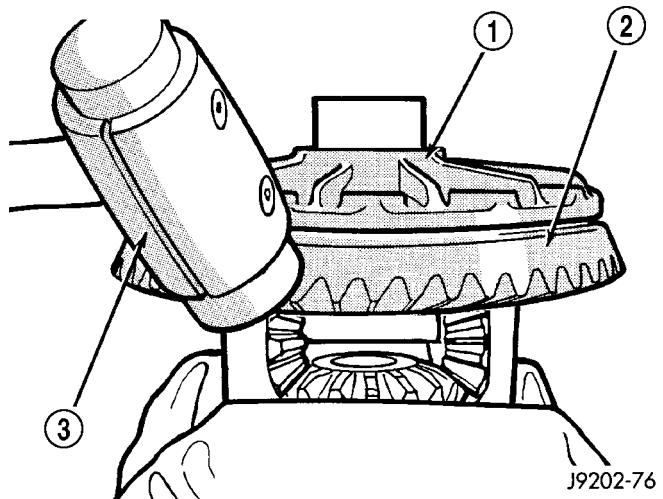


Fig. 50 RING GEAR

- 1 - CASE
- 2 - RING GEAR
- 3 - RAWHIDE HAMMER

(8) Install bolts into two of the threaded holes in the companion flange 180° apart.

(9) Position Holder 6719 against the companion flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so the Holder 6719 is held to the flange.

(10) Use Holder 6719 to hold companion flange and remove the companion flange nut and washer.

(11) Remove companion flange with Remover C-452 (Fig. 51).

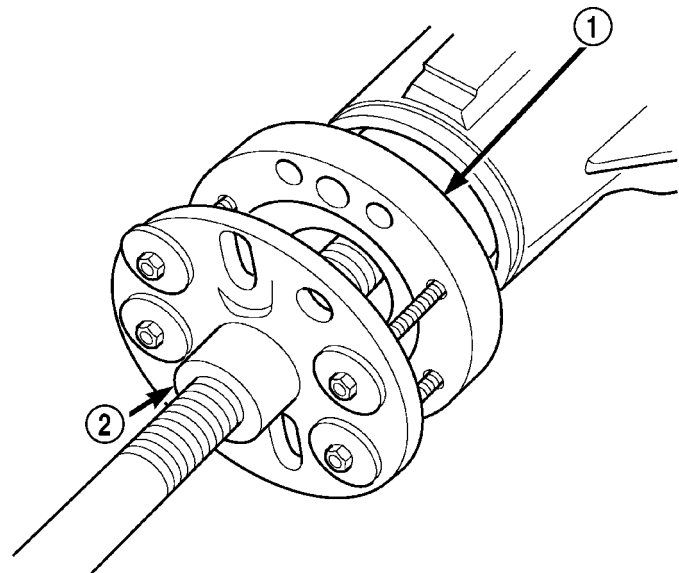


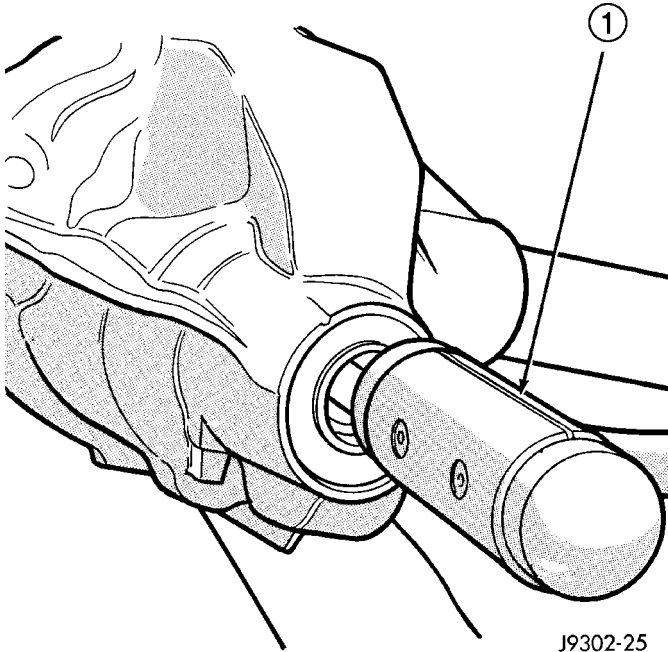
Fig. 51 COMPANION FLANGE

- 1 - COMPANION FLANGE
- 2 - REMOVER

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(12) Remove pinion gear from the housing (Fig. 52).

PINION GEAR/RING GEAR/TONE RING (Continued)

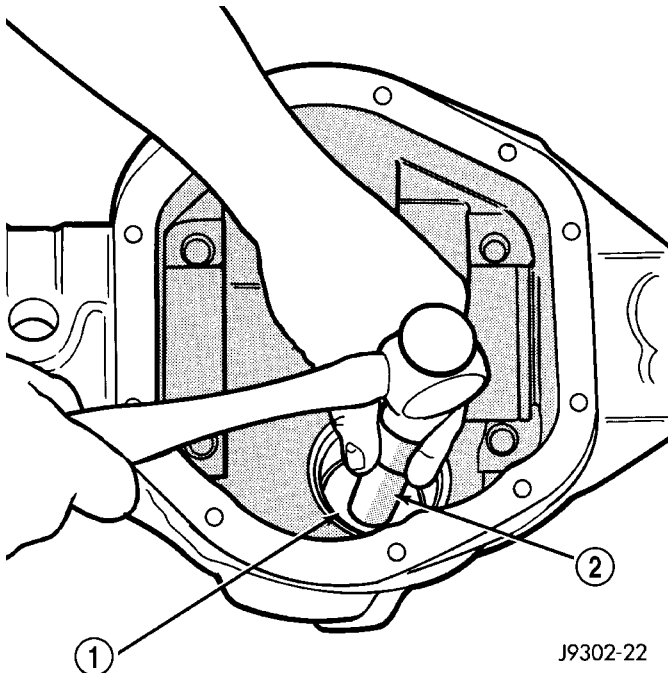
**Fig. 52 PINION GEAR**

1 - RAWHIDE HAMMER

(13) Remove pinion seal with a pry tool or slide-hammer mounted screw.

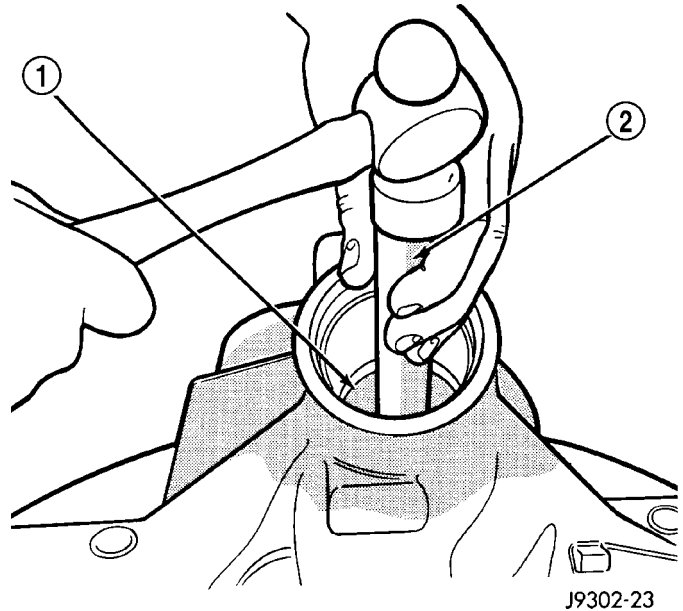
(14) Remove front pinion bearing and oil slinger if equipped.

(15) Remove front pinion bearing cup with Remover C-4345 and Handle C-4171 (Fig. 53).

**Fig. 53 FRONT PINION BEARING CUP**

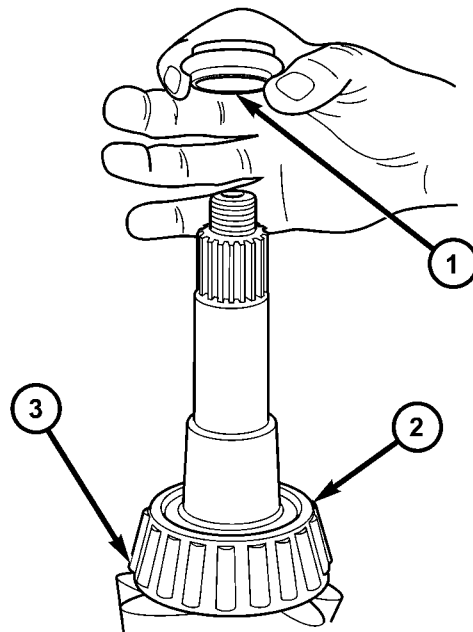
1 - REMOVER
2 - HANDLE

(16) Remove rear pinion bearing cup from housing (Fig. 54) with Remover C-4307 and Handle C-4171.

**Fig. 54 REAR PINION BEARING CUP**

1 - DRIVER
2 - HANDLE

(17) Remove collapsible spacer from the pinion shaft (Fig. 55).

**Fig. 55 COLLAPSIBLE SPACER**

1 - COLLAPSIBLE SPACER
2 - REAR PINION BEARING
3 - PINION DEPTH SHIM

PINION GEAR/RING GEAR/TONE RING (Continued)

(18) Remove rear pinion bearing (Fig. 56) from the pinion shaft with Puller C-293-PA and Adapters C-293-37.

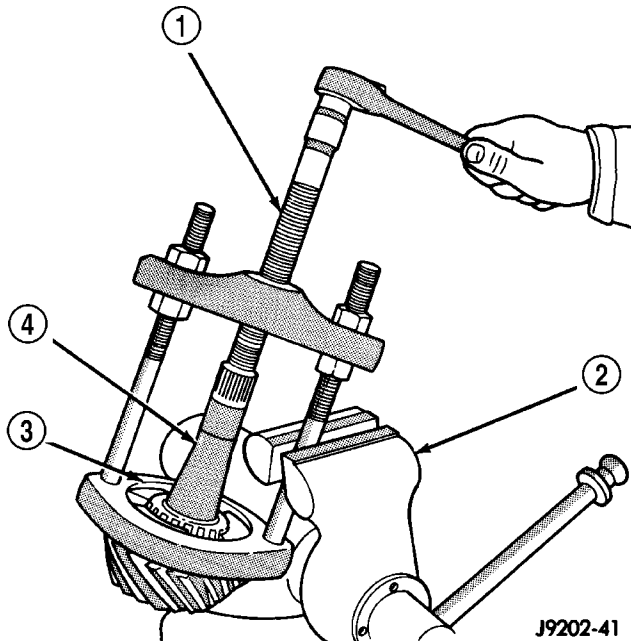


Fig. 56 REAR PINION BEARING

- 1 - PULLER
- 2 - VISE
- 3 - ADAPTERS
- 4 - PINION SHAFT

(19) Remove pinion depth shim (Fig. 57) from the pinion shaft and record shim thickness.

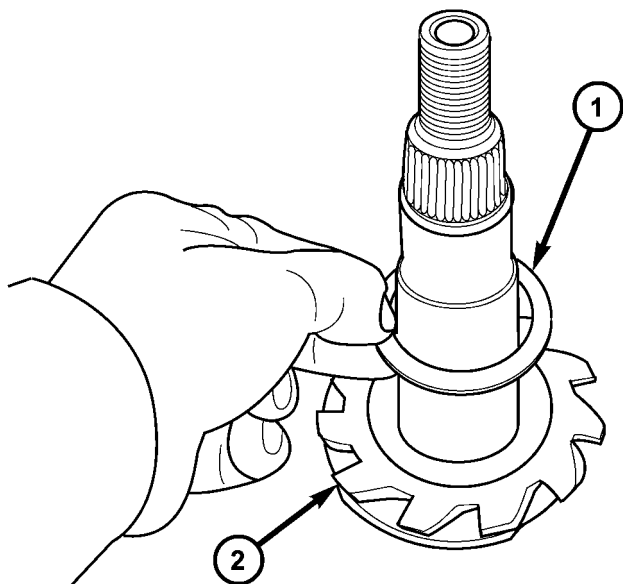


Fig. 57 PINION DEPTH SHIM

- 1 - PINION DEPTH SHIM
- 2 - PINION GEAR

INSTALLATION

NOTE: The ring gear and pinion are serviced in a matched set. Do not replace one gear without replacing the other matching gear. If ring and pinion gears or bearings are replaced, Refer to Adjustments for Pinion Gear Depth Setting.

(1) Apply Mopar Door Ease or equivalent stick lubricant to outside surface of the pinion bearing cups.

(2) Install rear pinion bearing cup (Fig. 58) with Installer C-4308 and Driver Handle C-4171 and verify cup is seated.

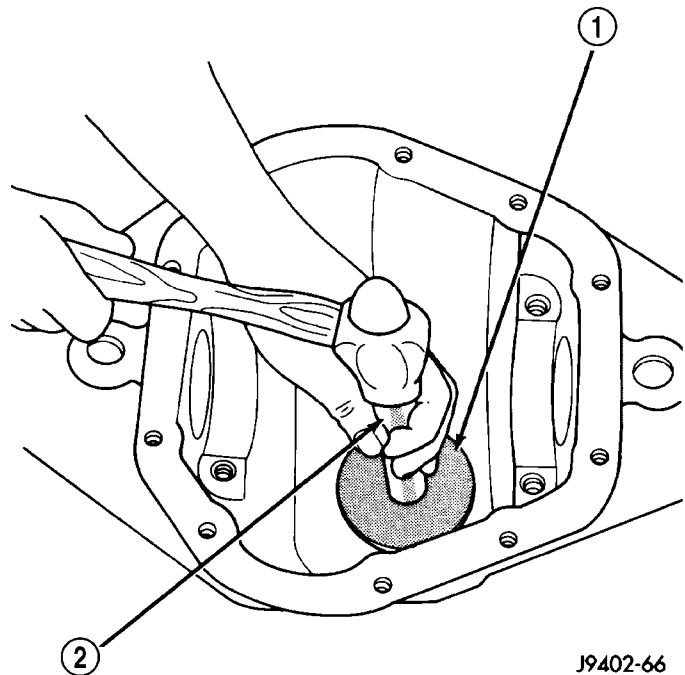


Fig. 58 REAR PINION BEARING CUP

- 1 - INSTALLER
- 2 - HANDLE

(3) Install front pinion bearing cup (Fig. 59) with Installer D-129 and Handle C-4171 and verify cup is seated.

(4) Lubricate and install front pinion bearing into the housing.

(5) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-4076-B and Handle C-4735-1 (Fig. 60).

PINION GEAR/RING GEAR/TONE RING (Continued)

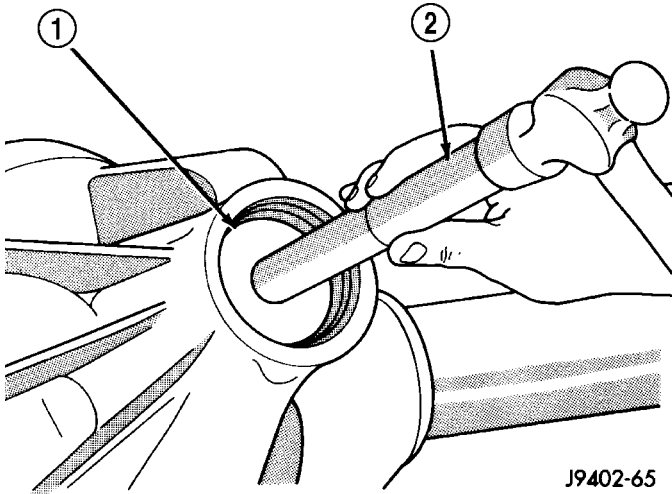


Fig. 59 FRONT PINION BEARING CUP

- 1 - INSTALLER
- 2 - HANDLE

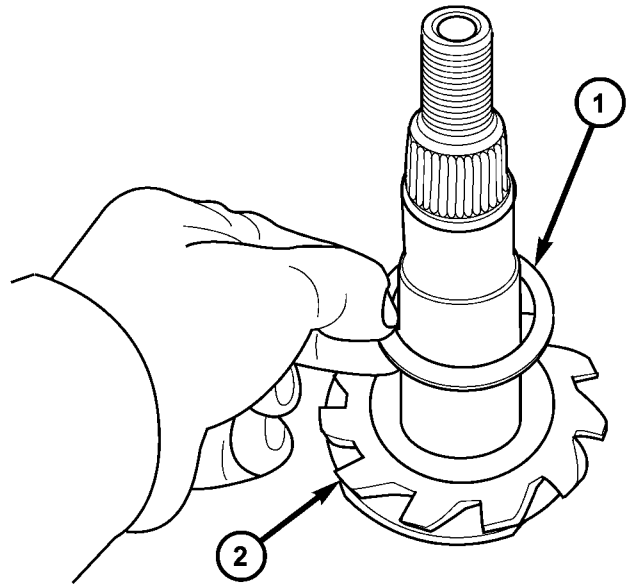


Fig. 61 PINION DEPTH SHIM

- 1 - PINION DEPTH SHIM
- 2 - PINION GEAR

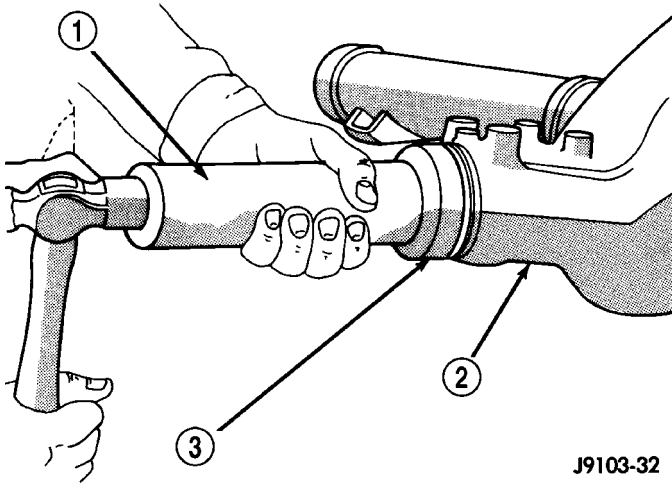


Fig. 60 PINION SEAL INSTALLER

- 1 - HANDLE
- 2 - INSTALLER
- 3 - HOUSING

(6) Install pinion depth shim (Fig. 61) on the pinion gear shaft.

(7) Install rear bearing on the pinion (Fig. 62) with Installer C-3095-A and a press.

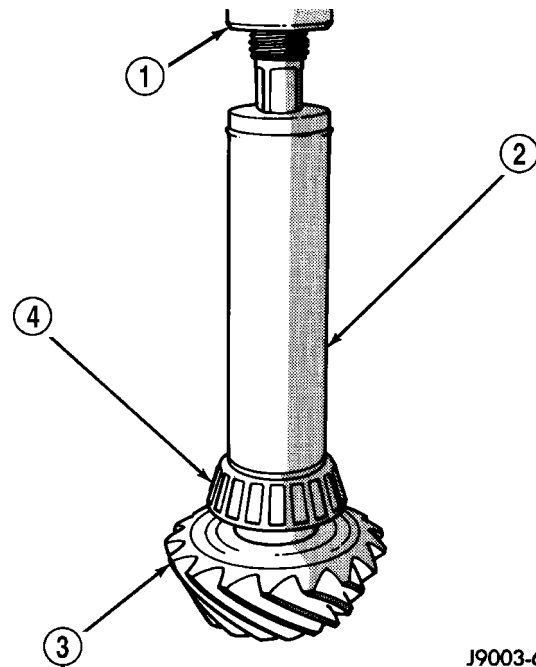
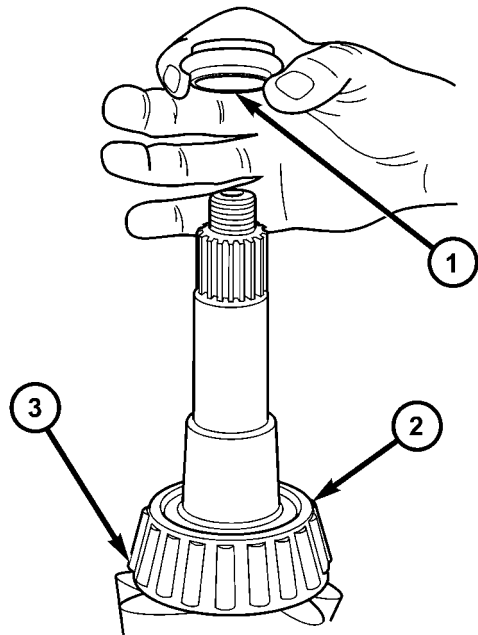


Fig. 62 REAR PINION BEARING

- 1 - PRESS
- 2 - INSTALLER
- 3 - PINION GEAR
- 4 - REAR PINION BEARING

PINION GEAR/RING GEAR/TONE RING (Continued)

(8) Install a **new** collapsible spacer on the pinion shaft (Fig. 63).



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Fig. 63 COLLAPSIBLE SPACER

- 1 - COLLAPSIBLE SPACER
2 - REAR PINION BEARING
3 - PINION DEPTH SHIM

(9) Lubricate rear pinion bearing and install pinion gear into the housing.

(10) Install companion flange with Installer C-3718 and Holder 6719.

(11) Install bolts into two of the threaded holes in the companion flange 180° apart.

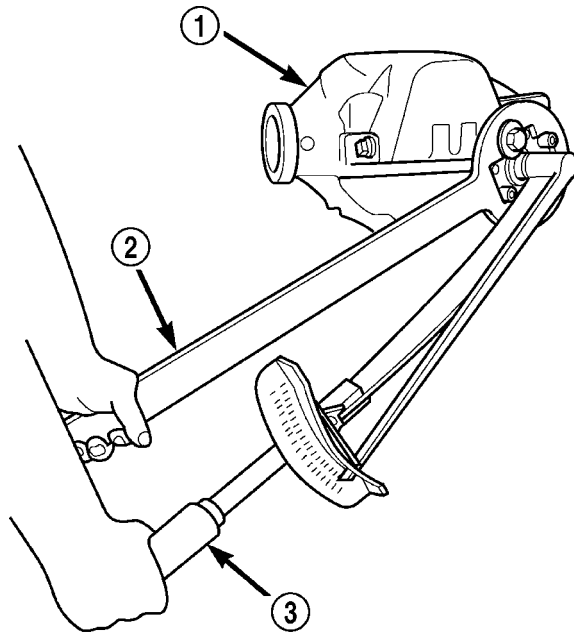
(12) Position Holder 6719 against the companion flange and install a bolt and washer into one of the remaining threaded holes. Tighten the bolts so the Holder 6719 is held to the flange.

(13) Install companion flange washer and a **new** nut on the pinion and tighten the nut until there is zero bearing end-play.

(14) With a torque wrench tighten the nut to 285 N·m (210 ft. lbs.) (Fig. 64).

CAUTION: Never loosen pinion nut to decrease pinion rotating torque and never exceed specified preload torque. If preload torque or rotating torque is exceeded a new collapsible spacer must be installed.

(15) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure pinion rotating torque frequently to avoid over crushing the collapsible spacer.



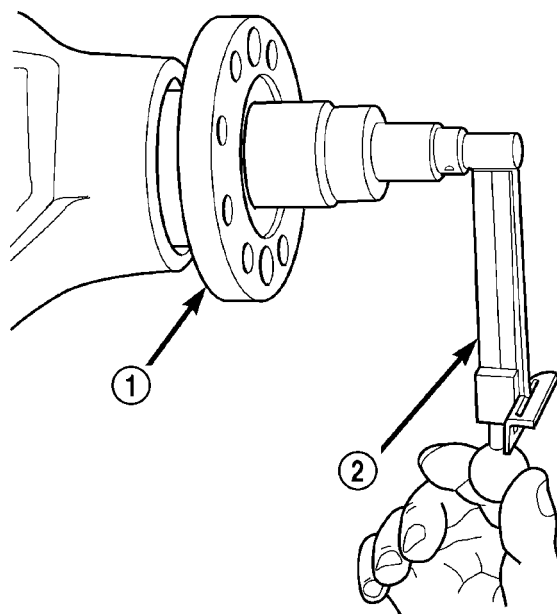
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Fig. 64 PINION NUT

- 1 - DIFFERENTIAL HOUSING
2 - HOLDER
3 - TORQUE WRENCH

(16) Check pinion rotating torque with an inch pound torque wrench (Fig. 65). The pinion rotating torque should be:

- Original Bearings: 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings: 2 to 5 N·m (15 to 35 in. lbs.).



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Fig. 65 PINION ROTATION TORQUE

- 1 - COMPANION FLANGE
2 - TORQUE WRENCH

PINION GEAR/RING GEAR/TONE RING (Continued)

(17) Position exciter ring on differential case. With a brass drift, slowly and evenly tap the exciter ring into position.

(18) Position ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(19) Invert the differential case in the vise.

(20) Install **new** ring gear bolts and alternately tighten to 156 N·m (115 ft. lbs.) (Fig. 66).

CAUTION: Never reuse the ring gear bolts. The bolts can fracture causing extensive damage.

(21) Install differential in housing and verify gear mesh, backlash and contact pattern.

(22) Install axle shafts.

(23) Install differential cover and fill with gear lubricant.

(24) Install propeller shaft with reference marks aligned.

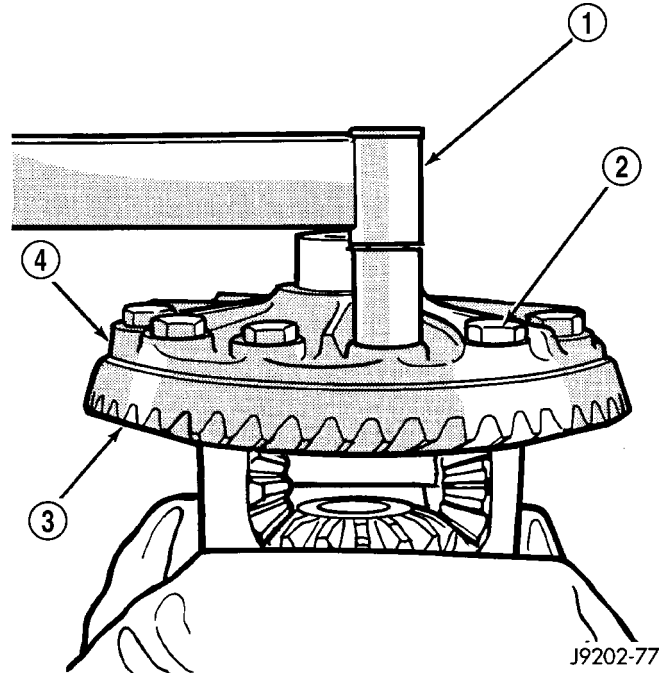


Fig. 66 RING GEAR BOLTS

- 1 - TORQUE WRENCH
- 2 - RING GEAR BOLTS
- 3 - RING GEAR
- 4 - DIFFERENTIAL CASE

REAR AXLE - 10 1/2 AA

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AXLE BEARINGS		DIFFERENTIAL CASE BEARINGS	
REMOVAL	112	REMOVAL	121
INSTALLATION	112	INSTALLATION	121
PINION SEAL		PINION GEAR/RING GEAR/TONE RING	
REMOVAL	113	REMOVAL	122
INSTALLATION	113	INSTALLATION	123
DIFFERENTIAL			
DESCRIPTION	114		

REAR AXLE - 10 1/2 AA

DESCRIPTION

The axle consists of a cast iron center casting differential housing with axle shaft tubes extending from each side. The tubes are pressed into the differential housing and welded. The design has the centerline of the pinion set below the centerline of the ring gear. The axle is a full floating axle where the loads are supported by the axle housing tubes. The axle has a vent used to relieve internal pressure caused by lubricant vaporization and internal expansion.

OPERATION

The axle receives power from the propeller shaft. The propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion shaft can also cause a snapping or a knocking noise.

REAR AXLE - 10 1/2 AA (Continued)**BEARING NOISE**

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).

- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

NOTE: All driveline components should be examined before starting any repair.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube. 2. Bent or sprung axle shaft.	1. Inspect axle tube alignment. Correct as necessary. 2. Inspect and correct as necessary.

REAR AXLE - 10 1/2 AA (Continued)

Condition	Possible Causes	Correction
Axle Shaft Broke	1. Misaligned axle tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace the broken shaft after correcting tube mis-alignment. 2. Replace broken shaft and avoid excessive weight on vehicle. 3. Replace broken shaft and avoid or correct erratic clutch operation. 4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly. 2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly. 3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight. 4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Fill differential with the correct fluid type and quantity. 2. Replace scored gears. Fill differential with the correct fluid type and quantity. 3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high. 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn pinion seal. 5. Worn/scored yoke. 6. Axle cover not properly sealed.	1. Drain lubricant to the correct level. 2. Replace seals. 3. Repair as necessary. 4. Replace seal. 5. Replace yoke and seal. 6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low. 2. Improper grade of lubricant. 3. Bearing pre-loads too high. 4. Insufficient ring gear backlash.	1. Fill differential to correct level. 2. Fill differential with the correct fluid type and quantity. 3. Re-adjust bearing pre-loads. 4. Re-adjust ring gear backlash.

REAR AXLE - 10 1/2 AA (Continued)

Condition	Possible Causes	Correction
Gear Teeth Broke	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavement. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation. 3. Replace gears and examine remaining parts for damage. 4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant. 2. Improper ring gear and pinion adjustment. 3. Unmatched ring gear and pinion. 4. Worn teeth on ring gear and/or pinion. 5. Loose pinion bearings. 6. Loose differential bearings. 7. Mis-aligned or sprung ring gear. 8. Loose differential bearing cap bolts. 9. Housing not machined properly.	1. Fill differential with the correct fluid type and quantity. 2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth. 3. Replace gears with a matched ring gear and pinion. 4. Replace ring gear and pinion. 5. Adjust pinion bearing pre-load. 6. Adjust differential bearing pre-load. 7. Measure ring gear run-out. Replace components as necessary. 8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued to the proper specification. 9. Replace housing.

REMOVAL

- (1) Raise and support the vehicle.
- (2) Position a lifting device under the axle.
- (3) Secure axle to device.
- (4) Remove wheels and tires assemblies.
- (5) Remove RWAL sensor from the differential housing.
- (6) Remove brake hose at the axle junction block and axle vent hose.
- (7) Disconnect parking brake cables and cable brackets.
- (8) Remove brake calipers and rotors.
- (9) Mark propeller shaft and companion flange for installation alignment reference.
- (10) Remove propeller shaft.
- (11) Remove shock absorbers from axle.
- (12) Remove U-bolts from axle.
- (13) Separate the axle from the vehicle.

INSTALLATION

- (1) Raise axle with lifting device and align to the leaf spring centering bolts.
- (2) Install axle U-bolts and tighten to 149 N·m (110 ft. lbs.).
- (3) Install shock absorbers to axle and tighten to specification.
- (4) Install the RWAL sensor to the differential housing.
- (5) Connect the parking brake cables and cable brackets.
- (6) Install brake calipers.
- (7) Connect brake hose to the axle junction block and axle vent hose.
- (8) Align propeller shaft and pinion companion flange reference marks and tighten companion flange bolts to 115 N·m (85 ft. lbs.).
- (9) Install the wheels and tires.

REAR AXLE - 10 1/2 AA (Continued)

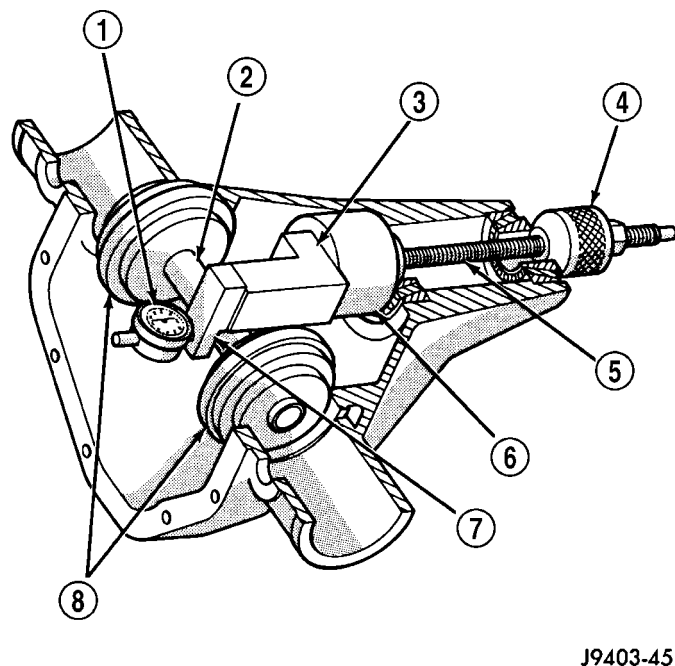
- (10) Fill differential to specifications.
- (11) Remove lifting device from axle and lower the vehicle.

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. Compensation for pinion depth variance is achieved with a select shim. The shim is located between the rear pinion bearing and the pinion gear head.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 1).



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Fig. 1 PINION GEAR DEPTH GAUGE TOOLS

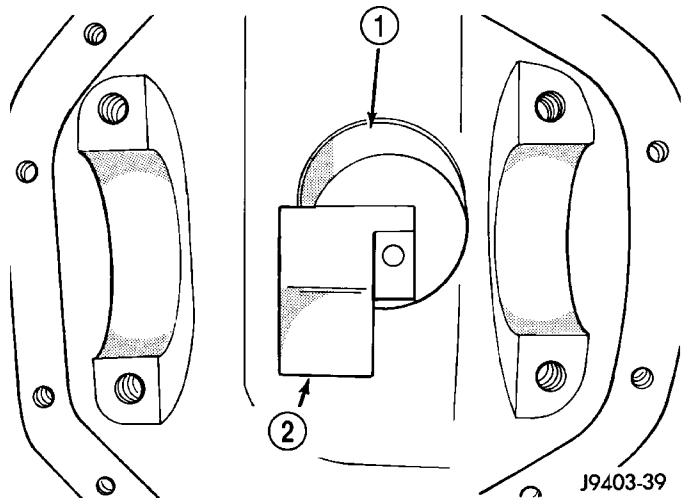
- 1 - DIAL INDICATOR
- 2 - ARBOR
- 3 - PINION HEIGHT BLOCK
- 4 - CONE
- 5 - SCREW
- 6 - PINION BLOCK
- 7 - SCOOTER BLOCK
- 8 - ARBOR DISC

(1) Assemble Pinion Height Block 6739, Pinion Block 8899 and rear pinion bearing onto Screw 6741 (Fig. 1).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through pinion bearing cups (Fig. 2).

(3) Install front pinion bearing and install the Cone-nut 6740 hand tight. Then check tool rotating torque with an inch pound torque wrench. The rotat-

ing torque should be 1.7-2.26 N·m (15-20 in. lbs.) (Fig. 1).

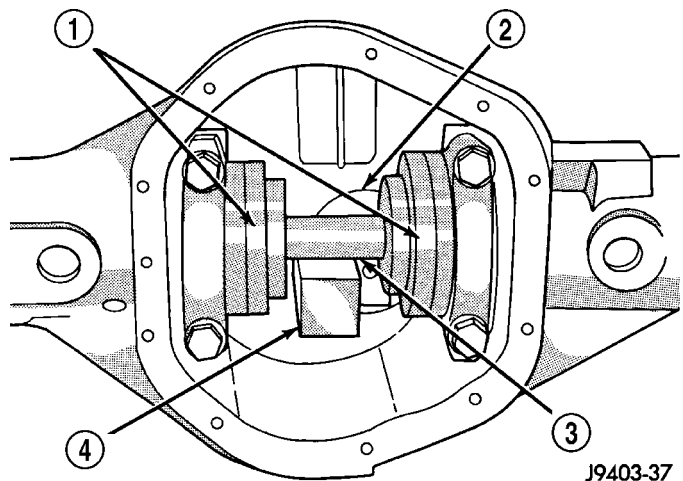
**Fig. 2 PINION HEIGHT BLOCK**

- 1 - PINION BLOCK
- 2 - PINION HEIGHT BLOCK

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 3).

(5) Install differential bearing caps on arbor discs and snug the bearing cap bolts. Then cross tighten cap bolts to 165 N·m (122 ft. lbs.).

NOTE: Arbor should rotate freely in the arbor discs.

**Fig. 3 GAUGE TOOLS IN HOUSING**

- 1 - ARBOR DISC
- 2 - PINION BLOCK
- 3 - ARBOR
- 4 - PINION HEIGHT BLOCK

(6) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(7) Position Scooter Block/Dial Indicator flush on the pinion height block. Hold scooter block and zero the dial indicator.

REAR AXLE - 10 1/2 AA (Continued)

(8) Slowly slide the scooter block across the pinion height block over to the arbor (Fig. 4). Move the scooter block till dial indicator crests the arbor, then record the highest reading.

(9) Select a shim equal to the dial indicator reading.

(10) Install the select shim between the rear pinion bearing and the pinion gear head.

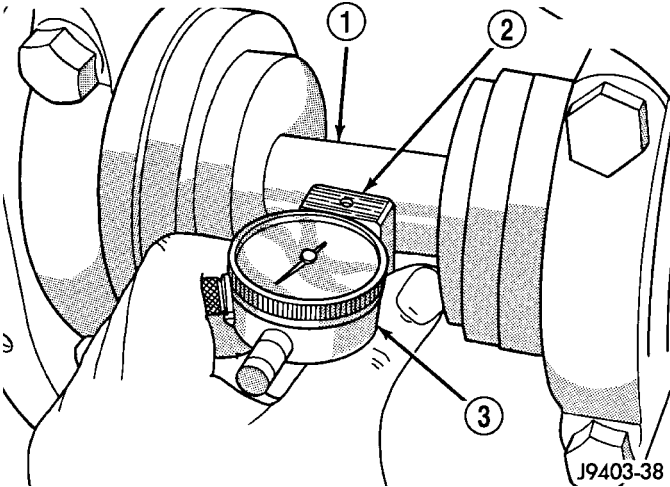


Fig. 4 PINION GEAR DEPTH MEASUREMENT

- 1 - ARBOR
- 2 - SCOOTER BLOCK
- 3 - DIAL INDICATOR

DIFFERENTIAL CASE BEARING PRELOAD AND GEAR BACKLASH

Backlash is adjusted by moving the adjusters in and out or both. By moving the adjusters the case/ring gear will move closer or further away from the pinion. In most cases this adjustment can be used to achieve the correct gear tooth pattern and set the case bearing preload.

(1) Remove adjuster lock bolts and adjuster locks (Fig. 5).

(2) Loosen the differential bearing caps.

(3) Slide differential case toward the pinion gear until the gears make contact/zero backlash. If zero backlash cannot be obtained, turn the pinion side adjuster until zero backlash is obtained.

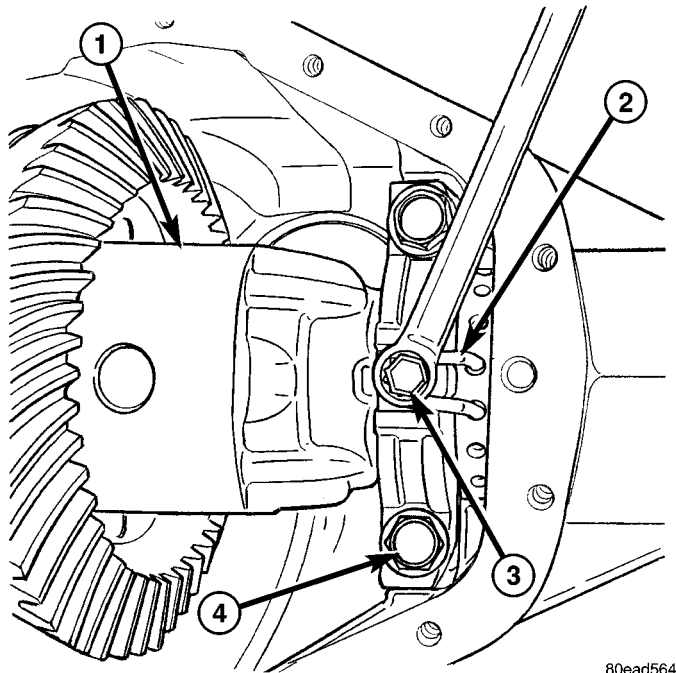
(4) Holding the differential case toward the pinion gear, turn bearing adjusters with Spanner Wrench 8883 (Fig. 6) until they make contact with the differential bearings/cups.

(5) Back off the ring gear side adjuster 4 holes, to obtain initial ring gear backlash.

(6) Install ring gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(7) Tighten pinion gear side adjuster firmly against the differential case bearing cup.

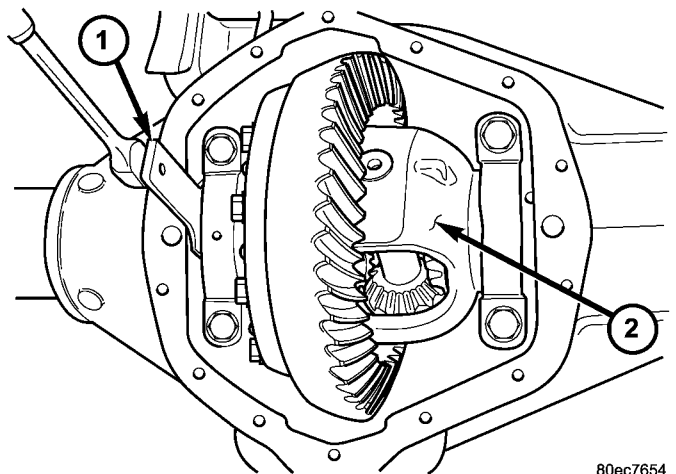
(8) Rotate the pinion several times to seat the differential bearings.



80ead564

Fig. 5 ADJUSTER LOCK BOLT

- 1 - DIFFERENTIAL CASE
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER LOCK BOLT
- 4 - BEARING CAP BOLT



80ec7654

Fig. 6 ADJUSTER SPANNER WRENCH

- 1 - WRENCH
- 2 - DIFFERENTIAL

(9) Loosen pinion gear side adjuster until it is no longer in contact with the bearing cup, then tighten it until it makes contact.

(10) Tighten pinion gear side adjuster an additional:

- **New Bearings:** 6 Adjuster Holes
- **Original Bearings:** 4 Adjuster Holes

(11) Install pinion gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

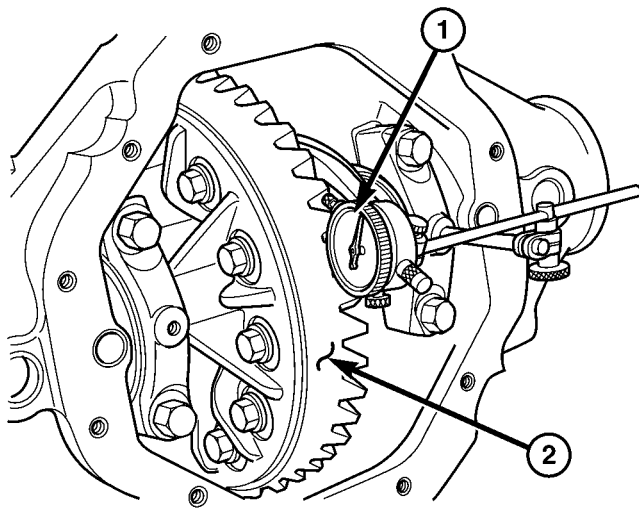
REAR AXLE - 10 1/2 AA (Continued)

(12) Tighten bearing cap bolts to 115 N·m (85 ft. lbs.).

(13) Tighten adjuster lock bolts to 33 N·m (24 ft. lbs.).

(14) Measure ring gear backlash with a Dial Indicator C-3339 and Dial Indicator Stud L-4438 at eight points around the drive side of the ring gear (Fig. 7). The backlash should be 0.08-0.25 mm (0.003-0.010 in) with a preferred backlash of 0.13-0.18 mm (0.005-0.007 in).

NOTE: Backlash measurement should not vary more than 0.05 mm (0.002 in) between measuring points. If measurement does vary inspect the gears for burrs, the differential case flange and ring gear mounting.



80e58063

Fig. 7 RING GEAR BACKLASH

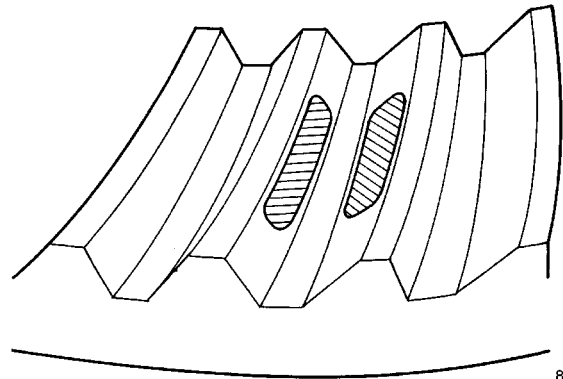
- 1 - DIAL INDICATOR
2 - RING GEAR

GEAR TOOTH CONTACT PATTERN

Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shorten gear life.

- (1) Wipe clean each tooth of the ring gear.
- (2) Apply gear marking compound to all of the ring gear teeth.
- (3) Verify bearing cap bolts are torque specification.
- (4) Apply parking brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.
- (5) Rotate the pinion/pinion yoke 4 full revolutions in each directions.
- (6) Read gear tooth contact pattern:

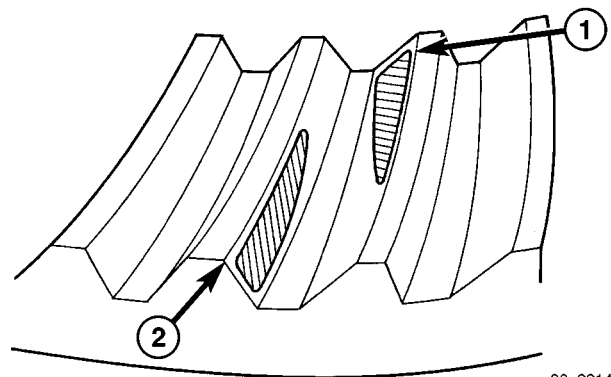
- Gear contact pattern correct (Fig. 8). Backlash and pinion depth is correct.



80e22005

Fig. 8 CORRECT CONTACT PATTERN

- Ring gear too far away from pinion gear (Fig. 9). Decrease the backlash, by moving the ring closer to the pinion gear using the adjusters.

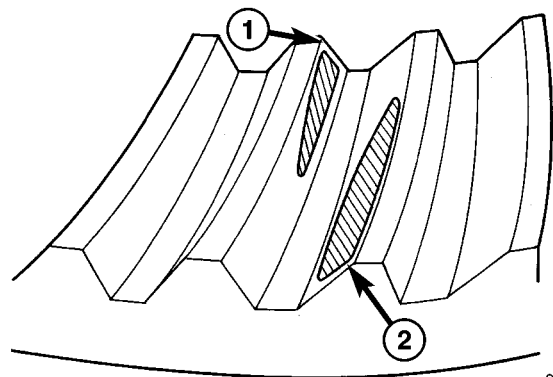


80e2214b

Fig. 9 INCORRECT BACKLASH

- 1 - COAST SIDE TOE
2 - DRIVE SIDE HEEL

- Ring gear too close to pinion gear (Fig. 10). Increase the backlash, by moving the ring away from the pinion gear using the adjusters.



80e222bd

Fig. 10 INCORRECT BACKLASH

- 1 - DRIVE SIDE TOE
2 - COAST SIDE HEEL

REAR AXLE - 10 1/2 AA (Continued)

- Ring gear too far away from pinion gear (Fig. 11). Decrease the backlash, by moving the ring closer to the pinion gear using the adjusters.

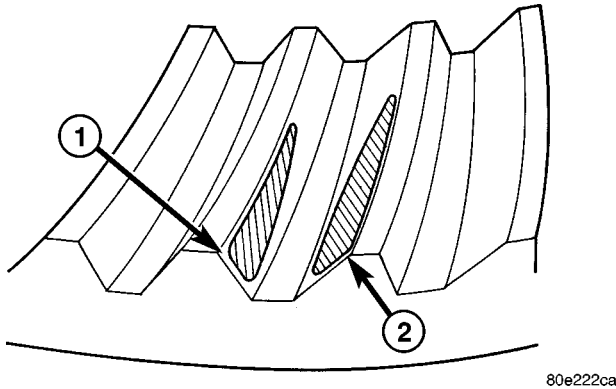


Fig. 11 INCORRECT BACKLASH

- 1 - DRIVE SIDE HEEL
2 - COAST SIDE HEEL

- Ring gear too close to pinion gear (Fig. 12). Increase the backlash, by moving the ring away from the pinion gear using the adjusters.

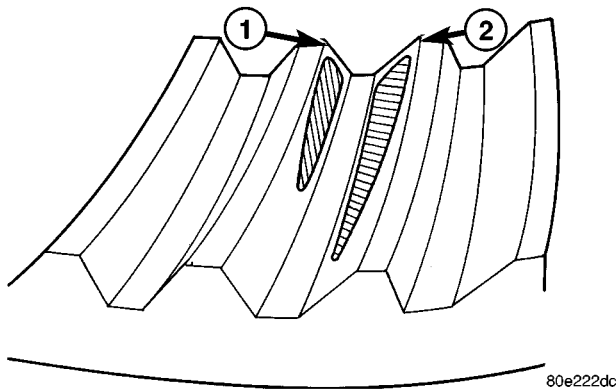


Fig. 12 INCORRECT BACKLASH

- 1 - DRIVE SIDE TOE
2 - COAST SIDE TOE

- Pinion gear is set too low (Fig. 13). Increase the pinion gear height, by increasing the pinion depth shim thickness.

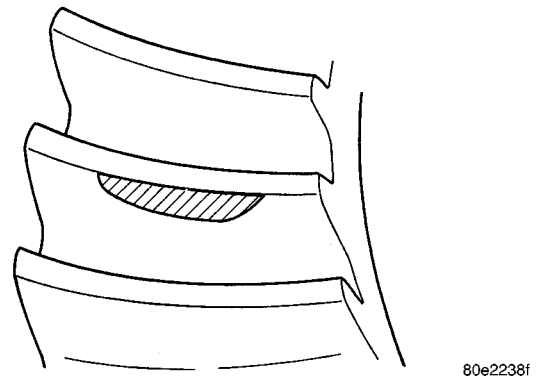


Fig. 13 LOW PINION HEIGHT

- Pinion gear is set too high (Fig. 14). Decrease the pinion depth, by decreasing the pinion depth shim thickness.

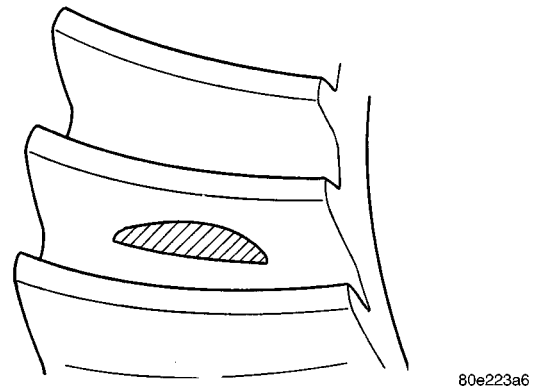


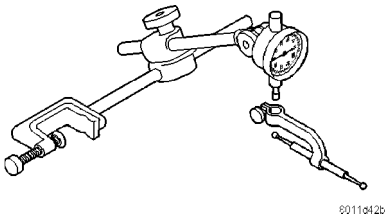
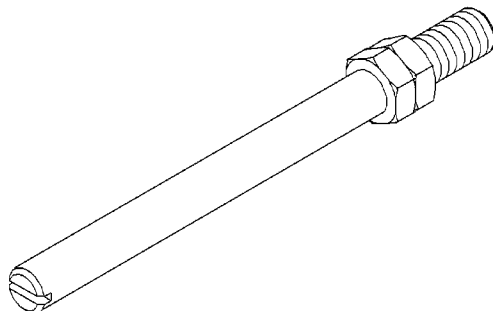
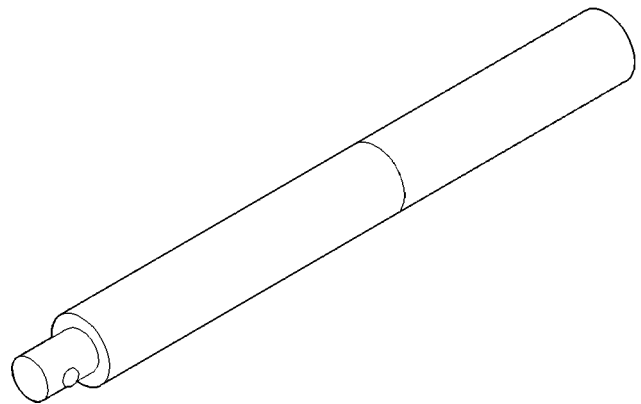
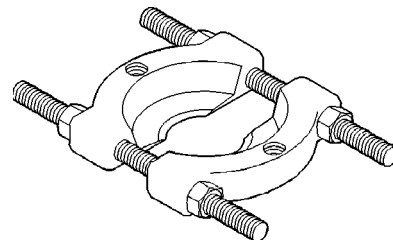
Fig. 14 HIGH PINION HEIGHT

REAR AXLE - 10 1/2 AA (Continued)**SPECIFICATIONS****AXLE SPECIFICATIONS**

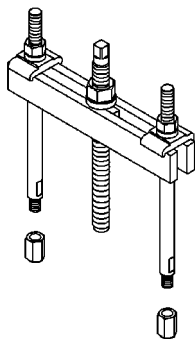
DESCRIPTION	SPECIFICATION
Axle Ratio	3.73, 4.10
Ring Gear Diameter	266 mm (10.5 in.)
Ring Gear Backlash	0.13-0.18 mm (0.005-0.007 in.)
Pinion Bearing Preload - New Bearings	1.69-2.82 N·m (15-25 in. lbs.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload + Diff Case Bearing Preload - New Bearings	3.4-5.6 N·m (30-50 in. lbs.)
Pinion Bearing Preload + Diff Case Bearing Preload - Original Bearings	2.8-5.1 N·m (25-45 in. lbs.)

TORQUE SPECIFICATIONS

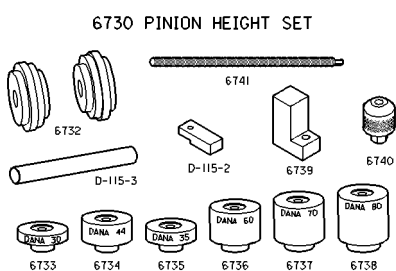
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fill Hole Plug	32	24	-
Differential Cover Bolts	40	30	-
Bearing Cap Bolts	165	122	-
Ring Gear Bolts	237	175	-
Axle Flange Bolts	129	95	-
Adjuster Lock Bolt	25	18	-

SPECIAL TOOLS**DIAL INDICATOR SET C-3339****DIAL INDICATOR STUD L-4438****HANDLE C-4171****SPLITTER 1130**

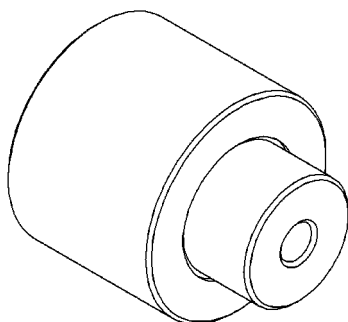
REAR AXLE - 10 1/2 AA (Continued)



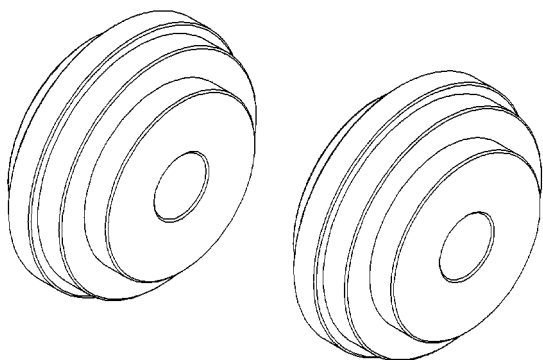
BRIDGE 938



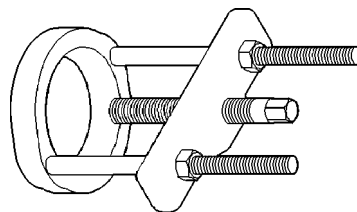
PINION DEPTH GAUGE 6730



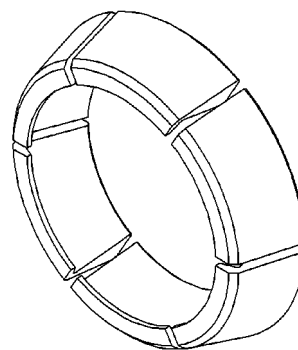
GAUGE BLOCK 8899



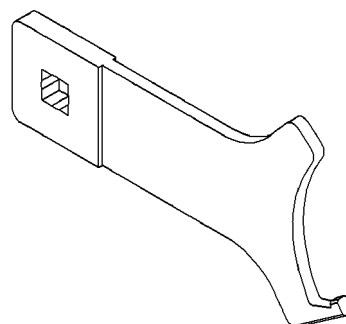
ARBOR DISCS 6732



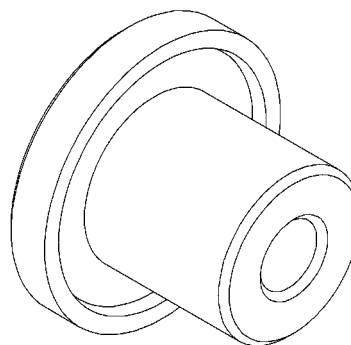
PULLER C-293-PA



ADAPTERS 8879

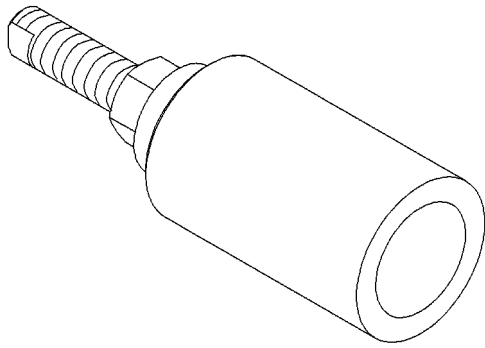


ADJUSTER WRENCH 8883

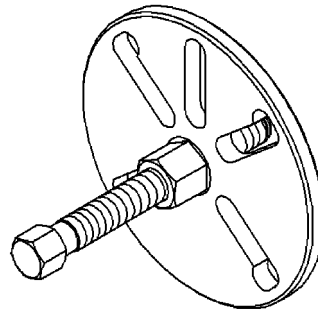


BEARING INSTALLER 8956

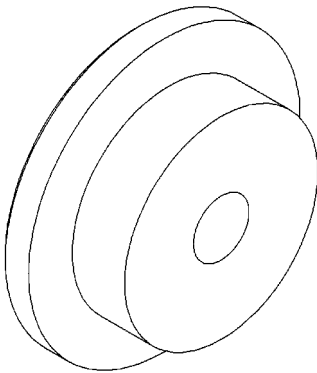
REAR AXLE - 10 1/2 AA (Continued)



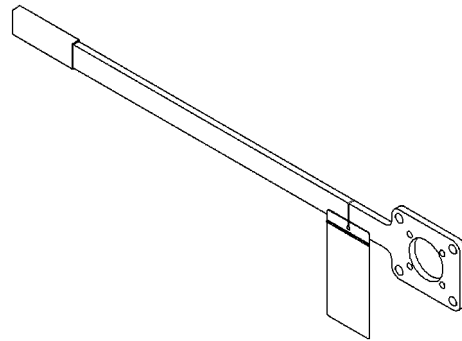
PINION INSTALLER 8981



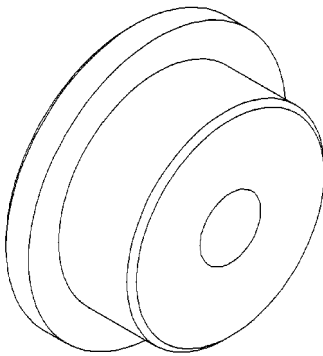
FLANGE PULLER 8992



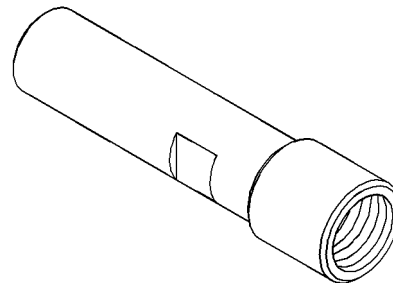
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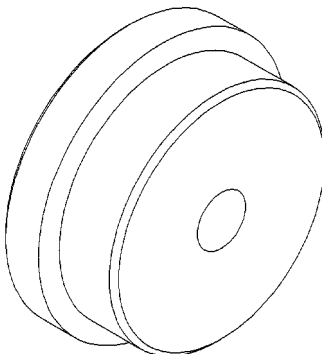
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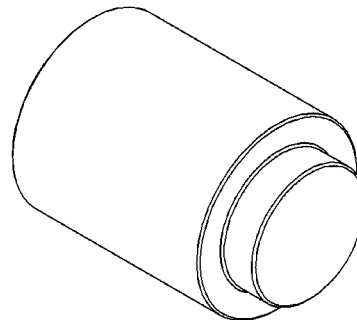
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PINION DRIVER 8977

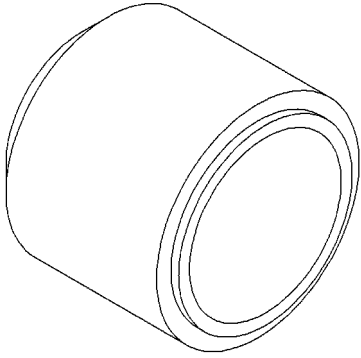


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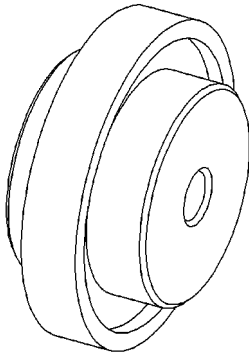


PLUG 8888

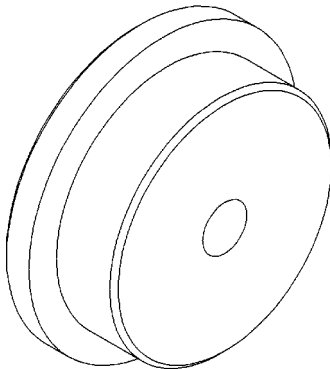
REAR AXLE - 10 1/2 AA (Continued)



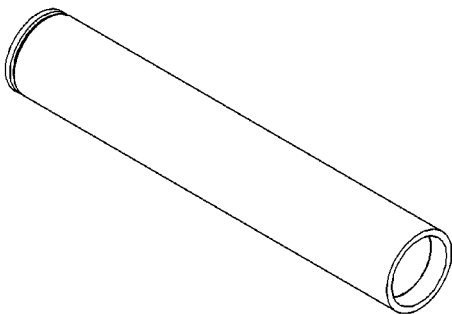
SEAL INSTALLER 8896



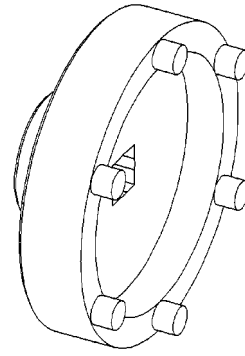
SEAL INSTALLER 8963



CUP INSTALLER 8962



BEARING INSTALLER MD-998805

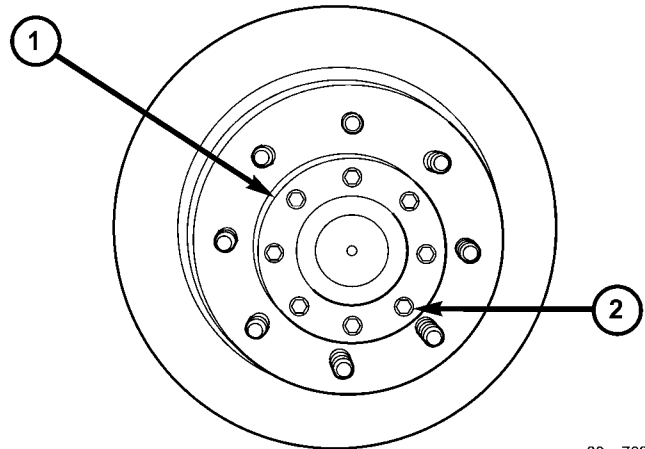


SOCKET 8954

AXLE SHAFTS

REMOVAL

- (1) Remove axle shaft flange bolts (Fig. 15).



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Fig. 15 AXLE FLANGE BOLTS

- 1 - AXLE FLANGE
- 2 - FLANGE BOLT

- (2) Slide axle shaft out of the axle tube.
- (3) Remove axle shaft gasket.

INSTALLATION

NOTE: Axle flange bolts must be replaced or use Mopar Lock N' Seal or Loctite® 242 on cleaned existing bolts.

- (1) Clean axle flange and hub.
- (2) Install new axle shaft gasket.
- (3) Slide axle shaft into the axle tube.
- (4) Install axle shaft flange bolts and tighten to 129 N·m (95 ft. lbs.).

AXLE BEARINGS

REMOVAL

- (1) Remove axle shaft flange bolts and remove axle shaft.
- (2) Remove retainer ring (Fig. 16) from the axle shaft tube.

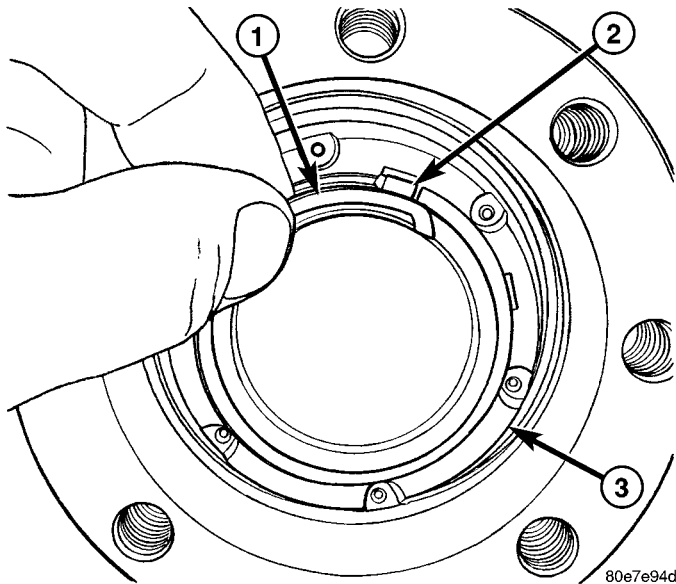


Fig. 16 RETAINER RING

- 1 - RETAINER RING
- 2 - LOCKING KEY
- 3 - BEARING NUT

- (3) Remove hub bearing nut locking key (Fig. 17).

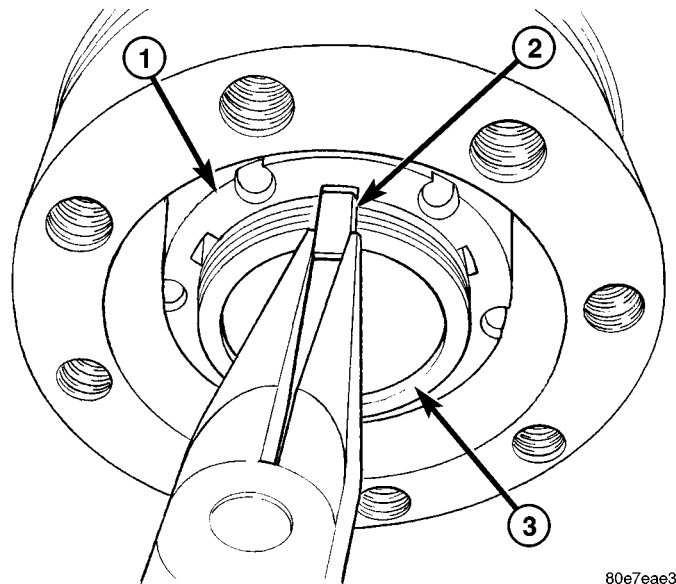


Fig. 17 LOCKING KEY

- 1 - BEARING NUT
- 2 - LOCKING KEY
- 3 - AXLE TUBE

- (4) Remove hub bearing nut with Socket 8954.
- (5) Remove hub and bearings from the axle.
- (6) Pry out hub bearing seal from the back of the hub.

NOTE: The inner part of the seal may stay on the axle tube (Fig. 18). This part must also be removed.

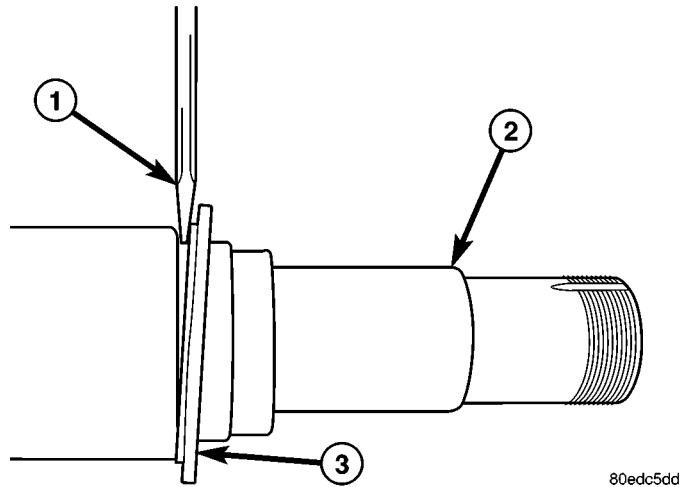


Fig. 18 INNER PART OF SEAL

- 1 - PRY BAR
- 2 - AXLE TUBE
- 3 - REMAINING SEAL

- (7) Remove rear bearing.
- (8) Remove hub bearing cups with a hammer and drift.

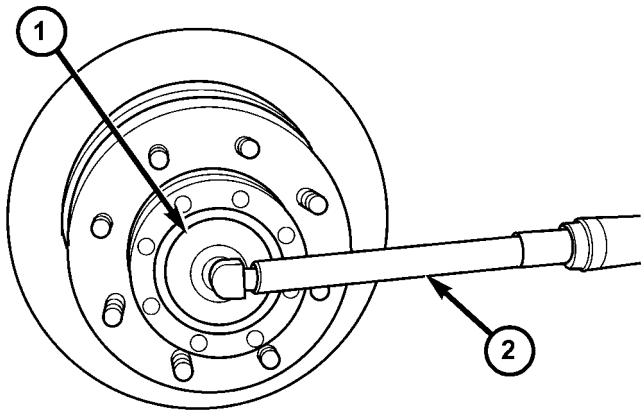
INSTALLATION

- (1) Install outer hub bearing cup with Installer 8961 and Handle C-4171.
- (2) Install inner hub bearing cup with Installer 8962 and Handle C-4171.
- (3) Pack bearings with the appropriate grease.
- (4) Install rear bearing and install **new** grease seal with Installer 8963 and Handle C-4171.
- (5) Slide hub on the axle tube and install front bearing into the hub.
- (6) Install hub bearing nut with Socket 8954 and tighten to 30 N·m (22 ft. lbs.) while rotating the hub (Fig. 19).
- (7) Back off nut about 30° and align next hub nut key slot with axle tube key slot and install locking key.

NOTE: End play should be 0.025-0.25 mm (0.001-0.010 in.).

- (8) Install retainer ring with ring end in the key slot.
- (9) Install new axle shaft gasket and install axle shaft.

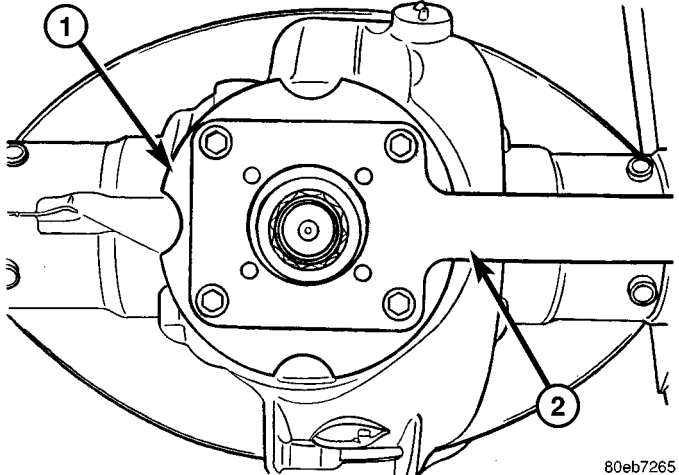
AXLE BEARINGS (Continued)



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Fig. 19 HUB NUT SOCKET

- 1 - SOCKET
2 - TORQUE WRENCH



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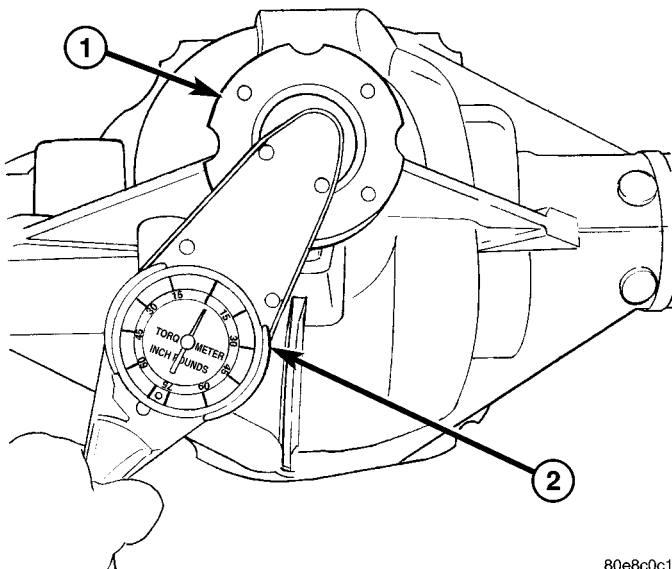
Fig. 21 FLANGE WRENCH

- 1 - PINION FLANGE
2 - FLANGE WRENCH

PINION SEAL

REMOVAL

- (1) Remove axle shafts.
- (2) Mark propeller shaft and pinion flange for installation reference and remove shaft.
- (3) Rotate pinion gear three or four times.
- (4) Measure and record the amount of torque necessary to rotate the pinion gear with an inch pound torque wrench (Fig. 20).



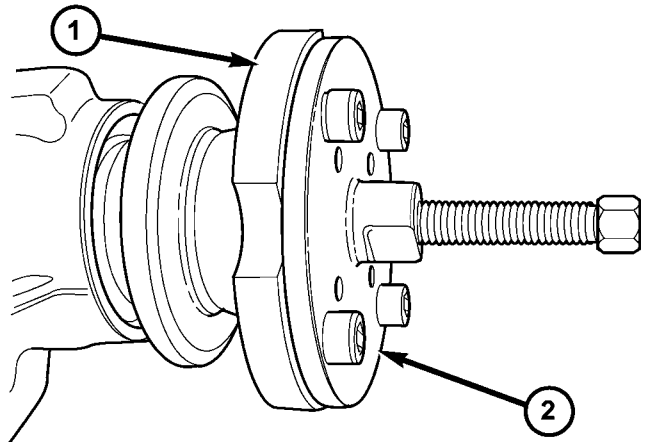
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Fig. 20 PINION ROTATING TORQUE

- 1 - PINION FLANGE
2 - TORQUE WRENCH

- (5) Hold pinion flange with Flange Wrench 8979 (Fig. 21) and remove pinion flange nut and washer.

- (6) Remove pinion flange with Pinion Flange Puller 8992 (Fig. 22).



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Fig. 22 PINION FLANGE PULLER

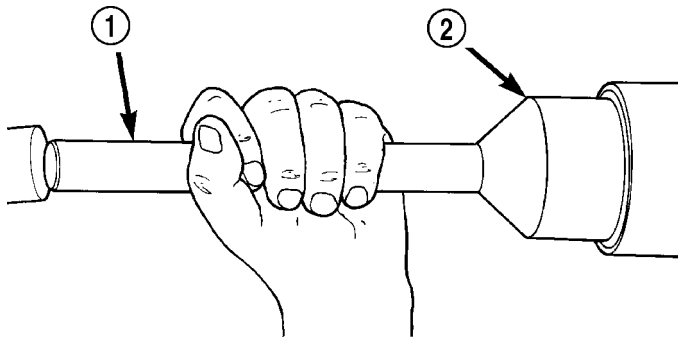
- 1 - PINION FLANGE
2 - PULLER

- (7) Remove pinion shaft seal with a pry tool or slide hammer mounted screw.

INSTALLATION

- (1) Install **new** pinion seal with Installer 8896 and Handle C-4171 (Fig. 23).
- (2) Apply a light coat of teflon sealant to the pinion flange splines.
- (3) Lightly tap the pinion flange onto the pinion until a few threads are showing.
- (4) Install flange washer and **new** pinion nut.
- (5) Hold flange with Flange Wrench 8979 (Fig. 24) and tighten pinion nut until pinion end play is taken up.

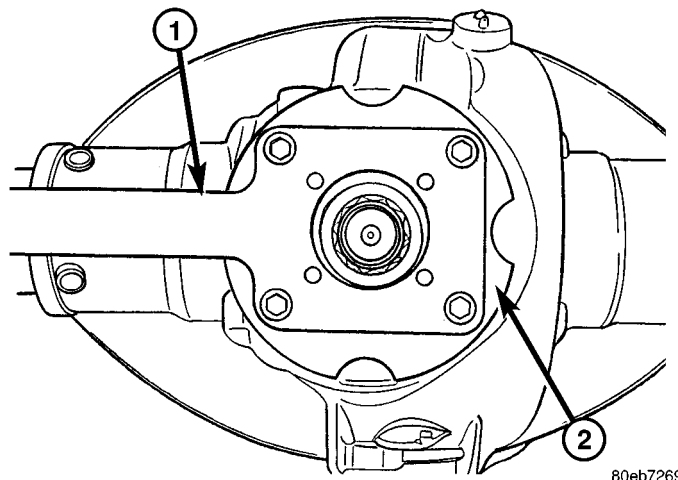
PINION SEAL (Continued)



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Fig. 23 PINION SEAL INSTALLER

- 1 - HANDLE
2 - INSTALLER



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Fig. 24 FLANGE WRENCH

- 1 - FLANGE WRENCH
2 - PINION FLANGE

- (6) Rotate pinion several times to seat bearings.
- (7) Measure pinion rotating torque with an inch pound torque wrench and compare it to recorded measurement.
- (8) Tighten pinion nut in small increments, until pinion rotating torque is 0.40-0.57 N·m (3-5 in. lbs.) greater than recorded measurement.
- (9) Rotate pinion several times then verify pinion rotating torque again.
- (10) Install axle shafts.
- (11) Install propeller shaft with reference marks aligned.
- (12) Check and fill differential if necessary.

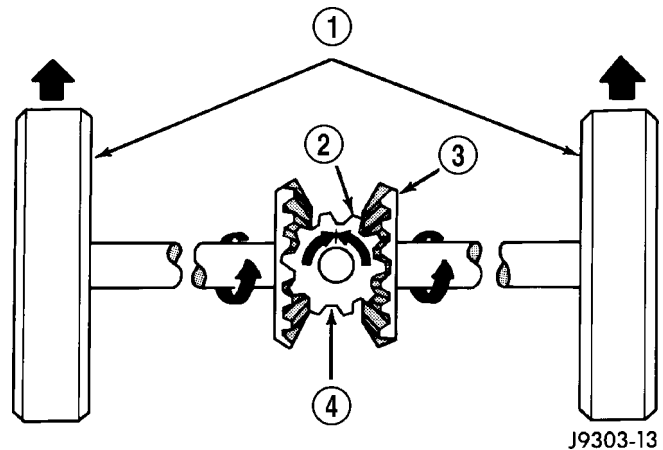
DIFFERENTIAL

DESCRIPTION

The differential case is a one-piece design. The differential pinion shaft is retained with a snap ring. Differential bearing preload and ring gear backlash is adjusted by the use of adjusters. The adjusters are between the differential bearings and the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The stamped steel cover provides a means for inspection and servicing the differential.

OPERATION

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 25).



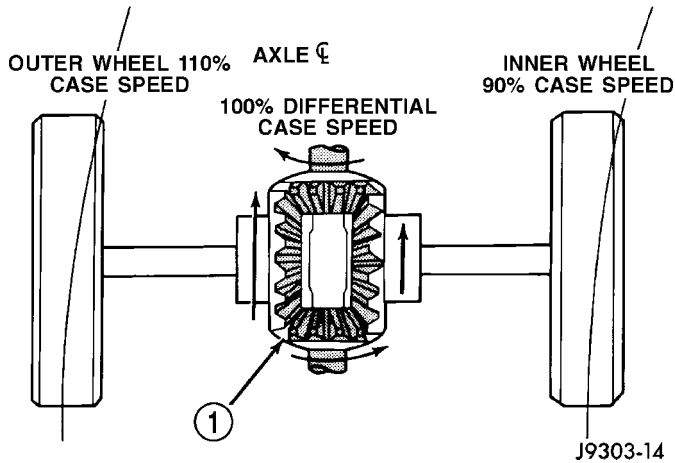
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Fig. 25 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

- 1 - IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 26). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

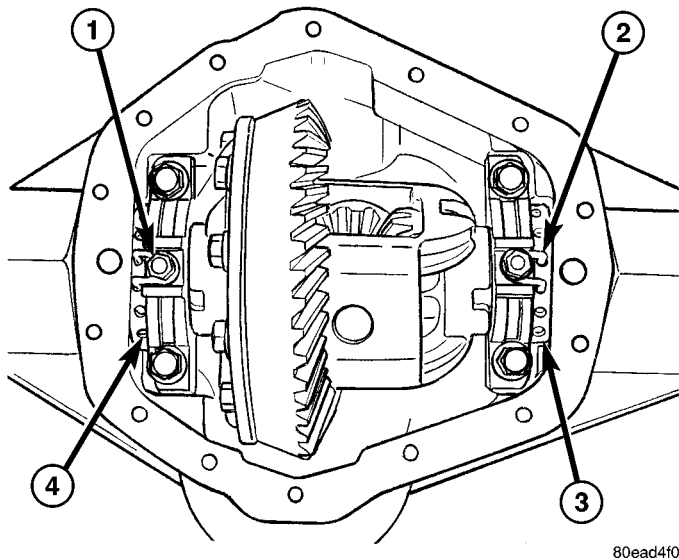
DIFFERENTIAL (Continued)

**Fig. 26 DIFFERENTIAL-ON TURNS**

1 - PINION GEARS ROTATE ON PINION SHAFT

REMOVAL

- (1) Remove lubricant fill hole plug from the differential housing cover.
- (2) Remove differential housing cover and drain the lubricant from housing.
- (3) Remove axle shafts.
- (4) Remove adjuster lock bolts and adjuster locks (Fig. 27).

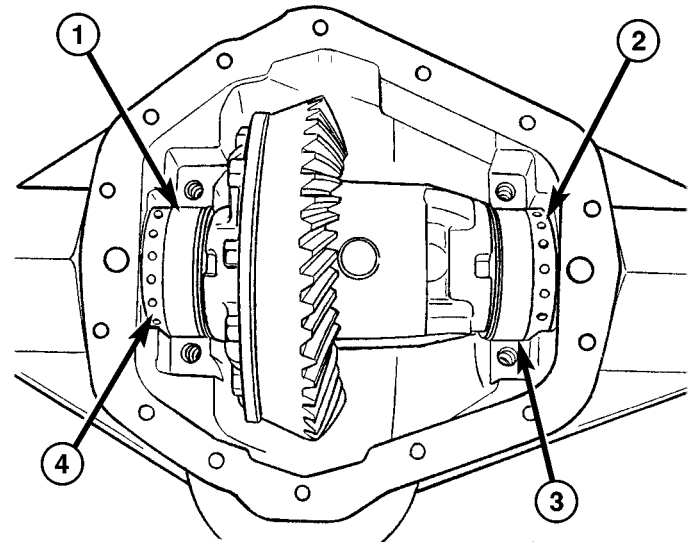
**Fig. 27 ADJUSTER LOCKS**

- 1 - LOCK BOLT
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER
- 4 - BEARING CAP

- (5) Mark bearing caps left and right for installation reference.

- (6) Remove bearing cap bolts and remove bearing caps.

- (7) Loosen differential bearing adjusters (Fig. 28) with Spanner Wrench 8883.

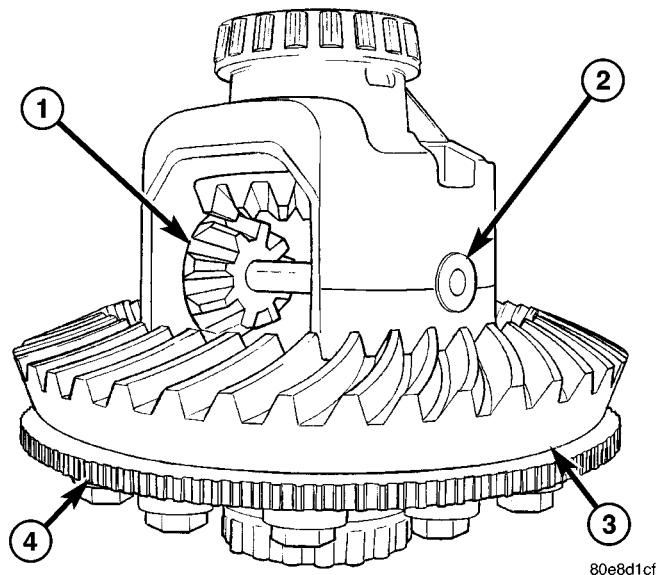
**Fig. 28 BEARING ADJUSTERS**

- 1 - BEARING CUP
- 2 - ADJUSTER
- 3 - BEARING CUP
- 4 - ADJUSTER

- (8) Remove differential case from the housing.
- (9) Remove bearing cups and tag them left and right for installation reference.

DISASSEMBLY

- (1) Remove pinion shaft with a hammer and punch from the side with the hole in the pinion shaft (Fig. 29).

**Fig. 29 PINION SHAFT**

- 1 - PINION GEAR
- 2 - PINION SHAFT
- 3 - RING GEAR
- 4 - EXCITER RING

DIFFERENTIAL (Continued)

(2) Rotate one pinion gear with thrust washer (Fig. 30) to the differential window and remove the gear.

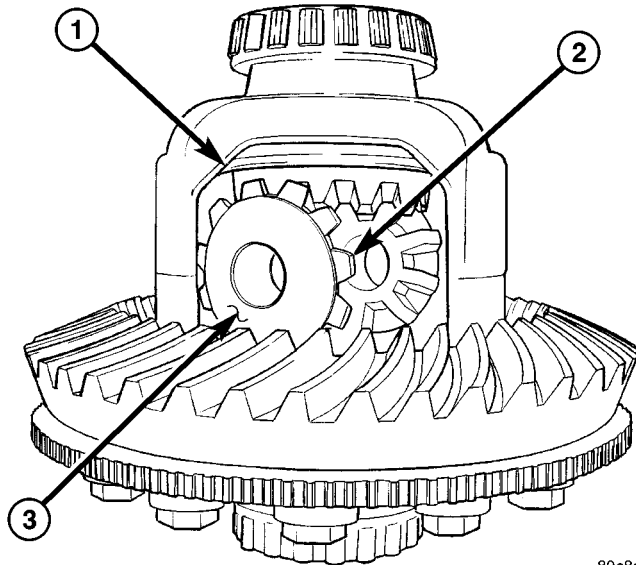


Fig. 30 FRIST PINION GEAR

- 1 - DIFFERENTIAL CASE WINDOW
- 2 - PINION GEAR
- 3 - THRUST WASHER

(3) Rotate the other pinion gear with thrust washer (Fig. 31) to the differential window and remove the gear.

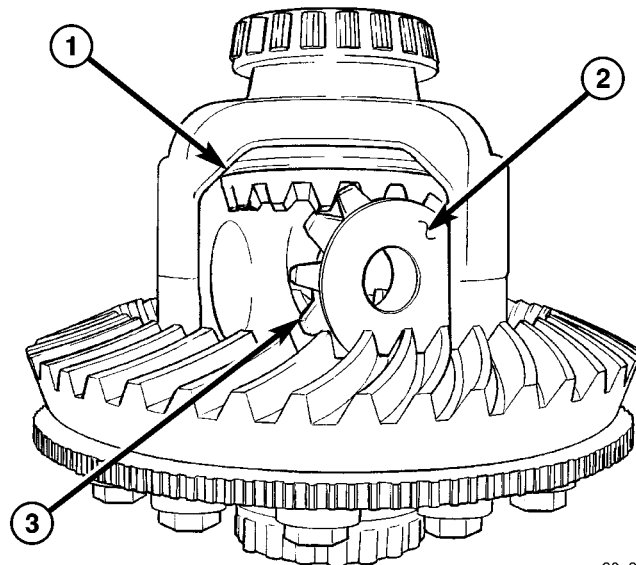


Fig. 31 SECOND PINION GEAR

- 1 - DIFFERENTIAL WINDOW
- 2 - THRUST WASHER
- 3 - PINION GEAR

(4) Remove differential side gears and thrust washers (Fig. 32).

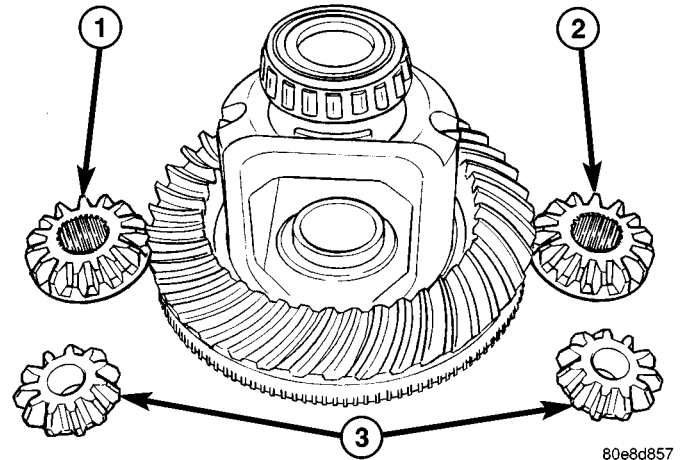


Fig. 32 SIDE GEARS

- 1 - SIDE GEAR
- 2 - SIDE GEAR
- 3 - PINION GEARS

ASSEMBLY

NOTE: If the same gears and thrust washers are being used, install them into their original locations.

(1) Lubricate all differential components with axle lubricant.

(2) Install differential side gears and thrust washers (Fig. 33).

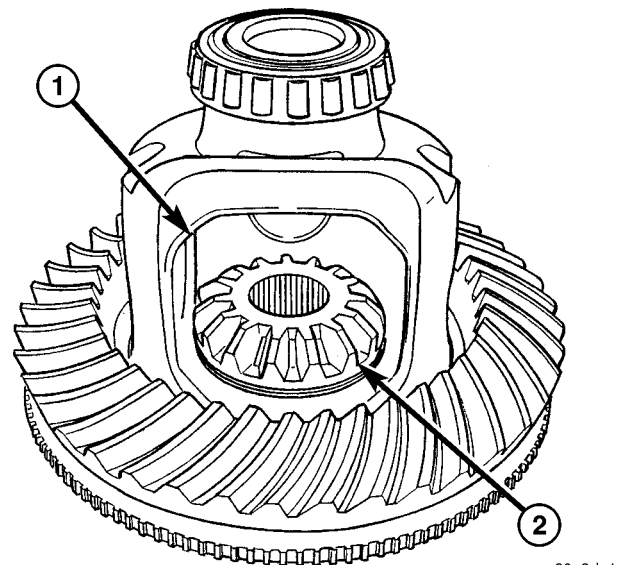
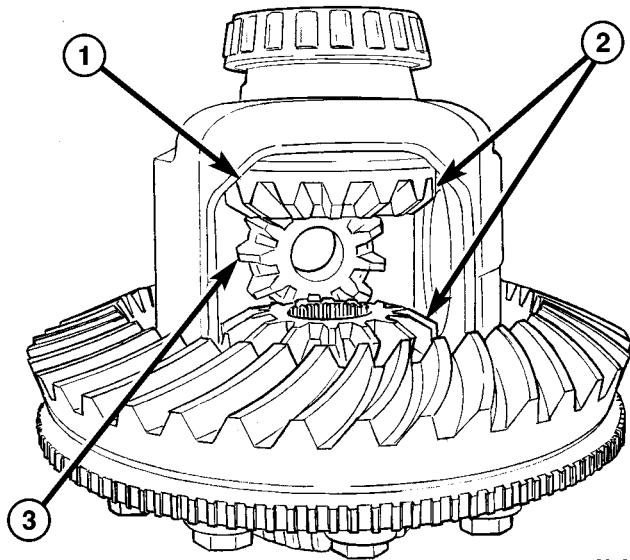


Fig. 33 SIDE GEAR

- 1 - DIFFERENTIAL WINDOW
- 2 - SIDE GEAR

(3) Install first pinion gear into the differential window and side gears. Rotate the pinion gear to the back of the case (Fig. 34).

DIFFERENTIAL (Continued)



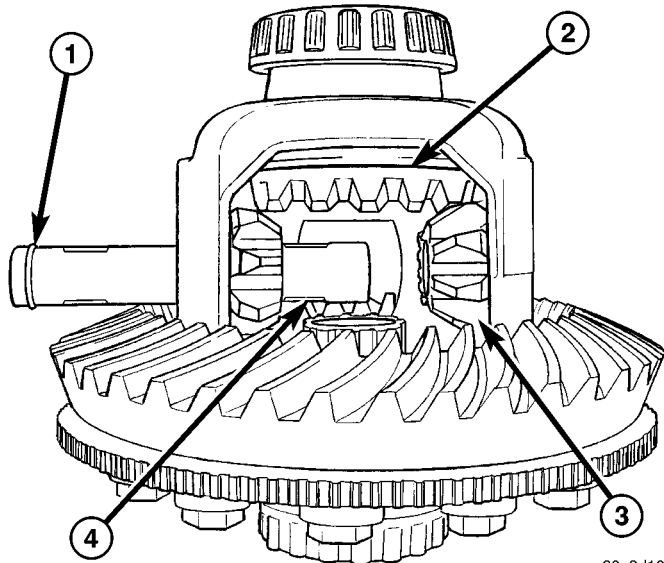
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Fig. 34 PINION GEAR

- 1 - DIFFERENTIAL WINDOW
2 - SIDE GEARS
3 - PINION GEAR

(4) Install the other pinion gear and thrust washer. Rotate the gears to align hole in the pinion gears with hole in the differential case.

(5) Slide pinion shaft into the case and through the pinion gears. Tap the shaft to seat the pinion shaft snap-ring into the case (Fig. 35).



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Fig. 35 PINION SHAFT INSTALLATION

- 1 - PINION SHAFT SNAP-RING
2 - SIDE GEAR
3 - PINION GEAR
4 - PINION SHAFT

INSTALLATION

(1) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth.

CAUTION: Do not use water, steam, kerosene or gasoline for cleaning.

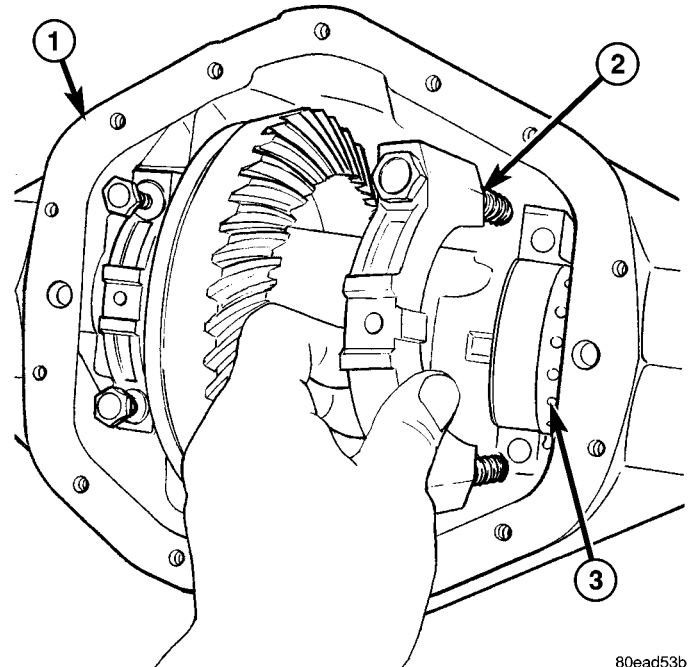
(2) Lubricate differential case bearing.

(3) Install differential case with bearings cups into the housing.

NOTE: A light coat of grease on the cups will hold them in place during installation.

(4) Install bearing caps and bolts (Fig. 36). Tighten the bearing cap bolts finger-tight.

NOTE: Do not torque bearing cap and bolts at this time.



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Fig. 36 CASE BEARING CAP

- 1 - DIFFERENTIAL HOUSING
2 - BEARING CAP
3 - ADJUSTER

(5) Slide differential case toward the pinion gear until the gears make contact/zero backlash. If zero backlash cannot be obtained, turn the pinion side adjuster until zero backlash is obtained.

(6) Holding the differential case toward the pinion gear, turn bearing adjusters with Spanner Wrench 8883 until they make contact with the differential bearings/cups.

(7) Back off the ring gear side adjuster 4 holes, to obtain initial ring gear backlash.

DIFFERENTIAL (Continued)

(8) Install ring gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(9) Tighten pinion gear side adjuster firmly against the differential case bearing cup.

(10) Rotate the pinion several times to seat the differential bearings.

(11) Loosen pinion gear side adjuster until it is no longer in contact with the bearing cup.

(12) Tighten pinion gear side adjuster until it just makes contact with the bearing cup.

(13) Tighten pinion gear side adjuster an additional:

- **New Bearings** 6 Adjuster Holes
- **Original Bearings** 4 Adjuster Holes

(14) Install pinion gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(15) Tighten bearing cap bolts to 165 N·m (122 ft. lbs.).

(16) Tighten adjuster lock bolts to 25 N·m (18 ft. lbs.) (Fig. 37).

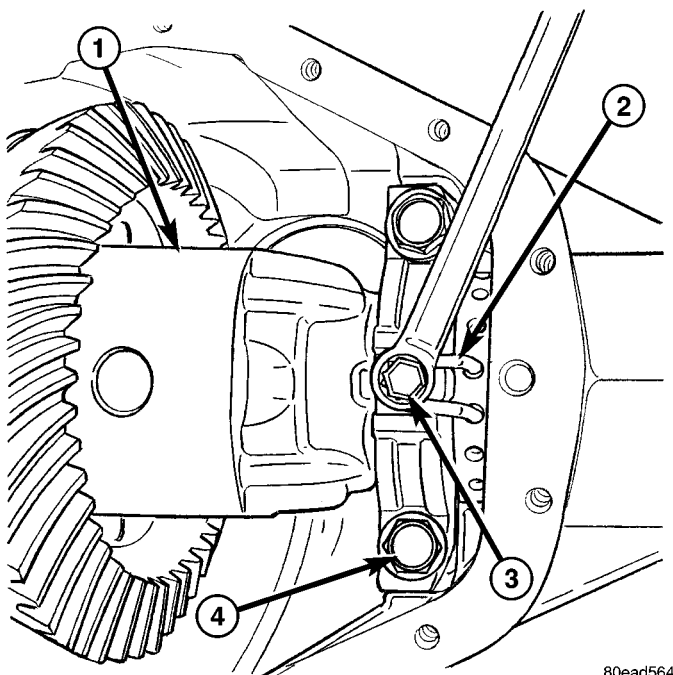


Fig. 37 ADJUSTER LOCK BOLT

- 1 - DIFFERENTIAL CASE
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER LOCK BOLT
- 4 - BEARING CAP BOLT

(17) Measure ring gear backlash and check gear tooth contact pattern. Refer to Adjustments for procedure.

(18) Install axle shafts.

(19) Install differential housing gasket and cover. Tighten cover bolts to 40 N·m (30 ft. lbs.).

(20) Fill axle with lubricant, refer to Lubrication & Maintenance for capacity and lubricant type.

(21) Install fill plug and tighten to 32 N·m (24 ft. lbs.).

DIFFERENTIAL TRAC-RITE

DESCRIPTION

The Trac-Rite™ differential is a helical gear differential. The differential has two side gears, six pinion gears and six pinion brake shoes.

NOTE: The differential is serviced as an assembly only if damaged, but can be disassembled for cleaning. The assembly should be cleaned every time a bearing is changed due to damage.

OPERATION

When one wheel begins to spin the pinion gears on that side are forced toward the pinion brake shoes. The pinion brake shoes then cause frictional drag on the opposite pinion gears and the side gear. These friction forces transfer the power to the opposite wheel. Once the frictional forces are overcome, differentiation will occur. The torque will be continually biased by the frictional forces to the high traction wheel.

DISASSEMBLY

- (1) Remove differential ring gear bolts.
- (2) Remove differential case cover locating screws (Fig. 38).

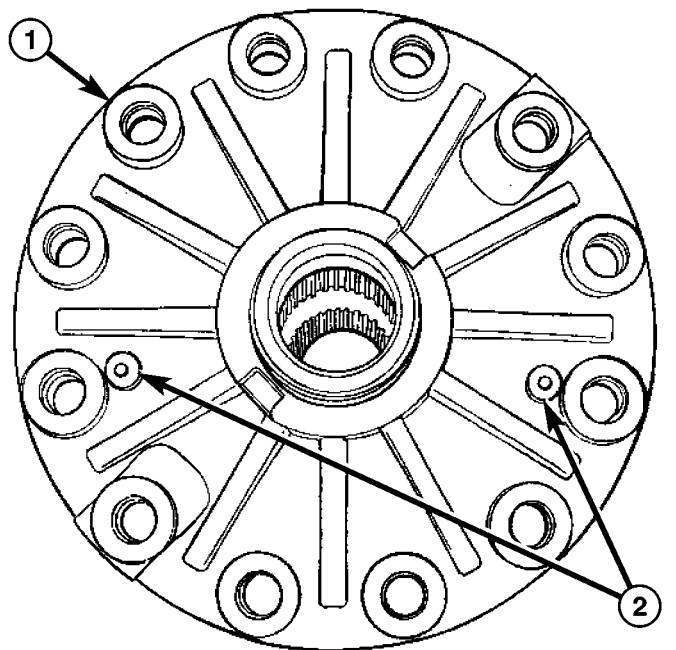
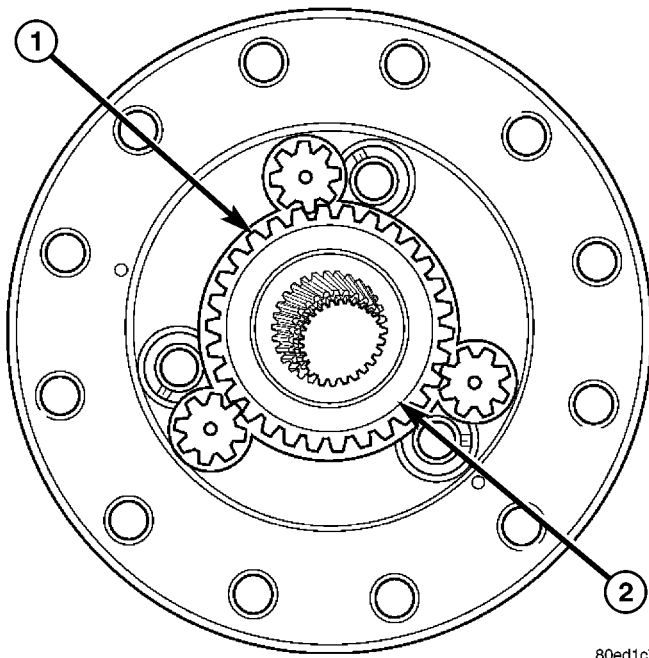


Fig. 38 LOCATION SCREWS

- 1 - DIFFERENTIAL COVER
- 2 - LOCATION SCREWS

- (3) Remove differential case cover.
- (4) Remove side gear and thrust washer (Fig. 39).

DIFFERENTIAL TRAC-RITE (Continued)

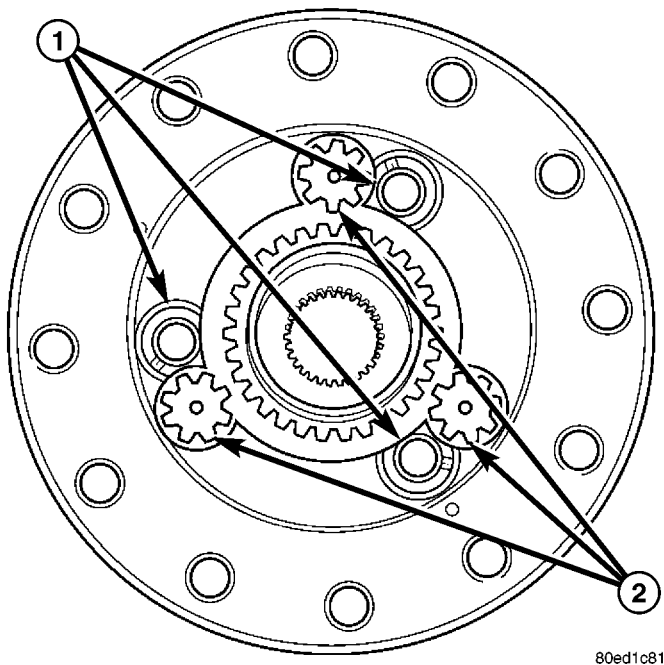
NOTE: Mark all component locations.

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Fig. 39 SIDE GEAR AND THRUST WASHER

- 1 - SIDE GEAR
2 - THRUST WASHER

(5) Remove three pinion brake shoes (Fig. 40).

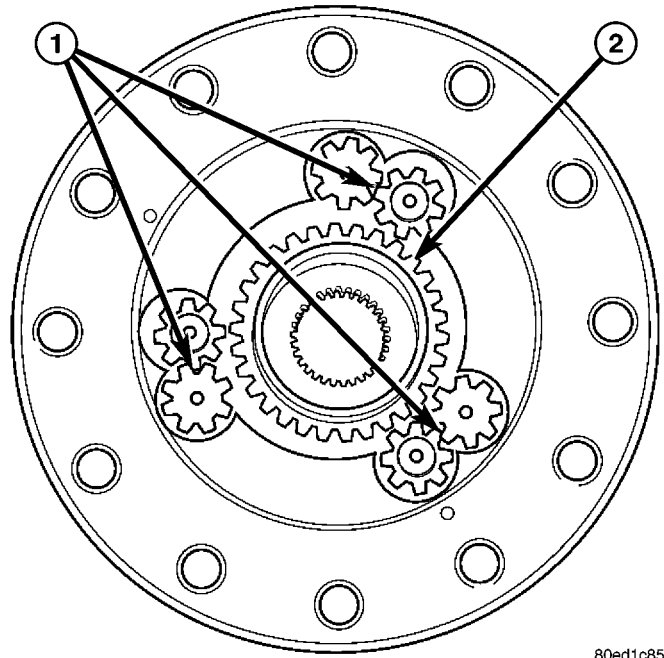


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Fig. 40 PINION BRAKE SHOES

- 1 - BRAKE SHOES
2 - PINION GEARS

(6) Remove six pinion gears (Fig. 41).



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Fig. 41 PINION GEARS

- 1 - PINION GEARS
2 - SIDE GEAR

(7) Remove remaining side gear thrust washer and spacer.

(8) Remove remaining three pinion brake shoes.

CLEANING

Clean the differential case and gears with light oil or a lint free cloth.

NOTE: Never use water, steam, kerosene or gasoline for cleaning.

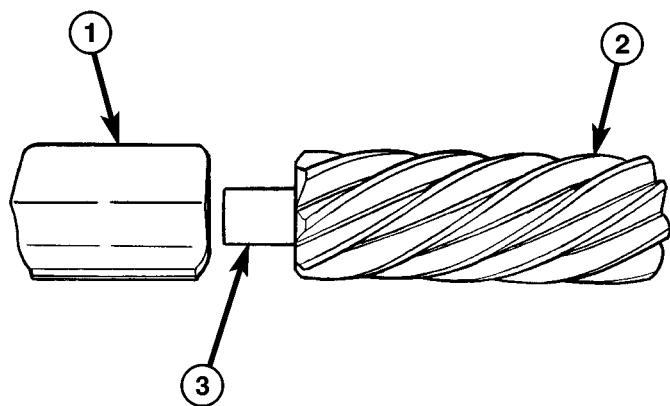
INSPECTION

NOTE: Minor corrosion, nicks or scratches can be smoothed with 400 grit emery cloth and polished out with crocus cloth.

- (1) Inspect pinion gears teeth for chips and cracks (Fig. 42).
- (2) Inspect pinion gears shafts and brake shoes for scratches, flat-spots or worn (Fig. 42).
- (3) Inspect side gears teeth for chips and cracks (Fig. 43).
- (4) Inspect pinion and side gear bores for scratches (Fig. 44).

NOTE: If any damage is found the differential must be replaced as an assembly. Individual components can not be replaced separately.

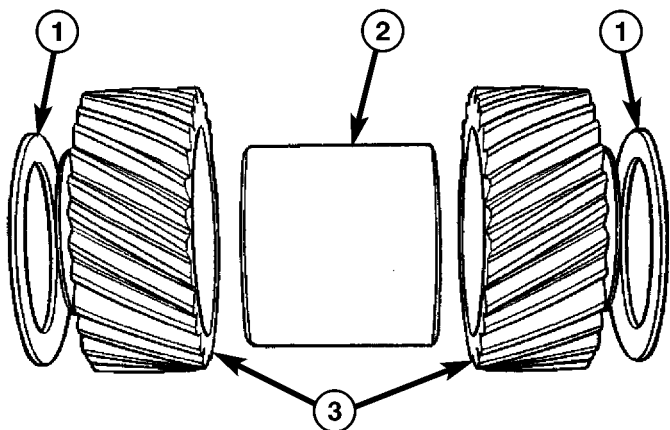
DIFFERENTIAL TRAC-RITE (Continued)



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Fig. 42 PINION GEAR AND BRAKE SHOE

- 1 - BRAKE SHOES
2 - PINION GEAR
3 - PINION SHAFT



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Fig. 43 SIDE GEARS

- 1 - THRUST WASHERS
2 - SPACER
3 - SIDE GEARS

ASSEMBLY

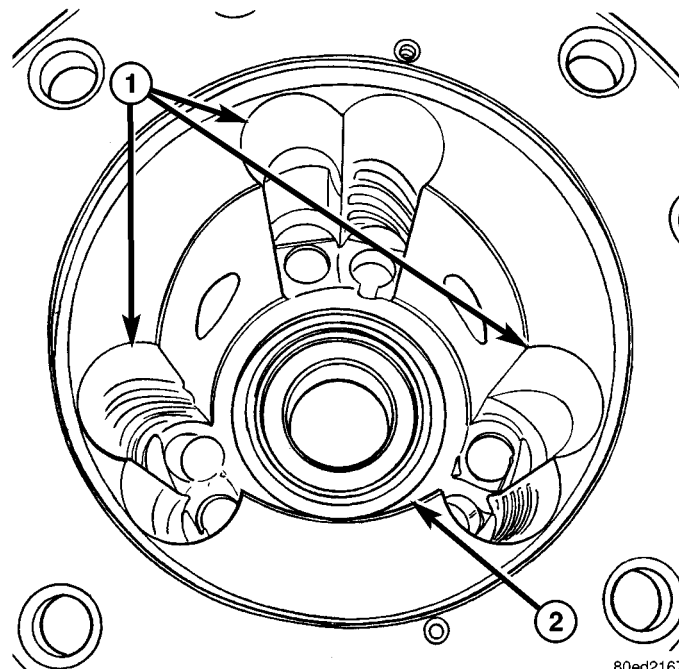
NOTE: Install all component in their original locations.

(1) Lubricate all gears and differential bores with differential lubricant.

(2) Install one set of pinion brake shoes into the case bores.

NOTE: Brake shoes can be installed upside down, but if install wrong pinion gear will not fit.

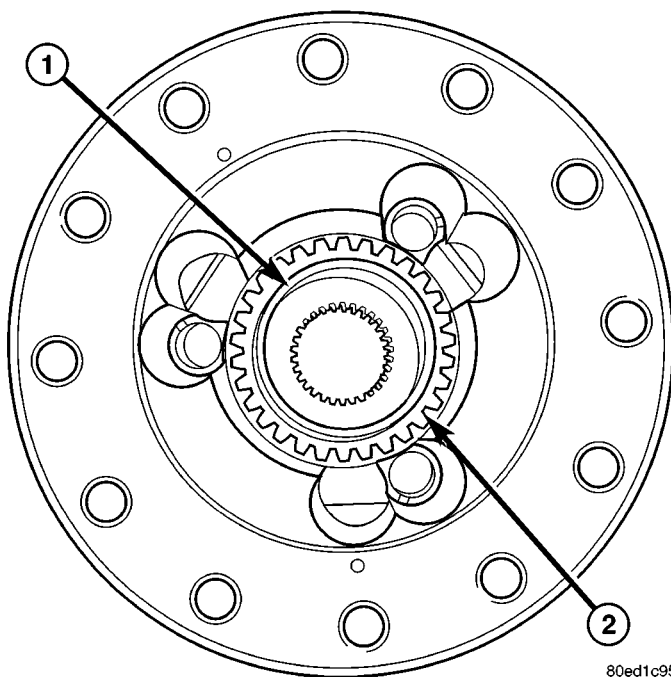
(3) Install side gear thrust washer, side gear and spacer (Fig. 45).



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Fig. 44 PINION/SIDE GEAR BORE

- 1 - PINION BORES
2 - SIDE GEAR BORE



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Fig. 45 SIDE GEAR AND SPACER

- 1 - SPACER
2 - SIDE SPACER

(4) Install one set of pinion gears into the bores next to the brake shoes, with the pinion shaft facing up.

(5) Install other side gear and thrust washer.

DIFFERENTIAL TRAC-RITE (Continued)

(6) Install other set of pinion gears into the brake shoes in the case.

(7) Install other set of brake shoes onto the pinion gears shafts (Fig. 46).

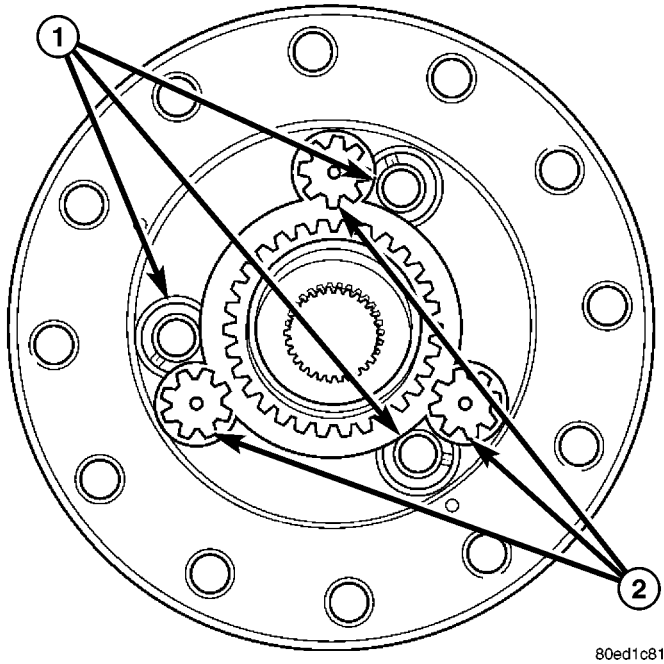


Fig. 46 PINION BRAKE SHOES

- 1 - BRAKE SHOES
- 2 - PINION GEARS

(8) Install differential cover and location screws.
 (9) Install **new** ring gear bolts and tighten to 237 N·m (175 ft. lbs.).

DIFFERENTIAL CASE BEARINGS

REMOVAL

- (1) Remove differential case from the housing.
- (2) Install Plug 8888 into the end of the case.
- (3) Remove differential case bearings with Bearing Splitter 1130 and Bridge 938 (Fig. 47).

INSTALLATION

- (1) Install differential case bearings with Installer 8956 and Handle C-4171 (Fig. 48).
- (2) Install differential case into housing.

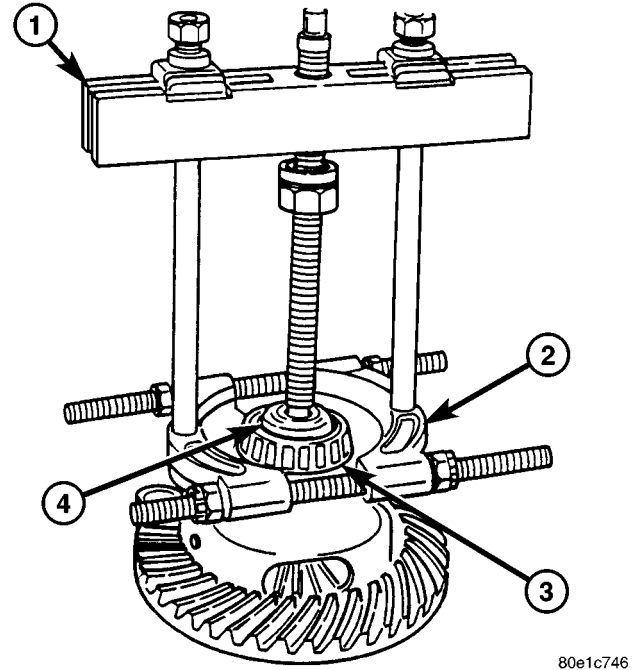


Fig. 47 DIFFERENTIAL CASE BEARING

- 1 - BRIDGE
- 2 - SPLITTER
- 3 - BEARING
- 4 - PLUG

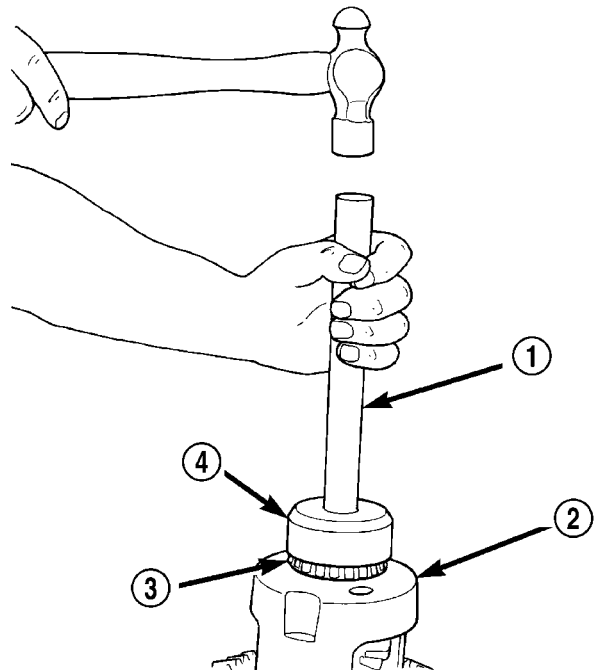


Fig. 48 DIFFERENTIAL CASE BEARINGS

- 1 - HANDLE
- 2 - DIFFERENTIAL CASE
- 3 - BEARING
- 4 - INSTALLER

PINION GEAR/RING GEAR/ TONE RING

REMOVAL

NOTE: The ring and pinion gears are service in a matched set. Never replace the ring gear/pinion gear without replacing the other matching gear.

(1) Mark pinion flange and propeller shaft for installation alignment.

(2) Disconnect propeller shaft from pinion flange and remove propeller shaft.

(3) Remove differential from axle housing.

(4) Place differential on Plug 8888 and drive exciter ring off the differential case with a hammer and punch (Fig. 49).

NOTE: Do not remove the exciter ring if it is not being replaced.

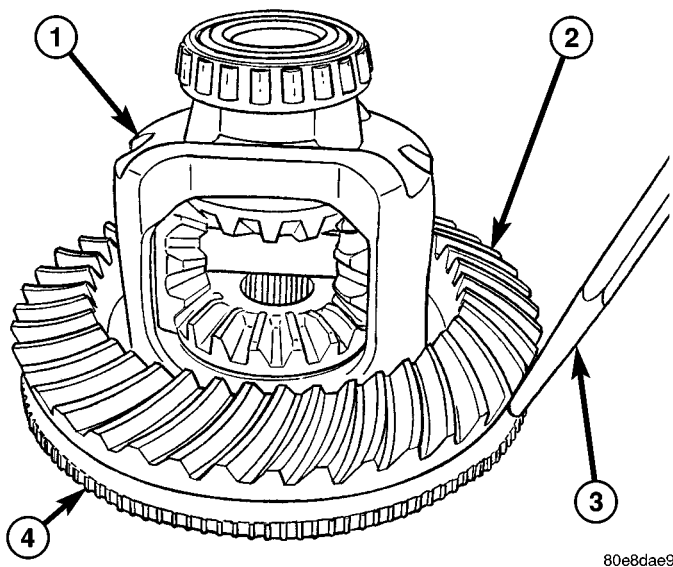


Fig. 49 EXCITER RING

- 1 - DIFFERENTIAL CASE
- 2 - RING GEAR
- 3 - PUNCH
- 4 - EXCITER RING

(5) Place differential case in a vise with soft metal jaw protectors

(6) Remove bolts holding ring gear to differential case.

(7) Drive ring gear from differential case with a soft hammer (Fig. 50).

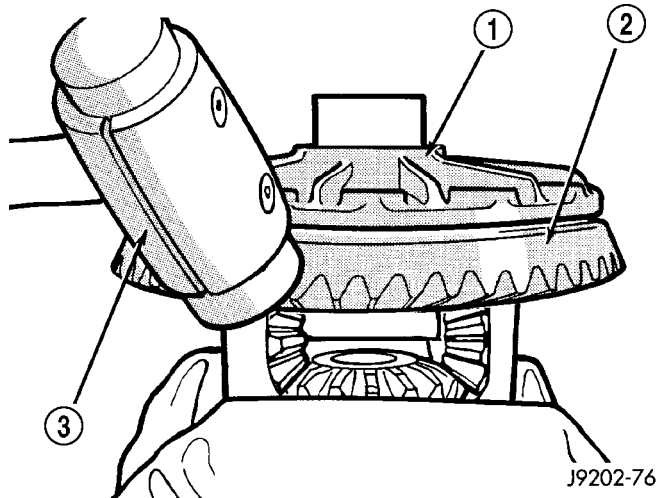


Fig. 50 RING GEAR

- 1 - DIFFERENTIAL CASE
- 2 - RING GEAR
- 3 - HAMMER

(8) Hold pinion flange with Flange Wrench 8979 (Fig. 51) and remove pinion flange nut and washer.

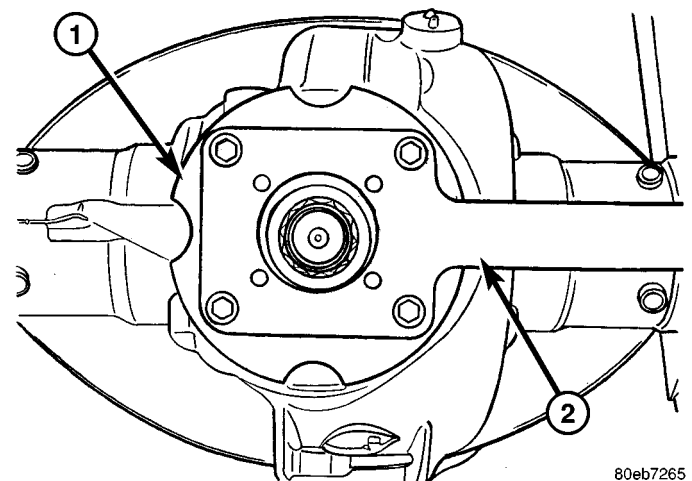


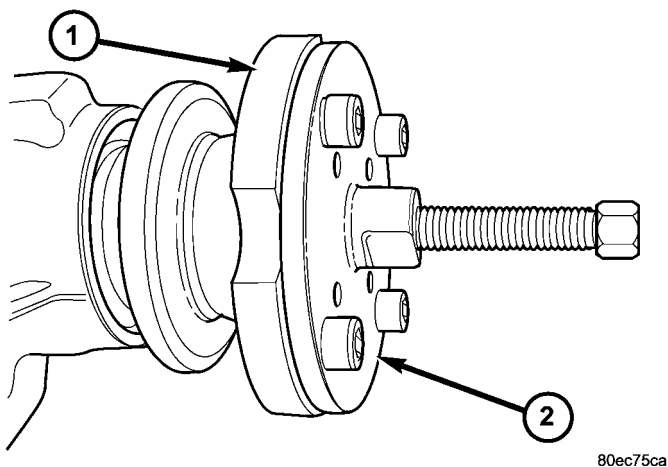
Fig. 51 FLANGE WRENCH

- 1 - PINION FLANGE
- 2 - FLANGE WRENCH

(9) Remove pinion flange from the pinion with Pinion Flange Puller 8992 (Fig. 52).

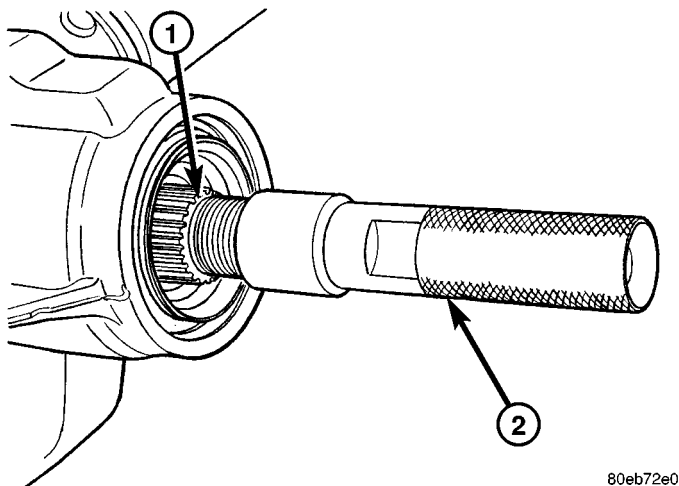
(10) Remove pinion gear from housing, with Pinion Driver 8977 (Fig. 53) and a hammer.

PINION GEAR/RING GEAR/TONE RING (Continued)

**Fig. 52 PINION FLANGE PULLER**

- 1 - PINION FLANGE
2 - PULLER

NOTE: Thread the driver on the pinion shaft till it bottoms out.

**Fig. 53 PINION DRIVER**

- 1 - PINION SHAFT
2 - PINION DRIVER

(11) Remove pinion seal with a slide hammer or pry bar.

(12) Remove and discard front pinion bearing.

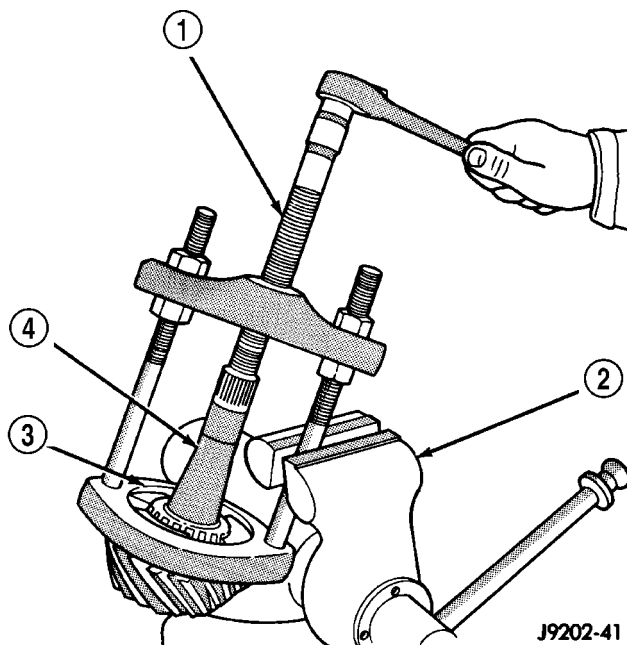
CAUTION: Do not reuse front pinion bearing/cup.

(13) Remove collapsible spacer from the pinion shaft.

(14) Remove rear pinion bearing with Puller C-293-PA and Adapter Blocks 8879 (Fig. 54).

(15) Remove pinion depth shim from the pinion gear shaft and record thickness of the shims.

(16) Remove front pinion bearing cup from the housing with a punch and hammer and discard cup.

**Fig. 54 REAR PINION BEARING**

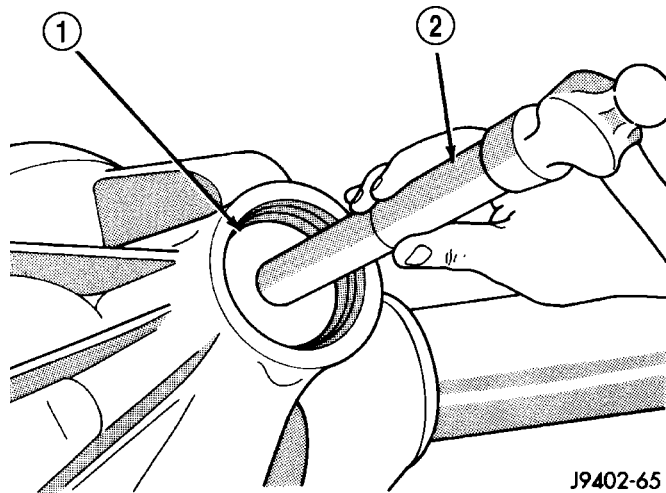
- 1 - PULLER
2 - VISE
3 - PINION SHAFT
4 - ADAPTER BLOCKS

CAUTION: Do not reuse front pinion bearing/cup.

(17) Remove rear pinion bearing cup from the housing with a punch and hammer, if bearing is going to be replaced.

INSTALLATION

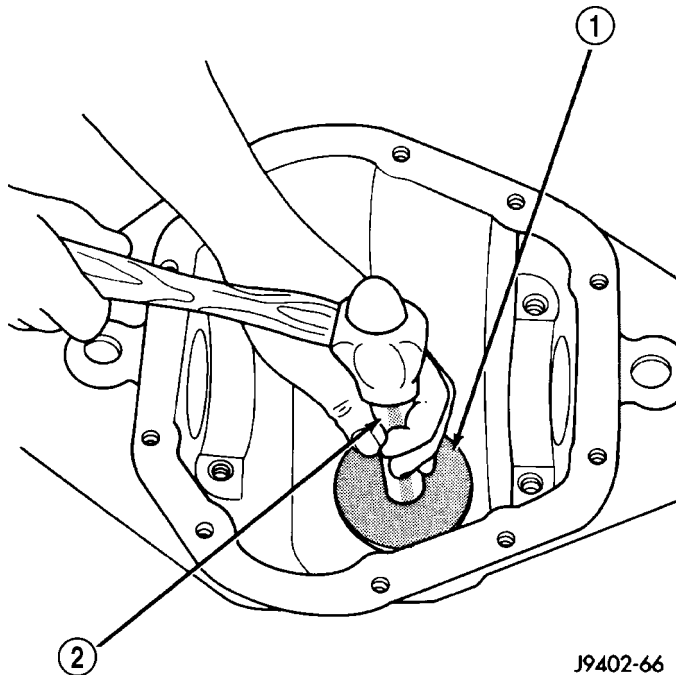
(1) Install new front pinion bearing cup (Fig. 55) with Installer 8960 and Handle C-4171.

**Fig. 55 FRONT PINION BEARING CUP**

- 1 - INSTALLER
2 - HANDLE

PINION GEAR/RING GEAR/TONE RING (Continued)

(2) Install new rear pinion bearing cup (Fig. 56) with Installer 8959 and Handle C-4171.

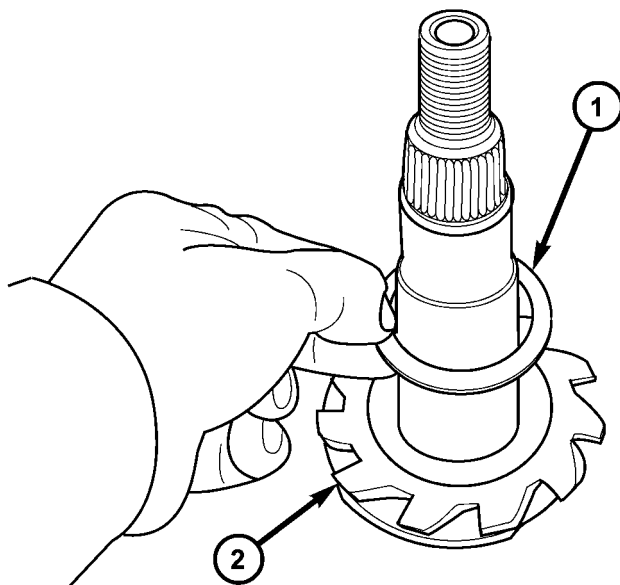


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Fig. 56 REAR PINION BEARING CUP

- 1 - INSTALLER
- 2 - HANDLE

(3) Install pinion depth shim (Fig. 57) on the pinion gear shaft.

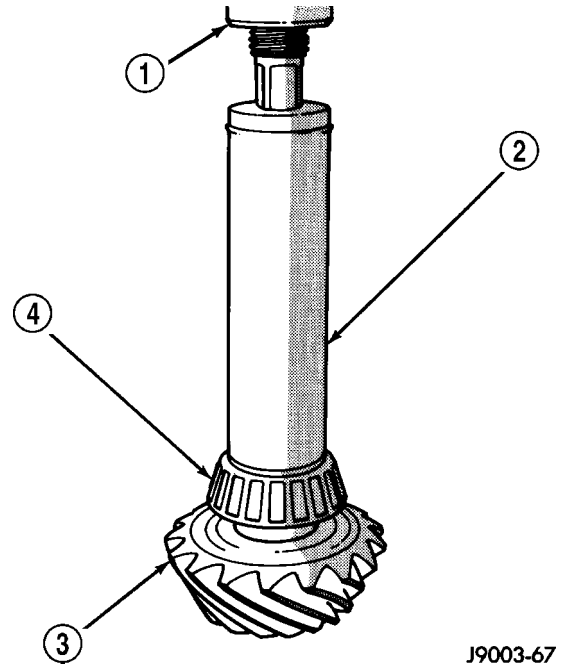


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Fig. 57 PINION DEPTH SHIM

- 1 - PINION DEPTH SHIM
- 2 - PINION GEAR

(4) Install rear pinion bearing (Fig. 58) with Installer MD-998805 and a press.

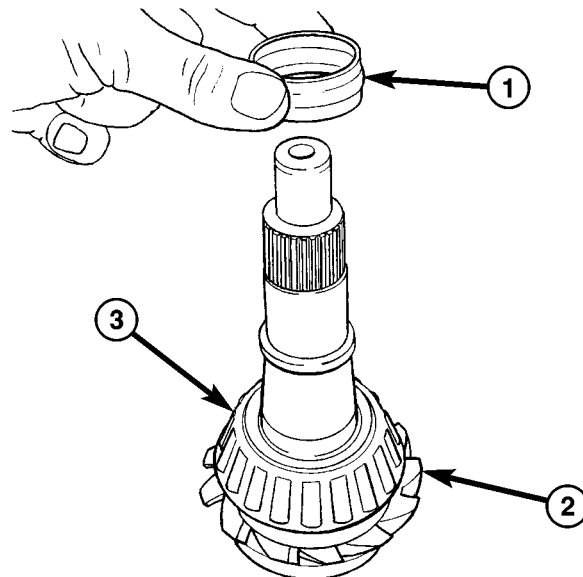


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Fig. 58 REAR PINION BEARING

- 1 - PRESS
- 2 - INSTALLER
- 3 - PINION GEAR
- 4 - REAR PINION BEARING

(5) Install **new** collapsible spacer (Fig. 59).



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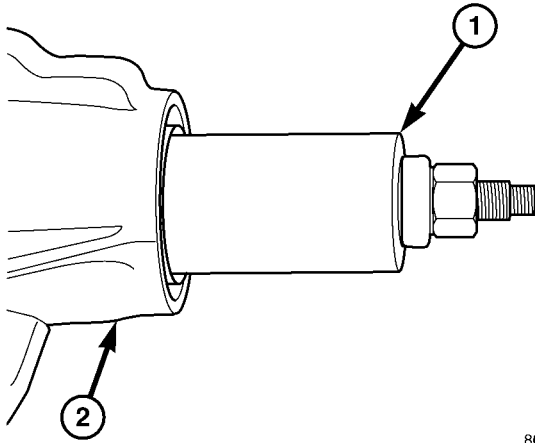
Fig. 59 COLLAPSIBLE SPACER

- 1 - COLLAPSIBLE SPACER
- 2 - PINION GEAR
- 3 - REAR PINION BEARING

(6) Lubricate pinion and bearings.

PINION GEAR/RING GEAR/TONE RING (Continued)

(7) Install pinion into the housing and place front pinion bearing onto the pinion shaft. Draw the pinion shaft into the front bearing with Installer 8981 (Fig. 60).

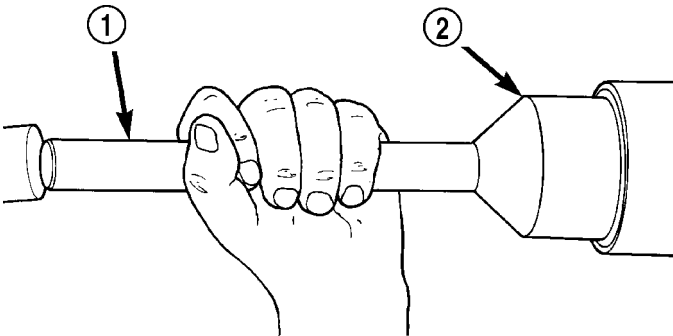


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Fig. 60 PINION GEAR INSTALLER

- 1 - INSTALLER
2 - DIFFERENTIAL HOUSING

(8) Install **new** pinion seal (Fig. 61) with Installer 8896 and Handle C-4171.



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Fig. 61 PINION SEAL INSTALLER

- 1 - HANDLE
2 - INSTALLER

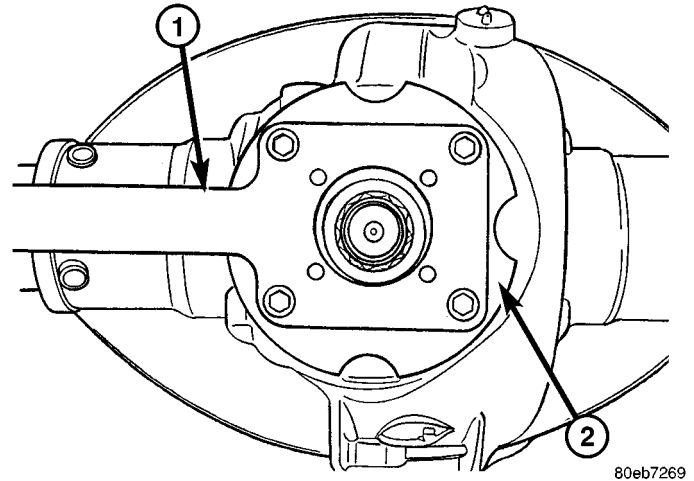
(9) Apply a light coat of teflon sealant to the pinion flange splines.

(10) Hold the pinion and lightly tap the pinion flange onto the pinion, until a few threads are showing.

(11) Install pinion flange washer and **new** pinion nut.

(12) Hold pinion flange with Flange Wrench 8979 (Fig. 62) and tighten pinion nut until pinion end play is taken up.

(13) Rotate pinion several times to seat bearings.



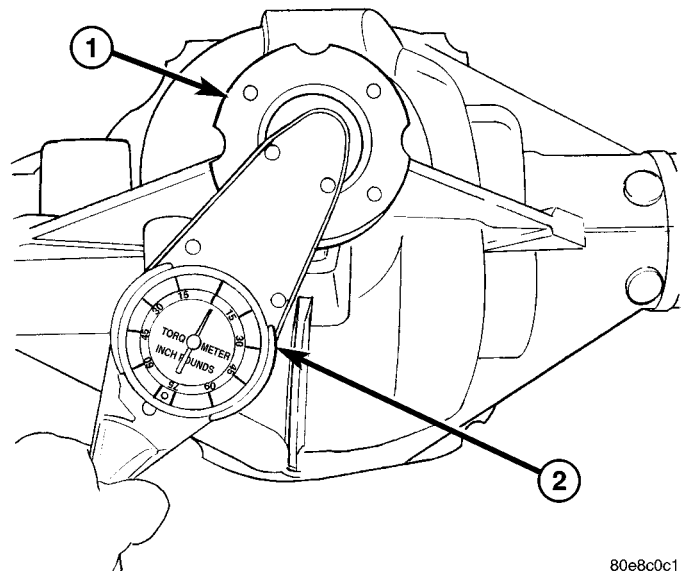
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Fig. 62 FLANGE WRENCH

- 1 - FLANGE WRENCH
2 - PINION FLANGE

(14) Measure pinion rotating torque with an inch pound torque wrench (Fig. 63). Tighten pinion nut in small increments until pinion rotating torque is:

- **New Pinion Bearings:** 1.7-2.8 N·m (15-25 in. lbs.)
- **Original Pinion Bearings:** 1.1-2.2 N·m (10-20 in. lbs.)



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Fig. 63 PINION ROTATING TORQUE

- 1 - PINION FLANGE
2 - TORQUE WRENCH

(15) Rotate pinion several times then verify pinion rotating torque again.

(16) Position the ring gear on differential case and start two **new** ring gear bolts.

(17) Install the rest of the **new** ring gear bolts and tighten them alternately to seat the ring gear.

PINION GEAR/RING GEAR/TONE RING (Continued)

(18) Torque ring gear bolts to 237 N·m (175 ft. lbs.).

(19) If exciter ring was removed, position differential assembly on differential Plug 8888 (Fig. 64) and place exciter ring on the differential case.

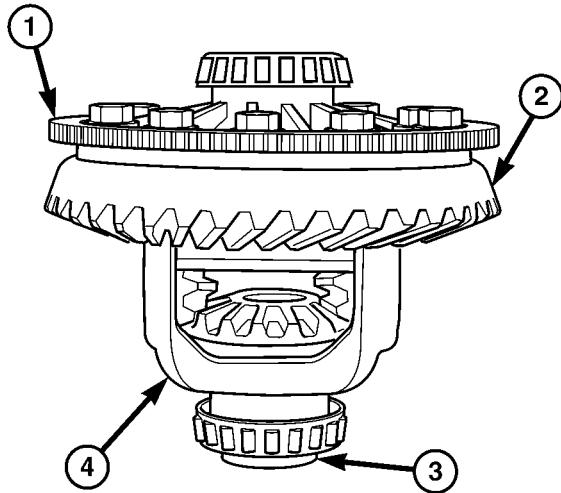


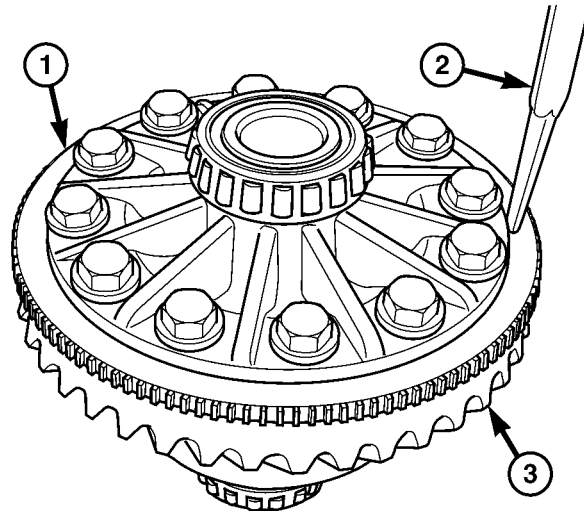
Fig. 64 EXCITER RING

- 1 - EXCITER RING
- 2 - RING GEAR
- 3 - DIFFERENTIAL PLUG
- 4 - DIFFERENTIAL CASE

(20) Install the exciter ring on the differential case evenly with a hammer and brass punch (Fig. 65). Drive the ring down until it is seated against the ring gear.

CAUTION: Do not damage exciter ring teeth during installation.

(21) Install differential into the housing.



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Fig. 65 EXCITER RING INSTALLATION

- 1 - EXCITER RING
- 2 - PUNSH
- 3 - RING GEAR

(22) Verify ring gear backlash and gear contact pattern.

(23) Measure final rotating torque with an inch pound torque wrench. The final pinion rotating torque plus differential case bearing preload is:

- **New Bearings:** 3.4-5.6 N·m (30-50 in. lbs.)
- **Original Bearings:** 2.8-5.1 N·m (25-45 in. lbs.)

(24) Install axle shafts.

(25) Install the propeller shaft with the reference marks aligned.

(26) Install differential cover with gasket and tighten bolts to 40 N·m (30 ft. lbs.).

(27) Fill differential with fluid and tighten fill plug to 32 N·m (24 ft. lbs.).

REAR AXLE - 11 1/2 AA

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REAR AXLE - 11 1/2 AA

DESCRIPTION

The axle consists of a cast iron center casting differential housing with axle shaft tubes extending from each side. The tubes are pressed into the differential housing and welded. The design has the centerline of the pinion set below the centerline of the ring gear. The axle is a full floating axle where the loads are supported by the axle housing tubes. The axle has a vent used to relieve internal pressure caused by lubricant vaporization and internal expansion.

OPERATION

The axle receives power from the propeller shaft. The propeller shaft is connected to the pinion gear which rotates the differential through the gear mesh with the ring gear bolted to the differential case. The engine power is transmitted to the axle shafts through the pinion mate and side gears. The side gears are splined to the axle shafts.

DIAGNOSIS AND TESTING

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, incorrect pinion depth, tooth contact, worn/damaged gears, or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant.
- Incorrect ring gear backlash.
- Gear damage.

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion shaft can also cause a snapping or a knocking noise.

REAR AXLE - 11 1/2 AA (Continued)

BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

Pinion bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

Worn or damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

Axle shaft bearings produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

VIBRATION

Vibration at the rear of the vehicle is usually caused by a:

- Damaged drive shaft.
- Missing drive shaft balance weight(s).

- Worn or out-of-balance wheels.
- Loose wheel lug nuts.
- Worn U-joint(s).
- Loose/broken springs.
- Damaged axle shaft bearing(s).
- Loose pinion gear nut.
- Excessive pinion yoke run out.
- Bent axle shaft(s).

Check for loose or damaged front-end components or engine/transmission mounts. These components can contribute to what appears to be a rearend vibration. Do not overlook engine accessories, brackets and drive belts.

NOTE: All driveline components should be examined before starting any repair.

DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged), can be caused by:

- High engine idle speed.
- Transmission shift operation.
- Loose engine/transmission/transfer case mounts.
- Worn U-joints.
- Loose spring mounts.
- Loose pinion gear nut and yoke.
- Excessive ring gear backlash.
- Excessive side gear to case clearance.

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube. 2. Bent or sprung axle shaft.	1. Inspect axle tube alignment. Correct as necessary. 2. Inspect and correct as necessary.

REAR AXLE - 11 1/2 AA (Continued)

Condition	Possible Causes	Correction
Axle Shaft Broke	1. Misaligned axle tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	1. Replace the broken shaft after correcting tube mis-alignment. 2. Replace broken shaft and avoid excessive weight on vehicle. 3. Replace broken shaft and avoid or correct erratic clutch operation. 4. Replace broken shaft and inspect and repair clutch as necessary.
Differential Cracked	1. Improper adjustment of the differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly. 2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly. 3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight. 4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.
Differential Gears Scored	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	1. Replace scored gears. Fill differential with the correct fluid type and quantity. 2. Replace scored gears. Fill differential with the correct fluid type and quantity. 3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.
Loss Of Lubricant	1. Lubricant level too high. 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn pinion seal. 5. Worn/scored yoke. 6. Axle cover not properly sealed.	1. Drain lubricant to the correct level. 2. Replace seals. 3. Repair as necessary. 4. Replace seal. 5. Replace yoke and seal. 6. Remove, clean, and re-seal cover.
Axle Overheating	1. Lubricant level low. 2. Improper grade of lubricant. 3. Bearing pre-loads too high. 4. Insufficient ring gear backlash.	1. Fill differential to correct level. 2. Fill differential with the correct fluid type and quantity. 3. Re-adjust bearing pre-loads. 4. Re-adjust ring gear backlash.

REAR AXLE - 11 1/2 AA (Continued)

Condition	Possible Causes	Correction
Gear Teeth Broke	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavement. 4. Improper adjustments.	1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation. 3. Replace gears and examine remaining parts for damage. 4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	1. Insufficient lubricant. 2. Improper ring gear and pinion adjustment. 3. Unmatched ring gear and pinion. 4. Worn teeth on ring gear and/or pinion. 5. Loose pinion bearings. 6. Loose differential bearings. 7. Mis-aligned or sprung ring gear. 8. Loose differential bearing cap bolts. 9. Housing not machined properly.	1. Fill differential with the correct fluid type and quantity. 2. Check ring gear and pinion contact pattern. Adjust backlash or pinion depth. 3. Replace gears with a matched ring gear and pinion. 4. Replace ring gear and pinion. 5. Adjust pinion bearing pre-load. 6. Adjust differential bearing pre-load. 7. Measure ring gear run-out. Replace components as necessary. 8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued to the proper specification. 9. Replace housing.

REMOVAL

- (1) Raise and support the vehicle.
- (2) Position a lifting device under the axle.
- (3) Secure axle to device.
- (4) Remove wheels and tires assemblies.
- (5) Remove RWAL sensor from the differential housing.
- (6) Remove brake hose at the axle junction block and axle vent hose.
- (7) Disconnect parking brake cables and cable brackets.
- (8) Remove brake calipers.
- (9) Mark propeller shaft and companion flange for installation alignment reference.
- (10) Remove propeller shaft.
- (11) Remove shock absorbers from axle.
- (12) Remove U-bolts from axle.
- (13) Separate the axle from the vehicle.

INSTALLATION

- (1) Raise axle with lifting device and align to the leaf spring centering bolts.
- (2) Install axle U-bolts and tighten to 149 N·m (110 ft. lbs.).
- (3) Install shock absorbers to axle and tighten to specification.
- (4) Install the RWAL sensor to the differential housing.
- (5) Connect the parking brake cables and cable brackets.
- (6) Connect brake hose to the axle junction block and axle vent hose.
- (7) Align propeller shaft and pinion companion flange reference marks and tighten companion flange bolts to 115 N·m (85 ft. lbs.).
- (8) Install the wheels and tires.
- (9) Fill differential to specifications.

REAR AXLE - 11 1/2 AA (Continued)

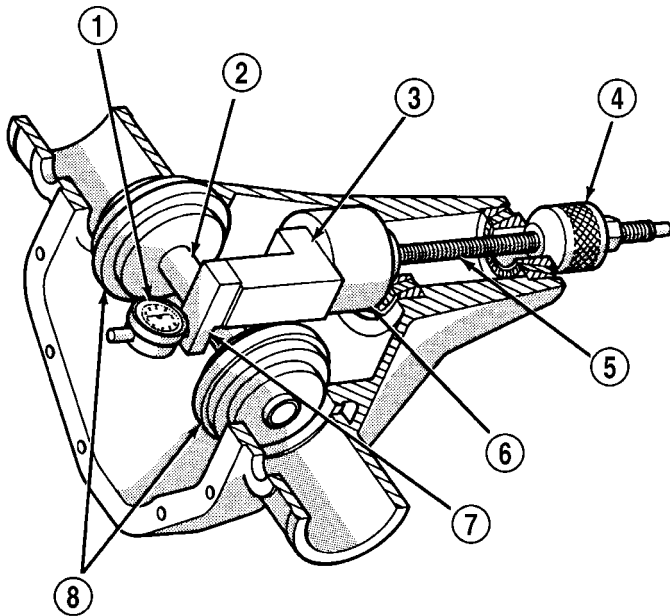
(10) Remove lifting device from axle and lower the vehicle.

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. Compensation for pinion depth variance is achieved with a select shim. The shim is located between the rear pinion bearing and the pinion gear head.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 1).



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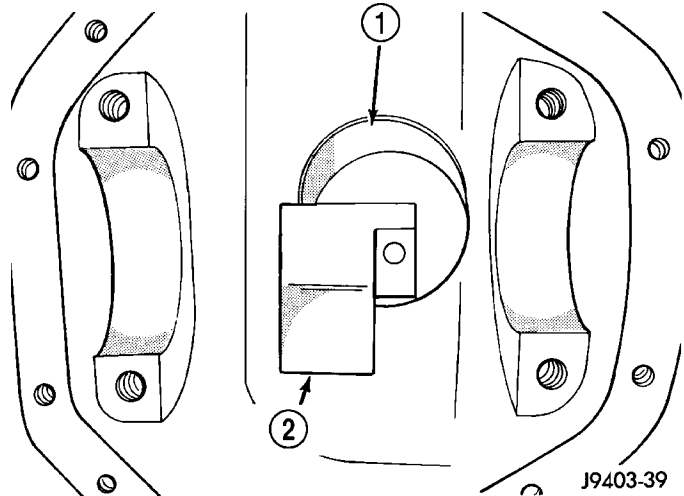
Fig. 1 PINION GEAR DEPTH GAUGE TOOLS

- 1 - DIAL INDICATOR
- 2 - ARBOR
- 3 - PINION HEIGHT BLOCK
- 4 - CONE
- 5 - SCREW
- 6 - PINION BLOCK
- 7 - SCOOTER BLOCK
- 8 - ARBOR DISC

(1) Assemble Pinion Height Block 6739, Pinion Block 8897 and rear pinion bearing onto Screw 6741 (Fig. 1).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through pinion bearing cups (Fig. 2).

(3) Install front pinion bearing and install the Cone-nut 6740 hand tight. Then check tool rotating torque with an inch pound torque wrench. The rotating torque should be 1.7-2.26 N·m (15-20 in. lbs.). (Fig. 1).

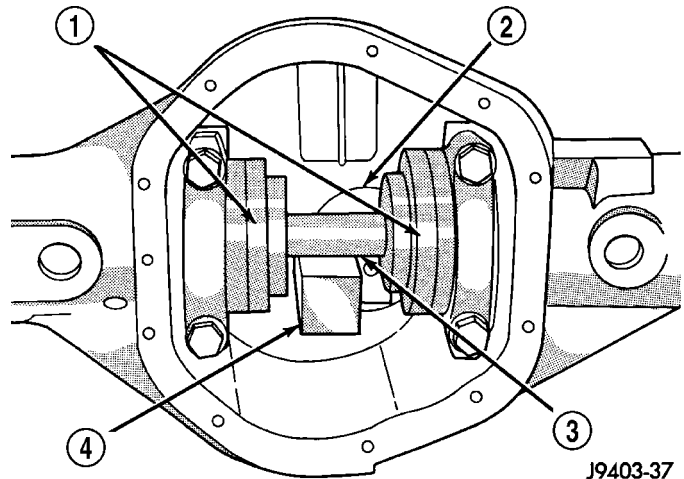
**Fig. 2 PINION HEIGHT BLOCK**

- 1 - PINION BLOCK
- 2 - PINION HEIGHT BLOCK

(4) Place Arbor Discs 8289 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 3).

(5) Install differential bearing caps on arbor discs and snug the bearing cap bolts. Then cross tighten cap bolts to 281 N·m (207 ft. lbs.).

NOTE: Arbor should rotate freely in the arbor discs.

**Fig. 3 GAUGE TOOLS IN HOUSING**

- 1 - ARBOR DISC
- 2 - PINION BLOCK
- 3 - ARBOR
- 4 - PINION HEIGHT BLOCK

(6) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

(7) Position Scooter Block/Dial Indicator flush on the pinion height block. Hold scooter block and zero the dial indicator.

REAR AXLE - 11 1/2 AA (Continued)

(8) Slowly slide the scooter block across the pinion height block over to the arbor (Fig. 4). Move the scooter block till dial indicator crests the arbor, then record the highest reading.

(9) Select a shim equal to the dial indicator reading.

(10) Install the select shim between the rear pinion bearing and the pinion gear head.

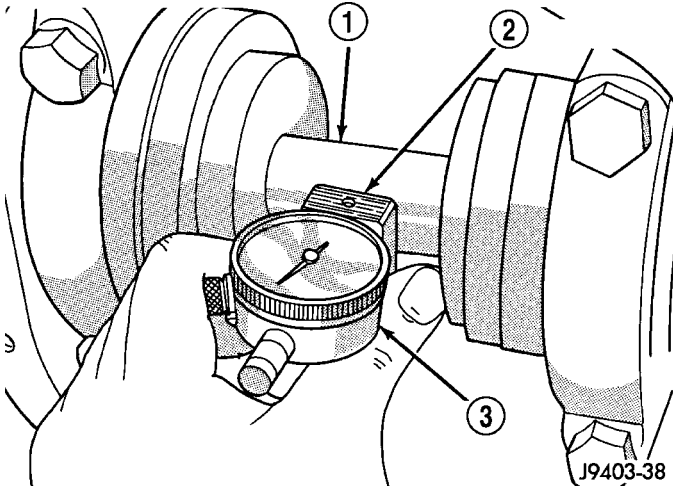


Fig. 4 PINION GEAR DEPTH MEASUREMENT

- 1 - ARBOR
- 2 - SCOOTER BLOCK
- 3 - DIAL INDICATOR

DIFFERENTIAL CASE BEARING PRELOAD AND GEAR BACKLASH

Backlash is adjusted by moving the adjusters in and out or both. By moving the adjusters the case/ring gear will move closer or further away from the pinion. In most cases this adjustment can be used to achieve the correct gear tooth pattern and set the case bearing preload.

(1) Remove adjuster lock bolts and adjuster locks (Fig. 5).

(2) Loosen the differential bearing caps.

(3) Slide differential case toward the pinion gear until the gears make contact/zero backlash. If zero backlash cannot be obtained, turn the pinion side adjuster until zero backlash is obtained.

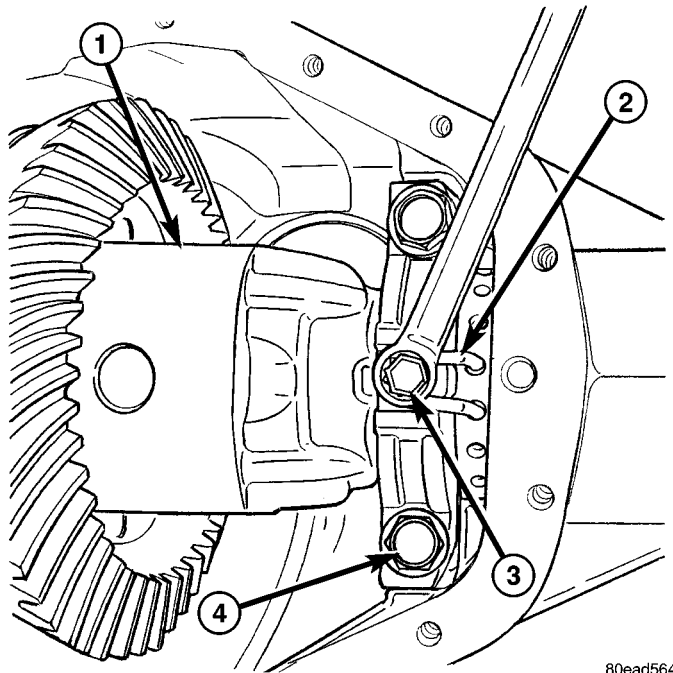
(4) Holding the differential case toward the pinion gear, turn bearing adjusters with Spanner Wrench 8883 (Fig. 6) until they make contact with the differential bearings/cups.

(5) Back off the ring gear side adjuster 4 holes, to obtain initial ring gear backlash.

(6) Install ring gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(7) Tighten pinion gear side adjuster firmly against the differential case bearing cup.

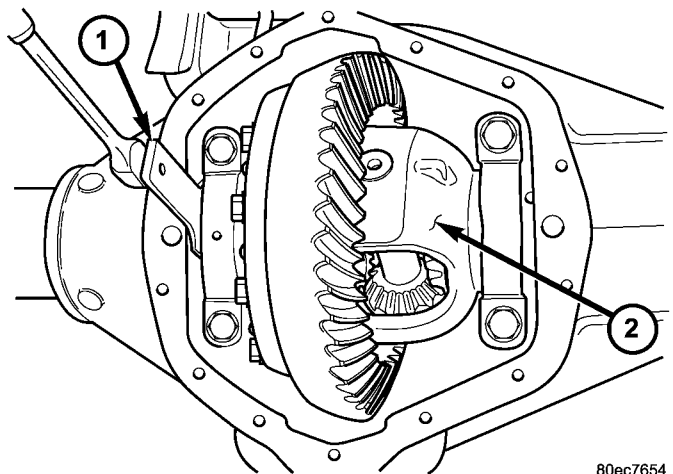
(8) Rotate the pinion several times to seat the differential bearings.



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Fig. 5 ADJUSTER LOCK BOLT

- 1 - DIFFERENTIAL CASE
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER LOCK BOLT
- 4 - BEARING CAP BOLT



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Fig. 6 ADJUSTER SPANNER WRENCH

- 1 - WRENCH
- 2 - DIFFERENTIAL

(9) Loosen pinion gear side adjuster until it is no longer in contact with the bearing cup, then tighten it until it makes contact.

(10) Tighten pinion gear side adjuster an additional:

- **New Bearings:** 6 Adjuster Holes
- **Original Bearings:** 4 Adjuster Holes

(11) Install pinion gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

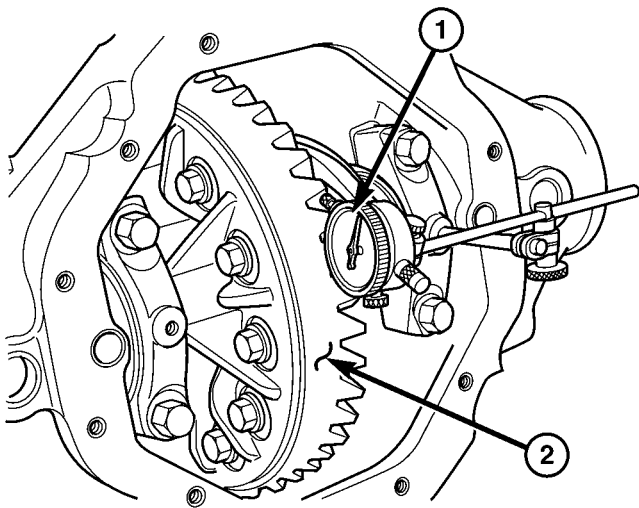
REAR AXLE - 11 1/2 AA (Continued)

(12) Tighten bearing cap bolts to 115 N·m (85 ft. lbs.).

(13) Tighten adjuster lock bolts to 33 N·m (24 ft. lbs.).

(14) Measure ring gear backlash with a Dial Indicator C-3339 and Dial Indicator Stud L-4438 at eight points around the drive side of the ring gear (Fig. 7). The backlash should be 0.08-0.25 mm (0.003-0.010 in) with a preferred backlash of 0.13-0.18 mm (0.005-0.007 in).

NOTE: Backlash measurement should not vary more than 0.05 mm (0.002 in) between measuring points. If measurement does vary inspect the gears for burrs, the differential case flange and ring gear mounting.



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Fig. 7 RING GEAR BACKLASH

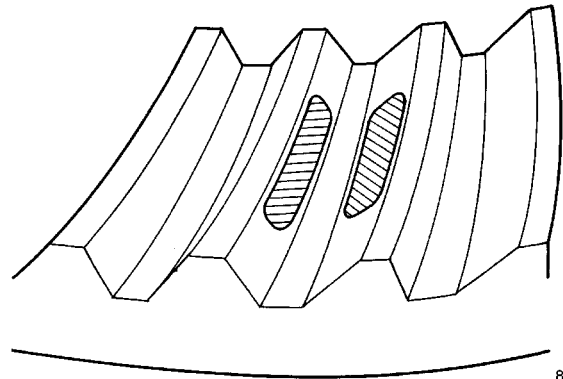
- 1 - DIAL INDICATOR
2 - RING GEAR

GEAR TOOTH CONTACT PATTERN

Gear tooth contact pattern is used to verify the correct running position of the ring and pinion gears. This will produce low noise and long gear life. Gears which are not positioned properly may be noisy and have shorten gear life.

- (1) Wipe clean each tooth of the ring gear.
- (2) Apply gear marking compound to all of the ring gear teeth.
- (3) Verify bearing cap bolts are torque specification.
- (4) Apply parking brakes lightly to create at 14 N·m (10 ft. lbs.) pinion rotating torque.
- (5) Rotate the pinion/pinion yoke 4 full revolutions in each directions.
- (6) Read gear tooth contact pattern:

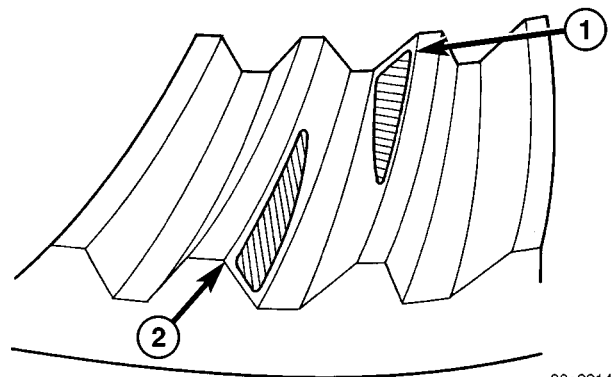
- Gear contact pattern correct (Fig. 8). Backlash and pinion depth is correct.



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Fig. 8 CORRECT CONTACT PATTERN

- Ring gear too far away from pinion gear (Fig. 9). Decrease backlash, by moving the ring closer to the pinion gear using the adjusters.

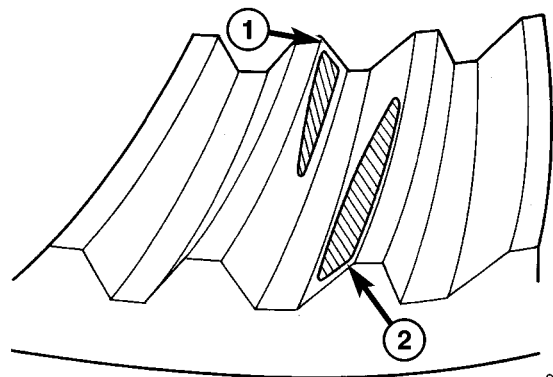


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Fig. 9 INCORRECT BACKLASH

- 1 - COAST SIDE TOE
2 - DRIVE SIDE HEEL

- Ring gear too close to pinion gear (Fig. 10). Increase backlash, by moving the ring away from the pinion gear using the adjusters.



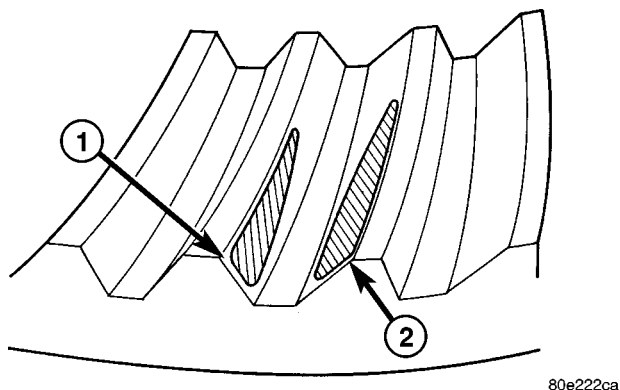
80e222bd

Fig. 10 INCORRECT BACKLASH

- 1 - DRIVE SIDE TOE
2 - COAST SIDE HEEL

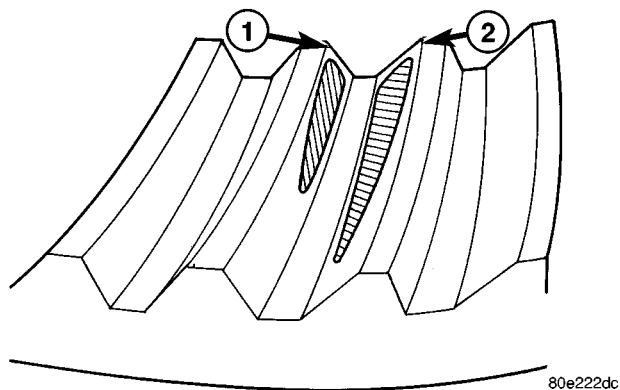
REAR AXLE - 11 1/2 AA (Continued)

- Ring gear too far away from pinion gear (Fig. 11). Decrease backlash, by moving the ring closer to the pinion gear using the adjusters.

**Fig. 11 INCORRECT BACKLASH**

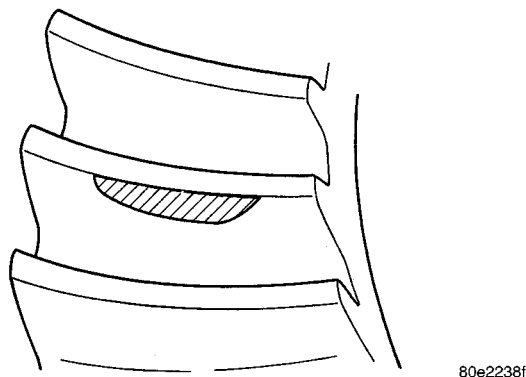
- 1 - DRIVE SIDE HEEL
2 - COAST SIDE HEEL

- Ring gear too close to pinion gear (Fig. 12). Increase backlash, by moving the ring away from the pinion gear using the adjusters.

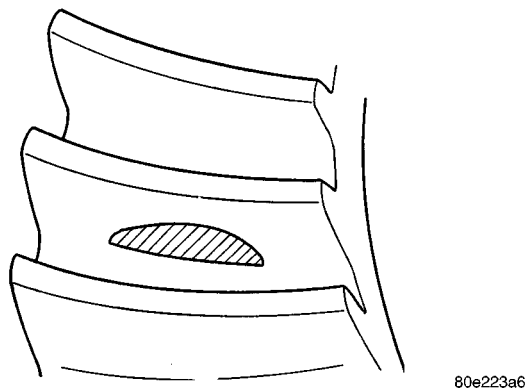
**Fig. 12 INCORRECT BACKLASH**

- 1 - DRIVE SIDE TOE
2 - COAST SIDE TOE

- Pinion gear is set too low (Fig. 13). Increase pinion gear height, by increasing the pinion depth shim thickness.

**Fig. 13 LOW PINION HEIGHT**

- Pinion gear is set too high (Fig. 14). Decrease pinion depth, by decreasing the pinion depth shim thickness.

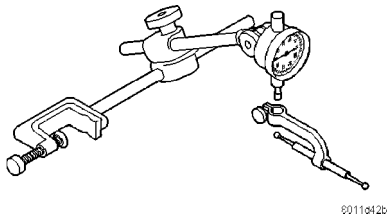
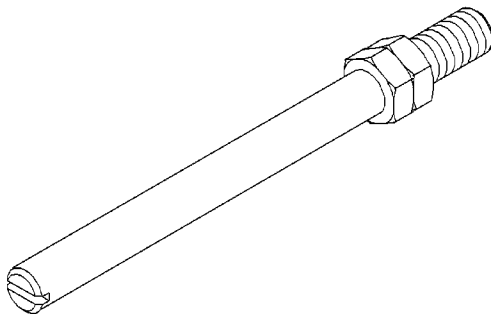
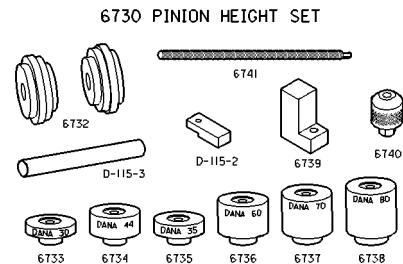
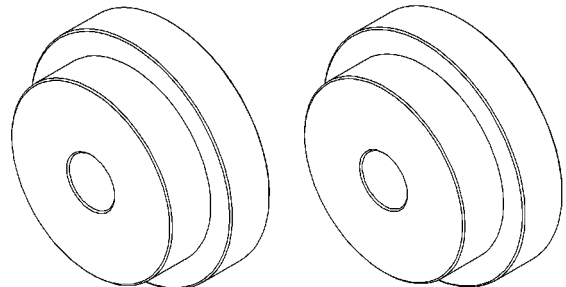
**Fig. 14 HIGH PINION HEIGHT**

REAR AXLE - 11 1/2 AA (Continued)
SPECIFICATIONS
AXLE SPECIFICATIONS

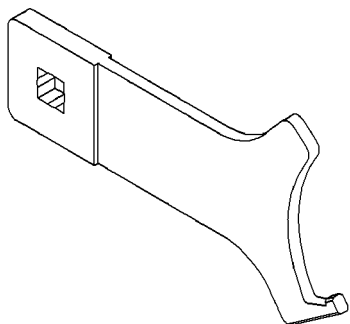
DESCRIPTION	SPECIFICATION
Axle Ratio	3.73, 4.10
Ring Gear Diameter	292 mm (11.5 in.)
Ring Gear Backlash	0.13-0.18 mm (0.005-0.007 in.)
Pinion Bearing Preload - New Bearings	1.69-2.82 N·m (15-25 in. lbs.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload + Differential Case Bearing Preload - New Bearing	3.4-5.6 N·m (30-50 in. lbs.)
Pinion Bearing Preload + Differential Case Bearing Preload - Original Bearing	2.8-5.1 N·m (25-45 in. lbs.)

TORQUE SPECIFICATIONS

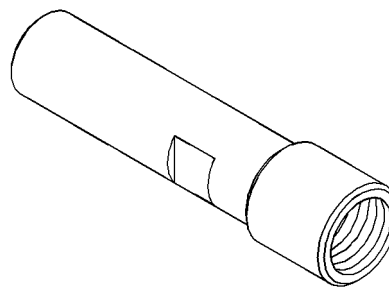
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Fill Hole Plug	32	24	-
Differential Cover Bolts	40	30	-
Bearing Cap Bolts	281	207	-
Ring Gear Bolts	237	175	-
Axle Flange Bolts	129	95	-
Adjuster Lock Bolt	25	18	-

SPECIAL TOOLS

DIAL INDICATOR SET C-3339

DIAL INDICATOR STUD L-4438

PINION DEPTH GAUGE 6730

ARBOR DISCS 8289

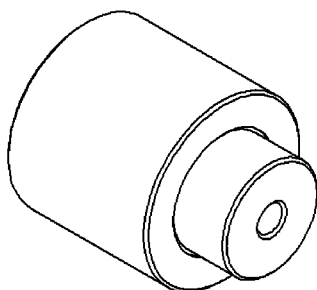
REAR AXLE - 11 1/2 AA (Continued)



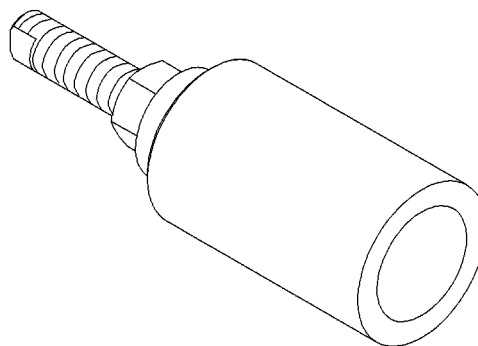
ADJUSTER WRENCH 8883



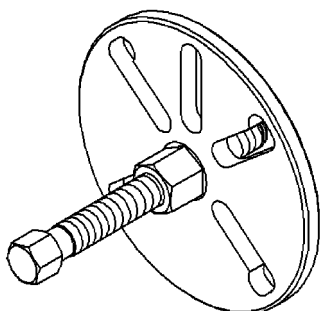
PINION DRIVER 8977



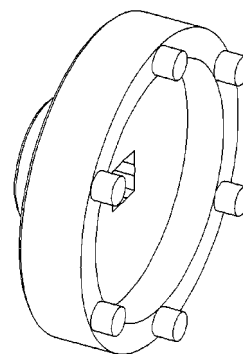
PINION BLOCK 8897



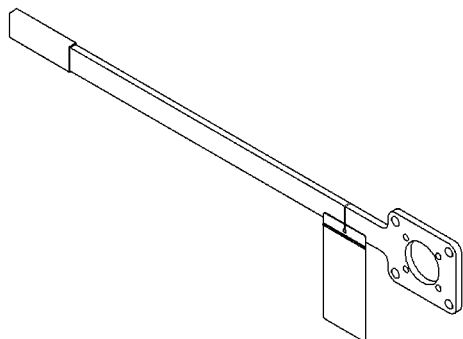
PINION INSTALLER 8981



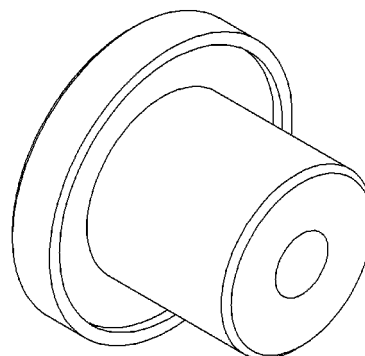
FLANGE PULLER 8992



SOCKET 8954

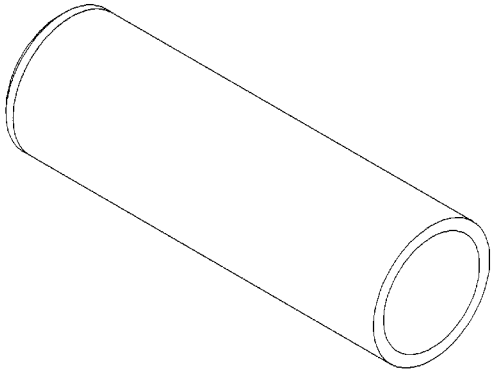


FLANGE WRENCH 8979

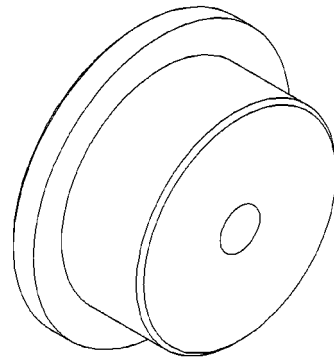


BEARING INSTALLER 8965

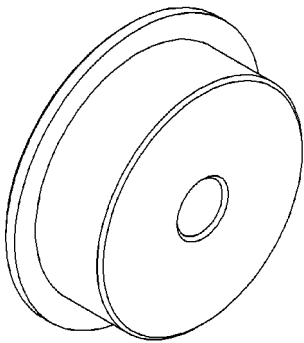
REAR AXLE - 11 1/2 AA (Continued)



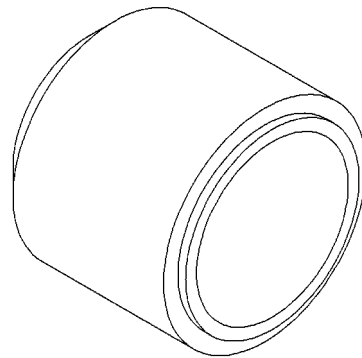
BEARING INSTALLER D-389



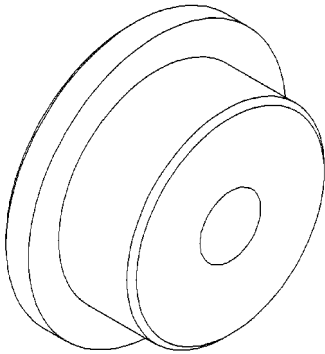
CUP INSTALLER 8968



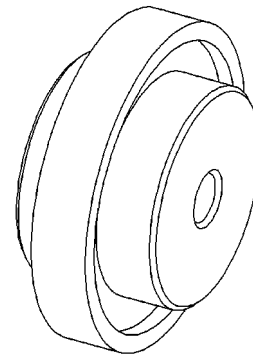
CUP INSTALLER 8153



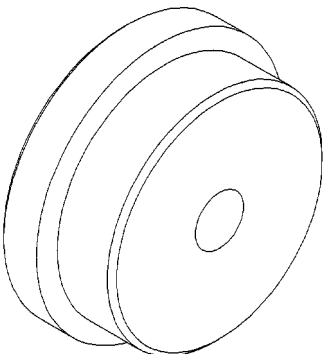
SEAL INSTALLER 8896



CUP INSTALLER 8960

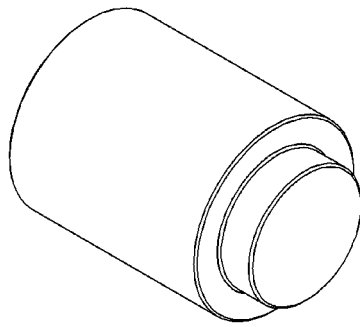
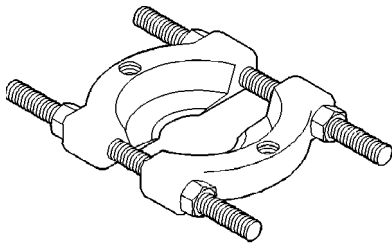


SEAL INSTALLER 8963

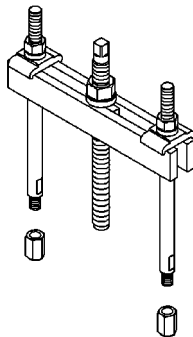
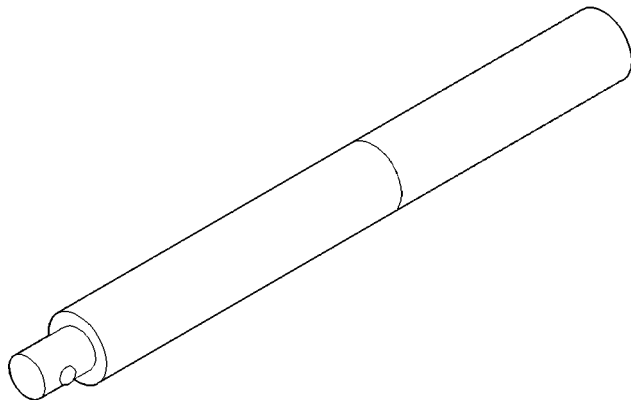


CUP INSTALLER 8961

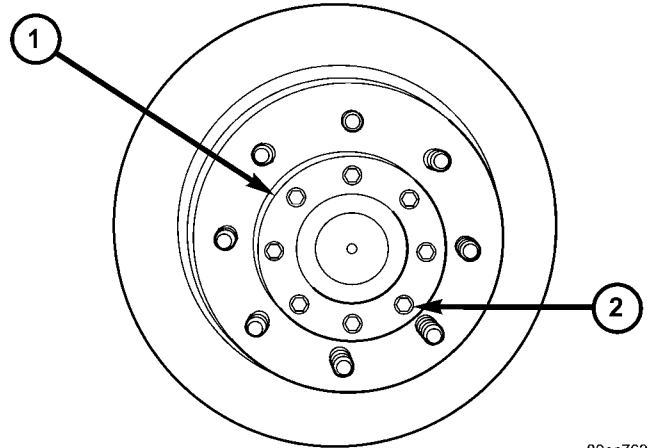
REAR AXLE - 11 1/2 AA (Continued)

**PLUG 8964**

1130-00109ec2

SPLITTER 1130**BRIDGE 938****HANDLE C-4171****AXLE SHAFTS****REMOVAL**

- (1) Remove axle shaft flange bolts (Fig. 15).



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Fig. 15 AXLE FLANGE BOLTS

- 1 - AXLE FLANGE
- 2 - FLANGE BOLT

- (2) Slide axle shaft out of the axle tube.
- (3) Remove axle shaft gasket.

INSTALLATION

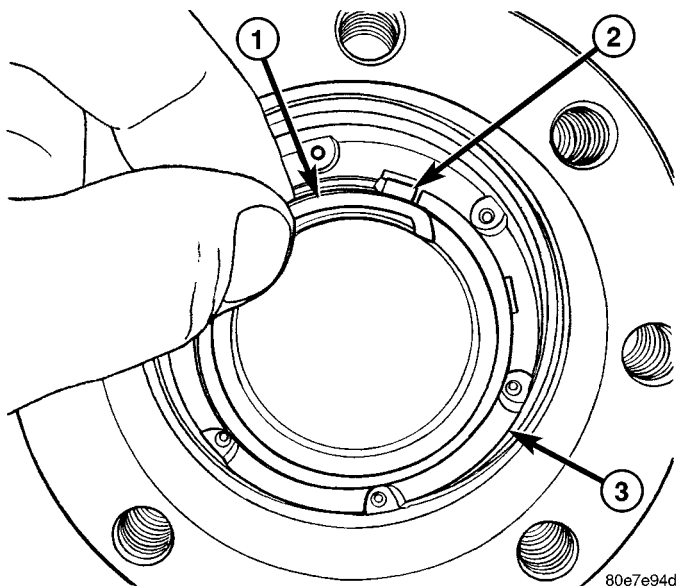
NOTE: Axle flange bolts must be replaced or use Mopar Lock N' Seal or Loctite® 242 on cleaned existing bolts.

- (1) Clean axle flange and hub.
- (2) Install new axle shaft gasket.
- (3) Slide axle shaft into the axle tube.
- (4) Install axle shaft flange bolts and tighten to 129 N·m (95 ft. lbs.).

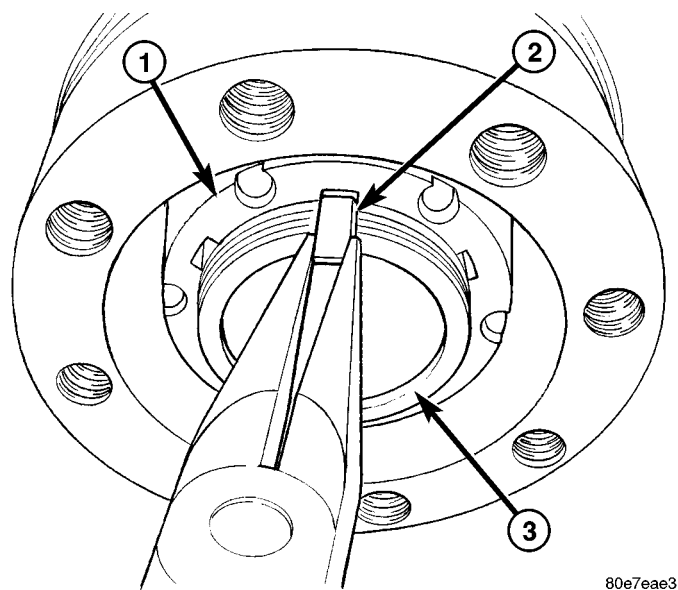
AXLE BEARINGS**REMOVAL**

- (1) Remove axle shaft flange bolts and remove shaft.
- (2) Remove retainer ring (Fig. 16) from the axle shaft tube.
- (3) Remove hub bearing nut locking key (Fig. 17).
- (4) Remove hub bearing nut with Socket 8954.
- (5) Remove hub and bearings from the axle.
- (6) Pry out hub bearing seal from the back of the hub.

AXLE BEARINGS (Continued)

**Fig. 16 RETAINER RING**

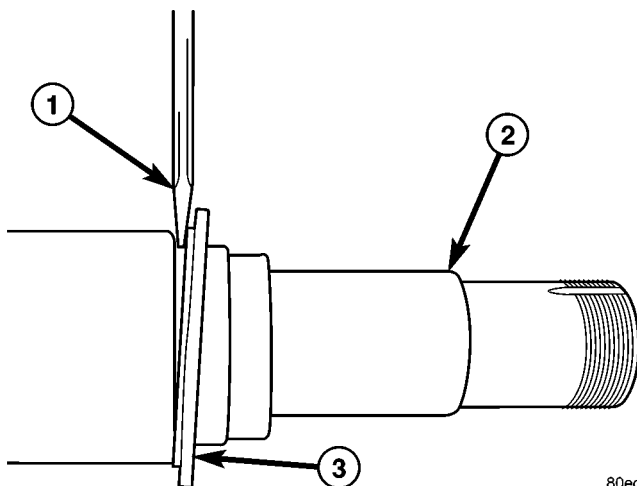
- 1 - RETAINER RING
- 2 - LOCKING KEY
- 3 - BEARING NUT

**Fig. 17 LOCKING KEY**

- 1 - BEARING NUT
- 2 - LOCKING KEY
- 3 - AXLE TUBE

NOTE: The inner part of the seal may stay on the axle tube (Fig. 18). This part must also be removed.

- (7) Remove rear bearing.
- (8) Remove hub bearing cups with a hammer and drift.



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Fig. 18 INNER PART OF SEAL

- 1 - PRY BAR
- 2 - AXLE TUBE
- 3 - REMAINING SEAL

INSTALLATION

(1) Install outer hub bearing cup with Installer 8961 and Handle C-4171.

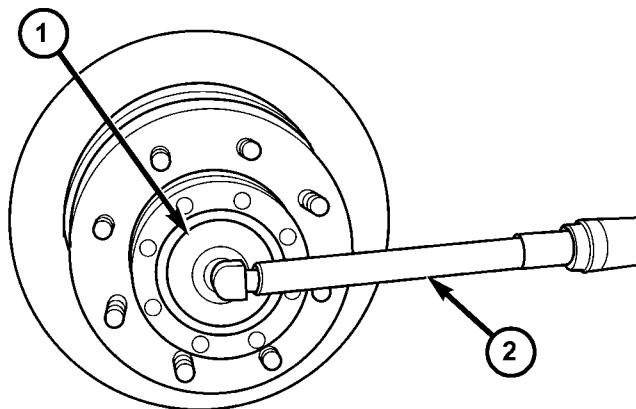
(2) Install inner hub bearing cup with Installer 8153 and Handle C-4171.

(3) Pack bearings with the appropriate wheel bearing grease.

(4) Install rear bearing and install **new** grease seal with Installer 8963 and Handle C-4171.

(5) Slide hub on the axle tube and install front bearing into the hub.

(6) Install hub bearing nut with Socket 8954 and tighten to 30 N·m (22 ft. lbs.) while rotating the hub (Fig. 19).



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Fig. 19 HUB NUT SOCKET

- 1 - SOCKET
- 2 - TORQUE WRENCH

AXLE BEARINGS (Continued)

(7) Back off nut about 30° and align next hub nut key slot with axle tube key slot and install locking key.

NOTE: End play should be 0.025-0.25 mm (0.01-0.001 in.)

(8) Install retainer ring with ring end in the key slot.

(9) Install new axle shaft gasket and install the axle shaft.

PINION SEAL

REMOVAL

- (1) Remove axle shafts.
- (2) Mark the propeller shaft and pinion flange for installation reference.
- (3) Remove propeller shaft.
- (4) Rotate pinion gear three or four times.
- (5) Measure and record the amount of torque necessary to rotate the pinion gear with an inch pound torque wrench (Fig. 20).

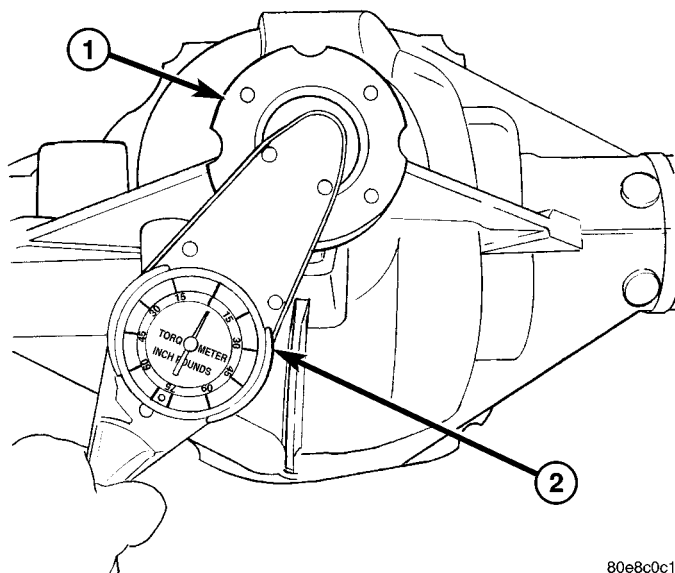


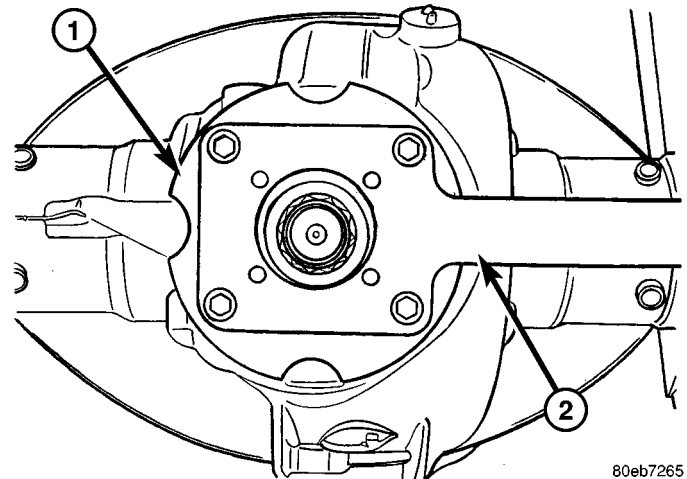
Fig. 20 PINION ROTATING TORQUE

- 1 - PINION FLANGE
2 - TORQUE WRENCH

(6) Hold pinion flange with Flange Wrench 8979 (Fig. 21) and remove pinion flange nut.

(7) Remove pinion flange with Pinion Flange Puller 8992 (Fig. 22).

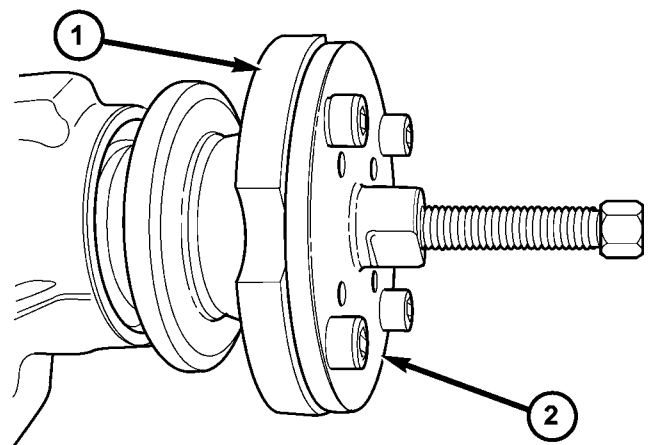
(8) Remove pinion shaft seal with a pry tool or slide hammer mounted screw.



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Fig. 21 FLANGE WRENCH

- 1 - PINION FLANGE
2 - FLANGE WRENCH



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Fig. 22 PINION FLANGE PULLER

- 1 - PINION FLANGE
2 - PULLER

INSTALLATION

(1) Install **new** pinion seal with Installer 8896 (Fig. 23).

(2) Apply a light coat of teflon sealant to the pinion flange splines.

(3) Lightly tap the pinion flange onto the pinion until a few threads are showing.

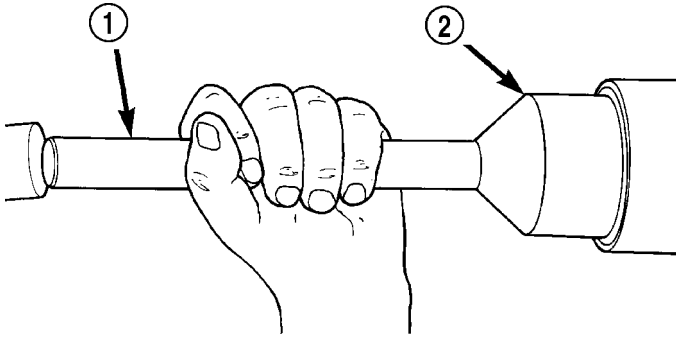
(4) Install flange washer and **new** pinion nut.

(5) Hold pinion flange with Flange Wrench 8979 (Fig. 24) and tighten pinion nut until pinion end play is taken up.

(6) Rotate pinion several times to seat bearings.

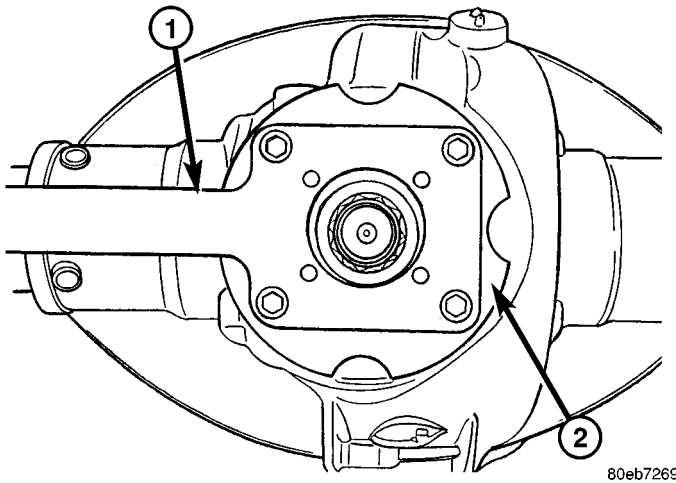
(7) Measure pinion rotating torque with an inch pound torque wrench and compare it to recorded measurement. Tighten pinion nut in small incre-

PINION SEAL (Continued)

**Fig. 23 PINION SEAL INSTALLER**

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- 1 - HANDLE
2 - INSTALLER

**Fig. 24 FLANGE WRENCH**

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- 1 - FLANGE WRENCH
2 - PINION FLANGE

ments, until pinion rotating torque is 0.40-0.57 N·m (3-5 in. lbs.) greater than recorded measurement.

(8) Rotate pinion several times then verify pinion rotating torque again.

(9) Install axle shafts.

(10) Install propeller shaft with reference marks aligned.

(11) Check differential fluid level.

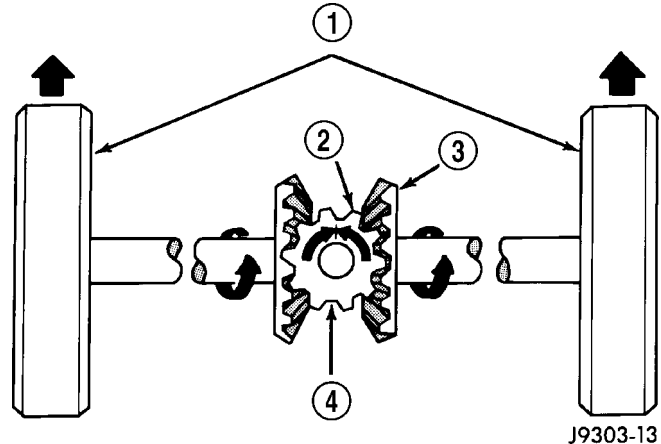
DIFFERENTIAL

DESCRIPTION

The differential case is a one-piece design. The differential pinion shaft is retained with a snap ring. Differential bearing preload and ring gear backlash is adjusted by the use of adjusters. The adjuster are between the differential bearings and the differential housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer. The stamped steel cover provides a means for inspection and servicing the differential.

OPERATION

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 25).

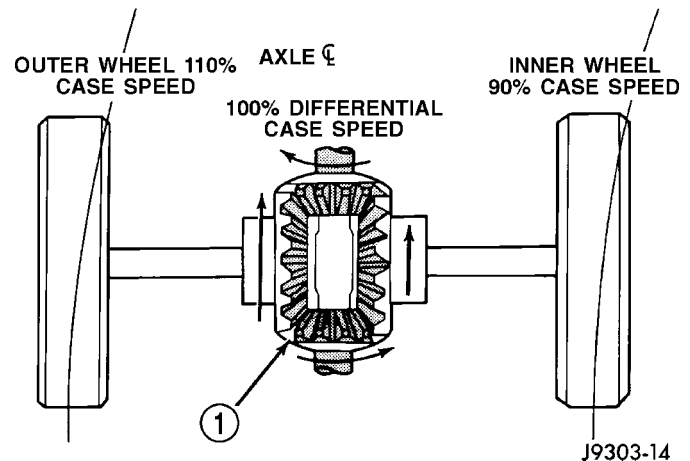


J9303-13

Fig. 25 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

- 1 - IN STRAIGHT AHEAD DRIVING EACH WHEEL ROTATES AT 100% OF CASE SPEED
2 - PINION GEAR
3 - SIDE GEAR
4 - PINION GEARS ROTATE WITH CASE

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 26). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.



J9303-14

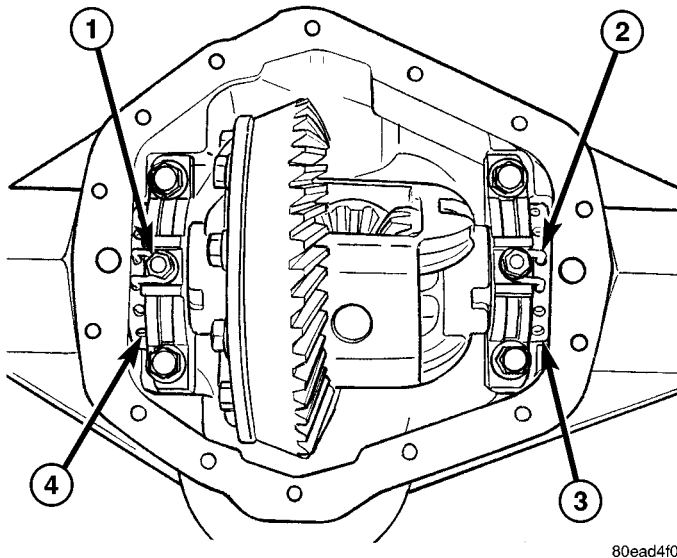
Fig. 26 DIFFERENTIAL-ON TURNS

- 1 - PINION GEARS ROTATE ON PINION SHAFT

DIFFERENTIAL (Continued)

REMOVAL

- (1) Remove fill hole plug from the differential housing cover.
- (2) Remove differential housing cover and drain the lubricant.
- (3) Remove axle shafts.
- (4) Remove adjuster lock bolts and adjuster locks (Fig. 27).

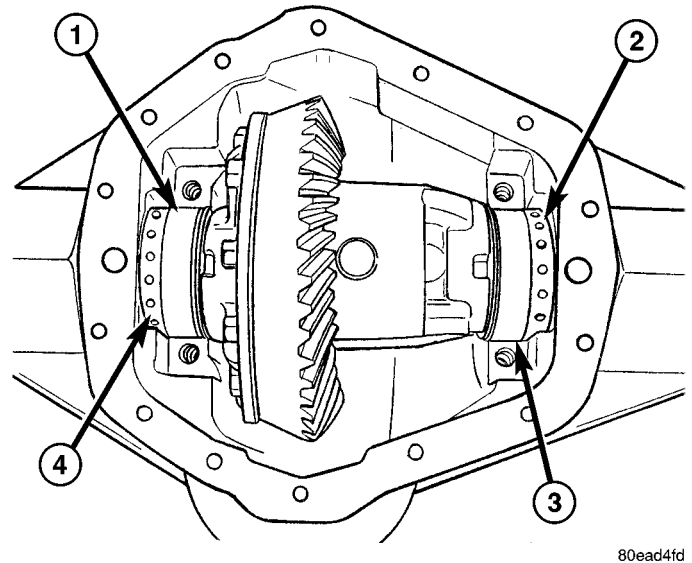
**Fig. 27 ADJUSTER LOCKS**

- 1 - LOCK BOLT
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER
- 4 - BEARING CAP

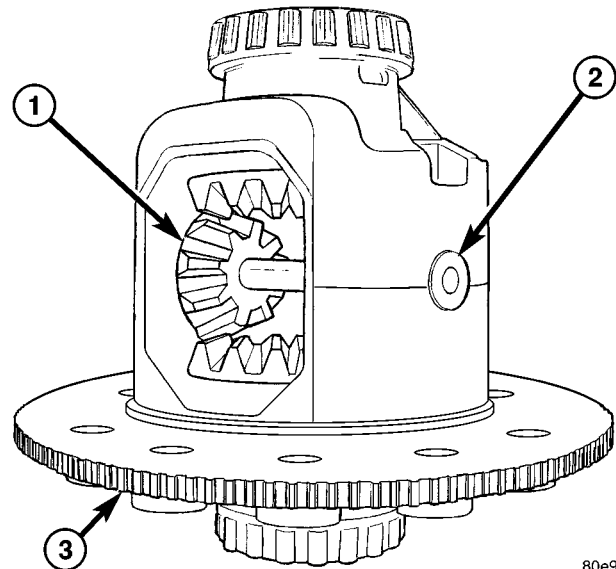
- (5) Mark bearing caps left and right for installation reference.
- (6) Remove bearing cap bolts and remove bearing caps.
- (7) Loosen differential bearing adjusters (Fig. 28) with Spanner Wrench 8883.
- (8) Remove differential case from the housing.
- (9) Remove bearing cups and tag them left and right for installation reference.

DISASSEMBLY

- (1) Remove ring gear.
- (2) Remove pinion shaft with a hammer and punch from the side with the hole in the pinion shaft (Fig. 29).
- (3) Rotate one pinion gear with thrust washer (Fig. 30) to the differential window and remove the gear.

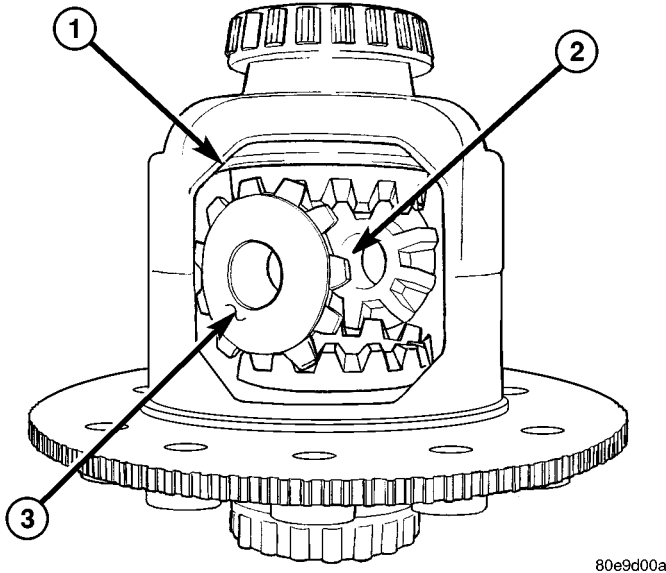
**Fig. 28 ADJUSTERS**

- 1 - BEARING CUP
- 2 - ADJUSTER
- 3 - BEARING CUP
- 4 - ADJUSTER

**Fig. 29 PINION SHAFT**

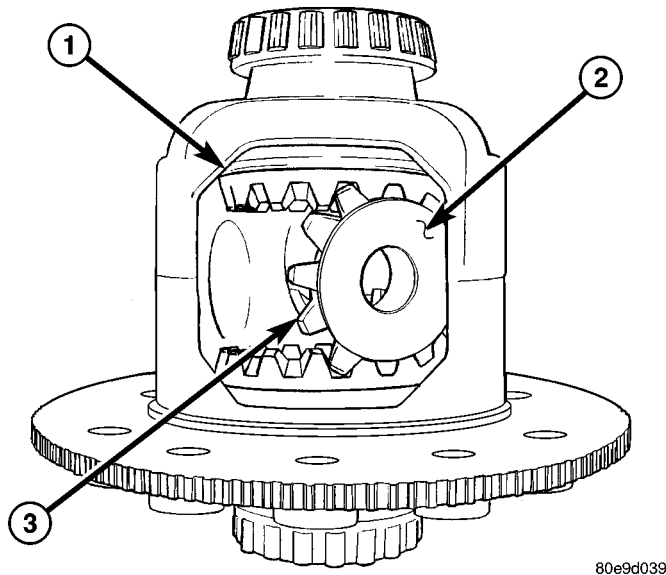
- 1 - PINION GEAR
- 2 - PINION SHAFT
- 3 - EXCITER RING

DIFFERENTIAL (Continued)

**Fig. 30 FIRST PINION GEAR**

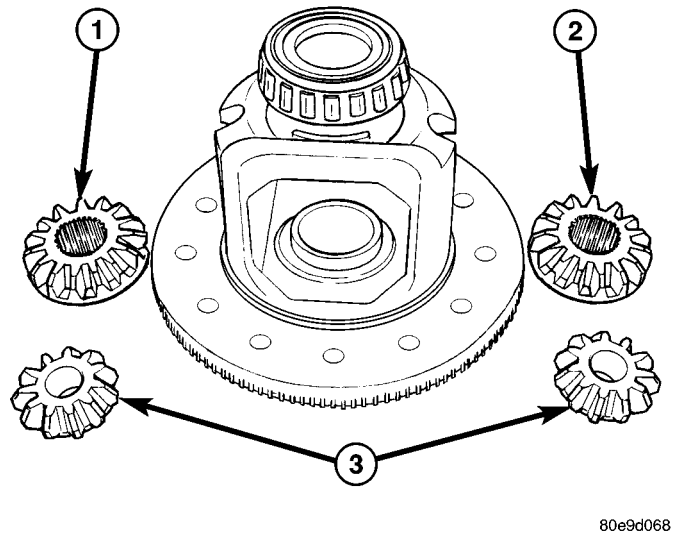
- 1 - DIFFERENTIAL WINDOW
2 - PINION GEAR
3 - THRUST WASHER

(4) Rotate the other pinion gear with thrust washer (Fig. 31) to the differential window and remove the gear.

**Fig. 31 SECOND PINION GEAR**

- 1 - DIFFERENTIAL WINDOW
2 - THRUST WASHER
3 - PINION GEAR

(5) Remove differential side gears and thrust washers (Fig. 32).

**Fig. 32 SIDE GEARS**

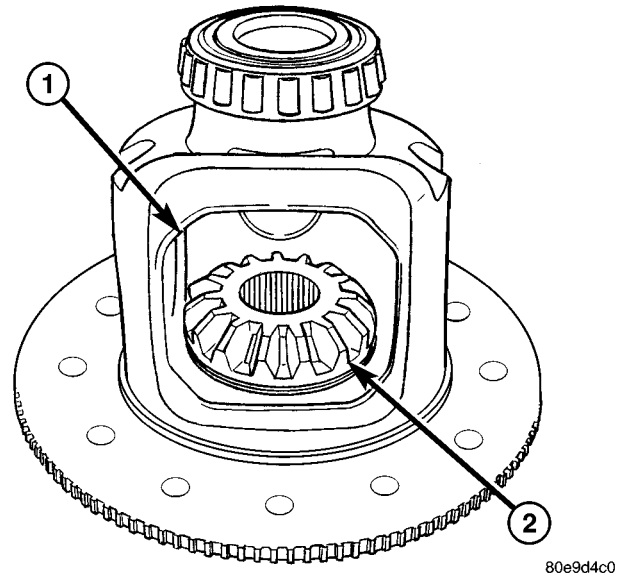
- 1 - SIDE GEAR
2 - SIDE GEAR
3 - PINION GEARS

ASSEMBLY

NOTE: If the same gears and thrust washers are being used, install them into their original locations.

(1) Lubricate all differential components with axle lubricant.

(2) Install differential side gears and thrust washers (Fig. 33).

**Fig. 33 SIDE GEAR**

- 1 - DIFFERENTIAL WINDOW
2 - SIDE GEAR

DIFFERENTIAL (Continued)

(3) Install first pinion gear into the differential window and side gears. Rotate the pinion gear to the back of the case (Fig. 34).

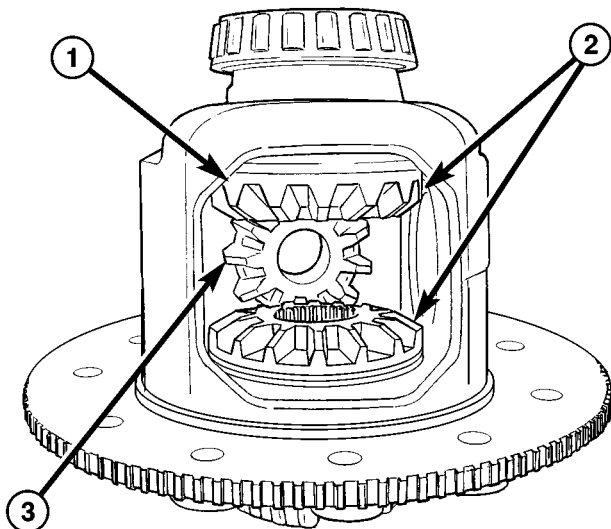


Fig. 34 PINION GEAR

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- 1 - DIFFERENTIAL WINDOW
2 - SIDE GEARS
3 - PINION GEAR

(4) Install the other pinion gear and thrust washer. Rotate the gears to align hole in the pinion gears with hole in the differential case.

(5) Slide pinion shaft into the case and through the pinion gears. Tap the shaft to seat the pinion shaft snap-ring into the case (Fig. 35).

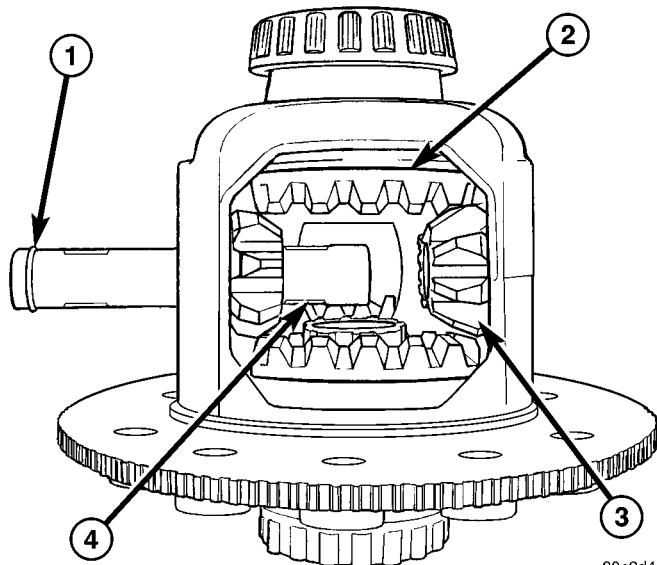


Fig. 35 PINION SHAFT INSTALLATION

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- 1 - SNAP RING
2 - SIDE GEAR
3 - PINION GEAR
4 - PINION SHAFT

(6) Install ring gear.

INSTALLATION

(1) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth.

CAUTION: Do not use water, steam, kerosene or gasoline for cleaning.

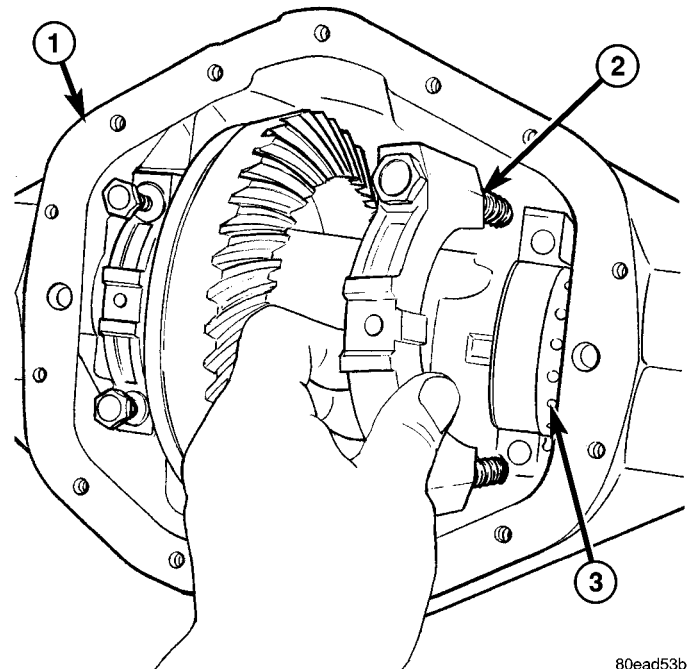
(2) Lubricate differential case bearing.

(3) Install differential case with bearings cups into the housing.

NOTE: A light coat of grease on the cups will hold them in place during installation.

(4) Install bearing caps and bolts (Fig. 36). Tighten the bearing cap bolts finger-tight.

NOTE: Do not torque bearing cap and bolts at this time.



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Fig. 36 CASE BEARING CAP

- 1 - DIFFERENTIAL HOUSING
2 - BEARING CAP
3 - ADJUSTER

(5) Slide differential case toward the pinion gear until the gears make contact/zero backlash. If zero backlash cannot be obtained, turn the pinion side adjuster until zero backlash is obtained.

(6) Holding the differential case toward the pinion gear, turn bearing adjusters with Spanner Wrench 8883 until they make contact with the differential bearings/cups.

(7) Back off the ring gear side adjuster 4 holes, to obtain initial ring gear backlash.

DIFFERENTIAL (Continued)

(8) Install ring gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(9) Tighten pinion gear side adjuster firmly against the differential case bearing cup.

(10) Rotate the pinion several times to seat the differential bearings.

(11) Loosen pinion gear side adjuster until it is no longer in contact with the bearing cup.

(12) Tighten pinion gear side adjuster until it just makes contact with the bearing cup.

(13) Tighten pinion gear side adjuster an additional:

- **New Bearings** 6 Adjuster Holes
- **Original Bearings** 4 Adjuster Holes

(14) Install pinion gear side adjuster lock and bolt. Do not tighten adjuster lock bolt at this time.

(15) Tighten bearing cap bolts to 281 N·m (207 ft. lbs.).

(16) Tighten adjuster lock bolts to 25 N·m (18 ft. lbs.) (Fig. 37).

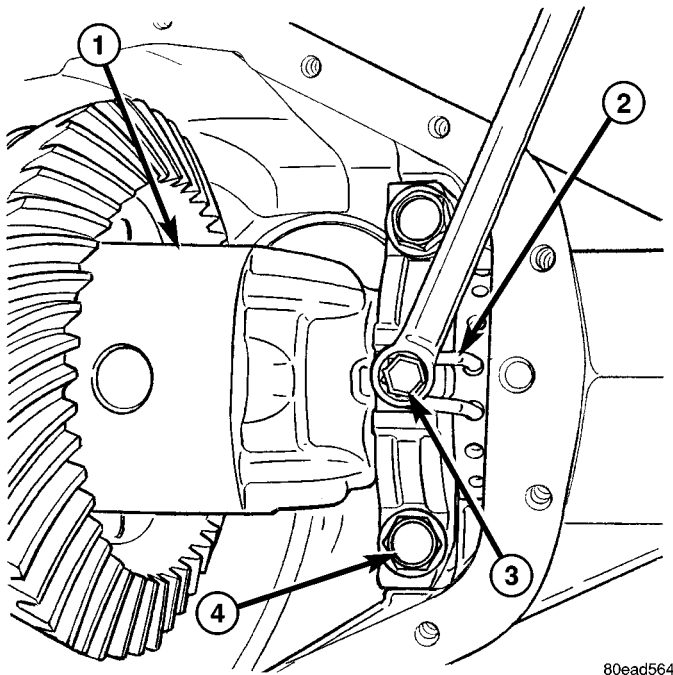


Fig. 37 ADJUSTER LOCK BOLT

- 1 - DIFFERENTIAL CASE
- 2 - ADJUSTER LOCK
- 3 - ADJUSTER LOCK BOLT
- 4 - BEARING CAP BOLT

(17) Measure ring gear backlash and check gear tooth contact pattern. Refer to Adjustments for procedure.

(18) Install axle shaft gasket and install axle shafts.

(19) Install differential housing gasket and cover. Tighten cover bolts to 40 N·m (30 ft. lbs.).

(20) Fill axle with lubricant, refer to Lubrication & Maintenance for capacity and lubricant type.

(21) Install fill plug and tighten to 32 N·m (24 ft. lbs.).

DIFFERENTIAL TRAC-RITE

DESCRIPTION

The Trac-Rite™ differential is a helical gear differential. The differential has two side gears, six pinion gears and six pinion brake shoes.

NOTE: The differential is serviced as an assembly only if damaged, but can be disassembled for cleaning. The assembly should be cleaned every time a bearing is changed due to damage.

OPERATION

When one wheel begins to spin the pinion gears on that side are forced toward the pinion brake shoes. The pinion brake shoes then cause frictional drag on the opposite pinion gears and the side gear. These friction forces transfer the power to the opposite wheel. Once the frictional forces are overcome, differentiation will occur. The torque will be continually biased by the frictional forces to the high traction wheel.

DISASSEMBLY

- (1) Remove differential ring gear bolts.
- (2) Remove differential case cover locating screws (Fig. 38).

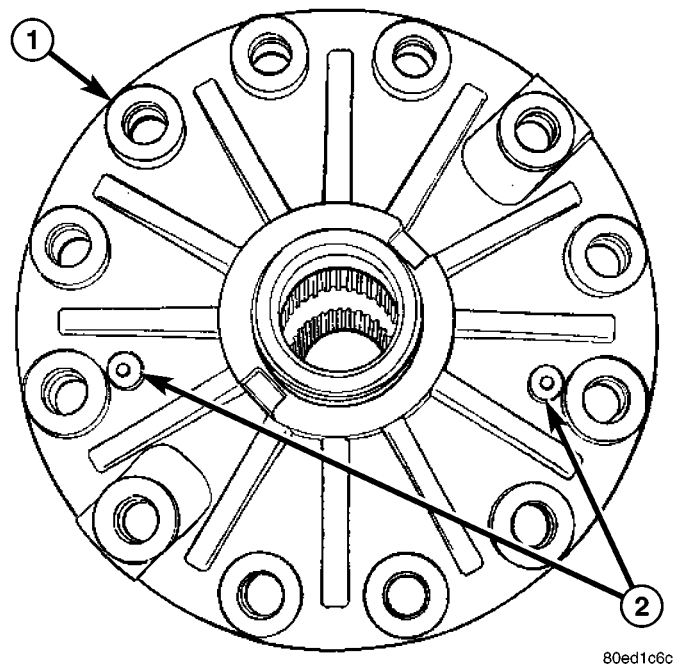


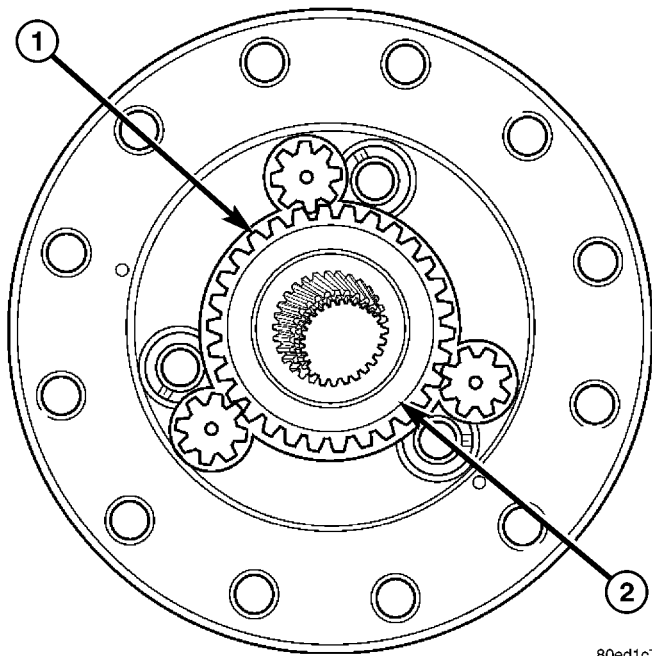
Fig. 38 LOCATION SCREWS

- 1 - DIFFERENTIAL COVER
- 2 - LOCATION SCREWS

- (3) Remove differential case cover.
- (4) Remove side gear and thrust washer (Fig. 39).

DIFFERENTIAL TRAC-RITE (Continued)

NOTE: Mark all component locations.

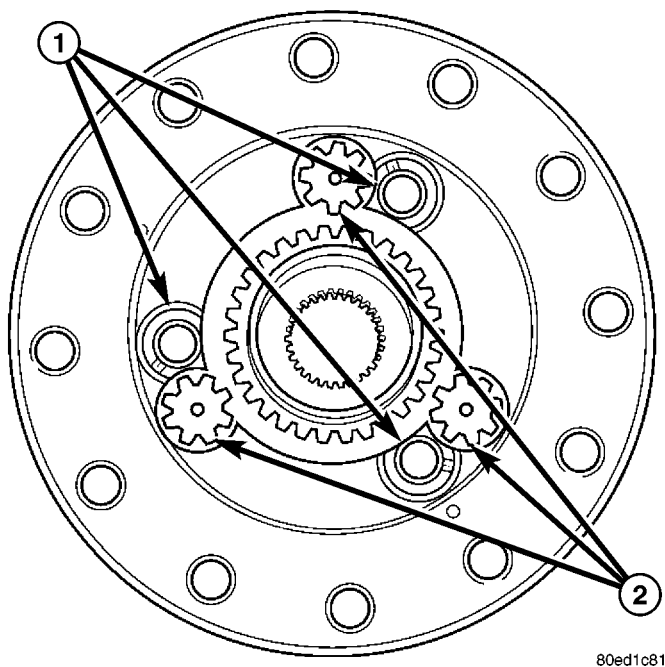


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Fig. 39 SIDE GEAR AND THRUST WASHER

- 1 - SIDE GEAR
2 - THRUST WASHER

(5) Remove three pinion brake shoes (Fig. 40).

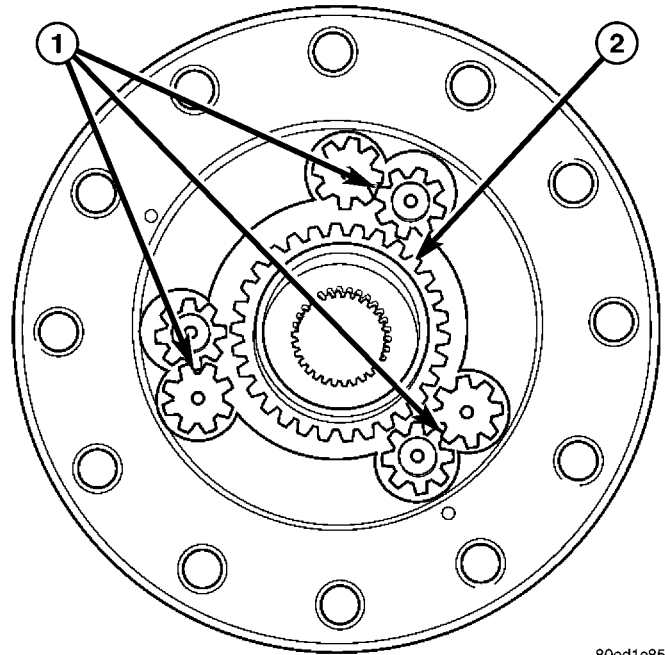


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Fig. 40 PINION BRAKE SHOES

- 1 - BRAKE SHOES
2 - PINION GEARS

(6) Remove six pinion gears (Fig. 41).



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Fig. 41 PINION GEARS

- 1 - PINION GEARS
2 - SIDE GEAR

(7) Remove remaining side gear thrust washer and spacer.

(8) Remove remaining three pinion brake shoes.

CLEANING

Clean the differential case and gears with light oil or a lint free cloth.

NOTE: Never use water, steam, kerosene or gasoline for cleaning.

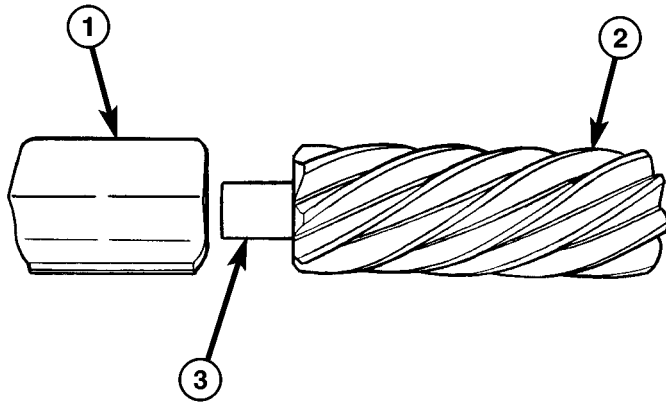
INSPECTION

NOTE: Minor corrosion, nicks or scratches can be smoothed with 400 grit emery cloth and polished out with crocus cloth.

- (1) Inspect pinion gears teeth for chips and cracks (Fig. 42).
- (2) Inspect pinion gears shafts and brake shoes for scratches, flat-spots or worn (Fig. 42).
- (3) Inspect side gears teeth for chips and cracks (Fig. 43).
- (4) Inspect pinion and side gear bores for scratches (Fig. 44).

NOTE: If any damage is found the differential must be replaced as an assembly. Individual components can not be replaced separately.

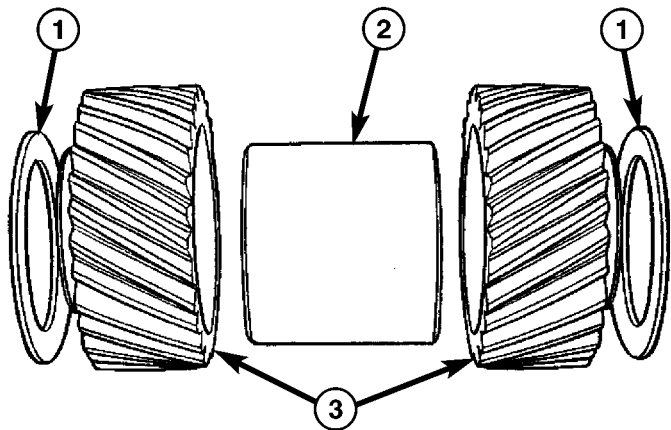
DIFFERENTIAL TRAC-RITE (Continued)



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Fig. 42 PINION GEAR AND BRAKE SHOE

- 1 - BRAKE SHOES
- 2 - PINION GEAR
- 3 - PINION SHAFT



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Fig. 43 SIDE GEARS

- 1 - THRUST WASHERS
- 2 - SPACER
- 3 - SIDE GEARS

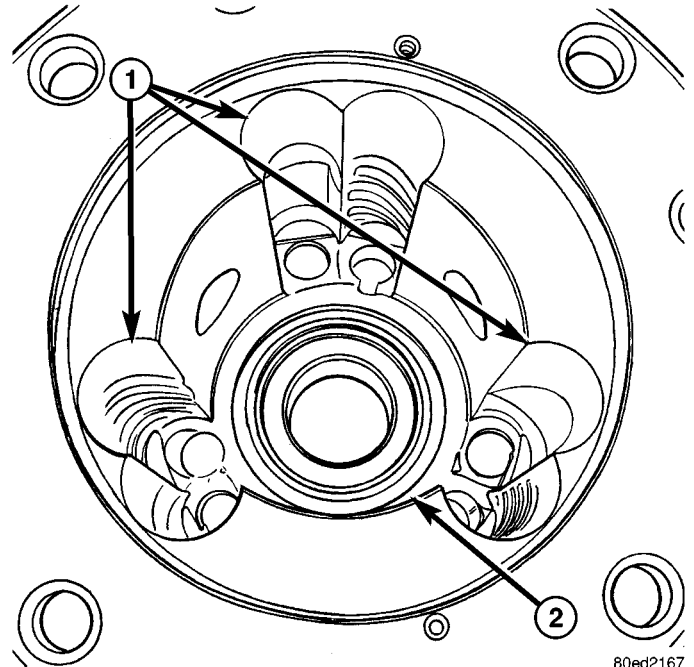
ASSEMBLY

NOTE: Install all component in their original locations.

(1) Lubricate all gears and differential bores with differential lubricant.

(2) Install one set of pinion brake shoes into the case bores.

NOTE: Brake shoes can be installed upside down, but if install wrong pinion gear will not fit.

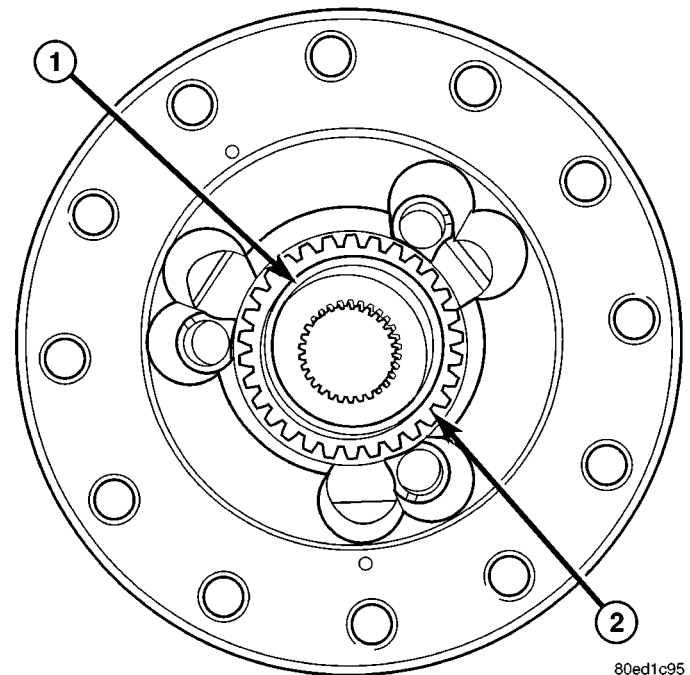


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Fig. 44 PINION/SIDE GEAR BORE

- 1 - PINION BORES
- 2 - SIDE GEAR BORE

(3) Install side gear thrust washer, side gear and spacer (Fig. 45).



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Fig. 45 SIDE GEAR AND SPACER

- 1 - SPACER
- 2 - SIDE SPACER

DIFFERENTIAL TRAC-RITE (Continued)

(4) Install one set of pinion gears into the bores next to the brake shoes, with the pinion shaft facing up.

(5) Install other side gear and thrust washer.

(6) Install other set of pinion gears into the brake shoes in the case.

(7) Install other set of brake shoes onto the pinion gears shafts (Fig. 46).

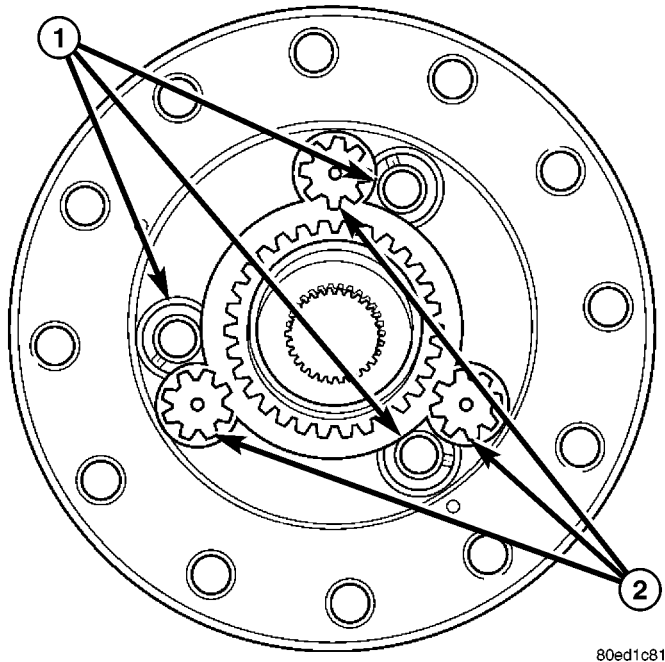


Fig. 46 PINION BRAKE SHOES

- 1 - BRAKE SHOES
2 - PINION GEARS

(8) Install differential cover and location screws.
(9) Install **new** ring gear bolts and tighten to 237 N·m (175 ft. lbs.).

DIFFERENTIAL CASE BEARINGS

REMOVAL

- (1) Remove differential case from the housing.
- (2) Install Plug 8964 into the end of the case.
- (3) Remove differential case bearings with Bearing Splitter 1130 and Bridge 938 (Fig. 47).

INSTALLATION

- (1) Install differential case bearings with Installer 8965 and Handle C-4171 (Fig. 48).
- (2) Install differentail case into housing.

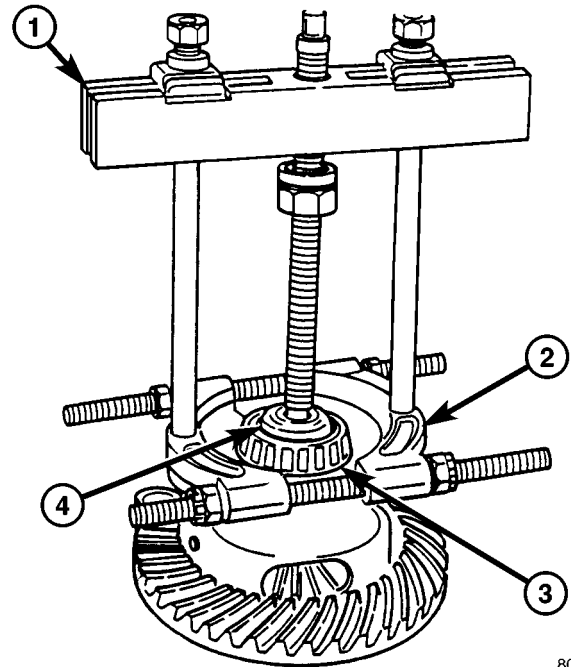


Fig. 47 DIFFERENTIAL CASE BEARING

- 1 - BRIDGE
2 - SPLITTER
3 - BEARING
4 - PLUG

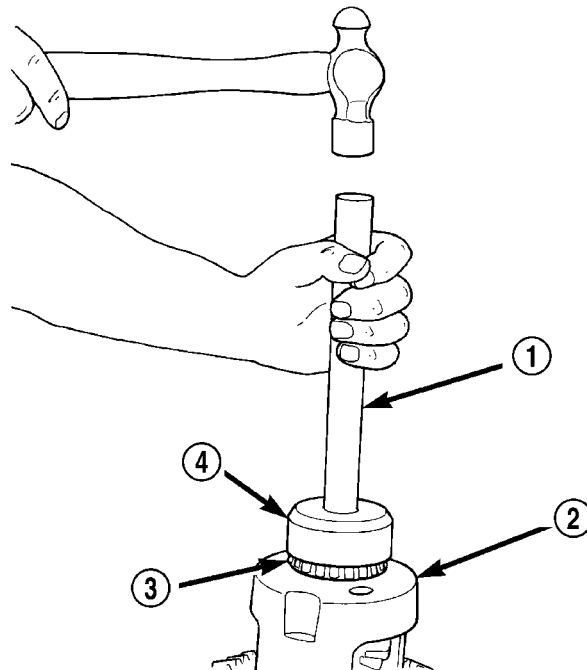


Fig. 48 DIFFERENTIAL CASE BEARINGS

- 1 - HANDLE
2 - DIFFERENTIAL CASE
3 - BEARING
4 - INSTALLER

PINION GEAR/RING GEAR/ TONE RING

REMOVAL

NOTE: The ring and pinion gears are service in a matched set. Never replace the ring gear/pinion gear without replacing the other matching gear.

(1) Mark pinion flange and propeller shaft for installation alignment.

(2) Disconnect propeller shaft from pinion flange and remove propeller shaft.

(3) Remove differential from the housing.

(4) Place differential on Plug 8964. Drive exciter ring off the differential case with a hammer and punch (Fig. 49).

NOTE: Do not remove the exciter ring if it is not being replaced.

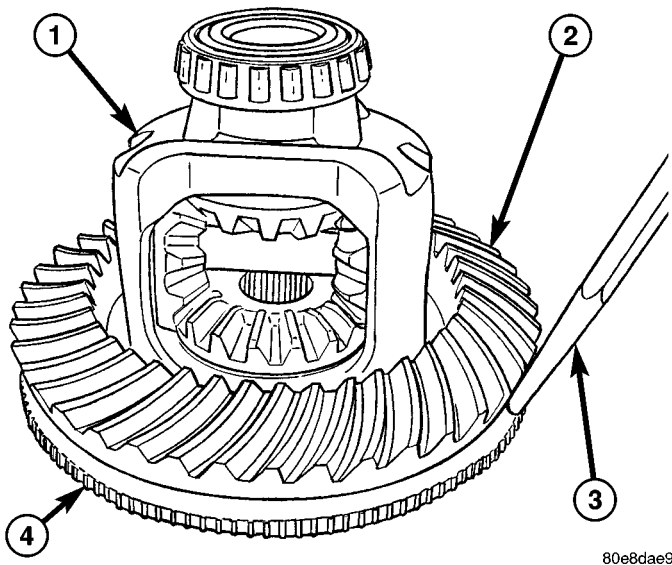


Fig. 49 EXCITER RING

- 1 - DIFFERENTIAL CASE
- 2 - RING GEAR
- 3 - PUNCH
- 4 - EXCITER RING

(5) Place differential case in a vise with soft metal jaw protectors

(6) Remove bolts holding ring gear to differential case.

(7) Drive ring gear from differential case with a soft hammer (Fig. 50).

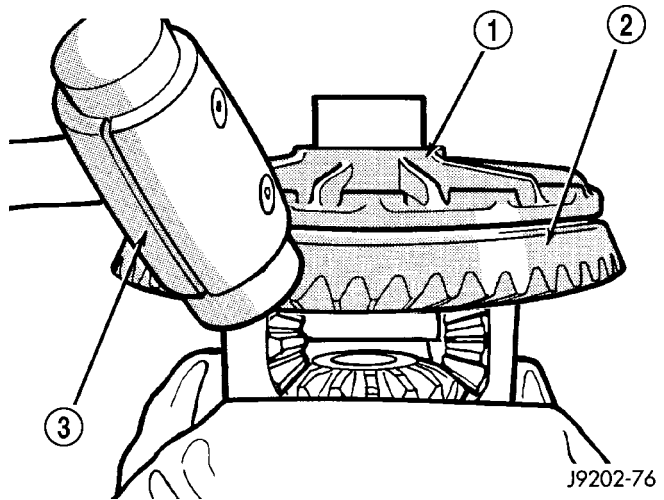


Fig. 50 RING GEAR

- 1 - DIFFERENTIAL CASE
- 2 - RING GEAR
- 3 - HAMMER

(8) Hold pinion flange with Flange Wrench 8979 (Fig. 51) and remove pinion flange nut.

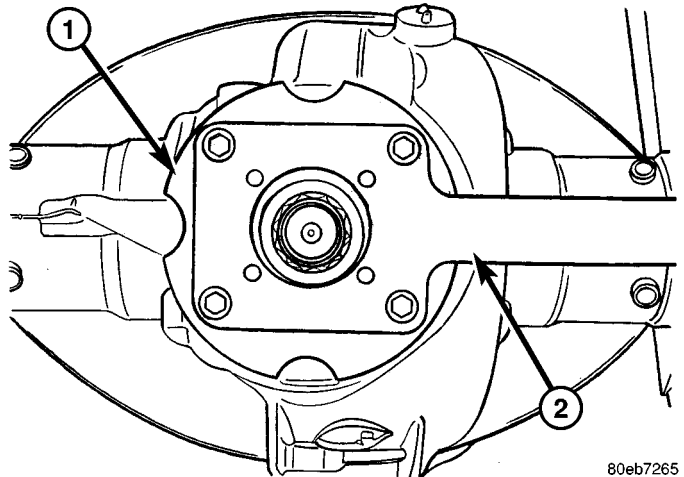


Fig. 51 FLANGE WRENCH

- 1 - PINION FLANGE
- 2 - FLANGE WRENCH

PINION GEAR/RING GEAR/TONE RING (Continued)

(9) Remove pinion flange from pinion with Pinion Flange Puller 8992 (Fig. 52).

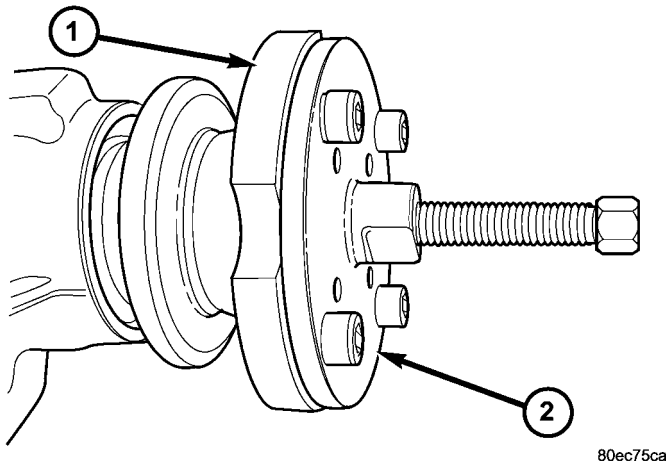


Fig. 52 PINION FLANGE PULLER

1 - PINION FLANGE
2 - PULLER

(10) Remove pinion gear from housing with Pinion Driver 8977 and a hammer (Fig. 53).

NOTE: Thread the driver on the pinion shaft till it bottoms out.

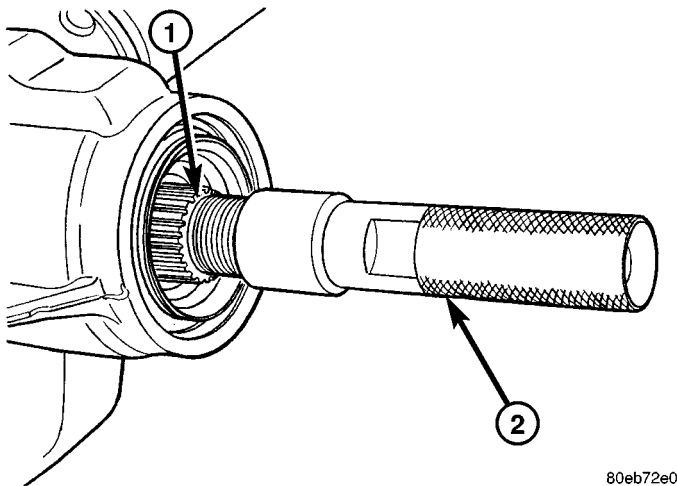


Fig. 53 PINION DRIVER

1 - PINION SHAFT
2 - PINION DRIVER

(11) Remove pinion seal with a slide hammer or pry bar.

(12) Remove front pinion bearing and discard bearing.

CAUTION: Do not reuse front pinion bearing/cup.

(13) Remove collapsible spacer from the pinion shaft.

(14) Remove rear pinion bearing with Bearing Splitter 1130 and a press (Fig. 54).

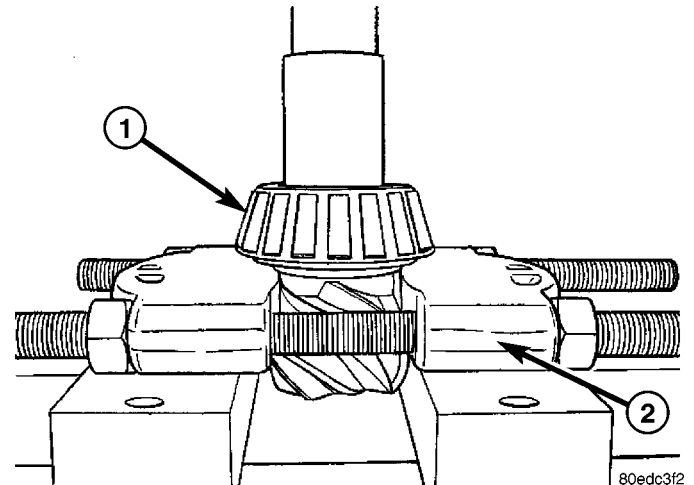


Fig. 54 BEARING SPLITTER

1 - PINION BEARING
2 - SPLITTER

(15) Remove pinion depth shim from the pinion gear shaft and record thickness of the shims.

(16) Remove front pinion bearing cup from the housing with a punch and hammer, and discard cup.

CAUTION: Do not reuse front pinion bearing/cup.

(17) Remove rear pinion bearing cup from the housing with a punch and hammer, if bearing is going to be replaced.

INSTALLATION

(1) Install new front pinion bearing cup (Fig. 55) with Installer 8960 and Handle C-4171.

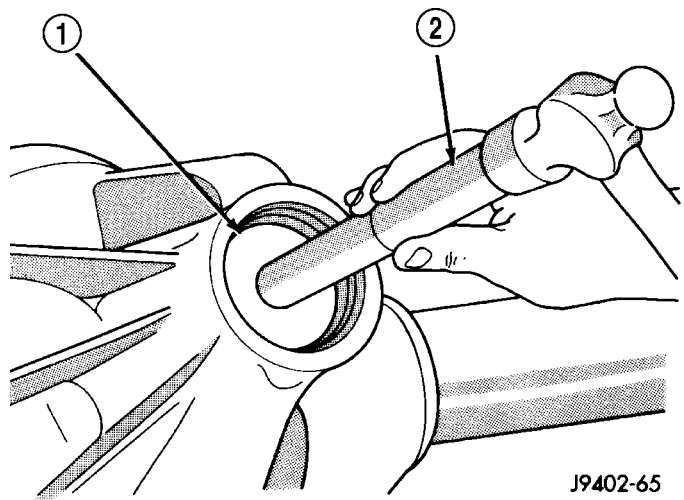


Fig. 55 FRONT PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

PINION GEAR/RING GEAR/TONE RING (Continued)

(2) Install new rear pinion bearing cup (Fig. 56) with Installer 8968 and Handle C-4171.

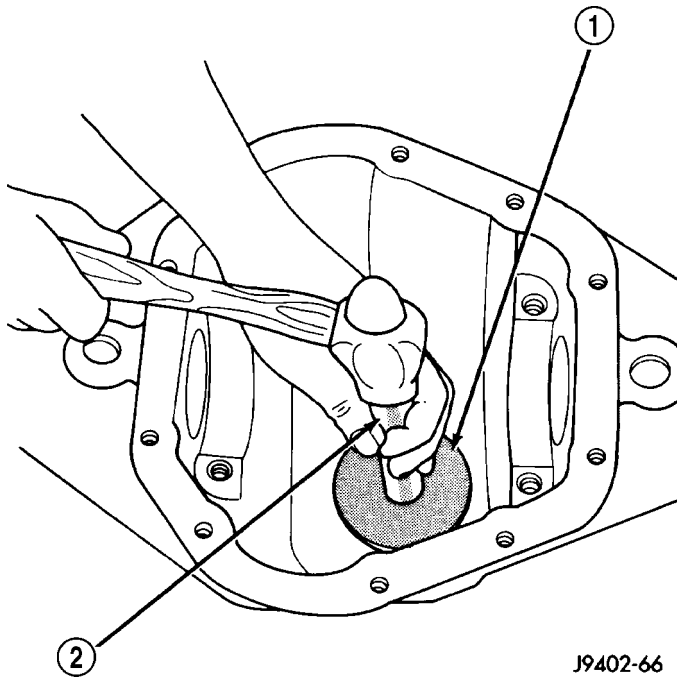


Fig. 56 REAR PINION BEARING CUP

- 1 - INSTALLER
2 - HANDLE

(3) Install pinion depth shim (Fig. 57) on the pinion gear shaft.

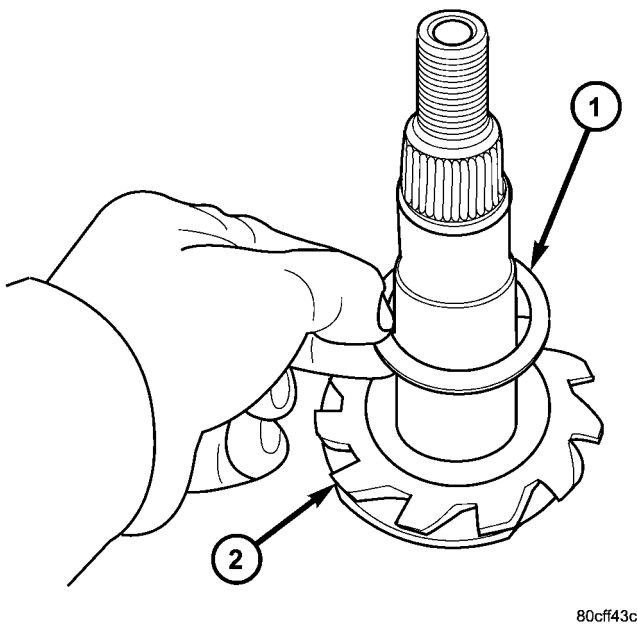


Fig. 57 PINION DEPTH SHIM

- 1 - PINION DEPTH SHIM
2 - PINION GEAR

(4) Install rear pinion bearing (Fig. 58) with Installer D-389 and a press.

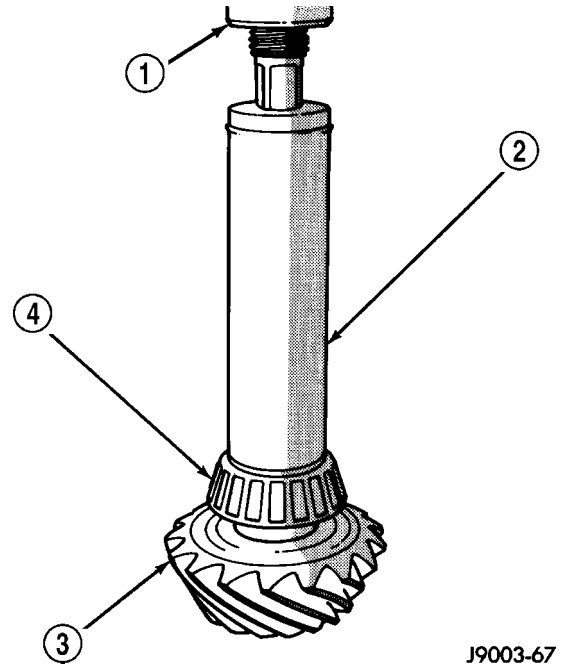


Fig. 58 REAR PINION BEARING

- 1 - PRESS
2 - INSTALLER
3 - PINION GEAR
4 - REAR PINION BEARING

(5) Install **new** collapsible spacer (Fig. 59).

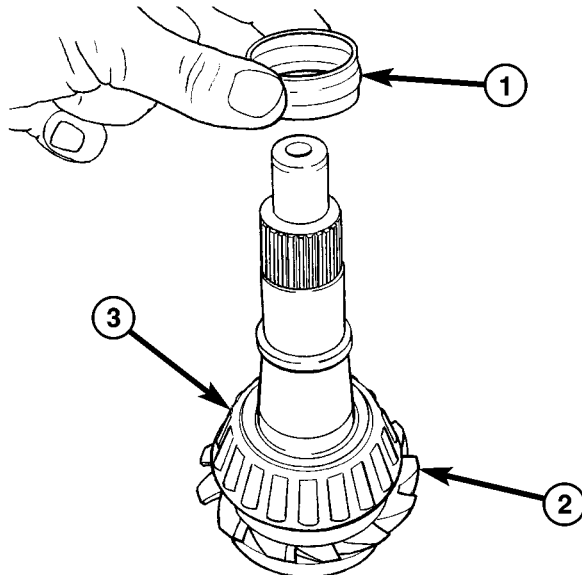


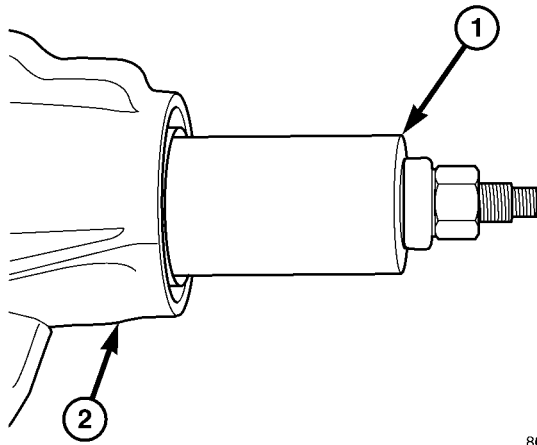
Fig. 59 COLLAPSIBLE SPACER

- 1 - COLLAPSIBLE SPACER
2 - PINION GEAR
3 - REAR PINION BEARING

(6) Lubricate pinion and bearings.

PINION GEAR/RING GEAR/TONE RING (Continued)

(7) Install pinion into the housing and place front pinion bearing onto the pinion shaft. Draw the pinion shaft into the front bearing with Installer 8981 (Fig. 60).

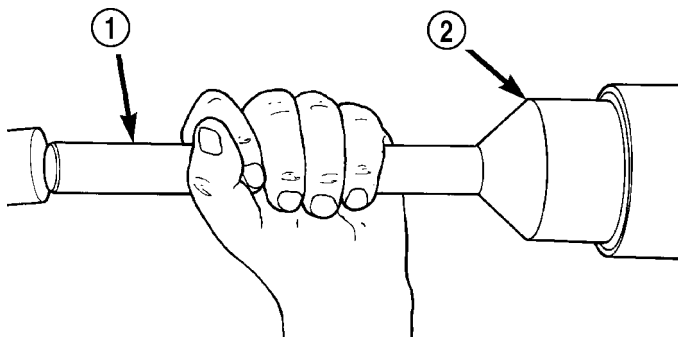


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Fig. 60 PINION GEAR INSTALLER

- 1 - INSTALLER
2 - DIFFERENTIAL HOUSING

(8) Install **new** pinion seal (Fig. 61) with Installer 8896 and Handle C-4171.



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Fig. 61 PINION SEAL INSTALLER

- 1 - HANDLE
2 - INSTALLER

(9) Apply a light coat of teflon sealant to the pinion flange splines.

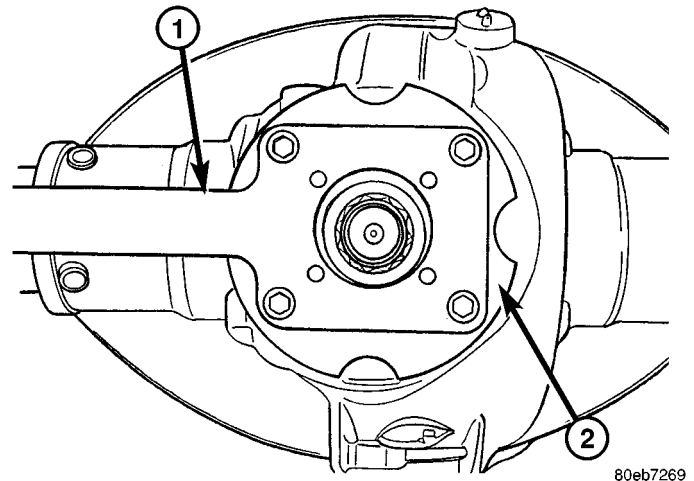
(10) Hold pinion and lightly tap the pinion flange onto the pinion, until a few threads are showing.

(11) Install pinion flange washer and **new** pinion nut.

(12) Hold pinion flange with Flange Wrench 8979 (Fig. 62) and tighten pinion nut until pinion end play is taken up.

(13) Rotate pinion several times to seat bearings.

(14) Measure pinion rotating torque with an inch pound torque wrench (Fig. 63). Tighten pinion nut in small increments until pinion rotating torque is:

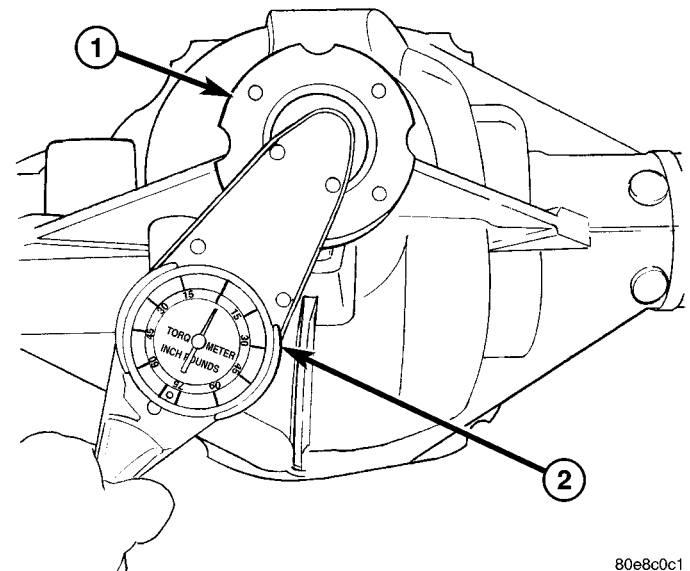


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Fig. 62 FLANGE WRENCH

- 1 - FLANGE WRENCH
2 - PINION FLANGE

- **New Pinion Bearings:** 1.7-2.8 N·m (15-25 in. lbs.)
- **Original Pinion Bearings:** 1.1-2.2 N·m (10-20 in. lbs.)



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Fig. 63 PINION ROTATING TORQUE

- 1 - PINION FLANGE
2 - TORQUE WRENCH

(15) Rotate pinion several times then verify pinion rotating torque again.

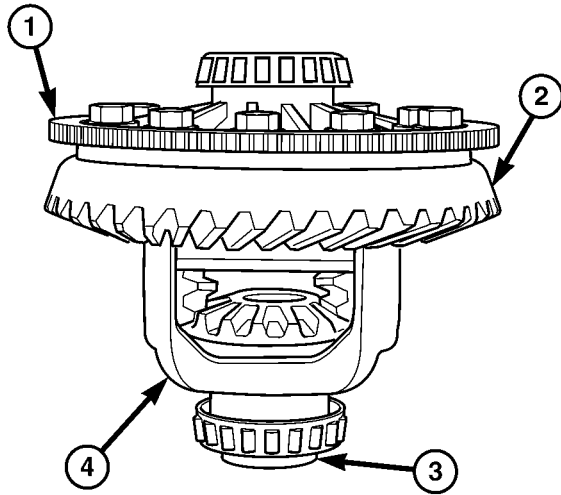
(16) Position the ring gear on differential case and start two **new** ring gear bolts.

(17) Install the rest of the **new** ring gear bolts and tighten them alternately to seat the ring gear.

(18) Torque ring gear bolts to 237 N·m (175 ft. lbs.).

PINION GEAR/RING GEAR/TONE RING (Continued)

(19) If exciter ring was removed, position differential assembly on differential Plug 8965 (Fig. 64) and place exciter ring on the differential case.



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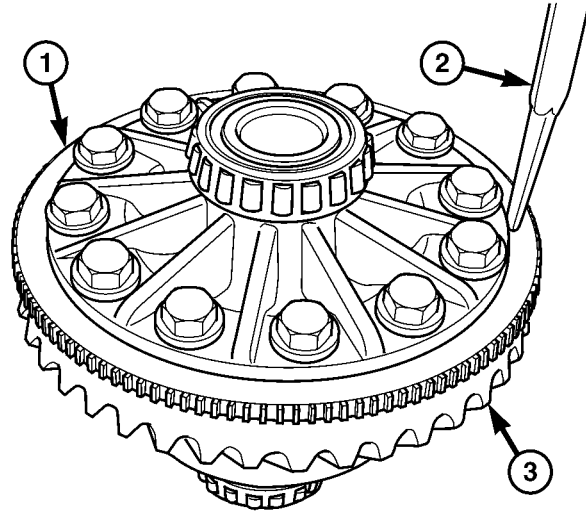
Fig. 64 EXCITER RING

- 1 - EXCITER RING
- 2 - RING GEAR
- 3 - DIFFERENTIAL PLUG
- 4 - DIFFERENTIAL CASE

(20) Install the exciter ring on the differential case evenly with a hammer and brass punch (Fig. 65). Drive the ring down until it is seated against the ring gear.

CAUTION: Do not damage exciter ring teeth during installation.

(21) Install differential in housing and verify gear backlash and gear contact pattern.



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Fig. 65 EXCITER RING INSTALLATION

- 1 - EXCITER RING
- 2 - PUNSH
- 3 - RING GEAR

(22) Measure final rotating torque with an inch pound torque wrench. The final pinion rotating torque plus differential case bearing preload is:

- **New Bearings:** 3.4-5.6 N·m (30-50 in. lbs.)
- **Original Bearings:** 2.8-5.1 N·m (25-45 in. lbs.)

(23) Install axle shafts.

(24) Install the propeller shaft with the reference marks aligned.

(25) Install differential cover with gasket and tighten bolts to 40 N·m (30 ft. lbs.).

(26) Fill differential with fluid and tighten fill plug to 32 N·m (24 ft. lbs.).