

DIFFERENTIAL AND DRIVELINE

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PROPELLER SHAFTS

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DESCRIPTION AND OPERATION

PROPELLER SHAFT

DESCRIPTION

A propeller shaft (Fig. 2), (Fig. 3), and (Fig. 4) is the shaft which connects the transmission/transfer case to the axle differential. This is the link through which the engine power is transmitted to the axle.

The propeller shaft is designed and built with the yoke lugs in line with each other which is called zero phasing. This design produces the smoothest running condition, an out-of-phase shaft can cause a vibration.

Tubular propeller shafts are balanced by the manufacturer with weights spot welded to the tube.

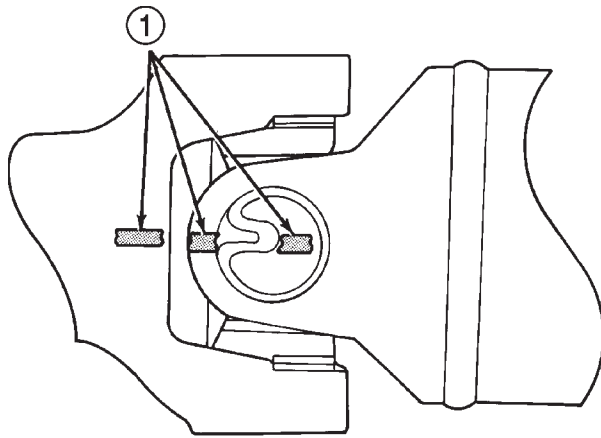
PRECAUTIONS

Use the exact replacement parts when installing the propeller shafts. The use of the correct replacement parts helps to ensure safe operation. All fasteners must be torqued to the specified values for safe operation.

Also make alignment reference marks (Fig. 1) on the propeller shaft yoke and axle, or transmission, yoke prior to servicing. This helps to eliminate possible vibration.

**CAUTION:** Do not allow the propeller shaft to drop or hang from any propeller shaft joint during removal. Attach the propeller shaft to the vehicle underside with wire to prevent damage to the joints.

## DESCRIPTION AND OPERATION (Continued)



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**Fig. 1 Reference Marks on Yokes**

1 - REFERENCE MARKS

**OPERATION**

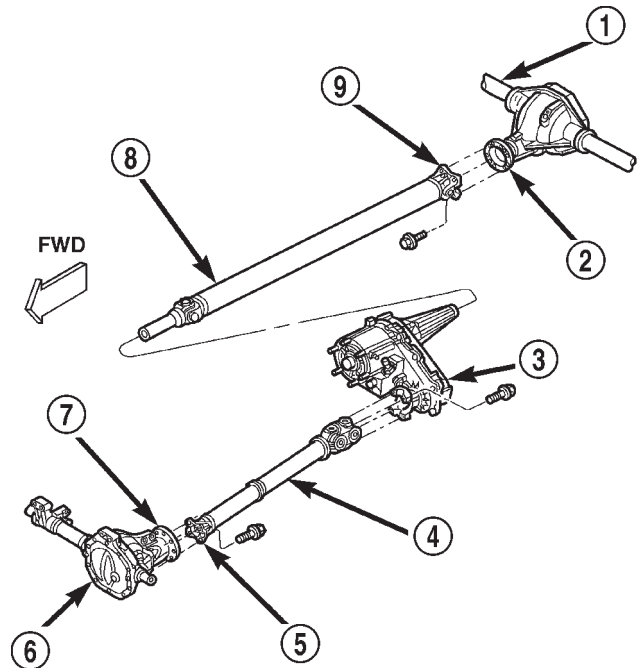
The propeller shaft must operate through constantly changing relative angles between the transmission and axle. It must also be capable of changing length while transmitting torque. The axle rides suspended by springs in a floating motion. The propeller shaft must be able to change operating angles when going over various road surfaces. This is accomplished through universal joints, which permit the propeller shaft to operate at different angles. The slip joints (or yokes) permit contraction or expansion (Fig. 2), (Fig. 3), and (Fig. 4).

**Before undercoating a vehicle, the propeller shaft and the U-joints should be covered to prevent an out-of-balance condition and driveline vibration.**

**CAUTION:** Use original equipment replacement parts for attaching the propeller shafts. The specified torque must always be applied when tightening the fasteners.

**CENTER BEARING****DESCRIPTION**

Vehicles equipped with a two-piece propeller shaft uses a rubber insulated center bearing. The bearing is used to support the shafts where they are joined together.



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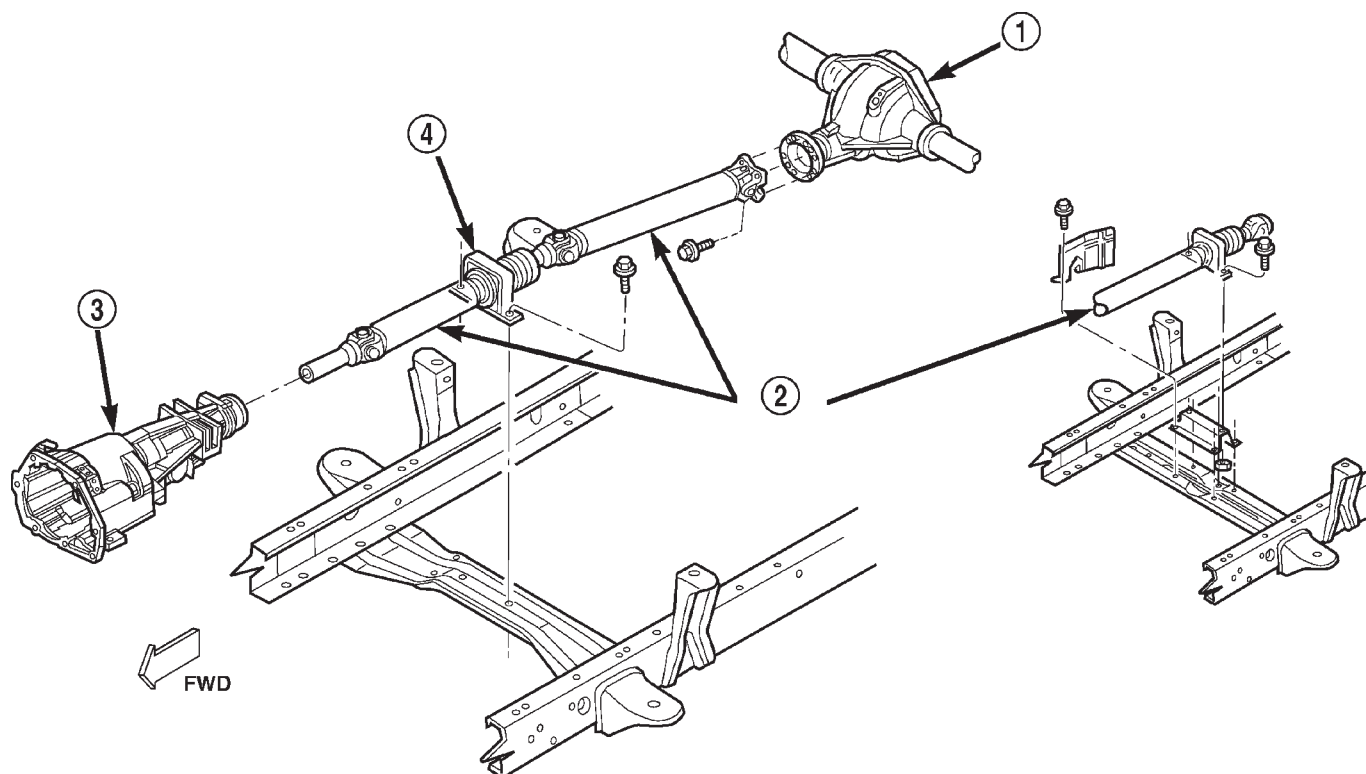
**Fig. 2 Front Propeller Shaft**

- 1 - REAR AXLE
- 2 - COMPANION FLANGE
- 3 - TRANSFER CASE
- 4 - FRONT PROPELLER SHAFT
- 5 - COMPANION YOKE
- 6 - FRONT AXLE
- 7 - COMPANION FLANGE
- 8 - REAR PROPELLER SHAFT
- 9 - COMPANION YOKE

**OPERATION**

The propeller shaft center bearing serves to divide the required propeller shaft length into two smaller shafts, which has several inherent advantages. Having two short propeller shafts instead of one long shaft decreases the chance of unwanted noise and vibrations. The shorter shafts are easier to balance and serve to increase ground clearance while maintaining acceptable driveline angles.

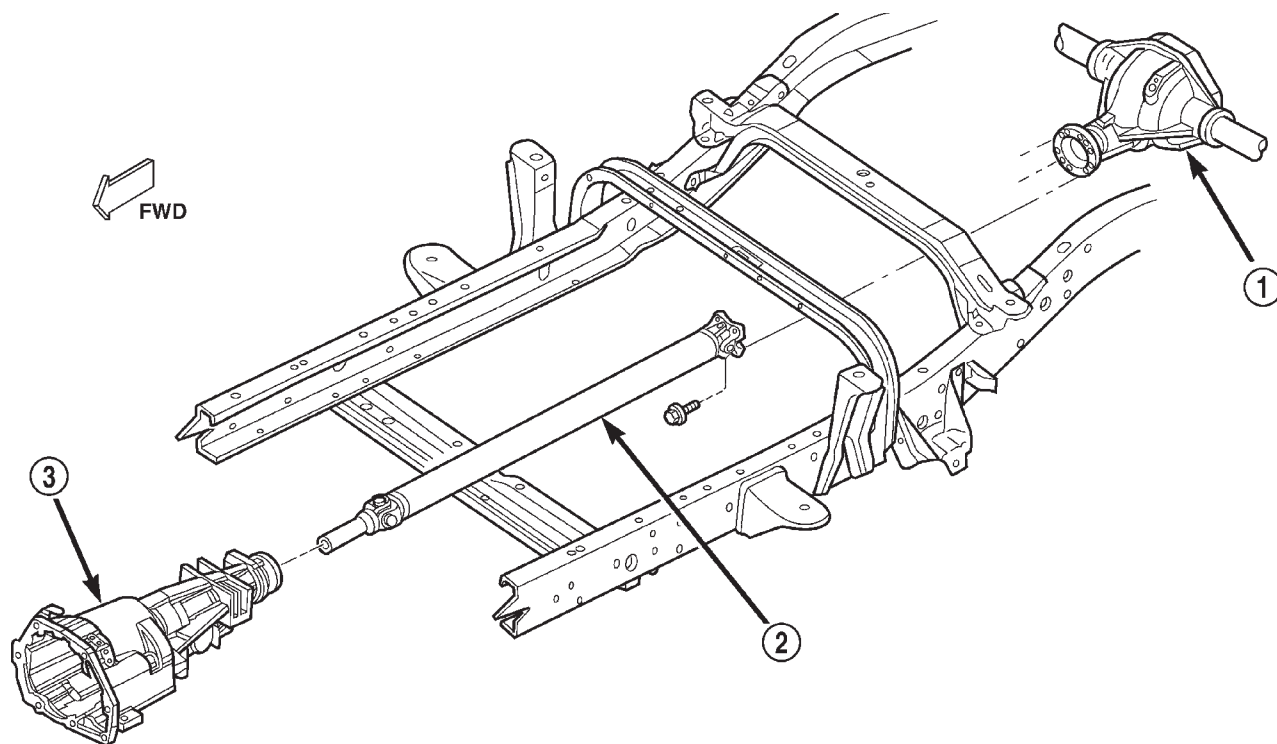
DESCRIPTION AND OPERATION (Continued)



**Fig. 3 Rear Propeller Shaft with Center Bearing**

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- |                          |                                    |
|--------------------------|------------------------------------|
| 1 - REAR AXLE            | 3 - TRANSMISSION EXTENSION HOUSING |
| 2 - REAR PROPELLER SHAFT | 4 - CENTER BEARING                 |



**Fig. 4 Rear Propeller Shaft**

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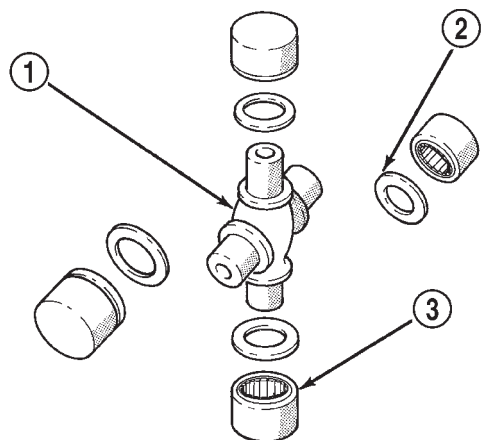
- |                          |                                    |
|--------------------------|------------------------------------|
| 1 - REAR AXLE            | 3 - TRANSMISSION EXTENSION HOUSING |
| 2 - REAR PROPELLER SHAFT |                                    |

## DESCRIPTION AND OPERATION (Continued)

## PROPELLER SHAFT JOINTS

## DESCRIPTION

Two different types of propeller shaft joints are used in AN vehicles (Fig. 5) and (Fig. 6). None of the joints are serviceable. If worn or damaged, they must be replaced as a complete assembly.



**Fig. 5 Single Cardan U-Joint**

- 1 - CROSS
- 2 - SEAL
- 3 - CAP AND NEEDLE BEARINGS

## LUBRICATION

The factory installed universal joints are lubricated for the life of the vehicle and do not need lubrication. All universal joints should be inspected for leakage and damage each time the vehicle is serviced. If seal leakage or damage exists, the universal joint should be replaced.

## PROPELLER SHAFT JOINT ANGLE

## DESCRIPTION

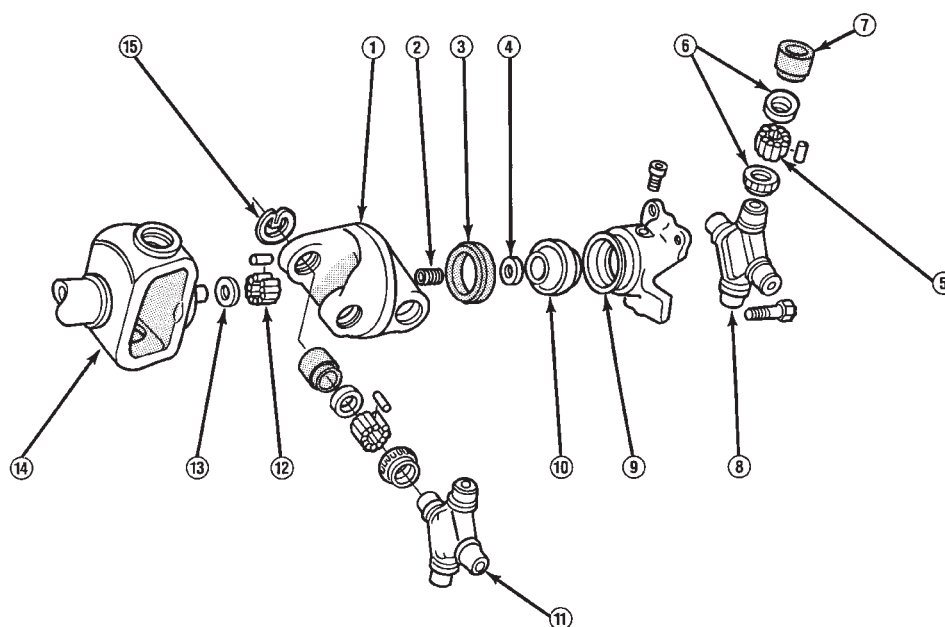
When two shafts come together at a common joint, the bend that is formed is called the operating angle. The larger the angle, the larger the amount of angular acceleration and deceleration of the joint. This speeding up and slowing down of the joint must be cancelled to produce a smooth power flow.

## OPERATION

This cancellation is done through the phasing of a propeller shaft and ensuring that the proper propeller shaft joint working angles are maintained.

A propeller shaft is properly phased when the yoke ends are in the same plane, or in line. A twisted shaft will make the yokes out of phase and cause a noticeable vibration.

When taking propeller shaft joint angle measurements, or checking the phasing, of two piece shafts, consider each shaft separately.



- |                         |                 |                      |
|-------------------------|-----------------|----------------------|
| 1. LINK YOKE            | 6. SEAL         | 11. FRONT SPIDER     |
| 2. SOCKET SPRING        | 7. BEARING CAP  | 12. NEEDLE BEARINGS  |
| 3. SOCKET BALL RETAINER | 8. REAR SPIDER  | 13. THRUST WASHER    |
| 4. THRUST WASHER        | 9. SOCKET YOKE  | 14. DRIVE SHAFT YOKE |
| 5. NEEDLE BEARINGS      | 10. SOCKET BALL | 15. RETAINING CLIP   |

**Fig. 6 Double Cardan U-Joint**

## DESCRIPTION AND OPERATION (Continued)

Ideally the driveline system should have;

- Angles that are equal or opposite within 1 degree of each other.
- Have a 3 degree maximum operating angle.
- Have at least a 1/2 degree continuous operating (propeller shaft) angle.

Propeller shaft speed (rpm) is the main factor in determining the maximum allowable operating angle. As a guide to the maximum normal operating angles refer to (Fig. 7).

PROPELLER SHAFT R.P.M.	MAX. NORMAL OPERATING ANGLES
5000	3°
4500	3°
4000	4°
3500	5°
3000	5°
2500	7°
2000	8°
1500	11°

**Fig. 7 Maximum Angles And Propeller Shaft Speed**

## DIAGNOSIS AND TESTING

### VIBRATION

Tires that are out-of-round, or wheels that are unbalanced, will cause a low frequency vibration. Refer to Group 22, Tires and Wheels, for additional information.

Brake drums that are unbalanced will cause a harsh, low frequency vibration. Refer to Group 5, Brakes, for additional information.

Driveline vibration can also result from loose or damaged engine mounts. Refer to Group 9, Engines, for additional information.

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.

### 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.



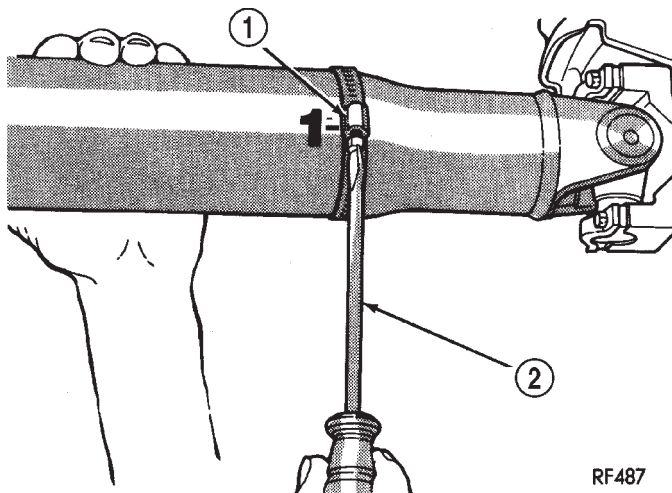
## DIAGNOSIS AND TESTING (Continued)

## UNBALANCE

**NOTE:** Removing and re-indexing the propeller shaft, 45° at a time, relative to the companion flange 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 companion flange bolts 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. 8).



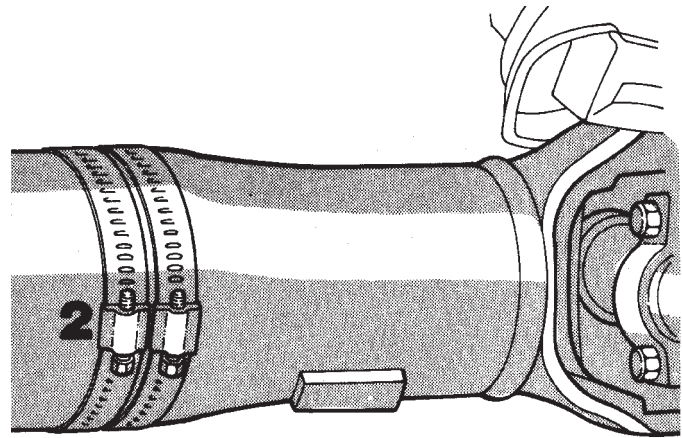
**Fig. 8 Clamp Screw At Position 1—Typical**

1 - CLAMP  
2 - SCREWDRIVER

(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.

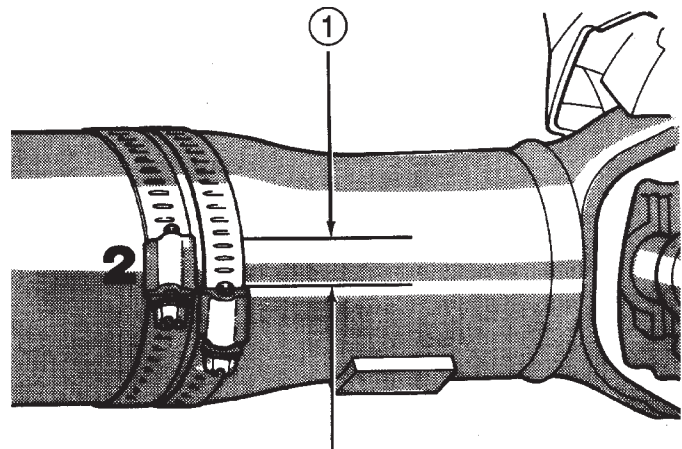
(12) If the vibration decreased, install a second clamp (Fig. 9) and repeat the test.



RF488

**Fig. 9 Two Clamp Screws At The Same Position—Typical**

(13) If the additional clamp causes an additional vibration, separate the clamps (1/4 inch above and below the mark). Repeat the vibration test (Fig. 10).



RF489

**Fig. 10 Clamp Screws Separated—Typical**

1 - 1/2 INCH

(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.

(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.

## 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.

## DIAGNOSIS AND TESTING (Continued)

- (4) Refer to Runout Specifications chart.
- (5) If the propeller shaft runout is out of specification, remove the propeller shaft, index the shaft 45°, 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)
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.	

## SERVICE PROCEDURES

### DRIVELINE ANGLE MEASUREMENT PREPARATION

Before measuring universal joint angles, the following must be done;

- Inflate all tires to correct pressure.
- Check the angles in the same loaded or unloaded condition as when the vibration occurred. Propeller shaft angles change according to the amount of load in the vehicle.
- Check the condition of all suspension components and verify all fasteners are torqued to specifications.
- Check the condition of the engine and transmission mounts and verify all fasteners are torqued to specifications.

### PROPELLER SHAFT ANGLE MEASUREMENT

**NOTE:** The following procedure is depicted using an axle equipped with a pinion yoke. The procedure and principles are the same for axles equipped with a companion flange.

### ONE-PIECE PROPELLER SHAFT

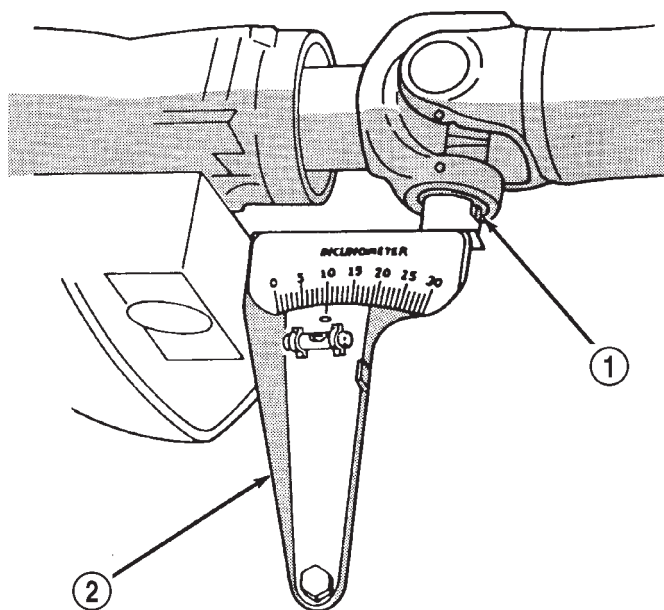
To accurately check driveline alignment, raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn. Remove any external bearing snap rings (if equipped) from universal joint so that the inclinometer base sits flat.

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

**Always make measurements from front to rear.**

- (2) Place Inclinometer on yoke bearing cap (A) parallel to the shaft (Fig. 11). Center bubble in sight glass and record measurement.

**This measurement will give you the transmission or Output Yoke Angle (A).**



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**Fig. 11 Front (Output) Angle Measurement (A)**

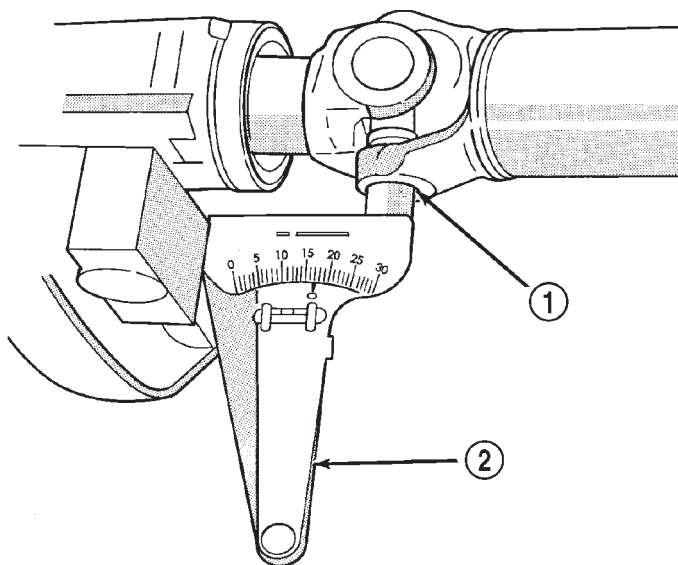
- 1 – SLIP YOKE BEARING CAP
- 2 – SPECIAL TOOL 7663 (J-23498A)

- (3) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing cap parallel to the shaft (Fig. 12). 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).**

- (4) Subtract smaller figure from larger (C minus A) to obtain transmission output operating angle.

## SERVICE PROCEDURES (Continued)



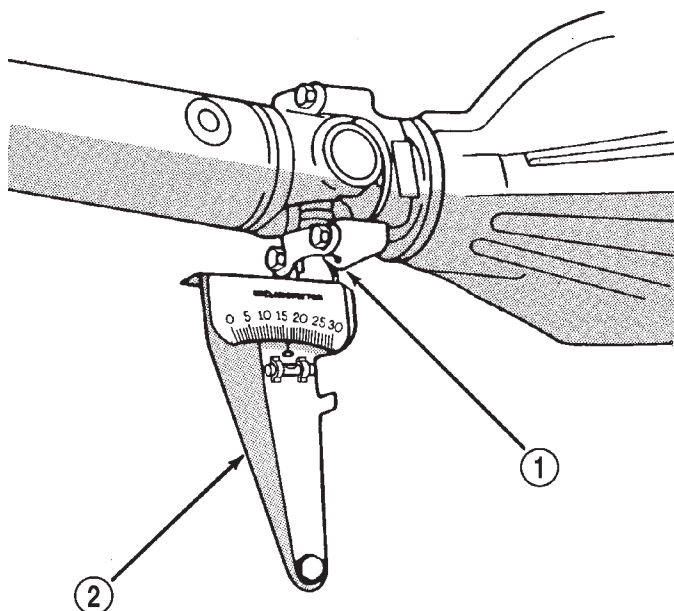
J9216-9

**Fig. 12 Propeller Shaft Angle Measurement (C)**

- 1 - SHAFT YOKE BEARING CAP  
2 - SPECIAL TOOL 7663 (J23498-A)

(5) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing cap parallel to the shaft (Fig. 13). Center bubble in sight glass and record measurement.

**This measurement will give you the pinion shaft or input yoke angle (B).**



J9216-12

**Fig. 13 Rear (Input) Angle Measurement (B)**

- 1 - PINION YOKE BEARING CAP  
2 - SPECIAL TOOL 7663 (J-23498A)

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

Refer to rules given below and the example in for additional information.

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

**TWO-PIECE PROPELLER SHAFT**

The procedure to measure the propeller shaft angles involved with a two-piece propeller shaft is the same as those for a one-piece propeller shaft. The following additional conditions also apply:

- The front half-shaft must be parallel to the rear axle pinion shaft.
- The front and rear half-shafts must be offset by a minimum of 1/2 of a degree. From the transmission/transfer case output shaft and from each other.
- Excessive variation in measurement angles of A, B or C indicate propeller mis-alignment.
- Vertical alignment of a two-piece shaft at the yokes should be greater than one-half degree and as close to one degree as possible.

**REMOVAL AND INSTALLATION****FRONT PROPELLER SHAFT****REMOVAL**

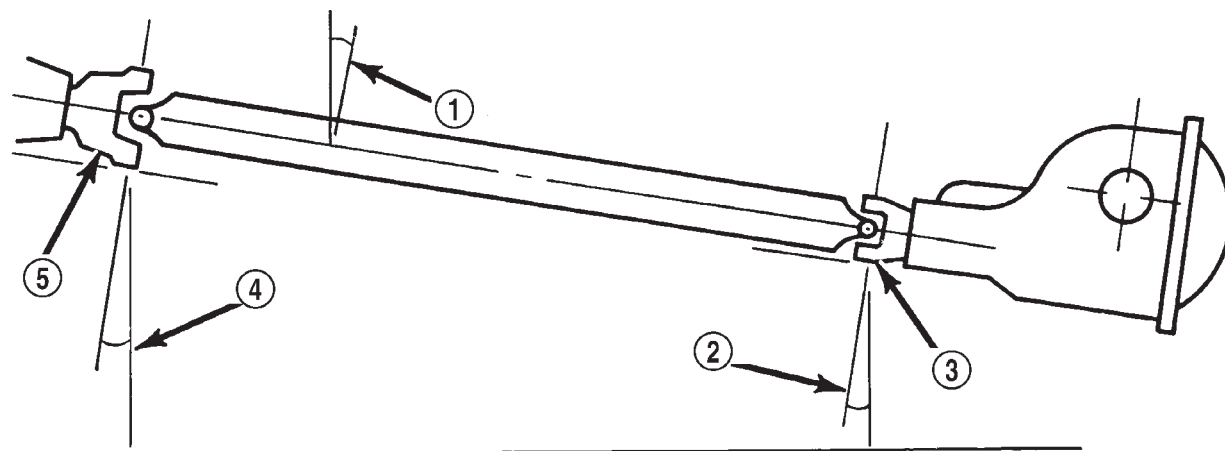
(1) Shift the transmission and transfer case to their neutral positions. Raise and support vehicle. Remove skid plate, if equipped.

(2) Using a suitable marker, mark a line across the yoke at the transfer case, the link yoke, and propeller shaft yoke at the rear of the front propeller shaft for installation reference.

(3) Mark a line across the propeller shaft companion yoke and flange at the front axle for installation reference.



REMOVAL AND INSTALLATION (Continued)



Horizontal Level

(A) Output Yoke =  $3.0^{\circ}$  or  $4.9^{\circ}$   
 (C) Prop. Shaft =  $4.9^{\circ}$  or  $-3.0^{\circ}$

Transmission Output  
 Operating Angle  $1.9^{\circ}$

(B) Axle Input Yoke =  $3.2^{\circ}$  or  $4.9^{\circ}$   
 (C) Prop. Shaft =  $4.9^{\circ}$  or  $-3.2^{\circ}$

Axle Input  
 Operating Angle  $1.7^{\circ}$

Trans. Output Operating Angle  $1.9^{\circ}$

Axle Input Operating Angle  $-1.7^{\circ}$

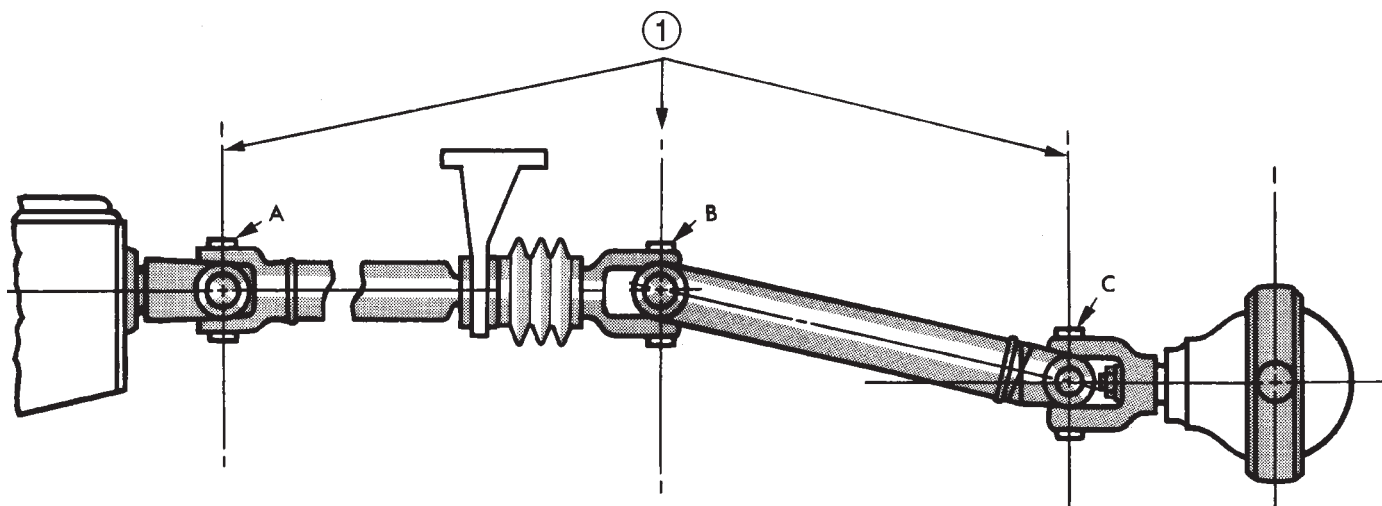
Amount of U-Joint Cancellation  $0.2^{\circ}$

J9316-3

**Fig. 14 Universal Joint Angle Example**

1 -  $4.9^{\circ}$  Angle (C)  
 2 -  $3.2^{\circ}$  Angle (B)  
 3 - Input Yoke

4 -  $3.0^{\circ}$  Angle (A)  
 5 - Output Yoke



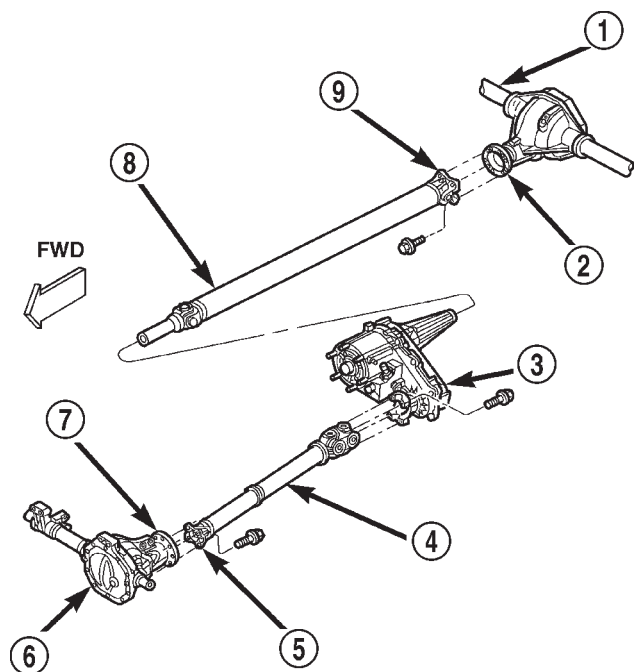
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**Fig. 15 Universal Joint Angle—Two-Piece Shaft**

1 - YOKES MUST BE IN SAME PLANE

## REMOVAL AND INSTALLATION (Continued)

- (4) Remove the bolts holding the companion yoke to the companion flange (Fig. 16).
- (5) Remove the bolts holding the propeller shaft to the transfer case yoke.
- (6) Remove the propeller shaft.

**Fig. 16 Front Propeller Shaft**

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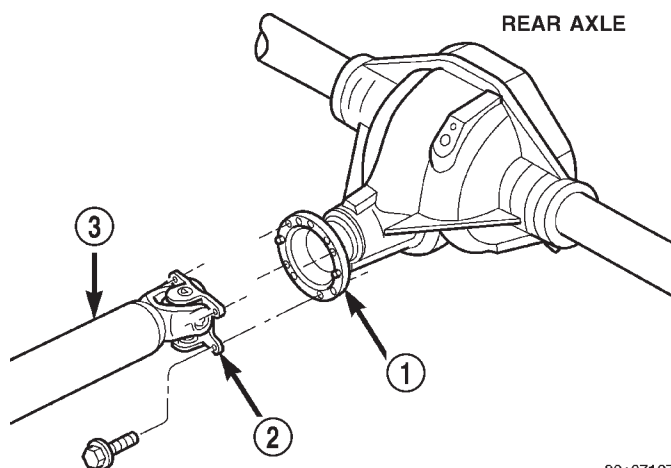
- 1 - REAR AXLE
- 2 - COMPANION FLANGE
- 3 - TRANSFER CASE
- 4 - FRONT PROPELLER SHAFT
- 5 - COMPANION YOKE
- 6 - FRONT AXLE
- 7 - COMPANION FLANGE
- 8 - REAR PROPELLER SHAFT
- 9 - COMPANION YOKE

**INSTALLATION**

- (1) Position front propeller shaft under vehicle with rear universal joint over the transfer case yoke flange.
- (2) Place front companion yoke into the axle companion flange.
- (3) Align mark on the link yoke and universal joint to the mark on the transfer case yoke flange.
- (4) Loosely install bolts to hold universal joint to transfer case yoke.
- (5) Align the mark on companion yoke to the mark on the companion flange.
- (6) Install bolts to hold the companion yoke to the companion flange. Tighten bolts to 108 N·m (80 ft. lbs.).
- (7) Tighten bolts to hold universal joint to transfer case yoke to 27 N·m (20 ft. lbs.).
- (8) Install skid plate, if equipped.
- (9) Lower vehicle and road test to verify repair.

**REAR PROPELLER SHAFT****REMOVAL**

- (1) Raise and support vehicle on safety stands.
- (2) Shift the transmission to the Neutral position.
- (3) Using a suitable marker, mark a line across the axle companion flange and yoke for installation reference.
- (4) Using a suitable marker, mark the outline of the center bearing on the support bracket for installation reference, if equipped.
- (5) Using a suitable marker, mark the outline of the heat shield on the center bearing for installation reference, if equipped.
- (6) Remove bolts that attach the center bearing and heat shield to the support bracket, if equipped.
- (7) Remove the bolts holding the companion yoke to the companion flange.
- (8) Slide the slip yoke off of the transmission, or transfer case, output shaft and remove the propeller shaft (Fig. 17).

**Fig. 17 Rear Propeller Shaft**

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- 1 - COMPANION FLANGE
- 2 - COMPANION YOKE
- 3 - REAR PROPELLER SHAFT

**INSTALLATION**

- (1) Slide the slip yoke onto the transmission, or transfer case, output shaft.
- (2) Align and install the center bearing and heat shield to the support bracket, if necessary.
- (3) Install the bolts and tighten to 68 N·m (50 ft. lbs.) torque.
- (4) Align the installation reference marks made on the companion flange and yoke.
- (5) Position the companion yoke onto the companion flange.
- (6) Install the bolts to hold the companion yoke to the companion flange. Tighten the bolts to 108 N·m (80 ft. lbs.) torque.
- (7) Lower the vehicle.

## REMOVAL AND INSTALLATION (Continued)

### CENTER BEARING

#### REMOVAL

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

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

- (5) Set shaft in press and press bearing off the shaft.

#### INSTALLATION

- (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.

## DISASSEMBLY AND ASSEMBLY

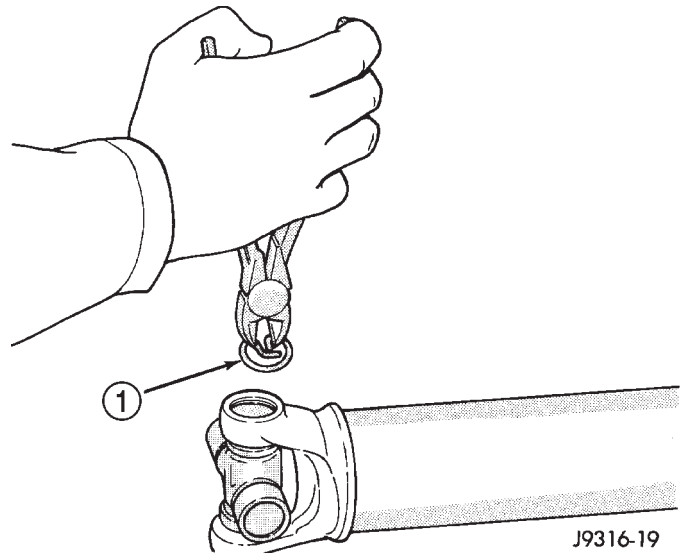
### SINGLE CARDAN UNIVERSAL JOINT

**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.

#### DISASSEMBLY

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

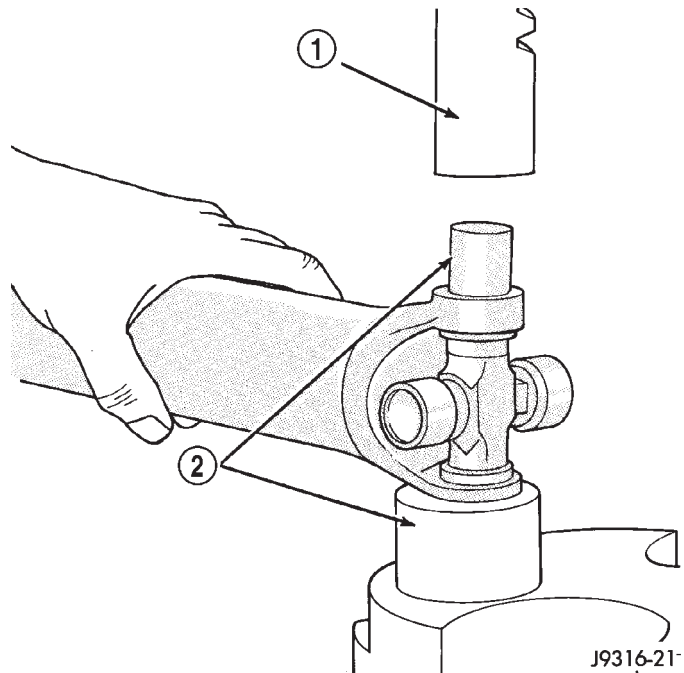
- (1) Remove the propeller shaft.
- (2) Using a soft drift, tap the outside of the bearing cap assembly to loosen snap ring.
- (3) Remove snap rings from both sides of yoke (Fig. 18).
- (4) Set the yoke in an arbor press or vise with a socket whose inside diameter is large enough to receive the bearing cap positioned beneath the yoke.



**Fig. 18 Remove Snap Ring**

1 - SNAP RING

- (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. 19).



**Fig. 19 Press Out Bearing**

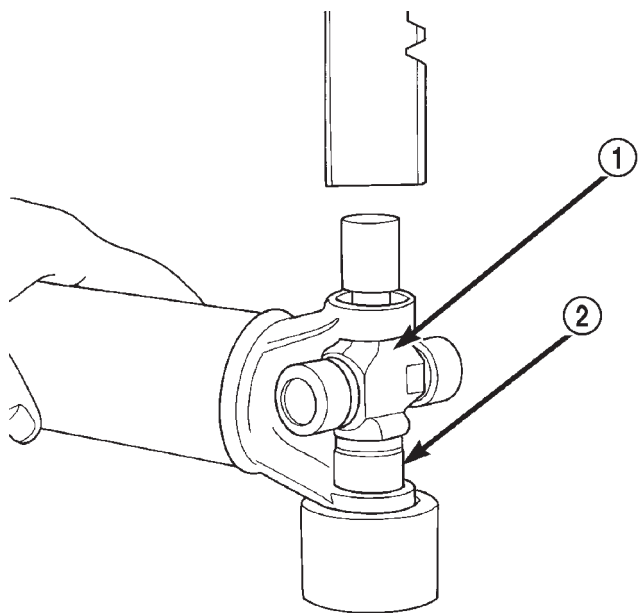
1 - PRESS  
2 - SOCKET

## DISASSEMBLY AND ASSEMBLY (Continued)

(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. 20).

**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.



80a9539c

**Fig. 20 Press Out Remaining Bearing**

- 1 - CROSS  
2 - BEARING CAP

## ASSEMBLY

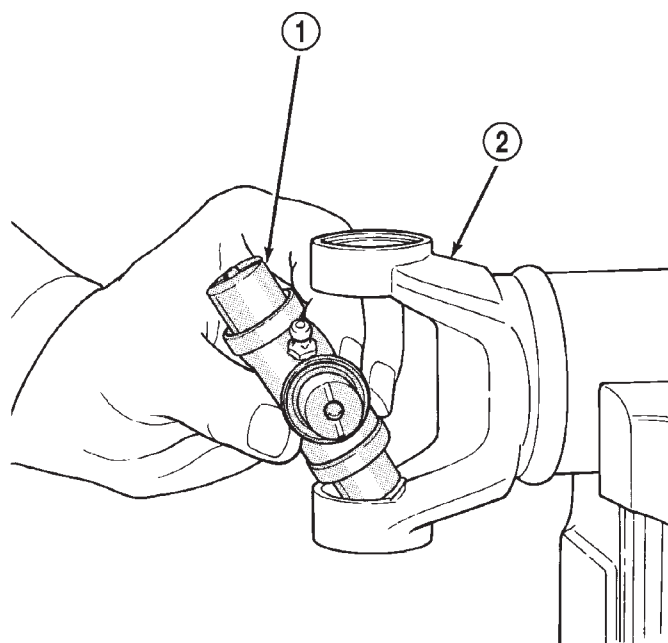
(1) Apply extreme pressure (EP) N.L.G.I. Grade 1 or 2 grease to inside of yoke bores to aid in installation.

(2) Position the cross in the yoke with its lube fitting, if equipped, pointing up (Fig. 21).

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 22). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.

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

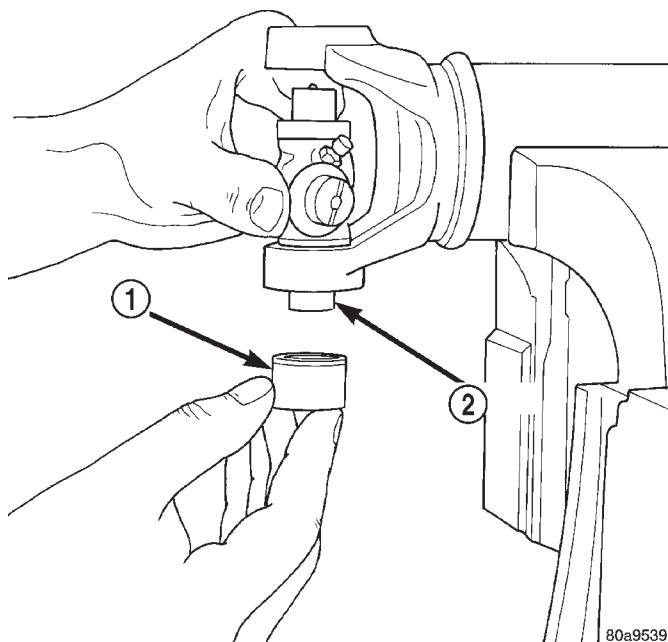
(5) Install a snap ring.



J9316-22

**Fig. 21 Install Cross In Yoke**

- 1 - CROSS  
2 - YOKE



80a9539b

**Fig. 22 Install Bearing On Trunnion**

- 1 - BEARING CAP  
2 - TRUNNION

(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.

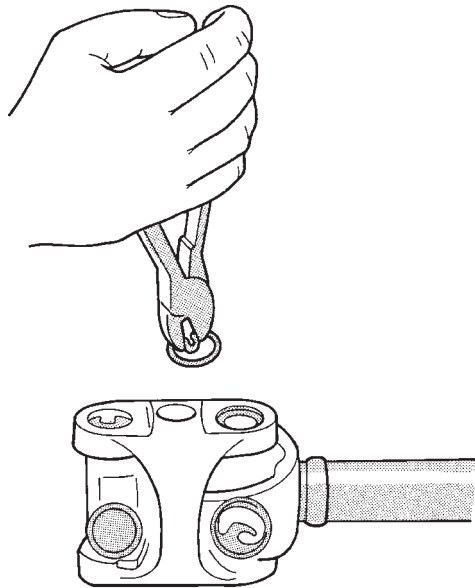
## DISASSEMBLY AND ASSEMBLY (Continued)

### DOUBLE CARDAN JOINT

#### DISASSEMBLY

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 all the bearing cap snap rings (Fig. 23).



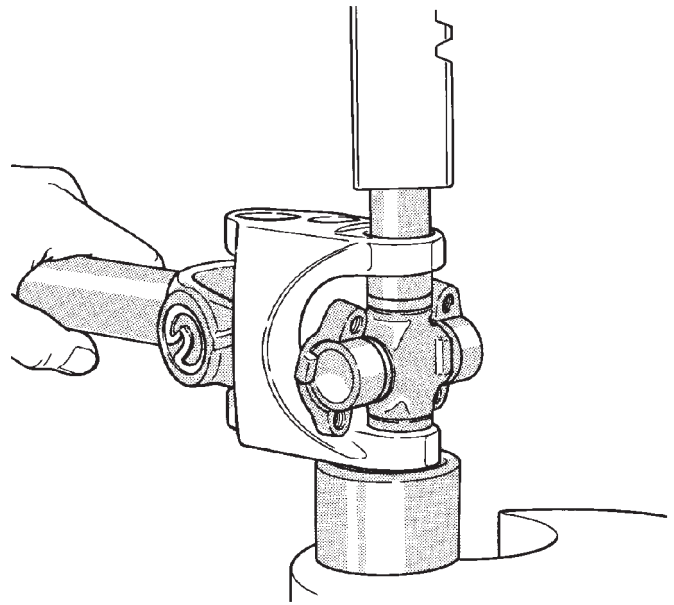
J9316-5

**Fig. 23 Remove Snap Rings**

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

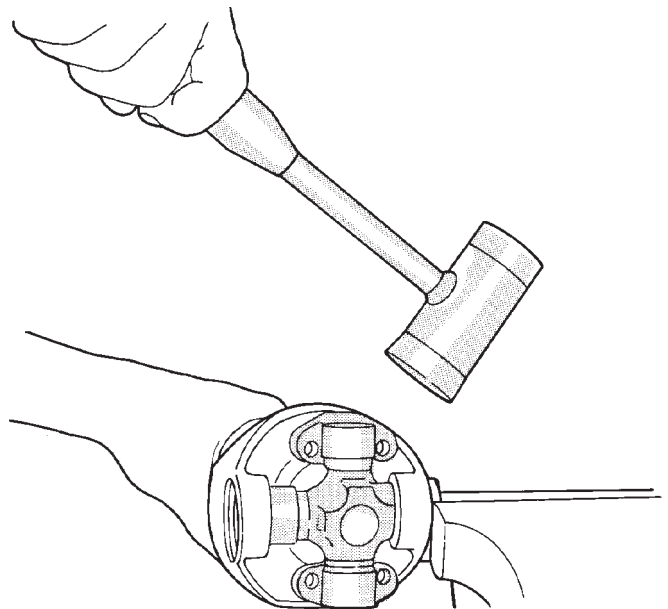
- (5) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and partially press one bearing cap from the outboard side of the link yoke enough to grasp the bearing cap with vise jaws (Fig. 24). Be sure to remove grease fittings that interfere with removal.

- (6) Grasp the protruding bearing by vise jaws. Tap the link yoke with a mallet and drift to dislodge the bearing cap from the yoke (Fig. 25).



J9316-6

**Fig. 24 Press Out Bearing**



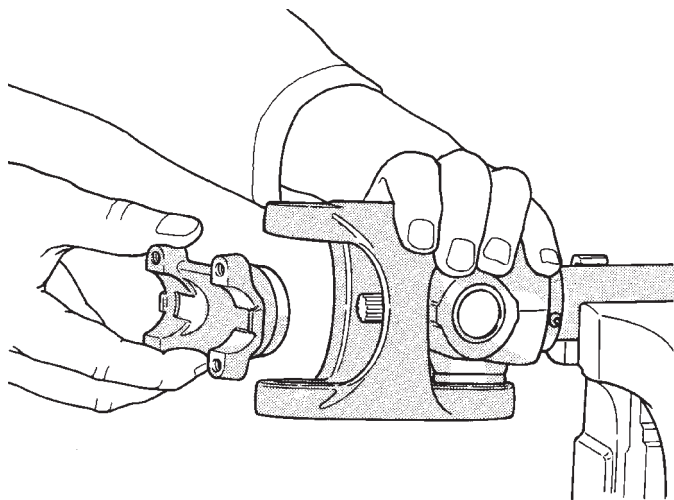
J9316-7

**Fig. 25 Remove Bearing From Yoke**



## DISASSEMBLY AND ASSEMBLY (Continued)

(7) Flip assembly and repeat Step 4, Step 5, and Step 6 to remove the opposite bearing cap. This will then allow removal of the cross centering kit assembly and spring (Fig. 26).



J9316-8

**Fig. 26 Remove Centering Kit**

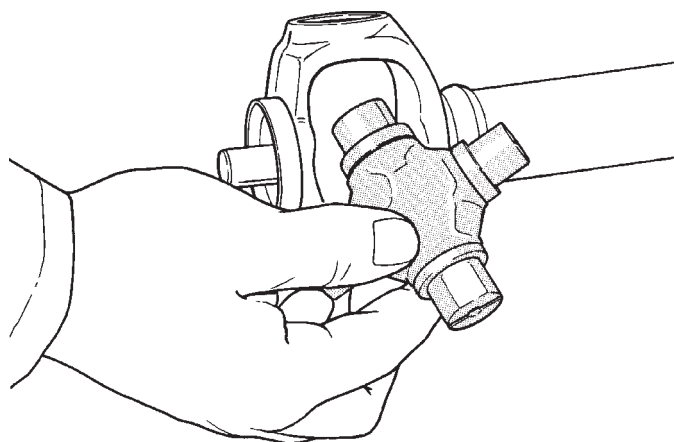
(8) Press the remaining bearing caps out the other end of the link yoke as described above to complete the disassembly.

## ASSEMBLY

**During assembly, ensure that the alignment marks on the link yoke and propeller shaft yoke are aligned.**

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

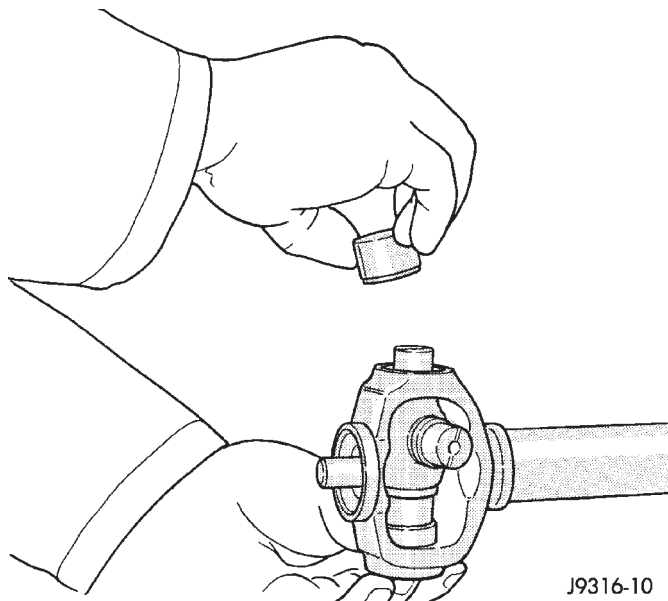
(2) Fit a cross into the propeller shaft yoke (Fig. 27).



J9316-9

**Fig. 27 Install Cross In Yoke**

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 28). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.

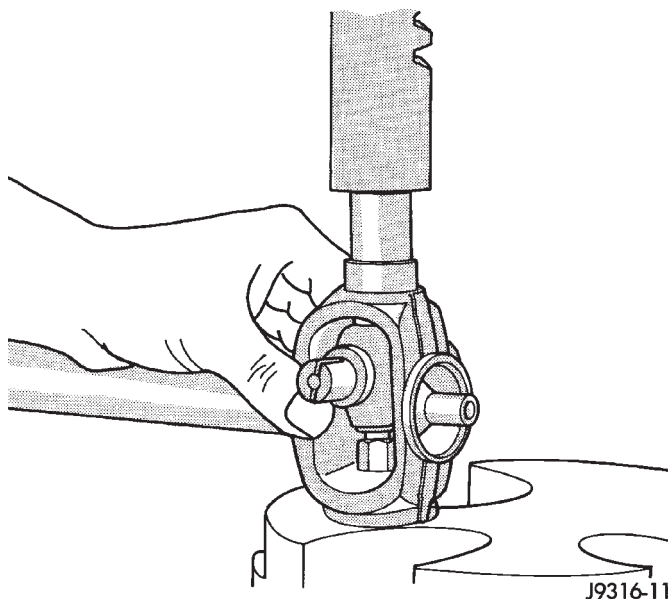


J9316-10

**Fig. 28 Install Bearing Cap**

(4) Press the bearing cap into the yoke bore enough to install a snap ring (Fig. 29).

(5) Install a snap ring.

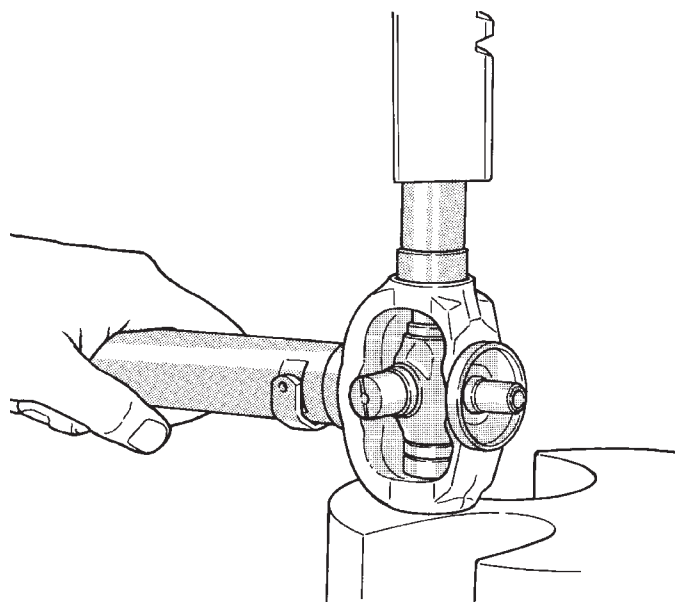


J9316-11

**Fig. 29 Press In Bearing Cap**

# DISASSEMBLY AND ASSEMBLY (Continued)

(6) Flip the propeller shaft yoke and install the bearing cap onto the opposite trunnion. Install a snap ring (Fig. 30).

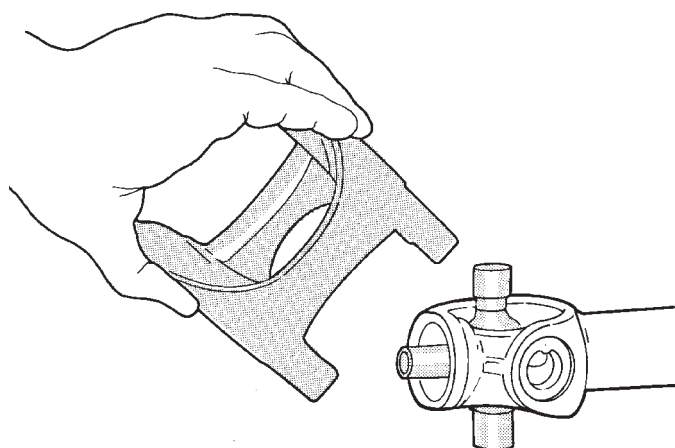


J9316-12

**Fig. 30 Press In Bearing Cap**

(7) Fit the link yoke on the remaining two trunnions and press both bearing caps into place (Fig. 31).

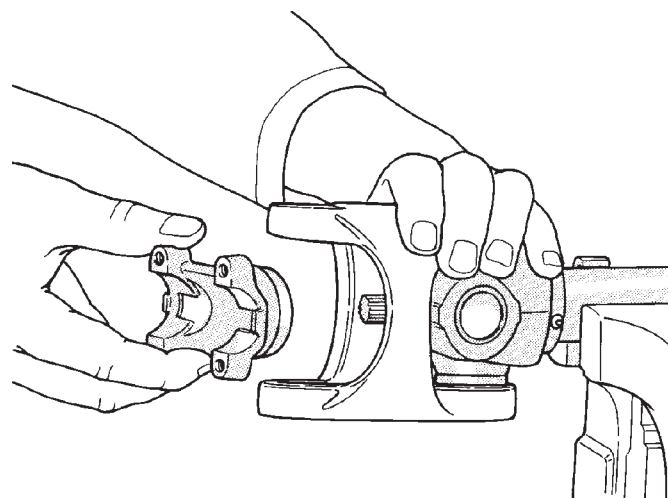
(8) Install snap rings.



J9316-13

**Fig. 31 Install Link Yoke**

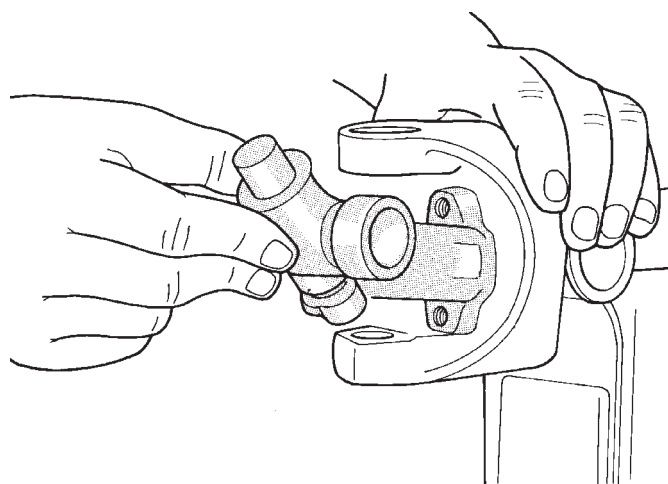
(9) Install the centering kit assembly inside the link yoke making sure the spring is properly positioned (Fig. 32).



J9316-14

**Fig. 32 Install Centering Kit**

(10) Place two bearing caps on opposite trunnions of the remaining cross. Fit the open trunnions into the link yoke bores and the bearing caps into the centering kit (Fig. 33).

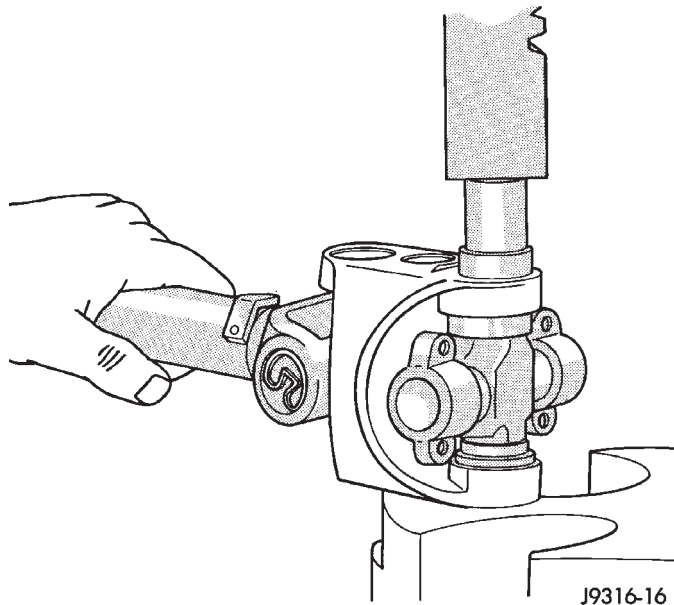


J9316-15

**Fig. 33 Install Remaining Cross**

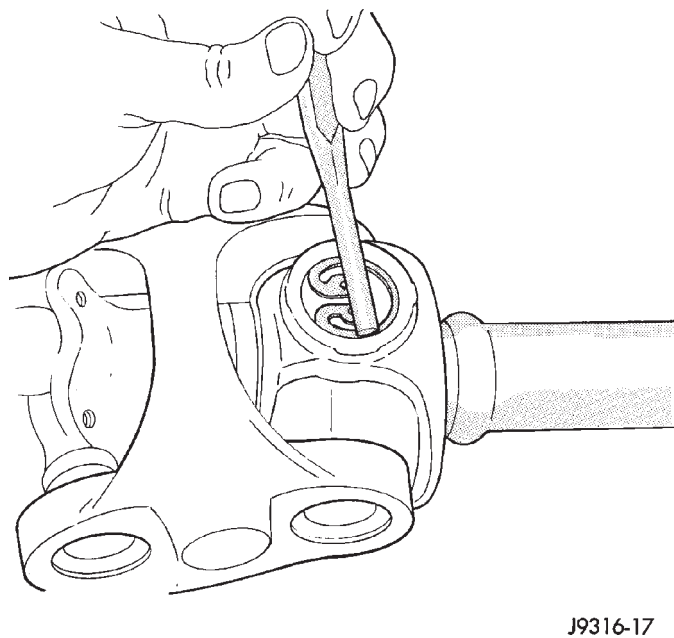
## DISASSEMBLY AND ASSEMBLY (Continued)

(11) Press the remaining two bearing caps into place and install snap rings (Fig. 34).



**Fig. 34 Press In Bearing Cap**

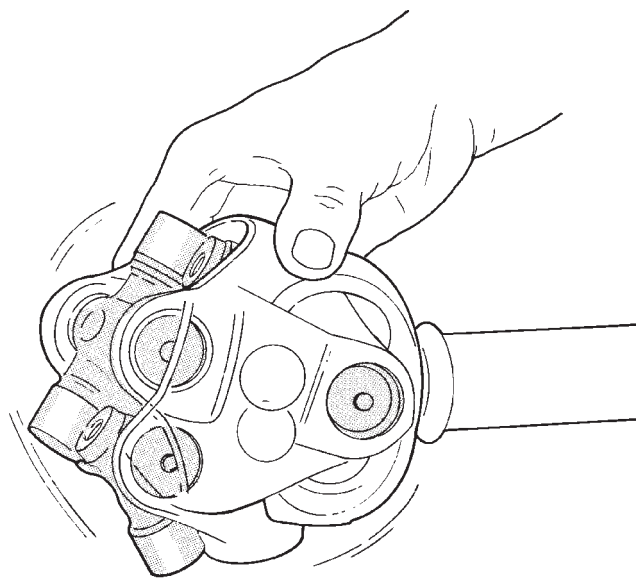
(12) Tap the snap rings to allow them to seat into the grooves (Fig. 35).



**Fig. 35 Seat Snap Rings In Groove**

(13) Check for proper assembly. Flex the joint beyond center, it should snap over-center in both directions when correctly assembled (Fig. 36).

(14) Install the propeller shaft.



**Fig. 36 Check Assembly**

## CLEANING AND INSPECTION

## PROPELLER SHAFT

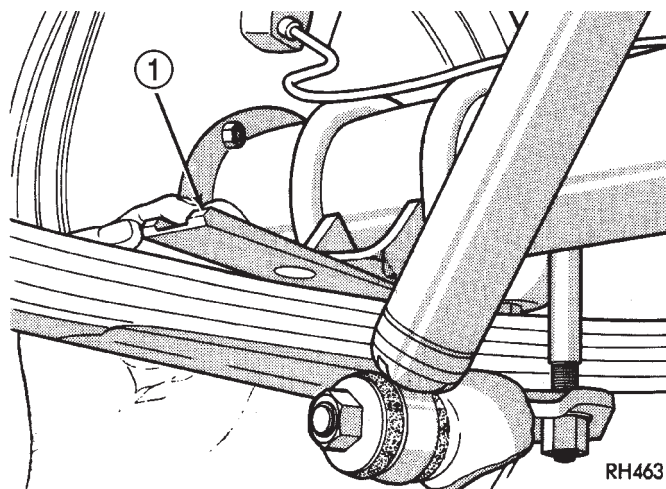
(1) Clean all universal joint bores with cleaning solvent and a wire brush.

(2) Inspect the yokes for distortion, cracks, and worn bearing cap bores.

## ADJUSTMENTS

## REAR AXLE PINION INPUT ANGLE

Adjust the rear axle pinion input angle on vehicles equipped with leaf springs with tapered shims (Fig. 37). Install tapered shims between the springs and axle pad to correct the angle. Refer to Group 2, Suspension, for additional information.



**Fig. 37 Pinion Angle Adjustment at Leaf Springs**

1 - WEDGE

## ADJUSTMENTS (Continued)

### CENTER BEARING ADJUSTMENT

Drive away 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.

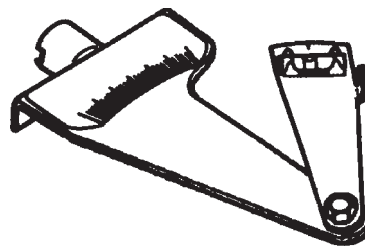
## SPECIFICATIONS

### TORQUE

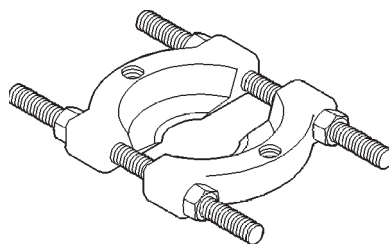
DESCRIPTION	TORQUE
<b>Bolts, Center Bearing</b> . . . . .	68 N·m (50 ft. lbs.)
<b>Bolts, Transfer Case Yoke</b> . . .	27 N·m (20 ft. lbs.)
<b>Bolts, Companion Flange</b> . .	108 N·m (80 ft. lbs.)

### SPECIAL TOOLS

#### PROPELLER SHAFT

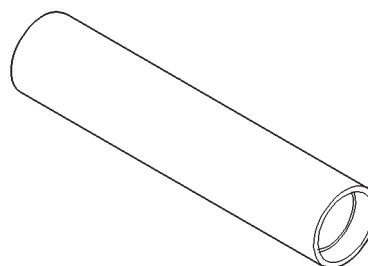


*Inclinometer—7663*



113C-80109ac3

*Bearing Splitter—1130*



*Installer, Bearing—6052*

## FRONT AXLE DRIVESHAFTS

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## DESCRIPTION AND OPERATION

### FRONT AXLE DRIVESHAFTS

#### DESCRIPTION

The two constant velocity (C/V) drive shafts are identical and interchangeable. They are comprised of three major components (Fig. 1) :

- An inner, tripod C/V joint
- A short, solid interconnecting shaft
- An outer, Rzeppa C/V joint with stub shaft

The inner tripod-joints are attached to the axle shaft splines (Fig. 1). The outer joint is splined and mates with the hub bearing on the knuckle.

The lubricant amounts included with replacement rubber boots are different for inner and outer C/V joints. Apply only the specified lubricant amount to each C/V joint.

**CAUTION:** Proper C/V joint boot sealing is critical for retaining the special lubricant. Prevent foreign material from entering and contaminating the C/V joints. Mishandling a C/V drive shaft can cause a boot to be punctured or damage within the joints. Always support both ends of the C/V drive shaft during removal and installation to avoid damage.

When replacing C/V drive shaft components, ensure that only exact replacements parts are installed.

#### OPERATION

The axle driveshafts are located on either side of the differential and transmits power to the drive wheels, while allowing for vertical movement in the vehicle's suspension.

## DIAGNOSIS AND TESTING

### VEHICLE INSPECTION

(1) Check for grease in the vicinity of the inboard tripod joint and outboard C/V joint; this is a sign of inner or outer joint seal boot or seal boot clamp damage.

(2) A light film of grease may appear on the right inner tripod joint seal boot; this is considered normal and should not require replacement of the seal boot.

### NOISE AND/OR VIBRATION IN TURNS

A clicking noise and/or a vibration in turns could be caused by one of the following conditions:

- Damaged outer C/V or inner tripod joint seal boot or seal boot clamps. This will result in the loss and/or contamination of the joint grease, resulting in inadequate lubrication of the joint.
- Noise may also be caused by another component of the vehicle coming in contact with the driveshafts.

### CLUNKING NOISE DURING ACCELERATION

This noise may be a result of one of the following conditions:

- A torn seal boot on the inner or outer joint of the driveshaft assembly which has allowed the C/V joint to become damaged.
- A loose or missing clamp on the inner or outer joint of the driveshaft assembly which has allowed the C/V joint to become damaged.
- A damaged or worn driveshaft C/V joint.

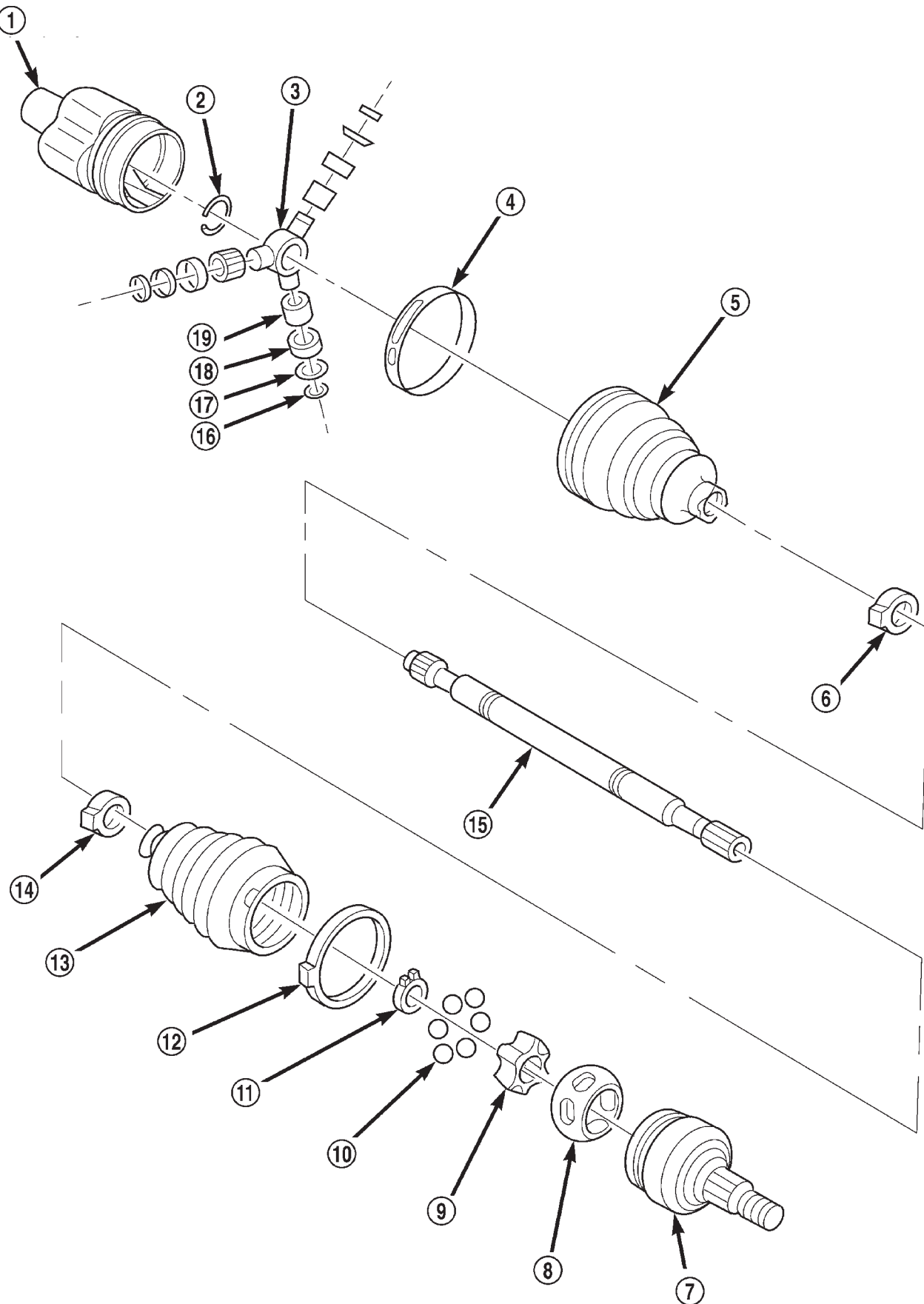
### SHUDDER OR VIBRATION DURING ACCELERATION

This problem could be a result of:

- A worn or damaged driveshaft inner tripod joint.



DIAGNOSIS AND TESTING (Continued)



**Fig. 1 C/V Drive Shaft Components**

## DIAGNOSIS AND TESTING (Continued)

- 1 - RETAINER & HOUSING ASM
- 2 - C-CLIP
- 3 - TRIPOD JOINT SPIDER
- 4 - SEAL RETAINING CLAMP
- 5 - INNER BOOT
- 6 - SEAL RETAINING CLAMP
- 7 - C/V JOINT OUTER RACE
- 8 - C/V JOINT CAGE
- 9 - C/V JOINT INNER RACE
- 10 - CHROME ALLOY BALL

- 11 - RACE RETAINING RING
- 12 - SEAL RETAINING CLAMP
- 13 - DRIVE AXLE OUTBOARD SEAL
- 14 - SEAL RETAINING CLAMP
- 15 - AXLE SHAFT
- 16 - RETAINING RING
- 17 - BALL & ROLLER RETAINER
- 18 - TRIPOD JOINT BALL
- 19 - NEEDLE ROLLER

- A sticking tripod joint spider assembly (inner tripod joint only).
- Improper wheel alignment. Refer to Group 2, Suspension, for alignment checking and setting procedures and specifications.

## VIBRATION AT HIGHWAY SPEEDS

This problem could be a result of:

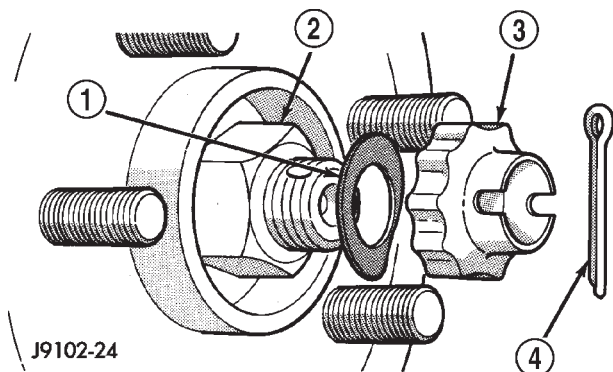
- Foreign material (mud, etc.) packed on the backside of the wheel(s).
- Out of balance front tires or wheels. Refer to Group 22, Wheels And Tires, for the required balancing procedure.
- Improper tire and/or wheel runout. Refer to Group 22, Wheels And Tires, for the required runout checking procedure.

## REMOVAL AND INSTALLATION

## FRONT DRIVESHAFT

## REMOVAL

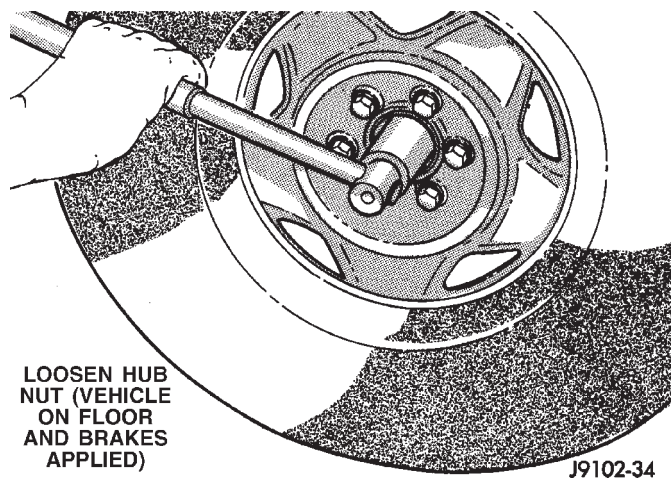
- (1) Remove the cotter pin, nut lock, and spring washer from the stub shaft (Fig. 2).



**Fig. 2 Cotter Pin, Nut Lock & Spring Washer Removal**

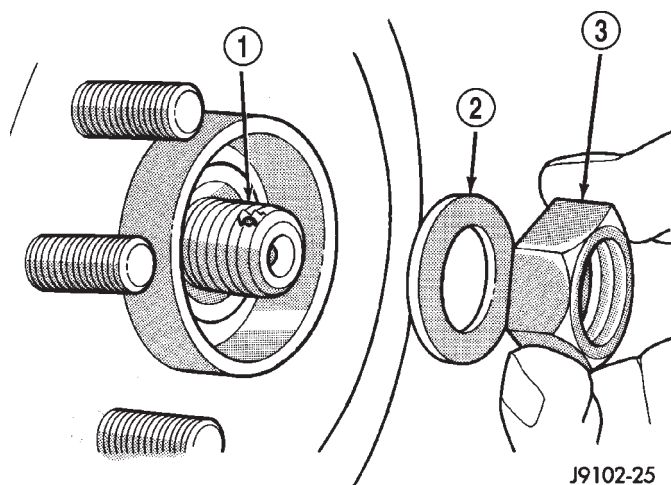
- 1 - SPRING WASHER
- 2 - HUB NUT
- 3 - NUT LOCK
- 4 - COTTER PIN

- (2) Loosen the lug nuts and hub nut while the vehicle is on the surface with the brakes applied (Fig. 3).



**Fig. 3 Loosening Wheel Hub Nut**

- (3) Raise the vehicle.  
 (4) Remove the skid plate, if equipped.  
 (5) Remove the hub nut and washer from the stub shaft (Fig. 4).  
 (6) Remove the wheel and tire.



**Fig. 4 Hub Nut & Washer**

- 1 - DRIVE SHAFT
- 2 - HUB WASHER
- 3 - HUB NUT

## REMOVAL AND INSTALLATION (Continued)

(7) Remove the brake caliper and rotor. Refer to Group 5, Brakes, for proper procedures.

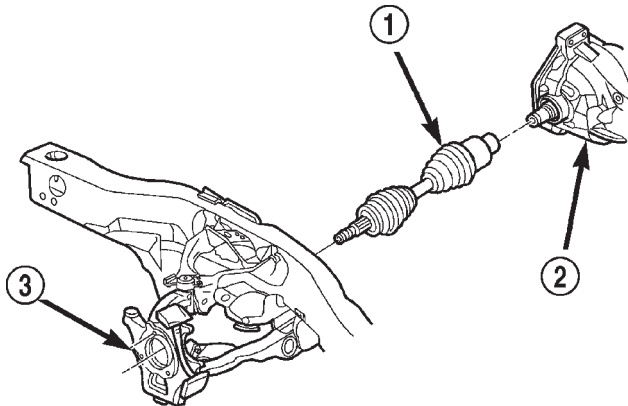
(8) Remove the ABS wheel speed sensor, if equipped. Refer to Group 5, Brakes, for proper procedures.

(9) Remove the bolts holding the hub bearing to the knuckle.

(10) Remove hub bearing from axle driveshaft and steering knuckle.

(11) Support the drive shaft at the C/V joint housings.

(12) Disengage the inner C/V joint from the axle shaft (Fig. 5). Position two pry bars between the inner C/V housing and the axle housing. Apply pressure away from the differential housing. This will disengage the axle shaft snap-ring from the groove on the inside of the C/V housing.



80c072e6

**Fig. 5 Front Driveshaft**

- 1 - DRIVESHAFT
- 2 - FRONT AXLE
- 3 - STEERING KNUCKLE

(13) Remove the driveshaft from the vehicle.

## INSTALLATION

(1) Insert the C/V drive shaft stub into the hub bearing bore of the steering knuckle.

(2) Apply a light coating of wheel bearing grease on the axle shaft splines.

(3) Install the inner C/V joint onto the axle shaft flange. Push firmly on the shaft until the axle shaft snap-ring engages with the groove on the inside of the joint housing.

(4) Clean hub bearing bore, axle driveshaft splines, and hub bearing mating surface of all foreign materials. Apply light coating of grease to all mating surfaces.

(5) Install the hub bearing to the axle driveshaft and the steering knuckle.

(6) Install the bolts to hold the hub bearing to the steering knuckle. Refer to Group 2, Suspension, for the proper torque.

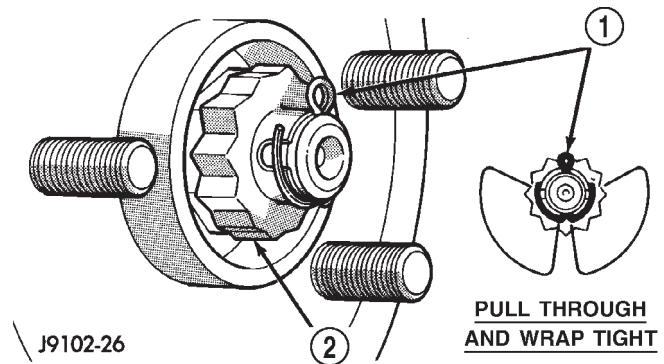
(7) Clean all foreign material from the stub shaft threads. Install the hub nut and washer.

(8) Install the ABS wheel speed sensor, if equipped. Refer to Group 5, Brakes, for proper procedures.

(9) Install the brake caliper and rotor. Refer to Group 5, Brakes, for proper procedures.

(10) Apply the brakes and tighten hub nut to 244 N·m (180 ft. lbs.) torque.

(11) Install the spring washer, nut lock and cotter pin on the stub shaft (Fig. 6).



**Fig. 6 Cotter Pin Installation**

- 1 - COTTER PIN
- 2 - NUT LOCK

(12) Install the skid plate, if equipped.

(13) Install the wheel and tire.

## C/V JOINT BOOTS

### REMOVAL

(1) Remove axle driveshaft from vehicle.

(2) Remove outer C/V joint.

(3) Remove outer C/V joint small clamp and remove boot (Fig. 7).

(4) Remove inner C/V joint boot clamps and remove boot.

### INSTALLATION

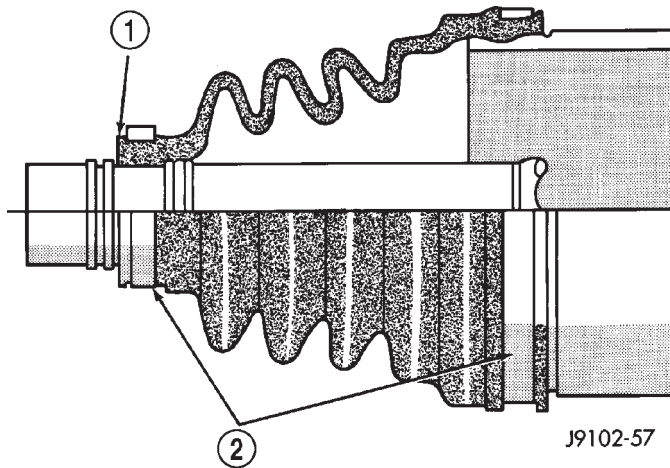
The lubricant amounts included with replacement boots are different for inner and outer C/V joints. Apply only the specified lubricant amount to each C/V joint.

(1) Clean the C/V joints and shaft of all old grease and foreign matter.

(2) Slide the inner C/V joint boot up the shaft and insert the lip located within the small-diameter end of the boot into the shaft groove (Fig. 7).

(3) Retain the small-diameter of the boot on the shaft with a ladder-type clamp in the boot groove

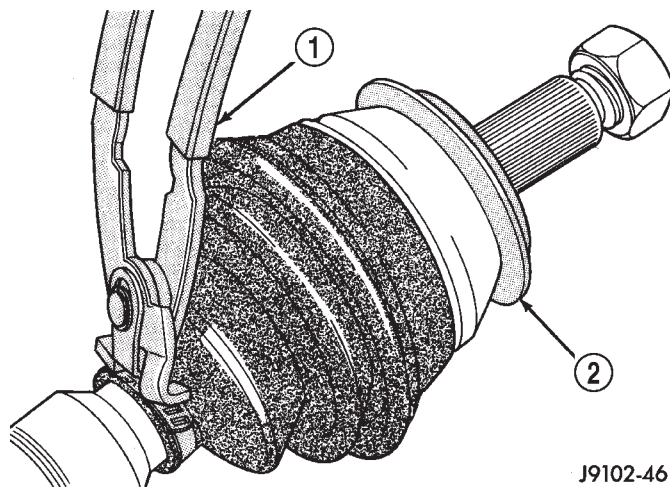
## REMOVAL AND INSTALLATION (Continued)

**Fig. 7 Boot Retaining Clamp Locations**

- 1 - POSITION ON FLAT BETWEEN LOCATING SHOULDERS  
2 - CLAMPS

(Fig. 7). Verify that the boot and lip are properly positioned on the intermediate shaft. Position the clamp locating tabs in the slots and tighten the clamp.

(4) Compress the clamp bridge with Remover/Installer C-4124. Squeeze the tool handles to complete the tightening of the clamp (Fig. 8). **Care must be exercised when using the tool to avoid cutting through the clamp bridge or damaging the boot.**

**Fig. 8 Compressing Clamp Bridge**

- 1 - TOOL C-4124  
2 - SLINGER

(5) Position the large-diameter end of the boot on the C/V joint housing.

(6) After the inner joint boot small clamp is installed, the inboard hub must be set to a service build length.

(a) Compress the inner hub down the connector shaft.

(b) Use a small blunt drift between the large end and the boot seal to relieve the pressure.

(c) The distance edge of the lip to the edge of the flange should be 181.00 mm (7.13 in.). This will eliminate excess air that can cause a ballooning affect and possibly cause damage to the boot.

(7) Verify that the boot is not twisted and that it is correctly positioned on the housing.

(8) Install the large ladder clamp on the boot and secure as done with the small ladder clamps (Fig. 8).

(9) Slide the outer C/V joint boot small clamp onto shaft.

(10) Slide outer C/V joint boot onto shaft and into position on shaft.

(11) Install small clamp to boot as done above.

(12) Install large boot clamp over outer C/V joint.

(13) Install outer C/V joint to shaft.

(14) Install large boot clamp to boot and C/V joint.

(15) Install the C/V driveshaft.

## DISASSEMBLY AND ASSEMBLY

## INNER C/V JOINT

## DISASSEMBLY

(1) Remove the axle driveshaft.

(2) Place the inner C/V joint housing in a vise.

(3) Remove the inner boot retaining clamps. Pull the inner boot back onto the interconnecting shaft. Discard the retaining clamps.

(4) Pull the tripod and shaft straight out from the inner C/V joint housing.

(5) Remove the snap retaining ring from the groove behind the tripod (Fig. 9). Slide the tripod toward the center of the shaft. Remove the C-clip on the outer end of the shaft (Fig. 10).

(6) Remove the tripod from the shaft. Replace the boot, if necessary.

(7) Remove the lubricant from the interior of the housing and from the tripod.

(8) Inspect the needle bearing raceways in the housing and tripod components for excessive wear and damage. Replace the tripod as a unit only if necessary.

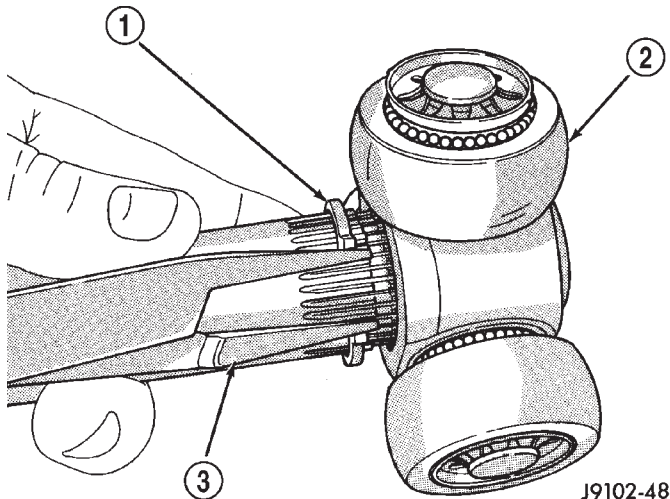
## ASSEMBLY

(1) Slide the boot down enough for work access.

(2) Install the snap ring past the ring groove (toward the center of the shaft). Slide the tripod onto the end of the interconnecting shaft. Be sure the chamfered end of the tripod is adjacent to the C-clip retaining ring groove (Fig. 10).



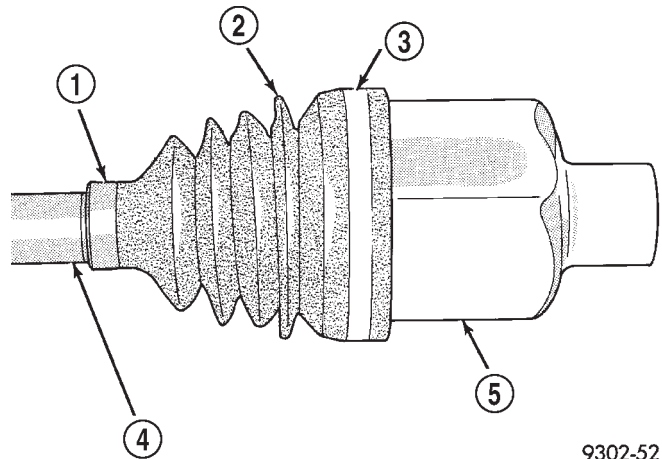
DISASSEMBLY AND ASSEMBLY (Continued)



**Fig. 9 Snap Retaining Ring Removal**

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

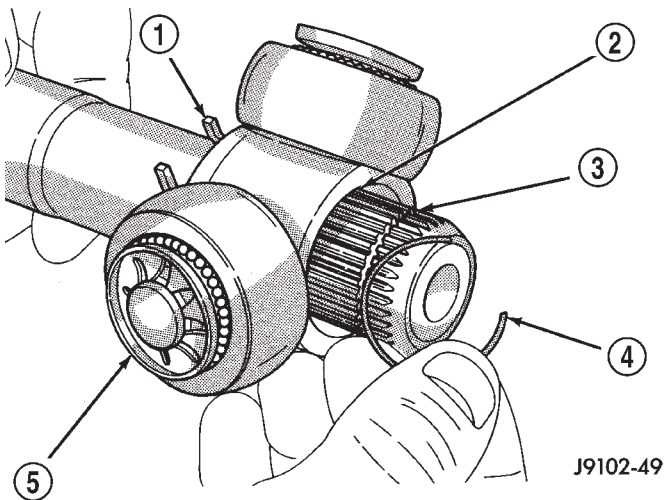
J9102-48



**Fig. 11 Inner C/V Joint Boot**

- 1 - SMALL CLAMP
- 2 - SEALING BOOT
- 3 - LARGE CLAMP
- 4 - INTERCONNECTING SHAFT
- 5 - INNER TRIPOD JOINT

9302-52



**Fig. 10 C-Clip Removal/Installation**

- 1 - SNAP RING
- 2 - CHAMFERED EDGE
- 3 - C-CLIP GROOVE
- 4 - C-CLIP
- 5 - TRIPOD

J9102-49

(3) Install the C-clip in the groove. Slide the tripod out against the clip. Install the snap ring in the inner groove. Be sure the snap ring and C-clip are seated.

(4) Apply the required quantity of lubricant to the housing and boot. Coat the interior of the joint housing and the tripod.

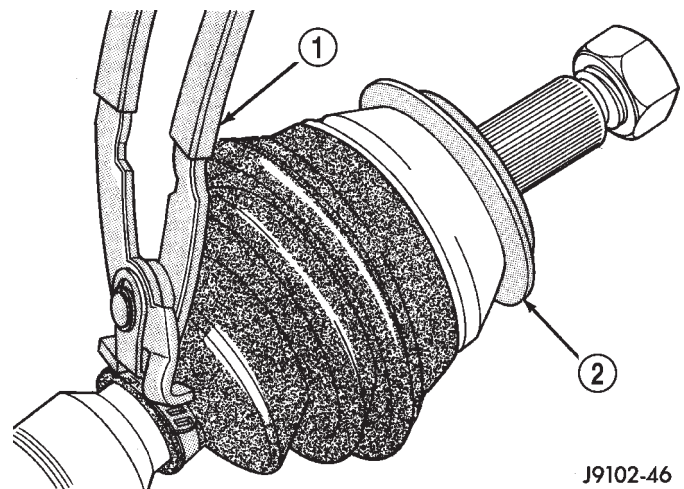
(5) Insert and seat the tripod and shaft in the housing.

(6) Position the large-diameter end of the inner C/V joint boot over the edge of the housing. Insert the lip of the boot into the locating groove at the edge of the housing (Fig. 11).

(7) Insert the small lip into the locating groove in the interconnecting shaft.

(8) Retain the small-diameter of the boot on the shaft with a ladder-type clamp in the boot groove. Verify that the boot and lip are properly positioned on the intermediate shaft. Position the clamp locating tabs in the slots and tighten the clamp.

(9) Compress the clamp bridge with Remover/Installer C-4124. Squeeze the tool handles to complete the tightening of the clamp (Fig. 12). **Care must be exercised when using the tool to avoid cutting through the clamp bridge or damaging the boot.**



**Fig. 12 Compressing Clamp Bridge**

- 1 - TOOL C-4124
- 2 - SLINGER

J9102-46

(10) Position the large-diameter end of the boot on the C/V joint housing.



## DISASSEMBLY AND ASSEMBLY (Continued)

(11) After the inner joint boot small clamp is installed, the inboard hub must be set to a service build length.

(a) Compress the inner hub down the connector shaft.

(b) Use a small blunt drift between the large end and the boot seal to relieve the pressure.

(c) The distance edge of the lip to the edge of the flange should be 181.00 mm (7.13 in.). This will eliminate excess air that can cause a ballooning affect and possibly cause damage to the boot.

(12) Verify that the boot is not twisted and that it is correctly positioned on the housing.

(13) Install the large ladder clamp on the boot and secure as done with the small ladder clamp (Fig. 12).

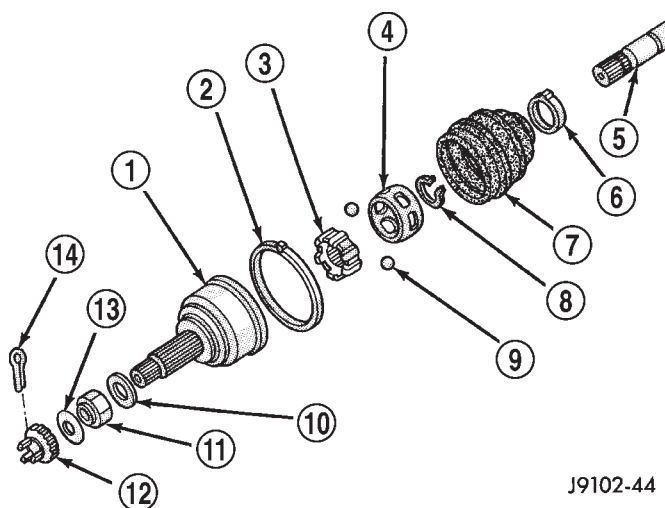
## OUTER C/V JOINT

If the outer C/V joint is excessively worn, replace the entire C/V joint and boot.

## DISASSEMBLY

(1) Remove retaining clamps from the outer C/V joint and discard. Slide the boot off the outer joint and down the shaft.

(2) Remove the lubricant to expose the outer C/V joint components (Fig. 13).



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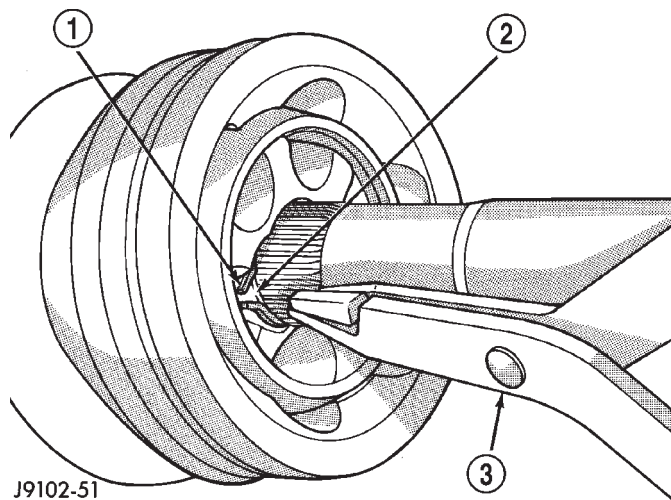
**Fig. 13 Outer C/V Joint Components**

- 1 - RZEPPA JOINT HOUSING (OUTER)
- 2 - CLAMP
- 3 - BEARING HUB
- 4 - BEARING CAGE
- 5 - SHAFT
- 6 - CLAMP
- 7 - BOOT
- 8 - SNAP RING
- 9 - BALLS (6)
- 10 - WASHER
- 11 - HUB NUT
- 12 - NUT LOCK
- 13 - SPRING WASHER
- 14 - COTTER PIN

(3) Clamp the shaft in a vise (with soft jaws). Support the outer C/V joint.

(4) Use snap ring pliers to release the clip from the groove.

(5) Slide the outer C/V joint from the shaft (Fig. 14).



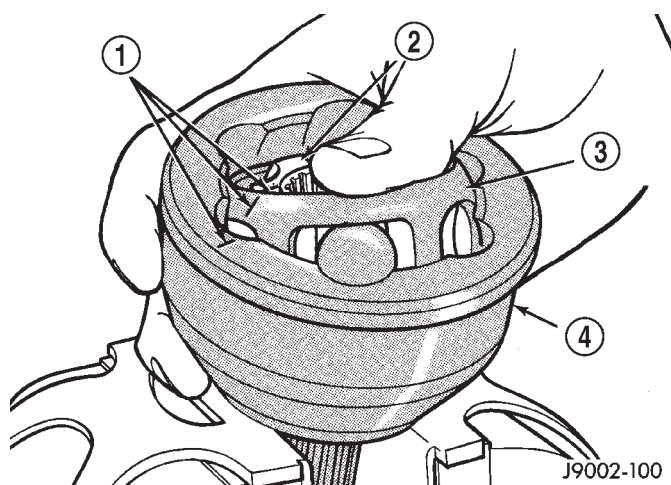
J9102-51

**Fig. 14 Outer C/V Joint Removal**

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

(6) Remove the slinger, if damaged, from the outer C/V joint. Use a brass drift and a hammer. Tap slinger ring off C/V joint and discard.

(7) Remove the old lubricant. Apply installation alignment marks on the bearing hub, bearing cage and housing with dabs of paint (Fig. 15).



J9002-100

**Fig. 15 Ball Access**

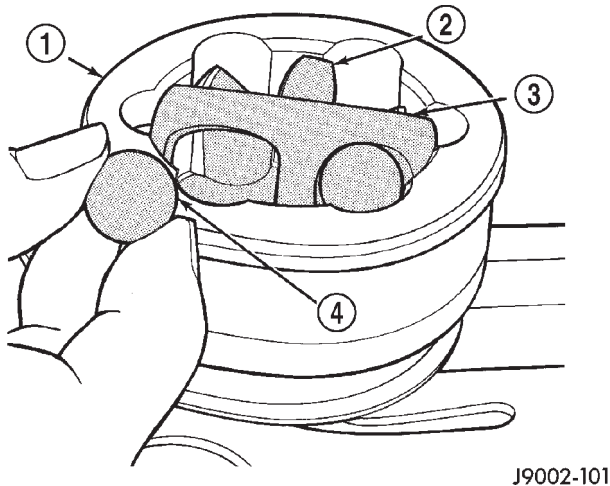
- 1 - INSTALLATION ALIGNMENT MARKS
- 2 - BEARING HUB
- 3 - BEARING CAGE
- 4 - CV JOINT HOUSING (OUTER)

## DISASSEMBLY AND ASSEMBLY (Continued)

(8) Clamp the outer C/V joint in a vertical position. Place the stub shaft in a soft-jawed vise.

(9) Press down on one side of the bearing cage/hub to tilt the cage. This will provide access to a ball at the opposite side of the cage. If the C/V 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 the ball from the bearing cage (Fig. 16). If necessary, a small pry bar can be used to pry the ball loose from the cage.



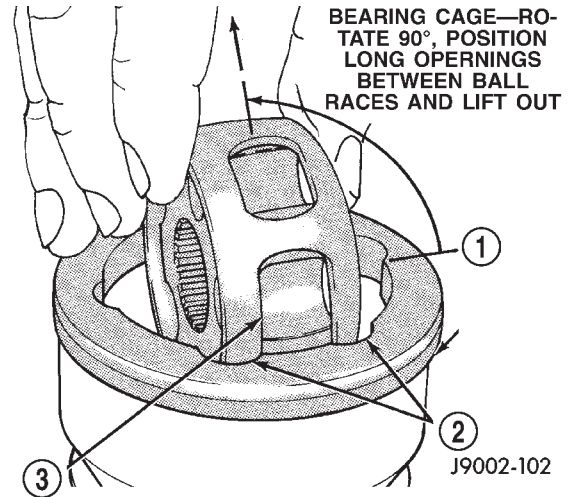
**Fig. 16 Ball Removal**

- 1 - CV JOINT HOUSING (OUTER)
- 2 - BEARING HUB (UP)
- 3 - BEARING CAGE (UP)
- 4 - BALL

(11) Repeat the step above until all six balls are removed from the bearing cage.

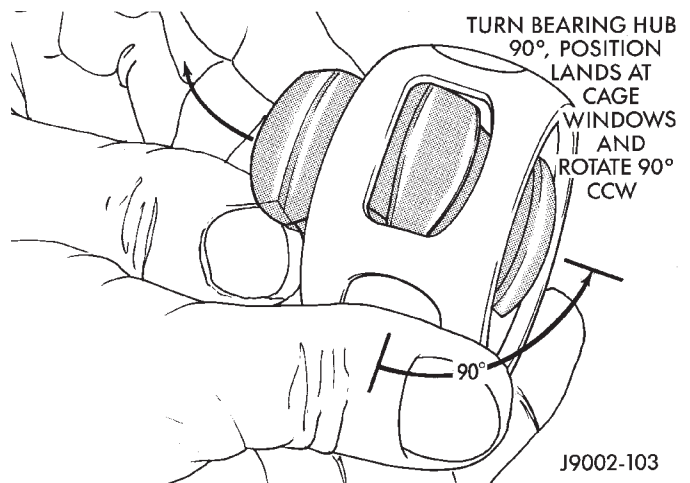
(12) Tilt the bearing cage and hub to a vertical position. Remove the cage from the housing. Pull cage upward and away from the housing (Fig. 17).

(13) Turn the bearing hub 90° from the bearing cage. Align one pair of the hub lands with the cage windows. Raise and insert one of the lands into the adjacent cage window. Remove the bearing hub by rolling it out of the cage (Fig. 18).



**Fig. 17 Bearing Cage & Hub Removal**

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



**Fig. 18 Bearing Hub Removal**

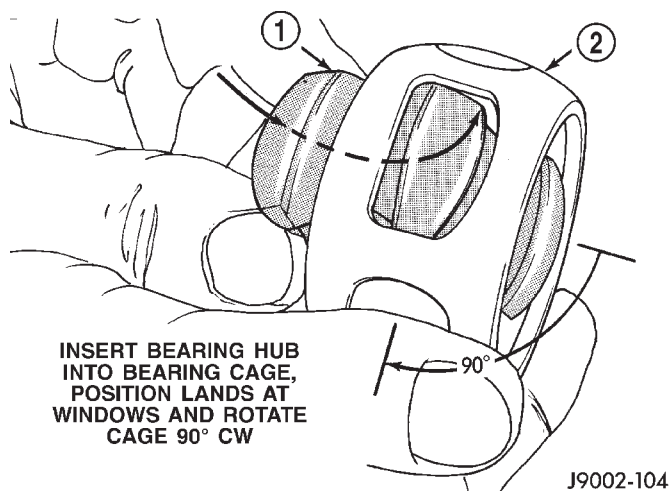
## ASSEMBLY

(1) Lightly apply lubricating oil to all the outer C/V joint components before assembling them.

(2) Align the bearing hub, cage and housing (Fig. 15) according to the alignment reference marks.

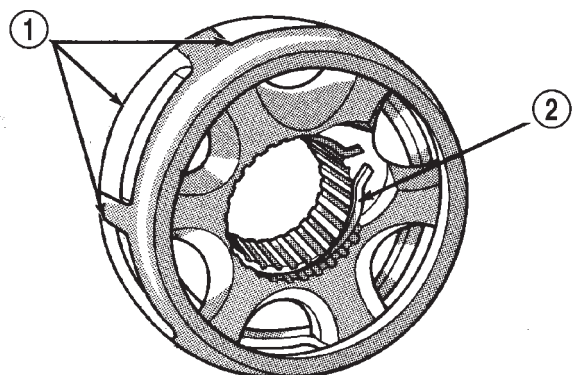
## DISASSEMBLY AND ASSEMBLY (Continued)

(3) Insert one of the bearing hub lands into a bearing cage window (Fig. 18). Roll the hub into the cage (Fig. 19). Rotate the bearing hub 90° to complete the installation (Fig. 20).



**Fig. 19 Bearing Hub Installation**

- 1 - BEARING HUB
- 2 - BEARING CAGE



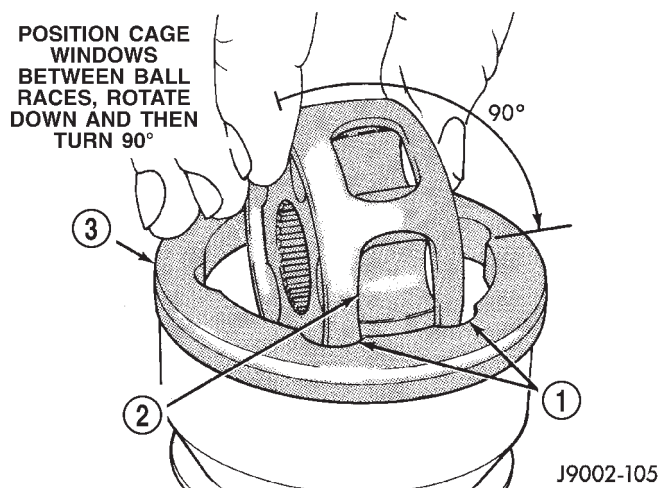
**Fig. 20 Assembled Bearing Cage & Hub**

- 1 - CAGE WINDOWS
- 2 - CIRCLIP RETAINER

(4) Insert bearing cage/hub into the housing (Fig. 21). Rotate the cage/hub 90° to complete the installation (Fig. 22).

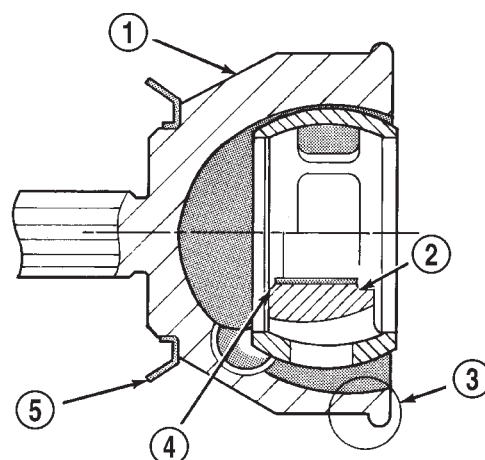
(5) Apply the lubricant included with the replacement boot to the ball raceways. Spread the lubricant equally between all the raceways. One packet of lubricant is sufficient to lubricate the complete C/V joint.

(6) Tilt the bearing hub and cage and install the balls in the raceways (Fig. 23).



**Fig. 21 Bearing Cage & Hub Installation**

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



**Fig. 22 Bearing Cage & Hub Installed In Housing**

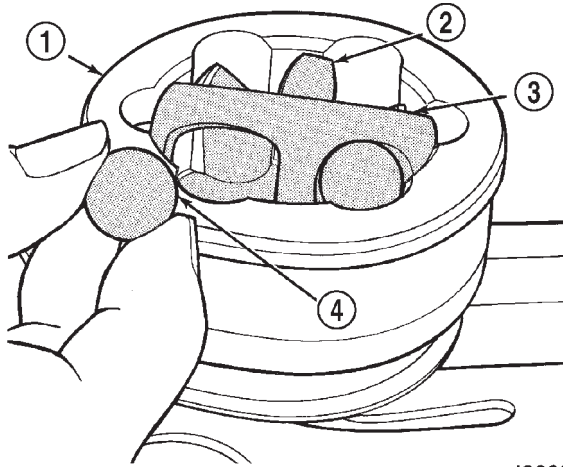
- 1 - CV JOINT HOUSING (OUTER)
- 2 - BEARING HUB LARGE COUNTERBORE OUTWARD
- 3 - BOOT RETAINING SHOULDER
- 4 - BEARING HUB SMALL COUNTERBORE INWARD
- 5 - SLINGER

(7) Apply a small amount of lubricant to inner diameter of slinger. Place slinger squarely on the outer C/V joint. Use installer tool L-4518-1 from tool set L-4518 and hammer slinger onto joint until it seats (Fig. 24).

**CAUTION:** Prevent damage to the slinger after installation or a when a replacement outer C/V joint is installed.



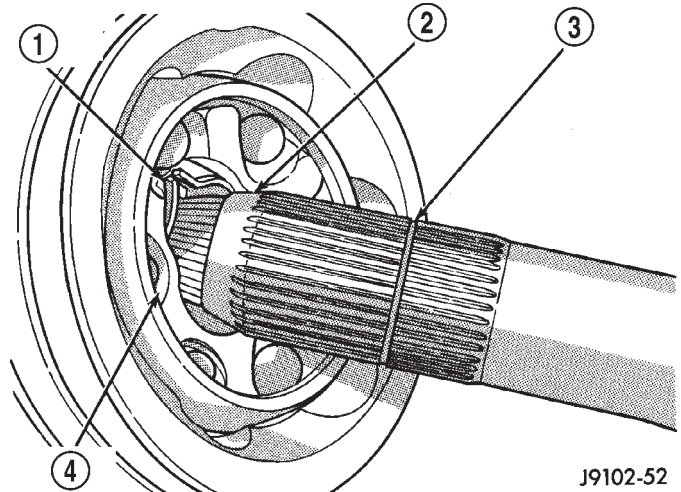
DISASSEMBLY AND ASSEMBLY (Continued)



J9002-101

**Fig. 23 Ball Installation In Raceway**

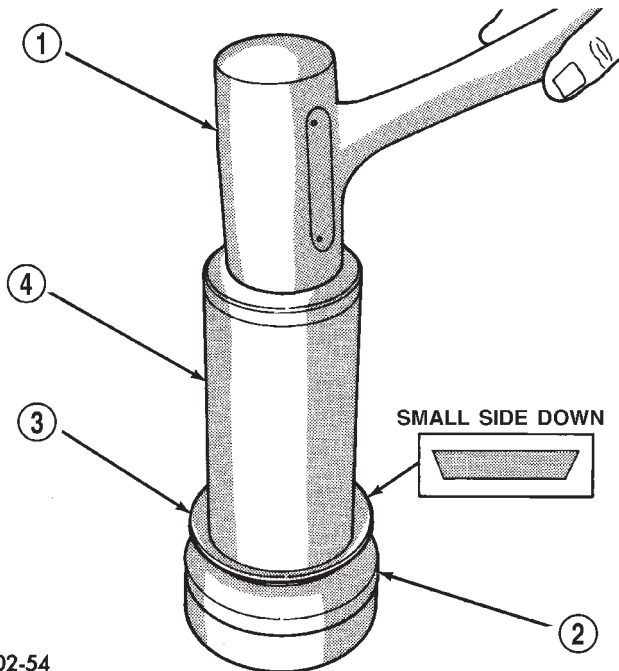
- 1 - CV JOINT HOUSING (OUTER)
- 2 - BEARING HUB (UP)
- 3 - BEARING CAGE (UP)
- 4 - BALL



J9102-52

**Fig. 25 Outer C/V Joint Installation**

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



J9102-54

**Fig. 24 Slinger Installation**

- 1 - HAMMER
- 2 - OUTER C.V. JOINT
- 3 - SLINGER
- 4 - SPECIAL TOOL L-4518-1

(8) Position the small-diameter end of the replacement boot on the interconnecting shaft. Retain the boot with a replacement clamp.

(9) Apply the required amount of lubricant to the outer C/V joint and boot.

(10) Align the shaft splines to the outer C/V joint splines. Push the outer C/V joint until the snap ring seats in the groove (Fig. 25).

(11) Ensure that the snap ring is properly seated in the housing. Pull the outer C/V joint from the interconnecting shaft to test.

(12) Place the large-diameter end of the replacement boot over the edge of the C/V joint housing. Ensure that the boot is not twisted.

(13) Retain the boot on the housing with a replacement retaining clamps.

## CLEANING AND INSPECTION

### C/V JOINT

Inspect the lubricant for contamination. Inspect the C/V joint components for defects according to the following instructions.

(1) Clean all the components with an appropriate solvent and dry them with compressed air.

(2) Inspect the ball raceways in the housing for excessive wear and scoring.

(3) Examine the stub shaft splines and threads for damage.

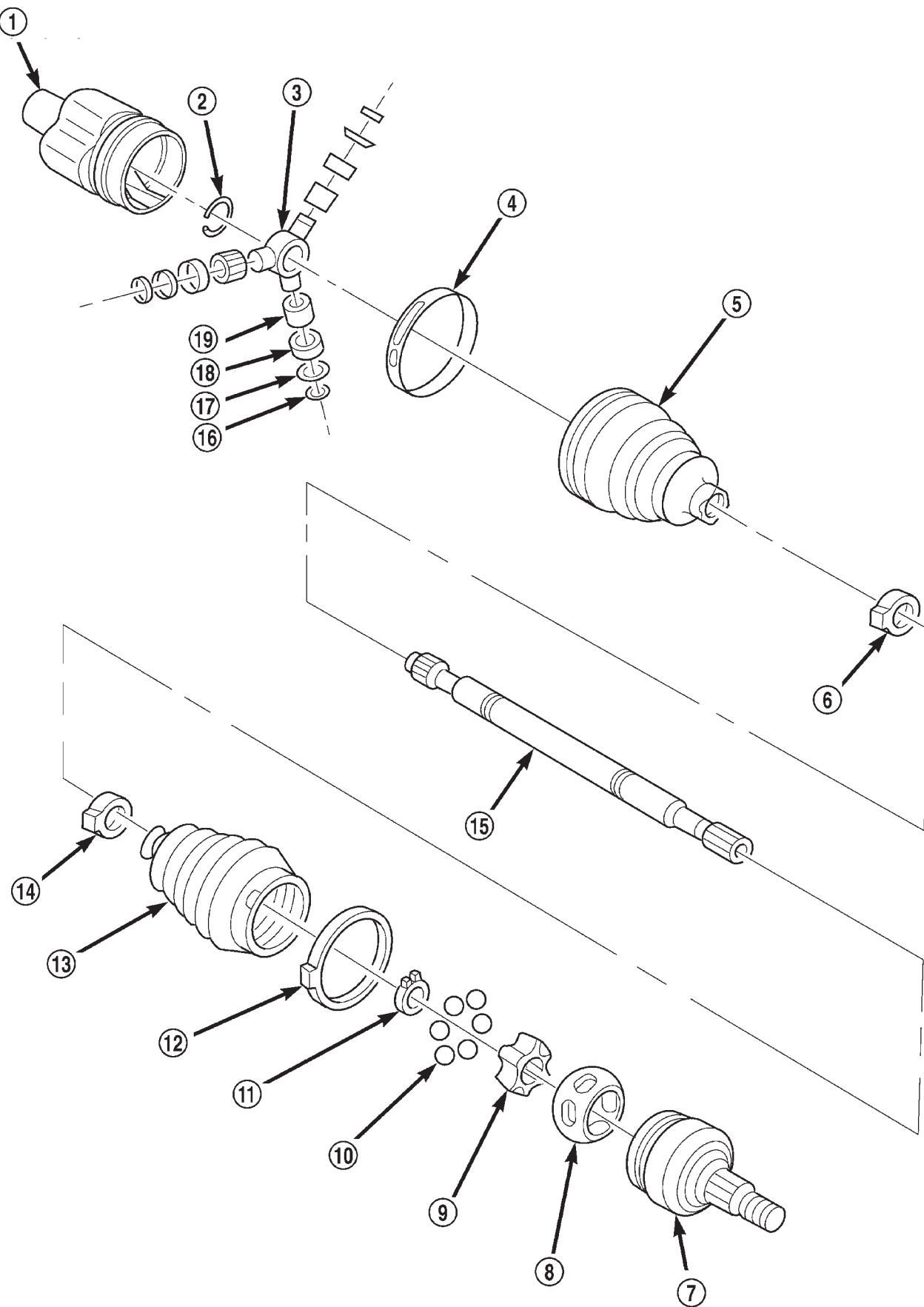
(4) Inspect the balls for pitting, cracks, scoring and excessive wear. A dull exterior surface is normal.

(5) Inspect the bearing cage for wear, grooves, ripples, cracks and chipping.

(6) Inspect the bearing hub (Fig. 26) for excessive wear and scoring on ball raceways.

**Polished contact surface areas on the raceways and on the bearing cage spheres are normal. If the joints cause a noise or a vibration, replace them.**

## CLEANING AND INSPECTION (Continued)

**Fig. 26 Drive Shaft Components**



CLEANING AND INSPECTION (Continued)

- |                            |                               |
|----------------------------|-------------------------------|
| 1 – RETAINER & HOUSING ASM | 11 – RACE RETAINING RING      |
| 2 – C-CLIP                 | 12 – SEAL RETAINING CLAMP     |
| 3 – TRIPOD JOINT SPIDER    | 13 – DRIVE AXLE OUTBOARD SEAL |
| 4 – SEAL RETAINING CLAMP   | 14 – SEAL RETAINING CLAMP     |
| 5 – INNER BOOT             | 15 – AXLE SHAFT               |
| 6 – SEAL RETAINING CLAMP   | 16 – RETAINING RING           |
| 7 – C/V JOINT OUTER RACE   | 17 – BALL & ROLLER RETAINER   |
| 8 – C/V JOINT CAGE         | 18 – TRIPOD JOINT BALL        |
| 9 – C/V JOINT INNER RACE   | 19 – NEEDLE ROLLER            |
| 10 – CHROME ALLOY BALL     |                               |

C/V JOINT BOOTS

Look for lubricant around the exterior of a boot. When a C/V drive shaft is removed from the vehicle for service, the boot should be properly cleaned. Inspect for cracks, tears and scuffed areas on the surfaces. If any of these conditions exist, boot replacement is recommended.

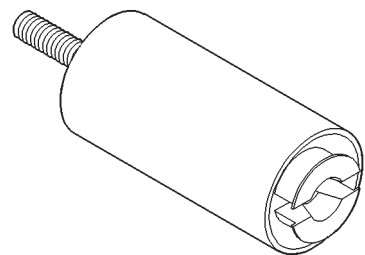
SPECIFICATIONS

TORQUE

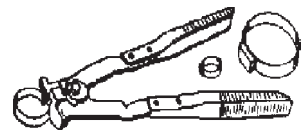
DESCRIPTION	TORQUE
Bolts, Axle Flange . . . . .	90 N·m (65 ft. lbs.)
Nut, Axle . . . . .	244 N·m (180 ft. lbs.)

SPECIAL TOOLS

C/V JOINT DRIVESHAFT



*Tool Set—L-4518*



*Remover/Installer—C-4124*

## C205F AXLE

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## DESCRIPTION AND OPERATION

### C205F AXLE

#### DESCRIPTION

The C205F ( **C** orporate **205** mm ring gear **F** ront) axle consists of an aluminum center section with an axle tube extending from one side. The tube is pressed into the differential housing.

The integral type housing, hypoid gear design has the centerline of the pinion set below the centerline of the ring gear.

The axle has a fitting for a vent hose used to relieve internal pressure caused by vaporization and internal expansion.

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.

The cover provides a means for inspection and service without removing the axle from the vehicle.

The C205F axle has the assembly date and gear ratio listed on a tag. The tag is attached to the housing cover by a cover bolt.

The differential case is a one-piece design. The differential pinion mate shaft is retained with a roll-pin. Differential bearing preload and ring gear backlash is adjusted by the use of shims (select thick-

ness). The shims are located between the differential bearing cups and the axle housing. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

#### OPERATION

The axle receives power from the transfer case through the front propeller shaft. The front 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.

### LUBRICANT

#### DESCRIPTION

A multi-purpose, hypoid gear lubricant which conforms to the following specifications should be used. Mopar® Hypoid Gear Lubricant conforms to all of these specifications.

- The lubricant should have MIL-L-2105C and API GL 5 quality specifications.

- Lubricant is a thermally stable SAE 80W-90 gear lubricant.

The C205F axle lubricant capacity is 1.66 L (3.5 pts.).

## DESCRIPTION AND OPERATION (Continued)

**CAUTION:** If axle is submerged in water, lubricant must be replaced immediately to avoid possible premature axle failure.

### STANDARD DIFFERENTIAL

#### DESCRIPTION

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

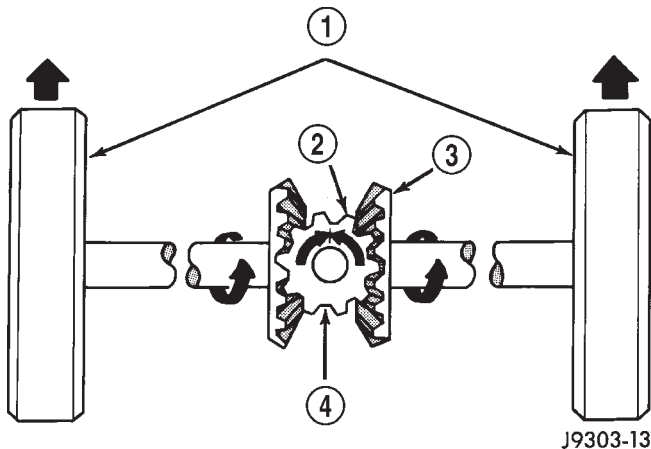
Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

#### OPERATION

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

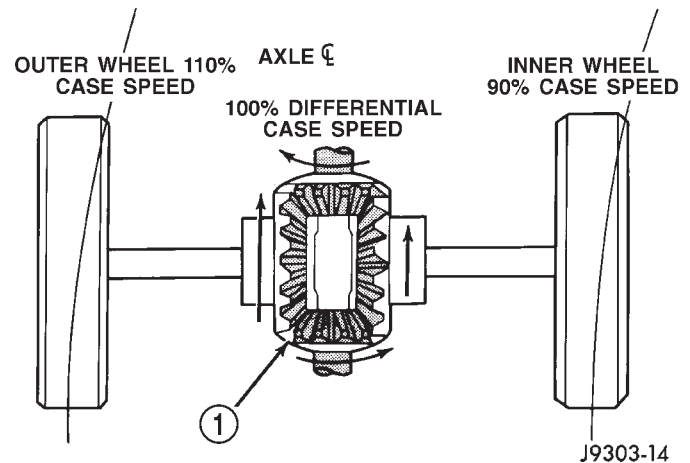
During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 1).



**Fig. 1 Differential Operation—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. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 2). 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. 2 Differential Operation—On Turns**

- 1 – PINION GEARS ROTATE ON PINION SHAFT

## DIAGNOSIS AND TESTING

### GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.
- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.

- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.
- Differential housing bores not square to each other.

## DIAGNOSIS AND TESTING (Continued)

## DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	<ol style="list-style-type: none"> <li>1. Wheel loose.</li> <li>2. Faulty, brinelled wheel bearing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten loose nuts.</li> <li>2. Replace bearing.</li> </ol>
Axle Shaft Noise	<ol style="list-style-type: none"> <li>1. Misaligned axle tube.</li> <li>2. Bent or sprung axle shaft.</li> <li>3. End-play in pinion bearings.</li> <li>4. Excessive gear backlash between the ring gear and pinion.</li> <li>5. Improper adjustment of pinion gear bearings.</li> <li>6. Loose pinion companion flange nut.</li> <li>7. Scuffed gear tooth contact surfaces.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspect axle tube alignment. Correct as necessary.</li> <li>2. Inspect and correct as necessary.</li> <li>3. Refer to pinion pre-load information and correct as necessary.</li> <li>4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.</li> <li>5. Adjust the pinion bearings pre-load.</li> <li>6. Tighten the pinion companion flange nut.</li> <li>7. Inspect and replace as necessary.</li> </ol>
Axle Shaft Broke	<ol style="list-style-type: none"> <li>1. Misaligned axle tube.</li> <li>2. Vehicle overloaded.</li> <li>3. Erratic clutch operation.</li> <li>4. Grabbing clutch.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the broken shaft after correcting tube mis-alignment.</li> <li>2. Replace broken shaft and avoid excessive weight on vehicle.</li> <li>3. Replace broken shaft and avoid or correct erratic clutch operation.</li> <li>4. Replace broken shaft and inspect and repair clutch as necessary.</li> </ol>
Differential Cracked	<ol style="list-style-type: none"> <li>1. Improper adjustment of the differential bearings.</li> <li>2. Excessive ring gear backlash.</li> <li>3. Vehicle overloaded.</li> <li>4. Erratic clutch operation.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.</li> <li>2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.</li> <li>3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.</li> <li>4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.</li> </ol>

## DIAGNOSIS AND TESTING (Continued)

Condition	Possible Causes	Correction
Differential Gears Scored	<ol style="list-style-type: none"> <li>1. Insufficient lubrication.</li> <li>2. Improper grade of lubricant.</li> <li>3. Excessive spinning of one wheel/tire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>2. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.</li> </ol>
Loss Of Lubricant	<ol style="list-style-type: none"> <li>1. Lubricant level too high.</li> <li>2. Worn axle shaft seals.</li> <li>3. Cracked differential housing.</li> <li>4. Worn pinion seal.</li> <li>5. Worn/scored companion flange.</li> <li>6. Axle cover not properly sealed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Drain lubricant to the correct level.</li> <li>2. Replace seals.</li> <li>3. Repair as necessary.</li> <li>4. Replace seal.</li> <li>5. Replace companion flange and seal.</li> <li>6. Remove, clean, and re-seal cover.</li> </ol>
Axle Overheating	<ol style="list-style-type: none"> <li>1. Lubricant level low.</li> <li>2. Improper grade of lubricant.</li> <li>3. Bearing pre-loads too high.</li> <li>4. Insufficient ring gear backlash.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill differential to correct level.</li> <li>2. Fill differential with the correct fluid type and quantity.</li> <li>3. Re-adjust bearing pre-loads.</li> <li>4. Re-adjust ring gear backlash.</li> </ol>
Gear Teeth Broke	<ol style="list-style-type: none"> <li>1. Overloading.</li> <li>2. Erratic clutch operation.</li> <li>3. Ice-spotted pavement.</li> <li>4. Improper adjustments.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace gears. Examine other gears and bearings for possible damage.</li> <li>2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.</li> <li>3. Replace gears and examine remaining parts for damage.</li> <li>4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.</li> </ol>



## DIAGNOSIS AND TESTING (Continued)

Condition	Possible Causes	Correction
Axle Noise	<ol style="list-style-type: none"> <li>1. Insufficient lubricant.</li> <li>2. Improper ring gear and pinion adjustment.</li> <li>3. Unmatched ring gear and pinion.</li> <li>4. Worn teeth on ring gear and/or pinion.</li> <li>5. Loose pinion bearings.</li> <li>6. Loose differential bearings.</li> <li>7. Mis-aligned or sprung ring gear.</li> <li>8. Loose differential bearing cap bolts.</li> <li>9. Housing not machined properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill differential with the correct fluid type and quantity.</li> <li>2. Check ring gear and pinion contact pattern.</li> <li>3. Replace gears with a matched ring gear and pinion.</li> <li>4. Replace ring gear and pinion.</li> <li>5. Adjust pinion bearing pre-load.</li> <li>6. Adjust differential bearing pre-load.</li> <li>7. Measure ring gear run-out. Replace components as necessary.</li> <li>8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued to the proper specification.</li> <li>9. Replace housing.</li> </ol>

**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 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.

## DIAGNOSIS AND TESTING (Continued)

- Damaged axle shaft bearing(s).
- Loose pinion nut.
- Excessive companion flange 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 Group 22, Wheels and Tires, for additional vibration information.

## 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 nut and companion flange.
- 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.

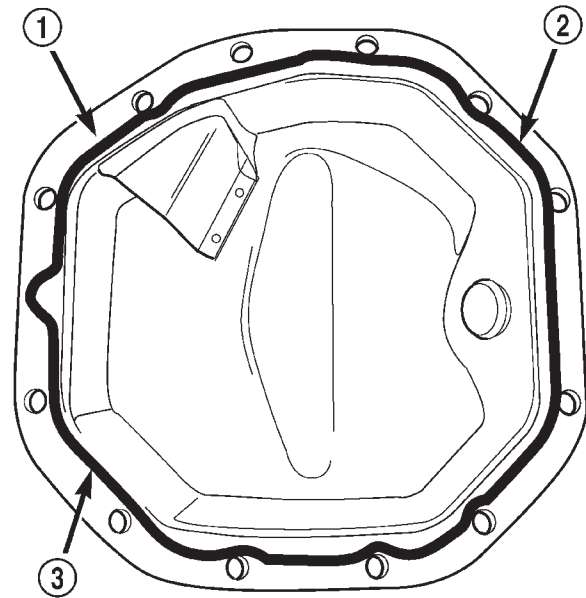
## SERVICE PROCEDURES

## LUBRICANT CHANGE

- (1) Raise and support the vehicle.
- (2) Remove the lubricant fill hole plug from the differential housing cover.
- (3) Remove the differential housing cover and drain the lubricant from the housing.
- (4) Clean the housing cavity with a flushing oil, light engine oil or lint free cloth. **Do not use water, steam, kerosene or gasoline for cleaning.**
- (5) Remove the sealant from the housing and cover surfaces. Use solvent to clean the mating surfaces.
- (6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 3).

**Install the housing cover within 5 minutes after applying the sealant.**

- (7) Install the cover and any identification tag. Tighten the cover bolts in a criss-cross pattern to 23 N·m (17 ft. lbs.) torque.



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**Fig. 3 Housing Cover With Sealant**

- 1 - SEALING SURFACE
- 2 - CONTOUR OF BEAD
- 3 - BEAD THICKNESS 5.0mm (3/16")

(8) Refill the differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications in this group for the quantity necessary.

(9) Install the fill hole plug and lower the vehicle.

## REMOVAL AND INSTALLATION

## FRONT AXLE

## REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the skid plate, if equipped.
- (3) Remove skid plate support crossmember, if necessary.
- (4) Remove both C/V driveshafts.
- (5) Mark the propeller shaft, transfer case, and pinion companion flange for installation alignment reference.
- (6) Remove the front propeller shaft.
- (7) Remove the axle vent tube.
- (8) Use an adjustable and movable jack to support the differential housing.

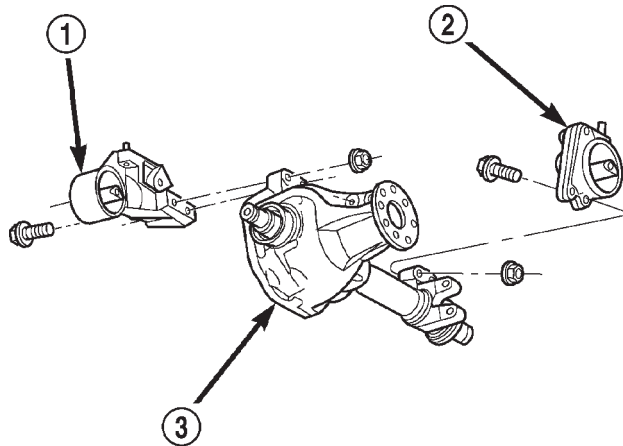
## REMOVAL AND INSTALLATION (Continued)

(9) Remove bolts holding the axle to the engine mounts (Fig. 4).

(10) Remove bolts holding the axle to the pinion nose bracket (Fig. 5).

(11) Lower the jack and housing.

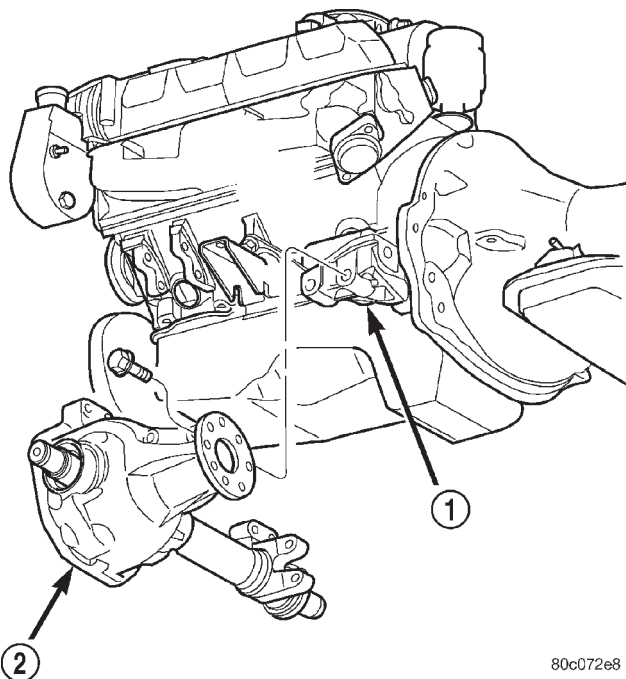
(12) Remove the axle from vehicle.



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**Fig. 4 Axle to Engine Mounts Mounting**

- 1 - LEFT ENGINE MOUNT
- 2 - RIGHT ENGINE MOUNT
- 3 - FRONT AXLE



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**Fig. 5 Pinion Nose Bracket Mounting**

- 1 - PINION NOSE BRACKET
- 2 - FRONT AXLE

## INSTALLATION

(1) Raise the axle into position. Loosely install the bolts and nuts to hold the axle to the engine mounts and pinion nose bracket.

(2) Tighten all the bolts finger-tight, then tighten all bolts to 95 N·m (70 ft. lbs.).

(3) Install the axle vent tube.

(4) Align the reference marks on the propeller shaft, transfer case, and pinion companion flange.

(5) Install propeller shaft.

(6) Install the C/V driveshafts.

(7) Install the skid plate support crossmember, if necessary.

(8) Install the skid plate, if necessary.

(9) Check differential lubricant level and add lubricant, if necessary. Refer to Lubricant Specifications in this group for lubricant requirements.

(10) Remove the supports and lower the vehicle.

## PINION SHAFT SEAL

## REMOVAL

(1) Raise and support the vehicle.

(2) Remove skid plate, if equipped.

(3) Remove both C/V driveshafts.

(4) Mark the propeller shaft and pinion companion flange for installation alignment reference.

(5) Remove the front propeller shaft.

(6) Rotate the pinion gear three or four times.

(7) Measure the amount of torque necessary to rotate the pinion with a (in. lbs.) dial-type torque wrench (Fig. 6). Record the torque reading for installation reference.

(8) Install socket head bolts into two of the threaded holes in the companion flange, 180° apart.

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

(10) Hold the flange with Holder 6719. Remove the pinion nut.

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

(12) Using a suitable pry tool, or a slide hammer mounted screw, remove the pinion seal.

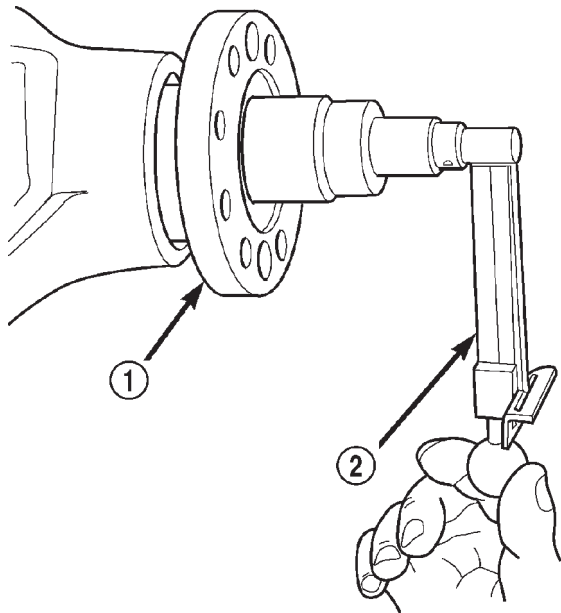
## INSTALLATION

(1) Clean the seal contact surface in the housing bore.

(2) Examine the splines on the pinion shaft for burrs or wear. Remove any burrs and clean the shaft.

(3) Inspect companion flange for cracks, worn splines and worn seal contact surface. Replace companion flange if necessary.

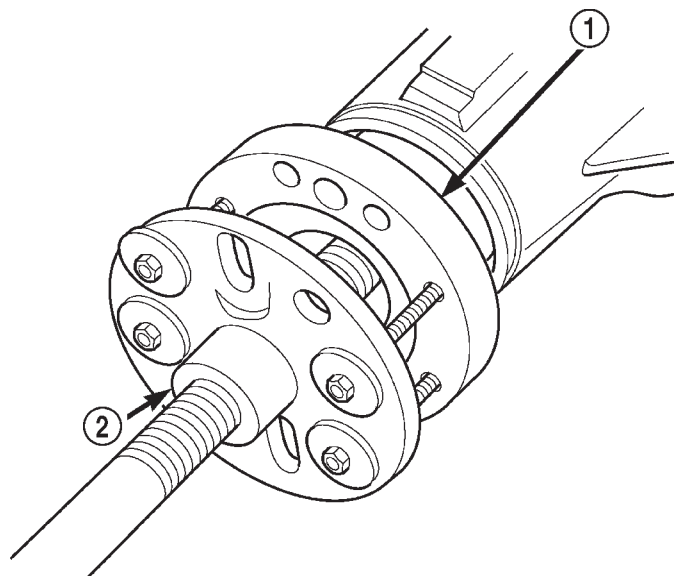
## REMOVAL AND INSTALLATION (Continued)



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**Fig. 6 Measure Total Axle Rotating Torque**

- 1 - COMPANION FLANGE  
2 - INCH POUND TORQUE WRENCH



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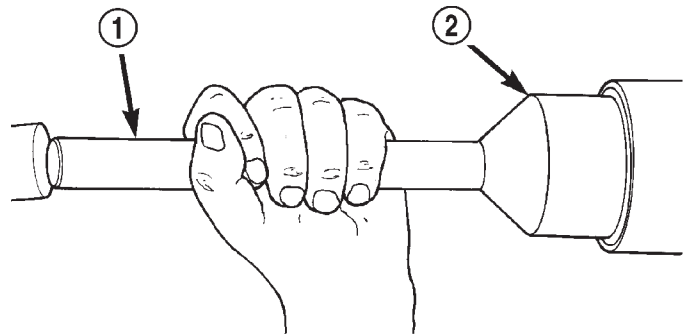
**Fig. 7 Companion Flange Removal**

- 1 - COMPANION FLANGE  
2 - PULLER TOOL

**NOTE:** The outer perimeter of the seal is pre-coated with a special sealant. An additional application of sealant is not required.

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

(5) Install seal with Installer C-3972-A and Handle C-4171 (Fig. 8).



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**Fig. 8 Pinion Seal Installation**

- 1 - SPECIAL TOOL C-4171  
2 - SPECIAL TOOL C-3972-A

(6) Install socket head bolts into two of the threaded holes in the companion flange, 180° apart.

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

(8) Seat the companion flange on the pinion shaft with Installer C-3718 and Holder 6719.

(9) Remove the Installer C-3718 and install the new pinion nut.

**CAUTION:** Do not exceed the minimum tightening torque when installing the companion flange at this point. Damage to the collapsible spacer or bearings may result.

(10) Tighten the pinion nut until there is zero bearing end-play (Fig. 9).

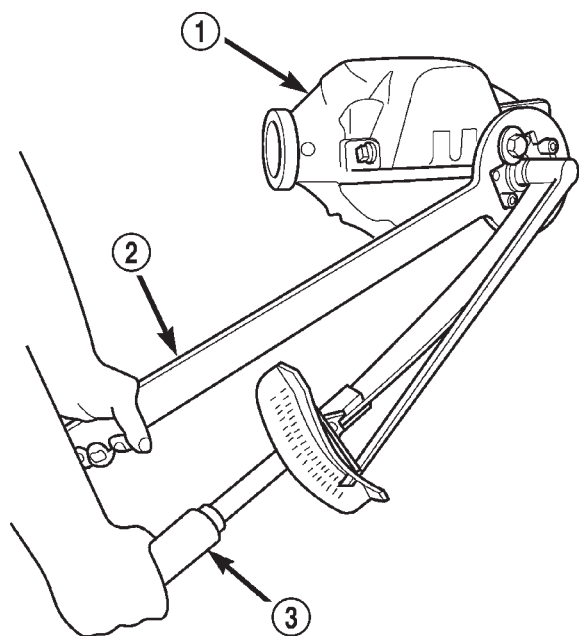
(11) Tighten the nut to 271 N·m (200 ft. lbs.).

**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. The torque sequence will then have to be repeated.

(12) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.) (Fig. 10).

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

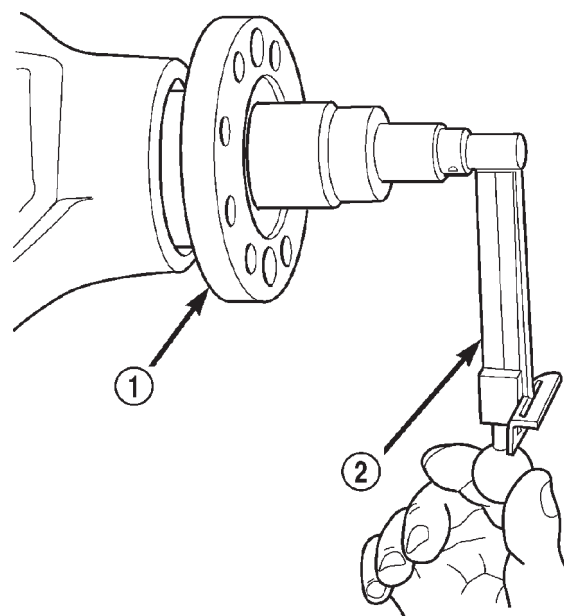
## REMOVAL AND INSTALLATION (Continued)



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**Fig. 9 Tighten Pinion Nut**

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



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**Fig. 10 Check Pinion Rotation Torque**

- 1 - COMPANION FLANGE
- 2 - INCH POUND TORQUE WRENCH

**CAUTION:** If the maximum tightening torque is reached prior to reaching the required rotating torque, the collapsible spacer may have been damaged. Replace the collapsible spacer.

(14) Align the installation reference marks on the propeller shaft and companion flange and install the propeller shaft.

(15) Add gear lubricant to the differential housing, if necessary. Refer to the Lubricant Specifications for gear lubricant requirements.

(16) Install both C/V driveshafts.

(17) Install skid plate, if equipped.

(18) Lower the vehicle.

**AXLE SHAFT****REMOVAL**

(1) Raise and support vehicle. Ensure that the transmission is in neutral.

(2) Remove the necessary C/V driveshaft from vehicle.

(3) Remove the skid plate, if equipped.

(4) Clean all foreign material from axle seal area.

(5) Install Puller Adapter 8420 onto the axle shaft.

(6) Install Slide Hammer C-3752 to the puller adapter.

(7) Remove axle shaft. Use care to prevent damage to axle shaft bearing and seal, which will remain in axle shaft tube.

(8) Inspect axle shaft seal for leakage or damage. Replace the seal if there is any question as to its condition.

(9) Inspect roller bearing contact surface on axle shaft for signs of brinelling, galling and pitting. If any of these conditions exist, the axle shaft and/or bearing and seal must be replaced.

**INSTALLATION**

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing, and engage it into side gear splines.

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

(2) Push firmly on the axle shaft until the axle shaft snap-ring passes completely through the side gear and engages the snap-ring groove.

(3) Check the differential fluid level and add fluid if necessary. Refer to Lubricant in this group for lubricant requirements.

(4) Install skid plate, if necessary.

(5) Install C/V driveshaft.

(6) Lower vehicle.

**AXLE SHAFT SEAL AND BEARING****REMOVAL**

(1) Remove the axle shaft.

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



## REMOVAL AND INSTALLATION (Continued)

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

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool C-4660-A.

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

## INSTALLATION

**Do not install the original axle shaft seal. Always install a new seal.**

(1) Wipe the axle shaft tube bore clean.

(2) Install axle shaft bearing with Installer 5063 and Handle C-4171.

(3) Install the new axle shaft seal with Installer 8402 and Handle C-4171.

(4) Install the axle shaft.

## DIFFERENTIAL

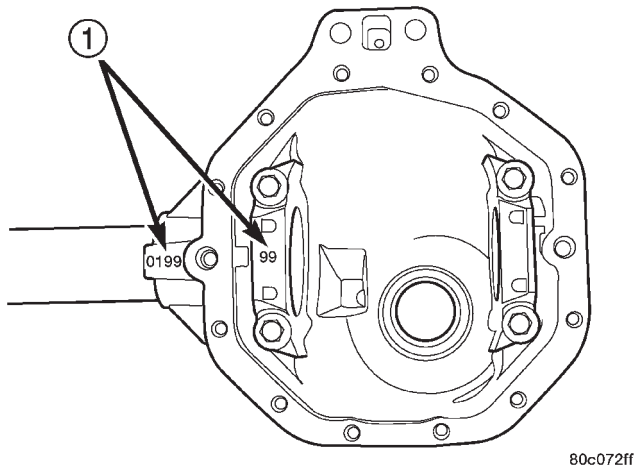
## REMOVAL

(1) Raise and support vehicle.

(2) Remove the differential housing cover and allow fluid to drain.

(3) Remove the axle shafts.

(4) Note the installation reference numbers stamped on one of the bearing caps and a machined flat on the housing next to the sealing surface. If the reference numbers cannot be found or seen easily, make new marks for later reference (Fig. 11).



**Fig. 11 Bearing Cap Identification**

1 - REFERENCE NUMBERS

(5) Loosen the differential bearing cap bolts.

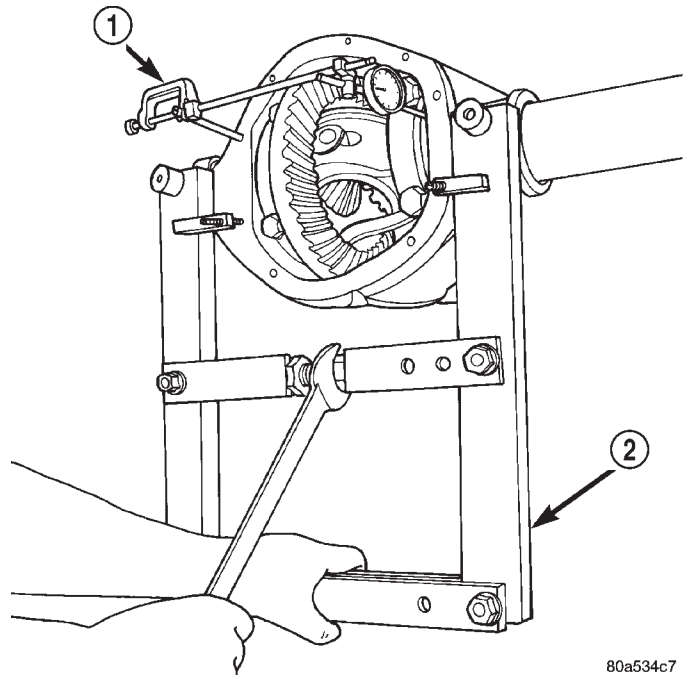
(6) Install Adapter Plates 8142-A onto the axle housing.

(7) Position Spreader W-129-B onto the adapter plates and install the safety holddown clamps. Tighten the tool turnbuckle finger-tight.

(8) 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.

**CAUTION:** Do not spread over 0.34 mm (0.013 in). If the housing is over-spread, it could be distorted or damaged.

(9) Spread the housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 12).



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**Fig. 12 Spread Axle Housing—Typical**

1 - SPECIAL TOOL C-3339

2 - SPECIAL TOOL W-129-B

(10) Remove the dial indicator.

(11) While holding the differential case in position, remove the differential bearing cap bolts and caps.

(12) Remove the differential from the housing. Ensure that the differential bearing cups and shims remain in position on the differential bearings.

(13) Mark or tag the differential bearing cups and shims to indicate which side of the differential they were removed from.

(14) Remove spreader from housing.

## INSTALLATION

If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

## REMOVAL AND INSTALLATION (Continued)

(1) Position Spreader W-129-B, with the Adapter Plates 8142-A seated in the locating holes, on the axle 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 the indicator plunger against the opposite side of the housing and zero the indicator.

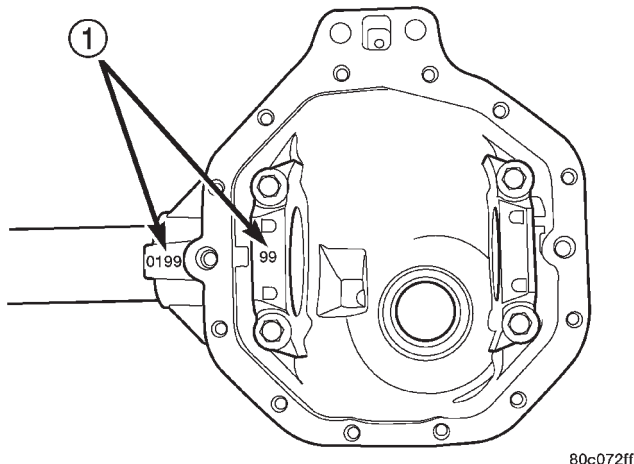
**CAUTION:** Do not spread over 0.34 mm (0.013 in). If the housing is over-spread, it could be distorted or damaged.

(3) Spread the housing enough to install the differential case and preload shims in the housing. Measure the distance with the dial indicator.

(4) Remove the dial indicator.

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

(6) Install the bearing caps at their original locations (Fig. 13).



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**Fig. 13 Bearing Cap Identification**

1 - REFERENCE NUMBERS

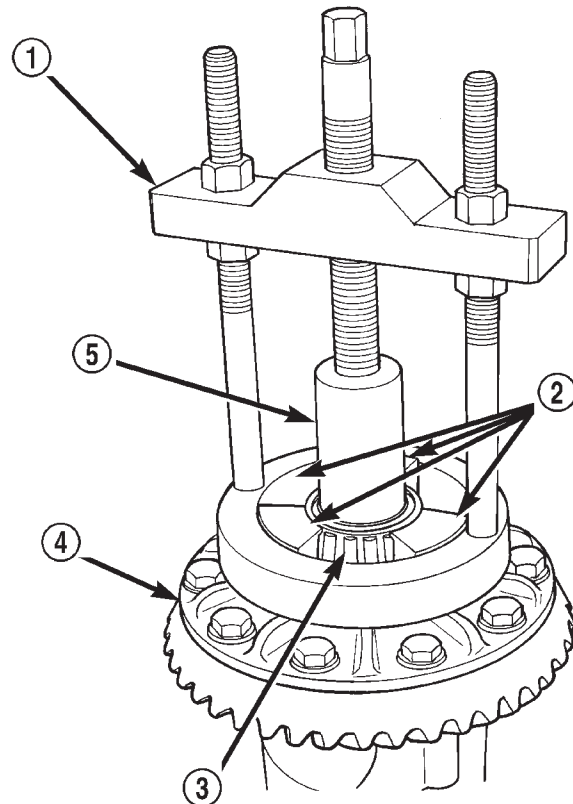
- (7) Loosely install differential bearing cap bolts.
- (8) Remove axle housing spreader.
- (9) Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.) torque.
- (10) Install the axle shafts.
- (11) Install the differential housing cover and fill with the correct lubricant.

## DIFFERENTIAL SIDE BEARINGS

### REMOVAL

- (1) Remove differential from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA, C-293-48 Blocks, and Plug C-293-3 (Fig. 14).



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**Fig. 14 Differential Bearing Removal**

- 1 - SPECIAL TOOL C-293-PA
- 1 - SPECIAL TOOL C-293-48
- 3 - BEARING
- 4 - DIFFERENTIAL
- 5 - SPECIAL TOOL C-293-3

## INSTALLATION

- (1) Using Installer 8236, with handle C-4171, install the differential side bearings (Fig. 15).
- (2) Install differential in axle housing.

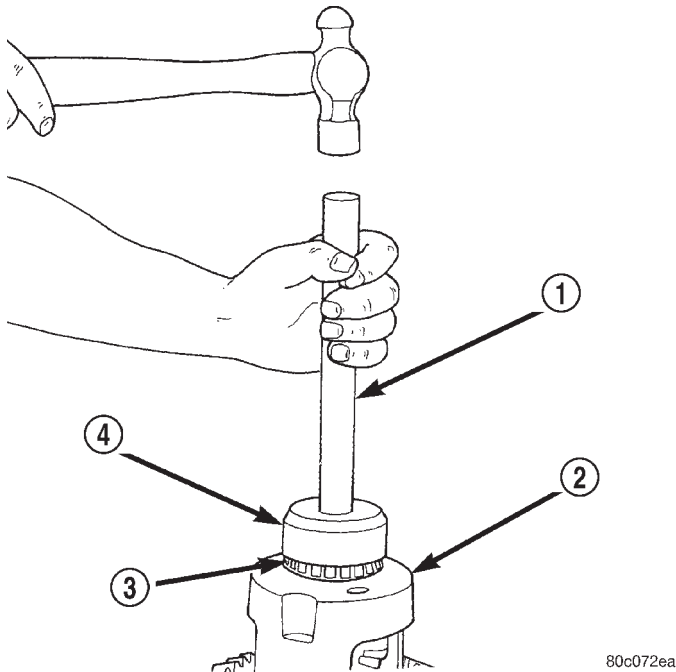
## RING GEAR

**NOTE:** The ring gear and pinion are service in a matched set. Do not replace the ring gear without replacing the pinion.

## REMOVAL

- (1) Remove differential from axle housing.
- (2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 16)
- (3) Remove bolts holding ring gear to differential case.

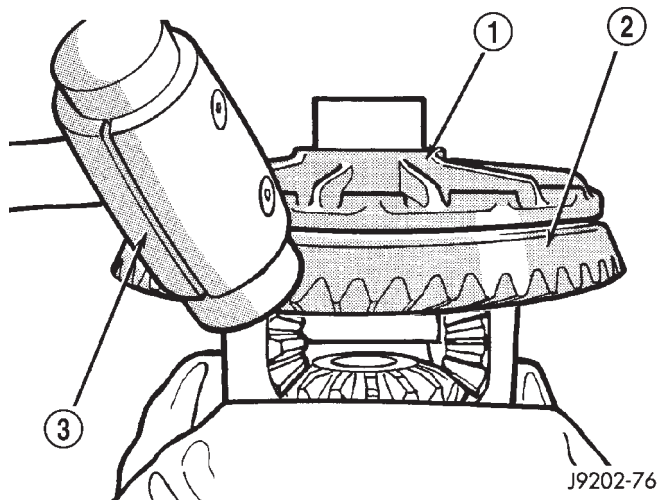
## REMOVAL AND INSTALLATION (Continued)



**Fig. 15 Install Differential Side Bearings**

- 1 - HANDLE C-4171
- 2 - DIFFERENTIAL
- 3 - BEARING
- 4 - TOOL 8236

(4) Using a soft hammer, drive ring gear from differential case (Fig. 16).



**Fig. 16 Ring Gear Removal**

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

## INSTALLATION

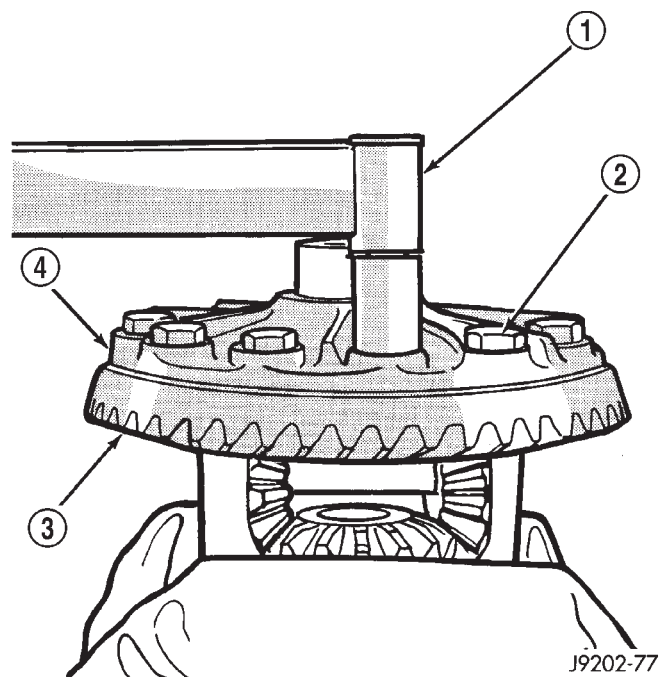
**CAUTION:** Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

(1) Invert the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.

(2) Invert the differential case in the vise.

(3) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 17).

(4) Install differential in axle housing and verify gear mesh and contact pattern.



**Fig. 17 Ring Gear Bolt Installation**

- 1 - TORQUE WRENCH
- 2 - RING GEAR BOLT
- 3 - RING GEAR
- 4 - CASE

## PINION GEAR

**NOTE:** The ring gear and pinion are serviced in a matched set. Do not replace the pinion without replacing the ring gear.

## REMOVAL

(1) Remove differential from the axle housing.

(2) Mark the companion yoke and companion flange for installation alignment.

(3) Remove the bolts holding the companion yoke to the companion flange.

## REMOVAL AND INSTALLATION (Continued)

(4) Separate the propeller shaft from the companion flange and using suitable wire, tie the propeller shaft to the vehicle underbody.

(5) Rotate the pinion gear three or four times.

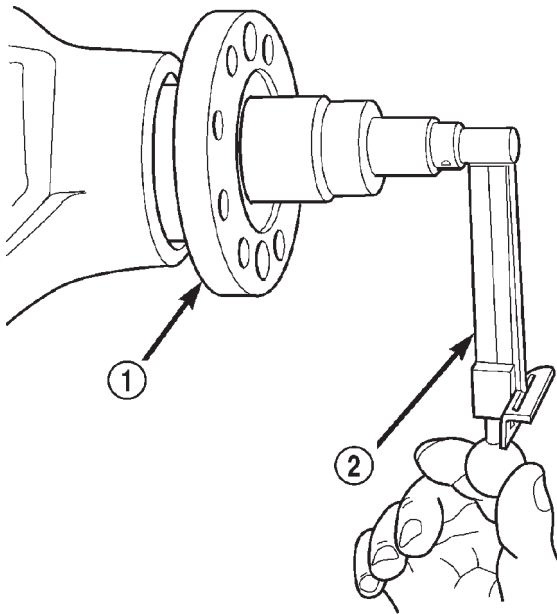
(6) Measure the amount of torque necessary to rotate the pinion with a (in. lbs.) dial-type torque wrench (Fig. 18). Record the torque reading for installation reference.

(7) Install socket head bolts into two of the threaded holes in the companion flange, 180° apart.

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

(9) Hold the flange with Holder 6719. Remove the pinion nut.

(10) Remove the companion flange with Remover C-452 (Fig. 19).



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**Fig. 18 Measure Pinion Rotating Torque**

- 1 - COMPANION FLANGE  
2 - INCH POUND TORQUE WRENCH

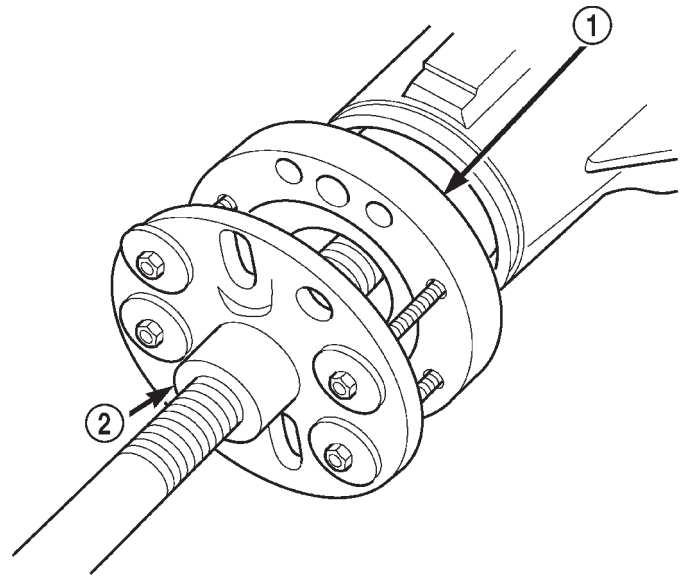
(11) Remove the pinion from housing (Fig. 20). Catch the pinion with your hand to prevent it from falling and being damaged.

(12) Using a suitable pry tool, or a slide hammer mounted screw, remove the pinion seal.

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

(14) Remove the front pinion bearing cup with Remover D-103 and Handle C-4171 (Fig. 21).

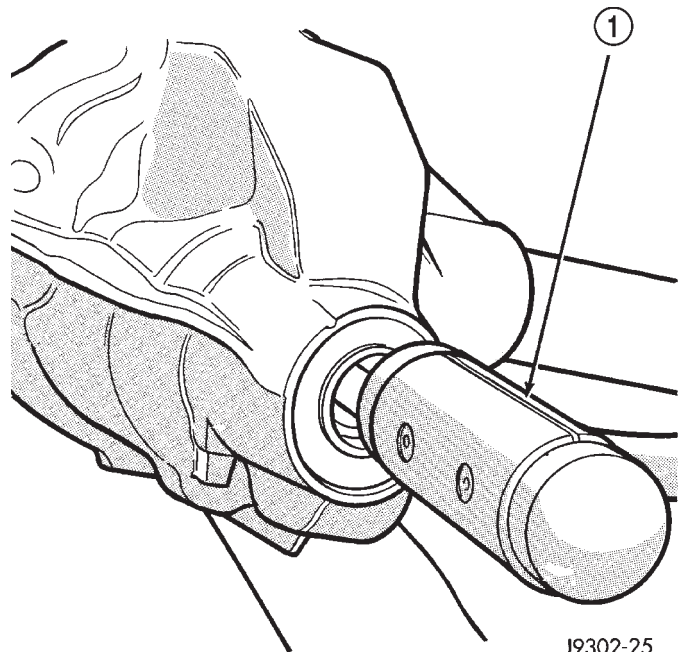
(15) Remove the rear bearing cup from housing (Fig. 22). Use Remover 8401 and Handle C-4171.



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**Fig. 19 Companion Flange Removal**

- 1 - COMPANION FLANGE  
2 - PULLER TOOL



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**Fig. 20 Remove Pinion**

- 1 - RAWHIDE HAMMER

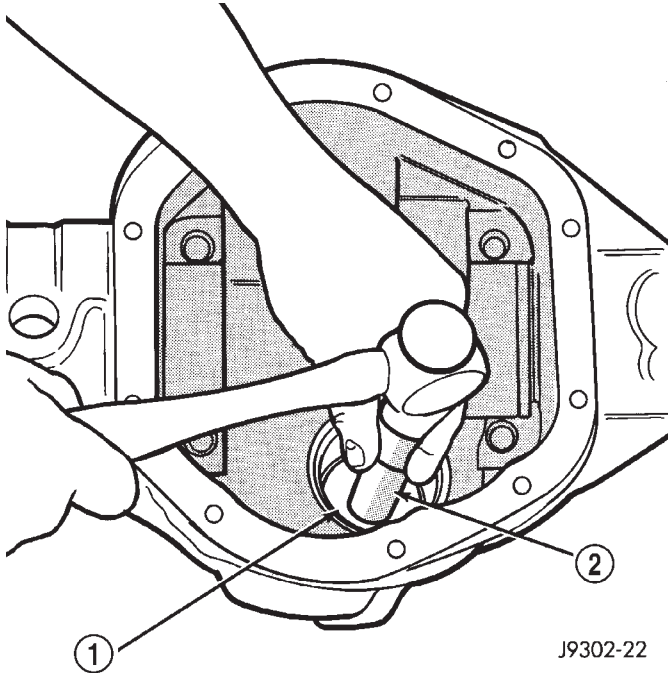
(16) Remove the collapsible preload spacer (Fig. 23).

(17) Remove the rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-42 (Fig. 24).

**Place 4 adapter blocks so they do not damage the bearing cage.**

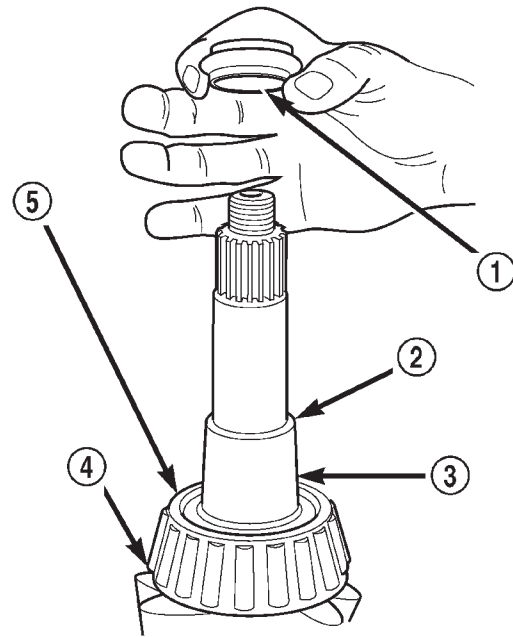


## REMOVAL AND INSTALLATION (Continued)



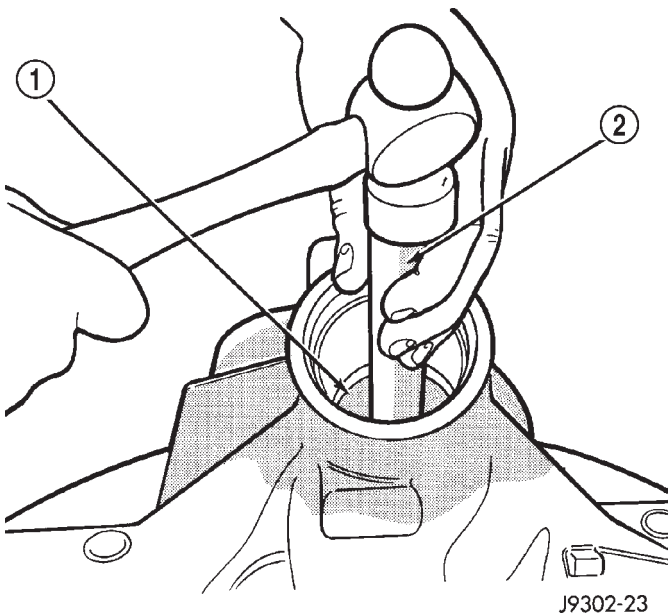
**Fig. 21 Front Bearing Cup Removal**

- 1 - REMOVER
- 2 - HANDLE



**Fig. 23 Collapsible Spacer**

- 1 - COLLAPSIBLE SPACER
- 2 - SHOULDER
- 3 - PINION
- 4 - PINION DEPTH SHIM
- 5 - REAR BEARING



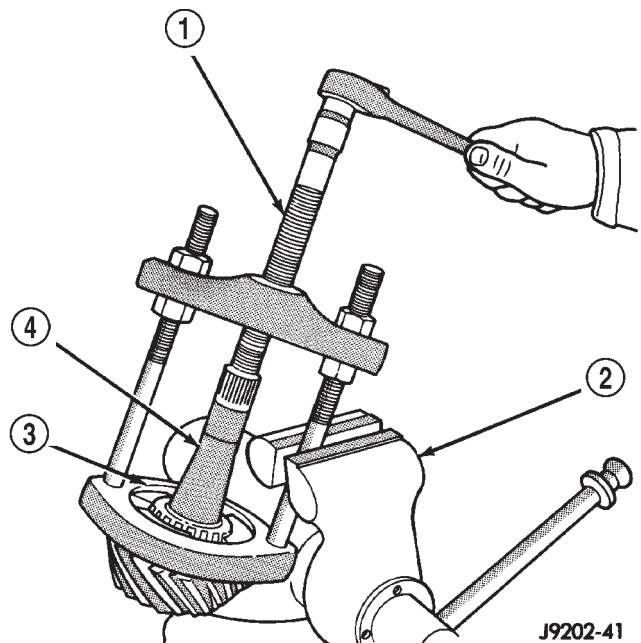
**Fig. 22 Rear Bearing Cup Removal**

- 1 - DRIVER
- 2 - HANDLE

(18) Remove the depth shims from the pinion shaft. Record the thickness of the depth shims.

## INSTALLATION

(1) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

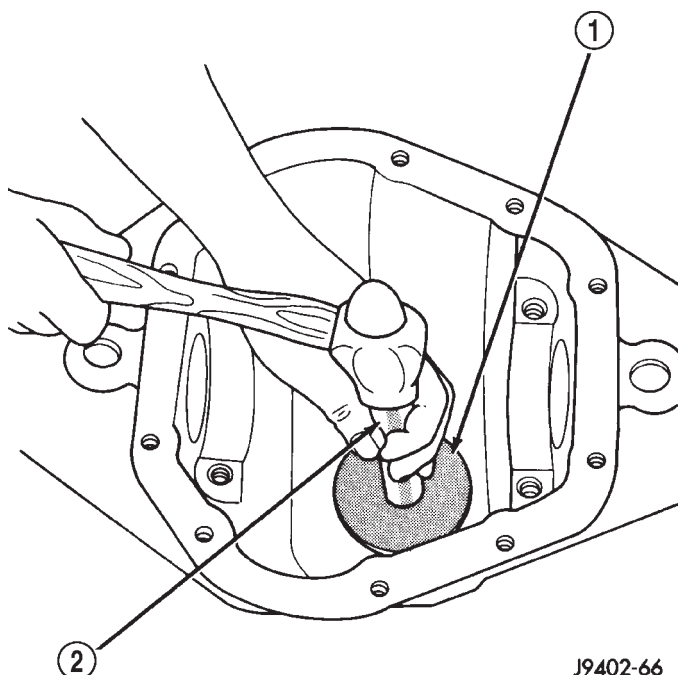


**Fig. 24 Rear Bearing Removal**

- 1 - SPECIAL TOOL C-293-PA
- 2 - VISE
- 3 - ADAPTERS
- 4 - DRIVE PINION GEAR SHAFT

## REMOVAL AND INSTALLATION (Continued)

(2) Install the pinion rear bearing cup with Installer D-145 and Driver Handle C-4171 (Fig. 25). Ensure cup is correctly seated.

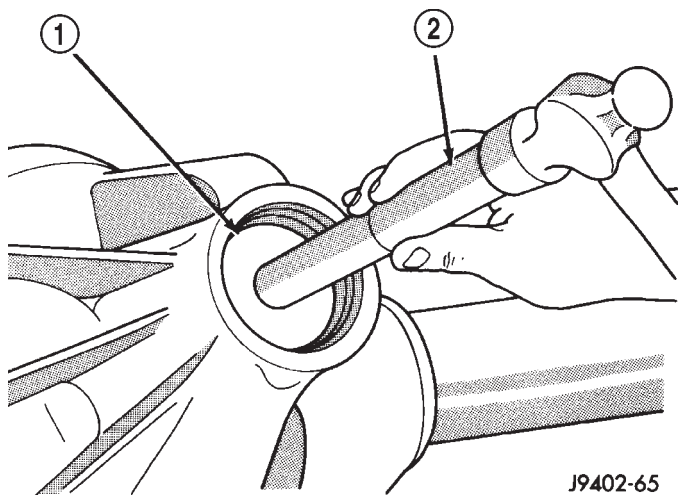


**Fig. 25 Pinion Rear Bearing Cup Installation**

- 1 - INSTALLER  
2 - HANDLE

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(4) Install the pinion front bearing cup with Installer D-129 and Handle C-4171 (Fig. 26).



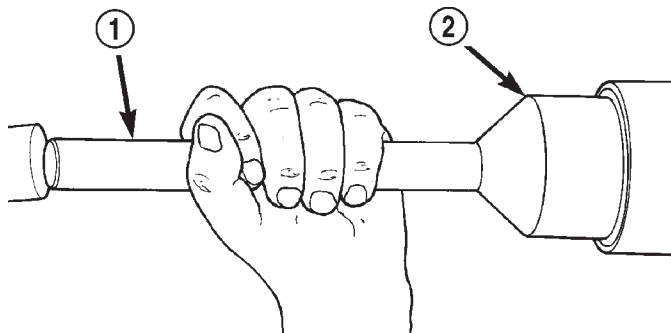
**Fig. 26 Pinion Front Bearing Cup Installation**

- 1 - INSTALLER  
2 - HANDLE

(5) Install pinion front bearing, and oil slinger, if equipped.

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

(7) Install seal with Installer C-3972-A and Handle C-4171 (Fig. 27).



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**Fig. 27 Pinion Seal Installation**

- 1 - SPECIAL TOOL C-4171  
2 - SPECIAL TOOL C-3972-A

**NOTE:** Pinion depth shims are placed between the rear pinion bearing cone and pinion gear head to achieve proper ring gear and pinion mesh. If the factory installed ring gear and pinion are reused, the pinion depth shim should not require replacement. If required, refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

(8) Place the proper thickness depth shim on the pinion shaft.

(9) Install the rear bearing and slinger, if equipped, onto the pinion shaft with Installer 6448 (Fig. 28).

(10) Install a new collapsible preload spacer onto the pinion shaft (Fig. 29).

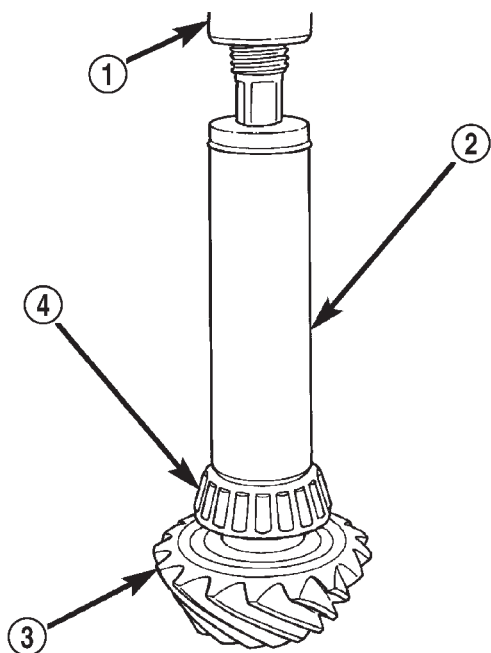
(11) Install the pinion in the axle housing.

(12) Seat the companion flange on the pinion shaft with Installer C-3718 and Holder 6719.

(13) Remove the Installer C-3718 and install the new pinion nut.

**CAUTION:** Do not exceed the minimum tightening torque when installing the companion flange at this point. Damage to the collapsible spacer or bearings may result.

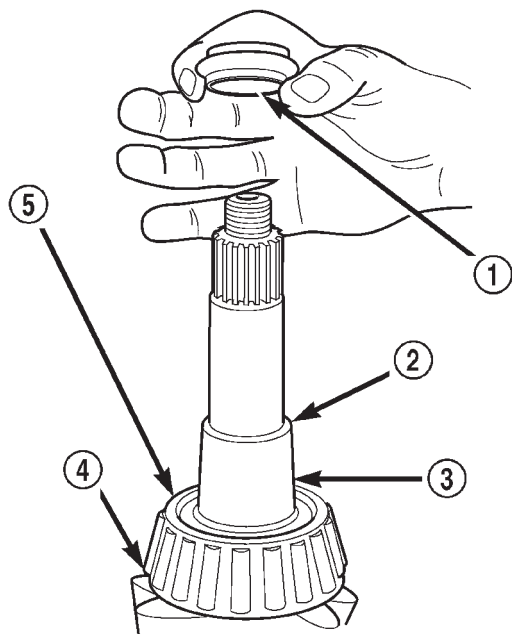
# REMOVAL AND INSTALLATION (Continued)



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**Fig. 28 Shaft Rear Bearing Installation**

- 1 - PRESS
- 2 - INSTALLATION TOOL
- 3 - DRIVE PINION
- 4 - DRIVE PINION SHAFT REAR BEARING



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**Fig. 29 Collapsible Preload Spacer**

- 1 - COLLAPSIBLE SPACER
- 2 - SHOULDER
- 3 - PINION
- 4 - PINION DEPTH SHIM
- 5 - REAR BEARING

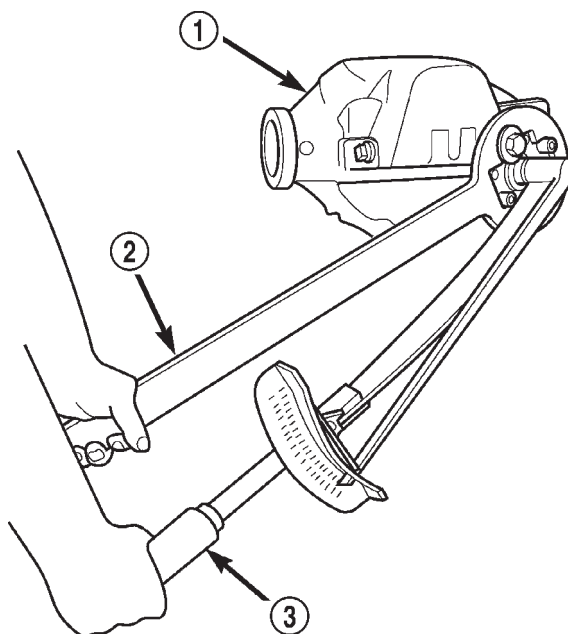
(14) Tighten the pinion nut until there is zero bearing end-play (Fig. 30).

(15) Tighten the nut to 271 N·m (200 ft. 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. The torque sequence will then have to be repeated.

(16) Using Holder 6719 and a torque wrench set at 474 N·m (350 ft. lbs.), crush collapsible spacer until bearing end play is taken up.

**NOTE:** If the spacer requires more than 474 N·m (350 ft. lbs.) torque to crush, the collapsible spacer is defective and must be replaced.



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**Fig. 30 Tighten Pinion Nut**

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

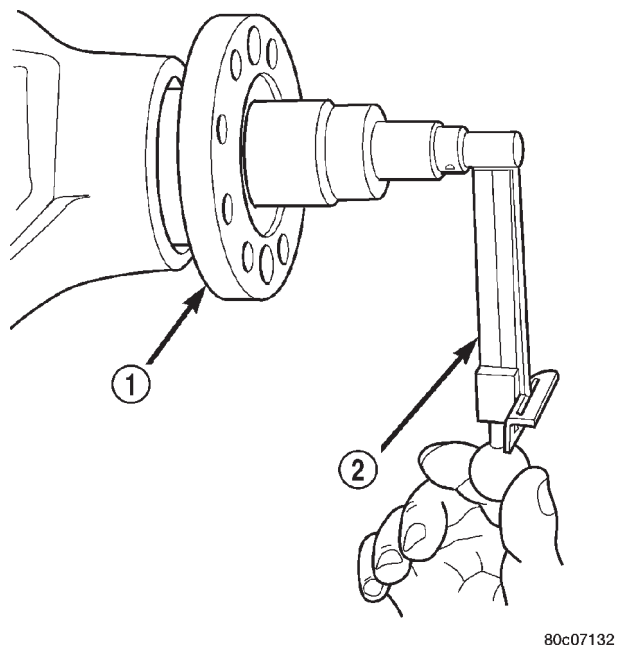
(17) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure the rotating torque frequently to avoid overcrushing the collapsible spacer (Fig. 31).

(18) Check bearing rotating torque with an inch pound torque wrench (Fig. 31). The torque necessary to rotate the pinion should be:

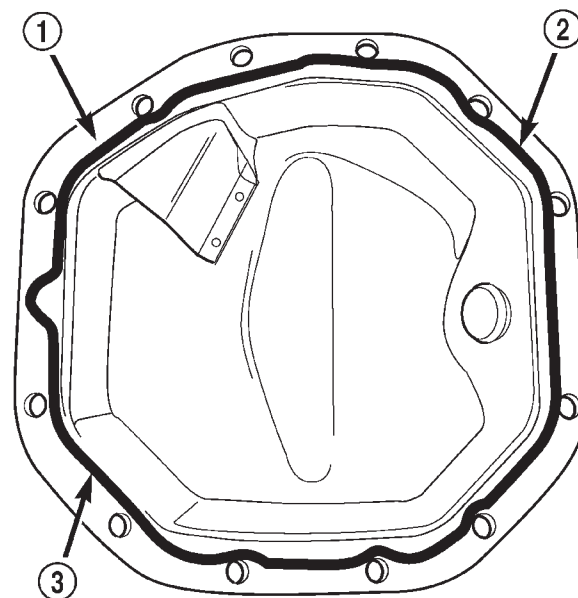
- Original Bearings — 1 to 2.5 N·m (10 to 20 in. lbs.).
- New Bearings — 1.7 to 2.5 N·m (15 to 22 in. lbs.).

(19) Install the differential in the axle housing.

## REMOVAL AND INSTALLATION (Continued)

**Fig. 31 Check Pinion Rotating Torque**

- 1 - COMPANION FLANGE  
2 - INCH POUND TORQUE WRENCH

**Fig. 32 Typical Housing Cover With Sealant**

- 1 - SEALING SURFACE  
2 - CONTOUR OF BEAD  
3 - BEAD THICKNESS 5.0mm (3/16")

**FINAL ASSEMBLY**

(1) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, on the housing cover (Fig. 32).

**Install the housing cover within 5 minutes after applying the sealant.**

(2) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts to 23 N·m (17 ft. lbs.) torque.

**CAUTION: Overfilling the differential can result in lubricant foaming and overheating.**

(3) Refill the differential housing with gear lubricant. Refer to the Lubricant Specifications section of this group for the gear lubricant requirements.

(4) Install the fill hole plug.

**DISASSEMBLY AND ASSEMBLY****STANDARD DIFFERENTIAL****DISASSEMBLY**

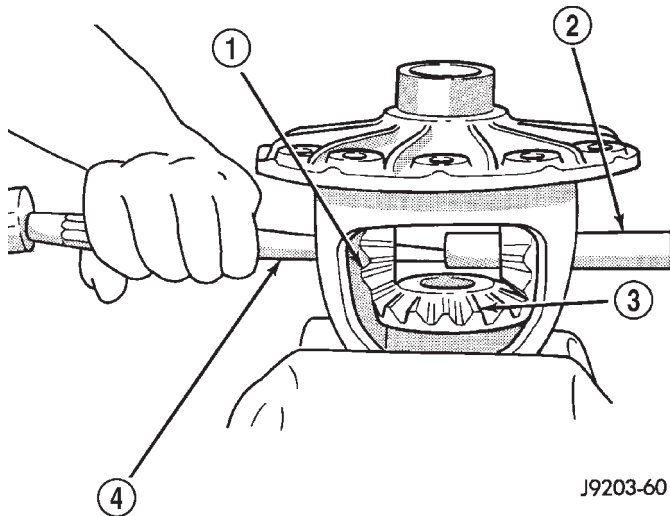
- (1) Remove ring gear.
- (2) Remove roll-pin holding mate shaft in housing.
- (3) Remove pinion gear mate shaft (Fig. 33).
- (4) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 34).
- (5) Remove the differential side gears and thrust washers.

**ASSEMBLY**

- (1) Install the differential side gears and thrust washers.
- (2) Install the pinion mate gears and thrust washers.
- (3) Install the pinion gear mate shaft.

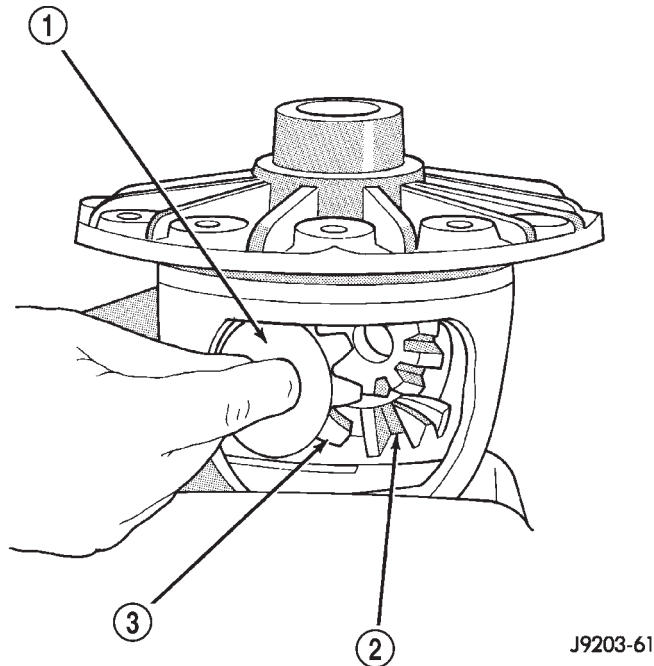


## DISASSEMBLY AND ASSEMBLY (Continued)



**Fig. 33 Pinion Mate Shaft Removal**

- 1 - PINION MATE GEAR
- 2 - PINION MATE SHAFT
- 3 - SIDE GEAR
- 4 - DRIFT



**Fig. 34 Pinion Mate Gear Removal**

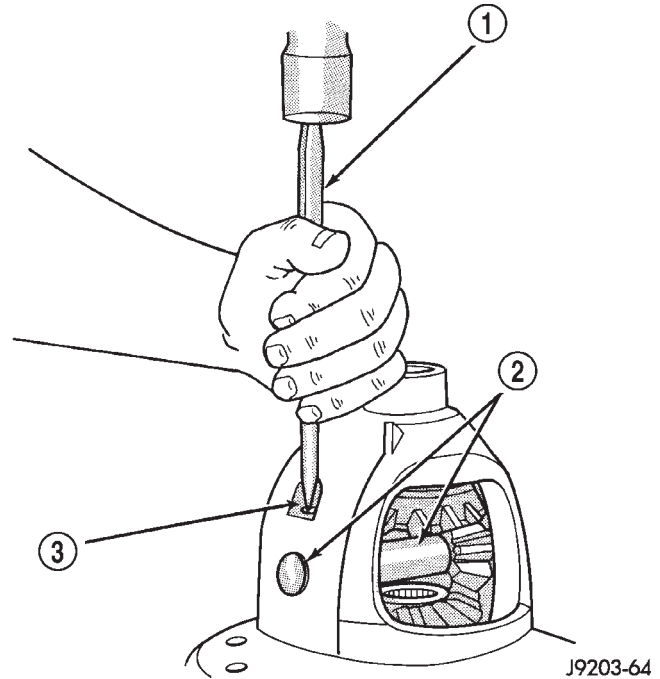
- 1 - THRUST WASHER
- 2 - SIDE GEAR
- 3 - PINION MATE GEAR

(4) Align the hole in the pinion gear mate shaft with the hole in the differential case.

(5) Install and seat the pinion mate shaft roll-pin in the differential case and mate shaft with a punch and hammer (Fig. 35). Peen the edge of the roll-pin hole in the differential case slightly in two places, 180° apart.

(6) Lubricate all differential components with hypoid gear lubricant.

(7) Install ring gear.



**Fig. 35 Pinion Mate Shaft Roll-Pin Installation**

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

## CLEANING AND INSPECTION

### AXLE COMPONENTS

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. **DO NOT** spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle shaft tubes and oil channels in housing. Inspect for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring gear and pinion for worn and chipped teeth.

## CLEANING AND INSPECTION (Continued)

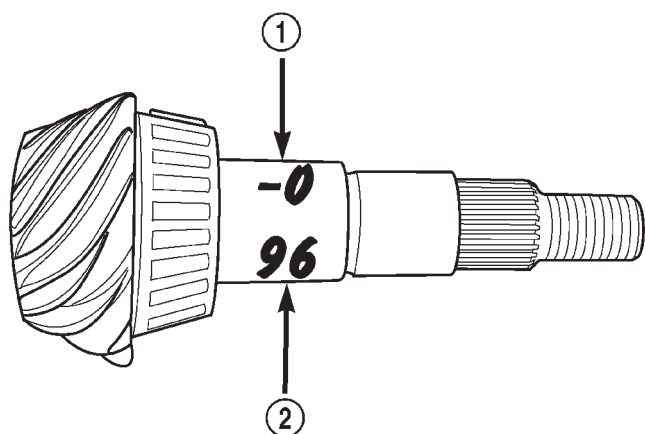
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Companion flange for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims, if necessary.

## ADJUSTMENTS

## PINION GEAR DEPTH

## GENERAL INFORMATION

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. 36) 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 face of the pinion is 99.690 mm (3.925 in.). The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern Analysis Paragraph in this section for additional information.



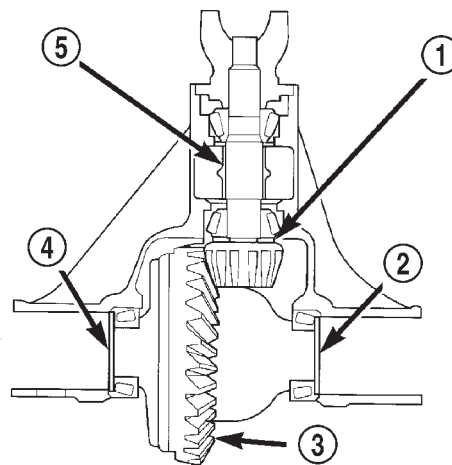
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**Fig. 36 Pinion ID Numbers**

- 1 - VARIANCE NUMBER  
2 - SEQUENCE NUMBER

Compensation for pinion depth variance is achieved with select shims. The shims are placed between the rear pinion bearing cone and the pinion gear head (Fig. 37).

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



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**Fig. 37 Shim Locations**

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

original depth shims to compensate for the difference in the depth variances. Refer to the 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. Refer to the Pinion Gear Depth Variance Chart.

## 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. 38).

(1) Assemble Pinion Height Block 6739, Pinion Block 8177, and rear pinion bearing onto Screw 6741 (Fig. 38).

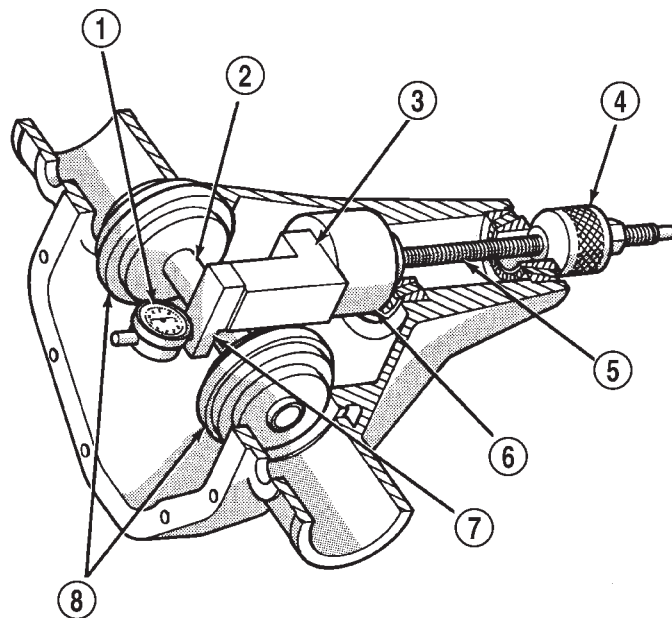
(2) Insert assembled height gauge components, rear bearing and screw into axle housing through the pinion bearing cups (Fig. 39).

(3) Install front pinion bearing and Cone 6740 onto the screw hand tight (Fig. 38).

# ADJUSTMENTS (Continued)

## 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

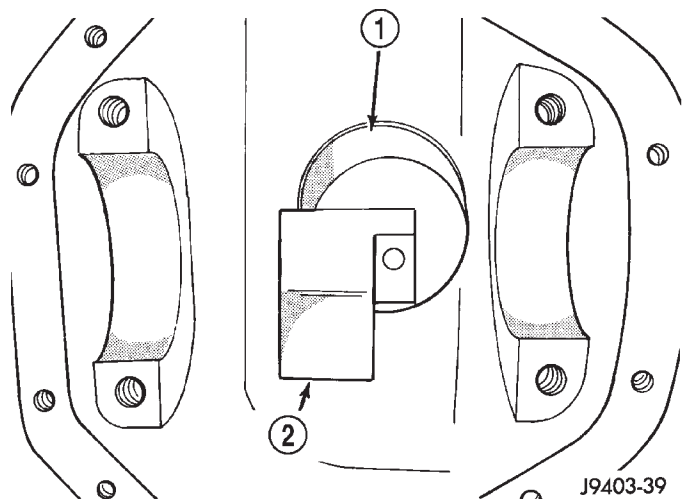


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**Fig. 38 Pinion Gear Depth Gauge Tools**

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

(4) Place Arbor Discs 8541 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 40). Install differential bearing caps on Arbor Discs and tighten cap bolts. Refer to the Torque Specifications in this section.



**Fig. 39 Pinion Height Block**

- 1 - PINION BLOCK
- 2 - PINION HEIGHT BLOCK

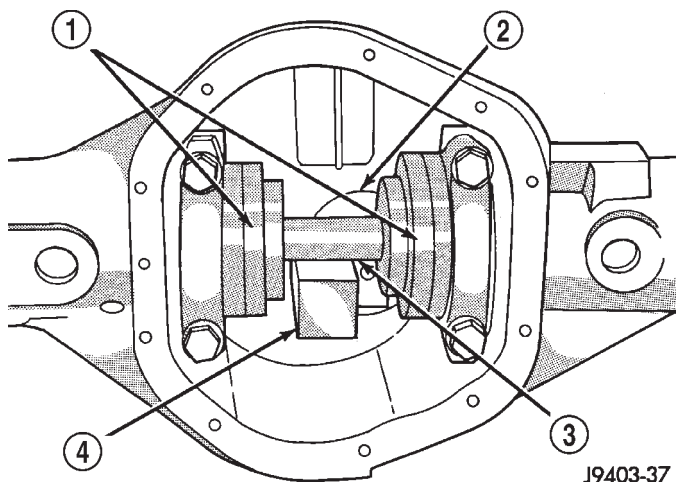
(5) Assemble Dial Indicator C-3339 into Scooter Block D-115-2 and secure set screw.

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

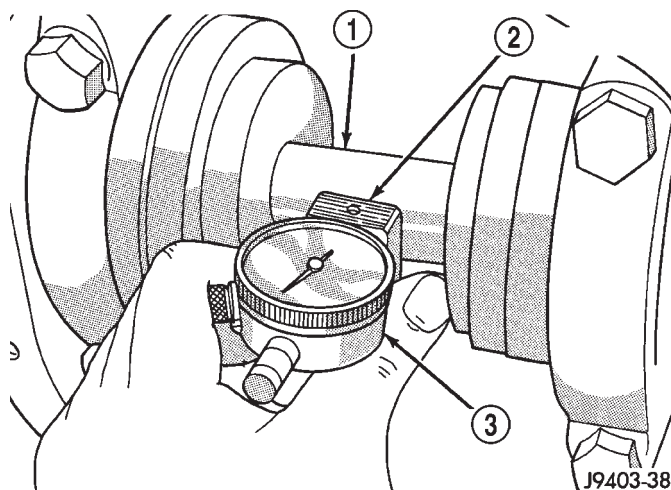
(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block. Observe how many revolutions counterclockwise the dial pointer travels (approximately 0.125 in.) to the out-stop of the dial indicator.

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

## ADJUSTMENTS (Continued)

**Fig. 40 Gauge Tools In Housing**

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

**Fig. 41 Pinion Gear Depth Measurement**

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

with the scooter block against the pinion height block (Fig. 41). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

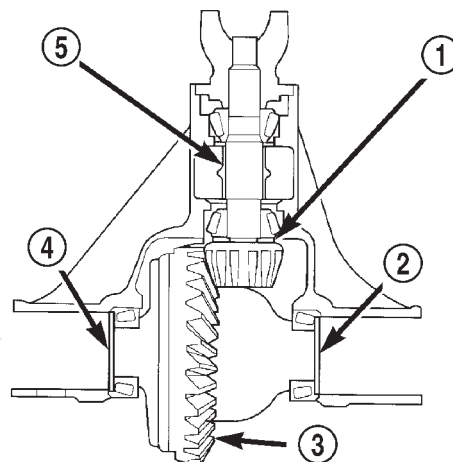
(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number marked on the shaft of the pinion gear using the opposite sign on the variance number. For example, if the depth variance is -2, add +0.002 in. to the dial indicator reading.

(10) Remove the pinion depth gauge components from the axle 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 axle 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 over-

all 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. 42).

**Fig. 42 Axle Adjustment Shim Locations**

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

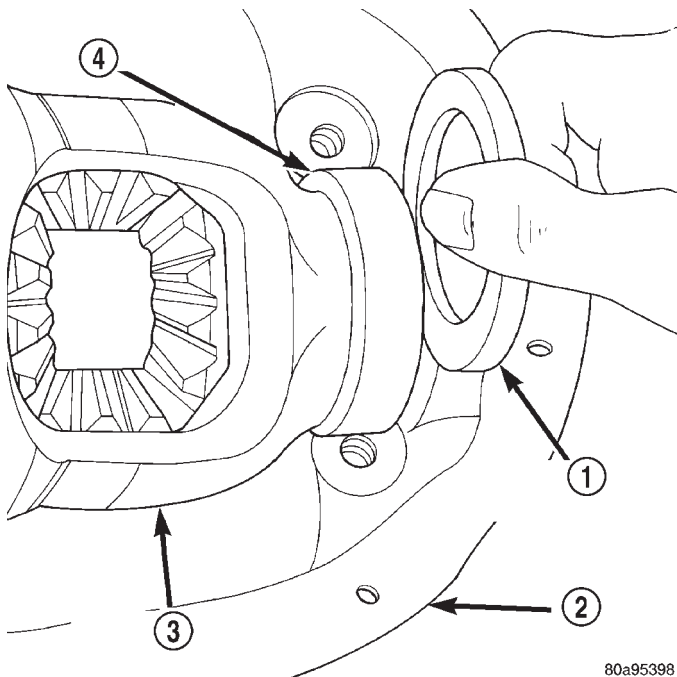


## ADJUSTMENTS (Continued)

### 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.
- (2) Install ring gear, if necessary, on differential case and tighten bolts to specification.
- (3) Install Dummy Side Bearings 8398 on differential case.
- (4) Install differential case in axle housing.
- (5) Insert Dummy Shims 8107 (0.118 in. (3.0 mm)) starting point shims between both dummy bearings and the axle housing (Fig. 43).



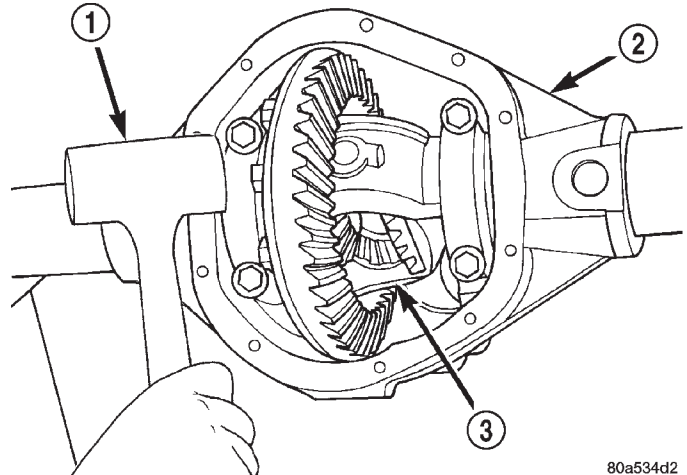
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**Fig. 43 Insert Starting Point Shims**

- 1 - SPECIAL TOOL 8107
- 2 - AXLE HOUSING
- 3 - DIFFERENTIAL CASE
- 4 - SPECIAL TOOL D-348

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

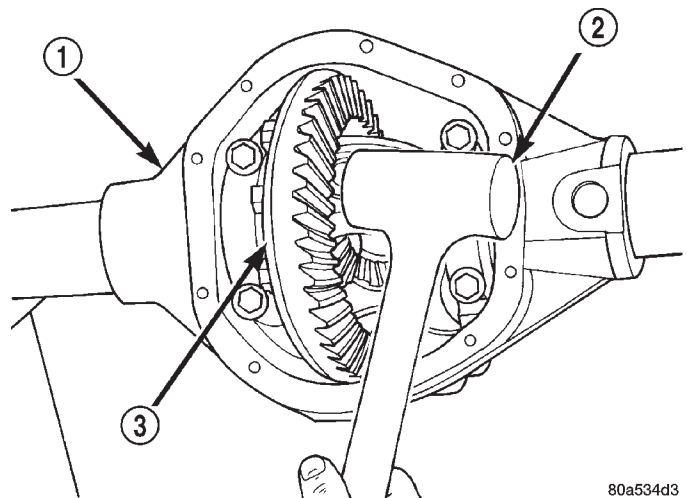
(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 44) and (Fig. 45).



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**Fig. 44 Seat Pinion Side Dummy Side Bearing**

- 1 - MALLET
- 2 - AXLE HOUSING
- 3 - DIFFERENTIAL CASE



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**Fig. 45 Seat Ring Gear Side Dummy Bearing**

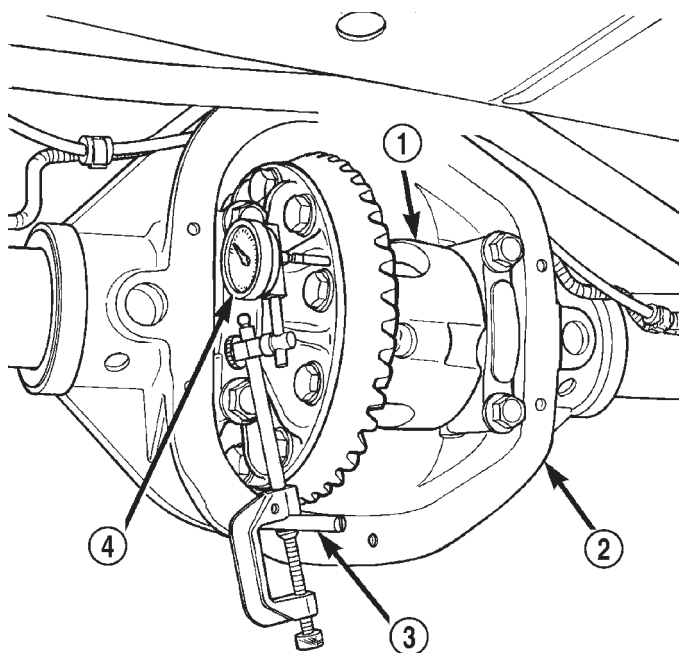
- 1 - AXLE HOUSING
- 2 - MALLET
- 3 - DIFFERENTIAL CASE

(8) Thread guide stud L-4438 into rear cover bolt hole below ring gear (Fig. 46).

(9) Attach dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface on a ring gear bolt head (Fig. 46).



## ADJUSTMENTS (Continued)

**Fig. 46 Differential Side play Measurement**

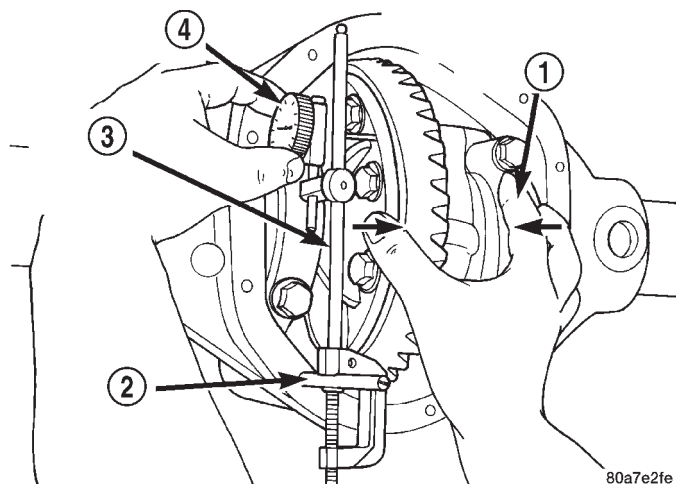
- 1 - DIFFERENTIAL CASE
- 2 - AXLE HOUSING
- 3 - SPECIAL TOOL C-3288-B
- 4 - SPECIAL TOOL C-3339

(10) Push firmly and hold differential case to pinion side of axle housing (Fig. 47).

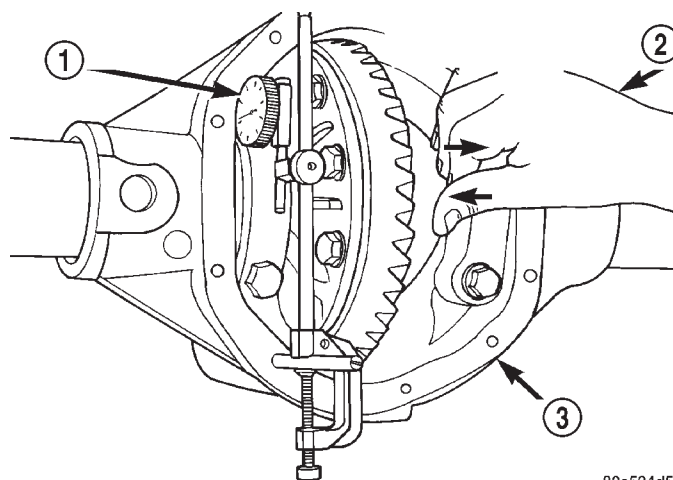
(11) Zero dial indicator face to pointer.

(12) Push firmly and hold differential case to ring gear side of the axle housing (Fig. 48).

(13) Record dial indicator reading.

**Fig. 47 Hold Differential Case and Zero Dial Indicator**

- 1 - FORCE DIFFERENTIAL CASE TO PINION GEAR SIDE
- 2 - SPECIAL TOOL C-3288-B
- 3 - SPECIAL TOOL C-3339
- 4 - ZERO DIAL INDICATOR FACE

**Fig. 48 Hold Differential Case and Read Dial Indicator**

- 1 - READ DIAL INDICATOR
- 2 - FORCE DIFFERENTIAL CASE TO RING GEAR SIDE
- 3 - AXLE HOUSING

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

(15) Add 0.008 in. (0.2 mm) to the zero end play total. This new total represents the thickness of shims necessary to compress, or preload the new bearings when the differential is installed.

(16) Rotate dial indicator out of the way on guide stud.

(17) Remove differential case, dummy bearings, and starting point shims from the axle housing.

(18) Install the pinion in the axle housing. Install the companion flange and establish the correct pinion rotating torque.

(19) Install differential case and dummy bearings in axle housing with a single Dummy Shim 8107 on the ring gear side of the axle and tighten retaining cap bolts.

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 46).

(21) Push and hold differential case toward pinion.

(22) Zero dial indicator face to pointer.

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

(24) Record dial indicator reading.

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

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

## ADJUSTMENTS (Continued)

(27) Rotate dial indicator out of the way on guide stud.

(28) Remove differential case, dummy bearings, and dummy shim from axle housing.

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

(30) Install spreader W-129-B, utilizing Adapter Plates 8142-A, on axle housing and spread axle opening enough to receive differential case.

(31) Place the side bearing shims in the axle housing against the axle housing shoulder.

(32) Install the differential case in the axle housing.

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

(34) Position the indicator plunger against a ring gear tooth (Fig. 49).

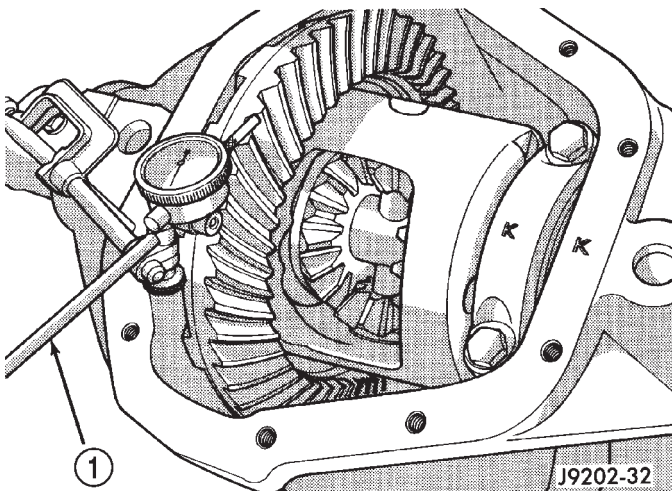
(35) Push and hold ring gear upward while not allowing the pinion gear to rotate.

(36) Zero dial indicator face to pointer.

(37) 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. 50).

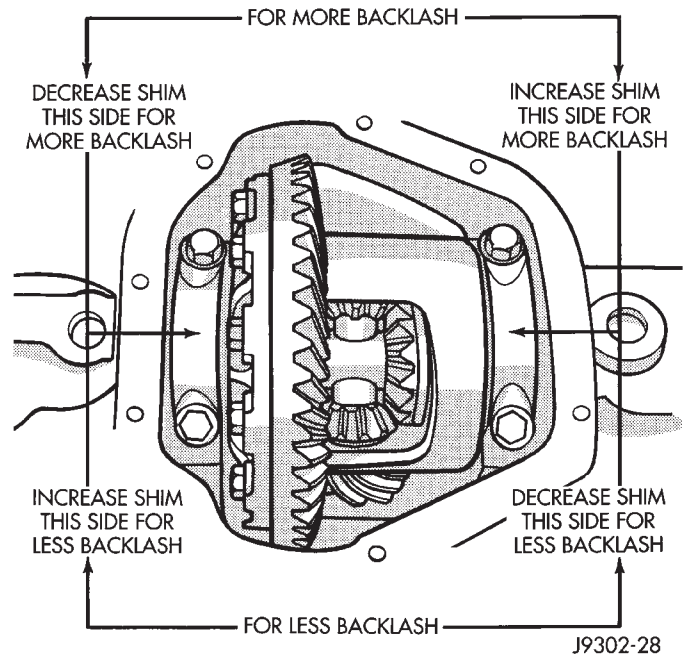
(38) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at eight locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary more than specified, the ring gear or the differential case is defective.

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



**Fig. 49 Ring Gear Backlash Measurement**

1 - DIAL INDICATOR



**Fig. 50 Backlash Shim Adjustment**

## GEAR CONTACT PATTERN ANALYSIS

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

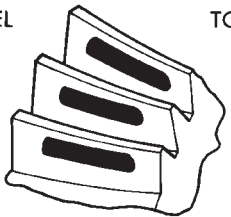
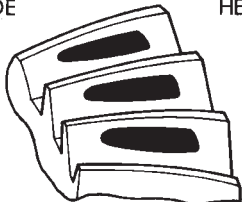

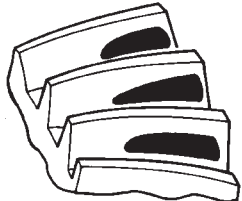


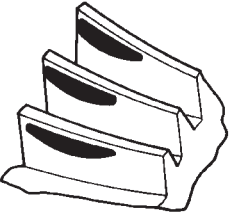
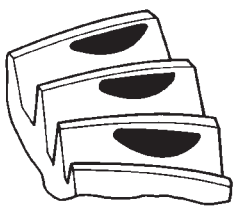
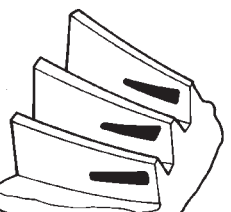
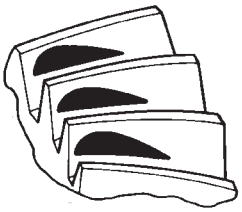
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeeze the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 51) and adjust pinion depth and gear backlash as necessary.

## ADJUSTMENTS (Continued)

<p>DRIVE SIDE OF RING GEAR TEETH</p> <p>HEEL                      TOE</p> 	<p>COAST SIDE OF RING GEAR TEETH</p> <p>TOE                      HEEL</p> 	<p>DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THINNER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THICKER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>DECREASE</b> RING GEAR BACKLASH.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>INCREASE</b> RING GEAR BACKLASH.</p>

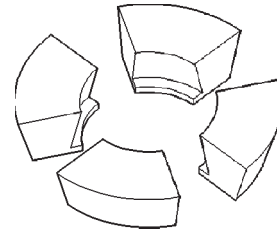
J9003-24

Fig. 51 Gear Tooth Contact Patterns

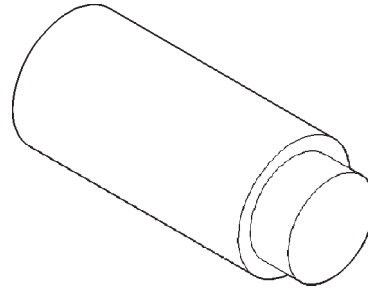
## SPECIFICATIONS

### C205F AXLE

DESCRIPTION	SPECIFICATION
Axle Type .....	Semi-Floating Hypoid
Lubricant .....	SAE Thermally Stable 80W-90
Lube Capacity .....	1.66 L (3.50 pts.)
Axle Ratios .....	3.55, 3.92
Differential Bearing Preload-total .....	0.203 mm (0.008 in.)
Differential Side Gear Clearance .....	0-0.15 mm (0-0.006 in.)
Ring Gear Diameter .....	205 mm (8.07 in.)
Ring Gear Backlash .....	0.12-0.20 mm (0.005-0.008 in.)
Pinion Std. Depth .....	99.690 mm (3.925 in.)
Pinion Bearing Preload-Original Bearings .....	1-2.5 N·m (10-20 in. lbs.)
Pinion Bearing Preload-New Bearings .	1.7-2.5 N·m (15-22 in. lbs.)



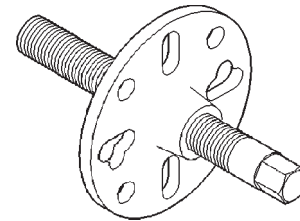
**Adapter—C-293-48**



**Plug—C-293-3**

### C205F AXLE

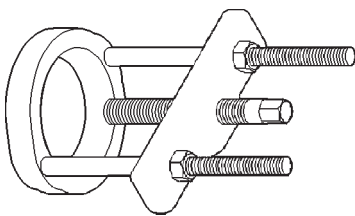
DESCRIPTION	TORQUE
Bolt, Diff. Cover .....	23 N·m (17 ft. lbs.)
Bolt, Bearing Cap .....	61 N·m (45 ft. lbs.)
Nut, Pinion .....	271-474 N·m (200-350 ft. lbs.)
Bolt, Ring Gear .....	95-122 N·m (70-90 ft. lbs.)



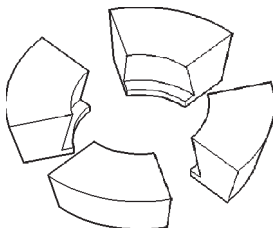
**Puller—C-452**

## SPECIAL TOOLS

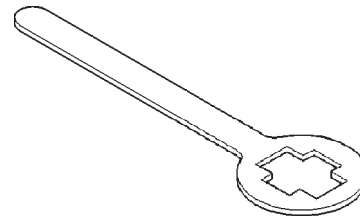
### C205F AXLE



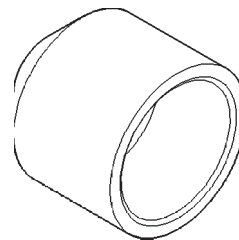
**Puller—C-293-PA**



**Adapter—C-293-42**

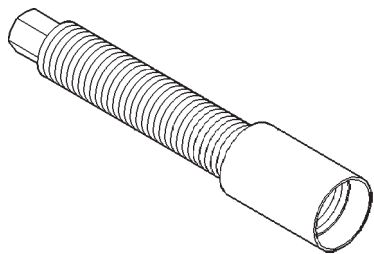
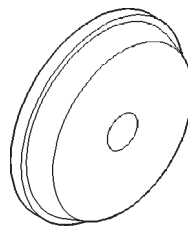
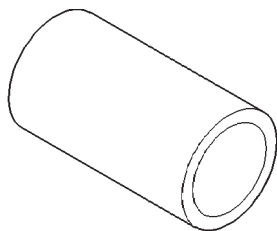
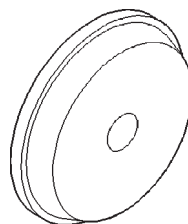
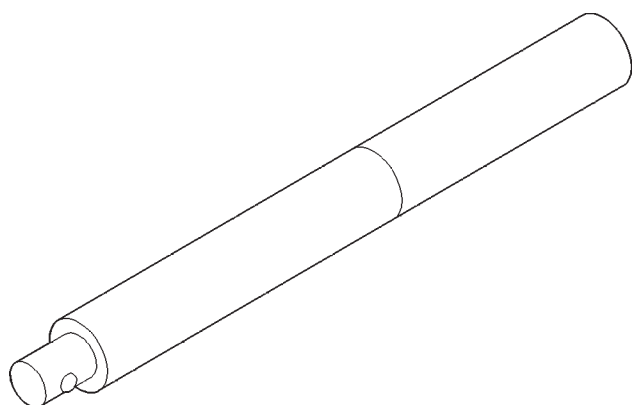
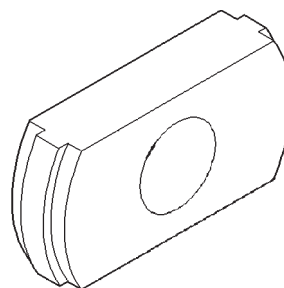
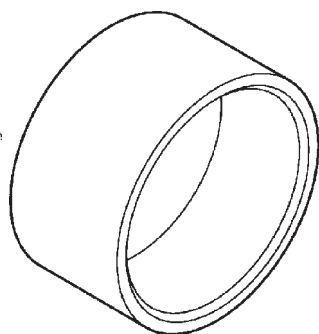
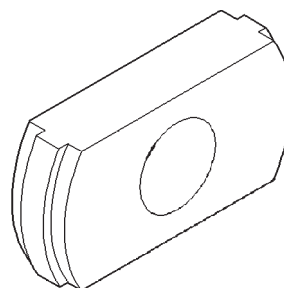
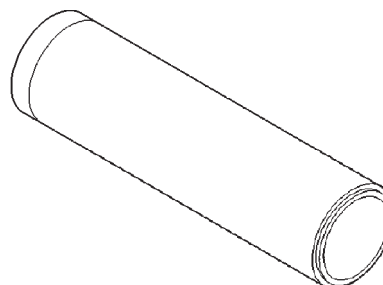


**Holder—6719A**



**Installer—C-3972-A**

## SPECIAL TOOLS (Continued)

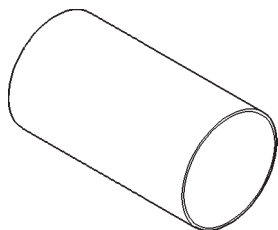
**Installer Screw—8112****Installer—D-129****Cup—8109****Installer—D-145****Handle—C-4171****Remover—D-103****Installer—8236****Remover—8401****Installer—6448**



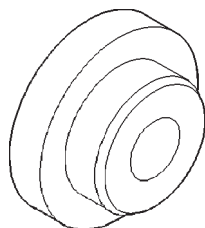
SPECIAL TOOLS (Continued)



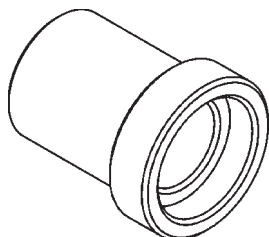
**Bearing Remover—C-4660**



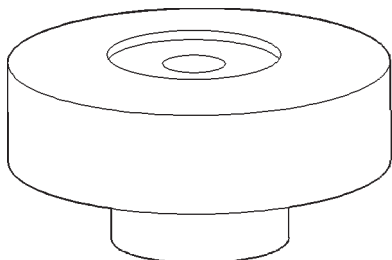
**Cup—8150**



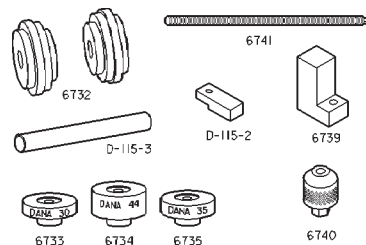
**Installer—5063**



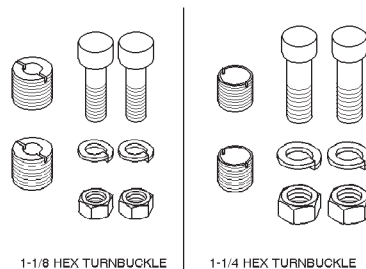
**Installer—8402**



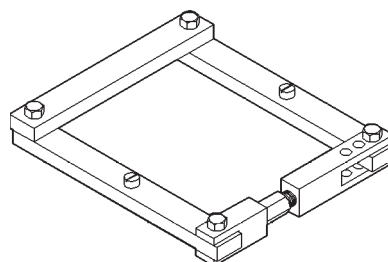
**Gauge Block—8177**



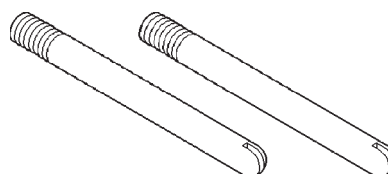
**Tool Set, Pinion Depth**



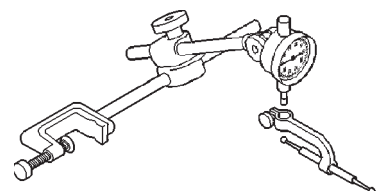
**Adapter Kit—6987A**



**Spreader—W-129-B**



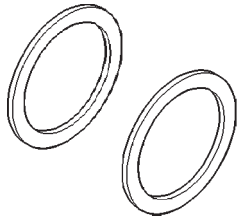
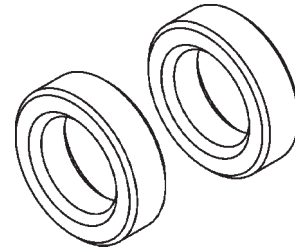
**Guide Pin—C-3288-B**



8011d42b

**Dial Indicator—C-3339**

## SPECIAL TOOLS (Continued)

***Dummy Shim—8107******Dummy Bearing—8398***

## 8 1/4 AND 9 1/4 AXLE

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## DESCRIPTION AND OPERATION

## 8 1/4 AXLE

## DESCRIPTION

The 8 1/4 inch axle housings 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 have a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

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.

The removable, stamped steel cover provides a means for inspection and service without removing the complete axle from the vehicle.

The 8 1/4 axle have a date tag and a gear ratio tag. The tags are attached to the differential housing by a cover bolt.

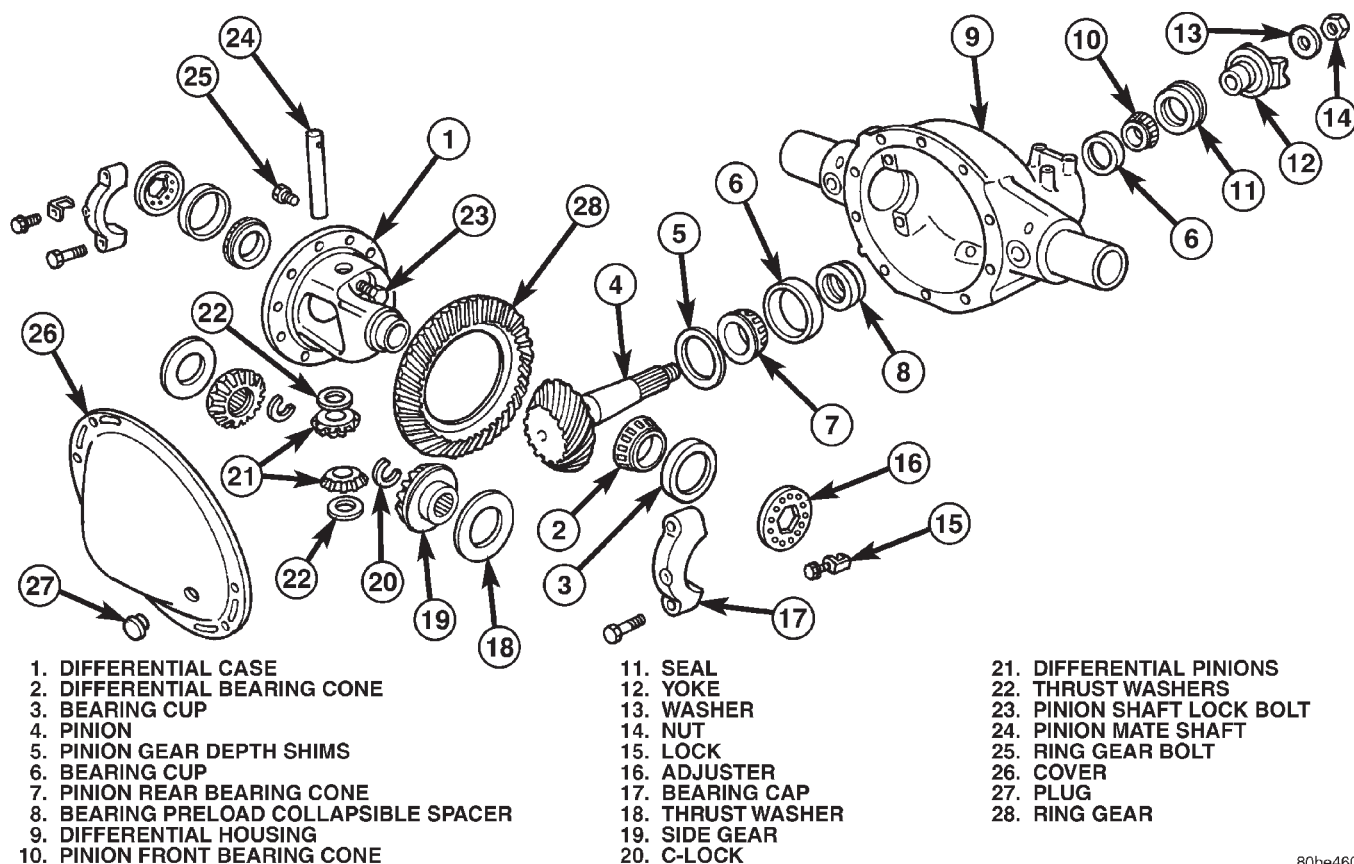
The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded pin. Differential bearing preload and ring gear backlash are set and maintained by threaded adjusters at the outside of the differential housing. Pinion bearing preload is set and maintained by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

Axles equipped with a Trac-Lok<sup>™</sup> differential are optional. A Trac-Lok<sup>™</sup> differential has a one-piece differential case, and the same internal components as a standard differential, plus two clutch disc packs.

## AXLE IDENTIFICATION

The axle differential cover can be used for identification of the axle (Fig. 2). A tag is also attached to the cover.

## DESCRIPTION AND OPERATION (Continued)



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Fig. 1 8 1/4 Axle

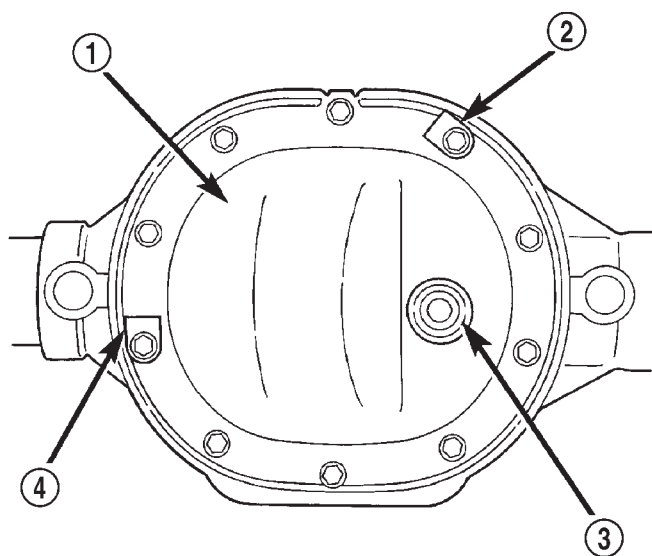


Fig. 2 Differential Cover 8 1/4 Inch Axle

- 1 - DIFFERENTIAL COVER  
2 - IDENTIFICATION TAG  
3 - PUSH-IN FILL PLUG  
4 - DATE TAG

## OPERATION

The axle receives power from the transmission/transfer case through the rear propeller shaft. The rear 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.

## 9 1/4 AXLES

## DESCRIPTION

The 9 1/4 Inch axle housings 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. 3).

The axles have a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

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.

80be4602

## DESCRIPTION AND OPERATION (Continued)

The removable, stamped steel cover provides a means for inspection and service without removing the complete axle from the vehicle.

The axle has a date tag and a gear ratio tag. The tags are attached to the differential housing by a cover bolt.

The rear wheel anti-lock (RWAL) brake speed sensor is attached to the top, forward exterior of the differential housing. A seal is located between the sensor and the wire harness connector. The seal must be in place when the wire connector is connected to the sensor. The RWAL brake exciter ring is press-fitted onto the differential case against the ring gear flange.

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.

Axles equipped with a Trac-Lok<sup>™</sup> differential are optional. A Trac-Lok<sup>™</sup> differential has a one-piece differential case, and the same internal components as a standard differential, plus two clutch disc packs.



## DESCRIPTION AND OPERATION (Continued)

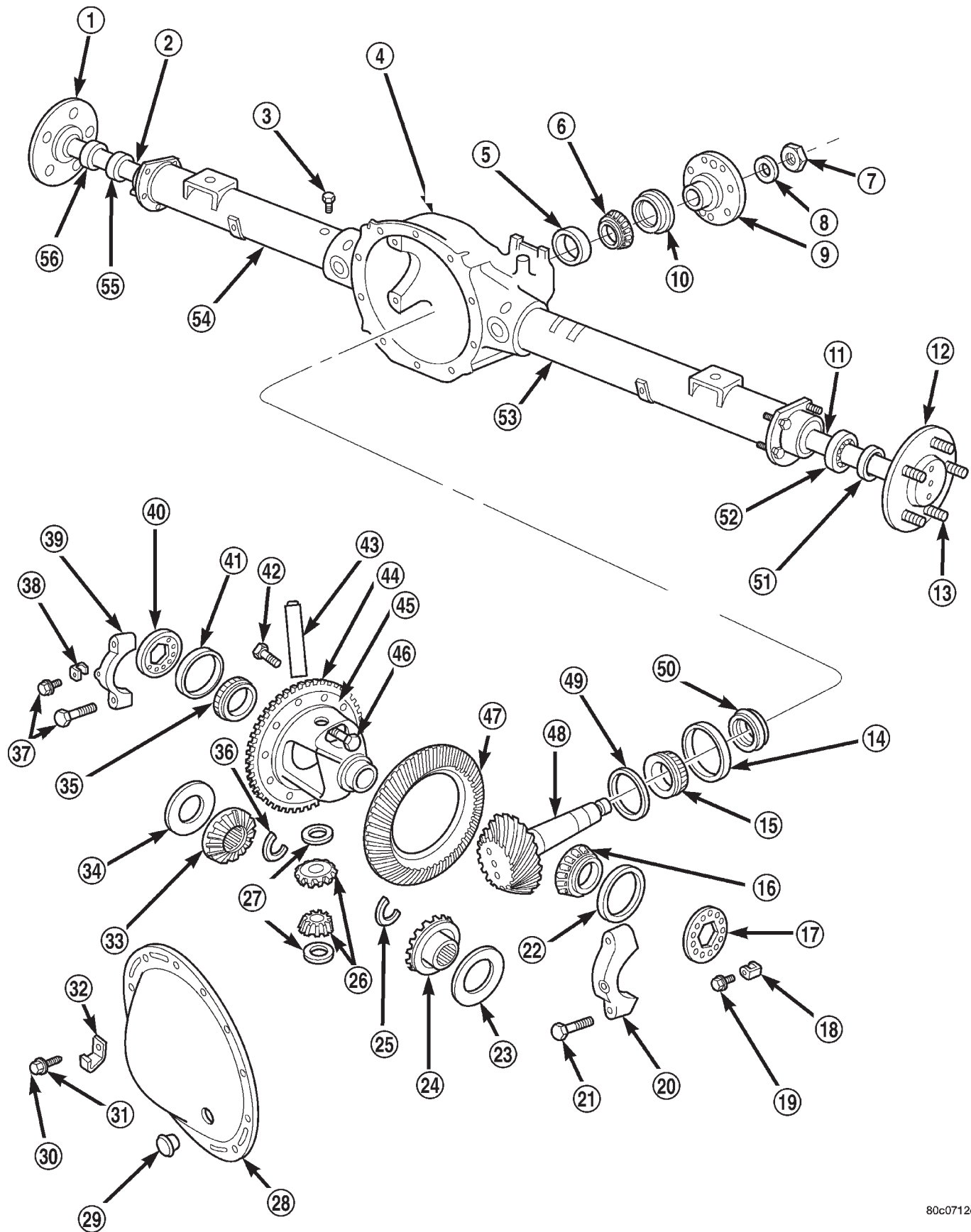


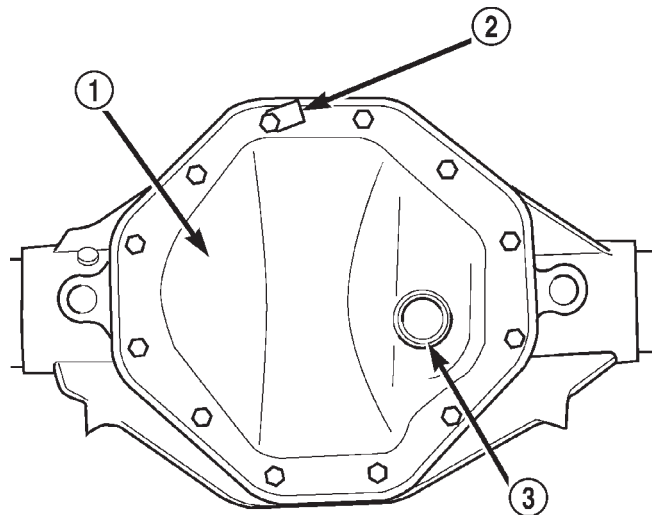
Fig. 3 9 1/4 Axle

## DESCRIPTION AND OPERATION (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 - PINION FRONT 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 - PINION REAR 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 - BEARING PRELOAD COLLAPSIBLE SPACER |
| 23 - THRUST WASHER            | 51 - SEAL                               |
| 24 - SIDE GEAR                | 52 - AXLE SHAFT BEARING                 |
| 25 - C-LOCK                   | 53 - AXLE SHAFT TUBE                    |
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| 27 - THRUST WASHER            | 55 - AXLE SHAFT BEARING                 |
| 28 - COVER                    | 56 - SEAL                               |

### AXLE IDENTIFICATION

The axle differential cover can be used for identification of the axle and (Fig. 4). A ratio tag is attached to the differential cover.



80c0712e

**Fig. 4 Differential Cover 9 1/4 Inch Axle**

- 1 - DIFFERENTIAL COVER  
2 - RATIO TAG  
3 - PUSH-IN FILL PLUG

### OPERATION

The axle receives power from the transmission/transfer case through the rear propeller shaft. The rear 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.

### LUBRICANT

#### DESCRIPTION

Multi-purpose, hypoid gear lubricant should be used for rear axles with a standard differential. The lubricant should have a MIL-L-2105C and API GL 5 quality specifications.

Trac-Lok differentials require the addition of 5 oz. of friction modifier to the axle lubricant after service. The 8 1/4 axle lubricant capacity is 2.22 L (4.7 pts.) total, including the friction modifier, if necessary. The 9 1/4 axle lubricant capacity is 2.32 L (4.9 pts.) total, including friction modifier, if necessary.

**NOTE:** If the rear axle is submerged in water, the lubricant must be replaced immediately. Avoid the possibility of premature axle failure resulting from water contamination of the lubricant.

## DESCRIPTION AND OPERATION (Continued)

## STANDARD DIFFERENTIAL

## DESCRIPTION

The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

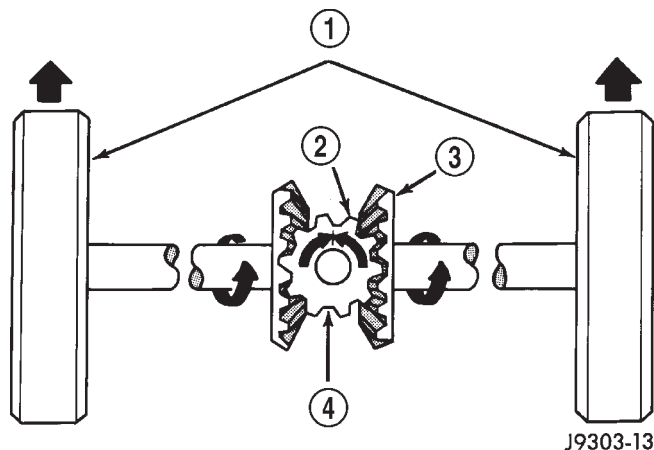
Each differential side gear is splined to an axle shaft. The pinion gears are mounted on a pinion mate shaft and are free to rotate on the shaft. The pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

## OPERATION

In operation, power flow occurs as follows:

- The pinion gear rotates the ring gear
- The ring gear (bolted to the differential case) rotates the case
- The differential pinion gears (mounted on the pinion mate shaft in the case) rotate the side gears
- The side gears (splined to the axle shafts) rotate the shafts

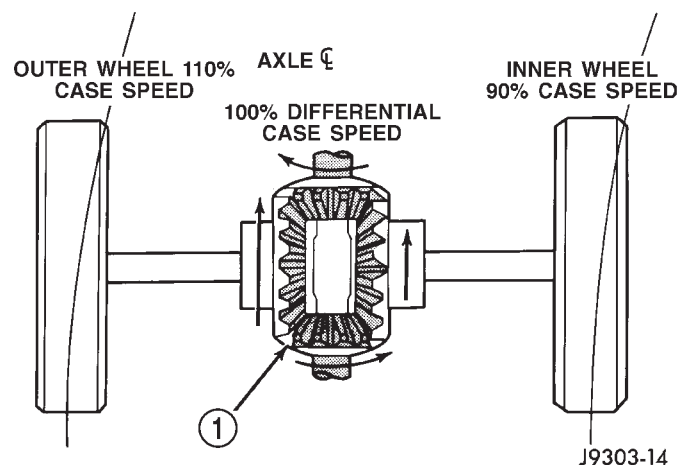
During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 5).



**Fig. 5 Differential Operation—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. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 6). 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. 6 Differential Operation—On Turns**

- 1 - PINION GEARS ROTATE ON PINION SHAFT

## TRAC-LOK™ DIFFERENTIAL

## DESCRIPTION

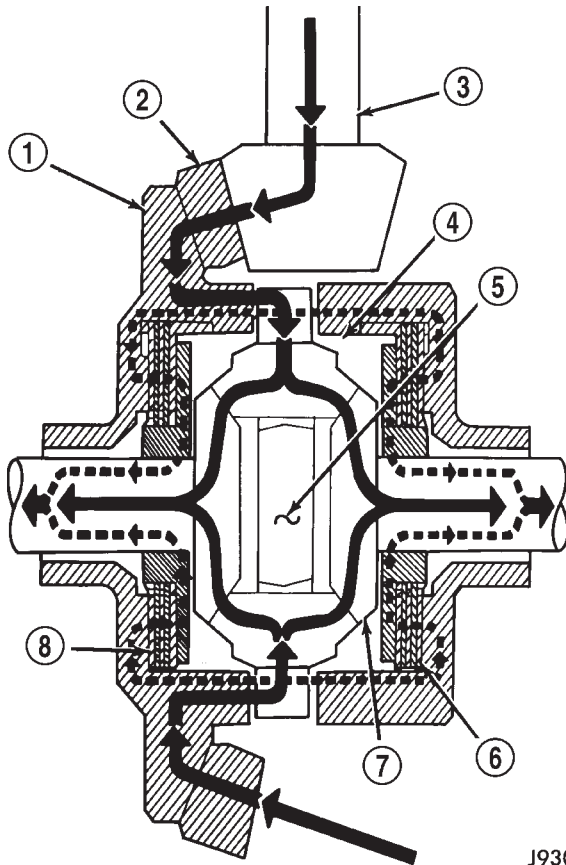
In a standard differential, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

In the Trac-lok™ differential, part of the ring gear torque is transmitted through clutch packs which contain multiple discs. The clutches will have radial grooves on the plates, and concentric grooves on the discs or bonded fiber material that is smooth in appearance.

## DESCRIPTION AND OPERATION (Continued)

## OPERATION

In operation, the Trac-lok™ 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 generated by the side gears as torque is applied through the ring gear (Fig. 7).



J9303-15

**Fig. 7 Trac-lok™ Limited Slip Differential Operation**

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

The Trac-lok™ 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. Trac-lok™ differentials resist 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

## GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

- Insufficient or incorrect lubricant.
- Foreign matter/water contamination.
- Incorrect bearing preload torque adjustment.
- Incorrect backlash.

Axle gear problem conditions are usually the result of:

- Insufficient lubrication.
- Incorrect or contaminated lubricant.
- Overloading (excessive engine torque) or exceeding vehicle weight capacity.
- Incorrect clearance or backlash adjustment.

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.
- Differential housing bores not square to each other.

## DIAGNOSIS AND TESTING (Continued)

## DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	<ol style="list-style-type: none"> <li>1. Wheel loose.</li> <li>2. Faulty, brinelled wheel bearing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten loose nuts.</li> <li>2. Replace bearing.</li> </ol>
Axle Shaft Noise	<ol style="list-style-type: none"> <li>1. Misaligned axle tube.</li> <li>2. Bent or sprung axle shaft.</li> <li>3. End-play in pinion bearings.</li> <li>4. Excessive gear backlash between the ring gear and pinion.</li> <li>5. Improper adjustment of pinion gear bearings.</li> <li>6. Loose pinion companion flange nut.</li> <li>7. Scuffed gear tooth contact surfaces.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspect axle tube alignment. Correct as necessary.</li> <li>2. Inspect and correct as necessary.</li> <li>3. Refer to pinion pre-load information and correct as necessary.</li> <li>4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.</li> <li>5. Adjust the pinion bearings pre-load.</li> <li>6. Tighten the pinion companion flange nut.</li> <li>7. Inspect and replace as necessary.</li> </ol>
Axle Shaft Broke	<ol style="list-style-type: none"> <li>1. Misaligned axle tube.</li> <li>2. Vehicle overloaded.</li> <li>3. Erratic clutch operation.</li> <li>4. Grabbing clutch.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the broken shaft after correcting tube mis-alignment.</li> <li>2. Replace broken shaft and avoid excessive weight on vehicle.</li> <li>3. Replace broken shaft and avoid or correct erratic clutch operation.</li> <li>4. Replace broken shaft and inspect and repair clutch as necessary.</li> </ol>
Differential Cracked	<ol style="list-style-type: none"> <li>1. Improper adjustment of the differential bearings.</li> <li>2. Excessive ring gear backlash.</li> <li>3. Vehicle overloaded.</li> <li>4. Erratic clutch operation.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace case and inspect gears and bearings for further damage. Set differential bearing pre-load properly.</li> <li>2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash properly.</li> <li>3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.</li> <li>4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.</li> </ol>
Differential Gears Scored	<ol style="list-style-type: none"> <li>1. Insufficient lubrication.</li> <li>2. Improper grade of lubricant.</li> <li>3. Excessive spinning of one wheel/tire.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>2. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.</li> </ol>



## DIAGNOSIS AND TESTING (Continued)

Condition	Possible Causes	Correction
Loss Of Lubricant	<ol style="list-style-type: none"> <li>1. Lubricant level too high.</li> <li>2. Worn axle shaft seals.</li> <li>3. Cracked differential housing.</li> <li>4. Worn pinion seal.</li> <li>5. Worn/scored companion flange.</li> <li>6. Axle cover not properly sealed.</li> </ol>	<ol style="list-style-type: none"> <li>1. Drain lubricant to the correct level.</li> <li>2. Replace seals.</li> <li>3. Repair as necessary.</li> <li>4. Replace seal.</li> <li>5. Replace companion flange and seal.</li> <li>6. Remove, clean, and re-seal cover.</li> </ol>
Axle Overheating	<ol style="list-style-type: none"> <li>1. Lubricant level low.</li> <li>2. Improper grade of lubricant.</li> <li>3. Bearing pre-loads too high.</li> <li>4. Insufficient ring gear backlash.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill differential to correct level.</li> <li>2. Fill differential with the correct fluid type and quantity.</li> <li>3. Re-adjust bearing pre-loads.</li> <li>4. Re-adjust ring gear backlash.</li> </ol>
Gear Teeth Broke	<ol style="list-style-type: none"> <li>1. Overloading.</li> <li>2. Erratic clutch operation.</li> <li>3. Ice-spotted pavement.</li> <li>4. Improper adjustments.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace gears. Examine other gears and bearings for possible damage.</li> <li>2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.</li> <li>3. Replace gears and examine remaining parts for damage.</li> <li>4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.</li> </ol>
Axle Noise	<ol style="list-style-type: none"> <li>1. Insufficient lubricant.</li> <li>2. Improper ring gear and pinion adjustment.</li> <li>3. Unmatched ring gear and pinion.</li> <li>4. Worn teeth on ring gear and/or pinion.</li> <li>5. Loose pinion bearings.</li> <li>6. Loose differential bearings.</li> <li>7. Mis-aligned or sprung ring gear.</li> <li>8. Loose differential bearing cap bolts.</li> <li>9. Housing not machined properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill differential with the correct fluid type and quantity.</li> <li>2. Check ring gear and pinion contact pattern.</li> <li>3. Replace gears with a matched ring gear and pinion.</li> <li>4. Replace ring gear and pinion.</li> <li>5. Adjust pinion bearing pre-load.</li> <li>6. Adjust differential bearing pre-load.</li> <li>7. Measure ring gear run-out. Replace components as necessary.</li> <li>8. Inspect differential components and replace as necessary. Ensure that the bearing caps are torqued to the proper specification.</li> <li>9. Replace housing.</li> </ol>

**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.

## DIAGNOSIS AND TESTING (Continued)

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 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 nut.
- Excessive companion flange 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 Group 22, Wheels and Tires, for additional vibration information.

### 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 nut and companion flange.
- 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.

### TRAC-LOK™ DIFFERENTIAL NOISE

The most common problem is a chatter noise when turning corners. Before removing a Trac-lok™ unit for repair, drain, flush and refill the axle with the specified lubricant. Refer to Lubricant change in this Group.

A container of Mopar® Trac-lok™ Lubricant (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.

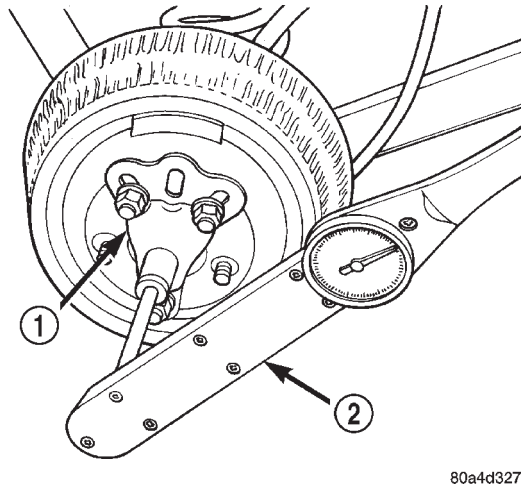
### TRAC-LOK™ TEST

**WARNING: WHEN SERVICING VEHICLES WITH A TRAC-LOK™ DIFFERENTIAL DO NOT USE THE ENGINE TO TURN THE AXLE AND WHEELS. BOTH REAR WHEELS MUST BE RAISED AND THE VEHICLE SUPPORTED. A TRAC-LOK™ AXLE CAN EXERT ENOUGH FORCE IF ONE WHEEL IS IN CONTACT WITH A SURFACE TO CAUSE THE VEHICLE TO MOVE.**

## DIAGNOSIS AND TESTING (Continued)

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 to studs.
- (5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 8).



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**Fig. 8 Trac-lok™ Test —Typical**

- 1 - SPECIAL TOOL 6790 WITH BOLT IN CENTER HOLE  
2 - TORQUE WRENCH

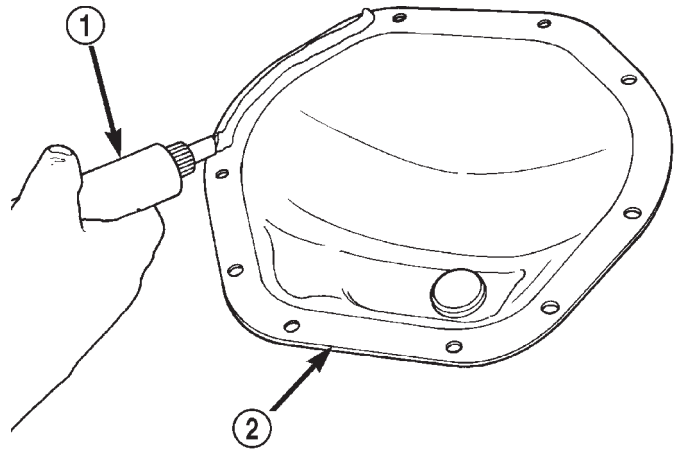
- (6) If rotating torque is less than 22 N·m (30 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

## SERVICE PROCEDURES

## LUBRICANT CHANGE

- (1) Raise and support the vehicle.
- (2) Remove the lubricant fill hole plug from the differential housing cover.
- (3) Remove the differential housing cover and drain the lubricant from the housing.
- (4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**
- (5) Remove the original sealant from the housing and cover surfaces.
- (6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 9).

**Install the housing cover within 5 minutes after applying the sealant.**



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**Fig. 9 Apply Sealant**

- 1 - SEALANT  
2 - AXLE HOUSING COVER

- (7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.
- (8) For Trac-lok™ differentials, a quantity of Mopar® Trac-lok™ lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.
- (9) Fill differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications section of this group for the quantity necessary.

**CAUTION: Overfilling the differential can result in lubricant foaming and overheating.**

- (10) Install the fill hole plug and lower the vehicle.
- (11) 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.

## REMOVAL AND INSTALLATION

## REAR AXLE

## REMOVAL

- (1) Raise and support the vehicle.
- (2) Position a suitable lifting device under the axle.
- (3) Secure axle to device.
- (4) Remove the wheels and tires.
- (5) Secure brake drums to the axle shaft.
- (6) Remove the RWAL sensor from the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.

## REMOVAL AND INSTALLATION (Continued)

(7) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.

(8) Disconnect the parking brake cables and cable brackets.

(9) Disconnect the vent hose from the axle shaft tube.

(10) Mark the propeller shaft and companion flange for installation alignment reference.

(11) Remove propeller shaft.

(12) Disconnect shock absorbers from axle.

(13) Remove the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.

(14) Separate the axle from the vehicle.

## INSTALLATION

(1) Raise the axle with lifting device and align to the leaf spring centering bolts.

(2) Install the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.

(3) Install shock absorbers and tighten nuts to 82 N·m (60 ft. lbs.) torque.

(4) Install the RWAL sensor to the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.

(5) Connect the parking brake cables and cable brackets.

(6) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.

(7) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.

(8) Install axle vent hose.

(9) Align propeller shaft and pinion companion flange reference marks. Install the companion flange bolts. Tighten to 108 N·m (80 ft. lbs.) torque.

(10) Install the wheels and tires.

(11) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.

(12) Remove lifting device from axle and lower the vehicle.

## AXLE SHAFT

## REMOVAL

(1) Raise and support vehicle. Ensure that the transmission is in neutral.

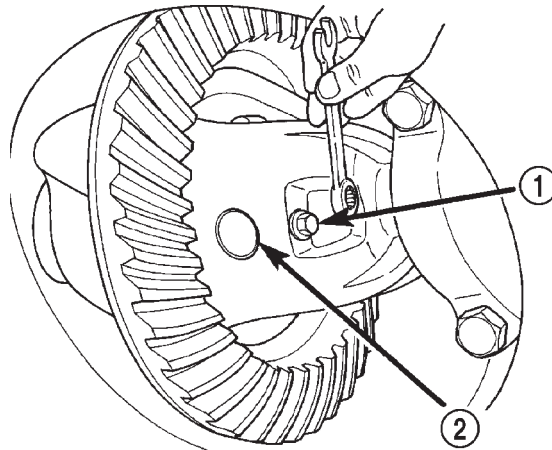
(2) Remove wheel and tire assembly.

(3) Remove brake drum. Refer to Group 5, Brakes, for proper procedure.

(4) Clean all foreign material from housing cover area.

(5) Loosen housing cover bolts. Drain lubricant from the housing and axle tubes. Remove housing cover.

(6) Rotate differential case so that pinion mate shaft lock screw is accessible. Remove lock screw and pinion mate shaft from differential case (Fig. 10).

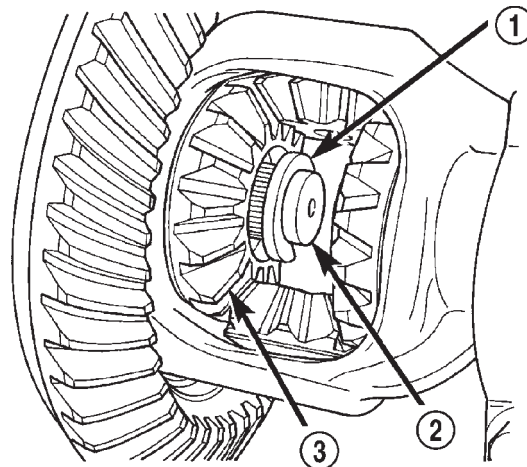


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Fig. 10 Pinion Mate Shaft Lock Screw

- 1 - LOCK SCREW  
2 - PINION MATE SHAFT

(7) Push axle shaft inward and remove axle shaft C-lock from the axle shaft (Fig. 11).



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Fig. 11 Axle Shaft C-Lock

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

(8) Remove axle shaft. Use care to prevent damage to axle shaft bearing and seal, which will remain in axle tube.

(9) Inspect axle shaft seal for leakage or damage.

(10) Inspect roller bearing contact surface on axle shaft for signs of brinelling, galling and pitting. If any of these conditions exist, the axle shaft and/or bearing and seal must be replaced.



## REMOVAL AND INSTALLATION (Continued)

### INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing, and engage it into side gear splines.

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

(2) Insert C-lock in end of axle shaft. Push axle shaft outward to seat C-lock in side gear.

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

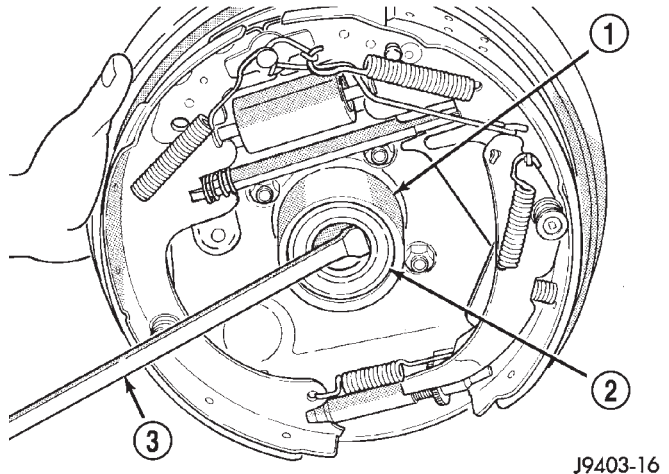
(4) Align hole in shaft with hole in the differential case and install lock screw with Loctite® on the threads. Tighten lock screw to 11 N·m (8 ft. lbs.) torque.

(5) Install cover and add fluid. Refer to Lubricant Change procedure in this section for procedure and lubricant requirements.

(6) Install brake drum. Refer to Group 5, Brakes, for proper procedures.

(7) Install wheel and tire.

(8) Lower vehicle.



**Fig. 12 Axle Seal Removal**

- 1 - AXLE TUBE
- 2 - AXLE SEAL
- 3 - PRY BAR

## 8 1/4 AND 9 1/4 AXLE SEAL AND BEARING

### REMOVAL

(1) Remove axle shaft.

(2) Remove axle shaft seal from the end of the axle tube with a small pry bar (Fig. 12).

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

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool Set 6310, using Adapter Foot 6310-9 (Fig. 13).

### INSTALLATION

**NOTE:** Do not install the original axle shaft seal. Always install a new seal.

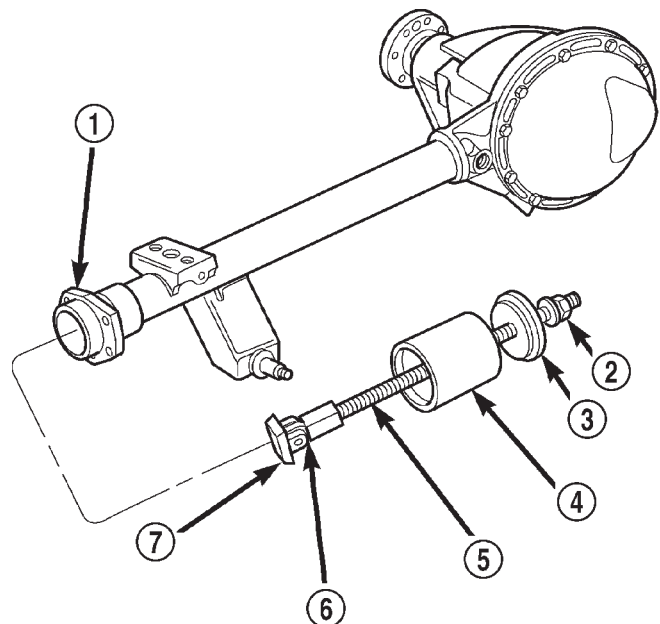
(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.

(2) Install the axle shaft bearing with Installer C-4198 and Handle C-4171 (Fig. 14). Ensure that the bearing part number is against the installer. Verify that the bearing is installed straight and the tool fully contacts the axle tube when seating the bearing.

(3) Install a new axle seal with Installer C-4076-B and Handle C-4735-1. When the tool contacts the axle tube, the seal is installed to the correct depth.

(4) Coat the lip of the seal with axle lubricant for protection prior to installing the axle shaft.

(5) Install the axle shaft.



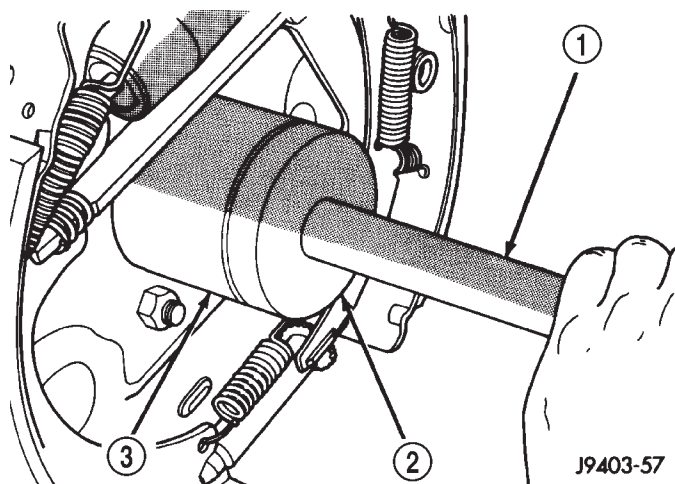
**Fig. 13 Axle Shaft Bearing Removal Tool**

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

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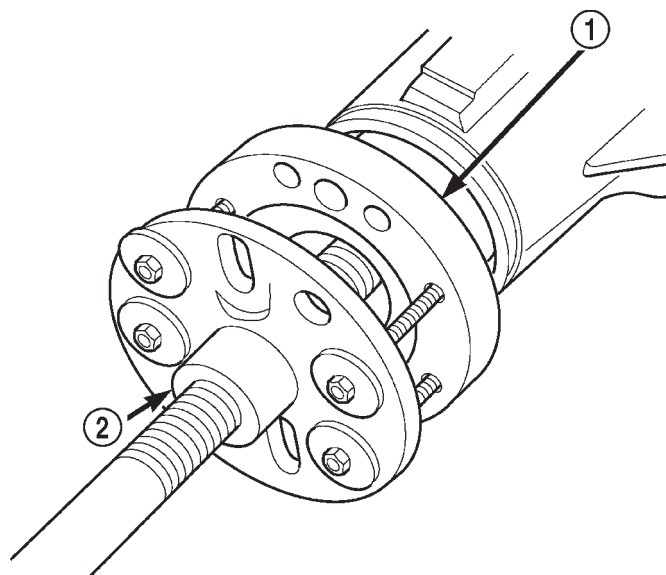
## REMOVAL AND INSTALLATION (Continued)

**Fig. 14 Axle Shaft Seal and Bearing Installation**

- 1 - HANDLE
- 2 - INSTALLER
- 3 - AXLE TUBE

**PINION SEAL****REMOVAL**

- (1) Raise and support the vehicle.
- (2) Scribe a mark on the universal joint, companion flange, and pinion shaft for installation reference.
- (3) Disconnect the propeller shaft from the companion flange. Secure the propeller shaft in an upright position to prevent damage to the rear universal joint.
- (4) Remove the wheel and tire assemblies.
- (5) Remove the brake drums to prevent any drag. The drag may cause a false bearing preload torque measurement.
- (6) Rotate the companion flange three or four times.
- (7) Measure the amount of torque necessary to rotate the pinion with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
- (8) Install socket head bolts into two of the threaded holes in the companion flange, 180° apart.
- (9) Position Holder 6719 against the companion flange and install a hex head bolt and washer into one of the remaining threaded holes. Tighten the bolt and washer so that the Holder 6719 is held to the flange.
- (10) Hold the flange with Holder 6719. Remove the pinion nut and washer.
- (11) Remove the companion flange with Remover C-452 (Fig. 15).
- (12) Remove the pinion seal with suitable pry tool or slide-hammer mounted screw.

**Fig. 15 Companion Flange Removal**

- 1 - COMPANION FLANGE
- 2 - PULLER TOOL

**INSTALLATION**

- (1) Clean the seal contact surface in the housing bore.
- (2) Examine the splines on the pinion shaft for burrs or wear. Remove any burrs and clean the shaft.
- (3) Inspect companion flange for cracks, worn splines and worn seal contact surface. Replace companion flange if necessary.

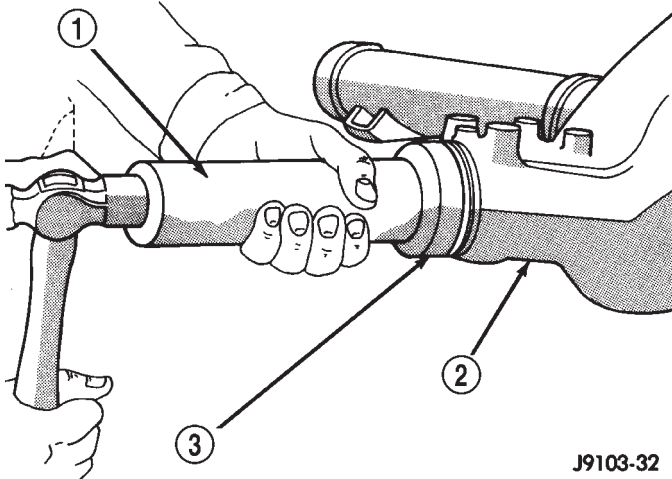
**NOTE:** The outer perimeter of the seal is pre-coated with a special sealant. An additional application of sealant is not required.

- (4) Apply a light coating of gear lubricant on the lip of pinion seal.
- (5) Install the new pinion seal with Installer C-4076-B and Handle C-4735-1 for 8 1/4 axles (Fig. 16) and Installer C-3860-A and Handle C-4171 for 9 1/4 axles.

**NOTE:** The seal is correctly installed when the seal flange contacts the face of the differential housing.

- (6) Position the companion flange on the end of the shaft with the reference marks aligned.
- (7) Install socket head bolts into two of the threaded holes in the companion flange, 180° apart.
- (8) Position Holder 6719 against the companion flange and install a hex head bolt and washer into one of the remaining threaded holes. Tighten the bolt and washer so that the Holder 6719 is held to the flange.

# REMOVAL AND INSTALLATION (Continued)



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**Fig. 16 8 1/4 Axle Pinion Seal Installation**

- 1 - SPECIAL TOOL C-4735
- 2 - DIFFERENTIAL HOUSING
- 3 - SPECIAL TOOL C-4076-A

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

(10) Remove the Installer C-3718 and install the pinion washer and a new pinion nut. The convex side of the washer must face outward.

**CAUTION:** Do not exceed the minimum tightening torque when installing the companion flange retaining nut at this point. Damage to collapsible spacer or bearings may result.

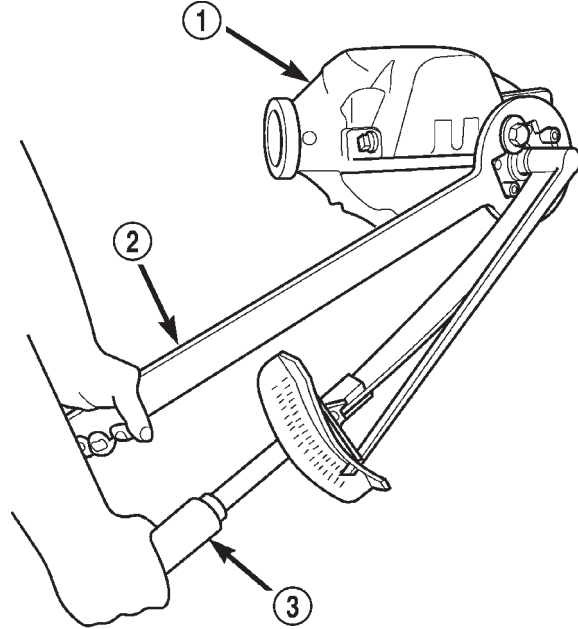
(11) Hold companion flange with Holder 6719 and tighten the pinion nut to 285 N·m (210 ft. lbs.) (Fig. 17). Rotate pinion several revolutions to ensure the bearing rollers are seated.

(12) Rotate the pinion using an (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 18).

**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. The torque sequence will then have to be repeated.

(13) If the rotating torque is low, use Holder 6719 to hold the companion flange (Fig. 17) and tighten the pinion nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

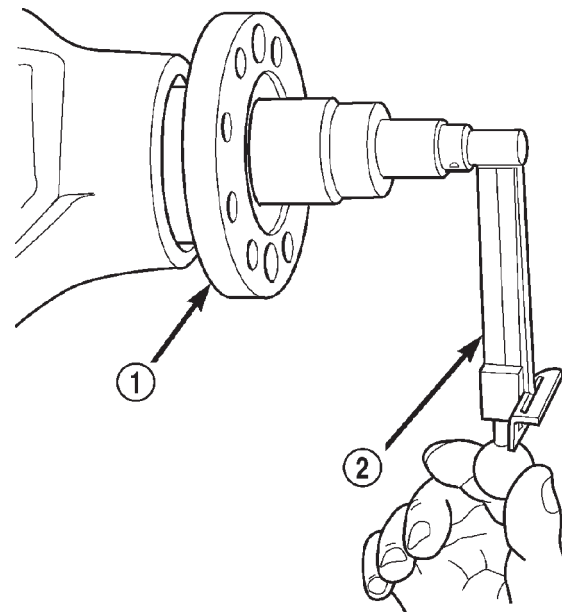
**NOTE:** The bearing rotating torque should be constant during a complete revolution of the pinion. If the rotating torque varies, this indicates a binding condition.



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**Fig. 17 Tightening Pinion Nut**

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



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**Fig. 18 Check Pinion Rotation Torque**

- 1 - COMPANION FLANGE
- 2 - INCH POUND TORQUE WRENCH

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

## REMOVAL AND INSTALLATION (Continued)

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

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

(17) Install the brake drums.

(18) Install wheel and tire assemblies and lower the vehicle.

(19) Check the differential housing lubricant level.

## DIFFERENTIAL

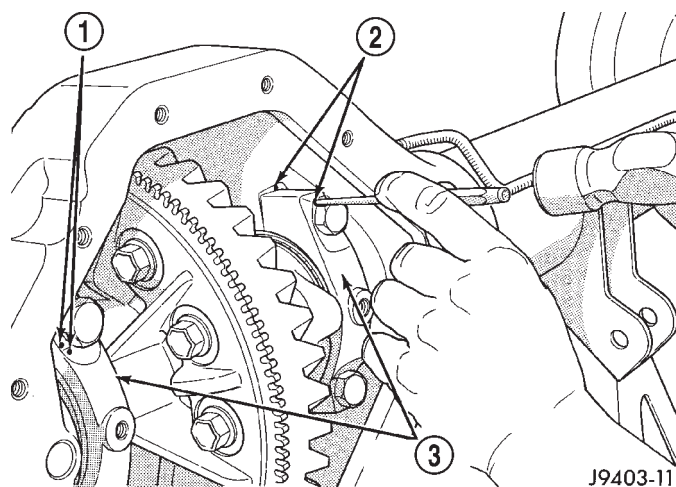
## REMOVAL

(1) Remove the axle shafts.

(2) Remove RWAL/ABS sensor from housing.

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

(3) Mark the differential housing and the differential bearing caps for installation reference (Fig. 19).



**Fig. 19 Mark For Installation Reference**

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

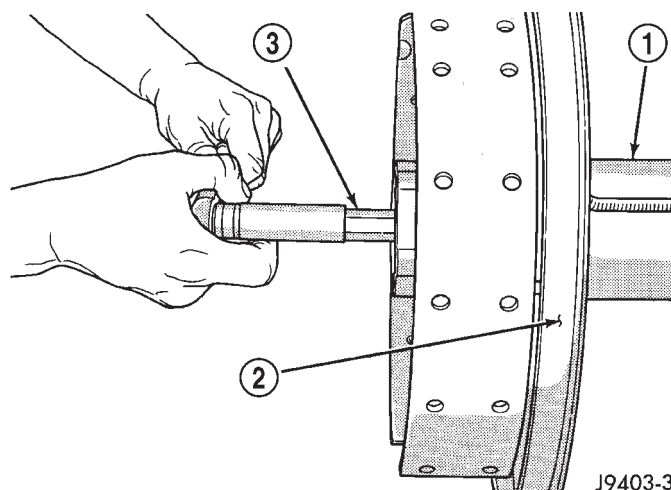
(4) Remove bearing threaded adjuster lock from each bearing cap. Loosen the bolts, but do not remove the bearing caps.

(5) Loosen the threaded adjusters with Wrench C-4164 (Fig. 20).

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

(7) Remove the differential case.

**NOTE:** Each differential bearing cup and threaded adjuster must be kept with their respective bearing.



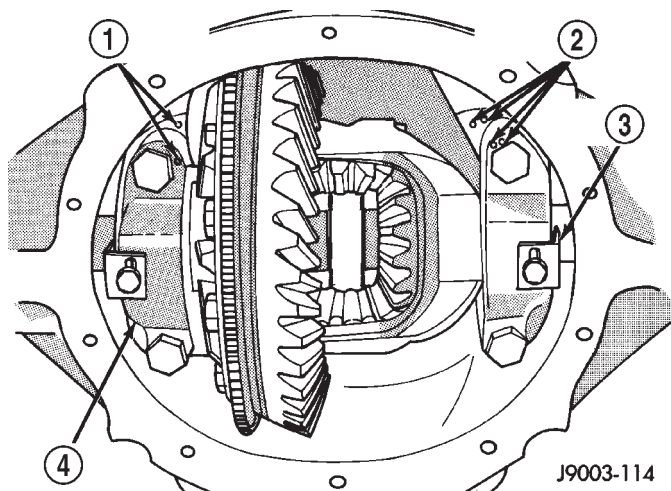
**Fig. 20 Threaded Adjuster Tool**

- 1 - AXLE TUBE
- 2 - BACKING PLATE
- 3 - TOOL C-4164

## 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. Carefully position the assembled differential case in the housing.

(2) Observe the reference marks and install the differential bearing caps at their original locations (Fig. 21).



**Fig. 21 Bearing Caps & Bolts**

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

## REMOVAL AND INSTALLATION (Continued)

(3) 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.

(4) Perform the differential bearing preload and adjustment procedure.

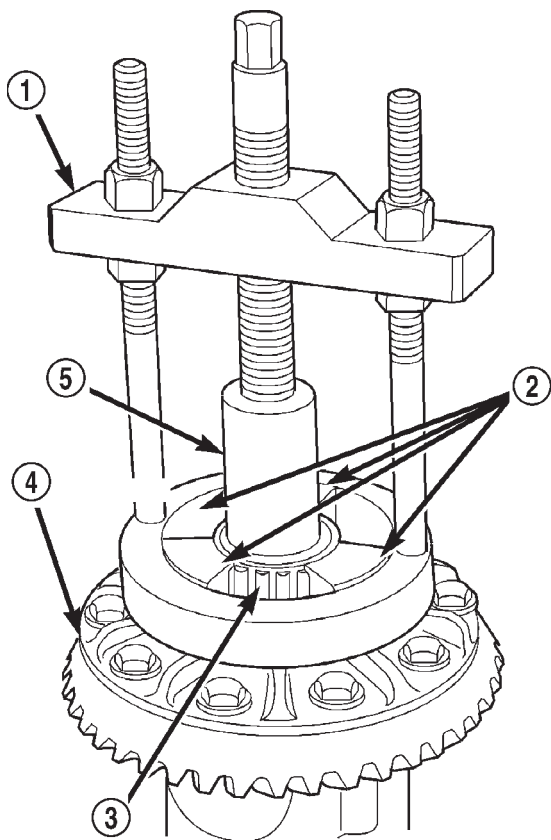
**NOTE:** Be sure that all bearing cap bolts are tightened to their final torque of 136 N·m (100 ft.lbs.) before proceeding.

(5) Install axle shafts and differential housing cover.

## DIFFERENTIAL SIDE BEARINGS

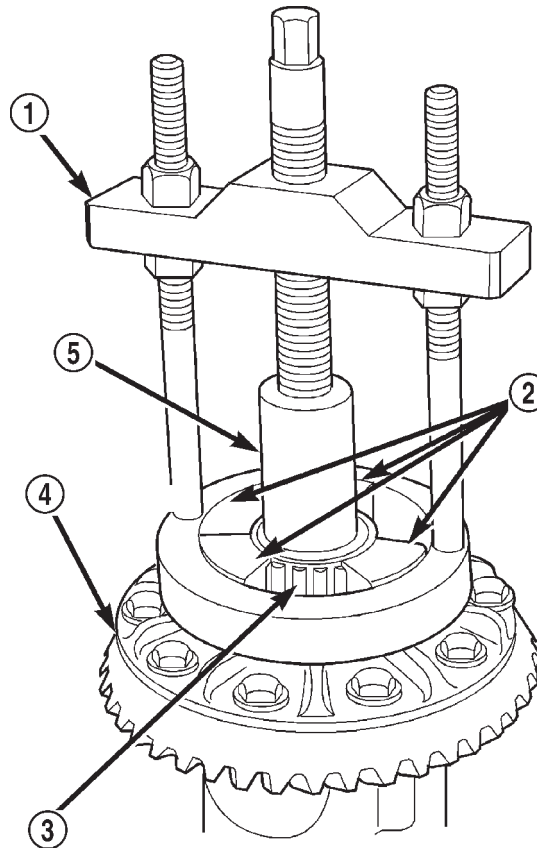
### REMOVAL

- (1) Remove differential case from axle housing.
- (2) Remove the bearings from the differential case with Puller/Press C-293-PA and:
  - Adapters C-293-48 and Plug SP-3289 for the 8 1/4 axle (Fig. 22).
  - Adapters C-293-47 and Plug C-293-3 for the 9 1/4 axle (Fig. 23).



**Fig. 22 Differential Bearing Removal—8 1/4 Axle**

- 1 - SPECIAL TOOL C-293-PA
- 2 - SPECIAL TOOL C-293-48
- 3 - BEARING
- 4 - DIFFERENTIAL
- 5 - SPECIAL TOOL SP-3289



**Fig. 23 Differential Bearing Removal—9 1/4 Axle**

- 1 - SPECIAL TOOL C-293-PA
- 2 - SPECIAL TOOL C-293-47
- 3 - BEARING
- 4 - DIFFERENTIAL
- 5 - SPECIAL TOOL C-293-3

### INSTALLATION

- (1) Install differential side bearings. Use:
  - Installer C-4340 with handle C-4171 for the 8 1/4 axle (Fig. 24).
  - Installer C-4213 and Handle C-4171 for the 9 1/4 axle.
- (2) Install differential case in axle housing.

### RING GEAR AND EXCITER RING

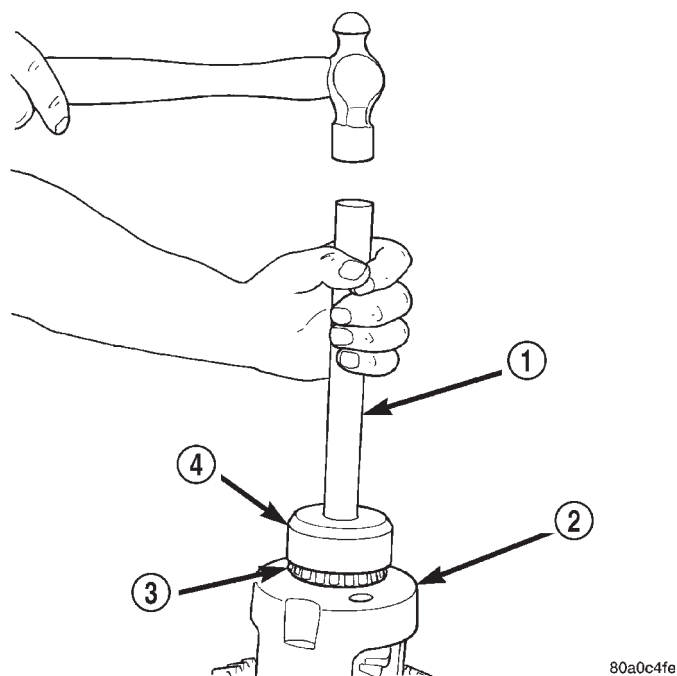
**NOTE:** The ring gear and pinion are serviced in a matched set. Do not replace the ring gear without replacing the pinion.

### REMOVAL

- (1) Remove differential from axle housing.
- (2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 25).
- (3) Remove bolts holding ring gear to differential case.



## REMOVAL AND INSTALLATION (Continued)

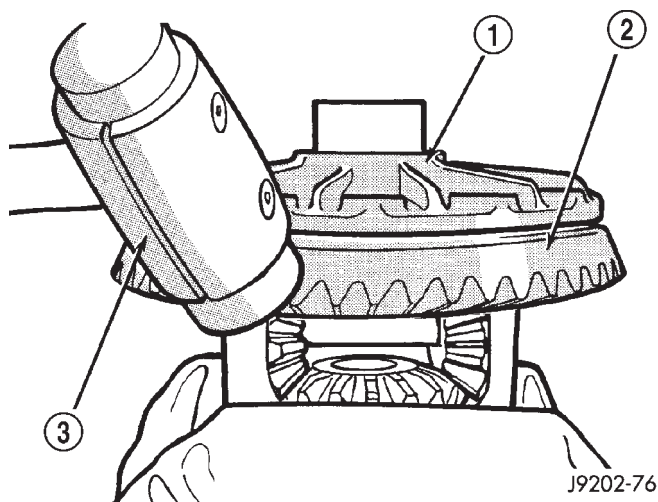


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**Fig. 24 Install Differential Side Bearings—8 1/4 Axle**

- 1 - HANDLE C-4171
- 2 - DIFFERENTIAL
- 3 - BEARING
- 4 - TOOL C-4340

(4) Using a soft hammer, drive ring gear from differential case (Fig. 25).



J9202-76

**Fig. 25 Ring Gear Removal**

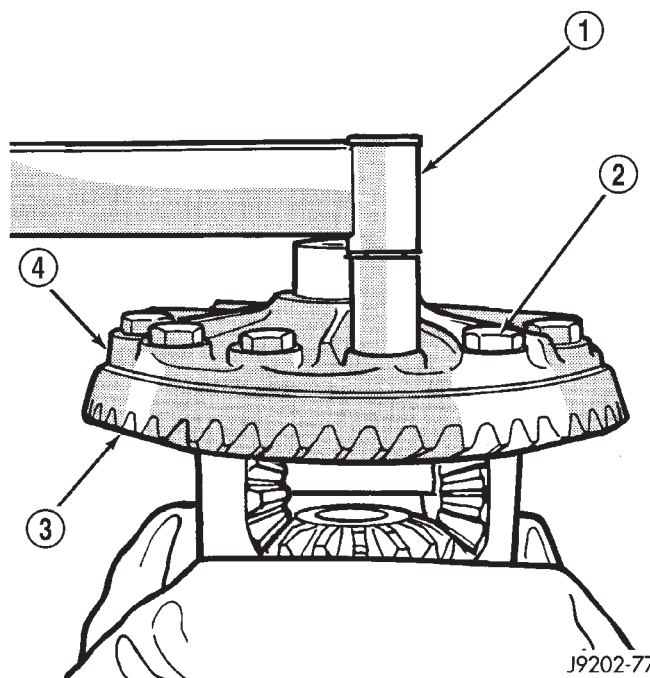
- 1 - CASE
- 2 - RING GEAR
- 3 - RAWHIDE HAMMER

(5) Use a brass drift and slowly tap the exciter ring from the differential case.

## INSTALLATION

**CAUTION:** Do not reuse the bolts that held the ring gear to the differential case. The bolts can fracture causing extensive damage.

- (1) Invert the differential case.
- (2) Position exciter ring on differential case.
- (3) Using a brass drift, slowly and evenly tap the exciter ring into position.
- (4) Position ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
- (5) Invert the differential case in the vise.
- (6) Install new ring gear bolts and alternately tighten to:
  - 102 N·m (75 ft. lbs.) torque (Fig. 26) for 8 1/4 axles.
  - 157 N·m (115 ft. lbs.) torque (Fig. 26) for 9 1/4 axles.
- (7) Install differential in axle housing and verify gear mesh and contact pattern.



J9202-77

**Fig. 26 Ring Gear Bolt Installation**

- 1 - TORQUE WRENCH
- 2 - RING GEAR BOLT
- 3 - RING GEAR
- 4 - CASE

## PINION GEAR

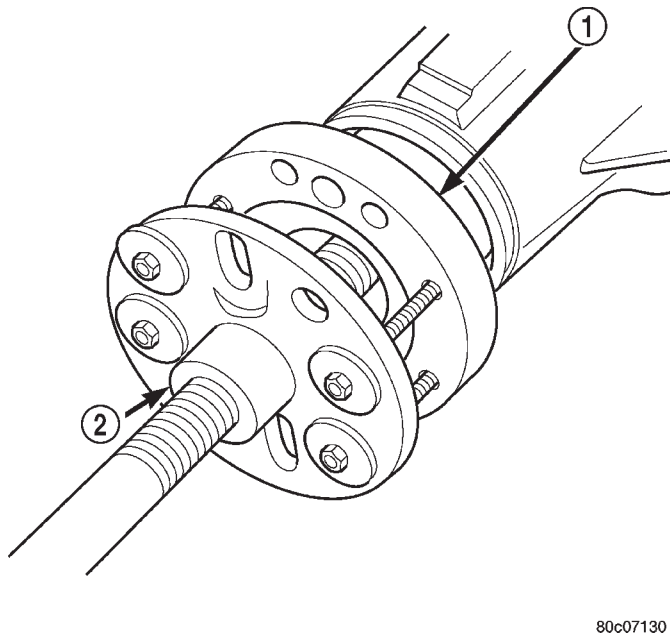
**NOTE:** The ring gear and pinion are serviced in a matched set. Do not replace the pinion without replacing the ring gear.



## REMOVAL AND INSTALLATION (Continued)

### REMOVAL

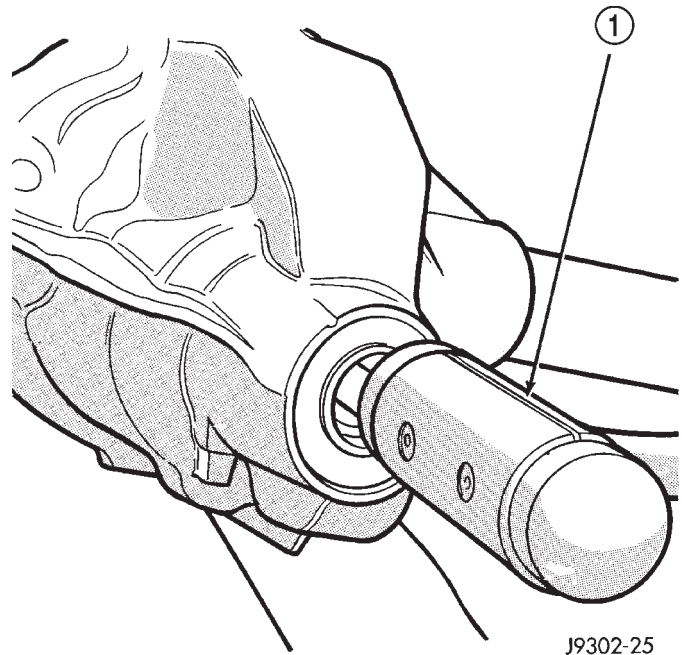
- (1) Remove differential from the axle housing.
- (2) Mark the companion flange and propeller shaft for installation alignment.
- (3) Disconnect the propeller shaft from the companion flange. Using suitable wire, tie propeller shaft to underbody.
- (4) Install socket head bolts into two of the threaded holes in the companion flange, 180° apart.
- (5) Position Holder 6719 against the companion flange and install a hex head bolt and washer into one of the remaining threaded holes. Tighten the bolt and washer so that the Holder 6719 is held to the flange.
- (6) Use Holder 6719 to hold companion flange and remove the companion flange nut and washer.
- (7) Using Remover C-452, remove the companion flange from the pinion (Fig. 27).



**Fig. 27 Companion Flange Removal**

- 1 - COMPANION FLANGE  
2 - PULLER TOOL

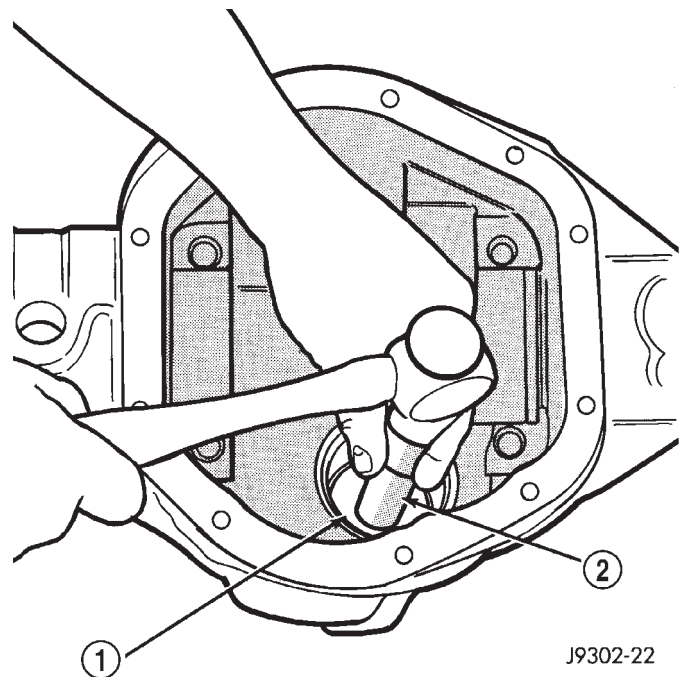
- (8) Partially install pinion nut onto pinion to protect the threads.
- (9) Remove the pinion from housing (Fig. 28). Catch the pinion with your hand to prevent it from falling and being damaged.
- (10) Remove the pinion shaft seal with suitable pry tool or slide-hammer mounted screw.
- (11) Remove oil slinger, if equipped, and front pinion bearing.



**Fig. 28 Remove Pinion**

- 1 - RAWHIDE HAMMER

- (12) Remove the front pinion bearing cup with:
  - Remover C-4345 and Handle C-4171 for the 8 1/4 axles (Fig. 29).
  - Bearing Removal Tool Set 6310 and Adapter Foot 6310-9 for the 9 1/4 axles.



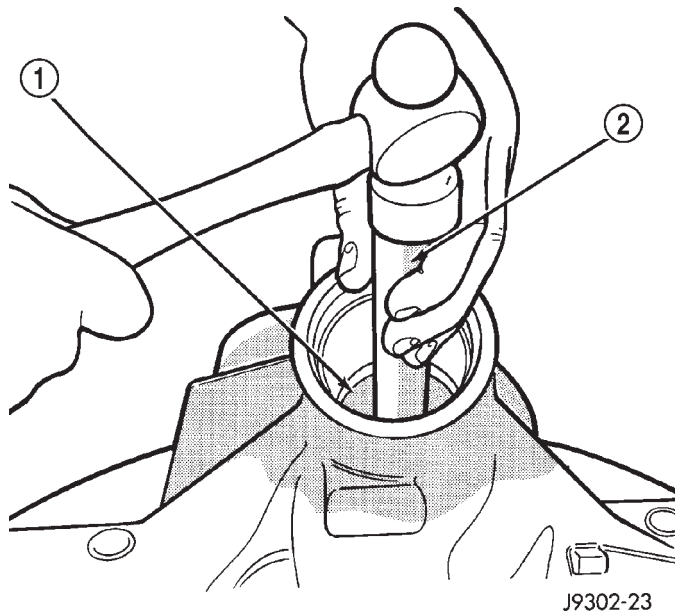
**Fig. 29 Front Bearing Cup Removal**

- 1 - REMOVER  
2 - HANDLE

## REMOVAL AND INSTALLATION (Continued)

(13) Remove the rear bearing cup from housing (Fig. 30). Use:

- Remover C-4307 and Handle C-4171 for the 8 1/4 axle.
- Remover C-4309 and Handle C-4171 for the 9 1/4 axle.



**Fig. 30 Rear Bearing Cup Removal**

- 1 - DRIVER  
2 - HANDLE

(14) Remove the collapsible preload spacer (Fig. 31).

(15) Remove the rear bearing from the pinion (Fig. 32) with:

- Puller/Press C-293-PA and Adapters C-293-47 for the 8 1/4 axle.
- Puller/Press C-293-PA and Adapters C-293-37 for the 9 1/4 axle.

**Place 4 adapter blocks so they do not damage the bearing cage.**

(16) Remove the depth shims from the pinion shaft. Record the thickness of the depth shims.

## INSTALLATION

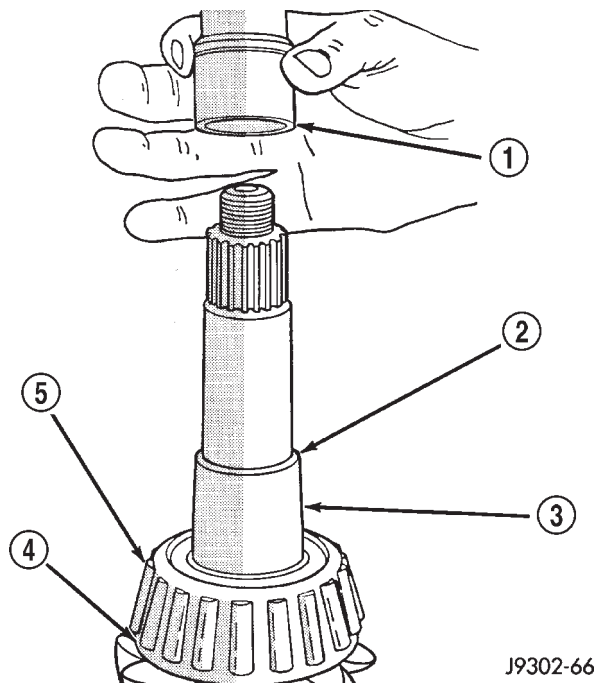
(1) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.

(2) Install the pinion rear bearing cup (Fig. 33) with:

- Installer C-4308 and Driver Handle C-4171 for the 8 1/4 axle.
- Installer C-4310 and Driver Handle C-4171 for the 9 1/4 axle.

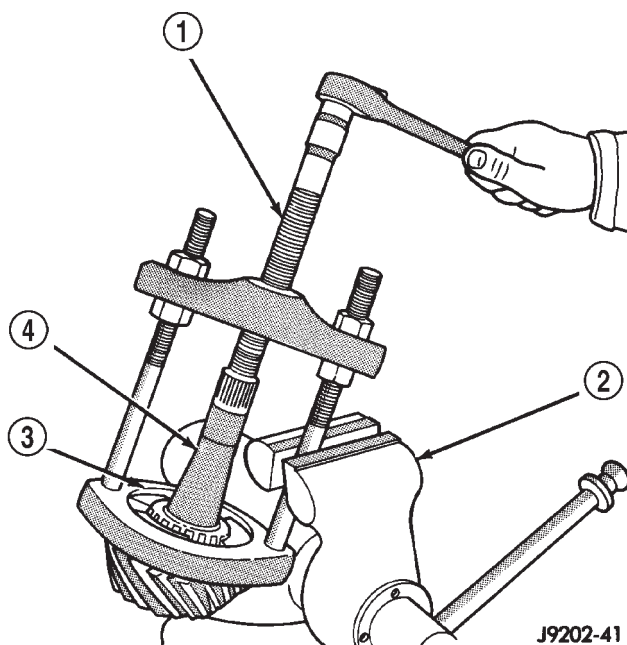
(2) Ensure cup is correctly seated.

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of bearing cup.



**Fig. 31 Collapsible Spacer**

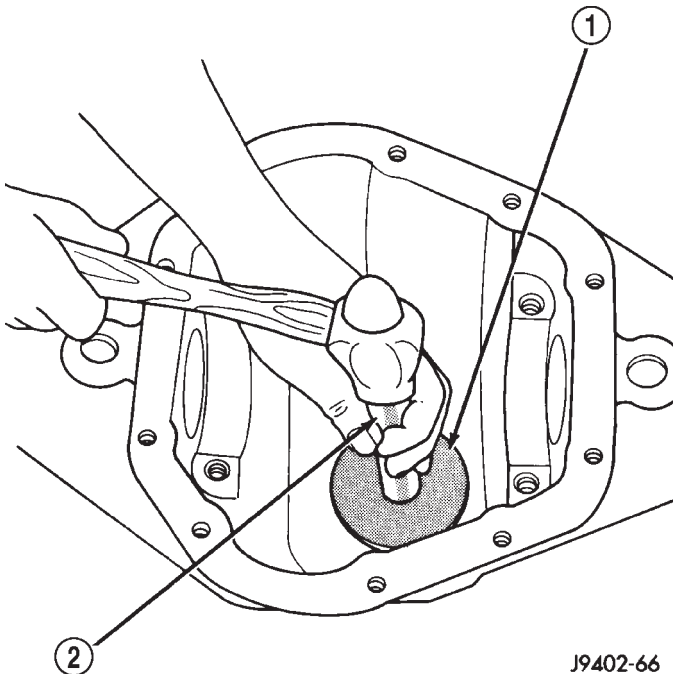
- 1 - COLLAPSIBLE SPACER  
2 - SHOULDER  
3 - PINION GEAR  
4 - OIL SLINGER  
5 - REAR BEARING



**Fig. 32 Rear Bearing Removal**

- 1 - SPECIAL TOOL C-293-PA  
2 - VISE  
3 - ADAPTERS  
4 - DRIVE PINION GEAR SHAFT

## REMOVAL AND INSTALLATION (Continued)



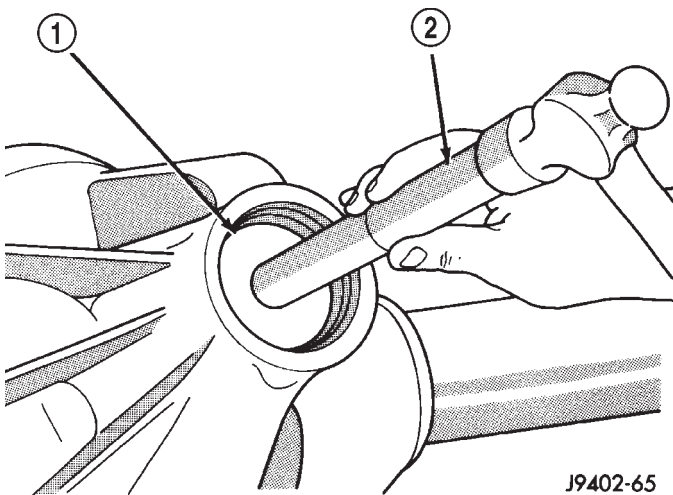
J9402-66

**Fig. 33 Pinion Rear Bearing Cup Installation**

- 1 - INSTALLER  
2 - HANDLE

(4) Install the pinion front bearing cup (Fig. 34) with:

- Installer D-130 and Handle C-4171 for the 8 1/4 axle.
- Installer D-129 and Handle C-4171 for the 9 1/4 axle.



J9402-65

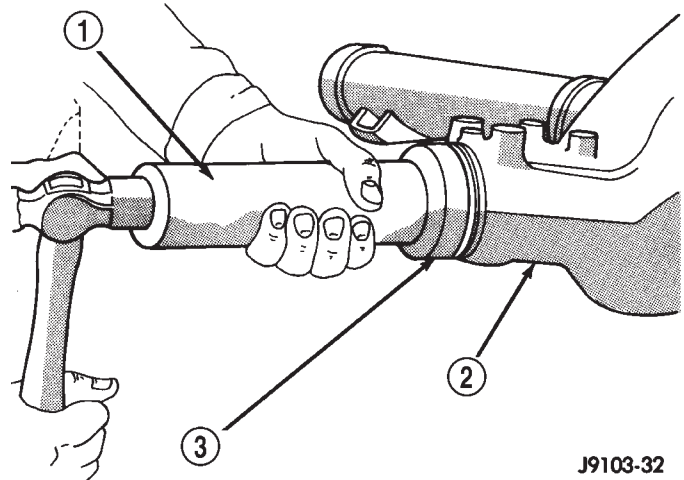
**Fig. 34 Pinion Front Bearing Cup Installation**

- 1 - INSTALLER  
2 - HANDLE

(5) Install pinion front bearing, and oil slinger, if equipped.

(6) 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 for the 8 1/4 axle (Fig. 35).
- Installer C-3860-A and Handle C-4171 for the 9 1/4 axle.



J9103-32

**Fig. 35 Pinion Seal Installation—8 1/4 Axle**

- 1 - SPECIAL TOOL C-4735  
2 - DIFFERENTIAL HOUSING  
3 - SPECIAL TOOL C-4076-A

**NOTE:** Pinion depth shims are placed between the rear pinion bearing cone and pinion head to achieve proper ring gear and pinion mesh. If the factory installed ring gear and pinion are reused, the pinion depth shim should not require replacement. If required, refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

(7) Place the proper thickness depth shim on the pinion shaft.

(8) Install the rear bearing and slinger, if equipped, on the pinion (Fig. 36) with:

- Installer 6448 for the 8 1/4 axle.
- Installer C-3095 for the 9 1/4 axle.

(9) Install a new collapsible preload spacer on pinion shaft and install the pinion in the housing (Fig. 37).

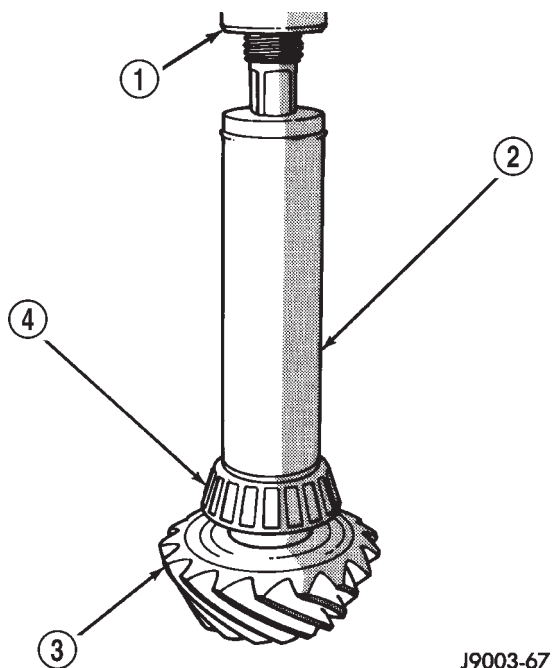
(10) Install the pinion in housing.

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

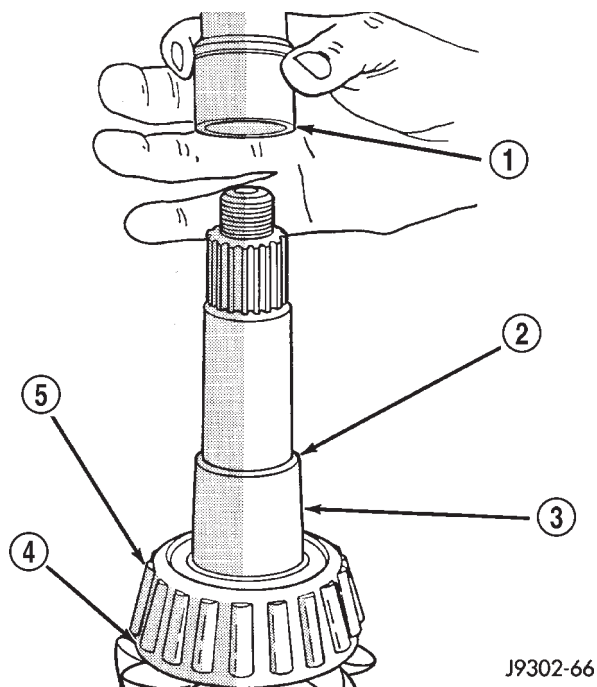
(12) Install socket head bolts into two of the threaded holes in the companion flange, 180° apart.

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

## REMOVAL AND INSTALLATION (Continued)

**Fig. 36 Shaft Rear Bearing Installation**

- 1 - PRESS
- 2 - INSTALLATION TOOL
- 3 - DRIVE PINION GEAR
- 4 - DRIVE PINION GEAR SHAFT REAR BEARING

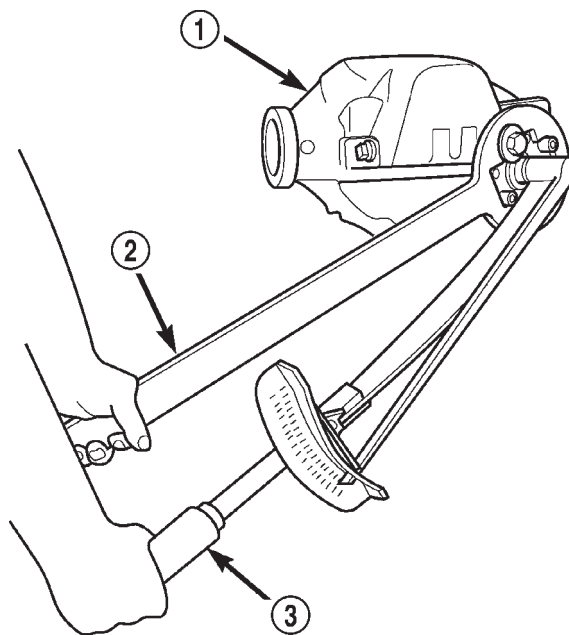
**Fig. 37 Collapsible Preload Spacer**

- 1 - COLLAPSIBLE SPACER
- 2 - SHOULDER
- 3 - PINION GEAR
- 4 - OIL SLINGER
- 5 - REAR BEARING

(14) Install the companion flange washer and a new nut on the pinion and tighten the pinion nut until there is zero bearing end-play. It will not be possible at this point to achieve zero bearing end-play if a new collapsible spacer was installed.

(15) Tighten the nut to 285 N·m (210 ft. lbs.) (Fig. 38).

**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. The torque sequence will then have to be repeated.

**Fig. 38 Tighten the Pinion Nut**

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

(16) Using Holder 6719, crush collapsible spacer until bearing end play is taken up.

(17) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 39).

(18) Check bearing rotating torque with an inch pound torque wrench (Fig. 39). The torque necessary to rotate the pinion should be:

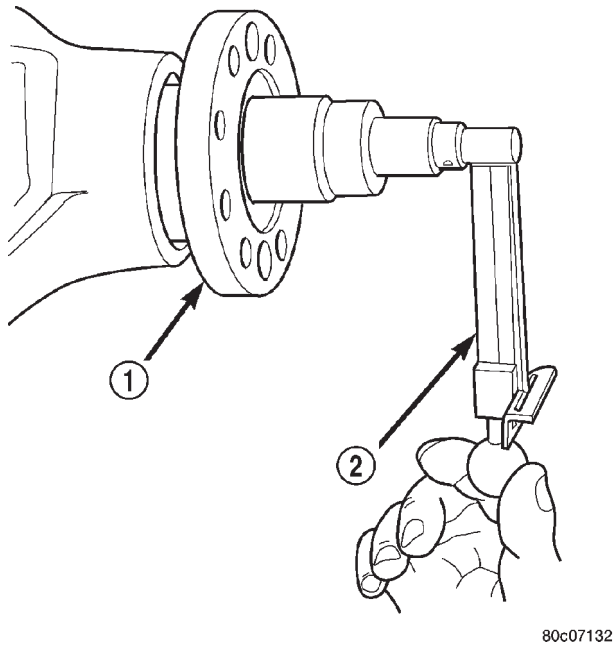
- Original Bearings — 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

(19) Install propeller shaft.

(20) Install differential in housing.



## REMOVAL AND INSTALLATION (Continued)



**Fig. 39 Check pinion Rotating Torque**

- 1 - COMPANION FLANGE  
2 - INCH POUND TORQUE WRENCH

## FINAL ASSEMBLY

(1) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, on the housing cover (Fig. 40).

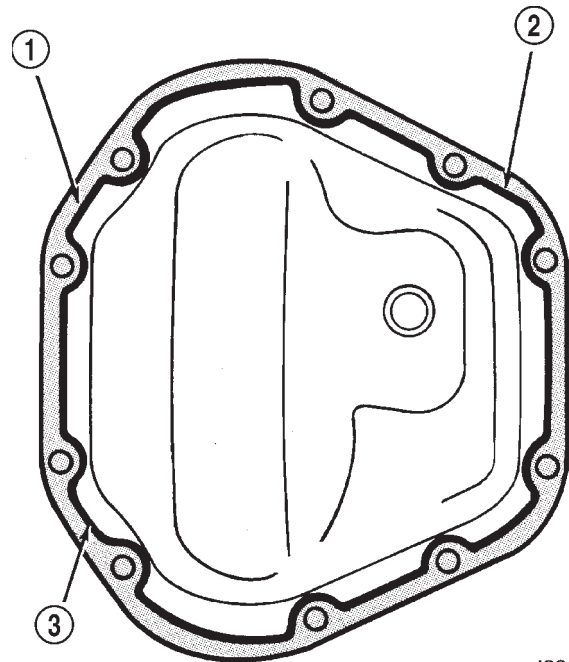
**Install the housing cover within 5 minutes after applying the sealant.**

(2) Install the cover on the differential with the attaching bolts. Install the identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

**CAUTION:** Overfilling the differential can result in lubricant foaming and overheating.

(3) Refill the differential housing with gear lubricant. Refer to the Lubricant Specifications section of this group for the gear lubricant requirements.

(4) Install the fill hole plug.



J9302-30

**Fig. 40 Typical Housing Cover With Sealant**

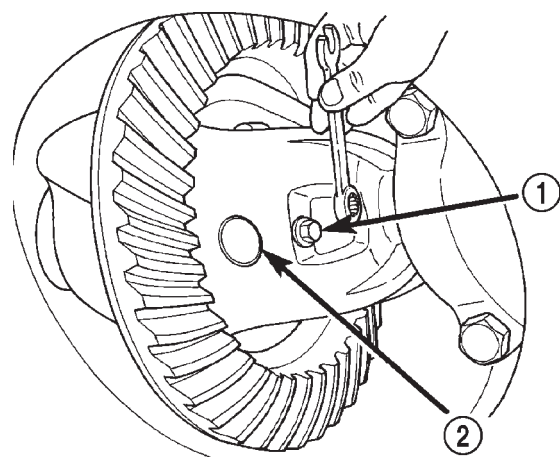
- 1 - SEALING SURFACE  
2 - CONTOUR OF BEAD  
3 - BEAD THICKNESS 6.35mm (1/4")

## DISASSEMBLY AND ASSEMBLY

### STANDARD DIFFERENTIAL

#### DISASSEMBLY

- (1) Remove pinion mate shaft lock screw (Fig. 41).
- (2) Remove pinion mate shaft.
- (3) Rotate the differential side gears and remove the differential pinion gears and thrust washers (Fig. 42).



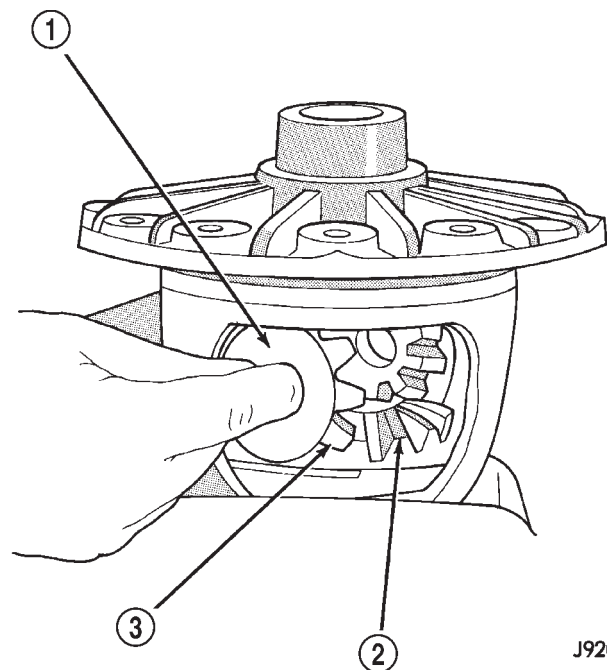
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**Fig. 41 Pinion Mate Shaft Lock Screw**

- 1 - LOCK SCREW  
2 - PINION MATE SHAFT



## DISASSEMBLY AND ASSEMBLY (Continued)

**Fig. 42 Pinion Mate Gear Removal**

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

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

**ASSEMBLY**

(1) Install the differential side gears and thrust washers.

(2) Install the differential pinion gears and thrust washers.

(3) Install the pinion mate shaft.

(4) Align the hole in the pinion mate shaft with the hole in the differential case and install the pinion mate shaft lock screw.

(5) Lubricate all differential components with hypoid gear lubricant.

**8 1/4 TRAC-LOK™ DIFFERENTIAL**

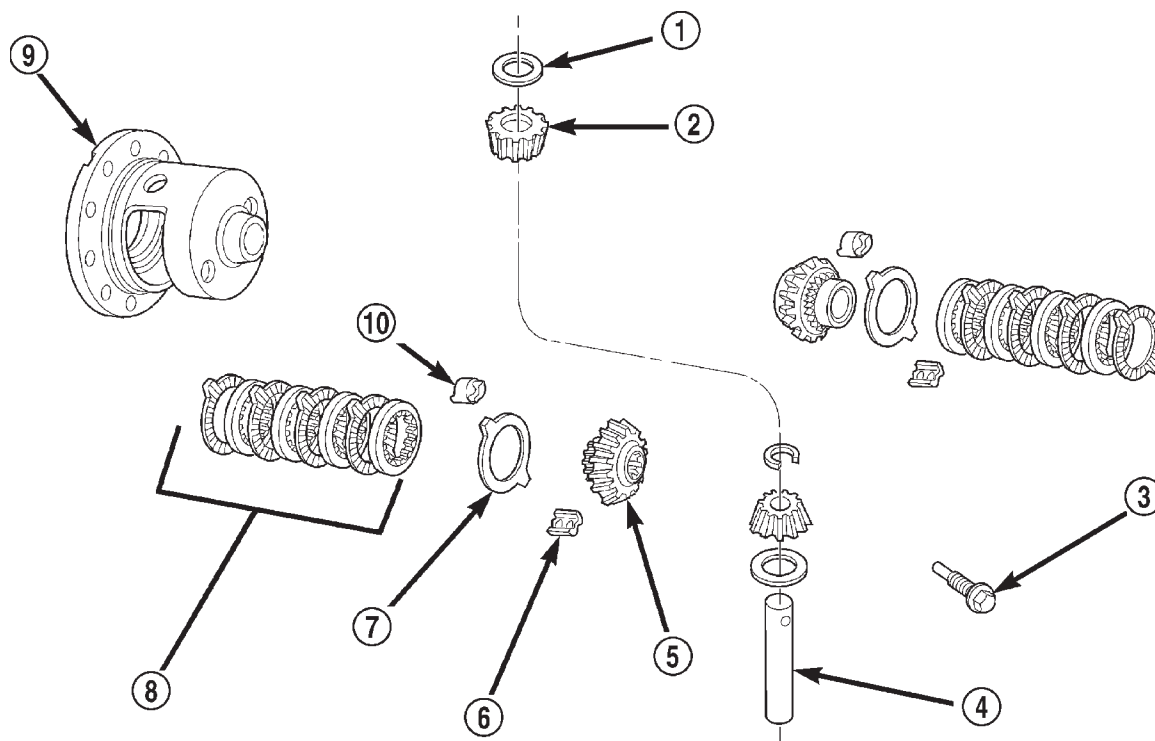
The Trac-lok™ differential components are illustrated in (Fig. 43). Refer to this illustration during repair service.

**DISASSEMBLY**

(1) Clamp Side Gear Holding Tool 8138 in a vise.

(2) Position the differential case on Side Gear Holding Tool 8138 (Fig. 44).

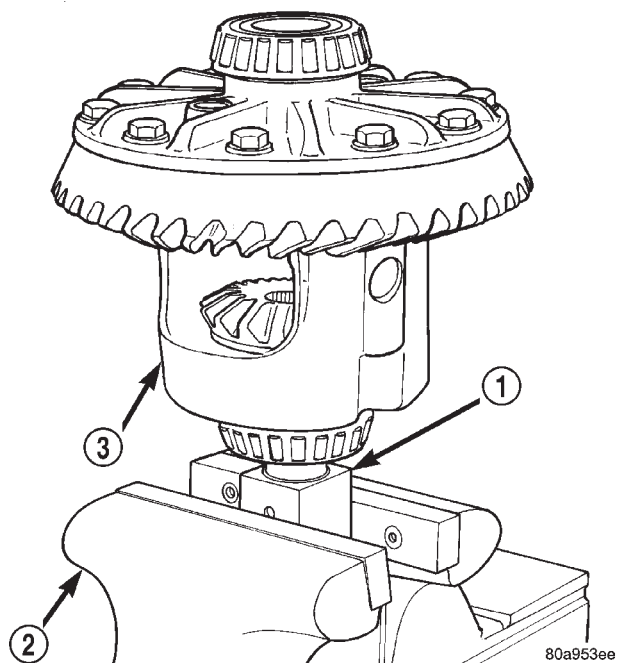
(3) Remove ring gear, if necessary. Ring gear removal is necessary only if the ring gear is to be

**Fig. 43 Trac-lok™ Differential Components**

- |                       |                       |
|-----------------------|-----------------------|
| 1 - THRUST WASHER     | 6 - RETAINER          |
| 2 - PINION            | 7 - DISC              |
| 3 - SHAFT LOCK SCREW  | 8 - CLUTCH PACK       |
| 4 - PINION MATE SHAFT | 9 - DIFFERENTIAL CASE |
| 5 - SIDE GEAR         | 10 - RETAINER         |

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# DISASSEMBLY AND ASSEMBLY (Continued)

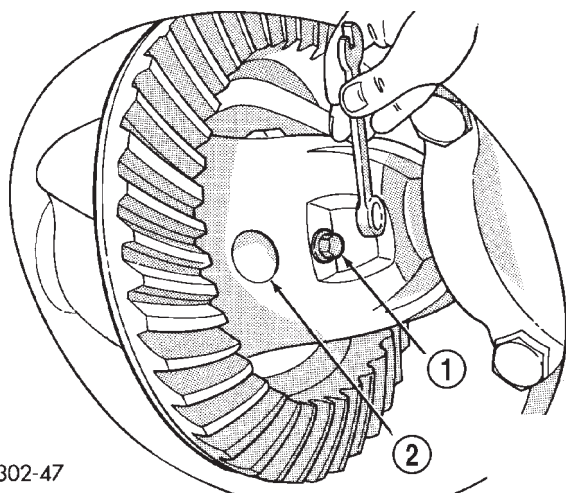


**Fig. 44 Differential Case Holding Tool**

- 1 - SIDE GEAR HOLDING TOOL
- 2 - VISE
- 3 - DIFFERENTIAL

replaced. The Trac-lok™ differential can be serviced with the ring gear installed.

(4) Remove the pinion gear mate shaft lock screw (Fig. 45).

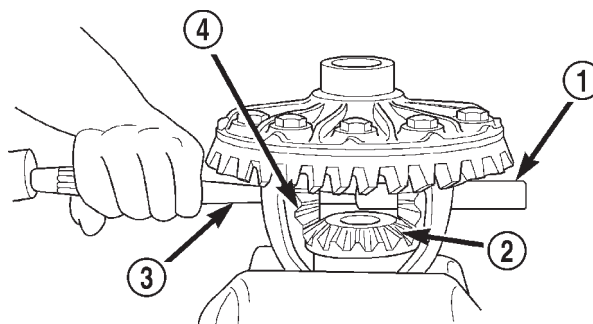


**Fig. 45 Mate Shaft Lock Screw**

- 1 - LOCK SCREW
- 2 - PINION GEAR MATE SHAFT

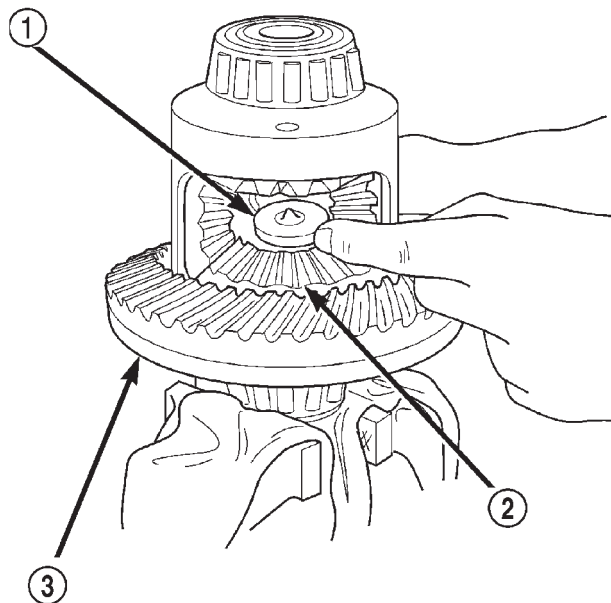
(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 46).

(6) Install and lubricate Step Plate 8140-2 (Fig. 47).



**Fig. 46 Mate Shaft Removal**

- 1 - PINION MATE SHAFT
- 2 - SIDE GEAR
- 3 - DRIFT
- 4 - PINION MATE GEAR



**Fig. 47 Step Plate Tool Installation**

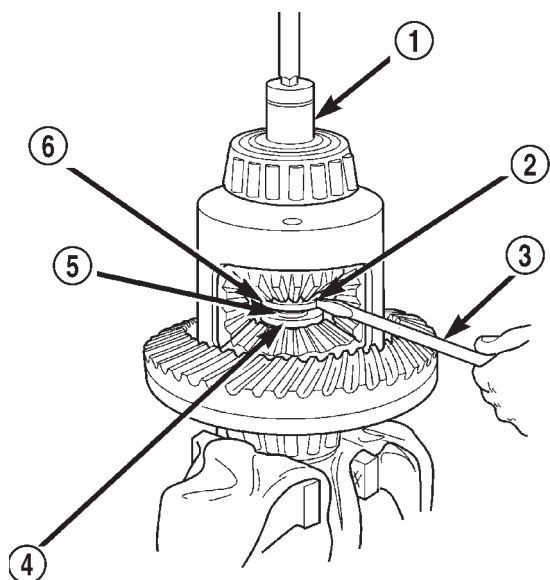
- 1 - SPECIAL TOOL 8140-2
- 2 - LOWER SIDE GEAR
- 3 - DIFFERENTIAL CASE

(7) Assemble Threaded Adapter 8140-1 into top side gear. Thread Forcing Screw 6960-4 into adapter until it becomes centered in adapter plate.

(8) Position a small screw driver in slot of Threaded Adapter 8140-1 (Fig. 48) to prevent adapter from turning.

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 49).

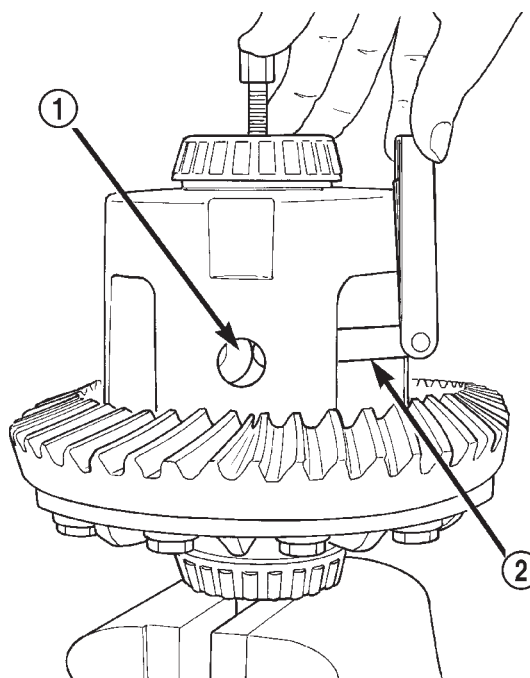
## DISASSEMBLY AND ASSEMBLY (Continued)



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**Fig. 48 Threaded Adapter Installation**

- 1 - SOCKET
- 2 - SLOT IN ADAPTER
- 3 - SCREWDRIVER
- 4 - DISC 8140-2
- 5 - THREADED ROD C-6960-4
- 6 - THREADED ADAPTER DISC 8140-1



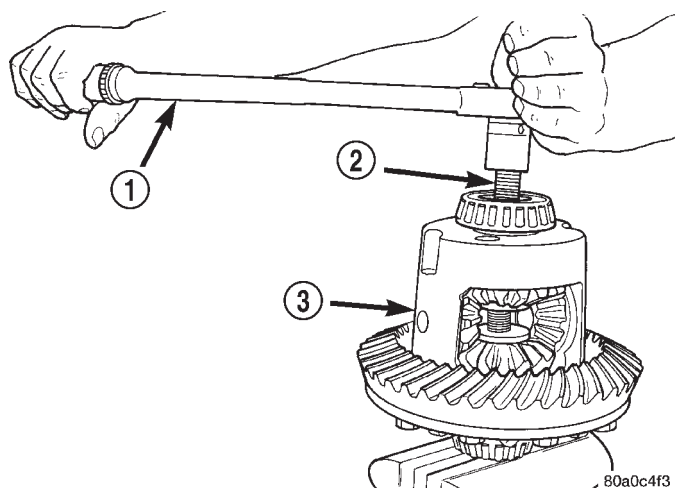
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**Fig. 50 Remove Pinion Gear Thrust Washer**

- 1 - THRUST WASHER
- 2 - FEELER GAUGE

(13) Rotate differential case until the pinion gears can be removed.

(14) Remove pinion gears from differential case.



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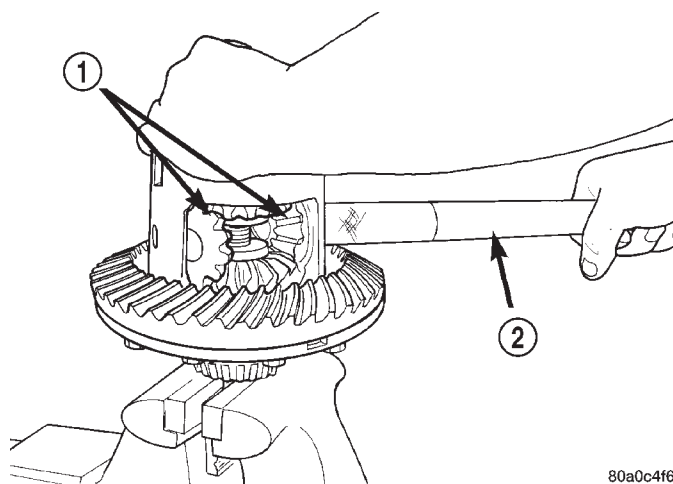
**Fig. 49 Tighten Belleville Spring Compressor Tool**

- 1 - TORQUE WRENCH
- 2 - TOOL ASSEMBLED
- 3 - DIFFERENTIAL CASE

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 50).

(11) Insert Turning Bar 6960-2 in case (Fig. 51).

(12) Loosen the Forcing Screw 6960-4 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar 6960-2.



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**Fig. 51 Pinion Gear Removal**

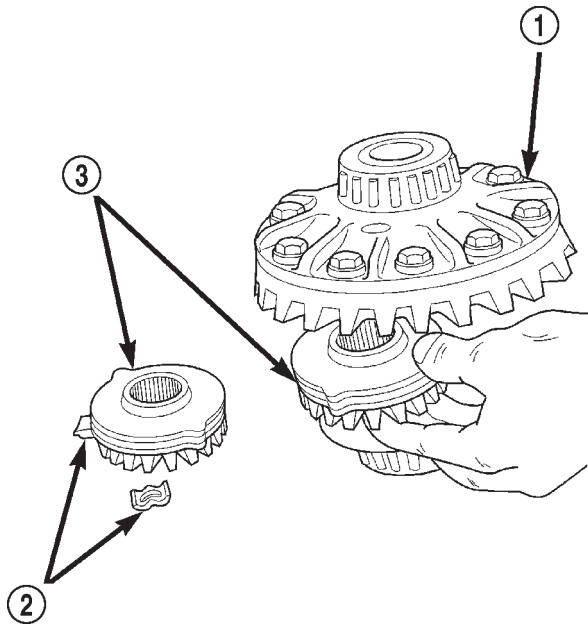
- 1 - PINION GEARS
- 2 - TOOL

(15) Remove Forcing Screw 6960-4, Step Plate 8140-2, and Threaded Adapter 8140-1.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 52).

(17) Remove differential case from Side Gear Holding Tool 8138. Remove side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal.

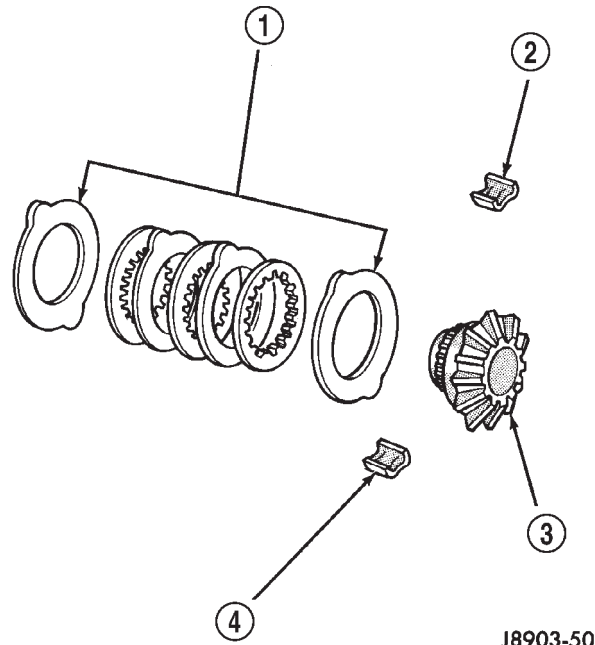
## DISASSEMBLY AND ASSEMBLY (Continued)



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**Fig. 52 Side Gear & Clutch Disc Removal**

- 1 - DIFFERENTIAL CASE
- 2 - RETAINER
- 3 - SIDE GEAR AND CLUTCH DISC PACK



J8903-50

**Fig. 53 Clutch Disc Pack**

- 1 - CLUTCH PACK
- 2 - RETAINER
- 3 - SIDE GEAR
- 4 - RETAINER

## ASSEMBLY

**NOTE:** The clutch discs are replaceable as complete sets only. If one clutch disc pack is damaged, both packs must be replaced.

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 53).

(2) Position assembled clutch disc packs on the side gear hubs.

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 54). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(4) Position the differential case on Side Gear Holding Tool 8138.

(5) Install lubricated Step Plate 8140-2 in lower side gear (Fig. 55).

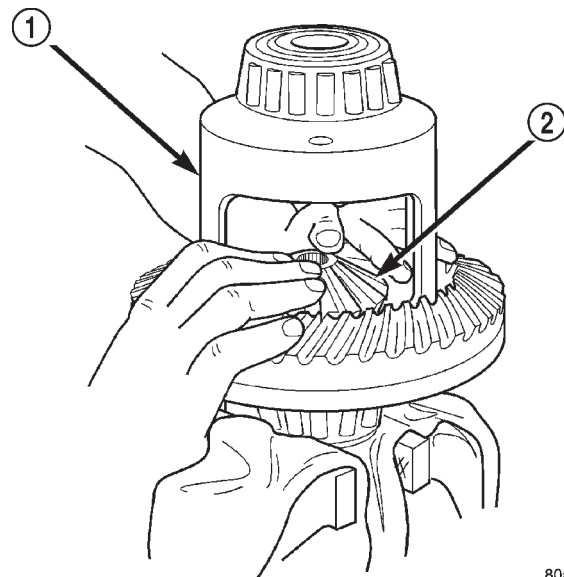
(6) Install the upper side gear and clutch disc pack (Fig. 55).

(7) Hold assembly in position. Insert Threaded Adapter 8140-1 into top side gear.

(8) Insert Forcing Screw 6960-4.

(9) Tighten forcing screw tool to slightly compress clutch discs.

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft holes are aligned.



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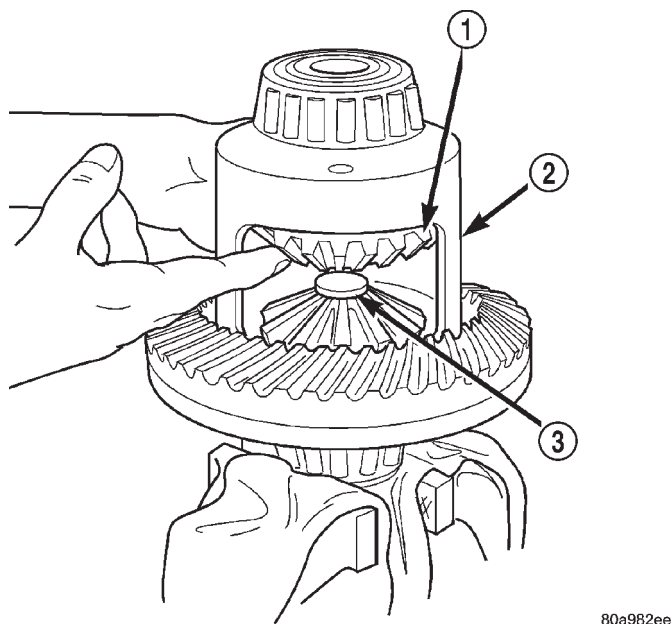
**Fig. 54 Clutch Discs & Lower Side Gear Installation**

- 1 - DIFFERENTIAL CASE
- 2 - LOWER SIDE GEAR AND CLUTCH DISC PACK

(11) Rotate case with Turning Bar 6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to 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.

## DISASSEMBLY AND ASSEMBLY (Continued)



**Fig. 55 Upper Side Gear & Clutch Disc Pack Installation**

- 1 - UPPER SIDE GEAR AND CLUTCH DISC PACK  
 2 - DIFFERENTIAL CASE  
 3 - SPECIAL TOOL 8140-2

(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 6960-4, Step Plate 8140-2, and Threaded Adapter 8140-1.

(15) Install pinion gear mate shaft and align holes in shaft and case.

(16) Install the pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(17) Lubricate all differential components with hypoid gear lubricant.

### 9 1/4 TRAC-LOK™ DIFFERENTIAL

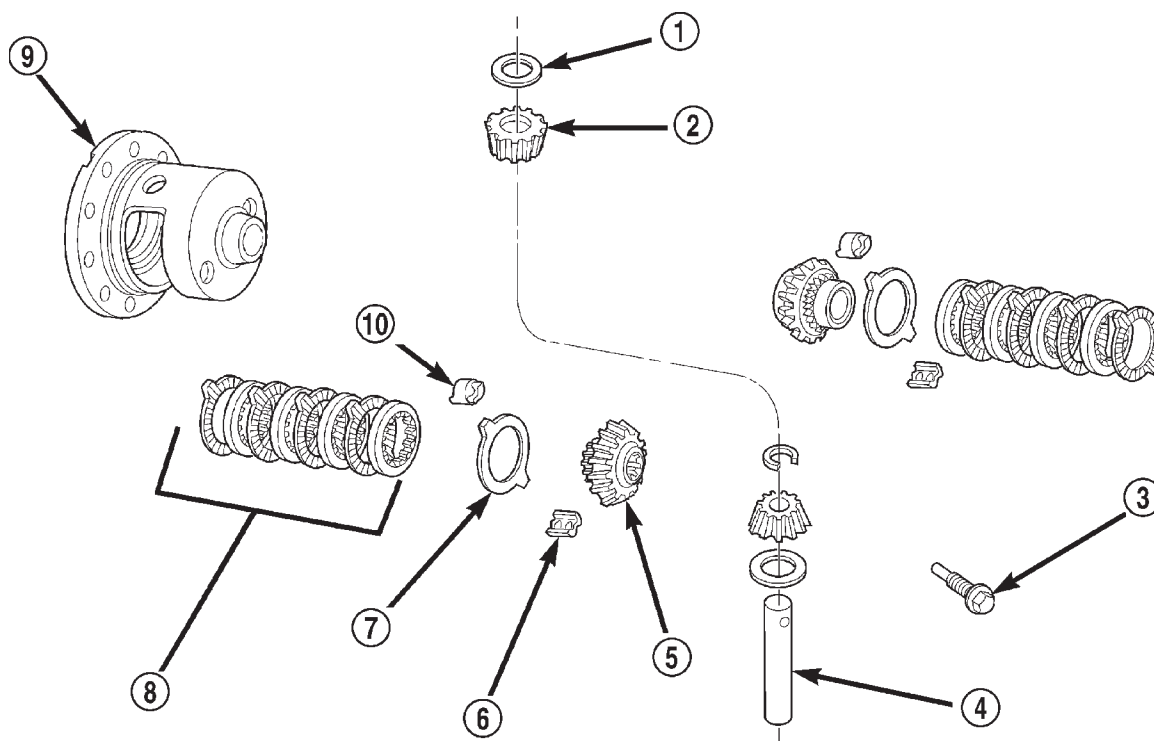
The Trac-lok™ differential components are illustrated in (Fig. 56). Refer to this illustration during repair service.

#### DISASSEMBLY

(1) Clamp Side Gear Holding Tool 8136 in a vise.

(2) Position the differential case on Side Gear Holding Tool 8136 (Fig. 57).

(3) Remove ring gear, if necessary. Ring gear removal is necessary only if the ring gear is to be replaced. The Trac-lok™ differential can be serviced with the ring gear installed.



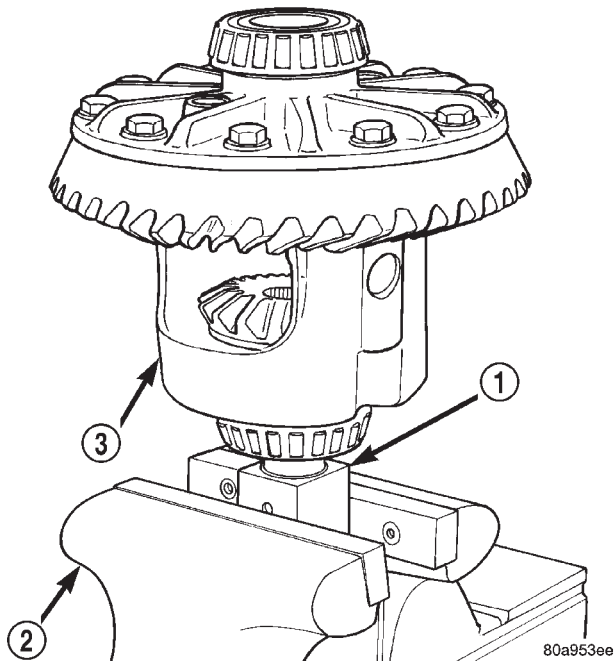
**Fig. 56 Trac-lok™ Differential Components**

- |                       |                       |
|-----------------------|-----------------------|
| 1 - THRUST WASHER     | 6 - RETAINER          |
| 2 - PINION            | 7 - DISC              |
| 3 - SHAFT LOCK SCREW  | 8 - CLUTCH PACK       |
| 4 - PINION MATE SHAFT | 9 - DIFFERENTIAL CASE |
| 5 - SIDE GEAR         | 10 - RETAINER         |

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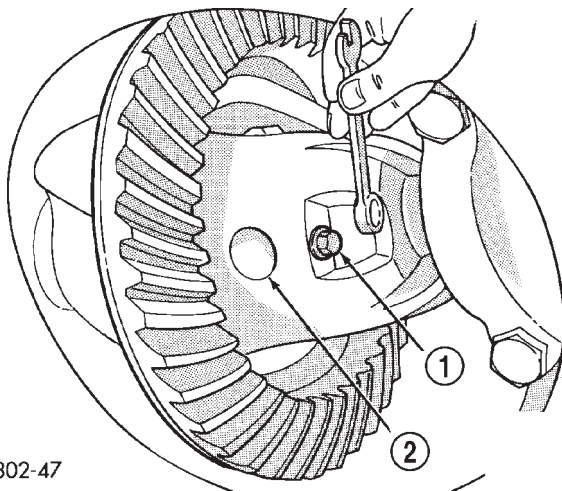
# DISASSEMBLY AND ASSEMBLY (Continued)



**Fig. 57 Differential Case Holding Tool**

- 1 - SIDE GEAR HOLDING TOOL
- 2 - VISE
- 3 - DIFFERENTIAL

(4) Remove the pinion gear mate shaft lock screw (Fig. 58).



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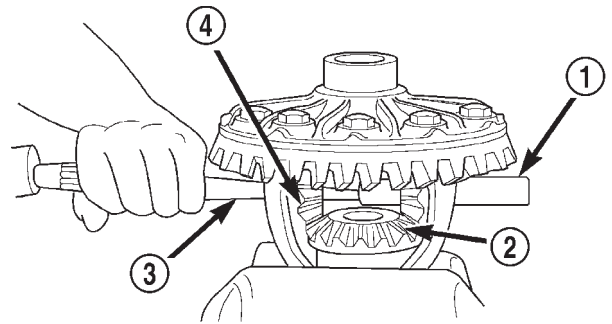
**Fig. 58 Mate Shaft Lock Screw**

- 1 - LOCK SCREW
- 2 - PINION GEAR MATE SHAFT

(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 59).

(6) Install and lubricate Step Plate 8139-2 (Fig. 60).

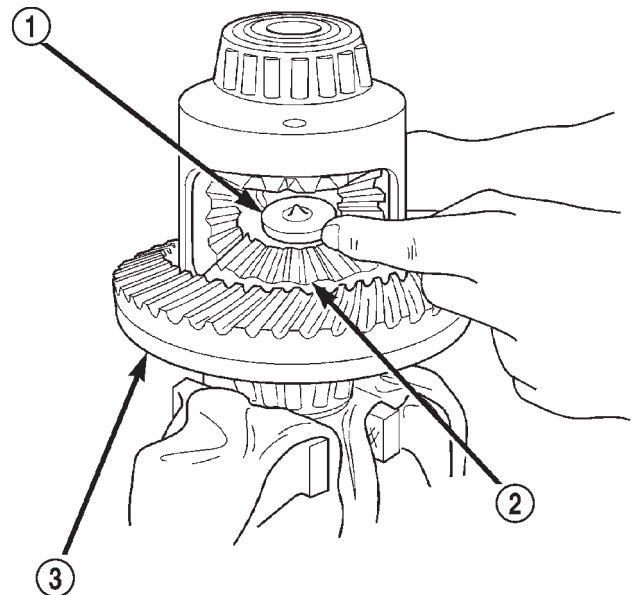
(7) Assemble Threaded Adapter 8139-1 into top side gear. Thread Forcing Screw C-4487-2 into adapter until it becomes centered in adapter plate.



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**Fig. 59 Mate Shaft Removal**

- 1 - PINION MATE SHAFT
- 2 - SIDE GEAR
- 3 - DRIFT
- 4 - PINION MATE GEAR



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**Fig. 60 Step Plate Tool Installation**

- 1 - SPECIAL TOOL 8139-2
- 2 - LOWER SIDE GEAR
- 3 - DIFFERENTIAL CASE

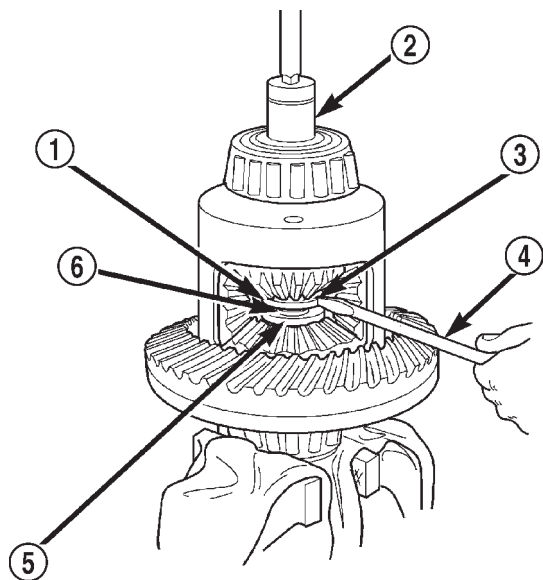
(8) Position a small screw driver in slot of Threaded Adapter 8139-1 (Fig. 61) to prevent adapter from turning.

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 62).

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 63).

(11) Insert Turning Bar C-4487-4 in case (Fig. 64).

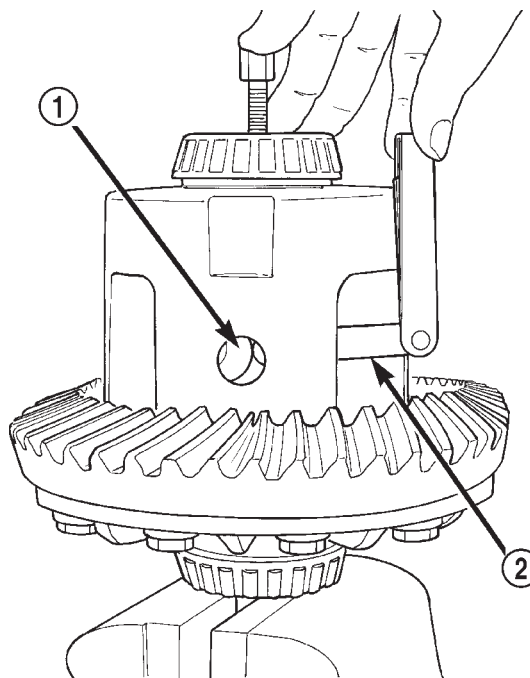
## DISASSEMBLY AND ASSEMBLY (Continued)



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**Fig. 61 Threaded Adapter Installation**

- 1 - THREADED ADAPTER DISC 8139-1
- 2 - SOCKET
- 3 - SLOT IN ADAPTER
- 4 - SCREWDRIVER
- 5 - DISC 8139-2
- 6 - THREADED ROD C-4487-2

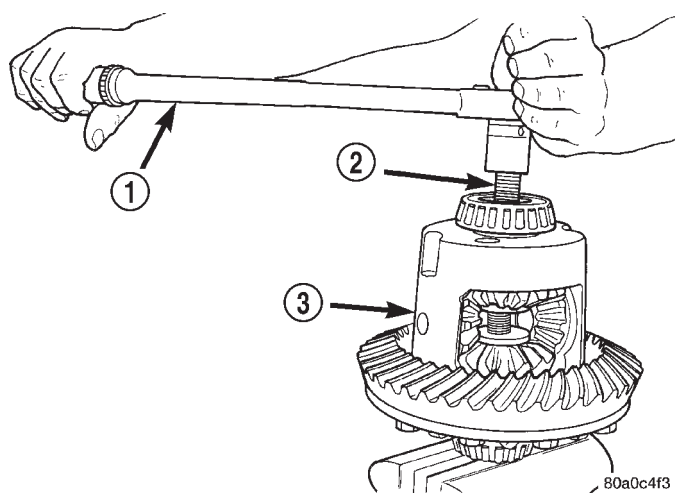


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**Fig. 63 Remove Pinion Gear Thrust Washer**

- 1 - THRUST WASHER
- 2 - FEELER GAUGE

(14) Remove pinion gears from differential case.



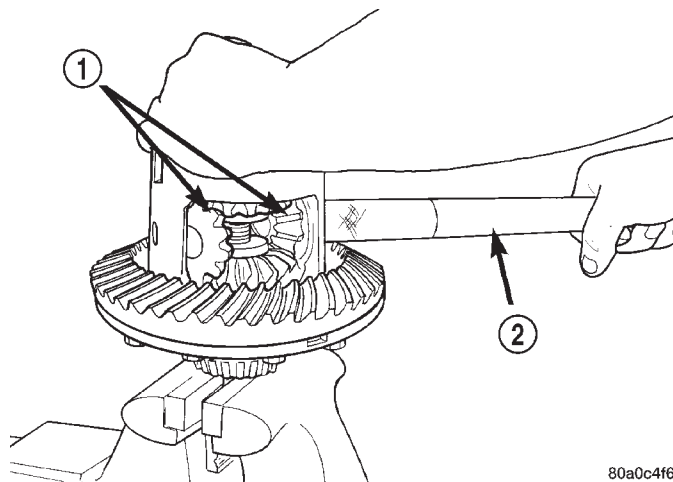
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**Fig. 62 Tighten Belleville Spring Compressor Tool**

- 1 - TORQUE WRENCH
- 2 - TOOL ASSEMBLED
- 3 - DIFFERENTIAL CASE

(12) Loosen the Forcing Screw C-4487-2 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar C-4487-4.

(13) Rotate differential case until the pinion gears can be removed.



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**Fig. 64 Pinion Gear Removal**

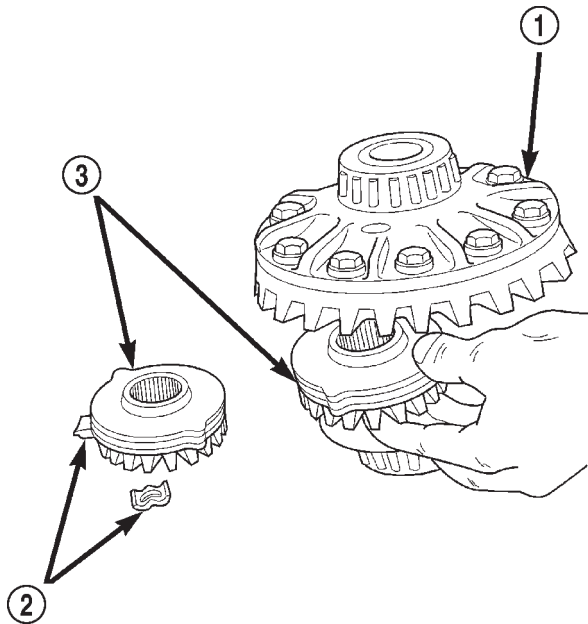
- 1 - PINION GEARS
- 2 - TOOL

(15) Remove Forcing Screw C-4487-2, Step Plate 8139-2, and Threaded Adapter 8139-1.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 65).

(17) Remove differential case from Side Gear Holding Tool 8136. Remove side gear, clutch pack retainer,

## DISASSEMBLY AND ASSEMBLY (Continued)



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**Fig. 65 Side Gear & Clutch Disc Removal**

- 1 - DIFFERENTIAL CASE
- 2 - RETAINER
- 3 - SIDE GEAR AND CLUTCH DISC PACK

and clutch pack. Keep plates in correct order during removal.

## ASSEMBLY

**NOTE:** The clutch discs are replaceable as complete sets only. If one clutch disc pack is damaged, both packs must be replaced.

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 66).

(2) Position assembled clutch disc packs on the side gear hubs.

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 67). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(4) Position the differential case on Side Gear Holding Tool 8136.

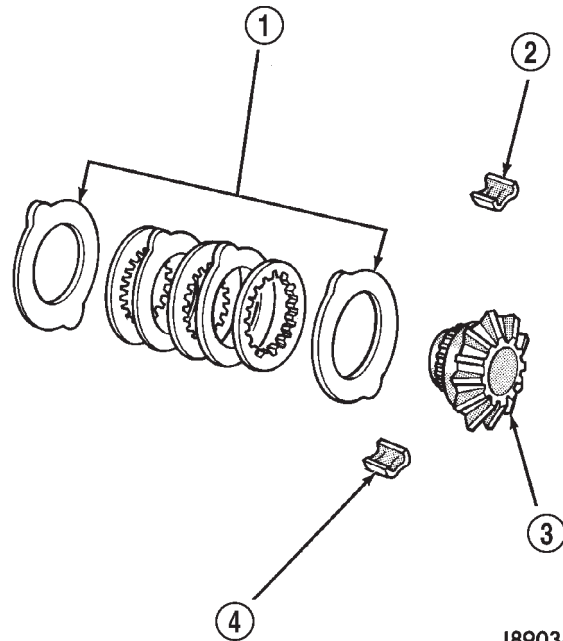
(5) Install lubricated Step Plate 8139-2 in lower side gear (Fig. 68).

(6) Install the upper side gear and clutch disc pack (Fig. 68).

(7) Hold assembly in position. Insert Threaded Adapter 8139-1 into top side gear.

(8) Insert Forcing Screw C-4487-2.

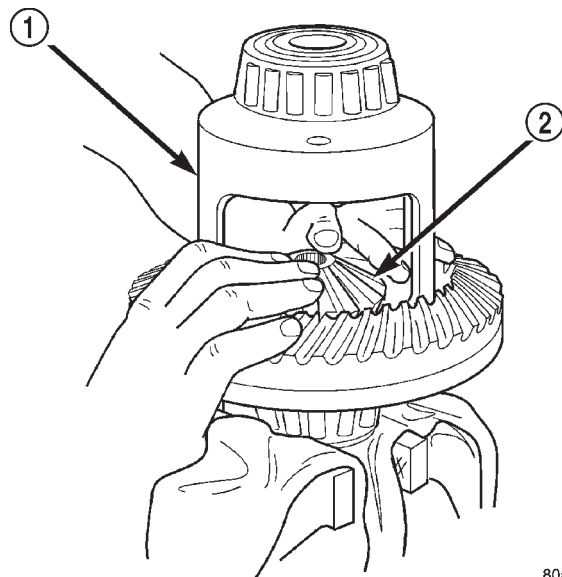
(9) Tighten forcing screw tool to slightly compress clutch discs.



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**Fig. 66 Clutch Disc Pack**

- 1 - CLUTCH PACK
- 2 - RETAINER
- 3 - SIDE GEAR
- 4 - RETAINER



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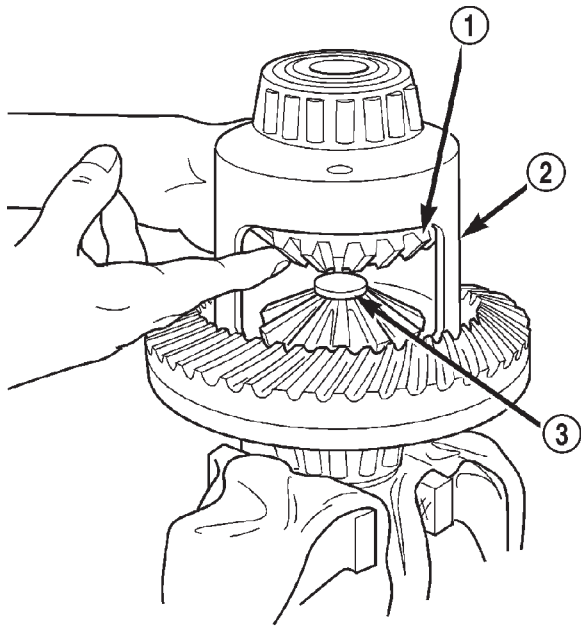
**Fig. 67 Clutch Discs & Lower Side Gear Installation**

- 1 - DIFFERENTIAL CASE
- 2 - LOWER SIDE GEAR AND CLUTCH DISC PACK

(10) Place pinion gears in position in side gears and verify that the pinion mate shaft holes are aligned.

(11) Rotate case with Turning Bar C-4487-4 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly

## DISASSEMBLY AND ASSEMBLY (Continued)



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**Fig. 68 Upper Side Gear & Clutch Disc Pack Installation**

- 1 - UPPER SIDE GEAR AND CLUTCH DISC PACK  
 2 - DIFFERENTIAL CASE  
 3 - SPECIAL TOOL 8139-2

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 C-4487-2, Step Plate 8139-2, and Threaded Adapter 8139-1.

(15) Install pinion gear mate shaft and align holes in shaft and case.

(16) Install the pinion mate shaft lock screw finger tight to hold shaft during differential installation.

(17) Lubricate all differential components with hypoid gear lubricant.

## CLEANING AND INSPECTION

### 8 1/4 AND 9 1/4 AXLES

Wash differential components with cleaning solvent and dry with compressed air. **Do not steam clean the differential components.**

Wash bearings with solvent and towel dry, or dry with compressed air. **DO NOT** spin bearings with compressed air. **Cup and bearing must be replaced as matched sets only.**

Clean axle tubes and oil channels in housing.

Inspect for:

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.

- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.

- Raised metal on shoulders of cup bores should be removed with a hand stone.

- Wear and damage to pinion mate shaft, differential pinions, side gears and thrust washers. Replace as a matched set only.

- Ring gear and pinion for worn and chipped teeth.

- Ring gear for damaged bolt threads. Replaced as a matched set only.

- Pinion companion flange for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.

- Pinion depth shims for damage and distortion. Install new shims if necessary.

- The differential case. Replace the case if cracked or damaged.

- The axle shaft C-locks for cracks and excessive wear. Replace them if necessary.

- Each threaded adjuster to determine if it rotates freely. If an adjuster binds, repair the damaged threads or replace the adjuster.

- The RWAL exciter ring for damage and missing teeth. Verify that the ring is fully seated to the differential case flange.

Polish each axle shaft sealing surface with No. 600 crocus cloth. This can remove slight surface damage. Do not reduce the diameter of the axle shaft seal contact surface. When polishing, the crocus cloth should be moved around the circumference of the shaft (not in-line with the shaft).

### TRAC-LOK™

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side gears and pinions. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

### PRESOAK PLATES AND DISC

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.



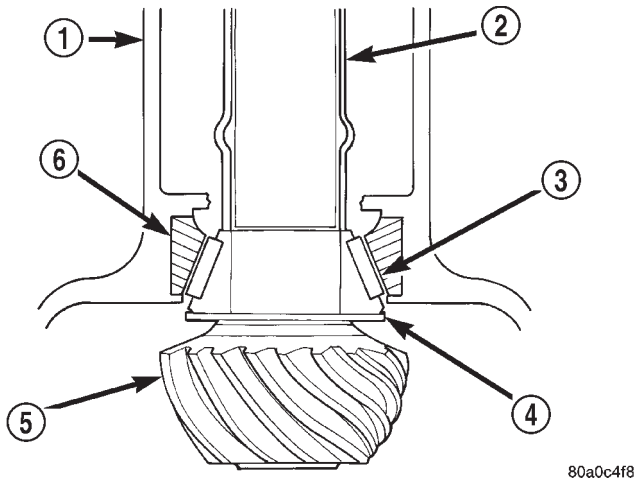
## ADJUSTMENTS

### 8 1/4 AXLE PINION GEAR DEPTH

#### GENERAL INFORMATION

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 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 Analysis Paragraph in this section for additional information.

Compensation for pinion depth variance is achieved with select shims. The shims are placed behind the rear pinion bearing (Fig. 69).



**Fig. 69 Shim Locations**

- 1 - AXLE 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 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 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 pinion gear (-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 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 DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the axle housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 70).

(1) Assemble Pinion Height Block 6739, Pinion Block 8540, and rear pinion bearing onto Screw 6741 (Fig. 70).

(2) Insert assembled height gauge components, rear bearing, and screw into axle housing through pinion bearing cups (Fig. 71).

(3) Install front pinion bearing and Cone-Nut 6740 hand tight (Fig. 70).

(4) Place Arbor Disc 8541 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 72). 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. 70). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

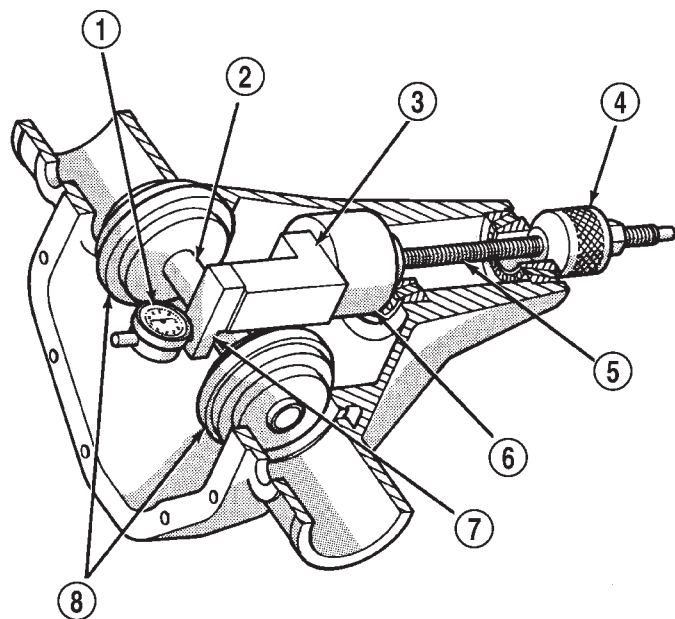
(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.



## ADJUSTMENTS (Continued)

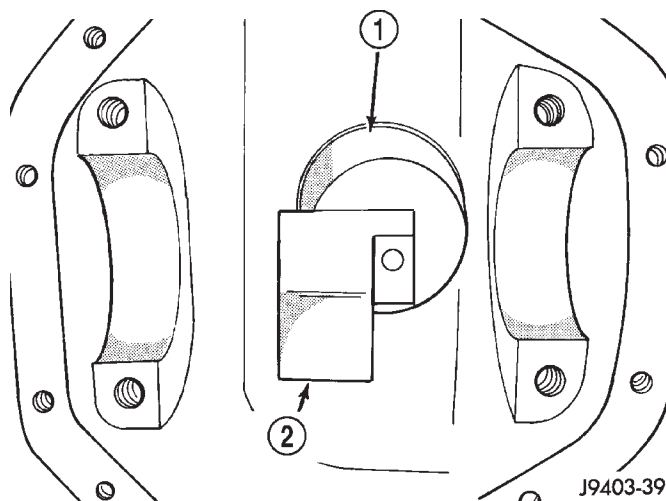
## PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-4	-3	-2	-1	0	+1	+2	+3	+4
<b>+4</b>	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
<b>+3</b>	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
<b>+2</b>	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
<b>+1</b>	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
<b>0</b>	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
<b>-1</b>	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
<b>-2</b>	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
<b>-3</b>	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
<b>-4</b>	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

**Fig. 70 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

(8) 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. 73). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading.

**Fig. 71 Pinion Height Block**

- 1 - PINION BLOCK
- 2 - PINION HEIGHT BLOCK

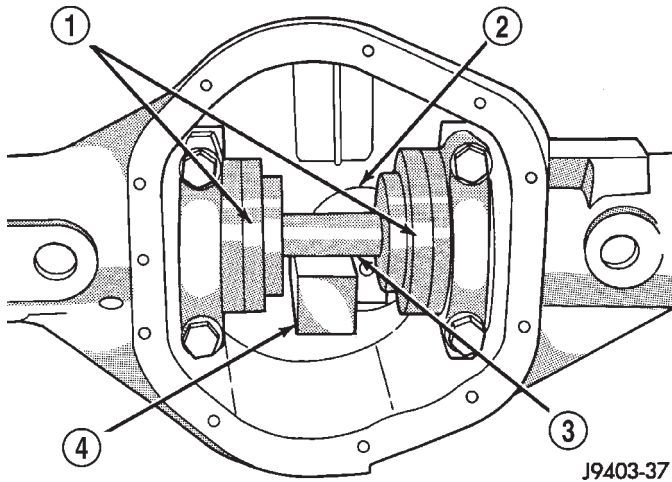
If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

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

**9 1/4 AXLE PINION GEAR DEPTH****GENERAL INFORMATION**

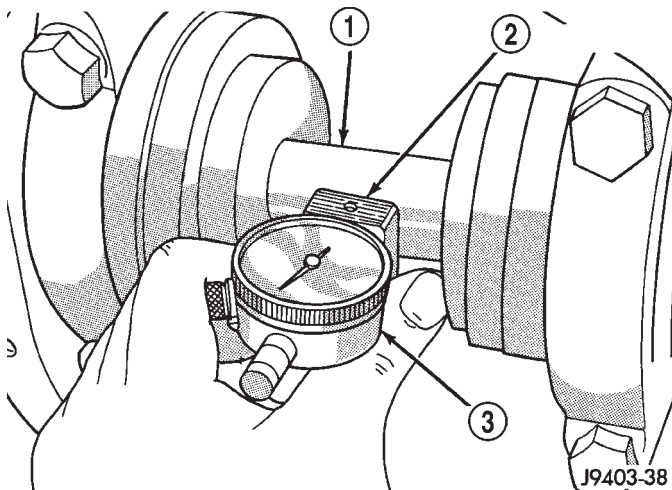
Ring gear and pinion are supplied as matched sets only. The identifying numbers for the ring gear and pinion are painted onto the pinion gear shaft and the side of the ring gear. A plus (+) number, minus (-) number or zero (0) along with the gear set sequence number (01 to 99) is on each gear. This first number

## ADJUSTMENTS (Continued)



**Fig. 72 Gauge Tools In Housing**

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

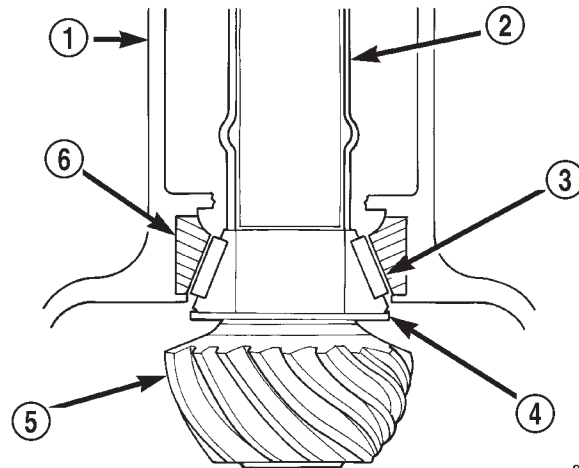


**Fig. 73 Pinion Gear Depth Measurement**

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

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 Analysis Paragraph in this section for additional information.

Compensation for pinion depth variance is achieved with select shims. The shims are placed behind the rear pinion bearing (Fig. 74).



**Fig. 74 Shim Locations**

- 1 - AXLE 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 represent 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.

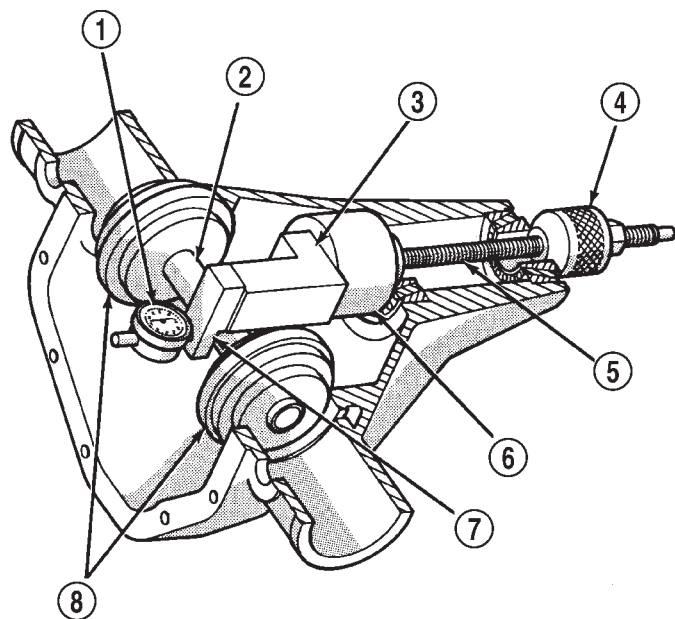
## ADJUSTMENTS (Continued)

## PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-4	-3	-2	-1	0	+1	+2	+3	+4
<b>+4</b>	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
<b>+3</b>	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
<b>+2</b>	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
<b>+1</b>	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
<b>0</b>	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
<b>-1</b>	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
<b>-2</b>	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
<b>-3</b>	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
<b>-4</b>	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

## PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the axle housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 75).



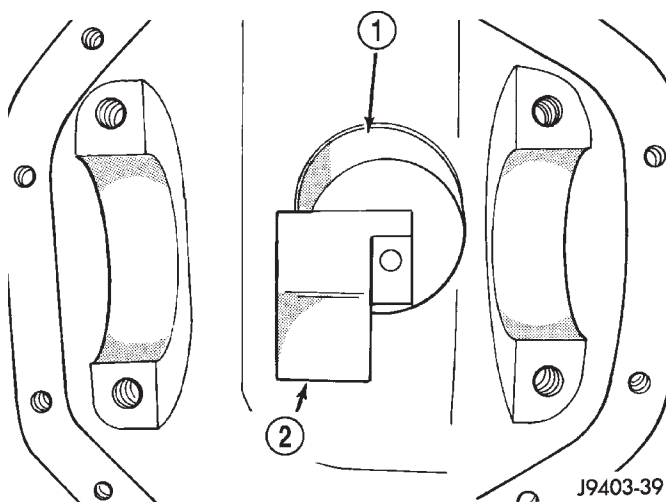
**Fig. 75 Pinion Gear Depth Gauge Tools**

- 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 8542, and rear pinion bearing onto Screw 6741 (Fig. 75).

(2) Insert assembled height gauge components, rear bearing, and screw into axle housing through pinion bearing cups (Fig. 76).

(3) Install front pinion bearing and Cone-Nut 6740 hand tight (Fig. 75).



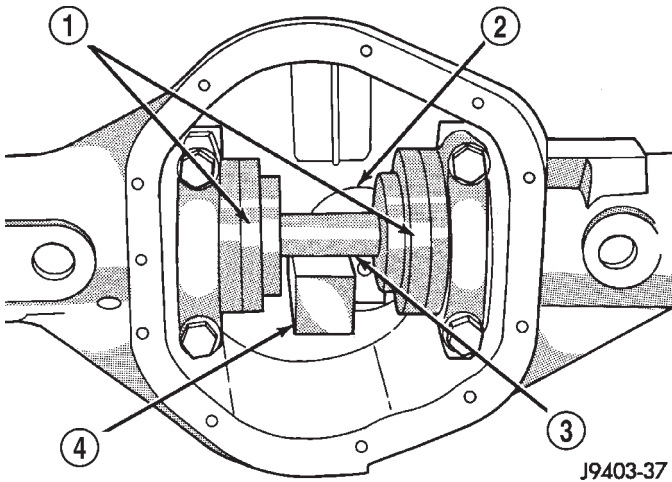
**Fig. 76 Pinion Height Block**

- 1 - PINION BLOCK
- 2 - PINION HEIGHT BLOCK

(4) Place Arbor Disc 8541 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 77). 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.

## ADJUSTMENTS (Continued)

**Fig. 77 Gauge Tools In Housing**

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

(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. 75). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

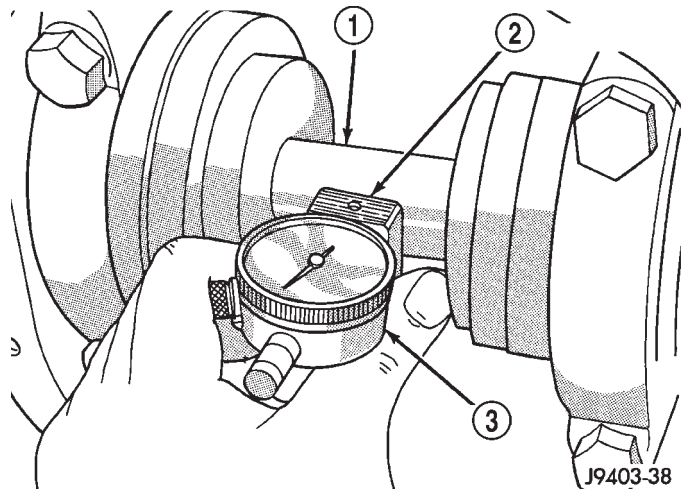
(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 78). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) 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 0.003 inch (0.076 mm).

**Fig. 78 Pinion Gear Depth Measurement**

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

- 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:

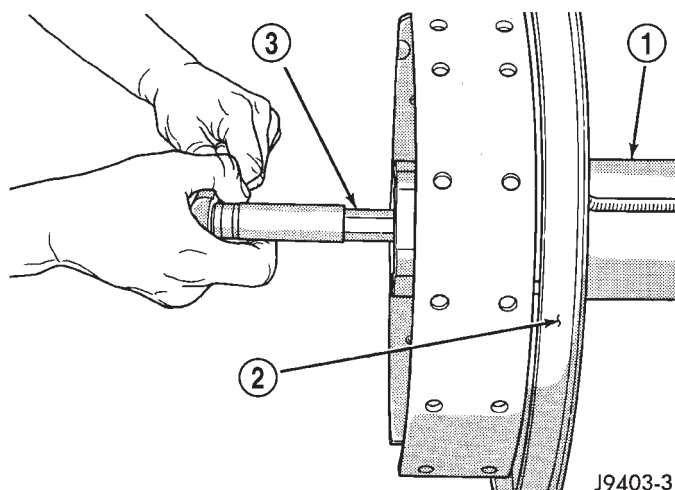
- Maintain the gear teeth engaged (meshed) as marked.
- The bearings must be seated by rapidly rotating the pinion gear a half turn back and forth.
- Do this five to ten times each time the threaded adjusters are adjusted.

(1) Use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated (Fig. 79). Allow some ring gear backlash (approximately 0.01 inch/0.25 mm) 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. 80). Measure the backlash at 4 positions (90 degrees apart) around the ring gear. Locate and mark the area of minimum backlash.

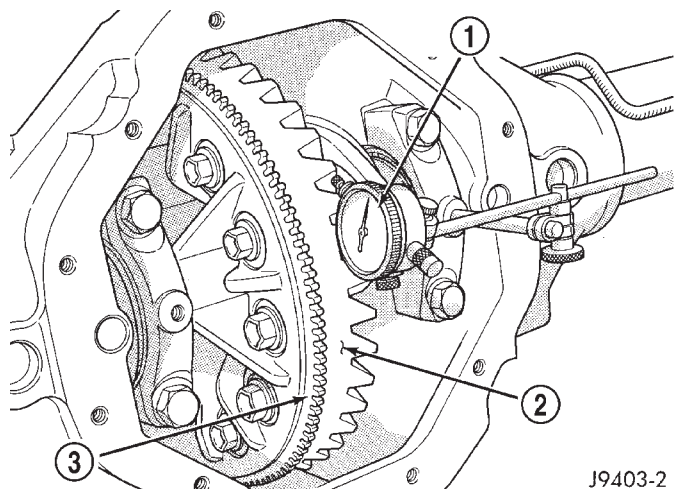


## ADJUSTMENTS (Continued)

**Fig. 79 Threaded Adjuster Tool**

- 1 - AXLE TUBE  
2 - BACKING PLATE  
3 - TOOL C-4164

(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. 80 Ring Gear Backlash Measurement**

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

(4) Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.003 to 0.004 inch (0.076 to 0.102 mm) 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;
- 8 1/4 axles: 95 N·m (70 ft. lbs.)
  - 9 1/4 axles: 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 0.006 to 0.008 inch (0.15 to 0.203 mm).

(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.).

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

**GEAR CONTACT PATTERN ANALYSIS**

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the axle housing. It will also show if the ring gear backlash has been adjusted correctly. The backlash can be adjusted within specifications to achieve desired tooth contact patterns.

(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(2) Wrap, twist, and hold a shop towel around the pinion yoke to increase the turning resistance of the pinion. This will provide a more distinct contact pattern.

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution in both directions while a load is being applied from shop towel.

The areas on the ring gear teeth with the greatest degree of contact against the pinion teeth will squeeze the compound to the areas with the least amount of contact. Note and compare patterns on the ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 81) and adjust pinion depth and gear backlash as necessary.

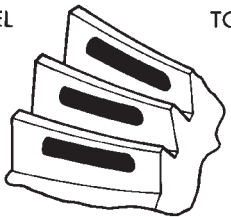
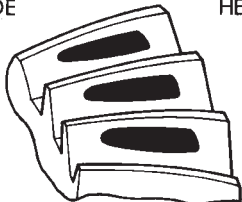

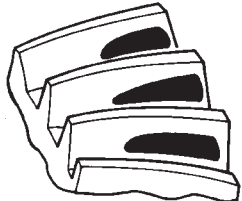


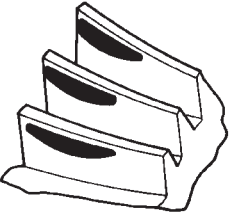
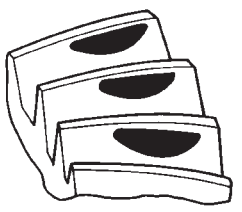
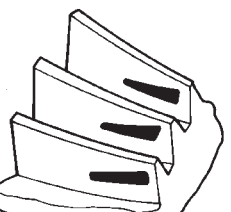
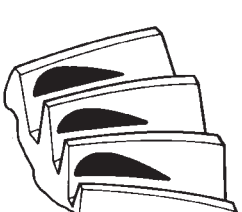
**SIDE GEAR CLEARANCE**

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.



## ADJUSTMENTS (Continued)

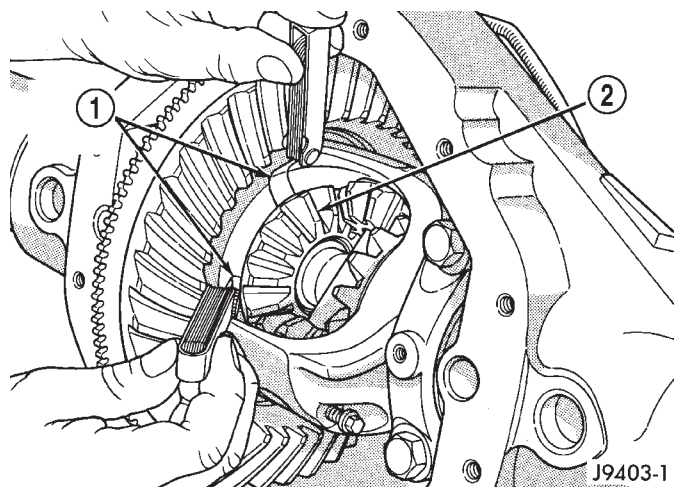
<p>DRIVE SIDE OF RING GEAR TEETH</p> <p>HEEL                      TOE</p> 	<p>COAST SIDE OF RING GEAR TEETH</p> <p>TOE                      HEEL</p> 	<p>DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS BE SOME CLEARANCE BETWEEN CONTACT PATTERN AND TOP OF THE TOOTH.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THINNER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>RING GEAR BACKLASH CORRECT. <b>THICKER</b> PINION GEAR DEPTH SHIM REQUIRED.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>DECREASE</b> RING GEAR BACKLASH.</p>
		<p>PINION GEAR DEPTH SHIM CORRECT. <b>INCREASE</b> RING GEAR BACKLASH.</p>

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Fig. 81 Gear Tooth Contact Patterns

## ADJUSTMENTS (Continued)

(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. 82).



**Fig. 82 Side Gear Clearance Measurement**

- 1 - FEELER GAUGE BLADES  
2 - SIDE GEAR

(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 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. 83).

SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
<b>TOTAL</b>	<b>0.040</b>
REPLACEMENT WASHER THICKNESS	- 0.037
<b>NEW SIDE GEAR CLEARANCE</b>	<b>0.003</b>

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**Fig. 83 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

## 8 1/4 INCH AXLE

Axle Type	Semi-floating, hypoid
Lubricant	SAE 80W-90
Lube Capacity	2.22 L (4.7 pts.)
Trac-Lok Additive	148 ml (5 oz.)
Axle Ratio	3.21, 3.55, 3.92

**Differential**

Case Clearance	0.12 mm (0.005 in.)
Case Flange Runout	0.076 mm (0.003 in.)

**Ring Gear**

Diameter	20.95 cm (8.25 in.)
Backlash	0.12-0.20 mm (0.005-0.008 in.)
Runout	0.127 mm (0.005 in.)

**Pinion Bearing Preload**

Original	1-2 N·m (10-20 in.lbs.)
New	2-5 N·m (15-35 in.lbs.)

## 9 1/4 INCH AXLE

Axle Type	Semi-floating, hypoid
Lubricant	SAE 75W-90
Lube Capacity	2.32 L (4.9 pts.)
Trac-Lok Additive	148 ml (5 oz.)
Axle Ratio	3.21, 3.55, 3.92

**Differential**

Case Flange Runout	0.076 mm (0.003 in.)
--------------------	----------------------

**Ring gear**

Diameter	23.50 cm (9.25 in.)
Backlash	0.12-0.20 mm (0.005-0.008 in.)
Runout	0.127 mm (0.005 in.)

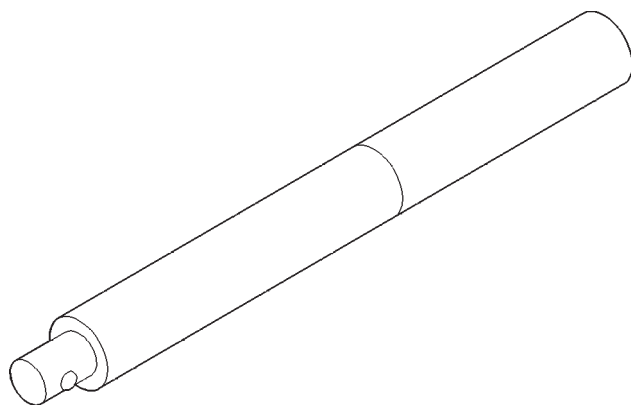
**Pinion Bearing Preload**

Original	1-2 N·m (10-20 in.lbs.)
New	2-5 N·m (15-35 in. lbs.)

# SPECIFICATIONS (Continued)

## 8 1/4 and 9 1/4 INCH AXLE

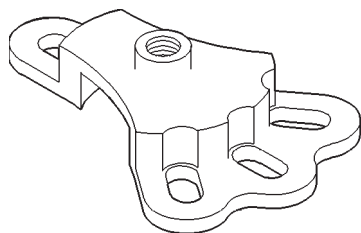
DESCRIPTION	TORQUE
Diff. Cover Bolt . . . . .	41 N·m (30 ft. lbs.)
Bearing Cap Bolt—8 1/4 Axle . .	95 N·m (70 ft. lbs.)
Bearing Cap Bolt—9 1/4 Axle . . . . .	136 N·m (100 ft. lbs.)
Pinion Nut . . . . .	285 N·m (210 ft. lbs.)
Ring Gear Bolt—8 1/4 Axle . . .	102 N·m (75 ft. lbs.)
Ring Gear Bolt—9 1/4 Axle . .	157 N·m (115 ft. lbs.)
Backing Plate Bolt . . . . .	64 N·m (48 ft. lbs.)
RWAL/ABS Sensor Bolt . . . . .	24 N·m (18. ft. lbs.)
Threaded Adjuster Lock Screw . .	10 N·m (90 in. lbs.)



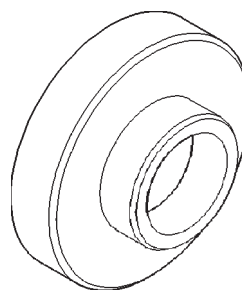
**Handle—C-4171**

# SPECIAL TOOLS

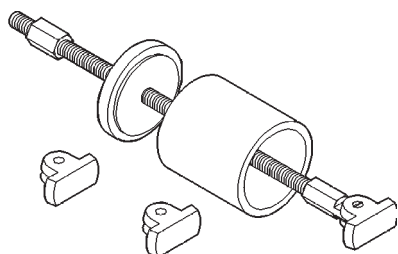
## 8 1/4 AND 9 1/4 AXLES



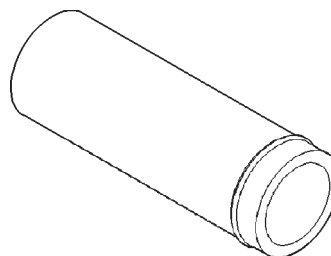
**Puller, Hub—6790**



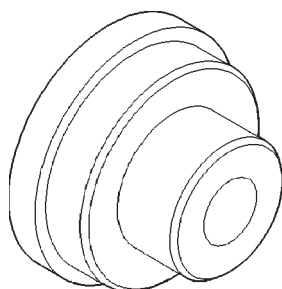
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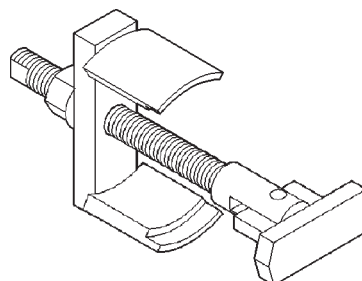
**Remover, Bearing—6310**



**Handle—C-4735-1**

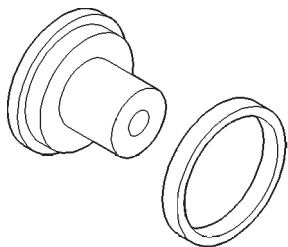
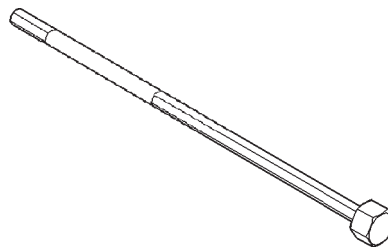
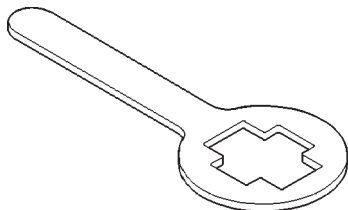
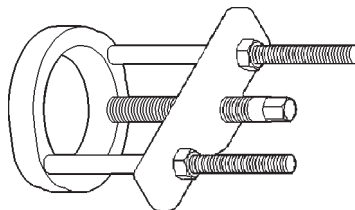
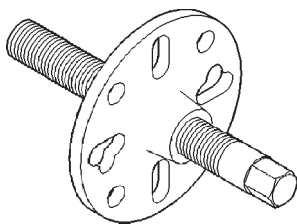
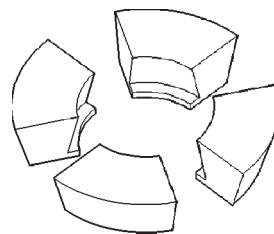
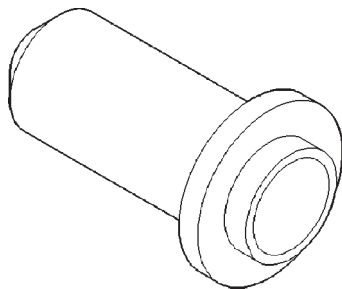
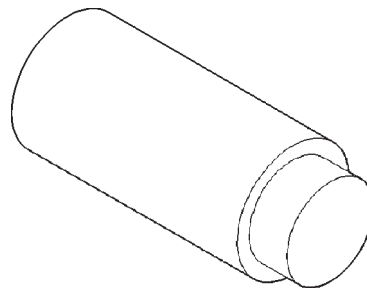
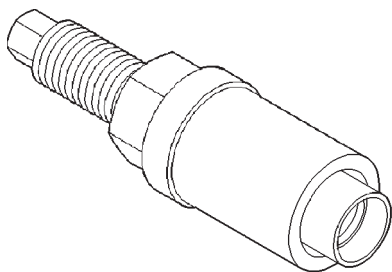
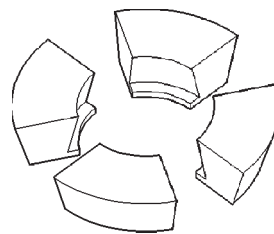


**Installer—C-4198**

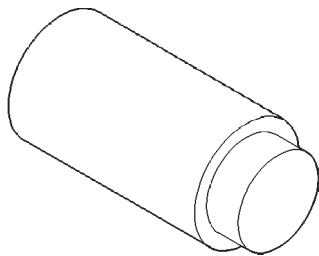


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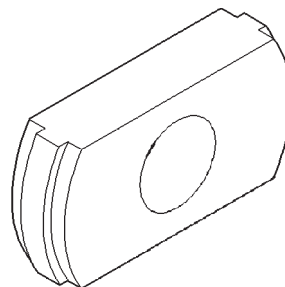
## SPECIAL TOOLS (Continued)

**Installer—C-4826****Adjustment Rod—C-4164****Holder—6719****Puller/Press—C-293-PA****Puller—C-452****Adapters—C-293-48****Installer—C-3860-A****Plug—SP-3289****Installer—C-3718****Adapters—C-293-47**

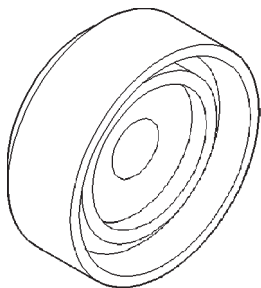
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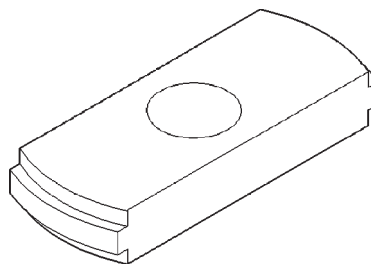
**Plug—C-293-3**



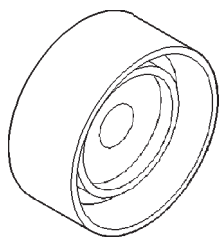
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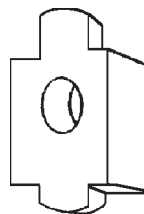
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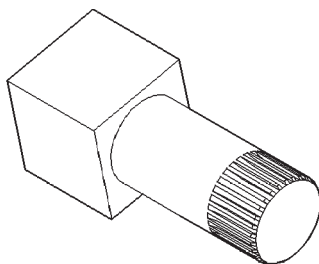
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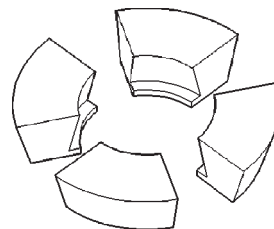
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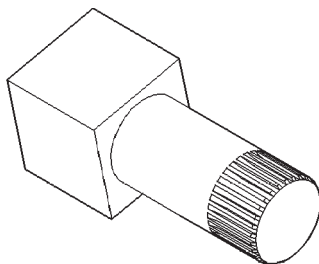
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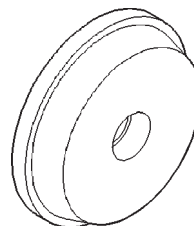
**Holder—8136**



**Adapters—C-293-37**



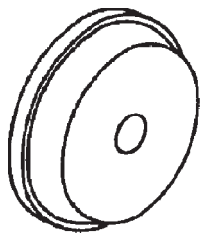
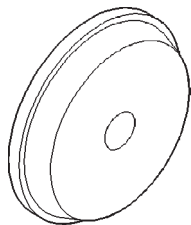
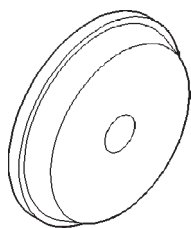
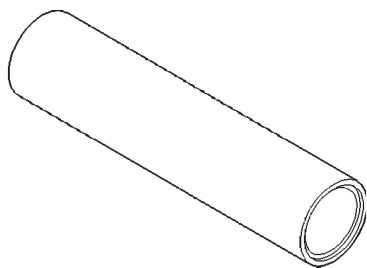
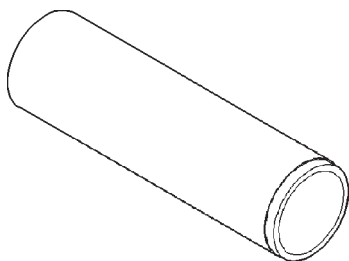
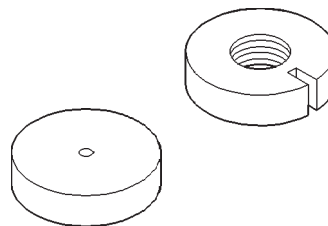
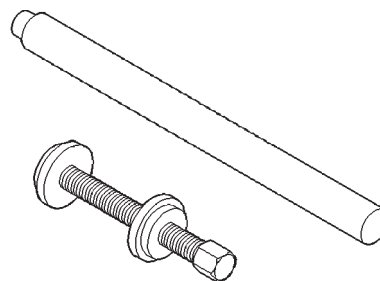
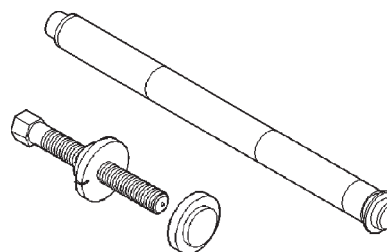
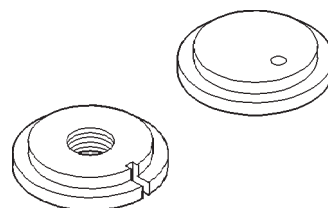
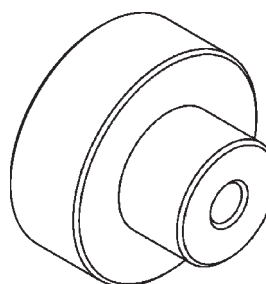
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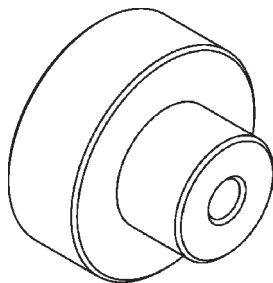
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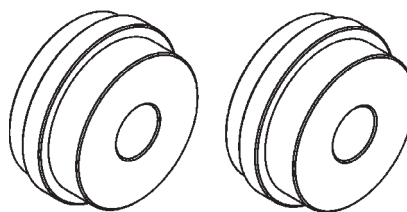
## SPECIAL TOOLS (Continued)

**Installer—C-4310****Installer—D-130****Installer—D-129****Installer—6448****Installer—C-3095****Trac-lok Tools—8140****Trac-lok Tools—6960****Trac-lok Tools—C-4487****Trac-lok Tools—8139****Pinion Gauge Block—8540**

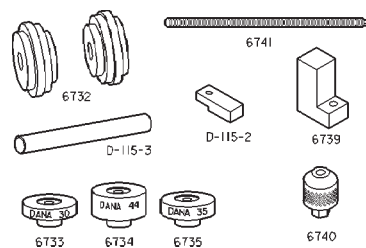
SPECIAL TOOLS (Continued)



**Pinion Gauge Block—8542**



**Arbor Discs—8541**



**Pinion Gauge Set**

