DIFFERENTIAL & DRIVELINE

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PROPELLER SHAFT

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PROPELLER SHAFT

DIAGNOSIS AND TESTING - PROPELLER SHAFT

VIBRATION

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

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

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

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

PROPELLER SHAFT (Continued)

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
Propeller Shaft Noise	1. Undercoating or other foreign material on shaft.	1. Clean exterior of shaft and wash with solvent.
	2. Loose U-joint clamp screws.	2. Install new clamps and screws and tighten to proper torque.
	3. Loose or bent U-joint yoke or excessive runout.	3. Install new yoke.
	4. Incorrect driveline angularity.	4. Measure and correct driveline angles.
	5. Worn joint.	5. Install new joint.
	6. Propeller shaft damaged or out of balance.	6. Installl new propeller shaft.
	7. Broken rear spring.	7. Install new rear spring.
	8. Excessive runout or unbalanced condition.	8. Re-index propeller shaft, test, and evaluate.
	9. Excessive drive pinion gear shaft runout.	9. Re-index propeller shaft and evaluate.
	10. Excessive axle yoke deflection.	10. Inspect and replace yoke if necessary.
	11. Excessive transfer case runout.	11. Inspect and repair as necessary.
Joint Noise	1. Loose U-joint clamp screws.	1. Install new clamps and screws and tighten to proper torque.
	2. Lack of lubrication.	2. Replace joints as necessary.

BALANCE

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

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

(1) Raise the vehicle.

(2) Clean all the foreign material from the propeller shaft and the universal joints.

(3) Inspect the propeller shaft for missing balance weights, broken welds, and bent areas. **If the propeller shaft is bent, it must be replaced.**

(4) Inspect the universal joints to ensure that they are not worn, are properly installed, and are correctly aligned with the shaft.

(5) Check the universal joint clamp screws torque.

(6) Remove the wheels and tires. Install the wheel lug nuts to retain the brake drums or rotors.

(7) Mark and number the shaft six inches from the yoke end at four positions 90° apart.

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

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

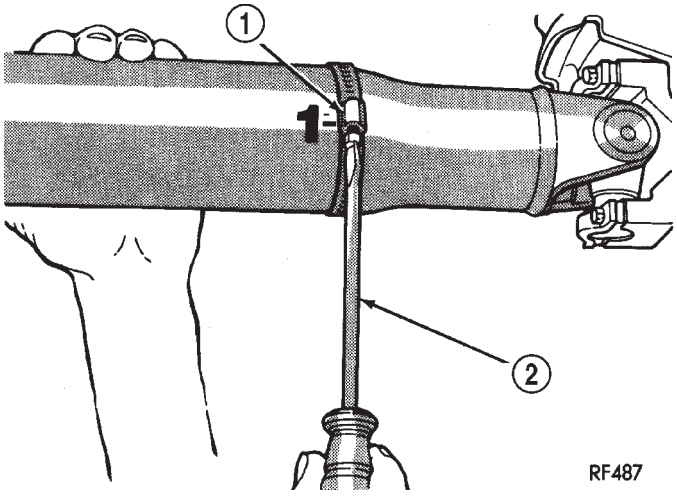


Fig. 1 CLAMP AT POSITION 1

1 - CLAMP
2 - SCREWDRIVER

PROPELLER SHAFT (Continued)

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

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

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

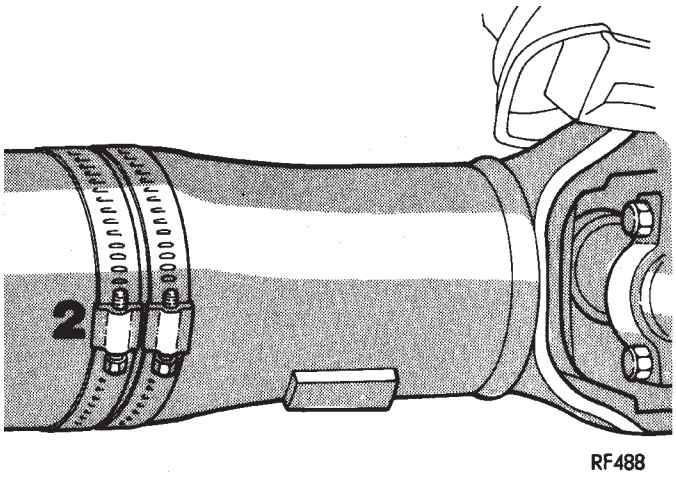


Fig. 2 TWO CLAMPS AT SAME POSITION

(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. 3).

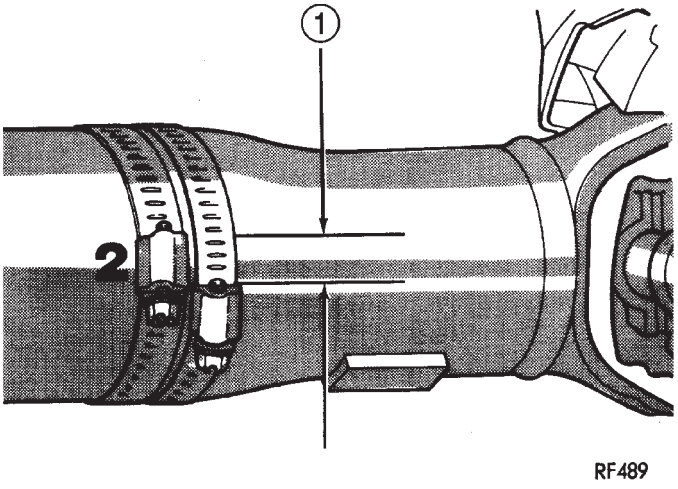


Fig. 3 CLAMPS SEPARATED

1 - ½ 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.

(4) Refer to Runout Specifications chart.

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

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

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

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

RUNOUT SPECIFICATIONS

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

STANDARD PROCEDURES - PROPELLER SHAFT ANGLE

The procedure applies to both the front propeller shafts and the rear propeller shaft. To obtain the front (output) angle on the C/V front propeller shaft, the inclinometer is placed on the machined ring of the pinion flange. To obtain the propeller shaft angle measurement on the C/V front propeller shaft, the inclinometer is placed on the propeller shaft tube.

(1) Raise and support the vehicle at the axles as level as possible. Allow the wheels and propeller shaft to turn.

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

PROPELLER SHAFT (Continued)

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

NOTE: Always make measurements from front to rear.

(4) Place Inclinometer on yoke bearing cap, or the pinion flange ring, (A) parallel to the shaft (Fig. 4). Center bubble in sight glass and record measurement.

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

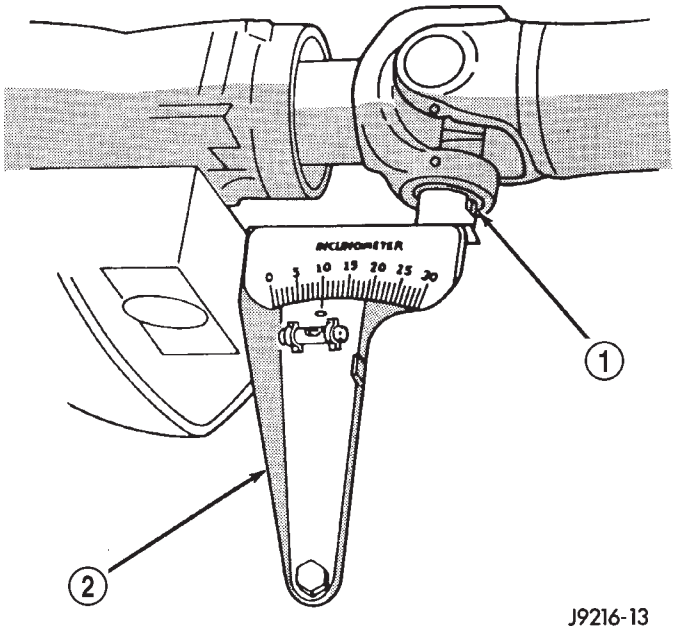


Fig. 4 OUTPUT YOKE ANGLE (A)

1 - SLIP YOKE BEARING CAP
2 - INCLINOMETER

(5) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing cap, or propeller shaft tube on C/V propeller shaft, parallel to the shaft (Fig. 5). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

NOTE: This measurement will give you the propeller shaft angle (C).

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

(7) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing cap parallel to the shaft (Fig. 6). Center bubble in sight glass and record measurement.

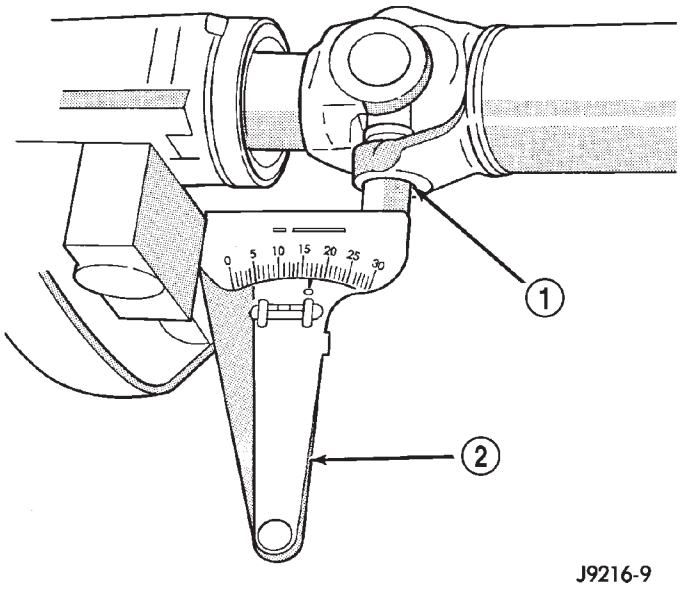


Fig. 5 PROPELLER SHAFT ANGLE (C)

1 - SHAFT YOKE BEARING CAP
2 - INCLINOMETER

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

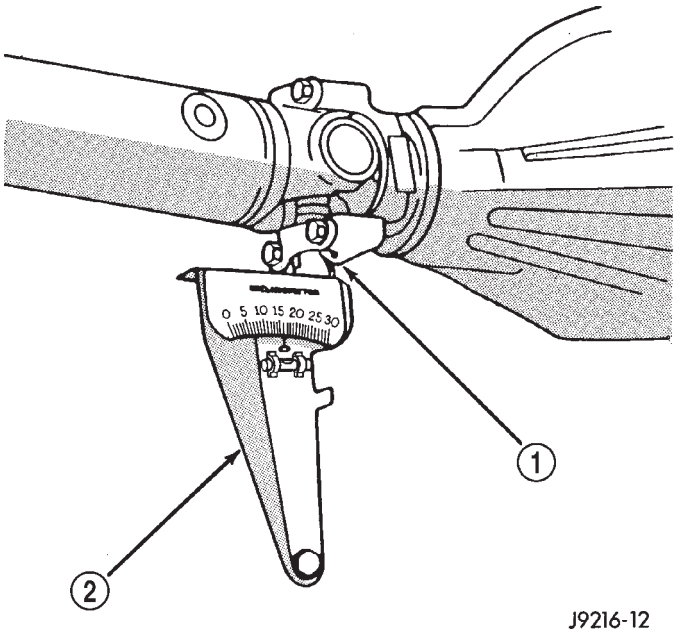


Fig. 6 INPUT YOKE ANGLE (B)

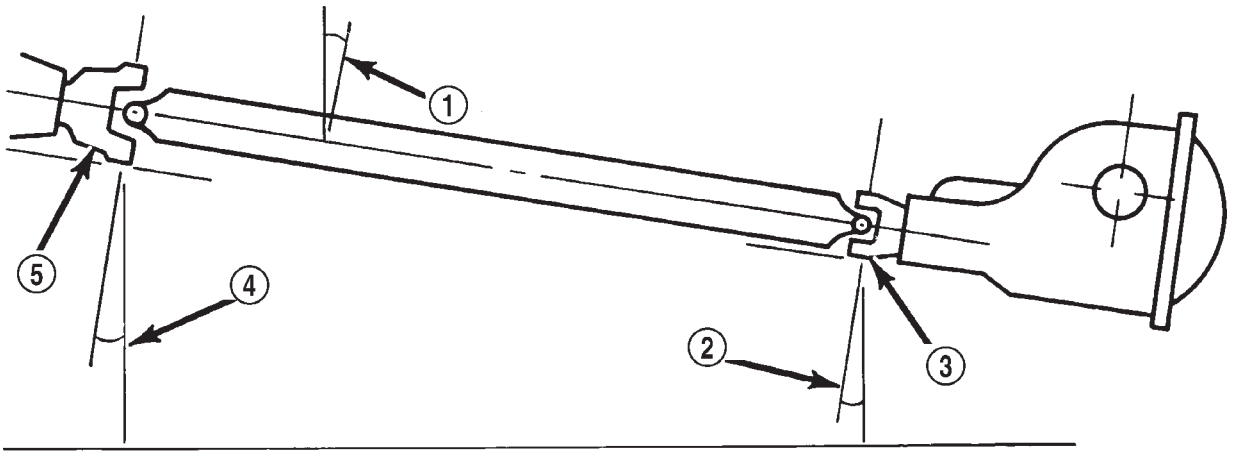
1 - PINION YOKE BEARING CAP
2 - INCLINOMETER

PROPELLER SHAFT (Continued)

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

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

- Good cancellation of U-joint operating angles (within 1°).
- Operating angles less than 3°.
- Operating angles less than 10° for double cardan U-joint.
- At least 1/2 of one degree continuous operating (propeller shaft) angle.



(A) Output Yoke = 3.0°	or 4.9°	(B) Axle Input Yoke = 3.2°	or 4.9°
(C) Prop. Shaft = 4.9°	-3.0°	(C) Prop. Shaft = 4.9°	-3.2°
Transmission Output Operating Angle	1.9°	Axle Input Operating Angle	1.7°

Trans. Output Operating Angle	1.9°
Axle Input Operating Angle	-1.7°
Amount of U-Joint Cancellation	0.2°

J9316-3

Fig. 7 U-JOINT ANGLE EXAMPLE

1 - 4.9° Angle (C)
2 - 3.2° Angle (B)
3 - Input Yoke
4 - 3.0° Angle (A)
5 - Output Yoke

PROPELLER SHAFT (Continued)

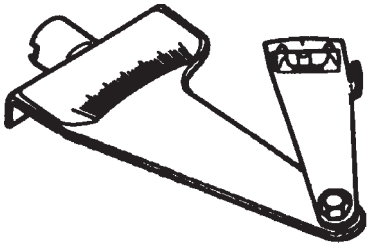
SPECIFICATIONS

PROPELLER SHAFT

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Front Shaft - Companion Flange Bolts	30	22	-
Rear Shaft - Yoke Nuts	18	13	-

SPECIAL TOOLS



Inclinometer 7663

PROPELLER SHAFT - FRONT

REMOVAL

(1) Shift transmission and transfer case into Neutral.

(2) Raise and support the vehicle.

(3) Mark companion flanges and C/V joints at the front and rear of the propeller shaft for installation reference.

(4) Remove bolts from the front and rear C/V joints.

(5) Push propeller shaft forward to clear transfer case companion flange (Fig. 8).

(6) Remove the shaft from the front axle companion flange.

(7) Tilt the front of the shaft down and pull shaft forward and remove from the vehicle.

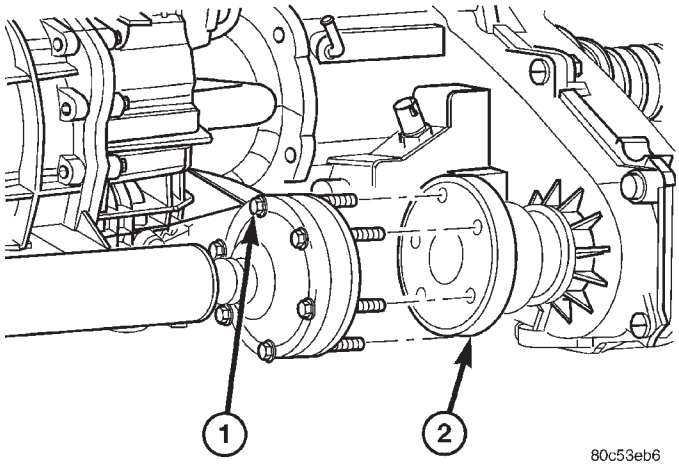


Fig. 8 TRANSFER CASE COMPANION FLANGE

1 - FLANGE BOLT
2 - COMPANION FLANGE

INSTALLATION

(1) Install propeller shaft between companion flanges.

(2) Align marks on the companion flanges with the marks on the C/V joints.

(3) Install front C/V joint bolts and tighten to 30 N·m (22 ft. lbs.).

(4) Install rear C/V joint bolts and tighten to 30 N·m (22 ft. lbs.).

(5) Lower vehicle.

PROPELLER SHAFT - REAR

REMOVAL

(1) Shift the transmission/transfer case into Neutral.

(2) Raise and support vehicle.

(3) Mark a reference line across the pinion yoke and propeller shaft for installation.

(4) Remove U-joint strap bolts at the pinion shaft yoke.

(5) Pry open clamp holding the dust boot to propeller shaft yoke (Fig. 9), if equipped.

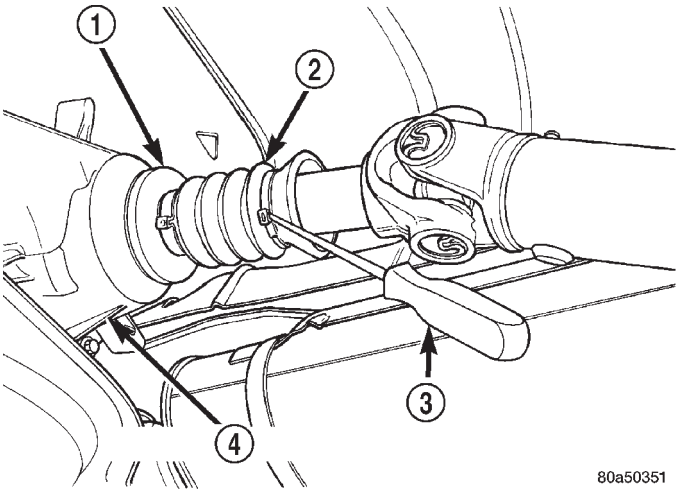


Fig. 9 DUST BOOT CLAMP

1 - SLINGER
2 - BOOT
3 - AWL
4 - TRANSFER CASE

(6) Slide slip yoke off of the transmission/transfer case output shaft and remove the propeller shaft (Fig. 10).

INSTALLATION

(1) Slide slip yoke on the transmission/transfer case output shaft.

(2) Align reference marks on the pinion yoke and propeller shaft.

(3) Install U-joint straps and tighten strap bolts to 18 N·m (13 ft. lbs.).

(4) Tighten dust boot clamp if equipped with Clamp C-4975A (Fig. 11).

(5) Remove support and lower the vehicle.

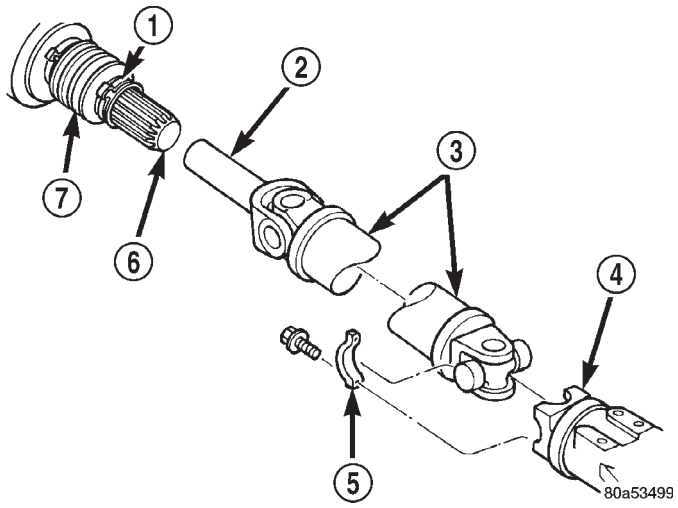


Fig. 10 REAR PROPELLER SHAFT

1 - CLAMP
2 - YOKE
3 - PROPELLER SHAFT
4 - AXLE YOKE
5 - CLAMP
6 - OUTPUT SHAFT
7 - BOOT

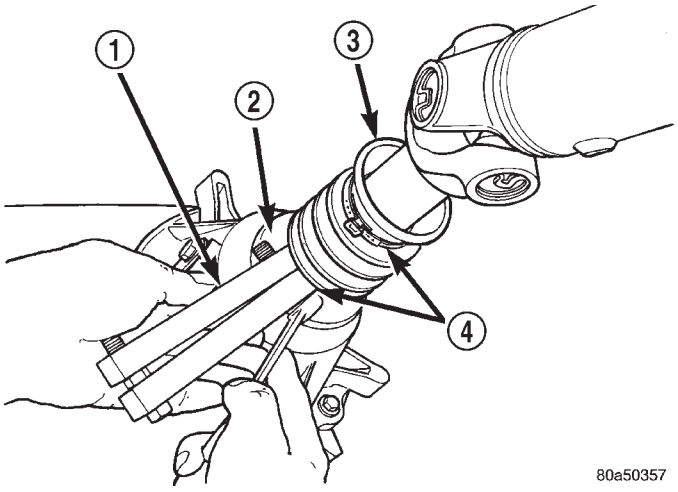


Fig. 11 CRIMPING BOOT CLAMP

1 - CLAMP TOOL
2 - SLINGER
3 - BOOT
4 - CLAMPS

SINGLE CARDAN UNIVERSAL JOINTS

DISASSEMBLY

NOTE: 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) Tap the outside of the bearing cap assembly with a drift to loosen snap ring.
(3) Remove snap rings from both sides of yoke (Fig. 12).

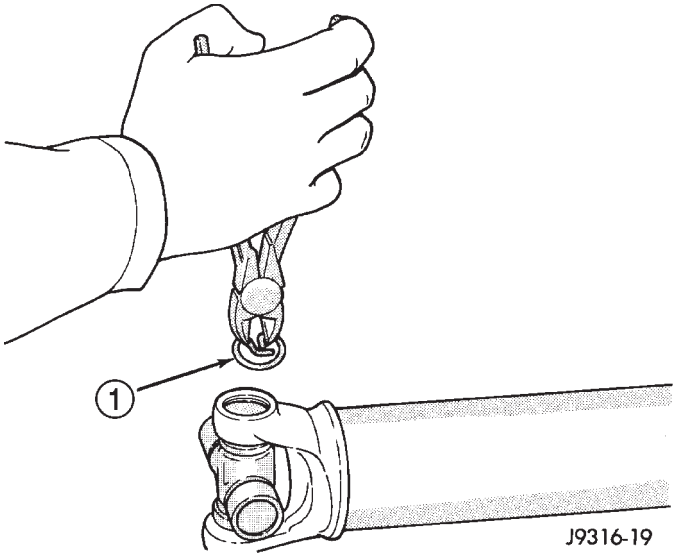


Fig. 12 REMOVE SNAP RING

1 - SNAP RING

(4) Set the yoke in an arbor press or vise with a socket whose inside diameter is large enough to receive the bearing cap positioned beneath the yoke.
(5) Position the yoke with the grease fitting, if equipped, pointing up.
(6) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and press the cap through the yoke to release the lower bearing cap (Fig. 13).
(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. 14).

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.

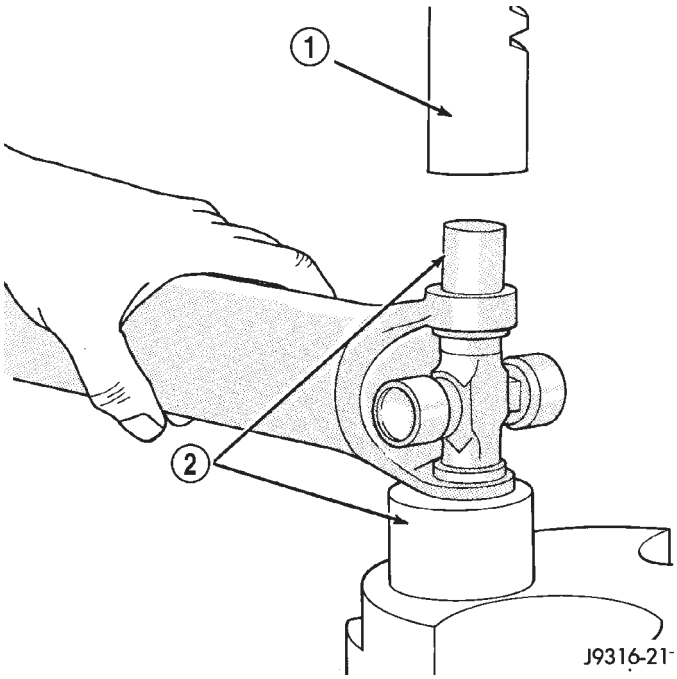


Fig. 13 PRESS OUT BEARING

1 - PRESS
2 - SOCKET

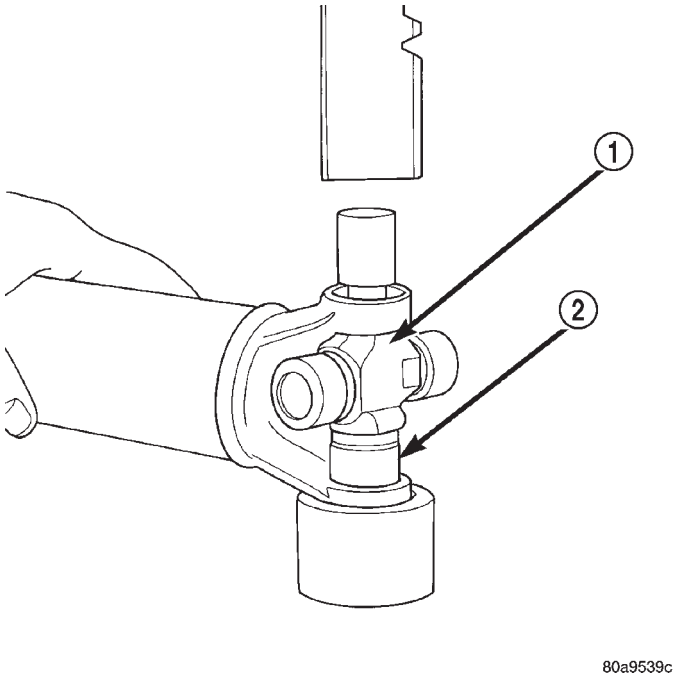


Fig. 14 PRESS OUT REMAINING BEARING

1 - CROSS
2 - BEARING CAP

SINGLE CARDAN UNIVERSAL JOINTS (Continued)

ASSEMBLY

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

(2) Position the cross in the yoke with its lube fitting, if equipped, pointing up (Fig. 15).

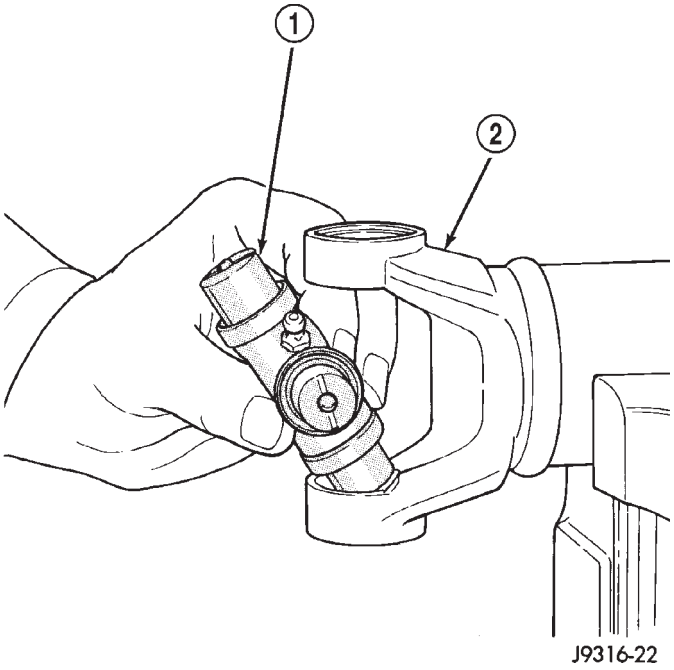


Fig. 15 CROSS IN YOKE

1 - CROSS
2 - YOKE

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 16). Keep the needle bearings upright in the bearing cap.

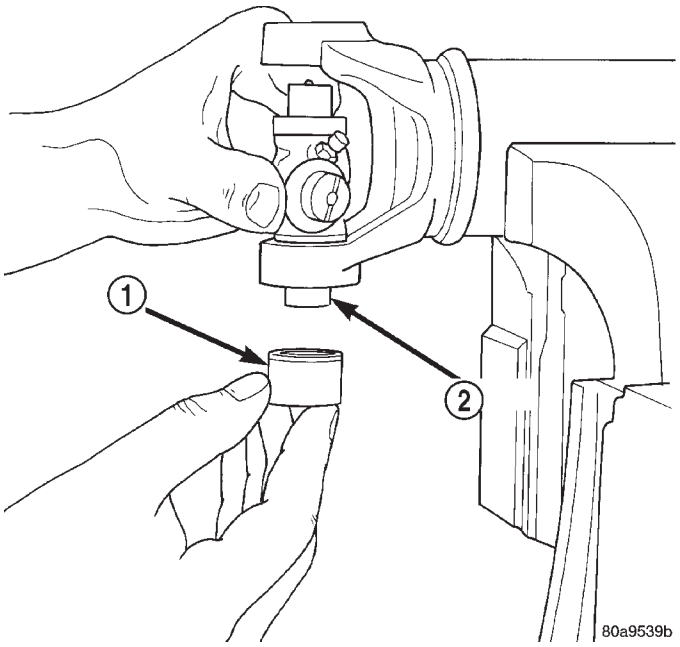


Fig. 16 INSTALL BEARING ON TRUNNION

1 - BEARING CAP
2 - TRUNNION

(4) Press the bearing cap into the yoke bore enough to clear snap ring groove.

(5) Install a snap ring.

(6) Repeat Step 3 and Step 4 to install the opposite bearing cap.

NOTE: If the joint is stiff or binding, strike the yoke with a soft hammer to seat the needle bearings.

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

(8) Install the propeller shaft.

HALF SHAFT

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HALF SHAFT

CAUTION

CAUTION:: Never grasp half shaft assembly by the boots. This may cause the boot to pucker or crease and reduce the service life of the boot.
Avoid over angulating or stroking the C/V joints when handling the half shaft.
Half shafts exposed to battery acid, transmission fluid, brake fluid, differential fluid or gasoline may cause the boots to deteriorate.

DIAGNOSIS AND TESTING - HALF SHAFT

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

NOISE AND/OR VIBRATION IN TURNS

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

CLUNKING NOISE DURING ACCELERATION

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

SHUDDER OR VIBRATION DURING ACCELERATION

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

VIBRATION AT HIGHWAY SPEEDS

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

REMOVAL

(1) Raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Remove half shaft hub nut.
(4) Remove stabilizer link (Fig. 1).

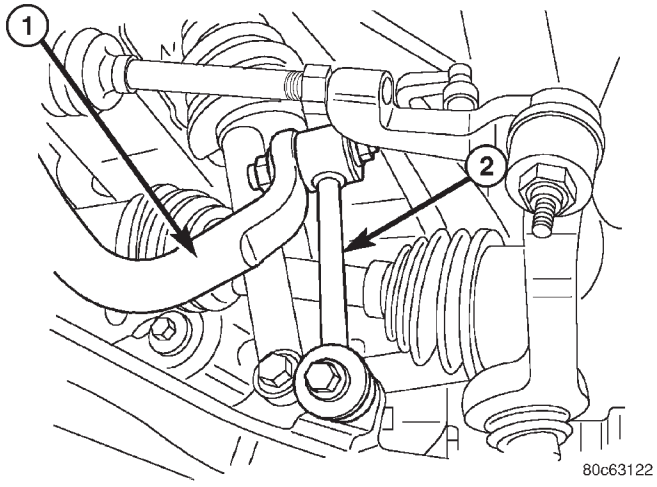


Fig. 1 STABILIZER BAR LINK

1 - STABILIZER BAR
2 - STABILIZER BAR LINK

HALF SHAFT (Continued)

(5) Remove lower clevis bolt (Fig. 2).

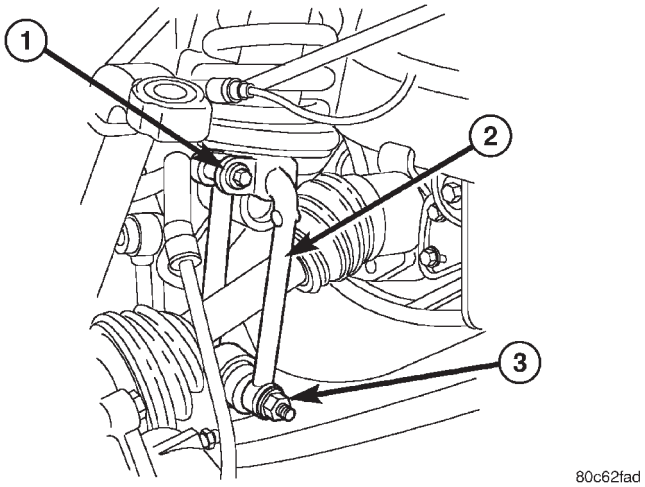


Fig. 2 CLEVIS BRACKET

1 - UPPER BOLT
2 - CLEVIS BRACKET
3 - LOWER BOLT

(6) Seperate lower ball joint from the lower control arm (Fig. 3).

(7) Pull out on the steering knuckle and push the half shaft out of the knuckle.

(8) With a pry bar remove the half shaft from the axle.

NOTE: The right side has a splined axle shaft that will stay in the axle.

INSTALLATION

(1) Apply a light coat of wheel bearing grease on the female splines of the inner C/V joint.

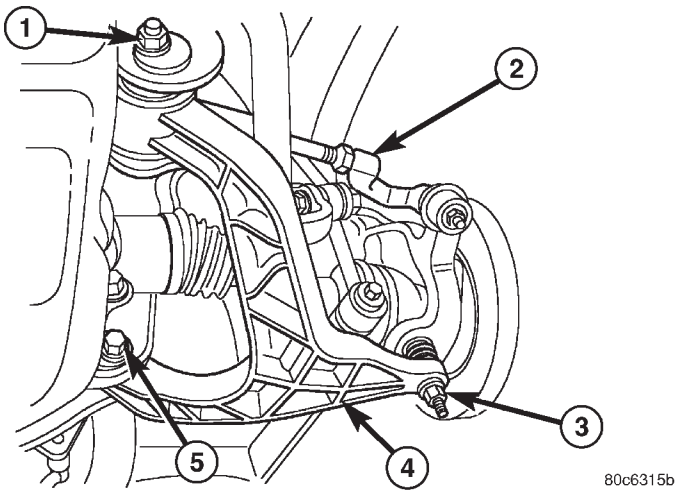


Fig. 3 LOWER CONTROL ARM

1 - FRONT CAM BOLT
2 - OUTER TIE ROD END
3 - LOWER BALL JOINT NUT
4 - LOWER CONTROL ARM
5 - REAR CAM BOLT

(2) Install half shaft on the axle shaft spline and push firmly to engage the snap ring. Pull on the half shaft to verify snap has engaged.

(3) Clean hub bearing bore and apply a light coat of wheel bearing grease.

(4) Pull out on the steering knuckle and push the half shaft through the knuckle.

(5) Install lower ball joint into the lower control arm and tighten pinch bolt.

(6) Align clevis with knuckle. Install and tighten lower clevis bolt.

(7) Install stabilizer link.

(8) Install half shaft hub nut.

(9) Install wheel and tire assembly.

(10) Remove support and lower vehicle.

SPECIFICATIONS

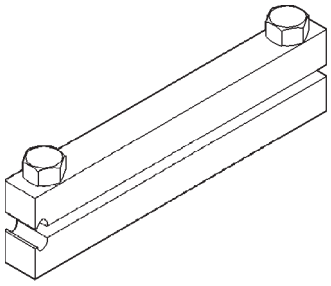
HALF SHAFT

TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Half Shaft Nut	136	100	-

HALF SHAFT (Continued)

SPECIAL TOOLS



CLAMP INSTALLER C-4975A

CV JOINT/BOOT-OUTER

REMOVAL

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

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

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

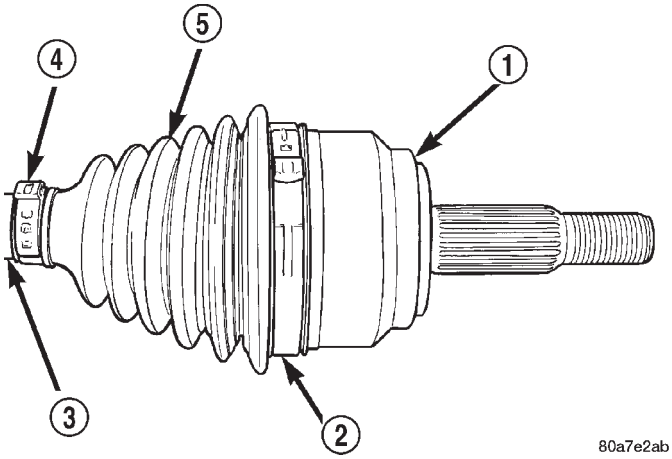


Fig. 4 BOOT CLAMP LOCATIONS

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

(3) Slide the boot down the shaft.

(4) Remove lubricant to expose the C/V joint snap ring.

(5) Spread snap ring and slide the joint off the shaft (Fig. 5).

(6) Slide boot off the shaft and discard old boot.

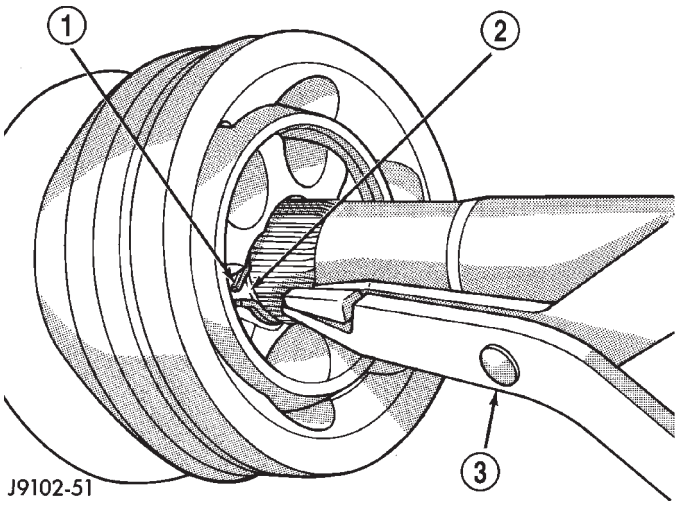


Fig. 5 OUTER C/V JOINT

1 - SNAP RING
2 - SNAP RING GROVE
3 - SNAP RING PLIERS

(7) Mark alignment marks on the inner race/hub, bearing cage and housing with dabs of paint (Fig. 6).

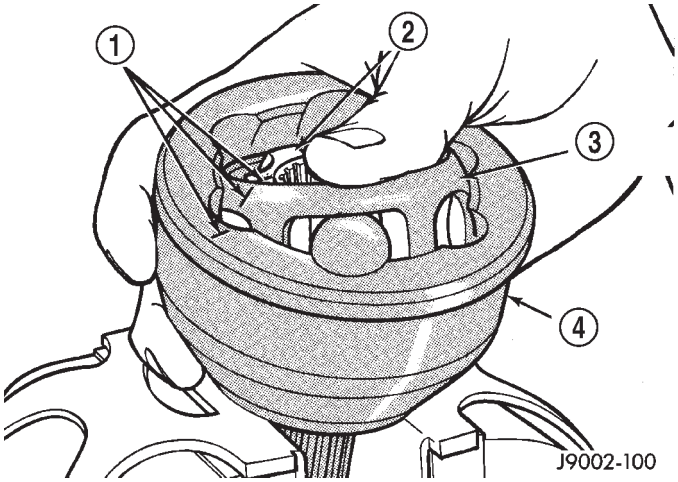


Fig. 6 BEARING ACCESS

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

(8) Clamp C/V joint in a vertical position in a in soft jawed vise.

(9) Press down one side of the bearing cage to gain access to the ball at the opposite.

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

CV JOINT/BOOT-OUTER (Continued)

(10) Remove ball from the bearing cage (Fig. 7).

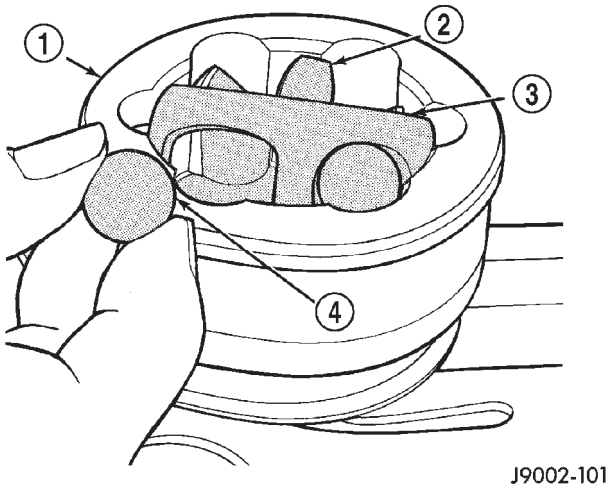


Fig. 7 BEARING

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

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

(12) Lift cage and inner race upward and out from the housing (Fig. 8).

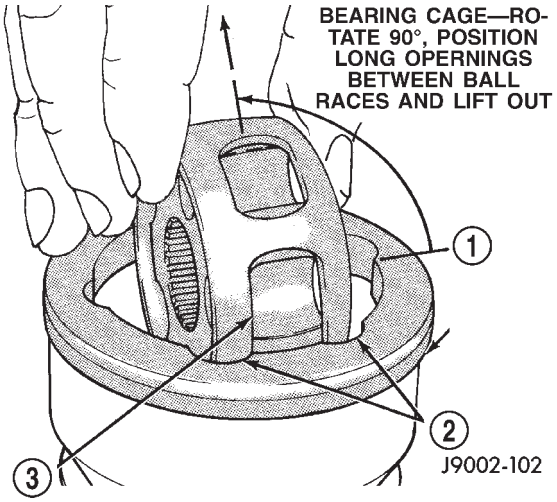


Fig. 8 CAGE AND INNER RACE/HUB

1 - HOUSING
2 - INNER RACE
3 - CAGE WINDOW

(13) Turn inner race 90° in the cage and rotate the inner race/hub out of the cage (Fig. 9).

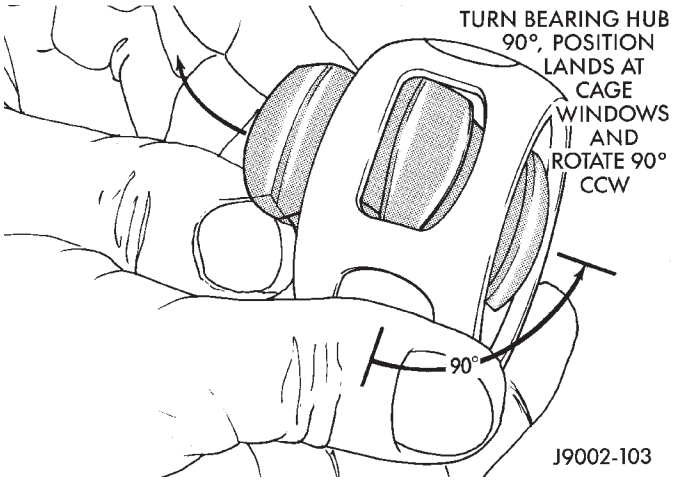


Fig. 9 INNER RACE/HUB

INSTALLATION

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

(1) Apply a light coat of grease to the C/V joint components before assembling them.

(2) Align the inner race, cage and housing according to the alignment reference marks.

(3) Insert the inner race into the cage (Fig. 10) and rotate race into the cage.

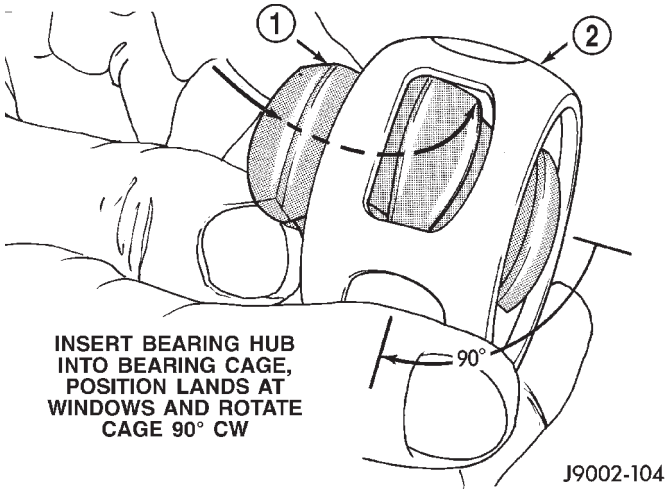


Fig. 10 INNER RACE/HUB

1 - INNER RACE/HUB
2 - BEARING CAGE

CV JOINT/BOOT-OUTER (Continued)

(4) Rotate the inner race/hub in the cage (Fig. 11).

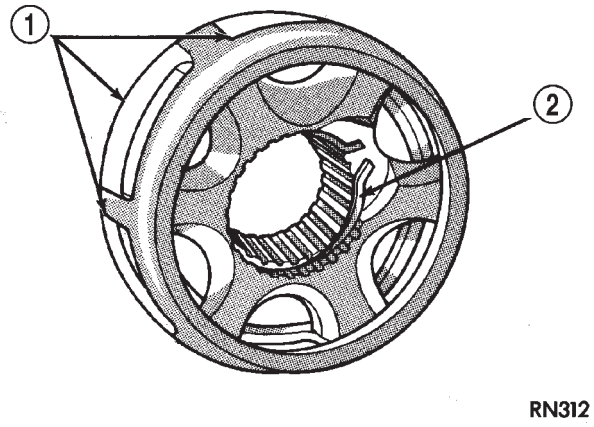


Fig. 11 CAGE AND INNER RACE/HUB

1 - CAGE WINDOWS
2 - SNAP RING

(5) Insert cage into the housing (Fig. 12). Rotate the cage 90° into the housing (Fig. 13).

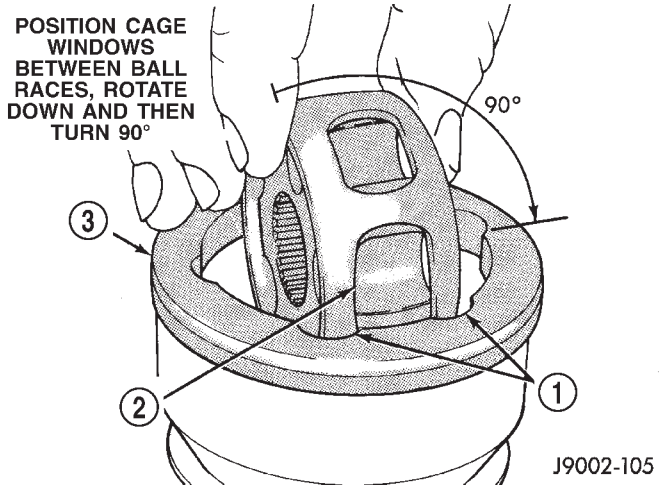


Fig. 12 BEARING CAGE AND HOUSING

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

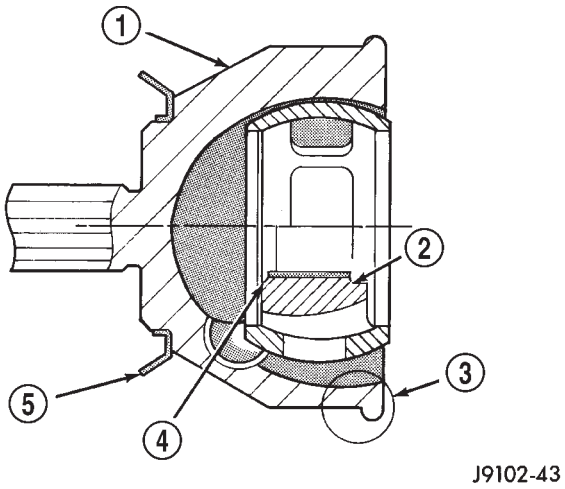


Fig. 13 CAGE AND INNER RACE/HUB

1 - C/V HOUSING
2 - BEARING HUB LARGE COUNTERBORE OUTWARD
3 - BOOT RETAINING SHOULDER
4 - BEARING HUB SMALL COUNTERBORE INWARD
5 - SLINGER

(6) Apply the lubricant included with the replacement boot to the ball races. Spread the lubricant equally between all the races.

(7) Tilt inner race/hub and cage and install the balls (Fig. 14).

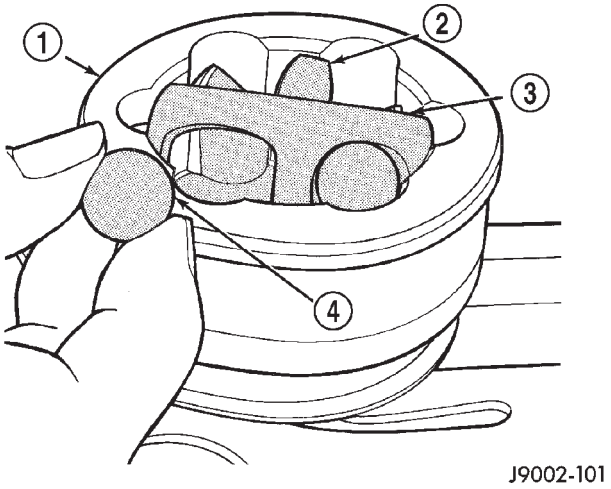


Fig. 14 BALL BEARING

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

CV JOINT/BOOT-OUTER (Continued)

(8) Place new clamps onto new boot and slide boot onto the shaft to it's original position.

(9) Apply the rest of lubricant to the C/V joint and boot.

(10) Install the joint onto the shaft. Push the joint onto the shaft until the snap ring seats in the groove (Fig. 15). Pull on the joint to verify the span ring has engaged.

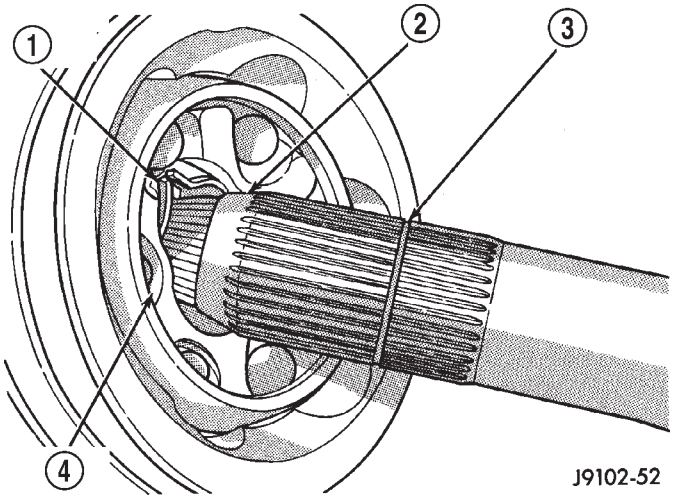


Fig. 15 OUTER C/V JOINT

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

(11) Position the boot on the joint in it's original position. Ensure that the boot is not twisted and remove any excess air.

(12) Secure both boot clamps (Fig. 16) with Clamp Installer C-4975A. Place tool on clamp bridge and tighten tool until the jaws of the toll are closed.

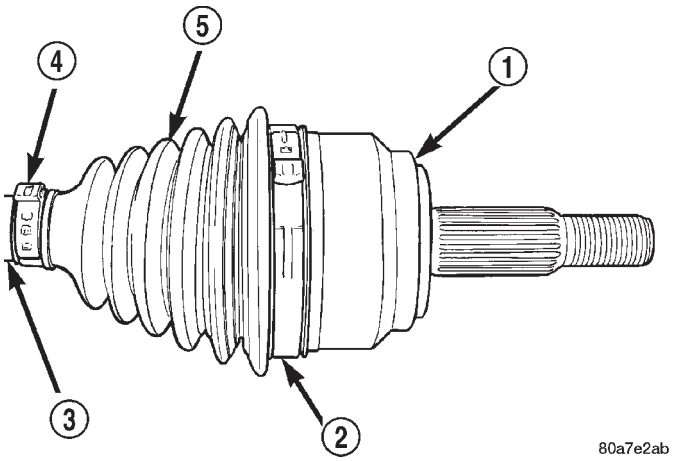


Fig. 16 BOOT CLAMP LOCATIONS

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

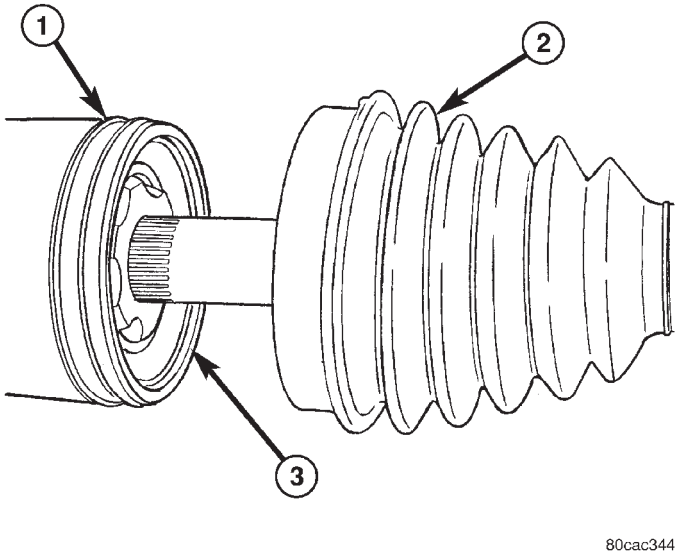


Fig. 17 INNER C/V BOOT

1 - HOUSING
2 - BOOT
3 - HOUSING SNAP RING

CV JOINT/BOOT-INNER

REMOVAL

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

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

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

(3) Slide the boot down the shaft (Fig. 17).

CV JOINT/BOOT-INNER (Continued)

(4) Remove lubricant to expose the C/V housing snap ring and remove snap ring (Fig. 18).

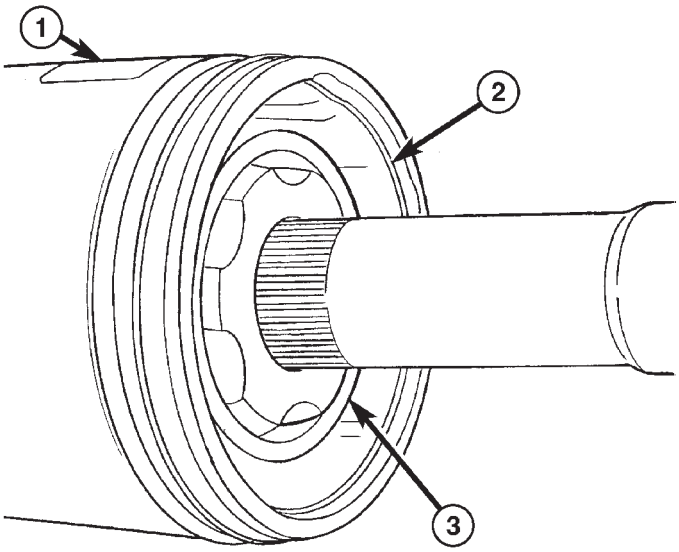


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Fig. 18 HOUSING SNAP RING

1 - HOUSING
2 - SNAP RING
3 - CAGE/INNER RACE

(5) Remove bearings from the cage (Fig. 19).

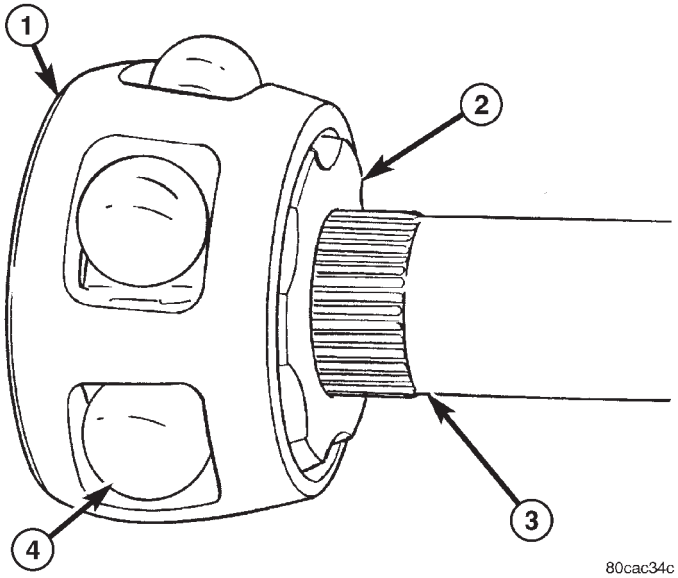

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Fig. 19 C/V BEARINGS

1 - CAGE
2 - INNER RACE
3 - SHAFT
4 - BEARING

(6) Rotate cage 30° and slide cage off the inner race and down the shaft.

(7) Remove spread inner race snap ring (Fig. 20) and remove race from the shaft.

(8) Remove boot from the shaft and discard.

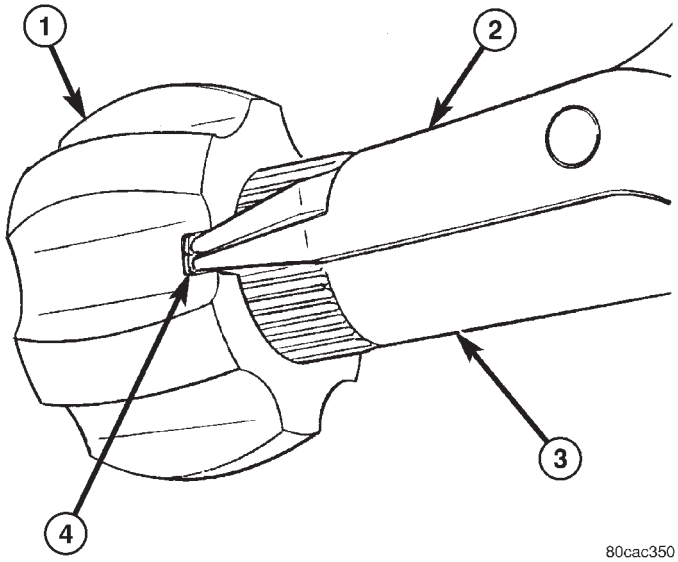

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Fig. 20 INNER RACE

1 - INNER RACE
2 - PLIERS
3 - SHAFT
4 - SNAP RING ACCESS

(9) Clean and inspect all components for wear or damage (Fig. 21).

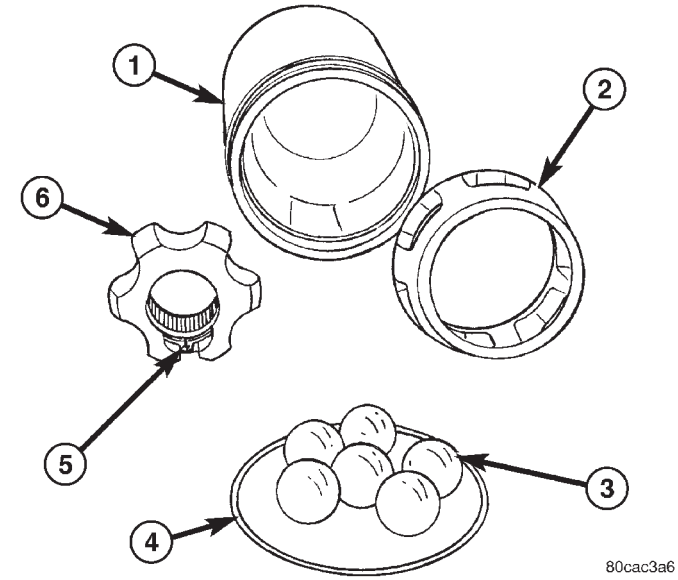

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Fig. 21 INNER C/V JOINT

1 - HOUSING
2 - CAGE
3 - BEARINGS
4 - HOUSING SNAP RING
5 - INNER RACE SNAP RING
6 - INNER RACE

CV JOINT/BOOT-INNER (Continued)

INSTALLATION

(1) Apply a coat of grease supplied with the joint/boot to the C/V joint components before assembling them.

(2) Place new clamps on the new boot and slide boot down the shaft.

(3) Slide cage onto the shaft (Fig. 22) with the small diameter end towards the boot.

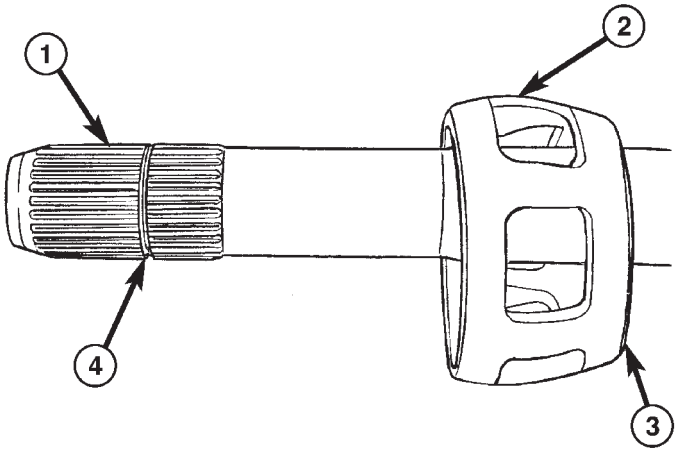

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Fig. 22 BEARING CAGE

1 - SHAFT
2 - CAGE
3 - SMALL DIAMETER
4 - SNAP RING GROOVE

(4) Install the inner race onto the shaft (Fig. 23). Pull on the race to verify snap ring has engaged.

(5) Align cage with the inner race and slide over the race.

(6) Turn the cage 30° to align the cage windows with the race (Fig. 24).

(7) Apply grease to the inner race and bearings and install the bearings.

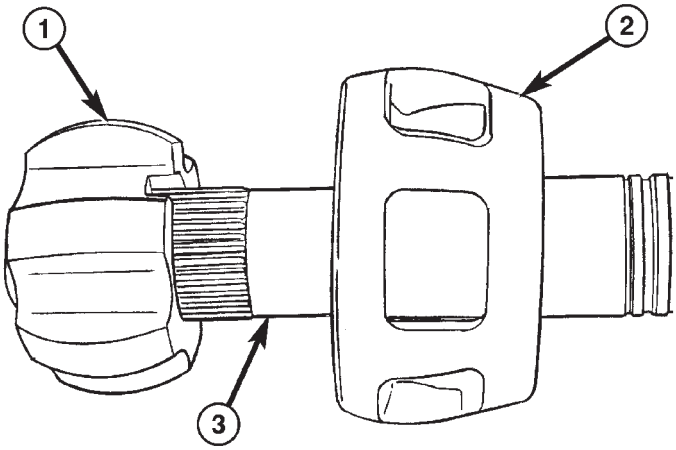

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Fig. 23 INNER RACE

1 - INNER RACE
2 - CAGE
3 - SHAFT

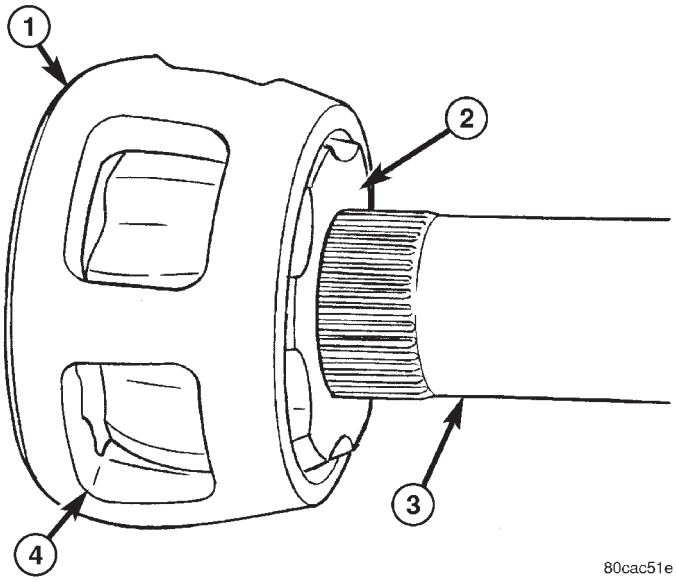

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Fig. 24 CAGE/INNER RACE

1 - CAGE
2 - INNER RACE
3 - SHAFT
4 - CAGE WINDOW

CV JOINT/BOOT-INNER (Continued)

(8) Apply grease to the housing bore (Fig. 25) then install the bearing assmbly into the housing.

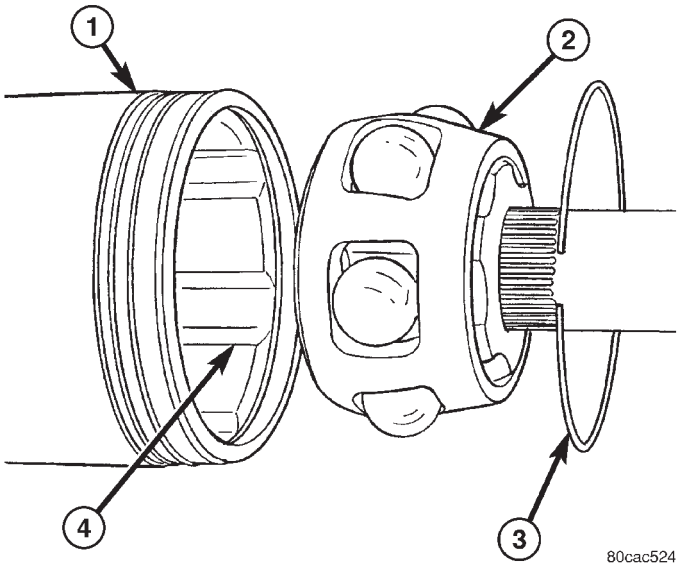

Fig. 25 C/V COMPONENTS

1 - HOUSING
2 - BEARING ASSEMBLY
3 - HOUSING SNAP RING
4 - HOUSING BORE

(9) Install the housing snap ring and verify it is seated in the groove.

(10) Fill the housing and boot with the remaining grease.

(11) Slide the boot onto the C/V housing into it's original position. Ensure boot is not twisted and remove any excess air.

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

FRONT AXLE - 186FIA

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FRONT AXLE - 186FIA

DESCRIPTION

The 186FIA (Model 30) axle consists of an alumunum 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 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 thickness). 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.

The power is transferred from the axle through two constant velocity (C/V) drive shafts to the wheel hubs.

The differential cover provides a means for inspection and service without removing the axle from the vehicle. The cover has a vent tube used to relieve internal pressure caused by vaporization and internal expansion.

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.

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).

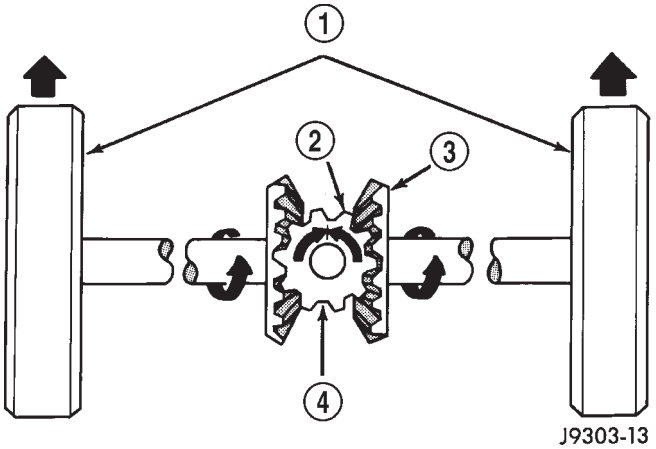


Fig. 1 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

1 - STRAIGHT AHEAD DRIVING
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.

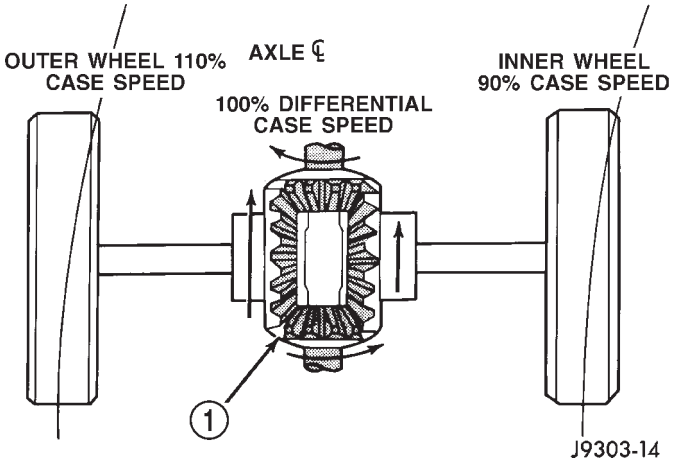


Fig. 2 DIFFERENTIAL-ON TURNS

1 - PINION GEARS ROTATE ON PINION SHAFT

DIAGNOSIS AND TESTING - AXLE

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:

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

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

All driveline components should be examined before starting any repair.

FRONT AXLE - 186FIA (Continued)

DRIVELINE SNAP

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

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

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

DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	1. Wheel loose.	1. Tighten loose nuts.
	2. Faulty, brinelled wheel bearing.	2. Replace bearing.
Axle Shaft Noise	1. Misaligned axle tube.	1. Inspect axle tube alignment. Correct as necessary.
	2. Bent or sprung axle shaft.	2. Inspect and correct as necessary.
	3. End-play in pinion bearings.	3. Refer to pinion pre-load information and correct as necessary.
	4. Excessive gear backlash between the ring gear and pinion.	4. Check adjustment of the ring gear and pinion backlash. Correct as necessary.
	5. Improper adjustment of pinion gear bearings.	5. Adjust the pinion bearings pre-load.
	6. Loose pinion yoke nut.	6. Tighten the pinion yoke nut.
	7. Scuffed gear tooth contact surfaces.	7. Inspect and replace as necessary.
Axle Shaft Broke	1. Misaligned axle tube.	1. Replace the broken shaft after correcting tube mis-alignment.
	2 Vehicle overloaded.	2. Replace broken shaft and avoid excessive weight on vehicle.
	3. Erratic clutch operation.	3. Replace broken shaft and avoid or correct erratic clutch operation.
	4. Grabbing clutch.	4. Replace broken shaft and inspect and repair clutch as necessary.

FRONT AXLE - 186FIA (Continued)

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

FRONT AXLE - 186FIA (Continued)

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

FRONT AXLE - 186FIA (Continued)

REMOVAL

(1) Raise and support vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove half shaft hub nuts.
(4) Remove lower control arms. Refer to 2 suspension for procedure.
(5) Remove half shafts.
(6) Remove skid plate.
(7) Remove differential drain plug (Fig. 3) and drain fluid.

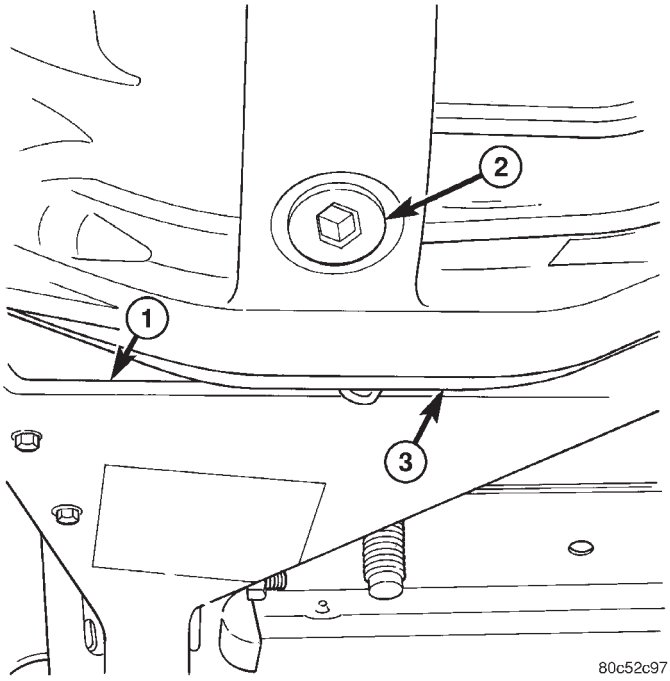


Fig. 3 DRAIN PLUG

1 - LEFT FRONT AXLE BRACKET
2 - DRAIN PLUG
3 - DIFFERENTIAL HOUSING

(8) Remove differential vent hose (Fig. 4) from cover.
(9) Remove propeller shaft from pinion flange.
(10) Support axle with a lift/jack.
(11) Remove bolt from left front axle bracket frame mount (Fig. 5).
(12) Remove bolts from right axle bracket frame mounts (Fig. 6).
(13) Remove bolt from left rear axle bracket frame mount (Fig. 7).
(14) Lower axle from vehicle.
(15) Remove brackets from axle if necessary.

INSTALLATION

(1) Install left rear bracket to axle and tighten to 61 N·m (45 ft. lbs.).
(2) Install right bracket to axle and tighten to 88 N·m (65 ft. lbs.).

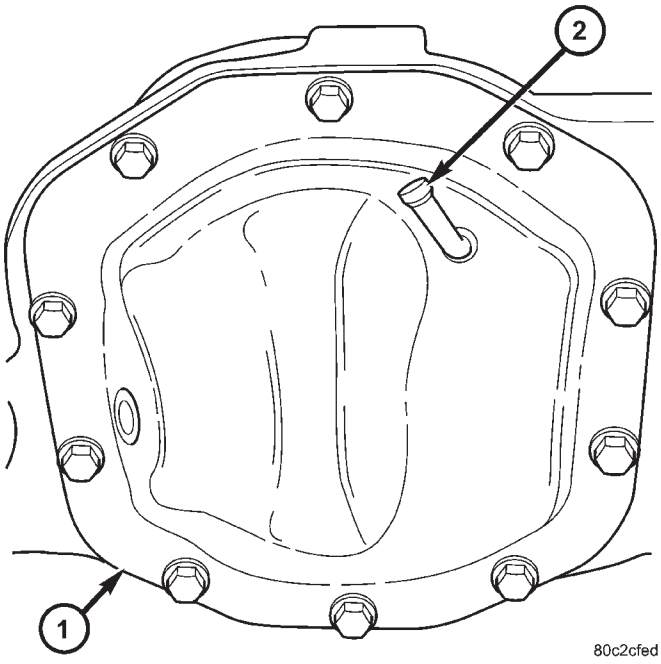


Fig. 4 DIFFERENTIAL COVER

1 - COVER
2 - VENT TUBE

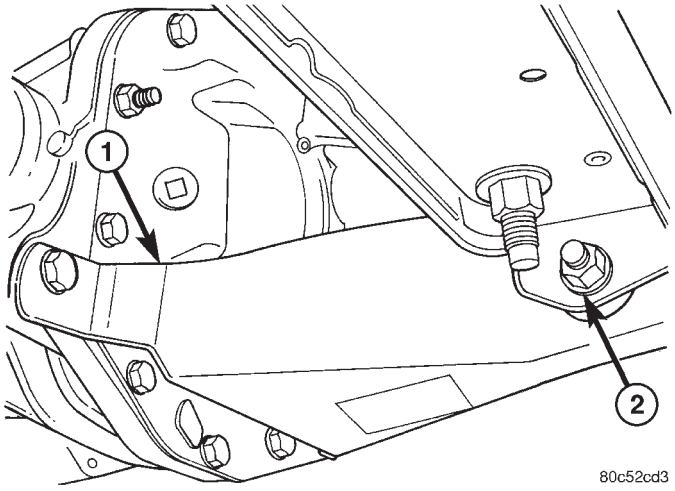


Fig. 5 LEFT FRONT AXLE BRACKET

1 - LEFT FRONT AXLE BRACKET
2 - BRACKET BOLT

(3) Install left front bracket to axle and tighten to 61 N·m (45 ft. lbs.).
(4) Raise axle up and align brackets with frame mounts.
(5) Install frame mount bolts and tighten to 88 N·m (65 ft. lbs.).
(6) Install propeller shaft.
(7) Install half shafts.

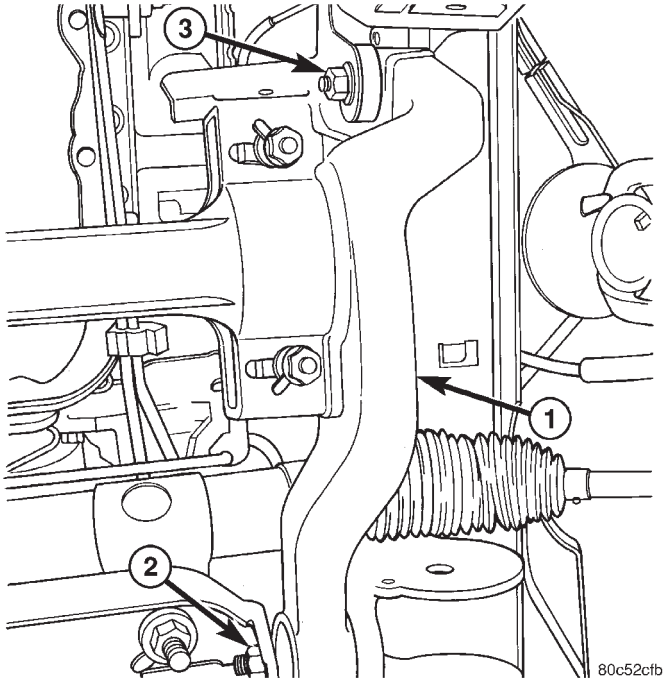


Fig. 6 RIGHT AXLE BRACKET

1 - RIGHT AXLE BRACKET
2 - FRONT BRACKET BOLT
3 - REAR BRACKET BOLT

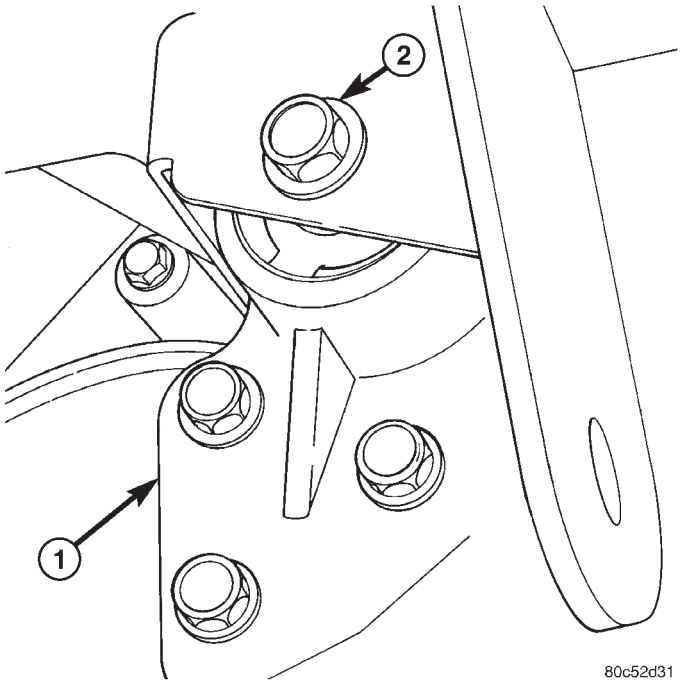


Fig. 7 LEFT REAR AXLE BRACKET

1 - LEFT REAR AXLE BRACKET
2 - BRACKET BOLT

(8) Install lower control arms, refer to 2 Suspension for procedures.
(9) Install new half shaft hub nuts and tighten to 136 N·m (100 ft. lbs.).
(10) Install axle vent hose.
(11) Fill differential with gear lubricant.
(12) Install skid plate.
(13) Install wheel and tire assemblies.
(14) Remove support and lower vehicle.
(15) Check vehicle alignment.

ADJUSTMENTS

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched onto each gear (Fig. 8). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 92.1 mm (3.625 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

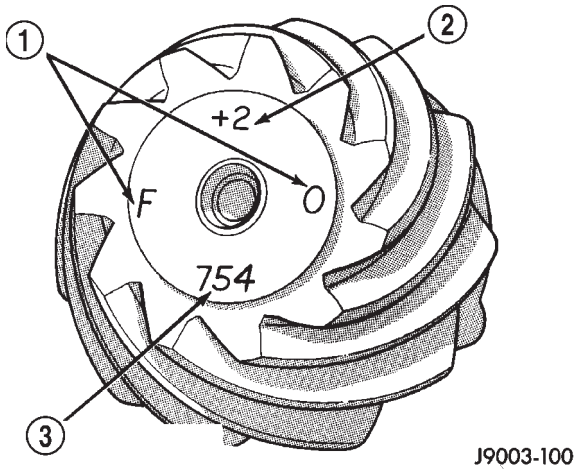


Fig. 8 PINION GEAR ID NUMBERS

1 - PRODUCTION NUMBERS
2 - DRIVE PINION GEAR DEPTH VARIANCE
3 - GEAR MATCHING NUMBER

FRONT AXLE - 186FIA (Continued)

Compensation for pinion depth variance is achieved with a select shim/oil slinger. The shims are placed between the rear pinion bearing and the pinion gear head (Fig. 9).

If a new gear set is being installed, note the depth variance etched into both the original and replacement pinion. Add or subtract this number from the thickness of the original depth shim/oil slinger to compensate for the difference in the depth variances. Refer to the Pinion Gear Depth Variance chart.

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

Note the etched number on the face of the pinion gear head (–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.

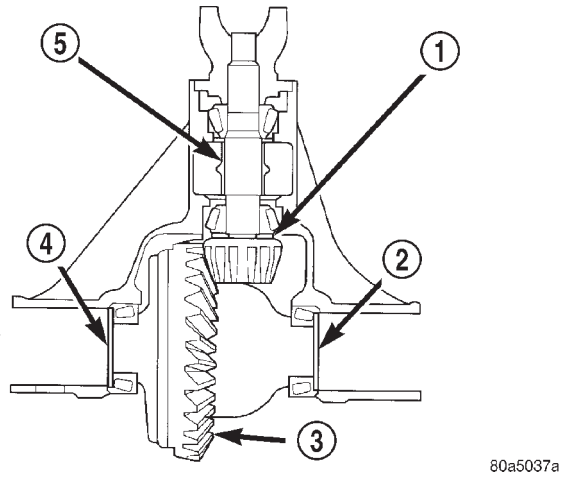


Fig. 9 SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM/OIL SLINGER
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

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

FRONT AXLE - 186FIA (Continued)

PINION DEPTH MEASUREMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the housing. Take measurements with Pinion Gauge Set and Dial Indicator C-3339 (Fig. 10).

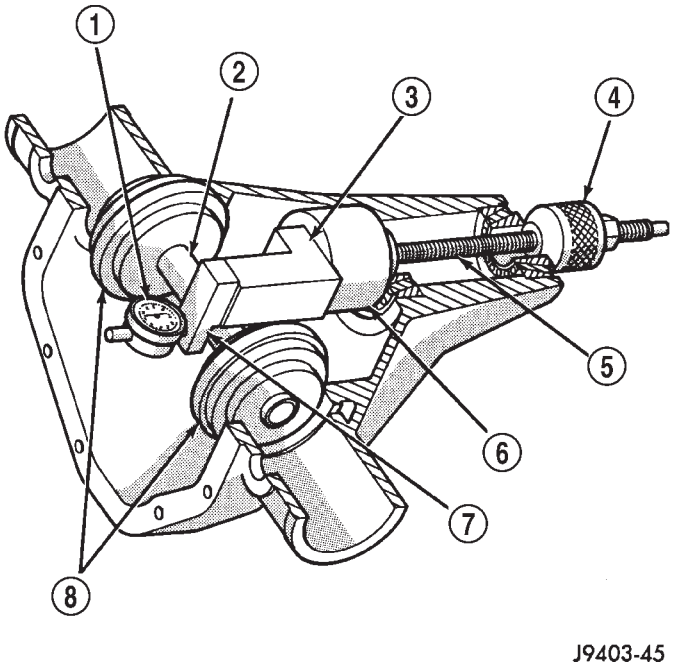


Fig. 10 PINION GEAR DEPTH TOOLS

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 8804 and rear pinion bearing onto Screw 6741 (Fig. 10).

(2) Insert height gauge components into the housing through pinion bearing cups.

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

(4) Position Arbor Disc 6732 and Arbor D-115-3 into the housing bearing cradles. Install differential bearing caps on Arbor Discs and tighten bolts to 41 N·m (30 ft. lbs.) (Fig. 11).

NOTE: Arbor Discs 6732 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.

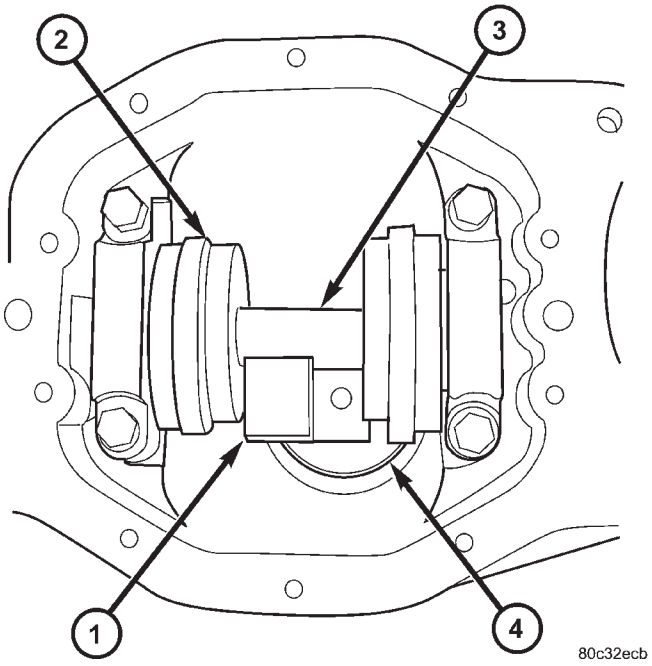


Fig. 11 DEPTH TOOLS IN HOUSING

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

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

(7) Slowly slide the scooter block across the pinion height block over to the arbor (Fig. 12). Move the scooter block till the dial indicator probe crests the arbor and record the highest reading.

(8) Select a shim/oil slinger equal to the dial indicator reading plus the pinion depth variance number etched in the face of the pinion (Fig. 8). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

DIFFERENTIAL

Differential bearing preload and gear backlash is adjusted by the use of selective shims. The shims are located between the differential bearing cups and the differential housing. The proper shim thickness can be determined using slip-fit Dummy Bearings D-348 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

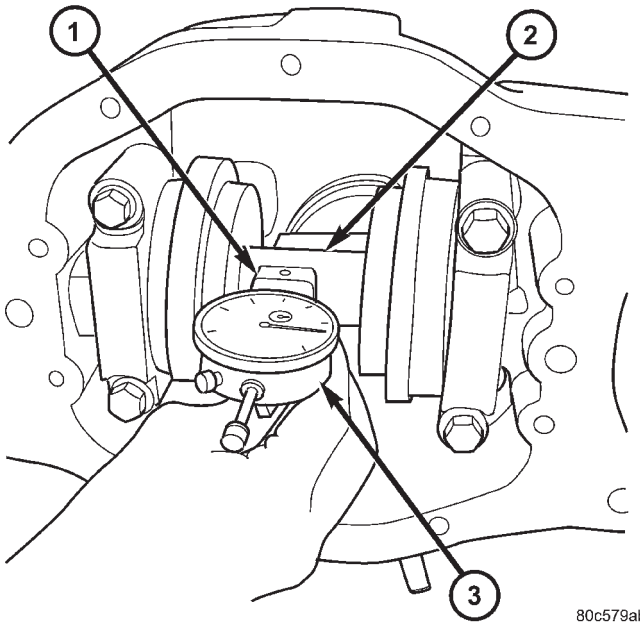


Fig. 12 PINION DEPTH MEASUREMENT

1 - SCOOTER BLOCK
2 - ARBOR
3 - DIAL INDICATOR

shim thickness is measured. The overall shim thickness is the total of the dial indicator reading 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 gear side of the differential (Fig. 13). Differential shim measurements are performed with spreader W-129-B removed.

SHIM SELECTION

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

(1) Remove differential side bearings from differential case.
(2) Install ring gear on differential case and tighten bolts to specification.
(3) Install Dummy Bearings D-348 on differential case.
(4) Install differential case in the housing.
(5) Record the thickness of Dummy Shims 8107. Insert the shims between the dummy bearings and the differential housing (Fig. 14).

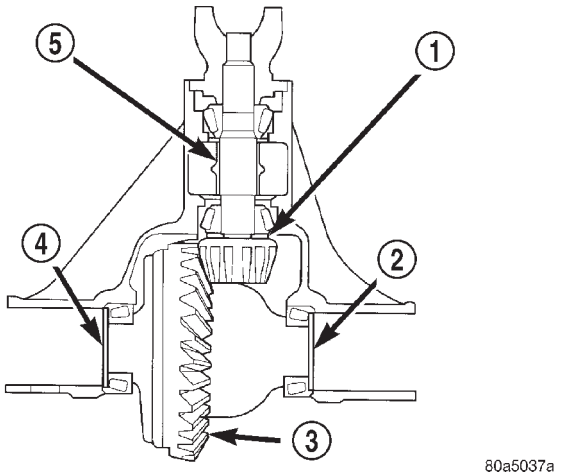


Fig. 13 SHIM LOCATIONS

1 - PINION GEAR DEPTH SHIM/OIL SLINGER
2 - DIFFERENTIAL BEARING SHIM
3 - RING GEAR
4 - DIFFERENTIAL BEARING SHIM
5 - COLLAPSIBLE SPACER

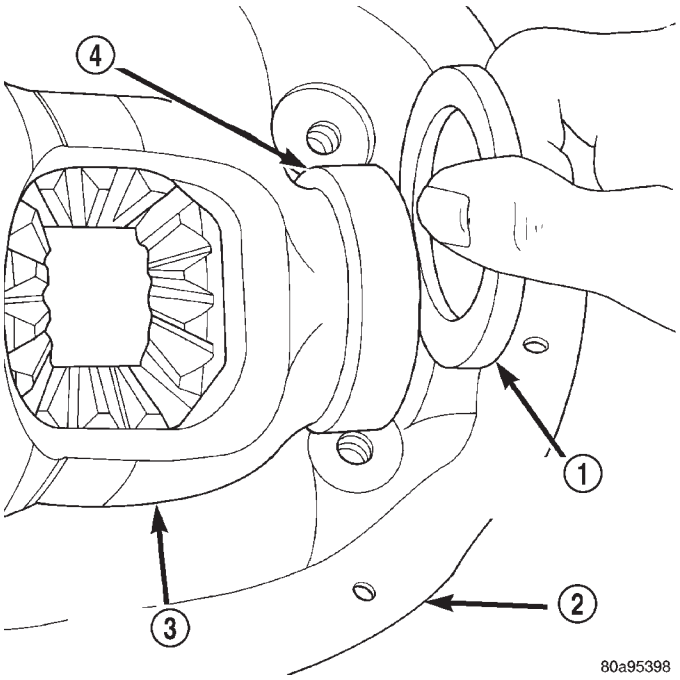


Fig. 14 DUMMY SHIMS

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

FRONT AXLE - 186FIA (Continued)

(6) Install the bearing caps in their correct positions and snug the bolts (Fig. 15).

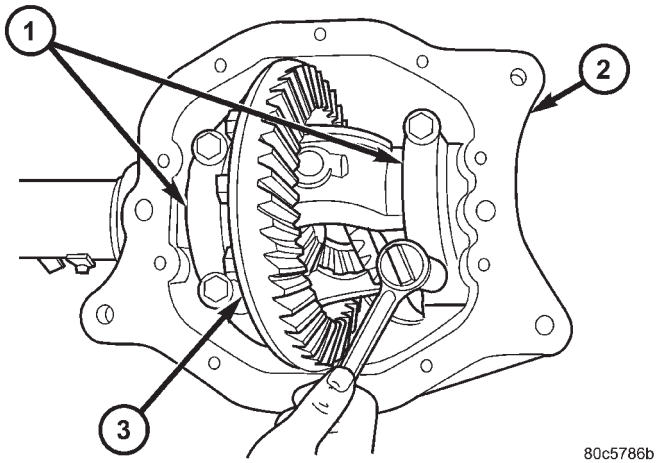


Fig. 15 BEARING CAP BOLTS

(7) With a dead-blow hammer, seat the differential dummy bearings to each side of the axle housing (Fig. 16) and (Fig. 17).

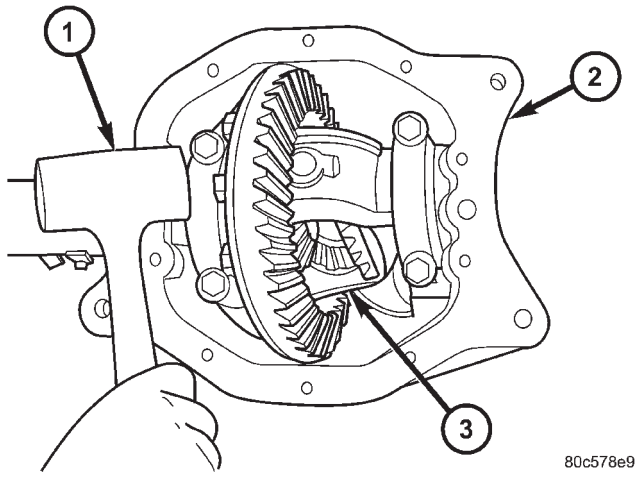


Fig. 16 SEAT DUMMY BEARINGS PINION SIDE

1 - HAMMER
2 - DIFFERENTIAL HOUSING
3 - DIFFERENTIAL

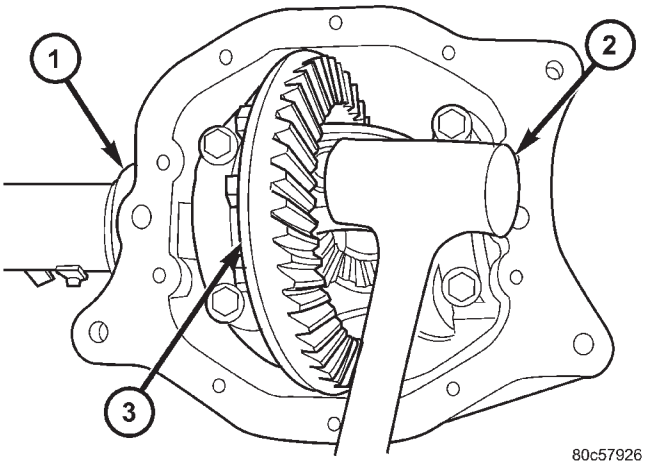


Fig. 17 SEAT DUMMY BEARING RING GEAR SIDE

1 - DIFFERENTAIL HOUSING
2 - HAMMER
3 - RING GEAR

(8) Thread Pilot Stud C-3288-B into rear cover bolt hole below ring gear.

(9) Attach a Dial Indicator C-3339 to the Pilot Stud. Position the dial indicator plunger on flat surface between the ring gear bolts.

(10) Push and hold differential case to pinion gear side of the housing and zero dial indicator (Fig. 18).

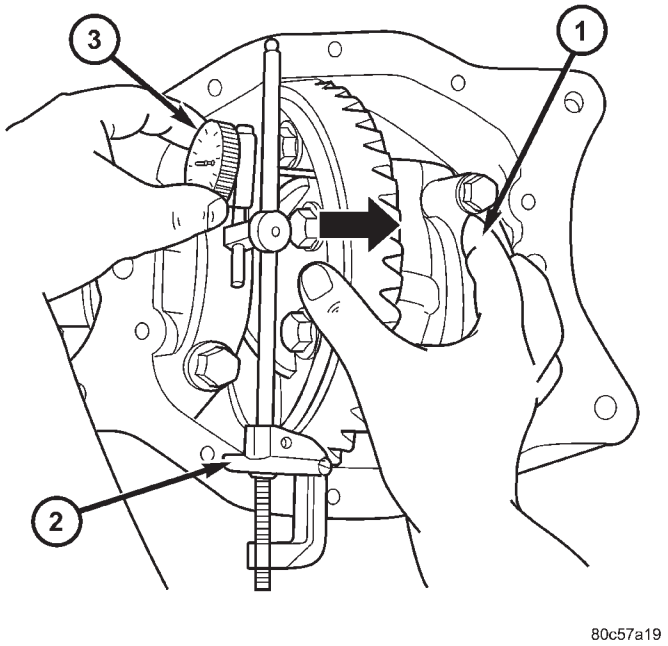


Fig. 18 DIFFERENTIAL PINION GEAR SIDE

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

FRONT AXLE - 186FIA (Continued)

(11) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 19).

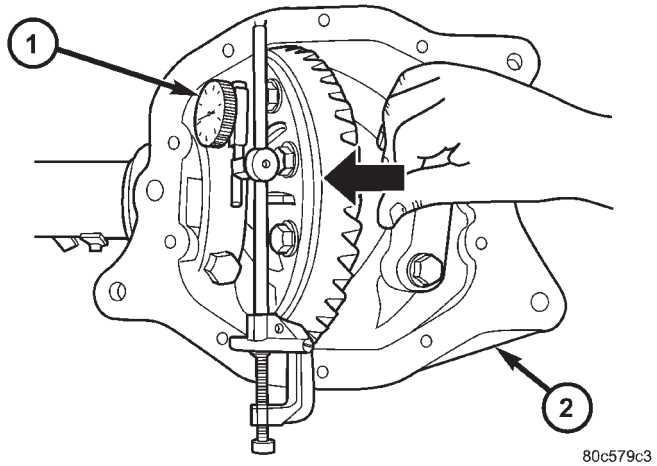


Fig. 19 DIFFERENTIAL RING GEAR SIDE

1 - DIAL INDICATOR
2 - DIFFERENTIAL HOUSING

(12) Add 0.152 mm (0.006 in.) to the zero end play total. This new total represents the thickness of shims to compress or preload the new bearings when the differential is installed.

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

(14) Remove differential case and dummy bearings from the housing.

(15) Install the pinion gear in the housing. Install the pinion yoke and establish the correct pinion rotating torque.

(16) Install differential case and Dummy Bearings D-348 in the housing.

(17) Install a single dummy shim in the ring gear side. Install bearing caps and tighten bolts snug.

(18) Seat ring gear side dummy bearing (Fig. 17).

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

(20) Push and hold differential case toward pinion gear and zero dial indicator (Fig. 20).

(21) Push and hold differential case to ring gear side of the housing and record dial indicator reading (Fig. 21). Add dummy shim thickness to this reading. This will be the total shim thickness to achieve zero backlash.

(22) Subtract 0.076 mm (0.003 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness shim required to achieve proper backlash.

(23) 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.

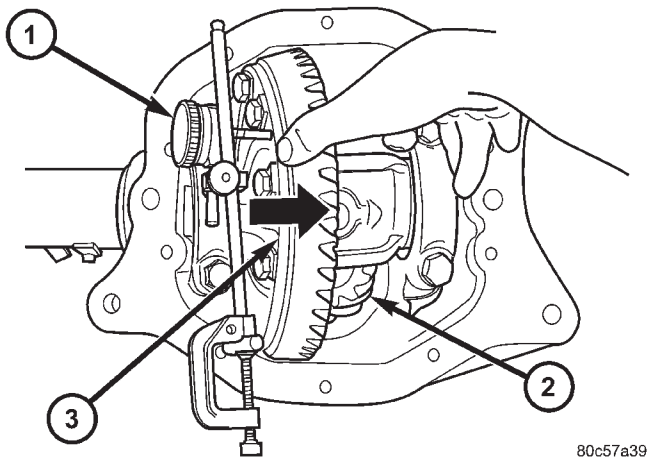


Fig. 20 DIFFERENTIAL PINION GEAR SIDE

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

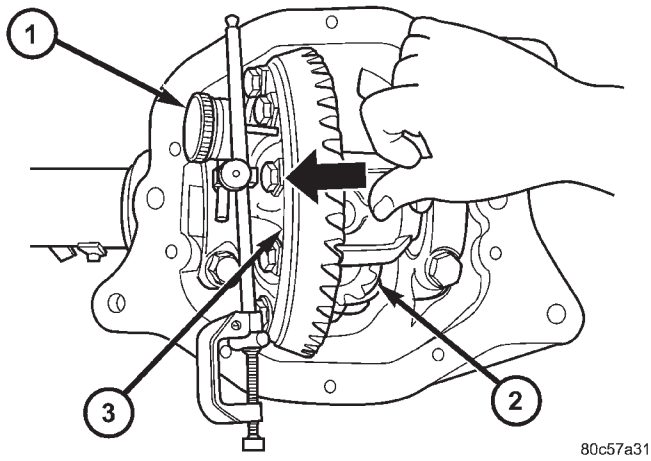


Fig. 21 DIFFERENTIAL RING GEAR SIDE

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

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

(25) Remove differential case and dummy bearings from the housing.

(26) Install side bearings and cups on differential case.

(27) Install spreader W-129-B with Adapter Set 6987 on the housing and spread axle opening enough to receive differential case.

CAUTION: Never spread the differential housing over 0.34 mm (0.013 in.). If the housing is over-spread, it could be distorted or damaged.

(28) Place the bearing preload shims in the axle housing, against the axle tubes.

(29) Install differential case into the housing.

(30) Remove spreader from the housing.

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

(32) Position the indicator plunger against a ring gear tooth (Fig. 22).

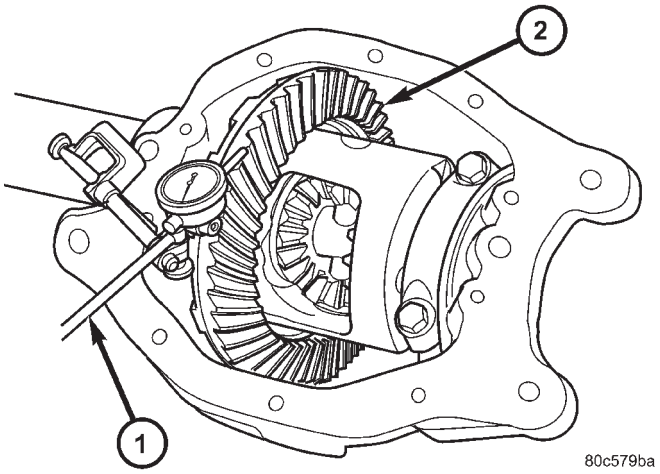


Fig. 22 RING GEAR BACKLASH

1 - DIAL INDICATOR
2 - RING GEAR

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

(34) Zero dial indicator face to pointer.

(35) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the housing to the other (Fig. 23).

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

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

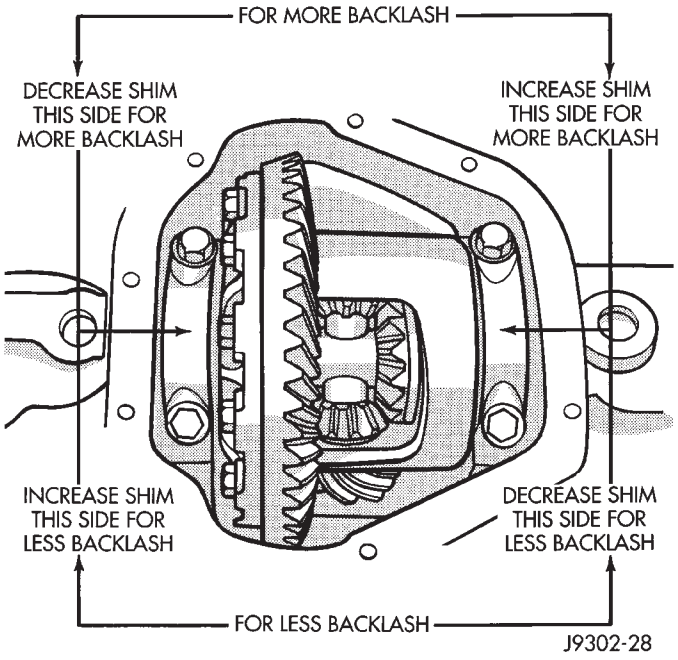


Fig. 23 BACKLASH SHIMS

GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the 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.

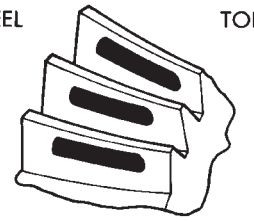
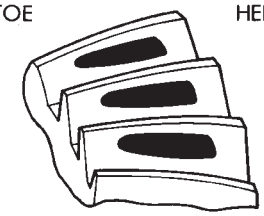
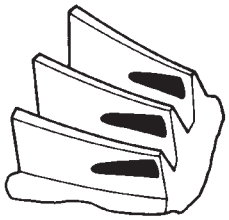
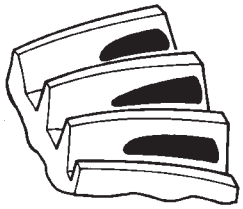
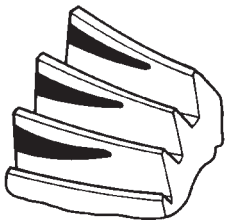
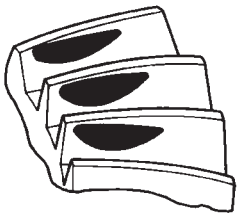
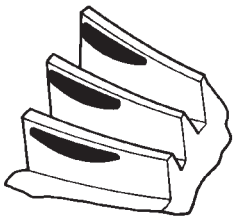
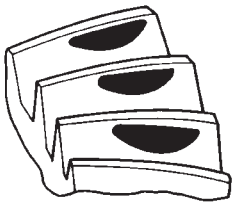
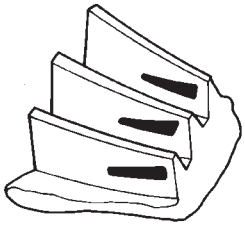
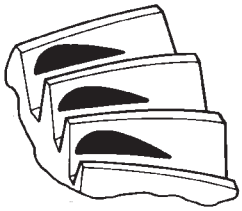
(1) Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.

(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) With 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 squeegee 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. 24)and adjust pinion depth and gear backlash as necessary.

FRONT AXLE - 186FIA (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	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.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 24 GEAR TOOTH CONTACT PATTERNS

DIFFERENTIAL BEARING PRELOAD CHECK

The final check on the differential assembly before installing the axles, is torque to rotate pinion and differential combined. This will verify the correct differential bearing preload.

Torque to rotate the differential and pinion is the torque to rotate the pinion plus:

Gear Ratio 3.73 . . . . 0.45-0.75 N·m (3.9-6.6 in. lbs.)
Gear Ratio 3.91 . . . . 0.43-0.72 N·m (3.8-6.4 in. lbs.)
Gear Ratio 4.10 . . . . 0.41-0.69 N·m (3.6-6.0 in. lbs.)

SPECIFICATIONS - FRONT AXLE

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratio	3.73, 3.92, 4.10
Ring Gear Diameter	186 mm (7.33 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Pinion Gear Standard Depth	92.1 mm (3.625 in.)
Pinion Bearing Preload	1.69-2.82 N·m (15-25 in. lbs.)
Differential Bearing Preload Added To Pinion Torque To Rotate	
Gear Ratio 3.73	0.45-0.75 N·m (3.9-6.6 in. lbs.)
Gear Ratio 3.92	0.43-0.72 N·m (3.8-6.4 in. lbs.)
Gear Ratio 4.10	0.41-0.69 N·m (3.6-6.0 in. lbs.)

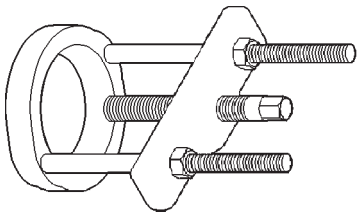
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Ring Gear Bolts	95-122	70-90	-
Differential Bearing Cap Bolts	54-67	39-50	-
Differential Cover Bolts	19-26	14-19	-
Pinion Nut	217-352	160-260	-
Left Axle Bracket Bolts	61	45	-
Front Axle Bracket Bolts	61	45	-
Right Axle Bracket Bolts	88	65	-
Axle Brackets To Frame Bolts	88	65	-

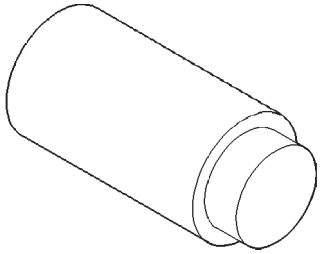
FRONT AXLE - 186FIA (Continued)

SPECIAL TOOLS

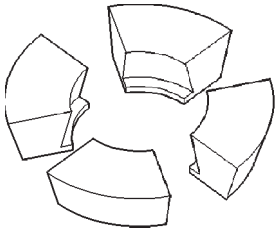
FRONT AXLE



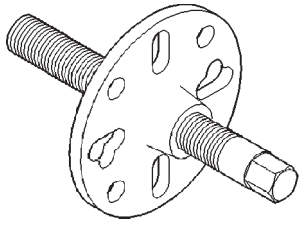
PULLER C-293-PA



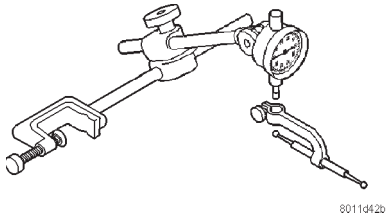
PLUG SP-3289



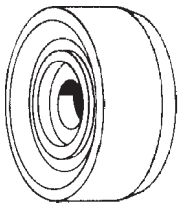
ADAPTER C-293-39



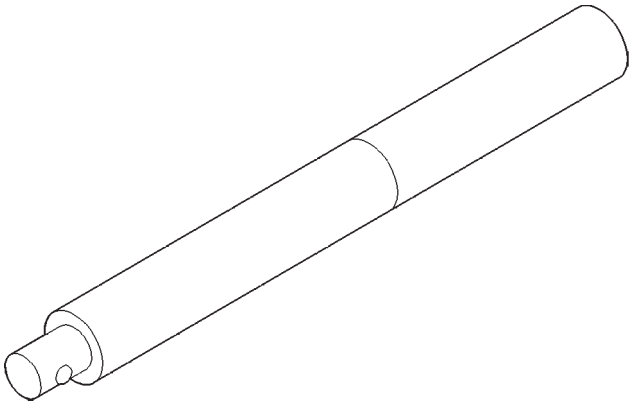
PULLER C-452



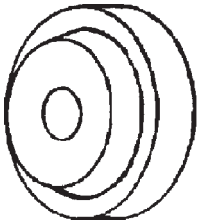
DIAL INDICATOR C-3339



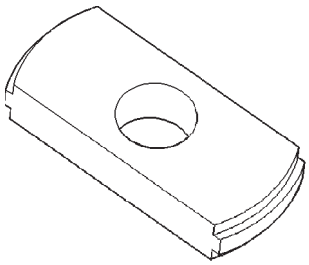
INSTALLER C-3716-A



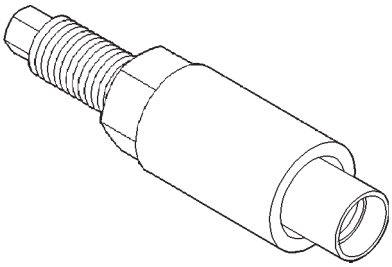
HANDLE C-4171



INSTALLER D-146

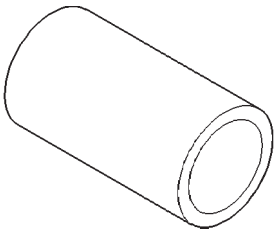


REMOVER D-149

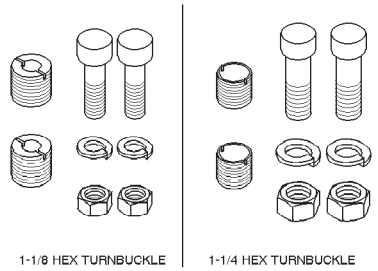


INSTALLER W-162-D

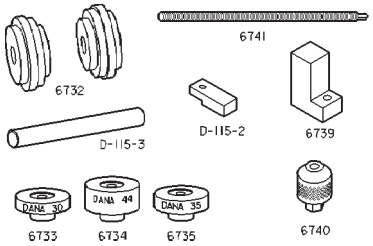
FRONT AXLE - 186FIA (Continued)



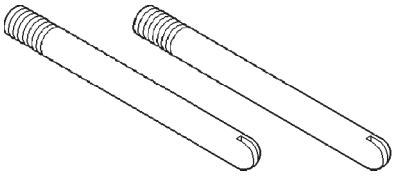
CUP 8109



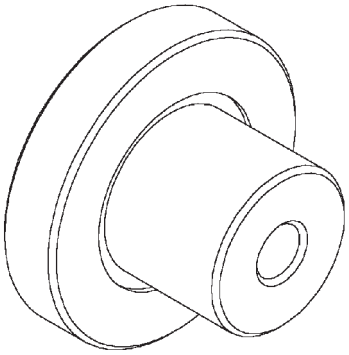
ADAPTER KIT 6987B



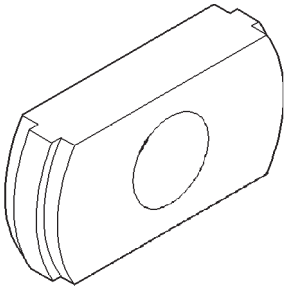
PINION DEPTH SET 6774



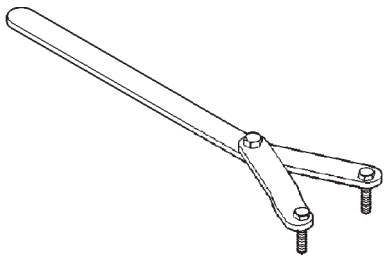
PILOT STUD C-3288-B



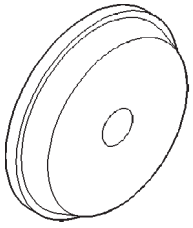
PINION BLOCK 8804



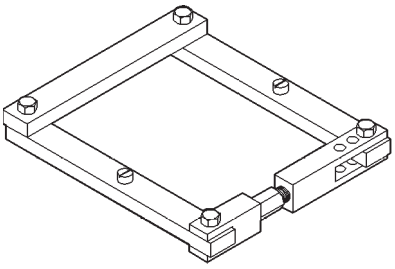
REMOVER C-4307



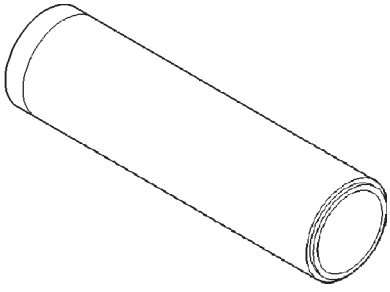
SPANNER WRENCH 6958



INSTALLER C-4308

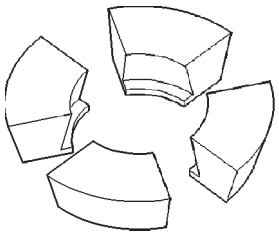


SPREADER W-129-B

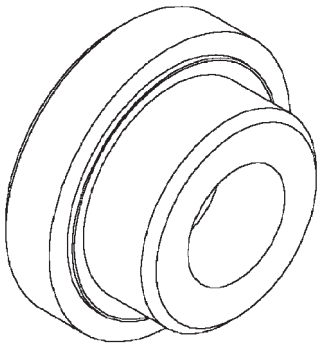


INSTALLER 6448

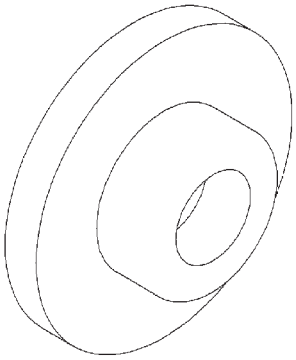
FRONT AXLE - 186FIA (Continued)



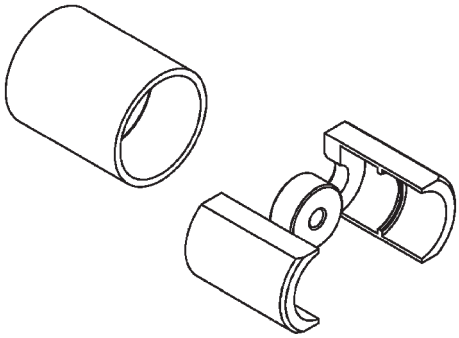
ADAPTER C-293-42



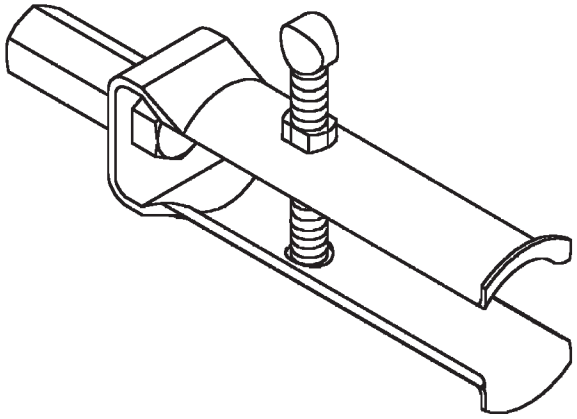
INSTALLER 8805



INSTALLER 8806



REMOVER 8420A



REMOVER 7794-A

AXLE SHAFTS

REMOVAL

(1) Place the transmission in Neutral.
(2) Raise and support vehicle.
(3) Remove right wheel and tire and assembly.
(4) Remove right half shaft from vehicle.
(5) Remove snap ring from axle shaft.
(6) Assemble Remover 8420A onto the shaft (Fig. 25). Thread slid hammer into remover and remove shaft.

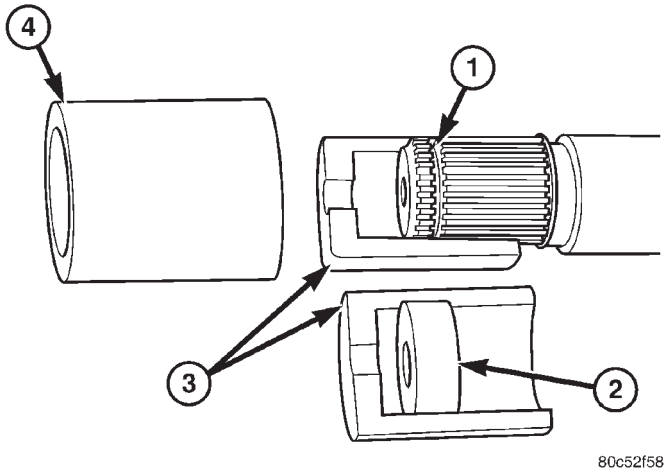


Fig. 25 AXLE SHAFT PULLER

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

(7) Slide axle shaft out of the axle tube.

NOTE: Use care to prevent damage to axle shaft bearing and seal, which will remain in axle shaft tube.

INSTALLATION

(1) Lubricate bearing bore and seal lip with gear lubricant. Insert axle shaft through seal, bearing (Fig. 26) and engage it into side gear splines.

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

(2) Push on the axle shaft until the axle shaft snap-ring passes through the side gear.
(3) Install right half shaft.
(4) Install right wheel and tire assembly.
(5) Check differential fluid level.
(6) Lower vehicle.

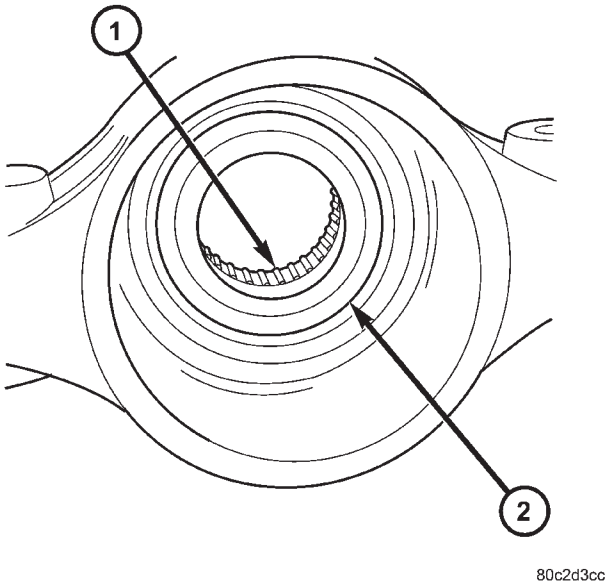


Fig. 26 AXLE SHAFT SEAL

1 - BEARING
2 - SEAL

AXLE SHAFT SEALS

REMOVAL

(1) Remove half shaft.
(2) Remove axle shaft for right side seal removal.
(3) Remove shaft seal with Remover 7794-A and a slide hammer (Fig. 27).

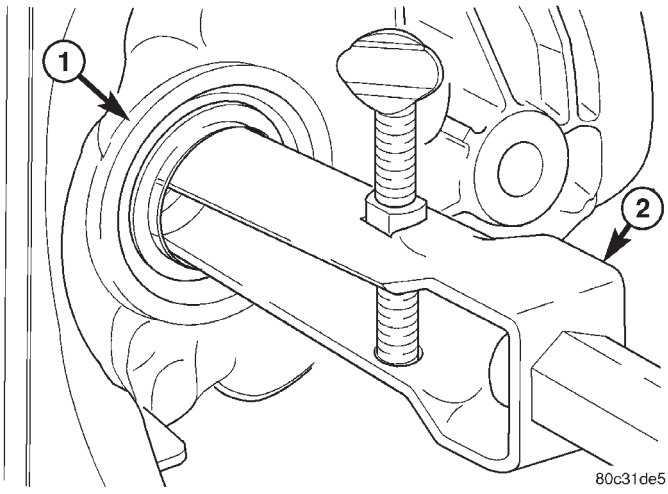


Fig. 27 SHAFT SEAL REMOVER

1 - SHAFT SEAL
2 - REMOVER

AXLE SHAFT SEALS (Continued)

INSTALLATION

(1) Apply a light coat of lubricant on the lip of the shaft seal.

(2) Install **new** shaft seal with Installer 8806 and Handle C-4171 (Fig. 28).

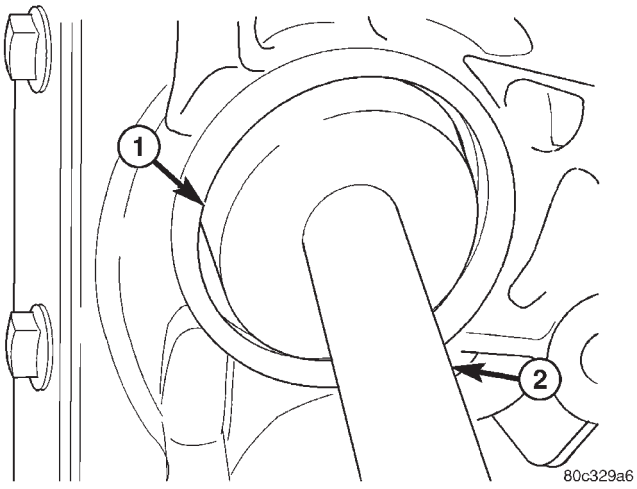


Fig. 28 SEAL INSTALLER

1 - SEAL BORE
2 - INSTALLER

(3) Install right axle shaft if removed.

(4) Install half shaft.

AXLE BEARINGS

REMOVAL

(1) Remove half shaft.

(2) Remove axle shaft for right side seal removal.

(3) Remove shaft seal with Remover 7794-A and a slide hammer.

(4) Remove shaft bearing with Remover 7794-A and a slide hammer (Fig. 29).

INSTALLATION

(1) Install **new** shaft bearing with Installer 8805 and Handle C-4171.

(2) Apply a light coat of lubricant on the lip of the shaft seal.

(3) Install **new** shaft seal with an appropriate installer.

(4) Install right axle shaft if removed.

(5) Install half shaft.

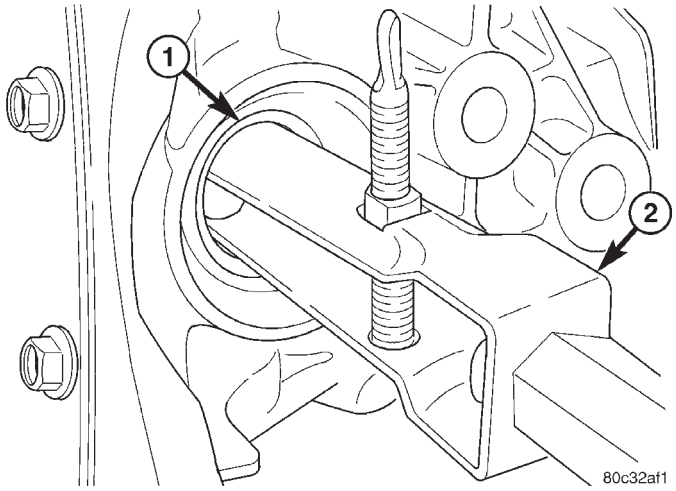


Fig. 29 SHAFT BEARING REMOVER

1 - SHAFT BEARING
2 - REMOVER

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake calipers and rotors, refer to 5 Brakes for procedures.

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

(5) Remove propeller shaft from the pinion companion flange.

(6) Rotate pinion gear a minimum of ten times and verify the pinion rotates smoothly.

(7) Record the torque to rotate the pinion gear (Fig. 30) with a inch pound torque wrench.

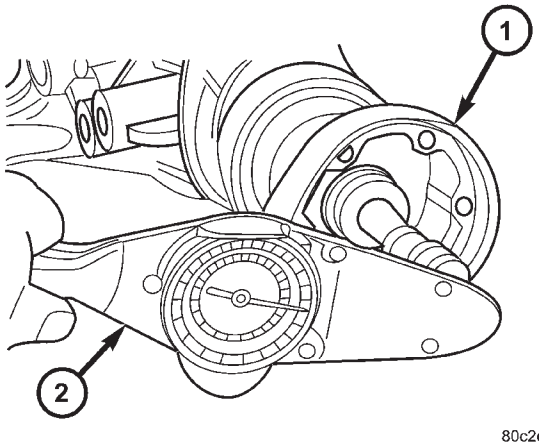


Fig. 30 PINION ROTATING TORQUE

1 - PINION COMPANION FLANGE
2 - TORQUE WRENCH

PINION SEAL (Continued)

(8) Using a short piece of pipe and Spanner Wrench 6958 to hold the pinion companion flange (Fig. 31) and remove the pinion nut.

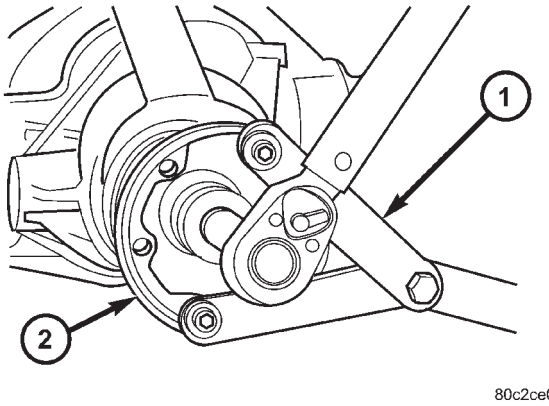


Fig. 31 PINION FLANGE NUT

1 - SPANNER WRENCH
2 - PINION COMPANION FLANGE

(9) Remove pinion companion flange (Fig. 32) with Remover C-452 and Spanner Wrench 6958.

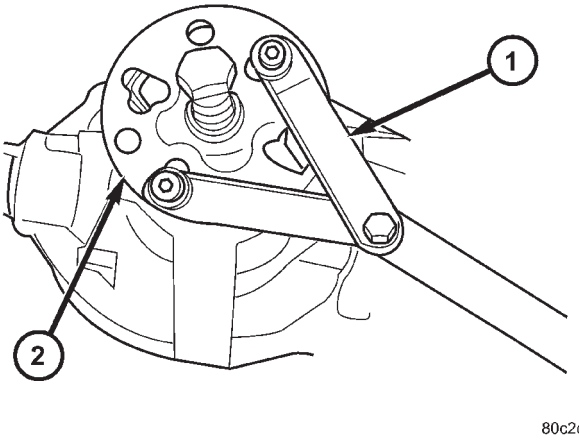


Fig. 32 PINION FLANGE REMOVER

1 - SPANNER WRENCH
2 - REMOVER

(10) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 33).

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate installer (Fig. 34).

(2) Install pinion companion flange on the pinion gear with Installer W-162-D, Cup 8109 and Wrench 6958.

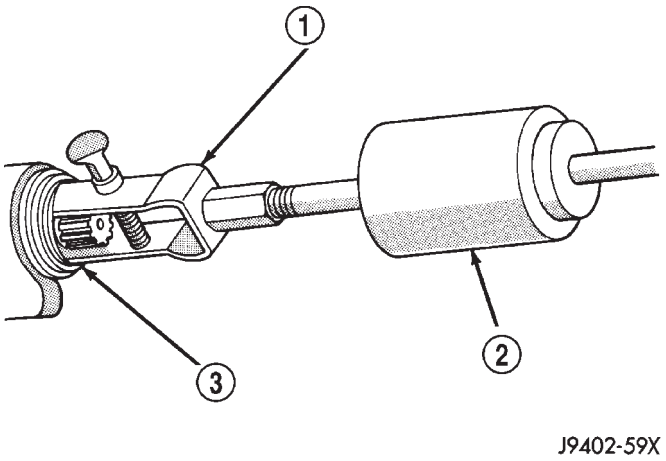


Fig. 33 PINION SEAL

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

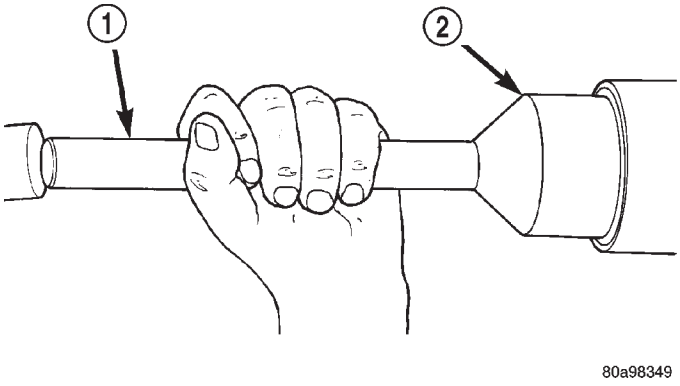


Fig. 34 PINION SEAL INSTALLATION

1 - HANDLE
2 - INSTALLER

CAUTION: Do not exceed the minimum tightening torque 216 N·m (160 ft. lbs.) while installing pinion nut at this point. Damage to collapsible spacer or bearings may result.

(3) Install a **new** nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

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

PINION SEAL (Continued)

(4) Rotate pinion a minimum of ten time and verify pinion rotates smoothly. Rotate the pinion shaft with an inch pound torque wrench. Rotating torque should be equal to the reading recorded during removal plus 0.56 N·m (5 in. lbs.) (Fig. 35).

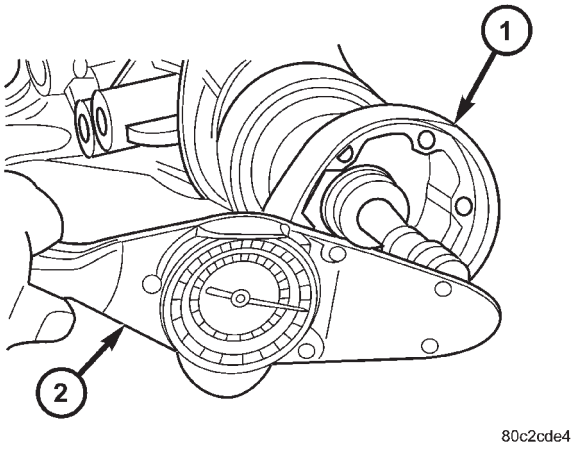


Fig. 35 PINION ROTATING TORQUE

1 - PINION COMPANION FLANGE
2 - TORQUE WRENCH

(5) If the rotating torque is low, use Spanner Wrench 6958 to hold the pinion companion flange and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

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

(6) Install propeller shaft with installation reference marks aligned.
(7) Fill differential with gear lubricant.
(8) Install brake rotors and calipers.
(9) Install wheel and tire assemblies.
(10) Lower the vehicle.

DIFFERENTIAL

REMOVAL

(1) Remove axle from the vehicle.
(2) Remove differential housing cover (Fig. 36).
(3) Push right axle shaft out of side gear (Fig. 37) and remove the shaft.
(4) Mark differential bearing caps for installation reference.
(5) Loosen the bearing cap bolts.

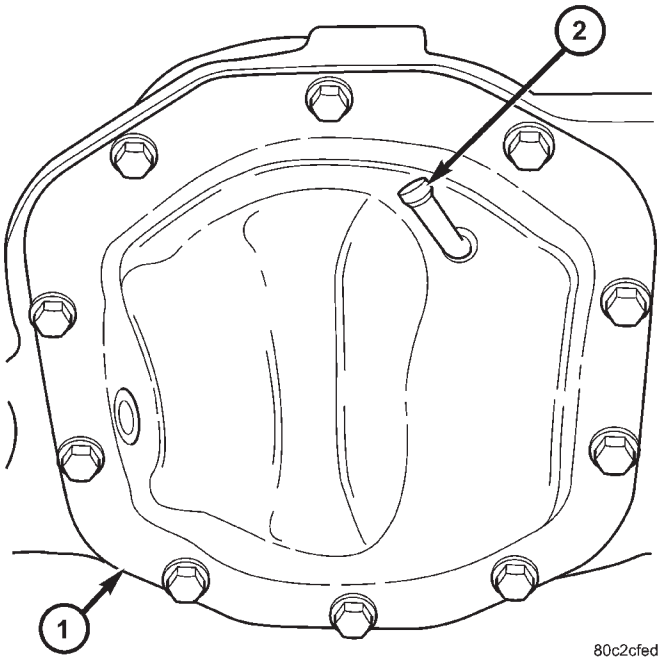


Fig. 36 DIFFERENTIAL COVER

1 - COVER
2 - VENT TUBE

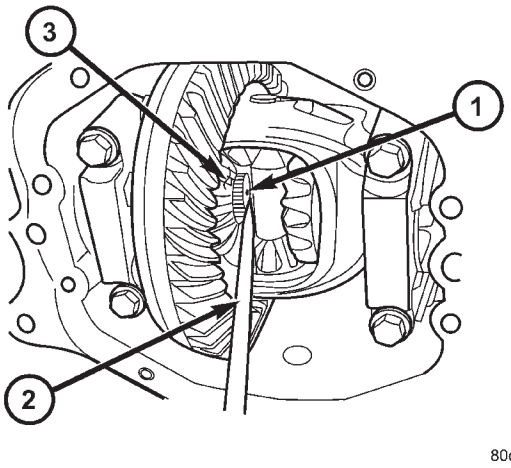


Fig. 37 RIGHT SHAFT IN SIDE GEAR

1 - AXLE SHAFT
2 - SCREWDRIVER
3 - SIDE GEAR

DIFFERENTIAL (Continued)

(6) Position Spreader W-129-B onto the differential locating holes and install the safety holddown clamps (Fig. 38). Tighten the tool turnbuckle finger-tight.

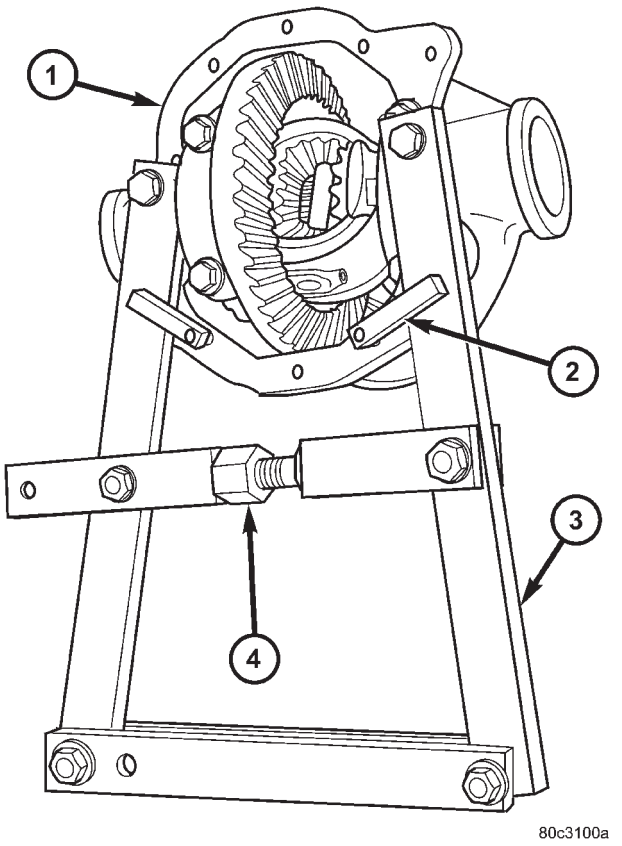


Fig. 38 DIFFERENTIAL SPREADER

1 - DIFFERENTIAL HOUSING
2 - SAFETY CLAMPS
3 - SPREADER
4 - TURNBUCKLE

(7) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load indicator plunger against the opposite side of the housing and zero the indicator.

(8) Spread the housing to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 39).

CAUTION: Never spread the differential housing over 0.34 mm (0.013 in). If housing is over-spread, it could be distorted or damaged.

(9) Remove the dial indicator.

(10) Holding the differential case in position, and remove bearing cap bolts and caps.

(11) Remove the differential from the housing (Fig. 40). Ensure differential bearing cups and shims remain in position on the differential bearings.

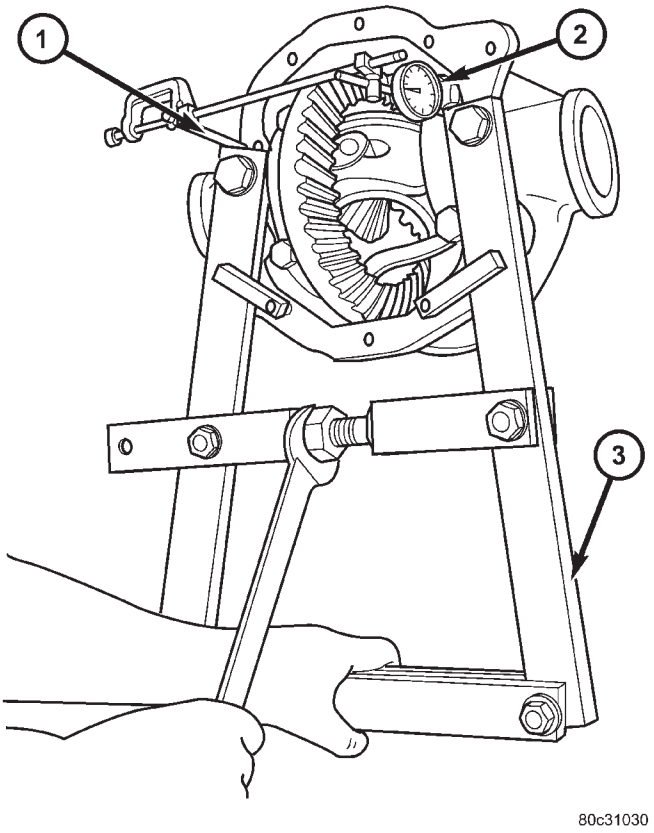


Fig. 39 SPREAD DIFFERENTIAL CASE

1 - PILOT STUD
2 - DIAL INDICATOR
3 - SPREADER

(12) Tag differential bearing cups and shims to indicate their location.

(13) Remove spreader from housing.

DISASSEMBLY

(1) Remove ring gear.

(2) Remove roll-pin holding mate shaft in housing.

(3) Remove pinion gear mate shaft.

(4) Rotate differential side gears and remove the pinion mate gears and thrust washers (Fig. 41).

(5) Remove differential side gears and thrust washers.

ASSEMBLY

(1) Install differential side gears and thrust washers.

(2) Install pinion mate gears and thrust washers.

(3) Install pinion gear mate shaft.

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

DIFFERENTIAL (Continued)

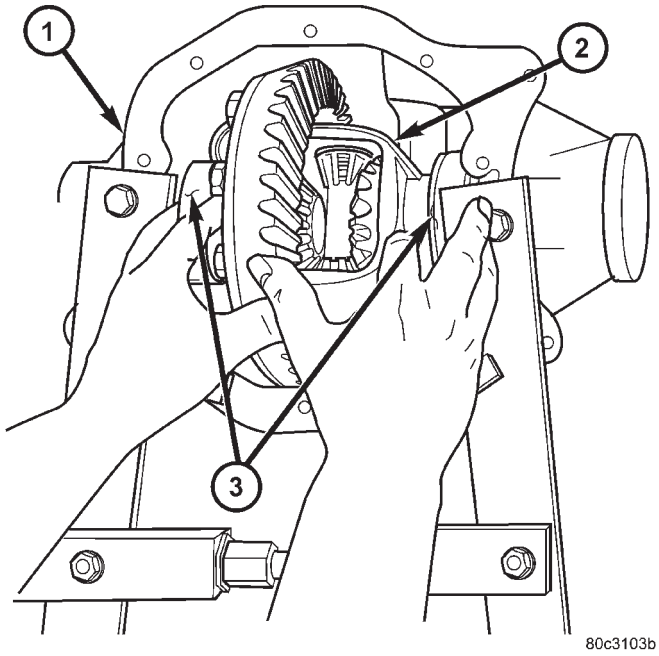


Fig. 40 DIFFERENTIAL CASE

1 - DIFFERENTIAL HOUSING
2 - DIFFERENTIAL CASE
3 - DIFFERENTIAL BEARINGS

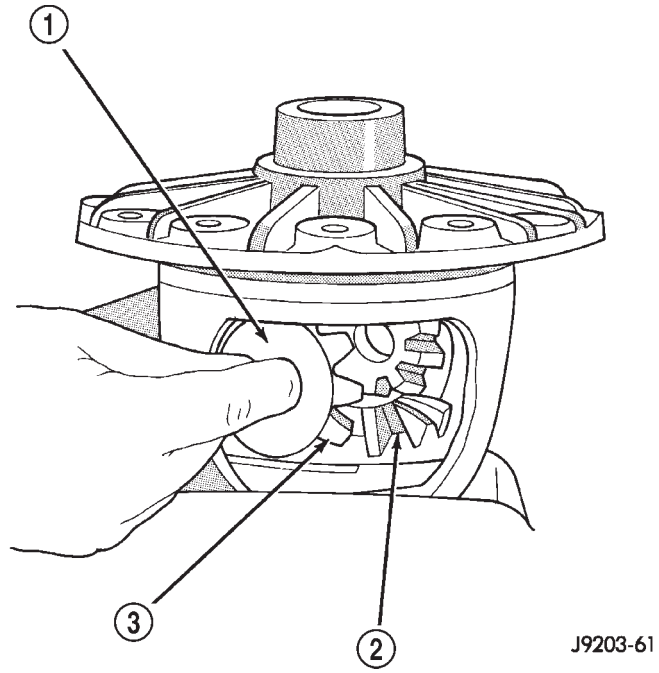


Fig. 41 PINION MATE GEAR

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

(5) Install the roll-pin in the differential case with a hammer and punch (Fig. 42). Peen the edge of the roll-pin hole in the differential case in two places 180° apart.

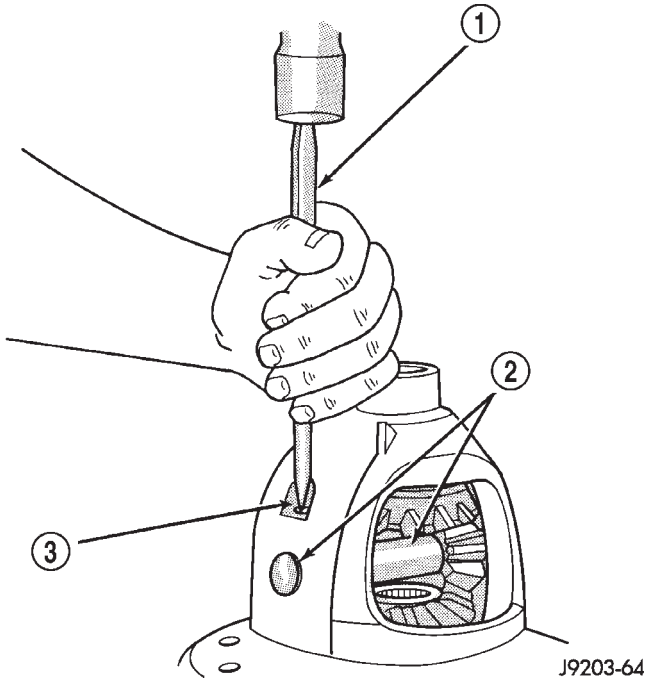


Fig. 42 PINION MATE SHAFT ROLL-PIN

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

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

INSTALLATION

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

(1) Position Spreader W-129-B on differential location holes and install safety holddown clamps. Tighten the tool turnbuckle finger-tight.
(2) Install Pilot Stud C-3288-B to 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.
(3) Spread the housing to install the differential case and preload shims in the housing. Measure the distance with the dial indicator.

CAUTION: Never spread the differential housing over 0.34 mm (0.013 in). If housing is over-spread, it could be distorted or damaged.

DIFFERENTIAL (Continued)

(4) Remove the dial indicator.

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

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

(7) Remove differential housing spreader (Fig. 43).

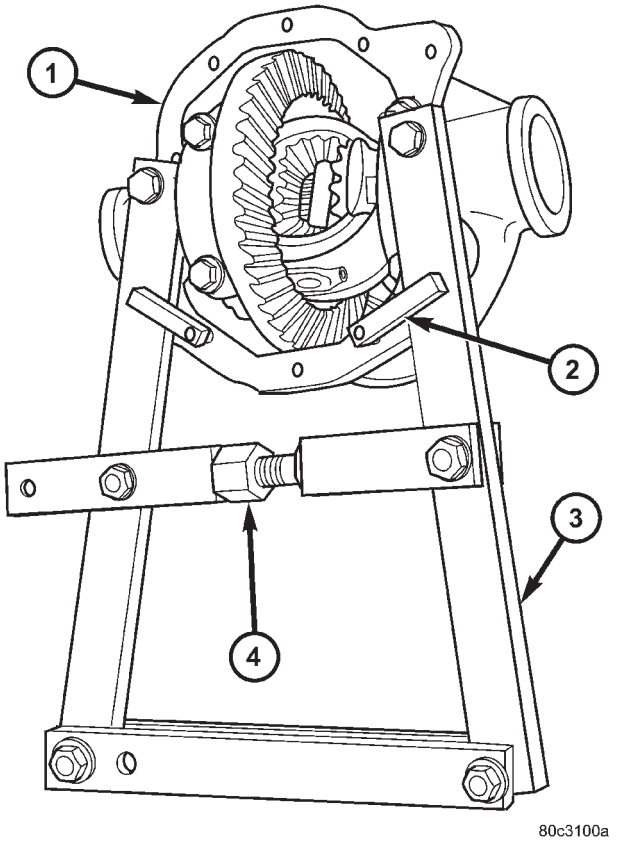


Fig. 43 DIFFERENTIAL SPREADER

1 - DIFFERENTIAL HOUSING
2 - SAFETY CLAMPS
3 - SPREADER
4 - TURNBUCKLE

(8) Tighten the bearing cap bolts in a criss-cross pattern to 54-68 N·m (39-50 ft. lbs.).

(9) Install the right axle shaft.

(10) Apply a 6.38mm (1/4 in.) bead of red Mopar Silicone Sealer or equivalent to the housing cover.

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

(11) Install differential housing cover and tighten bolts in a criss-cross pattern to 19-26 N·m (14-19 ft. lbs.).

(12) Install axle assembly in vehicle.

(13) Fill differential with lubricant and install fill plug.

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove differential from the housing.

(2) Remove bearings from the differential case with Puller/Press C-293-PA, Adapters C-293-39 and Plug SP-3289 (Fig. 44).

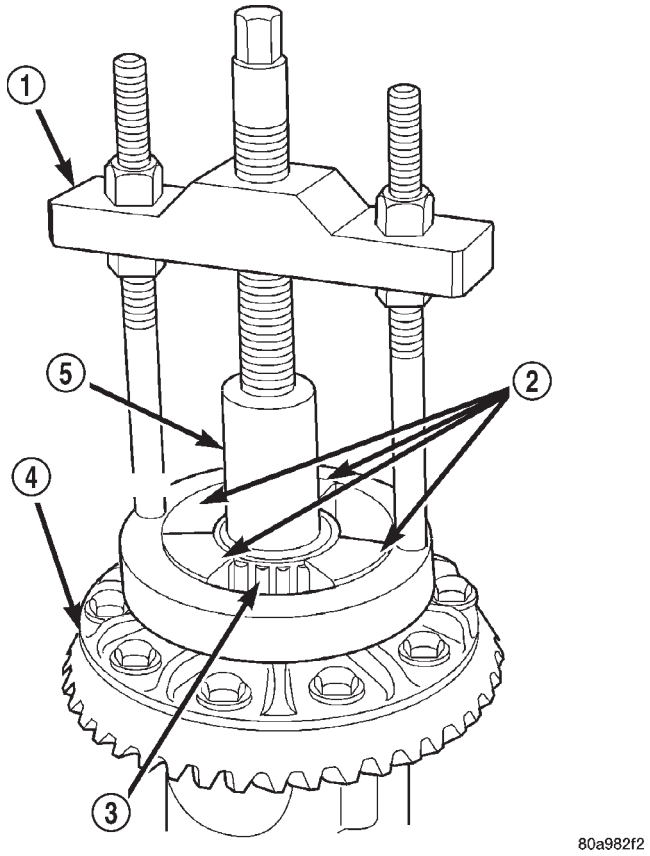


Fig. 44 DIFFERENTIAL BEARING PULLER

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

DIFFERENTIAL CASE BEARINGS (Continued)

INSTALLATION

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

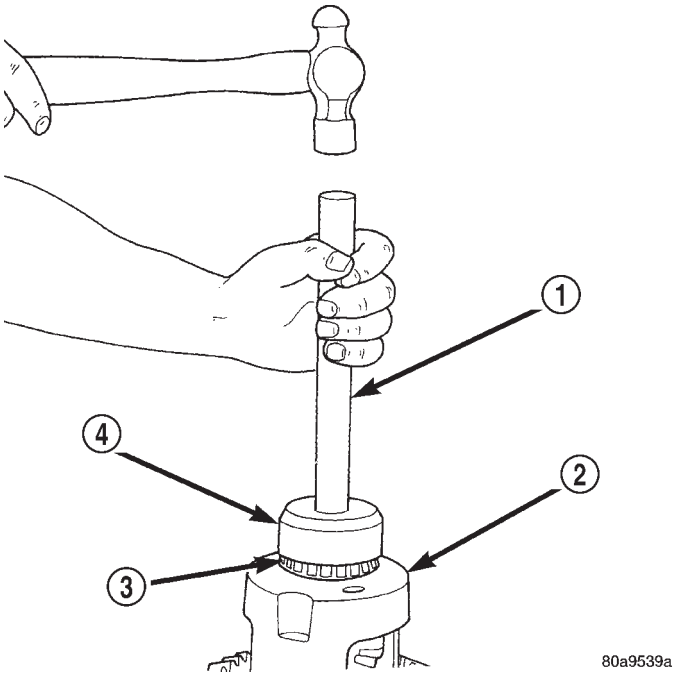


Fig. 45 DIFFERENTIAL CASE BEARINGS

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

(2) Install differential into the housing.

PINION GEAR/RING GEAR

REMOVAL

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

(1) Raise and support vehicle
(2) Mark pinion companion flange and propeller shaft for installation alignment.
(3) Remove propeller shaft from pinion companion flange and tie propeller shaft to underbody.
(4) Remove axle assembly from the vehicle.
(5) Remove differential from axle housing.
(6) Place differential case in a vise with soft metal jaw (Fig. 46).
(7) Remove bolts holding ring gear to differential case.
(8) Driver ring gear off the differential case with a rawhide hammer (Fig. 46).

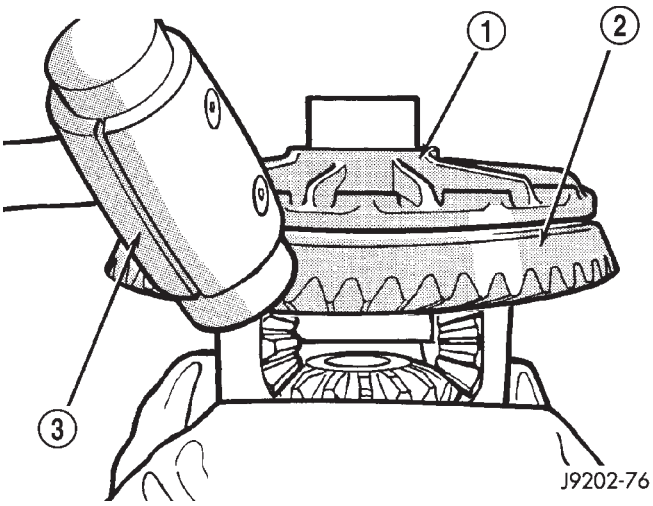


Fig. 46 RING GEAR

1 - DIFFERENTIAL CASE
2 - RING GEAR
3 - HAMMER

(9) With Spanner Wrench 6958 and a short length of 1 in. pipe, hold pinion companion flange and remove pinion nut (Fig. 47).

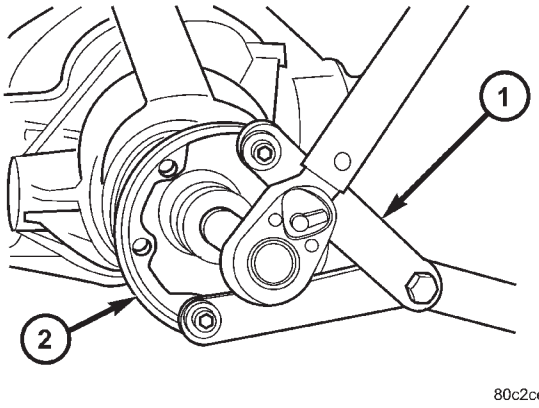


Fig. 47 PINION COMPANION FLANGE

1 - SPANNER WRENCH
2 - PINION COMPANION FLANGE

PINION GEAR/RING GEAR (Continued)

(10) Remove pinion companion flange from pinion shaft with Remover C-452 and Flange Wrench C-3281 (Fig. 48).

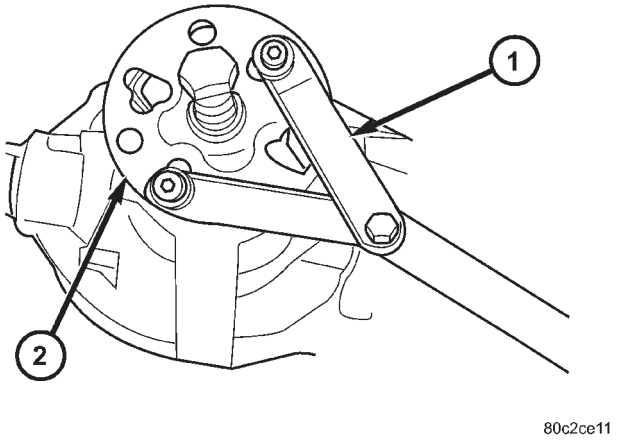


Fig. 48 PINION FLANGE REMOVER

1 - SPANNER WRENCH
2 - REMOVER

(11) Remove pinion gear and collapsible spacer from housing (Fig. 49).

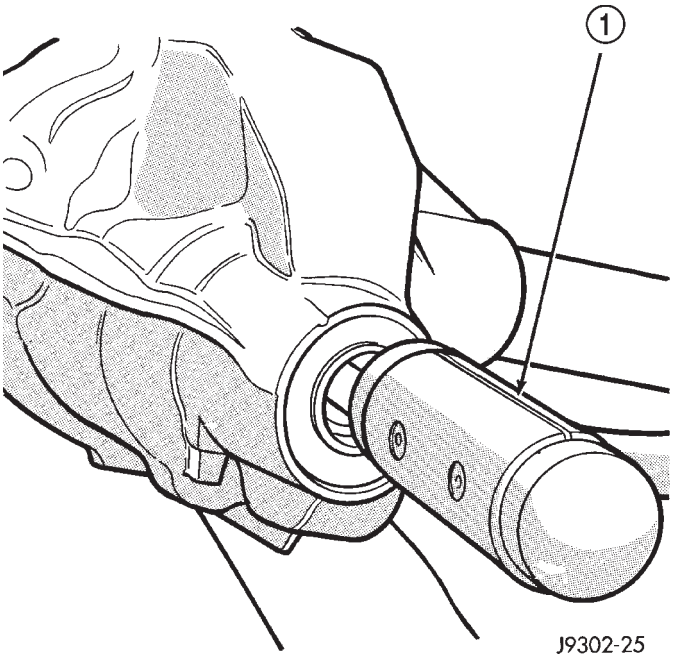


Fig. 49 PINION GEAR

1 - RAWHIDE HAMMER

(12) Remove front pinion bearing cup, bearing, oil slinger and pinion seal with Remover C-149 and Handle C-4171 (Fig. 50).

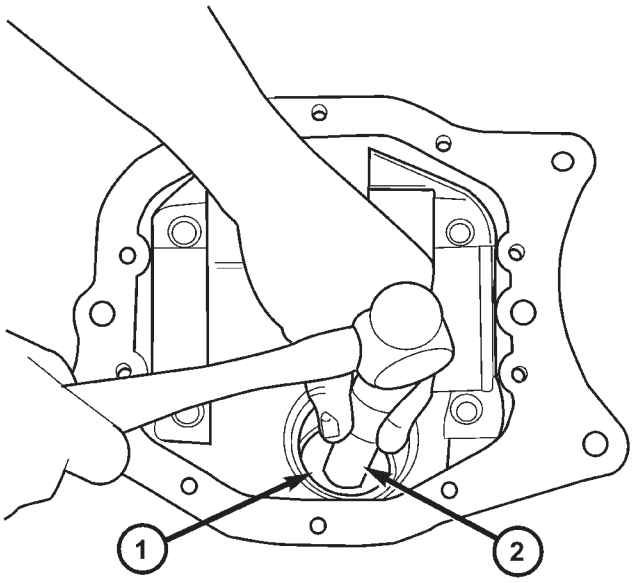


Fig. 50 FRONT BPINION BEARING CUP

1 - REMOVER
2 - HANDLE

(13) Remove rear pinion bearing cup (Fig. 51) with Remover C-4307 and Handle C-4171.

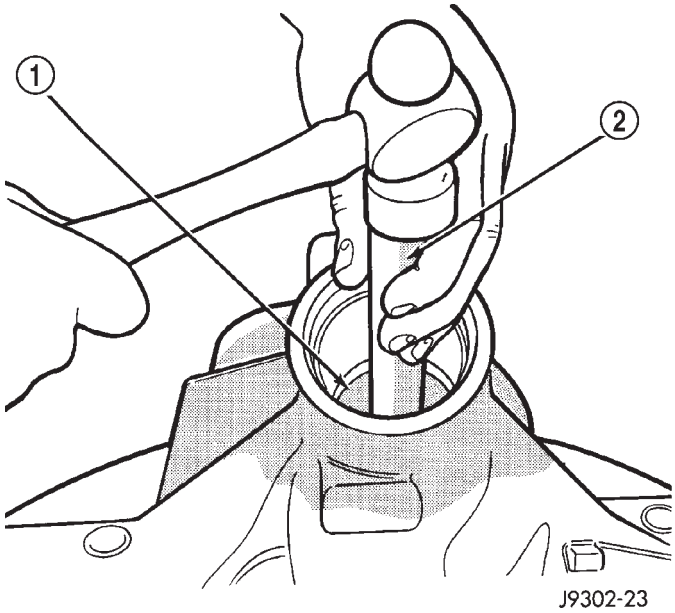


Fig. 51 REAR PINION BEARING CUP

1 - REMOVER
2 - HANDLE

PINION GEAR/RING GEAR (Continued)

(14) Remove collapsible preload spacer from pinion gear (Fig. 52).

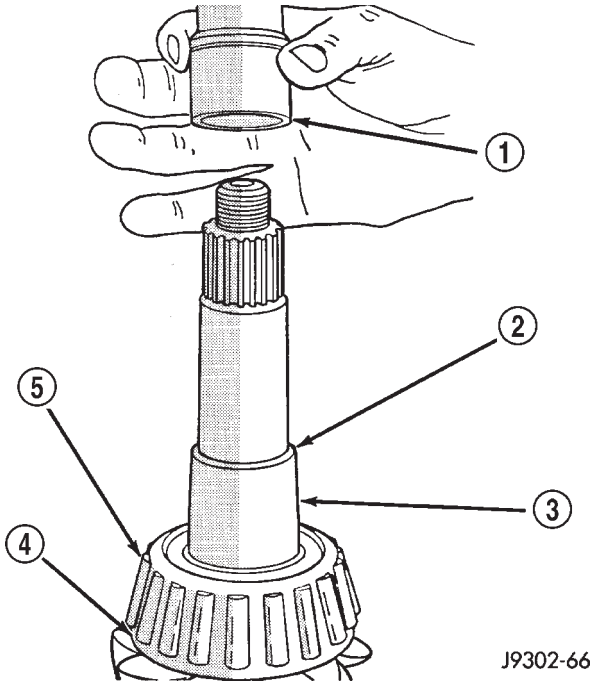


Fig. 52 COLLAPSIBLE PRELOAD SPACER

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

(15) Remove rear pinion bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-39 (Fig. 53). Remove oil slinger/pinion depth shim from the pinion shaft and record thickness.

INSTALLATION

NOTE: Pinion depth shims are placed between the rear pinion bearing and the pinion gear head to achieve proper ring and pinion gear mesh. If ring and pinion gears are reused, the pinion oil slinger/ depth shim should not require replacement. Refer to Adujstments (Pinion Gear Depth) to select the proper thickness shim before installing pinion gear.

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

(2) Install rear bearing cup with Installer C-4308 and Handle C-4171 and verify cup is seated.

(3) Install front bearing cup with Installer D-146 and Handle C-4171 (Fig. 54) and verify cup is seated.

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

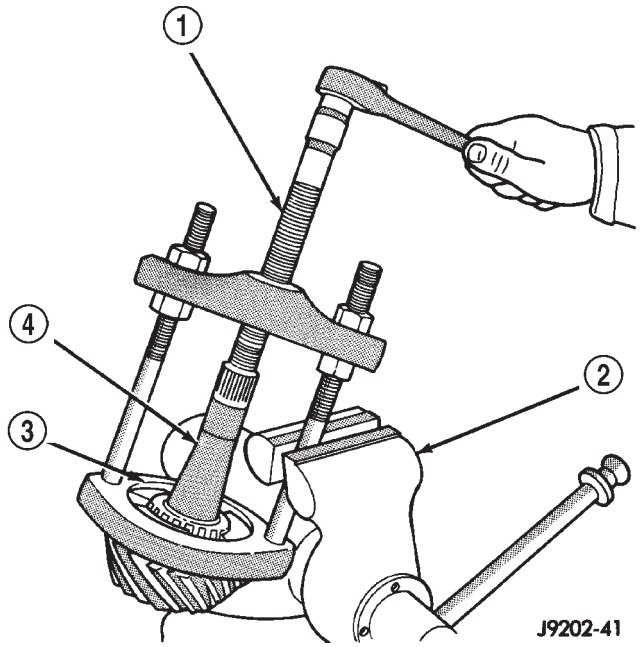


Fig. 53 REAR PINION BEARING

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

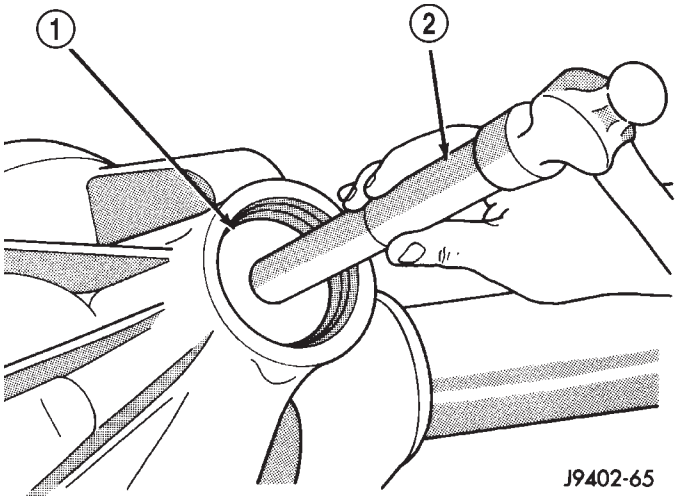


Fig. 54 FRONT PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

PINION GEAR/RING GEAR (Continued)

(5) Apply a light coating of gear lubricant on the lip of pinion seal and intall seal with an appropriate installer (Fig. 55).

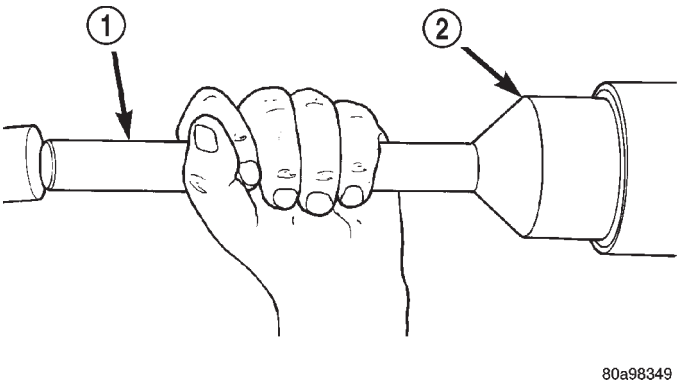


Fig. 55 PINION SEAL

1 - HANDLE
2 - INSTALLER

(6) Install rear pinion bearing and oil slinger/depth shim onto the pinion shaft with Installer 6448 and a press (Fig. 56).

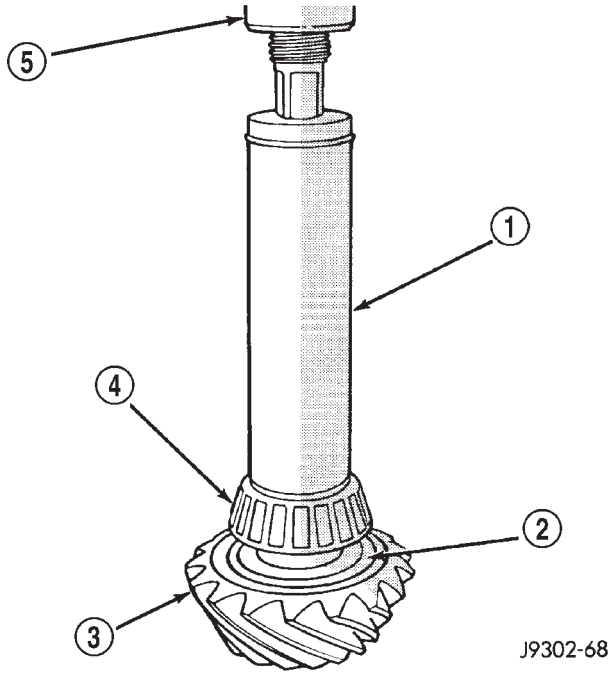


Fig. 56 REAR PINION BEARING

1 - INSTALLER
2 - OIL SLINGER
3 - PINION GEAR
4 - REAR PINION BEARING
5 - PRESS

(7) Install a **new** collapsible spacer on pinion shaft and install the pinion into the housing (Fig. 57).

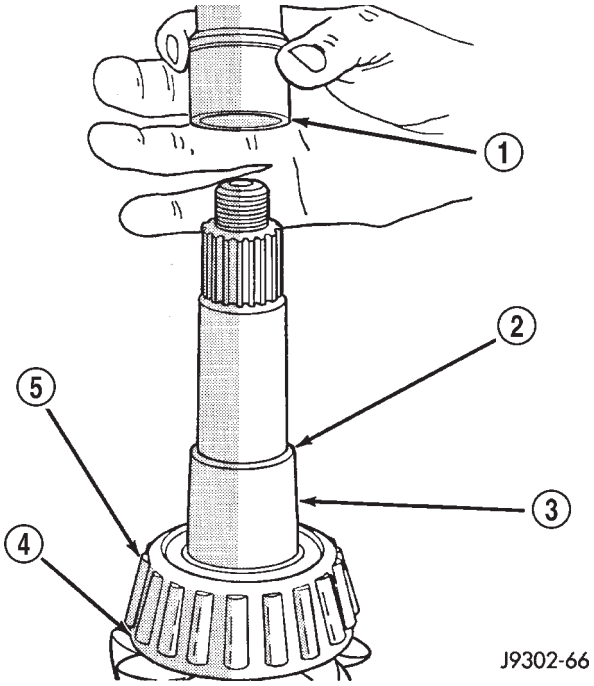


Fig. 57 COLLAPSIBLE PRELOAD SPACER

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

(8) Install pinion companion flange, with Installer W-162-D, Cup 8109 and Spanner Wrench 6958.

(9) Install pinion a **new** nut onto the pinion gear and tighten the nut to 216 N·m (160 ft. lbs.). **Do not over-tighten.**

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

PINION GEAR/RING GEAR (Continued)

(10) Use Flange Wrench 6958, a length of 1 in. pipe and a torque wrench set at 678 N·m (500 ft. lbs.) and crush collapsible spacer until bearing end play is taken up (Fig. 58).

(11) Slowly tighten the nut in 6.8 N·m (5 ft. lb.) increments until the required rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 59).

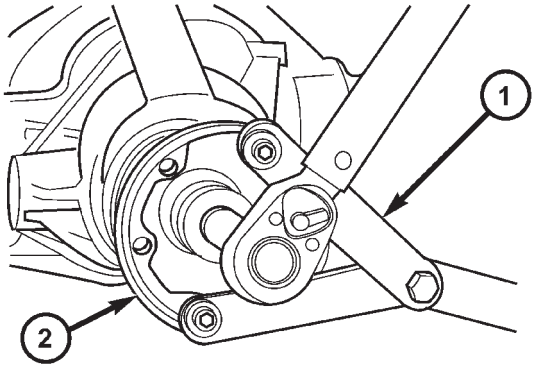


Fig. 58 PINION FLANGE NUT

1 - SPANNER WRENCH
2 - PINION COMPANION FLANGE

(12) Rotate the pinion a minimum of ten times. Verify pinion rotates smoothly and check rotating torque with an inch pound torque wrench (Fig. 59). Pinion gear rotating torque is:

- Original Bearings: 1 to 2.25 N·m (10 to 20 in. lbs.).
- New Bearings: 1.69 to 2.82 N·m (15 to 25 in. lbs.).

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

(14) Invert the differential case in the vise. Install **new** ring gear bolts and alternately tighten to 108 N·m (80 ft. lbs.) (Fig. 60).

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

(15) Install differential in housing and verify differential bearing preload, gear mesh and contact pattern. Refer to Adjustment for procedure.

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

(17) Install propeller shaft with reference marks aligned.

(18) Remove supports and lower vehicle.

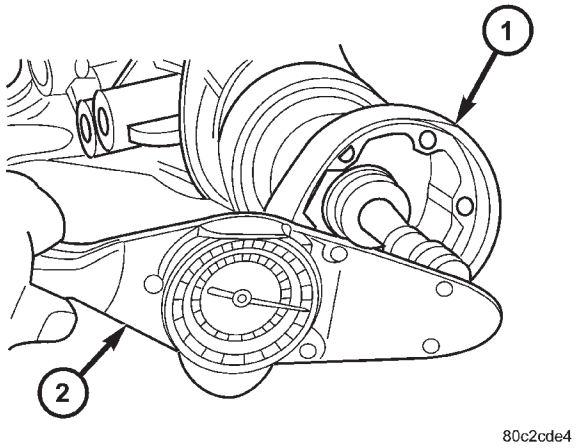


Fig. 59 PINION ROTATING TORQUE

1 - PINION COMPANION FLANGE
2 - TORQUE WRENCH

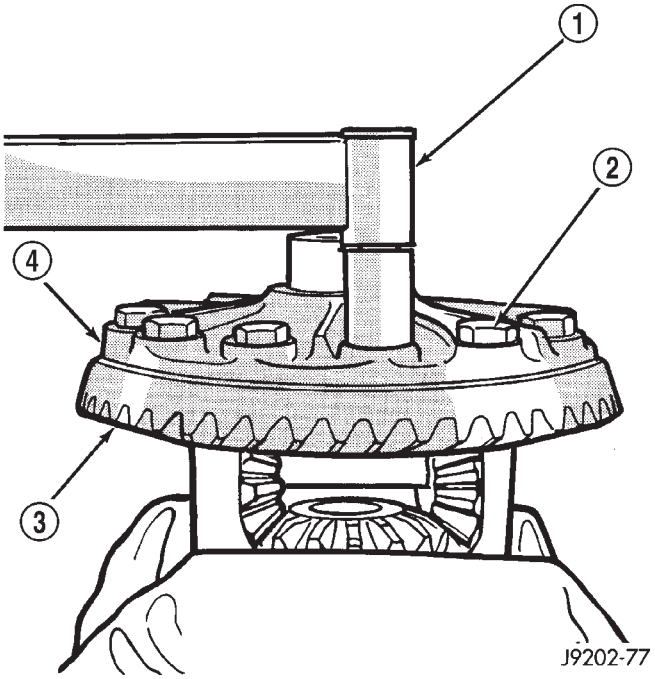


Fig. 60 RING GEAR BOLTS

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

REAR AXLE - 198RBI

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REAR AXLE - 198RBI

DESCRIPTION

The Rear Beam-design Iron (RBI) axle housing has an iron center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing. The axles are equipped with semi–floating axle shafts, meaning that loads are supported by the axle shaft and bearings. The axle shafts are retained by the unit bearing, retainer plate and bolts.

The integral type, hypoid gear design, housing has the centerline of the pinion set below the centerline of the ring gear. The differential case is a one-piece design. The differential pinion mate shaft is retained with a threaded screw. Differential bearing preload and ring gear backlash is adjusted by the use of selective spacer shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer (Fig. 1).

The cover provides a means for servicing the differential without removing the axle. The axle has a vent hose to relieve internal pressure caused by lubricant vaporization and internal expansion.

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

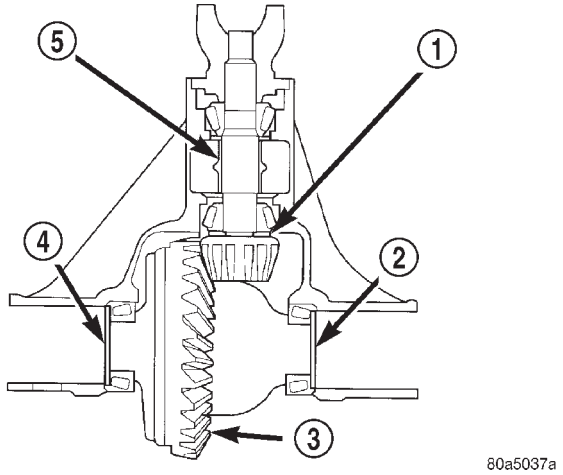


Fig. 1 SHIM LOCATIONS

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

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.

STANDARD DIFFERENTIAL

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. 2).

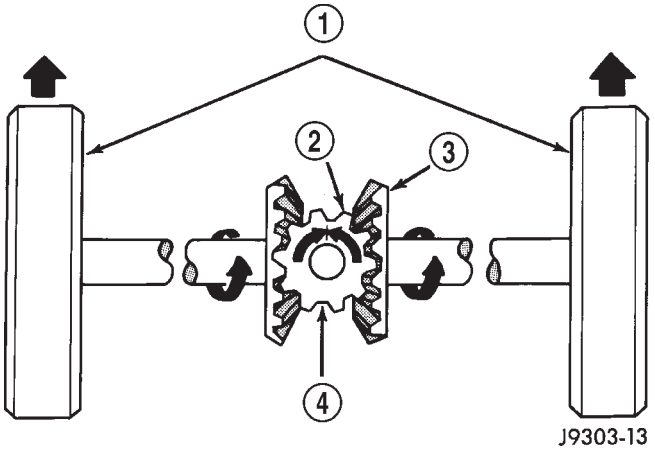


Fig. 2 DIFFERENTIAL-STRAIGHT AHEAD DRIVING

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

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. 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. 3). 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.

TRAC-LOK™ DIFFERENTIAL

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. 4).

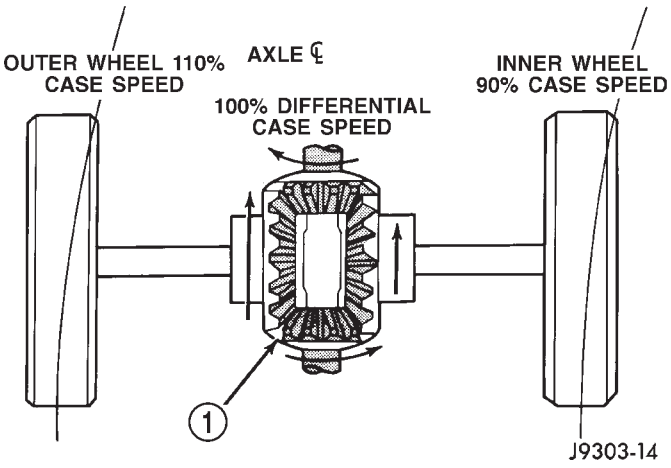


Fig. 3 DIFFERENTIAL-ON TURNS

1 - PINION GEARS ROTATE ON PINION SHAFT

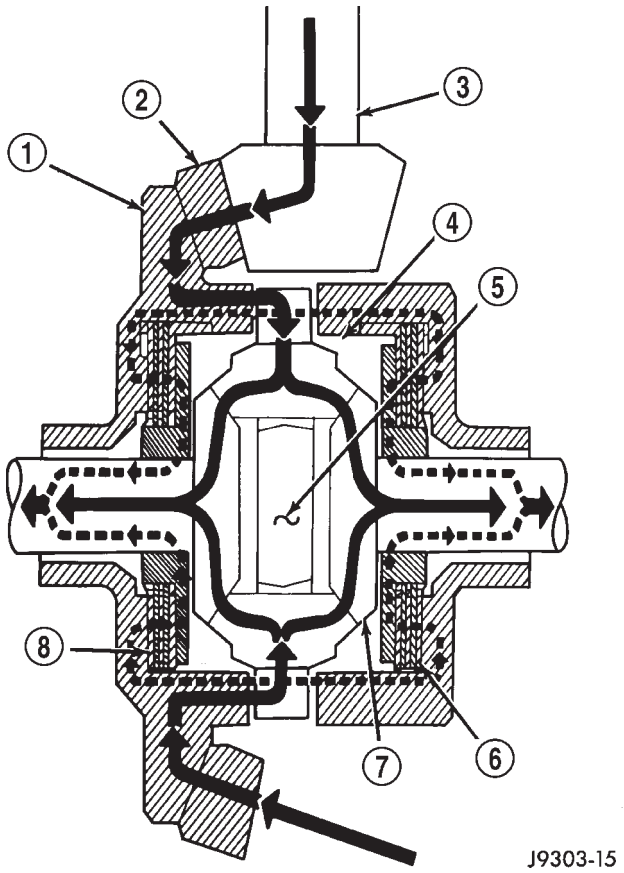


Fig. 4 TRAC-LOK DIFFERENTIAL

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 looses 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 looses traction. Pulling power is provided continuously until both wheels loose 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 - AXLE

GEAR NOISE

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

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

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

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

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

BEARING NOISE

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

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

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

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

LOW SPEED KNOCK

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

VIBRATION

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

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

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

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

DRIVELINE SNAP

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

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

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

REAR AXLE - 198RBI (Continued)

DIAGNOSTIC CHART

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

REAR AXLE - 198RBI (Continued)

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

REAR AXLE - 198RBI (Continued)

REMOVAL

(1) Raise and support the vehicle.
(2) Position a lift/jack under the axle and secure axle to device.
(3) Remove wheels and tires.
(4) Mark propeller shaft and pinion yoke for installation reference.
(5) Remove propeller shaft and suspend under the vehicle.
(6) Remove brake drums, parking brake cables and speed sensor from the axle.
(7) Disconnect the brake hose at the body junction block.
(8) Remove brakes and backing plates.
(9) Remove vent hose from the axle shaft tube.
(10) Remove the stabilizer bar (Fig. 5).

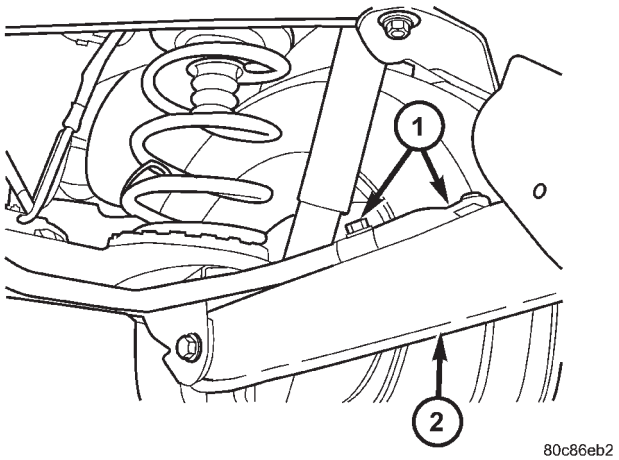


Fig. 5 STABILIZER BAR MOUNTS

1 - STABILIZER BAR MOUNTING BOLTS
2 - LOWER SUSPENSION ARM

(11) Remove upper control arm ball joint pinch bolt from bracket (Fig. 6).
(12) Remove shock absorbers from axle brackets (Fig. 7).
(13) Loosen all lower control arms mounting bolts (Fig. 8).
(14) Lower axle enough to remove coil springs and spring insulators.
(15) Remove lower control arm bolts from the axle brackets.
(16) Lower and remove the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before the lower control arms are tightened. This must be done to maintain vehicle ride height and prevent premature bushing failure.

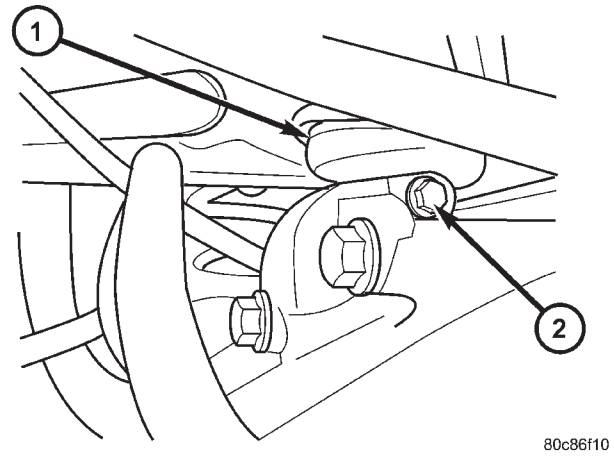


Fig. 6 BALL JOINT PINCH BOLT

1 - UPPER BALL JOINT
2 - PINCH BOLT

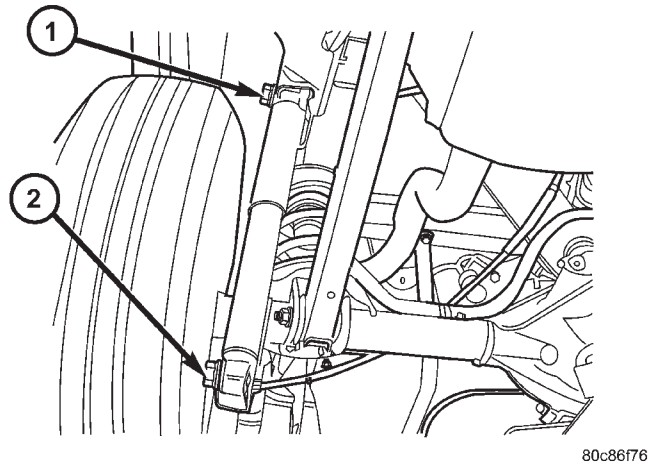


Fig. 7 SHOCK ABSORBER

1 - UPPER MOUNTING BOLT
2 - LOWER MOUNTING BOLT

(1) Raise the axle under the vehicle.
(2) Install lower control arms onto the axle brackets and loosely install the mounting bolts.
(3) Install coil spring isolators and spring.
(4) Raise axle up until springs are seated.
(5) Install upper control arm ball joint into axle bracket and tighten pinch bolt to torque specification.
(6) Install shock absorbers and tighten nuts to torque specification.
(7) Install stabilizer bar and tighten nuts to torque specification.
(8) Install brake backing plates, parking brake cables, brake drums and speed sensor.
(9) Install brake hose to the body junction block and bleed the brakes.

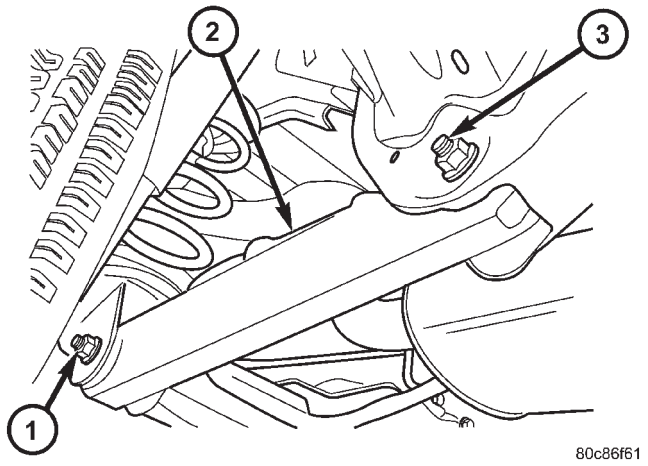


Fig. 8 LOWER SUSPENSION ARM

1 - AXLE BRACKET BOLT
2 - LOWER CONTROL ARM
3 - BODY BRACKET BOLT

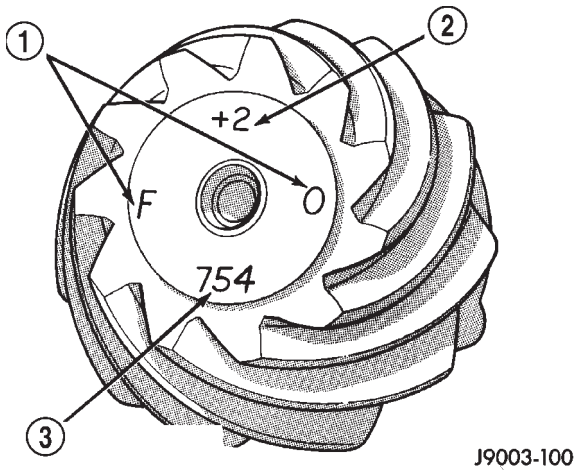


Fig. 9 PINION GEAR ID NUMBERS

1 - PRODUCTION NUMBERS
2 - PINION GEAR DEPTH VARIANCE
3 - GEAR MATCHING NUMBER

(10) Install axle vent hose.
(11) Install propeller shaft with reference marks.
(12) Install the wheels and tires.
(13) Add gear lubricant to specifications, if necessary.
(14) Remove lifting device from axle and lower the vehicle.
(15) Tighten the lower control arm bolts to torque specification.

ADJUSTMENTS

ADJUSTMENT

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are etched into the face of each gear (Fig. 9). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 96.850 mm (3.813 in.). 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 under the inner pinion bearing cone (Fig. 10).

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

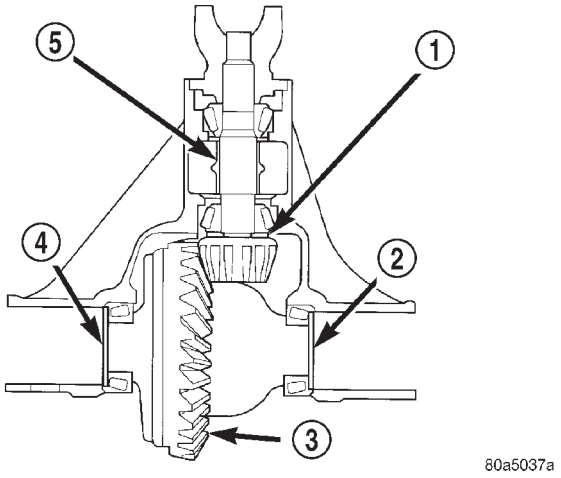


Fig. 10 Shim Locations

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

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

Note the etched number on the face of the drive 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 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.

REAR AXLE - 198RBI (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

PINION DEPTH MEASUREMENT

Measurements are taken with pinion cups and pinion bearings installed in the housing. Take measurements with a Pinion Gauge Set, Pinion Block 6735, Arbor Discs 6732 and Dial Indicator C-3339 (Fig. 11).

(1) Assemble Pinion Height Block 6739, Pinion Block 6735 and rear pinion bearing onto Screw 6741 (Fig. 11).

(2) Insert assembled height gauge components, rear bearing and screw into the housing through pinion bearing cups (Fig. 12).

(3) Install front pinion bearing and Cone 6740 hand tight.

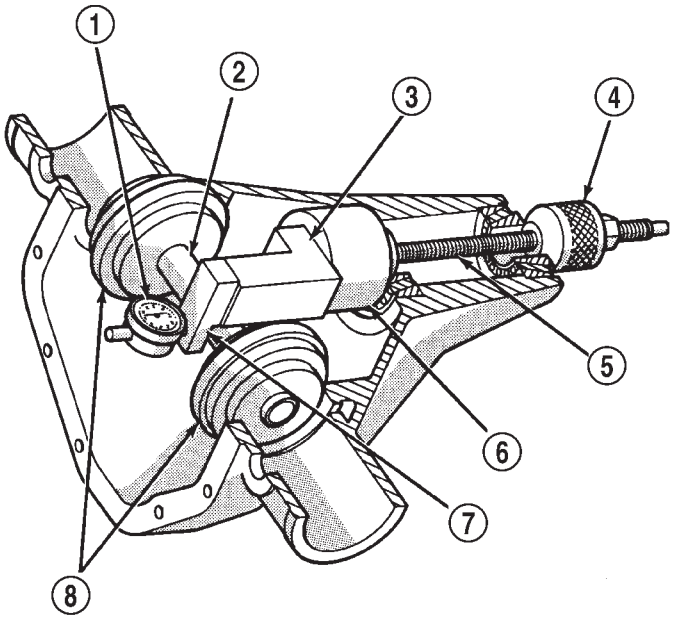


Fig. 11 PINION DEPTH TOOLS

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

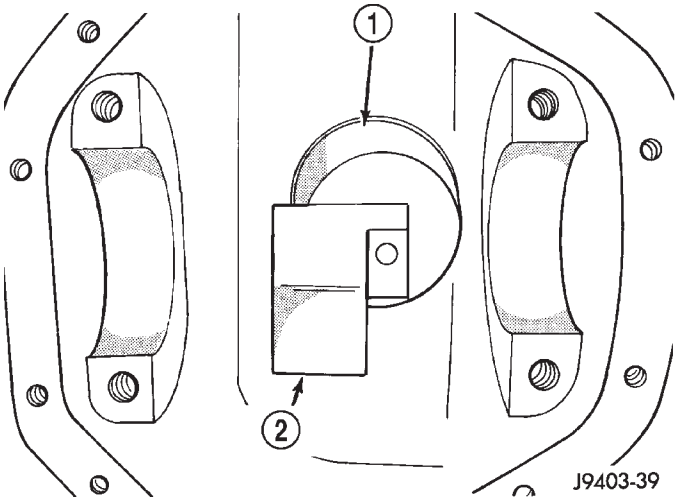


Fig. 12 PINION HEIGHT BLOCK

1 - PINION BLOCK
2 - PINION HEIGHT BLOCK

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 13). Install differential bearing caps on Arbor Discs and tighten cap bolts. Refer to the Torque Specifications.

NOTE: Arbor Discs 6732 have different step diameters to fit other axle sizes. Pick correct size step for axle being serviced.

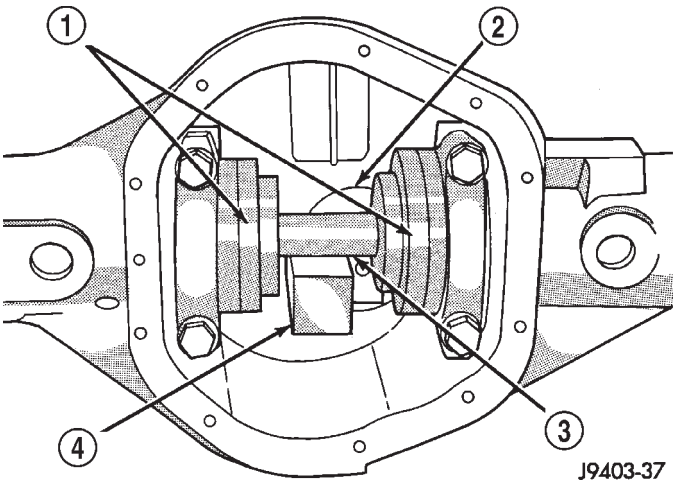


Fig. 13 GAUGE TOOLS IN HOUSING

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

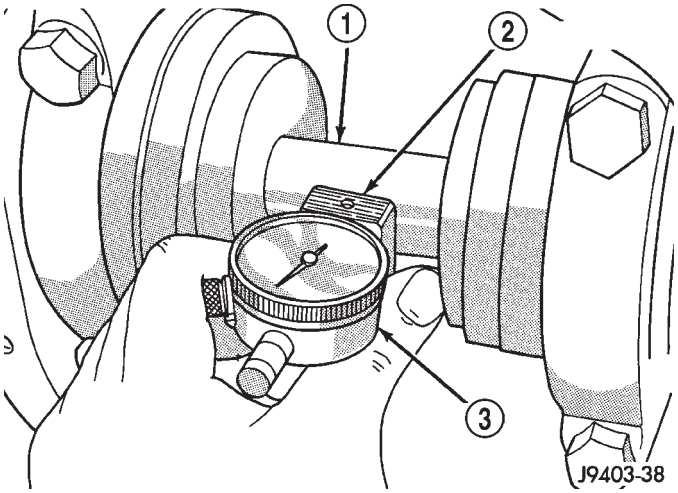


Fig. 14 Pinion Gear Depth Measurement

1 - ARBOR
2 - SCOOTER BLOCK
3 - DIAL INDICATOR

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

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

(7) Slowly slide the scooter block across the pinion height block over to the arbor (Fig. 14). Move the scooter block till the dial indicator probe crests 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.

(8) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion gear (Fig. 9) 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.

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

DIFFERENTIAL BEARING PRELOAD

Differential side bearing preload and gear backlash is achieved by selective shims inserted between the bearing cup and the housing. The proper shim thickness can be determined using slip-fit Dummy Bearings D-348 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 gear 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 gear is installed and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading, starting point shim thickness 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 gear side of the differential (Fig. 15).

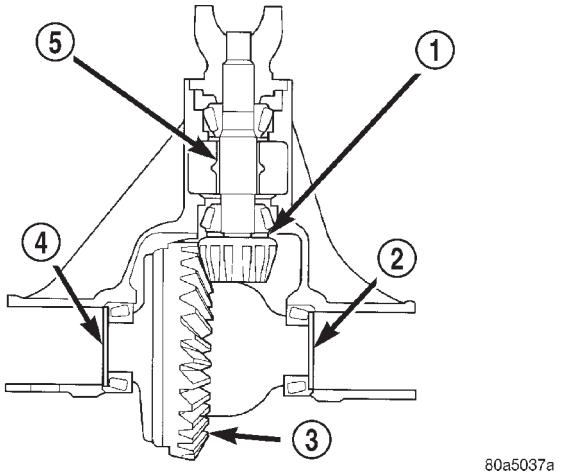


Fig. 15 Shim Locations

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

REAR AXLE - 198RBI (Continued)

PRELOAD 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 Bearings D-348 on differential case.
(4) Install differential case in the housing.
(5) Insert Dummy Shims 8107 (0.118 in. / 3.0 mm) starting point shims between the dummy bearing and the housing (Fig. 16).

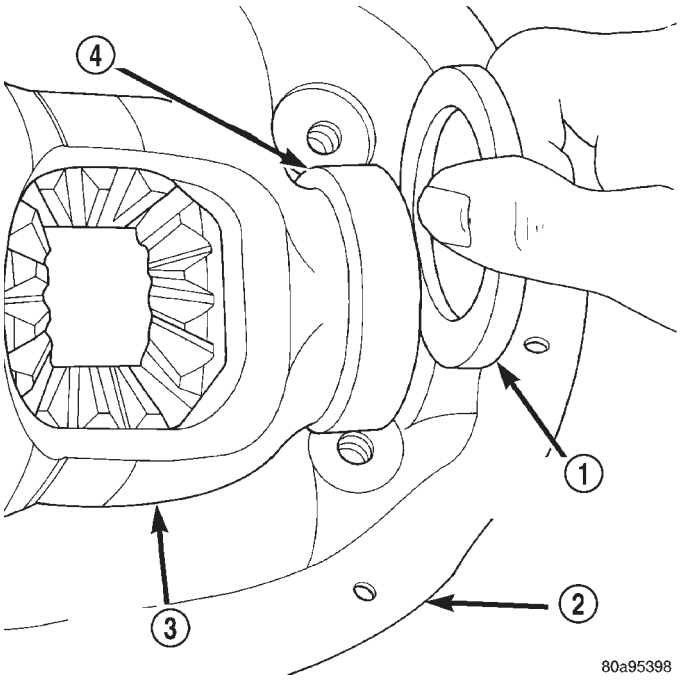


Fig. 16 DUMMY SHIMS

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

(6) Install bearing caps in their correct positions and snug the bolts.
(7) Use a dead-blow hammer to seat the differential dummy bearings to each side of the housing (Fig. 17) and (Fig. 18).

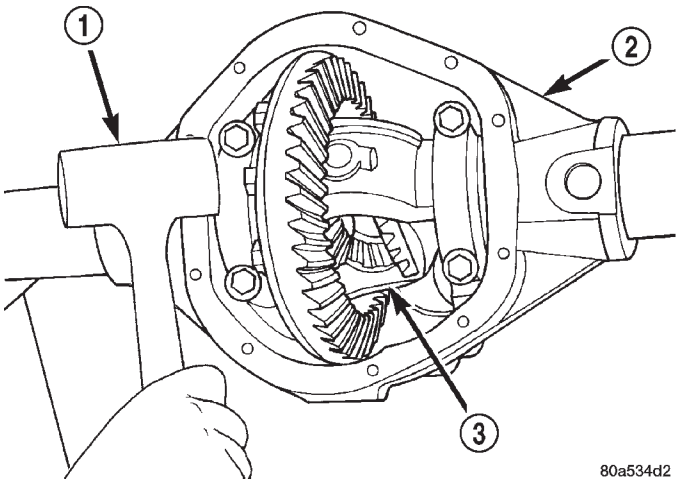


Fig. 17 SEAT DUMMY BEARING PINION GEAR SIDE

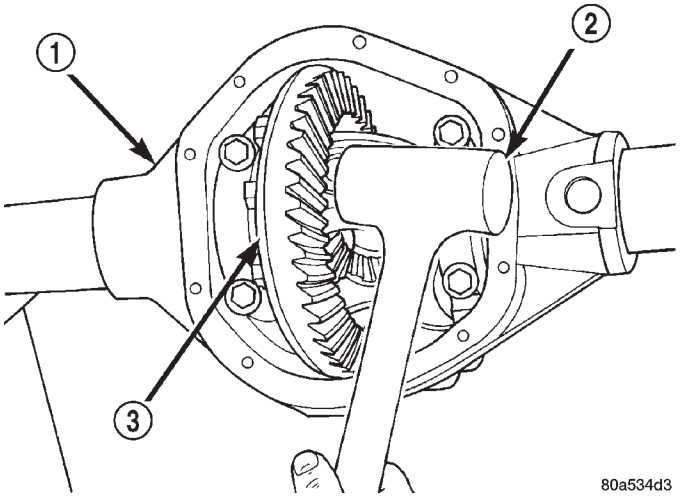


Fig. 18 SEAT DUMMY BEARING RING GEAR SIDE

1 - DIFFERENTIAL HOUSING
2 - DEAD-BLOW HAMMER
3 - DIFFERENTIAL CASE

REAR AXLE - 198RBI (Continued)

(8) Thread Pilot Stud C-3288-B into rear cover bolt hole below ring gear (Fig. 19).

(9) Attach Dial Indicator C-3339 to the pilot stud and position indicator plunger on a flat surface of the ring gear bolt head (Fig. 19).

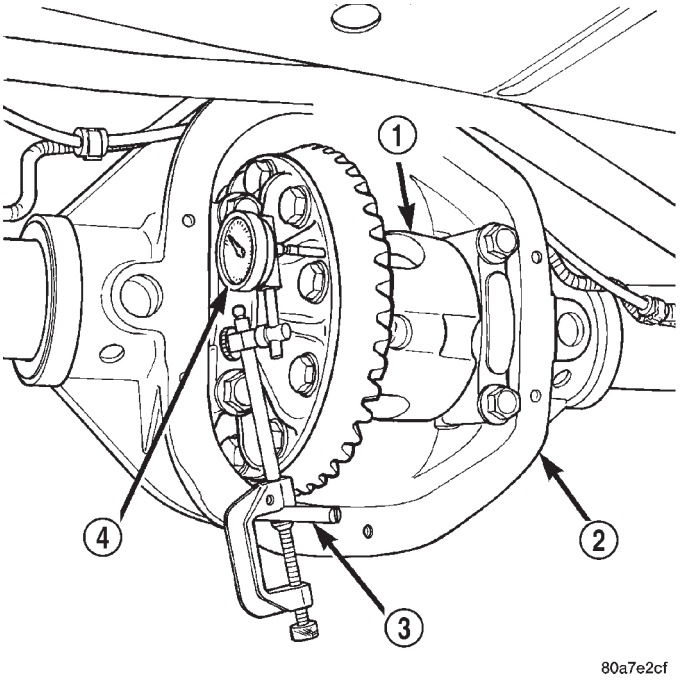


Fig. 19 DIFFERENTIAL SIDE PLAY

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

(10) Push the differential case firmly to the pinion gear side of the housing (Fig. 20) and zero dial indicator.

(11) Push differential case firmly to the ring gear side and record dial indicator reading (Fig. 21).

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

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

(14) Rotate dial indicator out of the way.

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

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

(17) Install differential case and dummy bearings in the housing (without shims) and tighten retaining cap bolts.

(18) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 19).

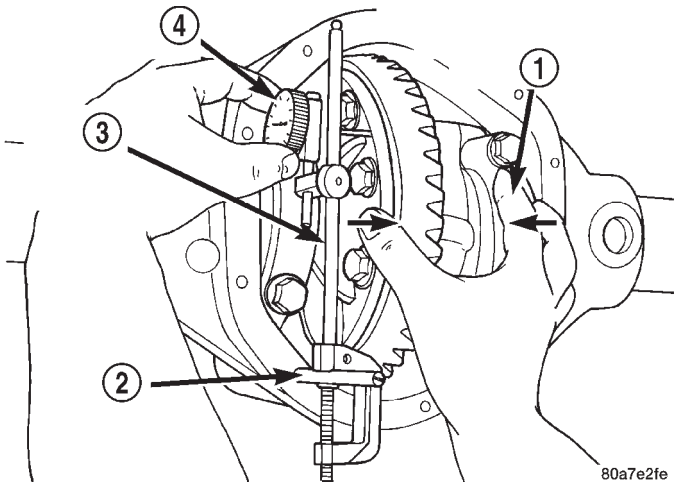


Fig. 20 ZERO DIAL INDICATOR

1 - FORCE CASE TO PINION SIDE
2 - PILOT STUD
3 - DIAL INDICATOR EXTENSION
4 - DIAL INDICATOR

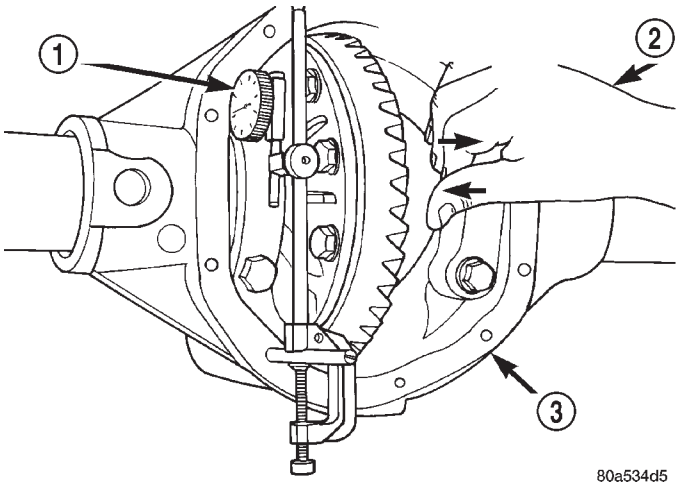


Fig. 21 RECORD DIAL INDICATOR

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

(19) Push and hold differential case toward pinion gear.

(20) Zero dial indicator face to pointer.

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

(22) Subtract 0.05 mm (0.002 in.) from the dial indicator reading to compensate for backlash between ring and pinion gears. This total is the thickness of shim required to achieve proper backlash.

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

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

(25) Remove differential case and dummy bearings from the housing.

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

(27) Install spreader W-129-B and some components of Adapter Set 6987 on differential housing and spread axle opening enough to receive differential case.

(28) Place side bearing shims into the housing against the axle tubes.

(29) Install differential case in the housing.

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

(31) Position the indicator plunger against a ring gear tooth (Fig. 22).

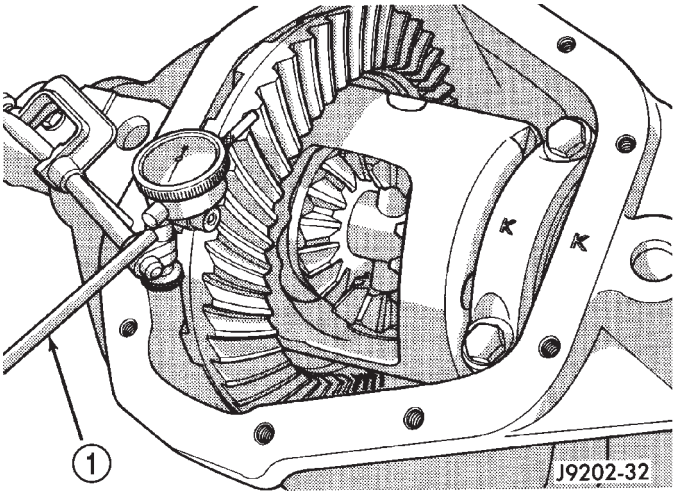


Fig. 22 RING GEAR BACKLASH

1 - DIAL INDICATOR

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

(33) Zero dial indicator face to pointer.

(34) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.13-0.20 mm (0.005-0.008 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. 23).

(35) 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.

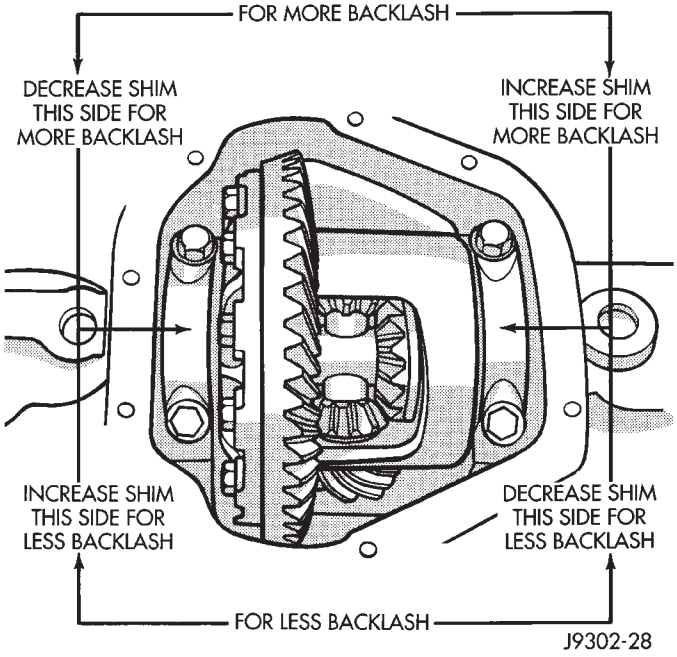


Fig. 23 BACKLASH SHIM

GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the 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.

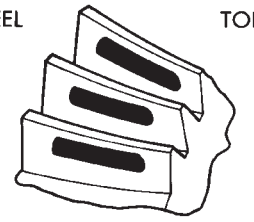
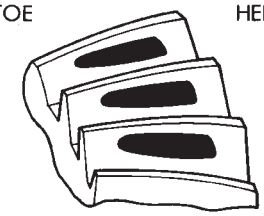
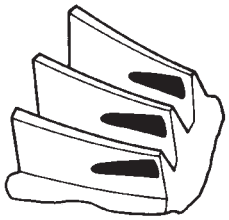
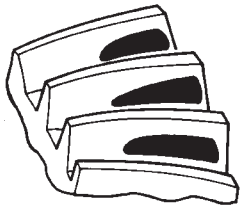
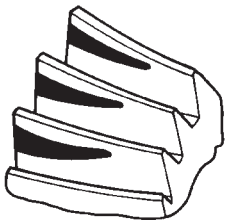
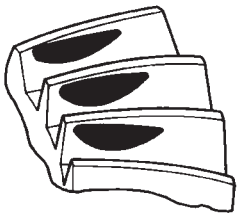
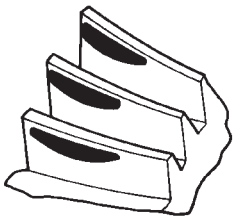
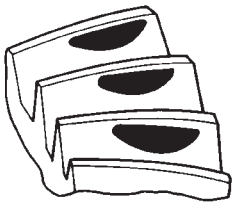
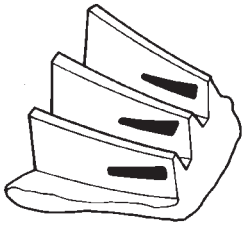
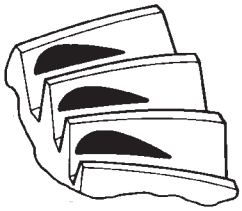
(1) Apply a thin coat of hydrated ferric oxide or equivalent to the drive and coast side of the ring gear teeth.

(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) With 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. 24) and adjust pinion depth and gear backlash as necessary.

REAR AXLE - 198RBI (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	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.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 24 GEAR TOOTH CONTACT PATTERNS

DIFFERENTIAL BEARING PRELOAD CHECK

The final check on the differential assembly before installing the axles is torque to rotate pinion and differential combined. This will verify the correct differential bearing preload.

Torque to rotate the differential and pinion is the torque to rotate the pinion plus:

Gear Ratio 3.73 . . . . . 0.45-0.76 N·m (4-7 in. lbs.)
Gear Ratio 4.10 . . . . . 0.41-0.69 N·m (3.6-6 in. lbs.)

SPECIFICATIONS - REAR AXLE

SPECIFICATIONS

DESCRIPTION	SPECIFICATION
Axle Ratio	3.73 4.10
Ring Gear Diameter	198 mm (7.795 in.)
Ring Gear Backlash	0.13-0.20 mm (0.005-0.008 in.)
Pinion Gear Standard Depth	96.85 mm (3.813 in.)
Pinion Bearing Preload - New Bearings	1.69-2.82 N·m (15-25 in. lbs.)
Differential Side Gear Clearance	0-0.15 mm (0-0.006 in.)
Differential Bearing Preload	0.20 mm (0.008 in.)
Differential Bearing Preload Added To Pinion Torque To Rotate	
3.73 Gear Ratio	0.45-0.76 N·m (4-7 in. lbs.)
4.10 Gear Ratio	0.41-0.69 N·m (3.6-6 in. lbs.)

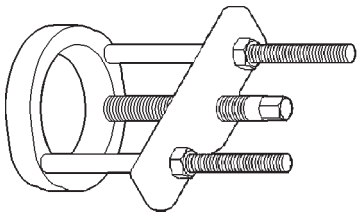
TORQUE SPECIFICATIONS

DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Ring Gear Bolts	129-142	95-105	-
Differential Bearing Cap Bolts	64-91	47-67	-
Differential Cover Bolts	38-45	28-33	-
Pinion Nut (Minimum)	271	200	-
Cross Shaft Lock Screw	11-22	8-16	-

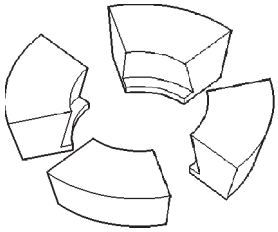
REAR AXLE - 198RBI (Continued)

SPECIAL TOOLS

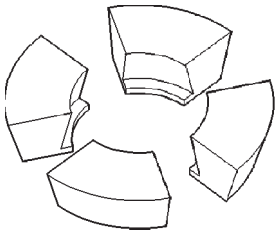
REAR AXLE



PULLER C-293-PA



ADAPTER 8352



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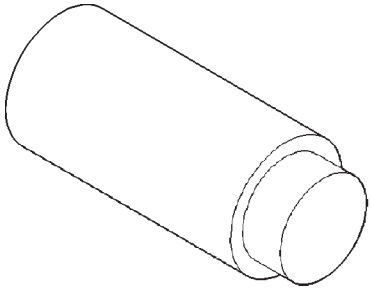
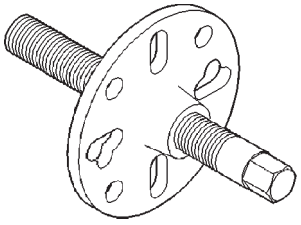
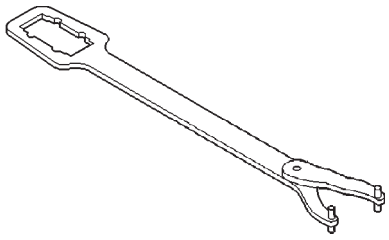


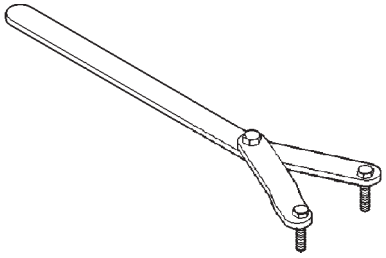
PLUG SP-3289



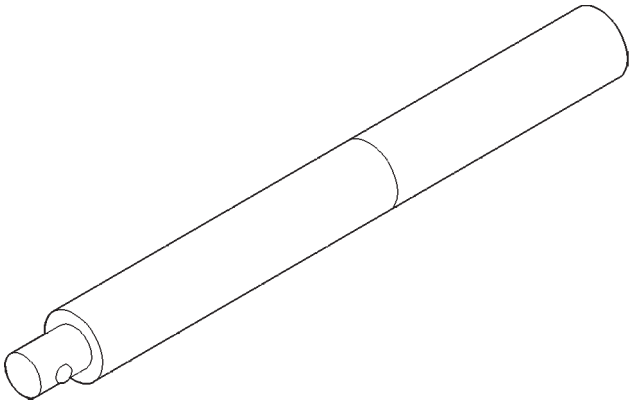
PULLER C-452



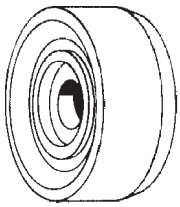
WRENCH C-3281



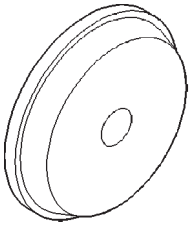
SPANNER WRENCH 6958



HANDLE C-4171

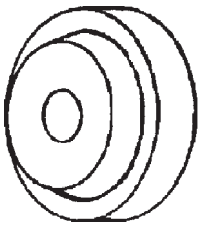


INSTALLER C-3716-A

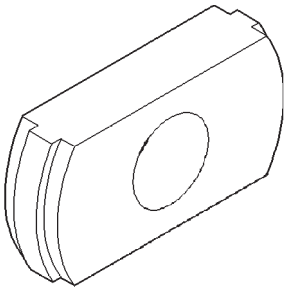


INSTALLER D-130

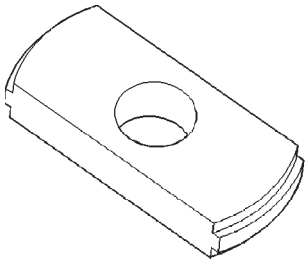
REAR AXLE - 198RBI (Continued)



INSTALLER D-146



REMOVER D-103



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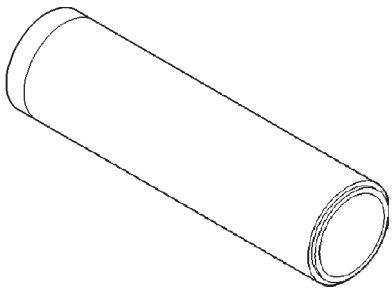
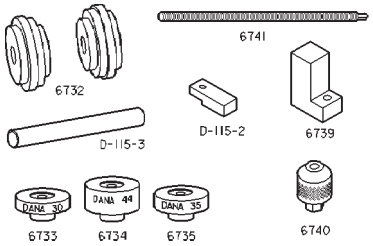
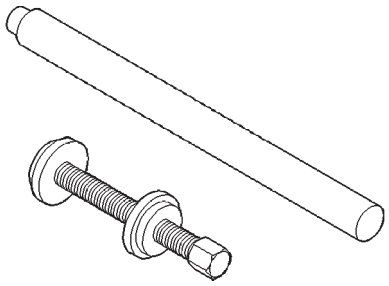


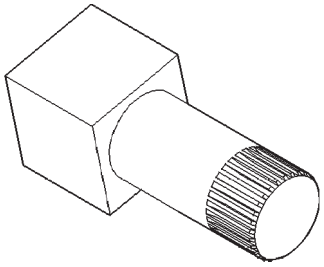
INSTALLER W-262



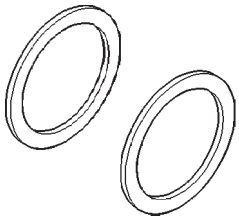
PINION DEPTH 6774



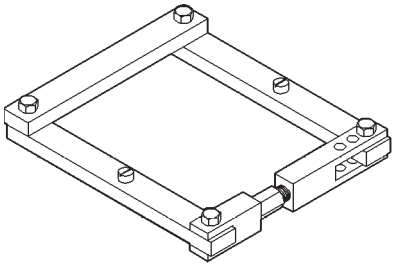
TRAC-LOK TOOLS 6960



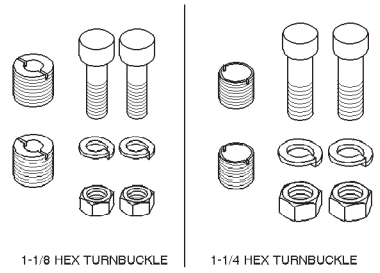
FIXTURE 6965



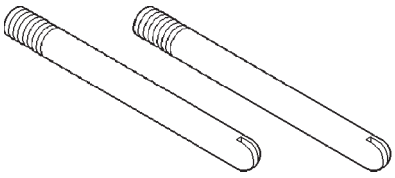
SHIMS DUMMY 8107



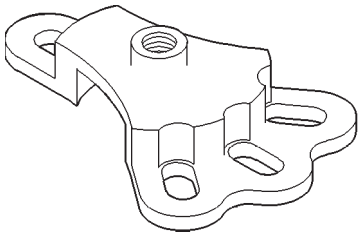
SPREADER W-129-B



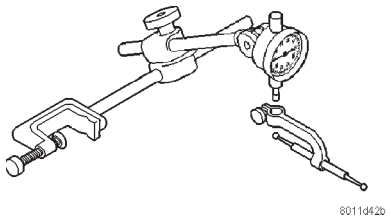
ADAPTER KIT 6987



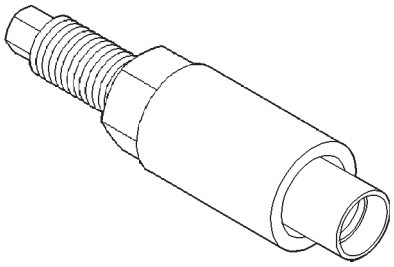
PILOT STUDS C-3288-B



PULLER 6790



DIAL INDICATOR C-3339



INSTALLER C-3718

AXLE SHAFTS

REMOVAL

(1) Place transmission in neutral and raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Remove brake drum.
(4) Remove axle retainer plate nuts from the rear of the axle flange.
(5) Pull axle shaft from the axle with Slide Hammer 7420 and Adapter 6790. Mount the adapter to the axle with lug nuts.

NOTE: It is normal that the axle bearing race is loose in the axle tube.

INSTALLATION

(1) Insall axle into the axle tube with the flat area of the retainer plate upward.
(2) Insert retaining plate studs into the brake backing plate and axle tube flange.
(3) Install retainer nuts and tighten to 47-75 N·m (35-55 ft. lbs.).
(4) Install the brake drum.
(5) Install wheel and tire.
(6) Check and fill the differential with gear lubricant.
(7) Lower vehicle.

AXLE BEARING/SEAL

REMOVAL

(1) Remove axle shaft from vehicle.

(2) Drill a shallow hole into soft steel axle bearing retaining ring with a 3/8 in. drill bit (Fig. 25). Use a drill depth stop to avoid marking the axle.

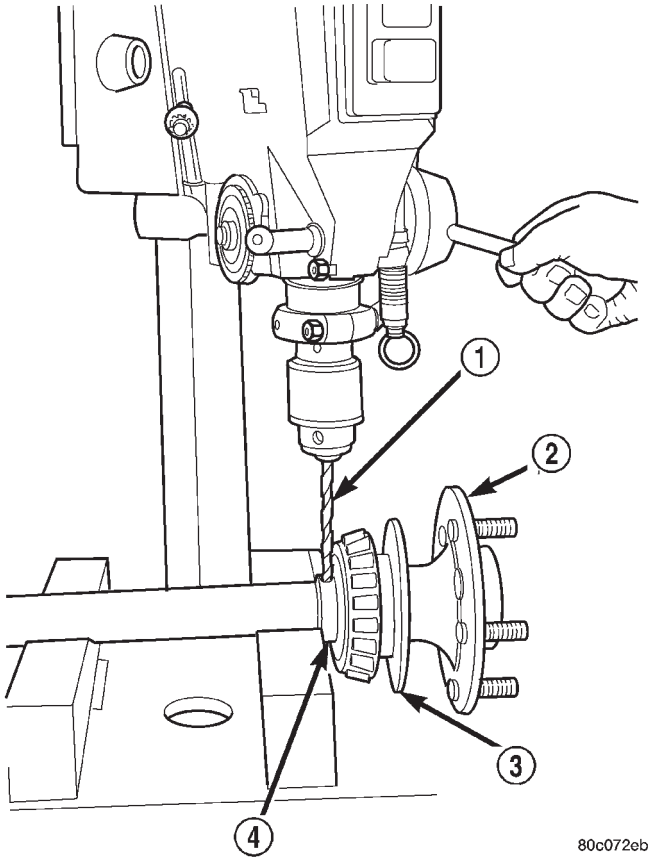


Fig. 25 DRILL RETAINING RING

1 - DRILL BIT
2 - AXLE
3 - RETAINING PLATE
4 - RETAINING RING

(3) With a cold chisel cut the retaining ring across drilled hole. (Fig. 26)

(4) Slide retaining ring from axle shaft.

(5) Remove axle bearing from the shaft with a press and Splitter 1130 placed between the seal and bearing (Fig. 27).

(6) Remove seal from axle.

(7) Remove retaining plate from axle shaft.

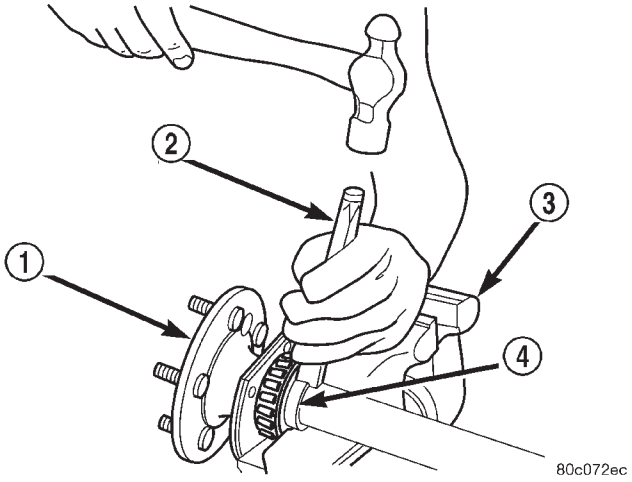


Fig. 26 CUT RETAINING RING

1 - AXLE
2 - COLD CHISEL
3 - VISE
4 - RETAINING RING

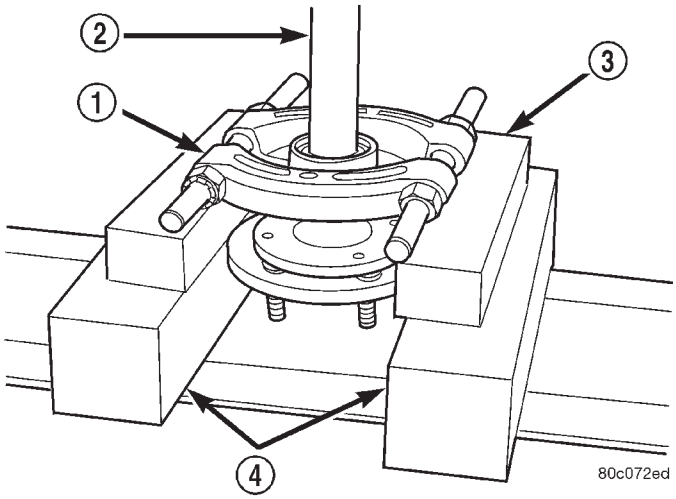


Fig. 27 AXLE BEARING AND SEAL

1 - SPLITTER
2 - AXLE SHAFT
3 - BLOCKS
4 - BLOCKS

AXLE BEARING/SEAL (Continued)

INSTALLATION

NOTE: Verify axle shaft retaining plate is flat with a straight edge. If the plate is warped replace the plate.

(1) Install retaining plate on the axle shaft (Fig. 28).
(2) Apply a coat of multi-purpose grease on sealing surface of axle seal.
(3) Install seal on the axle shaft with cavity away from retaining plate (Fig. 28).

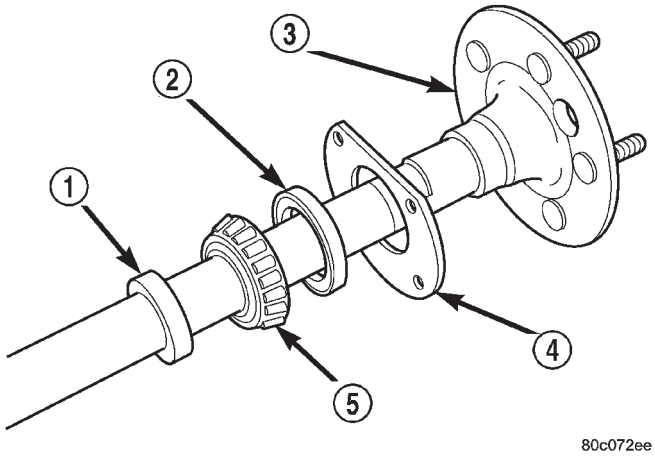


Fig. 28 AXLE BEARING AND SEAL COMPONENTS

1 - RETAINING RING
2 - SEAL
3 - AXLE
4 - RETAINING PLATE
5 - AXLE BEARING

(4) Lubricate bearing with Mopar® Wheel Bearing Grease or equivalent. Wipe excess grease from the bearing.
(5) Install bearing on the axle shaft with Installer 7913 and a press (Fig. 29).
(6) Press retaining ring onto axle shaft with Installer 7913 and a press (Fig. 30).
(7) Install axle in vehicle.

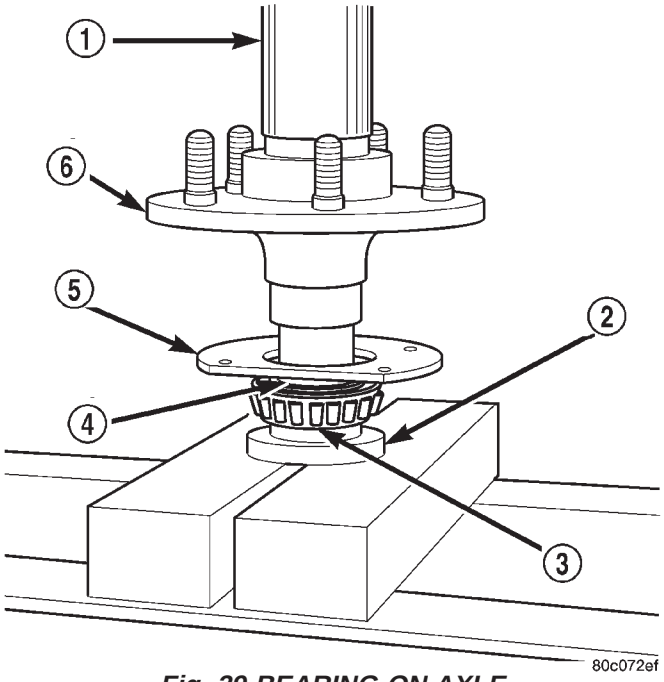


Fig. 29 BEARING ON AXLE

1 - PRESS RAM
2 - INSTALLER - 7913
3 - AXLE BEARING
4 - SEAL
5 - RETAINING PLATE
6 - AXLE

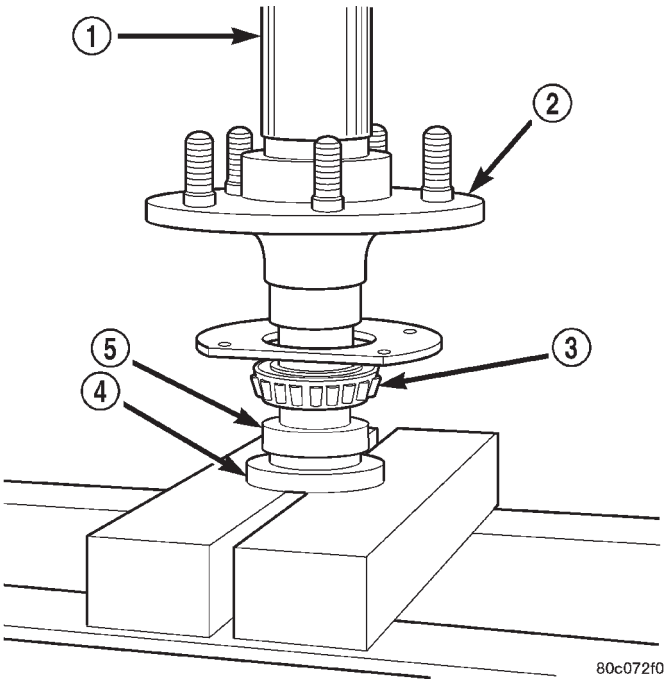


Fig. 30 BEARING RETAINING RING ON AXLE

1 - PRESS
2 - AXLE
3 - AXLE BEARING
4 - INSTALLER
5 - SOFT METAL RETAINING RING

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake rotors drums.
(4) Mark propeller shaft and pinion yoke for installation reference.
(5) Remove the propeller shaft from the yoke.
(6) Rotate pinion gear three or four times and verify that pinion rotates smoothly.
(7) Measure and record torque to rotate the pinion gear with an inch pound dial-type torque wrench.
(8) With a short piece of pipe and Spanner Wrench 6958 remove the pinion nut and washer (Fig. 31).

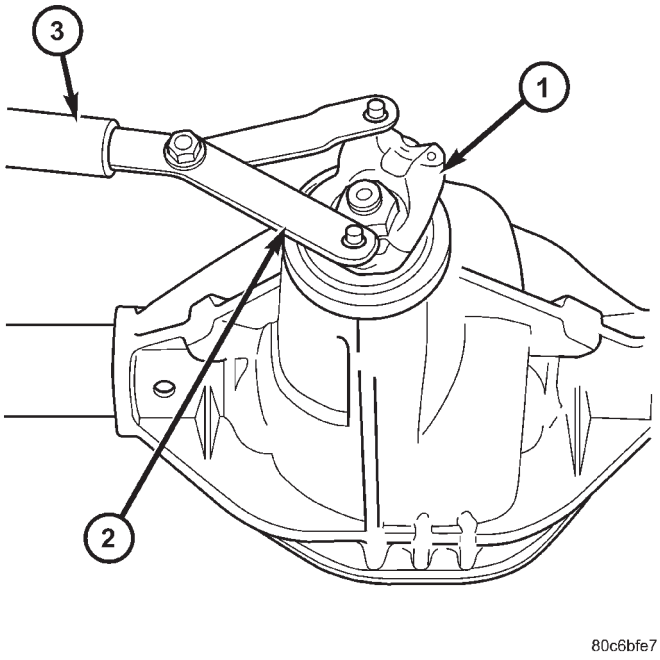


Fig. 31 YOKE SPANNER WRENCH

1 - PINION YOKE
2 - WRENCH
3 - PIPE

(9) Remove pinion companion flange with Remover C-452 and Flange Wrench C-3281. (Fig. 32)
(10) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 33).

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate seal installer (Fig. 34).
(2) Install yoke on the pinion gear with Installer C-3718 and Spanner Wrench 6958 (Fig. 35).

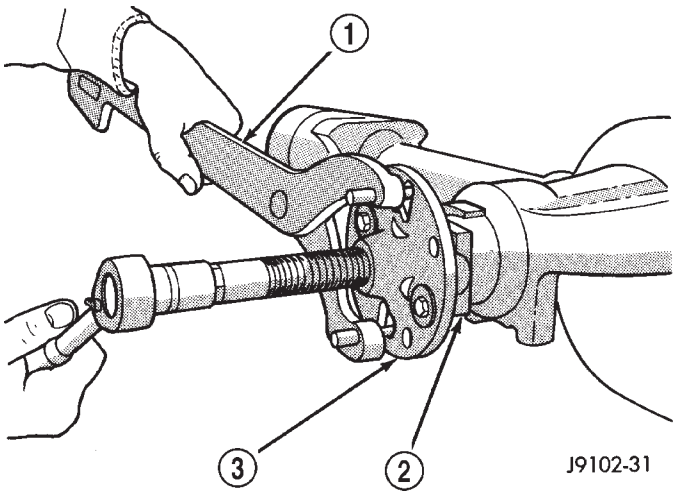


Fig. 32 PINION YOKE REMOVER

1 - WRENCH
2 - YOKE
3 - REMOVER

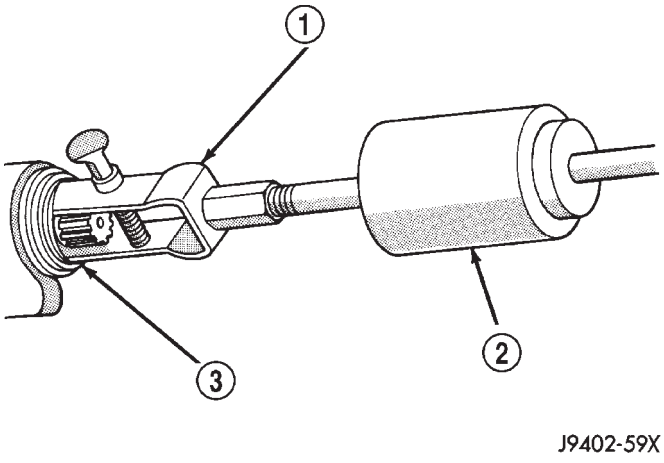


Fig. 33 PINION SEAL REMOVER

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

(3) Install a **new** nut on the pinion gear. **Tighten the nut only enough to remove the shaft end play.**

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

(4) Rotate the pinion a minimum of ten times and verify pinion rotates smoothly.
(5) Measure and recore pinion torque to rotate with an inch pound torque wrench. Torque to rotate should be equal to the reading recorded during removal, plus 0.56 N·m (5 in. lbs.) (Fig. 36).

PINION SEAL (Continued)

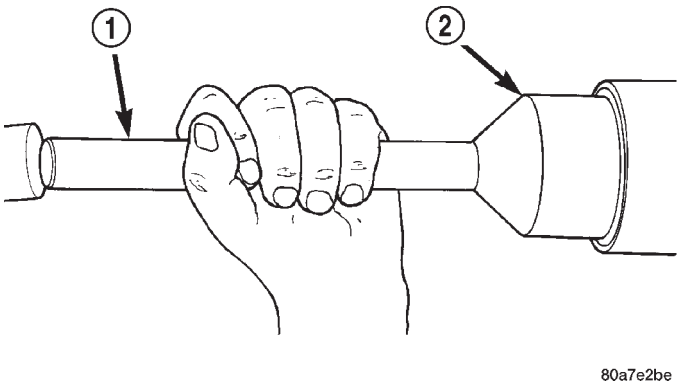


Fig. 34 PINION SEAL INSTALLATION

1 - HANDLE
2 - INSTALLER

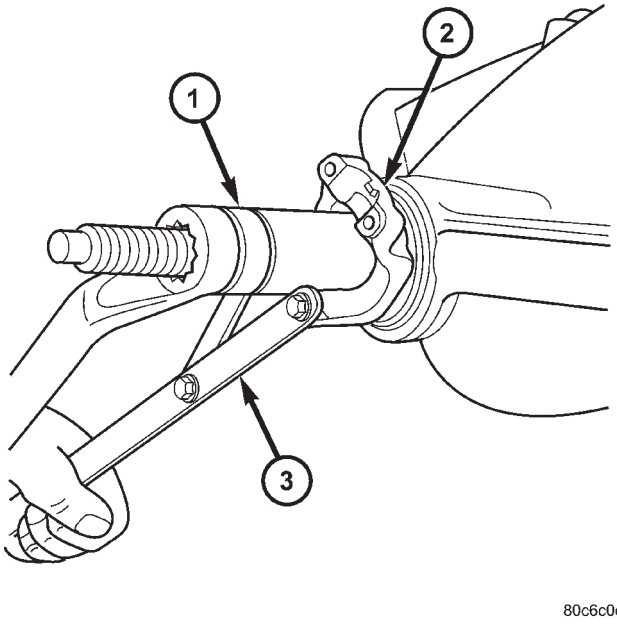


Fig. 35 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE
3 - WRENCH

(6) If rotating torque is low, hold pinion yoke with Wrench 6958 (Fig. 37) and tighten pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until rotating torque is achieved.

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

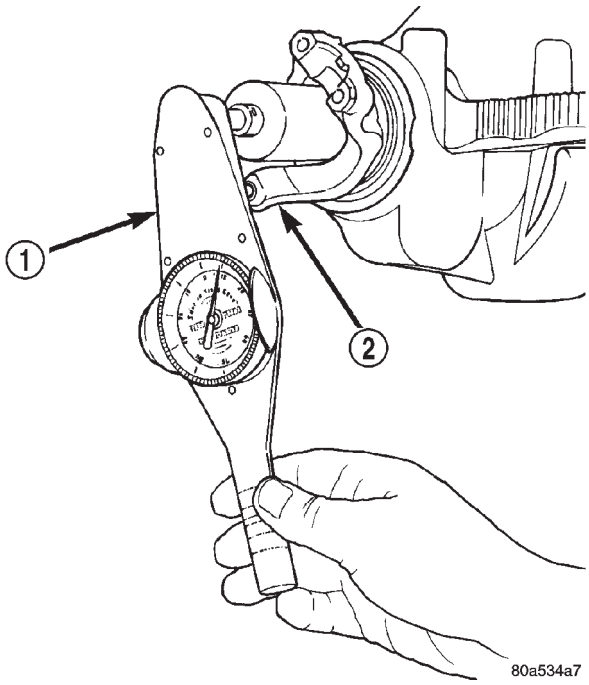


Fig. 36 PINION GEAR ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

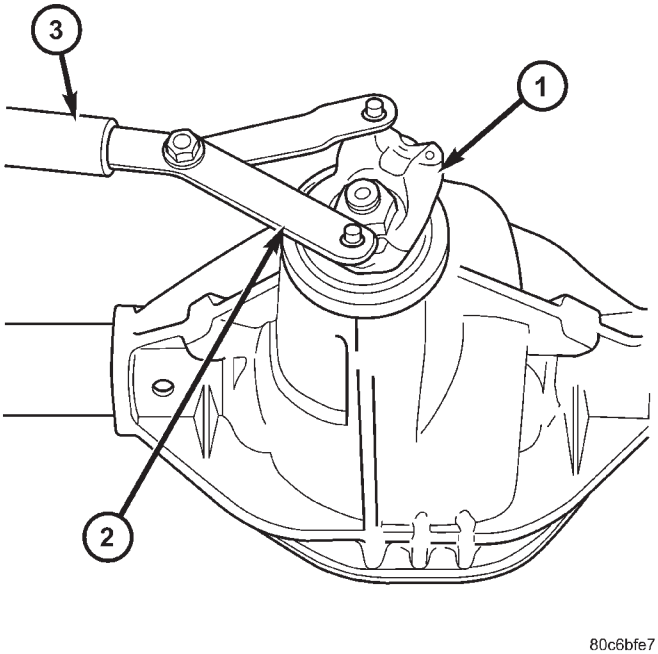


Fig. 37 YOKE SPANNER WRENCH

1 - PINION YOKE
2 - WRENCH
3 - PIPE

(7) Align the installation reference marks on the propeller shaft and pinion yoke and install the propeller shaft.

PINION SEAL (Continued)

(8) Fill differential with gear lubricant.
(9) Install the brake drums
(10) Install wheel and tire assemblies.
(11) Lower the vehicle.

COLLAPSIBLE SPACER

REMOVAL

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove rear brake drums.
(4) Mark the propeller shaft and pinion yoke for installation reference.
(5) Remove the propeller shaft from the yoke.
(6) Rotate the pinion gear three or four times.
(7) Measure and record torque to rotate the pinion gear with an inch pound dial-type torque wrench.
(8) Hold pinion yoke with Spanner Wrench 6958 and remove pinion nut and washer.
(9) Remove the pinion yoke with Remover C-452 and Flange Wrench C-3281 (Fig. 38).

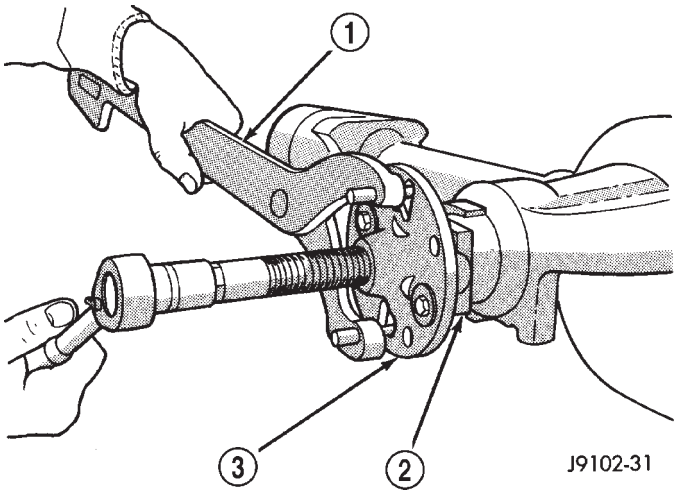


Fig. 38 PINION YOKE

1 - FLANGE WRENCH
2 - YOKE
3 - REMOVER

(10) Remove pinion shaft seal with a pry tool or a slide hammer mounted screw.
(11) Remove front pinion bearing using a pair of pick tools. Pull the bearing straight off the pinion gear shaft. If the bearing becomes bound on the pinion shaft, lightly tap the end of the pinion gear with a rawhide/rubber hammer.
(12) Remove the collapsible spacer.

INSTALLATION

(1) Install a **new** collapsible preload spacer on pinion shaft.
(2) Install pinion front bearing.
(3) Apply a light coating of gear lubricant on the lip of pinion seal and install a **new** seal with an appropriate installer (Fig. 39).

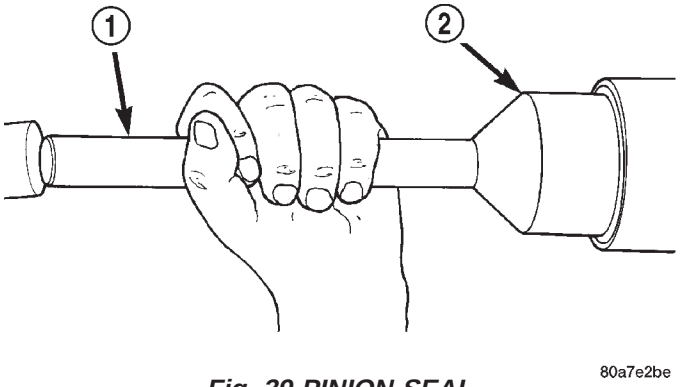


Fig. 39 PINION SEAL

1 - HANDLE
2 - INSTALLER

(4) Install yoke with Screw 8112, Cup 8109 and Spanner Wrench 6958 (Fig. 40).

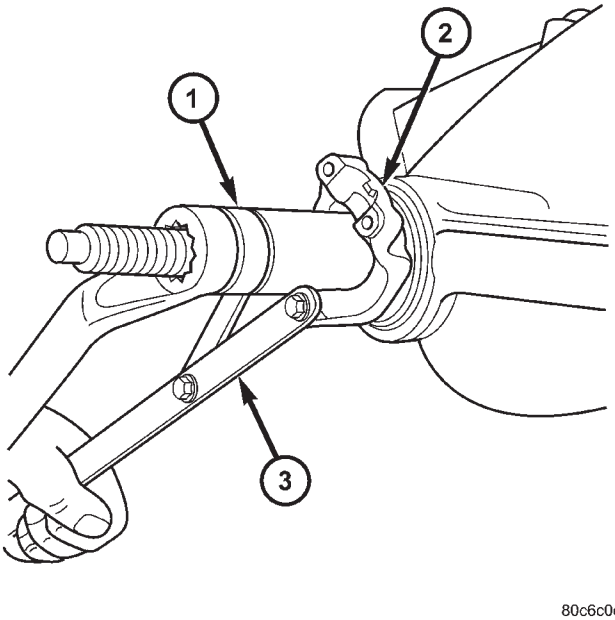


Fig. 40 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE
3 - WRENCH

(5) Install yoke washer and **new** nut on the pinion gear. Tighten the nut to 271 N·m (200 ft. lbs.).

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

COLLAPSIBLE SPACER (Continued)

(6) Using yoke with Spanner Wrench 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), (Fig. 41) slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 42).

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

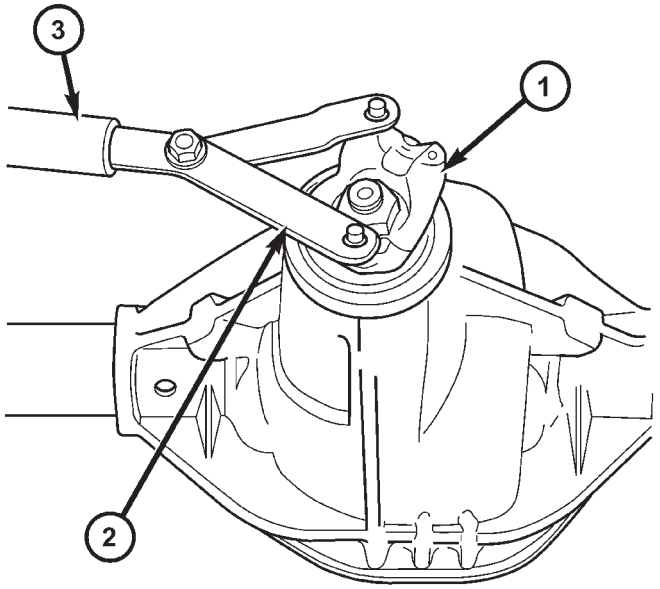


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Fig. 41 YOKE SPANNER WRENCH

1 - PINION YOKE
2 - WRENCH
3 - PIPE

(7) Check rotating torque with an inch pound torque wrench (Fig. 42). The rotating torque of the pinion gear should be, the reading recorded during removal plus an additional 0.56 N·m (5 in. lbs.).

(8) Install propeller shaft with reference marks aligned.

(9) Install rear brake drums.

(10) Add gear lubricant, if necessary.

(11) Install wheel and tire assemblies.

(12) Remove supports and lower vehicle.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove differential cover and drain fluid.

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

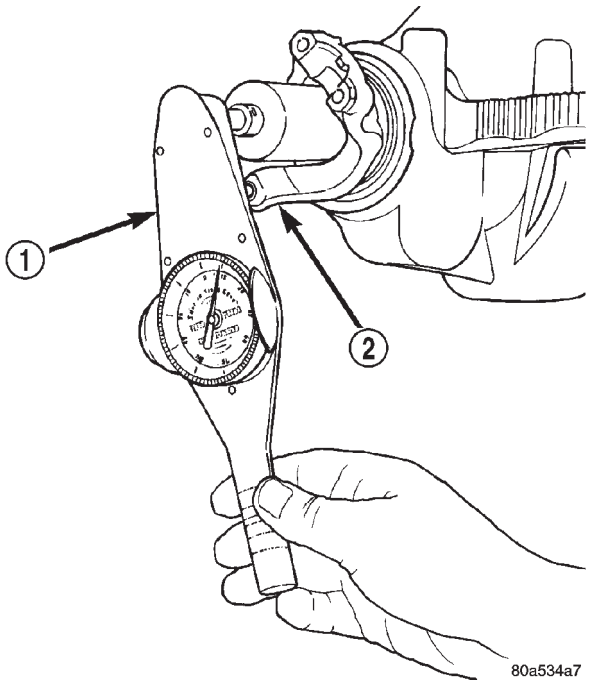

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Fig. 42 PINION ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

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

(4) Remove axle shafts.

(5) Note the reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 43).

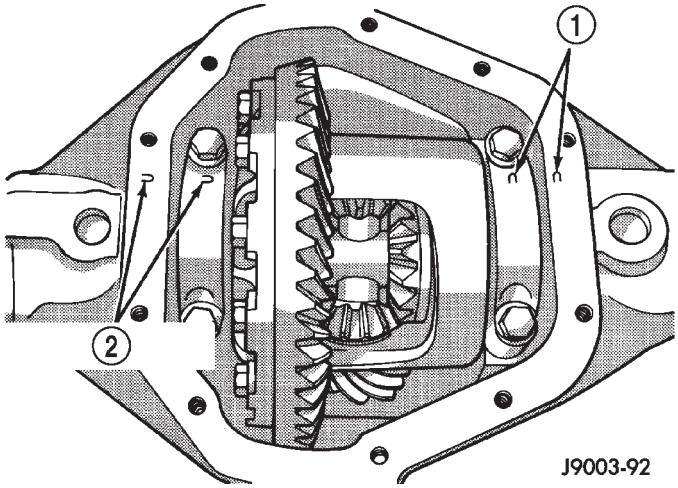

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Fig. 43 BEARING CAP IDENTIFICATION

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

DIFFERENTIAL (Continued)

(6) Loosen the differential bearing cap bolts.

(7) With Spreader W-129-B and adapters from Adapter set 6987, position the adapters in the differential holes (Fig. 44). Install hold-down clamps and tighten the tool turnbuckle finger-tight.

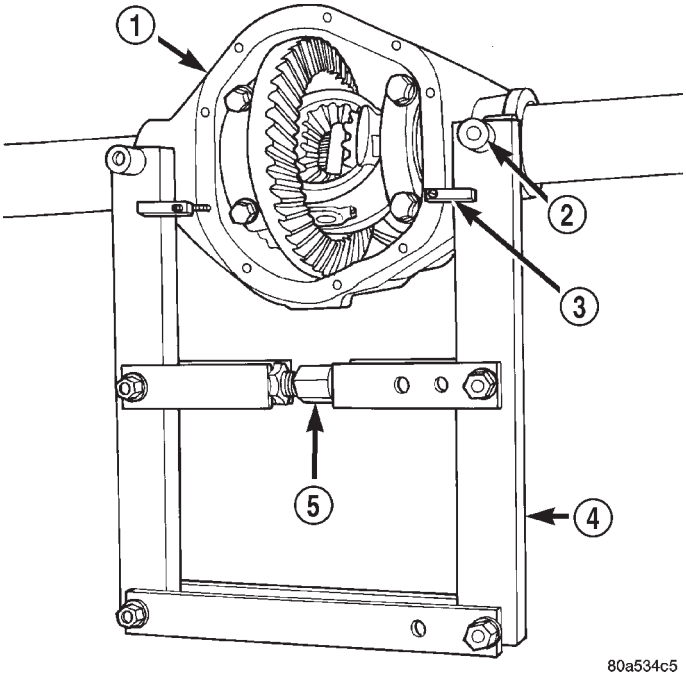

Fig. 44 SPREADER LOCATION

1 - DIFFERENTIAL HOUSING
2 - ADAPTER
3 - SAFETY HOLD DOWN
4 - SPREADER
5 - TURNBUCKLE

(8) Install Pilot Stud C-3288-B 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 (Fig. 45) and zero the indicator.

(9) Spread the housing while measuring the distance with the dial indicator. Spread the housing enough to remove the differential case (Fig. 46).

CAUTION: Do not spread over 0.38 mm (0.015 in). If housing is over-spread, it could be distorted or damaged.

(10) Remove the dial indicator and pilot stud.

(11) Remove differential bearing cap bolts and caps while holding the case.

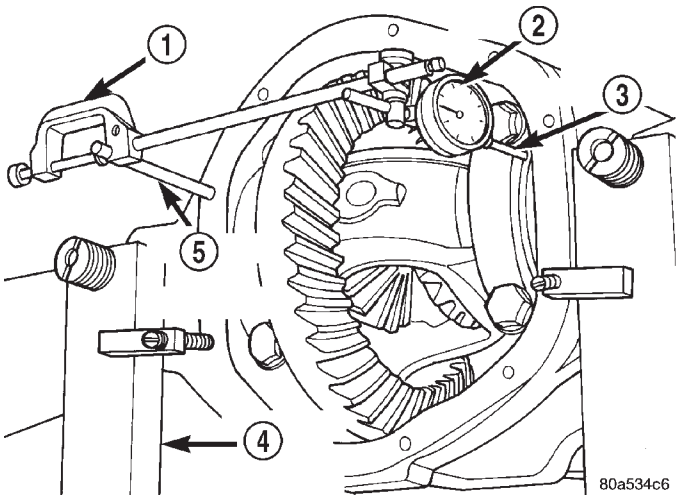

Fig. 45 DIAL INDICATOR LOCATION

1 - CLAMP
2 - DIAL INDICATOR
3 - LEVER ADADPTER
4 - SPREADER
5 - PILOT STUD

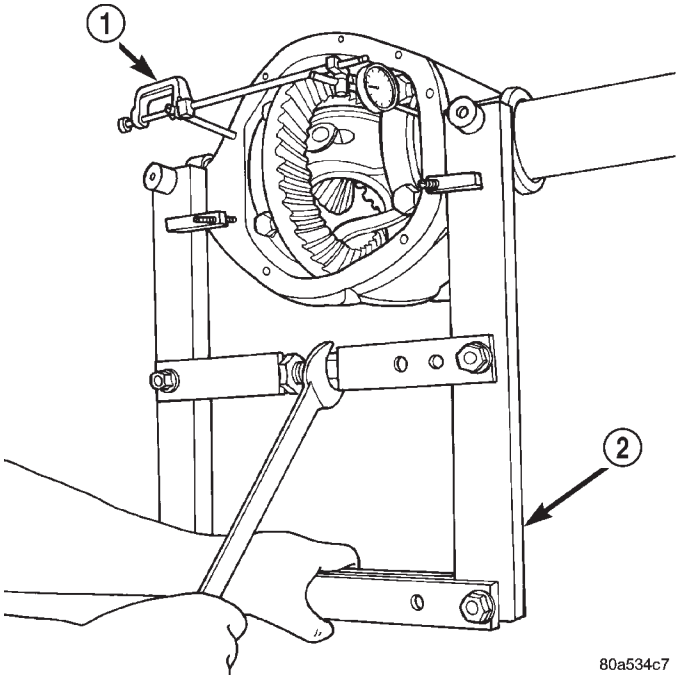

Fig. 46 SPREAD DIFFERENTIAL HOUSING

1 - DIAL INDICATOR
2 - SPREADER

DIFFERENTIAL (Continued)

(12) Remove differential from the housing. Ensure that the differential bearing cups remain in position on the differential bearings (Fig. 47).

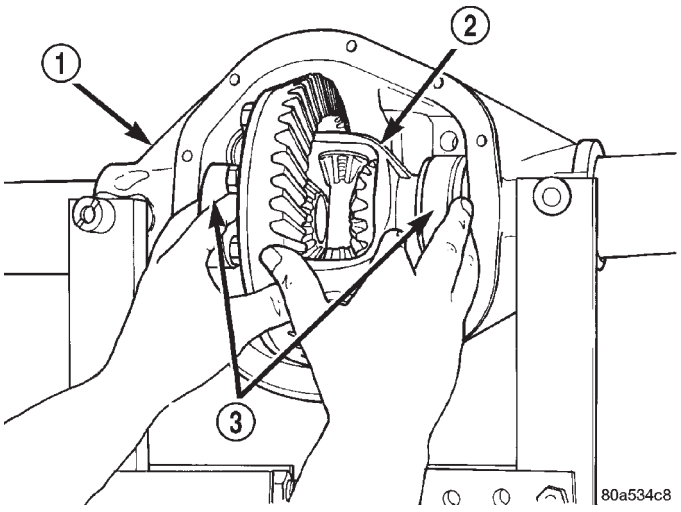

Fig. 47 DIFFERENTIAL CASE

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

(13) Remove bearing cups from the differential and tag them to indicate their location.

(14) Remove differential case preload shims from the housing and tag them to indicate their location.

(15) Remove spreader from housing.

INSTALLATION

NOTE: If differential bearings or differential case are replaced, differential bearing preload shim requirements may change. Refer Adjustments (Differential Bearing Preload and Gear Backlash) to determine the proper shim selection.

(1) With Spreader W-129-B and adapters from Adapter set 6987, position the adapters in the differential holes (Fig. 48). Install the hold-down clamps and tighten the tool turnbuckle finger-tight.

(2) Install a Pilot Stud C-3288-B 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.

(3) Spread the housing while measuring the distance with the dial indicator. Spread the housing enough to install the differential case.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–spread, it could be distorted or damaged.

(4) Remove the dial indicator.

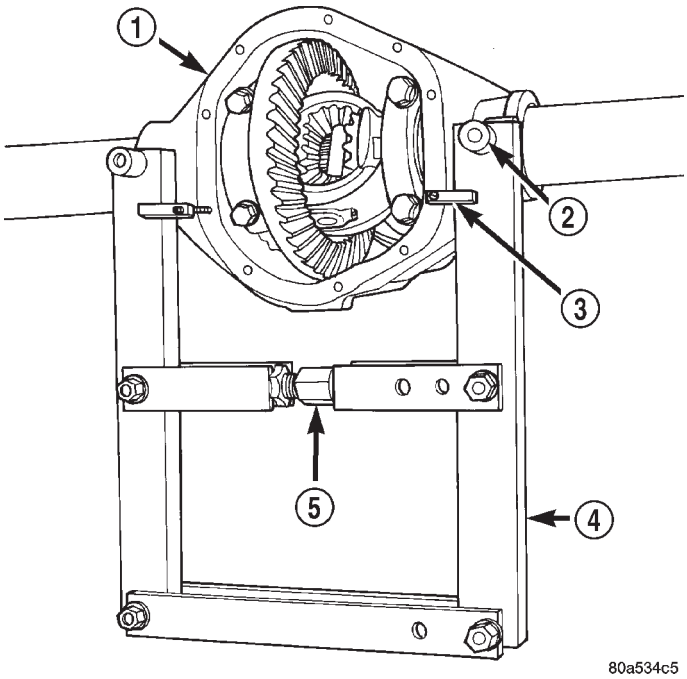

Fig. 48 SPREADER LOCATION

1 - DIFFERENTIAL HOUSING
2 - ADAPTER
3 - SAFETY HOLD DOWN
4 - SPREADER
5 - TURNBUCKLE

(5) Install differential case in the housing (Fig. 49) with bearing cups and preload shims in their original locations. Tap the differential case to ensure the bearings cups and shims are fully seated in the housing.

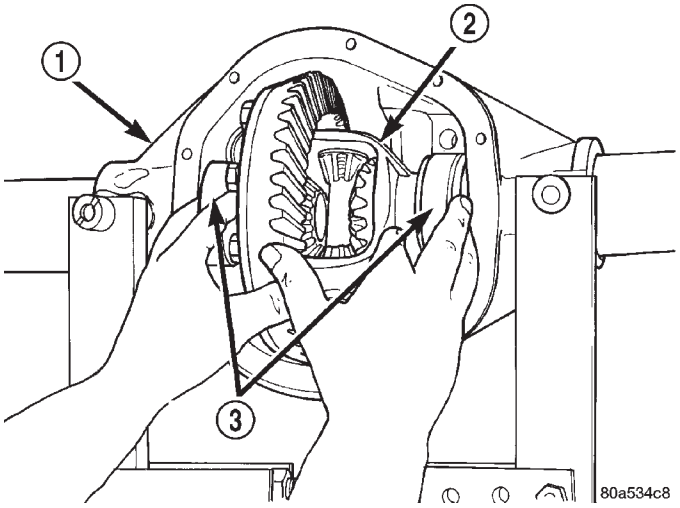

Fig. 49 DIFFERENTIAL CASE

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

DIFFERENTIAL (Continued)

(6) Install the bearing caps in their original locations (Fig. 50).

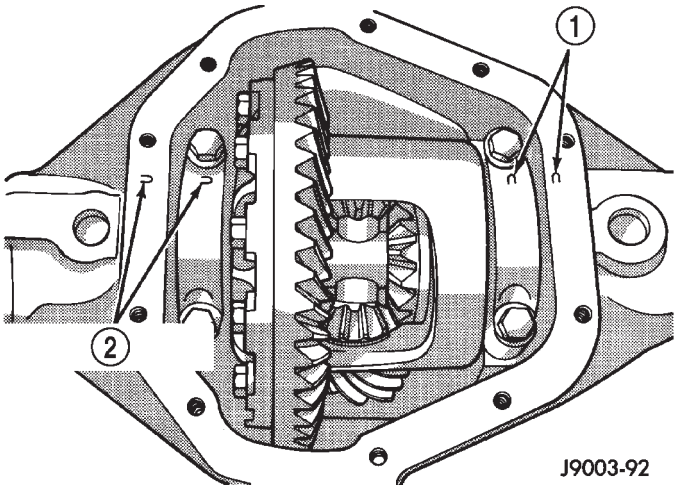

Fig. 50 BEARING CAP REFERENCE

1 - REFERENCE LETTERS
2 - REFERENCE LETTERS

(7) Loosely install differential bearing cap bolts.
(8) Remove axle housing spreader.
(9) Tighten the bearing cap bolts to 64-91 N·m (47-67 ft. lbs.).
(10) Install the axle shafts.
(11) Apply a 6.35mm (1/4 in.) bead of red Mopar Silicone Rubber Sealant or equivalent to the housing cover (Fig. 51).

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

(12) Install the cover and tighten cover bolts in a criss-cross pattern to 38-45 N·m (28-33 ft. lbs.).
(13) Refill the differential with lubricant and install fill plug.
(14) Remove support and lower the vehicle.

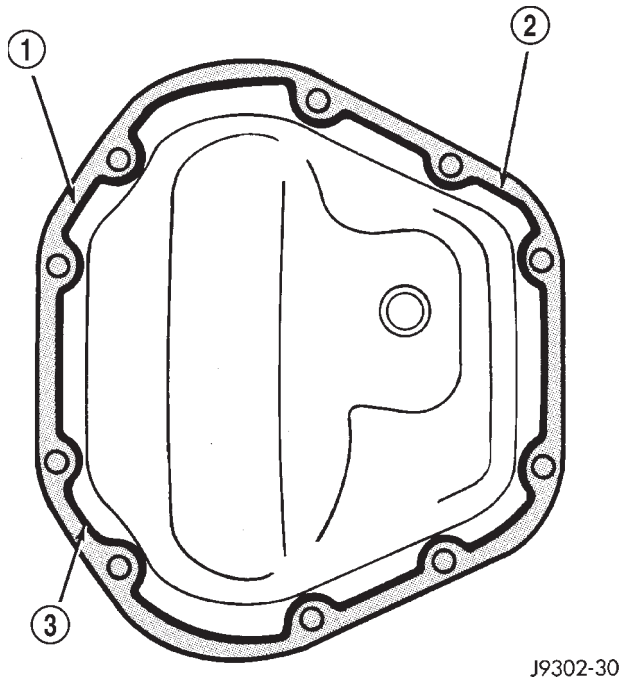

Fig. 51 DIFFERENTIAL COVER - TYPICAL

1 - SEALING SURFACE
2 - SEALANT BEAD
3 - SEALANT THICKNESS

DIFFERENTIAL - TRAC-LOK

DIAGNOSIS AND TESTING - TRAC-LOK®

The most common problem is a chatter noise when turning corners. Before removing the unit for repair, drain, flush and refill the axle with the specified lubricant. A container of Mopar Trac-lok® Lubricant (friction modifier) should be added after repair service or during a lubricant change.

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

DIFFERENTIAL TEST

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

(1) Place blocks in front and rear of both front wheels.
(2) Raise one rear wheel until it is completely off the ground.
(3) Engine off, transmission in neutral, and parking brake off.
(4) Remove wheel and bolt Special Tool 6790 or equivalent tool to studs.
(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 52).
(6) If rotating torque is less than 41 N·m (56 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

DIFFERENTIAL - TRAC-LOK (Continued)

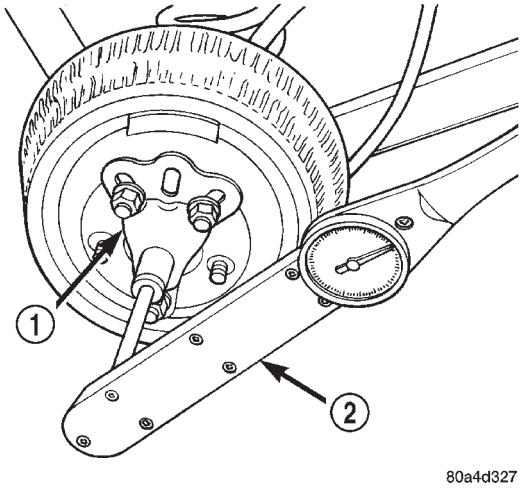

Fig. 52 ROTATING TORQUE TEST

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

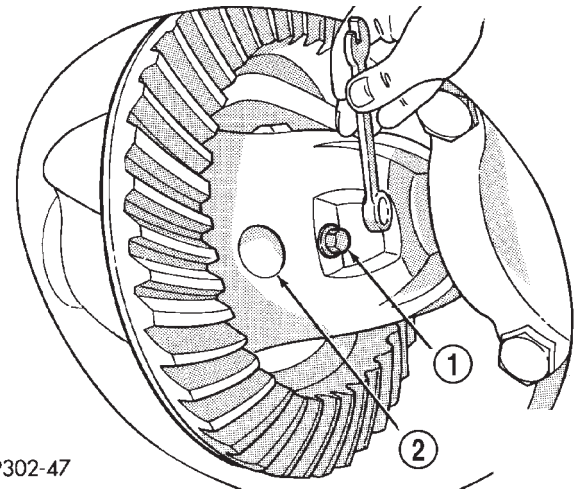

Fig. 54 MATE SHAFT LOCK SCREW

1 - LOCK SCREW
2 - PINION GEAR MATE SHAFT

DISASSEMBLY

(1) Clamp side gear Fixture 6965 in a vise and set differential case on the fixture (Fig. 53).

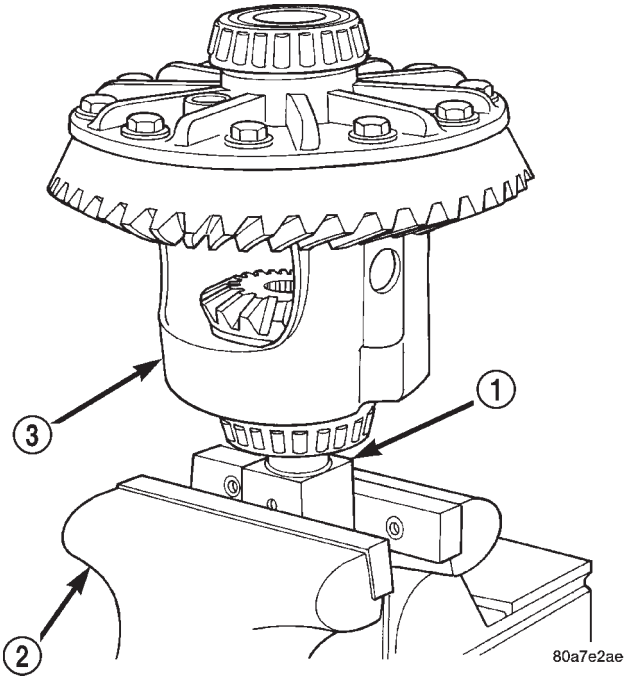

Fig. 53 DIFFERENTIAL CASE FIXTURE

1 - HOLDING FIXTURE
2 - VISE
3 - DIFFERENTIAL

(2) Remove ring gear if the ring gear is to be replaced. The Trac-lok® differential can be serviced with the ring gear installed.

(3) Remove pinion gear mate shaft lock screw (Fig. 54).

(4) Remove pinion gear mate shaft with a drift and hammer.

(5) Install and lubricate Step Plate 6960-3 (Fig. 55).

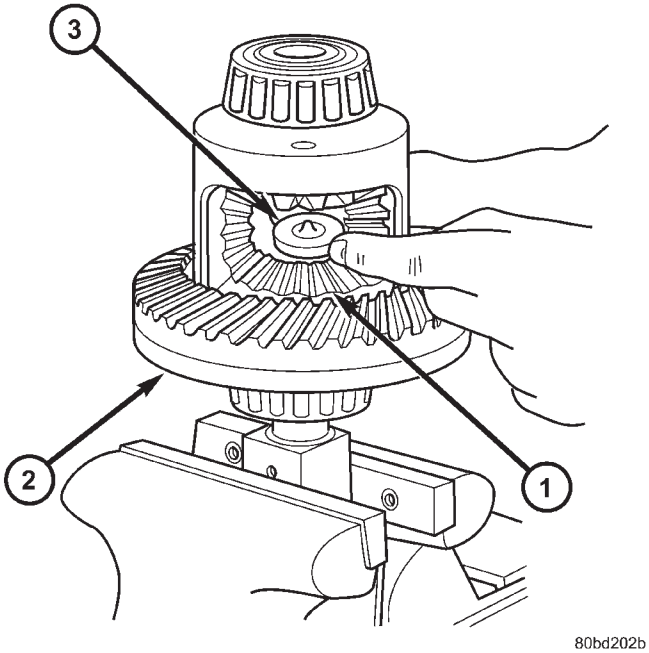

Fig. 55 Step Plate

1 - LOWER SIDE GEAR
2 - DIFFERENTIAL CASE
3 - STEP PLATE

DIFFERENTIAL - TRAC-LOK (Continued)

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

(7) Position a small screw driver in slot of Threaded Adapter Disc 6960-3 (Fig. 56) to prevent adapter from turning.

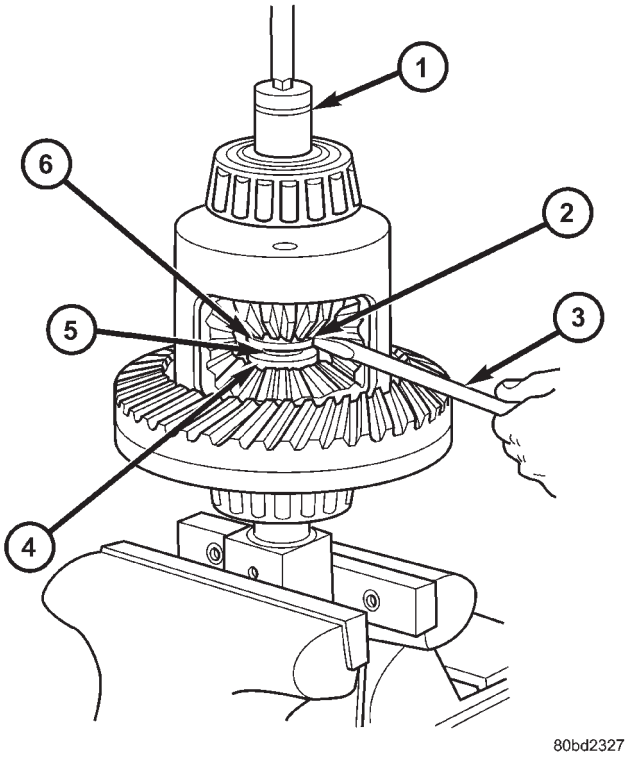

Fig. 56 THREAD ADAPTER DISC

1 - SOCKET
2 - SLOT IN ADAPTER
3 - SCREWDRIVER
4 - STEP PLATE
5 - THREADED ROD
6 - ADAPTER DISC

(8) Install Forcing Screw 6960-4 and tighten screw to 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 57).

(9) With a feeler gauge remove thrust washers from behind the pinion gears (Fig. 58).

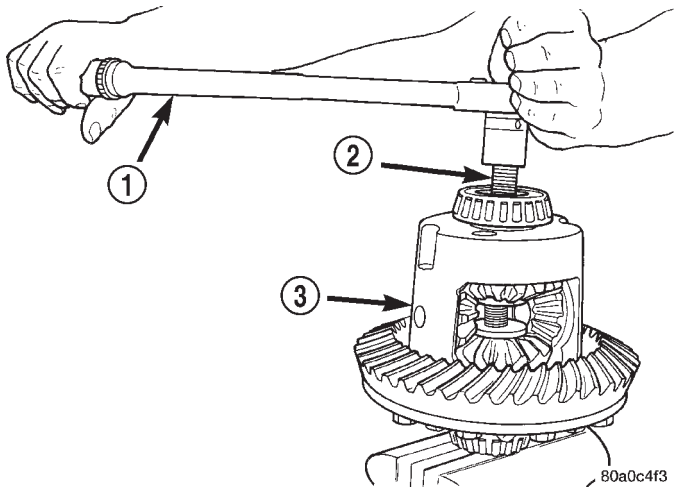

Fig. 57 COMPRESS BELLEVILLE SPRING

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

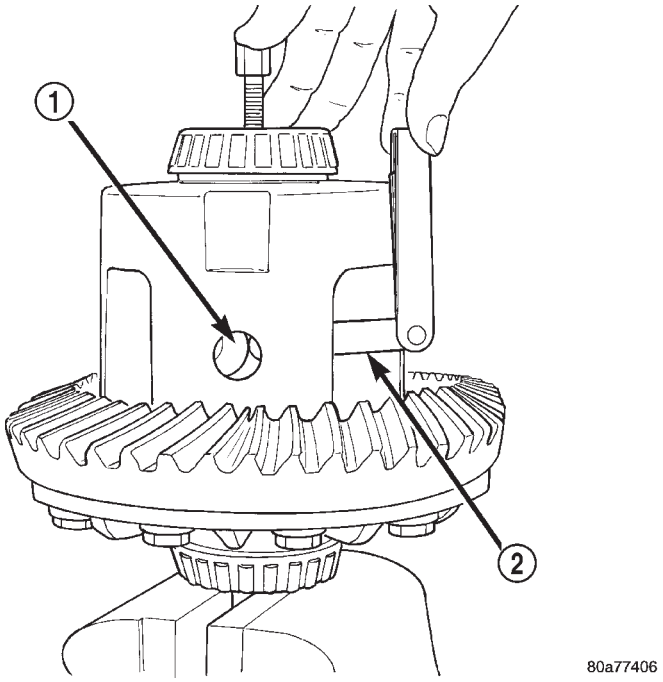

Fig. 58 PINION GEAR THRUST WASHER

1 - THRUST WASHER
2 - FEELER GAUGE

DIFFERENTIAL - TRAC-LOK (Continued)

(10) Insert Turning Bar 6960-2 into the pinion mate shaft hole in the case (Fig. 59).

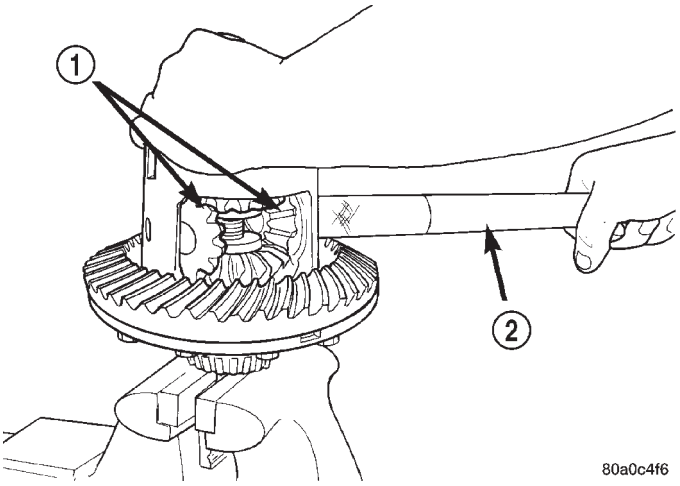

Fig. 59 PINION GEARS

1 - PINION GEARS
2 - TURNING BAR

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

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

(13) Remove pinion gears from differential case.

(14) Remove Forcing Screw, Step Plate and Threaded Adapter.

(15) Remove top side gear, clutch pack retainer and clutch pack. Keep plates in order during removal (Fig. 60).

(16) Remove differential case from the Holding Fixture. Remove side gear, clutch pack retainer and clutch pack. Keep plates in order during removal.

CLEANING

Clean all components in cleaning solvent and dry components with compressed air.

INSPECTION

Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears for cracks chips or damage and replace as necessary. Inspect differential case and pinion shaft and replace if worn or damaged.

ASSEMBLY

NOTE: New Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

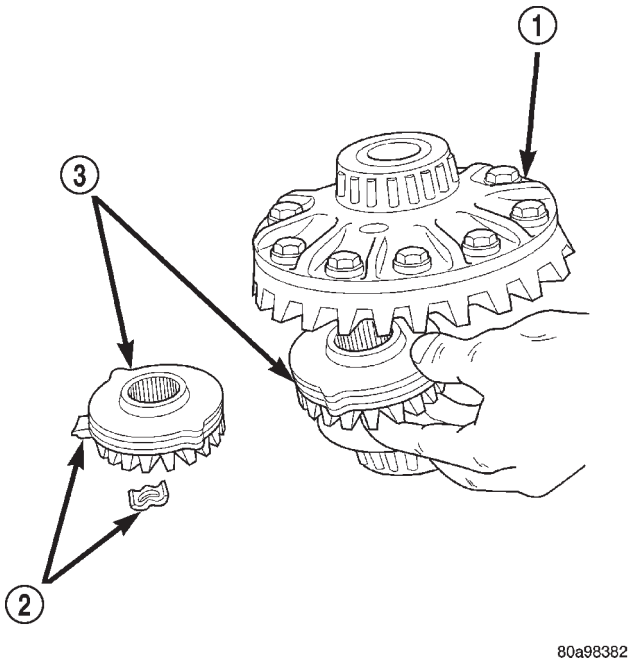

Fig. 60 SIDE GEARS AND CLUTCH DISCS

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

(1) Lubricate components with gear lubricant.

(2) Assemble clutch discs into packs and secure disc packs with retaining clips (Fig. 61).

NOTE: Dished plate is position with the convex side against the side gear.

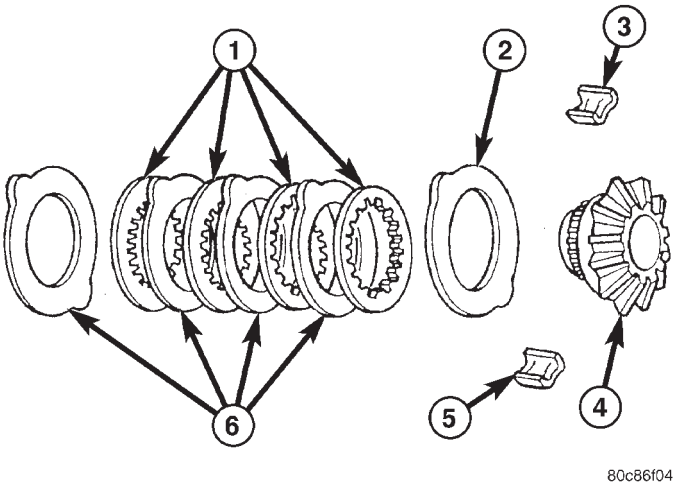

Fig. 61 CLUTCH PACK

1 - DISCS
2 - DISHED PLATE
3 - RETAINER
4 - SIDE GEAR
5 - RETAINER
6 - PLATES

DIFFERENTIAL - TRAC-LOK (Continued)

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

(4) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 62).**Verify clutch pack retaining clips are in position and seated in the case pockets.**

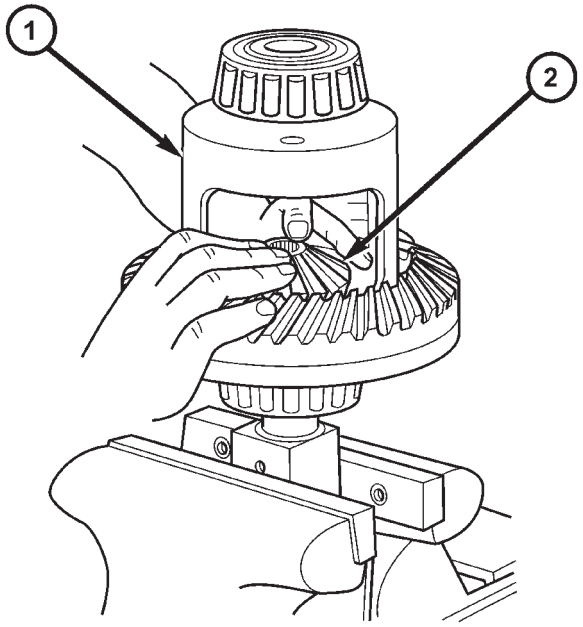

Fig. 62 CLUTCH PACK AND LOWER SIDE GEAR

1 - DIFFERENTIAL CASE
2 - SIDE GEAR AND CLUTCH PACK

(5) Position the differential case on the Holding Fixture 6965.

(6) Install lubricated Step Plate 6960-3 in lower side gear (Fig. 63).

(7) Install the upper side gear and clutch disc pack (Fig. 63).

(8) Hold assembly in position. Insert Threaded Adapter 6960-1 into top side gear.

(9) Install Forcing Screw 6960-4 and tighten screw to slightly compress clutch disc.

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

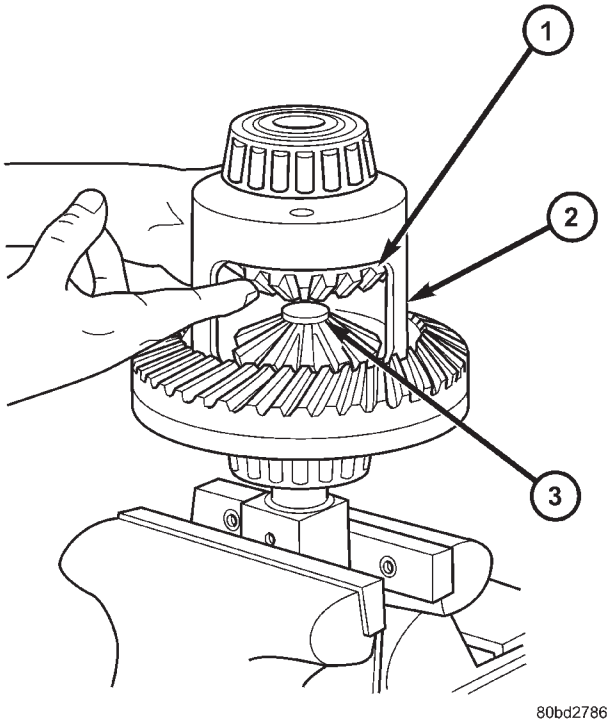

Fig. 63 CLUTCH PACK AND UPPER SIDE GEAR

1 - SIDE GEAR AND CLUTCH PACK
2 - DIFFERENTIAL CASE
3 - STEP PLATE

(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.

(13) Lubricate and install thrust washers behind pinion gears and align washers with a small screw driver. Insert mate shaft into each pinion gear to verify alignment.

(14) Remove Forcing Screw, Step Plate and Threaded Adapter.

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

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

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

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove differential case from axle housing.
(2) Remove side bearings from the differential case with Puller/Press C-293-PA, Adapters 8352 and Plug SP-3289 (Fig. 64).

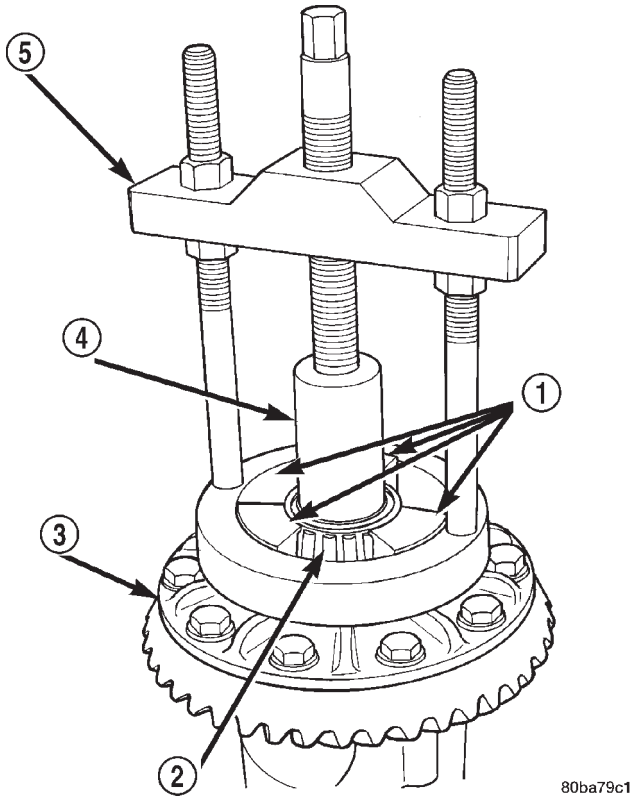

Fig. 64 DIFFERENTIAL CASE BEARING

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

INSTALLATION

NOTE: If differential side bearings or differential case are replaced, differential side bearing shim requirements may change. Refer to Adjustments (Differential Bearing Preload and Gear Backlash) for procedures.

(1) Install differential side bearings with Installer C-3716-A and Handle C-4171 (Fig. 65).
(2) Install differential case in housing.
(3) Remove support and lower vehicle.

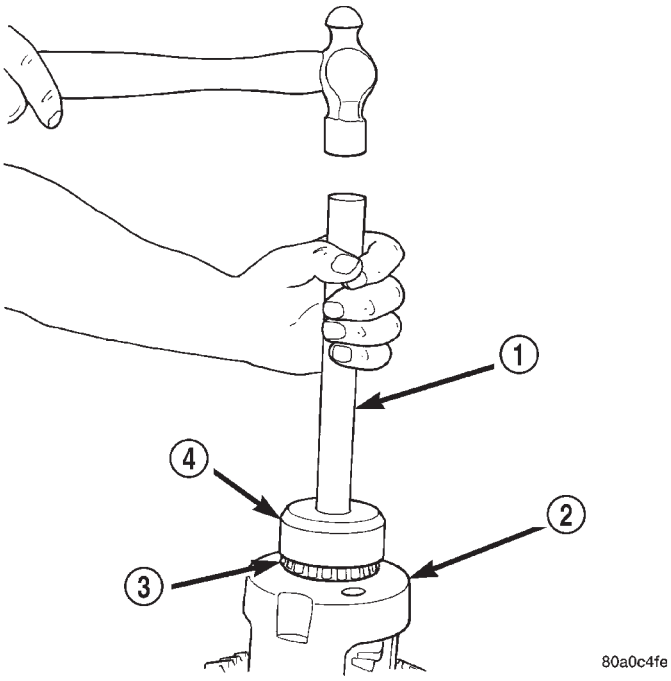

Fig. 65 DIFFERENTIAL CASE BEARINGS

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

PINION GEAR/RING GEAR/ TONE RING

REMOVAL

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

(1) Raise and support vehicle.
(2) Mark pinion yoke and propeller shaft for installation reference.
(3) Disconnect propeller shaft from pinion yoke and tie shaft to underbody.
(4) Remove differential from housing.
(5) Place differential case in a vise with soft metal jaw.
(6) Remove bolts holding ring gear to differential case.

PINION GEAR/RING GEAR/TONE RING (Continued)

(7) Drive ring gear from differential case with a rawhide hammer (Fig. 66).

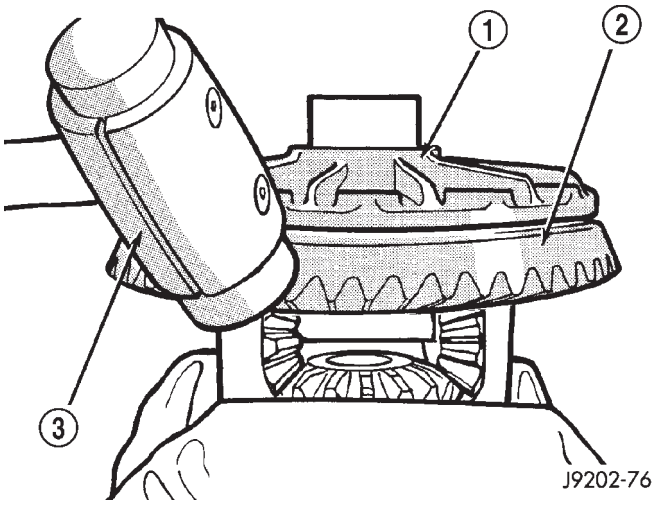

Fig. 66 RING GEAR

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

(8) Hold pinion yoke with Spanner Wrench 6958 and remove pinion yoke nut and washer (Fig. 67).

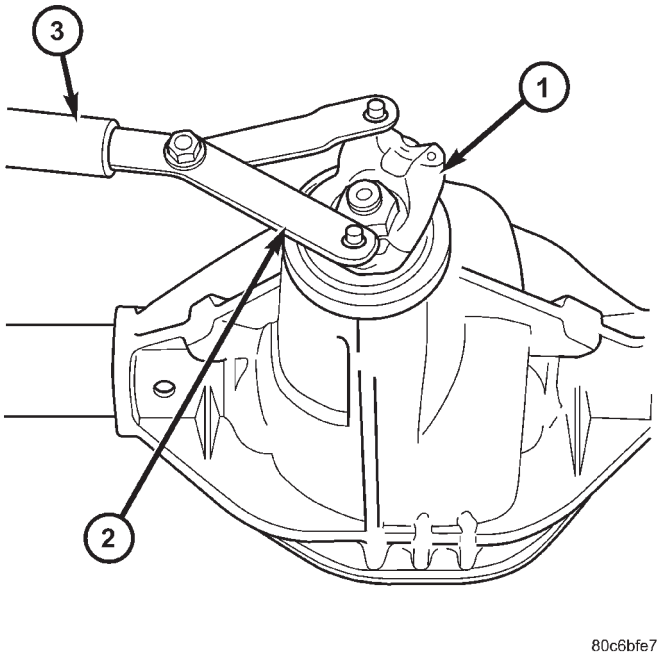

Fig. 67 YOKE SPANNER WRENCH

1 - PINION YOKE
2 - WRENCH
3 - PIPE

(9) Remove pinion yoke from pinion shaft with Remover C-452 and Wrench C-3281 (Fig. 68).

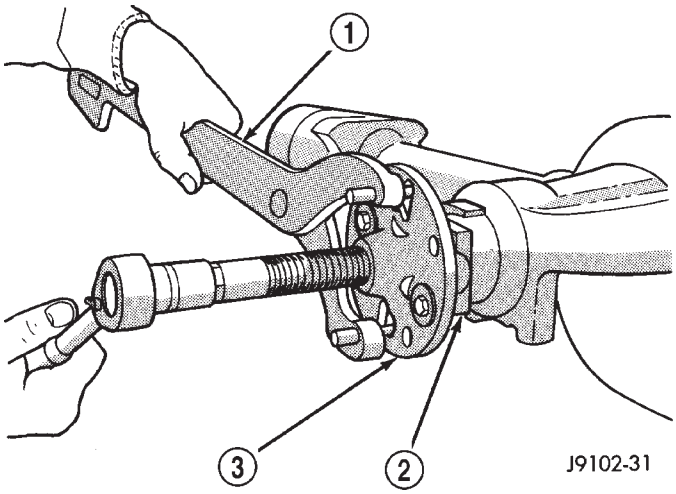

Fig. 68 PINION YOKE REMOVER

1 - WRENCH
2 - YOKE
3 - REMOVER

(10) Remove pinion gear from housing (Fig. 69).

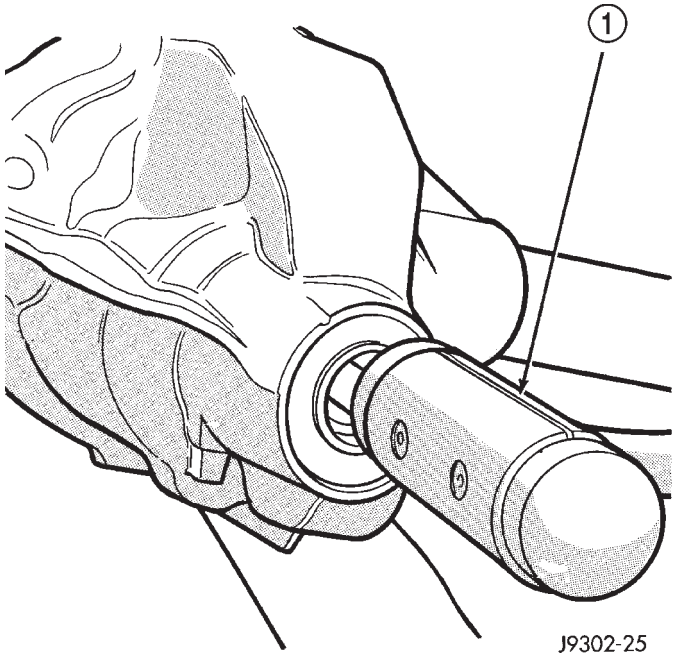

Fig. 69 PINION GEAR

1 - RAWHIDE HAMMER

PINION GEAR/RING GEAR/TONE RING (Continued)

(11) Remove pinion seal with Remover 7794-A and a slide hammer (Fig. 70).

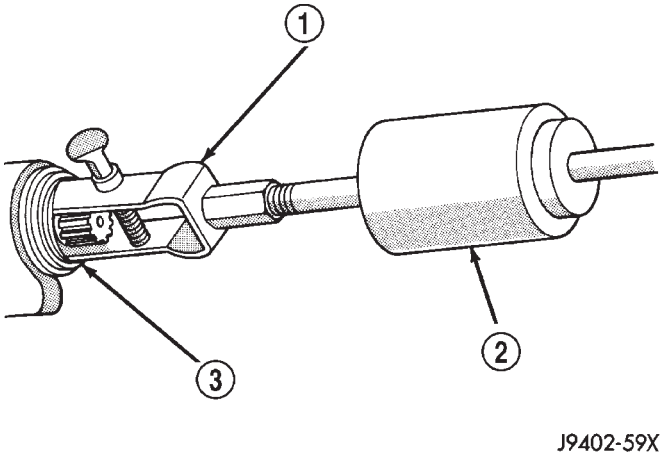

Fig. 70 PINION SEAL REMOVER

1 - REMOVER
2 - SLIDE HAMMER
3 - PINION SEAL

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

(13) Remove front pinion bearing cup with Remover D-103 and Handle C-4171 (Fig. 71).

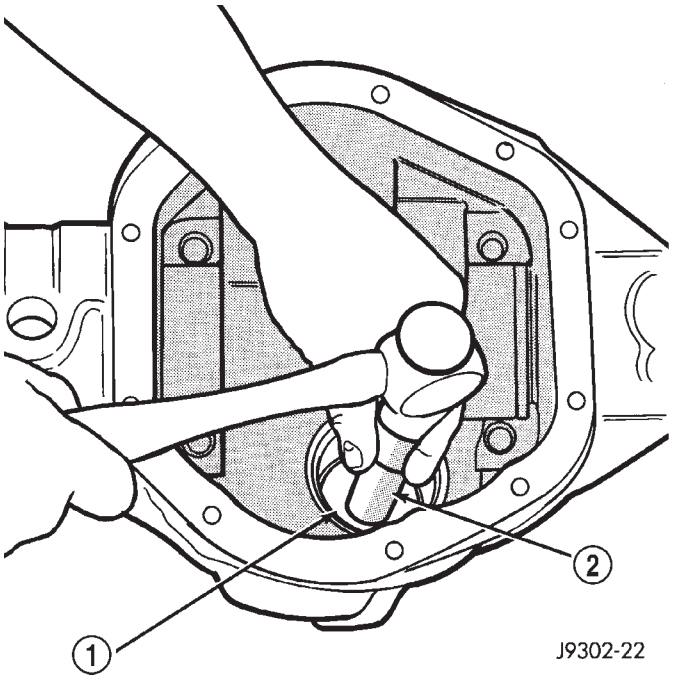

Fig. 71 FRONT PINION BEARING CUP

1 - REMOVER
2 - HANDLE

(14) Remove rear bearing cup from housing (Fig. 72) with Remover D-149 and Handle C-4171.

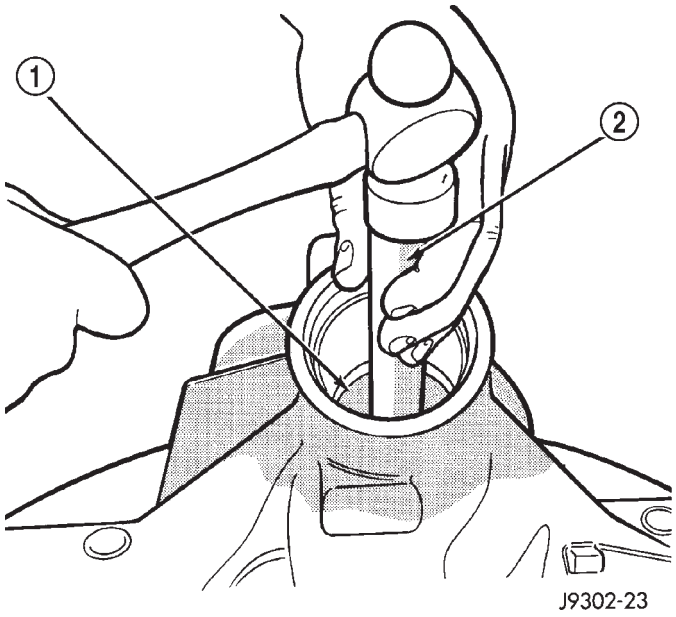

Fig. 72 REAR PINION BEARING CUP

1 - DRIVER
2 - HANDLE

(15) Remove collapsible preload spacer (Fig. 73).

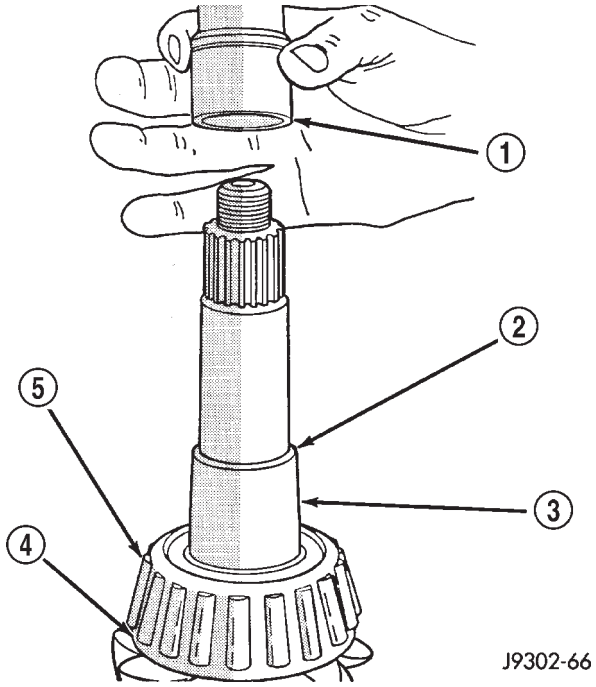

Fig. 73 COLLAPSIBLE SPACER

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

PINION GEAR/RING GEAR/TONE RING (Continued)

(16) Remove rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-39 (Fig. 74).

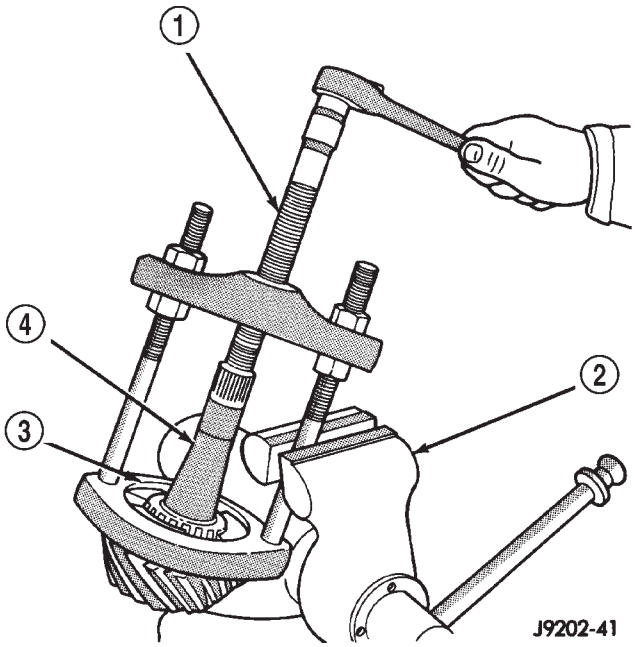

Fig. 74 REAR PINION BEARING PULLER

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

(17) Remove depth shims from pinion gear shaft and record shim thickness.

INSTALLATION

NOTE: A pinion depth shim/oil slinger is placed between the rear pinion bearing cone and the pinion head to achieve proper ring gear and pinion mesh. If ring gear and pinion are reused, the pinion depth shim/oil slinger should not require replacement. Refer to Adjustment (Pinion Gear Depth) to select the proper thickness shim/oil slinger if ring and pinion gears are replaced.

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

(2) Install pinion rear bearing cup with Installer C-146 and Driver Handle C-4171 (Fig. 75) and verify cup is seated.

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

(4) Install pinion front bearing cup with Installer D-130 and Handle C-4171 (Fig. 76) and verify cup is seated.

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

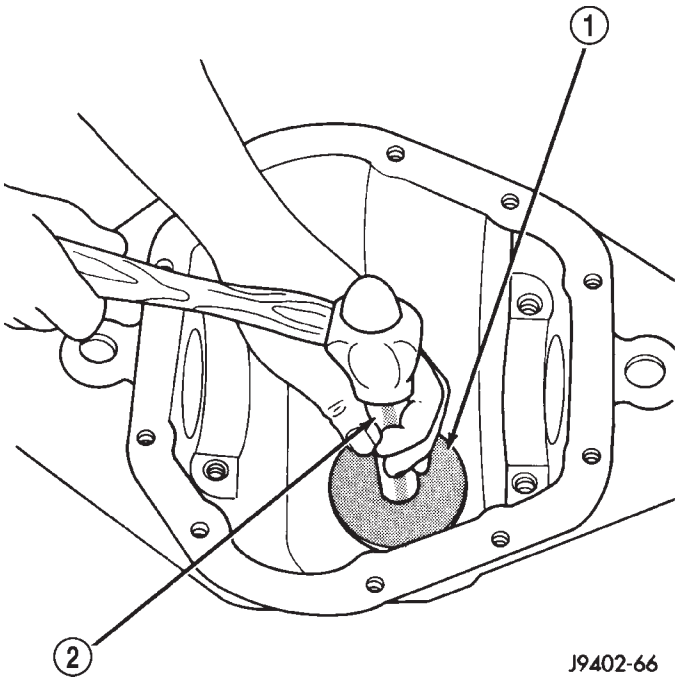

Fig. 75 REAR PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

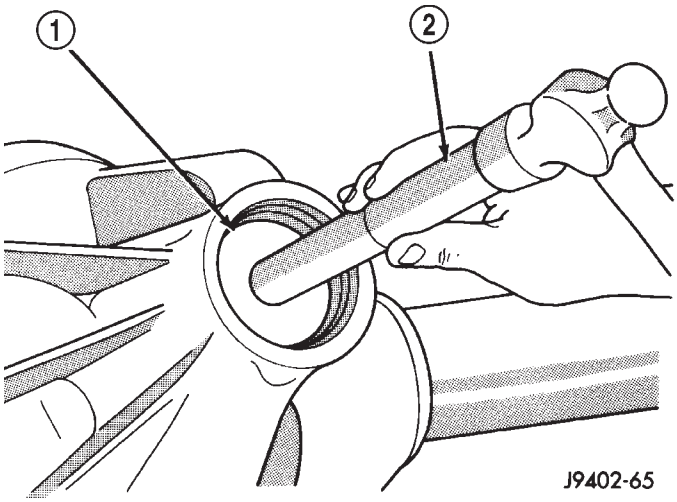

Fig. 76 FRONT PINION BEARING CUP

1 - INSTALLER
2 - HANDLE

PINION GEAR/RING GEAR/TONE RING (Continued)

(6) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with an appropriate installer (Fig. 77).

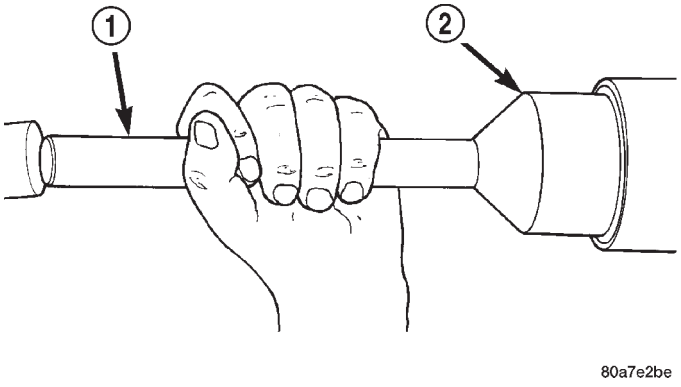

Fig. 77 PINION SEAL INSTALLER

1 - HANDLE
2 - INSTALLER

(7) Install pinion depth shim on the pinion gear.

(8) Install rear bearing on the pinion gear with Installer W-262 and a press (Fig. 78).

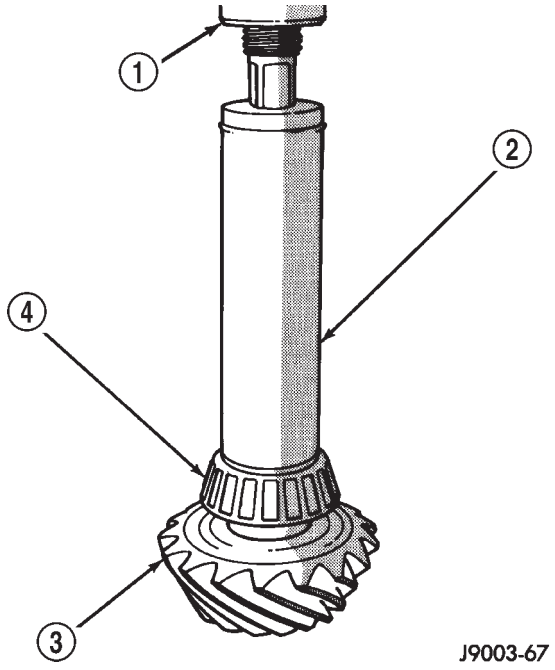

Fig. 78 REAR PINION BEARING

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

(9) Install a **new** collapsible preload spacer on pinion shaft and install pinion gear in the housing (Fig. 79).

(10) Install yoke with Installer C-3718 and Spanner Wrench 6958 (Fig. 80).

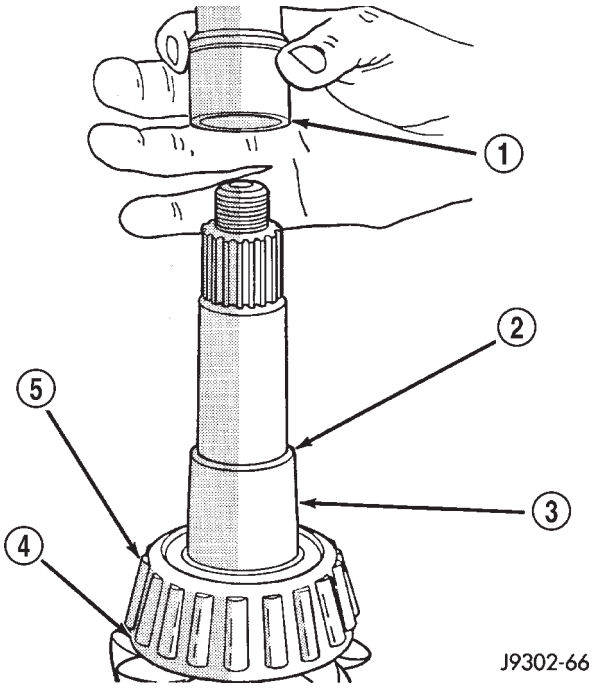

Fig. 79 COLLAPSIBLE SPACER

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

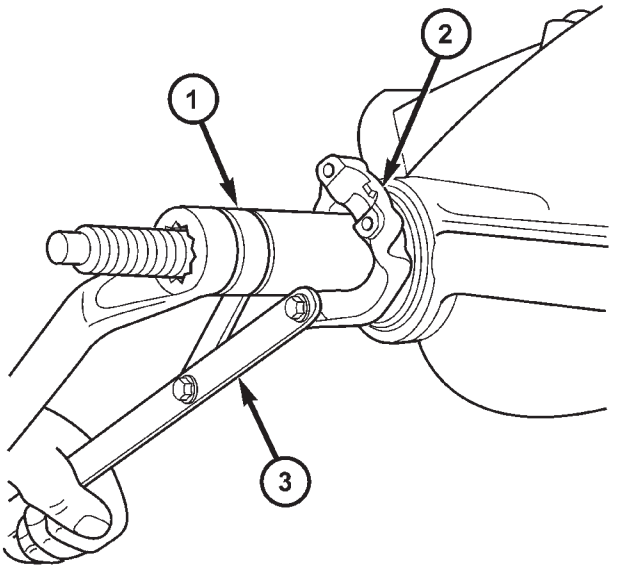

Fig. 80 PINION YOKE INSTALLER

1 - INSTALLER
2 - PINION YOKE
3 - WRENCH

PINION GEAR/RING GEAR/TONE RING (Continued)

(11) Install the yoke washer and a new nut on the pinion gear and tighten the pinion nut until there is zero bearing end-play.

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

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

(13) Using Spanner Wrench 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), (Fig. 81) slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque is achieved.

CAUTION: Measure torque to rotate frequently to avoid over crushing the collapsible spacer.

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

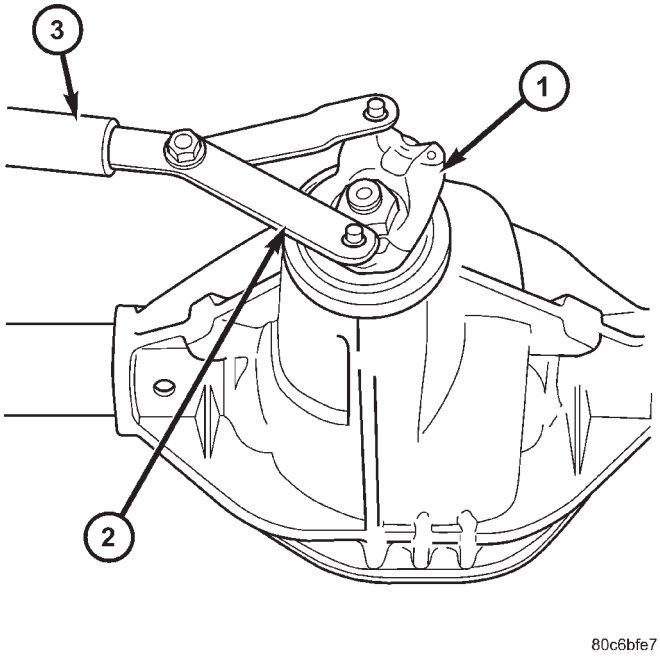

Fig. 81 YOKE SPANNER WRENCH

1 - PINION YOKE
2 - WRENCH
3 - PIPE

(14) Check pinion torque to rotate with a inch pound torque wrench (Fig. 82). The pinion torque to rotate should be:

- Original Bearings: 1 to 2.25 N·m (10 to 20 in. lbs.).
- New Bearings: 1.69 to 2.82 N·m (15 to 25 in. lbs.).

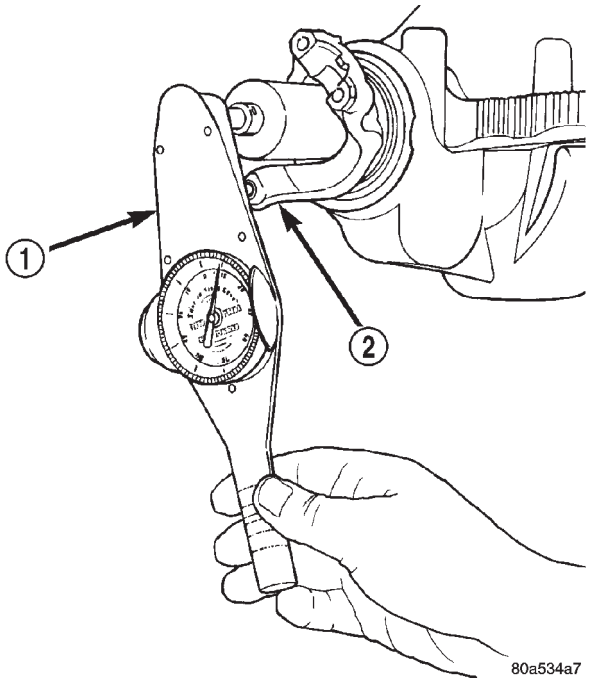

Fig. 82 PINION GEAR ROTATING TORQUE

1 - TORQUE WRENCH
2 - PINION YOKE

PINION GEAR/RING GEAR/TONE RING (Continued)

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

(16) Invert the differential case in the vise.

(17) Install **new** ring gear bolts and alternately tighten to 129-142 N·m (95-105 ft. lbs.) (Fig. 83).

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

(18) Install differential in housing.

(19) Verify differential bearing preload, gear mesh and contact pattern. Refer to Ajustments for procedure.

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

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

(22) Remove supports and lower vehicle.

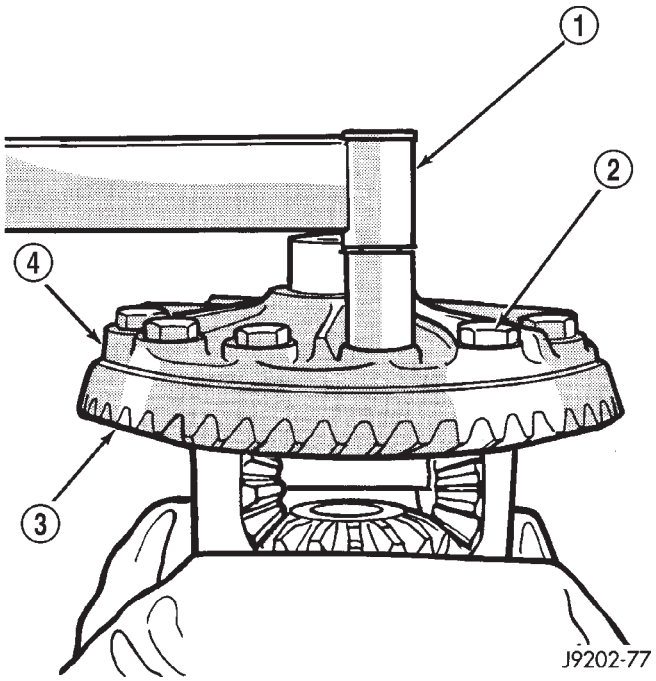

Fig. 83 RING GEAR

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

REAR AXLE - 8 1/4

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REAR AXLE - 8 1/4

DESCRIPTION

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

The differential cover provides a means for inspection and service without removing the complete axle from the vehicle. A vent hose is used to relieve internal pressure caused by lubricant vaporization and internal expansion.

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

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.

REAR AXLE - 8 1/4 (Continued)

STANDARD DIFFERENTIAL

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).

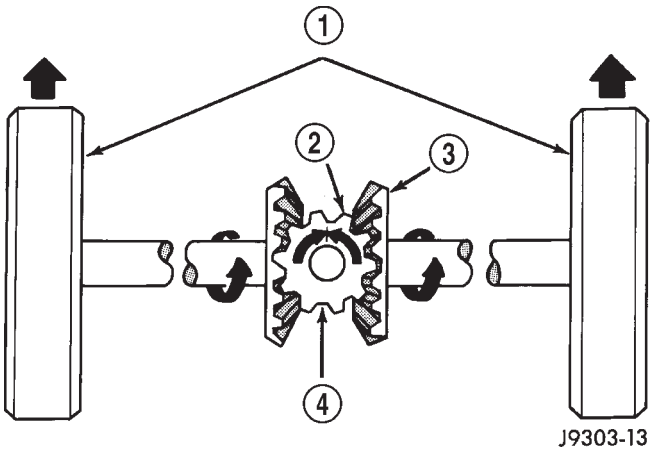


Fig. 1 Differential Operation - Straight Ahead Driving

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.

TRAC-LOK® DIFFERENTIAL

This differentials 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. 3).

This design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel looses traction, the clutch packs transfer additional torque to the wheel having the most traction. This differential resist wheel spin on bumpy roads and provide more pulling power when one wheel looses

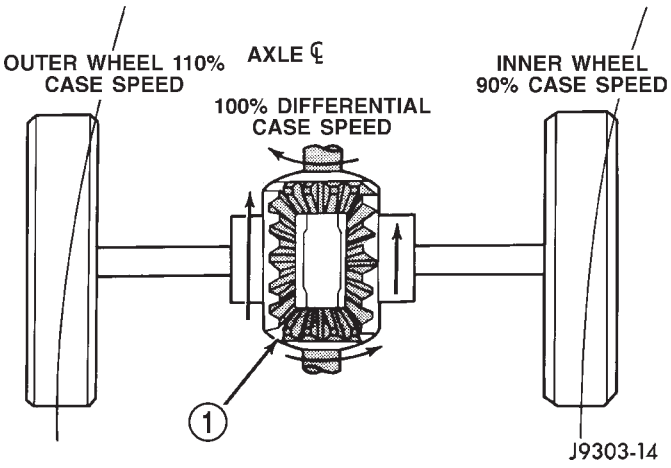


Fig. 2 Differential Operation - On Turns

1 - PINION GEARS ROTATE ON PINION SHAFT

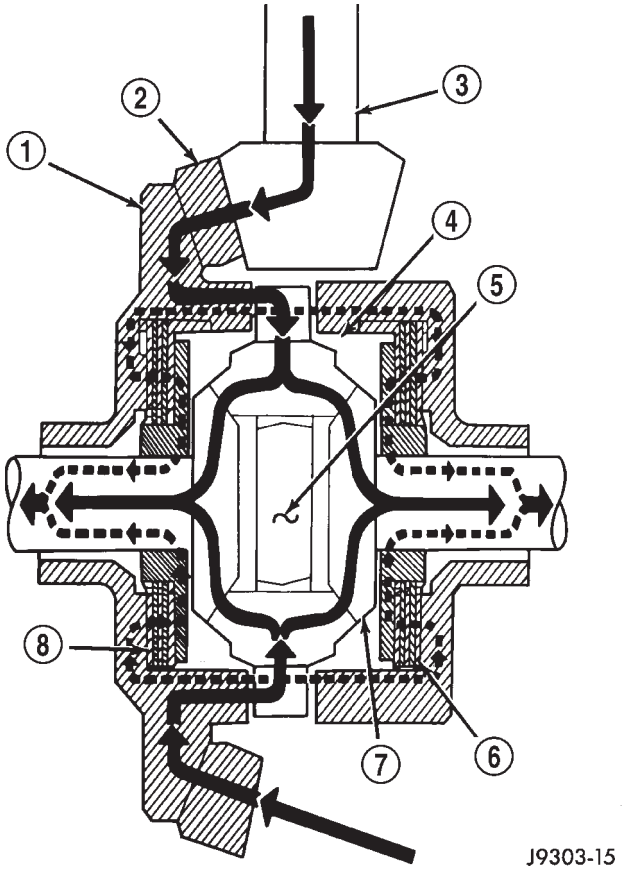


Fig. 3 Trac-lok® Limited Slip Differential

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

traction. Pulling power is provided continuously until both wheels loose 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 - AXLE

GEAR NOISE

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

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

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

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

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

BEARING NOISE

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

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

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

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

LOW SPEED KNOCK

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

VIBRATION

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

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

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

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

DRIVELINE SNAP

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

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

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

REAR AXLE - 8 1/4 (Continued)

DIAGNOSTIC CHART

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

REAR AXLE - 8 1/4 (Continued)

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

REAR AXLE - 8 1/4 (Continued)

REMOVAL

(1) Raise and support the vehicle.
(2) Position a lift/jack under the axle and secure axle to device.
(3) Remove wheels and tires.
(4) Mark propeller shaft and pinion yoke for installation reference.
(5) Remove propeller shaft and suspend under the vehicle.
(6) Remove brake drums, parking brake cables and speed sensor from the axle.
(7) Disconnect the brake hose at the body junction block.
(8) Remove brakes and backing plates.
(9) Remove vent hose from the axle shaft tube.
(10) Remove the stabilizer bar (Fig. 4).

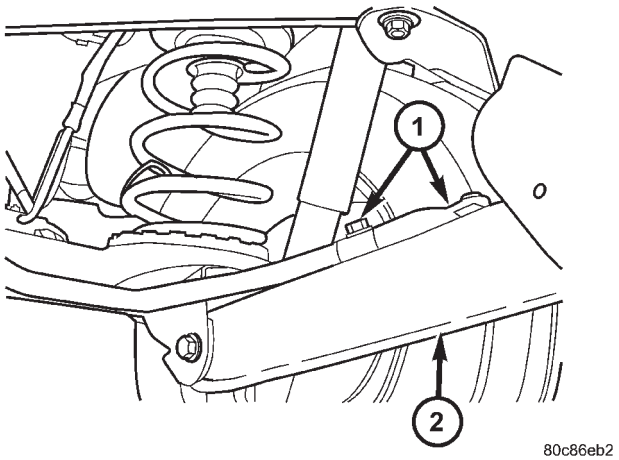


Fig. 4 STABILIZER BAR MOUNTS

1 - STABILIZER BAR MOUNTING BOLTS
2 - LOWER SUSPENSION ARM

(11) Remove upper control arm ball joint pinch bolt from bracket (Fig. 5).
(12) Remove shock absorbers from axle brackets (Fig. 6).
(13) Loosen all lower control arms mounting bolts (Fig. 7).
(14) Lower axle enough to remove coil springs and spring insulators.
(15) Remove lower control arm bolts from the axle brackets.
(16) Lower and remove the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before the lower control arms are tightened. This must be done to maintain vehicle ride height and prevent premature bushing failure.

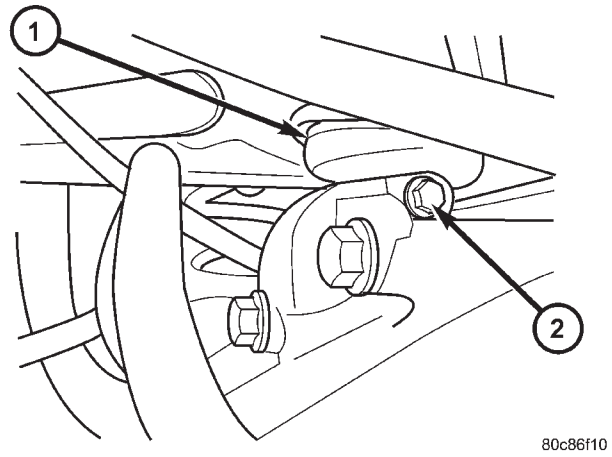


Fig. 5 BALL JOINT PINCH BOLT

1 - UPPER BALL JOINT
2 - PINCH BOLT

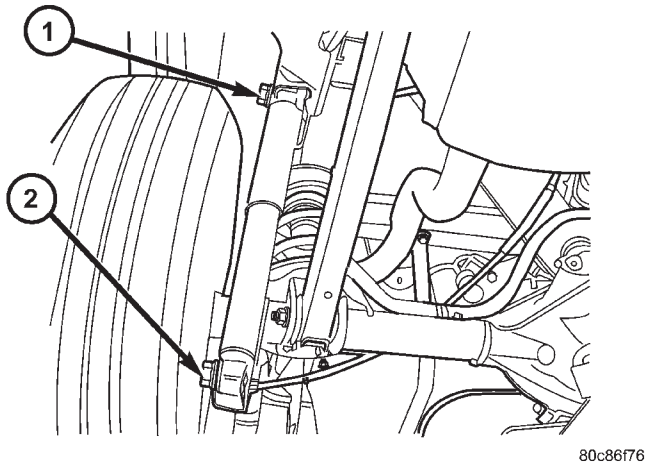


Fig. 6 SHOCK ABSORBER

1 - UPPER MOUNTING BOLT
2 - LOWER MOUNTING BOLT

(1) Raise the axle under the vehicle.
(2) Install lower control arms onto the axle brackets and loosely install the mounting bolts.
(3) Install coil spring isolators and spring.
(4) Raise axle up until springs are seated.
(5) Install upper control arm ball joint into axle bracket and tighten pinch bolt to torque specification.
(6) Install shock absorbers and tighten nuts to torque specification.
(7) Install stabilizer bar and tighten nuts to torque specification.
(8) Install brake backing plates, parking brake cables, brake drums and speed sensor.
(9) Install brake hose to the body junction block and bleed the brakes.

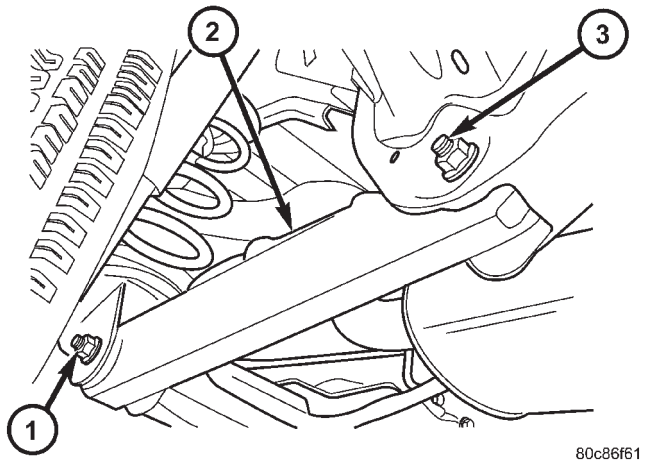


Fig. 7 LOWER SUSPENSION ARM

1 - AXLE BRACKET BOLT
2 - LOWER CONTROL ARM
3 - BODY BRACKET BOLT

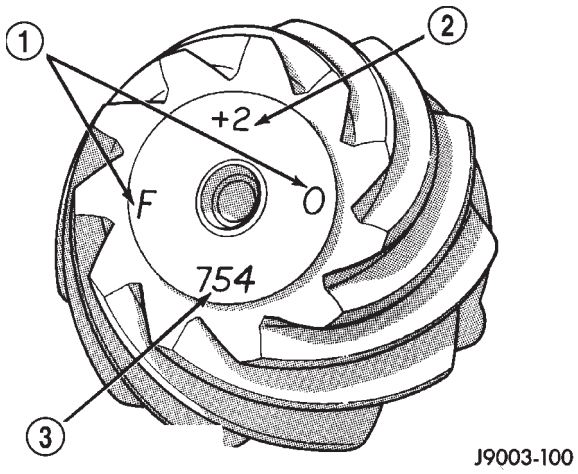


Fig. 8 Pinion Gear ID Numbers - Typical

1 - PRODUCTION NUMBERS
2 - DRIVE PINION GEAR DEPTH VARIANCE
3 - GEAR MATCHING NUMBER (SAME AS RING GEAR NUMBER)

(10) Install axle vent hose.
(11) Install propeller shaft with reference marks.
(12) Install the wheels and tires.
(13) Add gear lubricant to specifications, if necessary.
(14) Remove lifting device from axle and lower the vehicle.
(15) Tighten the lower control arm bolts to torque specification.

ADJUSTMENTS

Ring gears and pinions are supplied as matched sets only. The identifying numbers for the ring gear and pinion are etched/marked onto each gear (Fig. 8). A plus (+) number, minus (–) number or zero (0) is etched/marked on the face or shaft of the pinion. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard depth provides the best gear tooth 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. 9).

If a new gear set is being installed, note the depth variance etched into 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.

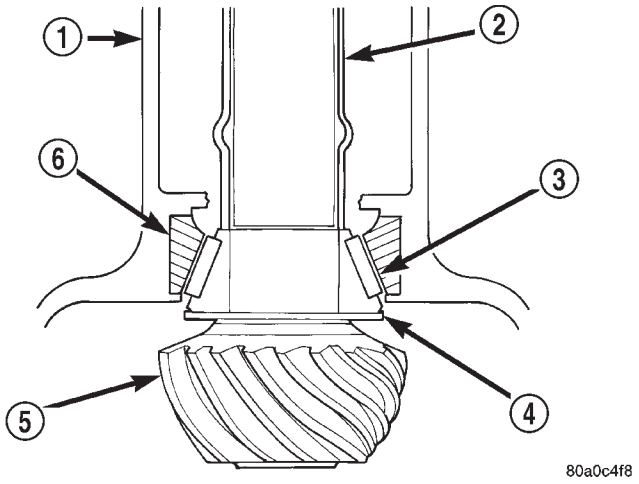


Fig. 9 Adjustment Shim Locations

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

Note the etched number on the face of the pinion gear head (–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.

REAR AXLE - 8 1/4 (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

PINION DEPTH MEASUREMENT

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

(1) Assemble Pinion Height Block 6739, Pinion Block 8540 and rear pinion bearing onto Screw 6741 (Fig. 10).

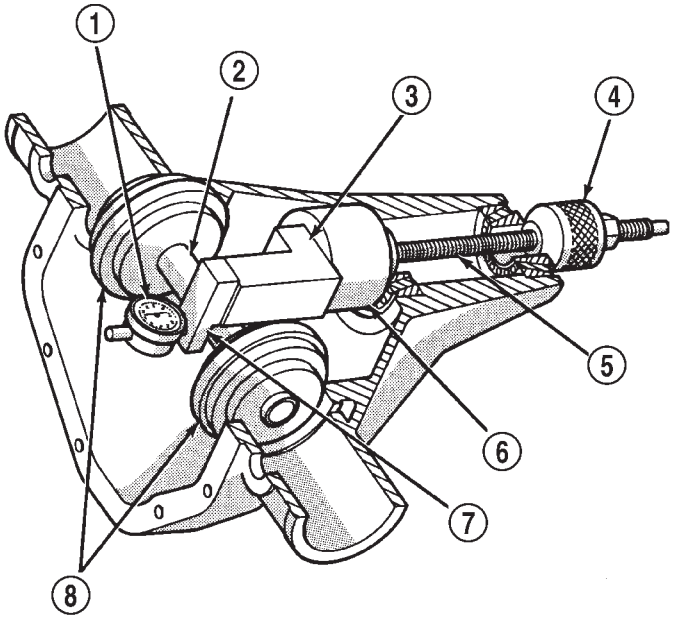


Fig. 10 Pinion Depth Gauge Tools

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

(2) Insert assembled height gauge components, rear bearing, and screw into the housing through pinion bearing cups (Fig. 11).

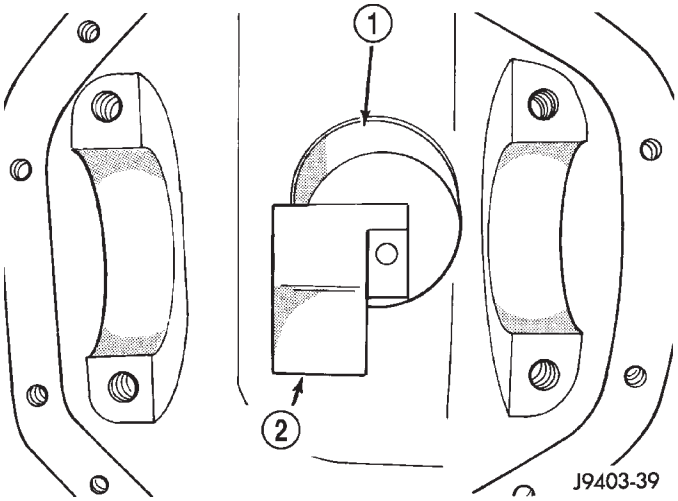


Fig. 11 Pinion Height Block

1 - PINION BLOCK
2 - PINION HEIGHT BLOCK

(3) Install front pinion bearing and Cone-Nut 6740 hand tight (Fig. 10).

(4) Place Arbor Disc 8541 on Arbor D-115-3 in position in the housing side bearing cradles (Fig. 12). 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.

REAR AXLE - 8 1/4 (Continued)

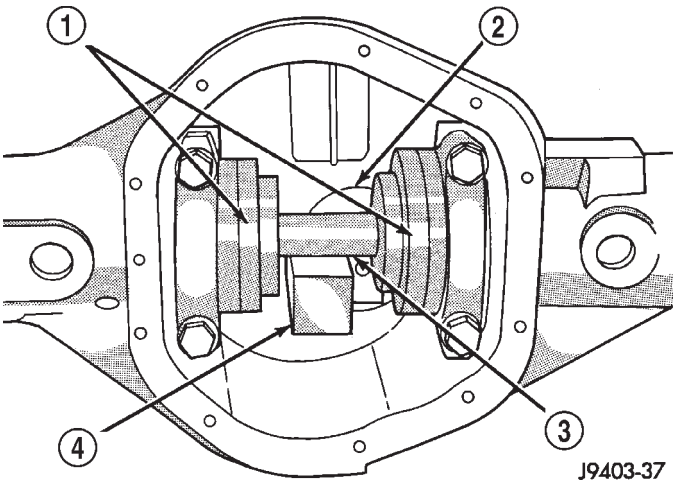


Fig. 12 Gauge Tools In Housing

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

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

(7) Slowly slide the scooter block across the pinion height block over to the arbor (Fig. 13). Move the scooter block till the dial indicator probe crests the arbor, then record the highest reading.

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

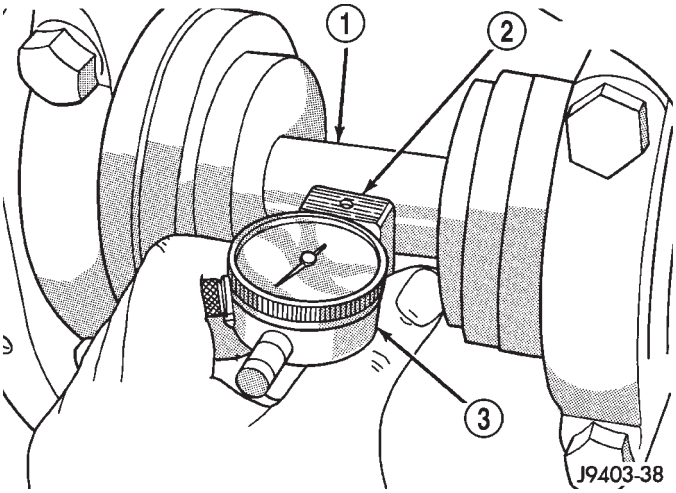


Fig. 13 Pinion Gear Depth Measurement

1 - ARBOR
2 - SCOOTER BLOCK
3 - DIAL INDICATOR

BEARING PRELOAD AND GEAR BACKLASH

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

- The maximum ring gear backlash variation is 0.076 mm (0.003 inch).
- 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) Adjust each threaded adjuster inward with Wrench C-4164 until the differential bearing free-play is eliminated (Fig. 14). Allow some ring gear backlash, approximately 0.25 mm (0.01 in.) between the ring and pinion gear. Seat the bearing cups with the procedure described above.

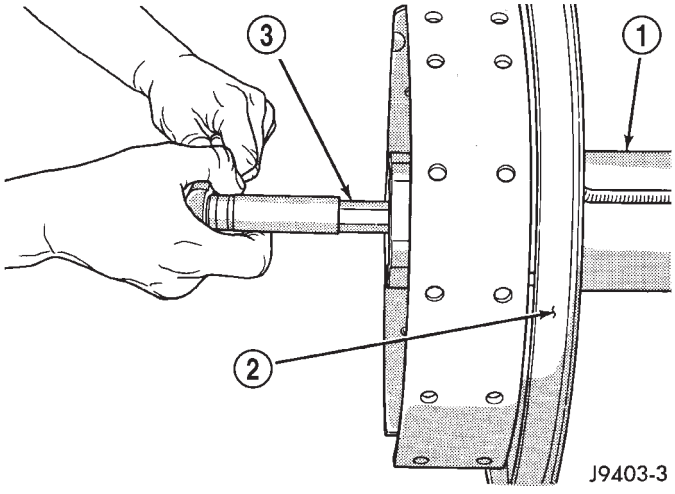


Fig. 14 Threaded Adjuster

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

(2) Install dial indicator and position the plunger against the drive side of a ring gear tooth (Fig. 15). Measure the backlash at 4 positions (90 degrees apart) around the ring gear. Locate and mark the area of minimum backlash.

(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.

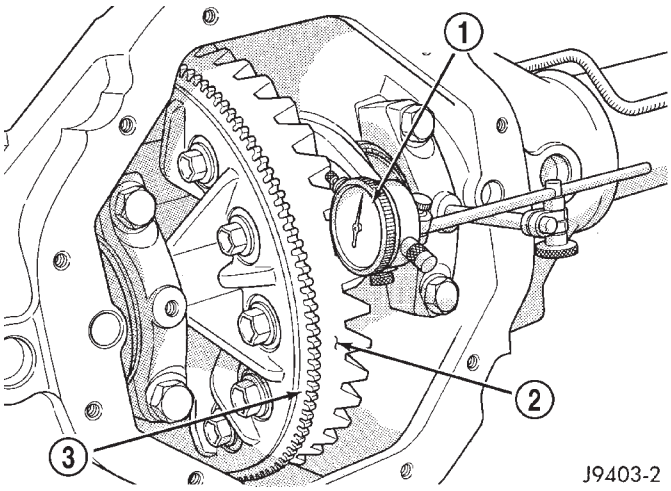


Fig. 15 Ring Gear Backlash

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

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

(5) Tighten the differential bearing cap bolts in a criss-cross pattern to 95 N·m (70 ft. lbs.).

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

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

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

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

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

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

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

GEAR CONTACT PATTERN

The ring gear and pinion teeth contact patterns will show if the pinion depth is correct in the 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.

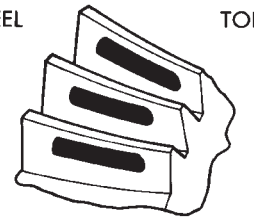
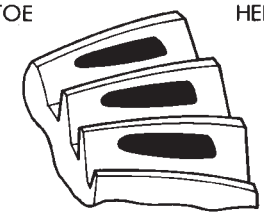
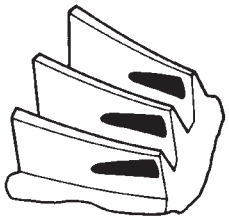
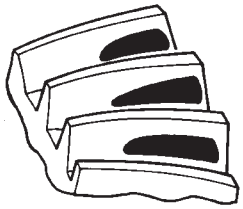
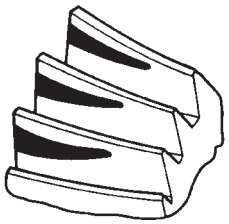
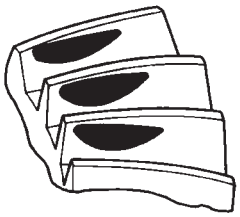
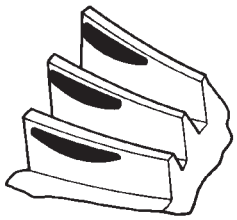
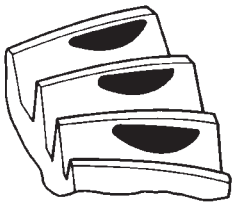
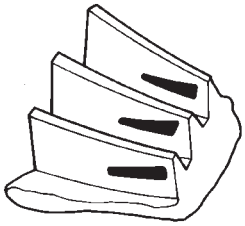
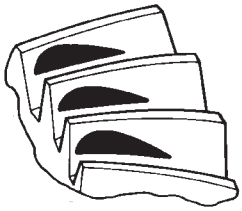
(1) Apply a thin coat of hydrated ferric oxide or equivalent, to the drive and coast side of the ring gear teeth.

(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) With 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 squeegee 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. 16) and adjust pinion depth and gear backlash as necessary.

REAR AXLE - 8 1/4 (Continued)

DRIVE SIDE OF RING GEAR TEETH	COAST SIDE OF RING GEAR TEETH	
HEEL TOE 	TOE HEEL 	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.
		RING GEAR BACKLASH CORRECT. **THINNER** PINION GEAR DEPTH SHIM REQUIRED.
		RING GEAR BACKLASH CORRECT. **THICKER** PINION GEAR DEPTH SHIM REQUIRED.
		PINION GEAR DEPTH SHIM CORRECT. **DECREASE** RING GEAR BACKLASH.
		PINION GEAR DEPTH SHIM CORRECT. **INCREASE** RING GEAR BACKLASH.

J9003-24

Fig. 16 Gear Tooth Contact Patterns

REAR AXLE - 8 1/4 (Continued)

SIDE GEAR CLEARANCE

NOTE: 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, C-locks and pinion mate shaft.

(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. 17).

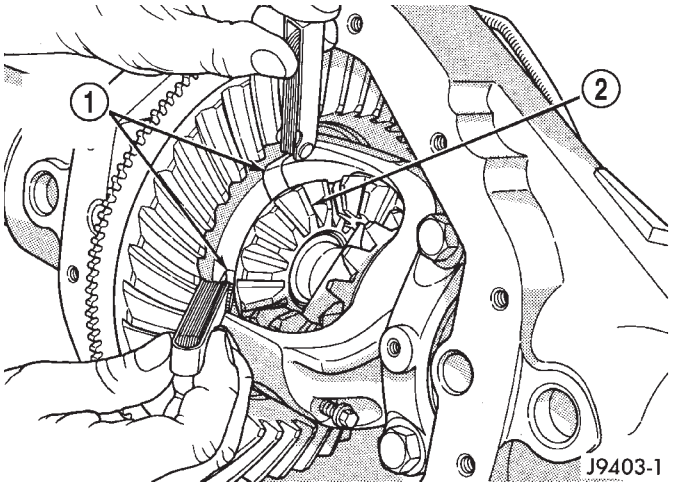


Fig. 17 Side Gear Clearance

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. 18).

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.

SIDE GEAR CLEARANCE	0.007
THRUST WASHER THICKNESS	+ 0.033
TOTAL	0.040
	→ 0.040
REPLACEMENT WASHER THICKNESS	− 0.037
NEW SIDE GEAR CLEARANCE	0.003

J9203-31

Fig. 18 Side Gear Calculations

(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.

REAR AXLE - 8 1/4 (Continued)

SPECIFICATIONS

REAR AXLE

AXLE SPECIFICATIONS

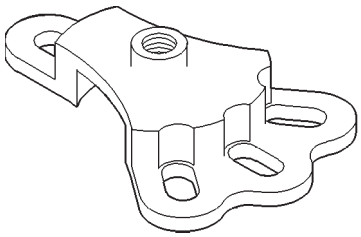
DESCRIPTION	SPECIFICATION
Axle Ratio	3.07, 3.55, 4.10
Differential Case Flange Runout	0.076 mm (0.003 in.)
Differential Case Clearance	0.12 mm (0.005 in.)
Ring Gear Diameter	209.5 mm (8.25 in.)
Ring Gear Backlash	0.12-0.20 mm (0.005-0.008 in.)
Ring Gear Runout	0.12 mm (0.005 in.)
Pinion Bearing Preload - Original Bearings	1-2 N·m (10-20 in. lbs.)
Pinion Bearing Preload - New Bearings	1-3.4 N·m (10-30 in. lbs.)

TORQUE SPECIFICATIONS

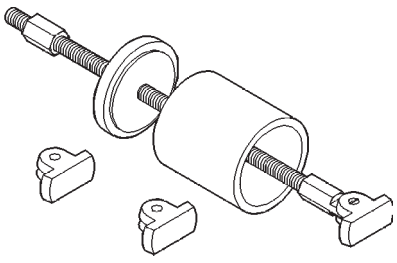
DESCRIPTION	N·m	Ft. Lbs.	In. Lbs.
Differential Cover Bolts	41	30	-
Bearing Cap Bolts	136	100	-
Ring Gear Bolts	95	70	-
Pinion Nut Minimum	285	210	-
Pinion Mate Shaft Screw	16.25	12	-

SPECIAL TOOLS

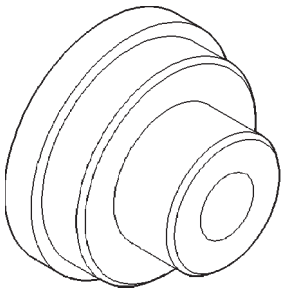
8 1/4 AXLE



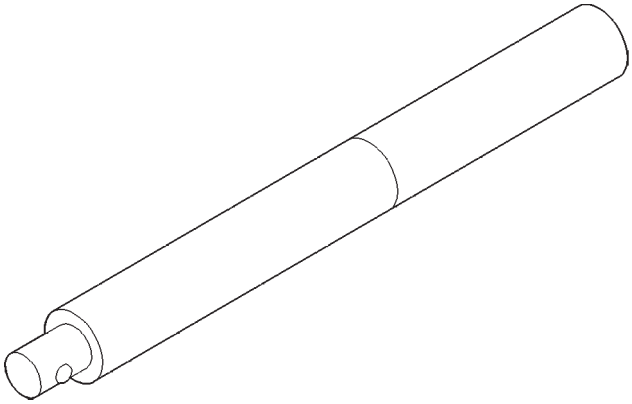
PULLER 6790



REMOVER 6310

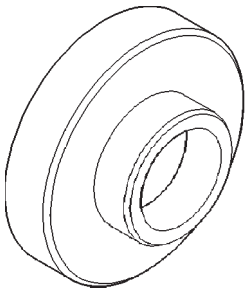


INSTALLER C-4198



HANDLE C-4171

REAR AXLE - 8 1/4 (Continued)



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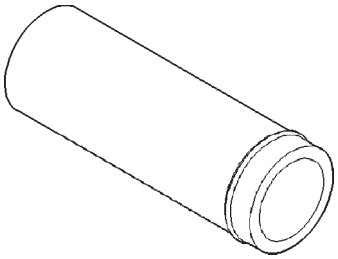

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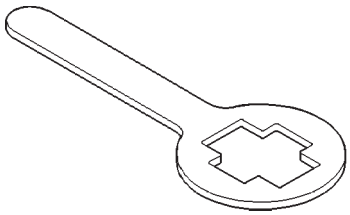
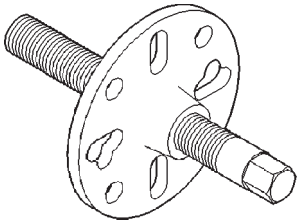
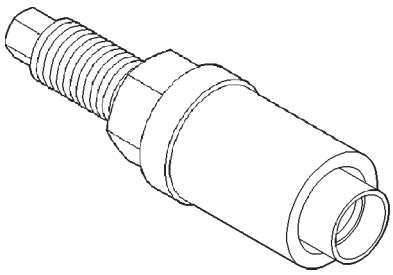


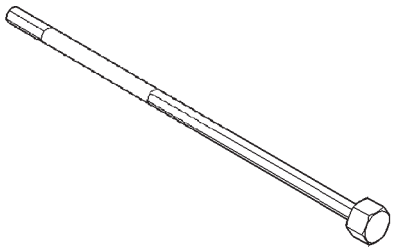
HOLDER 6719



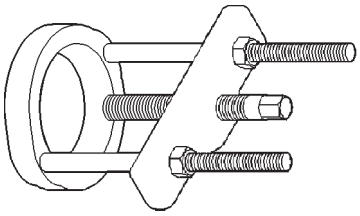
PULLER C-452



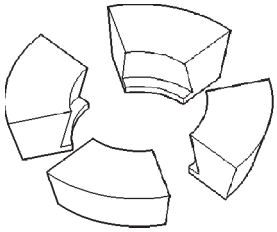
INSTALLER C-3718



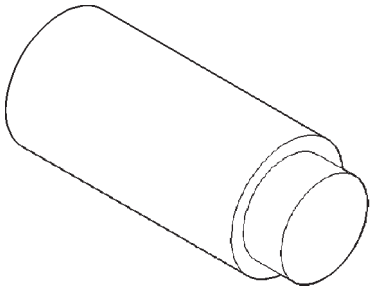
ADJUSTMENT WRENCH C-4164



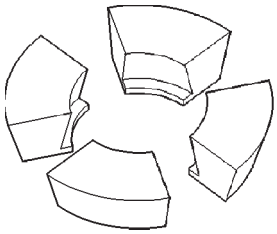
PULLER/PRESS C-293–PA



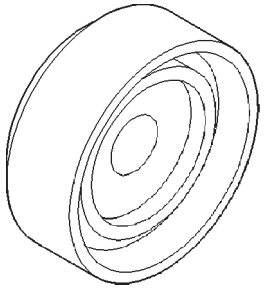
ADAPTERS C-293-48



ADAPTER PLUG SP-3289

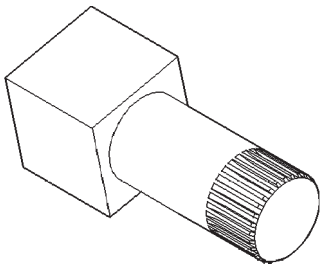


ADAPTERS C-293-47

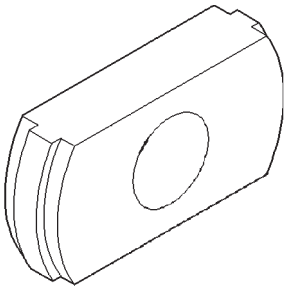


INSTALLER C-4340

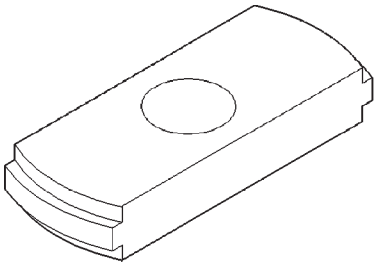
REAR AXLE - 8 1/4 (Continued)



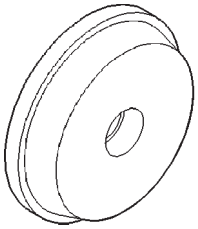
FIXTURE 8138



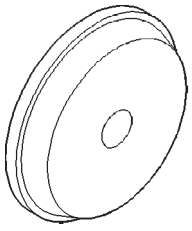
INSTALLER C-4345



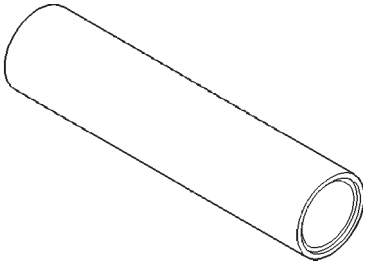
REMOVER C-4307



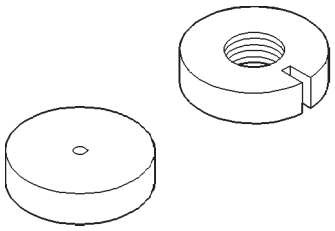
INSTALLER C-4308



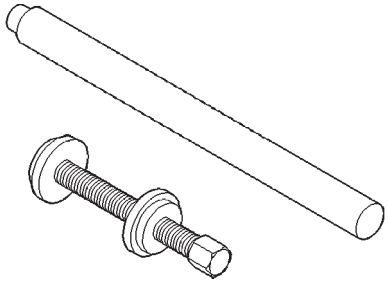
INSTALLER D-130



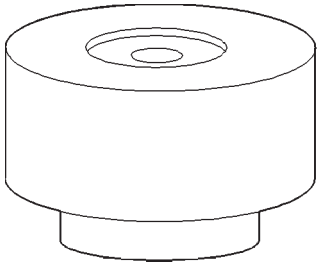
INSTALLER 6448



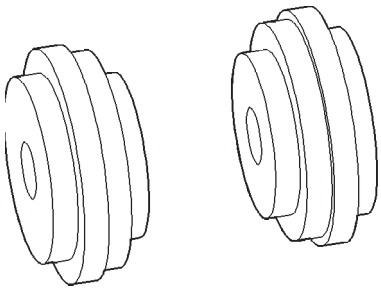
TRAC-LOK™ TOOLS 8140



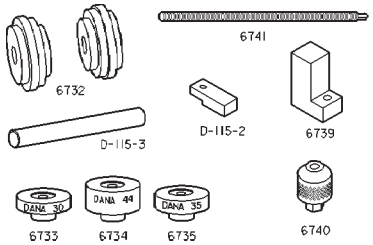
TRAC-LOK™ TOOLS 6960



PINION BLOCK 8540



ARBOR DISCS 8541



PINION GAUGE SET

AXLE SHAFTS

REMOVAL

(1) Place the transmission in NEUTRAL and raise and support vehicle.
(2) Remove wheel and tire assembly.
(3) Remove brake drum.
(4) Remove the housing cover and drain lubricant.
(5) Rotate differential case to access the pinion shaft lock screw. Remove lock screw and pinion shaft from differential case (Fig. 19).

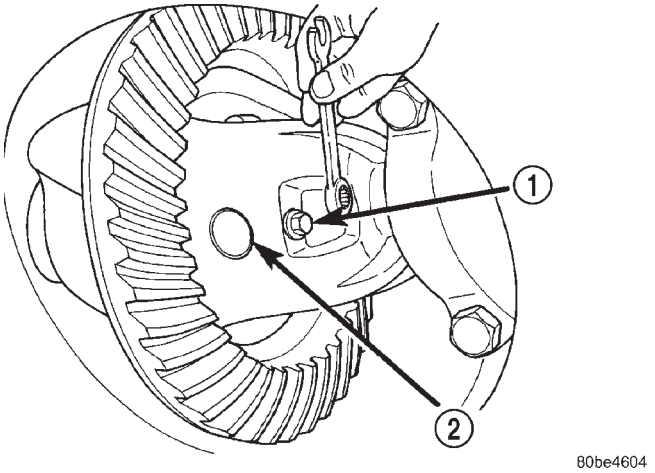


Fig. 19 Pinion Shaft Lock Screw

1 - LOCK SCREW
2 - PINION SHAFT

(6) Push axle shaft inward then remove axle shaft C-lock (Fig. 20).

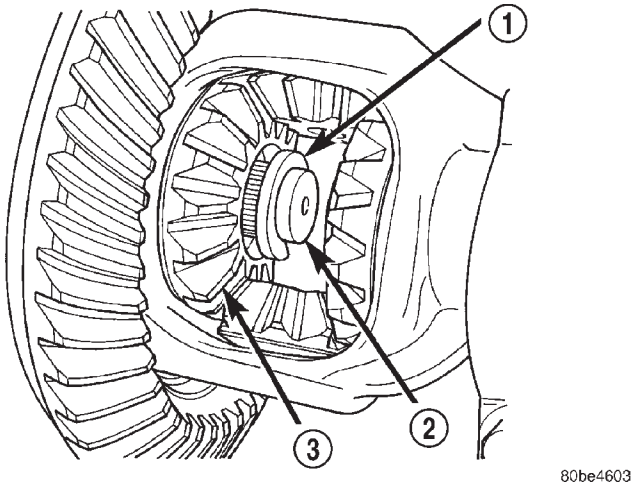


Fig. 20 Axle Shaft C-Lock

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

(7) Remove axle shaft being carefull not to damage shaft bearing and seal.
(8) Inspect axle shaft seal for leakage or damage.
(9) Inspect axle shaft bearing contact surface for signs of brinelling, galling and pitting.

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.).
(5) Install cover and fill with gear lubricant to the bottom of the fill plug hole.
(6) Install brake drum.
(7) Install wheel and tire assemblies.
(8) Remove support and lower vehicle.

AXLE SHAFT SEALS

REMOVAL

(1) Raise and support vehicle.
(2) Remove axle shaft.
(3) Remove axle shaft seal from the axle tube with a small pry bar (Fig. 21).

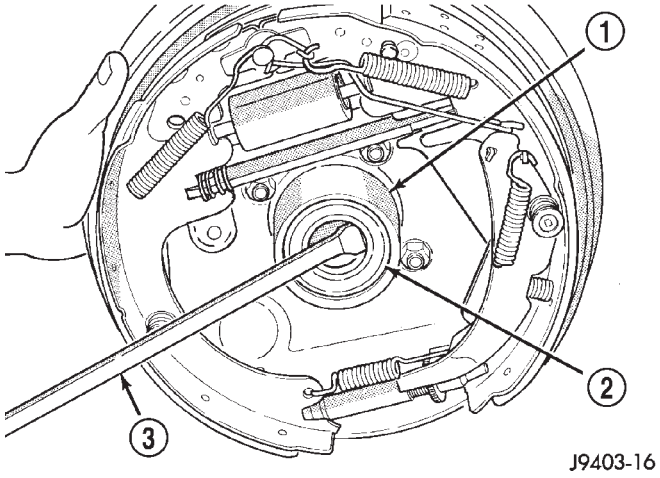


Fig. 21 Axle Seal

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

AXLE SHAFT SEALS (Continued)

INSTALLATION

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.
(2) 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.
(3) Coat the lip of the seal with axle lubricant for protection prior to installing the axle shaft.
(4) Install the axle shaft.
(5) Check and fill gear lubricant.
(6) Install wheel and tire assembly.
(7) Remove support and lower vehicle.

AXLE BEARINGS

REMOVAL

(1) Raise and support vehicle.
(2) Remove axle shaft.
(3) Remove axle shaft seal from the axle tube with a small pry bar (Fig. 22).

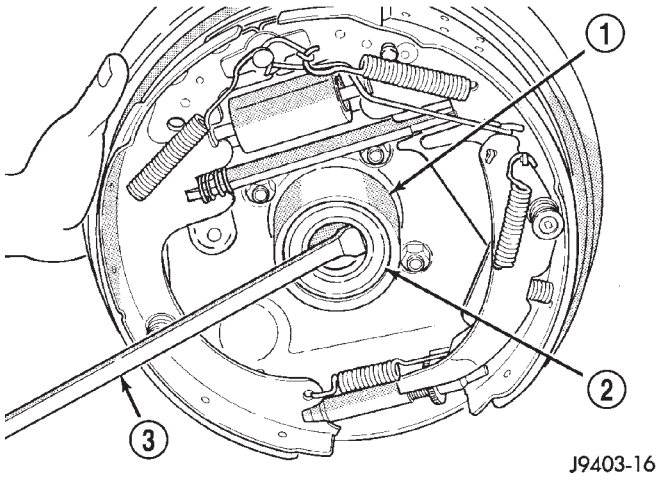


Fig. 22 Axle Seal

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

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

(4) Remove axle shaft bearing with Bearing Removal Tool Set 6310 and Adapter Foot 6310-9 (Fig. 23).

INSTALLATION

(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.
(2) Install axle shaft bearing with Installer C-4198 and Handle C-4171.

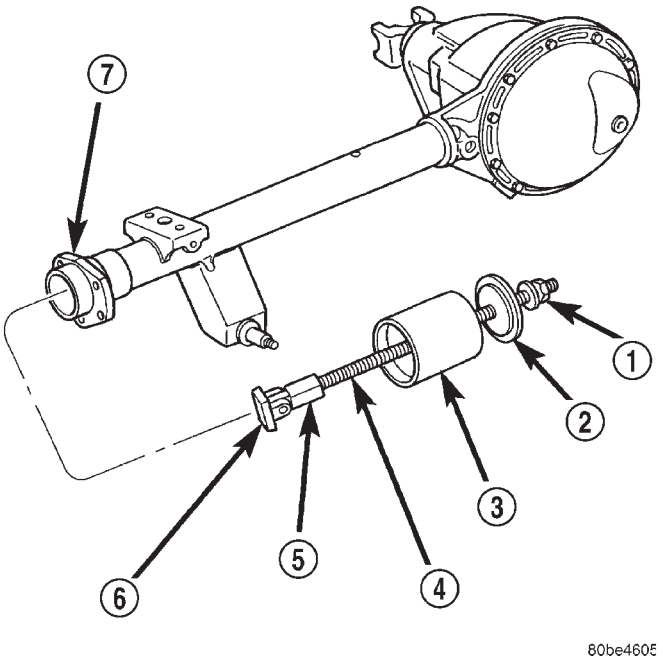


Fig. 23 Axle Shaft Bearing

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

NOTE: Install bearing with part number against the installer.

(3) Install a **new** axle seal with Installer C-4198 and Handle C-4171. 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.
(6) Check and fill gear lubricant.
(7) Install wheel and tire assembly.
(8) Remove support and lower vehicle.

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.
(2) Mark the universal joint, pinion yoke and pinion shaft for installation reference.
(3) Remove propeller shaft from pinion yoke.
(4) Remove the wheel and tire assemblies.
(5) Remove the brake drums.
(6) Rotate the pinion yoke three or four times.

PINION SEAL (Continued)

(7) Measure rotating torque of the pinion gear with an inch pound torque wrench and record the reading for installation reference.

(8) Hold the pinion yoke with Holder 6719 and remove the pinion nut and washer.

(9) Remove yoke with Remover C-452 (Fig. 24).

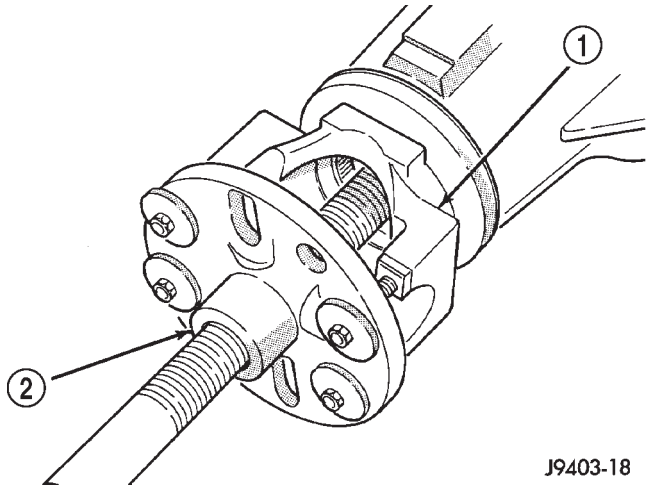


Fig. 24 Pinion Yoke

1 - PINION YOKE
2 - REMOVER

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

INSTALLATION

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

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

(2) Install the **new** pinion seal (Fig. 25) with Installer C-4076-A and Handle C-4735.

(3) Install pinion yoke on the shaft with the reference marks aligned.

(4) Seat yoke on pinion shaft with Installer C-3718 and Holder 6719A.

(5) Remove the tools and install the pinion yoke washer. The convex side of the washer must face outward.

(6) Using yoke Holder 6719A tighten shaft nut to 285 N·m (210 ft. lbs.) (Fig. 26). Rotate the pinion several revolutions to ensure the bearing rollers are seated.

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

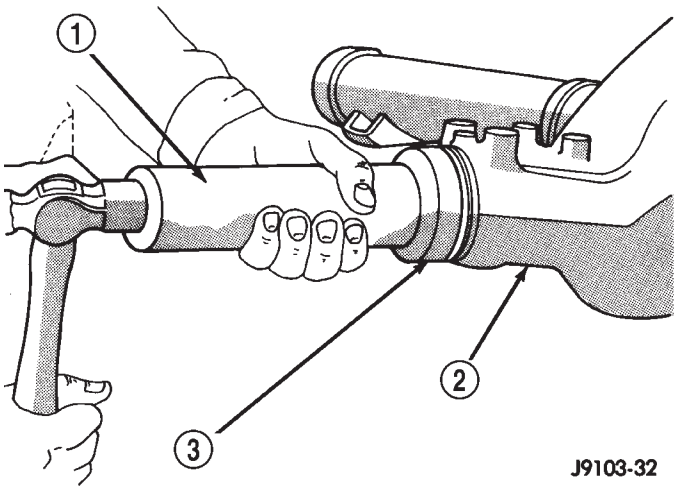


Fig. 25 Pinion Seal Installer

1 - HANDLE
2 - DIFFERENTIAL HOUSING
3 - INSTALLER

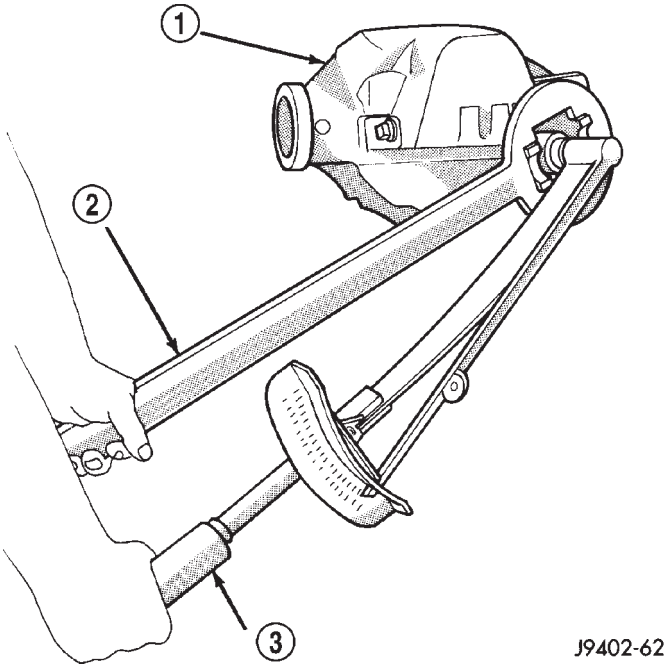


Fig. 26 Tightening Pinion Nut

1 - DIFFERENTIAL HOUSING
2 - YOKE HOLDER
3 - TORQUE WRENCH

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

(8) If the rotating torque is low, use Holder 6719A (Fig. 26) and tighten the pinion nut in 6.8 N·m (5 ft.

PINION SEAL (Continued)

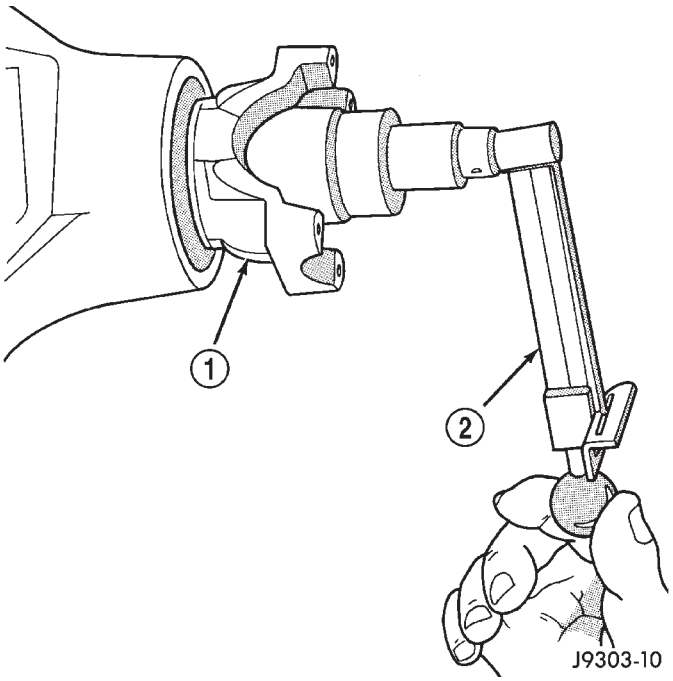


Fig. 27 Pinion Rotation Torque

1 - PINION YOKE
2 - INCH POUND TORQUE WRENCH

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, it indicates a binding condition.

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

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

(11) Install the brake drums.

(12) Check the differential housing lubricant level.

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

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove fill hole plug from the differential housing cover.

(3) Remove differential housing cover and drain 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 axle shafts.

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

(6) Mark the differential housing and bearing caps for installation reference (Fig. 28).

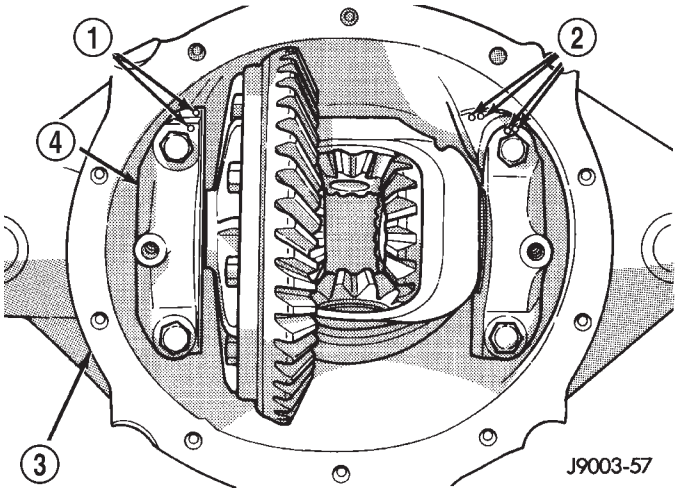


Fig. 28 Reference Mark

1 - REFERENCE MARKS
2 - REFERENCE MARKS
3 - DIFFERENTIAL HOUSING
4 - BEARING CAP

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

(8) Loosen bearing cap bolts, them loosen the threaded adjusters with Wrench C-4164 (Fig. 29).

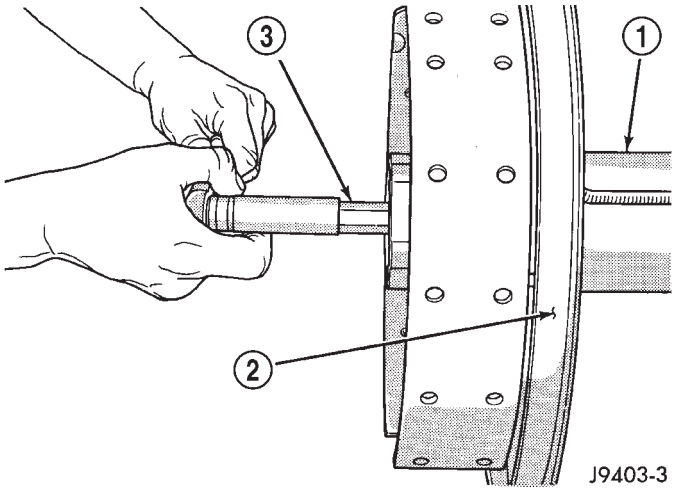


Fig. 29 Threaded Adjuster

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

DIFFERENTIAL (Continued)

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

NOTE: Tag bearing cups and threaded adjusters location, for installation reference.

DISASSEMBLY

(1) Remove pinion shaft lock screw (Fig. 30).

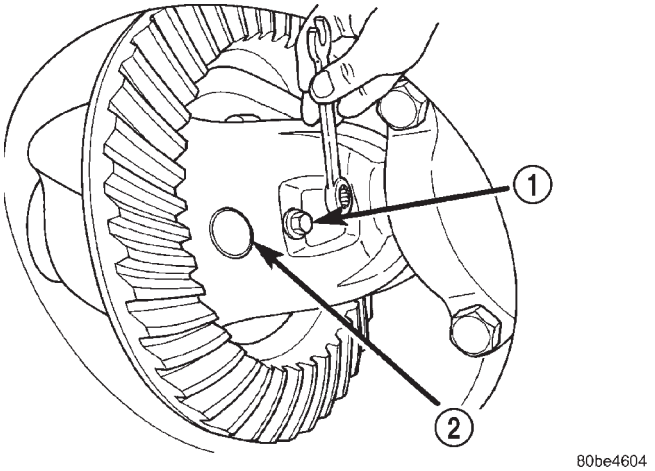


Fig. 30 Pinion Shaft Lock Screw

1 - LOCK SCREW
2 - PINION SHAFT

(2) Remove pinion shaft.
(3) Rotate differential side gears and remove differential pinions and thrust washers (Fig. 31).
(4) Remove differential side gears and thrust washers.

ASSEMBLY

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

INSTALLATION

(1) Apply a coating of hypoid gear lubricant to the differential bearings, bearing cups and threaded adjusters. A dab of grease can be used to keep the adjusters in position. Carefully position the assembled differential case in the housing.
(2) Install differential bearing caps in their original locations (Fig. 32).

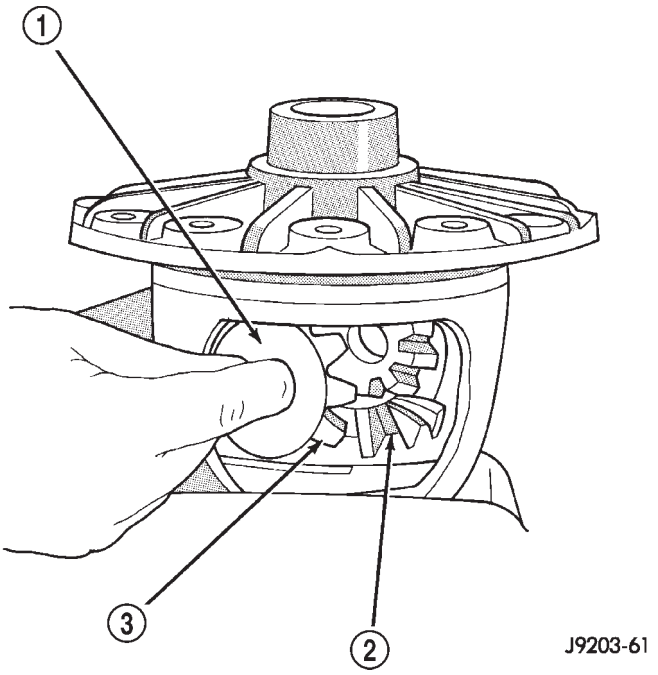


Fig. 31 Differential Case

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

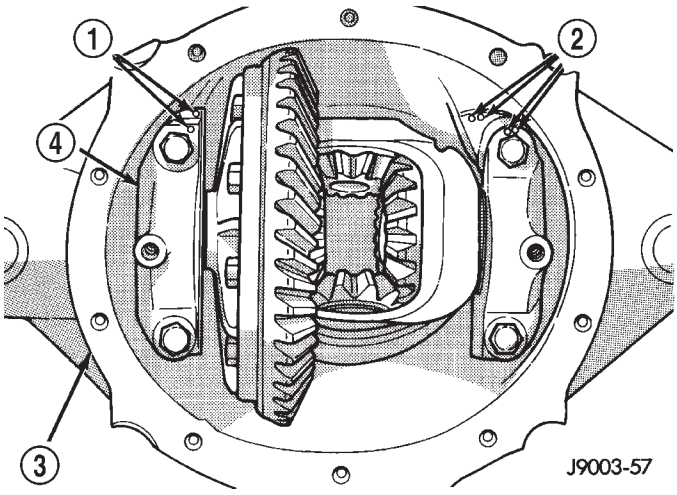


Fig. 32 Bearing Caps & Bolts

1 - REFERENCE MARKS
2 - REFERENCE MARKS
3 - DIFFERENTIAL HOUSING
4 - BEARING CAP

(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.
(5) Tighten bearing cap bolts in a criss-cross pattern to 95 N·m (70 ft.lbs).

DIFFERENTIAL (Continued)

(6) Install adjuster locks on the bearing caps.
(7) Install axle shafts.
(8) Apply a bead of red Mopar silicone rubber axle sealant or equivalent to the housing cover (Fig. 33).

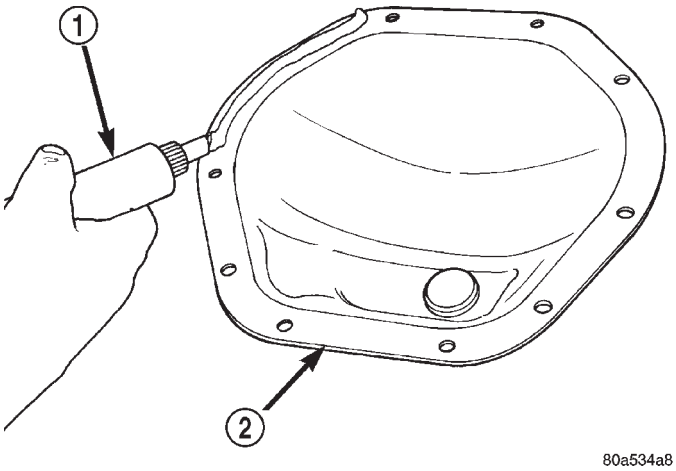


Fig. 33 Differential Cover Sealant

1 - SEALANT
2 - DIFFERNTIAL COVER

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

(9) Install cover and tighten bolts in a criss-cross pattern to 41 N·m (30 ft. lbs.).
(10) Fill differential with gear lubricant to bottom of the fill plug hole.
(11) Install the fill hole plug.
(12) Install wheel and tire assemblies.
(13) Remove support and lower vehicle.
(14) Trac-lok® differential equipped vehicles should be road tested by making 10 to 12 slow figure-eight turns. This maneuver will pump the lubricant through the clutch discs to eliminate a possible chatter noise complaint.

DIFFERENTIAL - TRAC-LOK

DIAGNOSIS AND TESTING - TRAC-LOK®

The most common problem is a chatter noise when turning corners. Before removing the unit for repair, drain, flush and refill the axle with the specified lubricant. A container of Mopar Trac-lok® Lubricant (friction modifier) should be added after repair service or during a lubricant change.

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

DIFFERENTIAL TEST

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

(1) Place blocks in front and rear of both front wheels.
(2) Raise one rear wheel until it is completely off the ground.
(3) Engine off, transmission in neutral, and parking brake off.
(4) Remove wheel and bolt Special Tool 6790 or equivalent tool to studs.
(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 34).

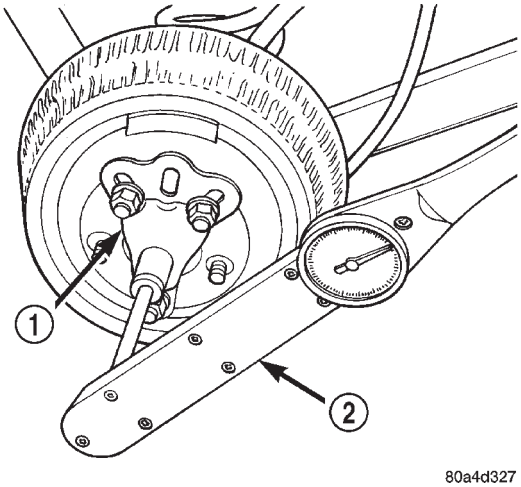


Fig. 34 ROTATING TORQUE TEST

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

(6) If rotating torque is less than 41 N·m (56 ft. lbs.) or more than 271 N·m (200 ft. lbs.) on either wheel the unit should be serviced.

DIFFERENTIAL - TRAC-LOK (Continued)

DISASSEMBLY

(1) Clamp side gear Fixture 8138 in a vise and set differential case on the fixture (Fig. 35).

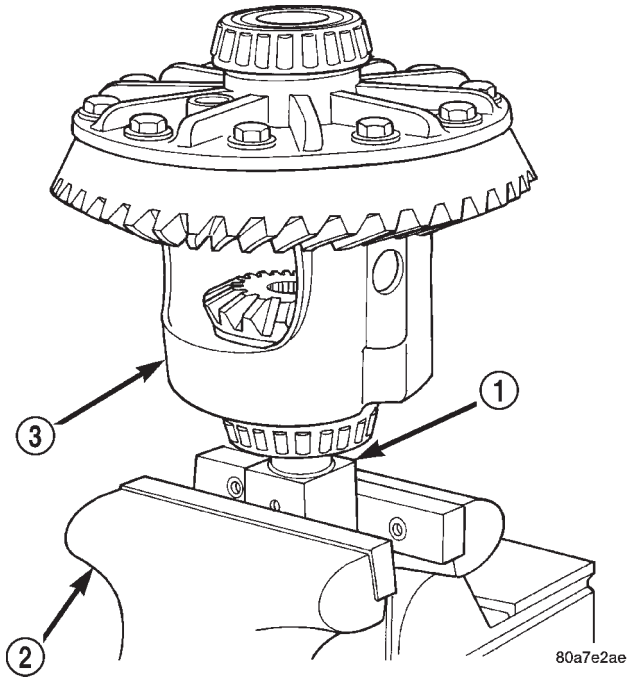


Fig. 35 DIFFERENTIAL CASE FIXTURE

1 - FIXTURE
2 - VISE
3 - DIFFERENTIAL

(2) Remove ring gear if the ring gear is to be replaced. The Trac-lok® differential can be serviced with the ring gear installed.

(3) Remove pinion gear mate shaft lock screw.

(4) Remove pinion gear mate shaft with a drift and hammer.

(5) Install Discs 8140 without threaded hole in the lower side gear (Fig. 36).

(6) Install Disc 8140 with threaded hole in the upper side gear. Thread Forcing Screw 6960-4 through the upper disc until it becomes centered in lower disc.

(7) Insert a screw driver in slot of upper disc (Fig. 37) to prevent disc from turning.

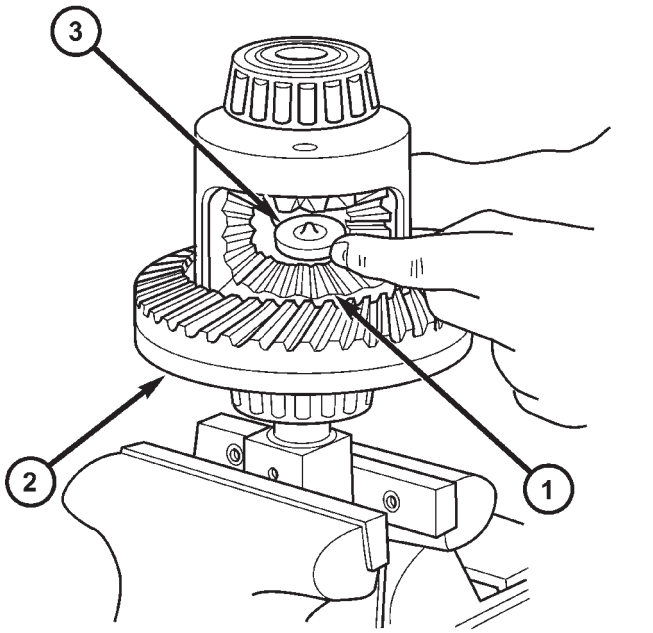


Fig. 36 LOWER DISC

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

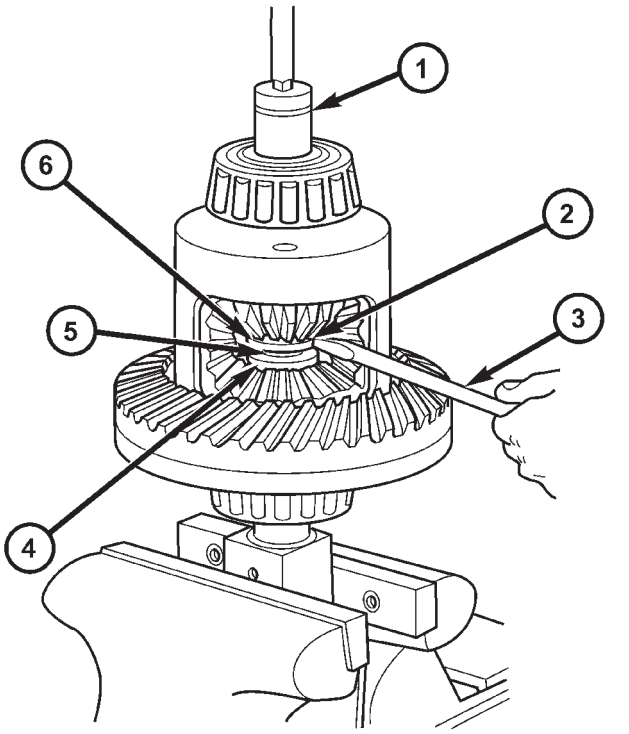


Fig. 37 TRAK-LOC® TOOLS

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

DIFFERENTIAL - TRAC-LOK (Continued)

(8) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 38).

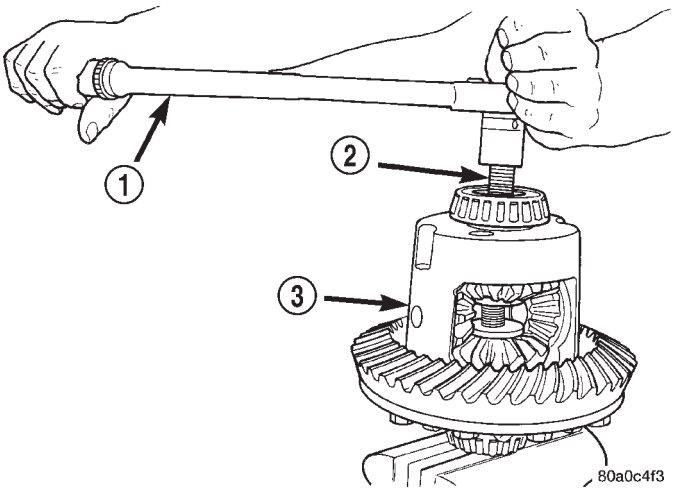


Fig. 38 COMPRESS BELLEVILLE SPRING

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

(9) With a feeler gauge remove thrust washers from behind the pinion gears (Fig. 39).

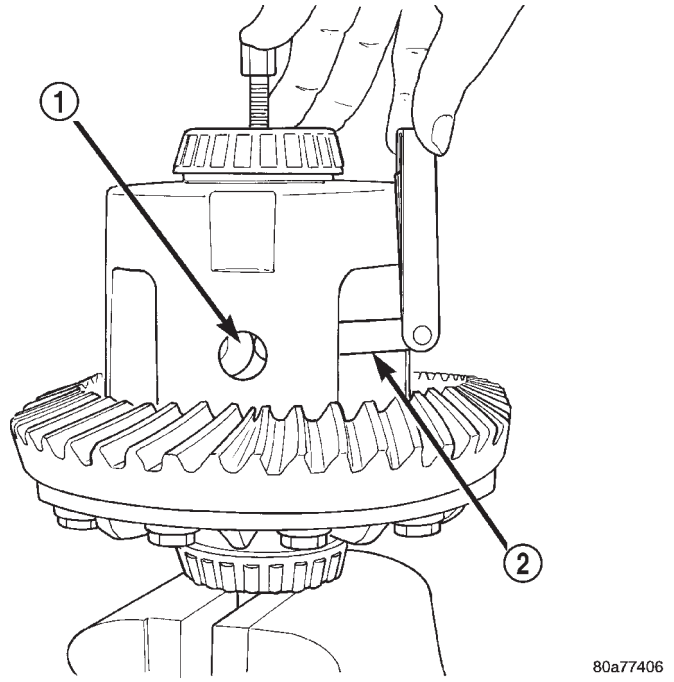


Fig. 39 PINION GEAR THRUST WASHER

1 - THRUST WASHER
2 - FEELER GAUGE

(10) Insert Turning Bar 6960-2 into the pinion mate shaft hole in the case (Fig. 40).

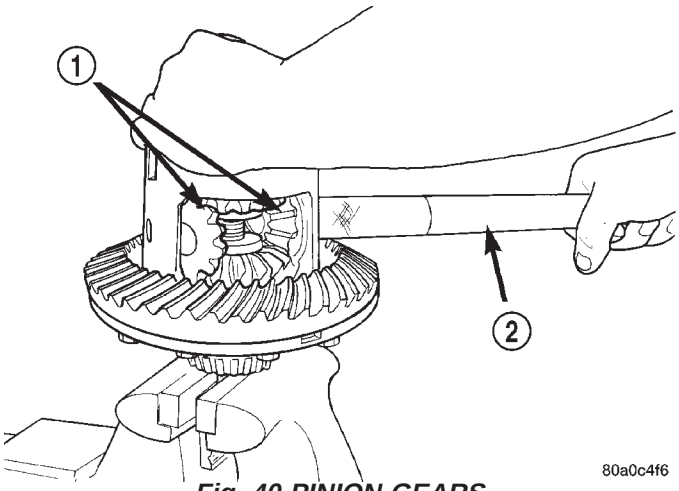


Fig. 40 PINION GEARS

1 - PINION GEARS
2 - TURNING BAR

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

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

(13) Remove pinion gears from differential case.

(14) Remove Forcing Screw and discs.

(15) Remove top side gear, clutch pack retainer and clutch pack. Keep plates in order during removal (Fig. 41).

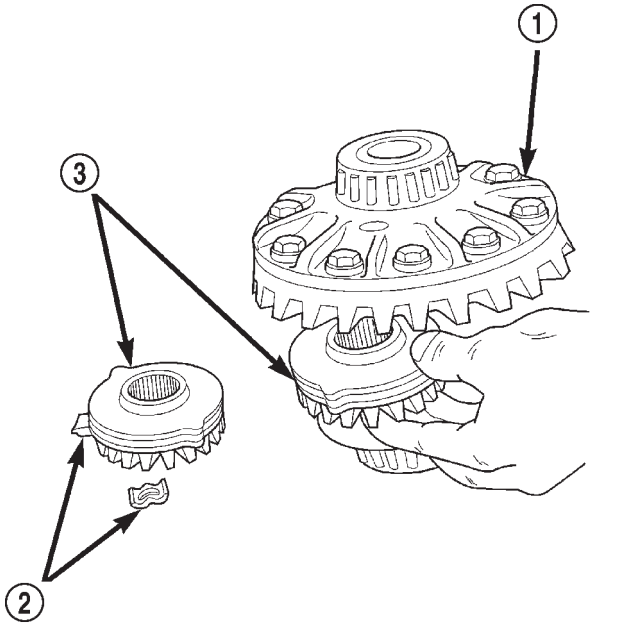


Fig. 41 SIDE GEARS AND CLUTCH DISCS

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

DIFFERENTIAL - TRAC-LOK (Continued)

(16) Remove differential case from the fixture. Remove side gear, clutch pack retainer and clutch pack. Keep plates in order during removal.

CLEANING

Clean all components in cleaning solvent and dry components with compressed air.

INSPECTION

Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears for cracks chips or damage and replace as necessary. Inspect differential case and pinion shaft and replace if worn or damaged.

ASSEMBLY

Lubricate each component with gear lubricant before assembly.

NOTE: New Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 42).

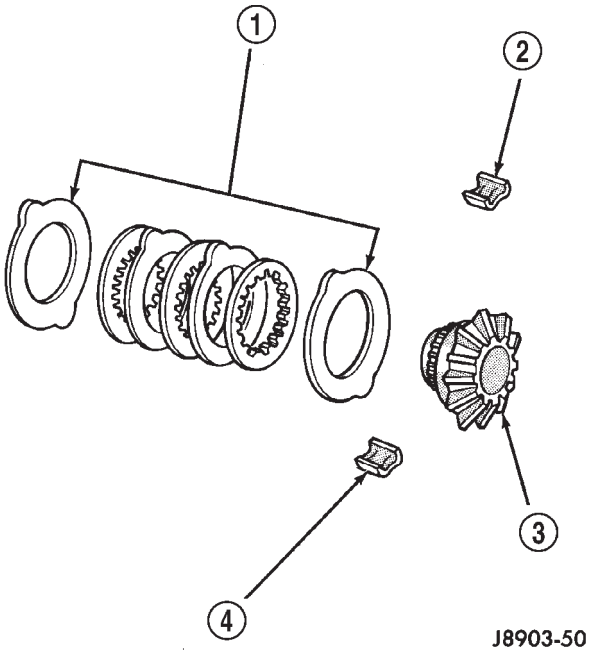


Fig. 42 CLUTCH DISC PACK

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

(2) Install 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. 43).**Verify clutch pack retaining clips are in position and seated in the case pockets.**

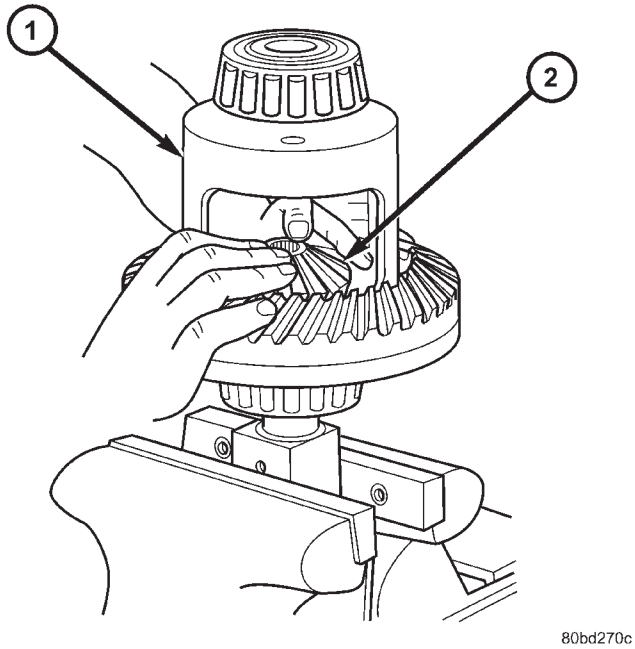


Fig. 43 CLUTCH PACK AND LOWER SIDE GEAR

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

(4) Set differential case on Fixture 8138.

(5) Install lubricated Disc 8140 without the hole in lower side gear (Fig. 44).

(6) Install the upper side gear and clutch disc pack (Fig. 44).

(7) Hold assembly in position. Insert Disc 8140 with threaded hole into top side gear.

(8) Install Forcing Screw 6960-4 and tighten screw to slightly compress clutch disc.

(9) Place pinion gears in position in side gears and verify that the pinion mate shaft hole is aligned.

(10) 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.

(11) Tighten forcing screw to 122 N·m (90 ft. lbs.) maximum to compress the Belleville springs.

(12) 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.

(13) Remove forcing screw and discs.

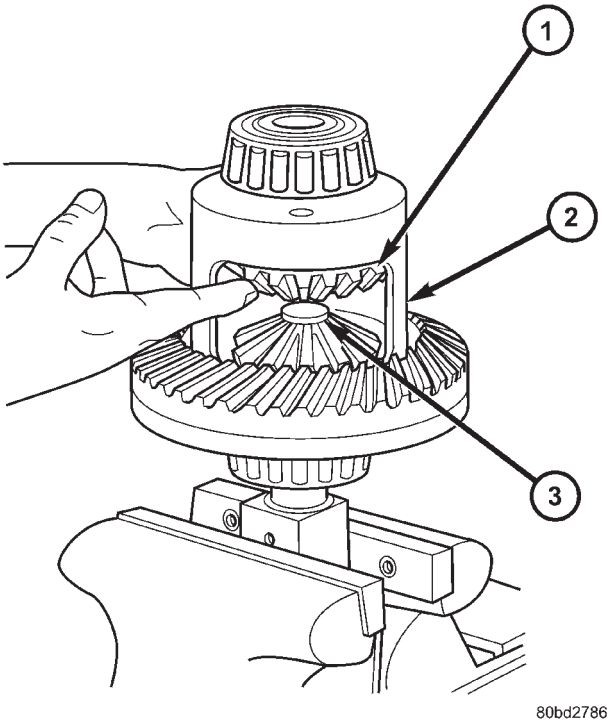


Fig. 44 CLUTCH PACK AND UPPER SIDE GEAR

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

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

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

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

DIFFERENTIAL CASE BEARINGS

REMOVAL

(1) Remove differential case from axle.

(2) Remove differential bearings from the case with Puller/Press C-293-PA and Adapters C-293-48 and Plug SP-3289 (Fig. 45).

INSTALLATION

(1) Install differential side bearings with Installer C-4340 and Handle C-4171 (Fig. 46).

(2) Install differential case in axle.

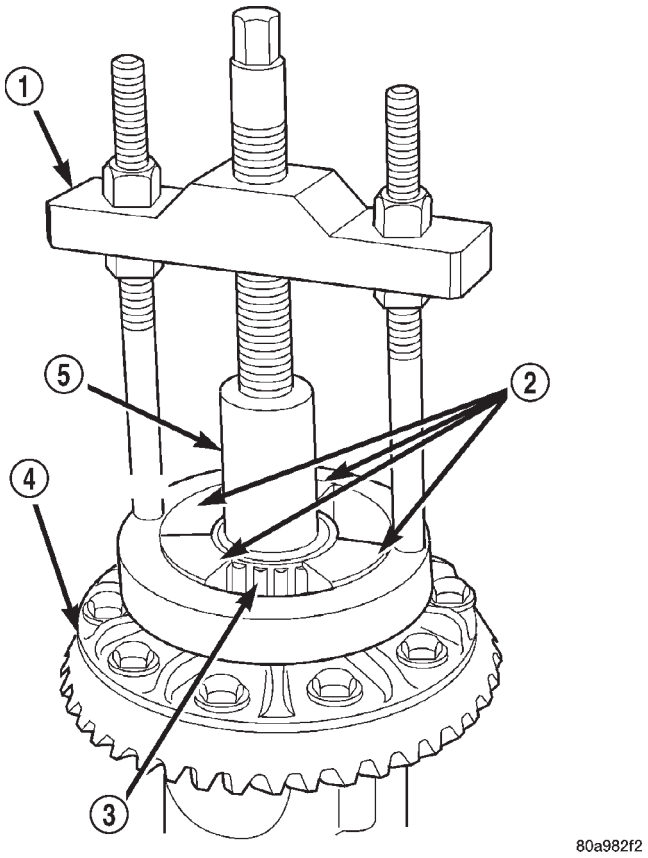


Fig. 45 Differential Bearing Puller

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

PINION GEAR/RING GEAR/ TONE RING

REMOVAL

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

(1) Mark pinion yoke and propeller shaft for installation reference.

(2) Remove propeller shaft from pinion yoke and tie propeller shaft to underbody.

(3) Remove differential from axle housing.

(4) Place differential case in a vise with soft metal jaw (Fig. 47).

(5) Remove bolts holding ring gear to differential case.

(6) Drive ring gear from the differential case with a rawhide hammer.

PINION GEAR/RING GEAR/TONE RING (Continued)

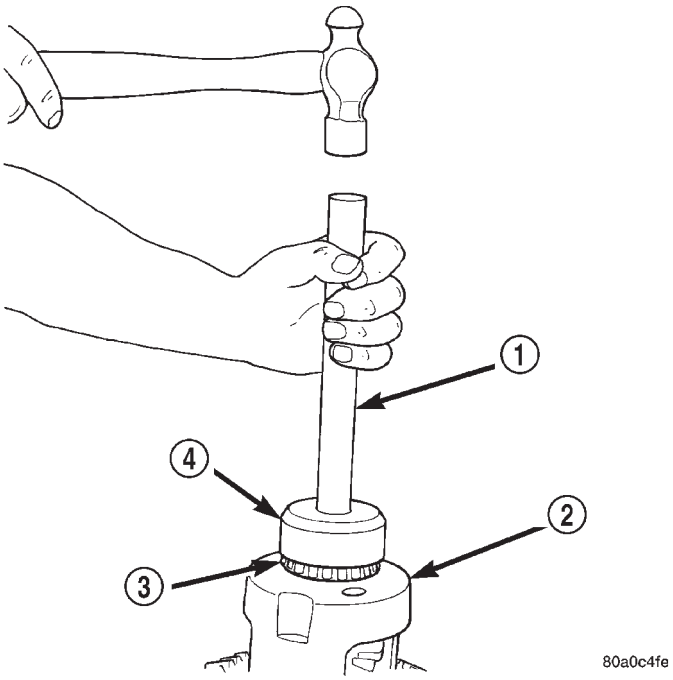


Fig. 46 Differential Bearing Installer

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

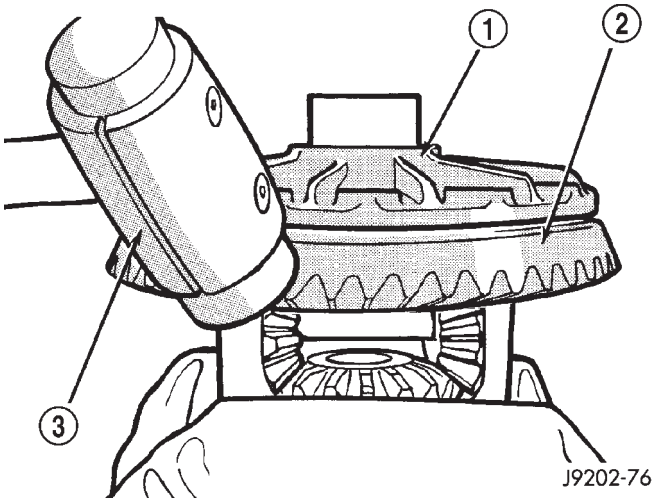


Fig. 47 Ring Gear

1 - CASE
2 - RING GEAR
3 - RAWHIDE HAMMER

(7) Hold pinion yoke with Holder 6719A and remove pinion yoke nut and washer.

(8) Remove pinion yoke from pinion shaft with Remover C-452 (Fig. 48).

(9) Remove pinion from the housing (Fig. 49).

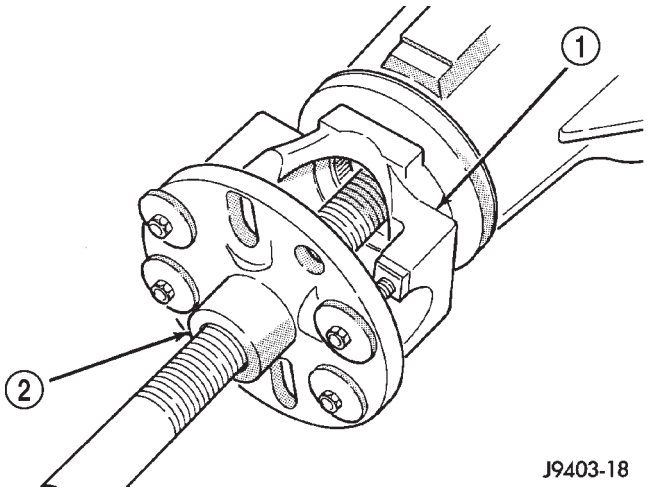


Fig. 48 Pinion Yoke

1 - PINION YOKE
2 - REMOVER

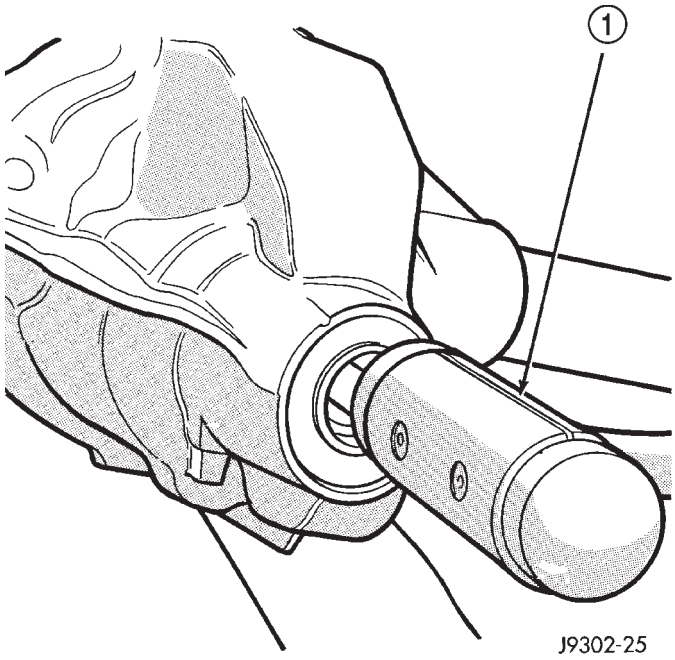


Fig. 49 Pinion Gear

1 - RAWHIDE HAMMER

PINION GEAR/RING GEAR/TONE RING (Continued)

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

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

(12) Remove front pinion bearing cup with Remover C-4345 and Handle C-4171 (Fig. 50).

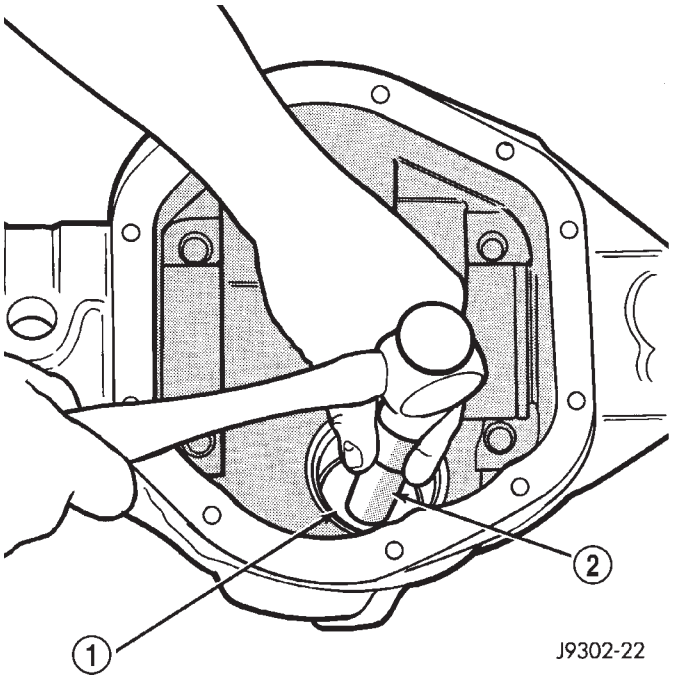


Fig. 50 Front Pinion Bearing Cup

1 - REMOVER
2 - HANDLE

(13) Remove rear bearing cup from housing (Fig. 51) with Remover C-4307 and Handle C-4171.

(14) Remove collapsible preload spacer (Fig. 52).

(15) Remove rear bearing from the pinion (Fig. 53) with Puller/Press C-293-PA and Adapters C-293-47.

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

INSTALLATION

NOTE: A pinion depth shim/oil baffle is placed between the rear pinion bearing cone and pinion gear. If the ring and pinion gears are reused, the original pinion depth shim/oil baffle can be used. Refer to Adjustments (Pinion Gear Depth) to select the proper shim thickness if ring and pinion gear are replaced.

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

(2) Install rear pinion bearing cup (Fig. 54) with Installer C-4308 and Handle C-4171 and verify cup is seated.

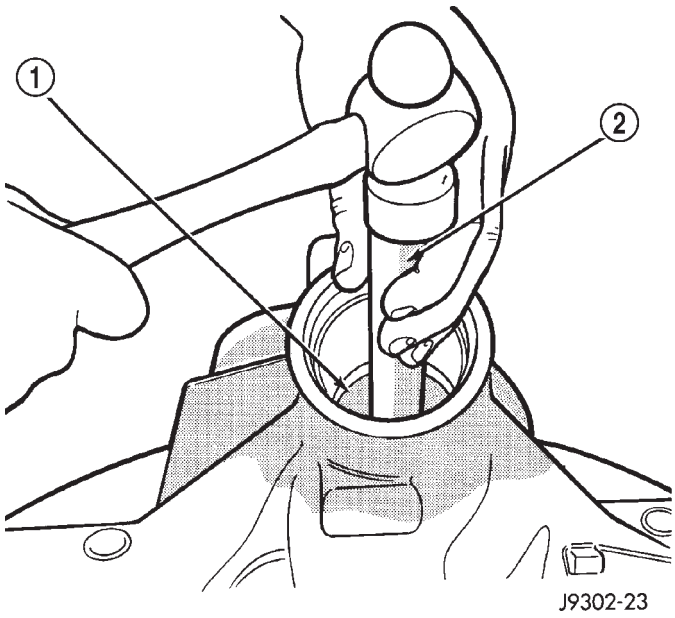


Fig. 51 Rear Pinion Bearing Cup

1 - DRIVER
2 - HANDLE

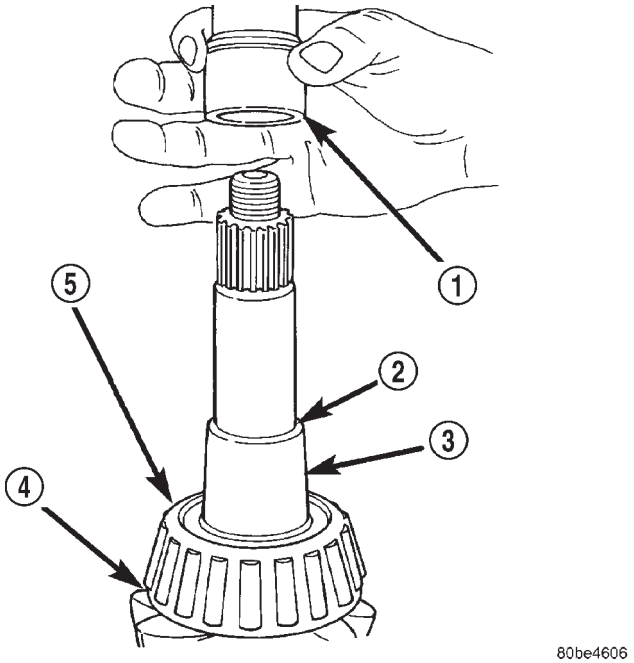


Fig. 52 Collapsible Spacer

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

(3) Install front pinion bearing cup (Fig. 55) with Installer D-130 and Handle C-4171 and verify cup is seated.

PINION GEAR/RING GEAR/TONE RING (Continued)

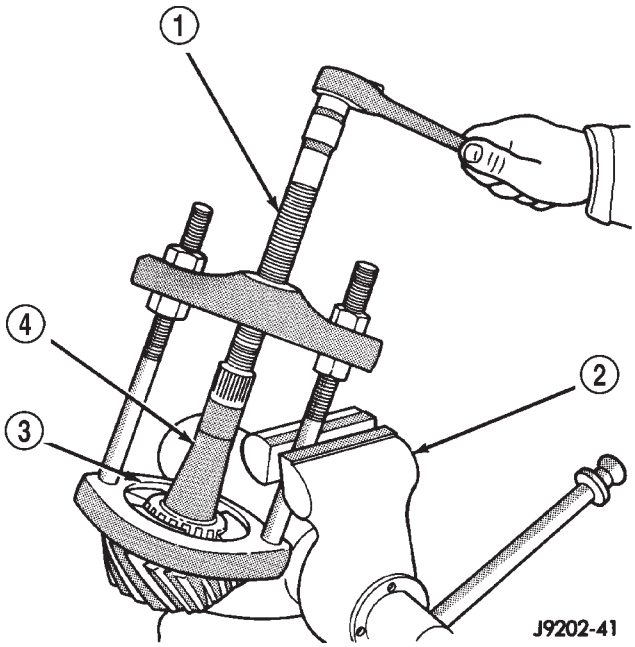


Fig. 53 Rear Pinion Bearing Puller

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

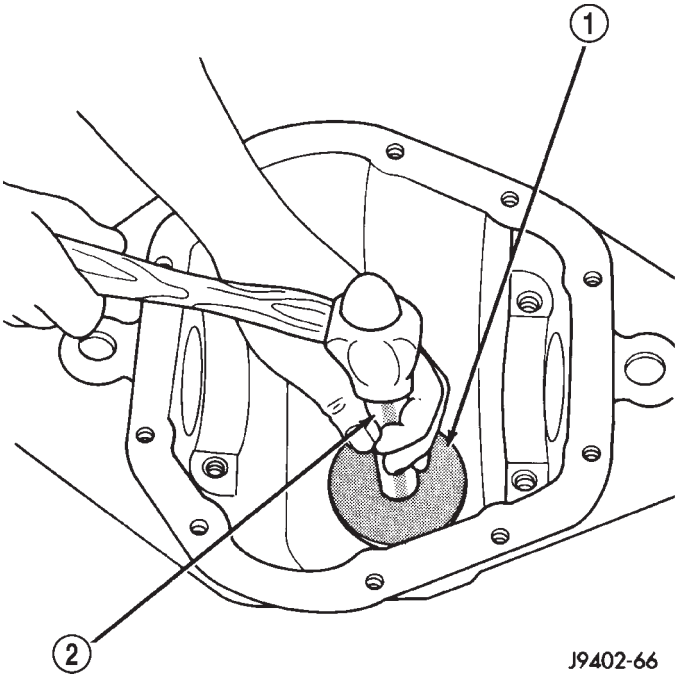


Fig. 54 Rear Pinion Bearing Cup

1 - INSTALLER
2 - HANDLE

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

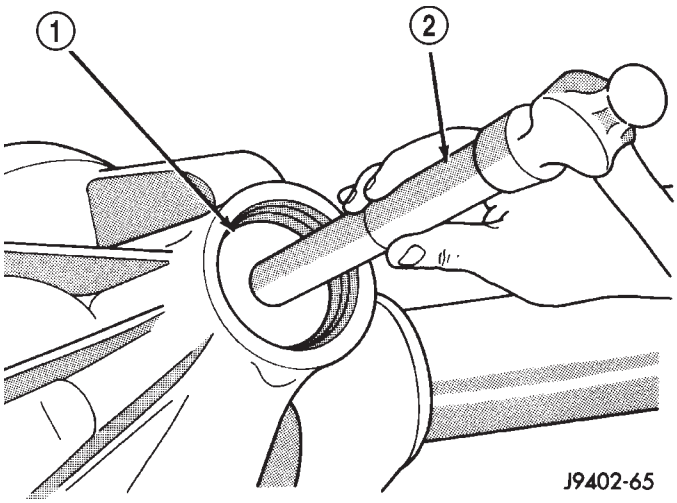


Fig. 55 Front Bearing Cup

1 - INSTALLER
2 - HANDLE

(5) Apply a light coating of gear lubricant on the lip of pinion seal and install seal with Installer C-4076-B and Handle C-4735 (Fig. 56).

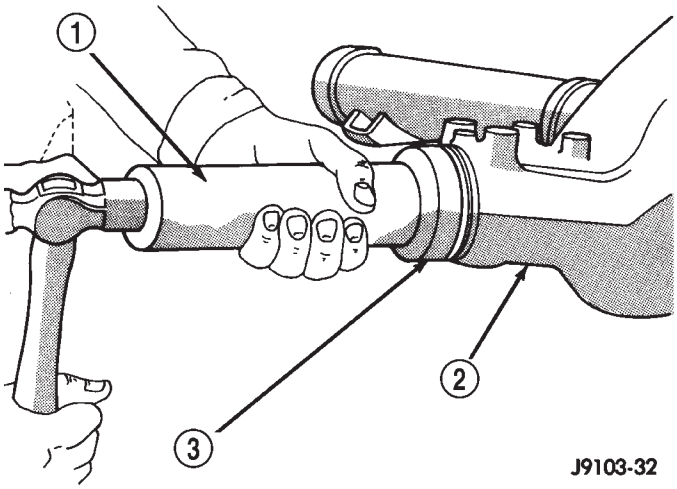


Fig. 56 Pinion Seal

1 - HANDLE
2 - DIFFERENTIAL HOUSING
3 - INSTALLER

(6) Place proper thickness depth shim on the pinion.

(7) Install rear bearing and slinger if equipped, on the pinion shaft (Fig. 57) with Installer 6448 and a press.

(8) Install a **new** collapsible preload spacer on pinion shaft and install pinion in housing (Fig. 58).

(9) Install pinion in housing.

(10) Install yoke with Installer C-3718 and Yoke Holder 6719A.

PINION GEAR/RING GEAR/TONE RING (Continued)

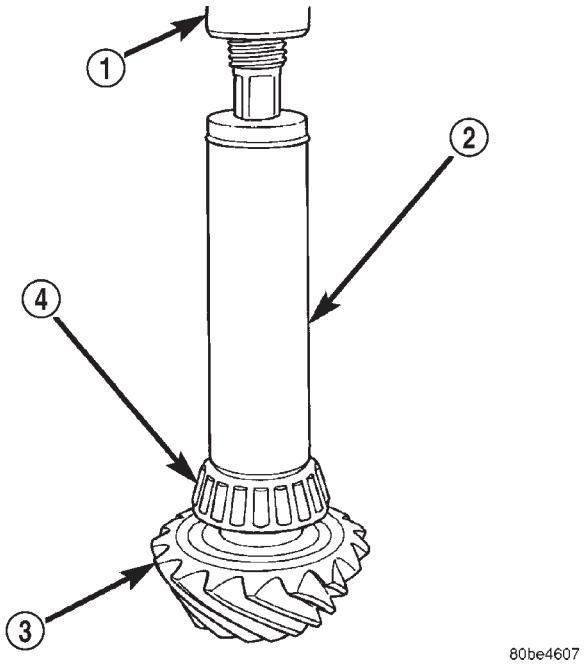


Fig. 57 Rear Pinion Bearing

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

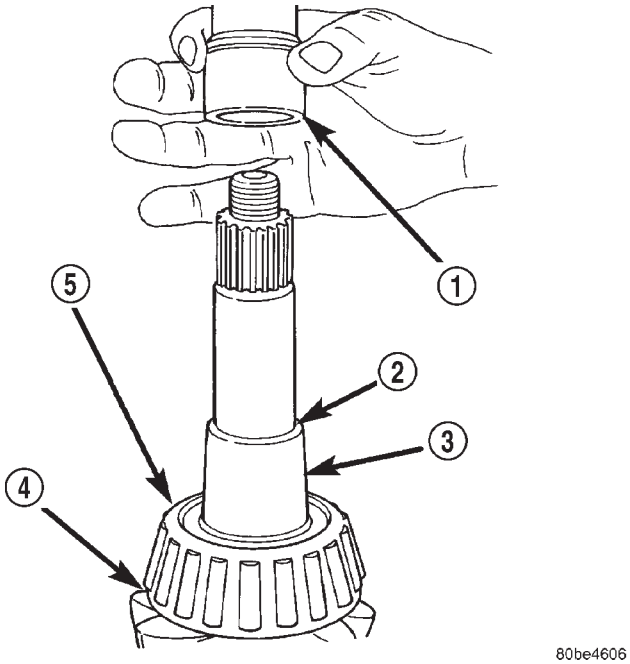


Fig. 58 Collapsible Preload Spacer

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

(11) Install yoke washer and a new nut on the pinion. The convex side of the washer must face outward.

(12) Tighten the nut to 285 N·m (210 ft. lbs.).

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

(13) Holding the yoke with Holder 6719A 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 spacer (Fig. 59).

(14) Check bearing rotating torque with an inch pound torque wrench (Fig. 59). The pinion gear rotating torque should be:

- Original Bearings: 1 to 2 N·m (10 to 20 in. lbs.).
- New Bearings: 1 to 5 N·m (10 to 30 in. lbs.).

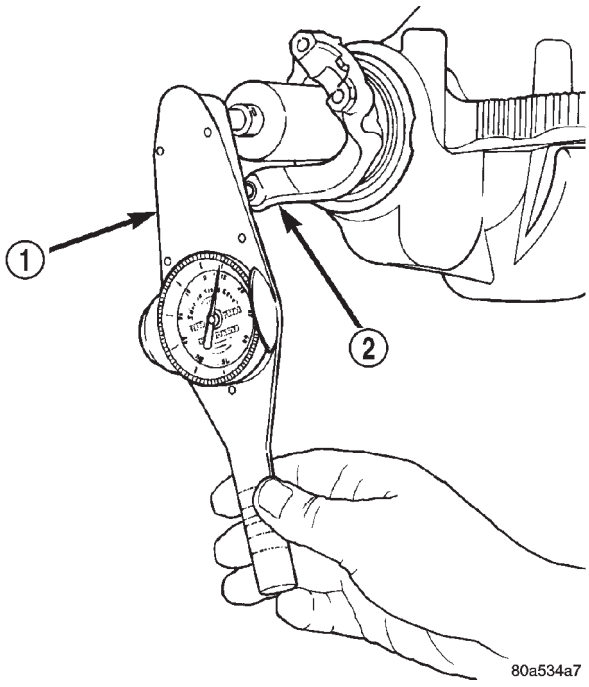


Fig. 59 Pinion Rotating Torque

1 - TORQUE WRENCH
2 - PINION YOKE

PINION GEAR/RING GEAR/TONE RING (Continued)

(15) Invert the differential case.

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

(17) Invert the differential case in the vise.

(18) Install **new** ring gear bolts and alternately tighten to 102 N·m (75 ft. lbs.) (Fig. 60).

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

(19) Install differential in axle housing and verify gear mesh refer to Adjustments (Gear Contact Pattern).

(20) Install differential cover fill with gear lubricant.

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

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

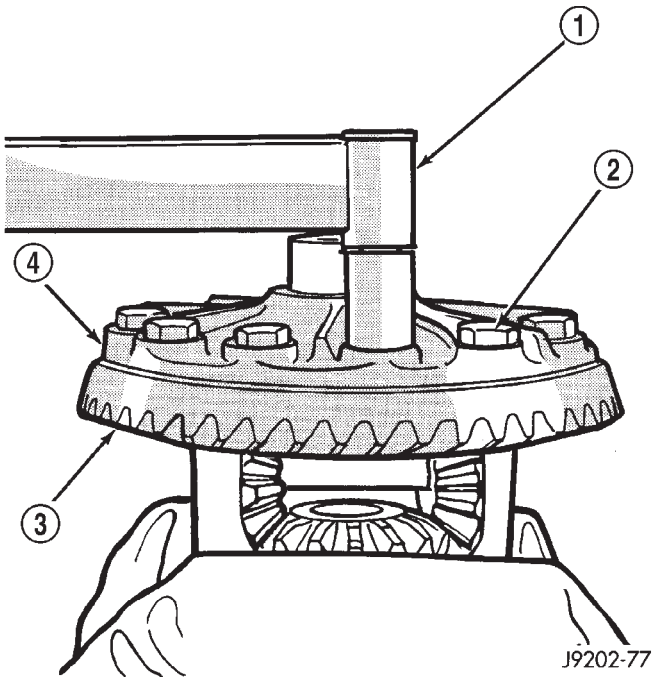


Fig. 60 Ring Gear

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