

DIFFERENTIAL AND DRIVELINE

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PROPELLER SHAFTS

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GENERAL INFORMATION

PROPELLER SHAFTS

The function of a propeller shaft is to transmit power from one point to another in a smooth action. The shaft is designed to send torque through an angle from the transmission (transfer case on 4WD vehicles) to the axle.

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

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

Before undercoating a vehicle, the propeller shaft and the U-joints should be removed if possible. If removal is not possible, make sure that the propeller shaft and u-joints are fully covered. This will prevent the undercoating from causing an out of balance condition and vibration.

CAUTION: Use exact replacement parts for attaching the propeller shafts to ensure safe operation. The specified torque must always be applied when tightening the fasteners.

GENERAL INFORMATION (Continued)

CENTER BEARING

The two-piece propeller shaft uses a center bearing to support the shafts. Two types of center bearings are used. Type 1 is used with the 9 1/4 axle. Type 2 is used with the Dana axles (Fig. 1). Both types are mounted in the same location.

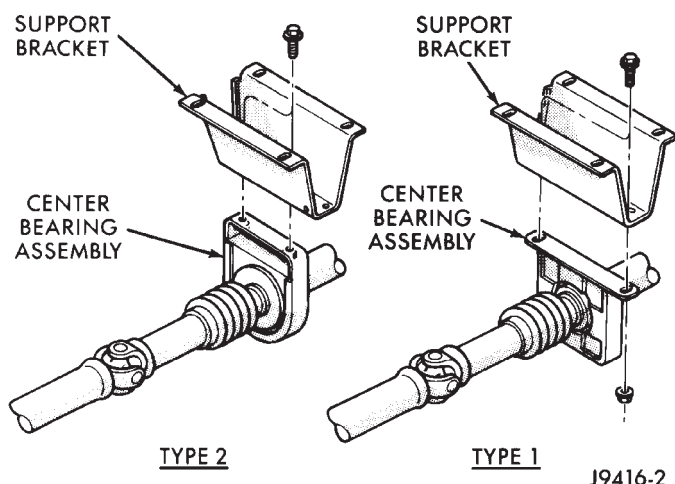


Fig. 1 Center Bearing

LUBRICATION

The factory installed universal joints are lubricated for the life of the vehicle. All universal joints should be inspected for leakage and damage each time the vehicle is serviced. If seal leakage or damage exists, the universal joint should be replaced. Refer to Group 0, Lubrication and Maintenance, for additional information.

PROPELLER SHAFT JOINT ANGLE

When two shafts come together at a common joint, the bend that is formed is called the operating angle. The larger the angle, the larger the amount of angular acceleration and deceleration of the joint. This speeding up and slowing down of the joint must be cancelled to produce a smooth power flow. This is done through the phasing of a propeller shaft and ensuring that the proper propeller shaft joint working angles are maintained.

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

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

Ideally the driveline system should have;

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

Engine speed (rpm) is the main factor in determining the maximum allowable operating angle. As a guide to the maximum normal operating angles refer to (Fig. 2).

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

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Fig. 2 Maximum Angles And Engine Speed

PRECAUTIONS

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

Also make alignment reference marks (Fig. 3) on the propeller shaft yoke and axle, or transmission, yoke prior to servicing. This helps to eliminate possible vibration.

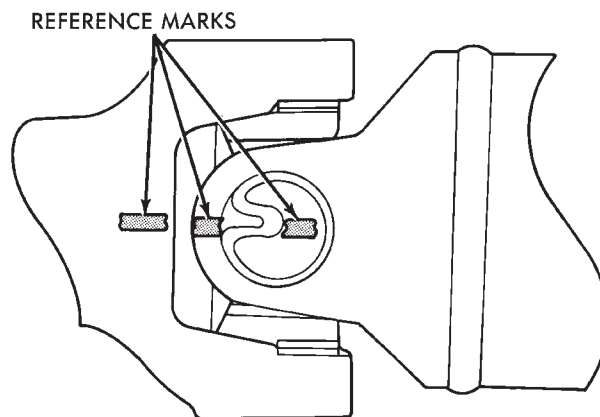


Fig. 3 Reference Marks on Yokes

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

CAUTION: It is very important to protect the external machined surface of the slip yoke from damage during and after propeller shaft removal. If the yoke is damaged, the transmission extension seal may be damaged and therefore cause a leak.

DIAGNOSIS AND TESTING

VIBRATION

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

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

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

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

UNBALANCE

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. 4).

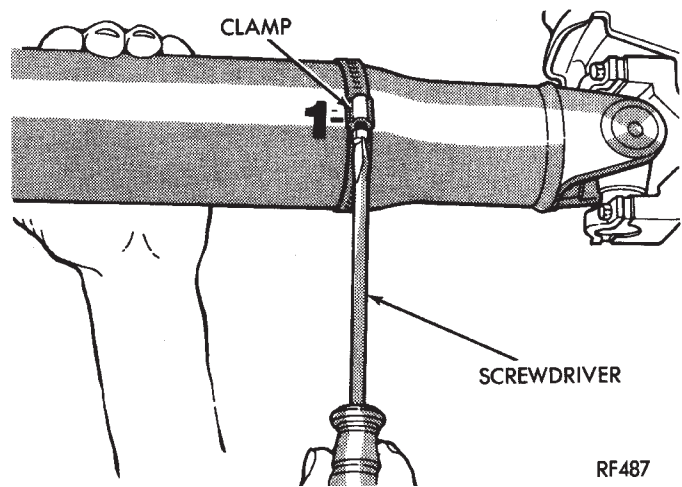


Fig. 4 Clamp Screw At Position 1

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
PROPELLER SHAFT	<ol style="list-style-type: none"> a. Undercoating or other foreign material on shaft. b. Loose U-joint clamp screws. c. Loose or bent U-joint yoke or excessive runout. d. Incorrect drive line angularity. e. Rear spring center bolt not in seat. f. Worn U-joint bearings. g. Propeller shaft damaged (bent tube) or out of balance. h. Broken rear spring. i. Excessive runout or unbalanced condition. j. Excessive drive pinion gear shaft yoke runout. 	<ol style="list-style-type: none"> a. Clean exterior of shaft and wash with solvent. b. Tighten screws properly. c. Install replacement yoke. d. Correct angularity e. Loosen spring U-bolts and seat center bolts. f. Replace U-joint. g. Install replacement propeller shaft. h. Replace rear spring. i. Reindex propeller shaft 180°, test and correct as necessary. j. Reindex propeller shaft 180° and evaluate.
UNIVERSAL JOINT NOISE	<ol style="list-style-type: none"> a. U-joint clamp screws loose. b. Lack of lubrication. 	<ol style="list-style-type: none"> a. Tighten screws with specified torque. b. Replace U-joint.

DIAGNOSIS AND TESTING (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. 5) and repeat the test.

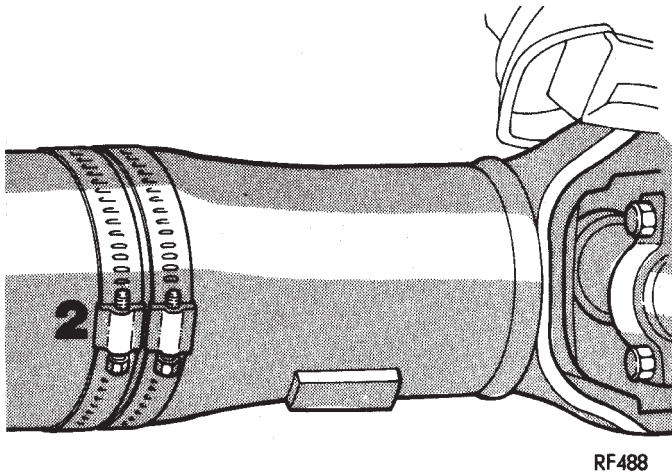


Fig. 5 Two Clamp Screws At The Same Position

(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. 6).

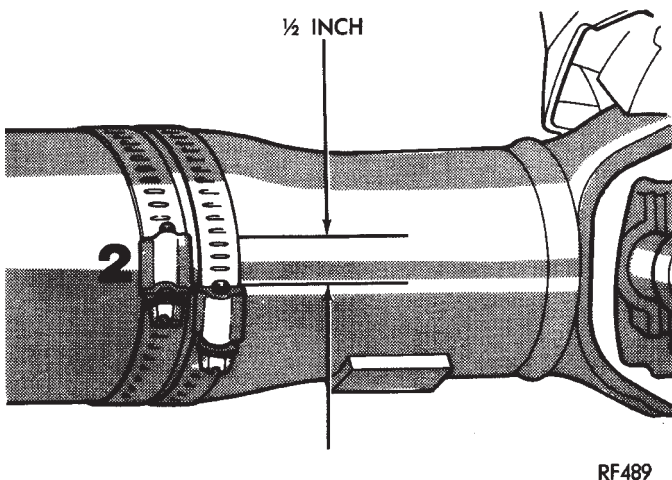


Fig. 6 Clamp Screws Separated

(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.

SERVICE PROCEDURES

DRIVELINE ANGLE MEASUREMENT PREPARATION

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

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

SERVICE PROCEDURES (Continued)

PROPELLER SHAFT ANGLE MEASUREMENT

ONE-PIECE PROPELLER SHAFT

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

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

Always make measurements from front to rear.

(2) Place Inclinometer on yoke bearing cap (A) parallel to the shaft (Fig. 7). Center bubble in sight glass and record measurement.

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

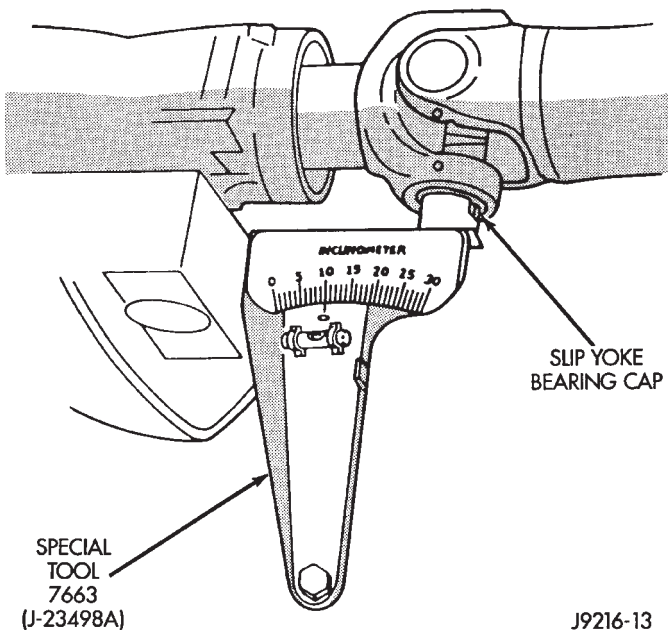


Fig. 7 Front (Output) Angle Measurement (A)

(3) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing cap parallel to the shaft (Fig. 8). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

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

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

(5) Rotate propeller shaft 90 degrees and place Inclinometer on pinion yoke bearing cap parallel to the shaft (Fig. 9). Center bubble in sight glass and record measurement.

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

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

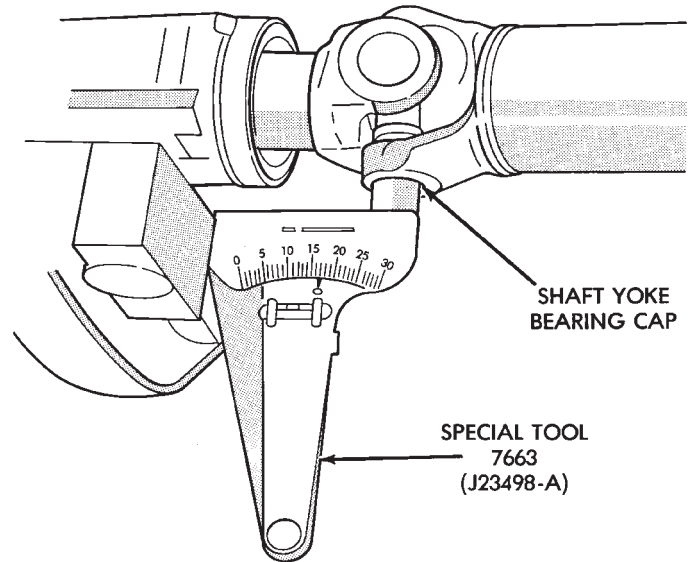


Fig. 8 Propeller Shaft Angle Measurement (C)

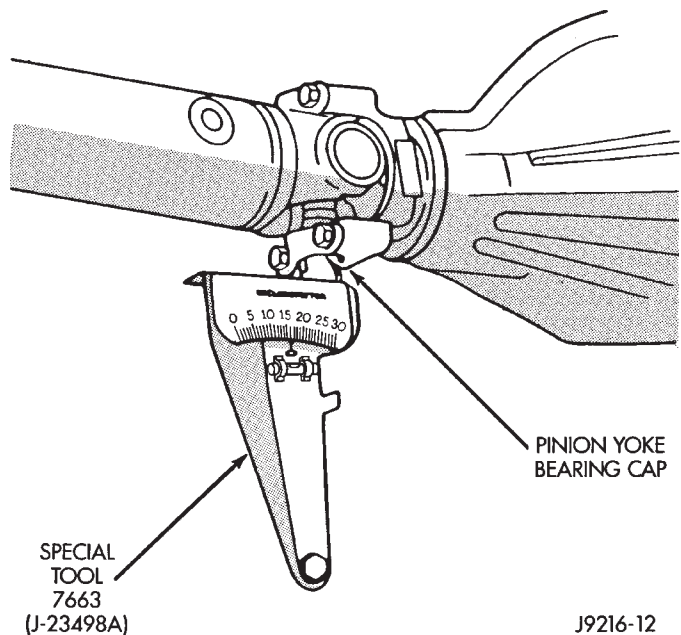


Fig. 9 Rear (Input) Angle Measurement (B)

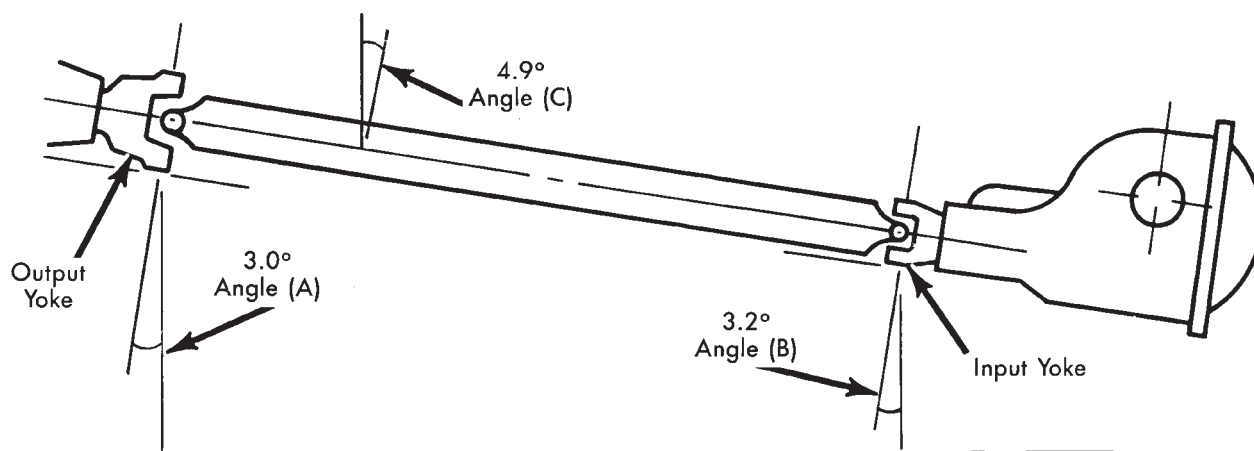
Refer to rules given below and the example in for additional information.

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

TWO-PIECE PROPELLER SHAFT

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

SERVICE PROCEDURES (Continued)



Horizontal Level

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

Transmission Output
Operating Angle 1.9°

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

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°

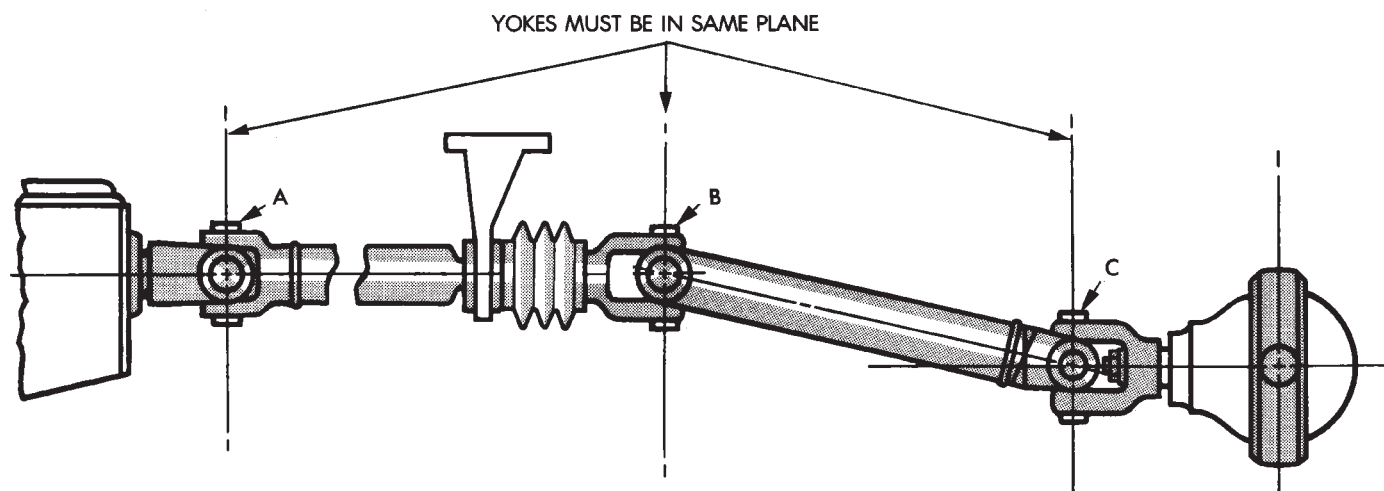
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Fig. 10 Universal Joint Angle Example

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

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

- (1) Shift the transmission and transfer case to their neutral positions. Raise and support vehicle. Remove skid plate, if equipped.
- (2) Using a suitable marker, mark a line across the yoke at the transfer case, the link yoke, and pro-



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Fig. 11 Universal Joint Angle—Two-Piece Shaft

REMOVAL AND INSTALLATION (Continued)

propeller shaft yoke at the rear of the front propeller shaft for installation reference.

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

(4) Remove the universal joint strap bolts at the pinion shaft yoke (Fig. 12).

(5) Remove the bolts holding the propeller shaft to the transfer case yoke flange.

(6) Remove the propeller shaft.

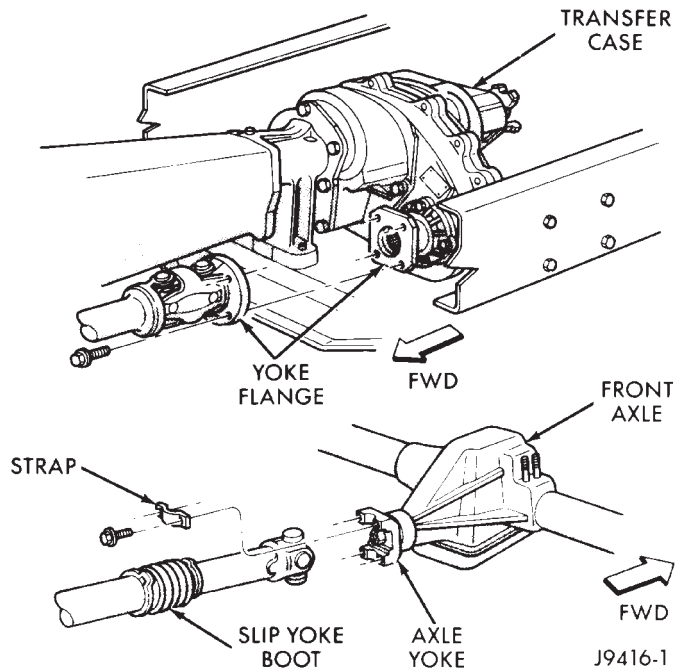


Fig. 12 Front Propeller Shaft

INSTALLATION

(1) Position front propeller shaft under vehicle with rear universal joint over the transfer case yoke flange.

(2) Place front universal joint into the axle pinion yoke.

(3) Align mark on the rear link yoke and universal joint to the mark on the transfer case yoke flange.

(4) Loosely install bolts to hold universal joint to transfer case yoke flange.

(5) Align mark on front universal joint to the mark on the axle pinion yoke.

(6) Install bolts to hold front universal joint to axle pinion yoke. Tighten bolts to 19 N·m (14 ft. lbs.).

(7) Tighten bolts to hold universal joint to transfer case yoke flange to 88 N·m (65 ft. lbs.).

(8) Install skid plate, if equipped.

(9) Lower vehicle and road test to verify repair.

REAR PROPELLER SHAFT

REMOVAL

(1) Raise and support vehicle on safety stands.

(2) Shift the transmission to the Neutral position.

(3) Using a suitable marker, mark a line across the axle pinion yoke and the propeller shaft yoke for installation reference.

(4) Using a suitable marker, mark the outline of the center bearing on the frame crossmember for installation reference, if equipped.

(5) Remove bolts that attach the center bearing to the support bracket (Fig. 13), if equipped.

(6) Remove the bolts holding the universal joint clamps to the pinion yoke.

(7) Slide the slip yoke off of the transmission, or transfer case, output shaft and remove the propeller shaft (Fig. 14).

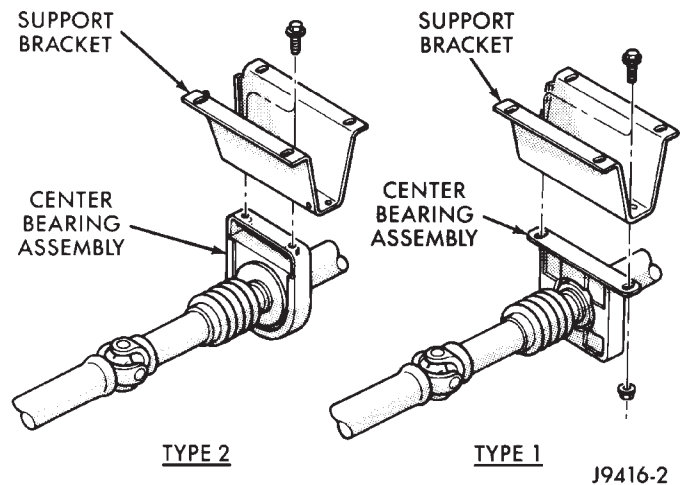


Fig. 13 Center Bearing

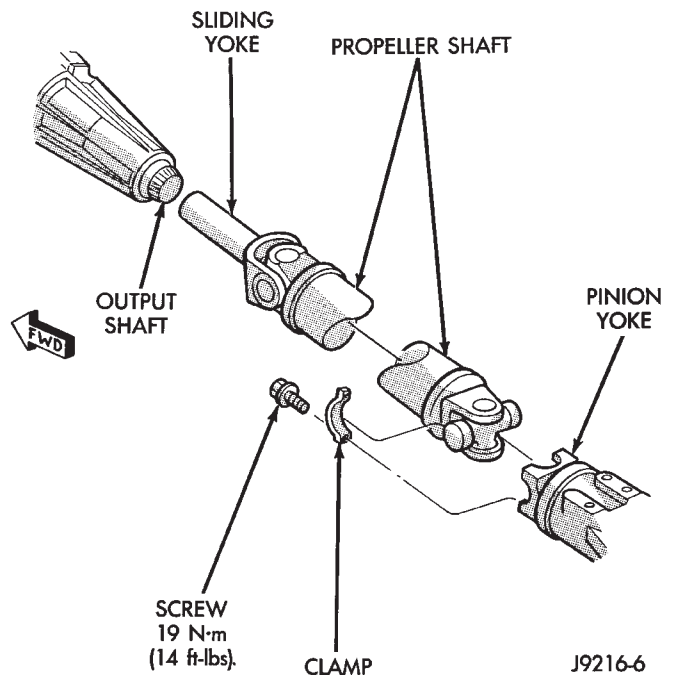


Fig. 14 Rear Propeller Shaft

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

- (1) Slide the slip yoke onto the transmission, or transfer case, output shaft.
- (2) Align the installation reference marks made on the propeller shaft and pinion yoke.
- (3) Align and install the center bearing to the support bracket, if necessary.
- (4) Install the bolts and tighten to 68 N·m (50 ft. lbs.) torque.
- (5) Position universal joint into pinion yoke.
- (6) Tighten the universal joint strap bolts to:
 - Dana Axle: 29 N·m (22 ft. lbs.) torque.
 - 9 1/4 Axle: 19 N·m (14 ft. lbs.) torque.
- (7) Lower the vehicle.

CENTER BEARING

Two types of center bearings are used. The two types are not interchangeable. Be sure to install the same type as the vehicle was built with.

REMOVAL

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

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

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

INSTALLATION

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

DISASSEMBLY AND ASSEMBLY

SINGLE CARDAN UNIVERSAL JOINT

DISASSEMBLY

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

- (1) Remove the propeller shaft.

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

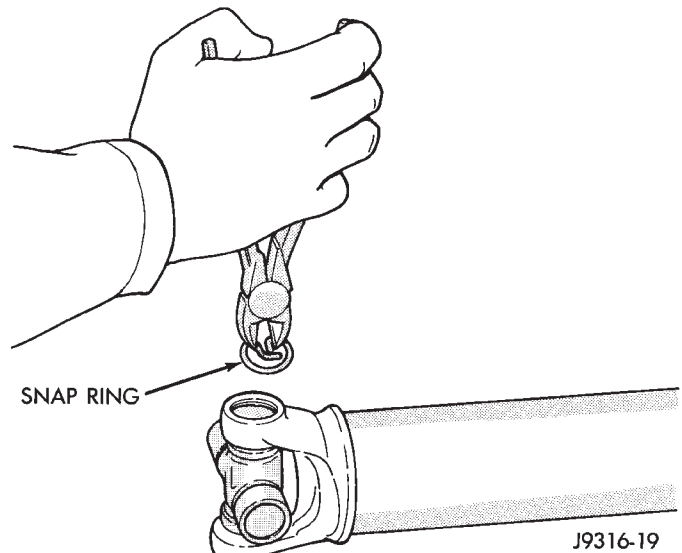


Fig. 15 Remove Snap Ring

- (4) Set the yoke in an arbor press or vise with a socket whose inside diameter is large enough to receive the bearing cap positioned beneath the yoke.
- (5) Position the yoke with the grease fitting, if equipped, pointing up.
- (6) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and press the cap through the yoke to release the lower bearing cap (Fig. 16).

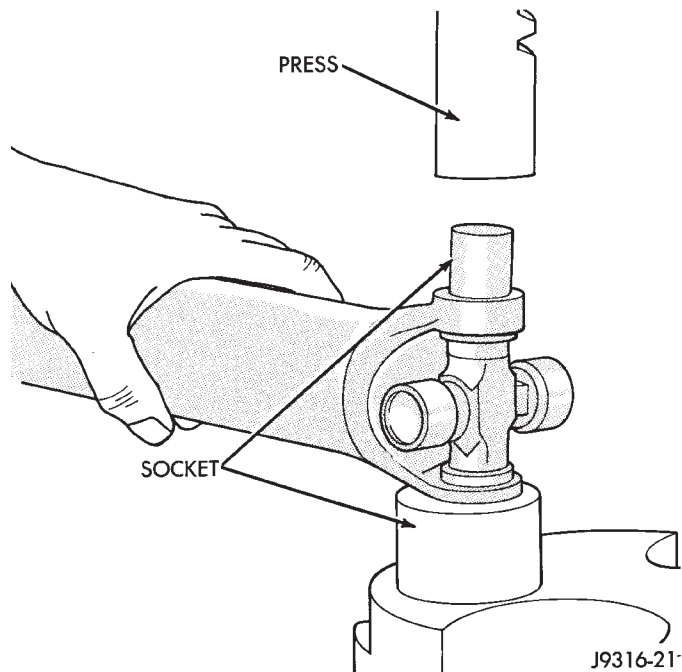


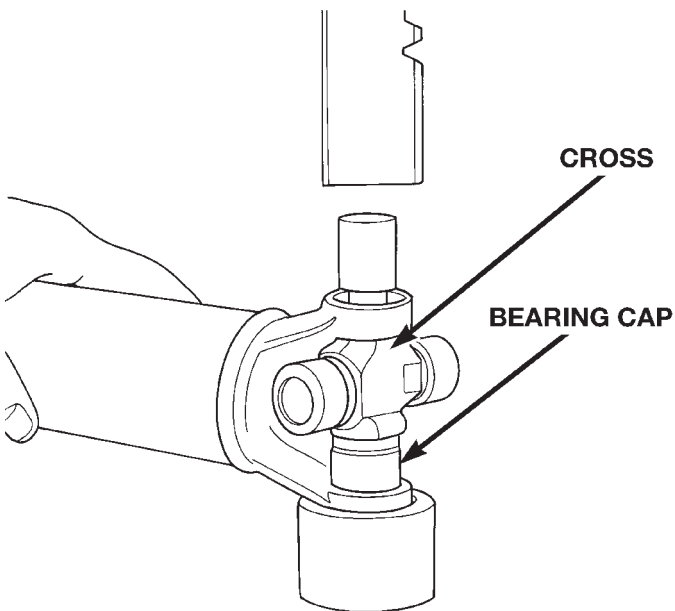
Fig. 16 Press Out Bearing

DISASSEMBLY AND ASSEMBLY (Continued)

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

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

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



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Fig. 17 Press Out Remaining Bearing

ASSEMBLY

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

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

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

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

(5) Install a snap ring.

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

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

(8) Install the propeller shaft.

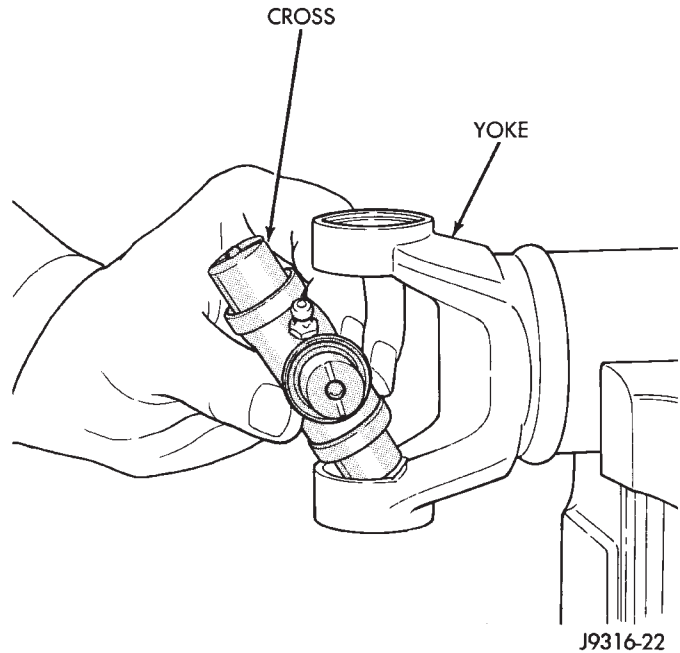


Fig. 18 Install Cross In Yoke

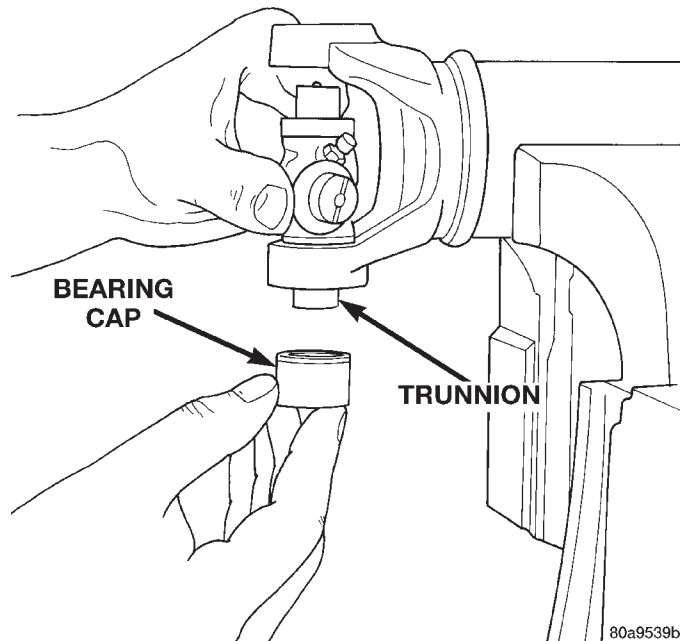


Fig. 19 Install Bearing On Trunnion

DOUBLE CARDAN JOINT

DISASSEMBLY

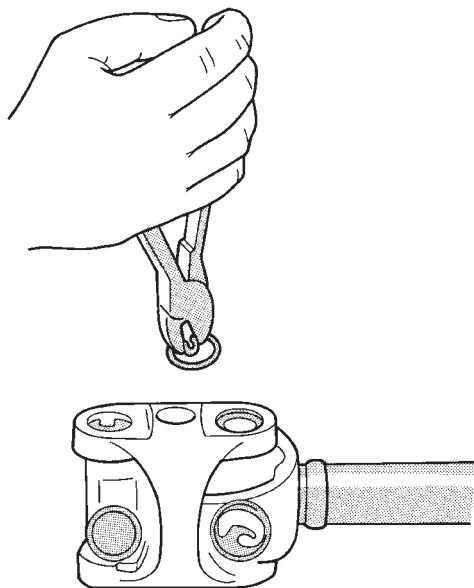
Individual components of cardan universal joints are not serviceable. If worn or leaking, they must be replaced as an assembly.

(1) Remove the propeller shaft.

(2) Using a soft drift, tap the outside of the bearing cap assembly to loosen snap ring.

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Remove all the bearing cap snap rings (Fig. 20).

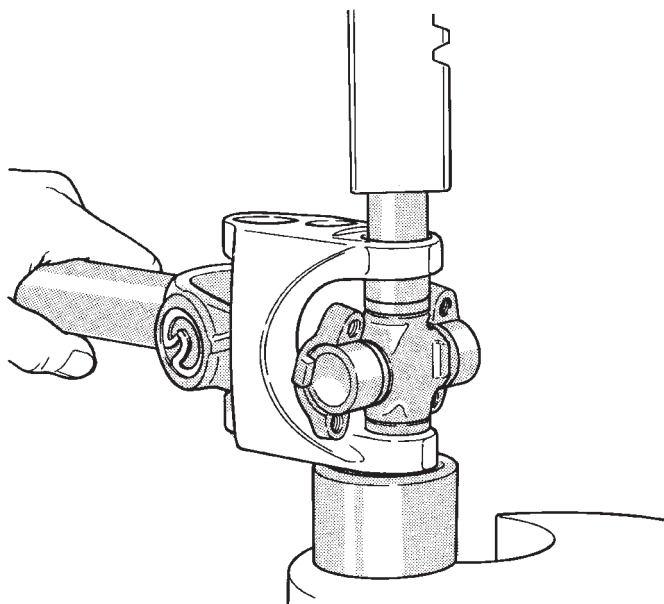


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Fig. 20 Remove Snap Rings

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

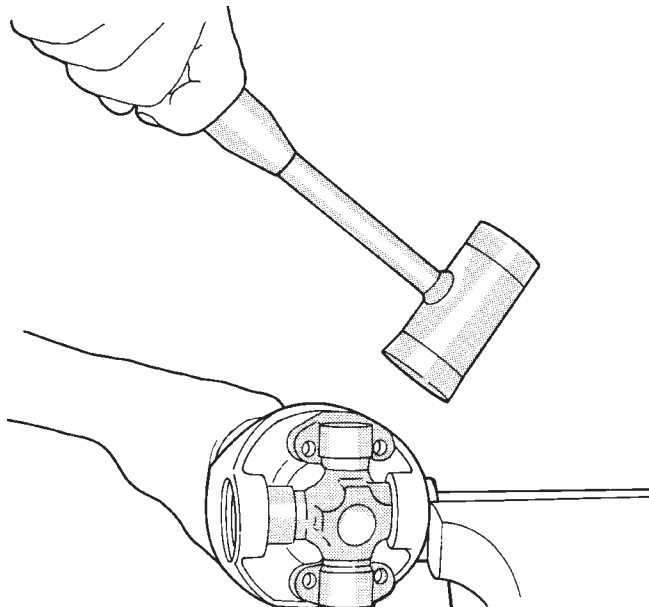
(5) Place a socket with an outside diameter smaller than the upper bearing cap on the upper bearing cap and partially press one bearing cap from the outboard side of the link yoke enough to grasp the bearing cap with vise jaws (Fig. 21). Be sure to remove grease fittings that interfere with removal.



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Fig. 21 Press Out Bearing

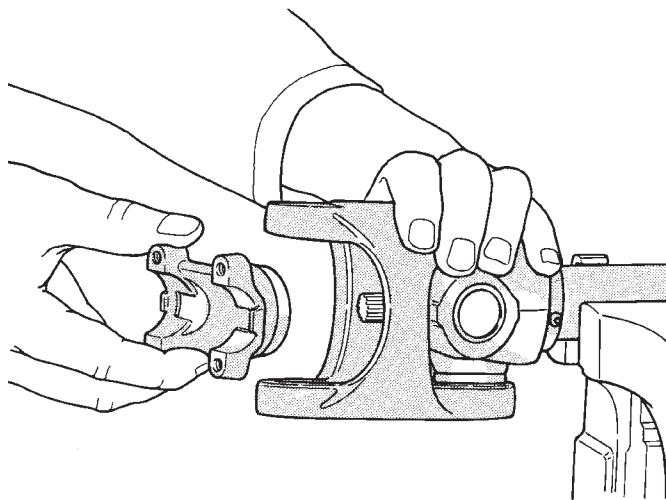
(6) Grasp the protruding bearing by vise jaws. Tap the link yoke with a mallet and drift to dislodge the bearing cap from the yoke (Fig. 22).



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Fig. 22 Remove Bearing From Yoke

(7) Flip assembly and repeat Step 4, Step 5, and Step 6 to remove the opposite bearing cap. This will then allow removal of the cross centering kit assembly and spring (Fig. 23).



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Fig. 23 Remove Centering Kit

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

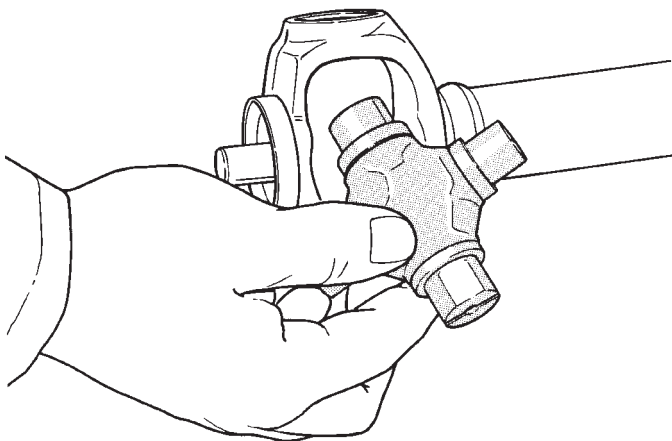
DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

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

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

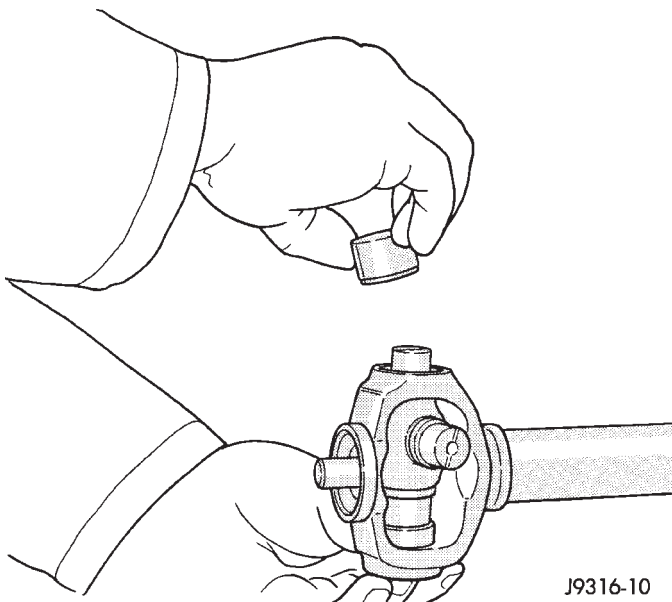
(2) Fit a cross into the propeller shaft yoke (Fig. 24).



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Fig. 24 Install Cross In Yoke

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 25). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.

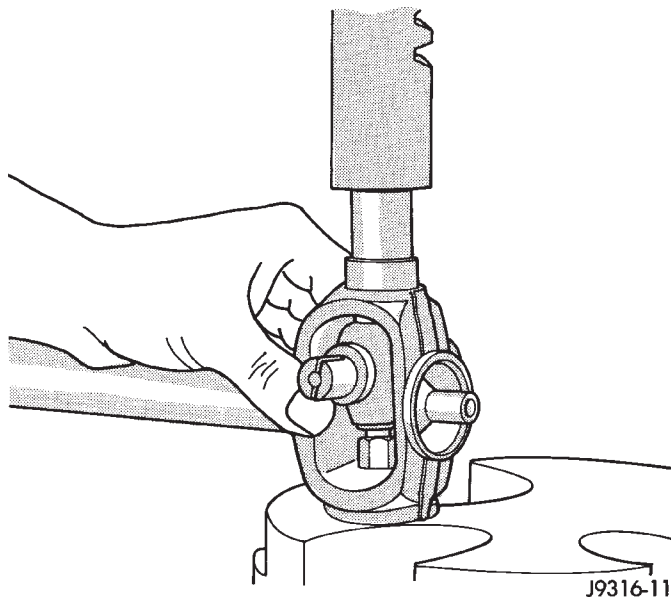


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Fig. 25 Install Bearing Cap

(4) Press the bearing cap into the yoke bore enough to install a snap ring (Fig. 26).

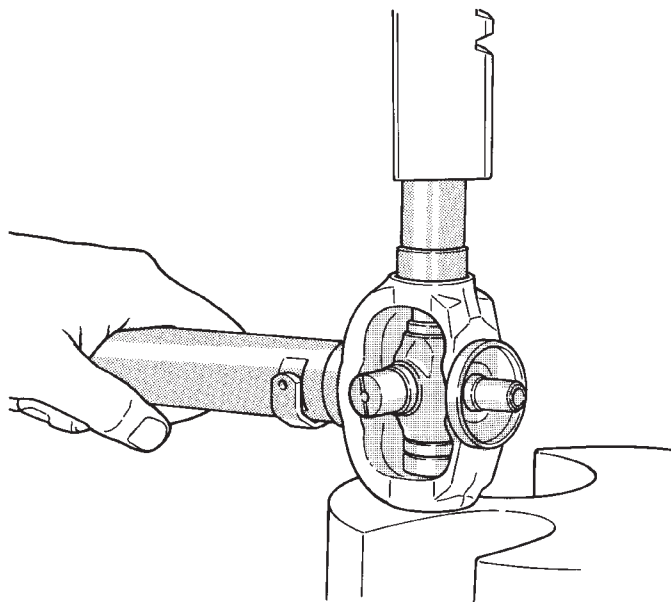
(5) Install a snap ring.



J9316-11

Fig. 26 Press In Bearing Cap

(6) Flip the propeller shaft yoke and install the bearing cap onto the opposite trunnion. Install a snap ring (Fig. 27).



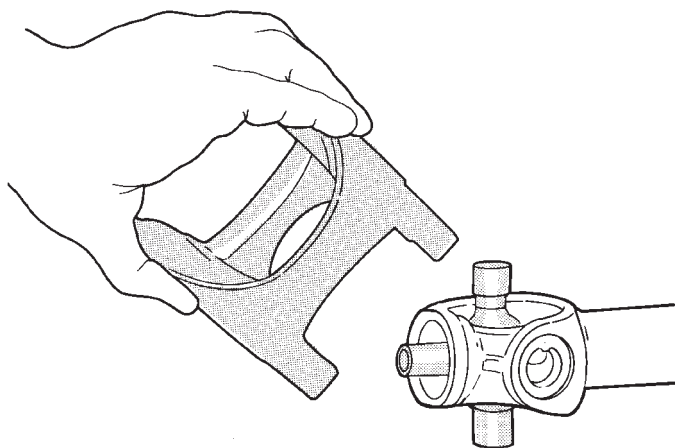
J9316-12

Fig. 27 Press In Bearing Cap

(7) Fit the link yoke on the remaining two trunnions and press both bearing caps into place (Fig. 28).

(8) Install snap rings.

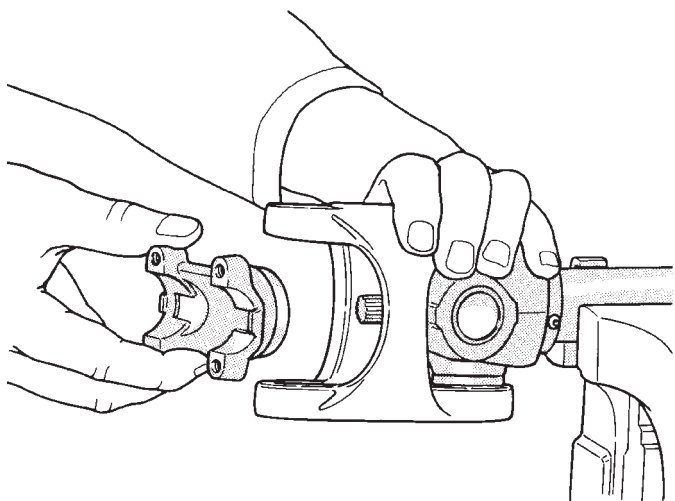
DISASSEMBLY AND ASSEMBLY (Continued)



J9316-13

Fig. 28 Install Link Yoke

(9) Install the centering kit assembly inside the link yoke making sure the spring is properly positioned (Fig. 29).



J9316-14

Fig. 29 Install Centering Kit

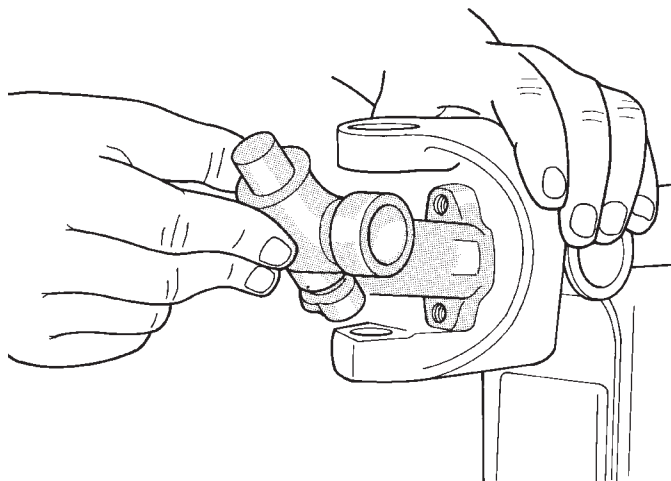
(10) Place two bearing caps on opposite trunnions of the remaining cross. Fit the open trunnions into the link yoke bores and the bearing caps into the centering kit (Fig. 30).

(11) Press the remaining two bearing caps into place and install snap rings (Fig. 31).

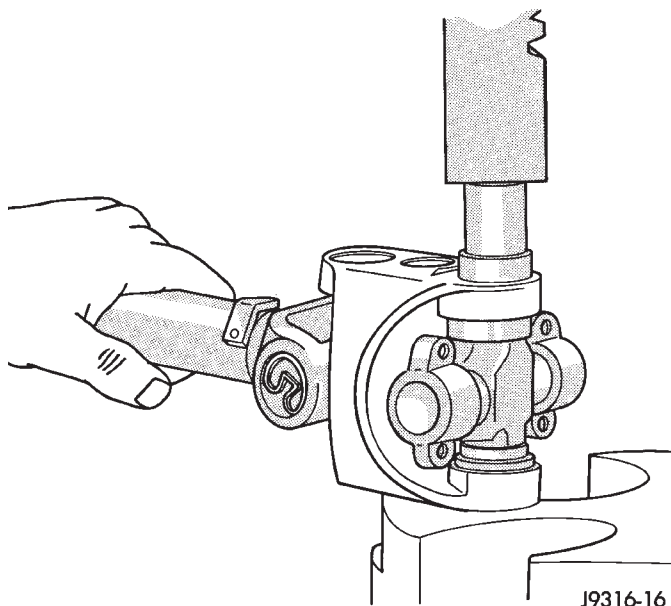
(12) Tap the snap rings to allow them to seat into the grooves (Fig. 32).

(13) Check for proper assembly. Flex the joint beyond center, it should snap over-center in both directions when correctly assembled (Fig. 33).

(14) Install the propeller shaft.



J9316-15

Fig. 30 Install Remaining Cross

J9316-16

Fig. 31 Press In Bearing Cap

CLEANING AND INSPECTION

PROPELLER SHAFT

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

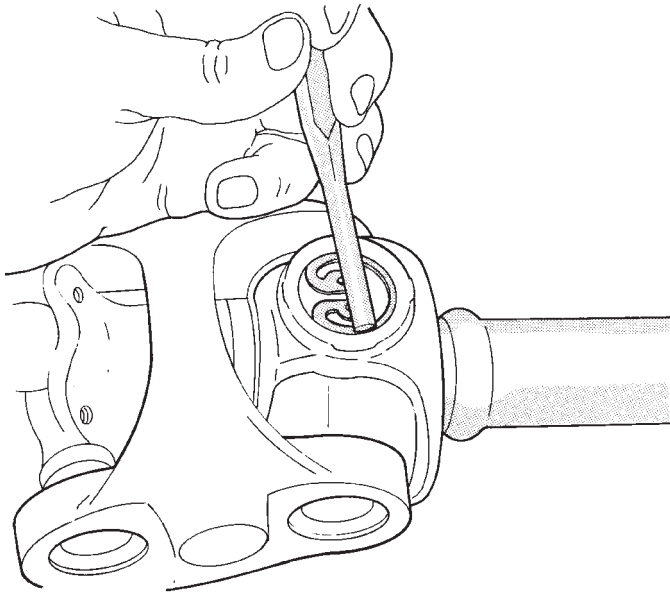
(2) Inspect the yokes for distortion, cracks, and worn bearing cap bores.

ADJUSTMENTS

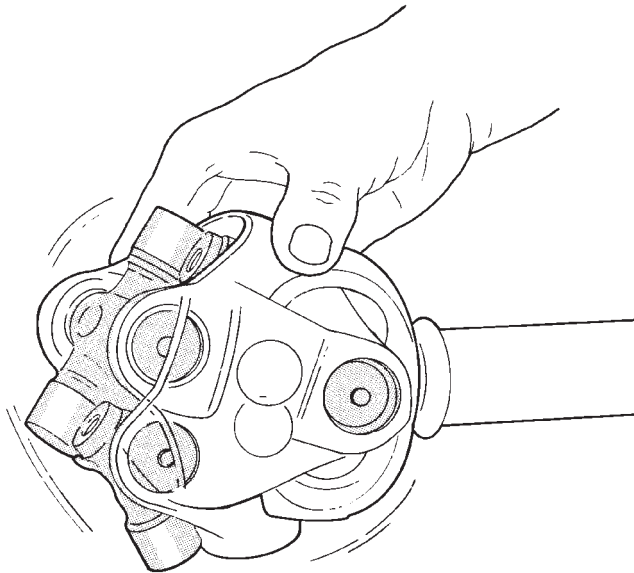
ADJUSTMENT AT AXLE WITH LEAF SPRINGS

Adjust the pinion shaft angle at the springs with tapered shims (Fig. 34). Install tapered shims between the springs and axle pad to correct the

ADJUSTMENTS (Continued)



J9316-17

Fig. 32 Seat Snap Rings In Groove

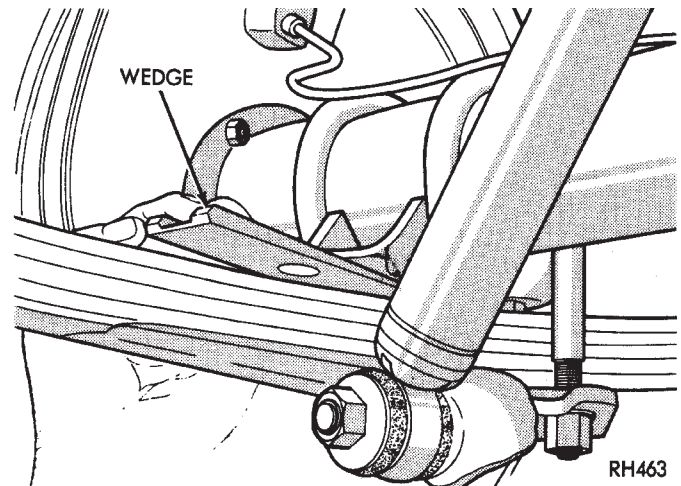
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Fig. 33 Check Assembly

angle. Refer to Group 2, Suspension, for additional information.

CENTER BEARING ADJUSTMENT

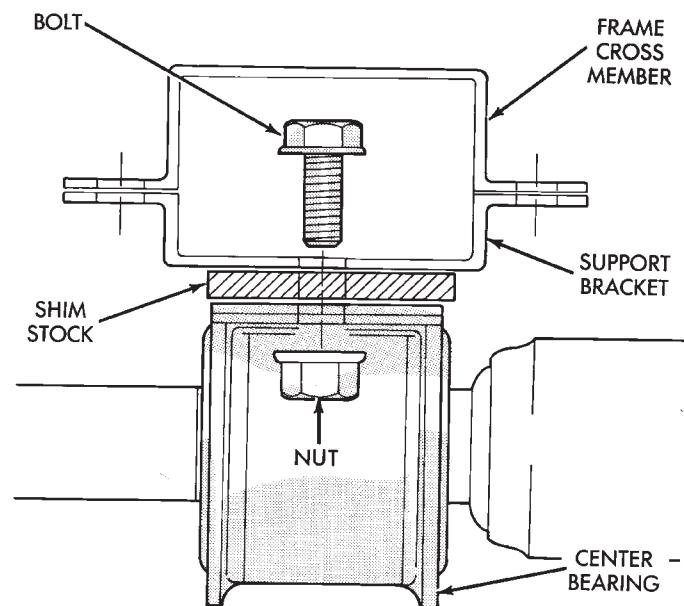
Drive away shudder is a vibration that occurs at first acceleration from a stop. Shudder vibration usually peaks at the engines highest torque output. Shudder is a symptom associated with vehicles using a two-piece propeller shaft. To decrease shudder, lower the center bearing in 1/8 inch increments. Use shim stock or fabricated plates (Fig. 35). Plate stock must be used to maintain compression of the rubber



RH463

Fig. 34 Angle Adjustment at Leaf Springs

insulator around the bearing. Do not use washers. Replace the original bolts with the appropriate increased length bolts.



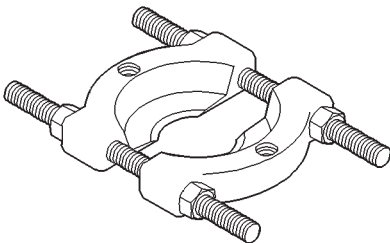
J9316-25

Fig. 35 Center Bearing Adjustment—Typical

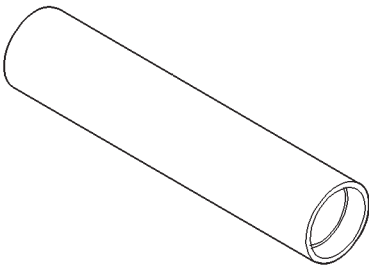
SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
FRONT SHAFT	
Bolts, flange yoke88 N·m (65 ft. lbs.)
Bolts, axle yoke19 N·m (14 ft. lbs.)
REAR SHAFT AXLE YOKE BOLTS	
9 1/4 Axle.19 N·m (14 ft. lbs.)
Dana Axle30 N·m (22 ft. lbs.)
CENTER BEARING BRACKET	
Frame Bolts68 N·m (50 ft. lbs.)
Bearing Bolts68 N·m (50 ft. lbs.)



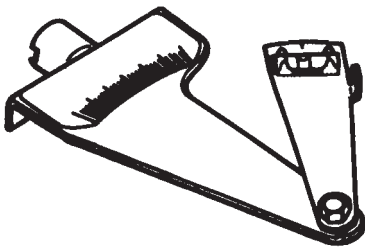
Bearing Splitter—1130



Installer, Bearing—6052

SPECIAL TOOLS

PROPELLER SHAFT



Inclinometer—7663

216 AND 248 FBI AXLES

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GENERAL INFORMATION

216 AND 248 FBI AXLES

The housing for the 216 and 248 Front Beam-design Iron (FBI) axles consists of an iron center casting with tubes on each side. The tubes are pressed into and welded to the differential housing.

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

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

The axles are equipped with semi-floating axle shafts, meaning that loads are supported by the hub bearings. The axle shafts are retained by nuts at the hub bearings. The hub bearings are bolted to the steering knuckle at the outboard end of the axle tube yoke. The hub bearings are serviced as an assembly.

The axles are equipped with ABS brake sensors. The sensors are attached to the knuckle assemblies and the tone rings are pressed onto the axle shaft.

Use care when removing axle shafts as NOT to damage the tone wheel or the sensor.

The stamped steel cover provides a means for inspection and servicing the differential.

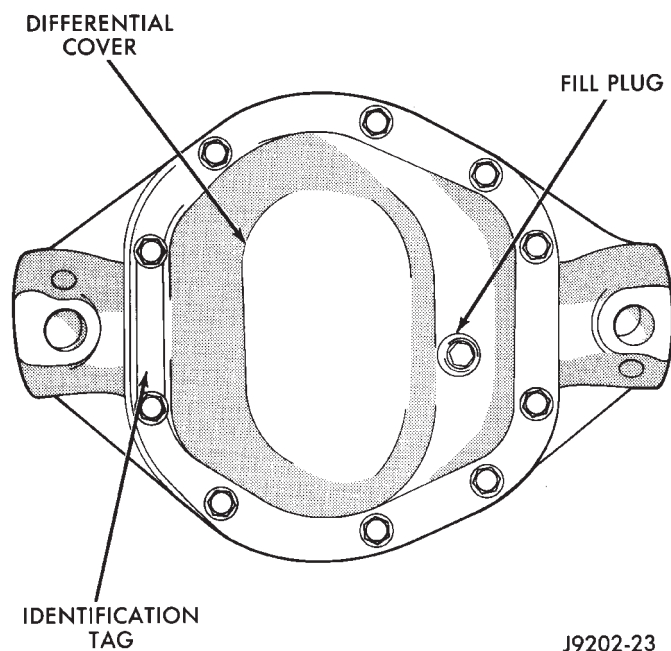
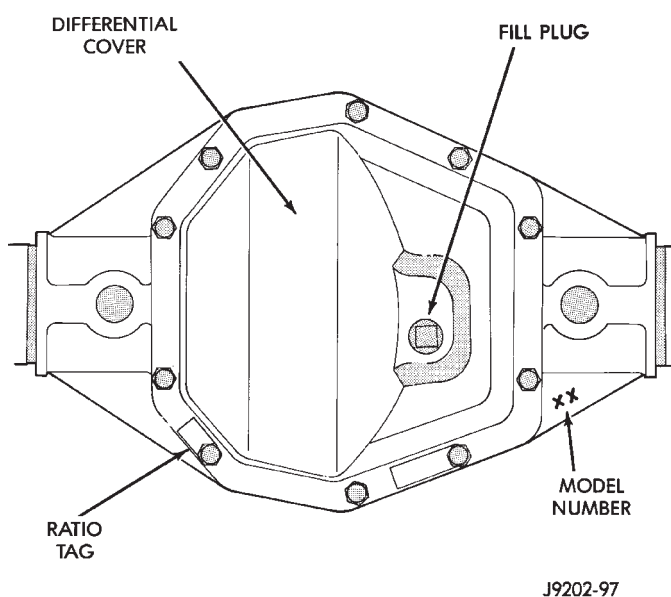
The 216 and 248 FBI axles have the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover by one of the cover bolts. Build date identification codes are stamped on the cover side of a axle tube.

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. The shims are located between the differential bearing cones and case. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

AXLE IDENTIFICATION

The axle differential covers can be used for identification of the axle (Fig. 1) and (Fig. 2). A tag is also attached to the cover.

GENERAL INFORMATION (Continued)

**Fig. 1 216 FBI Differential Cover****Fig. 2 248 FBI Differential Cover****LUBRICANT SPECIFICATIONS**

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

- The lubricant should have MIL-L-2105C and API GL 5 quality specifications.
- Lubricant is a thermally stable SAE 80W-90 gear lubricant.

The 216 FBI axle lubricant capacity is 2.3 L (4.8 pts.). The 248 FBI axle lubricant capacity is 3.6 L (7.6 pts.).

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

STANDARD DIFFERENTIAL

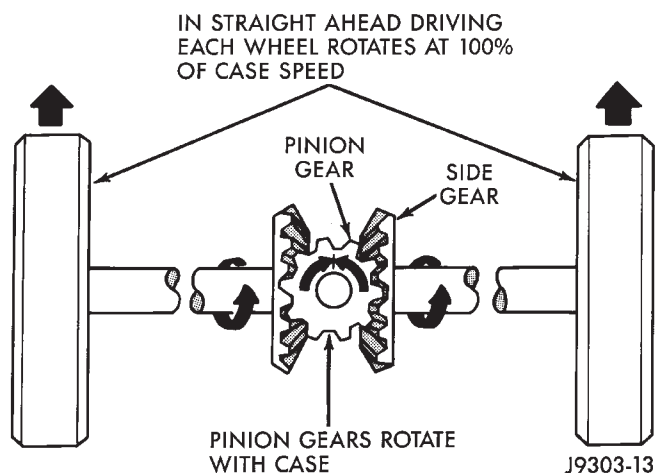
The differential gear system divides the torque between the axle shafts. It allows the axle shafts to rotate at different speeds when turning corners.

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

In operation, power flow occurs as follows:

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

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 3).

**Fig. 3 Differential Operation—Straight Ahead Driving**

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. 4). 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

GENERAL INFORMATION (Continued)

attached to the outside wheel to rotate at a faster speed.

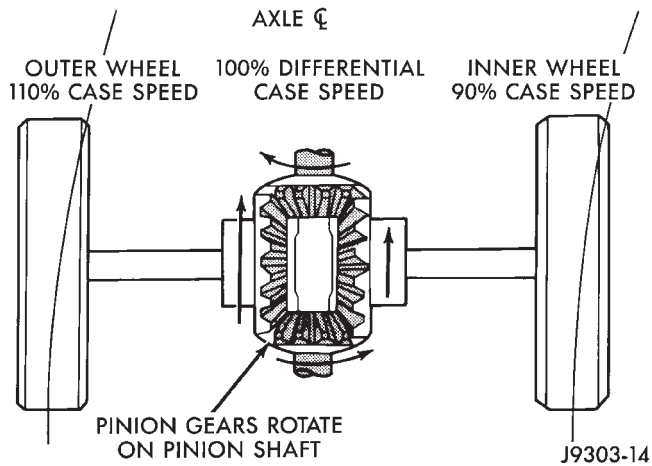


Fig. 4 Differential Operation—On Turns

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

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

Axle gear problem conditions are usually the result of:

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

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, or worn/damaged gears.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, 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 and pinion gears 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 gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

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

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

DIAGNOSIS AND TESTING (Continued)

can contribute to what appears to be a rear-end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

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

- High engine idle speed

- 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/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.

DIAGNOSIS AND TESTING (Continued)

FRONT AXLES

DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	<ol style="list-style-type: none"> 1. Wheel loose. 2. Faulty, brinelled wheel bearing. 	<ol style="list-style-type: none"> 1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces. 	<ol style="list-style-type: none"> 1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch. 	<ol style="list-style-type: none"> 1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	<ol style="list-style-type: none"> 1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation. 	<ol style="list-style-type: none"> 1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	<ol style="list-style-type: none"> 1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire. 	<ol style="list-style-type: none"> 1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 1. Lubricant level too high. 	<ol style="list-style-type: none"> 1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONTINUED

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed. 	<ol style="list-style-type: none"> 2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	<ol style="list-style-type: none"> 1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash. 	<ol style="list-style-type: none"> 1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	<ol style="list-style-type: none"> 1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments. 	<ol style="list-style-type: none"> 1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	<ol style="list-style-type: none"> 1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts 	<ol style="list-style-type: none"> 1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

DIAGNOSIS AND TESTING (Continued)

AXLE VACUUM SHIFT MOTOR DIAGNOSIS

VACUUM CONTROL SYSTEM

The disconnect axle control system consists of:

- Shift motor.
- Indicator switch.
- Vacuum switch.
- Vacuum harness (Fig. 5).

Refer to Group 21, Transmission and Transfer Case, for additional information.

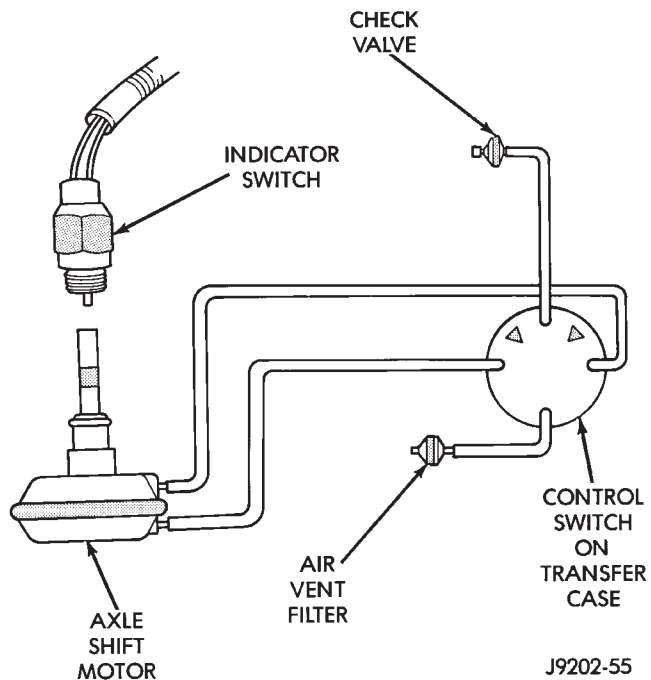
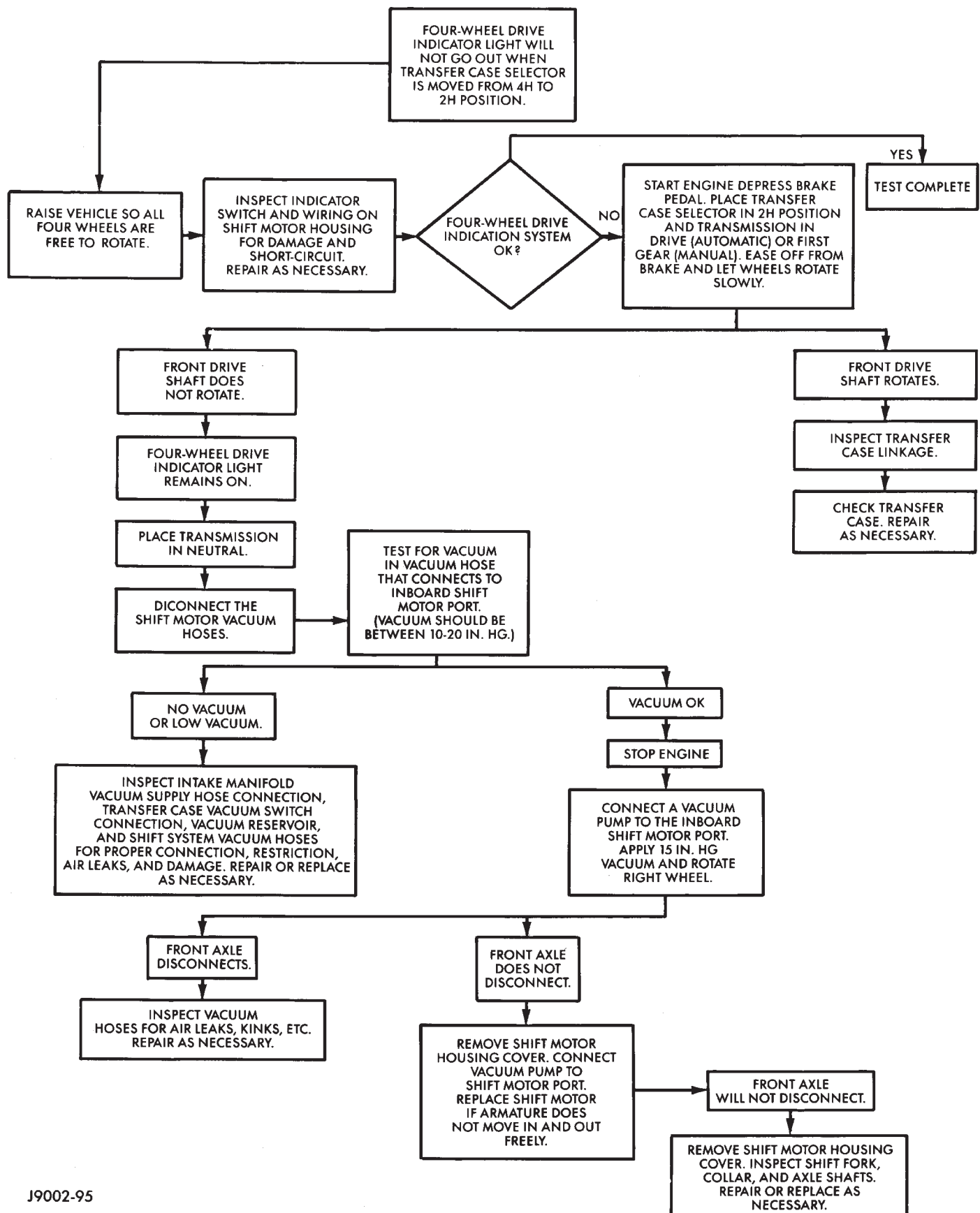


Fig. 5 Vacuum Control System

DIAGNOSIS AND TESTING (Continued)

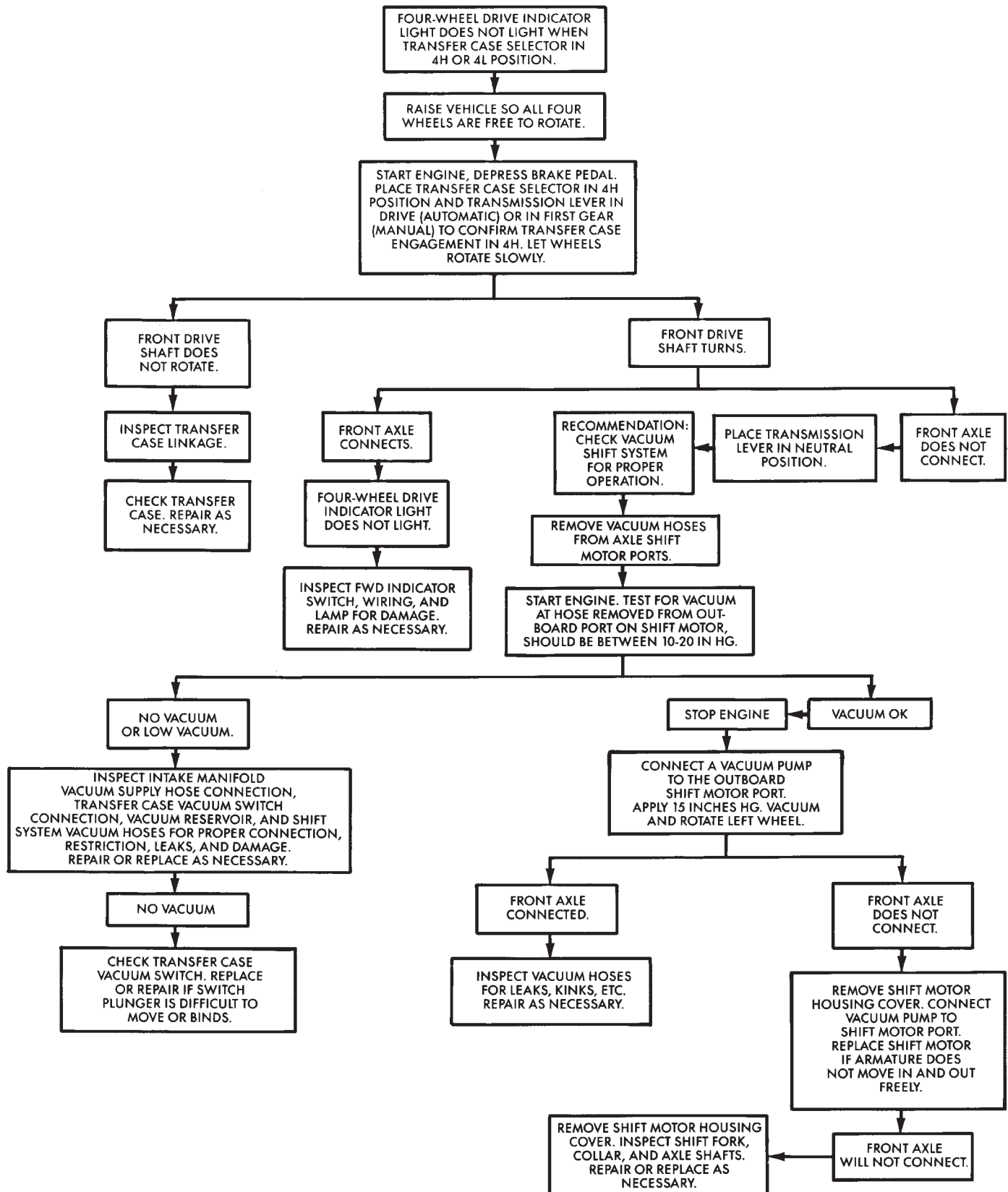
AXLE VACUUM SHIFT MOTOR DIAGNOSIS
TWO-WHEEL DRIVE OPERATION DIAGNOSIS



DIAGNOSIS AND TESTING (Continued)

AXLE VACUUM SHIFT MOTOR DIAGNOSIS (CONT'D)

FOUR-WHEEL DRIVE OPERATION DIAGNOSIS



SERVICE PROCEDURES

LUBRICANT CHANGE

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

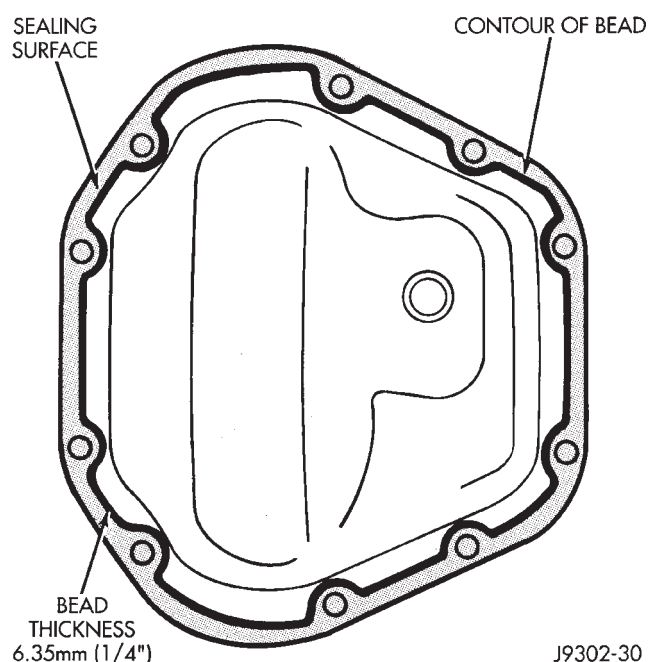


Fig. 6 Typical Housing Cover With Sealant

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

- (7) Install the cover and any identification tag. Tighten the cover bolts in a criss-cross pattern to 41 N·m (30 ft. lbs.) torque.
- (8) Refill the differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications in this group for the quantity necessary.
- (9) Install the fill hole plug and lower the vehicle.

REMOVAL AND INSTALLATION

AXLE ASSEMBLY

REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the wheels and tires.
- (3) Remove the brake calipers and rotors. Refer to Group 5, Brakes, for proper procedures.
- (4) Remove ABS wheel speed sensors, if equipped. Refer to Group 5, Brakes, for proper procedures.
- (5) Disconnect the axle vent hose.
- (6) Disconnect vacuum hose and electrical connector at disconnect housing.
- (7) Remove the front propeller shaft.
- (8) Disconnect the stabilizer bar links at the axle brackets.
- (9) Disconnect the shock absorbers from axle brackets.
- (10) Disconnect the track bar from the axle bracket.
- (11) Disconnect the tie rod and drag link from the steering knuckles.
- (12) Position the axle with a suitable lifting device under the axle assembly.
- (13) Secure axle to lifting device.
- (14) Mark suspension alignment cams for installation reference.
- (15) Disconnect the upper and lower suspension arms from the axle bracket.
- (16) Lower the axle. The coil springs will drop with the axle.
- (17) Remove the coil springs from the axle bracket.

INSTALLATION

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

- (1) Support the axle on a suitable lifting device.
- (2) Secure axle to lifting device.
- (3) Position the axle under the vehicle.
- (4) Install the springs, retainer clip and bolts.
- (5) Raise the axle and align it with the spring pads.
- (6) Position the upper and lower suspension arms in the axle brackets. Install bolts, nuts and align the suspension alignment cams to the reference marks. Do not tighten at this time.
- (7) Connect the track bar to the axle bracket and install the bolt. Do not tighten at this time.

REMOVAL AND INSTALLATION (Continued)

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

(9) Install the stabilizer bar link to the axle bracket. Tighten the nut to 37 N·m (27 ft. lbs.) torque.

(10) Install the drag link and tie rod to the steering knuckles and tighten the nuts to 88 N·m (65 ft. lbs.) torque.

(11) Install the ABS wheel speed sensors, if equipped. Refer to group 5, Brakes, for proper procedures.

(12) Install the brake calipers and rotors. Refer to Group 5, Brakes, for proper procedures.

(13) Connect the vent hose to the tube fitting.

(14) Connect vacuum hose and electrical connector to disconnect housing.

(15) Install front propeller shaft.

(16) Check and add differential lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.

(17) Install the wheel and tire assemblies.

(18) Remove the supports and lower the vehicle.

(19) Tighten the upper suspension arm nuts at axle to 121 N·m (89 ft. lbs.) torque. Tighten the upper suspension arm nuts at frame to 84 N·m (62 ft. lbs.) torque.

(20) Tighten the lower suspension arm nuts at axle to 84 N·m (62 ft. lbs.) torque. Tighten the lower suspension arm nuts at frame to 119 N·m (88 ft. lbs.) torque.

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

(22) Check the front wheel alignment.

PINION SHAFT SEAL—216 FBI AXLE

REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove wheel and tire assemblies.
- (3) Remove brake calipers and rotors
- (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 the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
- (8) Remove the pinion yoke nut and washer. Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 7).
- (9) Use suitable pry tool or slide hammer mounted screw to remove the pinion shaft seal.

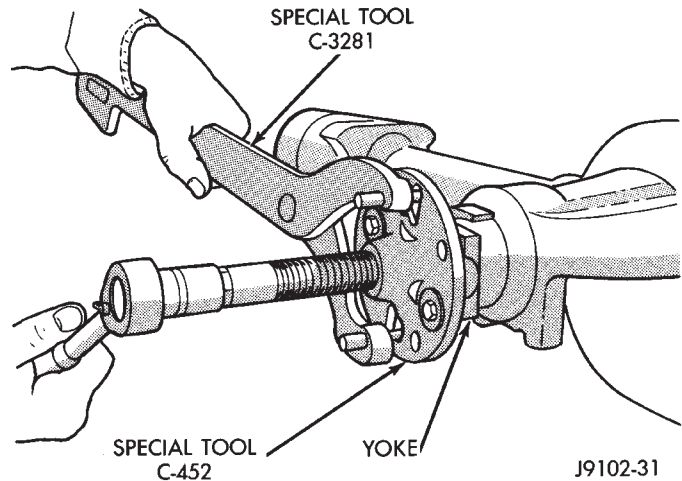


Fig. 7 Pinion Yoke Removal

INSTALLATION

- (1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C-4171 (Fig. 8).

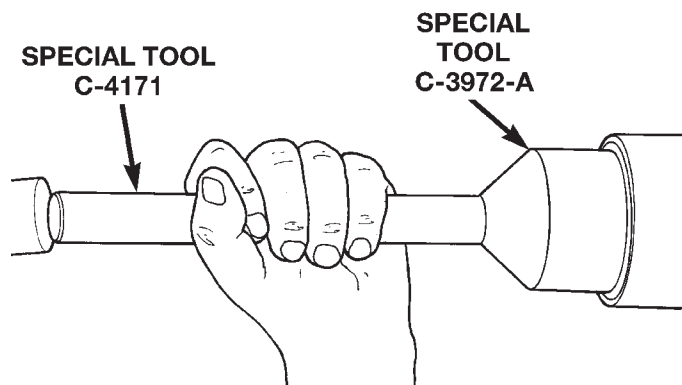


Fig. 8 Pinion Seal Installation

- (2) Install yoke on the pinion gear with Installer W-162-D (Fig. 9).

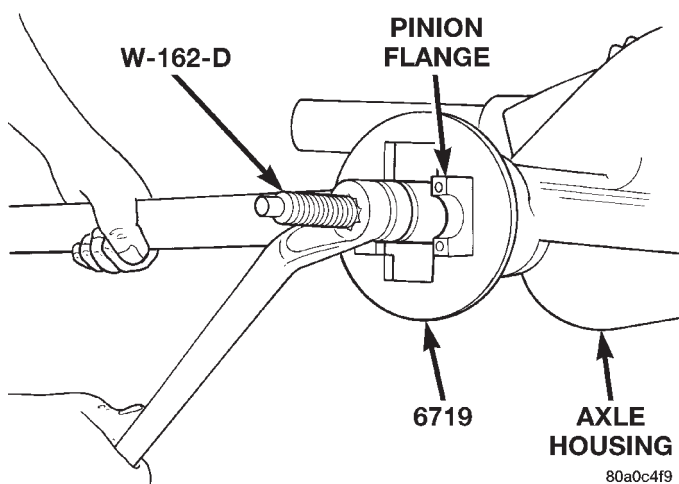
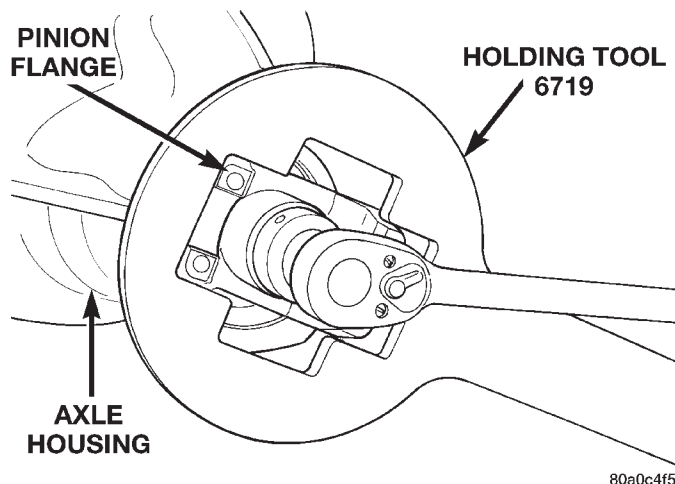
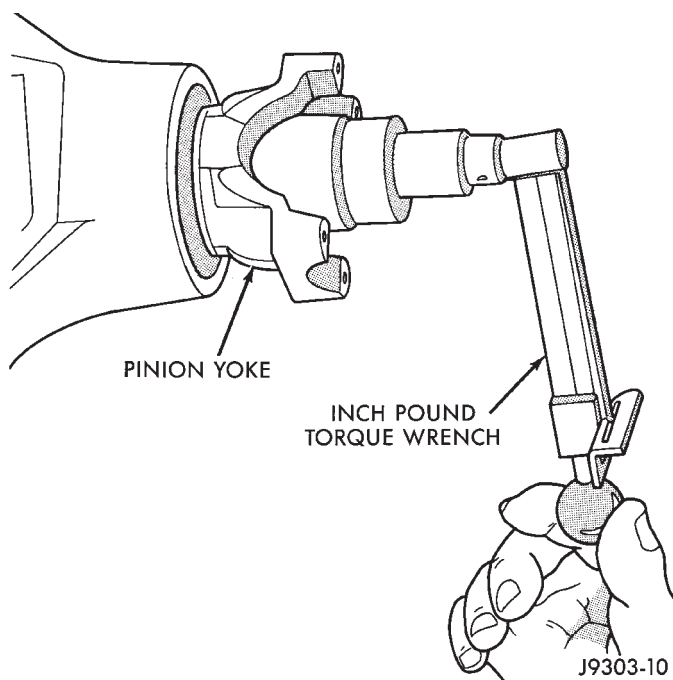
CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut. Damage to collapsible spacer or bearings may result.

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

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

- (5) If the rotating torque is too low, use Holder 6719 to hold the pinion yoke (Fig. 11), and tighten the pin-

REMOVAL AND INSTALLATION (Continued)

**Fig. 9 Install Pinion Yoke****Fig. 11 Tightening Pinion Shaft Nut****Fig. 10 Check Pinion Rotation Torque**

ion shaft nut in 6.8 N·m (5 ft. lbs.) until proper rotating torque is achieved.

(6) Align the installation reference marks and attach the propeller shaft to the yoke.

(7) Check and add lubricant to axle, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.

(8) Install brake rotors and calipers.

(9) Install wheel and tire assemblies.

(10) Lower the vehicle.

PINION SHAFT SEAL—248 FBI AXLE**REMOVAL**

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

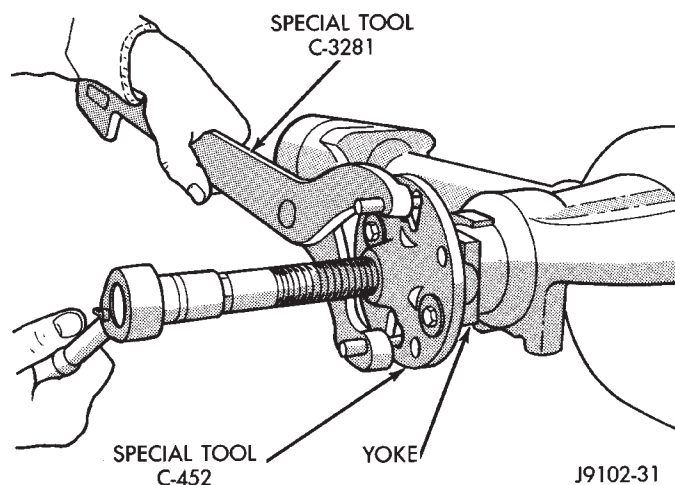
(3) Remove brake calipers and rotors
(4) Mark the propeller shaft and pinion yoke for installation reference.

(5) Remove the propeller shaft from the yoke.

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

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

(8) Remove the pinion yoke nut and washer. Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 12).

**Fig. 12 Pinion Yoke Removal**

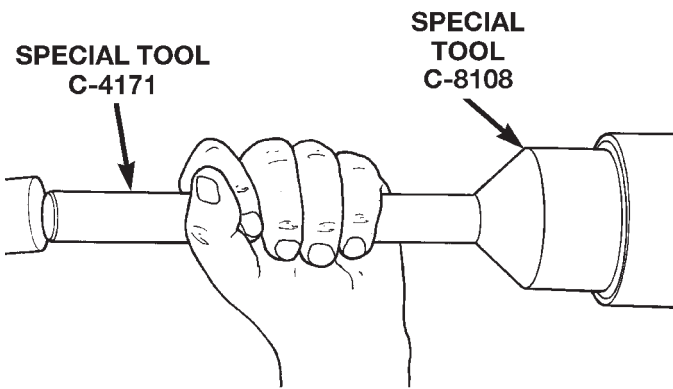
(9) Use suitable pry tool or slide hammer mounted screw to remove the pinion shaft seal.

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer 8108 and Handle C-4171 (Fig. 13).

(2) Install yoke on the pinion gear with Installer C-3718 and Holder 6719 (Fig. 14).

REMOVAL AND INSTALLATION (Continued)



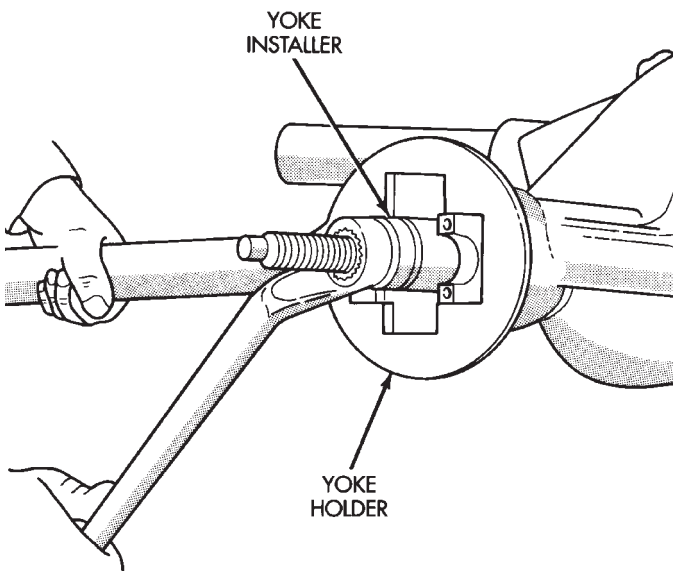
80a98349

Fig. 13 Pinion Seal Installation

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut. 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.

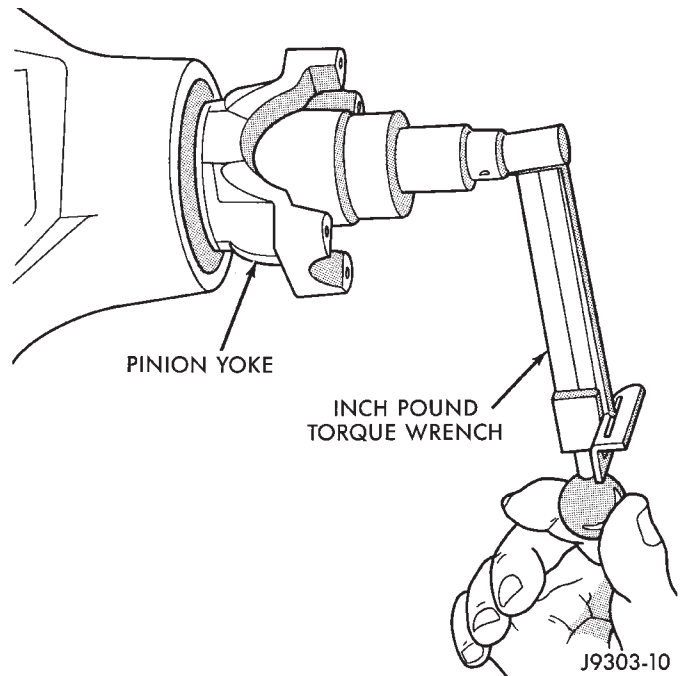
(4) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 15).



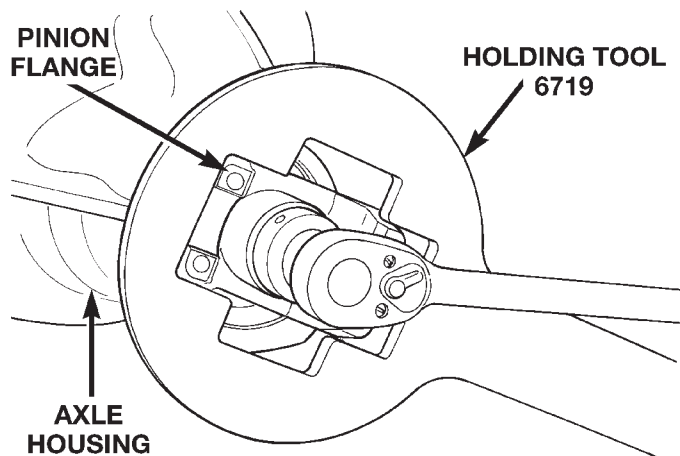
J9402-61

Fig. 14 Install Pinion Yoke

(5) If the rotating torque is to low, use Holder 6719 to hold the pinion yoke (Fig. 16), and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) until proper rotating torque is achieved.



J9303-10

Fig. 15 Check Pinion Rotation Torque

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Fig. 16 Tightening Pinion Shaft Nut

(6) Align the installation reference marks and attach the propeller shaft to the yoke.

(7) Check and add lubricant to axle, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.

(8) Install brake rotors and calipers.

(9) Install wheel and tire assemblies.

(10) Lower the vehicle.

AXLE SHIFT MOTOR**REMOVAL**

(1) Disconnect the vacuum and wiring connector from the shift housing.

(2) Remove indicator switch.

REMOVAL AND INSTALLATION (Continued)

(3) Remove the shift motor housing cover, gasket and shield from the housing (Fig. 17).

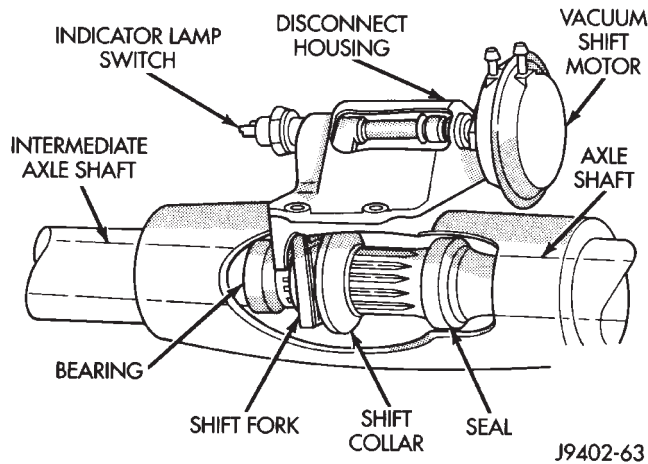


Fig. 17 Shift Motor Housing

INSTALLATION

(1) Install the shift motor housing gasket and cover. Ensure the shift fork is correctly guided into the shift collar groove.

(2) Install the shift motor housing shield and attaching bolts. Tighten the bolts to 11 N·m (96 in. lbs.) torque.

(3) Add 148 ml (5 ounces) of API grade GL 5 hypoid gear lubricant to the shift motor housing. Add lubricant through indicator switch mounting hole.

(4) Install indicator switch, electrical connector and vacuum harness.

HUB BEARING AND AXLE SHAFT

REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the wheel and tire assembly.
- (3) Remove the brake caliper and rotor. Refer to Group 5, Brakes, for proper procedures.
- (4) Remove ABS wheel speed sensor, if equipped. Refer to Group 5, Brakes, for proper procedures.
- (5) Remove the cotter pin and axle hub nut.
- (6) Remove the hub to knuckle bolts (Fig. 18). Remove the hub bearing from the steering knuckle and axle shaft.
- (7) Remove the brake dust shield.
- (8) Remove the axle shaft from the housing. Avoid damaging the axle shaft oil seal.

INSTALLATION

- (1) Clean the axle shaft and apply a thin film of Mopar® Wheel Bearing Grease to the shaft splines, seal contact surface, hub bore.
- (2) Install the axle shaft into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the differential.

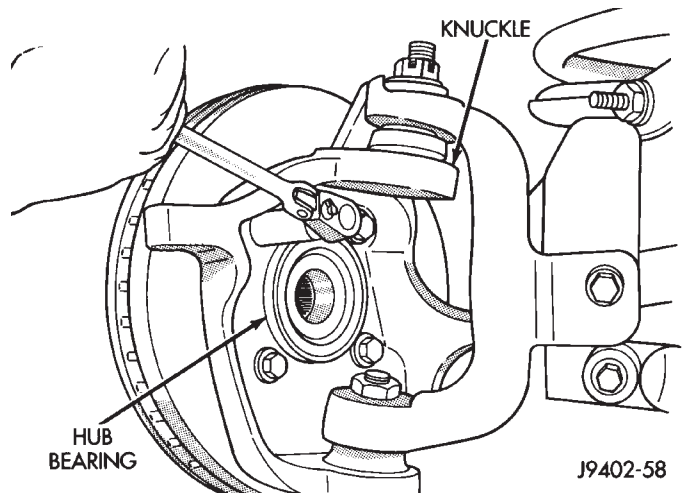


Fig. 18 Hub and Knuckle

(3) Install dust shield and hub bearing on knuckle, and axle shaft.

(4) Install the hub bearing to knuckle bolts and tighten to 170 N·m (125 ft. lbs.) torque.

(5) Install the axle washer and nut, tighten nut to 237 N·m (175 ft. lbs.) torque. Align nut to next cotter pin hole and install new cotter pin.

(6) Install ABS wheel speed sensor. Refer to Group 5, Brakes, for proper procedures.

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

(8) Install the wheel and tire assembly.

(9) Remove support and lower the vehicle.

AXLE SHAFT—CARDAN U-JOINT

Single cardan U-joint components are not serviceable. If defective, they must be replaced as a unit. If the bearings, seals, spider, or bearing caps are damaged or worn, replace the complete U-joint.

REMOVAL

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

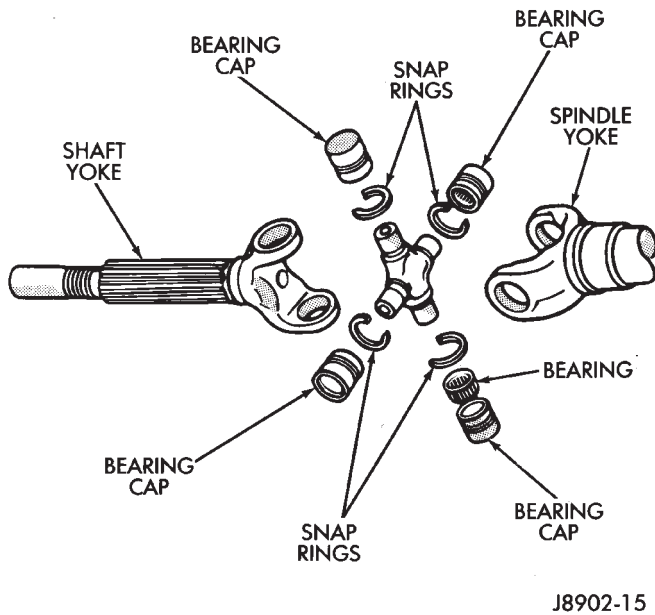
- (1) Remove axle shaft.
- (2) Remove the bearing cap retaining snap rings (Fig. 19).

It can be helpful to saturate the bearing caps with penetrating oil prior to removal.

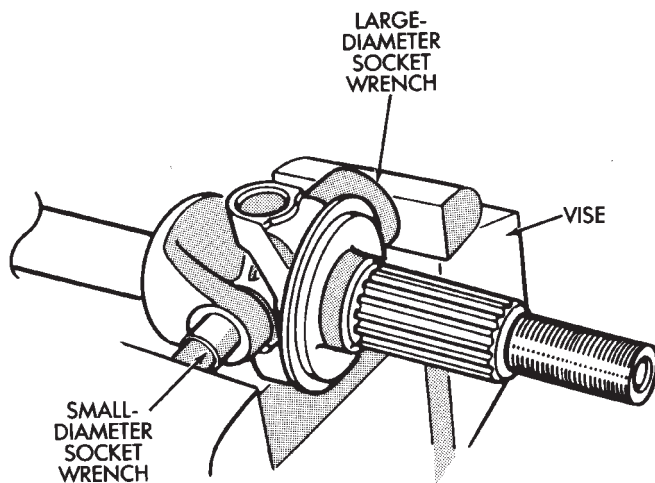
(3) Locate a socket where the inside diameter is larger in diameter than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed.

(4) Locate a socket where the outside diameter is smaller in diameter than the bearing cap. Place the socket (driver) against the opposite bearing cap.

REMOVAL AND INSTALLATION (Continued)

**Fig. 19 Axle Shaft Outer U-Joint**

(5) Position the yoke with the sockets in a vise (Fig. 20).

**Fig. 20 Yoke Bearing Cap Removal**

- (6) Compress the vise jaws to force the bearing cap into the larger socket (receiver).
- (7) Release the vise jaws. Remove the sockets and bearing cap that was partially forced out of the yoke.
- (8) Repeat the above procedure for the remaining bearing cap.
- (9) Remove the remaining bearing cap, bearings, seals and spider from the propeller shaft yoke.

INSTALLATION

- (1) Pack the bearing caps 1/3 full of wheel bearing lubricant. Apply extreme pressure (EP), lithium-base lubricant to aid in installation.
- (2) Position the spider in the yoke. Insert the seals and bearings. Tap the bearing caps into the yoke bores far enough to hold the spider in position.
- (3) Place the socket (driver) against one bearing cap. Position the yoke with the socket wrench in a vise.
- (4) Compress the vise to force the bearing caps into the yoke. Force the caps enough to install the retaining clips.
- (5) Install the bearing cap retaining clips.
- (6) Install axle shaft.

STEERING KNUCKLE—216 FBI AXLE**REMOVAL**

- (1) Remove hub bearing and axle shaft.
- (2) Remove tie-rod or drag link end from the steering knuckle arm.
- (3) Remove the ABS sensor wire and bracket from knuckle.
- (4) Remove the cotter pin from the upper ball stud nut. Remove the upper and lower ball stud nuts.
- (5) Strike the steering knuckle with a brass hammer to loosen. Remove knuckle from axle tube yokes.

INSTALLATION

- (1) Position the steering knuckle on the ball studs.
- (2) Install and tighten lower ball stud nut to 108 N·m (80 ft. lbs.) torque. Advance nut to next slot to line up hole and install new cotter pin.
- (3) Install and tighten upper ball stud nut to 101 N·m (75 ft. lbs.) torque. Advance nut to next slot to line up hole and install new cotter pin.
- (4) Install the hub bearing and axle shaft.
- (5) Install tie-rod or drag link end onto the steering knuckle arm.
- (6) Install the ABS sensor wire and bracket to the knuckle. Refer to Group 5, Brakes, for proper procedures.

STEERING KNUCKLE—248 FBI AXLE**REMOVAL**

- (1) Remove hub bearing and axle shaft.
- (2) Remove tie-rod or drag link end from the steering knuckle arm.
- (3) Remove the ABS sensor wire and bracket from knuckle. Refer to Group 5, Brakes, for proper procedures.
- (4) Remove the cotter pin from the upper ball stud nut. Remove the upper and lower ball stud nuts.
- (5) Strike the steering knuckle with a brass hammer to loosen.
- (6) Remove knuckle from axle tube yokes.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

- (1) Position the steering knuckle on the ball studs.
- (2) Install and tighten lower ball stud nut to 47 N·m (35 ft. lbs.) torque. Do not install cotter pin at this time.
- (3) Install and tighten upper ball stud nut to 94 N·m (70 ft. lbs.) torque. Advance nut to next slot to line up hole and install new cotter pin.
- (4) Retorque lower ball stud nut to 190–217 N·m (140–160 ft. lbs.) torque. Advance nut to next slot to line up hole and install new cotter pin.
- (5) Install the hub bearing and axle shaft.
- (6) Install tie-rod or drag link end onto the steering knuckle arm.
- (7) Install the ABS sensor wire and bracket to the knuckle. Refer to Group 5, Brakes, for proper procedure.

BALL STUDS—216 FBI AXLE

REMOVAL

- (1) Position tools as shown to remove upper ball stud (Fig. 21).

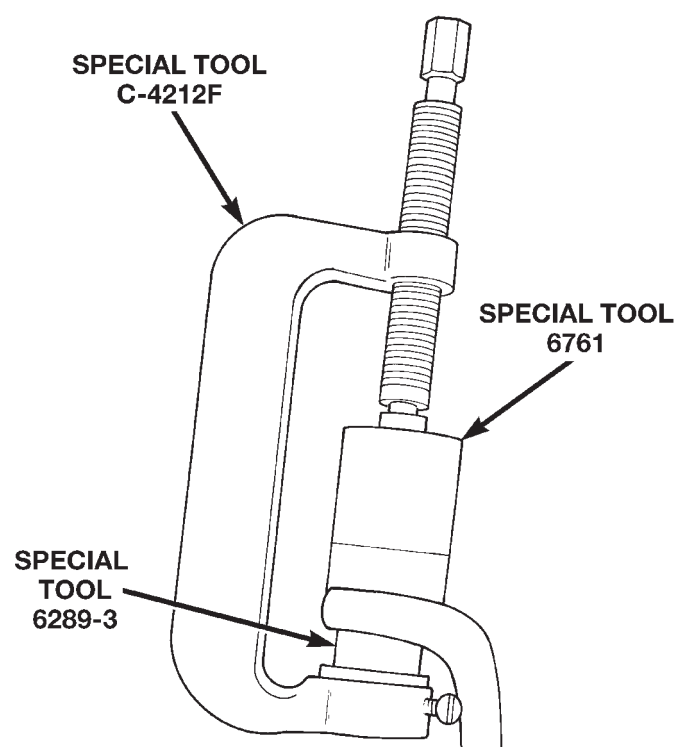


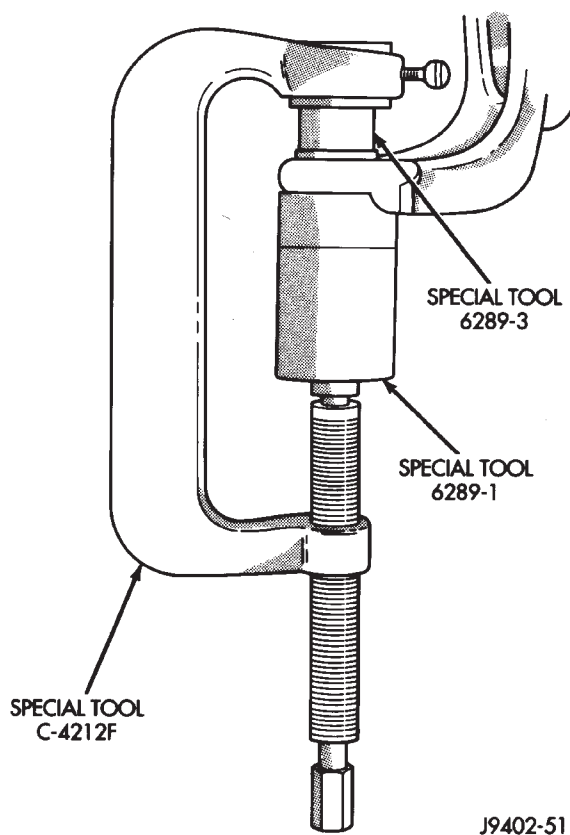
Fig. 21 Upper Ball Stud Remove

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- (2) Position tools as shown to remove lower ball stud (Fig. 22).

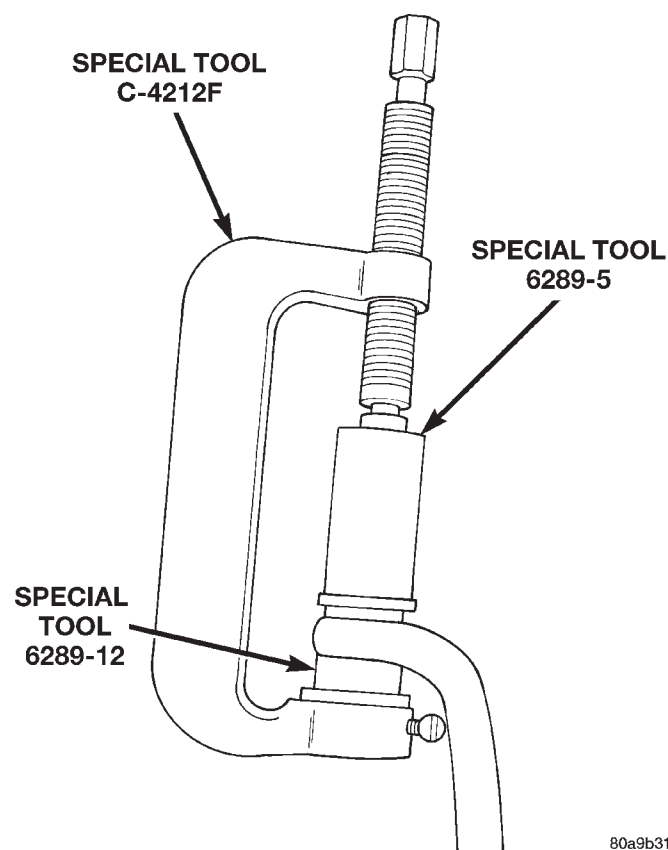
INSTALLATION

- (1) Position tools as shown to install upper ball stud (Fig. 23).



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Fig. 22 Lower Ball Stud Remove



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Fig. 23 Upper Ball Stud Install

REMOVAL AND INSTALLATION (Continued)

(2) Position tools as shown to install upper ball stud (Fig. 24).

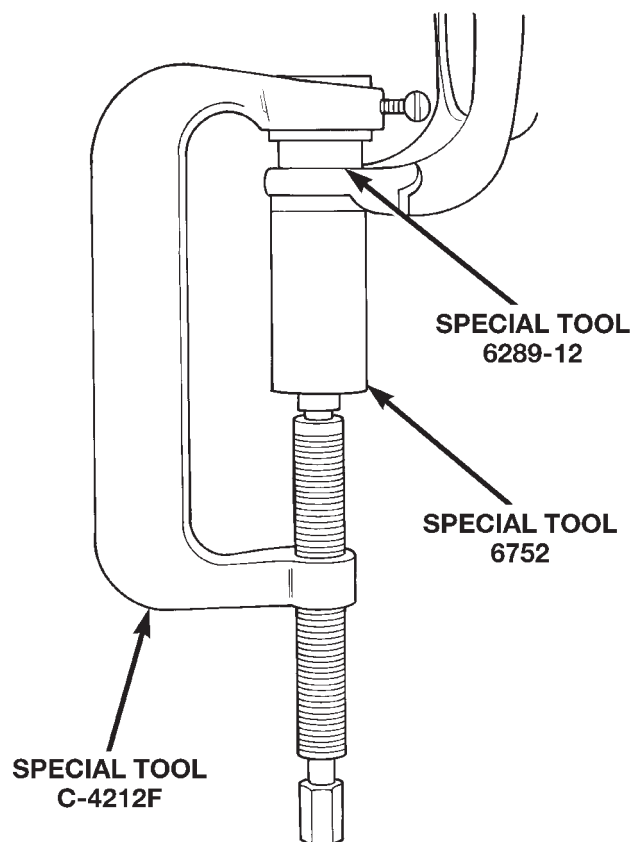


Fig. 24 Lower Ball Stud Install

BALL STUDS—248 FBI AXLE

REMOVAL

(1) Position tools as shown to remove upper ball stud (Fig. 25).

(2) Position tools as shown to remove lower ball stud (Fig. 26).

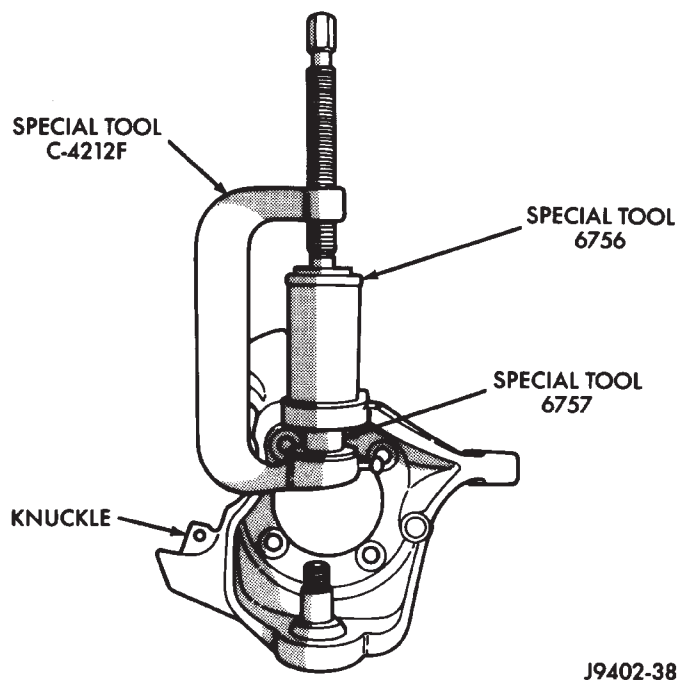


Fig. 25 Upper Ball Stud Remove

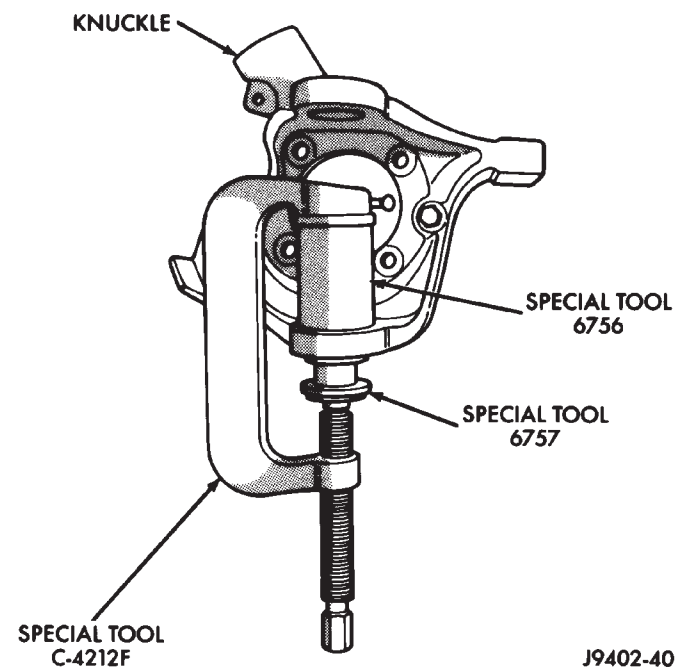


Fig. 26 Lower Ball Stud Remove

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Position tools as shown to install upper ball stud (Fig. 27).

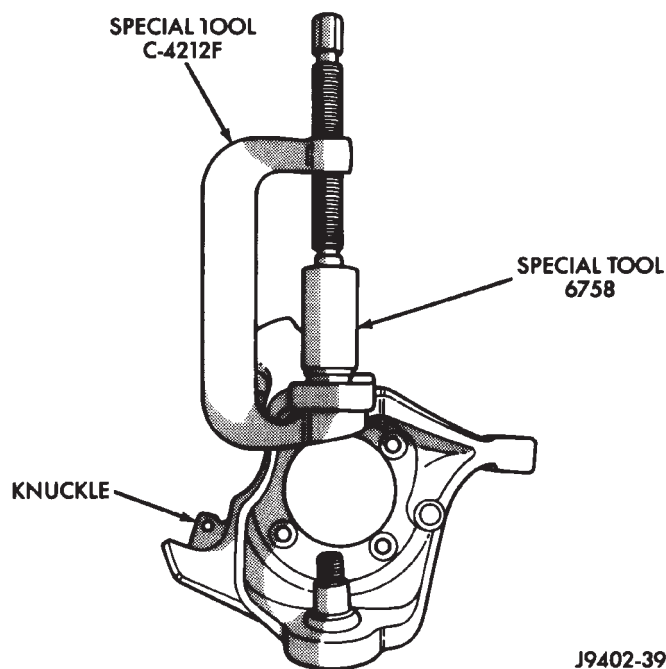


Fig. 27 Upper Ball Stud Install

(2) Position tools as shown to install lower ball stud (Fig. 28).

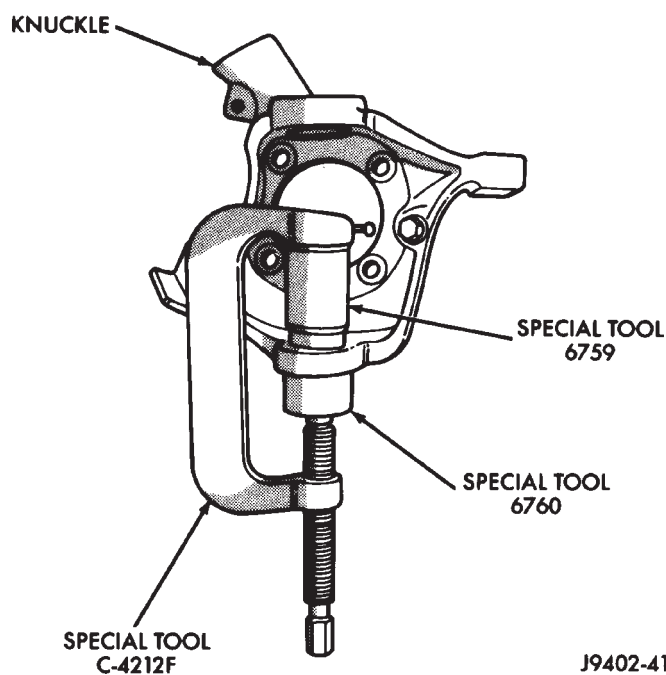


Fig. 28 Lower Ball Stud Install

DIFFERENTIAL

REMOVAL

(1) Remove axle shafts.

(2) Note the orientation of the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 29).

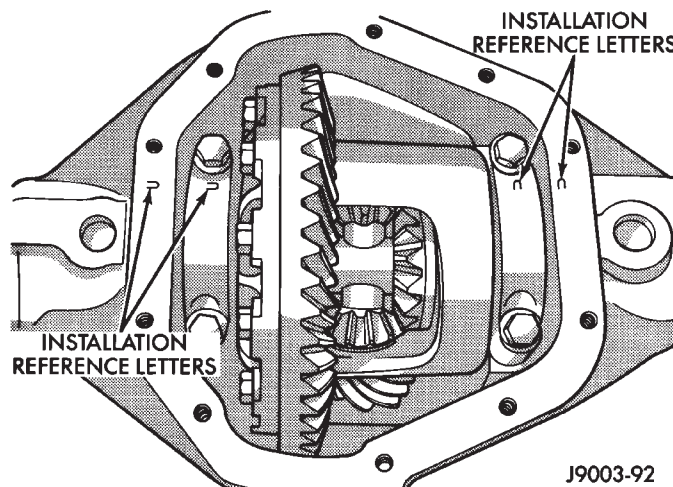


Fig. 29 Bearing Cap Identification

(3) Remove the differential bearing caps.

(4) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 30).

(5) Install the hold down clamps and tighten the tool turnbuckle finger-tight.

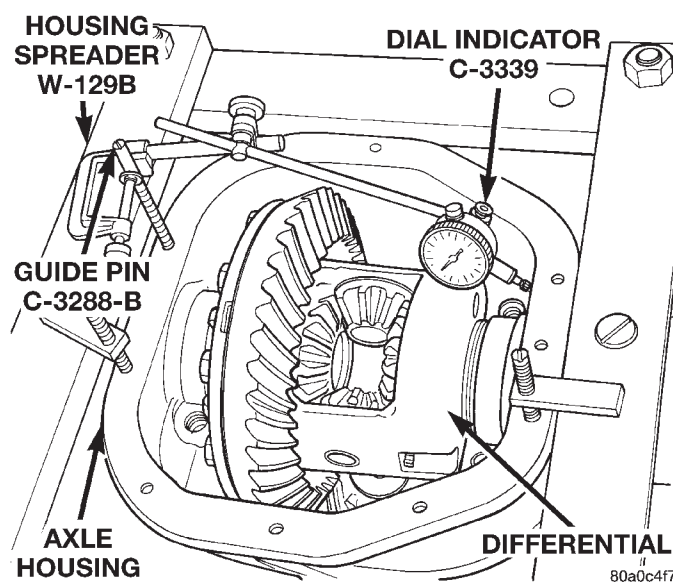


Fig. 30 Spread Differential Housing

(6) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach dial indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 30) and zero the indicator.

(7) Spread the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 30).

REMOVAL AND INSTALLATION (Continued)

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(8) Remove the dial indicator.

(9) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 31).

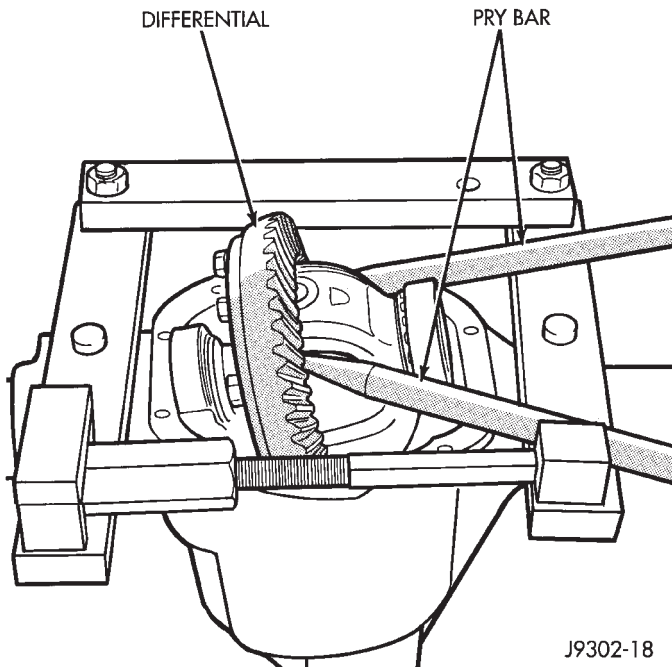


Fig. 31 Differential Removal

(10) Remove the case from housing. Mark or tag bearing cups to indicate which side they were removed from.

INSTALLATION

(1) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 30). Install the hold down clamps and tighten the tool turnbuckle finger-tight.

(2) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach dial indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 30) and zero the indicator.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 30).

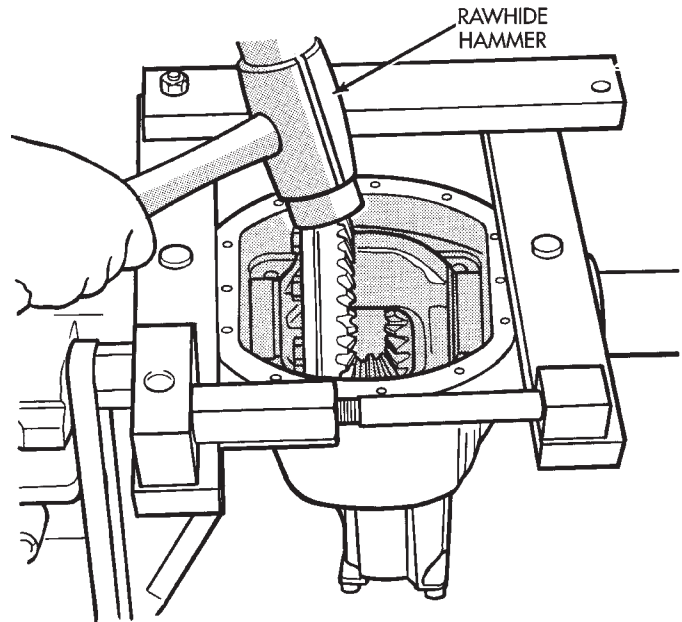
CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(4) Remove the dial indicator.

(5) Install differential in housing.

(6) Install case in the housing. Tap the differential case with a rawhide or rubber mallet to ensure the bearings are fully seated in the differential housing (Fig. 32).

(7) Remove the spreader.

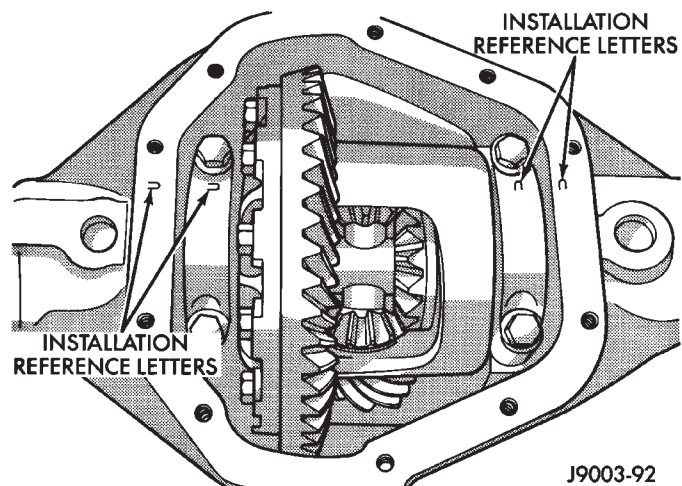


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Fig. 32 Differential Installation

(8) Install the bearing caps at their original locations (Fig. 33). Tighten the bearing cap bolts to 109 N·m (80 ft. lbs.) torque.

(9) Install axle shafts.



J9003-92

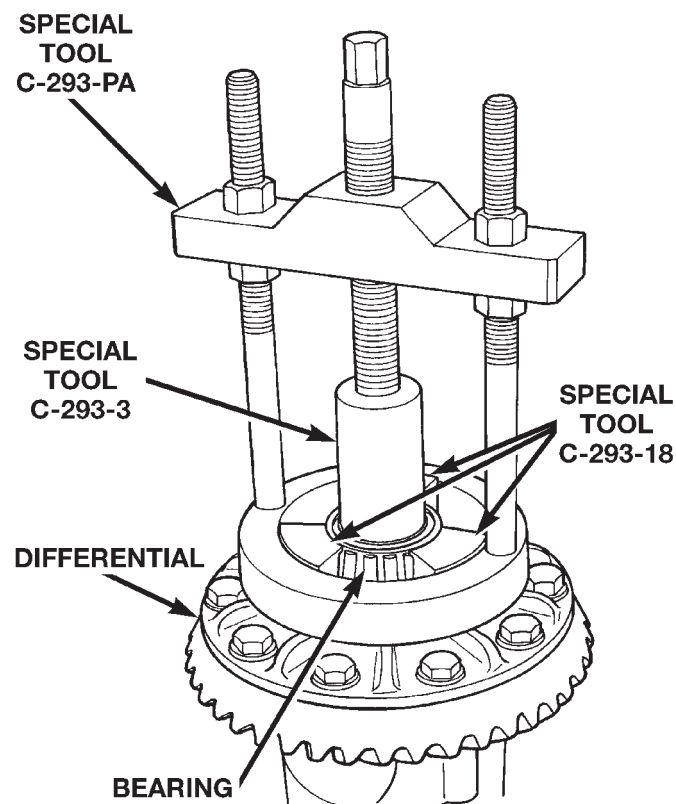
Fig. 33 Differential Bearing Cap Reference Letters
DIFFERENTIAL SIDE BEARINGS—216 FBI AXLE

REMOVAL

(1) Remove differential case from axle housing.

REMOVAL AND INSTALLATION (Continued)

(2) Remove the bearings from the differential case with Puller/Press C-293-PA, Adapters C-293-18, and Adapter C-293-3 (Fig. 34).



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Fig. 34 Differential Bearing Removal

(3) Remove differential preload shims from differential case hubs. Tag the shims to identify which side of the differential they came from.

INSTALLATION

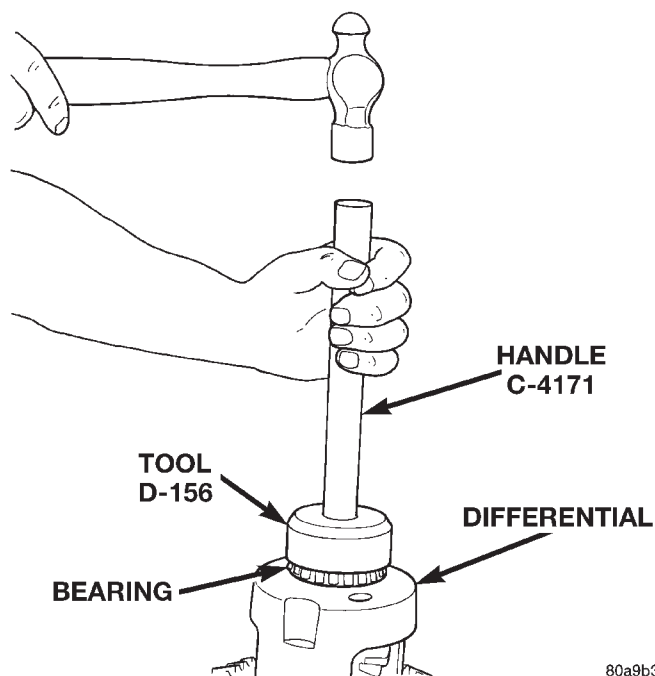
If ring and pinion gears have been replaced, verify differential side bearing preload and gear mesh backlash.

- (1) Install differential preload shims on differential case hubs.
- (2) Using tool D-156 with handle C-4171, install differential side bearings (Fig. 35).
- (3) Install differential in axle housing.

DIFFERENTIAL SIDE BEARINGS—248 AXLES

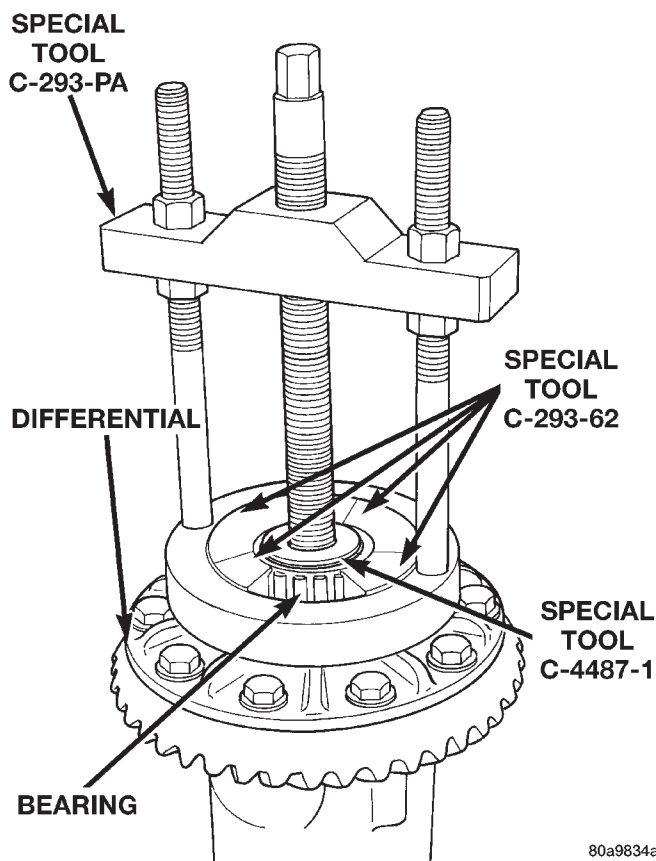
REMOVAL

- (1) Remove differential case from axle housing.
- (2) Remove the bearings from the differential case with Puller/Press C-293-PA, Adapters C-293-62, and Step Plate C-4487-1 (Fig. 36).



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Fig. 35 Install Differential Side Bearings



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Fig. 36 Differential Bearing Removal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Using tool C-4190 with handle C-4171, install differential side bearings (Fig. 37).

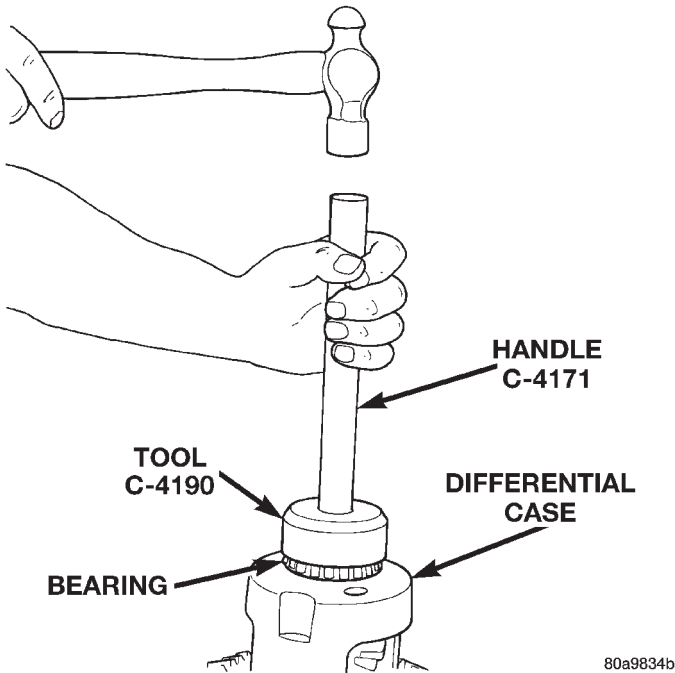


Fig. 37 Install Differential Side Bearings

(2) Install differential case in axle housing.

AXLE SHAFT OIL SEAL

REMOVAL

- (1) Remove the axle shaft seal from the differential housing with a long drift or punch. **Be careful not to damage housing.**
- (2) Clean the inside perimeter of the differential housing with fine crocus cloth.

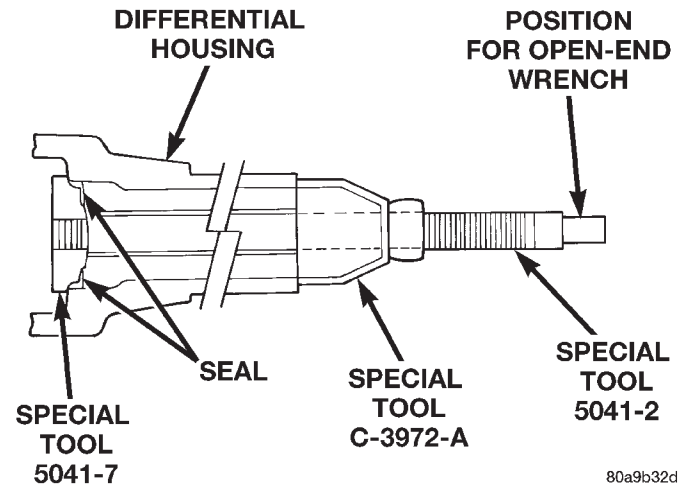
INSTALLATION

- (1) Apply a light film of oil to the inside lip of the new axle shaft seal.
- (2) Install the inner axle seal (Fig. 38). It may be necessary to substitute Installer C-3716-A for Installer C-3972-A on 216 FBI axles.

INTERMEDIATE AXLE SHAFT

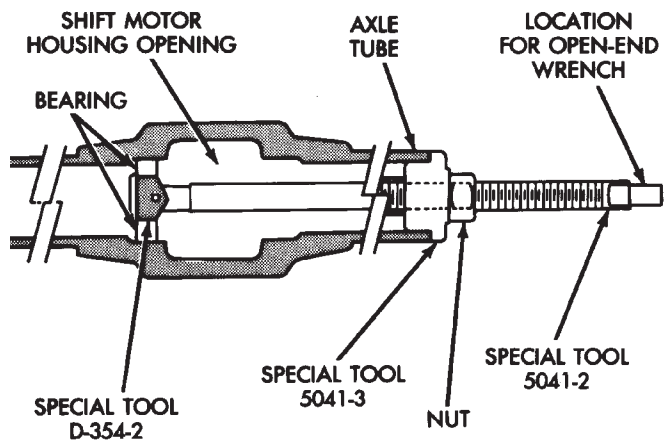
REMOVAL

- (1) Remove the vacuum shift motor housing.
- (2) Remove the outer axle shaft.
- (3) Remove the inner axle shaft seal from the shift motor housing with a long drift or punch. Be careful not to damage housing.
- (4) Remove intermediate axle shaft and shift collar.
- (5) Remove the intermediate axle shaft bearing (Fig. 39).



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Fig. 38 Axle Seal Installation

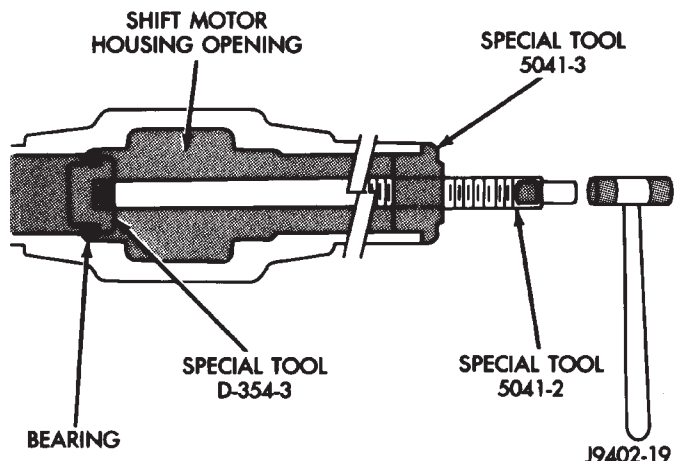


J9402-18

Fig. 39 Intermediate Shaft Bearing Removal

INSTALLATION

(1) Position the bearing on installation tool. Seat the bearing in the housing bore (Fig. 40).



J9402-19

Fig. 40 Intermediate Shaft Bearing Installation

REMOVAL AND INSTALLATION (Continued)

(2) Clean the inside perimeter of the axle shaft tube with fine crocus cloth.

(3) Apply a light film of oil to the inside lip of the new axle shaft seal.

(4) Install the inner axle seal (Fig. 41) or (Fig. 42).

The inner axle seal position is different on a 216 FBI axle than a 248 FBI axle. Be sure to use the correct installer.

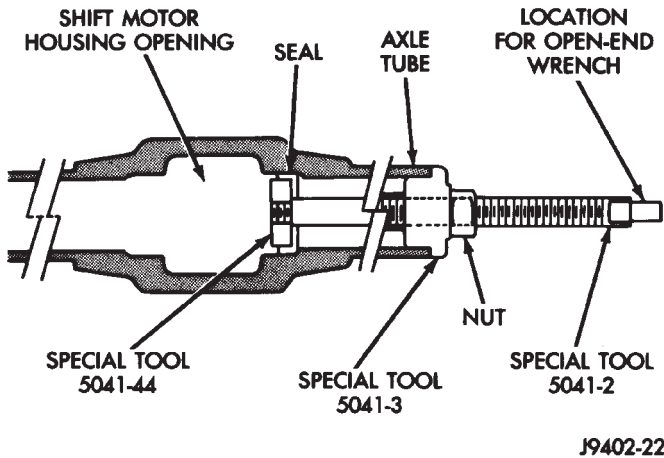


Fig. 41 Inner Axle Seal Installation—216 FBI Axle

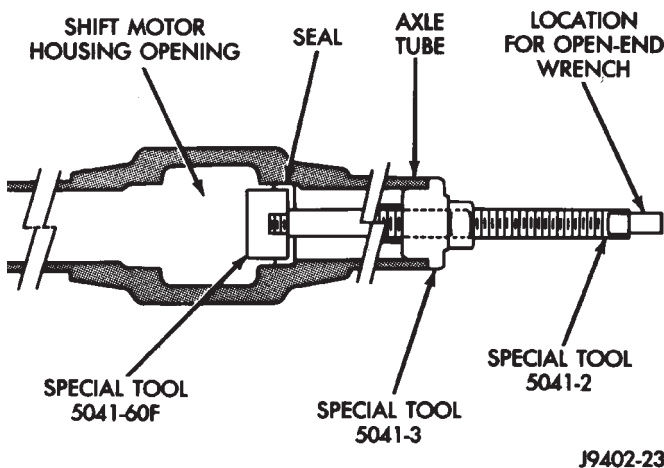


Fig. 42 Inner Axle Seal Installation—248 FBI Axle

(5) Install the shift collar in the axle housing.

(6) Lubricate the splined end of the intermediate axle shaft with multi-purpose lubricant.

(7) Insert the intermediate axle shaft into the differential side gear.

CAUTION: Apply all-purpose lubricant to the axle shaft splines to prevent damage to the seal during axle shaft installation.

(8) Insert the axle shaft into the tube. Engage the splined end of the shaft with the shift collar.

(9) Install the vacuum shift motor housing.

RING GEAR

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

REMOVAL

(1) Remove differential from axle housing.

(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 43)

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

(4) Using a soft hammer, drive ring gear from differential case (Fig. 43).

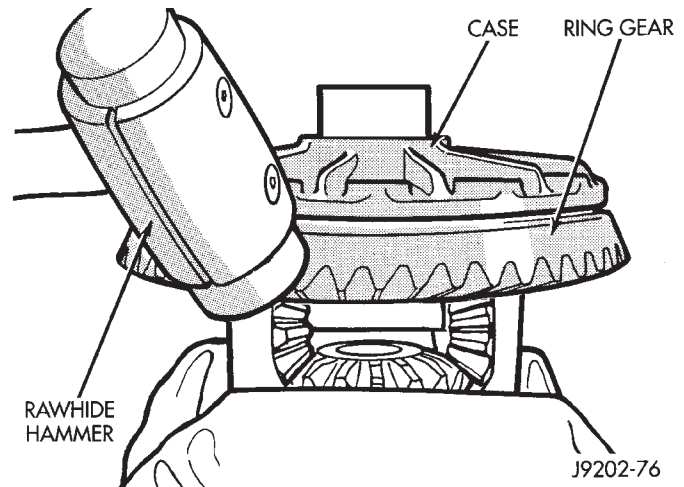


Fig. 43 Ring Gear Removal

INSTALLATION

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

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

(2) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque for 216 FBI axles and 163–190 N·m (120–140 ft. lbs.) for 248 FBI axles (Fig. 44).

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

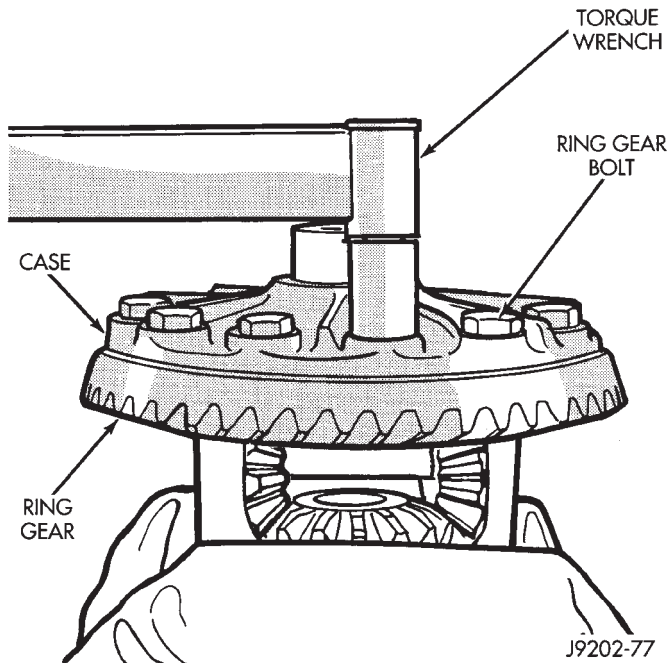
PINION GEAR

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

REMOVAL

(1) Remove differential assembly from axle housing.

REMOVAL AND INSTALLATION (Continued)

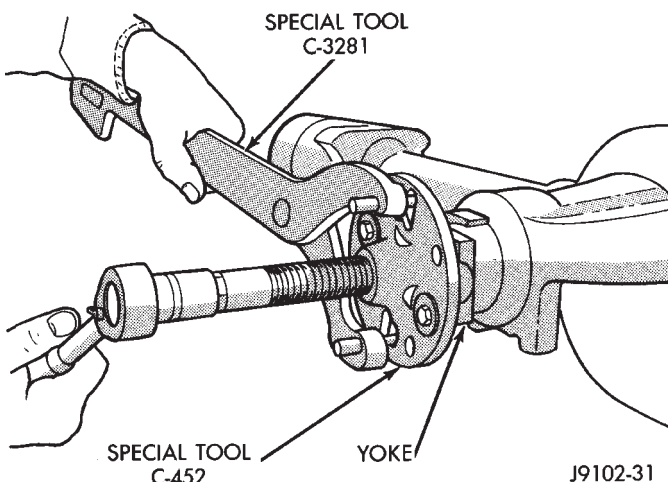
**Fig. 44 Ring Gear Bolt Installation**

(2) Mark the pinion yoke and propeller shaft for installation alignment.

(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.

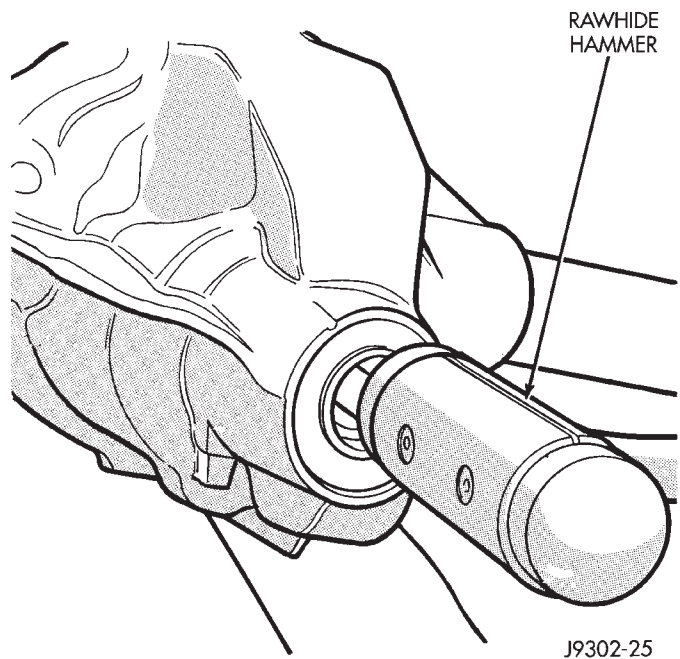
(4) Using Yoke Holder 6719 to hold yoke, remove the pinion yoke nut and washer.

(5) Using Remover C-452 and Wrench C-3281, remove the pinion yoke from the pinion shaft (Fig. 45).

**Fig. 45 Pinion Yoke Removal**

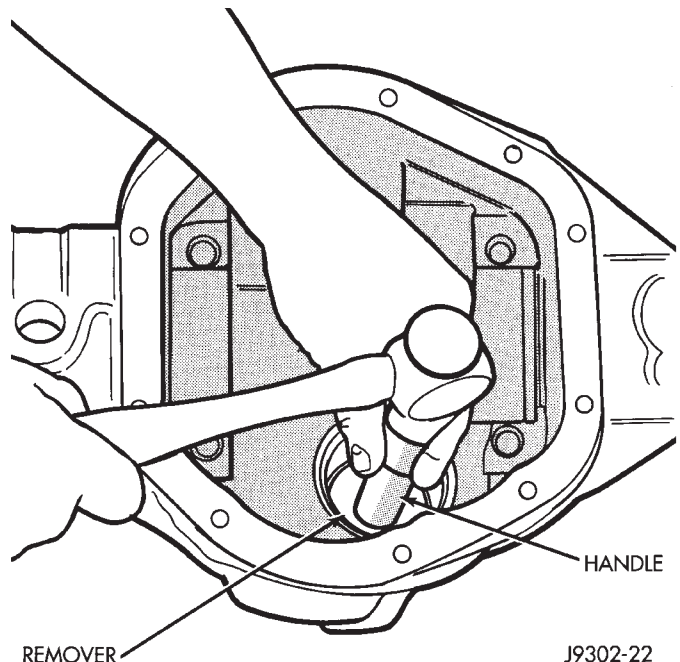
(6) Remove the pinion gear from housing (Fig. 46). Catch the pinion with your hand to prevent it from falling and being damaged.

(7) Remove the pinion gear seal with a slide hammer or suitable pry bar.

**Fig. 46 Remove Pinion Gear**

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

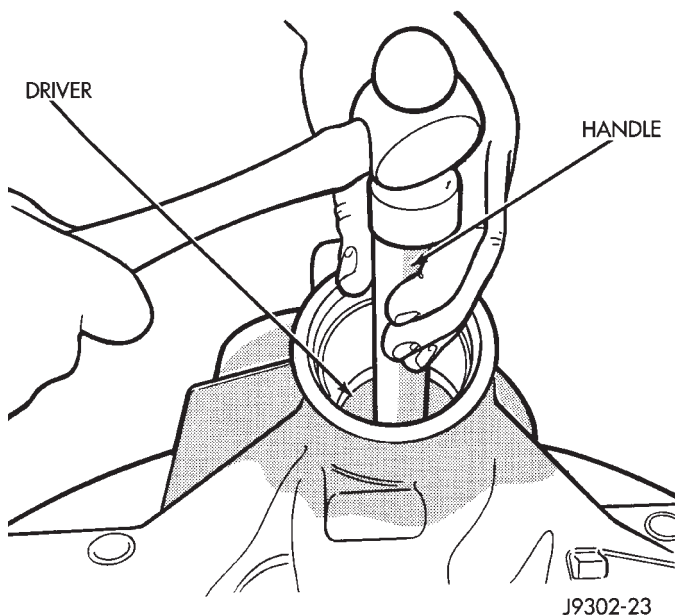
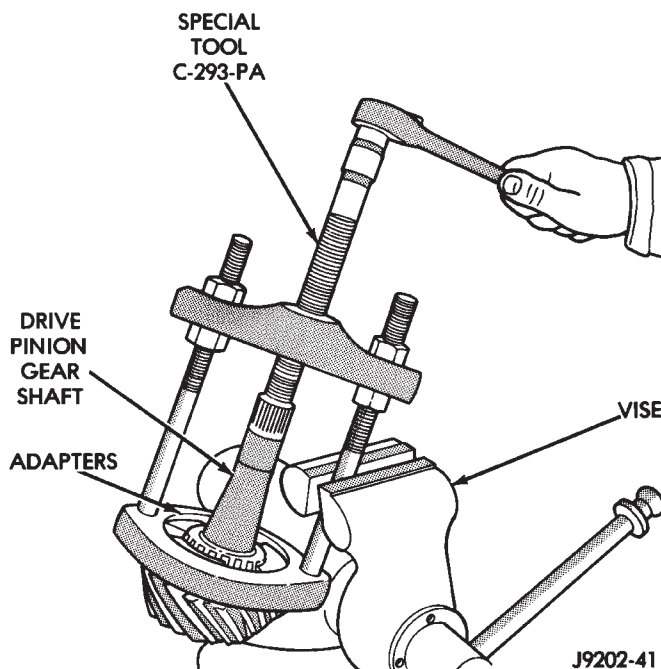
(9) Remove the front pinion bearing cup and seal with Remover D-147 for 216 FBI axles, or D-158 for 248 FBI axles, and Handle C-4171 (Fig. 47).

**Fig. 47 Front Bearing Cup Removal**

(10) Remove the rear bearing cup from housing (Fig. 48). Use Remover D-149 for 216 FBI axles, or D-162 for 248 FBI axles, and Handle C-4171.

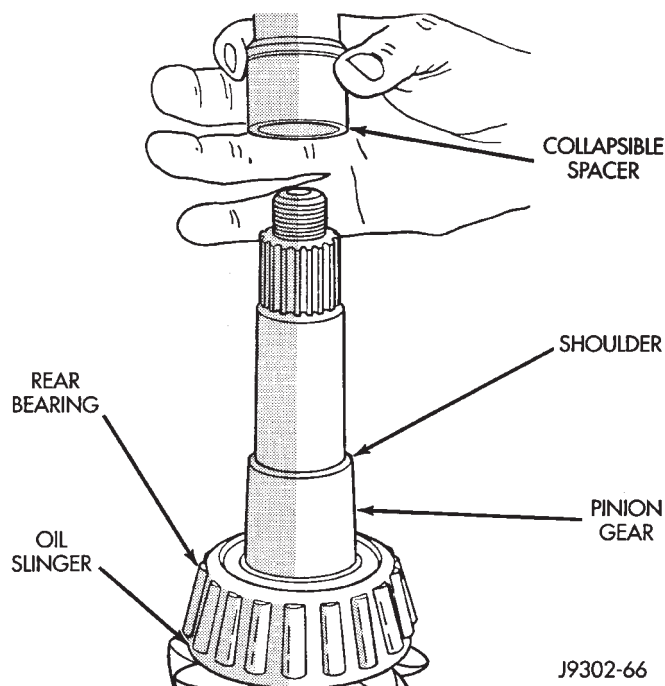
(11) Remove the collapsible preload spacer (Fig. 49).

REMOVAL AND INSTALLATION (Continued)

**Fig. 48 Rear Bearing Cup Removal****Fig. 50 Rear Bearing Removal****INSTALLATION**

(1) Apply Mopar® Door Ease stick lubricant to outside surface of bearing cups.

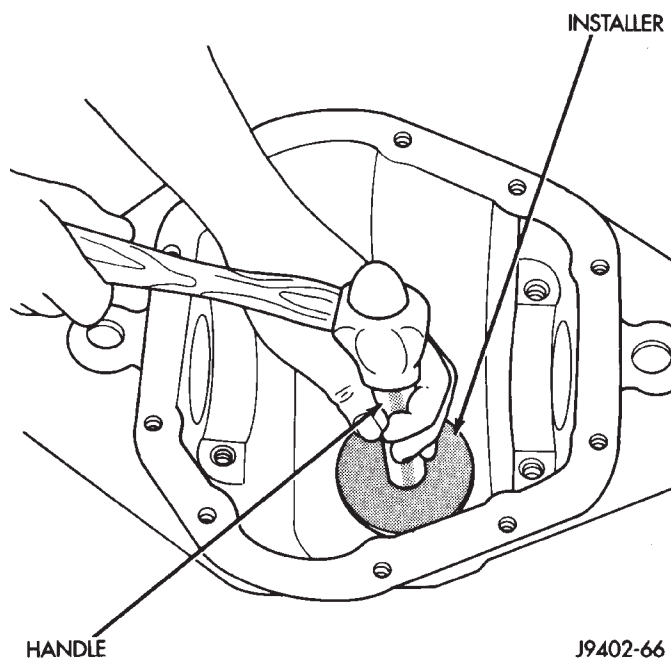
(2) Install the pinion rear bearing cup with Installer D-146 for 216 FBI axles, or D-111 for 248 FBI axles, and Handle C-4171 (Fig. 51). Ensure cup is correctly seated.

**Fig. 49 Collapsible Spacer**

(12) Remove the rear pinion bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-40 for 216 FBI axles, or C-293-37 for 248 FBI axles (Fig. 50).

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

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

**Fig. 51 Pinion Rear Bearing Cup Installation**

REMOVAL AND INSTALLATION (Continued)

(3) Install the pinion front bearing cup with Installer D-144 for 216 FBI axles, or D-146 for 248 FBI axles, and Handle C-4171 (Fig. 52).

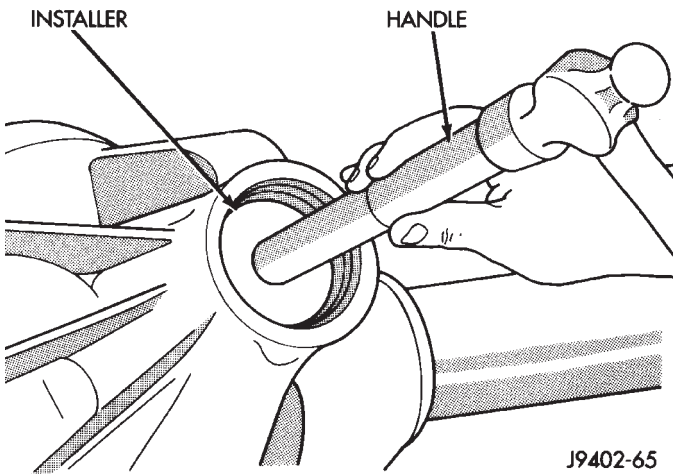


Fig. 52 Pinion Front Bearing Cup Installation

(4) Install pinion front bearing, oil slinger. Apply a light coating of gear lubricant on the lip of pinion seal.

(5) Install pinion seal with Installer C-3972-A for 216 FBI axles (Fig. 53), or 8108 for 248 FBI axles (Fig. 54), and Handle C-4171.

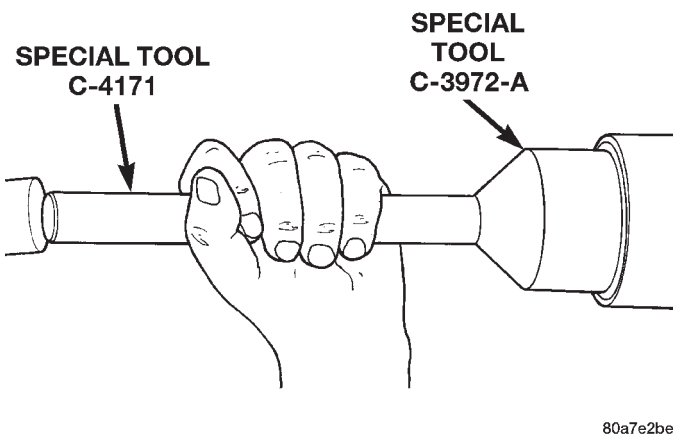


Fig. 53 Pinion Seal Installation—216 FBI Axle

NOTE: Pinion depth shims are placed between the rear pinion bearing cone and pinion gear to achieve proper ring and pinion gear mesh. If the factory installed ring and pinion gears are reused, the pinion depth shim should not require replacement. Refer to Pinion Gear Depth paragraph in this section to select the proper thickness shim before installing rear pinion bearing cone.

(6) Place the proper thickness depth shim on the pinion gear and install the rear bearing.

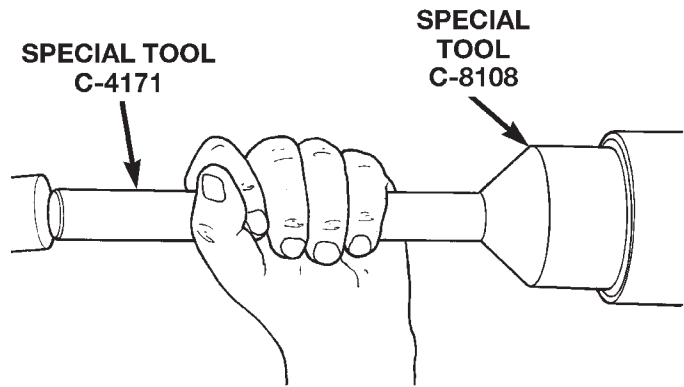


Fig. 54 Pinion Seal Installation—248 FBI Axle

(7) Install the rear bearing and oil slinger, if equipped, on the pinion gear with Installer W-262 for 216 FBI axles, or C-3095-A for 248 FBI axles, (Fig. 55).

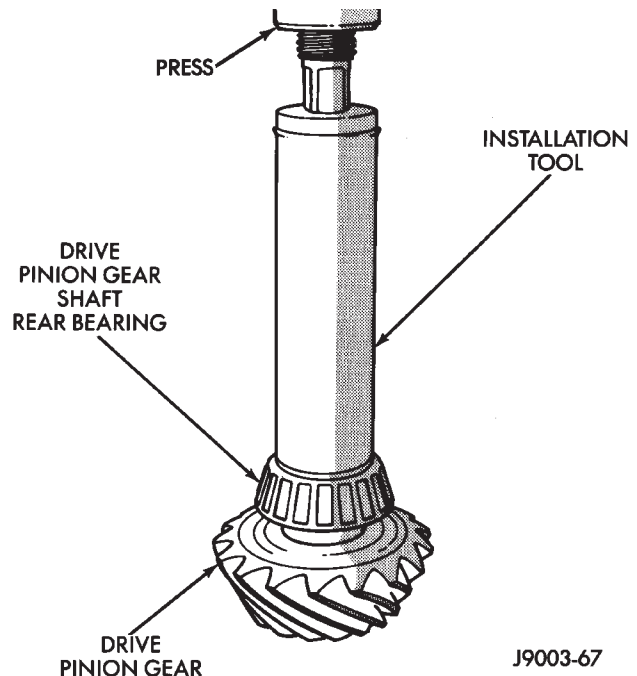


Fig. 55 Shaft Rear Bearing Installation

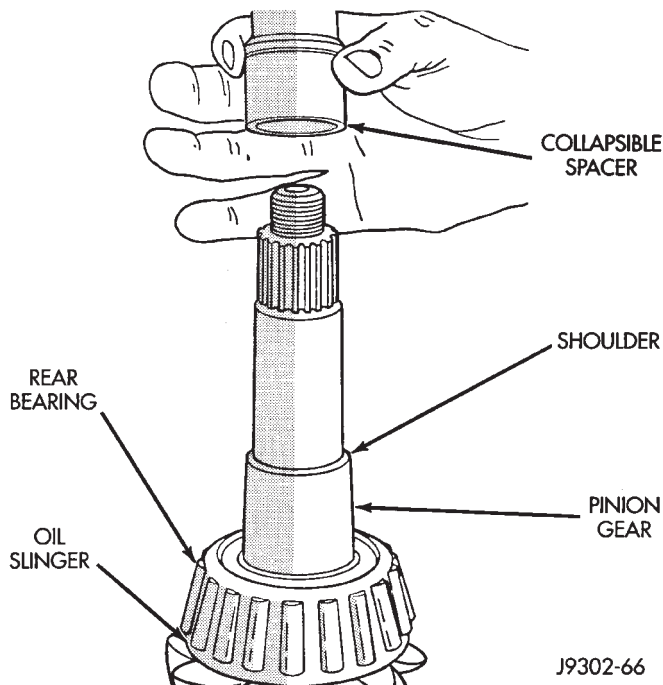
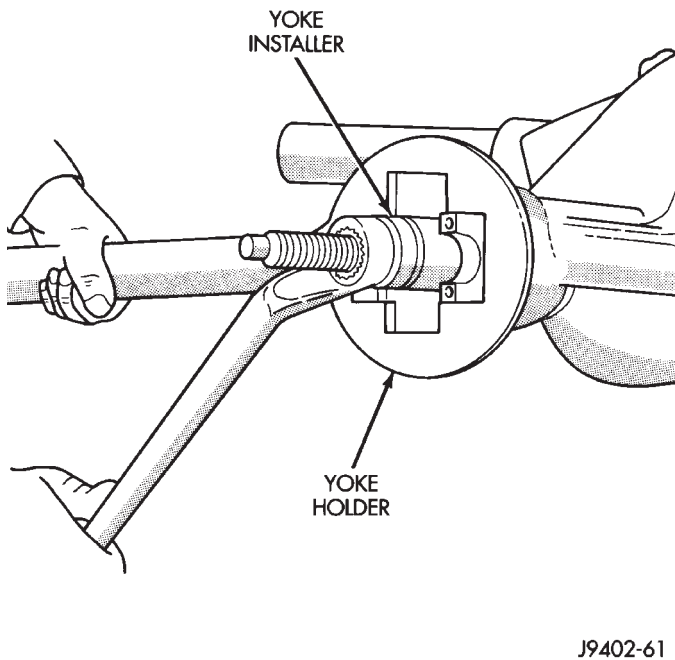
(8) Install a new collapsible preload spacer on pinion shaft (Fig. 56).

(9) Install pinion gear in housing.

(10) Install yoke with Installer W-162-D for 216 FBI axles, or C-3718 for 248 FBI axles, and Yoke Holder 6719 (Fig. 57).

(11) Install the yoke washer and a new nut on the pinion gear. Tighten the nut to 217 N-m (160 ft. lbs.) for 216 FBI axles, or 291 N-m (215 ft. lbs.) for 248 FBI axles, minimum. **Do not over-tighten.** Maxi-

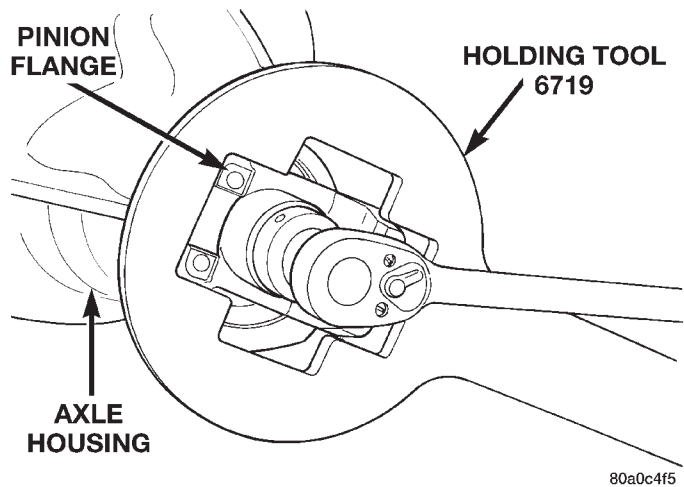
REMOVAL AND INSTALLATION (Continued)

**Fig. 56 Collapsible Preload Spacer****Fig. 57 Pinion Yoke Installation**

imum torque is 271 N·m (200 ft. lbs.) for 216 FBI axles and 380 N·m (280 ft. lbs.) for 248 FBI axles.

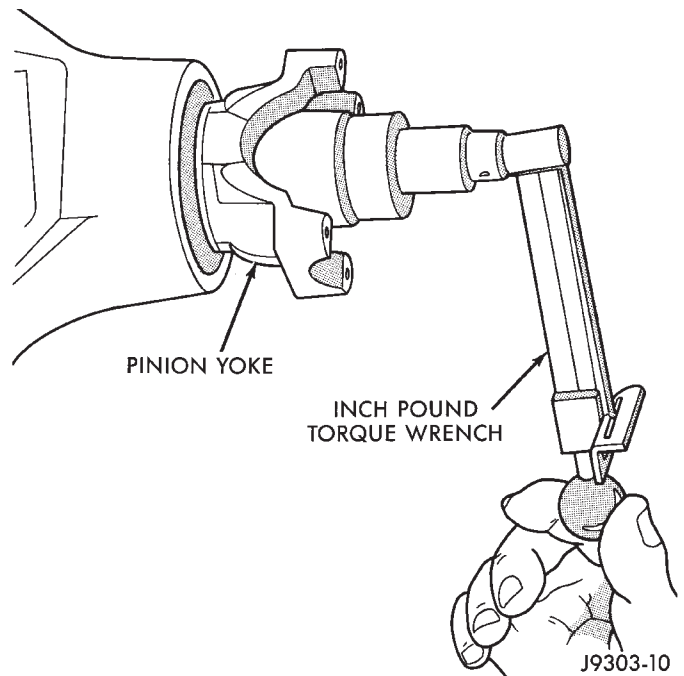
CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing preload torque and never exceed specified preload torque. If preload torque is exceeded a new collapsible spacer must be installed. The torque sequence will have to be repeated.

(12) Use Yoke Holder 6719 to retain the yoke (Fig. 58). Tighten the nut in 6.8 N·m (5 ft. lbs.) until the rotating torque is achieved. Measure the preload torque frequently to avoid over-tightening the nut.

**Fig. 58 Tightening Pinion Nut**

(13) Check bearing preload torque with an inch pound torque wrench (Fig. 59). The torque necessary to rotate the pinion gear should be:

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

**Fig. 59 Check Pinion Gear Rotation Torque****FINAL ASSEMBLY**

After pinion gear depth, differential bearing preload, and gear lash has been determined, install the pinion gear and differential assembly and proceed with this procedure.

REMOVAL AND INSTALLATION (Continued)

(1) Install the axle shafts. Refer to Axle Shaft Installation within this group.

(2) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar Silicone Rubber Sealant on the housing cover (Fig. 60). Allow the sealant to cure for a few minutes.

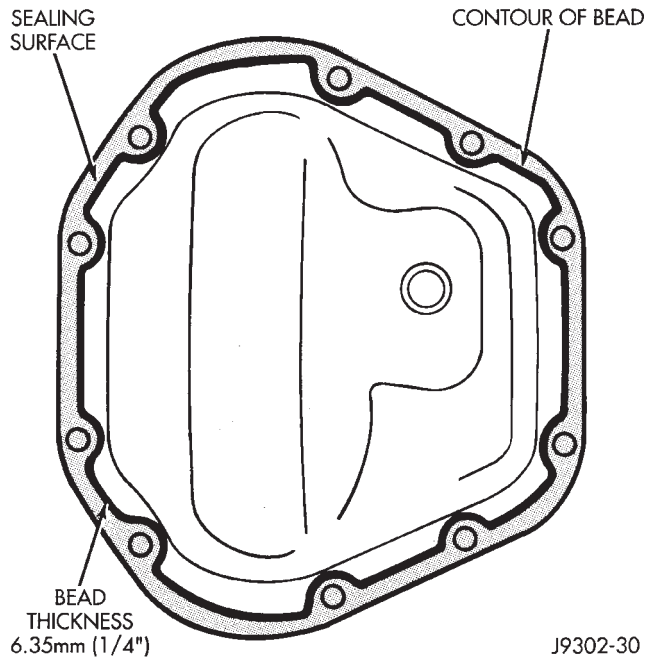


Fig. 60 Typical Housing Cover With Sealant

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

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

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

(4) Refill the differential housing with the specified quantity of Mopar Hypoid Gear Lubricant.

(5) Install the fill hole plug and tighten to 34 N·m (25 ft. lbs.) torque.

DISASSEMBLY AND ASSEMBLY

AXLE SHIFT MOTOR

DISASSEMBLY

(1) Remove the E-clips from the shift motor housing and shaft. Remove shift motor and shift fork from the housing (Fig. 61).

(2) Remove the O-ring seal from the shift motor shaft.

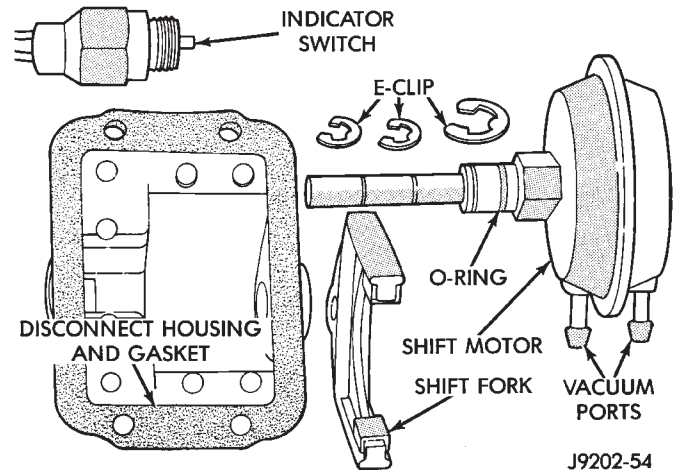


Fig. 61 Shift Motor Components

(3) Clean and inspect all components. If any component is excessively worn or damaged, it should be replaced.

ASSEMBLY

(1) Install a new O-ring seal on the shift motor shaft.

(2) Insert the shift motor shaft through the hole in the housing and shift fork. The shift fork offset should be toward the differential.

(3) Install the E-clips on the shift motor shaft and housing.

STANDARD DIFFERENTIAL

DISASSEMBLY

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

(2) Remove pinion gear mate shaft (Fig. 62).

(3) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 63).

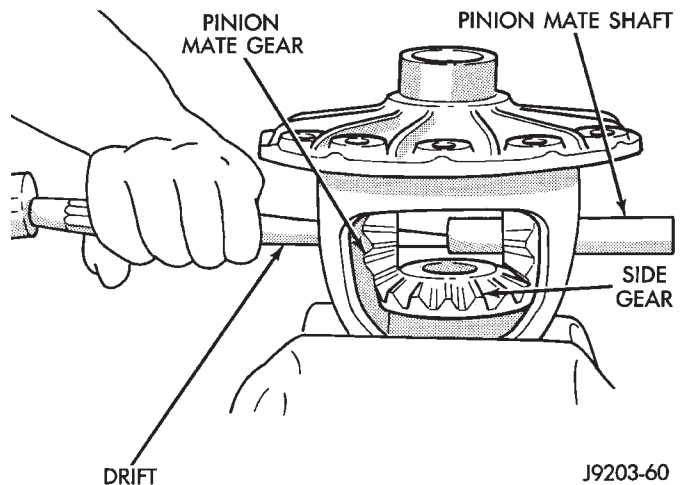
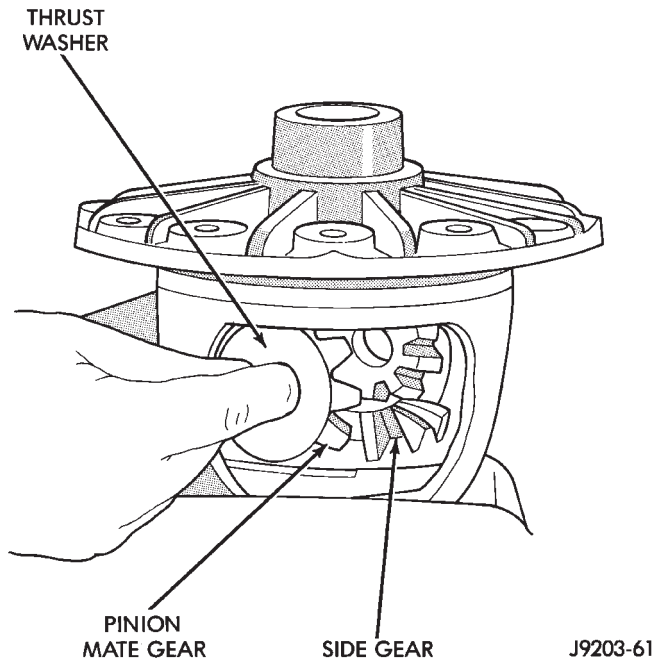


Fig. 62 Pinion Mate Shaft Removal

DISASSEMBLY AND ASSEMBLY (Continued)

**Fig. 63 Pinion Mate Gear Removal**

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

ASSEMBLY

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

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

(3) Install the pinion gear mate shaft.

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

(5) Install and seat the pinion mate shaft roll-pin in the differential case and mate shaft with a punch and hammer (Fig. 64). Peen the edge of the roll-pin hole in the differential case slightly in two places, 180° apart.

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

CLEANING AND INSPECTION**CARDAN U-JOINT**

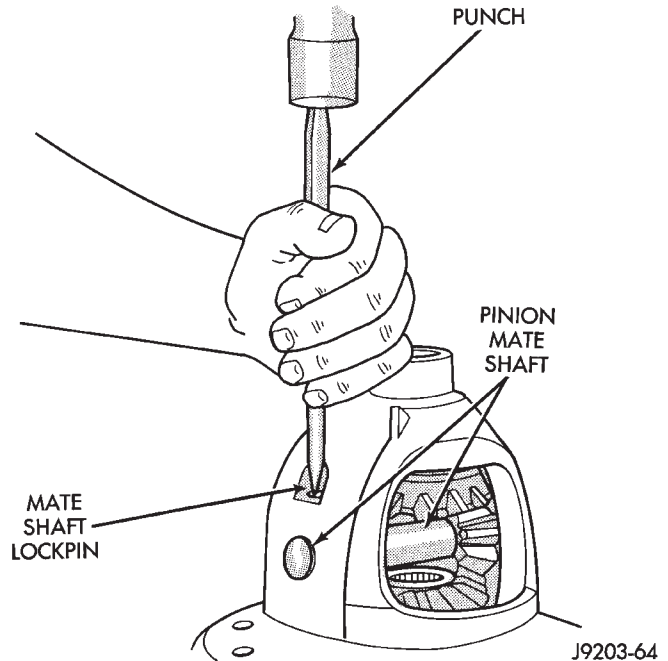
Clean all the U-joint yoke bores with cleaning solvent and a wire brush. Ensure that all the rust and foreign matter are removed from the bores.

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

Replace the complete U-joint if any of the components are defective.

AXLE COMPONENTS

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

**Fig. 64 Pinion Mate Shaft Roll-Pin Installation**

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

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

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims, if necessary.

ADJUSTMENTS**PINION GEAR DEPTH****GENERAL INFORMATION**

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

ADJUSTMENTS (Continued)

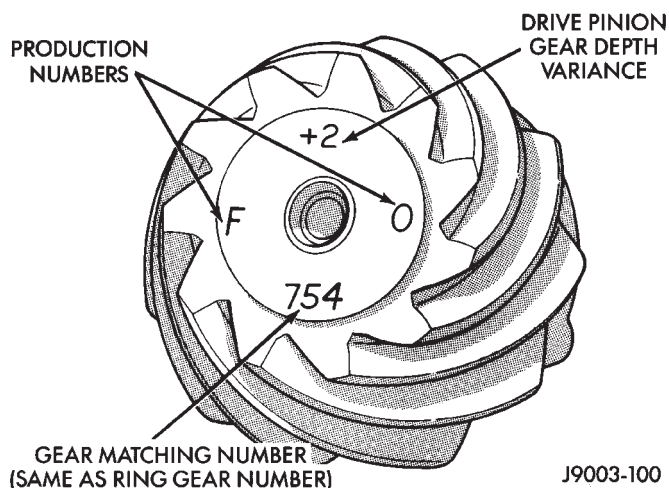
pinion gear are etched into the face of each gear (Fig. 65). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 109.5 mm (4.312 inches) for 216 FBI axles and 127 mm (5.00 in.) for 248 FBI axles. 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. 66).

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.

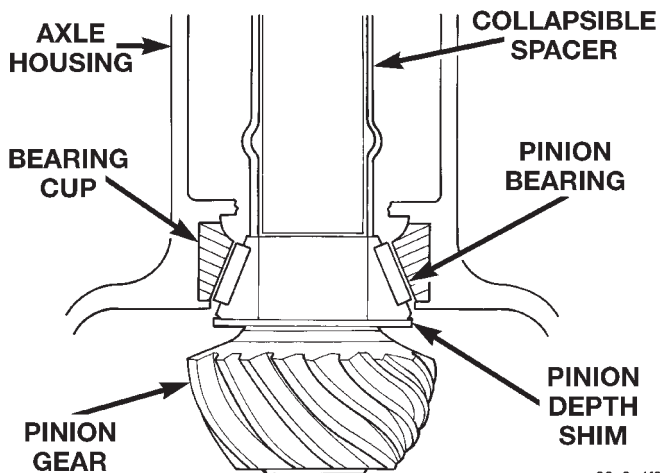
Note where Old and New Pinion Marking columns intersect. Intersecting figure represents plus or minus amount needed.

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.



J9003-100

Fig. 65 Pinion Gear ID Numbers



80a0c4f8

Fig. 66 Shim Locations

PINION GEAR DEPTH VARIANCE

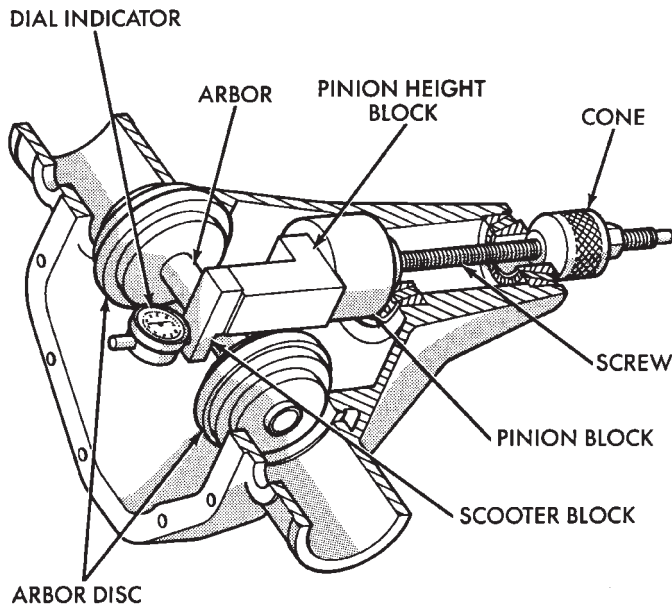
Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	–4	–3	–2	–1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	–0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	–0.001	–0.002
+1	+0.005	+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

J8902-46

ADJUSTMENTS (Continued)

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set 6730 and Dial Indicator C-3339 (Fig. 67).



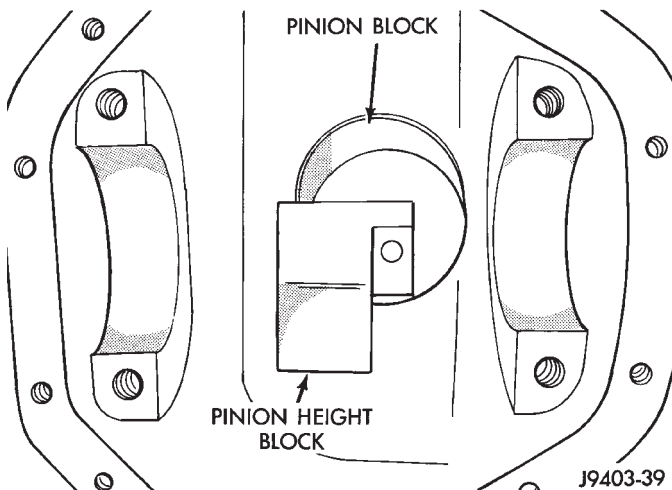
J9403-45

Fig. 67 Pinion Gear Depth Gauge Tools—Typical

(1) Assemble Pinion Height Block 6739, Pinion Block 6736, and rear pinion bearing onto Screw 6741 (Fig. 67) for the 248 FBI axle. For the 216 FBI axle, use Pinion Block 6734.

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 68).

(3) Install front pinion bearing and Cone 6740 hand tight (Fig. 67).

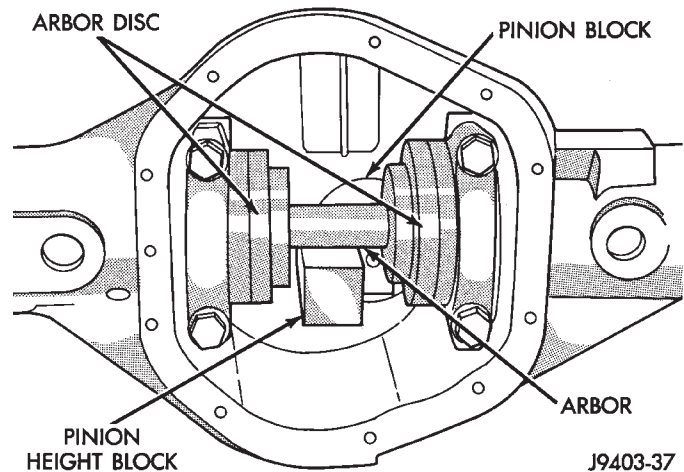


J9403-39

Fig. 68 Pinion Height Block—Typical

(4) Place Arbor Disc 6732 on Arbor D-115-3 and position in the bearing cradles (Fig. 69). Install differential bearing caps on Arbor Discs and tighten cap bolts. Refer to the Torque Specifications in this section.

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



J9403-37

Fig. 69 Gauge Tools In Housing—Typical

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

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

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

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 70). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion gear (Fig. 65) using the opposite sign on the variance number. For exam-

ADJUSTMENTS (Continued)

ple, if the depth variance is -2 , add $+0.002$ in. to the dial indicator reading.

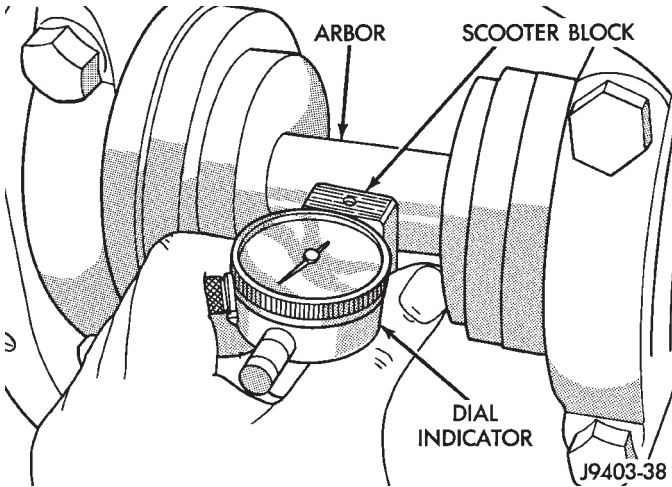


Fig. 70 Pinion Gear Depth Measurement—Typical

(10) Remove the measurement tools from the differential housing.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

INTRODUCTION

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential side bearing cones. The proper shim thickness can be determined using slip-fit dummy bearings D-345 for the 216 FBI axles, or D-343 for the 248 FBI axles, 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 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. 71). Differential shim measurements are performed with axle 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.

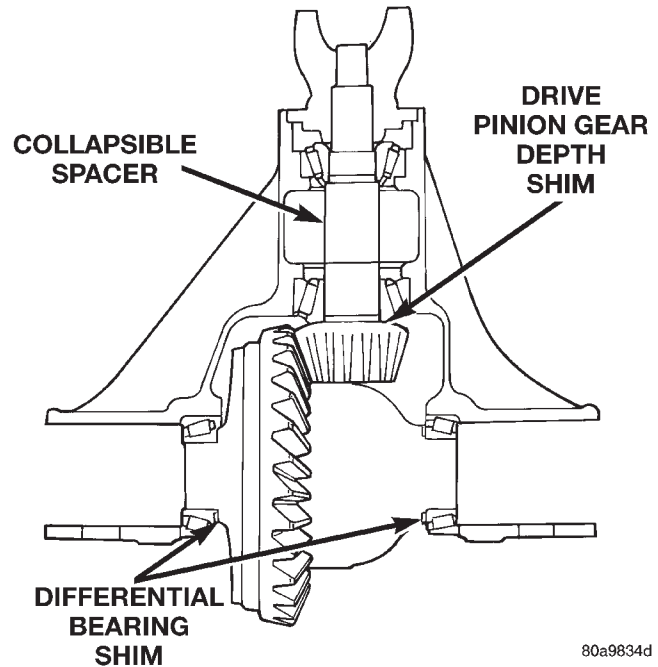


Fig. 71 Axle Adjustment Shim Locations

- (1) Remove differential side bearings from differential case.
- (2) Remove factory installed shims from differential case.
- (3) Install ring gear on differential case and tighten bolts to specification, if necessary.
- (4) Install dummy side bearings D-345 for 216 FBI axles, or D-343 for 248 FBI axles, on differential case.
- (5) Install differential case in axle housing.
- (6) Install the marked bearing caps in their correct positions. Install and snug the bolts (Fig. 72).

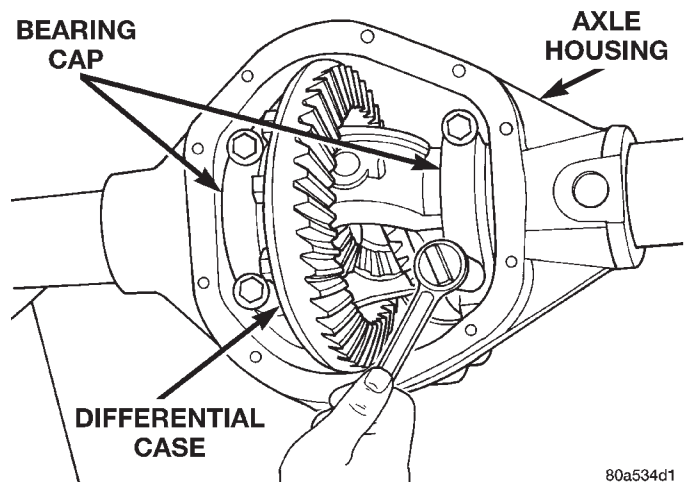


Fig. 72 Tighten Bolts Holding Bearing Caps

- (7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 73) and (Fig. 74).

ADJUSTMENTS (Continued)

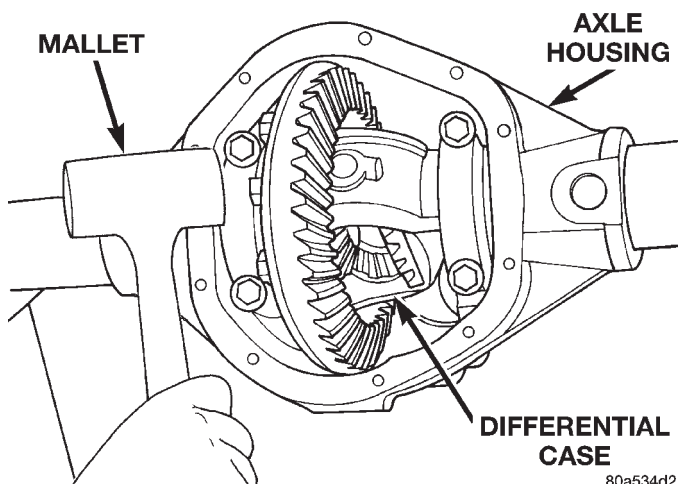


Fig. 73 Seat Pinion Gear Side Differential Dummy Side Bearing

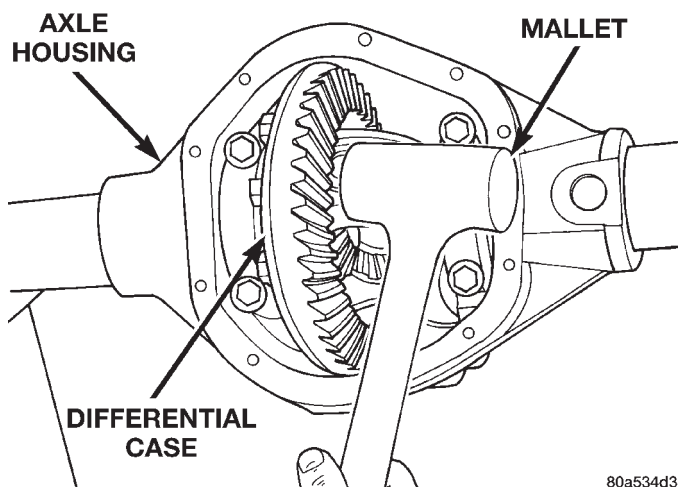


Fig. 74 Seat Ring Gear Side Differential Dummy Side Bearing

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 75).

(9) Attach a dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 75).

(10) Push and hold differential case to pinion gear side of axle housing (Fig. 76).

(11) Zero dial indicator face to pointer (Fig. 76).

(12) Push and hold differential case to ring gear side of the axle housing (Fig. 77).

(13) Record dial indicator reading (Fig. 77).

(14) Add 0.015 in. (0.38 mm) 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.

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

(16) Remove differential case and dummy bearings from axle housing.

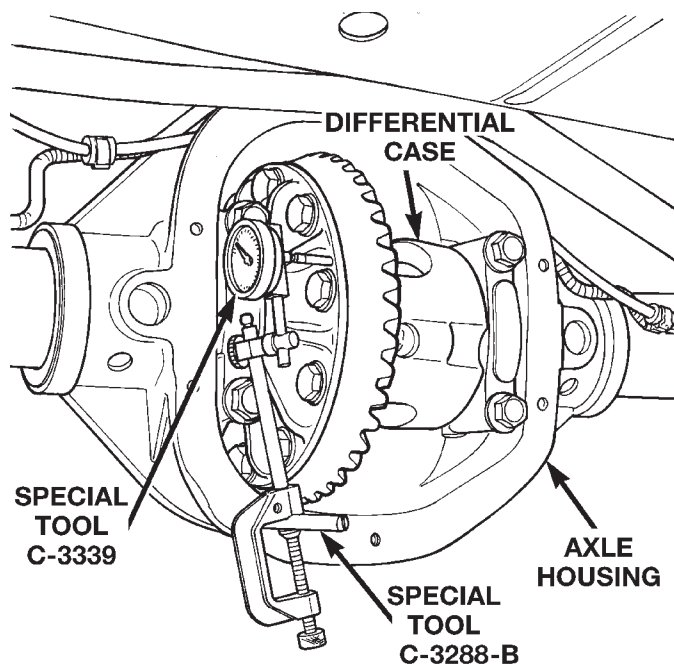


Fig. 75 Differential Side play Measurement

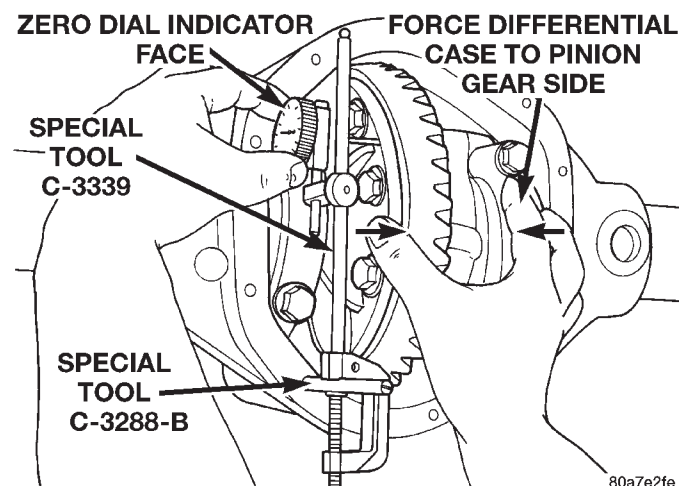


Fig. 76 Hold Differential Case and Zero Dial Indicator

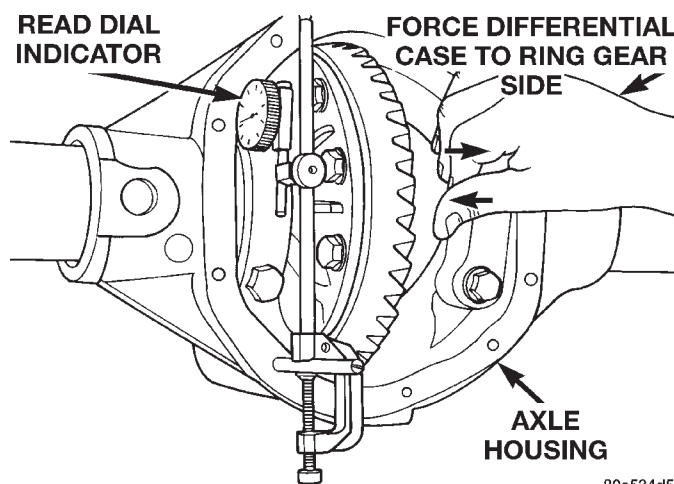


Fig. 77 Hold Differential Case and Read Dial Indicator

ADJUSTMENTS (Continued)

(17) Install the pinion gear in axle housing. Install the pinion yoke, or flange, and establish the correct pinion rotating torque.

(18) Install differential case and dummy bearings D-345 for 216 FBI axles, or D-343 for 248 FBI axles, in axle housing (without shims), install bearing caps and tighten bolts snug.

(19) Seat ring gear side dummy bearing (Fig. 74).

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads. (Fig. 75).

(21) Push and hold differential case toward pinion gear (Fig. 78).

(22) Zero dial indicator face to pointer (Fig. 78).

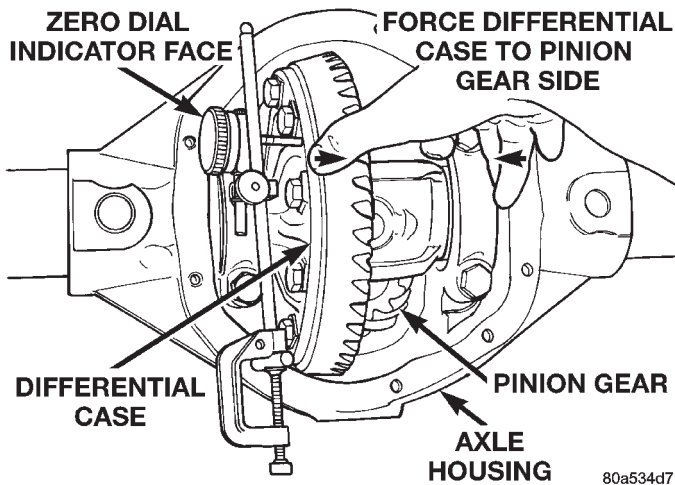


Fig. 78 Hold Differential Case and Zero Dial Indicator

(23) Push and hold differential case to ring gear side of the axle housing (Fig. 79).

(24) Record dial indicator reading (Fig. 79).

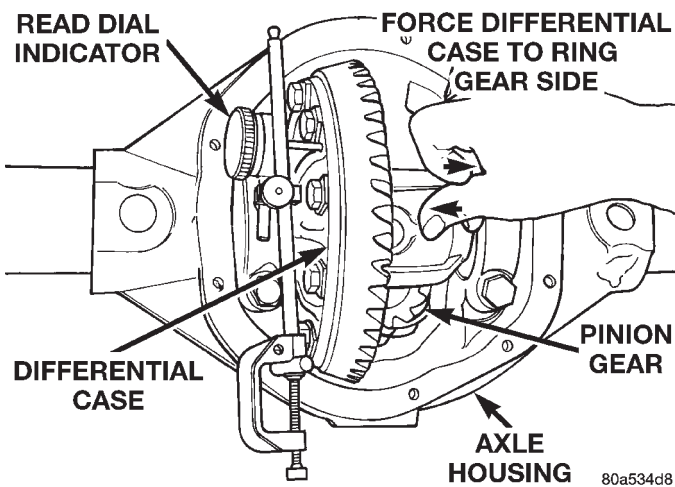


Fig. 79 Hold Differential Case and Read Dial Indicator

(25) This is the thickness shim required on the ring gear side of the differential case to achieve proper backlash.

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

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

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

(29) Install side bearing shims on differential case hubs.

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

(31) Install spreader W-129-B on axle housing and spread axle opening enough to receive differential case.

(32) Install differential case in axle housing.

(33) Remove spreader from axle housing.

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

(35) Position the indicator plunger against a ring gear tooth (Fig. 80).

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

(37) Zero dial indicator face to pointer.

(38) 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 axle housing to the other (Fig. 80).

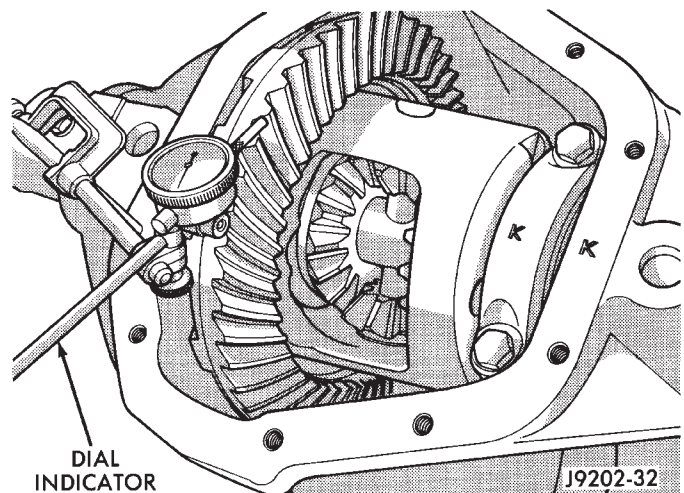


Fig. 80 Ring Gear Backlash Measurement

(39) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at several 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.

ADJUSTMENTS (Continued)

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

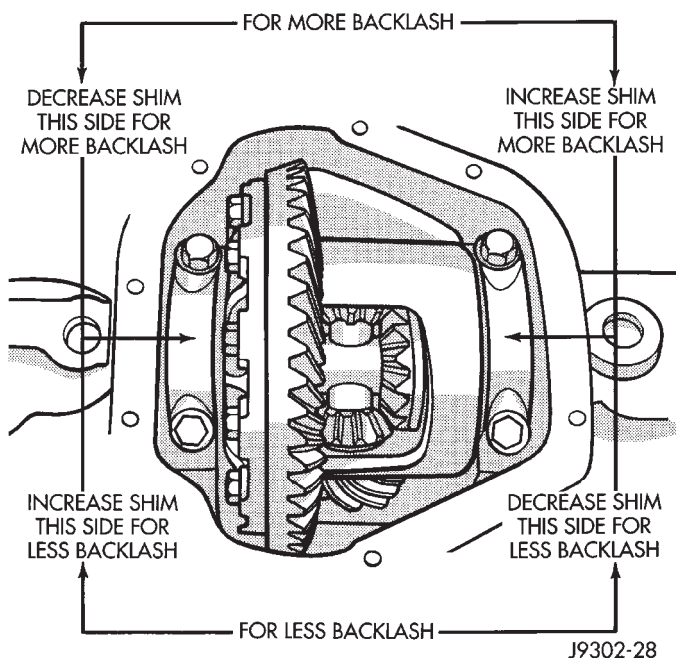


Fig. 81 Backlash Shim Adjustment

GEAR CONTACT PATTERN ANALYSIS

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

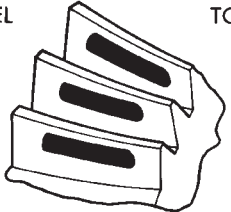
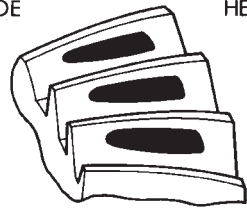

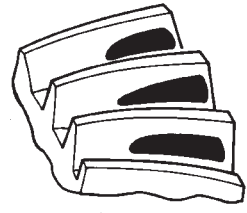

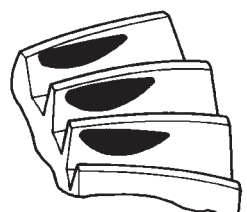
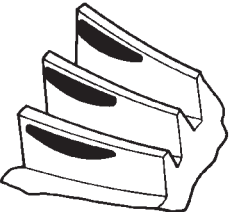
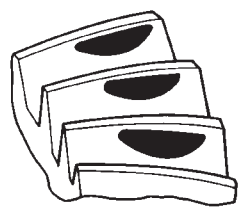
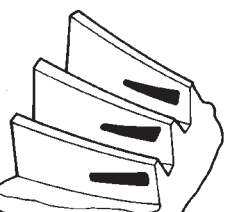
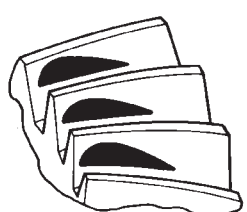
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

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

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

The areas on the ring gear teeth with the greatest degree of contact against the pinion gear 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. 82) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

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

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Fig. 82 Gear Tooth Contact Patterns

SPECIFICATIONS

216 AND 248 FBI AXLES

216 FBI AXLE

DESCRIPTION	SPEC.
Axle Type	Hypoid
Lubricant	Thermal Stable SAE 80W-90
Lube Capacity	2.3 L (4.8 pts.)
Axle Ratio	3.54, 3.92, 4.09
Ring Gear Diameter	215.9 mm (8.50 in.)
Pinion Standard Setting	109.5 mm (4.312 in.)
Pinion Bearing Preload	
Original Bearing	1-2 N·m (10-20 in. lbs.)
New Bearing	2-5 N·m (15-35 in. lbs.)

248 FBI AXLE

DESCRIPTION	SPEC.
Axle Type	Hypoid
Lubricant	Thermal Stable SAE 80W-90
Lube Capacity	3.6 L (7.6 pts.)
Axle Ratio	3.54, 4.10
Ring Gear Diameter	247.6 mm (9.75 in.)
Pinion Standard Setting	127 mm (5.000 in.)
Pinion Bearing Preload	
Original Bearing	1-2 N·m (10-20 in. lbs.)
New Bearing	2-5 N·m (15-35 in. lbs.)

TORQUE

216 FBI AXLE

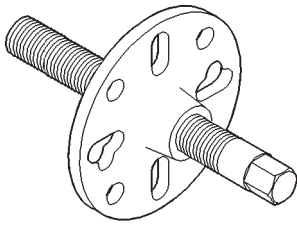
DESCRIPTION	TORQUE
Plug, Fill Hole	34 N·m (25 ft. lbs.)
Bolt, Diff. Cover	41 N·m (30 ft. lbs.)
Bolt, Bearing Cap	108 N·m (80 ft. lbs.)
Nut, Pinion	217-271 N·m (160-200 ft.lbs.)
Bolt, Ring Gear	95-122 N·m (70-90 ft. lbs.)
Bolt, Shift Motor	11 N·m (8 ft. lbs.)
Nut, Axle	237 N·m (175 ft. lbs.)
Bolt, Wheel Brg.	170 N·m (125 ft. lbs.)
Nut, Lower Ball Stud	108 N·m (80 ft. lbs.)
Nut, Upper Ball Stud	101 N·m (75 ft. lbs.)
Bolt, RWAL/ABS Sensor	11 N·m (96 in. lbs.)

248 FBI AXLE

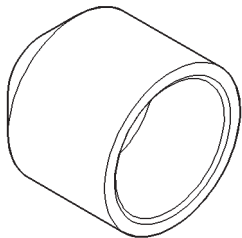
DESCRIPTION	TORQUE
Plug, Fill Hole	34 N·m (25 ft. lbs.)
Bolt, Diff. Cover	41 N·m (30 ft. lbs.)
Bolt, Bearing Cap	108 N·m (80 ft. lbs.)
Nut, Pinion	291-380 N·m (215-280 ft.lbs.)
Bolt, Ring Gear	163-190 N·m (120-140 ft. lbs.)
Bolt, Shift Motor	11 N·m (8 ft. lbs.)
Nut, Axle	237 N·m (175 ft. lbs.)
Bolt, Wheel Brg.	170 N·m (125 ft. lbs.)
Nut, Lower Ball Stud	190-217 N·m (140-160 ft. lbs.)
Nut, Upper Ball Stud	94 N·m (70 ft. lbs.)
Bolt, RWAL/ABS Sensor	11 N·m (96 in. lbs.)

SPECIAL TOOLS

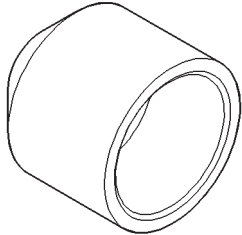
216 AND 248 FBI AXLES



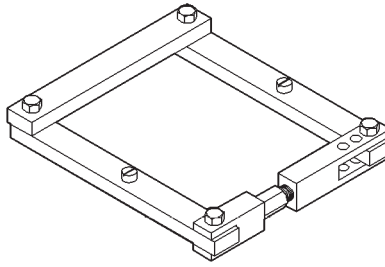
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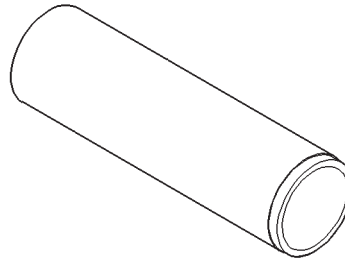
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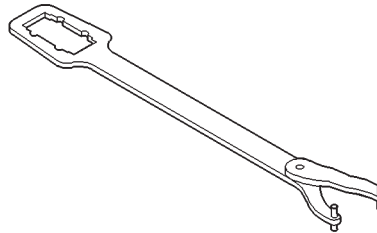
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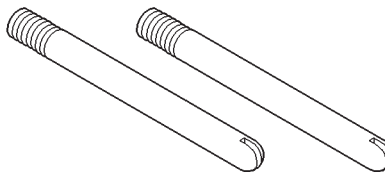
Spreader, Differential—W-129-B



Installer—C-3095-A

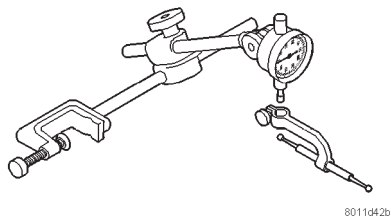
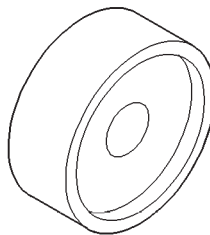
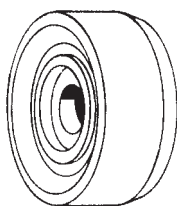
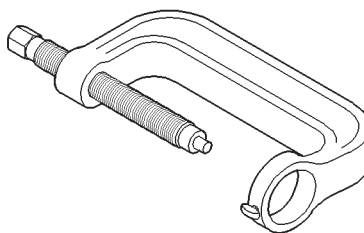


Holder—C-3281

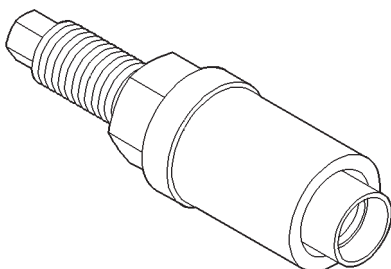
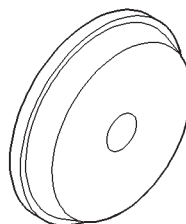
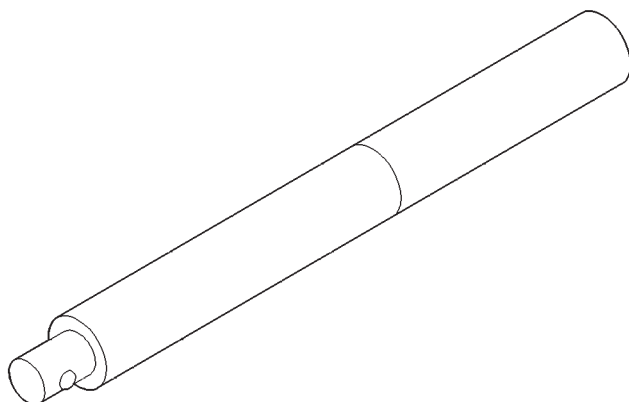
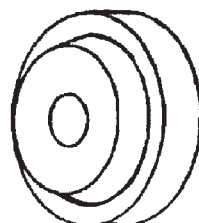


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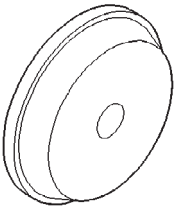
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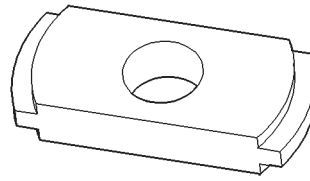
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Press, Ball Joint Remover/Installer—C-4212-F**Installer—C-3718****Installer, Pinion Bearing Cup—D-111****Handle—C-4171****Installer, Pinion Bearing Cup—D-144**

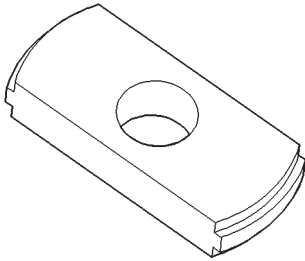
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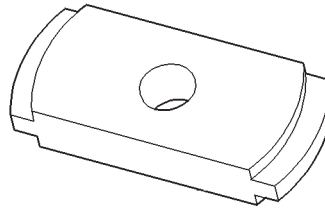
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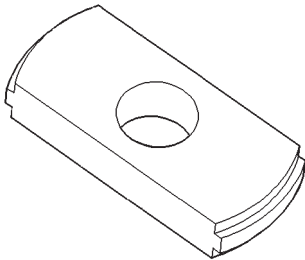
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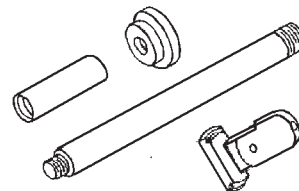
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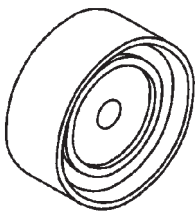
Remover, Pinion Bearing Cup—D-162



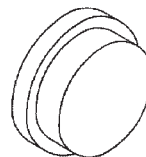
Remover, Pinion Bearing Cup—D-149



Remover/Installer Set—D-354

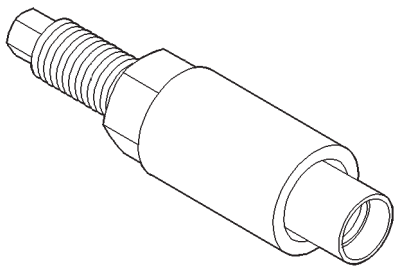
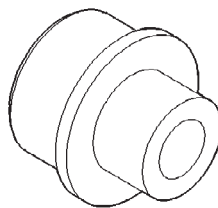
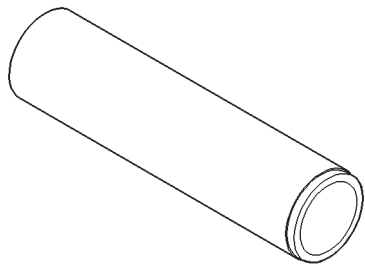
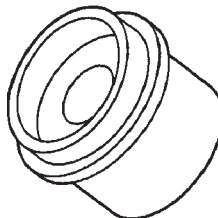
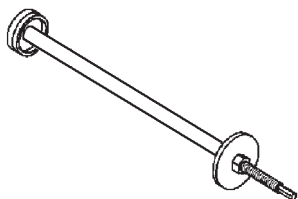
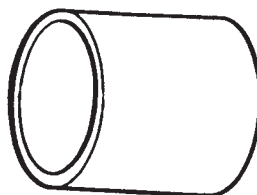
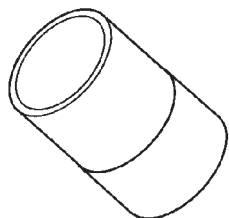
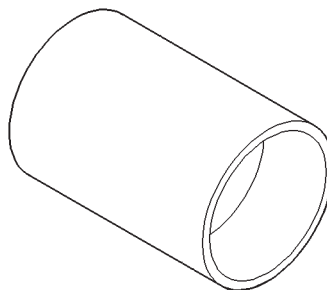


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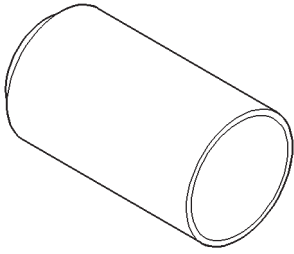


Button, Bearing Puller —DD-914-42

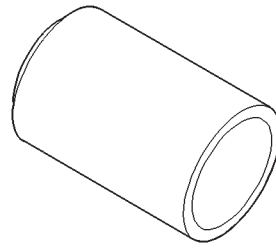
SPECIAL TOOLS (Continued)

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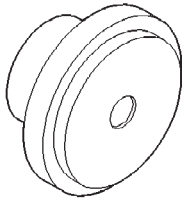
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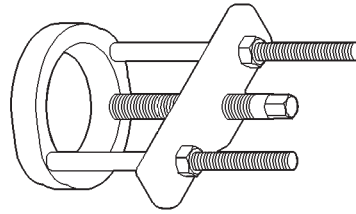
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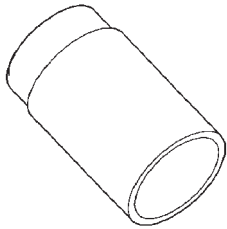
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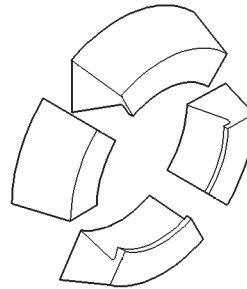
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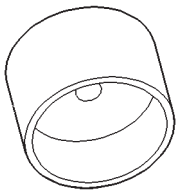
Puller/Press—C-293-PA



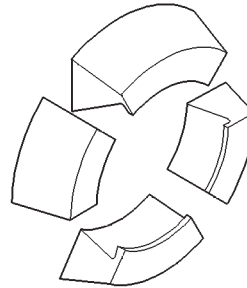
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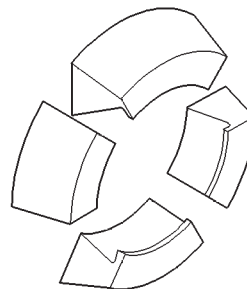
Adapter, Bearing Puller—C-293-18



Installer, Ball Stud—6760

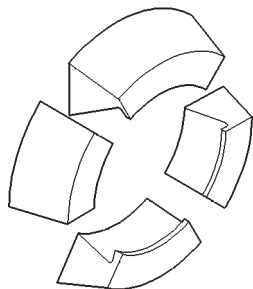
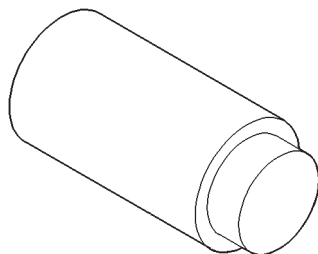
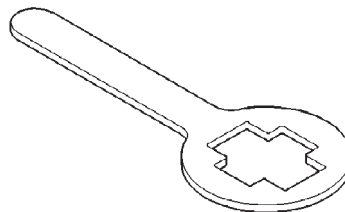


Adapter, Bearing Puller—C-293-37

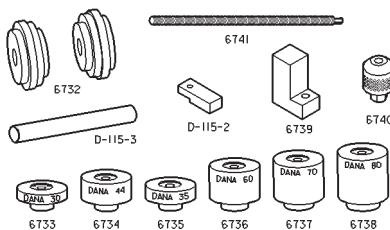
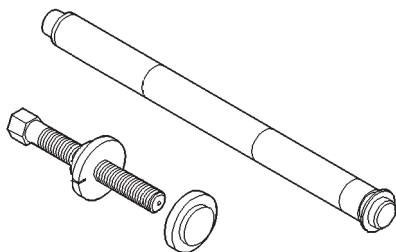


Adapter, Bearing Puller—C-293-40

SPECIAL TOOLS (Continued)

**Adapter, Bearing Puller—C-293-62****Adapter—C-293-3****Holder—6719**

6730 PINION HEIGHT SET

**Set, Pinion Depth Setting—6730****Remover/Installer—C-4487**

9 1/4 REAR AXLE

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GENERAL INFORMATION

9 1/4 AXLES

The 9 1/4 Inch axle housings consist of a cast iron center section 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 (Fig. 1).

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

The axles are equipped with semi-floating axle shafts, meaning vehicle loads are supported by the axle shaft and bearings. The axle shafts are retained by C-clips in the differential side gears.

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

Both axles have the assembly part number and gear ratio listed on tag. The tag is attached to the differential housing by a cover bolt.

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

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

Axles equipped with a Trac-Lok[™] 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.

GENERAL INFORMATION (Continued)

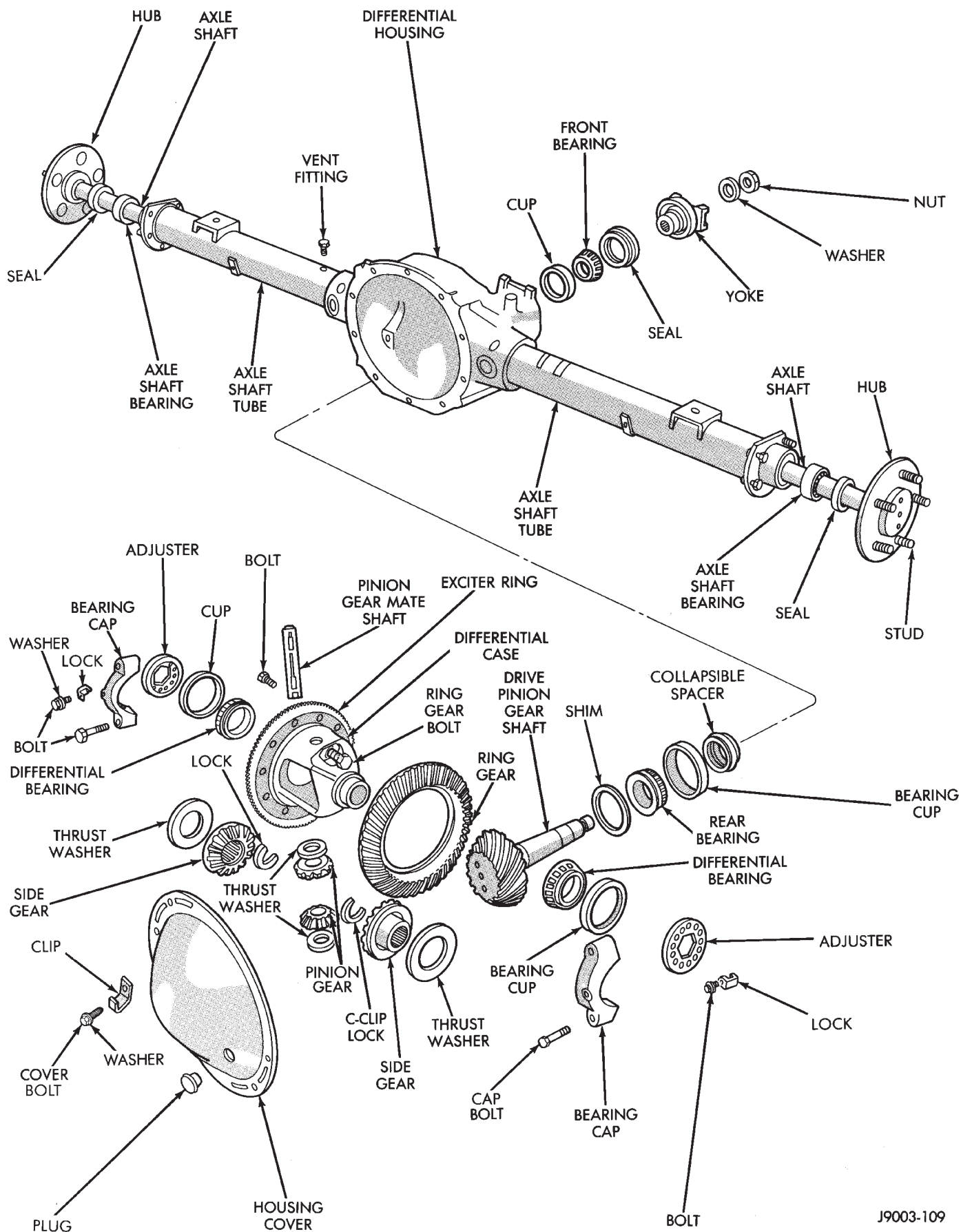


Fig. 1 9 1/4 Axle

J9003-109

GENERAL INFORMATION (Continued)

AXLE IDENTIFICATION

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

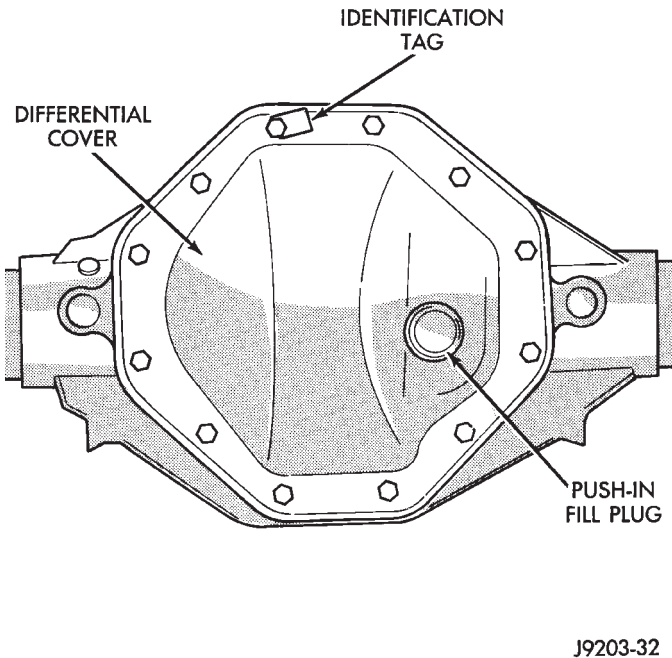


Fig. 2 Differential Cover 9 1/4 Inch Axle

LUBRICANTS

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

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

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

DESCRIPTION AND OPERATION

STANDARD DIFFERENTIAL

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

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

In operation, power flow occurs as follows:

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

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 3).

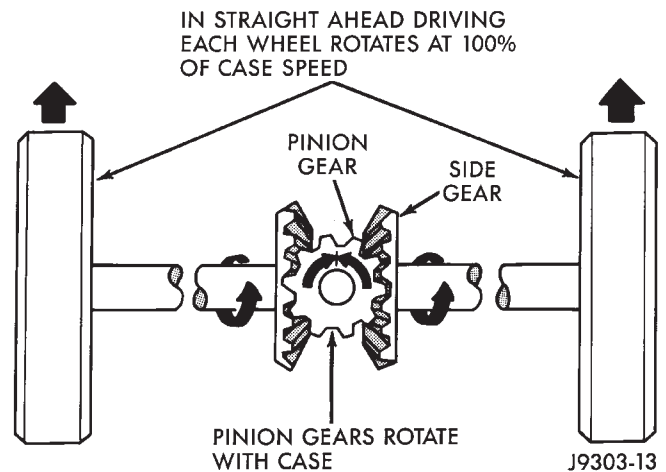


Fig. 3 Differential Operation—Straight Ahead Driving

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. 4). 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 OPERATION

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

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

In operation, the Trac-lok clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers

DESCRIPTION AND OPERATION (Continued)

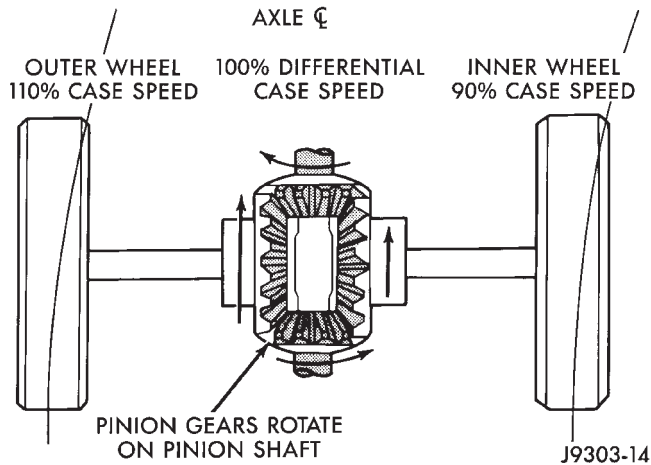


Fig. 4 Differential Operation—On Turns

within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 5).

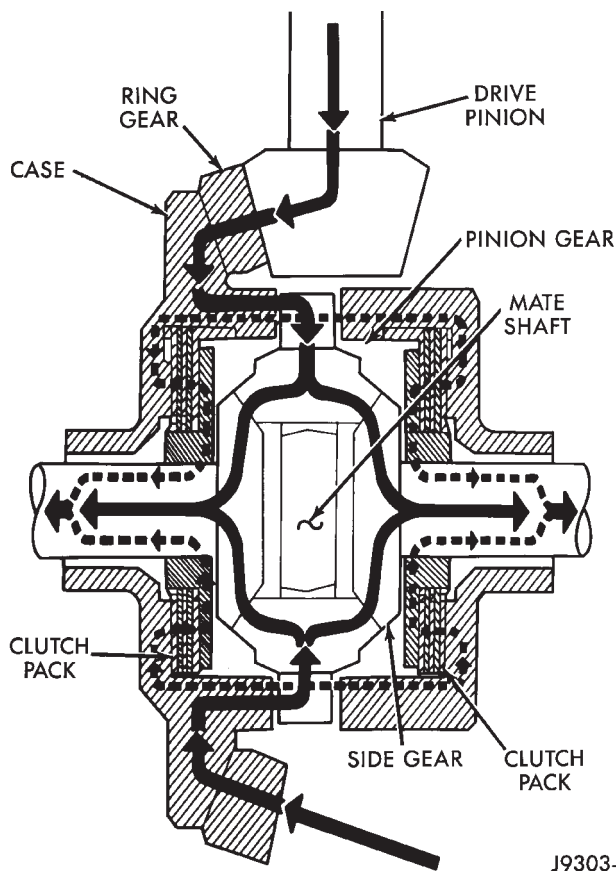


Fig. 5 Trac-lok Limited Slip Differential Operation

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

wheel loses traction. Pulling power is provided continuously until both wheels lose traction. If both wheels slip due to unequal traction, Trac-lok operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

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

Axle gear problem conditions are usually the result of:

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

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, or worn/damaged gears.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, 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 and pinion gears 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 gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

The axle shaft, differential and pinion gear bearings can all produce noise when worn or damaged.

DIAGNOSIS AND TESTING (Continued)

Bearing noise can be either a whining, or a growling sound.

Pinion gear bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher 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 gear 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 rear-end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

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

- High engine idle speed
- 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/case clearance

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

TRAC-LOK DIFFERENTIAL NOISE

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

A container of Mopar® Trac-lok Lubricant (friction modifier) should be added after repair service or during a lubricant change.

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

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	<ol style="list-style-type: none"> 1. Wheel loose. 2. Faulty, brinelled wheel bearing. 	<ol style="list-style-type: none"> 1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces. 	<ol style="list-style-type: none"> 1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch. 	<ol style="list-style-type: none"> 1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	<ol style="list-style-type: none"> 1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation. 	<ol style="list-style-type: none"> 1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	<ol style="list-style-type: none"> 1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire. 	<ol style="list-style-type: none"> 1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 1. Lubricant level too high. 	<ol style="list-style-type: none"> 1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONT., DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed. 	<ol style="list-style-type: none"> 2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	<ol style="list-style-type: none"> 1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash. 	<ol style="list-style-type: none"> 1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	<ol style="list-style-type: none"> 1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments. 	<ol style="list-style-type: none"> 1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	<ol style="list-style-type: none"> 1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts 	<ol style="list-style-type: none"> 1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

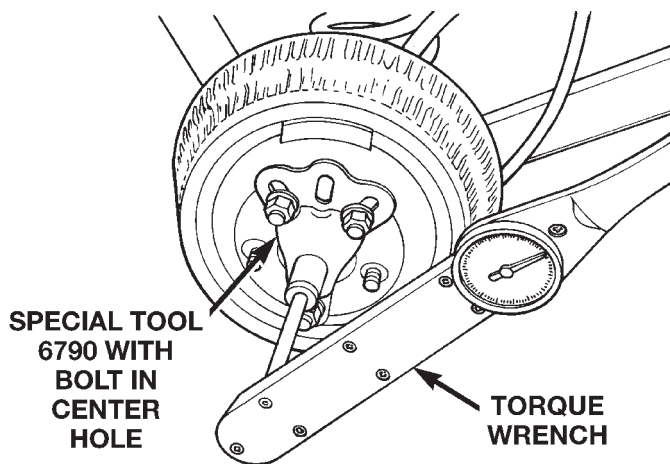
DIAGNOSIS AND TESTING (Continued)

TRAC-LOK TEST

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

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

- (1) Place blocks in front and rear of both front wheels.
- (2) Raise one rear wheel until it is completely off the ground.
- (3) Engine off, transmission in neutral, and parking brake off.
- (4) Remove wheel and bolt Special Tool 6790 to studs.
- (5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 6).



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Fig. 6 Trac-lok Test —Typical

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

SERVICE PROCEDURES

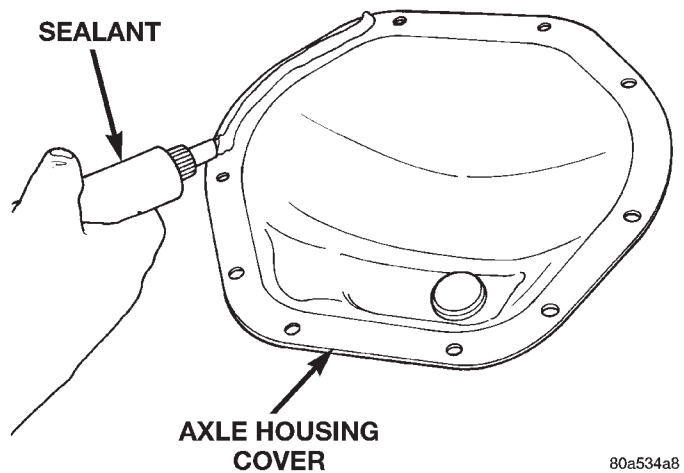
LUBRICANT CHANGE

- (1) Raise and support the vehicle.
- (2) Remove the lubricant fill hole plug from the differential housing cover.
- (3) Remove the differential housing cover and drain the lubricant from the housing.

- (4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**

- (5) Remove the original sealant from the housing and cover surfaces.

- (6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 7).



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Fig. 7 Apply Sealant

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

- (7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

- (8) For Trac-lok differentials, a quantity of Mopar® Trac-lok lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.

- (9) Fill differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications section of this group for the quantity necessary.

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

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

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

REMOVAL AND INSTALLATION

REAR AXLE

REMOVAL

- (1) Raise and support the vehicle.

REMOVAL AND INSTALLATION (Continued)

- (2) Position a suitable lifting device under the axle.
- (3) Secure axle to device.
- (4) Remove the wheels and tires.
- (5) Secure brake drums to the axle shaft.
- (6) Remove the RWAL sensor from the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.
- (7) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.
- (8) Disconnect the parking brake cables and cable brackets.
- (9) Disconnect the vent hose from the axle shaft tube.
- (10) Mark the propeller shaft and yoke for installation alignment reference.
- (11) Remove propeller shaft.
- (12) Disconnect shock absorbers from axle.
- (13) Remove the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
- (14) Separate the axle from the vehicle.

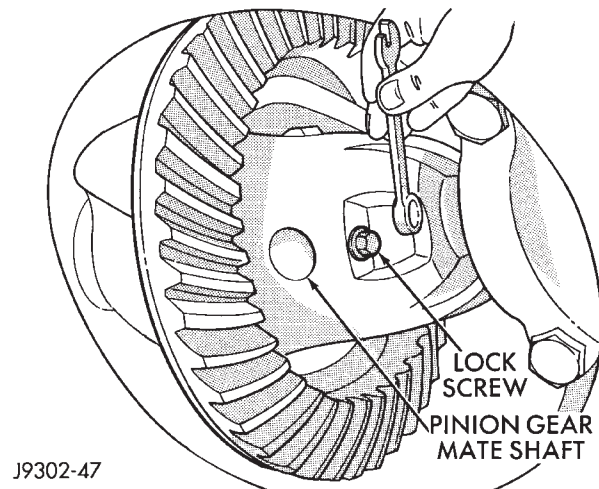
INSTALLATION

- (1) Raise the axle with lifting device and align to the leaf spring centering bolts.
- (2) Install the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
- (3) Install shock absorbers and tighten nuts to 82 N·m (60 ft. lbs.) torque.
- (4) Install the RWAL sensor to the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.
- (5) Connect the parking brake cables and cable brackets.
- (6) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.
- (7) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.
- (8) Install axle vent hose.
- (9) Align propeller shaft and pinion yoke reference marks. Install universal joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.
- (10) Install the wheels and tires.
- (11) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.
- (12) Remove lifting device from axle and lower the vehicle.

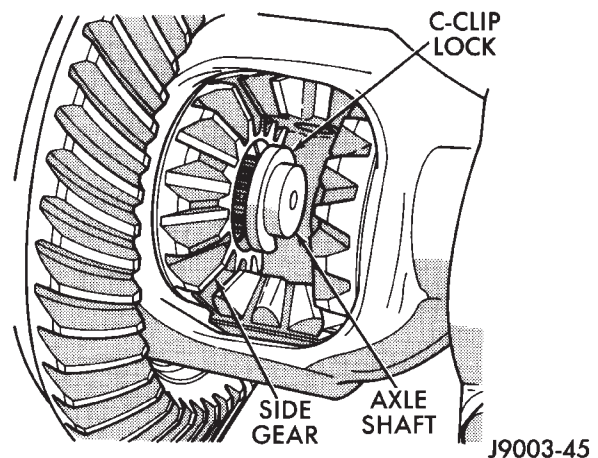
AXLE SHAFT

REMOVAL

- (1) Raise and support vehicle. Ensure that the transmission is in neutral.
- (2) Remove wheel and tire assembly.
- (3) Remove brake drum. Refer to Group 5, Brakes, for proper procedure.
- (4) Clean all foreign material from housing cover area.
- (5) Loosen housing cover bolts. Drain lubricant from the housing and axle shaft tubes. Remove housing cover.
- (6) Rotate differential case so that pinion mate gear shaft lock screw is accessible. Remove lock screw and pinion mate gear shaft from differential case (Fig. 8).

**Fig. 8 Mate Shaft Lock Screw**

- (7) Push axle shaft inward and remove axle shaft C-clip lock from the axle shaft (Fig. 9).

**Fig. 9 Axle Shaft C-Clip Lock**

REMOVAL AND INSTALLATION (Continued)

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

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

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

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-clip lock in end of axle shaft. Push axle shaft outward to seat C-clip lock in side gear.

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

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

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

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

(7) Install wheel and tire.

(8) Lower vehicle.

9 1/4 LD AXLE SEAL AND BEARING

REMOVAL

(1) Remove axle shaft.

(2) Remove axle shaft seal from the end of the axle tube with a small pry bar (Fig. 10).

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

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool Set 6310, using Adapter Foot 6310-9 (Fig. 11).

INSTALLATION

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

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

(2) Install the axle shaft bearing with Installer C-4198 and Handle C-4171 (Fig. 12). Ensure that the bearing part number is against the installer. Verify

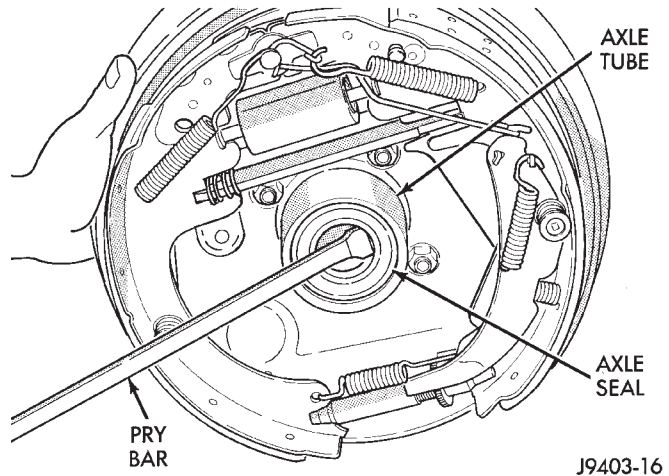


Fig. 10 Axle Seal Removal

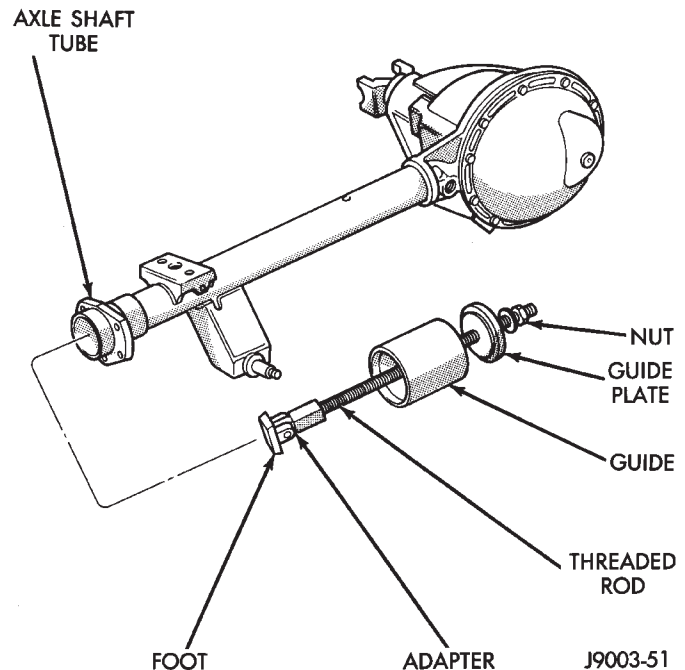


Fig. 11 Axle Shaft Bearing Removal Tool

that the bearing is installed straight and the tool fully contacts the axle tube when seating the bearing.

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

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

(5) Install the axle shaft.

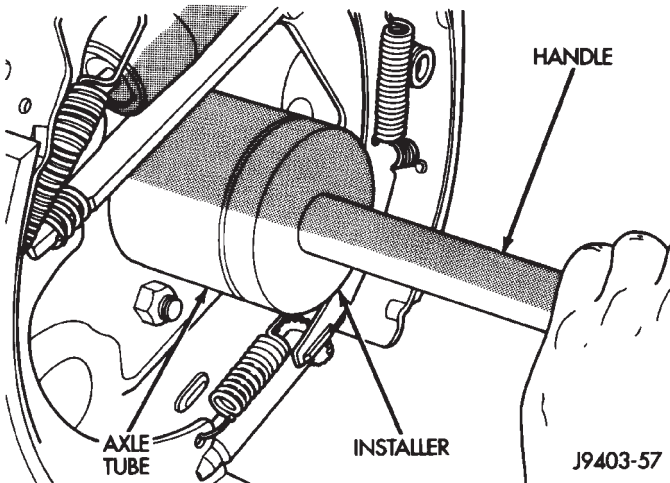
9 1/4 HD AXLE SEAL AND BEARING

REMOVAL

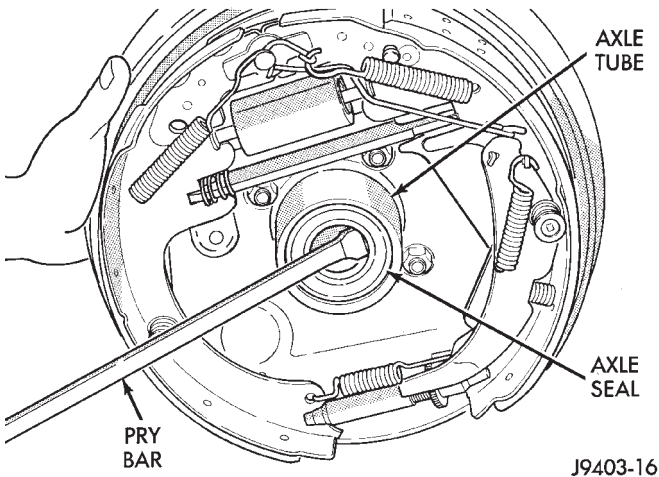
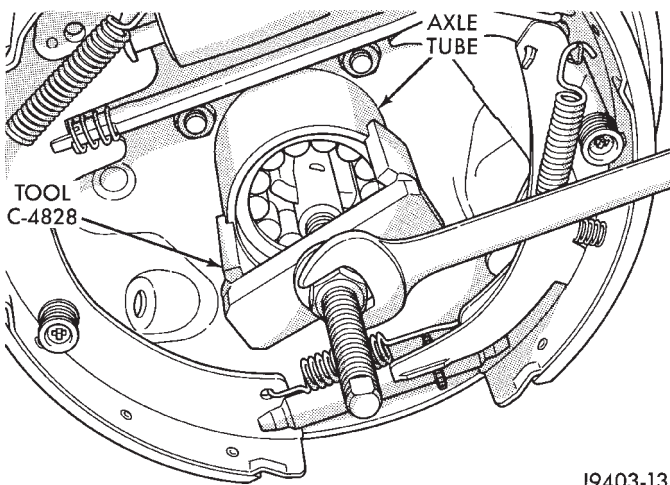
(1) Remove axle shaft.

(2) Remove axle shaft seal from the end of the axle tube with a small pry bar (Fig. 13).

REMOVAL AND INSTALLATION (Continued)

**Fig. 12 Axle Shaft Seal and Bearing Installation**

(3) Remove the axle shaft bearing from the axle tube with Bearing Removal Tool C-4828 (Fig. 14).

**Fig. 13 Axle Seal Removal****Fig. 14 Axle Shaft Bearing Removal Tool**

INSTALLATION

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

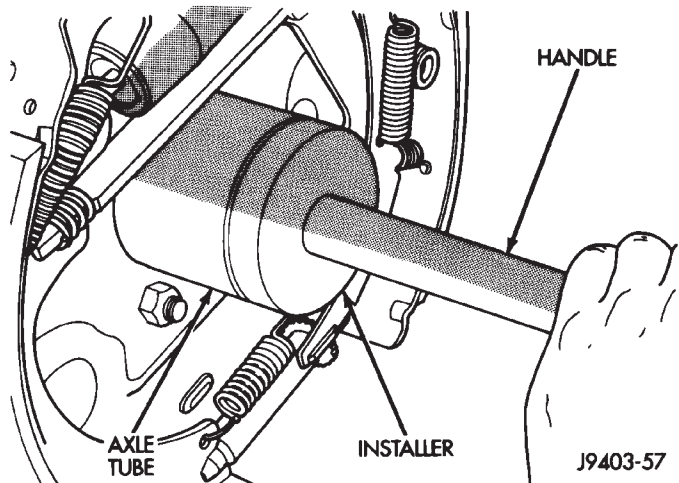
(1) Wipe the axle tube bore clean. Remove any old sealer or burrs from the tube.

(2) Install the axle shaft bearing with Installer C-4826-1 and Handle C-4171 (Fig. 15). Ensure that the bearing part number is against the installer. Verify that the bearing is installed straight and the tool fully contacts the axle tube when seating the bearing.

(3) Install a new axle seal with Installer C-4826-1, Adapter C-4826-2, 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.

**Fig. 15 Axle Shaft Seal and Bearing Installation**

PINION SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Scribe a mark on the universal joint, pinion yoke, and pinion shaft for reference.

(3) Disconnect the propeller shaft from the pinion yoke. Secure the propeller shaft in an upright position to prevent damage to the rear universal joint.

(4) Remove the wheel and tire assemblies.

(5) Remove the brake drums to prevent any drag. The drag may cause a false bearing preload torque measurement.

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

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

(8) Hold the yoke with Wrench 6719. Remove the pinion shaft nut and washer.

REMOVAL AND INSTALLATION (Continued)

(9) Remove the yoke with Remover C-452 (Fig. 16).

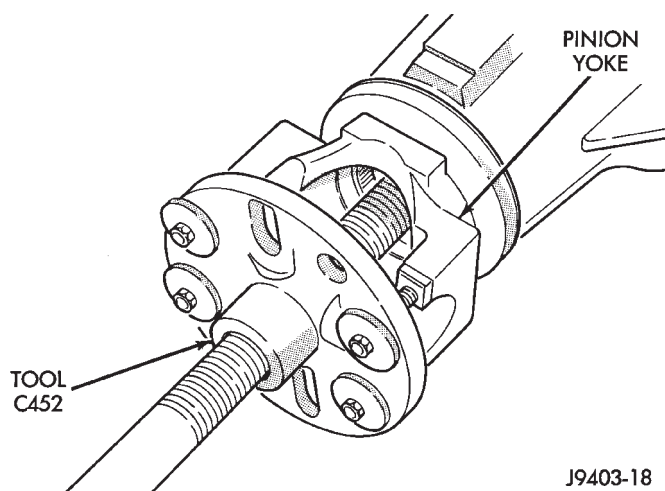


Fig. 16 Yoke Removal

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

INSTALLATION

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

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

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

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

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

(5) Install the new pinion shaft seal with Installer C-3860-A and Handle C-4171.

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

(6) Position the pinion yoke on the end of the shaft with the reference marks aligned.

(7) Seat yoke on pinion shaft with Installer C-3718 and Wrench 6719.

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

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

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

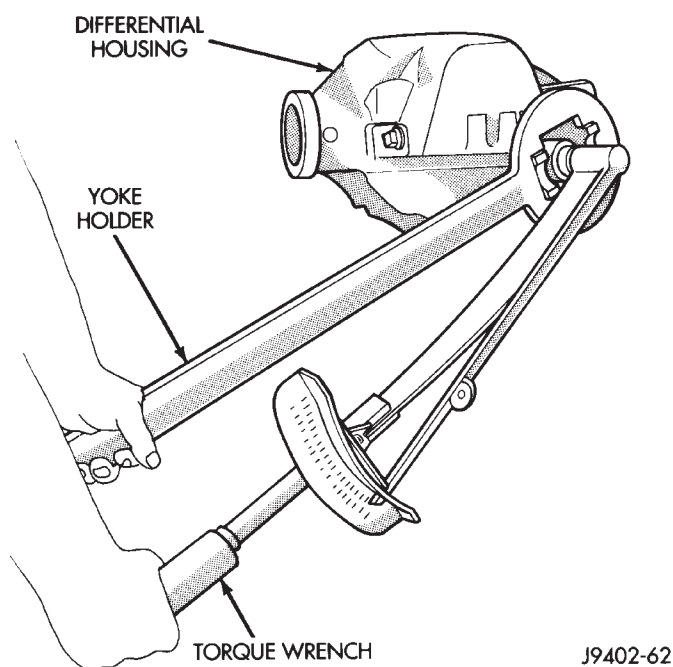


Fig. 17 Tightening Pinion Shaft Nut

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

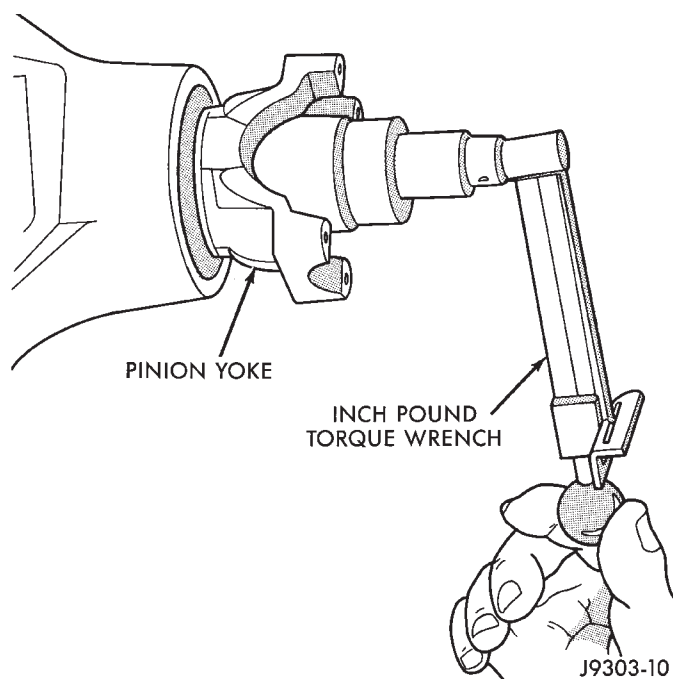


Fig. 18 Check Pinion Rotation Torque

REMOVAL AND INSTALLATION (Continued)

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

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

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

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

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

(14) Tighten the universal joint yoke clamp screws to 19 N·m (14 ft. lbs.).

(15) Install the brake drums.

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

(17) Check the differential housing lubricant level.

DIFFERENTIAL

REMOVAL

- (1) Remove the axle shafts.
- (2) Remove RWAL/ABS sensor from housing.

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

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

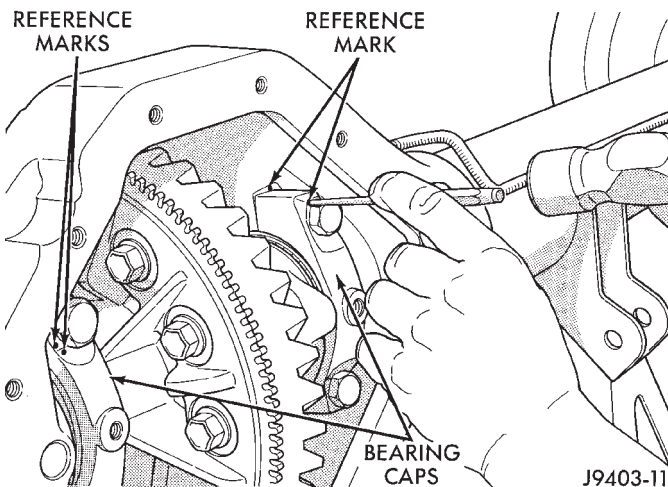


Fig. 19 Mark For Installation Reference

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

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

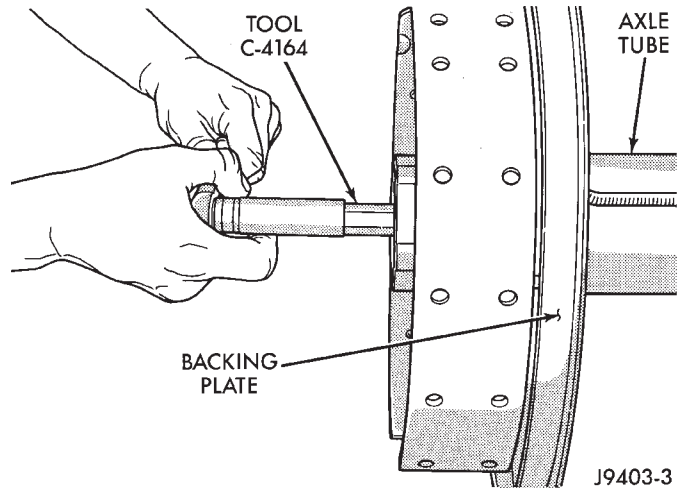


Fig. 20 Threaded Adjuster Tool

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

(7) Remove the differential case.

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

INSTALLATION

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

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

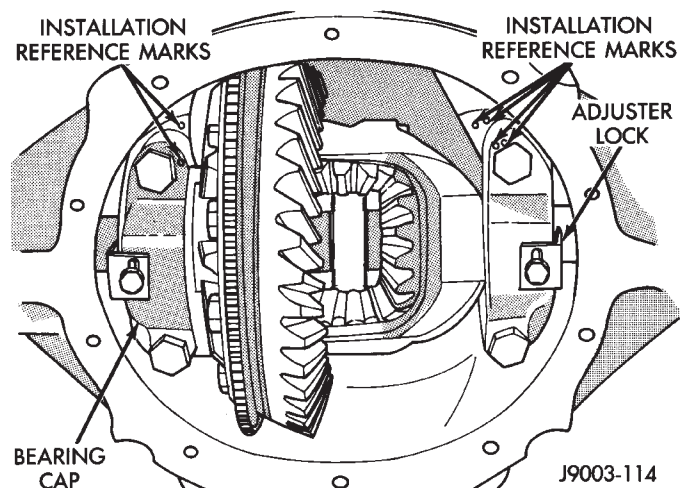


Fig. 21 Bearing Caps & Bolts

REMOVAL AND INSTALLATION (Continued)

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

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

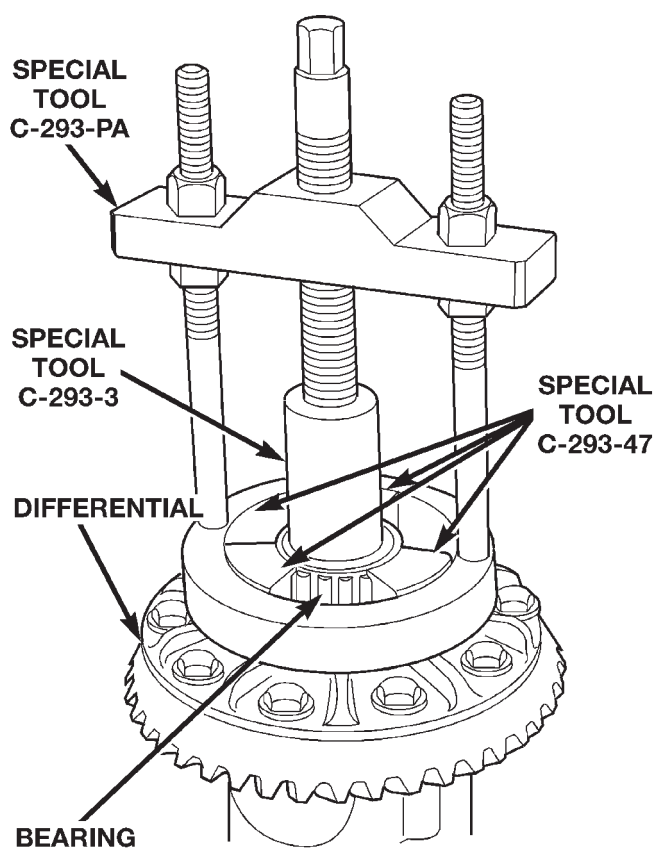
(5) Install axle shafts and differential housing cover.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential case from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA and Adapters C-293-47 and Plug C-293-3 (Fig. 22).



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Fig. 22 Differential Bearing Removal

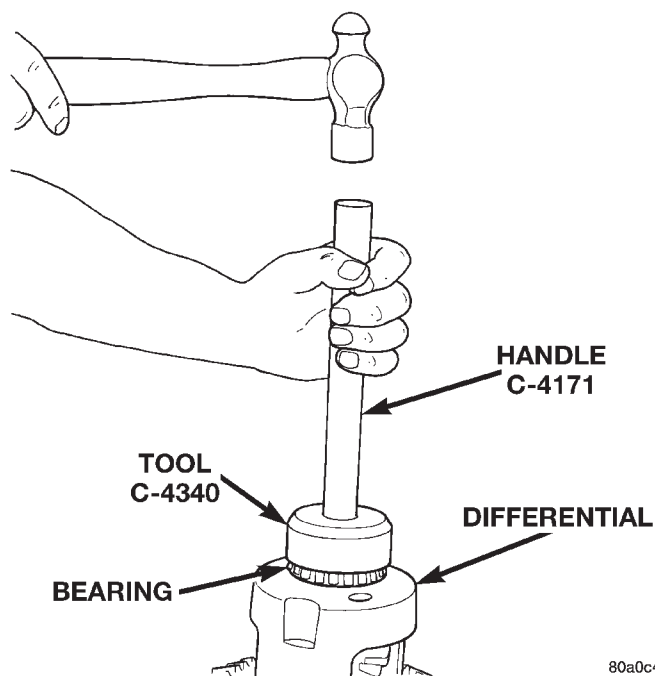
INSTALLATION

(1) Install differential side bearings. Use Installer C-4213 and Handle C-4171 (Fig. 23).

(2) Install differential case in axle housing.

RING GEAR AND EXCITER RING

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



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Fig. 23 Install Differential Side Bearings

REMOVAL

(1) Remove differential from axle housing.

(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 24).

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

(4) Using a soft hammer, drive ring gear from differential case (Fig. 24).

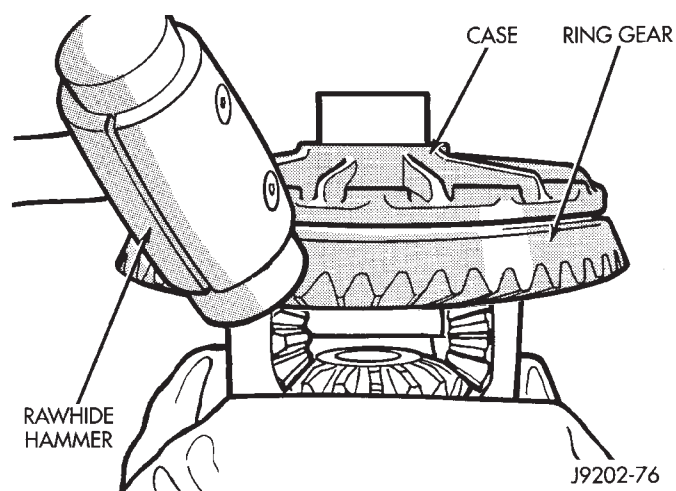


Fig. 24 Ring Gear Removal

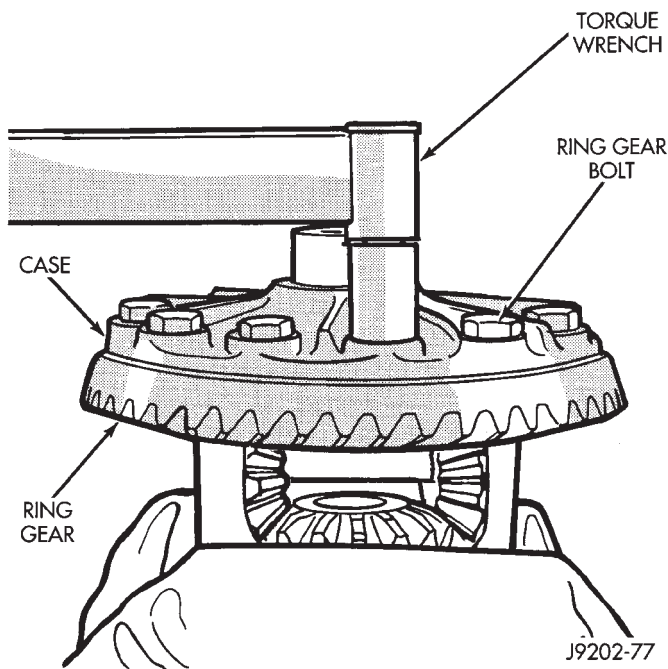
(5) Use a brass drift and slowly tap the exciter ring from the differential case.

INSTALLATION

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

REMOVAL AND INSTALLATION (Continued)

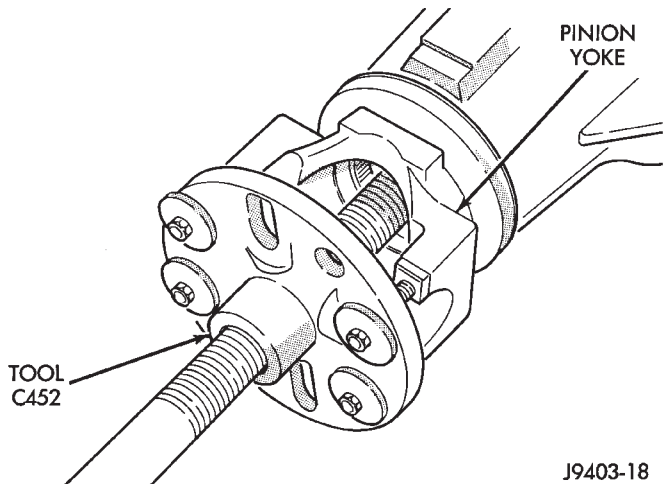
- (1) Invert the differential case.
- (2) Position exciter ring on differential case.
- (3) Using a brass drift, slowly and evenly tap the exciter ring into position.
- (4) Position ring gear on the differential case and start two ring gear bolts. This will provide case-to-ring gear bolt hole alignment.
- (5) Invert the differential case in the vise.
- (6) Install new ring gear bolts and alternately tighten to 157 N·m (115 ft. lbs.) torque (Fig. 25).
- (7) Install differential in axle housing and verify gear mesh and contact pattern.

**Fig. 25 Ring Gear Bolt Installation****PINION GEAR**

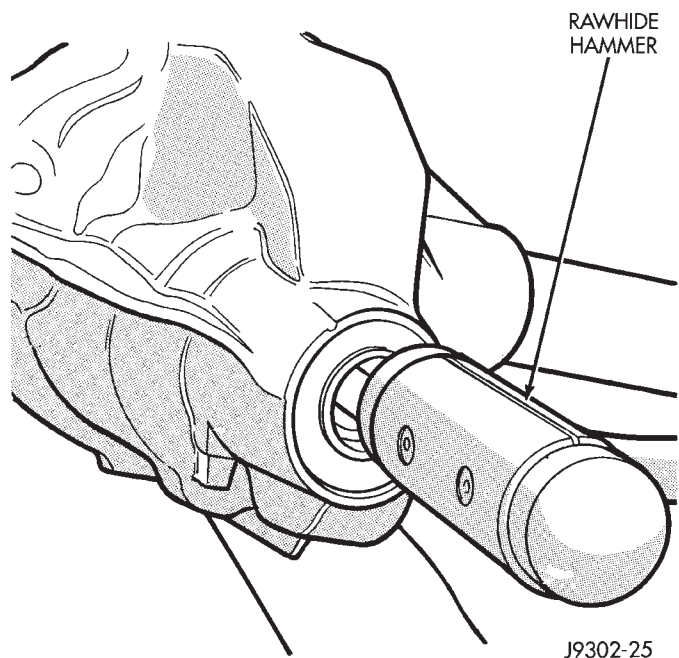
NOTE: The ring and pinion gears are serviced in a matched set. Do not replace the pinion gear without replacing the ring gear.

REMOVAL

- (1) Remove differential from the axle housing.
- (2) Mark pinion yoke and propeller shaft for installation alignment.
- (3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.
- (4) Using Yoke Holder 6719 to hold yoke and remove the pinion yoke nut and washer.
- (5) Using Remover C-452, remove the pinion yoke from pinion shaft (Fig. 26).
- (6) Partially install pinion nut onto pinion to protect the threads.

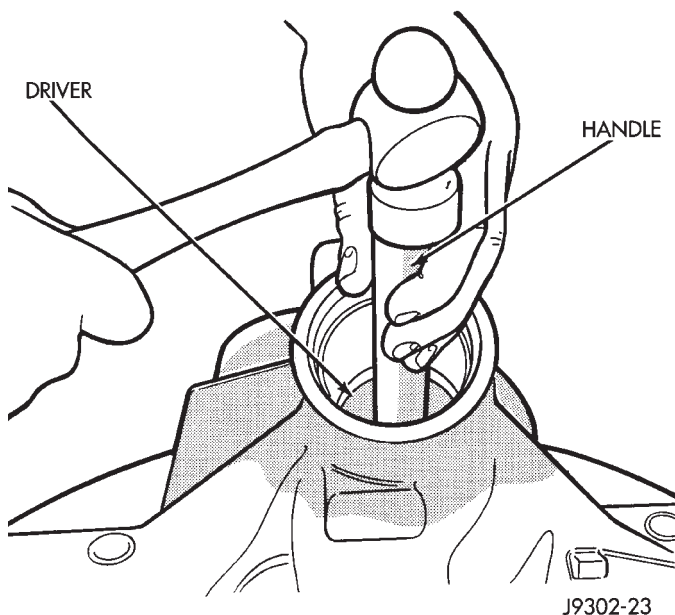
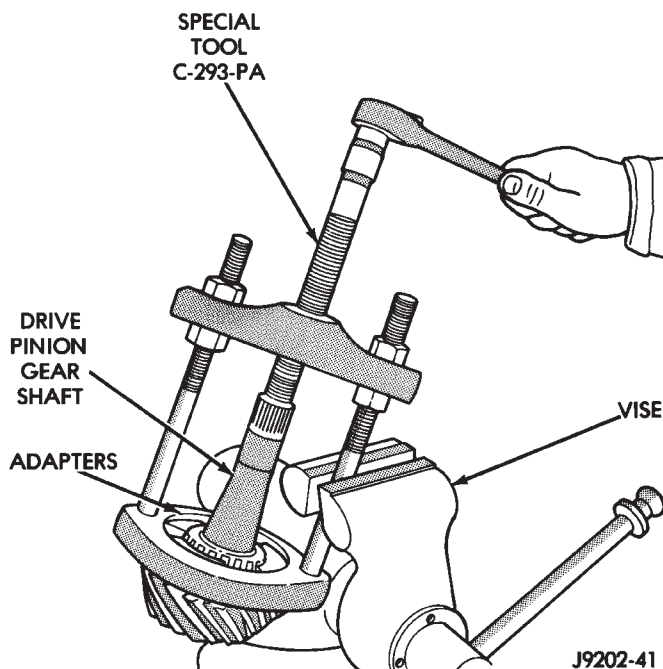
**Fig. 26 Pinion Yoke Removal**

- (7) Remove the pinion gear from housing (Fig. 27). Catch the pinion with your hand to prevent it from falling and being damaged.

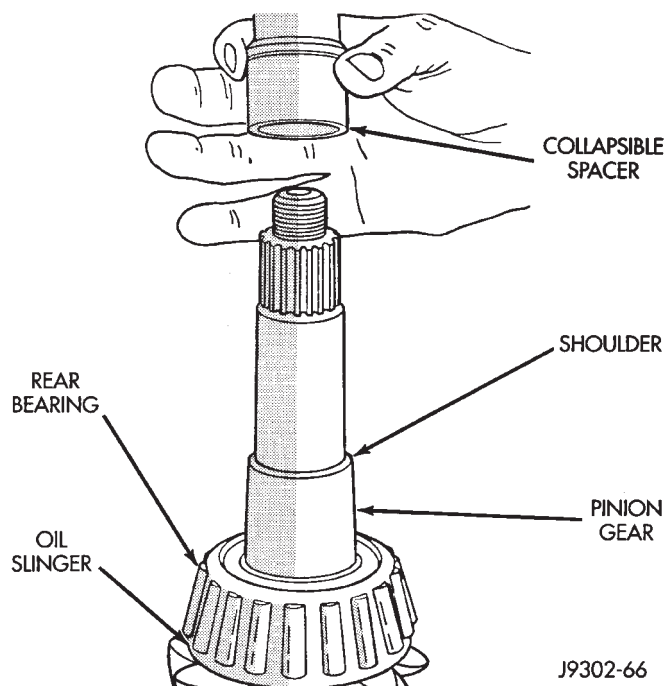
**Fig. 27 Remove Pinion Gear**

- (8) Remove the pinion shaft seal with suitable pry tool or slide-hammer mounted screw.
- (9) Remove oil slinger, if equipped, and front pinion bearing.
- (10) Remove the front pinion bearing cup with Bearing Removal Tool Set 6310 and Adapter Foot 6310-9.
- (11) Remove the rear bearing cup from housing (Fig. 28). Use Remover C-4309 and Handle C-4171 for the 9 1/4 axle.
- (12) Remove the collapsible preload spacer (Fig. 29).

REMOVAL AND INSTALLATION (Continued)

**Fig. 28 Rear Bearing Cup Removal****Fig. 30 Rear Bearing Removal**

- (2) Install the pinion rear bearing cup (Fig. 31) with Installer C-4310 and Driver Handle C-4171.
- (3) Ensure cup is correctly seated.

**Fig. 29 Collapsible Spacer**

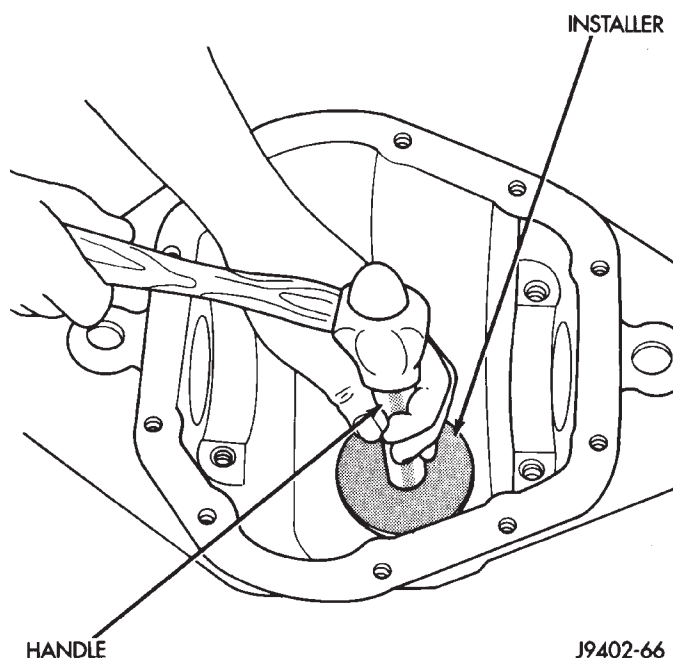
- (13) Remove the rear bearing from the pinion (Fig. 30) with Puller/Press C-293-PA and Adapters C-293-37.

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

- (14) Remove the depth shims from the pinion gear shaft. Record the thickness of the depth shims.

INSTALLATION

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

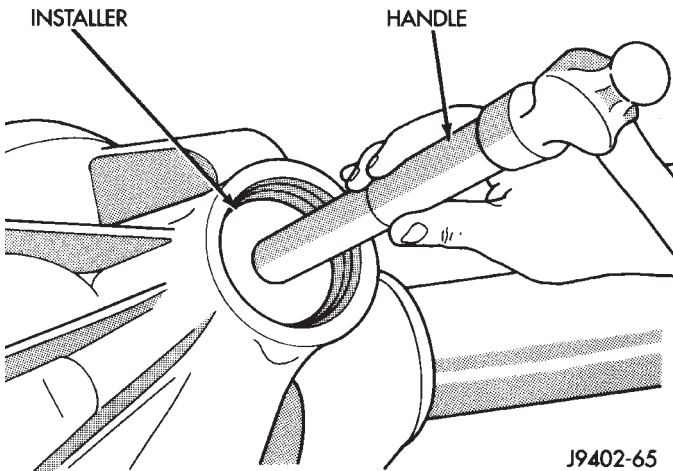
**Fig. 31 Pinion Rear Bearing Cup Installation**

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

- (5) Install the pinion front bearing cup (Fig. 32) with Installer D-129 and Handle C-4171.

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

REMOVAL AND INSTALLATION (Continued)

**Fig. 32 Pinion Front Bearing Cup Installation**

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

(8) Install seal with Installer C-3860-A and Handle C-4171.

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

(9) Place the proper thickness depth shim on the pinion gear.

(10) Install the rear bearing and slinger, if equipped, on the pinion gear (Fig. 33) with Installer C-3095.

(11) Install a new collapsible preload spacer on pinion shaft and install pinion gear in housing (Fig. 34).

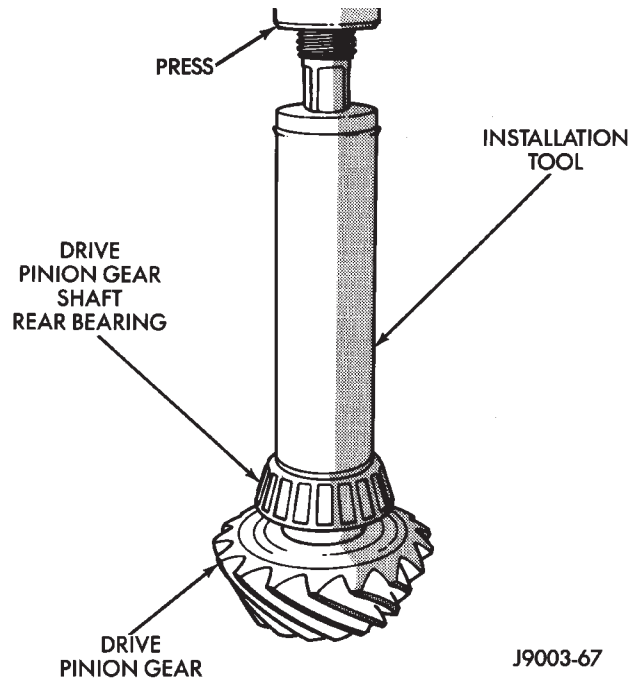
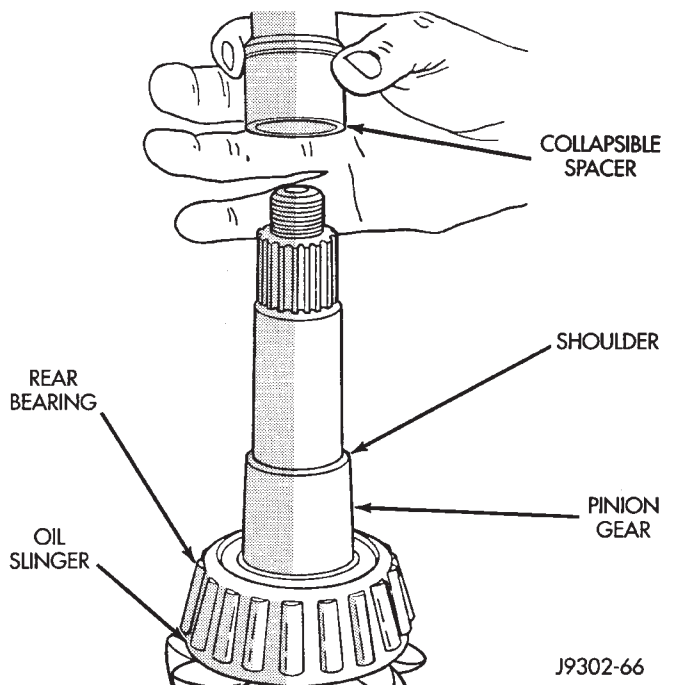
(12) Install pinion gear in housing.

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

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

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

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. The torque sequence will then have to be repeated.

**Fig. 33 Shaft Rear Bearing Installation****Fig. 34 Collapsible Preload Spacer**

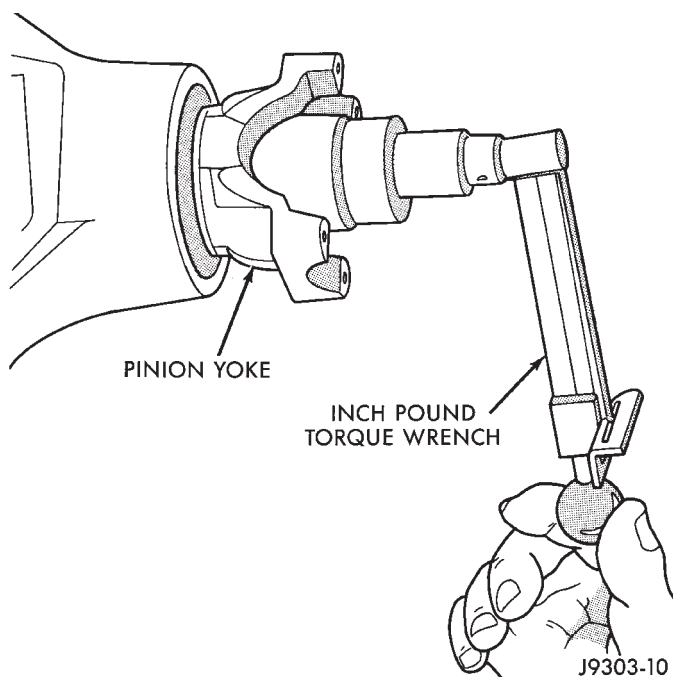
(16) Using Yoke Holder 6719, crush collapsible spacer until bearing end play is taken up.

(17) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the desired rotating torque is achieved. Measure the rotating torque frequently to avoid over crushing the collapsible spacer (Fig. 35).

(18) Check bearing rotating torque with an inch pound torque wrench (Fig. 35). The torque necessary to rotate the pinion gear should be:

REMOVAL AND INSTALLATION (Continued)

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

**Fig. 35 Check Pinion Gear Rotating Torque**

- (19) Install propeller shaft.
- (20) Install differential in housing.

FINAL ASSEMBLY

(1) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, on the housing cover (Fig. 36).

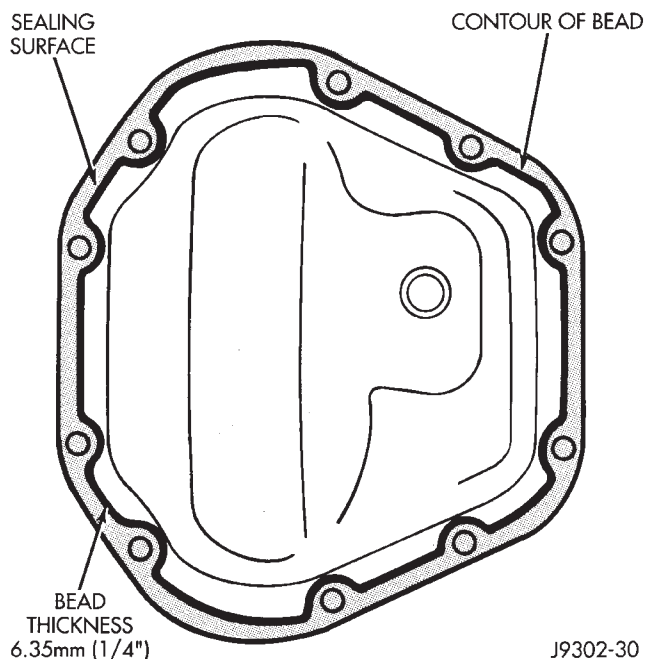
Install the housing cover within 5 minutes after applying the sealant.

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

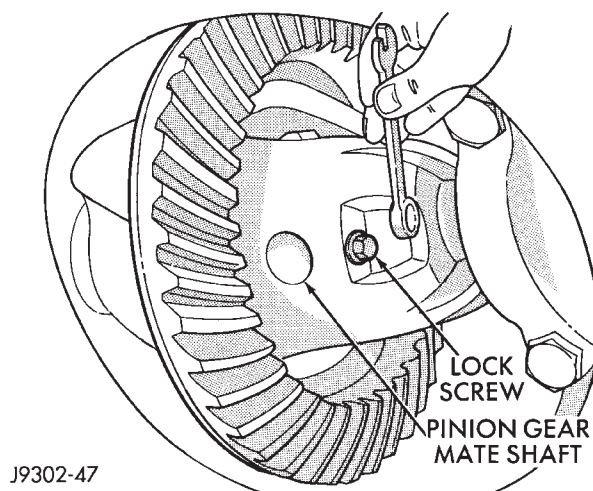
CAUTION: Overfilling the differential can result in lubricant foaming and overheating.

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

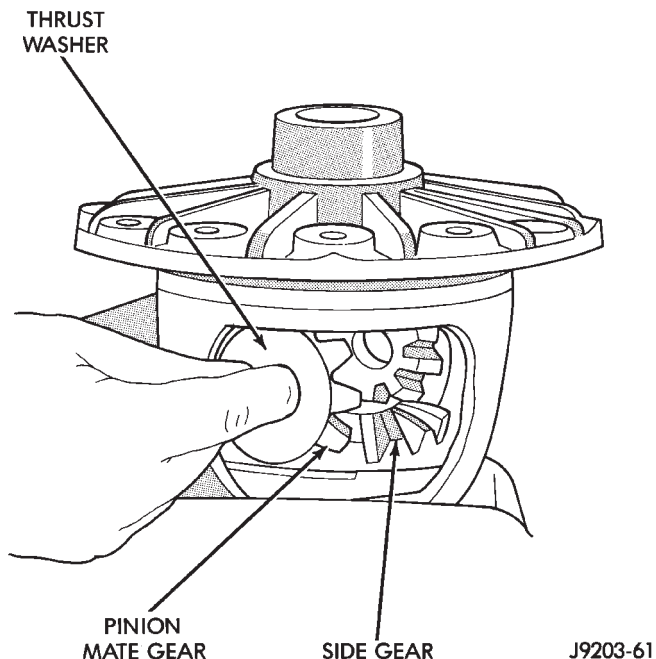
(4) Install the fill hole plug.

**Fig. 36 Typical Housing Cover With Sealant**
DISASSEMBLY AND ASSEMBLY**STANDARD DIFFERENTIAL****DISASSEMBLY**

- (1) Remove pinion gear mate shaft lock screw (Fig. 37).
- (2) Remove pinion gear mate shaft.
- (3) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 38).

**Fig. 37 Pinion Gear Mate Shaft Lock Screw**

DISASSEMBLY AND ASSEMBLY (Continued)

**Fig. 38 Pinion Mate Gear Removal**

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

ASSEMBLY

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

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

(3) Install the pinion gear mate shaft.

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

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

9 1/4 TRAC-LOK DIFFERENTIAL

The Trac-lok differential components are illustrated in (Fig. 39). Refer to this illustration during repair service.

DISASSEMBLY

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

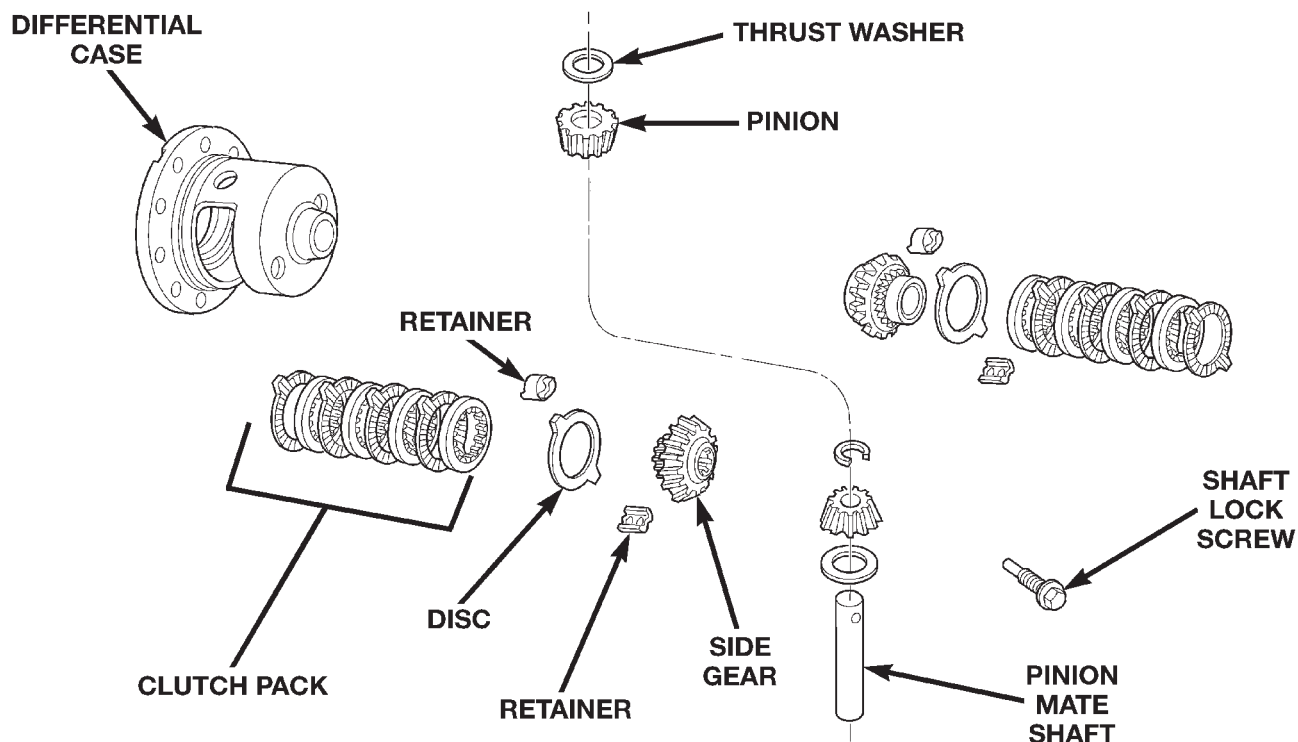
(2) Position the differential case on Side Gear Holding Tool 8136 (Fig. 40).

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

(4) Remove the pinion gear mate shaft lock screw (Fig. 41).

(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 42).

(6) Install and lubricate Step Plate 8139-2 (Fig. 43).

**Fig. 39 Trac-lok Differential Components**

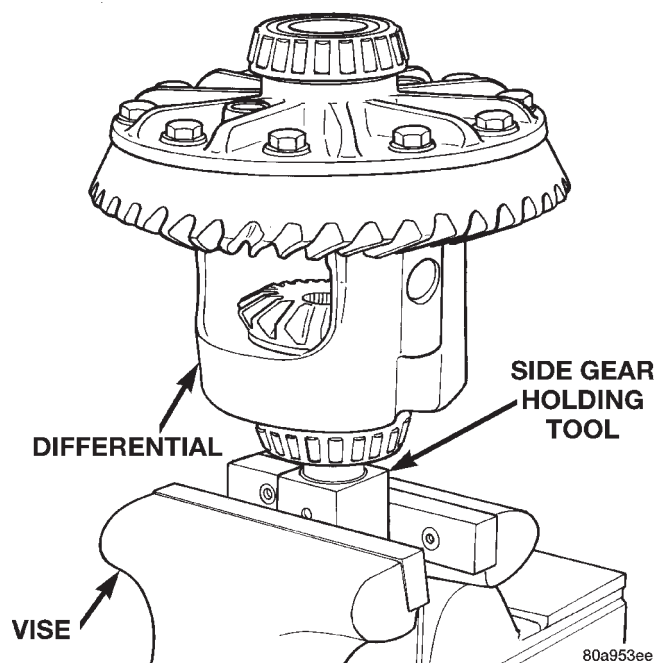


Fig. 40 Differential Case Holding Tool

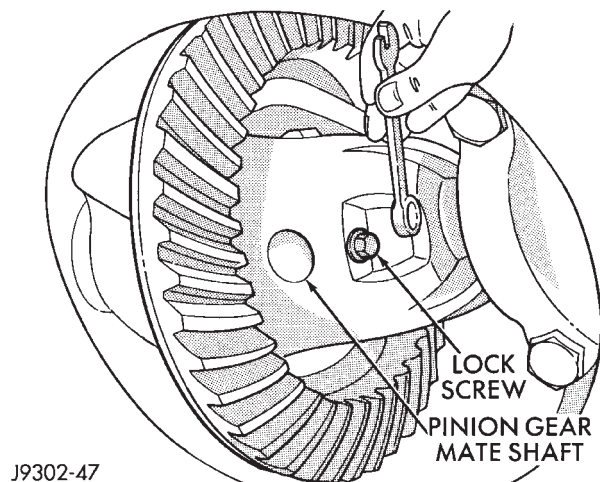


Fig. 41 Mate Shaft Lock Screw

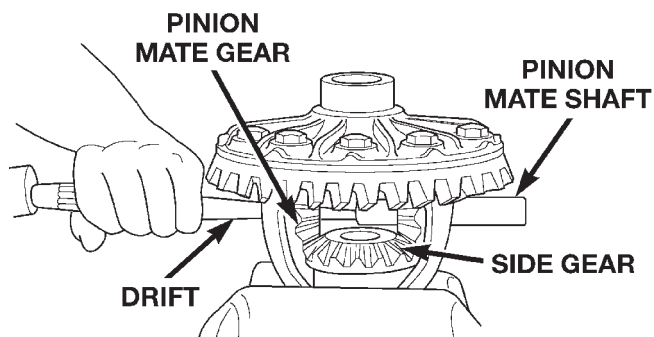


Fig. 42 Mate Shaft Removal

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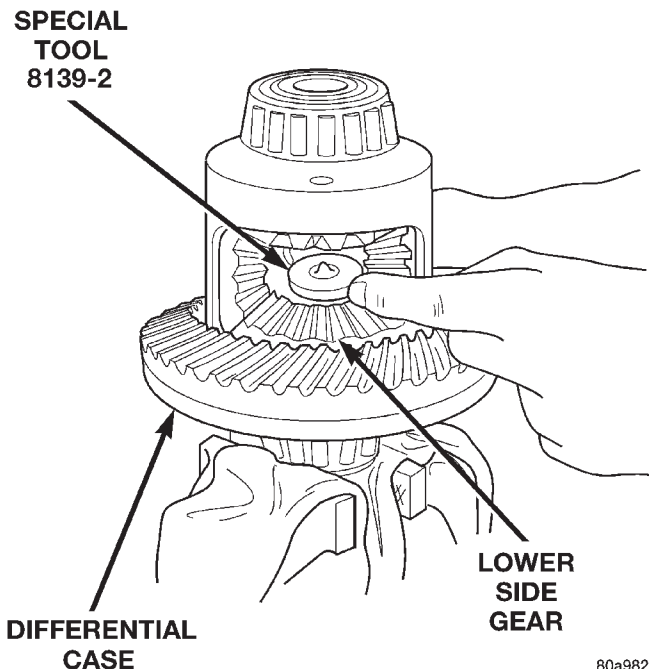
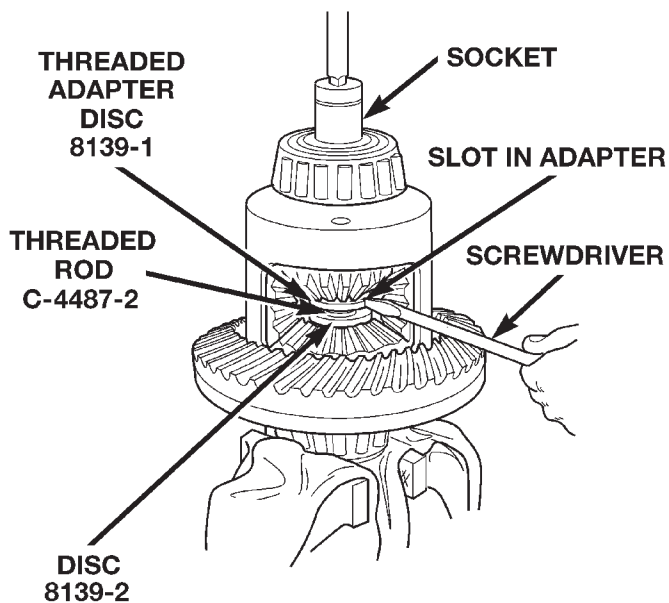


Fig. 43 Step Plate Tool Installation

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

(8) Position a small screw driver in slot of Threaded Adapter 8139-1 (Fig. 44) to prevent adapter from turning.



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Fig. 44 Threaded Adapter Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 45).

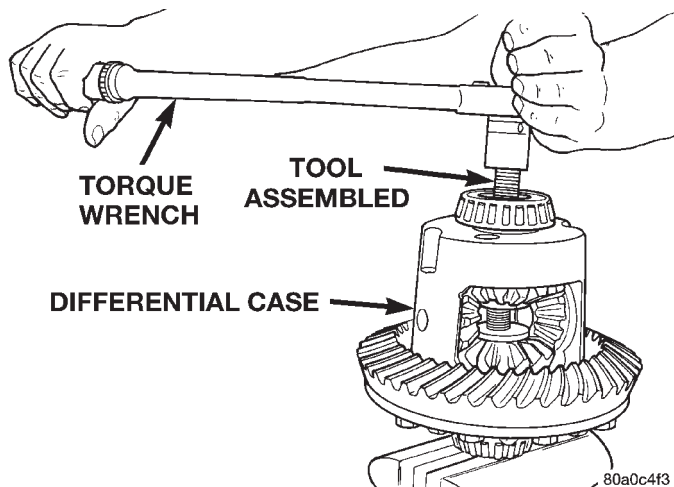


Fig. 45 Tighten Belleville Spring Compressor Tool

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 46).

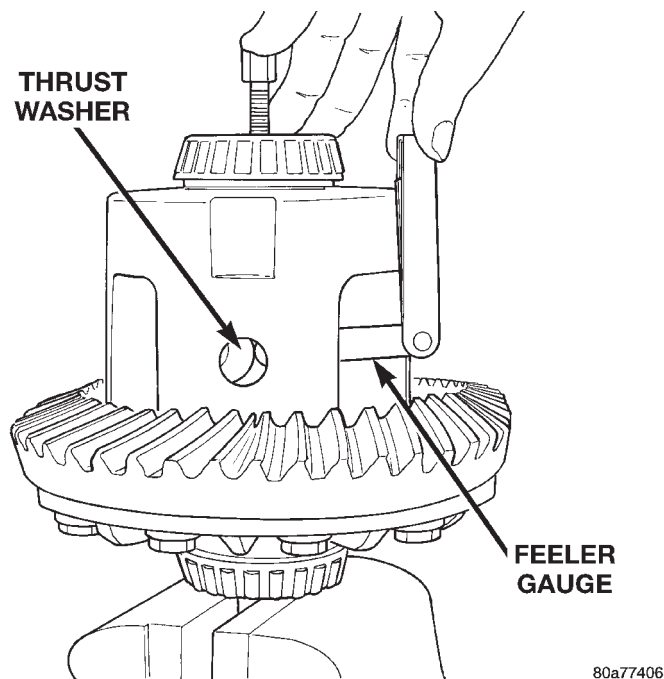


Fig. 46 Remove Pinion Gear Thrust Washer

(11) Insert Turning Bar C-4487-4 in case (Fig. 47).
 (12) Loosen the Forcing Screw C-4487-2 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar C-4487-4.

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

(14) Remove pinion gears from differential case.

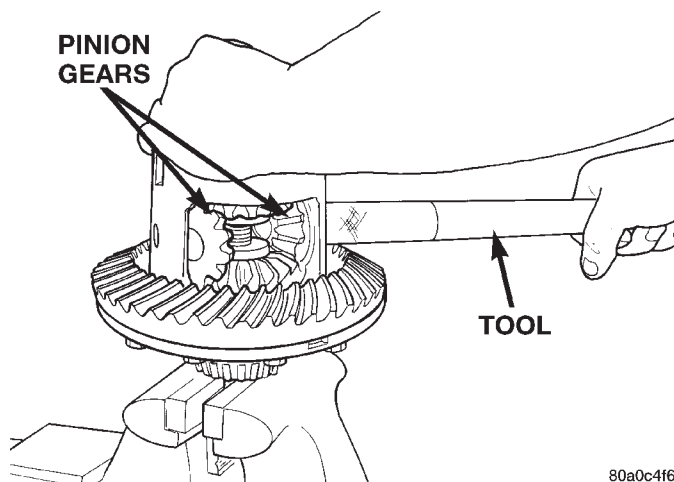


Fig. 47 Pinion Gear Removal

(15) Remove Forcing Screw C-4487-2, Step Plate 8139-2, and Threaded Adapter 8139-1.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 48).

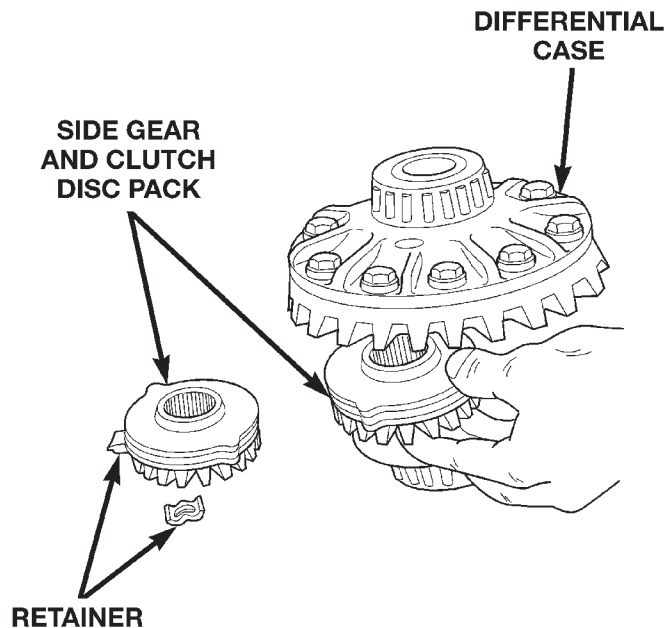


Fig. 48 Side Gear & Clutch Disc Removal

(17) Remove differential case from Side Gear Holding Tool 8136. Remove side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal.

ASSEMBLY

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

DISASSEMBLY AND ASSEMBLY (Continued)

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 49).

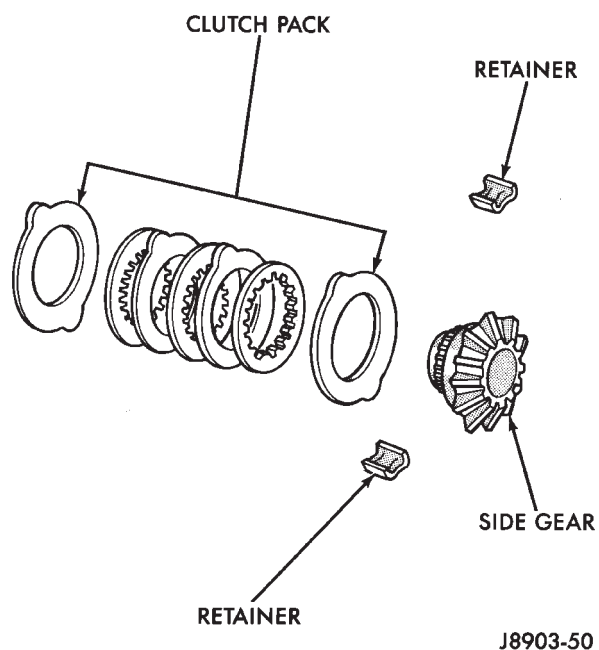


Fig. 49 Clutch Disc Pack

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

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 50). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

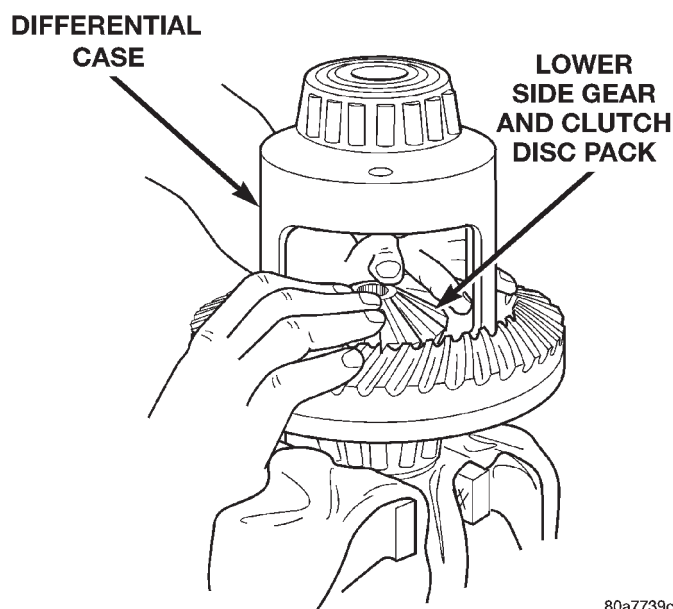


Fig. 50 Clutch Discs & Lower Side Gear Installation

(4) Position the differential case on Side Gear Holding Tool 8136.

(5) Install lubricated Step Plate 8139-2 in lower side gear (Fig. 51).

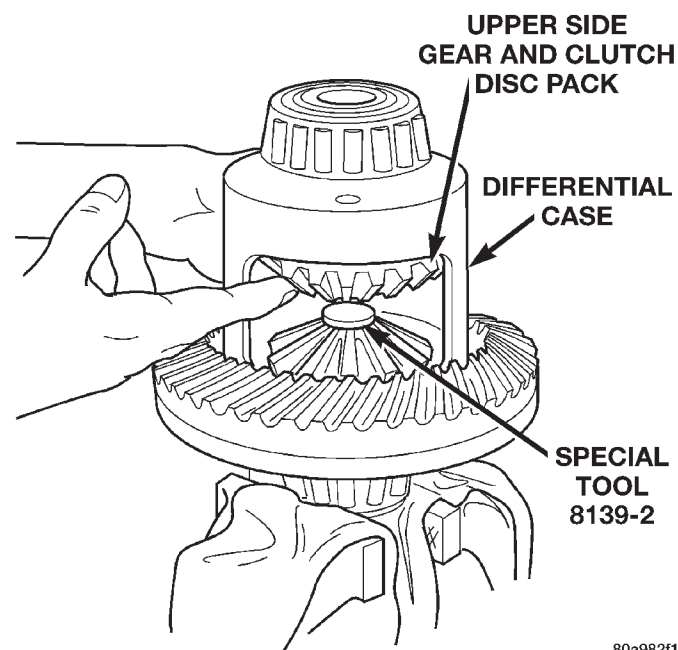


Fig. 51 Upper Side Gear & Clutch Disc Pack Installation

(6) Install the upper side gear and clutch disc pack (Fig. 51).

(7) Hold assembly in position. Insert Threaded Adapter 8139-1 into top side gear.

(8) Insert Forcing Screw C-4487-2.

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

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

(11) Rotate case with Turning Bar C-4487-4 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

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

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

(14) Remove Forcing Screw C-4487-2, Step Plate 8139-2, and Threaded Adapter 8139-1.

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

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

DISASSEMBLY AND ASSEMBLY (Continued)

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

CLEANING AND INSPECTION

9 1/4 AXLES

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

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

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

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Pinion depth shims for damage and distortion. Install new shims if necessary.
- The differential case. Replace the case if cracked or damaged.
- The axle shaft C-clip locks for cracks and excessive wear. Replace them if necessary.
- Each threaded adjuster to determine if it rotates freely. If an adjuster binds, repair the damaged threads or replace the adjuster.
- The RWAL exciter ring for damage and missing teeth. Verify that the ring is fully seated to the differential case flange.

Polish each axle shaft sealing surface with No. 600 crocus cloth. This can remove slight surface damage. Do not reduce the diameter of the axle shaft seal contact surface. When polishing, the crocus cloth should be moved around the circumference of the shaft (not in-line with the shaft).

TRAC-LOK

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both

clutch packs if any one component in either pack is damaged. Inspect side and pinion gears. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

PRESOAK PLATES AND DISC

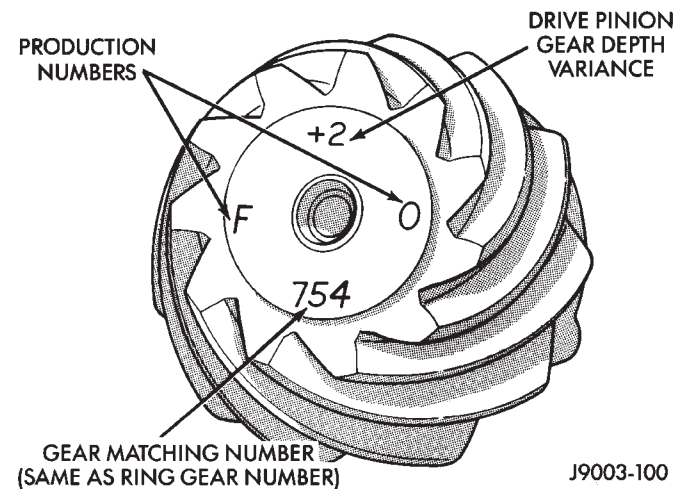
Plates and discs with fiber coating (no grooves or lines) must be presoaked in Friction Modifier before assembly. Soak plates and discs for a minimum of 20 minutes.

ADJUSTMENTS

9 1/4 AXLE PINION GEAR DEPTH

GENERAL INFORMATION

Ring and pinion gears are supplied as matched sets only. The identifying numbers for the ring and pinion gear are marked on the face of each gear (Fig. 52). A plus (+) number, minus (-) number or zero (0) is marked on 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 marked with a (0). The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern Analysis Paragraph in this section for additional information.



J9003-100

Fig. 52 Pinion Gear ID Numbers

Compensation for pinion depth variance is achieved with select shims. The shims are placed under the rear pinion bearing cone (Fig. 53).

If a new gear set is being installed, note the depth variance marked on 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.

ADJUSTMENTS (Continued)

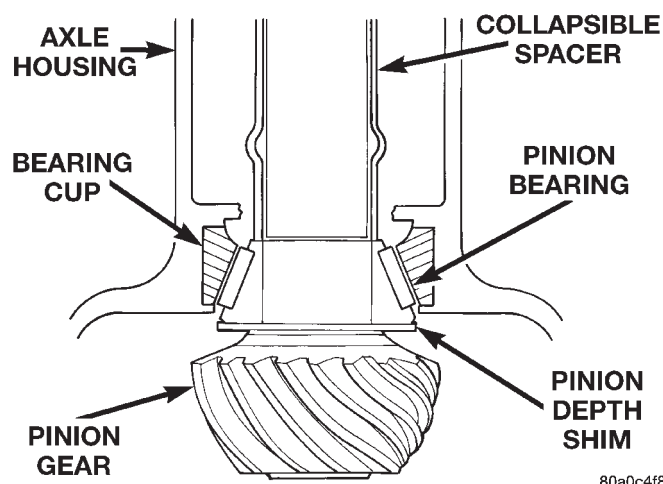


Fig. 53 Shim Locations

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

Note the marked 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.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

(1) Install front bearing cup. Use Installer D-129 and Handle C-4171.

(2) Install rear bearing cup. Use Installer C-4310 and Handle C-4171.

(3) Use Pinion Gear Adjustment Gauge Set C-758-D6 (Fig. 54).

(4) Position Spacer SP-6017 over Shaft SP-526.

(5) Position pinion rear bearing on shaft.

(6) Position tools (with bearing) in the housing.

(7) Install Sleeve SP-1730.

(8) Install pinion front bearing.

(9) Install Spacer SP-6022.

(10) Install Sleeve SP-535A, Washer SP-534, and Nut SP-533.

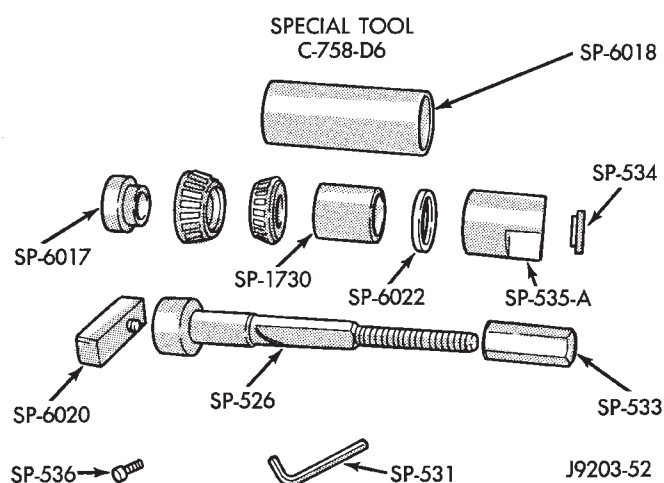


Fig. 54 9 1/4 Axle Pinion Adjustment Tools

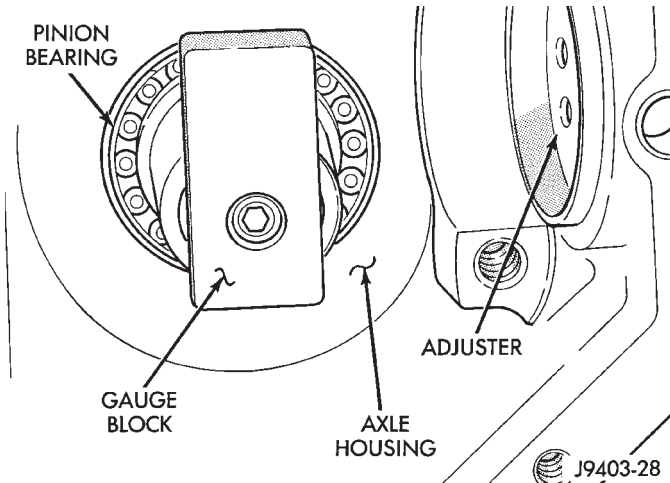
(11) Tighten the nut to seat the pinion bearings in the housing. Allow the sleeve to turn several times during tightening to prevent brinelling bearing cups or bearings.

PINION GEAR DEPTH VARIANCE

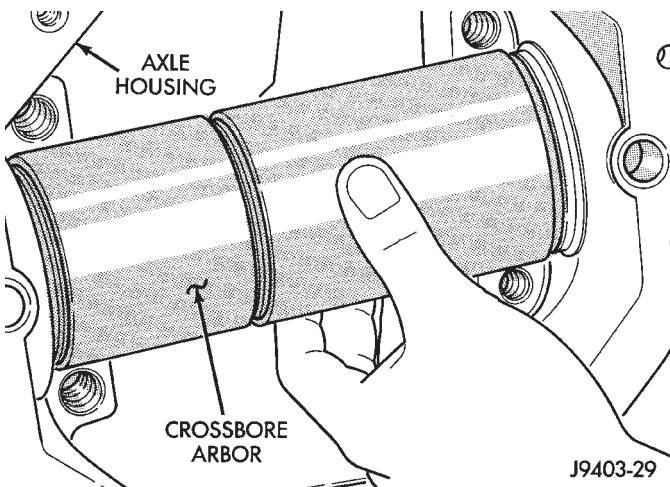
Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+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

ADJUSTMENTS (Continued)

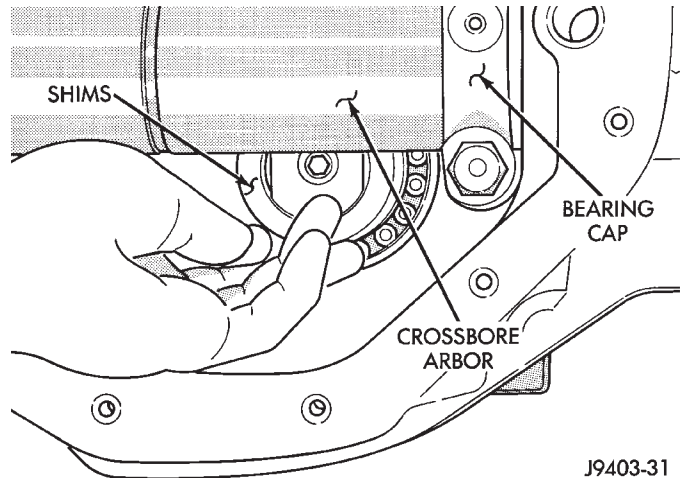
- (12) Loosen the compression nut tool.
- (13) Lubricate the pinion gear front and rear bearings with gear lubricant.
- (14) Re-tighten the compression nut tool to 1-3 N·m (15-25 in. lbs.) torque.
- (15) Rotate the pinion gear several complete revolutions to align the bearing rollers.
- (16) Install Gauge Block (Fig. 55).

**Fig. 55 Gauge Block**

- (17) Install Gauge Block SP-6020 at the end of SP-526.
- (18) Install Cap Screw SP-536 and tighten with Wrench SP-531.
- (19) Position Crossbore Arbor SP-6018 in the differential housing (Fig. 56).

**Fig. 56 Crossbore Arbor**

- (20) Center the tool.
- (21) Position the bearing caps on the arbor tool.
- (22) Install the attaching bolts.
- (23) Tighten the cap bolts to 14 N·m (10 ft. lbs.).
- (24) Trial fit depth shim(s) between the crossbore arbor and gauge block (Fig. 57). **The depth shim(s) fit must be snug but not tight (drag friction of a feeler gauge blade).**

**Fig. 57 Depth Shim(s) Selection**

- (25) Select a shim equal to the shim selected above plus the drive pinion gear depth variance number marked on the face of the pinion gear (Fig. 52) 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.

NOTE: Depth shims are available in 0.001-inch increments from 0.020 inch to 0.038 inch.

- (26) Remove the tools from the differential housing.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

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

- The maximum ring gear backlash variation is 0.003 inch (0.076 mm).
- 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.

ADJUSTMENTS (Continued)

(1) Use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated (Fig. 58). Allow some ring gear backlash (approximately 0.01 inch/0.25 mm) between the ring and pinion gear. Seat the bearing cups with the procedure described above.

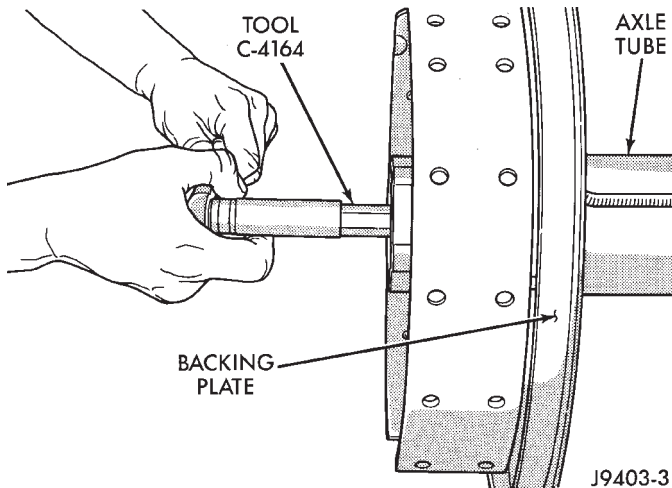


Fig. 58 Threaded Adjuster Tool

(2) Install dial indicator and position the plunger against the drive side of a ring gear tooth (Fig. 59). 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.

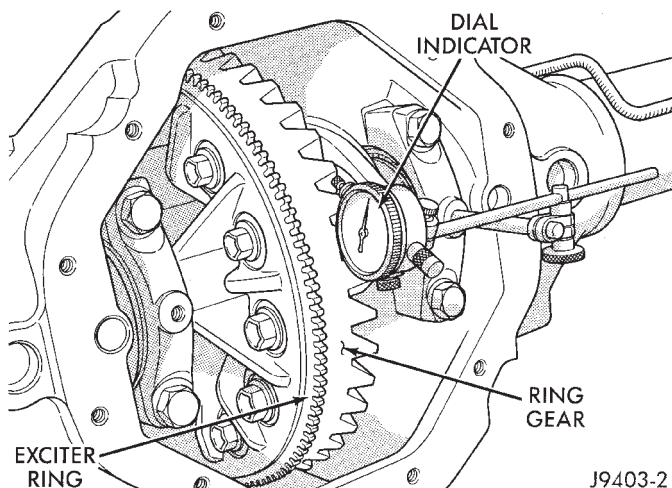


Fig. 59 Ring Gear Backlash Measurement

(4) Loosen the right-side, tighten the left-side threaded adjuster. Obtain backlash of 0.003 to 0.004

inch (0.076 to 0.102 mm) with each adjuster tightened to 14 N·m (10 ft. lbs.). Seat the bearing cups with the procedure described above.

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

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

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

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

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

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

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

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

GEAR CONTACT PATTERN ANALYSIS

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

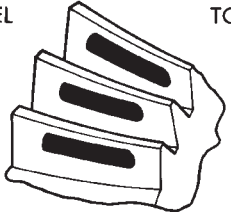
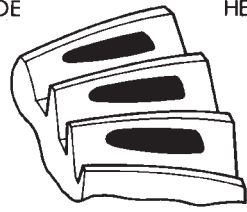

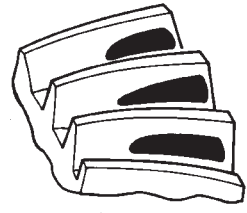

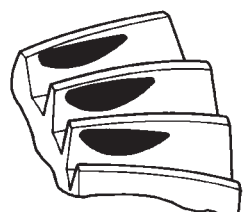
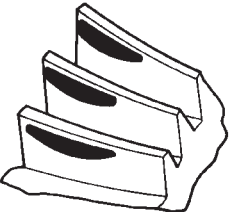
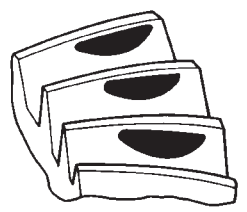

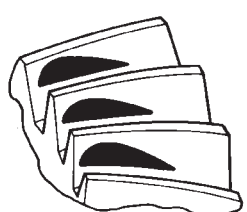
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

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

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

The areas on the ring gear teeth with the greatest degree of contact against the pinion gear 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. 60) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

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

J9003-24

Fig. 60 Gear Tooth Contact Patterns

ADJUSTMENTS (Continued)

SIDE GEAR CLEARANCE

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

(1) Install the axle shafts and C-clip 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. 61).

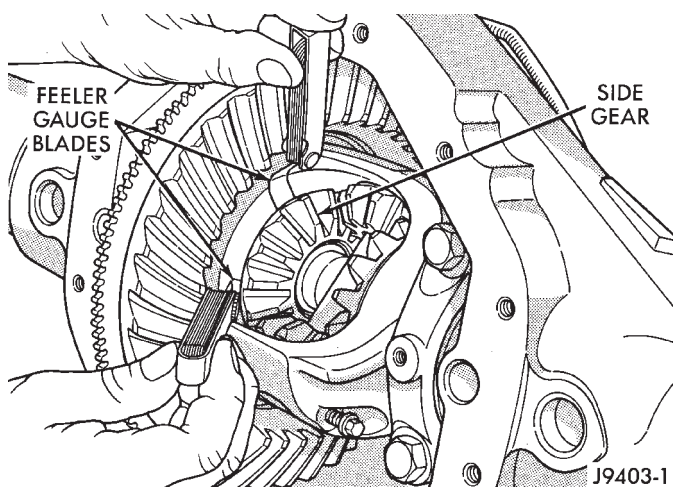


Fig. 61 Side Gear Clearance Measurement

(3) If side gear clearances is no more than 0.005 inch. Determine if the shaft is contacting the pinion gear 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 gear 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. 62).

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. 62 Side Gear Calculations

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

(5) If there is no side gear clearance, remove the C-clip 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-clip 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-clip lock was installed to thrust washer thickness measured. The sum will determine the required thickness of the replacement thrust washer.

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

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

SPECIFICATIONS

9 1/4 INCH AXLE

Axle Type	Semi-floating, hypoid
Lubricant	SAE 80W-90
Lube Capacity	2.32 L (4.9 pts.)
Trac-lok Additive	148 ml (5 oz.)
Axle Ratio	3.21, 3.55, 3.92

Differential

Case Clearance	0.12 mm (0.005 in.)
Case Flange Runout	0.076 mm (0.003 in.)

Ring gear

Diameter	23.50 cm (9.25 in.)
Backlash	0.12-0.20 mm (0.005-0.008 in.)
Runout	0.127 mm (0.005 in.)

Pinion Bearing Preload

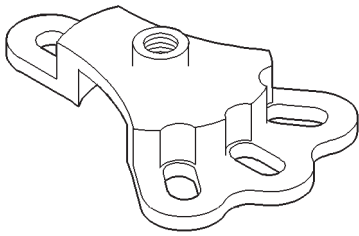
Original	1-2 N·m (10-20 in.lbs.)
New	2-5 N·m (15-35 in. lbs.)

TORQUE

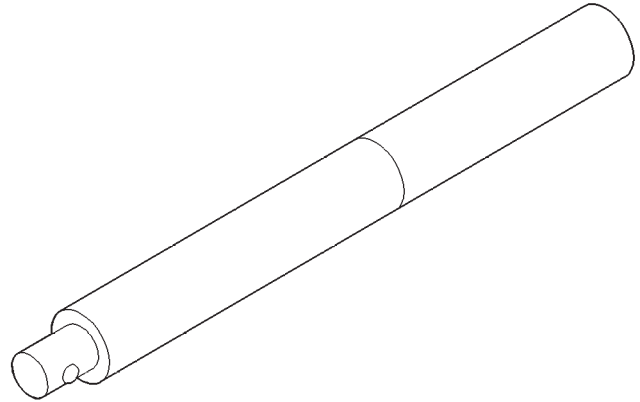
DESCRIPTION	TORQUE
Bolt, Diff. cover	41 N·m (30 ft. lbs.)
Bolt, Bearing cap	136 N·m (100 ft. lbs.)
Nut, Pinion-Minimum	285 N·m (210 ft. lbs.)
Bolt, Ring gear	157 N·m (115 ft. lbs.)
Bolt, Backing plate	64 N·m (48 ft. lbs.)
Bolt, RWAL/ABS sensor	24 N·m (18. ft. lbs.)
Screw, Pinion Mate Lock	11 N·m (8 ft. lbs.)

SPECIAL TOOLS

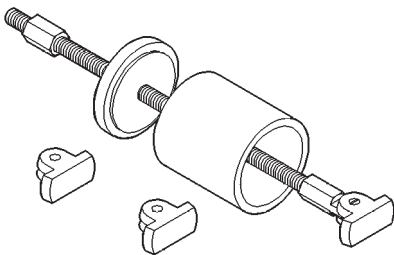
9 1/4 AXLES



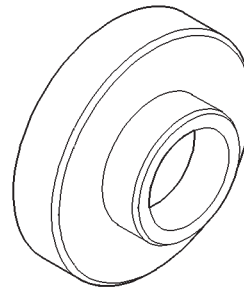
Puller, Hub—6790



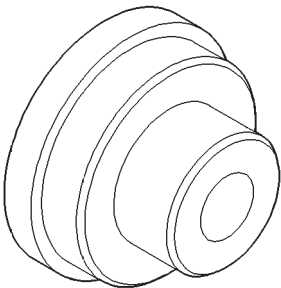
Handle—C-4171



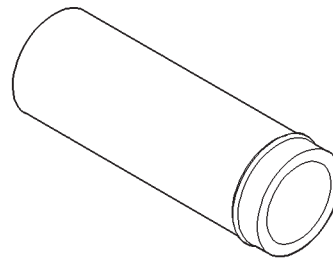
Remover, Bearing—6310



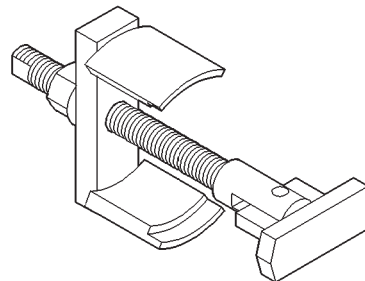
Installer—C-4076-B



Installer—C-4198

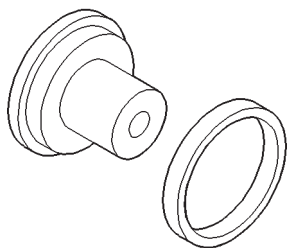
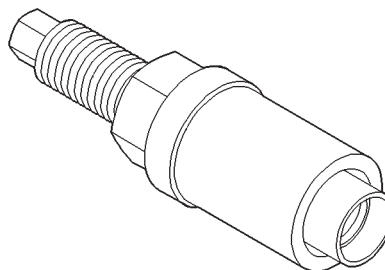
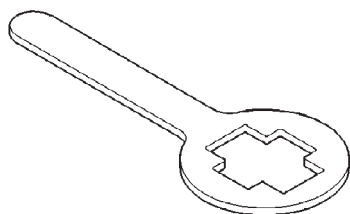
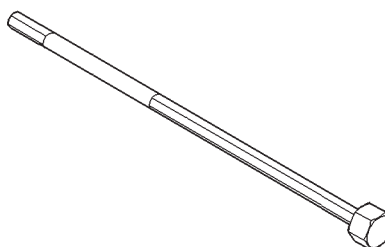
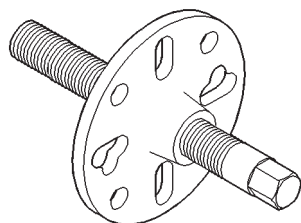
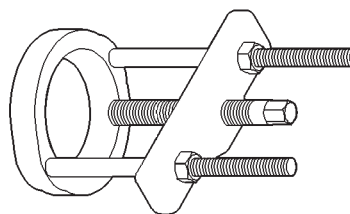
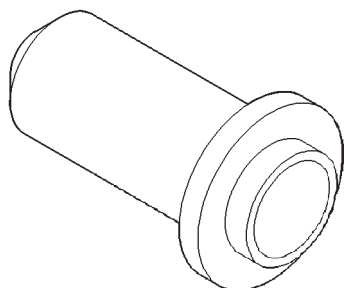
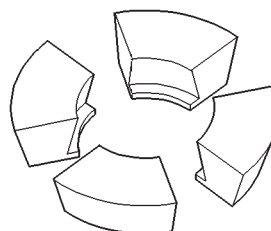


Handle—C-4735-1

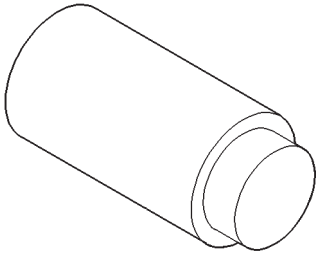


Remover—C-4828

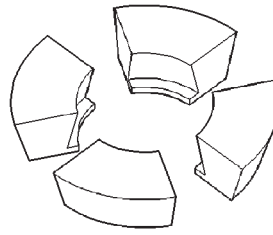
SPECIAL TOOLS (Continued)

**Installer—C-4826****Installer—C-3718****Holder—6719****Adjustment Rod—C-4164****Puller—C-452****Puller/Press—C-293-PA****Installer—C-3860-A****Adapters—C-293-47**

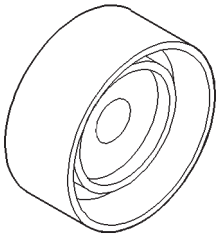
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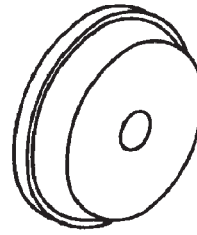
Plug—C-293-3



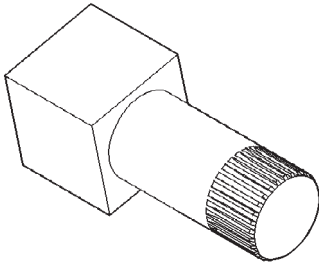
Adapters—C-293-37



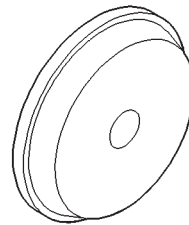
Installer—C-4213



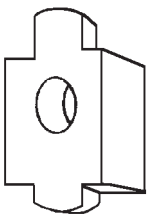
Installer—C-4310



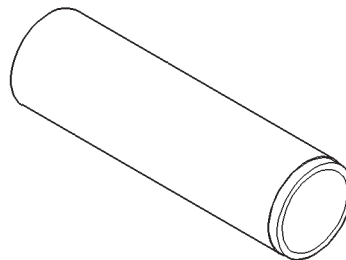
Holder—8136



Installer—D-129

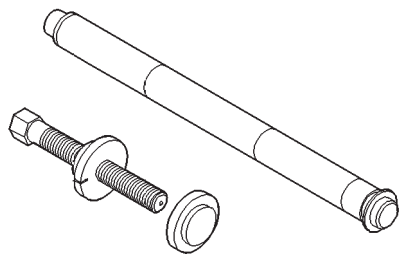


Remover—C-4309

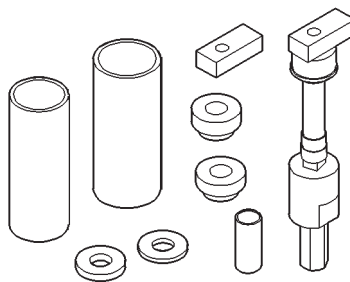


Installer—C-3095

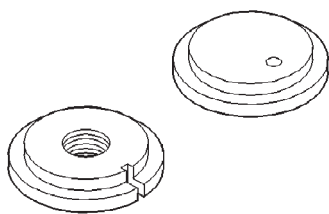
SPECIAL TOOLS (Continued)



Trac-lok Tools—C-4487



Gauge Set—C-758-D6



Trac-lok Tools—8139

248 AND 267 RBI AXLES

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GENERAL INFORMATION

248 AND 267 RBI AXLE

The 248 and 267 Rear Beam-design Iron (RBI) axle housings consist of an iron center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed in to form a one-piece axle housing.

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

The axles are equipped with full-floating axle shafts, meaning that loads are supported by the axle housing tubes. The full-float axle shafts are retained by bolts attached to the hub. The hub rides on two bearings at the outboard end of the axle tube. The axle shafts can be removed without disturbing or removing the wheel bearings. The wheel bearings are opposed tapered roller bearings and are contained in the hub assembly.

The removable, stamped steel cover provides a means for inspection and service without removing the complete axle from the vehicle. A small, stamped metal axle gear ratio identification tag is attached to

the housing cover via one of the cover bolts. This tag also identifies the number of ring and pinion teeth.

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

The differential case for the standard differentials and the Trac-lok differential in the 248 RBI axle are a one-piece design. The differential pinion mate shaft is retained with a roll pin. Differential bearing preload and ring gear backlash are adjusted by the use of shims located between the differential bearing cones and case. Pinion bearing preload is set and maintained by the use of a collapsible spacer in the 248 RBI axle. The 267 RBI axle uses solid shims to maintain pinion bearing preload.

Axles equipped with a Trac-Lok[™] differential are optional for the 248 RBI axle. A Trac-lok differential has a one-piece differential case and the same internal components as a standard differential plus two clutch disc packs.

GENERAL INFORMATION (Continued)

Axles equipped with a Power-Lok[™] differential are optional for the 267 RBI axle. A Power-lok differential has a two-piece differential case. A Power-lok differential contains four pinion gears and a two-piece pinion mate cross shaft to provide increased torque to the non-slipping wheel through a ramping motion in addition to the standard Trac-lok components.

LUBRICANT SPECIFICATIONS

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

- The lubricant should have MIL-L-2105C and API GL 5 quality specifications.
- Lubricant is a thermally stable SAE 90W gear lubricant.

Trac-lok differentials require the addition of 0.18 L (6 oz.) of friction modifier to the axle lubricant. The 248 RBI axle lubricant capacity is 2.96 L (6.25 pts.) total, including the friction modifier if necessary.

Power-lok differentials require the addition of 0.24 L (8 oz.) of friction modifier to the axle lubricant. The 267 RBI axle lubricant capacity is 3.31 L (7.0 pts.) total, including the friction modifier.

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

DESCRIPTION AND OPERATION

STANDARD DIFFERENTIAL

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

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

In operation, power flow occurs as follows:

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

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

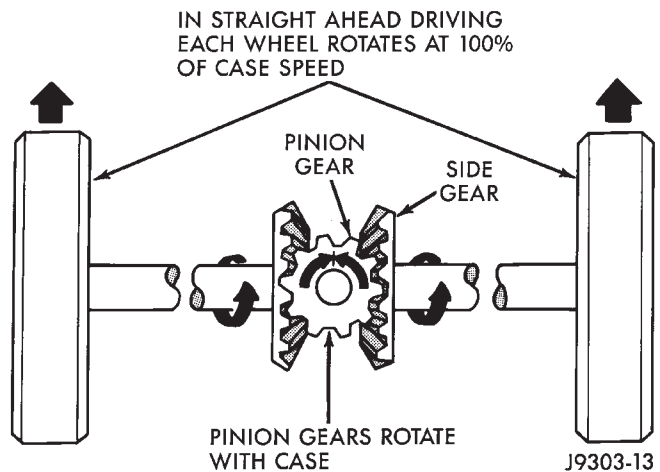


Fig. 1 Differential Operation—Straight Ahead Driving

When turning corners, the outside wheel must travel a greater distance than the inside wheel to complete a turn. The difference must be compensated for to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 2). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

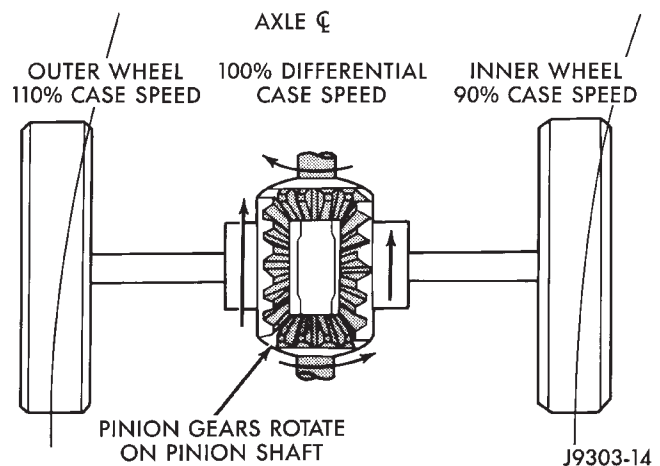


Fig. 2 Differential Operation—On Turns

TRAC-LOK/POWER-LOK OPERATION

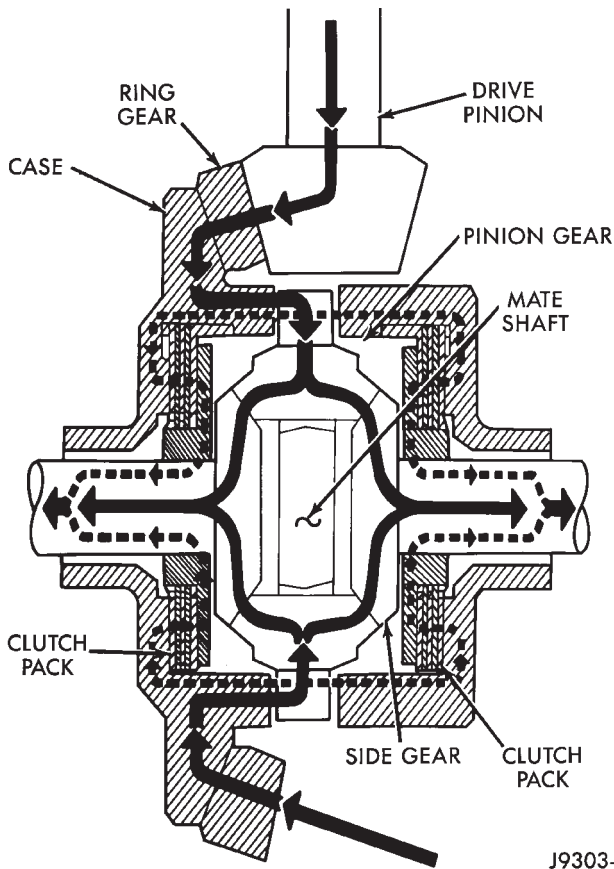
In a conventional differential, if one wheel spins, the opposite wheel will generate only as much torque as the spinning wheel.

The 248 RBI axle is optionally equipped with a Trac-lok differential while the 267 RBI axle is optionally equipped with a Power-lok differential. Both differentials achieve the same results through slightly different means.

DESCRIPTION AND OPERATION (Continued)

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

In operation, the Trac-lok and Power-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. 3).



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Fig. 3 Trac-lok/Power-lok Limited Slip Differential Operation

The Trac-lok and Power-lok designs provide the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel loses traction, the clutch packs transfer additional torque to the wheel having the most traction. The Power-lok differential additionally utilizes a ramping action supplied by the cross shafts to increase the force applied to the clutch packs to increase the torque supplied to the non-slipping wheel. Trac-lok and Power-lok differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel loses traction. Pulling power is provided continuously until both wheels lose traction. If both wheels slip due to unequal

traction, operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

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

Axle gear problem conditions are usually the result of:

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

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, or worn/damaged gears.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, 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 and pinion gears 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 gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

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

DIAGNOSIS AND TESTING (Continued)

Pinion gear bearings have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher 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 gear 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 rear-end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

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

- High engine idle speed
- 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/case clearance

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

TRAC-LOK/POWER-LOK DIFFERENTIAL NOISE

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

A container of Mopar® Trac-lok Lubricant (friction modifier) should be added after repair service or during a lubricant change.

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

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	<ol style="list-style-type: none"> 1. Wheel loose. 2. Faulty, brinelled wheel bearing. 	<ol style="list-style-type: none"> 1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces. 	<ol style="list-style-type: none"> 1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch. 	<ol style="list-style-type: none"> 1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	<ol style="list-style-type: none"> 1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation. 	<ol style="list-style-type: none"> 1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	<ol style="list-style-type: none"> 1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire. 	<ol style="list-style-type: none"> 1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 1. Lubricant level too high. 	<ol style="list-style-type: none"> 1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONT., DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed. 	<ol style="list-style-type: none"> 2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	<ol style="list-style-type: none"> 1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash. 	<ol style="list-style-type: none"> 1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	<ol style="list-style-type: none"> 1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments. 	<ol style="list-style-type: none"> 1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	<ol style="list-style-type: none"> 1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts 	<ol style="list-style-type: none"> 1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

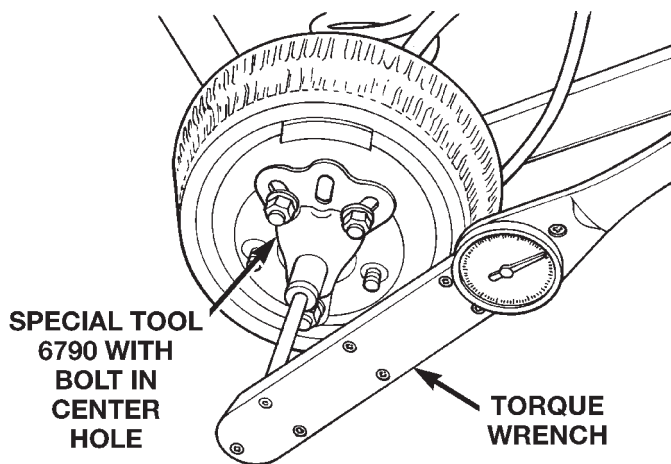
DIAGNOSIS AND TESTING (Continued)

TRAC-LOK/POWER-LOK TEST

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

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

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



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Fig. 4 Trac-lok/Power-lok Test —Typical

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

SERVICE PROCEDURES

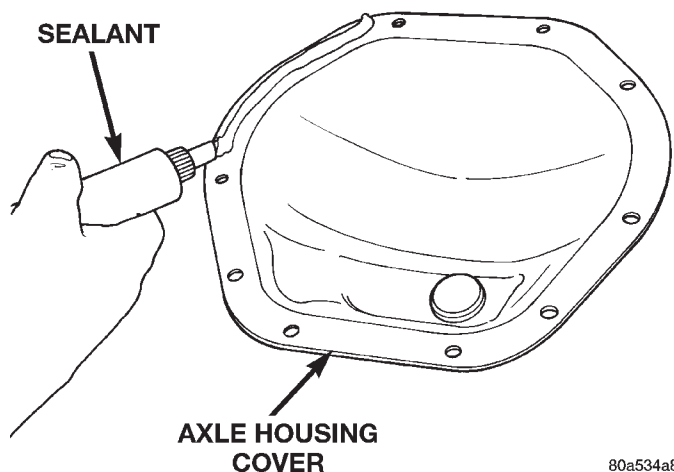
LUBRICANT CHANGE

- (1) Raise and support the vehicle.
- (2) Remove the lubricant fill hole plug from the differential housing cover.
- (3) Remove the differential housing cover and drain the lubricant from the housing.

- (4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**

- (5) Remove the original sealant from the housing and cover surfaces.

- (6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 5).



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Fig. 5 Apply Sealant

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

- (7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

- (8) For Trac-lok/Power-lok differentials, a quantity of Mopar® Trac-lok lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.

- (9) Fill differential with Mopar® Hypoid Gear Lubricant, or equivalent, to bottom of the fill plug hole. Refer to the Lubricant Specifications section of this group for the quantity necessary.

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

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

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

REMOVAL AND INSTALLATION

REAR AXLE

REMOVAL

- (1) Raise and support the vehicle.

REMOVAL AND INSTALLATION (Continued)

- (2) Position a suitable lifting device under the axle.
- (3) Secure axle to device.
- (4) Remove the wheels and tires.
- (5) Secure brake drums to the axle shaft.
- (6) Remove the RWAL sensor from the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.
- (7) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.
- (8) Disconnect the parking brake cables and cable brackets.
- (9) Disconnect the vent hose from the axle shaft tube.
- (10) Mark the propeller shaft and yoke for installation alignment reference.
- (11) Remove propeller shaft.
- (12) Disconnect shock absorbers from axle.
- (13) Remove the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
- (14) Separate the axle from the vehicle.

INSTALLATION

- (1) Raise the axle with lifting device and align to the leaf spring centering bolts.
- (2) Install the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
- (3) Install shock absorbers and tighten nuts to 82 N·m (60 ft. lbs.) torque.
- (4) Install the RWAL sensor to the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.
- (5) Connect the parking brake cables and cable brackets.
- (6) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.
- (7) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.
- (8) Install axle vent hose.
- (9) Align propeller shaft and pinion yoke reference marks. Install universal joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.
- (10) Install the wheels and tires.
- (11) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.
- (12) Remove lifting device from axle and lower the vehicle.

AXLE SHAFT

CAUTION: RAISE BOTH REAR WHEELS OFF THE SURFACE WHENEVER A REAR AXLE IS BEING SERVICED.

REMOVAL

- (1) Remove the axle shaft flange bolts.
- (2) Slide the axle shaft out from the axle tube.

INSTALLATION

- (1) Clean the gasket contact surface area on the flange with an appropriate solvent. Install a new flange gasket and slide the axle shaft into the tube.
- (2) Install the bolts and tighten to 122 N·m (90 ft. lbs.).

HUB AND AXLE BEARINGS

REMOVAL

- (1) Remove wheel and tire assembly.
- (2) Remove brake drum.
- (3) Remove the axle shaft.
- (4) Remove the lock wedge and adjustment nut. Use Socket DD-1241-JD to remove the adjustment nut.
- (5) Remove the hub assembly. The outer axle bearing will slide out as the hub is being removed.
- (6) Remove inner grease seal and discard. Use Installer 5064 and Handle C-4171 to drive grease seal and inner axle bearing from the hub.
- (7) Remove the bearing cups from the hub bore. Use a brass drift, or an appropriate removal tool, to tap out the cups.

INSTALLATION

- (1) Thoroughly clean both axle bearings and interior of the hub with an appropriate cleaning solvent.
- (2) Install the bearing cups. Use Installer 8151 and Handle C-4171 to install the bearing cups.
- (3) Apply lubricant to surface area of the bearing cup.
- (4) Install the inner axle bearing in the hub.
- (5) Install a new bearing grease seal. Use Installer 8149 and Handle C-4171 to install the grease seal.
- (6) Inspect the bearing and seal contact surfaces on the axle tube spindle for burrs and/or roughness. Remove all the rough contact surfaces from the axle spindle. Apply a coating of multi-purpose NLGI, grade 2, EP-type lubricant to the axle.

CAUTION: Use care to prevent the bearing grease seal from contacting the axle tube spindle threads during installation. Otherwise, the seal could be damaged.

- (7) Carefully slide the hub onto the axle.

REMOVAL AND INSTALLATION (Continued)

- (8) Install the outer axle bearing.
- (9) Install the hub bearing adjustment nut. Use Socket DD-1241-JD to install the adjustment nut.
- (10) Tighten the adjustment nut to 163-190 N·m (120-140 ft. lbs.) while rotating the wheel.
- (11) Loosen the adjustment nut 1/8 of-a-turn to provide 0.001-inch to 0.010-inch wheel bearing end play.
- (12) Tap the locking wedge into the spindle key-way and adjustment nut. Try to ensure that the locking wedge is installed into a new position in the adjustment nut.
- (13) Install the axle shaft.
- (14) Install the brake drum.
- (15) Install the wheel and tire assembly.

PINION SEAL

REMOVAL

- (1) Raise and support the vehicle.
- (2) Scribe a mark on the universal joint, pinion yoke, and pinion shaft for reference.
- (3) Disconnect the propeller shaft from the pinion yoke. Secure the propeller shaft in an upright position to prevent damage to the rear universal joint.
- (4) Remove the wheel and tire assemblies.
- (5) Remove the brake drums to prevent any drag. The drag may cause a false bearing preload torque measurement.
- (6) Rotate the pinion yoke three or four times.
- (7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
- (8) Hold the yoke with Wrench 6719. Remove the pinion shaft nut and washer.
- (9) Remove the yoke with Remover C-452 (Fig. 6).

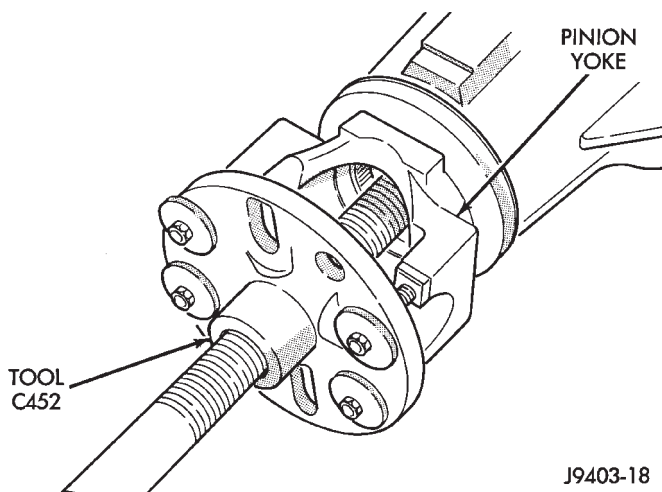


Fig. 6 Yoke Removal

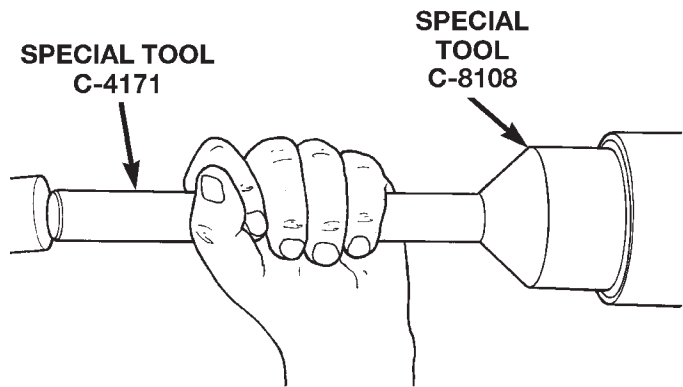
- (10) Remove the pinion shaft seal with suitable pry tool or slide-hammer mounted screw.

INSTALLATION

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

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

- (4) Apply a light coating of gear lubricant on the lip of pinion seal.
- (5) Install the new pinion shaft seal with Installer 8108 and Handle 4171 (Fig. 7).



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Fig. 7 Pinion Seal Installation

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

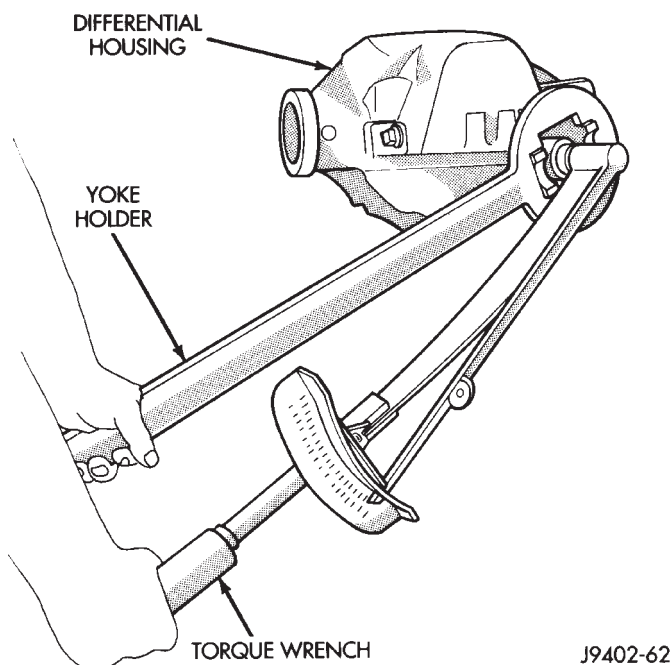
- (6) Position the pinion yoke on the end of the shaft with the reference marks aligned.
- (7) Seat yoke on pinion shaft with Installer C-3718 and Wrench 6719.
- (8) Remove the tools and install the pinion yoke washer and nut.

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Damage to collapsible spacer, if equipped, or bearings may result.

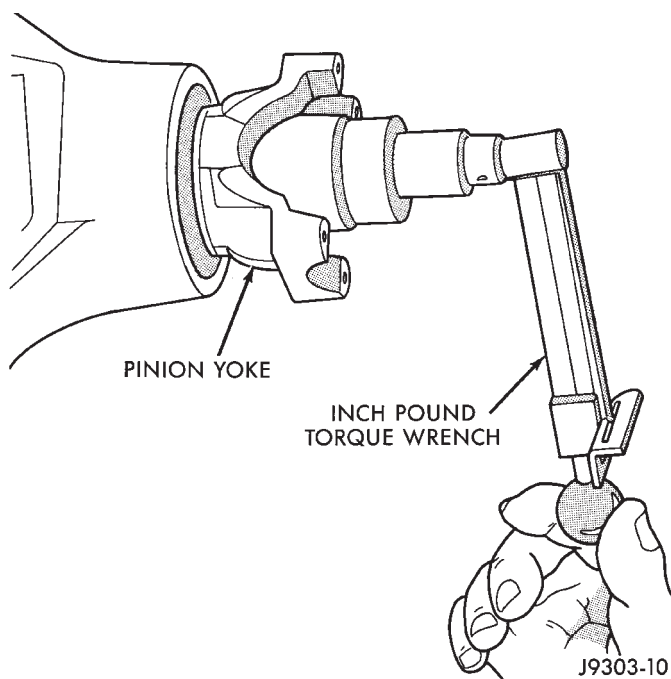
- (9) Hold pinion yoke with Yoke Holder 6719 and tighten shaft nut to 291.5 N·m (215 ft. lbs.) (Fig. 8). Rotate pinion shaft several revolutions to ensure the bearing rollers are seated.

- (10) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating resistance torque should be

REMOVAL AND INSTALLATION (Continued)

**Fig. 8 Tightening Pinion Shaft Nut**

equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 9).

**Fig. 9 Check Pinion Rotation Torque**

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload torque. If preload torque is exceeded a new pinion nut and collapsible spacer, if equipped, must be installed. The torque sequence will then have to be repeated.

(11) If the rotating torque is low, use Yoke Holder 6719 to hold the pinion yoke (Fig. 8) and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

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

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

(13) Tighten the universal joint yoke clamp screws to 19 N·m (14 ft. lbs.).

(14) Install the brake drums.

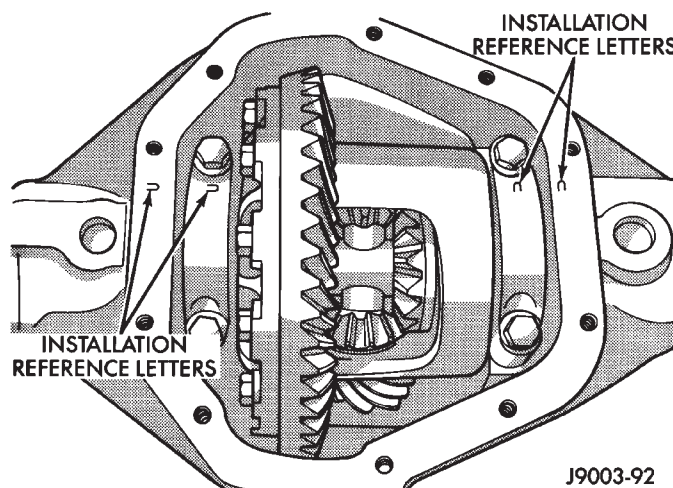
(15) Add gear lubricant to the differential housing, if necessary. Refer to the Lubricant Specifications for gear lubricant requirements.

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

DIFFERENTIAL**REMOVAL**

(1) Remove axle shafts.

(2) Note the orientation of the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 10).

**Fig. 10 Bearing Cap Identification**

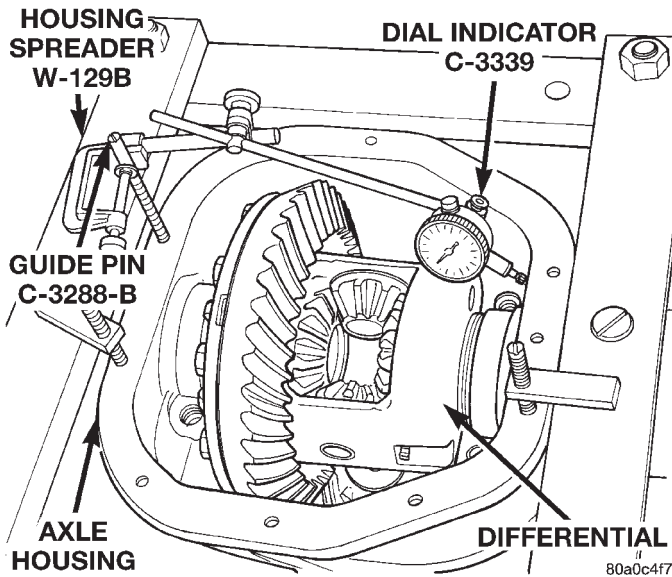
(3) Remove the differential bearing caps.

(4) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 11).

(5) Install the hold down clamps and tighten the tool turnbuckle finger-tight.

(6) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach dial indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 11) and zero the indicator.

REMOVAL AND INSTALLATION (Continued)

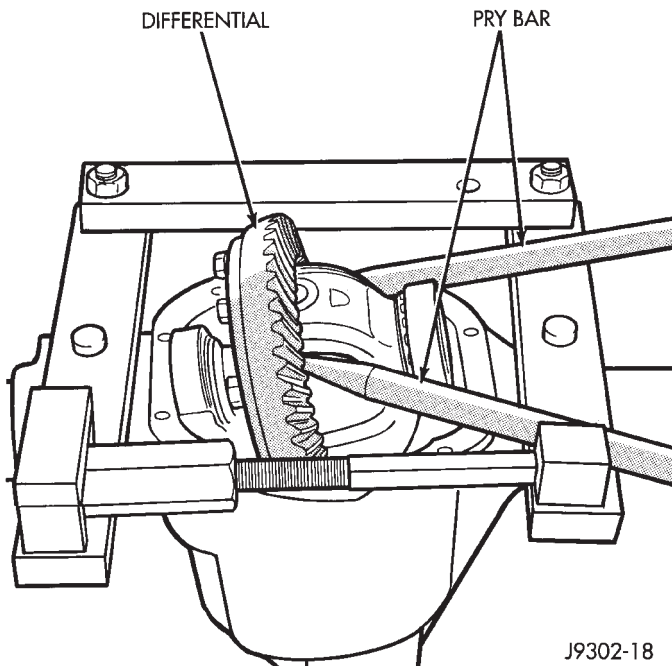
**Fig. 11 Spread Differential Housing**

(7) Spread the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 11).

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(8) Remove the dial indicator.

(9) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 12).

**Fig. 12 Differential Removal**

(10) Remove the case from housing. Mark or tag bearing cups to indicate which side they were removed from.

INSTALLATION

(1) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 11). Install the hold down clamps and tighten the tool turnbuckle finger-tight.

(2) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach dial indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 11) and zero the indicator.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 11).

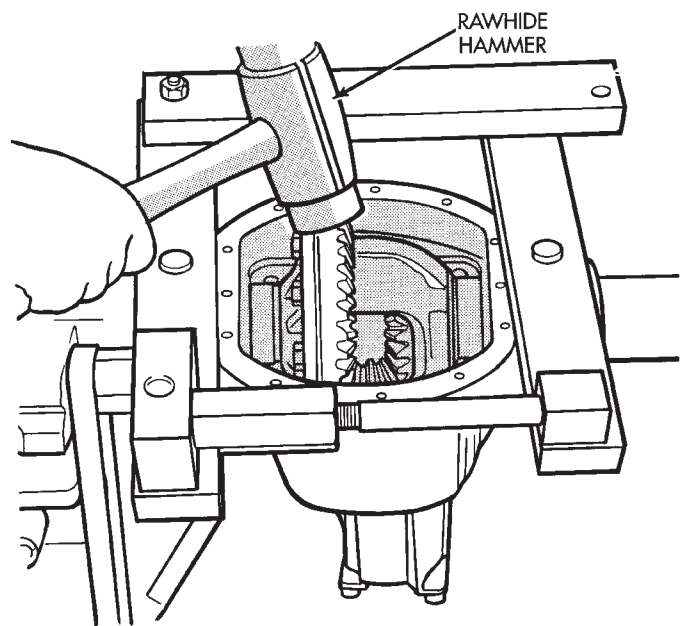
CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

(4) Remove the dial indicator.

(5) Install differential in housing.

(6) Install case in the housing. Tap the differential case with a rawhide or rubber mallet to ensure the bearings are fully seated in the differential housing (Fig. 13).

(7) Remove the spreader.

**Fig. 13 Differential Installation**

(8) Install the bearing caps at their original locations (Fig. 14). Tighten the bearing cap bolts to 109 N·m (80 ft. lbs.) torque.

(9) Install axle shafts.

REMOVAL AND INSTALLATION (Continued)

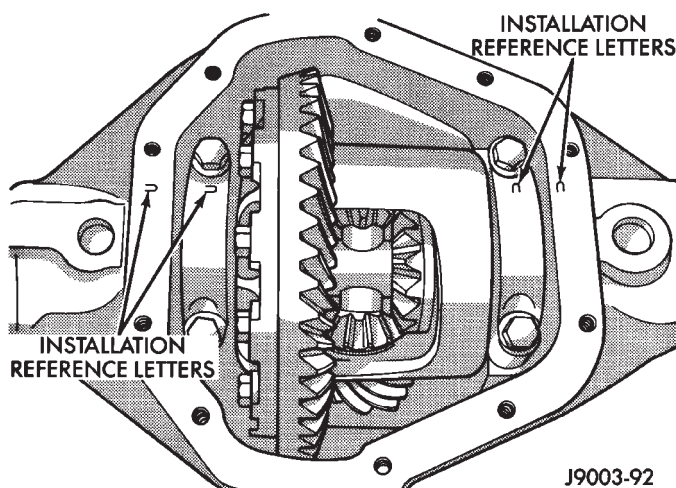


Fig. 14 Differential Bearing Cap Reference Letters

DIFFERENTIAL SIDE BEARINGS

REMOVAL

- (1) Remove differential case from axle housing.
- (2) Remove the bearings from the differential case with Puller/Press C-293-PA, Adapters C-293-62, and Step Plate C-4487-1 (Fig. 15).

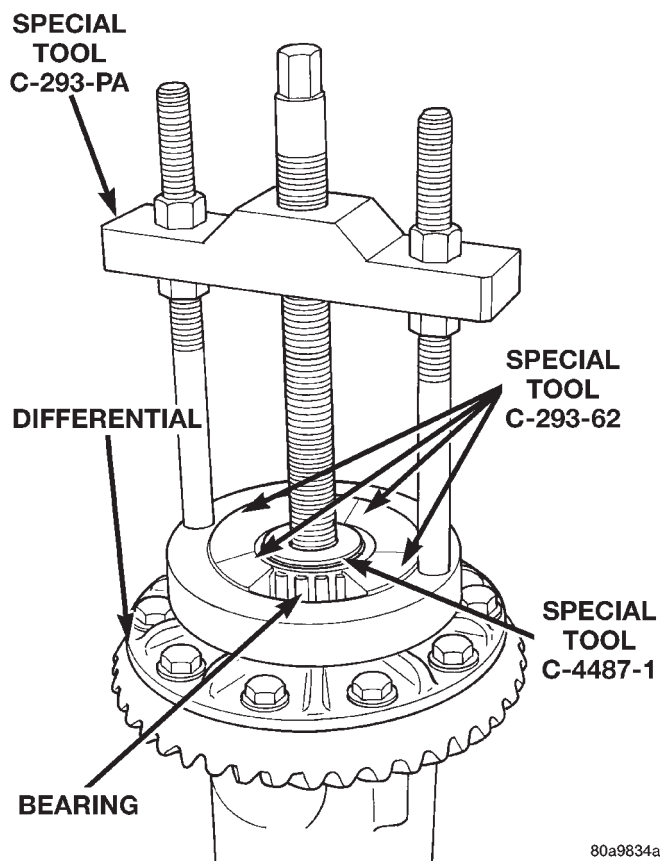


Fig. 15 Differential Bearing Removal

INSTALLATION

- (1) Using tool C-4190 with handle C-4171, install differential side bearings (Fig. 16).

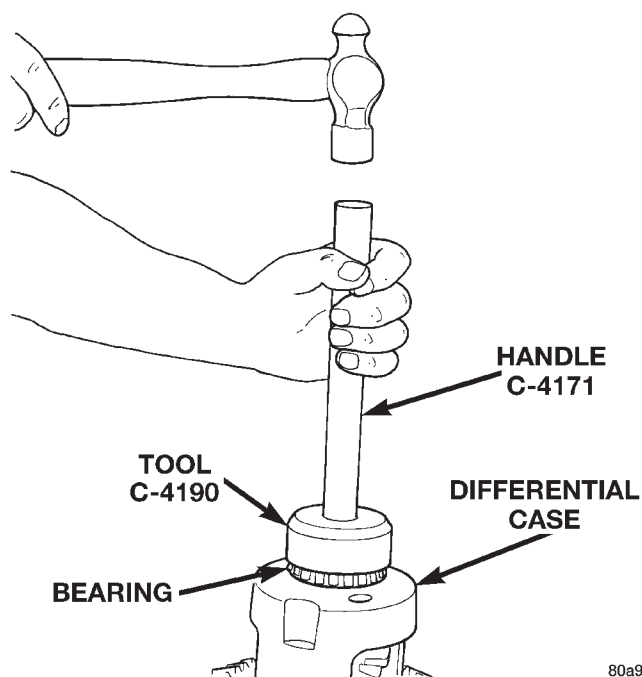


Fig. 16 Install Differential Side Bearings

- (2) Install differential case in axle housing.

RING GEAR AND EXCITER RING

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

REMOVAL

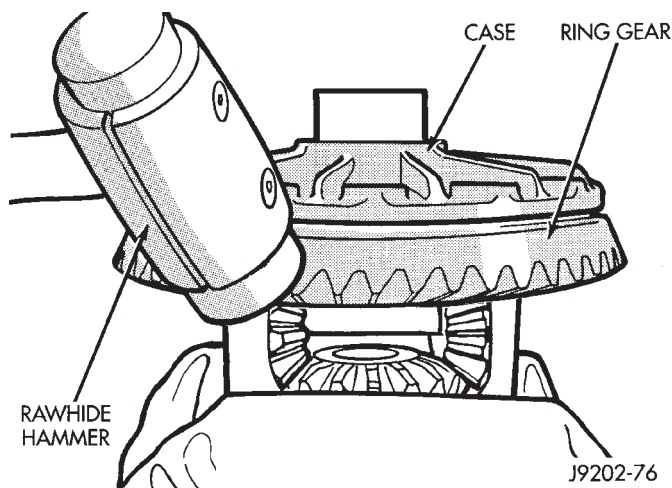
- (1) Remove differential from axle housing.
- (2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 17)
- (3) Remove bolts holding ring gear to differential case.
- (4) Using a soft hammer, drive ring gear from differential case (Fig. 17).
- (5) Use a brass drift and slowly tap the exciter ring from the differential case.

INSTALLATION

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

- (1) Invert the differential case.
- (2) Position exciter ring on differential case.
- (3) Using a brass drift, slowly and evenly tap the exciter ring into position.

REMOVAL AND INSTALLATION (Continued)

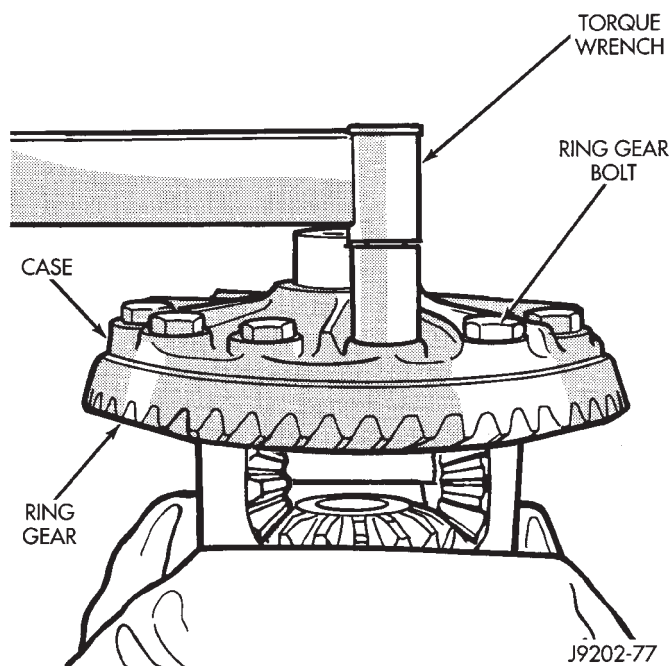
**Fig. 17 Ring Gear Removal**

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

(5) Invert the differential case in the vise.

(6) Install new ring gear bolts and alternately tighten to 163–190 N·m (120–140 ft. lbs.) torque (Fig. 18).

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

**Fig. 18 Ring Gear Bolt Installation****PINION GEAR**

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

REMOVAL

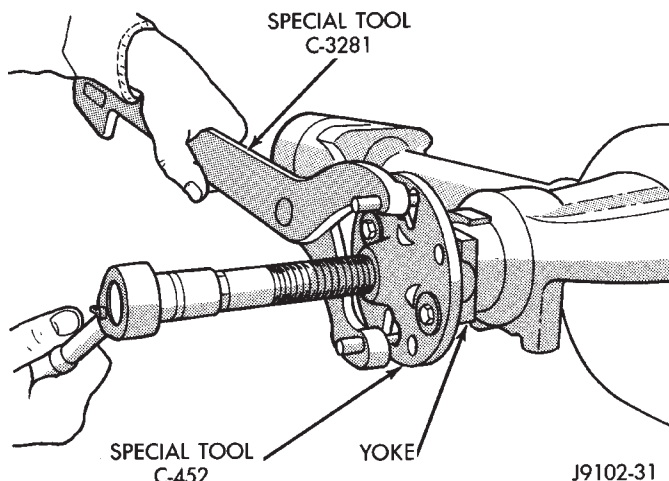
(1) Remove differential assembly from axle housing.

(2) Mark pinion yoke and propeller shaft for installation alignment.

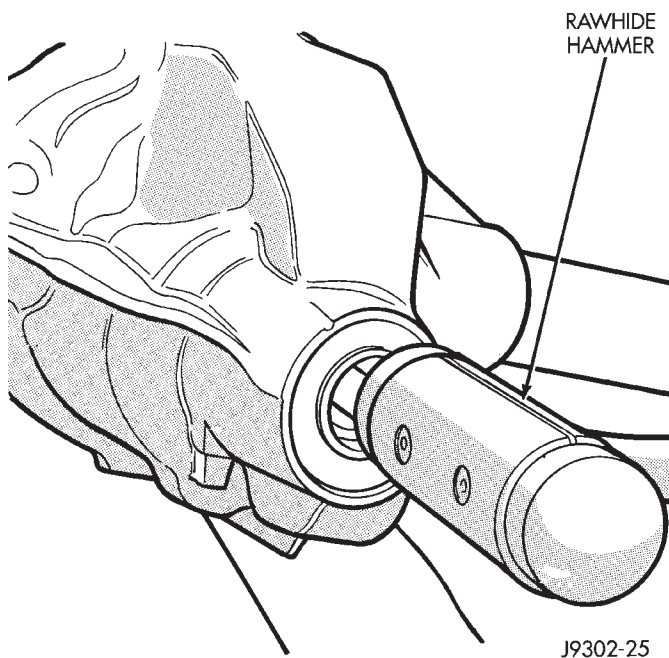
(3) Disconnect propeller shaft from pinion yoke. Using suitable wire, tie propeller shaft to underbody.

(4) Using Yoke Holder 6719 to hold yoke, remove the pinion yoke nut and washer.

(5) Using Remover C-452 and Wrench C-3281, remove the pinion yoke from pinion shaft (Fig. 19).

**Fig. 19 Pinion Yoke Removal**

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

**Fig. 20 Remove Pinion Gear**

REMOVAL AND INSTALLATION (Continued)

(7) Remove the pinion seal with a slide hammer or suitable pry bar.

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

(9) Remove the front pinion bearing cup with Remover D-158 and Handle C-4171 (Fig. 21).

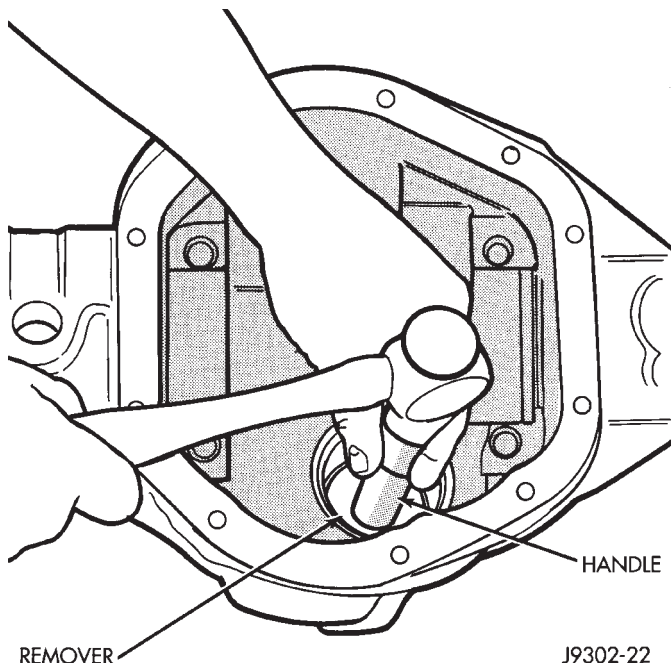


Fig. 21 Front Bearing Cup Removal

(10) Remove the rear bearing cup from housing (Fig. 22). Use Remover D-162 and Handle C-4171.

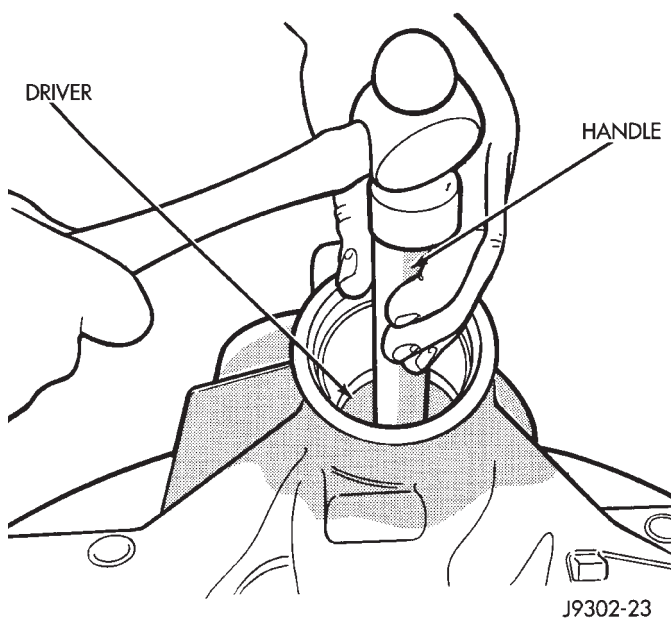


Fig. 22 Rear Bearing Cup Removal

(11) Remove the collapsible preload spacer (Fig. 23) from 248 RBI pinion gears.

(12) Remove the solid shims from 267 RBI pinion gears.

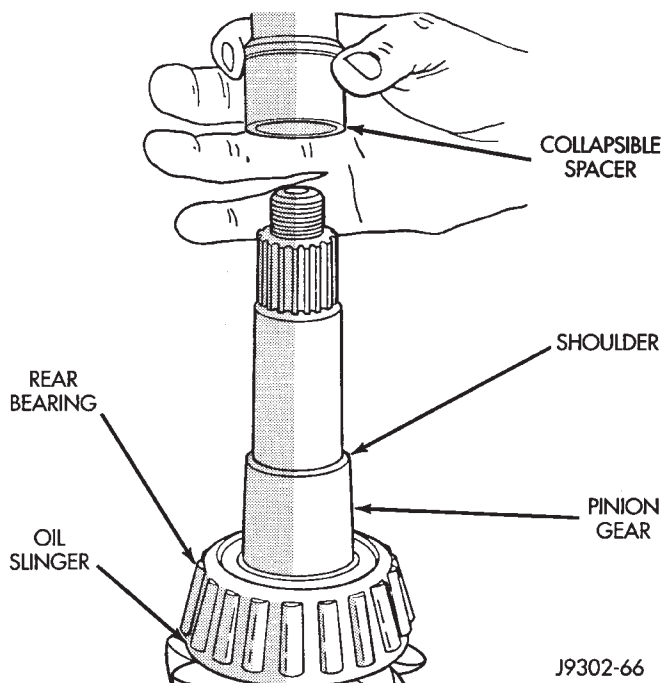


Fig. 23 Collapsible Spacer

(13) Remove the rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-37 (Fig. 24).

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

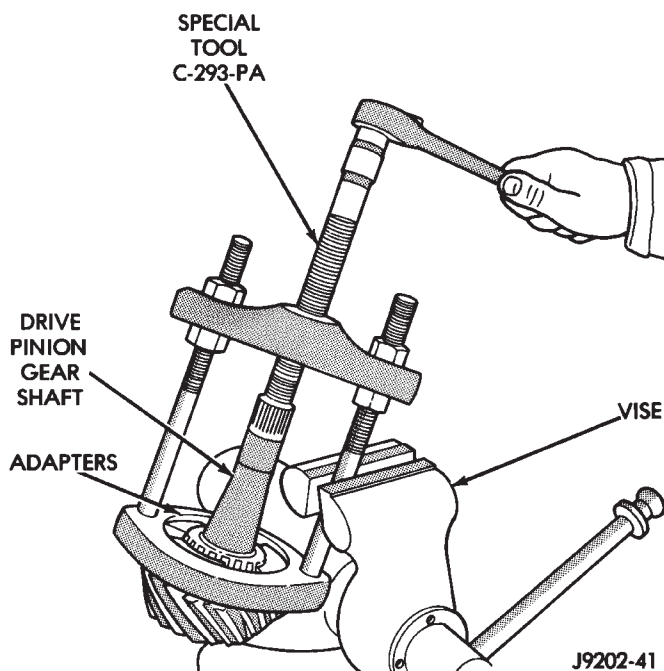


Fig. 24 Inner Bearing Removal

(14) Remove the pinion depth shims from the pinion gear shaft. Record the total thickness of the depth shims.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

(1) Apply Mopar® Door Ease stick lubricant to outside surface of bearing cup. Install the pinion rear bearing cup with Installer D-111 and Handle C-4171 (Fig. 25). Ensure cup is correctly seated.

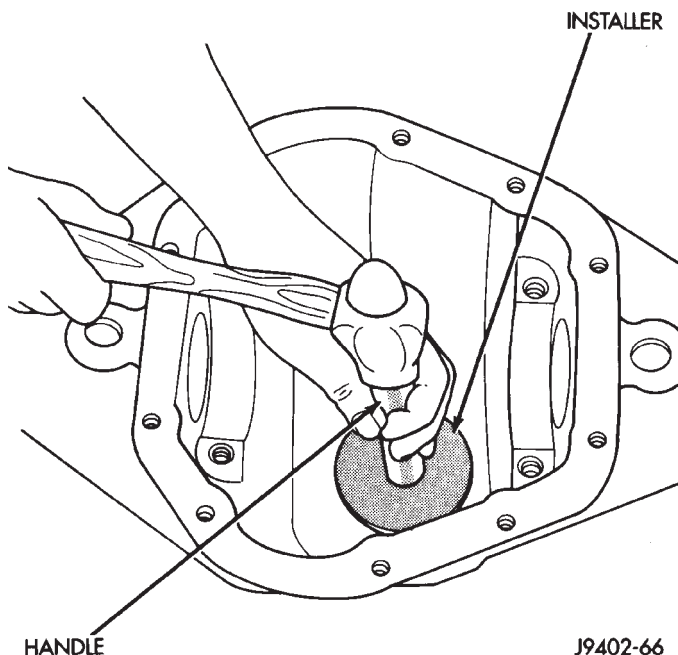


Fig. 25 Pinion Rear Bearing Cup Installation

(2) Apply Mopar® Door Ease stick lubricant to outside surface of bearing cup. Install the pinion front bearing cup with Installer D-146 and Handle C-4171 (Fig. 26).

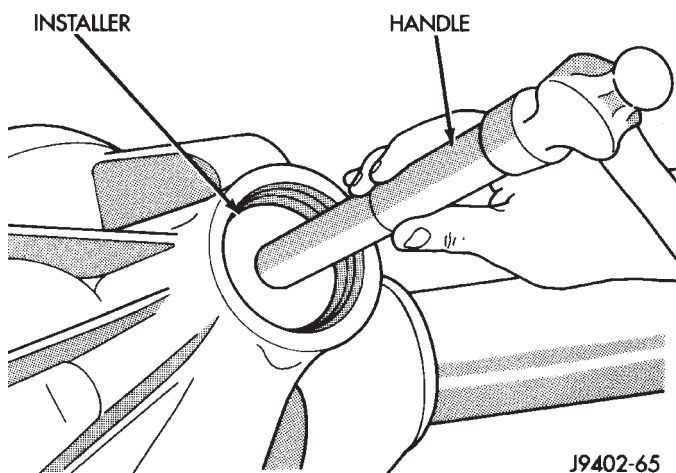


Fig. 26 Pinion Front Bearing Cup Installation

(3) Install pinion front bearing and oil slinger, if equipped. Apply a light coating of gear lubricant on the lip of pinion seal.

(4) Install seal with Installer 8108 and Handle C-4171 (Fig. 27).

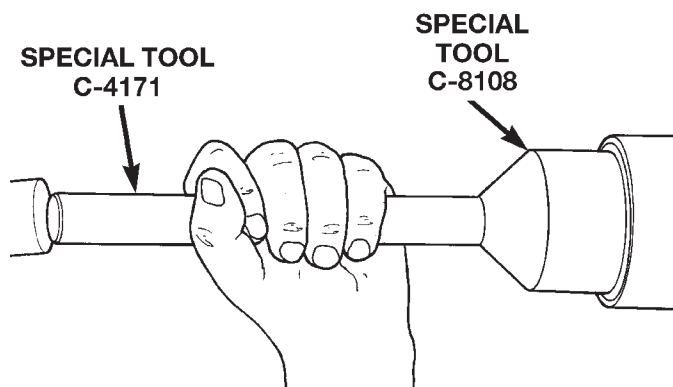


Fig. 27 Pinion Seal Installation

NOTE: Pinion depth shims are placed between the rear pinion bearing cone and pinion gear to achieve proper ring and pinion gear mesh. If the factory installed ring and pinion gears are reused, the pinion depth shim should not require replacement or adjustment. Refer to Pinion Gear Depth paragraph in this section to select the proper thickness shim before installing rear pinion bearing cone.

(5) Place the proper thickness pinion depth shim on the pinion gear.

(6) Install the rear bearing and oil slinger, if equipped, on the pinion gear with Installer C-3095-A (Fig. 28).

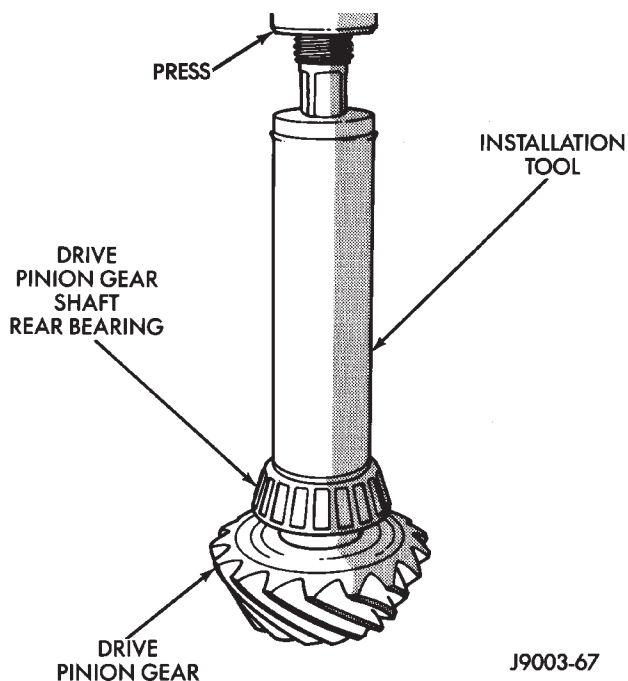
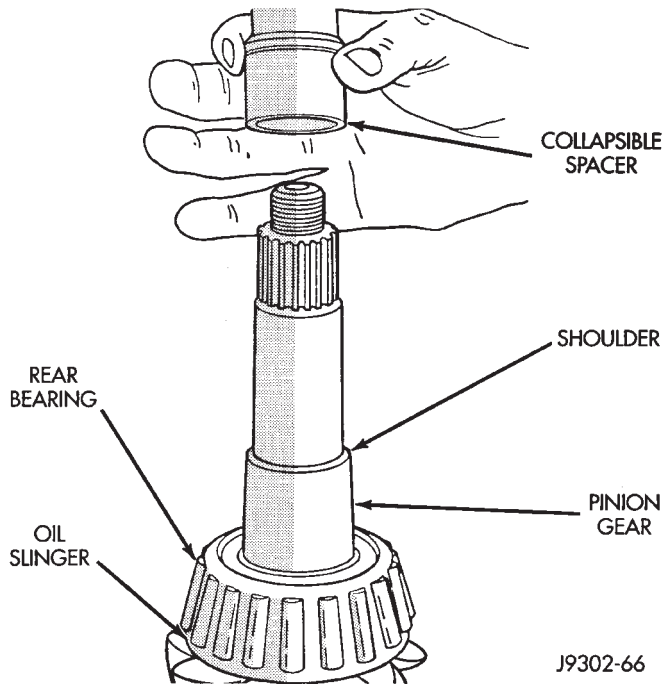


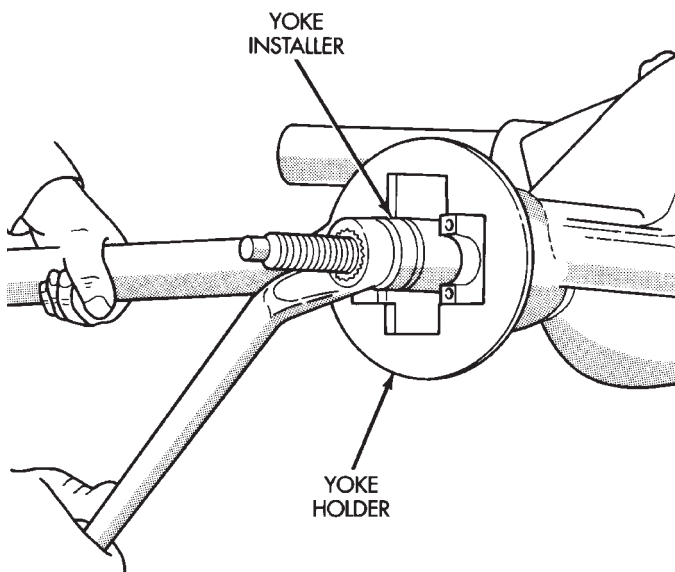
Fig. 28 Shaft Rear Bearing Installation

REMOVAL AND INSTALLATION (Continued)

- (7) Install a new collapsible preload spacer on pinion shaft (Fig. 29) on 248 RBI pinion gears.
- (8) Install original solid shims on 267 RBI pinion gears.
- (9) Install pinion gear in housing.

**Fig. 29 Collapsible Preload Spacer**

- (10) Install yoke with Installer C-3718 and Yoke Holder 6719 (Fig. 30).

**Fig. 30 Pinion Yoke Installation**

- (11) Install the yoke washer and a new nut on the pinion gear. Tighten the nut to 292 N·m (215 ft. lbs.) minimum. **Do not over-tighten.** Maximum torque is 447 N·m (330 ft. lbs.).

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing preload torque and never exceed specified preload torque. If preload torque is exceeded a new pinion nut and collapsible spacer, if equipped, must be installed. The torque sequence will have to be repeated.

- (12) Tighten pinion nut as follows for 248 RBI axles:

- (a) Using Yoke Holder 6719, and a torque wrench set at 447 N·m (330 ft. lbs.), crush collapsible spacer until bearing end play is taken up.

- (b) 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. 31).

- (13) Tighten pinion nut as follows for 267 RBI axles:

- (a) If the rotating torque is greater than the desired rotating torque, remove the pinion yoke and decrease the thickness of the solid shim pack. Decreasing the shim pack thickness by 0.025 mm (0.001 in.) will increase the rotating torque approximately 0.9 N·m (8 in. lbs.).

- (b) Slowly tighten the nut in 6.8 N·m (5 ft. lbs.) increments until the rotating torque or tightening torque of 447 N·m (330 ft. lbs.) is achieved. Measure the rotating torque frequently to avoid excessively preloading the pinion bearings (Fig. 31).

- (c) If the maximum tightening torque is reached prior to achieving the desired rotating torque, remove the pinion yoke and increase the thickness of the solid shim pack. Increasing the shim pack thickness by 0.025 mm (0.001 in.) will decrease the rotating torque approximately 0.9 N·m (8 in. lbs.).

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

- Original Bearings — 1 to 3 N·m (10 to 20 in. lbs.).

- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

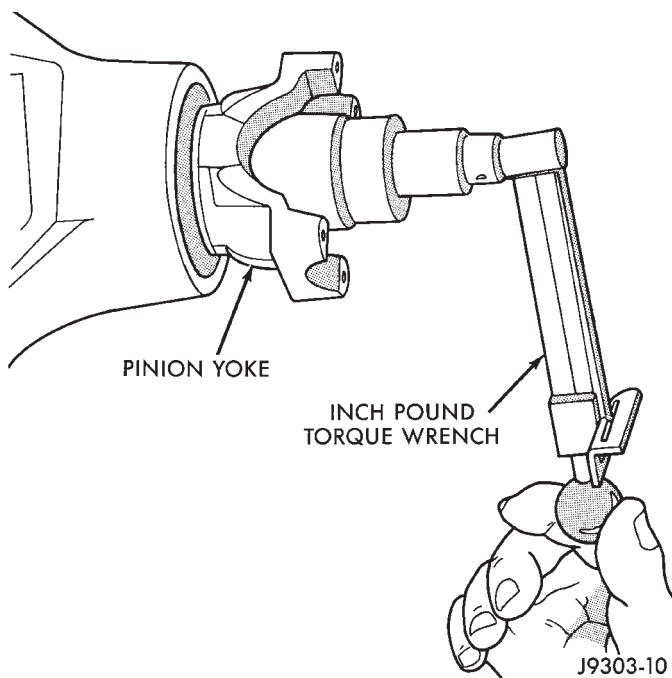
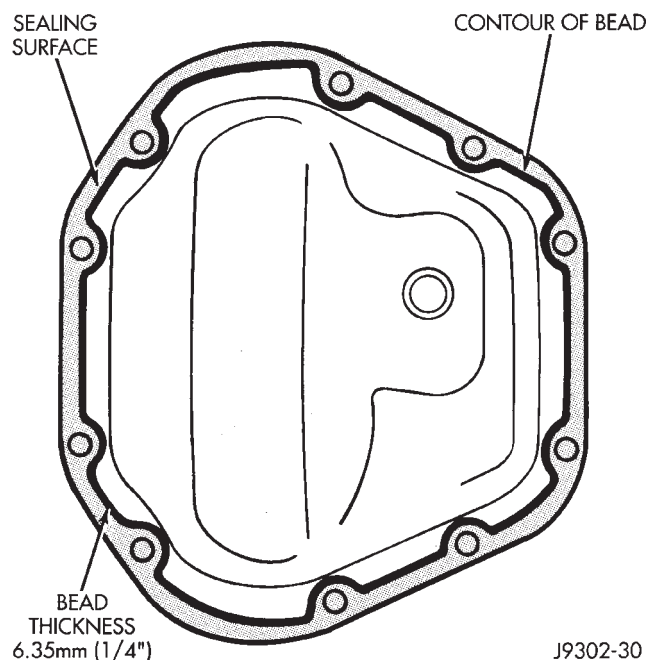
- (15) Align previously made marks on yoke and propeller shaft and install propeller shaft.

- (16) Install differential housing into the axle housing.

FINAL ASSEMBLY

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

REMOVAL AND INSTALLATION (Continued)

**Fig. 31 Check Pinion Gear Rotation Torque****Fig. 32 Typical Housing Cover With Sealant**

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

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

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

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

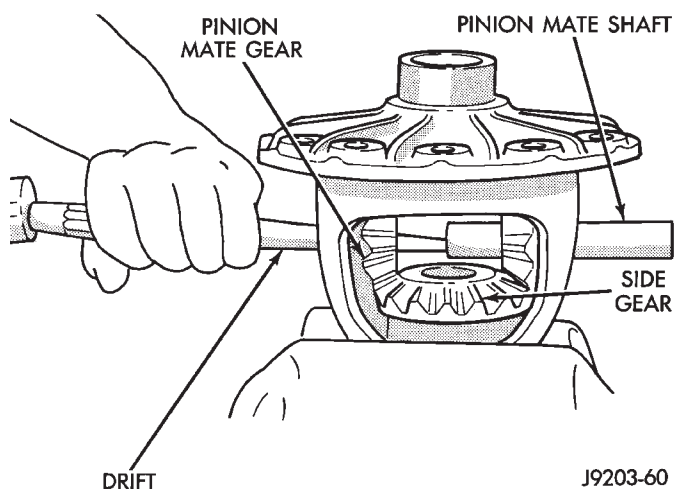
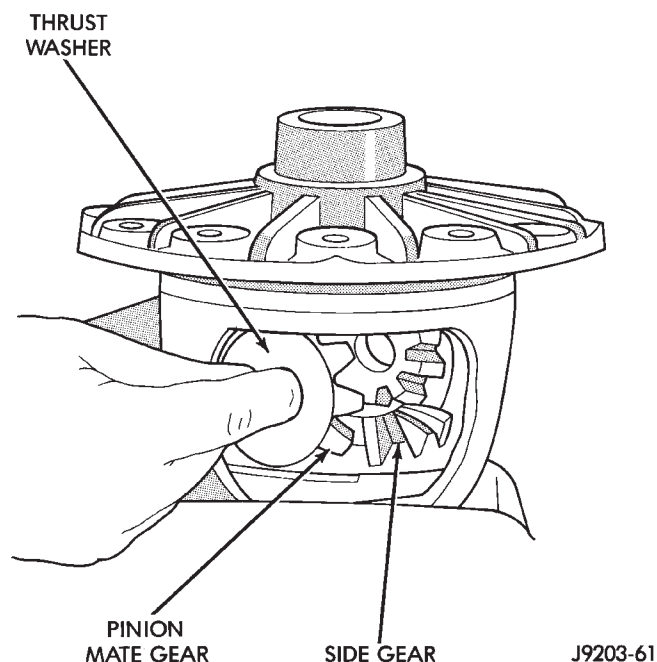
(4) Install the fill hole plug.

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

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

**Fig. 33 Pinion Mate Shaft Removal****Fig. 34 Pinion Mate Gear Removal**

DISASSEMBLY AND ASSEMBLY (Continued)

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

ASSEMBLY

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

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

(3) Install the pinion gear mate shaft.

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

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

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

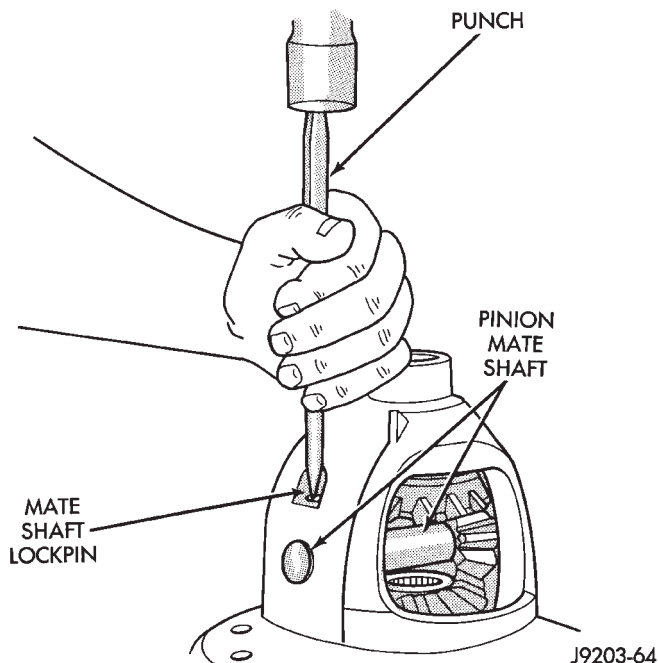


Fig. 35 Pinion Mate Shaft Roll-Pin Installation

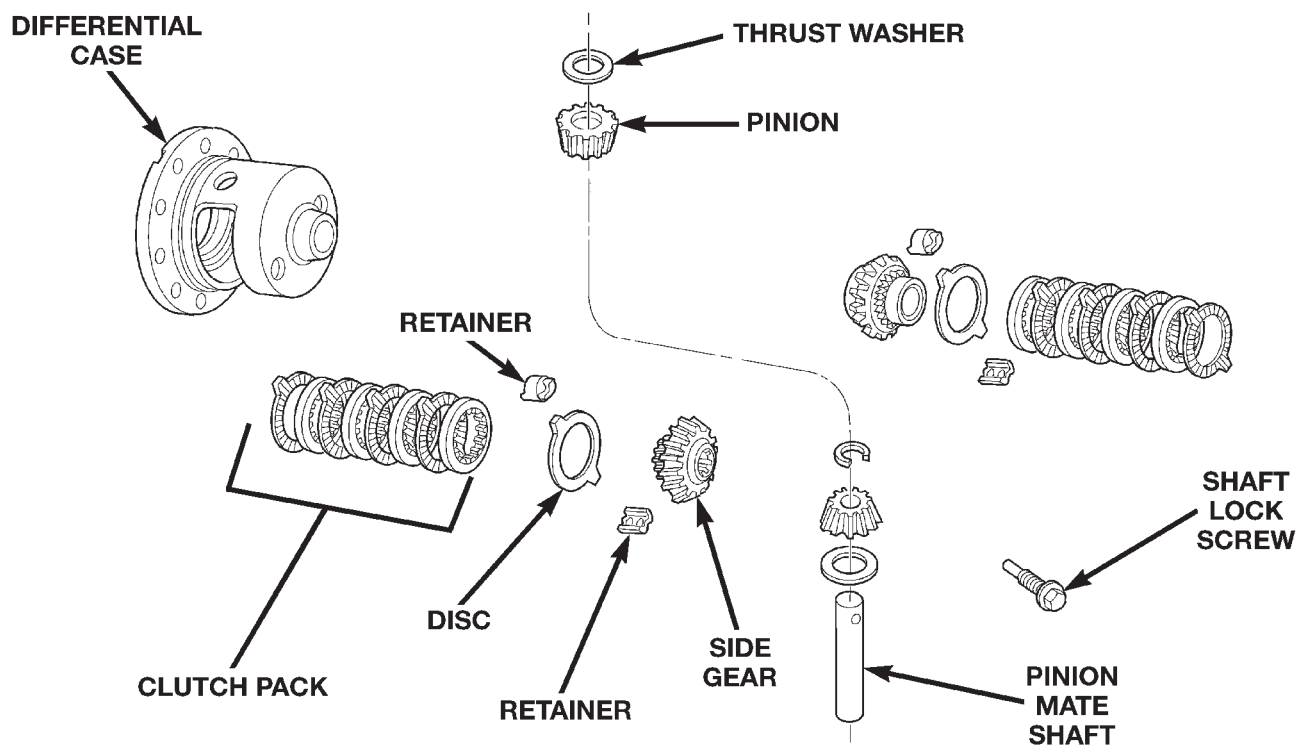


Fig. 36 Trac-Lok Differential Components—Typical

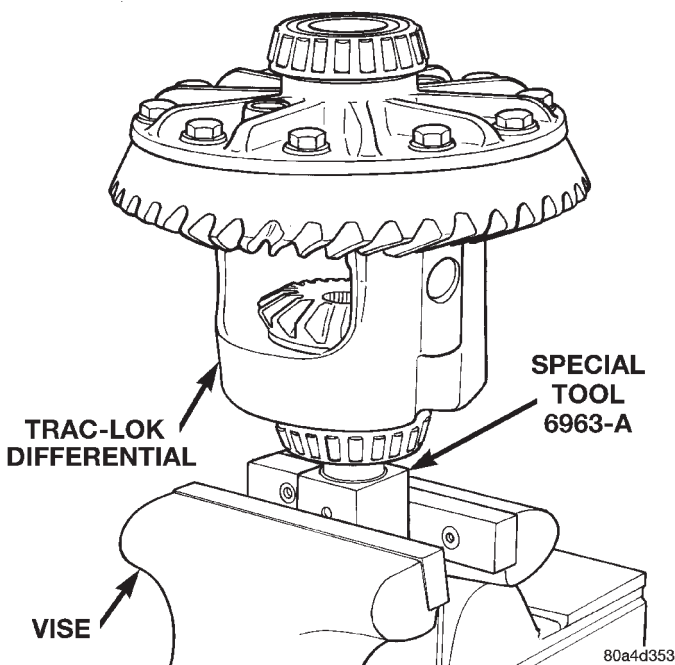
DISASSEMBLY AND ASSEMBLY (Continued)

TRAC-LOK DIFFERENTIAL

The Trac-Lok differential components are illustrated in (Fig. 36). Refer to this illustration during repair service.

DISASSEMBLY

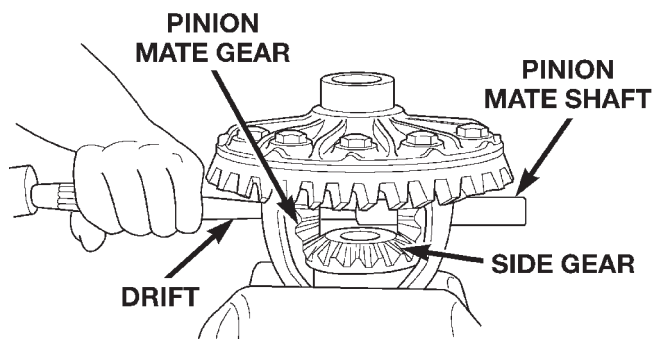
- (1) Clamp Side Gear Holding Tool 6963-A in a vise.
- (2) Position the differential case on Side Gear Holding Tool 6963-A (Fig. 37).

**Fig. 37 Differential Case Holding Tool**

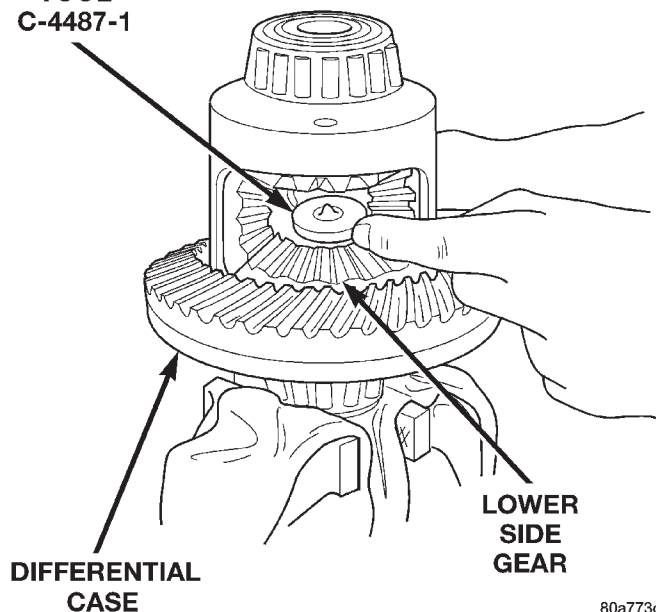
- (3) Remove ring gear, if necessary. Ring gear removal is necessary only if the ring gear is to be replaced. The Trac-Lok differential can be serviced with the ring gear installed.

- (4) Remove the roll pin holding the pinion mate shaft into the housing.

- (5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 38).

**Fig. 38 Mate Shaft Removal**

- (6) Install and lubricate Step Plate C-4487-1 (Fig. 39).

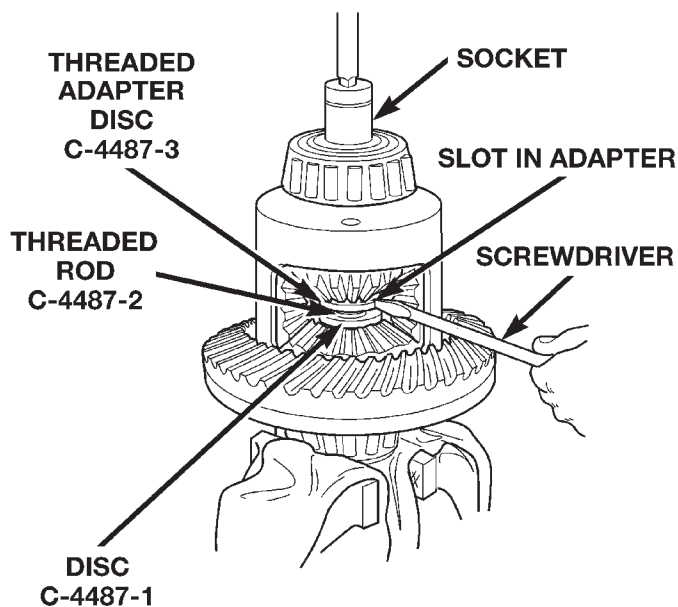
SPECIAL TOOL C-4487-1

80a773df

Fig. 39 Step Plate Tool Installation

- (7) Assemble Threaded Adapter C-4487-3 into top side gear. Thread Forcing Screw C-4487-2 into adapter until it becomes centered in adapter plate.

- (8) Position a small screw driver in slot of Threaded Adapter C-4487-3 (Fig. 40) to prevent adapter from turning.



80a773de

Fig. 40 Threaded Adapter Installation

80a773e1

DISASSEMBLY AND ASSEMBLY (Continued)

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) (maximum) to compress Belleville springs in clutch packs (Fig. 41).

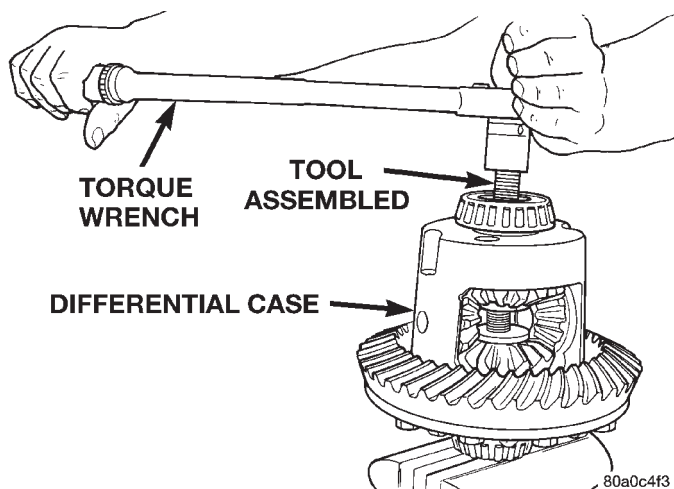


Fig. 41 Tighten Belleville Spring Compressor Tool

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 42).

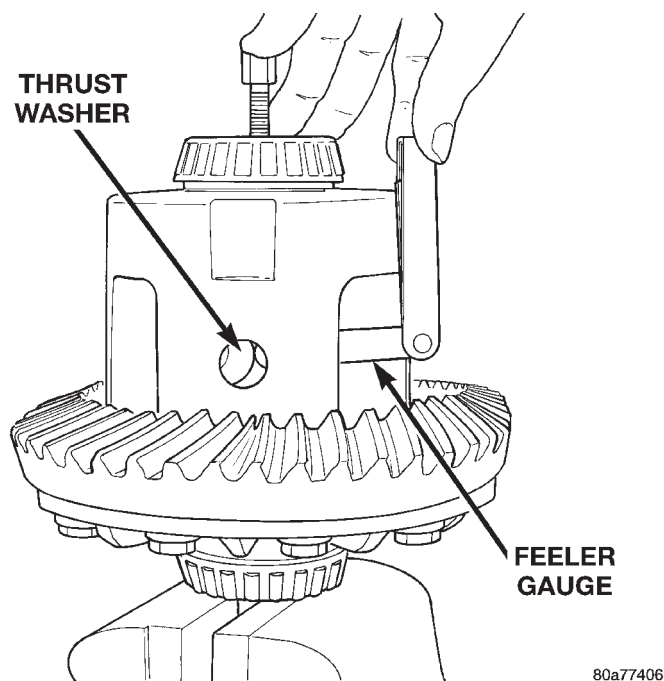


Fig. 42 Remove Pinion Gear Thrust Washer

(11) Insert Turning Bar C-4487-4 in case (Fig. 43).

(12) Loosen the Forcing Screw C-4487-2 in small increments until the clutch pack tension is relieved and the differential case can be turned using Turning Bar C-4487-4.

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

(14) Remove pinion gears from differential case.

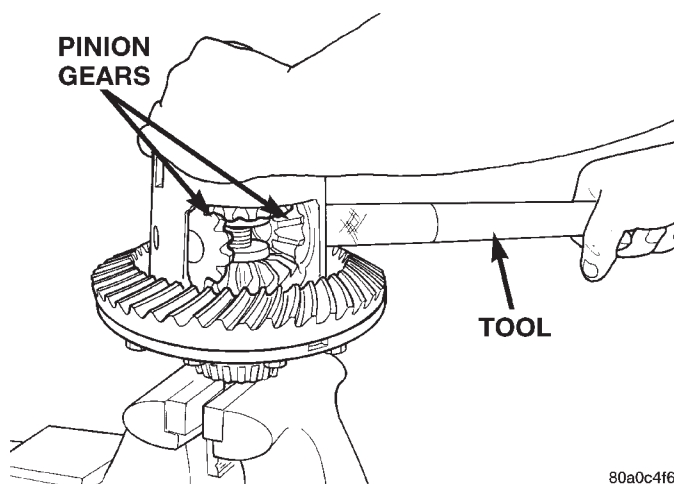


Fig. 43 Pinion Gear Removal

(15) Remove Forcing Screw C-4487-2, Step Plate C-4487-1, and Threaded Adapter C-4487-3.

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 44).

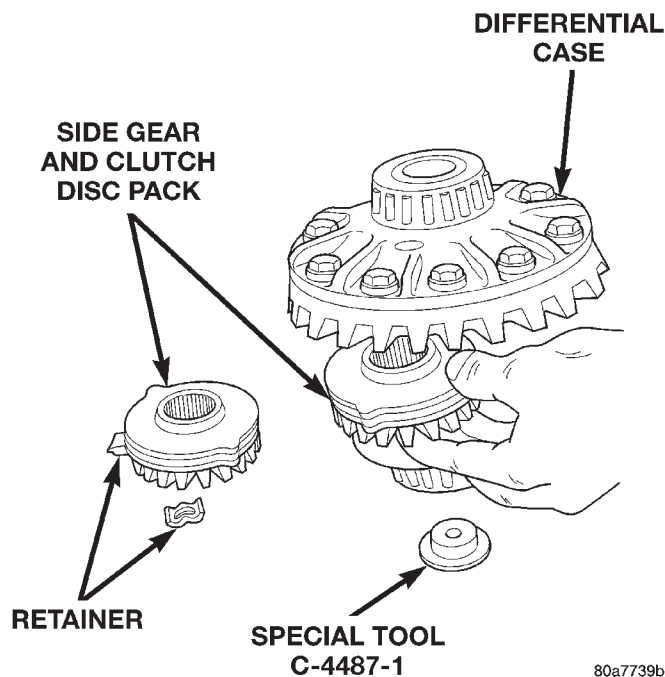


Fig. 44 Side Gear & Clutch Disc Removal

(17) Remove differential case from Side Gear Holding Tool 6963-A. Remove side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal.

ASSEMBLY

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

DISASSEMBLY AND ASSEMBLY (Continued)

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 45).

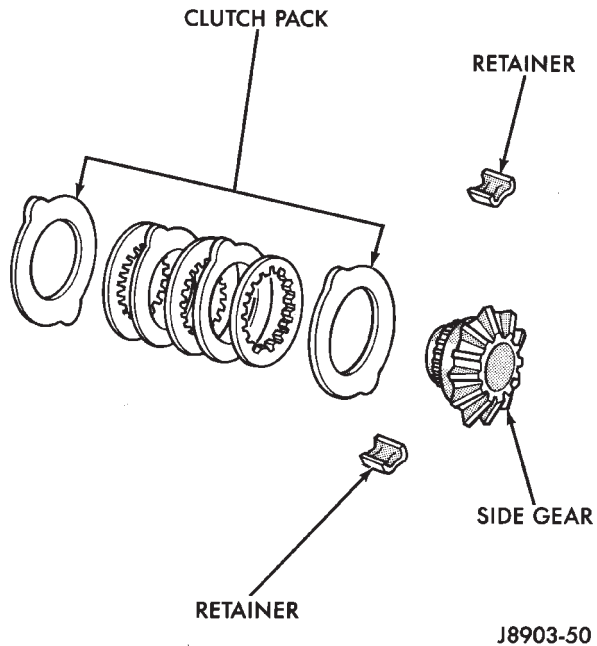


Fig. 45 Clutch Disc Pack

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

(3) Install clutch pack and side gear in the ring gear side of the differential case (Fig. 46). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

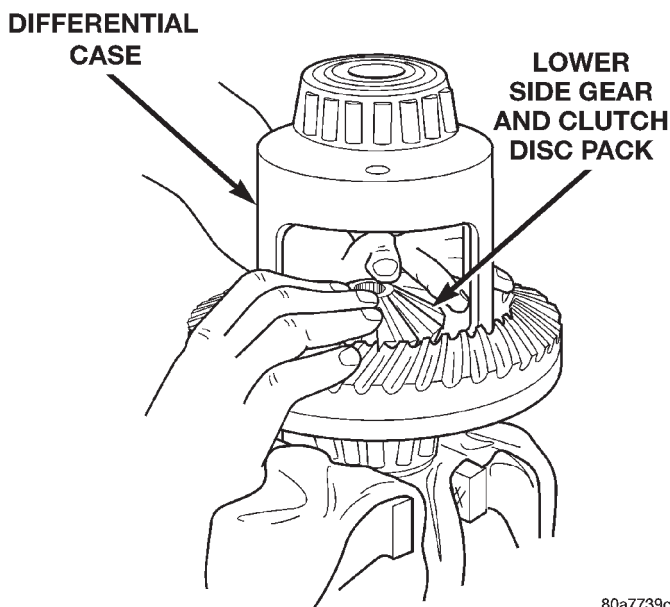


Fig. 46 Clutch Discs & Lower Side Gear Installation

(4) Position the differential case on Side Gear Holding Tool 6963-A.

(5) Install lubricated Step Plate C-4487-1 on side gear (Fig. 47).

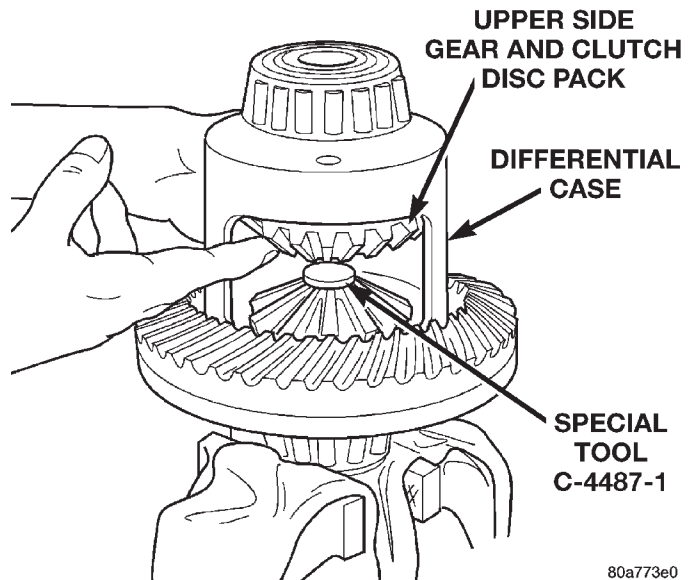


Fig. 47 Upper Side Gear & Clutch Disc Pack Installation

(6) Install the upper side gear and clutch disc pack (Fig. 47).

(7) Hold assembly in position. Insert Threaded Adapter C-4487-3 into top side gear.

(8) Insert Forcing Screw C-4487-2.

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

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

(11) Rotate case with Turning Bar C-4487-4 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

(12) Tighten forcing screw to 122 N·m (90 ft. lbs.) 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, threaded adapter, and step plate.

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

(16) Install the pinion mate shaft roll pin. Peen the edge of roll pin hole in the differential case in two places, 180° apart.

If replacement side and/or pinion gears and thrust washers were installed, it is not necessary to measure the side gear backlash. Correct

DISASSEMBLY AND ASSEMBLY (Continued)

fit is due to close machining tolerances during manufacture.

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

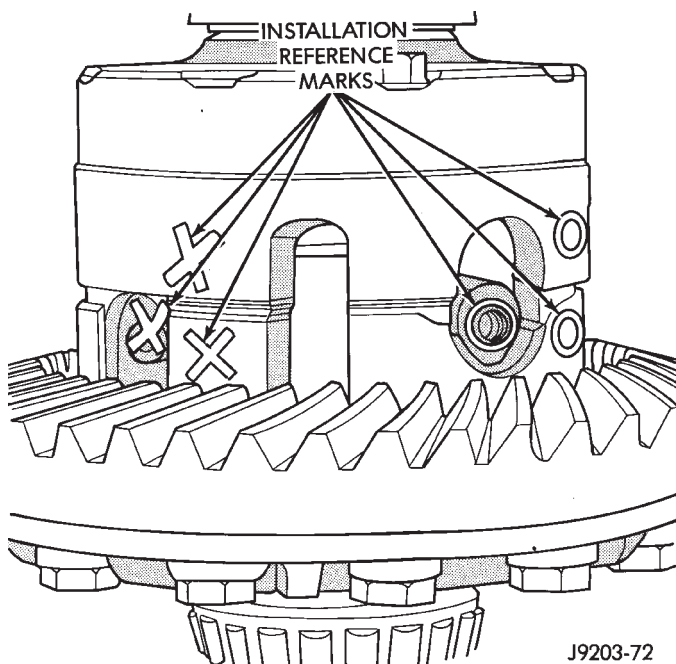
POWER-LOK—267 RBI

The 267 RBI Power-Lok differential has a two-piece cross shaft and uses 2 disc and 3 plates for each clutch pack. One plate and one disc in each clutch pack is dished.

DISASSEMBLY

Pay close attention to the clutch pack arrangement during this procedure. Note the direction of the concave and convex side of the plates and discs.

(1) Mark the ring gear half and cover half for installation reference (Fig. 48).

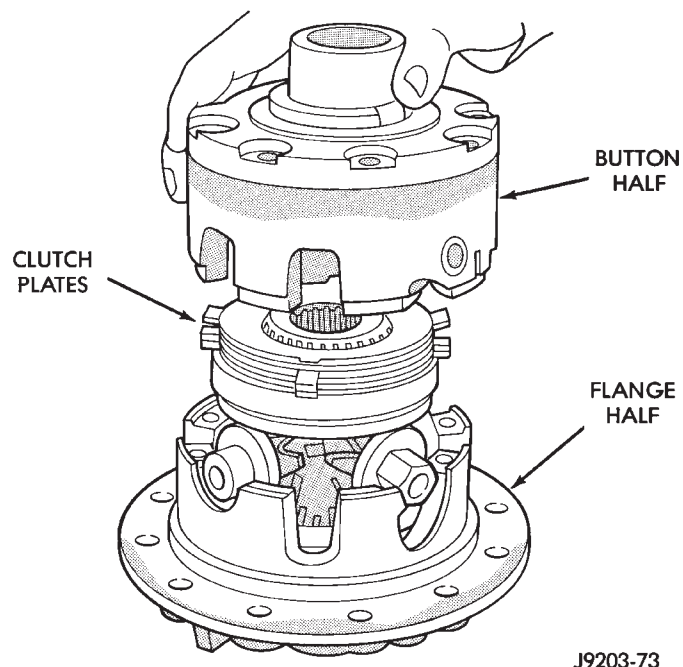


J9203-72

Fig. 48 Case Marked

(2) Remove the case attaching bolts and remove the button cover half (Fig. 49).

(3) Remove top clutch pack (Fig. 50).



J9203-73

Fig. 49 Cover Half Removal

- (4) Remove top side gear clutch ring.
- (5) Remove top side gear.
- (6) Remove pinion mate gears and cross shafts.
- (7) Remove the same parts listed above from the ring gear flange half of the case. Keep these parts with the flange cover half for correct installation in their original positions.

ASSEMBLY

The clutch discs are replaceable as complete sets only. **If one clutch disc pack is damaged, both packs must be replaced.** Lubricate each component with gear lube before assembly and installation.

(1) Saturate the clutch plates with Mopar® Hypoid Gear Lubricant or Additive (Fig. 51). Assemble clutch packs into the side gear plate in exactly the same position as removed (Fig. 50).

(2) Line up the plate ears and install the assembled pack into the flange half (Fig. 52). Ensure that the clutch plate lugs enter the slots in the case. Also ensure that the clutch pack bottoms out on the case.

DISASSEMBLY AND ASSEMBLY (Continued)

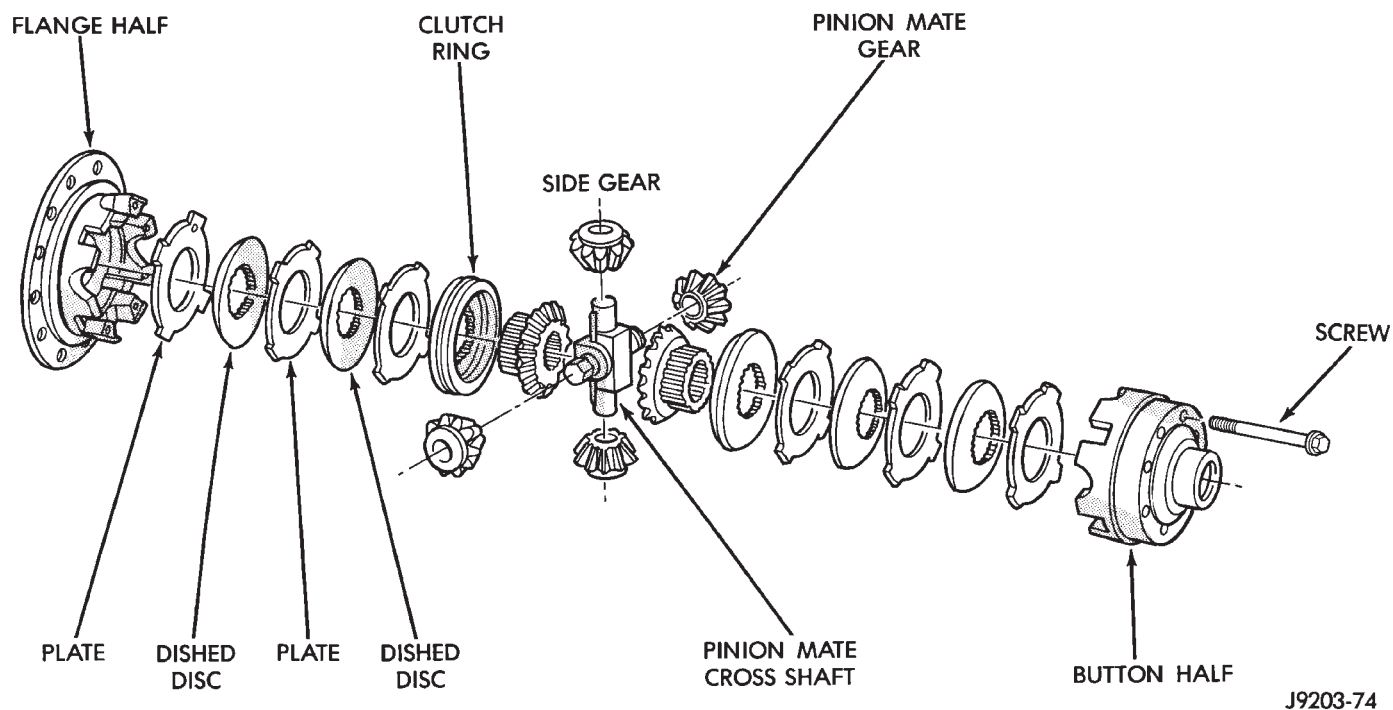


Fig. 50 Power-Lok Components

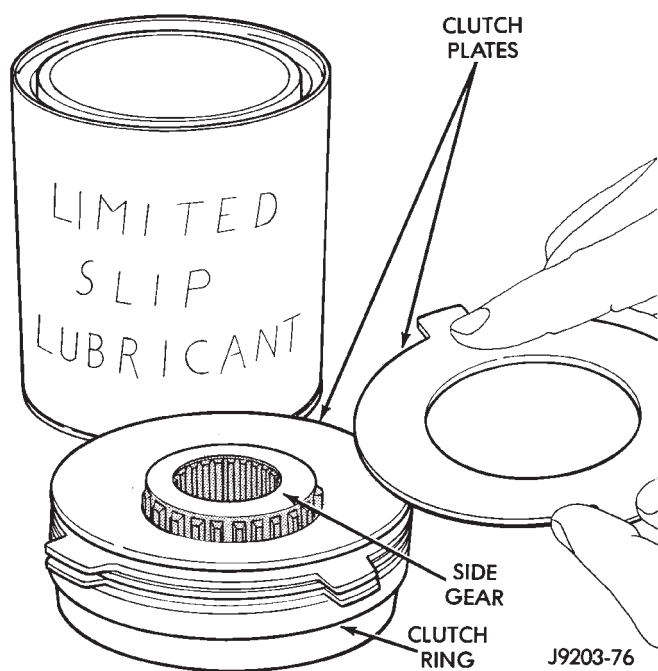


Fig. 51 Clutch Pack Power-Lok

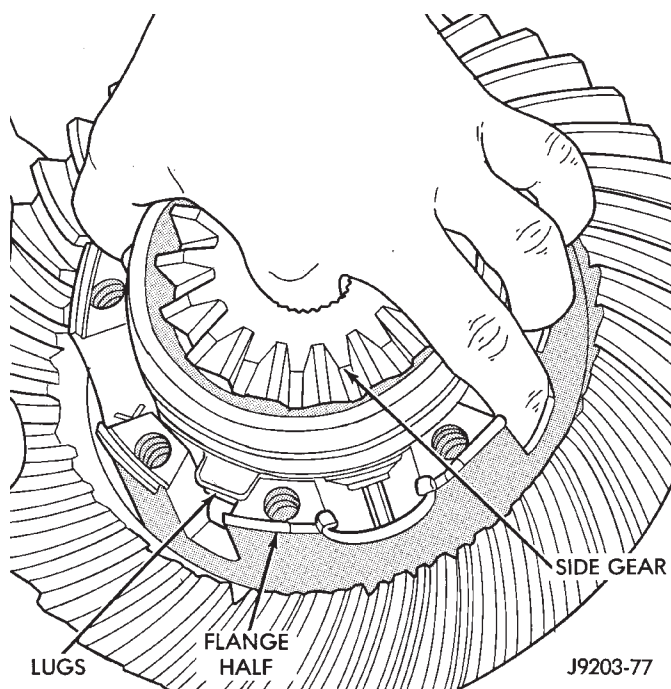


Fig. 52 Clutch Pack Installation

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Install pinion mate shafts and pinion mate gears (Fig. 53). **Make sure shafts are correctly installed according to the alignment marks.**

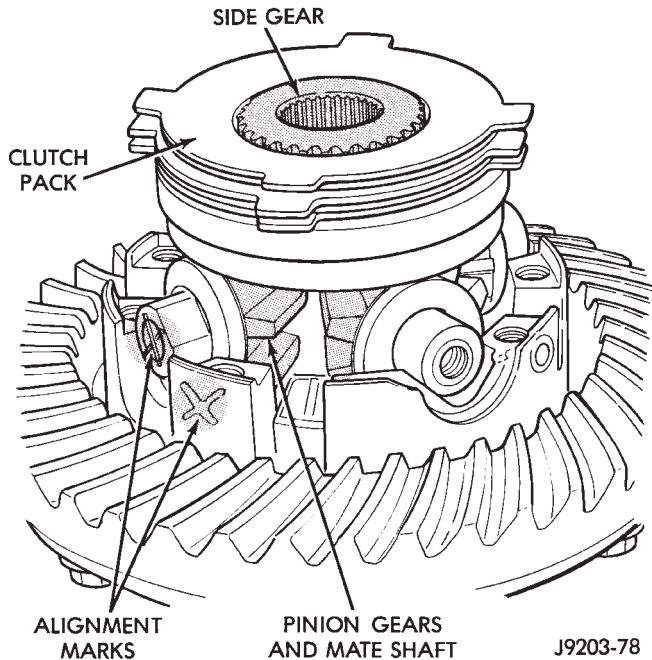


Fig. 53 Clutch Pack Installation

(4) Lubricate and install the other side gear and clutch pack (Fig. 52).

(5) Correctly align and assemble button half to flange half. Install case body screws finger tight.

(6) Tighten body screws alternately and evenly. Tighten screws to 89-94 N·m (65-70 ft. lbs.) torque (Fig. 54).

If bolt heads have 7 radial lines or the number 180 stamped on the head, tighten these bolts to 122-136 N·m (90-100 ft. lbs.) torque.

CLEANING AND INSPECTION

AXLE COMPONENTS

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

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

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

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.

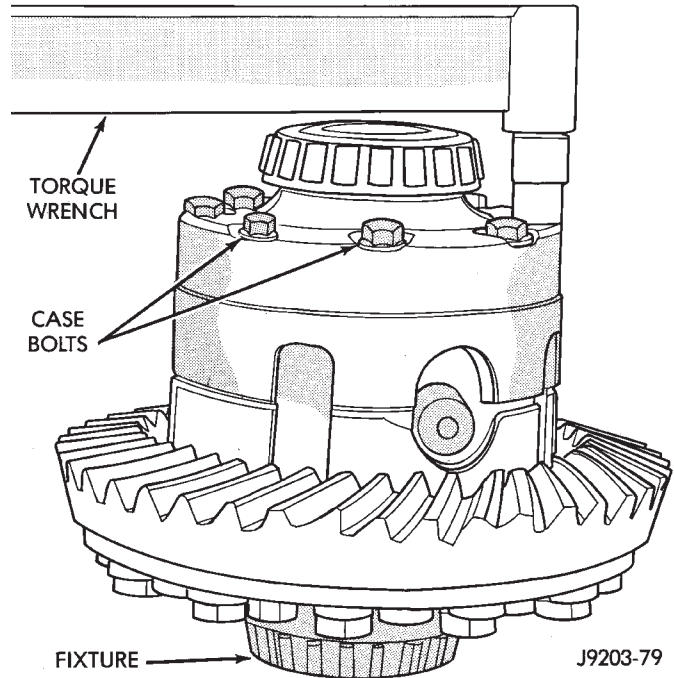


Fig. 54 Case Half Installation

- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.

- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.

- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.

- Preload shims for damage and distortion. Install new shims, if necessary.

TRAC-LOK/POWER-LOK

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

PRESOAK PLATES AND DISC

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

ADJUSTMENTS

PINION GEAR DEPTH

GENERAL INFORMATION

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

ADJUSTMENTS (Continued)

gear are etched into the face of each gear (Fig. 55). 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 127.00 mm (5.000 in.) for the 248 RBI axle. The standard setting for the 267 RBI axle is 136.525 (5.375 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. 56).

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.

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.

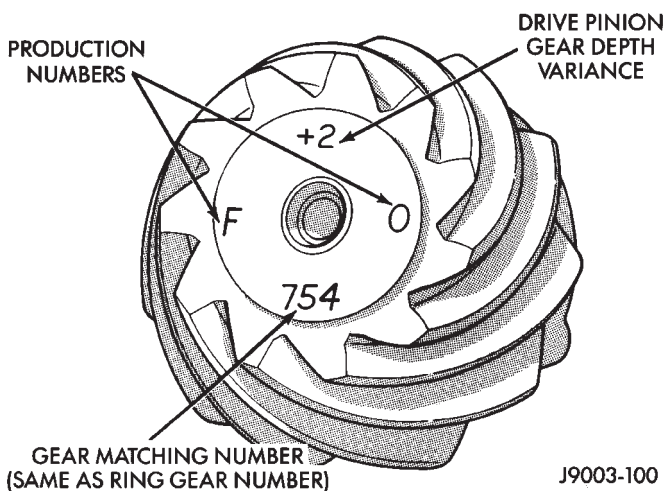


Fig. 55 Pinion Gear ID Numbers

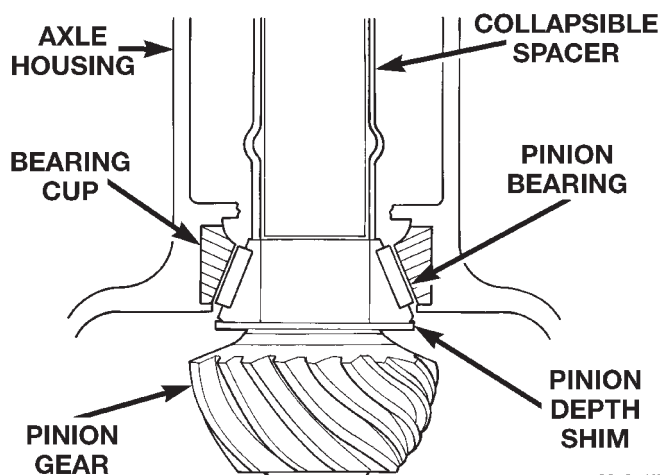


Fig. 56 Shim Locations—248 RBI Axle

80a0c4f8

PINION GEAR DEPTH VARIANCE

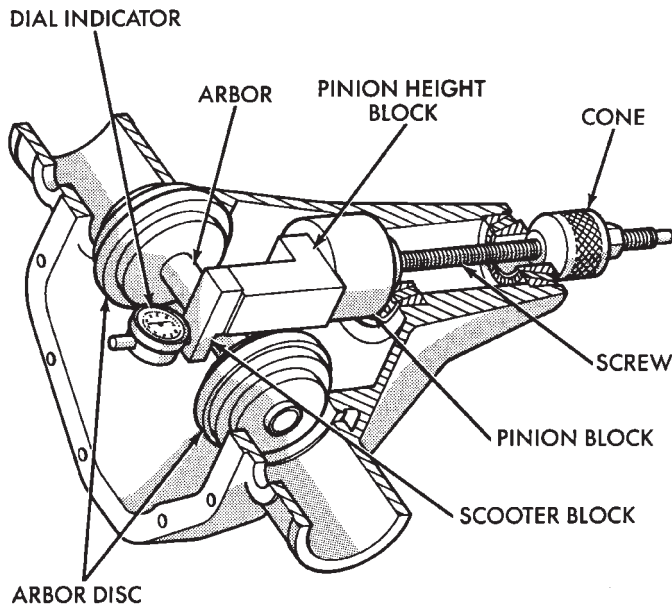
Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	–4	–3	–2	–1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	–0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	–0.001	–0.002
+1	+0.005	+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

J8902-46

ADJUSTMENTS (Continued)

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set 6730 and Dial Indicator C-3339 (Fig. 57).



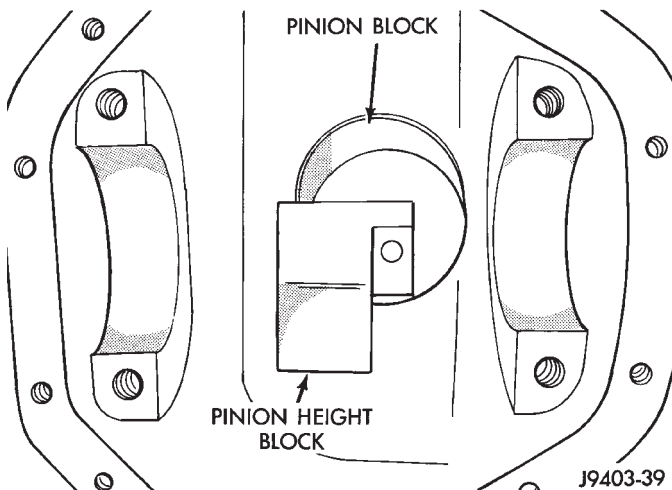
J9403-45

Fig. 57 Pinion Gear Depth Gauge Tools—Typical

(1) Assemble Pinion Height Block 6739, Pinion Block 6736, and rear pinion bearing onto Screw 6741 (Fig. 57) for the 248 RBI axle. For the 267 RBI axle, use Pinion Block 6737.

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 58).

(3) Install front pinion bearing and Cone 6740 hand tight (Fig. 57).

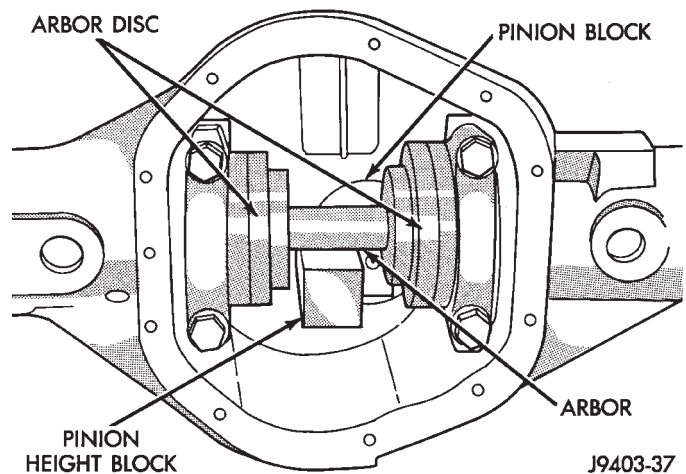


J9403-39

Fig. 58 Pinion Height Block—Typical

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 59). Install differential bearing caps on Arbor Discs and tighten cap bolts. Refer to the Torque Specifications in this section.

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



J9403-37

Fig. 59 Gauge Tools In Housing—Typical

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

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

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

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 60). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading, the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion gear (Fig. 55) using the opposite sign on the variance number. For

ADJUSTMENTS (Continued)

example, if the depth variance is -2 , add $+0.002$ in. to the dial indicator reading.

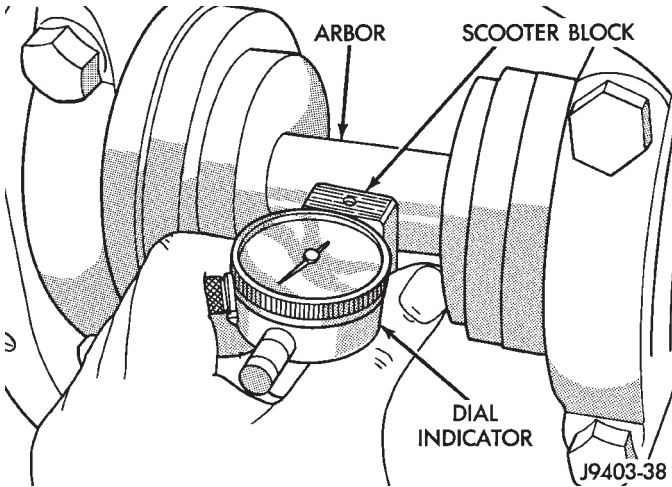


Fig. 60 Pinion Gear Depth Measurement—Typical

(10) Remove the pinion depth gauge components from the axle housing

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

INTRODUCTION

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential side bearing cones. The proper shim thickness can be determined using slip-fit dummy bearings D-343 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 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. 61). Differential shim measurements are performed with axle 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.

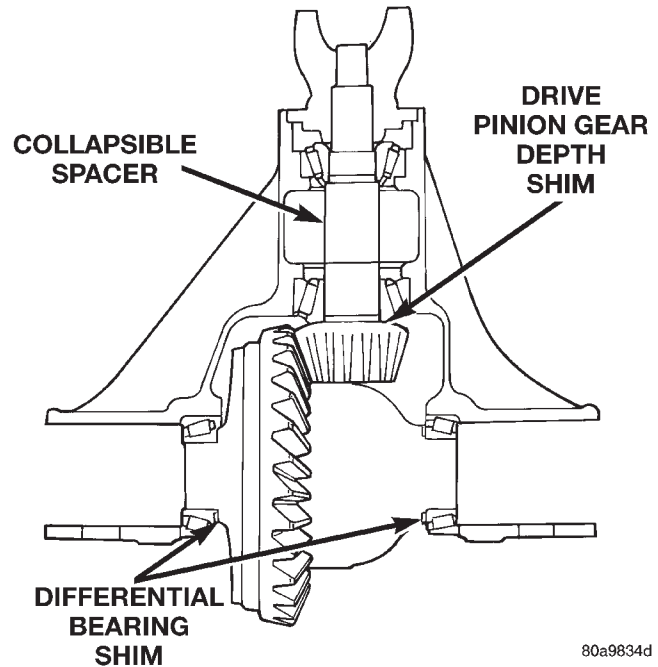


Fig. 61 Axle Adjustment Shim Locations—248 RBI

- (1) Remove differential side bearings from differential case.
- (2) Remove factory installed shims from differential case.
- (3) Install ring gear on differential case and tighten bolts to specification, if necessary.
- (4) Install dummy side bearings D-343 on differential case.
- (5) Install differential case in axle housing.
- (6) Install the marked bearing caps in their correct positions. Install and snug the bolts (Fig. 62).

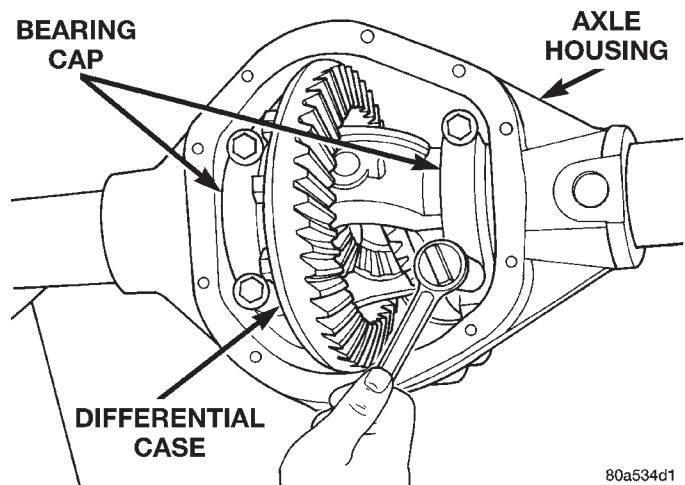


Fig. 62 Tighten Bolts Holding Bearing Caps

- (7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 63) and (Fig. 64).

ADJUSTMENTS (Continued)

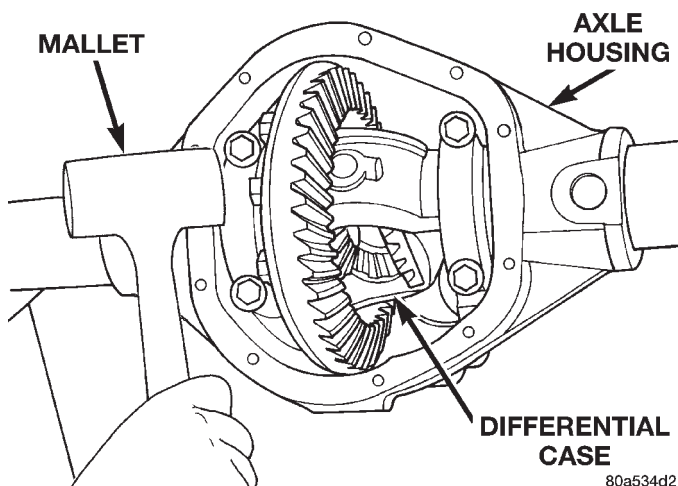


Fig. 63 Seat Pinion Gear Side Differential Dummy Side Bearing

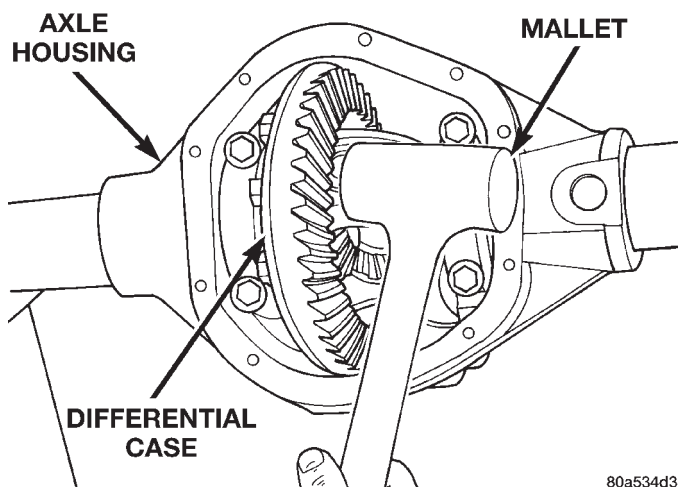


Fig. 64 Seat Ring Gear Side Differential Dummy Side Bearing

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 65).

(9) Attach a dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 65).

(10) Push and hold differential case to pinion gear side of axle housing (Fig. 66).

(11) Zero dial indicator face to pointer (Fig. 66).

(12) Push and hold differential case to ring gear side of the axle housing (Fig. 67).

(13) Record dial indicator reading (Fig. 67).

(14) Add 0.015 in. (0.38 mm) 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.

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

(16) Remove differential case and dummy bearings from axle housing.

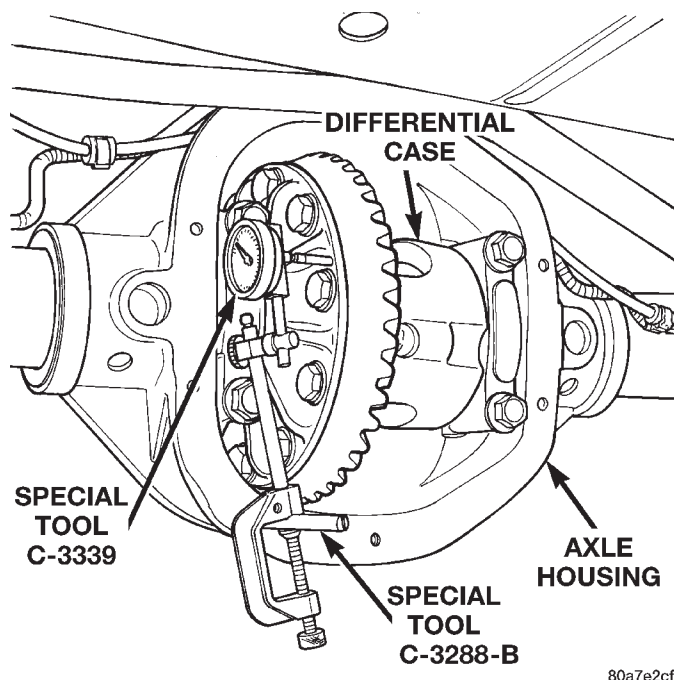


Fig. 65 Differential Side play Measurement

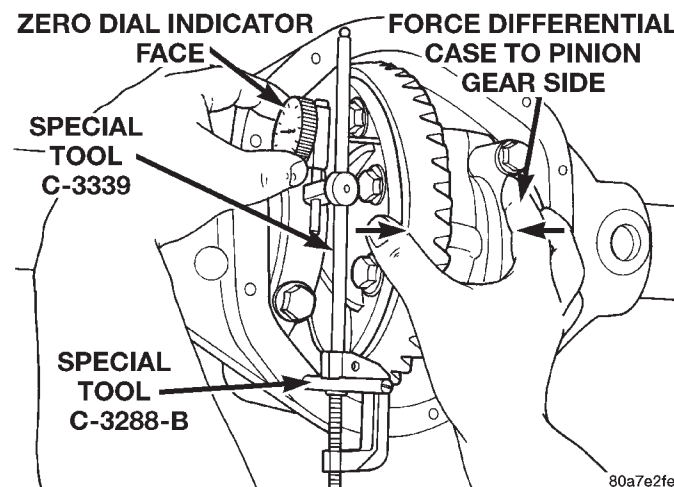


Fig. 66 Hold Differential Case and Zero Dial Indicator

(17) Install the pinion gear in axle housing. Install the pinion yoke, or flange, and establish the correct pinion rotating torque.

(18) Install differential case and dummy bearings D-343 in axle housing (without shims), install bearing caps and tighten bolts snug.

(19) Seat ring gear side dummy bearing (Fig. 64).

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

(21) Push and hold differential case toward pinion gear (Fig. 66).

(22) Zero dial indicator face to pointer (Fig. 68).

(23) Push and hold differential case to ring gear side of the axle housing (Fig. 69).

(24) Record dial indicator reading (Fig. 69).

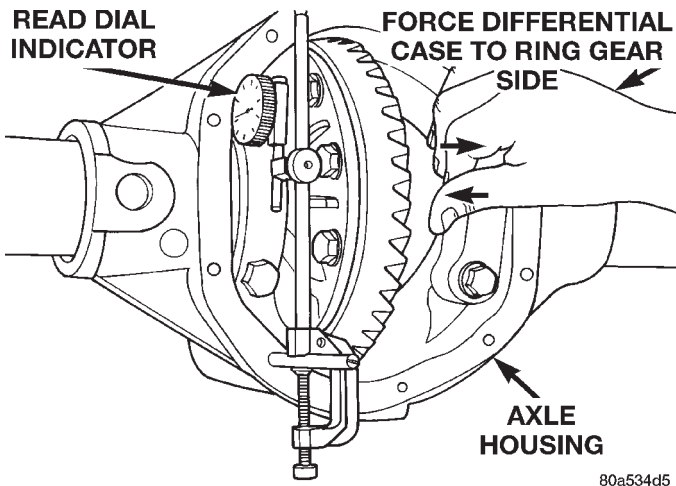


Fig. 67 Hold Differential Case and Read Dial Indicator

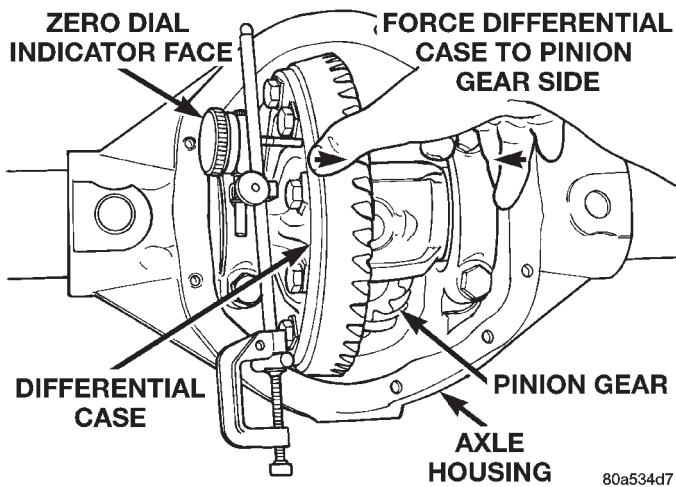


Fig. 68 Hold Differential Case and Zero Dial Indicator

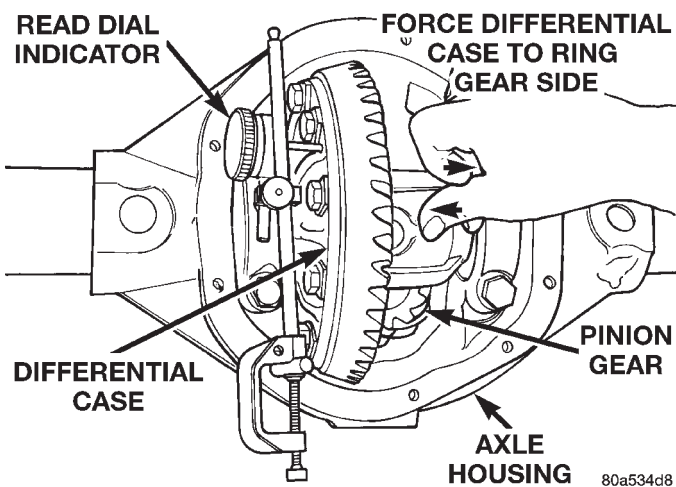


Fig. 69 Hold Differential Case and Read Dial Indicator

(25) This is the thickness shim required on the ring gear side of the differential case to achieve proper backlash.

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

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

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

(29) Install side bearing shims on differential case hubs.

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

(31) Install spreader W-129-B on axle housing and spread axle opening enough to receive differential case.

(32) Install differential case in axle housing.

(33) Remove spreader from axle housing.

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

(35) Position the indicator plunger against a ring gear tooth (Fig. 70).

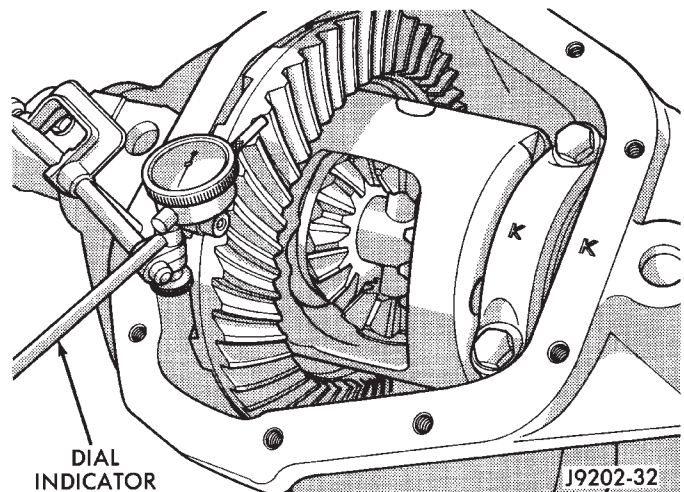


Fig. 70 Ring Gear Backlash Measurement

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

(37) Zero dial indicator face to pointer.

(38) 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 axle housing to the other (Fig. 71).

(39) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at several locations around the ring gear. Readings should not vary more than 0.05 mm (0.002 in.). If readings vary

ADJUSTMENTS (Continued)

more than specified, the ring gear or the differential case is defective.

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

GEAR CONTACT PATTERN ANALYSIS

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

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

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

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

The areas on the ring gear teeth with the greatest degree of contact against the pinion gear teeth will squeegee the compound to the areas with the least amount of contact. Note and compare patterns on the

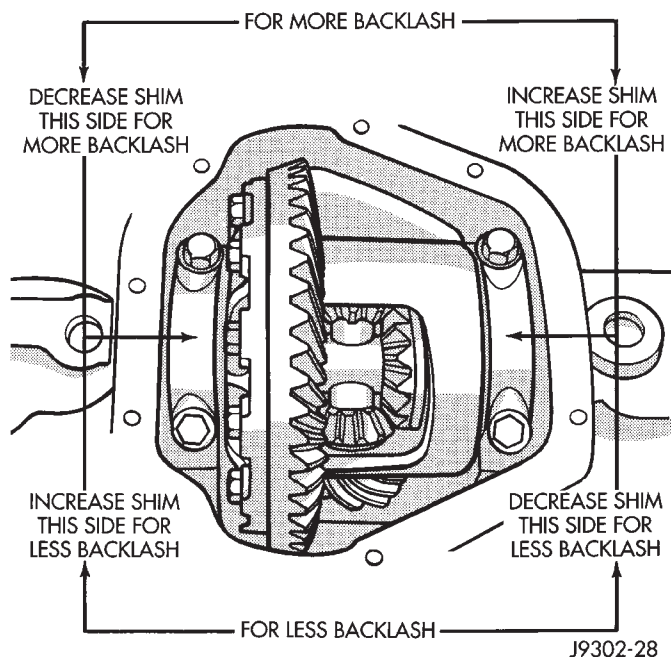
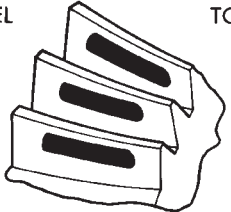
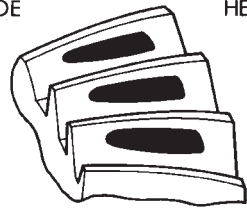

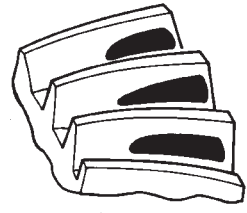

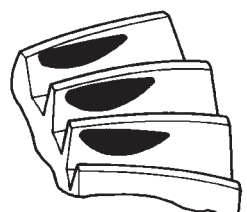
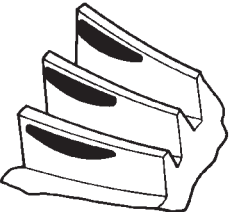
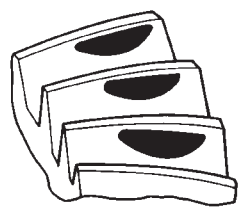
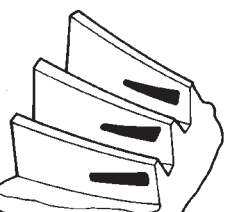
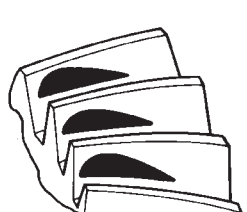


Fig. 71 Backlash Shim Adjustment

ring gear teeth to Gear Tooth Contact Patterns chart (Fig. 72) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

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

J9003-24

Fig. 72 Gear Tooth Contact Patterns

SPECIFICATIONS

248 AND 267 RBI AXLES

248 RBI AXLE

DESCRIPTION	SPEC.
Axle Type	Hypoid
Lubricant	SAE 90W
Lube Capacity	2.96 L (6.25 pts.)
Axle Ratio	3.55, 4.10
Ring Gear	
Diameter	247.7 mm (9.75 in.)
Backlash	0.10–0.23 mm (0.004–0.009 in.)
Pinion Std. Depth	127.0 mm (5.000 in.)
Pinion Bearing Preload	
Original Bearing	1–3 N·m (10–20 in. lbs.)
New Bearing	2–5 N·m (15–35 in. lbs.)

267 RBI AXLE

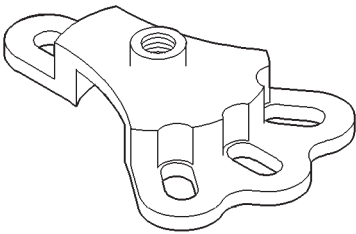
DESCRIPTION	SPEC.
Axle Type	Hypoid
Lubricant	SAE 90W
Lube Capacity	3.31 L (7.0 pts.)
Axle Ratio	3.54, 4.10
Ring Gear	
Diameter	266.7 mm (10.50 in.)
Backlash	0.10–0.23 mm (0.004–0.009 in.)
Pinion Std. Depth	136.525 mm (5.375 in.)
Pinion Bearing Preload	
Original Bearing	1–3 N·m (10–20 in. lbs.)
New Bearing	2–5 N·m (15–35 in. lbs.)

248 AND 267 RBI AXLE

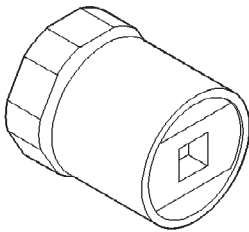
DESCRIPTION	TORQUE
Fill Hole Plug	34 N·m (25 ft. lbs.)
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	108 N·m (80 ft. lbs.)
Pinion Nut	292–447 N·m (215–330 ft. lbs.)
Ring gear Bolt	163–190 N·m (120–140 ft. lbs.)
Axle to Hub Bolt	123 N·m (90 ft. lbs.)
Power-lok Body Screws	See Procedure
Hub Nut	163–190 N·m (120–140 ft. lbs.)

SPECIAL TOOLS

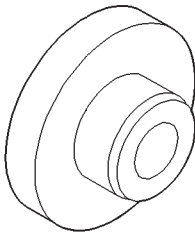
248 AND 267 RBI AXLES



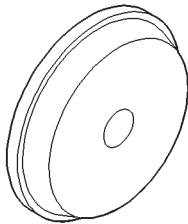
Puller—6790



Wrench—DD-1241-JD

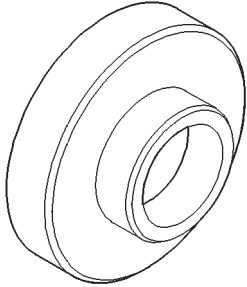


Installer—5064

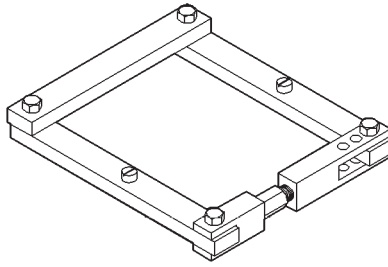


Installer—8151

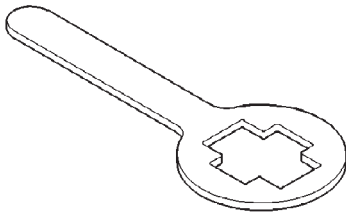
SPECIAL TOOLS (Continued)



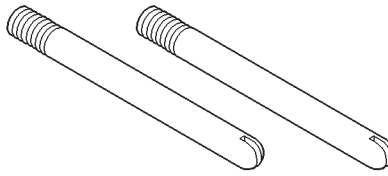
Installer—8149



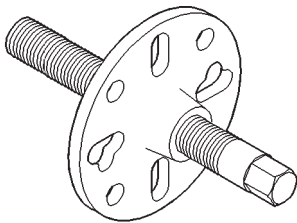
Spreader—W-129-B



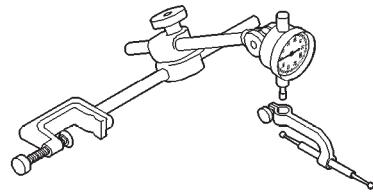
Holder—6719



Guide Pin—C-3288-B

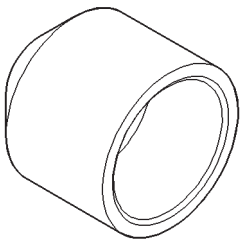


Puller—C-452

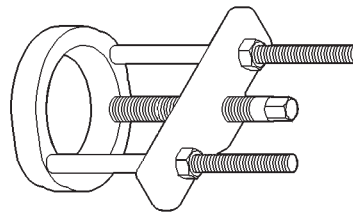


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Dial Indicator—C-3339

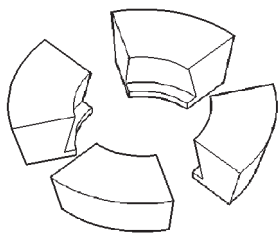


Installer—8108

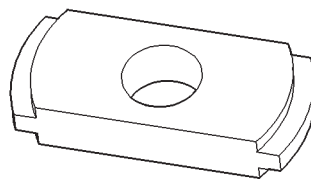


Puller/Press—C-293-PA

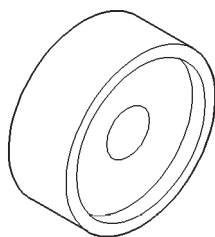
SPECIAL TOOLS (Continued)



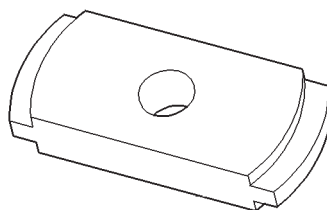
Adapters—C-293-62



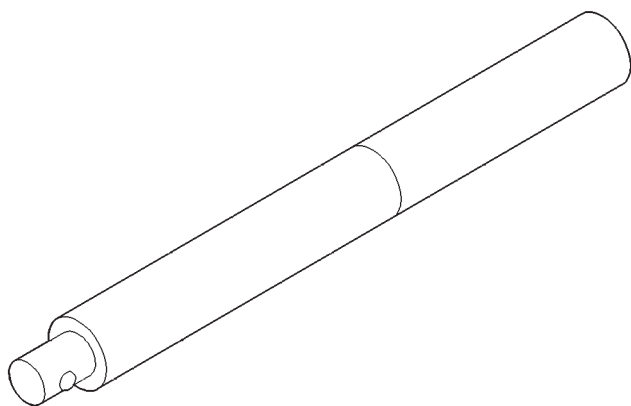
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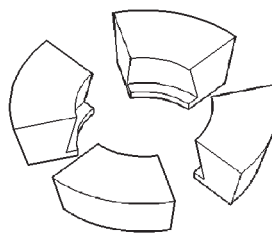
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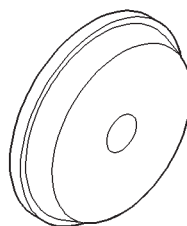
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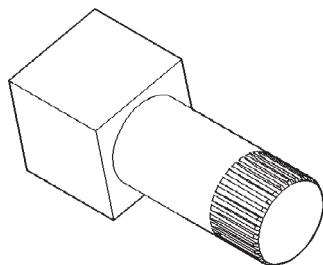
Handle—C-4171



Adapters—C-293-37

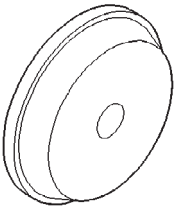
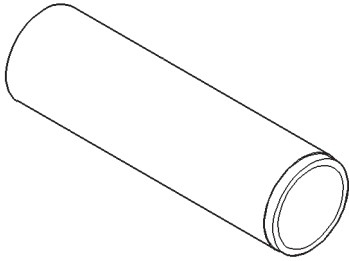
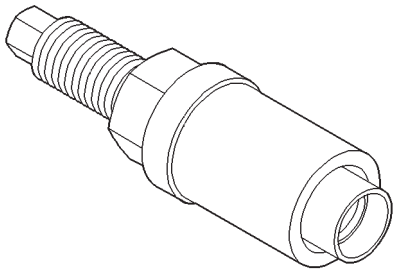
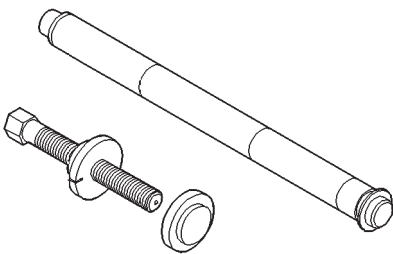
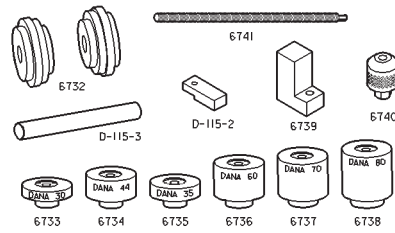
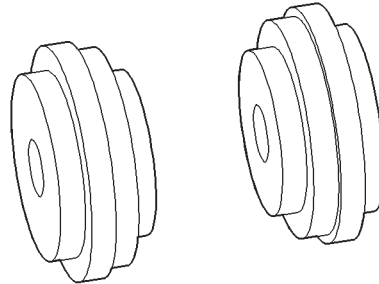


Installer—D-111



Holder—6963-A

SPECIAL TOOLS (Continued)

**Installer—D-146****Installer—C-3095-A****Installer—C-3718****Trac-lok Tools—C-4487****6730 PINION HEIGHT SET****Gauge Set—6730****Arbor Discs—6732**

286 RBI AXLE

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GENERAL INFORMATION

286 RBI AXLE

The 286 Rear Beam-design Iron (RBI) axle housings consist of an iron center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed in to form a one-piece axle housing.

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

The axles are equipped with full-floating axle shafts, meaning that loads are supported by the axle housing tubes. The full-float axle shafts are retained by bolts attached to the hub. The hub rides on two bearings at the outboard end of the axle tube. The axle shafts can be removed without disturbing or removing the wheel bearings. The wheel bearings are opposed tapered roller bearings and are contained in the hub assembly.

The removable, stamped steel cover provides a means for inspection and service without removing the complete axle from the vehicle. A small, stamped metal axle gear ratio identification tag is attached to the housing cover via one of the cover bolts. This tag also identifies the number of ring and pinion teeth.

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

The differential case for the standard differential is a one-piece design. The differential pinion mate shaft is retained with a roll pin. Differential bearing preload and ring gear backlash are adjusted by the use of shims located between the differential bearing cones and case. Pinion bearing preload is set and maintained by the use of solid shims.

Axles equipped with a Trac-Lok™ differential are optional for the 286 RBI axle. A Trac-lok differential contains two clutch packs, four pinion gears, and a one-piece pinion mate cross shaft to provide increased torque to the non-slipping wheel in addition to the standard differential components. A Trac-lok differential for the 286 RBI axle has a two-piece differential case.

LUBRICANT SPECIFICATIONS

A multi-purpose, hypoid gear lubricant which conforms to the following specifications should be used.

GENERAL INFORMATION (Continued)

Mopar® Hypoid Gear Lubricant conforms to all of these specifications.

- The lubricant should have MIL-L-2105C and API GL 5 quality specifications.
- Lubricant is a thermally stable SAE 80W-90 gear lubricant.

Trac-lok differential equipped 4X2 vehicles require the addition of 7 oz. of friction modifier to the axle lubricant. Trac-lok differential equipped 4X4 vehicles require the addition of 10 oz. of friction modifier to the axle lubricant. The 286 RBI axle lubricant capacity is 3.22 L (6.81 pts.) for 4X2 vehicles and 4.80 L (10.125 pts.) for 4X4 vehicles total, including the friction modifier if necessary.

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

DESCRIPTION AND OPERATION

STANDARD DIFFERENTIAL

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

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

In operation, power flow occurs as follows:

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

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

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

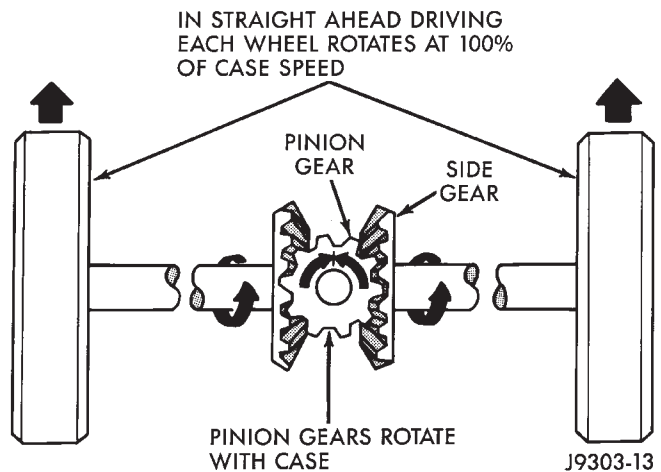


Fig. 1 Differential Operation—Straight Ahead Driving
attached to the outside wheel to rotate at a faster speed.

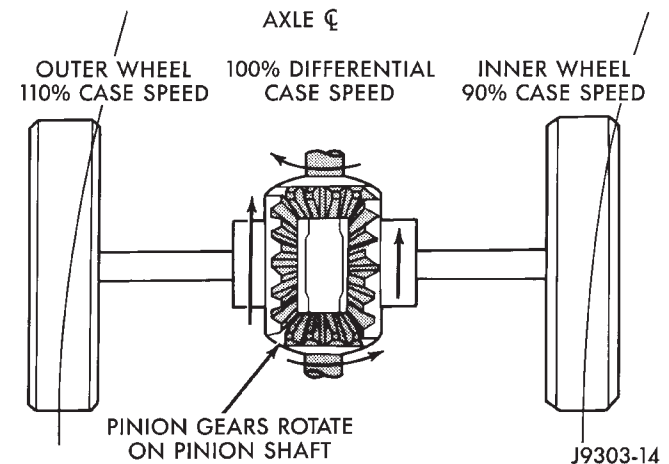


Fig. 2 Differential Operation—On Turns

TRAC-LOK OPERATION

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

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

In operation, the Trac-lok clutches are engaged by two concurrent forces. The first being the preload force exerted through Belleville spring washers within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear (Fig. 3).

The Trac-lok design provides the differential action needed for turning corners and for driving straight ahead during periods of unequal traction. When one wheel loses traction, the clutch packs transfer addi-

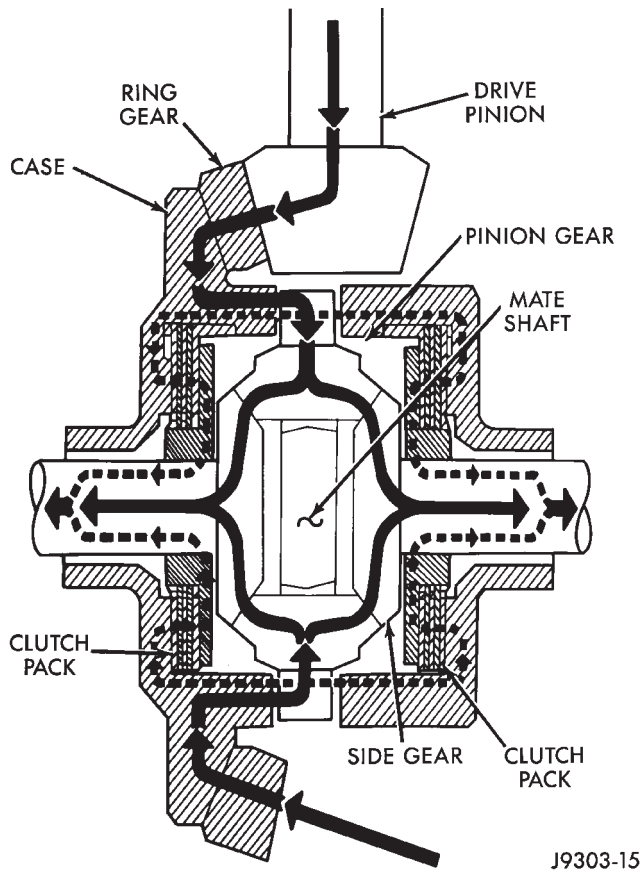


Fig. 3 Trac-lok Limited Slip Differential Operation

tional torque to the wheel having the most traction. Trac-lok differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel loses traction. Pulling power is provided continuously until both wheels 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

GENERAL INFORMATION

Axle bearing problem conditions are usually caused by:

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

Axle gear problem conditions are usually the result of:

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

Axle component breakage is most often the result of:

- Severe overloading.
- Insufficient lubricant.
- Incorrect lubricant.
- Improperly tightened components.

GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, or worn/damaged gears.

Gear noise usually happens at a specific speed range. The range is 30 to 40 mph, or above 50 mph. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, 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 and pinion gears 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 gear mate shaft can also cause a snapping or a knocking noise.

BEARING NOISE

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

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

DIAGNOSIS AND TESTING (Continued)

LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint or by worn side-gear thrust washers. A worn pinion gear 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 rear-end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be examined before starting any repair.

Refer to Group 22, Wheels and Tires, for additional vibration information.

DRIVELINE SNAP

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

- High engine idle speed
- 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/case clearance

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

TRAC-LOK DIFFERENTIAL NOISE

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

A container of Mopar® Trac-lok Lubricant (friction modifier) should be added after repair service or during a lubricant change.

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

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
WHEEL NOISE	<ol style="list-style-type: none"> 1. Wheel loose. 2. Faulty, brinelled wheel bearing. 	<ol style="list-style-type: none"> 1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Bent or sprung axle shaft. 3. End play in drive pinion bearings. 4. Excessive gear backlash between ring gear and pinion gear. 5. Improper adjustment of drive pinion gear shaft bearings. 6. Loose drive pinion gearshaft yoke nut. 7. Improper wheel bearing adjustment. 8. Scuffed gear tooth contact surfaces. 	<ol style="list-style-type: none"> 1. Inspect axle shaft tube alignment. Correct as necessary. 2. Replace bent or sprung axle shaft. 3. Refer to Drive Pinion Bearing Pre-Load Adjustment. 4. Check adjustment of ring gear backlash and pinion gear. Correct as necessary. 5. Adjust drive pinion shaft bearings. 6. Tighten drive pinion gearshaft yoke nut with specified torque. 7. Readjust as necessary. 8. If necessary, replace scuffed gears.
AXLE SHAFT BROKE	<ol style="list-style-type: none"> 1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch. 	<ol style="list-style-type: none"> 1. Replace broken axle shaft after correcting axle shaft tube alignment. 2. Replace broken axle shaft. Avoid excessive weight on vehicle. 3. Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. 4. Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	<ol style="list-style-type: none"> 1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation. 	<ol style="list-style-type: none"> 1. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. 2. Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. 3. Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. 4. Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	<ol style="list-style-type: none"> 1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire. 	<ol style="list-style-type: none"> 1. Replace scored gears. Scoring marks on the drive face of gear teeth or in the bore are caused by instantaneous fusing of the mating surfaces. Scored gears should be replaced. Fill rear differential housing to required capacity with proper lubricant. Refer to Specifications. 2. Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. 3. Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 1. Lubricant level too high. 	<ol style="list-style-type: none"> 1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

CONT., DIAGNOSIS CHART

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	<ol style="list-style-type: none"> 2. Worn axle shaft seals. 3. Cracked differential housing. 4. Worn drive pinion gear shaft seal. 5. Scored and worn yoke. 6. Axle cover not properly sealed. 	<ol style="list-style-type: none"> 2. Replace worn seals. 3. Repair or replace housing as necessary. 4. Replace worn drive pinion gear shaft seal. 5. Replace worn or scored yoke and seal. 6. Remove cover and clean flange and reseal.
AXLE OVERHEATING	<ol style="list-style-type: none"> 1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash. 	<ol style="list-style-type: none"> 1. Refill differential housing. 2. Drain, flush and refill with correct amount of the correct lubricant. 3. Readjust bearings. 4. Inspect gears for excessive wear or scoring. Replace as necessary. 5. Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	<ol style="list-style-type: none"> 1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments. 	<ol style="list-style-type: none"> 1. Replace gears. Examine other gears and bearings for possible damage. 2. Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. 3. Replace gears. Examine the remaining parts for possible damage. Replace parts as required. 4. Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	<ol style="list-style-type: none"> 1. Insufficient lubricant. 2. Improper ring gear and drive pinion gear adjustment. 3. Unmatched ring gear and drive pinion gear. 4. Worn teeth on ring gear or drive pinion gear. 5. Loose drive pinion gear shaft bearings. 6. Loose differential bearings. 7. Misaligned or sprung ring gear. 8. Loose differential bearing cap bolts 	<ol style="list-style-type: none"> 1. Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. 2. Check ring gear and pinion gear teeth contact pattern. 3. Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. 4. Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. 5. Adjust drive pinion gearshaft bearing preload torque. 6. Adjust differential bearing preload torque. 7. Measure ring gear runout. 8. Tighten with specified torque

DIAGNOSIS AND TESTING (Continued)

TRAC-LOK TEST

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

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

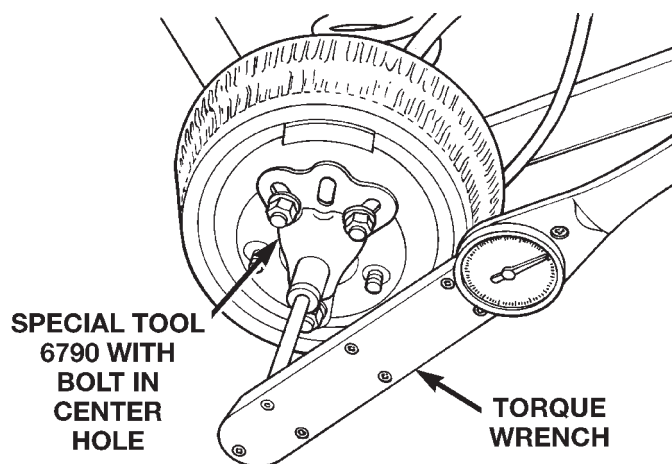
(1) Place blocks in front and rear of both front wheels.

(2) Raise one rear wheel until it is completely off the ground.

(3) Engine off, transmission in neutral, and parking brake off.

(4) Remove wheel and bolt Special Tool 6790 to studs.

(5) Use torque wrench on special tool to rotate wheel and read rotating torque (Fig. 4).



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Fig. 4 Trac-lok Test —Typical

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

SERVICE PROCEDURES

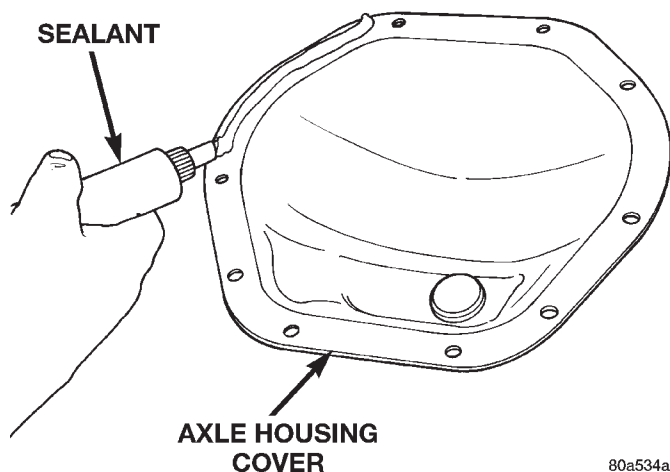
LUBRICANT CHANGE

- (1) Raise and support the vehicle.
- (2) Remove the lubricant fill hole plug from the differential housing cover.
- (3) Remove the differential housing cover and drain the lubricant from the housing.

(4) Clean the housing cavity with a flushing oil, light engine oil, or lint free cloth. **Do not use water, steam, kerosene, or gasoline for cleaning.**

(5) Remove the original sealant from the housing and cover surfaces.

(6) Apply a bead of Mopar® Silicone Rubber Sealant, or equivalent, to the housing cover (Fig. 5).



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Fig. 5 Apply Sealant

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

(7) Install the cover and any identification tag. Tighten the cover bolts to 41 N·m (30 ft. lbs.) torque.

(8) For Trac-lok differentials, a quantity of Mopar® Trac-lok lubricant (friction modifier), or equivalent, must be added after repair service or a lubricant change. Refer to the Lubricant Specifications section of this group for the quantity necessary.

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

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

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

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

REMOVAL AND INSTALLATION

REAR AXLE

REMOVAL

- (1) Raise and support the vehicle.

REMOVAL AND INSTALLATION (Continued)

- (2) Position a suitable lifting device under the axle.
- (3) Secure axle to device.
- (4) Remove the wheels and tires.
- (5) Secure brake drums to the axle shaft.
- (6) Remove the RWAL sensor from the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.
- (7) Disconnect the brake hose at the axle junction block. Do not disconnect the brake hydraulic lines at the wheel cylinders. Refer to Group 5, Brakes, for proper procedures.
- (8) Disconnect the parking brake cables and cable brackets.
- (9) Disconnect the vent hose from the axle shaft tube.
- (10) Mark the propeller shaft and yoke for installation alignment reference.
- (11) Remove propeller shaft.
- (12) Disconnect shock absorbers from axle.
- (13) Remove the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
- (14) Separate the axle from the vehicle.

INSTALLATION

- (1) Raise the axle with lifting device and align to the leaf spring centering bolts.
- (2) Install the spring clamps and spring brackets. Refer to Group 2, Suspension, for proper procedures.
- (3) Install shock absorbers and tighten nuts to 82 N·m (60 ft. lbs.) torque.
- (4) Install the RWAL sensor to the differential housing, if necessary. Refer to Group 5, Brakes, for proper procedures.
- (5) Connect the parking brake cables and cable brackets.
- (6) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.
- (7) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.
- (8) Install axle vent hose.
- (9) Align propeller shaft and pinion yoke reference marks. Install universal joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.
- (10) Install the wheels and tires.
- (11) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.
- (12) Remove lifting device from axle and lower the vehicle.

AXLE SHAFT

CAUTION: RAISE BOTH REAR WHEELS OFF THE SURFACE WHENEVER A REAR AXLE IS BEING SERVICED.

REMOVAL

- (1) Remove the axle shaft flange bolts.
- (2) Slide the axle shaft out from the axle tube.

INSTALLATION

- (1) Clean the gasket contact surface area on the flange with an appropriate solvent. Install a new flange gasket and slide the axle shaft into the tube.
- (2) Install the bolts and tighten to 122 N·m (90 ft. lbs.).

HUB AND AXLE BEARINGS

REMOVAL

- (1) Remove wheel and tire assembly.
- (2) Remove brake drum.
- (3) Remove the axle shaft.
- (4) Remove the lock wedge and adjustment nut. Use Socket DD-1241-JD to remove the adjustment nut.
- (5) Remove the hub assembly. The outer axle bearing will slide out as the hub is being removed.
- (6) Remove inner grease seal and discard. Use Installer 5064 and Handle C-4171 to drive grease seal and inner axle bearing from the hub.
- (7) Remove the bearing cups from the hub bore. Use a brass drift, or an appropriate removal tool, to tap out the cups.

INSTALLATION

- (1) Thoroughly clean both axle bearings and interior of the hub with an appropriate cleaning solvent.
- (2) Install the bearing cups. Use Installer 8153 and Handle C-4171 to install the bearing cups.
- (3) Apply lubricant to surface area of the bearing cup.
- (4) Install the inner axle bearing in the hub.
- (5) Install a new bearing grease seal. Use Installer 8152 and Handle C-4171 to install the grease seal.
- (6) Inspect the bearing and seal contact surfaces on the axle tube spindle for burrs and/or roughness. Remove all the rough contact surfaces from the axle spindle. Apply a coating of multi-purpose NLGI, grade 2, EP-type lubricant to the axle.

CAUTION: Use care to prevent the bearing grease seal from contacting the axle tube spindle threads during installation. Otherwise, the seal could be damaged.

- (7) Carefully slide the hub onto the axle.

REMOVAL AND INSTALLATION (Continued)

- (8) Install the outer axle bearing.
- (9) Install the hub bearing adjustment nut. Use Socket DD-1241-JD to install the adjustment nut.
- (10) Tighten the adjustment nut to 163-190 N·m (120-140 ft. lbs.) while rotating the wheel.
- (11) Loosen the adjustment nut 1/8 of-a-turn to provide 0.001-inch to 0.010-inch wheel bearing end play.
- (12) Tap the locking wedge into the spindle keyway and adjustment nut. Try to ensure that the locking wedge is installed into a new position in the adjustment nut.
- (13) Install the axle shaft.
- (14) Install the brake drum.
- (15) Install the wheel and tire assembly.

PINION SEAL

REMOVAL

- (1) Raise and support the vehicle.
- (2) Scribe a mark on the universal joint, pinion yoke, and pinion shaft for reference.
- (3) Disconnect the propeller shaft from the pinion yoke. Secure the propeller shaft in an upright position to prevent damage to the rear universal joint.
- (4) Remove the wheel and tire assemblies.
- (5) Remove the brake drums to prevent any drag. The drag may cause a false bearing preload torque measurement.
- (6) Rotate the pinion yoke three or four times.
- (7) Measure the amount of torque necessary to rotate the pinion gear with a (in. lbs.) dial-type torque wrench. Record the torque reading for installation reference.
- (8) Hold the yoke with Wrench 6719. Remove the pinion shaft nut and washer.
- (9) Remove the yoke with Remover C-452 (Fig. 6).

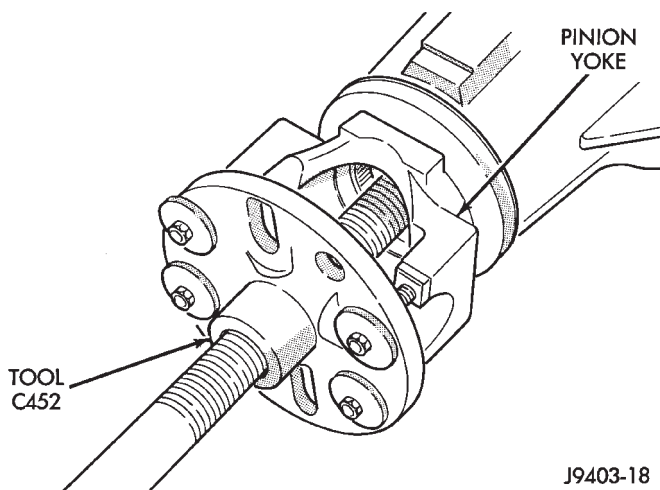


Fig. 6 Yoke Removal

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

INSTALLATION

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

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

- (4) Apply a light coating of gear lubricant on the lip of pinion seal.
- (5) Install the new pinion shaft seal with Installer D-187-B and Handle C-4171.

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

- (6) Position the pinion yoke on the end of the shaft with the reference marks aligned.
- (7) Seat yoke on pinion shaft with Installer D-191 and Wrench 6719 (Fig. 7).
- (8) Remove the tools and install the pinion yoke washer and nut.

CAUTION: Do not exceed the minimum tightening torque when installing the pinion yoke retaining nut at this point. Damage to bearings may result.

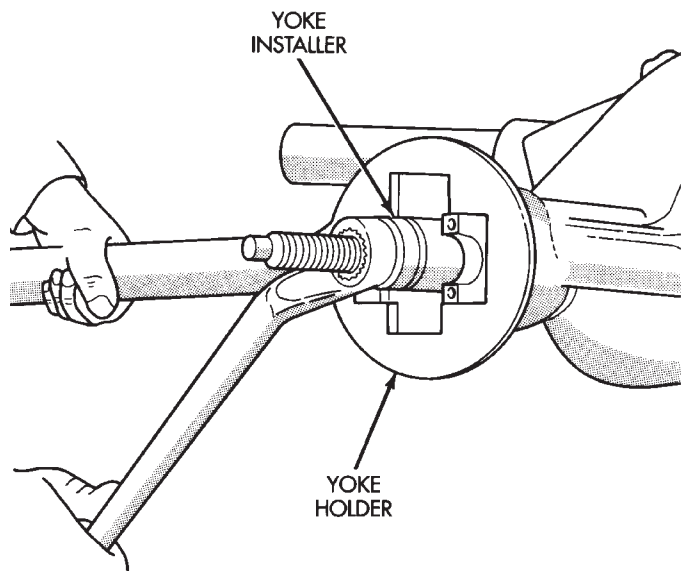


Fig. 7 Yoke Installation

- (9) Hold pinion yoke with Yoke Holder 6719 and tighten shaft nut to 597 N·m (440 ft. lbs.) (Fig. 8).

REMOVAL AND INSTALLATION (Continued)

Rotate pinion shaft several revolutions to ensure the bearing rollers are seated.

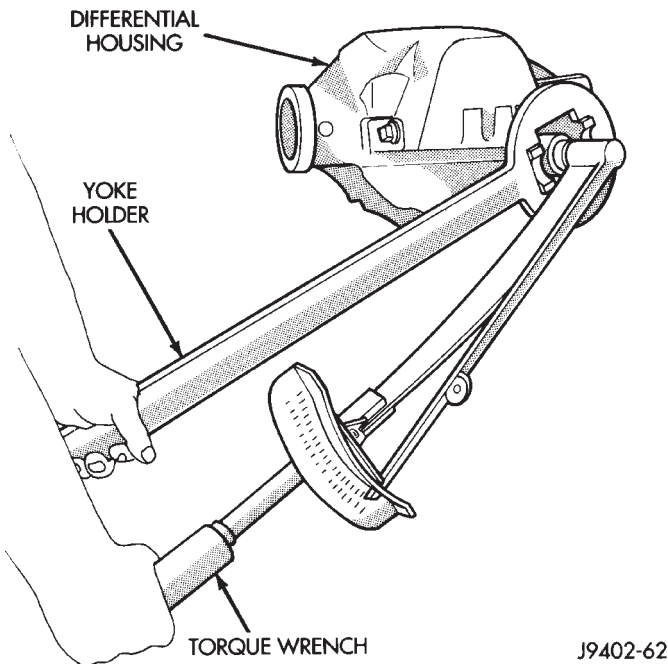


Fig. 8 Tightening Pinion Shaft Nut

(10) Rotate the pinion shaft using a (in. lbs.) torque wrench. Rotating resistance torque should be equal to the reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.) (Fig. 9).

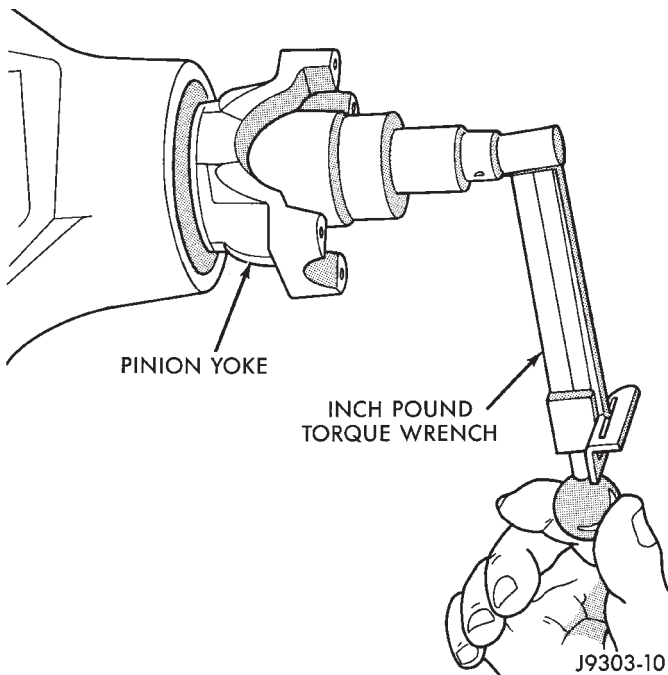


Fig. 9 Check Pinion Rotation Torque

(11) If the rotating torque is low, use Yoke Holder 6719 to hold the pinion yoke (Fig. 8) and tighten the

pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until proper rotating torque is achieved.

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

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

(13) Tighten the universal joint yoke clamp screws to 19 N·m (14 ft. lbs.).

(14) Install the brake drums.

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

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

DIFFERENTIAL

REMOVAL

(1) Remove axle shafts.

(2) Note the orientation of the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 10).

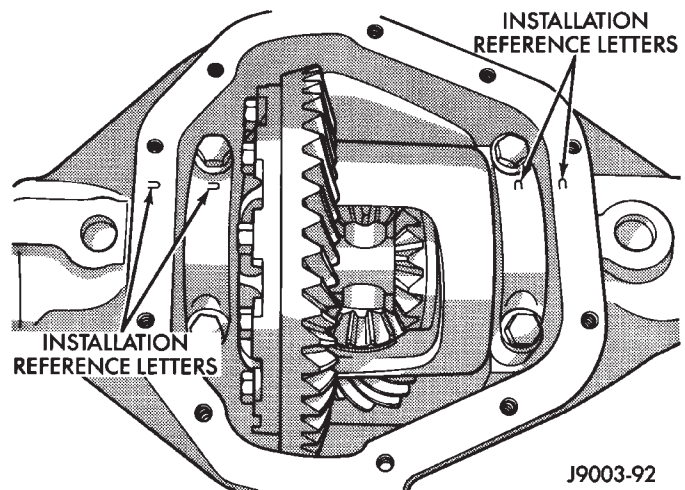


Fig. 10 Bearing Cap Identification

(3) Remove the differential bearing caps.

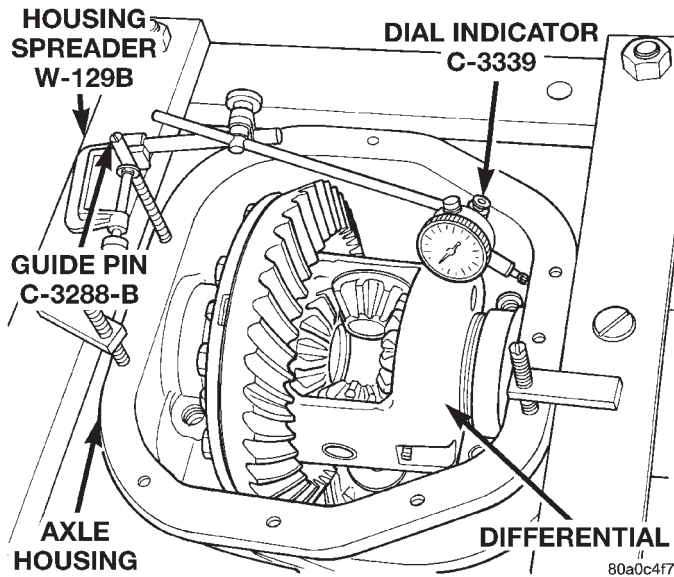
(4) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 11).

(5) Install the hold down clamps and tighten the tool turnbuckle finger-tight.

(6) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach dial indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 11) and zero the indicator.

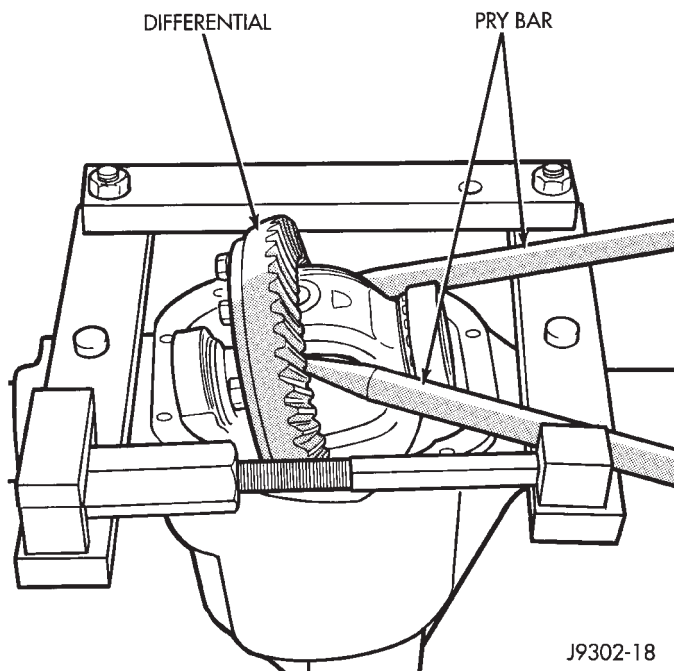
(7) Spread the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 11).

REMOVAL AND INSTALLATION (Continued)

**Fig. 11 Spread Differential Housing**

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

- (8) Remove the dial indicator.
- (9) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 12).

**Fig. 12 Differential Removal**

- (10) Remove the case from housing. Mark or tag bearing cups to indicate which side they were removed from.

INSTALLATION

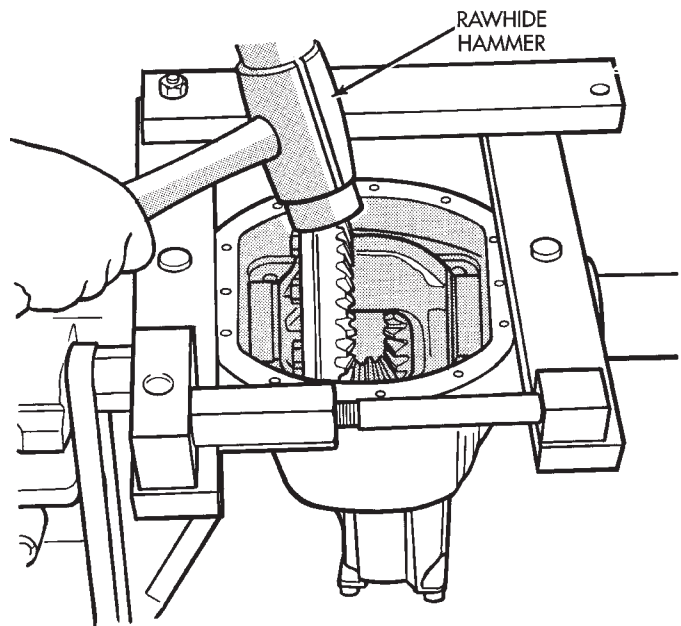
(1) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 11). Install the hold down clamps and tighten the tool turnbuckle finger-tight.

(2) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach dial indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 11) and zero the indicator.

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 11).

CAUTION: Do not spread over 0.50 mm (0.020 in). If the housing is over-spread, it could be distorted or damaged.

- (4) Remove the dial indicator.
- (5) Install differential in housing.
- (6) Install case in the housing. Tap the differential case with a rawhide or rubber mallet to ensure the bearings are fully seated in the differential housing (Fig. 13).
- (7) Remove the spreader.



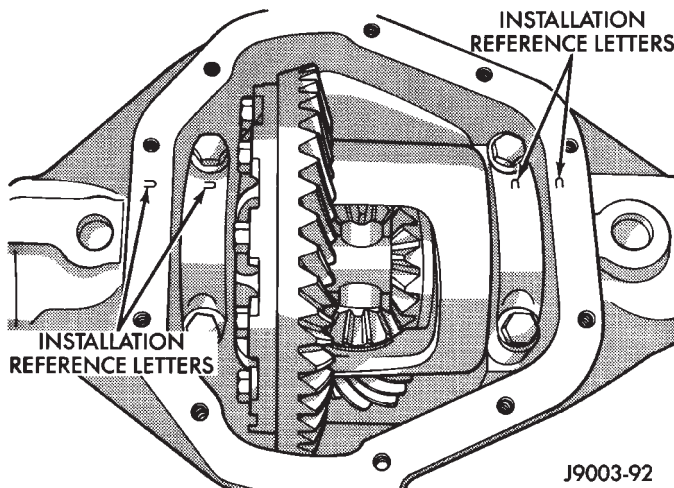
J9302-19

Fig. 13 Differential Installation

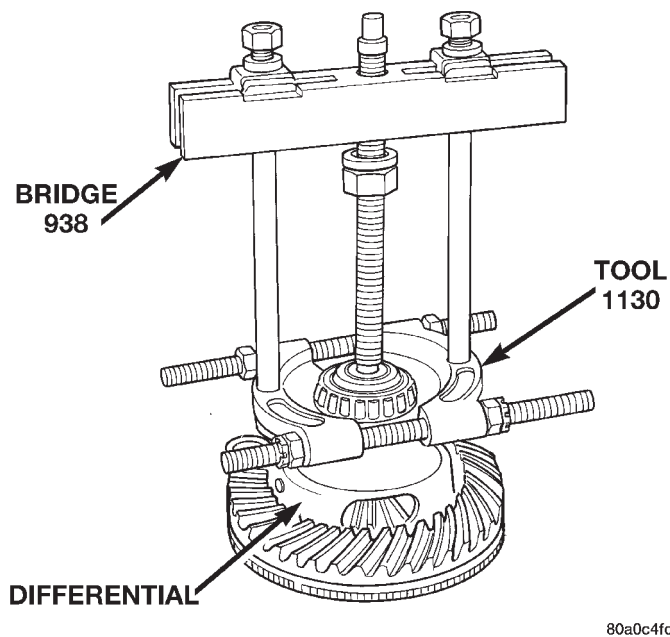
(8) Install the bearing caps at their original locations (Fig. 14). Tighten the bearing cap bolts to 109 N·m (80 ft. lbs.) torque.

- (9) Install axle shafts.

REMOVAL AND INSTALLATION (Continued)

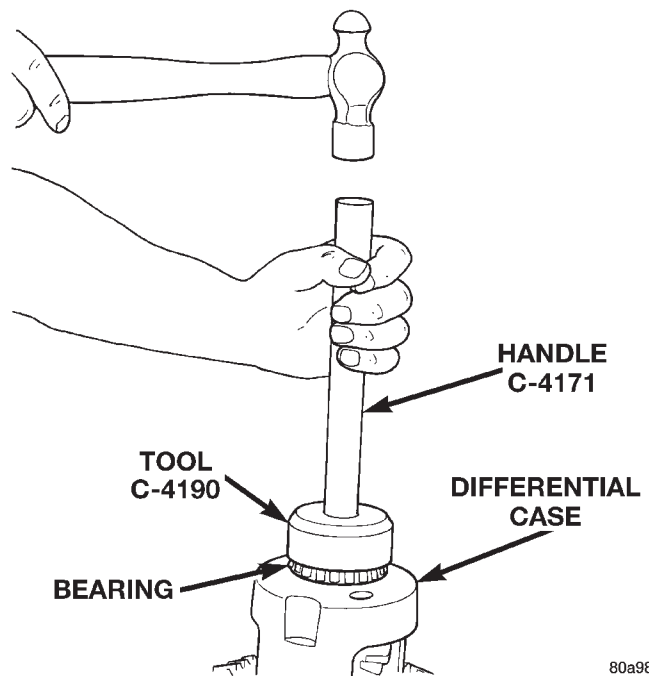
**Fig. 14 Differential Bearing Cap Reference Letters****DIFFERENTIAL SIDE BEARINGS****REMOVAL**

- (1) Remove differential case from axle housing.
- (2) Remove the bearings from the differential case with Press 938 and Bearing Splitter 1130 (Fig. 15).

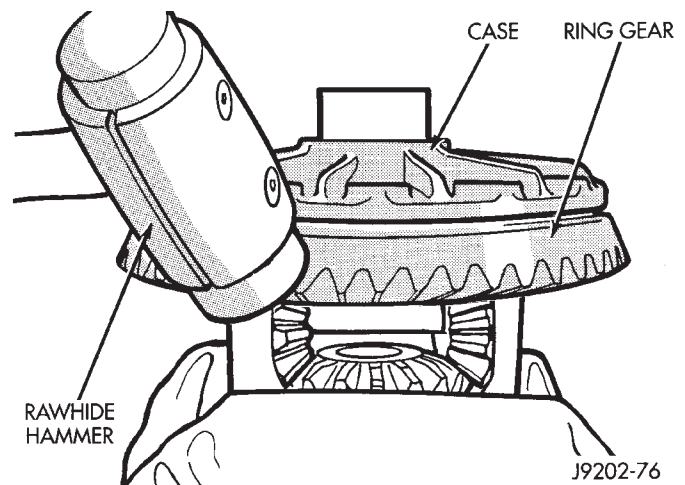
**Fig. 15 Differential Bearing Removal****INSTALLATION**

If ring and pinion gears have been replaced, verify differential side bearing preload and gear mesh backlash.

- (1) Using tool C-4190 with handle C-4171, install differential side bearings (Fig. 16).
- (2) Install differential in axle housing.

**Fig. 16 Install Differential Side Bearings****RING GEAR AND EXCITER RING****REMOVAL**

- (1) Remove the differential case from axle housing.
- (2) Clamp the differential case in a vise equipped with soft jaws.
- (3) Remove and discard the ring gear bolts.
- (4) Tap the ring gear off with a rawhide or plastic mallet (Fig. 17).

**Fig. 17 Ring Gear Removal**

REMOVAL AND INSTALLATION (Continued)

(5) The exciter ring can be removed with a soft-faced hammer (Fig. 18). Discard exciter ring after removal.

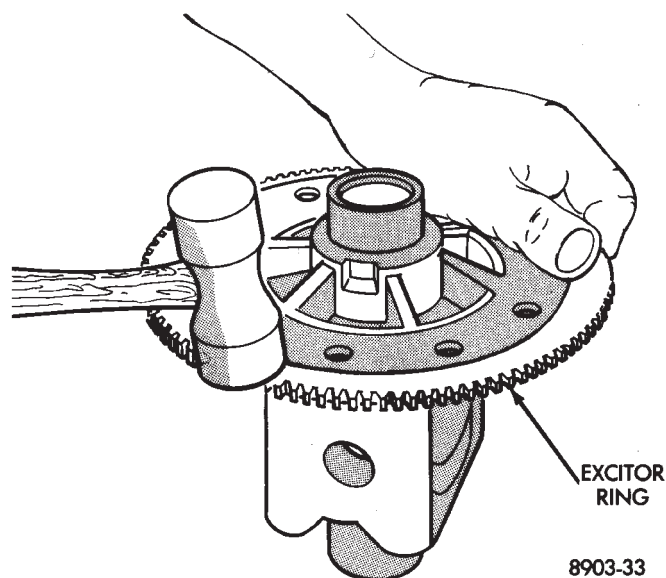


Fig. 18 Exciter Ring Removal

INSTALLATION

(1) If exciter ring was removed, align exciter ring tab with slot in differential case (Fig. 19).

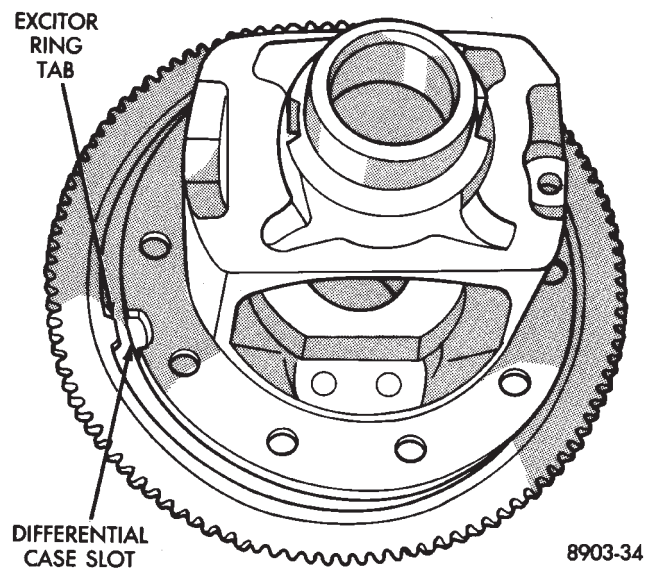


Fig. 19 Exciter Ring Alignment

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

(3) Press the exciter ring onto the differential case using the ring gear as a pilot (Fig. 20).

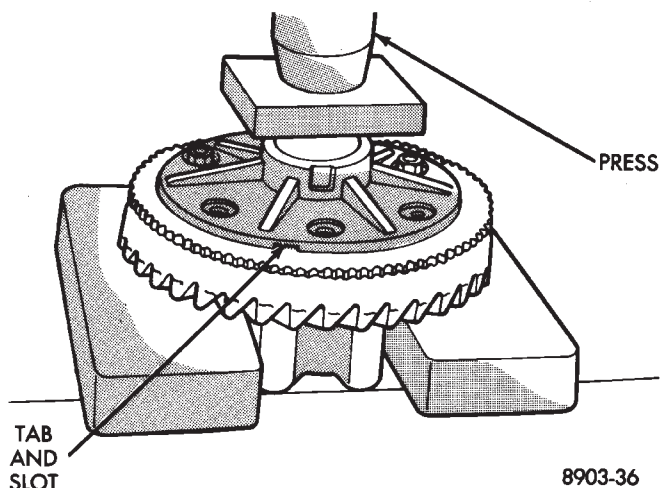


Fig. 20 Ring Gear Bolt Hole Alignment

(4) Install new ring gear bolts and alternately tighten to 272-325 N·m (200-240 ft. lbs.) torque.

PINION GEAR

REMOVAL

(1) Remove differential assembly from axle housing.

(2) Remove the pinion yoke nut and washer. Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 21).

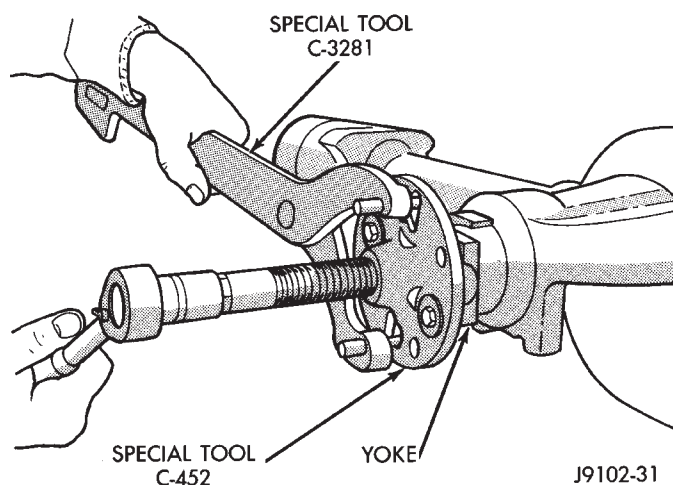


Fig. 21 Pinion Yoke Removal

REMOVAL AND INSTALLATION (Continued)

(3) Remove the pinion gear from housing (Fig. 22). Catch the pinion with your hand to prevent it from falling and being damaged.

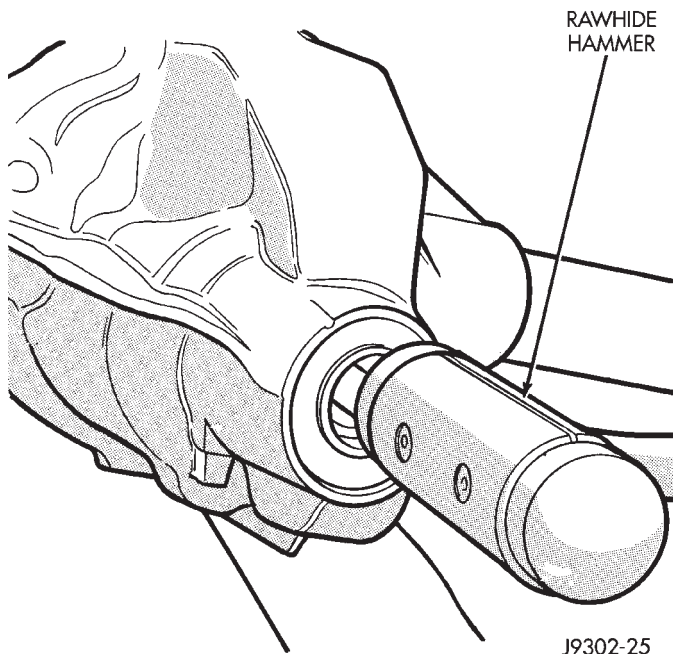


Fig. 22 Remove Pinion Gear

(4) Remove the pinion gear seal with a slide hammer or pry out with bar.

(5) Remove oil slinger, front bearing.

(6) Remove the front pinion bearing cup and seal with Remover C-4307 (Fig. 23).

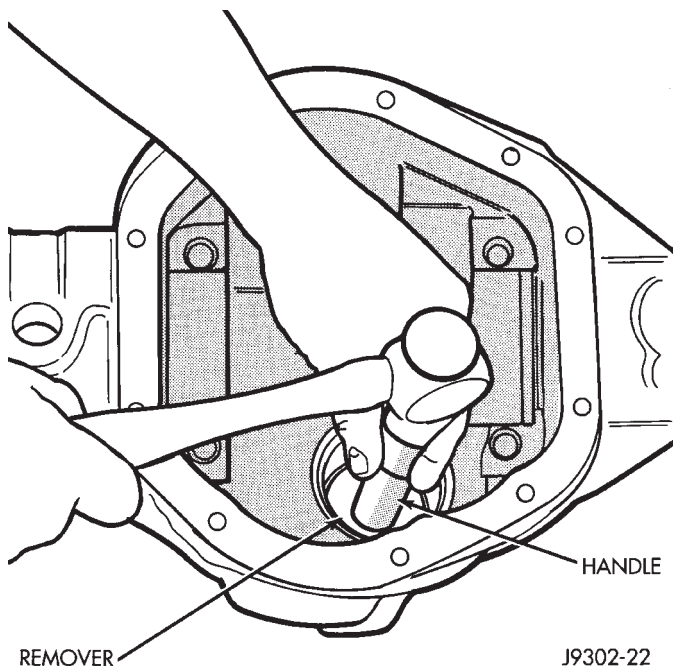


Fig. 23 Front Bearing Cup Removal

(7) Using Remover D-159, remove the rear bearing cup from housing (Fig. 24).

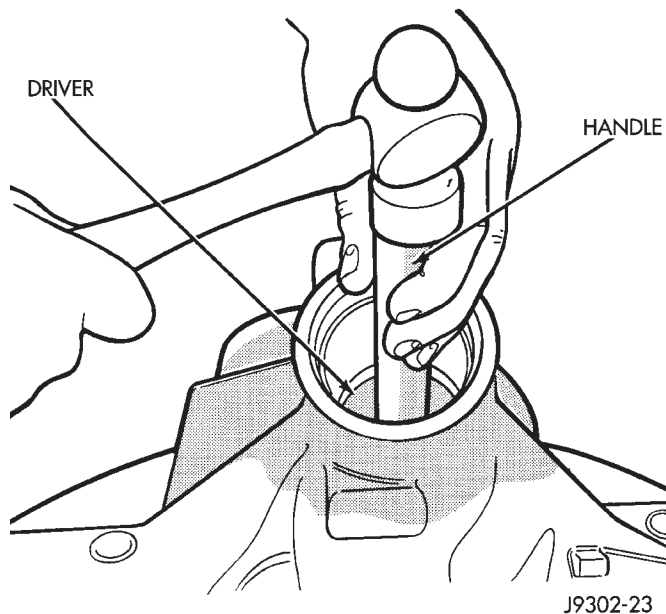


Fig. 24 Rear Bearing Cup Removal

(8) Remove the preload shims (Fig. 25).

(9) Remove the inner bearing from the pinion with Splitter 1130 and Bridge 938 (Fig. 26).

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

INSTALLATION

After selecting the proper pinion depth shim using the Pinion Depth Measurement paragraph in the Adjustment section of this Group, proceed with installation procedure.

(1) Place pinion depth shims in axle housing rear bearing bore.

(2) Install the pinion rear bearing cup with Installer C-4204 (Fig. 27). Ensure cup is correctly seated.

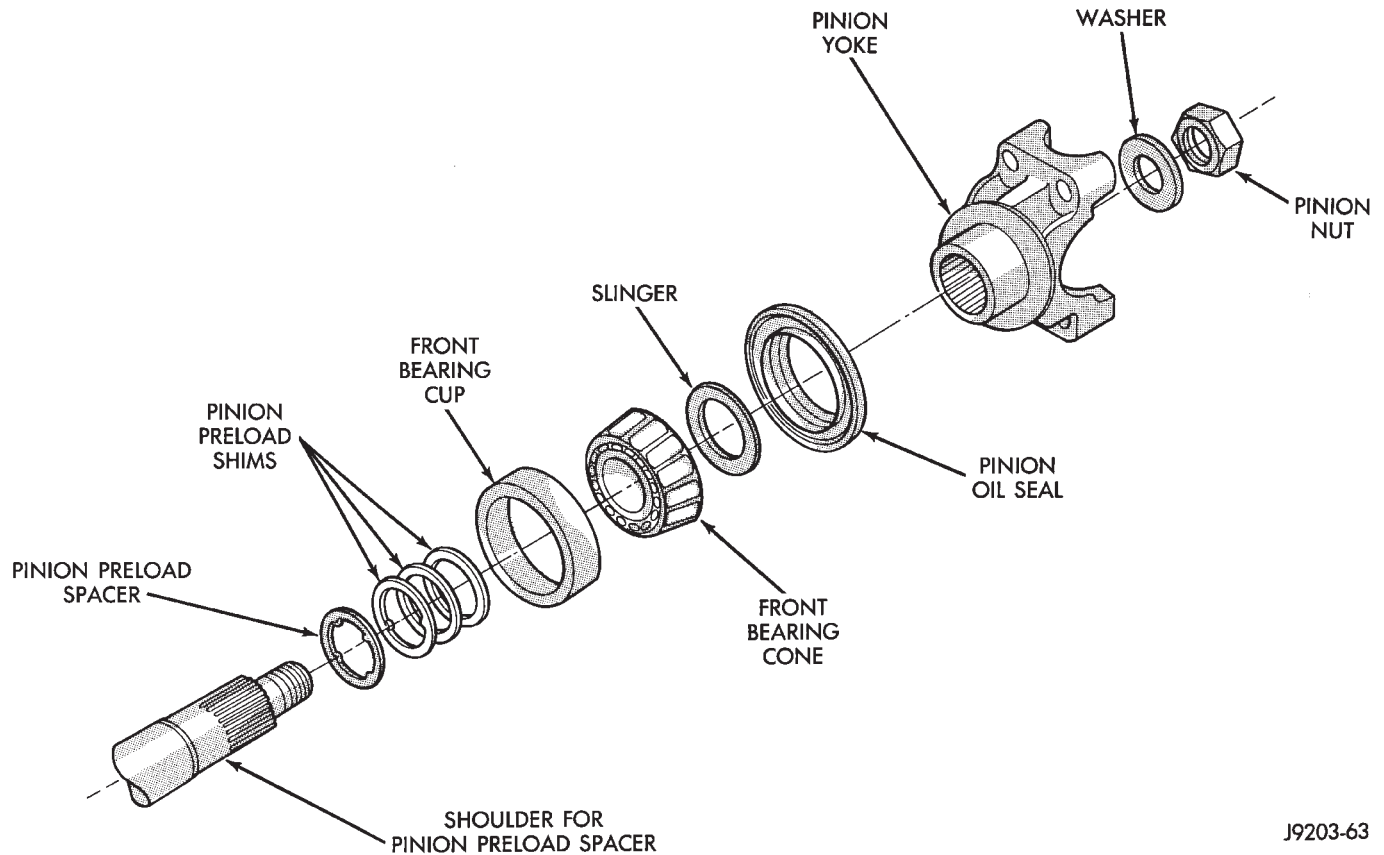


Fig. 25 Pinion Preload Shims

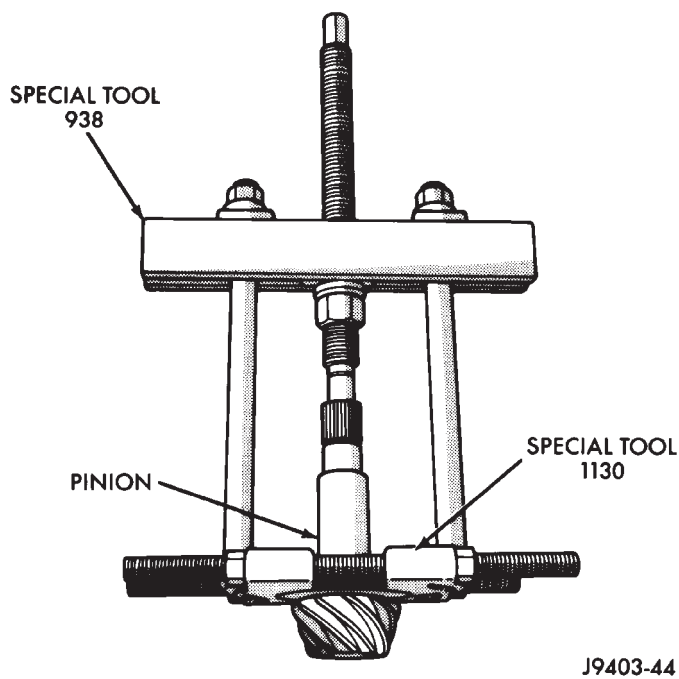


Fig. 26 Inner Bearing Removal

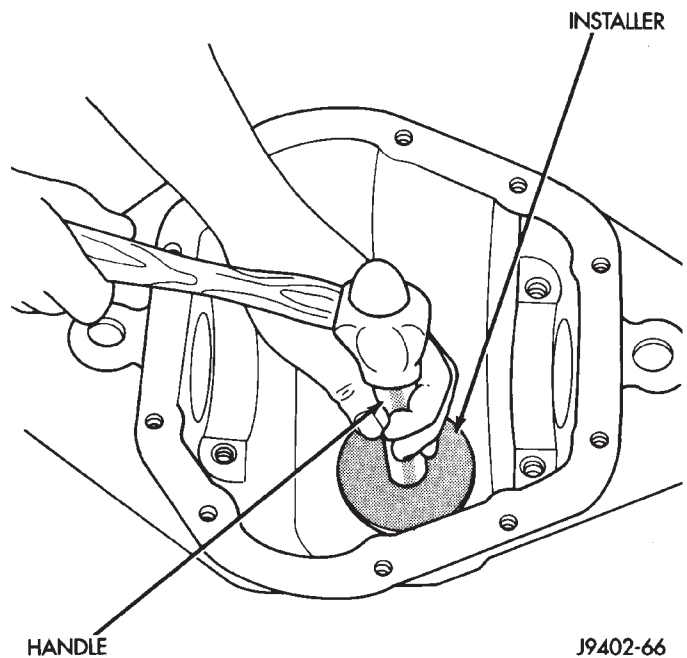


Fig. 27 Pinion Rear Bearing Cup Installation

REMOVAL AND INSTALLATION (Continued)

(3) Install the pinion front bearing cup with Installer C-4308 (Fig. 28).

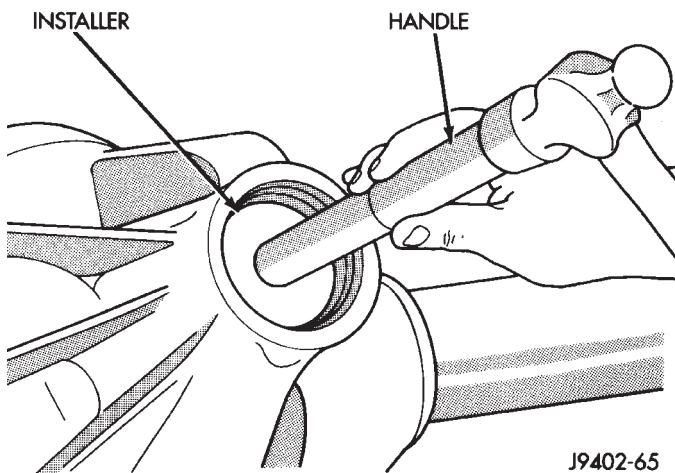


Fig. 28 Pinion Front Bearing Cup Installation

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

(5) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D-187-B and Handle C-4171 (Fig. 29).

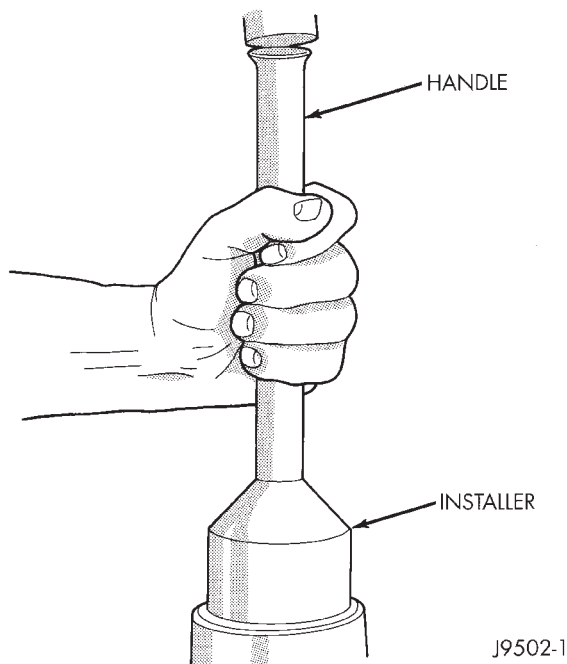


Fig. 29 Pinion Seal Installation

(6) Install the rear bearing and slinger, if equipped, on the pinion gear with Installer D-389 (Fig. 30).

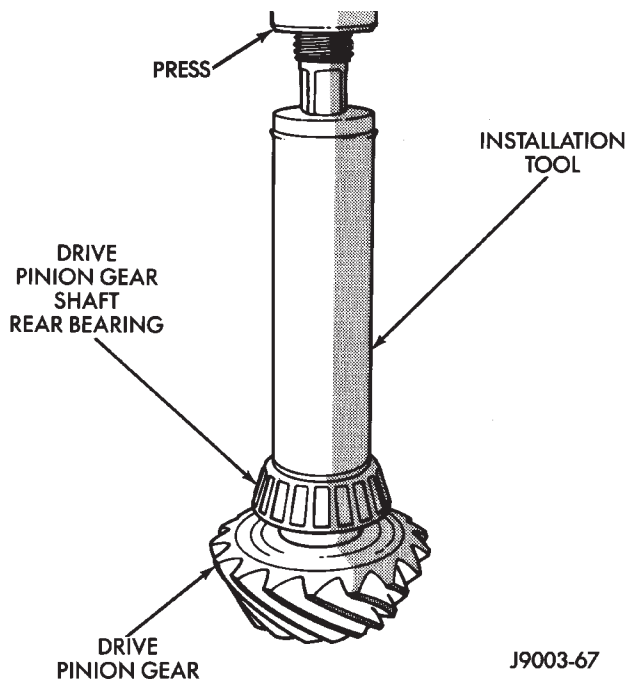


Fig. 30 Shaft Rear Bearing Installation

(7) Install pinion bearing preload shims (Fig. 31).

(8) Install yoke with Installer D-191 (Fig. 32).

(9) Install the yoke washer and a new nut on the pinion gear. Install yoke washer with concave surface against the yoke.

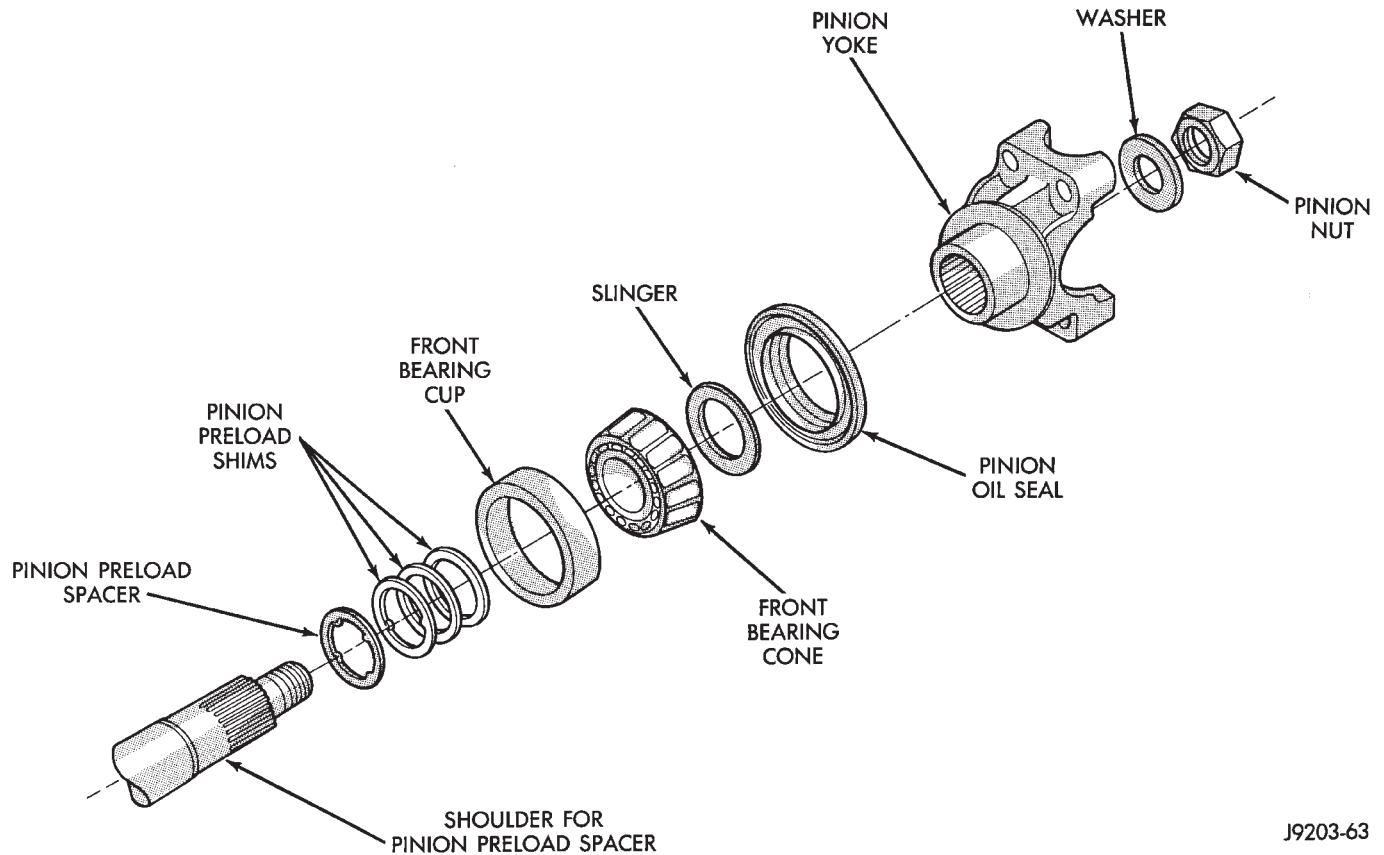


Fig. 31 Pinion Preload Shims

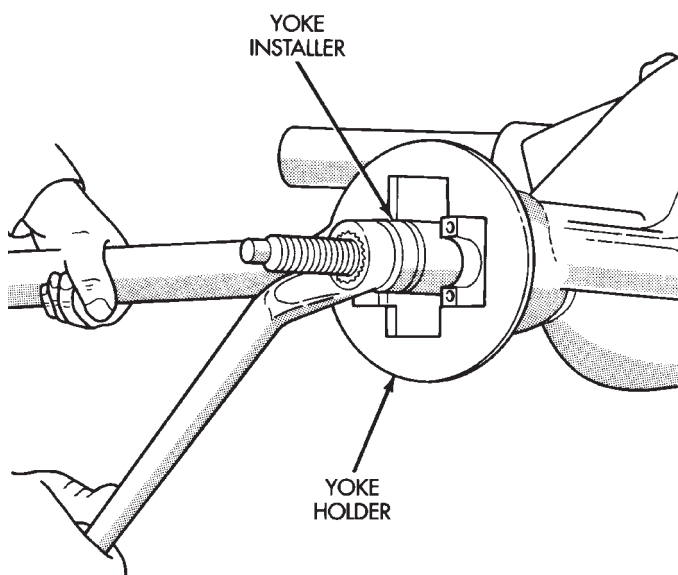


Fig. 32 Pinion Yoke Installation

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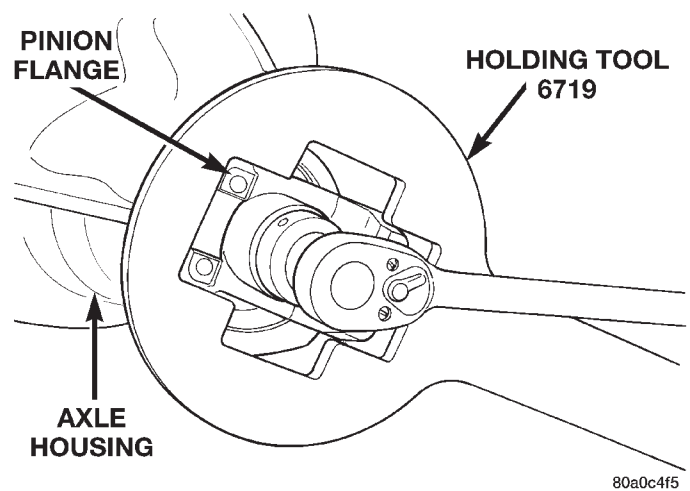


Fig. 33 Tightening Pinion Nut

REMOVAL AND INSTALLATION (Continued)

(10) Hold pinion yoke with Yoke Holder 6719 and tighten shaft nut to 597 N·m (440 ft. lbs.) (Fig. 34). Rotate pinion shaft several revolutions to ensure the bearing rollers are seated.

(11) Check bearing preload torque with an inch pound torque wrench (Fig. 35). The torque necessary to rotate the pinion gear should be:

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

(12) If rotating torque is above the desired amount, remove the pinion yoke and increase the preload shim pack thickness. Increasing the shim pack thickness 0.025 mm (0.001 in.) will decrease the rotating torque approximately 0.9 N·m (8 in. lbs.).

(13) Tighten pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until the maximum tightening or desired rotating torque is reached.

(14) If the maximum tightening torque is reached prior to achieving the desired tightening torque, remove the pinion yoke and decrease the thickness of the preload shim pack. Decreasing the shim pack thickness 0.025 mm (0.001 in.) will increase the rotating torque approximately 0.9 N·m (8 in. lbs.).

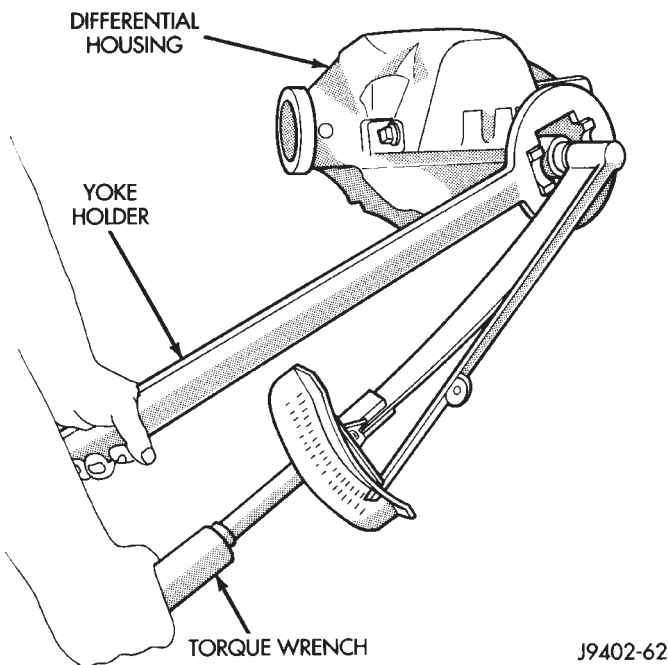


Fig. 34 Tighten Pinion Nut

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

- (1) Remove roll-pin holding mate shaft in housing.
- (2) Remove pinion gear mate shaft (Fig. 36).
- (3) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 37).

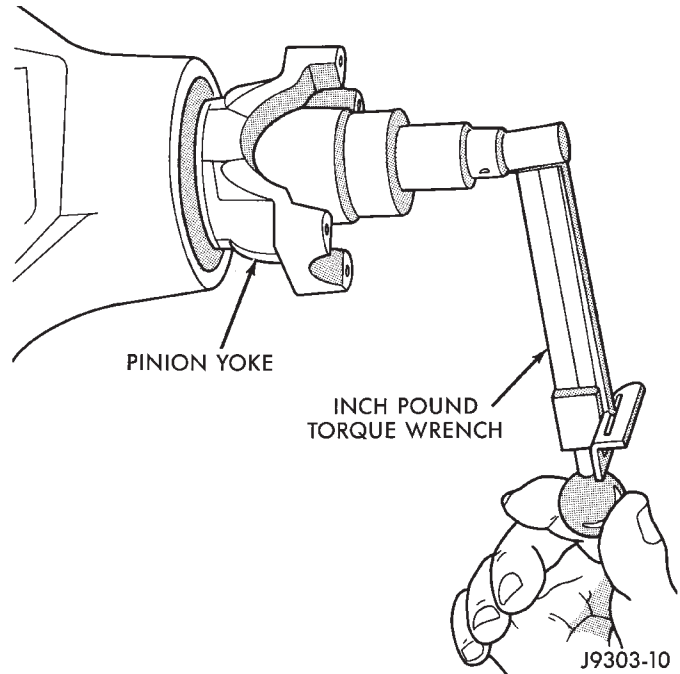


Fig. 35 Check Pinion Gear Rotation Torque

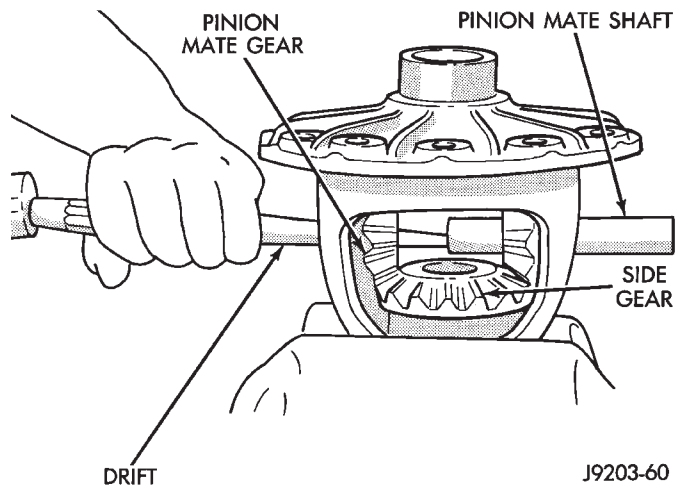


Fig. 36 Pinion Mate Shaft Removal

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

ASSEMBLY

- (1) Install the differential side gears and thrust washers.
- (2) Install the pinion mate gears and thrust washers.
- (3) Install the pinion gear mate shaft.
- (4) Align the hole in the pinion gear mate shaft with the hole in the differential case.
- (5) Install and seat the pinion mate shaft roll-pin in the differential case and mate shaft with a punch and hammer (Fig. 38). Peen the edge of the roll-pin hole in the differential case slightly in two places, 180° apart.

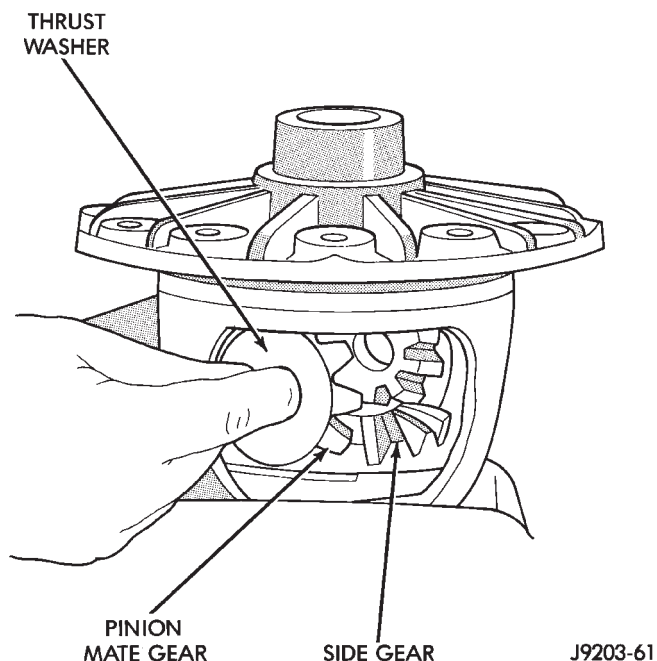


Fig. 37 Pinion Mate Gear Removal

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

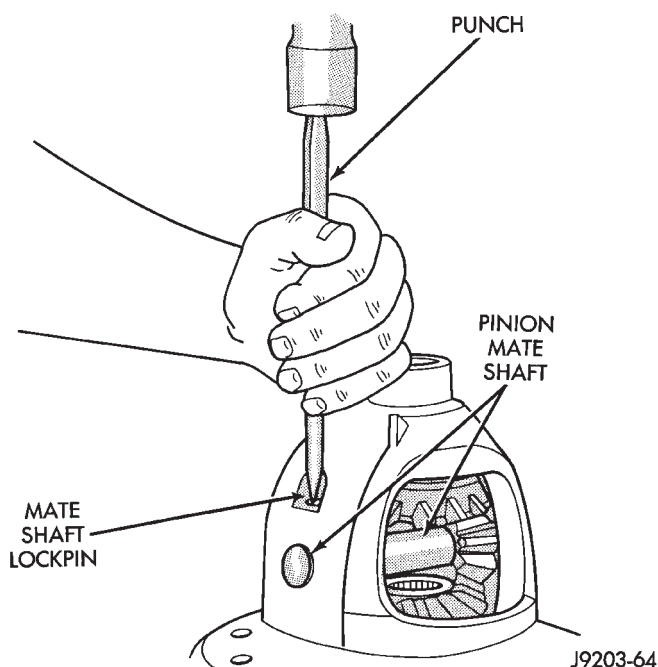


Fig. 38 Pinion Mate Shaft Roll-Pin Installation

TRAC-LOK DIFFERENTIAL

The 286 RBI Trac-Lok differential has a one-piece cross shaft and uses 6 disc and 5 plates for each clutch pack. Only one disc in each clutch pack is dished.

DISASSEMBLY

Pay close attention to the clutch pack arrangement during this procedure. Note the direction of the concave and convex side of the plates and discs.

(1) Mark the ring gear half and cover half for installation reference (Fig. 39).

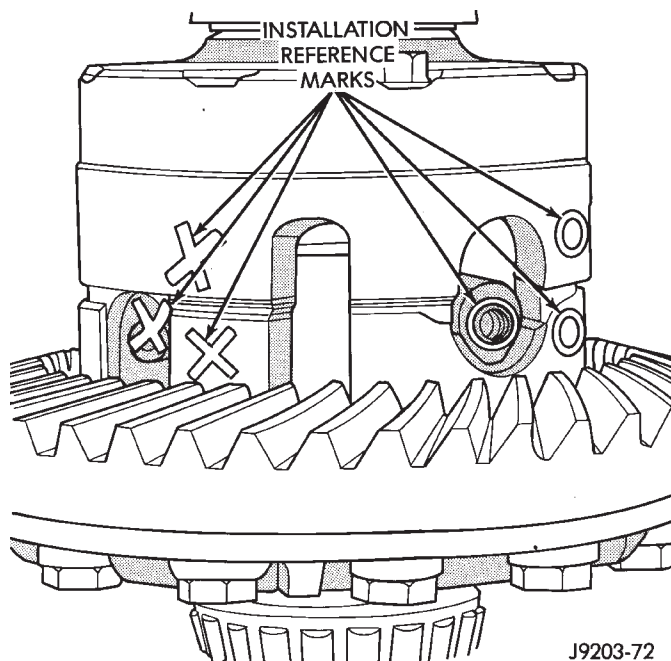


Fig. 39 Case Marked

(2) Remove the case attaching bolts and remove the button cover half (Fig. 40).

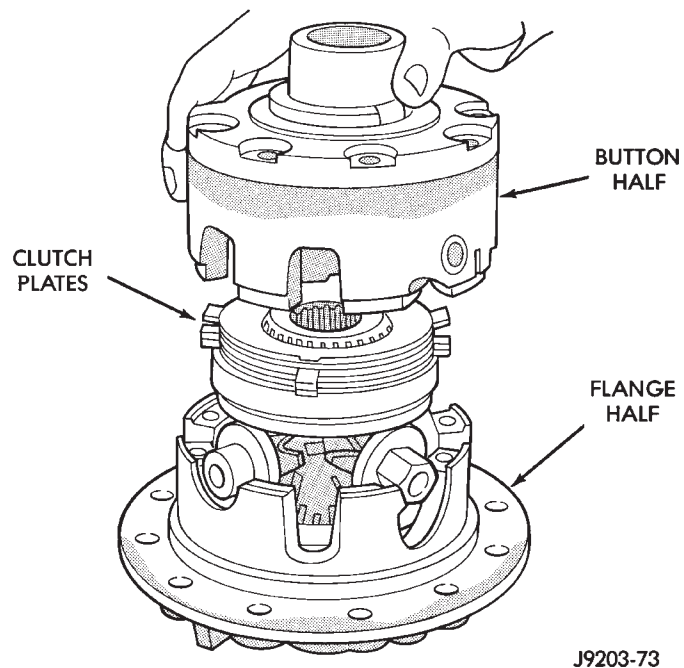
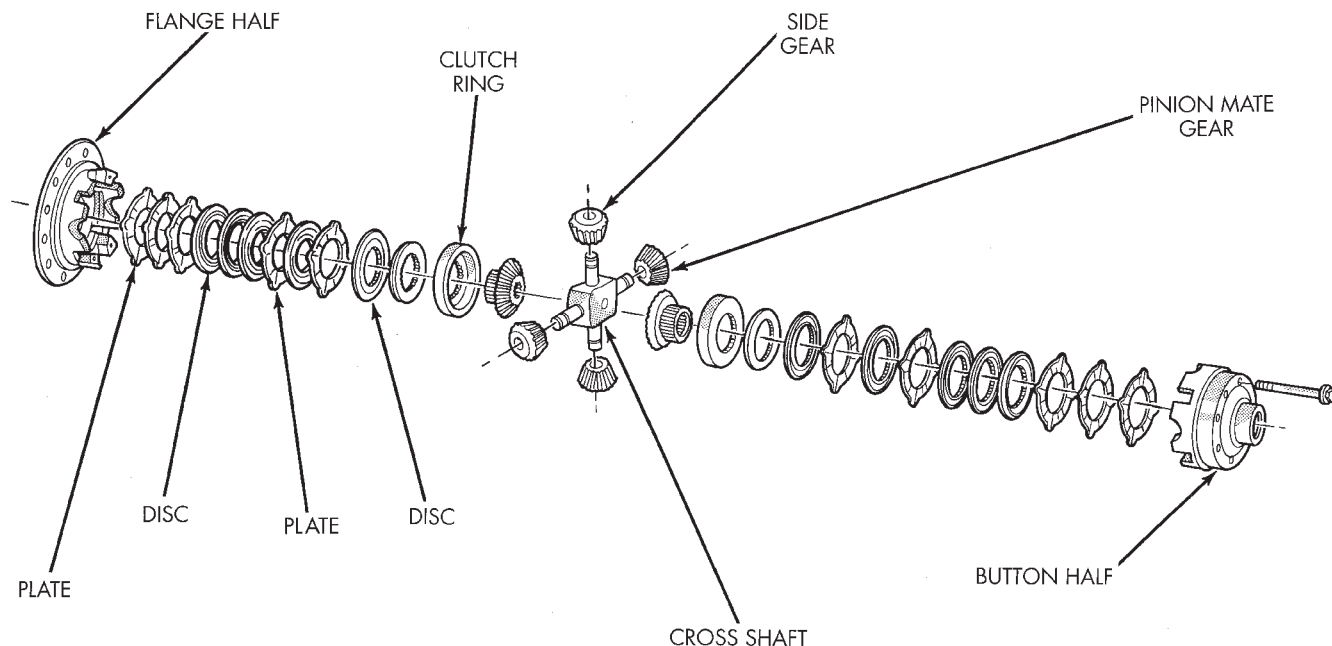


Fig. 40 Cover Half Removal

DISASSEMBLY AND ASSEMBLY (Continued)



J9503-8

Fig. 41 Trac-Lok Components

- (3) Remove top clutch pack (Fig. 41).
- (4) Remove top side gear clutch ring.
- (5) Remove top side gear.
- (6) Remove pinion mate gears and cross shaft.
- (7) Remove the same parts listed above from the ring gear flange half of the case. Keep these parts with the flange cover half for correct installation in their original positions.

ASSEMBLY

The clutch discs are replaceable as complete sets only. **If one clutch disc pack is damaged, both packs must be replaced.** Lubricate each component with gear lube before assembly and installation.

- (1) Saturate the clutch plates with Mopar® Hypoid Gear Lubricant or Additive (Fig. 42). Assemble clutch packs into the side gear plate in exactly the same position as removed (Fig. 41).

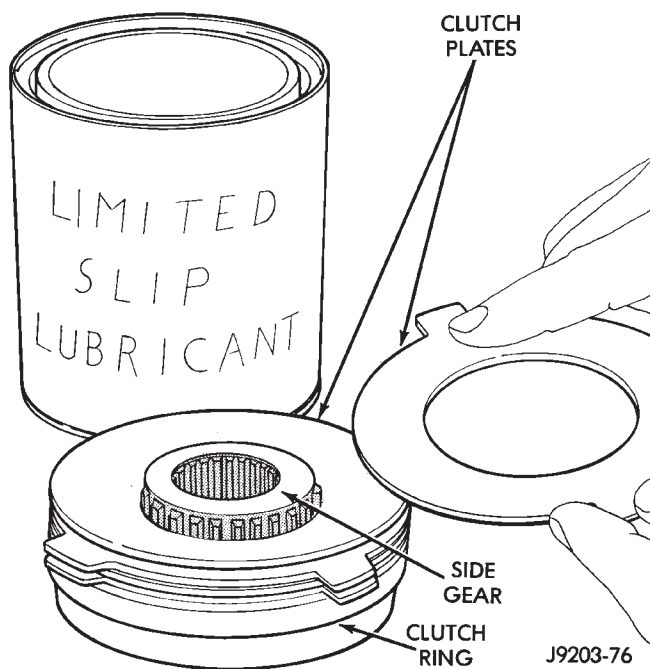
- (2) Line up the plate ears and install the assembled pack into the flange half (Fig. 43). Make sure the clutch plate lugs enter the slots in the case. Also make sure the clutch pack bottoms out on the case.

- (3) Install pinion mate shafts and pinion mate gears (Fig. 44). **Make sure shafts are correctly installed according to the alignment marks.**

- (4) Lubricate and install the other side gear and clutch pack (Fig. 43).

- (5) Correctly align and assemble button half to flange half. Install case body screws finger tight.

- (6) Tighten body screws alternately and evenly. Tighten screws to 89-94 N·m (65-70 ft. lbs.) torque (Fig. 45).



J9203-76

Fig. 42 Clutch Pack Assembly

If bolt heads have 7 radial lines or the number 180 stamped on the head, tighten these bolts to 122-136 N·m (90-100 ft. lbs.) torque.

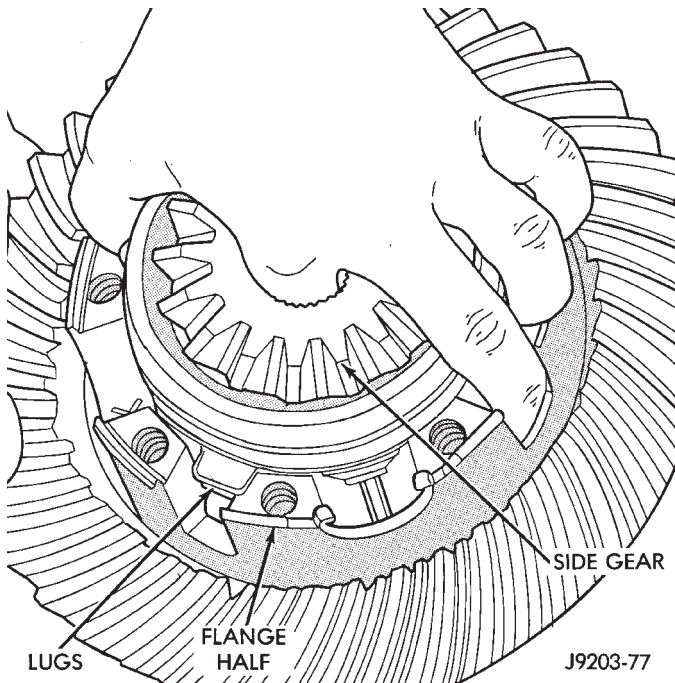


Fig. 43 Clutch Pack Installation

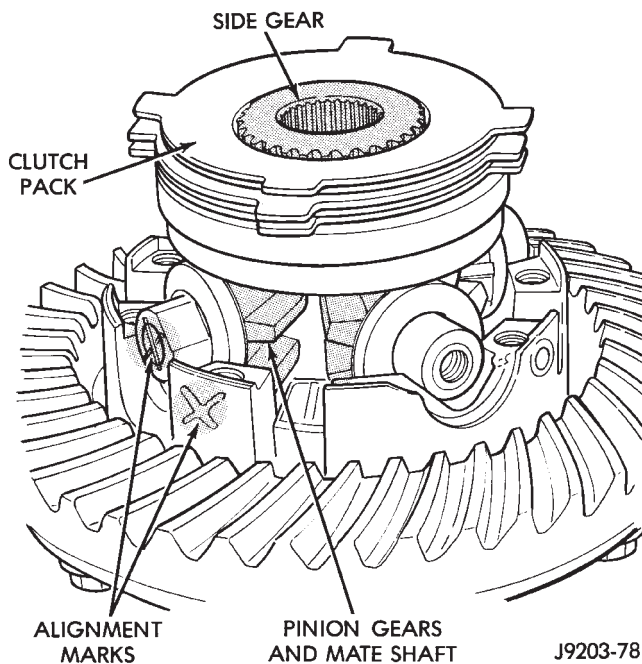


Fig. 44 Clutch Pack Installation

CLEANING AND INSPECTION

AXLE COMPONENTS

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

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

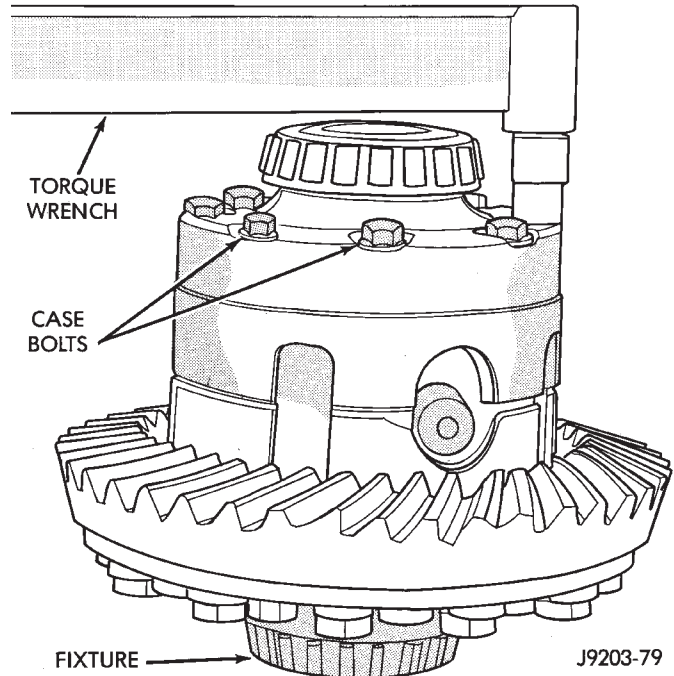


Fig. 45 Case Half Installation

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

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces.
- Bearing cups must not be distorted or cracked.
- Machined surfaces should be smooth and without any raised edges.
- Raised metal on shoulders of cup bores should be removed with a hand stone.
- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth.
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims, if necessary.

TRAC-LOK

Clean all components in cleaning solvent. Dry components with compressed air. Inspect clutch pack plates for wear, scoring or damage. Replace both clutch packs if any one component in either pack is damaged. Inspect side and pinion gears. Replace any gear that is worn, cracked, chipped or damaged. Inspect differential case and pinion shaft. Replace if worn or damaged.

CLEANING AND INSPECTION (Continued)

PRESOAK PLATES AND DISC

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

ADJUSTMENTS

PINION GEAR DEPTH

GENERAL INFORMATION

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. 46). 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 147.625 mm (5.812 in.). The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern Analysis Paragraph in this section for additional information.

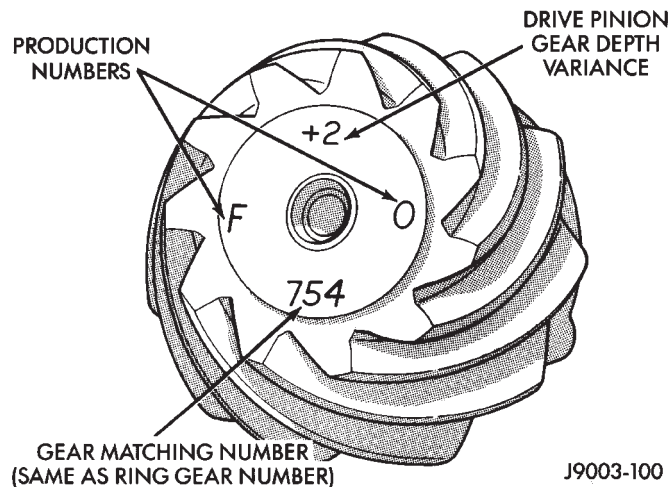


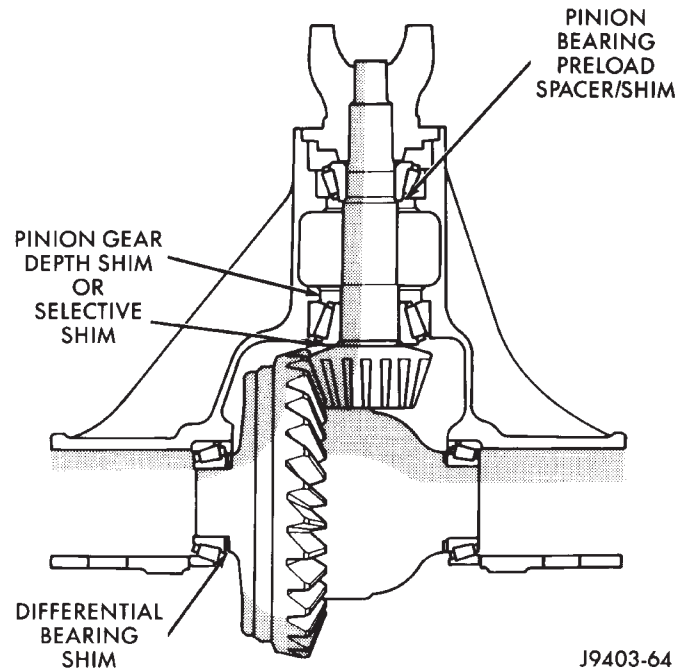
Fig. 46 Pinion Gear ID Numbers

Compensation for pinion depth variance is achieved with select shims. The shims are placed under the inner pinion bearing cone (Fig. 47).

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.

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 rep-



J9403-64

Fig. 47 Shim Locations

resent thousands of an inch deviation from the standard. If the number is negative, add that value to the required thickness of the depth shim(s). If the number is positive, subtract that value from the thickness of the depth shim(s). If the number is 0 no change is necessary. Refer to the Pinion Gear Depth Variance Chart.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set 6730 and Dial Indicator C-3339 (Fig. 48).

(1) Assemble Pinion Height Block 6739, Pinion Block 6738, and rear pinion bearing onto Screw 6741 (Fig. 48).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 49).

(3) Install front pinion bearing and Cone 6740 hand tight (Fig. 48).

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 50). Install differential bearing caps on Arbor Discs and tighten cap bolts. Refer to the Torque Specifications in this section.

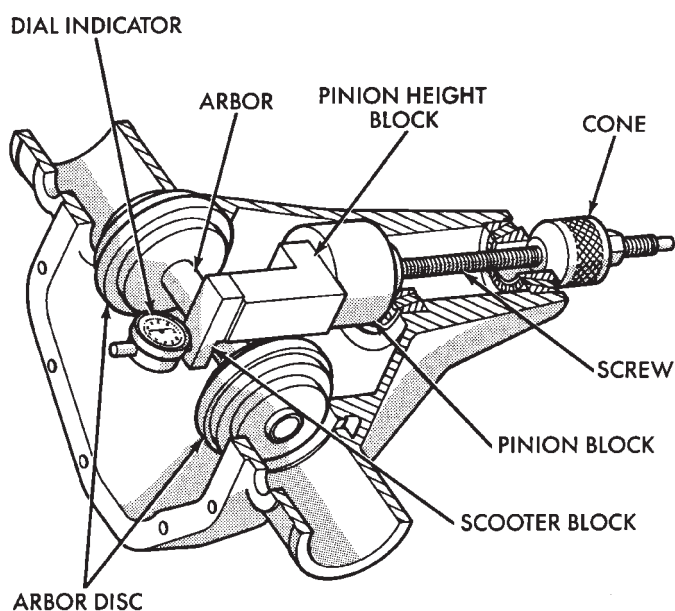
NOTE: Arbor Discs 6732 have different step diameters to fit other axle sizes. Pick correct size step for axle being serviced.

ADJUSTMENTS (Continued)

PINION GEAR DEPTH VARIANCE

Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

J8902-46

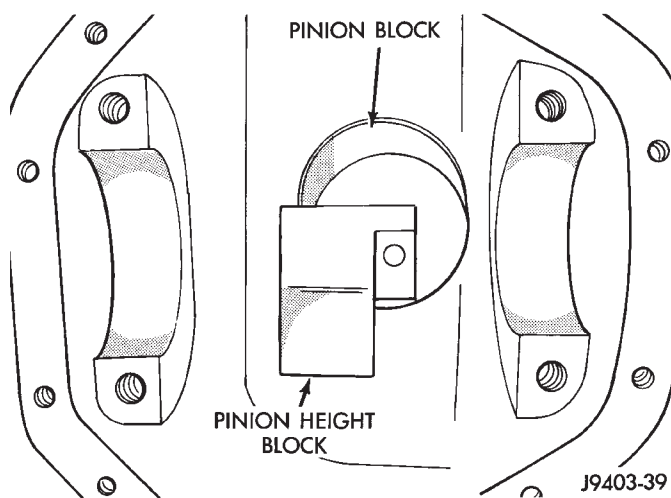


J9403-45

Fig. 48 Pinion Gear Depth Gauge Tools—Typical

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

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



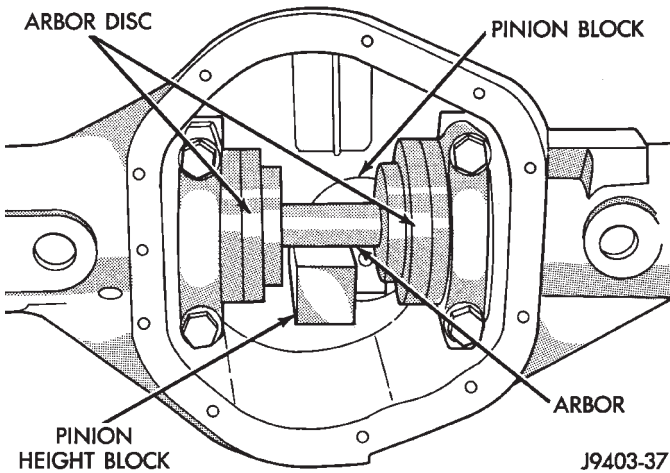
J9403-39

Fig. 49 Pinion Height Block—Typical

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

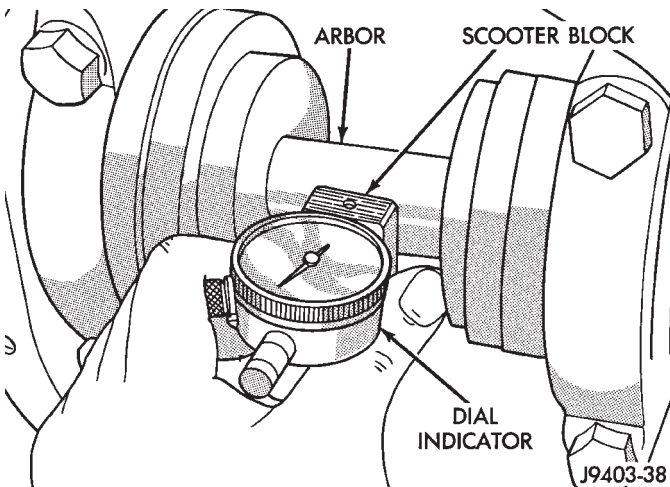
(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 51). When the dial probe contacts the arbor bar, the dial pointer will turn clockwise. Bring dial pointer back to zero against the arbor bar, do not turn dial face. Continue moving the dial probe to the crest of the arbor bar and record the highest reading. If the dial indicator can not achieve the zero reading,

ADJUSTMENTS (Continued)

**Fig. 50 Gauge Tools In Housing—Typical**

the rear bearing cup or the pinion depth gauge set is not installed correctly.

(9) Select a shim equal to the dial indicator reading plus the drive pinion gear depth variance number etched in the face of the pinion gear (Fig. 46) 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.

**Fig. 51 Pinion Gear Depth Measurement—Typical**

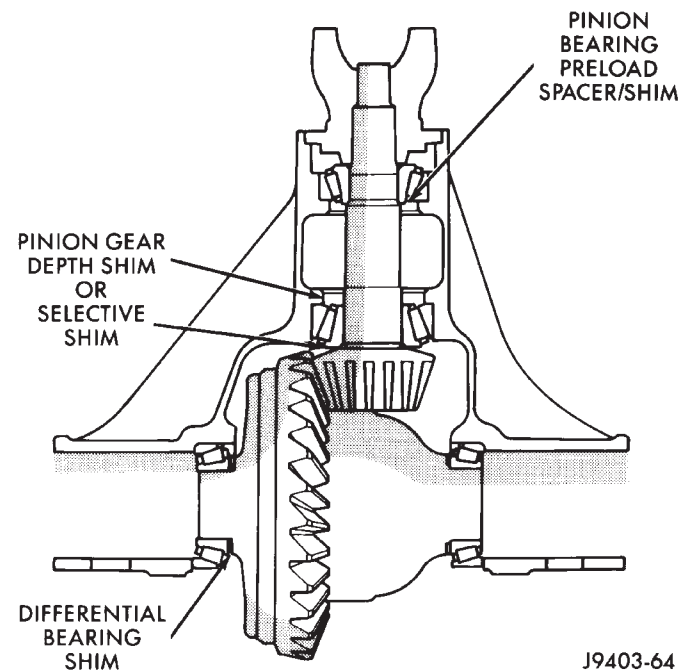
(10) Remove the pinion depth gauge components from the axle housing

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

INTRODUCTION

Differential side bearing preload and gear backlash is achieved by selective shims positioned behind the differential side bearing cones. The proper shim thickness can be determined using slip-fit dummy bearings D-346 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 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. 52). Differential shim measurements are performed with axle spreader W-129-B removed.

**Fig. 52 Axle Adjustment Shim Locations**

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) Remove factory installed shims from differential case.
- (3) Install ring gear on differential case and tighten bolts to specification, if necessary.
- (4) Install dummy side bearings D-346 on differential case.
- (5) Install differential case in axle housing.

ADJUSTMENTS (Continued)

(6) Install the marked bearing caps in their correct positions. Install and snug the bolts (Fig. 53).

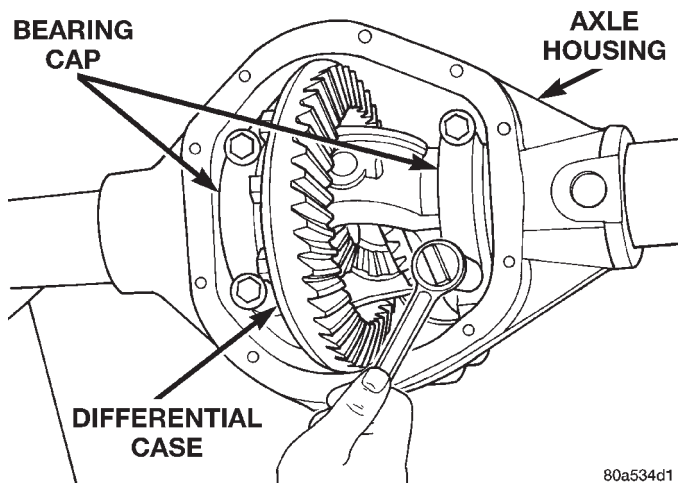


Fig. 53 Tighten Bolts Holding Bearing Caps

(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 54) and (Fig. 55).

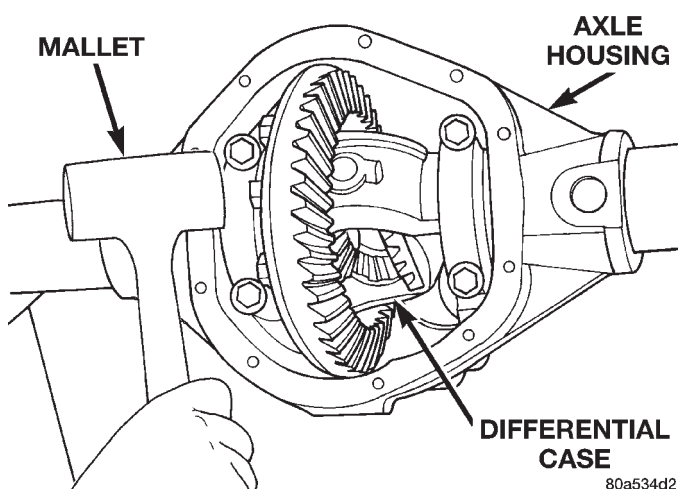


Fig. 54 Seat Pinion Gear Side Differential Dummy Side Bearing

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 56).

(9) Attach a dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 56).

(10) Push and hold differential case to pinion gear side of axle housing (Fig. 57).

(11) Zero dial indicator face to pointer (Fig. 57).

(12) Push and hold differential case to ring gear side of the axle housing (Fig. 58).

(13) Record dial indicator reading (Fig. 58).

(14) Add 0.010 in. (0.254 mm) 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.

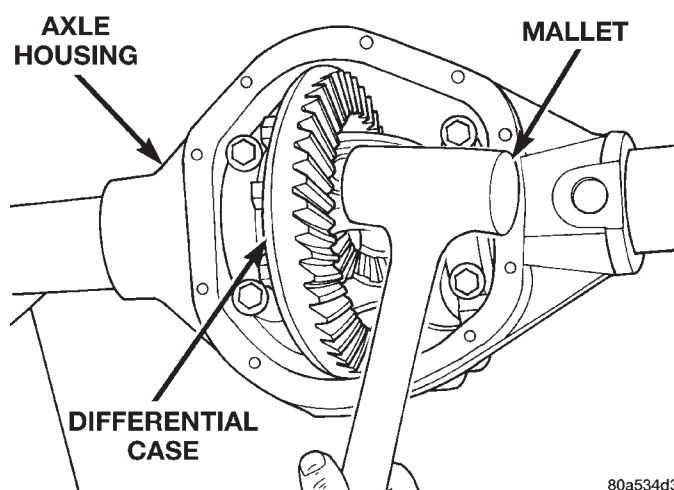


Fig. 55 Seat Ring Gear Side Differential Dummy Side Bearing

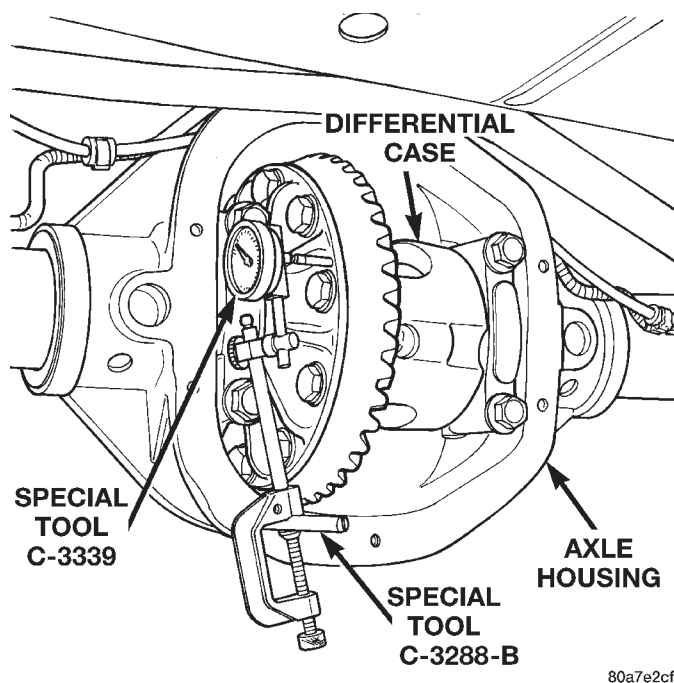


Fig. 56 Differential Side play Measurement

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

(16) Remove differential case and dummy bearings from axle housing.

(17) Install the pinion gear in axle housing. Install the pinion yoke, or flange, and establish the correct pinion rotating torque.

(18) Install differential case and dummy bearings D-346 in axle housing (without shims), install bearing caps and tighten bolts snug.

(19) Seat ring gear side dummy bearing (Fig. 54).

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads. (Fig. 56).

(21) Push and hold differential case toward pinion gear (Fig. 59).

ADJUSTMENTS (Continued)

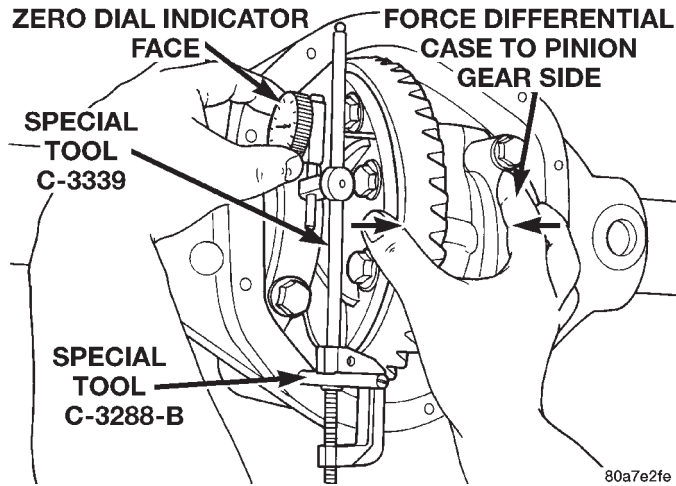


Fig. 57 Hold Differential Case and Zero Dial Indicator

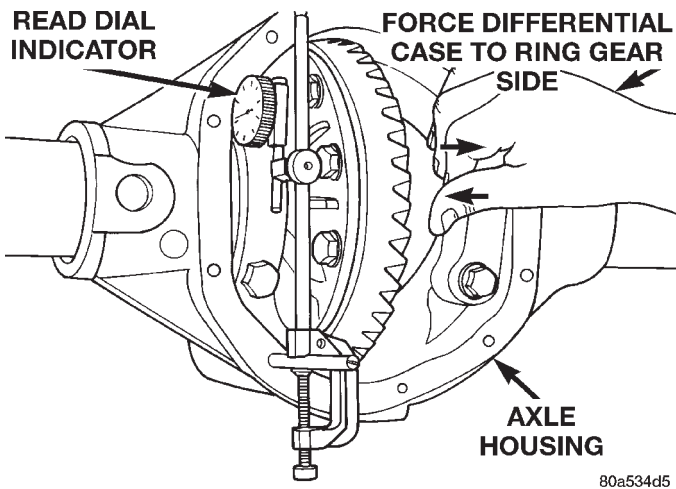


Fig. 58 Hold Differential Case and Read Dial Indicator

(22) Zero dial indicator face to pointer (Fig. 59).

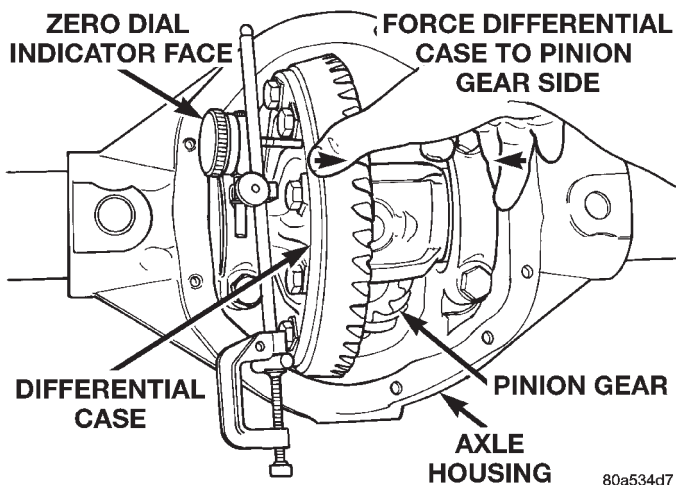


Fig. 59 Hold Differential Case and Zero Dial Indicator

(23) Push and hold differential case to ring gear side of the axle housing (Fig. 60).

(24) Record dial indicator reading (Fig. 60).

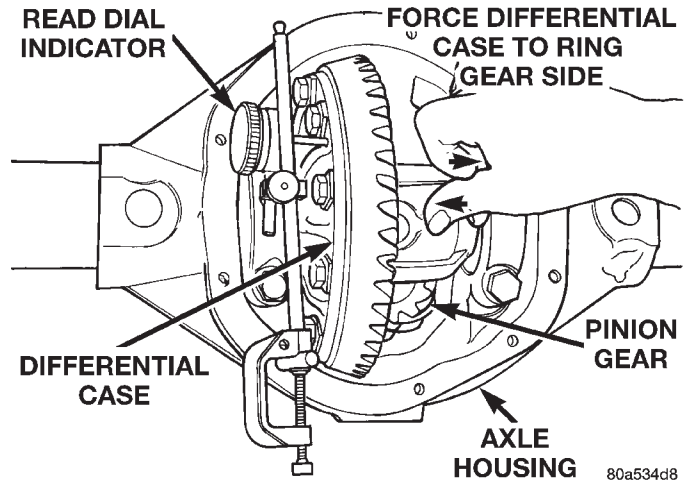


Fig. 60 Hold Differential Case and Read Dial Indicator

(25) This is the thickness shim required on the ring gear side of the differential case to achieve proper backlash.

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

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

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

(29) Install side bearing shims on differential case hubs.

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

(31) Install spreader W-129-B on axle housing and spread axle opening enough to receive differential case.

(32) Install differential case in axle housing.

(33) Remove spreader from axle housing.

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

(35) Position the indicator plunger against a ring gear tooth (Fig. 61).

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

(37) Zero dial indicator face to pointer.

(38) 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 axle housing to the other (Fig. 62).

ADJUSTMENTS (Continued)

(39) Verify differential case and ring gear runout by measuring ring to pinion gear backlash at several 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.

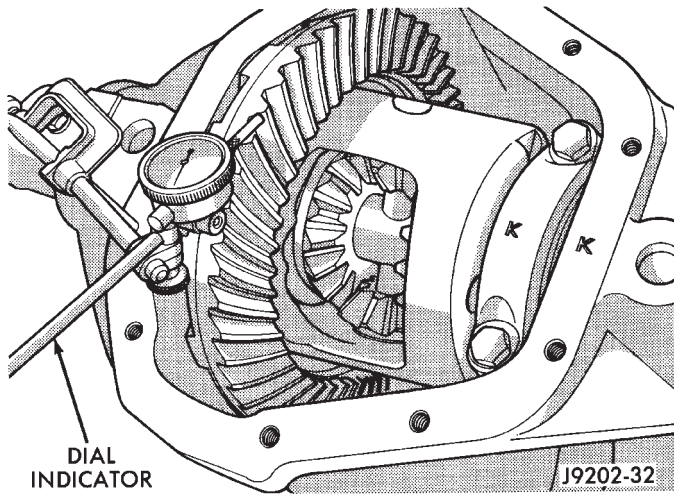


Fig. 61 Ring Gear Backlash Measurement

GEAR CONTACT PATTERN ANALYSIS

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

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

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

(3) Using a boxed end wrench on a ring gear bolt, Rotate the differential case one complete revolution

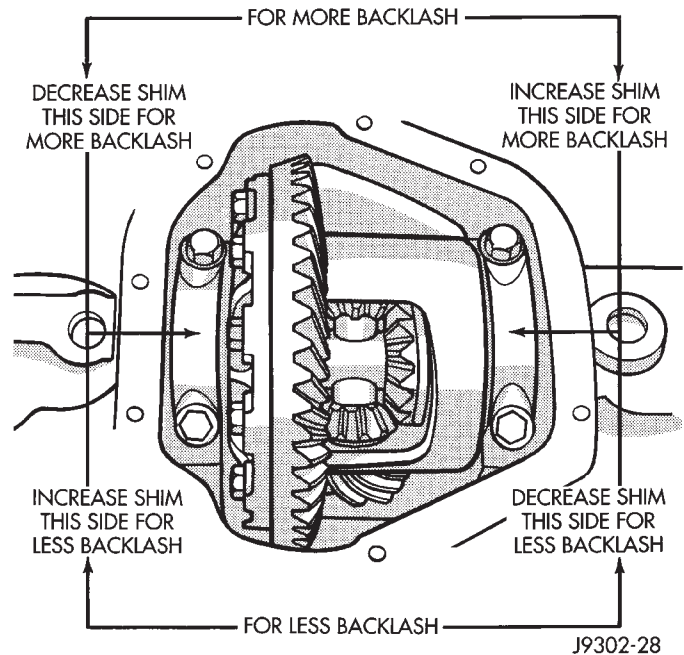
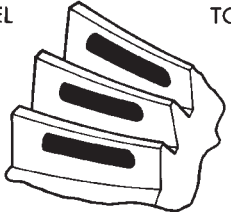
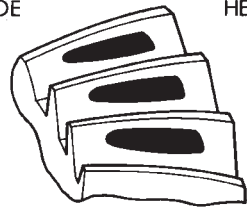

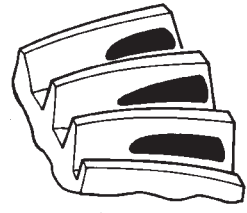

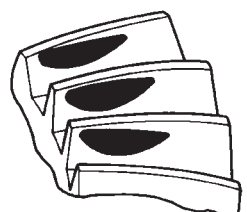
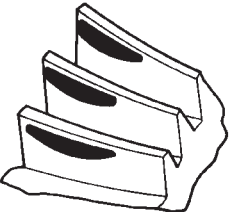
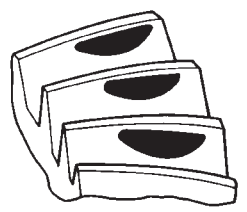
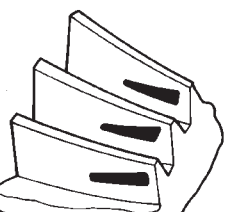
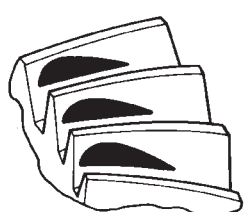


Fig. 62 Backlash Shim Adjustment

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 gear 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. 63) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

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

J9003-24

Fig. 63 Gear Tooth Contact Patterns

SPECIFICATIONS

286 RBI AXLES

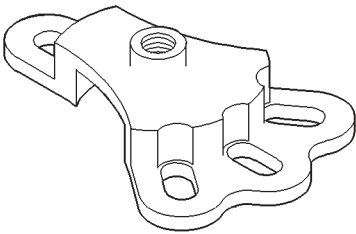
DESCRIPTION	SPEC.
Axle Type	Hypoid
Lubricant	Thermally Stable SAE 80W-90
Lube Capacity	
4x2	3.22 L (6.81 pts.)
4x4	4.80 L (10.125 pts.)
Axle Ratio	3.54, 4.10
Ring Gear	
Diameter	279.4 mm (11.00 in.)
Backlash	0.13-0.23 mm (0.005-0.009 in.)
Pinion Std. Depth	124.625 mm (5.812 in.)
Pinion Bearing Preload	
Original Bearing	1-3 N·m (10-20 in. lbs.)
New Bearing	2-5 N·m (15-35 in. lbs.)

TORQUE

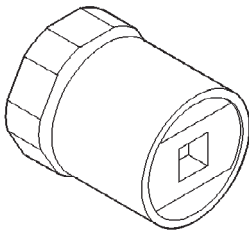
DESCRIPTION	TORQUE
DIFFERENTIAL	
Plug, Fill Hole	34 N·m (25 ft. lbs.)
Bolts, Cover	41 N·m (30 ft. lbs.)
Bolts, Bearing Cap	108 N·m (80 ft. lbs.)
Nut, Pinion	597-678 N·m (440-500 ft. lbs.)
Bolt, Ring Gear ...	272-325 N·m (200-240 ft. lbs.)
Bolt, Axle to Hub	123 N·m (90 ft. lbs.)
RWAL/ABS Sensor Bolt	24 N·m (18 ft. lbs.)
TRAC-LOK CASE BOLT	
Standard	89-94 N·m (65-70 ft. lbs.)
Heavy Duty	122-136 N·m (90-100 ft. lbs.)
Nut, Hub	163-190 N·m (120-140 ft. lbs.)

SPECIAL TOOLS

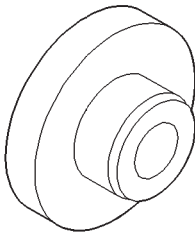
286 RBI AXLES



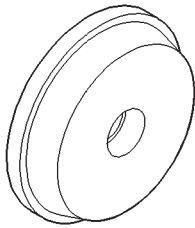
Puller, Hub—6790



Wrench—DD-1241-JD

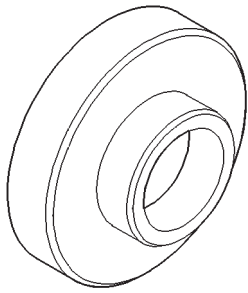
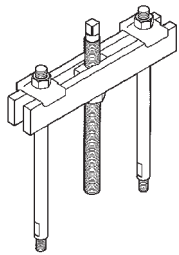
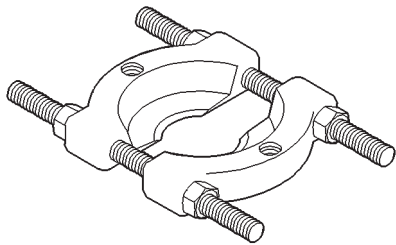
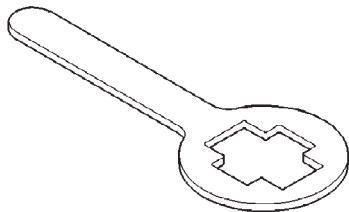
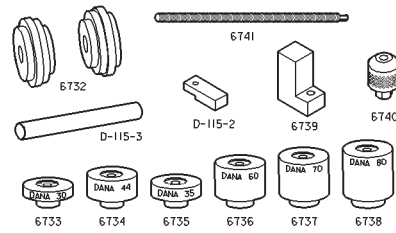
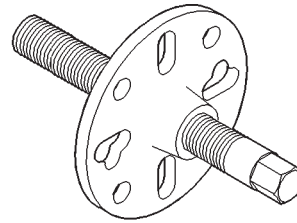
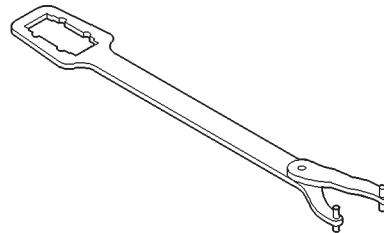
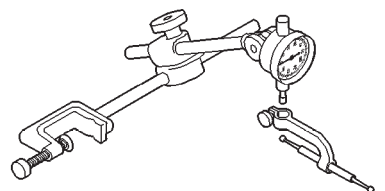


Installer—5064



Installer, Bearing Cup—8153

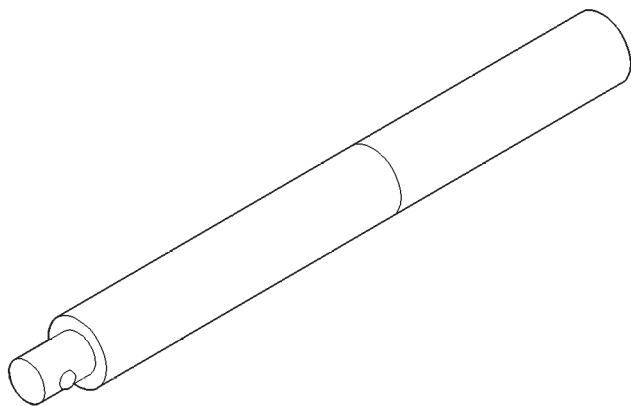
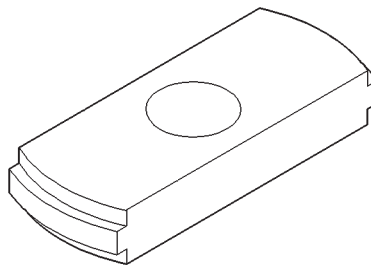
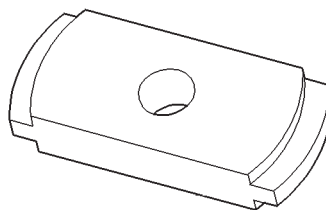
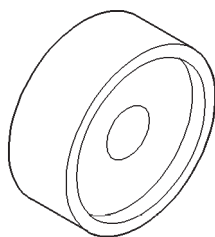
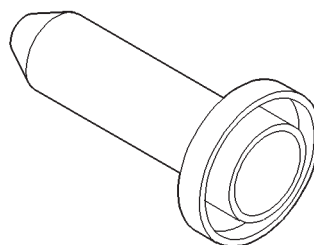
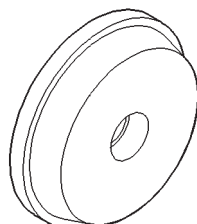
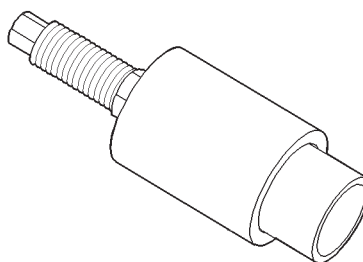
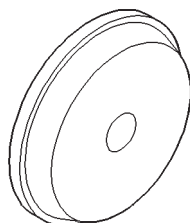
SPECIAL TOOLS (Continued)

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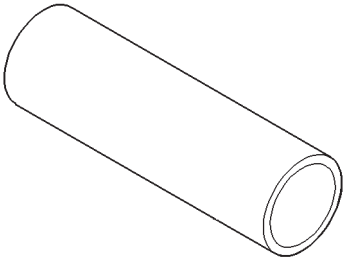
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Dial Indicator Set—C-3339

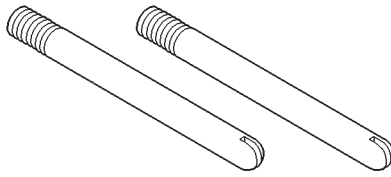
SPECIAL TOOLS (Continued)

**Handle—C-4171****Remover, Bearing Cup—C-4307****Remover, Pinion Bearing Cup—D-159****Installer, Differential Bearing—C-4190****Installer, Pinion Seal—D-187-B****Installer, Bearing Cup—C-4308****Installer, Pinion Yoke—D-191****Installer, Rear Bearing Cup—C-4204**

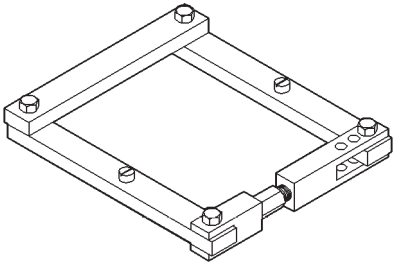
SPECIAL TOOLS (Continued)



Installer, Bearing—D-389



Studs, Guide—C-3288-B



Spreader, Differential—W-129-B

