DIFFERENTIAL AND DRIVELINE

CONTENTS

PROPELLER SHAFTS

INDEX

GENERAL INFORMATION

PROPELLER SHAFTS

The propeller shaft (Fig. 1) transmits power from one point to another in a smooth and continuous 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 contract, expand and change operating angles when going over various road surfaces. This is accomplished through universal joints, which permit the propeller shaft to operate at different angles. The slip joints (or yokes) permit contraction or expansion.

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

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

Before undercoating a vehicle, the propeller shaft and the U-joints should be covered. This will prevent the undercoating from causing an unbalanced condition.

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

LUBRICATION

The slip yoke on the front propeller shaft is equipped with a lubrication fitting. Use a multi-pur-

GENERAL INFORMATION (Continued)

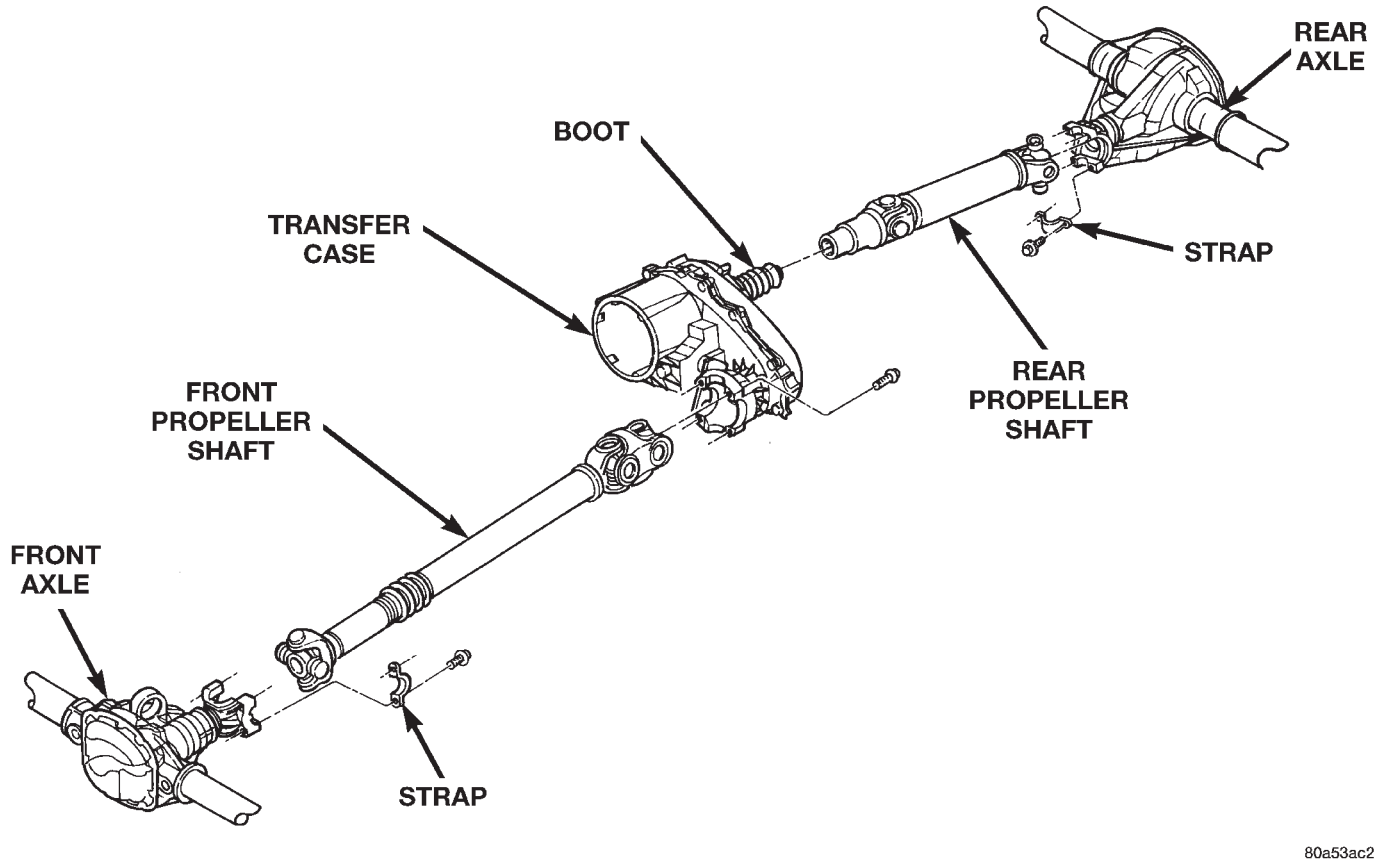

Fig. 1 Front & Rear Propeller Shafts—4WD

pose NLGI Grade 2 EP lubricant. The factory installed universal joints are lubricated for the life of the vehicle and do not need lubrication. All universal joints should be inspected for leakage and damage each time the vehicle is serviced. If seal leakage or damage exists, the universal joint should be replaced. 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

PROPELLER SHAFT JOINTS

Two different types of propeller shaft joints are used:

- Single cardan universal joint (Fig. 3)

GENERAL INFORMATION (Continued)

- Double cardan (CV) universal joint (Fig. 4)

None of the universal joints are servicible. If one becomes worn or damaged, the complete universal joint assembly must be replaced.

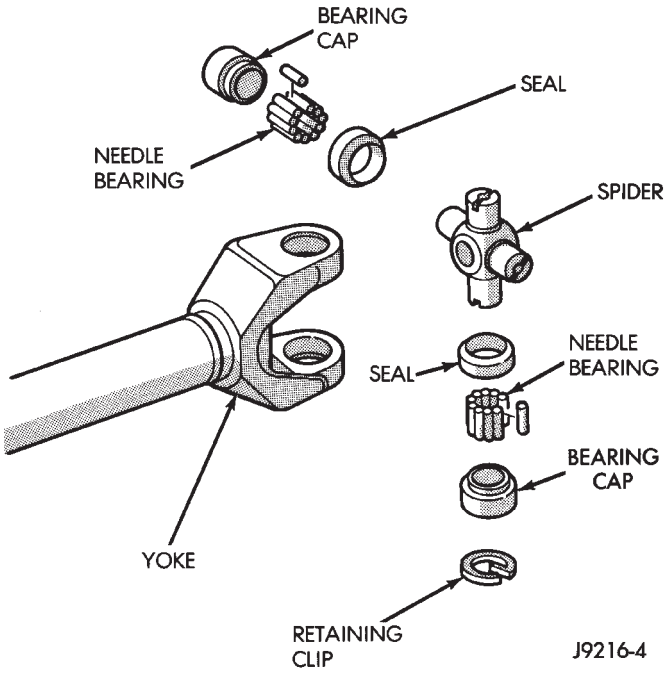


Fig. 3 Single Cardan Universal Joint

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.

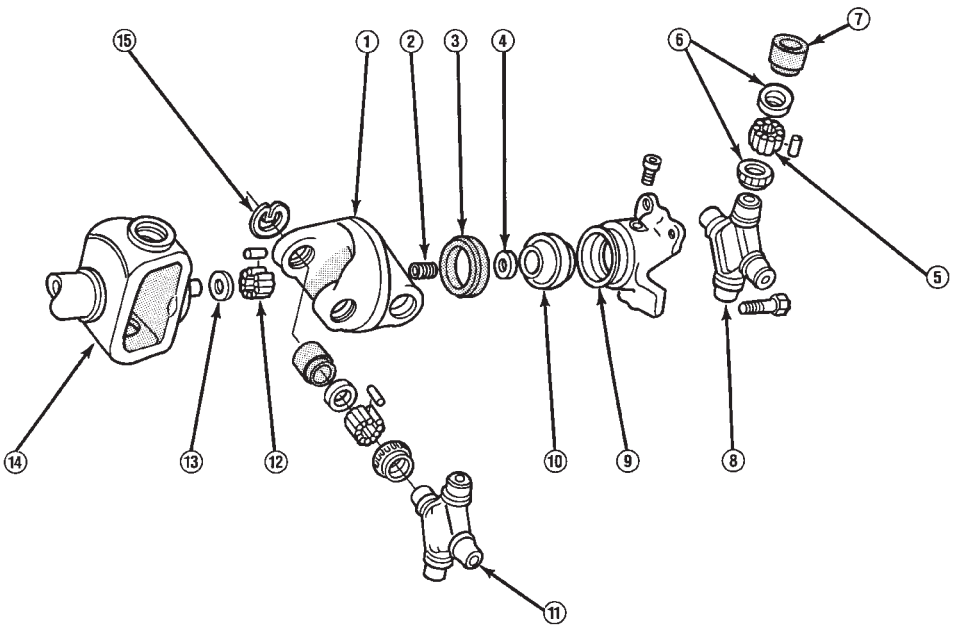
Brake drums that are unbalanced will cause a harsh, low frequency vibration. Refer to Group 5, Brakes, for additional information.

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.



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

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Fig. 4 Double Cardan (CV) Universal Joint

DIAGNOSIS AND TESTING (Continued)

DRIVELINE VIBRATION

Drive Condition	Possible Cause	Correction
PROPELLER SHAFT	a. Undercoating or other foreign material on shaft.	a. Clean exterior of shaft and wash with solvent.
	b. Loose U-joint clamp screws.	b. Tighten screws properly.
	c. Loose or bent U-joint yoke or excessive runout.	c. Install replacement yoke.
	d. Incorrect drive line angularity.	d. Correct angularity
	e. Rear spring center bolt not in seat.	e. Loosen spring U-bolts and seat center bolts.
	f. Worn U-joint bearings.	f. Replace U-joint.
	g. Propeller shaft damaged (bent tube) or out of balance.	g. Install replacement propeller shaft.
	h. Broken rear spring.	h. Replace rear spring.
	i. Excessive runout or unbalanced condition.	i. Reindex propeller shaft 180°, test and correct as necessary.
	j. Excessive drive pinion gear shaft yoke runout.	j. Reindex propeller shaft 180° and evaluate.
UNIVERSAL JOINT NOISE	a. U-joint clamp screws loose.	a. Tighten screws with specified torque.
	b. Lack of lubrication.	b. Replace U-joint.

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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. 5).

(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. 6) and repeat the test.

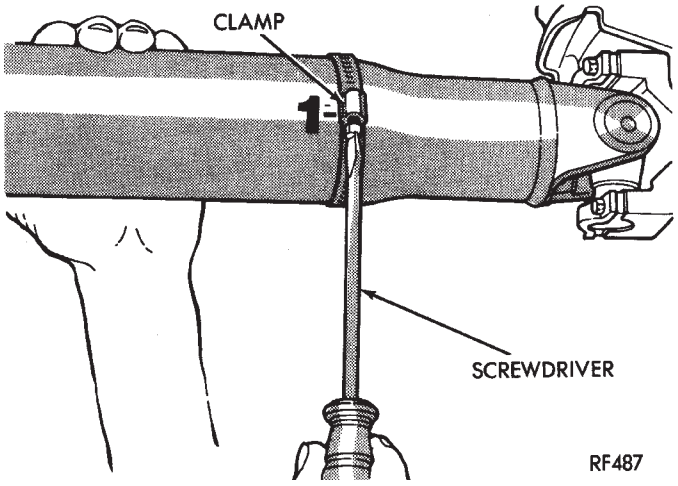


Fig. 5 Clamp Screw At Position 1

(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. 7).

(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.

DIAGNOSIS AND TESTING (Continued)

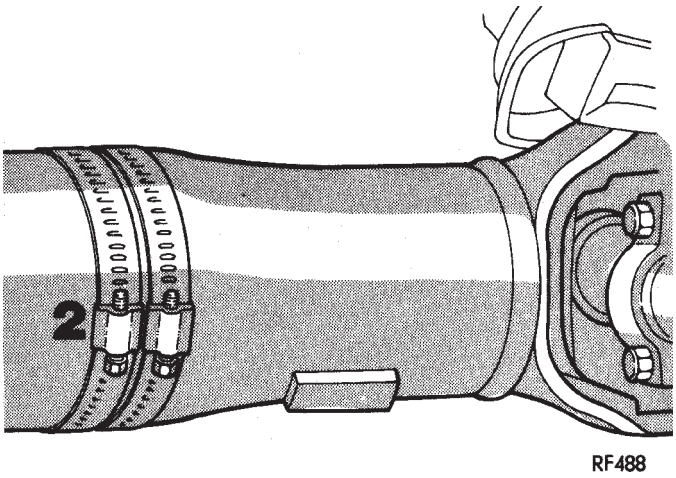


Fig. 6 Two Clamp Screws At The Same Position

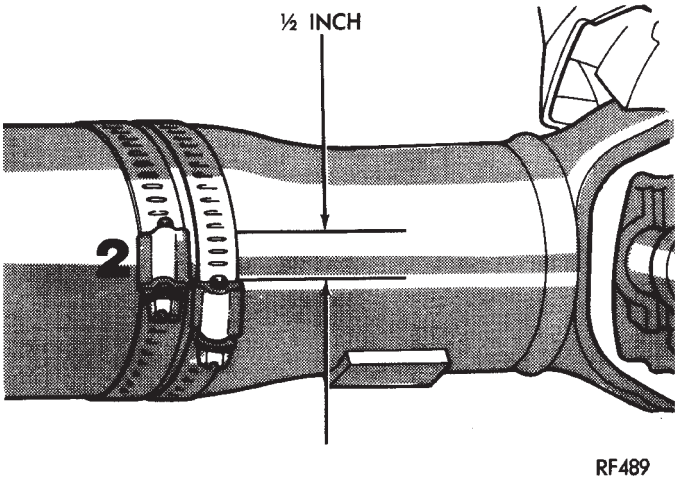


Fig. 7 Clamp Screws Separated

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

SERVICE PROCEDURES

DRIVELINE ANGLE MEASUREMENT PREPARATION

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

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

PROPELLER SHAFT ANGLE MEASUREMENT

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. 8). Center bubble in sight glass and record measurement.

SERVICE PROCEDURES (Continued)

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

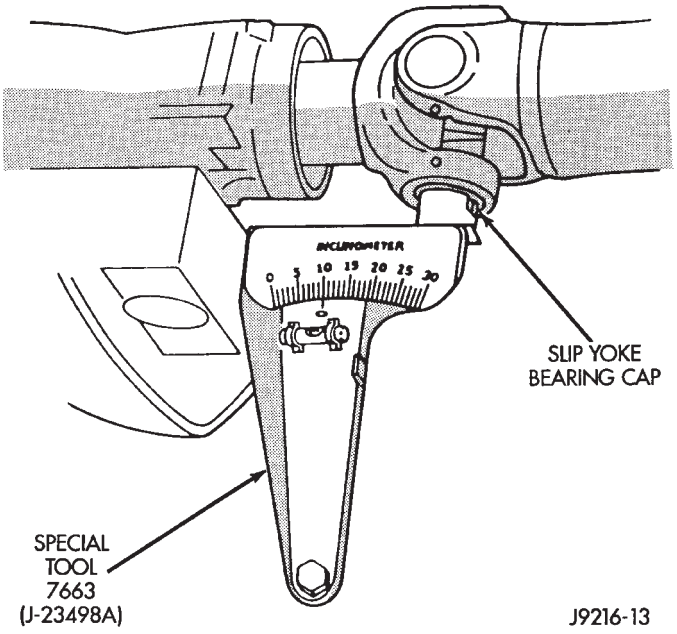


Fig. 8 Front (Output) Angle Measurement (A)

(3) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing cap parallel to the shaft (Fig. 9). 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).

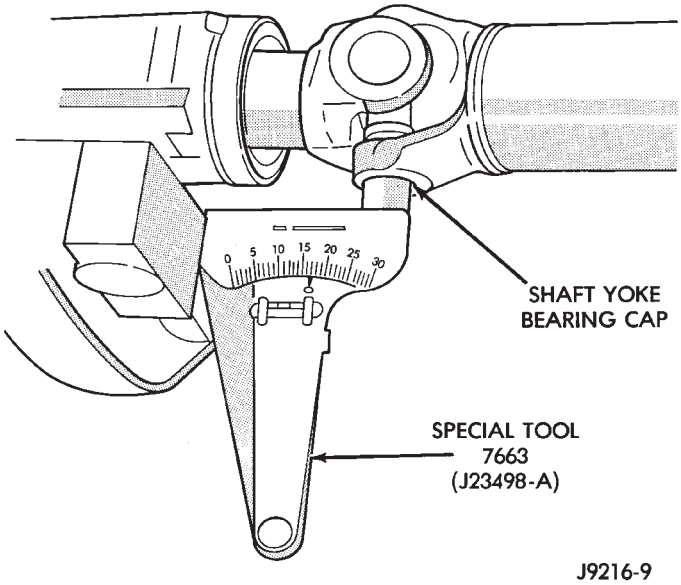


Fig. 9 Propeller Shaft Angle Measurement (C)

(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. 10). Center bubble in sight glass and record measurement.

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

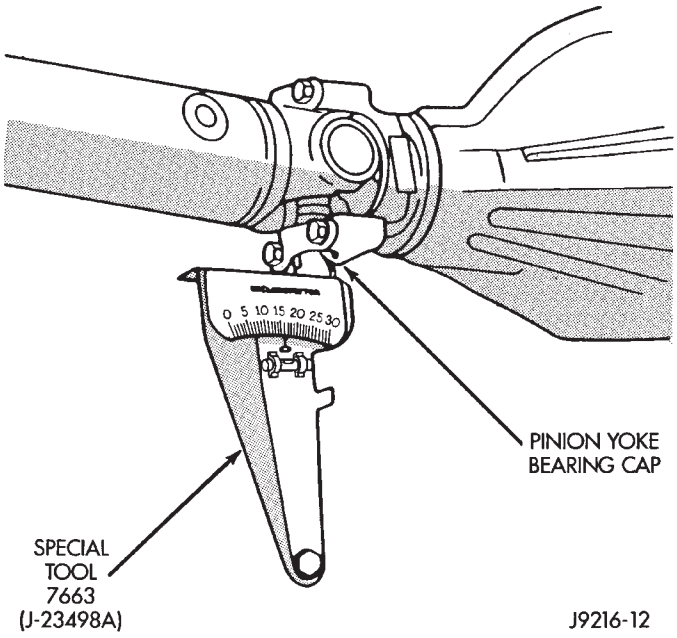


Fig. 10 Rear (Input) Angle Measurement (B)

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

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

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

SERVICE PROCEDURES (Continued)

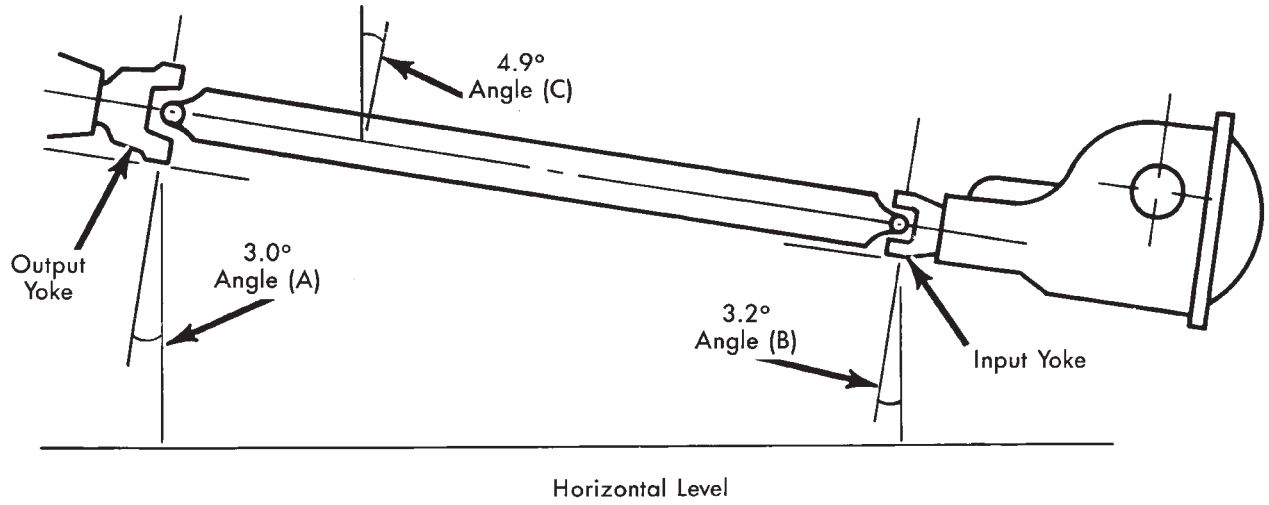


Fig. 11 Universal Joint Angle Example

REMOVAL AND INSTALLATION

FRONT PROPELLER SHAFT

REMOVAL

(1) Hoist and support vehicle on safety stands.

(2) Scribe alignment marks on the yokes at the transfer case. Place marks at the pinion shaft and at each end of the propeller shaft. These marks will be used for installation reference (Fig. 12).

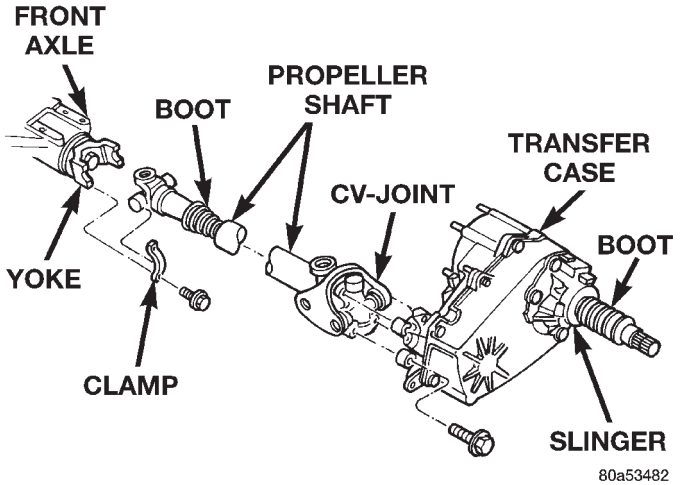


Fig. 12 Front Propeller Shaft

(3) Remove the universal joint strap bolts at the pinion shaft yoke.

(4) Disconnect the propeller shaft at the transfer case and remove the propeller shaft.

INSTALLATION

(1) Position the propeller shaft with the yoke reference marks aligned (Fig. 13). Install the propeller shaft.

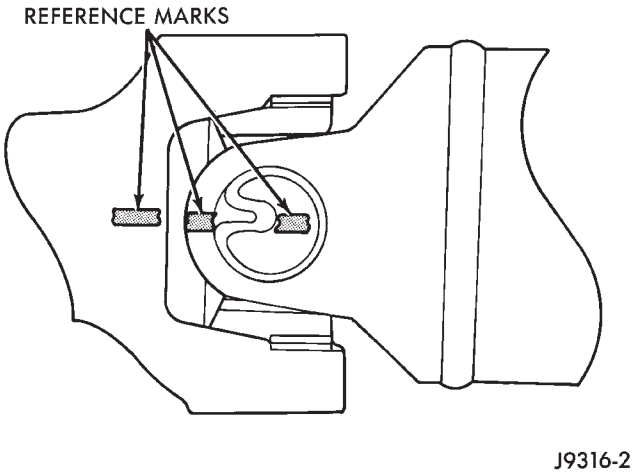


Fig. 13 Reference Marks on Yokes

REMOVAL AND INSTALLATION (Continued)

Replacement universal joint straps and bolts must be installed.

(2) Tighten the universal joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.) torque.

(3) Tighten the flange to transfer case bolts to 27 N·m (20 ft. lbs.) torque.

(4) Lower the vehicle.

REAR PROPELLER SHAFT

REMOVAL

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

(2) Hoist and support vehicle on safety stands.

(3) Scribe alignment marks at the pinion shaft and at each end of the propeller shaft. These marks will be used for installation reference.

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

(5) Pry open clamp holding the dust boot to propeller shaft yoke (Fig. 14).

(6) Slide the slip yoke off of the transmission/transfer case output shaft and remove the propeller shaft (Fig. 15).

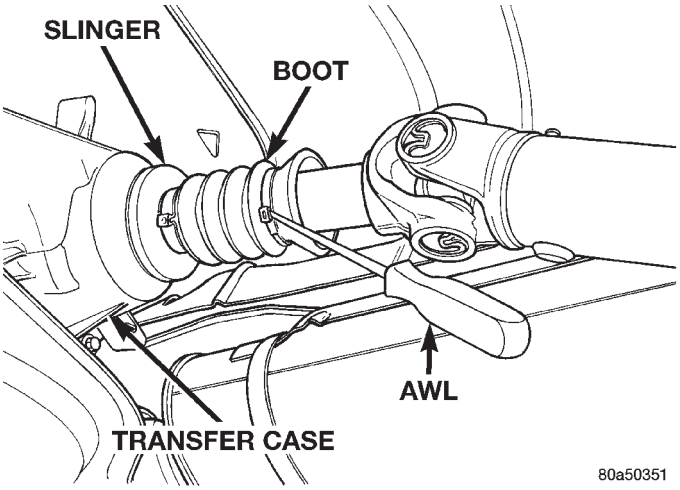


Fig. 14 Dust Boot Clamp

INSTALLATION

(1) Slide the slip yoke on the transmission/transfer case output shaft. Align the installation reference marks at the axle yoke and install the propeller shaft (Fig. 15).

Replacement universal joint straps and bolts must be installed.

(2) Tighten the universal joint strap/clamp bolts at the axle yoke to 19 N·m (14 ft. lbs.) torque.

(3) Crimp clamp to hold dust boot to propeller shaft yoke (Fig. 16).

(4) Lower the vehicle.

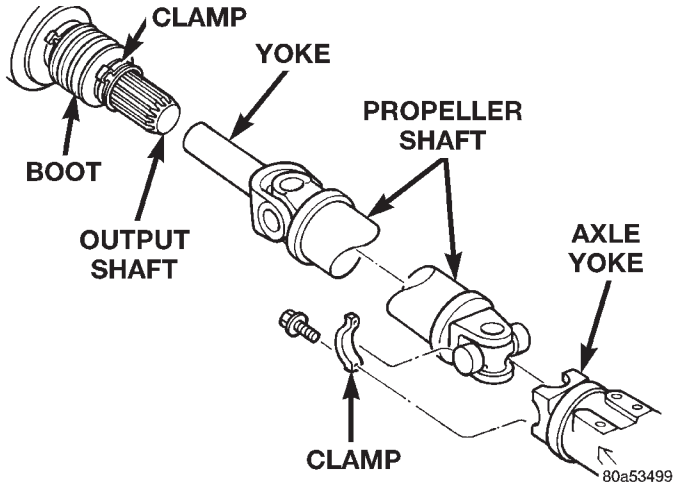


Fig. 15 Rear Propeller Shaft

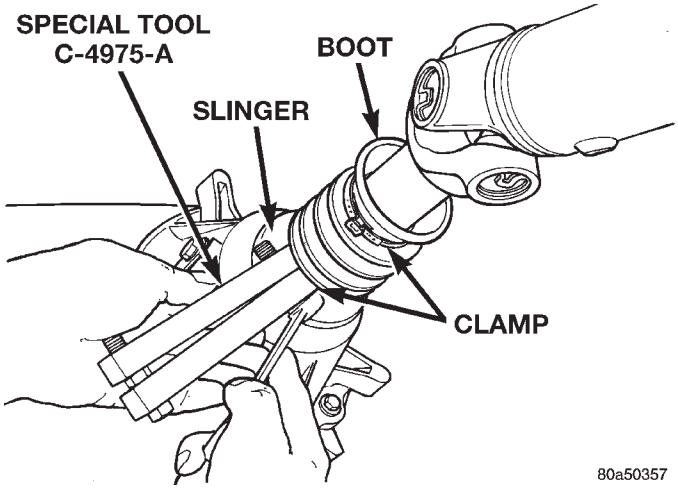


Fig. 16 Crimping Dust Boot Clamp—Typical

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. 17).

(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.

DISASSEMBLY AND ASSEMBLY (Continued)

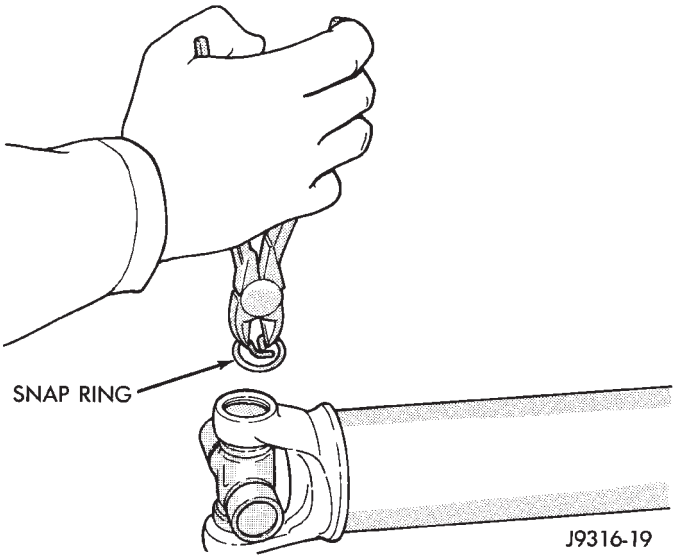


Fig. 17 Remove Snap Ring

(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. 18).

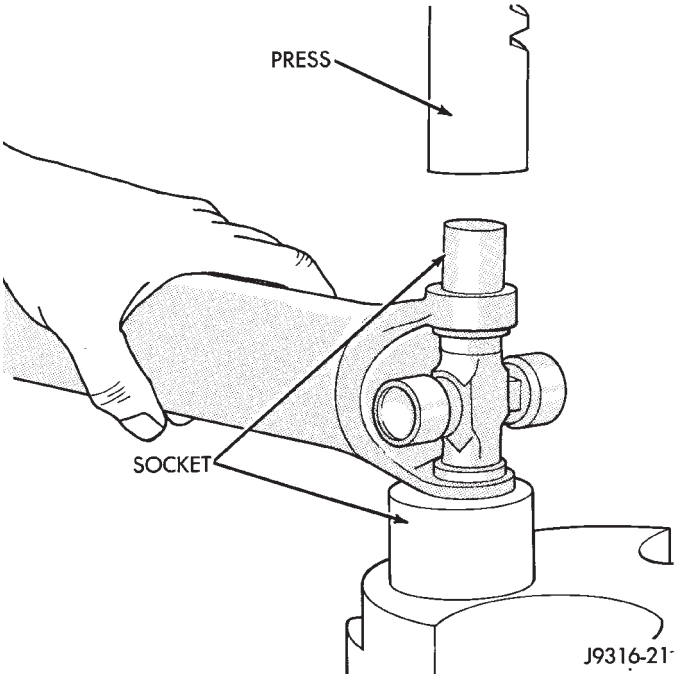


Fig. 18 Press Out Bearing

(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. 19).

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

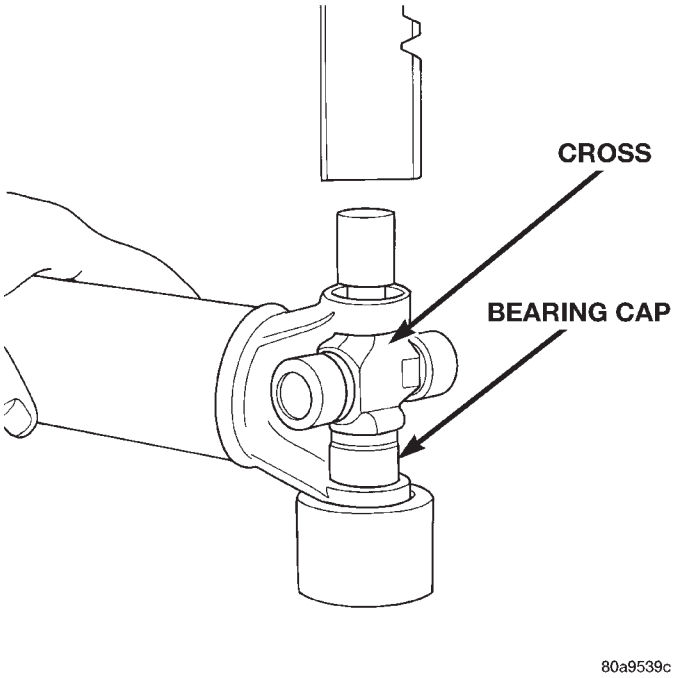


Fig. 19 Press Out Remaining Bearing

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. 20).

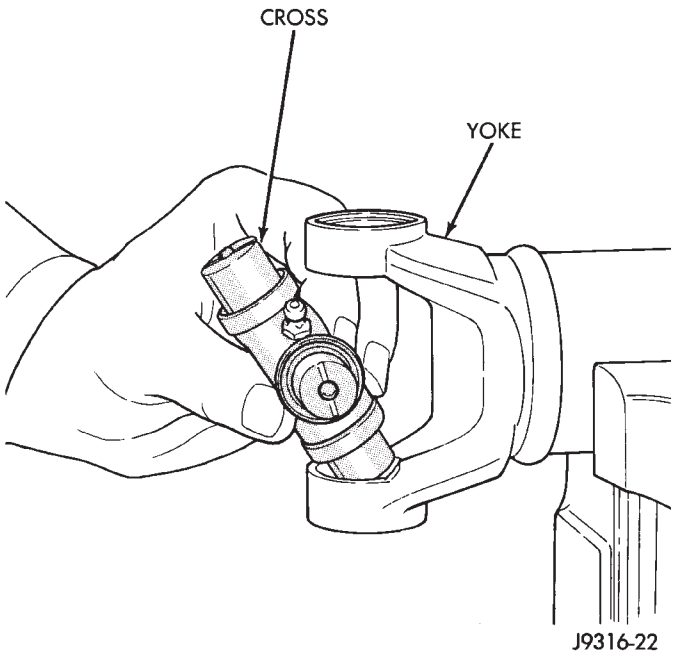


Fig. 20 Install Cross In Yoke

DISASSEMBLY AND ASSEMBLY (Continued)

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 21). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.

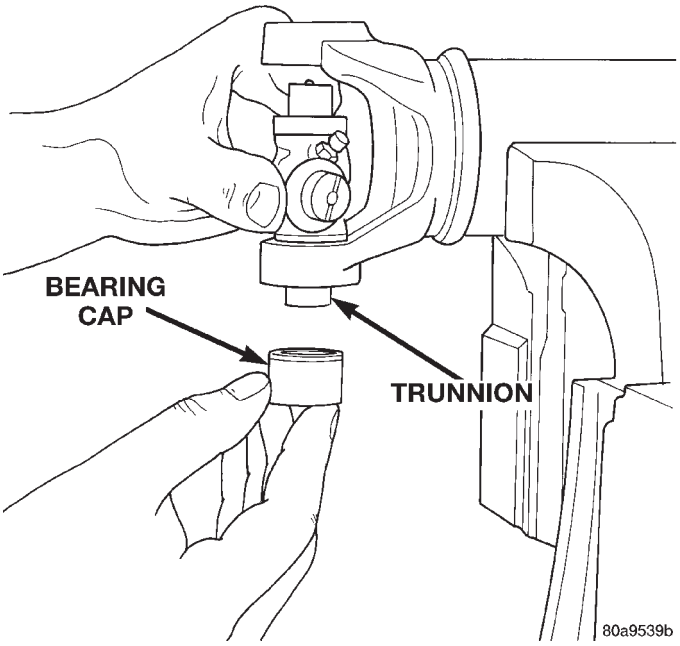


Fig. 21 Install Bearing On Trunnion

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

(5) Install a snap ring.

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

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

(8) Install the propeller shaft.

DOUBLE CARDAN JOINT

DISASSEMBLY

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

(1) Remove the propeller shaft.

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

(3) Remove all the bearing cap snap rings (Fig. 22).

(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

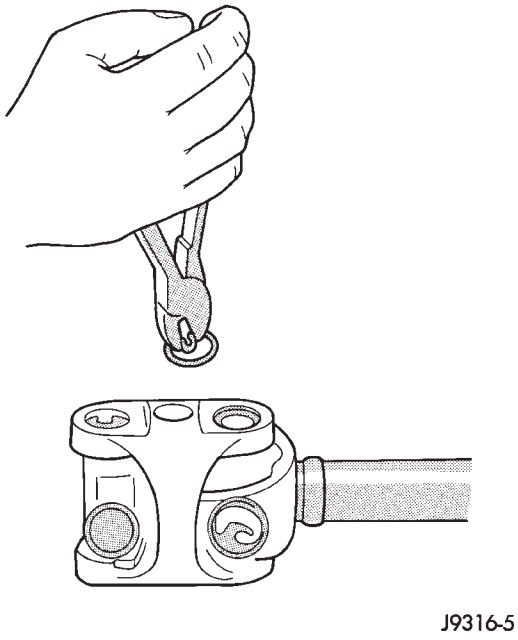


Fig. 22 Remove Snap Rings

the outboard side of the link yoke enough to grasp the bearing cap with vise jaws (Fig. 23). Be sure to remove grease fittings that interfere with removal.

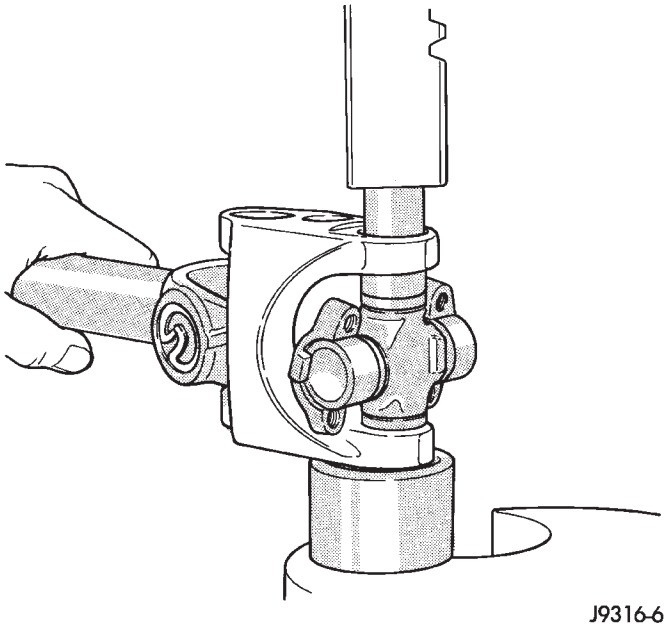


Fig. 23 Press Out Bearing

(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. 24).

(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. 25).

DISASSEMBLY AND ASSEMBLY (Continued)

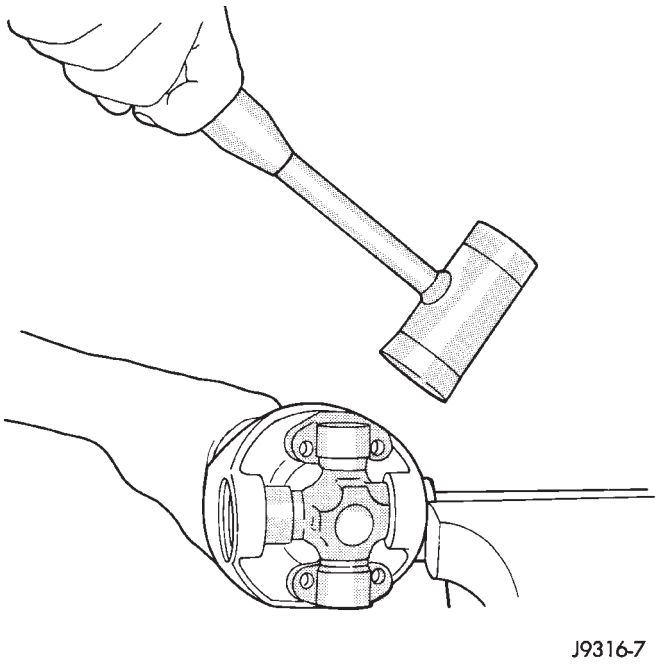


Fig. 24 Remove Bearing From Yoke

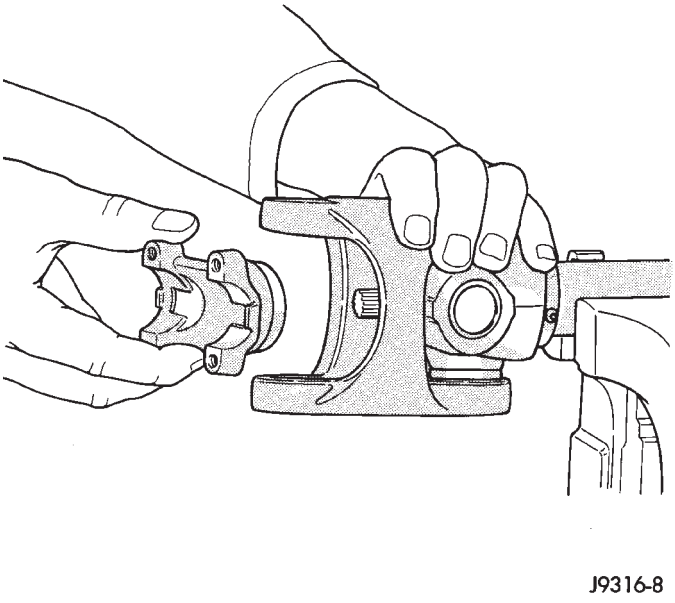


Fig. 25 Remove Centering Kit

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

ASSEMBLY

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

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

(2) Fit a cross into the propeller shaft yoke (Fig. 26).

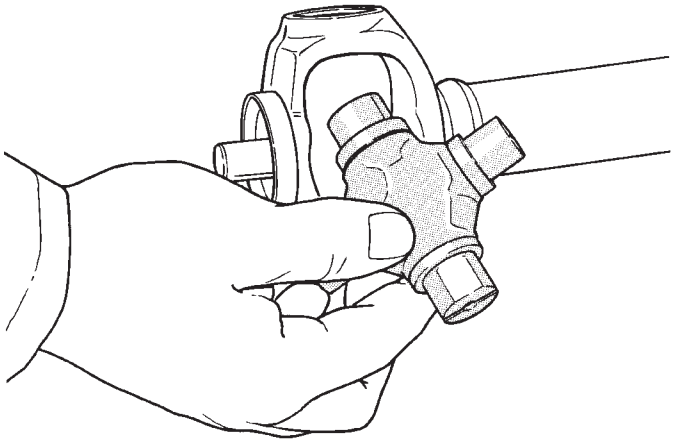


Fig. 26 Install Cross In Yoke

(3) Place a bearing cap over the trunnion and align the cap with the yoke bore (Fig. 27). Keep the needle bearings upright in the bearing assembly. A needle bearing lying at the bottom of the cap will prevent proper assembly.

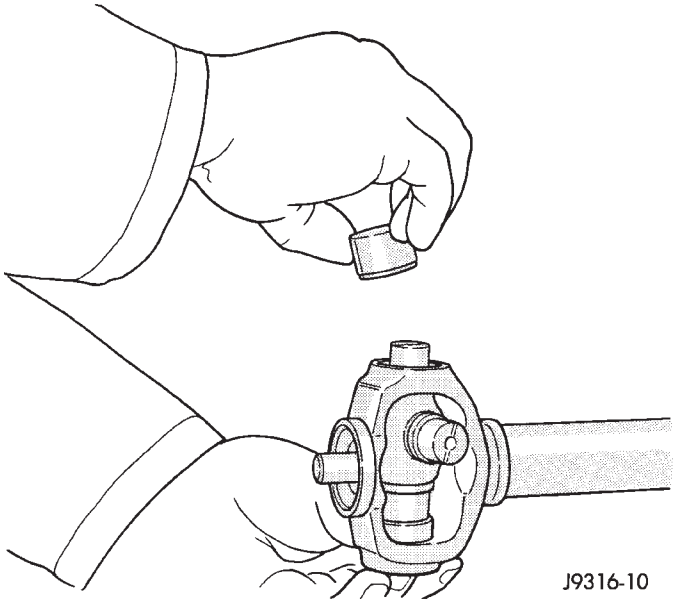


Fig. 27 Install Bearing Cap

(4) Press the bearing cap into the yoke bore enough to install a snap ring (Fig. 28).

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Install a snap ring.

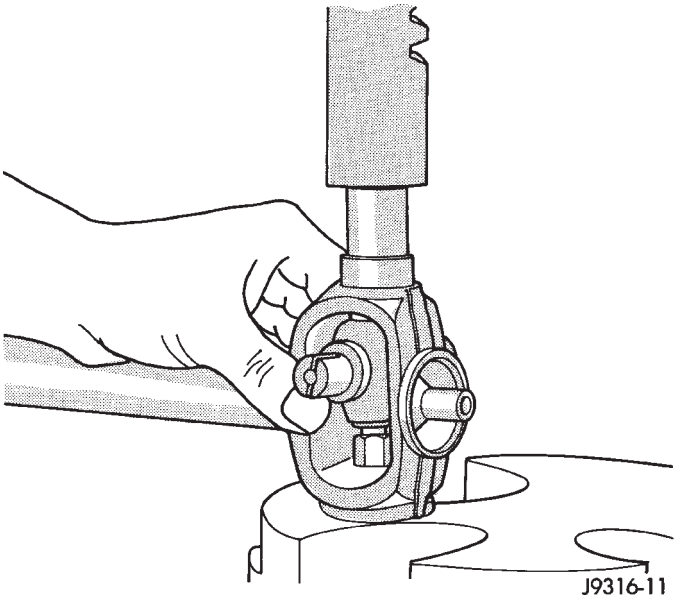


Fig. 28 Press In Bearing Cap

(6) Flip the propeller shaft yoke and install the bearing cap onto the opposite trunnion. Install a snap ring (Fig. 29).

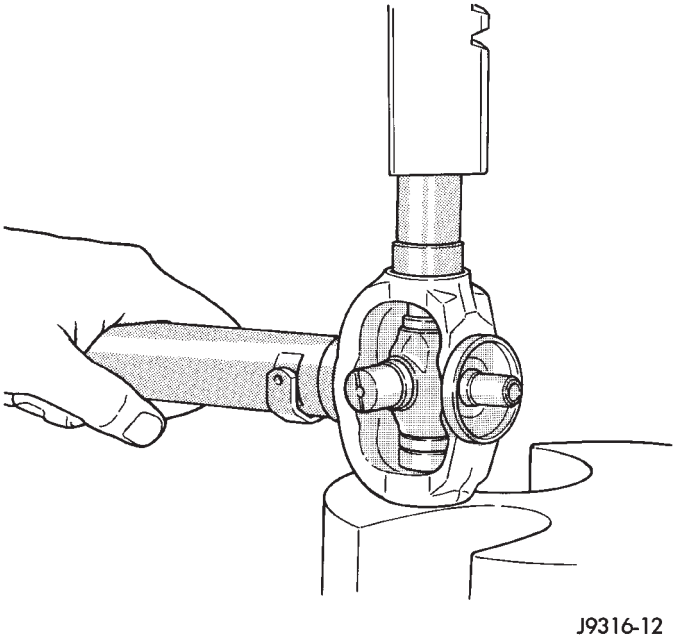


Fig. 29 Press In Bearing Cap

(7) Fit the link yoke on the remaining two trunnions and press both bearing caps into place (Fig. 30).

(8) Install snap rings.

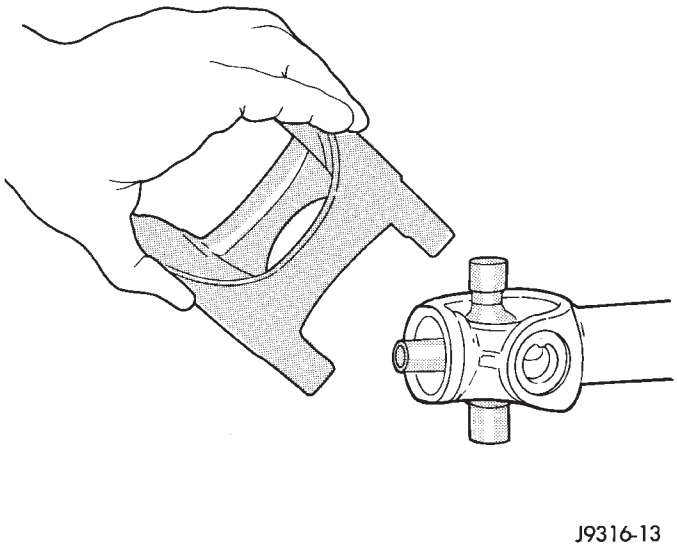


Fig. 30 Install Link Yoke

(9) Install the centering kit assembly inside the link yoke making sure the spring is properly positioned (Fig. 31).

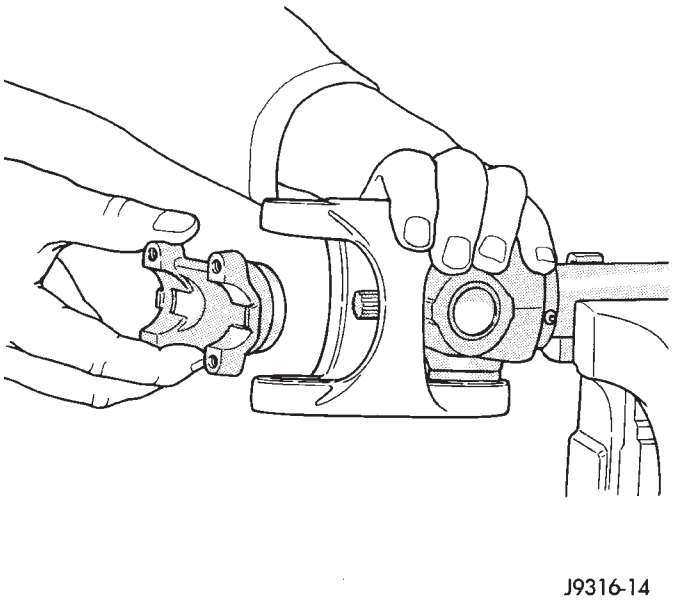


Fig. 31 Install Centering Kit

DISASSEMBLY AND ASSEMBLY (Continued)

(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. 32).

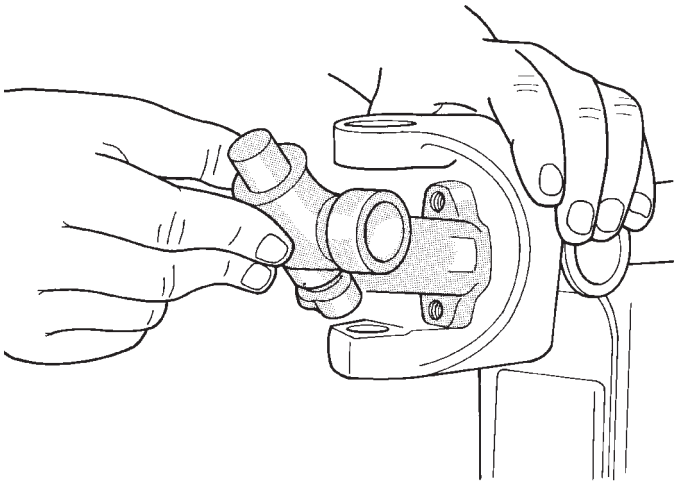


Fig. 32 Install Remaining Cross

(11) Press the remaining two bearing caps into place and install snap rings (Fig. 33).

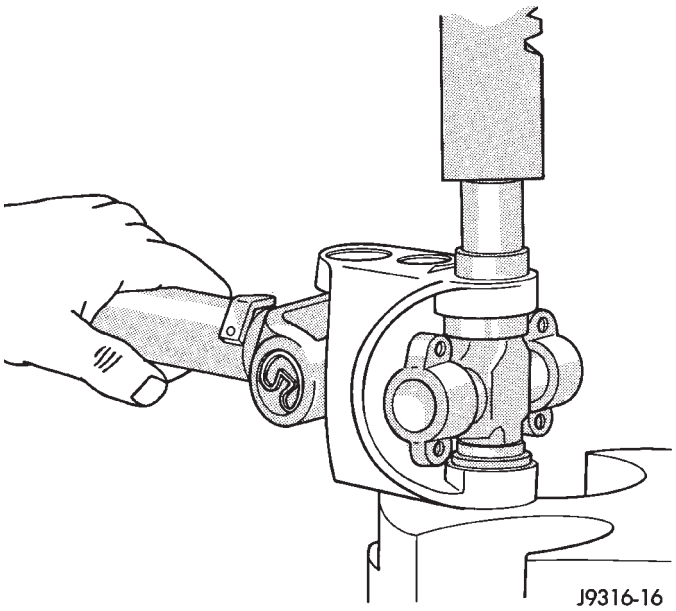


Fig. 33 Press In Bearing Cap

(12) Tap the snap rings to allow them to seat into the grooves (Fig. 34).

(13) Check for proper assembly. Flex the joint beyond center, it should snap over-center in both directions when correctly assembled (Fig. 35).

(14) Install the propeller shaft.

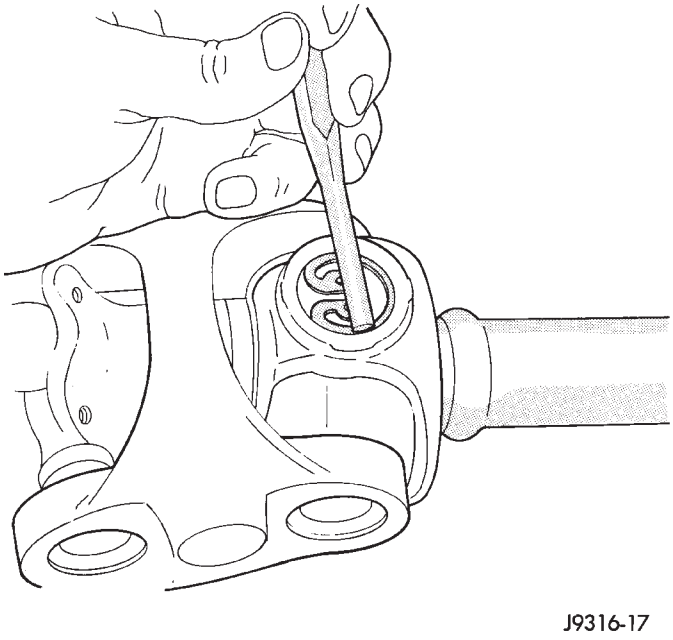


Fig. 34 Seat Snap Rings In Groove

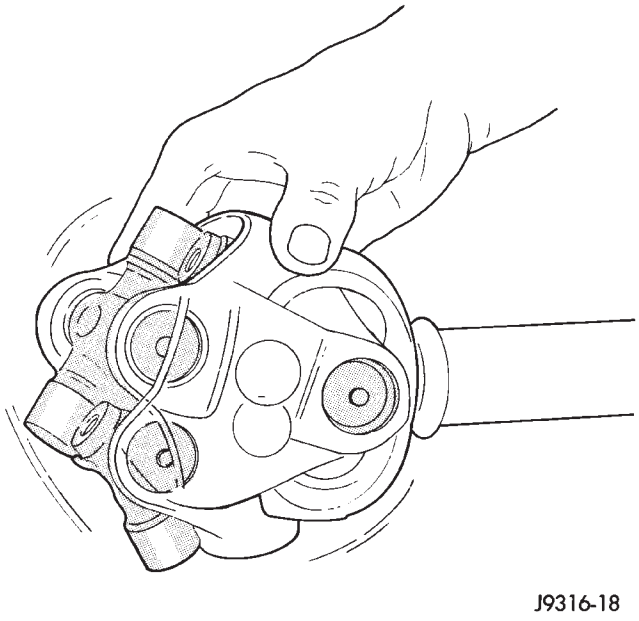


Fig. 35 Check Assembly

CLEANING AND INSPECTION

PROPELLER SHAFT

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

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

ADJUSTMENTS

ADJUSTMENT AT AXLE WITH LEAF SPRINGS

Adjust the pinion shaft angle at the springs with tapered shims (Fig. 36). Install tapered shims between the springs and axle pad to correct the angle. Refer to Group 2, Suspension, for additional information.

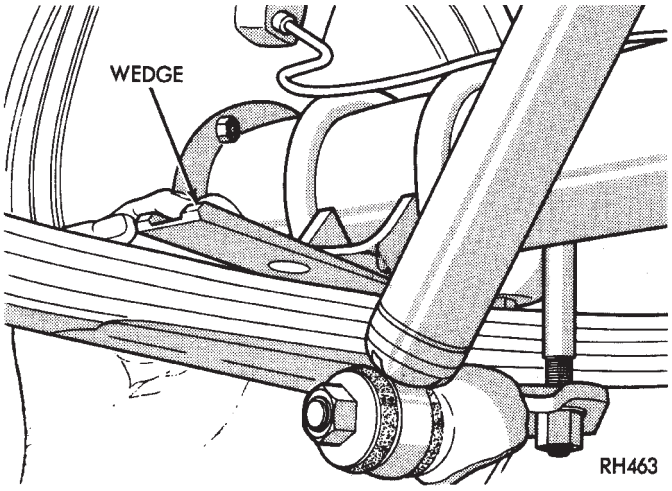


Fig. 36 Angle Adjustment at Leaf Springs

FRONT AXLE ANGLE ADJUSTMENT

Adjust the pinion gear angle at the lower suspension arms with shims (Fig. 37). Adding shims will decrease the pinion gear shaft angle but will increase the caster angle. The pinion gear shaft angle has priority over the caster angle. Refer to Group 2, Suspension, for additional information.

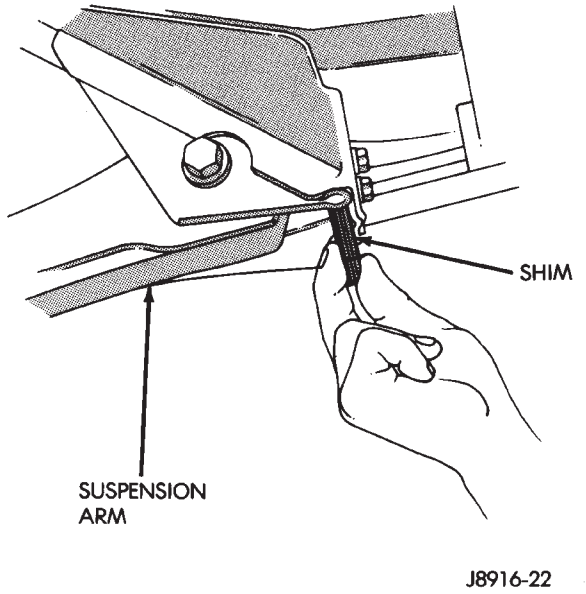


Fig. 37 Front Axle Angle Adjustment

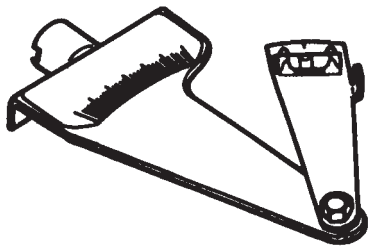
SPECIFICATIONS

PROPELLER SHAFTS AND U–JOINTS

DESCRIPTION	TORQUE
Bolts, Transfer Case Yoke	27 N·m (20 ft. lbs.)
Bolts, Axle Yoke	19 N·m (14 ft. lbs.)
Bolts, Axle Yoke	19 N·m (14 ft. lbs.)

SPECIAL TOOLS

PROPELLER SHAFT



Inclinometer—7663

TUBE AND 181 FBI AXLE

INDEX

GENERAL INFORMATION

181 FBI AXLE

The 181 Front Beam-design Iron (FBI) axle consists of a cast iron differential housing with axle shaft tubes extending from either side. The tubes are pressed into the differential housing and welded.

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

The axle has a fitting for a vent hose 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.

For vehicles with ABS brakes, the ABS wheel speed sensors are attached to the knuckle assemblies. The tone rings for the ABS system are pressed onto the axle shaft. **Do not damage ABS tone wheel or the sensor when removing axle shafts.**

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

The 181 FBI axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover by a cover bolt. Build date identification codes are stamped on the cover side of the axle shaft 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 (select thickness). The shims are located between the differential bearing cones and case. Pinion bearing preload is set and maintained by the use of shims (select thickness).

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.

GENERAL INFORMATION (Continued)

- Lubricant for axles intended for heavy-duty or trailer tow use is SAE 75W–140 SYNTHETIC gear lubricant.

The 181 FBI axle lubricant capacity is 1.48 L (3.13 pts.).

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).

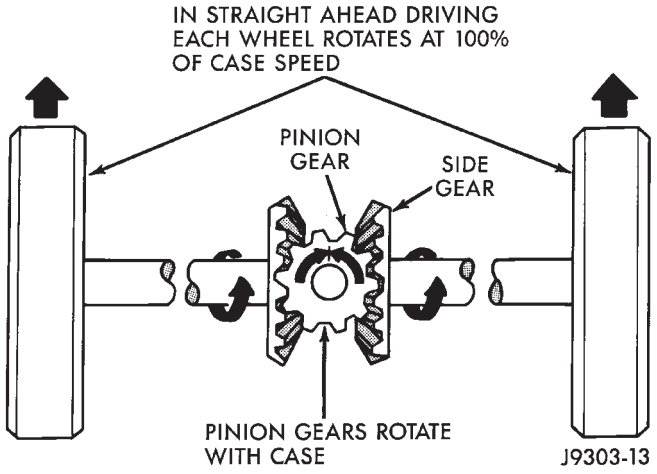


Fig. 1 Differential Operation—Straight Ahead Driving

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.

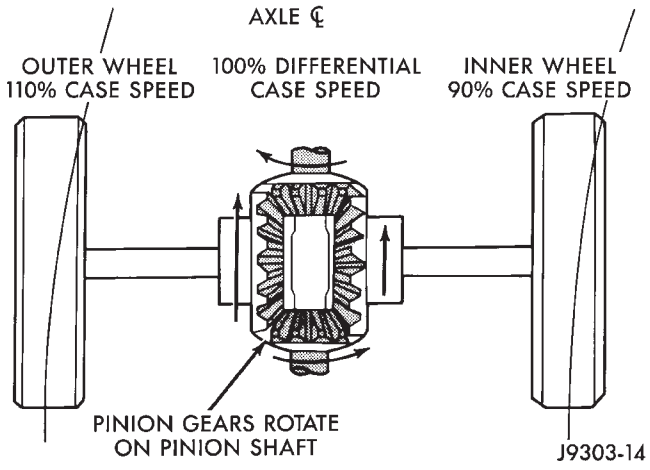


Fig. 2 Differential Operation—On Turns

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.

DIAGNOSIS AND TESTING (Continued)

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 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	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	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.	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	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	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	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	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	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	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	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS – CONTINUED

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	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.	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	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	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)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	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	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	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

SERVICE PROCEDURES

LUBRICANT CHANGE

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

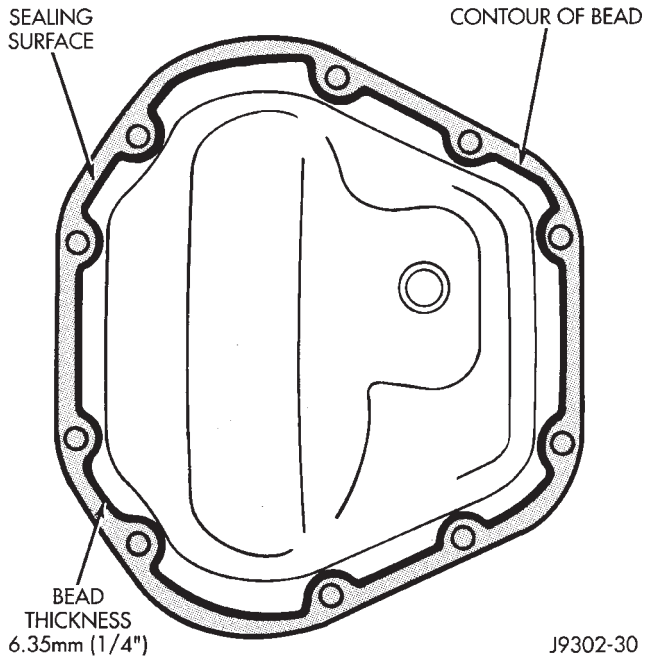


Fig. 3 Typical Housing Cover With Sealant

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. Tighten fill plug to 34 N·m (25 ft. lbs.).

REMOVAL AND INSTALLATION

DRIVE AXLE ASSEMBLY

REMOVAL

(1) Raise and support the vehicle.
(2) Position a suitable lifting device under the axle.
(3) Secure axle to device.
(4) Remove the wheels and tires.
(5) Remove the brake rotors and calipers from the axle. Refer to Group 5, Brakes, for proper procedures.
(6) Disconnect the wheel sensor wiring harness from the vehicle wiring harness, if necessary.
(7) Disconnect the vent hose from the axle shaft tube.
(8) Mark the propeller shaft and yoke for installation alignment reference.
(9) Remove propeller shaft.
(10) Disconnect stabilizer bar links at the axle.
(11) Disconnect shock absorbers from axle brackets.
(12) Disconnect track bar.
(13) Disconnect the tie rod and drag link from the steering knuckle. Refer to Group 2, Suspension, for proper procedures.
(14) Disconnect the steering damper from the axle bracket.
(15) Disconnect the upper and lower suspension arms from the axle brackets.
(16) Lower the lifting device enough to remove the axle. The coil springs will drop with the axle.
(17) Remove the coil springs from the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, ride height and handling could be affected.

(1) Install the springs and retainer clips. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.
(2) Support the axle on a suitable lifting device and position axle under the vehicle.
(3) Raise the axle and align it with the spring pads.
(4) Position the upper and lower suspension arms in the axle brackets. Loosely install bolts and nuts to hold suspension arms to the axle brackets.
(5) Connect the vent hose to the axle shaft tube.
(6) Connect the track bar to the axle bracket. Loosely install the bolt to hold the track bar to the axle bracket.

REMOVAL AND INSTALLATION (Continued)

(7) Install the shock absorbers and tighten the bolts to 23 N·m (17 ft. lbs.) torque.
(8) Install the stabilizer bar links to the axle brackets. Tighten the nut to 95 N·m (70 ft. lbs.) torque.
(9) Install the drag link and tie rod to the steering knuckles. Refer to Group 2, Suspension, for proper procedures.
(10) Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.
(11) Install the brake rotors and calipers. Refer to Group 5, Brakes, for the proper procedures.
(12) Connect the wheel speed sensor wiring harness to the vehicle wiring harness, if necessary.
(13) Align the previously made marks on the propeller shaft and the yoke.
(14) Install the straps and bolts to hold the propeller shaft to the yoke.
(15) Check and fill axle lubricant. Refer to the Lubricant Specifications in this group for the quantity necessary.
(16) Install the wheel and tire assemblies.
(17) Remove the lifting device from the axle and lower the vehicle.
(18) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.) torque. Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.) torque.
(19) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.
(20) Check the front wheel alignment.

TUBE AXLE ASSEMBLY

REMOVAL

(1) Raise and support the vehicle.
(2) Position a suitable lifting device under the axle.
(3) Secure axle to device.
(4) Remove the wheels and tires.
(5) Remove the brake rotors and calipers from the axle. Refer to Group 5, Brakes, for proper procedures.
(6) Disconnect the wheel sensor wiring harness from the vehicle wiring harness, if necessary.
(7) Disconnect stabilizer bar links at the axle.
(8) Disconnect shock absorbers from axle brackets.
(9) Disconnect track bar.
(10) Disconnect the tie rod and drag link from the steering knuckle. Refer to Group 2, Suspension, for proper procedures.
(11) Disconnect the steering damper from the axle bracket.
(12) Disconnect the upper and lower suspension arms from the axle brackets.
(13) Lower the lifting device enough to remove the axle. The coil springs will drop with the axle.
(14) Remove the coil springs from the axle.

INSTALLATION

CAUTION: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, ride height and handling could be affected.

(1) Install the springs and retainer clips. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.
(2) Support the axle on a suitable lifting device and position axle under the vehicle.
(3) Raise the axle and align it with the spring pads.
(4) Position the upper and lower suspension arms in the axle brackets. Loosely install bolts and nuts to hold suspension arms to the axle brackets.
(5) Connect the track bar to the axle bracket. Loosely install the bolt to hold the track bar to the axle bracket.
(6) Install the shock absorbers and tighten the bolts to 23 N·m (17 ft. lbs.) torque.
(7) Install the stabilizer bar links to the axle brackets. Tighten the nut to 95 N·m (70 ft. lbs.) torque.
(8) Install the drag link and tie rod to the steering knuckles. Refer to Group 2, Suspension, for proper procedures.
(9) Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.
(10) Install the brake rotors and calipers. Refer to Group 5, Brakes, for the proper procedures.
(11) Connect the wheel speed sensor wiring harness to the vehicle wiring harness, if necessary.
(12) Install the wheel and tire assemblies.
(13) Remove the lifting device from the axle and lower the vehicle.
(14) Tighten the upper suspension arm nuts to 75 N·m (55 ft. lbs.) torque. Tighten the lower suspension arm nuts to 115 N·m (85 ft. lbs.) torque.
(15) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.
(16) Check the front wheel alignment.

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.

REMOVAL AND INSTALLATION (Continued)

(1) Remove axle shaft.

(2) Remove the bearing cap retaining snap rings (Fig. 4).

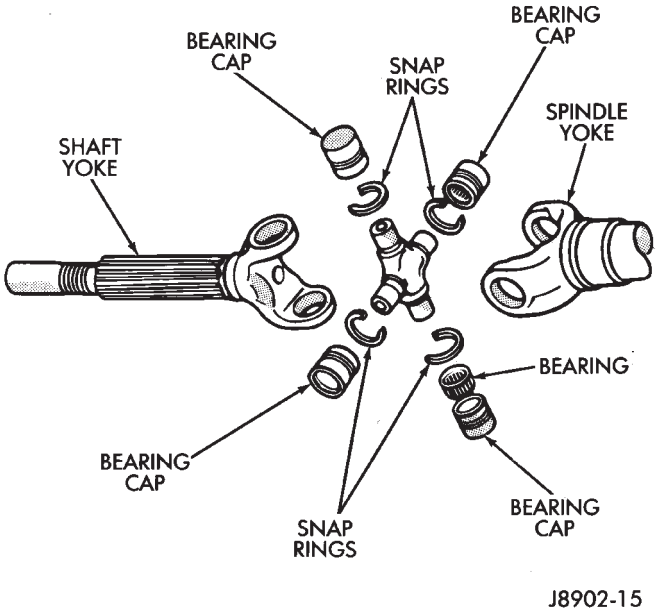


Fig. 4 Axle Shaft Outer U–Joint

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.

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

(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.

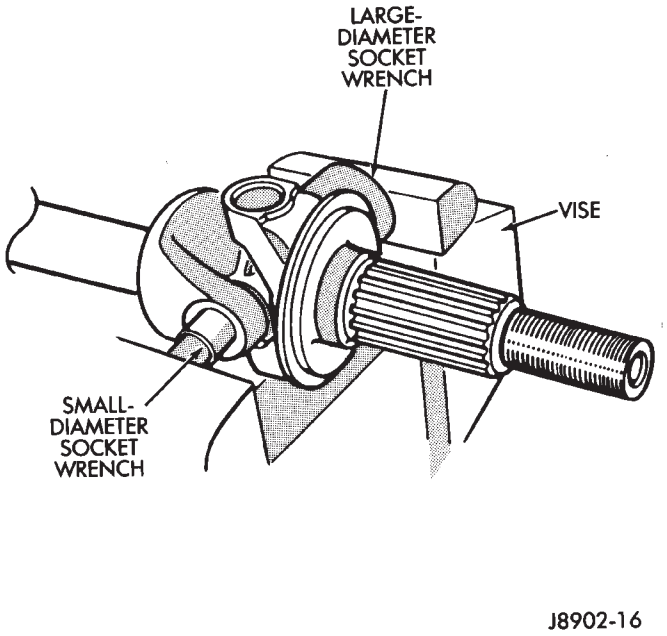


Fig. 5 Yoke Bearing Cap Removal

(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.

PINION SHAFT SEAL

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove brake rotors and calipers. Refer to Group 5, Brakes, for proper procedures.

(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) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 6).

(10) Use a suitable pry tool or a 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 C-3972-A and Handle C-4171 (Fig. 7).

(2) Install yoke on the pinion gear with Installer W-162–D, Cup 8109, and Holder 6958 (Fig. 8).

REMOVAL AND INSTALLATION (Continued)

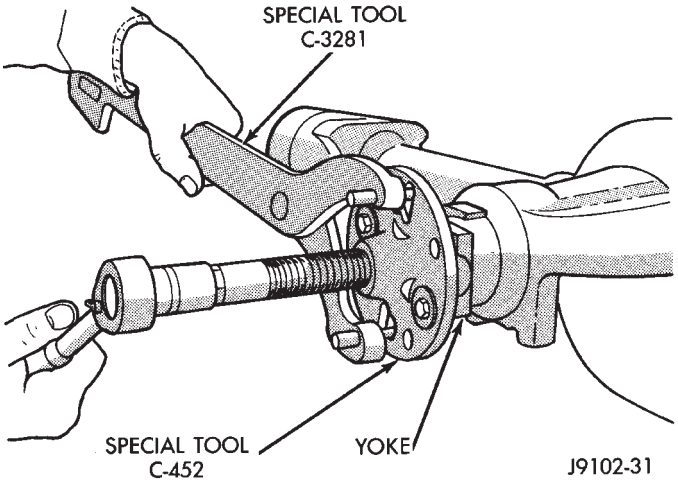


Fig. 6 Pinion Yoke Removal

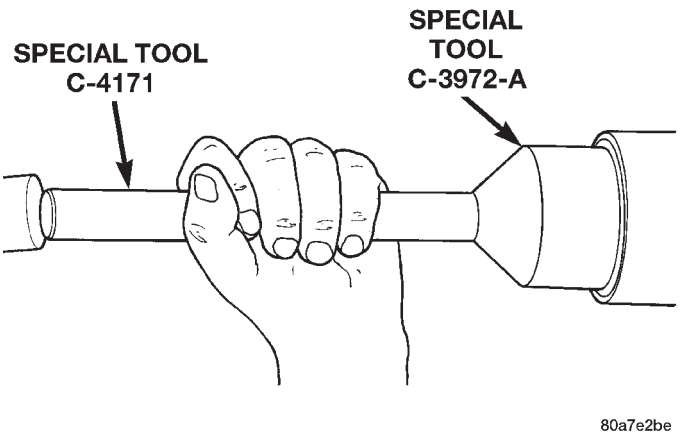


Fig. 7 Pinion Seal Installation

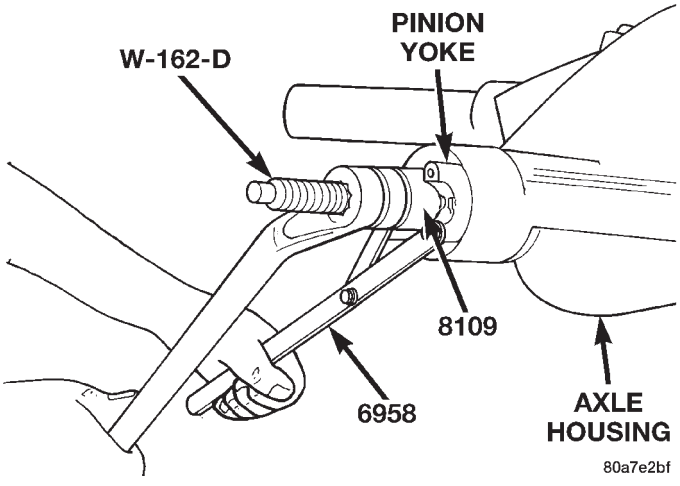


Fig. 8 Pinion Yoke Installation

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

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

(4) Tighten pinion nut to 217 N·m (160 ft. lbs.).

(5) 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. 9).

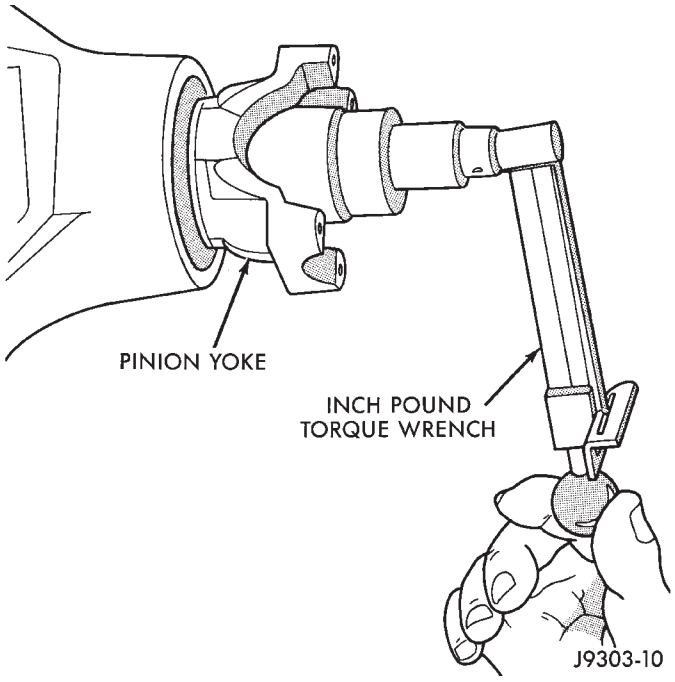


Fig. 9 Check Pinion Rotation Torque

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

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

(8) Check and fill the gear lubricant. Refer to the Lubricant Specifications for gear lubricant requirements.

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

(10) Install wheel and tire assemblies.

(11) Lower the vehicle.

HUB BEARING AND AXLE SHAFT

If the axle shaft and hub bearing are being removed in order to service another component, the axle shaft and hub bearing can be removed as an assembly.

REMOVAL

(1) Raise and support the vehicle.

(2) Remove the wheel and tire assembly.

REMOVAL AND INSTALLATION (Continued)

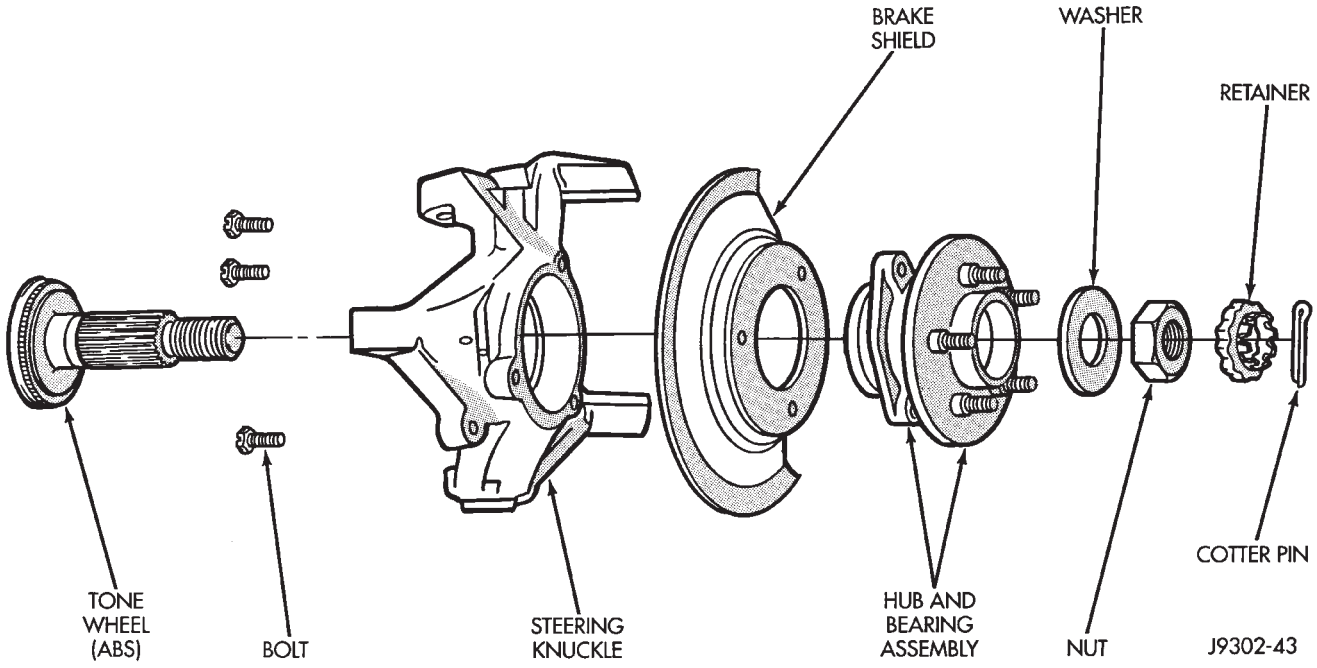


Fig. 10 Hub, Knuckle and Axle Shaft

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

(4) Remove ABS wheel speed sensor, if necessary. Refer to Group 5, Brakes, for proper procedures.

(5) Remove the cotter pin, nut retainer, and axle hub nut (Fig. 10), if necessary.

(6) Remove the hub to knuckle bolts (Fig. 11).

(7) Remove the hub from the steering knuckle and axle shaft, if necessary.

(8) Remove hub bearing and axle shaft assembly (Fig. 12), or axle shaft from axle. **Avoid damaging the axle shaft oil seals in the axle housing.**

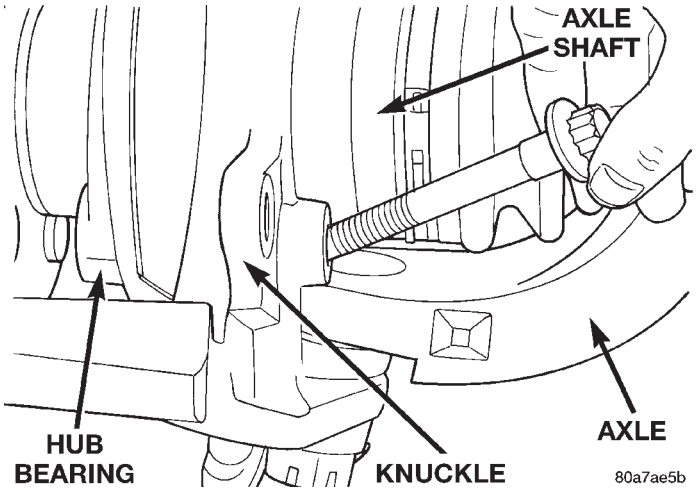


Fig. 11 Hub Bearing Bolts

(9) Remove the brake rotor shield from the hub bearing or knuckle (Fig. 10).

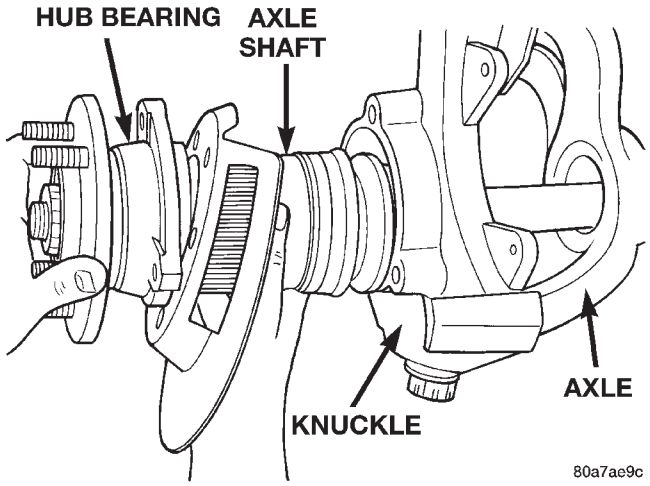


Fig. 12 Hub Bearing and Axle Assembly

INSTALLATION

(1) Thoroughly clean the axle shaft (Fig. 10) and apply a thin film of Mopar® Wheel Bearing Grease, or equivalent, to the shaft splines, seal contact surface, and hub bore.

(2) Install the brake rotor shield to the knuckle.

(3) Install the hub bearing and axle shaft assembly, or axle shaft, into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the axle housing.

(4) Install the hub bearing, if necessary.

(5) Install the hub to knuckle bolts and tighten to 102 N·m (75 ft. lbs.) torque.

REMOVAL AND INSTALLATION (Continued)

(6) Install the hub washer and nut, if necessary. Tighten the hub nut to 237 N·m (175 ft. lbs.) torque. Install the nut retainer and a new cotter pin (Fig. 10).

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

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

(9) Install the wheel and tire assembly.

(10) Remove support and lower the vehicle.

STEERING KNUCKLE AND BALL STUDS

Ball stud service procedures below require removal of the hub bearing and axle shaft. Removal and installation of upper and lower ball studs require the use of Tool Kit 6289.

KNUCKLE REMOVAL

(1) Remove hub bearing and axle shaft.

(2) Disconnect the tie-rod or drag link from the steering knuckle arm. Refer to Group 2, Suspension, for proper procedures.

(3) Remove the cotter pins from the upper and lower ball studs.

(4) Remove the upper and lower ball stud nuts.

(5) Strike the steering knuckle with a brass hammer to loosen knuckle from the ball studs. Remove knuckle from ball studs (Fig. 13).

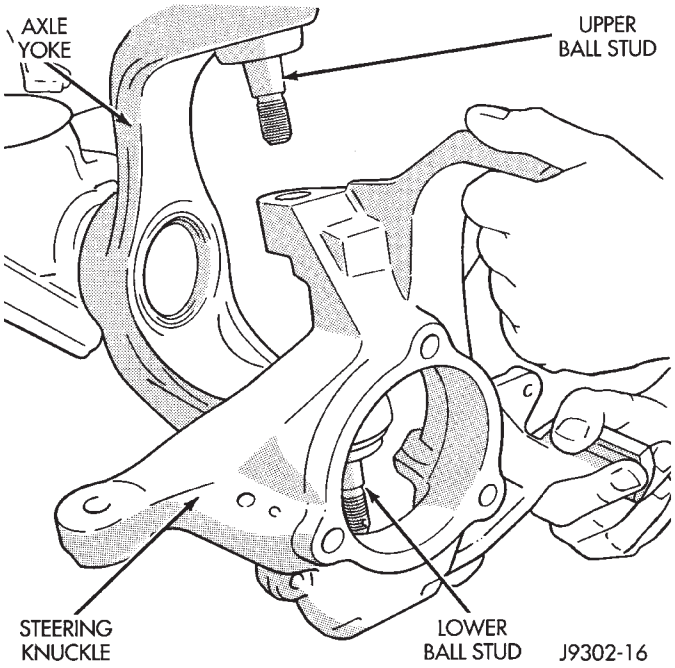


Fig. 13 Steering Knuckle Removal/Installation

UPPER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 14).

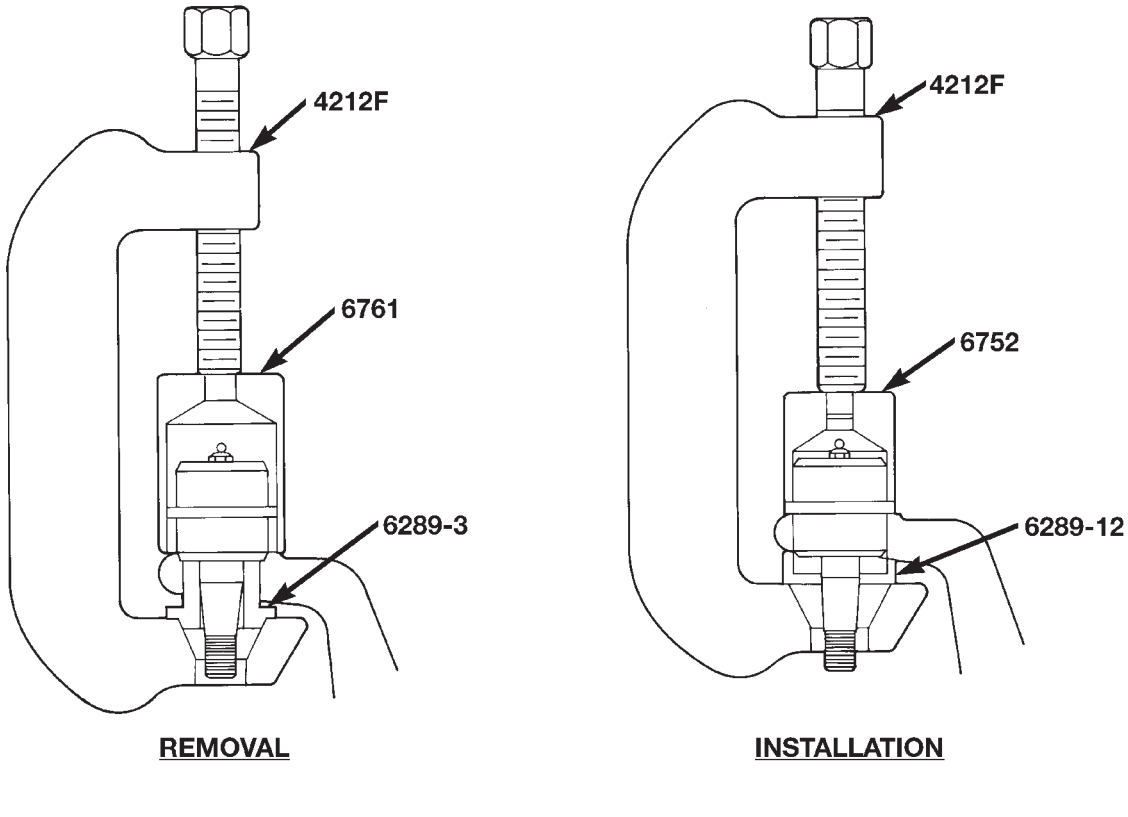


Fig. 14 Upper Ball Stud Remove/Install

REMOVAL AND INSTALLATION (Continued)

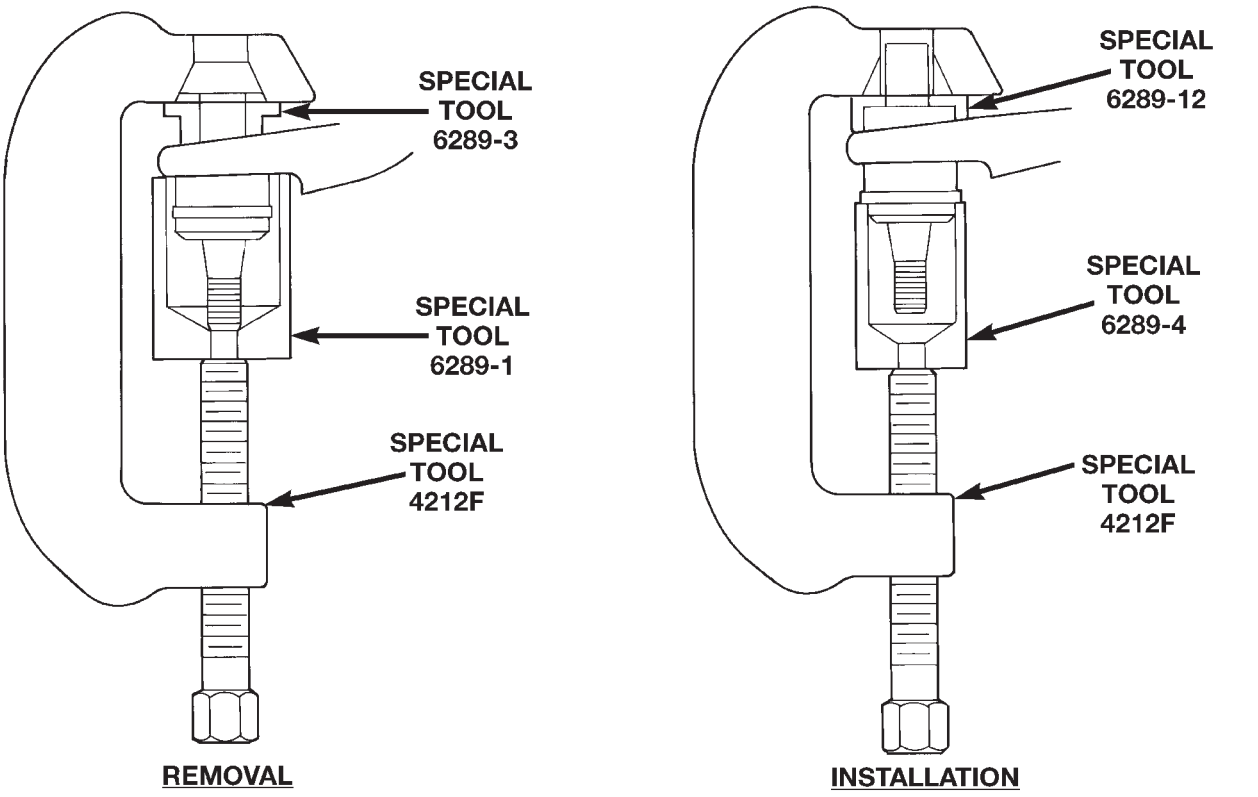


Fig. 15 Lower Ball Stud Remove/Install

LOWER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 15).

KNUCKLE INSTALLATION

(1) Position the steering knuckle on the ball studs.

(2) Install and tighten the bottom retaining nut to 109 N·m (80 ft. lbs.) torque. Install new cotter pin.

(3) Install and tighten the top retaining nut to 101 N·m (75 ft. lbs.) torque. Install new cotter pin.

(4) Install the hub bearing and axle shaft.

(5) Connect the tie-rod or drag link end to the steering knuckle arm. Refer to Group 2, Suspension, for proper procedures.

AXLE BUSHING REPLACEMENT

Refer to Group 2, Suspension, for the proper axle bushing procedures.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.

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

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

(4) Remove hub bearings and axle shafts.

(5) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 16).

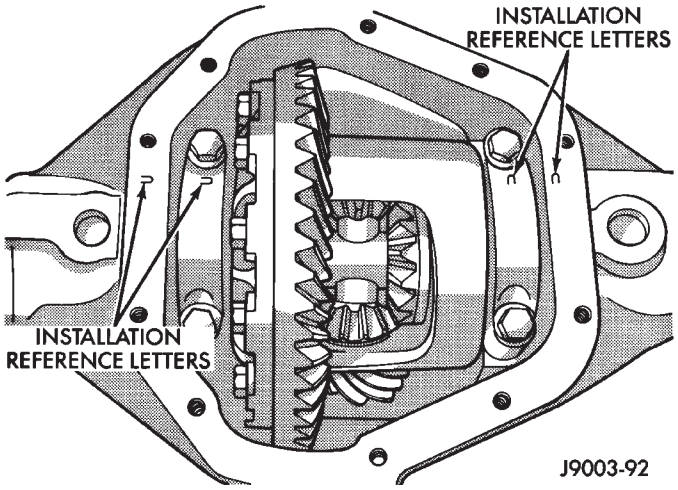


Fig. 16 Bearing Cap Identification

(6) Loosen the differential bearing cap bolts.

(7) Position Spreader W–129–B, utilizing some items from Adapter Kit 6987, with the tool dowel pins seated in the locating holes (Fig. 17). Install the

REMOVAL AND INSTALLATION (Continued)

holddown clamps and tighten the tool turnbuckle finger–tight.

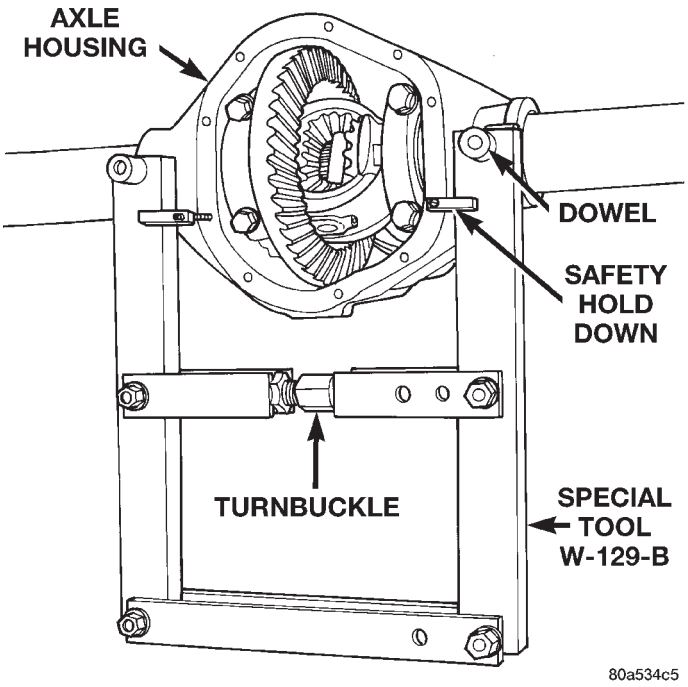


Fig. 17 Install Axle Housing Spreader

(8) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to guide pin. Load the lever adapter against the opposite side of the housing (Fig. 18) and zero the indicator.

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

(9) Spread the housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 19).

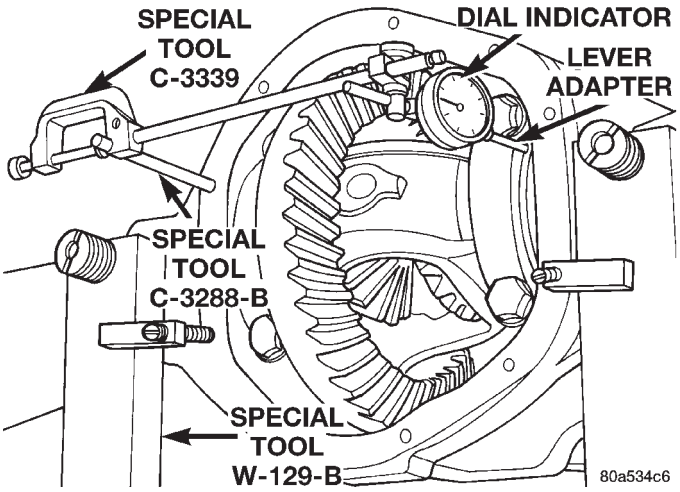


Fig. 18 Install Dial Indicator

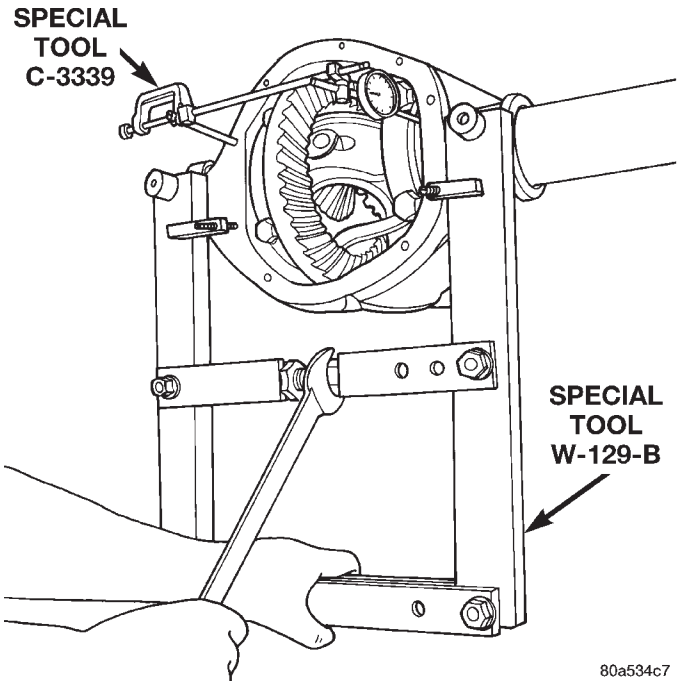


Fig. 19 Spread Axle Housing

(10) Remove the dial indicator.

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

(12) Remove the differential from the housing. Ensure that the differential bearing cups remain in position on the differential bearings (Fig. 20).

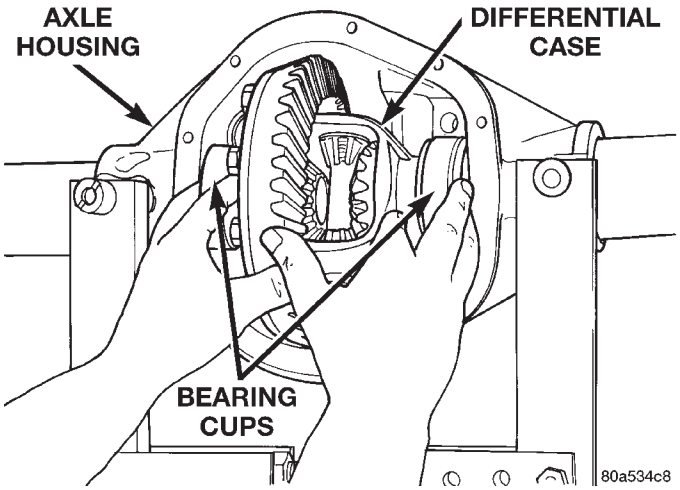


Fig. 20 Differential Case Removal

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

(14) Remove spreader from housing.

INSTALLATION

If replacement differential bearings or differential case are being installed, differential side bearing shim requirements may change. Refer to the Differ-

REMOVAL AND INSTALLATION (Continued)

ential Bearing Preload and Gear Backlash procedures in this section to determine the proper shim selection.

(1) Position Spreader W-129-B, utilizing some items from Adapter Kit 6987, with the tool dowel pins seated in the locating holes (Fig. 21). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

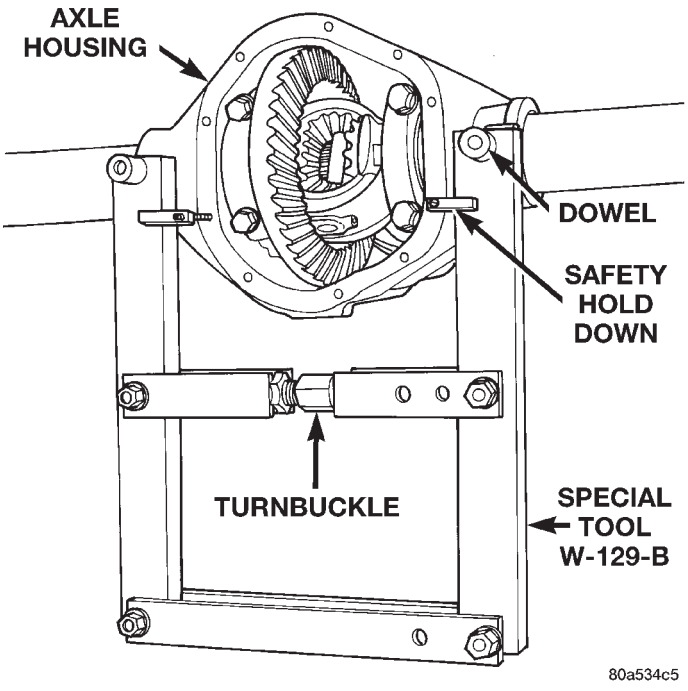


Fig. 21 Install Axle Housing Spreader

(2) Install a Guide Pin C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to guide pin. Load the lever adapter against the opposite side of the housing (Fig. 18) and zero the indicator.

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

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 19).

(4) Remove the dial indicator.

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

(6) Install the bearing caps at their original locations (Fig. 22).

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

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

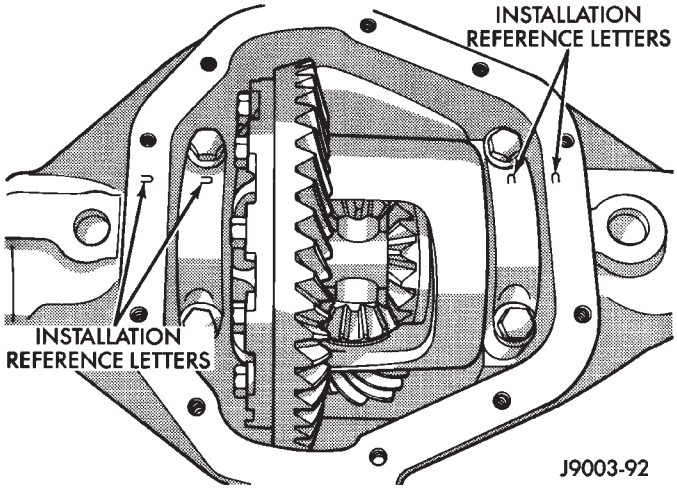


Fig. 22 Differential Bearing Cap Reference Letters

(10) Install the hub bearings and axle shafts.

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, C-293-39 Adapter Blocks, and Plug SP-3289 (Fig. 23).

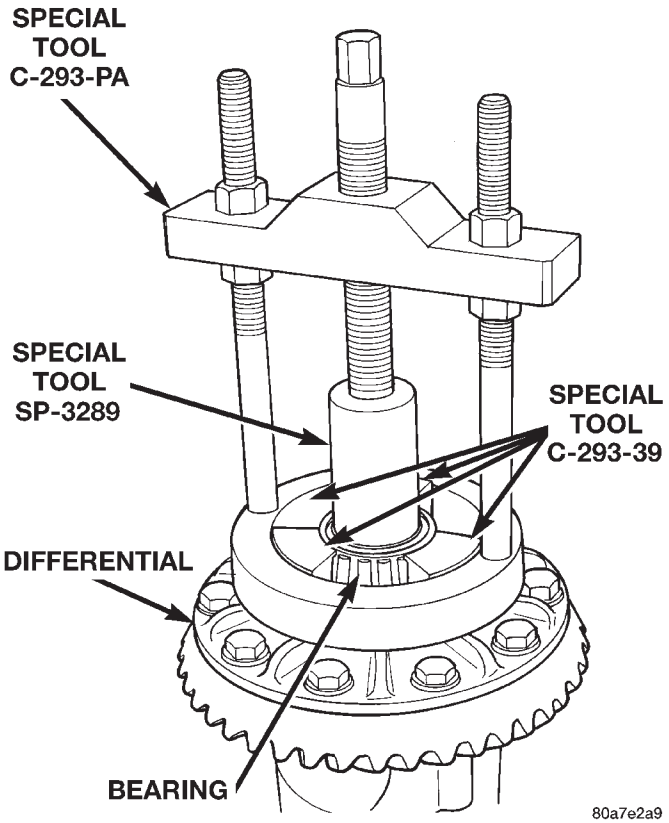


Fig. 23 Differential Bearing Removal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

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

(1) Install differential side bearing shims onto differential case hubs.

(2) Using Installer C-3716-A and Handle C-4171, install differential side bearings (Fig. 24).

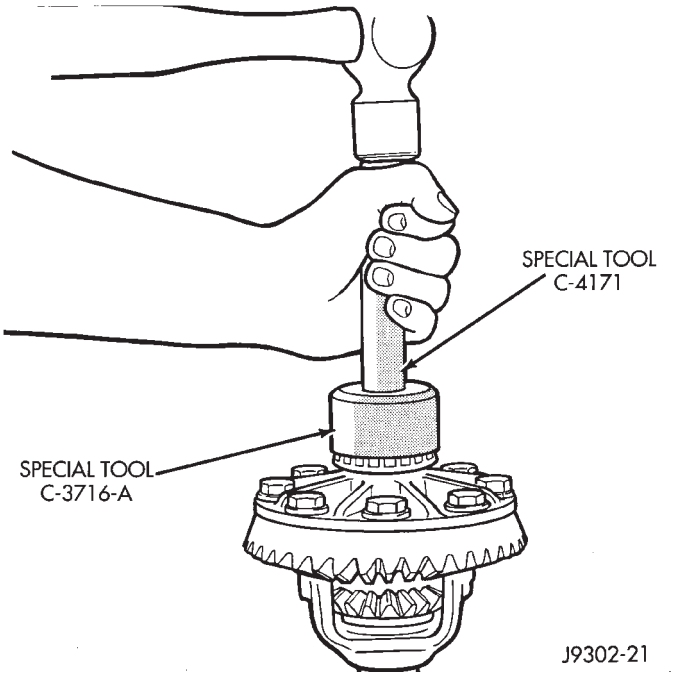


Fig. 24 Differential Side Bearing Installation

(3) Install differential in axle housing.

AXLE SHAFT OIL SEAL

REMOVAL

(1) Raise and support vehicle.

(2) Remove differential assembly.

(3) Remove the inner axle shaft seals with a pry bay.

INSTALLATION

(1) Remove any sealer remaining from original seals.

(2) Remove sealer from axle tube to housing junction, if necessary.

(3) Install oil seals with Discs 8110 and Turnbuckle 6797 (Fig. 25). Tighten tool until disc bottoms in housing.

(4) Install differential assembly.

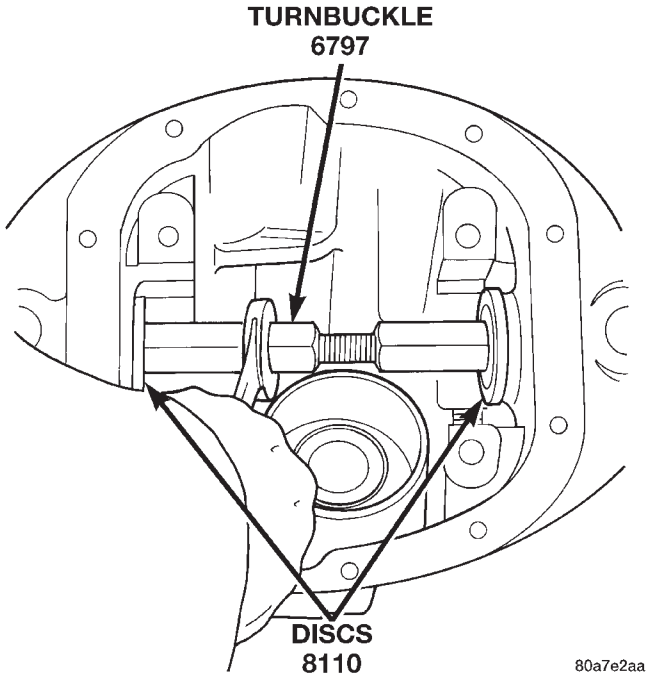


Fig. 25 Axle Seal Installation

RING GEAR

NOTE: 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. 26).

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

(4) Using a soft hammer, drive ring gear from differential case (Fig. 26).

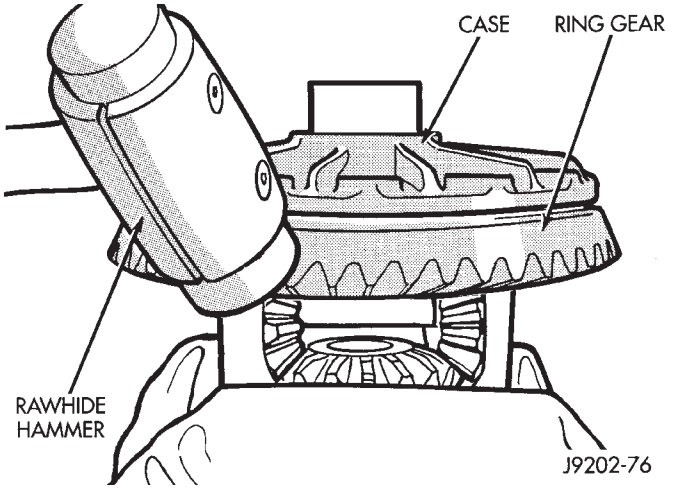


Fig. 26 Ring Gear Removal

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

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

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

(2) Invert the differential case in the vise.

(3) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 27).

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

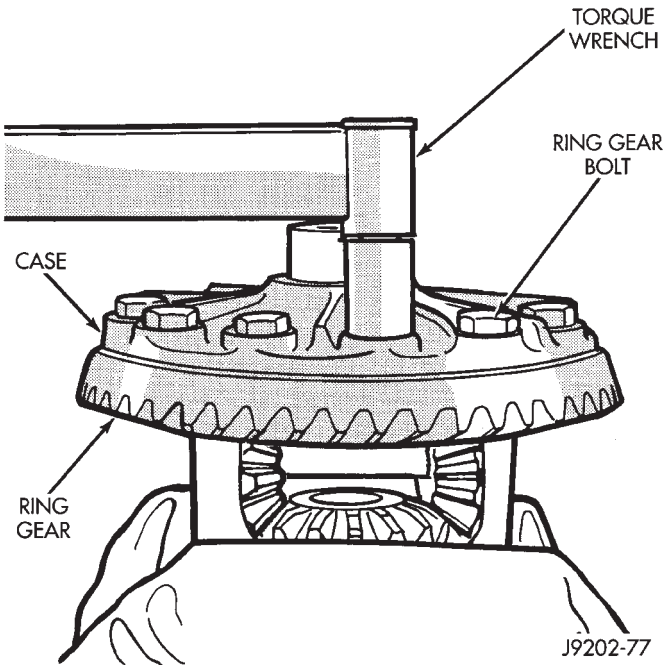


Fig. 27 Ring Gear Bolt Installation

PINION GEAR

The ring and pinion gears are serviced as 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 Holder 6958 to hold yoke, remove the pinion nut and washer.

(5) Using Remover C-452 and Holder C-3281, remove the pinion yoke from pinion shaft (Fig. 28).

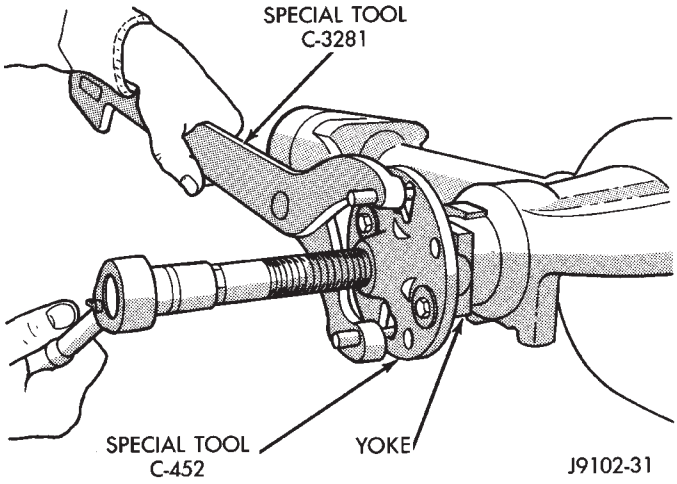


Fig. 28 Pinion Yoke Removal

(6) Remove the pinion gear and preload shims from housing (Fig. 29). Catch the pinion with your hand to prevent it from falling and being damaged.

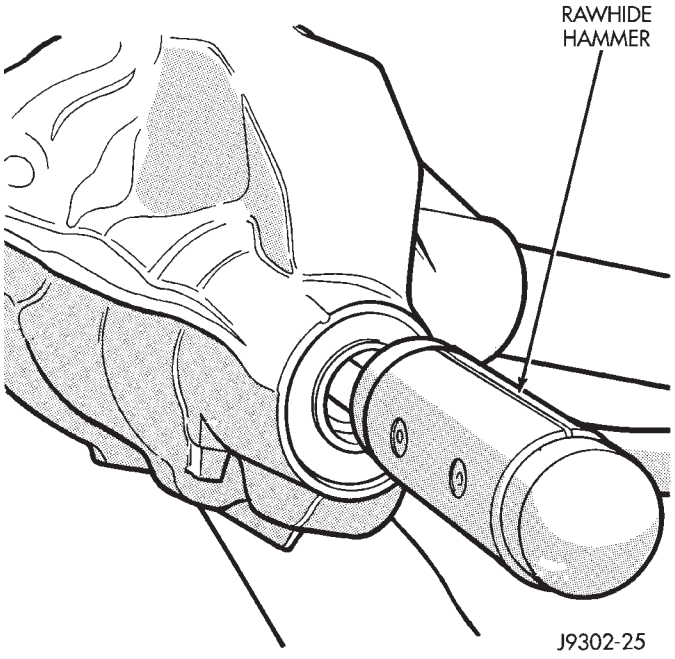


Fig. 29 Remove Pinion Gear

(7) Remove the front pinion bearing cup, bearing, oil slinger, if equipped, and pinion seal with Remover D-147 and Handle C–4171 (Fig. 30).

(8) Remove the rear pinion bearing cup from axle housing (Fig. 31). Use Remover D-149 and Handle C–4171.

REMOVAL AND INSTALLATION (Continued)

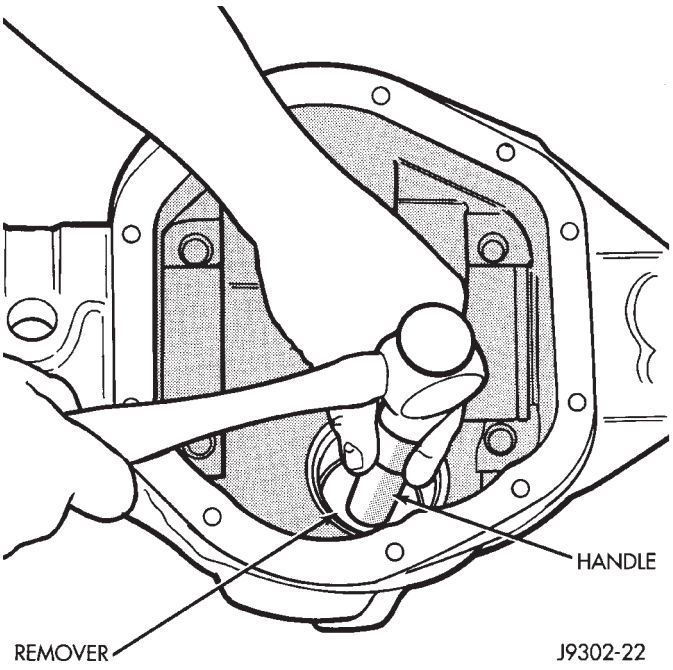


Fig. 30 Front Bearing Cup Removal

(9) Remove the depth shims from rear pinion bearing cup bore in axle housing. Record the thickness of the depth shims.

NOTE: The pinion depth shims can be very thin. Verify that all shims have been removed before proceeding.

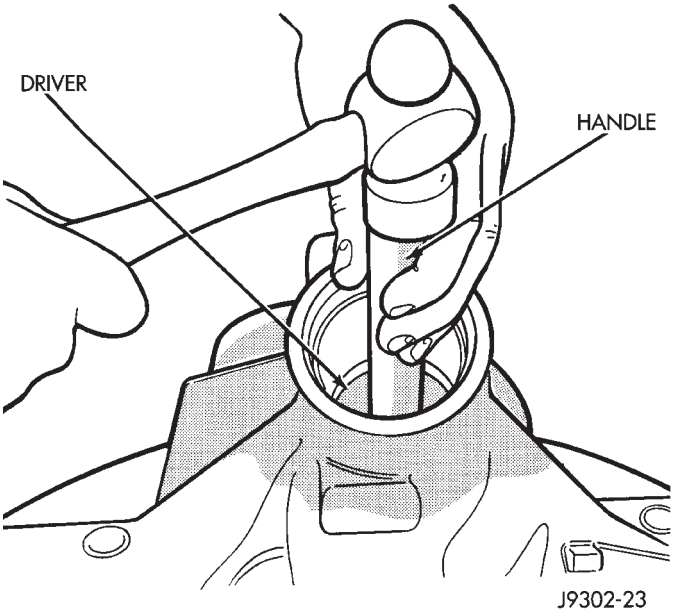


Fig. 31 Rear Bearing Cup Removal

(10) Remove the rear pinion bearing from the pinion with Puller/Press C–293-PA and Adapters C-293-39 (Fig. 32).

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

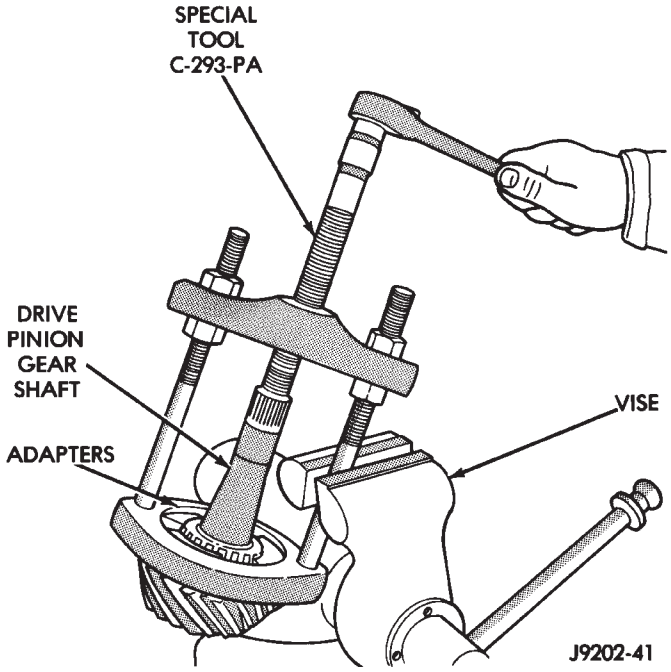


Fig. 32 Inner Bearing Removal

INSTALLATION

NOTE: Pinion depth shims are placed between the rear pinion bearing cup and axle housing 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 to select the proper thickness shim before installing pinion gear.

(1) Place proper thickness depth shim in rear pinion bearing cup bore in the axle housing.

(2) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of rear pinion bearing cup. Install the bearing cup with Installer D-146 and Handle C–4171 (Fig. 33). Verify cup is correctly seated.

(3) Apply Mopar® Door Ease, or equivalent, stick lubricant to outside surface of front pinion bearing cup. Install the bearing cup with Installer D-144 and Handle C–4171 (Fig. 34).

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

REMOVAL AND INSTALLATION (Continued)

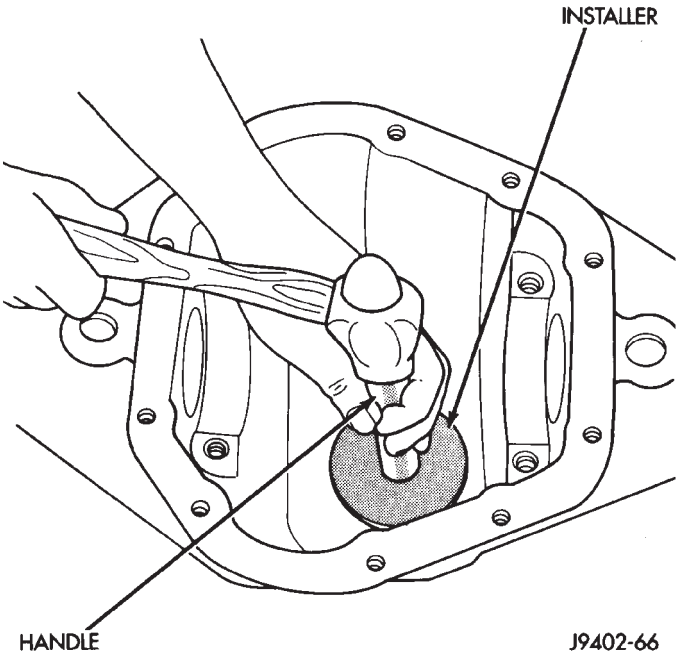


Fig. 33 Rear Pinion Bearing Cup Installation

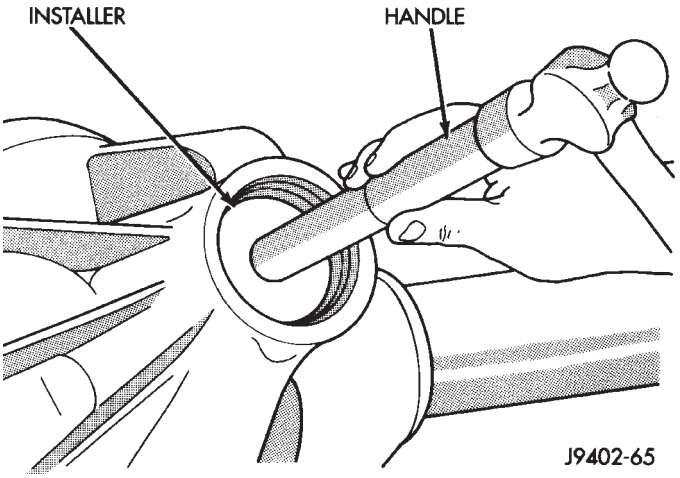


Fig. 34 Pinion Outer Bearing Cup Installation

(5) 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. 35).

(6) Install the rear pinion bearing and oil slinger, if equipped, on the pinion gear with Installer W-262 and a shop press (Fig. 36).

(7) Install pinion bearing preload shims onto the pinion gear (Fig. 37).

(8) Install pinion gear in housing.

(9) Install yoke with Installer W-162-B, Cup 8109, and Holder 6958 (Fig. 38).

(10) Install the pinion washer and a new nut on the pinion gear. Tighten the nut to 217 N·m (160 ft. lbs.).

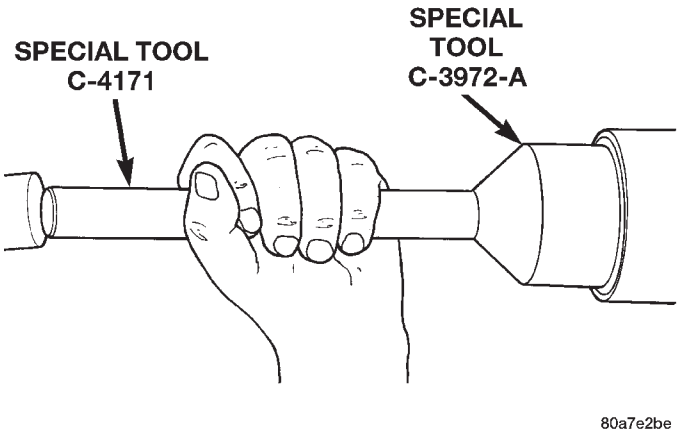


Fig. 35 Pinion Seal Installation

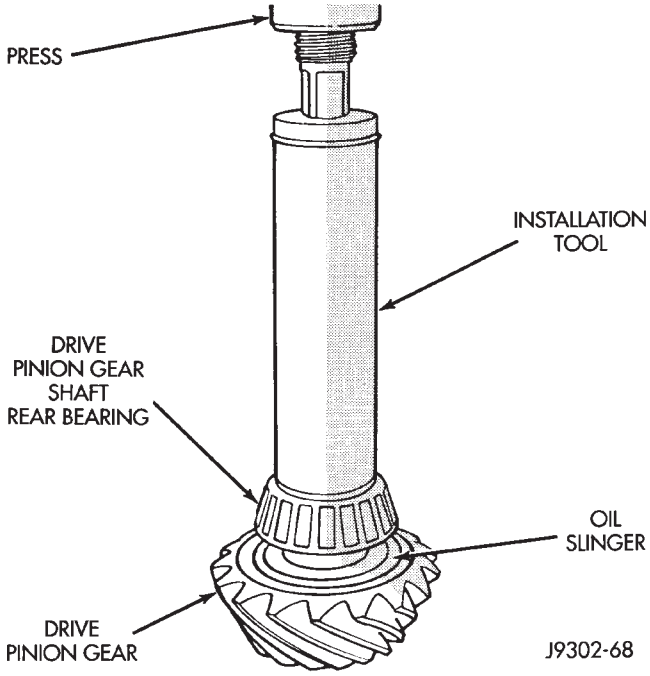


Fig. 36 Rear Pinion Bearing Installation

CAUTION: Never loosen pinion gear nut to decrease pinion gear bearing rotating torque and never exceed specified preload rotating torque.

(11) Check bearing preload torque with an inch pound torque wrench (Fig. 39). 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.).

REMOVAL AND INSTALLATION (Continued)

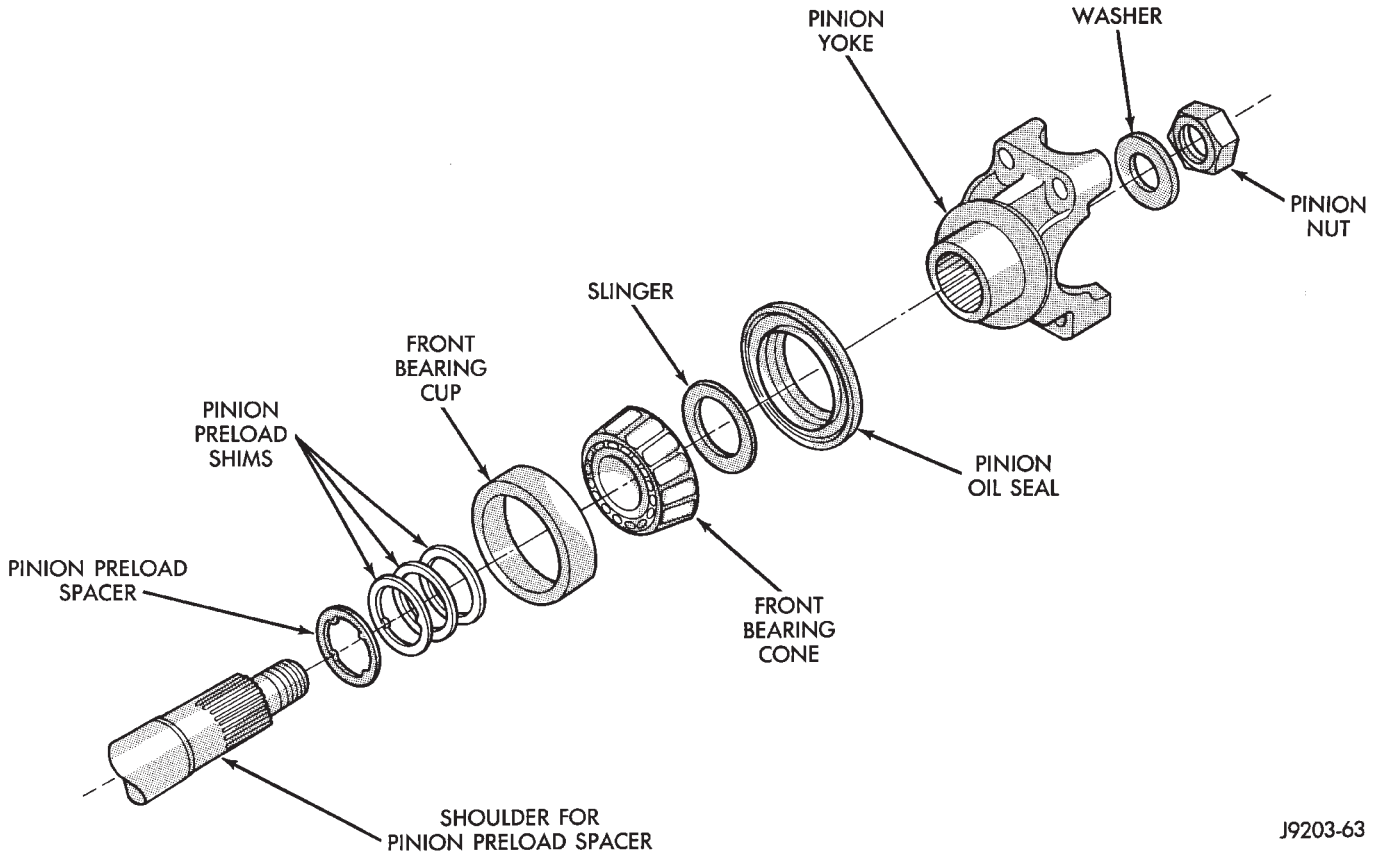


Fig. 37 Pinion Preload Shims–Typical

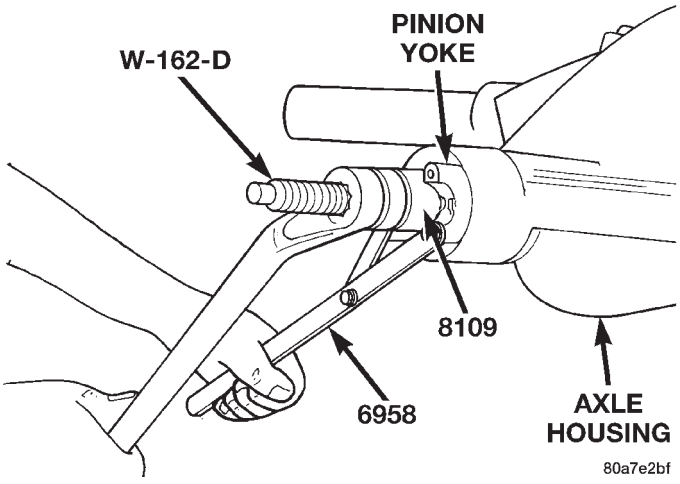


Fig. 38 Pinion Yoke Installation

(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 rotating 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.).

(15) Install differential assembly.

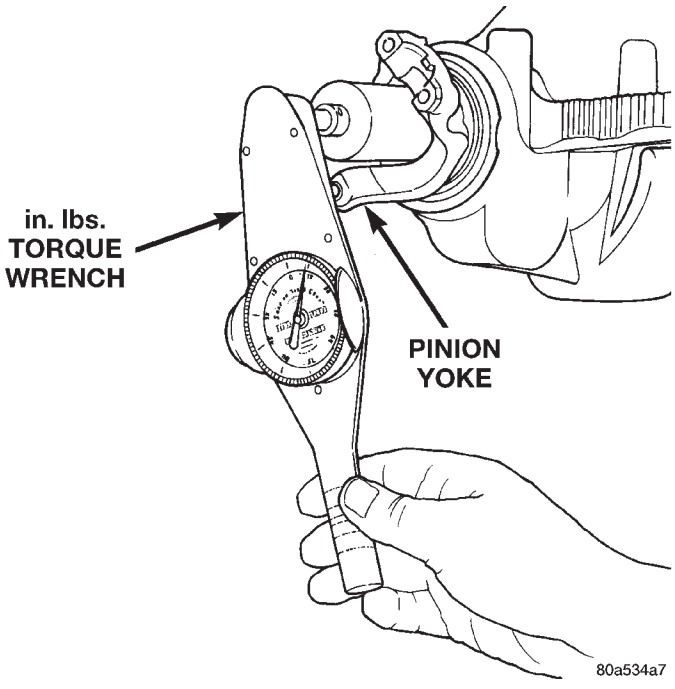


Fig. 39 Check Pinion Gear Rotating Torque

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove the ring gear.

(2) Using a suitable roll pin punch, drive out the roll pin holding pinion gear mate shaft in the differential case (Fig. 40).

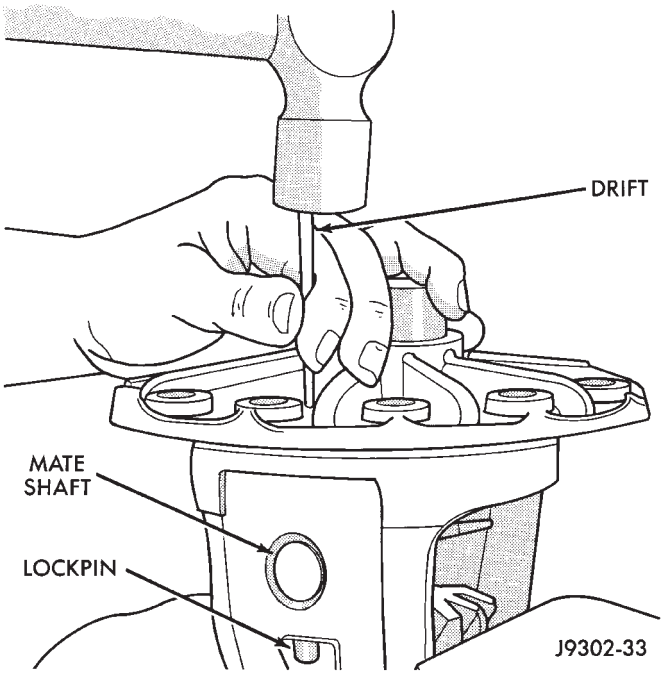


Fig. 40 Mate Shaft Roll Pin Removal

(3) Remove the pinion gear mate shaft from the differential case and the pinion mate gears.

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

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

ASSEMBLY

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

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

(3) Install the pinion gear mate shaft. Align the roll pin holes in shaft and the differential case.

(4) Install the roll pin to hold the pinion mate shaft in the differential case (Fig. 42).

(5) Install the ring gear.

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

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. 43).

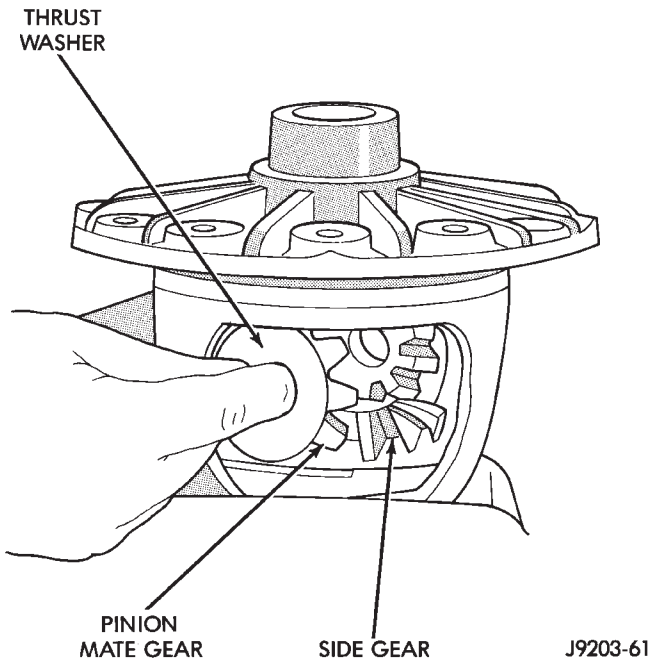


Fig. 41 Pinion Mate Gear Removal

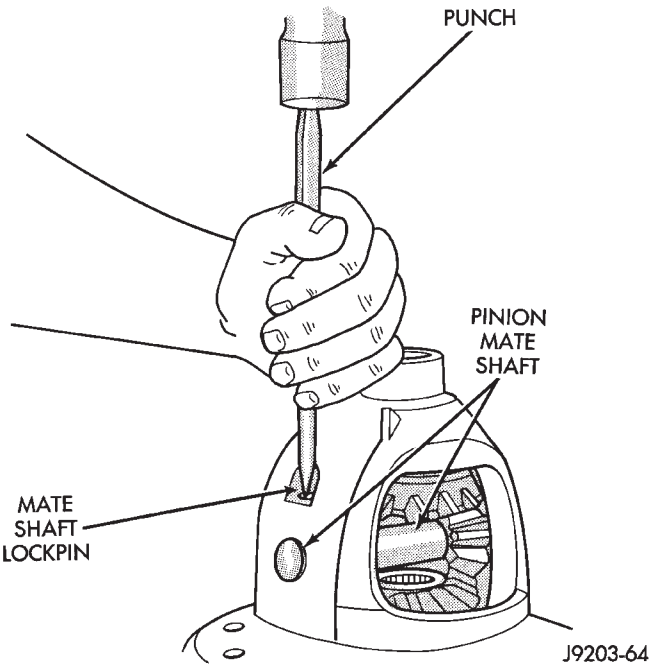


Fig. 42 Mate Shaft Roll Pin Installation

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.

DISASSEMBLY AND ASSEMBLY (Continued)

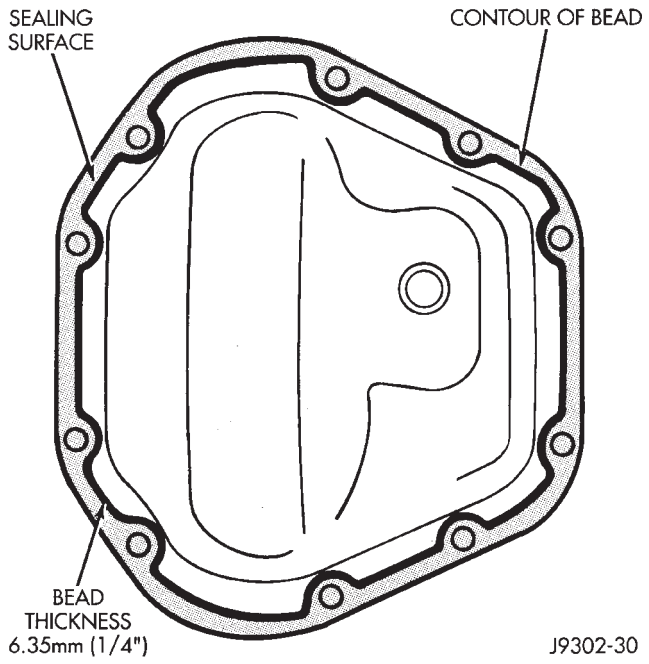


Fig. 43 Typical Housing Cover With Sealant

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.

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.**

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 pinion gear are etched into the face of each gear (Fig. 44). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 92.08 mm (3.625 in.). The standard depth provides the best gear tooth contact pattern. Refer to Backlash and Contact Pattern Analysis paragraph in this section for additional information.

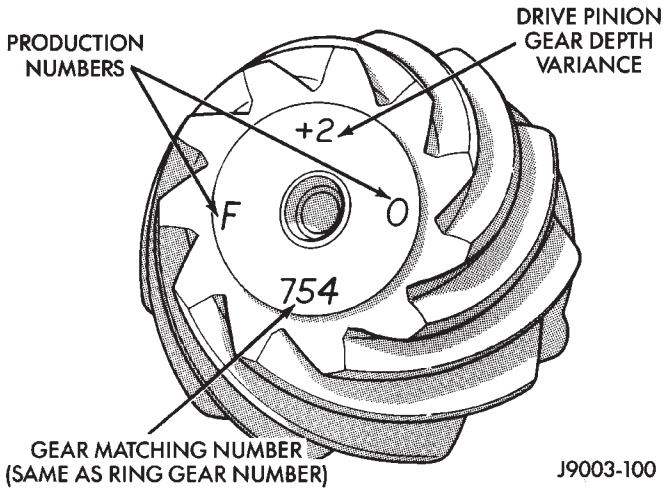


Fig. 44 Pinion Gear ID Numbers

ADJUSTMENTS (Continued)

Compensation for pinion depth variance is achieved with select shims. The shims are placed behind the rear pinion bearing cup (Fig. 45).

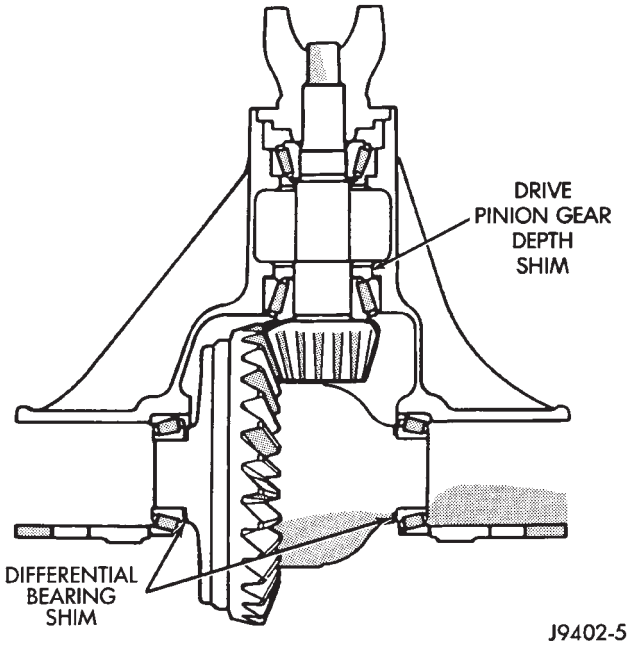


Fig. 45 Shim Locations

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 chart.

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

Note the etched number on the face of the 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 shims. If the number is positive, subtract that value from the thickness of the depth shim. If the number is 0 no change is necessary.

PINION GEAR DEPTH VARIANCE

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

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ADJUSTMENTS (Continued)

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion bearing cups and pinion bearings installed in the axle housing without any shims placed behind the rear pinion bearing cup. Take measurements with Pinion Gauge Set 6774 and Dial Indicator C-3339 (Fig. 46).

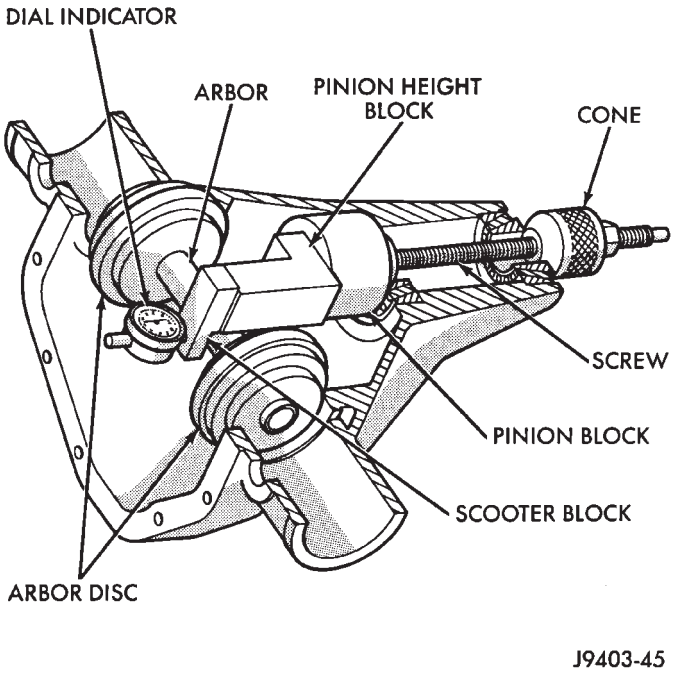


Fig. 46 Pinion Gear Depth Gauge Tools—Typical

(1) Assemble Pinion Height Block 6739, Pinion Block 6733, and rear pinion bearing onto Screw 6741 (Fig. 46).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 47).

(3) Install front pinion bearing and Cone-nut 6740 hand tight (Fig. 46).

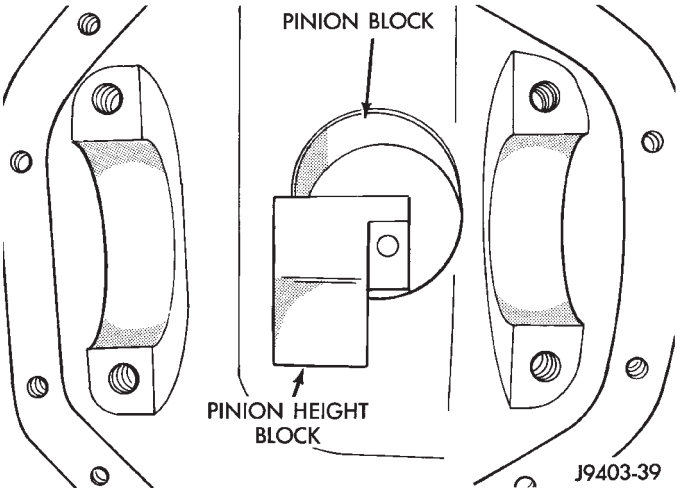


Fig. 47 Pinion Height Block—Typical

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 48). Install differential bearing caps on Arbor Discs and tighten cap bolts to 41 N·m (30 ft. lbs.).

NOTE: Arbor Discs 6732 has different step diameters to fit other axles. Choose proper step for axle being serviced.

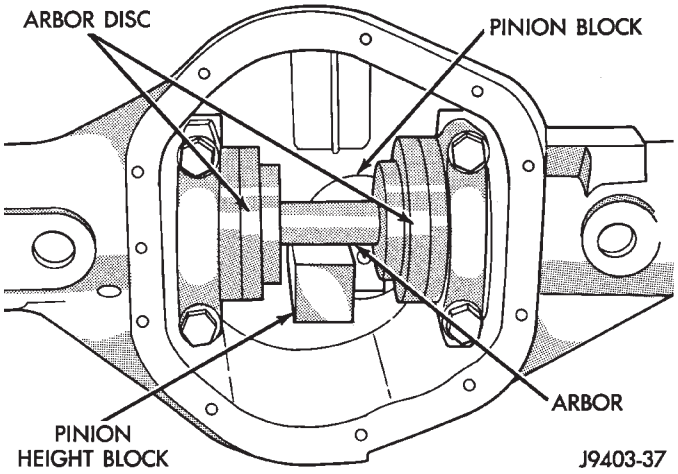


Fig. 48 Gauge Tools In Housing—Typical

(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 rearward surface of the pinion height block (Fig. 46). Hold scooter block in place and zero the dial indicator face to the pointer. Tighten dial indicator face lock screw.

(7) With scooter block still in position against the pinion height block, slowly slide the dial indicator probe over the edge of the pinion height block.

(8) Slide the dial indicator probe across the gap between the pinion height block and the arbor bar with the scooter block against the pinion height block (Fig. 49). 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. 44). For example, if the depth variance is –2, add +0.002 in. to the dial indicator reading.

ADJUSTMENTS (Continued)

NOTE: If an oil slinger is used behind the inner pinion bearing, deduct the thickness of the slinger from the dial indicator reading and use that total for shim selection.

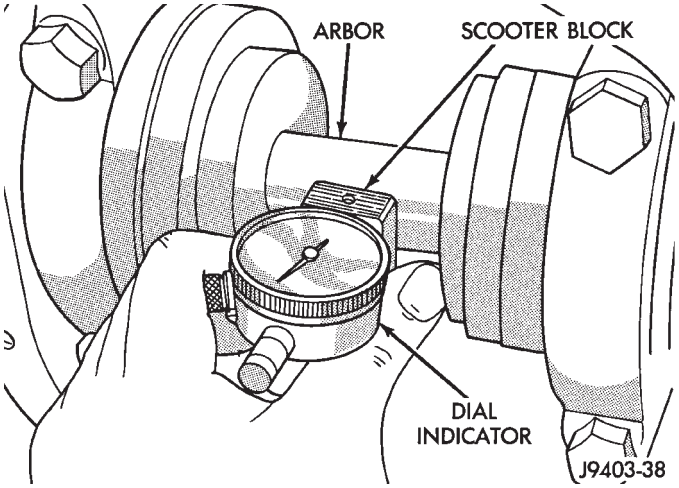


Fig. 49 Pinion Gear Depth Measurement—Typical

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-348 in place of the differential side bearings and a dial indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion gear for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differential side play is measured, the pinion gear is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading 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. 50). 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.

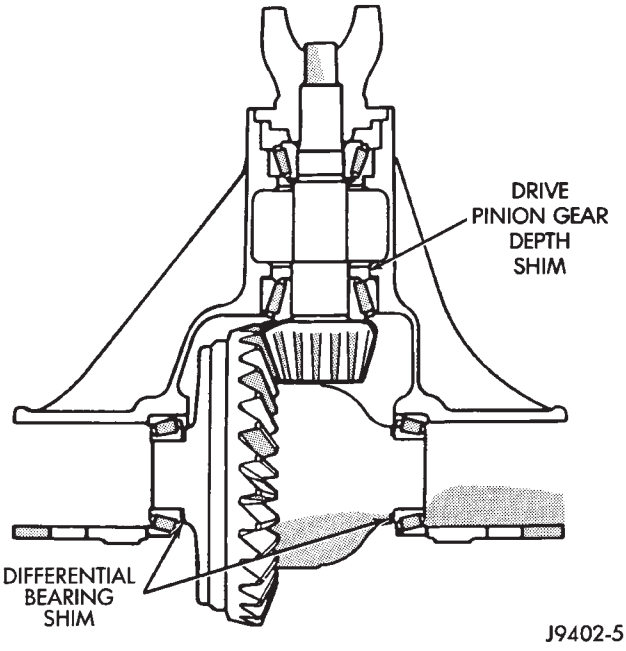


Fig. 50 Axle Adjustment Shim Locations

(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.

(4) Install dummy side bearings D-348 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. 51).

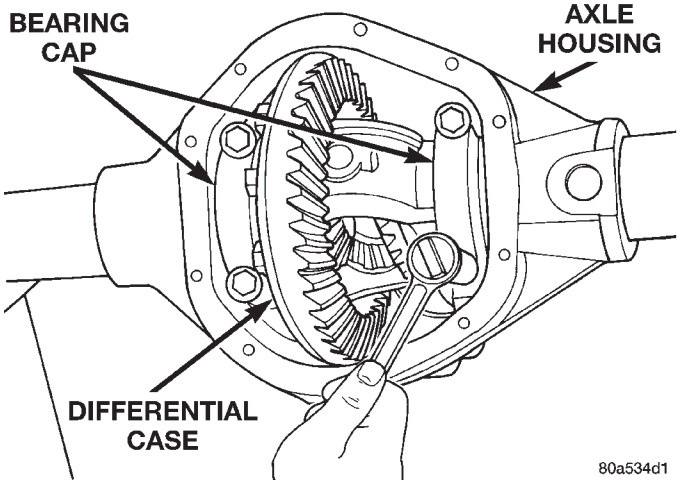


Fig. 51 Tighten Bolts Holding Bearing Caps

ADJUSTMENTS (Continued)

(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 52) and (Fig. 53).

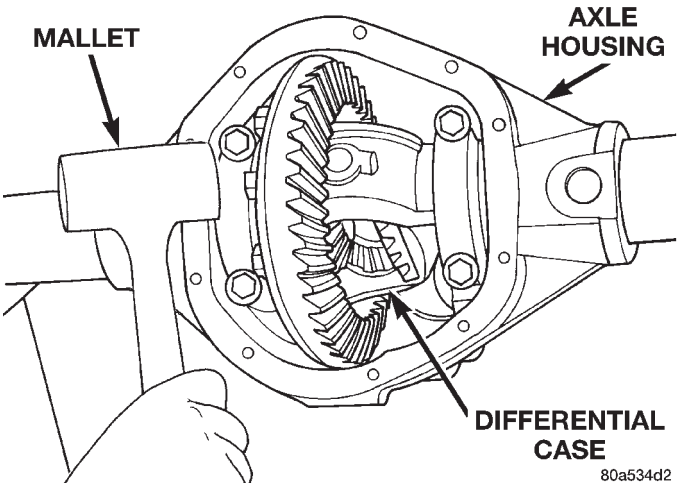


Fig. 52 Seat Pinion Gear Side Differential Dummy Side Bearing

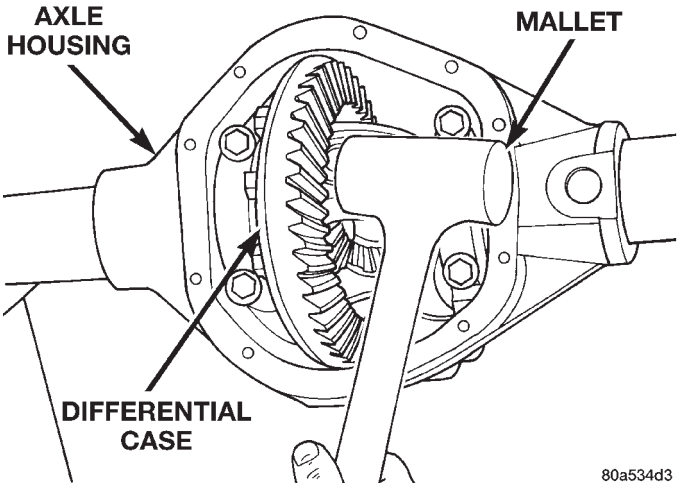


Fig. 53 Seat Ring Gear Side Differential Dummy Side Bearing

(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 54).

(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. 54).

(10) Push and hold differential case to pinion gear side of axle housing (Fig. 55).

(11) Zero dial indicator face to pointer (Fig. 55).

(12) Push and hold differential case to ring gear side of the axle housing (Fig. 56).

(13) Record dial indicator reading (Fig. 56).

(14) Add 0.008 in. (0.2 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.

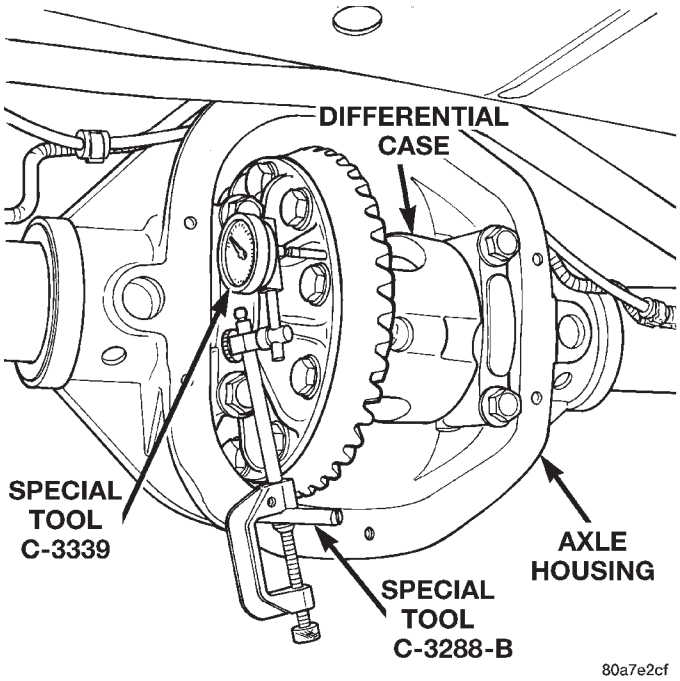


Fig. 54 Differential Side play Measurement

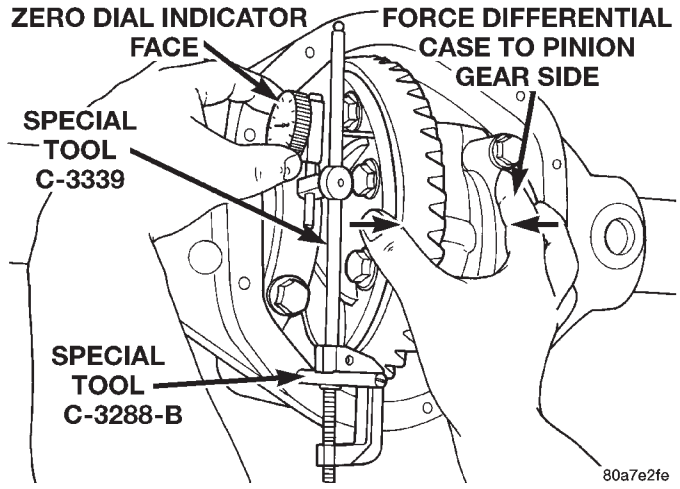


Fig. 55 Hold Differential Case and Zero Dial Indicator

(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 and establish the correct pinion rotating torque.

(18) Install differential case and dummy bearings D-348 in axle housing (without shims), install bearing caps and tighten bolts snug.

(19) Seat ring gear side dummy bearing (Fig. 53).

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 54).

(21) Push and hold differential case toward pinion gear (Fig. 57).

ADJUSTMENTS (Continued)

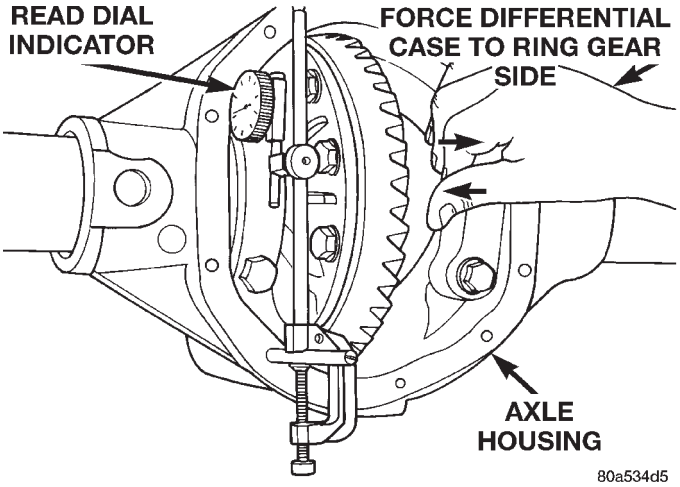


Fig. 56 Hold Differential Case and Read Dial Indicator

(22) Zero dial indicator face to pointer (Fig. 57).

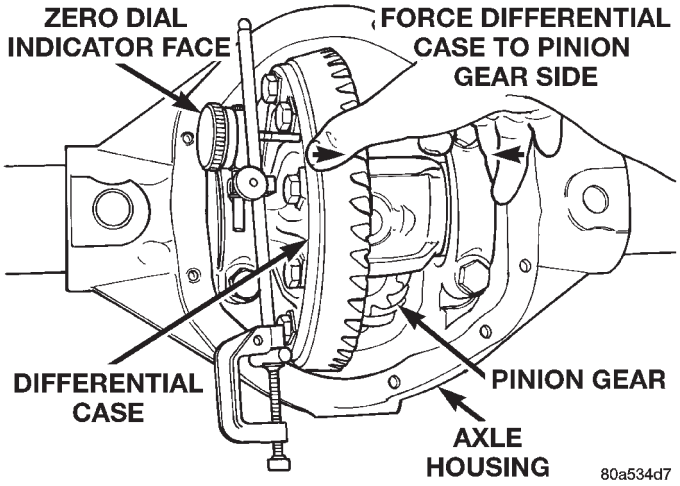


Fig. 57 Hold Differential Case and Zero Dial Indicator

(23) Push and hold differential case to ring gear side of the axle housing (Fig. 58).

(24) Record dial indicator reading (Fig. 58).

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

(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.

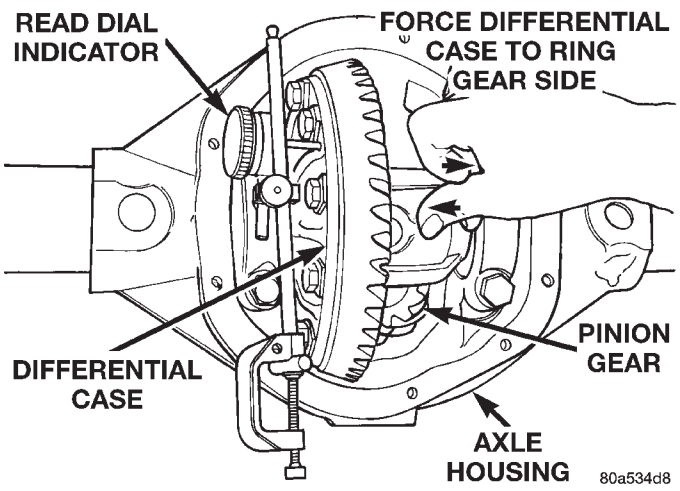


Fig. 58 Hold Differential Case and Read Dial Indicator

(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, utilizing some items from Adapter Set 6987, 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. 59).

(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. 60).

(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.

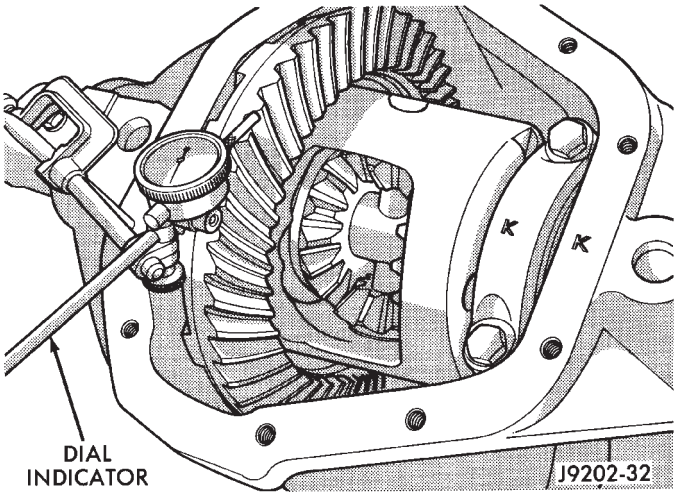


Fig. 59 Ring Gear Backlash Measurement

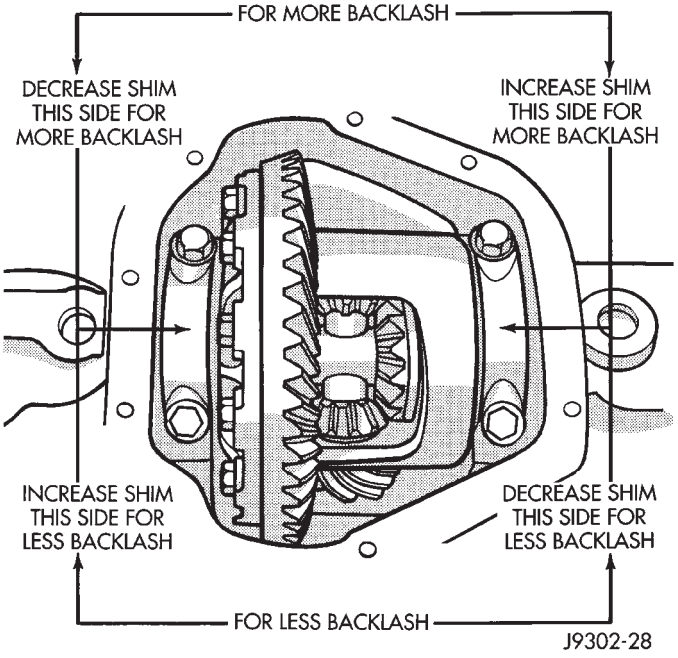


Fig. 60 Backlash Shim Adjustment

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.

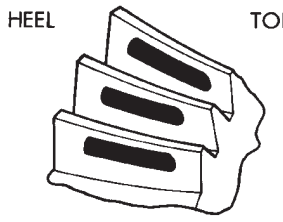
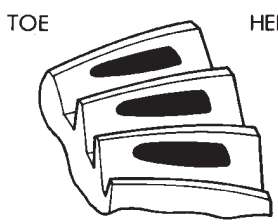
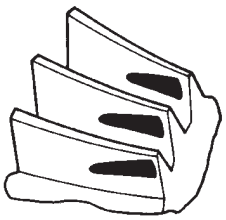
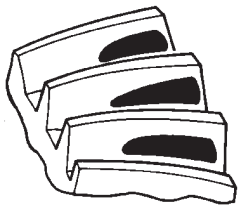
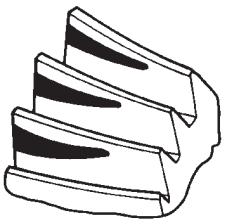
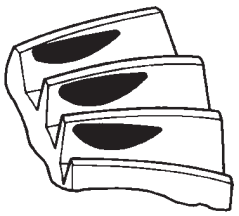
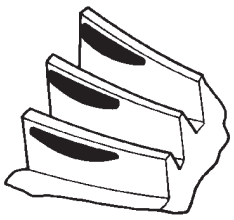
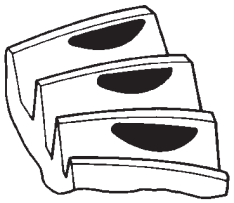
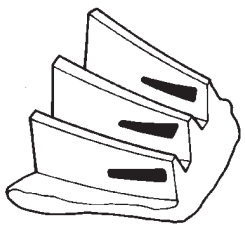
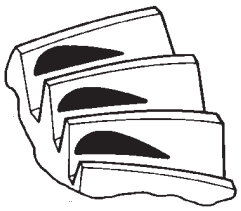
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(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. 61) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

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

J9003-24

Fig. 61 Gear Tooth Contact Patterns

SPECIFICATIONS

181 FBI AXLE

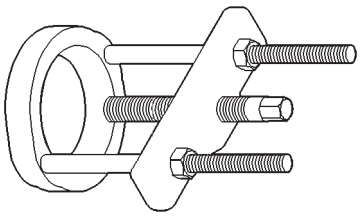
Axle Type	Hypoid
Lubricant	SAE Thermally Stable 80W–90
Lube Capacity	1.48 L (3.13 pts.)
Axle Ratio	3.07, 3.55, 3.73, 4.10
Differential Side Gear Clearance	0.12–0.20 mm (0.005–0.008 in.)
Ring Gear Diameter	18.09 cm (7.125 in.)
Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	92.1 mm (3.625 in.)
Pinion Bearing Rotating Torque	
Original Bearings	1–2 N·m (10–20 in. lbs.)
New Bearings	1.5–4 N·m (15–35 in. lbs.)

181 FBI AXLE

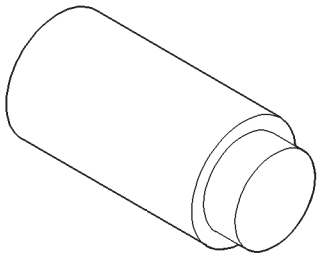
DESCRIPTION	TORQUE
Fill Hole Plug	34 N·m (25 ft. lbs.)
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	61 N·m (45 ft. lbs.)
Ring Gear Bolt	95–122 N·m (70–90 ft. lbs.)
Axle Nut	237 N·m (175 ft. lbs.)
Hub Brg. Bolt	102 N·m (75 ft. lbs.)
Lower Ball Stud	108 N·m (80 ft. lbs.)
Upper Ball Stud	101 N·m (75 ft. lbs.)

SPECIAL TOOLS

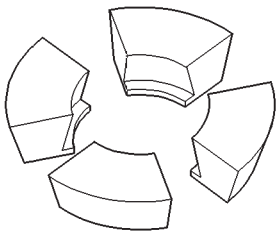
181 FBI AXLE



Puller—C-293-PA



Plug—SP-3289



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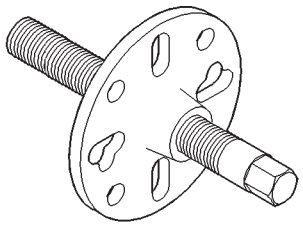
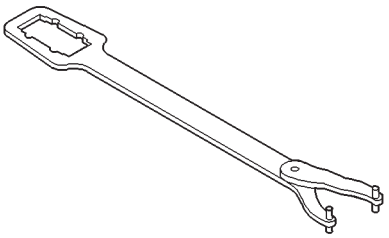
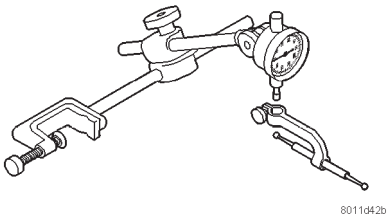


Puller—C-452

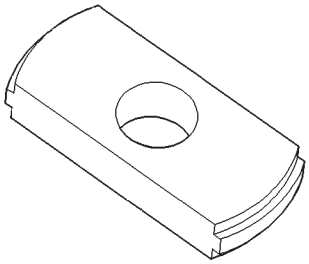


Wrench—C-3281

SPECIAL TOOLS (Continued)



Dial Indicator—C-3339



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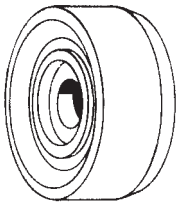
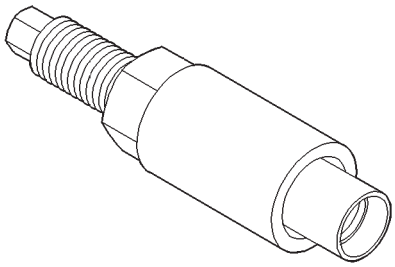


Driver—C-3716-A



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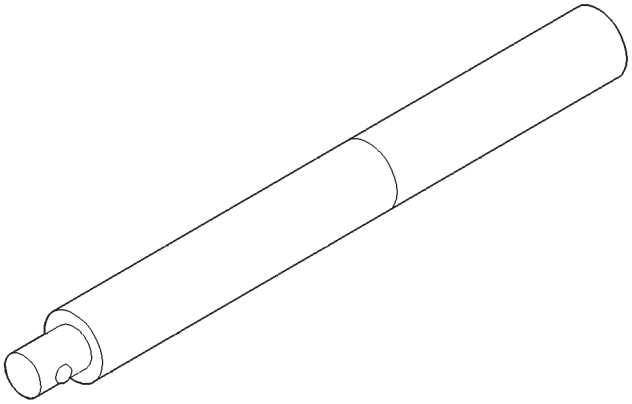
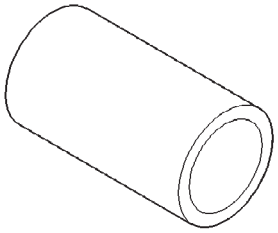
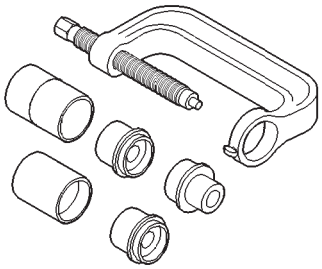


Handle—C-4171



Cup—8109



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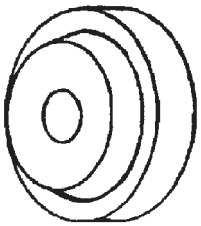

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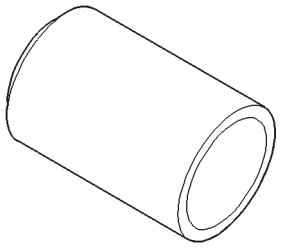
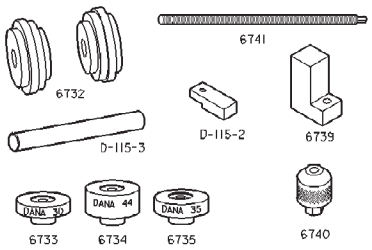
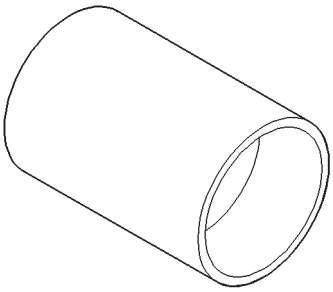


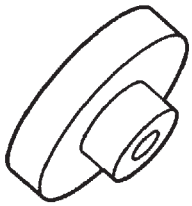
Installer—6761



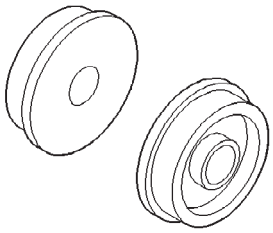
Tool Set, Pinion Depth—6774



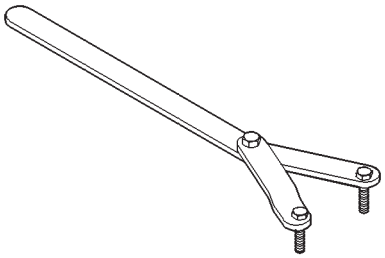
Installer—6752



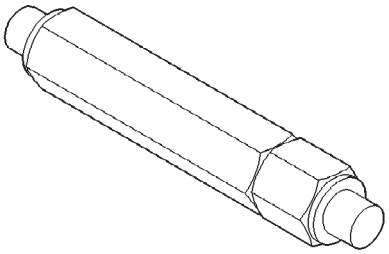
Gauge Block—6733



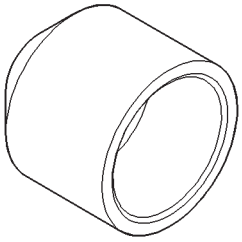
Installer Discs—8110



Spanner—6958



Turnbuckle—6797



Installer—C-3972-A

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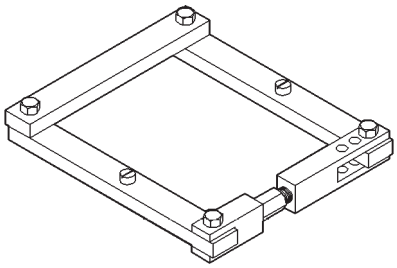
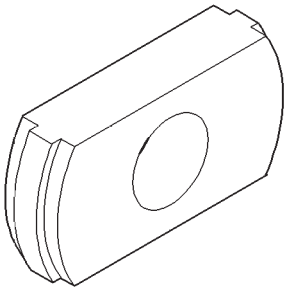


Spreader—W-129-B



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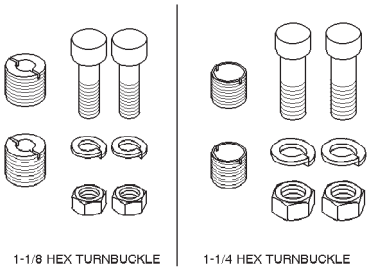
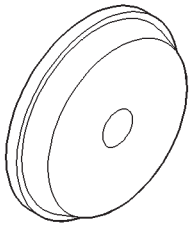


Adapter Kit—6987



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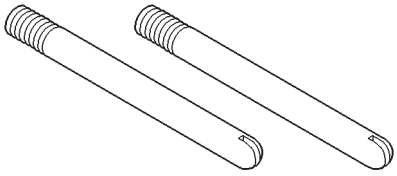
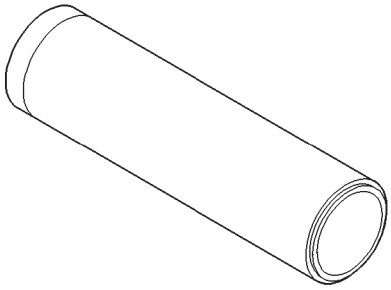


Pilot Stud—C-3288-B



Installer—W-262

194 RBI AXLE

INDEX

GENERAL INFORMATION

194 RBI AXLE

The 194 Rear Beam-design Iron (RBI) axle housing has an iron center casting (differential housing) with axle shaft tubes extending from either side. The tubes are pressed into and welded to the differential housing to form a one-piece axle housing.

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

The axle has a vent hose 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 axle shaft and bearings. The axle shafts are retained by C–clips in the differential side gears.

The cover provides a means for servicing the differential without removing the axle.

For vehicles equipped with ABS brakes, the axles have a tone ring pressed onto the axle shaft. Use care when removing axle shafts to ensure that the tone wheel or the wheel speed sensor are not damaged.

The 194 RBI axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the differential housing by a cover bolt. Build date identification codes are stamped on the cover side of an axle shaft tube.

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 is adjusted by the use of selective spacer shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer (Fig. 1).

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.
- Lubricant for axles intended for heavy-duty or trailer tow use is SAE 75W–140 SYNTHETIC gear lubricant.

Trac-lok differentials require the addition of 3.5 oz. of friction modifier to the axle lubricant. The 194 RBI

GENERAL INFORMATION (Continued)

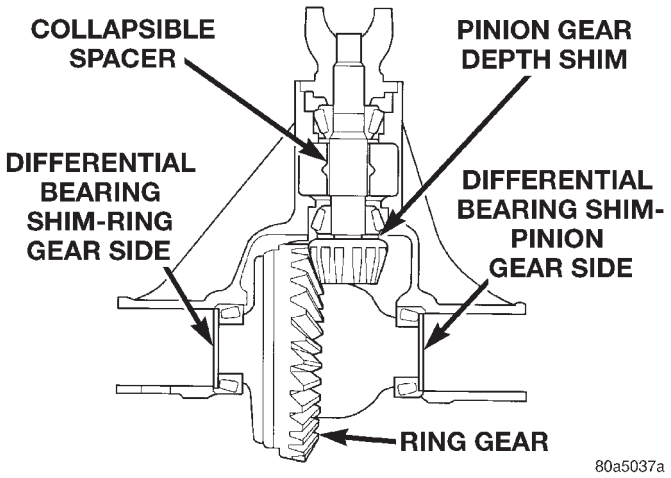


Fig. 1 Shim Locations

axle lubricant capacity is 1.66L (3.50 pts.) 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. 2).

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

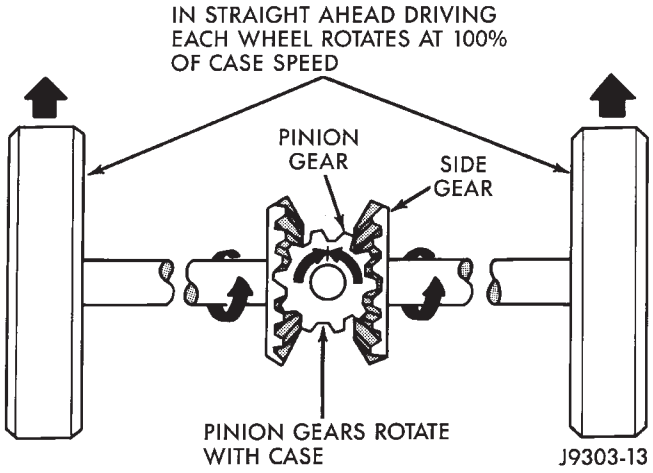


Fig. 2 Differential Operation—Straight Ahead Driving

allows the axle shafts to turn at unequal speeds (Fig. 3). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

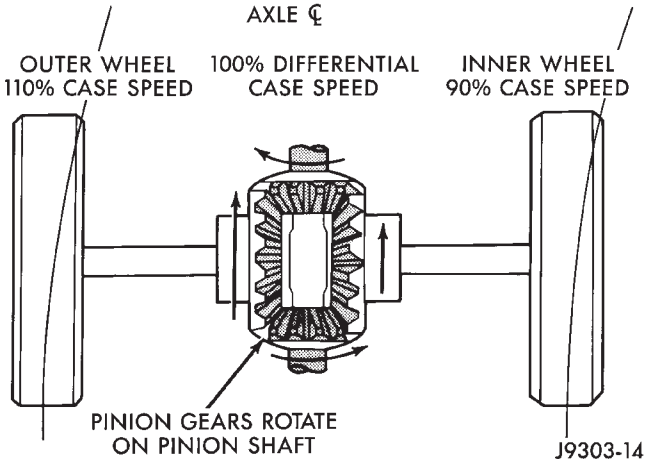


Fig. 3 Differential Operation—On Turns

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

DESCRIPTION AND OPERATION (Continued)

forces generated by the side gears as torque is applied through the ring gear (Fig. 4).

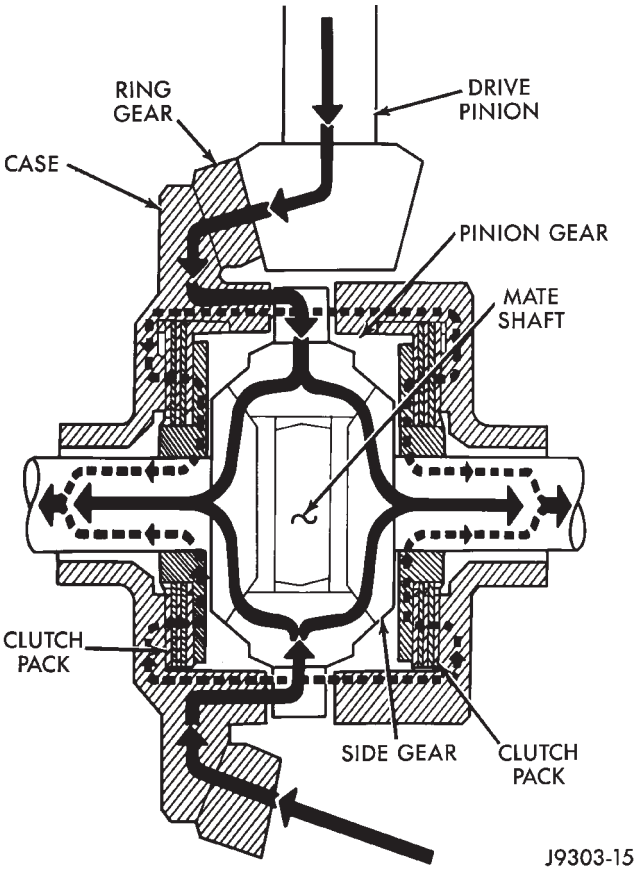


Fig. 4 Trac-lok™ Limited Slip Differential Operation

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 looses traction, the clutch packs transfer additional torque to the wheel having the most traction. Trac-lok™ differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok™ operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

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.

DIAGNOSIS AND TESTING (Continued)

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	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	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.	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	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	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	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	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	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	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	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHART – CONTINUED

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	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.	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	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	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)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	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	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	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. 5).

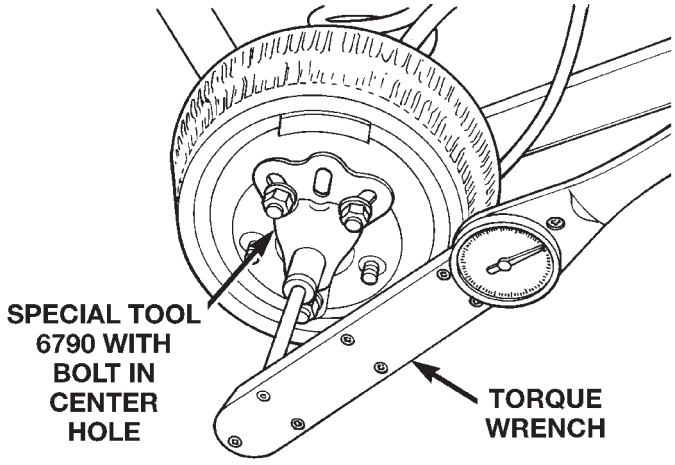


Fig. 5 Trac-lok™ Test —Typical

(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. 6).

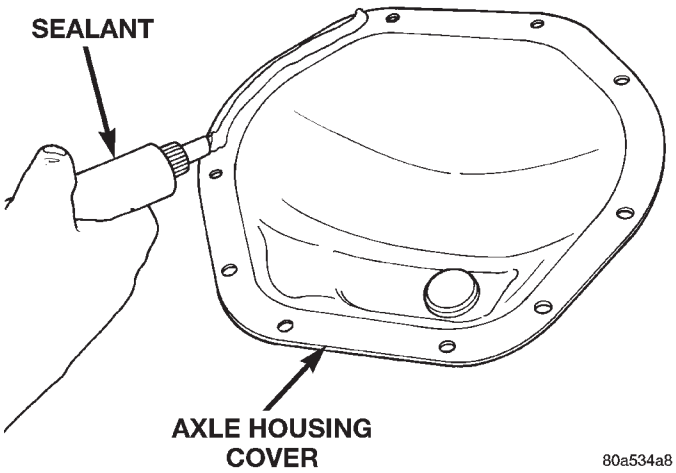


Fig. 6 Apply Sealant

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.
(2) Position a suitable lifting device under the axle.
(3) Secure axle to device.
(4) Remove the wheels and tires.
(5) Remove the brake drums from the axle. Refer to Group 5, Brakes, for proper procedures.
(6) Disconnect parking brake cables from brackets and lever.
(7) Remove wheel speed sensors, if necessary. Refer to Group 5, Brakes, for proper procedures.
(8) 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.
(9) Disconnect the vent hose from the axle shaft tube.
(10) Mark the propeller shaft and yokes for installation alignment reference.
(11) Remove propeller shaft.
(12) Disconnect stabilizer bar links.
(13) Disconnect shock absorbers from axle.
(14) Remove the U-bolts which hold the axle to the spring brackets.
(15) Separate the axle from the vehicle.

INSTALLATION

NOTE: The weight of the vehicle must be supported by the springs before suspension arms and track bar fasteners can be tightened. If the springs are not at their normal ride position, vehicle ride height and handling could be affected.

(1) Raise the axle with lifting device and align the spring centering bolts with the mating holes in the axle spring perch.
(2) Install the U-bolts which hold the axle to the spring brackets. Tighten nuts to 70 N·m (52 ft. lbs.).
(3) Install shock absorbers and tighten nuts to 60 N·m (44 ft. lbs.) torque.
(4) Install stabilizer bar links and tighten nuts to 74 N·m (55 ft. lbs.) torque.
(5) Install the wheel speed sensors, if necessary. Refer to Group 5, Brakes, for proper procedures.
(6) Connect parking brake cable to brackets and lever.
(7) Install the brake drums. Refer to Group 5, Brakes, for proper procedures.
(8) Connect the brake hose to the axle junction block. Refer to Group 5, Brakes, for proper procedures.
(9) Install axle vent hose.
(10) Align propeller shaft and pinion yoke reference marks. Install U-joint straps and bolts. Tighten to 19 N·m (14 ft. lbs.) torque.
(11) Install the wheels and tires.
(12) Add gear lubricant, if necessary. Refer to Lubricant Specifications in this section for lubricant requirements.
(13) Remove lifting device from axle and lower the vehicle.

PINION SHAFT SEAL

REMOVAL

(1) Raise and support the vehicle.
(2) Remove wheel and tire assemblies.
(3) Remove the brake drums. Refer to Group 5, Brakes, for proper procedures.
(4) Mark the propeller shaft and pinion yoke for installation alignment 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) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.
(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 7).

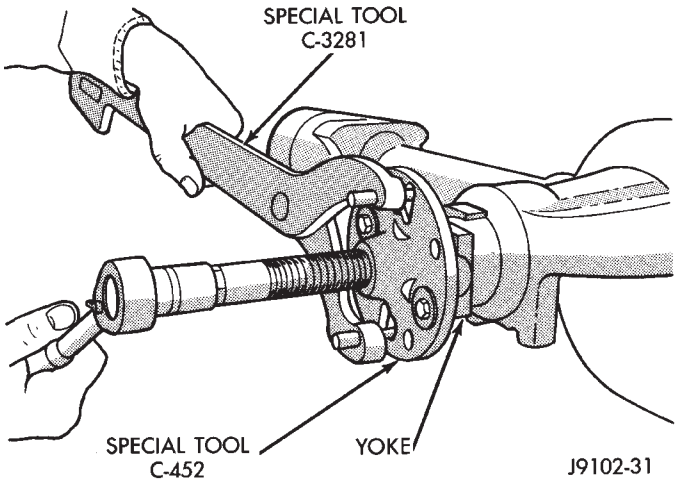


Fig. 7 Pinion Yoke Removal

(10) Use a suitable pry tool or slide hammer mounted screw to remove the pinion gear seal.

REMOVAL AND INSTALLATION (Continued)

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).

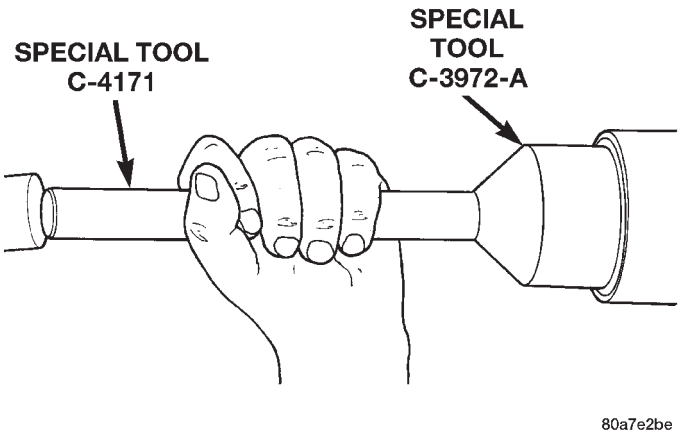


Fig. 8 Pinion Seal Installation

(2) Install yoke on the pinion gear with Screw 8112, Cup 8109, and Holder 6958 (Fig. 9).

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

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

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

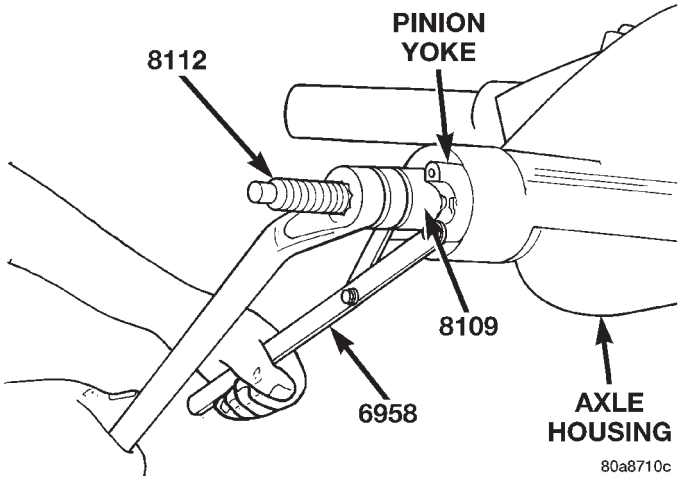


Fig. 9 Pinion Yoke Installation

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.

(5) 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).

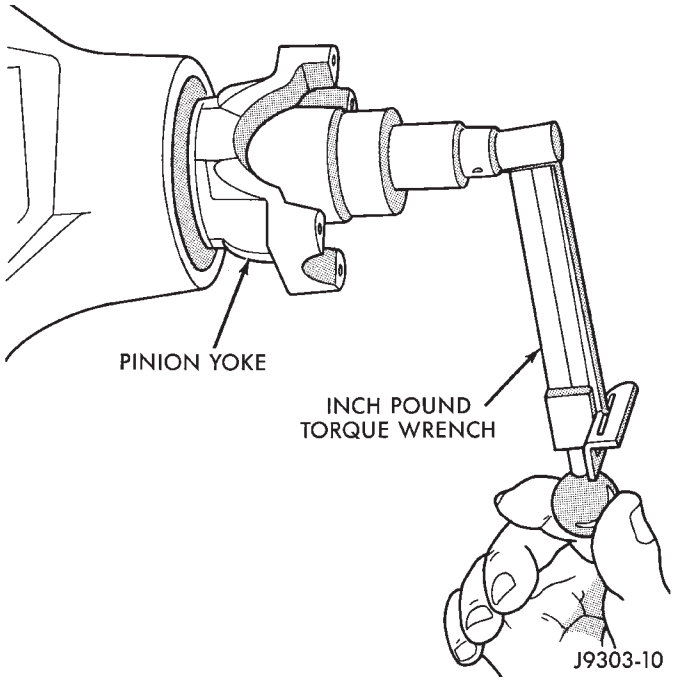


Fig. 10 Check Pinion Rotation Torque

(6) If the rotating torque is low, use Holder 6958 to hold the pinion yoke (Fig. 11), and tighten the pinion shaft nut in 6.8 N·m (5 ft. lbs.) increments until the proper rotating torque is achieved.

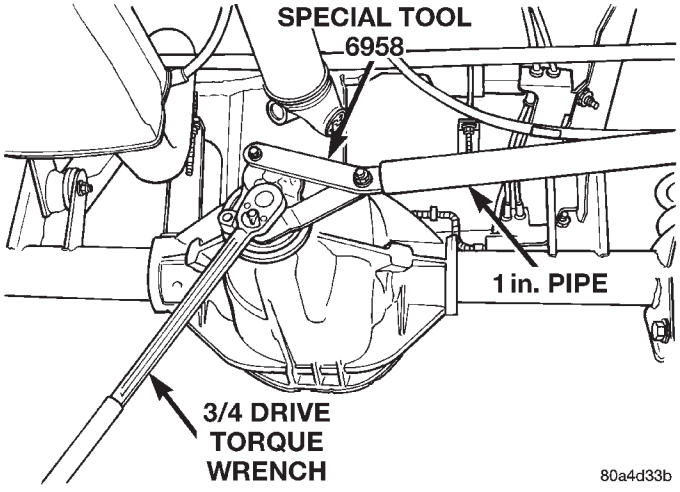


Fig. 11 Tightening Pinion Shaft Nut–Typical

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

REMOVAL AND INSTALLATION (Continued)

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

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

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

(10) Install wheel and tire assemblies.

(11) Lower the vehicle.

COLLAPSIBLE SPACER

REMOVAL W/PINION INSTALLED

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove rear brake drums. Refer to Group 5, Brakes, for proper procedures.

(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) Using Holder 6958 to hold the pinion yoke, remove the pinion nut and washer.

(9) Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 12).

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

(11) Remove the front pinion bearing using a pair of suitable pick tools to pull the bearing straight off the pinion gear shaft. It may be necessary to lightly tap the end of the pinion gear with a rawhide or rubber mallet if the bearing becomes bound on the pinion shaft.

(12) Remove the collapsible spacer.

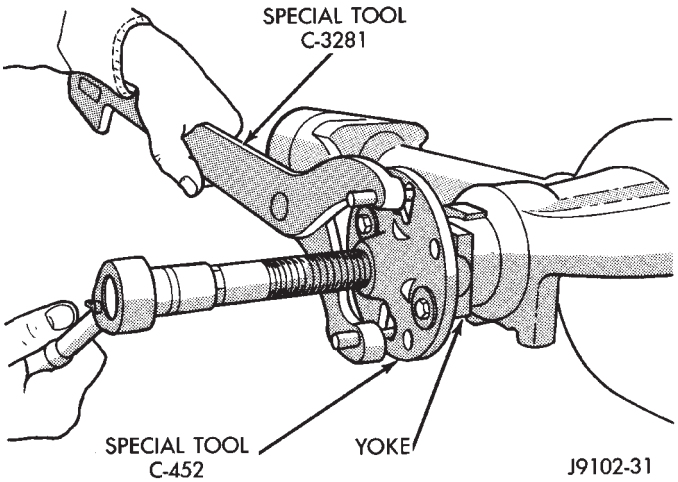


Fig. 12 Pinion Yoke Removal

REMOVAL W/PINION REMOVED

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Remove rear brake drums. Refer to Group 5, Brakes, for proper procedures.

(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 differential assembly from axle housing.

(9) Using Holder 6958 to hold yoke, remove the pinion yoke nut and washer.

(10) Using Remover C–452 and Wrench C–3281, remove the pinion yoke from pinion shaft (Fig. 12).

(11) Remove the pinion gear from housing (Fig. 13). Catch the pinion with your hand to prevent it from falling and being damaged.

(12) Remove collapsible spacer from pinion shaft.

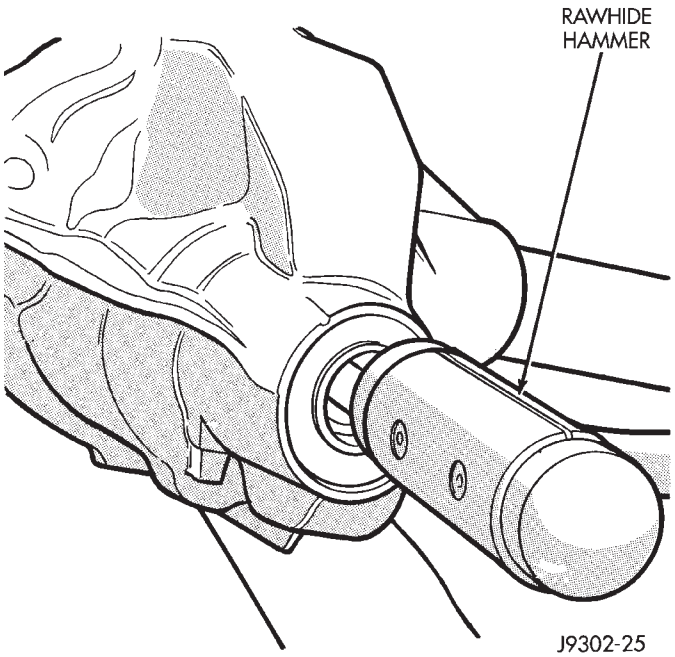


Fig. 13 Remove Pinion Gear

INSTALLATION

(1) Install a new collapsible preload spacer on pinion shaft (Fig. 14).

(2) If pinion gear was removed, install pinion gear in housing.

(3) Install pinion front bearing, if necessary.

(4) 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. 15).

REMOVAL AND INSTALLATION (Continued)

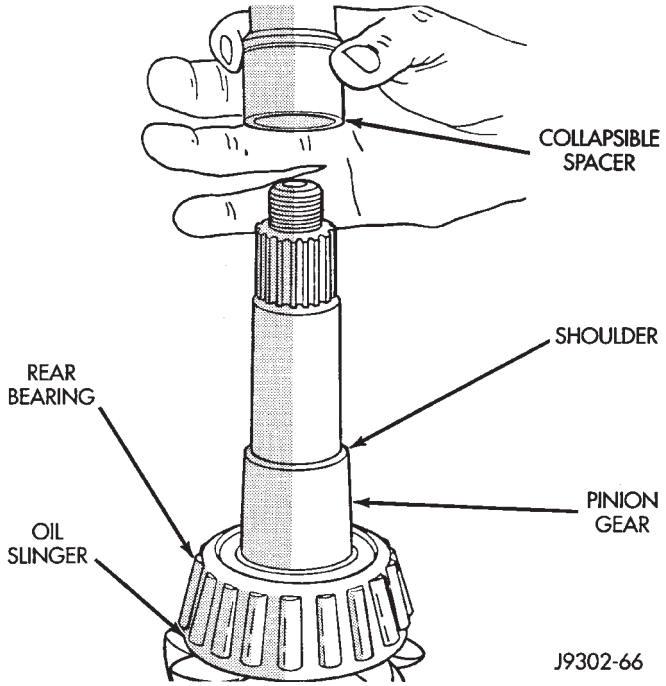


Fig. 14 Collapsible Preload Spacer

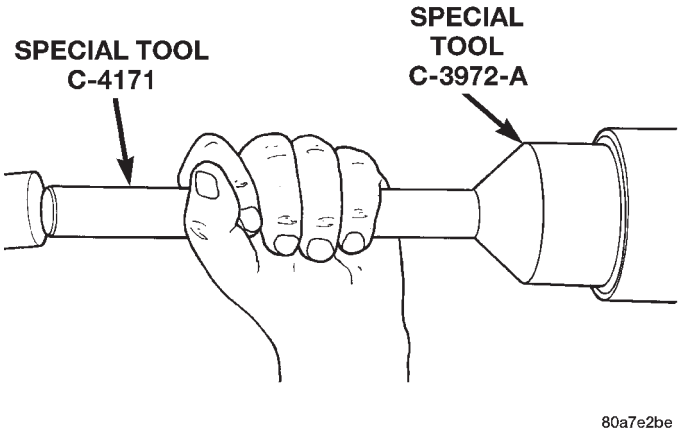


Fig. 15 Pinion Seal Installation

(5) Install yoke with Screw 8112, Cup 8109, and Holder 6958 (Fig. 16).

(6) If the original pinion bearings are being used, install differential assembly and axle shafts, if necessary.

NOTE: If new pinion bearings were installed, do not install the differential assembly and axle shafts until after the pinion bearing preload and rotating torque are set.

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

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

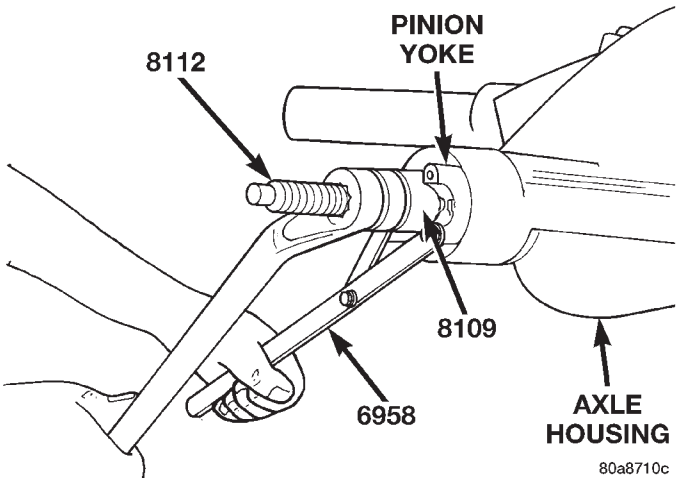


Fig. 16 Pinion Yoke Installation

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.

(9) Using yoke holder 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), crush collapsible spacer until bearing end play is taken up (Fig. 17).

NOTE: If more than 474 N·m (350 ft. lbs.) of torque is necessary to remove the bearing end play, the collapsible spacer is defective and must be replaced.

(10) 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. 18).

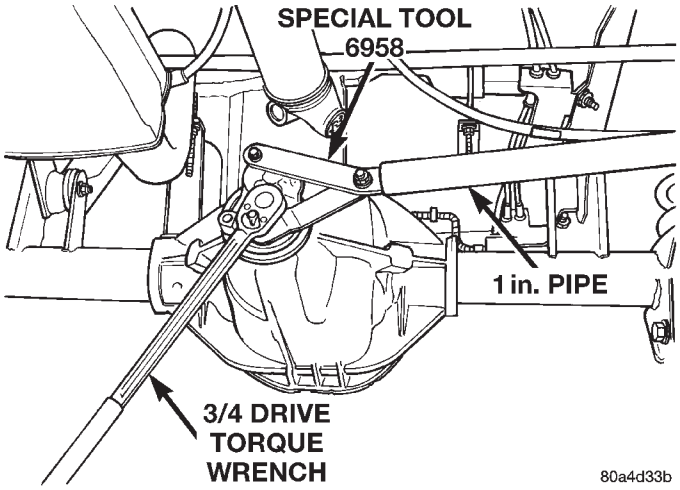


Fig. 17 Tightening Pinion Nut–Typical

REMOVAL AND INSTALLATION (Continued)

(11) Check rotating torque with a (in. lbs.) torque wrench (Fig. 18). The torque necessary to rotate the pinion gear should be:

- Original Bearings — The reading recorded during removal, plus an additional 0.56 N·m (5 in. lbs.).
- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

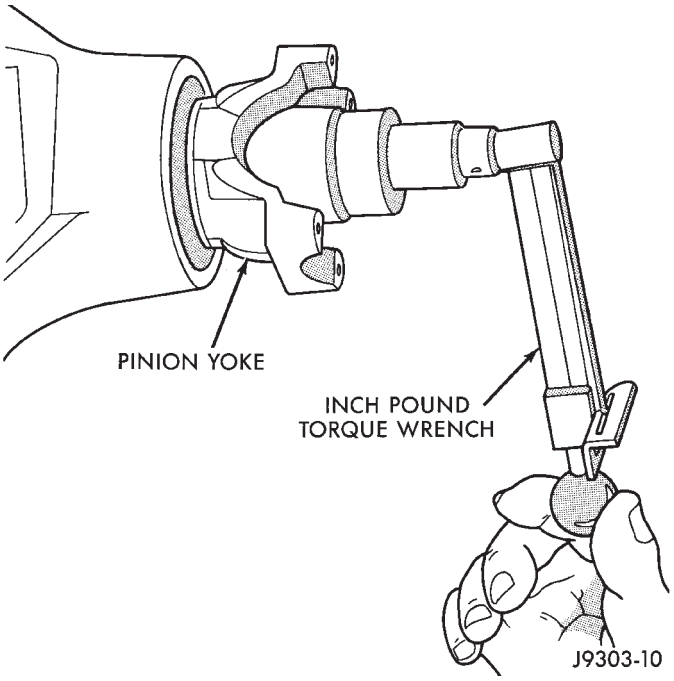


Fig. 18 Check Pinion Gear Rotation Torque

(12) Install differential assembly and axle shafts, if necessary.

(13) Align marks made previously on yoke and propeller shaft and install propeller shaft.

(14) Install rear brake drums. Refer to Group 5, Brakes, for proper procedures.

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

(16) Install wheel and tire assemblies.

(17) Lower 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. 19).

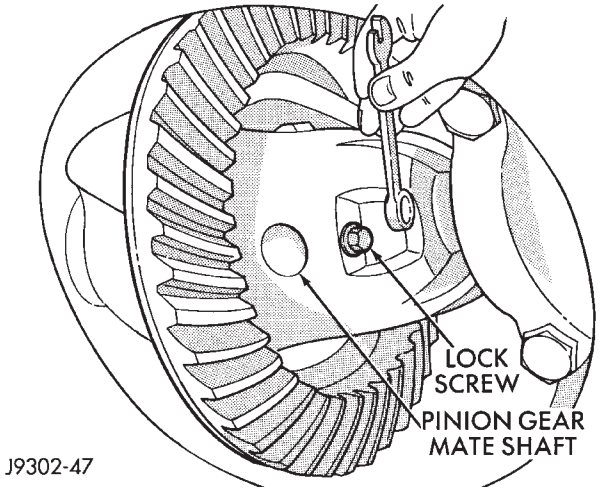


Fig. 19 Mate Shaft Lock Screw

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

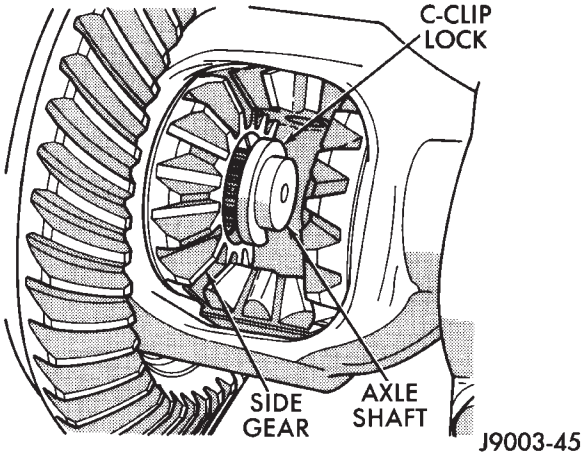


Fig. 20 Axle Shaft C–Clip Lock

(8) Remove axle shaft. Use care to prevent damage to axle shaft bearing and seal, which will remain in axle shaft tube. Also, exercise care not to damage the wheel speed sensor on vehicles equipped with ABS brakes.

(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.

REMOVAL AND INSTALLATION (Continued)

NOTE: Use care to prevent shaft splines from damaging axle shaft seal lip. Also, exercise care not to damage the wheel speed sensor on vehicles equipped with ABS brakes.

(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 19 N·m (14 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.

AXLE SHAFT SEAL AND BEARING

REMOVAL

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

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 6310-5 (Fig. 21).
(4) Inspect the axle shaft tube bore for roughness and burrs. Remove as necessary.

INSTALLATION

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

(1) Wipe the axle shaft tube bore clean.
(2) Install axle shaft bearing with Installer 6436 and Handle C–4171. Ensure that the part number on the bearing is against the installer.
(3) Install the new axle shaft seal with Installer 6437 and Handle C–4171 (Fig. 22).
(4) Install the axle shaft.

DIFFERENTIAL

REMOVAL

(1) Raise and support vehicle.
(2) Remove the lubricant fill hole plug from the differential housing cover.
(3) Remove the differential housing cover and allow fluid to drain.
(4) Remove axle shafts.

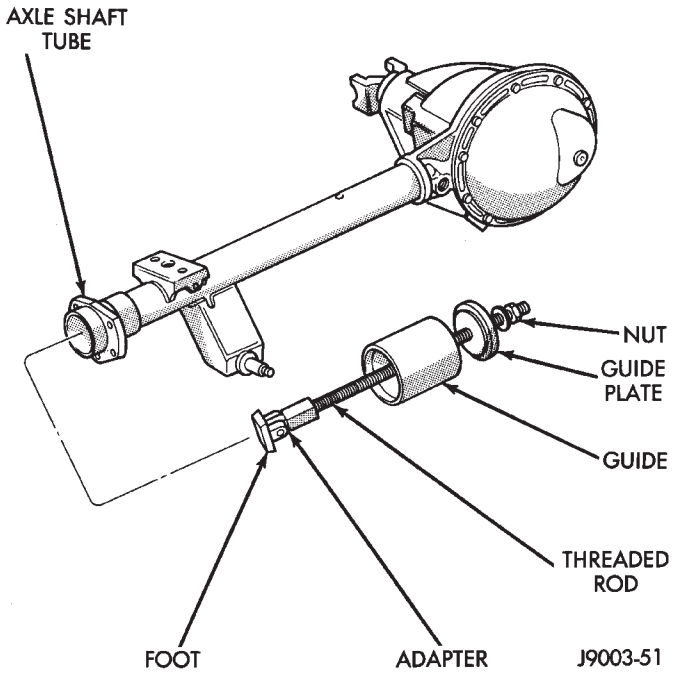


Fig. 21 Axle Shaft Bearing Removal

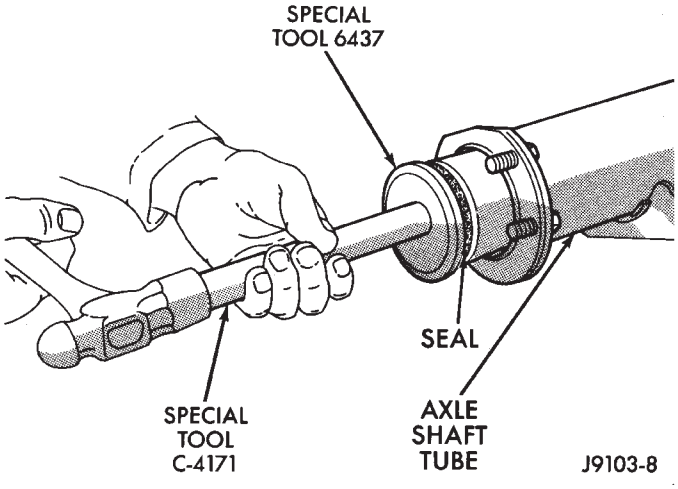


Fig. 22 Axle Shaft Seal Installation

(5) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 23).
(6) Loosen the differential bearing cap bolts.
(7) Position Spreader W–129–B, utilizing some items from Adapter set 6987, with the tool dowel pins seated in the locating holes (Fig. 24). Install the hold-down clamps and tighten the tool turnbuckle finger–tight.
(8) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 25) and zero the indicator.

REMOVAL AND INSTALLATION (Continued)

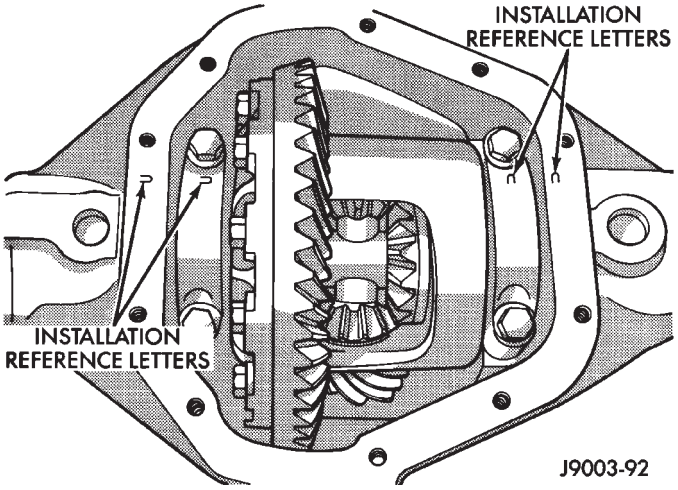


Fig. 23 Bearing Cap Identification

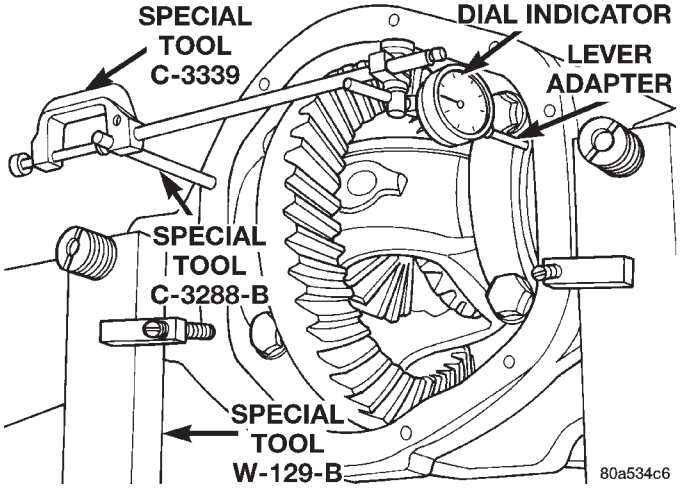


Fig. 25 Install Dial Indicator

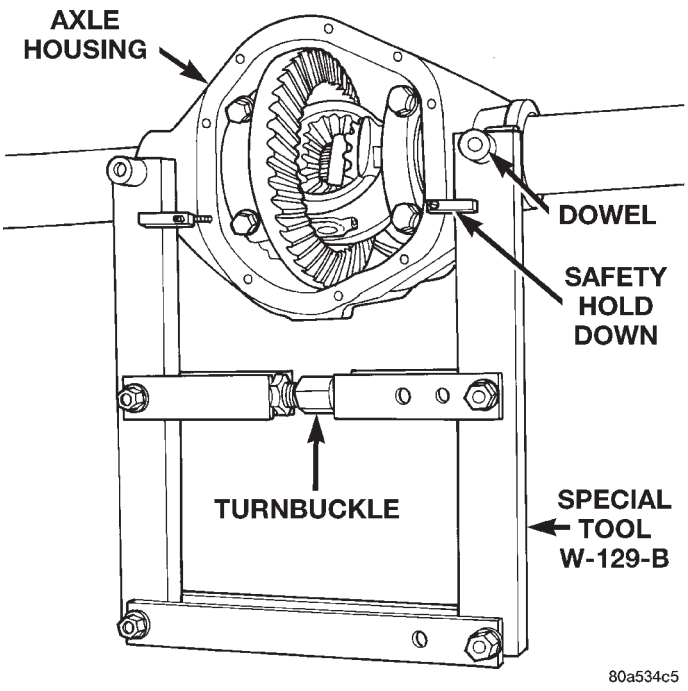


Fig. 24 Install Axle Housing Spreader

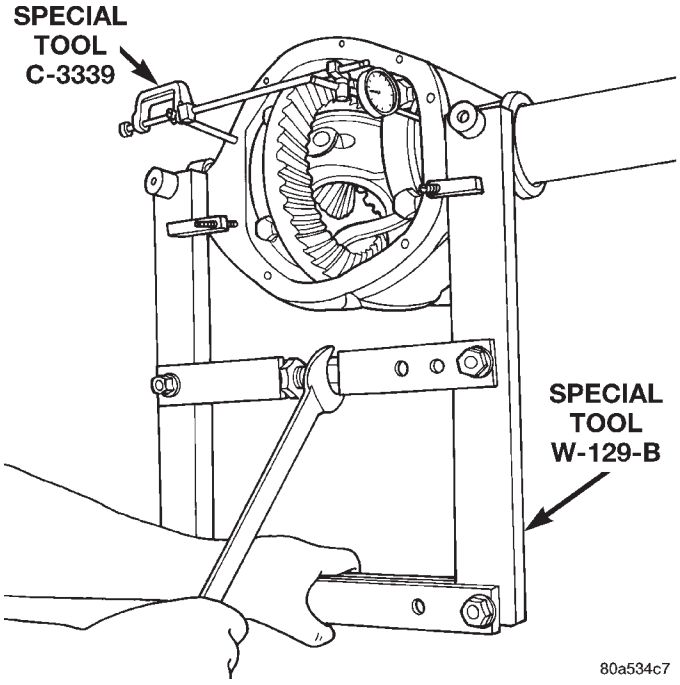


Fig. 26 Spread Axle Housing

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

(9) Spread the housing enough to remove the differential case from the housing. Measure the distance with the dial indicator (Fig. 26).

(10) Remove the dial indicator.

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

(12) Remove the differential from the housing. Ensure that the differential bearing cups remain in position on the differential bearings (Fig. 27).

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

(14) Retrieve differential case preload shims from axle housing. Mark or tag the differential case preload shims to indicate which side of the differential they were removed from.

(15) Remove spreader from housing.

INSTALLATION

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

REMOVAL AND INSTALLATION (Continued)

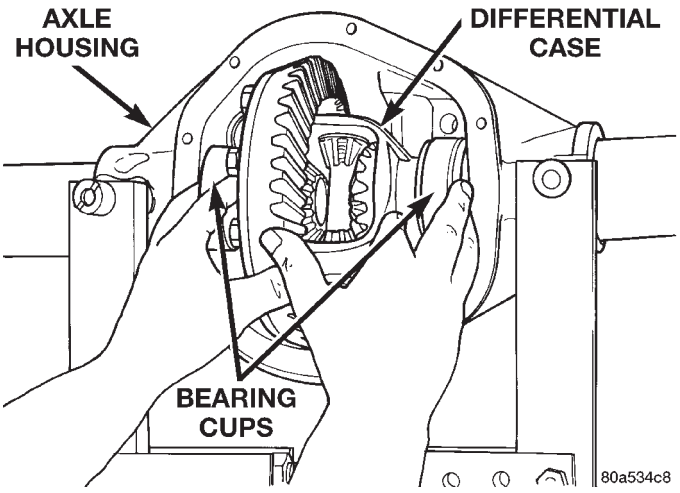


Fig. 27 Differential Case Removal

(1) Position Spreader W–129–B, utilizing some items from Adapter set 6987, with the tool dowel pins seated in the locating holes (Fig. 28). Install the hold-down clamps and tighten the tool turnbuckle finger–tight.

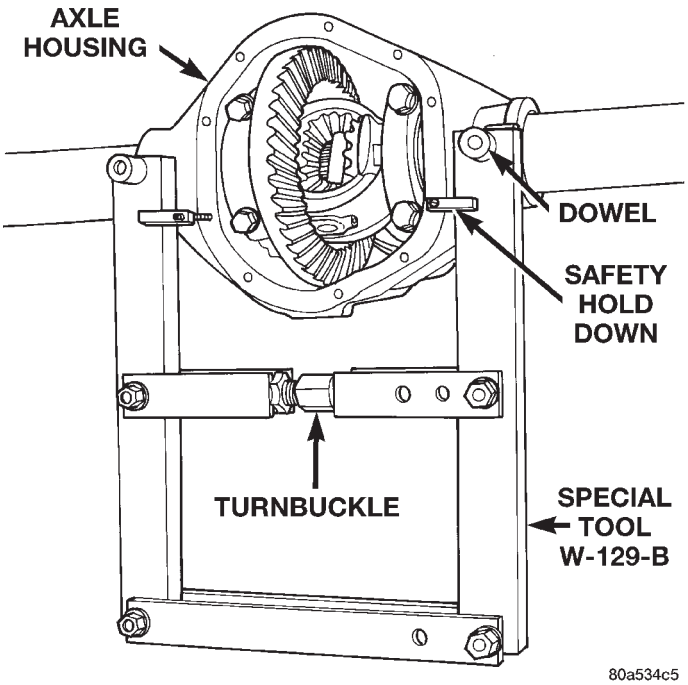


Fig. 28 Install Axle Housing Spreader

(2) Install a Pilot Stud C-3288-B at the left side of the differential housing. Attach Dial Indicator C-3339 to pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 25) and zero the indicator.

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

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 26).

(4) Remove the dial indicator.

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

(6) Install the bearing caps at their original locations (Fig. 29).

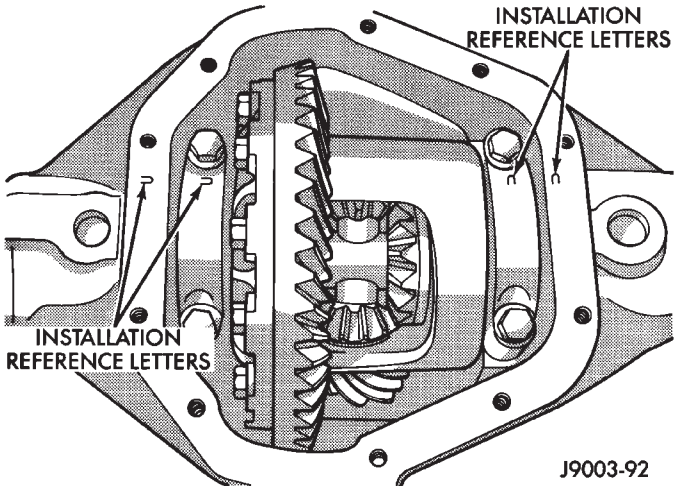


Fig. 29 Differential Bearing Cap Reference Letters

(7) Loosely install differential bearing cap bolts.

(8) Remove axle housing spreader.

(9) Tighten the bearing cap bolts to 77 N·m (57 ft. lbs.) torque.

(10) Install the axle shafts.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove differential from axle housing.

(2) Remove the bearings from the differential case with Puller/Press C-293-PA, C-293-39 Blocks, and Plug SP-3289 (Fig. 30).

INSTALLATION

(1) Using tool C-3716-A with handle C-4171, install differential side bearings (Fig. 31).

(2) Install differential in axle housing.

RING GEAR

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

REMOVAL AND INSTALLATION (Continued)

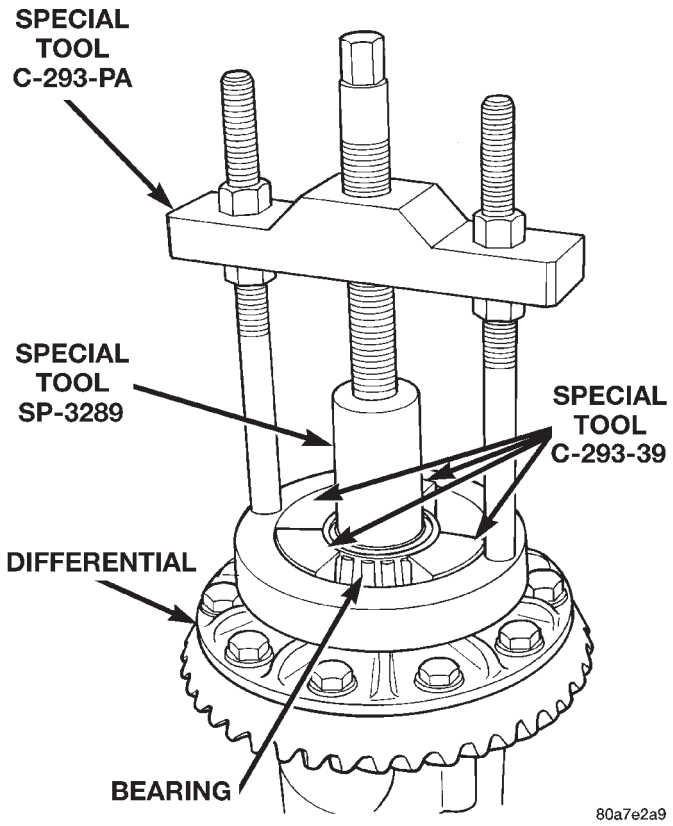


Fig. 30 Differential Bearing Removal

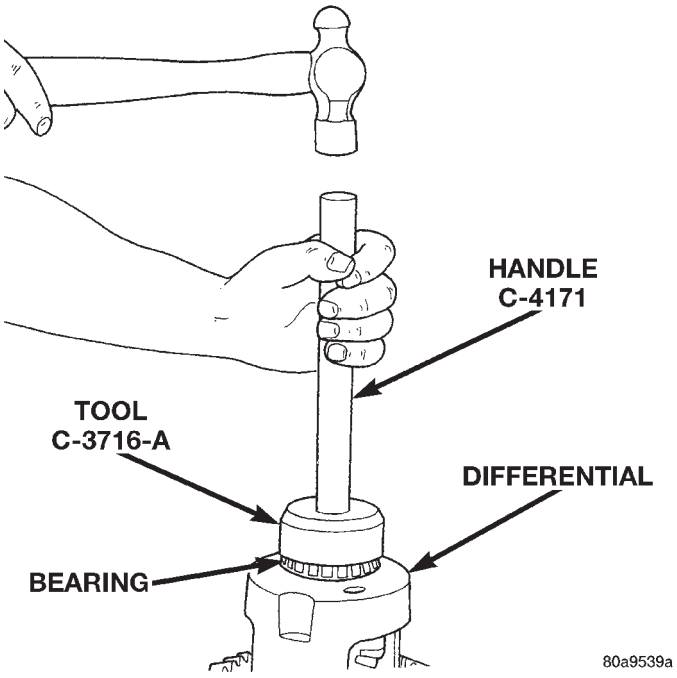


Fig. 31 Install Differential Side Bearings

REMOVAL

(1) Remove differential from axle housing.

(2) Place differential case in a suitable vise with soft metal jaw protectors (Fig. 32).

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

(4) Using a soft hammer, drive ring gear from differential case (Fig. 32).

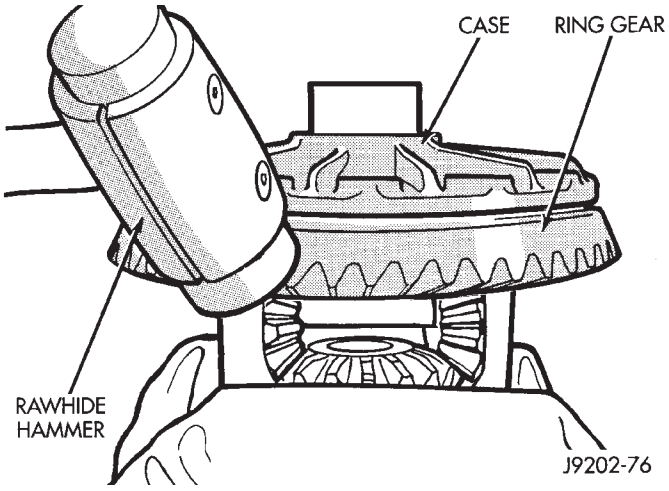


Fig. 32 Ring Gear Removal

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) Invert the differential case in the vise.

(3) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 33).

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

PINION GEAR

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 Holder 6958 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. 34).

(6) Remove the pinion gear from housing (Fig. 35). Catch the pinion with your hand to prevent it from falling and being damaged.

REMOVAL AND INSTALLATION (Continued)

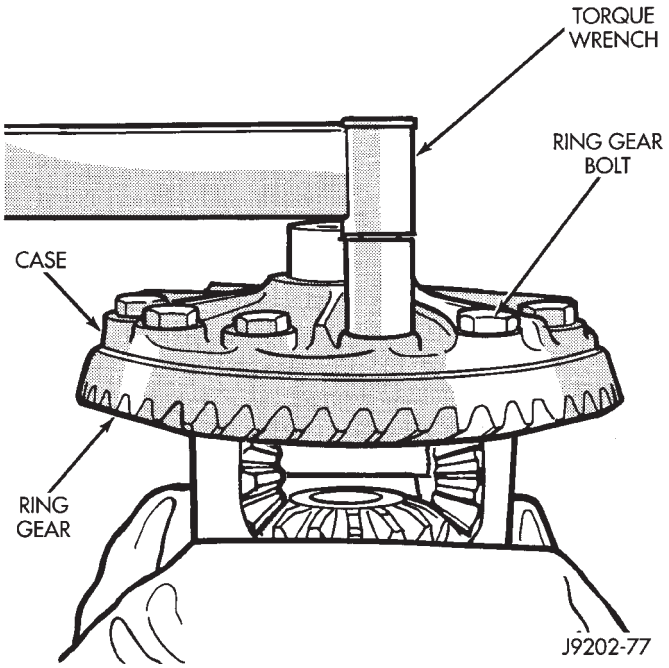


Fig. 33 Ring Gear Bolt Installation

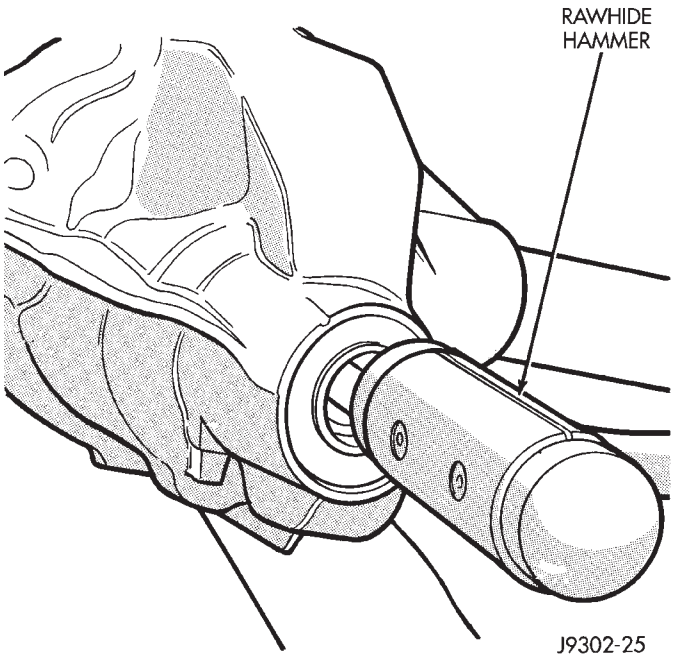


Fig. 35 Remove Pinion Gear

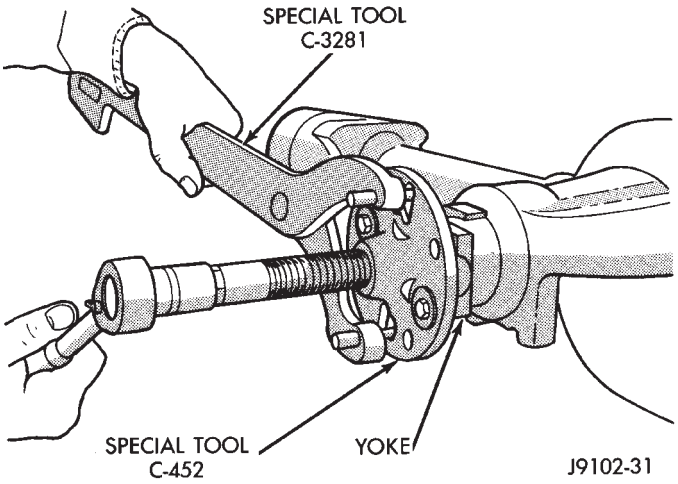


Fig. 34 Pinion Yoke Removal

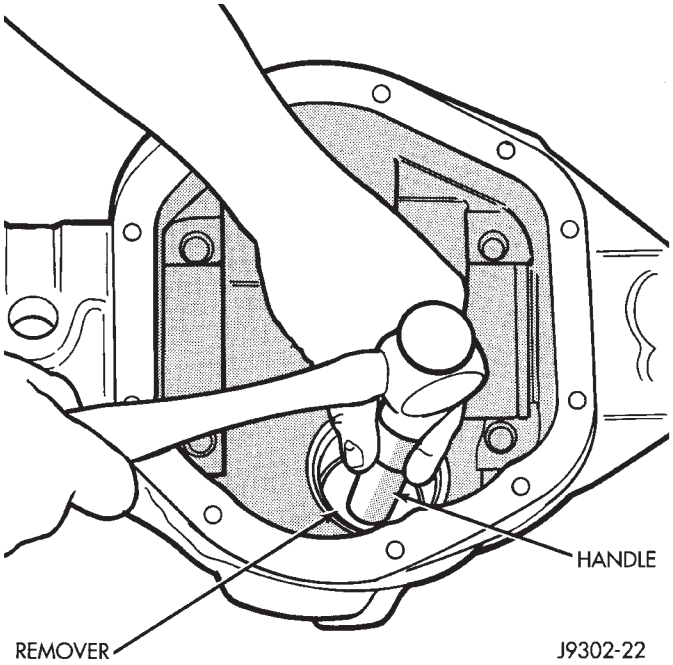


Fig. 36 Front Bearing Cup Removal

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

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

(9) Remove the front pinion bearing cup with Remover C-4345 and Handle C–4171 (Fig. 36).

(10) Remove the rear bearing cup from housing (Fig. 37). Use Remover D-149 and Handle C–4171.

(11) Remove the collapsible preload spacer (Fig. 38).

(12) Remove the rear bearing from the pinion with Puller/Press C-293-PA and Adapters C-293-40 (Fig. 39).

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.

INSTALLATION

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

(2) Install the pinion rear bearing cup with Installer D-146 and Driver Handle C–4171 (Fig. 40). Ensure cup is correctly seated.

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

(4) Install the pinion front bearing cup with Installer D–130 and Handle C–4171 (Fig. 41).

REMOVAL AND INSTALLATION (Continued)

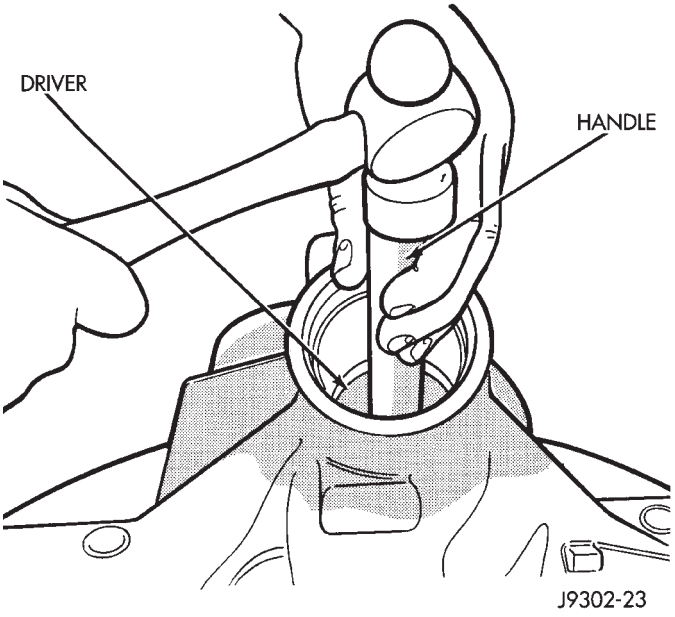


Fig. 37 Rear Bearing Cup Removal

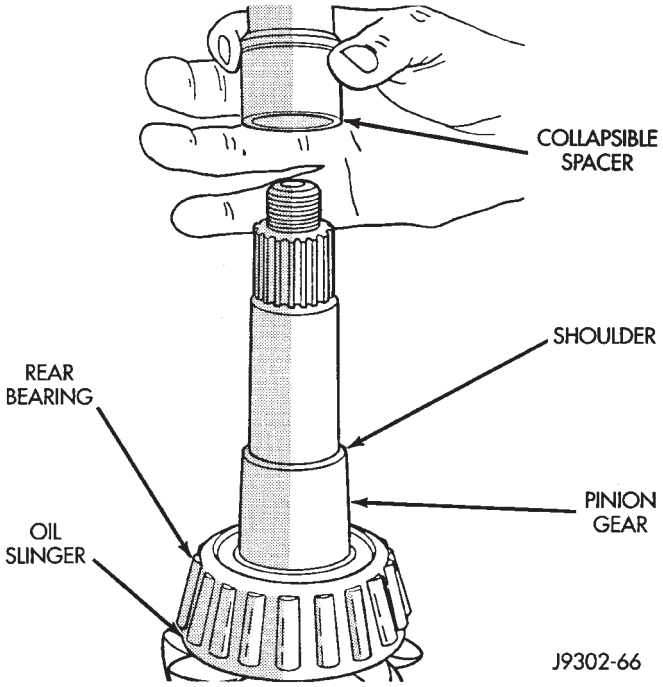


Fig. 38 Collapsible Spacer

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

(6) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-3972-A and Handle C–4171 (Fig. 42).

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,

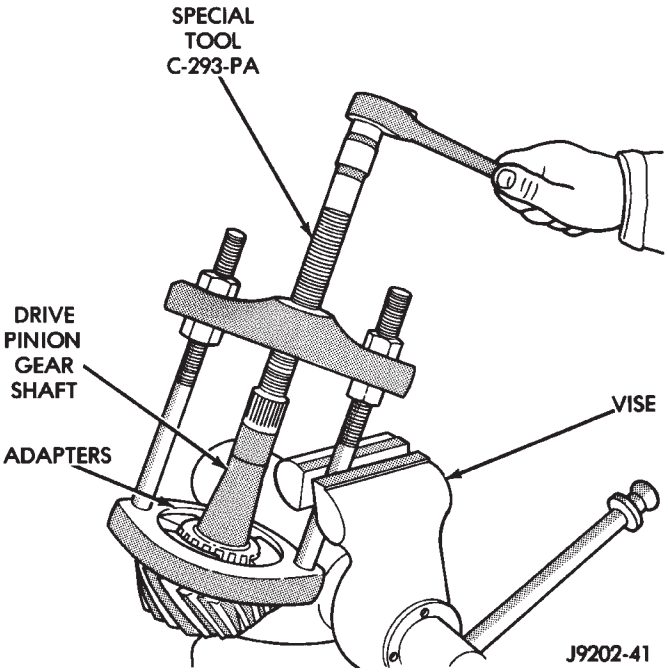


Fig. 39 Rear Bearing Removal

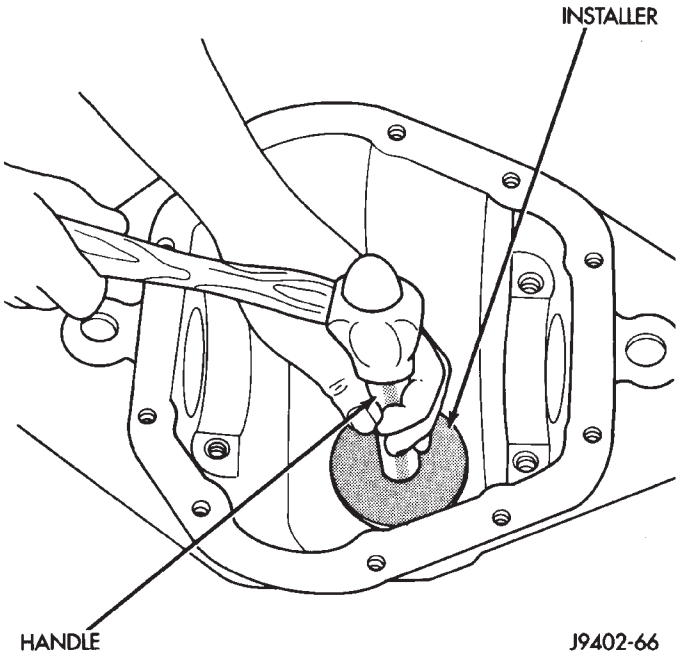


Fig. 40 Pinion Rear Bearing Cup Installation

refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

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

(8) Install the rear bearing and slinger, if equipped, on the pinion gear with Installer W-262 (Fig. 43).

(9) Install a new collapsible preload spacer on pinion shaft and install pinion gear in housing (Fig. 44).

REMOVAL AND INSTALLATION (Continued)

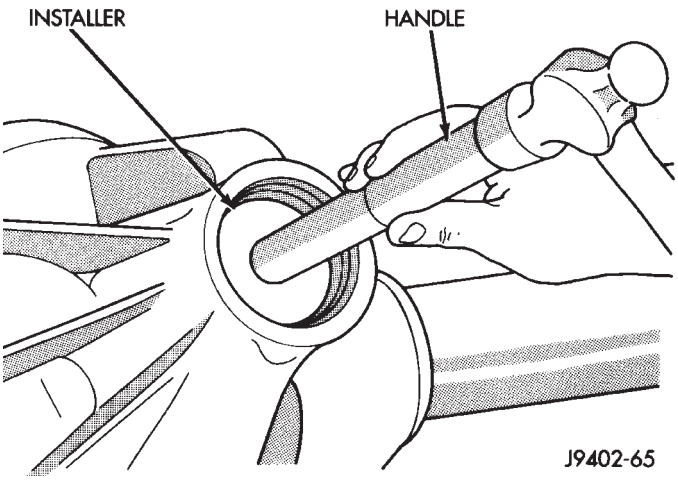


Fig. 41 Pinion Front Bearing Cup Installation

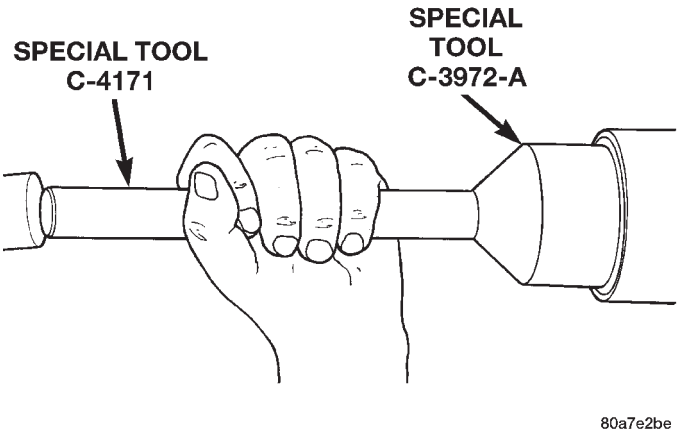


Fig. 42 Pinion Seal Installation

(10) Install pinion gear in housing.

(11) Install yoke with Installer Screw 8112, Cup 8109, and holder 6958 (Fig. 45).

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

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

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

(14) Using yoke holder 6958 and a torque wrench set at 474 N·m (350 ft. lbs.), crush collapsible spacer until bearing end play is taken up (Fig. 46).

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

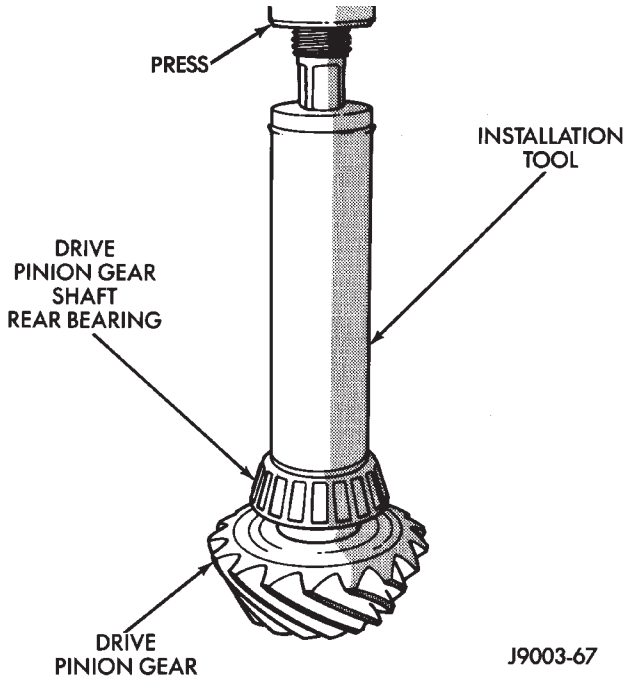


Fig. 43 Shaft Rear Bearing Installation

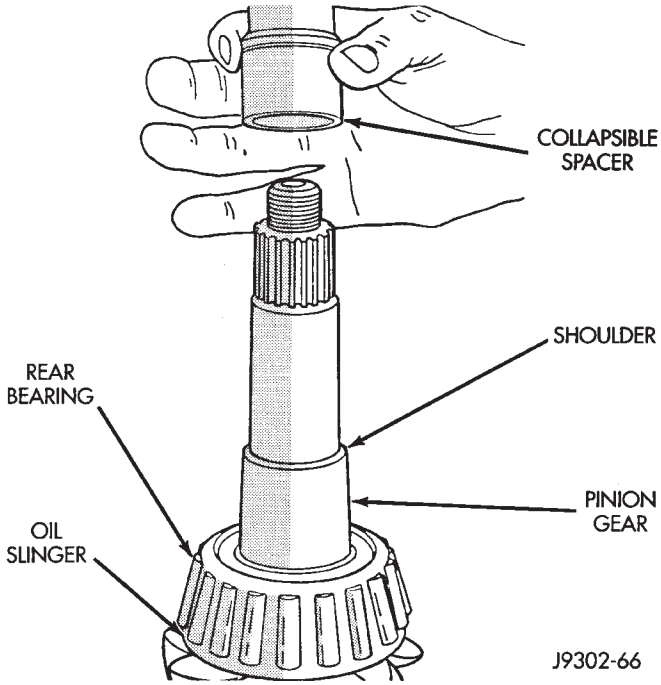


Fig. 44 Collapsible Preload Spacer

(15) 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. 47).

(16) Check bearing rotating torque with a (in. lbs.) torque wrench (Fig. 47). 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.).

REMOVAL AND INSTALLATION (Continued)

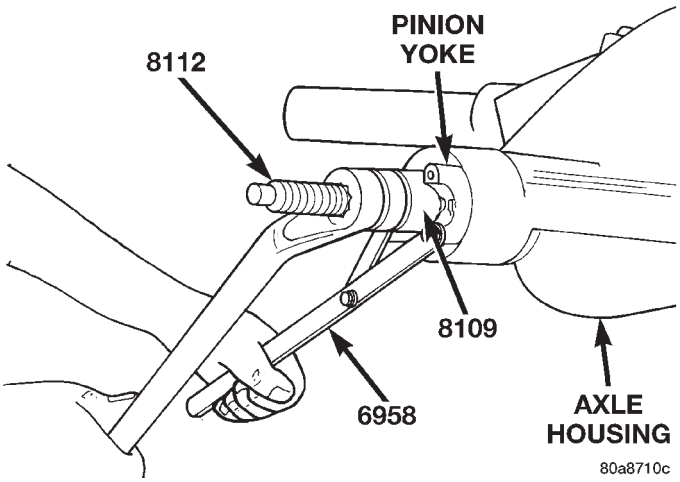


Fig. 45 Pinion Yoke Installation

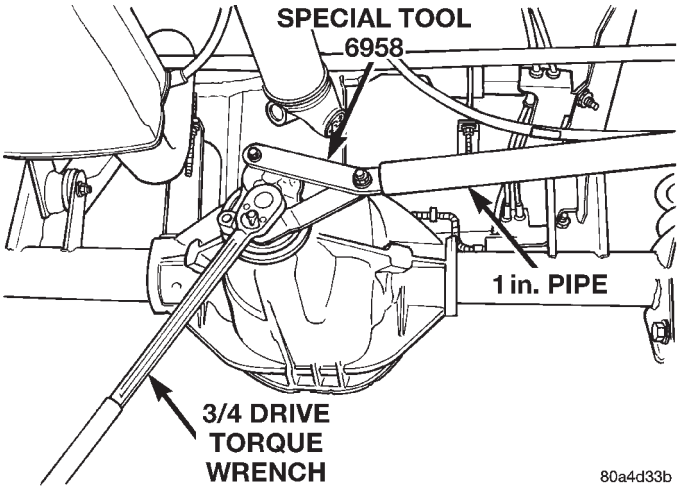


Fig. 46 Tightening Pinion Nut–Typical

(17) 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. 48).

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.

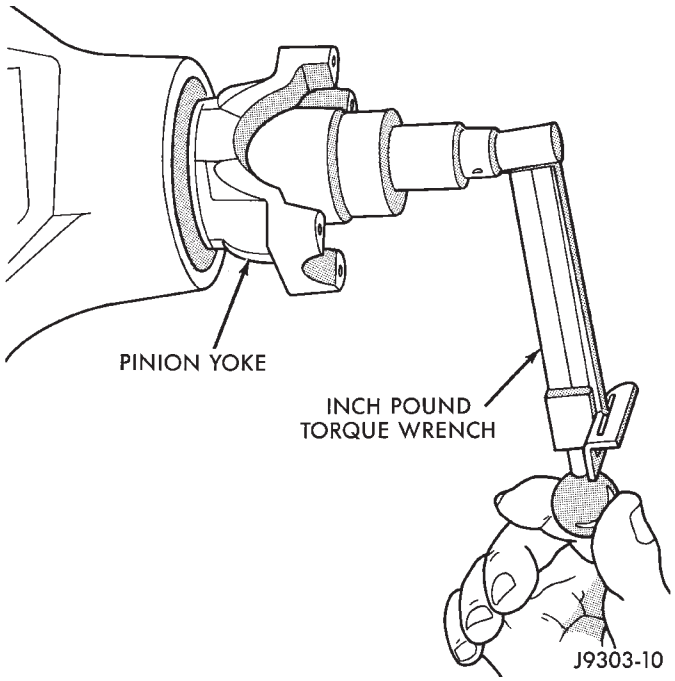


Fig. 47 Check Pinion Gear Rotating Torque

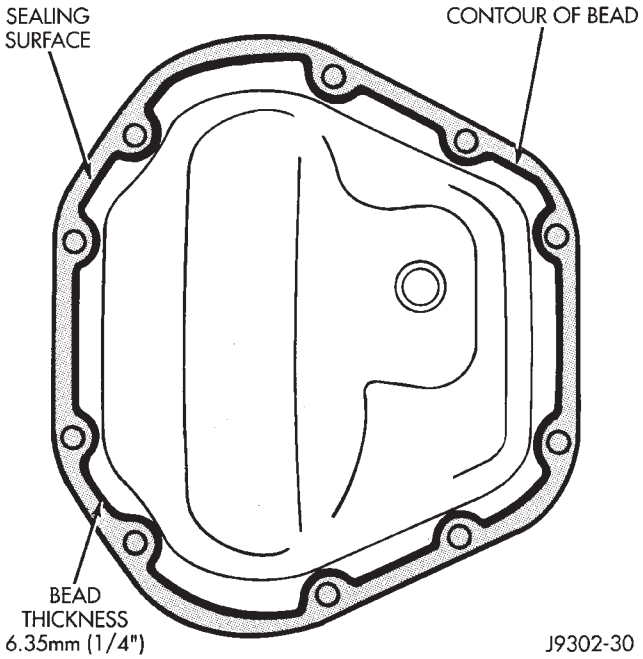


Fig. 48 Typical Housing Cover With Sealant

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove pinion gear mate shaft lock screw (Fig. 49).

(2) Remove pinion gear mate shaft.

(3) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 50).

DISASSEMBLY AND ASSEMBLY (Continued)

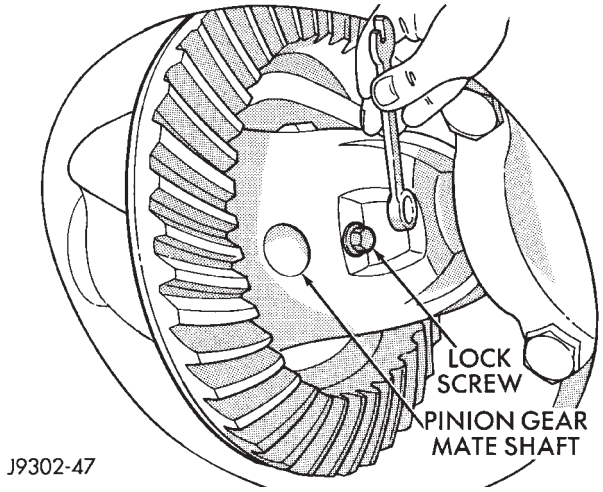


Fig. 49 Pinion Gear Mate Shaft Lock Screw

(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.

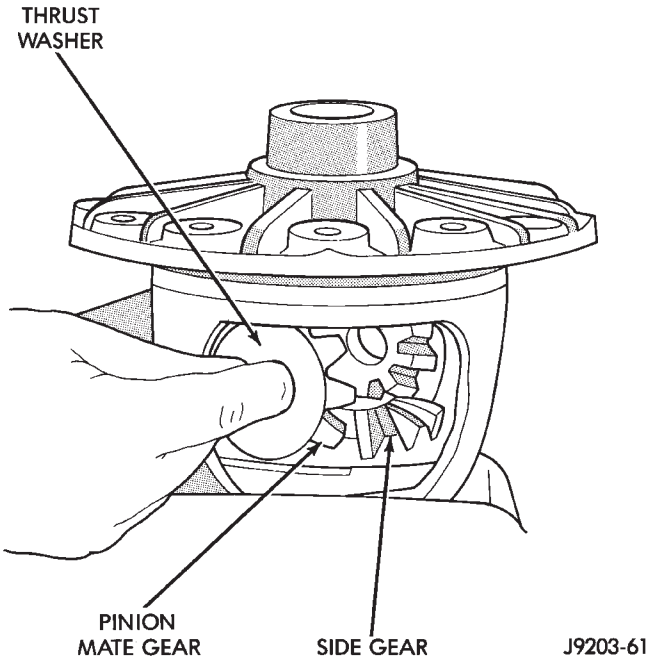


Fig. 50 Pinion Mate Gear Removal

TRAC-LOK™ DIFFERENTIAL

The Trac–lok™ differential components are illustrated in (Fig. 51). Refer to this illustration during repair service.

DISASSEMBLY

(1) Clamp Side Gear Holding Tool 6965 in a vise.

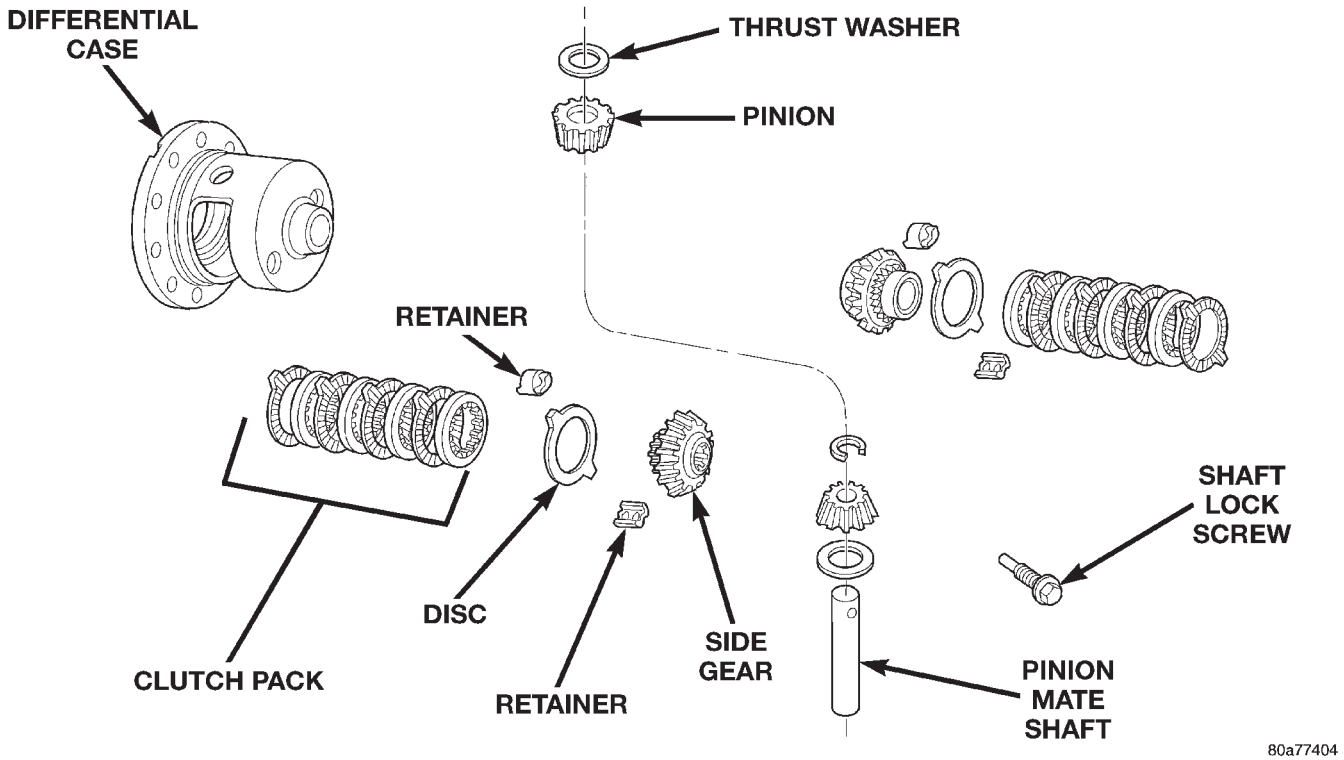


Fig. 51 Trac–lok™ Differential Components

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Position the differential case on Side Gear Holding Tool 6965 (Fig. 52).

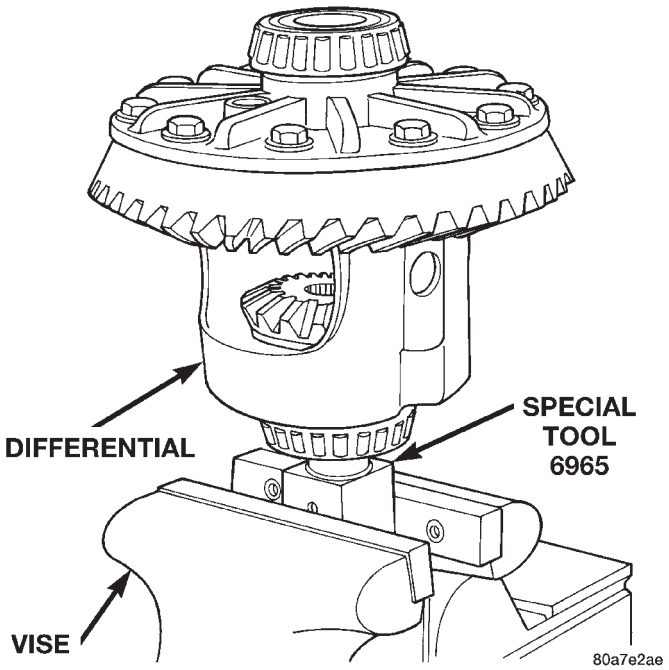


Fig. 52 Differential Case Holding Tool

(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 pinion gear mate shaft lock screw (Fig. 53).

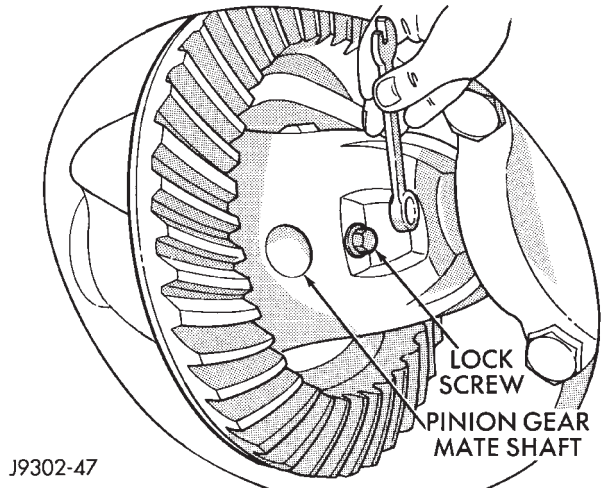


Fig. 53 Mate Shaft Lock Screw

(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 54).

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

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

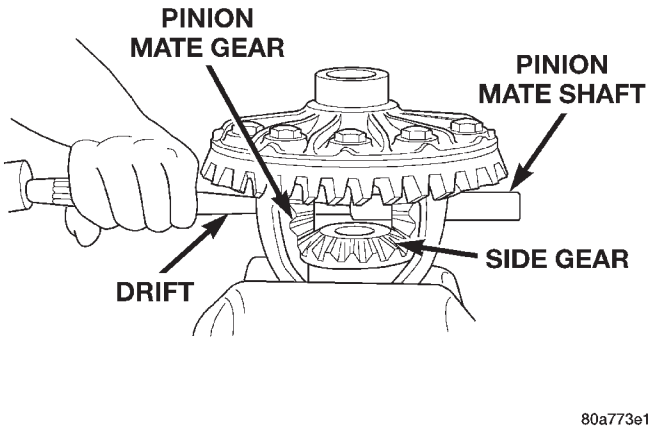


Fig. 54 Mate Shaft Removal

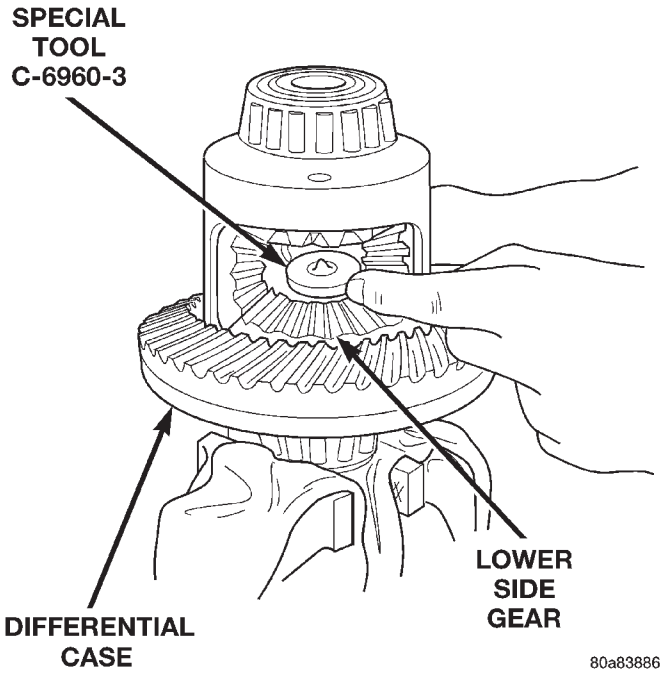


Fig. 55 Step Plate Tool Installation

(8) Position a small screw driver in slot of Threaded Adapter C-6960-1 (Fig. 56) to prevent adapter from turning.

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 57).

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 58).

(11) Insert Turning Bar C-6960-2 in case (Fig. 59).

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

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

DISASSEMBLY AND ASSEMBLY (Continued)

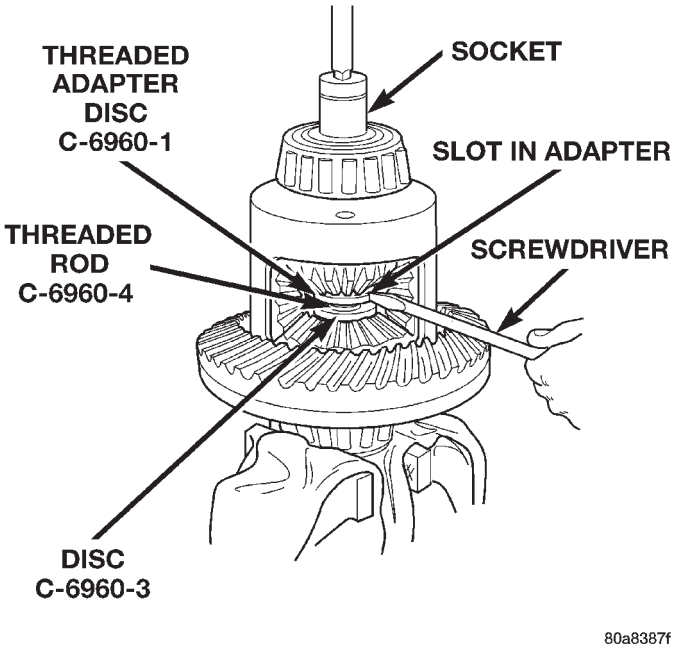


Fig. 56 Threaded Adapter Installation

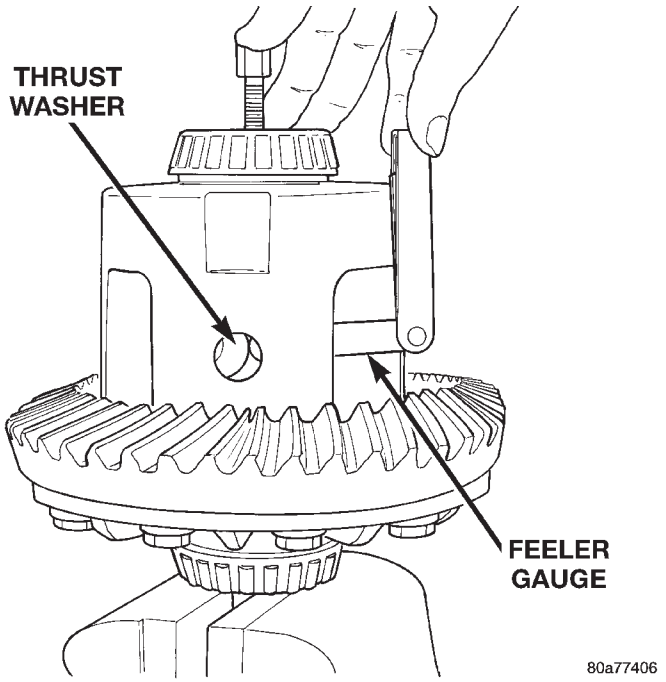


Fig. 58 Remove Pinion Gear Thrust Washer

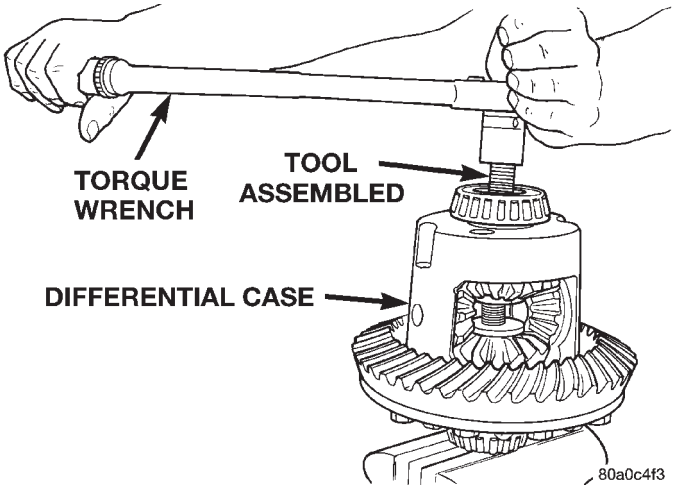


Fig. 57 Tighten Belleville Spring Compressor Tool

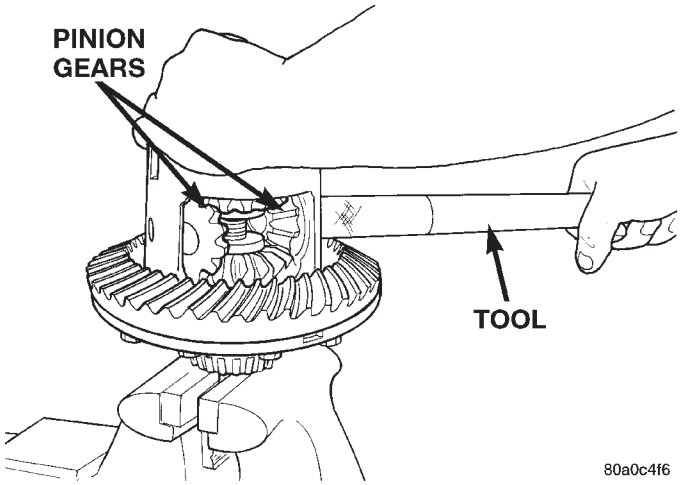


Fig. 59 Pinion Gear Removal

(14) Remove pinion gears from differential case.

(15) Remove Forcing Screw C-6960-4, Step Plate C-6960-3, and Threaded Adapter C-6960-1.

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

(17) Remove differential case from Side Gear Holding Tool 6965. 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.

Lubricate each component with gear lubricant before assembly.

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

(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. 62). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

(4) Position the differential case on Side Gear Holding Tool 6965.

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

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

DISASSEMBLY AND ASSEMBLY (Continued)

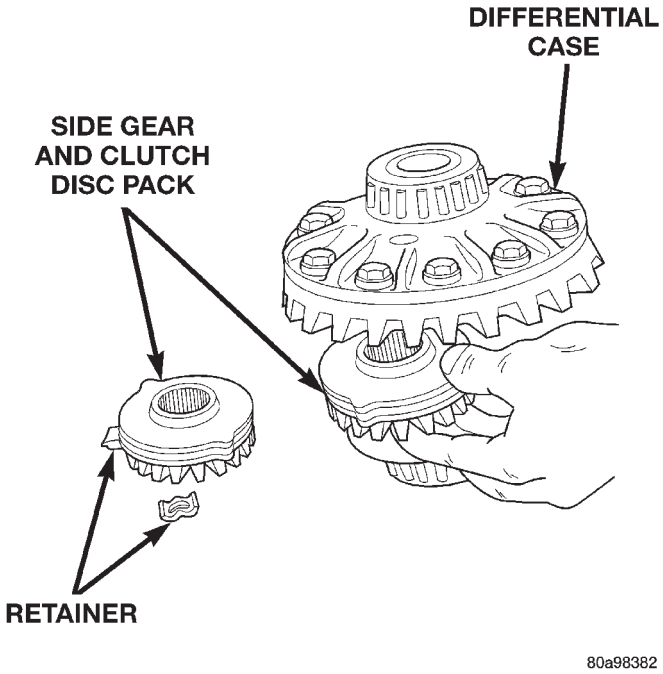


Fig. 60 Side Gear & Clutch Disc Removal

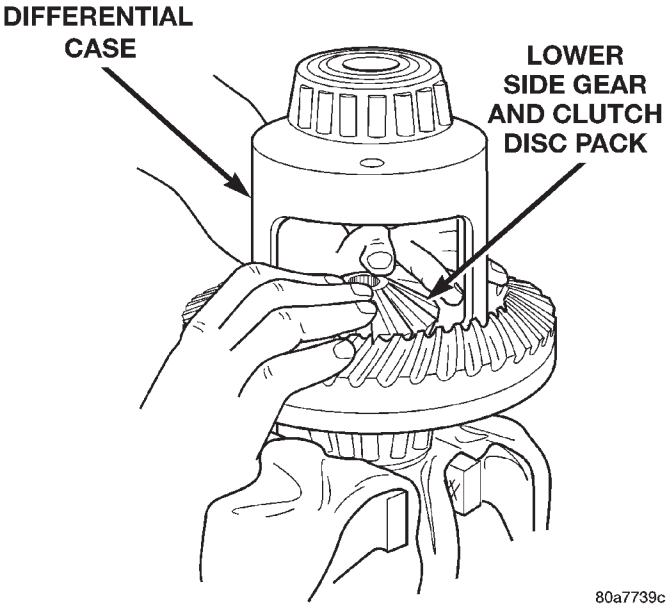


Fig. 62 Clutch Discs & Lower Side Gear Installation

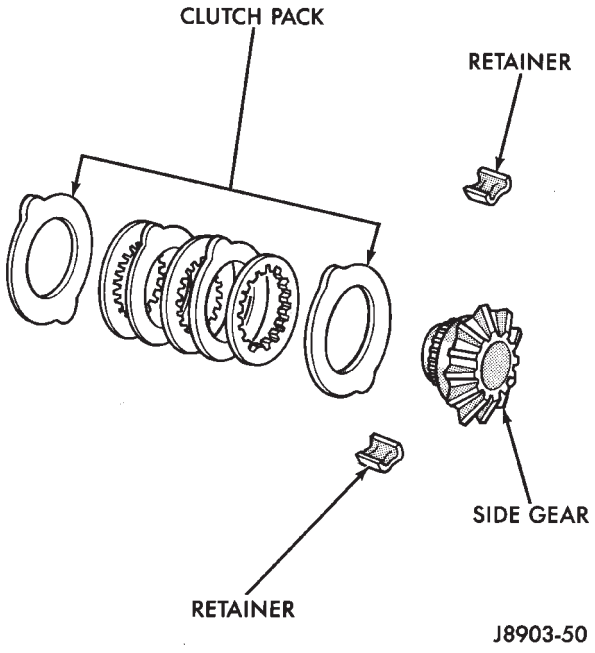


Fig. 61 Clutch Disc Pack

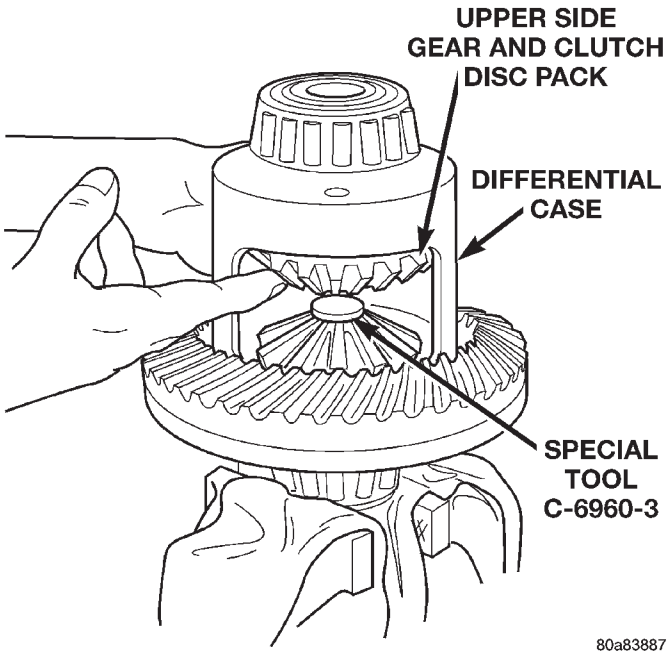


Fig. 63 Upper Side Gear & Clutch Disc Pack Installation

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

(8) Insert Forcing Screw C-6960-4.

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

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

(11) Rotate case with Turning Bar C-6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

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

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

DISASSEMBLY AND ASSEMBLY (Continued)

(14) Remove Forcing Screw C-6960-4, Step Plate C-6960-3, and Threaded Adapter C-6960-1.

(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.

If replacement gears and thrust washers were installed, it is not necessary to measure the gear backlash. Correct fit is due to close machining tolerances during manufacture.

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

CLEANING AND INSPECTION

AXLE COMPONENTS

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

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

Clean axle shaft tubes and oil channels in housing.

Inspect for;

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

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. 64). A plus (+) number, minus (–) number or zero (0) is etched into the face of the pinion gear. This number is the amount (in thousandths of an inch) the depth varies from the standard depth setting of a pinion etched with a (0). The standard setting from the center line of the ring gear to the back face of the pinion is 96.850 mm (3.813 in.). The standard depth provides the best teeth contact pattern. Refer to Backlash and Contact Pattern Analysis Paragraph in this section for additional information.

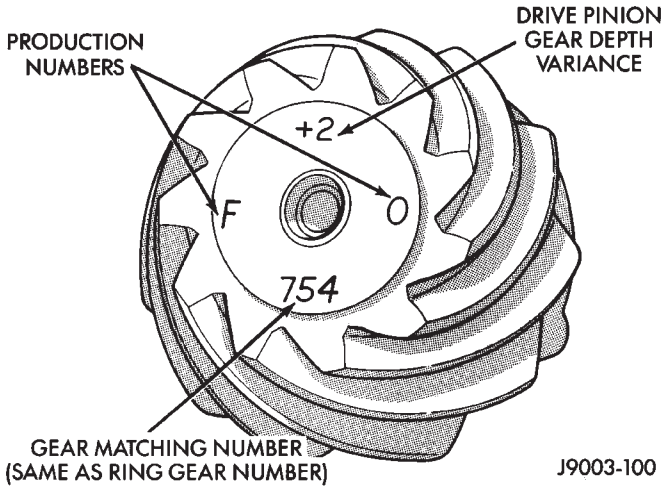


Fig. 64 Pinion Gear ID Numbers

Compensation for pinion depth variance is achieved with select shims. The shims are placed under the inner pinion bearing cone (Fig. 65).

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.

ADJUSTMENTS (Continued)

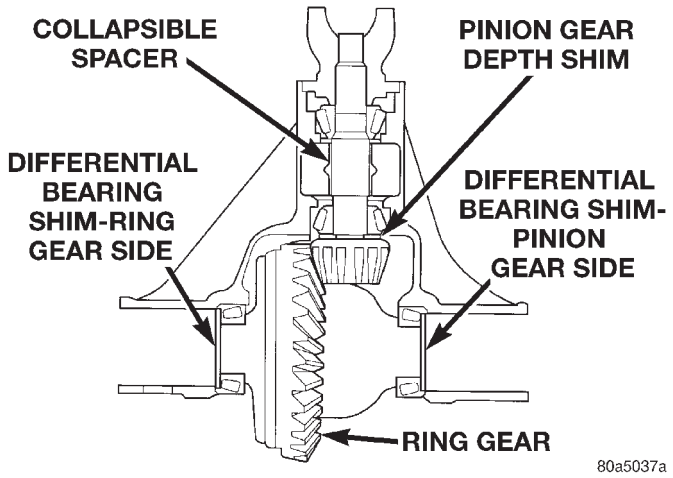


Fig. 65 Shim Locations

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.

PINION DEPTH MEASUREMENT AND ADJUSTMENT

Measurements are taken with pinion cups and pinion bearings installed in housing. Take measurements with a Pinion Gauge Set, Pinion Block 6735, Arbor Discs 6732, and Dial Indicator C-3339 (Fig. 66).

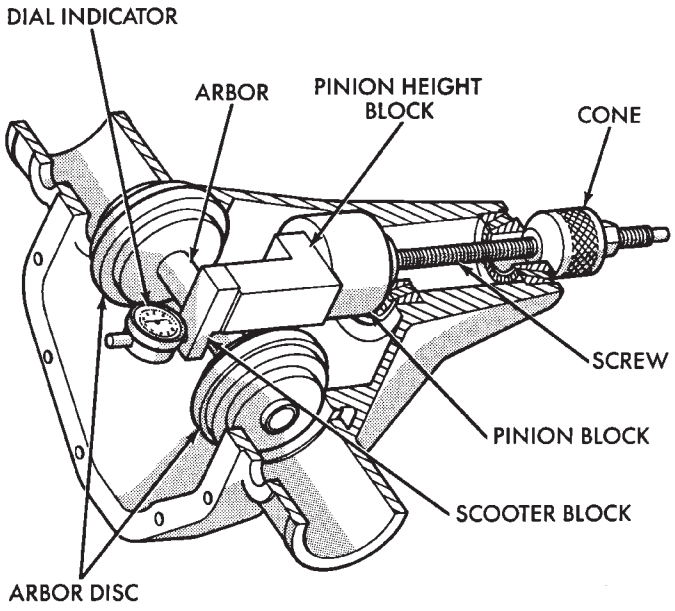


Fig. 66 Pinion Gear Depth Gauge Tools—Typical

(1) Assemble Pinion Height Block 6739, Pinion Block 6735, and rear pinion bearing onto Screw 6741 (Fig. 66).

(2) Insert assembled height gauge components, rear bearing and screw into axle housing through pinion bearing cups (Fig. 67).

PINION GEAR DEPTH VARIANCE

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

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ADJUSTMENTS (Continued)

(3) Install front pinion bearing and Cone 6740 hand tight (Fig. 66).

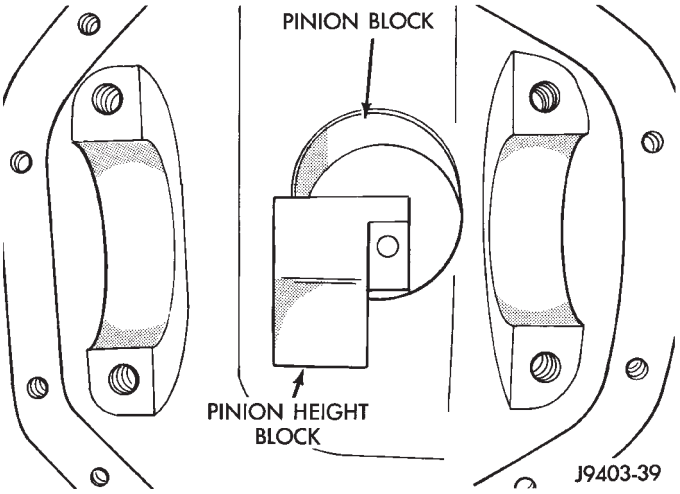


Fig. 67 Pinion Height Block—Typical

(4) Place Arbor Disc 6732 on Arbor D-115-3 in position in axle housing side bearing cradles (Fig. 68). 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.

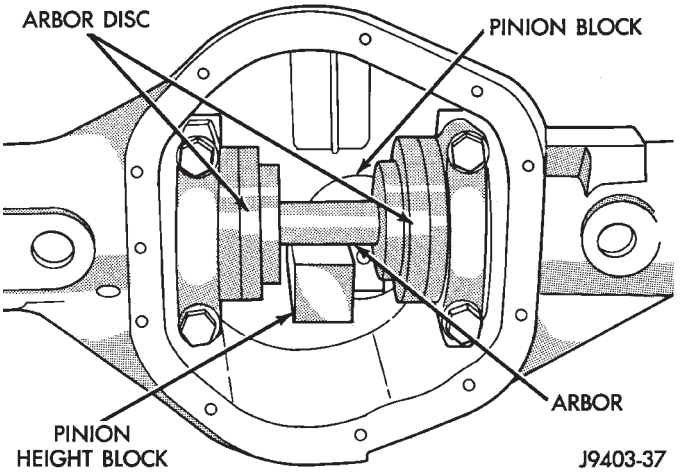


Fig. 68 Gauge Tools In Housing—Typical

(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. 69). 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. 64) 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.

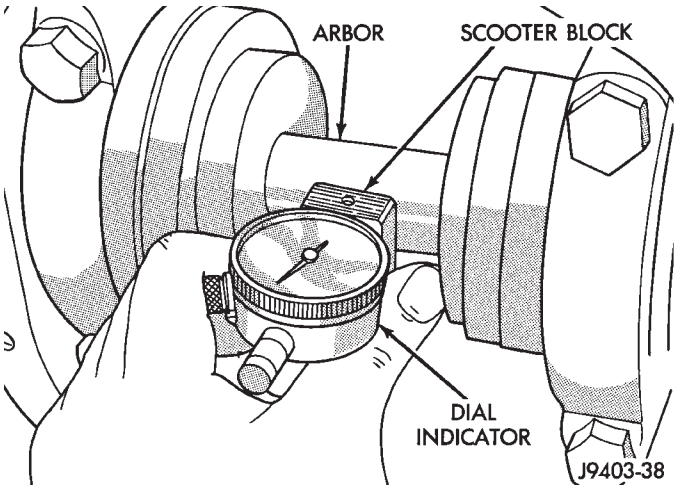


Fig. 69 Pinion Gear Depth Measurement—Typical

(10) Remove the pinion depth gauge components from the axle housing.

DIFFERENTIAL BEARING PRELOAD AND GEAR BACKLASH

Differential side bearing preload and gear backlash is achieved by selective shims inserted between the bearing cup and the axle housing. The proper shim thickness can be determined using slip-fit dummy bearings D-348 in place of the differential side bearings and a dial indicator C-3339. Before proceeding with the differential bearing preload and gear backlash measurements, measure the pinion gear depth and prepare the pinion gear for installation. Establishing proper pinion gear depth is essential to establishing gear backlash and tooth contact patterns. After the overall shim thickness to take up differen-

ADJUSTMENTS (Continued)

tial side play is measured, the pinion gear is installed, and the gear backlash shim thickness is measured. The overall shim thickness is the total of the dial indicator reading, starting point shim thickness, and the preload specification added together. The gear backlash measurement determines the thickness of the shim used on the ring gear side of the differential case. Subtract the gear backlash shim thickness from the total overall shim thickness and select that amount for the pinion gear side of the differential (Fig. 70).

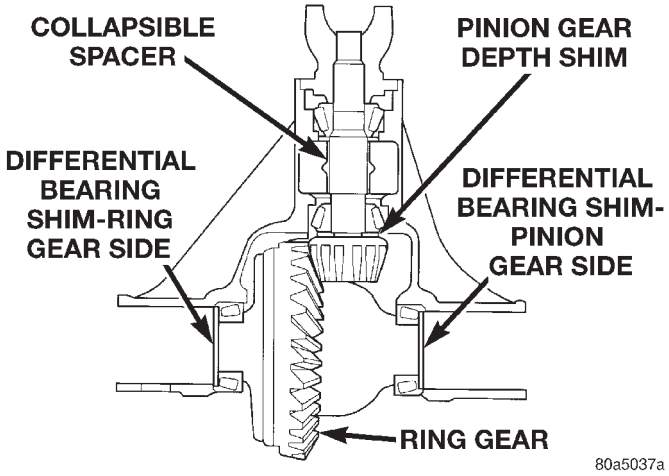


Fig. 70 Axle Adjustment Shim Locations

SHIM SELECTION

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

(1) Remove side bearings from differential case.
(2) Install ring gear, if necessary, on differential case and tighten bolts to specification.
(3) Install dummy side bearings D-348 on differential case.
(4) Install differential case in axle housing.
(5) Insert Dummy Shims 8107 (0.118 in. (3.0 mm)) starting point shims between the dummy bearing and the axle housing (Fig. 71).
(6) Install the marked bearing caps in their correct positions. Install and snug the bolts.
(7) Using a dead-blow type mallet, seat the differential dummy bearings to each side of the axle housing (Fig. 72) and (Fig. 73).
(8) Thread guide stud C-3288-B into rear cover bolt hole below ring gear (Fig. 74).
(9) Attach dial indicator C-3339 to guide stud. Position the dial indicator plunger on a flat surface on a ring gear bolt head (Fig. 74).
(10) Push firmly and hold differential case to pinion gear side of axle housing (Fig. 75).
(11) Zero dial indicator face to pointer.

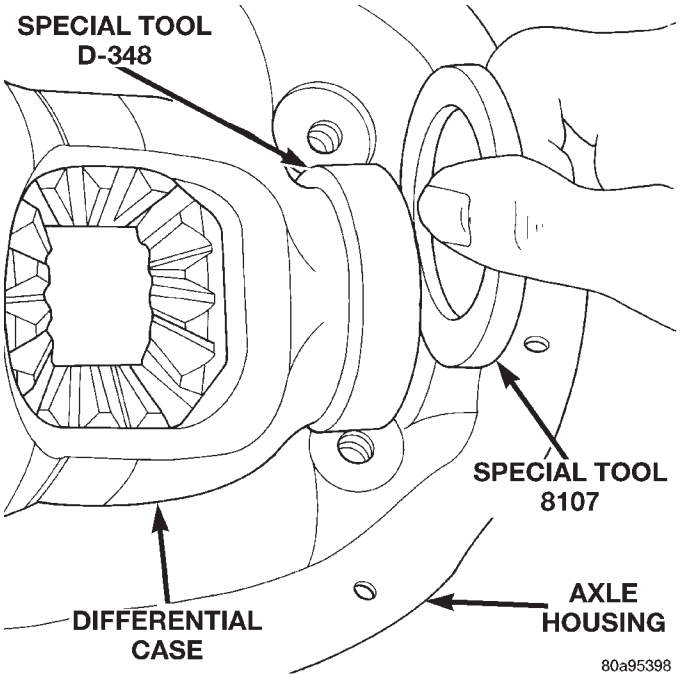


Fig. 71 Insert Starting Point Shims

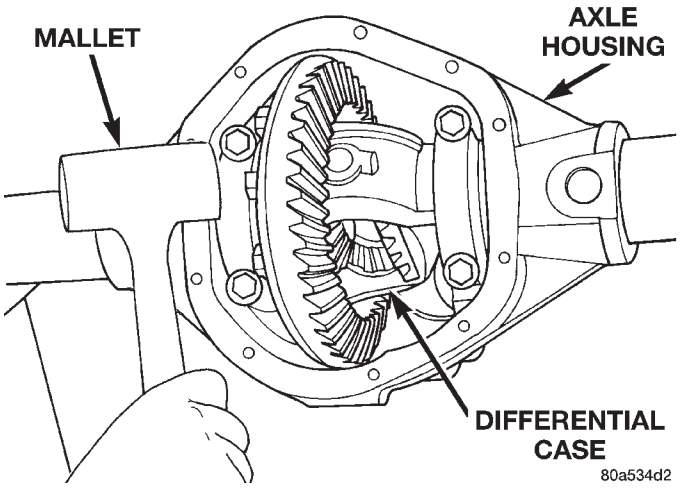


Fig. 72 Seat Pinion Gear Dummy Side Bearing

(12) Push firmly and hold differential case to ring gear side of the axle housing (Fig. 76).
(13) Record dial indicator reading.
(14) Add the dial indicator reading to the starting point shim thickness to determine total shim thickness to achieve zero differential end play.
(15) Add 0.008 in. (0.2 mm) to the zero end play total. This new total represents the thickness of shims to compress, or preload the new bearings when the differential is installed.
(16) Rotate dial indicator out of the way on guide stud.
(17) Remove differential case, dummy bearings, and starting point shims from axle housing.
(18) Install pinion gear in axle housing. Install the yoke and establish the correct pinion rotating torque.

ADJUSTMENTS (Continued)

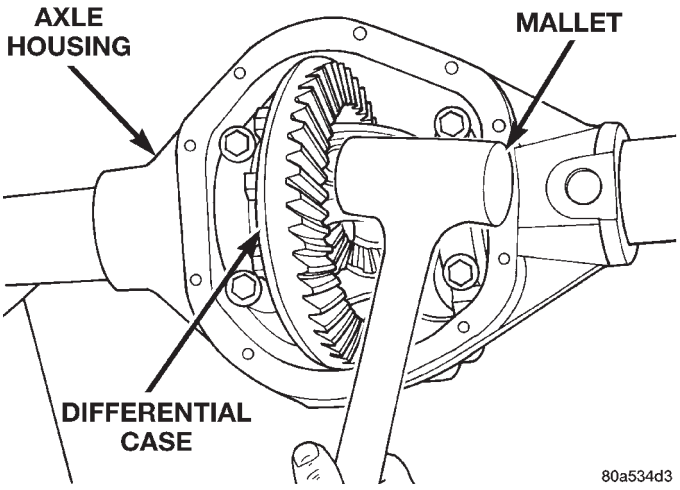


Fig. 73 Seat Ring Gear Side Dummy Bearing

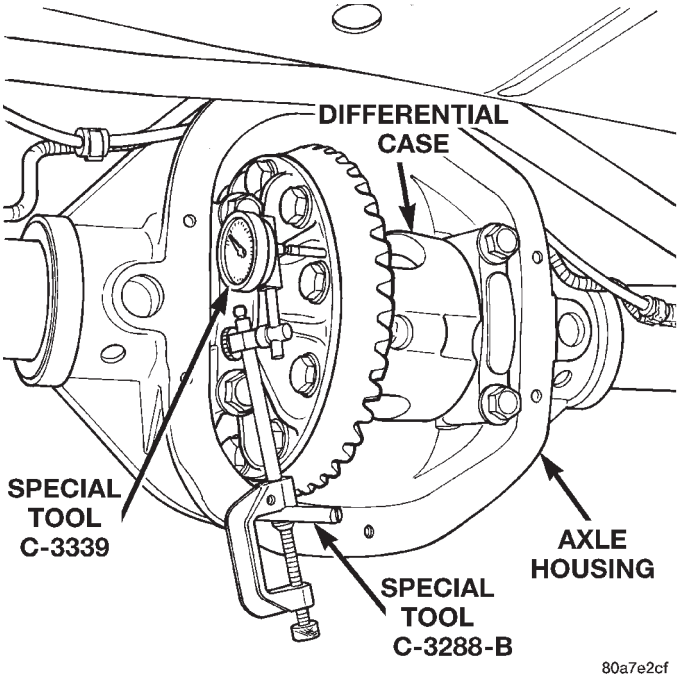


Fig. 74 Differential Side play Measurement

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

(20) Position the dial indicator plunger on a flat surface between the ring gear bolt heads (Fig. 74).

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

(22) Zero dial indicator face to pointer.

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

(24) Record dial indicator reading.

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

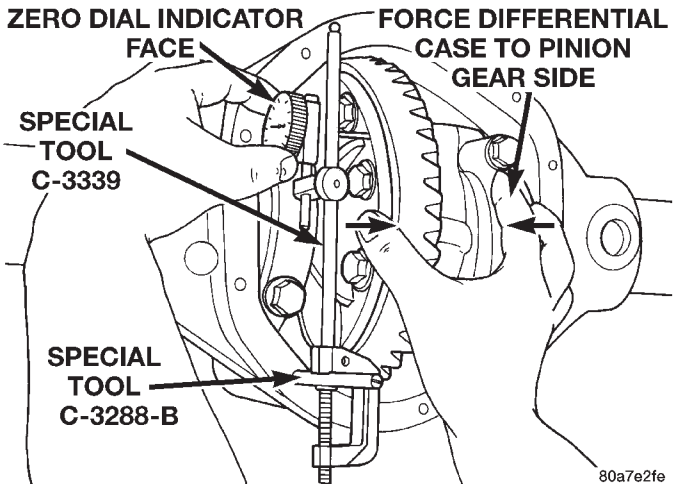


Fig. 75 Hold Differential Case and Zero Dial Indicator

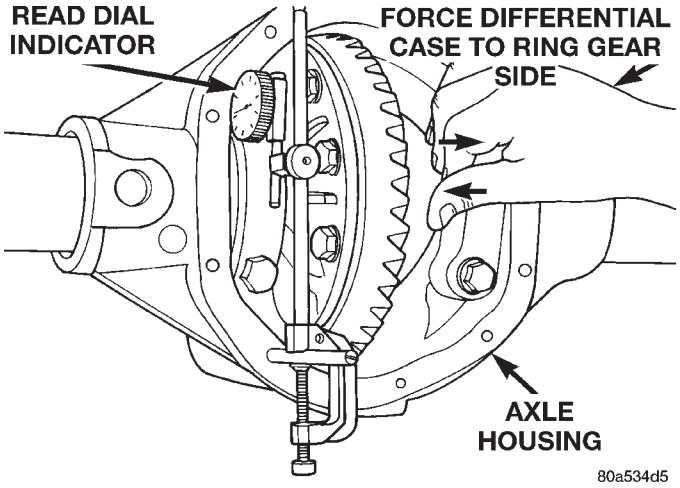


Fig. 76 Hold Differential Case and Read Dial Indicator

(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 new side bearing cones and cups on differential case.

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

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

(32) Install differential case in axle housing.

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

ADJUSTMENTS (Continued)

(34) Position the indicator plunger against a ring gear tooth (Fig. 77).

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

(36) Zero dial indicator face to pointer.

(37) Push and hold ring gear downward while not allowing the pinion gear to rotate. Dial indicator reading should be between 0.12 mm (0.005 in.) and 0.20 mm (0.008 in.). If backlash is not within specifications transfer the necessary amount of shim thickness from one side of the differential housing to the other (Fig. 78).

(38) 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 the Gear Contact Pattern Analysis procedure.

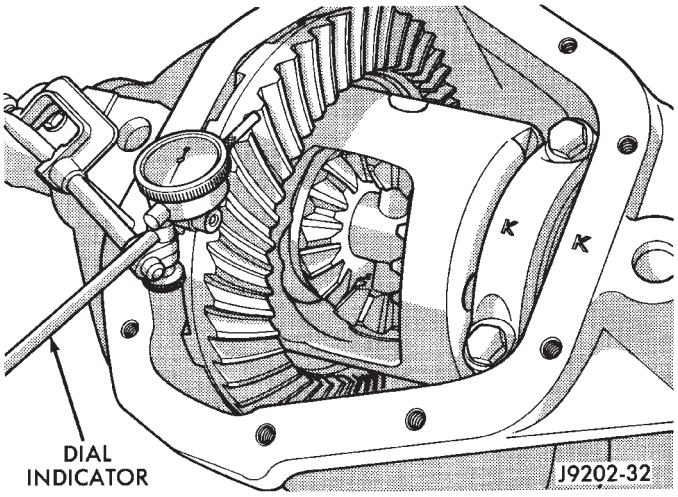


Fig. 77 Ring Gear Backlash Measurement

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.

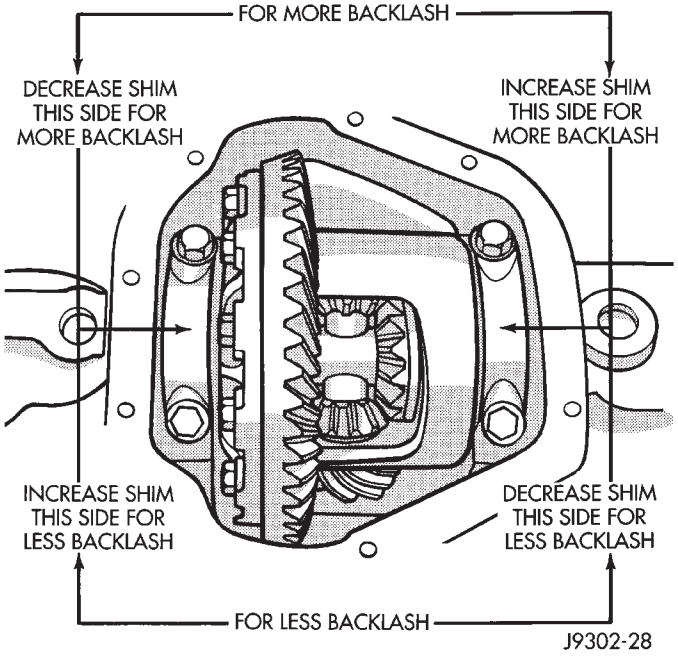


Fig. 78 Backlash Shim Adjustment

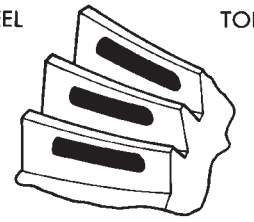
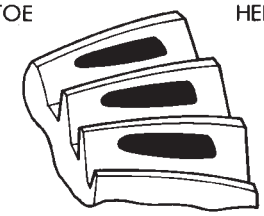
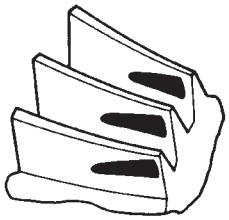
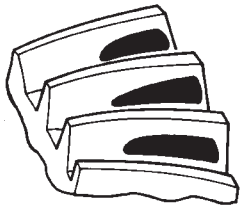
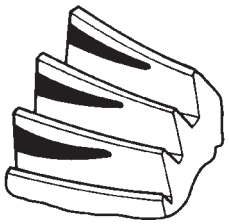
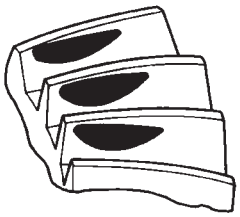
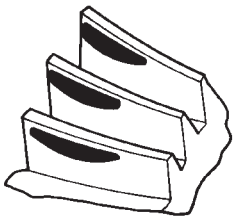
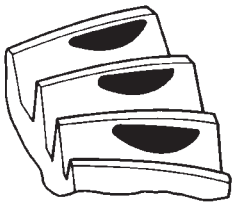
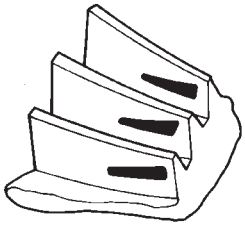
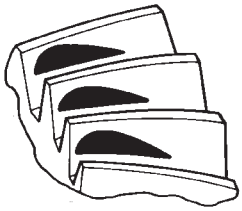
(1) Apply a thin coat of hydrated ferric oxide, or equivalent, to the drive and coast side of the ring gear teeth.

(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. 79) and adjust pinion depth and gear backlash as necessary.

ADJUSTMENTS (Continued)

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

J9003-24

Fig. 79 Gear Tooth Contact Patterns

SPECIFICATIONS

194 RBI AXLE

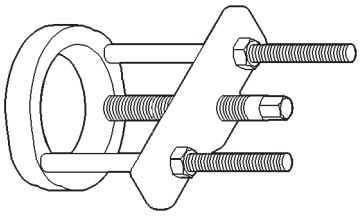
DESCRIPTION	SPECIFICATION
Axle Type	Semi–Floating Hypoid
Lubricant	SAE Thermally Stable 80W–90
Lubricant Trailer Tow	Synthetic 75W–140
Lube Capacity	1.66 L (3.50 pts.)
Axle Ratios	3.07, 3.55, 3.73
Differential Bearing Preload	0.1 mm (0.004 in.)
Differential Side Gear Clearance	0–0.15 mm (0–0.006 in.)
Ring Gear Diameter	19.2 cm (7.562 in.)
Ring Gear Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	92.08 mm (3.625 in.)
Pinion Bearing Preload-Original Bearings	1–2 N·m (10–20 in. lbs.)
Pinion Bearing Preload-New Bearings	1.5–4 N·m (15–35 in. lbs.)

TORQUE – 194 RBI AXLE

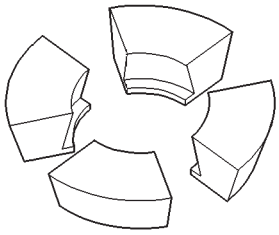
DESCRIPTION	TORQUE
Bolt, Diff. Cover	41 N·m (30 ft. lbs.)
Bolot, Bearing Cap	77 N·m (57 ft. lbs.)
Nut, Pinion	271–474 N·m (200–350 ft. lbs.)
Screw, Pinion Mate Shaft Lock	16.25 N·m (12 ft. lbs.)
Bolt, Ring Gear	95–122 N·m (70–90 ft. lbs.)
Bolt, RWAL/ABS Sensor	8 N·m (70 in. lbs.)

SPECIAL TOOLS

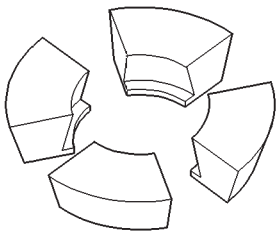
194 RBI AXLE



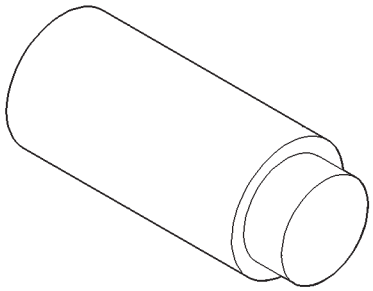
Puller—C-293-PA



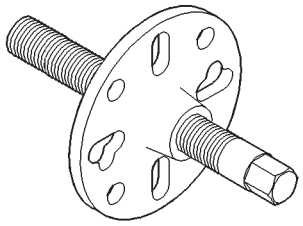
Adapter—C-293-39



Adapter—C-293-40

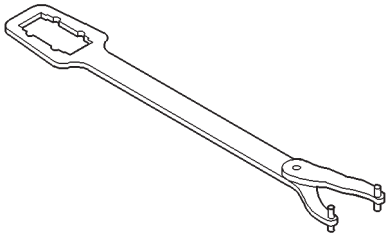


Plug—SP-3289

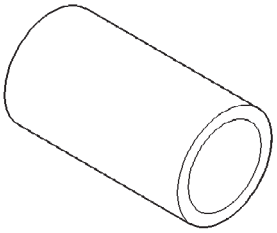


Puller—C-452

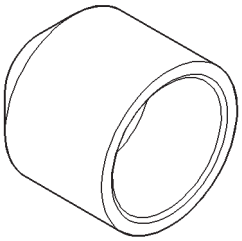
SPECIAL TOOLS (Continued)



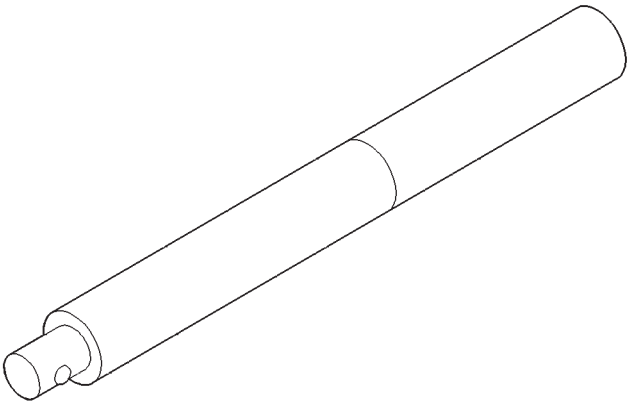
Wrench—C-3281



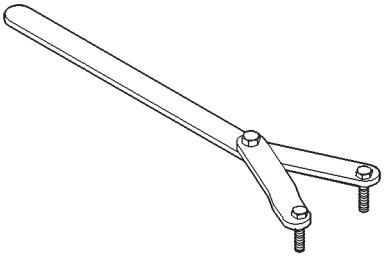
Cup—8109



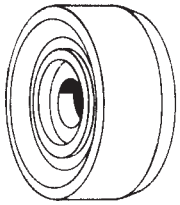
Installer—C-3972-A



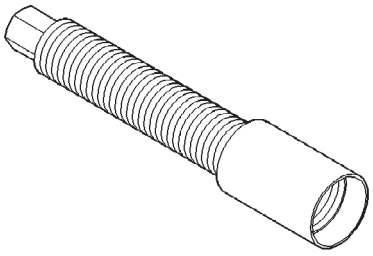
Handle—C-4171



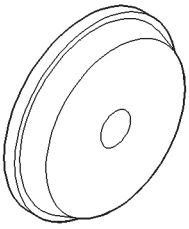
Spanner—6958



Driver—C-3716-A

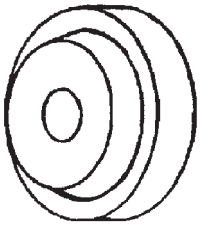


Installer Screw—8112

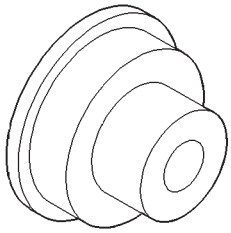


Installer—D-130

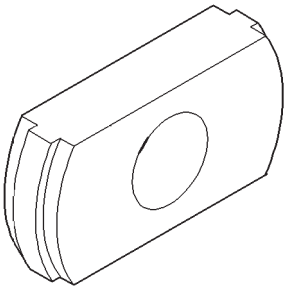
SPECIAL TOOLS (Continued)



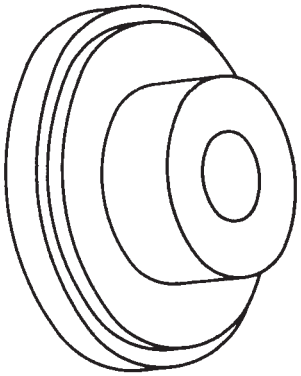
Installer—D-146



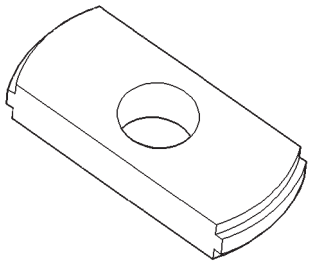
Installer—6436



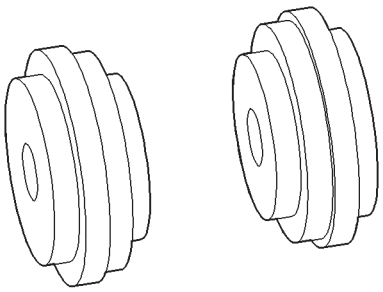
Remover—C-4345



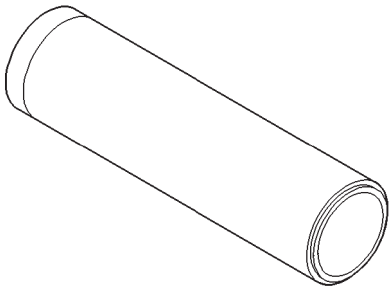
Installer—6437



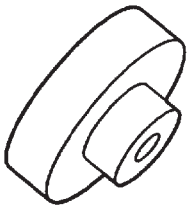
Remover—D-149



Disc, Axle Arbor—6732

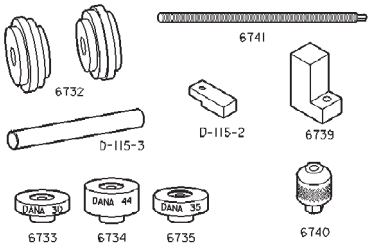


Installer—W-262

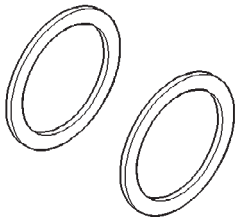


Gauge Block—6735

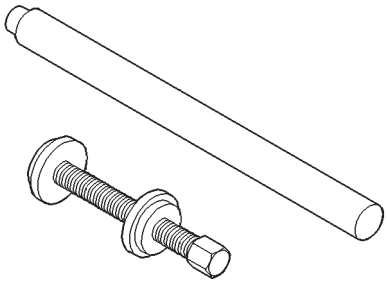
SPECIAL TOOLS (Continued)



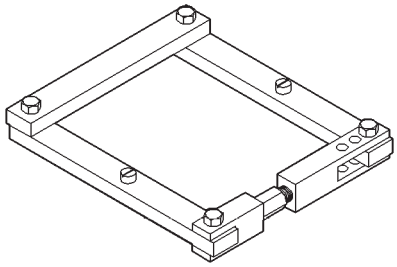
Tool Set, Pinion Depth—6774



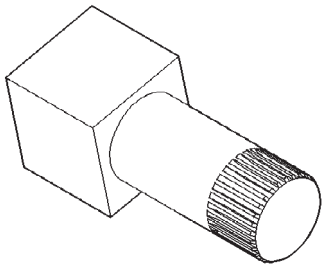
Starting Point Shim—8107



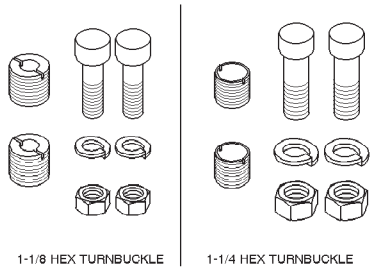
Trac-lok Tool Set—6960



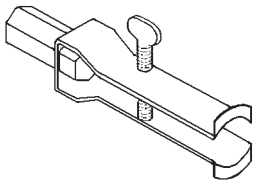
Spreader—W-129-B



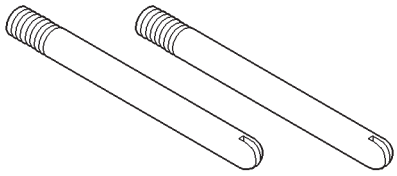
Holder—6965



Adapter Kit—6987

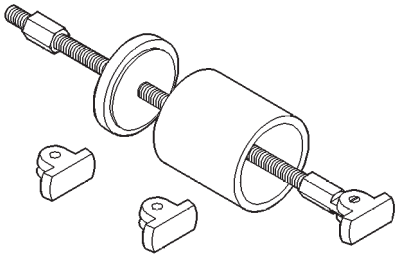


Puller—7794-A

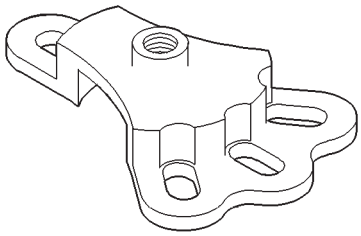


Guide Pin—C-3288-B

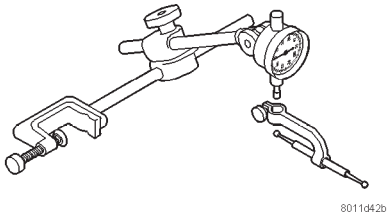
SPECIAL TOOLS (Continued)



Bearing Remover Tool Set—6310



Hub Puller—6790



Dial Indicator—C-3339

8 1/4 REAR AXLE

INDEX

GENERAL INFORMATION

8 1/4 AXLES

The 8 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.

The 8 1/4 axle have the assembly part number and gear ratio listed on tag. The tag is attached to the differential housing by a cover bolt.

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

Axles equipped with a Trac-Lok™ 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.

AXLE IDENTIFICATION

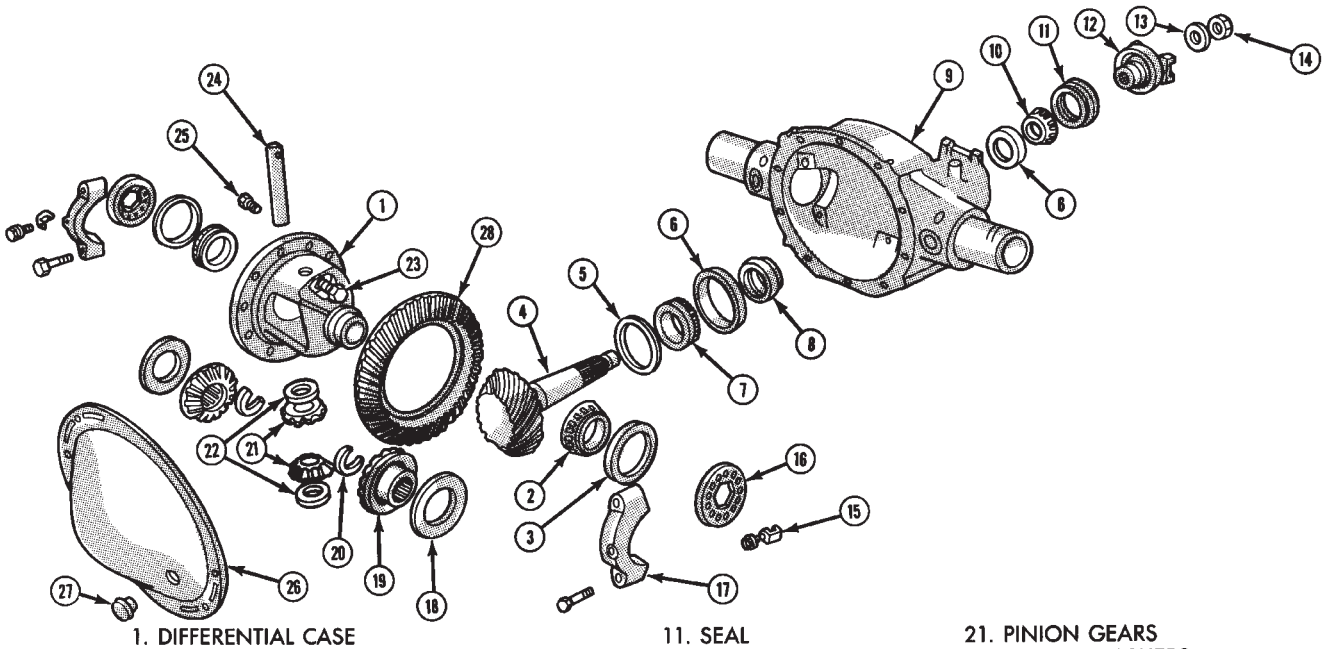
The axle differential cover can be used for identification of the axle (Fig. 2). A tag is also attached to the cover.

LUBRICANT SPECIFICATIONS

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 4 oz. of friction modifier to the axle lubricant after service. The 8 1/4 axle lubricant capacity is 2.08 L (4.4 pts.) total, including the friction modifier, if necessary.

GENERAL INFORMATION (Continued)



1. DIFFERENTIAL CASE
2. DIFFERENTIAL BEARING
3. BEARING CUP
4. PINION GEAR SHAFT
5. PINION GEAR DEPTH SHIMS
6. BEARING CUP
7. PINION GEAR SHAFT REAR BEARING
8. BEARING PRELOAD COLLAPSIBLE SPACER
9. DIFFERENTIAL HOUSING
10. PINION GEAR SHAFT FRONT BEARING
11. SEAL
12. YOKE
13. WASHER
14. NUT
15. LOCK
16. ADJUSTER
17. BEARING CAP
18. THRUST WASHER
19. SIDE GEAR
20. C-LOCK
21. PINION GEARS
22. THRUST WASHERS
23. SHAFT LOCK BOLT
24. MATE SHAFT
25. RING GEAR BOLT
26. COVER
27. PLUG
28. RING GEAR

J9203-14

Fig. 1 8 1/4 Axle

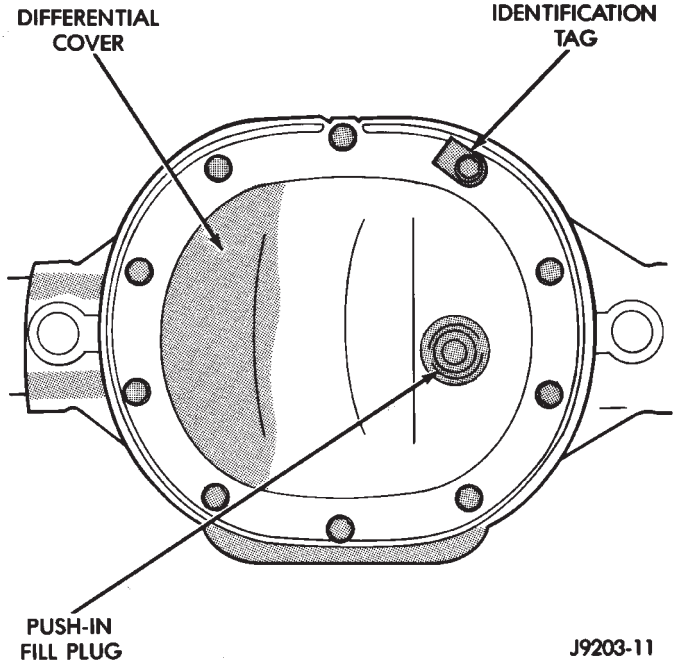


Fig. 2 Differential Cover 8 1/4 Inch Axle

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).

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

DESCRIPTION AND OPERATION (Continued)

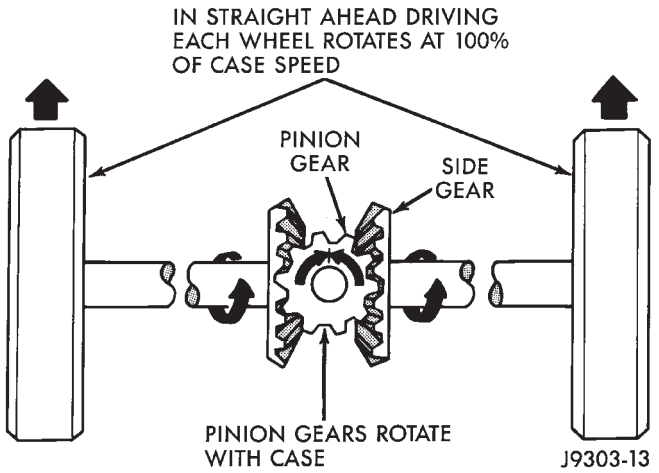


Fig. 3 Differential Operation—Straight Ahead Driving

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.

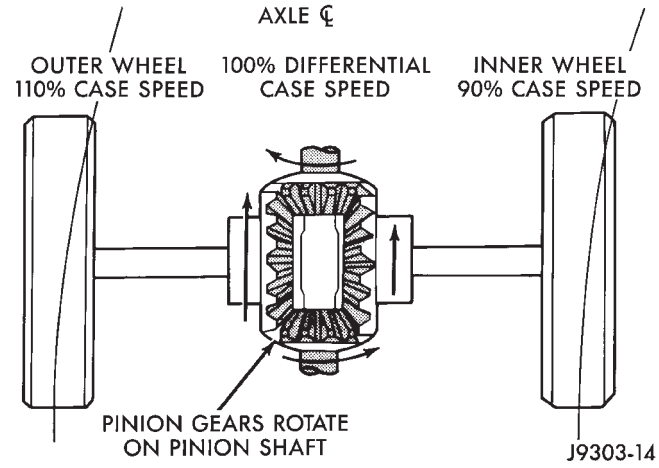


Fig. 4 Differential Operation—On Turns

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. 5).

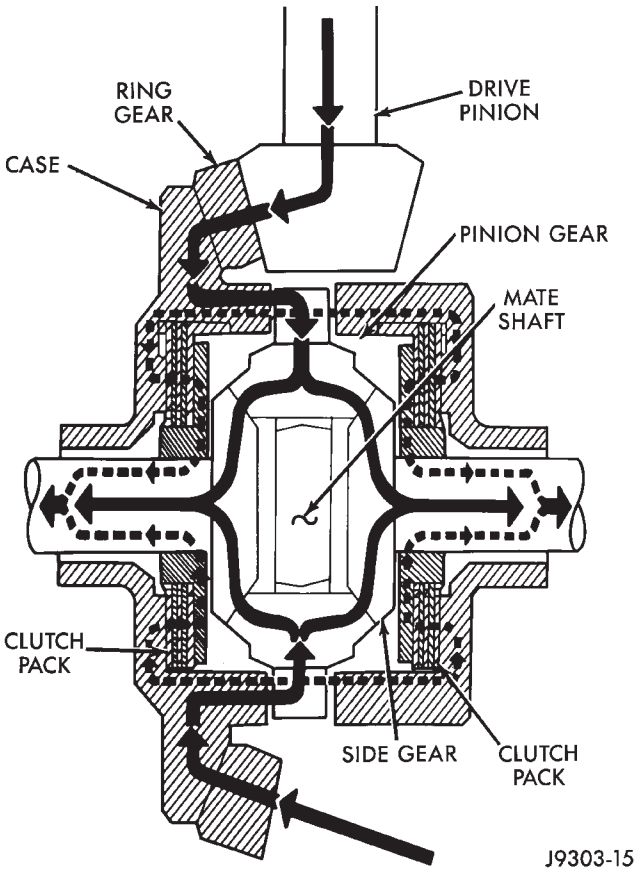


Fig. 5 Trac-lok™ Limited Slip Differential Operation

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 looses traction, the clutch packs transfer additional torque to the wheel having the most traction. Trac-lok™ differentials resist wheel spin on bumpy roads and provide more pulling power when one wheel looses traction. Pulling power is provided continuously until both wheels loose traction. If both wheels slip due to unequal traction, Trac-lok™ operation is normal. In extreme cases of differences of traction, the wheel with the least traction may spin.

DIAGNOSIS AND TESTING

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.

DIAGNOSIS AND TESTING (Continued)

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 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	1. Wheel loose. 2. Faulty, brinelled wheel bearing.	1. Tighten loose nuts. 2. Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	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.	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	1. Misaligned axle shaft tube. 2. Vehicle overloaded. 3. Erratic clutch operation. 4. Grabbing clutch.	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	1. Improper adjustment of differential bearings. 2. Excessive ring gear backlash. 3. Vehicle overloaded. 4. Erratic clutch operation.	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	1. Insufficient lubrication. 2. Improper grade of lubricant. 3. Excessive spinning of one wheel/tire.	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	1. Lubricant level too high.	1. Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

DIAGNOSIS AND TESTING (Continued)

DIAGNOSIS CHART – CONTINUED

CONDITION	POSSIBLE CAUSES	CORRECTION
LOSS OF LUBRICANT	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.	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	1. Lubricant level too low. 2. Incorrect grade of lubricant. 3. Bearings adjusted too tight. 4. Excessive gear wear. 5. Insufficient ring gear backlash.	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)	1. Overloading. 2. Erratic clutch operation. 3. Ice-spotted pavements. 4. Improper adjustments.	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	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	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).

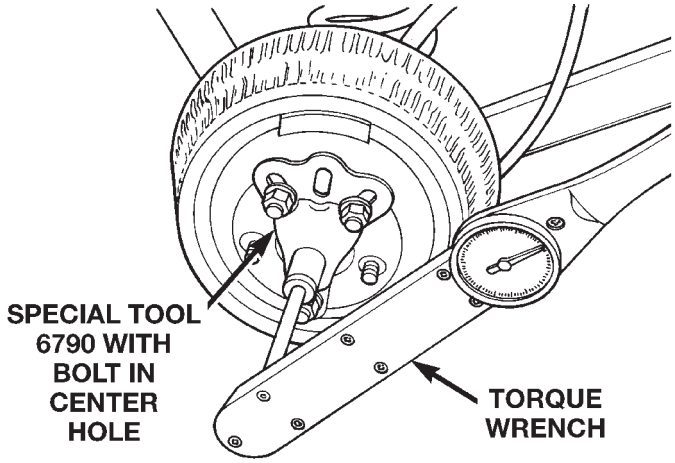


Fig. 6 Trac-lok™ Test —Typical

(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).

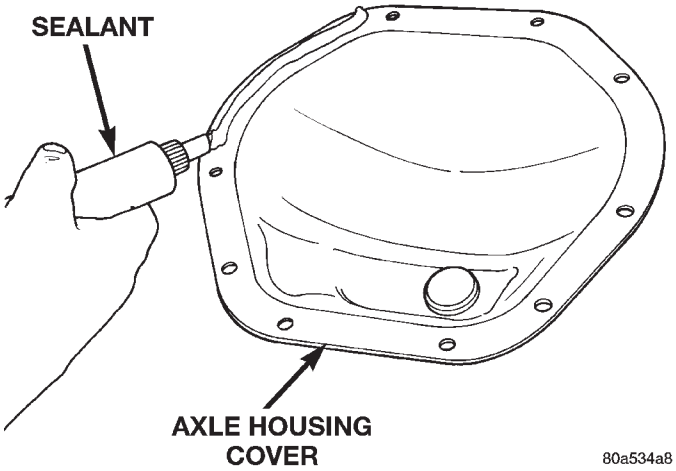


Fig. 7 Apply Sealant

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) 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.
(7) Disconnect the parking brake cables and cable brackets.
(8) Disconnect the vent hose from the axle shaft tube.
(9) Mark the propeller shaft and yoke for installation alignment reference.
(10) Remove propeller shaft.
(11) Disconnect shock absorbers from axle.
(12) Remove the stabilizer links.
(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 60 N·m (44 ft. lbs.) torque.
(4) Install the stabilizer links. Tighten sway bar links to 74 N·m (55 ft. lbs.).
(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).

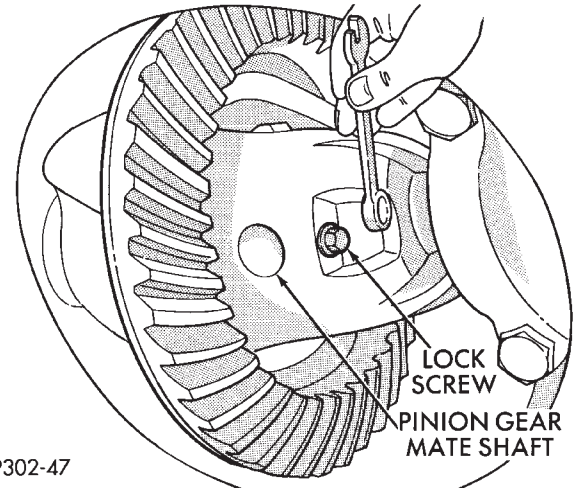


Fig. 8 Mate Shaft Lock Screw

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

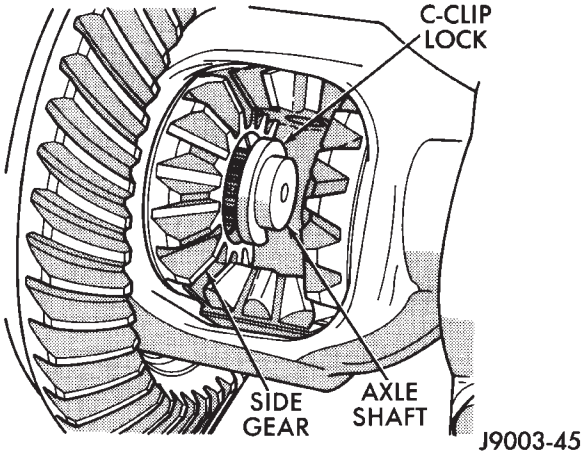


Fig. 9 Axle Shaft C–Clip Lock

(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.

REMOVAL AND INSTALLATION (Continued)

INSTALLATION

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

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

(2) Insert C–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.

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).

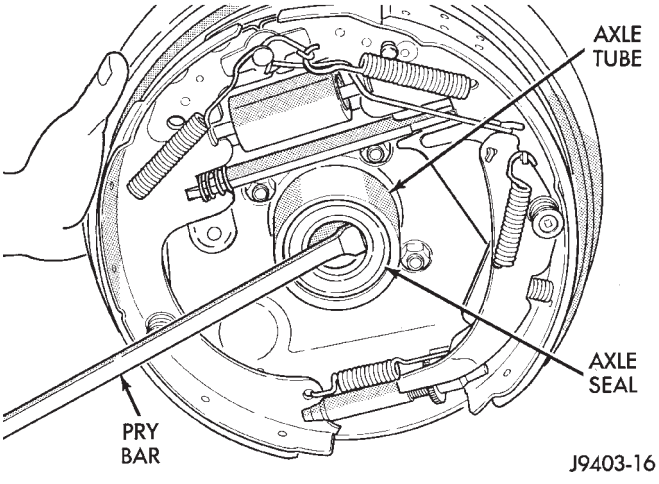


Fig. 10 Axle Seal Removal

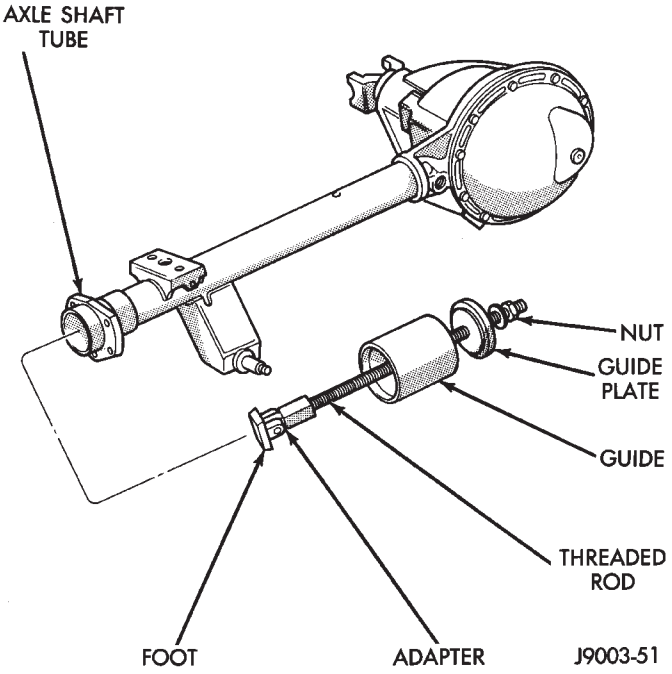


Fig. 11 Axle Shaft Bearing Removal Tool

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-4198 and Handle C-4171 (Fig. 12). Ensure that the bearing part number is against the installer. Verify that the bearing in 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.

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.

REMOVAL AND INSTALLATION (Continued)

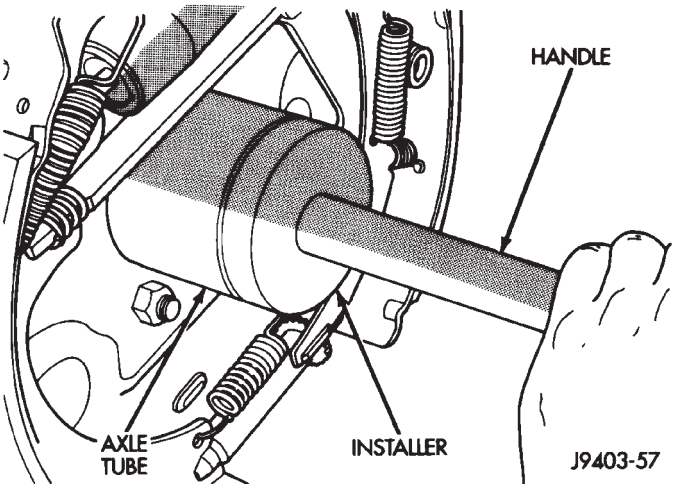


Fig. 12 Axle Shaft Seal and Bearing Installation

(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. 13).

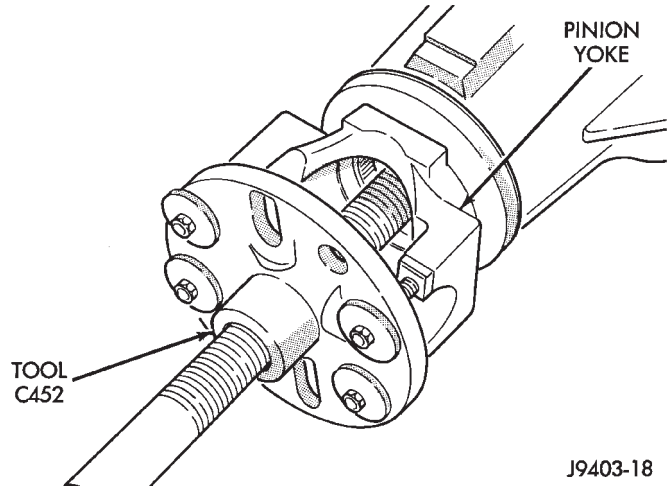


Fig. 13 Yoke Removal

(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-4076-B and Handle C-4735-1 (Fig. 14).

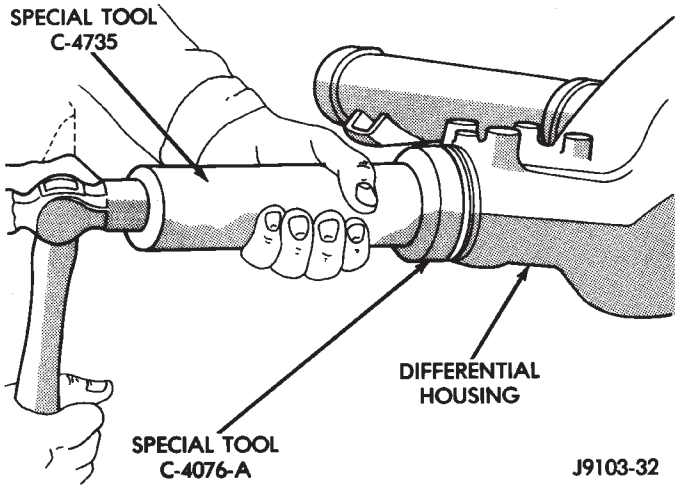


Fig. 14 8 1/4 Axle Pinion Seal Installation

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. 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. 15). Rotate pinion shaft several revolutions to ensure the bearing rollers are seated.

(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. 16).

REMOVAL AND INSTALLATION (Continued)

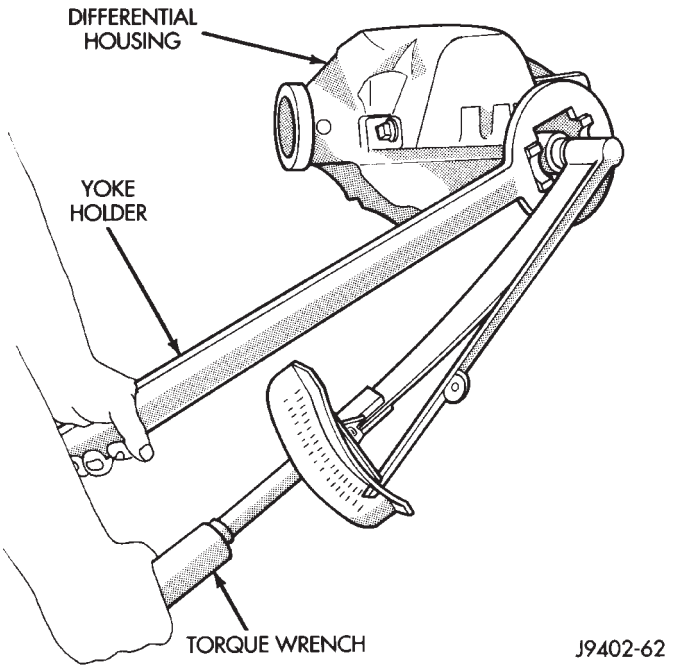


Fig. 15 Tightening Pinion Shaft Nut

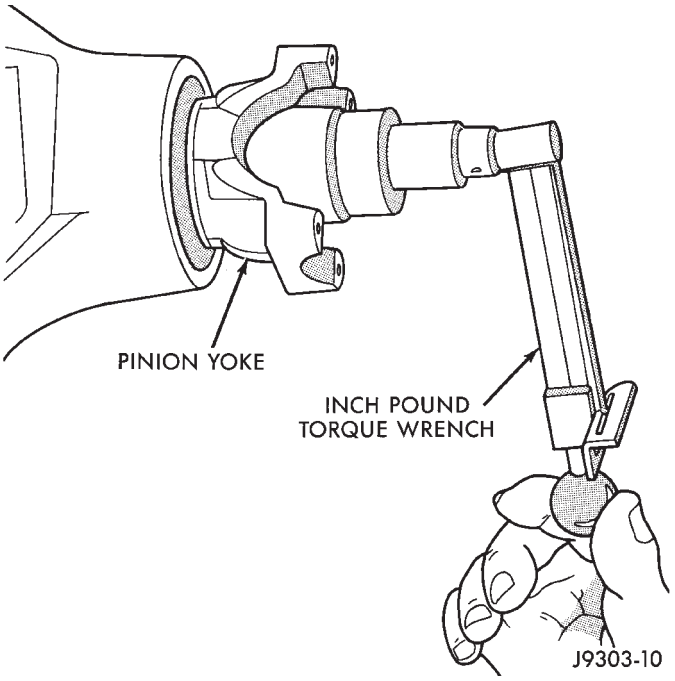


Fig. 16 Check Pinion Rotation Torque

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 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. 15) 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.

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

(2) Mark the differential housing and the differential bearing caps for installation reference (Fig. 17).

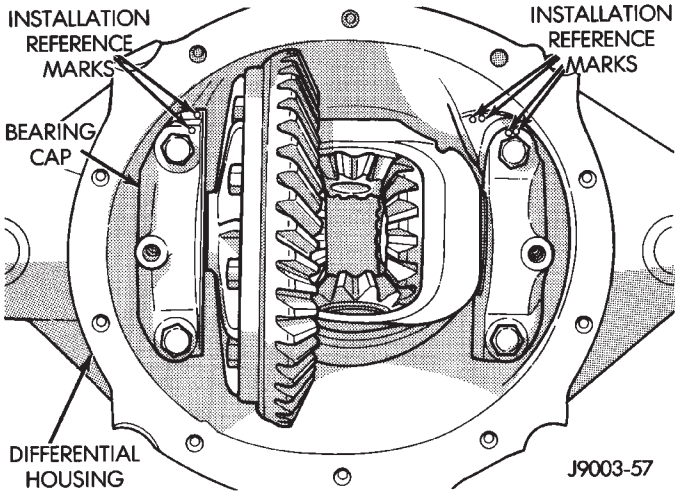


Fig. 17 Mark For Installation Reference

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

(4) Loosen the threaded adjusters with Wrench C-4164 (Fig. 18).

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

REMOVAL AND INSTALLATION (Continued)

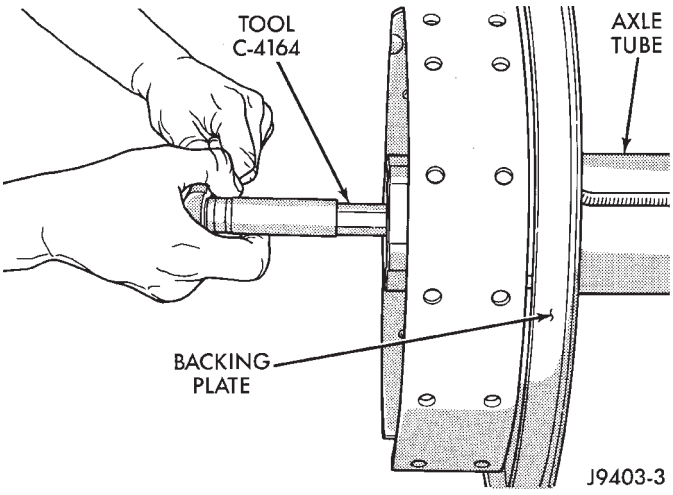


Fig. 18 Threaded Adjuster Tool

(6) 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. 19).

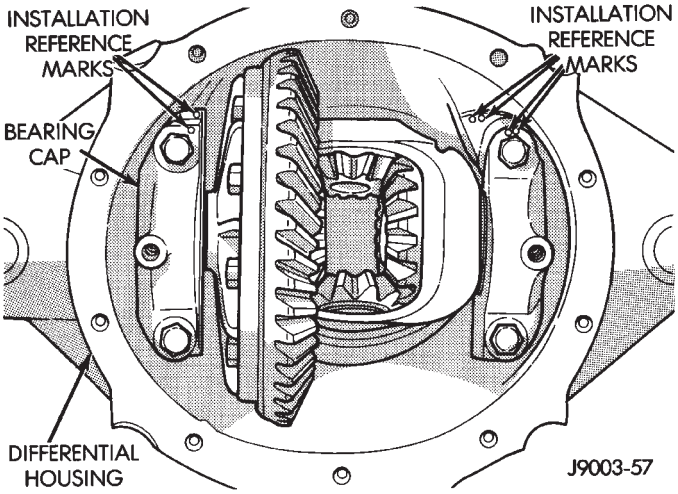


Fig. 19 Bearing Caps & Bolts

(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-293-48 and Plug SP-3289 (Fig. 20).

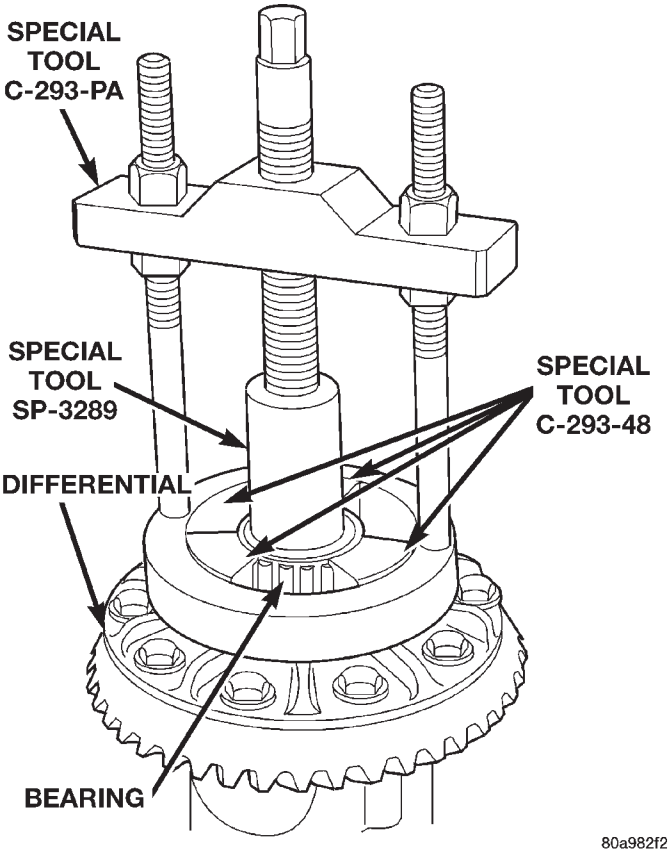


Fig. 20 Differential Bearing Removal

INSTALLATION

(1) Install differential side bearings. Use Installer C-4340 with handle C-4171 (Fig. 21).

(2) Install differential case in axle housing.

RING GEAR

The ring and pinion gears are serviced 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. 22).

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

(4) Using a soft hammer, drive ring gear from differential case (Fig. 22).

REMOVAL AND INSTALLATION (Continued)

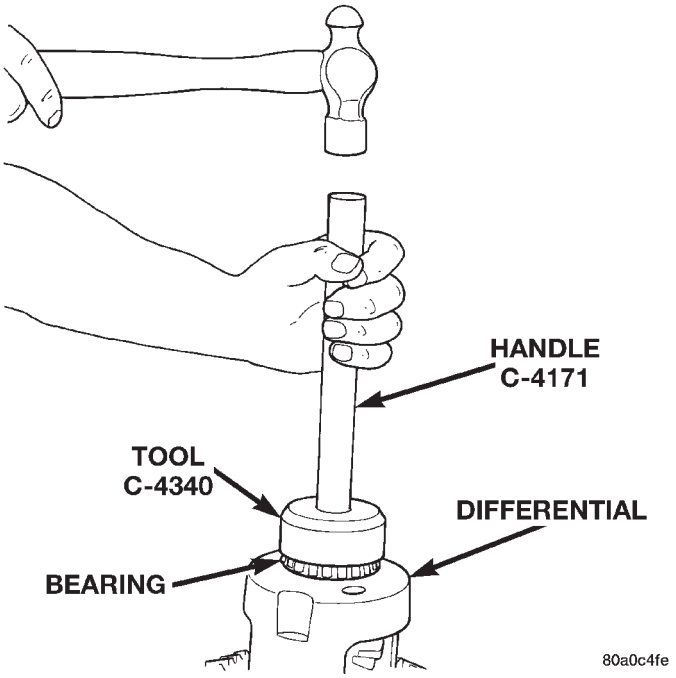


Fig. 21 Install Differential Side Bearings

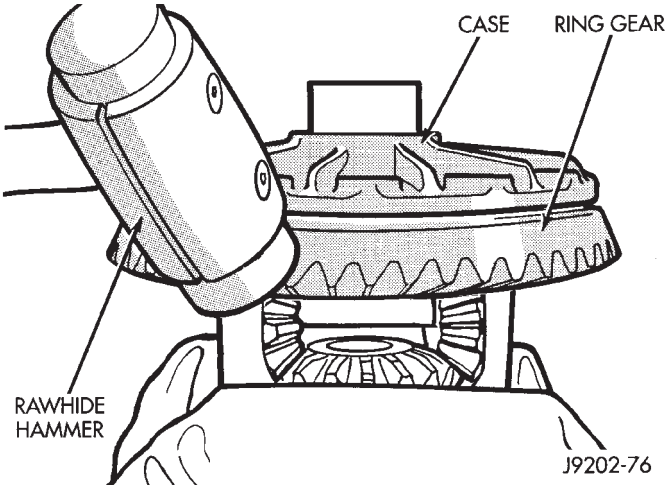


Fig. 22 Ring Gear Removal

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.

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

(3) Invert the differential case in the vise.

(4) Install new ring gear bolts and alternately tighten to 102 N·m (75 ft. lbs.) torque (Fig. 23).

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

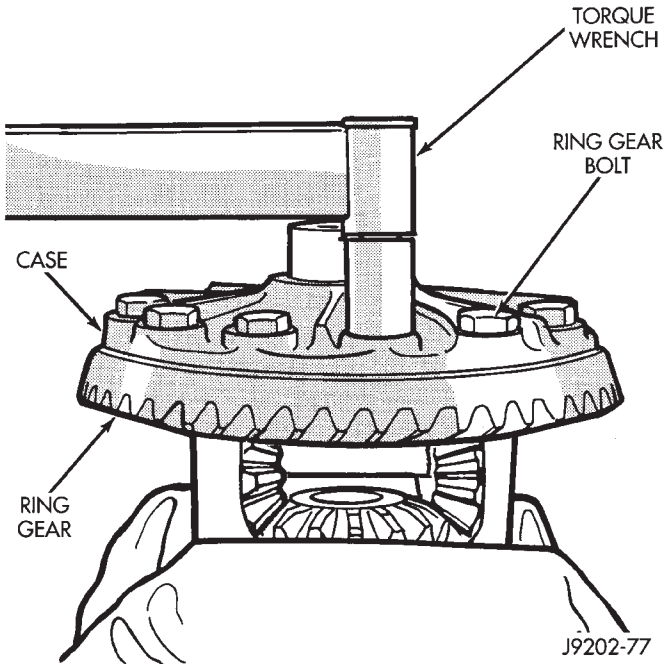


Fig. 23 Ring Gear Bolt Installation

PINION GEAR

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. 24).

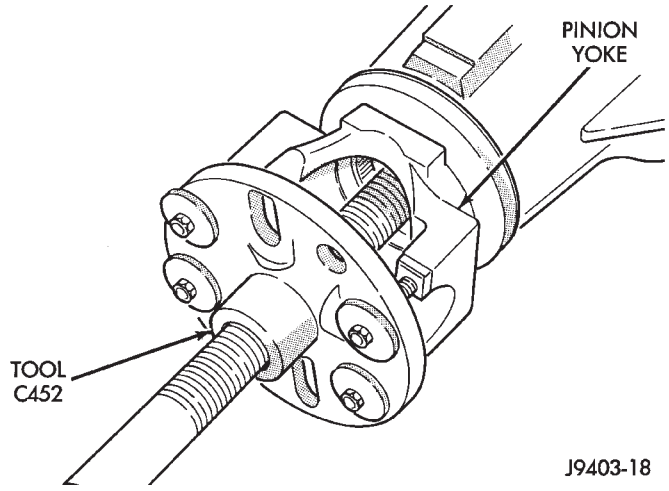


Fig. 24 Pinion Yoke Removal

REMOVAL AND INSTALLATION (Continued)

(6) Partially install pinion nut onto pinion to protect the threads.

(7) Remove the pinion gear from housing (Fig. 25). Catch the pinion with your hand to prevent it from falling and being damaged.

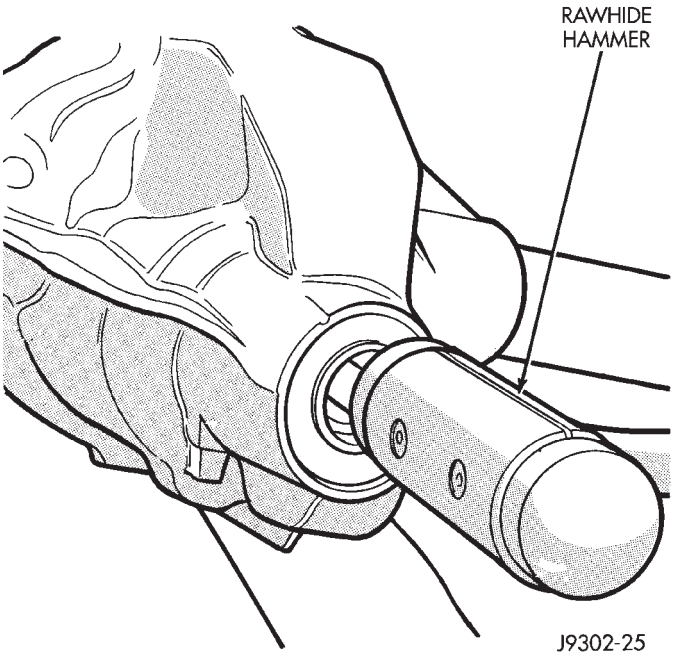


Fig. 25 Remove Pinion Gear

(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 Remover C-4345 and Handle C–4171 (Fig. 26).

(11) Remove the rear bearing cup from housing (Fig. 27). Use Remover C-4307 and Handle C–4171.

(12) Remove the collapsible preload spacer (Fig. 28).

(13) Remove the rear bearing from the pinion (Fig. 29) with Puller/Press C-293-PA and Adapters C-293-47.

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.

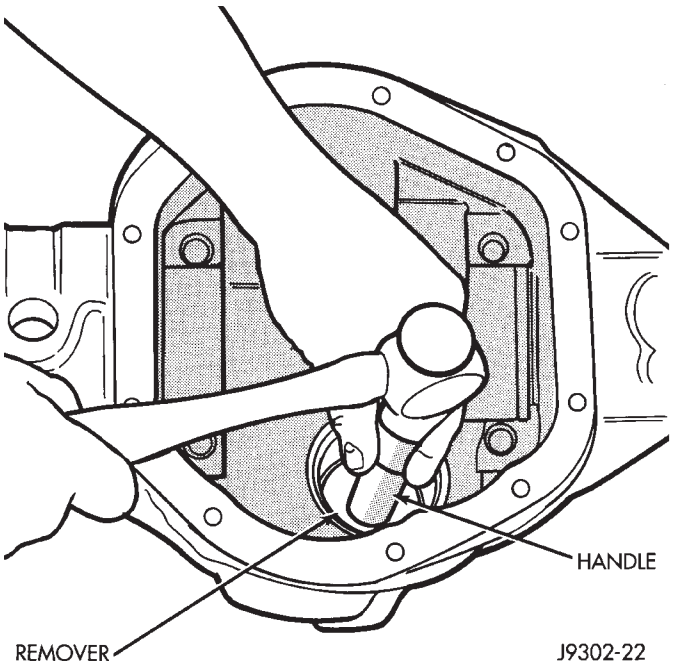


Fig. 26 Front Bearing Cup Removal

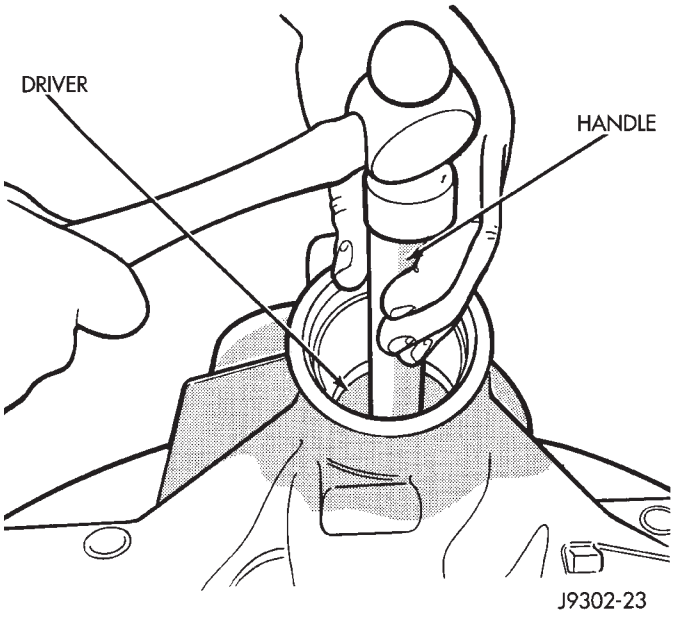


Fig. 27 Rear Bearing Cup Removal

REMOVAL AND INSTALLATION (Continued)

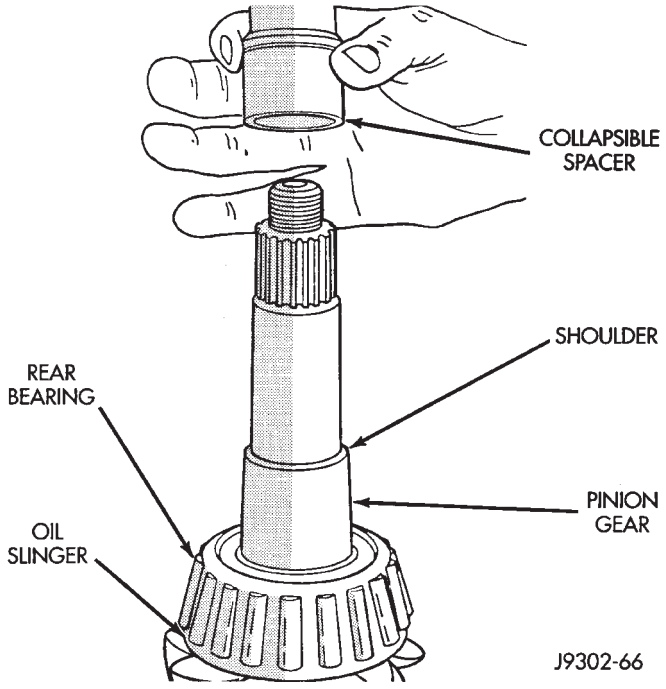


Fig. 28 Collapsible Spacer

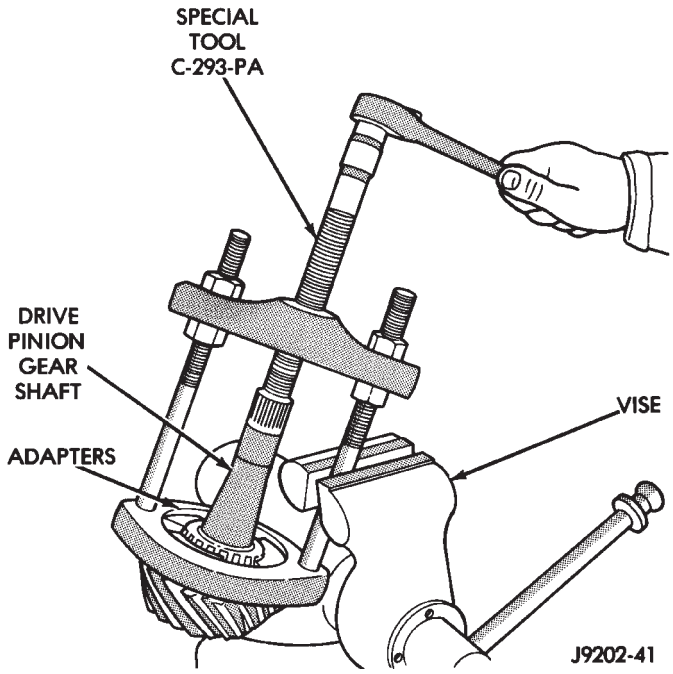


Fig. 29 Rear Bearing Removal

INSTALLATION

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

(2) Install the pinion rear bearing cup (Fig. 30) with Installer C-4308 and Driver Handle C–4171.

(2) Ensure cup is correctly seated.

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

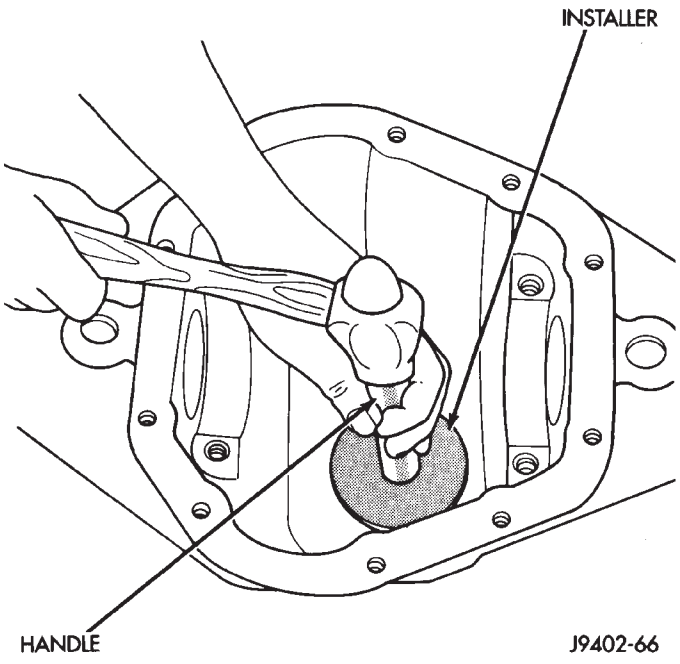


Fig. 30 Pinion Rear Bearing Cup Installation

(4) Install the pinion front bearing cup (Fig. 31) with Installer D–130 and Handle C–4171.

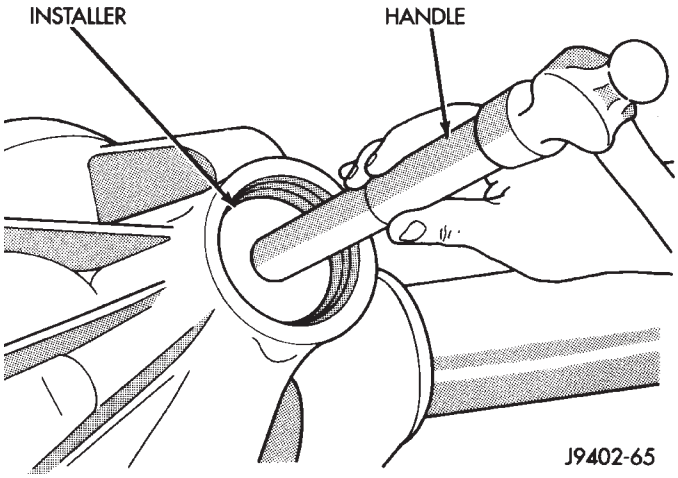


Fig. 31 Pinion Front Bearing Cup Installation

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

(6) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer C-4076–B and Handle C-4735-1 (Fig. 32).

REMOVAL AND INSTALLATION (Continued)

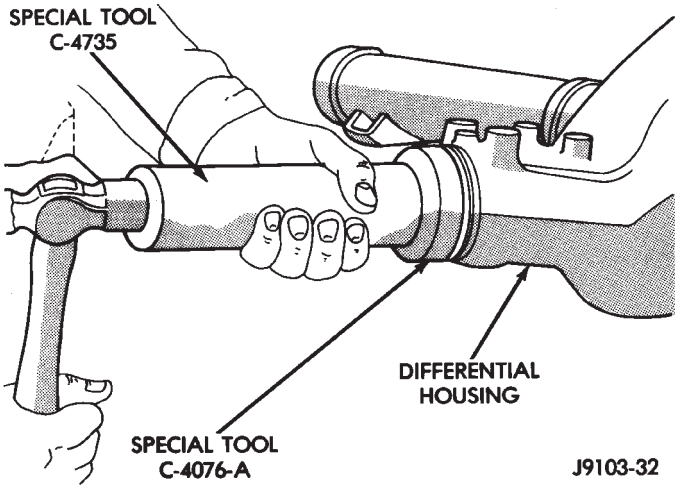


Fig. 32 Pinion Seal Installation

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. If required, refer to Pinion Gear Depth to select the proper thickness shim before installing rear pinion bearing.

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

(8) Install the rear bearing and slinger, if equipped, on the pinion gear (Fig. 33) with Installer 6448.

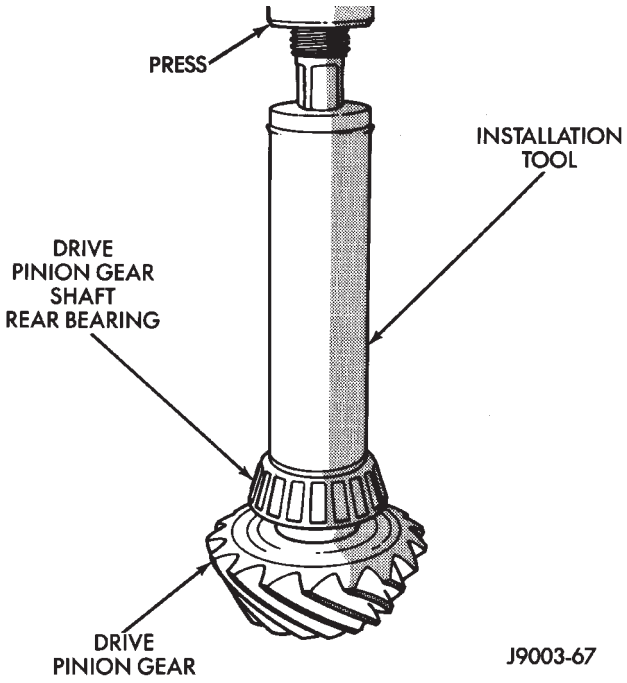


Fig. 33 Shaft Rear Bearing Installation

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

(10) Install pinion gear in housing.

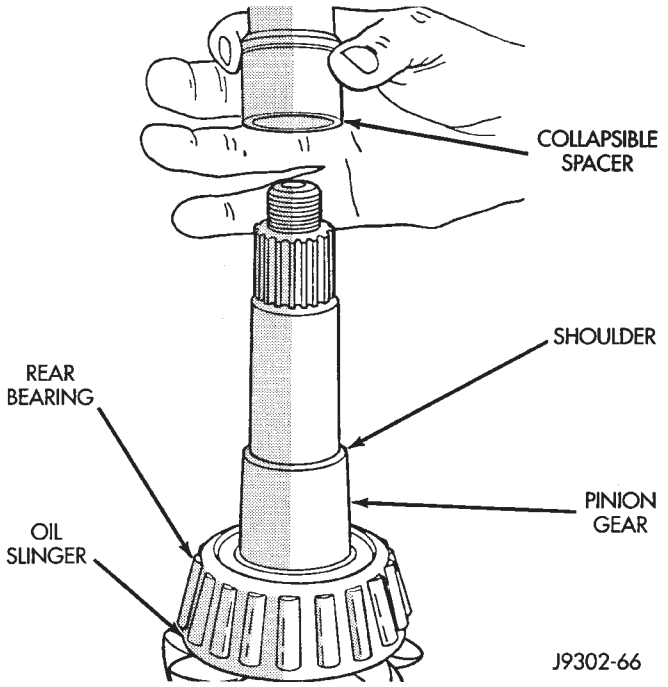


Fig. 34 Collapsible Preload Spacer

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

(12) 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.

(13) 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.

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

(15) 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).

(16) Check bearing rotating 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.).

REMOVAL AND INSTALLATION (Continued)

- New Bearings — 2 to 5 N·m (15 to 35 in. lbs.).

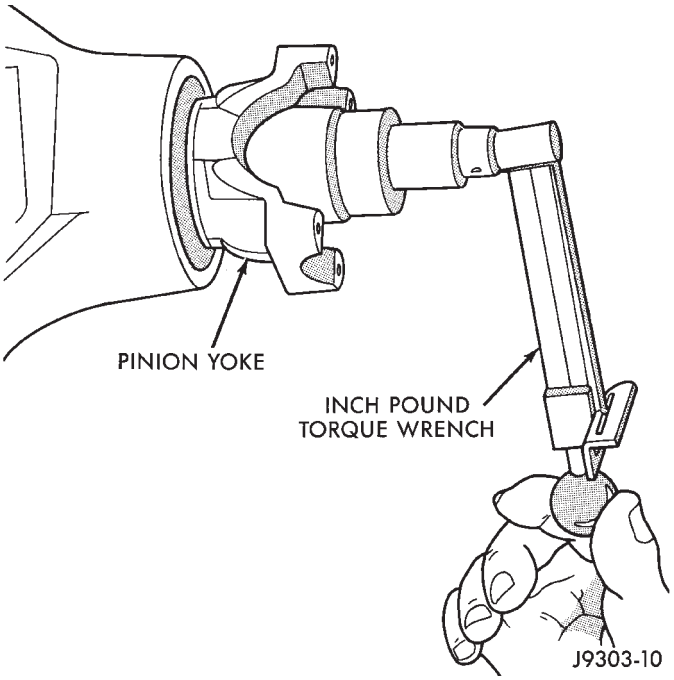


Fig. 35 Check Pinion Gear Rotating Torque

(17) Install propeller shaft.
(18) Install differential in housing.

DISASSEMBLY AND ASSEMBLY

STANDARD DIFFERENTIAL

DISASSEMBLY

(1) Remove pinion gear mate shaft lock screw (Fig. 36).
(2) Remove pinion gear mate shaft.
(3) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 37).

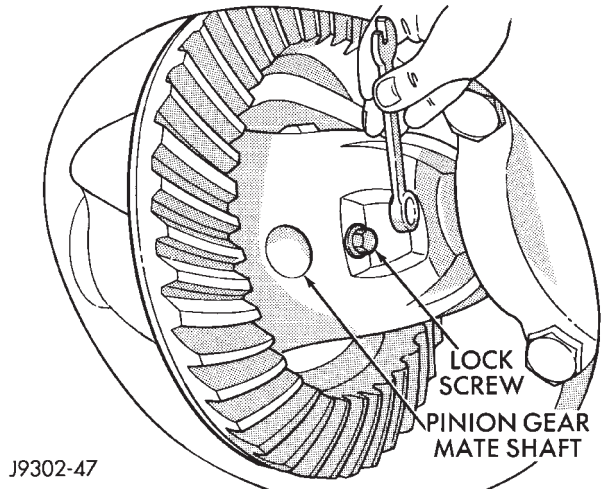


Fig. 36 Pinion Gear Mate Shaft Lock Screw

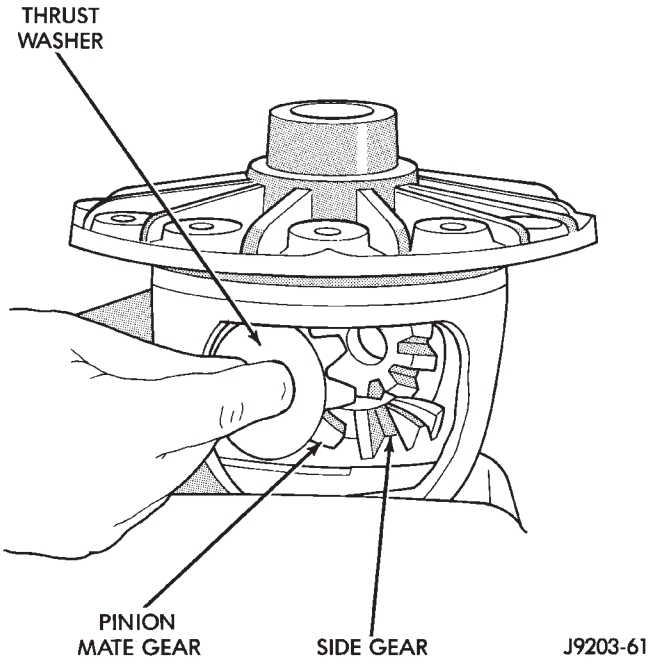


Fig. 37 Pinion Mate Gear Removal

(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.

TRAC-LOK DIFFERENTIAL

The Trac–lok differential components are illustrated in (Fig. 38). Refer to this illustration during repair service.

DISASSEMBLY

(1) Clamp Side Gear Holding Tool 8138 in a vise.
(2) Position the differential case on Side Gear Holding Tool 8138 (Fig. 39).
(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. 40).

DISASSEMBLY AND ASSEMBLY (Continued)

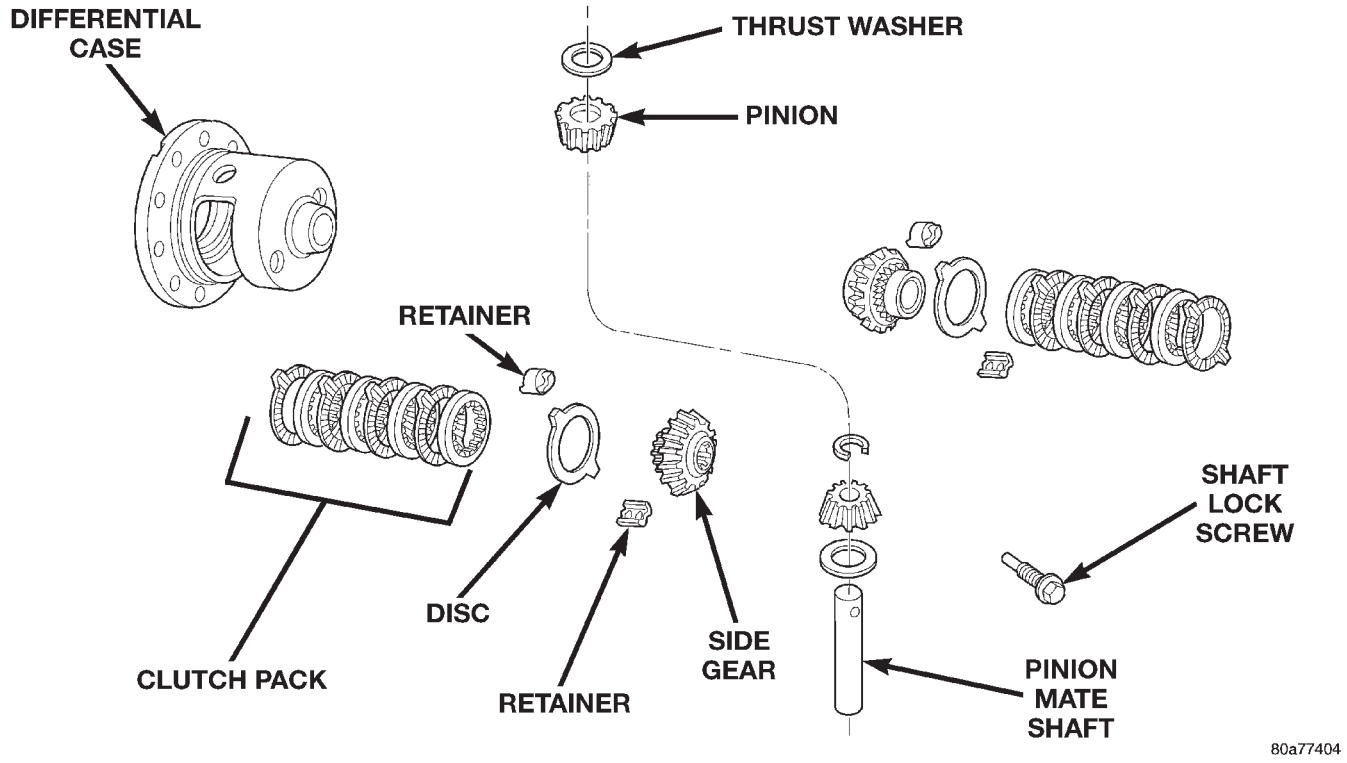


Fig. 38 Trac–lok Differential Components

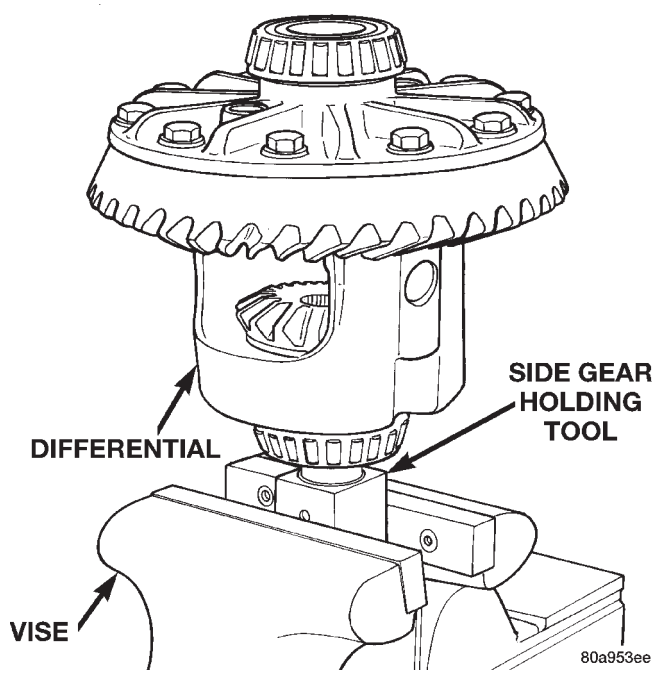


Fig. 39 Differential Case Holding Tool

(5) Remove the pinion gear mate shaft. If necessary, use a drift and hammer (Fig. 41).

(6) Install and lubricate Step Plate 8140–2 (Fig. 42).

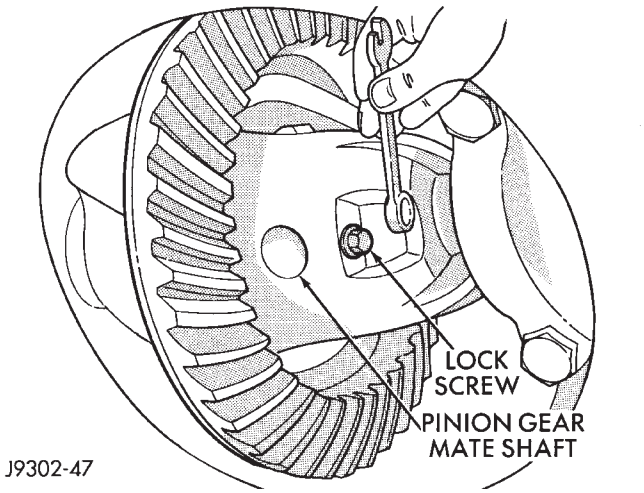


Fig. 40 Mate Shaft Lock Screw

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

(8) Position a small screw driver in slot of Threaded Adapter 8140-1 (Fig. 43) to prevent adapter from turning.

(9) Tighten forcing screw tool 122 N·m (90 ft. lbs.) maximum to compress Belleville springs in clutch packs (Fig. 44).

DISASSEMBLY AND ASSEMBLY (Continued)

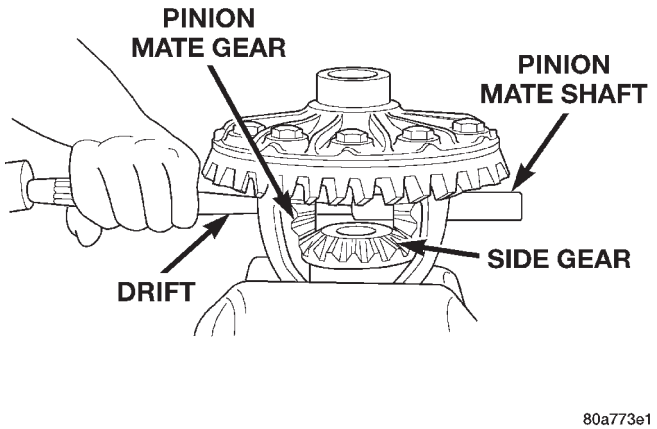


Fig. 41 Mate Shaft Removal

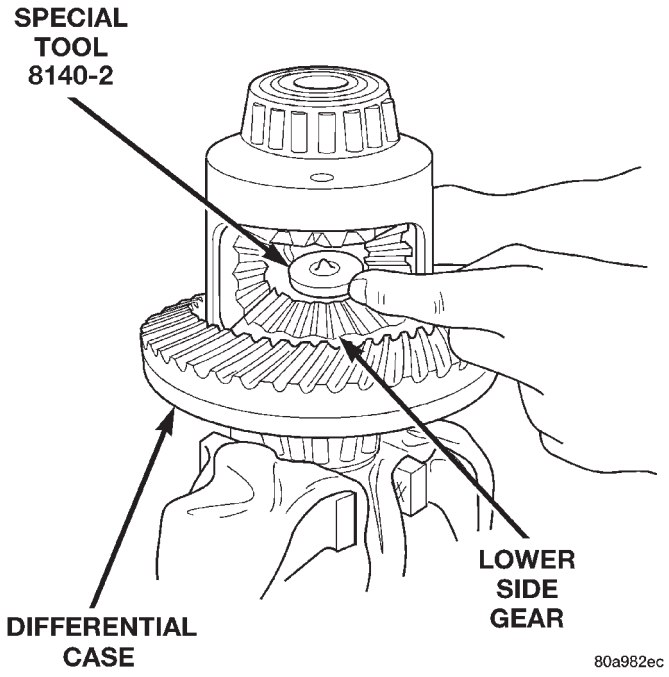


Fig. 42 Step Plate Tool Installation

(10) Using an appropriate size feeler gauge, remove thrust washers from behind the pinion gears (Fig. 45).

(11) Insert Turning Bar 6960-2 in case (Fig. 46).

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

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

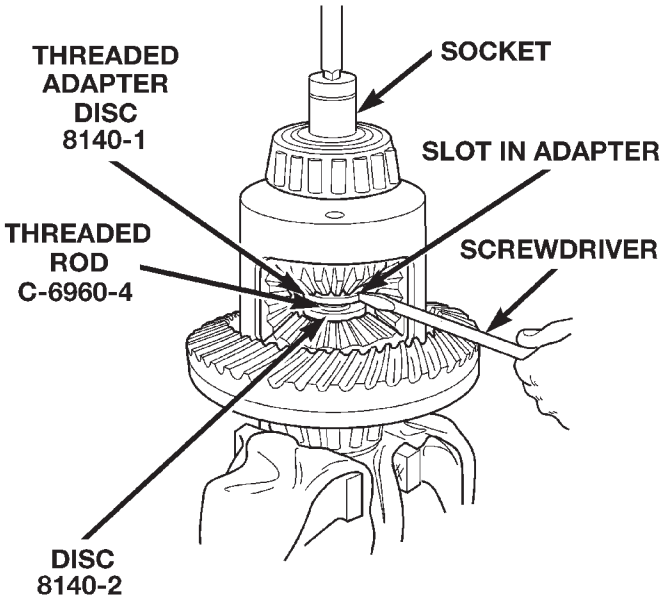


Fig. 43 Threaded Adapter Installation

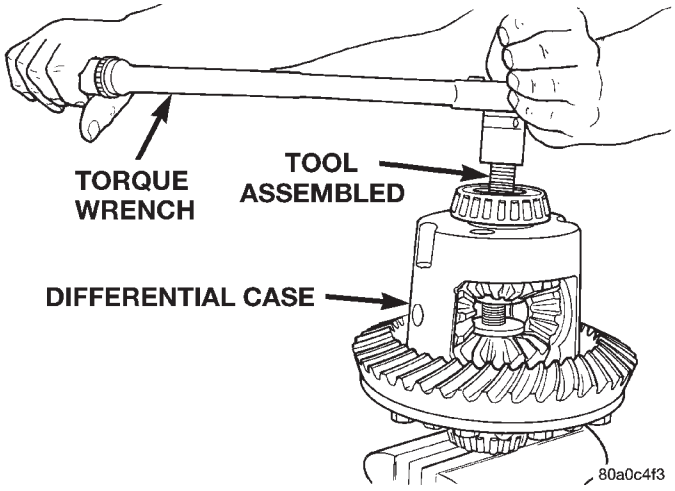


Fig. 44 Tighten Belleville Spring Compressor Tool

(14) Remove pinion gears from differential case.

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

(16) Remove top side gear, clutch pack retainer, and clutch pack. Keep plates in correct order during removal (Fig. 47).

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

DISASSEMBLY AND ASSEMBLY (Continued)

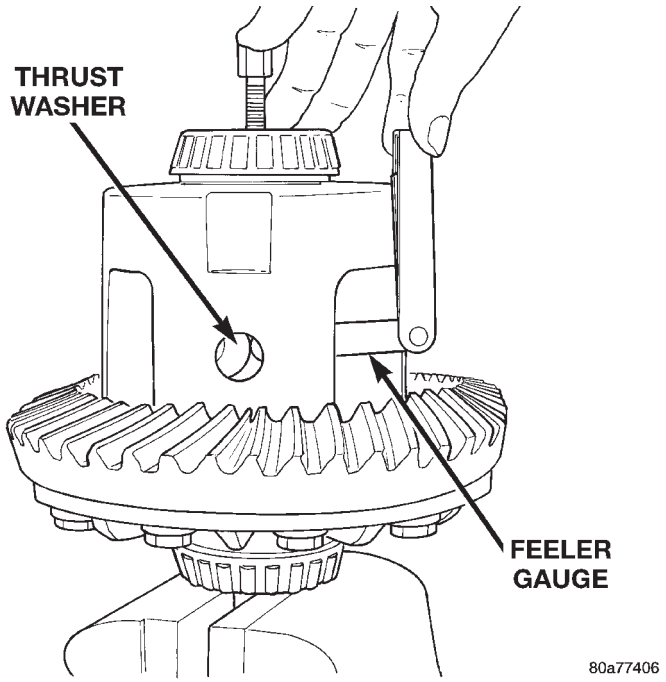


Fig. 45 Remove Pinion Gear Thrust Washer

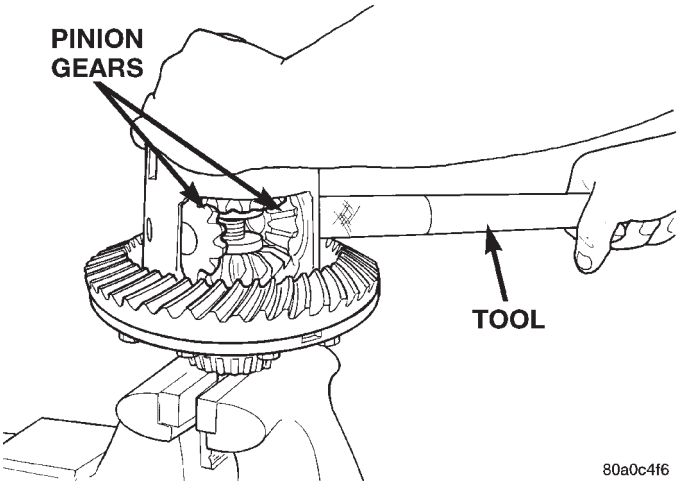


Fig. 46 Pinion Gear Removal

ASSEMBLY

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

Lubricate each component with gear lubricant before assembly.

(1) Assemble the clutch discs into packs and secure disc packs with retaining clips (Fig. 48).

(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. 49). **Be sure clutch pack retaining clips remain in position and are seated in the case pockets.**

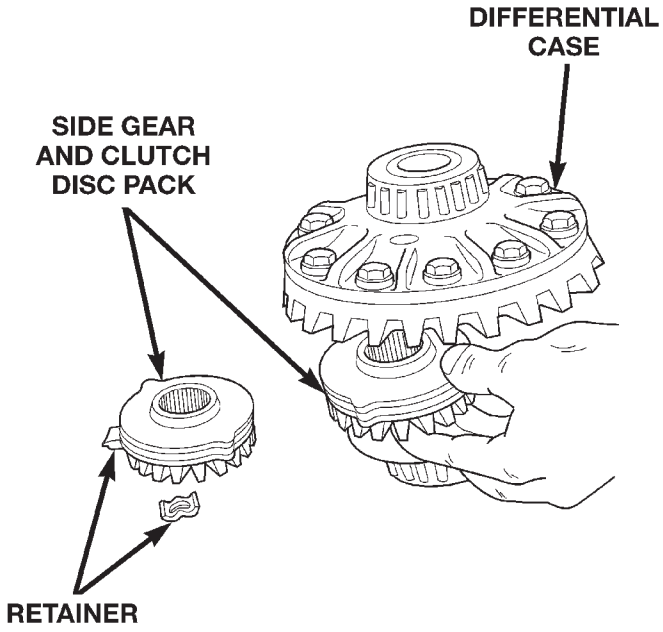


Fig. 47 Side Gear & Clutch Disc Removal

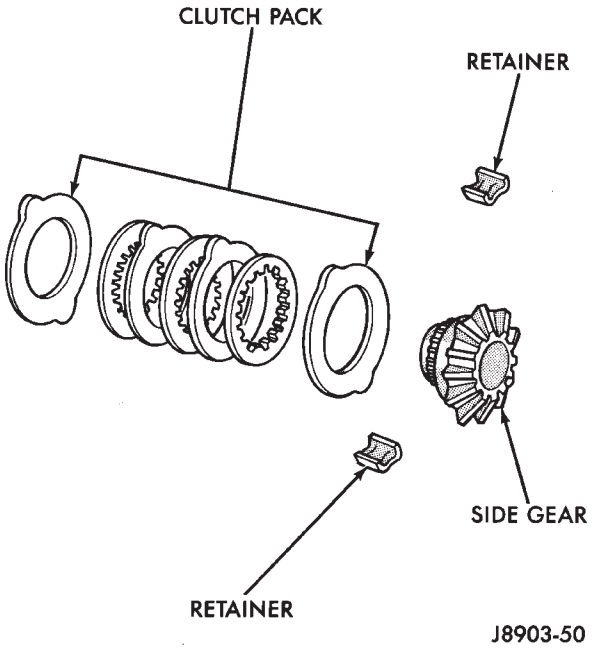


Fig. 48 Clutch Disc Pack

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

(5) Install lubricated Step Plate 8140–2 in lower side gear (Fig. 50).

(6) Install the upper side gear and clutch disc pack (Fig. 50).

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

(8) Insert Forcing Screw 6960-4.

DISASSEMBLY AND ASSEMBLY (Continued)

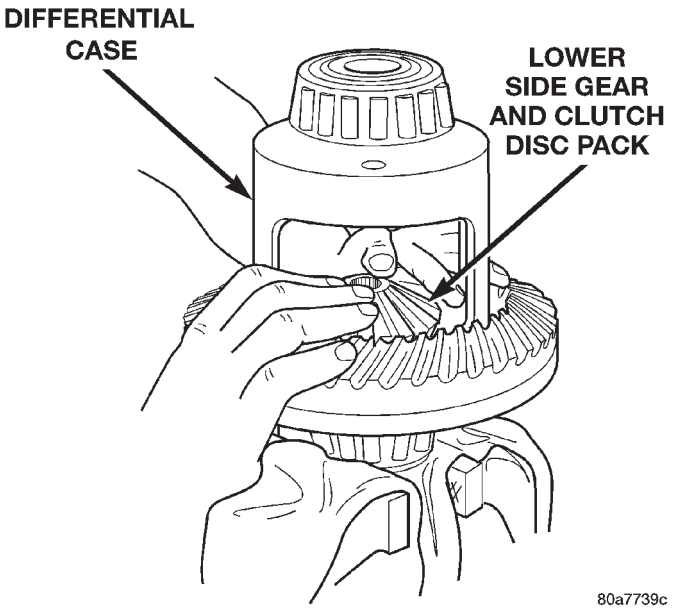


Fig. 49 Clutch Discs & Lower Side Gear Installation

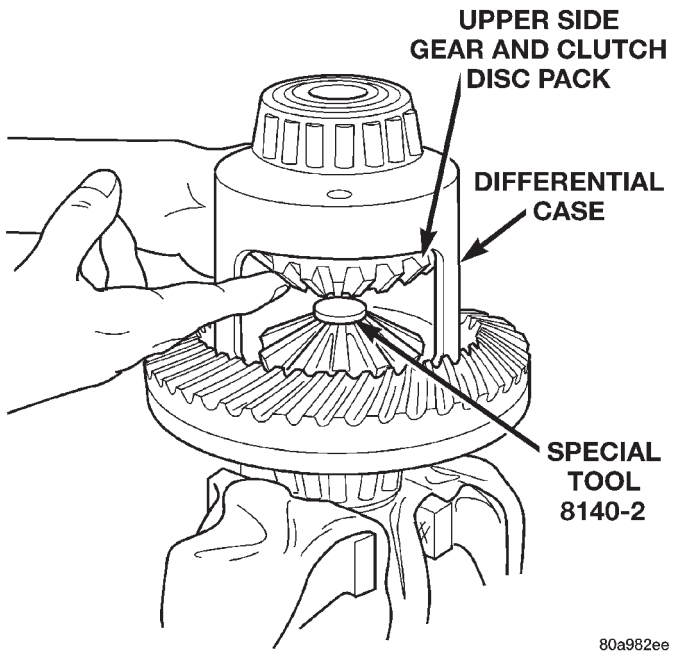


Fig. 50 Upper Side Gear & Clutch Disc Pack Installation

(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 6960-2 until the pinion mate shaft holes in pinion gears align with holes in case. It may be necessary to slightly tighten the forcing screw in order to install the pinion gears.

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

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

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

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

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

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

CLEANING AND INSPECTION

8 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.

Polish each axle shaft sealing surface with No. 600 crocus cloth. This can remove slight surface damage.

CLEANING AND INSPECTION (Continued)

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

8 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. 51). 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.

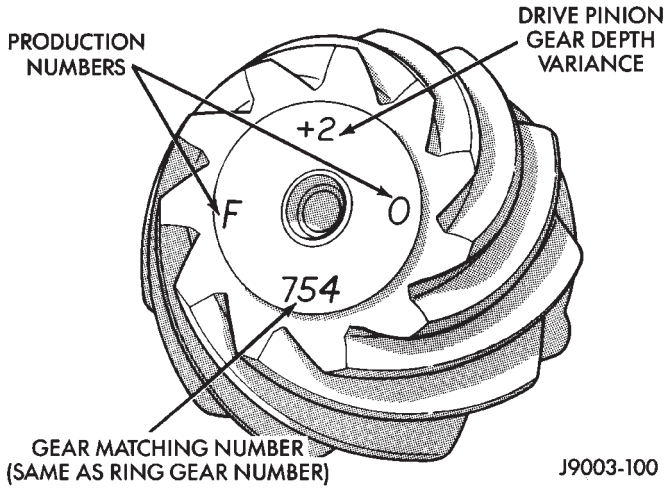


Fig. 51 Pinion Gear ID Numbers

Compensation for pinion depth variance is achieved with select shims. The shims are placed under the rear pinion bearing cone (Fig. 52).

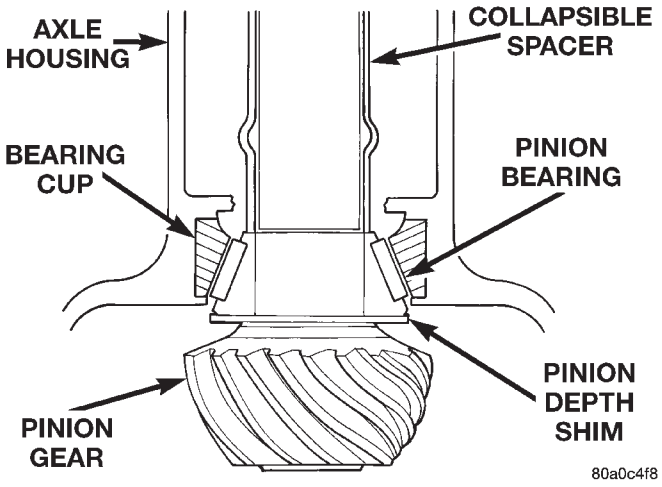


Fig. 52 Shim Locations

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.

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 pinion bearing cup. Use Installer D-130 and Handle C-4171.

(2) Install rear pinion bearing cup. Use Installer C-4308 and Handle C-4171.

(3) Use Pinion Gear Adjustment Gauge Set C-3715-B (Fig. 53).

(4) Position Spacer SP-6030 over Shaft SP-5385.

(5) Position pinion rear bearing on shaft.

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

(7) Install Sleeve SP-5382.

(8) Install pinion front bearing.

(9) Install Spacer SP-6022.

(10) Install Sleeve SP-3194-B, Washer SP-534, and Nut SP-3193.

(11) Tighten the nut to seat the pinion bearings in the housing. Allow the sleeve to turn several times

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

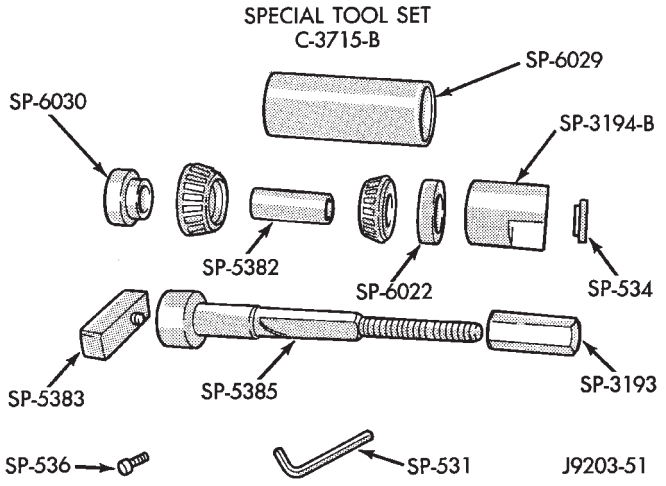


Fig. 53 8 1/4 Axle Pinion Adjustment Tools

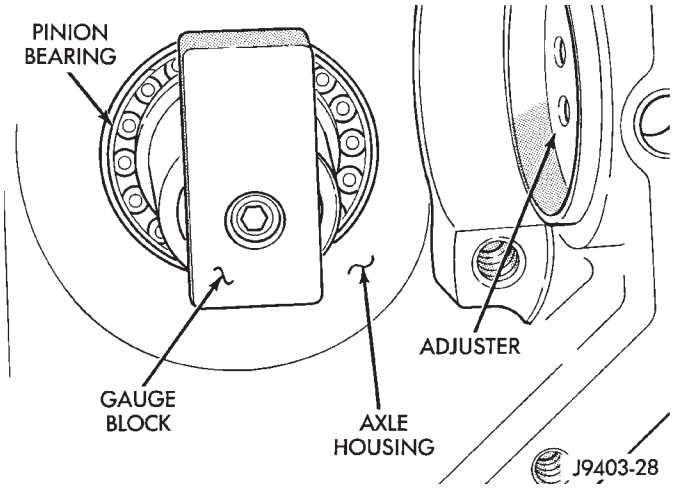


Fig. 54 Gauge Block

during tightening to prevent brinelling bearing cups or bearings.

(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. 54).

(17) Install Gauge Block SP-5383 at the end of SP-5385.

(18) Install Cap Screw SP-536 and tighten with Wrench SP-531.

(19) Position Crossbore Arbor SP-6029 in the differential housing (Fig. 55).

(20) Center the arbor 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. 56). **The depth shim(s) fit must be snug but not tight (drag friction of a feeler gauge blade).**

(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. 51) using the opposite sign on the variance number. For exam-

ADJUSTMENTS (Continued)

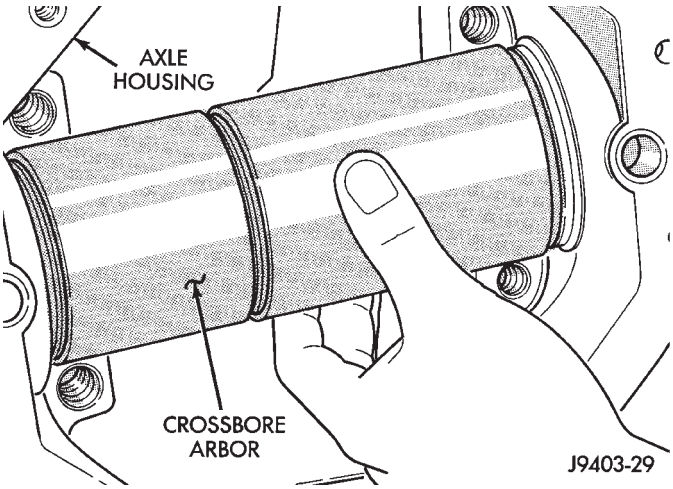


Fig. 55 Crossbore Arbor

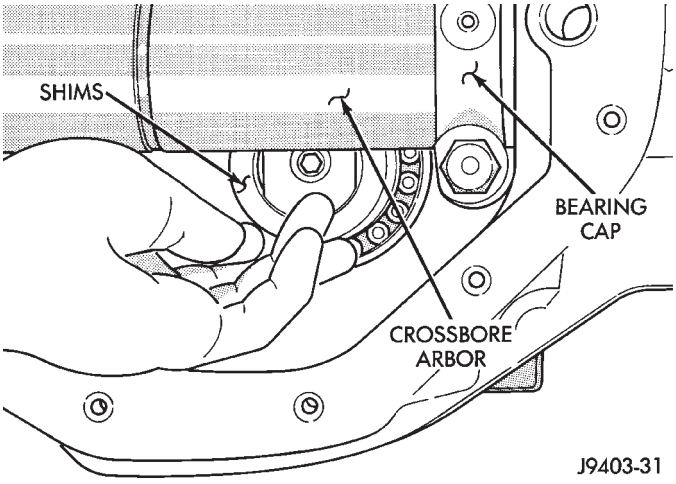


Fig. 56 Depth Shim(s) Selection

ple, 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.**

(1) Use Wrench C-4164 to adjust each threaded adjuster inward until the differential bearing free-play is eliminated (Fig. 57). 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.

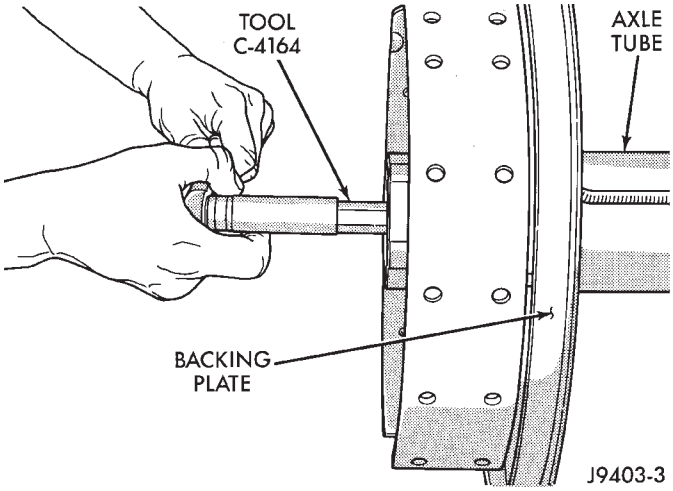


Fig. 57 Threaded Adjuster Tool

(2) Install dial indicator and position the plunger against the drive side of a ring gear tooth (Fig. 58). 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.

(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 95 N·m (70 ft. lbs.).

ADJUSTMENTS (Continued)

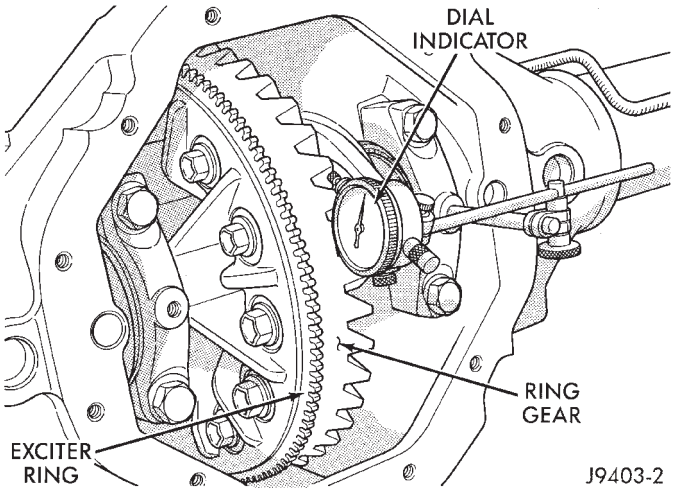


Fig. 58 Ring Gear Backlash Measurement

(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. 59) and adjust pinion depth and gear backlash as necessary.

SIDE GEAR CLEARANCE

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

(1) Install the axle shafts and C-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. 60).

(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. 61).

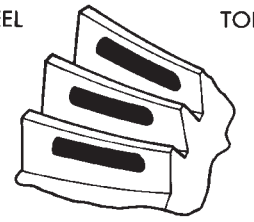
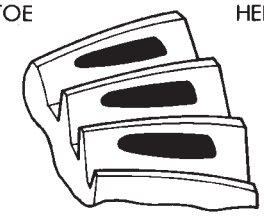
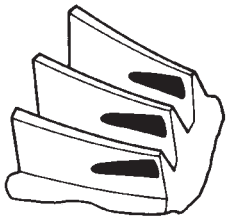
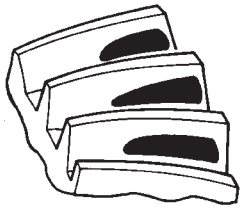
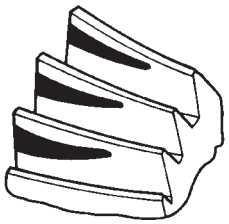
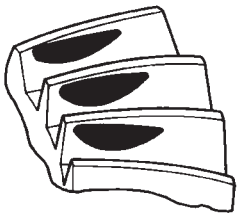
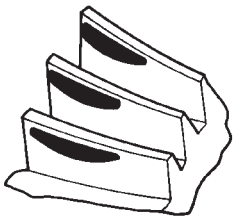
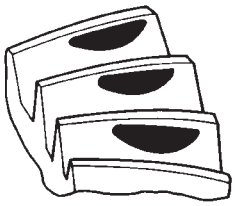
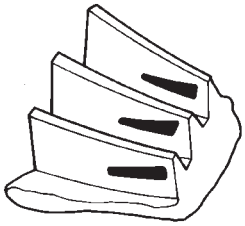
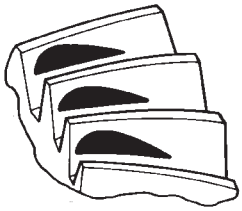
In some cases, the end of the axle shaft will move and contact the mate shaft when the feeler gauge is inserted. The C-clip lock is preventing the side gear from sliding on the axle shaft.

(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.

ADJUSTMENTS (Continued)

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

J9003-24

Fig. 59 Gear Tooth Contact Patterns

ADJUSTMENTS (Continued)

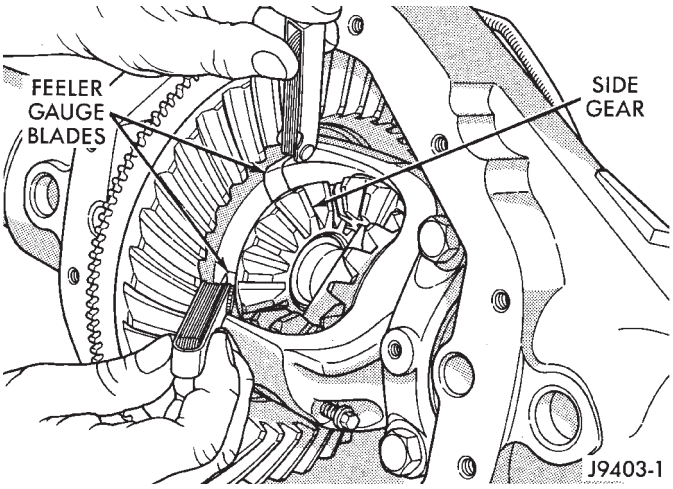


Fig. 60 Side Gear Clearance Measurement

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. 61 Side Gear Calculations

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

SPECIFICATIONS

8 1/4 INCH AXLE

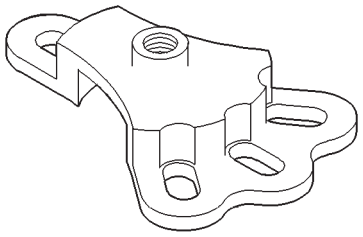
Axle Type	Semi-floating, hypoid
Lubricant	SAE 80W-90
Lube Capacity	2.08 L (4.4 pts.)
Trac-Lok Additive	118 ml (4 oz.)
Axle Ratio	3.07, 3.55, .4.10
Differential	
Case Clearance	0.12 mm (0.005 in.)
Case Flange Runout	0.076 mm (0.003 in.)
Ring Gear	
Diameter	20.95 cm (8.25 in.)
Backlash	0.12-0.20 mm (0.005-0.008 in.)
Runout	0.127 mm (0.005 in.)
Pinion Bearing	
Preload	1-2 N·m (10-20 in.lbs.)

TORQUE – 8 1/4 INCH AXLE

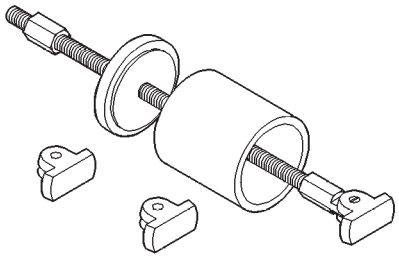
DESCRIPTION	TORQUE
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	136 N·m (100 ft. lbs.)
Pinion Nut–Minimum	285 N·m (210 ft. lbs.)
Ring Gear Bolt	95 N·m (70 ft. lbs.)
Backing Plate Bolt	64 N·m (48 ft. lbs.)
RWAL/ABS Sensor Bolt	24 N·m (18. ft. lbs.)

SPECIAL TOOLS

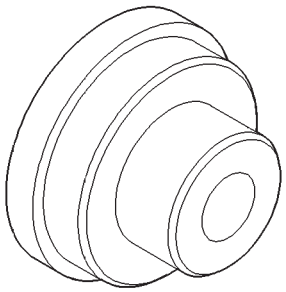
8 1/4 AXLES



Puller, Hub—6790

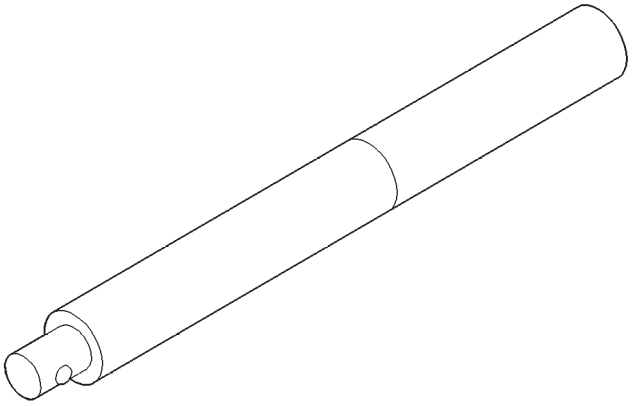


Remover, Bearing—6310

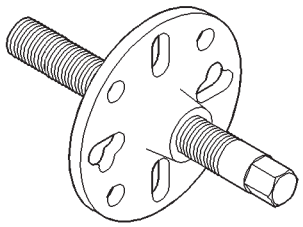


Installer—C-4198

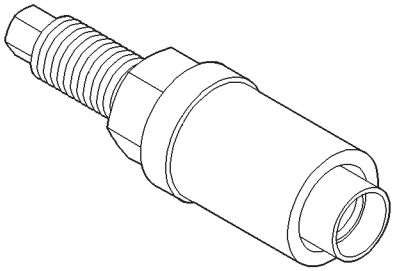
SPECIAL TOOLS (Continued)



Handle—C-4171



Puller—C-452



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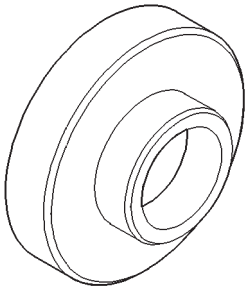
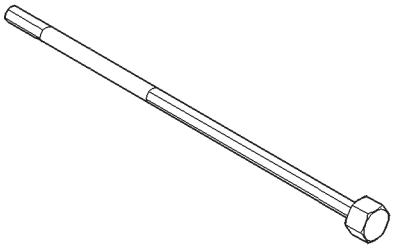
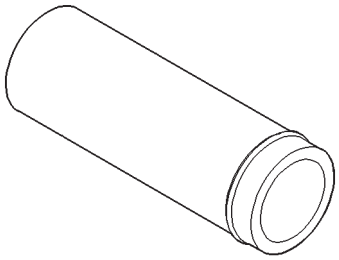


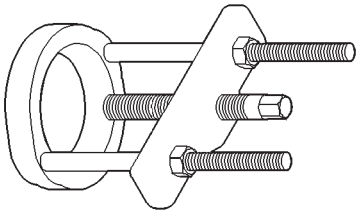
Installer—C-4076-B



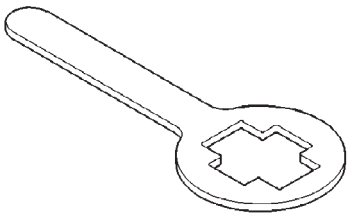
Adjustment Rod—C-4164



Handle—C-4735-1

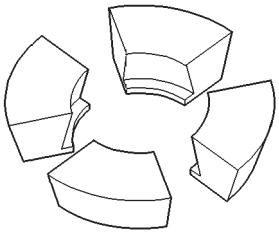


Puller/Press—C-293–PA

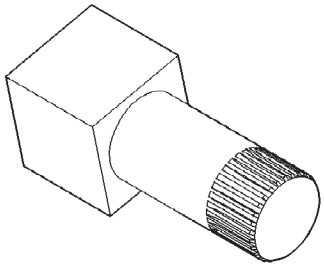


Holder—6719

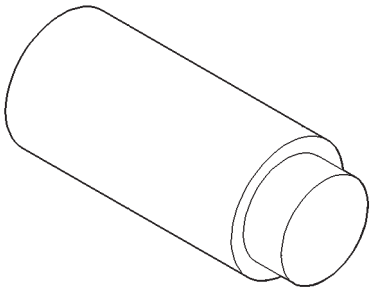
SPECIAL TOOLS (Continued)



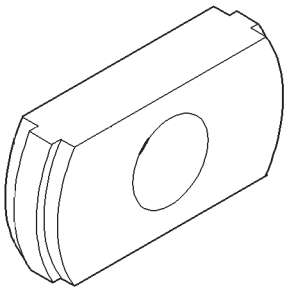
Adapters—C-293-48



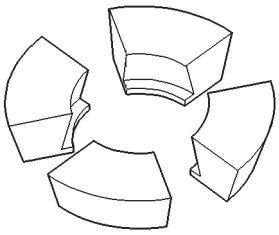
Holder—8138



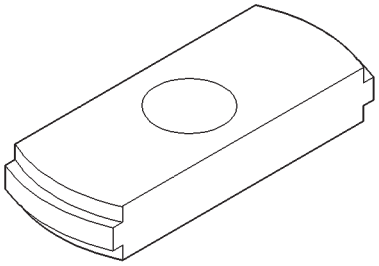
Plug—SP-3289



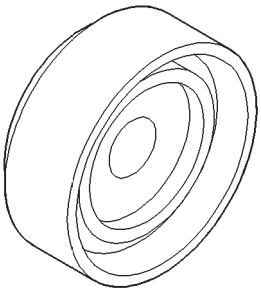
Installer—C-4345



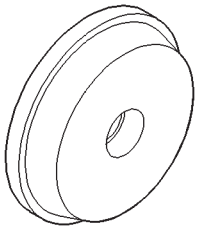
Adapters—C-293-47



Remover—C-4307

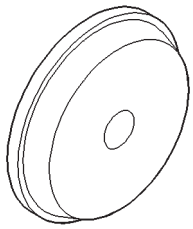


Installer—C-4340

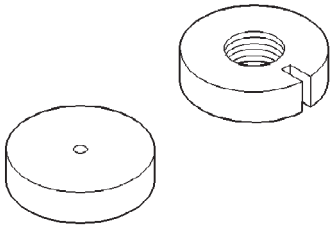


Installer—C-4308

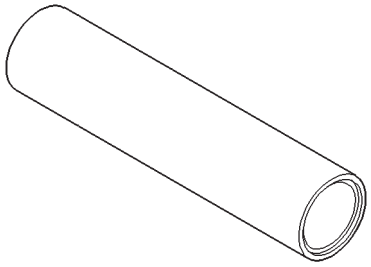
SPECIAL TOOLS (Continued)



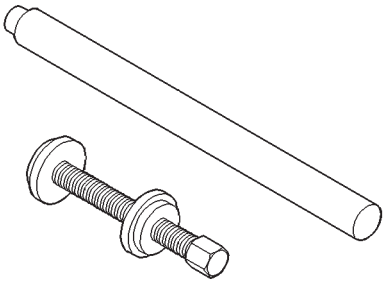
Installer—D-130



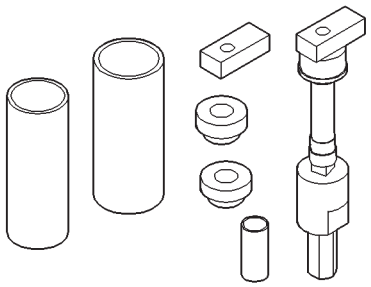
Trac-lok Tools—8140



Installer—6448



Trac-lok Tools—6960



Gauge Set—C-3715-B