DIFFERENTIAL AND DRIVELINE

CONTENTS

PROPELLER SHAFTS

INDEX

GENERAL INFORMATION

PROPELLER SHAFTS

The function of a propeller shaft is to transmit power from one point to another in a smooth action. The shaft is designed to send torque through an angle from the transmission (transfer case on 4WD vehicles) to the axle (Fig. 1).

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

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

The propeller shaft is designed and built with the yoke lugs in line with each other which 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 out of balance condition and vibration.

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.

FRONT PROPELLER SHAFT

The propeller shaft has no slip yoke. This shaft uses a double cardan joint at the transfer case end and a Constant Velocity joint (CV) at the front axle end (Fig. 2). The CV joint contracts and extends

GENERAL INFORMATION (Continued)

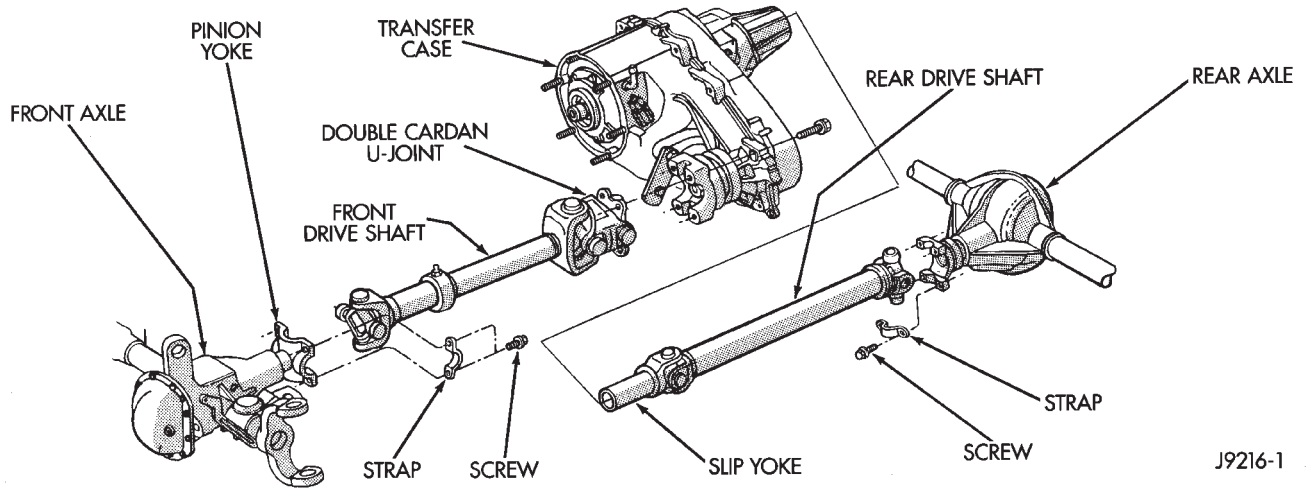

Fig. 1 Front & Rear Propeller Shafts—Typical 4WD

which eliminates the need for a slip yoke. The CV joint has a splined shaft which allows the overall shaft length to be adjusted for optimum joint travel. This spline shaft is locked in place with a nut. **Never attempt to adjust the shaft length. The overall shaft length is preset during manufacturing.**

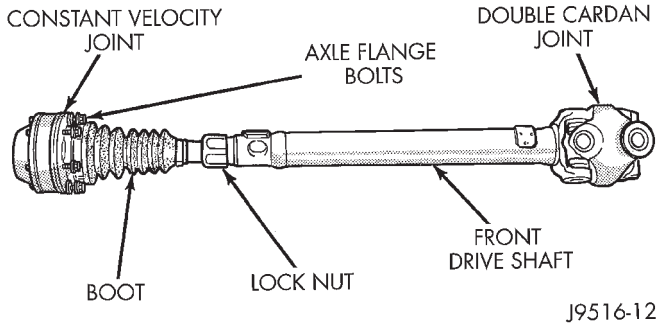

Fig. 2 Front Propeller Shaft

UNIVERSAL JOINTS

Three different types of universal joints are used (Fig. 3), (Fig. 4) and (Fig. 5). These joints are not repairable if worn or damaged they must be replaced. If a vehicle has a damaged constant velocity joint or boot (Fig. 5), the propeller shaft must be replaced.

LUBRICATION

The slip yoke on the Type 1 front shaft is equipped with a lubrication fitting. Use a multi-purpose NLGI Grade 2 EP lubricant.The factory installed U-joints are lubricated for the life of the vehicle and do not need lubrication. All U-joints should be inspected for leakage and damage each time the vehicle is serviced. If seal leakage or damage exists, the U–joint should be replaced.

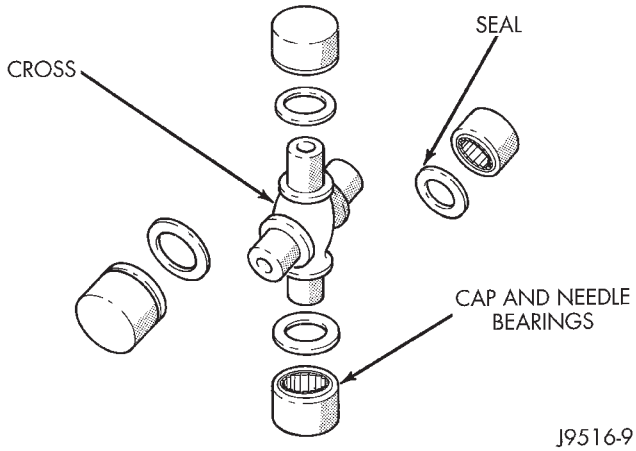

Fig. 3 Single Cardan U-Joint —Rear

PRECAUTIONS

Use exact replacement hardware for attaching the propeller shafts. Exact replacement will ensure safe operation. The specified torque must always be applied when tightening the fasteners.

Put reference marks on the propshaft yoke and axle or transmission yoke before service (Fig. 6). This will assure correct phasing and eliminate possible vibration.

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

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

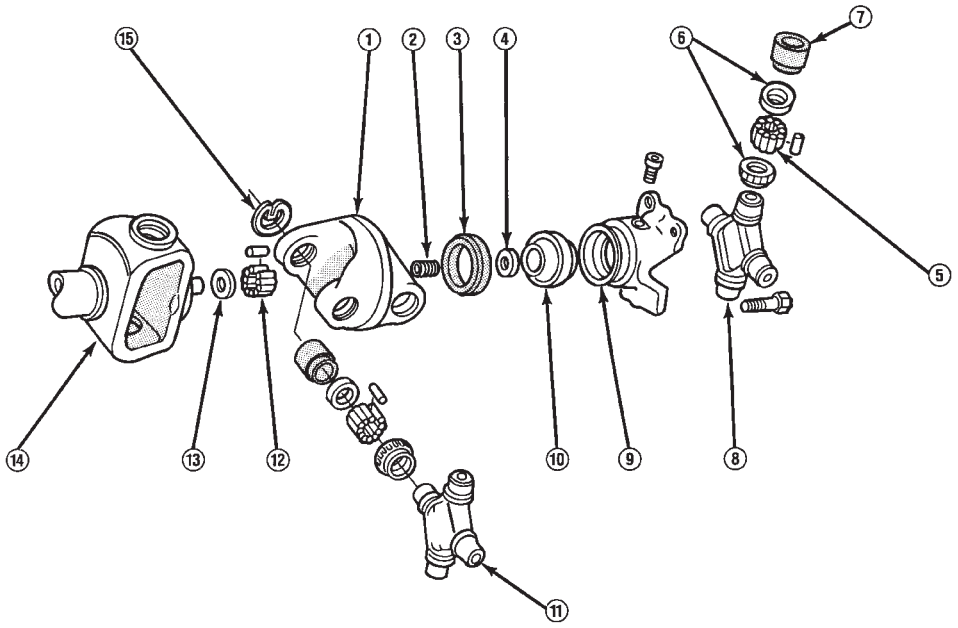

Fig. 4 Double Cardan U-Joint —Front

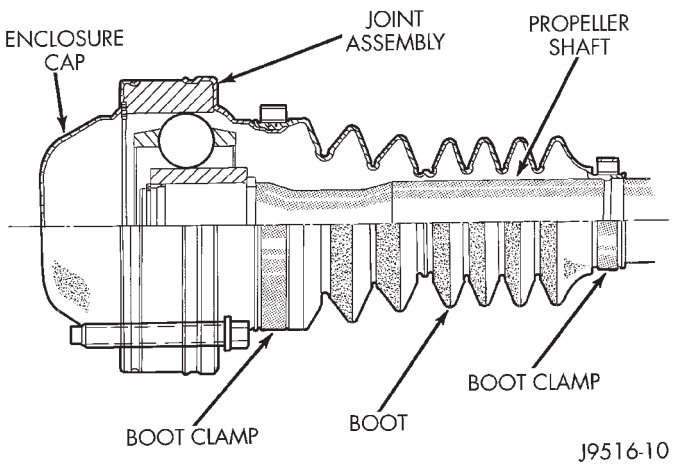

Fig. 5 Constant Velocity Joint—Front

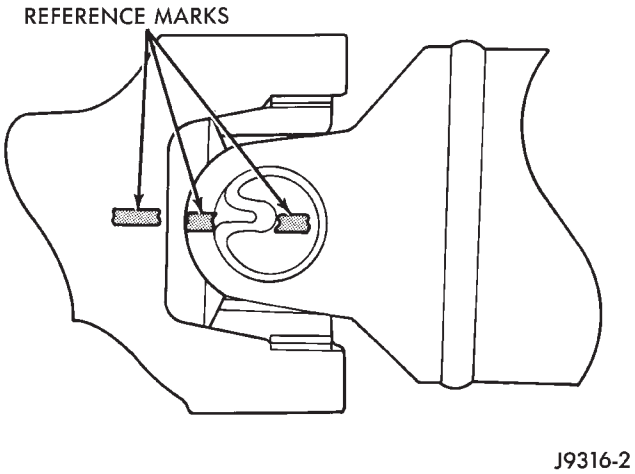

Fig. 6 Reference Marks on Yokes

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, Wheels and Tires 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 21, Transmissions for additional information.

Propeller shaft vibration will increase as the vehicle speed is increased. A vibration that occurs within a specific speed range is not caused by propeller shaft unbalance. Defective universal joints or an incorrect propeller shaft angle are usually the cause.

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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UNBALANCE

If propeller shaft unbalance is suspected, it can be verified with the following procedure:

Removing and re–indexing the propeller shaft 180° may eliminate some vibrations.

- Clean all the foreign material from the propeller shaft and the universal joints.
- Inspect the propeller shaft for missing balance weights, broken welds, and bent areas. **If the propeller shaft is bent, it must be replaced.**
- Ensure the universal joints are not worn, are properly installed, and are correctly aligned with the shaft.
- Check the universal joint clamp screws torque

(1) Raise the vehicle.

(2) Remove the wheel and tires assembly. Install the wheel lug nuts to retain the brake drums.

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

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

(5) Install a screw clamp at position 1 (Fig. 7).

(6) 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.

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

(8) If the vibration decreased, install a second clamp (Fig. 8) and repeat the test.

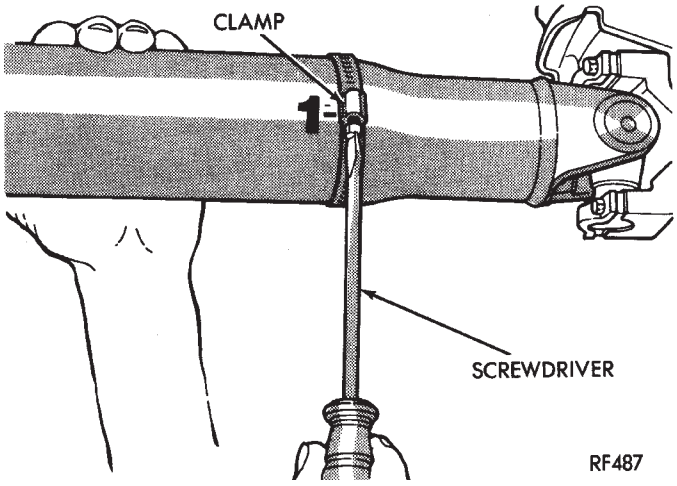

Fig. 7 Clamp Screw At Position 1

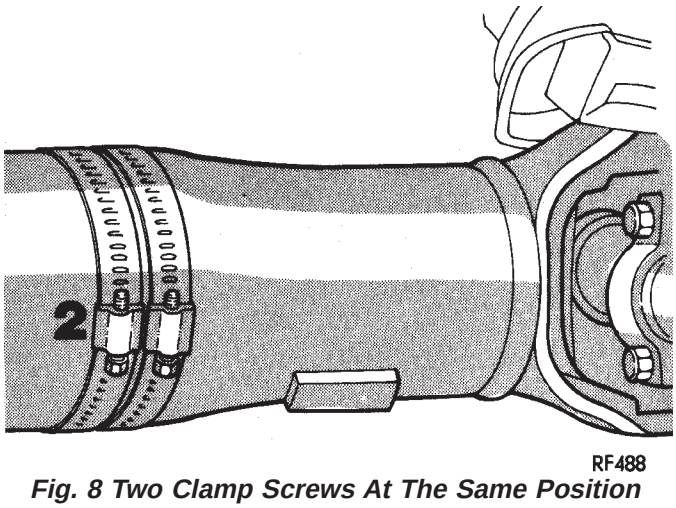

Fig. 8 Two Clamp Screws At The Same Position

DIAGNOSIS AND TESTING (Continued)

(9) If the clamps cause an additional unbalance, separate the clamps (1/4 inch above and below the mark). Repeat the vibration test (Fig. 9).

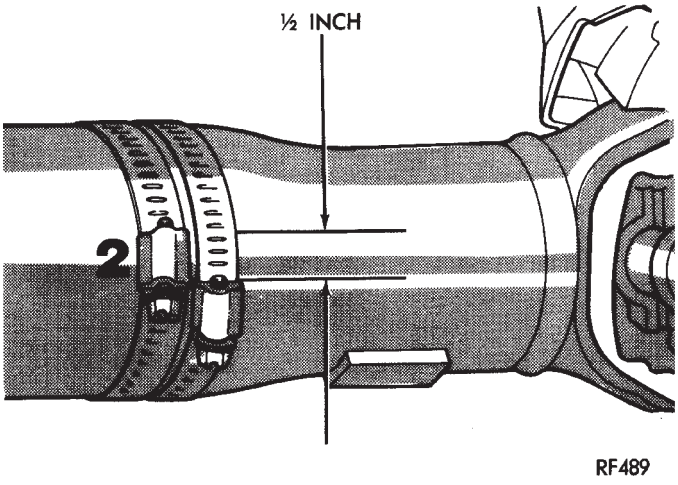

Fig. 9 Clamp Screws Separated

(10) 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.

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

(12) If the amount of vibration remains unacceptable, apply procedures at the front end of the propeller shaft.

RUNOUT

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

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

(3) Measure runout at the center and ends away from welds.

(4) Refer to Runout Specifications chart.

(5) Replace the propeller shaft if the runout exceeds the limit.

RUNOUT SPECIFICATIONS

Front of shaft	0.010 in. (0.25 mm)
Center of shaft	0.015 in. (0.38 mm)
Rear of shaft	0.010 in. (0.25 mm)

NOTE: Measure front/rear runout approximately 3 inches (76 mm) from the weld seam at each end of the shaft tube for tube lengths over 30 inches. Under 30 inches the max. runout is 0.20 inch for full length of the tube.

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SERVICE PROCEDURES

UNIVERSAL JOINT ANGLE

INFORMATION

When two shafts come together at any common joint, the bend that is formed is called the operating angle. The larger the angle, the larger the amount of 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 phasing and proper universal joint working angles.

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

When taking universal joint angle measurements or checking phasing with two piece shafts, consider each shaft separately. On 4WD vehicles, the front shaft input (pinion shaft) angle has priority over the caster angle.

Ideally the driveline system should have;

- Angles that are in 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 though in determining maximum allowable operating angles. As a guide to maximum normal operating angles refer to the chart listed (Fig. 10).

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. 10 Maximum Angles And Engine Speed

INSPECTION

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

- Inflate all tires to correct pressure
- Check angles in the same loaded or unloaded condition as when the vibration occurred. Propeller

SERVICE PROCEDURES (Continued)

shaft angles will change according to the amount of load in the vehicle. Always check angles in loaded and unloaded conditions.

- 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 protractor base sits flat.

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

Always make measurements from front to rear.

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

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

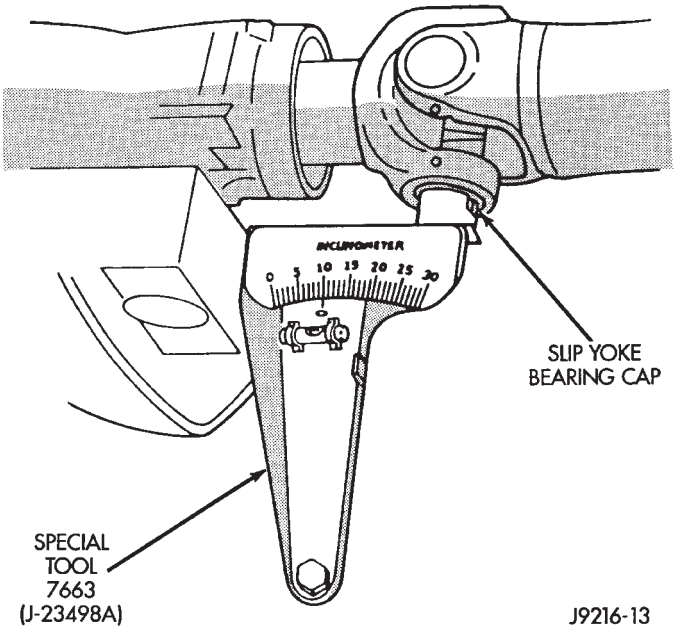


Fig. 11 Front (Output) Angle Measurement (A)

(3) Rotate propeller shaft 90 degrees and place Inclinometer on yoke bearing parallel to the shaft (Fig. 12). Center bubble in sight glass and record measurement. This measurement can also be taken at the rear end of the shaft.

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

(4) Subtract smaller figure from larger (C minus A) to obtain Transmission Output Operating Angle.

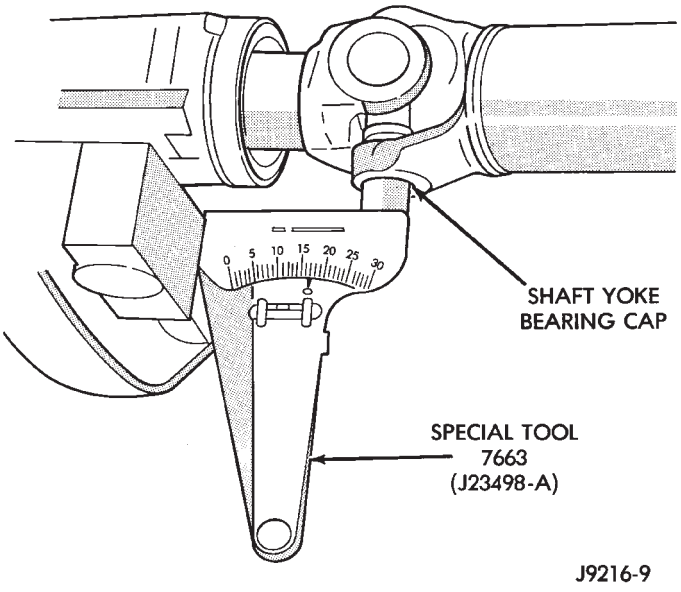


Fig. 12 Propeller Shaft Angle Measurement (C)

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

This measurement will give you the pinion shaft or Input Yoke Angle (B).

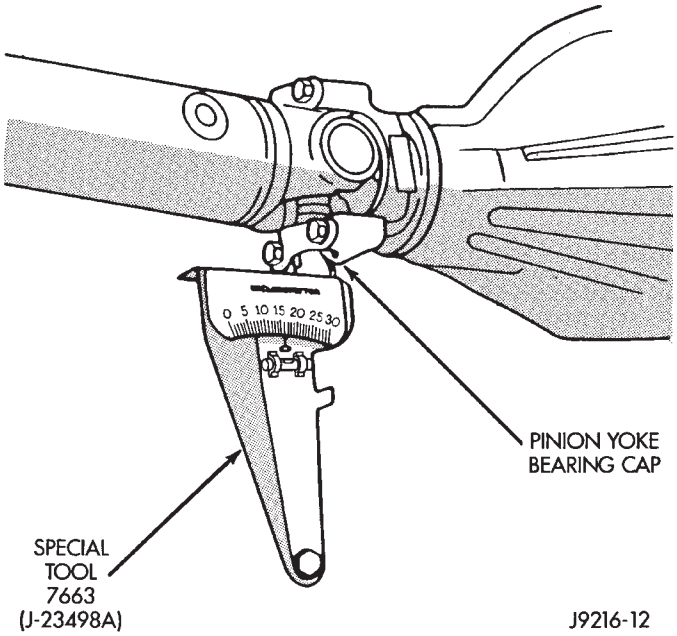


Fig. 13 Rear (Input) Angle Measurement (B)

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

Refer to rules given below and the example in (Fig. 14) for additional information.

- Good cancellation of U–joint operating angles (within 1°)
- Operating angles less than 3°

SERVICE PROCEDURES (Continued)

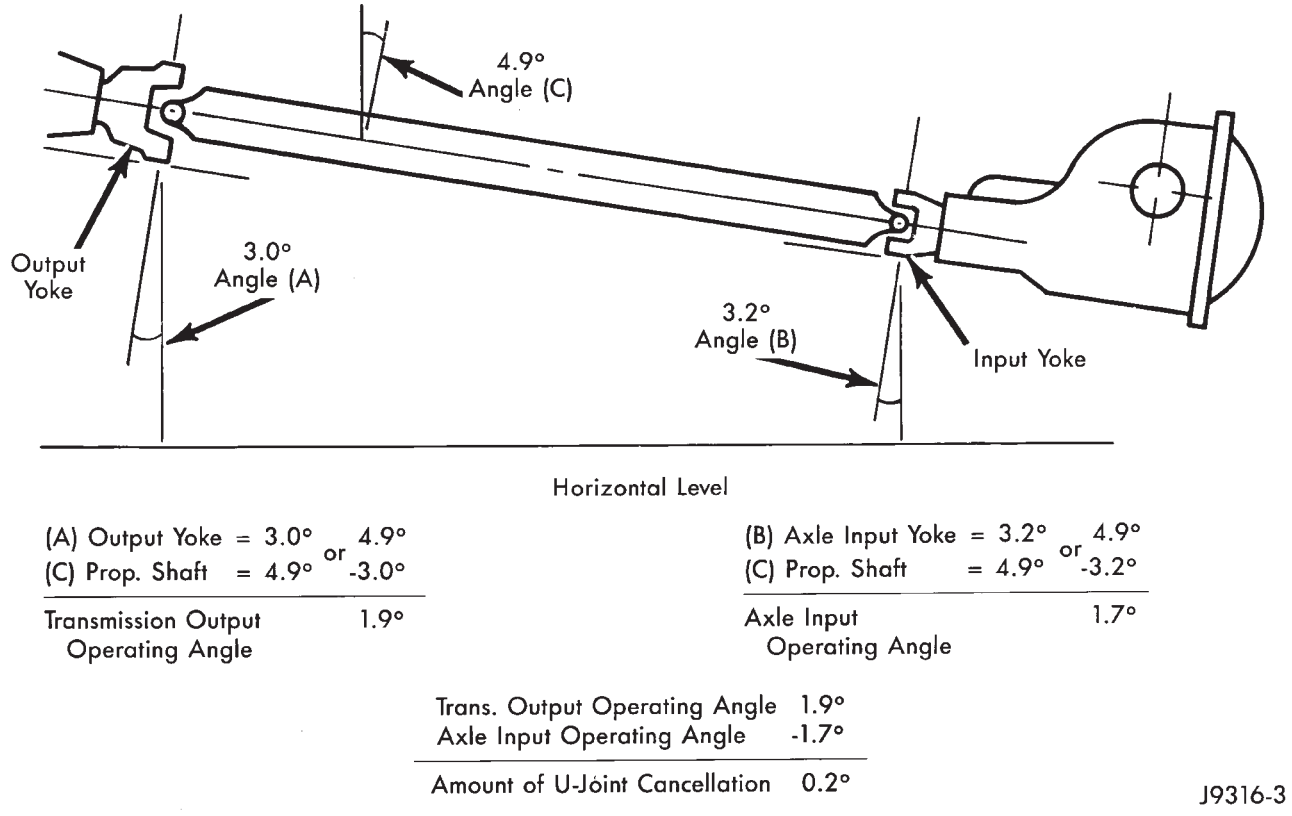


Fig. 14 Universal Joint Angle Example

• At least 1/2 of one degree continuous operating (propeller shaft) angle

REMOVAL AND INSTALLATION

FRONT PROPELLER SHAFT

CAUTION: If front propeller shaft must be replaced, the new shaft length must be measured and adjusted before the vehicle is returned to use.

REMOVAL

(1) Shift the transmission and transfer case (if applicable) to Neutral position.

(2) Raise and support vehicle on safety stands.

(3) Using a suitable marker, mark a line across the yoke at the transfer case and the cardan-join at the rear of the front propeller shaft.

(4) Marks a line across the CV-joint and the pinion shaft yoke.

NOTE: The reference marks will be used to aid installation.

CAUTION: Do not loosen CV-joint lock nut or collapse the front propeller shaft. Driveline vibration can result.

(5) Remove bolts holding CV joint at front of shaft to front axle pinion yoke.

(6) Remove bolts holding rear cardan-joint to the transfer case yoke.

(7) Separate the cardan-joint from the transfer case yoke.

(8) Push rear of propeller shaft upward to clear transfer case yoke.

(9) Separate CV-joint from front axle.

(10) Separate propeller shaft from vehicle.

INSTALLATION

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

(2) Place CV-joint into axle pinion yoke. CV-joint should rotate freely in the pinion yoke.

(3) Align mark on the rear cardan-joint to the mark on the transfer case yoke.

(4) Loosely install bolts to hold cardan-joint to transfer case yoke.

(5) Align mark on CV-joint to the mark on the axle pinion yoke.

(6) Install bolts to hold CV-joint to axle pinion yoke. Tighten bolts to 41 N·m (30 ft. lbs.)

(7) Tighten bolts to hold cardan-joint to transfer case yoke to 27 N·m (20 ft. lbs.)

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

REMOVAL AND INSTALLATION (Continued)

MEASUREMENT

This measurement is taken with the shaft installed and the vehicle at proper ride height.

(1) Place vehicle on floor or drive-on hoist with full weight of vehicle on suspension.

(2) Take a measure from the CV-joint cup to the end of the CV-joint boot (Fig. 15).

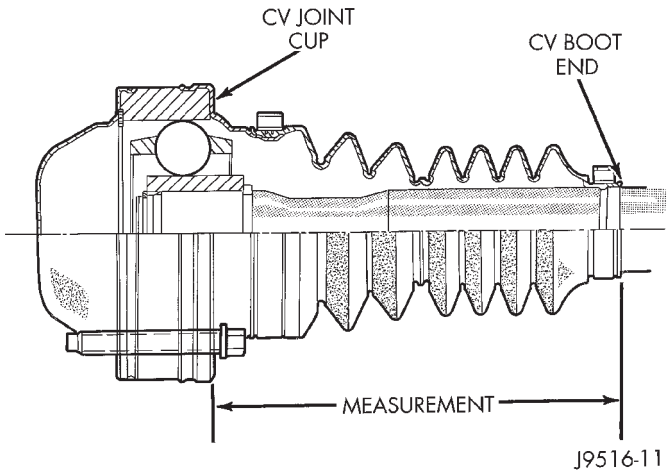


Fig. 15 Measurement

(3) Adjust by loosening the lock nut and moving the one end of the shaft in or out of the other end.

(4) When the shaft is adjusted to the correct length (Fig. 15) 142.7 mm (5.61 in.) tighten the lock-nut (Fig. 16) to 115 N·m (85 ft. lbs.).

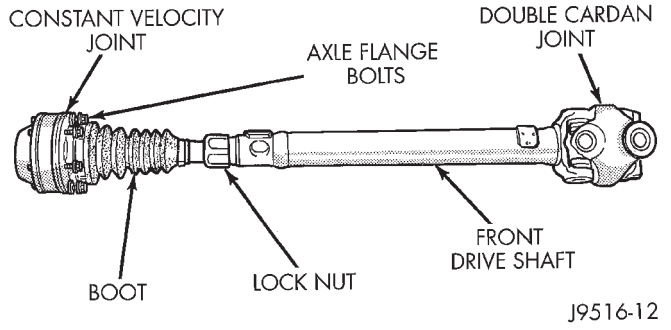


Fig. 16 Lock–nut

CAUTION: A propeller shaft that has been in use for a long period of time cannot be adjusted. If the length of the propeller is incorrect and causing vibration, replace the propeller shaft.

REAR PROPELLER SHAFT

REMOVAL

(1) Shift the transmission and transfer case (if applicable) to their Neutral positions. Raise the vehicle.

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

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

(4) Slide the slip yoke off of the transmission/transfer case output shaft and remove the propeller shaft (Fig. 17).

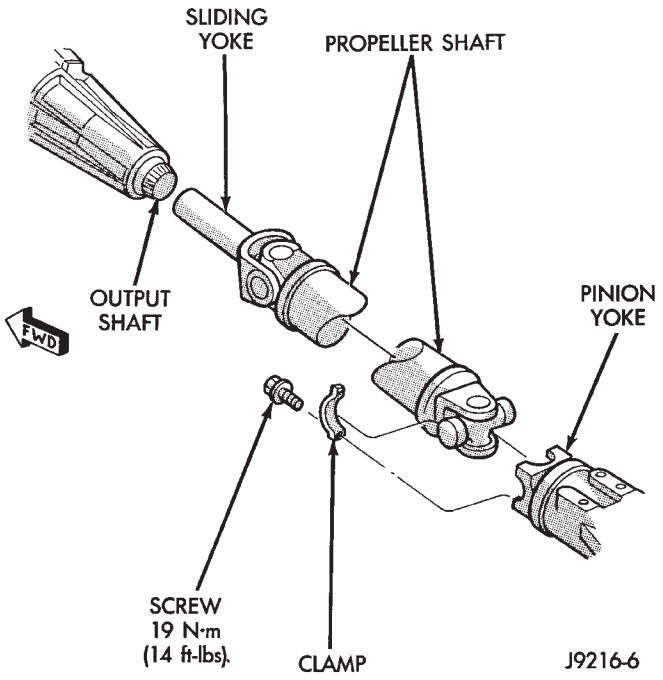


Fig. 17 Rear Propeller Shaft

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. 17).

Replacement U–joint straps and bolts must be installed.

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

(3) Lower the vehicle.

DISASSEMBLY AND ASSEMBLY

SINGLE CARDAN

REMOVAL

Single cardan universal joints are not serviceable. If worn or leaking, they must be replaced as a unit.

(1) Remove the propeller shaft. Refer to Propeller Shaft Replacement in this Group.

(2) **Paint or score alignment marks on the yokes and propeller shaft for installation reference.**

DISASSEMBLY AND ASSEMBLY (Continued)

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

(4) Remove snap rings from both sides of yoke (Fig. 18).

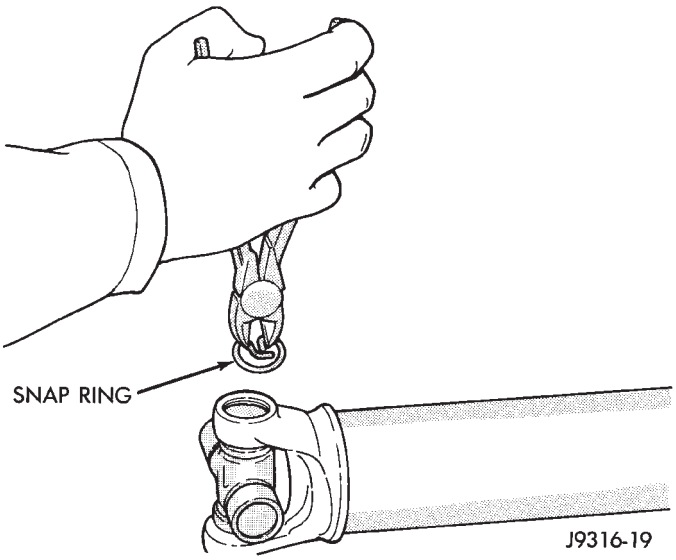


Fig. 18 Remove Snap Ring

(5) Set the yoke in an arbor press or vise with a large socket beneath it. Position the yoke with the grease fitting pointing up (if equipped). Place a smaller socket on the upper bearing assembly and press it through to release the lower bearing assembly (Fig. 19).

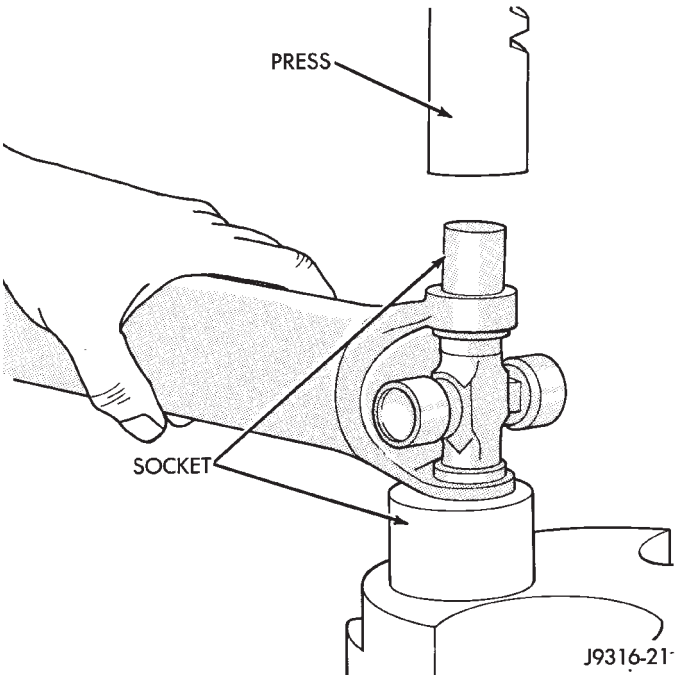


Fig. 19 Press Out Bearing

(6) If the bearing assembly will not pull out by hand after pressing, tap the base of the lug near it to dislodge.

(7) To remove the opposite bearing, turn the yoke over and straighten the cross in the open hole. Then carefully press the end of the cross until the remaining bearing can be removed (Fig. 20).

CAUTION: If the cross or bearing assembly are cocked when being pressed, the bearing assembly will score the walls of the yoke bore and ruin the yoke.

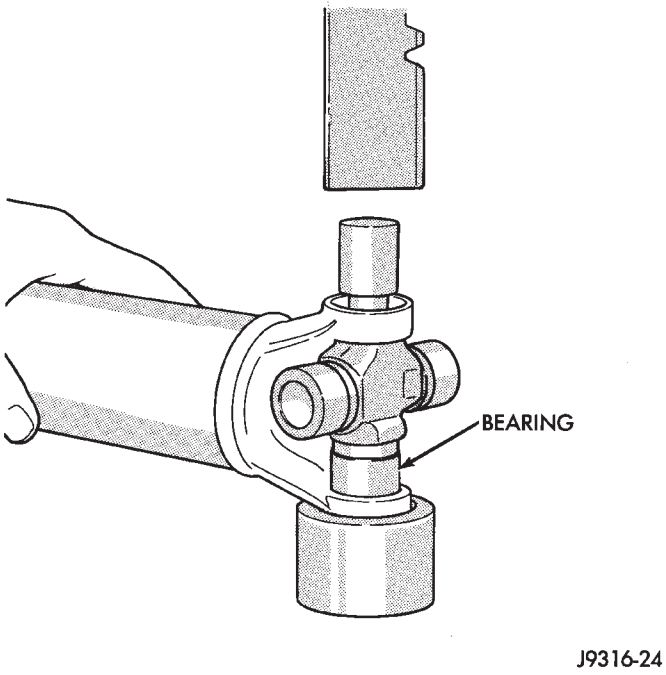


Fig. 20 Press Out Remaining Bearing

DISASSEMBLY AND ASSEMBLY (Continued)

ASSEMBLY

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

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

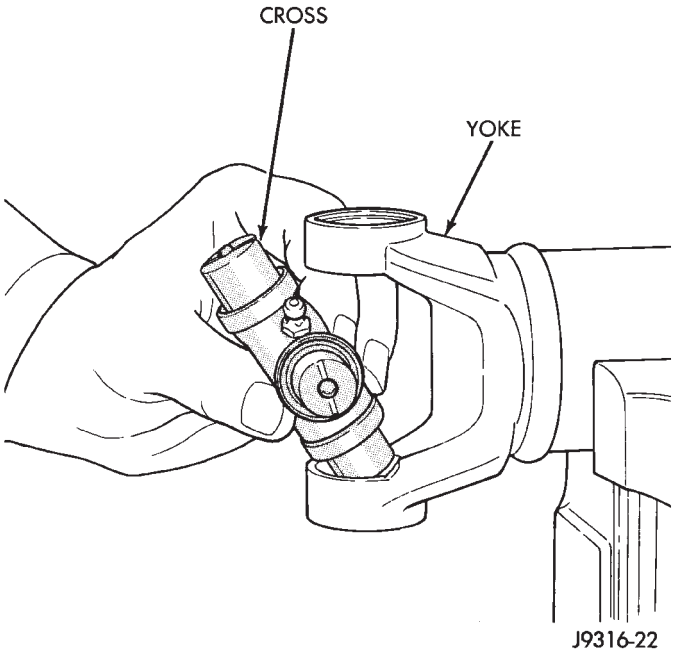


Fig. 21 Install Cross In Yoke

(3) Place a bearing assembly over the trunnion and align it with the cross hole (Fig. 22). Keep the needle bearings upright in the bearing assembly. A needle roller lying at the bottom will prevent proper assembly.

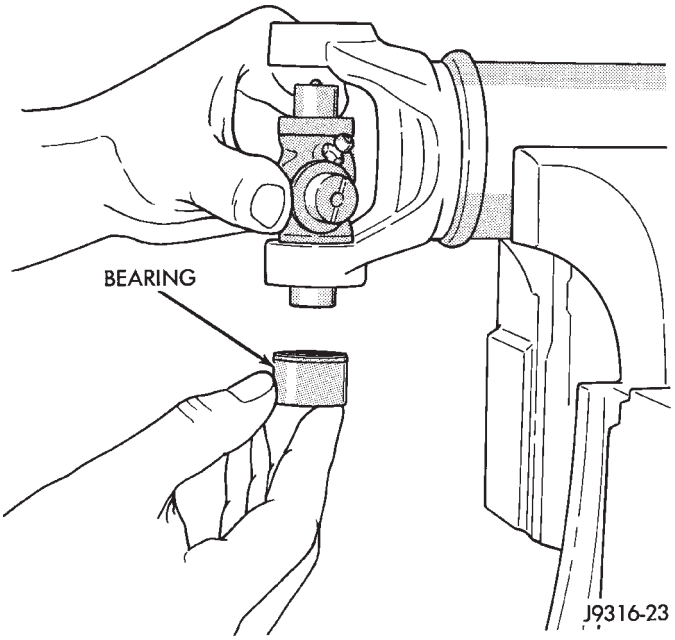


Fig. 22 Install Bearing On Trunnion

(4) Press the bearing assembly into the cross hole enough to install a snap ring. Install a snap ring.

(5) Repeat steps 3 and 4 to install the opposite bearing assembly. If the joint is stiff, strike the yoke with a soft hammer to seat the needle bearings. Install a snap ring.

(6) Add grease to lube fitting (if equipped).

(7) Install the propeller shaft.

DOUBLE CARDAN (CV)

REMOVAL

Cardan universal joints are not serviceable. If worn or leaking, they must be replaced as a unit.

(1) Remove the propeller shaft. Refer to Propeller Shaft Replacement in this Group.

(2) **Paint or score alignment marks on the yokes and propeller shaft for installation reference.**

(3) Remove all the bearing assembly snap rings (Fig. 23).

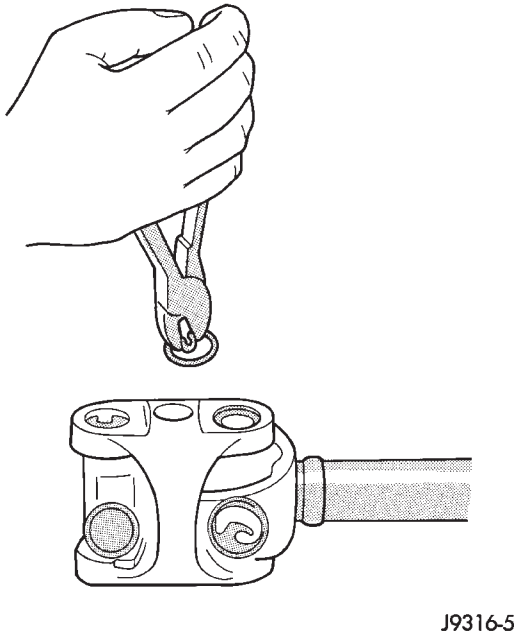


Fig. 23 Remove Snap Rings

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Press the bearing assembly partially from the outboard side of the center yoke, enough to grasp by vise jaws (Fig. 24). Be sure to remove grease fittings that interfere with removal.

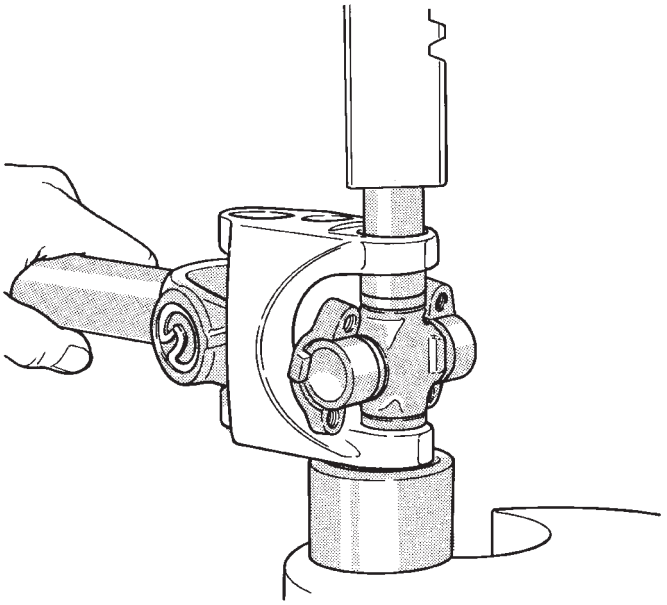


Fig. 24 Press Out Bearing

(5) Grasp the protruding bearing by vise jaws. Tap the tube yoke with a mallet and drift to dislodge from the yoke (Fig. 25).

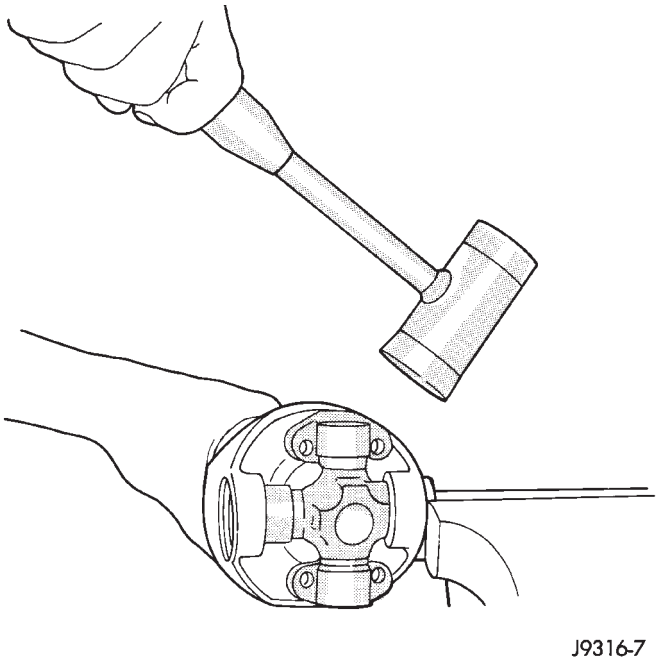


Fig. 25 Remove Bearing From Yoke

(6) Flip assembly and repeat steps 4 and 5 for removing the opposite side bearing. This will then allow removal of the cross centering kit assembly and spring (Fig. 26).

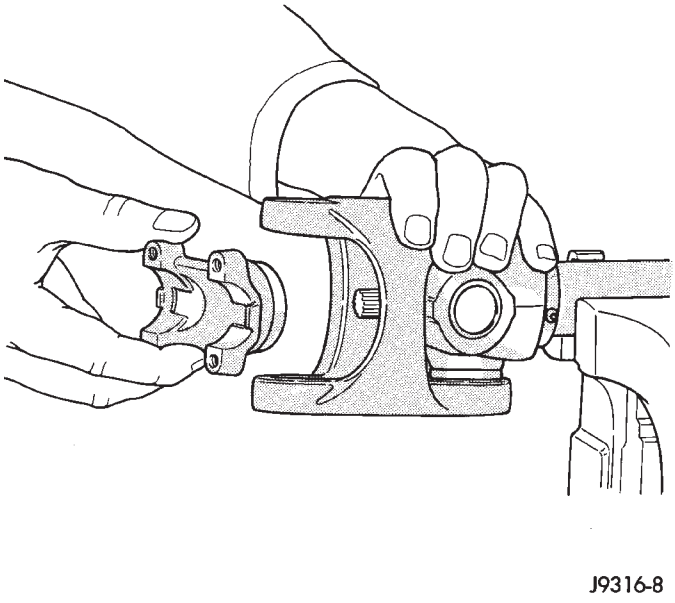


Fig. 26 Remove Centering Kit

(7) Press the remaining bearing assemblies out the other cross as described above to complete the disassembly.

INSTALLATION

During installation, ensure that the spiders and yokes are aligned to the reference marks.

(1) Fit a cross into the tube yoke (Fig. 27).

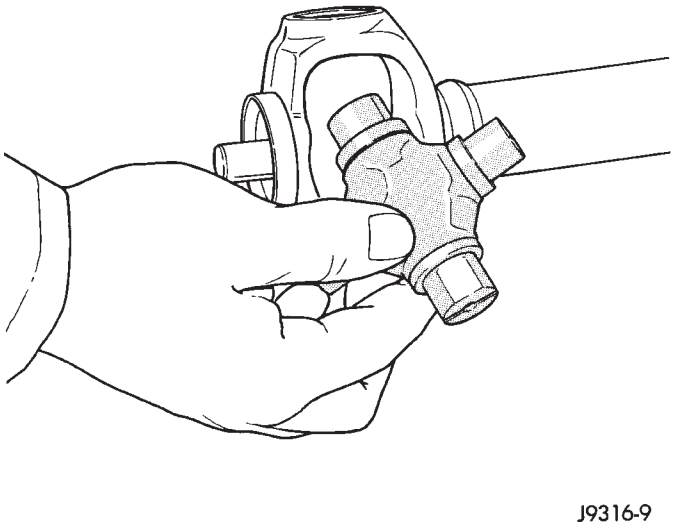


Fig. 27 Install Cross In Yoke

DISASSEMBLY AND ASSEMBLY (Continued)

(2) Place a bearing assembly in a tube yoke hole and over a trunnion. Keep the needle bearings upright in the bearing assembly (Fig. 28). A needle roller lying at the bottom will prevent proper assembly. Be sure to remove any lube fittings that may interfere with removal.

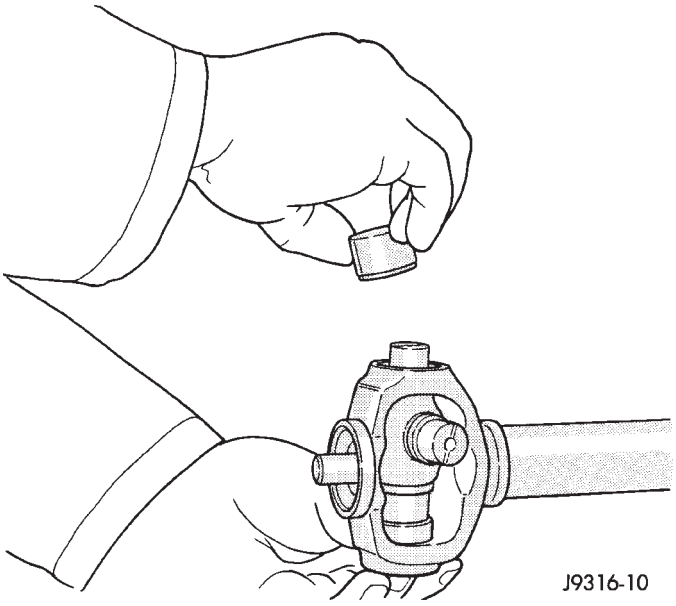


Fig. 28 Install Bearing Assembly

(3) Press the bearing assembly in place and install a snap ring (Fig. 29).

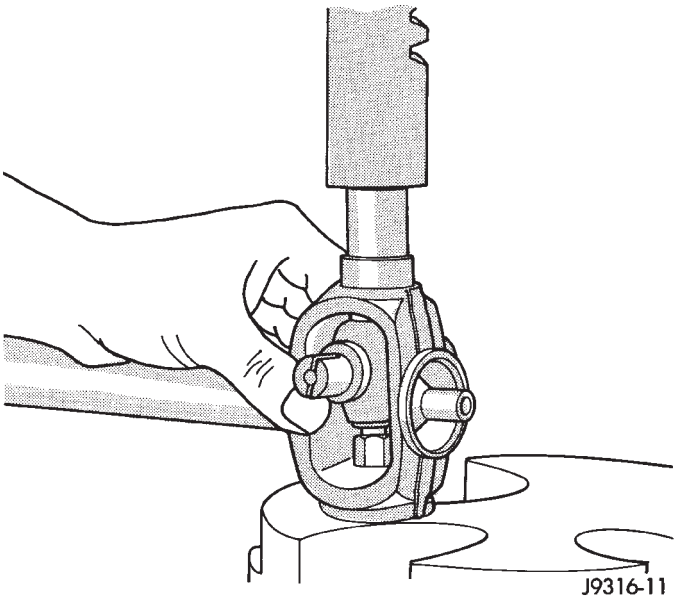


Fig. 29 Press In Bearing Assembly

(4) Flip the tube yoke and bearing assembly installation on the opposite trunnion. Install a snap ring (Fig. 30).

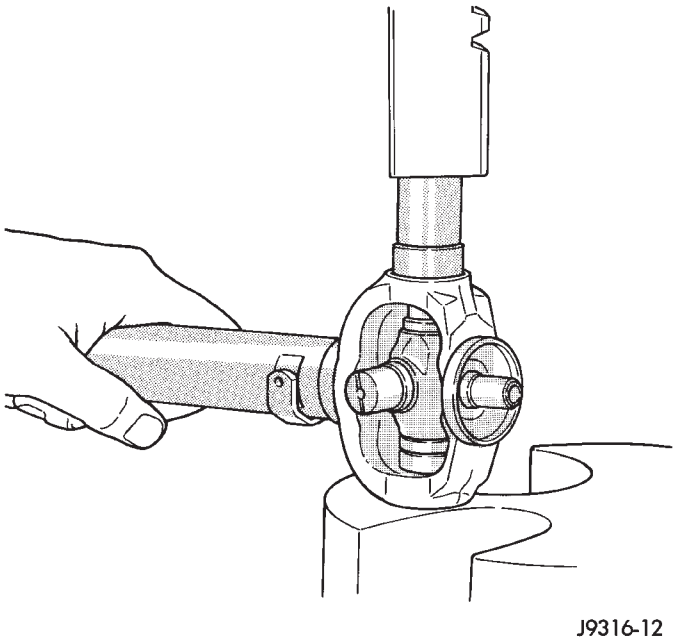


Fig. 30 Press In Bearing Assembly

(5) Fit the center yoke on the remaining two trunnions and press bearing assemblies in place, both sides (Fig. 31). Install a snap ring.

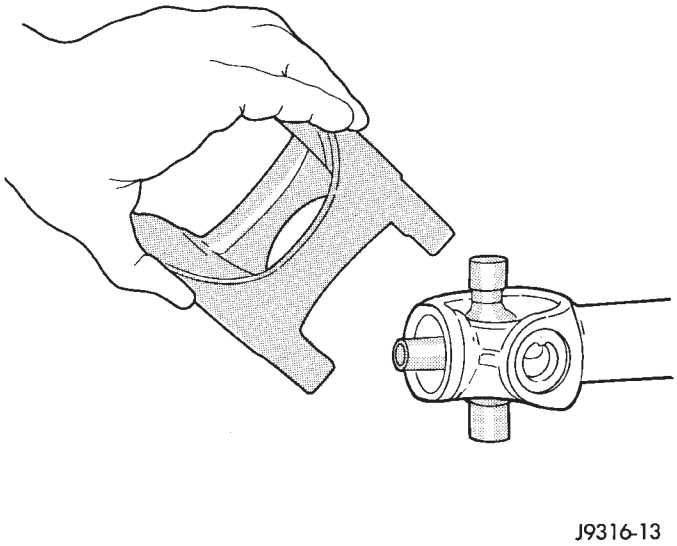


Fig. 31 Install Center Yoke

DISASSEMBLY AND ASSEMBLY (Continued)

(6) Install the centering kit assembly inside the center yoke making sure the spring is in place (Fig. 32).

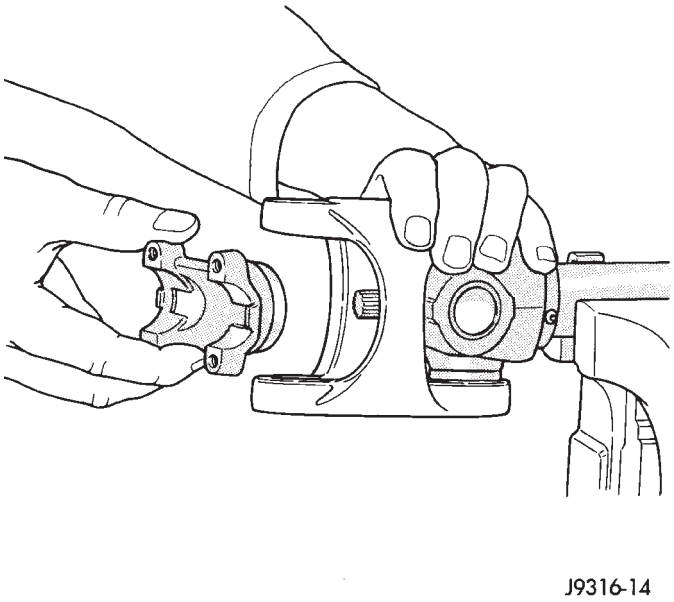


Fig. 32 Install Centering Kit

(7) Place two bearing assemblies on the remaining cross (opposite sides). Fit the open trunnions into the center yoke holes and the bearing assemblies into the centering kit (Fig. 33).

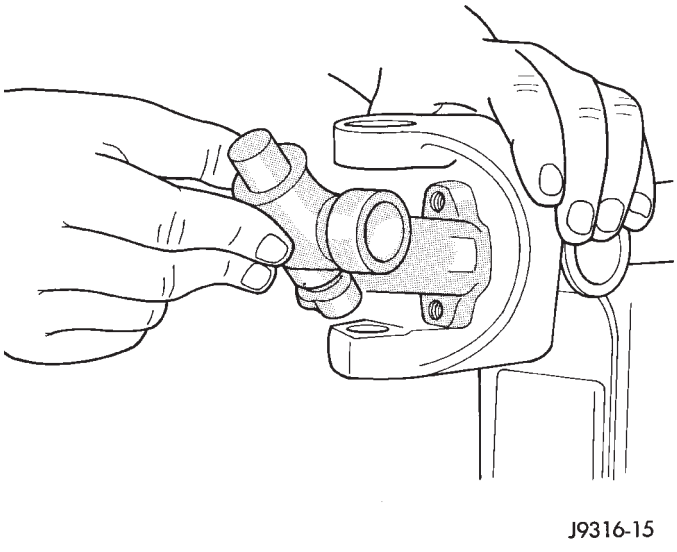


Fig. 33 Install Remaining Cross

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

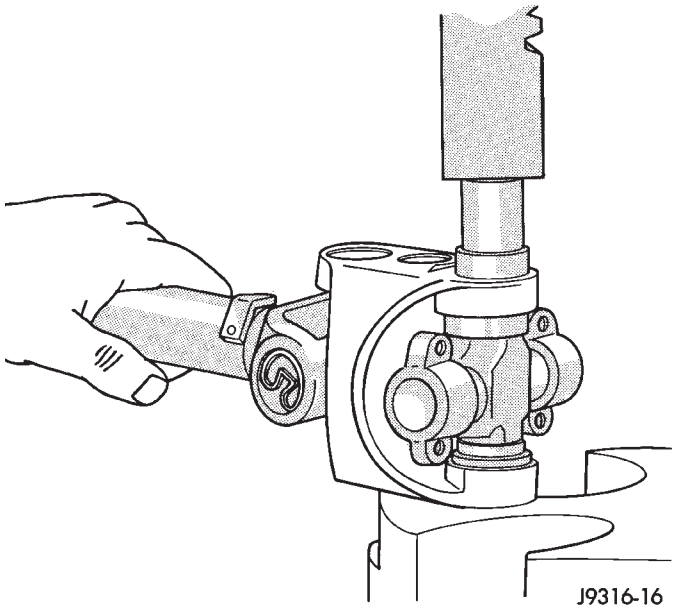


Fig. 34 Press In Bearing Assembly

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

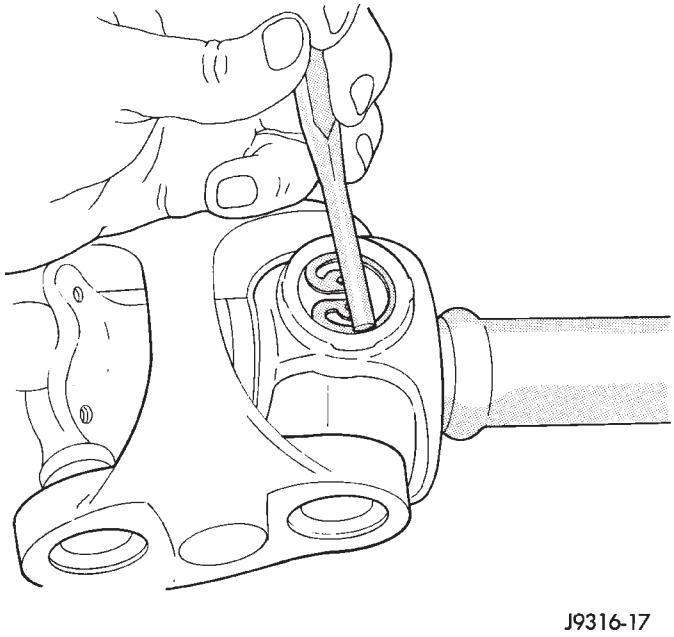


Fig. 35 Seat Snap Rings In Groove

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

(11) Install the propeller shaft.

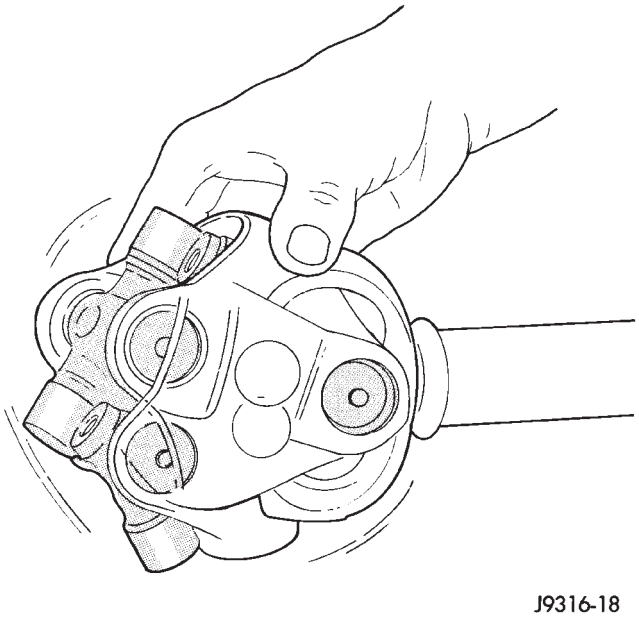


Fig. 36 Check Assembly

CLEANING AND INSPECTION

SINGLE AND DOUBLE CARDAN JOINT

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

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

ADJUSTMENTS

ADJUSTMENT AT AXLE WITH LEAF SPRINGS

Adjust the pinion shaft angle at the springs with tapered shims (Fig. 37). Install tapered shims between the springs and axle pad to correct the angle.

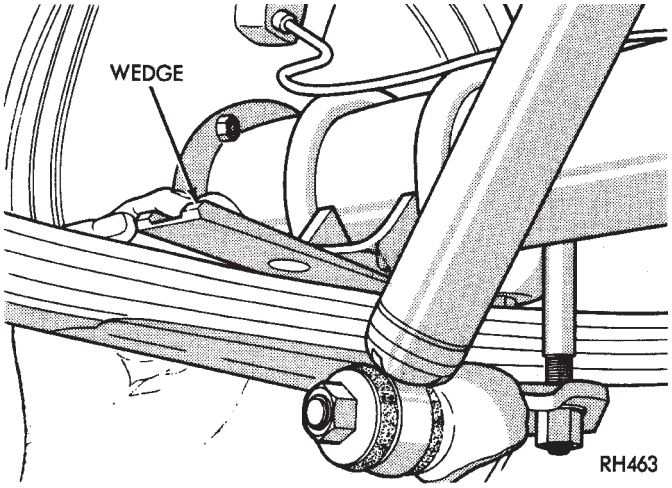


Fig. 37 Angle Adjustment at Leaf Springs

Adjust the pinion gear angle at the lower suspension arms with shims (Fig. 38). 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.

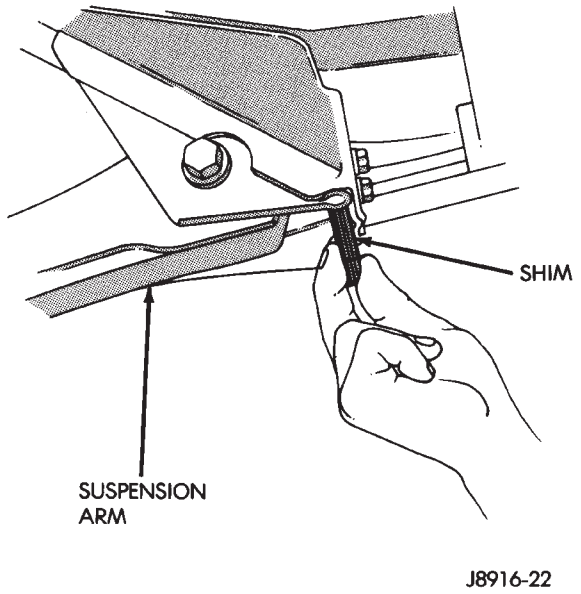


Fig. 38 Front Axle Angle Adjustment

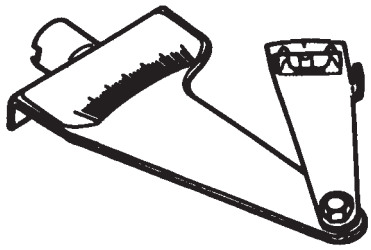
SPECIFICATIONS

TORQUE

DESCRIPTION	TORQUE
Front Propeller Shaft	
Bolts, Rear Yoke	27 N·m (20 ft. lbs.)
Bolts, Front Yoke	41 N·m (30 ft. lbs.)
Nut, Lock	115 N·m (85 ft. lbs.)
Rear Propeller Shaft	
Bolts, Rear Yoke	19 N·m (14 ft. lbs.)

SPECIAL TOOLS

PROPELLER SHAFT



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FRONT AXLE—TUBE AND MODEL 30

INDEX

GENERAL INFORMATION

INFORMATION

The Model 30 front 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.

The axles are equipped with ABS brake sensors. The sensors are attached to the knuckle assemblies and tone rings are pressed on 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 Model 30 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover. Build date identification codes are stamped on the axle shaft tube cover side.

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 collapsible spacer.

SELEC–TRAC

The Selec–Trac system is a non–disconnect axle. Shifting from two– wheel to four–wheel drive is done at the transfer case.

Vehicles equipped with **Selec–Trac** and ABS brake system, refer to Group 5—Brakes for additional service information.

LUBRICATION SPECIFICATIONS

Multi–purpose, hypoid gear lubricant should be used for Model 30 axles. The lubricant should have MIL–L–2105C and API GL 5 quality specifications. Mopar Hypoid Gear Lubricant conforms to both of these specifications.

- The factory fill for the Model 30 axle is SAE Thermally Stable 80W–90 gear lubricant. **Do not use heavier weight lubricant, this will cause axle engagement difficulties.**

GENERAL INFORMATION (Continued)

- The factory installed lubricant quantity for the non–disconnect type axle is 1.48 L (3.13 pts.).
- The factory installed lubricant quantity for the vacuum–disconnect type axle is 1.65 L (3.76 pts.).

Refer to Group 0, Lubrication and Maintenance for additional information regarding temperature range, viscosity and fluid level.

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

PINION GEAR DEPTH 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. 1). 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 centerline of the ring gear to the back face of the pinion is 92.1 mm (3.625 inches) for Model 30 axles (Fig. 2). The standard depth provides the best teeth contact pattern.

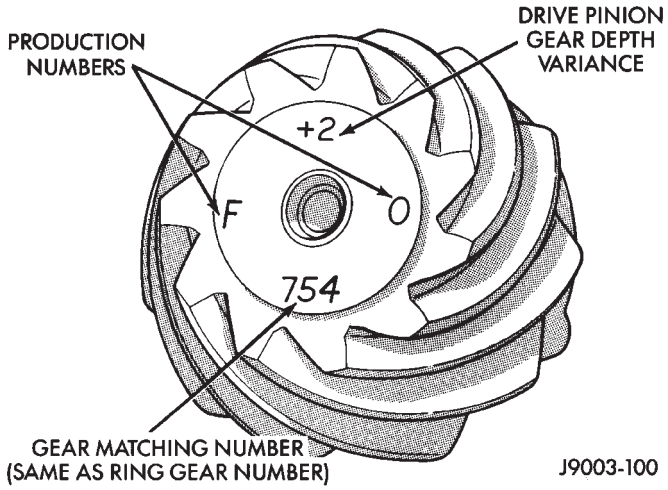

Fig. 1 Pinion Gear ID Numbers

THE BUTTON END ON THE PINION GEAR HEAD IS NO LONGER A MACHINED–TO– SPECIFICATIONS SURFACE. DO NOT USE THIS SURFACE FOR PINION DEPTH SET–UP OR CHECKING (Fig. 2).

Compensation for depth variance is achieved by a selected thickness oil slinger (production) or shims (service). The slinger is placed between the inner pinion bearing cone and gear head (Fig. 3). The shim pack is placed under the inner (rear) bearing cup for service. To change the pinion adjustment, shims are available in thicknesses of 0.003, 0.005, and 0.010 inch. **The oil slinger or baffle must be measured and the thickness included with the total shim pack.**

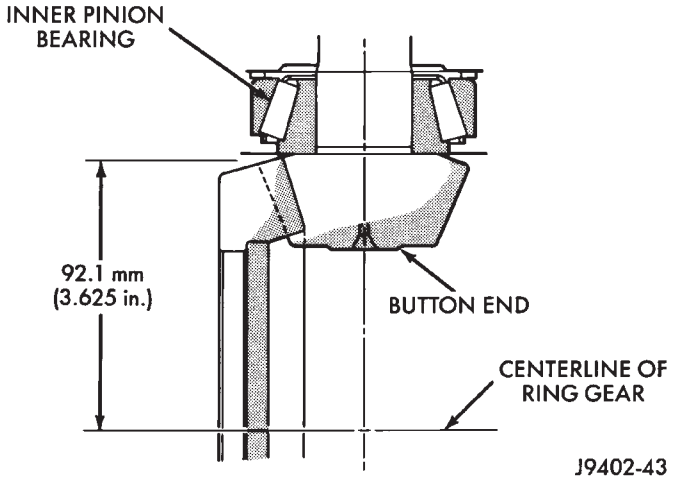

Fig. 2 Pinion Gear Head

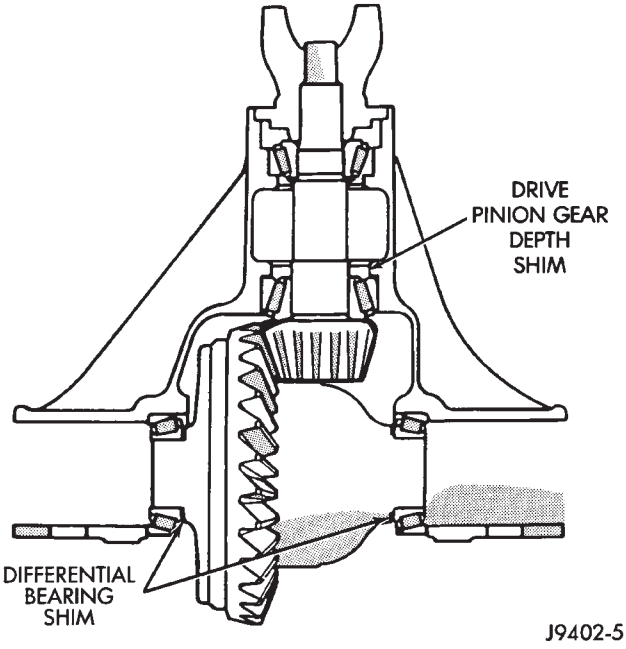

Fig. 3 Shim Locations

New gear set: note the depth variance etched into both the original and the 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.

For example, if old pinion is plus (+) 1 and the new pinion is minus (–) 3, intersecting figure is (+) 0.004 in. (0.10 mm). Add this amount to the original shim. Or if the old pinion is (–) 3 and the new pinion is (–)

GENERAL INFORMATION (Continued)

PINION GEAR DEPTH VARIANCE

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

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2, intersecting figure is (–) 0.001 in. (0.025 mm). Subtract this amount from original shim. **Refer to the Pinion Gear Depth Variance Chart.**

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 (to tight)

When serviced, the bearings must be cleaned thoroughly. They should be dried with lint–free shop towels. **Never spin dry bearings with compressed air. This will overheat them and brinell the bearing surfaces. This will result in noisy operation after repair.**

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

Insufficient lubrication is usually the result of a housing cover leak. It can also be from worn axle shaft or pinion gear seals. Check for cracks or porous areas in the housing or tubes.

Using the wrong lubricant will cause overheating and gear failure. Gear tooth cracking and bearing spalling are indicators of this.

Axle component breakage is most often the result of:

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

Overloading occurs when towing heavier than recommended loads. Component breakage can occur when the wheels are spun excessively. Incorrect lubricant quantity contributes to breakage. Loose differential components can also cause breakage.

Incorrect bearing preload or gear backlash will not result in component breakage. Mis–adjustment will produce enough noise to cause service repair before a failure occurs. If a mis–adjustment condition is not corrected, component failure can result.

Excessive bearing preload may not be noisy. This condition will cause high temperature which can result in bearing failure.

GEAR AND BEARING NOISE

GEAR NOISE

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

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

DIAGNOSIS AND TESTING (Continued)

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, or gear damage can cause noise changes.

Differential side and pinion gears can be checked by turning the vehicle. They usually do not cause noise in straight–ahead driving. These gears are loaded during vehicle turns. If noise does occur during vehicle turns, the side or pinion gears could be worn or damaged. 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 pinion rear bearing is the source of the noise. If the bearing noise is heard during a coast, front bearing is the source.

Worn, damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing. 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:

- Damaged drive shaft
- Missing drive shaft balance weight
- Worn, out-of-balance wheels
- Loose wheel lug nuts
- Worn U-joint
- Loose spring U-bolts
- Loose/broken springs
- Damaged axle shaft bearings
- Loose pinion gear nut
- Excessive pinion yoke run out
- Bent axle shaft

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, Tires And Wheels for additional information involving vibration diagnosis.

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 differential side gear–to–case clearance

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

DIAGNOSIS AND TESTING (Continued)

FRONT DRIVE AXLE

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)

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

The gear lubricant will drain quicker if the vehicle has been recently driven.

(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 to the housing cover (Fig. 4). **Allow the sealant to cure for a few minutes.**

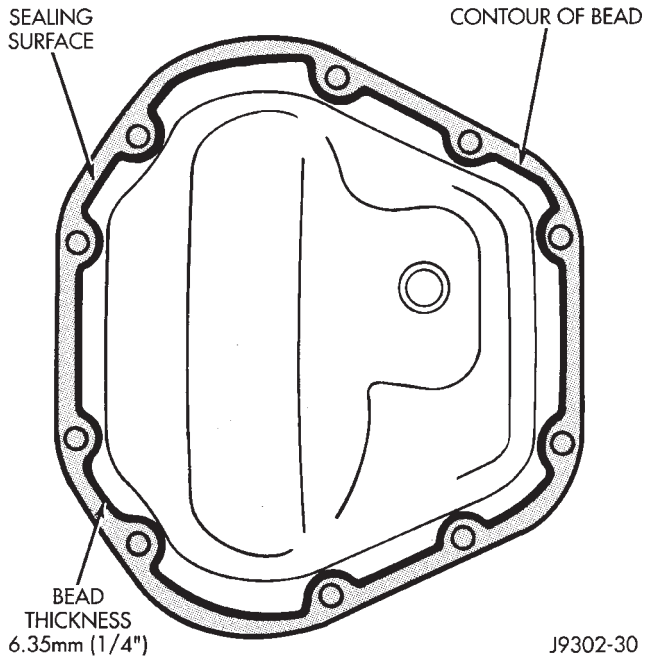

Fig. 4 Typical Housing Cover With Sealant

Install the housing cover within 5 minutes after applying the sealant. If not installed the sealant must be removed and another bead applied.

(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 to bottom of the fill plug hole.

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

REMOVAL AND INSTALLATION

DRIVE AXLE ASSEMBLY REPLACEMENT

REMOVAL

(1) Raise the vehicle and position support stands under the frame rails behind the lower suspension arm frame brackets.

(2) Remove the front wheels.

(3) Remove the brake components and ABS brake sensor (if equipped). Refer to Group 5—Brakes.

(4) On 4WD vehicles, disconnect the axle vent hose.

(5) On 4WD vehicles, mark the drive shaft yoke and axle pinion yoke for alignment reference. Disconnect the drive shaft from the axle.

(6) Disconnect the stabilizer bar link at the axle bracket.

(7) Disconnect the shock absorbers from axle bracket.

(8) Disconnect the track bar from the axle bracket.

(9) Disconnect the tie rod and drag link from the steering knuckle. Disconnect the steering damper from the axle bracket.

(10) Support the axle with a hydraulic jack under the differential.

(11) Disconnect the upper and lower suspension arms from the axle bracket.

(12) Lower the jack enough to remove the axle. The coil springs will drop with the axle.

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

INSTALLATION

CAUTION: Suspension components with rubber bushings should be tightened with the vehicle at normal height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur. Rubber bushings must never be lubricated.

(1) Install the springs and retainer clip. Tighten the retainer bolts to 21 N·m (16 ft. lbs.) torque.

(2) Support the axle on a hydraulic jack under the differential. Position the axle under the vehicle.

(3) Raise the axle with a floor jack and align it with the spring pads.

(4) Position the upper and lower suspension arm at the axle bracket. Install bolts and nuts finger tighten.

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

It is important that the springs support the weight of the vehicle when the track bar is connected. If springs are not at their usual position, vehicle ride comfort could be affected.

REMOVAL AND INSTALLATION (Continued)

(6) Install the shock absorber and tighten the bolt to 23 N·m (17 ft. lbs.) torque.

(7) Install the stabilizer bar link to the axle bracket. Tighten the nut to 95 N·m (70 ft. lbs.) torque.

(8) Install the drag link and tie rod to the steering knuckles and tighten the nuts to 47 N·m (35 ft. lbs.) torque. Install the steering damper to the axle bracket and tighten the nut to 75 N·m (55 ft. lbs.) torque.

(9) Install the brake components and ABS brake sensor (if equipped). Refer to Group 5, Brakes.

(10) On 4WD vehicles, connect the vent hose to the tube fitting.

(11) On 4WD vehicles, align the reference marks and connect the drive shaft to the axle yoke. Tighten the U–joint clamp bolts to 19 N·m (14 ft. lbs.) torque.

(12) Check differential lubricant and add if necessary.

(13) Install the wheel and tire assemblies.

(14) Remove the supports and lower the vehicle.

(15) 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.

(16) Tighten the track bar bolt at the axle bracket to 100 N·m (74 ft. lbs.) torque.

(17) Check the front wheel alignment.

PINION SEAL REPLACEMENT

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

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

(4) Remove the propeller shaft from the yoke.

(5) Remove the pinion yoke nut and washer. Use Remover C–452 and Wrench C–3281 to remove the pinion yoke (Fig. 5).

(6) Mark the positions of the yoke and pinion gear for installation alignment reference.

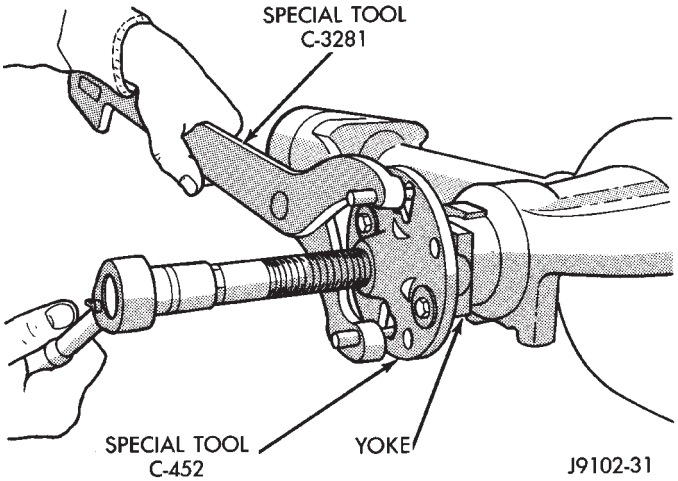

Fig. 5 Pinion Yoke Removal

(7) Use Remover 7794A and slide hammer to remove the pinion gear seal (Fig. 6).

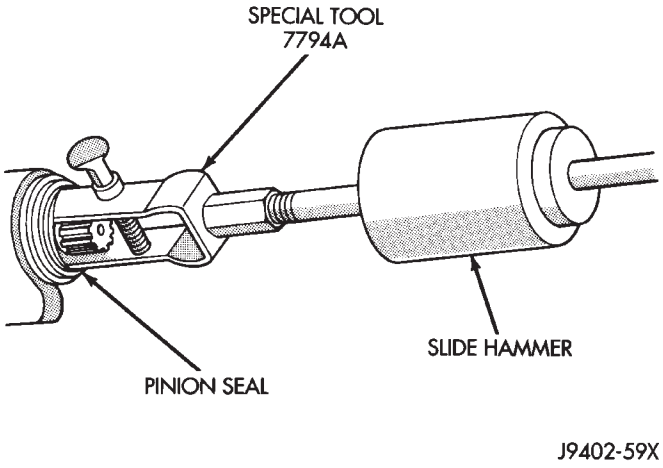

Fig. 6 Seal Removal

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 7).

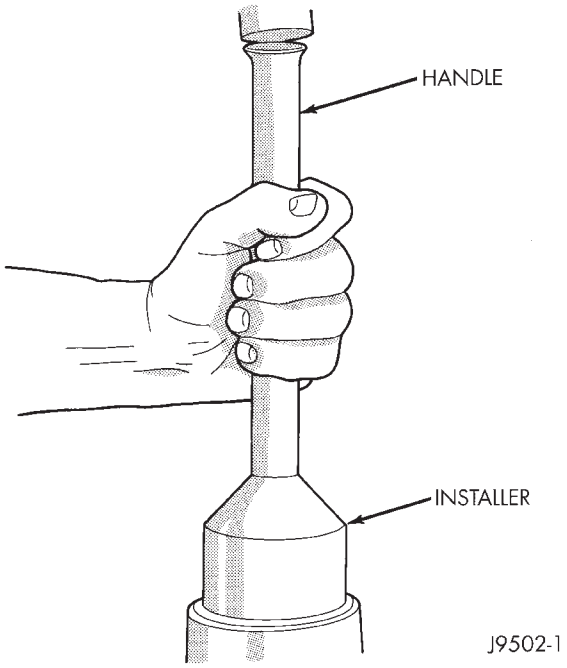

Fig. 7 Pinion Seal Installation

(2) Align the reference marks and install yoke on the pinion gear with Installer W–162–D.

(3) Install a new pinion nut on pinion shaft using hloding tool 6958 and a torque wrench (Fig. 8). **Tighten the nut to 217–352 N·m (160–260 ft. lbs.). Refer to Pinion Gear removal and installation section of this group.**

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

REMOVAL AND INSTALLATION (Continued)

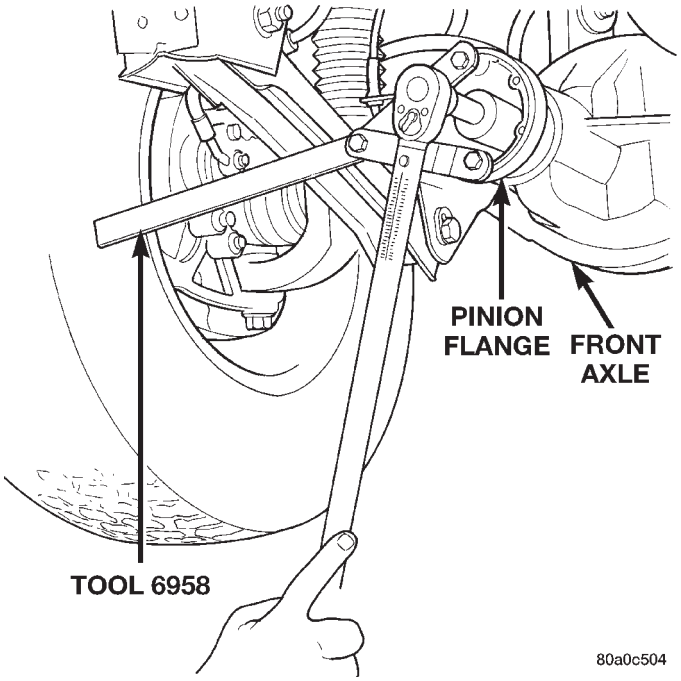

Fig. 8 Tighten Pinion Nut

(5) Add API grade GL 5 hypoid gear lubricant to the differential housing, if necessary.
(6) Install wheel and tire assemblies.
(7) Remove support and lower the vehicle.

HUB BEARING AND AXLE SHAFT

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the wheel and tire assembly.
(3) Remove the brake components from the axle, refer to Group 5, Brakes.
(4) Remove the cotter pin, nut retainer and axle hub nut (Fig. 9).
(5) Remove the hub to knuckle bolts (Fig. 9). Remove the hub from the steering knuckle and axle shaft.
(6) Remove the disc brake rotor shield from the bearing carrier (Fig. 9).
(7) On disconnect axles, remove vacuum shift motor housing. Refer to Vacuum Disconnect Axle in this section.
(8) Remove the axle shaft from the housing. **Avoid damaging the axle shaft oil seals in the differential.**

INSTALLATION

(1) Thoroughly clean the axle shaft (Fig. 9) and apply a thin film of Mopar Wheel Bearing Grease to the shaft splines, seal contact surface, hub bore.
(2) Install the axle shaft into the housing and differential side gears. Avoid damaging the axle shaft oil seals in the differential.
(3) Install the hub bearing and brake dust shield to the knuckle.
(4) Install the hub to knuckle bolts and tighten to 102 N·m (75 ft. lbs.) torque.
(5) Install the hub washer and nut. Tighten the hub nut to 237 N·m (175 ft. lbs.) torque. Install the nut retainer and a new cotter pin (Fig. 9).
(6) Install the brake components, refer to Group 5, Brakes.
(7) Install the wheel and tire assembly.

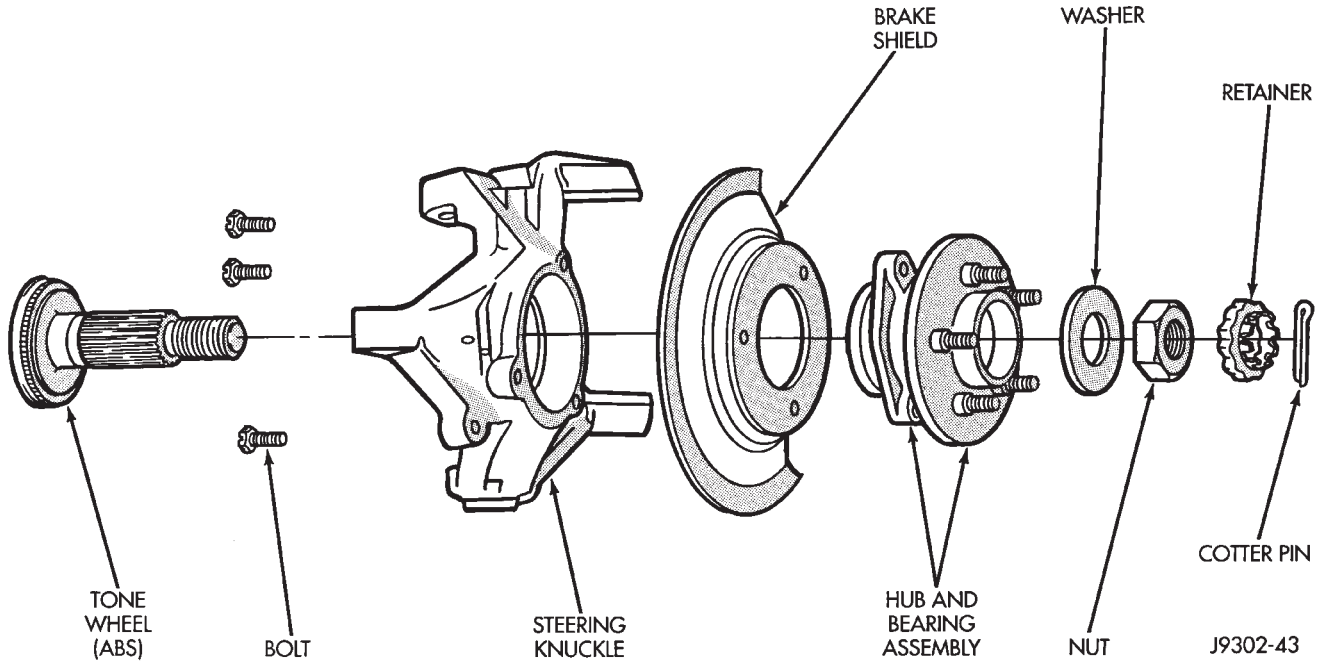

Fig. 9 Hub, Knuckle and Axle Shaft

REMOVAL AND INSTALLATION (Continued)

(8) 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 stud requires use of Tool Kit 6289 (J34503–A).

The lower ball stud has two different designs. For this reason Installer 6752 will also be needed. Check installers for proper fit.

KNUCKLE REMOVAL

(1) Remove hub bearing and axle shaft refer to the Removal procedure.

(2) Disconnect the tie–rod or drag link end from the steering knuckle arm. Remove the ABS sensor wire and bracket from knuckle.

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

(4) Strike the steering knuckle with a brass hammer to loosen. Remove knuckle from axle tube yokes (Fig. 10).

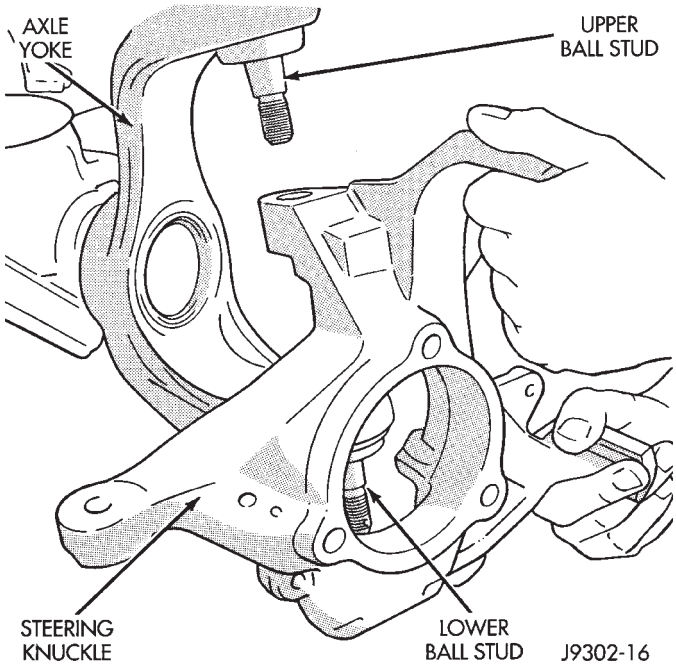

Fig. 10 Steering Knuckle Removal/Installation

UPPER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 11).

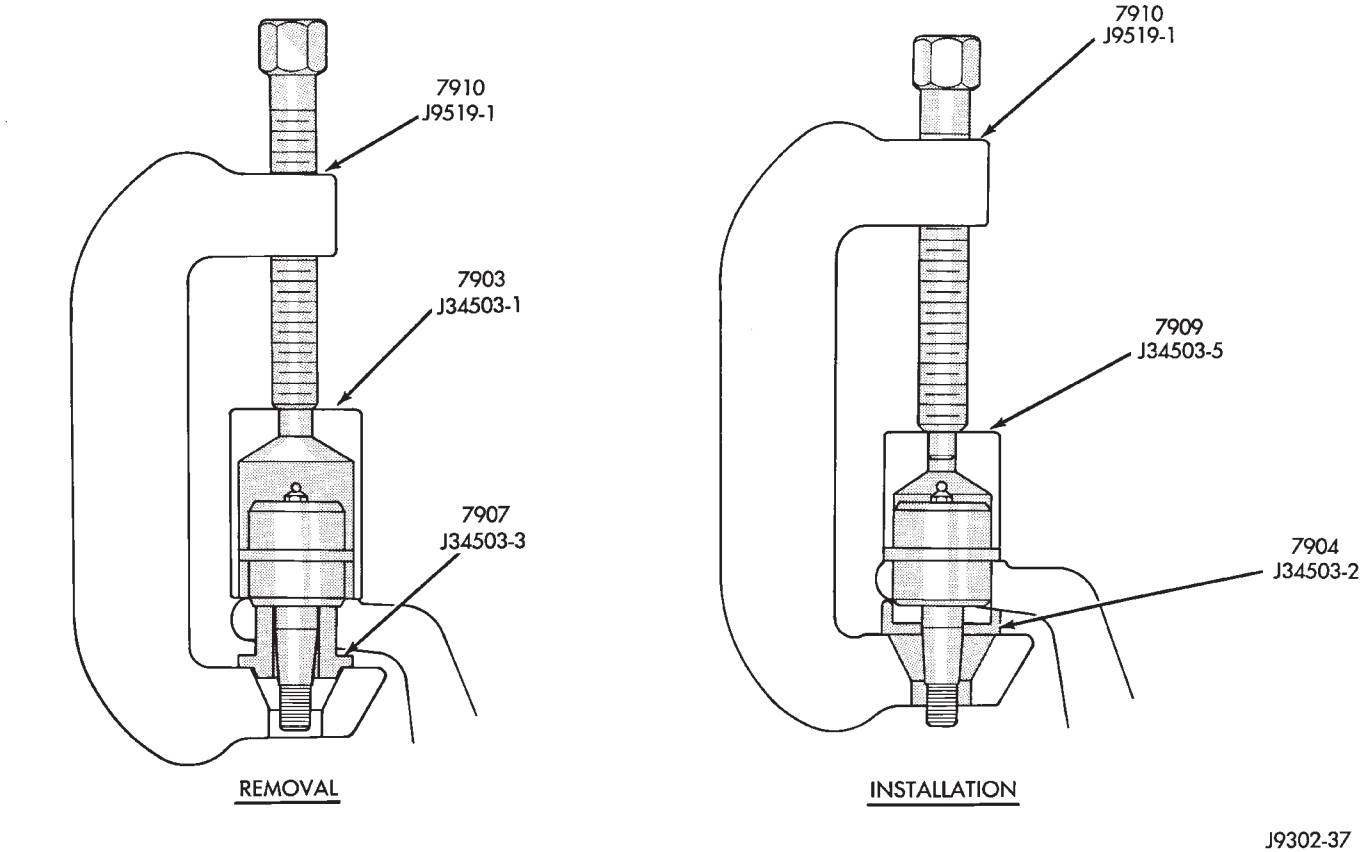

Fig. 11 Upper Ball Stud Remove/Install

REMOVAL AND INSTALLATION (Continued)

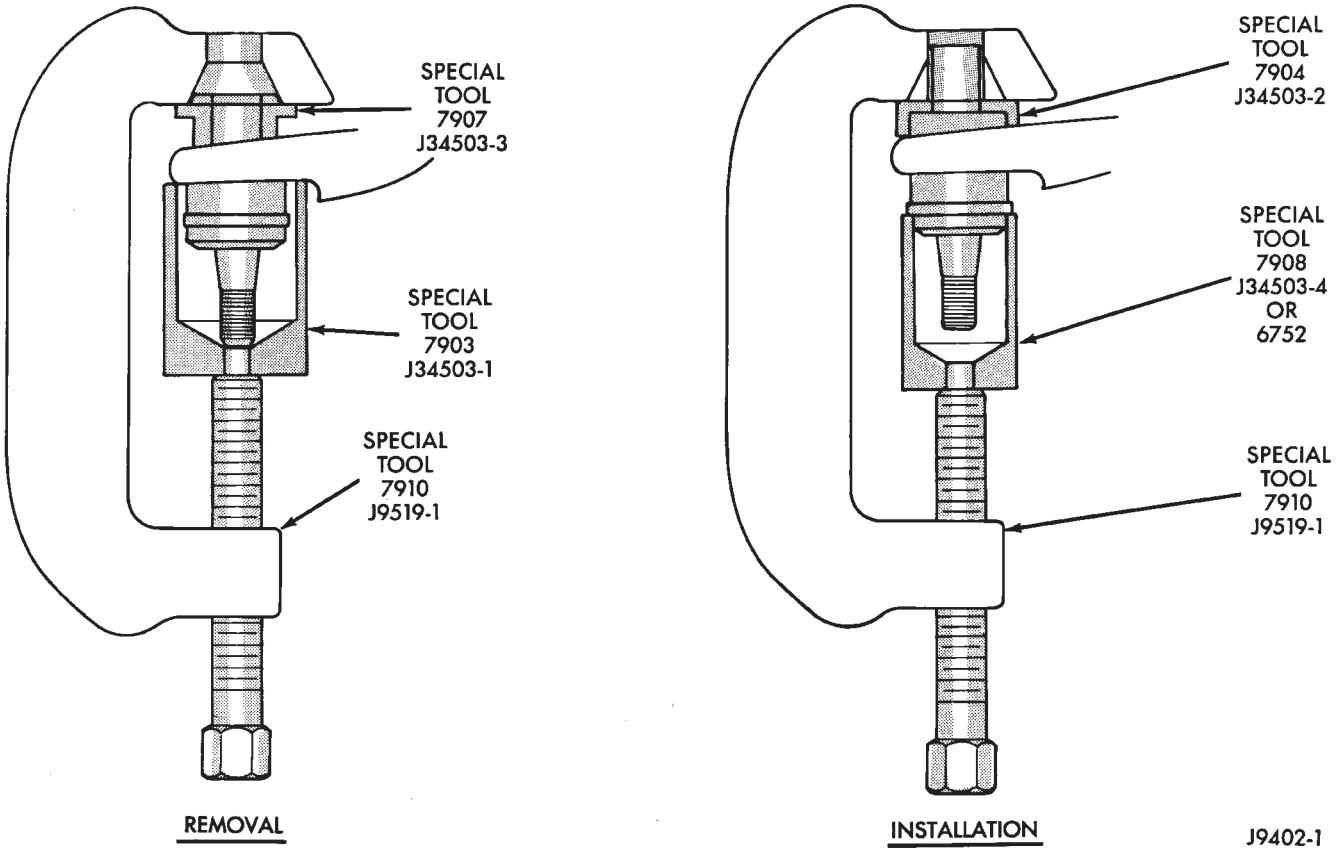

Fig. 12 Lower Ball Stud Remove/Install

LOWER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig. 12). Because there are two different designs for the lower ball studs try both installers for proper fit.

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 according to the installation procedure.

(5) Reconnect the tie–rod or drag link end onto the steering knuckle arm. Install the ABS sensor wire and bracket to the knuckle, refer to Group 5 Brakes.

AXLE BUSHING REPLACEMENT

Refer to Axle Bushing Replacement in the Front Suspension section.

DIFFERENTIAL

REMOVAL

To service the differential the axle assembly and axle shafts must be removed. Refer to the removal procedures in this Group.

(1) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 13).

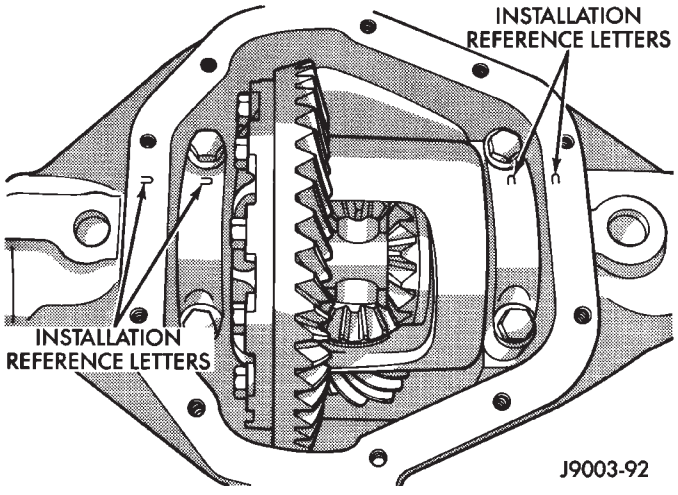

Fig. 13 Bearing Cap Identification

REMOVAL AND INSTALLATION (Continued)

(2) Remove the differential bearing caps.

(3) Position Spreader W–129–B with the tool dowel pins seated in the locating holes (Fig. 14). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

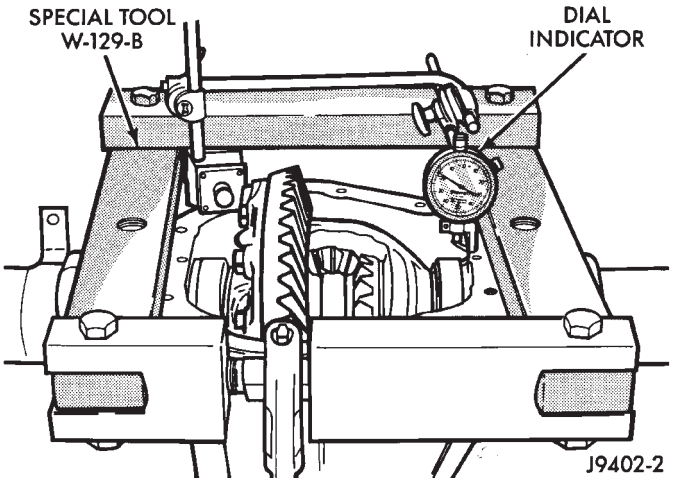

Fig. 14 Spread Differential Housing

(4) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 14) and zero the indicator.

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

(5) Separate the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 14).

(6) Remove the dial indicator.

(7) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 15).

(8) Remove the case from housing. Mark or tag bearing cups indicating which side they were removed. Remove spreader from housing.

INSTALLATION

(1) Position Spreader W–129–B with the tool dowel pins seated in the locating holes (Fig. 16). Install the holddown clamps and tighten the tool turnbuckle finger–tight.

(2) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot

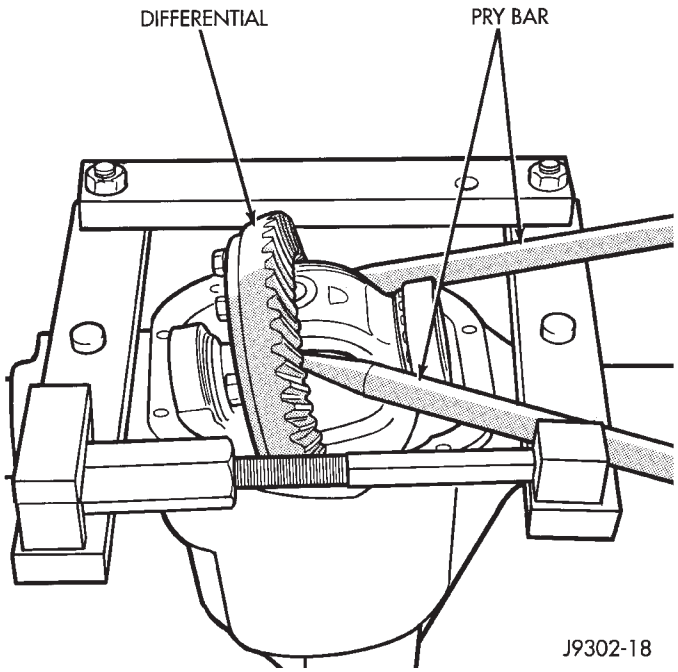

Fig. 15 Differential Removal

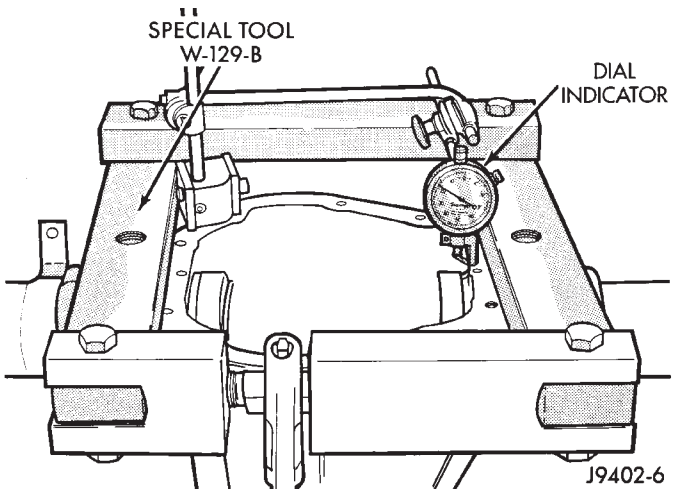

Fig. 16 Spread Differential Housing

stud. Load the indicator plunger against the opposite side of the housing (Fig. 16) and zero the indicator.

CAUTION: Do not spread over 0.38 mm (0.015 in). If the housing is over–separated, 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. 16).

(4) Remove the dial indicator.

REMOVAL AND INSTALLATION (Continued)

(5) Install case in the housing. Tap the differential case to ensure the bearings are fully seated (Fig. 17). Remove the spreader.

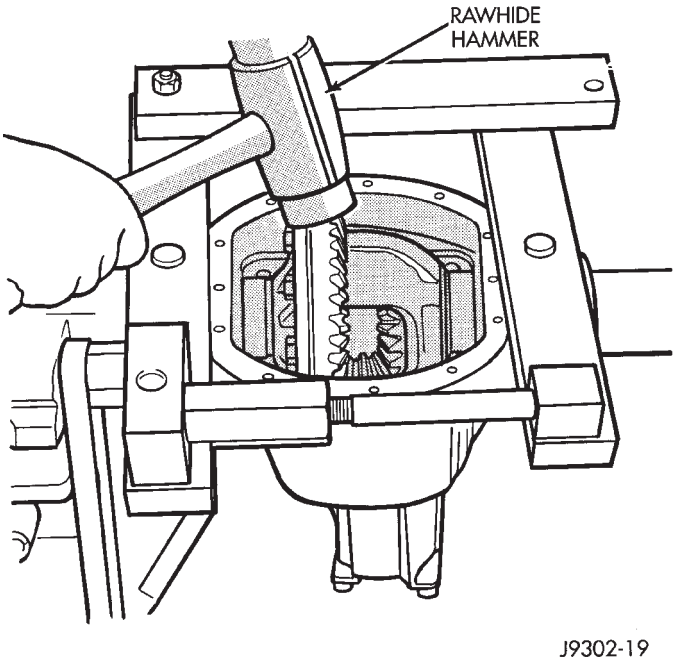

Fig. 17 Differential Installation

(6) Install the bearing caps at their original locations (Fig. 18). Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.) torque.

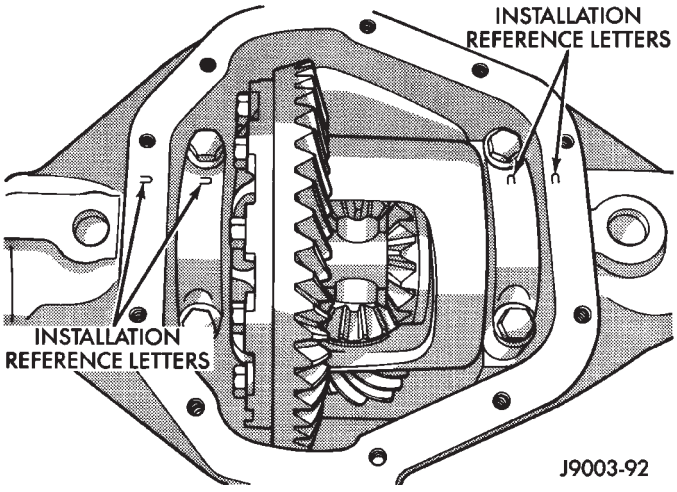

Fig. 18 Differential Bearing Cap Reference Letters

INNER AXLE SHAFT OIL SEAL REPLACEMENT

SELECT–TRAC

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

(2) Install oil seals with Discs 6764 and Turnbuckle D–112A (Fig. 19). Tighten tool until disc bottoms in housing.

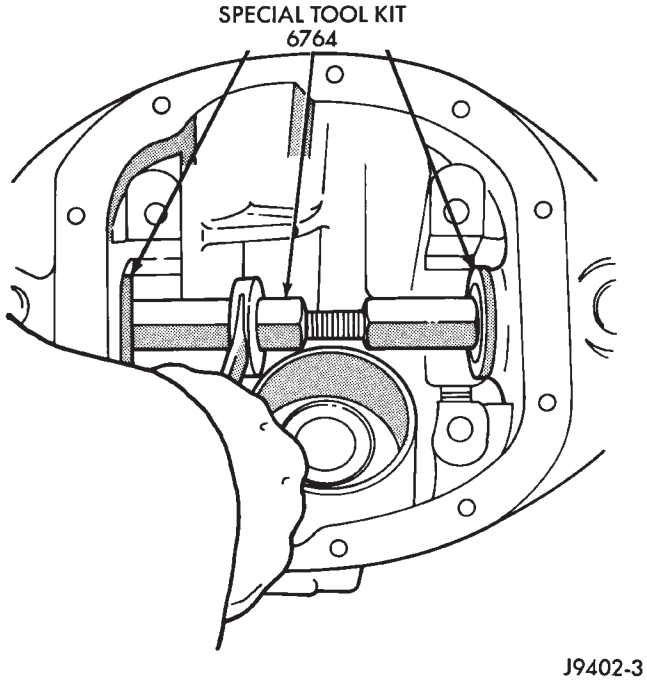

Fig. 19 Axle Seal Installation

PINION GEAR

REMOVAL/DISASSEMBLY

(1) Remove the pinion yoke nut and washer. Use Remover C–452 and Wrench C–3281 to remove the pinion yoke (Fig. 20).

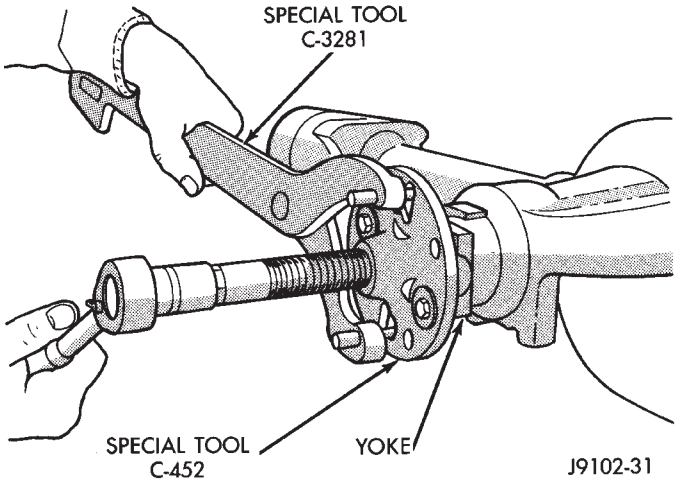

Fig. 20 Pinion Yoke Removal

REMOVAL AND INSTALLATION (Continued)

(2) Remove the pinion gear seal with a slide hammer or pry out with bar.

(3) Drive out pinion gear from housing with rawhide or plastic hammer (Fig. 21). Catch the pinion with your hand to prevent it from falling and being damaged. **This will damage the front bearing rollers and bearing cup. The front bearing and cup must be replaced.** Remove preload shims and record the thickness.

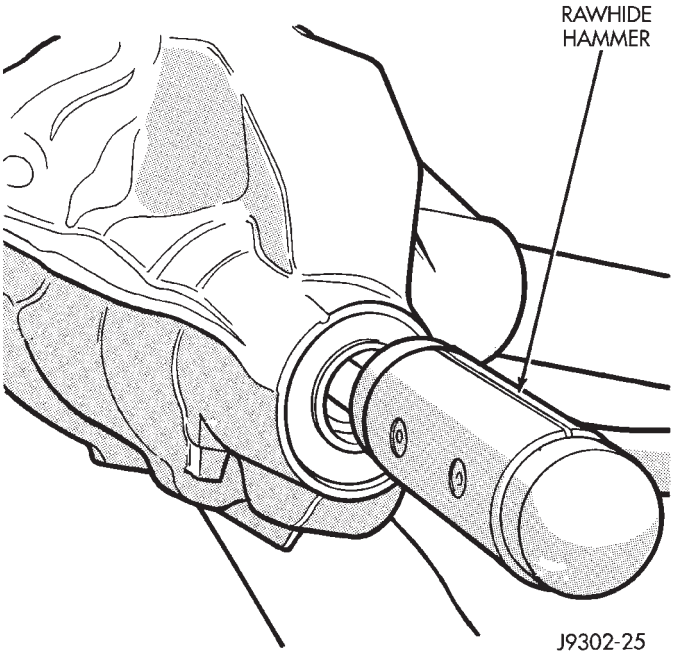

Fig. 21 Remove Pinion Gear

(4) Remove front bearing from housing.

(5) Remove the front pinion bearing cup and seal with Remover D–147 and Handle C–4171 (Fig. 22).

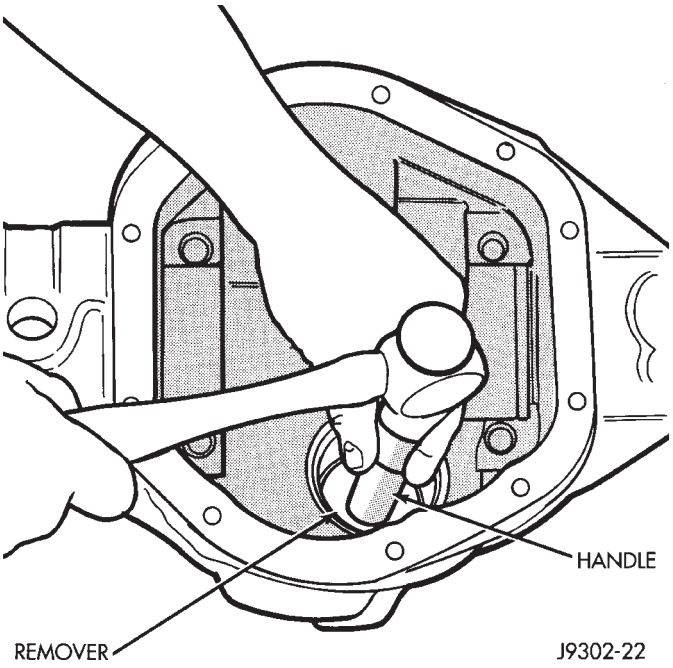

Fig. 22 Front Bearing Cup Removal

(6) Remove the rear bearing cup from housing (Fig. 23). Use Remover D– 149 and Handle C–4171.

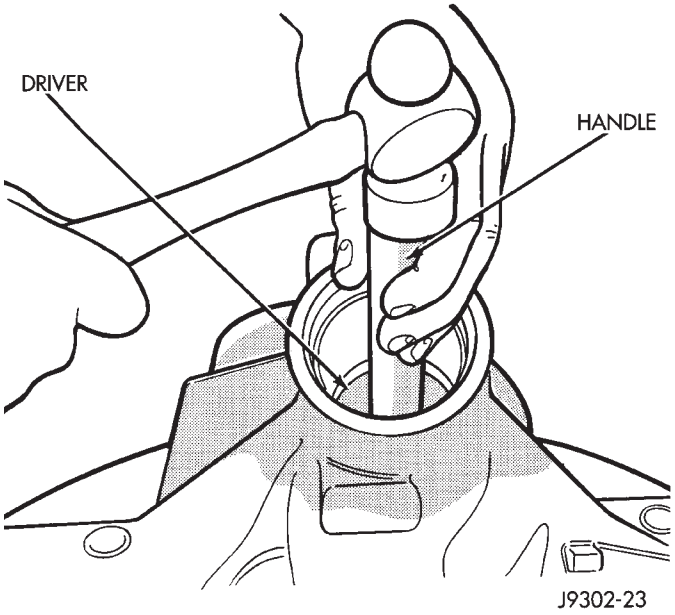

Fig. 23 Rear Bearing Cup Removal

(7) Remove the inner bearing from the pinion with Puller C–293PA and Adapter C–293–39 (Fig. 24).

Place adapter rings so they do not damage the bearing cage.

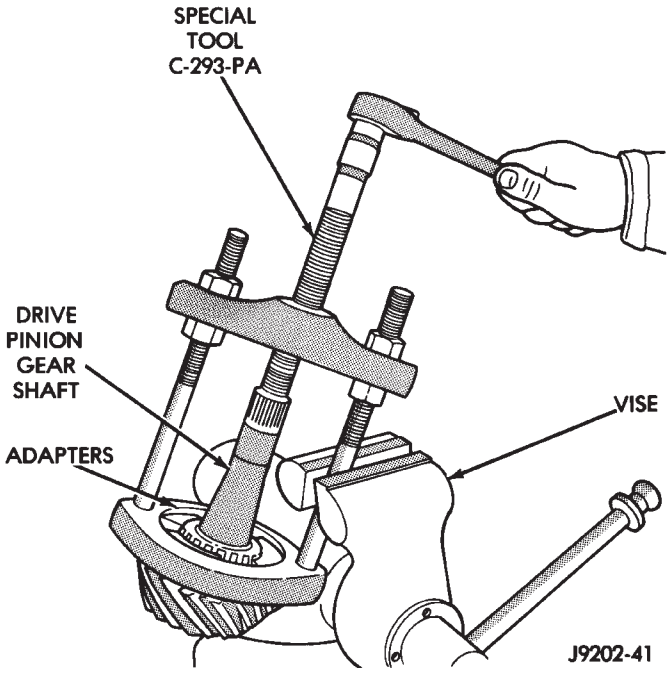

Fig. 24 Inner Bearing Removal

(8) Remove the oil slinger from the pinion gear shaft. **Save the slinger it is used as select shim for pinion depth.**

REMOVAL AND INSTALLATION (Continued)

PINION GEAR ASSEMBLY/INSTALLATION

(1) Remove rear pinion bearing cup with Remover D–149 and Handle C– 4171. Place shims (and baffle if equipped) in the pinion gear rear bearing bore. Install the bearing cup with Installer D–146 and Driver Handle C– 4171. Ensure cup is correctly seated.

(2) Install rear bearing and oil slinger on pinion gear with Installer W–262 until completely seated (Fig. 25).

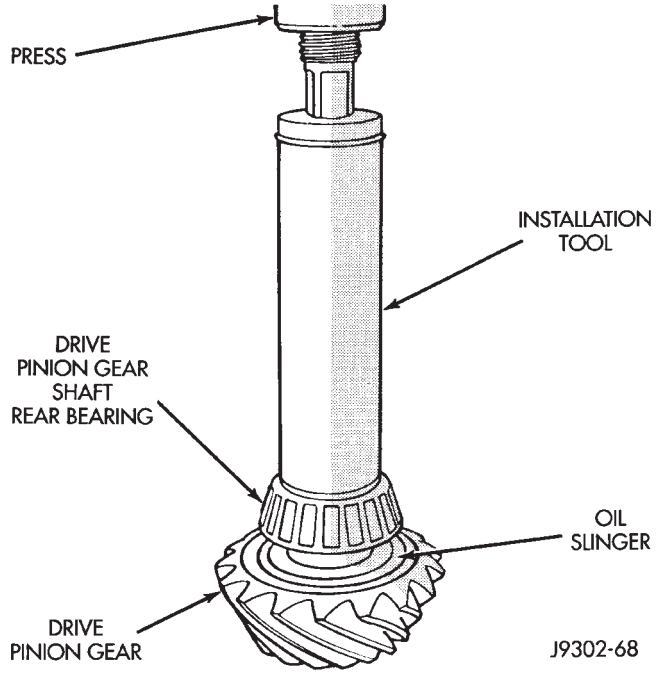

Fig. 25 Pinion Rear Bearing Installation

(3) Assemble preload shims onto pinion shaft.

(4) Install pinion front bearing cone into cup and end yoke thrust washer.

(5) Apply a light coat of gear lubricant on lip of new pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 26).

(6) Install pinion gear into differential housing.

(7) Install yoke with Installer W–162D and Holder 6958 (Fig. 27).

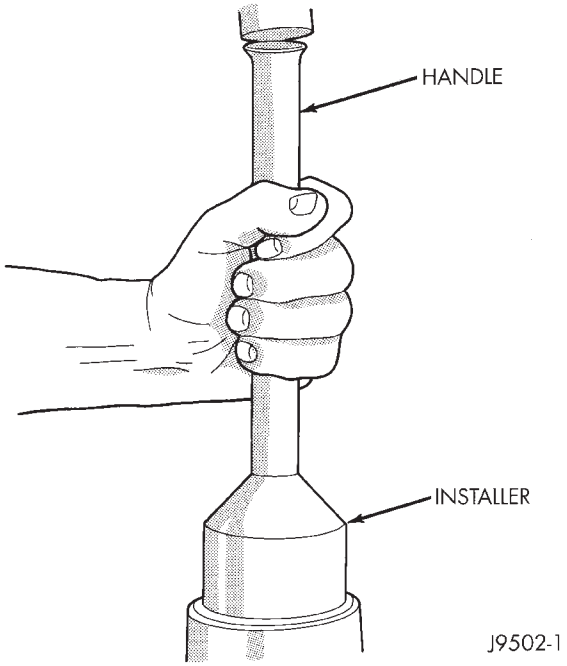

Fig. 26 Pinion Seal Installation

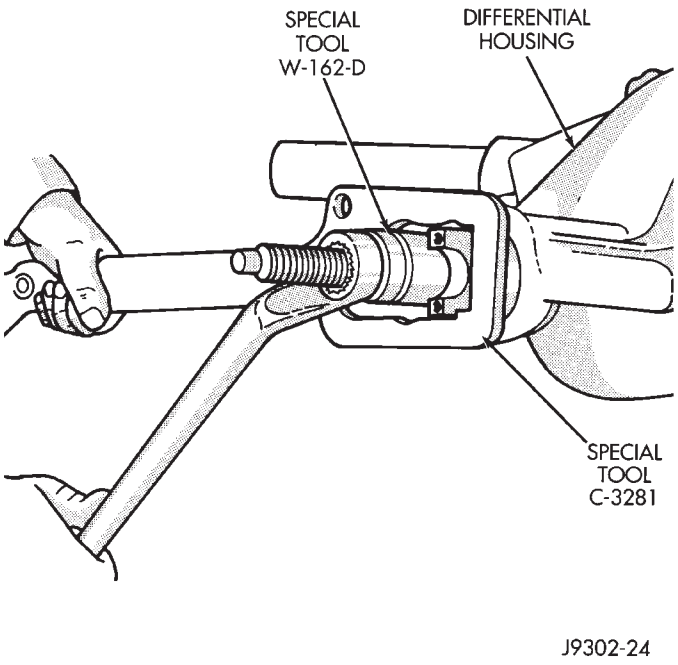

Fig. 27 Pinion Yoke Installation

REMOVAL AND INSTALLATION (Continued)

(8) Install the yoke washer and **old nut** on the pinion gear. Use Holder 6958 to retain the yoke (Fig. 28). Tighten nut to 216– 352 N·m (160–260 ft. lbs.) torque.

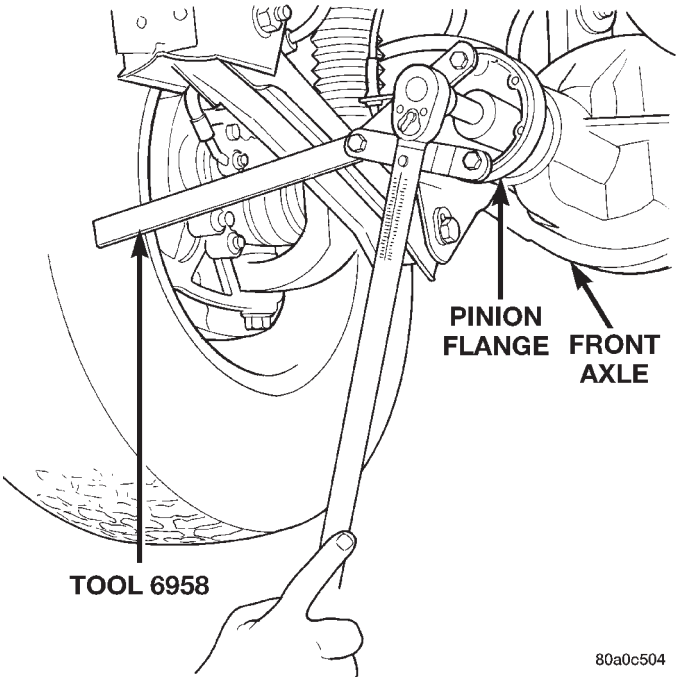

Fig. 28 Tightening Pinion Nut

(9) Check bearing rotating torque with an inch pound torque wrench (Fig. 29). If torque to rotate is within specification, remove old nut and install new nut. The torque necessary to rotate the pinion gear should be;

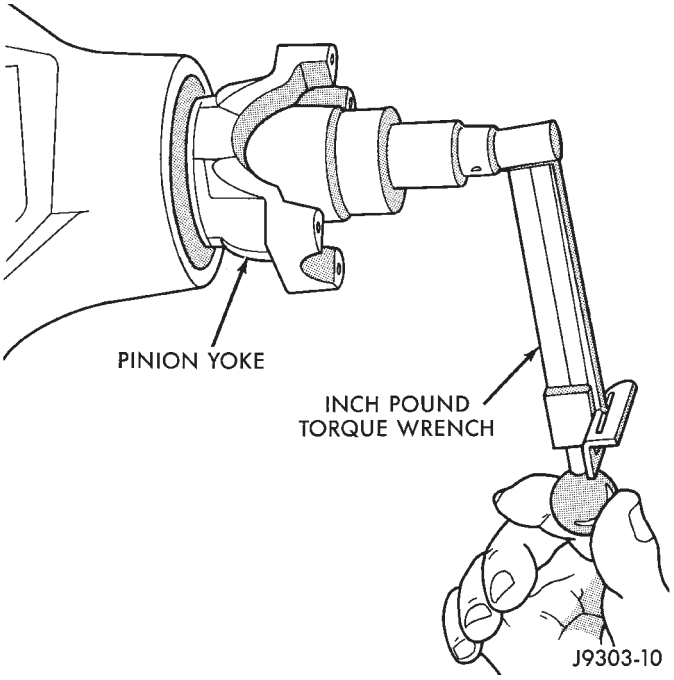

Fig. 29 Check Pinion Gear Torque

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

(10) If rotating torque is high, add shims to decrease torque. If rotating torque is low, remove shims to increase torque.

DISASSEMBLY AND ASSEMBLY

AXLE SHAFT—CARDAN U-JOINT

DISASSEMBLY

Single cardan U–joints 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.

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

(1) Remove the bearing cap retaining snap rings (Fig. 30).

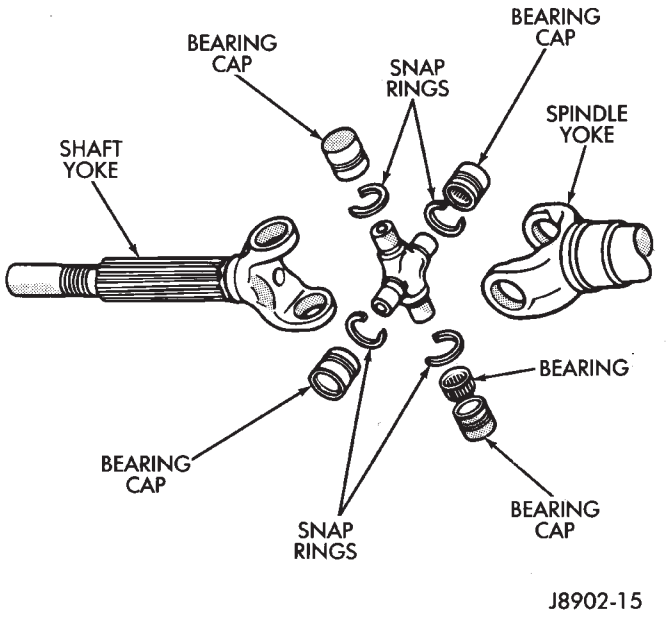

Fig. 30 Axle Shaft Outer U–Joint

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

(2) Locate a socket that 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. Locate a socket that is smaller in diameter than the bearing cap. Place the socket (driver) against the opposite bearing cap. Position the yoke with the sockets in a vise (Fig. 31).

(3) Compress the vise jaws to force the bearing cap into the larger socket (receiver).

DISASSEMBLY AND ASSEMBLY (Continued)

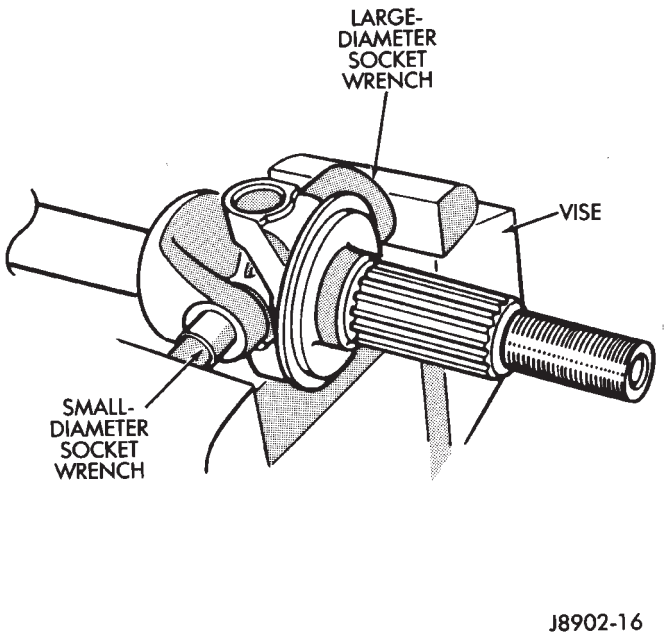

Fig. 31 Yoke Bearing Cap Removal

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

(5) Repeat the above procedure for the remaining bearing cap.

(6) Remove the remaining bearing cap, bearings, seals and spider from the propeller shaft yoke.

ASSEMBLY

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

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

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

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

(5) Install the bearing cap retaining clips.

(6) Install the axle shaft, refer to Hub Bearing and Axle Shaft installation.

DIFFERENTIAL

DISASSEMBLY

(1) Remove the bearings from the differential case with Press C–293PA, Plug C–293–3, Adapter C–293–39 (Fig. 32).

Place adapter rings so they do not damage the bearing cage.

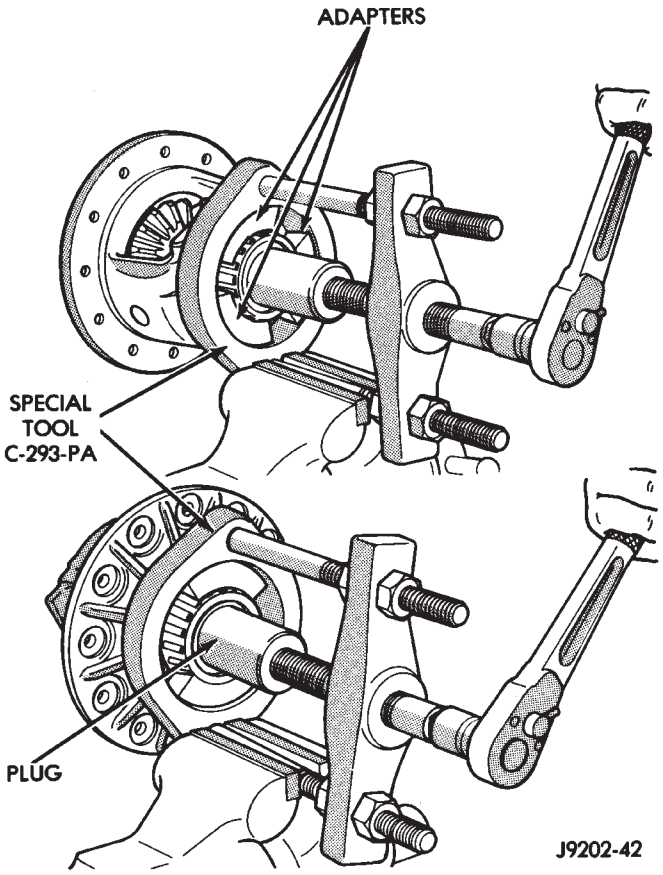

Fig. 32 Differential Bearing Removal

(2) Remove bearing shims from case hubs and mark them (with hub identity) for assembly reference. Record the thickness of the shims.

(3) Clamp the differential case in a vise equipped with soft jaws. Remove and **discard** the ring gear bolts. Tap the ring gear with a rawhide or plastic mallet and remove (Fig. 33).

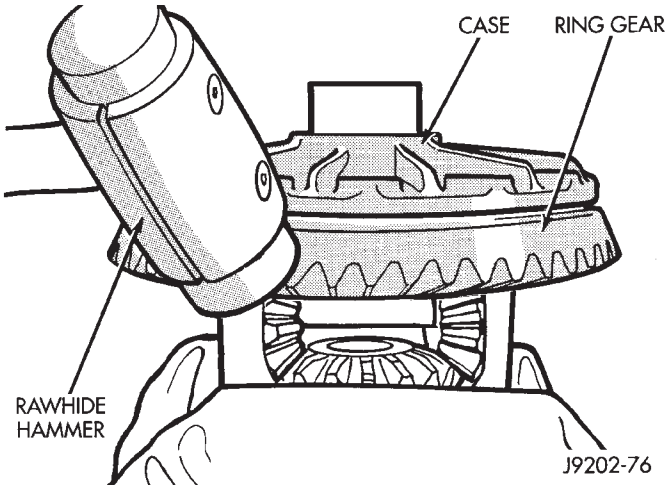

Fig. 33 Ring Gear Removal

DISASSEMBLY AND ASSEMBLY (Continued)

(4) Use a drift to remove the pinion gear mate shaft lock pin (Fig. 34).

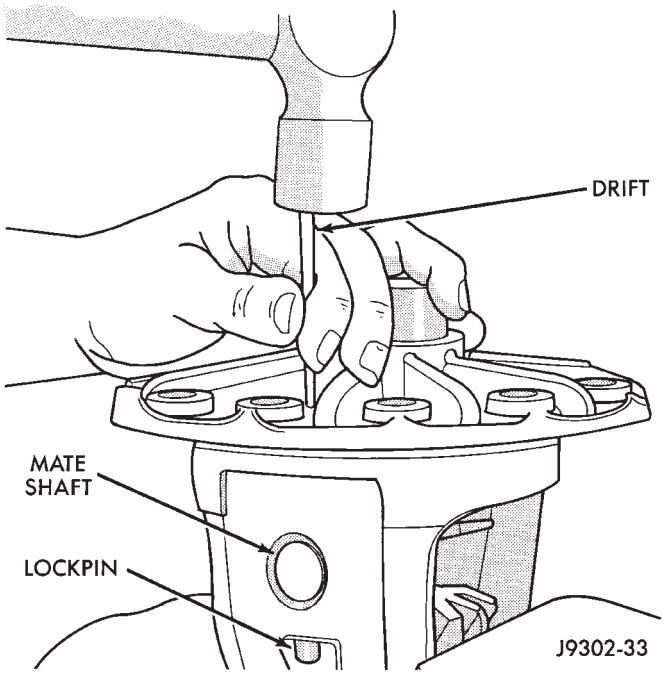

Fig. 34 Mate Shaft Lock Pin Removal

(5) Remove the mate shaft with a drift and hammer (Fig. 35).

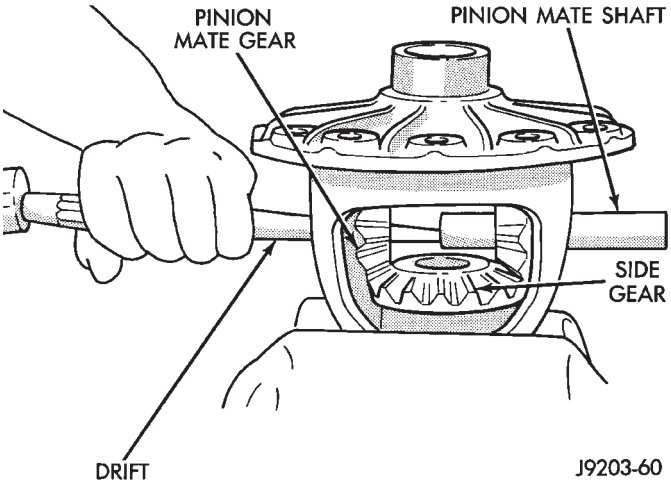

Fig. 35 Mate Shaft Removal

(6) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 36).

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

(8) Remove the case from the vise.

DIFFERENTIAL ASSEMBLY

(1) Install the following components in the differential case (Fig. 37).

- Differential side gears and thrust washers
- Pinion gears and thrust washers

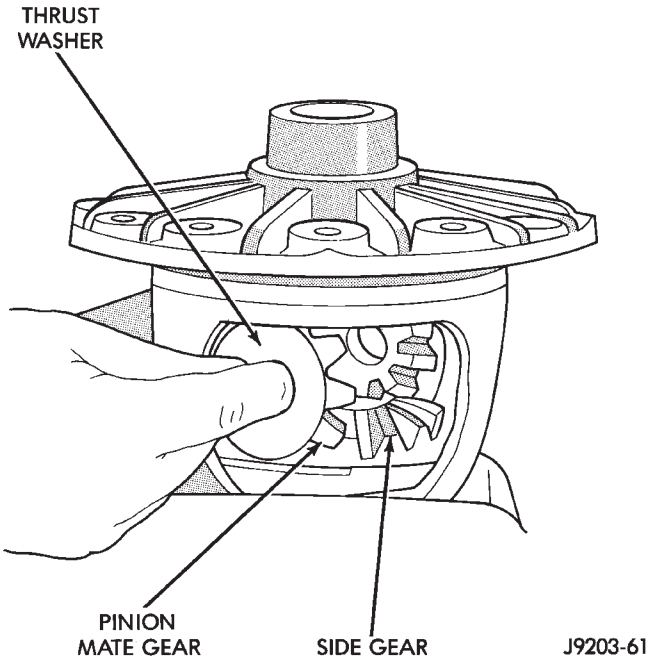

Fig. 36 Pinion Mate Gear Removal

- Pinion gear mate shaft (align holes in shaft and case)

(2) Install and seat the locking roll pin in the differential case and mate shaft with a punch and hammer (Fig. 37). Peen metal part of case over pin in two places 180 degrees apart.

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.

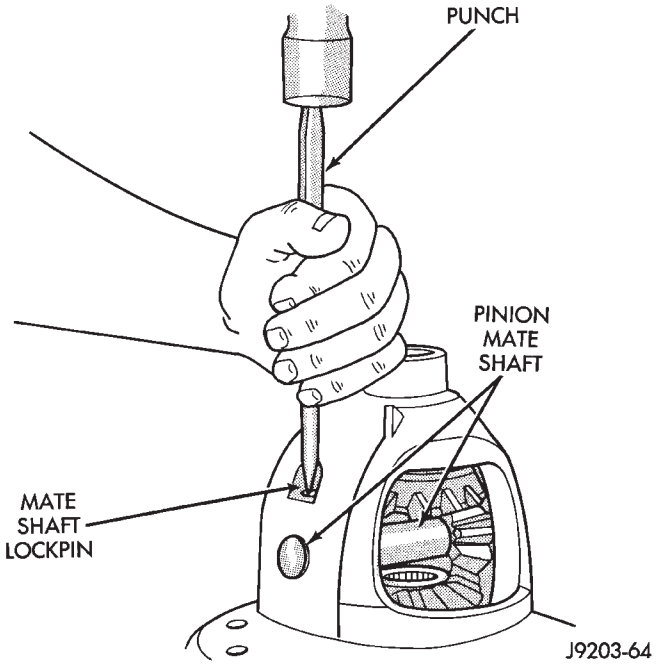

Fig. 37 Mate Shaft Pin Installation

DISASSEMBLY AND ASSEMBLY (Continued)

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

(4) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 38).

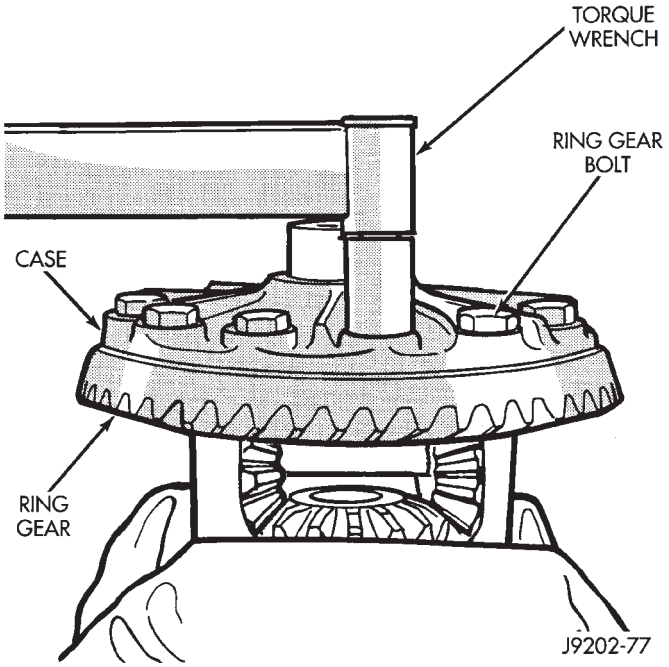

Fig. 38 Ring Gear Bolt Installation

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

DIFFERENTIAL AND PINION MEASUREMENT

DIFFERENTIAL ZERO END PLAY MEASUREMENT

(1) Place Master Differential Bearing D–134 (D–348) on the case hubs (Fig. 39). Install differential case into housing.

(2) Install a pilot stud at the right side of housing. Attach Dial Indicator to the pilot stud. Load indicator plunger against the back of the ring gear (Fig. 40).

(3) Insert a small pry bar between the bearing cap and left side of differential case. Pry the case as far as possible to right side (Fig. 40). Zero the dial indicator pointer.

(4) Pry the case to left side and **record** the travel distance.

The measurement above is the shim thickness necessary for case zero end–play. The total thickness will be determined during the ring gear backlash adjustment.

(5) Remove indicator, pilot stud and differential case from housing.

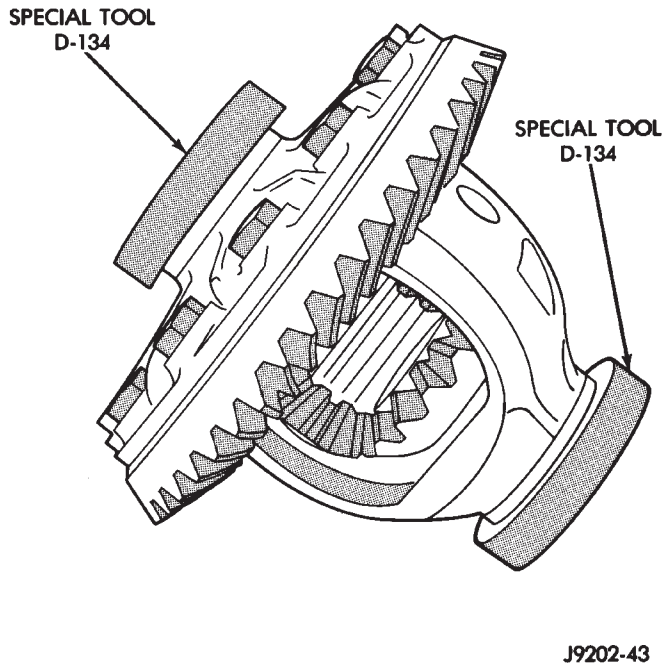

Fig. 39 Master Bearing Tools On Hubs

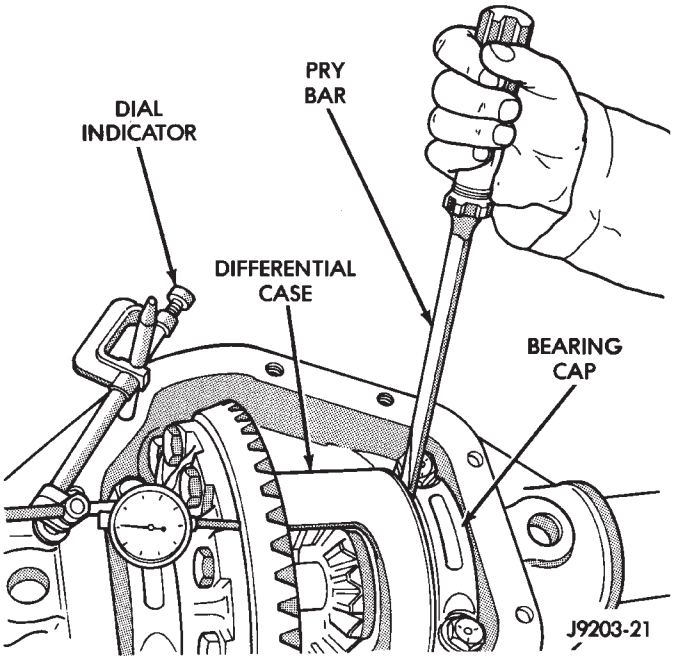

Fig. 40 Differential Case End Play Measurement

PINION GEAR DEPTH MEASUREMENT

Pinion gear depth measurement is necessary when;

- Axle housing or differential case is replaced
- Pinion select shim pack is unknown
- Ring and pinion gears are replaced

Measurements are done with pinion cups and pinion bearings installed in housing. Take measurements with Pinion Gauge Set 6774, Pinion Block 6733 and Dial Indicator C–3339 (Fig. 41).

DISASSEMBLY AND ASSEMBLY (Continued)

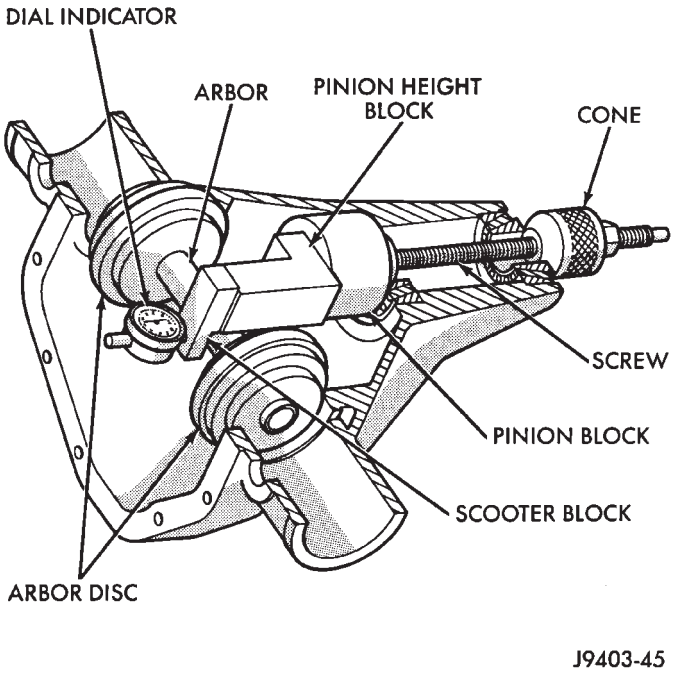

Fig. 41 Pinion Gear Depth Gauge Tools

(1) Install the pinion front bearing cup with Installer D–144 and Handle C–4171 (Fig. 42).

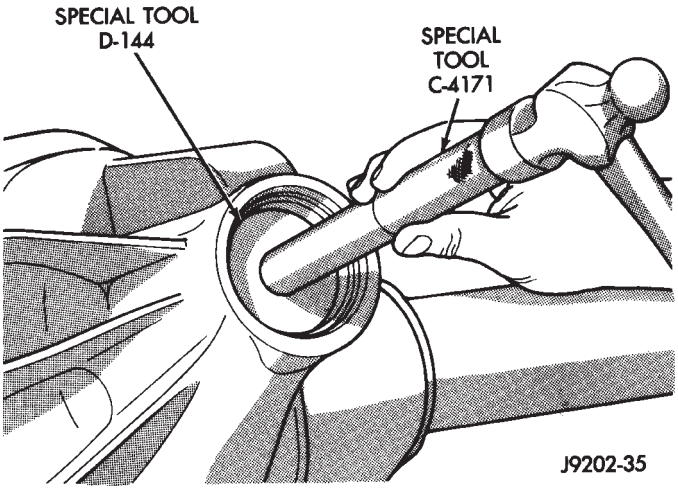

Fig. 42 Pinion Front Bearing Cup Installation

(2) Install the bearing cup with Installer D–146 and Driver Handle C– 4171 (Fig. 43). Ensure cup is correctly seated.

(3) Assemble Pinion Gauge Set, Pinion Block and pinion bearings. Install assembly into differential pinion gear bore and hand tighten cone (Fig. 44).

(4) Place Arbor Disc 6732 on Arbor D–115–3 and position in the bearing cradles (Fig. 45). Install differential bearing caps on Arbor Discs and tighten caps snug only.

Arbor Discs have different steps to fit other axle sizes. Pick correct size step for axle being serviced.

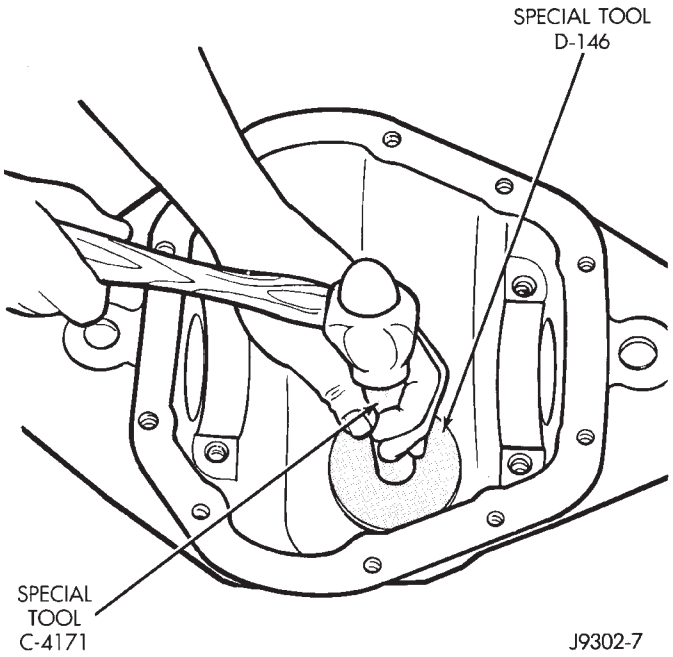

Fig. 43 Pinion Rear Bearing Cup Installation

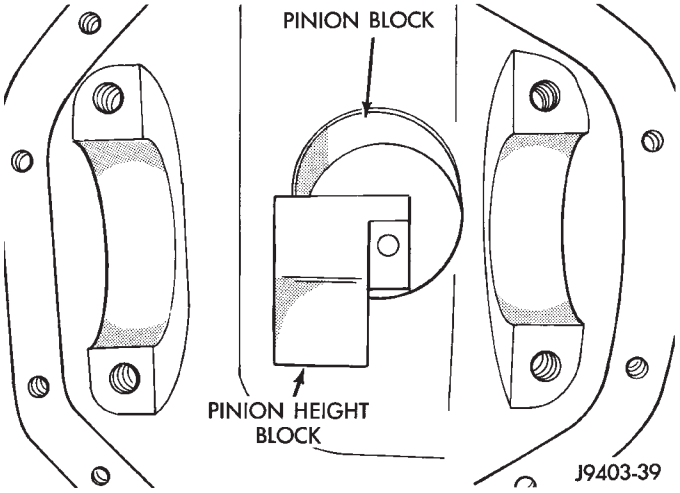

Fig. 44 Pinion Height Block

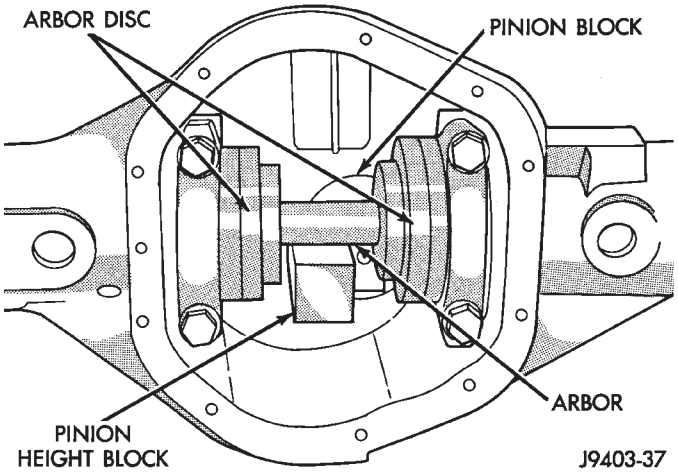

Fig. 45 Gauge Tools In Housing

DISASSEMBLY AND ASSEMBLY (Continued)

(5) Firmly place Scooter Block and Dial Indicator on pinion height block tool and zero the dial indicator pointer.

(6) Slide the Scooter Block across the arbor while observing indicator (Fig. 46). Record the longest travel distance, whether inward (–) or outward (+), indicated by the pointer.

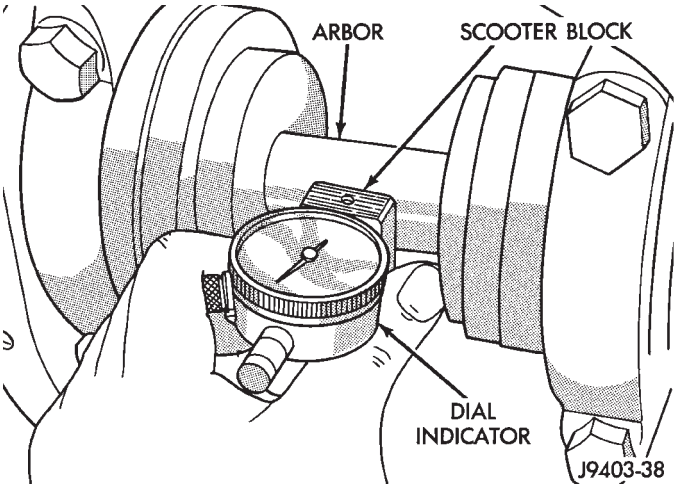

Fig. 46 Pinion Depth Measurement

The plunger travel, plus or minus the variance etched in the gear, is the required thickness for the depth shims.

(7) Measure the thickness of each depth shim with a micrometer. Combine the shims necessary for total required shim pack thickness. **Include oil slinger or baffle thickness with the total shim pack thickness.**

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

DIFFERENTIAL SHIM PACK MEASUREMENT AND ADJUSTMENT

(1) Place Master Differential Bearing D–134 (D–348) on the case hubs.

(2) Install a pilot stud at the left side of housing. Attach Dial Indicator to housing. Load the indicator plunger against the back of the ring gear (Fig. 47). Ensure ring and pinion gear teeth are tightly meshed. Zero the indicator.

(3) Insert a small pry bar between the bearing cap and left side of differential case. Pry the case as far as possible to right side (Fig. 47). Zero the dial indicator pointer.

(4) Repeat the measurement several times to check consistency. Record the travel distance.

The measurement above shows shim thickness necessary to eliminate ring gear backlash. Subtract this thickness from case zero end–play shim thickness (Fig. 48). The shims must be placed at the ring gear side between the case and bearing.

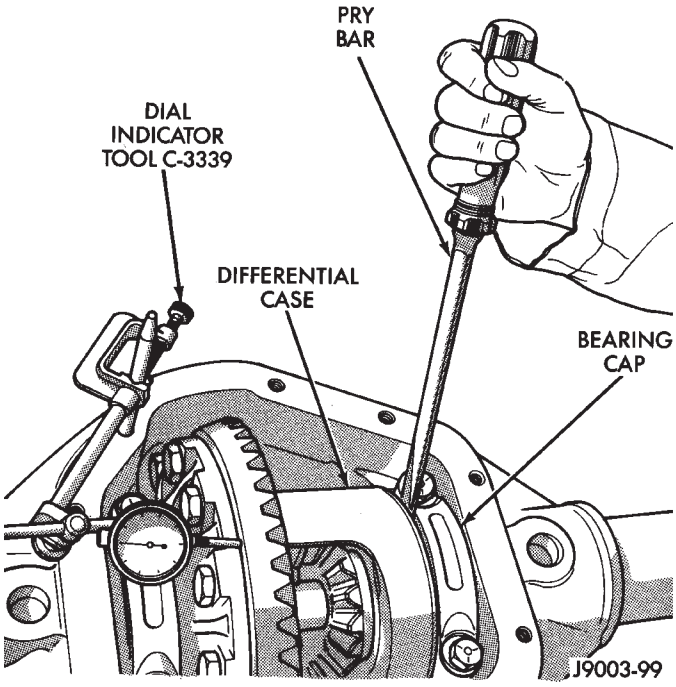

Fig. 47 Shim Pack Measurement

For Example:

Indicator Reading	LESS PINION	0.085 in.	total
Indicator Reading	WITH PINION	0.055 in.	total
BALANCE OF SHIM PACK		0.030 in.	total

Place BALANCE of shims at opposite side of ring gear

ADD an additional 0.015 in. shim to opposite side of ring gear for bearing preload

Ring Gear Side (Flange Side)	0.055 in.
Opposite Side	0.030 in.
Opposite Side Preload	0.015 in.
Total Opposite Side	0.045 in.

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Fig. 48 Shim Pack Calculations

(5) Remove indicator and pilot stud.

(6) Remove the differential case from housing.

(7) Remove the master bearing tools from the differential case hubs.

(8) Position the backlash shims (with determined thickness) on case hub (ring gear side). Install bear-

DISASSEMBLY AND ASSEMBLY (Continued)

ing on the hub with Bearing Installer C– 3716A and Driver Handle C–4171 (Fig. 49).

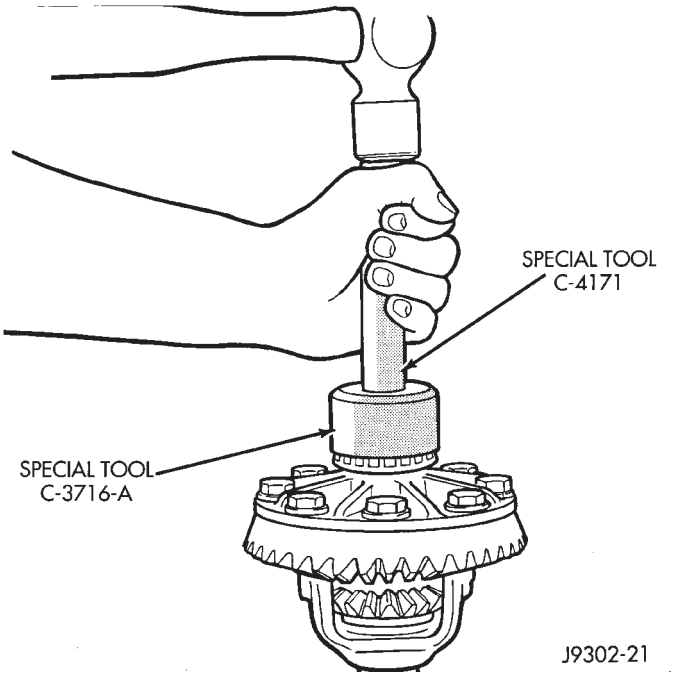


Fig. 49 Differential Bearing Installation

(9) Position the remaining zero end–play shims on hub at opposite side of case. Include an additional 0.015 in. (0.38 mm) thick shim on this hub. This will provide the required differential bearing preload.

(10) Install bearings on hubs with Installer C–3716A and Handle C–4171 (Fig. 49).

(11) Match each bearing cup with bearing (original). Install the cups on the bearings.

BACKLASH AND CONTACT PATTERN ANALYSIS

(1) Rotate assembly several revolutions to seat bearings. Measure backlash at three equally spaced locations around the perimeter of the ring gear with a dial indicator (Fig. 50).

The ring gear backlash must be within 0.12 – 0.20 mm (0.005 – 0.008 inch). It cannot vary more than 0.05 mm (0.002 inch) between the points checked.

If backlash must be adjusted, transfer shims from one side of carrier to the other side. Adjust the backlash accordingly (Fig. 51). **DO NOT INCREASE THE TOTAL SHIM PACK THICKNESS, EXCESSIVE BEARING PRELOAD AND DAMAGE WILL OCCUR.**

If the mesh and backlash steps have been followed, good gear teeth contact patterns should exist.

The ring gear teeth contact patterns will show if the pinion gear depth is correct. It will also show if the ring gear backlash has been adjusted correctly. The backlash must be maintained within the specified limits until the correct tooth contact patterns are obtained.

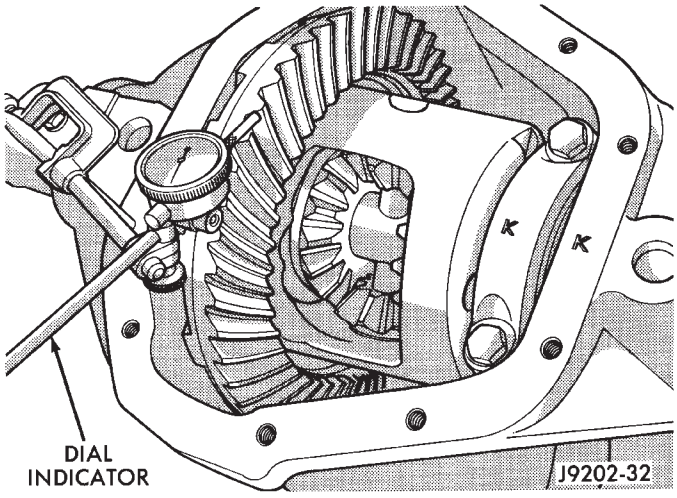


Fig. 50 Ring Gear Backlash Measurement

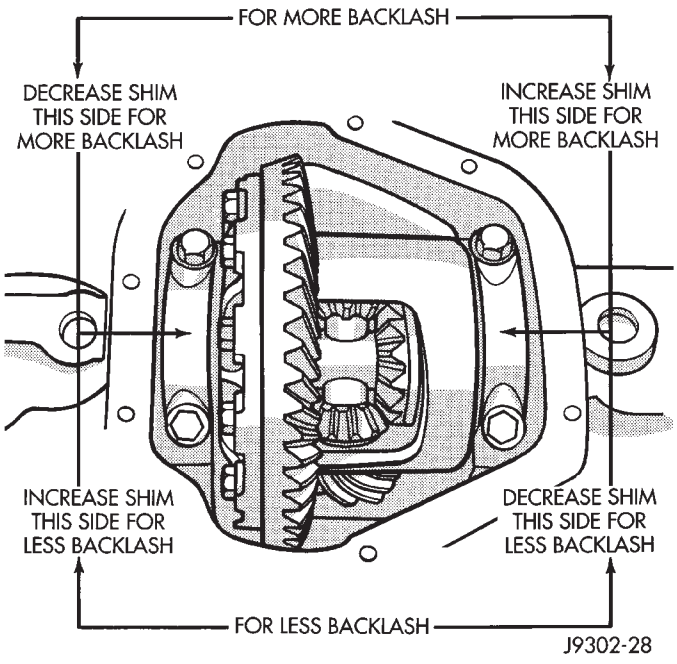


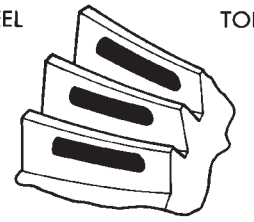
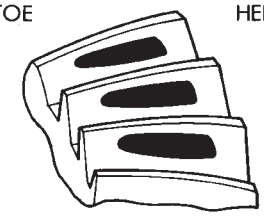
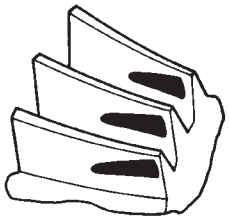
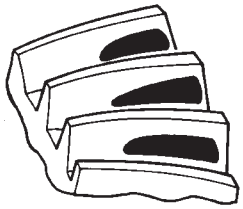
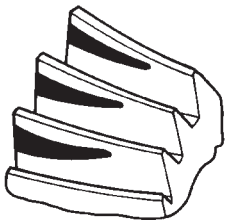
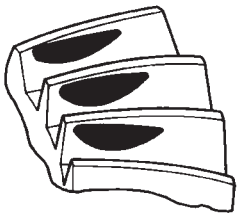
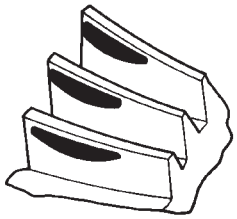
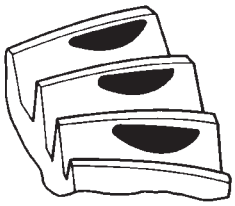
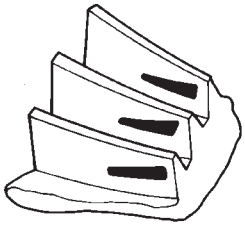
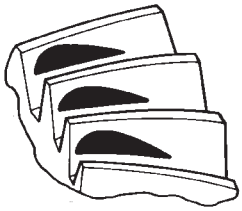
Fig. 51 Backlash Shim Adjustment

(2) Apply a thin coat of hydrated ferric oxide (yellow oxide of iron) to the drive and coast side of the ring gear teeth.

(3) Rotate the ring gear one complete revolution in both directions while a load is being applied. Insert a pry bar between the differential housing and the case flange to load gears. This will produce a distinct contact patterns on both the drive side and coast side of the ring gear teeth.

(4) Note patterns in compound. Refer to (Fig. 52) for interpretation of contact patterns and adjust accordingly.

DISASSEMBLY AND ASSEMBLY (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. 52 Gear Tooth Contact Patterns

DISASSEMBLY AND ASSEMBLY (Continued)

FINAL ASSEMBLY

(1) Install the axle shafts. Refer to Axle Shaft Installation in this Group.

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

Install the housing cover within 5 minutes after applying the sealant. If not installed the sealant must be removed and another bead applied.

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

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

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

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

CLEANING AND INSPECTION

CARDAN U-JOINT

(1) 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.

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

(3) Replace the complete U–joint if any of the components are defective.

DIFFERENTIAL

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 a matched sets only.**

Clean axle shaft tubes and oil channels with clean cloth.

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 or damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Worn or chipped teeth to ring and pinion gears.
- Damaged bolt threads to ring gear. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace the as necessary.

SPECIFICATIONS

FRONT AXLE—MODEL 30

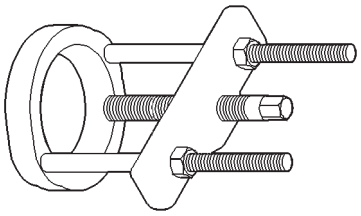
Axle Type	Hypoid
Lubricant	SAE Thermally Stable 80W–90
Lube Capacity	1.48 L (3.13 pts.)
Axle Ratio	3.07 3.55 3.73 4.10
Differential	
Side Gear Clearance	0.12–0.20 mm (0.005–0.008 in.)
Ring Gear	
Diameter	18.09 cm (7.125 in.)
Backlash	0–0.15 mm (0.005–0.008 in.)
Pinion Std. Depth	92.1 mm (3.625 in.)
Pinion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

TORQUE—MODEL 30 AXLE

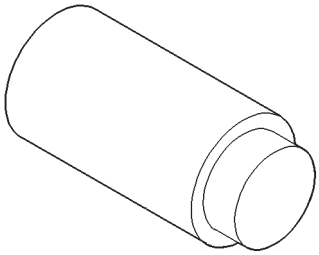
DESCRIPTION	TORQUE
Fill Hole Plug	34 N·m (25 ft. lbs.)
Diff. Cover Bolt	41 N·m (30 ft. lbs.)
Bearing Cap Bolt	61 N·m (45 ft. lbs.)
Ring Gear Bolt	95–122 N·m (70–90 ft. lbs.)
Shift Motor Bolt	11 N·m (8 ft. lbs.)
Axle Nut	237 N·m (175 ft. lbs.)
Wheel Brg. Bolt	102 N·m (75 ft. lbs.)
Lower Ball Stud	108 N·m (80 ft. lbs.)
Upper Ball Stud	101 N·m (75 ft. lbs.)
ABS Sensor Bolt	11 N·m (96 in. lbs.)

SPECIAL TOOLS

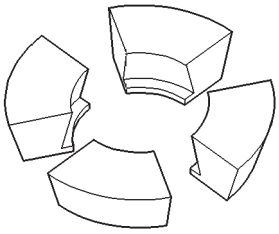
FRONT AXLE—MODEL 30



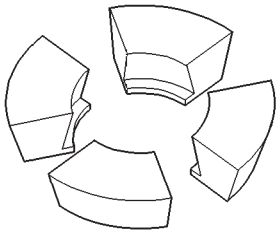
Puller—C-293-PA



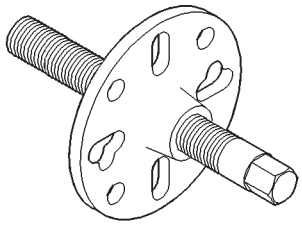
Extension—C293–3



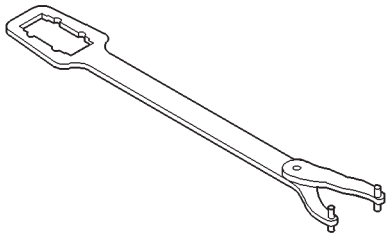
Adapter—C-293-39



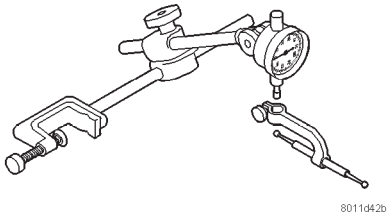
Adapter—C-293-48



Puller—C-452

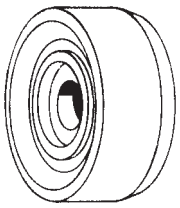


Wrench—C-3281

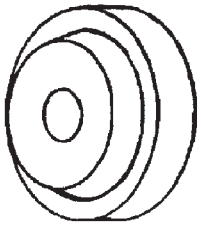


Dial Indicator—C-3339

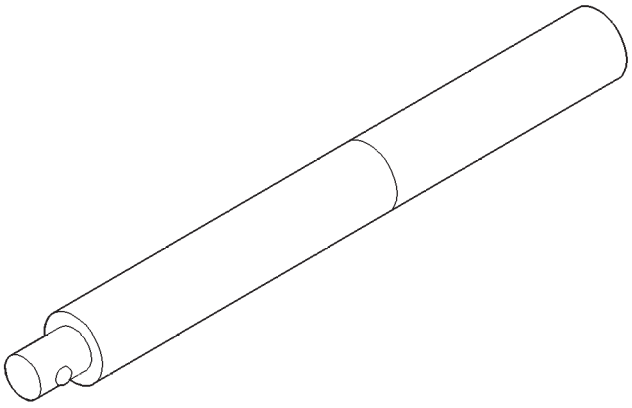
SPECIAL TOOLS (Continued)



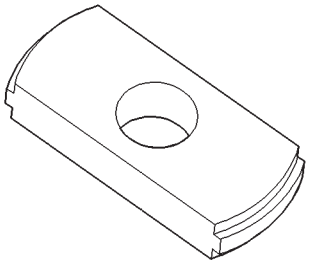
Driver—C-3716-A



Installer—D-146



Handle—C-4171



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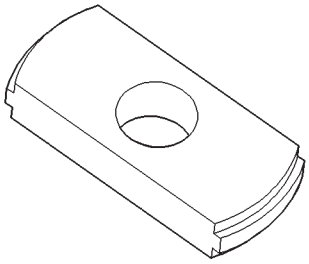

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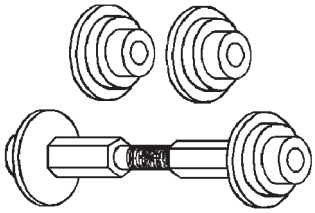

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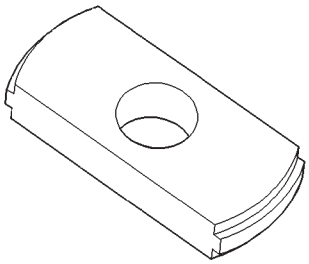

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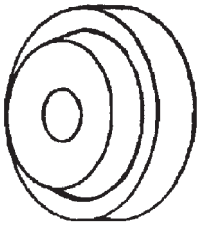

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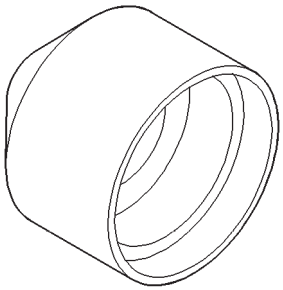
SPECIAL TOOLS (Continued)



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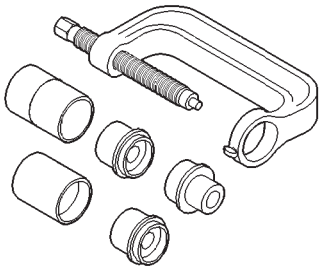

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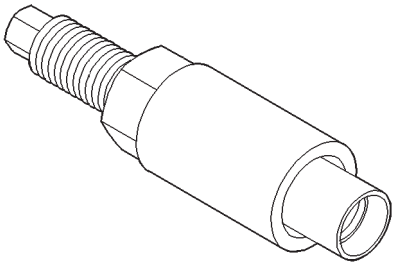
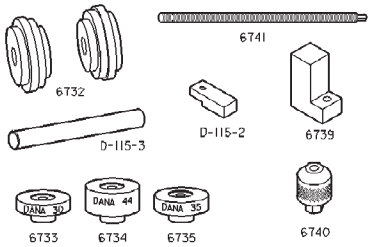


Installer—W-162-D



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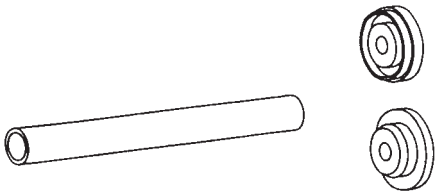

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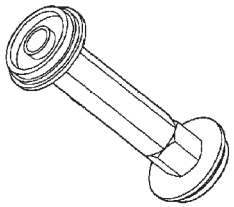

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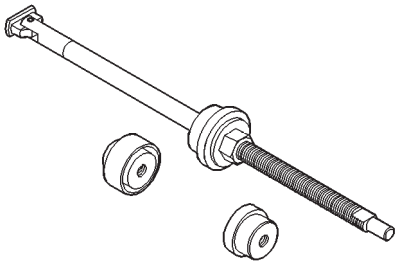
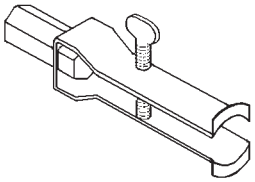


Remover/Installer—6288



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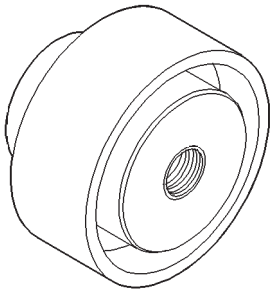
SPECIAL TOOLS (Continued)



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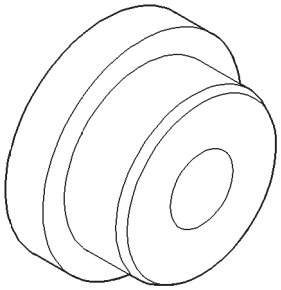

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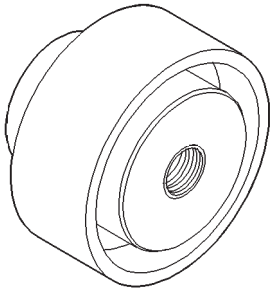

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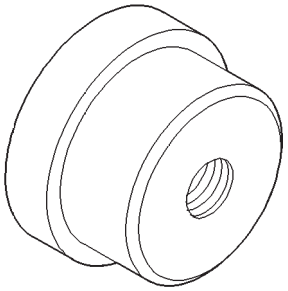

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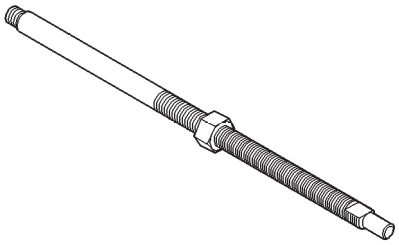

Screw, Forcing—7918

MODEL 35 AXLE

INDEX

GENERAL INFORMATION

GENERAL INFORMATION

The Model 35 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 housing, hypoid gear design has the center line of the pinion set below the center line 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.

Axles may be equipped with drum or disc brakes. The axles that are equipped with ABS brake have a tone ring pressed on the axle shaft. Use care when removing axle shafts as NOT to damage the tone wheel or the sensor.

The Model 35 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover. Build date identification codes are stamped on the axle shaft tube cover side.

The differential case is a one–piece design. The differential pinion mate shaft is retained with a threaded roll pin. Differential bearing preload and ring gear backlash is adjusted by the use of spacer shims. Pinion bearing preload is set and maintained by the use of a collapsible spacer.

For complete drive axle assembly removal and installation refer to Drive Axle Assembly Replacement in this Group.

LUBRICANT SPECIFICATIONS

Multi–purpose, hypoid gear lubricant should be used. The lubricant should have MIL–L–2105C and API GL 5 quality specifications. Mopar Hypoid Gear Lubricant conforms to both of these specifications.

- Lubricant is a thermally stable SAE 80W–90 gear lubricant.
- Lubricant for axle with Trailer Tow is SAE 75W–140 SYNTHETIC gear lubricant.
- Trac–Lok differentials add 4 oz. of friction modifier.
- Lubricant capacity is 1.66 L (3.50 pts.).

GENERAL INFORMATION (Continued)

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

DESCRIPTION AND OPERATION

AXLES

The Model 35 axle is standard for XJ vehicles. The 8 1/4 axle is available in XJ vehicles without ABS brakes.

The Model 35 and 8 1/4 axle housings has a cast iron center section. Two steel axle shaft tubes are pressed into the differential housing and welded.

It is not necessary to remove the axle from the vehicle for service. A removable differential cover is provided for routine vehicle service. If the differential housing is damaged, the complete axle assembly can be removed.

For complete drive axle assembly removal and installation refer to Drive Axle Assembly Replacement in this Group.

IDENTIFICATION

Model 35 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the left side of the housing cover (Fig. 1). Build date identification codes on axles are stamped on the axle shaft tube cover side. The Model 35 axle has a flat housing cover gasket flange at the outer edge (Fig. 1).

The 8 1/4 axle has the build date code and gear ratio tags attached to the housing cover (Fig. 2). The housing cover gasket has a rolled gasket flange at the outer edge (Fig. 2).

- The Model 35 axle has shaft tubes that are 2.625 inch (66.67 mm) in diameter.
- The 8 1/4 axle has axle shaft tubes that are 3.0–inch (76.2 mm) in diameter.

STANDARD DIFFERENTIAL OPERATION

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

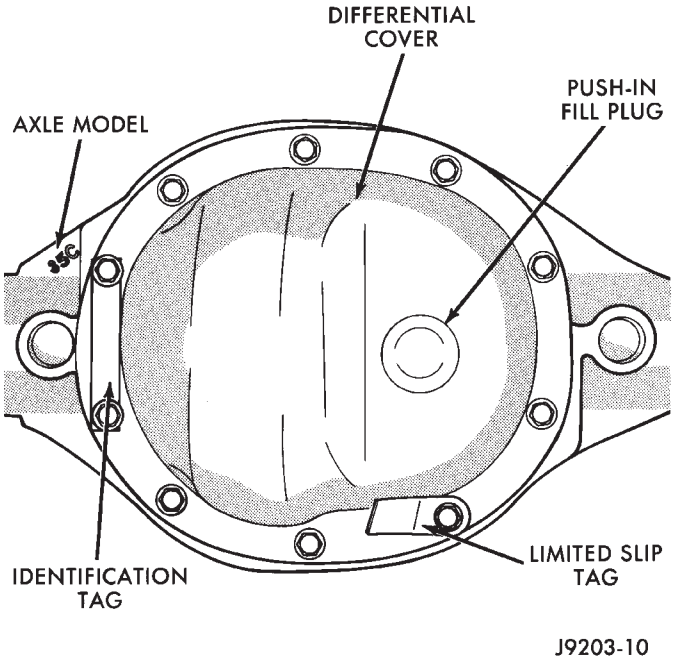

Fig. 1 Model 35 Differential Cover

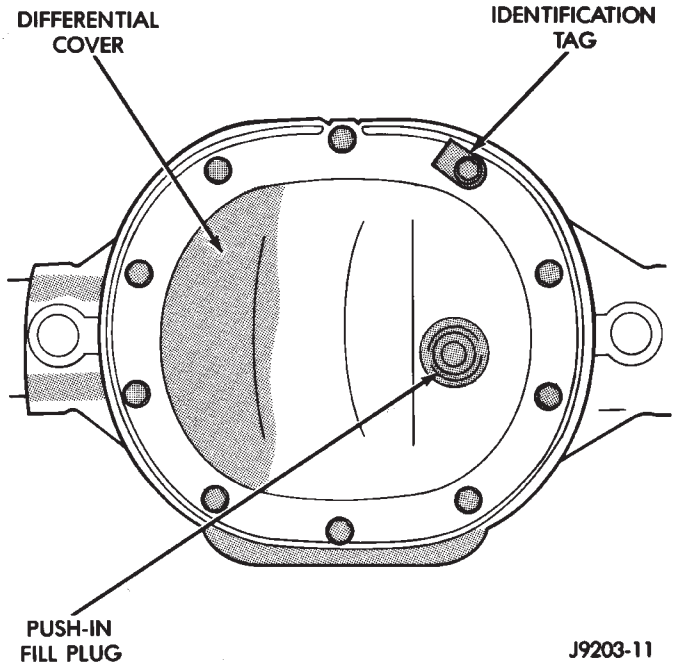

Fig. 2 Differential Cover–8 1/4

- 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).

DESCRIPTION AND OPERATION (Continued)

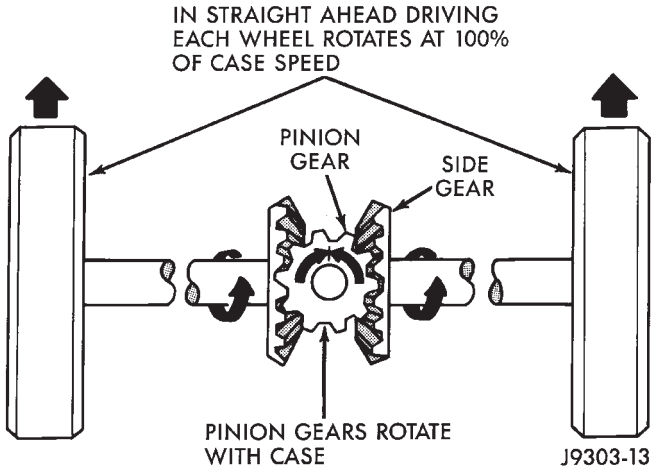

Fig. 3 Differential Operation—Straight Ahead Driving

When turning corners, the outside wheel must travel a greater distance than the inside wheel in order to complete a turn. The difference must be compensated for, to prevent the tires from scuffing and skidding through turns. To accomplish this, the differential allows the axle shafts to turn at unequal speeds (Fig. 4). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

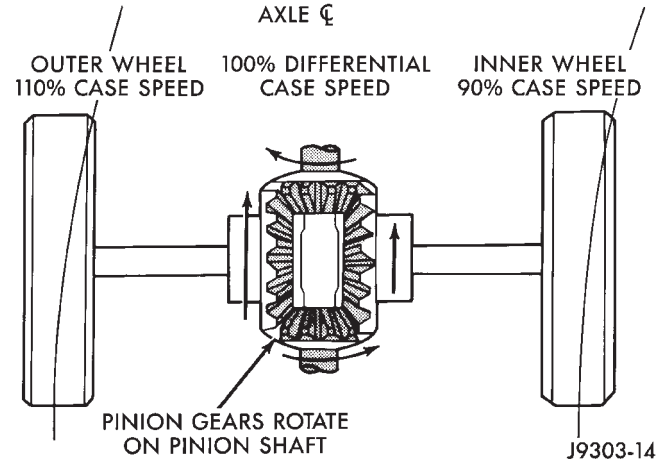

Fig. 4 Differential Operation—On Turns

TRAC-LOK OPERATION

In a conventional differential, the torque applied to the ring gear is transmitted to the axle shafts through the differential gears. During normal operation, the torque transmitted to each wheel is equal at all times. However, 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. The clutch packs contain multiple disc. The clutch will have radial grooves on the plates, and concentric grooves on the discs or bonded fiber material that is smooth appearance.

In operation, the Trac-lok clutches are engaged by two concurrent forces. The first being preload force exerted through Belleville spring washers contained in the clutch packs. The second from separating forces generated by the side gears as torque is applied through the ring gear (Fig. 5).

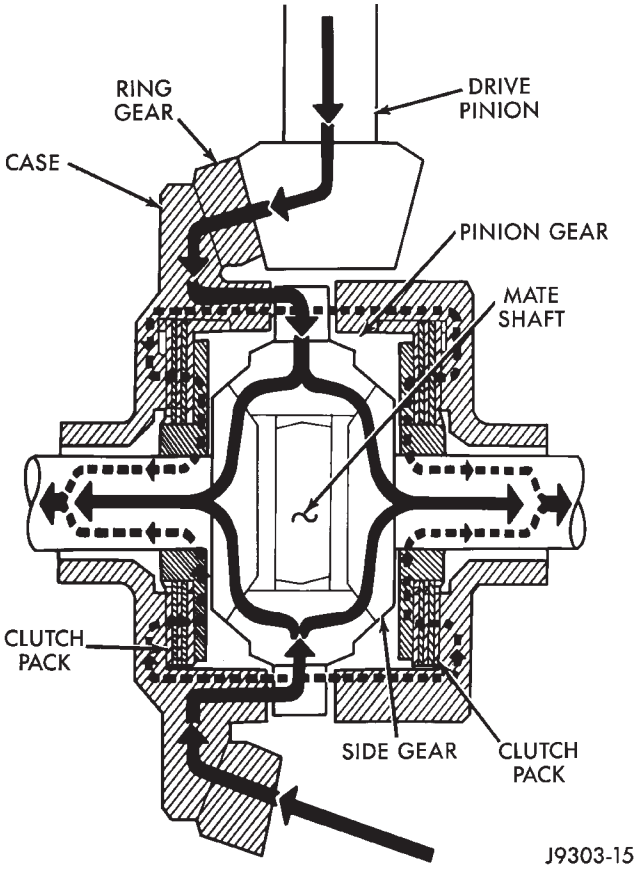

Fig. 5 Trac-lok Limited Slip Differential Operation

The Trac-lok design provides differential action needed for turning corners and for driving straight ahead. However, 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 (to tight)

When serviced, the bearings must be cleaned thoroughly. They should be dried with lint–free shop towels.

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

Insufficient lubrication is usually the result of a housing cover leak. It can also be from worn axle shaft or pinion gear seals. Check for cracks or porous areas in the housing or tubes.

Using the wrong lubricant will cause overheating and gear failure. Gear tooth cracking and bearing galling are indicators of this.

Axle component breakage is most often the result of:

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

Overloading occurs when towing heavier than recommended loads. Component breakage can occur when the wheels are spun excessively. Incorrect lubricant quantity contributes to breakage. Loose differential components can also cause breakage.

Incorrect bearing preload or gear backlash will not result in component breakage. Misadjustment will produce enough noise to cause service repair before a failure occurs. If a misadjustment condition is not corrected, component failure can result.

Excessive bearing preload may not be noisy. This condition will cause high temperature which can result in bearing failure.

GEAR AND BEARING NOISE

GEAR NOISE

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

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, or gear damage can cause noise changes.

Differential side and pinion gears can be checked by turning the vehicle. They usually do not cause noise in straight–ahead driving. The side gears are loaded during vehicle turns. If noise does occur during vehicle turns, the side or pinion gears could be worn or damaged. 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 pinion rear bearing is the source of the noise. If the bearing noise is heard during a coast, front bearing is the source.

Worn, damaged differential bearings usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing. 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
- Worn, out–of–balance wheels
- Loose wheel lug nuts
- Worn U–joint
- Loose spring U–bolts
- Loose/broken springs

DIAGNOSIS AND TESTING (Continued)

- Damaged axle shaft bearings
- Loose pinion gear nut
- Excessive pinion yoke run out
- Bent axle shaft

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 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.

REAR AXLE ALIGNMENT

MEASUREMENT

The following procedure can be used to determine if abnormal rear tire tread wear is the result of a bent or deformed rear axle shaft.

(1) Raise both rear wheels off the surface with a frame contact hoist.

(2) Attach a one–inch long piece of masking tape at the center of each tire tread for use as reference marks.

(3) Rotate the rear wheels until both reference marks face the front of the vehicle. Measure the distance between the outside edges of the two pieces of tape. Record this measurement as the front of tire (FTR) measurement.

(4) Rotate the rear wheels until both reference marks face the rear of the vehicle. Measure the distance between the outside edges of the two pieces of tape. Record this measurement as the rear of tire (RTR) measurement.

(5) Subtract the (RTR) measurement from the (FTR) measurement to obtain the amount of wheel toe. The acceptable rear wheel toe–in position is 1/16 in. (1.6 mm) to 3/16 inch (4.8 mm) toe–out.

(6) Rotate the rear wheels until the reference marks are facing downward. Measure the distance between the outside edges of the two pieces of tape. Record this measurement as the bottom of tire (BTR) measurement.

(7) Average the (FTR) and the (RTR) distance measurements. Subtract the (BTR) measurement from this average distance to obtain the camber. The acceptable amount of camber is 1/16 inch to 3/32 inch (1.6 to 2.4 mm).

(FTR + RTR) DIVIDED BY 2 (TWO) MINUS BTR EQUALS CAMBER

If the (BTR) distance measurement is less than the average FTR and RTR distance measurement, the camber will be positive (+). If the (BTR) distance measurement is greater than the average FTR and RTR distance, the camber will be negative (–).

If the toe position or camber is not acceptable, a bent or deformed rear axle shaft is most likely the cause.

LIMITED SLIP DIFFERENTIAL

Under normal traction conditions, engine torque is divided evenly. With low–traction surfaces, engine torque is transferred to the wheel with the most tire traction. When diagnosing a limited–slip differential the wheel with the least traction can continue spinning.

The most common problem is a chatter noise when turning corners. Check for incorrect or contaminated lubricant. Replace the gear lubricant if necessary.

- With Trac–Lok™ differentials add a container of Mopar Trac–Lok Lubricant.

This will correct the condition in most instances. If the chatter persists, clutch damage could have occurred.

After changing the lubricant, drive the vehicle and make 10 to 12 slow, figure–eight turns. This maneuver will pump lubricant through the clutches.

DIAGNOSIS AND TESTING (Continued)

SERVICE DIAGNOSIS

SERVICE 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)

SERVICE DIAGNOSIS (CONT'D)

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 NOISE DIAGNOSIS

If a noise occurs when turning corners, the most probable cause is incorrect or contaminated lubricant. Before removing the 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 Trac-lok Lubricant (friction modifier) should be added after repair service or a lubricant change.

Vehicles with a limited slip differential 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 or pop** noise complaint.

Refer to Group 0, Lubrication and Maintenance for additional information.

DIFFERENTIAL TEST

WARNING: WHEN SERVICING VEHICLES WITH A LIMITED SLIP DIFFERENTIAL DO NOT USE THE ENGINE TO TURN THE AXLE AND WHEELS. BOTH REAR WHEELS MUST BE RAISED AND THE VEHICLE SUPPORTED. A LIMITED SLIP AXLE CAN EXERT ENOUGH FORCE (IF ONE WHEEL IS IN CONTACT WITH THE 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) Engine off, transmission in neutral, and parking brake off.

(2) Place blocks in front and rear of both front wheels.

(3) Raise one rear wheel until it is completely off the ground.

(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).

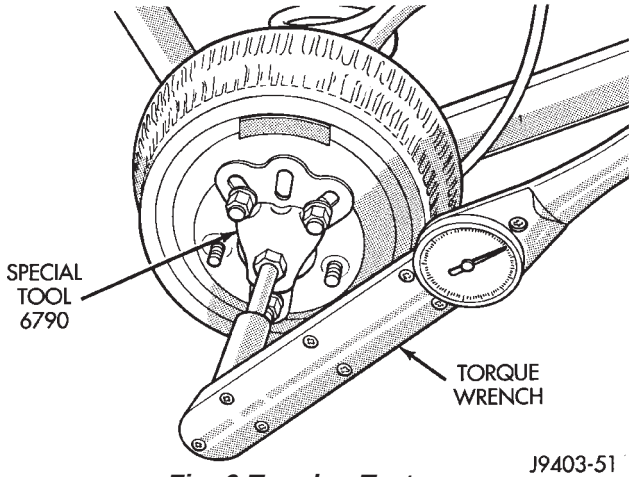

Fig. 6 Trac-loc Test

(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 service.

SERVICE PROCEDURES

LUBRICANT CHANGE

The gear lubricant will drain quicker if the vehicle has been recently driven.

(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.

(6) Apply a bead of Mopar Silicone Rubber Sealant to the housing cover (Fig. 7). **Allow the sealant to cure for a few minutes.**

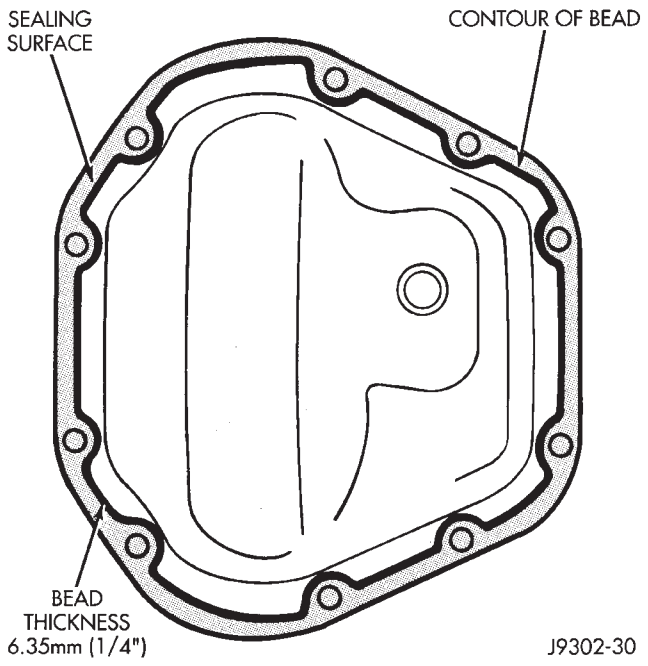

Fig. 7 Typical Housing Cover With Sealant

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

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

(8) Refill differential with Mopar Hypoid Gear Lubricant to bottom of the fill plug hole.

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

SERVICE PROCEDURES (Continued)

Trac–Lok Differentials; A container of Trac–Lok lubricant (friction modifier) should be added after repair service or a lubricant change.

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

Limited slip differential 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

DRIVE AXLE ASSEMBLY REPLACEMENT VEHICLES

REMOVAL

(1) Raise the vehicle and position support stands under the frame rails slightly in front the springs.

(2) Remove the rear wheels.

(3) Mark the drive shaft yoke and axle pinion yoke for alignment reference. Disconnect the drive shaft from the axle.

(4) Disconnect the axle vent hose.

(5) Disconnect the parking brake cables at the equalizer or backing plate.

(6) Disconnect the shock absorbers from the axle brackets.

(7) Disconnect the brake hose at the axle junction block. **Do not disconnect the wheel cylinder tubing fittings.**

(8) If equipped, disconnect ABS wiring connections at the axle.

(9) Support the axle with a hydraulic jack under the differential.

(10) Remove the spring U–bolts from the plate brackets.

(11) Lower the jack enough to remove the axle.

INSTALLATION

CAUTION: Suspension components with rubber bushings should be tightened with the vehicle at normal height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur. Rubber bushings must never be lubricated.

(1) Support the axle on a hydraulic jack under the differential. Position the axle under the vehicle.

(2) Raise the axle and align the spring center bolts with the locating holes in the axle pads and plate brackets.

(3) Install the spring U–bolts through the plate brackets and tighten to 70 N·m (52 ft. lbs.) torque.

(4) Install ABS wiring connections (if equipped) at the axle.

(5) Connect the brake hose at the axle junction block.

(6) Install the shock absorbers to the axle brackets and tighten to 62 N·m (46 ft. lbs.) torque.

(7) Connect the parking brake cables at the equalizer or backing plate.

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

(9) Align the reference marks and connect the drive shaft to the axle yoke. Tighten the U–joint clamp bolts to 19 N·m (14 ft. lbs.) torque.

(10) Check differential lubricant and add if necessary.

(11) Install the wheel and tire.

(12) Bleed the brakes.

(13) Remove the supports and lower the vehicle.

PINION SHAFT SEAL REPLACEMENT

REMOVAL

(1) Raise and support the vehicle.

(2) Remove wheel and tire assemblies.

(3) Mark the drive shaft yoke and pinion yoke for installation alignment reference.

(4) Remove the drive shaft from the yoke.

(5) Rotate the pinion gear three or four times. **Make sure brakes are not dragging during this procedure.**

(6) Measure the amount of torque (in Newton–meters or inch–pounds) necessary to rotate the pinion gear with a torque wrench. Note the torque for installation reference. **It must be known to properly adjust the pinion gear bearing preload torque after seal installation.**

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

(8) Mark the positions of the yoke and pinion gear for installation alignment reference.

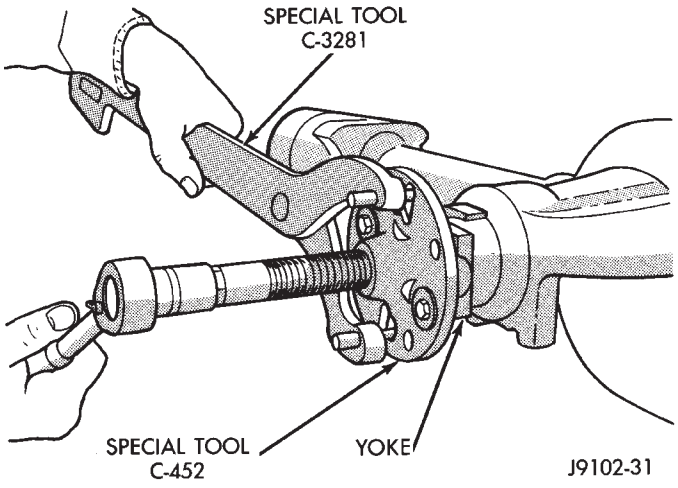

Fig. 8 Pinion Yoke Removal

REMOVAL AND INSTALLATION (Continued)

(9) Use Remover 7794A and slide hammer to remove the pinion gear seal (Fig. 9).

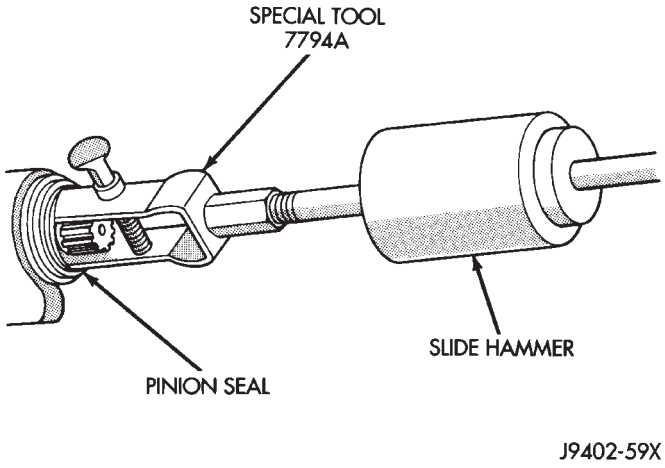

Fig. 9 Seal Removal

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 10).

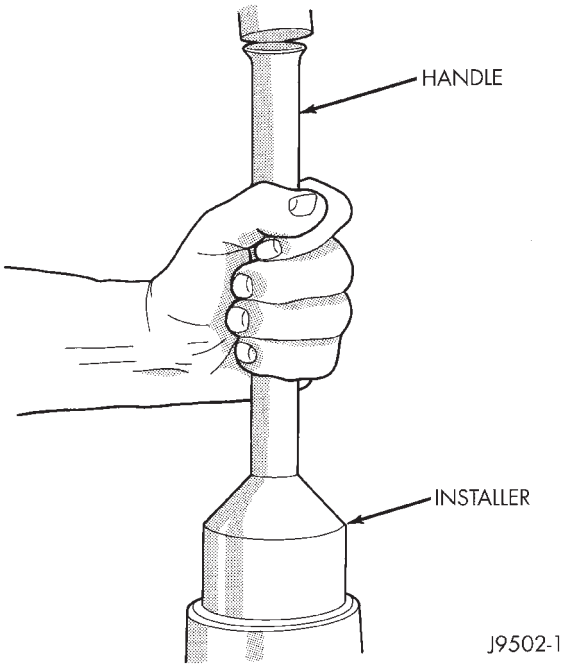

Fig. 10 Pinion Seal Installation

(2) Align the installation reference marks and install yoke on the pinion gear with Installer W–162D.

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

CAUTION: Exercise care during the bearing preload torque adjustment. Do not over–tighten, or loosen and then re–tighten the nut. Do not exceed the bearing preload torque. The collapsible preload spacer on the shaft will have to be replaced. The bearing preload torque will be re–adjusted afterward.

(4) Install a socket and inch–pound torque wrench on the pinion nut.

(5) Rotate the shaft with the torque wrench and note the torque.

The required preload torque is equal to the amount recorded during removal plus an additional 0.56 N·m (5 in. lbs.).

(6) Use Flange Wrench C–3281 to retain the yoke and shaft (Fig. 11). Tighten the shaft nut in very small increments.

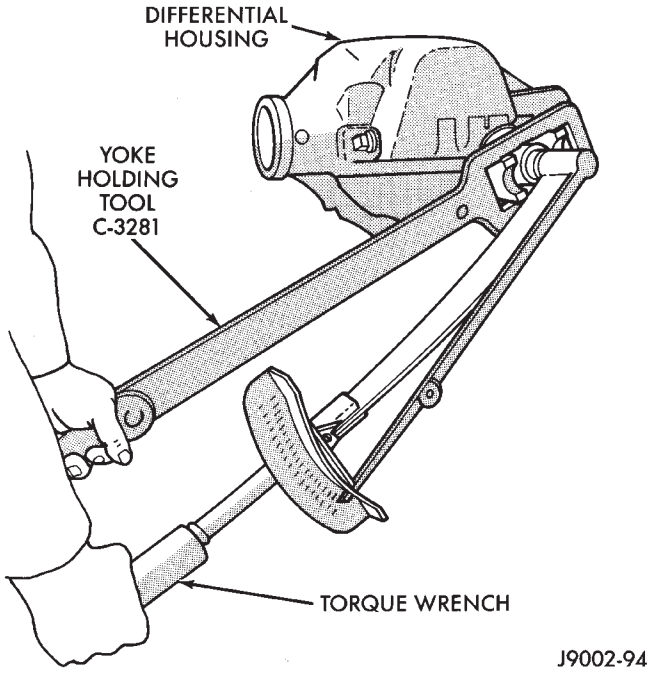

Fig. 11 Tightening Pinion Shaft Nut

(7) Continue tightening the shaft nut in small increments until the correct bearing preload torque is attained.

(8) Align the installation reference marks and attach the drive shaft to the yoke.

(9) Add API grade GL 5 hypoid gear lubricant to the differential housing, if necessary.

(10) Install wheel and tire assemblies.

(11) Lower the vehicle.

REMOVAL AND INSTALLATION (Continued)

AXLE SHAFT

REMOVAL

(1) Raise and support the vehicle.
(2) Remove the wheel and tire.
(3) Remove the brake drum.
(4) Clean all the foreign material from housing cover area.
(5) Loosen the housing cover bolts. Drain the lubricant from the housing and the axle shaft tubes. Remove the housing cover.
(6) Rotate the differential case so that the pinion mate gear shaft lock screw is accessible. Remove the lock screw and the pinion mate gear shaft from the case (Fig. 12).

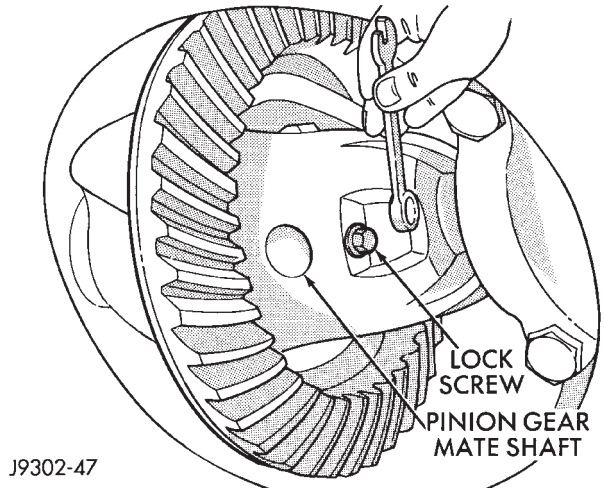

Fig. 12 Mate Shaft Lock Screw

(7) Force the axle shaft in toward the center of the vehicle. Remove the axle shaft C–clip lock from the axle shaft (Fig. 13).

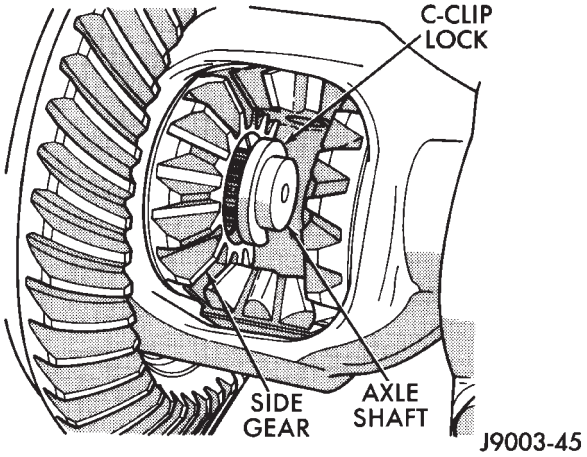

Fig. 13 Axle Shaft C–Clip Lock

(8) Remove the axle shaft. Use care to prevent damage to the axle shaft bearing and seal, which will remain in the axle shaft tube.
(9) Inspect axle shaft seal for leakage or damage.
(10) Inspect the roller bearing contact surface on the axle shaft for signs of brinelling, galling and pitting.
(11) If any of these conditions exist, the axle shaft and bearing or seal must be replaced.

INSTALLATION

(1) Lubricate the bearing bore and seal lip with gear lubricant. Insert the axle shaft through the seal, bearing, and engage it with the side gear splines. **Use care to prevent the shaft splines from damaging the axle shaft seal lip.**
(2) Insert the C–clip lock in the end of the axle shaft. Push the axle shaft outward to seat the C–clip lock in the side gear.
(3) Insert the mate shaft into the case and through the thrust washers and pinion gears. Align the hole in shaft with the hole in the differential case and install the lock screw with Loctite® on the threads. Tighten the screw to 19 N·m (14 ft. lbs.) torque.
(4) Install the cover and add fluid. Refer to the Drain and Refill in this section.

AXLE SHAFT SEAL AND BEARING

REMOVAL

(1) Remove the axle shaft. Refer to the Removal procedures in this Group.
(2) Remove the axle shaft seal from the end of the axle shaft tube with a small pry bar.
(3) Remove the bearing if it appears damaged.
The seal and bearing can be removed at the same time with the bearing removal tool.
(4) Remove the axle shaft bearing from the tube (Fig. 14) with Bearing Removal Tool Set 6310.
(5) Inspect the axle shaft tube bore for roughness and burrs. Remove as necessary.

CAUTION: Inspect the housing bore for burrs. Remove them if they exist.

INSTALLATION

Do not install the original axle shaft seal. Always install a new seal.
(1) Wipe the bore in the axle shaft tube clean.
(2) Install axle shaft bearing with Installer 6436 and Handle C–4171. Ensure part number on the bearing must go against the Installer.
(3) Install the new axle shaft seal (Fig. 15) with Installer 6437 and Handle C–4171.
(4) Install the Axle Shaft. Refer to the installation procedure.

REMOVAL AND INSTALLATION (Continued)

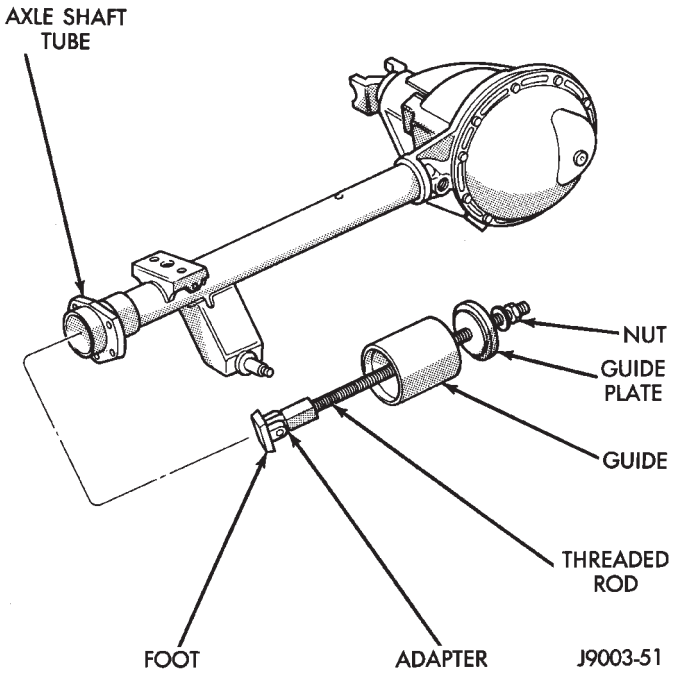

Fig. 14 Axle Shaft Bearing Removal Tool

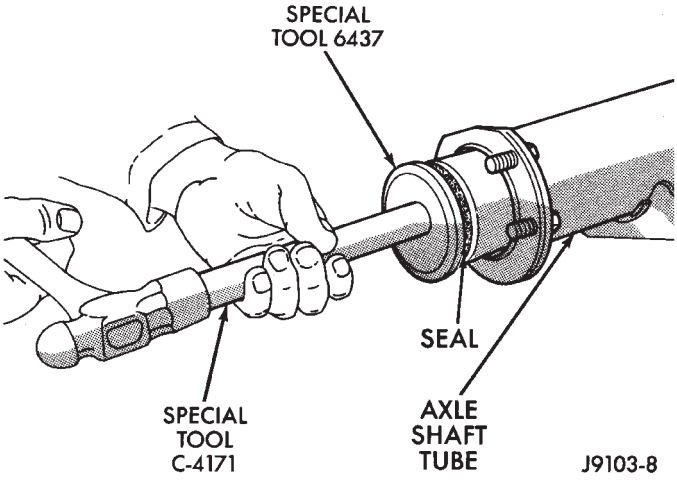

Fig. 15 Axle Shaft Seal Installation

DIFFERENTIAL

REMOVAL

To service the differential the axle shafts must be removed. Refer to the removal procedures in this Group.

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

(2) Remove the differential bearing caps.

(3) Position Spreader W–129–B with the tool dowel pins seated in the locating holes (Fig. 17). Install the hold down clamps and tighten the tool turnbuckle finger–tight.

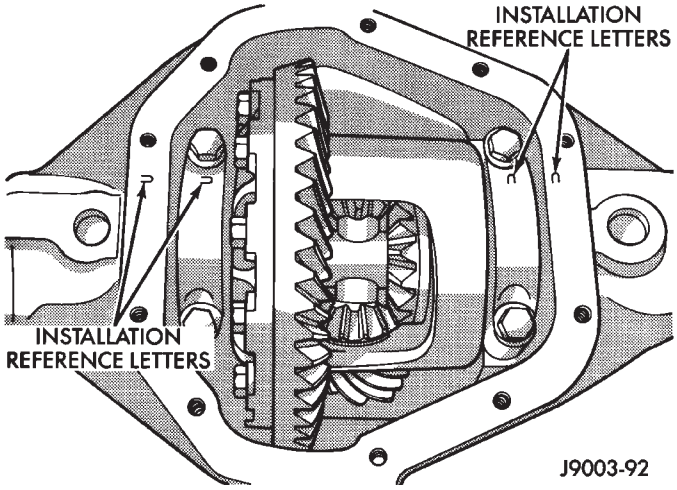

Fig. 16 Bearing Cap Identification

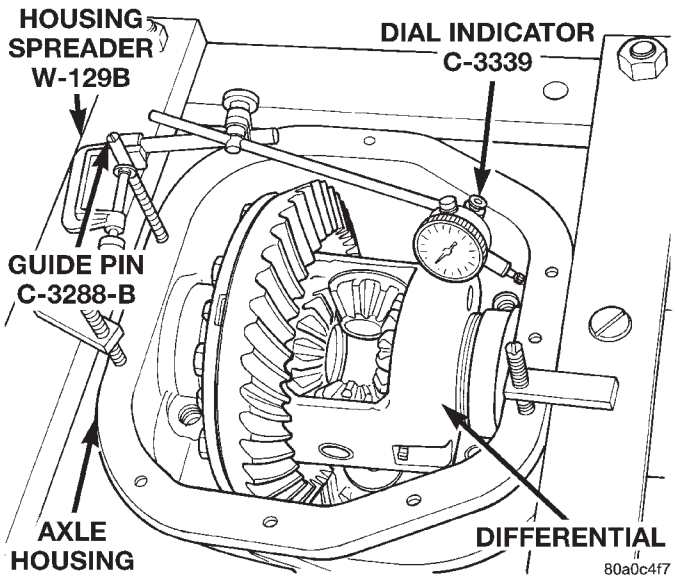

Fig. 17 Spread Differential Housing

(4) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 17) and zero the indicator.

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

(5) Separate the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 17).

(6) Remove the dial indicator.

(7) Pry the differential case loose from the housing. To prevent damage, pivot on housing with the end of the pry bar against spreader (Fig. 18).

(8) Remove the case from housing. Mark or tag bearing cups and outboard shim/spacer (selected thickness) indicating which side they were removed.

REMOVAL AND INSTALLATION (Continued)

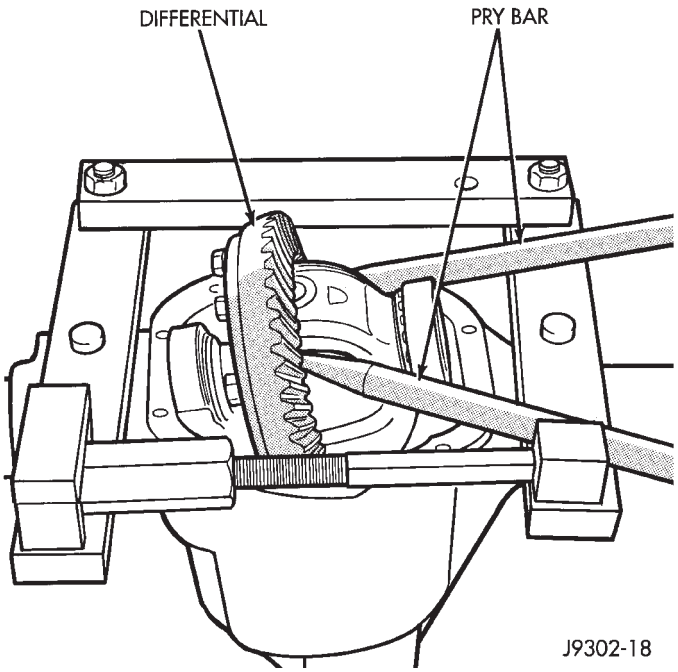

Fig. 18 Differential Removal

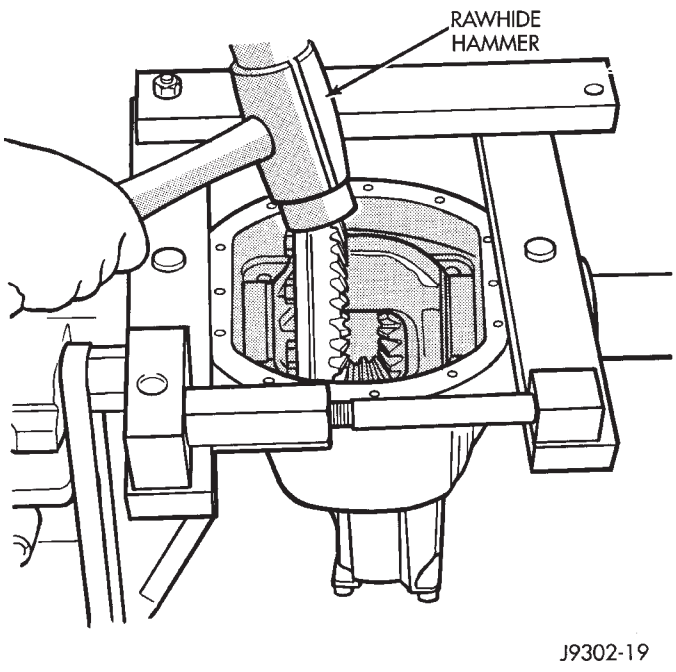

Fig. 19 Differential Installation

DIFFERENTIAL INSTALLATION

(1) Position Spreader W–129–B with the tool dowel pins seated in the locating holes (Fig. 17). Install the hold down clamps and tighten the tool turnbuckle finger–tight.

(2) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 17) and zero the indicator.

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

(3) Separate the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 17).

(4) Remove the dial indicator.

(5) Install differential and outboard shim/spacer (selected thickness) in housing.

(6) Install case in the housing. Tap the differential case to ensure the bearings are fully seated (Fig. 19). Remove the spreader.

(7) Install the bearing caps at their original locations (Fig. 20). Tighten the bearing cap bolts to 77 N·m (57 ft. lbs.) torque.

DIFFERENTIAL SIDE BEARINGS

REMOVAL

(1) Remove Differential case from axle housing.

(2) Remove the bearings from the differential case with Press 938, and Adapter 1130 (Fig. 21).

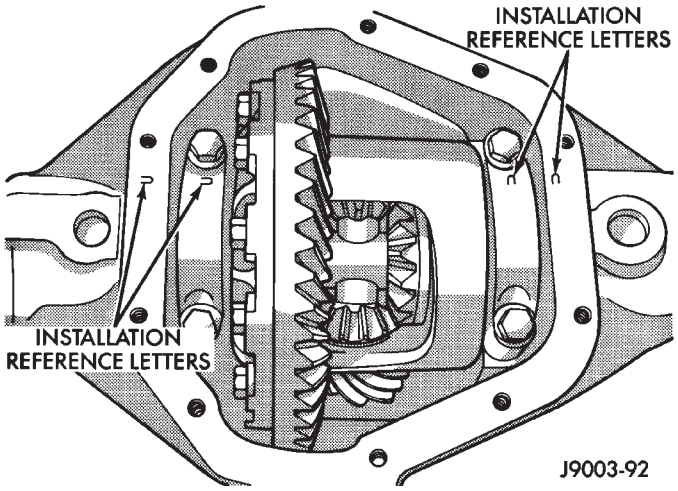

Fig. 20 Differential Bearing Cap Reference Letters

DIFFERENTIAL SIDE BEARING INSTALLATION

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

(1) Using tool C-4340 with handle C-4171, install differential side bearings (Fig. 22).

(2) Install differential in axle housing.

RING GEAR

The ring and pinion gears are service in a matched set. Do not replace the ring gear with replacing the pinion gear. Refer to Pinion Gear removal and installation paragraph in this section for proper procedure.

REMOVAL

(1) Remove differential from axle housing.

REMOVAL AND INSTALLATION (Continued)

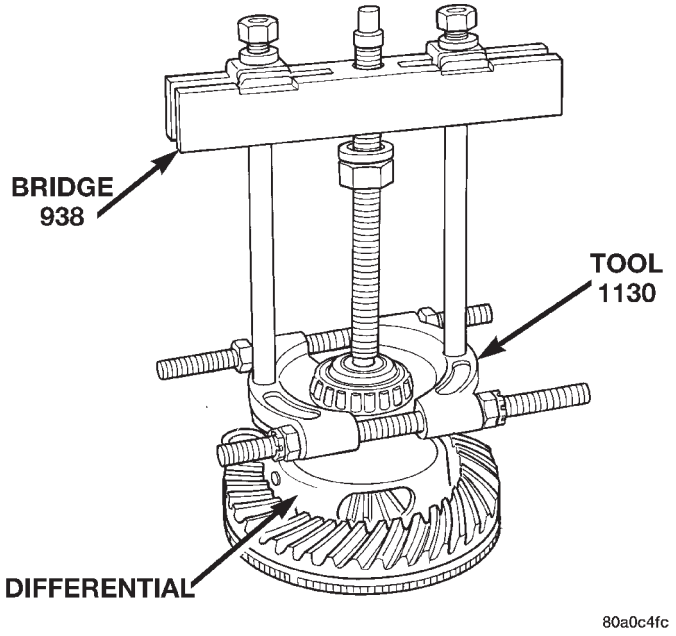

Fig. 21 Differential Bearing Removal

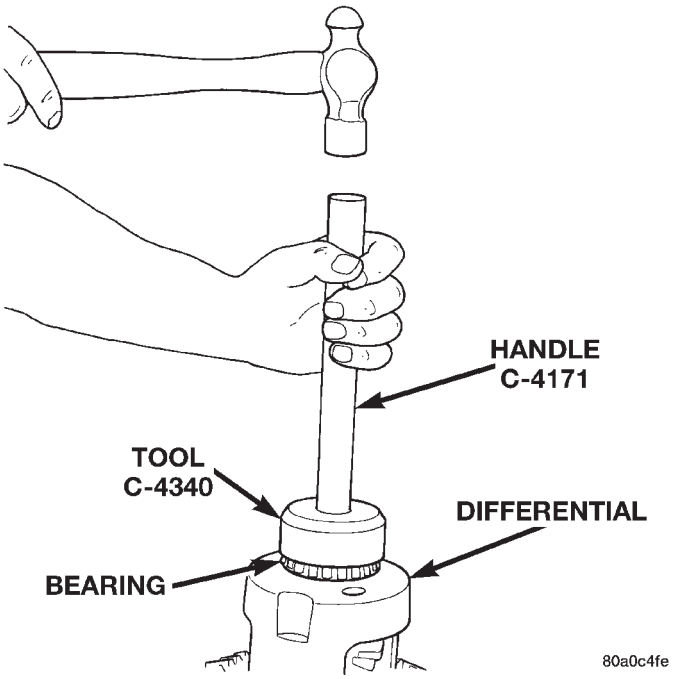

Fig. 22 Install Differential Side Bearings

(2) Place differential case in a suitable vise with soft metal jaw protectors. (Fig. 23)

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

(4) Using a soft hammer, drive ring gear from differential case (Fig. 23).

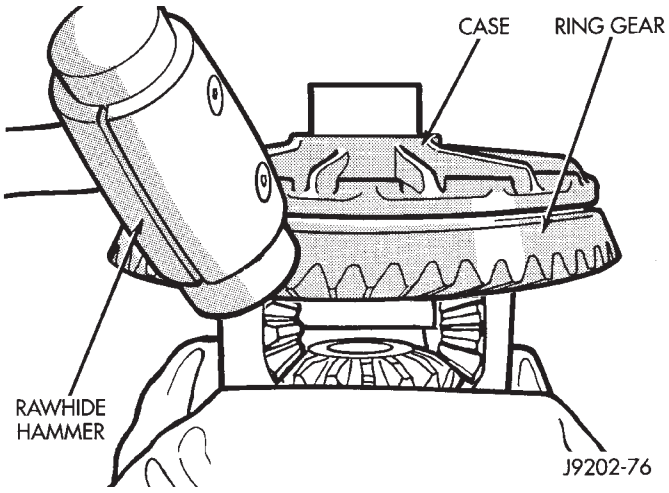

Fig. 23 Ring Gear Removal

RING GEAR INSTALLATION

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

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

(2) Install new ring gear bolts and alternately tighten to 95–122 N·m (70–90 ft. lbs.) torque (Fig. 24).

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

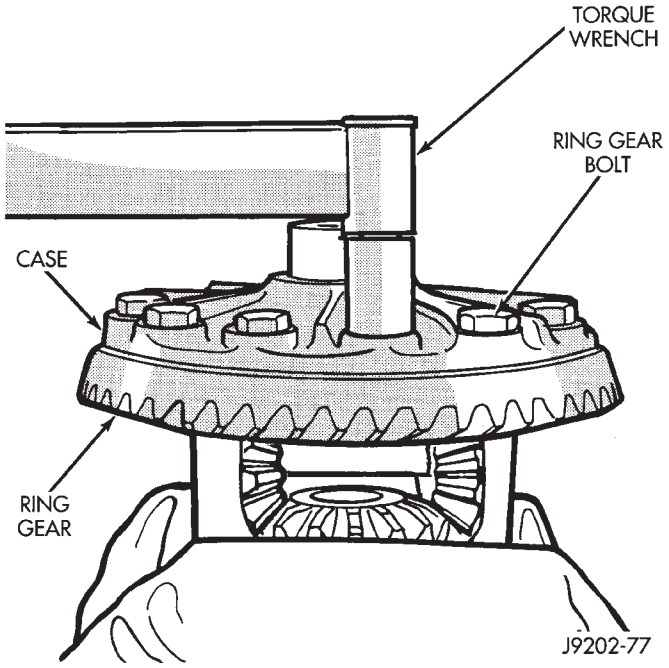

Fig. 24 Ring Gear Bolt Installation

REMOVAL AND INSTALLATION (Continued)

PINION GEAR

REMOVAL

(1) Remove differential assembly from axle housing.

(2) Remove the pinion yoke nut and washer. Use Remover C–452 and Wrench C–3281 to remove the pinion yoke (Fig. 25).

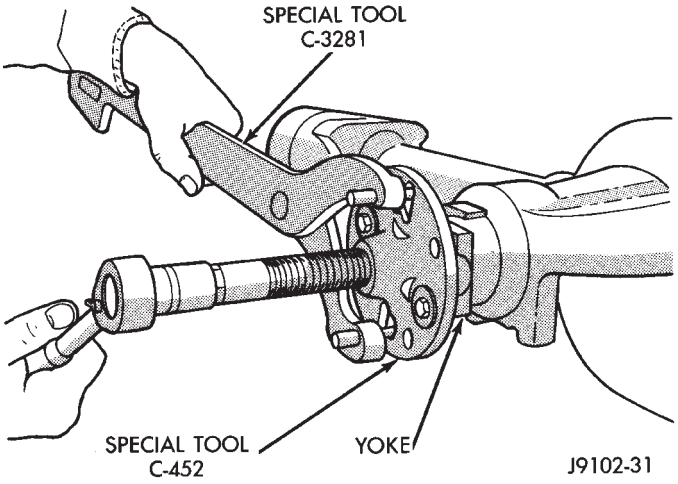

Fig. 25 Pinion Yoke Removal

(3) Remove the pinion gear from housing (Fig. 26). Catch the pinion with your hand to prevent it from falling and being damaged.

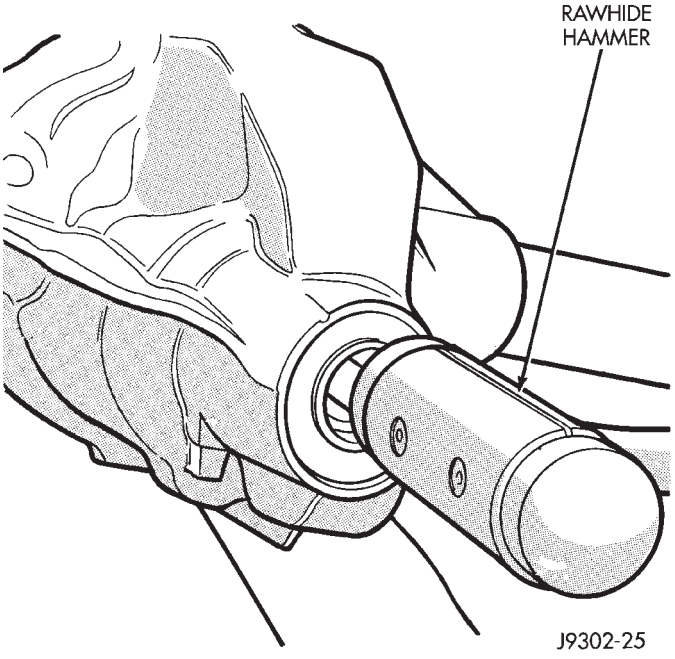

Fig. 26 Remove Pinion Gear

(4) Remove the pinion gear seal with a slide hammer or pry out with bar.

(5) Remove oil slinger, front bearing.

(6) Remove the front pinion bearing cup and seal with Remover D-103 and Handle C–4171 (Fig. 27).

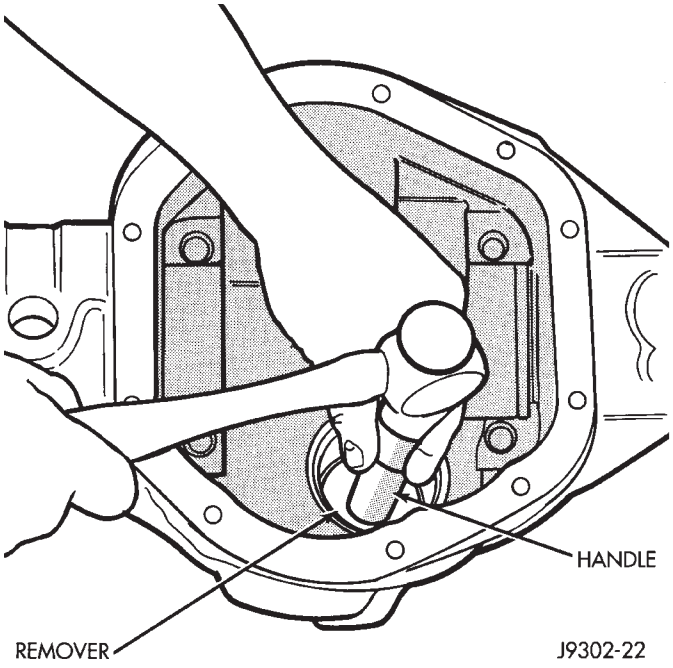

Fig. 27 Front Bearing Cup Removal

(7) Remove the rear bearing cup from housing (Fig. 28). Use Remover C-4307 and Handle C–4171.

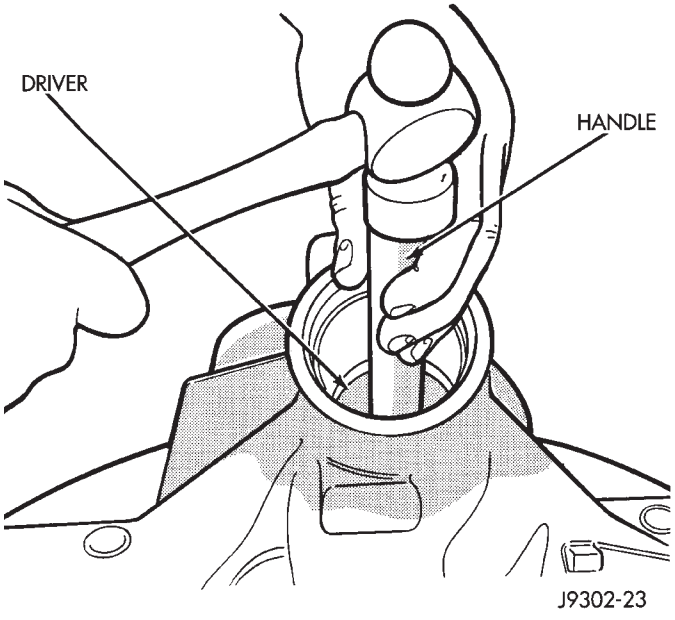

Fig. 28 Rear Bearing Cup Removal

REMOVAL AND INSTALLATION (Continued)

(8) Remove the collapsible preload spacer (Fig. 29).

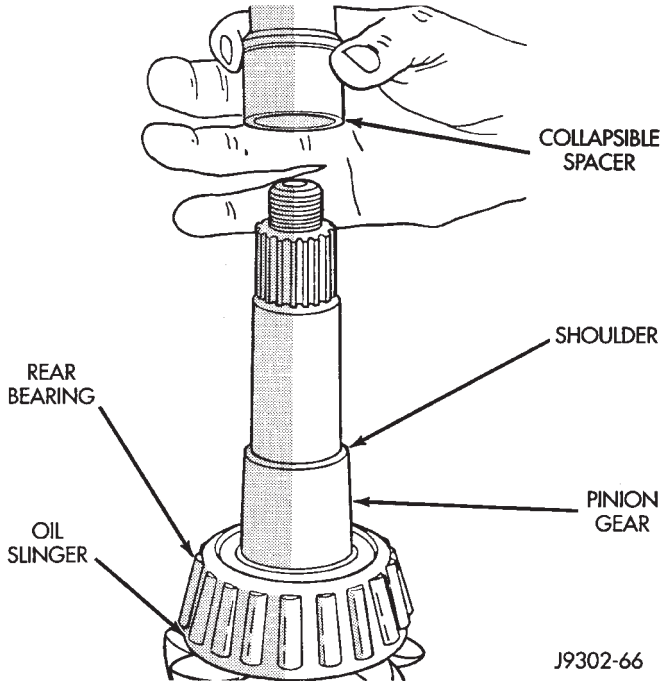

Fig. 29 Collapsible Spacer

(9) Remove the inner bearing from the pinion with Puller C–293PA and Adapter C–293–39 (Fig. 30).

Place adapter rings so they do not damage the bearing cage.

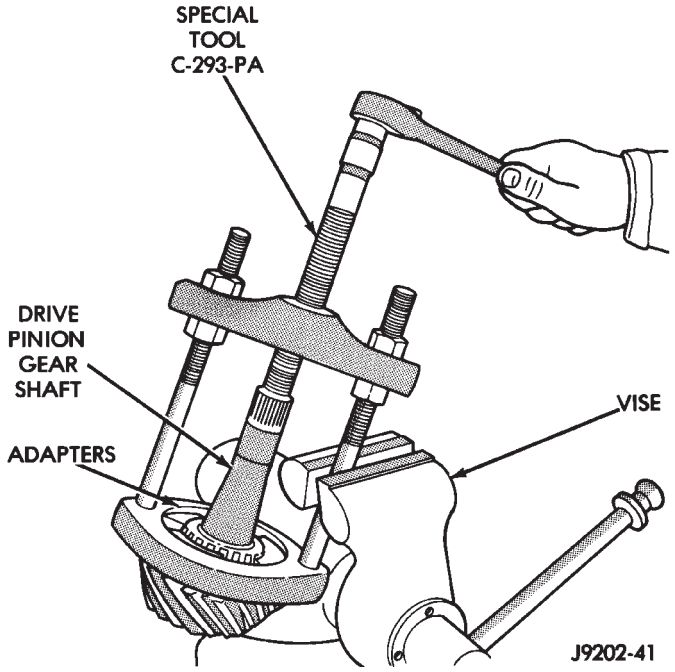

Fig. 30 Inner Bearing Removal

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

PINION GEAR INSTALLATION

(1) Install the pinion rear bearing cup with Installer C—4308 and Driver Handle C–4171 (Fig. 31). Ensure cup is correctly seated.

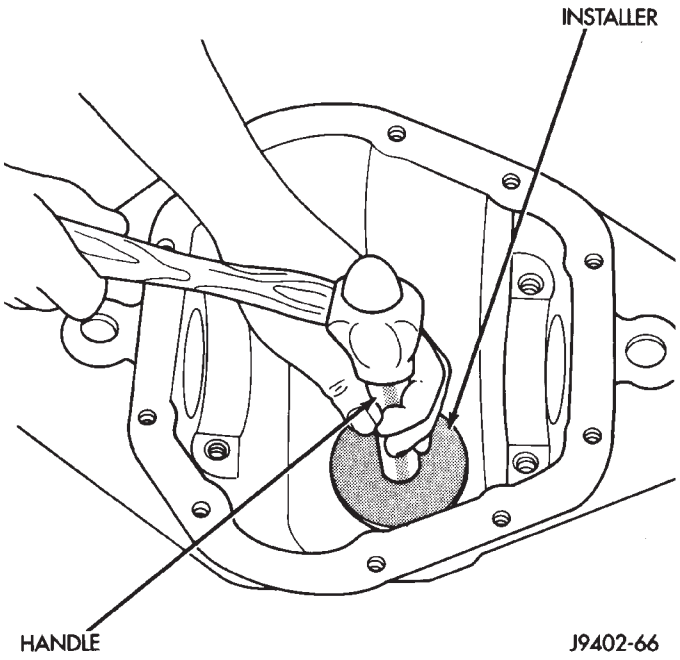

Fig. 31 Pinion Rear Bearing Cup Installation

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

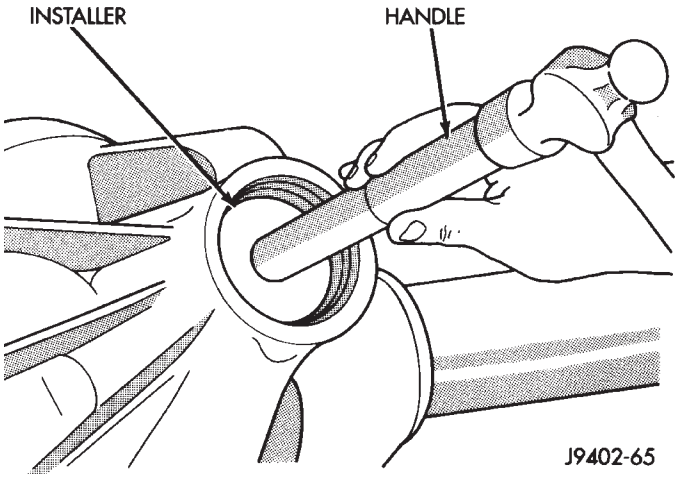

Fig. 32 Pinion Front Bearing Cup Installation

REMOVAL AND INSTALLATION (Continued)

(3) Install pinion front bearing, oil slinger. Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer D–163 and Handle C–4171 (Fig. 33).

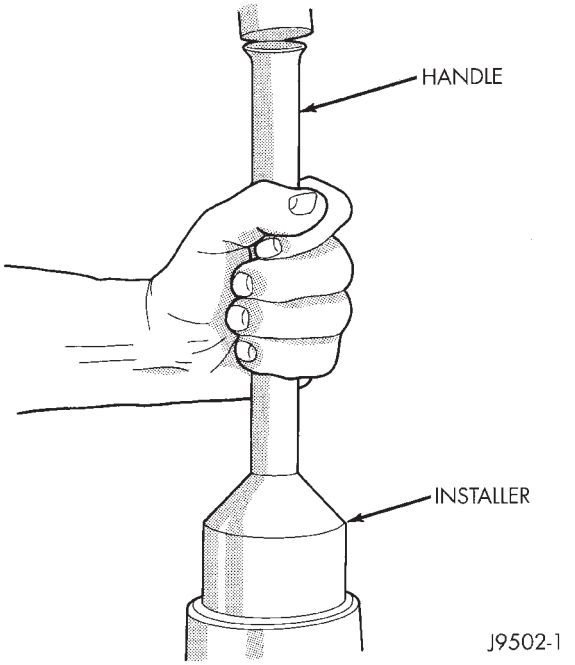

Fig. 33 Pinion Seal Installation

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. Refer to Pinion Gear Deptht paragraph in this section to select the proper thickness shim before installing rear pinion bearing cone.

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

(5) Install the rear bearing (and slinger if used) on the pinion gear with Installer 6448 (Fig. 34).

(6) Install a new collapsible preload spacer on pinion shaft and install pinion gear in housing (Fig. 35).

(7) Install yoke with Installer W–162D and Wrench 6719 (Fig. 36).

(8) Install the yoke washer and a new nut on the pinion gear. Tighten the nut to 298 N·m (220 ft. lbs.) minimum. **Do not over–tighten.** Maximum torque is 380 N·m (280 ft. lbs.).

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

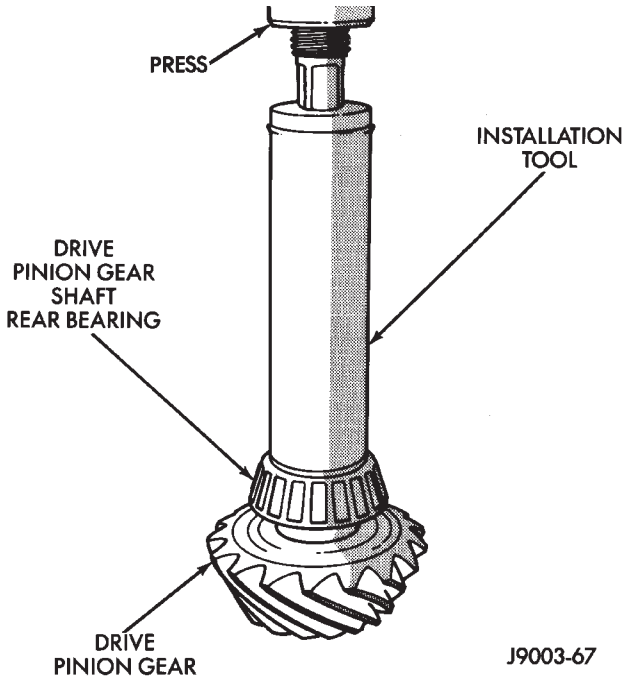

Fig. 34 Shaft Rear Bearing Installation

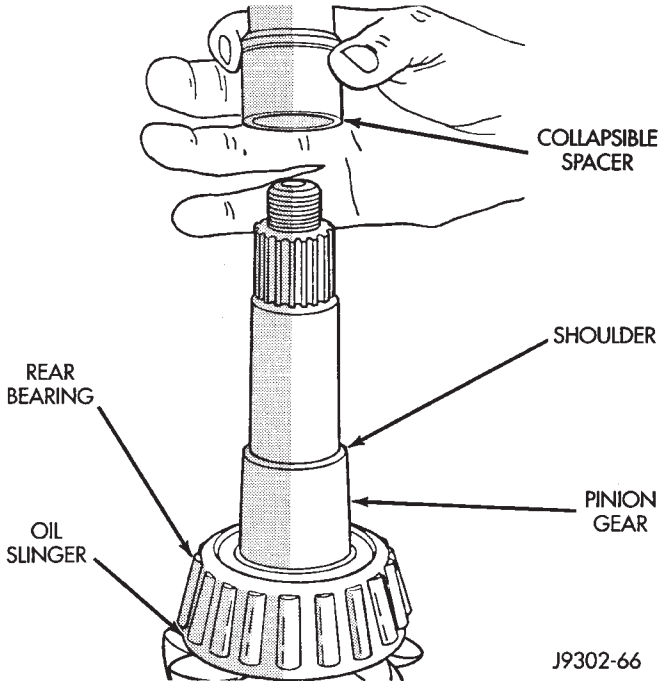

Fig. 35 Collapsible Preload Spacer

(9) Use Flange Wrench 6719 to retain the yoke (Fig. 37). Slowly tighten the nut in small increments until the rotating torque is achieved. Measure the preload torque frequently to avoid over–tightening the nut.

(10) Check bearing preload torque with an inch pound torque wrench (Fig. 38). The torque necessary to rotate the pinion gear should be:

REMOVAL AND INSTALLATION (Continued)

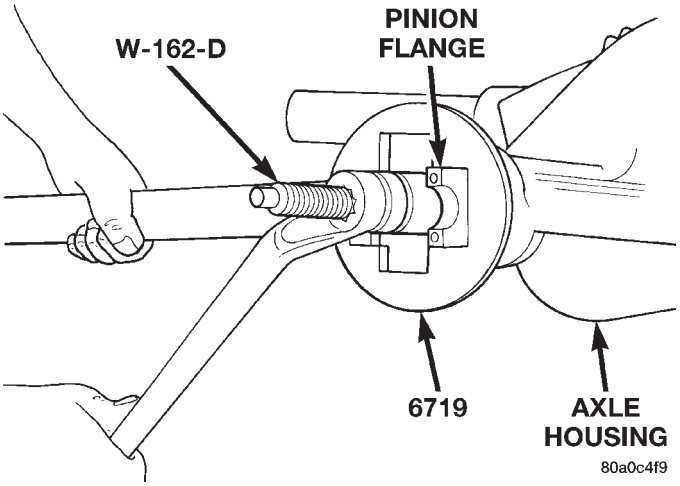

Fig. 36 Pinion Yoke Installation—Typical

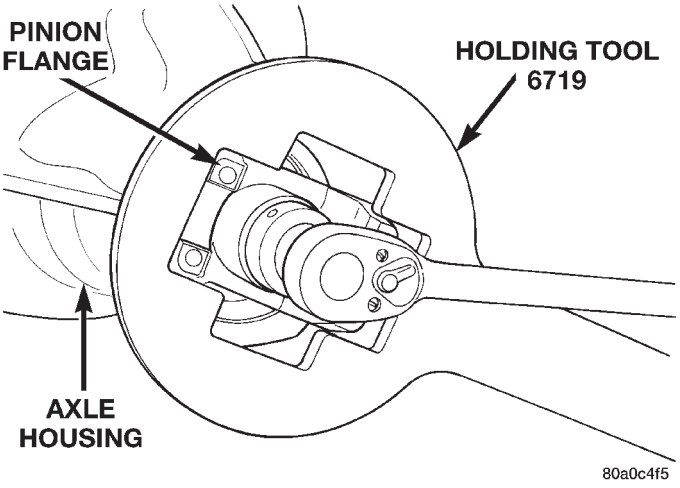

Fig. 37 Tightening Pinion Nut

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

FINAL ASSEMBLY

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

(2) Scrape the residual sealant from the housing and cover mating surfaces. Clean the mating surfaces with mineral spirits. Apply a bead of Mopar Silicone Rubber Sealant on the housing cover (Fig. 39). Allow the sealant to cure for a few minutes.

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

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

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

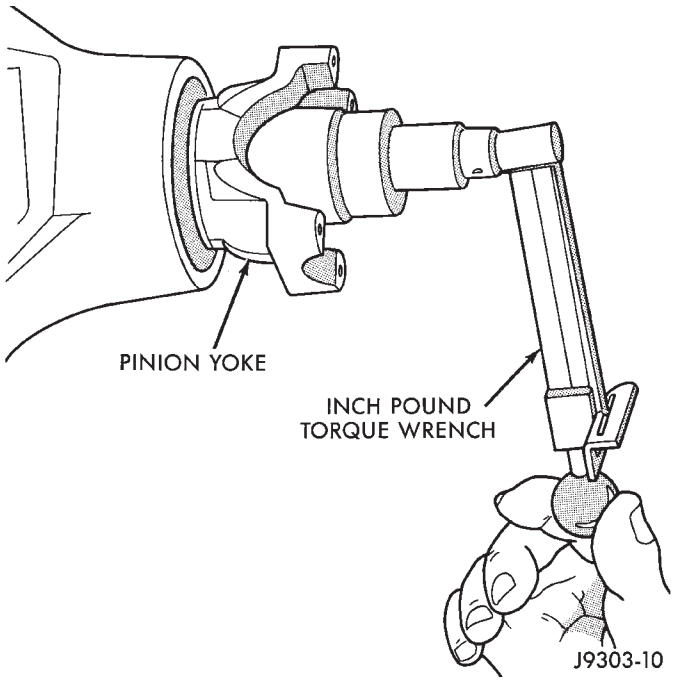

Fig. 38 Check Pinion Gear Rotation Torque

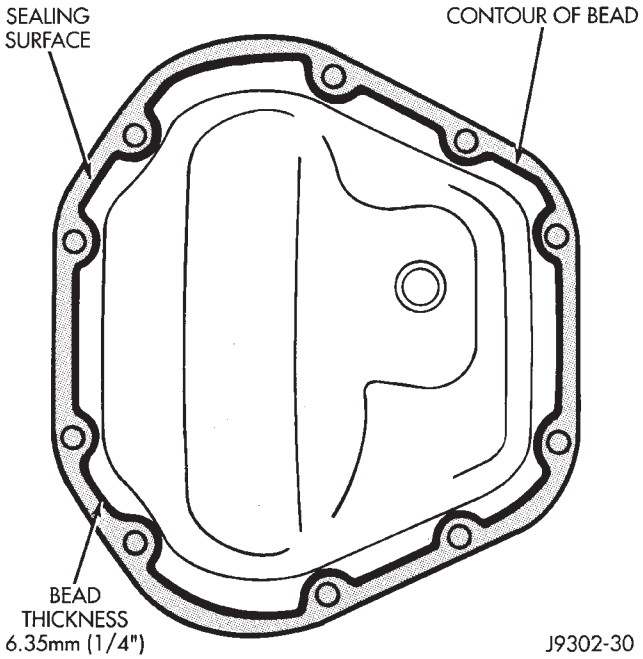

Fig. 39 Typical Housing Cover With Sealant

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

(5) Install the fill hole plug and tighten to 34 N·m (25 ft. lbs.) torque. Axles equipped with rubber fill plug install plug into cover.