

# FRONT SUSPENSION AND AXLE

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## GENERAL INFORMATION

### FRONT SUSPENSION

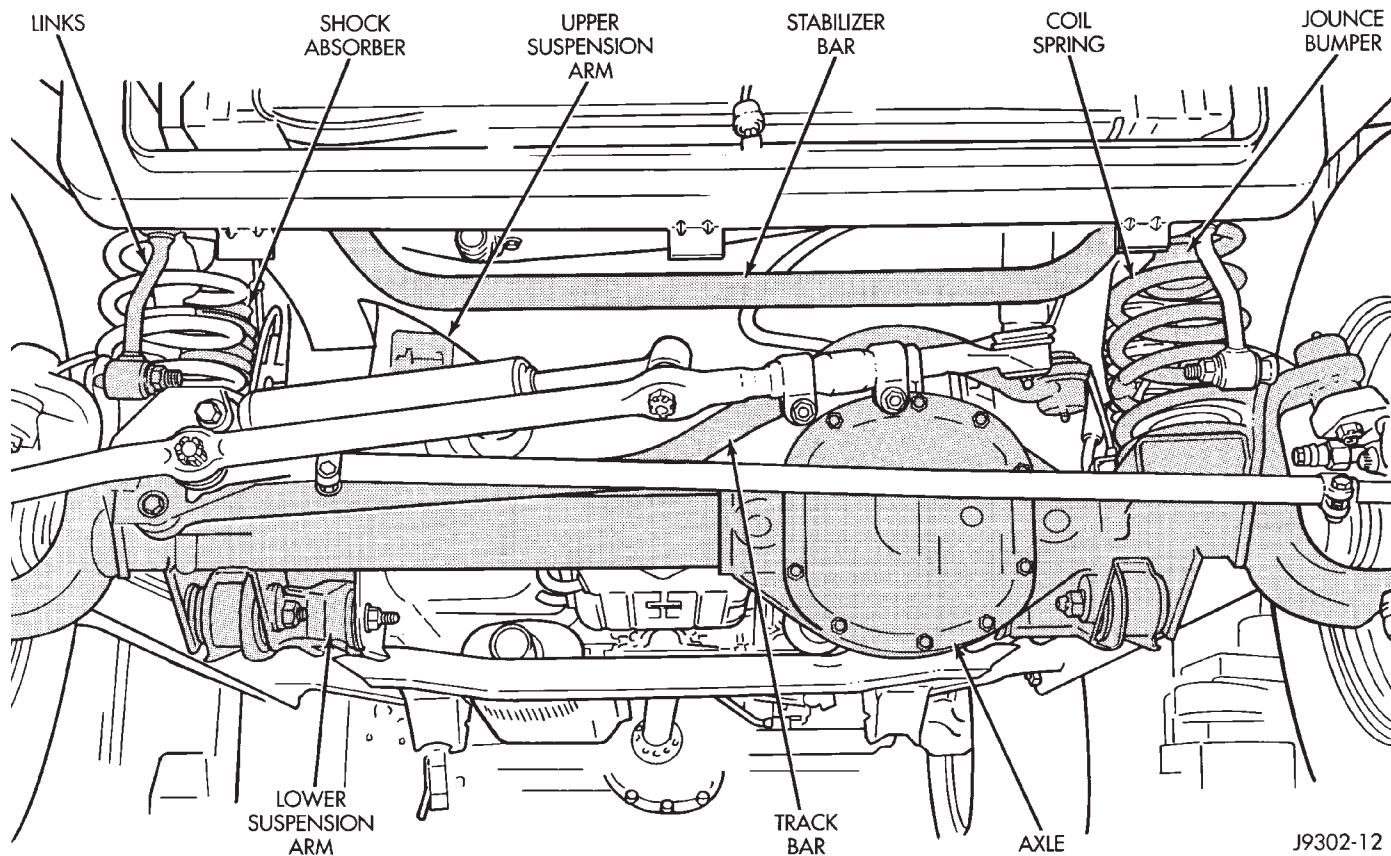
#### XJ VEHICLES

The XJ front suspension is a link/coil design. This suspension is use on Left Hand Drive (LHD) and Right Hand Drive (RHD) vehicles. It is comprised of (Fig. 1);

- Drive axle (4WD), tube axle (2WD)

- Track bar
- Stabilizer bar
- Upper and lower suspension arms
- Coil springs
- Dual-action shock absorbers
- Jounce bumpers

The link/coil suspension allows each wheel to adapt to different road surfaces without greatly affecting



J9302-12

**Fig. 1 XJ Front Suspension (LHD)**

the opposite wheel. Wheels are attached to a hub/bearings which bolts to the knuckles. The hub/bearing is not serviceable and is replaced as a unit. Steering knuckles pivot on replaceable ball studs attached to the axle tube yokes.

The upper and lower suspension arms are different lengths, with bushings at both ends. They bolt the axle assembly to the body. The lower arms uses shims at the body mount to allow for adjustment of caster and drive shaft pinion angle. The suspension arm travel is limited through the use of jounce bumpers in compression and shocks absorbers in rebound.

Suspension components which use rubber bushings should be tightened at vehicle ride height. This will prevent premature failure of the bushing and maintain ride comfort. Bushings must never be lubricated.

The coil springs control ride quality and maintain proper ride height. The coil springs mount up in the fender shield which is part of the unitized body bracket. A rubber isolator is located between the top of the spring and the frame. The bottom of the spring seats on a axle pad and is retained with a clip.

The shock absorbers dampen jounce and rebound of the vehicle over various road conditions. The top of the shock absorbers are bolted to the body. The bottom of the shocks are bolted to the axle spring bracket.

The stabilizer bar is used to minimize vehicle body roll during turns. The spring steel bar helps to control the vehicle body in relationship to the suspension. The bar extends across the front underside of the chassis and connects to the body rails. Links are connected from the bar to the axle brackets. Stabilizer bar mounts are isolated by rubber bushings.

The track bar is used to minimize front axle side-to-side movement. The bar is attached to a frame rail bracket with a ball stud and isolated with a bushing at the axle bracket.

**TUBE AXLE (2WD VEHICLES)**

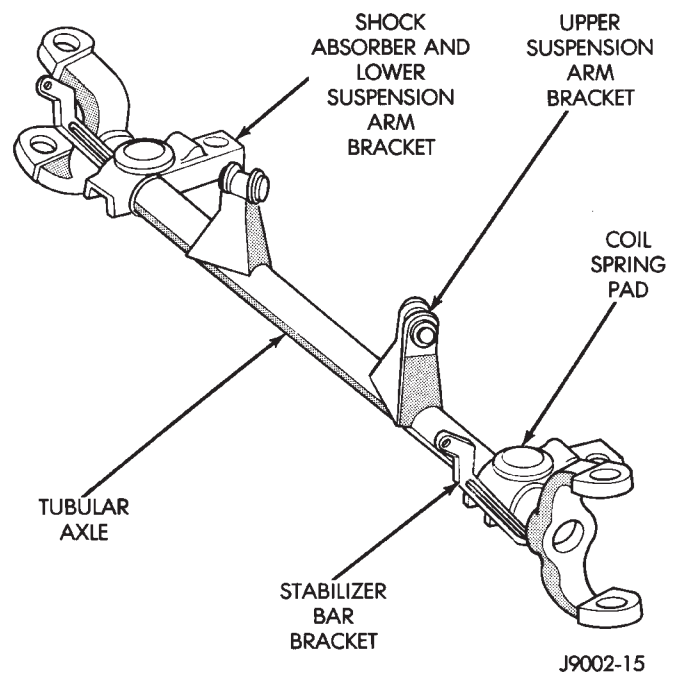
The front axle used on two-wheel drive vehicles is a one-piece, tubular axle (Fig. 2). The tubular axle mounts in the same bracketry as the four-wheel drive axle.

The steering knuckles and hub bearing assemblies are the same as used on the Model 30 drive axle.

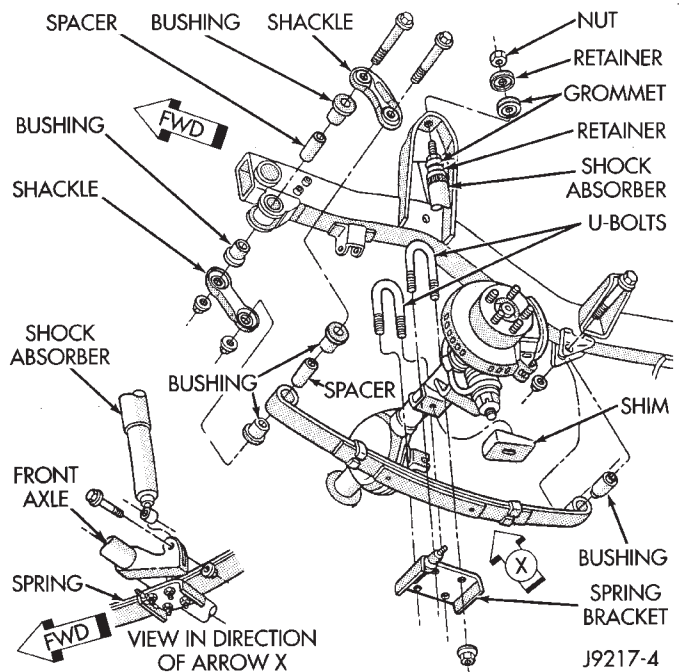
**YJ VEHICLES**

The Wrangler (YJ) front suspension is leaf spring design comprised of (Fig. 3);

- Drive axle
- Track bar
- Stabilizer bar
- Leaf springs
- Dual-action shock absorbers
- Jounce bumpers (used to limit the travel of the suspension)



**Fig. 2 Front Axle—2WD Vehicles**



**Fig. 3 YJ Front Suspension**

The front suspension has semi-elliptic multi-leaf springs mounted to the axle assembly. The rearward end of the springs are mounted to the frame rail hangers. The forward end of the springs are attached to the frame with shackles. The springs and shackles use rubber bushings to isolate road noise. The shackles allow the springs to change their length as the vehicle moves over various road conditions. The

spring and axle travel (jounce or rebound) is limited through use of rubber bumpers mounted on the frame.

Suspension components which use rubber bushings should be tightened at vehicle ride height. This will prevent premature failure of the bushing and maintain ride comfort. The bushings should never be lubricated.

The shocks absorbers dampen jounce and rebound of the vehicle over various road conditions. The top of the shock absorbers bolt to the frame. The bottom of the shocks bolt to the axle brackets.

The stabilizer bar is used to minimize vehicle front sway during turns. The spring steel bar helps control vehicle body in relationship to the suspension movement. The bar extends across the front underside of the chassis and connects to the frame rails. Links connect the bar to the axle brackets. Stabilizer bar mounts are isolated by rubber bushings.

The track bar is used to minimize front axle side-to-side movement. The track bar is attached to a frame rail bracket and axle bracket. The bar uses bushings at both ends.

## FRONT DRIVE AXLE

It is not necessary to remove the complete axle from the vehicle for routine differential service. If the differential housing or axle shaft tubes are damaged, the complete axle assembly can be removed and serviced.

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

The removable cover provides for servicing without removing axle from vehicle.

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

The Model 30 axle has the assembly part number and gear ratio listed on a tag. The tag is attached to the housing cover (Fig. 4). Build date identification codes are stamped on the axle shaft tube cover side.

XJ and YJ axles are equipped with an optional A.B.S. brake system. The A.B.S. tone rings are pressed onto the axle shaft near the hub and knuckle. For additional information on the A.B.S. system refer to Group 5, Brakes.

- XJ vehicles use a non-disconnect axle.
- YJ vehicles use a vacuum disconnect axle (Fig. 5).

## 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

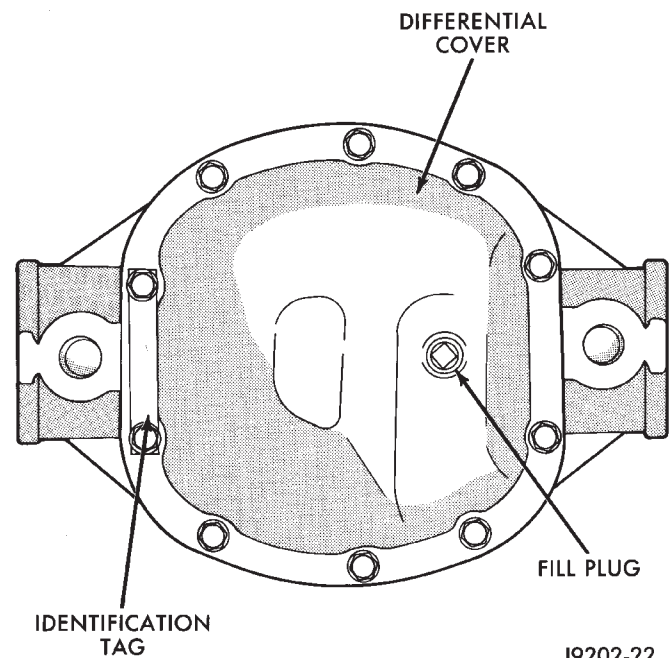


Fig. 4 Model 30 Differential Cover

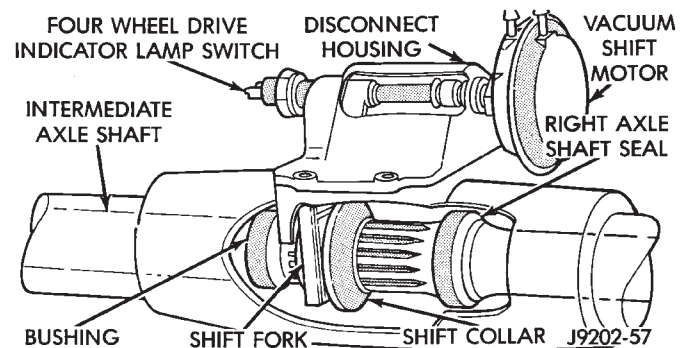


Fig. 5 Disconnect Feature

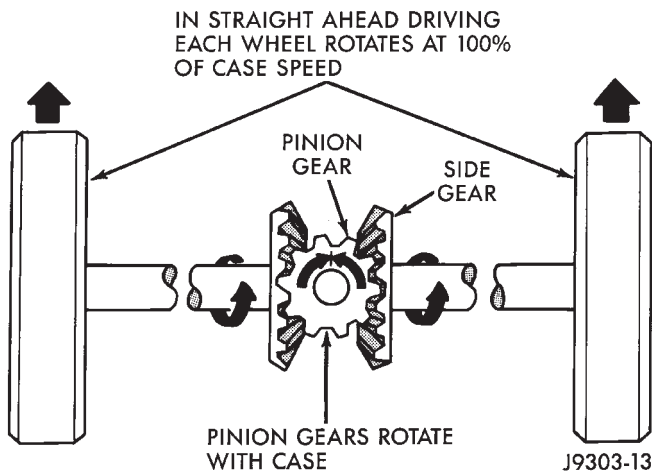
pinion gear is fitted in a bore in the differential case and is positioned at a right angle to the axle shafts.

In operation, power flow occurs as follows:

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

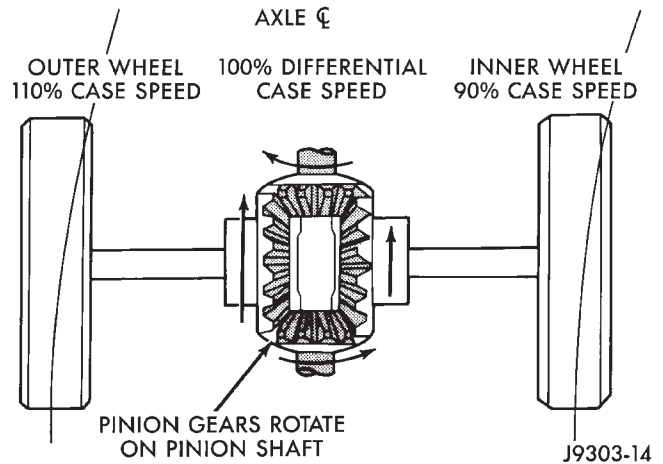
During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft. This occurs because input torque applied to gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 6).

When turning corners, the outside wheel must travel a greater distance than the inside wheel. This difference must be compensated for in order to prevent the wheels from scuffing and skidding through the turn. To accomplish this, the differential allows



**Fig. 6 Differential Operation—Straight-Ahead Driving**  
the axle shafts to turn at unequal speeds (Fig. 7). 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 direc-

tions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.



**Fig. 7 Differential Operation—On Turns**

## FRONT WHEEL ALIGNMENT

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### GENERAL INFORMATION

Front wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to maximize tire wear. The most important measurements of front end alignment are caster, camber and toe position.

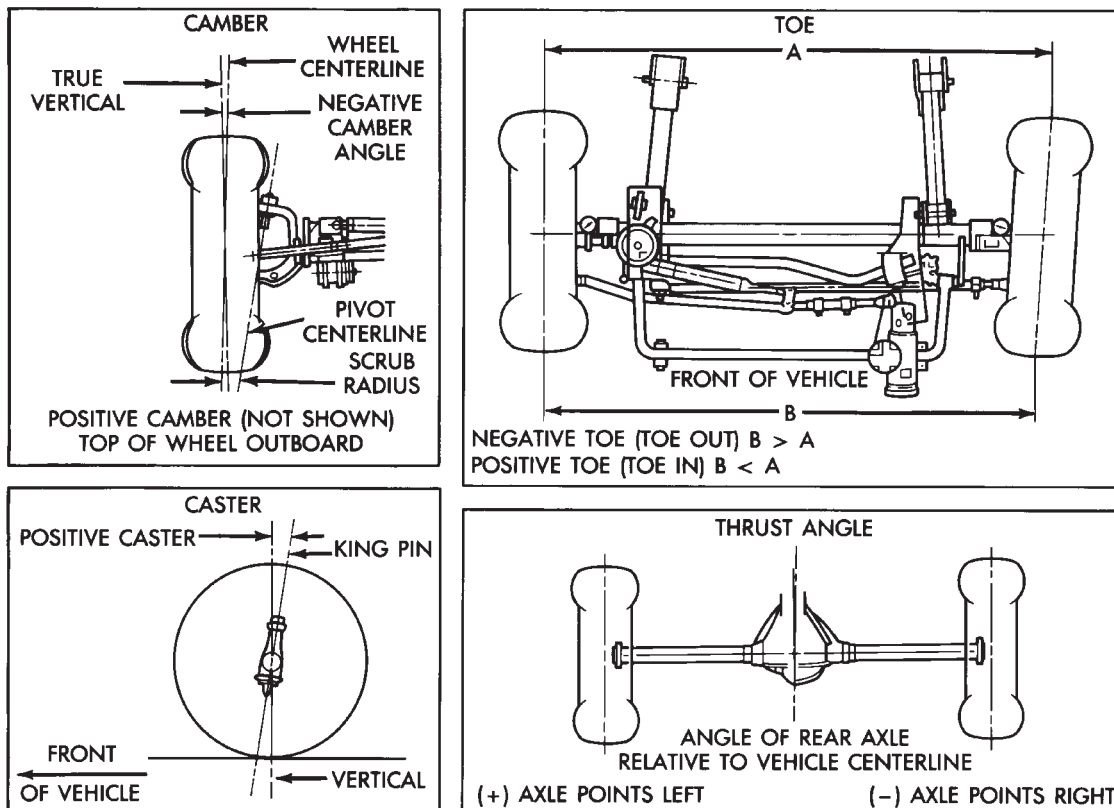
**Routine inspection of the front suspension and steering components is a good preventative maintenance practice. Inspection also helps to ensure safe operation of the vehicle.**

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle rearward provides positive caster. Tilting the

top of the knuckle forward provides negative caster. Caster is a directional stability angle. This angle enables the front wheels to return to a straight ahead position after turns (Fig. 1).

- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire (Fig. 1). The angle is not adjustable, the damaged component(s) must be replaced to correct mis-alignment.

- **WHEEL TOE POSITION** is the difference between the leading inside edges and trailing inside edges of the front tires (Fig. 1). Incorrect wheel toe position is the most common cause of unstable steering and un-



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**Fig. 1 Wheel Alignment Measurements**

even tire wear. The wheel toe position is the **final** front wheel alignment adjustment.

- **STEERING AXIS INCLINATION ANGLE** is measured in degrees and is the angle that the steering knuckles are tilted (Fig. 1). The inclination angle has a fixed relationship with the camber angle. It will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable, the damaged component(s) must be replaced to correct misalignment.

**WARNING: DO NOT ATTEMPT TO MODIFY ANY SUSPENSION OR STEERING COMPONENT BY HEATING AND BENDING.**

### PRE-ALIGNMENT INSPECTION

Before starting a front wheel alignment, the following inspection and necessary corrections must be completed.

- (1) Tires with the same recommended air pressure, size, and thread wear. Refer to Group 22, Tires And Wheels for diagnosis information.

- (2) Front wheel bearings for wear and looseness.

- (3) Ball studs, steering linkage pivot points and steering gear for looseness, roughness, binding or wear. Refer to Group 19, Steering for additional information.

- (4) Front wheels for excessive radial or lateral runout and unbalance. Refer to Group 22, Tires And Wheels for diagnosis information.

- (5) Suspension components for wear. Check components for correct torque. Refer to Groups 2 and 3, Suspension and Axle for additional information.

## SUSPENSION AND STEERING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	<ol style="list-style-type: none"> <li>1. Loose or worn front wheel bearings.</li> <li>2. Loose or worn suspension bushings or components.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust or replace wheel bearings.</li> <li>2. Replace worn bushings or suspension components.</li> </ol>
EXCESSIVE PLAY IN STEERING	<ol style="list-style-type: none"> <li>1. Loose or worn front wheel bearings.</li> <li>2. Loose or worn steering components.</li> <li>3. Loose or worn steering gear.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust or replace wheel bearings.</li> <li>2. Replace loose or worn steering components.</li> <li>3. Adjust or replace steering gear.</li> </ol>
FRONT WHEELS SHIMMY	<ol style="list-style-type: none"> <li>1. Loose or worn front wheel bearings.</li> <li>2. Loose or worn suspension bushings or components.</li> <li>3. Tires worn or out of balance.</li> <li>4. Alignment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust or replace wheel bearings.</li> <li>2. Replace worn bushings or suspension components.</li> <li>3. Replace or balance tires as needed.</li> <li>4. Align front end.</li> </ol>
VEHICLE INSTABILITY	<ol style="list-style-type: none"> <li>1. Loose or worn front wheel bearings.</li> <li>2. Alignment.</li> <li>3. Loose or worn suspension bushings or components.</li> <li>4. Weak or broken spring.</li> <li>5. Tire pressure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust or replace wheel bearings.</li> <li>2. Align front end.</li> <li>3. Replace worn bushings or suspension components.</li> <li>4. Replace weak or broken spring.</li> <li>5. Correct tire pressure.</li> </ol>
DIFFICULT STEERING	<ol style="list-style-type: none"> <li>1. Tire pressure.</li> <li>2. Alignment.</li> <li>3. Steering gear or pump.</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct tire pressure.</li> <li>2. Align front end.</li> <li>3. Adjust or replace steering gear. Test and repair pump as needed.</li> </ol>
VEHICLE PULLS TO ONE SIDE	<ol style="list-style-type: none"> <li>1. Tire pressure.</li> <li>2. Alignment.</li> <li>3. Loose or worn suspension bushings or components.</li> <li>4. Weak or broken spring.</li> <li>5. Brake pull.</li> </ol>	<ol style="list-style-type: none"> <li>1. Correct tire pressure.</li> <li>2. Align front end.</li> <li>3. Replace worn bushings or suspension components.</li> <li>4. Replace weak or broken spring.</li> <li>5. Repair brakes.</li> </ol>

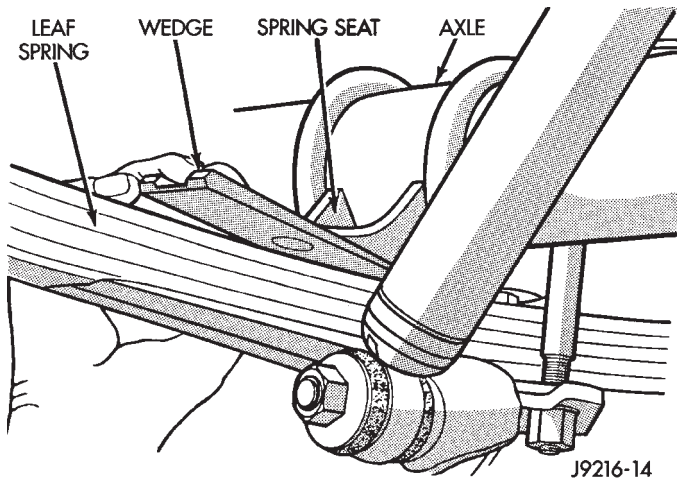


Fig. 2 Adjustment—YJ Vehicles

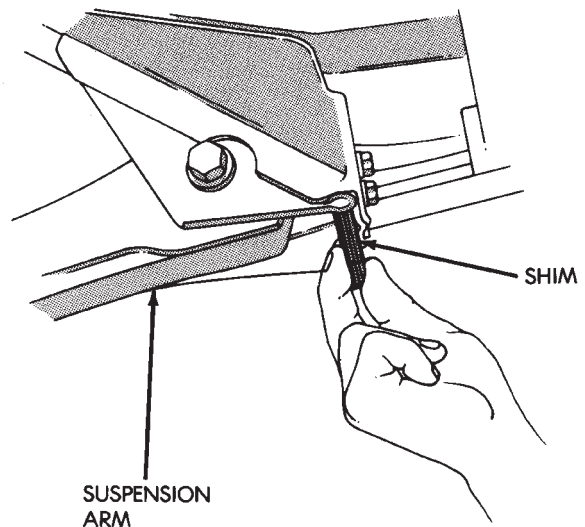


Fig. 3 Adjustment—XJ Vehicles

**ALIGNMENT MEASUREMENTS AND ADJUSTMENTS**

Before each alignment reading, the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down several times. Always release the bumper in the down position. **Set the front end alignment to specifications with the vehicle at its NORMALLY RIDE HEIGHT.**

**CAMBER**

The wheel camber angle is preset. This angle is not adjustable and cannot be altered.

**CASTER**

Before checking the caster of the front axle for correct angle, be sure the axle is not bent or twisted.

Road test the vehicle, make left and right turns. If the steering wheel returns to the center position unassisted, the caster angle is correct. If steering wheel

does not return toward the center position unassisted, an incorrect caster angle is probable.

Caster can be adjusted by installing the appropriate size shims (Fig. 2, 3). **Changing caster angle will also change the front propeller shaft angle. The propeller shaft angle has priority over caster. Refer to Group 16, Propeller Shafts for additional information.**

**TOE POSITION—XJ VEHICLES**

The wheel toe position adjustment should be the final adjustment.

(1) Start the engine if equipped with power steering. Turn wheels both ways before straightening the

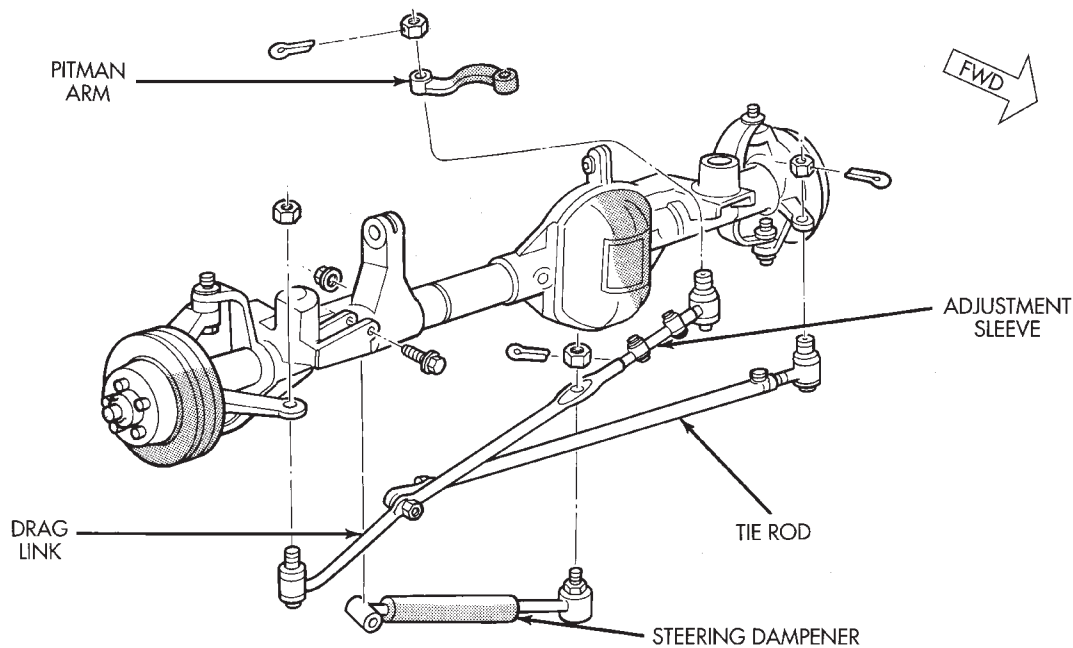
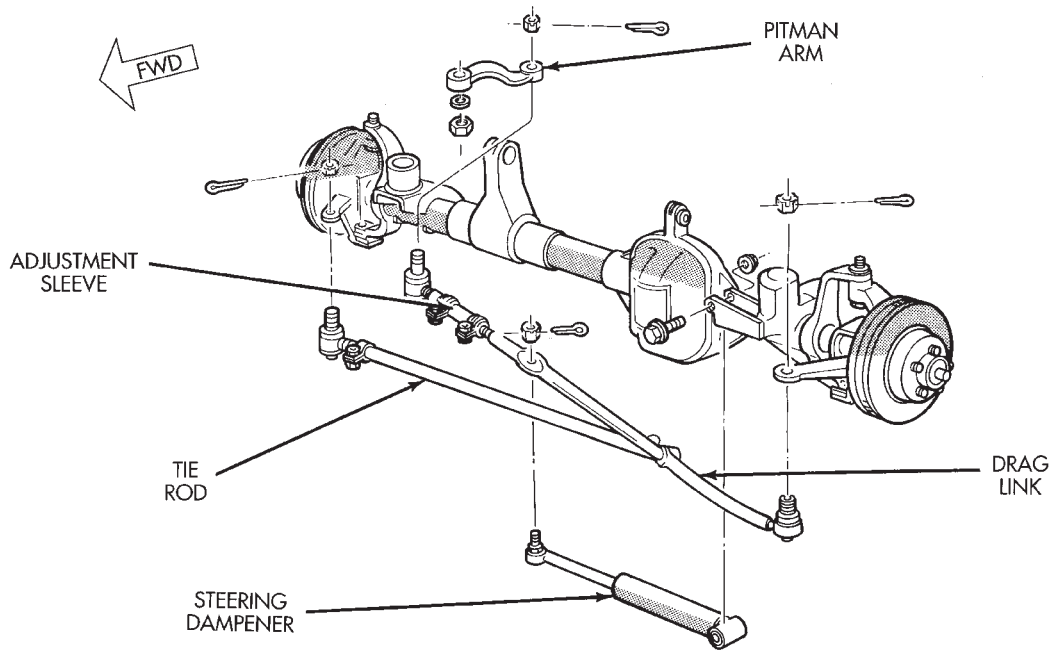


Fig. 4 Steering Linkage—XJ (LHD)





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**Fig. 5 Steering Linkage—XJ (RHD)**

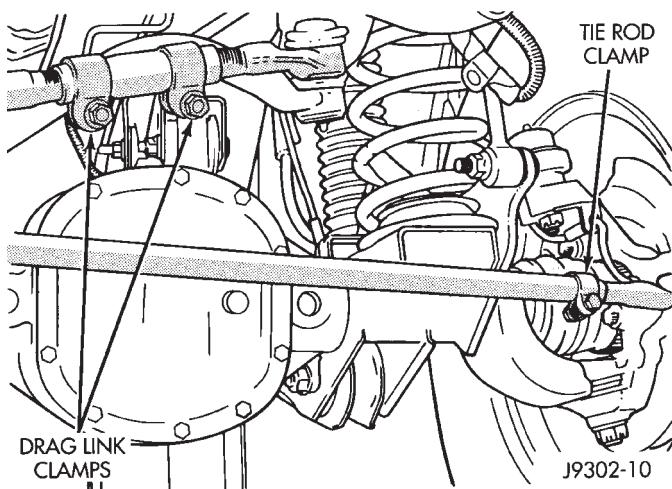
wheels. Secure the steering wheel with the front wheels in the straight-ahead position. Turn off the engine.

(2) Loosen the adjustment sleeve clamp bolts (Fig. 4, 5).

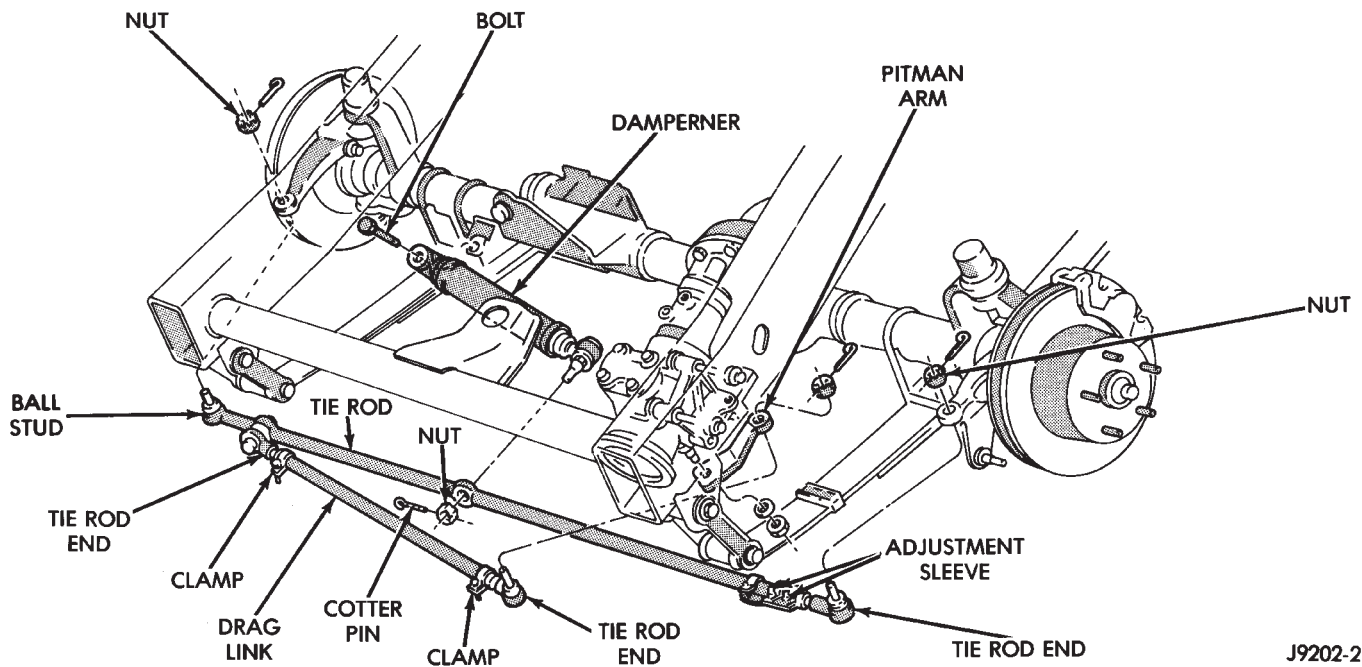
(3) Adjust the right wheel toe position with the drag link. Turn the sleeve until the right wheel is at specifications. Position the clamp bolts as shown (Fig. 6) and tighten to 49 N·m (36 ft. lbs.) torque. **Make sure the toe setting does not change during clamp tightening.**

(4) Adjust the left wheel toe position with the tie rod. Turn the sleeve until the left wheel is at specifications. Position the clamp bolts as shown (Fig. 6) and tighten to 27 N·m (20 ft. lbs.) torque. **Make sure the toe setting does not change during clamp tightening.**

(5) Verify the right toe setting.



**Fig. 6 Drag Link and Tie Rod Clamp Location (LHD)**



J9202-2

**Fig. 7 Steering Linkage  
YJ Vehicles**

**TOE POSITION—YJ VEHICLES**

The wheel toe position should be the final front wheel alignment adjustment. In all instances follow the equipment manufacturer's recommended procedure.

(1) Start the engine if equipped with power steering. Turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position. Turn off the engine.

(2) Loosen the adjustment sleeve clamp bolts on the tie rod (Fig. 7).

**The tie rod and adjustment sleeve have both right and left hand threads to provide equal adjustment for each wheel.**

(3) After the adjustment is completed, position the tie rod adjustment sleeve clamp bolts as shown.

(4) Tighten the adjustment sleeve clamp bolts to 27 N·m (20 ft. lbs.) torque.

(5) Complete the adjustment. Position the drag link clamp bolts as shown. Tighten the bolts to 49 N·m (36 ft. lbs.) torque.

**ALIGNMENT SPECIFICATIONS—XJ VEHICLES**

ADJUSTMENT	SET TO	OK RANGE
CASTER	7.07°	5.25° to 8.0°
CAMBER (not adjustable)	-0.25°	-0.75° to 0.5°
WHEEL TOE-IN (each side)	0°	-0.107° to +0.125°

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**ALIGNMENT SPECIFICATIONS—YJ VEHICLES**

ADJUSTMENT	SET TO	OK RANGE
CASTER Manual Trans. Auto Trans.	6.5° 8.0°	5.25° to 7.25° 6.5° to 9.0°
CAMBER (not adjustable)	0°	-0.5° to +0.5°
WHEEL TOE-IN (each side)	0°	-0.125° to +0.125°

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## XJ FRONT SUSPENSION

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### SERVICE INFORMATION

Periodic lubrication of the steering system and suspension components is required. Refer to Group 0, Lubrication And Maintenance for the service interval.

**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.

### TRACK BAR

#### REMOVAL

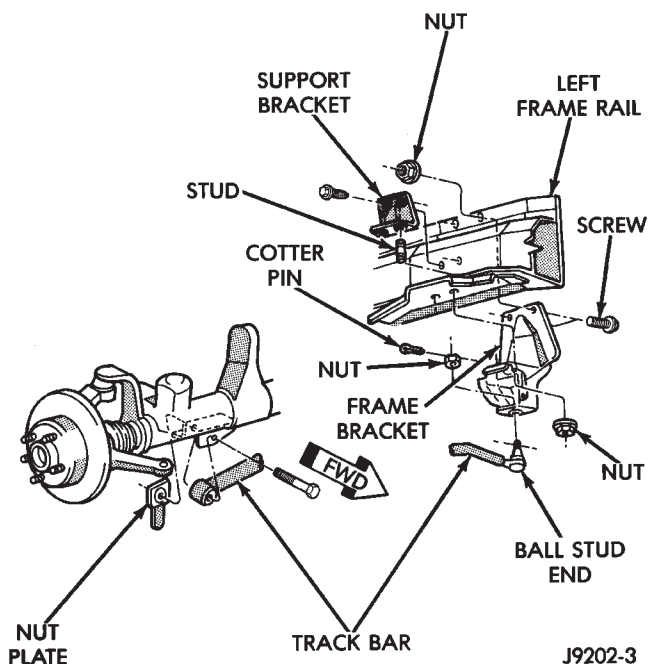
- (1) Raise and support the vehicle.
- (2) Remove the cotter pin and nut from the ball stud end at the frame rail bracket (Fig. 1).

**A puller tool may be necessary to separate the ball stud from the frame rail bracket.**

- (3) Remove the bolt and flag nut from the axle shaft tube bracket (Fig. 1). Remove the track bar.

#### INSTALLATION

- (1) Install the track bar at axle tube bracket. Loosely install the retaining bolt and flag nut (Fig. 1).
- (2) It may be necessary to pry the axle assembly over to install the track bar at the frame rail. Install track bar at the frame rail bracket. Install the retaining nut on the stud (Fig. 1).
- (3) Remove the supports and lower the vehicle.
- (4) Tighten the retaining bolt at the axle shaft tube bracket to 100 N·m (74 ft. lbs.) torque.
- (5) Tighten the ball stud nut to 81 N·m (60 ft. lbs.) torque. Install a new cotter pin.



**Fig. 1 Track Bar (LHD)**

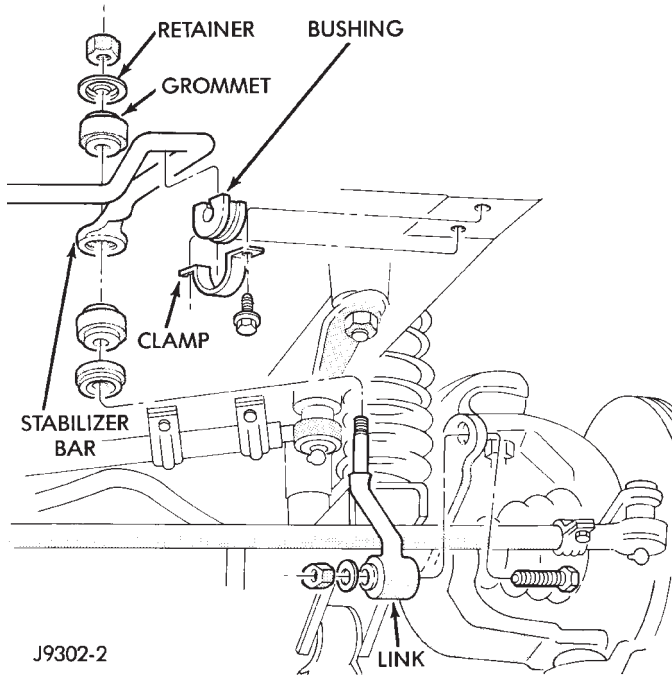
### STABILIZER BAR

#### REMOVAL

- (1) Raise and support the vehicle.
- (2) Disconnect the stabilizer bar links from the axle brackets (Fig. 2).
- (3) Disconnect the stabilizer bar from the links.
- (4) Disconnect the stabilizer bar clamps from the frame rails. Remove the stabilizer bar.

#### INSTALLATION

- (1) Inspect stabilizer bar bushings ( Fig. 2). Replace bushings if cracked, cut, distorted, or worn.
- (2) Position the stabilizer bar on the frame rail and install the bushings and clamps. Ensure the bar is centered with equal spacing on both sides. Tighten the bolts to 75 N·m (40 ft. lbs.).
- (3) Install the links and grommets onto the stabilizer bar and axle brackets (Fig. 2). Tighten the nut at the connecting links at the axle bracket to 95 N·m (70 ft. lbs.) torque.



**Fig. 2 Stabilizer Bar**

(3) Tighten the stabilizer bar to connecting link nut to 36 N·m (27 ft. lbs.) torque.

(4) Remove the supports and lower the vehicle.

## UPPER SUSPENSION ARM

### REMOVAL

(1) Raise and support the vehicle.

(2) Remove the upper suspension arm nut and bolt at the axle bracket (Fig. 3).

(3) Remove the nut and bolt (Fig. 3) at the frame rail and remove the upper suspension arm.

### INSTALLATION

(1) Position the upper suspension arm at the axle and frame rail (Fig. 3).

(2) Install the bolts and finger tighten the nuts (Fig. 3).

(3) Remove the supports and lower the vehicle.

(4) Tighten the nut at the axle to 75 N·m (55 ft. lbs.) torque.

Tighten the nut at the frame bracket to 90 N·m (66 ft. lbs.) torque.

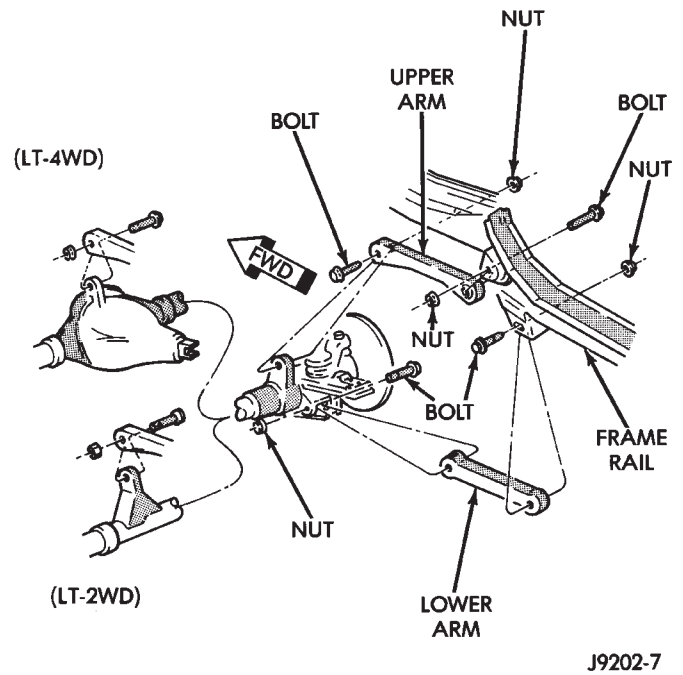
## AXLE BUSHING REPLACEMENT

(1) Remove the upper suspension arm from axle. Refer to Upper Suspension Arm Removal in this Group.

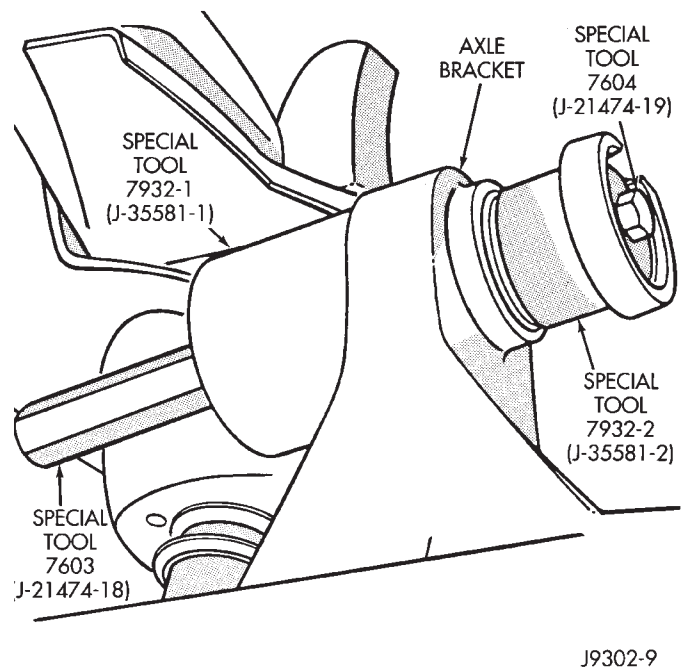
(2) Insert Spacer 7932-3 (J-35581-3) around the bushing in the axle bracket ears (Fig. 4).

(3) Assemble and install Bushing Removal/Installer (Fig. 4).

(4) Remove the bushing by tightening the hex-head on Long Nut.



**Fig. 3 Upper and Lower Suspension Arms**



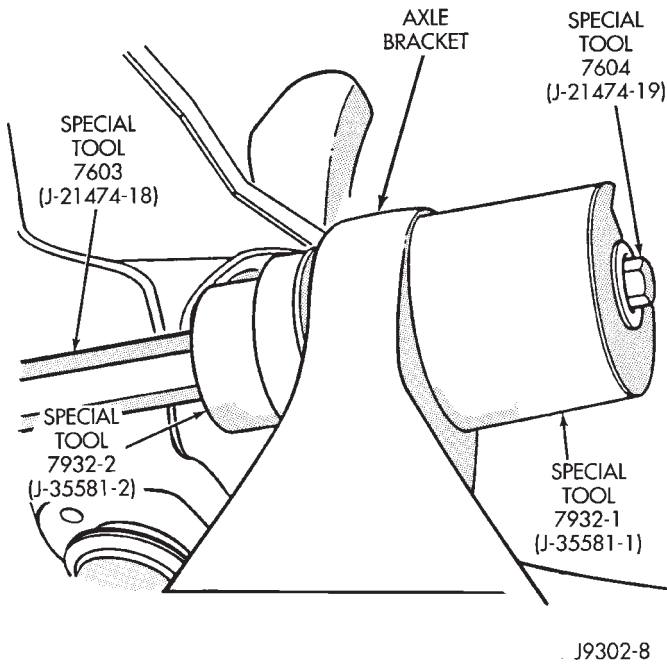
**Fig. 4 Axle Bracket Bushing Removal**

**For two-wheel drive axles and right side on Model 30 axle, do not remove Spacer 7932-3 (J-35581-3) at this time.**

(5) Position the new bushing on Installer.

(6) Install the bushing by tightening the hex-head on Long Nut (Fig. 5). Remove Spacer 7932-3 (J-35581-3).

(7) Install the upper suspension arm to axle. Refer to Upper Suspension Arm Installation in this Group.



**Fig. 5 Axle Bracket Bushing Installation**

## LOWER SUSPENSION ARM

### REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the lower suspension arm nut and bolt from the axle bracket (Fig. 3).
- (3) Remove the nut and bolt (Fig. 3) from the rear bracket and remove the lower suspension arm.

### INSTALLATION

- (1) Position the lower suspension arm at the axle bracket and rear bracket (Fig. 3).
- (2) Install the bolts and finger tighten the nuts (Fig. 3).
- (3) Remove support and lower the vehicle.
- (4) Tighten the front and rear nuts to 115 N·m (85 ft. lbs.) torque.

### SPRING AND SHOCK DIAGNOSIS

A squeak noise from the shock absorber can be produced if movement between the rubber bushings and the metal occurs. This noise can usually be stopped by tightening the attaching nuts. If the squeak noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary.

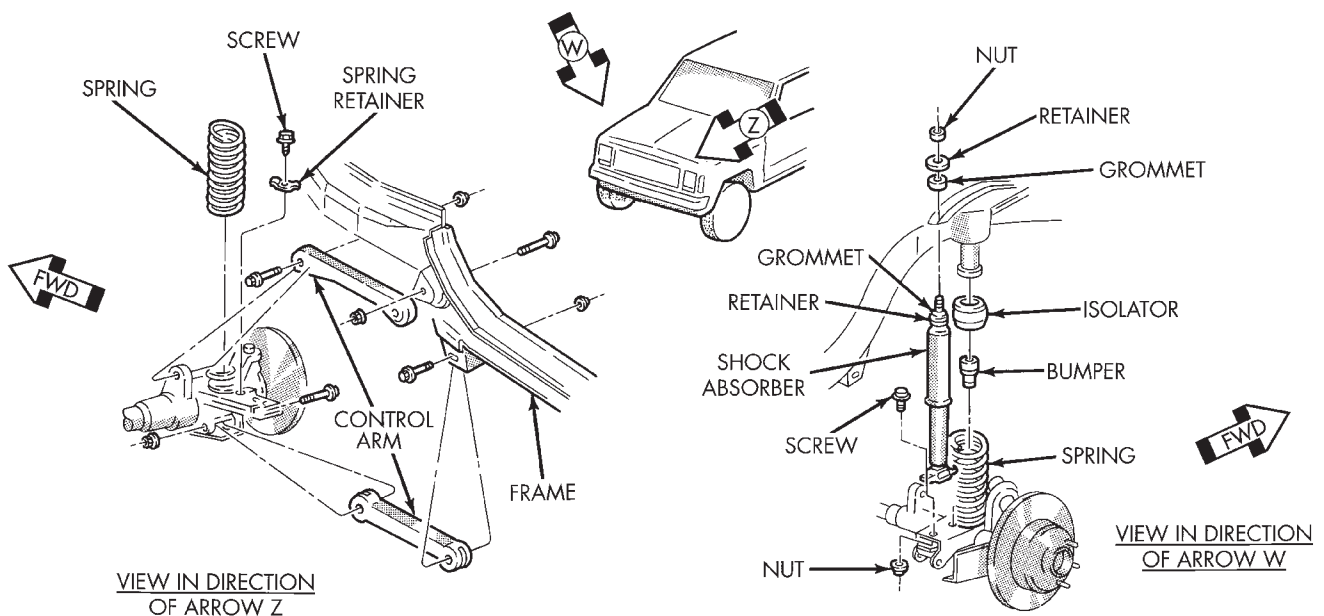
The shock absorber bushings do not require any type of lubrication. Do not lubricate the bushings to reduce bushing noise. Grease or mineral oil-base lubricants will deteriorate the bushing rubber.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in an upright position and force the piston into and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

### SHOCK ABSORBER

#### REMOVAL

- (1) Remove the nut, retainer and grommet from the upper stud in the engine compartment (Fig. 6).
- (2) Remove the lower nuts and bolts from the axle bracket (Fig. 6). Remove the shock absorber.



**Fig. 6 Coil Spring & Shock Absorber**

*INSTALLATION*

(1) Position the lower retainer and grommet on the upper stud. Insert the shock absorber through the shock tower hole.

(2) Install the lower bolts and nuts. Tighten nuts to 23 N·m (17 ft. lbs.) torque.

(3) Install the upper grommet and retainer on the stud in the engine compartment. Install the nut and tighten to 10 N·m (8 ft. lbs.) torque.

**COIL SPRING***REMOVAL*

(1) Raise and support the vehicle. Position a hydraulic jack under the axle to support it.

(2) Remove the wheel if necessary.

(3) Mark and disconnect the front propeller shaft from the axle.

(4) Disconnect the lower suspension arms from the axle (Fig. 6).

(5) Disconnect the stabilizer bar link and shock absorber from the axle.

(6) Disconnect the track bar from the frame rail bracket.

(7) Disconnect the drag link from the pitman arm.

(8) Lower the axle until the spring is free from the upper mount. Remove the coil spring clip (Fig. 6) and remove the spring.

(9) Pull jounce bumper out of mount.

*INSTALLATION*

(1) Install jounce bumper into mount.

(2) Position the coil spring on the axle pad. Install the spring clip and bolt (Fig. 6). Tighten bolt to 21 N·m (16 ft. lbs.) torque.

(3) Raise the axle into position until the spring seats in the upper mount.

(4) Connect the stabilizer bar links and shock absorbers to the axle bracket. Connect the track bar to the frame rail bracket.

(5) Install the lower suspension arms to the axle.

**DO NOT TIGHTEN AT THIS TIME.**

(6) Install the front propeller shaft to the axle.

(7) Remove the supports and lower the vehicle.

(8) Tighten lower suspension arms nuts to 115 N·m (85 ft. lbs.) torque.

## YJ FRONT SUSPENSION

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### SERVICE INFORMATION

Periodic lubrication of the steering system and suspension components is required. Refer to Group 0, Lubrication And Maintenance for the service interval.

**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.

### TRACK BAR

#### REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the retaining nuts and bolts (Fig. 1) from the axle bracket and frame bracket. Remove track bar.

#### INSTALLATION

- (1) Position track bar at axle shaft tube bracket. Loosely install the retaining bolt and nut (Fig. 1).
- (2) Loosely install the retaining bolt and nut at the frame bracket.
- (3) Remove support and lower vehicle.
- (4) Tighten the retaining nut at the axle shaft tube bracket to 100 N·m (74 ft. lbs.) torque.
- (5) Tighten the retaining nut at the frame bracket to 142 N·m (105 ft. lbs.) torque.

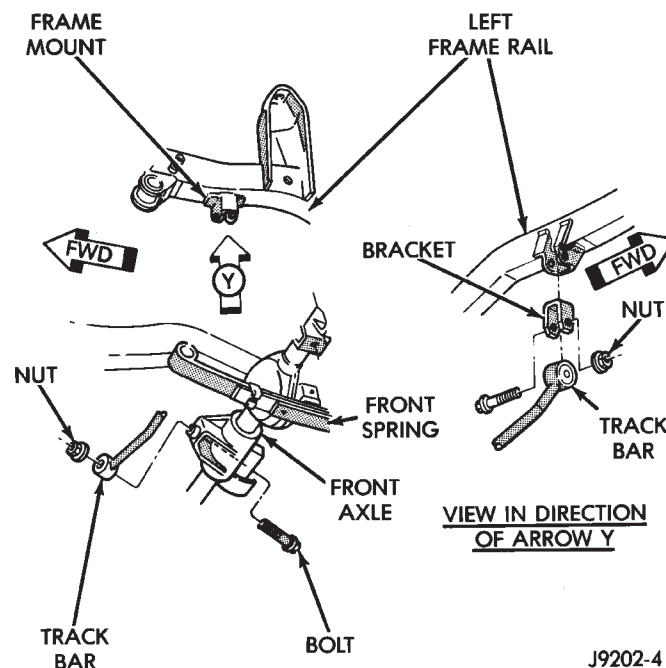
### STABILIZER BAR

#### REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the retaining nut from the connecting link bolt (Fig. 2).
- (3) Remove the retaining clamps from frame rails
- (4) Remove the stabilizer bar.

#### INSTALLATION

- (1) Inspect the stabilizer bar bushings (Fig. 2). Replace the bushings if cracked, cut, distorted, or worn.



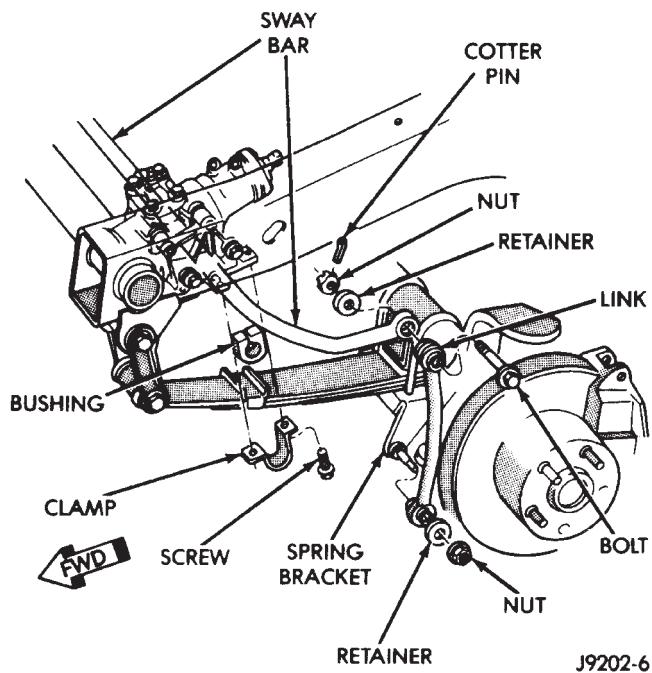
**Fig. 1 Track Bar**

- (2) Position the stabilizer bar on the frame. Install the retaining brackets and fasteners. Tighten bolts to 41 N·m (30 ft. lbs.) torque.
- (3) Install the link upper bolts and nuts. Tighten the nuts to 61 N·m (45 ft. lbs.) torque.
- (4) Tighten the link spring bracket nuts to 61 N·m (45 ft. lbs.) torque.
- (5) Lower the vehicle.

### SPRING AND SHOCK DIAGNOSIS

A squeak noise from the shock absorber or springs can be produced if movement between the rubber bushings and the metal occurs. This noise can usually be stopped by tightening the attaching nuts. If the squeak noise persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

J9202-4



**Fig. 2 Stabilizer Bar**

The shock absorber bushings do not require any type of lubrication. Do not lubricate the bushings to reduce bushing noise. Grease or mineral oil-base lubricants will deteriorate the bushing rubber.

The shock absorbers are not refillable or adjustable. If a malfunction occurs, the shock absorber must be replaced. To test a shock absorber, hold it in an upright position and force the piston into and out of the cylinder four or five times. The action throughout each stroke should be smooth and even.

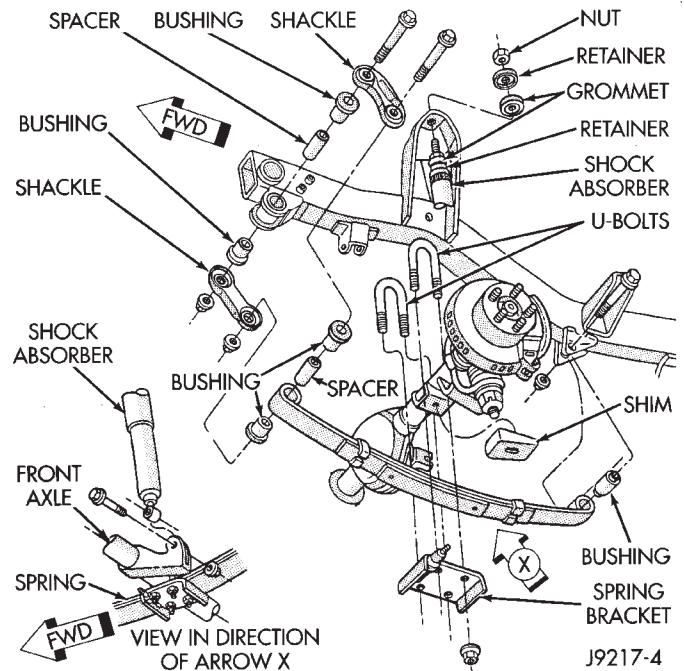
## SHOCK ABSORBER

### REMOVAL

- (1) Remove the nut, retainer and grommet from the upper stud on the frame bracket (Fig. 3).
- (2) Raise and support the vehicle.
- (3) Remove the nut, washers and bolt from the shock absorber lower eye (Fig.3).
- (4) Remove the shock absorber.
- (5) Remove the remaining grommet and retainer from the shock absorber stud.

### INSTALLATION

- (1) Position the lower retainer and grommet on the upper stud. Insert the shock absorber through the shock tower hole.
- (2) Install the lower bolts and nuts. Tighten the nuts to 61 N·m (45 ft. lbs.) torque.
- (3) Install the upper grommet and retainer on the stud on the frame bracket. Install the nut and tighten to 12 N·m (9 ft. lbs.) torque.



**Fig. 3 Spring & Shock Absorber**

## LEAF SPRING

### REMOVAL

- (1) Raise the vehicle.
- (2) Support the vehicle with jack stands placed under the frame.
- (3) Position a hydraulic jack under the axle. Raise the axle to relieve the axle weight from the springs.
- (4) Remove the stabilizer bar links attaching nut.
- (5) Remove the nuts, the U-bolts and spring bracket from the axle.
- (6) Remove the nut and bolt that attaches the spring front eye to the shackle (Fig. 3).
- (7) Remove the nut and bolt from the spring rear eye.
- (8) Remove the spring from the vehicle.

**The spring can be disassembled by removing the spring clips and the center bolt. If the spring bushings require replacement, refer to the bushing removal and installation procedures.**

### INSTALLATION

- (1) Position the spring front eye in the shackle. Loosely install the attaching bolt and nut. Do not tighten at this time.
- (2) Position the rear eye in the hanger bracket. Loosely install the attaching bolt and nut (Fig. 3). Do not tighten at this time.
- (3) Position the axle. Install the spring bracket, U-bolts and nuts (Fig. 3). Tighten the U-bolt nuts to 122 N·m (90 ft. lbs.) torque.
- (4) Attach the stabilizer bar links.
- (5) Remove the hydraulic jack.



(6) Remove the support stands and lower the vehicle.

(7) Tighten the front shackle plate nut (Fig. 3) to 135 N·m (100 ft. lbs.) torque.

(8) Tighten the rear eye bracket nut to 142 N·m (105 ft. lbs.) torque.

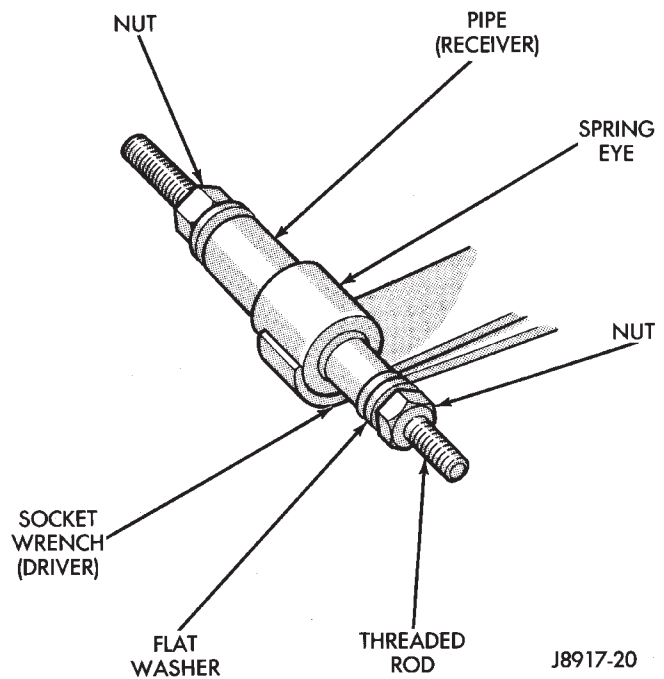
#### LEAF SPRING EYE BUSHING REPLACEMENT

(1) Assemble tools shown (Fig. 4). Tighten the nut located at the socket wrench end of the threaded rod until the bushing is forced out.

(2) Assemble and align the bushing installation tools.

(3) Align the bushing with the spring eye and tighten the nut located at the socket wrench end of the threaded rod. Tighten until the bushing is forced into the spring eye.

**The bushing must be centered in the spring eye. The ends of the bushing must be flush or slightly recessed within the end surfaces of the spring eye.**



*Fig. 4 Spring Eye Bushing Removal*

## AXLE NOISE/VIBRATION DIAGNOSIS

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## 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 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 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 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
- 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.

## SERVICE DIAGNOSIS

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

## SERVICE DIAGNOSIS (CONT'D)

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

## MODEL 30 AXLE AND TUBE AXLE (2WD)

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## INFORMATION

The Model 30 front axles 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. **Use care when removing axle shafts as NOT to damage the tone wheel or the sensor.**

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

The 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.

## COMMAND-TRAC—YJ VEHICLES

The Command-Trac system is a vacuum disconnect axle. The system has a two-piece axle shaft coupled together by a shift collar. For two-wheel drive operation, the vacuum motor and shift fork disengages the axle shaft splines. For four-wheel drive operation, the vacuum motor and shift fork engages the axle splines.

## SELEC-TRAC—XJ VEHICLES

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

For XJ vehicles equipped with **Selec-Trac** and ABS brake system, refer to Group 5—Brakes for additional service information.

## LUBRICANT 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.**
- 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.).

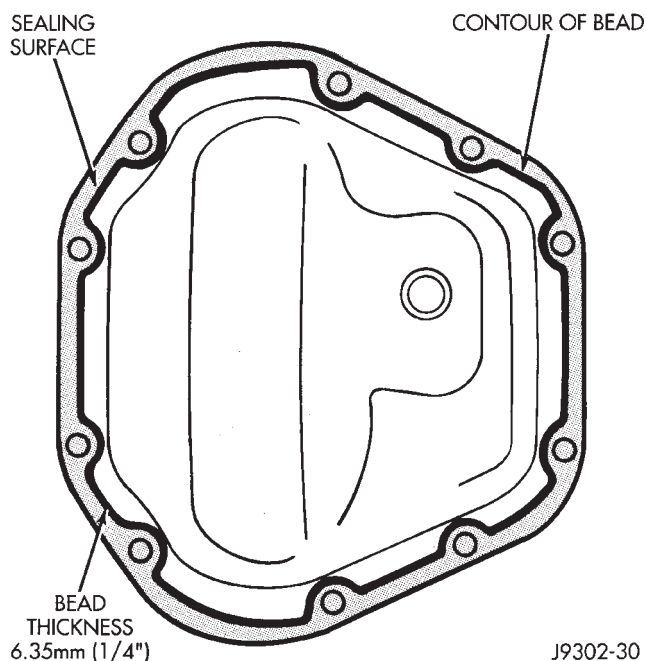
Refer to Group 0, Lubrication and Maintenance for additional information regarding temperature range, viscosity and fluid level.

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

### 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. 1). **Allow the sealant to cure for a few minutes.**



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**Fig. 1 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.

### DRIVE AXLE ASSEMBLY REPLACEMENT—XJ VEHICLES

#### 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.**

(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.

## DRIVE AXLE ASSEMBLY REPLACEMENT—YJ VEHICLES

### REMOVAL

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

(2) Remove the front wheels.

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

(4) Disconnect the axle vent hose and axle shift motor vacuum harness.

(5) 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 from the steering knuckle. Disconnect the steering damper from the axle bracket.

(10) Support the axle with a hydraulic jack under the differential. Raise the axle just enough to relieve the axle weight from the springs.

(11) Remove the spring U-bolts from the plate brackets.

(12) Loosen BUT DO NOT REMOVE the bolts that attach the spring rear pivot at the frame rail brackets. This will allow the springs to pivot without binding on the bushings.

(13) Disconnect shackle from the springs and lower the springs to the surface.

(14) 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 springs and install the spring shackle bolts. **Do not tighten at this time.**

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

(4) Install the spring U-bolts through the plate brackets and tighten to 122 N·m (90 ft. lbs.) torque.

(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, the vehicle ride comfort could be affected.**

(6) Install the shock absorber and tighten the nut to 61 N·m (45 ft. lbs.) torque.

(7) Install the stabilizer bar link to the axle bracket. Tighten the nut to 61 N·m (45 ft. lbs.) torque.

(8) Install the 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 bolt 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) Connect the vent hose to the tube fitting and axle shift motor vacuum harness.

(11) 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.

(15) Remove the supports and lower the vehicle.

(16) Tighten the spring rear pivot bolt/nut to 142 N·m (105 ft. lbs.) torque. Tighten the spring shackle bolt/nut to 135 N·m (100 ft. lbs.) torque.

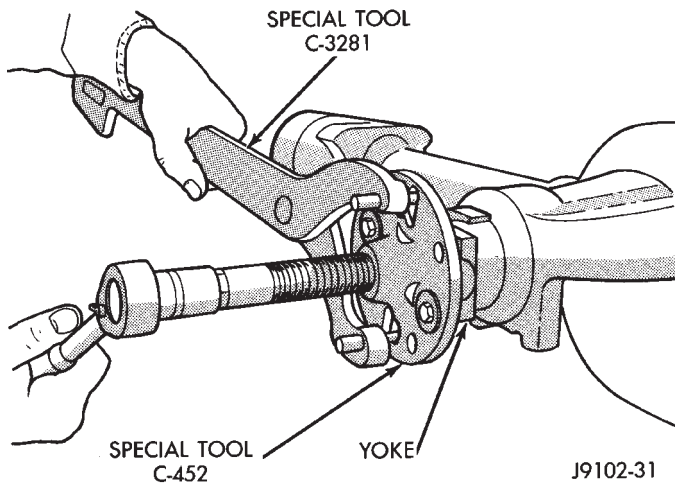


- (17) Tighten the track bar nut at the axle bracket to 100 N·m (74 ft. lbs.) torque.
- (18) Check the front wheel alignment.

**PINION SEAL REPLACEMENT**

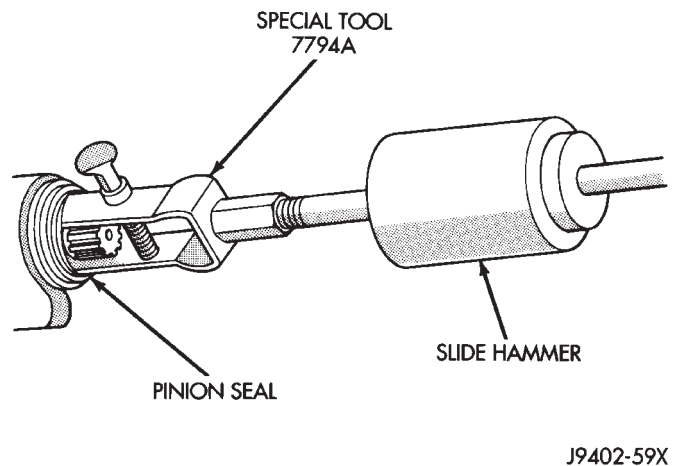
**REMOVAL**

- (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. 2).
- (6) Mark the positions of the yoke and pinion gear for installation alignment reference.



**Fig. 2 Pinion Yoke Removal**

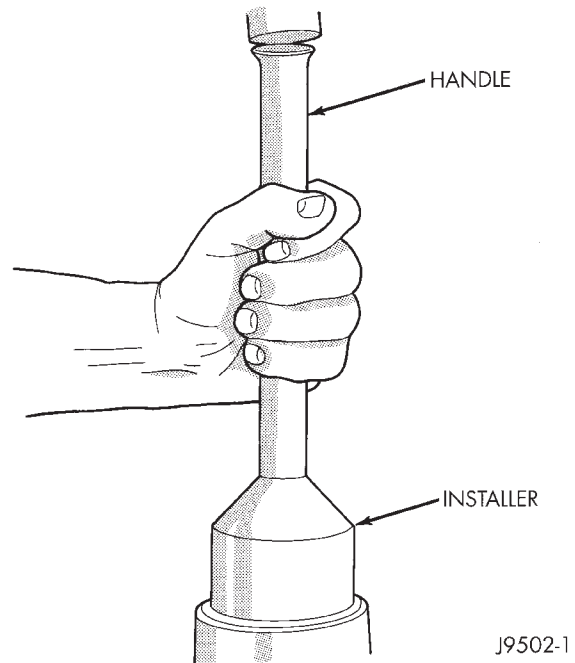
- (7) Use Remover 7794A and slide hammer to remove the pinion gear seal (Fig. 3).



**Fig. 3 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. 4).



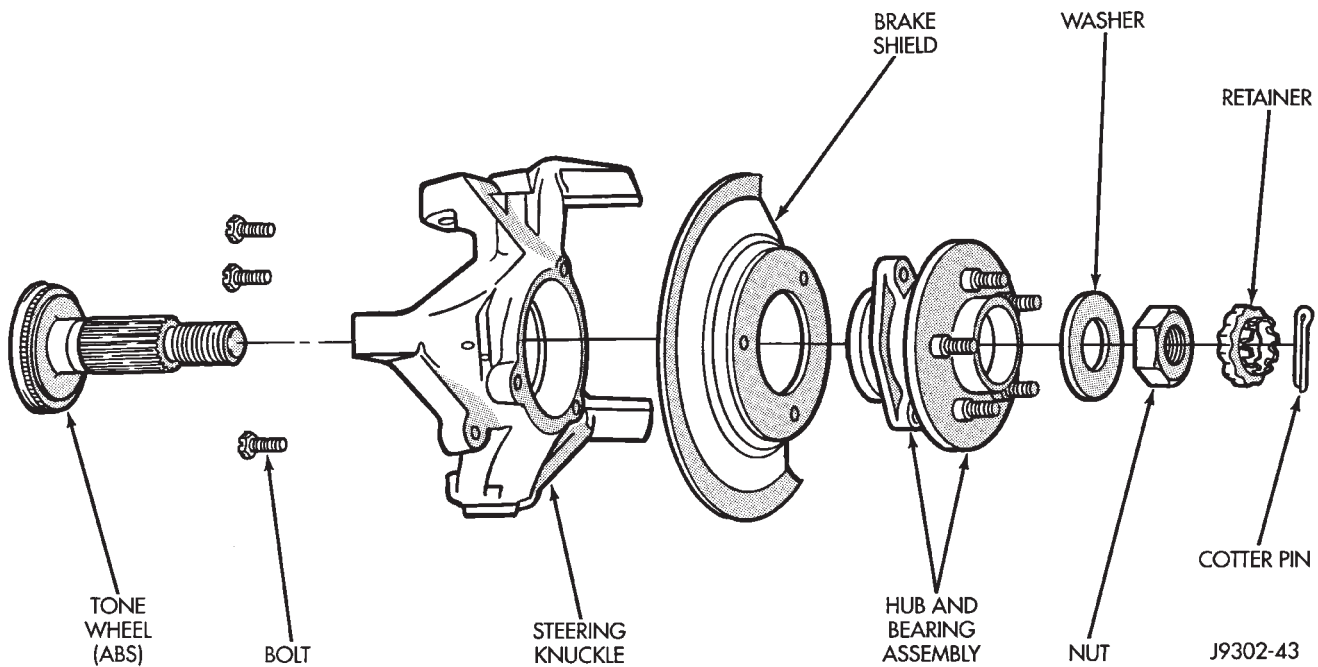
**Fig. 4 Pinion Seal Installation**

- (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. **Tighten the nut to 217-352 N·m (160-260 ft. lbs.) (Fig. 5).**
- (4) Align the installation reference marks and attach the propeller shaft to the yoke.
- (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. 6).
- (5) Remove the hub to knuckle bolts (Fig. 6). Remove the hub from the steering knuckle and axle shaft.
- (6) Remove the disc brake rotor shield from the bearing carrier (Fig. 6).
- (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.**



**Fig. 6 Hub, Knuckle and Axle Shaft**

#### INSTALLATION

- (1) Thoroughly clean the axle shaft (Fig. 6) 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. 6).
- (6) Install the brake components, refer to Group 5, Brakes.
- (7) Install the wheel and tire assembly.
- (8) Remove support and lower the vehicle.

#### AXLE SHAFT—CARDAN U-JOINT

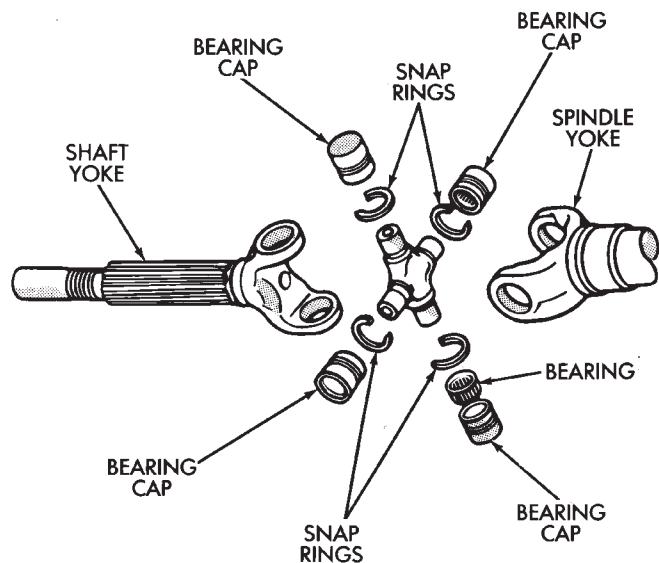
##### DISASSEMBLY

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. 7).

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



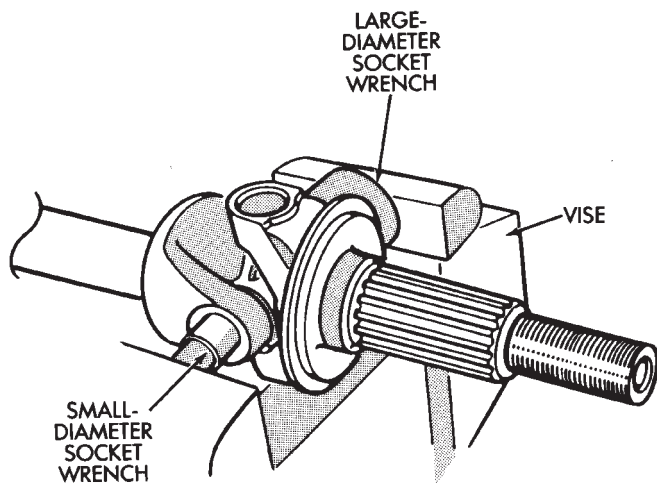
**Fig. 7 Axle Shaft Outer U-Joint**

- (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. 8).

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

- (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.



J8902-16

**Fig. 8 Yoke Bearing Cap Removal**

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

#### CLEANING AND INSPECTION

(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.

#### 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.

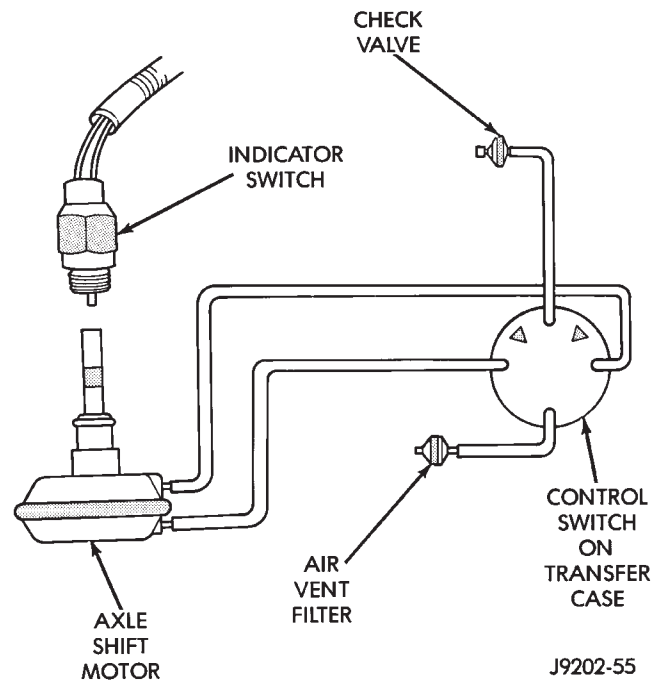
(6) Install the axle shaft, refer to Hub Bearing and Axle Shaft installation.

## VACUUM DISCONNECT AXLE—YJ VEHICLES

### VACUUM CONTROL SYSTEM

The disconnect axle control system consists of;

- Vacuum control switch on the transfer case
- Air vent filter
- Shift motor
- Indicator switch
- Vacuum switch
- Check valve
- Vacuum harness (Fig. 9, 10)



J9202-55

**Fig. 9 Vacuum Control System**

**Refer to Group 21—Transmissions for additional information involving the Command-Trac System Transfer Case.**

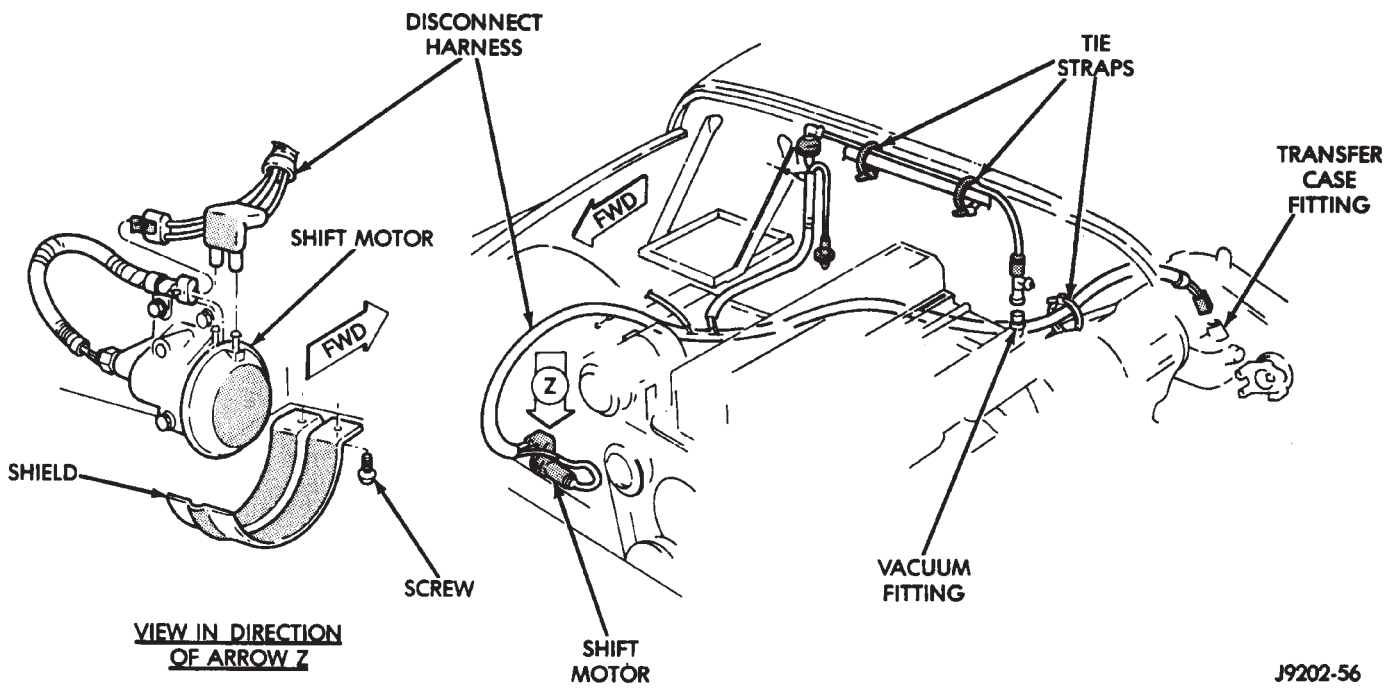
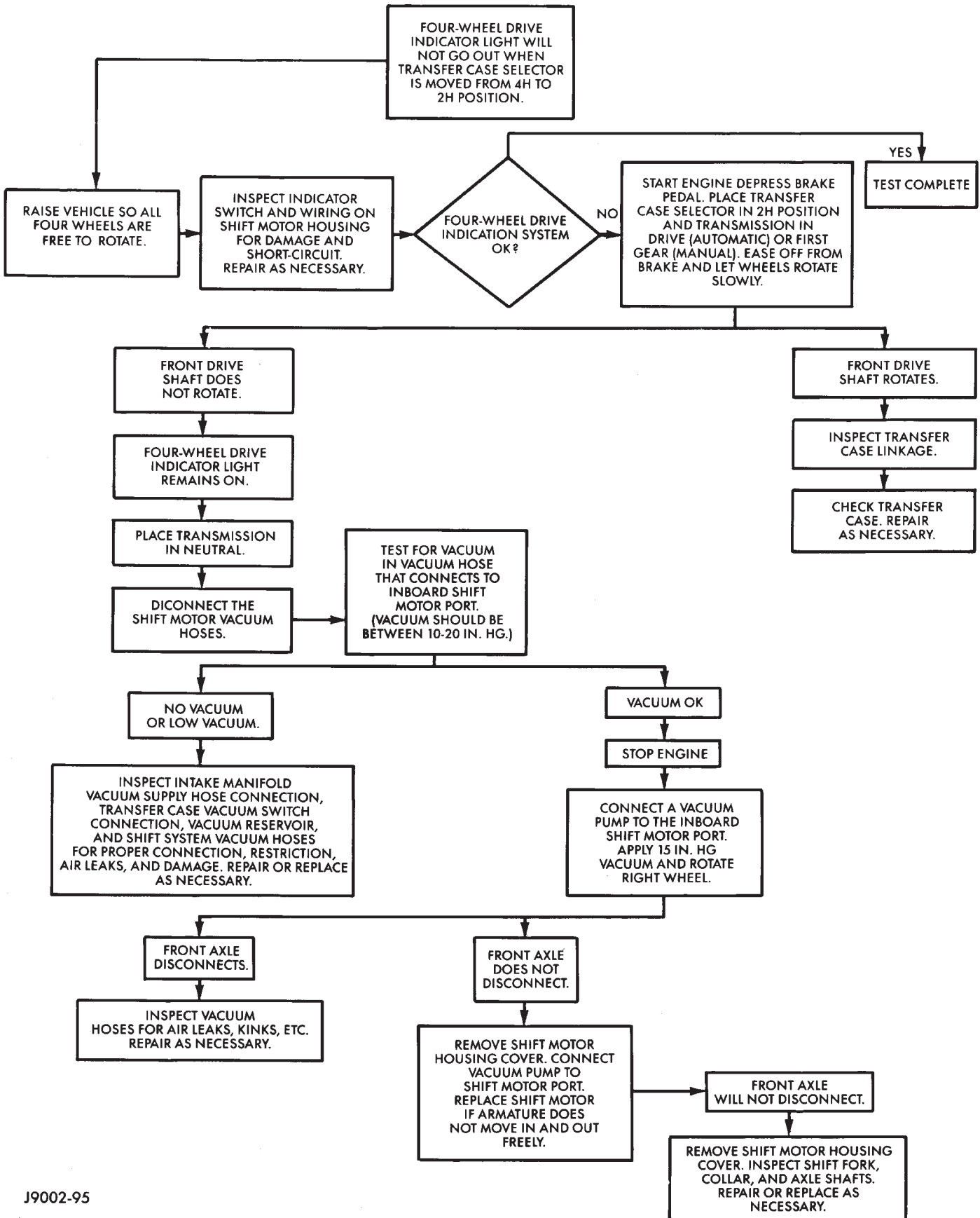


Fig. 10 Vacuum Hose Routing

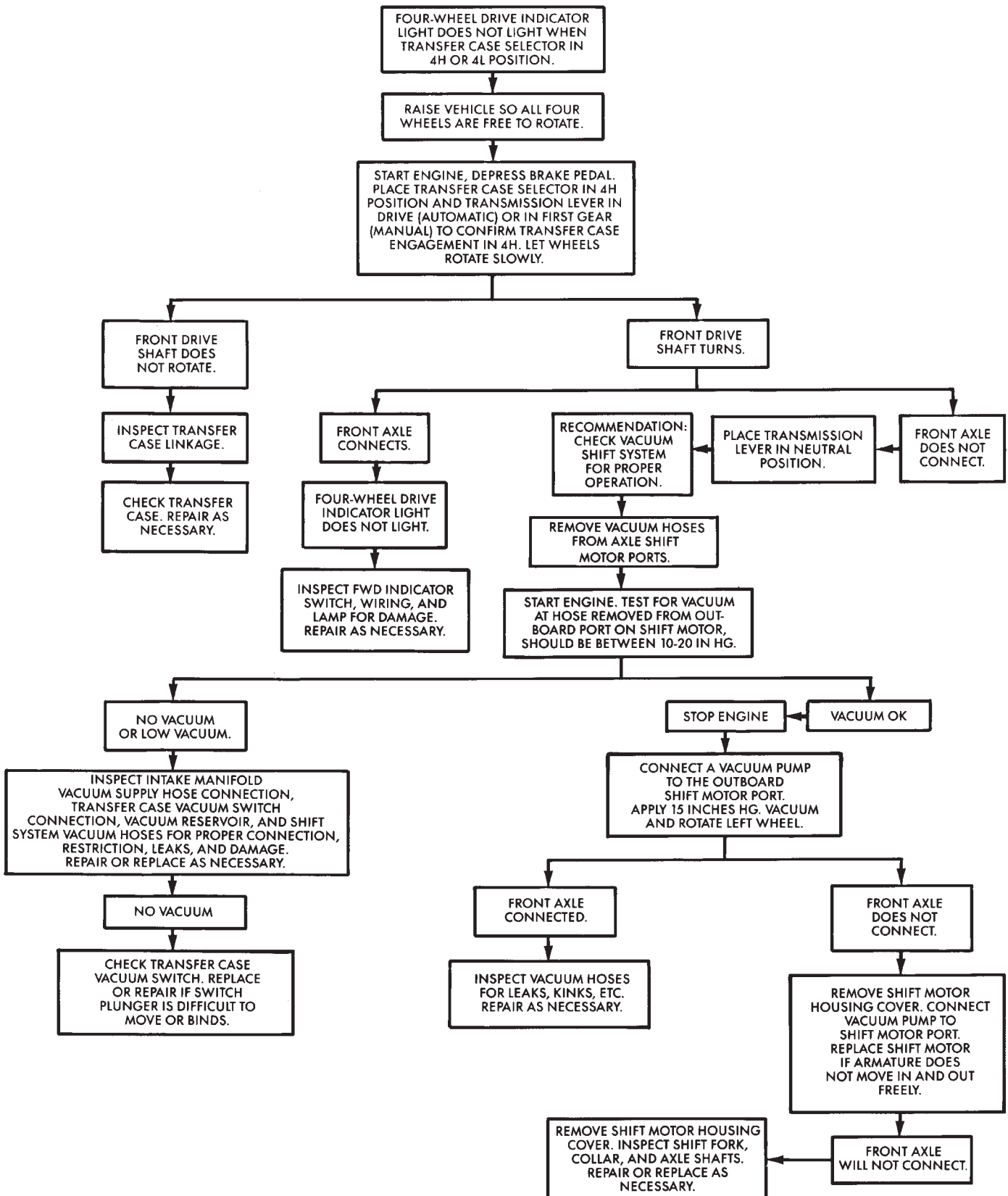
DISCONNECT AXLE/SHIFT MOTOR DIAGNOSIS

**TWO-WHEEL DRIVE OPERATION DIAGNOSIS**



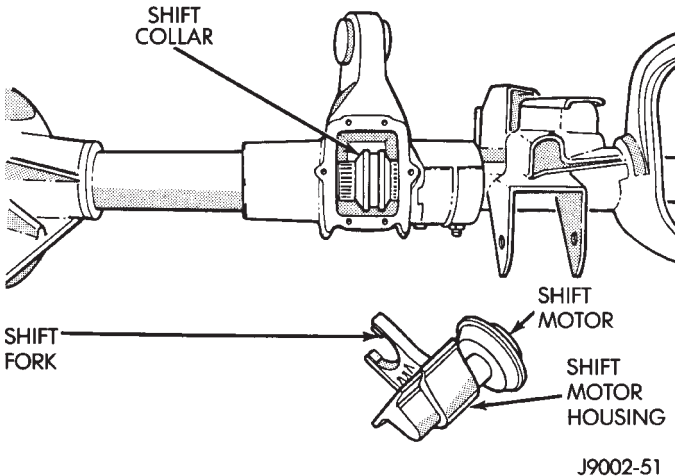
DISCONNECT AXLE/SHIFT MOTOR DIAGNOSIS (CONT'D)

**FOUR-WHEEL DRIVE OPERATION DIAGNOSIS**

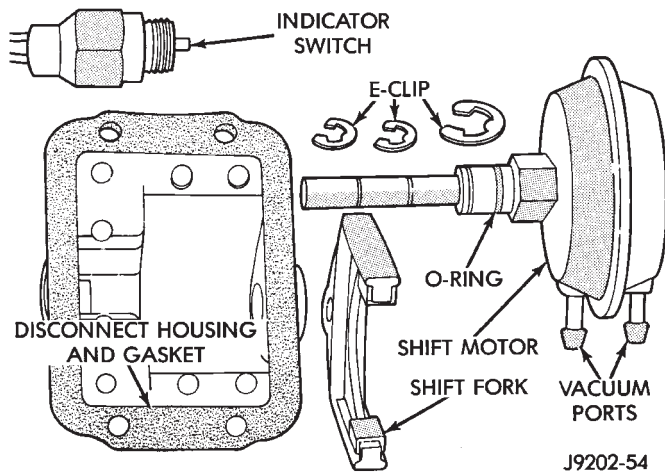


**SHIFT MOTOR—REMOVAL/DISASSEMBLY**

- (1) Disconnect the vacuum and wiring connector from the shift housing.
- (2) Remove indicator switch.
- (3) Remove the shift motor housing cover, gasket and shield from the housing (Fig. 11).

**Fig. 11 Shift Motor Housing and Shift Collar**

- (4) Remove the E-clips from the shift motor housing and shaft. Remove shift motor and shift fork from the housing (Fig. 12).

**Fig. 12 Vacuum Shift Motor Components**

- (5) Remove the O-ring seal from the shift motor shaft.
- (6) Clean and inspect all components. If any component is excessively worn or damaged, it should be replaced.

**ASSEMBLY/INSTALLATION**

- (1) Install a new O-ring seal on the shift motor shaft.
- (2) Insert the shift motor shaft through the hole in the housing and shift fork. The shift fork offset should be toward the differential.

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

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

- (5) Install the shift motor housing shield and attaching bolts. Tighten the bolts to 11 N·m (101 in. lbs.) torque.

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

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

**INTERMEDIATE AXLE SHAFT—REMOVAL/DISASSEMBLY**

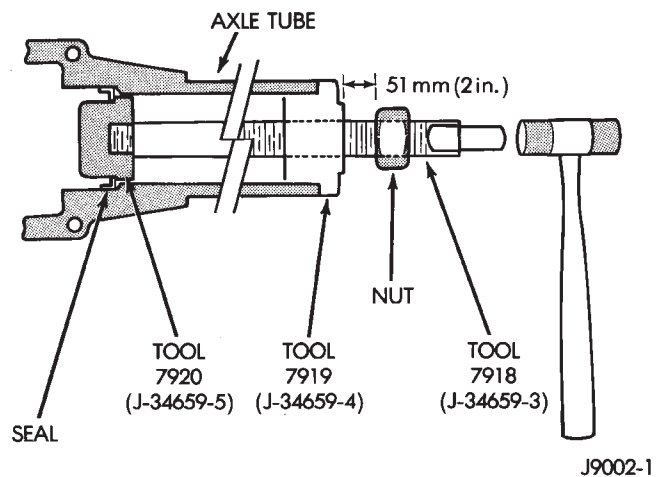
Service to the Disconnect axle seals and bearing require the use of Tool Set 6288 (J34659) and Seal Installer 6228.

- (1) Remove the vacuum motor housing. Refer to Shift Motor Removal in this section.

- (3) Remove the outer axle shaft. Refer to Hub Bearing and Axle Shaft in this section.

- (4) Remove shift collar and intermediate axle shaft.

- (5) Remove the inner axle shaft seal from the shift motor housing (Fig. 13).

**Fig. 13 Axle Shaft Inner Seal Removal**

- (6) Remove the intermediate axle shaft bearing (Fig. 14).

**ASSEMBLY/INSTALLATION**

- (1) Position the bearing on installation tool. Seat the bearing in the housing bore (Fig. 15).

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

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

- (4) Install the inner axle seal (Fig. 16, 17).

**The axle shaft seal primary installation tool 6228-1 will only force the seal partially into the**

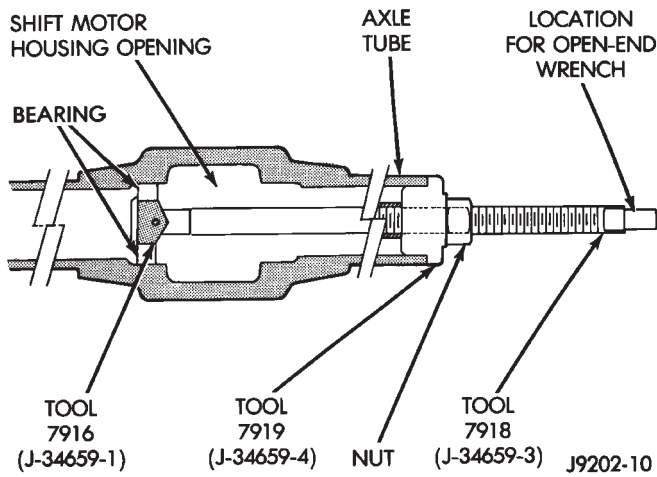


Fig. 14 Bearing Removal Tool Installed

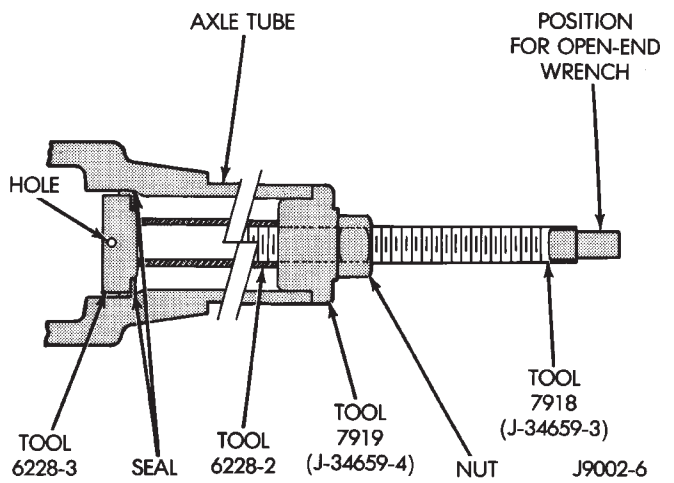


Fig. 17 Secondary Installation of Seal (Step Two)

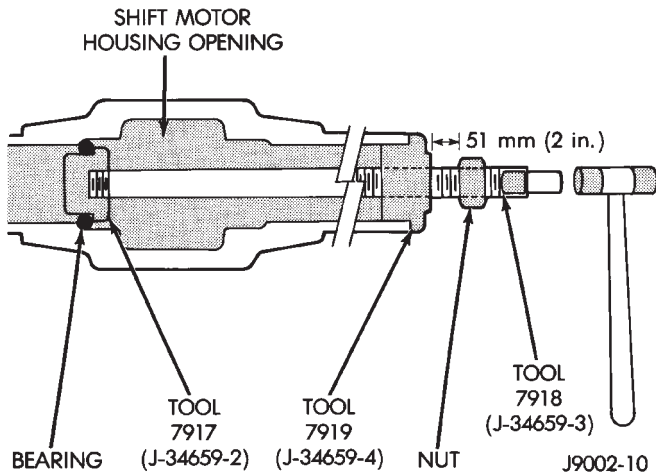


Fig. 15 Intermediate Shaft Bearing Installation

axle shaft tube bore. The axle shaft seal secondary installation tool 6228-3 must be used to completely seat the seal in the axle shaft tube bore. After seal installation, inspect that the seal is NOT distorted or cocked in the tube.

- (5) Insert the intermediate axle shaft into the differential side gear.
- (6) Install the shift collar on the splined end of the intermediate axle shaft.
- (7) Lubricate the splined end of the intermediate axle shaft with multi-purpose lubricant (Fig. 18).

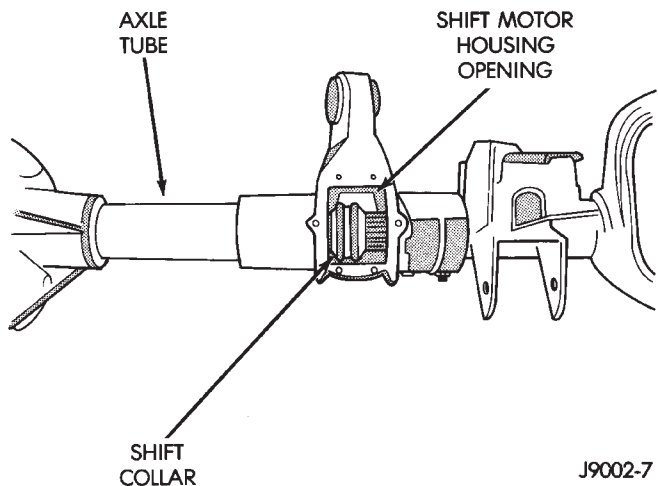


Fig. 18 Shift Collar Installation

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

- (8) Insert the axle shaft into the tube. Engage the splined-end of the shaft with the shift collar. Refer to Hub Bearing and Axle Shaft in this section.
- (9) Install the vacuum motor housing. Refer to Shift Motor Installation in this section.

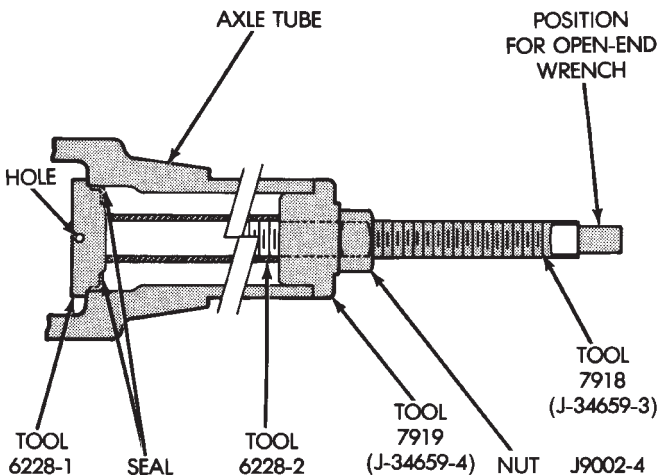


Fig. 16 Primary Installation of Seal (Step One)

### 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. 19).

#### UPPER BALL STUD REPLACEMENT

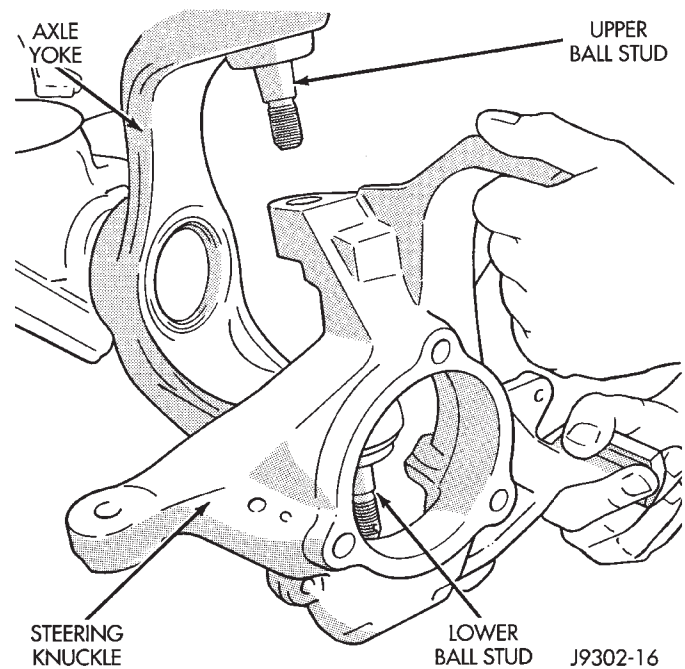
(1) Position tools as shown to remove and install ball stud (Fig. 20).

#### LOWER BALL STUD REPLACEMENT

(1) Position tools as shown to remove and install ball stud (Fig.21). Because there are two different designs for the lower ball studs try both installers for proper fit.

#### KNUCKLE INSTALLATION

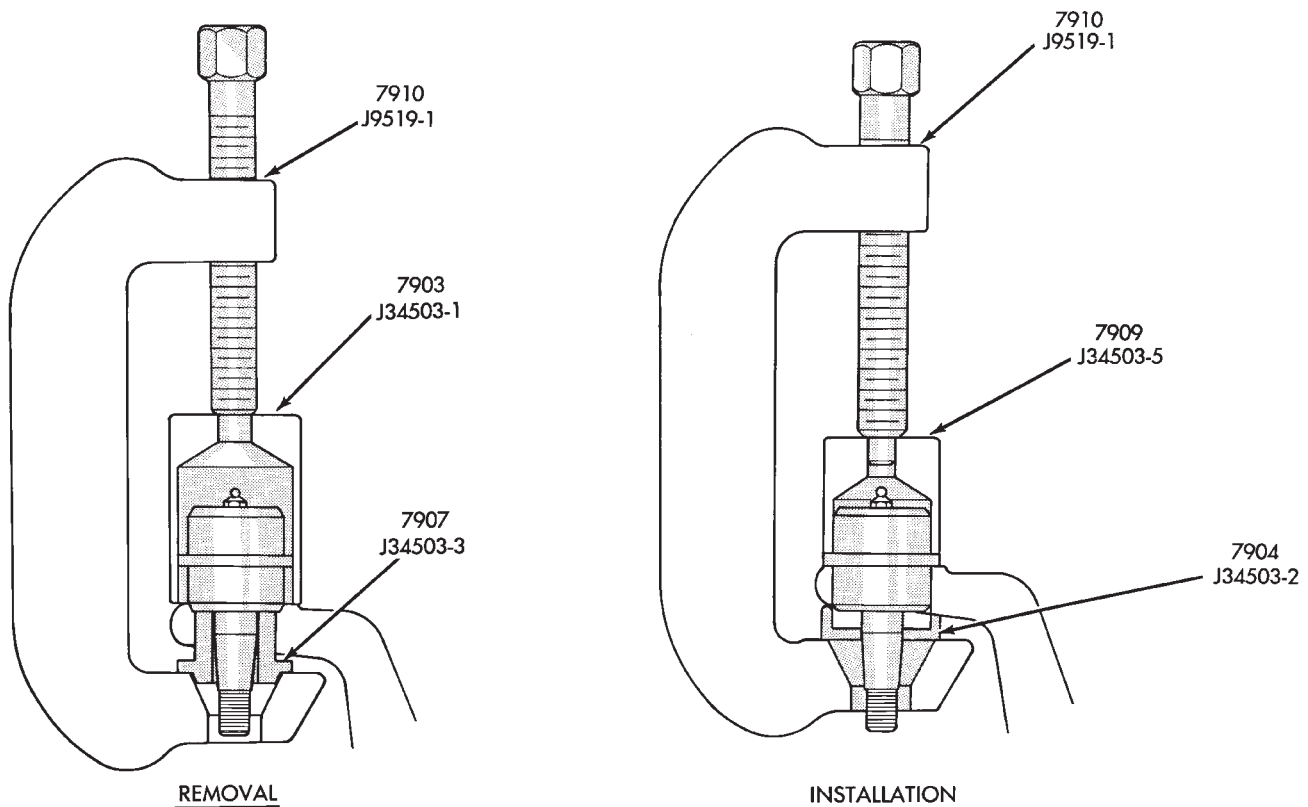
(1) Position the steering knuckle on the ball studs.



**Fig. 19 Steering Knuckle Removal/Installation**

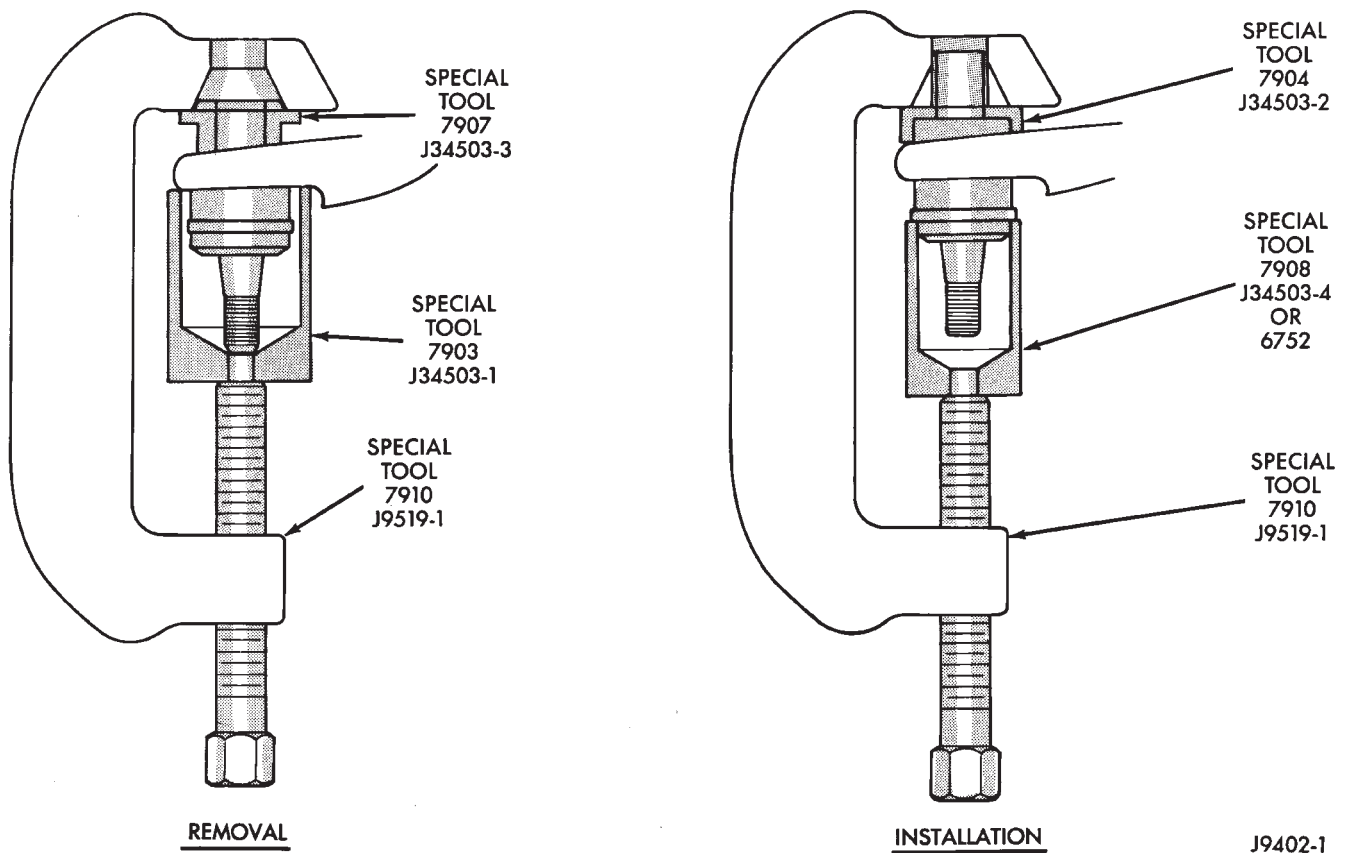
(2) Install and tighten the bottom retaining nut to 109 N·m (80 ft. lbs.) torque. Install new cotter pin.

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



J9302-37

**Fig. 20 Upper Ball Stud Remove/Install**



**Fig. 21 Lower Ball Stud Remove/Install**

(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

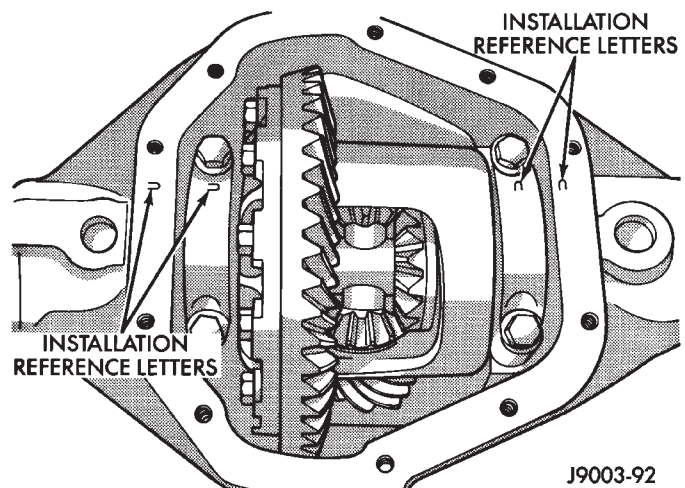
To service the differential the axle assembly and axle shafts must be removed. Refer to the removal procedures in this Group.

(1) Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 22).

(2) Remove the differential bearing caps.

(3) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 23). Install the holddown clamps and tighten the tool turnbuckle finger-tight.

(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. 23) and zero the indicator.



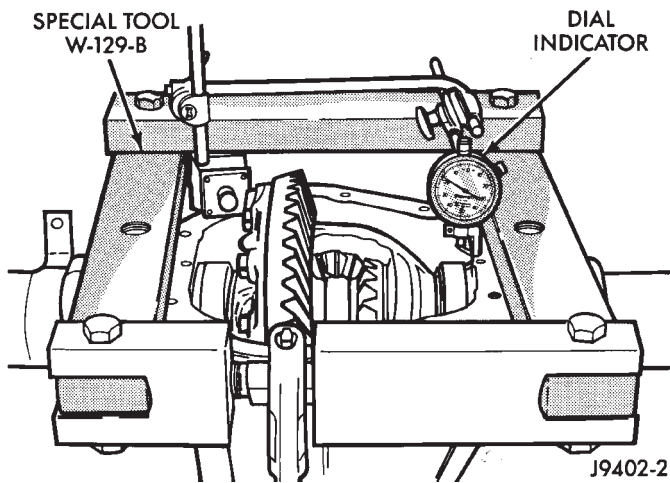
**Fig. 22 Bearing Cap Identification**

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

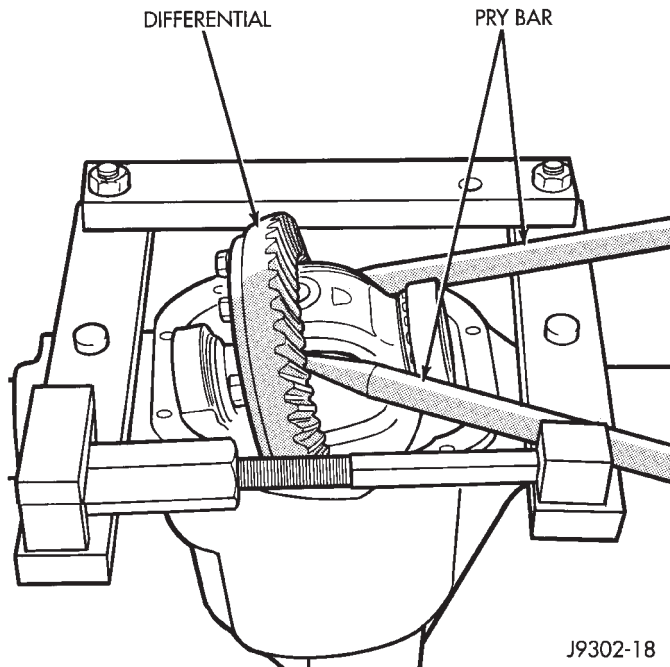
(5) Separate the housing enough to remove the case from the housing. Measure the distance with the dial indicator (Fig. 23).

(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. 24).



**Fig. 23 Spread Differential Housing**



**Fig. 24 Differential Removal**

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

### INNER AXLE SHAFT OIL SEAL REPLACEMENT

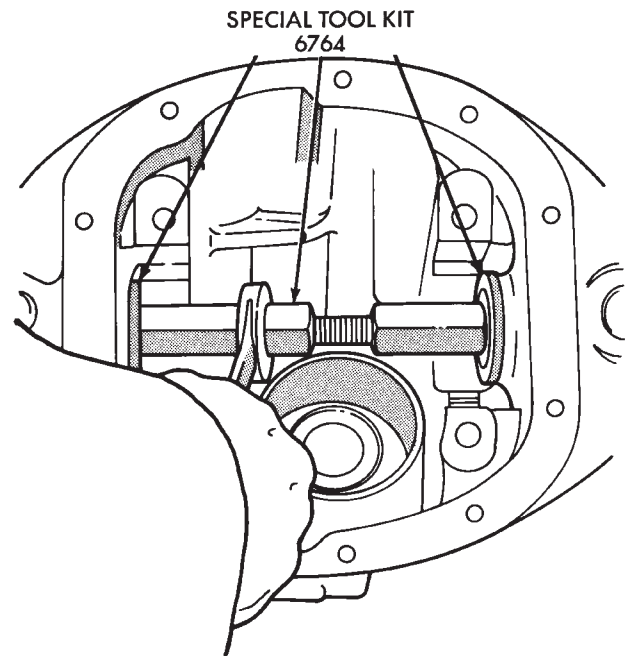
#### SELECT-TRAC

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

(2) Install oil seals with Discs 6764 and Turnbuckle D-112-A (Fig. 25). Tighten tool until disc bottoms in housing.

#### COMMAND-TRAC—LEFT-SIDE

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

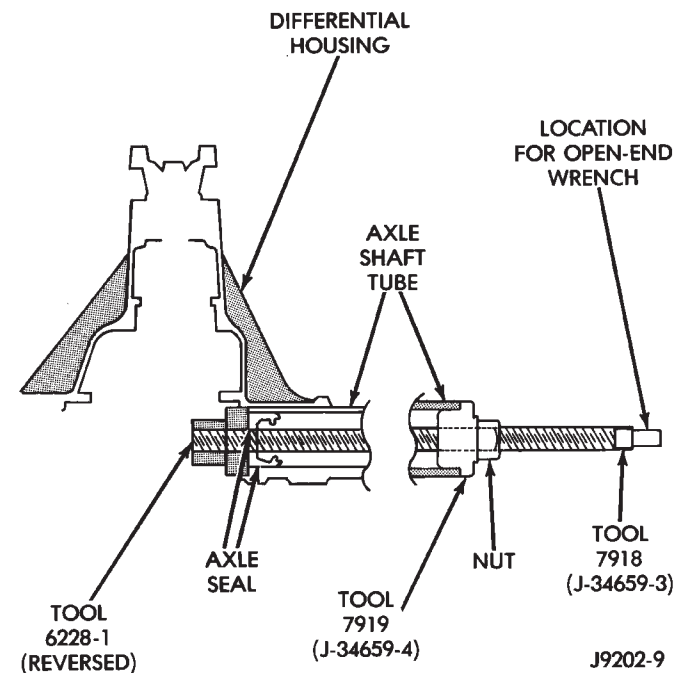


**Fig. 25 Axle Seal Installation**

(2) Install the inner axle seal on Tool 6228-1 (Fig. 26).

(3) Thread the **reverse** side of Installer 6228-1 tightly onto the threaded rod tool (Fig. 26).

(4) Press the seal into position.



**Fig. 26 Left Side Seal Installation**

### DIFFERENTIAL DISASSEMBLY

(1) Remove the bearings from the differential case with Press C-293-PA, Plug C-293-3, Adapter C-293-39 (Fig. 27).

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

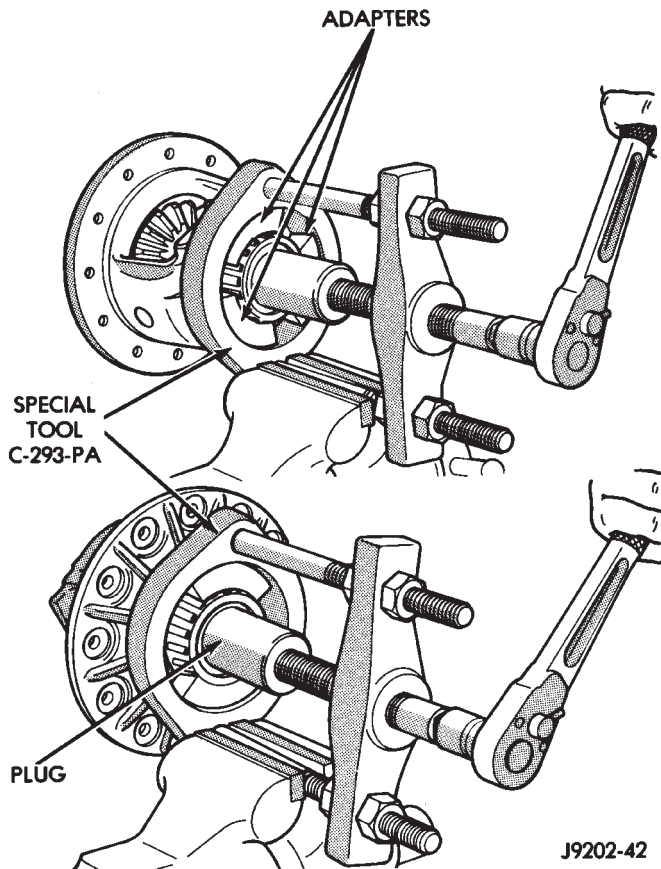


Fig. 27 Differential Bearing Removal

(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. 28).

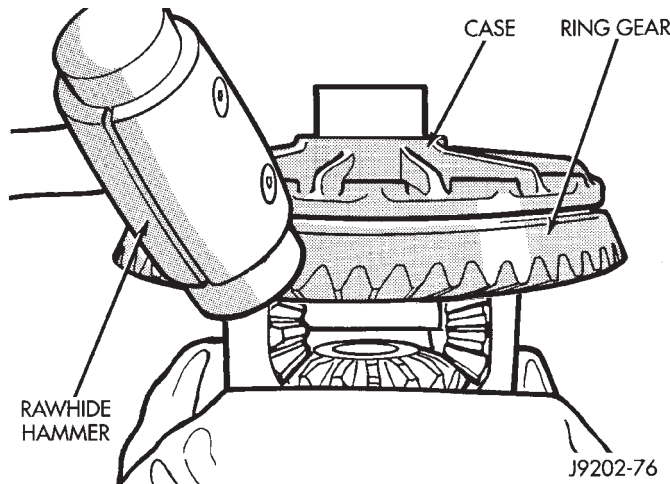


Fig. 28 Ring Gear Removal

(4) Use a drift to remove the pinion gear mate shaft lock pin (Fig. 29).

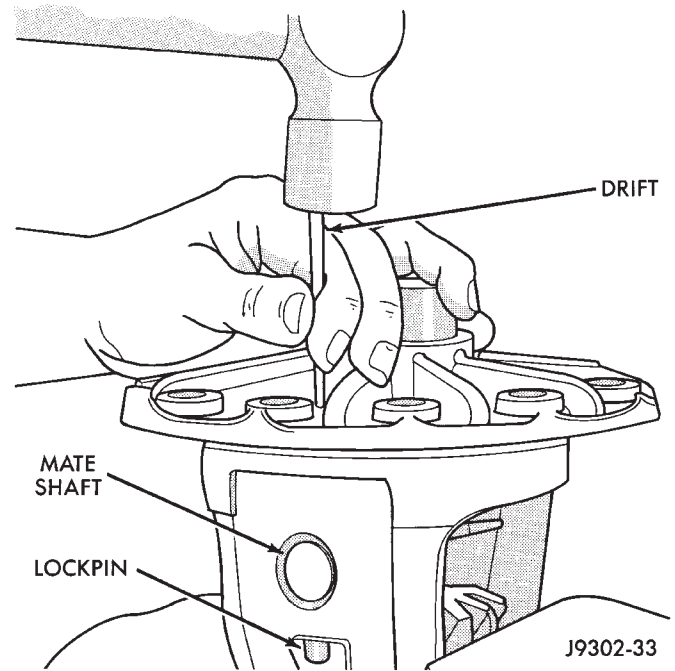


Fig. 29 Mate Shaft Lock Pin Removal

(5) Remove the mate shaft with a drift and hammer (Fig. 30).

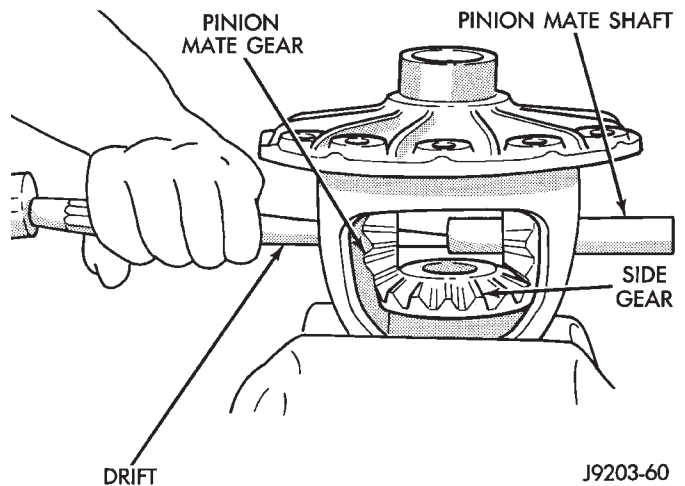


Fig. 30 Mate Shaft Removal

(6) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 31).

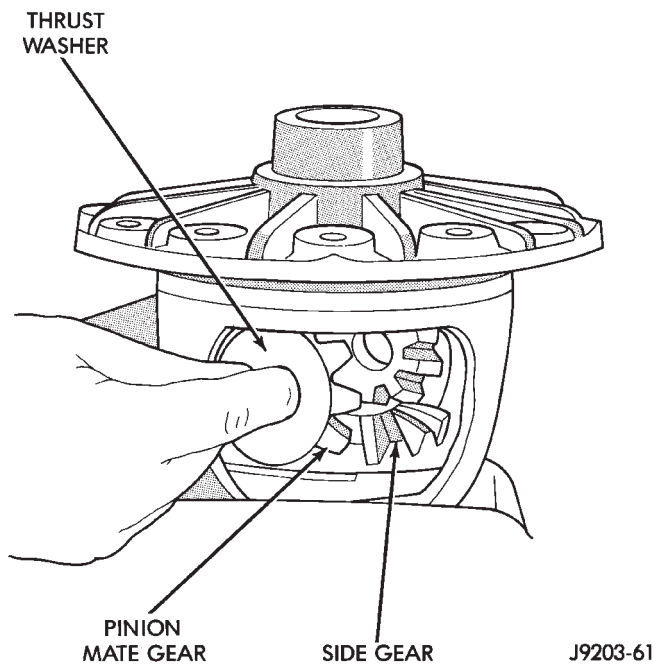
(7) Remove the differential side gears and thrust washers.

(8) Remove the case from the vise.

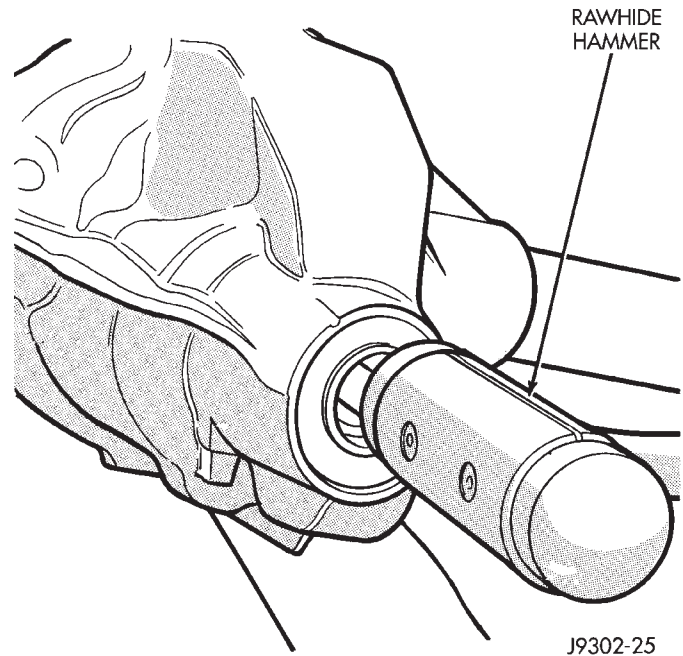
**PINION REMOVAL/DISASSEMBLY**

(1) Remove the pinion yoke nut and washer. Use Remover C-452 and Wrench C-3281 to remove the pinion yoke (Fig. 32).

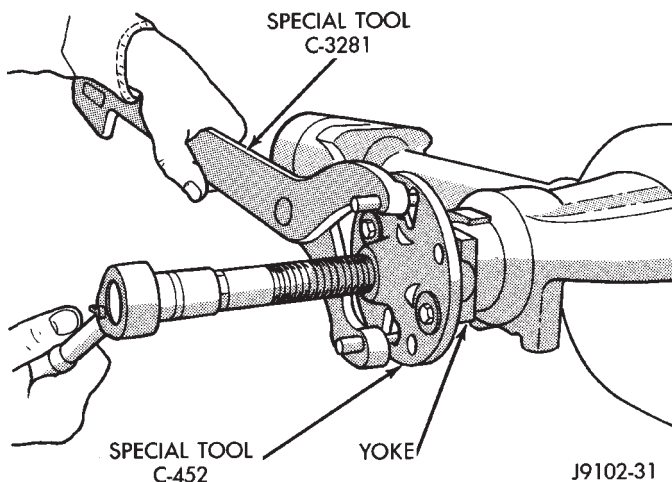
(2) Remove the pinion gear seal with a slide hammer or pull out with bar.



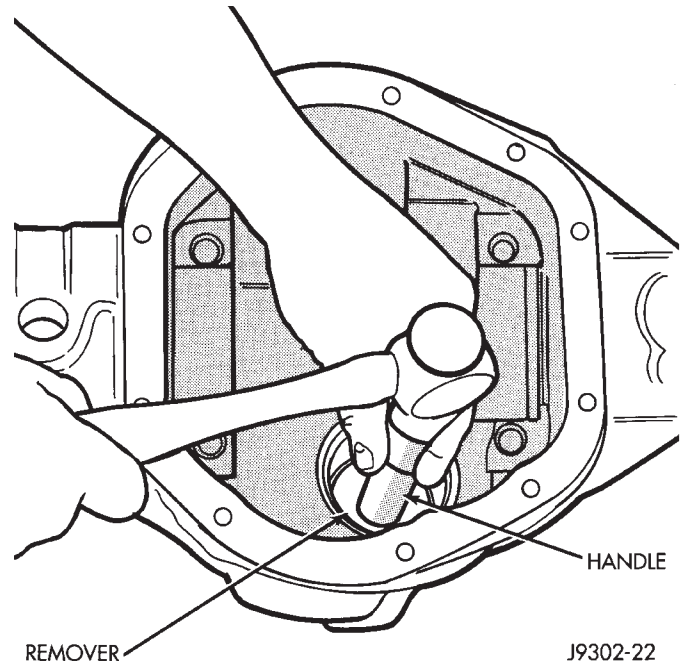
**Fig. 31 Pinion Mate Gear Removal**



**Fig. 33 Remove Pinion Gear**



**Fig. 32 Pinion Yoke Removal**



**Fig. 34 Front Bearing Cup Removal**

(3) Drive out pinion gear from housing with rawhide or plastic hammer (Fig. 33). 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.

(4) Remove front bearing from housing.

(5) Remove the front pinion bearing cup and seal with Remover D-147 and Handle C-4171 (Fig. 34).

(6) Remove the rear bearing cup from housing (Fig. 35). Use Remover D-149 and Handle C-4171.

(7) Remove the inner bearing from the pinion with Puller C-293-PA and Adapter C-293-39 (Fig. 36).

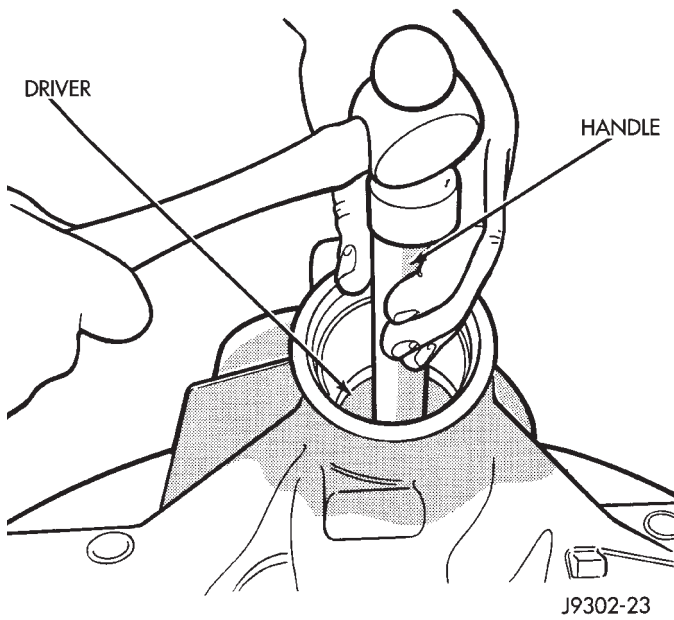
**Place adapter rings so they do not damage the bearing cage.**

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

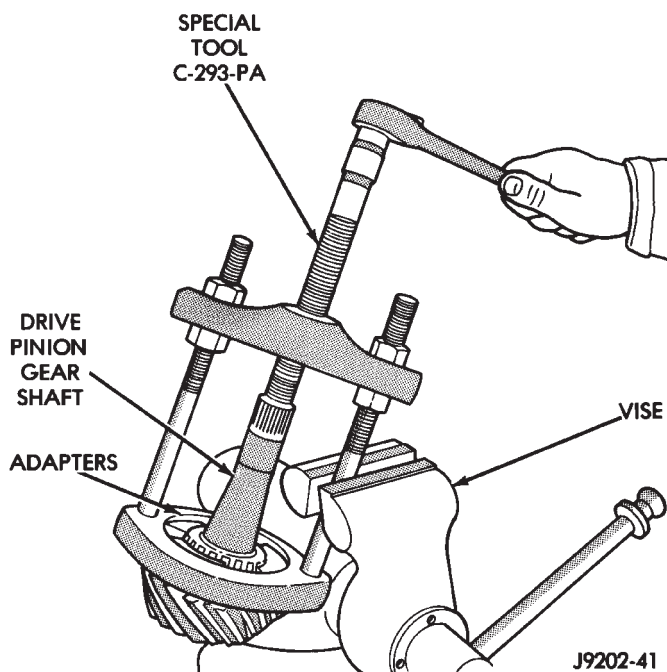
#### CLEANING/INSPECTION

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



**Fig. 35 Rear Bearing Cup Removal**



**Fig. 36 Inner Bearing Removal**

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.

## DIFFERENTIAL ASSEMBLY

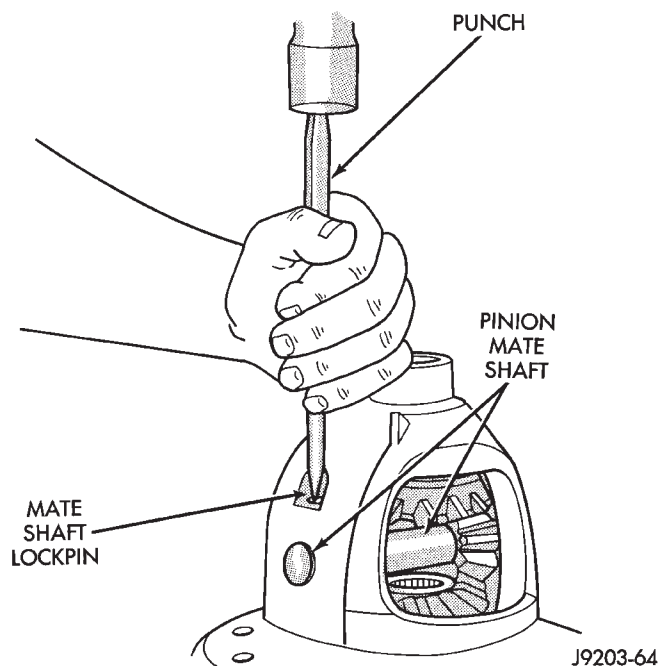
### ASSEMBLY

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

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

(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).

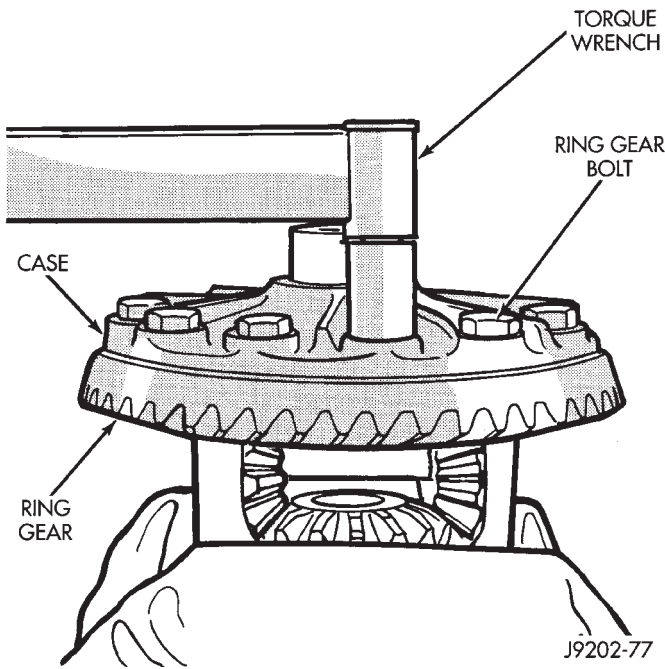


Fig. 38 Ring Gear Bolt Installation

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

**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. 39). 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. 40). The standard depth provides the best teeth contact pattern.

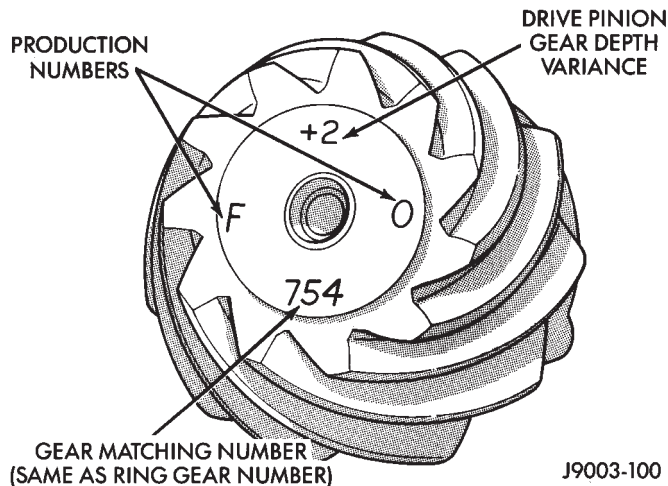


Fig. 39 Pinion Gear ID Numbers

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. 40).

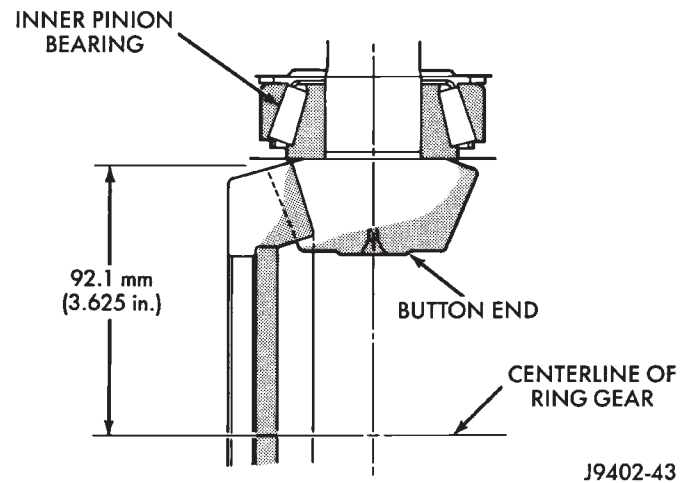


Fig. 40 Pinion Gear Head

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. 41). 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.**

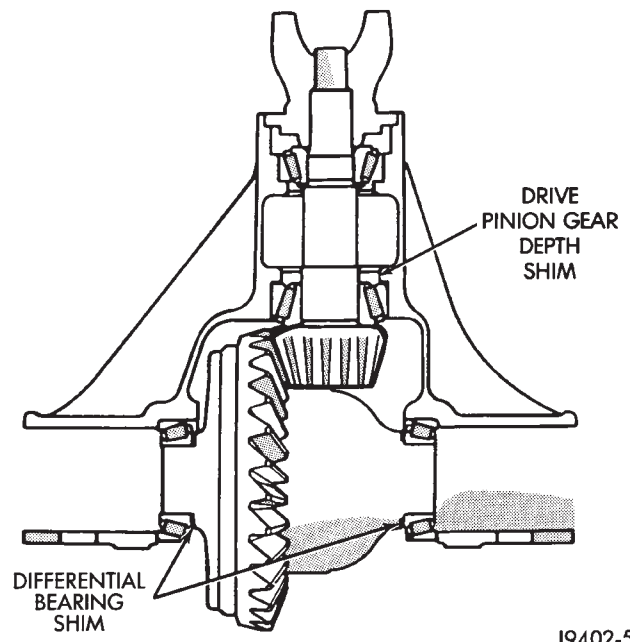


Fig. 41 Shim Locations

PINION GEAR DEPTH VARIANCE

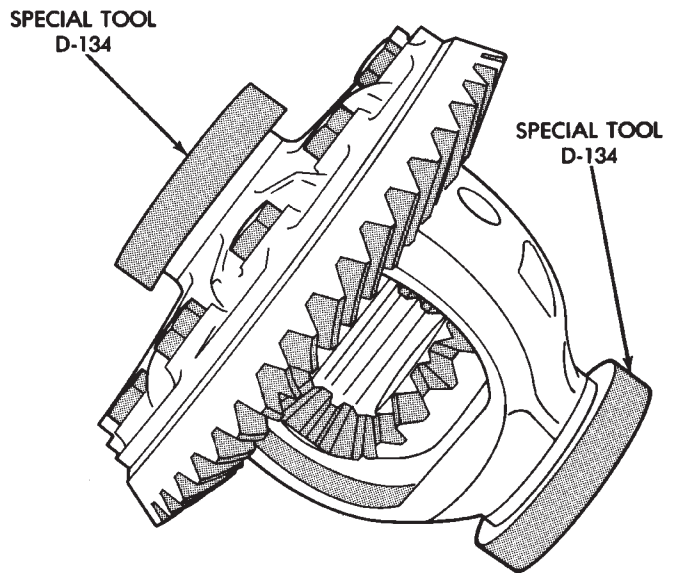
Original Pinion Gear Depth Variance	Replacement Pinion Gear Depth Variance								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005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

J8902-46

**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 inch (0.10mm). Add this amount to the original shim. Or if the old pinion is (-) 3 and the new pinion is (-) 2, intersecting figure is (-)0.001 inch (0.025mm). Subtract this amount from original shim. **Refer to the Pinion Gear Depth Variance Chart.**



J9202-43

**Fig. 42 Master Bearing Tools On Hubs**

**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.

**DIFFERENTIAL AND PINION MEASUREMENT**

**DIFFERENTIAL ZERO END PLAY MEASUREMENT**

(1) Place Master Differential Bearing D-134 (D-348) on the case hubs (Fig. 42). 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. 43).

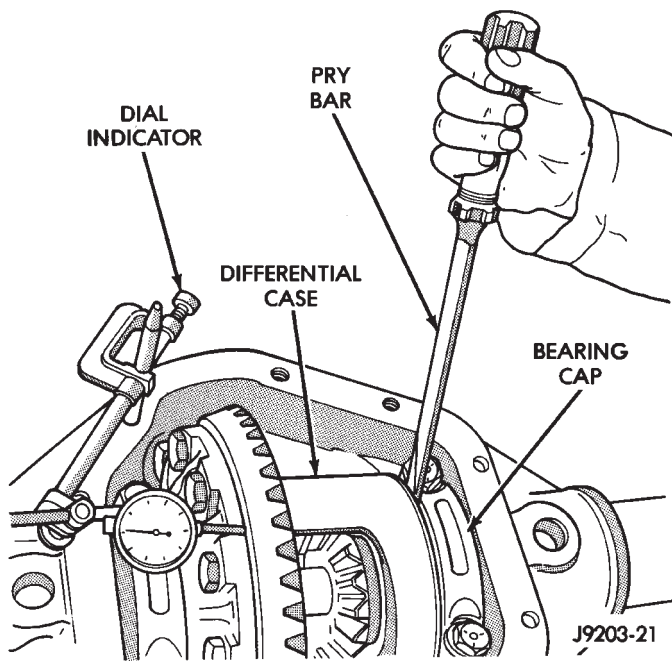
(3) Insert a small pry bar between the bearing cap and left side of differential case. Pry the case as far as possible to right side (Fig. 43). Zero the dial indicator pointer.

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

**PINION GEAR DEPTH MEASUREMENT**

**Pinion gear depth measurement is necessary when;**

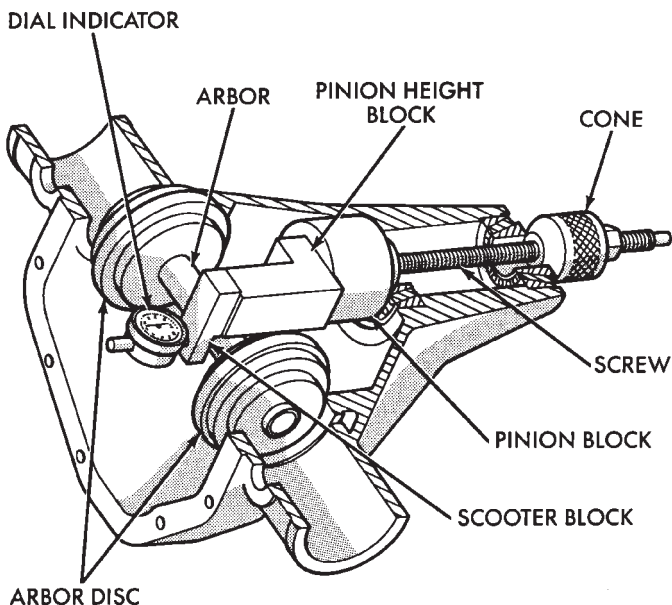




**Fig. 43 Differential Case End Play Measurement**

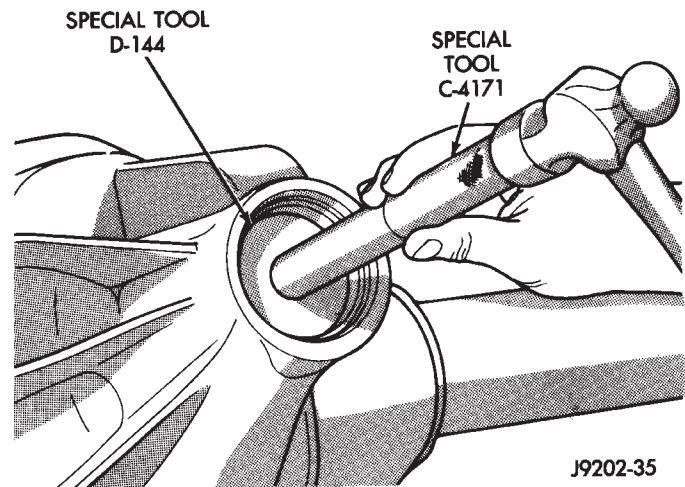
- Axle housing or differential case is replaced
- Pinion select shim pack is unknown
- Ring and pinion gears are replaced

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. 44).



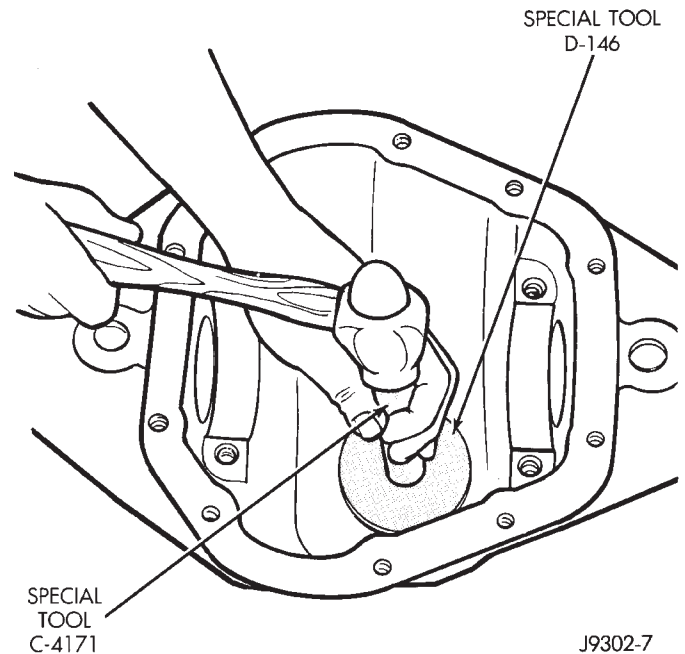
**Fig. 44 Pinion Gear Depth Gauge Tools**

(1) Install the pinion front bearing cup with Installer D-144 and Handle C-4171 (Fig. 45).



**Fig. 45 Pinion Front Bearing Cup Installation**

(2) Install the bearing cup with Installer D-146 and Driver Handle C-4171 (Fig. 46). Ensure cup is correctly seated.



**Fig. 46 Pinion Rear Bearing Cup Installation**

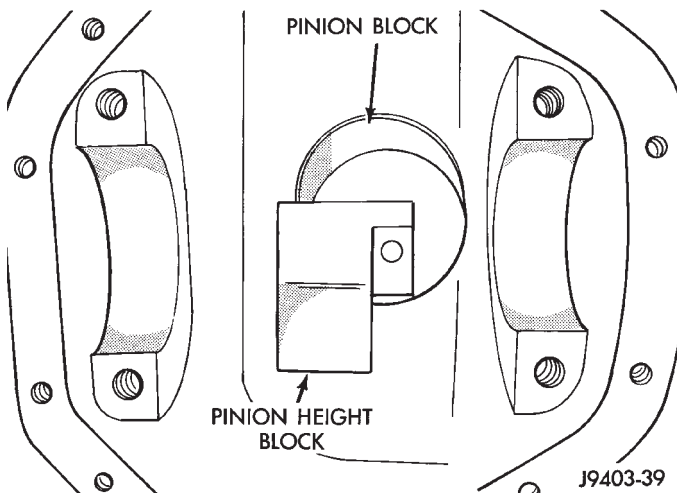
(3) Assemble Pinion Gauge Set, Pinion Block and pinion bearings. Install assembly into differential pinion gear bore and hand tighten cone (Fig. 47).

(4) Place Arbor Disc 6732 on Arbor D-115-3 and position in the bearing cradles (Fig. 48). Install differential bearing caps on Arbor Discs and tighten caps snug only.

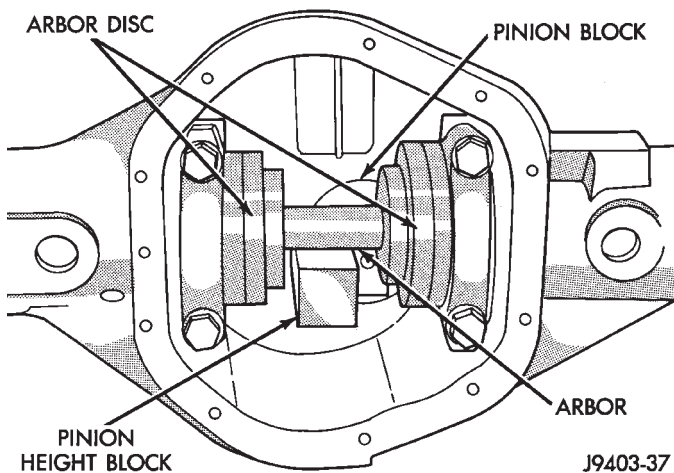
**Arbor Discs have different steps to fit other axle sizes. Pick correct size step for axle being serviced.**

(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

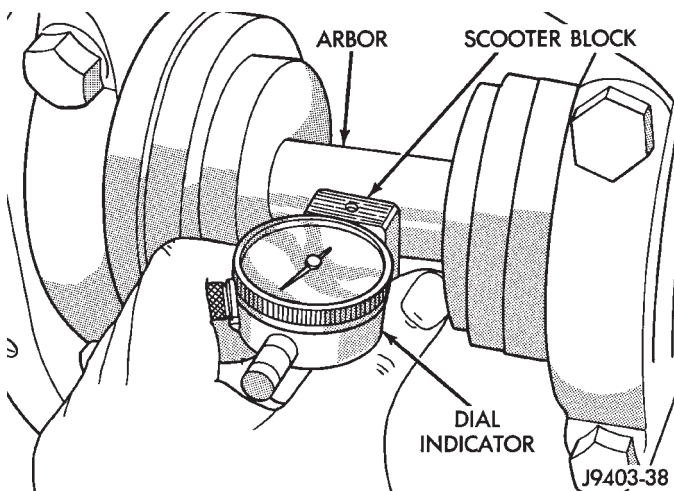


**Fig. 47 Pinion Height Block**



**Fig. 48 Gauge Tools In Housing**

observing indicator (Fig. 49). Record the longest travel distance, whether inward (-) or outward (+), indicated by the pointer.



**Fig. 49 Pinion Depth Measurement**

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

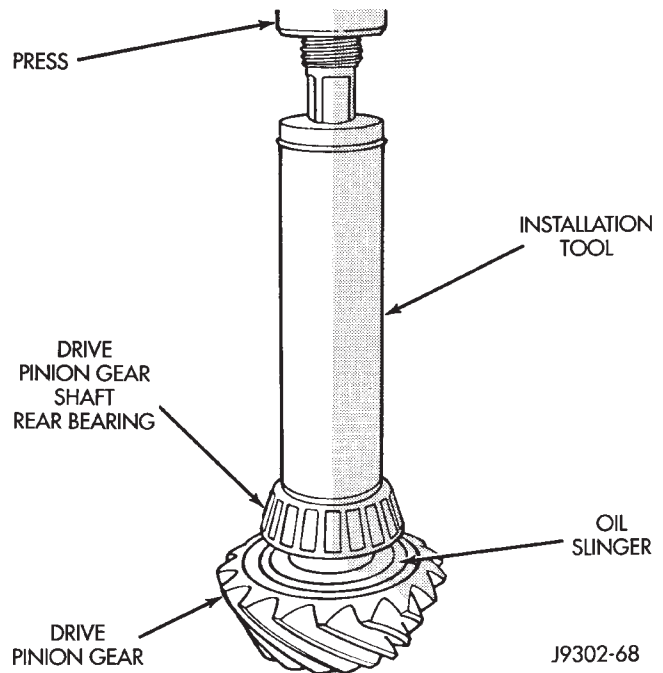
(7) Measure the thickness of each depth shim with a micrometer. Combine the shims necessary for total required shim pack thickness. **Include oil slinger or baffle thickness with the total shim pack thickness.**

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

### 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.

(3) Install rear bearing and oil slinger on pinion gear with Installer W-262 until completely seated (Fig. 50).



**Fig. 50 Pinion Rear Bearing Installation**

(4) Assemble preload shims onto pinion shaft.

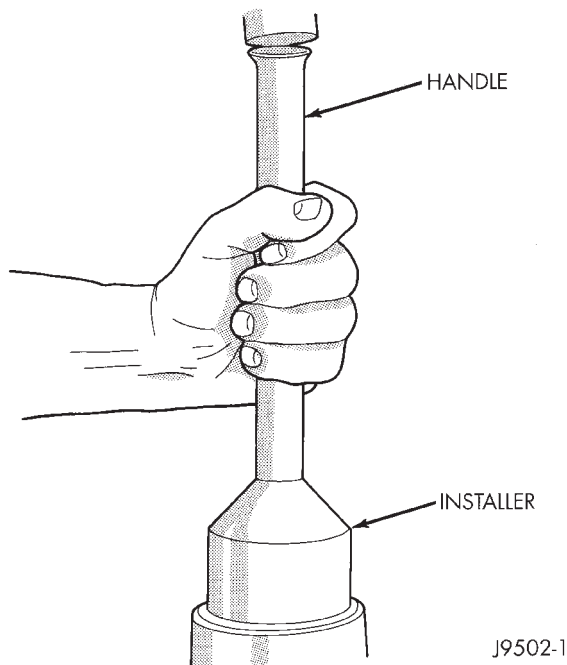
(5) Install pinion front bearing cone into cup and end yoke thrust washer.

(6) Apply a light coat of gear lubricant on lip of new pinion seal. Install seal with Installer D-163 and Handle C-4171 (Fig. 51).

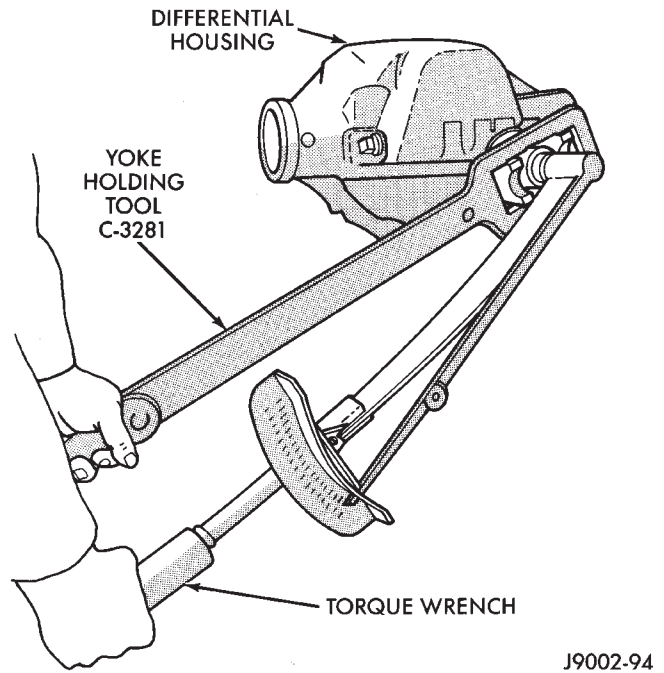
(7) Install pinion gear into differential housing.

(9) Install yoke with Installer W-162-D and Wrench C-3281 (Fig. 52).

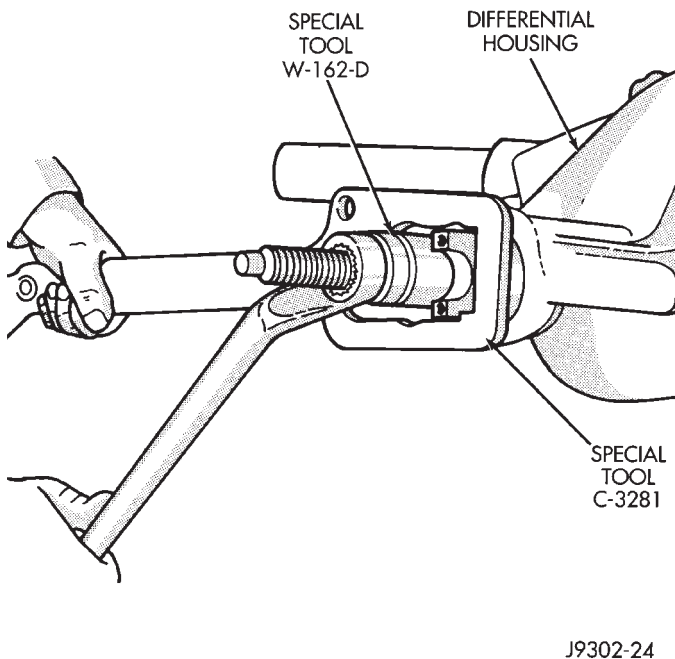
(10) Install the yoke washer and **old nut** on the pinion gear. Use Flange Wrench C-3281 to retain the yoke (Fig. 53). Tighten nut to 216-352 N·m (160-260 ft.lbs.) torque.



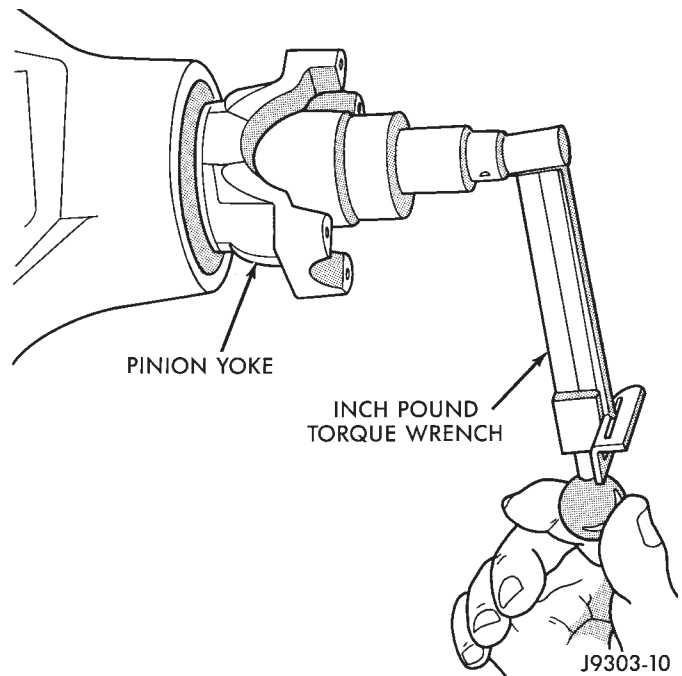
**Fig. 51 Pinion Seal Installation**



**Fig. 53 Tightening Pinion Nut**



**Fig. 52 Pinion Yoke Installation**



**Fig. 54 Check Pinion Gear Torque**

(11) Check bearing rotating torque with an inch pound torque wrench (Fig. 54). If torque to rotate is within specification, remove old nut and install new nut. The torque necessary to rotate the pinion gear should be;

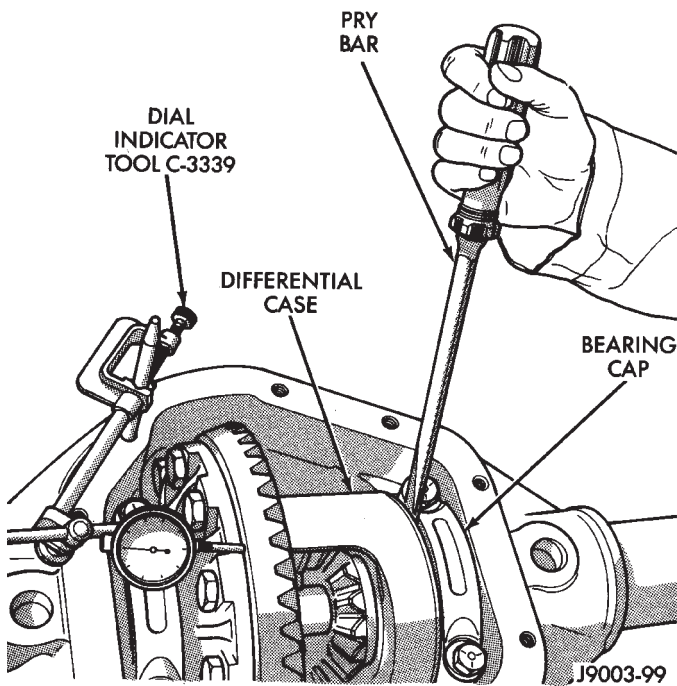
- Original Bearings: 1 to 3 N·m (10 to 20 in. lbs.).
- New Bearings: 2 to 5 N·m (15 to 35 in. lbs.).

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

## 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. 55). Ensure ring and pinion gear teeth are tightly meshed. Zero the indicator.



**Fig. 55 Shim Pack Measurement**

(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. 55). 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. 56). The shims must be placed at the ring gear side between the case and bearing.**

- (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 bearing on the hub with Bearing Installer C-3716-A and Driver Handle C-4171 (Fig. 57).

(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-3716-A and Handle C-4171 (Fig. 57).

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

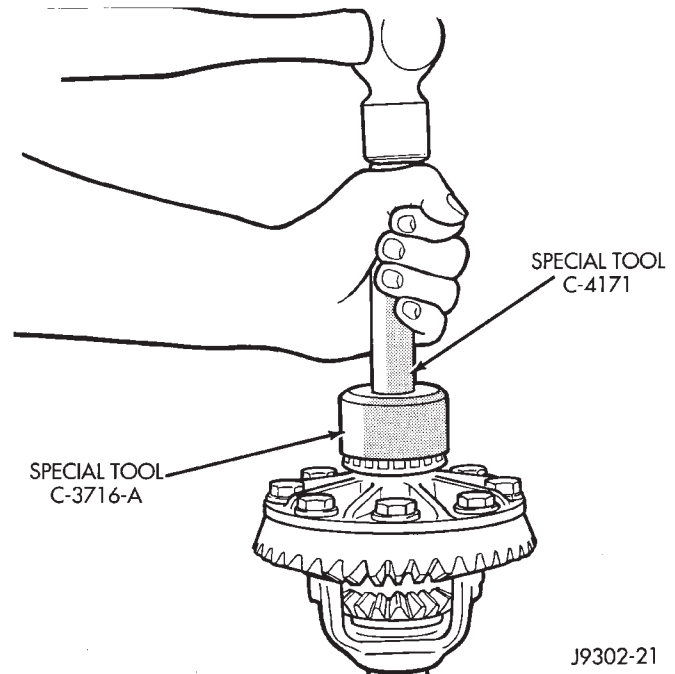
**DIFFERENTIAL INSTALLATION**

(1) Position Spreader W-129-B with the tool dowel pins seated in the locating holes (Fig. 58). Install the hold-down clamps and tighten the tool turnbuckle finger-tight.

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.	J9302-65

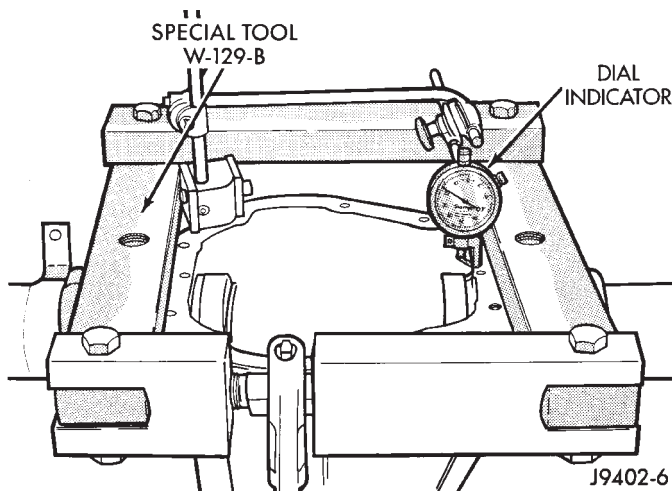
**Fig. 56 Shim Pack Calculations**



**Fig. 57 Differential Bearing Installation**

(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. 58) 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.**

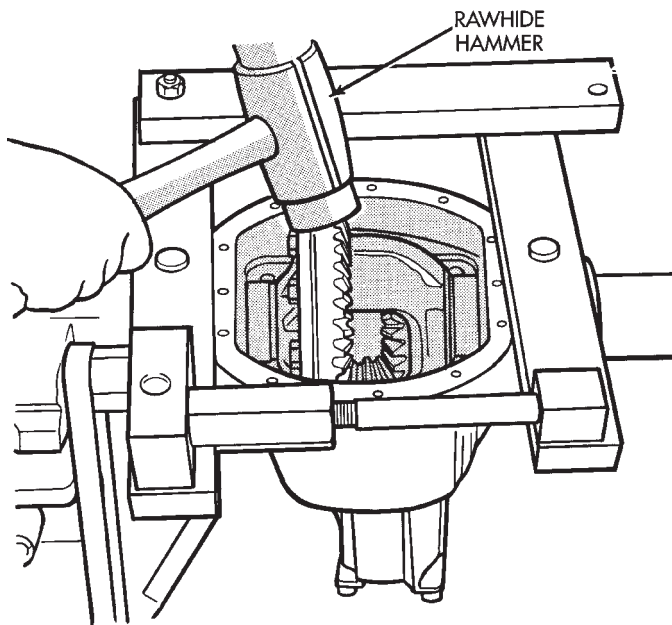


**Fig. 58 Spread Differential Housing**

(3) Spread the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 58).

(4) Remove the dial indicator.

(5) Install case in the housing. Tap the differential case to ensure the bearings are fully seated (Fig. 59). Remove the spreader.

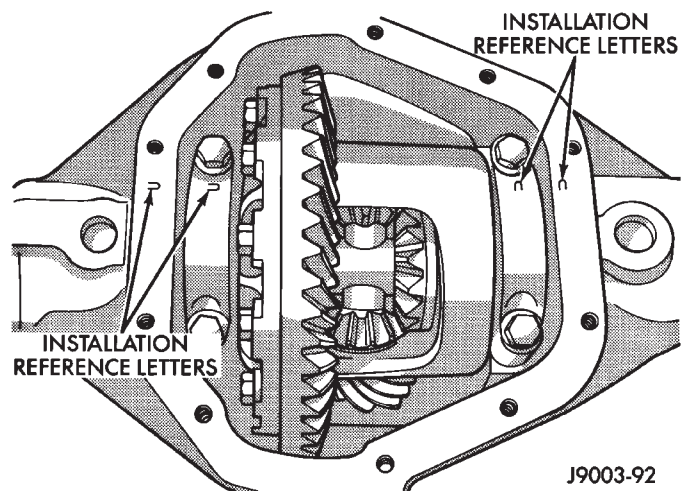


**Fig. 59 Differential Installation**

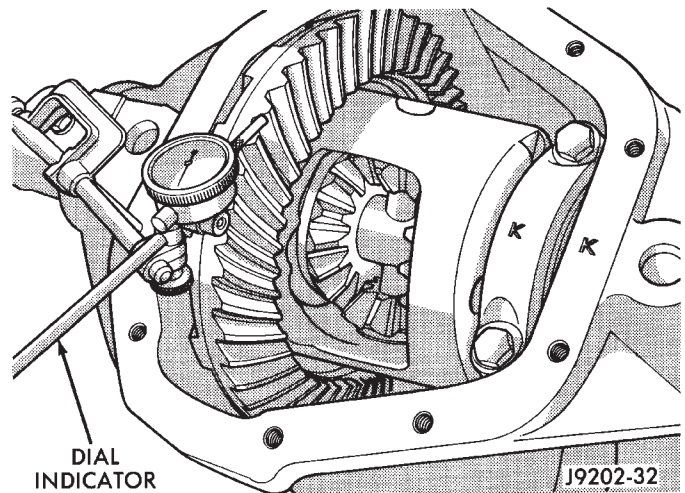
(6) Install the bearing caps at their original locations (Fig. 60). Tighten the bearing cap bolts to 61 N·m (45 ft. lbs.) torque.

### 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. 61).



**Fig. 60 Differential Bearing Cap Reference Letters**



**Fig. 61 Ring Gear Backlash Measurement**

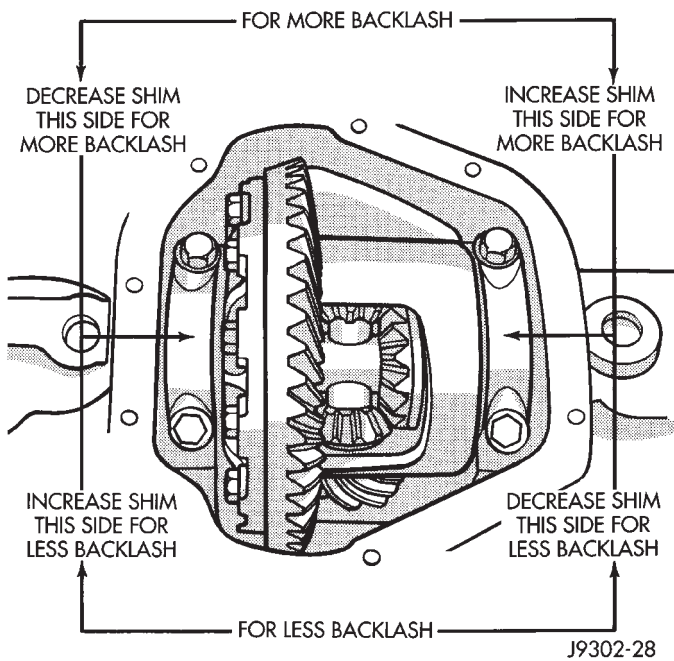
The ring gear backlash must be within 0.12 - 0.20 mm (0.005 - 0.008 inch). It cannot vary more than 0.05 mm (0.002 inch) between the points checked.

If backlash must be adjusted, transfer shims from one side of carrier to the other side. Adjust the backlash accordingly (Fig. 62). **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.

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



**Fig. 62 Backlash Shim Adjustment**

(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. 63) for interpretation of contact patterns and adjust accordingly.

#### 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 (Fig. 64). 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.

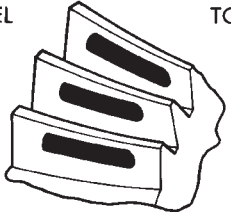

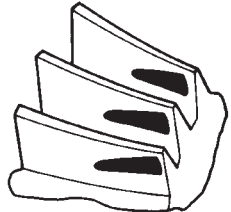
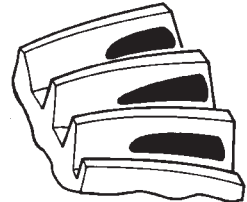
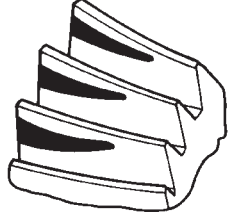
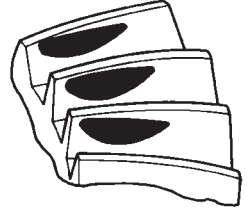
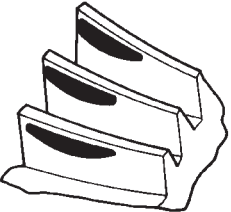
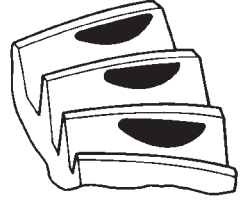
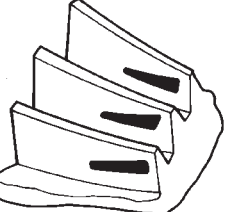
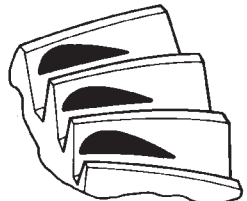
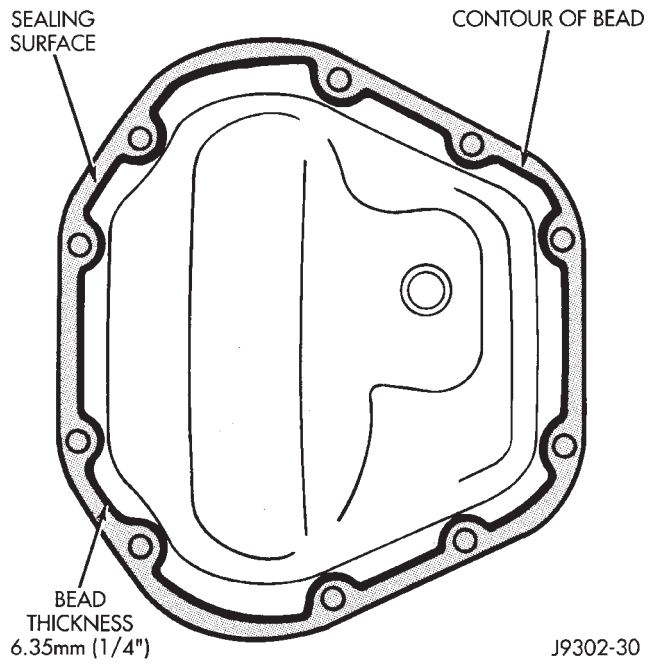
<p>DRIVE SIDE OF RING GEAR TEETH</p> <p>HEEL TOE</p> 	<p>COAST SIDE OF RING GEAR TEETH</p> <p>TOE HEEL</p> 	<p>DESIRABLE CONTACT PATTERN. PATTERN SHOULD BE CENTERED ON THE DRIVE SIDE OF TOOTH. PATTERN SHOULD BE CENTERED ON THE COAST SIDE OF TOOTH, BUT MAY BE SLIGHTLY TOWARD THE TOE. THERE SHOULD ALWAYS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

Fig. 63 Gear Tooth Contact Patterns



**Fig. 64 Typical Housing Cover With Sealant**



### AXLE SPECIFICATIONS

#### MODEL 30 FRONT AXLE

<b>Axle Type</b> .....	Hypoid
<b>Lubricant</b> .....	SAE Thermally Stable 80W-90
<b>Lube Capacity</b>	
YJ .....	1.65 L (3.76 pts.)
XJ .....	1.48 L (3.13 pts.)
<b>Axle Ratio</b> .....	3.07 3.55 3.73 4.10
<b>Differential</b>	

Side Gear Clearance	.012-0.20mm (0.005-0.008 in.)
<b>Ring Gear</b>	
Diameter .....	18.09 cm (7.125 in.)
Backlash .....	0-0.15 mm (0.005-0.008 in.)
<b>Pinion Std. Depth</b> .....	92.1 mm (3.625 in.)
<b>Pinion Bearing Preload</b>	
Original Bearing .....	1-2 N·m (10-20 in. lbs.)
New Bearing .....	1.5-4 N·m (15-35 in. lbs.)

### TORQUE SPECIFICATIONS

#### XJ FRONT SUSPENSION COMPONENTS

DESCRIPTION .....	TORQUE
<b>Shock Absorber</b>	
Upper Nut .....	11 N·m (8 ft. lbs.)
Lower Nut .....	23 N·m (17 ft. lbs.)
<b>Suspension Arm Upper</b>	
Front Nut .....	74 N·m (55 ft. lbs.)
Rear Nut .....	89 N·m (66 ft. lbs.)
<b>Suspension Arm Lower</b>	
Front and Rear Nut .....	115 N·m (85 ft. lbs.)
<b>Stabilizer Bar</b>	
Clamp Bolt .....	54 N·m (40 ft. lbs.)
Link Upper Nut .....	36 N·m (27 ft. lbs.)
Link Lower Nut .....	95 N·m (70 ft. lbs.)
<b>Track Bar</b>	
Ball Stud Nut .....	81 N·m (60 ft. lbs.)
Axle Bracket Bolt .....	100 N·m (74 ft. lbs.)
<b>Track Bar Bracket</b>	
Bolts .....	125 N·m (92 ft. lbs.)
Nut .....	100 N·m (74 ft. lbs.)
Support Bolts .....	42 N·m (31 ft. lbs.)

Lower Nut .....	61 N·m (45 ft. lbs.)
<b>Stabilizer Bar</b>	
Clamp Bolt .....	41 N·m (30 ft. lbs.)
Link Nut .....	61 N·m (45 ft. lbs.)
<b>Track Bar</b>	
Frame Bracket Nut .....	142 N·m (105 ft. lbs.)
Axle Bracket Nut .....	100 N·m (74 ft. lbs.)
<b>Spring</b>	
U-Bolt Nut .....	122 N·m (90 ft. lbs.)
Front Shackle Bolt .....	135 N·m (100 ft. lbs.)
Rear Pivot Bolt .....	142 N·m (105 ft. lbs.)

#### MODEL 30 AXLE

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

#### YJ FRONT SUSPENSION COMPONENTS

DESCRIPTION .....	TORQUE
<b>Shock Absorber</b>	
Upper Nut .....	13 N·m (9 ft. lbs.)

