

FRONT SUSPENSION AND AXLE

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GENERAL INFORMATION

FRONT SUSPENSION

The Grand Cherokee front suspension is a link/coil design 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 (used to limit the travel of the suspension)

The front suspension is designed to allow each wheel to adapt to different road surfaces without greatly affecting the opposite wheel. The wheels are mounted to hub/bearings that ride on tapered bearings on the steering knuckle. The hub/bearing design is not serviceable and is replaced as a unit only. The steering knuckles turn (pivot) on replaceable ball studs mounted on the axle tube yokes.

The upper and lower suspension arms use bushings to isolate road noise. The suspension arms are bolted to the frame and axle through the rubber bushings. The lower suspension arm uses cam bolts at the axle

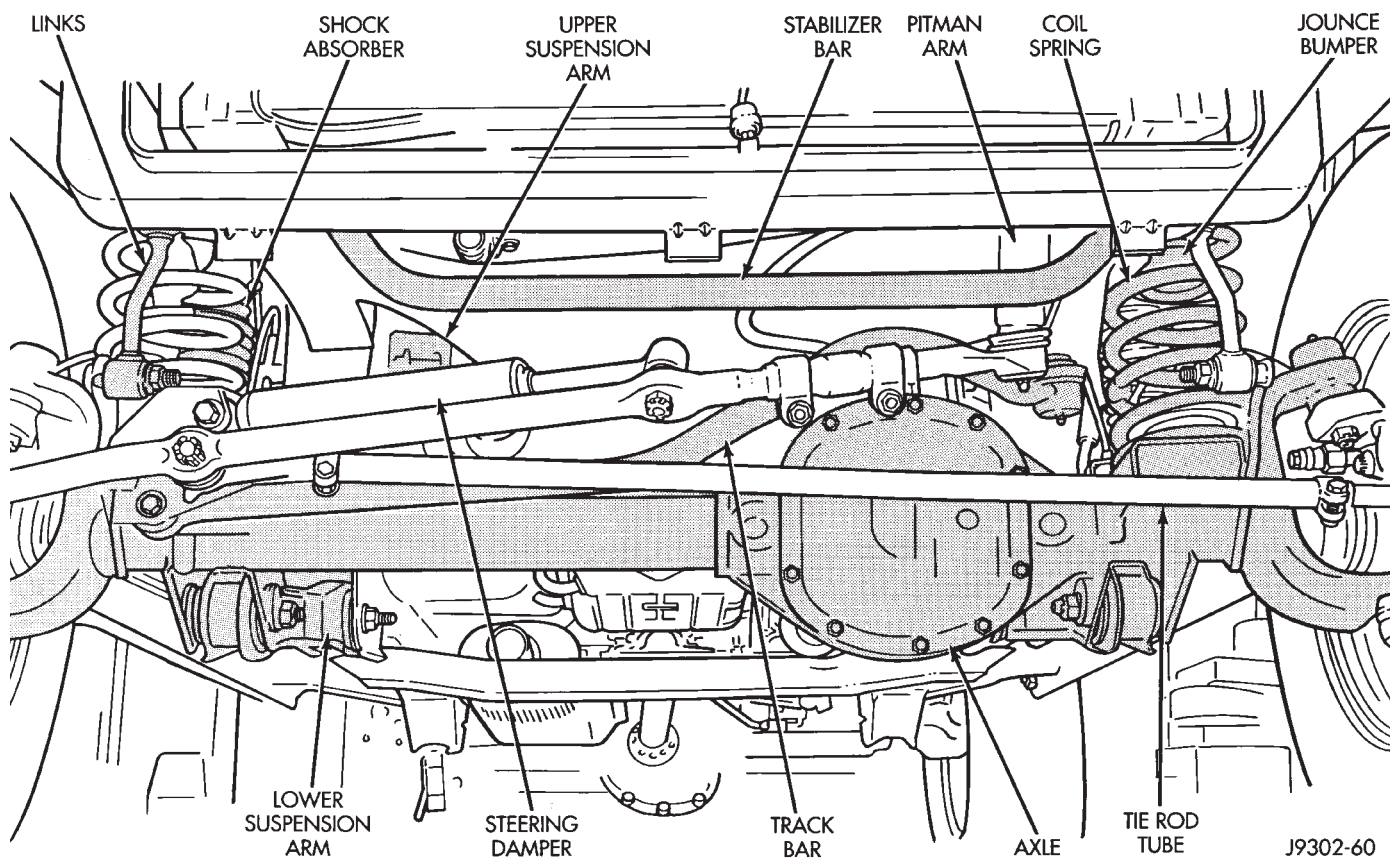


Fig. 1 Front Suspension

to allow for caster and pinion angle adjustment. The suspension arm travel (jounce or rebound) is limited through the use of rubber bumpers.

All suspension components that use rubber bushings should be tightened with the vehicle at normal height. If the springs are not at their normal ride position, vehicle ride comfort could be affected. Rubber bushings must never be lubricated.

The vehicles use coil springs mounted up in the fender shield that is part of the unitized body bracket. There is a rubber doughnut isolator between the top of the spring and bracket. The bottom of the spring seats on the axle pad and is retained with a clip.

Ride control is accomplished through the use of dual-action shock absorbers. The shocks dampen the jounce and rebound as the vehicle travels over various road conditions. The top of the shock absorbers are bolted to the frame. The bottom of the shocks are bolted to the axle spring bracket.

The stabilizer bar is used to minimize vehicle front sway during turns. The spring steel bar helps to equalize the vehicle body in relationship to the suspension. The bar extends across the front underside of the chassis and connects to the frame rails. The links are connected to the axle brackets. All mounting points of the stabilizer bar are isolated by rubber bushings.

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

FRONT DRIVE AXLE

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

The axles are equipped with A.B.S. brake systems. 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.

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. 2). Build date identification codes are stamped on the axle shaft tube cover side.

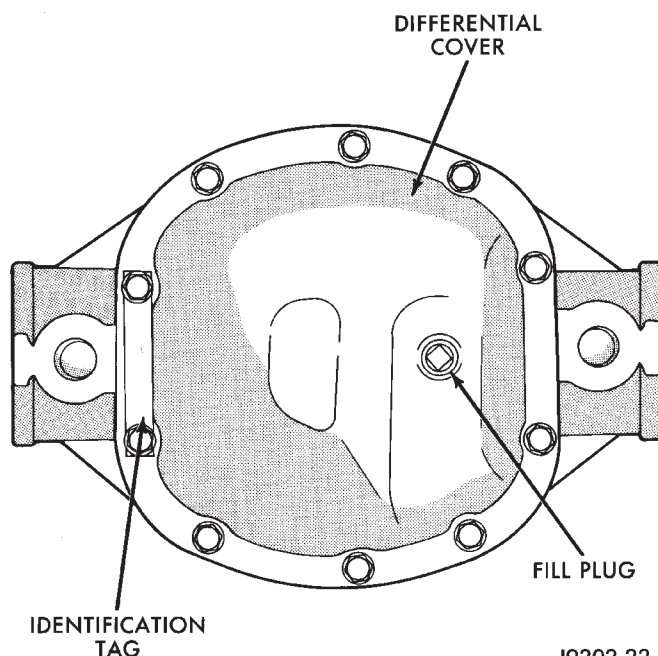
STANDARD DIFFERENTIAL OPERATION

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

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

In operation, power flow occurs as follows:

- Pinion gear rotates the ring gear
- Ring gear (bolted to the differential case) rotates the case

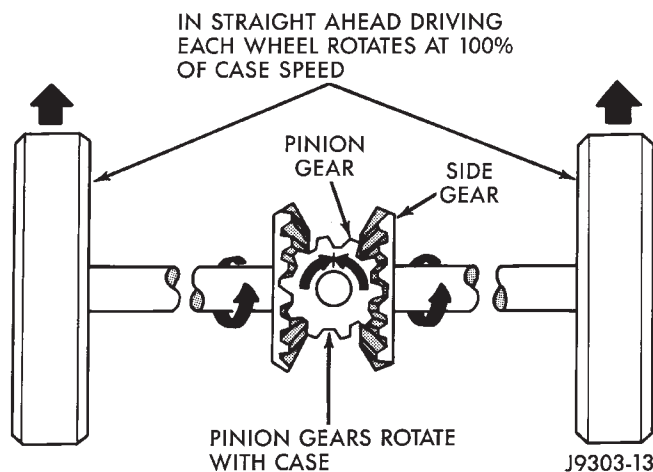


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Fig. 2 Model 30 Differential Cover

- 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 the gears is divided and distributed equally between the two side gears. As a result, the pinion gears revolve with the pinion mate shaft but do not rotate around it (Fig. 3).



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Fig. 3 Differential Operation—Straight-Ahead Driving

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

the axle shafts to turn at unequal speeds (Fig. 4). In this instance, the input torque applied to the pinion gears is not divided equally. The pinion gears now rotate around the pinion mate shaft in opposite directions. This allows the side gear and axle shaft attached to the outside wheel to rotate at a faster speed.

TUBE AXLE (2WD VEHICLES)

The front axle used on two-wheel drive vehicles is a one-piece, tubular axle (Fig. 5). The tubular axle mounts in the same bracketry as does the four-wheel drive front axle. The steering knuckles and hub bearing assemblies are the same as used on the Model 30 drive axle.

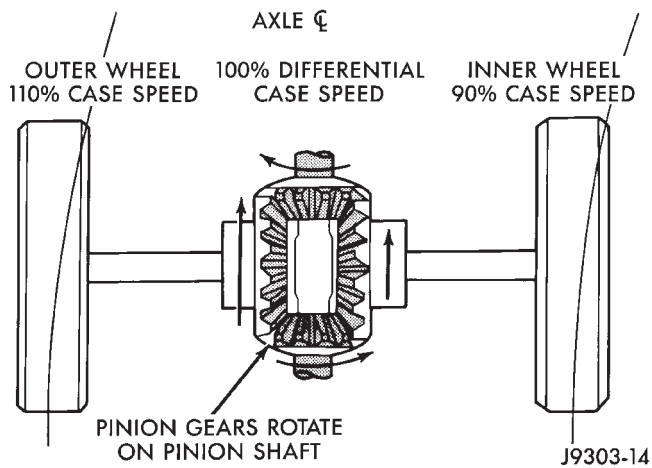


Fig. 4 Differential Operation—On Turns

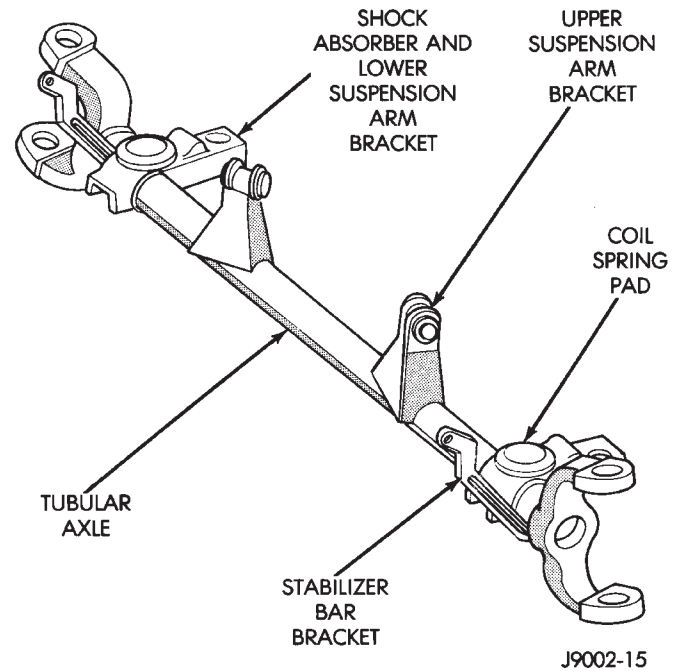


Fig. 5 Front Axle— 2WD Vehicles

FRONT WHEEL ALIGNMENT

GENERAL INFORMATION

Front wheel alignment involves the correct positioning of the tire contact patch in relation to the pavement. The positioning is accomplished through the suspension and steering linkage adjustments. An alignment is essential for efficient steering and directional stability. The most important factors of front end alignment are camber, caster 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.

- **CAMBER** is the number of degrees the top of the wheel is tilted either inward or outward. An excessive negative camber angle will cause tread wear at the inside of the tire. An excessive positive camber angle will cause tread wear at the outside of the tire (Fig. 1).
- **CASTER** is the number of degrees of forward or rearward tilt of the steering knuckles. Forward tilt provides a negative caster angle. Rearward tilt provides a positive caster angle (Fig. 1).
- **WHEEL TOE POSITION** is the difference between the leading and trailing inside edges of the front tires (Fig. 1). Incorrect wheel toe position is the most com-

mon cause of unstable steering and steering wheel off-center. The wheel toe position is the **final** front wheel alignment adjustment.

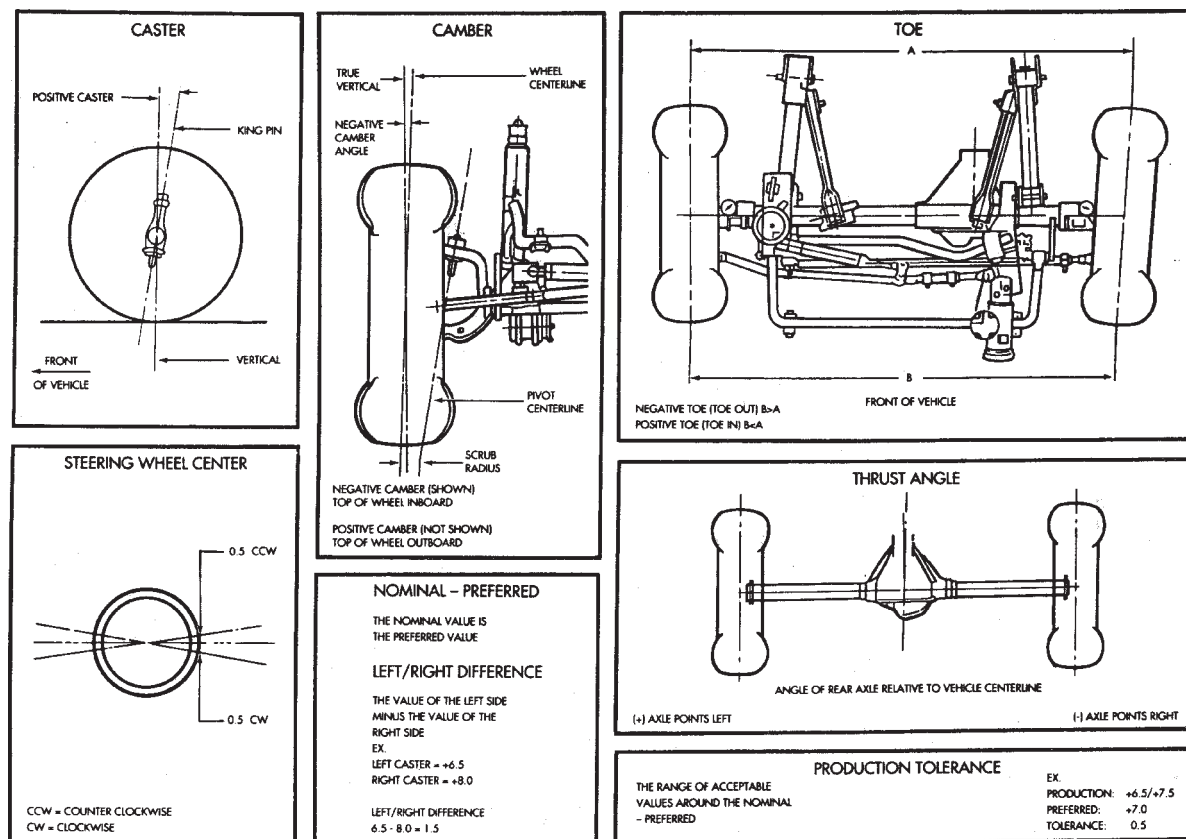
- **STEERING AXIS INCLINATION ANGLE** is measured in degrees and is the angle that the steering knuckles are tilted (Fig. 1). The inclination angle has a fixed relationship with the camber angle. This will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable and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

CAUTION: 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 tread wear. Refer to Group 22, Wheels and Tires for diagnosis information.
- (2) Front wheel bearings for wear or adjustment.



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Fig. 1 Wheel Alignment Measurements

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

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

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

ALIGNMENT MEASUREMENTS AND ADJUSTMENTS

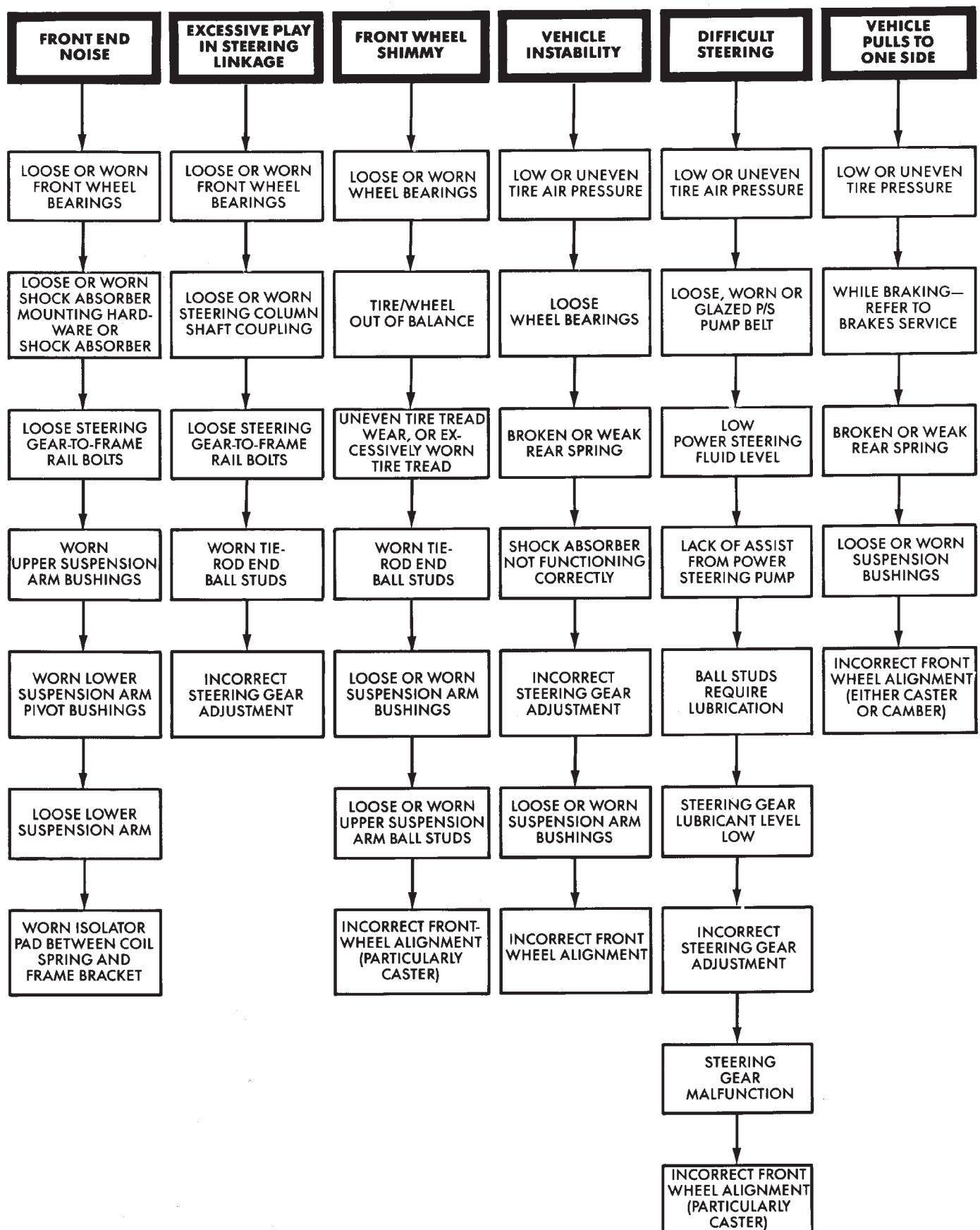
Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper

at the center and jounce the vehicle up and down several times. Always release the bumper when it's at the down position. **Set the front end alignment to specifications while the vehicle is in its NORMALLY LOADED CONDITION.**

CAMBER

The wheel camber angle (Fig. 1) is preset at NEGATIVE 0.25 DEGREES (-0.25°). The angle is not adjustable and cannot be altered.

SUSPENSION AND STEERING SYSTEM DIAGNOSIS



CASTER

The caster angle (Fig. 1) is set at POSITIVE 7 DEGREES (+7°).

Check the caster of the front axle for correct angle. Be sure the axle is not bent or twisted. Road test the vehicle and observe the steering wheel return-to-center position. Low caster will cause poor steering wheel returnability.

During the road test, turn the vehicle to both the left and right. If the steering wheel returns to the center position unassisted, the caster angle is correct. However, if steering wheel does not return toward the center position unassisted, an incorrect caster angle is probable.

Caster can be adjusted by rotating the cams on the lower suspension arm (Fig. 2). **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.**

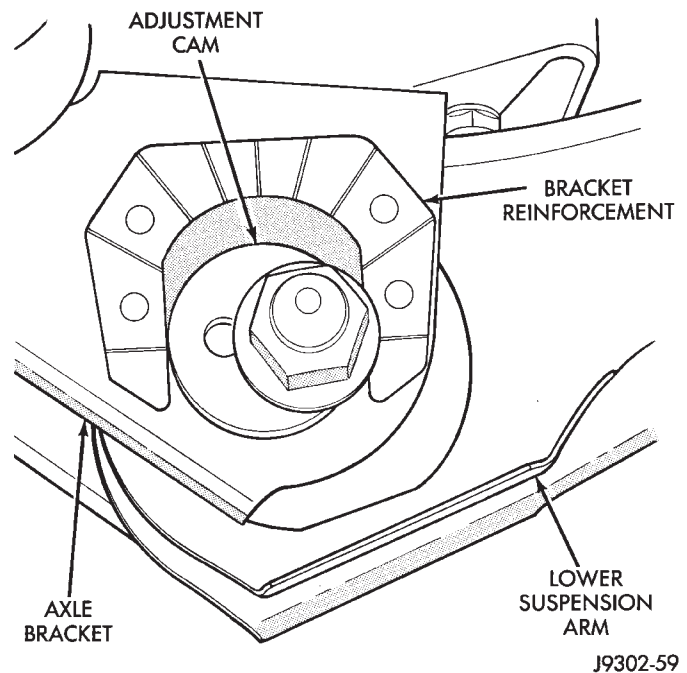


Fig. 2 Cam Adjuster

TOE POSITION

The wheel toe position adjustment should be the final adjustment.

(1) Start the engine and turn wheels both ways before straightening the wheels. Secure the steering wheel with the front wheels in the straight-ahead position.

- (2) Loosen the adjustment sleeve clamp bolts (Fig. 3).
- (3) Adjust the right wheel toe position with the drag link. Turn the sleeve until the right wheel is at the 0.12 degrees (0.12°) TOE-IN position. Position the

FASTENER TORQUE			
LETTER	N·m	IN. LBS.	FT. LBS.
⬠	251	—	185
⬢			
⬡	74	—	55
⬢			
⬢	49	—	36
⬢	27	—	20

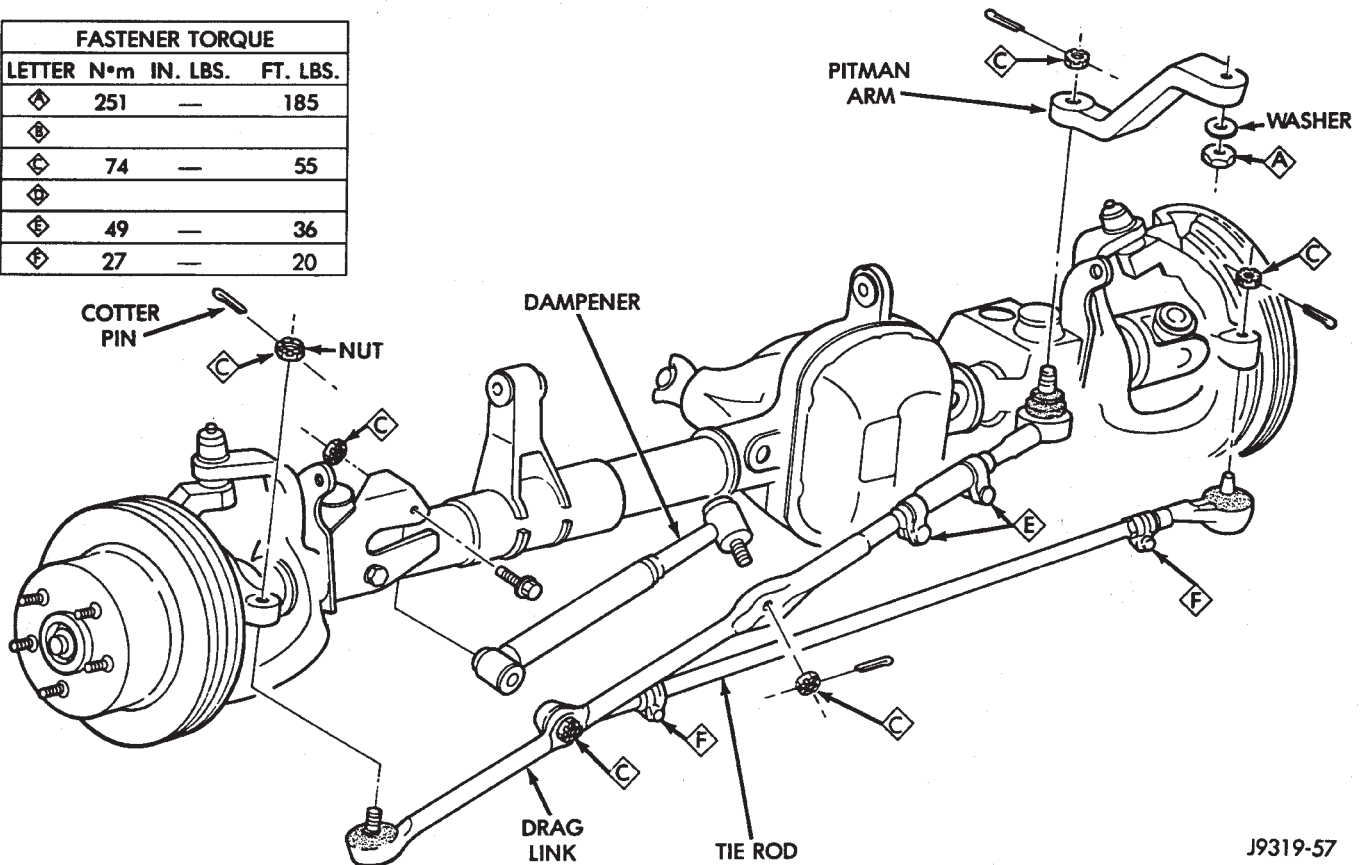


Fig. 3 Steering Linkage

clamp bolts as shown (Fig. 4) and tighten to 49 N•m (36 ft. lbs.) torque. **Make sure the toe setting does not change during clamp tightening.**

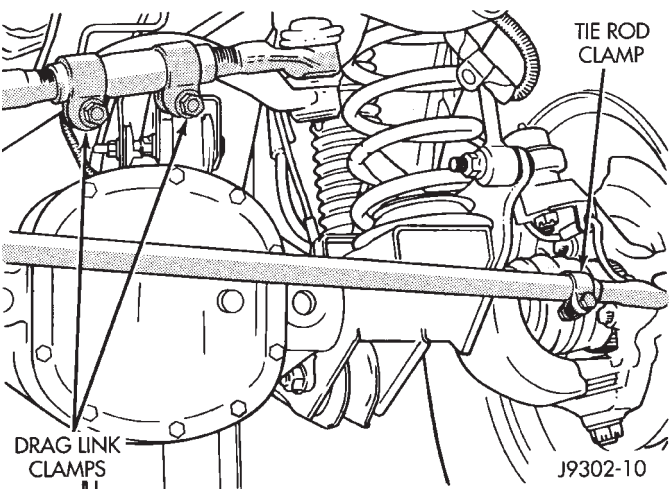


Fig. 4 Drag Link and Tie Rod Clamp Location

(4) Adjust the left wheel toe position with the tie rod. Turn the sleeve until the left wheel is at the 0.12 degrees (0.12°) TOE-IN position. Position the clamp bolts as shown (Fig. 4) 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.

ALIGNMENT SPECIFICATIONS

ADJUSTMENT	SET TO	OK RANGE
CASTER	+7°	6.5° to 7.5°
CAMBER (not adjustable)	-0.25	-0.75 to .50
WHEEL TOE-IN (each side)	0.12	0.12 TO 0.22
OUTSIDE WHEEL TURN ANGLE*	33°	33° to 32°
*Steering stops are not adjustable.		J9302-62

FRONT SUSPENSION

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SERVICE INFORMATION

CAUTION: All suspension components that use rubber bushings should be tightened with the vehicle at the normal height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If the springs are not at their normal ride position, vehicle ride comfort could be affected. 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.
- (4) Remove the frame rail bracket nuts and bolts to remove the track bar bracket (Fig. 1).

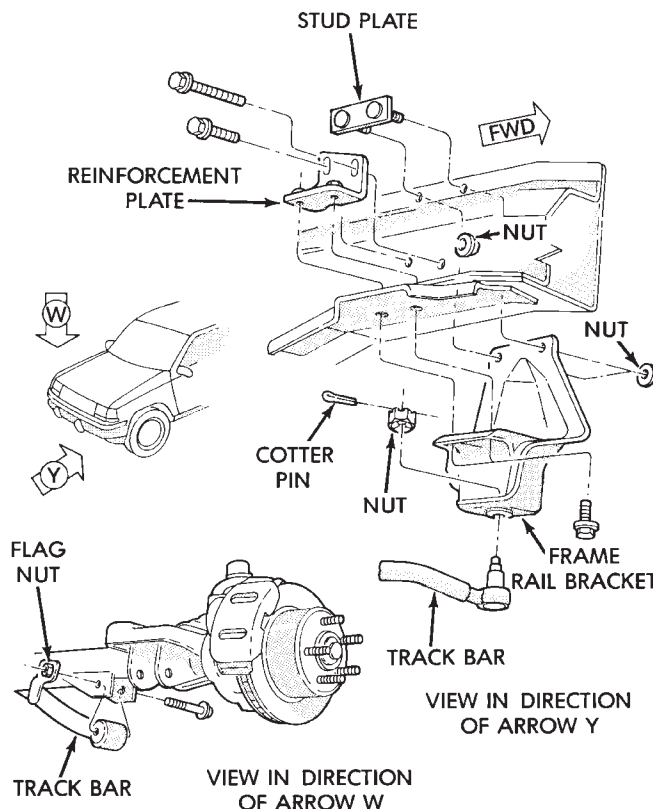
INSTALLATION

- (1) Install the frame rail bracket and install the bolts and nuts (Fig. 1).
- (2) Tighten the bracket to reinforcement plate bottom bolts to 121 N•m (90 ft. lbs.) torque. Tighten the bracket to stud plate nuts to 121 N•m (90 ft. lbs.) torque. Tighten the reinforcement plate side nuts to 95 N•m (70 ft. lbs.) torque.
- (3) Install the track bar at axle tube bracket. Loosely install the retaining bolt and flag nut (Fig. 1).
- (4) 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 (Fig. 1). Install the retaining nut on the stud.
- (5) Remove the supports and lower the vehicle.
- (6) Tighten the retaining nut at the axle shaft tube bracket to 75 N•m (55 ft. lbs.) torque.
- (7) Tighten the ball stud nut to 81 N•m (60 ft. lbs.) torque. Install a new cotter pin.

STABILIZER BAR

REMOVAL

- (1) Raise and support the vehicle.



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Fig. 1 Track Bar

- (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) Position the stabilizer bar on the frame rail and install the clamps and bolts. Ensure the bar is centered with equal spacing on both sides. Tighten the bolts to 75 N•m (40 ft. lbs.).

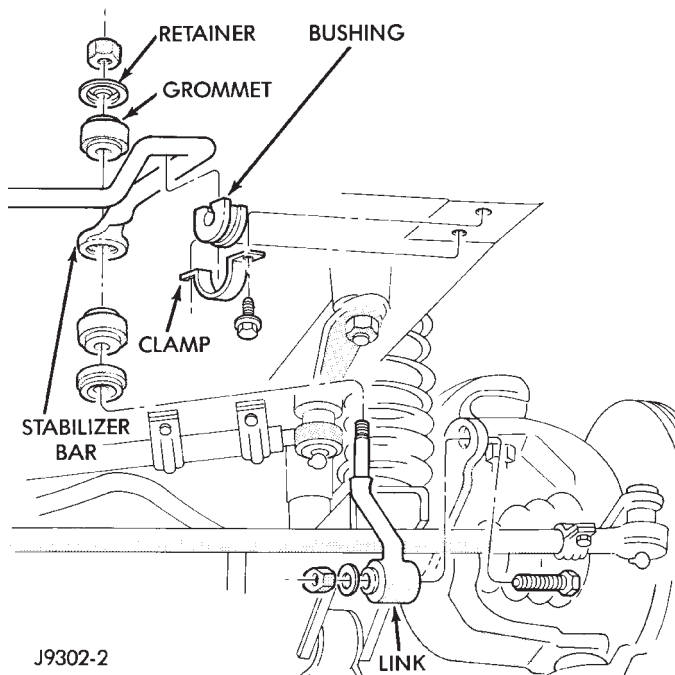


Fig. 2 Stabilizer Bar

(2) 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.

FASTENER TORQUE			
LETTER	N•m	IN. LBS.	FT. LBS.
A	74	—	55
B	176	—	130

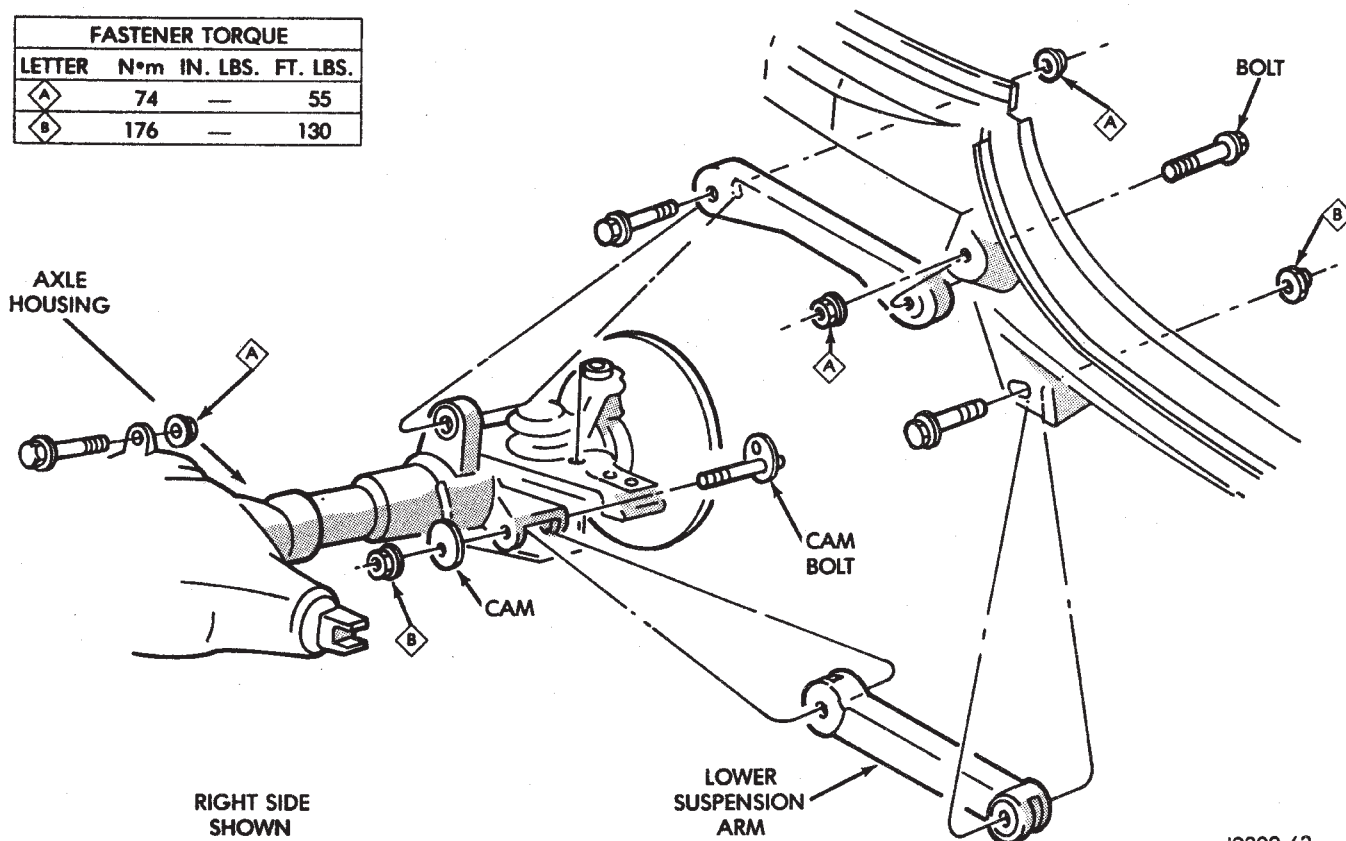


Fig. 3 Upper and Lower Suspension Arms

(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 and frame bracket to 75 N•m (55 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).

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

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

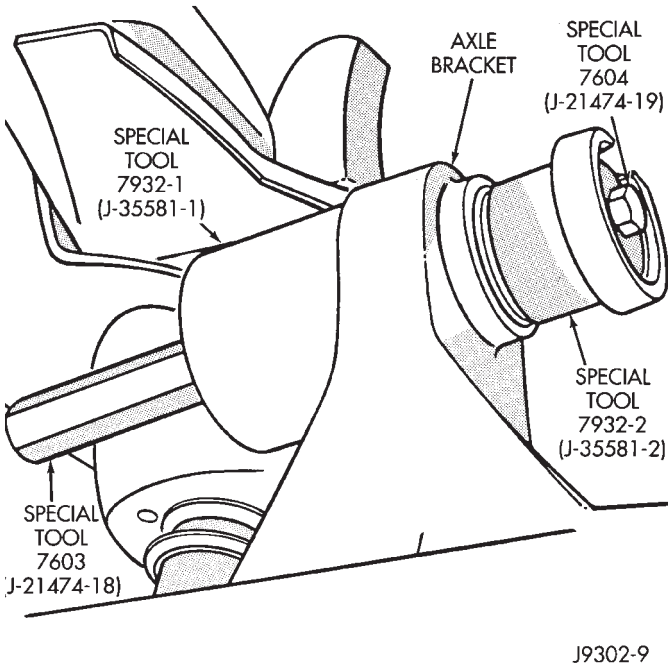


Fig. 4 Axle Bracket Bushing Removal

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).

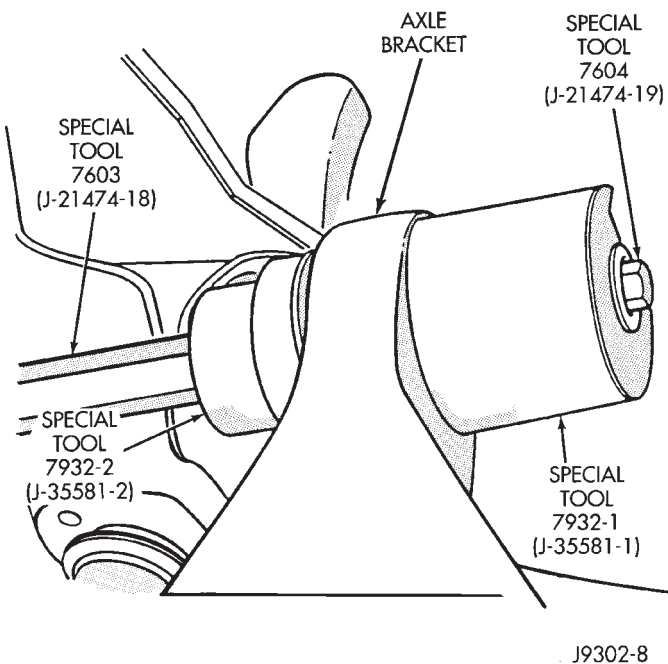


Fig. 5 Axle Bracket Bushing Installation

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

LOWER SUSPENSION ARM

REMOVAL

(1) Raise and support the vehicle.

(2) Paint or scribe alignment marks on the cam adjusters and suspension arm for installation reference (Fig. 6).

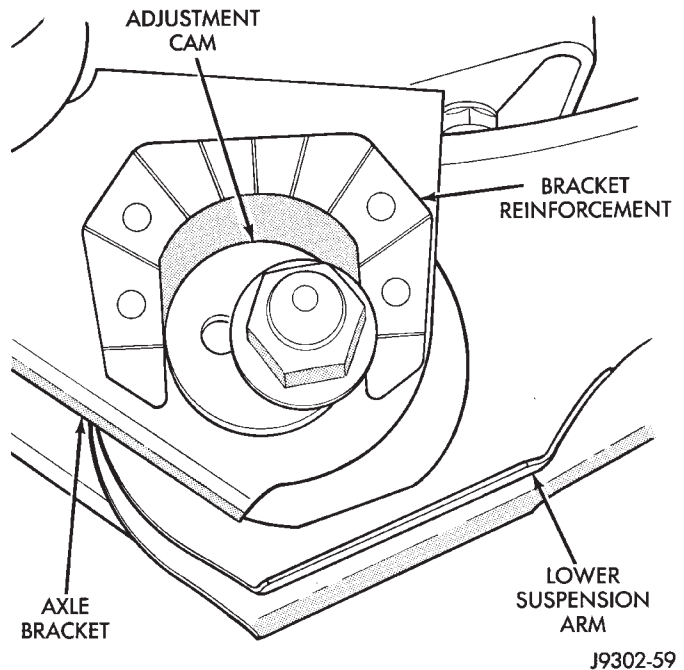


Fig. 6 Cam Adjuster

(3) Remove the lower suspension arm nut, cam and cam bolt from the axle (Fig. 3).

(4) Remove the nut and bolt from the frame rail bracket and remove the lower suspension arm (Fig. 6).

INSTALLATION

(1) Position the lower suspension arm at the axle bracket and frame rail bracket.

(2) Install the rear bolts and finger tighten the nuts (Fig. 6).

(3) Install the cam bolt, cam and nut in the axle. Re-align the reference marks.

(4) Install the bolts and finger tighten the nuts (Fig. 6).

(5) Lower the vehicle.

(6) Tighten the front and rear nuts to 176 N•m (130 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

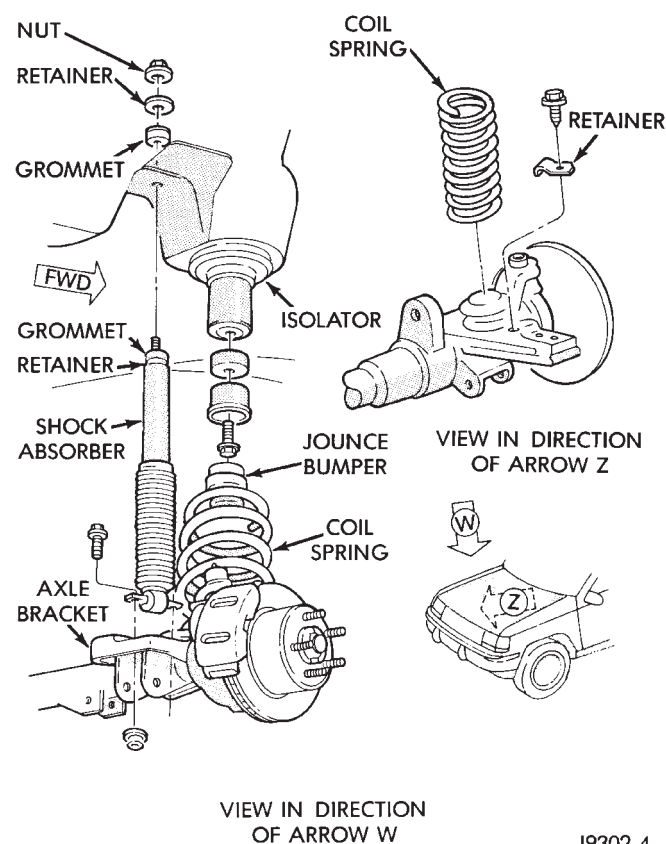
persists, inspect for damaged and worn bushings, and attaching components. Repair as necessary if any of these conditions exist.

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. 7).



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Fig. 7 Coil Spring & Shock Absorber

(2) Remove the lower nuts and bolts from the axle bracket (Fig. 7). Remove the 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 19 N•m (14 ft. lbs.) torque.

(3) Install the upper grommet and retainer on the stud in the engine compartment. Install the nut and tighten to 23 N•m (17 ft. lbs.) torque.

COIL SPRING

REMOVAL

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

(2) Paint or scribe alignment marks on the cam adjusters and axle bracket for installation reference (Fig. 6).

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

(4) Remove the lower suspension arm nut, cam and cam bolt from the axle (Fig. 3).

(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 screw and remove the spring.

(9) Remove the jounce bumper if necessary from the upper spring mount (Fig. 7).

INSTALLATION

(1) Install the jounce bumper on the upper spring mount. Tighten the screw to 42 N•m (31 ft. lbs.) torque (Fig. 7).

(2) Position the coil spring on the axle pad. Install the spring clip and screw. Tighten the screw 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 arm to the axle.

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

(7) Remove the supports and lower the vehicle.

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

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)
- 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

Common causes of overloading is from full-throttle acceleration. Overloading happens when towing heavier-than-recommended loads. Component breakage can occur when the wheels are spun excessively. Insufficient or incorrect lubricants contribute to breakage through overheating. 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.

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, Wheels And Tires for additional information.

DRIVELINE SNAP

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

- High engine idle speed
- Loose engine/transmission/transfer case mounts
- Worn U-joints
- Loose spring mounts
- Loose pinion gear nut and yoke
- Excessive ring gear backlash
- Excessive 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 Cause	Correction
WHEEL NOISE	(a) Wheel loose. (b) Faulty, brinelled wheel bearing.	(a) Tighten loose nuts. (b) Faulty or brinelled bearings must be replaced.
AXLE SHAFT NOISE	(a) Misaligned axle shaft tube. (b) Bent or sprung axle shaft. (c) End play in drive pinion bearings. (d) Excessive gear backlash between ring gear and pinion gear. (e) Improper adjustment of drive pinion gear shaft bearings. (f) Loose drive pinion gearshaft yoke nut. (g) Improper wheel bearing adjustment. (h) Scuffed gear tooth contact surfaces.	(a) Inspect axle shaft tube alignment. Correct as necessary. (b) Replace bent or sprung axle shaft. (c) Refer to Drive Pinion Bearing Pre-Load Adjustment. (d) Check adjustment of ring gear backlash and pinion gear. Correct as necessary. (e) Adjust drive pinion shaft bearings. (f) Tighten drive pinion gearshaft yoke nut with specified torque. (g) Readjust as necessary. (h) If necessary, replace scuffed gears.
AXLE SHAFT BROKE	(a) Misaligned axle shaft tube. (b) Vehicle overloaded. (c) Erratic clutch operation (d) Grabbing clutch.	(a) Replace broken axle shaft after correcting axle shaft tube alignment. (b) Replace broken axle shaft. Avoid excessive weight on vehicle. (c) Replace broken axle shaft after inspecting for other possible causes. Avoid erratic use of clutch. (d) Replace broken axle shaft. Inspect clutch and make necessary repairs or adjustments.
DIFFERENTIAL CASE CRACKED	(a) Improper adjustment of differential bearings. (b) Excessive ring gear backlash. (c) Vehicle overloaded. (d) Erratic clutch operation.	(a) Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust differential bearings properly. (b) Replace cracked case; examine gears and bearings for possible damage. At reassembly, adjust ring gear backlash properly. (c) Replace cracked case; examine gears and bearings for possible damage. Avoid excessive weight on vehicle. (d) Replace cracked case. After inspecting for other possible causes, examine gears and bearings for possible damage. Avoid erratic use of clutch.
DIFFERENTIAL GEARS SCORED	(a) Insufficient lubrication. (b) Improper grade of lubricant. (c) Excessive spinning of one wheel/tire.	(a) 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. (b) Replace scored gears. Inspect all gears and bearings for possible damage. Clean and refill differential housing to required capacity with proper lubricant. (c) Replace scored gears. Inspect all gears, pinion bores and shaft for damage. Service as necessary.
LOSS OF LUBRICANT	(a) Lubricant level too high.	(a) Drain excess lubricant by removing fill plug and allow lubricant to level at lower edge of fill plug hole.

SERVICE DIAGNOSIS (CONT'D)

Condition	Possible Cause	Correction
LOSS OF LUBRICANT (Cont'd)	(b) Worn axle shaft seals. (c) Cracked differential housing. (d) Worn drive pinion gear shaft seal. (e) Scored and worn yoke. (f) Axle cover not properly sealed.	(b) Replace worn seals. (c) Repair or replace housing as necessary. (d) Replace worn drive pinion gear shaft seal. (e) Replace worn or scored yoke and seal. (f) Remove cover and clean flange and reseal.
AXLE OVERHEATING	(a) Lubricant level too low. (b) Incorrect grade of lubricant. (c) Bearings adjusted too tight. (d) Excessive gear wear. (e) Insufficient ring gear backlash.	(a) Refill differential housing. (b) Drain, flush and refill with correct amount of the correct lubricant. (c) Readjust bearings. (d) Inspect gears for excessive wear or scoring. Replace as necessary. (e) Readjust ring gear backlash and inspect gears for possible scoring.
GEAR TEETH BROKE (RING GEAR AND PINION)	(a) Overloading. (b) Erratic clutch operation. (c) Ice-spotted pavements. (d) Improper adjustments.	(a) Replace gears. Examine other gears and bearings for possible damage. Replace parts as needed. Avoid overloading of vehicle. (b) Replace gears and examine the remaining parts for possible damage. Avoid erratic clutch operation. (c) Replace gears. Examine the remaining parts for possible damage. Replace parts as required. (d) Replace gears. Examine other parts for possible damage. Ensure ring gear backlash is correct.
AXLE NOISE	(a) Insufficient lubricant. (b) Improper ring gear and drive pinion gear adjustment. (c) Unmatched ring gear and drive pinion gear. (d) Worn teeth on ring gear or drive pinion gear. (e) Loose drive pinion gear shaft bearings. (f) Loose differential bearings. (g) Misaligned or sprung ring gear. (h) Loose differential bearing cap bolts.	(a) Refill axle with correct amount of the proper lubricant. Also inspect for leaks and correct as necessary. (b) Check ring gear and pinion gear teeth contact pattern. (c) Remove unmatched ring gear and drive pinion gear. Replace with matched gear and drive pinion gear set. (d) Check teeth on ring gear and drive pinion gear for correct contact. If necessary, replace with new matched set. (e) Adjust drive pinion gearshaft bearing preload torque. (f) Adjust differential bearing preload torque. (g) Measure ring gear runout. (h) Tighten with specified torque.

MODEL 30 AXLE AND TUBE AXLE (2WD)

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GENERAL INFORMATION

The housing for Model 30 front axles consists of an iron center casting with tubes on each side. The tubes are pressed into and welded to the differential housing.

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

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

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

PINION GEAR DEPTH MEASUREMENT WITH GAUGE SET D-115-30 is used when;

- Axle/differential housing is being replaced

- Original pinion depth shim pack is lost or misplaced
- Replacing the differential case
- Original differential bearing shim pack is lost or misplaced

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 75W gear lubricant
- The factory installed lubricant quantity for the NON-DISCONNECT TYPE AXLE is 50±1 fluid oz.

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

CAUTION: If the axle is submerged in water, the lubricant must be replaced immediately to avoid the possibility of contaminated lubricant.

DRIVE AXLE ASSEMBLY REPLACEMENT

REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the wheels and tires. Remove the brake components from the axle, refer to Group 5, Brakes.
- (3) On 4WD vehicles, disconnect the vent hose from the axle shaft tube.
- (4) On 4WD vehicles, mark the front propeller shaft and pinion yokes for installation alignment reference. Disconnect the propeller shaft from the axle.
- (5) Disconnect the following components from the axle:

- Stabilizer bar link
- Tie rod and drag link

- Front propeller shaft
- Shock absorbers
- Steering dampener
- ABS brake sensor
- Track bar

(6) Position a floor jack under the axle.

(7) Paint or scribe alignment marks on the lower suspension arm cam adjusters and axle bracket for installation reference.

(8) Remove the lower suspension arm nut, cam and cam bolt from the axle bracket.

(9) Remove the upper suspension arm nut and bolt from the axle.

(10) Lower the axle with the jack.

INSTALLATION

It is important to have the springs supporting the weight of the vehicle when the arms and fasteners are being torqued. If the springs are not at their normal ride position, vehicle ride comfort could be affected along with premature rubber bushing wear.

(1) Raise the axle with a floor jack and align it with the coil springs.

(2) Install the upper and lower suspension arms.

(3) Install the lower suspension arm cam bolt, cam and nut in the axle bracket. Re-align the reference marks. (If installing a new axle housing assembly, a front alignment is recommended to set caster.)

(4) Install the bolts and tighten the nuts on the suspension arms;

- Lower: 176 N•m (130 ft. lbs.) torque

- Upper: 75 N•m (55 ft. lbs.) torque

(5) Install the following components to the axle:

- Track bar bolt — 100 N•m (74 ft. lbs.) torque
- Steering dampener bolt/nut — 75 N•m (55 ft. lbs.) torque

- Shock absorber bolt/nut — 19 N•m (14 ft. lbs.) torque

- Stabilizer bar link nut — 95 N•m (70 ft. lbs.) torque

- Drag link stud nut — 74 N•m (55 ft. lbs.) torque

- Tie rod stud nut — 74 N•m (55 ft. lbs.) torque

- ABS brake sensor

- Axle vent hose

- Front propeller shaft — 19 N•m (14 ft. lbs.) torque

(6) Install the brake components, refer to Group 5, Brakes.

(7) Install the wheels and tires.

(8) Check and add gear lubricant if needed.

(9) Lower the vehicle.

(10) Check the front wheel alignment.

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.**

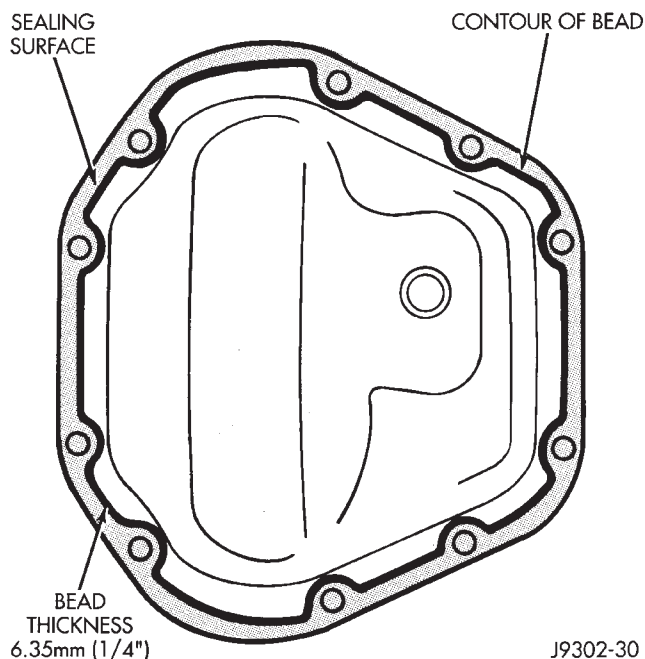


Fig. 1 Typical Housing Cover With Sealant

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 47 N•m (35 ft. lbs.) torque.

(8) Refill the differential with MOPAR® Hypoid Gear Lubricant within 13 mm (1/2 in.) below the fill plug hole.

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

PINION SHAFT SEAL REPLACEMENT

REMOVAL

(1) Raise and support the vehicle.

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

(3) Remove the propeller shaft from the yoke.

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

(5) Measure the amount of torque (in Newton-meters or inch-pounds) necessary to rotate the pinion gear with a torque wrench. Note the torque for in-

stallation reference. **It must be known to properly adjust the pinion gear bearing preload torque after seal installation.**

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

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

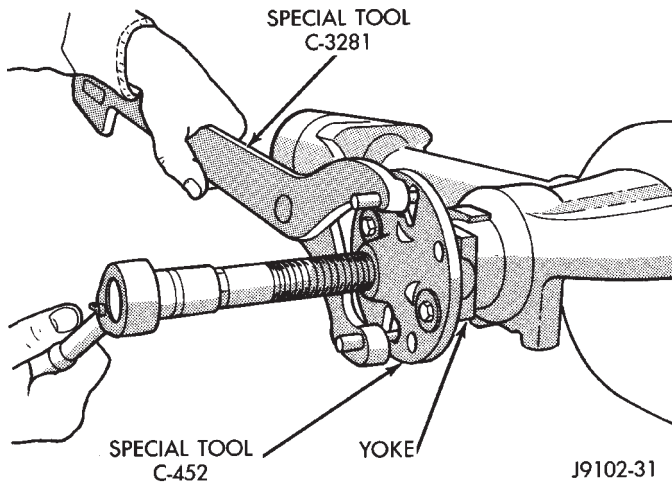


Fig. 2 Pinion Yoke Removal

(8) Use Remover W-251 to remove the pinion gear seal (Fig. 3).

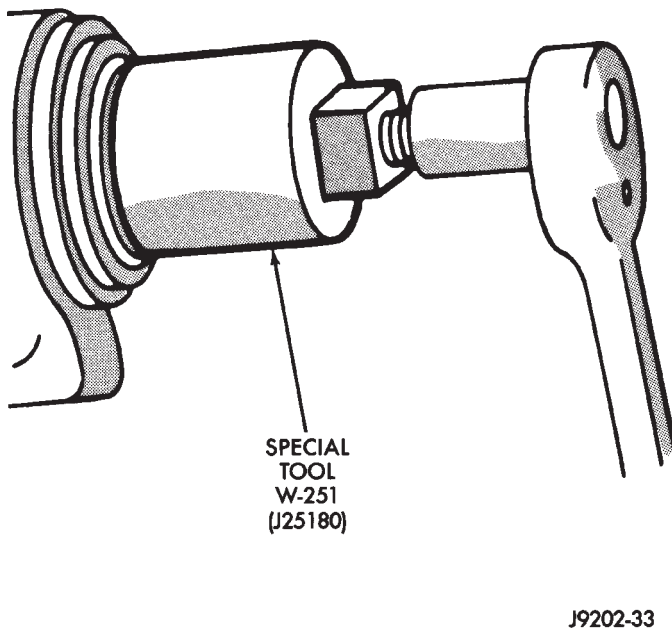


Fig. 3 Seal Removal

INSTALLATION

(1) Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer W-147-E and Handle C-4171 (Fig. 4).

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

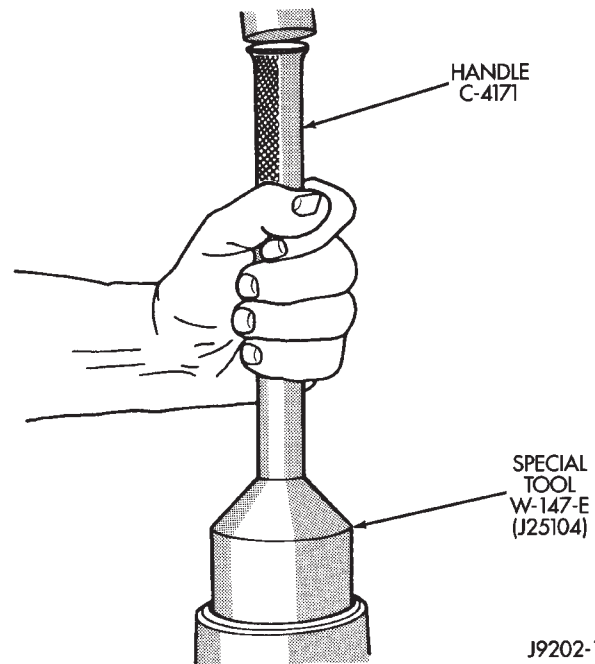


Fig. 4 Pinion Seal Installation

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

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

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

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

The required preload is equal to amount recorded during removal plus 0.56 N•m (5 in. lbs.). The used bearing preload torque must never exceed 2.25 N•m (20 in. lbs.)

(6) Use Flange Wrench C-3281 to retain the yoke and shaft (Fig. 5). Tighten the shaft nut in very small increments.

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

- **No less than 217 N•m (160 ft. lbs.) torque**
- **No greater than 352 N•m (260 ft. lbs.) torque**

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

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

(10) Lower the vehicle.

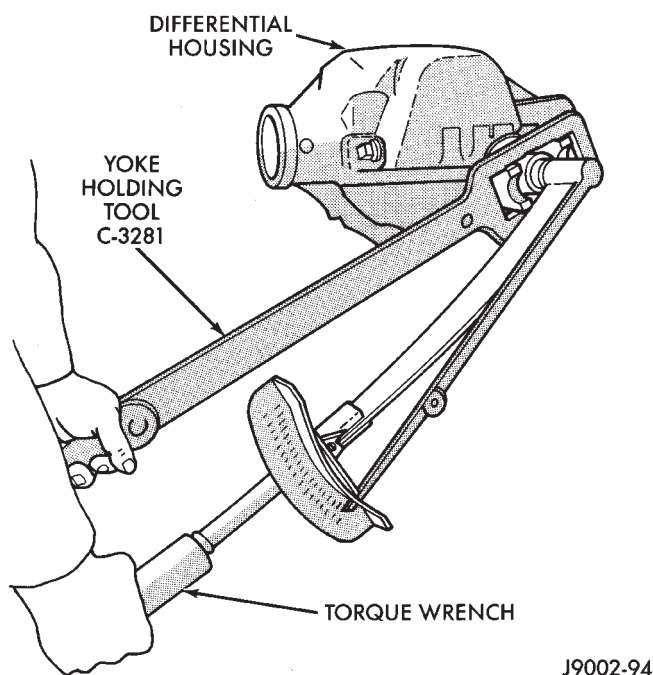


Fig. 5 Tightening Pinion Shaft Nut

HUB BEARING AND AXLE SHAFT

REMOVAL

- (1) Raise and support the vehicle.
- (2) Remove the wheels and tires.
- (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 4WD vehicles, remove the axle shaft from the housing. **Avoid damaging the axle shaft oil seals in the differential.**

INSTALLATION

(1) Thoroughly clean the axle shaft (Fig. 6) and apply a thin film of Mopar Wheel Bearing Grease to the shaft splines, seal contact surface, hub bore.

(2) On 4WD vehicles, 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 wheels and tires.

(8) 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.

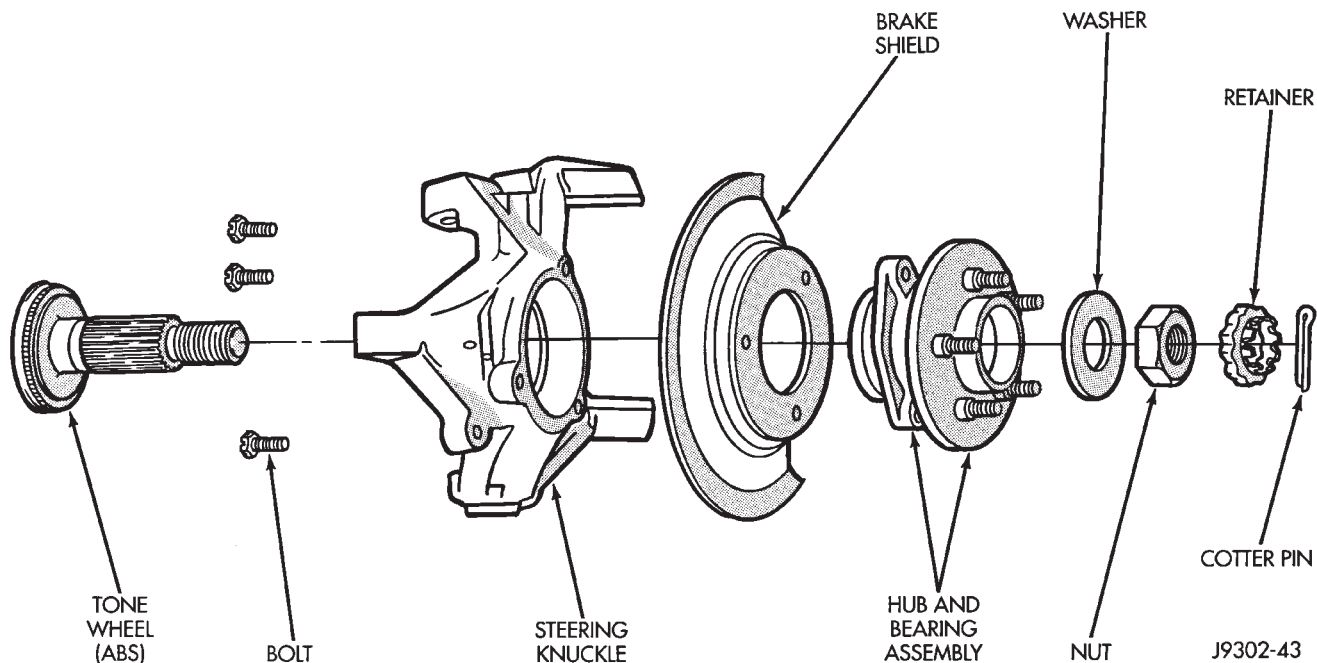


Fig. 6 Hub, Knuckle and Axle Shaft

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).

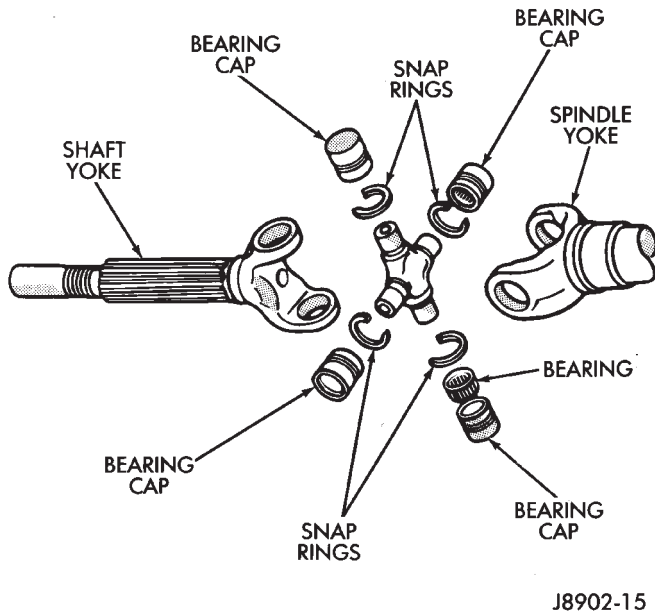


Fig. 7 Axle Shaft Outer U-Joint

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

(2) Locate a socket that is larger in diameter than the bearing cap. Place the socket (receiver) against the yoke and around the perimeter of the bearing cap to be removed. Locate a socket that is smaller in diameter than the bearing cap. Place the socket (driver) against the opposite bearing cap. Position the yoke with the sockets in a vise (Fig. 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.

(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.

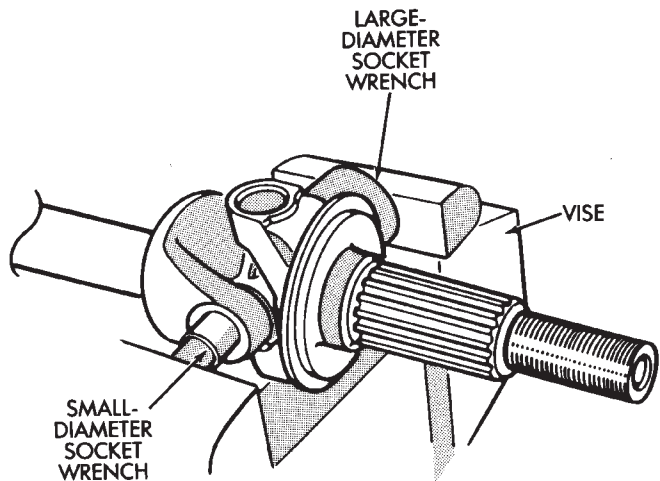


Fig. 8 Yoke Bearing Cap Removal

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.

AXLE SHAFT— CV-JOINT

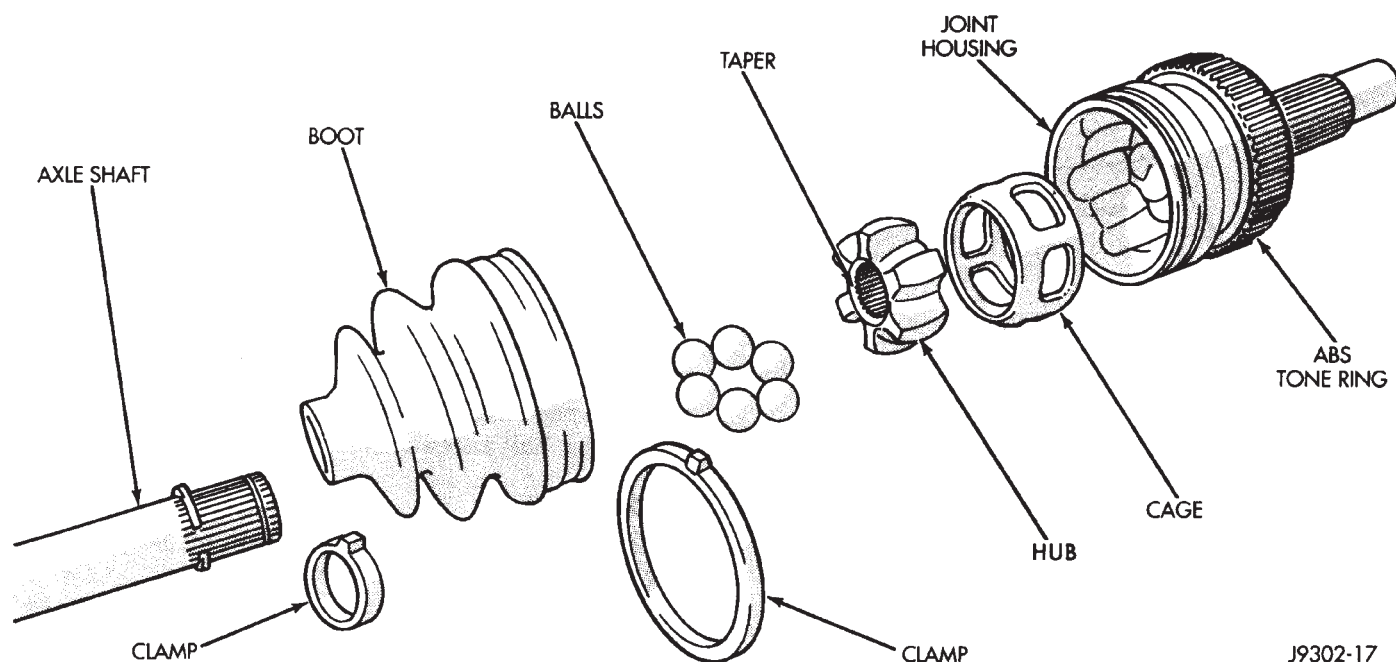
HANDLING AND CLEANING PRECAUTIONS

Extreme care must be exercised to avoid puncturing or tearing the boots. Also avoid damage to the ABS tone ring pressed onto the CV-joint.

The rubber material in shaft boots is not compatible with oil, gasoline, or petroleum-based cleaning solvents. Do not expose the rubber boots to any of these fluids. Use only soap and water to clean the rubber boots. After cleaning, the rubber boot must be thoroughly rinsed and dried.

INSPECTION

The most common failure of CV-joints is torn or ripped boots and subsequent lubricant loss or contamination. Look for lubricant around the exterior of



J9302-17

Fig. 9 CV Joint Components

boot. Check if boot is either punctured, torn or that a retaining clamp is loose. If joint was operating satisfactorily and grease does not appear contaminated, replace boot. When a CV drive shaft is removed from the vehicle for service, the boot should be properly cleaned. Inspect the boot for cracks, tears and scuffed areas on the surfaces. If any of these conditions exist, boot replacement is recommended.

If joint is noisy or worn, bypass following disassembly and replace entire unit and boot.

DISASSEMBLY

(1) Remove retaining clamps from the outer CV joint and discard. Slide the boot off the outer joint and down the shaft.

(2) Remove the lubricant to expose the joint components (Fig. 9).

(3) Clamp the shaft in a vise (with soft jaws). Give a sharp tap to the top of the housing to dislodge joint from internal circlip. Slide the joint from the shaft. (Fig. 10).

(4) Remove the surplus lubricant. Apply installation alignment marks on the bearing hub, bearing cage and housing with dabs of paint (Fig. 11).

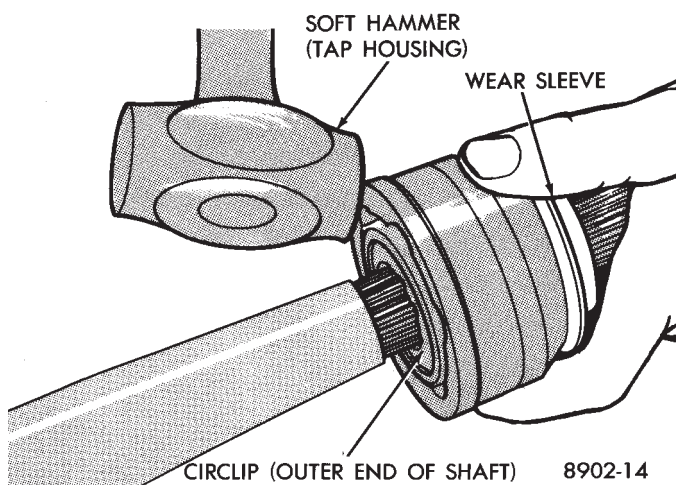


Fig. 10 Joint Removal

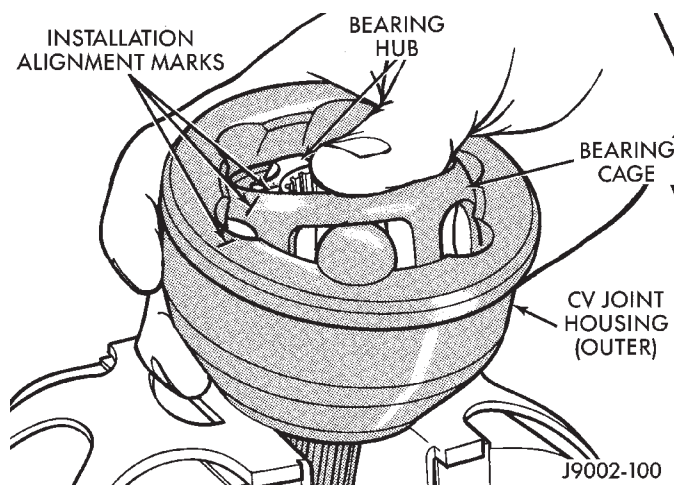


Fig. 11 Ball Access

(5) Place the stub shaft in a soft-jawed vise to avoid damage to the shaft splines.

(6) Press down on one side of the bearing cage/hub to tilt the cage. This will provide access to a ball at the opposite side of the cage. If the CV joint is tight, use a hammer and brass drift to loosen the bearing hub. **Do not hit the bearing cage with the drift.**

(7) Remove the ball from the bearing cage (Fig. 12). If necessary, a small pry bar can be used to pry the ball loose from the cage.

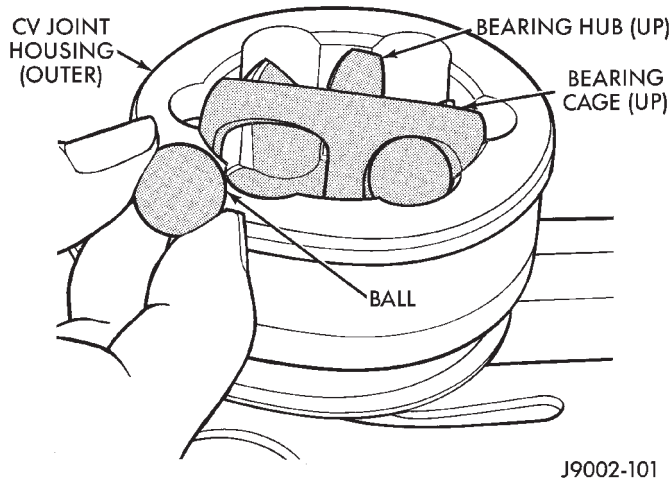


Fig. 12 Ball Removal

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

(9) Tilt the bearing cage and hub to a vertical position to remove (Fig. 13).

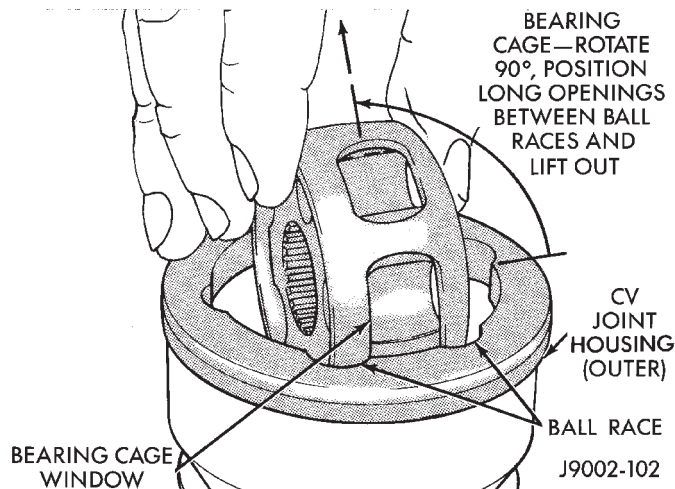


Fig. 13 Bearing Cage & Hub Removal

(10) Insert one of the bearing hub lands into the adjacent cage window and roll it out of the cage (Fig. 14).

INSPECTION

Polished contact surface areas on raceways and bearing cage spheres are normal. If the joints cause a noise or a vibration, replace them.

(1) Inspect the lubricant for grit, dirt, water damage and metallic particles.

(2) Clean all the components with an appropriate solvent and dry them with compressed air.

(3) Inspect the ball raceways in the housing for excessive wear, gouging or scoring.

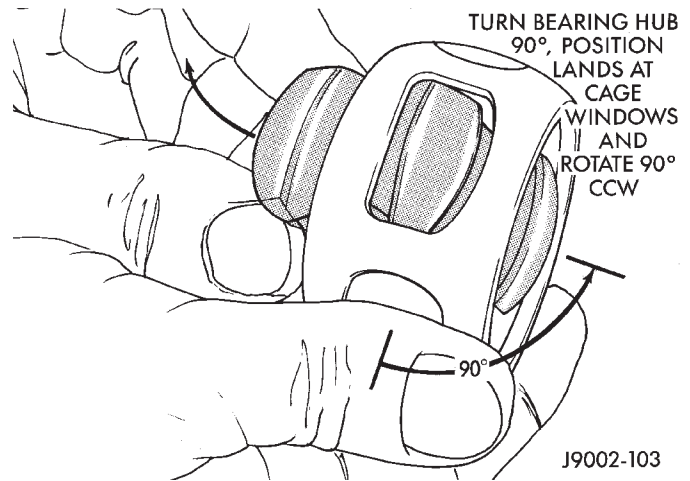


Fig. 14 Bearing Hub Removal

(4) Examine the stub shaft splines and threads for damage.

(5) Inspect the balls for pitting, cracks, scoring and excessive wear. A dull exterior surface is normal.

(6) Inspect the bearing cage for wear, grooves, ripples, cracks and chipping.

(7) Inspect the bearing hub for excessive wear and scoring on ball raceways.

ASSEMBLY

(1) Lightly apply lubricating oil to all joint components before assembling them.

(2) Align the bearing hub, cage and housing (Fig. 11) according to the alignment reference marks.

(3) Insert one of the bearing hub lands into a bearing cage window and roll it into the cage (Fig. 15). Rotate the bearing hub 90° to complete the installation (Fig. 16).

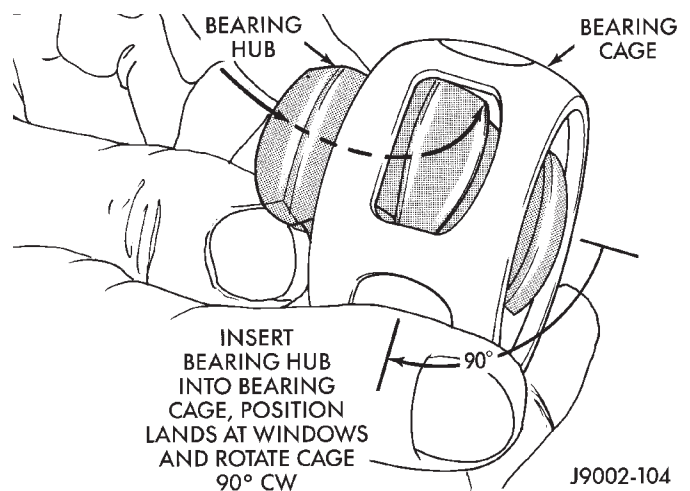


Fig. 15 Bearing Hub Installation

(4) Insert bearing cage/hub into the housing (Fig. 17). Rotate the cage/hub 90° to complete the installation. **Ensure the tapered edge is facing outward (Fig. 18).**

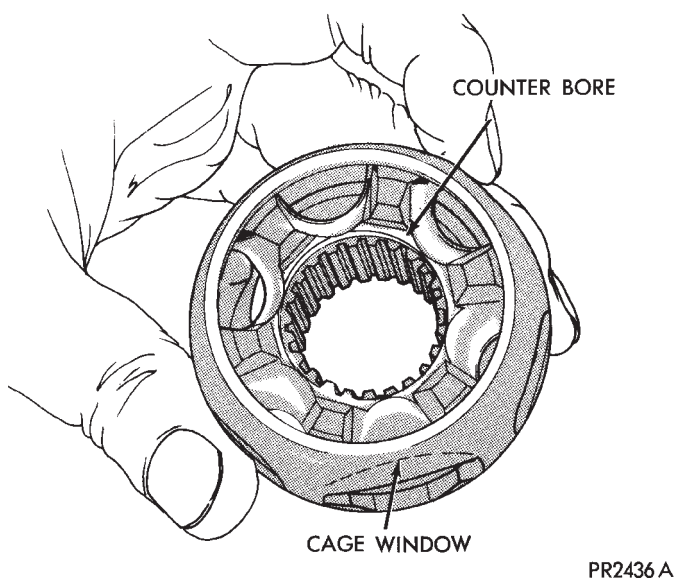


Fig. 16 Assembled Bearing Cage & Hub

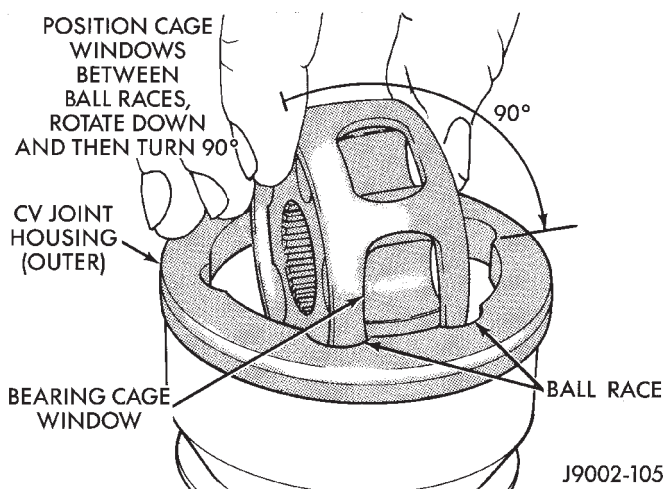


Fig. 17 Bearing Cage & Hub Installation

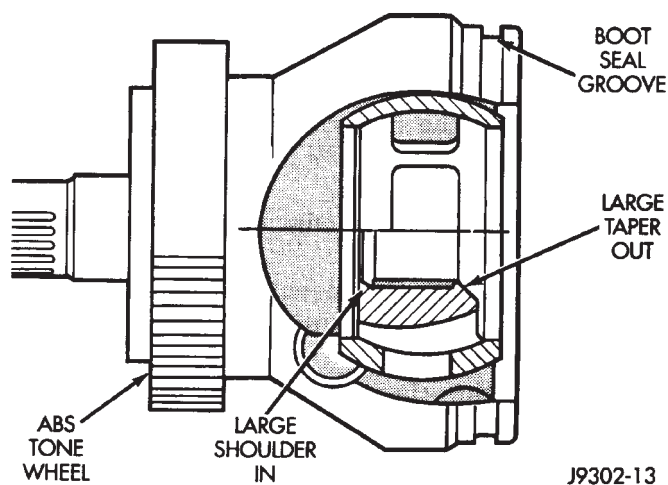


Fig. 18 Assembly Installed

(5) Apply the lubricant included with the replacement rubber boot to the ball raceways. Spread the lu-

bricant equally between all the raceways. One packet of lubricant is sufficient to lubricate the joint.

(6) Tilt the bearing hub and cage and install the balls in the raceways (Fig. 19).

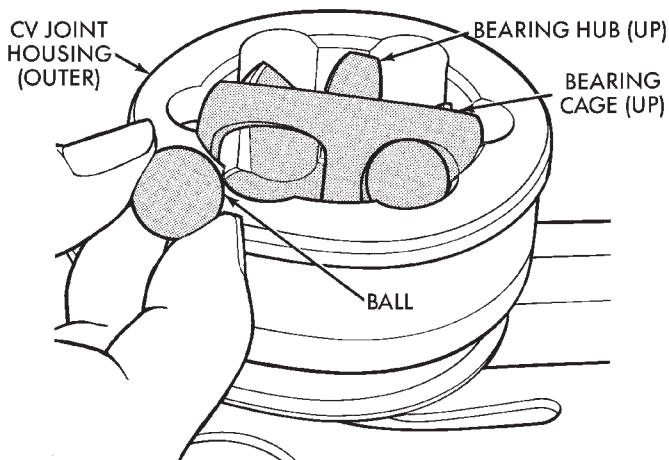


Fig. 19 Ball Installation In Raceway

(7) Install the rubber boot on the axle shaft. Ensure the clamp sealing area is in the grooved section of the axle shaft. Install a new clamp.

(8) Engage the splines and install the joint onto the shaft. Tap sharply with mallet until seated (Fig. 20).

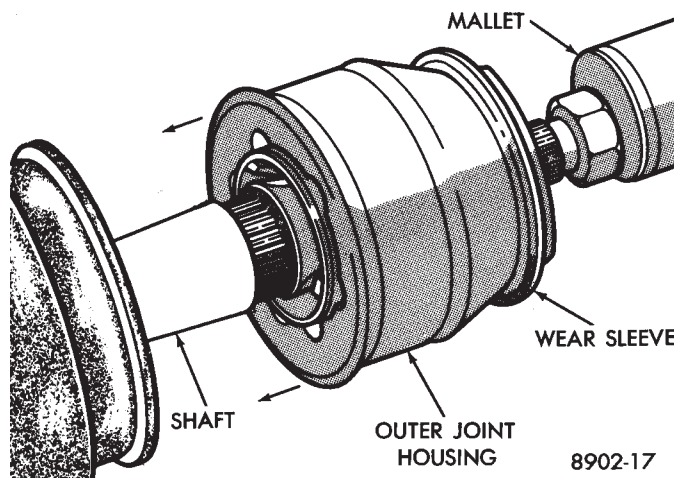


Fig. 20 Joint Installation

(9) Ensure that the snap ring is properly seated in the housing. Pull the outer CV joint from the shaft to test, it should not come off.

(10) Install remaining amount of lubricant to cage and balls.

(11) Place the large diameter end of the rubber boot over the edge of the housing. **Ensure that the boot is not twisted.**

(12) Ensure the clamp sealing area is in the grooved section of the housing. Install a new clamp.

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

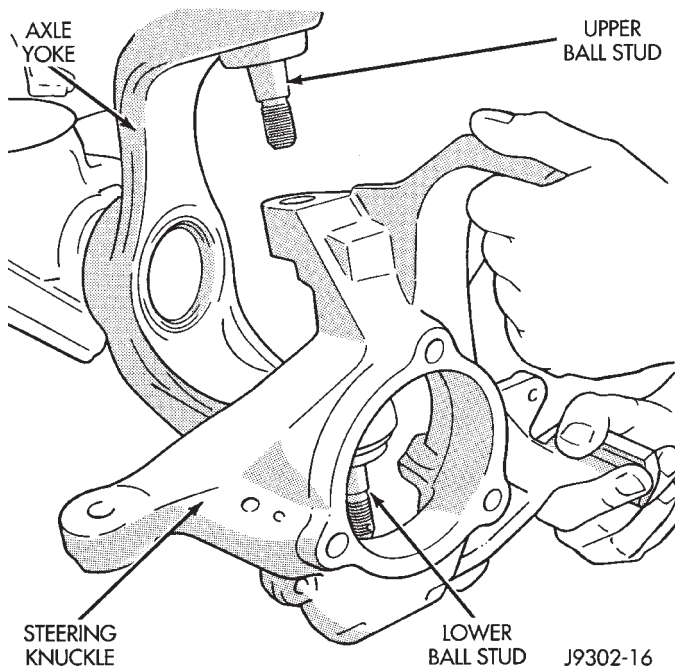


Fig. 21 Steering Knuckle Removal/Installation

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).

KNUCKLE REMOVAL

- (1) Remove hub bearing and axle shaft. Refer to the Removal procedures in this Group.
- (2) If necessary, 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 pin from the upper ball stud nut. 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. 21).

UPPER BALL STUD REPLACEMENT

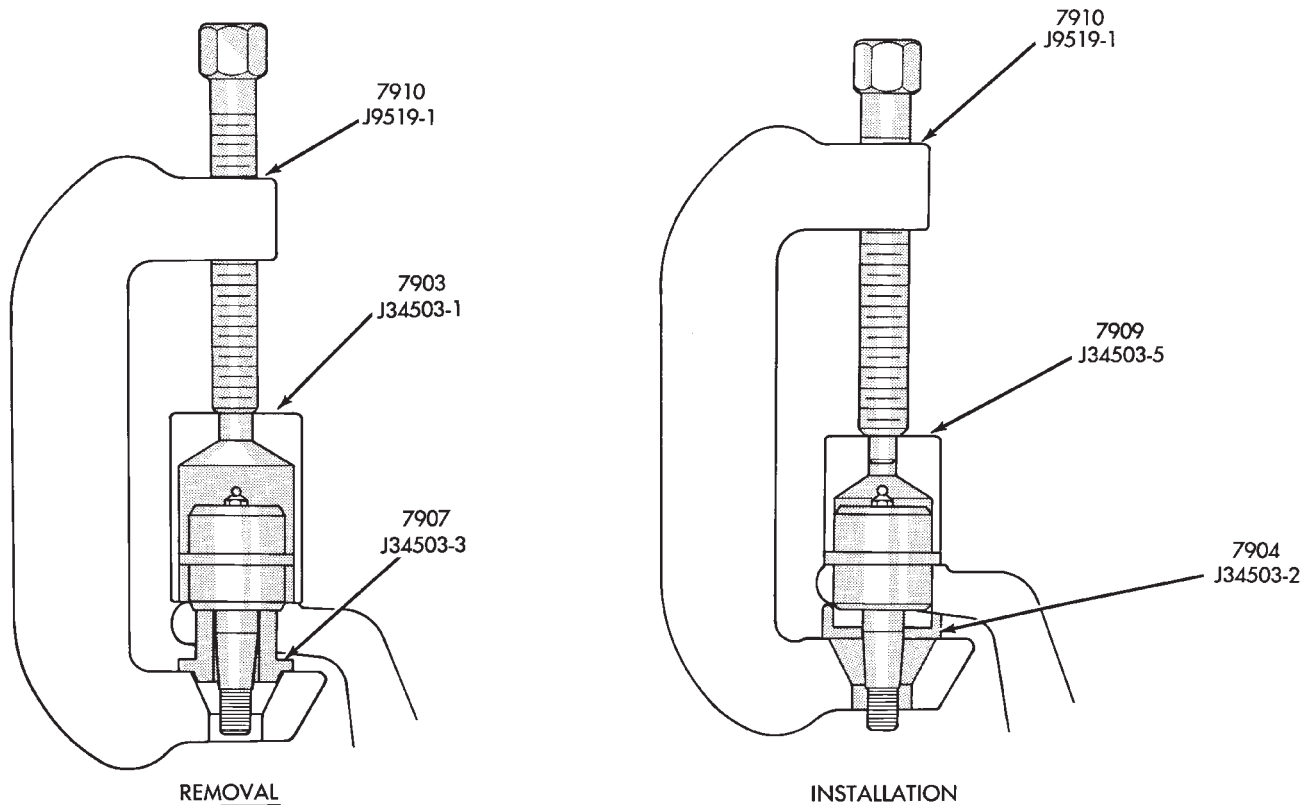
- (1) Position tools as shown to remove and install ball stud (Fig. 22).

LOWER BALL STUD REPLACEMENT

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

KNUCKLE INSTALLATION

- (1) Position the steering knuckle on the ball studs.
- (2) Install and tighten the bottom retaining nut to 108 N•m (80 ft. lbs.) torque. Install new cotter pins.
- (3) Install and tighten the top retaining nut to 101 N•m (75 ft. lbs.) torque. Install new cotter pin.
- (4) Install the Hub Bearing and Axle Shaft. Refer to the installation procedure.



J9302-37

Fig. 22 Upper Ball Stud Remove/Install

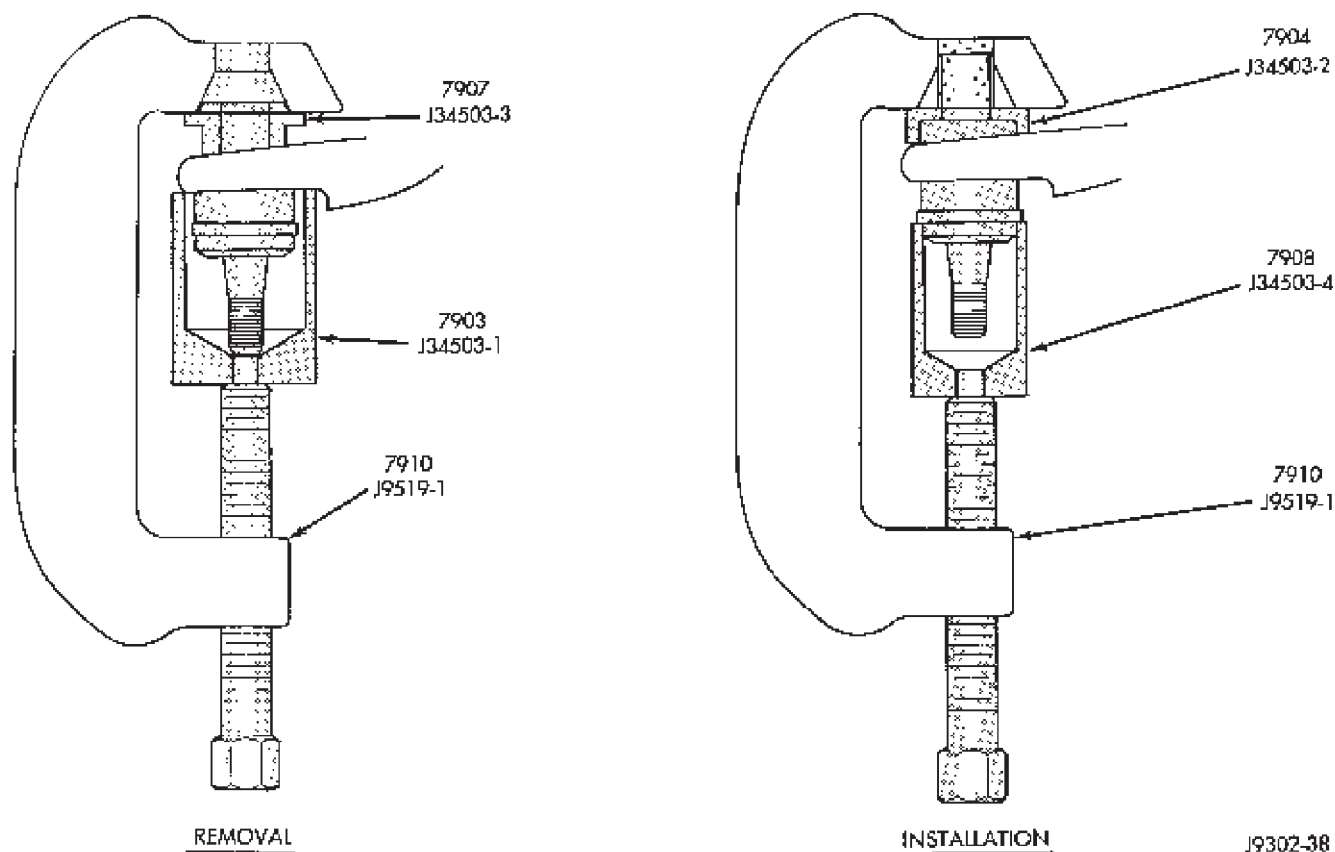


Fig. 23 Lower Ball Stud Remove/Install

(5) If necessary, 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 for proper set-up.

AXLE BUSHING REPLACEMENT

Refer to Axle Bushing Replacement in the Front Suspension section.

DIFFERENTIAL REMOVAL

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

(1) **Note the installation reference letters stamped on the bearing caps and housing machined sealing surface (Fig. 24).**

(2) Remove the differential bearing caps.

(3) Position Spreader W-129-A with the tool dowel pins seated in the locating holes (Fig. 25). 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. 25) and zero the indicator.

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

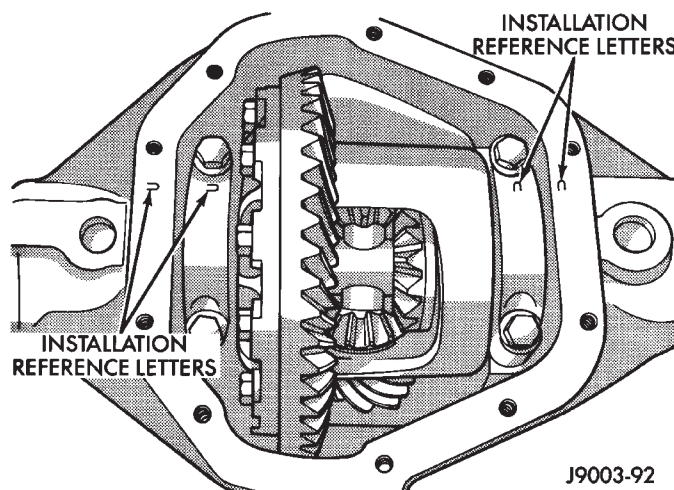


Fig. 24 Bearing Cap Identification

(5) Separate the housing a maximum of 0.38 mm (0.015 in.). Measure the distance with the dial indicator (Fig. 25).

(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. 26).

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

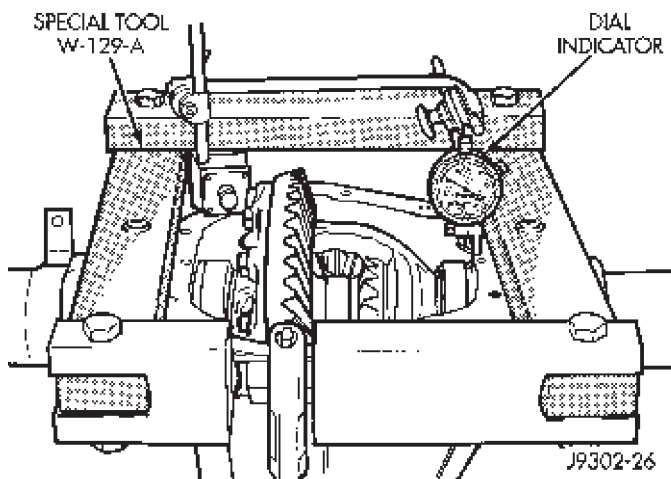


Fig. 25 Spread Differential Housing

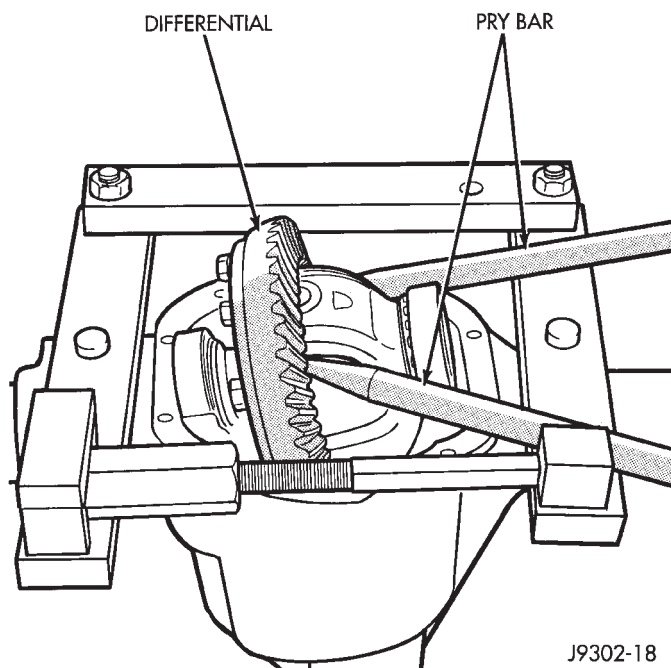


Fig. 26 Differential Removal

AXLE SHAFT OIL SEALS

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

(2) Install oil seals with Adapter D-112-4, D-112-5 and Turnbuckle D-112 (Fig. 27). Tighten tool until disc bottoms in housing. Be sure the seals are not cocked.

DIFFERENTIAL DISASSEMBLY

(1) Remove the bearings from the differential case with Press C-293-PA, Plug C-293-3, Adapter C-293-39 (Fig. 28).

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

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

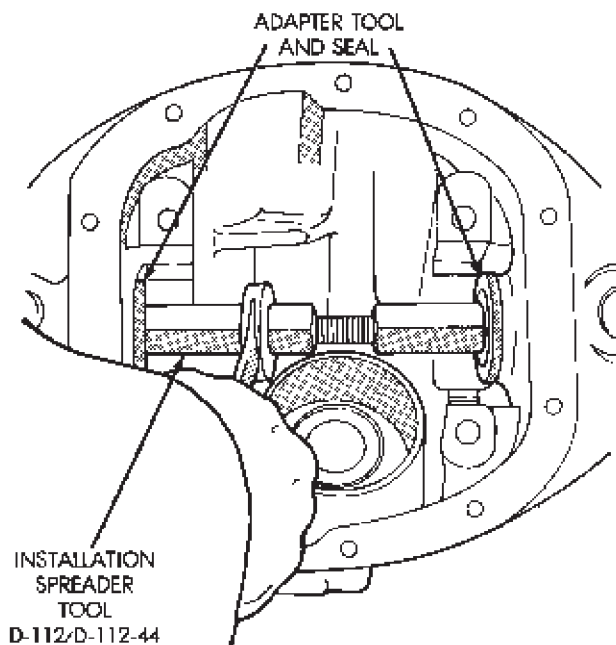


Fig. 27 Axle Shaft Oil Seal Installation

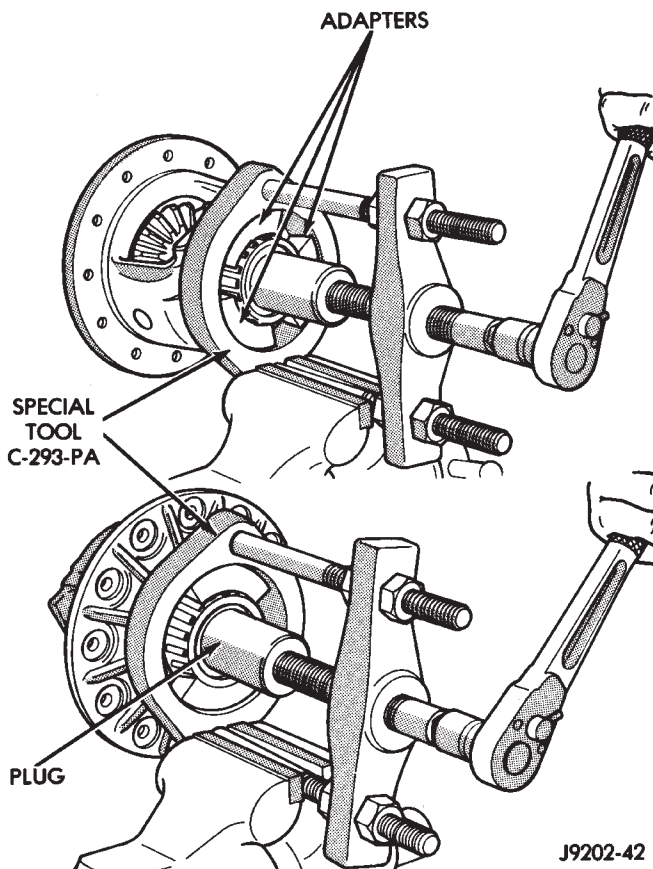


Fig. 28 Differential Bearing Removal

(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 mallet and remove (Fig. 29).

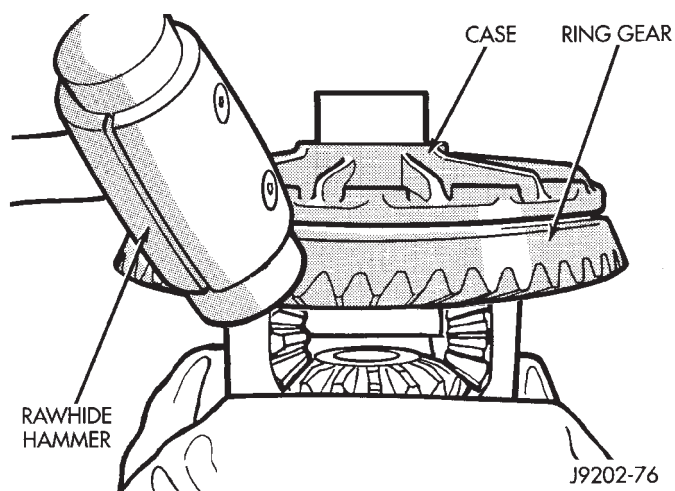


Fig. 29 Ring Gear Removal

(4) Use a drift to remove the pinion gear mate shaft lock pin (Fig. 30).

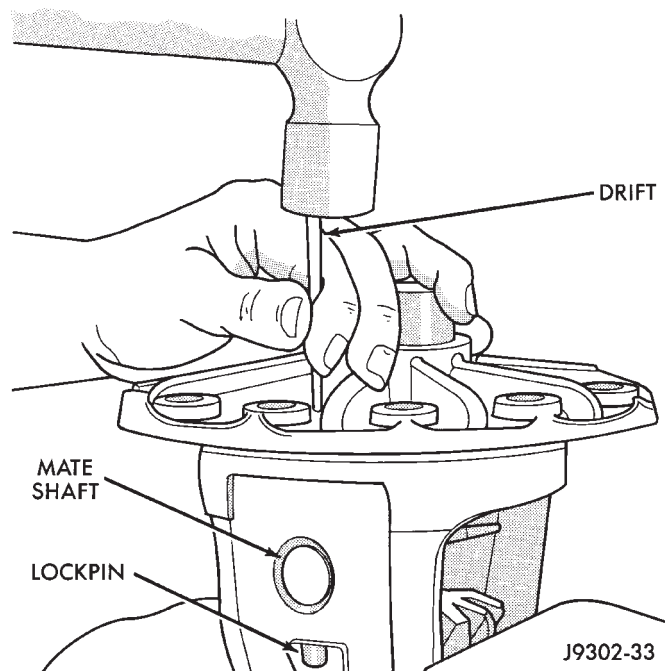


Fig. 30 Mate Shaft Lock Pin Removal

(5) Remove the mate shaft with a drift and hammer (Fig. 31).

(6) Rotate the differential side gears and remove the pinion mate gears and thrust washers (Fig. 32).

(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. 33).

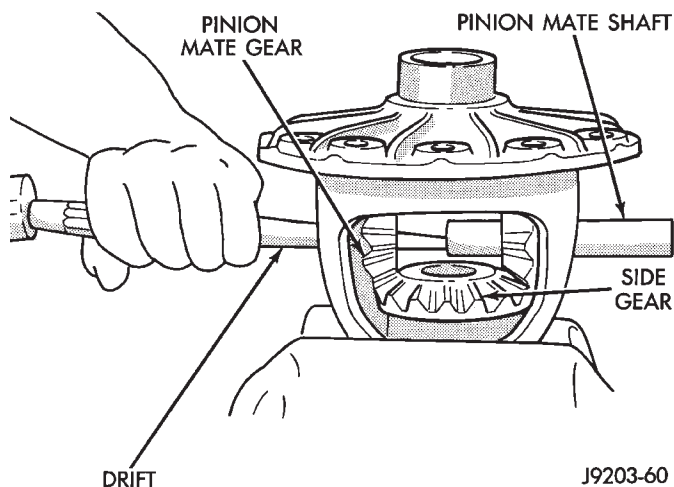


Fig. 31 Mate Shaft Removal

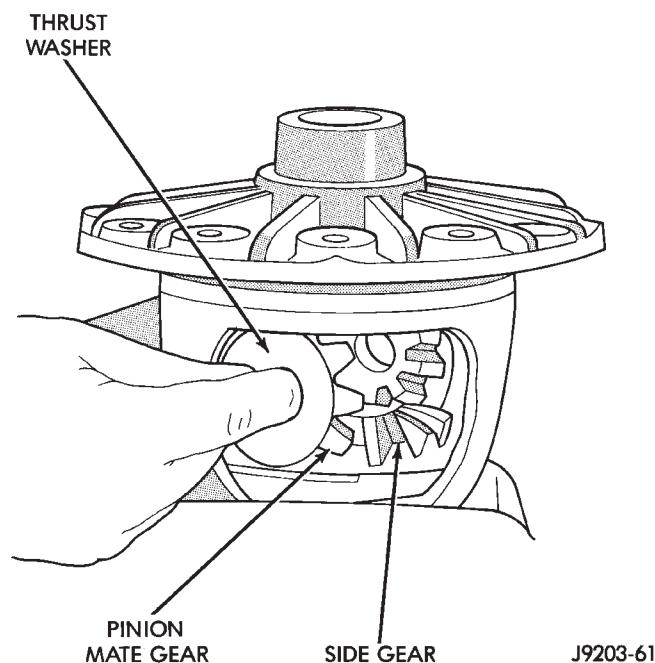


Fig. 32 Pinion Mate Gear Removal

(2) Remove the pinion gear from housing (Fig. 34). Catch the pinion with your hand to prevent it from falling and being damaged.

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

(4) Remove the collapsible preload spacer (Fig. 35).

(5) Remove oil slinger, front bearing.

(6) Remove the front pinion bearing cup with Remover D-147 and Handle C-4171 (Fig. 36).

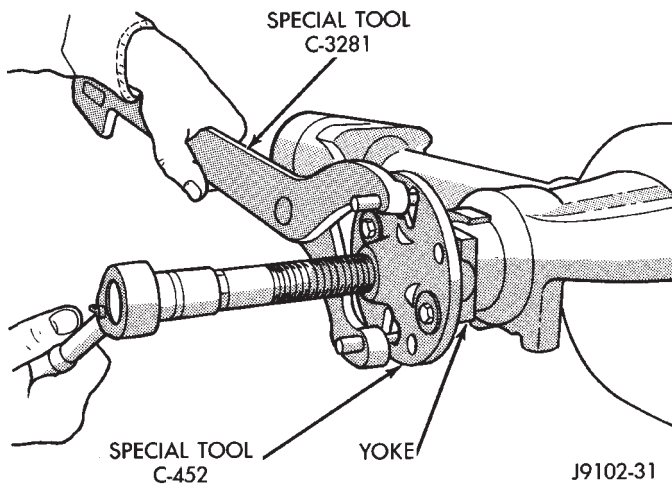


Fig. 33 Pinion Yoke Removal

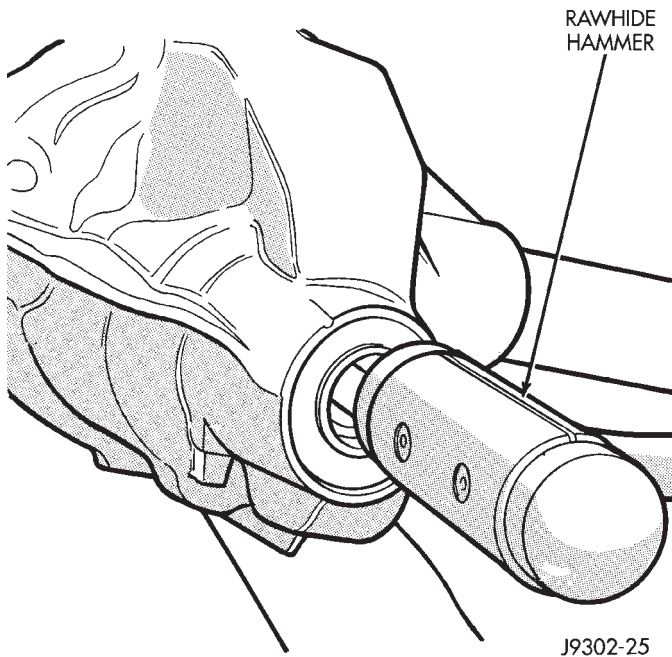


Fig. 34 Remove Pinion Gear

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

(8) Remove the inner bearing from the pinion with Puller C-293-PA and Adapter C-293-39 (Fig. 38).

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

(9) Remove the oil slinger (select thickness-production) from the pinion gear shaft. Record the thickness of the slinger.

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, do not dry with compressed air. **Cup and bearing must be replaced as matched sets only.**

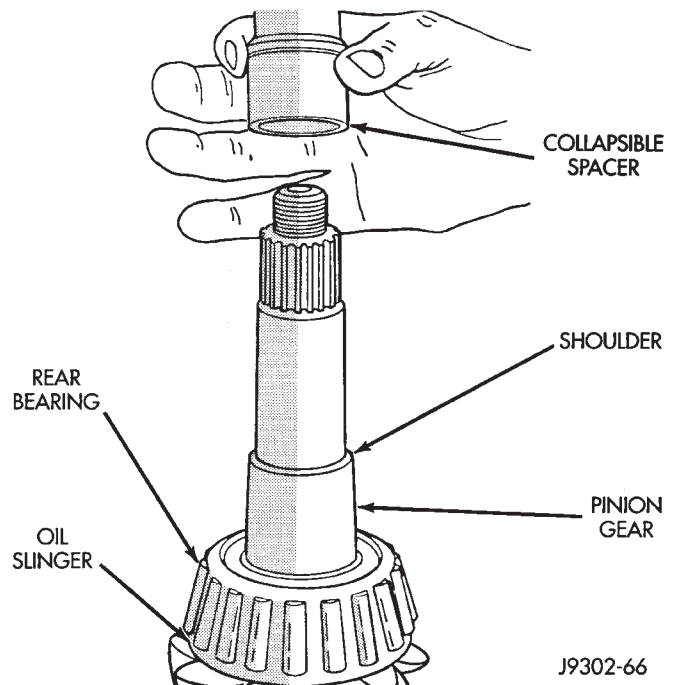


Fig. 35 Collapsible Spacer

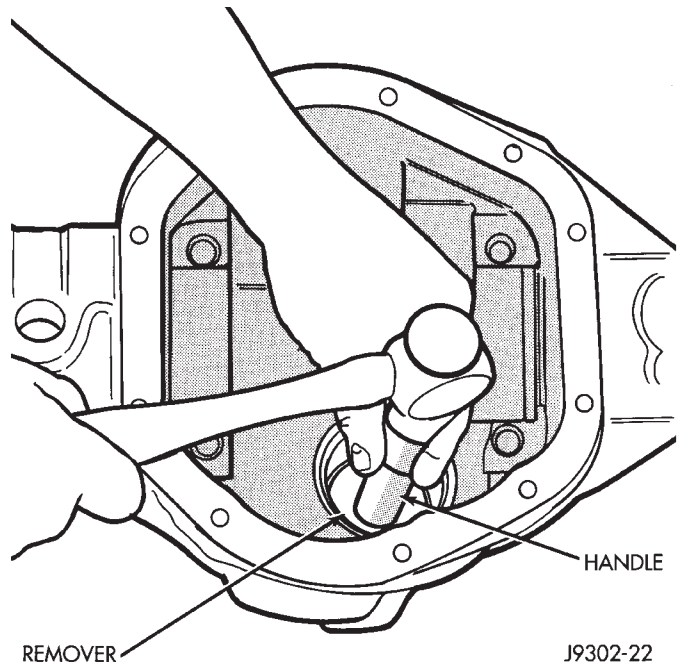


Fig. 36 Front Bearing Cup Removal

Clean the axle shaft tubes with a stiff wire brush or clean cloth.

Inspect the components for;

- Smooth appearance with no broken/dented surfaces on the bearing rollers or the roller contact surfaces
- Bearing cups must not be distorted or cracked
- Machined surfaces should be smooth and without any raised edges
- Raised metal on shoulders of cup bores should be removed with a hand stone

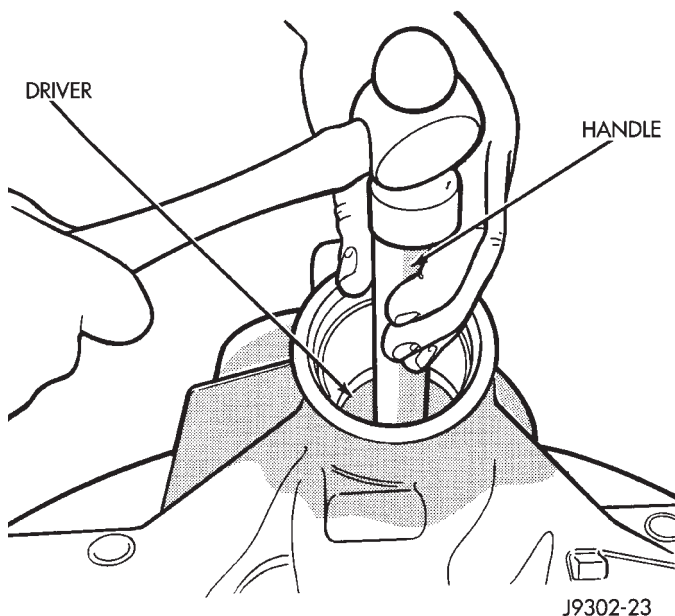


Fig. 37 Rear Bearing Cup Removal

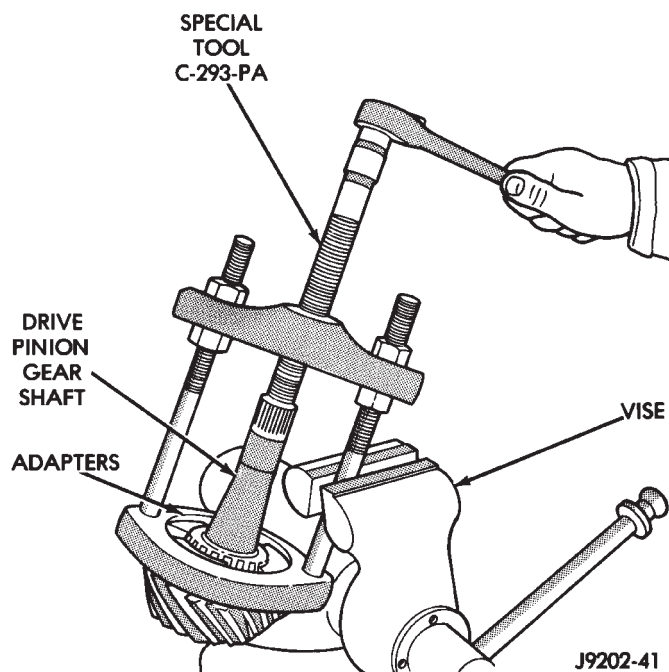


Fig. 38 Inner Bearing Removal

- Wear and damage to pinion gear mate shaft, pinion gears, side gears and thrust washers. Replace as a matched set only.
- Ring and pinion gear for worn and chipped teeth
- Ring gear for damaged bolt threads. Replaced as a matched set only.
- Pinion yoke for cracks, worn splines, pitted areas, and a rough/corroded seal contact surface. Repair or replace as necessary.
- Preload shims for damage and distortion. Install new shims if necessary.

DIFFERENTIAL ASSEMBLY

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

- 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 lock pin in the differential case and mate shaft with a punch and hammer (Fig. 39). Peen metal part of case over pin in two places.

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.

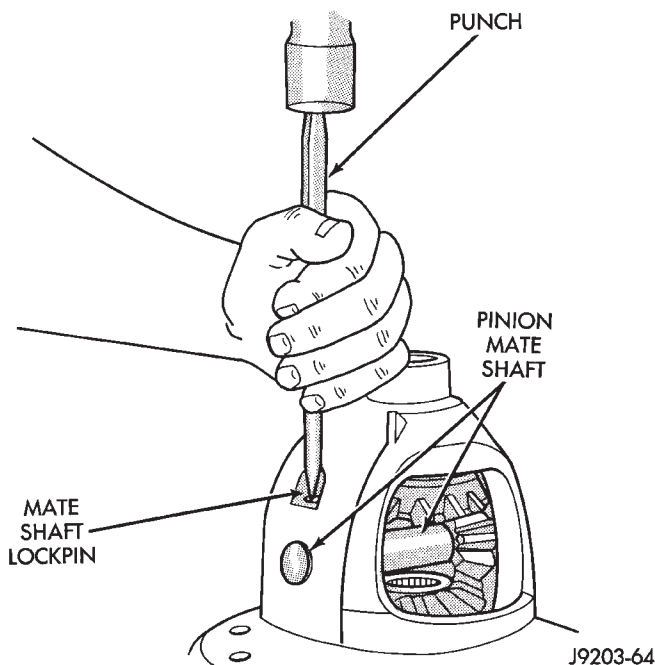


Fig. 39 Mate Shaft Pin Installation

(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 61-81 N•m (45-60 ft. lbs.) torque (Fig. 40).

(5) Lubricate all differential components with a light coat of grease or hypoid gear lubricant.

PINION GEAR DEPTH INFORMATION

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. 41). 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 2.250 inches (57.1 mm) for Model 30 axles. The standard depth provides the best teeth contact pattern.

THE BUTTON END ON THE PINION GEAR HEAD IS NO LONGER A MACHINED-TO-SPECI-

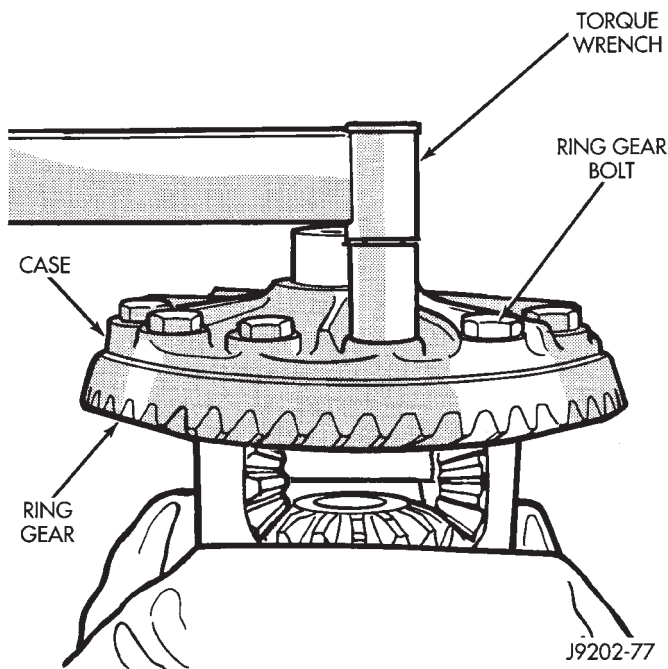


Fig. 40 Ring Gear Bolt Installation

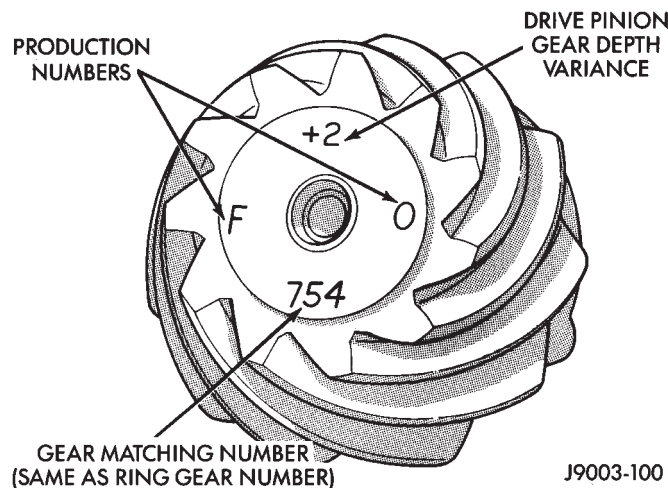


Fig. 41 Pinion Gear ID Numbers

FICATIONS SURFACE. DO NOT USE THIS SURFACE FOR PINION DEPTH SET-UP OR CHECKING (Fig. 42).

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. 43). The shim pack is placed under the inner (rear) bearing cup. To change the pinion adjustment, shims are available in thicknesses of 0.003, 0.005, and 0.010 inch. **If equipped, the oil slinger or baffle must be measured and the thickness included with the total shim pack.**

If a new gear set is being installed, note the number etched into both pinion gears. Add or subtract the thickness of the original depth

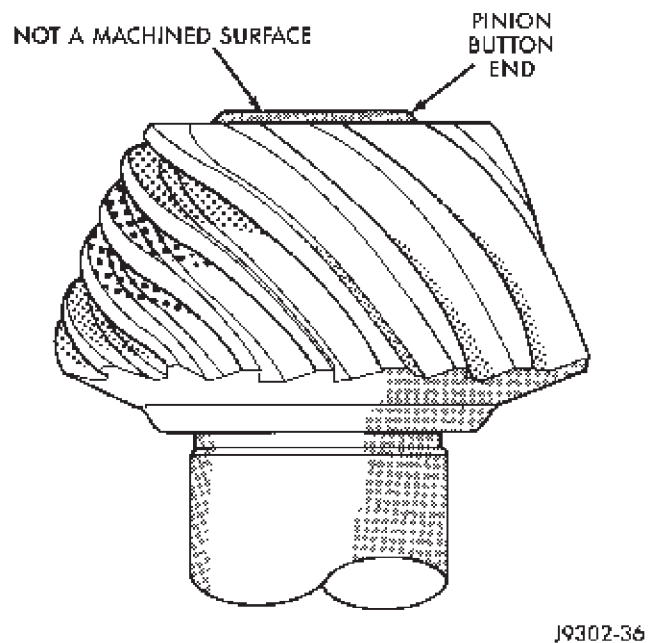


Fig. 42 Pinion Gear Head

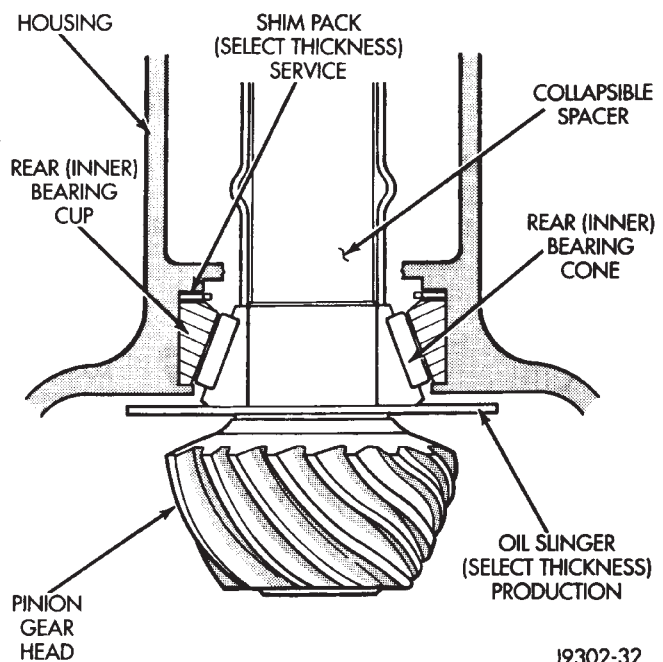


Fig. 43 Shim and Slinger Location

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.

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

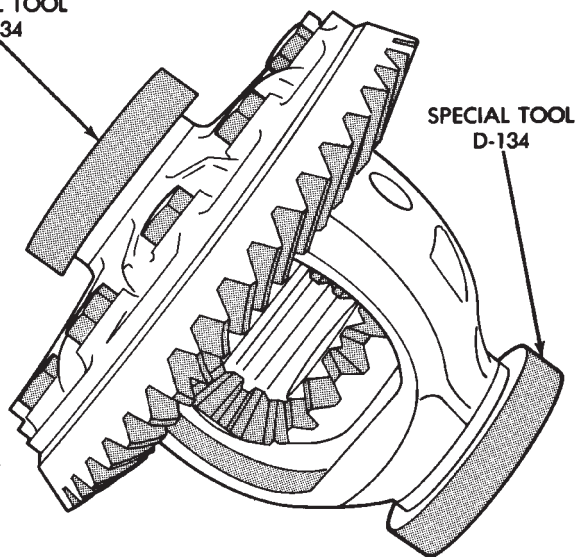
Refer to the Pinion Gear Depth Variance Chart.

DIFFERENTIAL AND PINION MEASUREMENT WITH GAUGE SET D-115-30

DIFFERENTIAL ZERO END PLAY MEASUREMENT

(1) Place Master Differential Bearing D-134 (D-348) on the case hubs (Fig. 44).

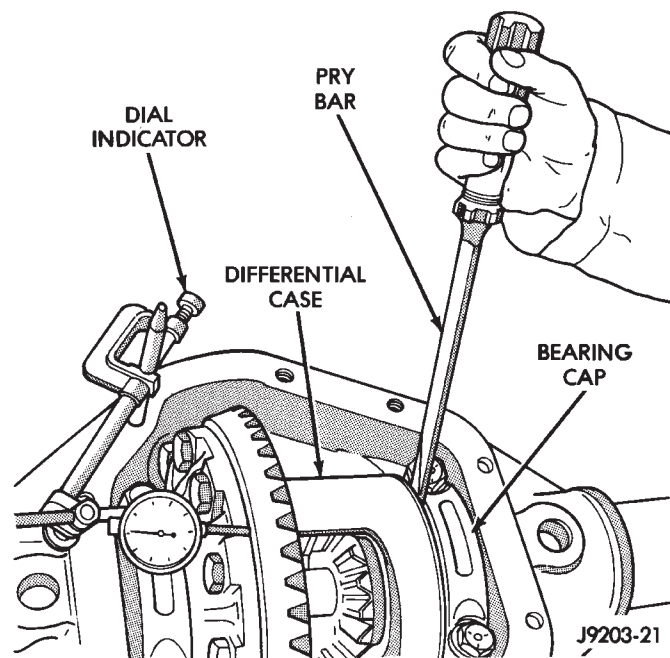
SPECIAL TOOL
D-134



J9202-43

Fig. 44 Master Bearing Tools On Hubs

(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. 45).



J9203-21

Fig. 45 Differential Case End Play 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. 45). Zero the dial indicator pointer.

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

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

(5) Remove indicator and pilot stud.

PINION GEAR DEPTH MEASUREMENT

The following gear depth measurement and adjustment procedure involves using Gauge Set D-115-30 (Fig. 46).

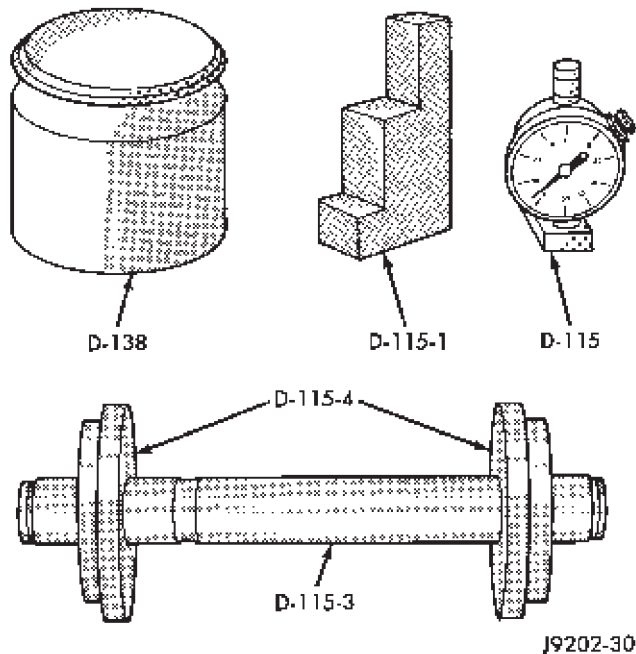


Fig. 46 Pinion Gear Depth Gauge Tool Set D-115-30

(1) Insert Master Pinion Block D-138 into the pinion gear bore (Fig. 47).

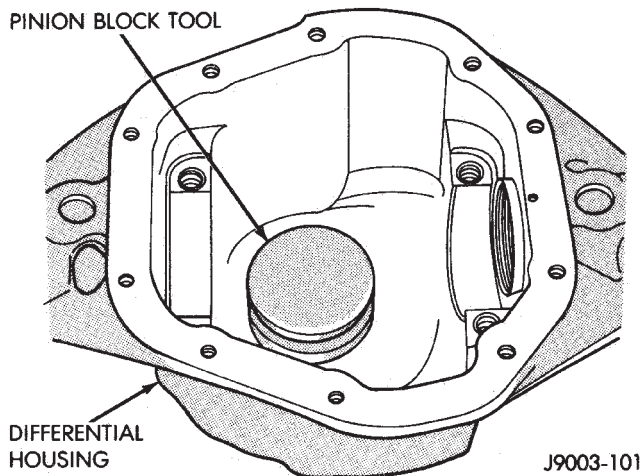


Fig. 47 Pinion Block Tool Inserted In Shaft Bore

(2) Place Disc D-115-4 on Arbor D-115-3 and position in the bearing cradles (Fig. 48).

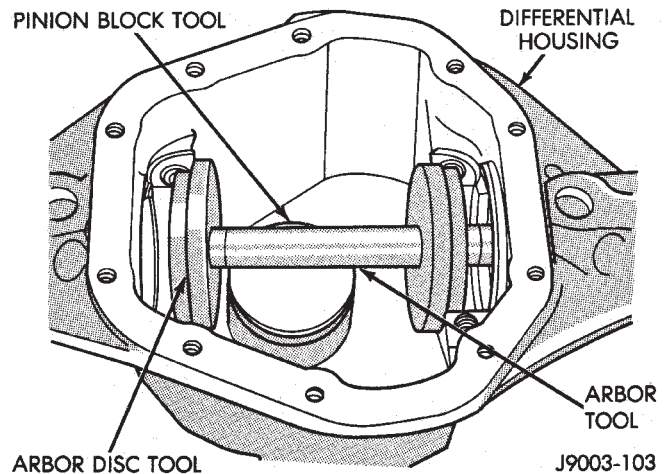


Fig. 48 Gauge Tools In Housing

(3) Place Pinion Height Block D-115-1 on top of master pinion block tool and against arbor tool (Fig. 49).

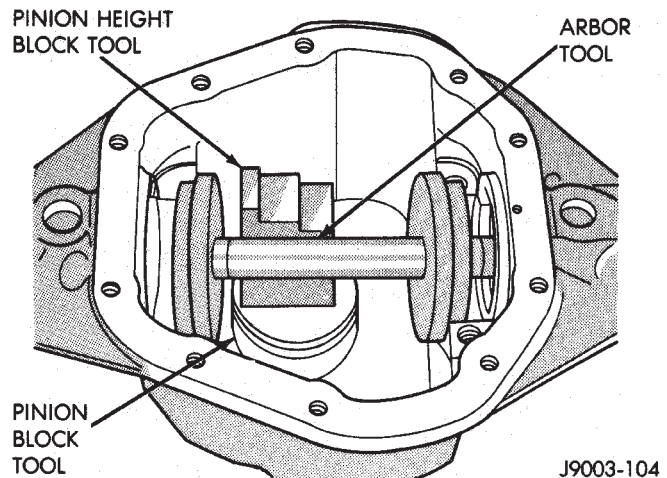


Fig. 49 Pinion Height Block Tool Against Arbor

(4) Firmly place Scooter Block and Dial Indicator D-115 on the **lowest step** of pinion height block tool (Fig. 50). Zero the dial indicator pointer.

(5) Move the gauge block toward the arbor until the indicator plunger contacts the arbor tool (Fig. 50). Slide the gauge block across the arbor while observing indicator. Record the longest travel distance, whether inward (-) or outward (+), indicated by the pointer.

The plunger distance, plus the variance in the gear is the required thickness for the shims.

(6) If equipped, the oil slinger and baffle must be measured and the thickness included with the total shim thickness.

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

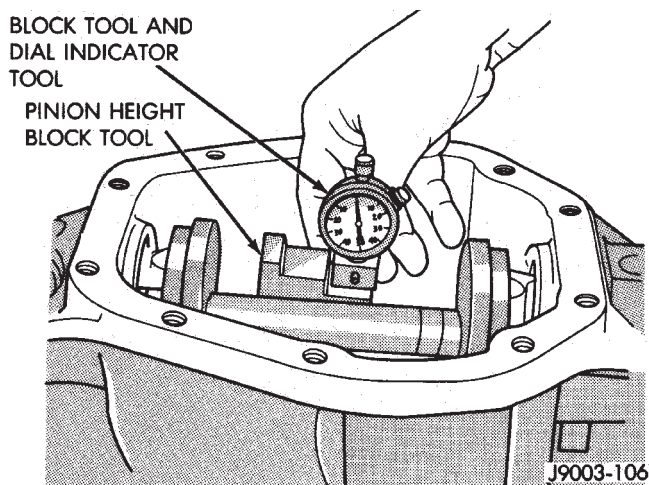


Fig. 50 Pinion Gear Depth Measurement

PINION GEAR ASSEMBLY/INSTALLATION

(1) Place the needed shim pack thickness in the pinion gear rear bearing bore (service only). Install the bearing cup with Installer D-146 and Driver Handle C-4171 (Fig. 51). Ensure cup is correctly seated.

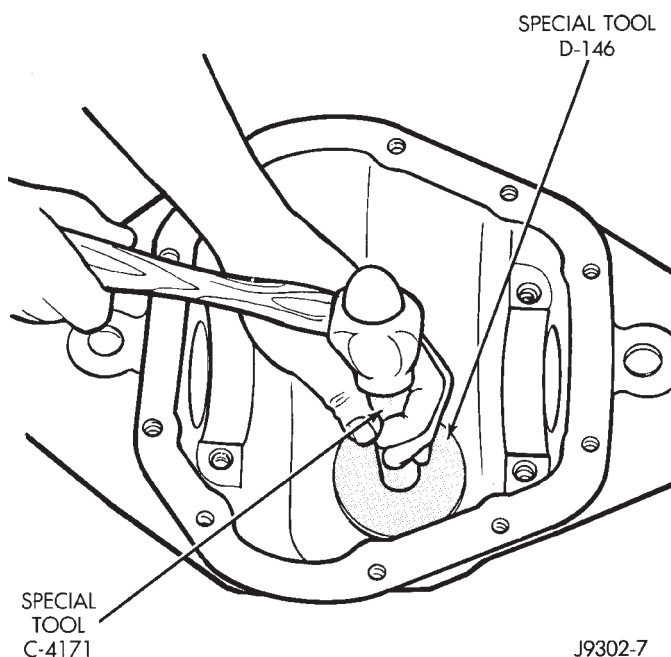


Fig. 51 Pinion Rear Bearing Cup Installation

(2) Install the pinion front bearing cup with Installer D-144 and Handle C-4171 (Fig. 52).

(3) If used, place the oil slinger on the pinion gear. Install the rear (inner) bearing on the pinion gear with Installer W-262 (Fig. 53).

(4) Install a new collapsible preload spacer on pinion shaft. Install the pinion gear in housing (Fig. 54).

(5) Install pinion front bearing and oil slinger. Apply a light coating of gear lubricant on the lip of pinion seal. Install seal with Installer W-147-E and Handle C-4171 (Fig. 55).

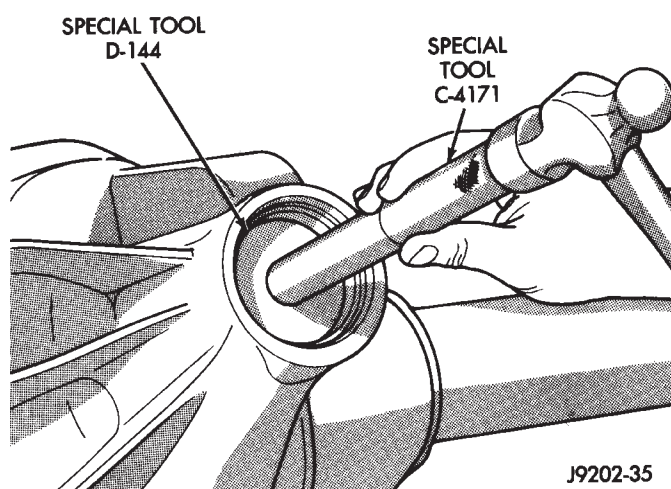


Fig. 52 Pinion Front Bearing Cup Installation

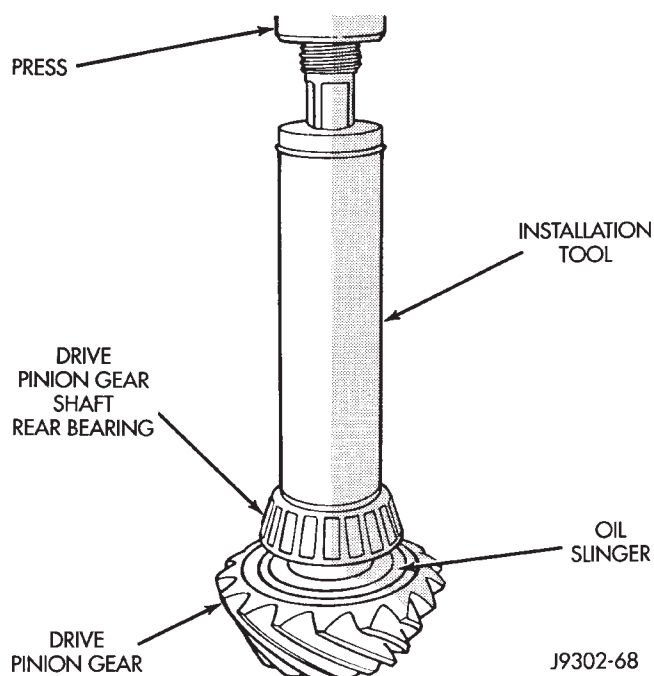


Fig. 53 Rear Bearing Installation

(6) Install yoke with Installer W-162-D and Wrench C-3281 (Fig. 56).

(7) Install the yoke washer AND A NEW NUT on the pinion gear. **Tighten the nut only enough to remove the end play. Do not over-tighten it.**

CAUTION: Never loosen the pinion gear nut to decrease the pinion gear bearing preload torque. IF THE SPECIFIED PRELOAD TORQUE IS EXCEEDED, A NEW COLLAPSIBLE SPACER MUST BE INSTALLED. The torque sequence will have to be repeated.

(8) Use Flange Wrench C-3281 to retain the yoke (Fig. 57). Slowly tighten the nut in small increments

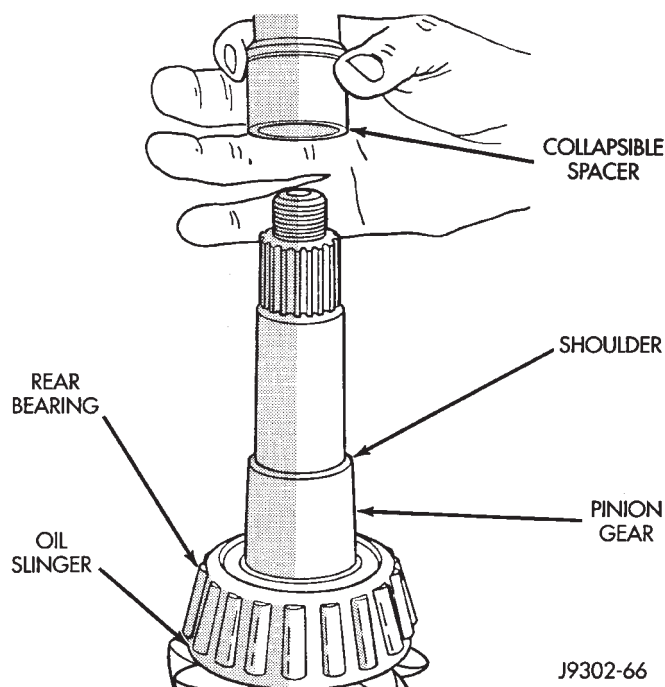


Fig. 54 Collapsible Preload Spacer

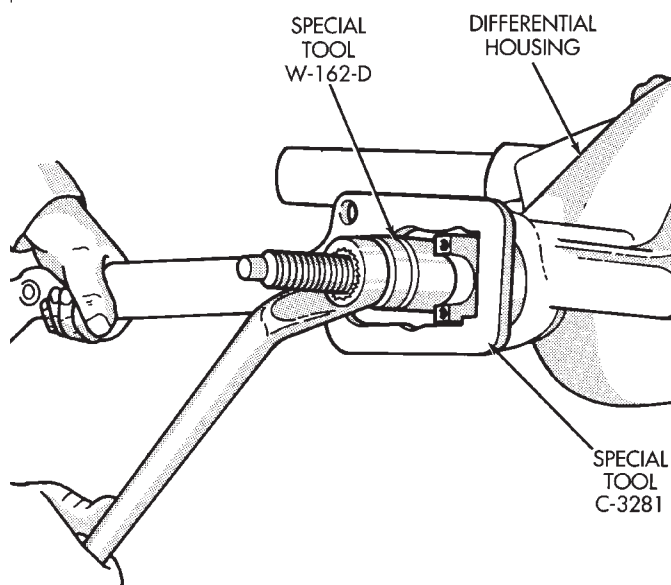


Fig. 56 Pinion Yoke Installation

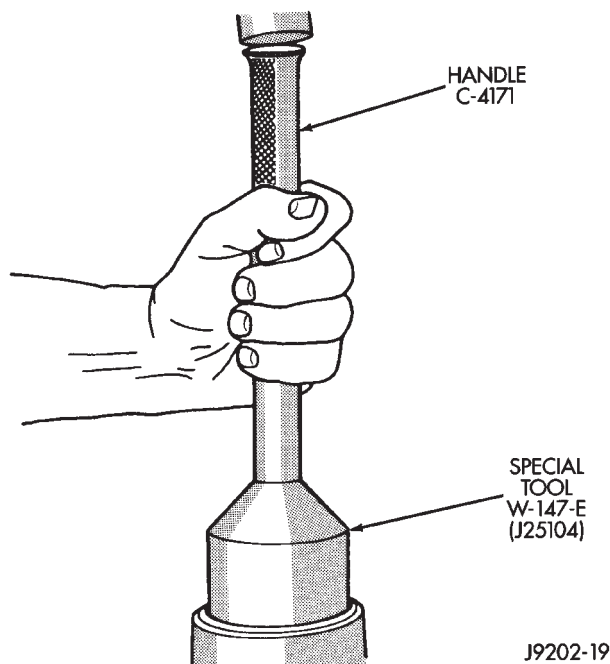


Fig. 55 Pinion Seal Installation

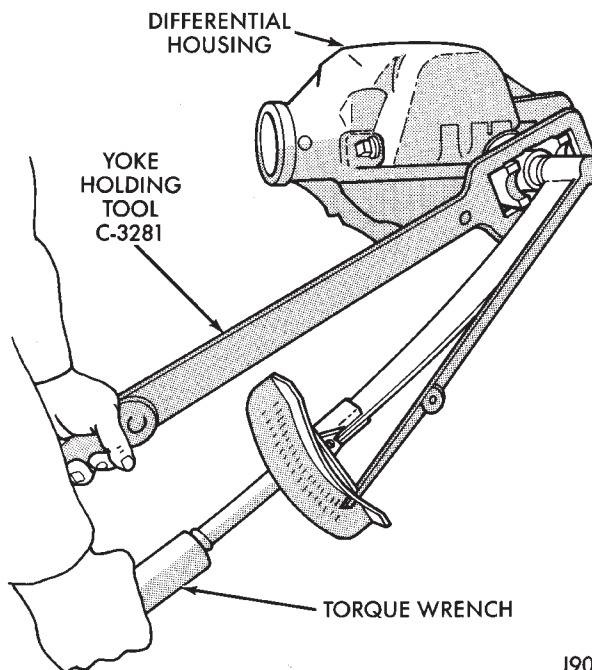


Fig. 57 Tightening Pinion Nut

until the rotating torque is achieved. **Measure the preload torque frequently to avoid over-tightening the nut.**

(9) Check bearing preload torque with an inch pound torque wrench (Fig. 58). The torque necessary to rotate the pinion gear should be;

- Original Bearings: 1 to 3 N•m (10 to 20 in. lbs.).
- New Bearings: 1.5 to 4 N•m (15 to 35 in. lbs.).

DIFFERENTIAL SHIM PACK MEASUREMENT AND ADJUSTMENT

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

(2) Place Differential assembly in the housing. Assemble Differential bearing caps.

(3) 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. 59). Ensure ring and pinion gear teeth are tightly meshed. Zero the indicator.

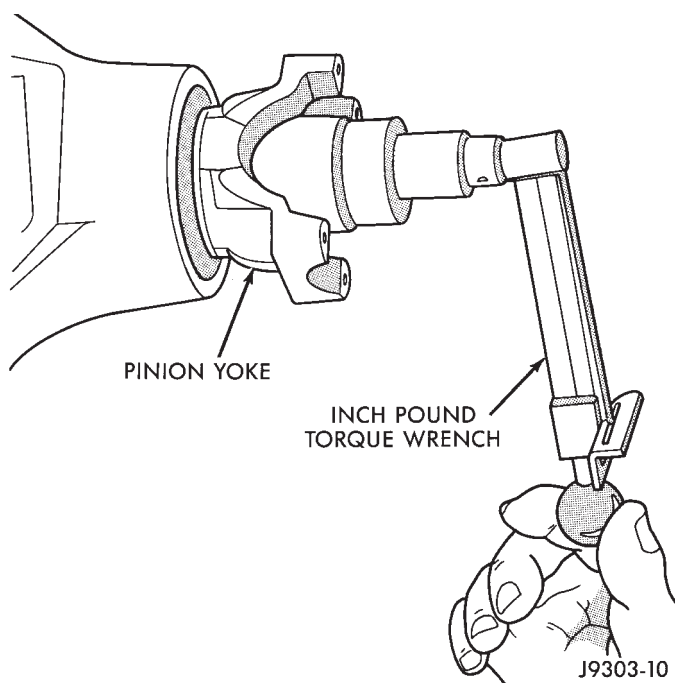


Fig. 58 Check Pinion Gear Torque

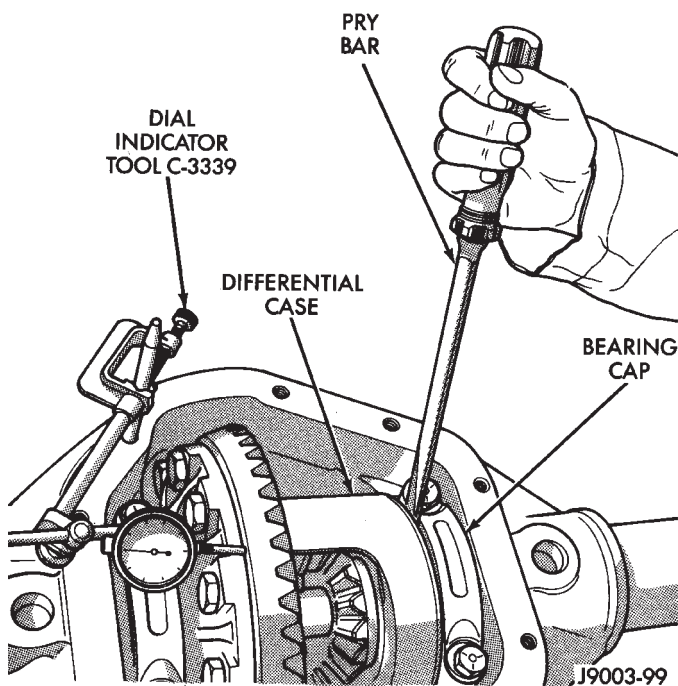


Fig. 59 Shim Pack Measurement

(4) 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. 60). Zero the dial indicator pointer.

(5) 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. 60). The shims must be placed at the ring gear side between the case and bearing.

For Example:

Indicator Reading	LESS PINION	0.085 in.	total
Indicator Reading	WITH PINION	0.055 in.	total
<hr/>			
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. 60 Shim Pack Calculations

- (6) Remove indicator and pilot stud.
- (7) Remove the differential case from housing.
- (8) Remove the master bearing tools from the differential case hubs.
- (9) 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. 61).
- (10) 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.
- (11) Install bearings on hubs with Installer C-3716-A and Handle C-4171 (Fig. 61).
- (12) Match each bearing cup with bearing (original). Install the cups on the bearings.

DIFFERENTIAL INSTALLATION

(1) Position Spreader W-129-A with the tool dowel pins seated in the locating holes (Fig. 62). Install the holddown clamps and tighten the tool turnbuckle finger-tight.

(2) Install a pilot stud at the left side of the differential housing. Attach Dial Indicator to housing pilot stud. Load the indicator plunger against the opposite side of the housing (Fig. 62) 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.

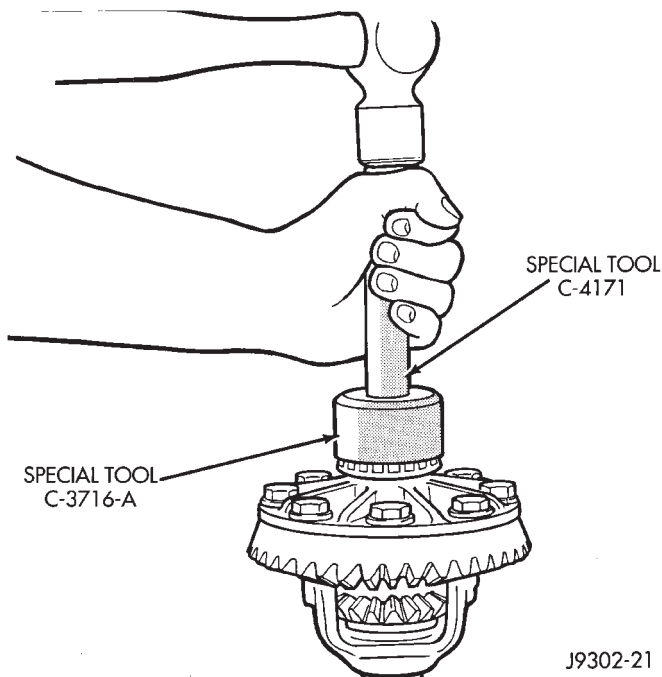


Fig. 61 Differential Bearing Installation

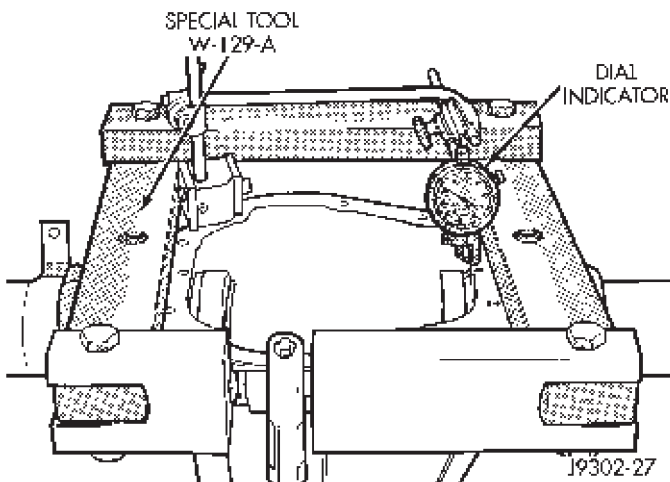


Fig. 62 Spread Differential Housing

(3) Separate the housing enough to install the case in the housing. Measure the distance with the dial indicator (Fig. 62).

(4) Remove the dial indicator.

(5) Install case in the housing. Tap the differential case to ensure the bearings are fully seated (Fig. 63). Remove the spreader.

(6) Install the bearing caps at their original locations (Fig. 64). Tighten the bearing cap bolts to 77 N•m (57 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. 65).

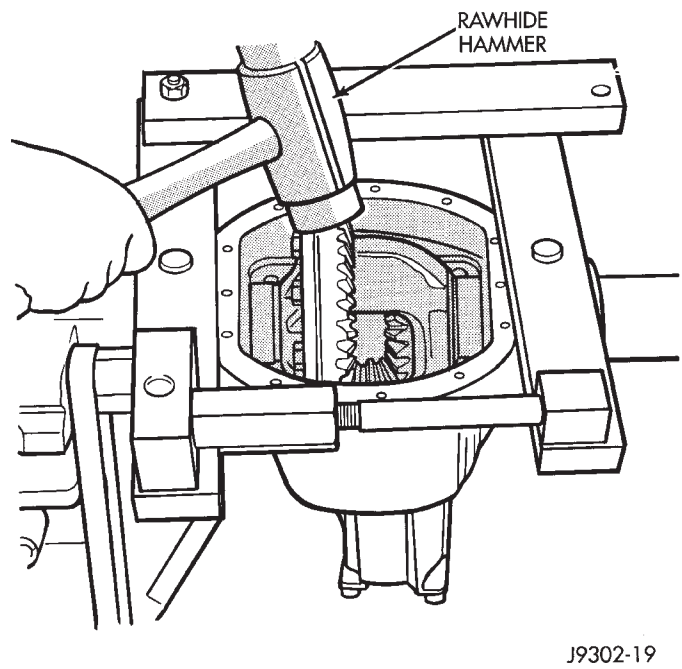


Fig. 63 Differential Installation

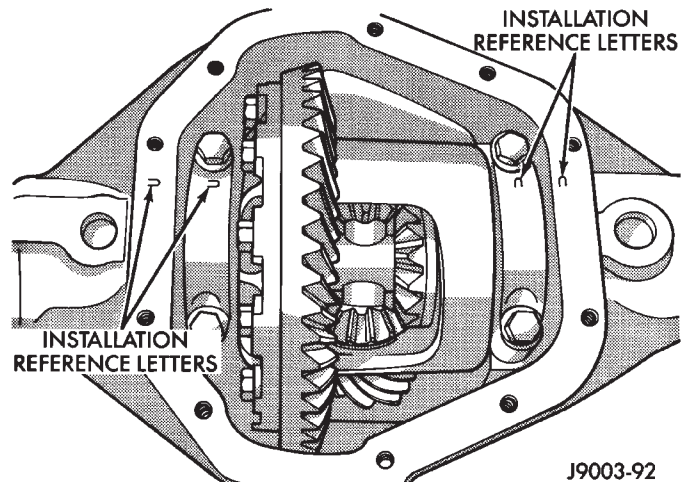


Fig. 64 Differential Bearing Cap Reference Letters

The ring gear backlash must be within 0.005 - 0.008 inch (0.12 - 0.20 mm). It cannot vary more than 0.002 inch (0.05 mm) 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. 66). **DO NOT INCREASE THE TOTAL SHIM PACK THICKNESS, EXCESSIVE BEARING PRELOAD AND DAMAGE MAY OCCUR.**

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

The ring gear teeth contact patterns will show if the pinion gear depth shim(s) have the correct thickness. It will also show if the ring gear backlash has been adjusted correctly. The backlash must be main-

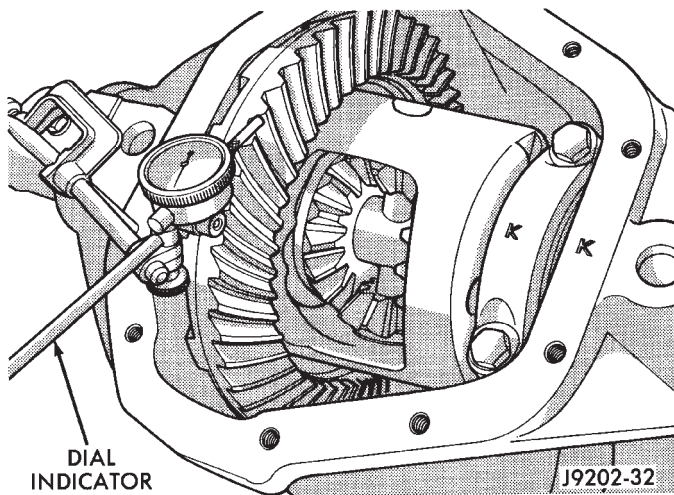


Fig. 65 Ring Gear Backlash Measurement

tained within the specified limits until the correct tooth contact patterns are obtained.

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

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

(4) Note patterns in compound. Refer to (Fig. 67) for interpretation of contact patterns and adjust accordingly.

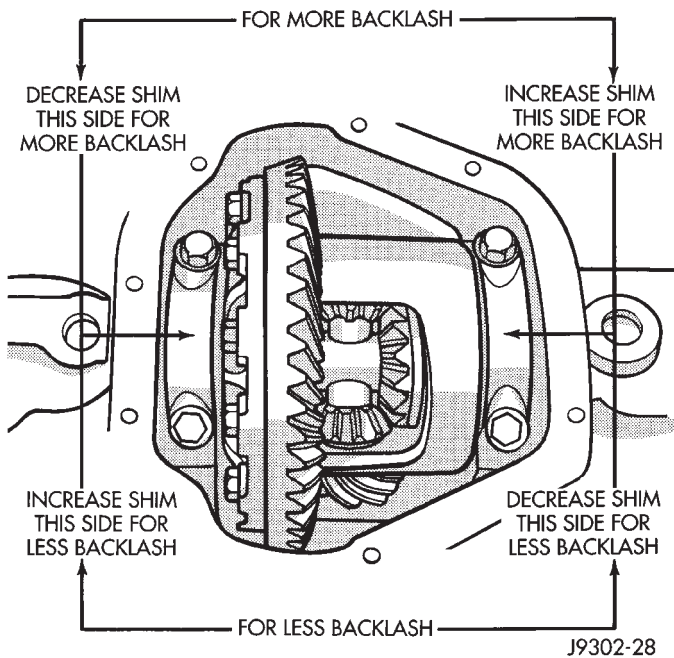
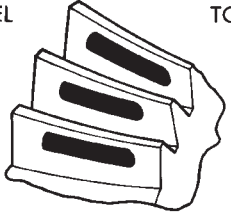
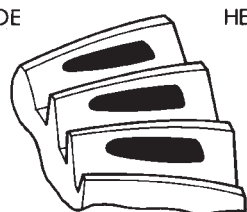
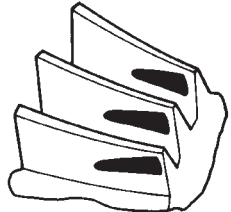
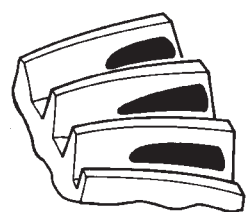

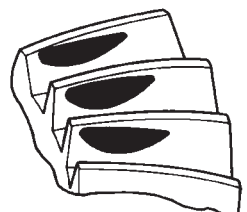
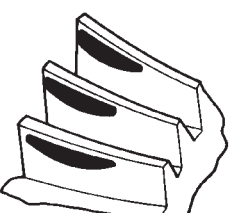
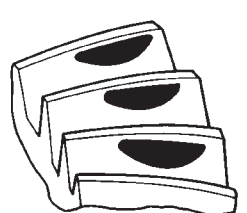
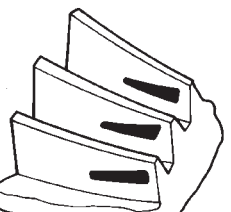
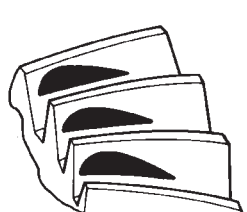


Fig. 66 Backlash Shim Adjustment

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

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Fig. 67 Gear Tooth Contact Patterns

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. 68). **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 47 N•m (35 ft. lbs.) torque.

CAUTION: Overfilling the differential can result in the 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.

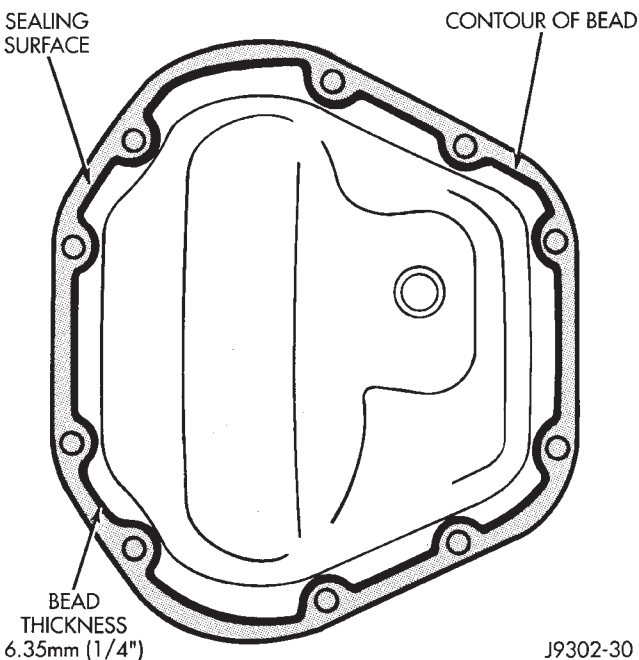


Fig. 68 Typical Housing Cover With Sealant
AXLE SPECIFICATIONS

MODEL 30 FRONT AXLE

Axle Type	Hypoid
Application	ZJ
Ring Gear Diameter	7.125 in. (18.09 cm)
Lubricants	MOPAR Gear Lubricant or Equivalent SAE 75W-90, API Grade GL-5, MIL-L-2105C
Axle Shaft Joint	Cardan, C.V.
Lubricant Capacity	50 oz. (1.48L)
Axle Model	Dana M30F
Axle Ratio	3.55, 3.73
Track	58.5 in.
GAWR	2750 lbs.

Differential Bearing Preload Shim	0.015 in.	0.38 mm
Differential Side Gear-to-Case Clearance	0.000-0.007 in.	0.00-0.18 mm
Ring Gear Backlash	0.005-0.008 in.	0.12-0.20 mm
Drive Pinion Gearshaft Bearing Break-Away Preload Torque	Collapsible Spacer	
Original Bearings	10-20 in. lbs.	1-2 N•m
Replacement Bearings	15-35 in. lbs.	1.5-4 N•m
Drive Pinion Gear Depth	Select Shims	
Standard Setting	2.250 in.	57.1 mm
Side Gear Clearance (max.)	0.006 in.	0.15 mm
Case Runout (max.)	0.006 in.	0.15 mm

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TORQUE SPECIFICATIONS

FRONT SUSPENSION COMPONENTS

DESCRIPTION	TORQUE
Coil Spring Retainer Screw	21 N·m (16 ft. lbs.)
Jounce Bumper Bolt	42 N·m (31 ft. lbs.)
Lower Suspension Arm Nuts	176 N·m (130 ft. lbs.)
Shock Absorber Upper Nut	23 N·m (17 ft. lbs.)
Shock Absorber Lower Bolt/Nut	19 N·m (14 ft. lbs.)
Stabilizer Bar Link Nuts	36 N·m (27 ft. lbs.)
Stabilizer Bar Link Axle Bracket Bolt	95 N·m (70 ft. lbs.)
Stabilizer Bar Clamp Bolts	75 N·m (55 ft. lbs.)
Track Bar Bracket to Reinforcement Plate Bolts	121 N·m (90 ft. lbs.)
Track Bar Bracket to Stud Plate Nuts	121 N·m (90 ft. lbs.)
Track Bar Bracket Reinforcement Plate Side Nuts	95 N·m (70 ft. lbs.)
Track Bar Axle Bracket Bolt	75 N·m (55 ft. lbs.)
Track Bar Ball Stud Retaining Nut	81 N·m (60 ft. lbs.)
Upper Suspension Arm Nuts	75 N·m (55 ft. lbs.)
Wheel Lug Nut 1/2 x 20 with 60° Cone	109 to 150 N·m (80 to 110 ft. lbs.)

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MODEL 30 AXLE

DESCRIPTION	TORQUE
Bearing Cap Bolts	77 N·m (57 ft. lbs.)
Differential Cover Bolts	47 N·m (35 ft. lbs.)
Fill Hole Plug	34 N·m (25 ft. lbs.)
Hub Bearing to Knuckle Bolts	102 N·m (75 ft. lbs.)
Hub Bearing to Axle Shaft Nut	237 N·m (175 ft. lbs.)
Lower Ball Stud Nut	108 N·m (80 ft. lbs.)
Upper Ball Stud Nut	101 N·m (75 ft. lbs.)
Ring Gear Bolts	61 to 81 N·m (45 to 60 ft. lbs.)

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