AXLES—PROPELLER SHAFTS

TESTING AND DIAGNOSIS

GENERAL

When diagnosing an axle noise condition, obtain a complete description of the noise and driving conditions when the noise occurred. A preliminary road test with the customer demonstrating the complaint condition is recommended.

The action of transmitting engine torque to the wheels will produce some noise in all axles. Slight axle noises confined to a short speed range or to a specific period are considered normal.

Noises produced by the engine, transfer case, transmission, tires, wheel bearings, exhaust system, propeller shaft, or the action of wind on the body or grille may be incorrectly diagnosed as produced by an axle. Thoroughly test the vehicle to isolate the problem component.

Before road testing the vehicle, start the engine, shift the transmission into neutral and operate the engine at various speeds. If the noise is heard during this test, the noise is being generated by the engine, exhaust system, clutch, transmission, transfer case, or by engine-driven accessory equipment.

Before road testing, check and correct tire inflation pressures and axle lubricant levels.

TIRE NOISE TESTS

Because certain types of tire tread wear or tread patterns may produce objectionable noises, drive the vehicle on various types of road surfaces and listen for a change in the noise. If the noise varies with the type of road surface, the tires may be the cause.

WHEEL BEARING TESTS

Worn, loose, or damaged wheel bearings can be confused with axle noises. Wheel bearing noise is usually more noticeable when coasting at lower vehicle speeds. Applying the brakes gently will usually change wheel bearing noise. Another test involves turning the vehicle alternately left and right while moving straight ahead at relatively low speed. This manuever side-loads the bearings causing the problem bearing to become noisy.

AXLE TESTS

Before testing the axle, drive the vehicle a distance sufficient to warm the axles and axle lubricant. During the test, operate the transmission and transfer case in every gear combination.

Axle noises are usually related to vehicle speed rather than engine rpm or transmission gear range.

Axle noises may be classified into two types: gear noise and bearing noise.

Gear noise is often described as a whine or high-pitched resonating sound. It is usually more pronounced at certain vehicle speeds and within a narrow speed range under a drive (accelerating load), coast (decelerating load), or float (constant speed) condition.

Axle bearing noise is usually constant and the pitch is related to vehicle speed.

Since the pinion gear rotates faster than the ring gear, the pinion bearings produce a higher pitch sound than the differential bearings. The pinion bearings are usually heard at lower vehicle speeds (20 to 30 mph).

Differential bearings produce a lower pitch sound because they are rotating at the same speed as the wheels. Differential bearing noise will not vary when the vehicle is turned alternately left and right or when the brakes are gently applied.

AXLE NOISY ON PULL AND COAST

- Excessive ring and pinion backlash.
- Excessive pinion end play.
- Worn pinion bearings.
- Incorrect pinion depth adjustment.
- Incorrect lubricant (Trak-Lok differential).

AXLE NOISY ON PULL

- Incorrect ring and pinion backlash or depth adjustment.
- Damaged or worn pinion bearings.
- Incorrect pinion bearing preload.

AXLE NOISY ON COAST

- Excessive ring and pinion backlash.
- Excessive pinion end play.
- Worn or damaged pinion or differential bearings.

BACKLASH

Excessive driveline backlash may be the result of backlash in the transmission, propeller shaft yoke or spline, universal joint, ring and pinion, differential gears, or axle shaft splines.

CHATTER—TRAC-LOK DIFFERENTIAL

Chatter in the Trac-Lok rear differential is usually caused by the use of improper lubricant. If improper lubricant is determined to be the cause of chatter, drain and refill the axle with Jeep Trak-Lok lubricant or equivalent only.

OTHER AXLE CONDITIONS

A knocking noise heard at low speed or when coasting may be caused by loose fitting differential side gears. When this condition is encountered, applying the brakes lightly will usually reduce the sound.

Differential gear noise is considered normal when spinning a wheel with an on-the-vehicle wheel balancer, or when the wheels are spinning on an icy road surface.

When axle noise has been determined to be caused by bearings, do not replace the gears unless they are worn or damaged. Similarily, if the axle gears are causing noise, do not replace the bearings unless they are worn or damaged.

DRIVELINE VIBRATION

Driveline vibration can be caused by a variety of conditions. The following procedure will help to isolate the most common causes.

(1) Check tire condition. Look for differences in tread wear, side-to-side and front-to-rear. Be sure all tires are same size, type, have matching tread design, and are at correct inflation pressures. These items are especially important on Quadra-Trac equipped vehicles.

(2) Check and correct tire inflation pressures. Correct and equal inflation pressures are very important on Quadra-Trac equipped vehicles.

(3) Check for loose or damaged driveline components (universal joints, engine/transmission mounts, spring U-bolts, spring shackles, spring eye bushings, engine driven accessories and belts).

(4) Check front and rear axle pinion angles as follows:

(a) Place vehicle on drive-on type hoist or hoist that will support vehicle on all four tires.

(b) Check vehicle level using bubble protractor. Position protractor on straight portion of frame rail to take reading. If necessary, correct vehicle level by inserting shim between tire and hoist ramp at low side of vehicle.

(c) Check pinion angle using bubble protractor. Place protractor on flange of differential housing cover to take reading. Although reading can be taken from cover flange, most accurate reading is obtained by removing housing cover, draining axle lubricant, and taking reading directly from machined cover mounting surface of housing.

(d) Refer to Pinion Angle Chart at end of this section for specifications.

NOTE: *All pinion angles in the Pinion Angle Chart are given in degrees above horizontal.*

(e) Adjust pinion angle as necessary using tapered shims. Install shims between axle spring pad and spring.

AUDIBLE VIBRATION

On some Jeep models with Quadra-Trac, an incorrect rear axle pinion angle may generate an audible-type vibration. The vibration occurs as a booming or drone-like sound which is most noticeable in the 40 to 60 mph speed range.

If a vehicle exhibits this condition, the rear axle pinion and engine angles must be checked. If the angles are not within specified limits, shims must be installed between the rear axle spring pads and rear springs to correct the angles. Shims are available in one, two, and three degree increments for this purpose. The procedure for checking and correcting the pinion angle is as follows:

(1) Place vehicle on level surface.

(2) Measure engine downward angle as follows:

(a) Position protractor on left side of engine block at transmission mounting ear on engine block. Place protractor in fore and aft direction. Use mirror to view protractor if necessary.

(b) Record engine downward angle, remove protractor, and proceed to next step.

(3) Measure pinion upward angle as follows:

(a) Place protractor on left side of rear axle housing, on flat machined surface of housing next to welded plug. Be sure this surface is free of weld flash.

(b) Record pinion upward angle, remove protractor, and proceed to next step.

(4) If pinion upward angle is one degree less than engine downward angle, pinion angle is within specified limits. Check for other causes of vibration.

(5) If pinion upward angle is greater than engine downward angle by more than one degree, pinion angle must be adjusted as outlined in next step.

EXAMPLE: If the engine angle measures 5 degrees downward and the pinion angle measures 7 degrees upward, the pinion angle must be adjusted downward 3 degrees. This changes the pinion downward angle to 4 degrees which is the required one degree less than the engine downward angle.

(6) Adjust pinion angle as follows:

(a) Raise rear of vehicle and place support stands under frame rails.

(b) Position hydraulic jack under axle housing and raise jack just enough to support weight of axle.

(c) Remove rear wheels.

(d) Loosen rear spring U-bolt nuts.

(e) Install appropriate degree tapered shim between spring and axle spring pad. Install shim so thickest end is facing front of vehicle to adjust pinion angle downward.

(f) Tighten U-bolt nuts to 100 foot-pounds torque.

(g) Install rear wheels.

(h) Remove support stands and lower vehicle.

FRONT AXLE

GENERAL

The front axle used on all Jeep models is a drive-type axle with hypoid gears and steering knuckles. Engine torque is transmitted to the wheels through full-floating axle shafts which have integral universal joints that revolve within and are supported by the steering knuckles. All front axles use open end design steering knuckles. The knuckles are not enclosed.

CJ models use the model 30 front axle. Wagoneer, Cherokee, and Truck models use the model 44 front axle. Refer to the Axle Application Chart at the end of this section for details.

On all front axles, toe-in and caster are the only adjustable front alignment angles. Camber is built into the axle and cannot be adjusted. Toe-in is adjusted by lengthening or shortening the steering tie rod. Caster is adjusted by installing tapered shims between the spring and axle pad. If caster is adjusted, the front axle pinion angle must also be adjusted. Refer to the Pinion Angle Chart at the end of this section for details.

IDENTIFICATION

The axle model code number is cast into the upper surface of the reinforcing rib at the left side of the axle housing (fig. 10-1).

The build date and manufacturers part numbers are stamped on the right-hand axle tube adjacent to the housing cover. The build date is decoded as follows: The first number is the month, the second number is the day of the month, the third number is the year, the letter is the shift, and the last number is the assembly line. If there are two build dates, the latter date will indicate when the brake components were installed.

The gear ratio tag, attached to the left side of the axle housing cover, indicates the Jeep manufacturing reference part number and the tooth combination of the ring and pinion gears.

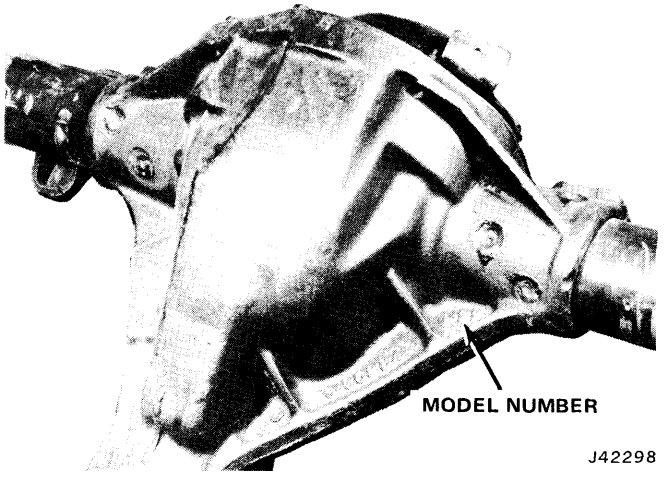

Fig 10-1 Axle Identification

AXLE HOUSING

The front axle housing should be inspected periodically for weld cracks or other damage that could cause loss of axle lubricant, affect driving characteristics, or result in front end misalignment.

If the vehicle is driven through water that is deep enough to cover the front hubs, the axle/wheel ends should be disassembled and inspected for water damage and contamination. All components should be examined, cleaned, and lubricated as necessary before assembly. Damaged parts should be replaced. During the inspection, pay particular attention to the axle bearings and brake components.

HIGH STEERING EFFORT

High steering effort or slow return of the steering mechanism after turns may be the result of excessive steering knuckle ball stud preload. If this condition occurs and all other items affecting steering effort are OK, ball stud preload should be checked as follows:

Ball Stud Preload Inspection

(1) Raise vehicle.

(2) Remove front wheels.

(3) Disconnect steering damper, if equipped, from tie rod and move damper aside.

(4) Unlock steering column.

(5) Disconnect steering connecting rod. On CJ models, disconnect rod at right-side steering knuckle. On all other models, disconnect rod from right-side of steering tie rod.

(6) Remove cotter pin from nut attaching tie rod to right-side steering knuckle.

(7) Rotate both steering knuckles through complete arc several times. Work from right-side of vehicle to rotate knuckles.

(8) Assemble socket and 0-to-50 foot-pound torque wrench and install wrench on steering tie rod attaching nut.

NOTE: *The torque wrench must be positioned paralell with the steering knuckle arm to obtain an accurate reading.*

(9) Rotate knuckles slowly and steadily through a complete arc and measure torque required to rotate knuckles.

(a) If torque reading is less than 25 foot-pounds, turning effort is within specifications and fault is not in steering knuckle. Check steering pump, gear, and column.

(b) If torque reading is more than 25 foot-pounds, turning effort is excessive. Proceed to next step.

(10) Disconnect steering tie rod from both steering knuckles.

(11) Install 1/2 x 1 inch bolt, flat washer, and nut in tie rod hole in one steering knuckle. Tighten bolt and nut securely.

(12) Assemble socket and 0-to-25 foot-pound torque wrench and install on bolt previously installed in steering knuckle.

(13) Rotate steering knuckle slowly and steadily through complete arc and measure torque required to turn knuckle. Remove torque wrench, and nut and bolt.

(14) Install bolt, flat washer, nut and torque wrench on opposite steering knuckle and measure torque required to turn knuckle.

(a) If torque reading is less than 10 foot-pounds, steering effort is within specifications and fault is not in knuckle ball studs. Check for tight or damaged tie rod ends and lubricate or replace as necessary and proceed to next step.

(b) If torque reading is more than 10 foot-pounds, turning effort is excessive. Proceed to Ball Stud Preload Correction procedure.

(15) Install steering tie rod and rod-end retaining nuts. Tighten nuts to 35 foot-pounds torque and install replacement cotter pins.

(16) Install steering connecting rod and rod-end retaining nut. Tighten nut to 60 foot-pounds torque on CJ models and 75 foot-pounds torque on all other models and install replacement cotter pin.

(17) Connect steering damper to tie rod, if equipped.

(18) Install front wheels.

(19) Lower vehicle.

Ball Stud Preload Correction

(1) Remove front axle shafts.

(2) Remove cotter pin and slotted nut from upper ball stud and loosen lower ball stud jamnut.

(3) Unseat upper and lower ball stud by striking upper ball stud with lead or rawhide hammer.

(4) Remove split ring seat from upper ball stud using Tool J-25158. Discard seat.

(5) Remove lower ball stud jamnut and steering knuckle. Discard jamnut.

(6) Clean upper ball stud split ring seat threads and clean lower ball stud taper in steering knuckle. Clean

threads and tapered surfaces of both ball studs and clean threads in upper ball stud retaining nut.

(7) Instal steering knuckle. Support knuckle by hand and install replacement lower ball stud jamnut. Finger tighten jamnut only.

(8) Install upper ball stud nut and tighten nut until lower ball stud is drawn into tapered hole in axle yoke. Do not install split ring seat at this time.

(9) Tighten lower ball stud jamnut to 80 foot-pounds torque.

(10) Remove upper ball stud nut and install replacement upper ball stud split ring seat using Tool J-25158. Tighten seat to 50 foot-pounds torque.

(11) Install replacement nut on upper ball stud. Tighten nut to 100 foot-pounds torque and install replacement cotter pin.

NOTE: *If the cotter pin hole does not align, tighten the nut until the hole does align. Do not loosen the nut to align the cotter pin hole.*

(12) Install front axle shafts and steering spindles loosely and measure turning effort of each steering knuckle as outlined in Ball Stud Preload Inspection.

(a) If less than 10 pounds torque is required to rotate knuckles, proceed to next step.

(b) If more than 10 pounds torque is required to rotate knuckles, replace upper and lower ball studs and repeat Ball Stud Preload Correction procedure.

(13) Install front axle shafts.

(14) Connect tie rod to steering knuckle arms. Tighten tie rod end retaining nuts to 45 foot-pounds torque and install replacement cotter pins.

(15) Connect steering connecting rod to tie rod. Tighten connecting rod-end retaining nut to 60 foot-pounds torque on CJ models and 75 foot-pounds torque on all other models. Install replacement cotter pin.

(16) Connect steering damper to tie rod, if equipped.

(17) Install front wheels.

(18) Lower vehicle.

PINION SEAL AND FRONT YOKE REPLACEMENT

(1) Raise vehicle.

(2) Mark propeller shaft and yoke for assembly alignment reference and disconnect propeller shaft from yoke.

(3) Remove pinion nut and washer using socket and handle and Tool J-8614-01 (fig. 10-2).

(4) Remove yoke using Tool J-8614-01, 02, 03 (fig. 10-3).

(5) Remove pinion seal using Tool J-25180.

(6) Install replacement seal using Tool J-25104.

(7) Install yoke.

(8) Install pinion washer and nut. Tighten nut to 210 foot-pounds torque.

(9) Align reference marks on propeller shaft and yoke and connect shaft to yoke. Tighten shaft-to-yoke attaching bolts or nuts to 16 foot-pounds torque.

(10) Lower vehicle.

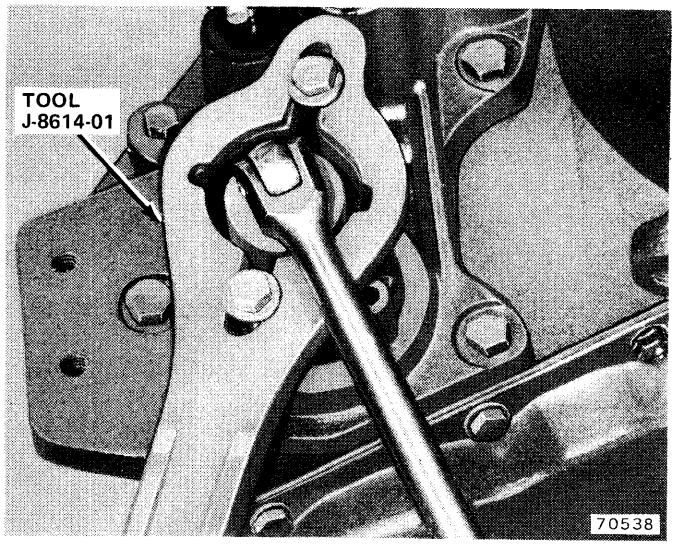

Fig. 10-2 Removing Pinion Nut

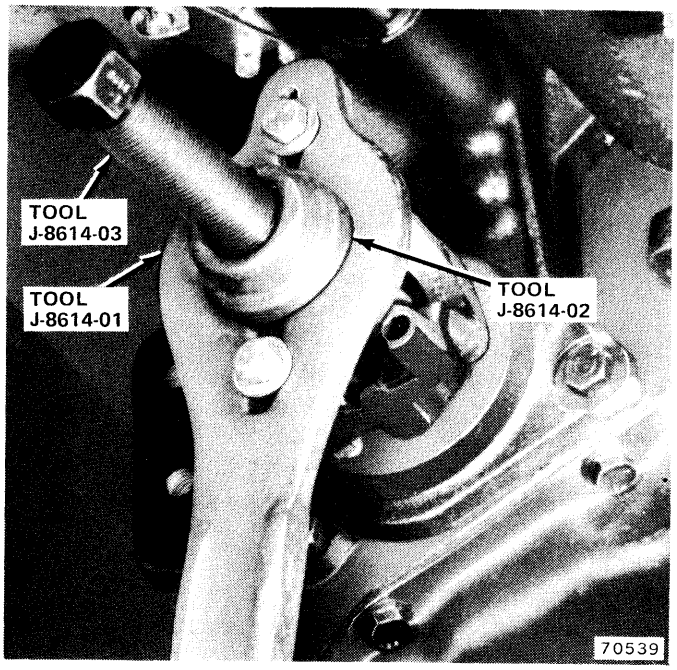

Fig. 10-3 Removing Yoke

AXLE SHAFT

Removal—CJ Models

(1) Raise vehicle.

(2) On models with disc brakes, remove caliper. Refer to Brakes and Wheels section.

(3) Remove hub cap.

(4) Remove drive flange snap ring.

(5) On models with disc brakes, remove rotor hub bolts and remove hub cover and gasket.

(6) On models with drum brakes, remove axle flange bolts.

(7) Remove axle flange using Tool J-25133.

(8) Straighten lip of lockwasher and remove outer nut, lockwasher, inner adjusting nut, and bearing lockwasher. Use Tool J-25103 to remove locknut.

(9) On models with disc brakes, remove outer bearing and remove rotor.

(10) On models with drum brakes, remove outer bearing and remove brake drum. Do not damage oil seal during removal. Retract brakeshoes if drum is difficult to remove.

(11) On models with drum brakes, remove brake support plate.

(12) On models with disc brakes, remove adapter and splash shield.

(13) Remove spindle and spindle bearing.

(14) Remove axle shaft and universal joint assembly.

Installation—CJ Models

(1) Clean all parts thoroughly.

(2) Install axle shaft and universal joint assembly. Do not remove inner oil seal.

(3) Insert splined end of axle shaft into differential side gear and push shaft into place.

(4) Install spindle and inner bearing.

(5) On models with drum brakes, install brake support plate.

(6) On models with disc brakes, install splash shield and adapter.

(7) Lubricate and install outer bearing in drum or rotor.

(8) Install brake drum or rotor.

(9) Install washer and adjusting nut. Tighten adjusting nut to 50 foot-pounds torque using Tool J-25103, then loosen nut 1/3 turn.

(10) Install outer lockwasher and nut. Tighten nut to 50 foot-pounds torque and bend lip of lockwasher over nut.

(11) Install drive flange and gasket and install flange or rotor attaching bolts.

(12) Install drive flange retaining snap ring in groove at outer end of axle shaft.

(13) On models with disc brakes, install caliper. Refer to Brakes and Wheels section.

(14) On models with disc brakes, install rotor hub cover and install bolts.

(15) Install hub cap.

(16) Install wheel and lower vehicle.

Removal—Wagoneer-Cherokee-Truck

(1) Raise vehicle.

(2) Remove wheel and dust cover.

(3) Remove axle shaft snap ring, drive flange, presure spring, and spring retainer.

(4) Remove outer locknut, lockwasher, and adjusting nut using Tool J-6893.

(5) On models with disc brakes, remove bolts attaching caliper to support shield and move caliper aside.

(6) Remove rotor or brakedrum. Spring retainer and outer bearing will be removed with rotor or drum.

(7) Remove nuts and bolts attaching spindle and support shield and remove spindle and shield. If necessary, tap spindle with rawhide mallet to remove it from knuckle (fig. 10-4).

(8) Remove axle shaft.

Installation—Wagoneer-Cherokee-Truck

(1) Install axle shaft, spindle, and bearing.

(2) Install hub and drum or if equipped with disc brakes, install support shield, rotor and hub, and caliper.

(3) Install inner wheel bearing adjusting nut (nut has peg on one side). Tighten nut to 50 foot-pounds torque. Back off adjusting nut 1/4 turn (maximum) while rotating hub.

(4) Install lockwasher so inner tab is aligned with spindle keyway and turn inner adjusting nut until peg engages nearest hole in lockwasher.

(5) Install outer locknut and tighten nut to 50 foot-pounds torque (minimum).

(6) Install spring retainer, pressure spring, and drive flange.

CAUTION: *Install the spring retainer with the cupped side of the retainer facing toward the center of the vehicle.*

(7) Push drive flange inward to provide clearance for axle shaft snap ring and install snap ring.

(8) Install wheel and dust cover.

(9) Lower vehicle.

AXLE SHAFT UNIVERSAL JOINT

Replacement

(1) Remove axle shaft.

(2) Remove snap rings from bearing cups (fig. 10-5).

(3) Press on end of one bearing cup to press opposite bearing from yoke half.

(4) Turn yoke over and press first bearing out by pressing on exposed end of journal shaft.

NOTE: *To avoid damaging the bearing, remove the bearing using a brass drift with a flat face that is about 1/32-inch smaller in diameter than the hole in the yoke arm.*

(5) Repeat above step to remove remaining bearings and remove bearing cross-journal by sliding it to one side and lifting out.

(6) Wash all parts in cleaning solvent and inspect parts after cleaning. Replace any part that shows extensive wear.

(7) Pack bearing cups one-third full of lubricant and install bearing rollers.

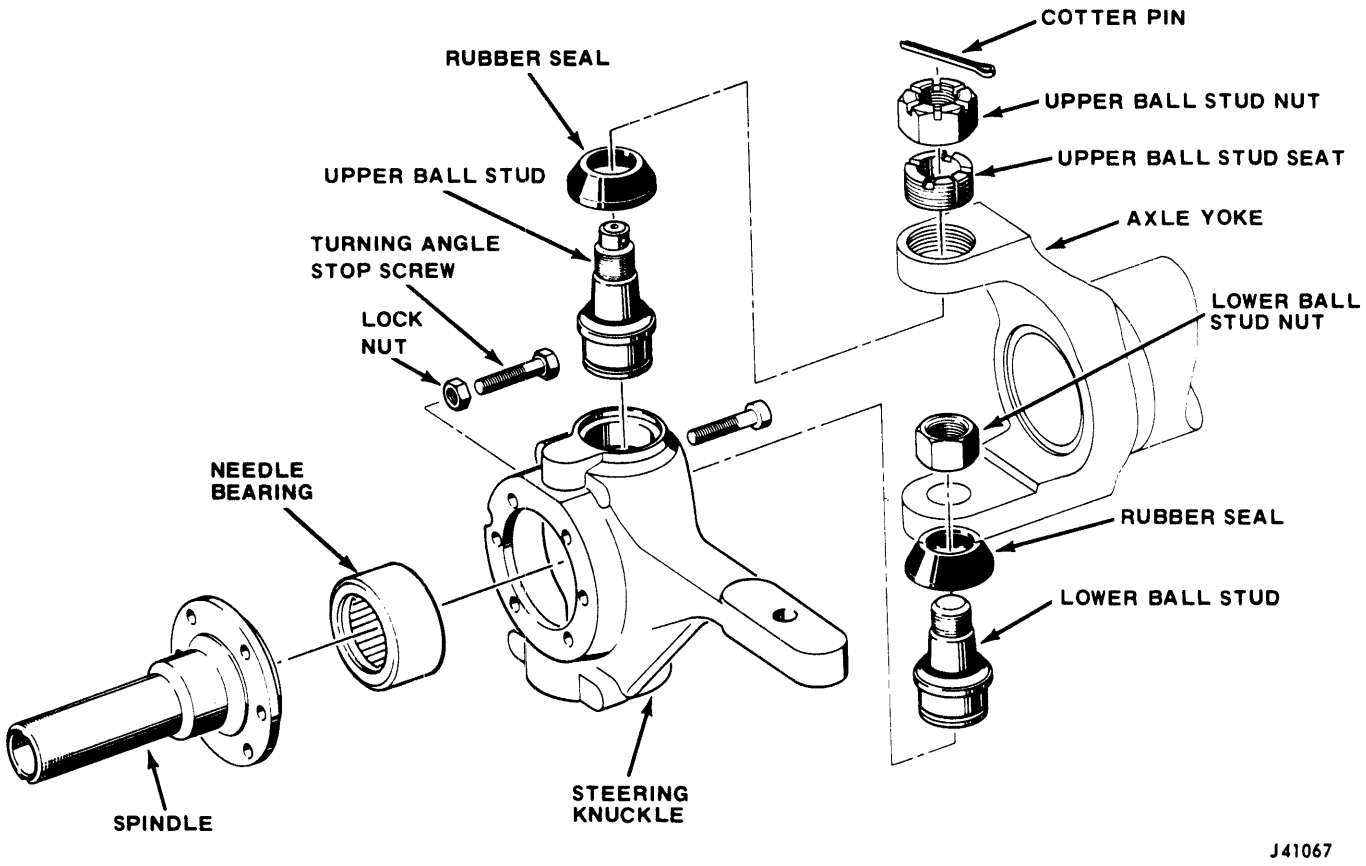

Fig. 10-4 Model 44 Steering Knuckle Components

(8) Insert bearings into axle shaft yoke half and seat them firmly against bearing shoulders.

(9) Install bearing cross-journal while holding bearings in a vertical position to prevent bearings from dropping out.

(10) Press bearing cup on journal from opposite side until firmly seated.

(11) Repeat steps (9) and (10) on opposite journal.

(12) Install snap rings on bearing cups.

NOTE: *If the universal joint binds when assembled, tap the yoke lightly to relieve any pressure on the bearings at each end of the journal.*

(13) Install axle shaft.

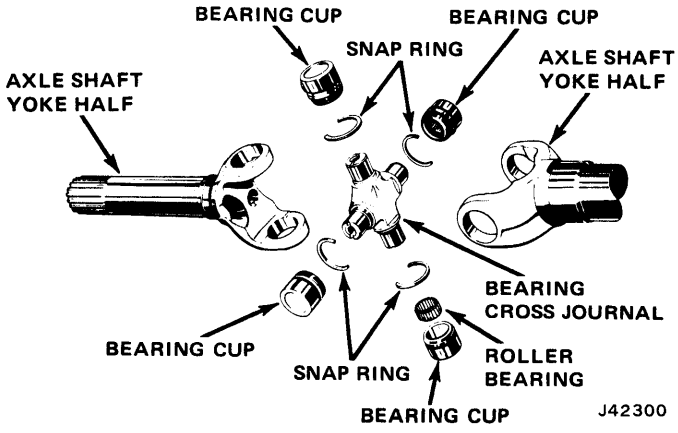

Fig. 10-5 Axle Shaft Universal Joint

STEERING KNUCKLE REMOVAL

NOTE: *The open-end design steering knuckle pivots on ball studs. Ball stud replacement requires removal of the axle shaft and steering knuckle.*

(1) Remove axle shaft.

(2) Disconnect steering tie-rod end at knuckle arm.

(3) Remove and discard lower ball stud nut (fig. 10-6).

(4) Remove cotter pin from upper ball stud and loosen stud nut until top edge of nut is flush with top of stud.

(5) Unseat upper and lower bal studs using lead hammer.

(6) Remove upper ball stud nut and steering knuckle.

(7) Remove upper ball stud seat using Nut Wrench J-25158.

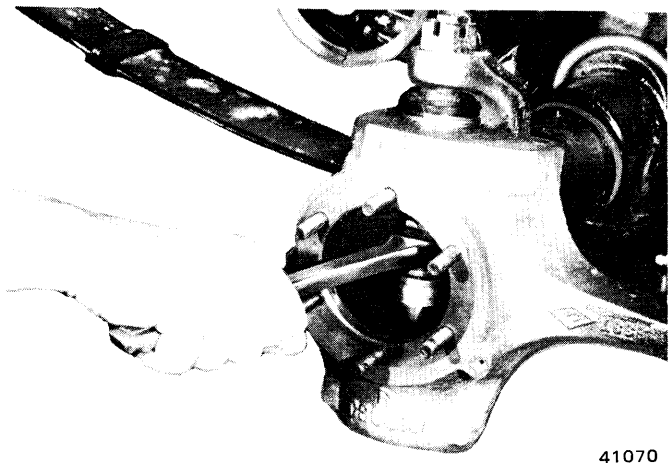

Fig. 10-6 Lower Ball Stud Nut Removal

STEERING KNUCKLE BALL STUD

Replacement

(1) Remove lower ball stud snap ring.

(2) Clamp knuckle assembly securely in vise with upper ball stud pointing downward.

(3) Attach Plate J-25211-1 to spindle mating surface of knuckle assembly (fig. 10-7). Position Button J-25211-3 on lower joint. Assemble and align Puller J-25215. Tighten puller screw to press lower stud out of knuckle.

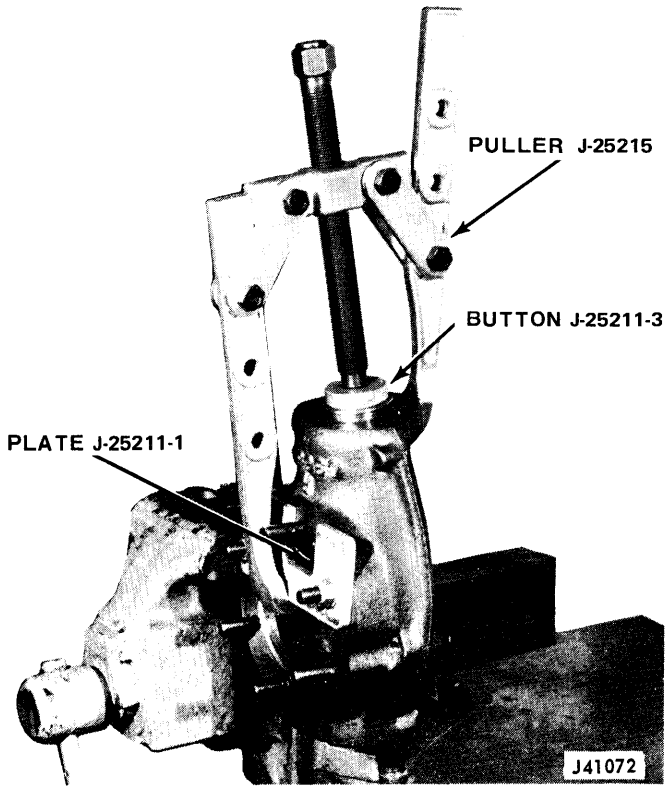

Fig. 10-7 Lower Ball Stud Removal

(4) Disassemble Puller J-25215. On CJ models, install Adapter J-25211-4 on puller screw with adapter shoulder toward head of screw. Thread puller nut about halfway onto screw. Place Button J-25211-3 on upper joint and install puller in knuckle (fig. 10-8). Tighten screw to remove upper ball stud.

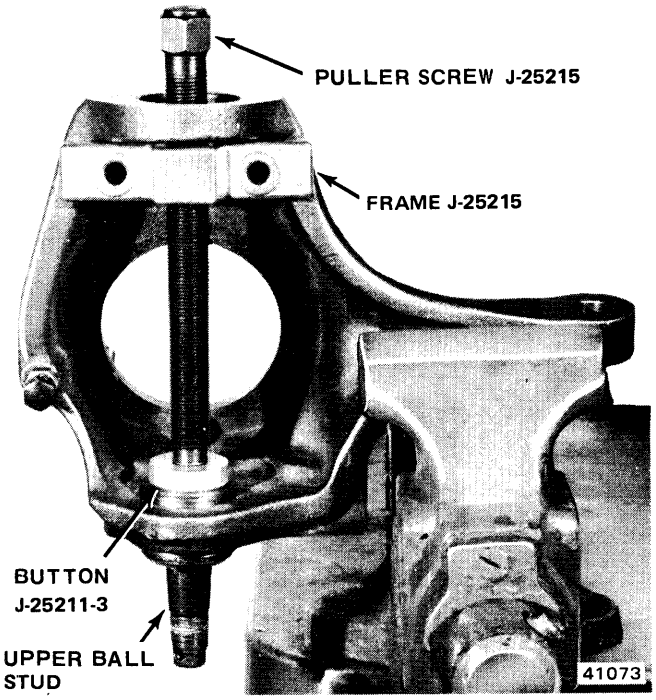

Fig. 10-8 Upper Ball Stud Removal

(5) Invert knuckle in vise. Position lower ball stud in knuckle. Use Installer Cup J-25211-2, Adapter J-25211-4, and Puller J-25215 screw and nut (fig. 10-9) to press in the lower stud. Install ball stud snap ring.

(6) Position upper ball stud on knuckle. Use Installer Cup J-25211-2 and Puller J-25215 to press in upper ball stud (fig. 10-10).

STEERING KNUCKLE INSTALLATION

(1) Install upper ball stud seat into axle yoke. Top of stud seat should be flush with top of yoke.

(2) Install knuckle assembly onto axle yoke. Install lower stud nut. Hand-tighten nut only. Position and align Nut Wrench J-25158, Buttom J-25211-3, Plate J-25211-1, and Puller J-25212 (fig. 10-11). Tighten puller screw until lower ball stud is held firmly in its seat. Tighten lower stud nut to 75 foot-pounds torque (85 foot-pounds torque on CJ models). Remove puller and plate.

(3) Use Nut Wrench J-25158 to tighten upper ball stud seat to 50 foot-pounds torque (fig. 10-12).

(4) Install upper stud nut and tighten to 100 foot-pounds torque. Install cotter pin. If cotter pin holes do not align, tighten nut until cotter pin can be installed. Do not loosen nut to align holes.

(5) Connect steering tie rod. Tighten nuts to 50 foot-pounds torque.

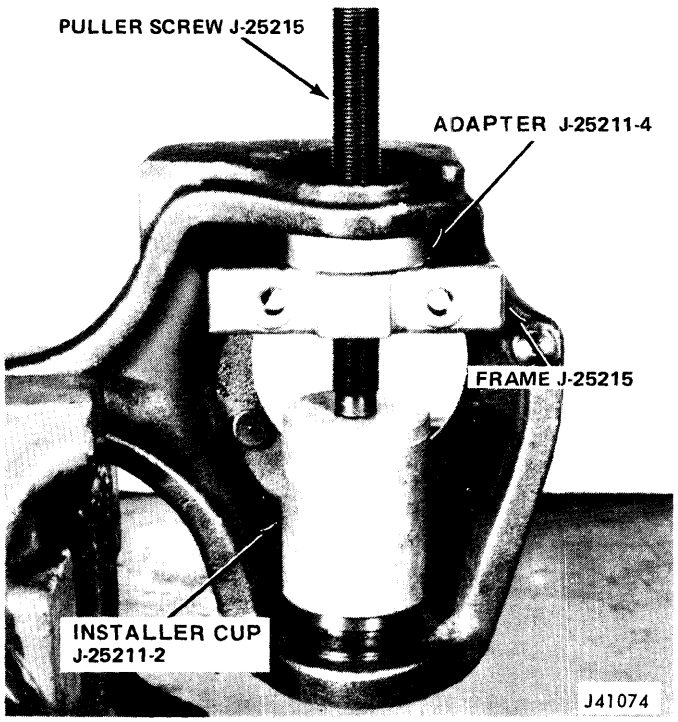

Fig. 10-9 Lower Ball Stud Installation

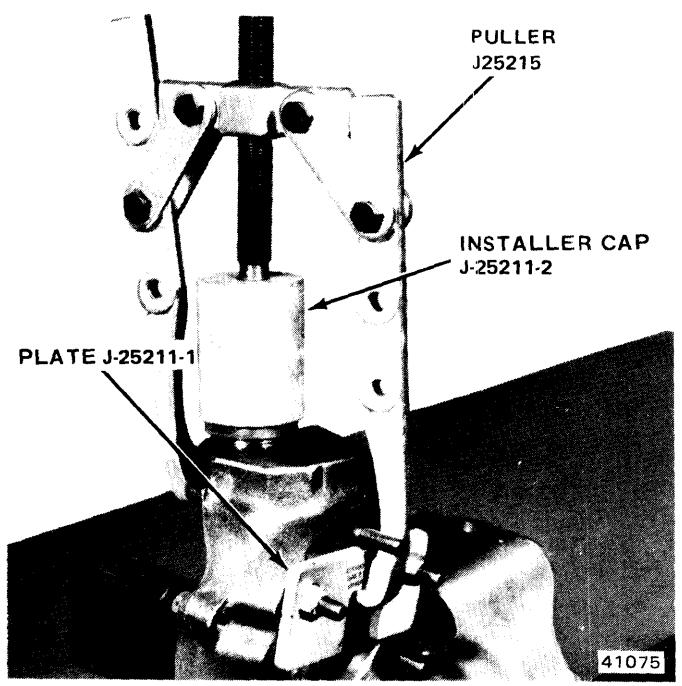

Fig. 10-10 Upper Ball Stud Installation

NOTE: *When the steering knuckle is removed or replaced, check the turning angle.*

AXLE SHAFT SEAL

Replacement

(1) Remove seal (fig. 10-13).

(2) Remove bronze thrust washer. If washer is worn, replace it.

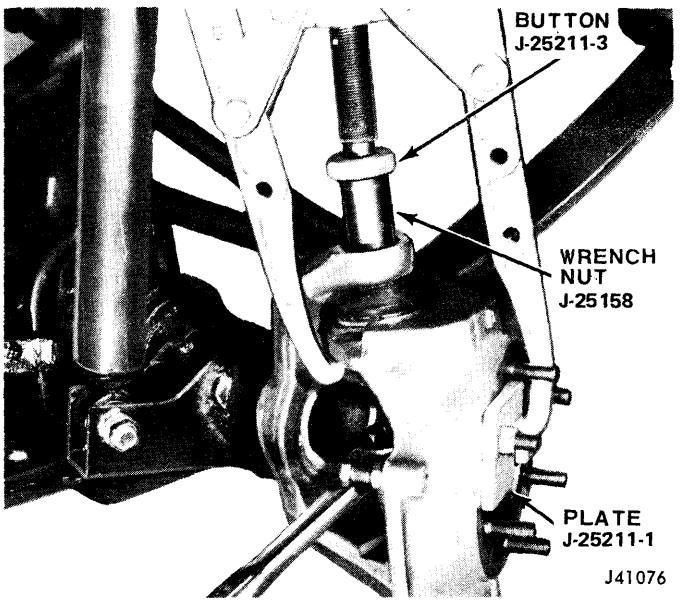

Fig. 10-11 Steering Knuckle Installation

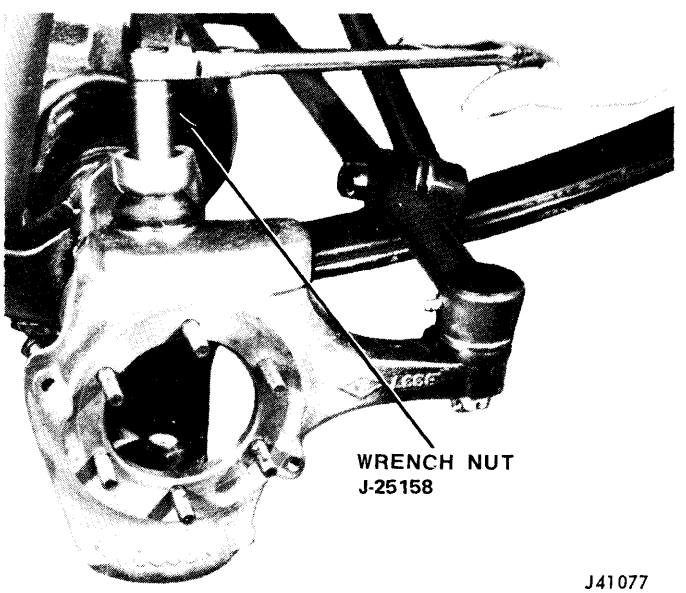

Fig. 10-12 Tightening Upper Ball Stud Seat

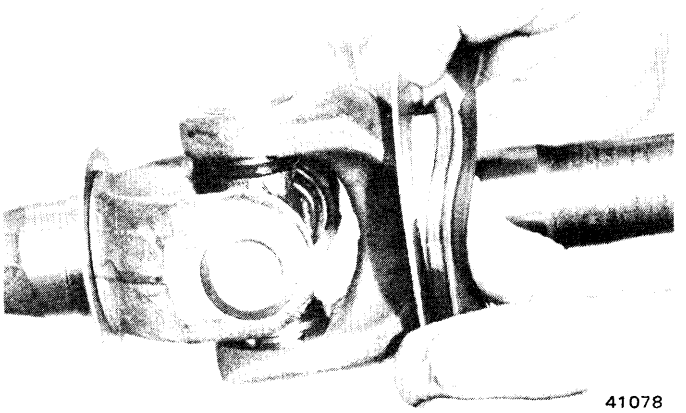

Fig. 10-13 Axle Shaft Seal Replacement

(3) Clean area of dirt and foreign matter.
(4) Install bronze washer with chamfered side toward axle shaft seal.
(5) Install seal. Direct lip of seal toward spindle (fig. 10-13).
(6) Pack wheel bearing grease around thrust face of shaft and seal. Fill seal area of spindle with wheel bearing grease.

SPINDLE BEARING

Replacement

NOTE: *Front axle spindles are equipped with a needle roller bearing located at the rear spindle flange (fig. 10-14).*

(1) Place spindle in vise. Use caution and protect all machined surfaces on spindle.
(2) Use an internal bearing puller and remove needle bearing.
(3) Clean area of dirt and foreign matter.
(4) Use an internal bearing installer and install new bearing.
(5) Pack needle bearing with grease.

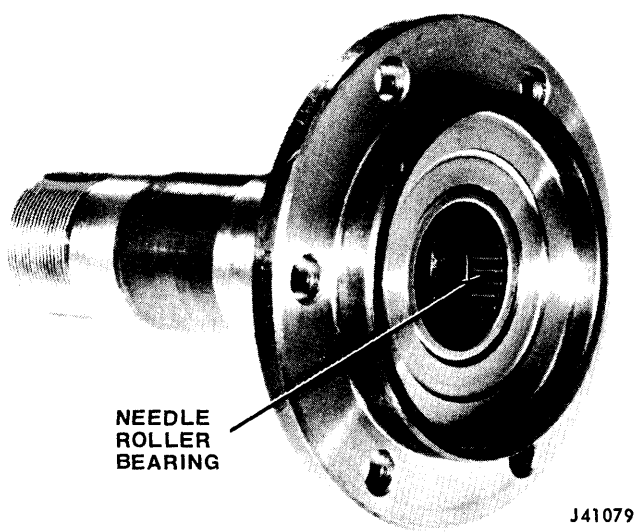

Fig. 10-14 Spindle Bearing

FRONT AXLE REMOVAL

(1) Raise and support front end. Position frame stands at rear of front springs.
(2) Remove wheel covers, wheel locknuts, and wheels.
(3) Index propeller shaft for assembly reference, and remove propeller shaft.
(4) Disconnect steering connecting rod at ball and socket connection on steering knuckles.
(5) Disconnect shock absorbers at axle housing.
(6) Disconnect breather tube from axle housing.
(7) Disconnect sway bar link bolts at spring clips.
(8) Remove brakedrums and support plates or brake calipers, hub and rotor, and support shields.
(9) Remove U-bolts and tie plates.
(10) Support axle assembly on jack; raise jack slightly to relieve spring tension.
(11) Loosen nuts securing rear spring shackles but do not remove bolts.
(12) Remove bolts securing front spring shackles and rest springs on floor.
(13) Pull jack and axle assembly from underneath vehicle.

FRONT AXLE INSTALLATION

(1) Support axle assembly on jack and slide assembly into position underneath vehicle.
(2) Raise springs and install bolts in front spring shackles, but do not tighten.
(3) Lower axle assembly on springs and rotate axle assembly into position.
(4) Install U-bolts and tie plates.
(5) Tighten front and rear spring shackle bolts.
(6) On models with disc brakes, install support shield, hub and rotor, and brake calipers. On models with drum brakes, install support plates and hubs and drums.
(7) Connect breather tube.
(8) Connect shock absorbers.
(9) Connect steering connecting rod at steering knuckles.
(10) Install propeller shaft. Align index marks made during removal.
(11) Install wheels and wheel locknuts.
(12) Remove support stands and lower vehicle.
(13) Tighten wheel locknuts and install wheel covers.
(14) Check front wheel alignment.
(15) Check turning angle.

TURNING ANGLE ADJUSTMENT

The turning angle stopscrews are located at the rear of the steering knuckle just above the axle centerline. If adjustment is necessary, proceed as follows.
(1) Loosen locknut on turning angle stopscrew.
(2) Using a turntable to measure angle, adjust stopscrew to obtain proper turning angle (see Specifications).
(3) Tighten stopscrew locknut.

NOTE: *Turning adjusting screw inward increases turning angle. Turning screw outward decreases turning angle.*

Turning Angle Specifications: On CJ models, set turning angle at 29 degrees. On Cherokee, Wagoneer, and Truck, set the turning angle at 36 to 37 degrees.

REAR AXLE

GENERAL

CJ models use the AMC/Jeep semi-floating rear axle with an 8-7/8-inch diameter ring gear and tapered axle shafts. Cherokee, Wagoneer, and Truck models use the Model 44F semi-floating rear axle which has flanged axle shafts. Truck models rated from 6800 to 8400 GVWR use the Model 60 full-floating rear axle. Refer to the Axle Application Chart at the end of this section for further information.

IDENTIFICATION

CJ Axle

The axle ratio identification code letter is located on the axle housing tube boss, adjacent to the dowel hole (fig. 10-15).

Letter Codes Chart

	Letter	Ratio	Pinion/Drive Gear Teeth
Trac-Lok	N	3.54:1	11/39
Trac-Lok	M	4.09:1	10/41
Standard	A	3.54:1	11/39
Standard	L	4.09:1	10/41

60650

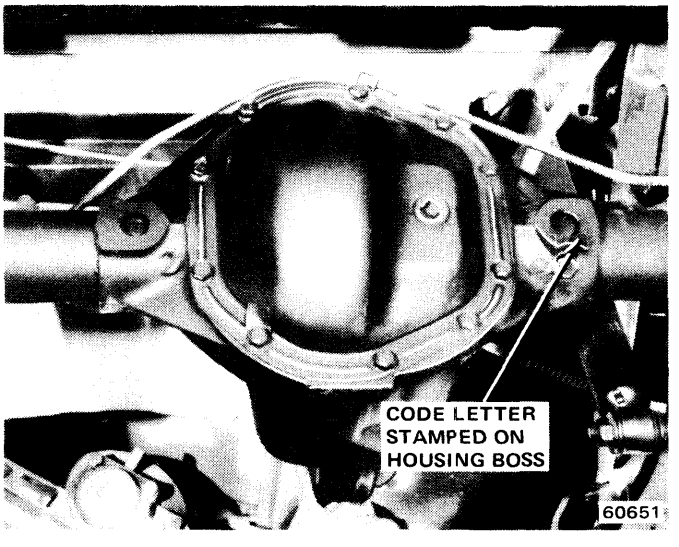

Fig. 10-15 Axle Ratio Code Location AMC/Jeep Axle

Cherokee-Wagoneer-Truck Axles

On Model 44 rear axles, the model number is cast into the upper surface of the left side reinforcing rib of the housing (fig. 10-1). On the Model 60 rear axle, the model number is cast into a boss on the lower right side of the housing, adjacent to the housing cover.

The axle build date and manufacturer's part numbers are stamped on the right-hand tube, adjacent to the cover (fig. 10-16). The build date of the axle is as follows. First number is the month, second number is the day of the month, third number is the year, the alpha-lettter is the shift and the last number is the assembly line. If there are two build dates, the latter will be the date in which the brake components were installed.

The gear ratio tag, attached to the left side of the housing cover, indicates the Jeep manufacturing reference part number, the tooth combination of the drive gear and pinion, and the gear ratio.

Axles equipped with the Trac-Lok differential have a tag attached which states that a special lubricant must be used (fig. 10-16). Use only Jeep Trac-Lok Lubricant or equivalent.

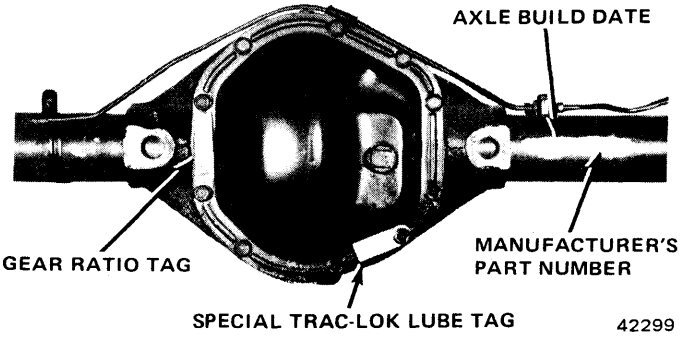

Fig. 10-16 Axle Identification

AXLE HOUSING

The rear axle housing should be checked periodically for weld cracks and other damage that may cause loss of lubricant or affect driving characteristics.

If the vehicle is driven through water deep enough to cover the hubs, the wheel ends should be disassembled and inspected for water damage or contamination.

Examine, clean, and replace damaged parts before lubricating and assembling the wheel end components. Pay particular attention to the axle bearings and brake components.

REAR AXLE HUB REPLACEMENT—CJ MODELS

Removal

(1) Remove axle shaft dust cap.
(2) Remove axle shaft nut and washer.
(3) Raise and support vehicle.
(4) Remove wheel and tire.
(5) Remove screws attaching brake drum to rear hub and remove drum.
(6) Install Puller Tool J-25109-01 on axle hub and remove hub (fig. 10-17).

CAUTION: *Do not use a knockout or slide hammer-type puller to remove the hub. This type of puller may damage axle bearings, axle shaft, or differential thrust block.*

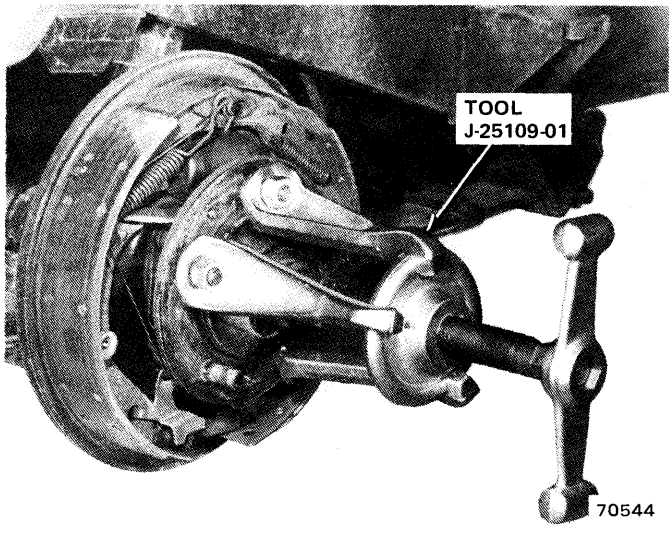

Fig. 10-17 Removing Rear Axle Hub—CJ Models

Inspection

Inspect hub for loose or distorted wheel lug studs. Inspect keyway and tapered center bore for wear, damaged serrations, or cracks. Replace hub if worn or damaged.

Installation

NOTE: *Procedures for installing an original hub and installing a replacement hub differ.*

Install an original hub as follows:
(1) Align keyway in hub with axle shaft key.
(2) Slide hub onto axle shaft as far as possible.
(3) Install axle shaft nut and washer.
(4) Install drum, drum retaining screws, and road wheel.
(5) Lower vehicle onto wheels. Tighten axle shaft nut to 250 foot-pounds torque. If cotter key hole is not aligned, tighten nut to the next castellation and install cotter key. Do not loosen nut to align cotter key hole.

NOTE: *When a replacement axle shaft is installed, a replacement hub must also be installed. However, a replacement hub may be installed on an original axle shaft if the serrations on the shaft are not worn or damaged.*

Install a replacement hub as follows:
(1) Align keyway in hub with axle shaft key.
(2) Install two well-lubricated thrust washers and axle shaft nut.
(3) Install drum, drum retaining screws, and road wheel.
(4) Lower vehicle onto wheels. Tighten axle shaft nut until distance from hub outer face to axle shaft outer end is 1.30 inches (fig. 10-18).

NOTE: *Pressing hub onto axle shaft to specified dimension is necessary to form hub serrations properly.*

(5) Remove axle shaft nut and one thrust washer.
(6) Install axle shaft nut and tighten to 250 foot-pounds torque. If cotter pin hole is not aligned, tighten nut to next castellation and install cotter pin. Do not loosen nut to align cotter pin hole.

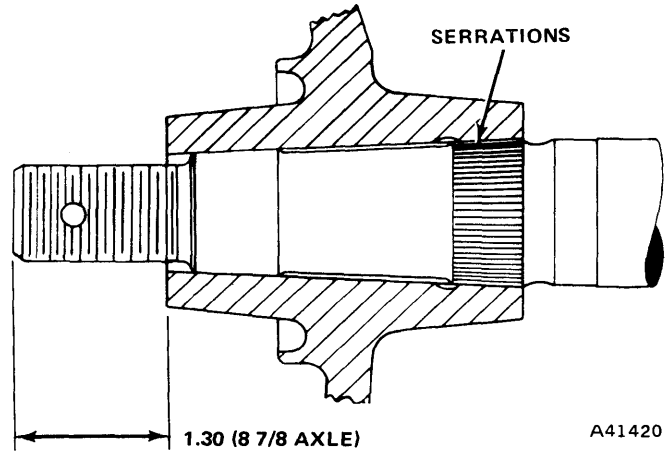

Fig. 10-18 Replacement Hub Installation Measurement (In Inches)

AXLE SHAFT AND BEARING REPLACEMENT

Removal—Tapered Shaft

(1) Remove rear wheel, drum, and hub as outlined in Rear Axle Hub Replacement.
(2) Disconnect parking brake cable at equalizer.
(3) Disconnect brake line at wheel cylinder and remove brake support plate assembly, oil seal, and shims from axle shaft.

NOTE: *If both axle shafts are removed, keep the shims separated. Axle shaft end play is adjusted on the left side only.*

(4) Use Axle Shaft Bearing Puller Tool J-2498 to remove axle shaft and bearing (fig. 10-19).

(5) Remove and discard axle shaft inner oil seal.

NOTE: *Bearing cone is press-fit on axle shaft and must be removed using an arbor press (fig. 10-20).*

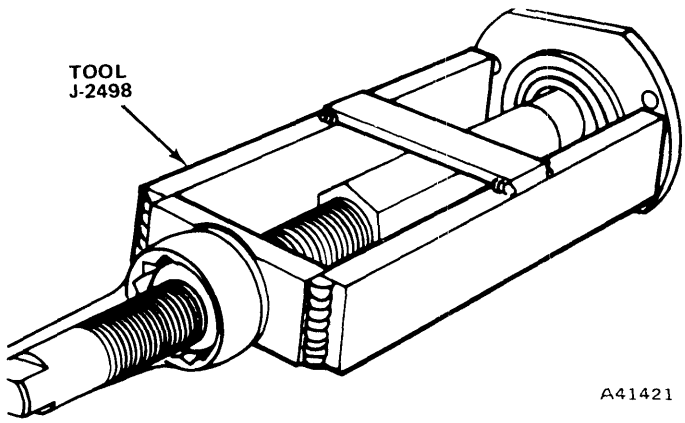

Fig. 10-19 Removing Axle Shaft

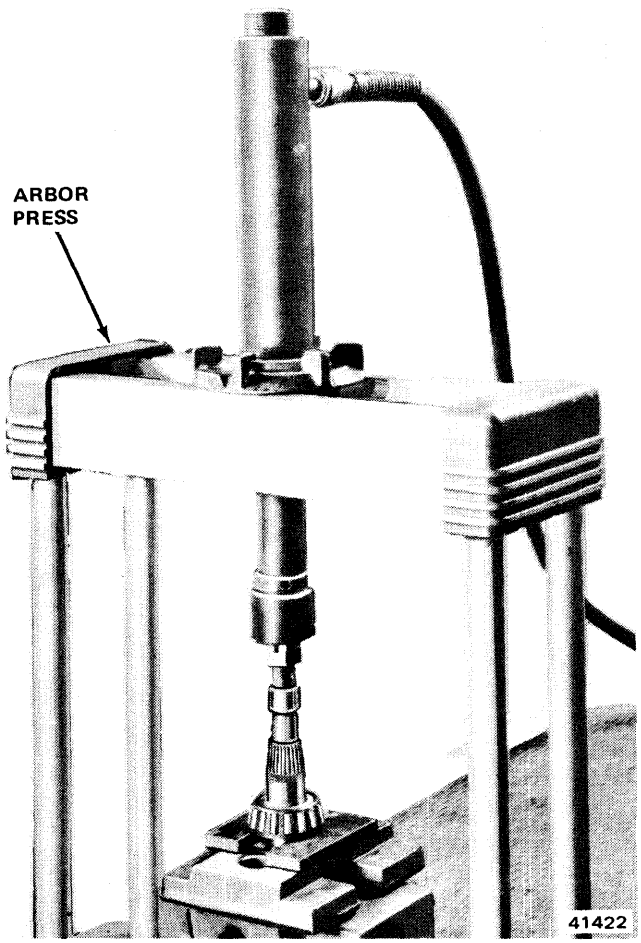

Fig. 10-20 Removing Axle Shaft Bearing

Installation—Tapered Shaft

Tapered shaft axle bearings have no provision for lubrication after assembly and must be packed with a good quality wheel bearing luricant before installation.

(1) Press axle shaft bearing(s) onto axle shaft(s). Small diameter of cone must face toward outer tapered end of shaft.

NOTE: *Coat inner axle shaft seal with a light lubricating oil.*

(2) Coat outer surface of seal metal retainer with nonhardening sealer.

(3) Install inner oil seal using Axle Shaft Seal Installer J-21788 (fig. 10-21).

(4) Install axle shaft(s). Align splined end with differential gears.

(5) Install outer bearing cup.

(6) Inspect brake support plate for elongated bolt holes. Replace support plate if necessary.

NOTE: *During assembly, apply a silicone sealer material to the axle tube flange and brake support plate mounting area to prevent entry of dust and water.*

(7) Install original axle end play shims, oil seal assembly, and brake support plate. Tighten attaching bolts to 35 foot-pounds torque.

NOTE: *The oil seal and retainer are located on the outside of brake support plate.*

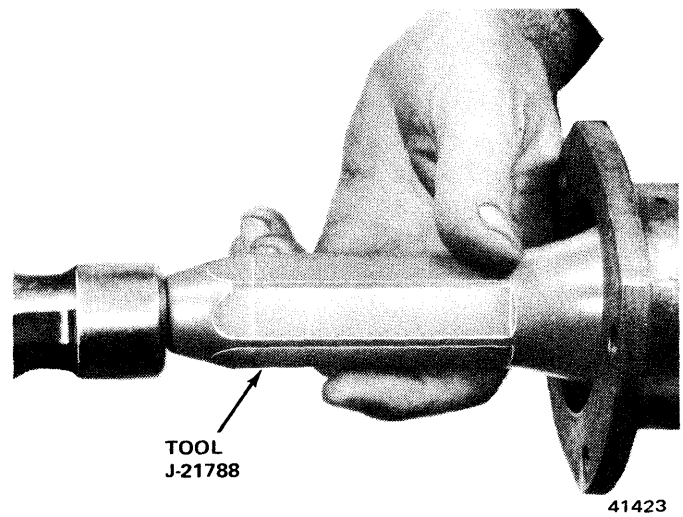

Fig. 10-21 Installing Inner Seal

End Play Adjustment

Axle shaft end play is adjusted at the left side axle shaft only.

(1) Strike end of each axle shaft with lead hammer to seat bearing cups against support plate.

(2) Attach Axle Shaft End Play Tool J-2092 to end of left side axle shaft. Mount dial indicator on support

plate or tool, and check end play while pushing and pulling on axle shaft (fig. 10-22).

(3) End play should be 0.004 to 0.008 inch, 0.006 inch is desired.

(4) Add shims to increase end play, remove shims to decrease end play.

(5) Install hub and drum as outlined in Rear Axle Hub—Installation.

(6) After axle shaft end play is checked and corrected, adjust brakes as outlined in Brake Section.

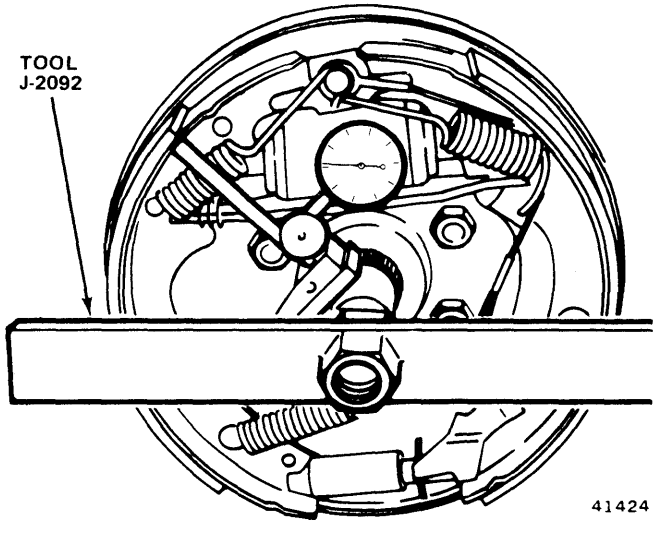

Fig. 10-22 Checking Axle Shaft End Play

Removal—Flanged Shaft

(1) Raise and support vehicle and remove wheels.

(2) Remove brake drum locknuts (spring-type) and remove drum.

(3) Remove axle shaft flange cup plug by piercing center with sharp tool and prying out.

(4) Remove nuts attaching support plate and retainer to axle tube flange using access hole in axle shaft flange.

(5) Assemble Adapter Tool J-21579 and Slide Hammer J-2619, install tools on axle shaft flange, and remove axle shaft (fig. 10-23).

NOTE: *Be sure the original bearing cup is removed from the axle housing.*

(6) Remove axle shaft oil seal from axle housing tube.

(7) Wipe seal bore in axle housing tube clean and install oil seal using Driver J-25135.

CAUTION: *Under no circumstances should the axle shaft retaining rings or bearings be removed using a torch. Heat will transfer into the axle shaft bearing journal and weaken it.*

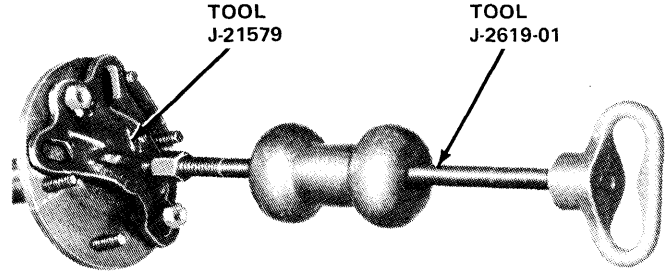

Fig. 10-23 Removing Flanged Axle Shaft

Bearing Replacement

(1) Mount axle shaft in vise.

(2) Drill 1/4 inch diameter hole in retainer ring. Hole depth should be approximately 3/4 of ring thickness. Do not allow drill to contact axle shaft.

(3) Position chisel over drilled hole in retainer bearing. Cut deep groove in retaining ring using chisel. This will enlarge ring, or split it, allowing ring to be removed from axle shaft (fig. 10-24).

(4) Cut through oil seal using hacksaw and remove seal and retainer plate. Do not damage seal contact surface.

(5) Inspect axle shaft oil seal journal for scratches. Remove scratches using crocus cloth.

(6) Install retainer plate on axle shaft.

(7) Pack wheel bearing grease in oil seal cavity and between seal lips and install seal on axle shaft seal seat. Outer face of seal must face axle flange.

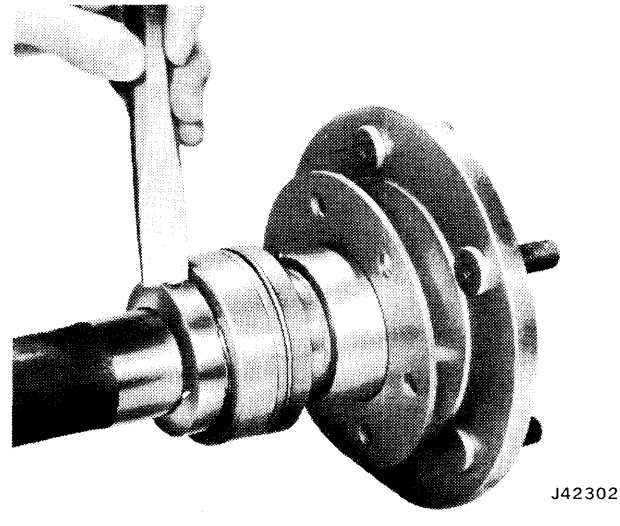

Fig. 10-24 Notching Bearing Retainer Ring

(8) Pack replacement axle bearing with wheel bearing grease.

(9) Install bearing on axle shaft. Be sure cup rib ring is facing axle flange.

(10) Install bearing retainer ring on axle shaft.

(11) Using Tool J-23674 and arbor press, press axle shaft bearing and retainer ring on axle shaft simultaneously. Be sure bearing and retainer ring are properly seated against axle shaft shoulder.

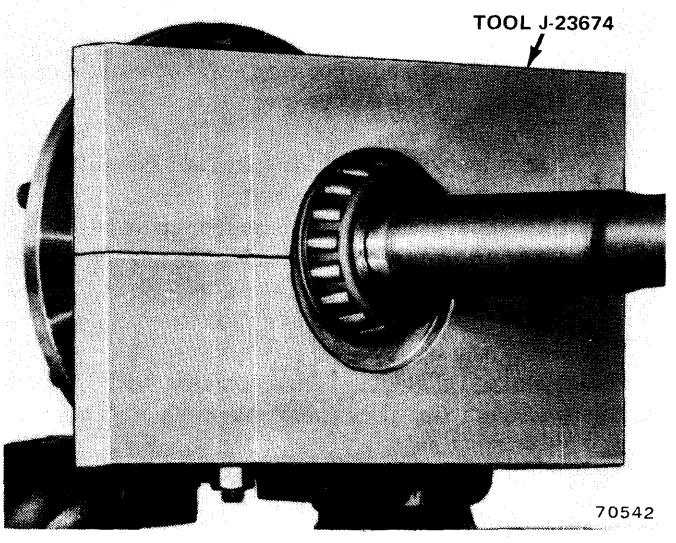

Fig. 10-25 Removing Axle Shaft Bearing

Installation—Flanged Shaft

(1) Install axle shaft through support plate. Do not damage axle housing tube inner oil seal.

(2) Apply coating of wheel bearing grease to outside diameter of bearing cup before installing in bearing bore.

(3) Tap end of flanged shaft lightly with rawhide mallet to position axle shaft bearing in bearing bore of housing.

(4) Attach axle shaft retainer and brake support plate to axle tube flange. Install attaching nuts and lockwashers.

(5) Install cup plug in axle shaft flange hole.

(6) Install brake drum, spring-type locknuts, and rear wheels.

(7) Remove supports and lower vehicle.

Removal—Full-Floating Shaft (Model 60)

NOTE: *It is not necessary to raise the rear wheels in order to remove the rear axle shafts on Model 60 full-floating rear axles.*

(1) Remove axle flange nuts, lockwashers, and split washers retaining axle shaft flange (fig. 10-26).

(2) Remove axle shaft from housing.

Installation—Full-Floating Shaft (Model 60)

(1) Be sure axle flange mating area on hub and axle are clean and free of old gasket material.

(2) Install replacement flange gasket on hub studs.

(3) Insert axle shaft into housing.

NOTE: *It will be necessary to rotate the axle shaft to simultaneously align the shaft splines with the differential gear splines and the flange attaching holes with the hub studs.*

(4) Install split washers, lockwashers, and flange bolts. Tighten bolts.

PINION SEAL AND YOKE REPLACEMENT

Semi-Floating Axle with Tapered Shaft

(1) Raise and support vehicle. Remove rear wheels and brake drums.

(2) Disconnect propeller shaft from rear yoke. Index shaft to yoke for assembly reference.

(3) Rotate drive pinion several revolutions using Socket Tool J-22575 and inch-pound torque wrench to measure torque required to turn drive pinion.

NOTE: *The torque required to turn the drive pinion must be recorded for reference at time of assembly.*

(4) Remove pinion nut using Tool J-8614-01 (fig. 10-2). Discard pinion nut.

(5) Mark yoke and pinion for alignment reference at time of assembly.

(6) Remove yoke using Tools J-8614-01,02,03 (fig. 10-3).

(7) Inspect seal surface of yoke. If surface is damaged or grooved, replace yoke.

(8) Remove pinion seal using Tool J-9233 (fig. 10-26).

(9) Before installing replacement seal, coat seal lip with rear axle lubricant.

(10) Install seal using Tool J-22661 (fig. 10-27).

(11) Install yoke on pinion. Note alignment marks. Install replacement pinion nut. Tighten nut using Tools J-8641-01 and J-22575 to remove pinion bearing end play only. **Do not overtighten.**

(12) Check torque required to turn drive pinion. Pinion must be turned several revolutions to obtain accurate torque reading. Refer to torque reading recorded during disassembly and add 5 inch-pounds for proper amount of torque.

(13) If preload torque is less than desired amount (disassembly torque reading plus 5 inch-pounds), tighten pinion nut slightly and check torque.

(14) Repeat these steps until desired torque is attained. **Do not loosen and retighten nut.**

CAUTION: *Do not overtighten the pinion nut. If the desired torque is exceeded, a new collapsible pinion spacer sleeve must be installed and the pinion gear preload reset. Refer to Differential Overhaul.*

(15) Install propeller shaft. Align index marks made at disassembly

(16) Install rear brake drums and wheels.

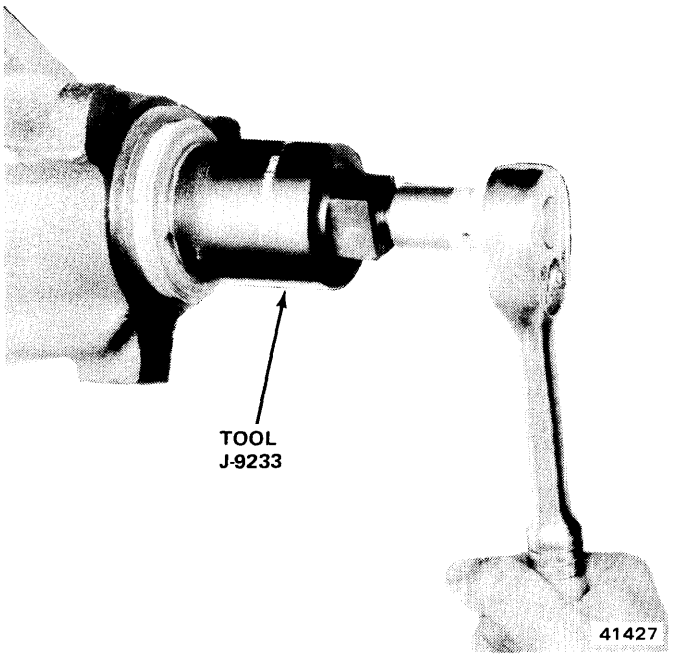

Fig. 10-26 Removing Pinion Seal

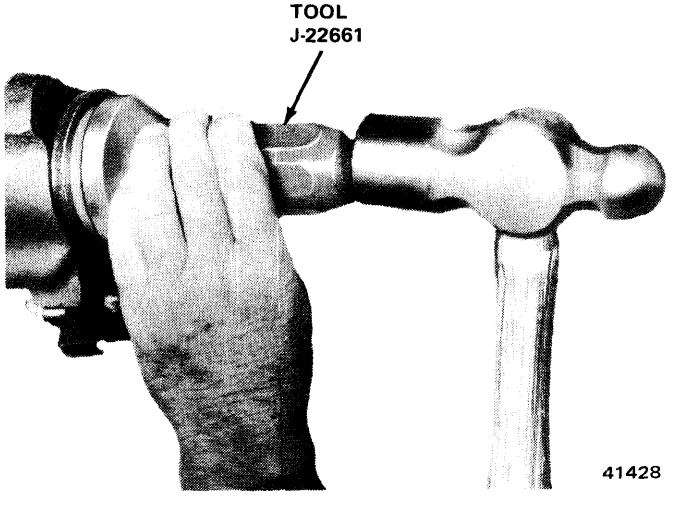

Fig. 10-27 Installing Pinion Seal

Semi-Floating and Full-Floating Axles with Flange Shaft

(1) Raise and support vehicle.

(2) Index propeller shaft to front yoke for assembly reference and disconnect shaft at yoke.

(3) Remove pinion nut and washer using Tool J-8614-01.

(4) Remove yoke using Tools J-8614-01,02,03 (fig. 10-3).

(5) On semi-floating axle, remove pinion seal using Tool J-25180. On full-floating axle, use Tool J-25144.

(6) Install replacement oil seal using Installer Tool J-25104.

(7) Install yoke on pinion.

(8) Install pinion washer and nut. Tighten nut to 210 foot-pounds torque on Model 44 and 260 foot-pounds torque on Model 60.

(9) Align index marks on propeller shaft and yoke and install shaft. Tighten attaching bolts or nuts to 16 foot-pounds torque.

(10) Remove supports and lower vehicle.

REAR AXLE REMOVAL

(1) Raise vehicle and position support stands under frame rails just forward of rear springs.

(2) Remove wheels.

(3) Index propeller shaft at yoke for assembly reference and disconnect propeller shaft.

(4) Disconnect shock absorbers from axle tubes.

(5) Disconnect brake hydraulic hose at rear axle tee fitting. Tape ends of hose and fitting to keep out dirt.

(6) Disconnect parking brake cable to equalizer.

(7) Support axle on hydraulic jack.

(8) Remove U-bolts. On vehicle with spring-mounted above axle, disconnect shackle bolts and move spring away from axle.

(9) Slide axle from under vehicle.

REAR AXLE INSTALLATION

NOTE: *All service replacement axle assemblies are shipped from the factory without lubricant in the differential. Lubricant must be added to the differential before the axle is installed. Use Gear Lubricant Grade SAE 80 for standard axles. Use Jeep Trac-Lok Lubricant or equivalent in Trax-Lok axles.*

When adding differential lubricant, suspend the axle with the axle shafts in a horizontal position and the yoke end of the pinion housing facing downward. Then, turn the pinion shaft several times to be sure that lubricant reaches the pinion bearings.

(1) Support axle assembly on hydraulic jack and position axle under vehicle.

(2) Align springs with axle spring pads, and install U-bolts and nuts. On vehicles with spring-mounted above axle, position spring on shackle and install bolts. Do not tighten bolts completely.

(3) Attach brake line hose at tee fitting on top of housing.

(4) Connect parking brake cables.

(5) Connect shock absorbers to axle tubes.

(6) Install propeller shaft. Align marks made during removal.

(7) Bleed brakes and adjust.

(8) Install wheels, remove supports, and lower vehicle.

(9) Check lubricant level and add lubricant as required.

STANDARD DIFFERENTIAL

GENERAL

CJ models use the Model 30 front axle and the AMC/-Jeep rear axle, which has an 8-7/8-inch ring gear and tapered axle shafts.

Cherokee, Wagoneer, and Truck models use the Model 44F front axle and the Model 44 rear axle with flanged axle shafts. Truck models rated at 6800 GVWR and up use the Model 60 full-floating rear axle.

Axle Models 30, 44, and AMC/Jeep are all semi-floating type axles. Only the Model 60 is a full-floating type unit.

DIFFERENTIAL OPERATION

The differential gear system divides the torque between the axle shafts and allows them 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 is as follows: the pinion gear rotates the ring gear. The ring gear, being bolted to the differential case, rotates the case. The differential pinion gears, which are mounted on the pinion mate shaft (which is fitted in the case), rotate the side gears. The side gears, which are splined to the axle shafts, rotate the shafts.

During straight-ahead driving, the differential pinion gears do not rotate on the pinion mate shaft because input torque on thegears is equally divided between the two side gears. As a result, the pinion gears revolve with the pinion shaft, but do not rotate around it (fig. 10-28).

When turning corners, the outside wheel has to travel farther than the inside wheel. This difference in travel must be compensated for in order to prevent the wheels from scuffing and sliding through the turn. To accomplish this, the differential becomes effective and allows the axle shafts to rotate at unequal speeds (fig. 10-29).

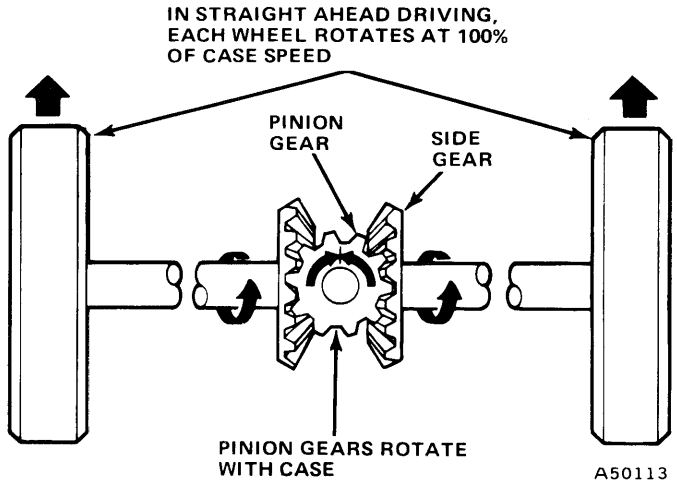

Fig. 10-28 Differential Operation—Straight-Ahead Driving

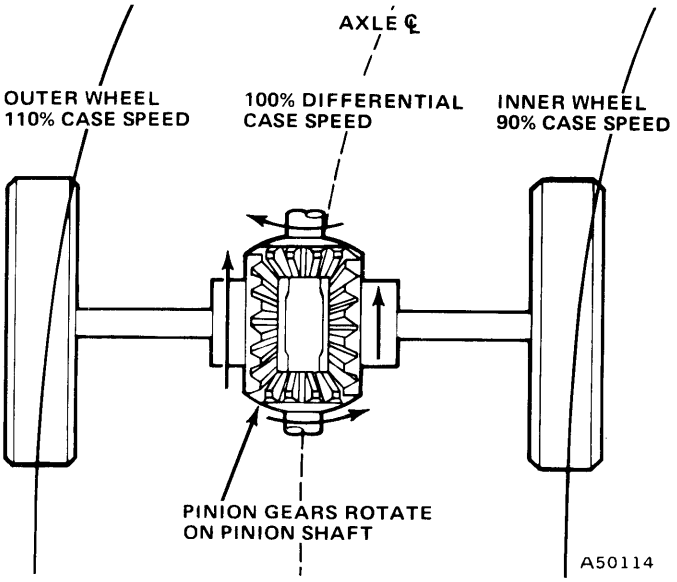

Fig. 10-29 Differential Operation—On Turns

DIFFERENTIAL OVERHAUL—AMC/JEEP AXLE

Disassembly

NOTE: *It is not necessary to remove the rear axle assembly to overhaul the differential. Refer to figure 10-30 for parts nomenclature during overhaul.*

(1) Remove axle shaft dust caps and retaining nuts.

(2) Raise and support vehicle.

(3) Remove axle housing cover and drain lubricant.

(4) Remove wheels, brake drums, hubs, axle shafts, and seals. Keep left and right side axle parts separated.

(5) Mark bearing caps with center punch for assembly reference.

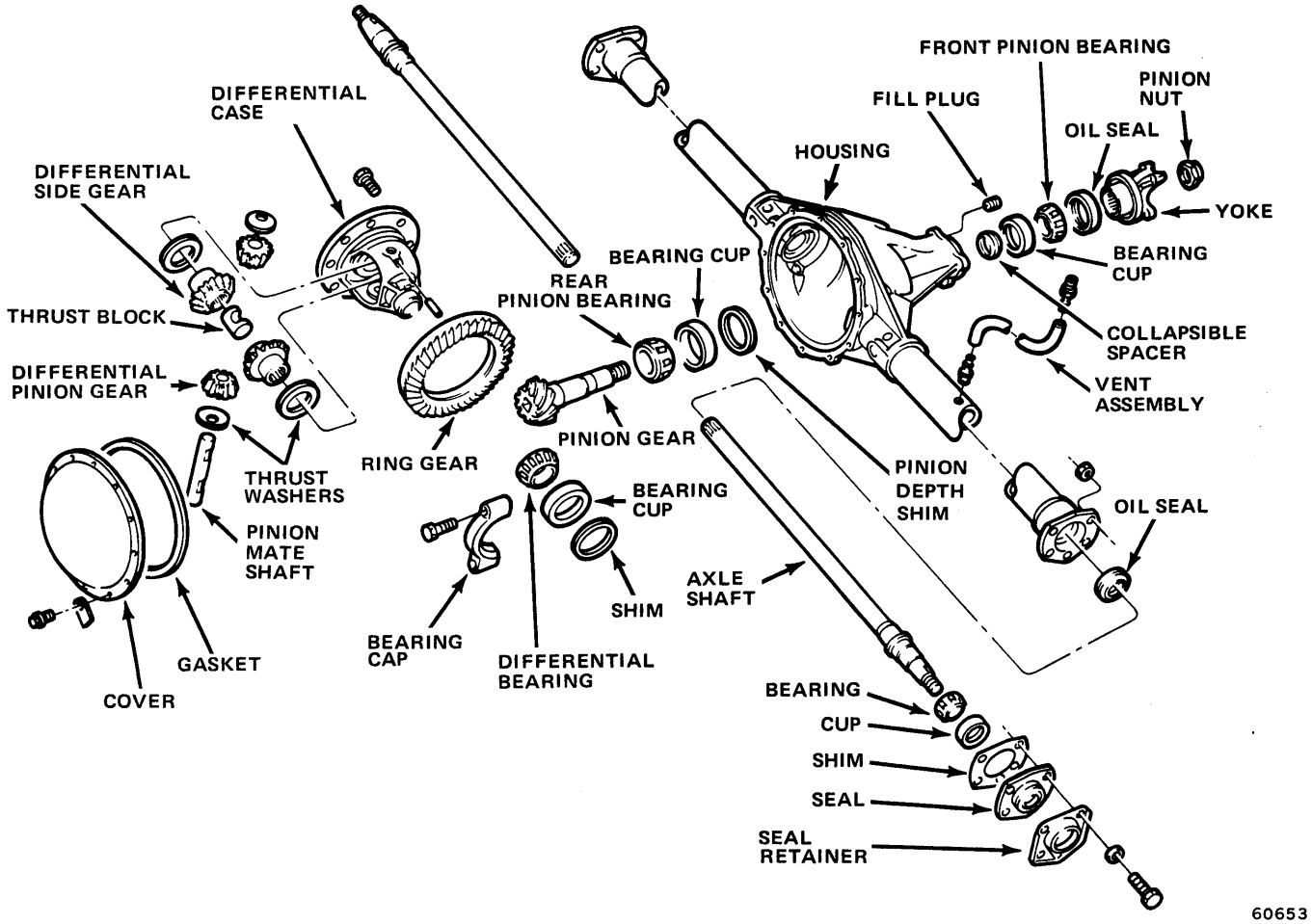

Fig. 10-30 AMC-Jeep Rear Axle (CJ Models)

(6) Loosen bearing cap bolts until only several threads are engaged, then pull bearing caps away from bearings. This will prevent differential from falling out and sustaining damage when pried from axle housing.

(7) Pry differential loose in axle housing.

(8) Remove bearing caps and remove differential.

(9) Tie differential bearing shims to their respective bearing caps and cups to prevent misplacement.

Differential Bearing Removal

Use Puller J-2497-01 to remove differential bearing cones from differential case (fig. 10-31). When using this tool, be sure it pulls on bearing cone in such a manner that rollers are free. If puller bears on bearing roller cage, it will damage cage.

Ring Gear Removal

(1) Remove ring gear-to-differential case bolts.

(2) Using brass drift, tap ring gear from case. Do not nick ring gear face of differential case or drop gear.

CAUTION: *Do not chisel or wedge gear from case.*

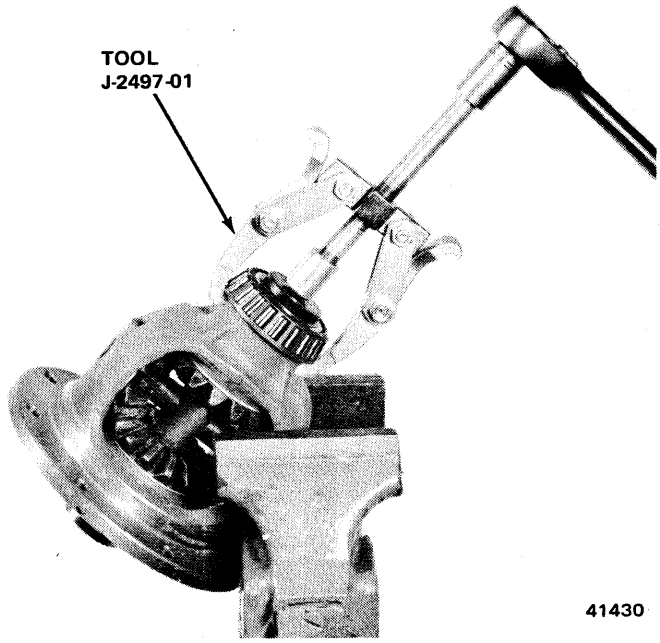

Fig. 10-31 Removing Differential Bearing

Pinion Mate Shaft Removal

(1) Using 3/16-inch diameter drift at least 3 inches long drive out lockpin that holds pinion mate shaft in place (fig. 10-32).

(2) Remove pinion mate shaft and remove thrust block (fig. 10-33).

(3) Roll pinion gears around on side gears until they can be removed from case, then remove side gears and thrust washers.

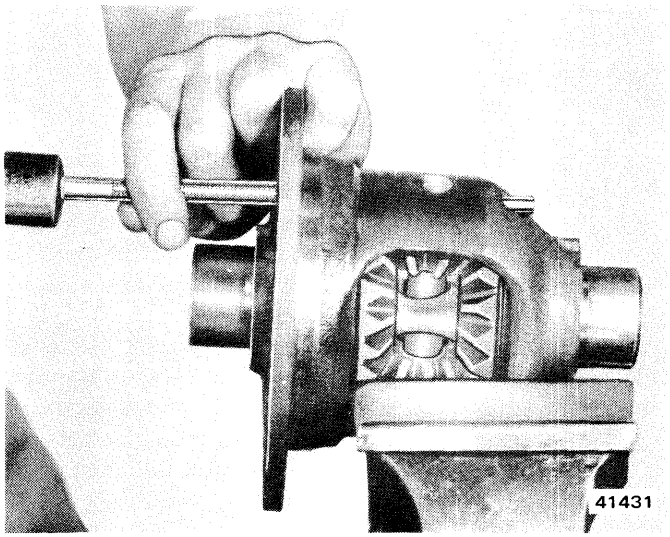

Fig. 10-32 Removing Pinion Mate Shaft Lockpin

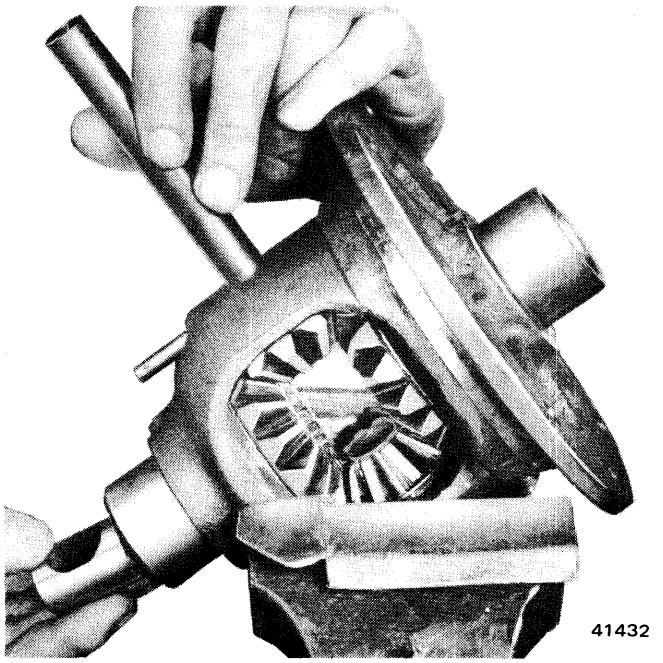

Fig. 10-33 Removing Pinion Mate Shaft and Thrust Block

Pinon Gear Removal

(1) Remove pinion nut using Tool J-8614-01 (fig. 10-2).

(2) Remove yoke using Tools J-8614-01,02,03 (fig. 10-3).

(3) Install housing cover after removing nut. Secure cover with two bolts to prevent pinion gear from falling out when it is driven out of housing.

(4) Remove pinion seal, tap end of pinion gear with fiber hammer to free front bearing cone from pinion gear, and remove bearing.

NOTE: *A collapsible spacer is used to control pinion bearing preload. Discard this spacer; it is not reusable.*

(5) Remove housing cover, pinion gear, and rear bearing from housing.

Pinion Rear Bearing Cup Removal

(1) Remove rear bearing cup using Driver Handle J-8592 and Cup Remover J-21786.

NOTE: *Pinion depth adjustment shims are located behind rear bearing cup. Tag shims for assembly reference.*

(2) Remove front bearing cup using Driver Handle J-8592 and Cup Remover J-21787.

CAUTION: *Keep cups square in bore to prevent damaging cup bores.*

Cleaning and Inspection

Clean all parts in solvent. Allow bearings to air dry. Dry other parts with compressed air.

Inspect differential bearing cones, cups, and rollers for pitting, galling, flat spots, or cracks.

Inspect differential case for elongated or enlarged pinion mate shaft hole. The machined thrust washer surface areas and counterbores must be smooth and free of nicks, gouges, cracks, or burrs. Inspect differential case for cracks or other visible damage which would necessitate replacement.

Inspect pinion mate shaft for excessive wear in contact area of differential pinions. Shaft should be smooth and round with no scoring or metal pickup.

Inspect side gears and pinions; they should have smooth teeth with a uniform contact pattern without excessive wear or broken surfaces. The side gear and pinion thrust washers should be smooth and free from any scoring or metal pickup.

Inspect pinion mate shaft lockpin for damage or looseness in case. Replace pin or case as necessary.

Inspect ring gear and pinion for worn or chipped teeth or damaged attaching bolt threads. If replacement is necessary, replace both the ring gear and pinion as matched set only.

Inspect pinion bearing cones, cups, and rollers for pitting, galling, excessive wear, or other visible damage. If inspection reveals that either are unfit for further service, replace both cup and cone.

Inspect axle housing for cracks or other visible damage which might necessitate replacement. Raised metal on shoulder of bearing cup bores incurred in removing pinion cups should be flattened using a blunt punch.

Inspect pinion gear for damaged bearing journals and mounting shim surfaces or excessively worn splines. If replacement is necessary, replace both the pinion gear and ring gear (available in matched sets only).

Inspect pinion yoke for cracks, worn splines, pitted, rough or corroded oil seal contacting surface. Repair or replace pinion yoke as necessary.

Inspect pinion bearing shim pack for broken, damaged, or distorted shims. Replace shims if necessary during setting of pinion bearing preload.

Assembly

(1) Install rear bearing on pinion gear with large diameter of roller case toward gear. Press bearing against rear face of gear.

(2) Clean axle housing bearing bores to correctly check pinion gear depth.

NOTE: *When installing a new gear set, use the original depth shim as starting point.*

(3) Install shim in rear bearing bore of housing and install rear bearing cup with Driver Handle J-8592 and Bearing Cup Installer J-8608 (fig. 10-34).

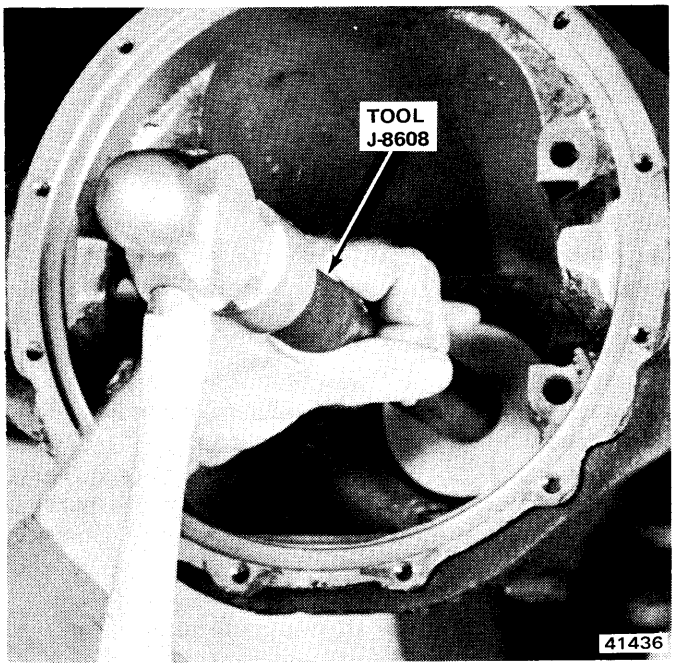

Fig. 10-34 Installing Pinion Rear Bearing Cup

NOTE: *Install shim with chamfered side facing bottom of bearing cup bore in housing. If shim is not chamfered, be sure shim is centered when installed to prevent misaligning bearing cup when it is installed.*

(4) Install front bearing cup using Driver Handle J-8592 and Bearing Cup Installer J-8611-01.

(5) Insert pinion gear through rear bearing cup. Install front bearing, rear universal joint yoke, and original pinion gear nut. **Tighten nut only enough to remove bearing end play.**

NOTE: *A new nut and collapsible spacer should not be installed at this time because the pinion will gear be removed after depth measurement.*

Pinion Gear Depth

Pinion gear depth refers to the distance (measured in inches) from the end face of the pinion gear to the centerline of the axle shafts (fig. 10-35). This dimension is controlled by shims which are installed between the pinion gear inner bearing cup and the axle housing (fig. 10-30).

Ring and pinion gear sets are factory tested to detect machining variances. The test is started at a standard setting which is then varied to obtain the most desirable tooth contact pattern and quiet operation. When this setting is determined, the ring gear and pinion gear are etched with identifying numbers (fig. 10-36).

The ring gear receives one number. The pinion gear receives two numbers which are separated by a plus (+) or minus (-) sign.

The second number on the pinion gear indicates pinion position in relation to the centerline of the axle shafts where tooth contact was best and gear operation was quietest. This number is the pinion depth variance. The number on the ring gear and first number on the pinion gear identify the gears as a matched set. Do not attempt to use a ring and pinion gear set that have different numbers. This is not a matched set.

The second number on the pinion gear indicates the amount, in thousandths of an inch, that the gear set varied from the standard setting. When the pinion gear is marked plus, the distance from the pinion end face to the axle shaft centerline must be more than the standard setting. When the pinion gear is marked minus, the distance from the pinion end face to the axle shaft centerline must be less than the standard setting. The standard setting for the AMC/Jeep axle is 2.547 inches (fig. 10-35).

NOTE: *Service replacement gear sets marked + or - 0.009 (or more) should be returned to the Parts Distribution Center. Do not attempt to install these gear sets. The number on the pinion gear must match the first of the two numbers of the ring pinion. If the number on the pinion gear differs from the first number on the ring pinion, the gear set is not matched.*

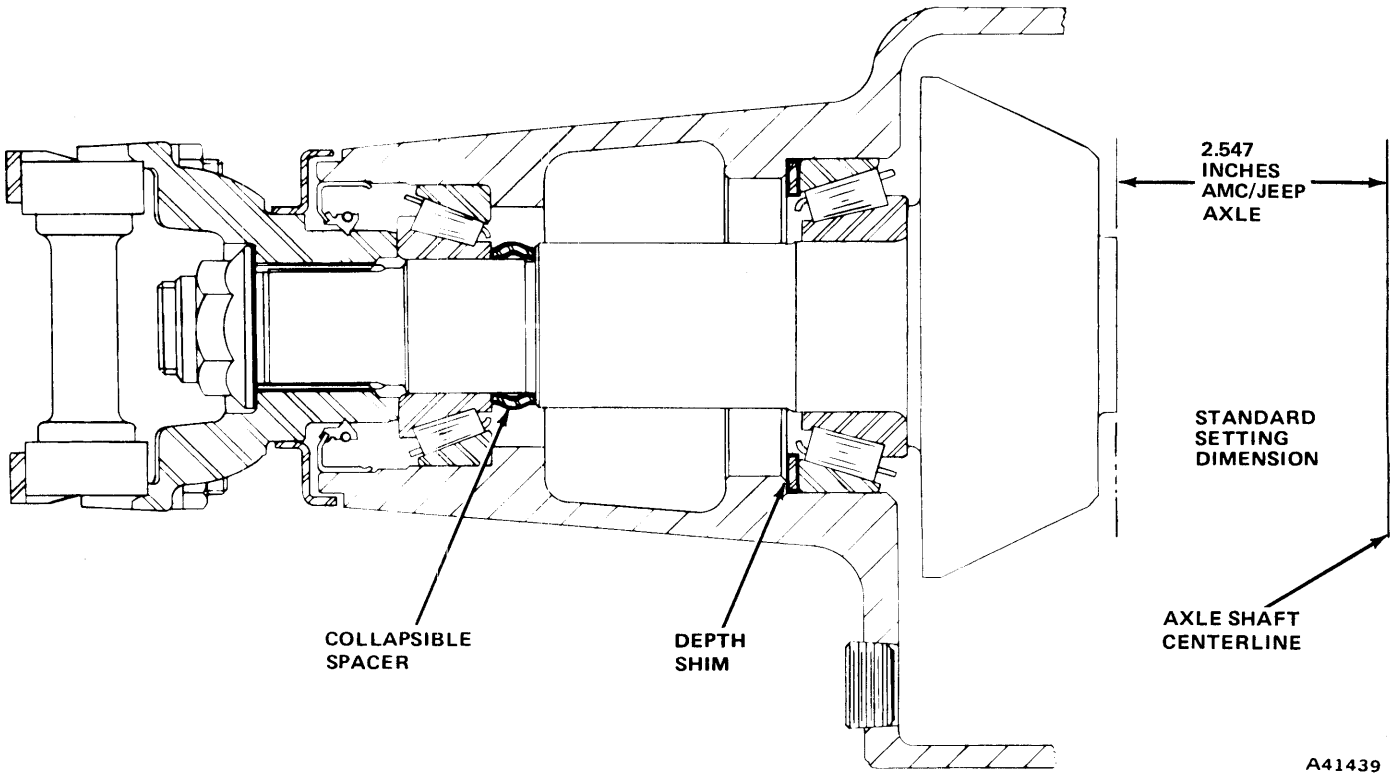

Fig. 10-35 Standard Setting Dimension and Pinion Depth Shim Location

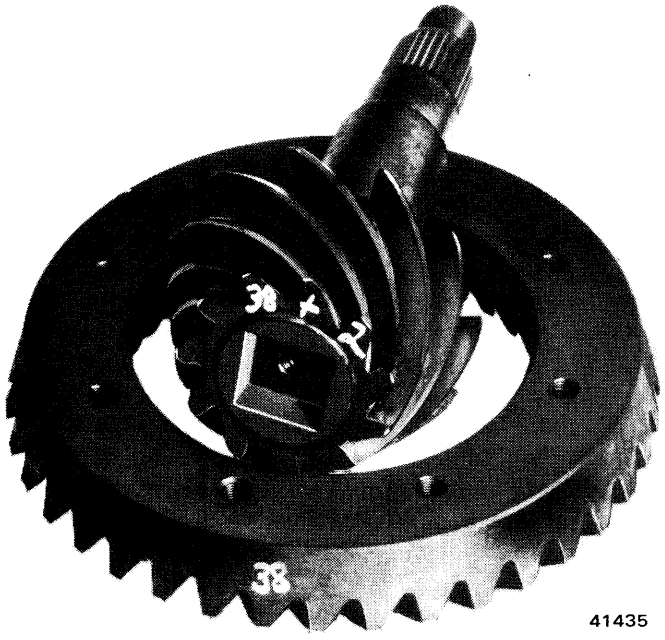

Fig. 10-36 Ring and Pinion Gear Markings

Pinion Gear Depth Measurement

Observe the pinion depth variance marked on the pinion gear. If the number is preceded by a plus (+) sign, add that amount (in thousands) to the standard setting for the axle model being overhauled. If the number is preceded by a minus (-) sign, subtract that amount (in thousandths) from the standard setting. The result of this addition or subtraction is the desired pinion depth. Record this figure for future reference.

(1) Assemble Arbor Tool J-5223-4 and Discs J-55223-23 and install in differential bearing cup bores in axle housing. Be sure discs are seated in bearing bores.

(2) Install bearing caps in axle housing and over discs (fig. 10-37). Tighten bearing cap bolts securely, but not to specified torque.

(3) Position Gauge Block J-5223-20 on end face of pinion gear with anvil end of gauge block seated on gear and plunger underneath Arbor Tool J-5223-4 (fig. 10-37).

(4) Mount Clamp and Bolt Assembly J-5223-24 on axle housing (fig. 10-37). Use housing cover bolt to attach clamp to housing.

(5) Extend clamp bolt until it presses against gauge block with enough force to prevent gauge block from moving.

(6) Loosen thumbscrew in gauge block to release plunger in gauge block. When plunger contacts arbor tool, tighten thumbscrew to lock plunger in position. Do not disturb plunger position.

(7) Remove clamp and bolt assembly from axle housing.

(8) Remove gauge block and measure distance from end of anvil to end of plunger using a 2- to 3-inch micrometer (fig. 10-38). This dimension represents the **measured pinion depth**. Record this dimension for assembly reference.

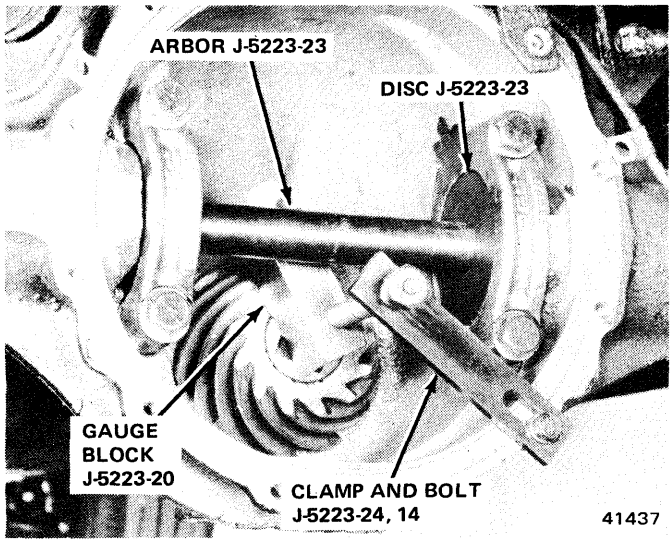

Fig. 10-37 Installing Pinion Depth Gauge Tools

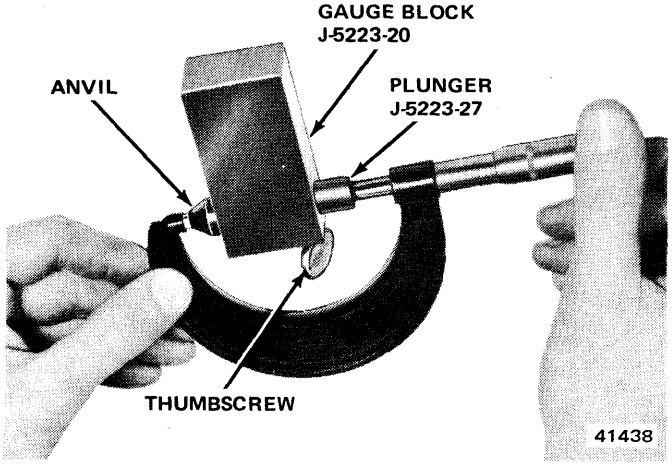

Fig. 10-38 Measuring Gauge Block

(9) Remove bearing caps and remove arbor tool and discs from axle housing.

(10) Remove pinion gear, rear bearing cup, and depth shim from axle housing.

(11) Measure thickness of depth shim removed in step (10). Add this dimension to measured pinion depth obtained in step (8). From this total, subtract the desired pinion depth. The result represents the correct shim thickness required.

NOTE: *Desired pinion depth is the standard setting plus or minus the pinion depth variance.*

The following examples illustrate the procedure for determining correct shim thickness.

Example I—Pinion Depth Variance is Plus (+)

Step 1—Determine desired pinion depth

Add pinion depth variance (marked on pinion gear) to standard setting. Result is desired pinion depth.

2.547
+0.007
2.554

Step 2—Determine total measured pinion depth

Add measured pinion depth to measured shim thickness. Result is total measured pinion depth.

2.550
+0.101
2.651

Step 3—Determine correct shim thickness

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

2.651
-2.554
0.097

Example II—Pinion Depth Variance is Minus (-)

Step 1—Obtain desired pinion depth

Subtract pinion depth variance (marked on pinion gear) from standard setting. Result is desired pinion depth.

2.547
-0.003
2.544

Step 2—Determine total measured pinion depth

Add measured pinion depth to measured shim thickness. Result equals total measured pinion depth.

2.553
+0.096
2.649

Step 3—Determine correct shim thickness

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

2.649
-2.544
0.105

(12) Install correct thickness shim(s) in axle housing bearing cup bore and install rear bearing cup and pinion gear.

Pinion Gear Bearing Preload Adjustment

(1) Install collapsible spacer and front bearing on pinion gear. Install pinion oil seal using Installer Tool J-22661 (fig. 10-27).

CAUTION: *Collapsible spacer controls preload on pinion gear bearings. Do not reuse old spacer. Use new part only.*

(2) Install pinion yoke and new pinion nut. Tighten pinion nut finger-tight only.

(3) Install J-8614-01 on yoke and tighten pinion nut only enough to remove end play and seat bearings. Rotate pinion while tightening nut to seat bearings evenly. Use Tool J-22575 to tighten pinion nut.

(4) Remove Tools J-8614-01 and J-22575 and check torque required to turn pinion gear. Use Tool J-22575 and inch-pound torque wrench to check. Correct pinion bearing preload torque is 17 to 25 inch-pounds torque. Continue tightening pinion nut until required preload torque is obtained.

CAUTION: *Do not exceed the specified preload torque. Do not loosen the nut to reduce preload torque if the specified torque is exceeded.*

(5) If pinion bearing preload torque is exceeded, replace pinion nut and collapsible spacer and adjust preload to correct torque.

Differential Case Assembly

(1) Install differential bearings on case using Installer Tool J-21784 and Driver Handle J-8592 (fig. 10-39).

(2) Install thrust washers on differential side gears and install gears in differntial case.

(3) Install differential pinion gears in case and install thrust washers behind pinion gears. Align bores in pinion gears.

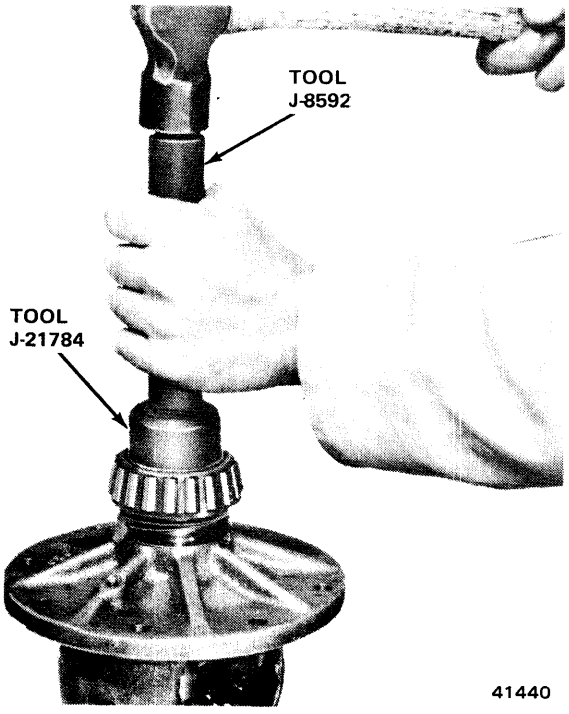

Fig. 10-39 Installing Differential Bearings

(4) Rotate differential side and pinion gears in case until pinion mate shaft bores in pinion gears are aligned with shaft bores in case.

(5) Install thrust block in case. Insert block through bore in side gear. Align bore in block with pinion mate shaft bores in gears and case.

(6) Install pinion mate shaft. Align lockpin bore in shaft with bore in case and install lockpin.

Differential Bearing Adjustment

(1) Place bearing cup over each differential bearing and install differential case assembly in axle housing.

(2) Install shim on each side between bearing cup and housing. Use 0.080-inch shims as starting point (fig. 10-40).

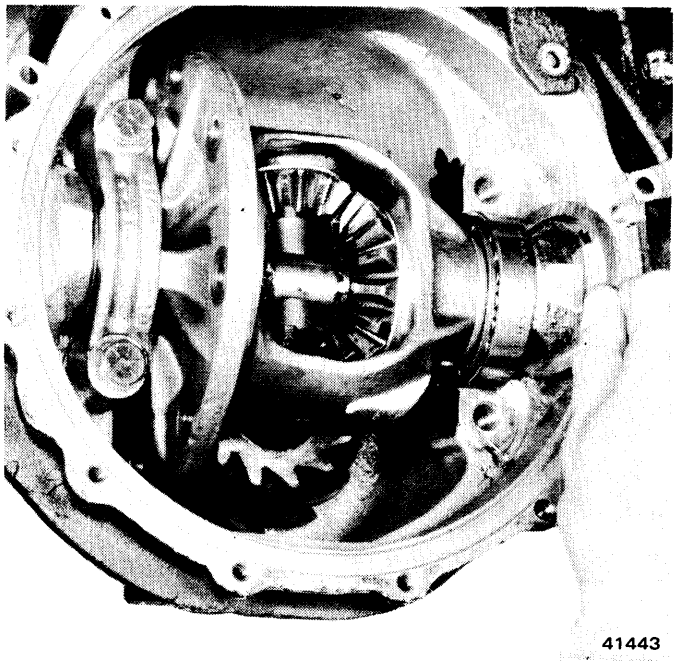

Fig. 10-40 Adjusting Sideplay

(3) Install bearing caps and tighten bolts finger-tight. Mount dial indicator as shown in figure 10-41.

(4) Using two screwdrivers, pry between shims and housing. Pry assembly to one side and zero indicator. Pry assembly to opposite side and read indicator.

NOTE: *Do not zero or read indicator while prying.*

(5) Amount read on indicator is amount of shim that should be added to arrive at zero preload and zero end play. Repeat procedure to ensure accuracy. Adjust if necessary.

(6) Shims are available in thicknesses from 0.080 to 0.110 inch in 0.002-inch variations.

(7) When sideplay is elminated, a slight bearing drag will be noticed. Install bearing caps and tighten bolts to specified torque.

(8) Attach dial indicator to axle housing and check ring gear mounting face of differential case for runout (fig. 10-41). Runout should not exceed 0.002 inch.

(9) Remove case from housing. Retain shims used to adjust sideplay.

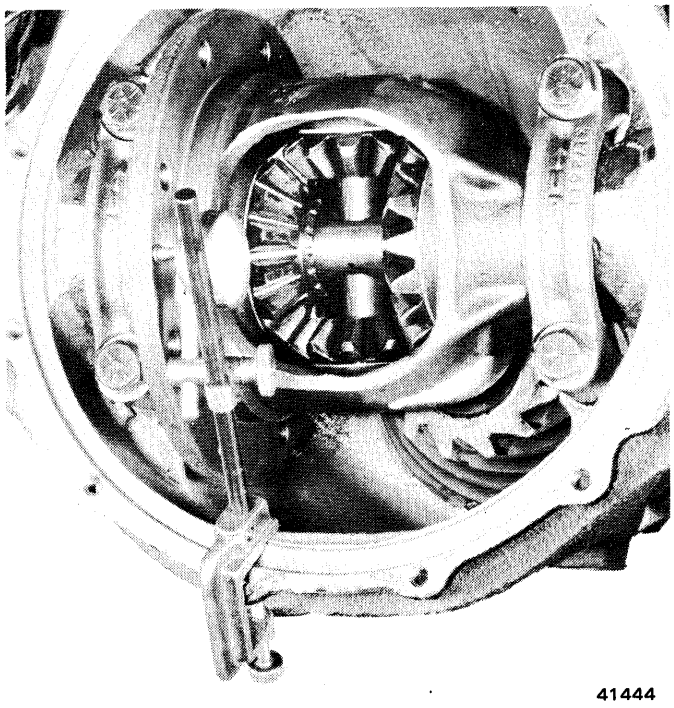

Fig. 10-41 Checking Ring Gear Face of Case for Runout

Ring Gear Installation

(1) Place ring gear on differential case.

(2) Bolt ring gear to differential case.

NOTE: *Two bolts installed in opposite holes may be used as guides to pull gear into position.*

(3) Tighten attaching bolts to 105 foot-pounds torque.

Ring and Pinion Gear Backlash Adjustment

(1) Install differential assembly in housing using shims previously selected to remove sideplay. Tighten bearing cap bolts to 87 foot-pounds torque. Attach dial indicator to housing with stylus contacting drive side of a tooth on ring gear and at right angle to it (fig. 10-42).

(2) Move ring gear back and forth and note movement registered on dial indicator. Backlash of ring gear should be 0.005 to 0.009 inch, 0.008 inch desired.

(3) Adjust backlash as follows: to increase backlash, install thinner shim on ring gear side and thicker shim on opposite side. To decrease backlash, reverse procedure; however, do not change total thickness of shims.

Example: Sideplay was removed using 0.090-inch shims on each side totaling 0.180 inch. Backlash is checked and found to be 0.011 inch. To correct backlash, add 0.004 inch to shim on ring gear side and subtract 0.004 inch from shim on opposite side.

This will result in 0.094-inch shim on ring gear side and 0.086-inch shim on other side. Backlash will be approximately 0.007 inch to 0.008 inch. Total shim thickness remains 0.180 inch.

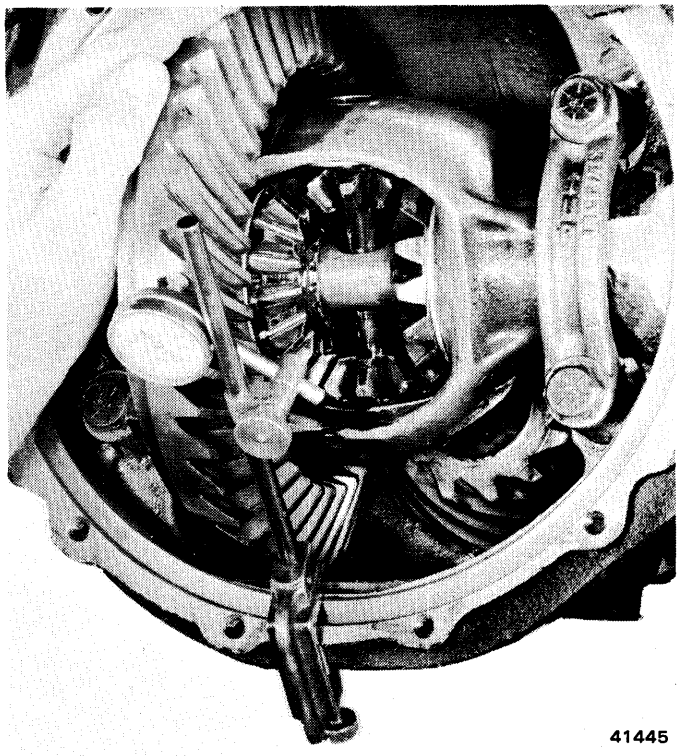

Fig. 10-42 Checking Backlash

Differential Bearing Preload Adjustment

Differential bearings should be preloaded to compensate for heat and loads during operation. Correct preload is 0.008 inch.

Differential bearings are preloaded by increasing each shim 0.004 inch in thickness.

(1) Install differential bearing shims in axle housing bearing bores.

(2) Assemble differential bearing cups on differential bearings. Bearings should completely cover differential bearing rollers.

(3) Position differential so that bearings just start in axle housing bearing bores (fig. 10-43).

NOTE: *Slightly tipping bearing cups will ease starting cups into bores. Keep differential assembly square in housing and push it in as far as possible.*

(4) Using plastic mallet, tap outer edge of bearing cups until seated in housing.

CAUTION: *Do not distort shims by hammering them into housing.*

(5) Install bearing caps, aligning punch marks correctly. Tighten bolts to 87 foot-pounds torque.

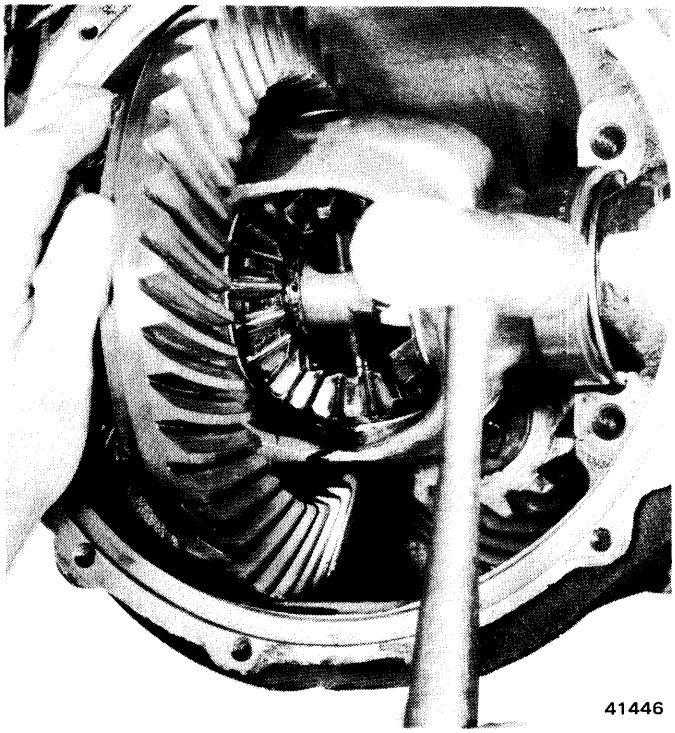

Fig. 10-43 Differential Installation

(6) Preloading differential bearings may change backlash setting. Check backlash and correct if necessary.

(7) Install propeller shaft, aligning index marks made at disassembly.

(8) Install axle shafts, bearings, seals, and brake support plates.

(9) Fill rear axle with Trac-Lok Lubricant, or equivalent.

(10) Check and adjust axle shaft end play if necessary. Adjust end play at left side of axle shaft only.

(11) Install hubs, drums, and wheels, and lower vehicle.

OVERHAUL—AXLE MODELS 30-44-60

Disassembly

NOTE: *It is not necessary to remove the axle assembly to overhaul the differential. Refer to figures 10-44 and 10-45 for parts nomenclature during overhaul.*

(1) Raise vehicle and remove axle shafts.

(2) Remove axle housing cover and loosen bolts that retain differential bearing caps. Do not remove caps.

NOTE: *Centerpunch identification marks on bearing caps and housing so caps are installed in same position at assembly.*

(3) Spread axle housing using Tool J-25102. Install holddown clamps to keep spreader tool in position (fig. 10-46). Position dial indicator as shown in figure 10-51 and measure amount housing is spread by Tool J-25102. Do not spread housing more than 0.020 inch.

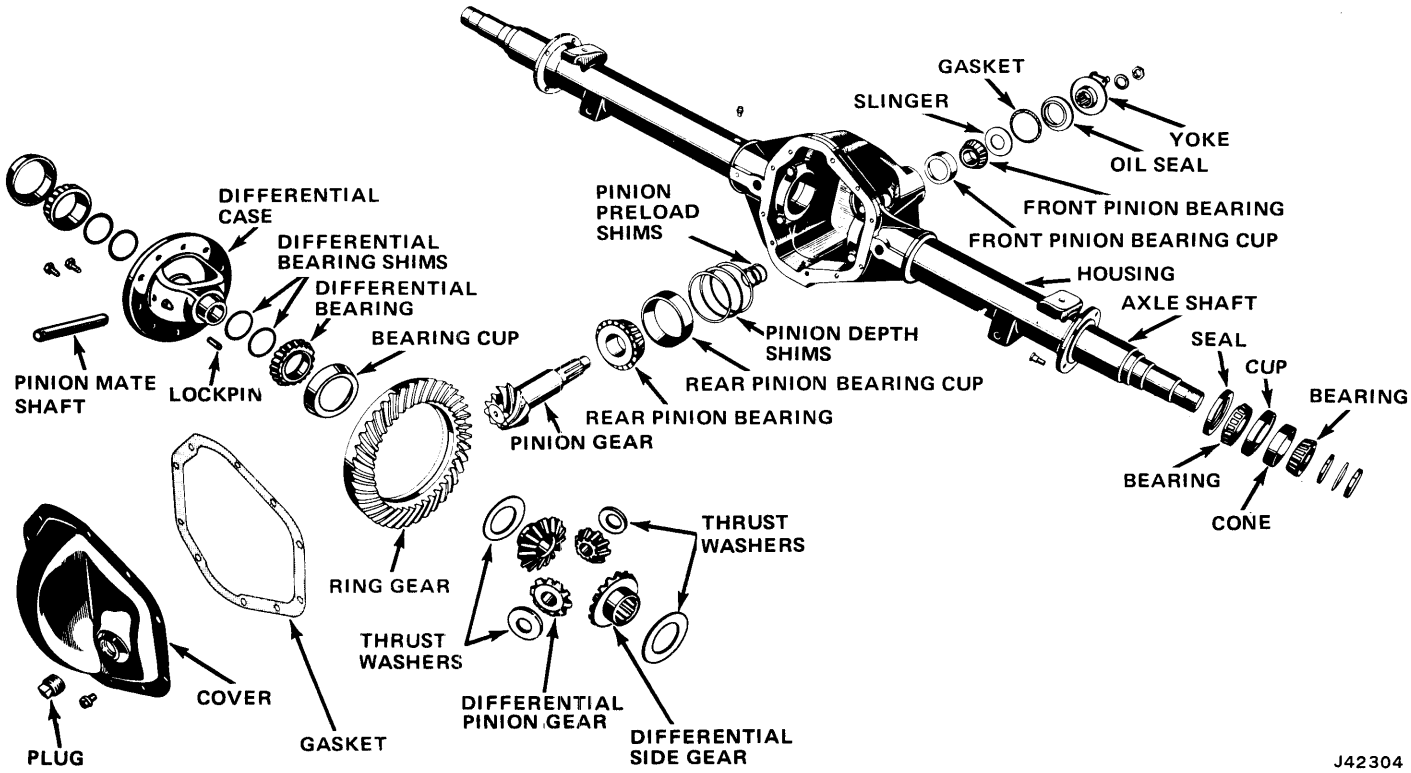

Fig. 10-44 Model 60 Rear Axle

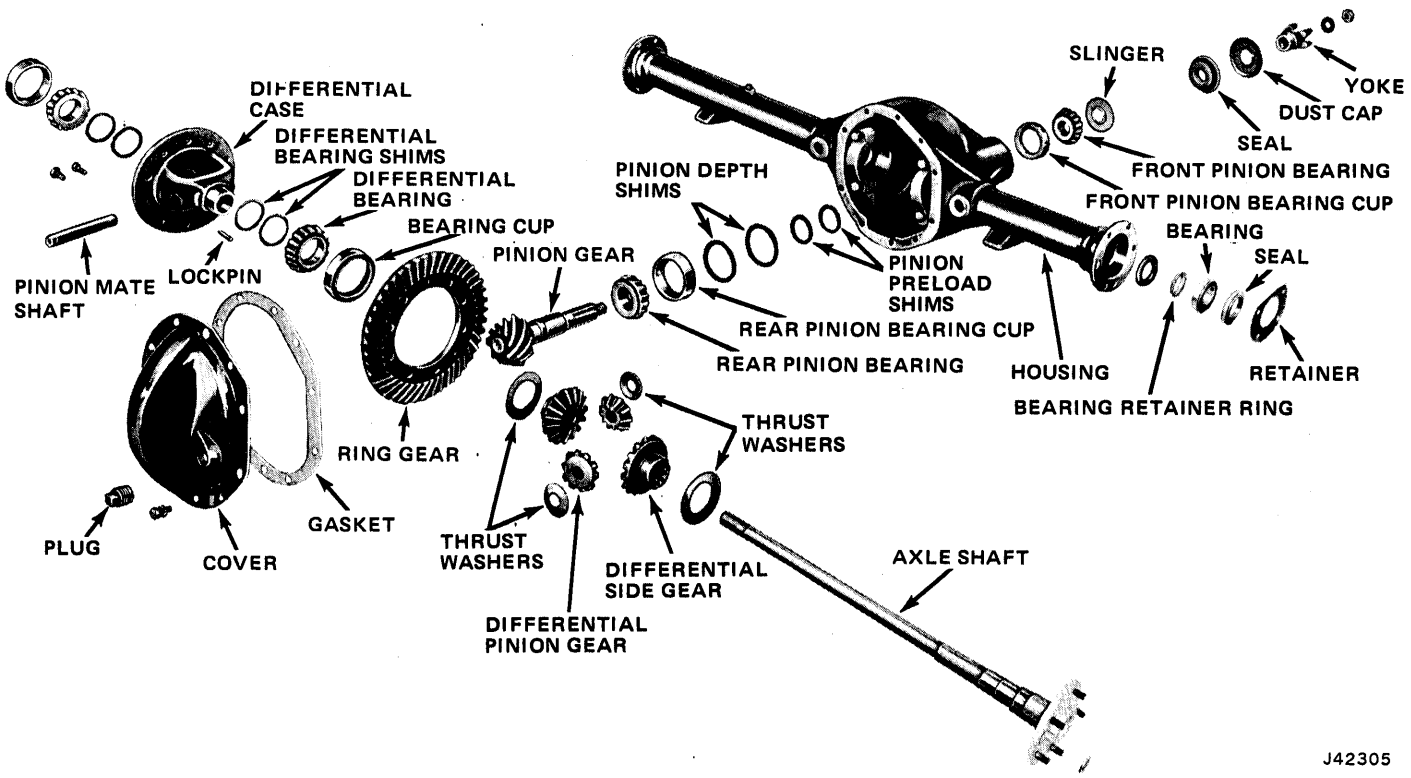

Fig. 10-45 Model 30 and Model 44 Rear Axle—Typical

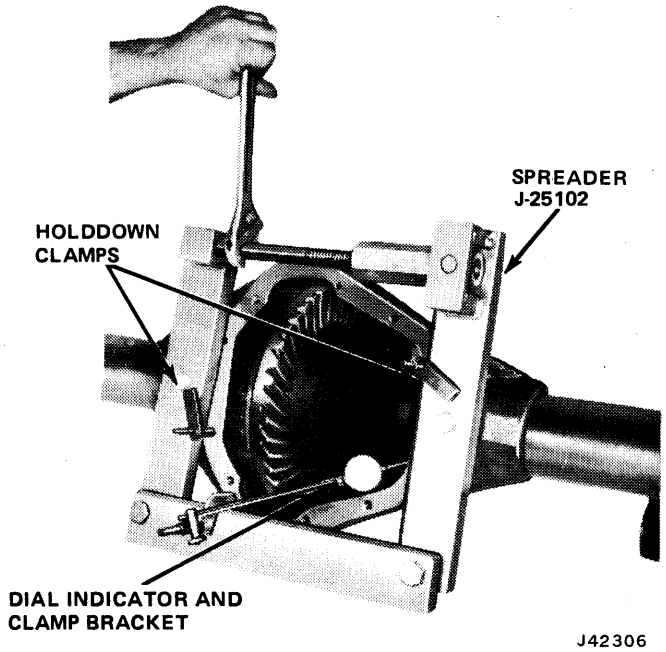

Fig. 10-46 Spreading Axle Housing

(4) When housing has been spread sufficiently, remove dial indicator and bearing caps.

(5) Pry differential from housing using pry bars under heads of ring gear bolts and carrier casting.

(6) Remove spreader immediately to prevent possibility of housing taking set.

(7) Remove bolts that attach ring gear to differential case.

(8) Remove pinion mate shaft lockpin using small punch (fig. 10-47).

(9) Remove pinion mate shaft and thrust block.

(10) Remove differential pinion gears.

NOTE: *Do not lose pinion gear thrust washers.*

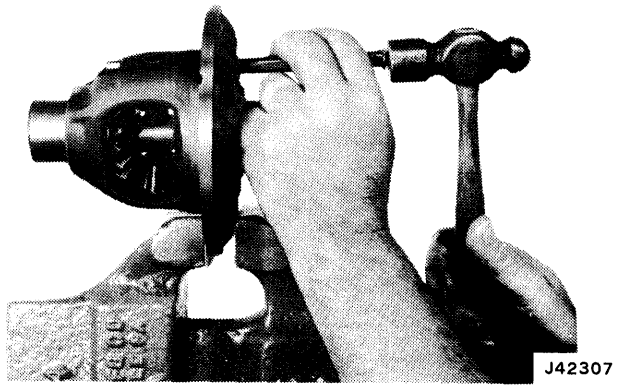

Fig. 10-47 Removing Lockpin

(11) Remove pinion nut using Tool J-8614-01 (fig. 10-2).

(12) Remove yoke using Tools J-8614-01, -02, -03 (fig. 10-3).

(13) Using rawhide hammer, strike end of pinion gear to force pinion out of housing.

NOTE: *The pinion bearing preload adjusting shims may remain on the pinion shaft, or stick to the bearing that remains in the housing, or may fall out. These shims should be collected and retained for assembly.*

(14) Remove outer pinion bearing, oil slinger, and oil seal, using two-inch by two-inch piece of hardwood or length of pipe. Drive cone, slinger, and seal out of housing. Discard seal.

Differential Bearing Removal—Model 30-44 Axle

Remove differential bearings and pinion inner bearing using Bearing Puller Set J-25100. This puller set eases removal of the bearings without damaging the cone rollers as pulling pressure is applied directly to the bearing (fig. 10-48).

NOTE: *When removing front axle differential inner pinion bearing with oil slinger attached, two puller adapter plates must be inserted from top into one side of J-25100 puller base, then repositioned 180 degrees apart (fig. 10-48).*

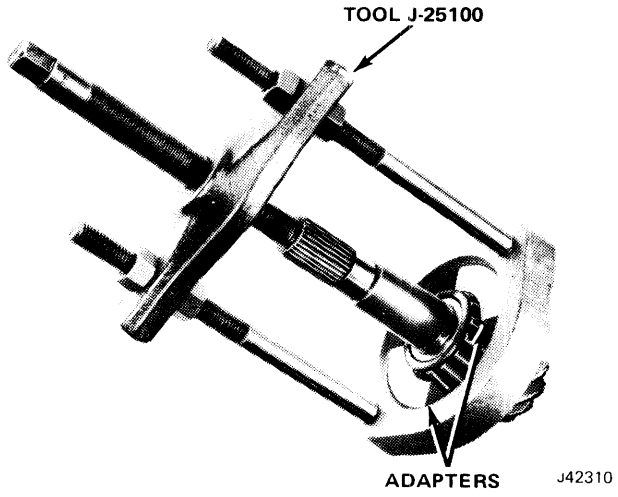

Fig. 10-48 Removing Differential Bearing—Models 30-44

Differential Bearing Removal—Model 60 Axle

Remove differential bearings using Press J-25123, Extension J-25124, Button J-25127, Holding Ring J-25125 and Adapter J-25128 (fig. 10-49).

Remove pinion inner bearing using Puller Set J-25123 with Reducer Ring J-25126 and Adapter J-25128.

Pinion Bearing Cup Removal

(1) Using brass drift, drive inner pinion bearing cup and shims from housing. Shims should be kept for assembly reference even if mutilated.

(2) Using brass drift, drive outer pinion bearing cup from housing.

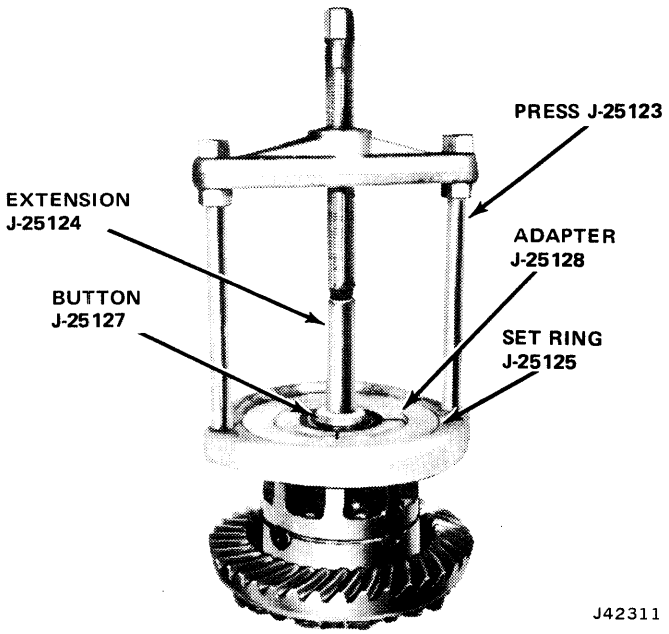

Fig. 10-49 Differential Bearing Removal—Model 60

Cleaning and Inspection

Clean all parts in solvent. Allow bearings to air dry. Dry other parts with compressed air.

Inspect differential, cups, and bearing rollers for pitting, galling, flat spots, or cracks.

Inspect differential case for elongated or enlarged pinion mate shaft hole. The machined thrust washer surface areas and counterbores must be smooth and free of nicks, gouges, cracks, or burrs. Inspect case for cracks or other visible damage which would necessitate replacement.

Inspect pinion mate shaft for excessive wear in contact area of differential pinions. Shaft should be smooth and round with no scoring or metal pickup.

Inspect side gears and pinions. They should have smooth teeth with a uniform contact pattern without excessive wear or broken surfaces. The side gear and and pinion thrust wahers should be smooth and free from any scoring or metal pickup.

Inspect pinion mate shaft lockpin for damage or looseness in case. Replace pin or case as necessary.

Inspect ring gear and pinion gear for worn or chipped teeth or damaged attaching bolt threads. If replacement is necessary, replace both the ring gear and pinion as matched set only.

Inspect pinion bearing cones, cups, and rollers for pitting, galling, excessive wear, or other visible damage. If inspection reveals that either are unfit for further service, replace both cup and cone.

Inspect differential case for cracks or other visible damage which might necessitate replacement. Raised metal on shoulder of bearing cup bores incurred in removing pinion cups should be flattened by use of a blunt punch.

Inspect pinion gear for damaged bearing journals and mounting shim surfaces or excessively worn splines. If replacement is necessary, replace both the pinion gear and ring gear (available in matched sets only).

Inspect pinion yoke for cracks, worn splines, pitted, rought or corroded oil seal contacting surface. Repair or replace pinion yoke as necessary.

Inspect pinion bearing shim pack for broken, damaged, or distorted shims. Replace shims if necessary during setting of pinion bearing preload.

Assembly

Pinion Gear Installation

NOTE: *Front axles use an oil slinger between the bearing cone and the pinion head. If the oil slinger is not installed correctly, the pinion shim pack dimension will be incorrect.*

(1) Install outer bearing cup using Driver J-25101.

(2) Install inner bearing cup using Installer J-25101 on Model 30 axles, and Installer J-25157 on Model 44 and Model 60 axles to drive cup into housing.

(3) Use Sleeve J-25218 to press inner bearing onto pinion shaft on axle Models 44 and 60. Use Sleeve J-25181 on Model 30 (fig. 10-50).

(4) Install pinion gear in housing and install 0.065-inch shim, inner bearing, and universal joint yoke to hold pinion in position for pinion depth adjustment. Install pinion nut. Tighten nut only enough to remove end play and allow 10 to 15 inch-pounds of rotating (drag) torque.

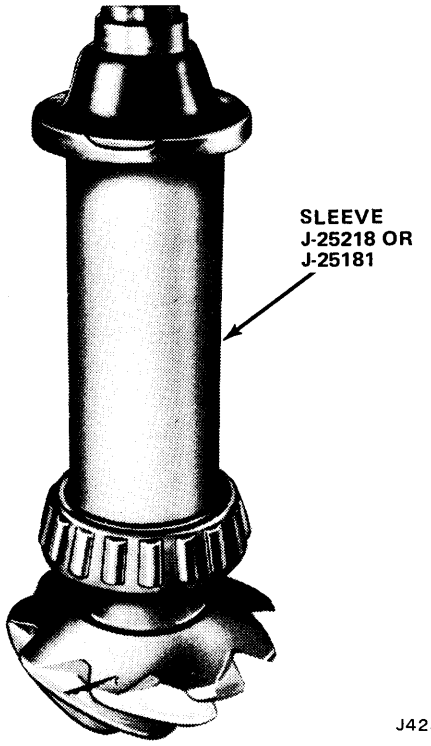

Fig. 10-50 Installing Pinion Bearing

Pinion Gear Depth

Pinion gear depth refers to the distance (measured in inches) from the end face of the pinion gear to the centerline of the axle shafts (fig. 10-35). This dimension is controlled by shims which are installed between the pinion gear inner bearing cup and the axle housing (fig. 10-51).

Ring and pinion gear sets are factory tested to detect machining variances. The test is started at a standard setting which is then varied to obtain the most desrable tooth contact pattern and quiet operation. When this setting is determined, the end of each pinion gear is etched with a plus (+), minus (-), or zero (number). This number indicates the amount, in thousandths of an inch, that the gear set varied from the standard setting and is the pinion depth variance.

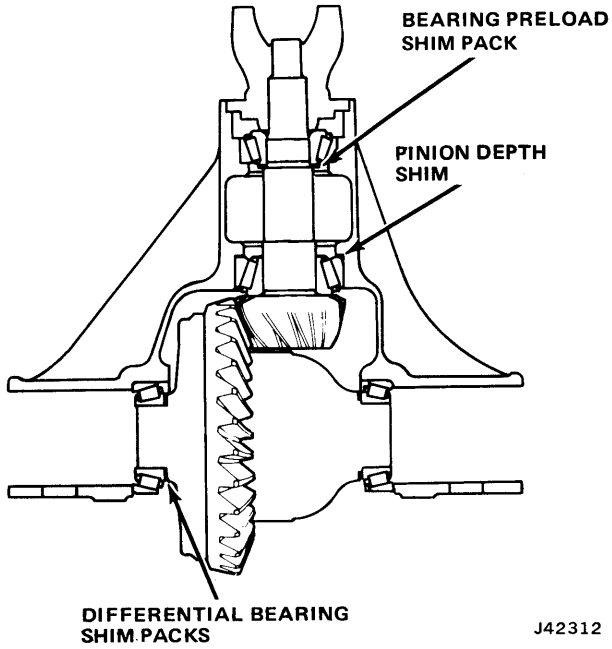

Fig. 10-51 Differential Shim Locations

The standard setting for axle Models 30, 44, and 60 are as follows:

- Model 30: 2.250
- Model 44: 2.625
- Model 60: 3.125

If the pinion is marked +2, the gear set varied from the standard setting by 0.002 inch and will require 0.002 inch less shims than a gear set marked 0 (zero). When the pinion gear is marked plus (+), the distance from the pinion end face to the axle shaft centerline must be more than the standard setting. If the pinion is marked -3, the gear set will require 0.003 inch more shims than a gear set marked 0 (zero).

When the pinion gear is marked minus (-), the distance from the pinion end face to the axle shaft centerline must be less than the standard setting. Refer to figure 10-35 for an illustration of standard setting dimension.

Pinion Gear Depth Adjustment

Observe the pinion depth variance marked on the pinon gear. If the number is preceded by a plus (+) sign, add that amount (in thousands) to the standard setting for the axle model being overhauled. If the number is preceded by a minus (-) sign, subtract that amount (in thousands) from the standard setting. The result of this addition or subtraction is the desired pinion depth. Record this figure for further reference.

NOTE: *If the gear is marked 0 (zero), use the standard setting.*

(1) Assemble Arbor Tool J-5223-4 and Discs J-5223-26 (Model 30 axle) or Discs J-5223-25 (Model 44 and 60 axles) and install in differential bearing cup bores in axle housing (fig. 10-52). Be sure discs are seated in bearing cup bores.

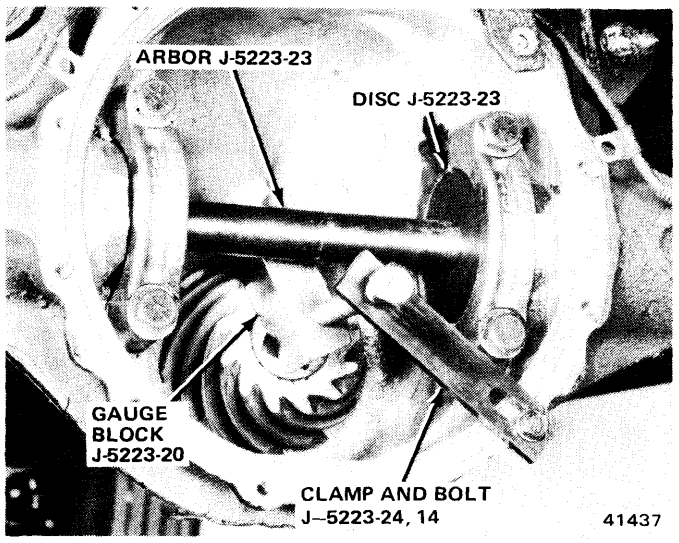

Fig. 10-52 Installing Pinion Depth Gauge Tools

(2) Install differential bearing caps in axle housing and over discs. Tighten bearing cap bolts securely, but do not tighten to specified torque.

(3) Install Plunger J-5223-27 in Gauge Block J-5223-20. Compress plunger and tighten thumbscrew in gauge block.

(4) Position Gauge Block J-5223-20 on end face of pinion gear with anvil end of gauge block seated on gear and plunger underneath Arbor Tool J-5223-4 (fig. 10-52).

(5) Install bolt J-5223-29 in Clamp J-5223-24 and mount assembly on axle housing (fig. 10-53). Use housing cover bolt to attach clamp to housing.

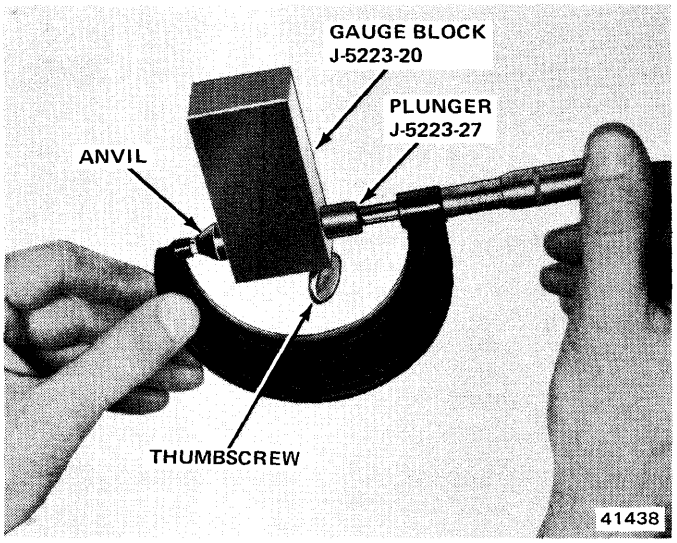

Fig. 10-53 Measuring Gauge Block

(6) Extend clamp bolt until it presses against gauge block with enough force to prevent gauge block from moving.

(7) Loosen thumbscrew in gauge block to release plunger. When plunger contacts arbor tool, tighten thumbscrew in gauge block to lock plunger in position. Do not disturb plunger position.

(8) Remove clamp and bolt assembly from axle housing.

(9) Remove gauge block and measure distance from end of anvil to end of plunger using a 2- to 3-inch micometer (fig. 10-53). This dimension represents the *measured pinion depth*. Record this dimension for assembly reference.

(10) Remove bearing caps and remove arbor tool and discs from axle housing.

(11) Remove pinion gear, rear bearing cup, and depth shim from axle housing.

(12) Measure thickness of depth shim removed in step (10). Add this dimension to measured pinion depth obtained in step (9). From this total, subtract the desired pinion depth. The result represents the correct shim thickness required.

NOTE: *Desired pinion depth is the standard setting plus or minus the pinion depth variance.*

The following examples illustrate the procedure for determining correct shim thickness.

Example I—Pinion Depth Variance is Plus (+) Model 44 Axle

Step 1—Determine desired pinion depth.

Add pinion depth variance (marked on pinion gear) to standard setting. Result is desired pinion depth.

2.625
+0.004
2.629

Step 2—Determine total measured pinion depth.

Add mesured pinion depth to measure shim thickness. Result is total measured pinion depth.

2.601
+0.107
2.708

Step 3—Determine correct shim thickness.

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

2.708
-2.629
0.079

Example II—Pinion Depth Variance is Minus (-) Model 60 Axle

Step 1—Obtain desired pinion depth.

Subtract pinion depth variance (marked on pinion gear) from standard setting. Result is desired pinion depth.

3.125
-0.002
3.123

Step 2—Determine total measured pinion depth.

Add measured pinion depth to measured shim thickness. Result equals total measured pinion depth.

3.120
+0.100
3.220

Step 3—Determine correct shim thickness.

Subtract desired pinion depth from total measured pinion depth. Result is correct shim thickness.

3.220
-3.123
0.097

(13) Install correct thickness shim in bearing cup bore of axle housing and install rear bearing cup and pinion gear.

Differential Side Gear Adjustment

Clearance between the differential side gears and case should be 0.000 inch to 0.006 inch. With the differential positioned on end (fig. 10-54), tap the differential lightly on a flat surface so differential gears settle in position. Measure the clearance between each side gear and the case with feeler gauges. If clearance exceeds 0.006 inch, add shims between the gears and case.

NOTE: *If shims are required, at least one shim should be placed on each side and the shim packs kept as even as possible. After adding shims, repeat the clearance check.*

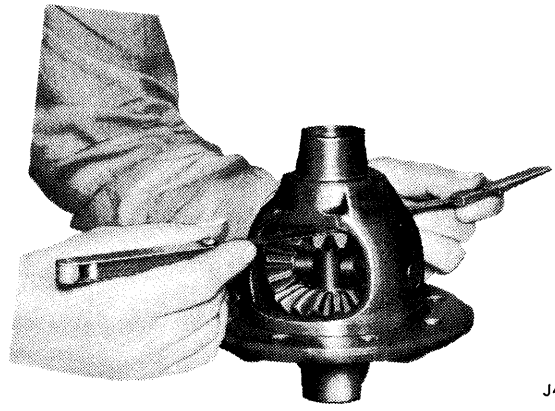

Fig. 10-54 Checking Side Gear Clearance

Differential Bearing Preload and Ring Gear Backlash Adjustment

Differential bearing preload is controlled by shims between the differential case and differential bearing.

(1) Install differential case and bearings in axle housing without shims and with bearing cups snug.

(2) Hold ring gear in contact with pinion, use screwdriver to move differential bearing cups toward center, and insert feeler gauge (on each side) between differential bearing cup and axle housing. There should be only 0.001 inch to 0.002 inch backlash remaining with feeler gauge inserted.

(3) After shim pack requirement for each bearing has been established, remove differential assembly. Make up shim packs and keep separated.

(4) Add additional 0.015-inch thickness of shims to pack on tooth side of ring gear.

(5) Place differential bearing shim packs on differential case under each bearing. Install bearings with Driver J-25136 for Model 44 rear axle and Driver J-25519 for Model 60 rear axle (fig. 10-55).

NOTE: *When overhauling front axle differential, check axle inner oil seals. Should new seals be required, install using Tool J-25111 for Model 44 axle (fig. 10-56).*

(6) Attach Carrier Spreader J-25102, install dial indicator, and spread carrier maximum of 0.020 inch.

(7) Remove dial indicator.

(8) Lubricate bearings and install differential in housing.

(9) Tap unit into place using plastic mallet. Be sure ring gear teeth mesh with pinion teeth.

(10) Apply sealing compound to bearing cap bolt threads. Tighten bolts to 40 foot-pounds torque (Model 30) or 80 foot-pounds torque (Model 44 and 60).

(11) Install dial indicator and check ring gear backlash (fig. 10-57). Check backlash at two points. Backlash must be between 0.005 inch to 0.010 inch. If backlash is incorrect, install shims between differential bearing shim packs until correct backlash is obtained.

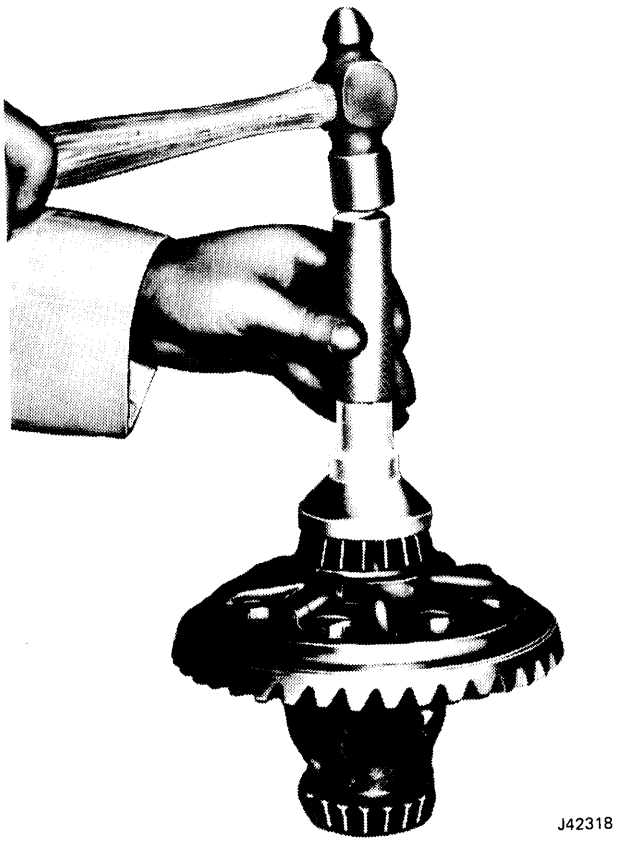

Fig. 10-55 Installing Differential Bearings

NOTE: *Changing position of a 0.005-inch shim from one side to the other will change the amount of backlash approximately 0.003 inch.*

(12) Check ring gear runout. A reading in excess of 0.006 inch indicates sprung differential case, dirt between case and gear, or loose ring gear bolts.

(13) Remove universal joint yoke and install oil seal using Driver J-25104 on all axles except Model 60 rear axle. Use Driver J-25110 on Model 60 rear axle.

(14) Install yoke on pionion and install pinion washer and nut. Tighten nut to 210 foot-pound torque (Models 30 and 44) or 260 foot-pounds torque (Model 60).

(15) Install axle shafts and axle housing cover.

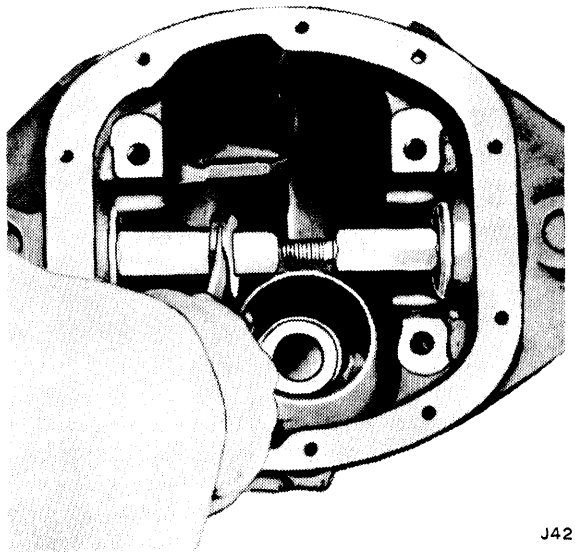

Fig. 10-56 Installing Inner Oil Seals

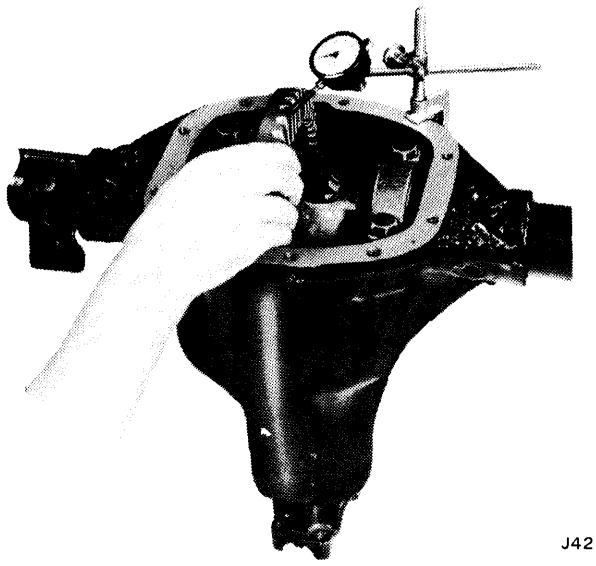

Fig. 10-57 Checking Ring Gear Backlash

TRAC-LOK DIFFERENTIAL

OPERATION

A conventional differential transmits all of the ring gear torque through the differential gears to the axle shafts. Torque is at all times equal on the axle shafts, and if one wheel slips, the other wheel can only put out as much torque as the slipping wheel.

The Trac-Lok differential differs in that part of the torque from the ring gear is transmitted through clutch packs between the side gears and differential case. The multiple disc clutches with radial grooves on the plates and concentric grooves on the discs are engaged by a preload from Belleville springs, plus separating forces from the side gears as torque is applied through the ring gear.

The Trac-Lok construction permits differential action when required for turning corners and transmits equal torque to both wheels when driving straight ahead. However, when one wheel encounters ice or leaves the ground and spins, the clutch packs automatically provide more torque to the wheel which is not spinning. The Trac-Lok differential resists wheel spin on bumpy roads and provides more pulling power when one wheel tries to slip. Pulling power will be automatically provided until both wheels start to slip. If, with unequal traction, both wheels slip, Trac-Lok operation is normal. In extreme cases of differences in traction, the wheel with the least traction may spin after the Trac-Lok has transferred as much torque as possible to the nonslipping wheel.

LUBRICATION

The Trac-Lok differential requires a special lubricant. Ordinary multipurpose gear lubricants MUST NOT be used. Use Jeep Trac-Lok Lubricant or equivalent only.

Trac-Lok differentials may be cleaned only by disassembling the unit and wiping it clean with shop towels.

NOTE: *The Trac-Lok differential is serviced at the same time intervals as the standard differential.*

TROUBLE SYMPTOMS

If noises or roughness such as chatter occur when turning corners, the probable cause is incorrect or contaminated lubricant.

Before any differential is removed and disassembled for chatter complaints, check to see if proper lubricant is used.

A complete lubricant drain and refill with specified differential lubricant will usually correct chatter.

DRAINING LUBRICANT

(1) Warm lubricant by driving vehicle for 5 minutes of operation in gear at 30 mph with wheels off ground (on hoist).

WARNING: *Never shift the transmission into gear with the engine running when only one wheel of a Trac-Lok equipped vehicle is raised. The vehicle could propel itself off the jack and cause damage or personal injury.*

(2) Drain lubricant while warm. Remove drain plug or cover to drain completely. If cover is removed, it may be necessary to replace gasket at this time.

(3) Refill axle with specified lubricant.

(4) Operate vehicle for approximately ten miles, making at least ten figure-eight turns to flush old lubricant out of clutch packs.

(5) Repeat steps (2) through (4), above, making sure to replace cover gasket if required.

NOTE: *If slight chatter occurs after draining and flushing Trac-Lock, drive vehicle an additional 10 to 20 miles or until chatter stops. If chatter still persists after the lubricant change, disassembly and repair will be necessary.*

OPERATIONAL TEST

A properly functioning Trac-Lok unit can be determined by the following operational test.

Place one wheel on good dry pavement, and the other on ice, mud, grease, etc.

Gradually increase engine rpm to obtain maximum traction prior to breakaway. The ability to move the vehicle effectively will demonstrate proper performance.

If extremely slick surfaces such as ice or grease are used, some question may exist as to proper performance. In these extreme cases, a properly performing Trac-Lok will provide greater pulling power by lightly applying the parking brake.

DISASSEMBLY

(1) Remove Trac-Lok differential from axle housing. Removal procedures are same as outlined for standard differential. Refer to Figure 10-58 for parts nomenclature.

(2) Install one axle shaft in vise with spline end up and tighten vise. Do not allow more than 2-3/4 inch of shaft to extend above top of vise (fig. 10-59). This will prevent shaft from fully entering side gear, causing interference with step plate tool used to remove differential gears.

(3) Mount differential case on axle shaft with ring gear bolt heads facing up (fig. 10-60).

(4) Remove and discard ring gear bolts.

(5) Place shop towels on vise under ring gear to protect gear when it is removed from case (fig. 10-60).

(6) Remove ring gear from case using rawhide hammer.

(7) Remove differential case from axle shaft and remove ring gear.

(8) Mount differential case on axle shaft.

(9) Remove snap rings from pinion mate shaft (fig. 10-61). Use two screwdrivers to disengage snap rings. Place shop towel on opposite opening of case to prevent snap rings from flying out of case.

NOTE: *On Model 60 Trac-Lok, pinion mate shaft is retained in case by roll pin. Use 3/16-inch diameter punch to remove pin.*

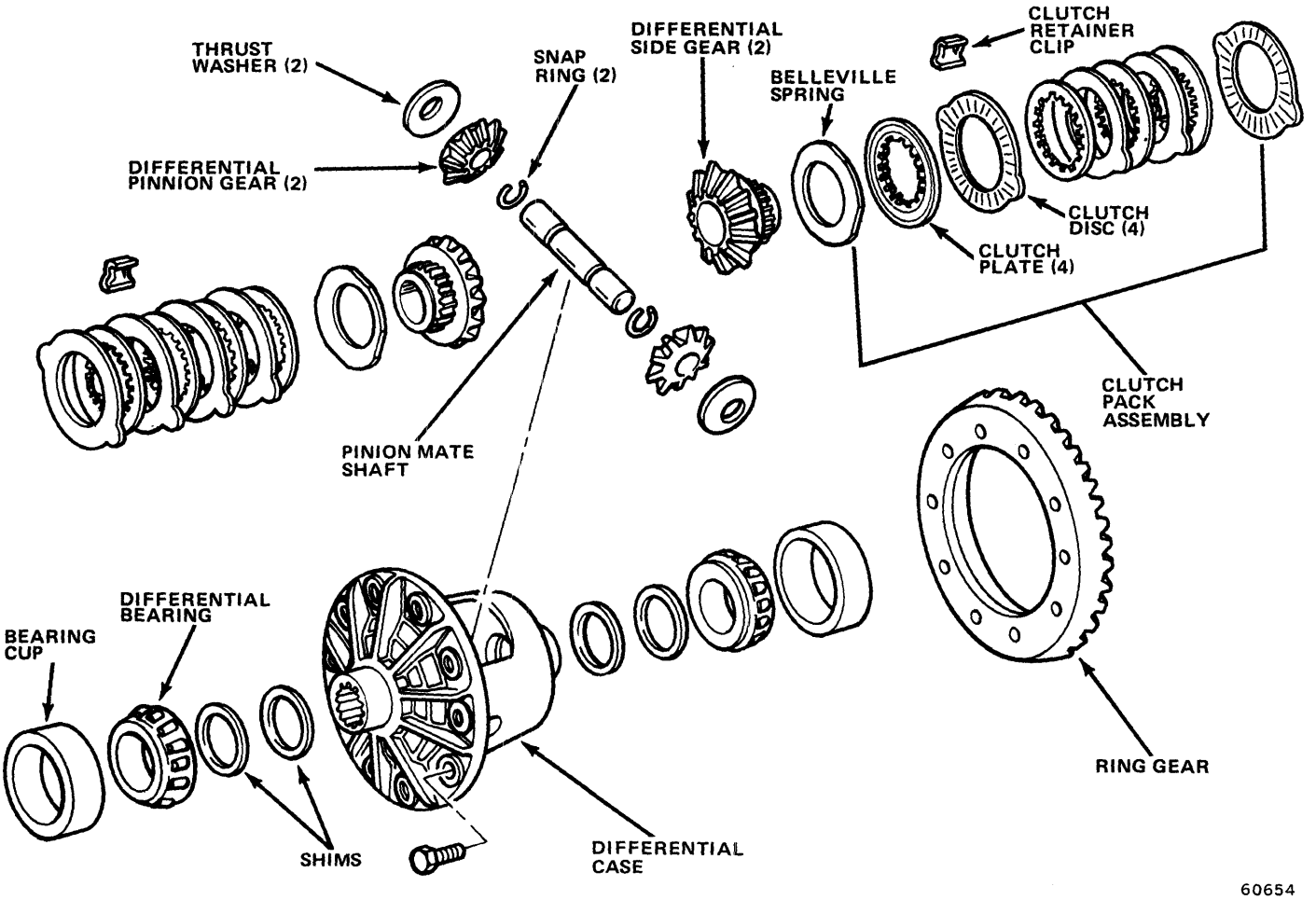

Fig. 10-58 Trac-Lok Differential

Fig. 10-59 Axle Shaft Positioned In Vise

(10) Remove pinion mate shaft using hammer and brass drift.

Fig. 10-60 Differential Mounted on Axle Shaft

NOTE: *Gear Rotating Tool J-23781 is required to perform the following steps. The tool consists of three parts: gear rotating tool, forcing screw, and step plate.*

(11) Install step plate in lower differential side gear (fig. 10-62).

Fig. 10-61 Removing Snap Rings from Pinion Mate Shaft

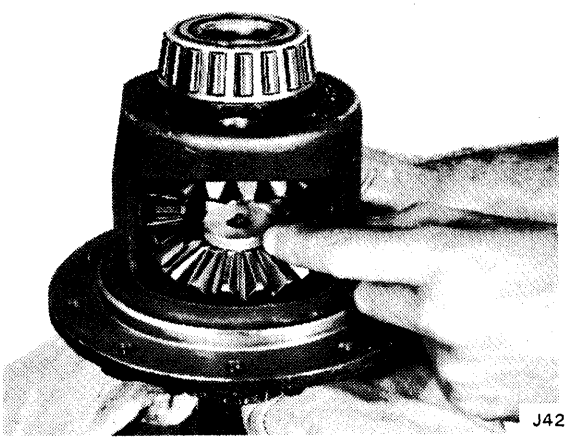

Fig. 10-62 Installing Step Plate

(12) Position pawl end of gear rotating tool on step plate (fig. 10-63).

(13) Insert forcing screw through top of case and thread into gear rotating tool.

NOTE: *Before using forcing screw, apply daub of grease to centering hole in step plate and oil threads of forcing screw.*

(14) Center forcing screw in step plate and tighten screw to move differential side gears away from differential pinion gears.

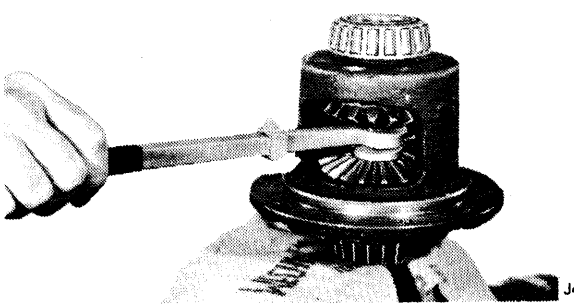

Fig. 10-63 Installing Gear Rotating Tool

(15) Remove differential pinion gear thrust washers using feeler gauge or shim stock of 0.030-inch thickness. Insert shim stock or gauge between weasher and case and withdraw shim stock and thrust washer (fig. 10-64).

(16) Tighten forcing screw until a slight movement of differential pinion gears is observed.

(17) Insert pawl end of gear rotating tool between teeth of one differential side gear. Pull handle of tool to rotate side gears and pinion gears. Remove pinion gears as they appear in case opening (fig. 10-65).

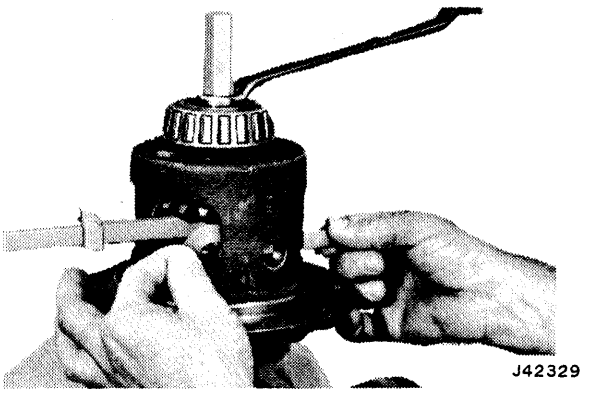

Fig. 10-64 Removing Pinion Thrust Washer

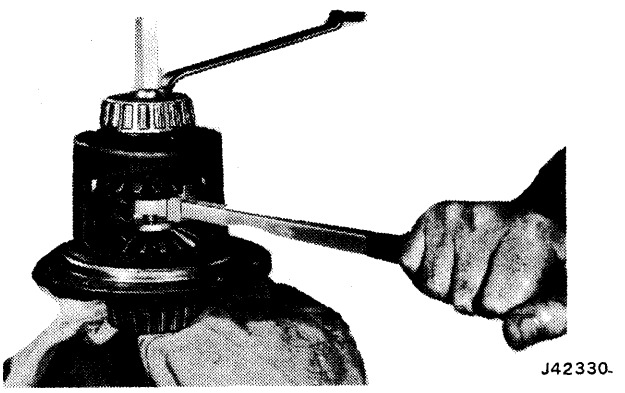

Fig. 10-65 Removing Pinion Gears

NOTE: *It may be necessary to adjust tension applied on Belleville springs by tightening screw before gears can be rotated in case.*

(18) Retain upper side gear and clutch pack in case by holding hand on bottom of rotating tool while removing forcing screw. Remove rotating tool, upper side gear, and clutch pack.

(19) Remove differential case from axle shaft. Invert case with flange or ring gear side up and remove step plate tool, lower side gear, and clutch pack from case. Remove retainer clips from both clutch packs to allow separation of plates and discs (fig. 10-66).

Fig. 10-66 Removing Side Gear and Clutch Pack

Inspection

Clutch Plates and Disc

If any one member of either clutch pack shows evidence of excessive wear or scoring, the complete clutch pack must be replaced on both sides.

Differential Side and Pinion Gears

The gear teeth should be checked for extreme wear or possible cracks. The external teeth of the side gear which holds the clutch pack also should be checked for wear or cracks. If replacement of one gear is required due to wear, both side gears, pinion gears, and thrust washers must be replaced.

Pinion Mate Shaft

If excessive wear is evident on any one of the retainer clips, it is suggested that all clips be replaced.

Differential Case

If scoring, wear, or metal pickup is evident on the machined surfaces, then replacement of the case is necessary.

Examples of radial groove clutch plate (A) and the concentric groove disc (B) are shown in figure 10-67.

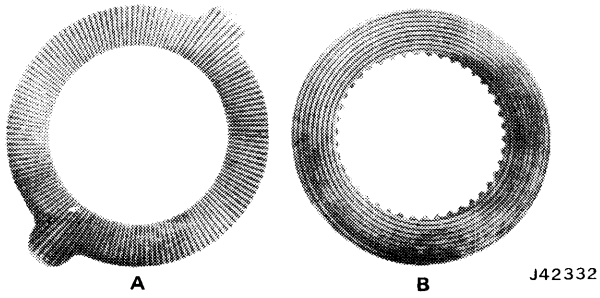

Fig. 10-67 Plate and Disc Identification

ASSEMBLY

(1) Lubricate differential gear teeth, thrust faces and splines. Lubricate clutch discs and plates. Use Trac-Lok lubricant or equivalent only.

(2) Assemble clutch packs. Install plates and discs in same position as when removed regardless of whether they are replacement or original parts.

(3) Install clutch retainer clips on ears of clutch plates. Be sure clutch packs are completely assembled and seated on ears of plates.

(4) Install clutch packs on differential side gears and install assembly in case.

NOTE: *Be sure clutch pack stays assembled on side gear splines and that retainer clips are completely seated in case pockets. To prevent pack from falling out of case, it will be necessary to hold them in place by hand while mounting case on axle shaft (fig. 10-68).*

(5) Mount case assembly on axle shaft (fig.10-68).

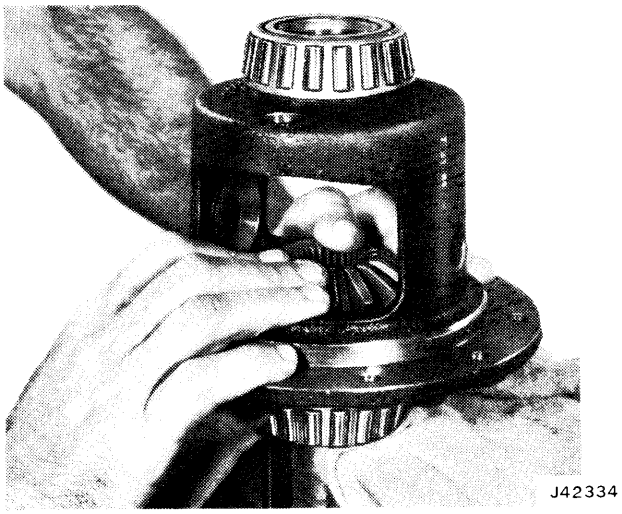

Fig. 10-68 Mounting Differential Case on Axle Shaft

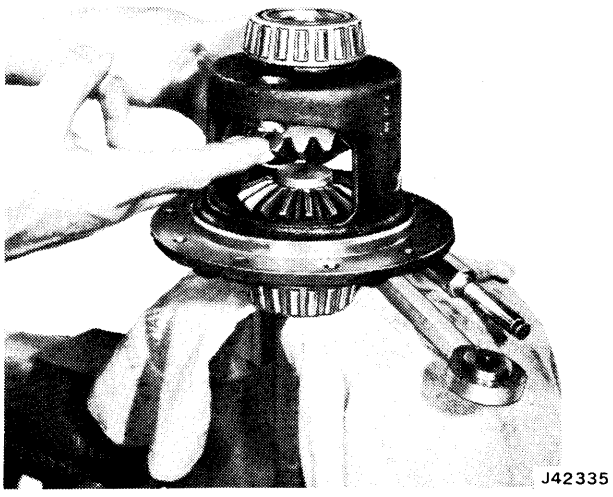

Fig. 10-69 Installing Clutch Pack and Side Gear

CAUTION: *When installing differential case on axle shaft, be sure that splines of side gears are aligned with those of axle shaft. Be sure clutch pack is still properly assembled in case after installing case on axle shaft.*

(6) Install step plate tool in side gear. Apply small daub of grease in centering hole of step plate.

(7) Install remaining clutch pack and side gear. Be sure clutch pack stays assembled on side gear splines and that retainer clips are completely seated in pockets of case (fig. 10-69).

(8) Position gear rotating tool in upper side gear.

(9) Keep side gear and rotating tool in position by holding with hand. Insert forcing screw through top of case and thread into rotating tool (fig. 10-70).

(10) Install both differential pinion gears in case. Be sure bores of gears are aligned. Hold gears in place by hand (fig. 10-71).

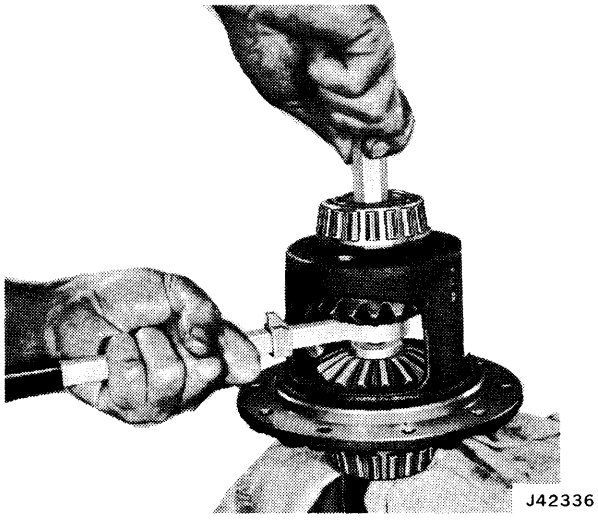

Fig. 10-70 Threading Forcing Screw into Rotating Tool

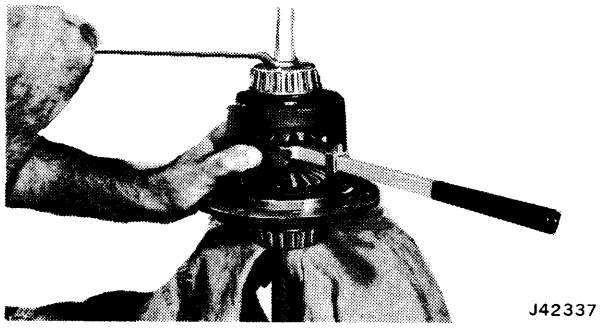

Fig. 10-71 Starting Pinion Gears into Case

(11) Tighten forcing screw to compress Belleville springs and provide clearance between teeth of pinion gears and side gears.

(12) While holding pinion gears in place, insert pawl of rotating tool between teeth of side gear. Pull on handle to rotate gear and allow pinion gears to be installed.

NOTE: *It may be necessary to adjust forcing screw by very slightly loosening or tightening until required load is applied to Belleville springs to allow side and pinion gears to rotate.*

(13) Pull on tool until handle hits gear. Remove pawl from between gear teeth and reposition handle and pawl. Repeat same operation until holes of both pinion gears are aligned with those of case.

(14) Lubricate both sides of pinion gear thrust washers with Trac-Lok lubricant or equivalent.

(15) Apply torque to forcing screw to allow installation of thrust washers.

(16) Install washers in case. Use small screwdriver to push washers into place (fig. 10-72).

CAUTION: *Be sure holes of washers and gears are aligned with those of case.*

(17) Remove forcing screw, rotating tool, and step plate.

(18) Lubricate pinion mate shaft and install in case using hammer. Be sure snap ring grooves of shaft are exposed to allow assembly of snap rings (fig. 10-73).

(19) Install snap rings.

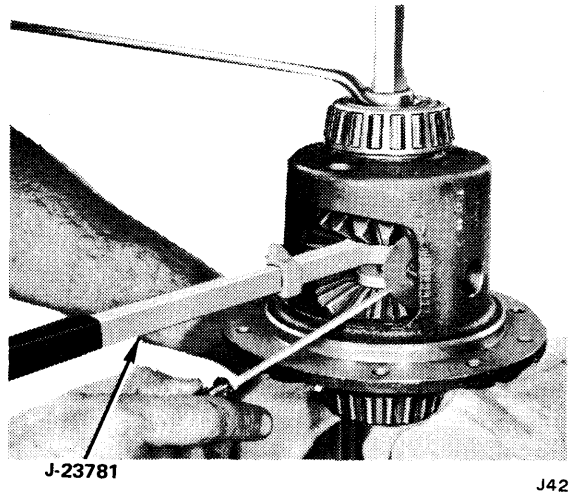

Fig. 10-72 Installing Pinion Gear Thrust Washers

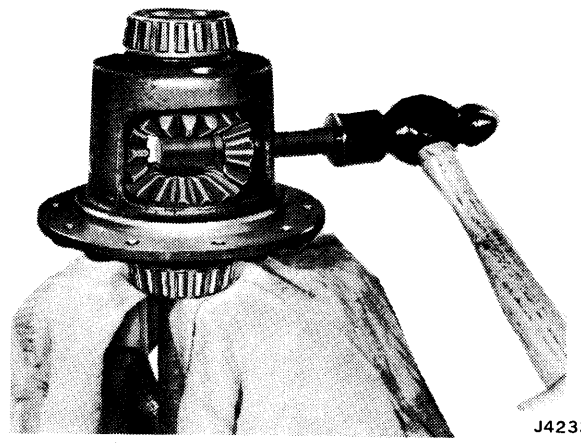

Fig. 10-73 Installing Pinion Mate Shaft

NOTE: *On Model 60 Trac-Lok, align hole in shaft with hole in case. Drive shaft into position and install retaining roll pin. If case is positioned in vise with machined side of ring gear flange facing upward, use 5/16-inch diameter punch to install roll pin until punch bottoms in case bore. If case is positioned in vise with machined side of ring gear flange facing downward, wrap piece of tape around 3/16-inch diameter punch approximately 1-3/4 inch away from end of punch and install roll pin in case until edge of tape is flush with roll pin bore.*

(20) Remove case from axle shaft. Install ring gear on case.

NOTE: *Use new ring gear bolts only. Do not use original bolts.*

(21) Align ring gear bolt holes with those of case. Install ring gear bolts finger-tight.

(22) Mount differential case on axle shaft, and tighten bolts evenly to specified torque. Refer to Torque Specifications.

(23) Install Trac-Lok differential assembly in axle housing. Follow service procedures previously outlined for conventional axles to complete differential and axle assembly servicing.

TRAC-LOK REPLACEMENT

If inspection reveals that replacement of the Trac-Lok as a unit is required, the following steps should be followed.

(1) Remove differential bearings and shims. Mark or tag each bearing and shim pack to indicate from which side of the case they were removed.

(2) Remove ring gear from case.

(3) Install ring gear on case. Be sure gear flange on differential case is free of nicks or burrs.

(4) Inspect shims and bearings which were removed. If shims and bearings show excessive wear or damage, they should be replaced. Be sure shims and bearings are used on same sides of replacement case as on old case.

(5) Install shims and differential bearings. Use step plate on bottom bearing to protect bearing from damage during installation of upper bearing. Seat bearings, using bearing driver tool.

(6) Lubricate differential bearings with specified lubricant and install case in axle housing.

(7) Follow service procedures previously outlined for conventional axles to complete differential and axle assembly servicing.

PROPELLER SHAFTS AND UNIVERSAL JOINTS

GENERAL

Torque transfer from the transfer case to the front and rear axles is accomplished by means of tubular propeller shafts. Each shaft is equipped with a universal joint at each end.

Because of the various combinations of drive line components, several types of propeller shafts are required.

Always check the replacement propeller shaft for correct part number before installation.

Both the propeller shafts and the universal joints should be checked regularly for foreign matter on the shafts, dented or bent shafts, and loose attaching bolts. Refer to Section B—Maintenance for proper lubrication requirements and specifications.

Universal Joint Service

Each shaft is equipped with a splined slip joint at one end to allow for variations in length caused by vehicle spring action. The yokes at the front and rear of te shaft must be aligned in the same horizontal plane. This is necessary to avoid vibration.

CARDAN CROSS-TYPE UNIVERSAL JOINT

Disassembly

NOTE: *Repair of single and double Cardan joints are similar except for the center ball and socket in the double Cardan joint (fig. 10-74). The rollers and bushings are replaceable once the joint is disassembled.*

(1) Position tube or propeller shaft, near cross-type universal joint, in vise and clamp tightly.

(2) Remove two cup retainer rings, which fasten bearing cups to tube yoke. If necessary, tap ends of bearing cups with brass hammer to release pressure on retainer rings before removal.

(3) Mount joint in vise so that ears on one yoke are supported on vise jaws.

(4) Using brass hammer, strike ear of yoke behind bearing to drive bearing out. Remove opposite bearing in same manner.

(5) Remove cross from yoke.

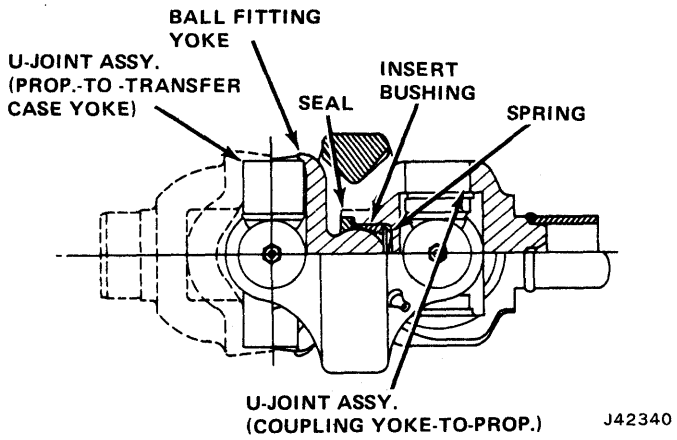

Fig. 10-74 Double Cardan Joint

(6) Disengage and remove tie link from bearing block retainers. Remove retainers and roller bearing cups from cross. Remove bearing seals and seal retainers from cross.

(7) Clean tube yoke of propeller shaft with suitable cleaning solvent and dry thoroughly.

(8) Inspect yoke for wear and damage. If bent out of alignment with propeller shaft tube, or if bearing bores are worn or damaged, replace propeller shaft.

Assembly

(1) If cross of universal joint has not been replaced, install four new seal retainers and bearing seals, one on each arm of cross.

(2) Install two roller bearing cup assemblies, on opposite arms of cross.

(3) Install bearing block retainer on each bearing cup, and connect retainers with tie link to fasten bearings to cross.

(4) Thread remaining arms of cross, which do not carry bearings, into tube yoke.

(5) Position yoke in vise, so that inner surface is supported by vise jaws.

(6) Using brass hammer, tap roller bearing cup assembly into bearing of yoke, so that bearing fits over ends of cross. Drive bearing cup downward until retaining ring groove is fully exposed below yoke inner surface.

(7) Attach bearing to yoke using a retainer ring; be sure retainer ring is properly seated.

(8) Reverse yoke on vise and repeat steps (5) through (7), above, to install opposite bearing assembly.

SPECIFICATIONS

Adjustments

Model 30 Front Axle

Differential Bearing Preload	.015 in
Differential Side Gear-to-Case Clearance	.000-.006 in
Drive Gear-to-Pinion Backlash	.005-.009 in
Drive Pinion Bearing Break-Away Preload	
Original Bearings	15-25 in-lbs
New Bearings	20-40 in-lbs

Model 44 Axle (Full-Floating and Semi-Floating Types)

Differential Bearing Preload	.015 in
Differential Side Gear-to-Case Clearance	.000-.006 in
Drive Gear-to-Pinion Backlash	.005-.010 in
Drive Pinion Bearing Break-Away Preload	
Original Bearings	10-20 in-lbs
New Bearings	20-40 in-lbs

Model 60 Axle

Differential Bearing Preload	.015 in
Differential Side Gear-to-Case Clearance	.000-.006 in
Drive Gear-to-Pinion Backlash	.005-.009 in
Drive Pinion Bearing Break-Away Preload	
Original Bearings	10-20 in-lbs
New Bearings	20-40 in-lbs

AMC – Jeep Axle (Semi-Floating Tapered Shaft)

Axle Shaft End Play (Shims—Left Side Only)	.004-.008 in (.006 in desired)
Bearing Preload (Collapsible Sleeve)	17-25 in-lbs
Differential Bearing Preload (Shims)	.008 in
Differantial Case Flange Runout (Inspection only—no adjustment)	.002 in max
Differential Gear-to-Case Preload (Adjusted Using Oversize Thrust Washers)	0-180 in-lbs
Ring Gear-to-Drive Pinion Gear Backlash (Shims)	.005-.009 in (.008 in desired)
Pinion Gear Standard Setting (Shims)	2.547 in

Torque Specifications

Service Set-To Torques should be used when assembling components.
Service In-Use Recheck Torques should be used for checking a pre-torqued item.

Model 30 Front Axle

	Service Set-To Torques	Service In-Use Recheck Torques
Axle Housing Cover	20	15-25
Differential Bearing Bolts	45	35-50
Drive Gear-to-Case Bolts	55	45-65
Lower Ball Joint Nut	80	—
Pinion Yoke Nut	210	200-220
Universal Joint U-Bolts	15	13-18
Upper Ball Joint Nut	100	—
Upper Ball Stud Seat	50	—
Wheel-to-Hub Nuts	80	65-90

Model 44 Axle
(Full-Floating and Semi-Floating Types)

Axle Housing Cover	20	15-25
Backing Plate Mounting Bolts/Nuts		
Front Brakes	28	25-30
Rear Brakes	30	25-35
Differential Bearing Bolts	80	70-90
Disc Brake Shield Bolt	8	5-10
Disc Brake Shield Nuts	35	30-40
Drive Gear-to-Case Bolts	55	45-65
Lower Ball Joint Nut	80	—
Pinion Yoke Nut	210	200-220
Upper Ball Joint Nut	100	—
Upper Ball Stud Seat	50	—
Universal Joint Flange Bolts	35	25-45
Universal Joint U-Bolts	15	13-18
Wheel-to-Hub Nuts	80	65-90

Model 60 Axle

	Service Set-To Torques	Service In-Use Recheck Torques
Axle Housing Cover Bolts	20	15-25
Backing Plate Mounting Bolts/Nuts	50	45-55
Differential Bearing Bolts	80	70-90
Drive Gear-to-Case Bolts	105	100-110
Pinion Yoke Nut	260	250-270
Universal Joint Flange Bolts	35	25-45
Universal Joint U-Bolts	15	13-18
Wheel-to-Hub Nuts	120	110-125

AMC-Jeep Axle
(Semi-Floating Tapered Shaft)

Axle Cover Screw	170 in-lbs	150-190 in-lbs
Brake Tubing-to-Rear Wheel Brake Cylinder	97 in-lbs	90-105 in-lbs
Differential Bearing Capscrew	87	80-95
Ring Gear-to-Case Screw	105	95-115
Rear Brake Support Plate Screw Nut	32	25-40
Rear Wheel Hub-to-Shaft Nut	250 Min	250 Min
Universal Joint U-Bolt Clamp	13	10-18

All torque values given in foot-pounds with dry fits unless otherwise specified.
Refer to the Standard Torque Specifications and Capscrew Markings Chart in Section A of this manual for any torque specifications not listed above.

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Pinion Angle Chart

	Front		Rear	
	OK Range	Set-To	OK Range	Set-To
Wagoneer — Cherokee Quadra-Trac)	8°	7°-9°	5°	4°-6°
Cherokee (Dana 20)	8°	7°-9°	5°	4°-6°
Truck (Model 25)	8°	7°-9°	3°30′	2°30′-4°30′
Truck (Model 45)	8°	7°-9°	5°	4°-6°

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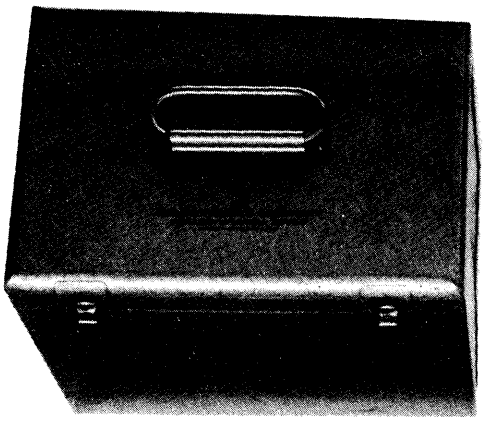
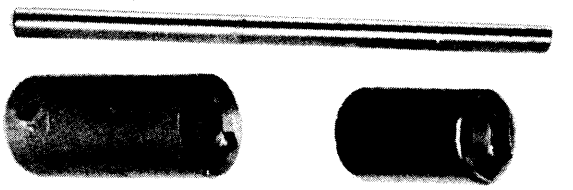
Special Tools



J-25100 PULLER SET



J-25105 AND J-25106 WRENCH

J-25103 WRENCH

J-25173 FLANGE INSTALLER

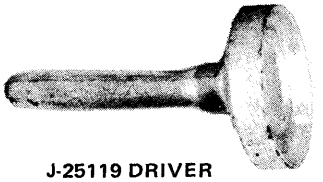
J-25124 EXTENSION

J-25136 DRIVER

J-25135 DRIVER

J-25218 SLEEVE

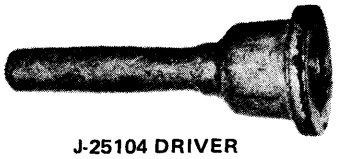
J-25127 BUTTON



J-25119 DRIVER

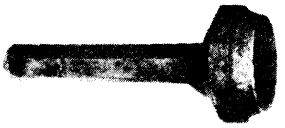
J-25181 SLEEVE

J-25111 INSTALLER



J-25104 DRIVER

J-25133 PULLER



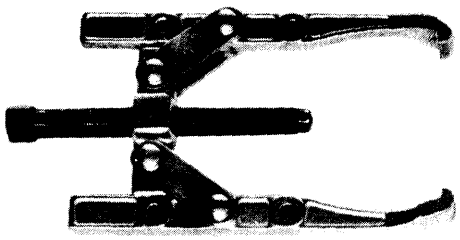
J-25101 DRIVER

J-25157 INSTALLER
J-25122 HANDLE

J-25180 PULLER

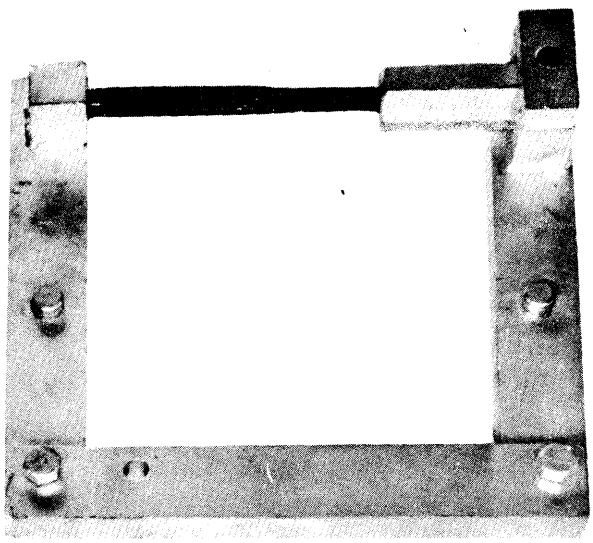
J42341

Special Tools



J-25215 PULLER

J-25211-3 BUTTON



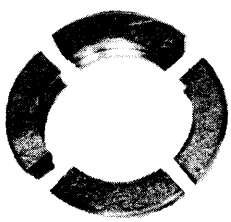
J-25102 SPREADER

J-25211-1 PLATE

J-25211-2 CUP

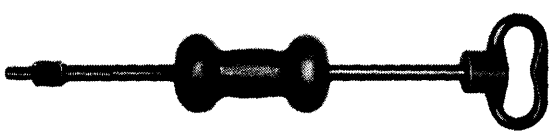
J-25211-4 ADAPTER

J-25158 WRENCH NUT

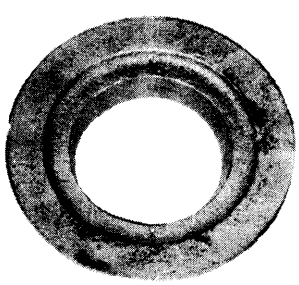


J-25128 ADAPTER

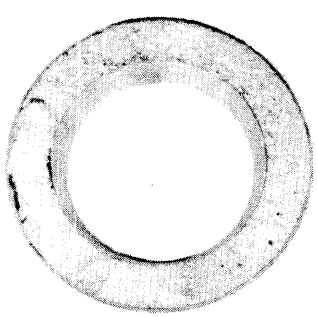
J-25170 DRIVER AND ADAPTER



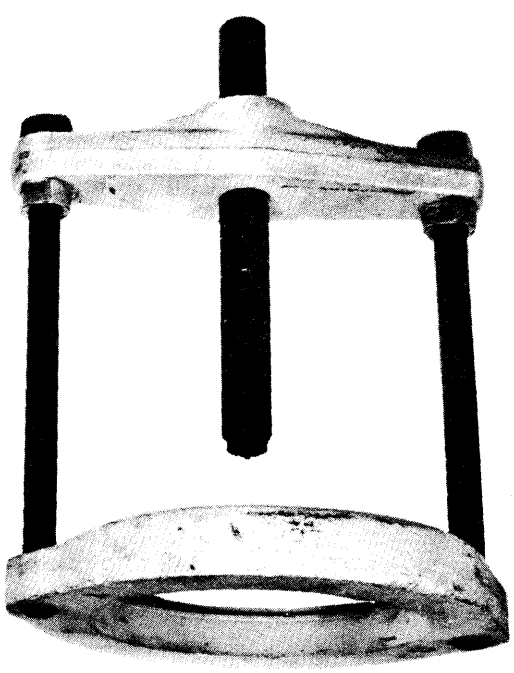
J-2619-01 SLIDE HAMMER



J-25126 REDUCER RING



J-25125 HOLDING RING



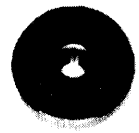
J-25123 PRESS SET

J42342

Special Tools

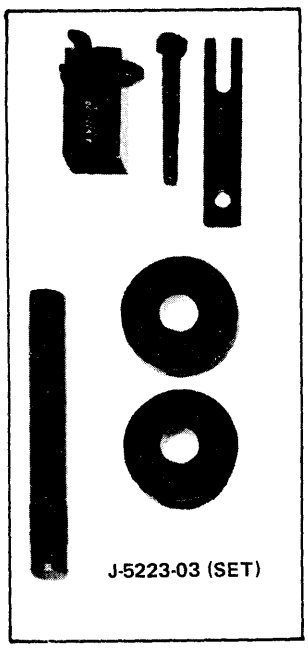
J-21787
FRONT PINION
BEARING CUP
REMOVER

J-21786
REAR PINION
BEARING REMOVER



J-8608
REAR PINION BEARING
CUP INSTALLER

J-8611-01
FRONT PINION
CUP BEARING
INSTALLER



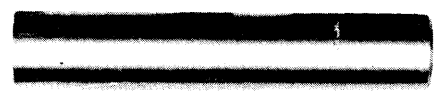
J-5223-03 (SET)

J-5223-03
PINION SETTING GAUGE

J-8092 (J-8592) -
DRIVER HANDLE

J-21784
AXLE DIFFERENTIAL
BEARING INSTALLER

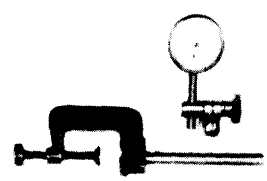
J-21788
AXLE SHAFT OIL
SEAL INSTALLER



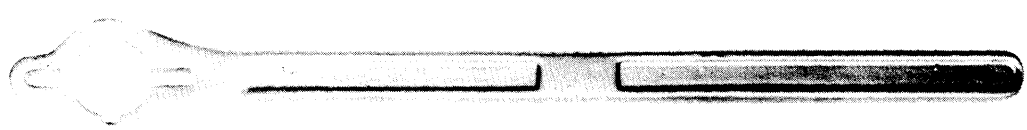
J-22697 REAR PINION
BEARING INSTALLER

J-9233
PINION OIL SEAL REMOVER

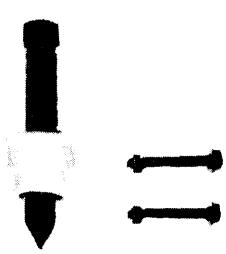
J-2266 REAR PINION
OIL SEAL INSTALLER



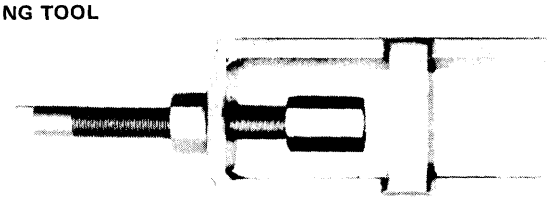
J-8001
DIAL INDICATOR SET



J-8614-01
YOKE HOLDING TOOL



J-8614-2
J-8614-3
YOKE REMOVER
TOOLS



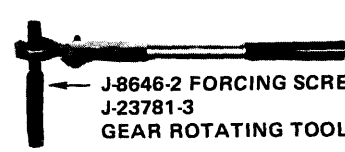
J-2498
AXLE SHAFT REMOVER
(TAPERED AXLE SHAFT)

J-23781-7 STEP PLATE

J-2092 – 7-9/16 OR 8-7/8 INCH AXLE
END PLAY CHECKING TOOL

J-22575
PINION NUT SOCKET

J-2497-01
DIFFERENTIAL BEARING PULLER



J-8646-2 FORCING SCREW
J-23781-3
GEAR ROTATING TOOL

A41472