

AXLES - PROPELLER SHAFTS

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AXLES

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GENERAL

The front axle on all Jeep 4-wheel drive vehicles is a line driving unit with steering knuckles and hypoid driving gears. The drive is full-floating through axle shafts built integrally with universal joints which revolve in the steering knuckles. All Cherokees, Wagoneers, and Trucks are equipped with the Model 44F front axle while the CJ-5 Models are equipped with the Model 30.

On all front axles, front wheel toe-in is adjustable.

However, the required caster and camber of the front wheels is built into the axles. Wheel camber cannot be changed. Wheel caster can be adjusted by placing tapered shims or wedges between the spring and spring seats.

The CJ-5/CJ-6, Cherokee, Wagoneer, and Truck (up to and including 5600 GVW) use the Model 44 semi-floating rear axle with flanged axle shafts. Trucks from 6500 GVW to 8000 GVW are equipped with the Model 60 full floating rear axle (refer to Axle Application Chart).

AXLE APPLICATION CHART

Jeep Model	Engine		Transmission			Axle Model		Axle Ratio	
			3-Speed Manual Model	4-Speed Manual Model T-18	Auto-matic				
	CID	Carb				Front	Rear	Std	Opt
CJ-5/CJ-6	232	1V	T-14A	Opt. CJ-5 Only	NA	Model 30 (Open Knuckle) Full Floating		3.73	4.27
	258	1V							
	304	2V	T-15A	NA					
Cherokee	258	1V	T-14A	NA	Opt.	Model 44F (Open Knuckle) Full Floating	Model 44 Semi-Floating (Flanged Shaft)	3.54	4.09
	360	2V	T-15A	Opt.					
	360	4V	NA	NA	Std.			3.07	3.54
	401	4V							
Wagoneer	360	2V	NA	NA	Std.				
	360	4V	NA	NA	Std.				
	401	4V							
J-10 Truck 5200 5600	258	1V	T-14A	Opt.	Opt.			4.09	NA
	360	2V	T-15A						
	360	4V	NA	NA	Std.			3.54	4.09
	401	4V							
J-20 Truck 6500 7200 8000	360	2V	T-15A	Opt.	Opt.		Model 60 Full Floating	3.73	4.09
	401	4V	NA	Std.	Opt.				

All axle housings should be checked periodically for weld cracks and other damage that may cause loss of lubricant, or affect driving characteristics, especially misalignment of the front wheels.

If the vehicle is exposed to water deep enough to cover the hubs of either the front or rear axles, it is recommended that the wheel ends be disassembled and inspected daily for water damage or contamination.

Examine, clean, and replace damaged parts, if necessary, prior to lubricating and assembling the wheel end components. Pay particular attention to the bearings on the front driving axle.

Examine, clean, and replace damaged parts, if necessary, prior to assembling the cover housing and refilling with MIL-L-2105-B (SAE 80) or equivalent for standard axles and part number 94557 for Trac-Lok Axles.

AXLE IDENTIFICATION

The axle model number is cast in the axle housing as illustrated in figure 10-1.

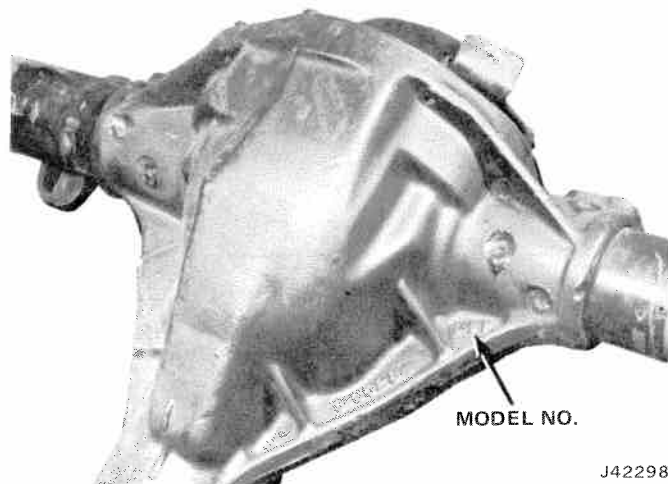


Fig. 10-1 Axle Model Identification

The axle build date, and the axle manufacturer's part numbers are stamped in the right-hand axle tube on the cover side (fig. 10-2). The build date of the axle is interpreted as follows: the first number is the month, second number is the day of the month, third number is the year, the alpha-letter is the shift and the last number is the assembly line. In the event there are two build dates, the latter will be the date in which the brake components were assembled. It may be necessary to wipe or scrape dirt from the tube in order to read the numbers.

The gear ratio tag indicates the Jeep manufacturing reference part number, the tooth combination of the ring gear and pinion, and also the total gear ratio.

Axles equipped with the Trac-Lok differential have a special tag specifying that special lubricant only must be used: Use only Jeep Trac-Lok Lubricant, part number 94557 (fig. 10-2).

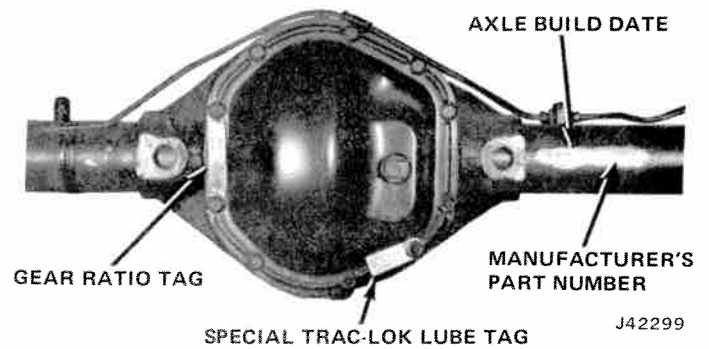


Fig. 10-2 Ratio, Build Date, and Trac-Lok Differential Identification

AXLE TESTING AND DIAGNOSIS

In diagnosing a reported 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 drive the wheels will produce some noise in the 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 trouble to a specific unit.

With the vehicle stopped and the transmission in neutral, run the engine at various speeds. If the noise is heard during this test, the noise is confined to the engine, exhaust system, clutch, transmission, transfer case, or engine-driven accessory equipment.

Prior to the diagnostic road test, check the tire pressure and axle lubricant levels.

Tire Noise Tests

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

Wheel Bearing Tests

Worn, loose, or damaged wheel bearings may be confused with axle noise. 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 is to turn the vehicle alternately left and right, which side-loads the bearings, causing the defective bearing to become noisy.

Axle Tests

Drive the vehicle a sufficient distance to warm the axle to the required operating temperature. Tests should then be performed using different transmission and transfer case shift combinations.

Axle noise conditions are usually related to vehicle speed rather than engine rpm or transmission gears.

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

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

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

Since the drive pinion turns faster than the drive gear, the drive pinion bearings produce a higher pitch than the differential bearings. The drive pinion bearings are usually heard at low vehicle speeds (20 to 30 mph).

Differential bearings are lower in pitch because they are turning at the same speed as the wheels when the vehicle is driven straight ahead. Differential bearing noise will not vary when the vehicle is turned alternately left to right or when the brakes are gently applied.

Axle Noisy on Pull and Coast

- Excess backlash bevel gear and pinion - adjust.
- End play pinion shaft - adjust.
- Worn pinion shaft bearing - replace.
- Pinion set too deep in bevel gear (too tight) - adjust.
- Wrong Trac-Lok differential lubricant - replace.

Axle Noisy on Pull

- Pinion and bevel gear out of adjustment - adjust.
- Pinion bearings rough - replace.
- Pinion bearings loose - adjust.

Axle Noisy on Coast

- Excessive backlash in bevel gear and pinion - adjust.
- End play in pinion shaft - adjust.
- Improper tooth contact - adjust.
- Rough bearings - replace.

Backlash

Excessive backlash in the vehicle drive line may be the result of excessive backlash in the transmission, propeller shaft spline, universal joint, ring gear and pinion, the axle shaft spline, or the differential.

Excessive backlash in the differential may be measured as follows:

- (1) Jack up one rear wheel.
- (2) Put the transmission in gear.
- (3) Measure the travel of the jacked up wheel on a 10-inch radius from the wheel center. This total movement should not exceed 1-1/4 inch in a new unit. In order to restrict the backlash to the axle only, make sure that the yoke of the propeller shaft does not move during the check. On older vehicles, check the universal joints and replace if worn.

If all causes of backlash mentioned above have been eliminated with the exception of the differential and that still exceeds the maximum allowable movement, overhaul the differential. Generally, the assignable cause will be worn differential pinion gear washers or improper adjustment of the bevel gear and pinion.

Chatter - Trac-Lok

Differential chatter in the Trac-Lok rear differential is usually caused by improper lubricant. Change lubricant.

Drive Line Vibrations

Vibration in the drive line can be caused by a variety of conditions. The following is a checklist that can be used to isolate the most common causes.

(1) Check condition of tires. Compare differences in tread wear, side to side and front to rear. Be sure tire type and sizes are same, especially Quadra-Trac units.

(2) Check tire pressures and set to specifications.

(3) Check wheel and tire balance and correct if necessary.

(4) Check all drive line components (U-joints, engine mounts, transmission mounts, spring bushings) for tightness.

(5) Check front and rear pinion angle as follows:

(a) Place the vehicle on rail hoist (one that supports the vehicle on all four tires).

(b) Check levelness of vehicle by placing a bubble protractor on straight portion of frame side rail and reading out-of-level condition. Shim low end by placing a spacer between tire and lift rail to bring vehicle to level position.

(c) Using bubble protractor, check pinion angle by taking a reading from cover face of differential housing. Reading can be taken from cover flange; however, if desired, differential can be drained, cover removed, and reading taken from machined surface of housing. Refer to Pinion Angle Specifications Chart on page 10-4.

Other Axle Conditions

A knocking or clucking noise heard at low speed when coasting may be caused by a loose-fitting differential gear in the differential case bore. When this

PINION ANGLE SPECIFICATIONS

	FRONT		REAR	
	OK RANGE	SET TO	OK RANGE	SET TO
WAGONEER & CHEROKEE (QUADRA-TRAC)	6° - 8°	7°	1/2° - 2-1/2°	1-1/2°
CHEROKEE (DANA 20)	6° - 8°	7°	6° - 8°	7°
TRUCK MODELS 25, 45	6° - 8°	7°	4° - 6°	5°
TRUCK MODELS 26, 46	6° - 8°	7°	2° - 4°	3°

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condition is encountered, applying the brakes lightly will usually reduce the sound.

Differential gear noise is considered normal when spinning a rear wheel for on-the-vehicle wheel balancing, or when a rear wheel is spinning due to icy conditions.

When a noise has been determined to be caused by the bearings, the gears do not require replacement unless an inspection reveals signs of obvious damage.

When the noise is determined to be caused by the drive pinion and drive gears at low mileages, the need for bearing replacement is dependent upon inspection of the bearings during overhaul.

FRONT AXLE SHAFT

Removal - CJ-5 and CJ-6

- (1) Remove hub cap.
- (2) Remove drive flange snap ring.
- (3) Remove axle flange bolts.
- (4) Remove axle flange with Puller W-163.
- (5) Release locking lip of lockwasher and remove outer nut, lockwasher, adjusting nut, and bearing lockwasher. Use Wrench W-144 for removal.
- (6) Back off on brake adjusting starwheel adjuster and remove brake drum assembly with bearings. Be careful not to damage the oil seal.
- (7) Remove brake backing plate and set in convenient place.
- (8) Remove spindle and spindle bushing.
- (9) Remove axle shaft and universal joint assembly.

Installation

- (1) Clean all parts of dirt and foreign matter.
- (2) Enter universal joint and axle shaft assembly in axle housing, taking care not to knock out the inner oil seal.
- (3) Enter splined end of axle shaft into differential and push into place.
- (4) Install wheel bearing spindle and bushing.
- (5) Install brake backing plate.
- (6) Grease and assemble wheel bearings and oil seal.

(7) Install the wheel hub and drum on the wheel bearing spindle. Install the wheel bearing washer and adjusting nut. Tighten nut with Wrench W-144 until there is a slight drag on the bearings when the hub is turned. Then back off approximately one-sixth turn.

(8) Install lockwasher and nut. Tighten nut and bend lip of lockwasher over on locknut.

(9) Install drive flange and gasket on hub and attach with capscrews. Install snap ring on outer end of axle shaft.

(10) Install hub cap.

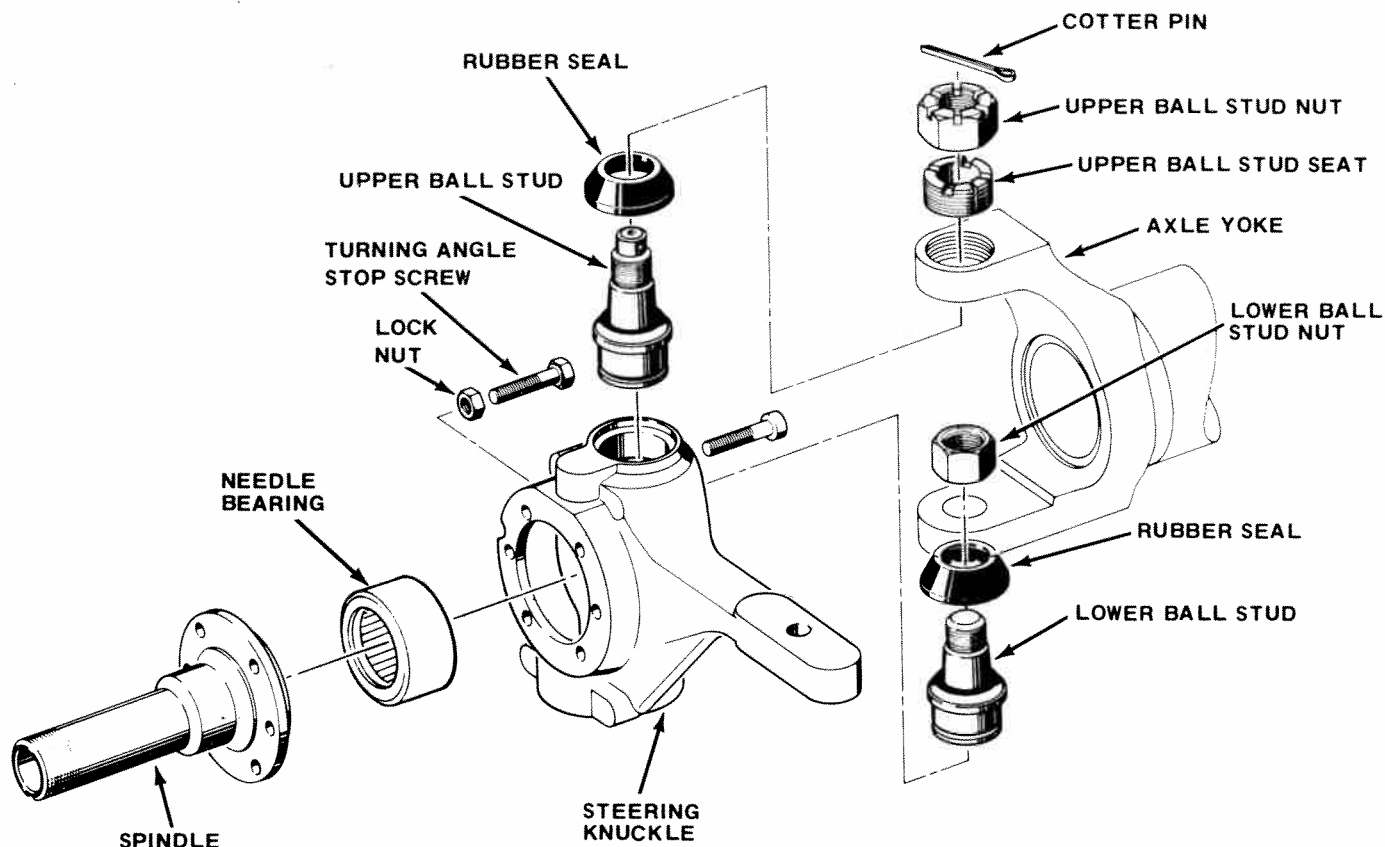
(11) Install wheel.

Removal - Cherokee, Wagoneer, Truck

- (1) Raise and support front of vehicle.
- (2) Remove wheel and dust cover.
- (3) Remove axle shaft snap ring, drive gear, and pressure spring. If drive gear is stuck to the shaft, use a screwdriver to pry out gear.
- (4) Use Nut Wrench W-372 to remove wheel bearing locknut, lockring, and wheel bearing adjusting nut.
- (5) Remove two bolts securing brake caliper assembly to disc brake shield and place caliper assembly aside.
- (6) Remove rotor and hub assembly (spring retainer and outer wheel bearing will slide out as assembly is removed).
- (7) Remove six nuts and one bolt securing spindle and disc brake shield.
- (8) Remove spindle and disc brake shield. If necessary tap lightly with a rawhide hammer to free components from knuckle (fig. 10-3).
- (9) Slide axle shaft out through the steering knuckle (fig. 10-3).

Installation - Cherokee, Wagoneer, Truck

- (1) Install axle shaft, spindle, and bearing assembly.
- (2) Install brake shield, rotor, and hub assembly. Install and align brake caliper assembly.
- (3) Install inner wheel bearing adjusting nut (the one with the peg on the side). Tighten nut to 50 foot-pounds torque using wheel bearing wrench. Rotate hub, then back off adjusting nut 1/4-turn maximum.



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Fig. 10-3 Model 44F Steering Knuckle Assembly

Install lockwasher with inner tab lined up with keyway in spindle. Turn adjusting nut until the peg engages the nearest hole in the lockwasher. Install outer locknut and tighten to 50 foot-pounds torque (minimum) using wheel bearing wrench.

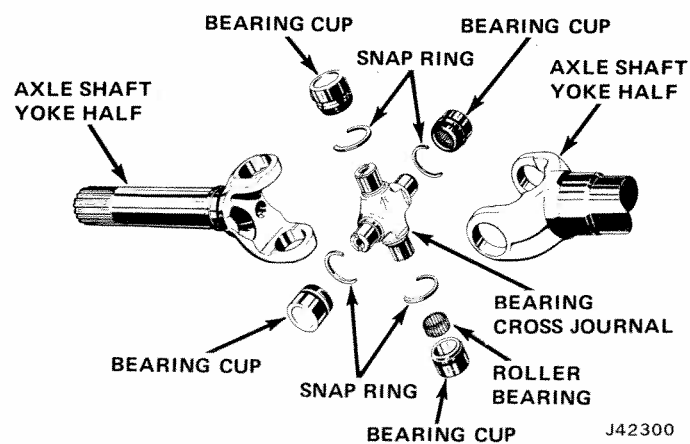
- (4) Install spring retainer, spring, and drive gear.
- (5) Push on gear to allow clearance for installation on axle shaft snap ring.
- (6) Install wheel and dust cover.
- (7) Remove support stands and lower vehicle.

UNIVERSAL JOINT REPLACEMENT

- (1) Remove axle shaft.
- (2) Remove snap rings from the bearing cup assemblies (fig. 10-4).
- (3) Press on end of one bearing cup assembly until opposite bearing is pushed from yoke half.
- (4) Turn yoke over and press first bearing back out by pressing on exposed end of journal shaft.

NOTE: To avoid damaging the bearing, use a soft drift with a flat face about $1/32$ inch smaller in diameter than the hole in the yoke arm to drive out the bearing.

- (5) Repeat step (4) for other two bearings. Then lift out bearing cross-journal by sliding it to one side.



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Fig. 10-4 Axle Shaft Universal Joint

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

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

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

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

- (10) Press bearing cup on from opposite side until firmly seated.
- (11) Repeat steps (9) and (10) on other journal.
- (12) Install snap rings on bearing cup assemblies.

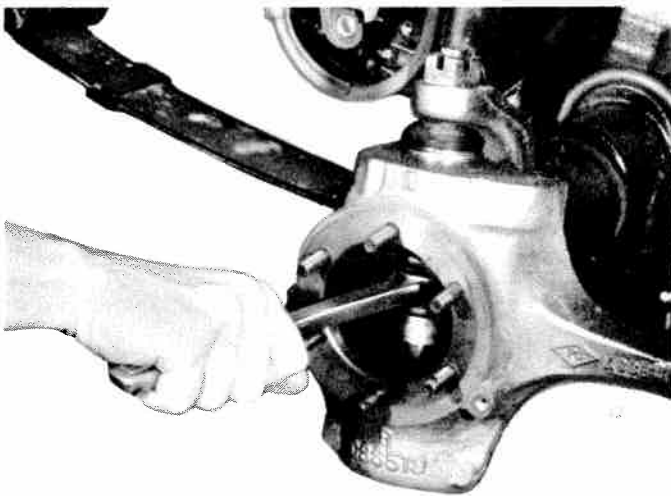
NOTE: If the joint binds when assembled, tap the yoke lightly to relieve any pressure on the bearings at the end of the journal.

- (13) Install axle shaft.

Steering Knuckle Removal

NOTE: The open-end type knuckle pivots on ball joints. Replacement of the ball joints requires removal of the axle shaft and steering knuckle.

- (1) Remove axle shaft.
- (2) Disconnect steering tie-rod end from knuckle arm.
- (3) Remove lower ball stud nut (fig. 10-5).



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Fig. 10-5 Lower Ball Stud Nut Removal

- (4) Remove cotter pin from upper stud and loosen stud nut until its top edge is flush with top of stud.
- (5) Unseat upper and lower studs using a lead hammer.
- (6) Remove upper nut and remove knuckle assembly.
- (7) Remove upper ball stud seat using Nut Wrench W-355.

Ball Joint Replacement

- (1) Remove lower ball joint snap ring.
- (2) Clamp knuckle assembly securely in a vise with upper ball stud pointed downward.
- (3) Attach Plate SP-5581 to spindle mating surface

of knuckle assembly (fig. 10-6). Position Button SP-5583 on lower joint. Assemble and align Puller SP-5574. Press lower joint out of knuckle by tightening puller screw.

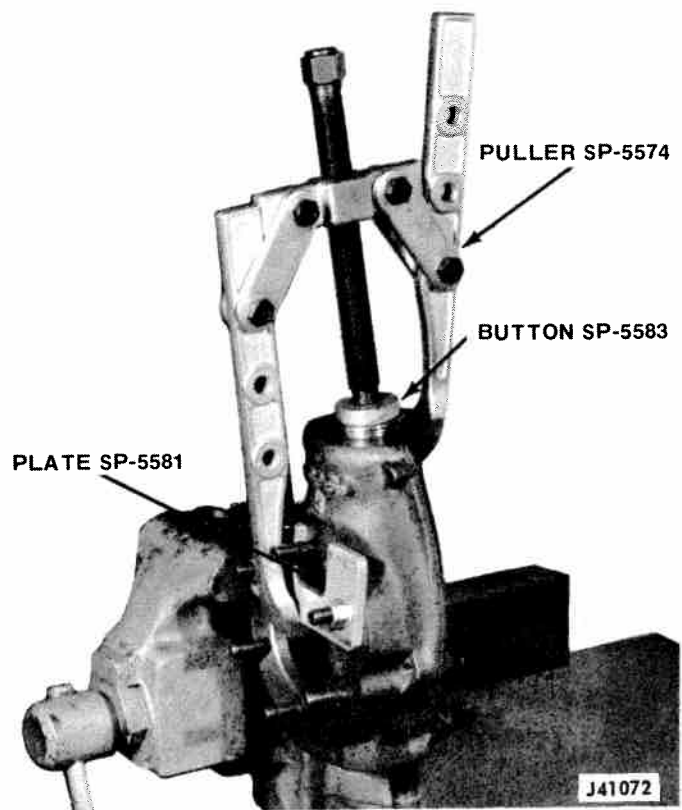


Fig. 10-6 Lower Ball Joint Removal

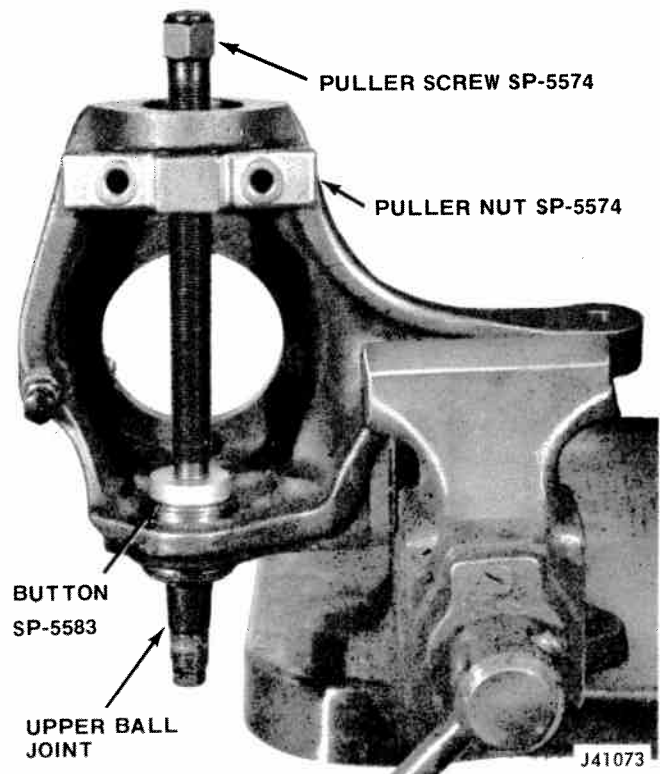


Fig. 10-7 Upper Ball Joint Removal

(4) Disassemble Puller SP-5574. On CJ-5 and CJ-6 install Adapter SP-5584 on puller screw with adapter shoulder toward head of screw. Thread puller nut about halfway onto screw. Place Button SP-5583 on upper joint and install puller in knuckle (fig. 10-7). Tighten screw to remove upper ball joint.

(5) Invert the knuckle in the vise. Position the lower ball joint in the knuckle. Use Installer Cup SP-5582, Adapter SP-5584, and Puller SP-5574 screw and nut (fig. 10-8) to press in the lower joint. Install ball joint snap ring.

(6) Position upper ball joint on the knuckle. Use Installer Cup SP-5582 and Puller Assembly SP-5574 to press in upper joint (fig. 10-9).

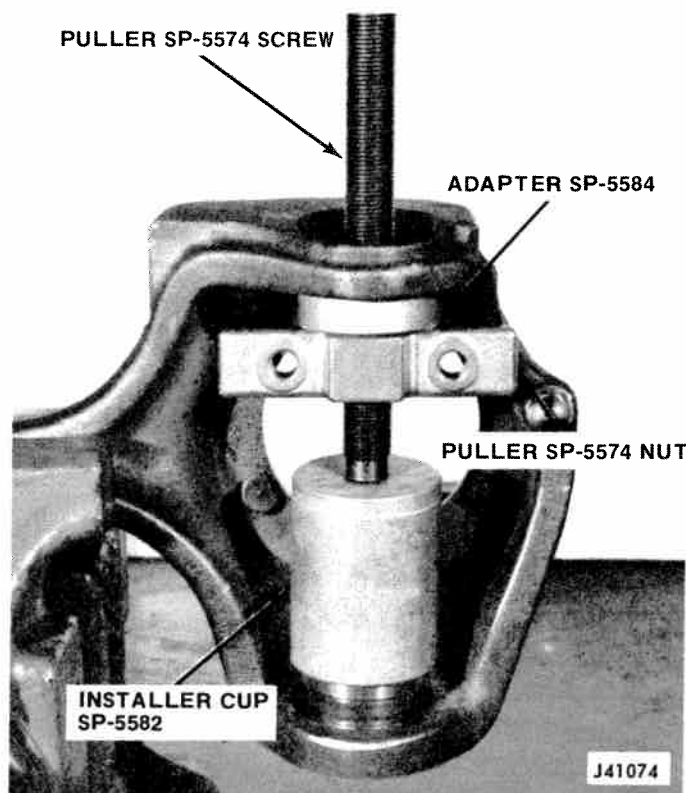


Fig. 10-8 Lower Ball Joint Installation

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. Loosely install lower stud nut. Position and align Wrench Nut W-355, Button SP-5583, Plate SP-5581, and Puller SP-5574 as shown in figure 10-10. Tighten puller screw until lower ball stud is held firmly in its seat. Tighten lower stud nut to 70 to 80 foot-pounds torque (on CJ models, 70 to 90 foot-pounds torque). Remove the puller and plate.

(3) Use Wrench Nut W-355 to tighten upper ball joint stud seat to 50 foot-pounds torque (fig. 10-11).

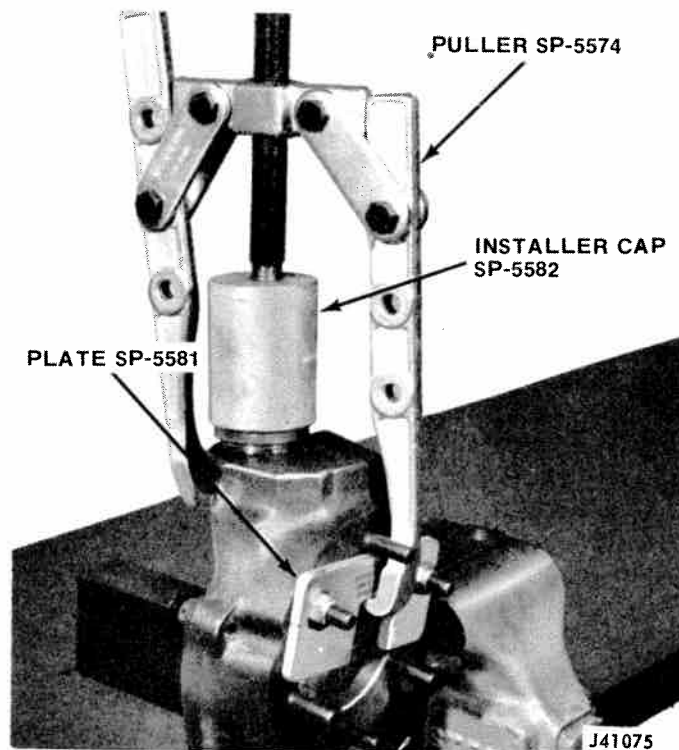


Fig. 10-9 Upper Ball Joint Installation

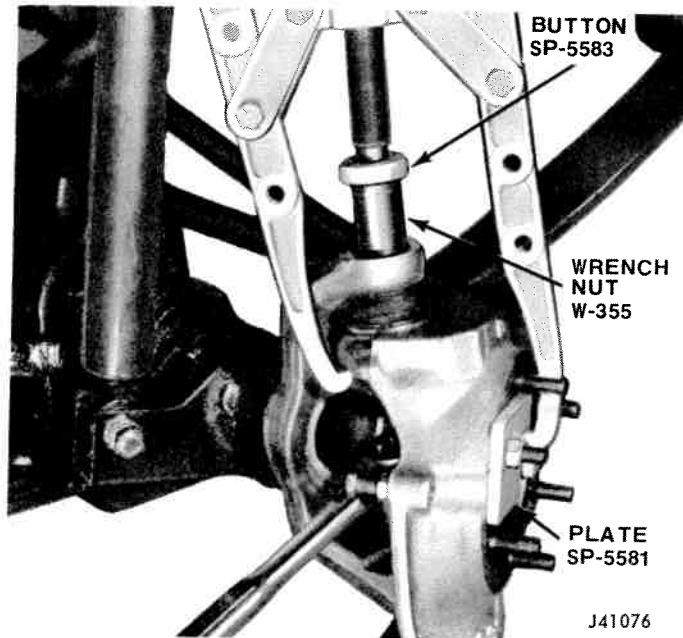
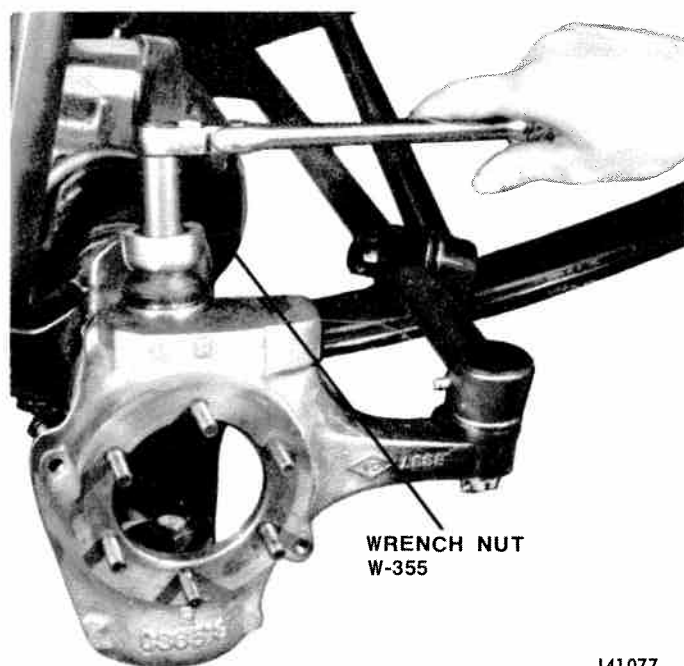


Fig. 10-10 Steering Knuckle Installation

(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 the pin can be installed. Do not loosen nut to align the holes.

(5) Connect steering rod.

NOTE: When the steering knuckle is removed or replaced, the turning angle must be checked.



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Fig. 10-11 Tightening Upper Joint Stud Seat

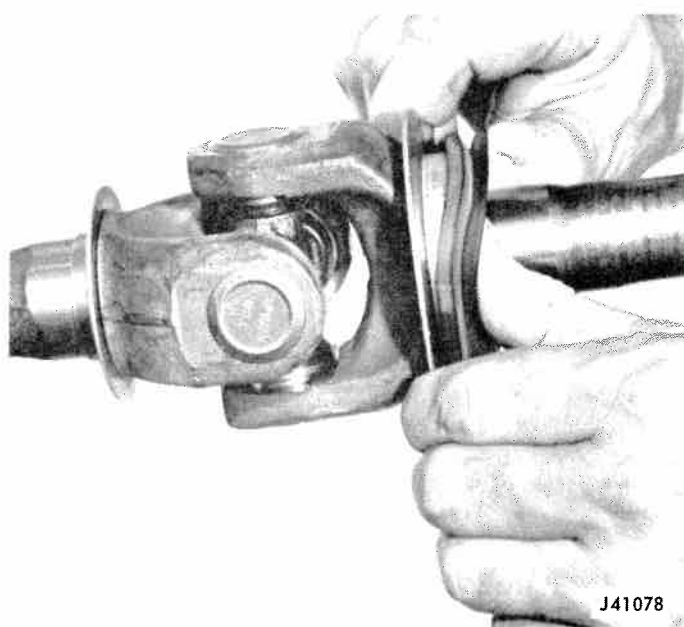


Fig. 10-12 Axle Shaft Seal Replacement

Axle Shaft Seal Replacement

Front axles are equipped with a V-seal which is installed at the axle shaft stone shield.

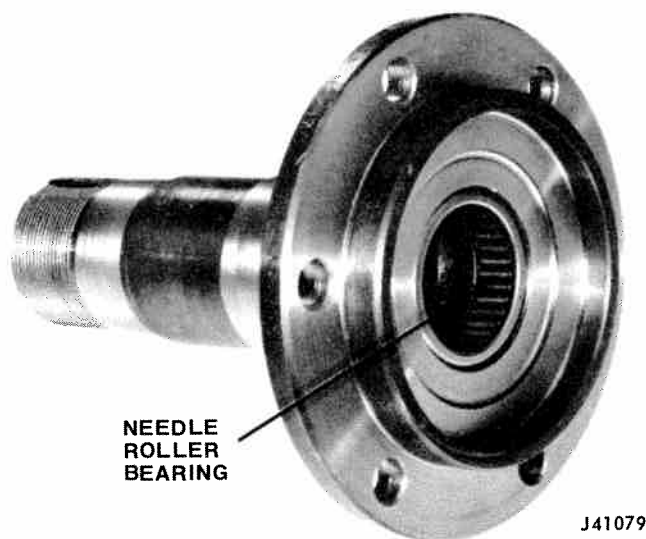
- (1) Remove defective seal (fig. 10-12).
- (2) Remove bronze thrust washer. If wear is evident, replace washer.
- (3) Clean area of dirt and foreign matter.
- (4) Install bronze washer with chamfered side toward the axle shaft seal.
- (5) Install new seal. Direct lip of seal toward the spindle (fig. 10-12).

- (6) Pack area around thrust face area of shaft and seal with grease. Fill seal area of spindle with grease (NLGI 2).

Spindle Bearing Replacement

NOTE: Front axle spindles are equipped with a needle roller bearing located at rear spindle flange (fig. 10-13).

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



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Fig. 10-13 Spindle Bearing Removal

Front Axle Assembly Removal

- (1) Raise front end of vehicle and support frame behind springs.
- (2) Remove wheel discs, lug nuts, and wheels.
- (3) Index propeller shaft to ensure proper alignment upon installation. Disconnect propeller shaft at front universal companion flange.
- (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) Remove brake calipers or backing plates and position in a convenient place.
- (8) Remove spring clip plates and spring clips.
- (9) Support axle assembly on a jack; raise jack slightly to remove spring tension.
- (10) Loosen nuts securing upper spring shackles; do not remove bolts.
- (11) Remove bolts securing lower spring shackles and rest springs on floor.

(12) Roll jack and axle assembly from underneath vehicle.

Front Axle Assembly Installation

- (1) Support axle assembly on a jack and slide assembly into position underneath vehicle.
- (2) Raise springs and install bolts in lower spring shackles.
- (3) Lower axle assembly on springs and rotate into position.
- (4) Install spring clips and spring clip plates.
- (5) Tighten upper and lower spring shackle bolts.
- (6) On models with disc brakes, install and align brake calipers. On CJ-5 and CJ-6 install backing plate.
- (7) Connect breather tube.
- (8) Connect shock absorbers.
- (9) Connect steering connecting rod at steering knuckles.
- (10) Connect propeller shaft and check alignment.
- (11) On CJ-5 and CJ-6, install brake drums.
- (12) Install wheels and lug nuts.
- (13) Remove support stands and lower vehicle.
- (14) Tighten lug nuts and install wheel discs.
- (15) Check front end wheel alignment.
- (16) Check turning angle.

Turning Angle Adjustment

The turning angle stop screws are located in the back of the knuckle just above the axle centerline. If adjustment is necessary, proceed as follows:

- (1) Loosen the locknut.
- (2) Use a turntable and adjust the stop screw to permit proper turning angle (see specifications below).
- (3) Tighten locknut.

NOTE: Adjusting the screw in increases the turning angle. Adjusting the screw out decreases the turning angle.

Turning Angle Specifications: Set turning angle stop screws at 34 degrees to 35 degrees on CJ-5 and CJ-6 equipped with standard tires (F78 x 15). This will provide the shortest turning diameter and improve vehicle maneuverability. If the vehicle is equipped with optional tires, set the turning angle stop screws at 31 degrees to provide clearance for the larger size tires. On Cherokee, Wagoneer, and Truck, set the turning angle stop screws at 36 degrees to 37 degrees.

REAR AXLE

Rear axle models and application to Jeep vehicles are outlined at the front of this section. Methods of axle identification are shown in figures 10-1 and 10-2.

Axle Shaft and Bearing Removal (Semi-Float - Flange Shaft)

- (1) Jack up vehicle and remove wheels.
- (2) Remove brake drum spring locknuts and remove drum.
- (3) Remove axle shaft flange cup plug by piercing center with a sharp tool and prying out.
- (4) Using access hole in axle shaft flange, remove nuts attaching backing plate and retainer to axle tube flange.
- (5) Attach Axle Shaft Adapter Tool W-343 and Slide Hammer Handle C-637 to axle shaft flange and remove axle shaft (fig. 10-14).

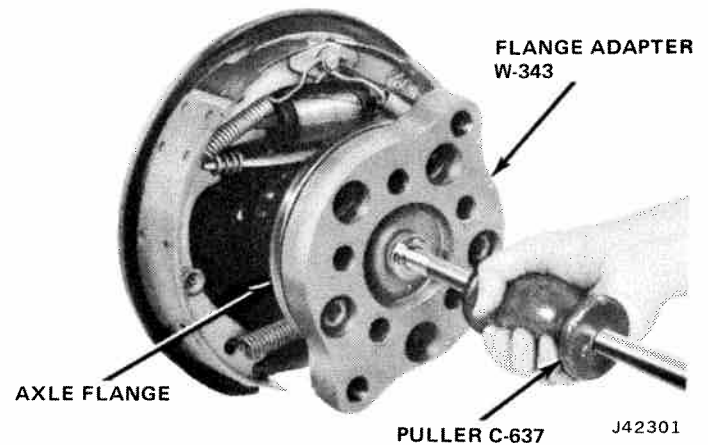


Fig. 10-14 Removing Flanged Axle Shaft

NOTE: Make certain the old bearing cup has been removed from the axle housing.

(6) Remove axle shaft oil seal from axle housing tube using Puller C-637.

(7) Wipe axle housing tube seal bore clean and install a new oil seal using Driver W-186.

CAUTION: Under no circumstances should axle shaft retaining rings or bearings be removed using a torch because heat is fed into the axle shaft bearing journal weakening this area.

- (8) Position axle shaft assembly in a heavy vise.
- (9) Using chisel, cut a deep groove into retaining ring. This will enlarge bore of retaining ring, or split ring and permit it to be driven off of axle shaft (fig. 10-15).
- (10) Using a hacksaw, cut through oil seal, being careful not to damage seal contact surface. Remove oil seal from axle shaft.

CAUTION: Thoroughly lubricate W-343 puller bolts and bolt contact points before attempting to remove bearing from axle shaft. Do not use power operated impact tools on puller bolts.

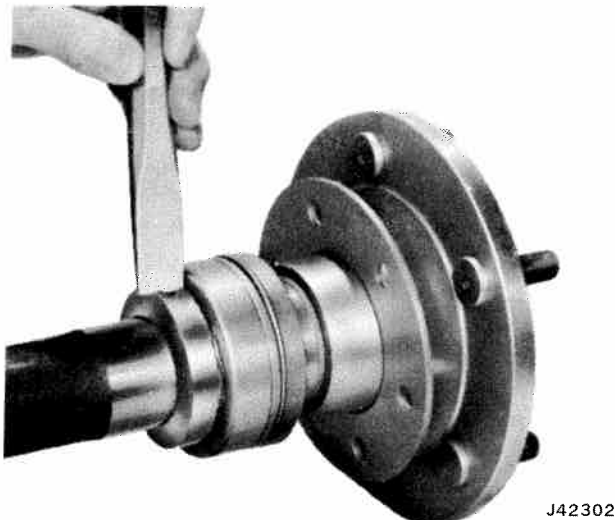


Fig. 10-15 Notching Bearing Retainer Ring

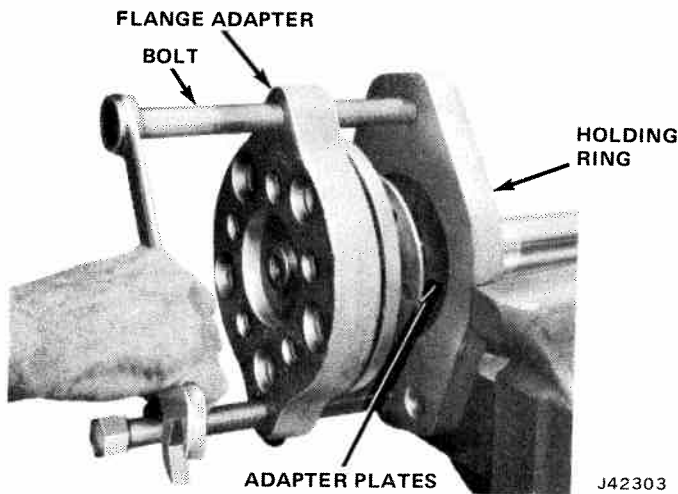


Fig. 10-16 Removing Axle Shaft Bearing

(11) Attach Puller W-343 to axle shaft using flange stud nuts. Position puller bolts against dimples of holding ring and alternately tighten until bearing is pressed from shaft (fig. 10-16).

Installation

- (1) Inspect axle shaft oil seal journal for scratches and polish with fine crocus cloth if necessary.
- (2) Install retainer plate on axle shaft.
- (3) Apply grease to new oil seal cavity between seal lips and carefully slide seal on axle shaft seal seat. Outer face of seal must be toward axle flange.
- (4) Pack bearing prior to installation using NLGI 2 Wheel Bearing Grease.
- (5) Install bearing on axle shaft making certain cup rib ring is facing axle flange.
- (6) Install bearing retainer ring on axle shaft.
- (7) Using Puller W-343, press new axle shaft bearing and retainer ring on axle shaft simultaneously.

Tighten puller bolts alternately until bearing and retainer ring are properly seated against shaft shoulder.

NOTE: Make certain old bearing cup has been removed from axle housing before axle shaft and new unit bearing are installed into the axle housing.

(8) Install axle shaft through backing plate using care not to damage axle housing tube inner oil seal.

(9) Apply thin coating of lubricant to outside diameter of bearing cup prior to installing in bearing bore.

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

(11) Attach axle shaft retainer and brake backing plate to axle tube flange. Secure with nuts and lockwashers (refer to Torque Specifications).

(12) Install new cup plug into axle shaft flange hole.

(13) Install brake drum, spring locknuts and rear wheel assembly.

Rear Axle Shaft Removal (Full-Floating)

Refer to Figure 10-17.

NOTE: It is not necessary to jack up the rear wheels.

- (1) Remove axle flange nuts, lockwashers, and split washers holding axle shaft flange.
- (2) Pull axle shaft free from housing.

NOTE: A broken axle shaft that cannot be removed with a wire hook can be removed from a full-floating axle by removing the opposite axle shaft and inserting a pipe which will drive the broken axle shaft out.

Rear Axle Shaft Installation (Full-Floating)

- (1) Be sure axle flange mating area on hub and axle are clean and free of old gasket material.
- (2) Install new flange gasket onto 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 nuts. Tighten nuts securely.

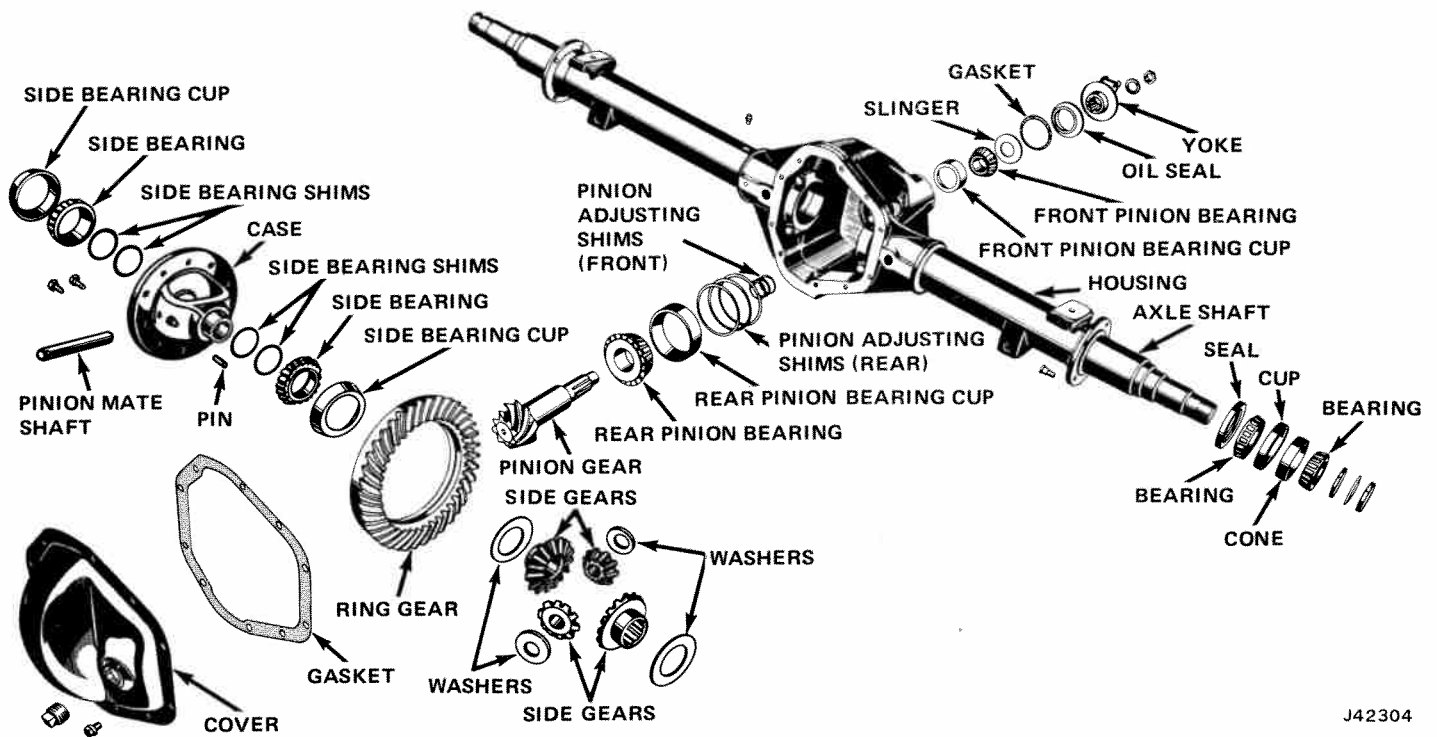


Fig. 10-17 Full-Floating Rear Axle - Model 60

NOTE: The pinion shaft oil seal is serviced in the vehicle when replacement is necessary. For Model 60 axle, use Puller W-286; for all other models, use Puller W-251.

INSPECTION AND SERVICING

All Axles

Refer to figures 10-17 and 10-18.

NOTE: Before disassembling the differential, it is advisable to determine through inspection the cause of the failure.

- (1) Remove housing cover and gasket, and drain lubricant.
- (2) Clean differential parts thoroughly with solvent.
- (3) Carefully inspect all parts.

NOTE: Should it be determined by inspection that the differential requires overhauling, first the axle must be removed from the vehicle.

Rear Axle Assembly Removal

- (1) Raise rear of vehicle. Support frame ahead of rear springs.
- (2) Remove wheels.
- (3) Index propeller shaft at rear yoke and disconnect.

- (4) Disconnect shock absorbers at axle mounting.
- (5) Disconnect brake hydraulic hose at tee fitting on axle just below left frame side rail. Tape ends of hose to keep out dirt.
- (6) Disconnect parking brake cable at frame mounting.
- (7) Support axle on jack.
- (8) Remove axle U-bolts.
- (9) Slide axle from under vehicle.

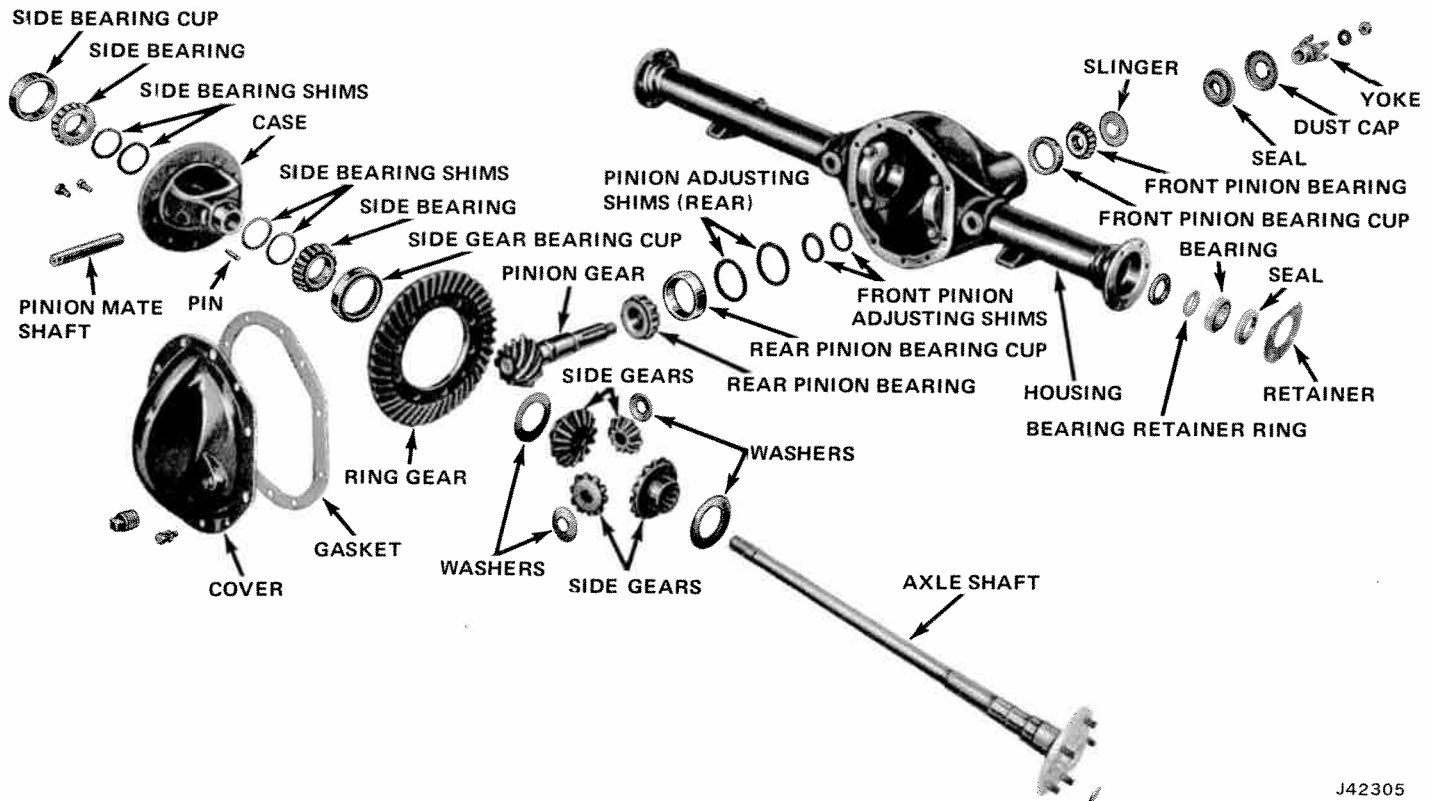
Rear Axle Assembly Installation

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 axles are installed in vehicles. Use MIL-L-2105B (SAE 80) for standard axles or Part Number 94557 for Trac-Lok axles.

When adding differential lubricant, suspend the axle with the axle shafts horizontal and the yoke end of the pinion housing hanging down; then, turn the pinion shaft several times to assure that the lubricant gets into the pinion shaft bearings.

- (1) Position axle assembly under vehicle.
- (2) Position springs to axle pads, and install spring clips and nuts.
- (3) Attach brake line hose at tee fitting on top of housing.
- (4) Attach parking brake cables at rear of brake backing plate.
- (5) Connect shock absorbers at axle mounting pads.

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J42305

Fig. 10-18 Semi-Float Rear Axle - Flanged Shaft

- (6) Connect propeller shaft at rear universal joint.
- (7) Adjust and bleed brakes.
- (8) Install and bleed brakes.
- (9) Install wheels and lower vehicle to floor.
- (10) Check parking brake.
- (11) Fill axle housing with lubricant.

DIFFERENTIAL CASE DISASSEMBLY

- (1) Remove axle shafts.
- (2) Remove housing cover and four capscrews holding two differential side bearing caps in position.

NOTE: Make sure there are matching letters or some type of identification marks on the caps and housing so that each cap can be installed in the same position and location from which it was removed.

(3) Use Spreader W-129 as shown in figure 10-19 to spread housing. Install Holddown Clamps W-129-18, if available, to keep spreader in position. Clamp on dial indicator. From side, measure the carrier spread. Do not spread carrier more than 0.020 inch.

- (4) Remove dial indicator.
- (5) Carefully pry differential case loose, using pry bars at heads of ring gear bolts and carrier casting.
- (6) Remove spreader immediately to prevent possibility of carrier taking a set.
- (7) Remove screws holding ring gear to differential case.

(8) With a small punch, as shown in figure 10-20, drive out lockpin.

(9) Remove differential shaft and thrust block.

(10) Carefully, so as not to lose thrust washers, remove differential pinion gears.

(11) With Wrench C-3281 to hold yoke, remove nut. With Puller W-172, remove yoke as shown in figure 10-21.

(12) Using a rawhide hammer, drive on end of pinion shaft to force pinion out of differential housing.

NOTE: Pinion bearing adjusting shims may remain on the pinion shaft, stick to the bearing which is still in the housing, or fall out loose. These shims should be collected and kept for assembly.

(13) Remove outer pinion bearing cone, baffle and oil seal by using a two-inch by two-inch piece of hardwood or a length of pipe and drive out through neck of carrier housing. Discard seal.

Pinion and Differential Case Bearing Removal (Semi-Float Axle)

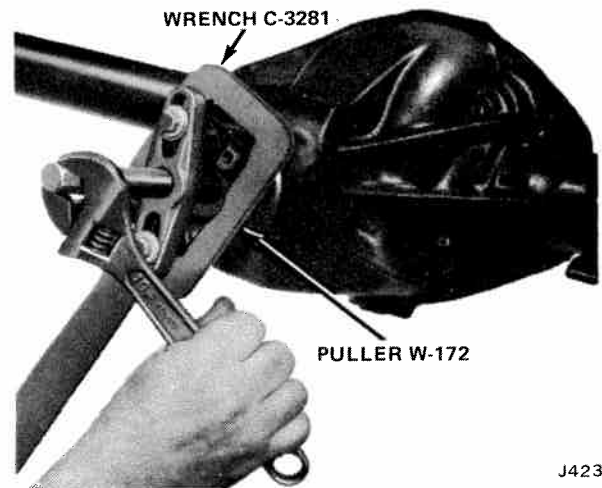
To remove the differential side bearings and pinion inner bearing, use Bearing Puller W-104-B as shown in figure 10-22. Use of the puller assures easy removal of bearings without damage to cone rollers, as pulling pressure is applied directly to the bearing cone.

NOTE: When pulling the front axle differential inner pinion bearing with an oil slinger attached, the adapter plates (two required) must be inserted, from the top, into one side of the W-104-B puller base, then repositioned 180 degrees apart.

Pinion and Differential Case Bearing Removal (Full-Floating Axle)

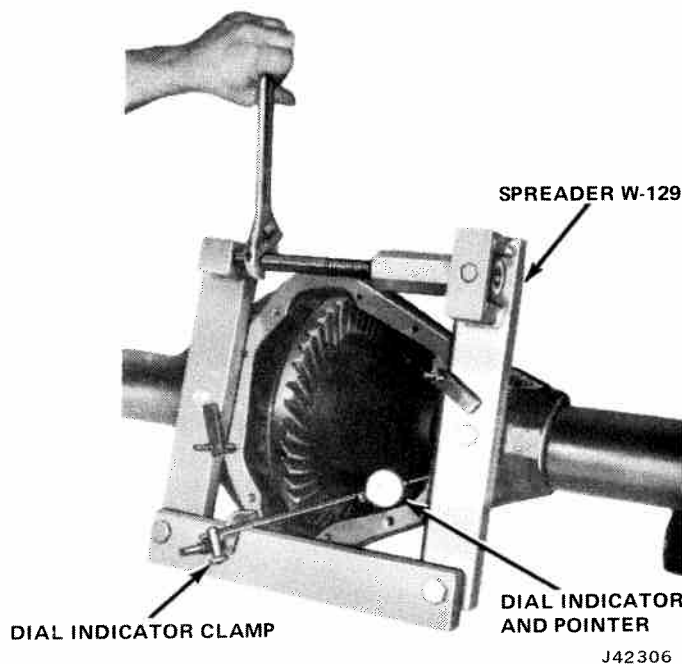
To remove differential side carrier bearings on Model 60 rear axle, use Press DD-914-P, Extension DD-914-7, Button DD-914-42, Holding Ring DD-914-8 and Adapter DD-914-62 (fig. 10-24).

To remove the Model 60 rear axle pinion inner bearing, use Tool DD-914-P with Holding Ring DD-914-9 and Adapter C-C-193-37.



J42308

Fig. 10-21 End Yoke Puller



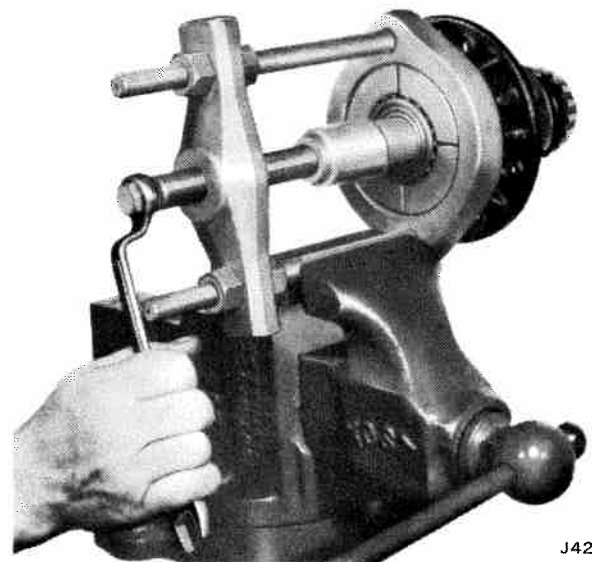
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Fig. 10-19 Differential Carrier Spreader



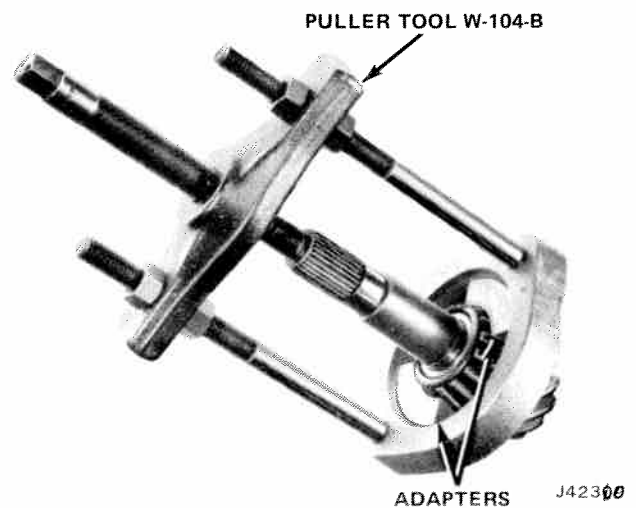
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Fig. 10-20 Removing Lockpin



J42309

Fig. 10-22 Pulling Differential Side Carrier Bearing



J42310

Fig. 10-23 Pulling Pinion Inner Bearing

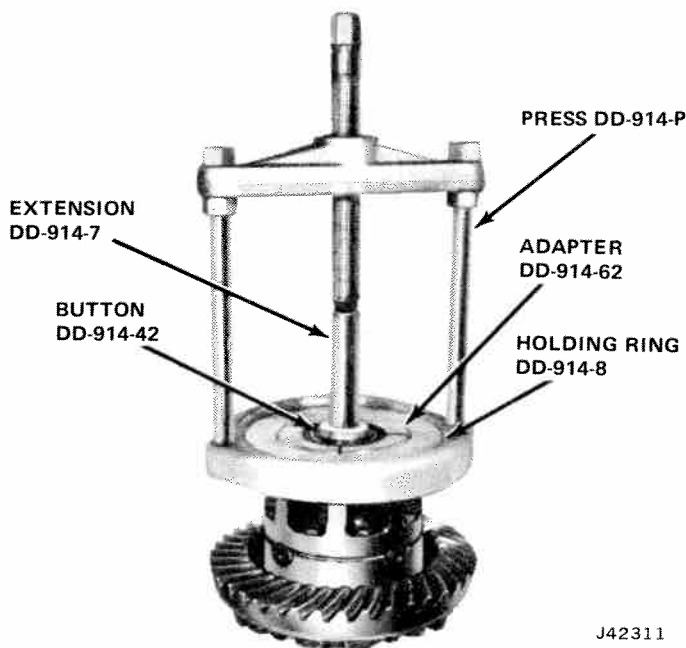


Fig 10-24 Pulling Differential Side Carrier Bearing

Pinion Bearing Cup Removal

NOTE: The differential carrier housing has recesses in the casting to permit the use of a brass drift to drive the inner and outer cups from the housing.

(1) Using a brass drift, drive pinion inner bearing cup and shims from housing. Even if mutilated, these shims should be kept for proper assembly of differential.

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

Cleaning and Inspection

Clean all parts in fast-evaporating mineral spirits or a dry cleaning solvent and, with the exception of bearings, dry with compressed air.

Inspect differential bearing cones, cups, and rollers for pitting, galling, or other visible damage.

Inspect differential case for elongated or enlarged pinion shaft hole. The machined thrust washer surface areas and counterbores must be smooth and without metal deposits or surface imperfections. If any of the above conditions exist, satisfactory correction must be made or the case replaced. Inspect case for cracks or other visible damage which might render it unfit for further service.

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

Inspect differential side gears and pinions; they should have smooth teeth with a uniform contact pattern without excessive wear or broken surfaces. The differential side gear and pinion thrust washers

should be smooth and free from any scoring or metal pickup.

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

Inspect drive gear and pinion for worn or chipped teeth or damaged attaching bolt threads. If replacement is necessary, replace both the drive gear and drive pinion as they are available in matched sets only.

Inspect drive 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 carrier for cracks or other visible damage which would render it unfit for further service. Raised metal on the shoulder of bearing cup bores incurred in removing pinion cups should be flattened by use of a flat-nose punch.

Inspect drive pinion for damaged bearings journals and mounting shim surface or excessively worn splines. If replacement is necessary, replace both the drive pinion and drive gear as they are available in matched sets only.

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

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

Pinion Installation and Adjustment

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

Adjustment of the pinion is accomplished by the use of shims placed between the inner bearing cup and the axle housing and between the pinion shaft shoulder and the outer bearing. The shims behind the inner bearing cup adjust the position of pinion in relation to the ring gear. The shims behind the outer bearing adjust the pinion inner and outer bearing preload (fig. 10-25).

(1) Install outer bearing cup using Driver W-126.

(2) Install inner bearing cup using Driver W-126 on Model 30 axles, and Installer W-344 on Model 44 and Model 60 axles to drive cup into housing.

(3) Use Sleeve C-3095 to press or drive inner bearing onto pinion shaft on axle models 44 and 60. Use Sleeve W-262 on Model 30 (fig. 10-26).

(4) Place pinion in housing and install a 0.065-inch shim, inner bearing, Sleeve SP-1997 (from Tool W-162), in place of U-joint yoke to hold pinion in position for adjustment. Install pinion nut.

(5) Select proper pinion adjusting gauge to obtain correct reading for differential model.

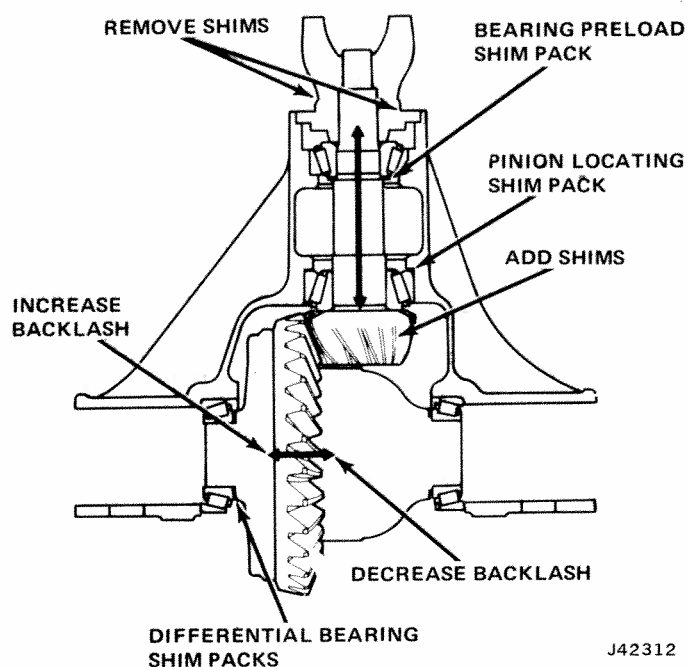


Fig. 10-25 Differential Shim Pack Locations

NOTE: The pinion adjusting fixture must first be set by the use of a master gauge which is included in the W-99 kit. Gauge Block SP-5433 or SP-5434, stamped with the letter J is used on Model 60 axles; Gauge Block W-101-A-22 or SP-5453, stamped E is used on Model 44 axles; and Gauge Block SP-5291 stamped K is used on Model 30 axles. SP-5264 is used with the dial indicator in W-99 tool set for setting pinion depth.

- (6) Place gauge block against machined surface of dial indicator mount (fig. 10-27).
- (7) Set dial indicator on zero.
- (8) Install pinion adjusting fixture on pinion with stationary guide pin and adjustable guide pin seated in pinion shaft lathe centers (fig. 10-28).

NOTE: Use the C-clamp type alignment fixture vertically as shown in figure 10-28) so that weight of jig assembly is always directly centered and supported on pinion shaft center. The function of the fixture is to accurately hold the dial indicator and its mount in alignment to the pinion shaft while it is pivoted on the stationary guide pin. If a consistent repeat dial reading cannot be obtained, look for dirty or burred pinion centers or a bent or twisted aligning jib. Keep jig flat in metal case when not in use. Do not allow other tools to rest on it. Treat the C-clamp fixture tool carefully (as a precision instrument).

- (9) Seat gauge mount firmly on pinion head and swing dial indicator through differential bearing bore (fig. 10-27).

- (10) Observe reading.

The lowest reading indicates the center of the differential bearing bore. At this point, the dial indicator

should read the same as mark etched on the pinion head. If the reading does not agree, add or remove shims behind the inner pinion bearing cup until the readings agree.

The end of each pinion is etched with a plus (+) number, a minus (-) number or zero (0) number to indicate the best running position for each particular gear set. This dimension is controlled by shimming behind the inner pinion bearing cup. Therefore if a pinion is etched (+2), this pinion would require 0.002 inch less shims than a pinion etched 0. By removing shims the mounting distance is **increased** which is just what a (+2) etching indicates. Or if a pinion is etched (-2), add 0.002 inch more shims than would be required if the pinion were etched 0. By adding 0.002 inch shims, the mounting distance is **decreased** which is just what a (-2) etching indicates.

NOTE: To increase the dial reading, decrease shims; to decrease the dial reading, increase the shims. Example: With a dial reading of minus 0.001 inch and a pinion marking of plus 0.002 inch, remove 0.003 inch shims to obtain a higher dial reading of plus 0.002 inch.

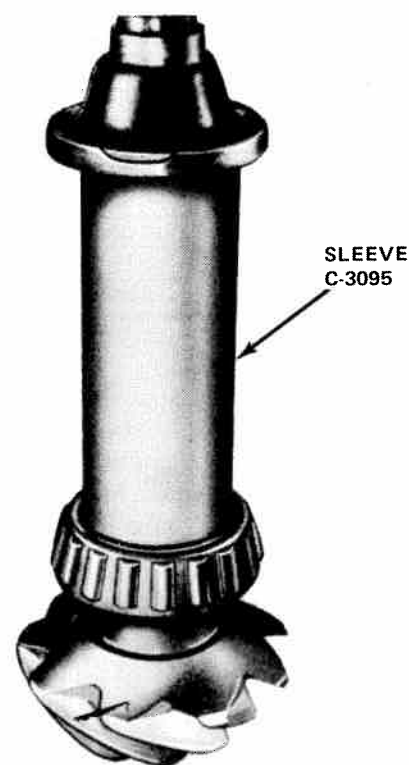
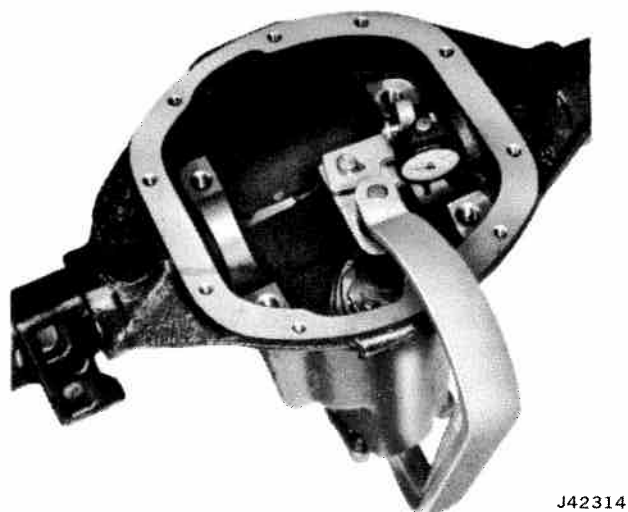


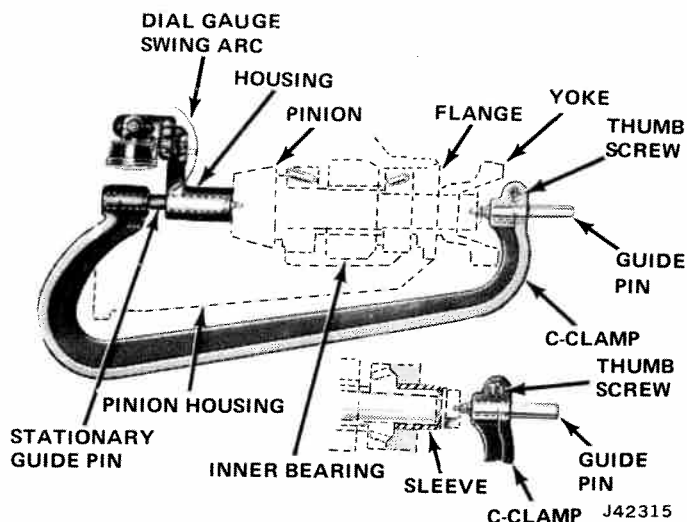
Fig. 10-26 Pinion Bearing Installing Sleeve

- (1) If the original ring and pinion set is to be reused, measure the old pinion shim pack and build a new shim pack to this dimension. Collect shim pack saved from teardown. Measure each shim separately with a micrometer and add together to get total shim pack thickness from original buildup. Note the (+) or (-) etching on both the old pinion and the new one, and



J42314

Fig. 10-27 Checking Pinion Adjustment



J42315

Fig. 10-28 Pinion Adjusting Fixture

PINION MARKING CHART

OLD PINION MARKING	NEW PINION MARKING								
	-4	-3	-2	-1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003
0	+0.004	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004
-1	+0.003	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005
-2	+0.002	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006
-3	+0.001	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007
-4	0	-0.001	-0.002	-0.003	-0.004	-0.005	-0.006	-0.007	-0.008

J42316

adjust the thickness of new shim pack to compensate for the difference between these two figures. Refer to Pinion Marking Chart for example. If the old pinion reads (+2), add 0.004-inch shims to the original pack dimension. Now build a new shim pack to this resulting dimension.

(2) When correct adjustment is reached, remove pinion adjusting fixture and sleeve SP-1997. Install outer bearing.

(3) Install only oil slinger, yoke, flat washer, and pinion nut. Holding yoke with Flange Holder C-3281, tighten nut 200 to 220 foot-pounds or 250 to 270 foot-pounds torque for full-floating rear axle.

(4) Using Inch-Pound Torque Wrench W-297 on nut, check rotating torque. The rotating torque should be 10 to 25 inch-pounds.

NOTE: Disregard starting torque.

(5) Add or remove shims between pinion outer bearing and pinion shaft to obtain correct torque reading (fig. 10-25).

Differential Case - Assembly

(1) Reassemble differential pinions, side gears, thrust washers, and shaft in relative position shown in figures 10-17 and 10-18. Make sure spacers are installed.

(2) Install differential shaft lockpin.

(3) Check side gear clearance.

(4) Examine contacting surfaces of ring gear and differential case for burrs or foreign matter.

(5) Assemble ring gear on differential case with assembly hole on each lined up.

(6) Tap ring gear into place with mallet.

(7) Install ring gear screws. Tighten to 45 to 65 foot-pounds torque on all except Model 60. Tighten valve 100 to 120 foot-pounds torque.

Adjustment of Differential Side Gears

Clearance between the differential side gears and differential case should be 0.000 inch to 0.006 inch.

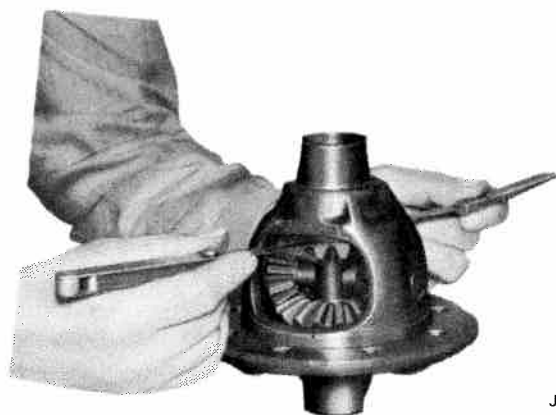
(1) With differential positioned (fig. 10-29), tap

differential lightly on a flat surface so differential gears settle into proper position.

(2) Measure clearance between side gear and case with leaf feeler gauge as illustrated.

(3) If clearance exceeds 0.006 inch, add shims between side 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.



J42317

Fig. 10-29 Checking Side Gear Clearance

Adjustment of Differential Bearing Preload and Ring Gear Backlash

The adjustment of the differential bearings is maintained by the use of shims placed between the differential case and the differential bearing.

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

(2) Holding ring gear in contact with pinion and using a screwdriver blade to move differential bearing cups toward center, 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 them separated.

(4) Add an 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 W-188 for Model 44 and Driver C-4025 for Model 60 (fig. 10-30).

NOTE: When overhauling the front axle differential, check the axle inner oil seals. Should new seals be required, install them with Installer DD-1243 for Model 44 axles (fig. 10-31).

(6) Attach Carrier Spreader W-129, install a dial

indicator, and spread carrier a maximum of 0.020 inch.

(7) Remove indicator.

(8) Lubricate bearings and place differential in carrier.

(9) Tap unit carefully into place with soft mallet, making sure ring gear teeth mesh with pinion teeth.

(10) Install bearing caps, matching their markings with those on carrier.

(11) Apply sealing compound to screw threads. Tighten screws to specified torque.

(12) Install dial indicator to check ring gear backlash (fig. 10-32). Check backlash at two points. Backlash must be held between 0.005 inch to 0.010 inch. If backlash does not fall within specifications, shims should be interchanged between the two differential bearing shim packs until correct backlash is obtained.

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

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

(14) Adjust tooth contact. Paint the bevel gear teeth with red lead or prussian blue and turn the bevel gear so that the pinion will make an impression on the teeth (fig. 10-33). After the differential has



J42318

Fig. 10-30 Differential Bearing Driver

been assembled and adjusted, pinion shaft oil seal should be installed.

(15) Remove sleeve previously installed in place of universal joint yoke and install oil seal with Driver W-147 in all axles except Model 60. Use Driver C-359 for pinion oil seal installation on Model 60.

(16) Install universal joint yoke with Flange Installing Tool W-162 (fig. 10-34). Install pinion washer and nut.

(17) Install axle shafts and differential housing cover.

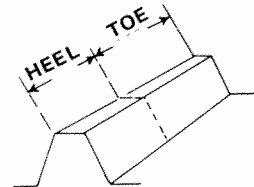
TRAC-LOK DIFFERENTIAL

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 is similar, except 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,



THE HEEL OF GEAR TOOTH IS THE LARGE END, AND THE TOE IS THE SMALL END.

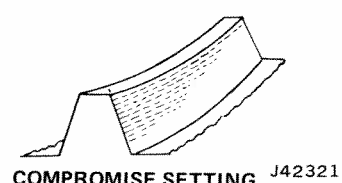
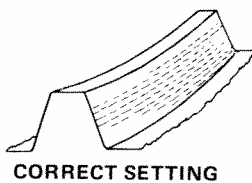
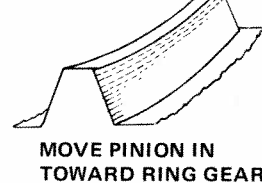
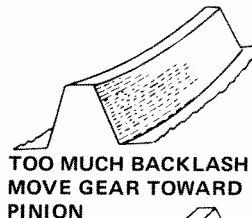
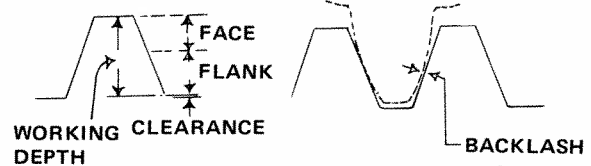


Fig. 10-33 Gear Tooth Contact

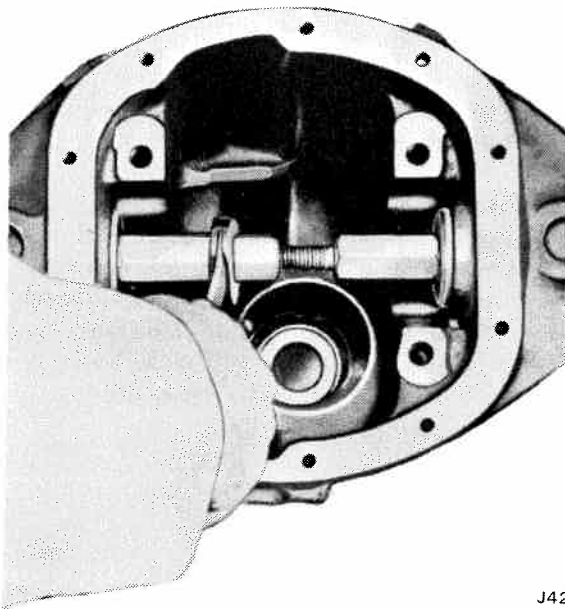


Fig. 10-31 Installing Inner Oil Seals

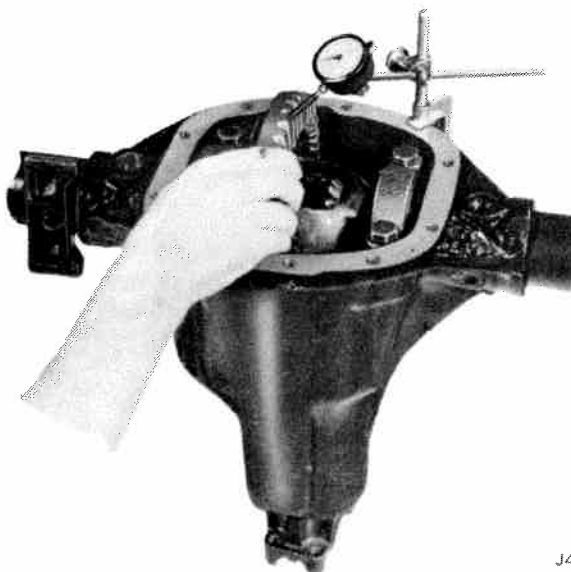


Fig. 10-32 Checking Ring Gear Backlash

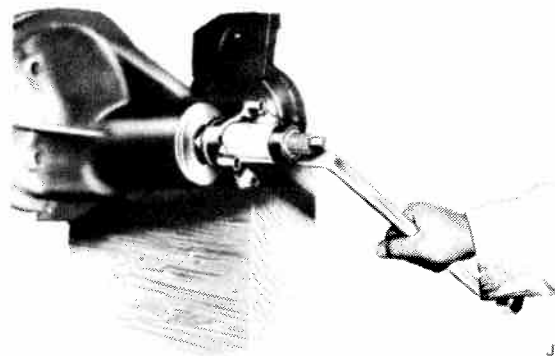


Fig. 10-34 Yoke Installing Tool

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 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 and ordinary multipurpose gear lubricants **MUST NOT** be used. Use only Jeep Differential Oil, part number 94557.

Trac-Lok differential may be cleaned only by disassembling the unit and wiping with clean rags.

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 are present in 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 Limited Slip Differential Lubricant will usually correct chatter.

Draining

(1) Warm lubricant by vehicle road operation, or 5 minutes of operation in gear at 30 mph with both wheels off ground on hoist.

WARNING: *Never place the transmission in gear with the engine running when only one wheel of a Trac-Lok equipped vehicle is raised. The vehicle might drive itself off the jack and cause damage or 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, Jeep part number 94557.

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

(5) Repeat three preceding steps making sure to replace cover gasket if required.

NOTE: *It is possible that slight chatter requiring additional vehicle operation may remain after step. If chatter persists after 100 miles of vehicle operation or remains severe after above procedure, disassembly and repair will be necessary.*

Operational Test

Proper performance and capabilities of Trac-Lok Differentials are often misunderstood. No precise method of measuring performance is generally available in the field. A functioning unit can be determined by a relatively simple vehicle operational test, as follows:

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 as described above. 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 from housing. Procedures for removal of axle shafts and differential case from axle housing are the same as that previously outlined for conventional axles.

(2) Place axle shaft into a vise.

(3) Tighten shaft in vise firmly.

NOTE: *The spline end of the shaft is not to extend beyond 2-3/4 inch above the top of the vise. This will eliminate the shaft from fully entering into the side gear and causing interference with the step plate tool during disassembly of the pinion mate gears (fig. 10-35 and 10-36).*

(4) Assemble differential case to axle shaft with ring gear screw heads up. Assembling differential case onto shaft will serve as a holding device to remove ring gear and to disassemble internal parts of case.

(5) Remove ring gear screws and ring gear.

(6) Place a few shop towels over top of vise to protect gear teeth from becoming nicked after it is free from case.

(7) Tap ring gear with a rawhide hammer to free it from case.

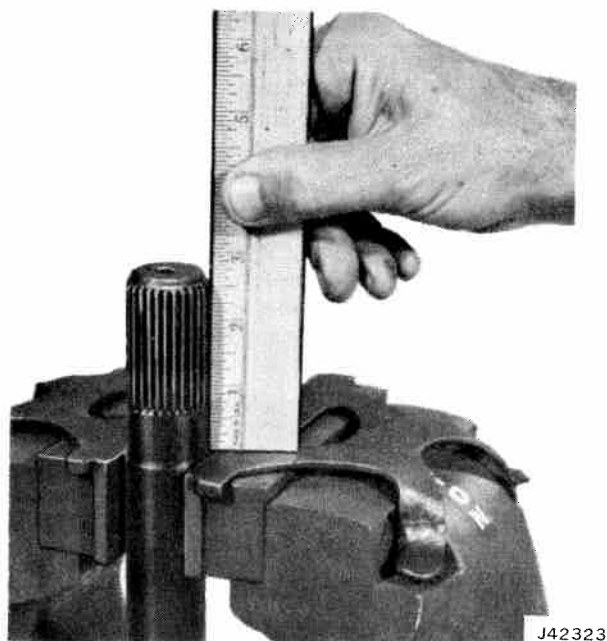


Fig. 10-35 Axle Shaft Positioned in Vise



Fig. 10-36 Differential Positioned on Axle Shaft

NOTE: Whenever the ring gear screws are removed, they are to be replaced with new screws.

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

NOTE: All Trac-Lok differentials are identified with a manufacturing date and the complete part number stamped on the barrel of the case (fig. 10-37).

It is recommended that when referring to the Trac-Lok, obtain the complete part number and build date. To do this, it will be necessary to wipe the lubricant from the case.

- (1) Reposition differential case onto axle shaft.
- (2) Remove two snap rings from cross pin.
- (3) Use two screwdrivers and push rings free from cross pin. Place a shop towel behind the case to prevent snap rings from flying out of case (fig. 10-38).



Fig. 10-37 Trac-Lok Differential Identification



Fig. 10-38 Removing Snap Rings from Cross Pin

NOTE: On the Model 60 Trac-Lok, the cross pin is held in the case by a roll pin. Use a 3/16-inch diameter punch to remove the roll pin.

(4) Remove cross pin. Use a hammer and punch to remove cross pin from case.

NOTE: Gear Rotating Tool C-4142 is required to service the Trac-Lok differential. The tool consists of four parts: handle, pawl, forcing screw, and step plate.

(5) Assemble step plate tool into bottom of side gear (fig. 10-39).

(6) Position gear rotating tool into top side gear (fig. 10-40).

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



Fig. 10-39 Installing Step Plate Tool

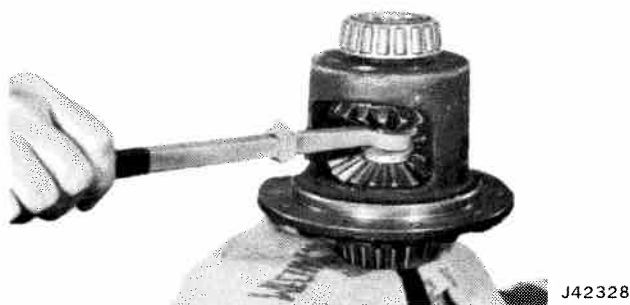


Fig. 10-40 Installing Gear Rotating Tool

NOTE: Before using the forcing screw, be sure the threads are lubricated with a fine coat of oil. Also apply a small spot of grease to the centering hole in the step plate before it contacts the forcing screw.

(8) Thread forcing screw so that it becomes centered into step plate. Tighten forcing screw. This will move the side gears away from pinion mate gears and relieve load between gears, allowing only pinion mate gears to be loose.

(9) Remove both pinion mate spherical washers. Use a shim stock of 0.030-inch thickness or an equivalent tool to push out spherical washers. Relieve tension of Belleville spring by loosening forcing screw (fig. 10-41).

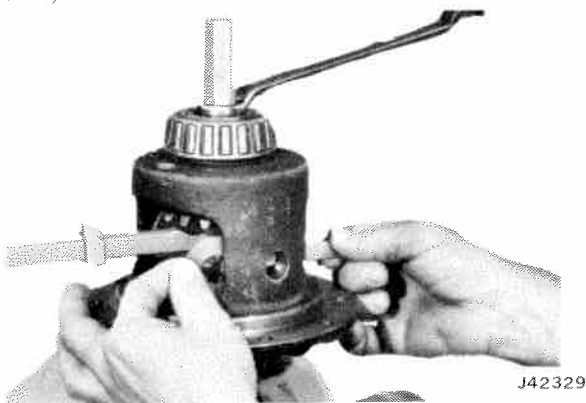


Fig. 10-41 Removing Pinion Mate Washers

(10) Retighten forcing screw until a very slight movement of pinion mate gears is detected.

(11) Insert pawl rotating tool between one of side gear teeth as shown. Pull on handle so top side gear will rotate and also allow pinion mate gears to rotate. Continue pulling on tool until gear hits the handle.

(12) Remove pawl from between gear teeth and repeat above until pinion mate gears can be removed through large opening of case.

NOTE: When attempting to rotate the side gear, it will probably be necessary to adjust the forcing screw by very slightly tightening or loosening until the required load is applied to the Belleville springs to allow the side gear and pinion mate gears to rotate (fig. 10-42).

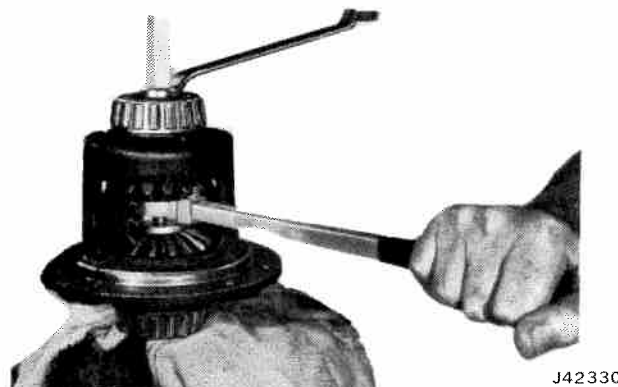


Fig. 10-42 Removing Pinion Mate Gears

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

(14) Remove differential case from axle shaft. Turn case with flange or ring gear side up and allow step plate tool side gear and dovetail from case. Remove the retainer clips from both clutch packs to allow separation of plates and discs (fig. 10-43).



Fig. 10-43 Trac-Lok Unit Disassembly

Inspection

Plates and Discs - If any one member of either stack shows evidence of excessive wear or scoring, then the complete stack is to be replaced on both sides.

Side Gears and Pinion Mate Gears - The gear teeth of these parts should be checked for extreme wear or possible cracks. The external teeth of the side gear which holds the clutch pack should also be checked for wear or cracks. If replacement of one gear is required due to wear, etc., then both side gears, pinion mate gears, and washers are to be replaced.

Cross Pin - If excessive wear is evident, then the cross pin should be replaced.

Clutch Retainer Clips - If wear is evident on any one of the retainer clips, it is suggested that all four 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 plate (A) and the concentric groove disc are shown in figure 10-44.

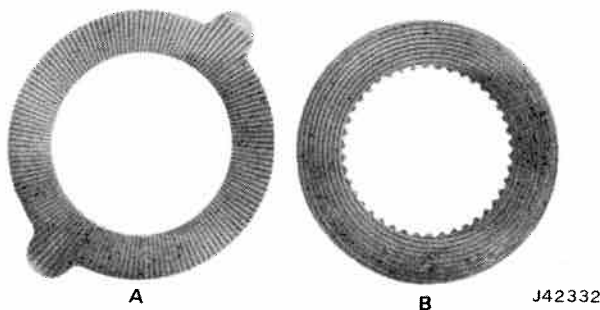


Fig. 10-44 Plate and Disc Identification

Assembly

(1) Assemble plates and discs in exactly same position as they were removed, regardless of whether they are new parts or original parts.

(2) Prelubricate thrust face of side gear, assemble plates and discs to side gear splines, prelubing each part as shown with specified lubricant. Lube stacks (fig. 10-45).



Fig. 10-45 Lubricating Trac-Lok Components

(3) Assemble retainer clips to ears of plates. Make sure both stacks are completely assembled or seated onto ears of plates.

(4) With differential case positioned as shown, assemble clutch pack and side gear into case.

NOTE: Make sure the clutch pack stays assembled to the side gear splines and that the retainer clips are completely seated into the pockets of the case. To prevent pack from falling out of the case, it will be necessary to hold them in place by hand while assembling the case onto the axle shaft.

(5) Assemble differential case onto the axle shaft in the position as shown in figure 10-46.



Fig. 10-46 Install Differential Case on Axle Shaft

CAUTION: When assembling the differential case onto the axle shaft, be sure that the splines of the side gears are lined up with those of the axle shaft. Also make sure that the clutch pack is still properly assembled into the case after assembling the case onto the shaft.

(6) Assemble step plate tool into side gear. Apply a small dab of grease into centering hole of step plate tool.

(7) Assemble other clutch pack and side gear exactly as shown. Be sure clutch pack stays assembled onto side gear splines and that retainer clips are completely seated into pockets of case (fig. 10-47).

(8) Position gear rotating tool into top side gear.

(9) Keep side gear and rotating tool in position by holding with hand. Insert forcing screw down through top of case and thread into rotating tool (fig. 10-48).

(10) Position both pinion mate gears exactly as shown. Be sure holes of gears are lined up with each other. Hold gears in place by hand (fig. 10-49).

(11) Tighten forcing screw so that Belleville springs will compress and allow clearance between teeth of pinion mate gears and side gears.

(12) While holding pinion mate gears in place, insert pawl of rotating tool between one of side gear teeth as shown. Pull on handle so top side gear will rotate and allow pinion mate gears to rotate and enter into case.

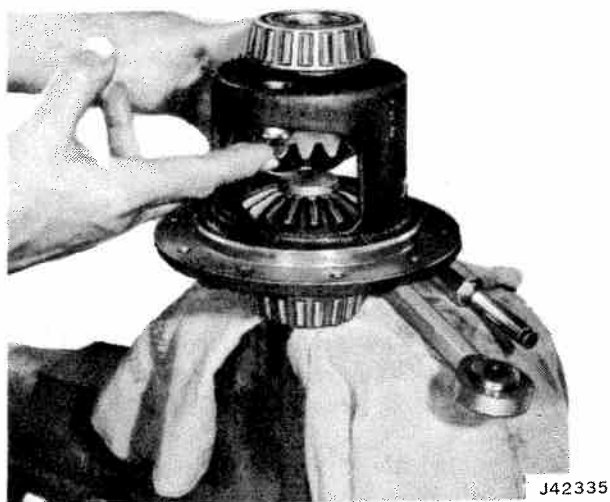


Fig. 10-47 Installing Clutch Pack and Side Gear



Fig. 10-48 Threading Forcing Screw into Rotating Tool

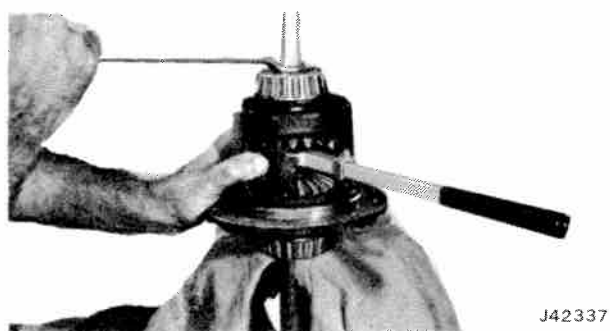


Fig. 10-49 Starting Pinion Mate Gears into Case

NOTE: As mentioned before, it will probably be necessary to adjust the forcing screw by very slightly loosening or tightening until the required load is applied to the Belleville plates or discs to allow the side gear and pinion mate gears to rotate.

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

(14) Prelubricate both sides of pinion mate spherical washers with specified lubricant.

(15) Apply torque to forcing screw to allow clearance to assemble spherical washers.

(16) Assemble washers into case. Use a very small screwdriver to push washers into place (fig. 10-50).

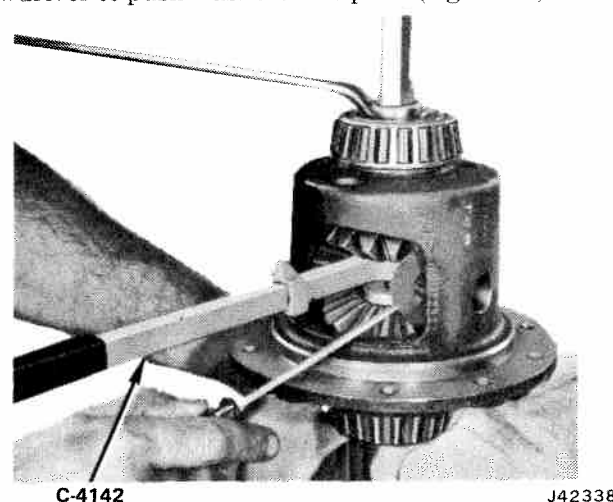


Fig. 10-50 Installing Pinion Mate Washers

CAUTION: Be sure the holes of the washers and gears are lined up exactly with those of the case.

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

(18) Prelubricate cross pin with specified lubricant. Assemble cross pin into case. Use a hammer as shown. Be sure snap ring grooves of the cross pin are exposed to allow assembly of snap rings (fig. 10-51).

(19) Assemble snap rings.

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

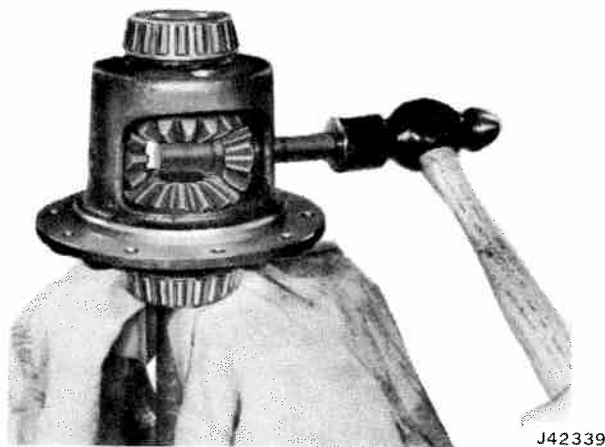


Fig. 10-51 Installing Cross Pin

(20) Remove case from axle shaft. Assemble ring gear to case.

(21) Line up ring gear screw holes with those of case. Assemble ring gear screws finger-tight.

(22) Reposition differential case onto axle shaft as shown. Draw screws up evenly. Tighten to specified torque (refer to Torque Specifications).

NOTE: Use new ring gear screws.

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

Assembly Replacement

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

(1) Remove both differential bearing cones and shims. Mark or tag each side bearing cone and shim pack as it is removed to indicate from which side of the case they were removed.

(2) Remove ring gear from case.

(3) Assemble ring gear to new Trac-Lok case. Make sure the gear flange on the differential case is free of nicks or burrs (refer to Torque Specifications).

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

(5) Assemble shims and differential bearing cones. Use step plate on bottom bearing to protect bearing from becoming damaged during assembly of top bearing. To completely seat bearings, use proper bearing driver tool.

(6) Prelubricate differential bearing cones with specified lubricant and assemble case into axle housing.

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

PROPELLER SHAFTS AND UNIVERSAL JOINTS

GENERAL

The drive 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 around 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 the shaft must be aligned in the same horizontal plane. This is necessary to avoid vibration.

NOTE: Whenever a vehicle is undercoated, use extreme care to keep undercoating material off the propeller shafts. Undercoating on a propeller shaft can cause vibration due to imbalance.

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. 10-52). The rollers and bushings are replaceable once the joint is disassembled.

(1) Position tube of propeller shaft, near cross-type universal joint, in a bench vise; clamp lightly.

(2) Remove two cup retainer rings, which fasten bearing cups to tube yoke. If necessary, tap ends of

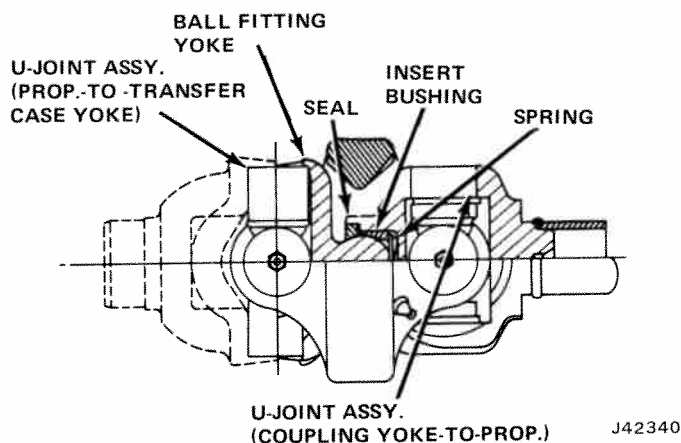


Fig. 10-52 Double Cardan Joint

bearing cups with a brass hammer to release pressure on retainer rings before removal.

(3) Place joint between open jaws of a soft-jawed vise so that ears on one yoke are supported on vise jaws.

(4) With a brass hammer, strike the ear of yoke behind bearing. This will drive out bearing. Remove opposite bearing in same manner.

(5) Remove cross from yoke.

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

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

(8) Inspect yoke for wear and damage. If it is bent out of alignment with propeller shaft tube, or if its 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 a 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 a soft-jaw vise, so that its inner surface is supported by vise jaws.

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

(7) Secure bearing to yoke with a retainer ring; be certain retainer ring is properly seated.

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

MODEL 30 FRONT AXLE SPECIFICATIONS

Torque Specifications	Foot-Pounds
Axle Housing Cover.....	15 to 25
Pinion Yoke Nut.....	200 to 220
Differential Bearing Cap Screw.....	35 to 50
Drive Gear-to-Case Screws.....	45 to 65
Universal Joint U-Bolts.....	13 to 18
Wheel-to-Hub Nuts.....	65 to 90
Lower Ball Joint Nut.....	80
Upper Ball Joint Nut.....	100
Upper Ball Stud Seat.....	50
Adjustments	
Drive Pinion Bearing Break-Away Preload	
Original Bearings.....	15 to 25 in lbs
New Bearings.....	20 to 40 in lbs
Differential Bearing Preload.....	.015 inch
Drive Gear-to-Pinion Backlash.....	.005 to .009 inch
Differential Side Gear-to-Case Clearance.....	.000 to .006 inch

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MODEL 44 AXLE SPECIFICATIONS (Full-Floating and Semi-Floating Types)

Torque Specifications	Foot-Pounds
Axle Housing Cover.....	15 to 25
Pinion Yoke Nut.....	200 to 220
Differential Bearing Cap Screw.....	70 to 90
Drive Gear-to-Case Screws.....	45 to 65
Universal Joint U-Bolts.....	13 to 18
Universal Joint Flange Bolts.....	25 to 45
Wheel-to-Hub Nuts.....	65 to 90
Backing Plate Mounting Bolts/Nuts	
Front Brakes.....	25 to 30
Rear Brakes.....	25 to 35
Disc Brake Shield Nuts.....	30 to 40
Disc Brake Shield Bolt.....	5 to 10
Lower Ball Joint Nut.....	80
Upper Ball Joint Nut.....	100
Upper Ball Stud Seat.....	50
Adjustments	
Drive Pinion Bearing Break-Away Preload	
Original Bearings.....	10 to 20 in-lbs
New Bearings.....	20 to 40 in-lbs
Differential Bearing Preload.....	.015 inch
Drive Gear-to-Pinion Backlash.....	.005 to .010 inch
Differential Side Gear-to-Case Clearance.....	.000 to .006 inch

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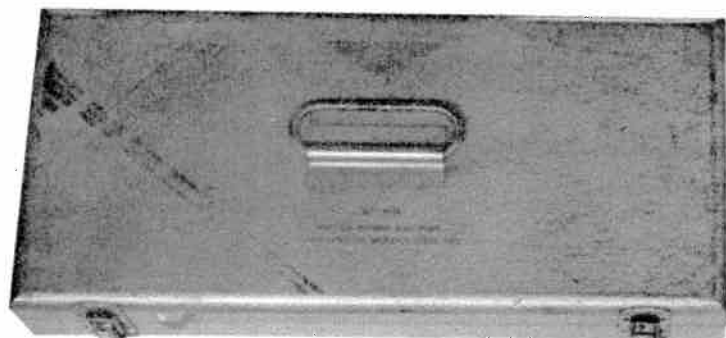
MODEL 60 AXLE SPECIFICATIONS

Torque Specifications	Foot-Pounds
Axle Housing Cover Screws.....	15 to 25
Pinion Yoke Nut.....	250 to 270
Differential Bearing Cap Screw.....	70 to 90
Drive Gear-to-Case Screws.....	100 to 110
Universal Joint U-Bolts.....	13 to 18
Universal Joint Flange Bolts.....	25 to 45
Wheel-to-Hub Nuts.....	110 to 125
Backing Plate Mounting Bolts/Nuts.....	45 to 55
Adjustments	
Drive Pinion Bearing Break-Away	
Original Bearings.....	10 to 20 in-lbs
New Bearings.....	20 to 40 in-lbs
Differential Bearing Preload.....	.015 inch
Drive Gear-to-Pinion Backlash.....	.005 to .009 inch
Differential Side Gear-to-Case Clearance.....	.000 to .006 inch

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W-104B PULLER SET



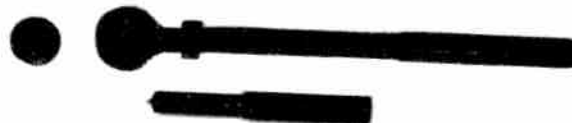
W-99D GAUGE SET



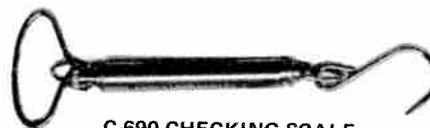
DD-1241 & DD-1245 WRENCH



W-144 WRENCH



C4142 GEAR ROTATING TOOL SET



C-690 CHECKING SCALE



W-162 FLANGE
INSTALLER



DD-914-7 EXTENSION



C-3095 SLEEVE



DD-914-42
BUTTON



W-188 DRIVER



C-359 DRIVER



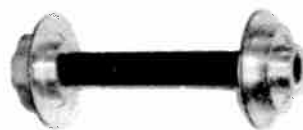
C-4025 DRIVER



W-186 DRIVER



W-147 DRIVER



DD-1243 INSTALLER



W-126 DRIVER



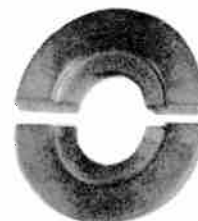
W-344 INSTALLER



W-262 SLEEVE



W-163 PULLER



SP-542 REMOVER
PART OF W-343



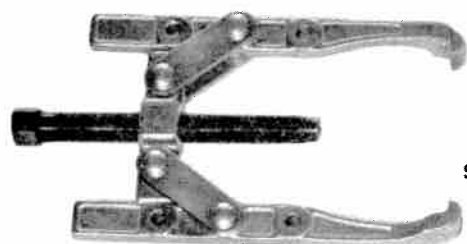
W-251 OR W-286
PULLER



SP-5441 INSTALLER
PART OF W-343

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Fig. 10-53 Axle and Propeller Shaft Service Tools
(Sheet 1 of 2)



SP-5574 PULLER



SP-5583 BUTTON



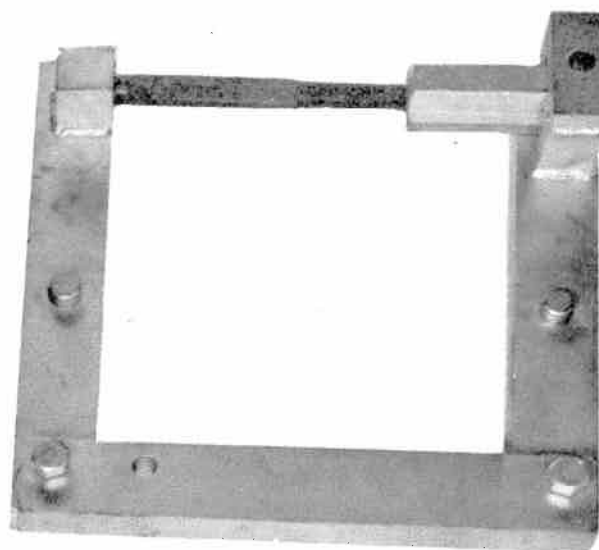
SP-5581 PLATE



SP-5582 CUP



C-3281 WRENCH



W-129 SPREADER



SP-5584 ADAPTER



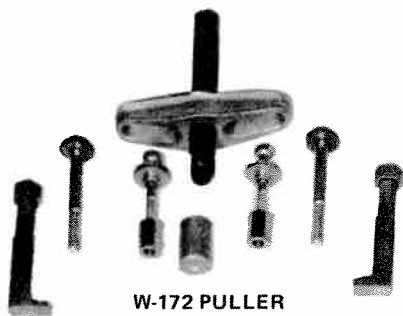
W-355 WRENCH
NUT



W-138 DRIVER AND ADAPTER



C-637 SLIDE HAMMER



W-172 PULLER



DD-914-62 ADAPTER



W-343 REMOVER AND
INSTALLER



SP-5439 INSTALLER
PART OF W-343



SP-5440 INSTALLER
PART OF W-343



DD-914-9 REDUCER RING



DD914-8 REDUCER RING



DD-914-P PRESS SET

J42342

Fig. 10-53 Axle and Propeller Shaft Service Tools
(Sheet 2 of 2)

TECHNICAL SERVICE LETTER REFERENCE

[illegible]