

# REAR AXLE

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## GENERAL DESCRIPTION

The design of all rear axle gear assemblies used on 1954 cars, as shown in Fig. 8-1, is identical, although the gear ratios for different series vary to provide optimum performance and economy on all models. The 3.07 to 1 ratio rear axle gear assembly is used as standard equipment on the 1954-62 and 60S Series car, except

when Air Conditioning is ordered. A 3.36 to 1 ratio axle is available for these models when ordered with the car, and is standard when Air Conditioning is ordered. The rear axle ratio for the 75 Series is 3.77 to 1 and 4.27 to 1 for the 86 Series whether or not Air Conditioning is ordered.

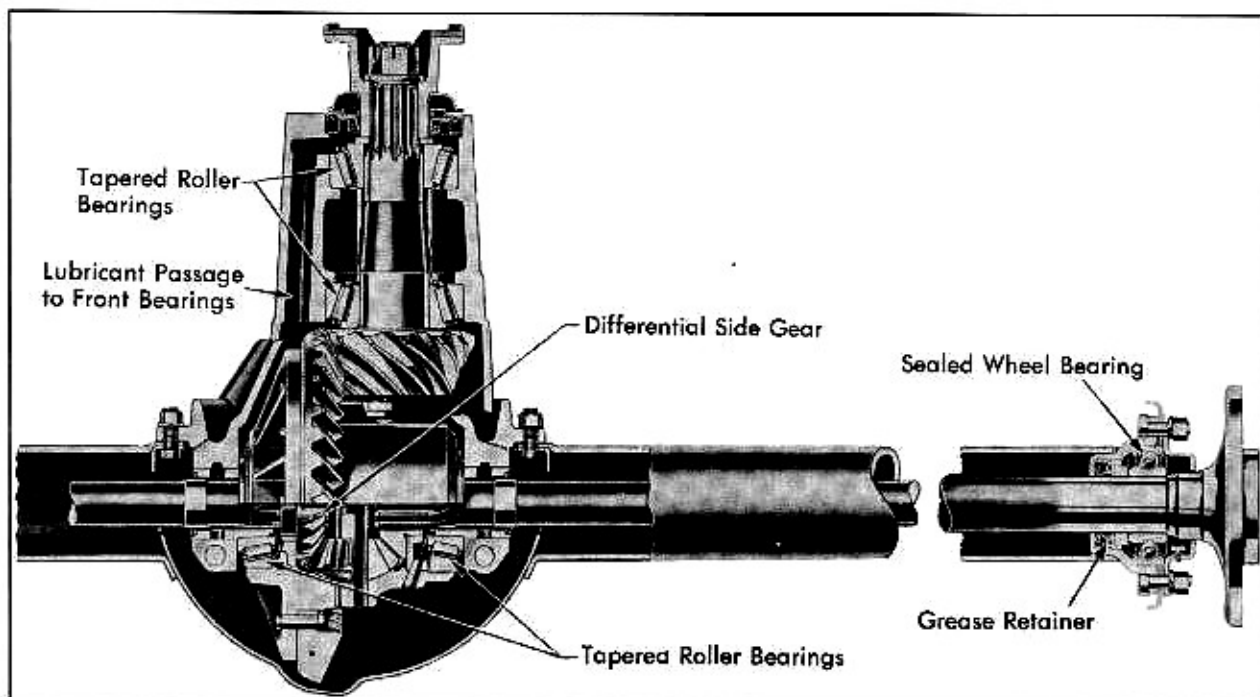


Fig. 8-1 Rear Axle Assembly

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The axle shaft is of the semi-floating design with a permanently lubricated and sealed ball bearing supporting it at the outer end near the wheels. Axle shaft oil seals are located at the outer ends of the axle housing, just inside the ball bearings.

The power and braking forces are transmitted to the frame through the rear springs (Hotchkiss Drive) which provides additional cushioning for all driving strains, resulting in smoother and quieter operation. Power is transmitted from the transmission to the rear axle assembly by a tubular propeller shaft, with "Mechanics" type

universal joints at each end. The rear universal joint cross bearings are attached to the rear axle pinion yoke by four screws and locks for easy removal of the propeller shaft from the car. On all 1954-60S and 62 Series passenger cars, the sliding joint is located at the rear of the transmission. The 1954-75 Series passenger car and the 1954-86 commercial chassis use a special yoke with a threaded plug in combination with a snap ring on the transmission shaft to lock the yoke to the transmission output shaft. On these series cars, the sliding yoke is located at the rear of the rear propeller shaft assembly.

## SERVICE INFORMATION

### (1) Axle Gear Ratio Identification

The gear ratio of the rear axle assembly on 1954 series Cadillac cars can be determined by an identifying number on the bottom of the differential case beneath the center of the pinion shaft.

The ratios for the various models are listed below.

Series	Ratio	Identification Number
1954-62, 60S	3.07-1	"3"
(optional)	3.36-1	"6"
1954-75	3.77-1	"7"
1954-86 (Comm.)	4.27-1	"4"

### (2) Replacement of Rear Axle Oil Seals

Whenever the axle shaft oil seal or the differential pinion shaft oil seal is removed for any reason, a new oil seal must be installed.

Guard against any bending or denting of the

seals, as this may cause leakage after installation. Even a slight scratch across the sealing lip may provide a channel for oil to seep through. Seals should be soaked in clean motor oil for 1/2 hour before being installed.

After removing the road wheel and axle shaft as explained in Note 5, the axle seal may be removed from the rear axle housing.

A tool, to facilitate the removal of the axle seal, may be made up to the dimensions indicated in Fig. 8-2 and used with the Special Slide Hammer Assembly, Tool No. J-2619. Install the plate on the slide hammer shaft and install a flat washer and nut on threaded end.

Dimension	62-60S Series	75-86 Series
A	1/4"	5/16"
B	3/4"	7/8"
C	1-1/8"	1-9/16"
D	2-1/8"	2-9/16"
E	1-1/4"	1-1/2"
F	3/16"	3/16"

Slide the shaft with plate, through seal and pull shaft outward to position plate against inside face of seal, Fig. 8-2. Be sure plate is not behind shoulder in housing, as it will bend the plate. Drive outward with slide hammer to remove seal.

Before installing a new seal, wipe the counter-bore into which the seal is pressed and carefully remove any nicks or burrs. The sealing surface on the axle shaft should be polished, using 400 grit "wet" paper and kerosene to insure a smooth surface and to prevent wear on the seal.

The surface of the sealing lip should be coated with lubricant at installation. The outside diameter

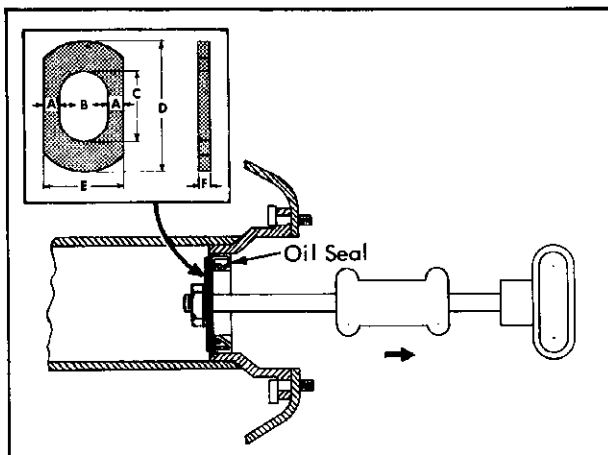


Fig. 8-2 Rear Axle Oil Seal Removal Tool

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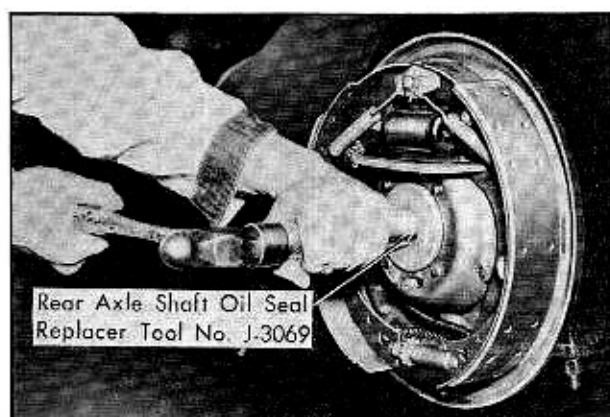


Fig. 8-3 Installing Rear Axle Oil Seal

of the oil seal metal shield should be coated with a good sealer compound before installation.

The oil seal must be pressed squarely into its bore and onto its seat. Use Rear Axle Shaft Oil Seal Replacer, Tool No. J-3069, as shown in Fig. 8-3 to install the rear axle seals on 1954-62-60S and 75 cars. On 1954-86 commercial chassis use Tool No. J-1355A.

### (3) Removal and Installation of Rear Axle Pinion Oil Seal or Yoke

When it is necessary to replace the rear axle pinion oil seal or yoke it is very important that the procedure outlined below be followed to avoid overloading the pinion bearings or collapsing the spacer.

#### a. Removal

1. Remove about 1-1/2 pints of rear axle lubricant from differential, using a suction gun.
2. Remove both rear wheels and brake drums.
3. Disconnect rear universal joint at pinion yoke.
4. Using a 50 inch pound torque wrench (KMO-654 or similar wrench) with Socket, Tool No. J-2571-1, and Adapter, Tool No. J-2571-2, measure the inch pounds torque required to rotate the pinion shaft slowly for at least 1/2 turn. Fig. 8-4. Repeat this torque check at least eight times, which will insure an accurate check over the entire circumference of the ring gear. Record all torque readings.

**NOTE:** Before each check of the torque, rotate the pinion shaft 1/4 turn in each direction, to free it up, thus eliminating an unusually high starting torque.

5. Mark pinion shaft and yoke with a punch so

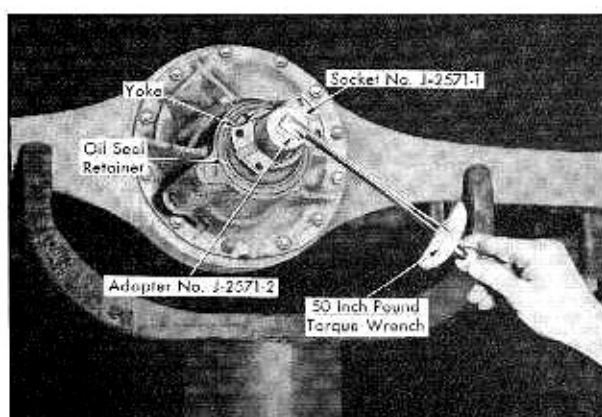


Fig. 8-4 Checking Preload Torque

that yoke can be installed in same position on spline.

6. Install Pinion Yoke Holding Tool, No. J-2659, on yoke and install two attaching nuts.

7. Install Socket, Tool No. J-2571-1, through hole in holding tool onto pinion nut and remove nut, using a 3/4 inch drive socket wrench.

8. Remove pinion yoke from pinion shaft with Puller, Tool No. J-5514. Fig. 8-5.

9. Remove pinion oil seal.

10. Remove staking burrs on pinion shaft with a small file or thread die, size 7/8" x 14.

#### b. Installation

1. Coat outer edge of oil seal with a good sealer and lubricate sealing lip. Drive seal into carrier, using Oil Seal Installer, Tool No. J-1357. Fig. 8-6.

**CAUTION:** Be sure outer surface of yoke is free from scratches or nicks. Clean up with No. 400 grit "wet" paper and kerosene.

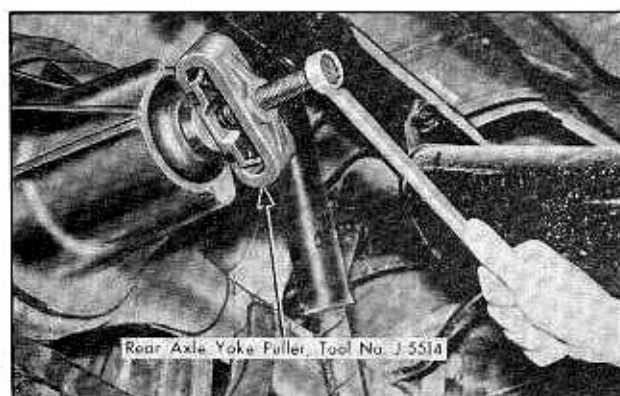


Fig. 8-5 Removing Pinion Yoke

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Fig. 8-6 Installing Pinion Oil Seal

2. Install yoke on pinion shaft splines with punch marks lined up.

3. Install new pinion nut, holding flange of yoke with Pinion Yoke Holding Tool, No. J-2659.

4. Tighten nut to 225 ft. lbs. torque.

**NOTE:** In cases where a 300 lb. torque wrench is not available, a Torque Wrench Extension, Tool No. J-3291, may be used with a 200 pound torque wrench, Tool no. J-1264, or any standard 200 pound torque wrench, Fig. 8-7. A table is given below for determining actual torque load on pinion nut for any length of torque wrench used, measured from center of grip to center of drive.

Indicated torque for 225 ft. lbs. actual -  $225 \times L/12 + L$ .

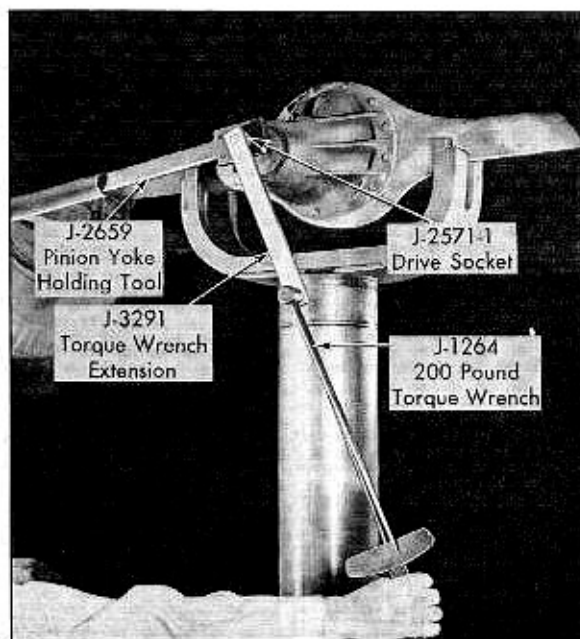


Fig. 8-7 Tightening Pinion Nut

Torque Wrench Length	13	14	15	16	17	18	19	20
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Torque Required for 225 ft. lbs. Actual	117	122	125	129	132	135	138	141
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5. Measure the inch pounds torque required to rotate pinion shaft as in step 5a. The average torque required should be from 3 to 7 inch pounds greater than the average of the torque recorded in step 5a.

6. If torque is low, tighten the nut in small increments ( $1/2$  a flat at a time approx.) and again measure the torque until the desired torque is obtained.

**CAUTION:** Do not over tighten and never back off on the nut to reduce preload torque. The maximum allowable torque on an assembly with over 1000 miles is 15 inch pounds (used seal) and 20 inch pounds with a new seal. The torque on a new assembly is 50 inch pounds.

7. Stake pinion shaft into nut.

8. Refill rear axle to correct level.

### (4) Measurement of Rear Axle Backlash

1. Place car on hoist.

2. Fasten one end of a piece of bar stock to the yoke on the differential pinion shaft, and the other end to the frame side rail by means of "C" clamps to prevent rotation of the pinion yoke.

3. Apply emergency brake cable on one wheel to prevent wheel from turning.

4. Measure rotation (backlash) of opposite wheel in inches at outer circumference of tire tread. A stiff wire pointer fastened to the fender or car frame will aid in this measurement.

**NOTE:** Maximum backlash under the above conditions should not exceed  $1/2$ ".

### (5) Removal and Installation of Axle Shaft and Bearing (Except 54-86)

#### a. Removal of Axle Shaft and Bearing Assembly

1. Dismount road wheel.

2. Remove two screws holding brake drum to axle shaft flange, and remove drum.

3. Remove four nuts and lock washers (six on 75 series) holding bearing retainer and backing plate to rear axle housing.

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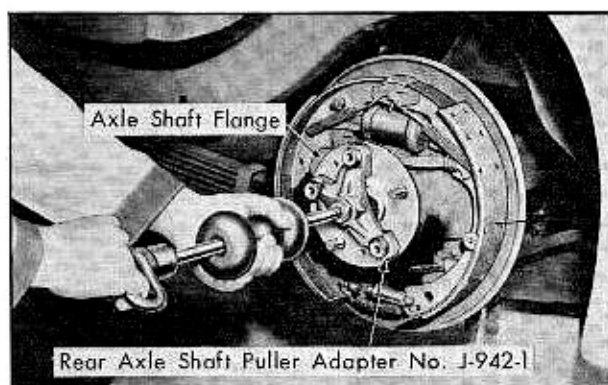


Fig. 8-8 Removing Rear Axle Shaft

4. Install wheel Puller, Tool No. J-942-1, on rear axle shaft studs and install Slide Hammer Assembly, Tool No. J-2619 in Puller. Fig. 8-8.

5. Remove axle shaft.

**CAUTION:** Be careful not to damage axle shaft oil seal when sliding axle shaft out.

### b. Removal of Bearing From Axle Shaft

1. Using a cold chisel and hammer, nick the spacer next to the bearing.

**NOTE:** The spacer need not be split. Only drive chisel into spacer until spacer can be slipped off shaft.

2. Assemble rear axle shaft and bearing assem-

bly to the "U" shaped piece of Rear Axle Bearing Remover and Replacer, Tool No. J-2986, and place on an arbor press. Fig. 8-9.

3. Assemble the rectangular shaped piece of the tool around bearing and over dowels.

**CAUTION:** Step 3 must be performed to decrease the danger of the bearing exploding while under arbor press load.

4. Press axle shaft through bearing.

### c. Installation of Bearing on Axle Shaft

1. Assemble retainer and new bearing on axle shaft.

2. Place assembly through ring of installer tool on arbor press. Fig. 8-9.

3. Press bearing on shaft up to, but not quite touching shoulder. Fig. 8-9.

4. Release arbor press and remove axle shaft from tool.

5. Assemble spacer to shaft and reinstall on tool.

6. Press shaft through spacer until spacer just contacts bearing.

### d. Installation of Axle Shaft and Bearing in Rear Axle Housing

1. Inspect rear axle shaft oil seal for wear or

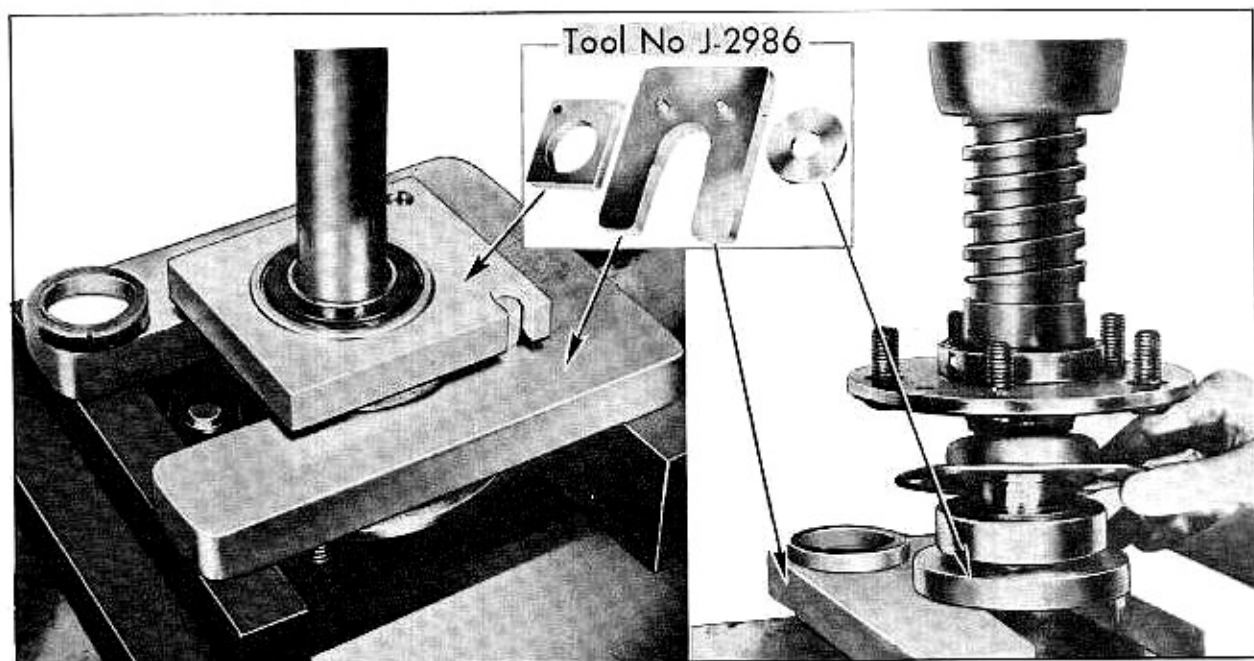


Fig. 8-9 Removing and Installing Rear Axle Shaft Bearing



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scratches. Replace seal if there is an indication of leakage, wear, or scratches, as outlined in Note 2.

2. Lubricate inner surface of oil seal leather with chassis lubricant.

3. Apply film of Lubriplate grease in wheel bearing bore in axle housing.

4. Install axle shaft (shorter shaft on left side), being careful not to damage oil seal.

NOTE: Before installing an axle shaft after an oil seal has been replaced, inspect rear wheel bearing for loss of lubricant, since leak in old seal may have permitted differential lubricant to "wash out" grease in sealed wheel bearing. A wheel bearing that spins freely indicates a lack of grease and should be replaced at the same time a new oil seal is installed.

5. Install backing plate and bearing retainer.

6. Install four nuts and lock washers (six on 75 series) on housing bolts, to hold bearing retainer in place, and tighten by inserting a socket wrench through hole in rear axle flange.

7. Install brake drum and two retaining screws.

8. Install road wheel, hub cap, and wheel shield.

### (6) Removal and Installation of Axle Shafts (54-86)

#### a. Removal

1. Dismount road wheel.

2. Remove retaining nut and locking washer from end of axle shaft.

3. Pull wheel hub and brake drum assembly off shaft. Use a five jaw puller, similar to Snap-on Puller, No. J-4567, with two extra jaws, which will reduce possibility of warping or distorting brake drum and will also pull it easier because of equally distributed tension.

4. Disconnect brake line at wheel cylinder.

5. Remove brake backing plate. The axle shaft is held in the housing by the backing plate which, when bolted in place, bears against outer race of wheel bearing.

6. Pull axle shaft and bearing assembly out of housing, using Rear Axle Shaft and Bearing Puller, Tool No. J-838. Be careful not to damage oil seal

next to inner side of wheel bearing.

#### b. Installation

The axle shaft is installed in the reverse order of its removal. It will be necessary to bleed the brake line, which was disconnected when the backing plate was removed.

NOTE: Before installing an axle shaft, after an oil seal has been replaced, inspect rear wheel bearing for loss of lubricant, since leak in old seal may have permitted differential lubricant to "wash out" grease in sealed wheel bearing. A wheel bearing that spins freely indicates a lack of grease and should be replaced at the same time a new oil seal is installed.

### (7) Removal and Installation of Differential Carrier

NOTE: Any service on the differential carrier assembly except seal or yoke replacement (See Note 3) should be handled by replacement of the complete assembly. No disassembly or adjustment of this unit should be attempted in the field, because special equipment is used at the factory for mating parts and setting side bearing preload.

#### a. Removal

1. Disconnect rear universal joint, as explained in Note 8.

2. Remove lubricant from differential with a suction gun.

3. Remove axle shafts, as explained in Notes 5 and 6.

4. Remove nuts and washers holding carrier to axle housing and remove entire assembly with gasket.

#### b. Installation

Reverse the above procedure using a new carrier to housing gasket.

NOTE: In case of lubricant leakage between the differential carrier and the axle housing, check the following: First make sure that the nuts are tightened to the recommended torque of 30 to 35 ft. lbs. If tightening the nuts does not stop the leak, an extra gasket should be installed, using a sealer. The additional sealing effect of the extra gasket will prevent further leakage. If a replacement differential is installed, special Differential Break-In Lubricant, supplied by the Factory Parts Department, must be used.

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**(8) Removal and Installation of Universal Joints**

Whenever it is necessary to disassemble the universal joints for inspection or overhaul, the propeller shaft must be removed from the car.

On 1954 Series 62 and 60S cars, it is only necessary to remove the cap screws which hold the bearing housings to the rear axle pinion yoke and slide the propeller shaft and front yoke off the transmission mainshaft.

NOTE: Slide a spare yoke into the transmission extension housing to prevent oil from leaking out.

On 1954-75 and 86 commercial chassis, it is necessary to remove cap screws from the universal joint at the cross member as well as the screws at the rear axle pinion yoke. To remove the front propeller shaft, it is necessary to remove the cap screws at the front yoke and also nuts which hold the center bearing support assembly to the insulators at the frame.

**a. Removal and Disassembly of Universal Joint**

1. Remove bearing retainer lock rings from universal joint, as illustrated in Fig. 8-10.
2. Support the yoke or bearing trunnion on vise jaws.
3. Place Bearing Remover, Tool No. J-4174, over

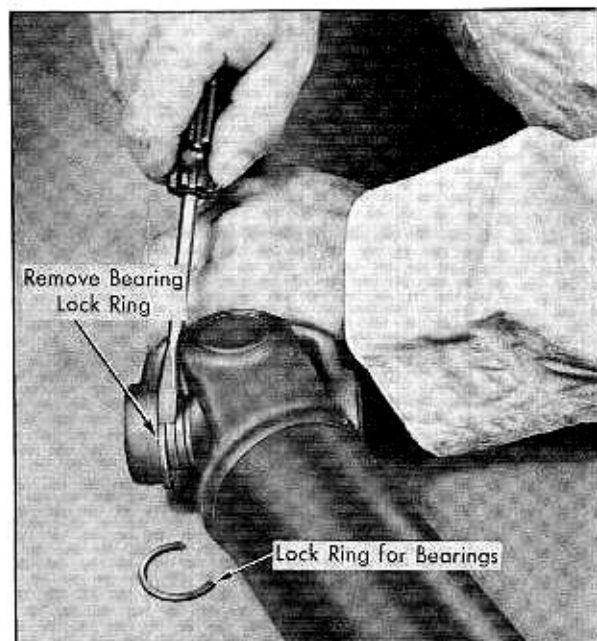


Fig. 8-10 Removing Lock Rings

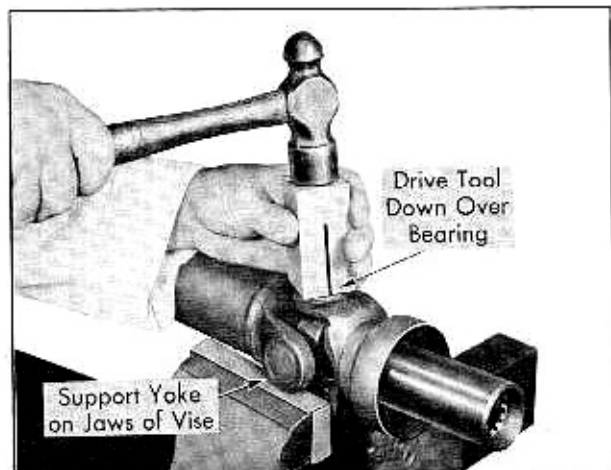


Fig. 8-11 Installing Tool on Bearing

bearing cap and drive on tool until universal joint bearing is out of yoke into tool about 1/2" inch, Fig. 8-11.

4. Place tool with bearing in vise and tighten vise until tool holds bearing and drives yoke away from tool until bearing is removed. Fig. 8-12.
5. Repeat operations 2, 3, and 4, on opposite bearing and remove cross.
6. Wash all parts thoroughly in clean solvent and inspect bearing housing for wear or pits. Replace any worn or damaged parts.
7. Inspect retainers and cork seals and replace if damaged or if cork is brittle.

**b. Assembly and Installation**

1. Install rollers into bearing housing and pack with chassis lubricant.

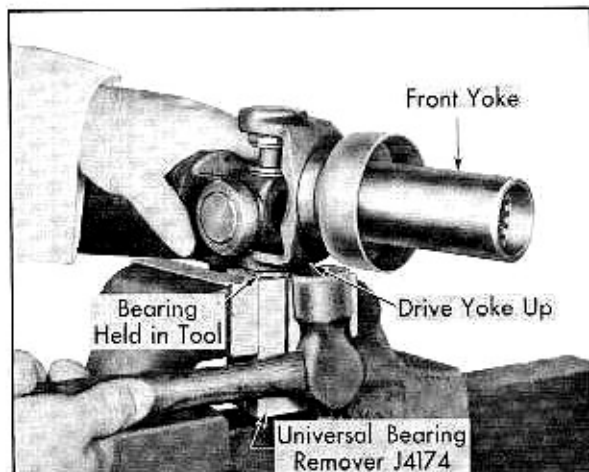


Fig. 8-12 Removing Bearings

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2. Install retainer and cork seal on universal joint cross.

3. Start one bearing into propeller shaft yoke by tapping lightly with a hammer.

4. Install universal joint cross in position and guide into bearing already started.

5. Start opposite bearing into propeller shaft yoke and place in vise with jaws against bearings. Fig. 8-13.

6. Tighten vise until cross is just ready to enter opposite bearing and adjust position of cross until it enters both bearings.

7. Tighten vise until both bearings are in far enough to allow lock rings to be installed.

**NOTE:** If bearings do not go into position with normal pressure on the vise, a needle bearing may have fallen out of place and the bearing must be removed and needle repositioned.

8. Install lock rings.

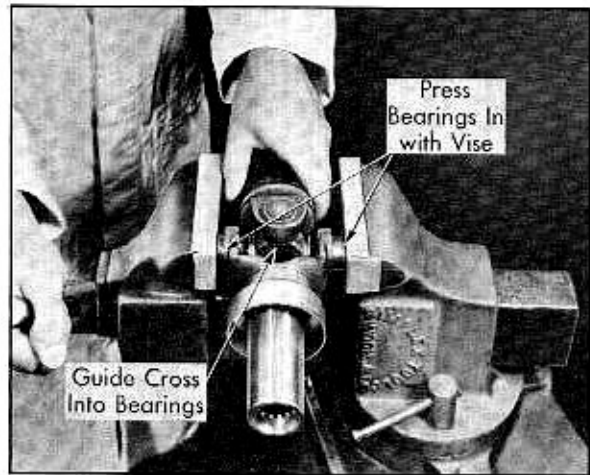


Fig. 8-13 Installing Bearings

### (9) Commercial Chassis Universal Joint Yokes

Wear in the drive line after high mileage usually becomes noticeable as a click at the splines and splineways of the universal joint yoke on the transmission mainshaft, and at the universal joint

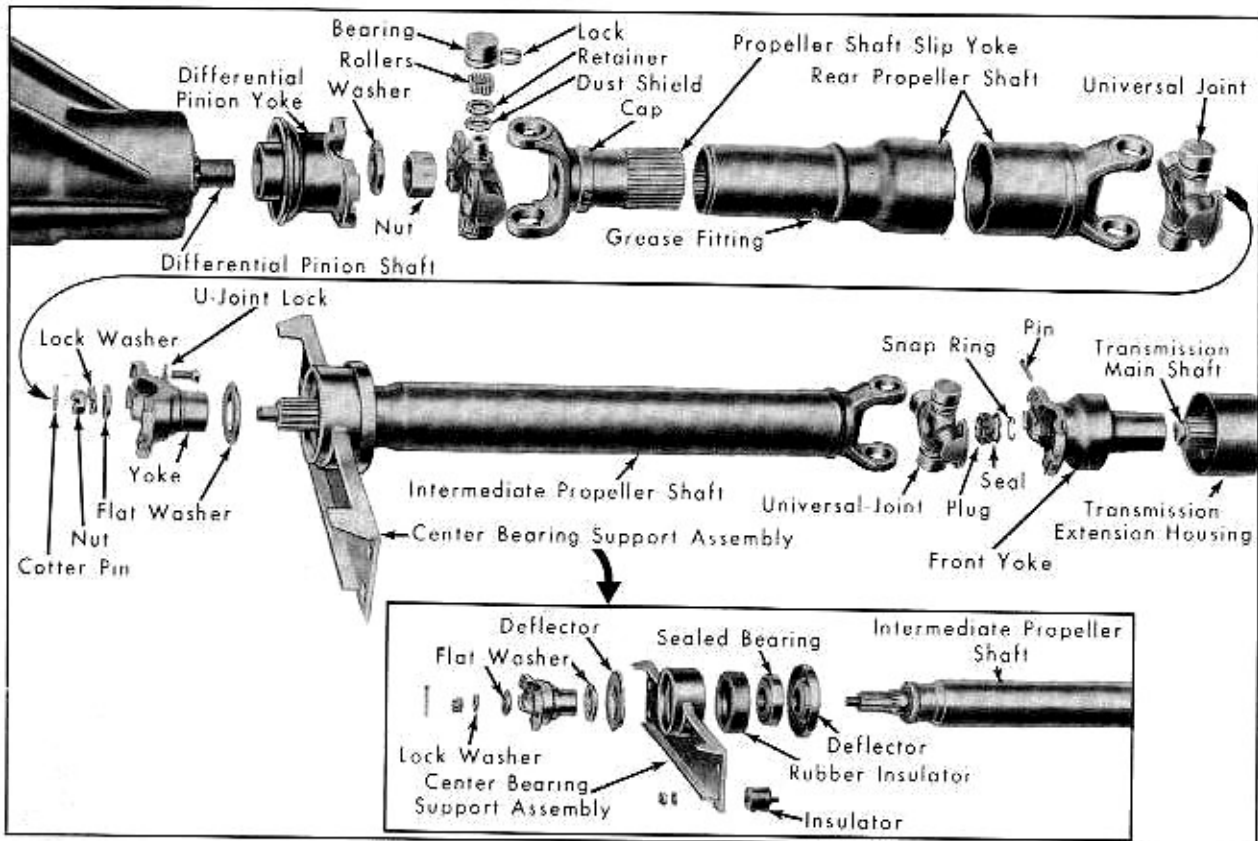


Fig. 8-14 Series 75 and 86 Propeller Shafts - Disassembled



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yoke at the rear of the front propeller shaft on commercial cars. Correction of this condition is made by replacing with new yokes as explained in Notes 8a and 8b. Installation of the new yokes is made by driving the yoke on the splines of the shaft.

### (10) Disassembly and Assembly of Propeller Shaft (1954-75 & 86)

#### a. Disassembly

1. Remove propeller shafts, as explained in Note 9.
2. Remove universal joints from shafts as explained in Note 9a.
3. Remove cotter pin, castellated-nut, lock washer, and flat washer which hold the universal joint yoke to the spline end of the front propeller shaft. Fig. 8-14.
4. Slide yoke off propeller shaft.
5. Slide large flat washer off shaft.
6. Press center bearing assembly off shaft over

spline end.

7. Press rubber bushing and bearing out of center bearing support.

8. Remove sealed bearing from rubber insulator.

#### b. Assembly

1. Install sealed bearing in rubber insulator.
2. Press bearing and insulator into bearing support.
3. Install front deflector, bearing support assembly, rear deflector, and flat washer over spline.
4. Press yoke on front drive shaft splines at right angles to front yoke. This should be a tight fit with no backlash or looseness.
5. Assemble flat washer, lock washer, and castellated nut and tighten to 40-50 foot pounds. Back off 1/2 turn and then install cotter pin.
6. Install universal joints in propeller shafts, as explained in Note 9.
7. Install propeller shafts, as explained in Note 8.

### SPECIFICATIONS

Subject and Remarks	54-62, 60S	54-75	54-86
Axle shaft length			
Left	30-1/4"	30-1/4"	32-3/4"
Right	32-1/2"	32-1/2"	35"
Runout (at ground surface near splines) not to exceed	.006"	.006"	.006"
Backlash - pinion and ring gear	.003"- .010"	.003"- .010"	.003"- .010"
Distance - outer face of flange to inner end of bearing inner race	3.075"-3.085"	3.075"-3.085"	
Minimum road clearance (under center of axle housing)	8"	8-1/4"	9"
Gear Ratio	3.07-1	3.77-1	4.27-1
Air Conditioner Equipped Cars and optional (62 & 60S)	3.36-1	3.77-1	4.27-1

### TORQUE TIGHTNESS

Location	Size	Ft. Lbs. Min.	Ft. Lbs. Max.
Spring U-bolts	Special	45	52
Brake backing plate to axle housing (54-86 Comm.)	7/16-20	55	60
Brake backing plate to axle housing (54-62, 60S, 75)	3/8-24	35	40
Axle shaft hub nuts (86 Comm.)	1-14	285	315
Differential carrier to axle housing	3/8-24	30	40
Pinion shaft nuts	7/8-14	200 Min.	
Universal joint screws	5/16-24	18	22
Intermediate propeller shaft yoke nut (75 & 86 Comm.)	1/2-20	40*	50*
Differential carrier pedestal clamp screw	1/2-20	50	60

\* Back off 1/2 turn. See Note 10b, Step 5.

