REAR AXLE

CONTENTS OF THIS SECTION

STANDARD DIFFERENTIAL

GENERAL DESCRIPTION

The rear axle assembly is of modified Hotchkiss drive construction utilizing a hypoid ring gear and pinion set as a means of transmitting power (torque) from the propeller shaft through a differential and then to semi-floating axle shafts.

Two rear axle upper control arms and two lower control arms (Fig. 4-1), with rubber bushings at connecting pivot points, form the basic links of rear suspension. The functions of the lower control arms are to maintain the axle in line relative to frame and to oppose torque reaction of the rear axle. The upper control arms control rear axle "windup" and maintain lateral stability of the car on the axle.

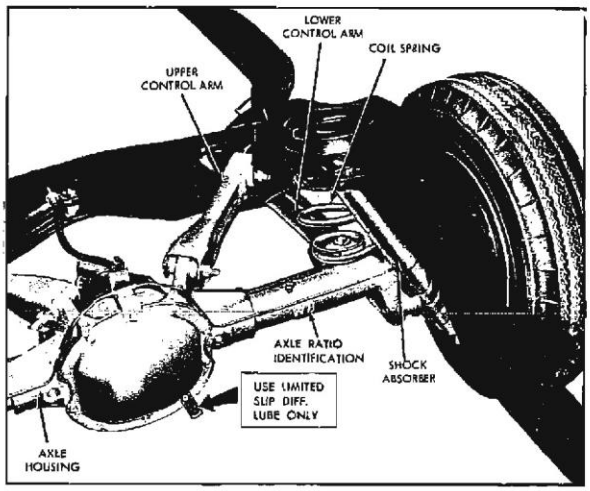


Fig. 4-1 Rear Axle View

The upper ends of rear coil springs are retained in seats formed in the frame while the lower ends ride on spring pads welded to the housing just forward of the centerline of axle assembly.

Direct-acting sealed shock absorbers are mounted with upper ends inclined toward center of vehicle. Rubber bumpers, inserted in a bracket on the rear axle, cushion extreme downward movement of the frame and body.

All parts necessary to transmit power from the propeller shaft to the rear wheels are enclosed in a Salisbury type axle housing. It is an iron casting with tubular axle housings pressed and welded into the carrier to form a complete carrier and tubes assembly. It is characterized by a removable steel cover bolted to the rear of the carrier, which permits service of the differential without removing the rear axle from the car. Rear axle shafts are mounted on heavy duty ball bearings located at the outer ends of the rear axle housing. Each bearing is pressed to a shoulder on the shaft and is additionally held in place by a pressed-on inner retainer ring. An outer retainer, which also clamps the brake backing plate to the axle housing, secures the bearing in the end of the axle housing. Axle shaft bearings are pre-lubricated and are backed by oil seals (pressed into the outer ends of the axle housing) which prevent oil seepage from the axle housing into the wheel bearing cavity and onto the brake assembly.

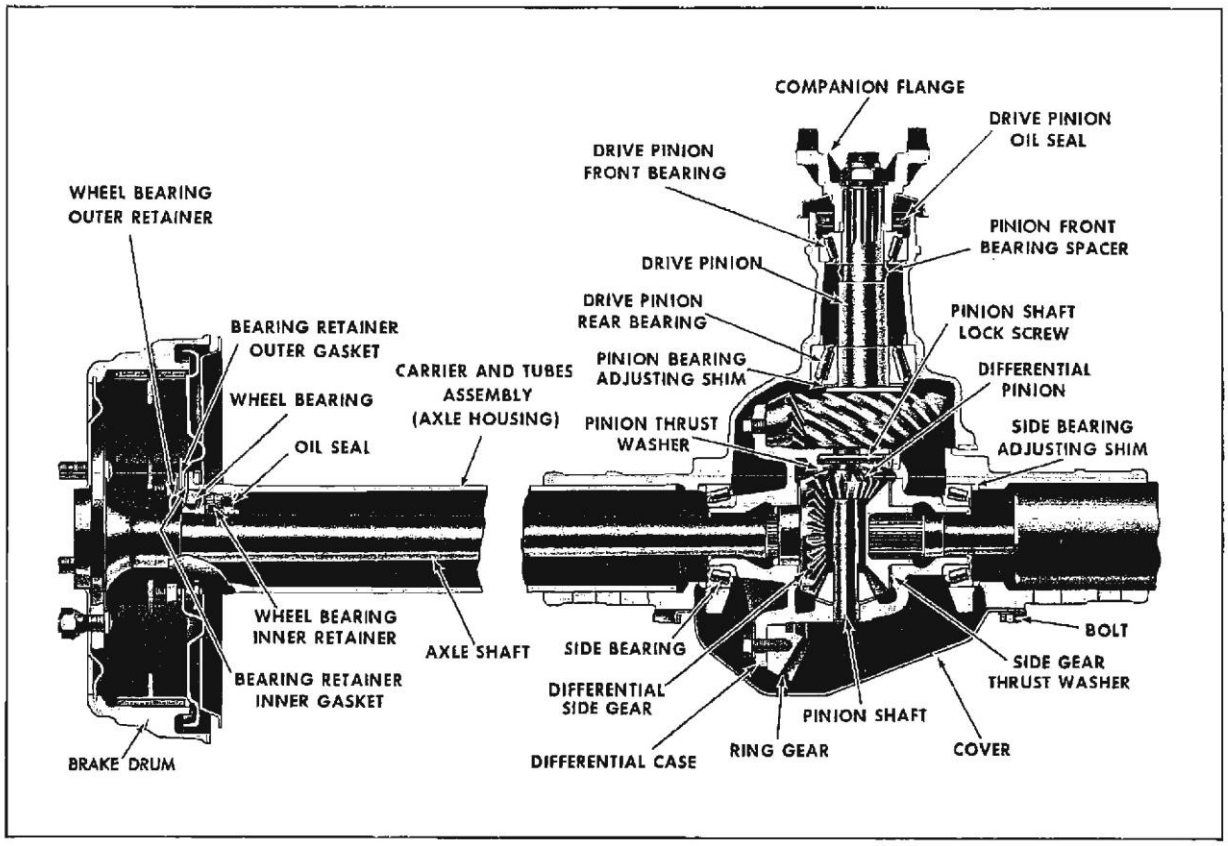


Fig. 4-2 Cross Section - Rear Axle

To prevent entrance of dirt and water, a breather vent with cap is provided at the right side of the axle housing.

DESIGN

Hotchkiss drive is the basic design used to transmit power from the drive shaft to the rear wheels but the design is modified by torque reaction links (upper and lower control arms) rather than leaf springs. A universal joint connects the end of the propeller shaft to a companion flange having a splined end which fits over and drives the rear axle drive pinion gear. This companion flange is securely fastened to the pinion shaft by a special self-locking nut which bears against a special washer.

Two preloaded taper roller bearings support the drive pinion gear in the carrier. The inner race of the rear bearing is a tight press-fit on the pinion stem. The inner race of the front bearing combines a light press-fit to a close sliding fit on the companion flange end of the pinion stem. The outer race of each bearing is pressed against a shoulder recessed in the carrier. Tightening the pinion nut compresses a collapsible spacer (Fig. 4-2), which bears against the inner race of the front bearing and a shoulder on the pinion stem. This spacer is used to maintain a load on the front bearing inner race and pinion stem, and to prevent the inner race of the front bearing from turning on the pinion.

Adjustment of the pinion along its axis is obtained by placing shims between the pinion rear bearing inner race and the pinion gear. Torque from the pinion gear is transmitted to a ring gear attached to a differential case by ten special hex head bolts.

The differential is a device that divides the torque between axle shafts. It permits the rear wheels to turn together at the same speed, or to turn at different speeds, as when making turns, etc.

The standard or conventional differential divides torque at the rear wheels equally. It is so designed that it will exert no more propelling effort than can be applied to the wheel having the least traction.

The differential case is of one-piece construction. Two side gears and two pinion gears are housed within the case. The two side gears have splined bores for indexing with and driving each of the axle shafts. They are positioned to turn in counterbored cavities in the case. The two differential pinion gears have smooth bores and are held in position by a solid pinion cross shaft mounted and locked in the differential case. All four gears are in mesh with each other and, because the pinion gears turn freely on their shaft, they act as idler gears when the rear wheels are turning at different speeds.

OPERATION—STANDARD DIFFERENTIAL

Power from the engine is transferred to the transmission via a clutch, or a fluid coupling with an automatic transmission. The transmission then provides the transfer of power to its output shaft which is splined to the propeller shaft by means of a universal joint connection. Since the rear of the propeller shaft is connected to the differential pinion gear at the companion flange, the transmission output shaft, propeller shaft, and differential pinion all turn at the same speed.

Power from the pinion gear is transmitted to the differential ring gear which is bolted to the differential case. When there is equal resistance on each rear wheel, the force through the pinion and ring gear turns the axle shafts at the same rate of speed, and there is no movement between differential pinions and side gears.

When the vehicle turns a corner, the outer rear wheel must turn faster than the inner one. The inner wheel, turning slower with respect to the outer wheel, slows the differential side gear (as the axle shaft is splined to the side gear) and the differential pinion gear will roll over the slowed differential side gear, driving the other differential side gear and wheel faster.

The differential allows both wheels to be mounted on individual axles and driven by a single shaft, yet it permits each wheel to move independently and at different speeds when the need arises.

AXLE RATIOS

Seven different axle ratios are available for the various car models. They can be identified by the code stamped on the rear of the R.H. axle tube adjacent to the carrier (Fig. 4-1), or on the left rear brake drum surface. Three differential cases which differ in ring gear mounting dimensions are used on 1965 models: one for the 2.56 ratio, one for the 2.93, 3.08, and 3.23 ratios, and one for the 3.36, 3.55, 3.90, and 4.33 ratios. When changing axle ratios, be sure to use the proper differential case.

NEW CAR PRE-DELIVERY INSPECTION

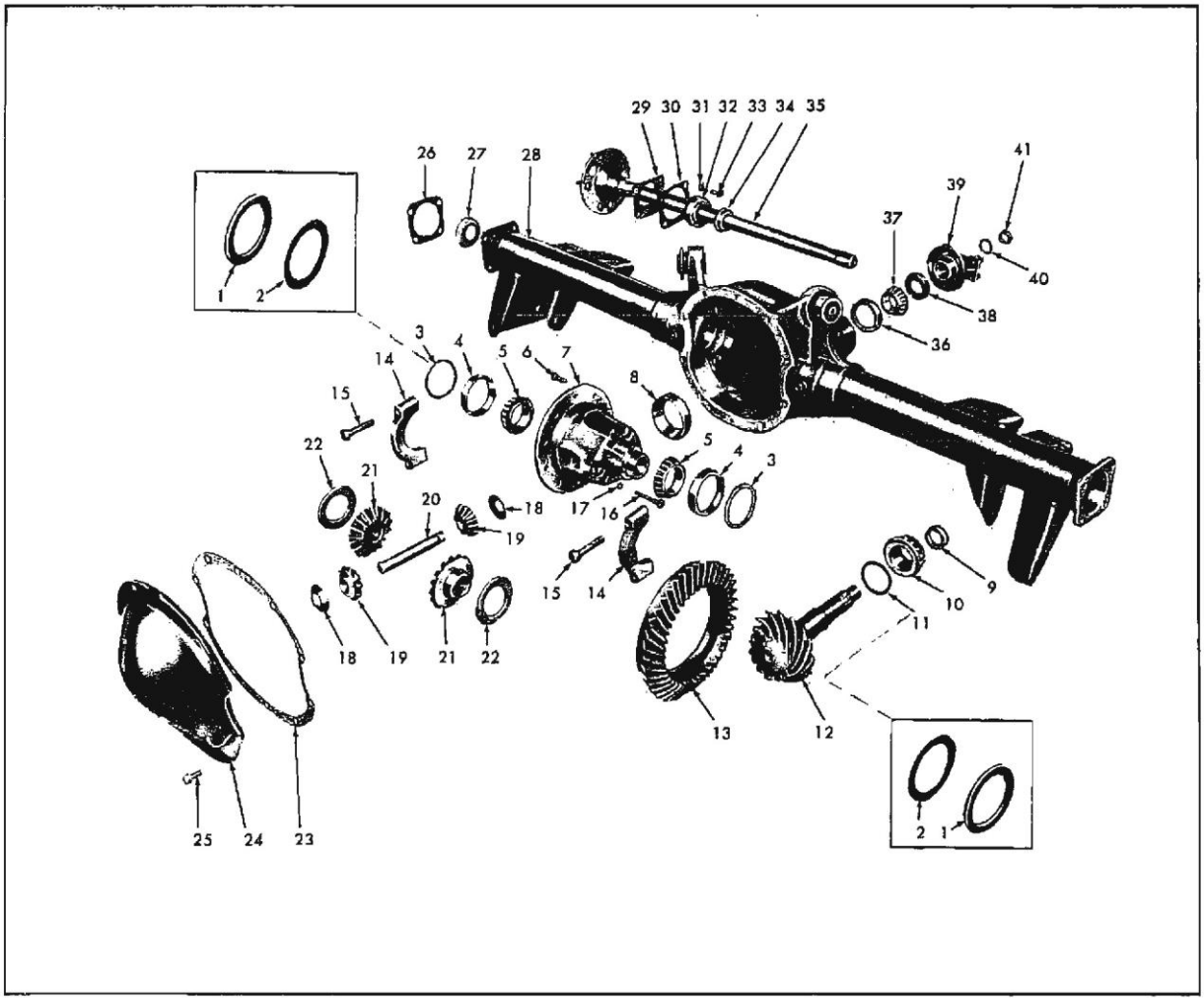
TORQUE

Check torque specifications at rear axle.

1. Tighten all rear suspension control arm bolts to 90 ± lb. ft. torque and nut to 75 ± 10 lb. ft. torque.

2. Tighten rear shock absorber to axle housing nut to 65 ± 10 lb. ft. and shock absorber to frame bolt and nut 20 ± 5 lb. ft. torque.

3. Tighten universal joint U-bolt nuts to 17 ± 3 lb. ft. torque.



1. Spacer (Service
2. Differential Side Bearing Shim (Service)
3. Differential Side Bearing Shim (Production)
4. Differential Side Bearing Race
5. Differential Side Bearing
6. Ring Gear to Differential Case Bolt
7. Differential Case
8. Rear Pinion Bearing Outer Race
9. Rear Pinion Bearing
10. Drive Pinion Bearing Shim
11. Drive Pinion Bearing Spacer
12. Drive Pinion Gear
13. Ring Gear
14. Differential Side Bearing Cap
15. Cap Bolt
16. Differential Pinion Shaft Lock Bolt
17. Washer
18. Differential Pinion Gear Thrust Washer
19. Differential Pinion Gear
20. Differential Pinion Shaft
21. Differential Side Gear
22. Differential Side Gear Thrust Washer
23. Cover Gasket
24. Cover
25. Cover Bolt
26. Inner Retainer Gasket
27. Axle Shaft Oil Seal
28. Carrier & Tubes Assembly
29. Outer Retainer
30. Outer Retainer Gasket
31. Nut
32. Axle Shaft Bearing
33. Brake Assembly to Housing Bolt
34. Inner Retainer
35. Axle Shaft
36. Front Pinion Bearing Outer Race
37. Front Pinion Bearing
38. Pinion Oil Seal
39. Companion Flange
40. Washer
41. Pinion Nut

Fig. 4-3 Differential Assembly - Exploded View

REAR AXLE USAGE AND IDENTIFICATION (1)

Rear Axle Gear		Model								Trans.				Ratio Release			Engine					Trailer		A/C	
Comb.	Ratio & Code	Tempest 4 Dr. & Coupe	Custom 4 Dr.	Custom Cpe & Conv.	Tempest & Custom Wagon	LeMans	Police	Taxi	GTO	3 Spd SMT	4 Spd SMT	Auto. Air Cooled	Auto. Water Cooled	Econ.	Std.	Perf.	6 Cyl.	326 2 Bbl.	326 H.O.	389 4 Bbl.	389 Tri-Carb.	W/O	With	W/O	With
41:16	2.56	X	X	X								X			X		X					X		X	
	(B)				X	X						X		X			X					X		X	
		X	X	X	X	X							X		X			X				X		X	
41:14	2.93	X	X	X								X				X	X					X		X	
	(D)				X	X						X			X		X					X		X	
							X						X		X			X	X			X		X	X
		X	X	X	X	X							X			X		X				X		X	
		X	X	X	X	X							X		X			X				X			X
								X				X			X		X					X		X	X
							X	X					X		X			X	X			X		X	X
															X		X					X		X	X
		X	X	X		X				X	X				X		X					X		X	
		X	X	X	X	X				X	X			X				X				X		X	X
								X		X	X				X			X				X		X	X
									X				X		X					X	X	X			X
								X		X	X				X				X			X		X	X
									X				X							X	X	X	X	X	
									X	X	X		X	SPECIAL ORDER						X	X	X	X	X	X
		X	X	X	X	X	X	X		X	X		X						X			X	X	X	X
		X	X	X	X	X				X	X		X						X			X	X	X	X
42:13	3.23	X	X	X	X	X							X		X				X			X		X	X
	(F)						X					X				X	X					X		X	X
							X						X			X		X	X			X		X	X
		X	X	X		X				X	X				X		X					X			X
		X	X	X	X	X				X	X				X			X				X		X	X
		X	X	X	X	X				X	X				X				X			X			X
								X		X	X				X		X					X		X	X
									X				X		X					X		X	X		
									X				X		X						X	X			X
									X	X	X				X						X	X	X	X	X
									X	X	X		X		X						X	X	X	X	X
		X	X	X		X				X	X			SPECIAL ORDER			X					X	X	X	
									X	X	X		X								X	X	X	X	
37:11	3.36	X	X	X	X	X							X		X				X	X				X	X	X
	(G)				X					X	X				X		X					X		X	X
		X	X	X	X	X				X	X				X				X			X		X	
									X	X	X					X		X	X			X		X	X
							X			X	X				X		X	X	X			X		X	X
							X			X	X				X			X	X			X		X	X
									X	X	X		X		X					X	X	X	X	X	
									X	X	X		X	SPECIAL ORDER							X	X	X	X	
		X	X	X		X				X	X				X							X		X	X
		X	X	X	X	X				X	X				X		X					X	X	X	X
		X	X	X	X	X				X	X				X		X	X	X			X	X	X	X
		X	X	X	X	X						X			X		X	X	X			X	X	X	
		X	X	X	X	X				X	X		X					X				X		X	
39:11	3.55	X	X	X	X	X				X	X				X			X	X					X	X	X
	(H)							X		X	X					X	X					X		X	X
							X			X	X					X	X	X	X			X		X	X
		X	X	X	X	X				X	X				X		X						X(2)	X	X
									X				X		X					X	X		X		X
									X	X	X		X		X					X		X	X	X	
		X	X	X	X	X						X			X		X					X		X	X
		X	X	X	X	X							X		X				X			X	X	X	
					X					X	X			SPECIAL ORDER			X					X	X(3)	X	
		X	X	X	X	X				X	X								X			X		X	
									X	X	X		X							X		X	X	X	
39:10	3.90	X	X	X	X	X	X		X	X	X				X		X						X(3)	X	X
		X	X	X	X	X				X	X				X		X						X	X	X
	(K)	X	X	X	X	X				X	X								X				X	X	X
									X	X	X		X	SPECIAL ORDER						X		X	X	X	
									X	X	X										X	X	X	X	
									X				X								X	X	X	X	
39:9	4.33								X	X	X		X	SPECIAL ORDER						X		X	X		
	(L)								X	X	X		X								X	X	X	X	

(1) For Radiator Usage, See Section 6A
(2) V81 Trailer Option Only
(3) V82 Trailer Option Only
(4) Stamped on R.H. axle tube adjacent to carrier and on L.H. brake drum surface

NOTE: This chart is subject to revision during the model year

DIFFERENTIAL CODE (4)

FIRST LETTER
W — Standard
Y — Safe-T-Track
X Standard (Metallic Brakes)
Z — Safe-T-Track (Metallic Brakes)

SECOND LETTER
B—2.56 Ratio
D—2.93 Ratio
E—3.08 Ratio
F—3.23 Ratio
G—3.36 Ratio
H—3.55 Ratio
K—3.90 Ratio
L—4.33 Ratio

Fig. 4-4 Chart - Rear Axle Usage and Identification

LUBRICATION

Check differential oil level and, if necessary, add sufficient amount of multi-purpose hypoid gear lubricant to bring level to bottom of filler plug hole.

PERIODIC SERVICE

LUBRICATION

Lubricant change in the differential is not recommended unless repair work is being done. The differential should be checked for leaks at each chassis lubrication. If there is evidence of leakage the leak should be corrected and lubricant added if needed. Lubricant level should be even with bottom of filler plug hole. Rear axle capacity is 3 pints.

Use multi-purpose hypoid gear lubricant in the standard and Safe-T-Track differential. Because of the importance of using factory-recommended lubricant, a container of this lubricant is furnished with each service ring gear and pinion set or differential carrier assembly. This lubricant is also available through regular parts channels (part number 531536).

SHOCK ABSORBERS

Give visual inspection for leaks and jounce car at each lubrication period to see that shock absorbers are in operative condition. If inoperative or if leaks are found, replace the unit.

MINOR SERVICE AND REPAIRS

NOTE: Most rear axle service repairs can be made with the rear axle assembly in the car by raising the rear end with the rear axle hanging on the shock absorbers. Rear axle lubricant may be drained by backing-out all cover bolts and breaking cover loose at the bottom.

COMPANION FLANGE—REMOVE AND REPLACE

NOTE: When replacing companion flange, it is important that new flange be properly installed to provide correct pinion bearing preload. The following procedure must be used to ensure correct pinion bearing adjustment.

1. With rear wheels off the floor, turn rear wheels, and rap brake backing plates with a soft hammer to ensure that brakes are free.

2. Remove U-bolts which hold rear universal joint to companion flange. Use a heavy rubber band or tape to hold bearings onto journal to prevent loss of bearing rollers when joint is disconnected if retainer strap has been removed (Fig. 4-5).

3. Attach a 1/2" drive adapter and socket to a lb. in. torque wrench. Place socket over drive pinion nut and turn pinion two or three revolutions to ensure free movement. Then take a torque reading while rotating pinion to measure bearing preload (Fig. 4-6). Record reading.

NOTE: Additional clearance to check preload can be obtained between differential and body by raising body a few inches by means of a jack or stand placed under frame at rear.

4. Hold companion flange with tool J-8614-1 (Fig. 4-7) and remove drive pinion nut and washer, using heavy-duty socket.

5. Remove companion flange, using puller J-8614-2 and 3 (Fig. 4-8).

6. Install new companion flange and washer and nut. Hold companion flange with tool J-8614-1 and tighten nut only a little at a time, stopping frequently to check preload (Step 3). Tighten nut to reading noted in Step 3; however, if reading obtained in Step 3 was less than 12 lb. in., increase preload to 16 ± 4 lb. in.

7. Connect universal joints. Use new lock washers and tighten U-joint to companion flange "U" bolt nuts to 17 ± 3 lb. ft. torque.

PINION BEARING OIL SEAL— REMOVE AND REPLACE

NOTE: Check pinion bearing preload before removing companion flange. Proper preload can then be maintained if inspection of the flange after removal shows damage requiring replacement.

1. With rear wheels off the floor, turn rear wheels and rap brake backing plates with a soft hammer to ensure that brakes are free.

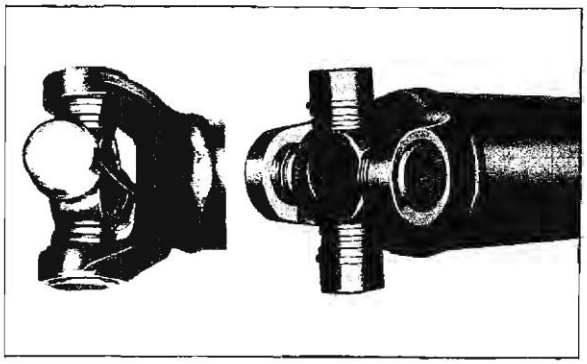


Fig. 4-5 Bearings Held in Place By Retainer Strap

2. Remove "U" bolts which hold rear universal joint to companion flange. Use a heavy rubber band or tape to hold bearings onto journal to prevent loss of bearing rollers when joint is disconnected if retainer strap has been removed (Fig. 4-5).

3. Scribe a line on end of pinion stem extending down along side of stem threads and onto companion flange.

4. Punch a small mark on the line at pinion stem end, and at top of lock nut, close to pinion stem threads.

5. Using a lb. in. torque wrench with a 1/2" drive adapter and socket placed over drive pinion nut, turn two or three revolutions to ensure free movement. Then take a torque reading while rotating pinion to measure bearing preload (Fig. 4-6). Record reading.

NOTE: Additional clearance to check preload can be obtained between differential and body by raising body a few inches by means of a jack or stand placed under frame at rear.

6. Count the number of exposed threads from top of pinion stem to lock nut. Remove lock nut with a heavy-duty socket while holding companion flange with J-8614-1 (Fig. 4-7).

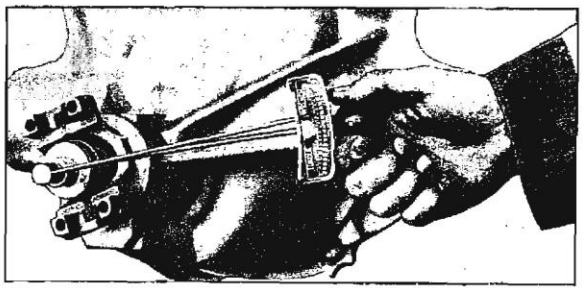


Fig. 4-6 Checking Pinion Bearing Preload

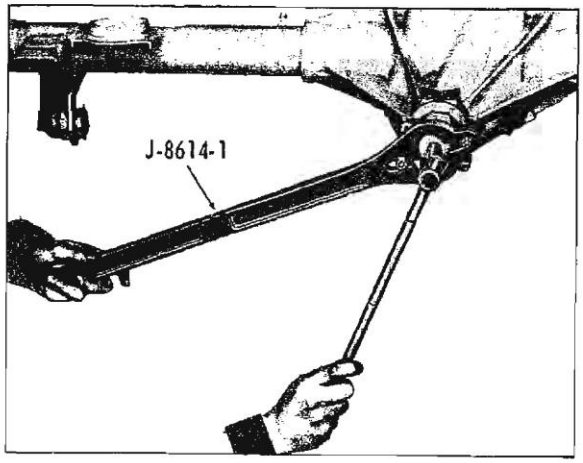


Fig. 4-7 Removing Pinion Nut

7. Remove companion flange using puller J-8614-2 & 3 (Fig. 4-8).

8. Remove oil seal by prying it out of carrier with a pointed tool, using care to keep tool away from the exposed front bearing. Discard seal.

CAUTION: Use care to keep dirt and other foreign matter out of exposed front pinion bearing.

9. Oil lip of new seal with clean gear lube. Coat outer diameter of seal case with suitable sealer. Install seal by tapping into place, using J-21128 (Fig. 4-9).

10. Before installing companion flange, inspect for nicks, scratches, or burned surfaces that may damage the seal. If any such damage is evident, bore carefully or install new flange.

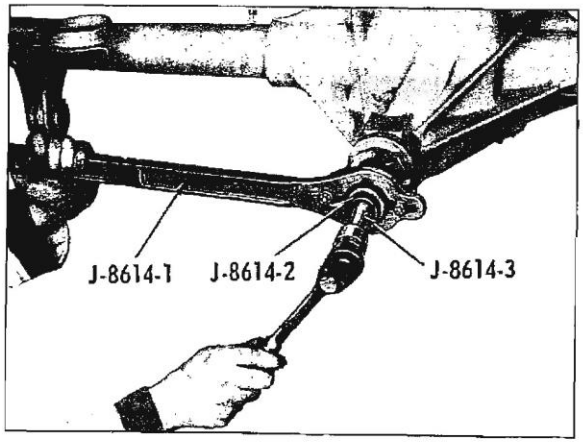


Fig. 4-8 Removing Companion Flange

a. If a new companion flange is installed, refer to Step 6 under Companion Flange - Remove and Replace.

b. If inspection shows the original flange to be satisfactory, replace by holding companion flange with J-8614-1 and install nut to exactly the same position as before. Make sure punched holes and scribe line are in alignment. Tighten lock nut an additional 1/32" beyond this alignment.

CAUTION: Do not exceed the additional tightening of the nut by a distance of more than 1/32 from its original position as tightening the nut in excess of this amount will disturb the pinion and ring gear tooth contact pattern.

11. Connect rear universal joint. Use new lock washers and tighten U-joint to companion flange "U" bolt nut to 17 ± 3 lb. ft. torque.

AXLE SHAFT AND/OR AXLE SHAFT BEARING AND/OR BEARING OIL SEAL AND/OR WHEEL BOLT—REMOVE AND REPLACE

REMOVE AXLE SHAFT ASSEMBLIES

Design allows for axle shaft end play up to .032" loose. This end play can be checked with the wheel and brake drum removed by measuring the difference between the end of the housing and the axle shaft flange while moving the axle shaft in and out by hand.

Inserting a shim inboard of the bearing to compensate for the end play is not recommended. This ignores end play of the bearing itself and may result in improper seating of the gasket or backing plate against the housing. If the end play is excessive, the axle ring assembly should be removed and the cause of the excessive end play determined and corrected.

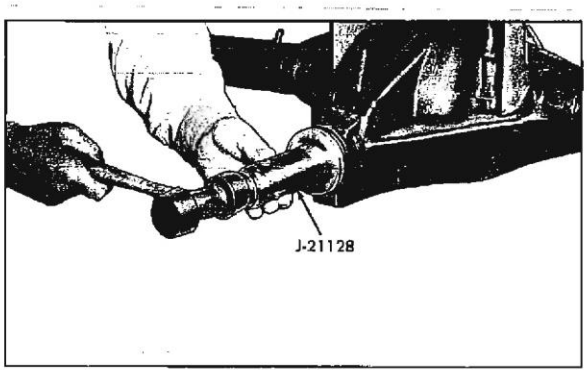


Fig. 4-9 Installing Pinion Oil Seal

1. Remove wheels. Both right and left wheels have right hand threads.

2. Remove brake drums.

3. Remove nuts holding retainer plates and brake backing plates. Pull retainers clear of bolts, and reinstall two lower nuts finger tight to hold brake backing plate in position.

4. Pull out axle shaft assemblies, using puller J-21579 and adapter J-2619-4 with a slide hammer J-2619 (Fig. 4-10).

REMOVE AND REPLACE AXLE SHAFT BEARING

1. Press axle shaft bearing and inner retainer off using split plate J-8916-1 (Fig. 4-11).

2. Press new axle shaft bearing against shoulder on axle shaft using installer J-21022 with holder J-6407 (Fig. 4-12).

NOTE: DO NOT press bearing and inner retainer on in one operation.

CAUTION: Outer retainer plate which retains bearing in housing must be on axle shaft before bearing is installed; a new outer retainer gasket can be installed after bearing. Use care not to wedge outer retainer between bearing and shoulder of shaft.

3. Press new inner retainer ring against bearing using installer J-21022 (Fig. 4-13).

REMOVE AND REPLACE REAR WHEEL BOLT

1. To remove and install a rear wheel bolt, axle shaft assembly must be out of car. Remove rear wheel bolt by pressing from axle flange.

2. Install new rear wheel bolt by pressing through axle flange. Check new bolt for looseness; if bolt is loose, axle shaft must be replaced.

REMOVE AND REPLACE AXLE SHAFT SEAL

1. Insert tongs J-943 (Fig. 4-14) behind seal and pull straight out to remove seal. Discard seal.

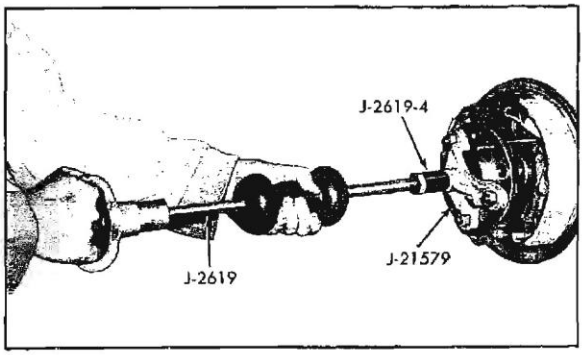


Fig. 4-10 Removing Axle Shaft

2. Apply sealer to O.D. of new seal.

3. Position seal over installer J-21129 (Fig. 4-15) and drive straight into axle housing until tool bottoms on bearing shoulder in housing.

REPLACE AXLE SHAFT ASSEMBLIES

1. Apply a coat of wheel bearing grease in bearing recess of housing. Lightly lubricate axle shaft with axle lubricant from sealing surface to approximately six inches inboard. This will help prevent damage to lip of wheel bearing seal when installing axle shaft and ensure lubricant on the seal lip during the first few miles of operation.

2. IMPORTANT: Install new axle housing to brake backing plate gasket.

3. Install brake assembly to axle housing bolts and place brake backing plate in proper position.

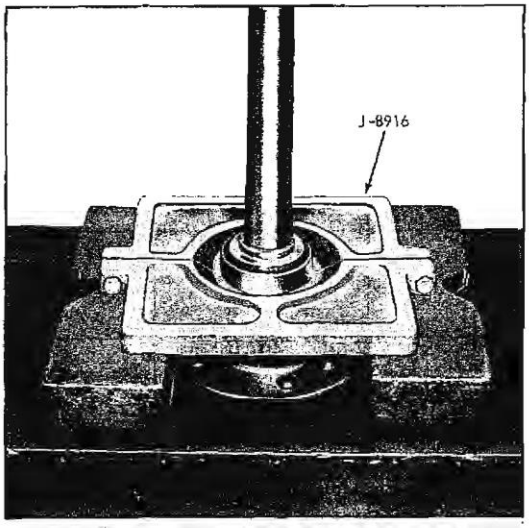


Fig. 4-11 Removing Axle Shaft Bearing and Inner Retainer

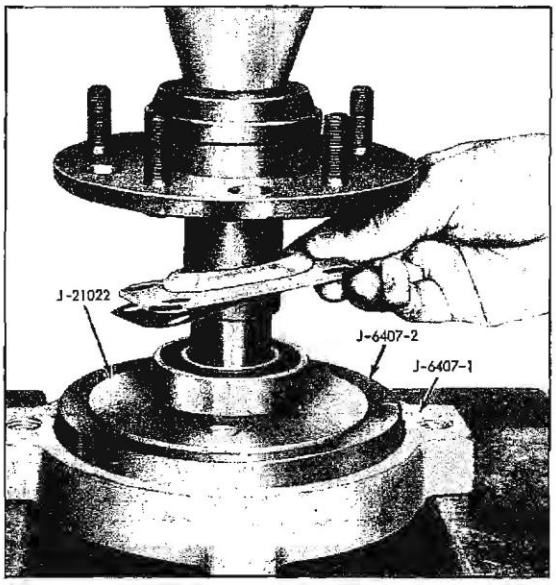


Fig. 4-12 Installing Axle Shaft Bearing

4. With a new outer retainer gasket in proper position, carefully insert axle shaft assembly into housing until splines engage differential.

CAUTION: Do not let shaft drag on oil seal.

5. Drive axle shaft assembly into position with soft faced hammer.

6. Place the new outer retainer gasket (Fig. 4-3) and retainer over studs and install nuts. Tighten nuts to 50± 5 lb. ft. torque.

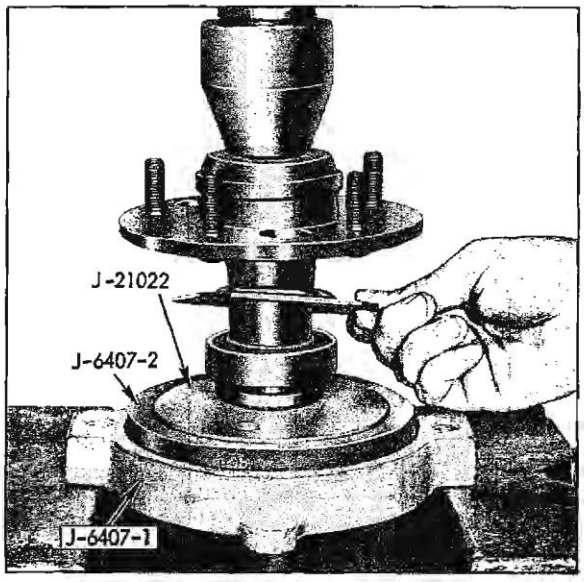


Fig. 4-13 Installing Inner Retainer

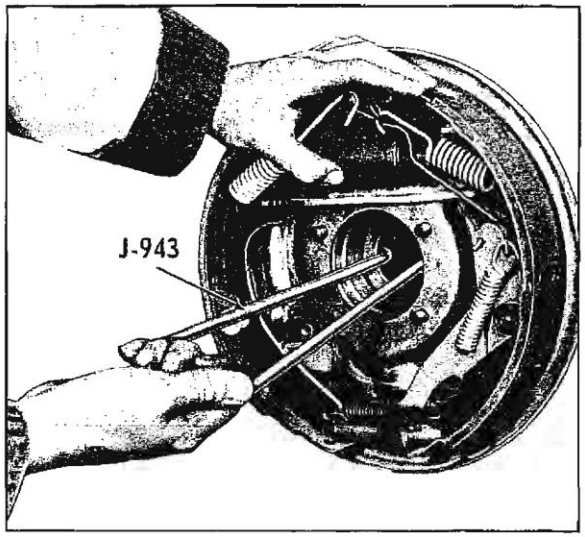


Fig. 4-14 Removing Axle Shaft Seal

7. Install brake drums over wheel bolts.

8. Install wheels and tighten wheel nuts to 80 ± 5 lb. ft. torque.

MAJOR REPAIRS

REMOVAL AND INSTALLATION OF REAR AXLE ASSEMBLY

It is not necessary to remove the rear axle assembly for any normal repairs. However, if the housing is damaged, the rear axle assembly may be removed and installed using the following procedure.

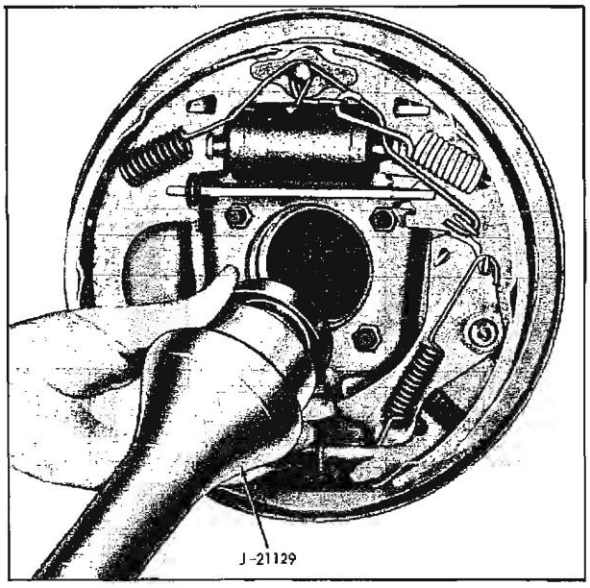


Fig. 4-15 Positioning Seal on Tool

REMOVE REAR AXLE ASSEMBLY

1. Raise rear of car high enough to permit working underneath. Place a floor jack under center of axle housing so it just starts to raise rear axle assembly. Place car stands solidly under body members on both sides.

2. Disconnect rear universal joint from companion flange by removing two "U" bolts. Use a heavy rubber band or tape to hold bearings onto journal to prevent loss of bearing rollers when joint is disconnected if retainer strap has been removed (Fig. 4-5). Support propeller shaft out of the way.

3. Remove both axle shafts.

4. Support both brake backing plates out of the way.

5. Disconnect rear brake hose bracket by removing top cover bolt. Remove brake line from housing by bending back tabs.

6. Loosen remaining cover bolts, break loose cover about 1/8" and allow lubricant to drain.

7. Disconnect shock absorbers at axle housing. Lower jack under axle housing until rear springs can be removed.

8. Disconnect upper control arms at axle housing.

9. Disconnect lower control arms at axle housing and remove rear axle assembly from under car.

REPLACE REAR AXLE ASSEMBLY

1. Rest car solidly on stands placed under body side members, with rear end of car high enough to permit working underneath. Position axle assembly under car.

2. Connect lower control arms to axle housing but do not torque.

3. Connect upper control arms to axle housing but do not torque.

4. Place rear springs in position and jack axle housing upward until shock absorbers will reach.

5. Connect shock absorbers and tighten nuts to 65 ± 10 lb. ft. Connect lower control arms and tighten bolts to 90 ± 10 lb. ft. or nuts to 75 ± 10 lb. ft. Connect upper control arm bolts and tighten to 90 ± 10 lb. ft. or nuts to 75 ± 10 lb. ft.

NOTE: Upper and lower control arms and lower shock absorber nuts must be torqued at curb position.

6. Install new axle housing to brake backing plate and outer retainer gaskets, then place backing plates in proper position and install axle shafts and wheels.

7. Connect rear universal joint to companion flange. Install new lock washers and nuts. Tighten nuts evenly to 17 ± 3 lb. ft.

CAUTION: "U" bolt nuts must be torqued as specified, as over-tightening will distort bearings and cause early failure.

8. Connect rear brake hose to top of housing and bend tabs over brake lines on housing.

9. Fill rear axle with specified gear lubricant.

REMOVE AND REPLACE DIFFERENTIAL

1. With rear wheels off the floor, turn rear wheels and rap brake backing plates with a soft hammer to ensure that brakes are free.

2. Remove both axle shafts.

3. Remove "U" bolts which hold rear universal joint to companion flange. Use a heavy rubber band or tape to hold bearings onto journal to prevent loss of bearing rollers when joint is disconnected if retainer strap has been removed (Fig. 4-5).

4. Thoroughly clean differential housing cover and surrounding area of axle housing to avoid dirt entering housing or falling on the gears.

5. Drain oil by loosening all cover attaching bolts and then break loose cover about 1/8 inch.

6. Allow oil to drain thoroughly then remove attaching bolts and remove cover from housing.

PRE-REPAIR INVESTIGATION

A close examination of the differential prior to disassembly will often reveal valuable information as to the extent and type of repairs or adjustments necessary. The information thus gained, coupled with the report of malfunctioning, will provide a basis for determining the degree of disassembly required. Since the frequent causes of axle noise are improper backlash or side bearing preload, or both, a few simple adjustments may be all that is necessary to correct a problem.

Therefore, before removing the differential from the housing the following checks should be made with the results recorded and analyzed.

A. Backlash (see page 4-22)

B. Pinion Bearing Preload (see page 4-6)

C. Red Lead Test

Use care at all times to keep dirt and other foreign matter, such as grinder dust, soot, or sand, away from differential to prevent possibility of subsequent failure.

GEAR TOOTH NOMENCLATURE

The side of the ring gear tooth which curves outward, or is convex, is referred to as the "drive" side. The concave side is the "coast" side. The end of the tooth nearest center of ring gear is referred to as the "toe" end. The end of the tooth farthest away from center is the "heel" end. Toe end of the tooth is smaller than heel end. It is very important that tooth contact be tested before the differential carrier assembly is disassembled and before it is installed. Allowable variations in the carrier or pinion rear bearing may cause the pinion to be too far away from, or close to, the ring gear. Thus, the tooth contact must be tested and corrected if necessary or the gears may be noisy.

RED LEAD TEST

1. Mix a small amount of powdered red lead (available from paint manufacturers and suppliers) with a drop of engine oil and apply this mixture sparingly to all ring gear teeth using a medium stiff brush. When properly used, the area of pinion tooth contact will be visible when hand load is applied.

2. Tighten bearing cap bolts to 70 ± 5 lb. ft. torque tapping heads of bolt intermittently while tightening to ensure proper seating of caps and sufficient tightness.

3. Insert crank (Fig. 4-16) in companion flange and, while turning, apply pressure to back side of ring gear with hand (a leather glove can be used). A test made without loading the gears will not give a satisfactory pattern. Turn companion flange with crank so that ring gear rotates one full revolution, then reverse rotation so that ring gear rotates one revolution in opposite direction. Excessive turning of ring gear may indicate good tooth pattern because one or two teeth are making proper contact.

NOTE: The crank in Fig. 4-16 may be easily made as follows:

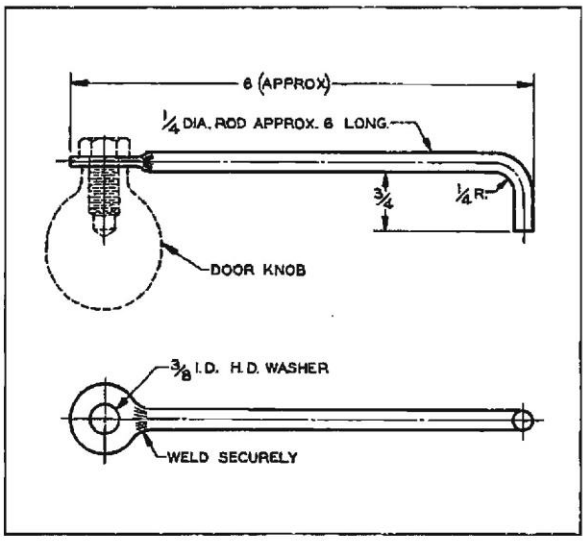


Fig. 4-16 Differential Cranking Tool

a. Weld a 3/8" heavy duty flat washer to a piece of 1/4" diameter rod approximately 6" long and form as shown.

b. Tap door knob for 3/8" bolt and attach knob to crank as shown. Leave bolt loose enough to permit knob to turn.

4. Closely inspect tooth pattern on ring gear to determine whether pressure lines are apparent.

NOTE: If observation reveals pressure lines are present (dark narrow band at edge of pattern), examine for pressure line position on drive and coast sides of ring gear. If lines on drive side are too deep and those on coast side are too high (near heel and toe respectively), additional shims to bring pinion gear out (providing a more centrally located tooth pattern on ring gear) will result in noisy tooth contact. This occurs because the pressure line has been moved deeper into the tooth on the drive side and farther out on the coast side. It does not follow that the ring gear and pinion are not good or should be destroyed. It only means they will not operate quietly in the carrier in which they are presently installed. These same parts may operate quietly in another carrier when tooth pattern is checked.

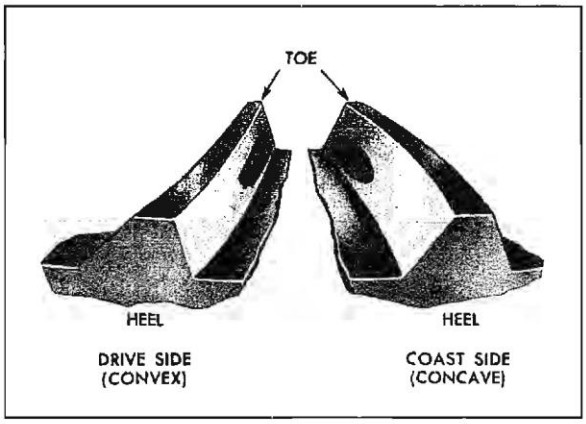


Fig. 4-17 Desired Tooth Contact Under Light Load

5. Observe pattern or ring gear teeth and compare with Fig. 4-17.

EFFECTS OF INCREASING LOAD ON TOOTH CONTACT PATTERN

When "load" on ring and pinion gear is increased, such as when car is accelerated from standstill or from normal drive, the tooth contact will tend to spread out, and under very heavy load will extend from near toe to near heel. The entire contact also tends to shift toward heel under increasingly heavier loads and will become somewhat broader with respect to tops and bottoms of teeth. The patterns obtained by red lead tests, dependent upon degree of "loading", approximate a normal light load. For this reason, they will not cover the entire face of the ring gear, but will extend only about halfway (Fig. 4-17). The important thing to note is that the contact pattern is centrally located up and down on the face of the ring gear.

ADJUSTMENTS EFFECTING TOOTH CONTACT

Two adjustments can be made which will affect tooth contact pattern: backlash, and position of drive pinion in carrier. The effects of bearing preloads are not readily apparent on (hand loaded) red lead tests; however, these adjustments should be within specifications before proceeding with backlash and drive pinion adjustments.

Backlash is adjusted by means of the side bearing adjusting shims which move the entire case and ring gear assembly closer to, or farther from, the drive pinion. (The adjusting shims are also used to set side bearing preload.)

The position of the drive pinion is adjusted by increasing or decreasing the shim pack between the pinion head and inner race of the rear bearing. The shim pack is used in the differential to compensate for manufacturing tolerances. Increasing shim pack thickness will move the pinion closer to centerline of the ring gear. Decreasing shim pack thickness will move pinion farther away from centerline of the ring gear.

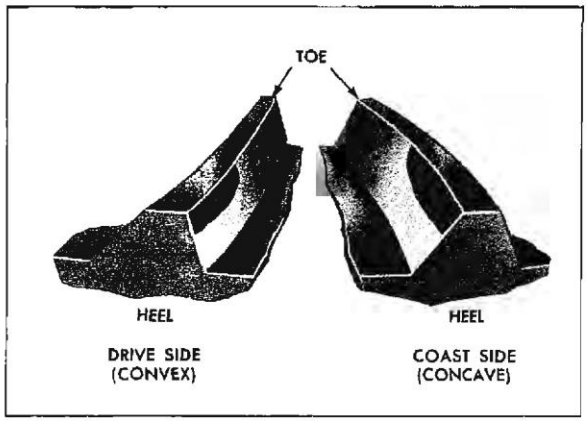


Fig. 4-18 Tooth Pattern - Excessive Backlash

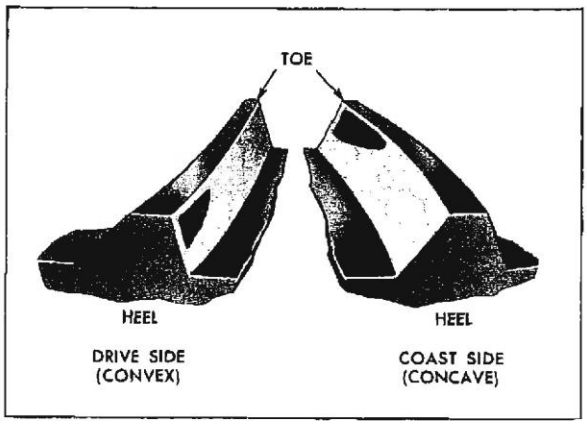


Fig. 4-20 Tooth Pattern - Pinion Too Far Away From Ring Gear (Shim Pack Thickness Insufficient)

EFFECTS OF BACKLASH ON TOOTH PATTERN

The terms "excess" and "insufficient" refer to settings which are greater than .009" or less than .005" as specified. With respect to tooth contact patterns, "excess" refers to backlash which, although less than .009", is more than necessary to provide the desired pattern. Similarly, "insufficient" refers to backlash which, although 005" or more, is less than necessary to provide the desired pattern.

Provided the pinion is properly positioned, excess backlash will give a high heel pattern on both drive and coast sides (Fig. 4-18). Decreasing backlash by moving the case and ring gear assembly closer to the pinion will cause the pattern to move toward the toe end and down toward center of the tooth on both drive and coast sides.

Insufficient backlash, provided the pinion is properly positioned, will give a low toe pattern on both drive and coast sides (Fig. 4-19). Increasing backlash will cause the pattern to move toward the heel end and up toward top of the tooth on both drive and coast sides.

EFFECTS OF PINION POSITION ON TOOTH PATTERN

When the drive pinion is too far away from centerline of the ring gear, the pattern will be a high heel contact on drive side and a high toe contact on coast side (Fig. 4-20), provided backlash is within specifications of .005" to .009". Moving the pinion closer to centerline of the ring gear by increasing shim pack thickness will cause the high heel contact on drive side to lower and move toward the toe; the high toe contact on coast side will lower and move toward the heel (Fig. 4-21).

When the pinion is too close to the ring gear, the pattern will be a low toe contact on drive side, and a low heel contact on coast (Fig. 4-22), provided backlash is within specifications of .005" to .009". Moving the pinion farther away from the ring gear by decreasing shim pack thickness will cause low toe contact on drive side to raise and move toward the heel; low heel contact on coast side will raise and move toward the toe (Fig. 4-23).

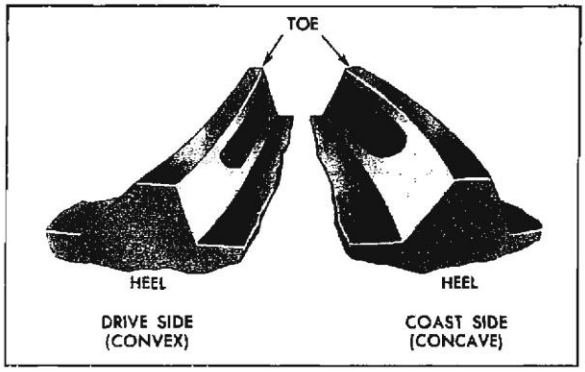


Fig. 4-19 Tooth Pattern - Insufficient Backlash

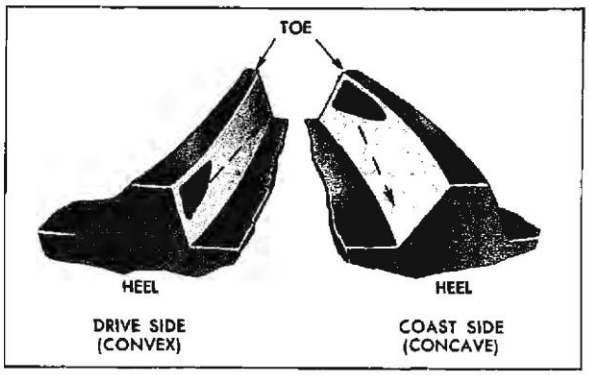


Fig. 4-21 Effect on Pattern as Shim Pack is Increased

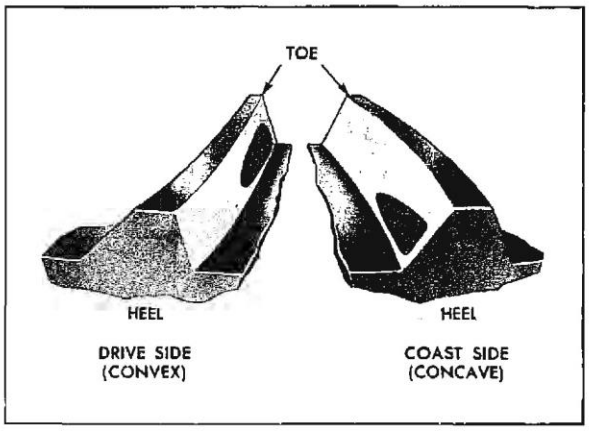


Fig. 4-22 Tooth Pattern - Pinion too Close to Ring Gear (Shim Pack Thickness Excessive)

DIFFERENTIAL ASSEMBLY—OVERHAUL

REMOVE DIFFERENTIAL CASE ASSEMBLY

NOTE: Before removing case from housing be sure the checks under pre-repair investigation have been completed.

1. Remove the four bearing cap bolts and reinstall bearing caps using four 7/16-14 x 4-1/2 bolts finger tight as a safety precaution.

NOTE: Bearing caps are not marked for identification. Use daub of paint to identify as the caps are not interchangeable.

2. Remove two ring gear to case assembly bolts. Install ring gear and case remover J-21322 and slide hammer J-2619 as shown in Fig. 4-24.

3. Loosen case from housing with slide hammer until it falls free. Safety bolts installed in step 2 will catch assembly.

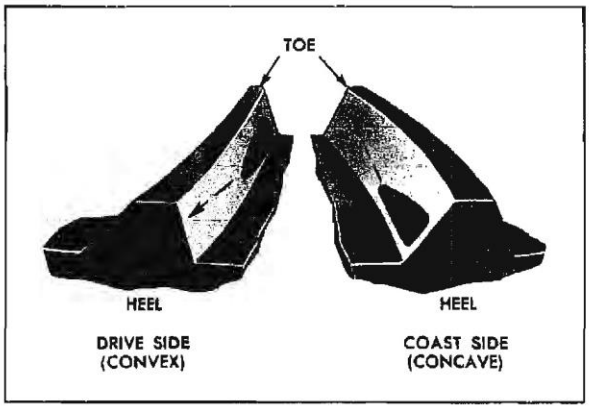


Fig. 4-23 Effect on Tooth Pattern as Shim Pack is Decreased

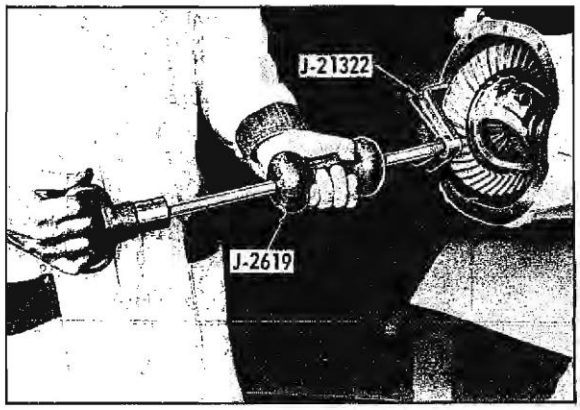


Fig. 4-24 Removing Differential Case

4. Support case assembly in one hand and remove safety bolts. CAREFULLY remove case so as not to let bearing races or shims fall from housing.

NOTE: Place right and left bearing outer race and shim in sets with marked bearing caps. Measure thickness of each shim and record.

DISASSEMBLE DIFFERENTIAL CASE ASSEMBLY

1. Before disassembling differential case, inspect differential side bearings for visible damage of rollers and outer races.

2. Place one outer race onto its matching inner race and roller assembly and turn slowly, applying hand load.

3. If bearing outer race turns smoothly and no visible damage is found, bearing can probably be reused.

4. Repeat above operation with other outer race and matching bearing.

NOTE: Both side bearings and their races are matching parts. If either bearing is to be replaced, its matching outer race must also be replaced.

5. Inspect fit of inner races on case hubs by prying against shoulders at puller recesses. Bearing inner races must be tight on case hubs.

NOTE: If either is loose on case, the entire case must be replaced.

6. If bearing inspection indicates that bearings should be replaced, insert differential case in vise and remove side bearing using side bearing puller J-8107, and adapter J-8107-2 (Fig. 4-25).

CAUTION: Make certain ends of puller arms are firmly seated in recesses in sides of hubs and fully against inner race of bearing.

7. Turn differential case in vise and remove other side bearing in same manner.

8. Remove pinion shaft lock screw and washer.

9. Drive pinion shaft out of case, using brass drift (Fig. 4-26).

10. Remove differential pinion gears, thrust washers and side gears. Place them in sets so they may be reinstalled in original position.

11. If ring gear is to be removed, clamp case in vise so jaws are 90° to pinion shaft holes. Remove ten ring gear retaining bolts.

12. Partially re-install two bolts on opposite sides of ring gear.

13. Remove ring gear from case by alternately tapping on bolts.

CAUTION: Do not pry between case and ring gear.

CLEANING AND INSPECTION

1. Thoroughly clean differential case and inspect, paying particular attention to ring gear mounting flange, ring gear pilot, side bearing hubs, thrust washer surfaces, pinion shaft bore, and side gear hub bore.

2. Remove nicks and burrs with mill file.

NOTE: When using a new case, thoroughly clean new case in suitable solvent, making certain all holes and bores are clean of steel filings and foreign material.

3. Clean side gears, pinion gears, pinion shaft and thrust washers with suitable solvent. Inspect for excessive wear.

4. Thoroughly clean ring gear and inspect back side for any adhering material which may cause runout.

5. Position ring gear on case and check fit of gear on flange and pilot. It should be from .002 tight to .001 loose. If ring gear easily falls into position, it must be replaced.

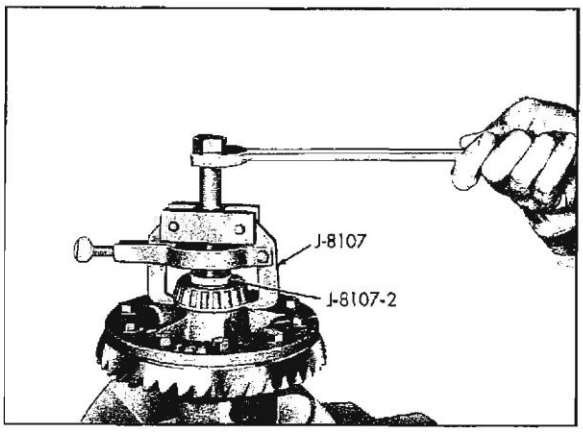


Fig. 4-25 Removing Differential Side Bearing

NOTE: If ring gear is replaced, pinion gear must also be replaced as they are only serviced in matched sets.

7. Replace parts as necessary and coat with clean gear lube before installing in case.

DIFFERENTIAL CASE ASSEMBLY - ASSEMBLE

1. After making sure that mating surfaces are clean and free of burrs, position ring gear on case so holes are in line.

2. Lubricate attaching bolts with clean engine oil and install.

3. Pull ring gear onto case by alternately tightening bolts around case. When all bolts are snug, tighten bolts evenly and alternately across diameter to 60 ± 5 lb. ft. torque.

CAUTION: Do not use hammer to force ring gear on case.

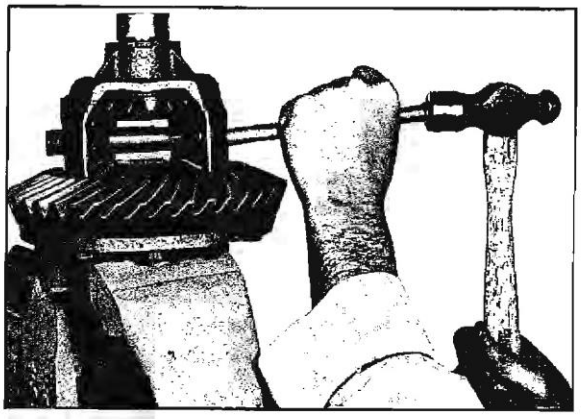


Fig. 4-26 Removing Pinion Shaft

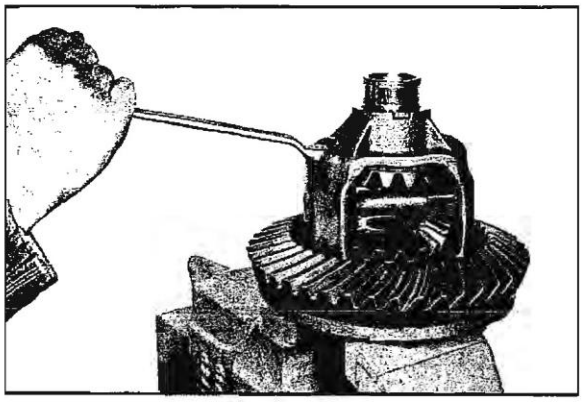


Fig. 4-27 Installing Pinion Shaft Locking Bolt

4. Place side gear thrust washers over side gear hubs and install side gears in case. Replace any reused parts in original sides.

5. Position one pinion (without washer) between side gears and rotate gears until pinion is directly opposite from loading opening in case. Place other pinion between side gears so that pinion shaft holes are in line, then rotate gears to make sure holes in pinions will line up with holes in case.

6. When holes line up, rotate pinions back toward loading opening just enough to permit sliding in pinion thrust washers.

7. Install pinion shaft and install pinion shaft retaining bolt. Torque to 15 ± 5 lb. ft. (Fig. 4-27).

8. Remove differential case from vise and lubricate outer bearing surfaces.

9. Using J-21028, press on bearing with arbor press (Fig. 4-28).

10. Reverse differential case, support previously installed bearing with J-8980, and press on other side bearing, using J-21028 (Fig. 4-29).

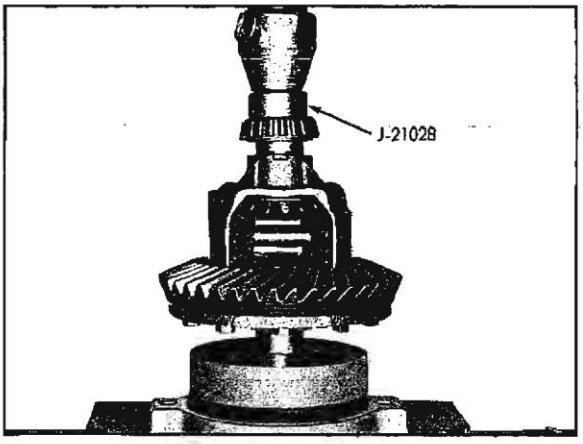


Fig. 4-28 Installing Right Differential Side Bearing

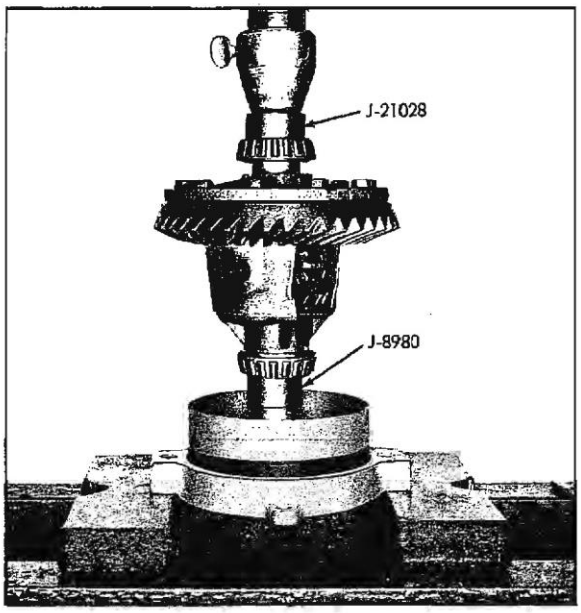


Fig. 4-29 Installing Left Differential Side Bearing

REMOVE PINION ASSEMBLY

1. Check pinion bearing preload as described on page 4-6. If there is no preload reading, check for looseness of pinion assembly by shaking. Looseness indicates need for bearing replacement. If assembly is run with loose bearings, for any extended period, ring gear and pinion will also need to be replaced.

2. Install holder J-8614-1 on pinion flange by using two 5/16" bolts with flat washers. Remove pinion nut and washer (Fig. 4-30).

3. Pull companion flange from pinion using puller J-8614-2 and 3 in holder J-8614-1. To install puller, back out puller screw, insert puller through holder, and rotate 1/8 turn (Fig. 4-31).

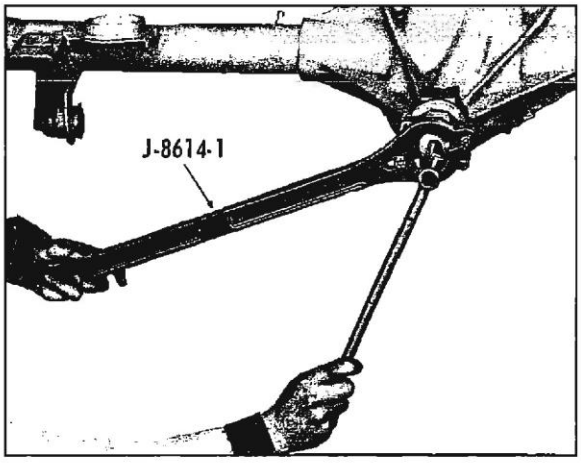


Fig. 4-30 Removing Pinion Nut

4. Remove pinion assembly. If necessary, tap pinion out with soft hammer, being careful to guide pinion with hand to avoid damage to bearing outer races.

DISASSEMBLE PINION ASSEMBLY

NOTE: Both front bearing and outer race and rear bearing and outer race are matched parts. If either bearing is to be replaced, its matching outer race must also be replaced.

1. If replacing rear pinion bearing or changing pinion depth setting, remove rear pinion bearing from pinion shaft using remover J-21493 with holder J-6407 (Fig. 4-32).

2. If replacing rear pinion bearing, drive rear bearing outer race from carrier using a drift.

3. Pry pinion oil seal from carrier and remove front pinion bearing. If replacing this bearing, drive outer race from carrier using a drift.

CLEANING AND INSPECTION

1. Check drive pinion stem and gear for excessive wear.

NOTE: Ring gears and pinions are matched at the factory and are serviced only in sets. Never attempt to replace either a ring gear or pinion without its matching member.

2. Thoroughly clean and inspect carrier for cracks or other damage.

3. Be sure oil passage in carrier is clean and clear.

4. Inspect bearing cap and bolt threads in carrier. Clean out metal filings and chips.

5. Carefully inspect pinion bore and shoulders against which pinion bearing outer races seal. They must be free of burrs, nicks or material which would prevent proper seating of bearing outer races.

NOTE: If axle housing (carrier and tube assembly) is being replaced, thoroughly clean and inspect new housing, paying particular attention to machined surfaces in bearing caps and carrier. Be sure all metal filings and foreign material are removed in the bearing cap bolt holes in the carrier. Be sure that bearing caps seat squarely on carrier. Use mill file lightly to remove nicks and burrs.

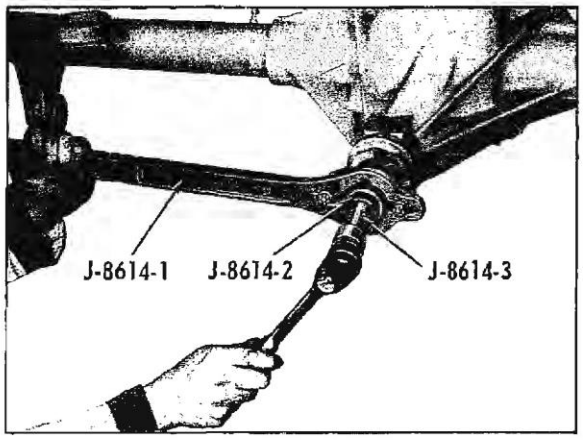


Fig. 4-31 Removing Companion Flange

DIFFERENTIAL ASSEMBLY—ASSEMBLE

INSTALL PINION BEARING OUTER RACES

1. If replacing rear pinion bearing, install new outer race using installer J-6197 with driver handle J-8092 (Fig. 4-33).

2. If replacing front pinion bearing, install new outer race using installer J-7817 with driver handle J-8092 (Fig. 4-34).

SETTING PINION DEPTH

The pinion bearing shim thickness (pinion depth) must be determined:

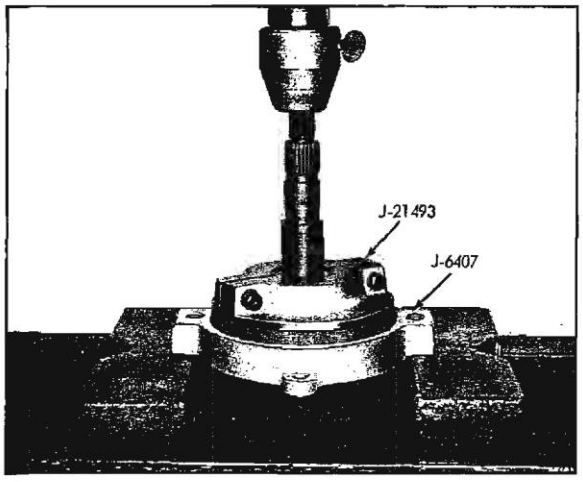


Fig. 4-32 Removing Rear Pinion Bearing

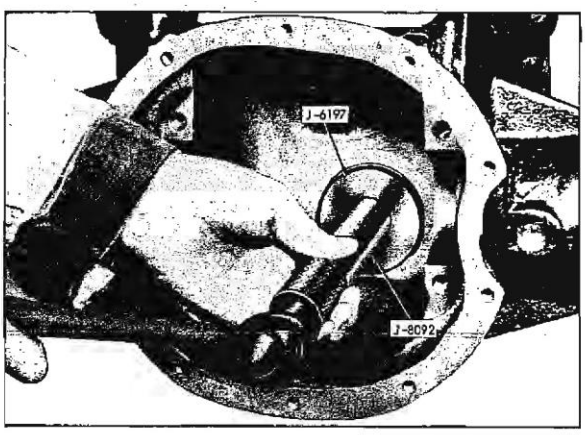


Fig. 4-33 Installing Rear Pinion Bearing Outer Race

a. whenever a new housing (carrier and tubes assembly) is to be used,

and/or b. new bearings and races,

c. the pre-repair investigation indicates the drive pinion bearing shim should be changed.

Ring and pinion gear sets are matched in a special test machine. All production pinions are marked (on face of pinion gear) in thousandths of an inch if they vary from a "nominal" setting. When a pinion is marked "+" (plus), it means that the pinion is located too far away from centerline of the ring gear. Shims must be added to move the pinion closer to the ring gear and position the pinion at the nominal setting. When a pinion is marked "-" (minus), it means the pinion shims must be removed to move the pinion away from the ring gear and position the pinion at the nominal setting. All pinions produced for service are "nominal" or "zero" pinions and are unmarked.

Pinion depth is set with pinion depth setting gauge J-21777 which consists of the following: (1) J-21777-1 cross shaft assembly (2) J-8619-10 discs, (1) J-21777-2 "A" gauge plate (1) J-8619-12 pilot and (1) J-8619-13 bolt. A J-8001 dial indicator must also be used with the cross shaft. The pinion depth setting gauge provides in effect a "nominal" or "zero" pinion as a gauging reference.

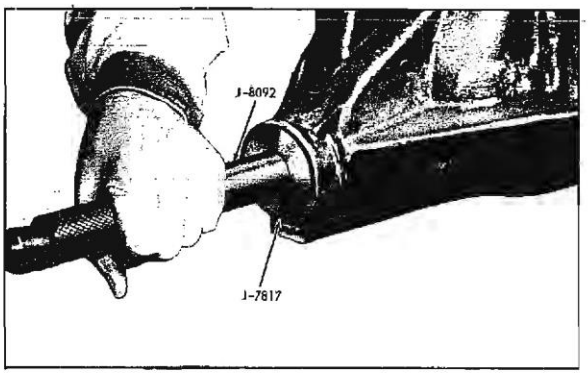


Fig. 4-34 Installing Front Pinion Bearing Outer Race

NOTE: While the 1965 procedure using tool J-21777 is preferable, 1964 Tempest Pinion Depth Setting Tool J-8619 can still be used on the 1965 Tempest differential (see 1964 Tempest Chassis Shop Manual Section 4 for proper procedure). J-8619 cannot be adapted for use on the 1965 Pontiac.

1. Make certain all gauge parts are clean. Check particularly the discs, gauge pin ends, dial indicator tip, and gauge plate surface.

2. Lubricate front and rear pinion bearings and position them in their respective races in carrier. Bearings used with gauge must be those to be installed in car in order to insure accurate reading.

3. Thread a nut onto J-8619-13 bolt to end of thread. Thread J-8619-13 bolt into J-21777-2 gauge plate so plate rests against nut. Insert assembled gauge plate and bolt into carrier through front and rear bearings with underside of plate against rear bearing (Fig. 35). Slip J-8619-12 pilot over bolt end with underside against front bearing. Tighten another nut finger-tight while rotating gauge plate to insure proper seating. Check to be sure gauge plate is centered over bearing (Fig. 36), then torque nut to obtain a bearing preload reading of 20 ± 5 in. lbs. (obtained with gauge plate assembly rotating). It may be necessary to hold stud stationary with a wrench on flats at end of stud.

4. Install a stem on the J-8001 dial indicator and mount loosely on cross shaft. Position stem of indicator on head of gauge pin so that stem is slightly depressed (causing a low indicator reading). Tighten thumb screw on indicator and set at zero.

5. Make certain bearing support bores are free of burrs and dirt. Place the J-8619-10 discs on cross-shaft assembly. Position assembly in carrier with the discs resting on the bearing support bores and gauge pin facing in toward gauge plate. Rotate discs to insure firm seating.

6. Position gauge plate so that as cross shaft is rotated (pressing firmly), the arc of the spherical end of the gauge pin scribes across the "A" surface of the gauge plate (Fig. 37). Record maximum reading of dial indicator throughout arc. (When indicator scale is less than .100", be sure to note if indicator completes more than one revolution).

7. Subtract recorded reading from .100". This figure will be used to select correct shim in Step 9.

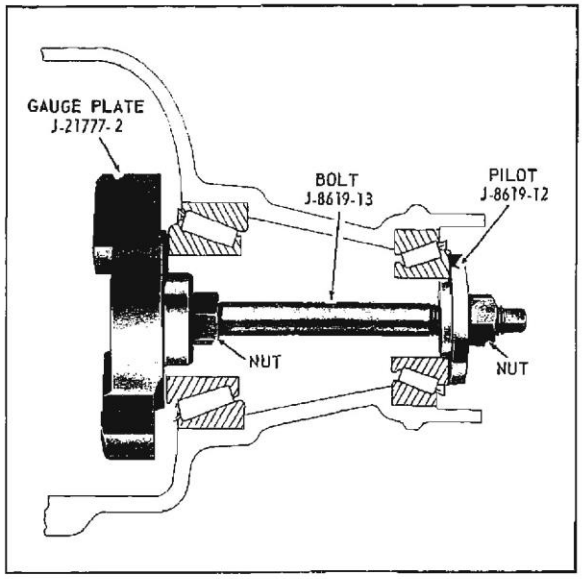


Fig. 4-35 Securing Gauge Plate in Carrier

NOTE: The pinion depth setting tool is designed so that a perfect dial indicator reading of .100" would require no shim. This is why the reading obtained must be subtracted from .100".

8. Examine ring gear and pinion for nicks, burrs, or scoring. Any of these conditions will require replacement of gear set.

9. Select correct pinion shim to be used during pinion reassembly on the following basis:

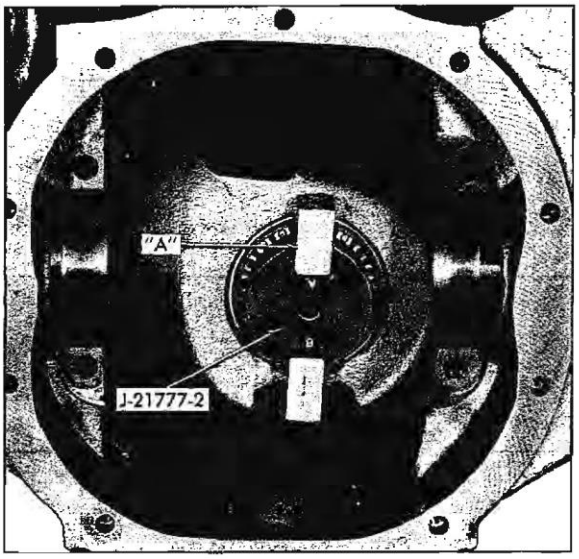


Fig. 4-36 Gauge Plate Installed

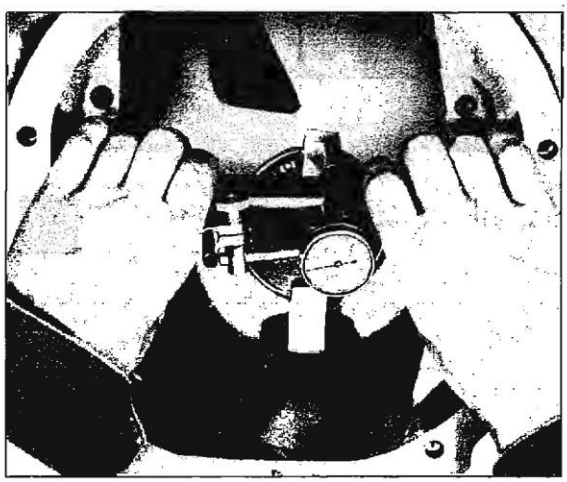


Fig. 4-37 Checking Pinion Depth

NOTE: Ten (10) shims are available in increments of (.002") two thousandths from .020" to .038 (Fig. 4-38).

a. If reusing production pinion and pinion is marked "+" (plus), the correct shim will have a thickness equal to gauge reading found in step 7, plus the amount specified on pinion.

b. If production pinion is marked "–" (minus), correct shim will have a thickness equal to gauge reading found in Step 7, less the amount specified on pinion.

c. If using a production or service pinion which has no marking, the correct shim will have a

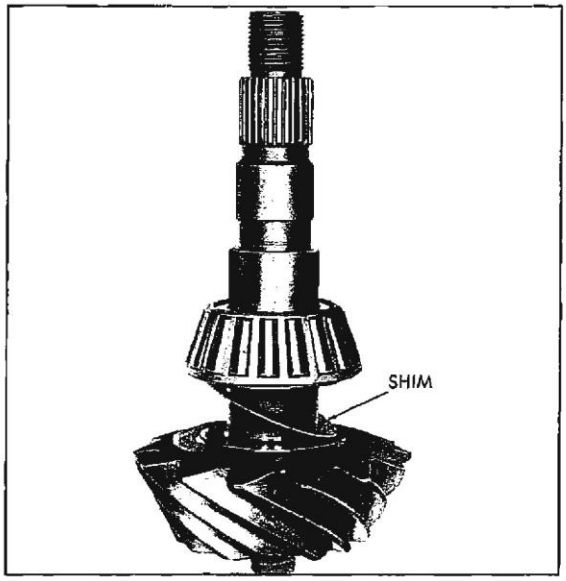


Fig. 4-38 Pinion Shim

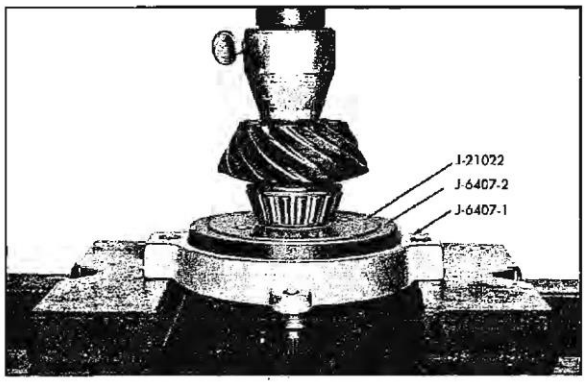


Fig. 4-39 Installing Rear Pinion Bearing

thickness equal to the gauge reading found in Step 7.

10. Loosen stud J-8619-13 and remove gauge plate J-21777, -2 pilot, J-8619-12, and both bearings from case.

11. Slide pinion shim onto pinion shaft and install rear pinion bearing on pinion using installer J-21022 and holder J-6407 in a press (Fig. 4-39).

INSTALL PINION ASSEMBLY AND ADJUST PINION PRELOAD

1. Position pinion assembly in carrier and install new collapsible spacer.

2. Place front pinion bearing in position on pinion. Hold pinion fully forward and drive bearing over pinion until seated, using installer J-21128 (Fig. 4-40).

3. Coat O.D. of pinion oil seal with sealing compound and install in carrier using installer J-21128.

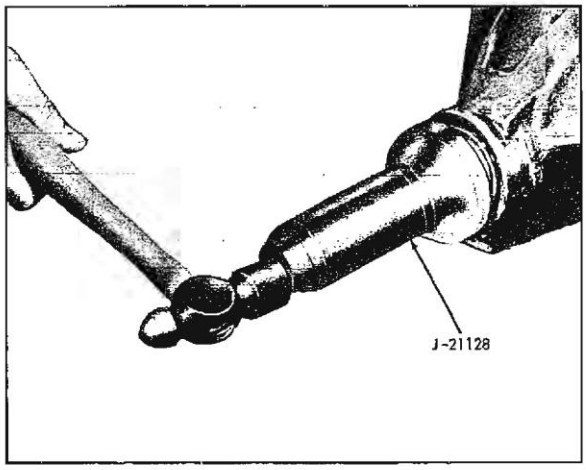


Fig. 4-40 Installing Front Pinion Bearing

4. Coat lips of pinion oil seal and seal surface of companion flange with gear lube. Install companion flange on pinion by tapping with a soft hammer until a few pinion threads project through flange.

5. Install pinion washer and nut. Hold companion flange with holder J-8614-1. While intermittently rotating pinion to seat bearings, tighten pinion nut until end play begins to be taken up.

CAUTION: When no further end play can be determined and holder J-8614-1 will no longer pivot freely as pinion is rotated, preload is being applied. Further tightening should be done only after preload has been checked.

6. Check preload by using a lb. in. torque wrench (Fig. 4-41).

CAUTION: After preload has been checked, final tightening should be done very cautiously. Tighten the pinion nut further only a little at a time. Check preload after each slight amount of tightening.

Exceeding preload specifications will compress the collapsible spacer too far and require its replacement. Backing off nut to correct excessive preload will unload the front bearing and pinion nut allowing bearing to turn on shaft.

7. While observing the preceding "caution", carefully set preload drag to 25 ± 5 lb. in on new bearings or 17 ± 3 lb. in. on used bearings.

8. Rotate pinion several times to assure that bearings have been seated. Check preload again. If drag has been reduced by rotating pinion, re-set preload to specifications.

INSTALL DIFFERENTIAL CASE AND ADJUST SIDE BEARING PRELOAD

Production shims are cast iron and vary in thickness from .210" to .272" in increments of .002".

NOTE: Whenever a case assembly is removed from the housing, measure the production shims for thickness and discard (Fig. 42).

This figure will be used to determine the approximate shim pack needed in step 4 (below). Use standard .170" service spacers and steel service shims (available from .040" to .082" in increments of .002") for all service repairs.

NOTE: Do not attempt to reinstall the production shims as they may break when tapped into place. If service shims were previously installed, they can be reused, but (whether using new or old bearings) adhere to the following procedure in all cases.

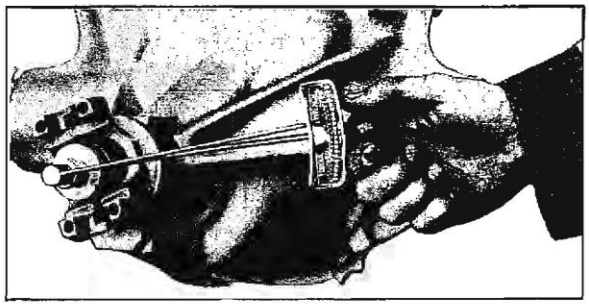


Fig. 4-41 Checking Pinion Bearing Preload

To adjust differential side bearing preload, change the thickness of the right and left shims equally, thus leaving the original backlash undisturbed.

1. Before installation of case assembly, make sure side bearing surfaces are clean and free of burrs. Lubricate side bearings with gear lube. If reusing original bearings, the original outer races must also be used.

2. Place the differential case with bearing outer races in position in carrier.

3. Slip one .170'' service spacer between each bearing race and carrier housing with flat edge against housing (Fig. 43).

NOTE: As a safety precaution, install the left bearing cap loosely so that the case may be moved while checking adjustments (one 7/16-14 x 4-1/2 bolt can be added as an extra safety precaution in the lower right bearing cap hole). This will prevent the case from dropping while making shim adjustments.

4. Subtract .365 (total of two .170'' service spacers plus .025'' gauging space) from total shim pack removed on disassembly. Select two shims totalling this amount and position both between right bearing race and service spacer. Be sure left bearing race and spacer are against left housing of carrier. (Fig. 44).

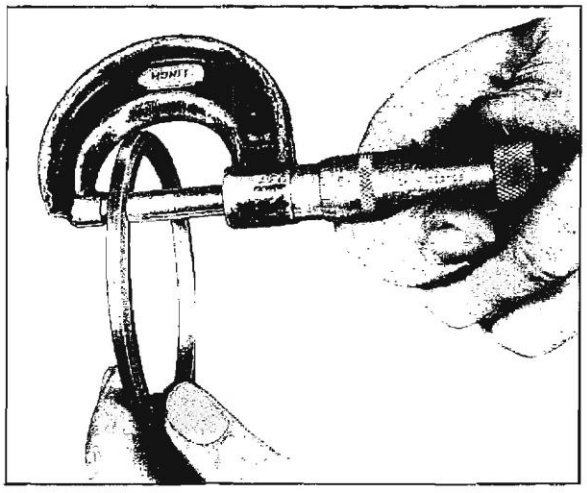


Fig. 4-42 Measuring Original Shim

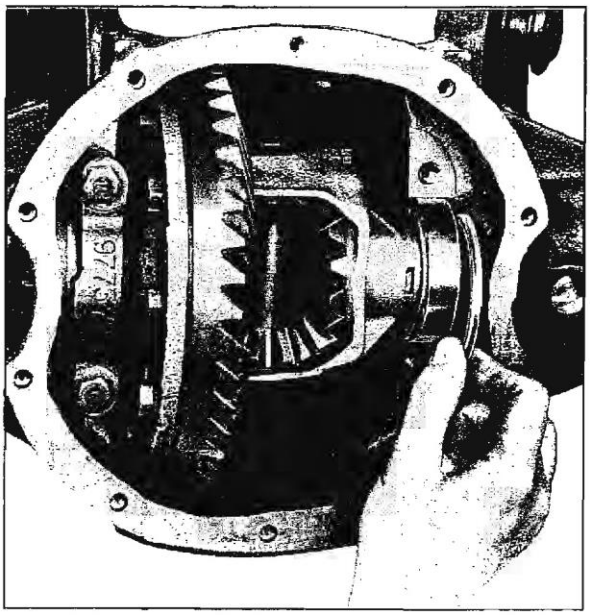


Fig. 4-43 Installing Service Spacer

5. Insert a feeler gauge of less than .010'' between right shim and service spacer (Fig. 45).

NOTE: It will be necessary to work the case in and out and to the left in order to insert the gauge. The gauge must be inserted in order to judge the drag. Be sure to locate the gauge at the centerline of the bearing.

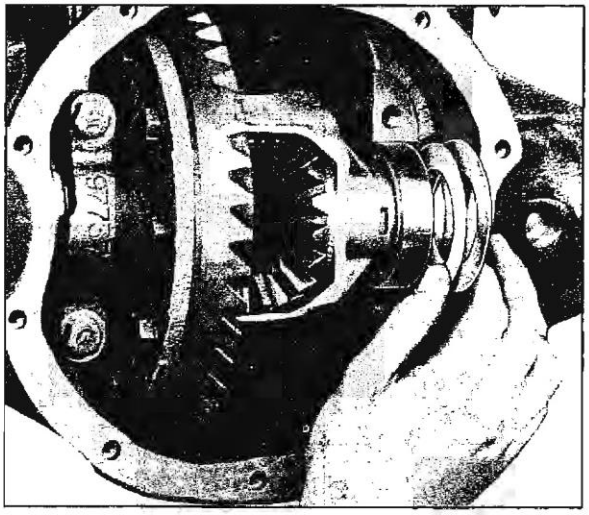


Fig. 4-44 Installing Two Service Shims

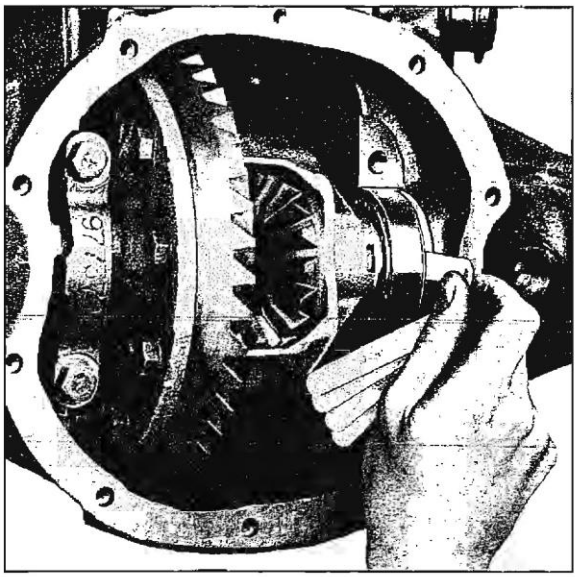


Fig. 4-45 Inserting Feeler Gauge

Insert progressively larger sizes (.010", .012", .014", etc.) until there is a noticeably increased drag. The point just before additional drag begins is correct gauge thickness. Rotate case while using gauge to insure an even reading.

NOTE: The original light drag was caused by weight of the case against the carrier while additional drag is caused by side bearing preload. By starting with a thin feeler gauge, a sense of "feel" is obtained so that the beginning of preload can be recognized.

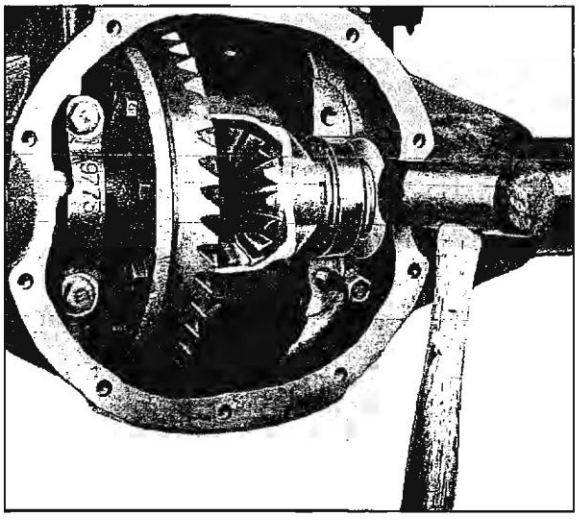


Fig. 4-46 Tapping Shim Into Place

6. Remove left bearing cap and all shims from carrier. The total shim pack needed (with no preload on the side bearings) is feeler gauge reading found in step 5 plus thickness of shims installed in step 4.

NOTE: The object of step 6 is to reach the equivalent of a "slip fit" of the case in the carrier. For convenience in setting backlash and tooth contact, the preload will not be added until the final step.

7. Select two shims of approximately equal size whose total thickness is equal to the value obtained in step 6. Install one of these shims between each side bearing race and service spacer.

CAUTION: If insertion of second shim causes excessive pinion to ring gear contact (noticeable by difficulty in rotation of the case), select thinner left shim and add difference to the right side. Keep total shim thickness at a value equal to that obtained in step 6.

8. Check backlash and tooth pattern as described in the following section. The bearing caps must be installed and the bolts torqued to 70 ± 5 lb. ft.

9. When backlash and tooth pattern operations are complete, remove shim pack installed in step 7. Select two shims each .004" thicker than those removed and install one each side. This additional thickness will provide the proper bearing preload. It will be necessary to tap the final shim into place with a soft hammer (Fig. 46).

ADJUSTING DIFFERENTIAL BACKLASH

1. Rotate differential case several times to seat bearings, then mount dial indicator (Fig. 4-47). Use a small button on indicator stem so that contact can be made near heel end of tooth. Set dial indicator so that stem is as nearly as possible in line with gear rotation and perpendicular to tooth angle for accurate backlash reading.

2. With pinion locked to carrier, check gear lash at 3 or 4 points around ring gear. Lash must not vary over .002" around ring gear. If variation is over .002" check for burrs, uneven bolting conditions or distorted case flange, and make corrections as necessary.

3. Gear lash at the point of minimum lash should be .005" to .009" for all new gears. If original gear set having a wear pattern is being reinstalled, original gear lash should be maintained with .001".

4. If gear backlash is not within specifications, correct by increasing thickness of one differential

shim and decreasing thickness of other shim the same amount. In this way, correct differential bearing preload will be maintained. Shift .002" in shim thickness for each .001" change in backlash desired. If backlash is .001" too much, decrease thickness of right shim .002" and increase thickness of left shim .002". If backlash is .002" too little, increase thickness of right shim .004" and decrease thickness of left shim .004".

5. When backlash is adjusted to specifications remove four safety bolts and tighten bearing cap bolts to 70 ± 5 lb. ft. torque.

6. Check tooth contact pattern with red lead test.

NOTE: It may be necessary to readjust the backlash to obtain the correct tooth contact pattern. On high mileage gear sets where a definite wear pattern has been established it may be necessary to exceed .009 backlash to obtain the desired tooth contact. It is important, however, not to exceed .009 backlash on new gear sets.

If readjusting the backlash doesn't give the correct tooth contact pattern, the pinion depth must be readjusted.

7. When correct tooth contact pattern is obtained, install cover with new gasket on housing. DO NOT USE GREASE TO RETAIN GASKET. Insert two upper cover bolts through cover and gasket and carefully install. Be sure gasket is flat and not twisted between cover and housing. Be sure all cover bolts pass through gasket holes. Torque to 25 ± 5 lb. ft.

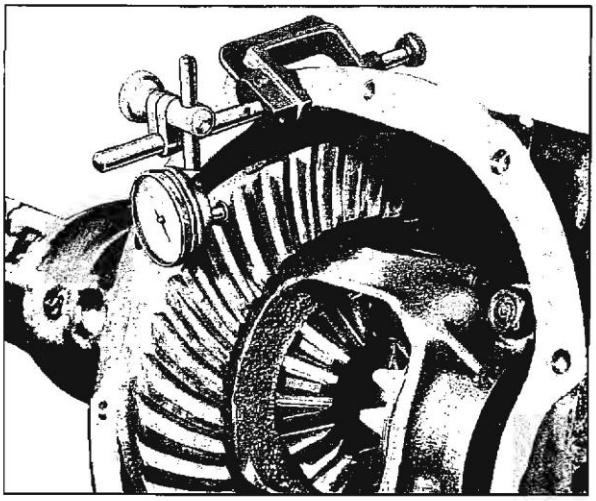


Fig. 4-47 Checking Ring Gear to Pinion Backlash

NOTE: See 4-10 for replacement of axle shaft assemblies.

SAFE-T-TRACK DIFFERENTIAL

GENERAL DESCRIPTION

The Safe-T-Track differential is available as optional equipment on all rear axle ratios of 1965 Tempests. It can be identified by a tag attached to the lower right section of the axle assembly cover. It is designed to direct the major driving force to the wheel with the greater traction, thereby reducing the possibility of the car becoming stuck while driving under adverse conditions. Unlike the conventional differential, when one wheel is on a slippery surface (ice, snow, mud, etc.) the car will still move since both wheels are frictionally connected together and rotating at the same speed, allowing the wheel on the dry surface to provide the necessary traction.

Rough roads, crushed stone, railroad tracks, etc. also do not adversely affect rear wheel action. With a conventional differential, when one wheel bounces free of the road, it picks up speed. When this rapidly spinning wheel contacts the road again it causes shock loads to the suspension and drive train. With the Safe-T-Track differential the free wheel continues to rotate at the same speed as the wheel on the road, thereby minimizing shock.

The Safe-T-Track differential is also superior to the conventional differential under conditions of deceleration, cornering, and braking.

All rear axle parts of cars equipped with the Safe-T-Track differential are interchangeable with those equipped with the conventional differential except for the case assembly. It is similar in all respects to the conventional case assembly with the addition of cone clutches behind each side gear. The frictional surface of these cones consists of a coarse spiral thread that provides passages for the flow of lubricant. The cones are statically preloaded with six springs (against the cone cavities in each half of the case assembly) to provide an internal resistance to differential action under low tractive conditions at one rear wheel.

The case assembly is held together with six bolts. In addition to the above parts, it also houses the differential pinion shaft, pinion gears, thrust washers, and the two piece spring thrust block.

OPERATION

The Safe-T-Track differential operates in reverse and deceleration as well as forward speeds. Torque is applied by the drive pinion to the ring gear which is bolted to the case assembly thereby causing it to rotate. The preload force from the springs, plus the inherent separating force between the pinion gears and side gears as the case rotates, forces the clutch cones against the case assembly. Since the clutch cones are splined to the axle shafts, the shafts are in effect locked together and rotate with the case assembly.

When turning corners, the axles are automatically unlocked as the torque created by differential action overcomes the calibrated spring load on the clutch cones allowing them to overrun.

When the rear wheels are under extremely unbalanced tractive conditions, such as one wheel on dry pavement and the other on ice, wheel spin can occur if over acceleration is attempted. However, even when wheel spin does occur, the major driving force is directed to the non-spinning wheel.

NOTE: Continued spinning may cause a whirring sound due to the overrunning clutch cones lacking sufficient lubricant. Such a condition or sound does not indicate failure of the unit.

SERVICE PROCEDURES

All rear axle service procedures are the same for the Safe-T-Track as for the conventional differential, except for servicing the case assembly.

NOTE: Two percautions must be observed when working on cars with Safe-T-Track differentials:

1. Never raise one wheel and run the engine with the transmission in gear. The driving force to the wheel on the floor may cause the car to move.

2. Do not use "on the car" type wheel balancers on the rear wheels, unless both wheels are off the floor.

LUBRICATION

The differential should be checked for leaks and level every 6000 miles. Maintain level to bottom of the filler plug opening. No periodic lubricant change is recommended. However, if necessary to add lubricant, use only Multi-Purpose Hypoid Gear Lubricant (Part No. 531536).

IMPORTANT: Never use any other lubricant in a Safe-T-Track differential or a severe chatter may result, especially when turning corners. If the wrong lubricant is added remove it from housing, flush with correct lubricant, and refill with the correct lubricant. It may be necessary to drive the car several miles to allow the lubricant to work through the cones and eliminate the chatter. If chatter persists drain and refill again to eliminate the contamination. Capacity of the rear axle housing is 3 pints.

TESTING FOR CORRECT OPERATION

If there is any doubt as to the proper functioning of the Safe-T-Track differential, the following simple test should be performed.

1. Place the car on a hoist with engine off and the transmission selector lever in park if automatic and in low gear if synchromesh.

2. Attempt to turn either wheel.

3. The average man will find it extremely difficult, if not impossible, to manually turn either wheel. This is because one wheel will provide approximately 400 lbs. draw bar pull with zero traction at the opposite wheel.

SAFE-T-TRACK DIFFERENTIAL CASE ASSEMBLY—DISASSEMBLE

1. Before disassemblying differential case, inspect differential side bearings for visible damage of rollers and outer races.

2. Place one outer race onto its matched inner race and roller assembly and turn slowly, applying hand load.

3. If bearing outer race turns smoothly and no visible damage is found, bearing can probably be reused.

4. Repeat above operation with other outer race and matched bearing and check for smoothness.

NOTE: Both side bearings and their outer races are matched parts. If either bearing is to be replaced, its matching outer race must also be replaced.

5. Inspect fit of inner races on case hubs by prying against shoulders at puller recesses. Bearing inner races must be tight on case hubs.

NOTE: If either bearing is loose on case, the engine case must be replaced.

6. If bearing inspection indicates that bearings should be replaced, insert differential case in vise and, using side bearing puller J-8107 and adapter J-8107-2 remove side bearing.

CAUTION: Make certain ends of puller arms are firmly seated in recesses in sides of hubs and fully against inner race of bearing.

7. Turn differential case in vise and remove other side bearing in same manner.

8. If removing ring gear, clamp case in vise so jaws are 90° to pinion shaft holes and remove ten ring gear retaining bolts.

9. Partially re-install two bolts on opposite sides of ring gear.

10. Remove ring gear from case by alternately tapping on bolts.

CAUTION: Do not pry between case and ring gear.

11. Scribe mark or paint differential case halves (Fig. 4-48) to aid in alignment of case when assembling.

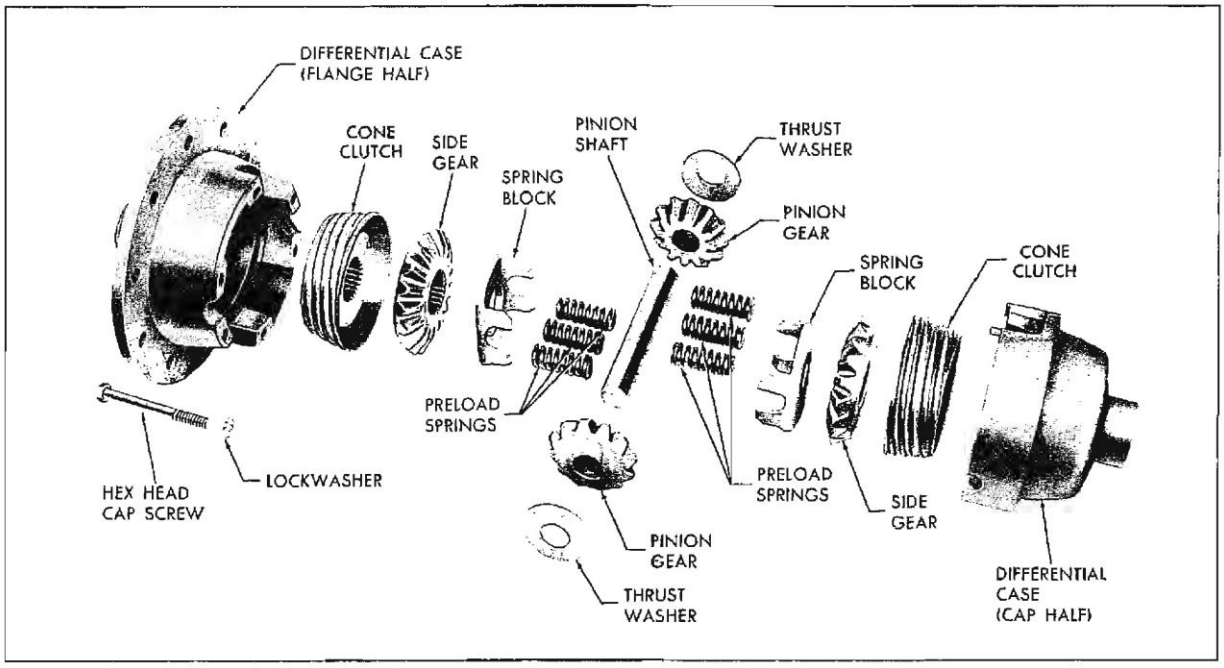


Fig. 4-48 Exploded View Safe-T-Track

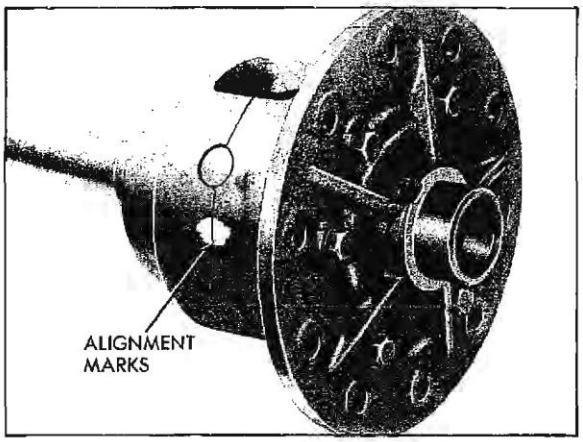


Fig. 4-49 Alignment Marks

12. Remove six differential case attaching bolts.

13. Lift cap half of case from flange half. Remove clutch cone side gear, thrust block, preload springs, and shims if provided.

NOTE: Shims are used in some units between the side gear and cone to maintain proper backlash between pinion gears and side gears. Keep these parts with the cap half of case assembly.

14. Remove corresponding parts from flange half of case and keep with flange half of case assembly.

CLEANING AND INSPECTION OF PARTS

1. Make certain all parts are absolutely clean and dry.

2. Inspect pinion shaft, pinion and side gears, brake cone surfaces, and corresponding cone seats in the case. The cone seats in the case should be smooth and free of any excessive scoring. Slight grooves or scratches indicating passage of foreign material are permissible and normal. The land surface on the heavy spirals of the male cones will duplicate the case surface condition. Replace any parts which are excessively scored, pitted, or worn. Both halves of case must be replaced if one half is damaged or worn.

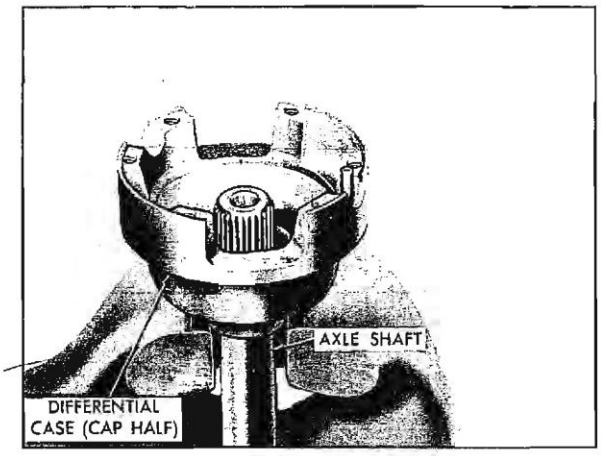


Fig. 4-50 Axle Shaft and Cap Half of Case

SAFE-T-TRACK DIFFERENTIAL—ASSEMBLE

CAUTION: When assembling the unit, use axle shafts as mounting tools to assure proper gear and cone spline alignment. Do not ignore this procedure or it will be impossible to install shafts at final assembly. Attempting to force the shafts into position may result in damage to the spring thrust blocks.

1. Clamp one axle shaft in a vise allowing three inches to extend above vise jaws. Then place the cap side of differential case over extended axle shaft with interior of case facing up (Fig. 4-49).

2. Install proper cone over axle shaft splines, seating it into position in cap half of case.

NOTE: Be certain that each cone is installed in proper case half since tapers and surfaces become matched and their positions should not be changed.

3. If unit was originally assembled with shims located between side gears and cones for backlash adjustment, reinstall side gear with shim so that gear may seat on shim. If unit was originally assembled without shims, reassemble the same way.

4. Place one spring block in position over gear face in alignment with pinion gear shaft grooves. Install thrust block, pinion shaft, pinion gears, and thrust washers into cap half of differential case in such a manner that pinion shaft retaining dowel can be inserted through pinion gear shaft into differential case. This prevents the pinion shaft from sliding out and causing damage to carrier assembly (Fig. 4-50).

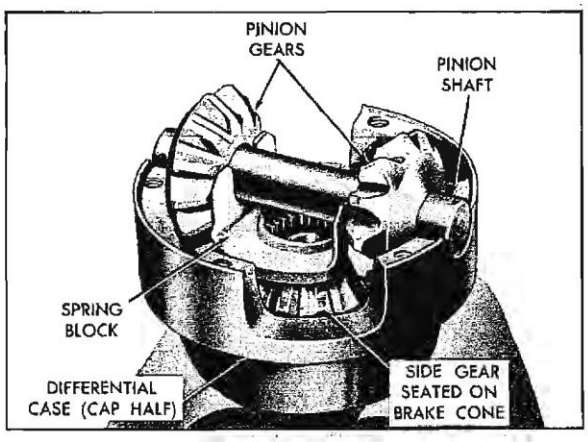


Fig. 4-51 Installing Parts in Cap Half

5. Insert springs into spring thrust block that is already installed into case and then place second thrust block over springs. Note offset construction of thrust block tabs (Fig. 4-51).

6. Install second side gear face down on spring thrust block so that side gear will mesh with pinion gears.

7. Place shim, if provided, and remaining cone over side gear.

8. Install flange side of differential assembly over cone in proper position to match alignment marks: insert two bolts finger tight 180° apart (Fig. 4-52).

9. Install other axle shaft through flange half of differential case rotating axle to enter cone splines and then side gear splines. Leaving the axle shaft in this position, insert remaining bolts and tighten to 17 ± 1 ft. lb. (Fig. 4-53).

10. Remove axle shafts. A slight tapping on the shafts with a soft hammer may be necessary to align the splines during assembly. The shafts can then be readily reinstalled without spline interference during final assembly.

11. If side bearings were removed, lubricate outer bearing surfaces and press on bearings as described in (standard) differential case assembly and assemble.

12. After making sure that matching surfaces are clean and free of burrs, position ring gear on case so holes are in line.

13. Lubricate attaching bolts with clean engine oil and install.

14. Pull ring gear onto case by alternately tightening bolts around case. When all bolts are snug, tighten bolts evenly and alternately across diameter to 60 ± 5 lb. ft. torque.

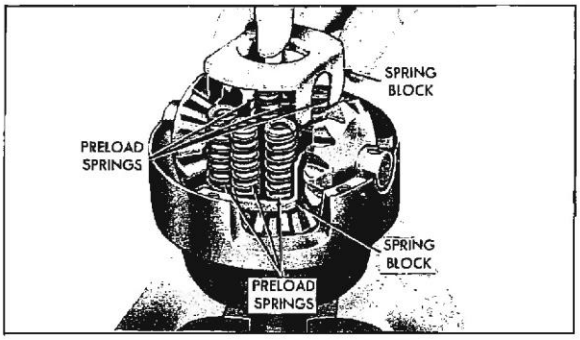


Fig. 4-52 Installing Second Thrust Block

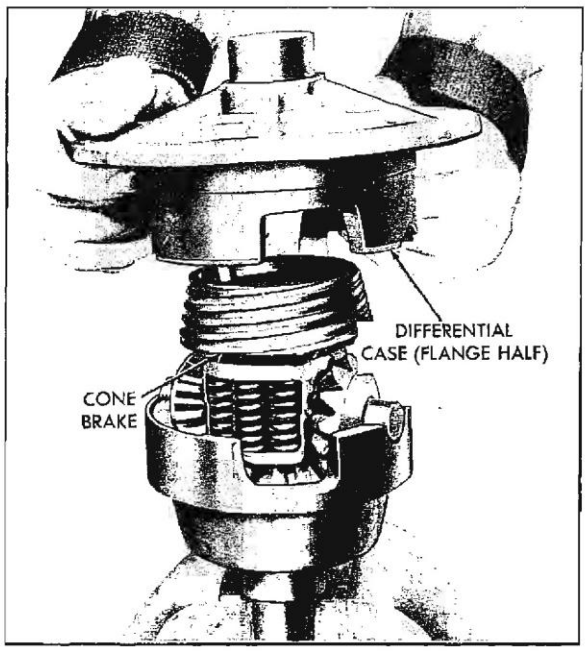


Fig. 4-53 Installing Flange Half of Differential Case

CAUTION: Do not use hammer to force ring gear on case.

15. Install unit into axle carrier following instructions given for Standard Differential.

CAUTION: After unit is installed in carrier, do not attempt to rotate on axle shaft until both are in position. Rotation of one shaft without the other installed will result in misalignment of cone and side gear splines, and may prevent entry of second shaft.

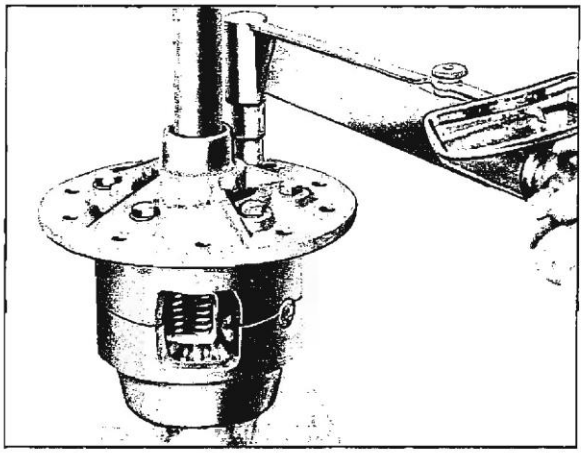


Fig. 4-54 Torquing Case Half Bolts

TROUBLE DIAGNOSIS AND TESTING

Many noises reported as coming from the rear axle actually originate from other sources such as tires, road surfaces, wheel bearings, engine, transmission, muffler, body drumming, etc. A thorough and careful check should be made to determine the source of the noise before disassembling the differential. Noise which originates in other places cannot be corrected by adjustment or replacement of parts in the rear axle. It should also be remembered that differential gears, like any other mechanical device, are not absolutely quiet and should be accepted as being commercially quiet unless some abnormal noise is present.

To make a systematic check for axle noise under standard conditions observe the following:

1. Select a level tarvia or asphalt road to reduce tire noise and body drumming.

2. Drive car far enough to thoroughly warm up rear axle lubricant.

3. Note speed at which noise occurs. Then stop car, and with clutch disengaged or automatic transmission in neutral, run engine slowly up and down through engine speeds corresponding to car speed at which noise was most pronounced, to determine if it is caused by exhaust, muffler roar, or other engine condition. Repeat while engaging and disengaging clutch (transmission in neutral) to determine if noise is in transmission. (Transmission rear bearing noise can only be isolated by removing propeller shaft and operating transmission in "high.")

4. Tire noise changes with different road surfaces but rear axle noise does not. Temporarily inflating all tires to approximately 50 pounds pressure, (for test purposes only) will materially alter noise caused by tires, but will not affect noise caused by the rear axle. Rear axle noise usually ceases when coasting at speeds under 30 miles per hour; however, tire noise continues but with lower tone as car speed is reduced. Rear axle noise usually changes when comparing "pull" and "coast", but tire noise remains about the same.

Distinguish between tire noise and differential noise by noting if noise varies with various speeds, and sudden acceleration and deceleration. Exhaust and axle noise show variations under these conditions while tire noise remains constant and is more pronounced at speeds of 20 to 30 miles per hour. Further check for tire noise by driving car over smooth pavements or dirt roads (not gravel) with tires at normal pressure. If noise is caused by tires, it will noticeably change or disappear and reappear with changes in road surface.

5. Loose or rough front wheel bearings will cause noise which may be confused with rear axle noises. However, front wheel bearing noise does not change when comparing "pull" and "coast". Light application of brake while holding car speed steady will often cause wheel bearing noise to diminish as this takes some weight off the bearing. Front wheel bearings may be easily checked for noise by jacking up the wheels and spinning them, or by shaking wheels to determine if bearings are loose.

6. Rear suspension rubber bushings and coil spring insulators dampen out rear axle noise when correctly installed. Check to see that no metallic contact exists between the springs and spring opening in frame, or between upper and lower control arm bushings and frame or axle housing brackets. Metal-to-metal contact at those points may result in "telegraphing" road noise and normal axle noise which would not be objectionable if dampened by bushings.

NOTE: It is important that a check also be made to ensure that floor of body is not in metallic contact with frame.

AXLE NOISES

GEAR NOISE

After the noise has been determined as being in the axle by following the above appraisal procedure, the type of axle noise should be determined to aid in making repairs if necessary.

Gear noise (whine) is audible from 20 to 65 MPH under four driving conditions.

1. Drive - Acceleration or heavy pull.

2. Road load - Car driving load or constant speed.

3. Float - Using enough throttle to keep the car from driving the engine - car slows down gradually but engine still pulls slightly.

4. Coast - Throttle closed and car in gear.

Gear noise most frequently has periods where noise is more prominent, usually 30 to 40 MPH and 50 to 60 MPH.

When objectionable axle noise is encountered, note the driving condition and speed range. Then remove differential for a red lead check. Shim and adjust to obtain best possible tooth pattern. If noise still persists, replace gear set.

BEARING NOISE

Bad bearings generally produce more of a rough growl or grating sound rather than the whine typical of gear noise. Bearing noise frequently "wow-wows" at bearing rpm which indicates a pinion or differential side bearing efect.

NOTE: This noise could easily be confused with rear wheel bearing noise. Inspect and replace as required.

REAR WHEEL BEARING NOISE

A rough rear wheel bearing produces a vibration or growl which continues with car coasting and transmission in neutral. A brinelled rear wheel bearing causes a knock or click approximately every two revolutions of the rear wheel, as the bearing rollers do not travel at the same speed as the rear axle and wheel. With rear wheels jacked up, spin rear wheels by hand while listening at hubs for evidence of rough or brinelled wheel bearing.

BEARING FAILURE

Bearings fail by "lapping", 'spalling" or "locking".

LAPPING Lapping is caused by fine particles of abrasive material such as scale, sand or emery which are circulated by oil and which cause wearing away of roller and race surfaces. Bearings which are worn loose but remain smooth without spalling or pitting are the result of dirty oil.

SPALLING Spalling failure of bearings is caused by overload or faulty assembly. Bearings which failed by spalling have either flaked or pitted rollers or races. Faulty assembly consists of misalignment or cocking of bearings, or adjustments which are too tight.

LOCKING Locking of bearings is caused by large particles of foreign material becoming wedged between rollers and race usually causing one of the races to turn. Preloading of taper roller bearings higher than specified can also cause locking of bearings.

KNOCK AT LOW SPEEDS

Low speed knock can be caused by worn and brinelled universal joints or a side gear hub counterbore in case worn oversize. Inspect and replace universal joint or case and side gear as required.

DRIVE-LINE SNAP

A snap sudden start either forward or reverse may be caused by a loose companion flange. Remove flange, turn 180°, apply white lead and oil to spline and reinstall. Pinion nut must be tightened to original position.

BACKLASH CLUNK

Excessive clunk with acceleration and deceleration is caused by worn differential pinion shaft, excessive clearance between axle shaft and side gear splines, excessive clearance between side gear hub and counterbore in case, worn pinion and side gear teeth, worn thrust washers and excessive drive pinion and ring gear backlash. Remove worn parts and replace as required selecting close fitting parts when possible. Adjust pinion and ring gear backlash.

DRIVE-LINE SQUEAL AND SQUEAK

Squeals and squeaks are audible only at low speeds, seldom over 20 MPH. A continuous squeal is from the pinion oil seal. Seal squeaks frequently correct themselves but replace persistent squealing seal.

PROPELLER SHAFT VIBRATION

Objectional vibrations at high speed (65 MPH or higher) may be caused by a propeller shaft that is out of balance. Out of balance may be due to a bent shaft.

To determine whether propeller shaft is causing vibration, drive car through speed range and note speed at which vibration is most pronounced. Shift transmission into lower gear range, and drive car at same engine speed as when vibration was most pronounced in direct drive. Note effect on vibration.

To determine engine speed, divide vehicle speed by the lower transmission gear ratio used (can be found at end of appropriate chapter in shop manual.)

If the vibration is still present at the same engine speed whether in direct drive or in the lower gear, since the propeller shaft speed varies, this cannot be the fault. If the vibration decreases or is eliminated in the lower gear, then the propeller shaft is out of balance and should be rebalanced or replaced.

See Section 4A (Propeller Shaft) for further trouble diagnosis.

OIL LEAKS

It is difficult to determine the source of some oil leaks.

Even after the point of leakage has been determined, it is hard to tell whether the oil is leaking past the lip of the seal or past the O.D. of the seal. Therefore, it is a good idea to make sure the leak is stopped by using a nonhardening sealing compound around the O.D. of the new seal.

SPECIFICATIONS

REAR AXLE

Type	Semi-Floating
Type of Drive	Modified Hotchkiss

Drive - Final . . . . . Hypoid Gear

Lubricant Capacity. . . . . 48 oz. or 3 pints

Lubricant . . . . . Multi-Purpose Hypoid Gear Lubricant

Lubricant Level. . . . . Bottom of Filler Plug Hole

RING AND PINION GEAR

Backlash . . . . . .005" - .009"

Ring gear run-out maximum . . . . . .002"

Ratios . . . . . See Fig. 4-4

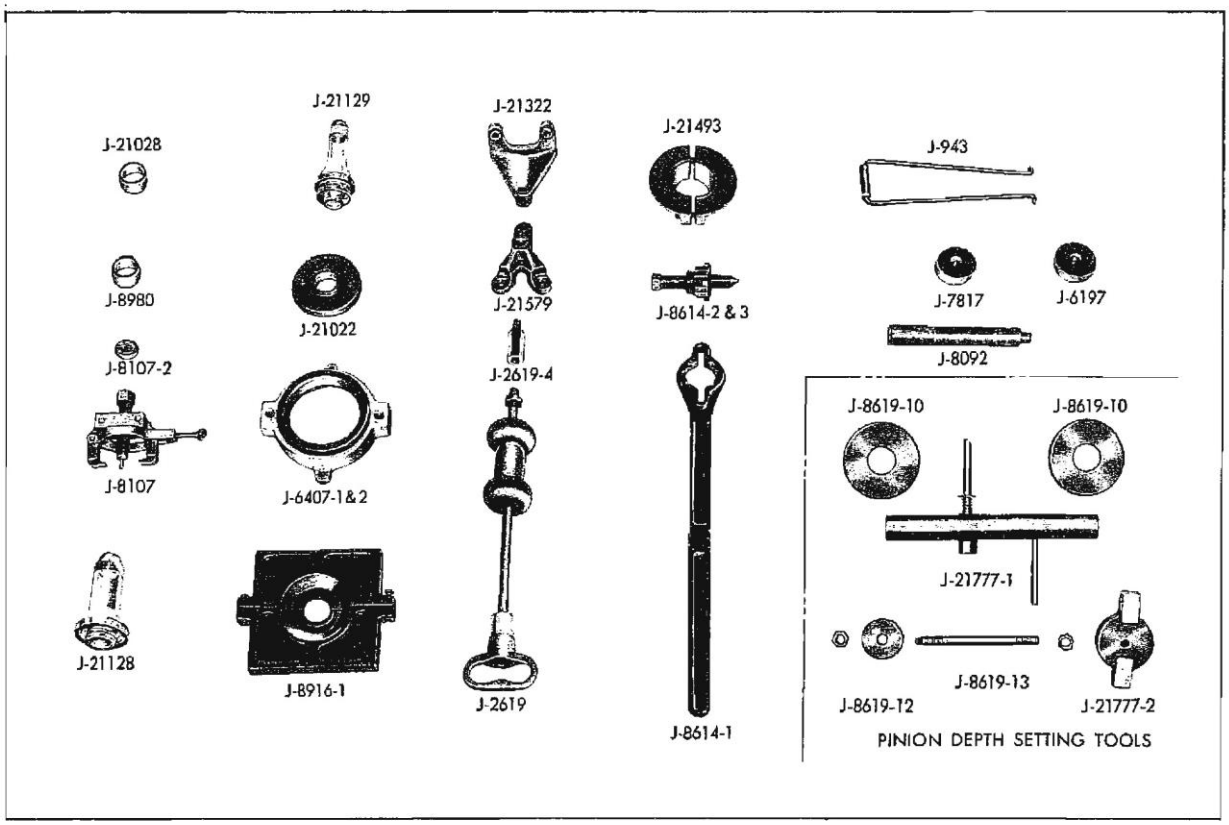
Pinion Bearing Preload (with ring rear)
New Bearings (New Seal) . . . . . 25 ± 5 lb. in.
Old Bearings (New Seal). . . . . 16 ± 4 lb. in.

Side Bearing Preload
Slip Fit Plus .008"

TORQUE SPECIFCATIONS

	Lb. Ft.
Differential Cover to Carrier Bolts	25 ± 5
Differential Bearing Caps to Carrier Bolts. .	70 ± 5
Differential Ring Gear to Case Bolts	60 ± 5
Differential Pinion Shaft Lock Screw	15 ± 5
Rear U-Joint Companion Flange Nut	16 ± 4
Rear Axle Upper Control Arm Assy to Axle Housing Bolt	90 ± 10
Rear Axle Upper Control Arm Assy to Axle Housing Nut	75 ± 10
Rear Axle Lower Control Arm Assy to Axle Housing Bolt	90 ± 10
Rear Axle Lower Control Arm Assy to Axle Housing Nut.	75 ± 10
Rear Axle Upper Control Arm Assy to Frame Bolt	90 ± 10
Rear Axle Upper Control Arm Assy to Frame Nut	75 ± 10
Rear Axle Lower Control Arm Assy to Frame Bolt	90 ± 10
Rear Axle Lower Control Arm Assy to Frame Nut.	75 ± 10
Rear Axle Bumper Spacer to Axle Housing Bracket Bolt and Nut	50 ± 5
Rear Spring Lower Clamp to Axle Housing Seat Bolt & Nut.	35 ± 5
Rear Shock Absorber to Axle Housing Bracket Nut	65 ± 10
Shock Absorber to Frame Bolt and Nut	20 ± 5
Rear Wheel and Drum to Axle Shaft Nut . . .	80 ± 5
Rear Brake Assy to Axle Housing Bolt and Nut	50 ± 5
Differential Case Bolts (Safe-T-Track)	17 ± 1

SPECIAL TOOLS



J-943	Oil Seal Remover	J-8619-10	Pinion Depth Gauge Discs
J-986-P	Differential Side Bearing Puller	J-8619-12	Pinion Depth Gauge Pilot
J-2619	Slide Hammer	J-8619-13	Pinion Depth Gauge Bolt and Nut
J-2619-4	Adapter	J-8916-1	Split Plate
J-6197	Rear Pinion Bearing Outer Race Installer	J-8980	Differential Side Bearing Installer
J-6407-1 & 2	Press Plate Holder and Insert	J-21022	Axle Shaft Bearing Installer
J-7817	Front Pinion Bearing Outer Race Installer	J-21028	Differential Side Bearing Installer
J-8092	Drive Handle	J-21128	Pinion Oil Seal Installer
J-8107, 8107-2	Differential Side Bearing Puller	J-21129	Axle Shaft Oil Seal Installer
J-8614-1	Companion Adapter Flange Holding Tool	J-21322	Differential Case Remover
J-8614-2 & 3	"U" Joint Companion Flange Puller	J-21493	Rear Pinion Bearing Remover
J-21777-1	Cross-Shaft Assembly	J-21579	Axle Shaft Remover
J-21777-2	Gauge Plate		

Fig. 4-55 Tools

PROPELLER SHAFT

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

The propeller shaft is the connecting link between, and transmits power from, the transmission to the differential. Propeller shafts are solid tubular steel and are interchangeable.

Each shaft has a universal joint and a splined yoke on the transmission end and is held in alignment by a bushing in the transmission rear bearing retainer (or rear extension housing), and a universal joint at the differential end (Fig. 4A-2).

A U-bolt type clamp with lockwashers and nuts is used to attach the universal joint to the companion flange at the differential. The front joint attaches to the output shaft of the transmission by means of a splined yoke. This permits fore and aft movement of the propeller shaft when the rear axle assembly moves up and down. The splined connection is lubricated from the transmission. An oil seal pressed into the transmission rear bearing retainer protects the transmission yoke from dust as well as loss of transmission lubricant.

INSPECTION

No periodic inspection of the propeller shaft assembly is required. Since the propeller shaft assembly is a balanced unit, it should be kept free of undercoating and other foreign material which could upset shaft balance. It is essential that the locating mark on the companion flange be in alignment with the mark on the propeller shaft.

MINOR SERVICES AND REPAIRS

ALIGNMENT OF ENGINE AND PROPELLER SHAFT

Adjustment of the propeller shaft angle, such as shimming, cannot be made at the rear axle and is not required at the front (engine and transmission).

All necessary differential pinion angle requirements are designed and built into the rear upper and lower control arm geometry. Slots in the engine front motor mounts provide for fore and aft movement of the engine and transmission assembly to give allowance for variation of the positioning of the transmission rear cross member. The relationship of engine crankshaft angle to propeller shaft angle is maintained within specification by design.

MAJOR REPAIRS

REMOVE PROPELLER SHAFT DRIVE LINE ASSEMBLY

1. Remove U-bolt nuts, lockwashers and U-bolts from rear axle drive pinion flange.

2. Use a suitable rubber band to hold bearing onto journals if tie wire has been removed to prevent loss of needle bearings when rear joint is disconnected (Fig. 4A-3).

3. Remove complete drive line assembly by sliding rearward to disengage from splines on transmission main shaft.

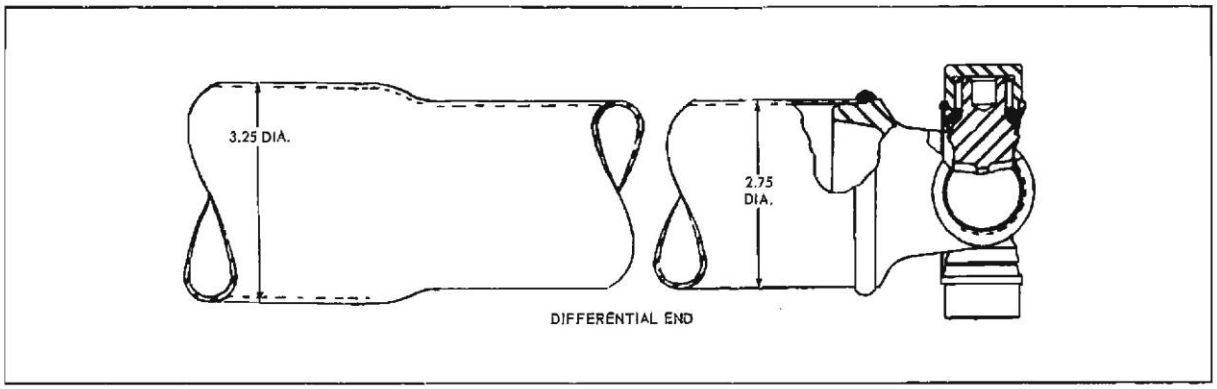


Fig. 4A-1 Propeller Shaft

DISASSEMBLE PROPELLER SHAFT UNIVERSAL JOINTS

NOTE: When removing bearings from universal joint yokes, use extreme care so as not to lose needle rollers from bearings.

1. Remove snap ring from yoke members by using screwdriver or similar tool.

2. Remove bearings from splined yoke member as follows:

a. Lay or clamp end of shaft in vise so fixed yoke member welded to tube bears against vise. (Do not lay or clamp tubular member in vise.) Shaft should be horizontal and splined yoke member must be free to move vertically between jaws of vise.

b. Using a piece of pipe or similar tool with diameter sufficiently large to encircle bearing (slightly larger than 1-1/8 inch), apply force on yoke around bearing (Fig. 4A-4). This will drive yoke down causing journal assembly (spider) to force bearing partially out of yoke.

c. Rotate shaft 180° and repeat above step to partially remove opposite bearing.

d. With yoke down as far as possible, place one or more flat washers (9/16", O.D.) inside lower bearing (Fig. 4A-5).

NOTE: Total thickness of washers should be 1/8"-3/16".

e. Rotate shaft 180° and again apply force around bearing in which washers were installed. This will completely remove bearing from yoke.

f. Remove splined yoke member from journal.

g. Remove remaining bearing from splined yoke member using brass drift.

3. Remove bearings and journal (spider) from fixed yoke member, which is welded to tubular shaft, as follows:

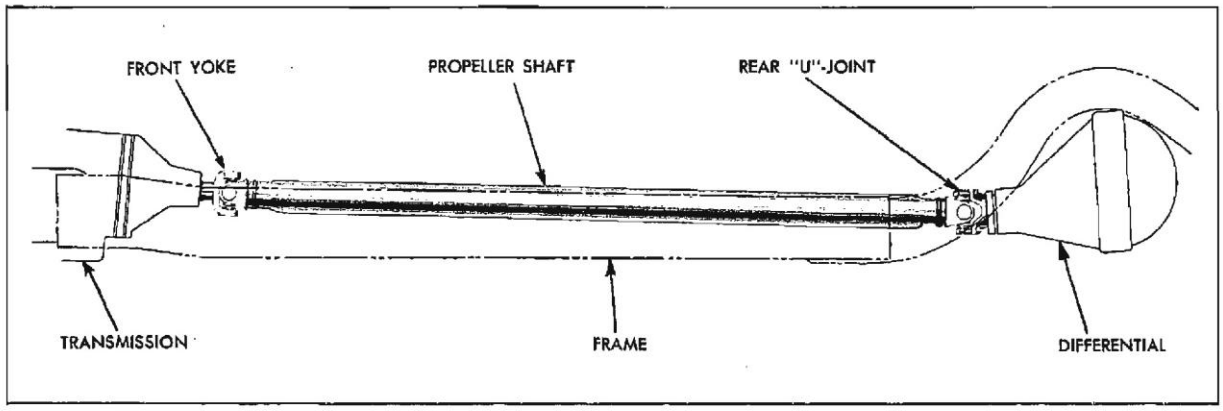


Fig. 4A-2 Relationship of Propeller Shaft to Transmission, Differential and Frame

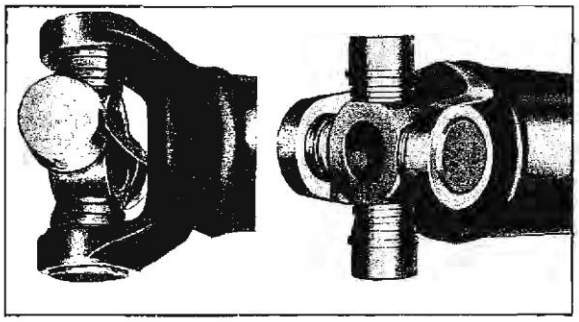


Fig. 4A-3 Bearings Held in Place by Tie Wire

a. With yoke member clamped or supported in vise, drive bearing out as far as possible using drift applied to center part of journal (Fig. 4A-6).

b. Rotate shaft 180° and drive opposite bearing out as far as possible using drift in same manner as in above step.

c. Hold journal up and install three or four small flat washers (Fig. 4A-7). Lower journal onto washers and drive bearing out using drift applied to journal.

d. Remove journal from yoke.

e. Remove remaining bearing using brass drift.

CLEANING AND INSPECTION

1. Wash all parts thoroughly in a cleaning fluid. Probe holes in journals to remove any hardened grease.

2. Inspect roller bearing surfaces of journals, inner bearing surfaces of outer races, and rollers for wear, scores, flat spots, or other damage.

3. Inspect packings (cork washers) and journal dust shields for wear and injury. Replace if necessary. Packing should be flexible, if brittle or hard replace with new packing.

4. Inspect outer surface of propeller shaft splined yoke to ensure that it is not burred since burrs will damage seal. Also inspect splines for freedom from dirt.

ASSEMBLE PROPELLER SHAFT UNIVERSAL JOINTS

1. Repack roller bearings and fill holes in ends of journal with high melting point wheel bearing lubricant (18 rollers are used for each bearing).

2. Install bearing journal and bearings in fixed yoke member as follows:

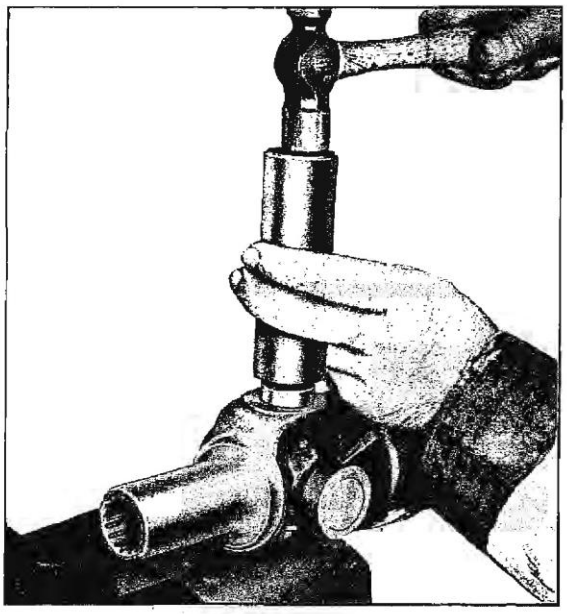


Fig. 4A-4 Removing Bearing From Splined Yoke Member

a. Press cork washer into position in recess of bearing and install bearing about one quarter way in on one side of fixed yoke using soft faced hammer.

b. Position journal, with dust shields installed, between arms of yoke and place journal in partially installed bearing.

c. Hold journal in place and complete installing bearing.

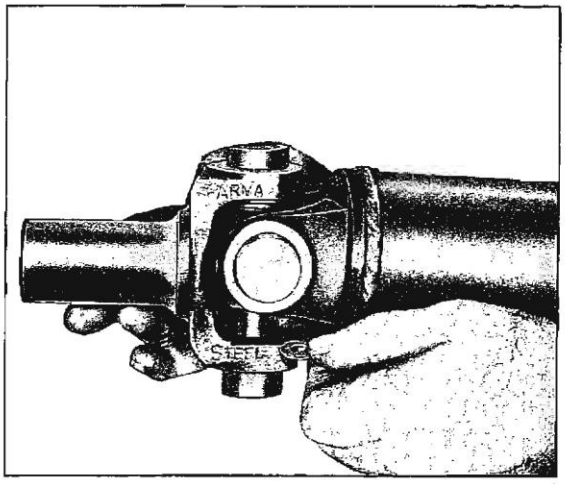


Fig. 4A-5 Placing Washers Inside Bearing of Splined Yoke Member

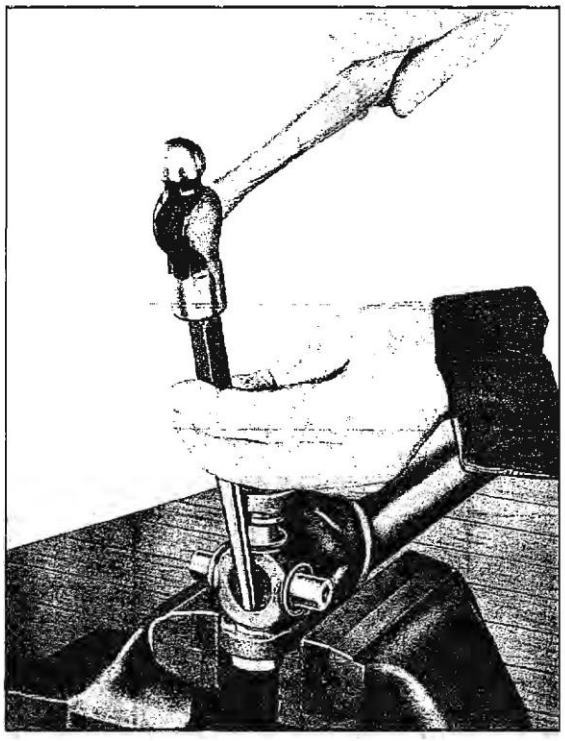


Fig. 4A-6 Removing Bearing From Fixed Yoke Member

d. Install opposite bearing, with cork washer in place, ensuring that bearing rollers do not bind on journal. Check movement of journal in bearings for smoothness.

NOTE: It may be necessary to tap fixed yoke with hammer to free joints of bind.

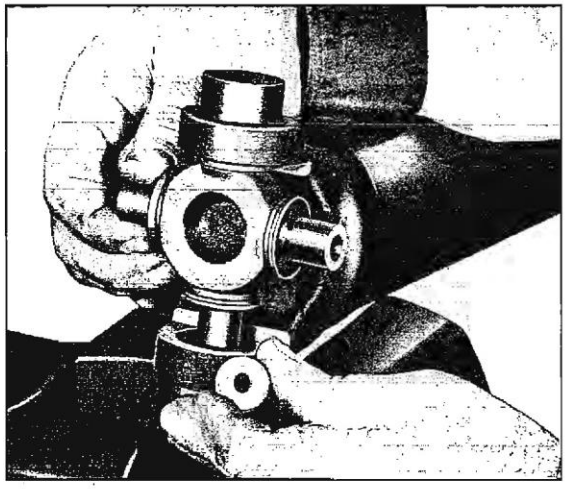


Fig. 4A-7 Placing Washers Inside Bearing of Fixed Yoke Member

3. Install bearings in splined yoke member as follows:

a. Press cork washer into bearing and start bearing into place in splined yoke member with a soft faced hammer.

b. Position yoke over journal so arm of journal seats in bearing. Support yoke on opposite side and complete installation of bearing.

c. Press cork washer in place in remaining bearing and install bearing, ensuring that bearing rollers do not jam on journal. Check for free movement of universal joint.

4. Install snap rings in yoke members with gap toward yoke.

INSTALL PROPELLER SHAFT DRIVE LINE ASSEMBLY

1. Inspect outer diameter of splined yoke to ensure that it is not burred so as to damage transmission seal.

2. Apply engine oil to spline and outside diameter of yoke and slide propeller shaft front joints onto transmission output shaft.

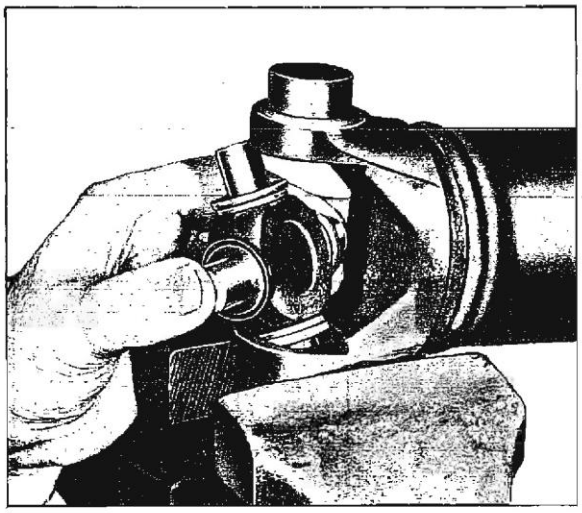


Fig. 4A-8 Correct Installation of Journal to Yoke

3. Position rear universal joint to rear axle companion flange making sure trunnion bearings are properly aligned in companion flange yoke.

NOTE: Be sure to align mark on companion flange with mark on propeller shaft.

4. Install U-bolts, lockwashers and nuts and tighten U-bolt nuts to 17 ± 3 lb. ft. torque.

TROUBLE DIAGNOSIS AND TESTING

OIL LEAK AT FRONT YOKE

CAUSE	REMEDY
Rough outside surface on splined yoke or defective transmission rear oil seal. An occasional drop of oil dripping from the spline yoke is normal and requires no correction.	Replace seal if cut by burrs on yoke. Replace yoke if outside surface is rough and burred badly. Minor burrs can be smoothed by careful use of crocus cloth or honing with a fine stone.

KNOCK IN DRIVE LINE

CAUSE	REMEDY
Worn universal joints. *NOTE: "Clunking" noise when car is operated under "floating" condition at approximately 10 mph in high gear or neutral.*	Disassemble universal joints, inspect, and replace worn parts.

PROPELLER SHAFT VIBRATION

If vibration comes in at definite speed while car is moving, check by driving car at speed above which vibration came in, shutting off engine and coasting in neutral down through speed where vibration came in. If vibration comes in at same speed when coasting, it is probably caused by propeller shaft or tires.

Tires may give a vibration at certain high speeds which could be mistaken for propeller shaft vibration. By inflating tires above normal pressure and retesting, it may be possible to distinguish tire noise from propeller shaft vibration. When it has been established that the tires are not the cause of vibration, then check propeller shaft assembly for balance and replace shaft.

WRENCH TORQUE SPECIFICATIONS

(Torque in lb. ft.)

TORQUE	SIZE	APPLICATION
17±3	5/16-24	Nut, Rear Universal Joint Companion Flange Clamp