GROUP 6

REAR AXLE AND PROPELLER SHAFT

SECTIONS IN GROUP 6

SECTION 6-A

REAR AXLE, 45000 SERIES

CONTENTS OF SECTION 6-A

6-1 REAR AXLE SPECIFICATIONS

Use a reliable torque wrench to tighten the parts listed, to insure proper tightening without straining or distorting parts. These specifications are for clean and lightly lubricated threads only; dry or dirty threads produce increased friction which prevents accurate measurement of tightness.

Part	Location	Thread Size	Torque ft. lbs.
Nut	Rear Universal Joint to Pinion Flange	5/16-18	15-18
Bolt	Differential Pinion Shaft Locking Bolt	5/16	20-28
Bolt	Rear Axle Housing Cover to Carrier	5/16-18	25-35
Bolt & Nut	Upper End of Shock Absorber to Rear Suspension Cross Member	5/16-18	12-24
Nut	Brake Assembly to Rear Axle Housing	3/8 -16	45-60
Bolt	Ring Gear to Differential Case	3/8 -24	50-60
Bolt	Bearing Cap to Carrier	7/16-14	40-60
Nut	Rear Wheel to Axle Shaft	7/16-14	55-75
Bolt & Nut	Lower Control Arm to Axle Bracket	1/2 -13	20-30
Bolt & Nut	Upper Control Arm to Frame & Rear Axle Housing	1/2 -13	65-90
Bolt & Nut	Lower Control Arm to Frame Bracket	1/2 -13	65-90
Nut	Lower End of Shock Absorber to Lower Control Arm Axle Bracket	1/2 -20	30-60

b. General Specifications

Item	All Series
Rear Axle Type	Semi-Floating Hypoid
Drive and Torque	Through 4 Arms
Rear Axle Oil Capacity	2 pints
Ring and Pinion Gear Set Type	Hypoid
Pinion Depth Setting	+ .0015 from marking on pinion

c. Limits for Fitting and Adjusting

Pinion Bearing Preload
New Bearings . . . . . 20-30 inch lbs. torque with new seal
Reused Bearings . . . . . 12-20 inch lbs. torque with new seal
Ring Gear Position . . . . . .007-.009 Backlash

Ring Gear Preload
New Bearings . . . . . 30-40 inch lbs. torque at ring gear with pinion
Reused Bearings . . . . . 20-30 inch lbs. torque at ring gear with pinion

d. Rear Axle Gear Ratios

Gear ratios are indicated by numbers stamped on the bottom of the right axle tube. See Figure 6-1. The letters designate the axle ratio while the number designates the day of the year that the axle was assembled.

e. Speedometer Gears

Speedometer gears must correspond with axle ratios and tire sizes in order to have correct speedometer and odometer readings.

6-2 DESCRIPTION OF REAR AXLE

The rear axle assembly is of the semi-floating type in which the car weight is carried on the axle shafts through ball bearings enclosed in the outer axle housing tubes. The rear axle is designed for use with an open drive line and coil springs. Drive from the axle housing is transmitted to body members through two lower and two upper control arms. Large rubber bushings at either end of these control arms are designed to absorb vibration and noise. The upper control arms are angle mounted to also hold the body in sidewise alignment with the rear axle assembly. The final drive has a hypoid type ring gear and pinion with the centerline of the pinion below the centerline of the ring gear. See Figure 6-2.

The drive pinion is mounted in two tapered roller bearings which are preloaded by a collapsible spacer during assembly. The pinion is positioned by shims located between a shoulder on the drive pinion and the rear bearing. The front bearing is held in place by a large nut.

The differential is supported in the carrier by two tapered roller side bearings. These are preloaded by inserting shims between the bearings and the pedestals. The differential assembly is positioned for proper gear and pinion backlash by varying these shims. The ring gear is bolted to the case. The case houses two side gears in mesh with two pinions mounted on a pinion axle which is anchored in the case by a bolt. The pinions and side gears are backed by thrust washers.

The axle shaft inner splines engage the differential side gears with a floating fit. The outer ends are supported in the axle housing by thrust type ball bearings which are factory packed for the life of the bearing and sealed on both sides. The axle shaft oil seals are located inboard of the bearings. The bearings are secured against shoulders on the shafts by press fit retainer rings. Retainer plates hold the bearings against shoulders in the housing. Wheel side thrust is taken at the wheel bearings, so an axle shaft may be removed simply by removing the bolts holding the retainer to the brake backing plate and axle housing flange. See Figure 6-3.

The differential carrier is a malleable iron casting with tubular axle housings pressed into the sides to form a complete assembly. A removable, heavy steel cover is bolted on the rear of the carrier to permit service of the differential without removing the rear axle from the car. A seal in the front of the carrier bears against the pinion flange. See Figure 6-2.

Brackets welded to the tubular axle housings and upper brackets integral with main carrier casting, form means of attaching the rear axle to the body. An oil feed passage to the pinion bearings and an oil return hole are provided in the carrier casting to allow lubricant to circulate.

The rear axle filler plug is located on the right side of the carrier casting just ahead of and below the axle housing.

The rear brake drum is mounted directly against the axle flange on hub bolts pressed through the back of the axle flange.

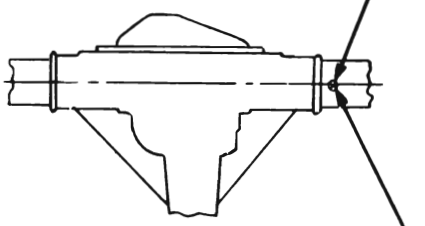
6-3 REAR AXLE TROUBLE DIAGNOSIS

a. Elimination of External Noises

When a rear axle is suspected of being noisy it is advisable to make a thorough test to determine whether the noise originates in the tires, road surface, front wheel bearings, engine, transmission, or rear axle assembly. Noise which originates in other places cannot be corrected by adjustment or replacement of parts in the rear axle assembly.

(1) Road Noise. Some road surfaces, such as brick or rough

AXLE TYPE	MFG. AXLE CODE	RATIO	SERIES
STANDARD DIFFERENTIAL	NA	3.55	45 SYNC.
	NB	3.08	45 2 & 3-SP. AUTO.
	NC	(S.C.O.)	ALL
POSITIVE TRACTION DIFFERENTIAL	NN	3.55	45 SYNC.
	NO	3.08	45 2 & 3-SP. AUTO.
	NP	(S.C.O.)	ALL



(FIELD IDENTIFICATION)

FOR FIELD IDENTIFICATION, ALL AXLE ASSEMBLIES TO BE STAMPED ON BOTTOM OF AXLE TUBE AS INDICATED FROM CHART. SAMPLE MARKING FOR 3.08 RATIO. DATE JULY 22 WOULD BE . . . STANDARD AXLES A-203, POSITIVE TRACTION AXLES ⊕ A-203.

SAMPLE MARKING FOR S.C.O. RATIO DATE JULY 22 WOULD BE . . . STANDARD AXLES 2.56-203, POSITIVE TRACTION AXLES ⊕ 2.56-203

.50 DIA. APPROX. TO BE ON BOTTOM OF AXLE TUBE WITH FIELD IDENTIFICATION CODE

NOTE: "S.C.O." INDICATES SPECIAL ORDER AXLE

Fig. 6-1—Rear Axle Markings U.S. Production Only

surfaced concrete, cause noise which may be mistaken for tire or rear axle noise. Driving on a different type of road, such as smooth asphalt or dirt, will quickly show whether the road surface is the cause of noise. Road noise usually is the same on drive or coast.

(2) Tire Noise. Tire noise may easily be mistaken for rear axle noise even though the noisy tires may be located on the front wheels. Tires worn unevenly or having surfaces of non-skid divisions worn in saw-tooth fashion are usually noisy, and may produce vibrations which seem to

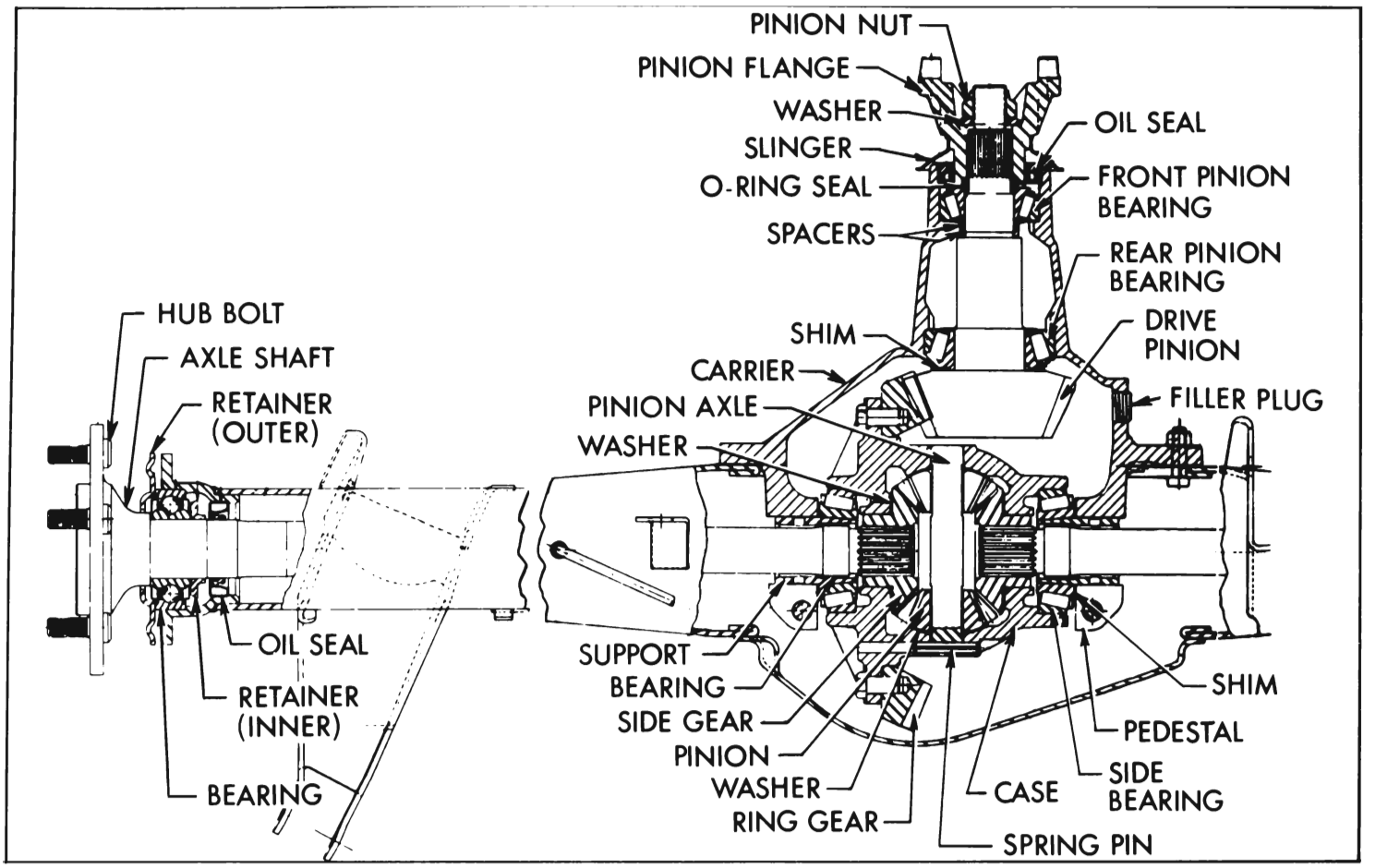


Fig. 6-2—Rear Axle Assembly

originate elsewhere in the vehicle. This is particularly true with low tire pressure. Some designs of non-skid treads may be more noisy than others, even when tires are new.

(3) Test for Tire Noise. 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 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.

(4) Front Wheel Bearing Noise. 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, also by shaking wheels to determine if bearings are loose.

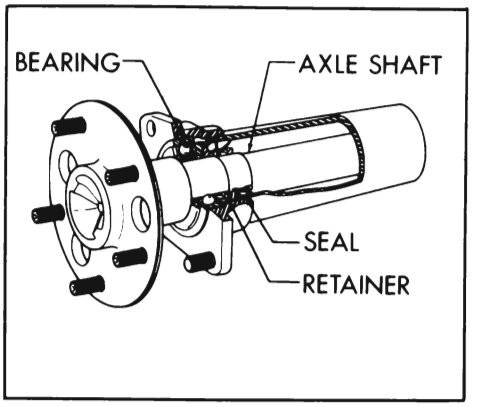


Fig. 6-3—Rear Axle Shaft Bearing and Seal

(5) Engine and Transmission Noises. Sometimes a noise which seems to originate in the rear axle is actually caused by the engine or transmission. To determine which unit is actually causing the noise, observe approximate car speeds and conditions under which the noise is most pronounced; then stop car in a quiet place to avoid interfering noises. With transmission in neutral, run engine slowly up and down through engine speeds corresponding to car speed at which the noise was most pronounced. If a similar noise is produced with car standing, it is caused by the engine or transmission, and not the rear axle.

b. Rear Axle Noises

If a careful test of car shows that noise is not caused by external items as described in subparagraph a, it is then resonable to assume that noise is caused by rear axle assembly. The rear axle should be tested on a smooth level road to avoid road noise. It is not advisable to test rear axle for noise by running with rear wheels jacked up.

Noises in rear axle assembly may be caused by a faulty propeller shaft, faulty rear wheel bearings, faulty differential or pinion shaft bearings, misalignment between two U-joints, or worn differential side gears and pinions; noises may also be caused by mismatched, improperly adjusted, or scored ring and pinion gear set.

(1) 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 rear wheel, since 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.

(2) Differential Side Gear and Pinion Noise. Differential side gears and pinions seldom cause noise since their movement is relatively slight on straight ahead driving. Noise produced by these gears will be most pronounced on turns.

(3) Pinion Bearing Noise. Rough or brinelled pinion bearings produce a continuous low pitch whirring or scraping noise starting at relatively low speed.

(4) Ring and Pinion Gear Noise. Noise produced by the ring and pinion gear set generally shows up as drive noise, coast noise, or float noise.

(a) Drive noise is noise produced during vehicle acceleration.

(b) Coast noise is noise produced while allowing car to coast with throttle closed.

(c) Float noise is noise occurring while just maintaining constant car speed at light throttle on a level road.

(d) Drive, coast, and float noises will vary in tone with speed, and will be very rough and irregular if the differential or pinion shaft bearings are rough, worn, or loose.

c. Body Boom Noise or Vibration

Objectional "body boom" noise or vibration at 55-65 MPH can be caused by an unbalanced propeller shaft. Excessive looseness at the spline can contribute to this unbalance.

Other items that may also contribute to the noise problem are as follows:

1. Undercoating or mud on the shaft causing unbalance.

2. Shaft balance weights missing.

3. Shaft damage such as bending, dents or nicks.

4. Tire-type roughness. Switch tires from a known good car to determine tire fault.

d. Check for Propeller Shaft Vibration

Objectionable 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 following transmission gear ratios as listed below:

1.55 (three speed synchromesh in second gear)

1.51 (four speed synchromesh in third gear)

1.76 (automatic transmission in low range).

EXAMPLE: If vibration is most pronounced in direct drive at 65 MPH, the same engine speed would be produced in second gear (three speed synchromesh) at 65/1.55 = 42 MPH; in third gear (four speed synchromesh) at 65/1.51 = 43 MPH; in low range (automatic) at 65/1.76 = 37 MPH.

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. See paragraph 6-17. See paragraph 6-11 for a more complete trouble diagnosis.

e. Oil Leaks

It is difficult to determine the source of some oil leaks. When there is evidence of an oil leak, determine source as follows:

(1) Oil coming from the drain hole under the axle housing at the brake backing plate is caused by a leaking axle shaft seal or a leaking wheel bearing inner gasket.

(2) Oil coming from between the rear pinion flange slinger and the carrier is caused by a leaking pinion seal.

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.

6-4 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:

a. Removal of 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 pinion flange by removing two U-bolts. Wire propeller shaft to exhaust pipe to support it out of the way.

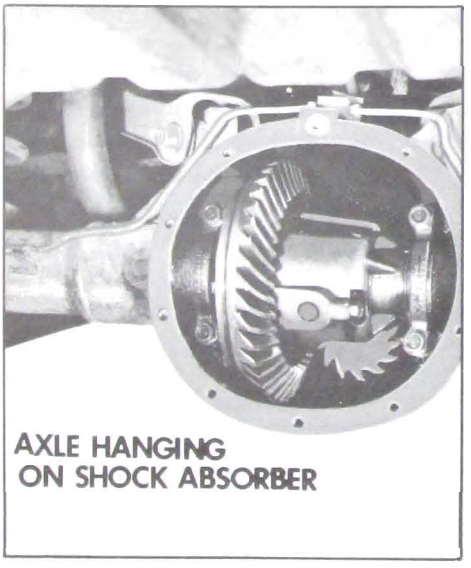


Fig. 6-4—Rear Axle Assembly in Position for Repair

3. Disconnect parking brake cables by removing adjusting nuts at equalizer. Slide center cable rearward and disconnect two rear cables at connectors to free from body.

4. Disconnect rear brake hose at floor pan. Cover brake hose and pipe openings to prevent entrance of dirt.

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

6. Disconnect upper control arms at frame brackets.

7. Disconnect lower control arms at axle housing and roll rear axle assembly out from under car.

b. Installation of 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. Roll rear axle assembly under car.

2. Connect lower control arms to axle housing.

3. Connect upper control arms at frame brackets.

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

5. Connect shock absorbers and tighten nuts to 30-60 ft. lbs. Connect lower control arms and tighten pivot bolts to 20-30 ft. lbs. Connect upper control arm bolts and tighten to 65-90 ft. lbs.

6. Connect parking brake cables. Adjust parking brake according to procedure in paragraph 9-9.

7. Connect rear universal joint to pinion flange. Tighten nuts evenly to 15-18 ft. lbs.

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

8. Connect rear brake hose at floor pan. Bleed both rear brakes and refill master cylinder. See paragraph 9-7.

9. Fill rear axle with specified gear lubricant (See par. 1-9). If axle housing or any rear suspension parts were replaced due to damage, rear universal joint angle must be checked and adjusted if necessary. See paragraph 6-16.

6-5 DISASSEMBLY OF REAR AXLE ASSEMBLY

Most rear axle service repairs can be made with the rear axle assembly in the car by raising the rear end of the car with the rear axle hanging on the shock absorbers. See Figure 6-4. Rear axle lubricant may be drained by backing-out all cover bolts and breaking cover loose at the bottom.

a. Remove Axle Shaft Assemblies

Design allows for axle shaft end play up to .042" 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.

End play over .042" is excessive. Compensating for all of the end play by inserting a shim inboard of the bearing in the housing is not recommended since it ignores the 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 shaft and bearing assembly should be removed and the cause of the excessive end play determined and corrected.

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

2. Remove brake drums.

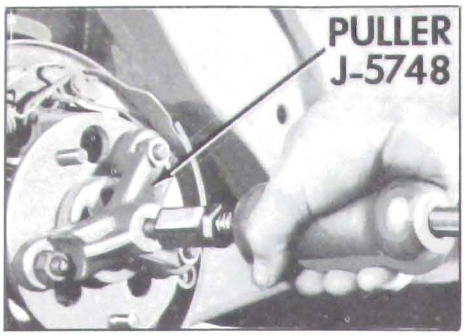


Fig. 6-5—Removing Rear Axle Shaft

3. Remove nuts holding retainer plates to 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-5748 and Adapter J-2619-4 with a slide hammer. See Figure 6-5.

CAUTION: While pulling axle shaft out through oil seal, support shaft carefully in center of seal to avoid cutting seal lip.

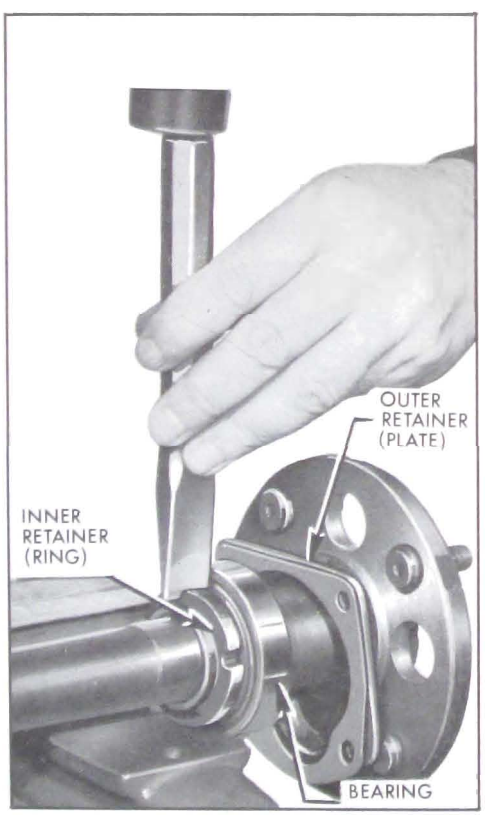


Fig. 6-6—Removing Axle Shaft Bearing Retainer

b. Remove and Install Axle Shaft Bearing

1. Nick bearing retainer in 3 or 4 places with a chisel deep enough to spread ring. Retainer will then slip off. See Figure 6-6.

2. Press axle shaft bearing off using Puller Plate J-8621 with Remover J-6525. An arbor press may be used or a set-up may be made using Ram and Yoke Assembly J-6180 with Adapter J-6258 and Puller J-5748. See Figure 6-7.

3. Press new axle shaft bearing against shoulder on axle shaft using Installer J-8853 with Holder J-6407. See Figure 6-8. CAUTION: Retainer plate which retains bearing in housing must be on axle shaft before bearing is installed; retainer gasket can be installed after bearing.

4. Press new retainer ring against bearing using Installer J-8853.

c. Remove and Install 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.

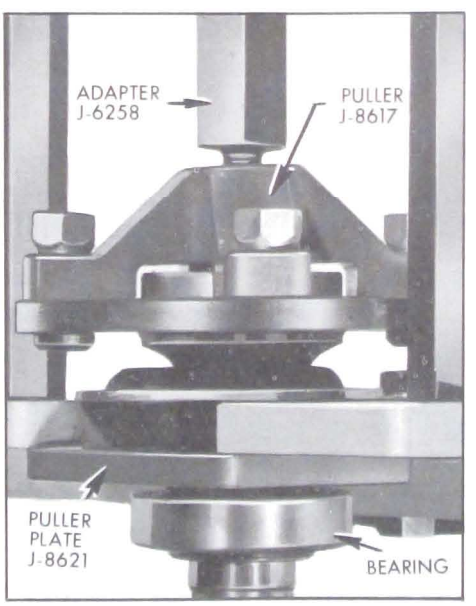


Fig. 6-7—Removing Axle Shaft Bearing

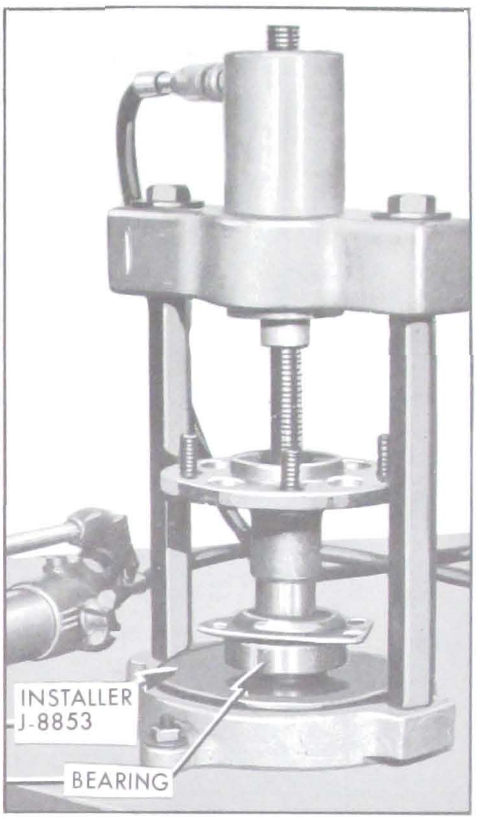


Fig. 6-8—Installing Axle Shaft Bearing

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.

d. Remove and Install Axle Shaft Seal

1. Insert axle shaft so that splined end is just through seal.

2. Using axle shaft as a lever, push down on shaft until seal is pried from housing. See Figure 6-9.

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

4. Position seal over Installer J-21129 and drive seal straight into axle housing until fully seated. See Figure 6-10.

e. Remove Differential Case Assembly

1. Before removing differential from housing, it is advisable to

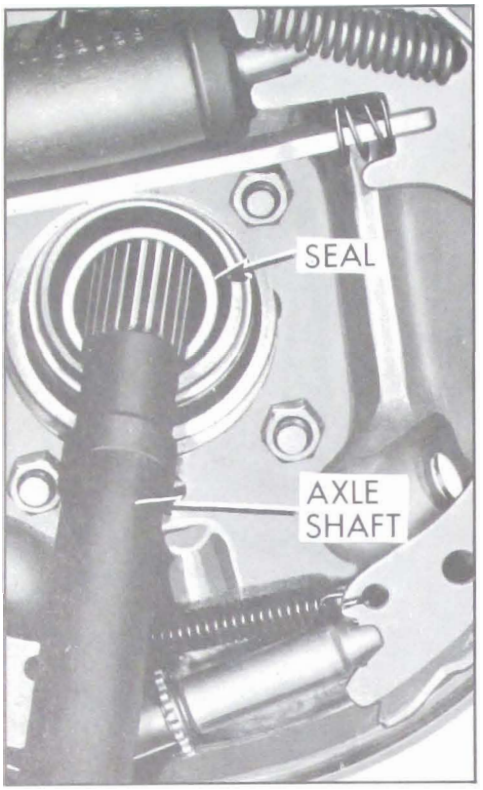


Fig. 6-9—Removing Axle Shaft Seal

check the existing ring gear to pinion backlash as described in paragraph 6-6(f). This will indicate gear or bearing wear or an error in backlash or preload setting which will help in determining cause of axle noise. Backlash should be recorded so that if same gears are reused, they may be reinstalled at original lash to avoid changing gear tooth contact.

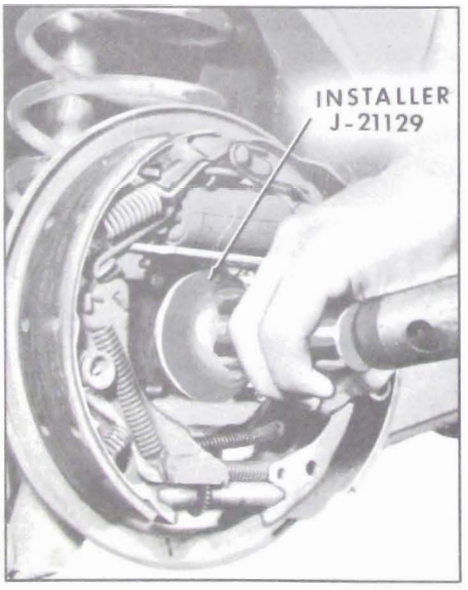


Fig. 6-10—Installing Axle Shaft Seal

2. Remove differential bearing cap bolts. Bearing caps are marked "R TOP" and "L TOP" in production to make sure they will be reassembled correctly.

3. Remove two ring gear retaining bolts from differential case and install Ring Gear & Case Remover J-21322 with slide hammer as shown in Figure 6-11. Remove case assembly and place right and left bearing outer races and shims in sets with marked bearing caps so that they can be reinstalled in their original positions.

f. Disassemble Differential Case Assembly

1. If differential side bearings are to be replaced, insert Remover Adapter J-2241-8 in center hole and pull bearing using Puller J-2241 or Hydraulic Puller J-9005. See Figure 6-12.

2. Remove bolt that retains differential pinion axle. See Figure 6-13. Remove differential pinions, side gears and thrust washers from case.

3. If ring gear is to be replaced and it is tight on case after removing bolts, tap it off using a soft hammer; do not pry between ring gear and case.

g. Remove Pinion Assembly

1. Check pinion bearing preload as described in paragraph 6-6(c).

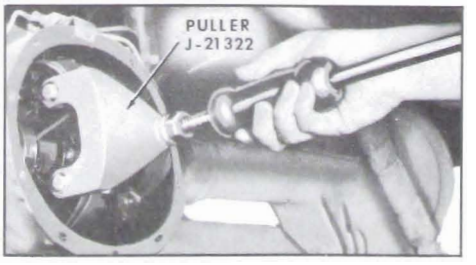


Fig. 6-11—Removing Differential Assembly

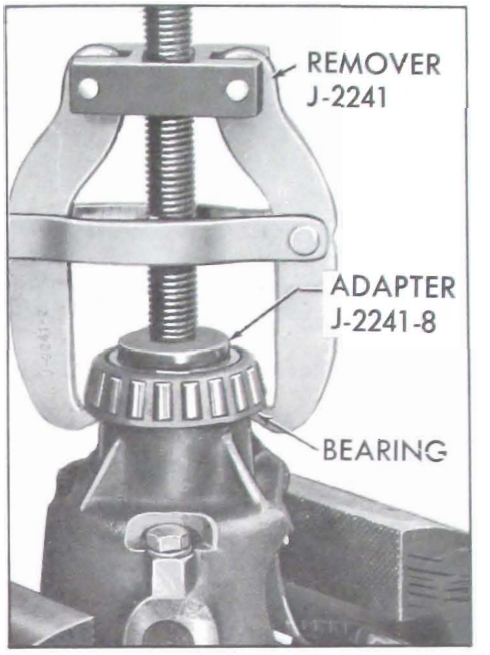


Fig. 6-12—Removing Differential Side Bearings

If there is no preload reading, check for looseness of pinion assembly by shaking. Looseness indicates need for bearing replacement. If assembly is run long with very loose bearings, ring and pinion will also require replacement.

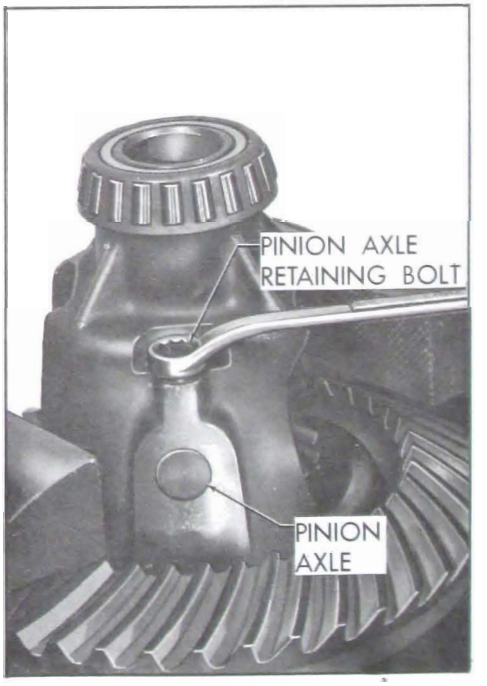


Fig. 6-13—Removing Pinion Axle Retaining Bolt

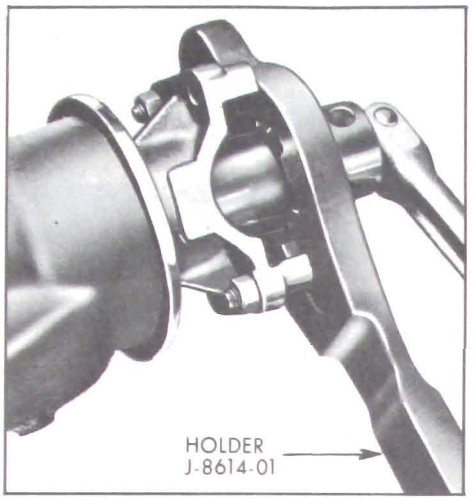


Fig. 6-14—Removing Pinion Nut

2. Install Holder J-8614-01 on pinion flange by using two 5/16-18 x 2 bolts with flat washers. Remove pinion nut and washer. See Figure 6-14.

3. Pull pinion flange from pinion using Puller J-8614-02 in Holder J-8614-01. To install puller, back out puller screw, insert puller through holder, and rotate 1/8 turn. See Figure 6-15.

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

h. Disassemble Pinion Assembly

1. If rear pinion bearing is to be replaced, remove rear pinion bearing from pinion shaft using Remover J-21493 with Holder J-6407. See Figure 6-16.

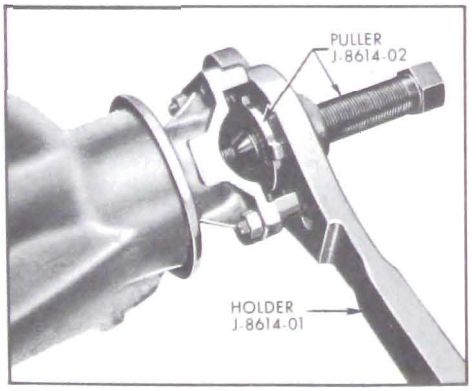


Fig. 6-15—Removing Pinion Flange

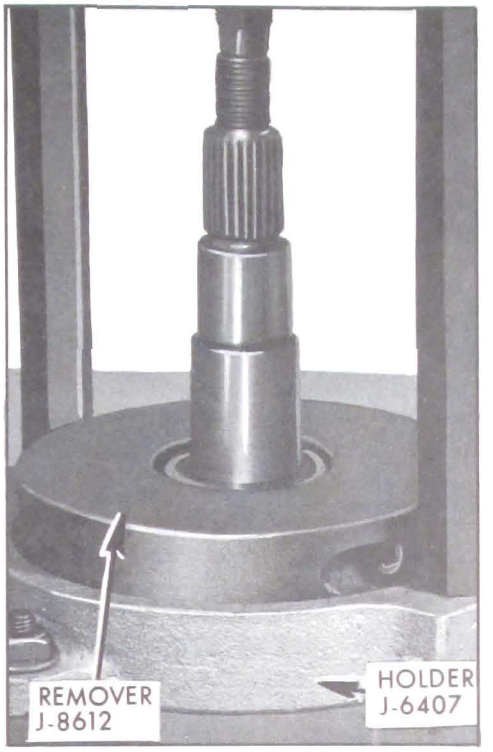


Fig. 6-16—Removing Rear Pinion Bearing

2. Pry pinion oil seal from carrier and remove front pinion bearing. If this bearing is to be replaced, drive outer race from carrier using a drift.

3. If rear pinion bearing is to be replaced, drive outer race from carrier using a drift in slots provided for this purpose.

6-6 ASSEMBLY OF REAR AXLE ASSEMBLY

a. Install Pinion Bearing Outer Races in Carrier

1. If rear pinion bearing is to be replaced, install new outer race using Installer J-6197 with Driver Handle J-8092. See Figure 6-17.

2. If front pinion bearing is to be replaced, install new outer race using Installer J-7817 with Driver Handle J-8092. See Figure 6-18.

b. Set Pinion Depth

Ring and pinion gear sets are matched in a special test machine which permits adjustment of pinion depth in ring gear until a point is reached where best operation

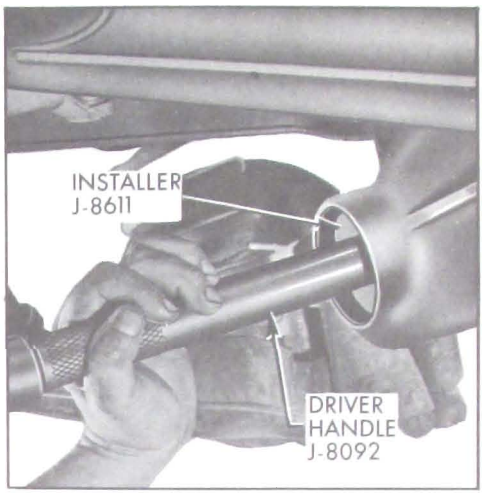


Fig. 6-17—Installing Rear Pinion Bearing Outer Race

and proper tooth contact under load is obtained. At this point, the setting of the pinion with reference to the centerline of the ring gear is indicated by the machine. This setting may vary slightly from the design or "nominal" setting due to allowable variation in machining the parts. However, most production pinions and all pinions used for service replacement are zero or nominal pinions.

If during repair, a pinion is found having a plus or minus reading recorded in thousandths on the rear face of the pinion, this indicates that the pinion during testing was found to have best tooth contact at a position varying from design or nominal depth.

In order to compensate for all of the allowable machining variables, a procedure of gauging the

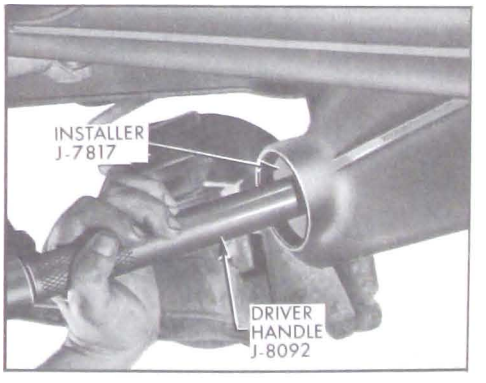


Fig. 6-18—Installing Front Pinion Bearing Outer Race

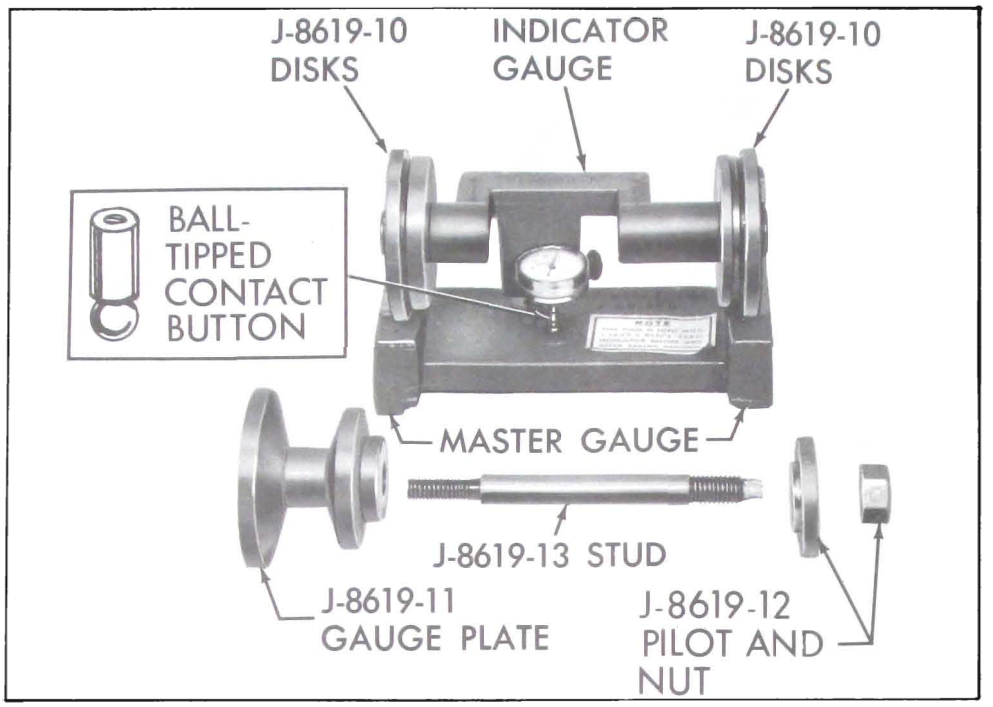


Fig. 6-19—Pinion Setting Gauge

carrier and shimming the pinion has been developed. After gauging a carrier, the assembler is able to install a shim between the front face of the pinion and its bearing so that pinion depth can be adjusted to an exact required specification for best tooth contact in each axle assembly.

Pinion depth is set with Pinion Setting Gauge J-8619 which consists of the following: (1) master gauge, (1) indicator gauge with dial indicator, (2) J-8619-10 Disks, (1) J-8619-11 Gauge Plate, J-8619-12 Pilot and Nut with J-8619-13 Stud. See Figure 6-19. Although production pinions are marked, neither production nor service pinions have a gauging tooth. The pinion setting gauge provides in affect a nominal or zero pinion as a gauging reference.

Set up pinion setting gauge as follows:

1. Make certain all of the gauge parts are clean, particularly the disks and center of the indicator gauge; also check the centering hole and disk pads on the master gauge.

2. Install the J-8619-10 Disks on the indicator gauge. Install the small ball-tipped contact button on the stem of the dial indicator and mount the dial indicator on the indicator gauge. See Figure 6-19. NOTE: When gauging for pinion depth, the ball-tipped contact button must be used on dial indicator in order to reach Gauge Plate J-8619-11 in carrier.

3. Place the indicator gauge on the master gauge, as shown in Figure 6-20 so that the spring loaded center is engaged in the centering hole, and the inner, large diameter portion of each disk contacts the master gauge pads.

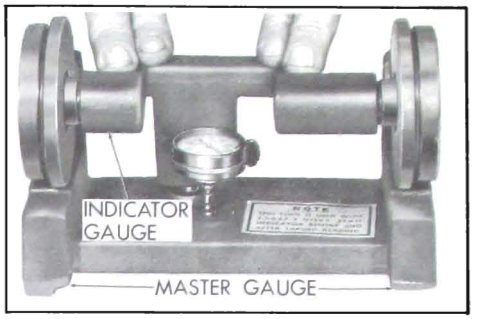


Fig. 6-20—Zeroing Pinion Setting Gauge

4. Center the indicator contact button on the indicator pad and lock the indicator by tightening the thumb screw.

5. Hold yoke down firmly, with both disks contacting the horizontal and vertical pads on master gauge, and set master gauge at zero.

6. Lubricate front and rear pinion bearings; then position them in their respective races in the carrier. While holding bearings in place, install Gauge Plate J-8619-11 in carrier on rear pinion bearing inner race as shown in Figure 6-21 and place Pilot

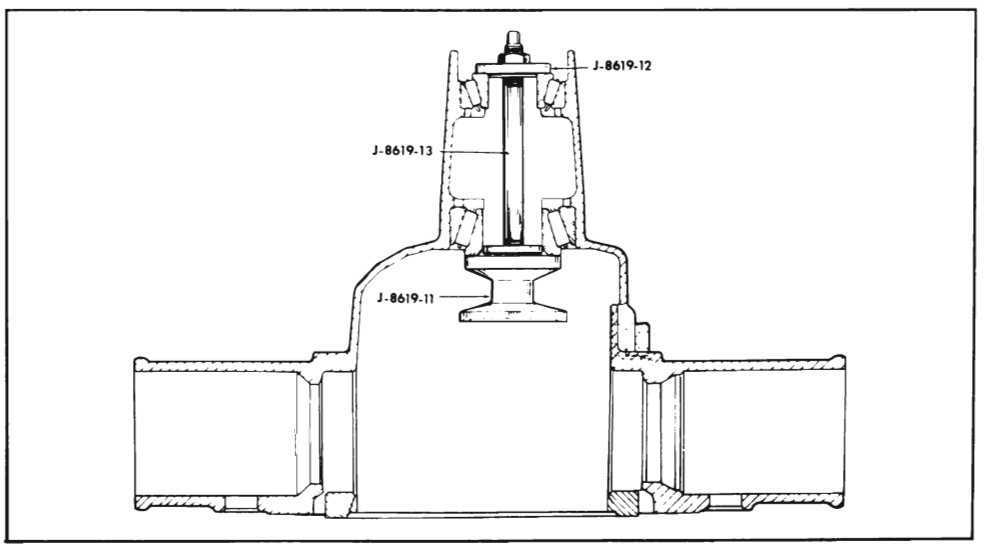


Fig. 6-21—Securing Gauge Plate in Carrier

J-8619-12 on surface of front pinion bearing. Insert Stud J-8619-13 through pilot, front and rear bearings, and thread it into gauge plate. See Figure 6-21.

7. Install nut on Stud J-8619-13. Hold stud stationary with wrench positioned over flats on ends of stud and tighten nut until a reading of 15-20 inch pounds is obtained when rotating gauge plate assembly with an inch pound torque wrench.

8. Make certain differential bearing support bores are free of burrs. Install indicator gauge in carrier so that small diameter outer portion of disks rest in differential bearing pedestal support bores. Spring-loaded center of gauge must be located in centering hole of gauge plate, and ball-tipped contact button of dial indicator must be positioned to bear against outer edge of gauge plate top surface. See Figure 6-22.

9. Press gauge yoke down firmly toward gauging plate; record the number of thousandths the dial moves from zero. Remove indicator gauge and recheck "zero setting" on master gauge to make sure this setting was not disturbed by handling.

10. If zero setting is still correct, remove gauging set up and both bearings from the carrier. Then subtract reading recorded

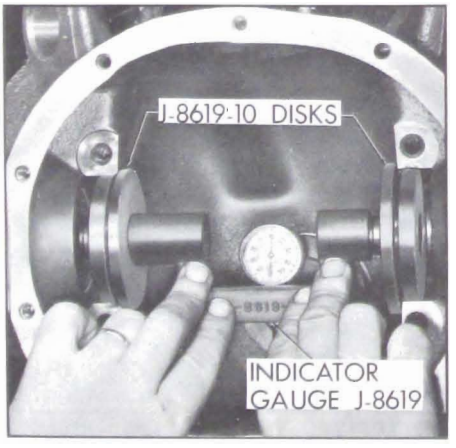


Fig. 6-22—Checking Pinion Depth

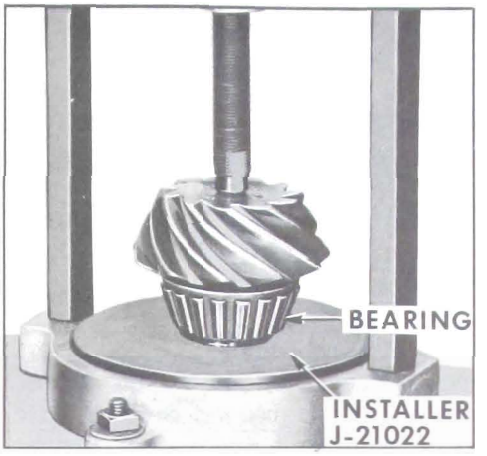


Fig. 6-23—Installing Rear Pinion Bearing

in previous step from 100. For example, a typical reading of 70 should be subtracted from 100; this answer (30) indicates the thickness of the shims to be selected as further qualified in Step 12 following.

NOTE: An average dial indicator reading will range from 65 to 75 thousandths with a corresponding shim thickness range of 35-25 thousandths.

11. Examine the ring gear for nicks, burrs, or scoring. Any of these conditions will require replacement of the gear set.

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

(a) If the production (marked) pinion is being reused and the pinion is marked "+" (plus), subtract the amount specified on the pinion from the shim thickness as determined in Step 9.

(b) If the production (marked) pinion is being reused and the pinion is marked "-" (minus) add the amount specified on the pinion to the shim thickness as determined in Step 9.

(c) If a service pinion is being used (no marking), shim pinion using shim thickness directly as determined in Step 9.

NOTE: Frequently production pinions are nominal or zero pinions (no marking). When reusing a nominal production pinion, shim as with service pinion using shim thickness directly as determined in Step 9.

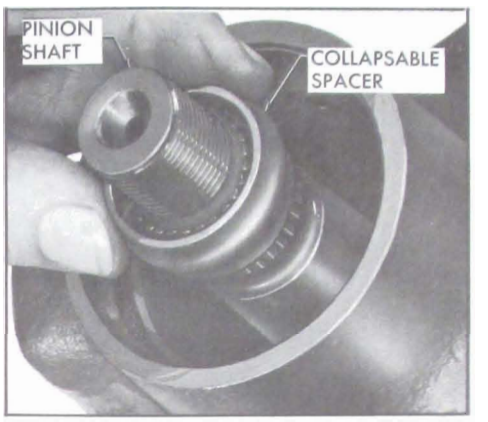


Fig. 6-24—Installing Collapsible Spacer

13. Position correct shim on pinion shaft and install rear pinion bearing. Use Installer J-21022 as shown in Figure 6-23.

c. Install Pinion Assembly and Adjust Pinion Preload

1. Position pinion assembly in carrier and install collapsible spacer as shown in Figure 6-24.

2. Place front pinion bearing in position on pinion. Hold pinion fully forward and drive bearing over pinion until seated. Use Installer J-21128. See Figure 6-25.

3. Install pinion oil seal in carrier. Coat O.D. of seal with sealing compound. Install seal by

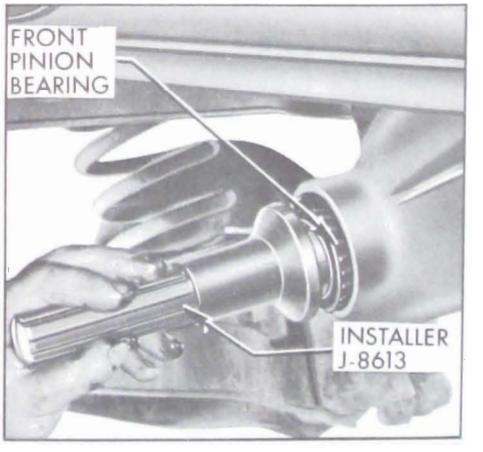


Fig. 6-25—Installing Front Pinion Bearing

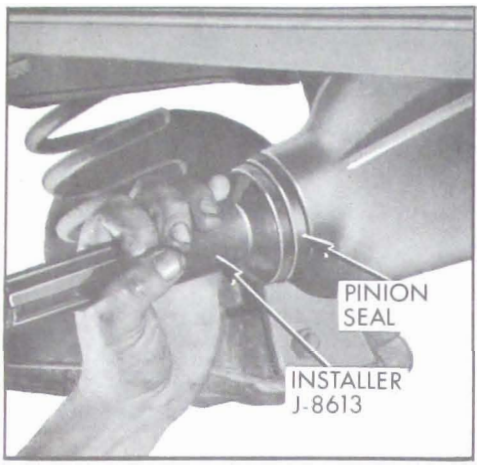


Fig. 6-26—Installing Pinion Oil Seal

using Installer J-21128. See Figure 6-26.

4. Coat lips of pinion oil seal; seal surface of pinion flange with gear lube. Install pinion 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-8614-01. While intermittently rotating pinion to seat bearings, tighten pinion nut until end play begins to be taken up. See Figure 6-27.
CAUTION: When no further end play is detectable, and when Holder J-8614 will no longer pivot freely as pinion is rotated, preload specifications are being neared. Further tightening should be done only after preload has been checked.

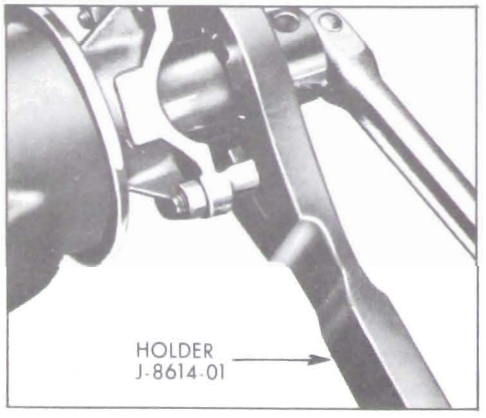


Fig. 6-27—Installing Pinion Nut

6. Check preload by using an inch pound torque wrench as shown in Figure 6-28.
CAUTION: After preload has been checked, final tightening should be done very cautiously. For example, if when checking, preload was found to be 5 inch pounds, additional tightening of the pinion nut as little as 1/8 turn can add 5 additional inch pounds drag. Therefore, the pinion nut should be further tightened only a little at a time and preload should be checked after each slight amount of tightening. Exceeding preload specifications will compress the collapsible spacer too far and require its replacement.

7. While observing the preceeding caution, carefully set preload drag at 20 to 30 inch pounds on new bearings or 15 to 20 inch pounds 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 specification.

d. Assemble Differential Case Assembly

Before assembling the differential, examine the wearing surfaces of all parts for scoring or unusual wear. Also make certain that all parts are absolutely clean. Lubricate parts with rear axle lubricant just before assembly.

1. Place side gear thrust washers over side gear hubs and install side gears in case. If same parts are reused, replace in original sides.

2. 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 axle holes are in line, then rotate gears to make sure holes in pinions will line up with holes in case.

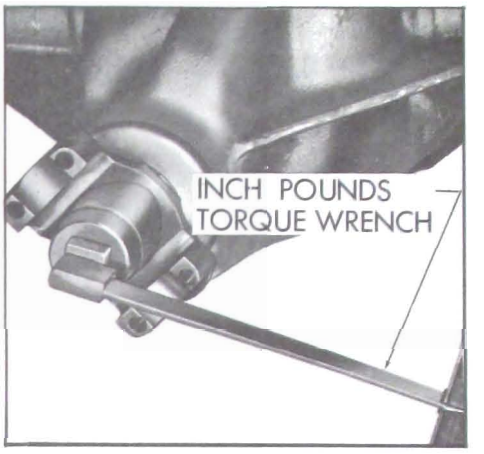


Fig. 6-28—Checking Pinion Bearing Preload

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

4. Install pinion axle. Install pinion axle retaining bolt. Torque to 20-28 ft. lbs.

5. After making certain that mating surfaces of case and ring gear are clean and free of burrs, thread two 3/8-24 x 2 studs into opposite sides of ring gear, then install ring gear on case. See Figure 6-29. Install ring gear attaching bolts just snug. Torque bolts alternately in progressive stages to 50-60 ft. lbs.

6. If differential side bearings were removed, install new bearings using Installer J-21132 with Driver Handle J-8092. See Figure 6-30.

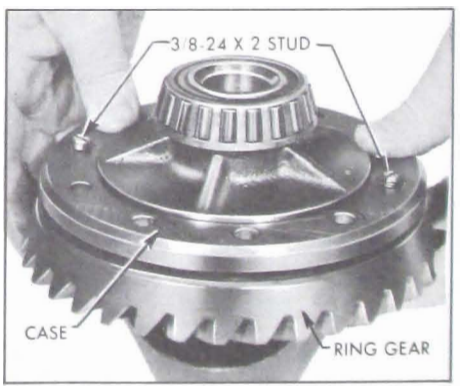


Fig. 6-29—Installing Ring Gear on Differential Case

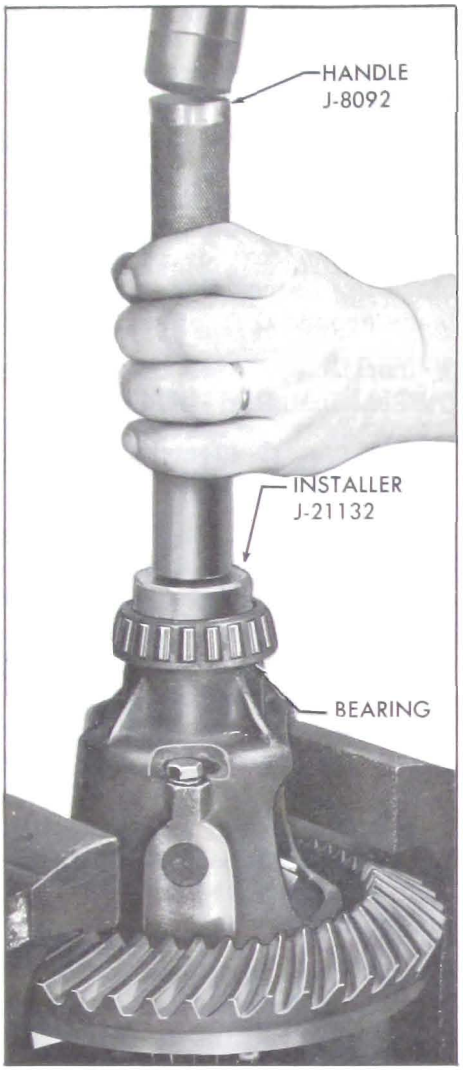


Fig. 6-30—Installing Differential Side Bearings

e. Install Differential Case and Adjust Side Bearing Preload

Differential side bearing preload is adjusted by changing the thickness of both the right and left shims by an equal amount. By changing the thickness of both shims equally, the original backlash will be maintained. Differential adjusting shims are available in thicknesses ranging from .040" to .082" by two thousandths.

1. Before installation of case assembly, make sure that side bearing surfaces in carrier are clean and free of burrs. Side bearings must be oiled with gear lube, and if same bearings are being reused, they must have original outer races in place.

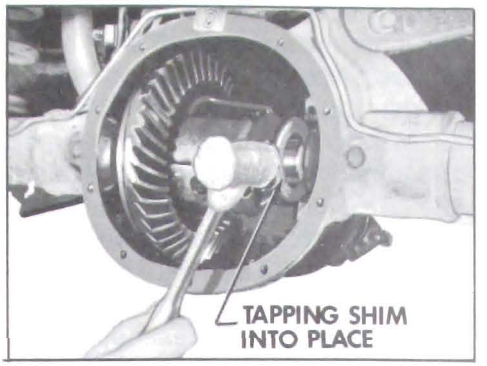


Fig. 6-31—Installing Differential Adjusting Shim

2. Place differential case and bearing assembly in position in carrier. If new side bearings were installed, use original adjusting shims; if same bearings are to be reused, select new right and left adjusting shims each .002" thicker than original shim. Slip left shim in position at left bearing, then drive right shim carefully into position using a soft hammer. See Figure 6-31.

3. As a safety precaution, install bearing caps using four 7/16-14 x 4-1/4 cylinder head bolts.

4. Rotate differential case several complete turns to seat bearings. Check bearing preload using an inch pound torque wrench connected at ring gear attaching bolt. With wrench projecting approximately straight out, bearing preload should read 30 to 40 in. lbs. with new bearings, or 15 to 25 in. lbs. with reused bearings. See Figure 6-32. If preload is not according to these specifications, increase shim thickness on each side .002" for each additional 10 in. lbs. preload desired, or decrease shim thickness .002" on each side for each 10 in. lbs. preload to be subtracted.

5. When preload is correctly adjusted, leave four safety head bolts and caps in position as a safety precaution while performing following backlash checking operation.

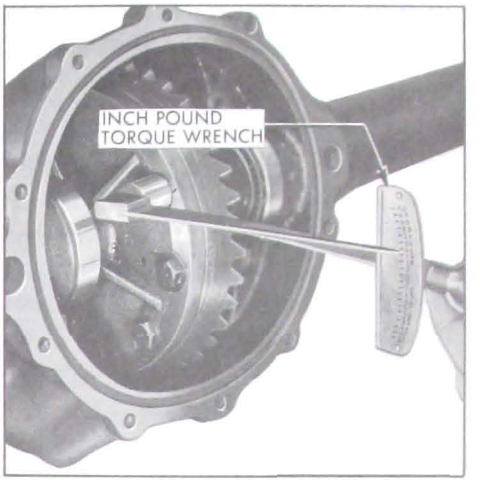


Fig. 6-32—Checking Differential Case Preload

f. Adjust Differential Backlash

1. Rotate differential case several times to seat bearings, then mount dial indicator as shown in Fig. 6-33. 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

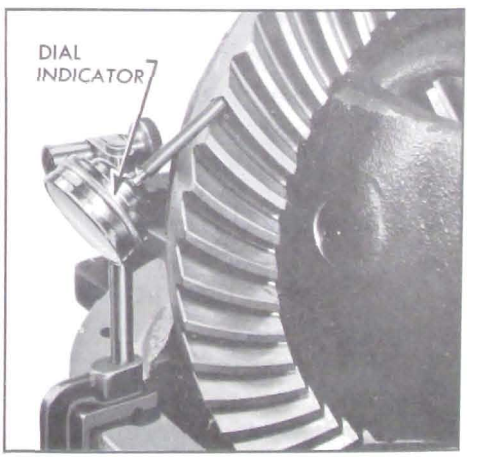


Fig. 6-33—Checking Ring Gear to Pinion Backlash

around ring gear. Lash must not vary over .001" around ring gear.

If variation is over .001" 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 .007" to .009" for all new gears. If adjustment is necessary, adjust to .008".

If original gear set having a wear pattern is being reinstalled, original gear lash should be maintained within ± .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 gear backlash is correctly adjusted, remove 4 safety head bolts and install bearing caps according to markings. Torque bearing cap bolts to 40-60 ft. lbs.

6. Install new gasket in housing using heavy grease to retain it in place. Install cover. Torque cover bolts to 25-35 ft. lbs. Wait 20 minutes and retorque cover bolts to specification.

g. Install Axle Shaft Assemblies

1. Apply a coat of wheel bearing grease in bearing recesses of housing. Install new outer retainer gaskets. Apply a thin coating of Permatex #2 or equivalent to outer diameter of seal if replaced. To help prevent damage to the lip of the wheel seal when installing axle shaft and to ensure lubricant on the seal lip during the first few miles of operation, the axle shaft should be lightly lubricated with axle lubricant from the sealing surface to approximately 6 inches inboard of the shaft. Insert axle shaft assemblies carefully until shaft splines engage in differential to avoid damage to seals.

2. Drive axle shaft assemblies into position.

3. Place gasket and retainer over studs and install nuts. Torque nuts to 60 ft. lbs.

4. Install brake drums over wheel bolts.

5. Install wheels and tighten wheel nuts.

h. Install Pinion Oil Seal with Differential Installed in Car

In case of pinion oil seal failure, remove old oil seal and install new one (with differential remaining in car) as follows:

1. Mark propeller shaft and companion flange to permit proper alignment at reinstallation. Disconnect propeller shaft from companion flange and support shaft out of way. If U-joint bearings are not held by a retainer strap, use a piece of wire or tape to retain bearings in their journals.

2. Remove wheels and brake drums. Install an inch pound torque wrench on pinion nut, and record torque required to rotate pinion freely.

3. Mark position of companion flange, pinion shaft threads, and pinion nut so that they can be reinstalled in the same position.

4. Remove companion flange nut and washer using Holder J-8614-01 to hold flange.

5. Pry oil seal out of carrier.

6. Examine surface of companion flange for nicks or damaged surface. If damaged, replace flange.

7. Examine carrier bore and remove any burrs that might cause leaks around O.D. of seal.

8. Install oil seal using Pinion Oil Seal Installer J-21128.

9. Apply seal lubricant to O.D. of companion flange.

10. While holding companion flange with Holder J-8614-01, install companion flange nut and tighten to same position as marked in Step 3 above. Tighten nut 1/8 turn beyond alignment marks on pinion shaft threads in order to preload collapsible spacer. Check preload using an inch pound torque wrench; torque reading should be equal to or five inch pounds above that recorded in Step 2 preceding.

11. Connect propeller shaft to companion flange using alignment marks. Torque the four (4) bolts to 15-18 ft. lbs.

6-7 DESCRIPTION OF POSITIVE TRACTION DIFFERENTIAL

a. General Description

Buick Positive Traction Differential is optional equipment on all Buicks. It is designed to perform all the desirable functions of a conventional differential and at the same time overcome its limitations. With a conventional differential, when one wheel is on a slippery surface, its pulling power is limited by the wheel with the lowest traction. Unlike the conventional differential, with the Positive Traction device, the anti-spinning action is limited by the wheel having the best traction, thus limiting the possibility of becoming stuck.

Buick Positive Traction Differential is not a fully locking type and will release before excessive driving force can be directed to one rear wheel. The safety value of this feature eliminates the possibility of dangerous steering reaction. When the rear wheels are under extremely unbalanced tractive conditions, such as having one wheel on ice and the other on dry pavement, 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.

Another advantage of the Positive Traction Differential is that on uneven surfaces such as railroad tracks, chuck holes, etc., wheel action is not adversely affected. During power application on a conventional differential, when one wheel hits a bump and bounces clear of the road, it spins momentarily. When this rapidly spinning wheel again contacts the road, the sudden shock may cause the car to swerve. This action is also hard on tires and the entire drive train. With a Positive Traction Differential the free wheel rotates at the same speed as the wheel on the road, thereby minimizing adverse effects.

b. Operation

The design of the Positive Traction Differential is basic and simple. The unit is completely interchangeable with a conventional differential. However, this unit has in addition coarse, spiral-threaded cone brakes installed behind the side gears. These brakes are statically spring preloaded to provide an internal resistance to the differential action within the case itself. This preload assures an adequate amount of pull when extremely low tractive conditions such as wet ice, mud, or snow are encountered at one rear wheel. It also provides smooth transfer of torque when traveling over alternating to tractive conditions at both rear wheels.

During application of torque to the axle, the initial spring loading of the cone brakes is supplemented by the inherent gear separating forces between the side and spider gears which progressively increases the resistance in the differential. This unit is therefore an automatic throttle-sensitive device that provides greater resistance under greater torque loads. It should be remembered however, that this is not a positive lock differential,

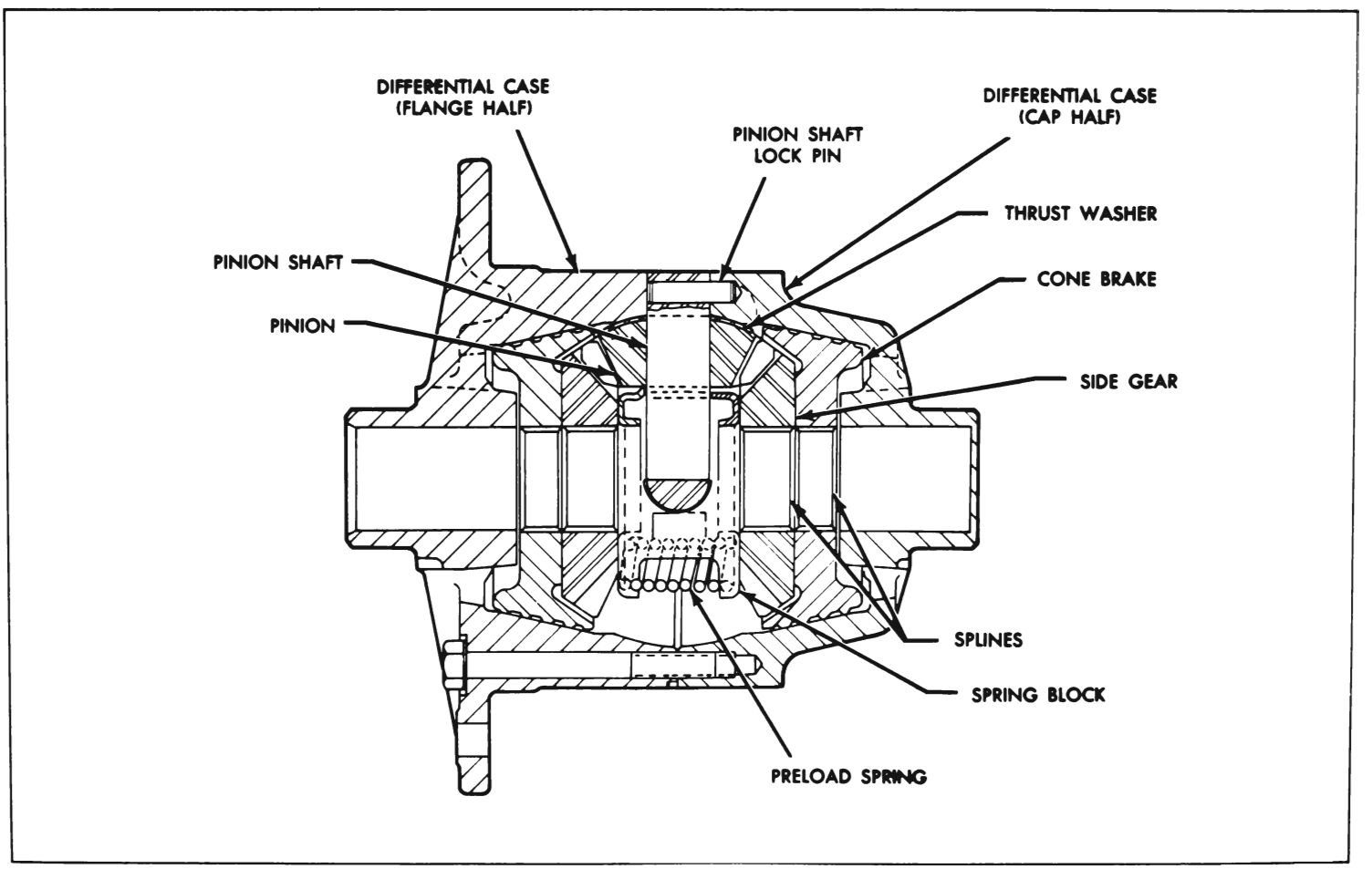


Fig. 6-35—Positive Traction Differential

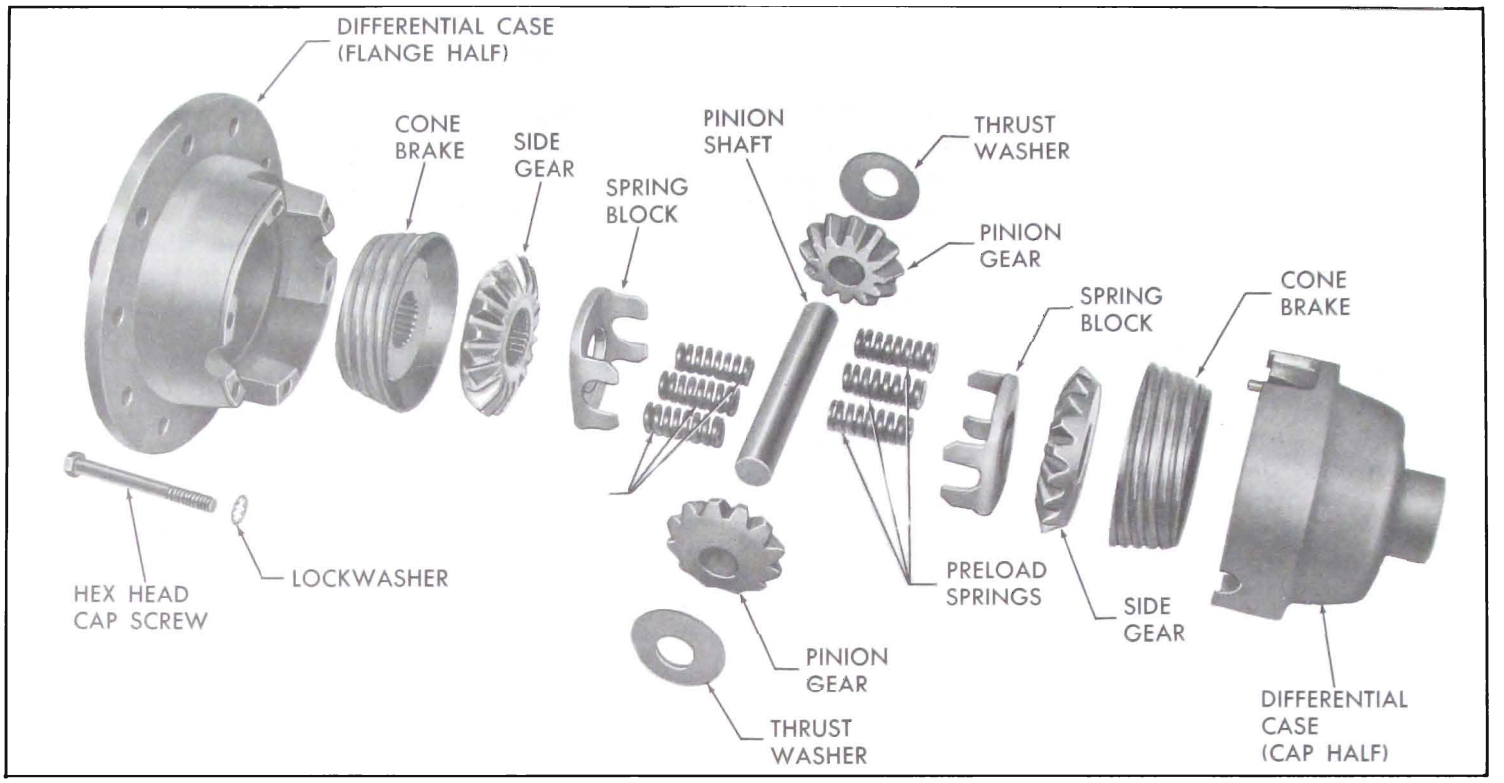


Fig. 6-36—Positive Traction Differential—Exploded View

and it will release before excessive driving force can be applied to one wheel.

CAUTION: When working on a car with Positive Traction Differential, never raise one rear wheel and run the engine with the transmission in gear. The driving force to the wheel on the floor could cause the car to move.

6-8 LUBRICATION OF POSITIVE TRACTION DIFFERENTIAL

The lubricant level should be checked every 6000 miles. Maintain level between the bottom of the filler plug opening and 1/4 inch below the opening by adding Special Positive Traction Lubricant or equivalent available through the GM Parts Department under Part No. 5786991. Never use any lubricant other than this special lubricant, even for adding.

Positive Traction Differentials can be easily identified either by a stainless steel plate attached by a rear cover bolt or by an X in a circle stamped on the bottom edge of the carrier housing flange. See Figure 6-37. However, if the wrong lubricant is accidentally added, it will be necessary to completely remove all lubricant, flush with light engine oil, and then fill with the special lubricant. Capacity of the rear axle housing is 2 pints.

6-9 POSITIVE TRACTION DIFFERENTIAL SERVICE PROCEDURES

All rear axle service procedures are the same in the Positive Traction rear axle as in a conventional rear axle, except for servicing the internal parts of the differential assembly. All rear axle parts outside of the differential, such as the ring gear, differential side bearings, and axle shafts, are the same in either rear axle assembly.

a. Disassembly of Differential

1. If ring gear or differential case is to be replaced, remove ring gear from case. Otherwise ring gear need not be removed.

2. If a differential bearing is to be replaced, pull bearing outer race from case, using Remover J-2241-A as described in paragraph 6-5 (f).

3. Clamp case assembly in a brass jawed vise by ring gear or by case flange.

4. Mark flange half of case and cover half with a center punch or

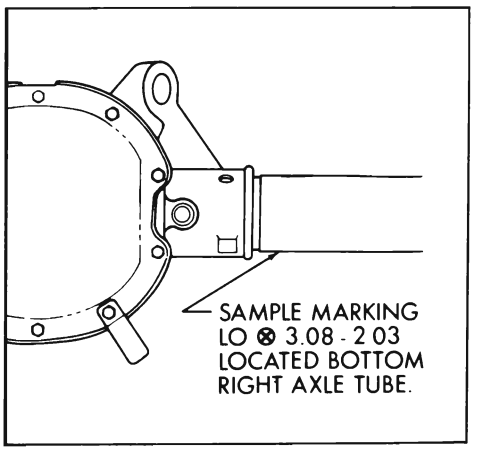


Fig. 6-37—Identification of Positive Traction Differential

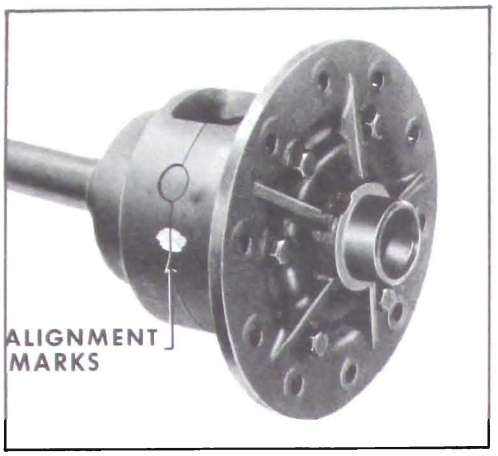


Fig. 6-38—Alignment Marks

paint to provide alignment for reassembly. See Figure 6-38.

5. Loosen six bolts holding cover half of case to cap half. Remove assembly from vise, place on bench with bolt heads up, and remove bolts.

6. Lift cap half of case from flange half. Remove cap half, cone brake, preload springs, spring block, and side gear shims if provided, from assembly so that they can be reinstalled in their original positions.

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

b. 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.

c. Assembly of Differential

CAUTION: When assembling the unit, use axle shafts as mounting tools to assure proper gear and cone spline alignment. Do not ignore this procedure as it will be impossible to install shafts at final assembly and 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. See Figure 6-39.

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.

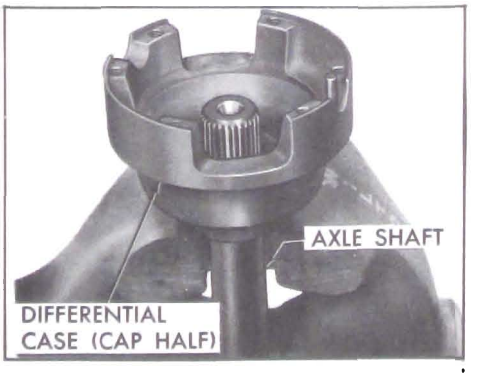


Fig. 6-39—Axle Shaft & Cap Half of Differential Positioned in a Vise

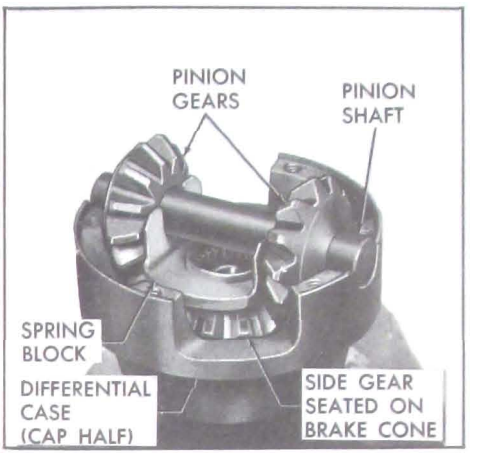


Fig. 6-40—Installing Parts into Cap Half of Differential Case

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 the carrier assembly. See Figure 6-40.

5. Insert springs into spring thrust block that is already installed into case, and then place second thrust block over springs. See Figure 6-41.

6. Install second side gear face down on spring thrust block so

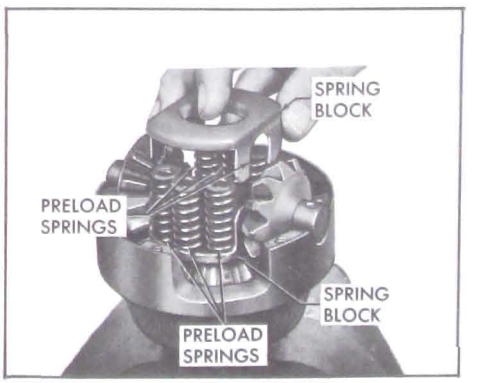


Fig. 6-41—Installing Preload Springs and Second Thrust Block Into Differential Case

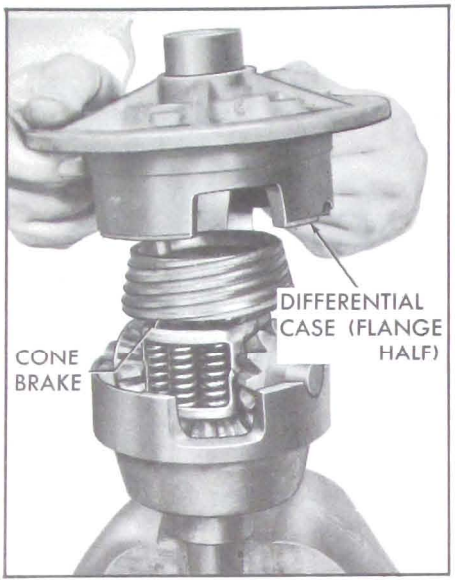


Fig. 6-42—Installing Flange Half of Differential Case

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. See Figure 6-42.

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 15-18 ft. lbs. See Figure 6-43.

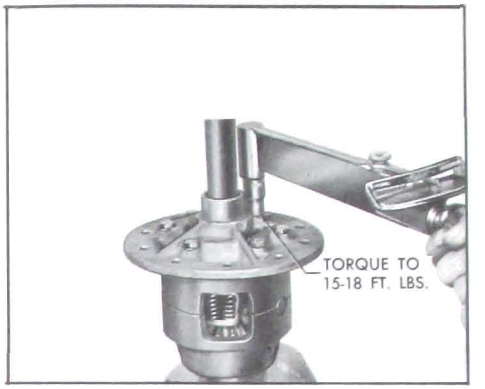


Fig. 6-43—Torquing Differential Bolts