SECTION D

DIFFERENTIAL
ALL SERIES

CONTENTS

DIVISION I

TROUBLE DIAGNOSIS

40-44 PRE-REPAIR INVESTIGATION AND TROUBLE DIAGNOSIS

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 frequent cause of axle noise are improper backlash, pinion bearing preload, or side bearing preload, or a combination, a few simple adjustments may be all that are 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: 1) Backlash; 2) Total Assembly Preload; and 3) Tooth Contact Pattern 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.

The pinion and ring gear must be completely assembled, installed, and all preload and backlash adjustments completed prior to the start of this method of pinion depth setting. The following procedure can be used in place of the gage method of pinion depth setting.

a. Gear Tooth Nomenclature

The side of the ring gear tooth which curves outward, or

TROUBLE DIAGNOSIS

Problem	Cause
1. Noise is the same in drive or coast	1. a) Road noise b) Tire noise c) Front wheel bearing noise d) Front or rear U-joint angle too great
2. Noise changes on a different type of road	2. a) Road noise b) Tire noise
3. Noise lowers tone as car speed is lowered	3. Tire noise
4. Similar noise is produced with car standing and driving	4. a) Engine noise b) Transmission noise c) Driveline angle
5. Vibration	5. a) Rough rear wheel bearing b) Unbalanced or damaged propeller shaft c) Tire unbalance d) Worn universal joint in propeller shaft e) Front or rear U-joint angle too great f) Mis-indexed propeller shaft at companion flange g) companion flange runout too great (See paragraph 41-10)
6. A knock or click approximately every two revolutions of rear wheel	6. A brinelled rear wheel bearing
7. Noise most pronounced on turns	7. Differential side gear and pinion
8. A continuous low pitch whirring or scraping noise starting at relatively low speed	8. Pinion bearing
9. Drive noise, coast noise or float noise	9. Ring and pinion gear
10. Clunk on acceleration or deceleration	10. a) Worn differential cross shaft in case b) Engine dash pot out of adjustment
11. Grunt on stops	11. No grease in propeller shaft slip yoke
12. Groan in Forward or Reverse	12. Wrong lube in differential
13. Chatter on turns	13. a) Wrong lube in differential b) Clutch plates worn
14. Clunk or knock on rough road operation	14. Excessive end play of axle shafts to differential cross shaft.

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 tooth is smaller than heel end. It is very important that tooth contact be tested before the differential carrier assembly is disassembled. 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.

b. Tooth Contact Pattern Test

1. Wipe oil out of carrier and carefully clean each tooth of ring gear.

2. Use gear marking compound 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.

3. Tighten bearing cap bolts to 55 lb. ft.

4. Expand brake shoes until a torque of 40-50 lb. ft. is required to turn the pinion.

A test made without loading the gears will not give a satisfactory pattern. Turn companion flange with wrench 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.

5. Observe pattern on ring gear teeth and compare with Figures 40-100 and 40-101.

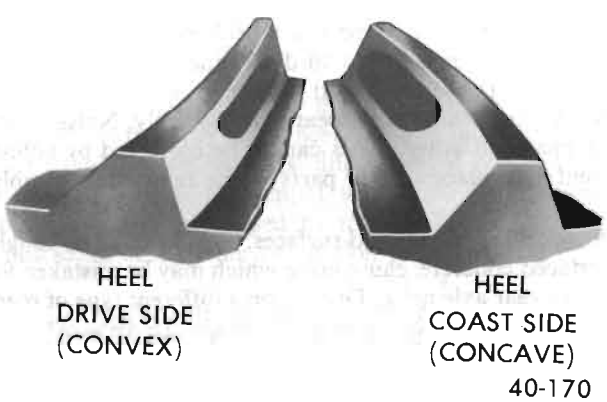


Figure 40-100 Gear Teeth Nomenclature

c. Effects of Increasing Load on Tooth Contact Pattern

When "load" on ring and pinion gear is increased, such as when car is accelerated forward from standstill or from

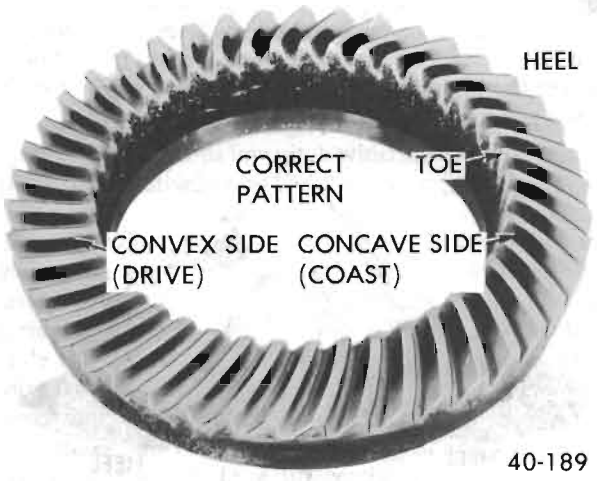


Figure 40-101 Desired Tooth Contact Under Light Load

normal drive, the tooth contact will tend to spread out and, under very heavy load, will extend from near toe to near heel on the drive side. 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 this tooth contact pattern test approximate a light load and, for this reason, they will extend only about halfway.

The important thing to note is that the contact pattern is centrally located up and down on the face of the ring gear teeth.

d. Adjustments Affecting 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) tooth contact pattern 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 moves 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 thickness between the pinion head and inner race of rear bearing. The shim is used in the differential to compensate for manufacturing tolerances. Increasing shim thickness will move the pinion closer to centerline of the ring gear. Decreasing shim thickness will move pinion farther away from centerline of the ring gear.

e. 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 the drive side and high toe contact on coast side, provided backlash is within specifications of .007", .008", .009". See

Figure 40-102. Moving the pinion closer to centerline of the ring gear by increasing shim 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. See Figure 40- 103.

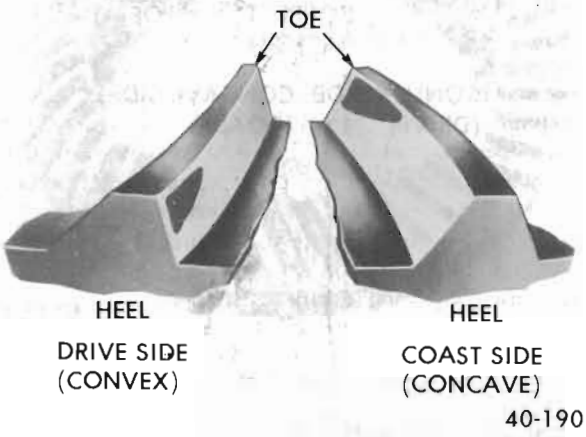


Figure 40-102 Tooth Pattern - Pinion Too Far Away From Ring Gear (Insufficient Shim Thickness)

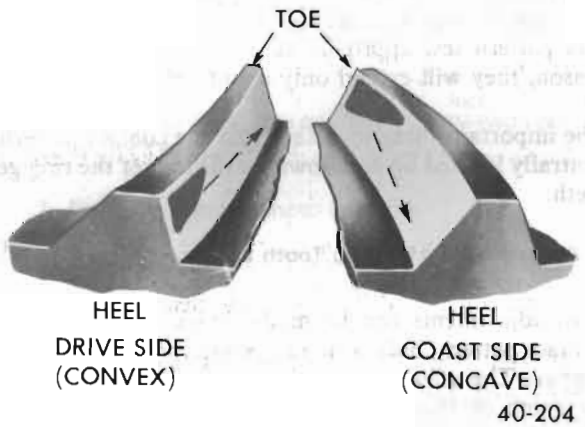


Figure 40-103 Effect on Pattern As Shim Thickness is Increased

When the pinion is too close to the centerline of the ring gear, the pattern will be a low toe contact on drive side, and a low heel contact on coast, provided backlash is within specifications. See Figure 40-104. Moving the pinion farther away from the ring gear by decreasing shim thickness will cause low toe contact on drive side to raise and move toward the heel; the low heel contact on coast side will raise and move toward the toe. See Figure 40-105.

NOTE: *Whenever the rear axle is overhauled to the point of requiring a new ring gear and pinion set, the rear axle should be filled ONLY with the lubricant included with the gear set. Whenever the rear axle is overhauled to the point of requiring only pinion and/or side bearings, it is recommended that lubricant 5.535 - 1051022, or equivalent, be used to refill for positive traction units and for regular units.*

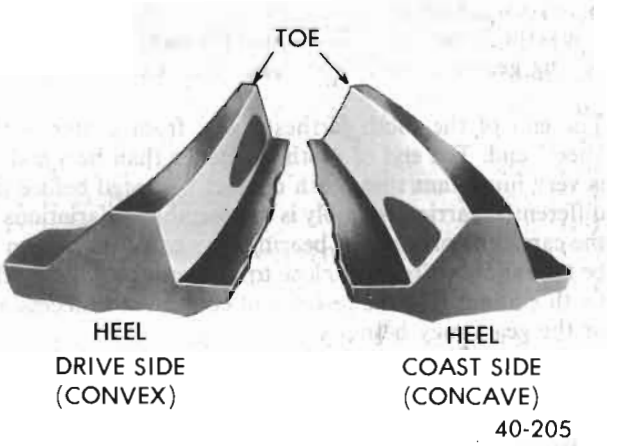


Figure 40-104 Tooth Pattern - Pinion Too Close to Ring Gear (Excessive Shim Thickness)

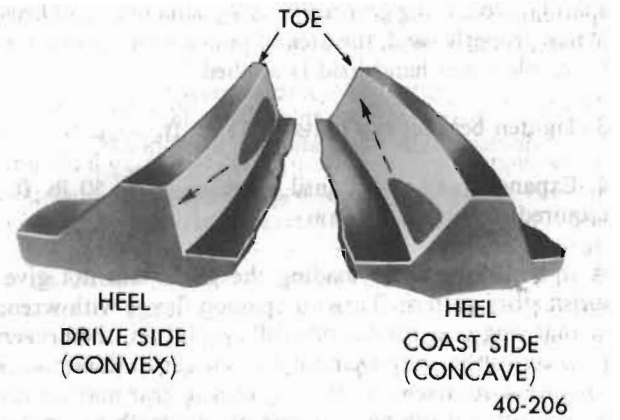


Figure 40-105 Effect on Tooth Pattern As Shim Thickness is Decreased

f. 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.

Road Noise Some road surfaces, such as brick or rough-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.

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 on non-skid divisions worn in saw- tooth fashion, are usually noisy and may produce vibrations which seem to originate elsewhere in the vehicle. This is particularly true with low tire pressure.

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.

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, and also by shaking wheels to determine if bearings are excessively loose.

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.

g. Rear Axle Noises

If a careful test of car shows that noise is not caused by external items, as described in subparagraph f, it is then reasonable 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.

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.

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.

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

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. Drive noise is noise produced during vehicle acceleration; coast noise is noise produced while allowing car to coast with throttle closed; and float noise is noise occuring while just maintaining constant car speed at light throttle on a level road. 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.

h. 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 or companion flange 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.

i. Check for Propeller Shaft Vibration

See paragraph 40-25.

j. 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 axle housing at the brake backing plate is caused by a leaking axle shaft seal.

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 OD of the seal. Therefore, it is a good idea to make sure the leak is stopped by using a non-hardening sealing compound around the OD of the new pinion seal.

3. Oil leaking at the junction of the axle tubes to the carrier, or at the puddle weld holes, are difficult to repair. Under no circumstances should any welding be done in attempts to stop leaks in these areas. If the leak is severe, the complete rear axle housing shouldd be replaced.

k. Testing Positive Traction Differential

If there is a doubt that a Buick is equipped with a Positive Traction Differential, or to determine if this option is performing satisfactorily, a simple test can be performed.

1. Place transmission in neutral.

2. Raise one wheel off floor and place a block of wood in front and rear of opposite wheel.

3. Remove wheei cover and install torque wrench with extension on lug nut.

4. Disregard breakaway torque and observe only torque required to continuously turn wheel smoothly. If differential assembly is equipped with Positive Traction Differential, the rotating torque will be at least 35 lb. ft.

l. Positive Traction Flushing Procedure

The following procedure is established for flushing the Positive Traction Differential in the event the wrong lubricant is accidentally added.

1. Drain original lubricant from differential housing.

2. Fill axle with a light, non-detergent engine oil.

3. Raise both rear wheels off floor.

4. With car properly supported, run car in "Drive" range for three to four minutes. Do not exceed 30 mph on speedometer or accelerate or decelerate rapidly.

5. Remove oil from axle.

6. Repeat Steps 2, 3, 4, and 5. It is important that the axle be flushed two times to ensure complete removal of the original lubricant.

7. Fill differential housing with positive traction lubricant, GM Part No. 1051022, or equivalent.

DIVISION II

DESCRIPTION AND OPERATION

40-45 DESCRIPTION AND OPERATION OF STANDARD AND POSITIVE TRACTION DIFFERENTIAL

a. Standard Differential Description

The differential is a device that divides the torque equally to both 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. It is so designed that it will exert equal force to the wheels. The amount of force available depends upon the traction under the tires.

The differential assembly is of the semi-floating type in which the car weight is carried on the axle housing. The differential assembly is designed for use with an open drive line and coil or leaf springs. The differential has a hypoid type ring gear and pinion with the centerline of the pinion gear below the centerline of the ring gear.

All parts necessary to transmit power from the propeller shaft to the rear wheels are enclosed in a salisbury type axle housing (a carrier casting with tubes pressed and welded into the carrier to form a complete carrier and tube assembly). A removable steel cover bolted to the rear of the carrier permits service of the differential without removing the entire assembly from the car.

A universal joint connects the rear end of the propeller shaft to a companion flange, having a splined end which fits over and drives the hypoid pinion gear. Two preloaded tapered roller bearings support the hypoid 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, which bears against the inner race of the front bearing and a shoulder on the pinion stem. This spacer is used to enable accurate bearing preload adjustment and maintain a preload on both front and rear pinion bearings. Adjustment of the fore and aft position of the pinion is obtained by placing shims between the head of the drive pinion and the rear pinion bearing. Torque from the pinion gear is transmitted to a ring gear attached to a differential case.

The differential case is of one-piece construction and is supported in the carrier by two tapered roller side bearings. These are preloaded by inserting shims between the bearings and the carrier. The differential case assembly is positioned for proper ring gear to pinion backlash by varying the shim thickness from side to side. The ring gear is bolted to the case. Two side gears have splined bores for driving the axle shafts. They are positioned to turn in counterbored cavities in the case. The two differential pinions 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. The pinions and side gears are backed by steel thrust washers.

b. Positive Traction Differential Description

The positive traction differential differs from the standard differential in that a different type of case assembly is used.

The positive traction case assembly provides increased resistance to differential action and multiplies the tractive force available at the wheel with the least traction. This multiplied force is then available to the wheel with the better traction.

Three types of positive traction differential case assemblies are used: 1) Cone clutch type; 2) Plate clutch type (waffle pattern plates and rounded ear lugs); and 3) Plate clutch type (swirl pattern plates and square ear lugs). The cone clutch type is only serviced as a complete case assembly. The plate clutch type case assemblies are serviced individually; the internal parts are not interchangeable between types of differentials.

Rear axle assemblies having positive traction differentials may be identified by a rectangular stainless steel tag on the five o'clock inspection cover bolt, or by a red plastic triangular tag on the filler plug. In addition, identification may be made by reading the code letters from the forward side of the right axle tube, three inches outboard of the carrier.

Axle Shaft and Wheel Bearings - Two types of axle shafts and wheel bearings are used. Both types of bearings are roller bearings. One type rolls directly on the axle shaft. With this type, the shaft is retained in the housing by 'C'-Locks in the differential side gears. This type may be identified by reading the code letters from the forward side of the right rear axle tube three inches outboard of the carrier. The third letter "C" or "K" identifies this type. For example, the code letters "NAC" would indicate a 3.08 ratio, standard differential, and direct-on type roller bearing, 'C'-Lock retained axle shaft. The second type wheel bearing has its own inner race and is retained on the axle shaft by a retainer ring. This type may be identified by reading the code letters on the right rear axle tube. The third letter "B" or "O" identifies this type. For example, the code letters "NAO" would indicate a 3.08 ratio, standard differential, unit roller wheel bearing retained in the axle housing by an outer retainer plate bolted to the housing end flange and retained on the shaft by a pressed on ring. See Figures 40- 143 and 40-144.

Axle Shaft Wheel Bearing Seals - Two types of wheel bearing seals are used, depending upon the type of wheel bearing. One type is used with the "Direct On" wheel

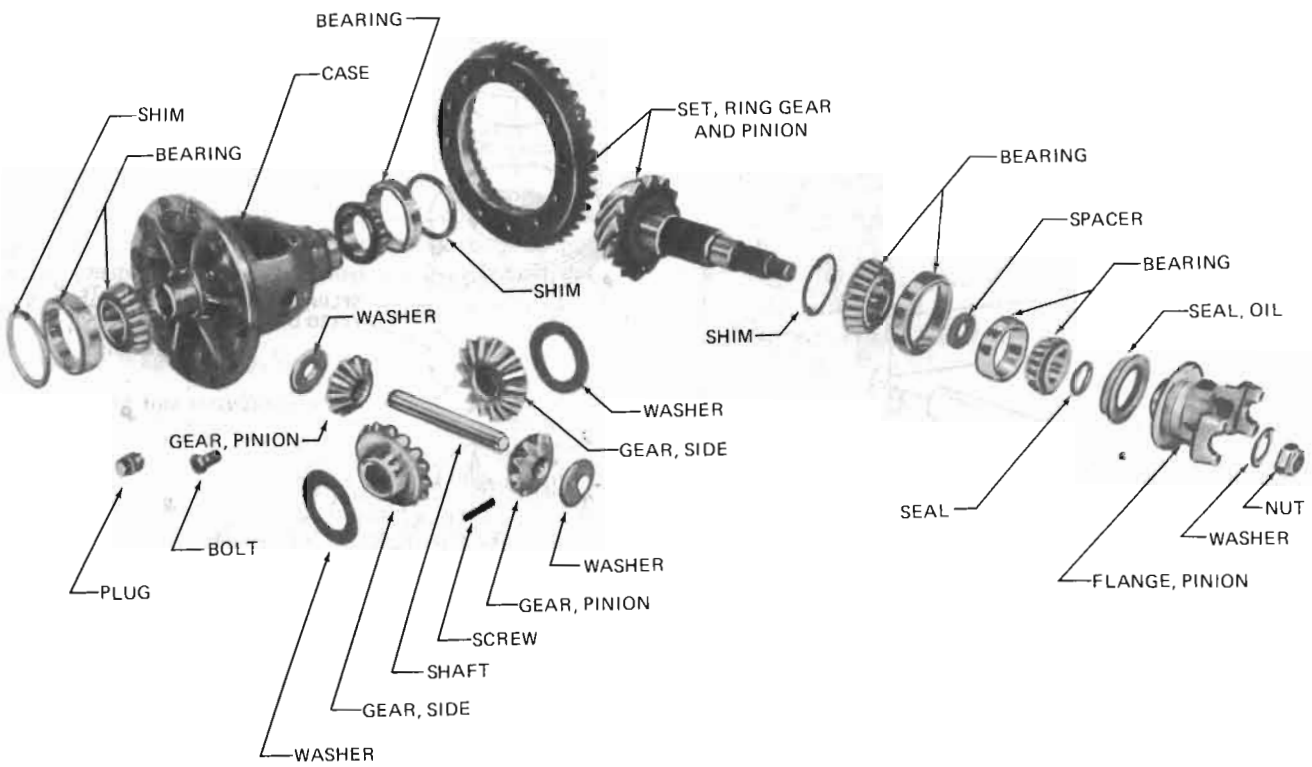


Figure 40-106 Exploded View - Typical Standard Differential

bearing. This seal is pressed into the axle housing end outboard of the wheel bearing. The second type is used with the "Unit Bearing" and is assembled onto the axle shaft before the bearing is pressed on.

c. Operation - Standard Differential

Power from the engine is transferred to the transmission via a clutch or a fluid coupling. 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 drive pinion through the companion flange, the transmission output shaft, propeller shaft, and differential drive pinion all turn at the same speed.

Power from the drive pinion gear is transmitted to the ring gear which is bolted to the differential case. When driving in a straight line and there is equal resistance on each rear wheel, the force through the drive 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 wheel. The inner wheel, turning slower with respect to the outer wheel, slows its differential side gear (as the axle shaft is splined to the side gear) and the differential pinion gears will roll around the slowed differential side gear, driving the other differential side gear and wheel faster. See Figure 40-106.

d. Operation - Positive Traction Differential

Operation of the positive traction differential is the same as the standard differential, except that there is additional friction provided by the clutches (cone or plate type). Under ordinary driving and cornering conditions, the clutches slip, allowing the outside wheel to turn faster than the inner. Under poor traction conditions, such as ice, snow, or loose gravel under one driving wheel, the increased friction provided by the clutches increases the driving torque available to the wheel with the better traction. The clutches (cone or plate type) are spring loaded to provide the increased driving torque under extremely low tractive conditions. See Figure 40-107.

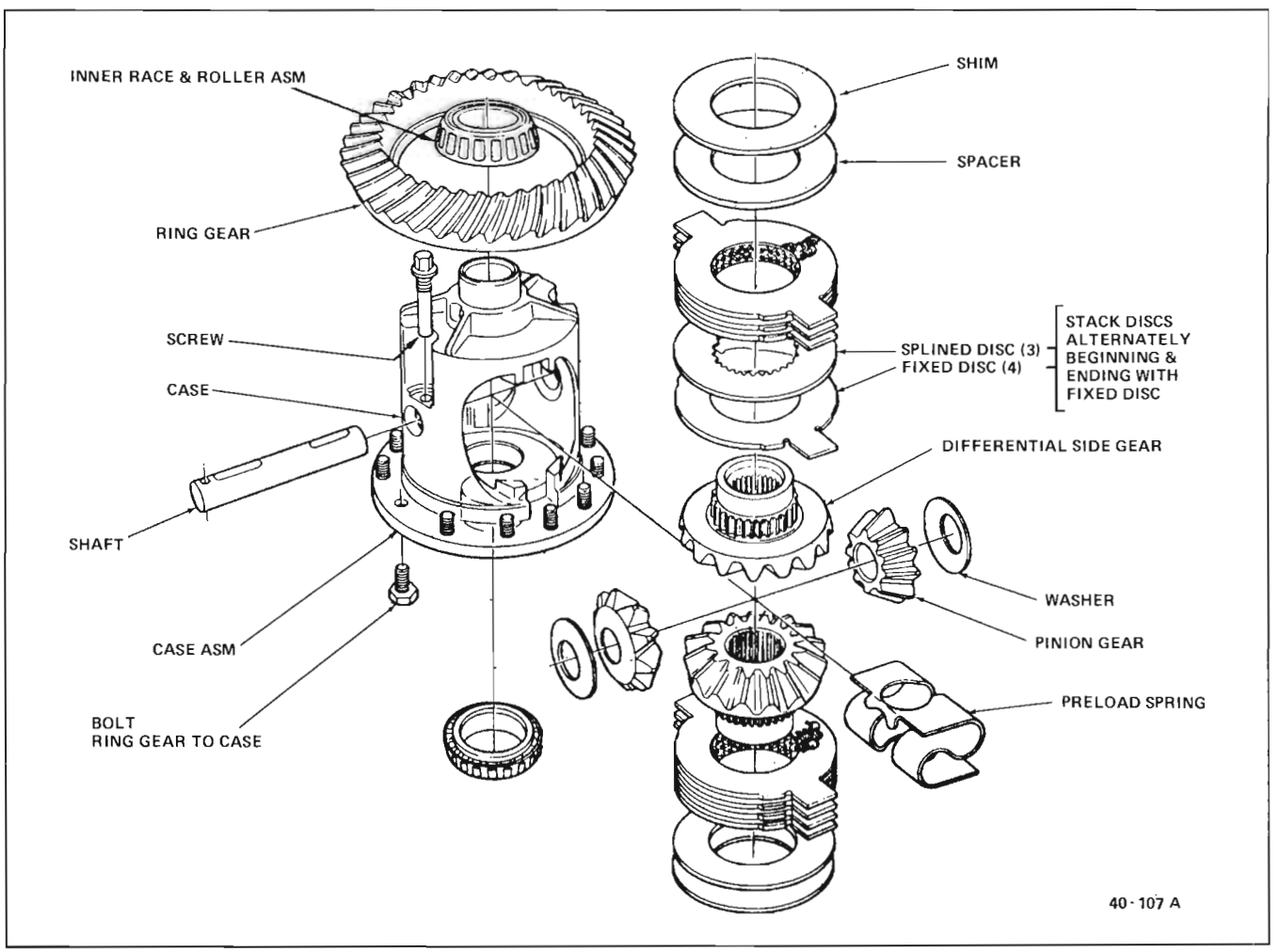


Figure 40-107 Exploded View - Typical Positive Traction Differential

DIVISION IV

REMOVAL AND INSTALLATION

40-46 REMOVAL AND INSTALLATION OF DIFFERENTIAL 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 jack stands solidly under frame members on both sides.

2. Mark rear universal joint and pinion flange for proper reassembly then disconnect rear universal joint from pinion flange by removing four bolts and two straps on the single joint connection, or by removing four bolts on the CV joint connection.

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. On all cars, except the Estate Wagons, disconnect shock absorbers at lower end and push shock absorbers up out of the way. Lower jack under housing until rear springs can be removed.

6. On Estate Wagons only, proceed as follows:

a. Raise car on hoist.

b. Disconnect shock at lower by removing nut.

c. Support car by placing jack stands at frame in front of leaf springs and at rear of leaf springs at bumper.

d. Disconnect right side of exhaust system by removing exhaust hanger screw to rear frame cross member.

e. Remove lower spring plate attaching nuts.

f. Remove front and rear attaching bolts and remove spring.

7. Roll assembly out from under car.

b. Installation of Rear Axle Assembly

NOTE: *Fasteners in subparagraph b are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part or lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.*

1. Connect lower control arms to housing.

NOTE: *Control arm bushing bolts and shock absorbers to be tightened with suspension in normal load position.*

2. Connect upper control arms to housing.

3. On all cars, except the Estate Wagon, place rear springs in position and jack axle housing upward until shock absorbers will reach. Connect shock absorbers.

4. On Estate Wagons, proceed as follows:

a. Connect leaf spring at front attachment.

b. Attach lower spring plate. Be sure spring cushions are in plate. Torque nuts to 40 lb. ft.

NOTE: *It may be necessary to lower axle to attach spring plate.*

c. Attach leaf spring at rear shackle. Torque nut to 115 lb. ft.

d. Torque nut at front attachment to 75 lb. ft.

e. Reconnect shock.

f. Reconnect exhaust system.

5. Connect upper and lower control arm bolts. Tighten to specified torque.

6. Connect and adjust parking brake cable.

7. Connect rear universal joint to pinion flange aligning marks previously made. Tighten bolts evenly to 15 lb. ft. on single joint and tighten to 85 lb. ft. on CV joint.

8. Connect rear brake hose at floor pan. Bleed both rear brakes and refill master cylinder.

9. Fill rear axle with specified gear lubricant.

40-47 REMOVAL AND INSTALLATION OF AXLE SHAFT, WHEEL BEARING OR OIL SEAL

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.

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 maximum axle shaft end play of .018". 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 .018" 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 backing plate against the axle tube flange. 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.

3. For the C-K type axles, proceed as follows:

a. Remove differential carrier cover and allow lubricant to drain.

b. Remove pinion shaft lock bolt and pinion shaft. See Figure 40-110.

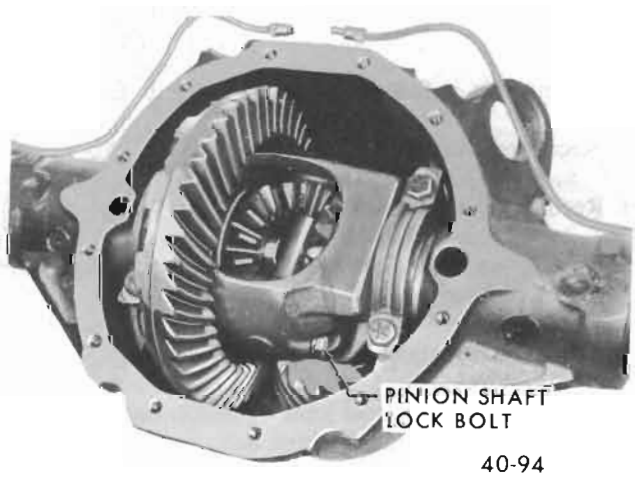


Figure 40-110 Pinion Shaft Lock Bolt

c. Push axle shafts inward to permit removal of "C" locks, then remove axle shafts. See Figure 40-111.

4. For the B-O type axles, proceed as follows:

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

b. Pull out axle shaft assemblies, using Puller J-21579 with a slide hammer. See Figure 40-112.

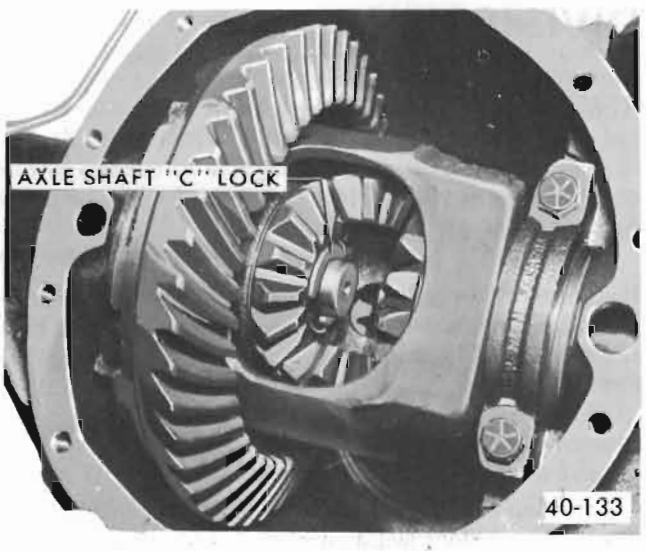


Figure 40-111 Axle Shaft "C" Locks

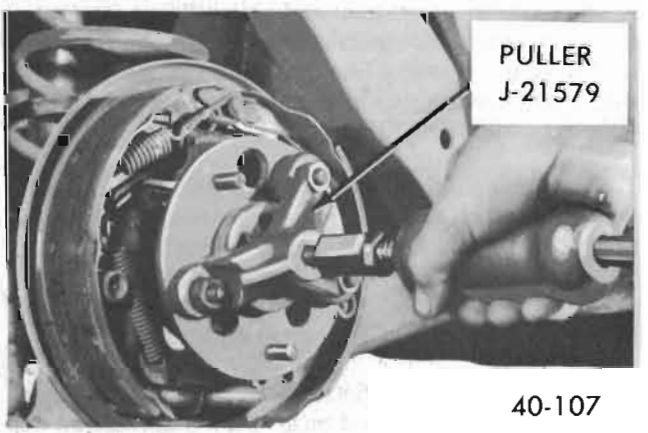


Figure 40-112 Removing Rear Axle Shaft

b. Remove and Install Axle Shaft Bearing and/or Seal (B-O Type Axles)

The rear wheel bearing and bearing retainer ring both have a heavy press fit on the axle shaft. Because of this fit they should be removed or installed separately. Both the retainer ring and the bearing must be removed to replace the seal.

1. Position and tighten axle shaft in vise so that the retainer ring rests on vise jaws. Use a heavy chisel and hammer to crack ring. See Figure 40-113.

NOTE: *Do not use torch.*

2. Press axle shaft bearing off using Plate J- 23133. See Figure 40-114.

3. Remove axle shaft seal if necessary and install new seal. Insure against damaging the seal lip.

NOTE: *Retainer plate which retains axle shaft in housing must be installed on axle shaft before seal and bearing are installed.*

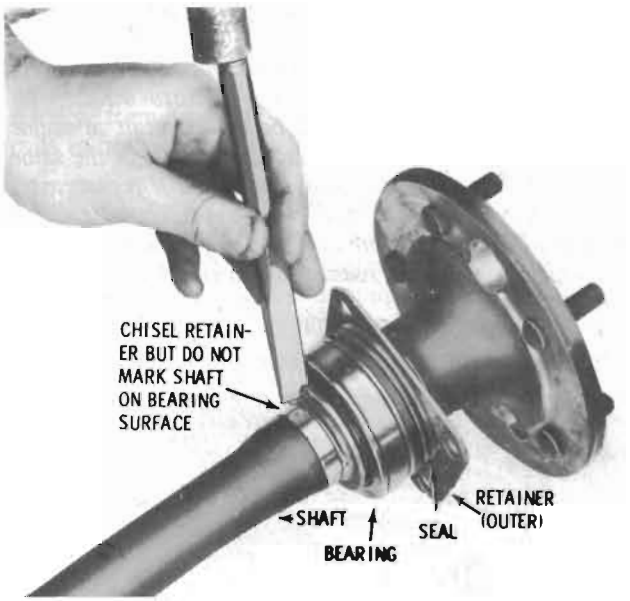


Figure 40-113 - Removing Axle Shaft Bearing Retainer

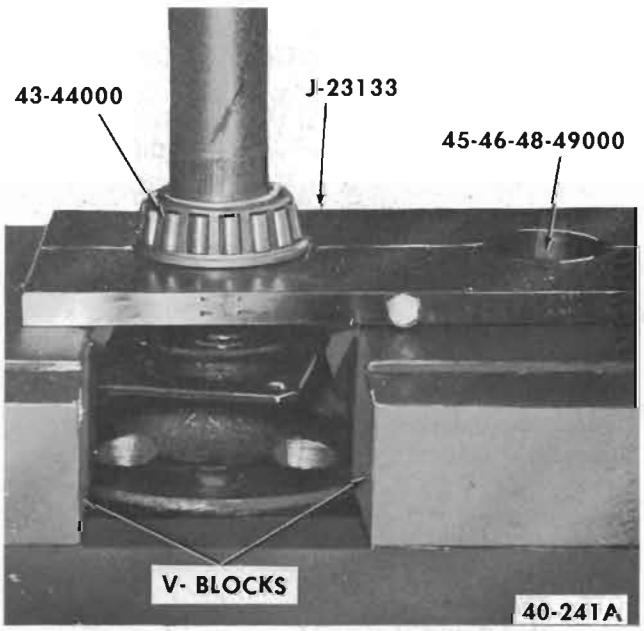


Figure 40-114 Removing Axle Shaft Bearing

4. Press new bearing against shoulder on axle shaft, using Installer J-21022 for 43-44000 and Installer J-8609 for 45-46-48-49000.

5. Press new service retainer ring against bearing, using Installer J-21022 for 43-44000 and Installer J-8609 for 45-46-48-49000. See Figure 40-115.

c. Remove and Install Axle Shaft Bearing and/or Seal C-K Type Axles

1. Position axle shaft bearing and seal, remove J-23689, and remove the bearing and seal. See Figures 40-116 and 40-117.

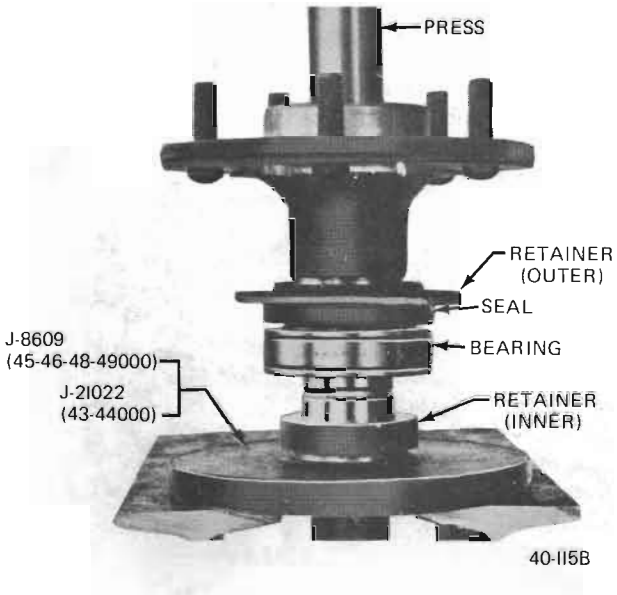


Figure 40-115 Pressing New Retainer Ring Against Bearing

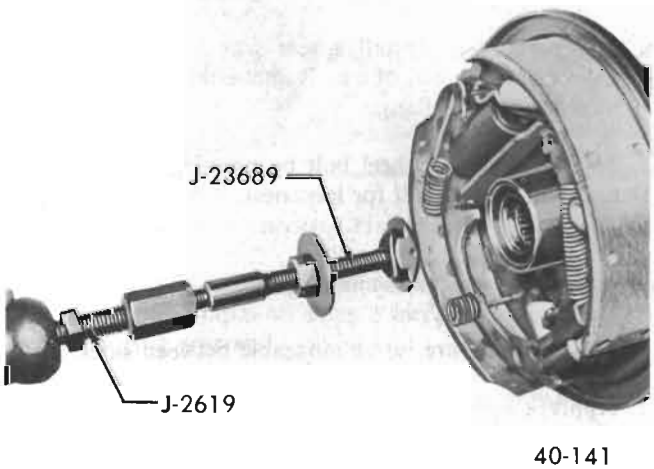


Figure 40-116 Axle Shaft Bearing and Seal Remover

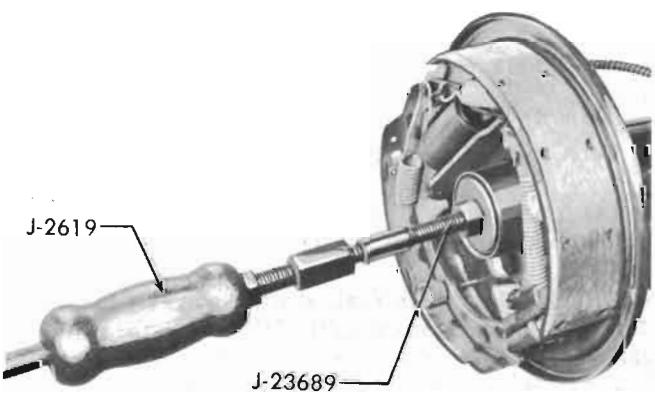


Figure 40-117 Axle Shaft Bearing and Seal Remover Installed

2. Using the axle shaft bearing and seal Installer J-23690, install the bearing and then the seal. See Figure 40-118.

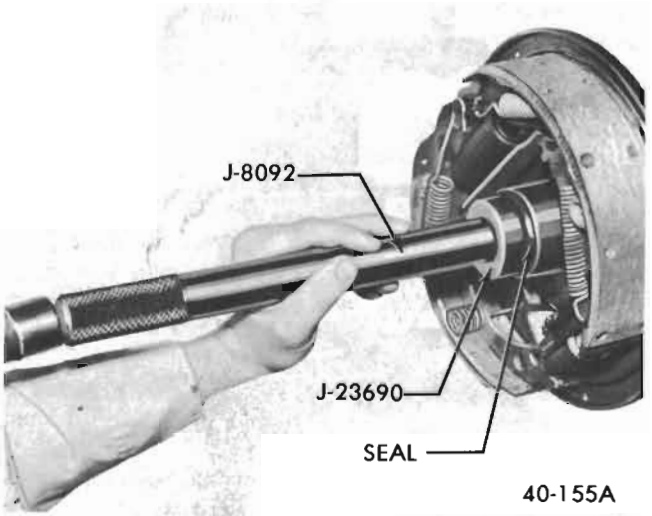


Figure 40-118 Axle Shaft Bearing and Seal Installer

d. 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.

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.

e. Install Axle Shaft Assembly

Rear axle shafts are interchangeable between sides.

1. Apply a light coat of wheel bearing grease in wheel bearing and seal recess of housing.

2. On the B-O type axles, apply gear lubricant to the splines at the inner end of the axle shaft. Apply a coat of wheel bearing grease on the seal surface of the shaft. Install axle shaft.

NOTE: *If the axle to be installed is a positive traction axle, only positive traction lubricant should be used.*

3. For C-K type axles, proceed as follows:

a. Insert axle shaft through the seal and bearing and, as far as possible, through the side gear.

b. Install "C" lock onto axle shaft. Move axle shaft and "C" lock outward to bottom the "C" lock in the recess of the side gear.

c. Install pinion shaft and secure with lock bolt (15 lb. ft.).

d. Install new gasket and cover, torque bolts to 30 lb. ft.

e. Install specified quantity and type of lubricant.

NOTE: *Fasteners in Steps 4 and 5 are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. It must be replaced with one of the same part number, or with an equivalent part, if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.*

4. Install retainer nuts and tighten to specified torque.

5. Install drum and wheel. Tighten lug nuts to specified torque.

DIVISION V

OVERHAUL AND MAJOR SERVICE

40-48 REMOVAL AND DISASSEMBLY OF DIFFERENTIAL CASE ASSEMBLY

a. Removal of Differential Case Assembly - Differential in Car

1. Raise rear of car and support securely under rear of frame.

2. Loosen parking brake cables so that brake is not applied when axle assembly is lowered.

3. Mark rear universal joint and pinion flange for proper alignment at reassembly. Disconnect rear universal joint.

4. Lower differential assembly just far enough to clear lower portion of fuel tank.

NOTE: *The following steps also apply when making repairs with differential assembly removed from car.*

5. Remove bolts securing cover to housing to drain lubricant.

6. While lubricant is draining, remove rear wheels and drums.

7. Remove rear axle shafts as described in paragraph 40-47.

NOTE: *Before proceeding with following steps, it is advisable to check the existing ring gear to pinion backlash as described in paragraph 40-49, subparagraph g. 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.

8. Mark side bearing caps for proper installation at reassembly. Remove bolts holding differential side bearing caps to housing.

9. Differential case assembly can now be removed by prying against ring gear bolt, using a suitable pry bar. See Figure 40-119. 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.

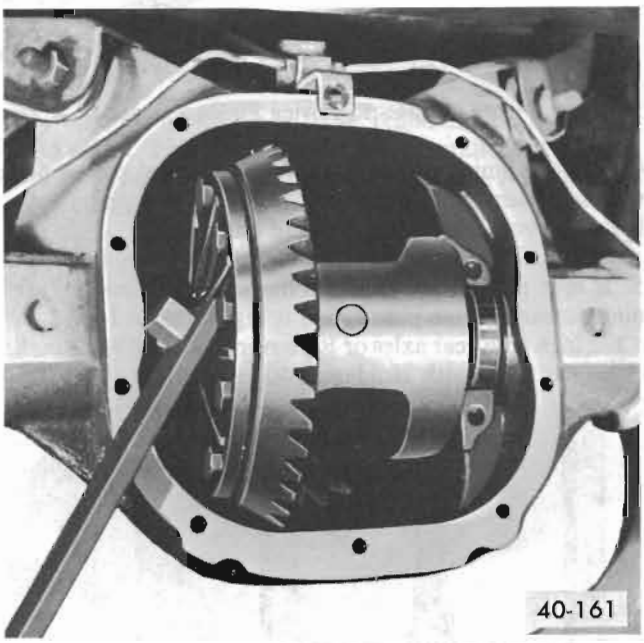


Figure 40-119 Removing Differential Case Assembly

CAUTION: *Do not allow case assembly to drop as this may cause injury or damage parts.*

b. Disassemble Standard Differential Case Assembly

1. If differential side bearings are to be replaced, insert Remover Adapter J-2241-10 in center hole and pull bearing using Puller J-22588. See Figure 40-120.

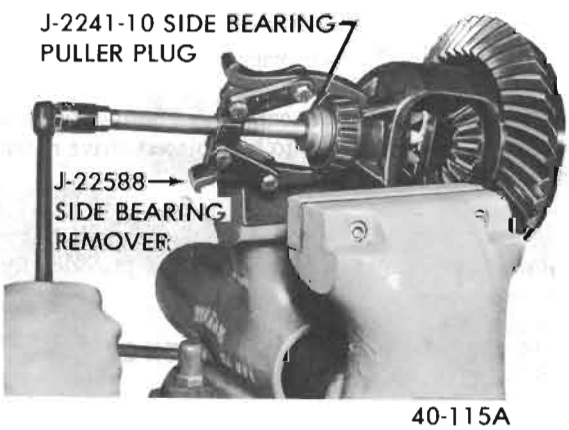


Figure 40-120 - Removing Differential Side Bearings

2. Remove screw that retains differential pinion shaft. See Figure 40-121. Remove differential pinions, side gears and thrust washers from case.

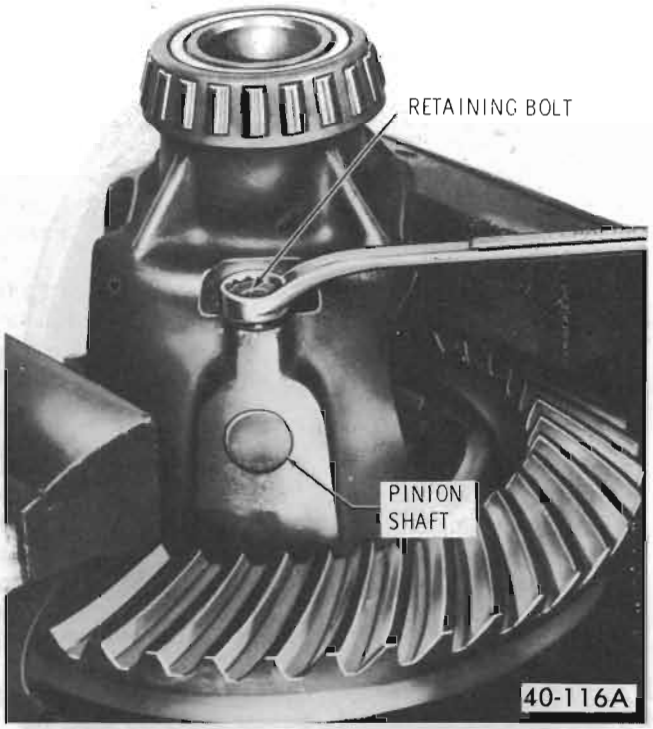


Figure 40-121 - Removing Pinion Shaft Lock Screw

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.

c. Disassemble Plate Type Positive Traction Differential Case Assembly

1. Remove screw that retains differential pinion shaft and remove differential cross shaft. Remove preload spring thrust blocks and springs from the case. See Figure 40-122.

2. Rotate side gears until the pinions are in the open area of the case, remove the pinions and thrust washers.

3. Remove a side gear, clutch pack, and shims from the case, noting location to aid in reassembly. Remove the side gear, clutch pack, and shims from the opposite side.

4. Remove clutch plates from side gears, keeping plates in their original location in the pack.

d. Removal of Pinion and Bearings

1. Check pinion bearing preload as described in paragraph 40-49, subparagraph c.

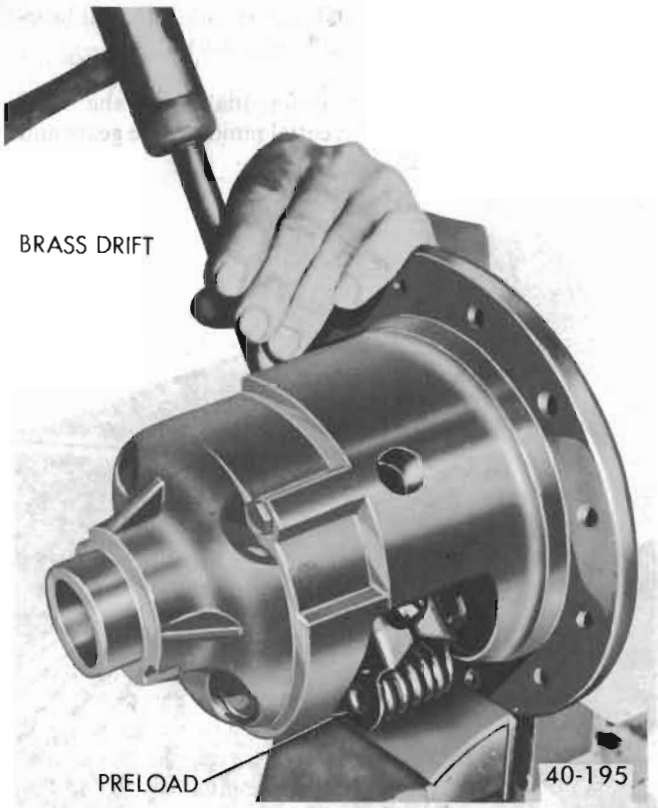


Figure 40-122 Removing Preload Thrust Blocks and Springs

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.

2. Install Holder J-8614 on flange by using two 5/16-18x2" bolts with flat washers. Remove pinion nut and washer. See Figure 40-123.

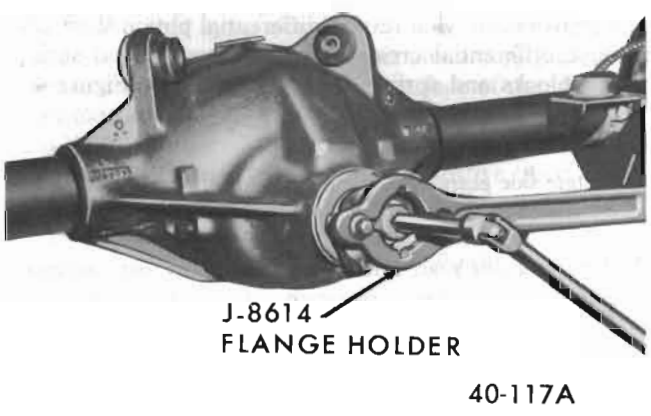


Figure 40-123 - Removing Pinion Nut

3. Pull pinion flange from pinion using Puller J-8614. To install puller, back out puller screw, insert puller through holder, and rotate 1/8 turn. See Figure 40-124.

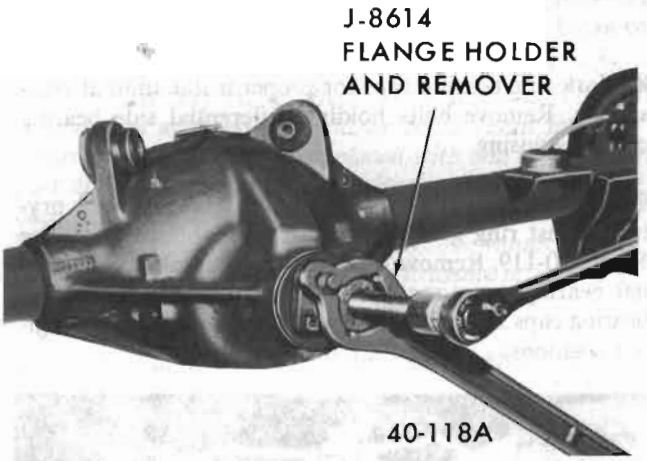


Figure 40-124 - Removing Pinion Flange

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

5. If rear pinion bearing is to be replaced, remove rear pinion bearing from pinon shaft using Remover J-8612 on 8 1/2 inch ring gear axles or Remover J 9746 on 9 3/8 inch ring gear axles with Holder J-6407. See Figure 40-125.

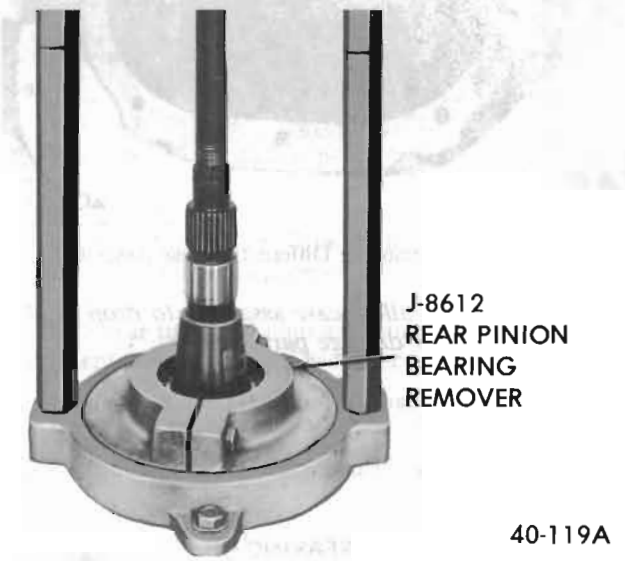


Figure 40-125 - Removing Rear Pinion Bearing

6. 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 brass drift.

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

40-49 ASSEMBLY AND INSTALLATION OF DIFFERENTIAL CASE ASSEMBLY

Before installation of any parts, examine the wearing surfaces of all parts for scoring or unusual wear. Make certain

that the interior of the carrier housing is absolutely clean and dry. Also make certain that the parts to be assembled are absolutely clean and that there are no burred edges. Lubricate all parts with the specified rear axle lubricant just before assembly.

NOTE: *If the Buick is equipped with a Positive Traction Differential, only Positive Traction Lube should be used.*

NOTE: *If the ring gear and pinion are changed, only factory hypoid lubricant should be used for filling because of its special anti-scoring properties. For this reason the proper lubricant is included in the carton with the replacement gears as received.*

a. Install Pinion Bearing Outer Races in Carrier

1. If rear pinion bearing is to be replaced, use Installer J-8608 on 8 1/2 inch ring gear axles or Installer J-9745 on 9 3/8 inch ring gear axles with Driver Handle J-8092. See Figure 40-126.

2. If front pinion bearing is to be replaced, install new outer race using Installer J-8611-01 with Driver Handle J-8092. See Figure 40-127.

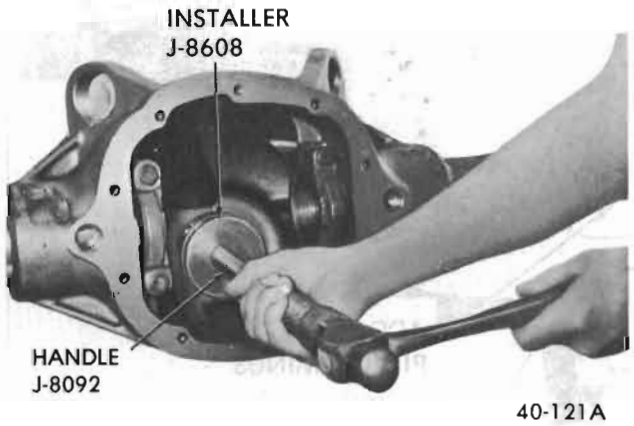


Figure 40-126 - Installing Rear Pinion Bearing Outer Race

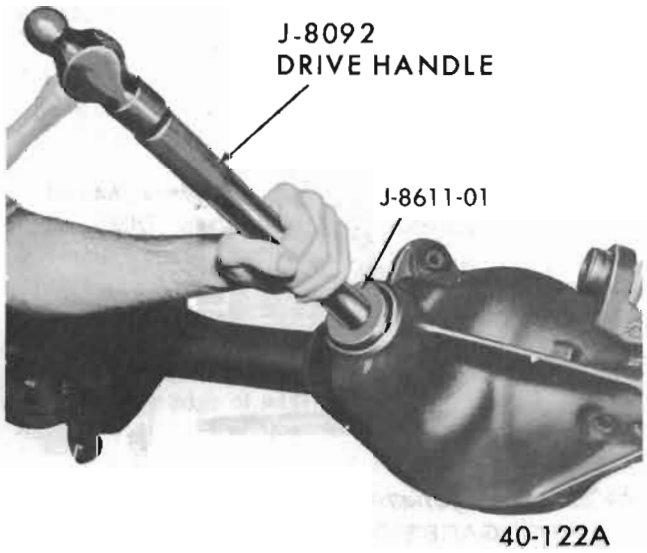


Figure 40-127 - Installing Front Pinion Bearing Outer Race

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 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 gaging the carrier and shimming the pinion has been developed. After gaging 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 for all axles is set with Pinion Setting Gage J-5647. See Figure 40-129 for gage usage on the 8 1/2 inch ring gear axles and Figure 40-129A for gage usage on the 9 3/8 inch ring gear axles. Although production pinions are marked, neither production nor service pinions have a gaging tooth. The pinion setting gage provides in effect a nominal or zero pinion as a reference.

Set up pinion setting gage as follows:

1. Be certain that all parts of pinion setting gage are clean.

2. Lubricate front and rear pinion bearings which will be used in final reassembly and position them in their respective races in the carrier. Thread Stud J-8619-13 into Gage Plate J-5647-45 on the 8 1/2 inch ring gear axles and Gage Plate J-5647-47 on the 9 3/8 inch ring gear axles. With bearings held in place in races, install gage plate and stud assembly on rear pinion bearing inner race. Install Pilot J-5647-37 on front pinion bearing with small diameter on raised portion of bearing race. See Figure 40 130.

3. Install nut on Stud J-8619-13. Hold stud stationary with wrench positioned on flats on end of stud; tighten nut until a reading of 20 pound inches is obtained when rotating gage plate assembly with a pound inch torque wrench.

4. Install Discs J-5647-46 (L) and J-8619-10 (R) 8 1/2 inch ring gear axles or Discs J-5647-40 (R) and J-5647-41 (L) 9 3/8 inch ring gear axles on the indicator gage. Install the small ball-tipped contact button on the stem of the dial indicator and mount the dial indicator on the indicator gage. See Figure 40-129.

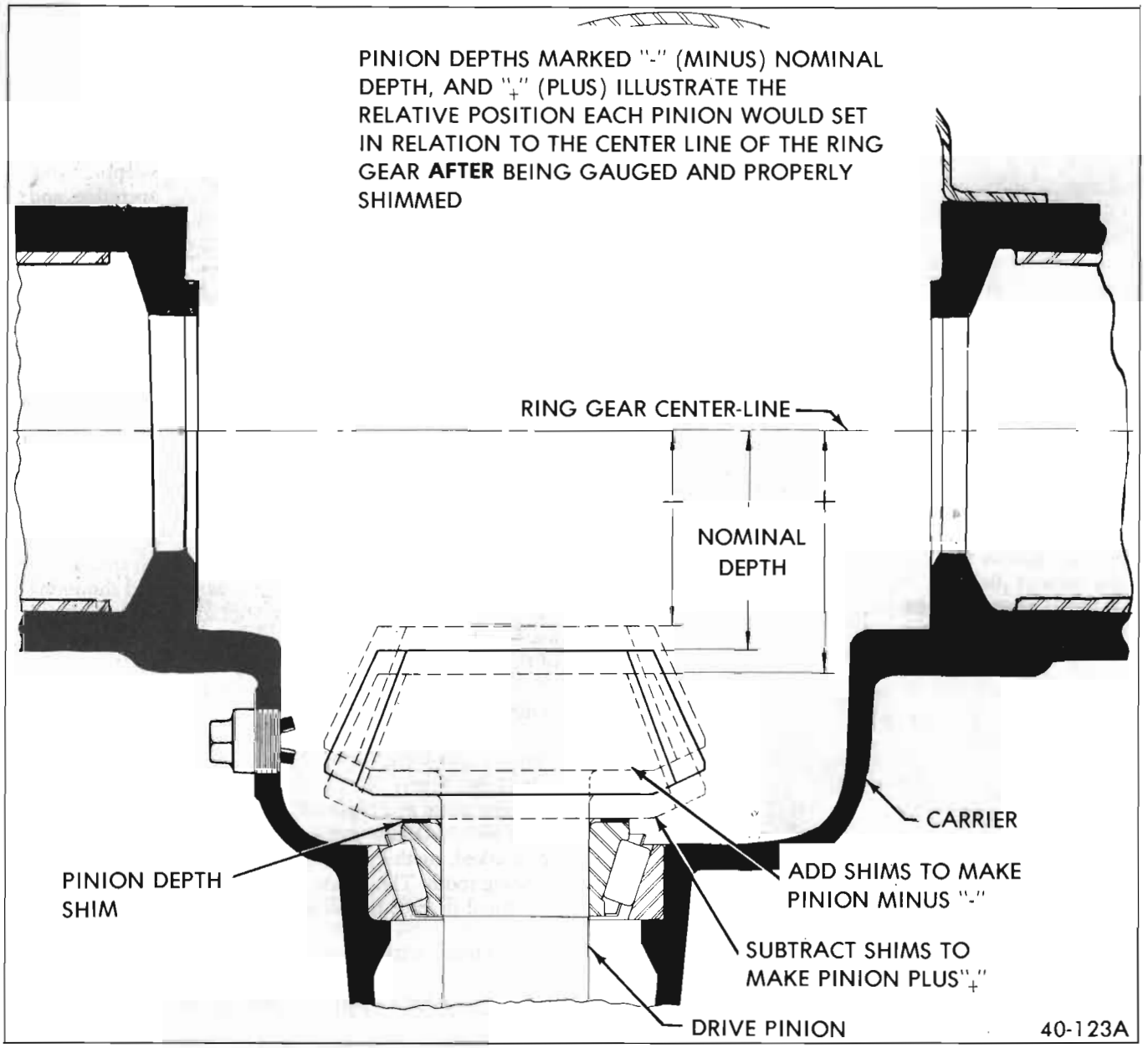


Figure 40-128 - Nominal Pinion Setting Depth

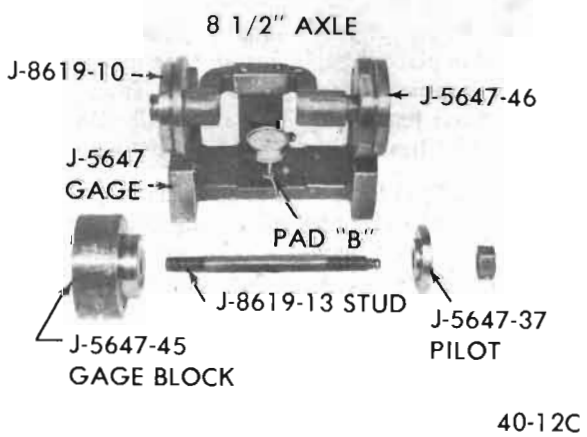


Figure 40-129 - Pinion Setting Gage

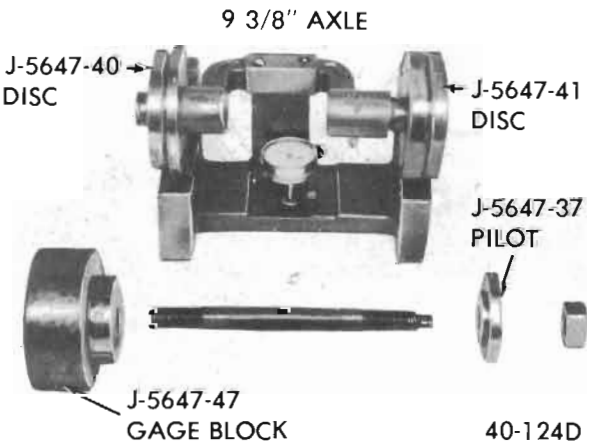


Figure 40-129A - Pinion Setting Gage

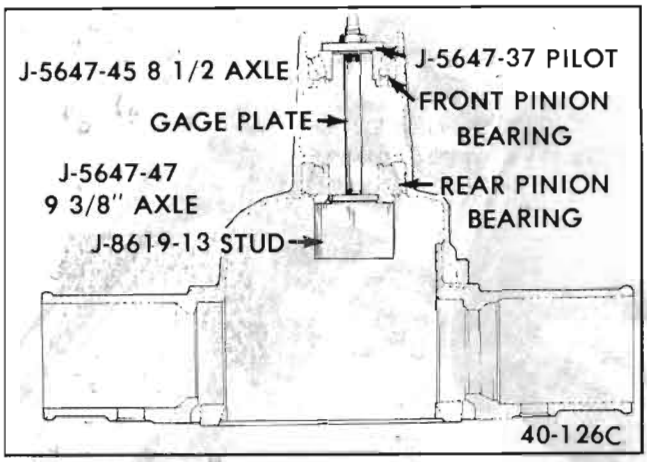


Figure 40-130 - Pinion Gage Plate Installed in Carrier

5. Place the indicator gage on the master gage, as shown in Figure 40-131 so that its spring loaded center is engaged in the centering hole for Pad "B" on the Master Gage.

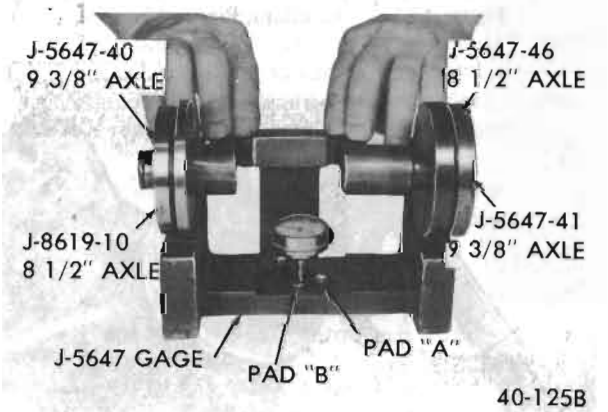


Figure 40-131 - Zeroing Pinion Setting Gage

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

7. Hold gage yoke down firmly, with large diameter portion of each disc contacting both the horizontal and vertical pads on master gage; set dial indicator at zero.

8. Be certain differential bearing support bores are free of dirt and burrs. Install indicator gage in carrier so that small diameter portion of discs rest in differential bearing pedestal support bores. Spring-loaded center of gage must be located in centering hole of gage plate, and ball-tipped contact button of dial indicator must be positioned to bear against outer edge of gage plate top surface. See Figure 40-132.

9. Press gage yoke down firmly toward gaging plate. Record the dial indicator reading. Remove indicator gage and recheck "zero setting" on master gage to make sure this setting was not disturbed by handling.

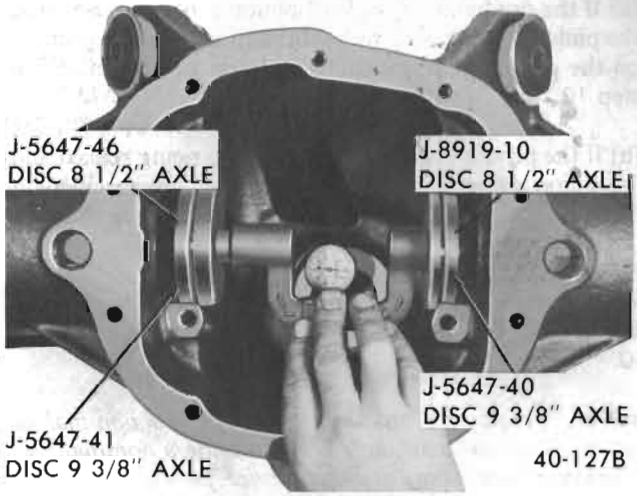


Figure 40-132 - Checking Pinion Depth

10. If zero setting is still correct, remove gaging set-up and both bearings from the carrier. Then subtract reading recorded in previous step from .100. For example, a typical reading of .070" should be subtracted from .100 this answer .030 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 .060" to .070" with a corresponding shim thickness range of .040" to .030".*

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:

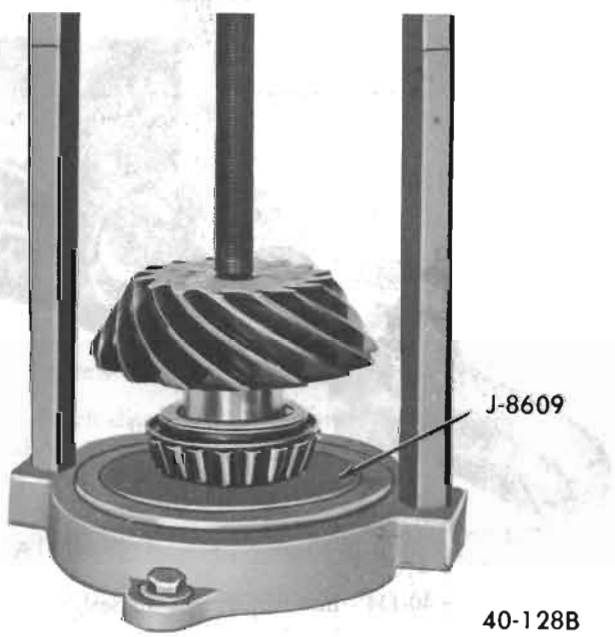


Figure 40-133 - Installing Rear Pinion Bearing

(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 10.

(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 10.

(c) If a service pinion is being used (no marking), shim pinion using shim thickness directly as determined in Step 10.

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 10.*

13. Position correct shim on pinion shaft and install rear pinion bearing. Use Installer J-8609 on 8 1/2 inch ring gear axles or Installer J-6377-01 on 9 3/8 inch ring gear axles. See Figure 40-133.

c. Install Pinion Assembly and Adjust Pinion Preload

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

2. Place front pinion bearing in position on pinion. Hold pinion fully forward and drive bearing over pinion until seated. Use Installer J-22388.

3. Install pinion oil seal in carrier. Coat O.D. of seal with sealing compound. Install seal by using Installer J-22388. See Figure 40-134.

NOTE: *A correctly installed pinion seal should be .150" from flush with nose of carrier casting.*

Figure 40-134 - Installing Pinion Oil Seal

4. Coat lips of pinion oil seal and 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.

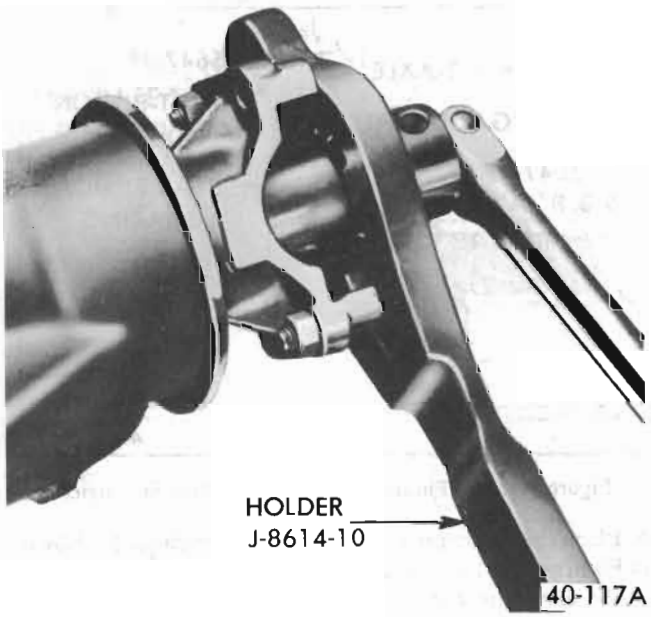


Figure 40-135 - Installing Pinion Nut

Figure 40-136 - Checking Pinion Preload

5. Install pinion washer and nut. Hold pinion flange with Holder J-8614. While intermittently rotating pinion to seat bearings, tighten pinion nut until end play begins to be taken up. See Figure 40-135.

NOTE: *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.*

6. Check preload by using a pound inch torque wrench as shown in Figure 40-136.

NOTE: *After preload has been checked, final tightening should be done very cautiously. For example, if when checking, preload was found to be 5 pound inches, additional tightening of the pinion nut as little as 1/8 turn can add 5 additional pound inches 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 requires its replacement.*

7. While observing the preceding caution, carefully set preload drag at 20-25 lb. in. on new bearings or 10-15 lb. in. on reused 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 Standard 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. Install the two pinion gears and washers, through the two big windows in the case, into mesh with the side gears making sure the pinion gear bores are 180 degrees apart.

3. Rotate the side and pinion gears as one assembly until the pinion gear bores are in alignment with the pinion shaft bores in the case.

4. Install pinion shaft and lock screw. Torque to 15 lb. ft.

5. After making certain that mating surfaces of case and ring gear are clean and free of burrs, thread two 7/16x20x2 (LH) studs into opposite sides of ring gear, then install ring gear on case. See Figure 40-137. Install ring gear attaching bolts just snug. Torque bolts alternately in progressive stages to 85 lb. ft.

6. If differential side bearings were removed, install new bearings using Installer J-22761 on 8 1/2 inch ring gear axles or Installer J-8606 on 9 3/8 inch ring gear axles with Driver Handle J-8092. See Figure 40-138.

e. Assemble Plate Type Positive Traction Differential Case Assembly

1. Inspect cross shaft, pinions, and side gears. Replace any parts which are excessively scored, pitted, or worn. In-

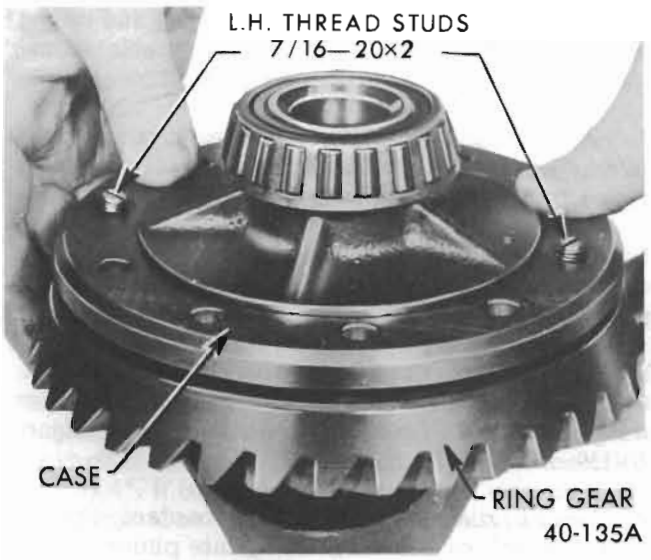


Figure 40-137 - Installing Ring Gear On Differential Case

Figure 40-138 - Installing Differential Side Bearings

spect clutch discs and plates for worn, cracked, or distorted condition. If any of these defects exist, new clutch packs must be installed.

2. Apply positive traction lubricant to the clutch plates.

NOTE: *Any other lubricant used may cause chatter.*

3. Assemble the clutch packs as follows: Alternately posi-

tion clutch plates on each side gear starting and ending with a clutch plate having external lugs. Assemble original spacer plate and shim to complete the stack.

4. On plate clutch type having rounded ear lugs, install ear guides over the lugs. The square ear lug type require no guides.

5. Install side gears and clutch pack assemblies into case on the same side from which they were removed. Install pinions, pinion thrust washers, and cross shaft.

6. Check the pinion to side gear backlash as follows: a. Compress one clutch pack by inserting screwdriver or wedge between the cross shaft and side gear. See Figure 40-139.

b. Mount dial indicator with contact button against tooth of pinion gear. Rotate pinion. Backlash should be .001″ to .006″.

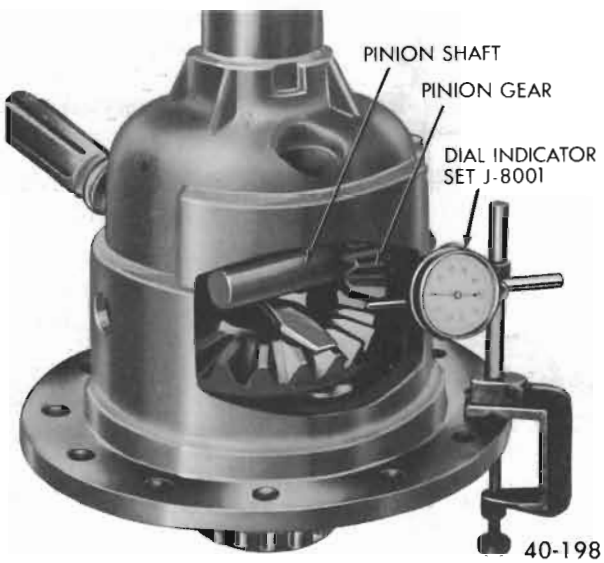


Figure 40-139 Checking Side Gear to Pinion Gear Backlash

c. If backlash is more than .006″, add shims between clutch pack and case. If backlash is less than .001″, remove shims. A .002″ shim will change backlash approximately .001″.

d. Repeat procedure with opposite side gear.

7. Remove cross shaft. Drive preload spring into position between the side gears. See Figure 40-140.

8. Assemble the cross shaft and lockscrew, torque to 15 lb. ft.

f. 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

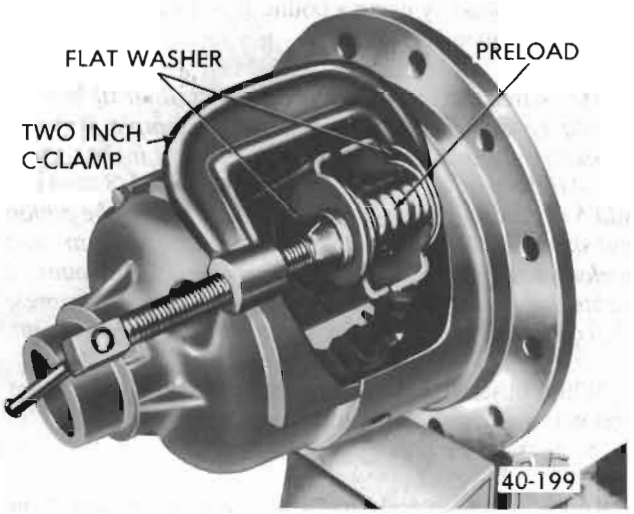


Figure 40-140 Compressing Preload Springs

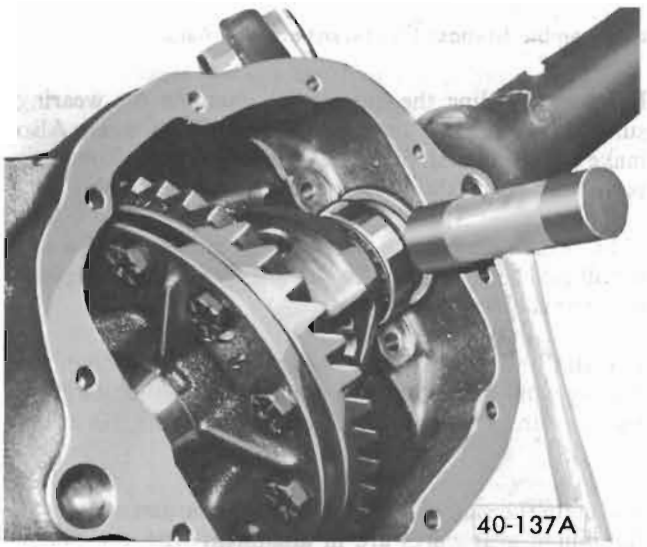


Figure 40-141 - Installing Differential Adjusting Shims

amount. By changing the thickness of both shims equally, the original backlash will be maintained. All differential side bearing preload shims used in production are cast. Shims used during service repairs of the differential are of a stamped steel design and are used along with a production type, nominal thickness, cast shim. Stamped steel service shims must be used when differential repairs are made that require changing side bearing preload. Service, steel, adjusting shims are available in thicknesses ranging from .040″ to .100″ in increments of .002″.

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.

2. Place differential case and bearing assembly in position in carrier. Use service type adjusting shim totaling same thickness as original production type adjusting shims if either new or reused bearings are to be used. Slip left shims

in position at left bearing with steel shim next to bearing, then place nominal thickness shim for right side in position and drive steel shim carefully into position between bearing and cast shim using a soft hammer. See Figure 40-141.

Install side bearing caps, as previously marked and tighten bolts to 55 lb. ft. before checking side bearing preload or backlash.

3. Rotate differential case assembly several complete turns to seat bearings. Check bearing preload using an inch pound torque wrench connected at pinion nut.

Bearing preload should read 35-40 lb. in. of rotating torque with new bearings or 20-25 lb. in. of rotating torque with reused bearings. See Figure 40-114. If preload is not according to these specifications, increase shim thickness on each side .002" for each additional 10 lb. in. preload desired, or decrease shim thickness .002" on each side for each 10 lb. in. preload to be subtracted.

g. Adjust Differential Backlash

1. Rotate differential case several times to seat bearings, then mount dial indicator as shown in Figure 40-142. 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.

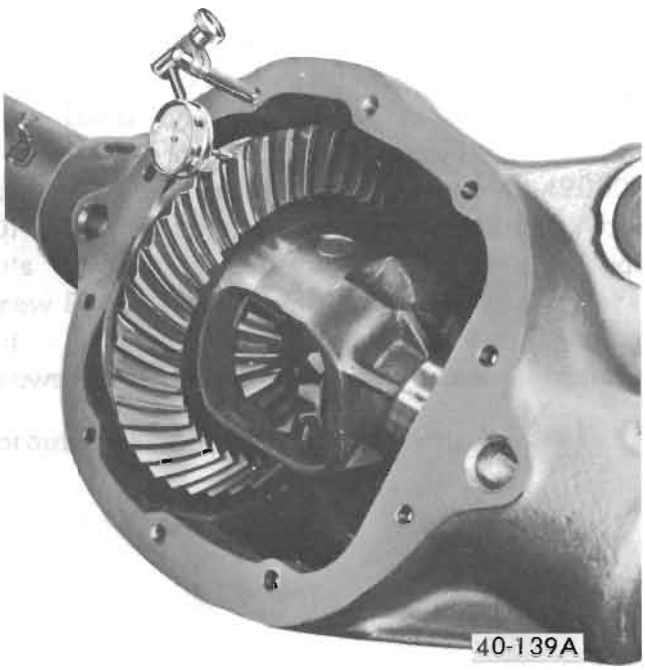


Figure 40-142 - Checking Ring Gear to Pinion Backlash

2. With pinion locked to carrier, check gear lash at 3 or 4 points 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 .006" to .008" for all new gears. If adjustment is necessary, adjust to .007".

If original gear set having a wear pattern is being reinstalled, original gear lash should be maintained with in plus or minus .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 .002" too much, decrease thickness of right shim .004" and increase thickness of left shim .004". If backlash is .002" too little, increase thickness of right shim .004" and decrease thickness of left shim .004".

5. Install new cover gasket and cover torquing bolts to 30 lb. ft.

After waiting 20 minutes retorque bolts to 30 lb. ft.

h. Install Axle Shaft Assemblies

1. Apply a coat of wheel bearing grease in bearing recesses of housing. Insert axle shaft assemblies carefully until shaft splines engage in differential to avoid damage to seals.

2. Drive axle shaft assemblies into position.

NOTE: *Fasteners in steps 3 and 5 are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. These must be replaced with one of the same part number of with an equivalent part if replacement becomes necessary. Do not use a replacement part or lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these part.*

3. Place retainer over studs and install nuts. Tighten to specified torque.

4. Install brake drums over wheel bolts.

5. Install wheels and tighten wheel nuts to specified torque.

6. Install lubricant. See Specifications Chart for correct quantity and type.

i. 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, and pinion nut so that they can be reinstalled in the same position.

4. Remove companion flange nut and washer using Holder J-6814-01 to hold flange.

5. Pry oil seal out of carrier.

6. Examine oil seal surface of companion flange for grooves, 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. Apply thin coating of No. 2 Permatex or equivalent on O.D. of new pinion oil seal and install seal using Installer J-22388.

NOTE: *A correctly installed pinion seal should be .150" from flush with nose of carrier casting.*

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

10. Install companion flange, with Holder J-8614-01 attached, onto pinion noting that the splines are mated as when removed.

11. Remove holding Tool J-8614.

12. Check pinion preload using a pound inch torque wrench; the torque reading should be equal to or five pound inches above that recorded in Step 2 above.

13. Connect propeller shaft to companion flange using alignment marks. Torque the four (4) bolts to 15 lb. ft. on the single joint connection, and 75 lb. ft. on the CV joint connection.

DIVISION VI

SPECIFICATIONS

40-50 DIFFERENTIAL SPECIFICATIONS

DIFFERENTIAL SPECIFICATIONS

a. Tightening Specifications

Use a reliable torque wrench to tighten the parts listed, to insure proper tightening without staining 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		Torque
Bolt	Rear Universal Joint to Pinion Flange — 43-44000 and Estate Wagon	5/16 — 24	15 lb. ft.
Bolt	Rear Universal Joint to Pinion Flange — 45-46-48-49000	7/16 — 14	85 lb. ft.
Bolt	Rear Axle Housing Cover to Carrier	5/16 — 18	30 lb. ft.
Nut	Brake Assembly to Rear Axle Housing — 43-44000	3/8 — 24	35 lb. ft.
Nut	Brake Assembly to Rear Axle Housing — 45-46-48-49000	7/16 — 14	55 lb. ft.
Bolt	Ring Gear to Differential Case	7/16 — 20	85 lb. ft.
Bolt	Bearing Cap to Carrier	7/16 — 14	60 lb. ft.
Nut	Rear Wheel to Axle Shaft — 43-44000	7/16 — 20	70 lb. ft.
Nut	Rear Wheel to Axle Shaft — 45-46-48-49000	1/2 — 20	75 lb. ft.
*Nut	Upper and Lower Control Arm — 43-44000	1/2 — 13	80 lb. ft.
*Bolt	Upper and Lower Control Arm — 43-44000	1/2 — 13	110 lb. ft.
*Nut	Upper Control Arm at Frame — 45-46-48-49000	9/16 — 12	115 lb. ft.
*Bolt	Upper Control Arm at Frame — 45-46-48-49000	9/16 — 12	140 lb. ft.
*Nut	Upper Control Arm at Axle — 45-46-48-49000	1/2 — 13	80 lb. ft.
*Bolt	Upper Control Arm at Axle — 45-46-48-49000	1/2 — 13	115 lb. ft.
*Nut	Lower Control Arm — 45-46-48-49000	9/16 — 12	115 lb. ft.
*Bolt	Lower Control Arm — 45-46-48-49000	9/16 — 12	115 lb. ft.
Nut	Lower End of Shock Absorber to Lower Control Arm Axle Bracket	1/2 — 20	65 lb. ft.
Nut	Pinion Nose Bumper — 45-46-48-49000 (Less Estate Wagon)	—	90 lb. in.
Nut	Leaf Spring Rear Shackle — Estate Wagon	9/16 — 12	115 lb. ft.
Nuts	Bottom Leaf Spring Plate — Estate Wagon	7/16 — 20	40 lb. ft.
Screw	Pinion Nose Bumper Bracket to Carrier — Estate Wagon	5/16 — 12	72 lb. in.
Nut	Pinion Nose Bumper to Bracket	—	20 lb. ft.
Screws	Rear Exhaust Hanger to Frame — Estate Wagon	—	72 lb. in.

*Torquing of nut or bolt to be optional.

b. General Specifications

Rear Axle Type	Semi-Floating Hypoid
Drive and Torque — (Except Estate Wagon)	Through 4 Arms
Drive and Torque — Estate Wagon	Leaf Spring
Rear Axle Oil Capacity — 46-48-49000	5.4 Pints
Rear Axle Oil Capacity — 43-44-45000	4.25 Pints
Ring and Pinion Gear Set Type	Hypoid
Differential Lubricant (Standard Axle)	SAE 90 GL-5
Differential Lubricant (Positive Traction Axle)	Special Lubricant//1051022 or Equivalent

c. Limits for Fitting and Adjusting

Pinion Bearings Preload (Measured at Pinion Flange Nut)	
New Bearings	20-25 lb. in. rotating torque with new seal
Reused Bearings	10-15 lb. in. rotating torque with new seal
Total Assembly Preload (Measured at Pinion Flange Nut)	
New Bearings	35-40 lb. in. rotating torque with new seal, with ring gear
Reused Bearings	20-25 lb. in. rotating torque with new seal, with ring gear
Ring Gear Position	.006" — .008" Backlash

40D-4

d. Differential Gear Ratios

Rear axle ratio, differential type, manufacturer, and build date information is stamped on the right rear axle tube on the forward side. Refer to Figures 40-143 and 40-144. Any reports made on rear axle assemblies must include the full code letters and build date numbers.

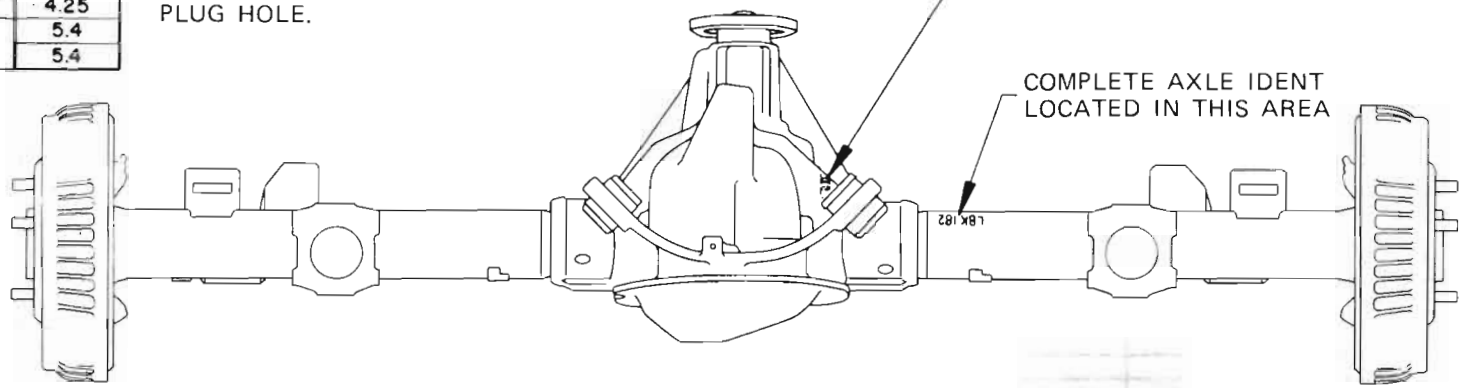
e. Speedometer Gears

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

AXLE OIL FILL

SERIES	AMOUNT (PTS)
43-44-45	4.25
	4.25
46-48-49	5.4
	5.4

AXLE IN CURB POSITION OF CAR, OIL TO BE FROM FLUSH TO 3/8" BELOW LOWER EDGE OF FILLER PLUG HOLE.



MODELS	ENG INE	TRANSMISSION	AXLE ASSEMBLY RATIO USAGE								
			STANDARD			ECONOMY			PERFORMANCE		
			RATIO	REGULAR CODE	LIMITED SLIP CODE	RATIO	(G95) REGULAR CODE	(G96) LIMITED SLIP CODE	RATIO	(G92) REG CODE	(G91) LTD. SLIP CODE
43327 43337 43369	250 L-6	3-SPEED MANUAL	3.08	LAB	LSB						
		THM-350	3.08	LAB	LSB				3.42	LHB	LWB
43327 43337 43369 44437 44439 44469 44467	350	3-SPEED MANUAL	3.08	LAB	LSB						
		2 BBL THM 350	2.56	LKB	LTB				3.08	LAB	LSB
		4 BBL THM 350	2.73	LLB	LOB	2.56	LKB	LTB			
43437-67	350	3 & 4 SPEED MANUAL –THM 350	3.08	LAB	LSB				3.42	LHB	LWB
43436	350	3-SPEED MANUAL –THM 350	3.08	LAB	LSB	2.73	LLB	LOB	3.42	LHB	LWB
43437-67	455	4-SPEED MANUAL	3.42	LHB	LWB						
		THM-400	3.08	LAB	LSB				3.42	LHB	LWB
	455 GSX	4-SP MAN & THM 400	3.42		LWB						
	455	4 SPEED MANUAL –THM-400	3.42		LWB						

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Figure 40-143 43-44000 Differential Identification

MODELS	ENGINE	TRANSMISSION	AXLE ASSEMBLY RATIO USAGE								
			STANDARD			ECONOMY			PERFORMANCE		
			RATIO	REGULAR CODE	LIMITED SLIP CODE	RATIO	(G95) REGULAR CODE	(G96) LIMITED SLIP CODE	RATIO	(G92) REGULAR CODE	(G91) LIMITED SLIP CODE
LE SABRE	350	[1] THM-350	3.08	NAB	NPB	2.73	NKB	NTB	3.42	NHB	NSB
				NAO			NKO			NHO	NSO
				NAC	NPC		NKC	NTC			
				NAK	NPK		NKK	NTK			
		3-SPEED MAN	3.42	NHB	NSB					NHB	NSB
LE SABRE	455	THM-400	2.93	QIO	QJO				3.42	QTO	QAO
ESTATE WAGON	455	THM-400	2.93	QEO	QLO				3.42	QHO	QMO
		3-SPEED MAN	3.42	QHO	QMO						
CENTURION	455	THM-400	2.93	QIO	QJO				3.42	QTO	QAO
		3-SPEED MAN	3.42	QTO	QAO						
ELECTRA	455	THM-400	2.73	QPO	QSO				2.93	QIO	QJO
RIVIERA	455	THM-400	2.93	QIO	QJO				3.42	QTO	QAO
RIVIERA GS			3.42		QAO						

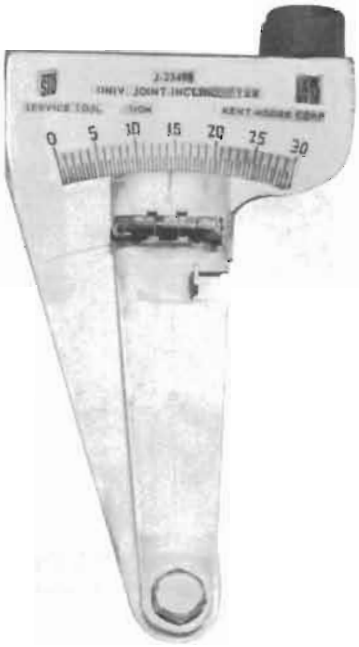
LAST LETTER OF CODE DESIGNATES MANUFACTURER

B – BUICK
O – OLDSMOBILE
C – CHEVROLET
K – GM CANADA

40-251

Figure 40-144 45-46-48-49000 Differential Identification

J-9522



J-23498

J-9113

J-8092

J-9522 - PROPELLER SHAFT SERVICE TOOL SET
J-8092 - DRIVE HANDLE
J-9113 - 1/2" TORQUE WRENCH ADAPTER
J-23498 - INCLINOMETER

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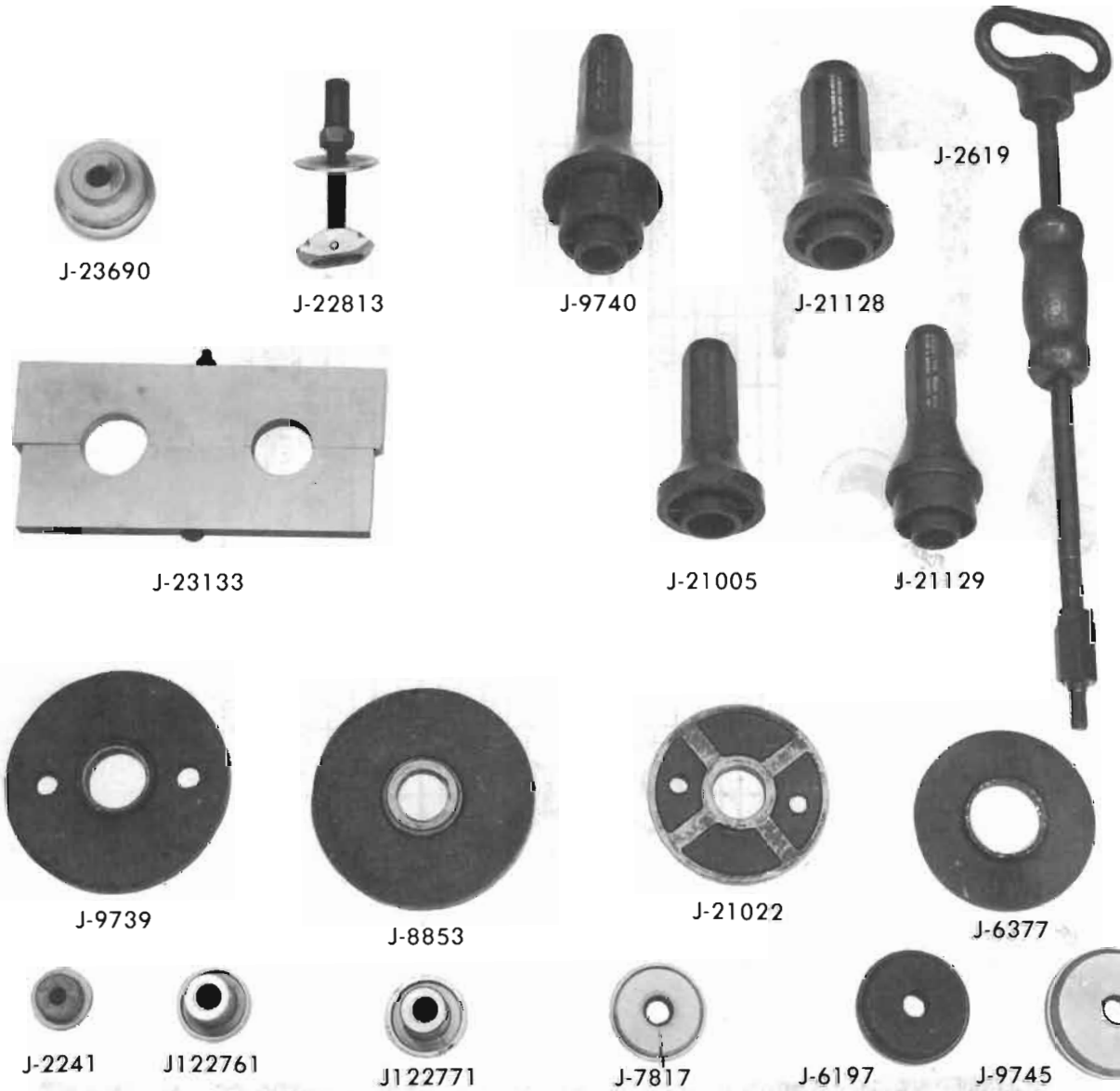
Figure 40-145 Special Tools - Propeller Shaft



J-2241 - DIFFERENTIAL SIDE BEARING PLUG
J-2619 - SLIDE HAMMER ASSEMBLY
J-6197 - FRONT PINION BEARING CUP INSTALLER
J-6377 - PINION BEARING INSTALLER PRESS PLATE
J-7817 - FRONT PINION BEARING OUTER RACE INSTALLER
J-8853 - AXLE BEARING AND BEARING RETAINER REPLACER
J-9739 - AXLE SHAFT BEARING AND LOCK RING INSTALLER
J-9740 - AXLE SHAFT OIL SEAL INSTALLER
J-9745 - REAR PINION BEARING CUP INSTALLER
J-21005 - PINION OIL SEAL INSTALLER
J-21022 - AXLE SHAFT BEARING INSTALLER
J-21128 - PINION OIL SEAL INSTALLER
J-21129 - AXLE SHAFT OIL SEAL INSTALLER
J-22761 - DIFFERENTIAL SIDE BEARING INSTALLER
J-22771 - DIFFERENTIAL SIDE BEARING INSTALLER
J-22813 - AXLE SHAFT BEARING AND SEAL REMOVER
J-23133 - AXLE SHAFT BEARING REMOVER
J-23690 - AXLE SHAFT BEARING INSTALLER

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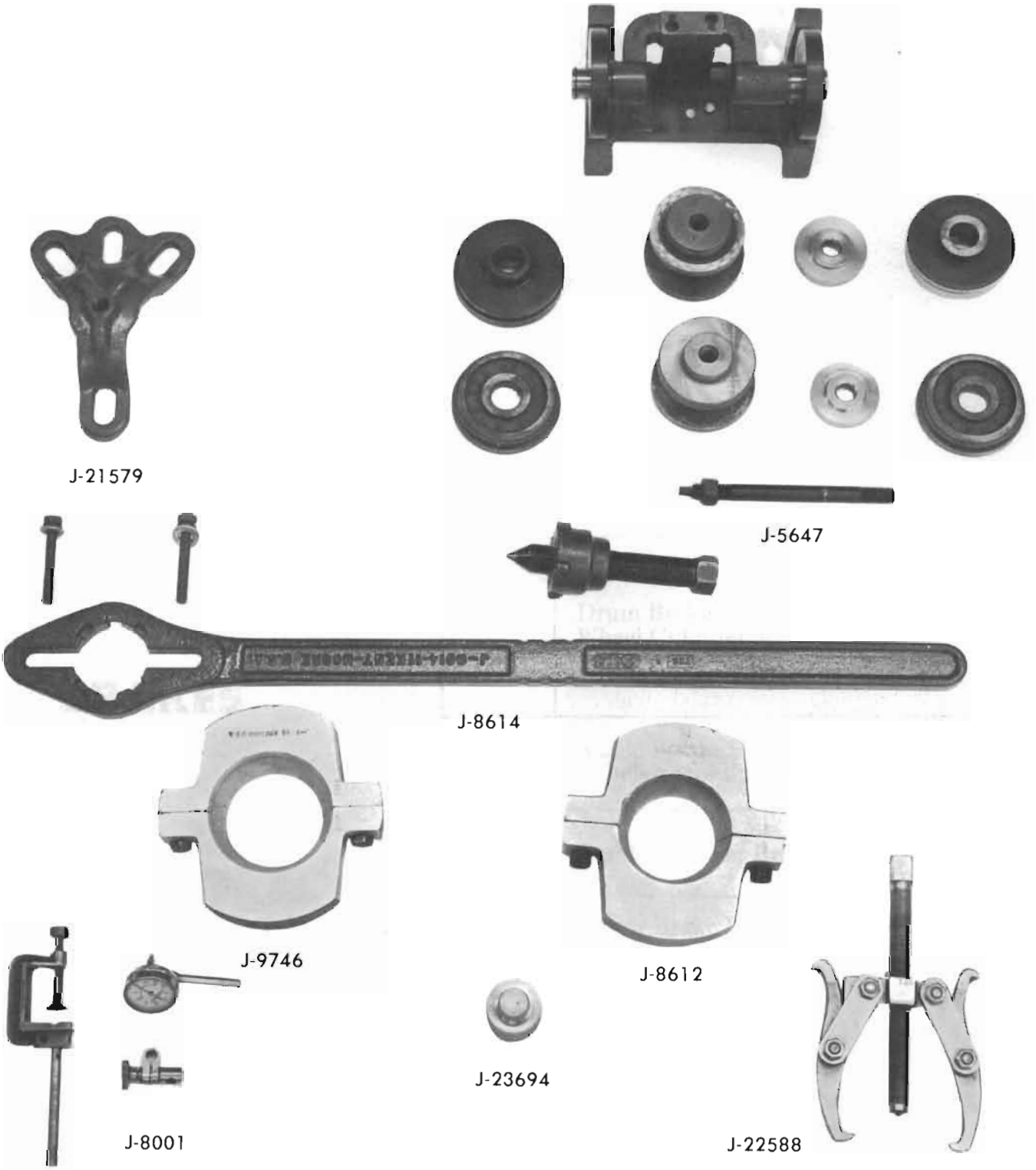
Figure 40-146 Special Tools - Differential



J-5647 - PINION SETTING GAUGE
J-8001 - DIAL INDICATOR
J-8612 - REAR PINION BEARING REMOVER
J-8614 - COMPANION FLANGE HOLDER AND REMOVER
J-9746 - REAR PINION BEARING REMOVER
J-21579 - AXLE SHAFT REMOVER
J-22588 - DIFFERENTIAL SIDE BEARING PULLER
J-23694 - BALL STUD SEAL INSTALLER
J-21322 - (NOT PICTURED) RING GEAR AND CASE REMOVER

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Figure 40-147 Special Tools - Differential