REAR SUSPENSION PROPELLER SHAFT DIFFERENTIAL

33 THROUGH 86 SERIES

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REAR SUSPENSION 33-86 SERIES

DESCRIPTION

The rear suspension is of the link-type with coil springs. It uses four suspension arms that attach the rear axle assembly to the frame. A bracket on the axle supports the coil spring, the top of which is positioned under the frame rail. The upper arms are attached to the top of the differential and extend forward to the frame. Two shock absorbers are attached to the frame and to brackets on the axle housing. (Fig. 4-1 and 4-2)

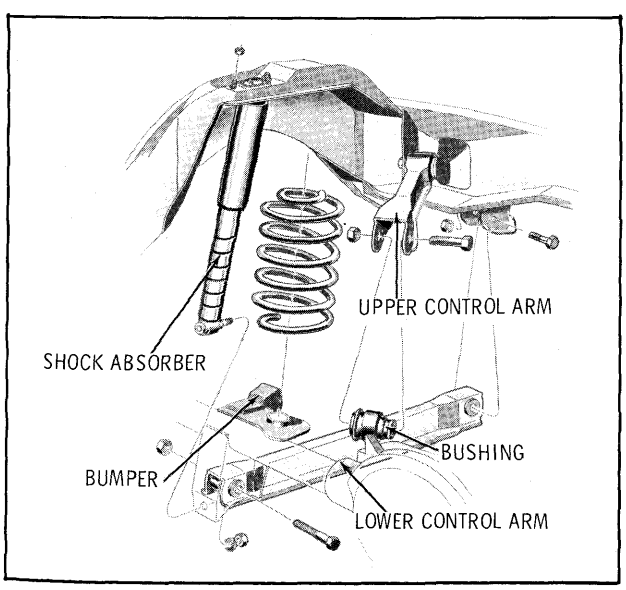

Fig. 4-1 Rear Suspension (52 through 86 Series)

SHOCK ABSORBERS

The double action shock absorbers are mounted by bolts through the frame at the top and to a bracket welded on the axle housing. (Fig. 4-3 and 4-4)

NOTE: If noisy rear shock absorbers are encountered, the attaching bolts should be re-torqued. If this does not correct the noise, further checking will be necessary.

Removal

If found necessary to replace, raise car and support rear axle. The lower end has a stud which is an integral part of the shock. Remove the nut and tap shock free from bracket. To disconnect the shock at the top, on all models except extended station wagons, remove the two bolts, nuts and lockwashers. On extended station wagons, remove the nut, retainer and grommet.

Installation

Loosely attach shock at both ends before tightening nuts. Torque lower stud nut to 45 ft. lbs. and on all models except extended station wagons torque upper mounting bolts to 20 ft. lbs. On extended station wagons, torque upper mounting nut to 20 ft. lbs. or until nut is to end of threads on stud.

UPPER SUSPENSION ARM

Removal

1. Remove nut from rear arm to differential

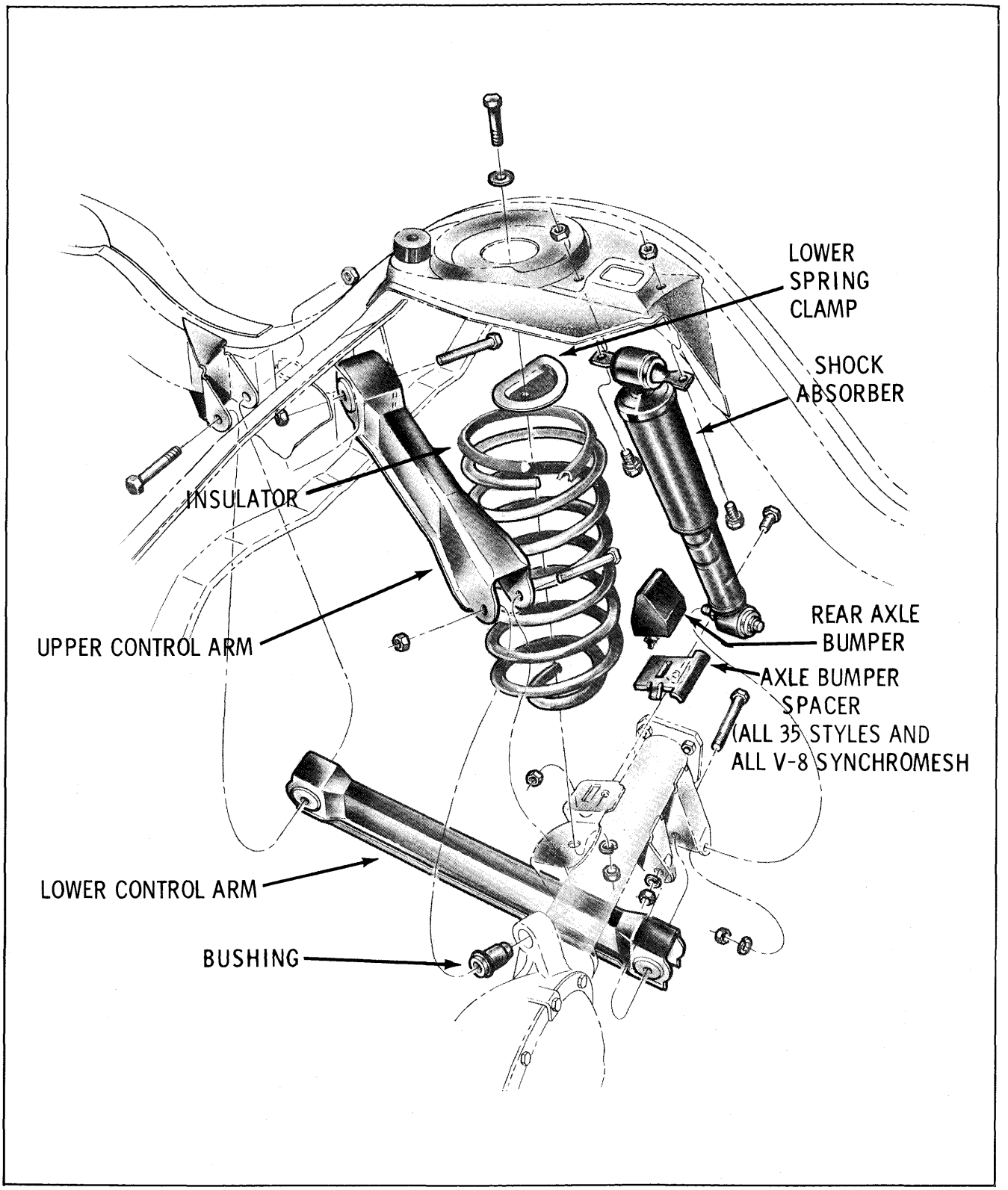

Fig. 4-2 Rear Suspension (33 through 38 Series)

housing bolt and while rocking differential, remove the bolt. (Fig. 4-5)

2. Remove front rear arm attaching nut and bolt.

3. Remove suspension arm and inspect bushing for damage.

Installation

To install, reverse removal procedure. Torque bolts and nuts to 75 ft. lbs. with car resting at normal carrying height.

33 - 38 Series upper arms on cars equipped

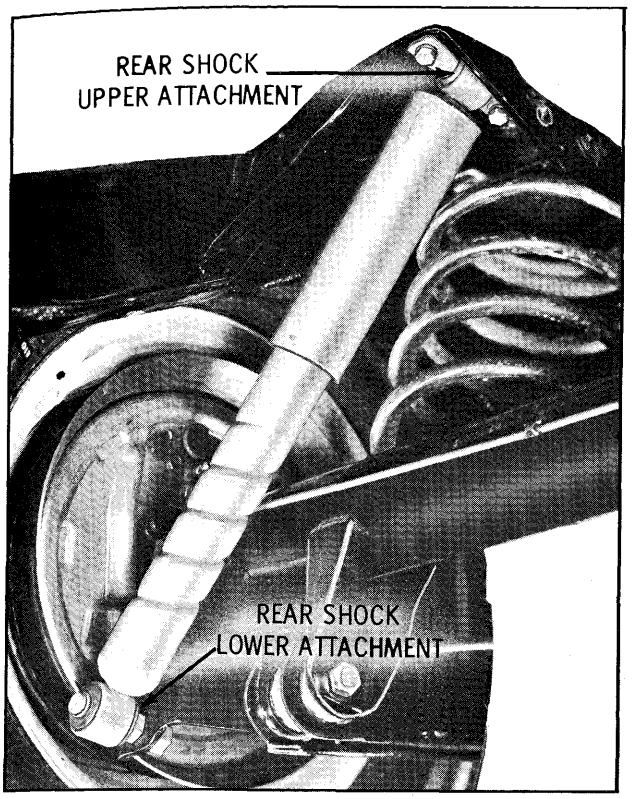

Fig. 4-3 Rear Shock Installation (Exc. 55 and 65 Styles)

with manual transmission are to be installed in upper holes of frame crossbar on V-8 Sedans, Coupes and 67 Styles

LOWER SUSPENSION ARM

Removal

1. Raise car and support under axle housing.
2. Remove rear arm to axle housing bracket bolt. (Fig. 4-6)

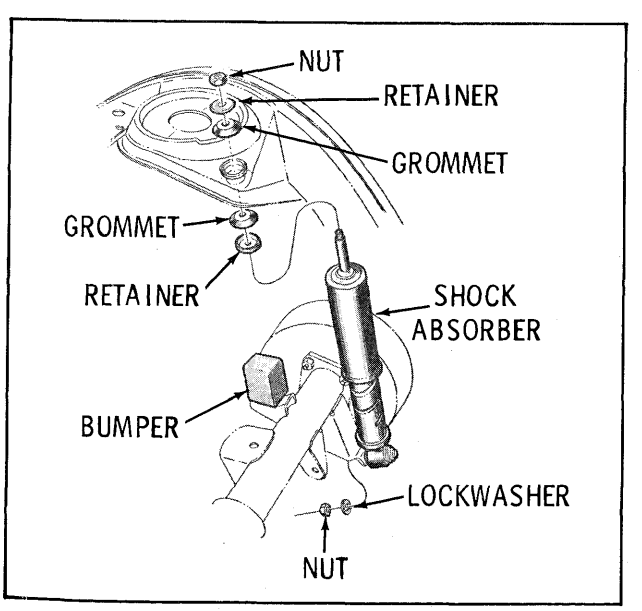

Fig. 4-4 Rear Shock Installation (55 and 65 Styles)

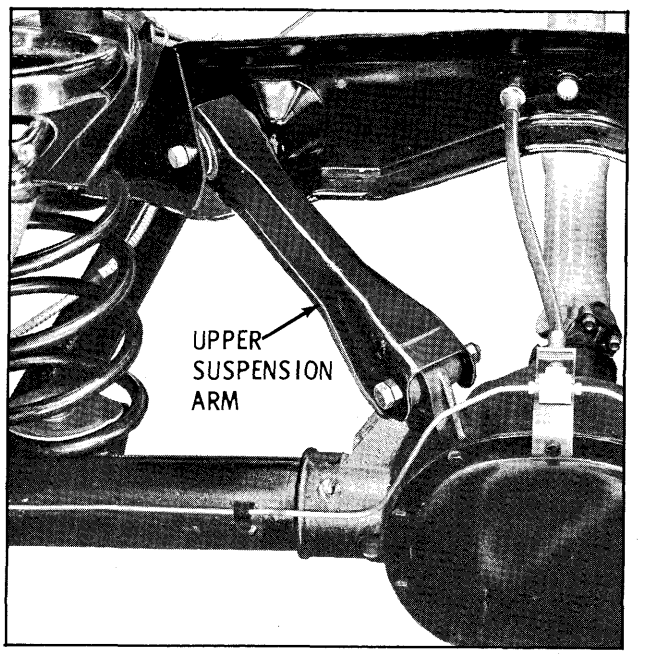

Fig. 4-5 Upper Suspension Arm

3. Remove front arm to bracket bolts and remove lower control arm.

Installation

To replace arm, reverse the removal sequence of operations. Torque arm attaching bolts and nuts to 75 ft. lbs. with the weight of the car on the rear springs.

BUSHINGS

The bushings in the differential carrier are replaceable. The bushings in the suspension arms can only be serviced by replacing the complete arms.

Removal

The bushing in the differential carrier can be

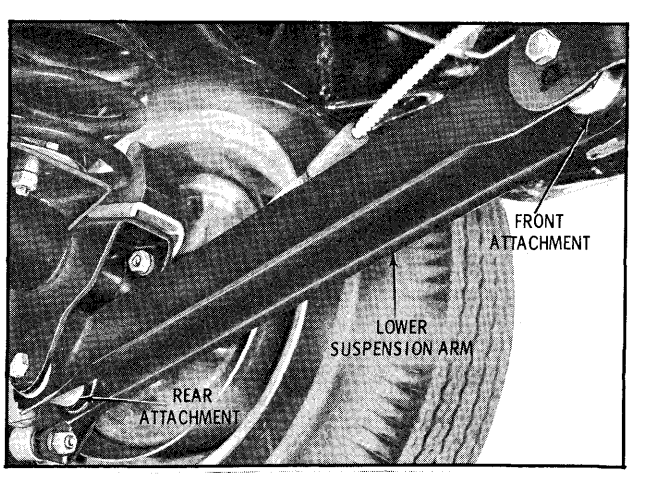

Fig. 4-6 Lower Suspension Arm

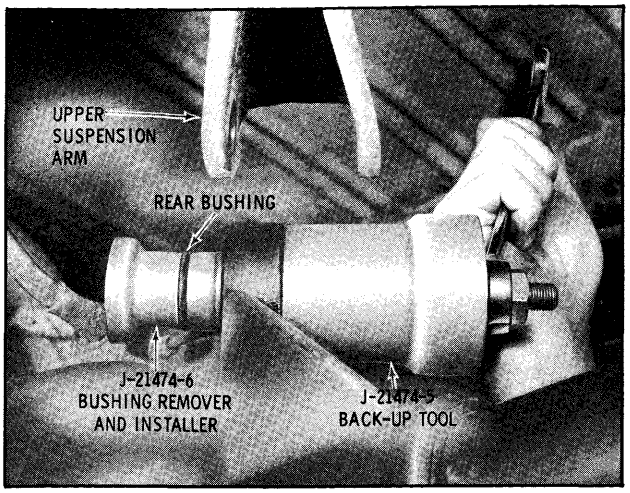

Fig. 4-7 Bushing Removal (33 through 38 Series)

replaced as follows:

1. Raise car and support under frame, lower axle housing until proper clearance is obtained.
2. Disconnect upper arm at differential and hold it up and out of the way.
3. Position tools as shown in Figs. 4-7 and 4-8 and remove bushing.

Installation

To install the bushing, reverse the tool as shown in Figs. 4-9 and 4-10 and pull bushing into position. Connect the upper suspension arms. Install bolt and torque nut to 75 ft. lbs.

COIL SPRINGS

Removal

1. Disconnect shock from lower bracket.
2. Lift car at rear by frame rail. This will allow suspension to drop far enough to remove the spring (52 - 86 Series).

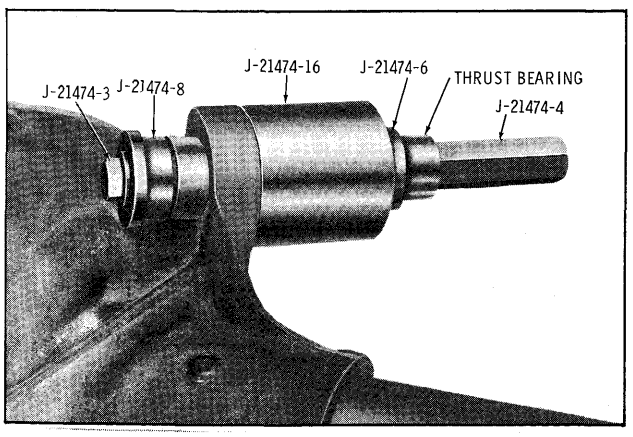

Fig. 4-8 Bushing Removal (52 through 86 Series)

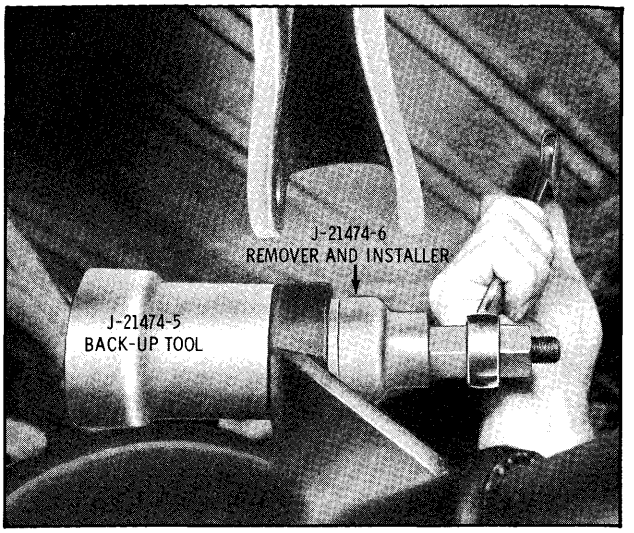

Fig. 4-9 Bushing Installation (33 through 38 Series)

NOTE: DO NOT STRETCH BRAKE HOSE.

3. Remove spring hold-down clamp and remove spring (33 - 38 Series).

Installation

1. (a) 52 - 86 Series, install spring in position so that spring pigtail on frame end points toward frame rail.

   (b) 33 - 38 Series, install spring insulator on top of spring. (Fig. 4-2)

   (c) 33 - 38 Series, install spring in position so that spring tail is positioned against step in upper spring seat.

2. 33 - 38 Series, install spring hold-down clamp. (Fig. 4-11) Torque to 30 ft. lbs.
3. Lower car sufficiently to attach shock to lower bracket. Torque shock nut to 45 ft. lbs.

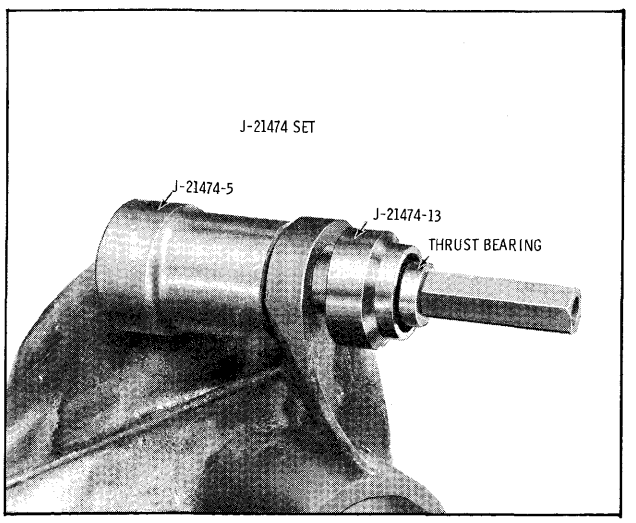

Fig. 4-10 Bushing Installation (52 through 86 Series)

Fig. 4-11 Rear Spring Attachment (33 through 38 Series)

AXLE HOUSING

Removal

1. Disconnect shock absorber from lower bracket.

2. Disconnect propeller shaft, brake line and parking cable equalizer. Compress parking brake cable housing clamp and pull housing through lower suspension arms mounting bracket. (52 - 86 Series)

3. Slowly raise car at rear end and remove coil springs.

4. Disconnect the upper suspension arm from the differential and the lower suspension arms from the brackets on the axle housing.

This will separate housing assembly from the frame. If replacing the housing, the components may be changed following the procedure outlined for such units in their respective sections.

Installation

To install, reverse removal procedure. After installing the assembly, it will be necessary to bleed the rear wheel brake cylinders, check brake and parking brake adjustment.

BUMPER (RUBBER)

The rear axle bumper is located on the top of the axle housing and is attached by snapping into a bracket on the axle housing. If found deteriorated or damaged, it must be replaced.

AXLE HOUSING ALIGNMENT

If rear tire wear indicates that the axle housing may be bent, the alignment can be checked as follows.

1. Back the car squarely onto an alignment machine.

2. Compensate for wheel runout the same as for checking front wheel toe-in.

3. Check camber reading which should be 1/4° negative to 1/2° positive.

4. 52 - 86 Series, check the amount of toe-out which should be 0" to 1/16".

5. 33 - 38 Series, check the amount of toe-out which should be 3/64" to 5/32".

   NOTE: Due to the fact that the car is backed onto an alignment machine, the actual toe-out will be read on the scale as toe-in. However, if the toe-out is checked with a tram gauge, disregard the aforementioned.

6. If a tram is used for checking toe-out, it will still be necessary to perform Steps 1 and 2 in order to check camber.

The necessary straightening operations may be performed using frame straightening equipment without removing the axle housing from the car. This procedure will allow checks during the straightening operation to determine when the housing is within the prescribed limits.

REAR STABILIZER SHAFT

The rear stabilizer shaft is available with Option G-69 only and is attached as shown in Fig. 4-12.

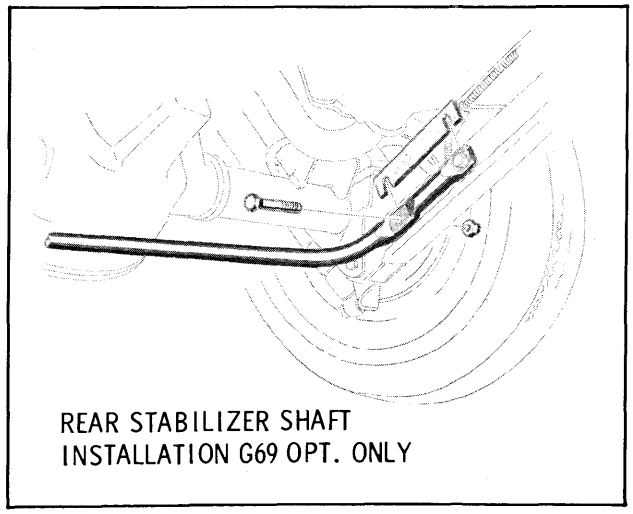

Fig. 4-12 Rear Stabilizer Shaft Installation

SERVICE DIAGNOSIS

REAR SUSPENSION NOISE

Possible Causes:

1. Improperly torqued upper or lower control arm bolts.
2. Worn bushings.
3. Loose shock absorber bolts and nuts.
4. Spring out of position.
5. Broken welds.
6. Bent control arms.

TORQUE SPECIFICATIONS

Application	Ft. Lbs. 33 - 38	Ft. Lbs. 52 - 86
Shock Absorbers		
Upper Attaching Bolts and Nuts (Exc. Ext. S.W.)	20	20
Upper Attaching Nut (Ext. S.W.)	20	
Lower Stud Nut	45	45
Suspension Arms		
*Upper Arm to Frame	75	75
*Upper Arm to Differential	75	75
*Lower Arm to Frame	75	75
*Lower Arm to Differential	75	75
Stabilizer Shaft to Lower Control Arm	45	45
Spring Clamp	30	

*Torque with Weight of Car on Wheels

PROPELLER SHAFT

33-86 SERIES

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33 THROUGH 52 SERIES

PERIODIC MAINTENANCE

The propeller shaft slip yoke does not require a scheduled lubrication interval. Universal joints, under both hot and cold weather conditions, do not require a scheduled lubrication interval.

DESCRIPTION

The rear yoke shaft on all Automatic Transmission equipped cars, is bonded in rubber to the inside of the propeller shaft tube and cannot be removed for service. The shaft used on manual transmission equipped cars is one piece.

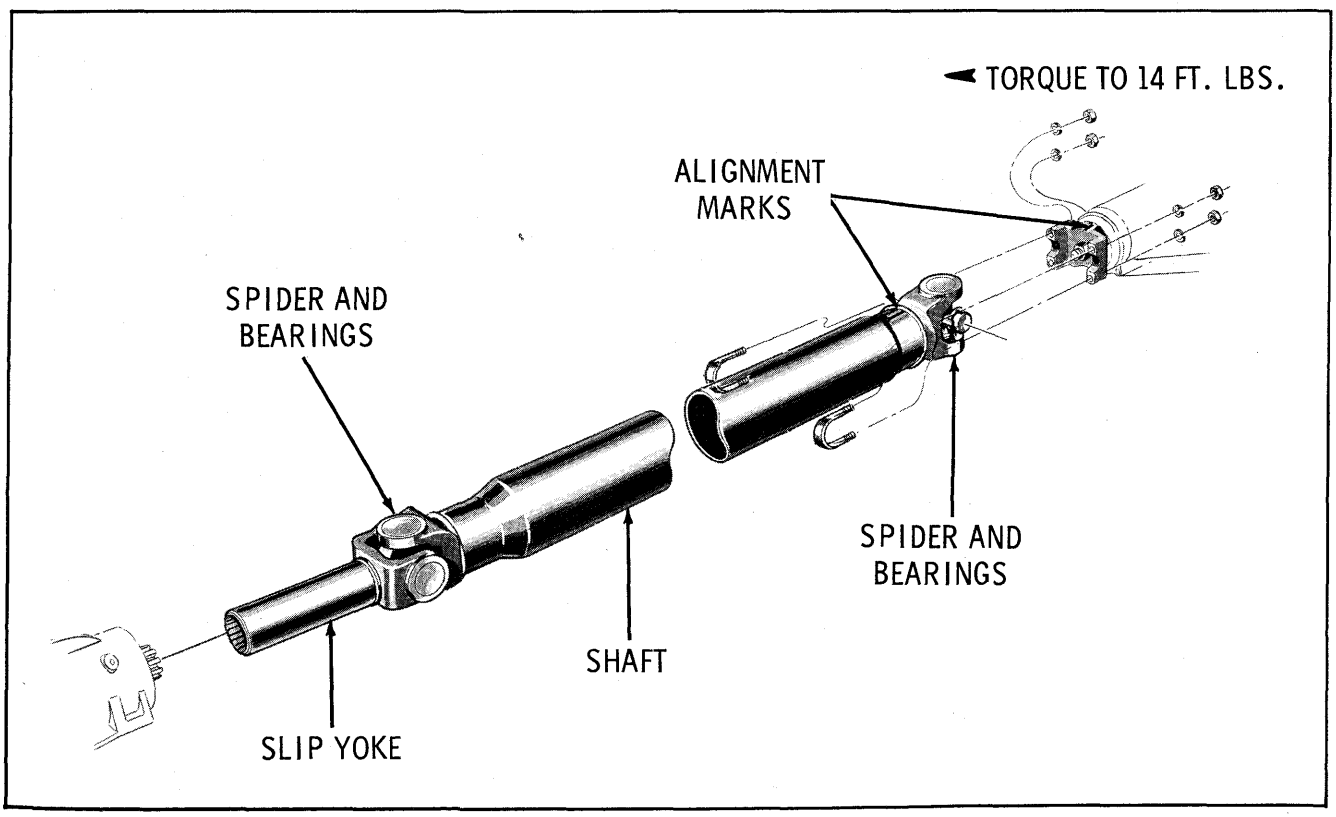


Fig. 4A-1 Propeller Shaft Installation

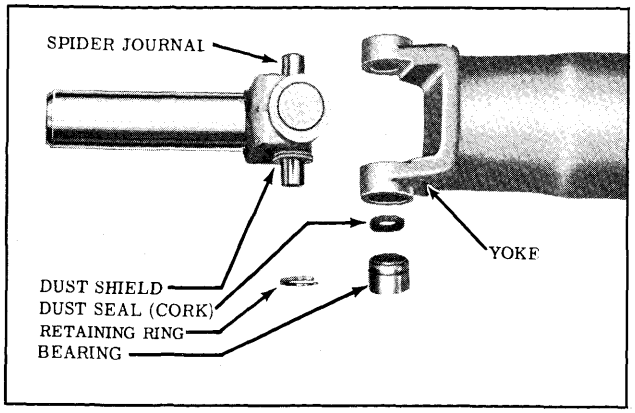


Fig. 4A-2 Universal Joint Bearings

The propeller shaft assembly is a balanced unit and should be kept free of undercoating or other material which could upset the balance.

Remove and Install (Fig. 4A-1)

1. Mark the companion flange and propeller shaft so they can be reinstalled in their original position.
2. Remove the four nuts and lockwashers from the U-bolts at the differential companion flange.

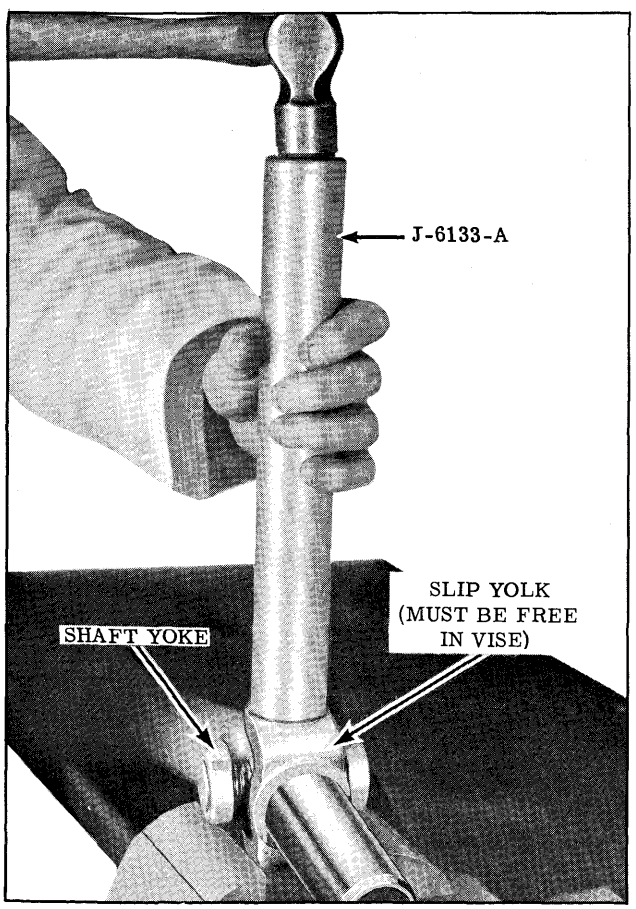


Fig. 4A-3 Partial Bearing Removal

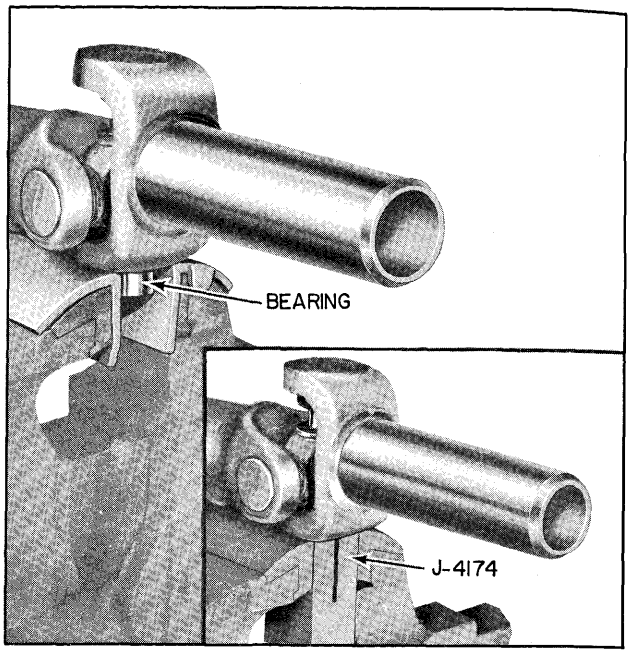


Fig. 4A-4 Bearing Removal

3. If the companion flange U-joint bearings are not retained with a metal retaining strap, use a piece of wire or tape to hold bearings on their spider journals.
4. Lower the rear of the shaft and slide rearward.

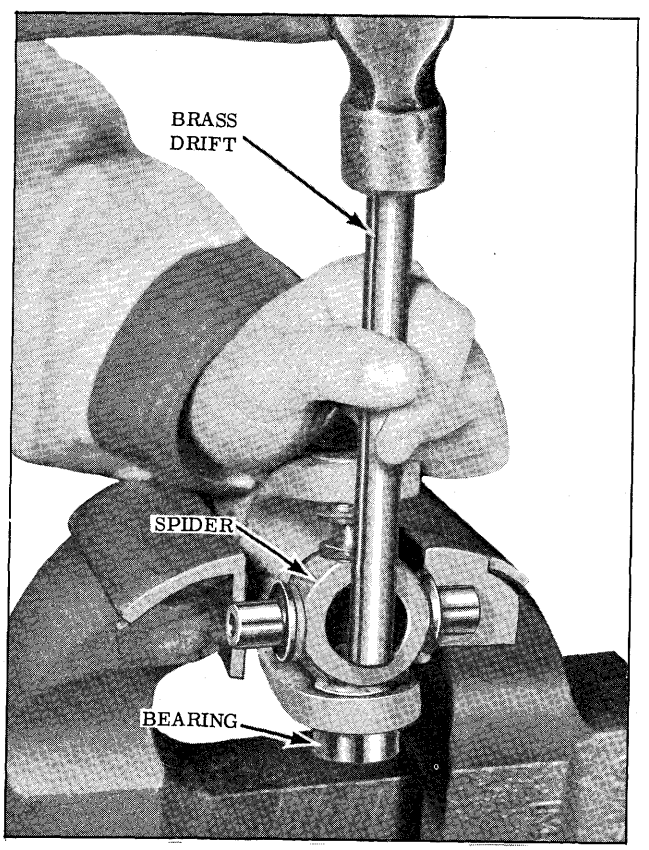


Fig. 4A-5 Partial Bearing Removal

To install, reverse removal procedure. Torque U-bolt nuts to 14 ft. lbs.

UNIVERSAL JOINT BEARINGS REMOVAL (Fig. 4A-2)

1. With propeller shaft removed from the car, remove all bearing retaining rings.

   NOTE: Mark both yoke and shaft so that the units may be reassembled in their original position in order to maintain the original balance.

2. Position the slip yoke end of propeller shaft on a vise so that the shaft yoke rests on top of the vise jaws. The slip yoke must be free to move vertically between jaws of vise.

3. Apply force on yoke around bearing. (Fig. 4A-3) This will drive the slip yoke down, causing spider to force bearing partially out of the yoke.

4. Clamp the partially exposed bearing in a brass jawed vise, then tap yoke until bearing is removed. (Fig. 4A-4) Remove bearing from vise.

   NOTE: The use of Tool J-4174 will facilitate removal of bearings. (Inset, Fig. 4A-4)

5. Remove slip yoke from spider.

6. Clamp shaft yoke in vise.

   NOTE: Do not clamp the propeller shaft tube in a vise.

7. Drive on spider until bearing is partially forced out of yoke. (Fig. 4A-5)

8. Clamp partially exposed bearing in a brass jawed vise and tap on yoke until bearing is removed.

9. To remove opposite bearing, repeat Steps 7, 8 and 9.

10. Remove spider from shaft yoke.

11. Remove spider and bearings.

Installation

1. Press dust seal into recess.

2. If new dust shields are to be installed, install at this time.

3. Position a spider journal in a shaft yoke.

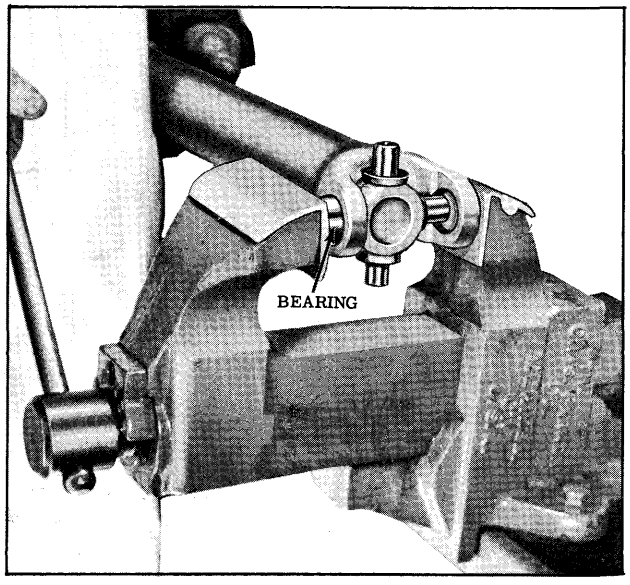


Fig. 4A-6 Installing Bearings

4. Press a bearing into one side of yoke until retaining ring can be installed. (Fig. 4A-6)

5. Install retaining ring. Retaining rings must be installed with the gap toward the yoke.

6. Repeat Steps 4 and 5 on opposite bearing. As the bearing is installed, align spider journal with the bearing.

7. To install the slip yoke, position the yoke over the spider journal with scribe marks aligned and repeat Steps 4, 5 and 6.

8. Position bearings which attach to a companion flange onto the spider journals and retain with wire or tape.

54 THROUGH 86 SERIES

PERIODIC MAINTENANCE

The propeller shaft slip yoke does not require a scheduled lubrication interval. However, if at high mileage a tendency for stickiness should develop at the slip yoke, it should be lubricated with one ounce of Seal Lubricant, Part No. 1050169. Universal joints, under both hot or cold weather conditions, do not require a scheduled lubrication interval.

DESCRIPTION (Fig. 4A-7)

The rear yoke shaft is bonded in rubber to the inside of the propeller shaft tube and cannot be removed for service.

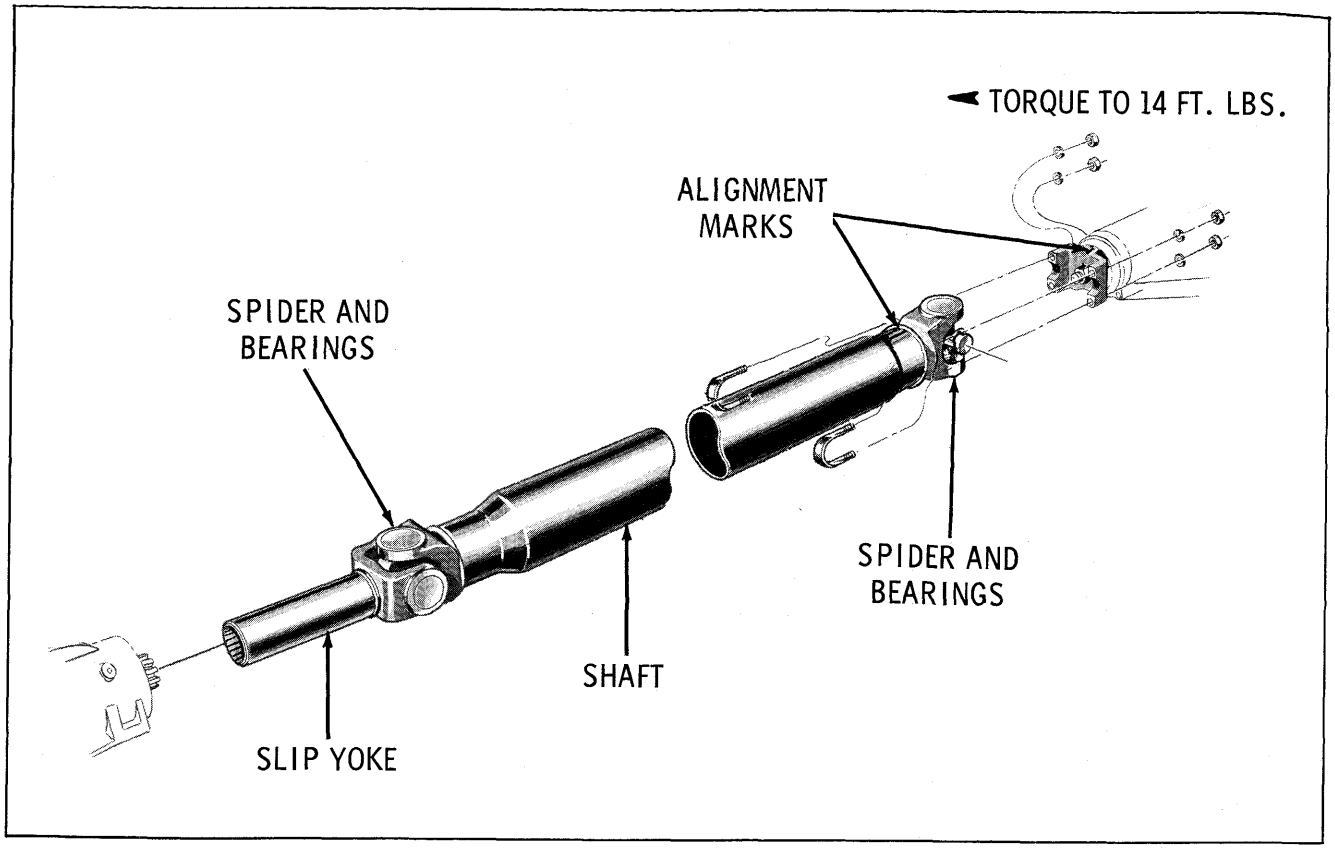


Fig. 4A-7 Propeller Shaft Installation

Both Saginaw and Spicer propeller shaft assemblies are used. Refer to Fig. 4A-8 for identification.

The propeller shaft assembly is a balanced unit and should be kept free of undercoating or other material which could upset the balance.

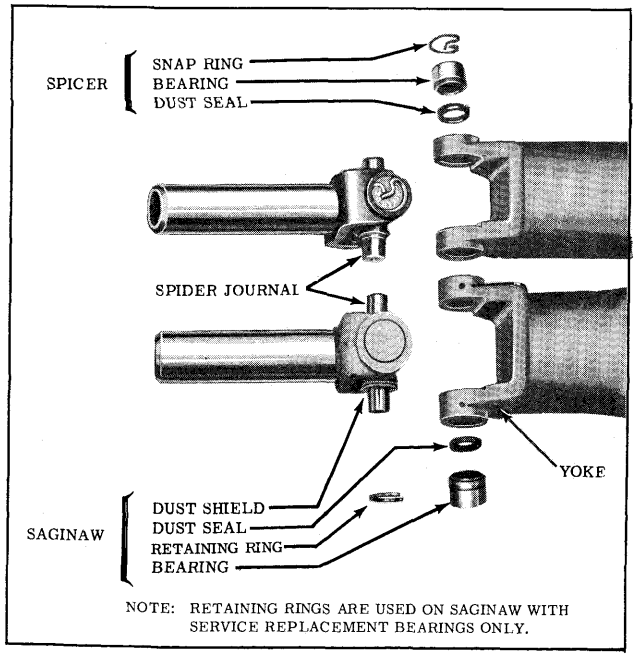


Fig. 4A-8 Propeller Shaft Identification

Remove and Install

1. Mark the companion flange and the propeller shaft so that they can be reinstalled in their original location.

2. Remove the nuts and lockwashers from the four U-bolts and remove the U-bolts from the differential companion flange.

3. If the companion flange U-joint bearings are not retained with a metal retaining strap, use a piece of wire or tape to hold bearings on their spider journals.

4. Lower the rear of the shaft and slide rearward.

To install, apply one ounce of Seal Lubricant, Part No. 1050169, to the splines of the slip yoke (Automatic Transmission only) and reverse removal procedure. Torque U-bolt nuts to 14 ft. lbs.

UNIVERSAL JOINT BEARINGS—REMOVE

Saginaw Type (Fig. 4A-8)

Production Saginaw propeller shafts use an internally molded nylon retainer to retain the universal joints bearings to the yoke. When servicing this type of bearing, the molded nylon retainer is

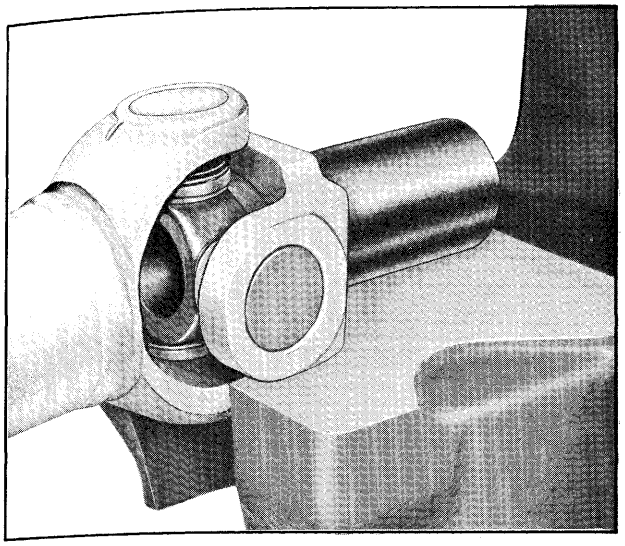


Fig. 4A-9 Supporting Propeller Shaft

sheared when the bearing is disassembled and new bearings with metal retaining rings must be reinstalled.

1. With propeller shaft removed from the car, remove all bearing retaining rings if so equipped.

   NOTE: Mark both yoke and shaft so that the units may be reassembled in their original position in order to maintain the original balance.

2. Support splined yoke on a press bed with the rear of the propeller shaft on a stand so shaft is horizontal. Be sure the weight is evenly distributed on each side of the splined yoke and that the fixed yoke half of the U-joint is free to move downward. (Fig. 4A-9)

3. Using a piece of pipe or similar tool with a diameter sufficiently large to encircle bearing

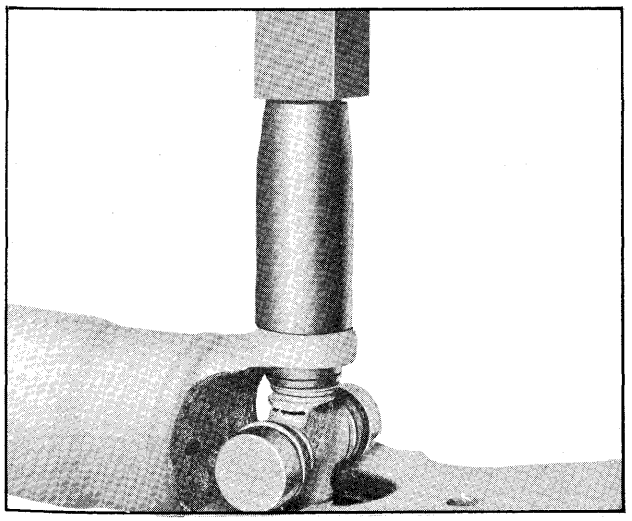


Fig. 4A-10 Pressing Out Bearings

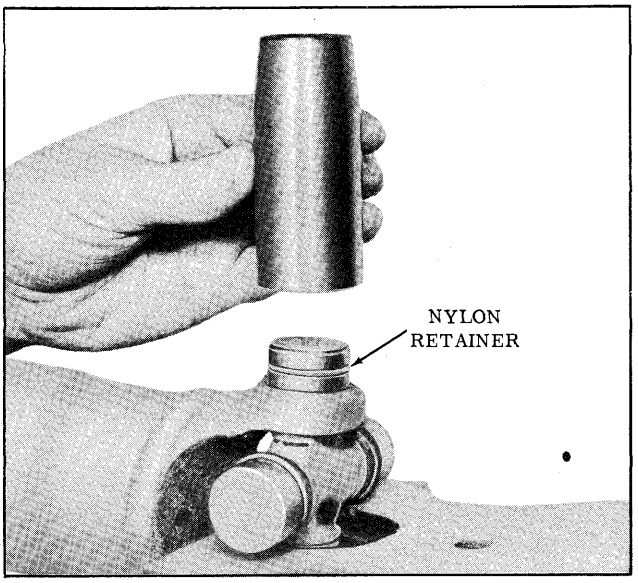


Fig. 4A-11 Partial Bearing Removal

(slightly larger than 1-1/8 inches), apply force on fixed yoke until nylon retainer breaks. (Fig. 4A-10) Continue to apply force until the downward movement of the yoke and the stationary position of the journal forces the bearing almost completely out of yoke. (Fig. 4A-11)

4. Rotate the propeller shaft 180° and repeat Step 3 to partially remove opposite bearing.

5. Completely remove bearings by tapping around circumference of exposed portion with a hammer. (Fig. 4A-12)

6. Remove splined yoke and journal from fixed yoke.

7. Remove bearings and journal from splined yoke.

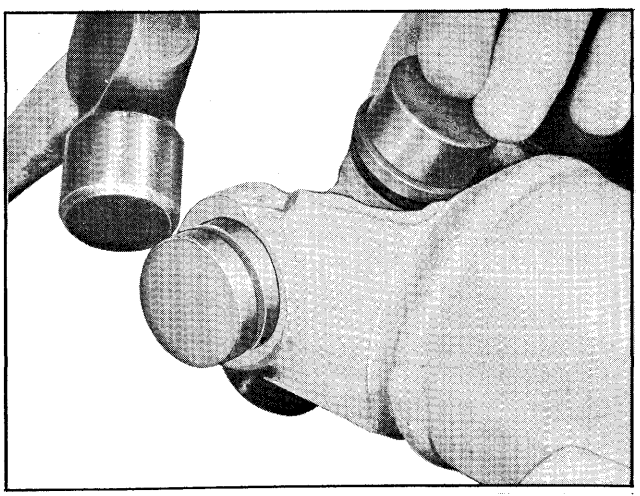


Fig. 4A-12 Removing Bearing

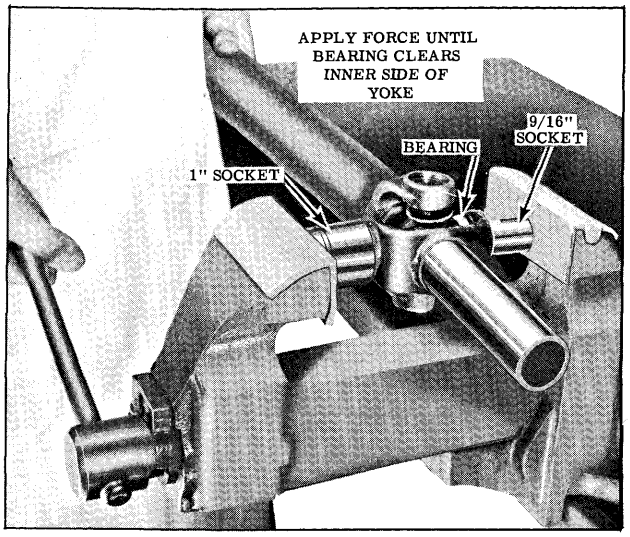


Fig. 4A-13 Pressing Bearing From Yoke (Spicer)

8. Remove bearings and journal from fixed yoke in a similar manner.

Spicer Type (Fig. 4A-8)

1. With propeller shaft removed, remove all retaining rings that retain bearings in the yoke.

   NOTE: Mark the slip yoke and fixed yoke, so that the units may be reassembled in their original position to maintain original balance.

2. Press the bearings from the yoke as shown in Fig. 4A-13. Continue pressing until bearing which is pushed by the 9/16" socket clears inner side of yoke.

3. Remove propeller shaft and sockets from vise.

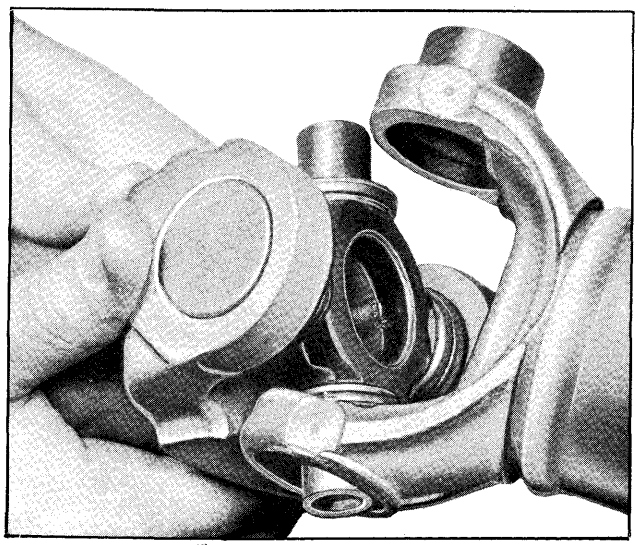


Fig. 4A-14 Installing Spider Journal

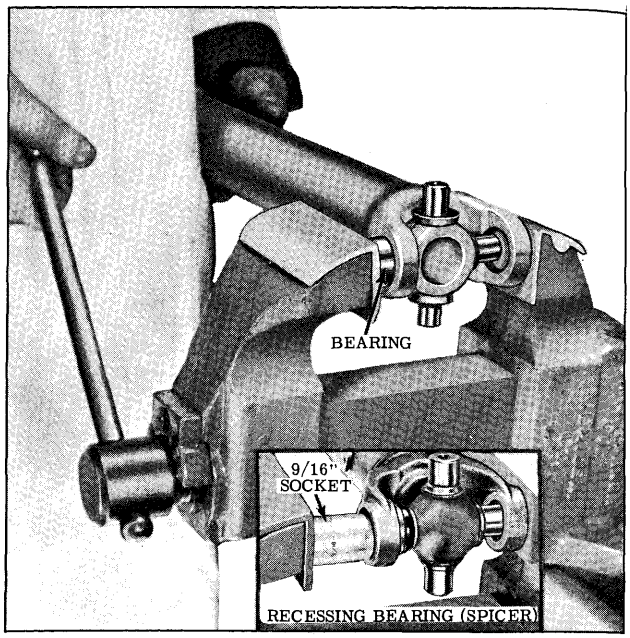


Fig. 4A-15 Installing Bearings

4. If exposed bearing on the outer side of yoke is still tight, clamp bearing in a brass jawed vise and tap yoke until bearing is free.

5. Remove slip yoke from spider. Remove bearing from spider journal.

6. To remove bearings from the fixed yoke, repeat Step 2.

7. Clamp exposed bearing in a brass jawed vise and tap yoke until bearing is free.

8. Remove spider from the fixed yoke.

9. The bearings can be removed from the rear fixed yoke in a similar manner.

UNIVERSAL JOINT BEARINGS—INSTALL

Saginaw and Spicer

1. Install neoprene dust seals on the bearings.

2. Install dust shields on Saginaw spiders.

3. Position a spider journal in a shaft yoke. (Fig. 4A-14)

4. Press a bearing into one side of yoke until retaining ring can be installed. (Fig. 4A-15)

   NOTE: On Spicer units, the bearing must be recessed into the yoke so that the retaining ring can be installed. The bearing can be recessed with a 9/16" socket and vise. (Inset, Fig. 4A-15).

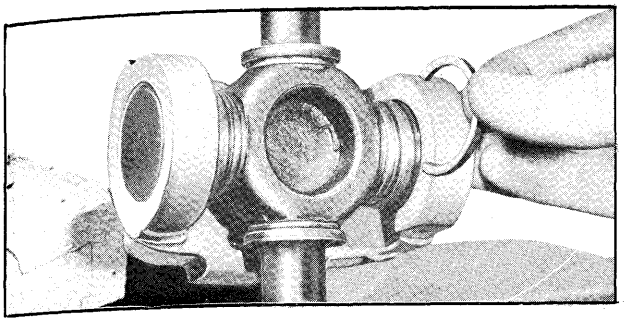


Fig. 4A-16 Installing Retaining Rings (Saginaw)

Install retaining rings. Retaining rings on Saginaw units must be installed with the gap toward the yoke. (Fig. 4A-16)

Repeat Steps 4 and 5 on opposite bearing. As the bearing is installed, align spider journal with the bearing.

To install the slip yoke, position the yoke over the spider journal with scribe marks aligned and repeat Steps 4, 5 and 6.

Position bearings which attach to a companion flange, onto the spider journals and retain with wire or tape.

33 THROUGH 86 SERIES

SERVICE DIAGNOSIS

PROPELLER SHAFT VIBRATION

Possible Causes:

1. Worn spider.
2. Worn universal bearings or needle bearings missing.
3. Propeller shaft sprung or out-of-balance.
4. Undercoating.
5. Loose companion flange nut.
6. Bent companion flanges.
7. Shifted springs.
8. Weak springs.
9. Joint not seated in companion flanges.
10. Companion flanges not aligned.
11. Excessive propeller shaft runout.
12. Spring pads not welded at the same angle.
13. Bent transmission or pinion flanges (check with dial indicator).
14. Sprung transmission output shaft and/or rear axle pinion (check with dial indicator).
15. Rear springs not matched.
16. Bent rear axle housing.
17. Rear frame section at kickup may be humped due to the car being hit in the rear.
18. Drive shaft and universal joints 180° out of phase.

UNIVERSAL JOINT NOISE

Possible Causes:

1. Improper lubrication.
2. Worn universal joint bearings.
3. Propeller shaft flange bolts loose.
4. Brinnelled spider.

DRIVE LINE ALIGNMENT

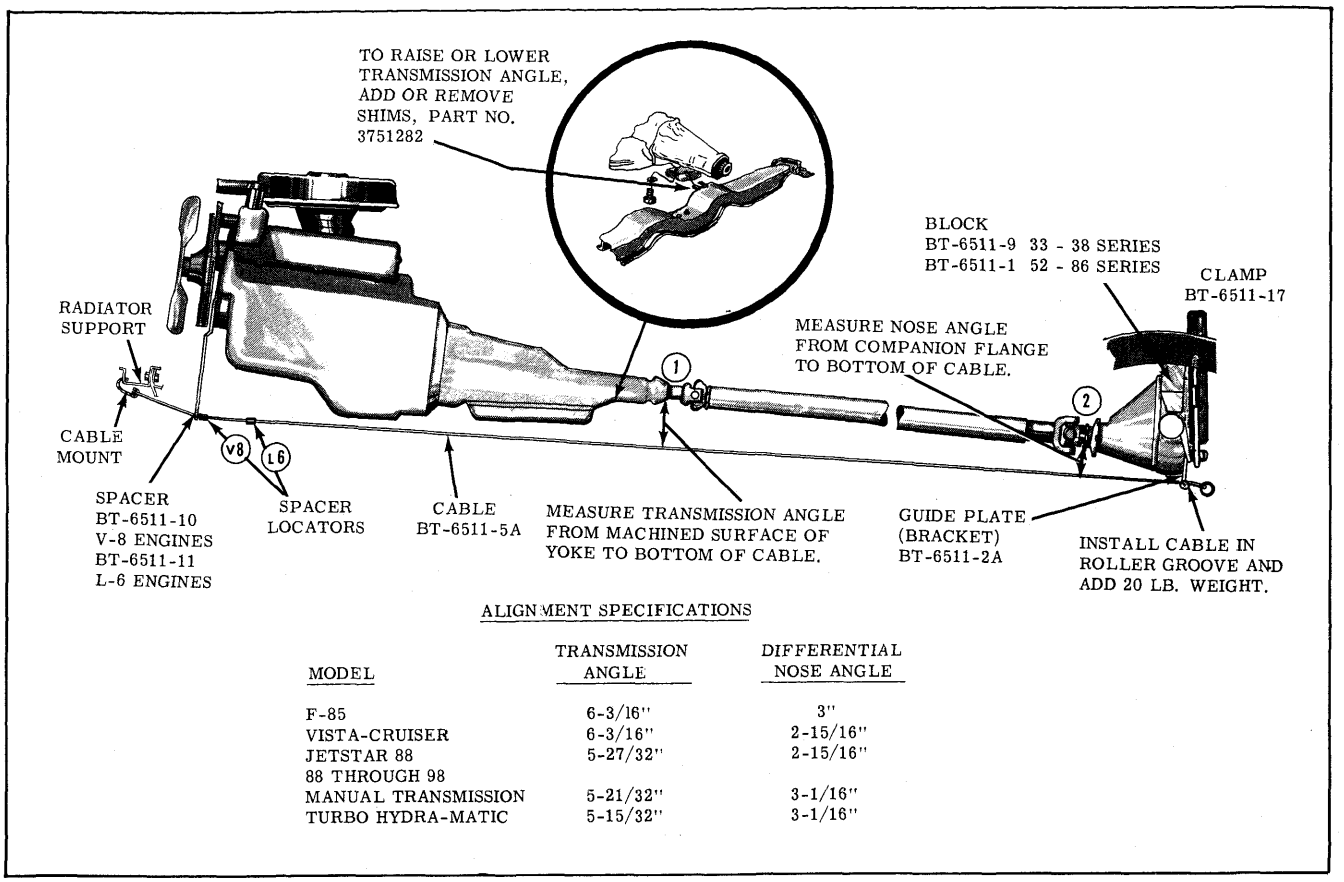
Proper alignment of the drive line components is necessary to provide vibration free operation through all speed ranges and driving conditions.

Shudder on acceleration and/or vibration while driving or during braking can be the result of misalignment of the drive line.

The available Drive Shaft Alignment Kit, BT-6511 can be used to check drive line alignment.

CHECKING (33-86 SERIES)

1. Install Differential Guide Plate BT-6511-2A on differential. (Fig. 4A-17) Special spacers and bolts are provided with the guide plate to space it away from the cover plate flange.
2. Install Cable BT-6511-5A. Fasten the cable hook through the existing hole in the radiator support. Assemble the ring end of the cable over the guide plate pulley and attach a 20 lb. weight to the ring as shown. Do not drop weight to tighten cable.
3. Install Spacer BT-6511-10 so that it rests against the machined surface of the crankshaft pulley and contacts the timing cover and the spacer locator on the cable.
4. Select the correct wood blocks for the series car being checked and install between the rear axle housing and frame. Blocks must rest solidly on axle housing, not on casting flash, dirt, etc.



ALIGNMENT SPECIFICATIONS

MODEL	TRANSMISSION ANGLE	DIFFERENTIAL NOSE ANGLE
F-85	6-3/16"	3"
VISTA-CRUISER	6-3/16"	2-15/16"
JETSTAR 88	5-27/32"	2-15/16"
88 THROUGH 98		
MANUAL TRANSMISSION	5-21/32"	3-1/16"
TURBO HYDRA-MATIC	5-15/32"	3-1/16"

Fig. 4A-17 Drive Line Alignment

5. Install Hold-Down Clamps BT-6511-17 as shown in Fig. 4A-17. Install upper hook through hole in frame and lower hook around shock mount. Adjust turnbuckles on clamps until wood blocks fit snugly between axle housing and frame. Hold down on rear bumper while adjusting turnbuckle.

   NOTE: The above adjustment is very critical for accurate measurement of transmission angle and should be performed carefully.

6. To check alignment, place a steel scale against the machined surface of the splined yoke immediately next to the rear transmission seal, read measurement to bottom of cable. Record measurement.

7. Place steel scale against differential companion flange and measure to bottom of cable. Record measurement and compare measurements with chart shown in Fig. 4A-17.

8. If not within specifications, make corrections as follows.

DRIVE LINE CORRECTIONS

1. To lower transmission angle on 52 through 86 Series, remove shims from beneath transmission mount as necessary to obtain specified dimension.

33 through 38 Series do not have a provision for lowering the transmission since the transmission is mounted directly to the support. Although it is very rare that 33 through 38 Series transmissions will be found low. If

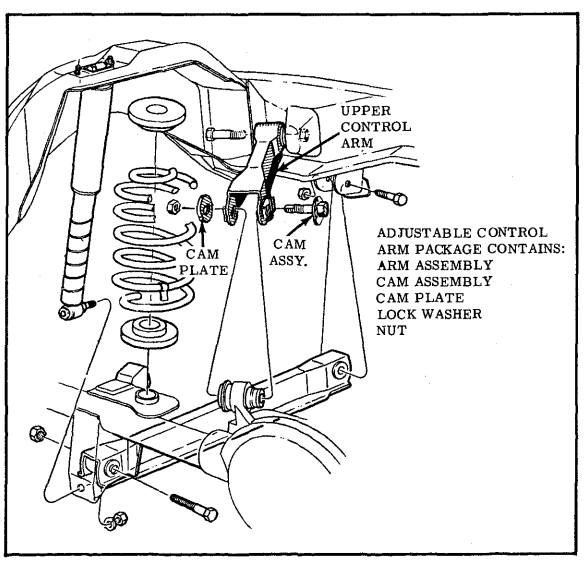


Fig. 4A-18 Adjustable Control Arm Installation

one is encountered, the differential nose angle should also be lowered slightly to obtain a suitable propeller shaft angle.

2. To raise transmission angle, add shims as necessary to obtain the correct angle.

   NOTE: Use care when installing shims on 33 through 38 Series to avoid contact between transmission and floor pan.

3. To adjust differential nose angle, remove upper control arms and replace with Adjustable Control Arm Package (two required per car). The adjustable arm package includes an adjustable cam assembly that is used to obtain correct nose angle.

4. Install arms, Fig. 4A-20, assemble cam so that alignment marks are centered and tighten cam assembly nuts finger tight.

5. Adjust nose angle by rotating either cam bolt until correct measurement is obtained.

6. Tighten nut and note alignment marks on cam and arm. Rotate opposite cam so that alignment marks are identical, tighten nut and recheck nose angle. If necessary, loosen nuts and readjust.

SPECIFICATIONS

PROPELLER SHAFT

Length (From Centerline of Front U-Joint to Centerline of Rear U-Joint)

33-38 Series (Exc. Ext. Wagons)	60.00"
Ext. Wagons	65.04"
52 Series, J.T.	59.69"
52 Series, Manual Transmission	59.50"
54-58 Series, Manual Transmission	58.56"
54-58 Series, A.T.	58.37"
84-86 Series, A.T.	61.37"

TORQUE

Propeller Shaft to Companion Flange Nuts	14 Ft. Lbs.

DIFFERENTIAL

33 THROUGH 86 SERIES

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PERIODIC MAINTENANCE

Periodic or seasonal lubricant changes are not recommended. The lubricant level should be checked at each oil change interval. If lubricant addition is required, add:

Conventional Differential: Special Lubricant, Part No. 1050081, or S.A.E. 90 Hypoid Gear Lubricant meeting the requirements of military specifications MIL-L-2105B.

Anti-Spin Differential: Only Special Lubricant, Part No. 1050081.

IMPORTANT: Use of other than the above mentioned type of lubricant in the Anti-Spin Differential may cause chatter. If the wrong type of lubricant is used in the Anti-Spin, it will require draining the differential and installing the recommended lubricant, Part No. 1050081. It may be necessary to drive Anti-Spin equipped cars for distances of 50 miles or more to allow the new lubricant to work through the unit before the chatter will disappear.

MINOR SERVICE OPERATIONS

PINION OIL SEAL REPLACEMENT

1. Mark the propeller shaft and companion flange so they can be reassembled in the same position.

2. Disconnect propeller shaft from differential companion flange and support shaft up in body tunnel by wiring propeller shaft to the exhaust pipe. If U-joint bearings are not retained by a retainer strap, use a piece of wire to hold bearings on their journals.

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

4. Remove companion flange nut, using Tool J-8614-01 to hold flange. (Fig. 4B-1) Remove washer.

5. Remove companion flange using Puller J-8614-02. (Fig. 4B-2)

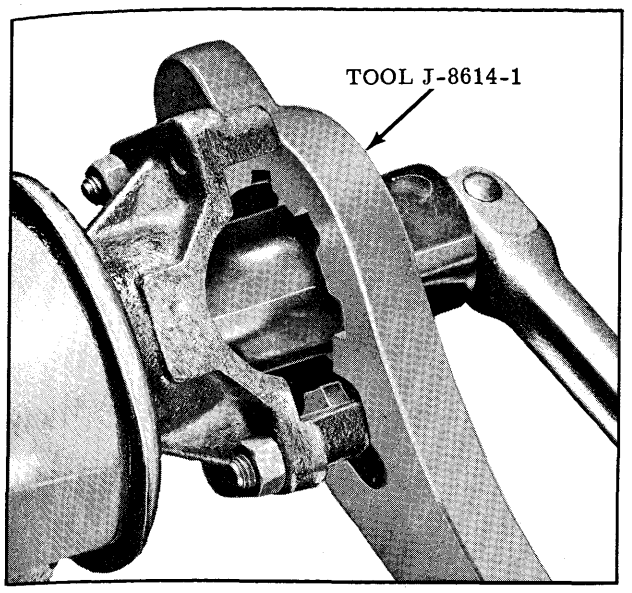


Fig. 4B-1 Removing Companion Flange Nut

6. Remove oil seal by driving it out of carrier with a blunt chisel.

7. Examine surface of companion flange for tool marks, nicks, or damaged surface such as a groove worn by the seal. If damaged, replace flange as outlined under COMPANION FLANGE REPLACEMENT.

8. Examine carrier bore and remove any burrs that might cause leaks around the OD of the seal.

9. Coat outside diameter of new seal sparingly with sealer, Part No. 1050026 and install seal as shown in Fig. 4B-3 to properly locate seal in carrier.

10. Apply Special Seal Lubricant, Part No. 1050169, to the OD of the companion flange and sealing lip of new seal.

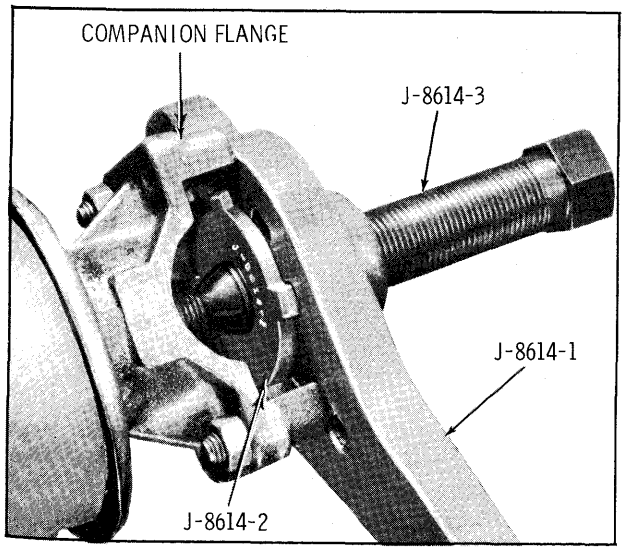


Fig. 4B-2 Removing Companion Flange

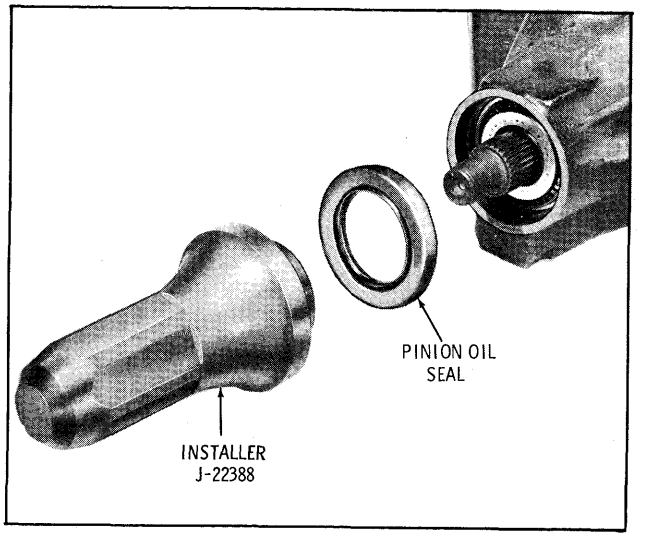


Fig. 4B-3 Installing Pinion Oil Seal

11. Install companion flange and tighten nut to the same position as marked in Step 2. While holding companion flange with Tool J-8614-01, tighten nut 1/16" beyond alignment marks.

COMPANION FLANGE REPLACEMENT

1. Remove both rear wheels and brake drums.

2. Remove both axle shafts BEING CAREFUL NOT TO DRAG THE AXLE SHAFTS ACROSS THE SEALS.

3. Mark propeller shaft and companion flange then disconnect rear universal joint and support propeller shaft by tying propeller shaft to exhaust pipe. If U-joint bearings are not retained by a retainer strap, use a piece of wire to hold bearings on their journals.

4. Remove companion flange nut using Holding Tool J-8614-01 to hold flange. (Fig. 4B-1)

5. Remove washer then remove companion flange using Puller J-8614-02. (Fig. 4B-2)

6. Apply Special Seal Lubricant, Part No. 1050169, to the OD of the new companion flange, then install companion flange, washer and companion flange nut finger tight.

7. While holding companion flange with Tool J-8614-01, tighten the nut a little at a time and turn drive pinion several revolutions after each tightening to seat the rollers. Check the pre-load of bearings each time with an inch pound torque wrench until pre-load is 10 to 15 inch pounds.

NOTE: The bearing pre-load should never exceed 25 inch pounds if the differential has been in use.

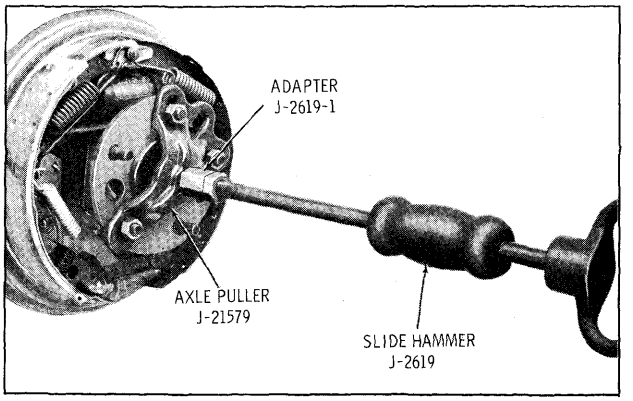


Fig. 4B-4 Removing Axle Shaft

8. Connect rear universal joint to differential companion flange.

9. Install axle shafts carefully to avoid dragging shafts across seals. Torque attaching nuts to 28 ft. lbs.

10. Install drums and wheels.

REAR AXLE HOUSING

REMOVAL AND INSTALLATION

It is not necessary to remove the rear axle housing for differential repairs. However, if the housing is damaged, it may be removed and installed following procedure given in Section 4, SUSPENSION.

AXLE SHAFT

DESCRIPTION

Design allows for axle shaft end play up to .035" 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 .035" 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.

Remove

1. Remove wheels.

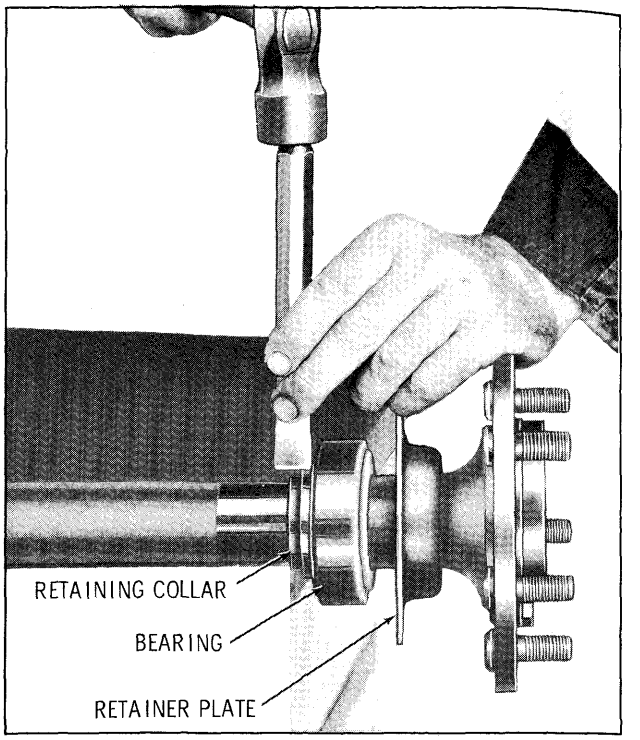


Fig. 4B-5 Removing Bearing Retainer

2. Remove brake drums.

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 as shown in Fig. 4B-4.

NOTE: While pulling axle shaft out through oil seal, support shaft carefully to avoid cutting seal lip.

AXLE SHAFT BEARING

Remove and Install

1. Nick bearing retainer in three or four places with a chisel, deep enough to spread ring. Retainer will then slip off. (Fig. 4B-5)

2. Press axle shaft bearing from the axle shaft as shown in Figs. 4B-6 and 4B-7.

3. Retainer plate which retains bearing in the axle housing must be installed on the axle shaft before the bearing is installed; retainer gasket can be installed over the bearing. Press new axle shaft bearing and retainer against shoulder on axle shaft as shown in Figs. 4B-8 or 4B-9.

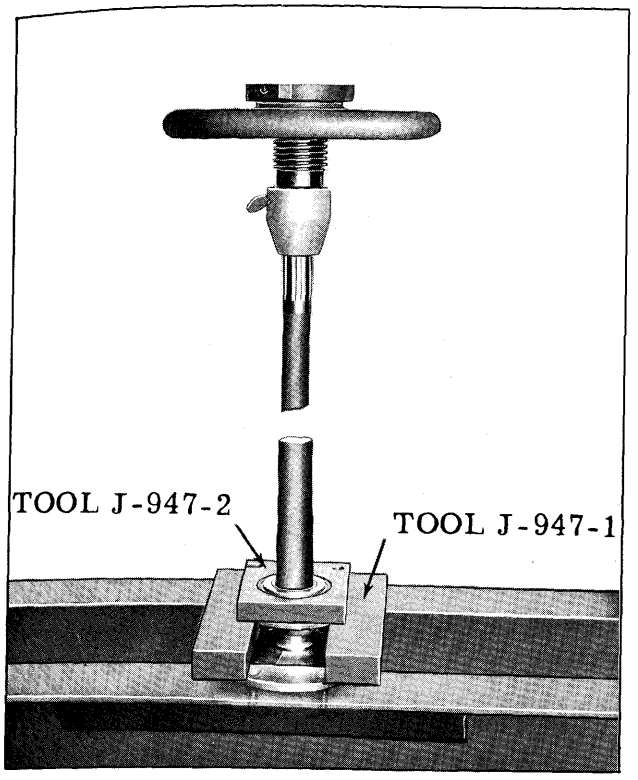


Fig. 4B-6 Removing Axle Bearing (54 through 86 Series)

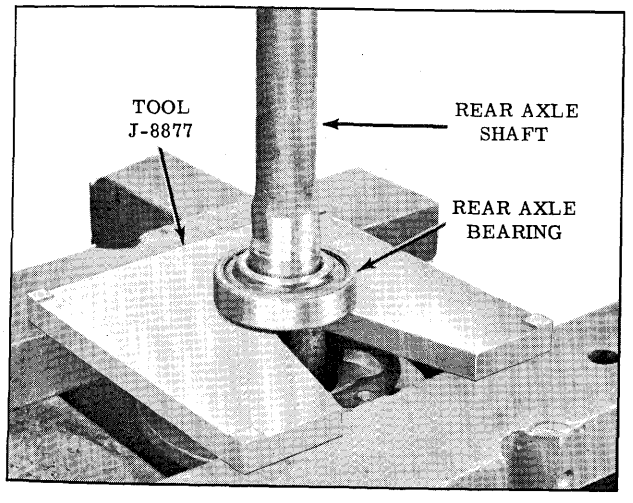


Fig. 4B-7 Removing Axle Bearing (33 through 52 Series)

AXLE SHAFT FLANGE BOLT

Remove and Install

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

2. Install new bolt by pressing through axle flange. Support bolt head and peen bolt with Peening Tool J-554-18 (54 through 86 series) and Peening Tool J-554-3 (for 33 through 52 series).

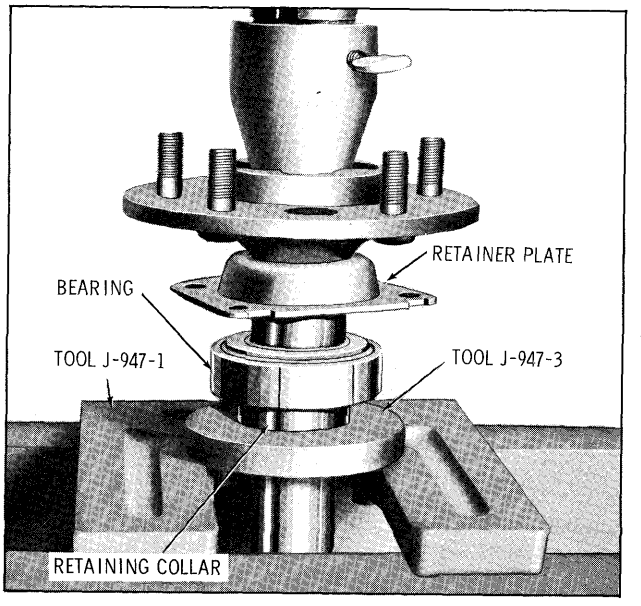


Fig. 4B-8 Installing Axle Bearing (54 through 86 Series)

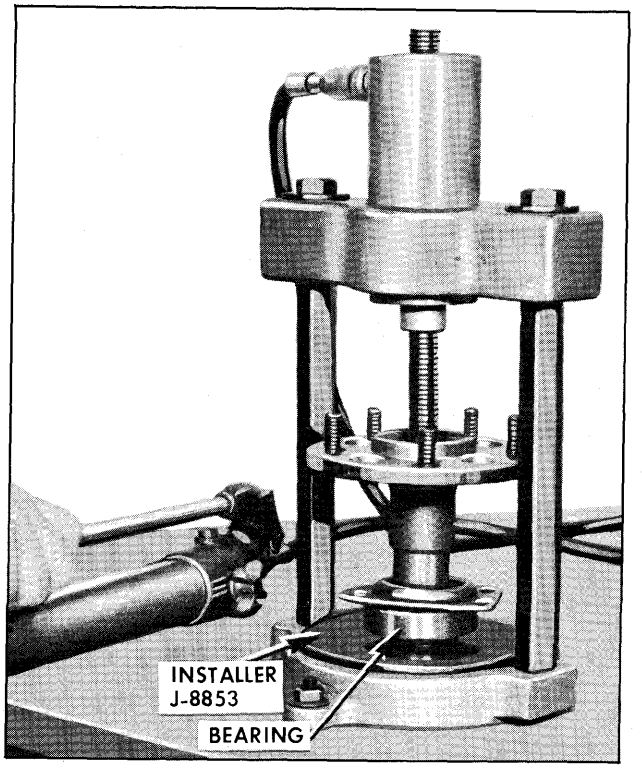


Fig. 4B-9 Installing Axle Bearing (33 through 52 Series)

AXLE SHAFT SEAL

Remove and Install

1. Remove the axle shaft.

2. Remove the axle shaft seal as shown in Fig. 4B-10.

3. Apply Sealer Part No. 1050026 to the OD of the new seal.

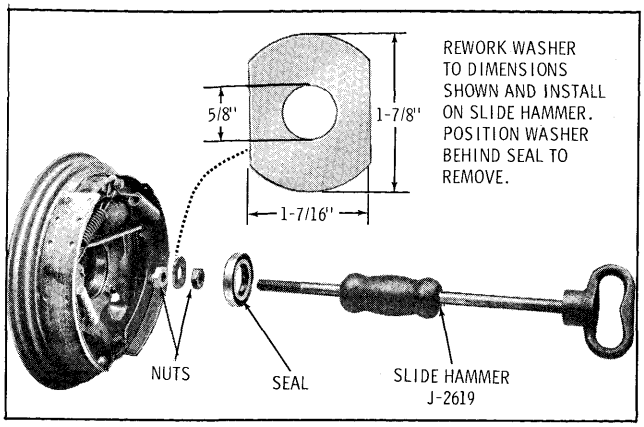


Fig. 4B-10 Removing Axle Shaft Seal

4. Install seal as shown in Fig. 4B-11. Make sure seal is fully seated.

AXLE SHAFT

Install

1. Apply a coat of wheel bearing grease in bearing recesses of housing. Install new outer retainer gaskets. To help prevent damage to the lip of the axle shaft seal when installing axle shaft and to insure 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 six 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 40 ft. lbs.

4. Install brake drums over wheel bolts.

5. Install wheels and tighten wheel nuts.

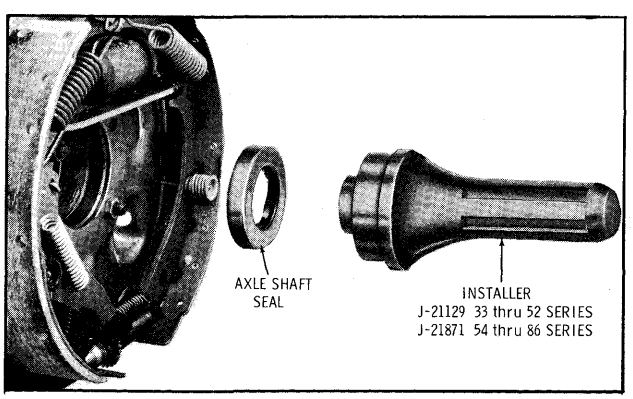


Fig. 4B-11 Installing Axle Shaft Seal

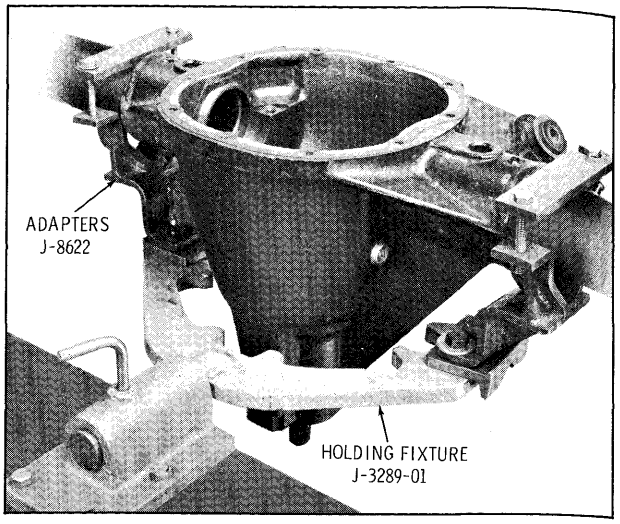


Fig. 4B-12 Differential Holding Fixture

DISASSEMBLY OF DIFFERENTIAL ASSEMBLY

Most differential service repairs can be made with the assembly in the car by disconnecting the shock absorbers and supporting the car by the frame with the axle housing lowered to its lowest maximum travel.

Lubricant may be drained by backing out all cover bolts and breaking cover loose at the bottom.

If the differential housing is removed for any reason, differential service can be performed on the bench by using the fixtures shown in Fig. 4B-12.

NOTE: When a new ring gear and pinion is installed, the owner should be advised not to accelerate rapidly or exceed 50 m.p.h. for the first 50 miles of driving.

DIFFERENTIAL CASE (Fig. 4B-13)

Remove

1. Before removing the differential from the housing, ring gear to pinion backlash should be checked. This will indicate gear or bearing wear or an error in backlash or pre-load setting which will help in determining cause of axle noise. (Fig. 4B-14)

2. Remove differential bearing cap bolts. Bearing caps should be marked "R" and "L" to make sure they will be reassembled in their original location.

3. Remove two ring gear retaining bolts from differential case and install Ring Gear and Case Remover J-21322 with slide hammer as

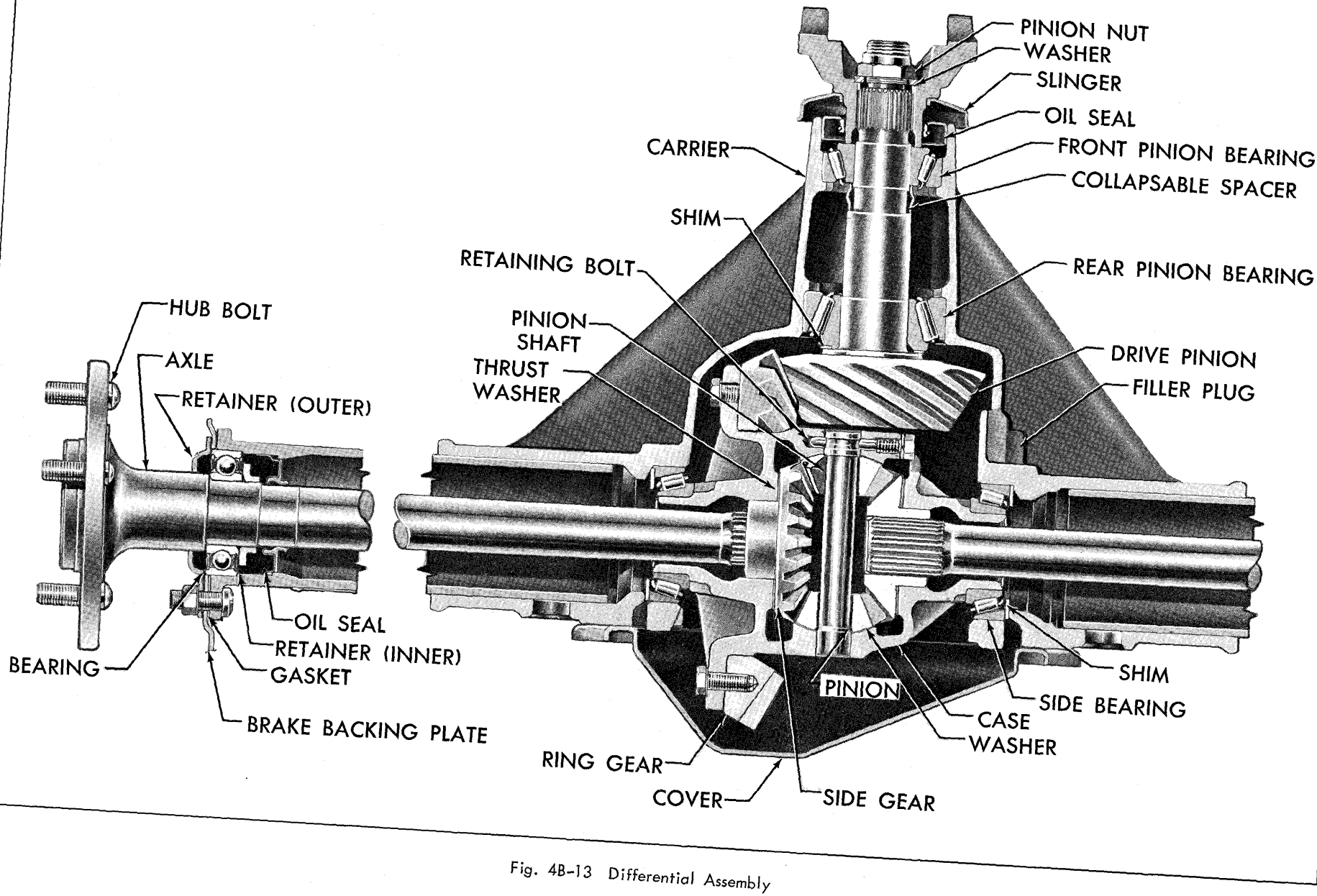


Fig. 4B-13 Differential Assembly

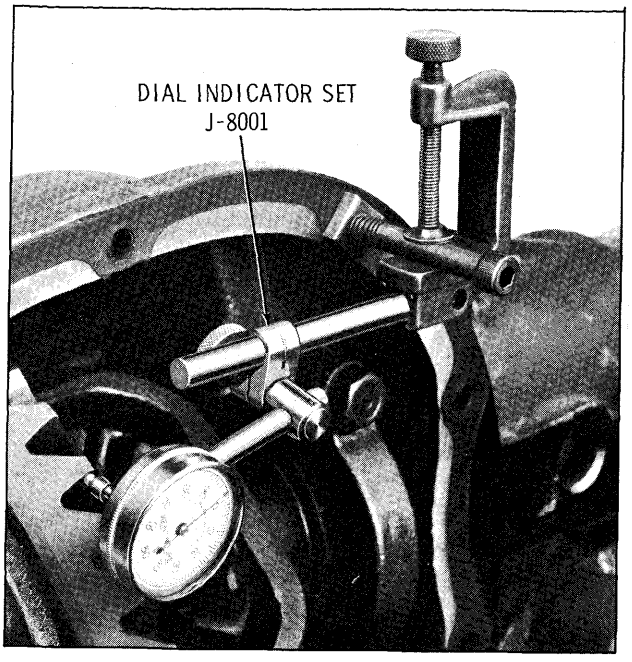


Fig. 4B-14 Checking Backlash

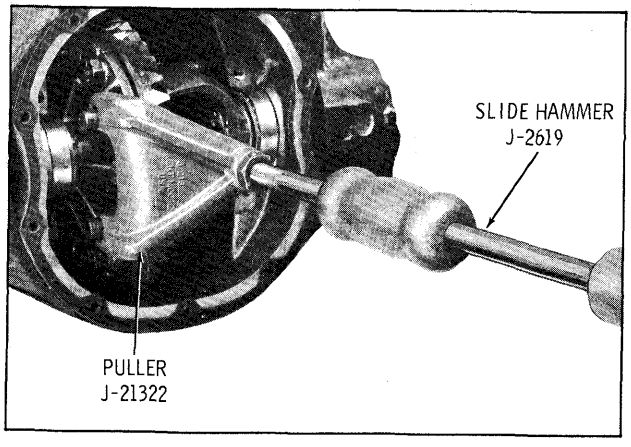


Fig. 4B-15 Removing Case Assembly

shown in Fig. 4B-15. Remove the 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.

NOTE: Ring gear attaching bolts on 54 through 86 series have LEFT hand threads. (33 through 52 have RIGHT hand threads)

Disassembly

1. If differential side bearings are to be replaced, they can be removed as shown in Fig. 4B-16.

2. Remove bolt that retains differential pinion shaft. (Fig. 4B-17) Remove differential pinions, side gears and thrust washers from case.

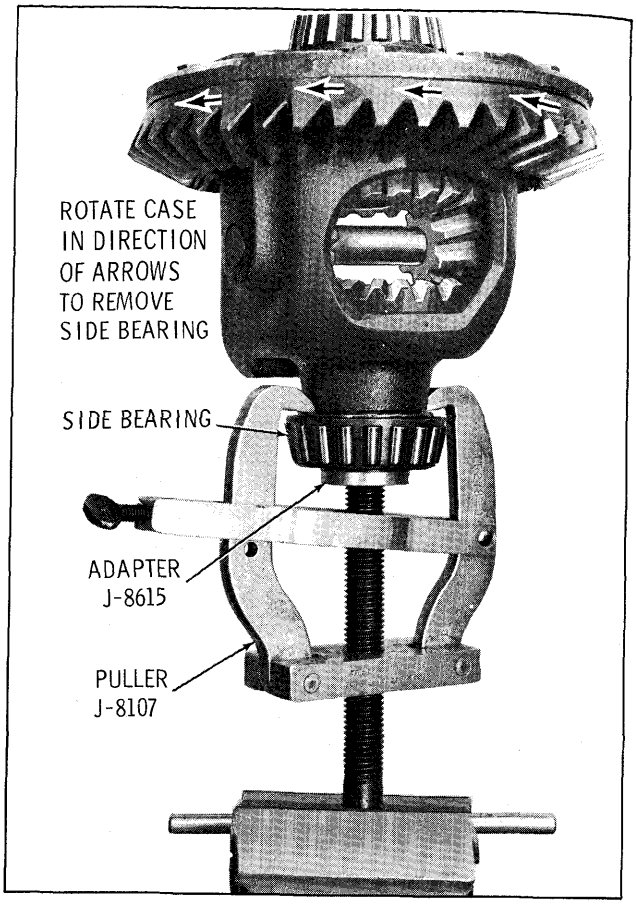


Fig. 4B-16 Removing Side Bearing

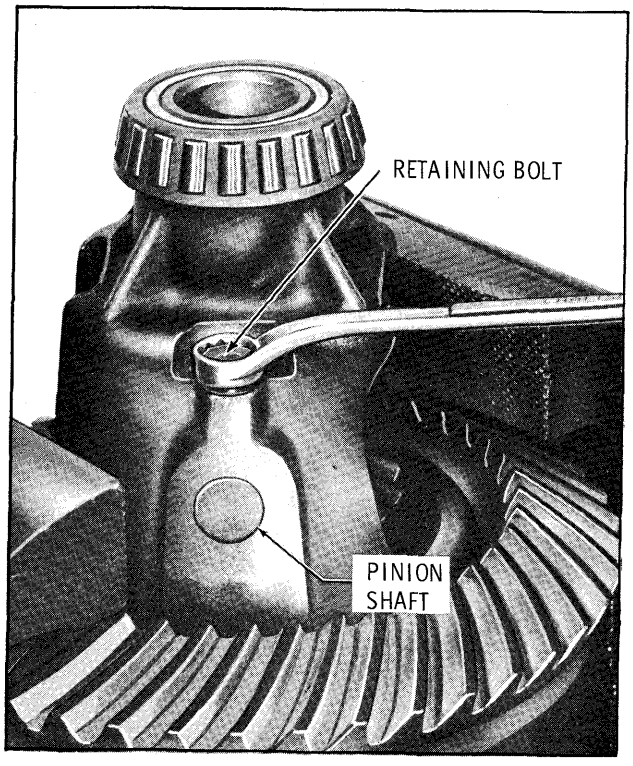


Fig. 4B-17 Removing Retaining Bolt

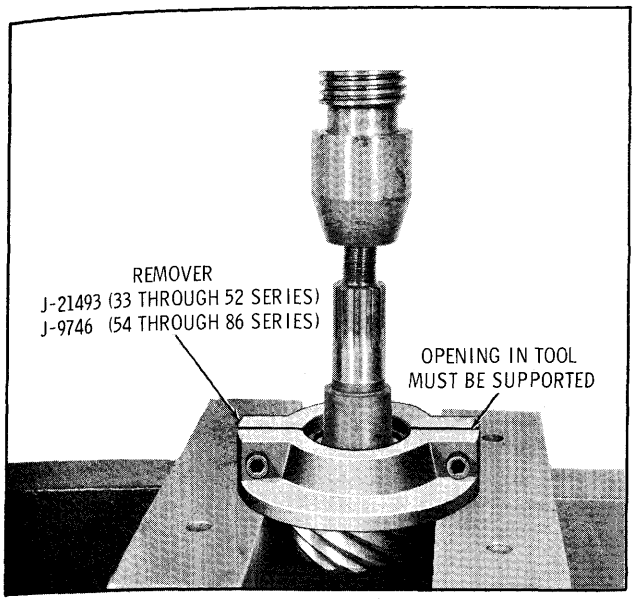


Fig. 4B-18 Removing Pinion Bearing

NOTE: Mark side gears and case so they can be installed in their original location.

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.

DRIVE PINION

Remove

NOTE: Before removing drive pinion, check ring gear to pinion back-lash as outlined under DIFFERENTIAL CASE - REMOVE.

1. Check drive pinion bearing pre-load. If there is no pre-load reading, check for looseness of pinion assembly by shaking. Looseness could be caused by defective bearings or a worn companion flange. If differential was operated for an extended period with very loose bearings, the ring gear and pinion will also require replacement.

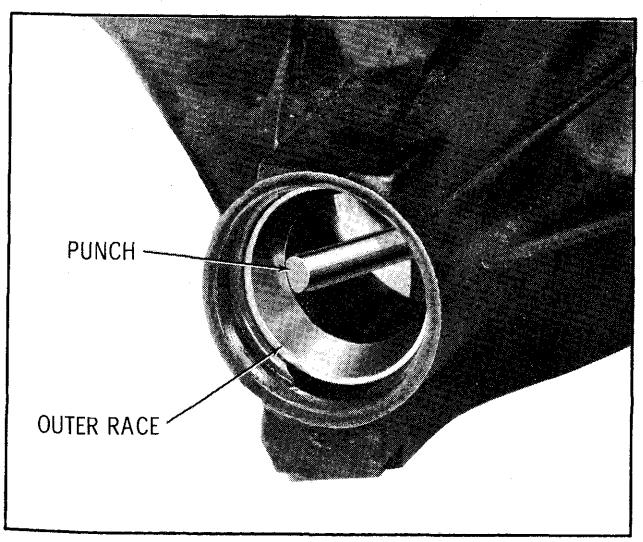


Fig. 4B-19 Removing Pinion Front Bearing Outer Race

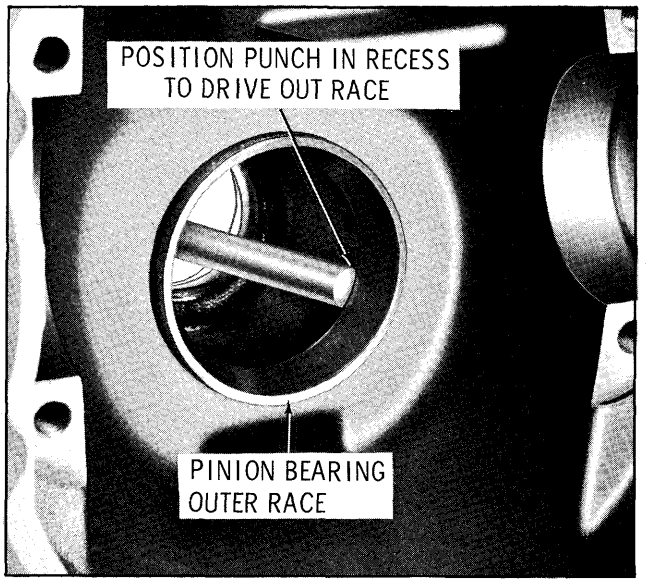


Fig. 4B-20 Removing Pinion Rear Bearing Outer Race

2. Install Holder J-8614-01 on companion flange by using two 5/16" x 2" bolts with flat washers. Remove pinion nut and washer. (Fig. 4B-1)

3. Pull companion 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. (Fig. 4B-2)

4. Remove drive 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.

Disassembly

The rear pinion bearing must be removed when it becomes necessary to change the pinion depth adjustment.

1. With drive pinion removed from carrier, press bearing from the pinion gear as shown in Fig. 4B-18.

2. Pry pinion oil seal from carrier and remove front pinion bearing. If this bearing is to be replaced, remove outer race from carrier as shown in Fig. 4B-19.

3. If rear pinion bearing is to be replaced, remove outer race from carrier using a punch in slots provided for this purpose as shown in Fig. 4B-20.

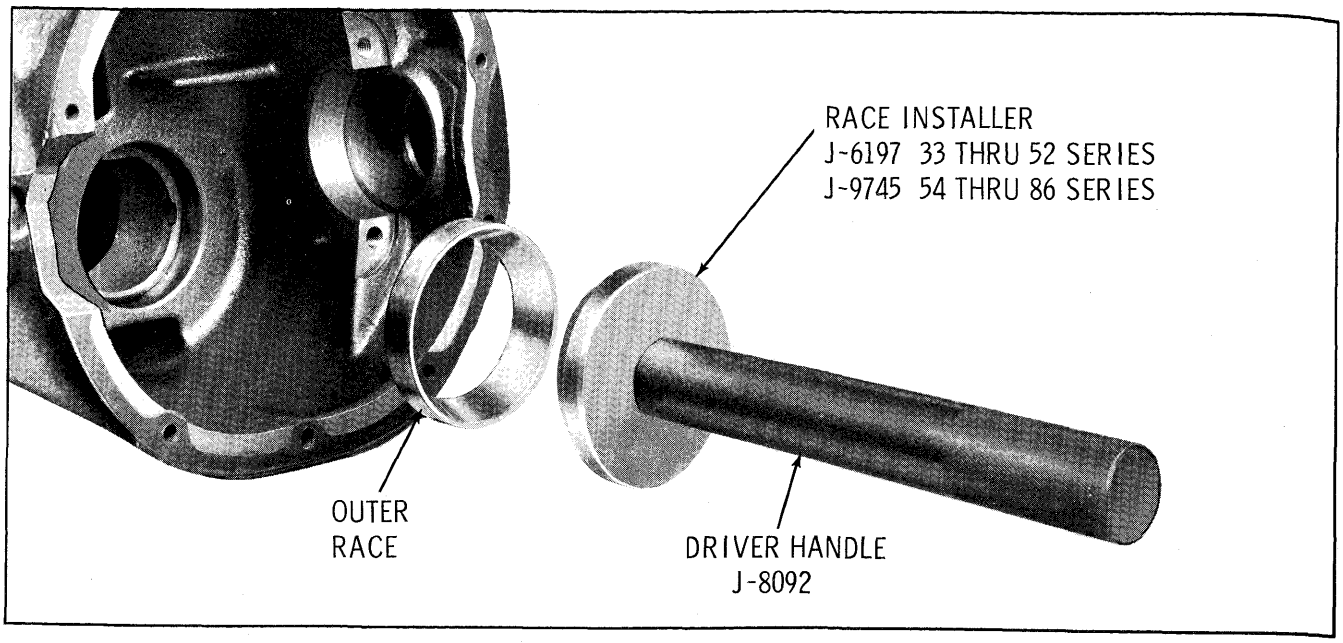


Fig. 4B-21 Installing Pinion Rear Bearing Outer Race

CLEANING AND INSPECTION

1. Clean all differential bearings thoroughly in clean solvent (do not use a brush). Examine bearings visually and by feel. All bearings should feel smooth when oiled and rotated while applying as much hand pressure as possible.

   NOTE: Minute scratches and pits that appear on rollers and races at low mileage are due to the initial pre-load, and bearings having these marks should not be rejected.

2. Examine sealing surface of companion flange for nicks, burrs, or rough tool marks which would cause damage to the seal and result in an oil leak. Replace if damaged.

3. Examine carrier bore and remove any burrs that might cause leaks around the OD of the seal.

4. Examine the differential ring gear and drive pinion teeth for excessive wear and scoring. Any of these conditions will require replacement of the gear set.

5. Inspect the differential pinion gear shaft for unusual wear; also check the pinion and side gears and thrust washers.

6. Check the press fit of the side bearing inner race on the differential case hub by prying against the shoulder at the puller recess in the case. Side bearings must be a tight press fit on the hub.

7. Diagnosis of a differential failure such as: chipped bearings, loose (lapped-in) bearings, chipped gears, etc., is a warning that some foreign material is present; therefore, the axle housing must be cleaned.

DRIVE PINION

Assembly

1. If a new rear pinion bearing is to be installed, install new outer race as shown in Fig. 4B-21.

2. If a new front pinion bearing is to be installed, install new outer race as shown in Fig. 4B-22.

Adjusting Pinion Depth

Pinion depth is set with Pinion Setting Gauge J-21777. The pinion setting gauge provides in effect, a "nominal" or "zero" pinion as a gauging reference.

1. Make certain all of the gauge parts are clean.

2. Lubricate front and rear pinion bearings liberally with differential lubricant, Part No. 1050081.

3. While holding bearings in position, install Gauge Plate J-21777-2, Pilot J-21777-8 (54 through 86 series only), Stud J-8619-13 and Washer J-8619-12 and Nut as shown in Figs. 4B-23 or 4B-24.

4. Hold stud stationary with a wrench positioned over the flats on the ends of stud and tighten nut to 20 in. lbs. torque. Rotate gauge plate

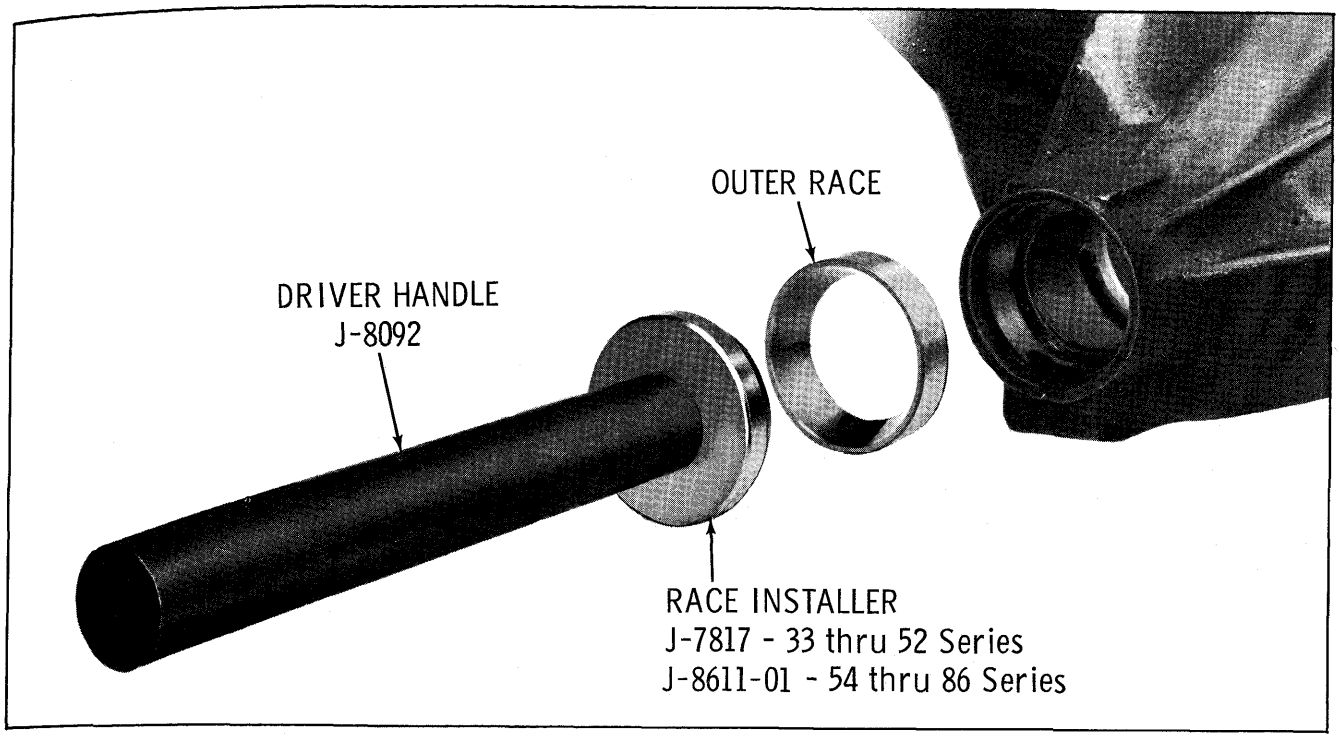


Fig. 4B-22 Installing Pinion Front Bearing Outer Race

assembly several complete revolutions to seat the bearings. Then tighten nut until a torque between 15 and 25 in. lbs. is required to keep the gauge plate in rotation.

5. Rotate the gauge plate until the gauging areas are parallel with the discs.

NOTE: The gauging area marked "B" is used with Discs J-21777-3 and the gauging area marked "A" is used with Discs J-8619-10. (Fig. 4B-25)

6. Make certain differential side bearing support bores are clean and free of burrs.

7. Install the correct discs on the gauge shaft.

8. Position the Dial Indicator, J-8001 on the mounting post of the gauge shaft with the contact button touching the indicator pad. Set the dial indicator on ZERO, then depress the dial indicator until the needle rotates 3/4 turn clockwise. Tighten the dial indicator in this position.

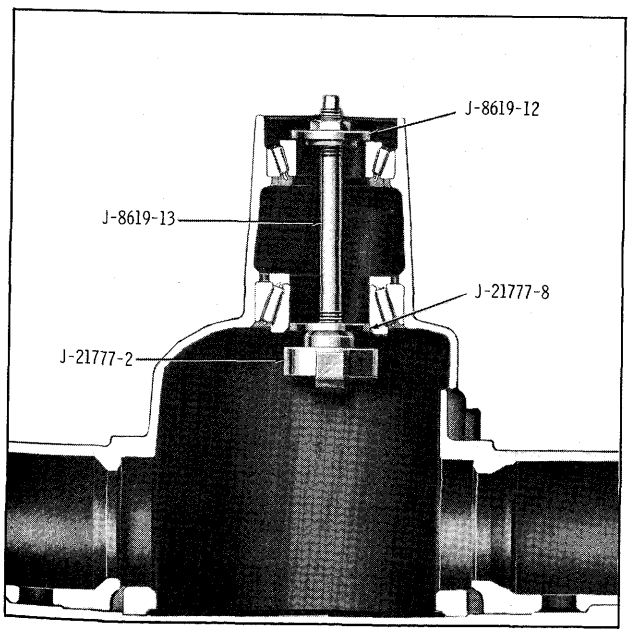


Fig. 4B-23 Installing Gauge Plate (54 through 86 Series)

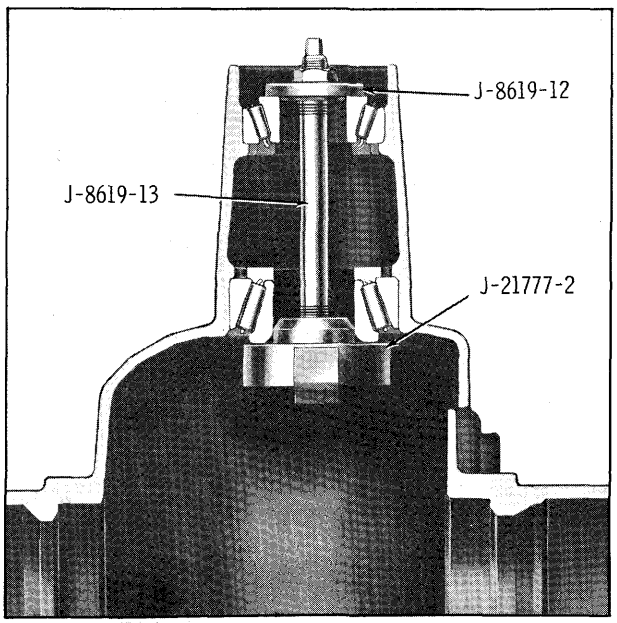


Fig. 4B-24 Installing Gauge Plate (33 through 52 Series)

9. Position the gauge shaft assembly in the carrier so that the dial indicator contact rod is directly over the gauging area of the gauge block, and the discs seated fully in the side bearing bores. (Fig. 4B-26)

10. Position gauge shaft so that the dial indicator rod contacts the gauge block. Rotate gauge shaft slowly back and forth until the dial indicator reads the greatest deflection. At the point of greatest deflection, set the dial indicator to ZERO. Repeat rocking action of gauge shaft to verify the ZERO setting.

11. After the ZERO setting is obtained, rotate gauge shaft until the dial indicator rod does not touch the gauge block. The dial indicator will read the pinion depth directly.

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

33 Through 86 Series

a. If a service pinion is being used, or a production pinion with no marking, the correct shim will have a thickness EQUAL to the indicator gauge reading found in Step 11.

b. If a production pinion is being used and it is marked "+" or "-", the correct shim will be determined as follows:

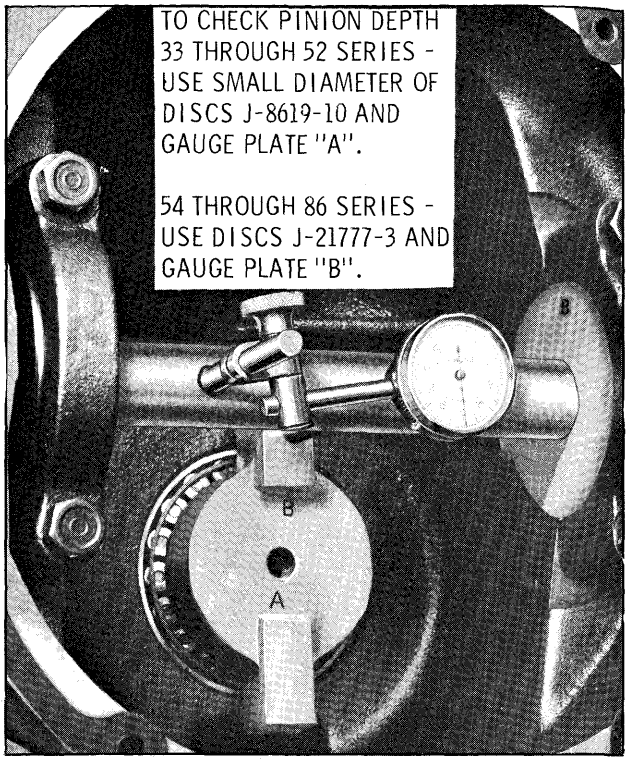


Fig. 4B-25 Pinion Depth Checking Gauge Installed

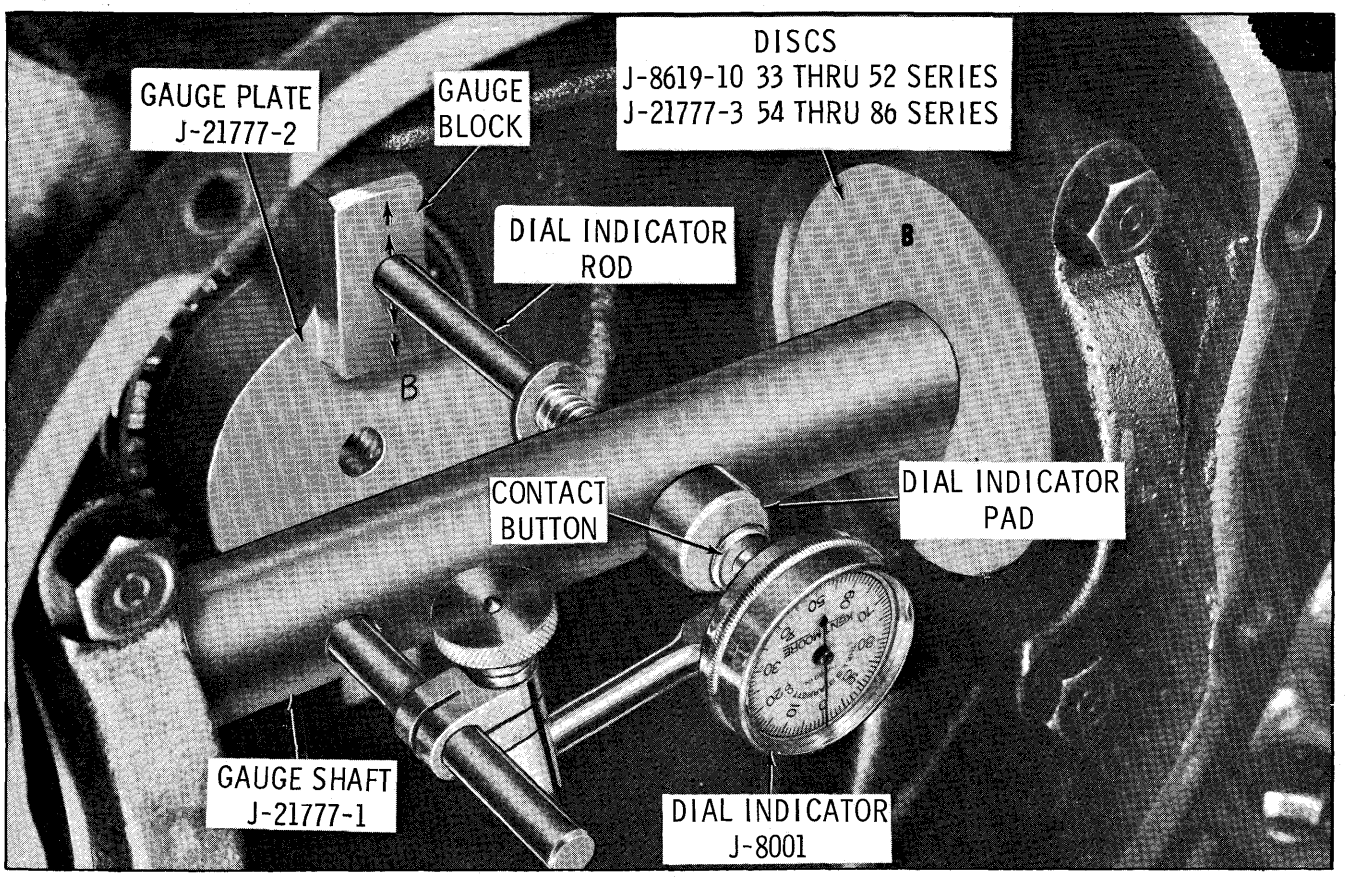


Fig. 4B-26 Checking Pinion Depth

33 Through 52 Series

(1) Pinions stamped with Part Numbers 1358139, 1358150, 1358152, 1358154, 1358166 or 1365995, and marked "+" (plus), the shim thickness indicated by the dial indicator on the pinion setting gauge must be DECREASED by the amount etched on the pinion.

If the pinion is marked "-" (minus), the shim thickness indicated by the dial indicator on the pinion setting gauge must be INCREASED by the amount etched on the pinion.

33 Through 86 Series

(2) Pinions not stamped with part numbers and marked "+" (plus) the shim thickness indicated by the dial indicator on the pinion setting gauge must be INCREASED by the amount etched on the pinion.

If the pinion is marked "-" (minus) the shim thickness indicated by the dial indicator on the pinion setting gauge must be DECREASED by the amount etched on the pinion.

13. Loosen Stud J-8619-13 and remove Gauge Plate J-21777-1, Washer J-8619-12 and both bearings from carrier.

14. Position correct shim on drive pinion and install the drive pinion rear bearing as shown in Fig. 4B-27.

DIFFERENTIAL CASE

Assembly

Before assembling the differential case, lubricate all parts with Lubricant Part No. 1050081.

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 shaft holes are in line; then rotate gears to make sure holes in pinions will line up with holes in case.

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

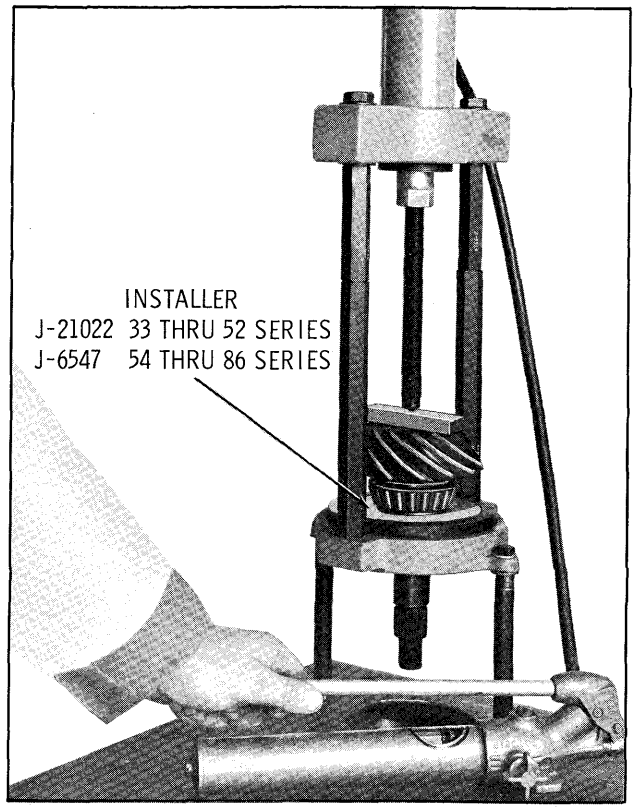


Fig. 4B-27 Installing Pinion Rear Bearing

4. Install pinion shaft. Install pinion shaft retaining bolt. Torque to 20 ft. lbs.

5. After making certain that mating surfaces of case and ring gear are clean and free of burrs, thread two bolts into opposite sides of ring gear; then install ring gear on case. (Fig. 4B-28) Install NEW ring gear attaching bolts just snug. NEVER REUSE OLD BOLTS. Torque bolts alternately in progressive stages to 60 ft. lbs. for 33 through 52 series, and 80 ft. lbs. for 54 through 86 series.

6. If differential side bearings were removed, install bearings as shown in Fig. 4B-29.

SIDE BEARING PRE-LOAD ADJUSTMENT

NOTE: The side bearing pre-load adjustment is to be made before installing the pinion. If the pinion is installed, remove ring gear.

Differential side bearing pre-load 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. Steel differential adjusting shims are available from .040" to .082" in increments of .002".

Production shims are cast iron and vary in thickness from .180" to .272" in increments of .002".

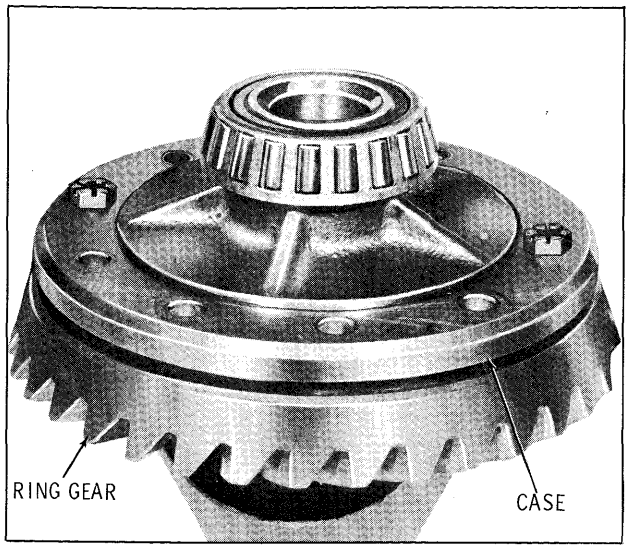


Fig. 4B-28 Installing Ring Gear

Standard service spacers are either .140" or .170" thick and steel service shims are available from .040" to .082" in increments of .002".

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

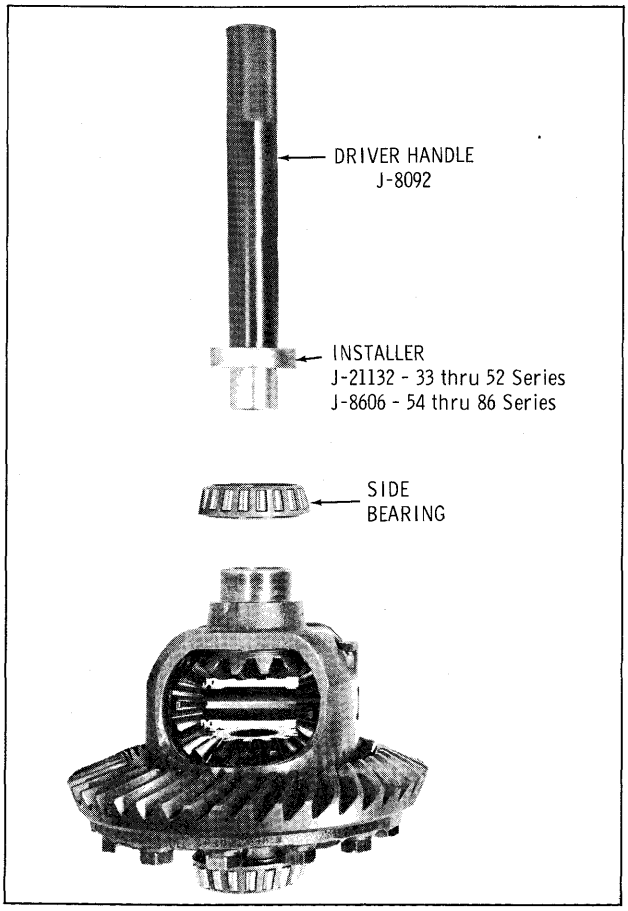


Fig. 4B-29 Installing Side Bearings

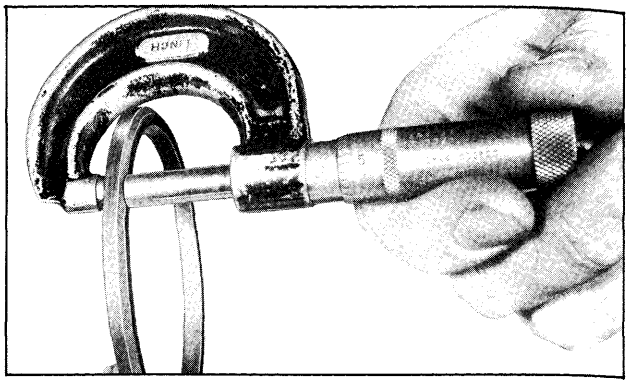


Fig. 4B-30 Measuring Production Shim

1. Before installation of the case assembly, make sure that side bearing surfaces in the carrier are clean and free of burrs. Side bearings must be oiled with Lubricant Part No. 1050081 and if the same bearings are being reused, they must have the original outer races in place.

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

   NOTE: Install the left bearing cap loosely so that the case may be moved while checking adjustments. Another bearing cap bolt can be added in the lower right bearing cap hole. This will prevent the carrier from dropping while making shim adjustments.

3. Determine the approximate thickness of shims needed by measuring each production shim or each service spacer and shim pack as shown in Fig. 4B-30. If the measurement is less than .210" use a .140" thick service spacer. If the shim thickness is greater than .210" a .170" thick service spacer will be

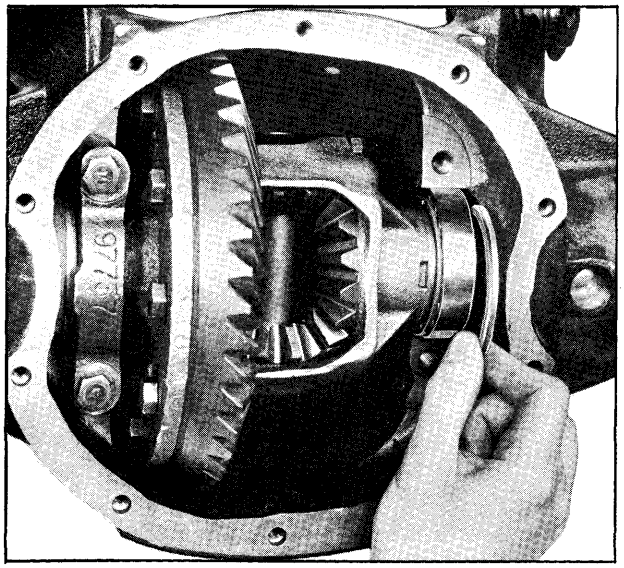


Fig. 4B-31 Installing Service Spacer

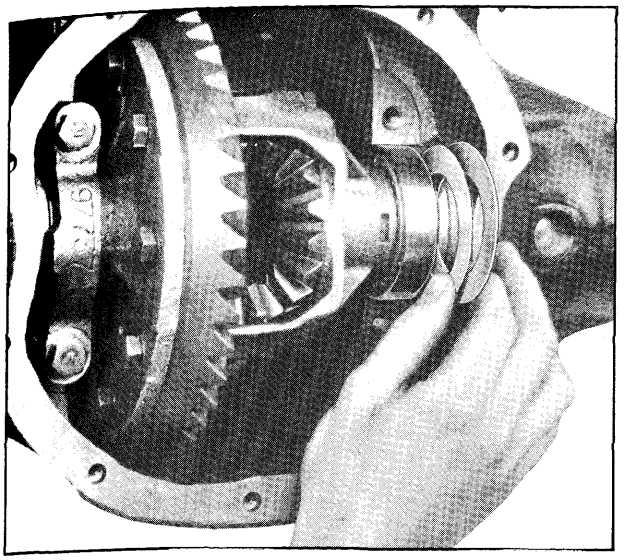


Fig. 4B-32 Installing Two Service Shims

required. Slip the selected service spacer between each bearing race and carrier housing with flat edge against housing. (Fig. 4B-31)

4. In addition to the service spacer, a service shim will be needed. To select a starting point in service shim thickness, use the following chart:

.140" Service Spacer	
Total Thickness of Both Prod. Shims Removed	Total Thickness of Service Shims to be used as a Starting Point
.360"	.060"
.370"	.070"
.380"	.080"
.390"	.090"
.400"	.100"
.410"	.110"
.420"	.120"

.170" Service Spacer	
Total Thickness of Both Prod. Shims Removed	Total Thickness of Service Shims to be used as a Starting Point
.420"	.060"
.430"	.070"
.440"	.080"
.450"	.090"
.460"	.100"
.470"	.110"
.480"	.120"
.490"	.130"

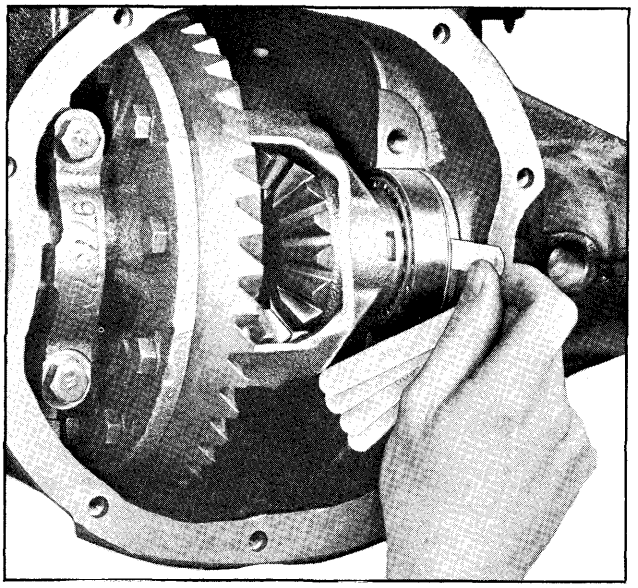


Fig. 4B-33 Inserting Feeler Gauge

.170" Service Spacer (Con't)	
Total Thickness of Both Prod. Shims Removed	Total Thickness of Service Shims to be used as a Starting Point
.500"	.140"
.510"	.150"
.520"	.160"
.530"	.170"
.540"	.180"
.550"	.190"

Select one or two shims totaling the amount shown in the right-hand column and position between the right bearing race and the service spacer. Be sure left bearing race and spacer are against left housing of carrier. (Fig. 4B-32)

5. Insert progressively larger feeler Gauge sizes (.010", .012", .014", etc.) between the right shim and service spacer until there is noticeable increased drag. The point just before additional drag begins is correct feeler gauge thickness. Rotate case while using feeler gauge to insure an even reading. (Fig. 4B-33).

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

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

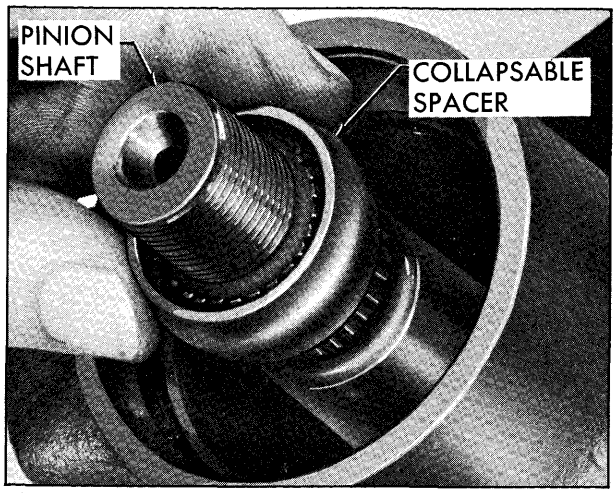


Fig. 4B-34 Installing Collapsible Spacer

6. Remove left bearing cap and all shims from carrier. The total shim pack needed (with no preload on side bearings) is the feeler gauge reading found in step 4 plus thickness of shims installed in Step 3.

7. Select two shims of approximately equal size whose total thickness is equal to the value obtained in Step 5. These shims will be installed between each side bearing race and service spacer when the case is installed in the carrier.

   NOTE: The object of Step 7 is to obtain the equivalent of a "slip fit" of the case in the carrier. For convenience in setting backlash, the preload will not be added until the final step.

8. If the pinion is in position, install the ring gear, then proceed to DIFFERENTIAL BACKLASH ADJUSTMENT.

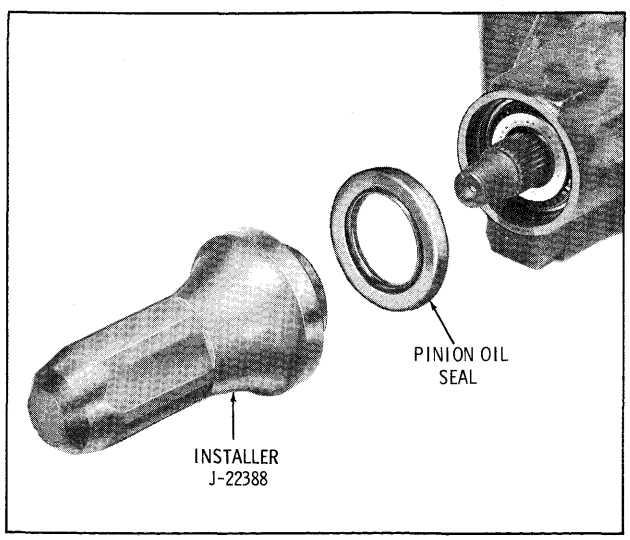


Fig. 4B-35 Installing Pinion Oil Seal

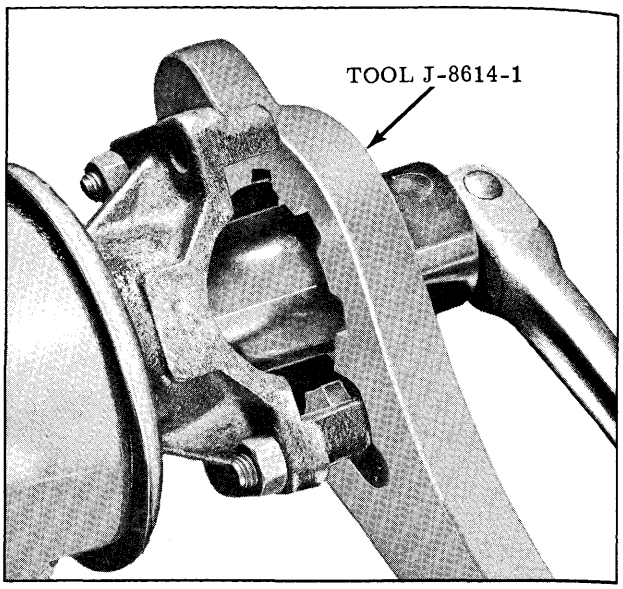


Fig. 4B-36 Installing Companion Flange Nut

DRIVE PINION INSTALLATION

NOTE: Lubricate pinion bearings with Lubricant Part No. 1050081 before installing pinion.

1. Position pinion assembly in carrier and install collapsible spacer as shown in Fig. 4B-34.

2. While holding pinion forward, install bearing until seated, using Tool J-6133.

3. Position pinion oil seal in carrier. Install seal as shown in Fig. 4B-35.

4. Coat lips of pinion oil seal and seal surface of pinion flange with Lubricant, Part No. 1050169. Install companion flange on pinion by tapping with a soft hammer until a few pinion threads project through flange.

5. Install pinion washer and nut. Hold companion flange with Holder J-8614-01. While intermittently rotating pinion to seat bearings, tighten pinion nut until end play begins to be taken up. (Fig. 4B-36)

   NOTE: When no further end play is detectable and when Holder J-8614-01 will no longer pivot freely as pinion is rotated, pre-load specifications are being approached. No further tightening should be attempted until the pre-load has been checked.

6. Check pre-load by using an inch pound torque wrench as shown in Fig. 4B-37.

   NOTE: After pre-load has been checked, final tightening should be done very carefully. For example, if when checking, pre-load was

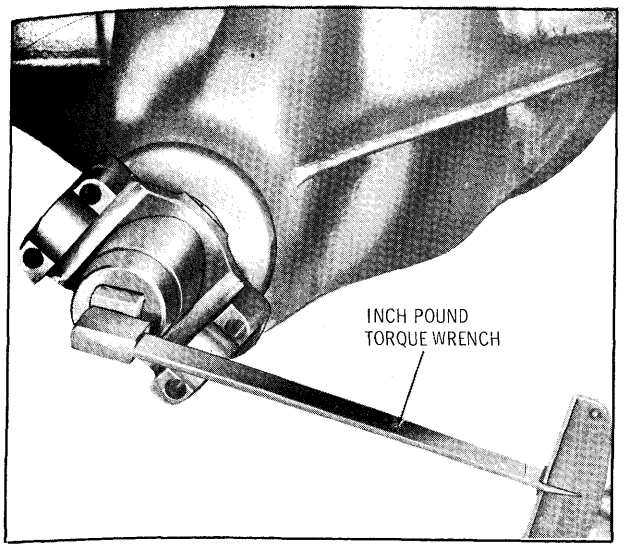


Fig. 4B-37 Checking Pinion Pre-load

found to be 5 in. lbs., any additional tightening of the pinion nut can add many additional inch pounds of torque. Therefore, the pinion nut should be further tightened only a little at a time and the pre-load should be checked after each slight amount of tightening. Exceeding pre-load specifications will compress the collapsible spacer too far and require the installation of a new collapsible spacer.

7. While observing the preceding note, carefully set pre-load at 20 to 30 in. lbs. on new bearings or 12 to 20 in. lbs. on used bearings.

8. Rotate pinion several times to assure that bearings have been seated. Check pre-load again. If pre-load has been reduced by rotating pinion, reset pre-load to specifications.

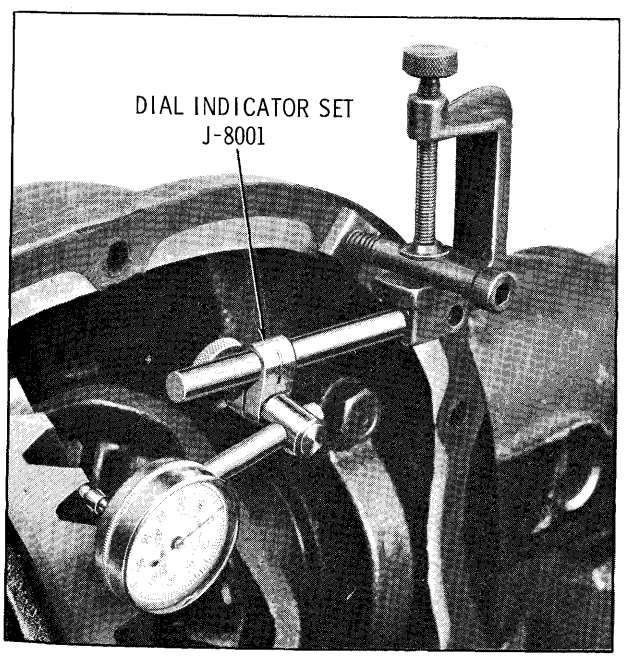


Fig. 4B-38 Checking Ring Gear to Pinion Backlash

DIFFERENTIAL BACKLASH ADJUSTMENT

1. Install differential case into carrier, using shims as determined by the side bearing pre-load adjustment.

2. Rotate differential case several times to seat bearings, then mount dial indicator as shown in Fig. 4B-38. Use a small button on the indicator stem so that contact can be made near heel end of tooth. Set dial indicator so that stem is in line as nearly as possible with gear rotation and perpendicular to tooth angle for accurate backlash reading.

3. Check backlash at three or four points around ring gear. Lash must not vary over .002" around ring gear.

   NOTE: Pinion must be held stationary when checking backlash.

   If variation is over .002" check for burrs, uneven bolting conditions or distorted case flange and make corrections as necessary.

4. Backlash at the point of minimum lash should be between .007" and .009" for all new gears.

5. If backlash is not within specifications, correct by increasing thickness of one differential shim and decreasing thickness of other shim the same amount. This will maintain correct differential side bearing pre-load.

   For each .001" change in backlash desired, transfer .002" in shim thickness. To decrease backlash .001", decrease thickness of right shim .002" and increase thickness of left shim .002". To increase backlash .002", increase thickness of right shim .004" and decrease thickness of left shim .004".

6. When backlash is correctly adjusted, loosen bearing cap bolts. Remove left bearing cap and left shim pack. Select a shim .004" thicker than the one removed, and insert between the spacer and the left bearing race. Loosely install bearing cap.

7. Remove right bearing cap and right shim pack. Select a shim .004" thicker than the one removed and insert between the spacer and the right bearing race. It will be necessary to tap the right shim into position with a soft hammer. (Fig. 4B-39)

8. Torque bearing cap bolts to 65 ft. lbs.

9. Install new gasket on housing. Install cover. Torque cover bolts to 25 ft. lbs.

10. Fill differential to proper level with the specified lubricant.

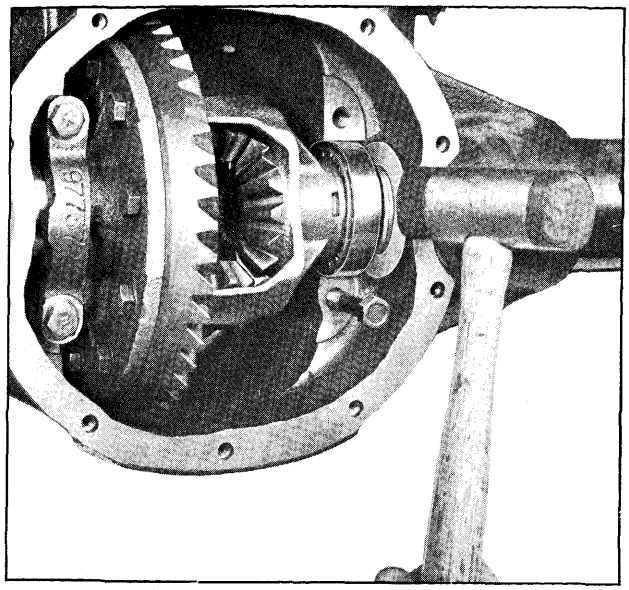


Fig. 4B-39 Tapping Shim Into Place

ANTI-SPIN DIFFERENTIAL (33 THROUGH 52 SERIES)

DESCRIPTION (Fig. 4B-40)

The Anti-Spin differential is available as optional equipment. With a conventional differential, when one wheel is on a slippery surface, its pulling power is limited by the wheel with the lowest traction. With the Anti-Spin differential, the locking action is controlled by the wheel having the best traction.

The Anti-Spin differential has cone brakes positioned behind the side gears. These brakes are spring pre-loaded to provide an internal resistance to the differential action within the case itself. This pre-load assures an adequate amount of pull when extremely low traction such as wet ice, mud or snow are encountered at one rear wheel. It also provides smooth transfer of torque when traveling over alternating tractive conditions at both rear wheels.

OPERATION

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

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

When the rear wheels are under extremely unbalanced tractive conditions, such as one wheel

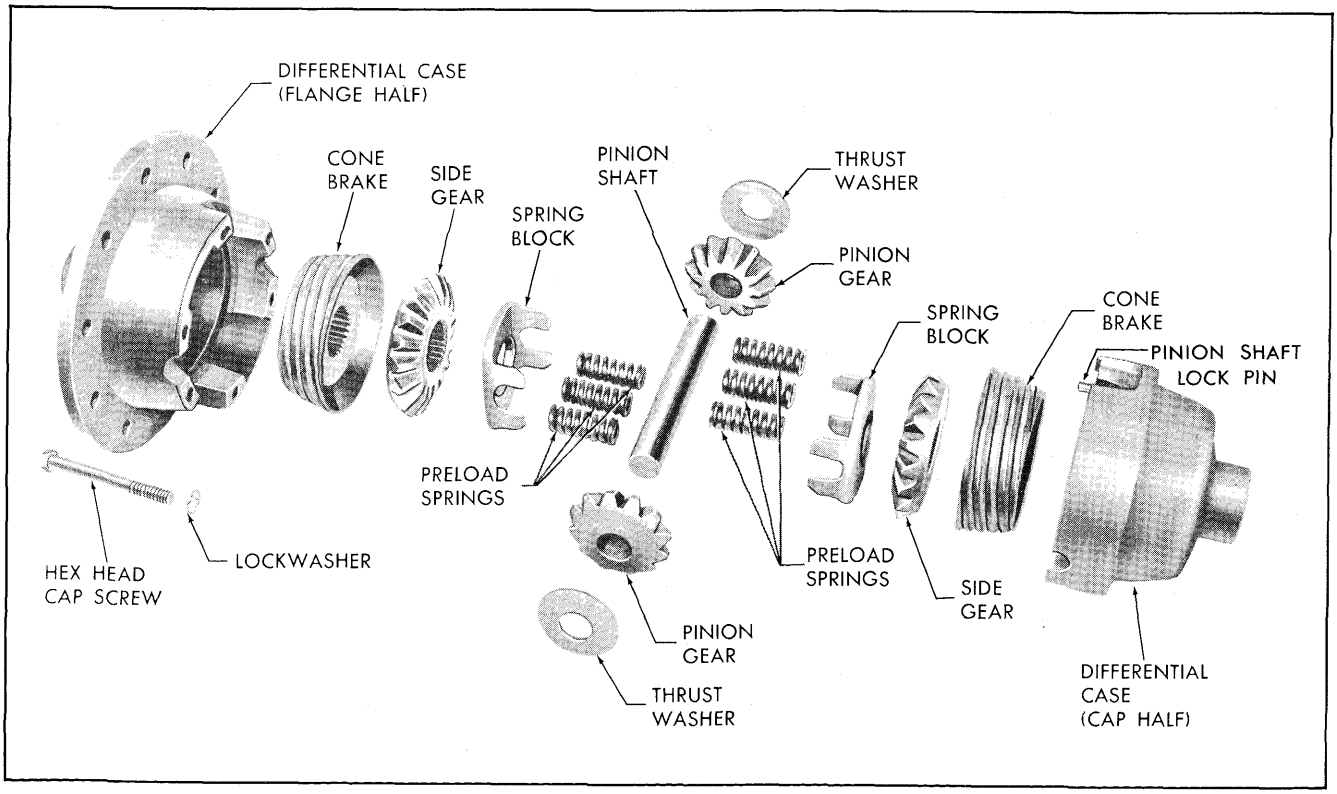


Fig. 4B-40 Anti-Spin Differential

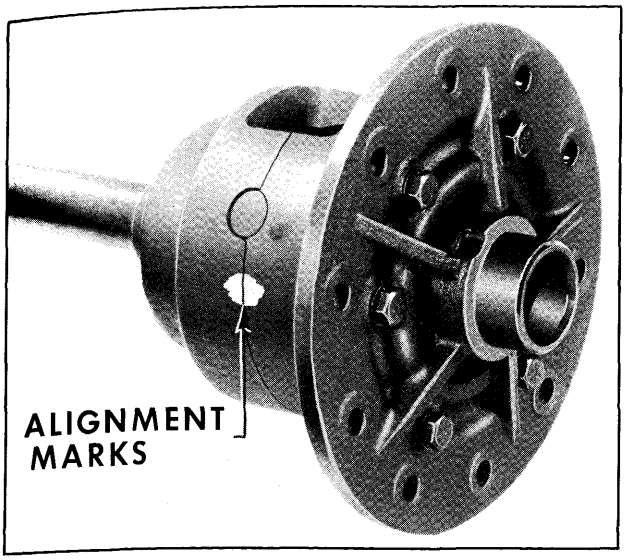


Fig. 4B-41 Alignment Marks

on dry pavement and the other on ice, wheel spin can occur if over-acceleration is attempted. However, even when wheel spin does occur, the major driving force is directed to the non-spinning wheel.

NOTE: Continued spinning may cause a whirring sound. Such a condition or sound does not indicate failure of the unit.

NOTE: When working on a car with Anti-Spin 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.

Also "on the car" type wheel balancers, should not be used on the rear wheels unless both wheels are off the floor.

PERIODIC MAINTENANCE

The lubricant level should be checked at every oil change interval. Maintain level between the bottom of the filler plug opening and 1/4" below the opening by adding lubricant Part No. 1050081.

IMPORTANT: Use of other than the above mentioned type of lubricant in the Anti-Spin differential may cause chatter. If the wrong type of lubricant is used in the Anti-Spin, it will require draining the differential and installing the recommended lubricant Part No. 1050081.

NOTE: For Anti-Spin identification, refer to the GENERAL INFORMATION SECTION.

ANTI-SPIN DIFFERENTIAL SERVICE PROCEDURES

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

ANTI-SPIN CONVERSION INFORMATION

The case assembly (less ring gear and side bearings) is available for converting a conventional differential to Anti-Spin. The ring gear and side bearings of the conventional differential, if in good condition, can be used with the Anti-Spin case assembly. The proper assembly must be ordered for the particular gear ratio with which it will be used.

DIFFERENTIAL CASE

Disassembly

1. If ring gear or differential case is to be replaced, remove ring gear from case.
2. If a differential side bearing is to be replaced, remove bearing as described in the CONVENTIONAL DIFFERENTIAL Section.
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 paint to provide alignment for reassembly. (Fig. 4B-41)
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, pre-load 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.

Cleaning and Inspection of Parts

1. Make certain all parts are clean and dry.

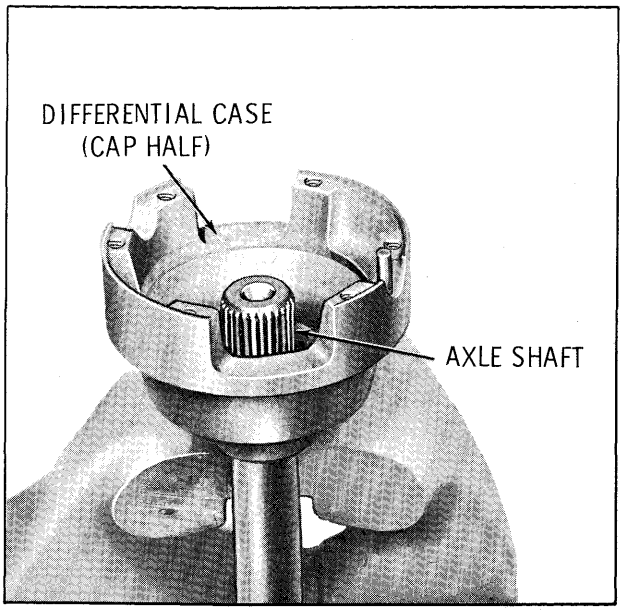


Fig. 4B-42 Assembling Cap Half of Case

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 and not worn to the point that the cones have bottomed out in the case. Slight grooves or scratches indicating passage of foreign material are permissible and normal. The land surface on the heavy spirals of the male cones will duplicate the case surface condition. Replace any parts which are excessively scored, pitted or worn. Both halves of case must be replaced if one half is damaged or worn.

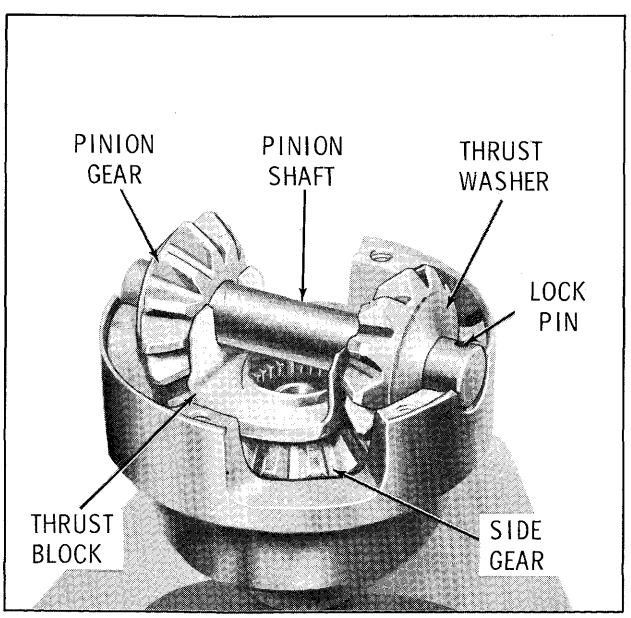


Fig. 4B-43 Installing Thrust Block

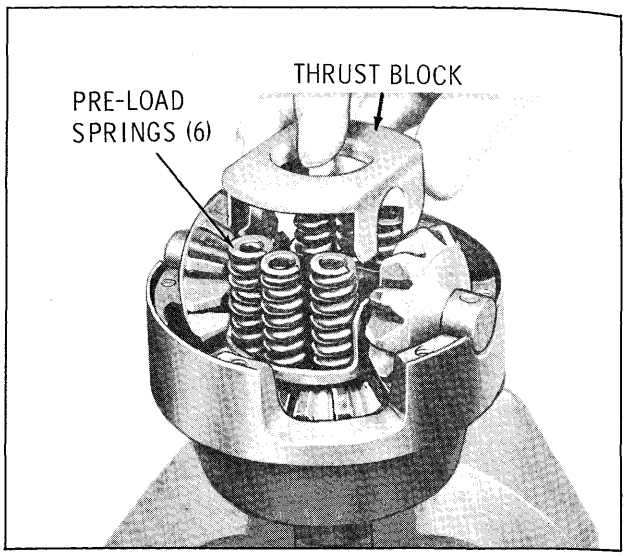


Fig. 4B-44 Installing Pre-load Springs

Assembly

NOTE: When assembling the case, use axle shafts as mounting tools to insure 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 an axle shaft in a vise allowing three inches to extend above vise jaws; then place the cap side of differential case over the extended axle shaft with interior of case facing up. (Fig. 4B-42)

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

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

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

4. Position a thrust block on side gear face in alignment with the pinion shaft grooves. Install the pinion gears and thrust washers on the pinion shaft; then position the pinion shaft into the cap half of the differential case so that the lock pin enters the pinion shaft. (Fig. 4B-43)

5. Insert springs into the thrust block that is already installed into the case, then place second thrust block over springs. (Fig. 4B-44)

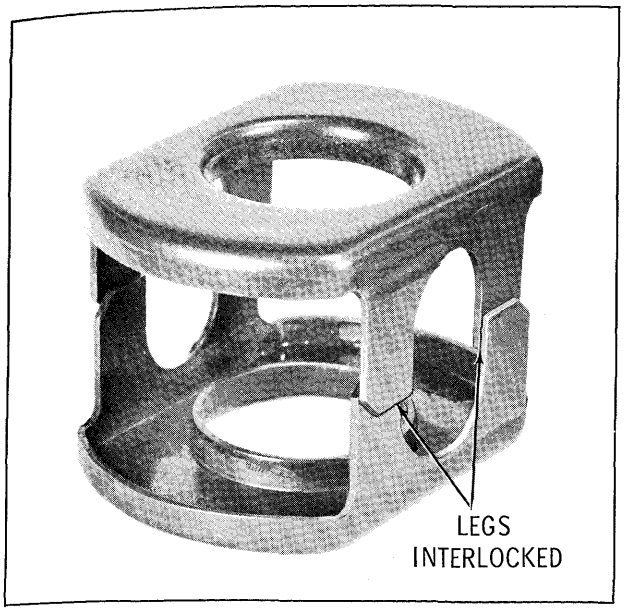


Fig. 4B-45 Thrust Blocks

NOTE: The legs on the thrust blocks are offset. During reassembly, be sure to position the legs as shown in Fig. 4B-45.

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

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

8. Install flange side of differential assembly over cone in proper position to match alignment marks; insert two bolts finger tight 180° apart. (Fig. 4B-46)

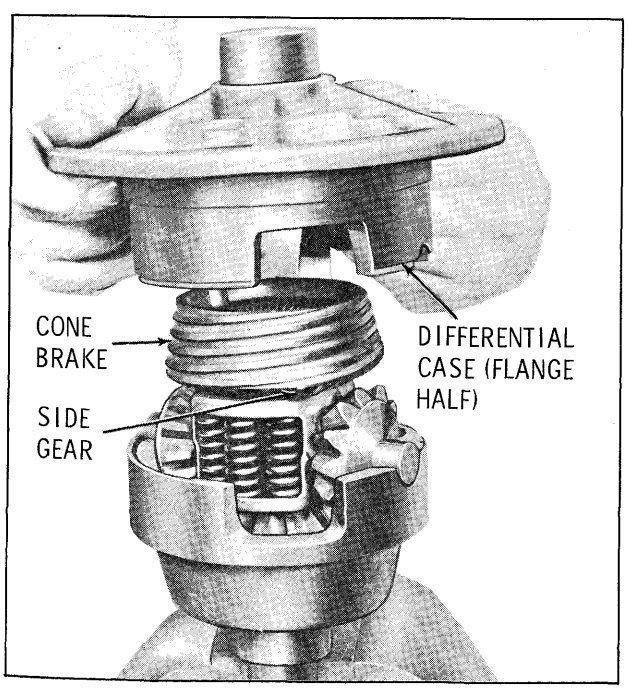


Fig. 4B-46 Assembling Case

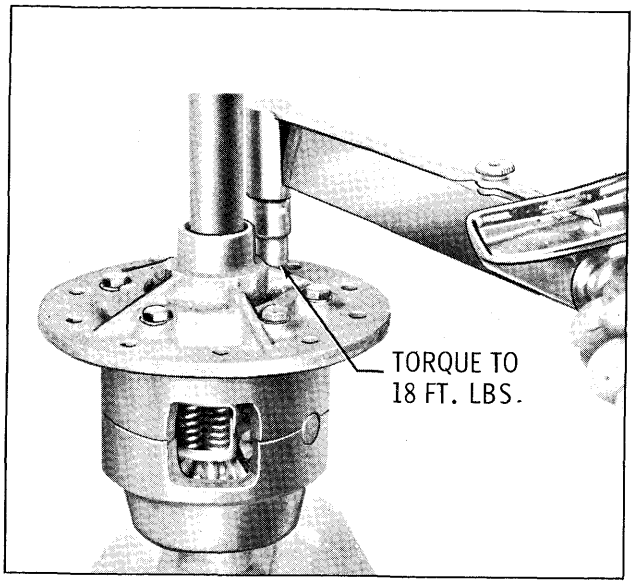


Fig. 4B-47 Torquing Case Bolts

9. Install other axle shaft through flange half of differential case rotating axle to enter the cone and side gear splines. Leave the axle shaft in this position, then insert the remaining bolts. Torque to 18 ft. lbs. (Fig. 4B-47)

10. Remove axle shafts.

11. Install unit into differential carrier following instructions given in the CONVENTIONAL DIFFERENTIAL Section.

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

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

ANTI-SPIN DIFFERENTIAL (54 THROUGH 86 SERIES)

DESCRIPTION

The conventional differential divides the driving force equally to both rear wheels. The driving force is limited by the wheel which has the least amount of traction; therefore, if one wheel is on snow or mud, the wheel will spin and the driving force is lost.

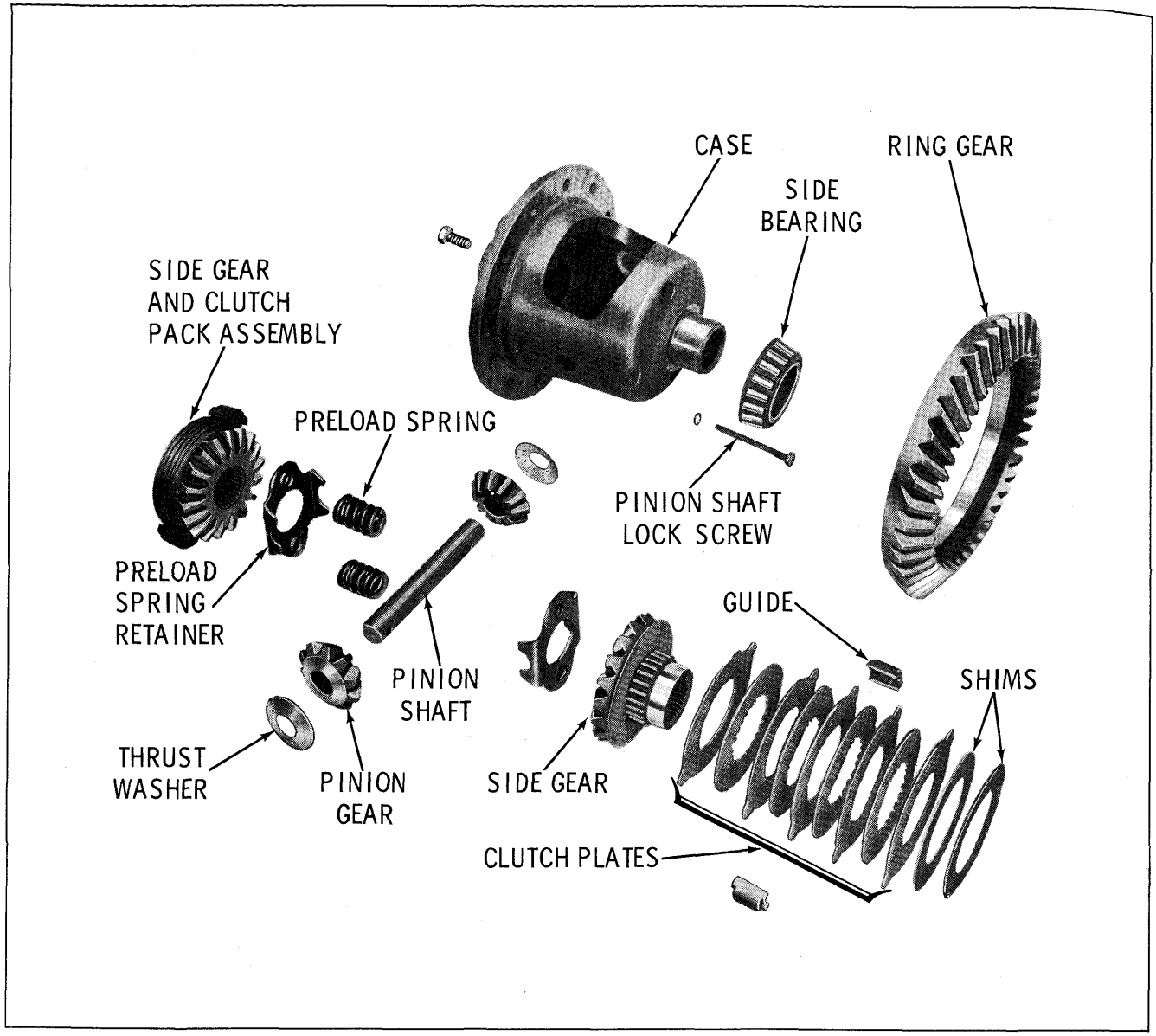


Fig. 4B-48 Anti-Spin Differential

The Anti-Spin differential (optional on all series) through the use of clutch plates directs the driving force to the wheel with the best traction thus improving the ability of the car to pull out of mud or snow.

NOTE: For Anti-Spin identification, refer to the GENERAL INFORMATION SECTION.

NOTE: ON CARS EQUIPPED WITH ANTI-SPIN DIFFERENTIALS, DO NOT RUN ENGINE WITH ONE REAR WHEEL OFF THE GROUND AND TRANSMISSION IN GEAR. Also, "on the car" type wheel balancers should not be used on the rear wheels unless both rear wheels are off the floor.

OPERATION

The Anti-Spin differential transmits torque from the drive pinion gear to the ring gear and to the case in the same manner as the conventional differential. In addition, the Anti-Spin differential incorporates the use of clutch plates which tend to lock the axle shafts to the case, or in effect, to each other.

When driving force is applied at the differential case, the pinion shaft, pinion gears and side gears (splined to the axle shafts) begin to rotate as an assembly in the same direction as the case. Although traction at the rear wheels may not be equal, their resistance to turning allows the pinion gears to bear against the side gears (splined to the axle shaft and the clutch plates) to apply the clutches, and to lock the axle shafts to the case. This allows both rear wheels to turn at an equal speed and the driving force is not lost by the wheel with poor traction.

When turning a corner, the action is essentially that of a conventional differential.

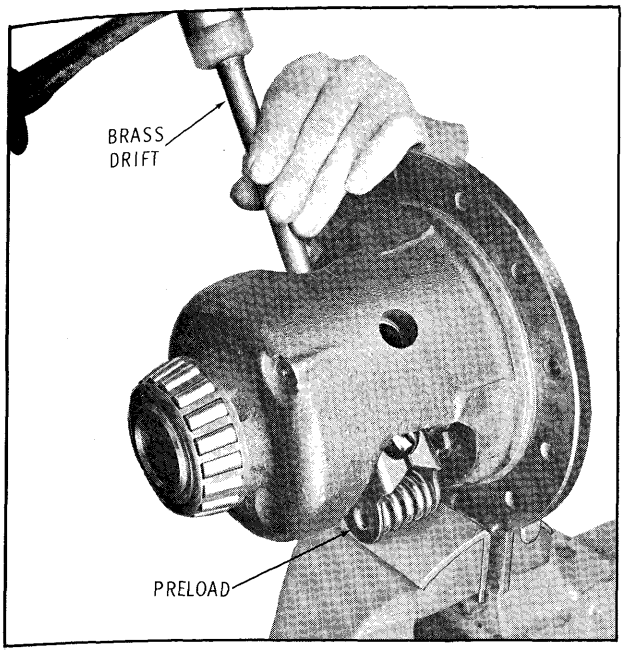


Fig. 4B-49 Removing Pre-load Springs

ANTI-SPIN CONVERSION INFORMATION

The case assembly (less ring gear and side bearings) is available for converting a conventional differential to Anti-Spin. The ring gear and side bearings of the conventional differential, if in good condition, can be used with the Anti-Spin case assembly.

DIFFERENTIAL CASE

Disassembly (Fig. 4B-48)

1. If side bearings are to be removed, they can be removed as outlined in the CONVENTIONAL DIFFERENTIAL Section.

2. If the ring gear or differential case is to be replaced, remove ring gear from case.

3. Remove pinion shaft lock screw and lockwasher, then remove pinion shaft from case.

4. Remove the pre-load spring retainer and springs from the case. (Fig. 4B-49)

5. Rotate side gears until the pinions are in the open area of the case. Remove the pinions and thrust washers.

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

NOTE: If a side gear or clutch pack cannot be readily removed from the case, drive it out with a brass drift. (Fig. 4B-50)

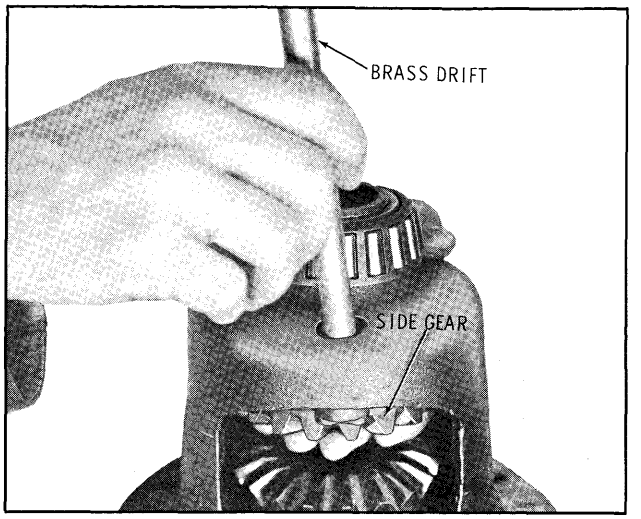


Fig. 4B-50 Removing Side Gear

7. Remove the clutch plate guides and separate the shims and clutch plates from the side gears.

NOTE: Keep the clutch plates in their original location in the clutch pack.

Cleaning and Inspection of Case

1. Clean side bearings thoroughly in clean solvent (do not use a brush). Examine bearings visually and by feel. Bearings should feel smooth when oiled and rotated while applying as much hand pressure as possible.

NOTE: Minute scratches and pits that appear on rollers and races at low mileage are due to the initial pre-load, and bearings having these marks should not be rejected.

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

3. Inspect pinion shaft, pinions and side gears. Replace if parts are excessively scored, pitted or worn.

4. Check the press fit of the side bearing inner race on the differential case. Side bearings must be a tight press fit on the hub.

5. Inspect clutch plates for scored, worn, cracked or a distorted condition. If any of these conditions exist, new clutch plates must be installed.

DIFFERENTIAL CASE

Assembly

1. If the ring gear was removed, position the

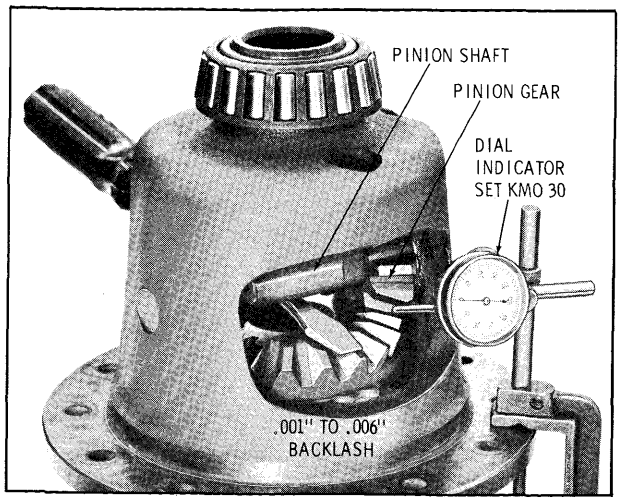


Fig. 4B-51 Checking Side Gear to Pinion Backlash

gear on the case flange and install new attaching bolts. Tighten the attaching bolts evenly and alternately across the diameter in progressive stages. Torque to 80 ft. lbs.

2. If side bearings were removed, lubricate the bearings and install on case hubs as outlined in the CONVENTIONAL DIFFERENTIAL Section.

3. Apply Special Lubricant, Part No. 1050081, to the clutch plates.

4. Assemble the clutch packs as follows:

   a. Alternately position nine clutch plates on the side gear, starting and ending with a clutch plate with the external lugs.

   b. Install the two clutch guides over the clutch plate lugs.

   c. Install the same shims which were removed or an equal amount on the clutch plate.

   d. Repeat Steps a, b, and c on the other clutch pack.

5. Check the pinion to side gear clearance as follows:

   a. Install one side gear with clutch pack and shims in the case.

   b. Position the two pinion gears and thrust washers on the side gear and install the pinion shaft.

   c. Compress the clutch stack by inserting a screwdriver or wedge between the side gear and the pinion shaft.

   d. Install Dial Indicator J-8001 with the contact button against the pinion gear. (Fig. 4B-51)

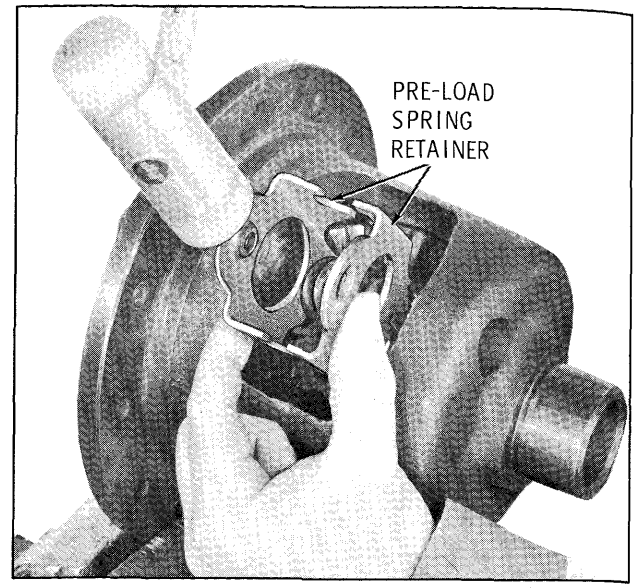


Fig. 4B-52 Installing Pre-load Spring and Retainer

   e. Rotate pinion gear. Clearance should be .001" to .006".

   f. If clearance is more than .006", add shims between clutch pack and case. If clearance is less than .001", remove shims. A .002" shim will change clearance approximately .001". Recheck clearance after adding or subtracting shims.

   g. Remove side gear and repeat procedure with opposite clutch pack, on opposite side of case.

6. Remove pinion shaft, pinions and thrust washers.

7. Install the remaining side gear and clutch pack with correct shims in the case.

8. Place the pinion gears on the side gears and rotate into correct position.

9. Assemble the retainer and one pre-load spring. Drive the pre-load retainer and spring between the side gears until the open ends of the retainer just start to come together. (Fig. 4B-52)

10. Install the remaining pre-load spring and finish driving the retainer and springs into position. (Fig. 4B-53)

11. Insert the thrust washers behind the pinion gears.

12. Install the pinion shaft and retain with the lock bolt. Torque lock bolt to 28 ft. lbs.

13. Check the side gear splined hole to be certain it is in line with the hole in the pre-load

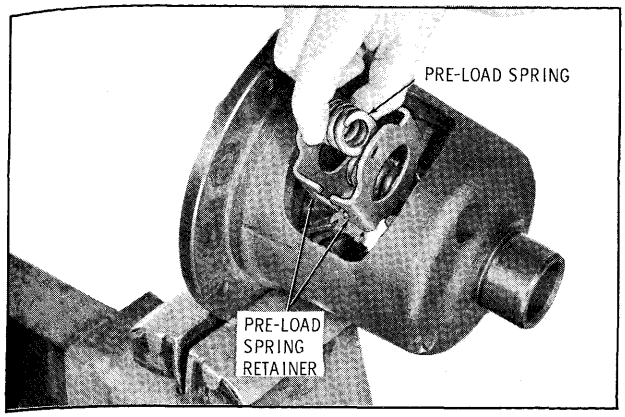


Fig. 4B-53 Installing Pre-load Spring

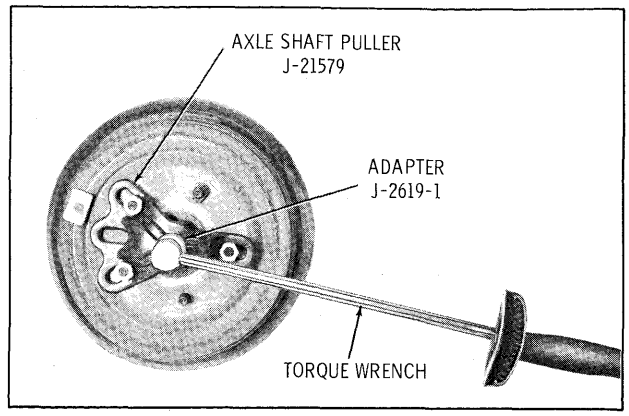


Fig. 4B-54 Checking Anti-Spin

spring retainer. The spring retainer can be moved slightly to correct misalignment.

DIAGNOSIS (ALL SERIES)

ANTI-SPIN OPERATION

If an Anti-Spin differential is suspected of not providing positive traction to the non-slipping wheel, the condition can be checked as follows:

1. Place the transmission in neutral.
2. Raise one wheel off the floor and place a block at the front and rear of the opposite wheel.
3. Remove hub cap or wheel disc and apply a torque wrench as shown in Fig. 4B-54.
4. Disregard breakaway torque and observe only the torque required to continuously turn the wheel smoothly.

If the torque reading is less than 40 ft. lbs., the unit should be disassembled and the case assembly repaired as necessary.

DIFFERENTIAL NOISE

When a differential assembly is suspected of being noisy, a thorough road test should be made to make sure that the noise is not being caused by tires, road surface, wheel bearings, engine, transmission, muffler, body or propeller shaft.

TIRE NOISE

Different types of road surfaces will affect tire noise but will not affect differential noise. For road testing, select a level tarvia or asphalt road, as this type road surface practically eliminates tire noise. For test purposes only, inflating all tires to approximately 50 lbs. pressure will materially alter noise caused by tires, but will not affect noise caused by the differential. Differential noise usually ceases when coasting with transmission in neutral at speeds under 30 mph, however, tire noise continues with lower tone as car speed is reduced. Differential noise always changes when comparing "pull" and "coast", but tire noise remains about the same.

WHEEL BEARING NOISE

Wheel bearing noise may be confused with differential noise; however, a rough rear axle bearing produces a vibration or growl which continues with car coasting with transmission in neutral. A bad bearing may cause a knock or click approximately every two revolutions of the wheel since the bearings do not travel at the same speed as the rear axle shaft. To determine which front wheel bearing is noisy, hoist the car and spin each wheel while listening at the hub cap. To determine which rear axle bearing is noisy, hoist car and start engine. With transmission in gear use a piece of rubber hose or stethoscope BT-37 at the axle housing to locate the noise.

ENGINE AND TRANSMISSION NOISE

Note speed at which noise occurs, and with car standing and transmission in neutral, accelerate the engine to approximate speed where noise was noticed. If a similar noise is produced with the car standing, it cannot be due to the differential.

DIFFERENTIAL SIDE AND PINION GEAR NOISE

Differential side gears and pinions seldom cause noise because their movement is negligible on straight ahead driving.

RING GEAR AND PINION GEAR NOISE

These generally show up as drive noise, coast noise, or float noise. Drive noise is most pronounced on constant acceleration through the speed range. Coast noise is most pronounced when the car is allowed to coast through the speed range while in gear. Float noise is most pronounced while holding the car speed constant at various speeds.

DRIVE PINION BEARING AND SIDE BEARING NOISE

Rough or brinnelled bearings produce a continuous whine starting at a relatively low speed. The noise is most noticeable with a light pull between 18 to 25 miles per hour.

DIFFERENTIAL CLUTCH CHATTER

Anti-Spin Only

Improper lubricant can cause the clutch plates or cones to grab and release intermittently resulting in chatter when the car is turning a corner slowly. Special Lubricant Part No. 1050081, MUST be used for initial fill of the differential and for any additions.

TORQUE SPECIFICATIONS

(33 THROUGH 86 SERIES)

APPLICATION	FT. LBS.
DIFFERENTIAL	
Filler Plug	30
Axle Housing Cover to Carrier	25
Ring Gear Bolts (33 through 52 Series)	60
Ring Gear Bolts (54 through 86 Series)	80
Side Bearing Cap Bolts	65
Pinion Gear Shaft Retaining Bolt	20
Case Cover to Case Bolts (33 through 52 Series Anti-Spin)	18

SPECIFICATIONS

(33 THROUGH 86 SERIES)

DIFFERENTIAL

LUBRICATION	
Capacity	
33 through 52 Series	3 Pts. Approx.
54 through 86 Series	4-3/4 Pts. Approx.
Replenish (Conventional)	S.A.E. 90 Multi-Purpose Gear Lubricant Meeting Military Specification MIL-L-2105B
Replenish (Anti-Spin)	Special Lubricant Part No. 1050081
ADJUSTMENTS	
Backlash	.007" to .009"
Drive Pinion Bearing Pre-load	
New Bearings	20 to 30 in. lbs.
Old Bearings	12 to 20 in. lbs.

SPEEDOMETER GEAR INFORMATION

(33 THROUGH 38 SERIES)

Transmission	Axle Ratio	Rear Tire Size	Speedo Drive Gear		Speedo Driven Gear			Adapter-If Used	
			Part No.	Teeth	Teeth	Part No.	Color	Ratio	Color
3 Speed Fully Synchronized	2.78	6.95-14 7.35-14 7.75-14 7.75-15	3708144 (28 Pitch)	8	18 20 19 19	3860341 3860343 3860342 3860342	Brown Blue Natural Natural	 1.125 1.125 1.125	 No Color
	3.08	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	3708144 (28 Pitch) 9777230*	8	20 19 19 18 18	3860343 3860342 3860342 3860341 3860341	Blue Natural Natural Brown Brown		
	3.23	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	3708144 9777230*	8	21 20 20 19 19	3860344 3860343 3860343 3860342 3860342	Red Blue Blue Natural Natural		
*9777230 With M-13 & M-14 Trans.	3.55	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	3708144 9777230*	8	20 19 19 21 21	3860343 3860342 3860342 3860344 3860344	Blue Natural Natural Red Red	.8653 .8653 .8653	Blue
	3.90	6.95-14 7.35-14 7.75-14 7.75-15	3708144 9777230*	8	19 19 18 18	3860342 3860342 3860341 3860341	Natural Natural Brown Brown	.7692 .7692 .7692 .7692	Yellow
	4.11	7.35-14 7.75-14 7.75-15	3708144 9777230*	8	20 19 19	3860343 3860342 3860342	Blue Natural Natural	.7692 .7692 .7692	Yellow
	4.33	7.35-14 7.75-14 7.75-15	3708144 9777230*	8	21 20 20	3860344 3860343 3860343	Red Blue Blue	.7692 .7692 .7692	Yellow
4 Speed (Standard Ratio) M-20 Fully Synchronized	3.08	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	3708144 (28 Pitch)	8	20 19 19 18 18	3860343 3860342 3860342 3860341 3860341	Blue Natural Natural Brown Brown		
	3.23	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	3708144	8	21 20 20 19 19	3860344 3860343 3860343 3860342 3860342	Red Blue Blue Natural Natural		

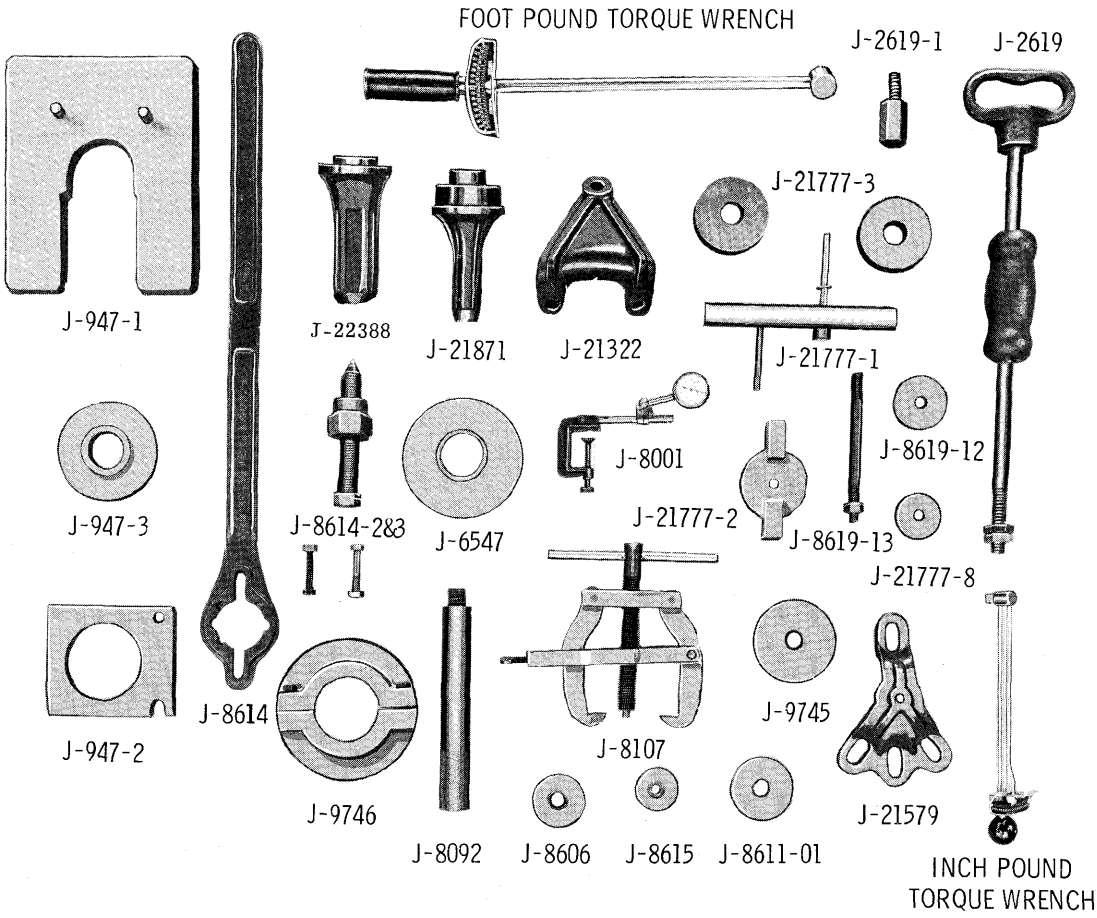
SPEEDOMETER GEAR INFORMATION (Cont'd.)

(33 THROUGH 38 SERIES)

Transmission	Axle Ratio	Rear Tire Size	Speedo Drive Gear		Speedo Driven Gear			Adapter-If Used	
			Part No.	Teeth	Teeth	Part No.	Color	Ratio	Color
4 Speed (Close Ratio) M-21 Fully Synchronized	3.55	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	3708145 (30 Pitch)	8	23 22 22 22 22	3860346 3860345 3860345 3860345 3860345	Black Green Green Green Green		
	3.90	6.95-14 7.35-14 7.75-14 7.75-15	3708145	8	25 24 24 23	3860348 3860347 3860347 3860346	Orange Yellow Yellow Black		
	4.11	7.35-14 7.75-14 7.75-15	3708145	8	22 25 24	3860345 3860348 3860347	Green Orange Yellow	.8653	Blue
	4.33	7.35-14 7.75-14 7.75-15	3708145	8	23 23 25	3860346 3860346 3860348	Black Black Orange	.8653 .8653	Blue
6 and 8 Cylinder Jetaway Trans.	2.78	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	1359239 (28 Pitch)	17	37 37 36 36 36	1359271 1359271 1359270 1359270 1359270	Red Red White White White		
	3.08	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	1359239	17	41 41 40 39 39	1362195 1362195 1362048 1359273 1359273	Yellow Yellow Black Brown Brown		
	3.23	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	1359239	17	38 43 42 41 41	1359272 1362196 1362049 1362195 1362195	Blue Purple Green Yellow Yellow	.8653	Blue
	3.55	6.95-14 7.35-14 7.75-14 8.25-14 7.75-15	1359239	17	42 41 40 39 39	1362049 1362195 1362048 1359273 1359273	Green Yellow Black Brown Brown	.8653 .8653 .8653 .8653 .8653	Blue
	3.90	6.95-14 7.35-14 7.75-14 7.75-15	1359239	17	41 40 39 38	1362195 1362048 1359273 1359272	Yellow Black Brown Blue	.7692 .7692 .7692 .7692	Yellow
	4.11	7.35-14 7.75-14 7.75-15	1359239	17	42 41 40	1362049 1362195 1362048	Green Yellow Black	.7692 .7692 .7692	Yellow
	4.33	7.35-14 7.75-14 7.75-15	1354239	17	43 43 42	1362196 1362196 1362049	Purple Purple Green	.7692 .7692 .7692	Yellow

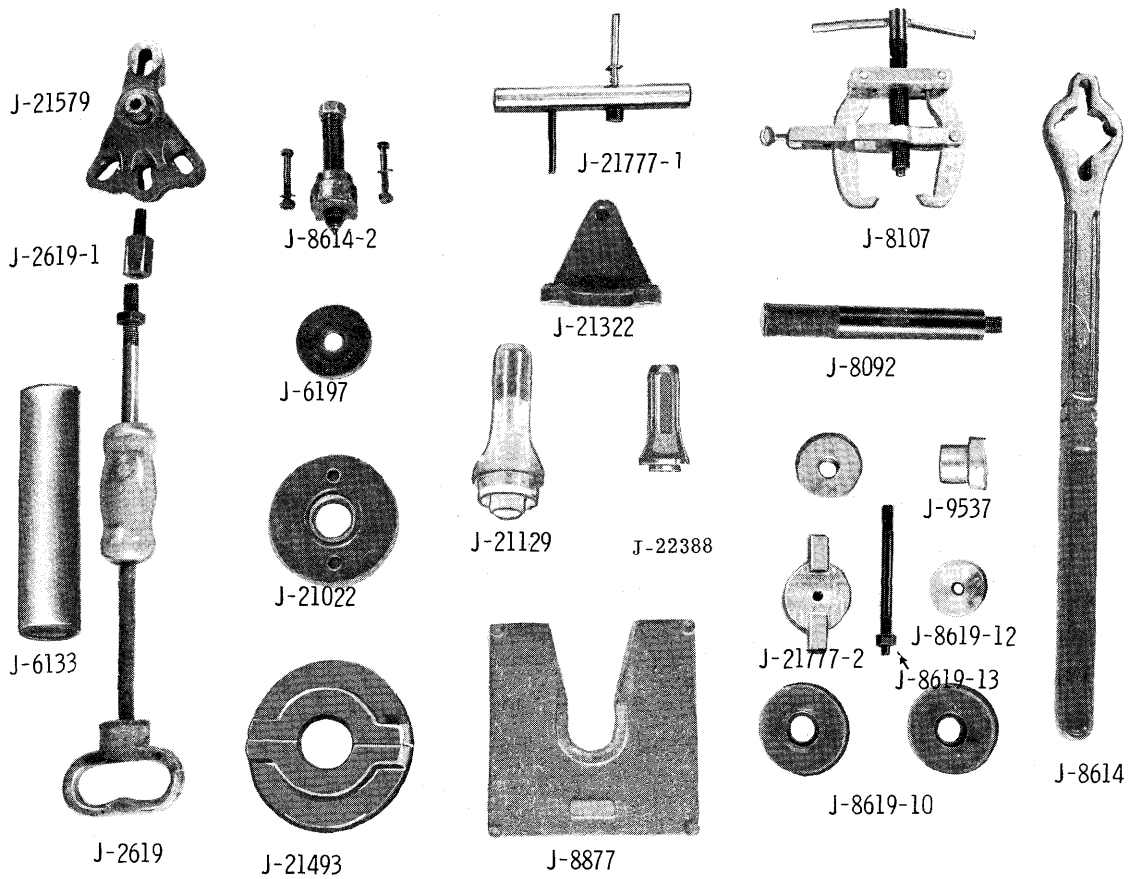
1966 DIFFERENTIAL IDENTIFICATION CODE

Series	Gear Ratio	No. Gear Teeth	Code Letters Std. Type Diff.				Code Letters Anti-Spin Type Diff.			
			Std. Equip.	With J-56	With Y-75	With J-56 & Y-75	Std. Equip.	With J-56	With Y-75	With J-56 & Y-75
3300 Thru 3800 Except Station Wagons	2.78 3.08 3.23 3.55 3.90	39:14 40:13 42:13 39:11 39:10	SA SC SE SI TG	SK SQ SV SX TJ			SB SD SF SJ TH	SL SR SW SZ TK		
Station Wagons (3455-65 3855-65)	3.08 3.23 3.55	40:13 42:13 39:11	SM SO SU	SG TC TE			SN SP SY	SH TD TF		
5200	2.78 3.08 3.23	39:14 40:13 42:13	RA RC RE	RM RI RK			RB RD RF	RN RJ RL		
5400 5600 & 5800 (*Only on 5600 & 5800 Series)	2.73 2.93 3.08 3.23 3.42	41:15 41:14 40:13 42:13 41:12	QA QC QE QG QI	*RO *RQ *RS *RU *RW	*QS	*RY	QB QD QF QH QJ	*RP *RR *RT *RV *RX	*QT	*RZ
8400 & 8600	2.73 3.08 3.23 3.42	41:15 40:13 42:13 41:12	QK QM QO QQ	RO RS RU RW			QL QN QP QR	RP RT RV RX		



H.C.P.-10	KEYSTONE CLAMP PLIERS (CORNWELL TOOL)
J-544-18	HUB BOLT PEENING TOOL
BT-6201	FRONT PINION BEARING CUP REMOVER (USED TO INSTALL INNER BEARING OUTER RACE)
BT-6202	PITMAN SHAFT OIL SEAL INSTALLER (USED TO INSTALL OUTER BEARING OUTER RACE)
BT-6309-1	PIVOT SHAFT BUSHING PRESS PLATE
BT-6412	BACK-UP PLATE
BT-6505	FRONT SUSPENSION COIL SPRING COMPRESSOR
BT-6507	DUST CAP REMOVER AND INSTALLER
BT-6515	SOCKET (USED FOR FRONT SHOCK ABSORBER REMOVAL)
J-8092	DRIVER HANDLE
J-8761	FRONT PUMP SEAL INSTALLER (USED TO INSTALL INLAND BALL JOINT SEAL)
J-8806	BALL JOINT REMOVER
J-9481	PIVOT SHAFT BUSHING INSTALLER
J-9519-9	BALL JOINT INSTALLER
J-9519-10	BALL JOINT FIXTURE
J-21474-3	SPECIAL BOLT AND THRUST BEARING ASSEMBLY
J-21474-4	SPECIAL NUT
J-21474-5	RECEIVER TOOL
J-21474-6	AXLE HOUSING BUSHING REMOVER & INSTALLER
J-21474-8	FRONT AND REAR LOWER CONTROL ARM BUSHING REMOVER
J-21474-12	FRONT LOWER CONTROL ARM BUSHING INSTALLER SPACER
J-21474-13	FRONT AND REAR LOWER CONTROL ARM BUSHING INSTALLER
J-21474-16	REAR CONTROL ARM BUSHING RECEIVER

Fig. 4B-55 Tools (54 through 86 Series)



J-2619	SLIDE HAMMER ASSEMBLY
J-2619-1	SLIDE HAMMER ADAPTER
J-6133	FRT. PINION BRG. INSTALLER
J-6197	FRONT PINION BEARING CUP INSTALLER
J-8092	DRIVER HANDLE
J-8107	DIFFERENTIAL SIDE BEARING PULLER
J-8614	COMPANION FLANGE HOLDER
J-8614-2	COMPANION FLANGE REMOVER
J-8619-10	PINION SETTING GAUGE
J-8619-12	PINION SETTING GAUGE SPECIAL WASHER
J-8619-13	PINION SETTING GAUGE STUD ASSEMBLY
J-8877	AXLE BEARING PULLER PLATE
J-9537	SIDE BEARING INSTALLER
J-21022	REAR PINION BEARING INSTALLER
J-21129	AXLE SHAFT OIL SEAL INSTALLER
J-22388	PINION SEAL INSTALLER
J-21322	RING GEAR AND CASE REMOVER
J-21493	REAR PINION BEARING REMOVER
J-21579	AXLE SHAFT REMOVER
J-21773-1	BODY AND PIN ASSEMBLY
J-21773-2	GAUGE PLATE

Fig. 4B-56 Tools (33 through 52 Series)