PROPELLER SHAFT ALL SERIES

CONTENTS

DESCRIPTION AND OPERATION

DESCRIPTION OF PROPELLER SHAFT

Two types of propeller shafts are used by Buick. One type used on the Apollo, Century, Century Luxus, Regal and Estate Wagons is a one-piece shaft with two cardan universal joints. See Figure 4A-1. The other type used on LeSabres, Electras and Rivieras also has a one-piece propeller shaft but has a cardan universal joint in the front and a double cardan universal joint at the rear. See Figure 4A-2.

A universal joint and splined slip yoke are located at the transmission end of the shaft, where they are held in alignment by a bushing in the transmission rear extension. The slip yoke permits fore and aft movement of the drive shaft, as the differential assembly moves up and down. The spline is lubricated internally by transmission lubricant or grease. An oil seal at the transmission prevents leakage and protects the slip yoke from dust, dirt, and other harmful material. On cars with THM-400 and THM-375 automatic transmissions, the slip yoke spline is lubricated with grease and provided with a small vent hole to prevent "blowing" the 0-ring seal during installation. These

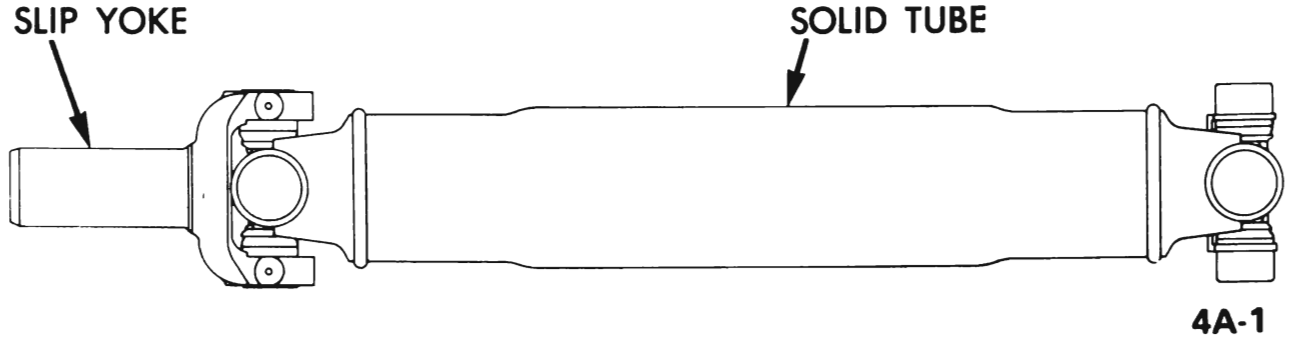

Figure 4A-1 Single Cardan Propeller Shaft

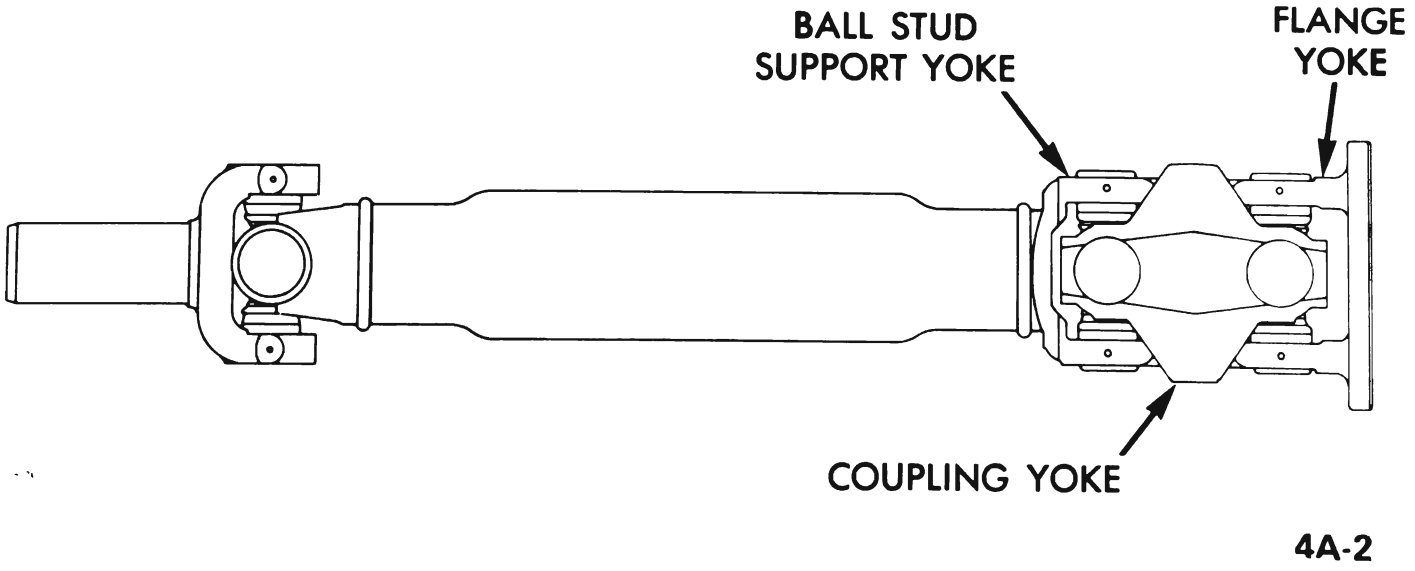

Figure 4A-2 Double Cardan Propeller Shaft

slip yokes should be inspected to be sure the vent hole is clear. See Figure 4A-3.

A second universal joint attached by two straps is used where the drive shaft mates with the pinion flange at the rear.

The propeller shaft used on the LeSabre, Electra and Riviera is similar to the type used on the Apollo, Century, Century Luxus, Regal and Estate Wagons, except for the double cardan universal joint at the rear.

This joint consists of two cardan joints, closely coupled with a link yoke.

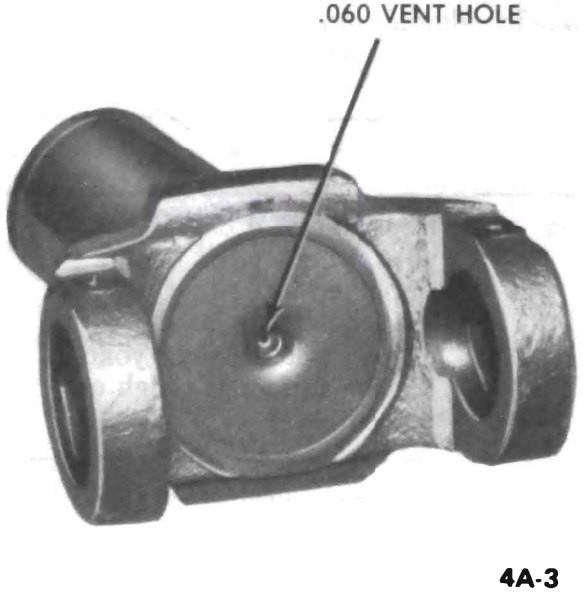

Figure 4A-3 Slip Yoke With Vent Hole

A centering ball socket between the joints maintains the relative position of the two units. This centering device causes each of the two units to operate through one-half of the included angle between the drive shaft and differential carrier.

This drive shaft is attached to the differential carrier by means of a double flange connection. A flange on the rear universal joint is attached to a flange on the differential carrier pinion by four (4) bolts.

A lubrication fitting has been added to the propeller shaft CV joint centering ball. Ball should be lubed at four months or 6,000 miles and each four months or 6,000 miles thereafter with Multi-purpose grease E.P. No. 1. See Figure 4A-4.

The universal joints are lubricated for life and cannot be lubricated while on the car. A service kit which consists of a spider with bearing assemblies and snap rings must be installed on the car if a universal joint becomes worn or noisy. If it becomes necessary to repair a universal joint, the entire propeller shaft must be removed from the car. Care should be taken to avoid jamming, bending, or over-angulating of any parts of the assembly.

If a car is to be undercoated, the propeller shaft must be kept completely free of undercoating material. Undercoating material or any other foreign material will upset the propeller shaft balance and produce serious vibration.

On all series cars except Apollo production universal joint bearing are retained by a nylon injection ring instead of the conventional snap ring. The Apollo uses the snap rings. All service universal joints however, will use snap rings.

Figure 4A-4 CV Joint Centering Ball Lube Fitting

DIAGNOSIS

PROPELLER SHAFT TROUBLE DIAGNOSIS

Condition	Possible Cause	Correction
Leak at front slip yoke. (An occasional drop of lubricant leaking from splined yoke is normal and requires no attention.)	1. Rough outside surface on slip yoke.	1. Replace seal if cut by burrs on yoke. Minor burrs can be smoothed by careful use of crocus cloth or honing with a fine stone. Replace yoke if outside surface is rough or burred badly.
	2. Defective transmission rear oil seal	2. Replace transmission rear oil seal.
		3. Bring transmission oil up to proper level after correction.

Condition	Possible Cause	Correction
Knock in drive line clunking noise when car is operated under float condition at 10 mph in high gear or "Neutral".	1. Worn or damaged universal joints.	1. Replace.
	2. Side gear hub counterbore in differential worn oversize.	2. Replace differential case and/or side gears as required.
Ping, snap, or click in drive line.	1. Loose upper or lower control arm bushing bolts.	1. Tighten bolts to specified torque.
	2. Worn or damaged universal joints.	2. Replace.
Scraping noise.	1. Slinger, pinion flange, or end yoke rubbing on rear axle carrier.	1. Straighten slinger to remove interference.
Roughness on heavy acceleration (short duration).	1. Double cardan joint ball seats worn. Ball seat spring may be broken.	1. Replace with ball seat repair kit. If centering ball is badly worn, replace.

Objectional vibration, roughness, rumble or boom can be caused by the input from a number of systems. The chart provides a systematic approach to finding the vehicle problem.

To determine whether the propeller shaft is causing the problem, drive vehicle through speed range and note speed (vehicle and/or engine) at which problem is most pronounced (tachometer may be used). Shift transmission into a lower gear range and drive vehicle at same engine speed as when problem was most pronounced in direct drive. Note effect on problem.

To determine engine speed, if tachometer is not used, divide vehicle speed by the transmission gear ratio in which the problem occurs.

Example: With the THM-400 in low range, divide by 1.50. If problem is most pronounced in direct drive at 65 M.P.H. the same engine speed would be produced in low range (THM-400) at 65/1.50=43 M.P.H.

If the problem is still present at the same engine speed whether in direct drive or in the lower gear range, since the propeller shaft speed varies, it cannot be at fault. If problem decreases or is eliminated, in a different gear range but at the same engine speed, check the possible causes in Figure 4A-5.

MAINTENANCE AND ADJUSTMENTS

CHECKING REAR UNIVERSAL JOINT ANGLE

When torque is transmitted through any ordinary universal joint, the driven yoke fluctuates slightly in speed. In other words, although the driving yoke rotates at a constant speed, the driven yoke speeds up and slows down twice per revolution. This fluctuation of the driven yoke is in direct proportion to the angle through which the universal joint is operating; the greater the angle, the greater the fluctuation.

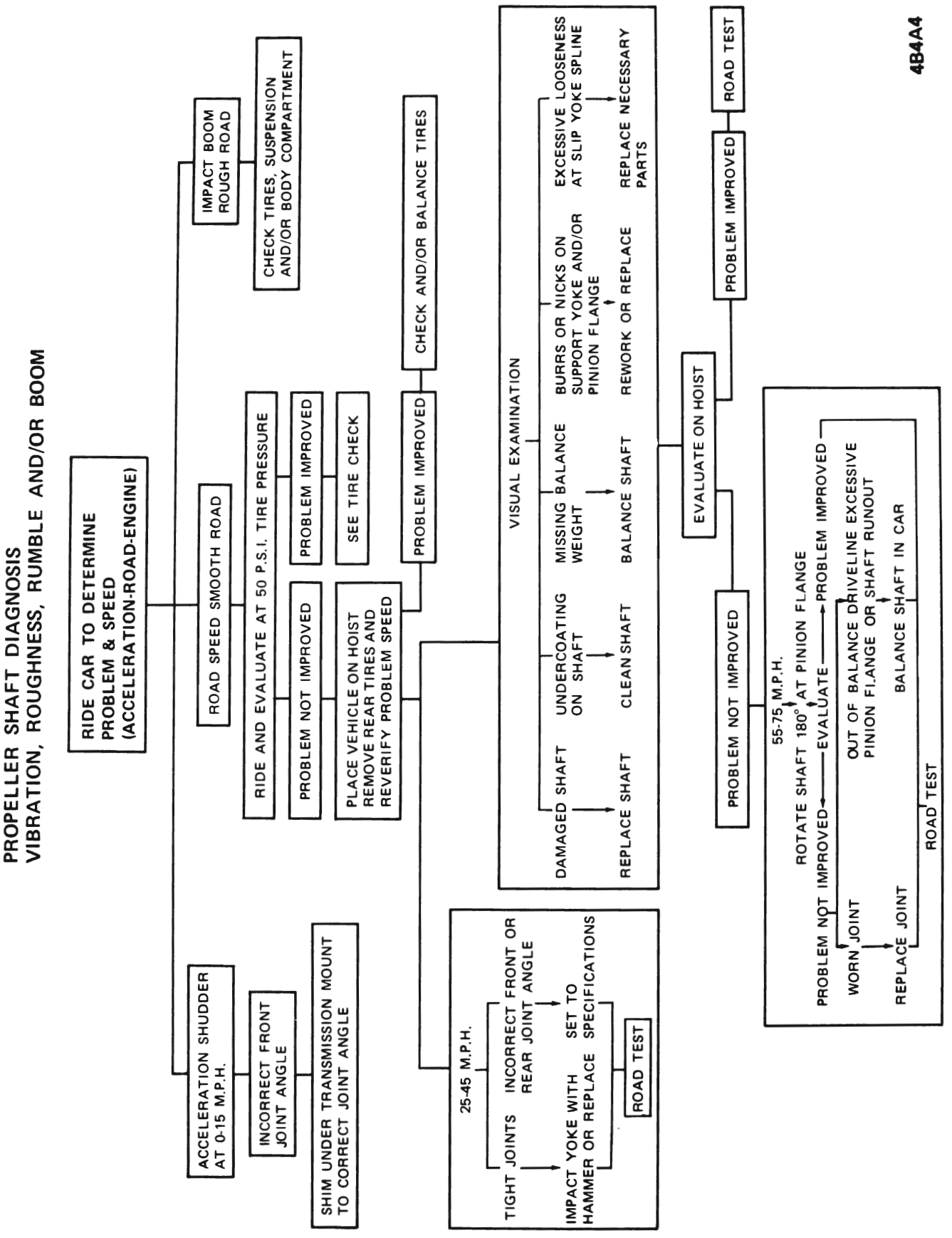

Figure 4A-5 Trouble Diagnosis Chart

Whenever two universal joints are used, this fluctuation effect can be eliminated by staggering the joints so that the two driving yokes are 90 degrees apart provided the two joints are transmitting torque through the same angle.

Therefore, when two universal joints are used, the angles through which they operate must be very nearly the same. This allows the alternate acceleration and deceleration of one joint to be offset by the alternate deceleration and acceleration of the second joint. When the two joints do not run at approximately the same angle, operation is rough and an objectionable vibration is produced.

The actual optimum angles desired must also consider the effects of various passenger loadings and rear axle windup during acceleration so that it is unlikely that the front and rear joints will be found to be the same in actual practice.

In addition, universal joints are designed to operate safely and efficiently within certain angles. If the designed angle is exceeded, the joint may be broken or otherwise damaged.

The front universal joint angle is actually the angle between the engine-transmission centerline and the propeller shaft. This angle is determined by the design of the frame assembly and may be altered by adding or removing shims between the transmission rear bearing retainer and the transmission mount.

Because sensitivity to pinion angle adjustment has been reduced, non-adjustable rear upper control arms are installed at the best pinion angle during factory installation.

Minor rear joint angle, corrections can be made by shimming between the spring plates on the Apollo and Estate Wagons or by loosening all of the rear suspension control arm bolts on all other cars and repositioning the pinion nose up or down. This takes advantage of all the bolt hole tolerances in the brackets.

All complaints of propeller vibration should be accompanied by rear trim height measurements at curb weight. An incorrect trim height may cause some vibration. If vibration is severe enough, removal or installation of spring shims may be required. If any irregular roughness or vibration is detectable in the drive line, the rear universal joint angle should be checked. Also, if a car is involved in a severe rear end collision, or if the rear axle housing is replaced, the rear universal joint angle should be checked and arms replaced if necessary.

INCLINOMETER METHOD

This method can be used with the car over a pit or on a drive-on platform hoist as long as the car is at curb weight with a full tank of gasoline. Jounce car up and down to assure curb height.

Readings should be taken at the following locations in the following manner.

Angle at Rear Universal Joint - Single Cardan Type

1. Place inclinometer on rear propeller shaft bearing cap. See Figure 4A-6. Center bubble in sight glass and record measurement. Bearing cap must be straight up and down and free of dirt or other foreign material to obtain an accurate measurement.

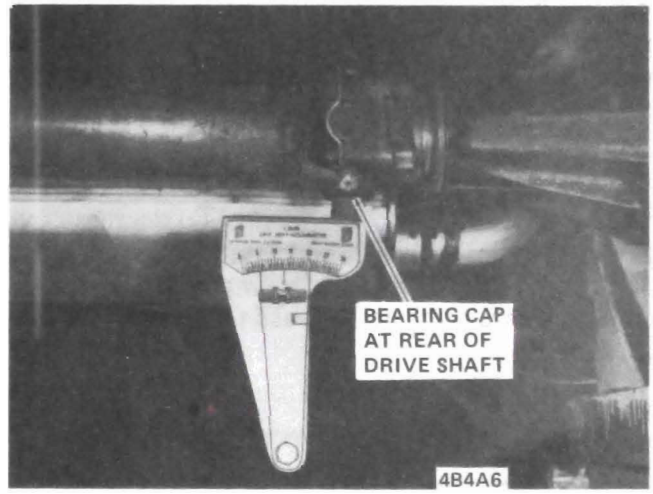

Figure 4A-6 Measuring Angle at Rear of Propeller Shaft

2. Rotate propeller shaft 90 degrees and place inclinometer on rear drive yoke bearing cap. See Figure 4A-7. Center bubble in sight glass and record measurement.

3. Subtract both figures to obtain existing rear joint angle.

4. For installation of shims to correct angle on the Apollo and Estate Wagons, use the following procedure:

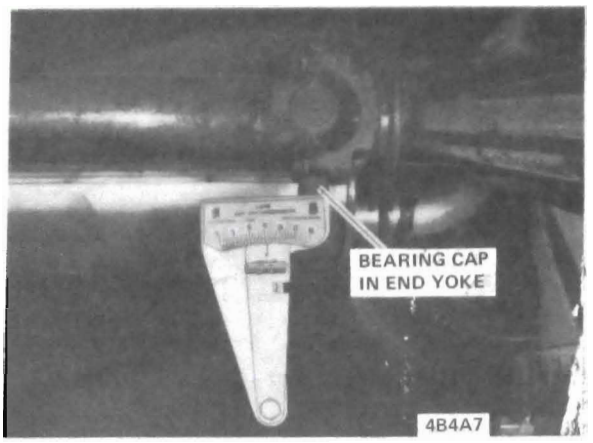

Figure 4A-7 Measuring Angle at Rear of Propeller Shaft

A. With rear wheels or axle housing supported, place floor stands forward of the front leaf spring attaching points.

B. Loosen, but do not remove the "U" bolt attaching nuts. "U" bolt nuts should be loosened 3 or 4 threads beyond the bottom of the "U" bolts. Perform operation on one side at a time.

C. Install proper degree shim between the upper spring plate cushion and the spring. To decrease the angle install shim with the thick end toward the front of the car. If it is necessary to increase the angle, install shim with thick end toward the rear of car. See Figure 4A-9.

D. Install the spacers between the upper and lower spring plates with the thick end in the same direction as the thick end of shim.

E. Torque "U" bolt nuts to 45 lb.ft.

F. Recheck angle for proper correction.

Angle at Front Universal Joint - Single Cardan Type

1. Place inclinometer on front propeller shaft bearing cap. See Figure 4A-10. Center bubble in sight and record measurement.

2. Rotate propeller shaft 90 degrees and place inclinometer on front slip spline yoke bearing cap. See Figure 4A-11. Center bubble on sight glass and record measurement.

3. Subtract smaller figure from larger figure to obtain existing front universal joint angle.

Angle at Rear Universal Joint - Double Cardan Joint

1. Place inclinometer on rear drive shaft bearing cup. See Figure 4A-12. Center bubble in sight glass and record angle.

UNIVERSAL JOINT ANGLES

	FRONT	REAR
"A" Series Sedans and Coupes	3¼°	2¾°
Century Wagon	2¾°	2¾°
LeSabre and Centurion	−¼°	10°
Electra	0°	9¾°
Riviera	+¼°	9¾°
"B" Wagon Estate Wagon	1¼°	2°
Apollo	1°	2½°

*THE ABOVE ANGLES MAY BE ± 1/2°

4B4A8

Figure 4A-8 Universal Joint Angles

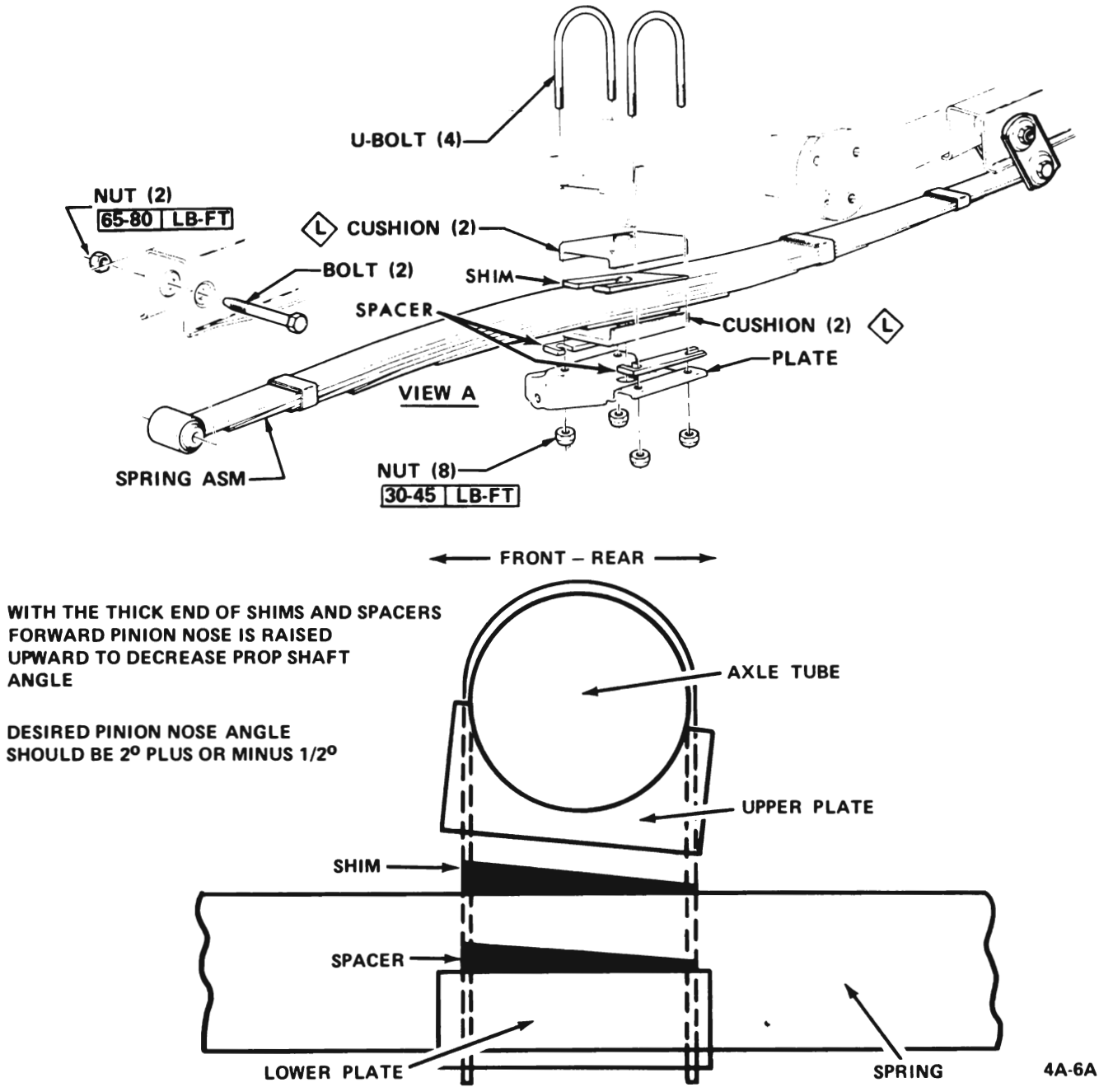

Figure 4A-9

2. Place inclinometer on rear flange yoke bearing cup. See Figure 4A-13. Center bubble in sight glass and record angle.

3. Subtract both figures to obtain rear joint angle.

When measuring the angle of any double cardan joint, the inclinometer measurements are made on the faces of the bearing cups joining the two shafts or shaft and flange yoke to the two crosses. Do not measure on the bearing cups on the coupling yoke. Rotate the drive shaft so that the bearing cups to be measured are in the straight up and down position. Measurements must be made on the clean metal face of the bearing cup ends.

PROPELLER SHAFT BALANCING PROCEDURE

Hose Clamp Method

1. Place the car on a twin post hoist so that the rear of the car is supported on the rear axle housing and the rear wheels are free to rotate. Remove both rear tire and wheel assemblies and reinstall wheel lug nuts with flat side next to drum.

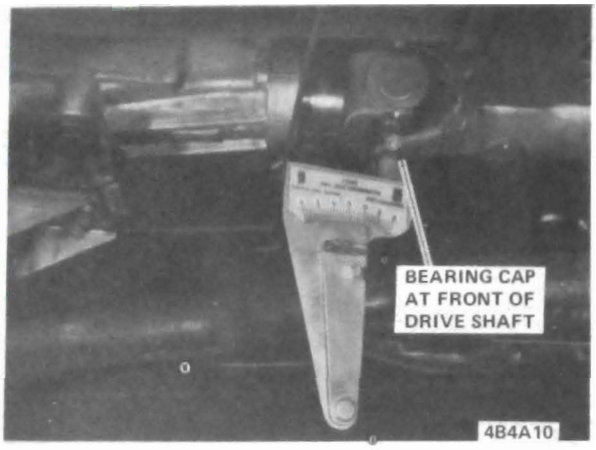

Figure 4A-10 Measuring Angle at Front of Propeller Shaft

2. Mark and number propeller shaft at four (4) points 90 degrees apart at rear of shaft just forward of balance weight.

3. Install two (2) Wittek type hose clamps on the rear propeller shaft and slide them rearward until the clamps stop at the nearest balance weight welded to the tube. Align both clamps to any one of the four marks made on shaft in Step 2. Tighten the clamps. See Figure 4A-14. Be sure sufficient clearance is maintained so that clamp heads do not contact floor pan of car when axle is in contact with rebound bumper in frame. In order to gain sufficient clearance, it may be necessary to position the clamps over the balance weights.

4. Run the car through the speed range to 65-70 MPH. Note amount of unbalance.

CAUTION: *Never run car higher than 75 M.P.H. Also all personnel should stay clear of driveline.*

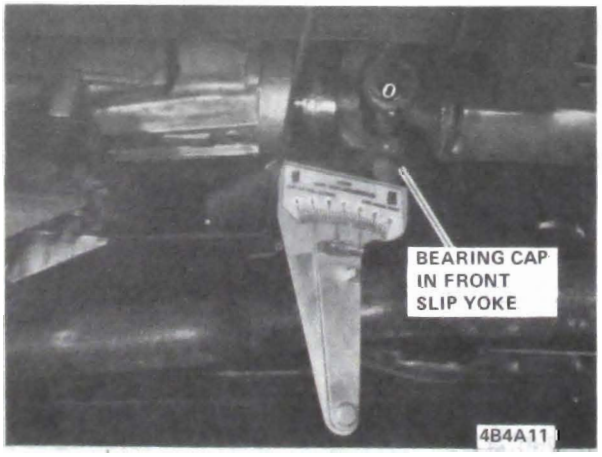

Figure 4A-11 Measuring Angle at Front of Propeller Shaft

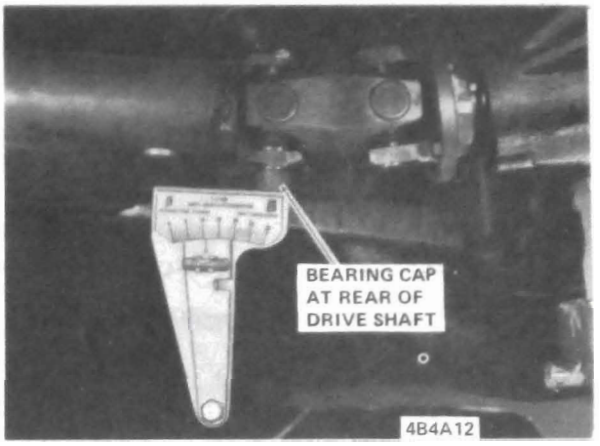

Figure 4A-12 - Measuring Angle at Rear of Propeller Shaft

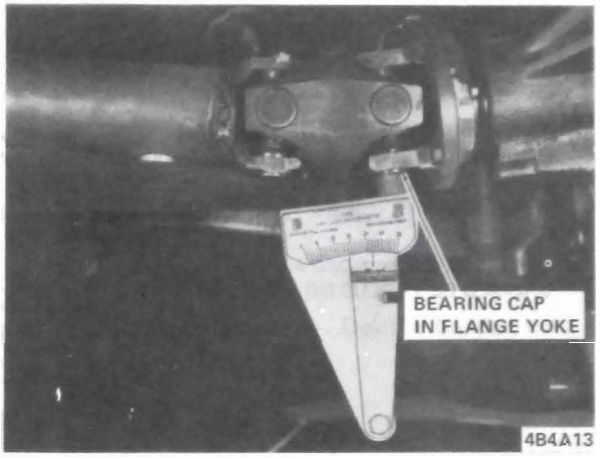

Figure 4A-13 - Measuring Angle at Rear of Propeller Shaft

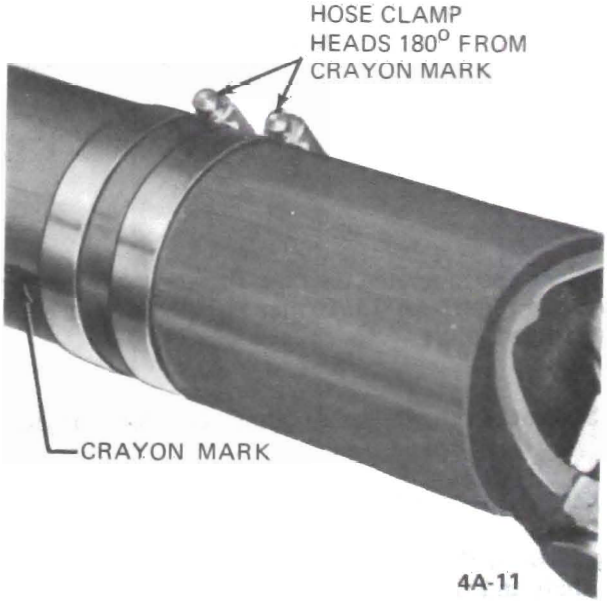

Figure 4A-14 - Balance Hose Clamps in Place

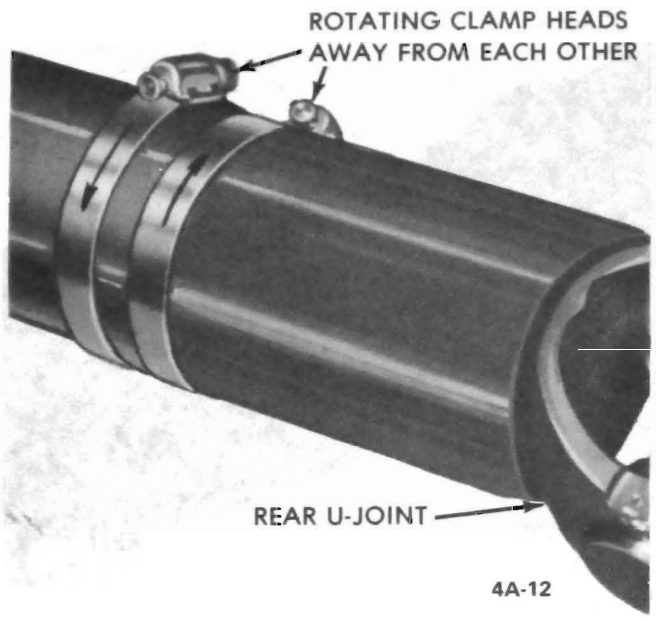

Figure 4A-15 - Rotating Balance Hose Clamps

5. Loosen clamps and rotate clamp heads 90 degrees to the next mark on shaft. Tighten clamps and repeat Step 4.

6. Repeat Step 5 until car has been run with clamp heads located at all four marks on shaft.

7. Position clamps at point of minimum unbalance. Rotate the clamp heads away from each other 45 degrees. (One each way from the point of minimum unbalance) Run the car and note if unbalance has improved. See Figure 4A-15.

In some cases it may be necessary to use one clamp or possibly three clamps in order to obtain a good balance.

Replace shaft if three hose clamps does not correct problem.

8. Continue to rotate the clamps apart in smaller angular increments until the car feel for unbalance is best.

Do not run car on hoist for extended periods due to danger of overheating the transmission or engine.

9. Reinstall tire and wheel assemblies and roadtest the car for final check of balance. Vibration felt in the car on the hoist may not show up in a roadtest which is, after all, the final determining factor.

Strobe Light - Wheel Balance and Hose Clamp Method

If a wheel balancer of the type that is equipped with a strobe light is available, the use of such a unit will facilitate the balancing of the drive shaft. The balance pick-up unit should be placed directly under the nose of the rear axle carrier and as far forward as possible.

1. Place the car on a twin post hoist so that the rear of the car is supported on the rear axle housing and the rear wheels are free to rotate. Remove both rear tire and wheel assemblies and reinstall wheel lug nuts with flat side next to drum.

2. Mark and number drive shaft at 4 points 90 degrees apart at rear of shaft just forward of balance weights as shown in Figure 4A-16.

3. Place strobe light wheel balancer pick-up under the nose of the differential. See Figure 4A-17.

4. With car running in gear at car speed where disturbance is at its peak, allow the driveline to stabilize by holding at constant speed. Point strobe light up at the spinning shaft and note position of one of these reference numbers. Shut off engine and position the drive shaft so that the reference numbers will be in the same position as was noted while the shaft was rotating.

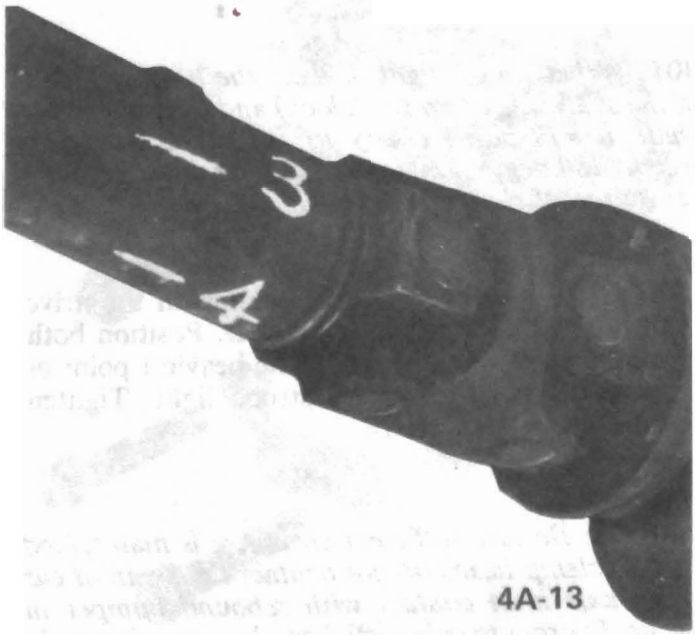

Figure 4A-16 Reference Marks on Drive Shaft

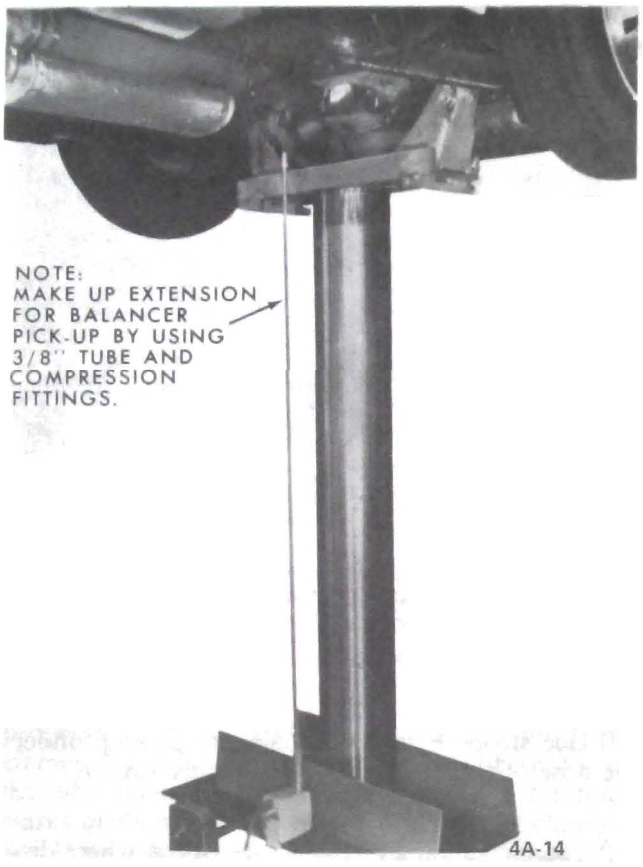

Figure 4A-17 Pick-Up Unit at Differential Pinion Nose

CAUTION: *Never run car higher than 75 M.P.H. Do not run car on hoist for extended periods due to danger of overheating the transmission or engine. All personnel to stay clear of driveline joint and balance weight area.*

NOTE: *When strobe light flashed, the heaviest point of the shaft was down (6 o'clock) and to balance this shaft, it will be necessary to apply the balancing weight 180 degrees away from the heaviest point or at the top of the shaft (12 o'clock).*

5. Install two screw-type hose clamps on the drive shaft as close to the rear as possible. Position both clamp heads 180 degrees from the heaviest point of drive shaft as indicated by strobe light. Tighten clamps. See Figure 4A-18.

CAUTION: *Be sure sufficient clearance is maintained so that clamp heads do not contact floor pan of car when axle is in contact with rebound bumper in frame. In order to gain sufficient clearance, it may be necessary to position the clamps over the balance weights.*

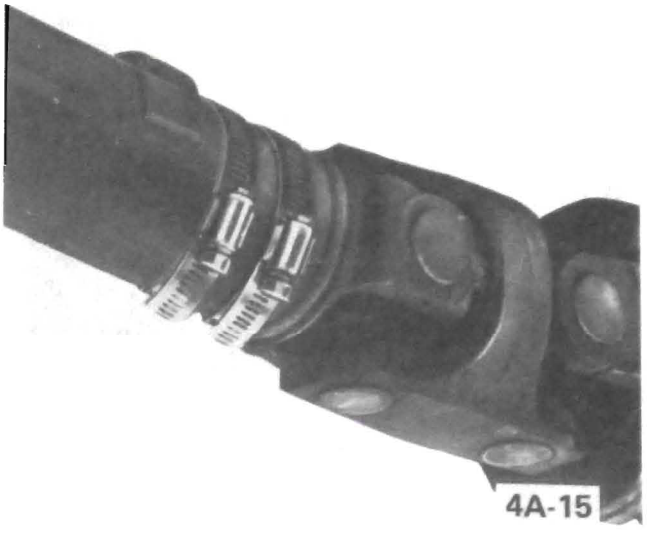

Figure 4A-18 Balance Hose Clamps in Place

6. Run car through the speed range 65-70 M.P.H. If disturbance is gone, nothing further need be done on the hoist. If the disturbance still exists and the strobe light shows the clamp heads at the bottom (6 o'clock) of the shaft, proceed to Step 7. If the strobe light shows the two clamp heads at the top of the shaft, additional weight must be added (more hose clamps). Continue to add weight until strobe light shows hose clamp heads at bottom of shaft (6 o'clock). If disturbance still exists, proceed to Step 7.

7. Rotate two of the hose clamps equally away from each other toward the top (one each way from the original position as shown in Figure 4A-19), in small increments until best balance is achieved.

In some cases it may be necessary to use one clamp or possibly three clamps in order to obtain a good balance.

Replace shaft if three hose clamps does not correct problem.

8. Install rear drums and wheels and road test car for final check of balance.

NOTE: *Vibration felt in the car on the hoist may not show up in a road test which is, after all, the final determining factor.)*

MAJOR REPAIR

REMOVAL OF PROPELLER SHAFT

CAUTION: *Do not pound on original propeller shaft yoke ears as injection joints may fracture.*

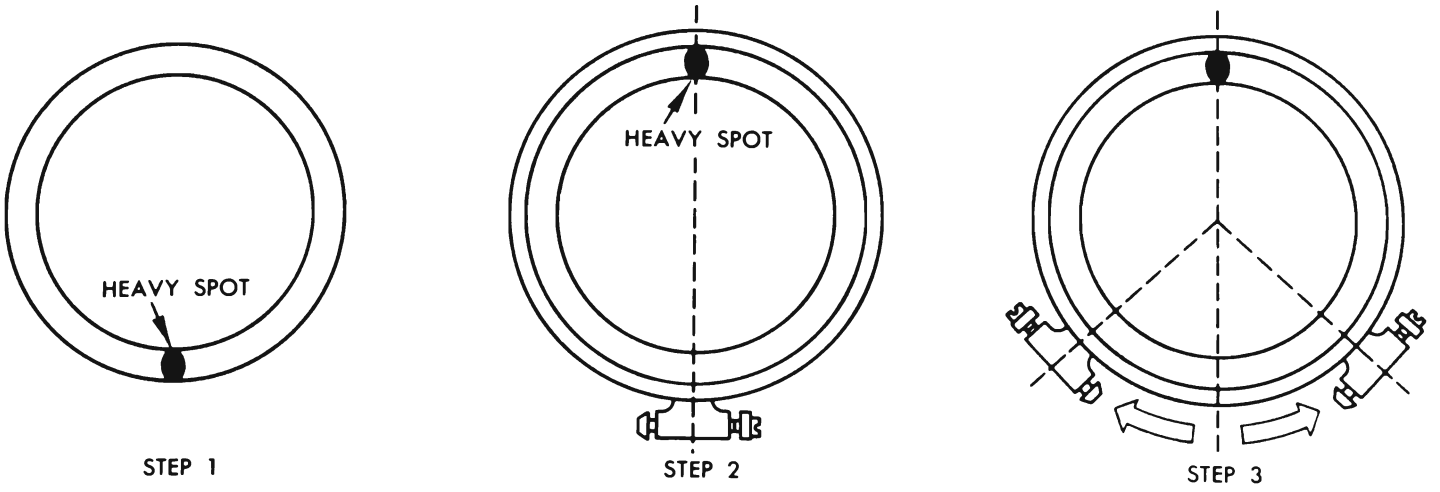

Figure 4A-19 Positioning Hose Clamp to Achieve Best Balance

There are two methods of attachment of the rear of the drive shaft to the differential pinion flange or end yoke. One method is a pair of straps, while the other method is a set of bolted flanges. See Figure 4A-21.

1. Raise vehicle on hoist. Mark relationship of shaft to pinion flange and disconnect the rear universal joint by removing straps or flange bolts. If bearing cups are loose, tape together to prevent dropping and loss of bearing rollers.

2. Withdraw propeller shaft slip yoke from transmission by moving shaft rearward, passing it under the axle housing. Do not allow drive shaft to drop or allow universal joints to bend to extreme angle, as this might fracture injected joint internally. Support propeller shaft during removal.

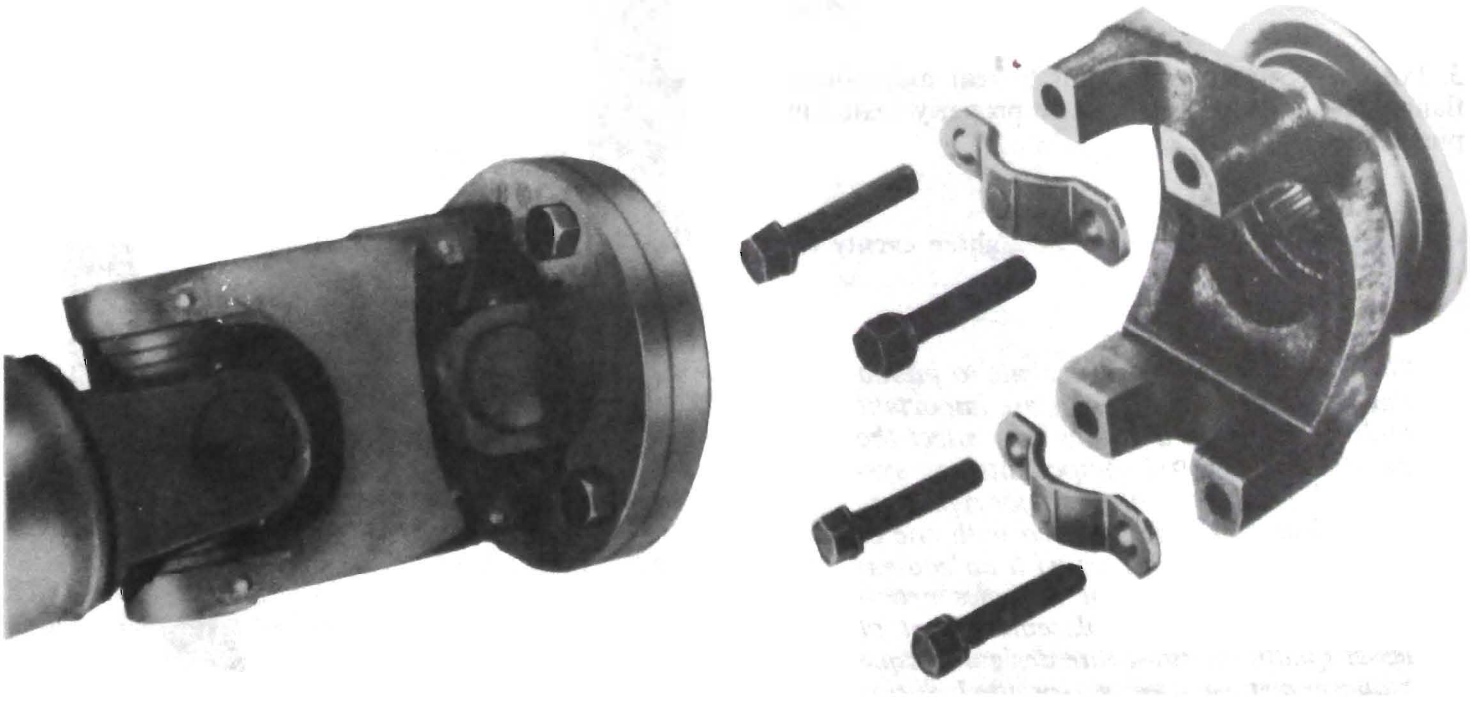

Figure 4A-21 - Rear Propeller Shaft Attachments

INSTALLATION OF PROPELLER SHAFT ASSEMBLY

The propeller shaft must be supported carefully during handling to avoid jamming or bending any of the parts.

1. Inspect outer diameter of splined yoke to ensure that it is not burred, as this will damage transmission seal. Inspect splines of slip yoke for damage.

2. Apply engine oil to all splined propeller shaft yokes which do not have vent holes, then slide yoke and driveshaft assembly onto transmission output shaft. Apply grease (EP 1 grade) to internal splined area of slip spline on slip yokes which have vent holes and slide the splined yoke onto the transmission output shaft. See Figure 4A-3. Make sure the vent hole in the yoke is not plugged.

CAUTION: *Do not drive propeller shaft in place with hammer. Check for burrs on transmission output shaft spline, twisted slip yoke splines, or possibly the wrong U-joint yoke. Make sure that the splines agree in number and fit.*

When making rear shaft connection, be sure to align mark on pinion flange or end yoke with mark on drive shaft rear yoke.

3. Position rear universal joint to rear axle pinion flange, making sure bearings are properly seated in pinion flange yoke.

4. Install rear joint fasteners and tighten evenly to torque specified.

CAUTION: *These propeller shaft to pinion flange or end yoke fasteners are important attaching parts in that they may affect the performance of vital components and systems, which may result in major repair expense. They must be replaced with one of the same part number or with an equivalent part, if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.*

DISASSEMBLY OF PROPELLER SHAFT

Disassembly of Single Cardan Universal Joint - A Series and Estate Wagons

When disassembling a propeller shaft, one or both of the two types of universal joints, as shown in Figure 4A-22, may be found.

Figure 4A-22 - Production Universal Joints

1. Position propeller shaft and spider press J- 9522-3 in power ram equipped with base plate J-8853 and ram screw adapter J-9522-2. See Figure 4A-23.

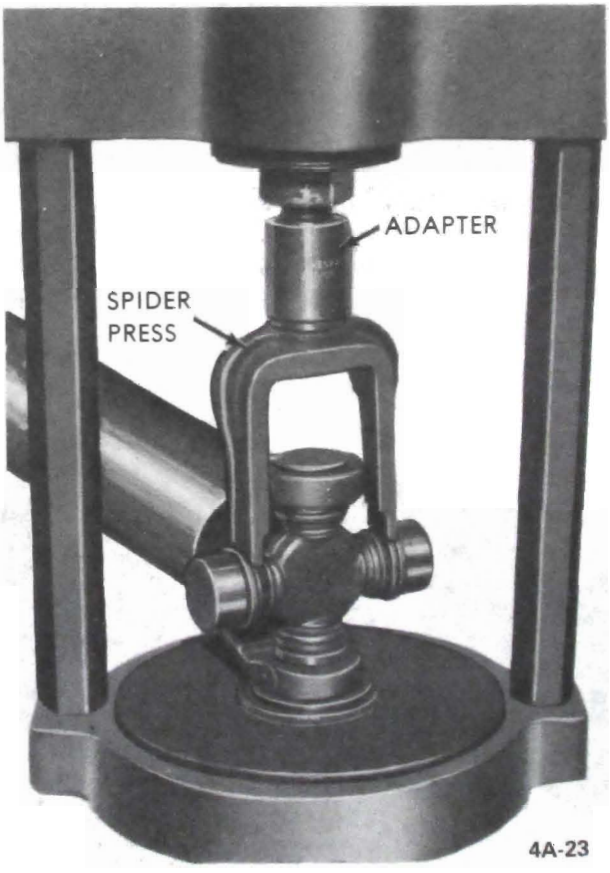

Figure 4A-23 - Pressing Out U-Joint Bearing

2. Actuate the pump to force the spider and bearing to shear the nylon retaining ring and remove the bearing.

3. Release pump valve, rotate propeller shaft 1/2 revolution and install spider guide J-9522-7 into yoke bore of removed bearing and onto the journal end of the spider.

4. Position propeller shaft as before and use spider press and power ram hydraulic pump to shear the nylon injection ring and remove the opposite bearing. See Figure 4A-24.

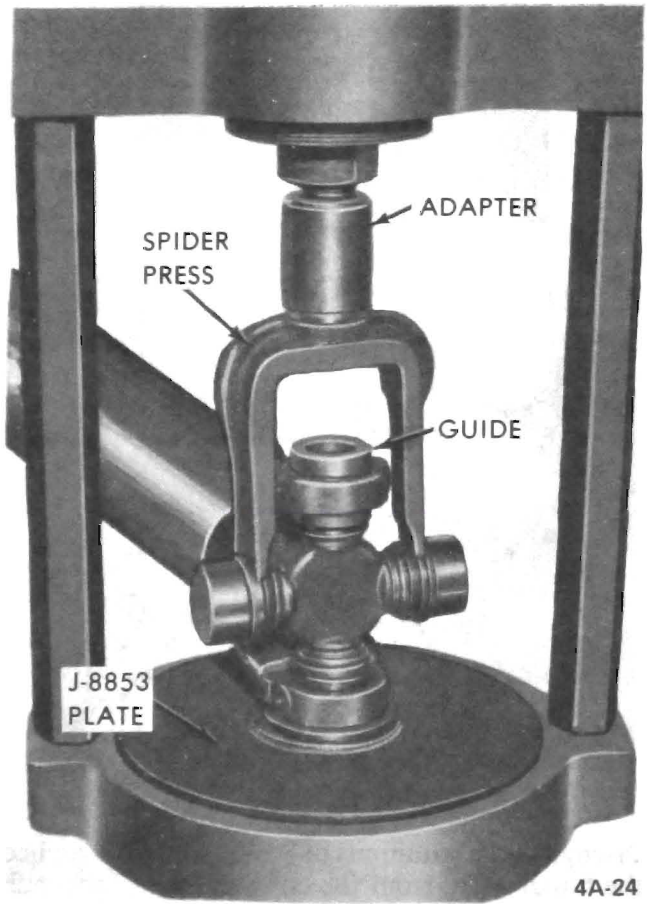

Figure 4A-24 - Pressing Out U-Joint Bearing With Guide Installed

The above procedures should also be used to disassemble the front universal joint.

Once a production universal joint is disassembled, it cannot be reassembled as there are no snap ring grooves provided in the bearing cap.

Disassembly of Single Cardan Universal Joint - X Series

The universal joints are of the extended life design and do not require periodic inspection or lubrication; however, when these joints are disassembled, repack bearings and lubricant reservoir at end of spider with high-melting point wheel bearing lubricant and replace the dust seals.

1. Remove bearing cap snap ring from yoke.

2. Support rear yoke on a piece of 1-1/4" I.D. pipe on an arbor press.

3. Using a suitable socket or rod, press on spider until bearing cap is almost out. Grasp cap in vise and work cup out of yoke.

The bearing cap cannot be fully pressed out.

4. Rotate propeller 1/2 revolution and remove opposite bearing cap using the procedure in step 3.

5. Clean and inspect all part and relubricate bearings.

The above procedure should also be used to disassemble front universal joint.

Disassembly of Double Cardan Universal Joint

CAUTION: *Never clamp propeller shaft tubing in a vise, as the tube may be dented. Always clamp on one of the yokes. Be careful not to damage the front propeller shaft slip yoke sealing surface. Any nicks can damage the bushing or cut the seal.*

1. Support the propeller shaft in a horizontal position in line with the base plate of a hydraulic press. The bearing cups should be removed in the order indicated in Figure 4A-25. This method requires the least work to get to the heart of the centering ball system where the most critical inspection should be made so that the correct service method can be determined.

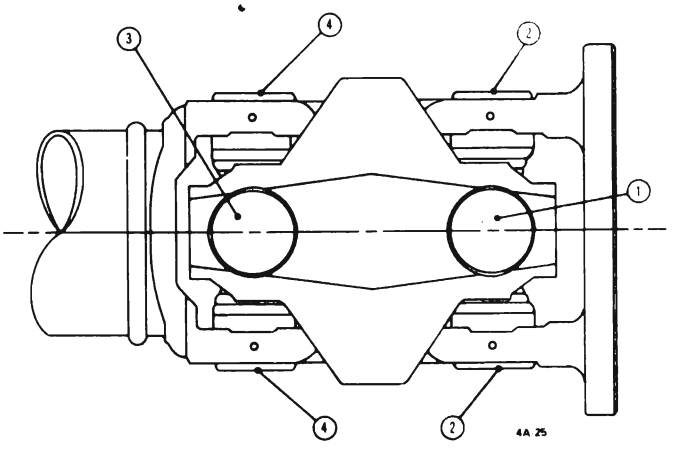

Figure 4A-25 Bearing Cap Removal Sequence

2. Mark all yokes before disassembly so that they can be reassembled in their original relationship to retain drive shaft balance. See Figure 4A-26 for marking method.

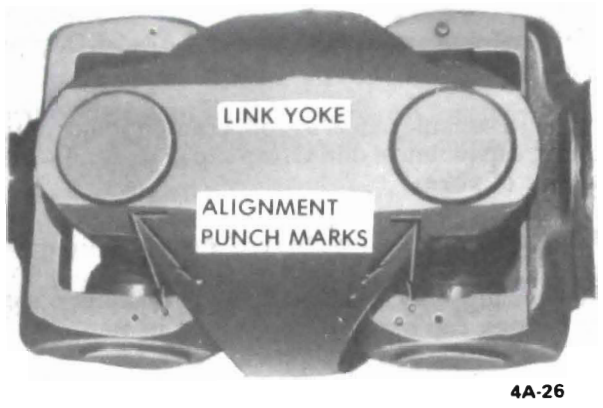

Figure 4A-26 Link Yoke Showing Alignment Punch Marks

3. Support the propeller shaft horizontally in line with the base plate of a press. Place the rear ear of the coupling yoke over a 1 1/8" socket. Place the spider press (J-9522-3) on the bearing cups in the flange yoke. See Figure 4A-27.

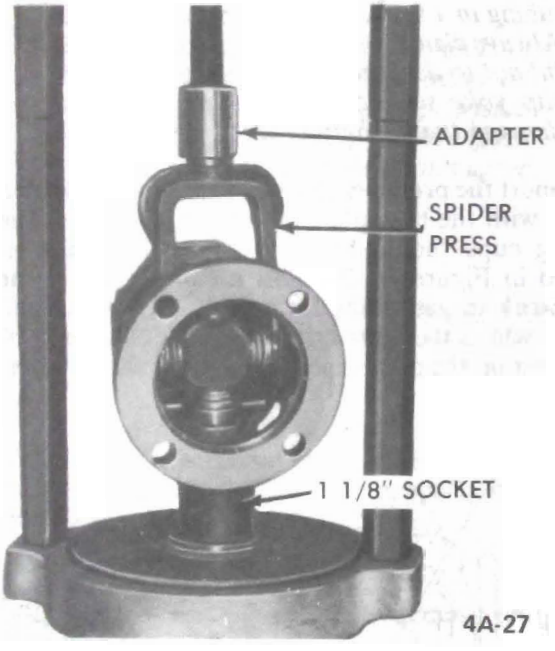

Figure 4A-27 Disassembling Rear Double Cardan U-Joint

See Figure 4A-28 for rework of older spider presses (J-9522-3) to clear the coupling yoke. Press the bearing cup out of the coupling yoke ear. If the bearing cup is not completely removed, insert spacer (J-9522-5), shown in Figure 4A-29, and complete the removal of the bearing cup.

4. Rotate the propeller shaft 180 degrees. Shear the opposite plastic retainer and press the bearing cup out of the coupling yoke as before, using Spacer J-9522-5.

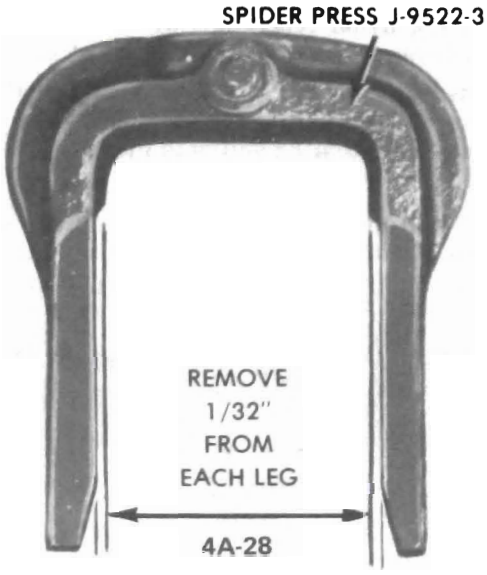

Figure 4A-28 Spider Press Leg Rework

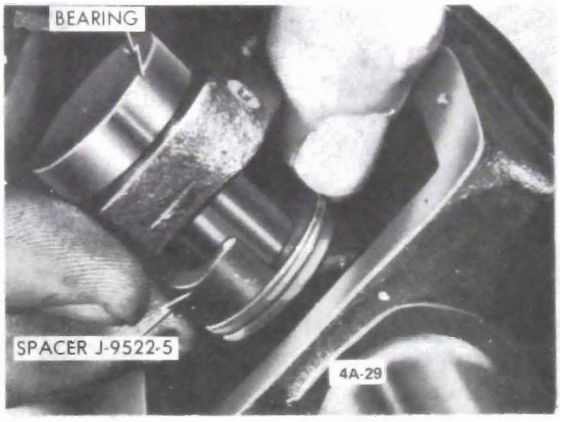

Figure 4A-29 Installing Spacer

5. Disengage the trunnions of the spider still attached to the flange yoke from the coupling yoke, and pull the flange yoke and spider from the centering ball on the ball support tube yoke. The ball socket is part of the flange yoke.

6. Pry the seal from the ball cavity, remove washers, spring, and three shoes, as shown in Figure 4A-30.

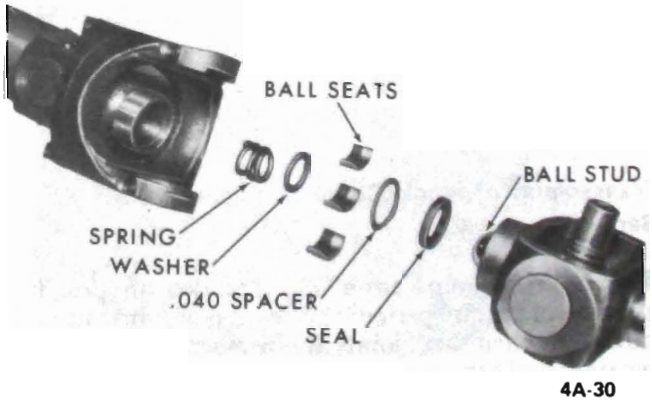

Figure 4A-30 Ball Stud Seat - Exploded View

7. The coupling yoke can now be removed from the shaft, as described above, for removal of the flange yoke.

Replacement of Centering Ball and Seats

NOTE: *To replace ball and seats only, the flange yoke has to be removed from the coupling yoke.*

1. Remove propeller shaft and flange yoke as described previously in this Section.

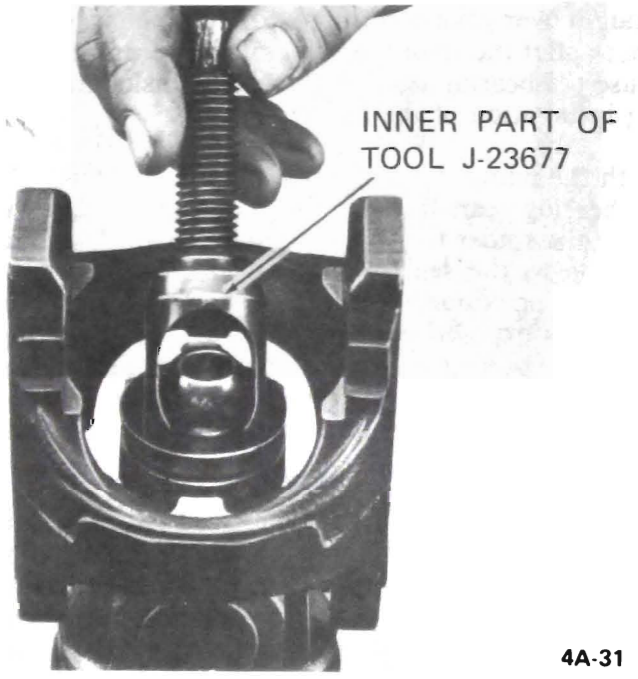

Figure 4A-31 First Step - Removing Centering Ball with Tool J-23677

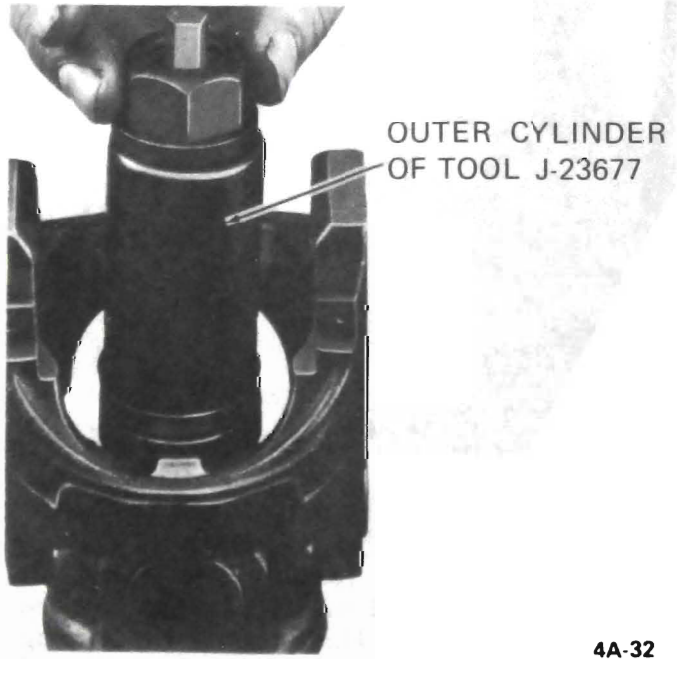

Figure 4A-32 Second Step - Removing Centering Ball with Tool J-23677

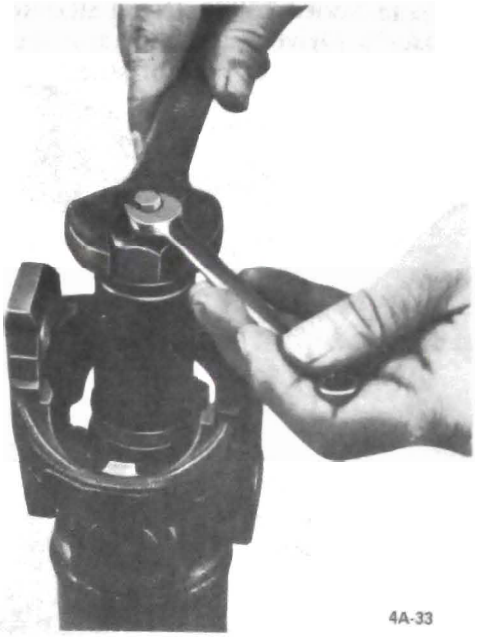

Figure 4A-33 Third Step - Removing Centering Ball with Tool J-23677

2. Inspect centering ball. Ball must be spherical in shape and must not show signs of wear beyond smooth polish.

3. If centering ball needs to be replaced, proceed as follows:

A. Place fingers of inner part of Tool J-23677 under ball. See Figure 4A-31.

B. Place outer cylinder of Tool J-23677 over outside of ball. See Figure 4A-32.

C. Thread nut on Tool J-23677 and draw ball off stud. See Figure 4A-33.

D. Place service replacement ball on stud. See Figure 4A-34.

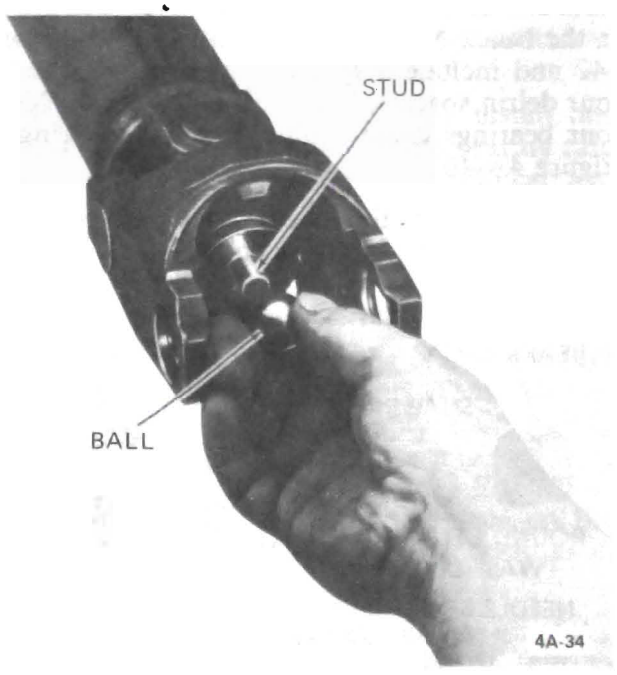

Figure 4A-34 Placing Ball on Stud

E. Using Tool J-23996 drive ball onto stud. See Figure 4A-35. Drive until ball can be seen to seat firmly against shoulder at base of stud.

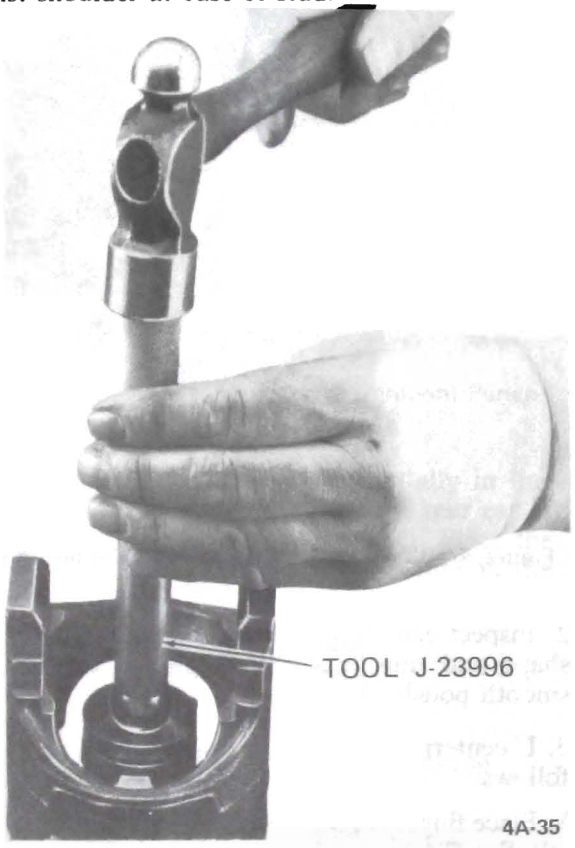

Figure 4A-35 Installing Ball Using Tool J-23996

ASSEMBLY OF PROPELLER SHAFT

Assemble of Single Cardan Universal Joint - A Series and Estate Wagons

When reassembling a propeller shaft, install complete universal joint repair kits. Repair kits are listed in the Buick Master Parts Catalog under Group 5.-442 and include a spider, four bearing assemblies, four delrin spacers, four seals and four shields. The four bearings come equipped with snap rings. See Figure 4A-40.

1. Make certain the shields and seals are in firm position and not damaged on the spider and install the spider in the yoke. The spider may face in either direction.

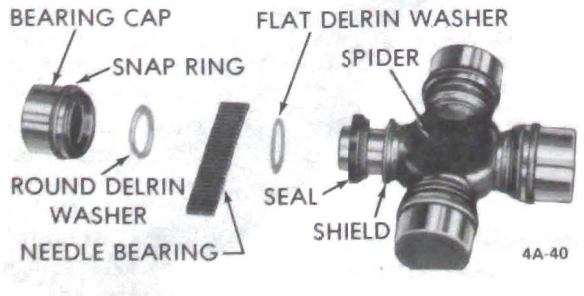

Figure 4A-40 - Service Universal Joint

2. Install spider guide J-9522-7 into one yoke bore and position spider journal into the guide. Push guide in far enough for opposite journal to extend slightly above yoke bore. Spider journals and bearings must be free of dirt or foreign material.

3. Place the propeller shaft and yoke assembly in position with the Power Ram and Pump. Inspect bearing cup to see that all needle bearings are in place and lubricated. Make certain the Delrin Washer is in place against the needle bearings. Position bearing straight over yoke bore and onto spider journal. Failure to pilot the spider journal into the bearing could cause the bearing needles to become dislodged during installation of the bearing cup.

With the pump, force the bearing into the yoke. As the bearing nears the end of its required travel, it will cause the spider to push the guide outward without damage to the seal or shield. The bearing cup is properly positioned in the yoke when the snap ring groove is exposed enough to install the snap ring. When the bearing is correctly positioned in the yoke, turn the assembly over, remove the guide J-9522-7 and again place bearing over the bore in the yoke.

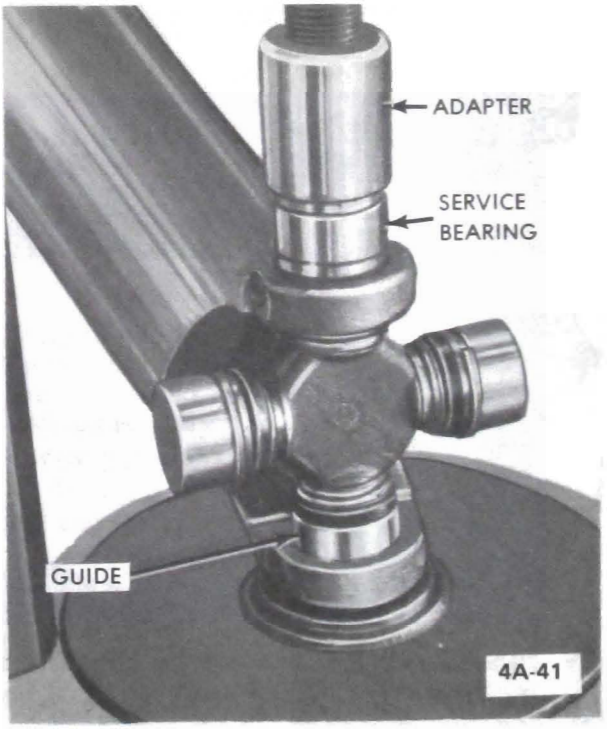

Figure 4A-41 - Installing U-Joint Bearing With Guide in Place.

Carefully slide the spider partially out of the previously seated bearing and start it carefully into the bearing being installed. This prevents the bearing needles from burring the edge of the spider journal if forced over journal other than straight. Even slight burring of the journal can cause premature failure.

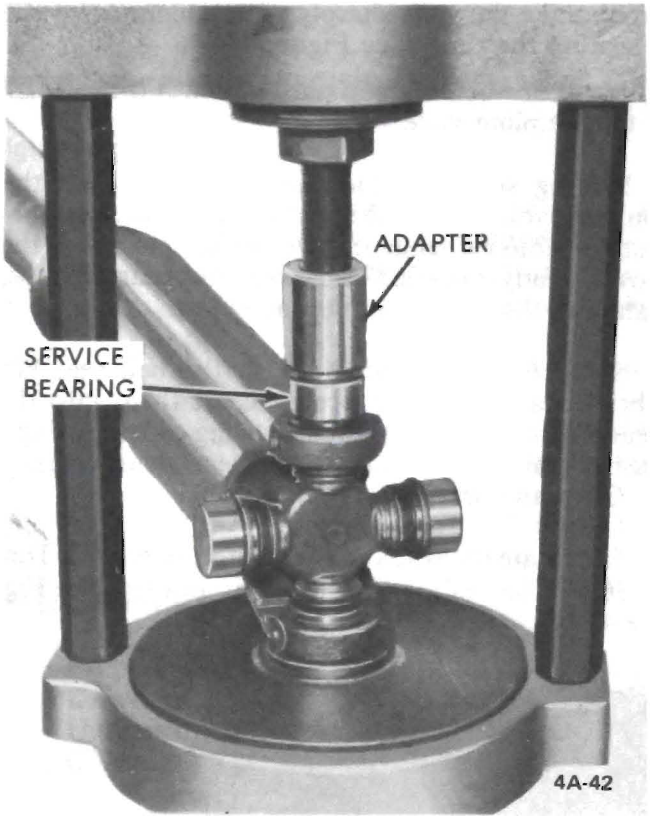

Figure 4A-42 - Installing U-Joint Bearing

While pressing bearings into position, move the spider back and forth to make certain that the spider journals engage the bearings squarely to avoid damage and binding. If binding exists, remove the bearings and spider and examine for dislodged rollers or damaged journals.

If excessive resistance is encountered, the bearings should be removed as this is an indication that one or more of the needles are out of place.

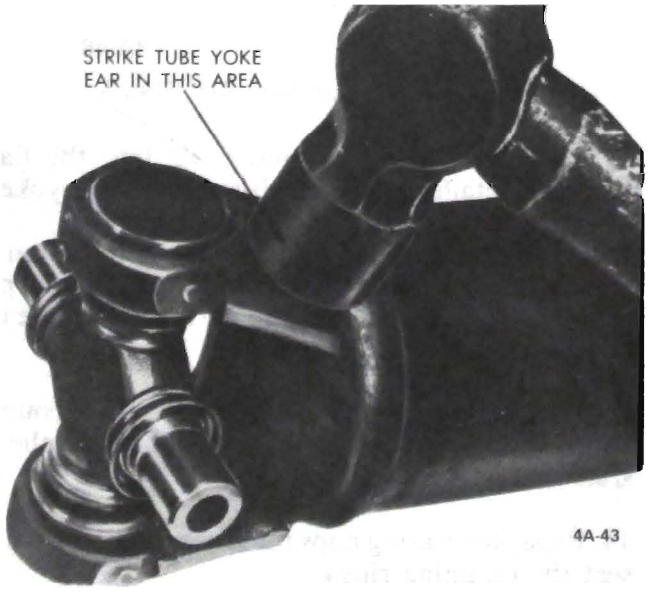

Figure 4A-43 Seating U-joint Snap Rings

3. While observing the previous precautions, install the balance of the bearings necessary to complete the assembly and install snap rings.

4. Strike the yoke firmly with a hammer to fully seat the snap rings against the yoke. Turn the spider to make certain that it is free. See Figure 4A-43.

Assemble Of Single Cardan Universal Joint - X Series

When reassembling a propeller shaft use complete universal joint repair kit. See Figure 4A-44.

Place dust seals on spider with the cavity of seal toward end of spacer. Press seal onto spider exercising caution during installation to prevent seal distortion and to assure proper seating of seal on spider.

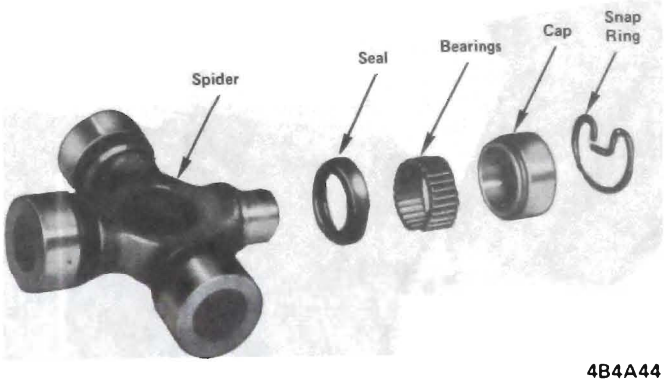

Figure 4A-44 Universal Joint Repair Kit - X Series

Make sure that the lubricant reservoir at the end of each spider is completely filled with lubricant. In filling these reservoirs, pack lubricant into thehole so as to fill from the bottom. The use of a squeeze bottle is recommended. This will prevent air pockets and ensure an adequate supply of lubricant.

1. Position spider into yoke. Partially install one bearing cap into yoke. Start spider into bearing cap. Partially install other cap, align spider into cap and press caps into yoke.

2. Install snap rings.

Assemble of Double Cardan Universal Joint

When reassembling a propeller shaft, always install complete universal joint service kits. These kits include one pregreased cross assembly, four bearing cup assemblies with seals, roller bearings, washers, and grease, and four retaining rings. See Figure 4A-40. Make sure that the seals are in place on the service bearing cups to hold the roller bearings in place for handling.

1. Install one bearing cup part way into one ear of the ball support tube yoke, and turn this bearing cup to the bottom.

2. Insert cross into tube yoke so that the trunnion seats freely into the bearing cup.

3. Install opposite bearing cup part way, making sure that both trunnions are started straight and true into both bearing cups.

4. Press against opposite bearing cups, working the cross all of the time to insure free movement of the trunnions in the bearings. If there seems to be a hangup, stop pressing and recheck roller bearings, because one or more of them has probably been tipped under the end of the trunnion.

5. As soon as one snap ring groove clears the inside of the yoke, stop pressing and snap the retaining ring into place. See Figure 4A-45.

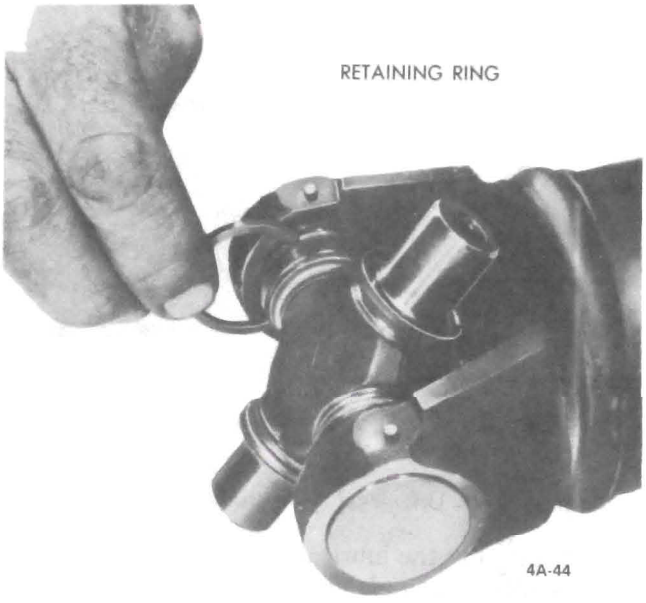

Figure 4A-45 Installing Retaining Ring

6. Continue to press until the opposite retaining ring can be snapped into place. If difficulty is encountered, strike the yoke sharply with a hammer to aid in seating the rings. See Figure 4A-46.

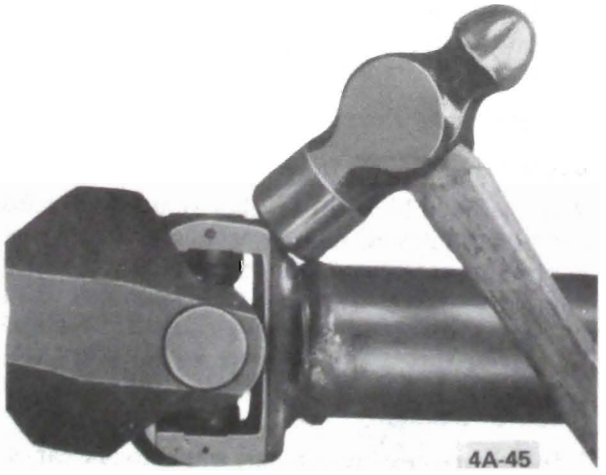

Figure 4A-46 Seating Snap Ring

7. Install one bearing cup part way into the one ear of the coupling yoke.

8. Making sure that the alignment marks on the coupling yoke and ball support tube yoke are correctly positioned, engage the coupling yoke over the cross already installed and press the bearing cups, installing the retaining rings as before.

9. Using the grease provided in the ball seat kit, lubricate all of the parts and insert them into the clean ball seat cavity in the following order: Springs, washer (smallest OD), three ball seats, washer (largest OD), and seal.

10. Lubricate the seal and press into cavity with Tool J-23694. The sealing lip should tip inward. See Figure 4A-47.

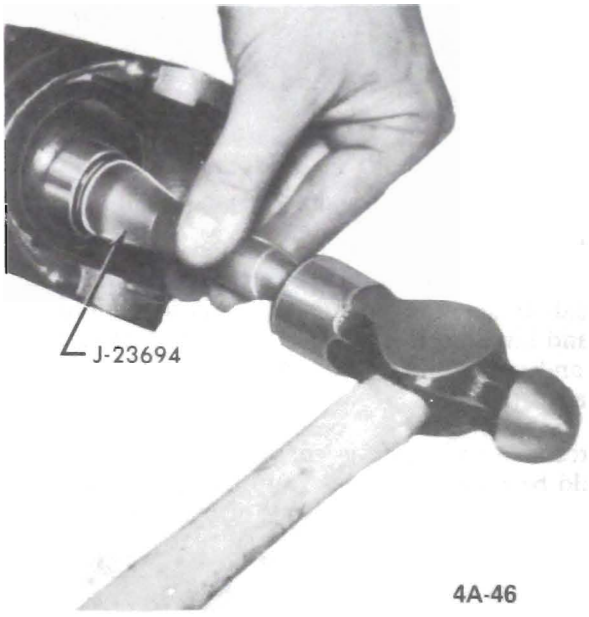

Figure 4A-47 Installing Ball Stud Seal

11. Install bearing cups and cross into the flange yoke, as detailed for the ball support tube yoke.

12. Making sure that the alignment marks on the coupling yoke and flange yoke are correctly positioned, insert one bearing cup part way into the coupling yoke.

13. Engage the ball stud into its seat and the coupling yoke over the exposed cross trunnion. Push the ball stud into its seat.

14. Press the bearing cups into the coupling yoke and seat the retaining rings.

The flange yoke should snap over center to right or left and up or down by the pressure of the ball seat spring freely, if correctly installed.

SPECIFICATIONS

PROPELLER SHAFT SPECIFICATIONS

Tightening Specifications

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

Part	Location	Thread Size	Torque Lb.Ft.
Bolt	Rear Universal Joint to Pinion Flange (Strap) Apollo, Century, Century Luxus, Regal and Estate Wagons	5/16-18	15
Bolt	Rear Propeller Shaft Flanged Yokes to Pinion LeSabre, Electra and Riviera	7/16-14	75

General Specifications

Propeller Shaft - All Series ..... 1 Piece Open Drive Line
Universal Joints - Appolo, Century, Century Luxus, Regal and Estate Wagons ..... 2 Single
Universal Joints - LeSabre, Electra and Riviera ..... Front Single Rear Double Cardan
CV Joint Centering Ball Lubrication ..... Multi-purpose Grease E.P. No.1