REAR AXLE

GROUP 4

PART 4-1 GENERAL AXLE SERVICE

1 DIAGNOSIS AND TESTING

DIAGNOSIS GUIDE

Certain rear axle and drive line trouble symptoms are also common to the engine transmission, tires, and other parts of the car. For this reason, be sure that the cause of the trouble is in the rear axle before adjusting, repairing, or replacing any of the axle parts.

Also, certain trouble symptoms are common to both the conventional and locking differential axles, while still other symptoms are found only in the locking differential.

To determine whether the car is equipped with a conventional or a locking differential, check the car warranty plate and the axle ratio tag. Refer to CAR IDENTIFICATION at the front of this manual.

LOCKING DIFFERENTIAL

The locking differential can be checked for proper operation without removing the carrier from the axle housing.

Jack up one rear wheel and remove the wheel cover. Install tool T59L-4204-A on the axle shaft flange studs as shown in Fig. 1.

Using a torque wrench of at least 200 foot-pounds capacity, rotate the axle shaft. **Be sure that the transmission is in neutral gear, one rear wheel is on the floor and the other rear wheel is raised off the floor.** The torque required to continuously rotate the shaft should be at least 75 foot-pounds. The initial breakaway torque may be higher than the continuous turning torque, but this is normal. The axle shaft should turn with even pressure throughout the check without slipping or binding.

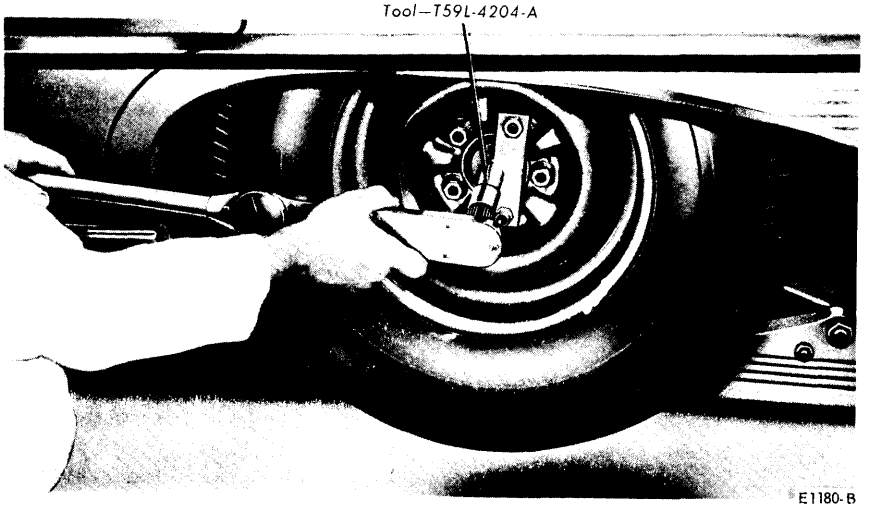

FIG. 1—Typical Locking Differential Check

If the torque reading does not exceed 75 foot-pounds, check the differential for improper assembly.

A car equipped with a locking differential will always have both wheels driving. If, while the car is being serviced, only one wheel is raised off the floor and the rear axle is driven by the engine, the wheel on the floor will drive the car off the stand or jack.

REAR AXLE TROUBLE SYMPTOMS AND POSSIBLE CAUSES

EXCESSIVE REAR AXLE NOISE (ALL REAR AXLES)	Since gears are in mesh, some rear axle noise is normal. However, excessive noise often indicates the beginning of other troubles in the axle. A road test can help determine whether the noise is being caused by trouble in the rear axle or in other parts of the car. **Before road-testing the car, make sure that the tire pressures and the rear axle lubricant level are normal. Then drive the car far enough to warm the axle lubricant to its normal operating temperature.** With the car stopped and the transmission in neutral, run the engine at various speeds. If the noise still exists during this test, it probably comes from the engine or the exhaust system. To determine if the noise is being caused by the rear axle or the tires, drive the car over several different types of road surfaces. Smooth asphalt or black-top roads minimize tire noises. Tire noises may be eliminated by cross-switching the tires. Snow tires often cause noises not heard with conventional tires.	Noise caused by a worn or damaged wheel bearing is often loudest when the car is coasting at low speeds, and it usually stops when the brakes are gently applied. To find the noisy bearing, jack up each wheel and check each bearing for roughness while the wheel is rotating, provided that the car is equipped with a conventional differential. If all possible external sources of noise have been checked and eliminated, and the noise still exists, road-test the rear axle under all four driving conditions–drive, cruise, float, and coast. Any noise produced by the sidegears and pinions in the differential case will be most pronounced on turns. A continuous whine under a light load between 20 and 35 miles per hour indicates rough or brinnelled pinion bearings. If the tone of drive, coast and float noise differs with speed and if the noise is very rough and irregular; worn, rough or loose differential or pinion shaft bearings are indicated. Remove, disassemble, and inspect the axle.
EXCESSIVE REAR AXLE BACKLASH (ALL REAR AXLES)	Excessive backlash in the axle driving parts may be caused by worn axle shaft splines, loose axle shaft flange nuts, loose U-joint flange mountings, excessive backlash between the drive	pinion and ring gear, excessive backlash in the differential gears, or bearings which are worn or out of adjustment.
ONE WHEEL SPINS EXCESSIVELY (LOCKING DIFFERENTIAL ONLY)	Use the procedure given under "Locking Differential" for checking the locking differential while the carrier assembly is in the car. If the torque required to rotate one rear	wheel is less than 75 foot-pounds, the differential is not functioning properly. To repair the unit, the carrier assembly must be removed from the axle housing.
AXLE HAS A HIGH-PITCHED, CHATTERING NOISE ON TURNS (LOCKING DIFFERENTIAL ONLY)	Drive the car in a fairly tight circle, making five circles clockwise and five counterclockwise. This will permit the lubricant to work in between the clutch plates. If the noise does not disappear during the drive test, it is probable that the axle does not have the approved Ford lubricant. The lubricant may be checked by draining two tablespoonfuls from the axle and mixing it with an equal amount of white alcohol, such as rubbing alcohol. Mix the lubricant and alcohol thoroughly and let it	stand for at least two minutes. If the sample now has a blue tint, the lubricant is approved Ford lubricant. If it has a yellow tint, it is not the correct lubricant. Drain and refill the axle with the approved lubricant. It is not necessary to flush the axle housing. After refilling the axle, drive the car in fairly tight circles clockwise and counterclockwise. The chattering noise should disappear as soon as the new lubricant works in between the clutch plates.

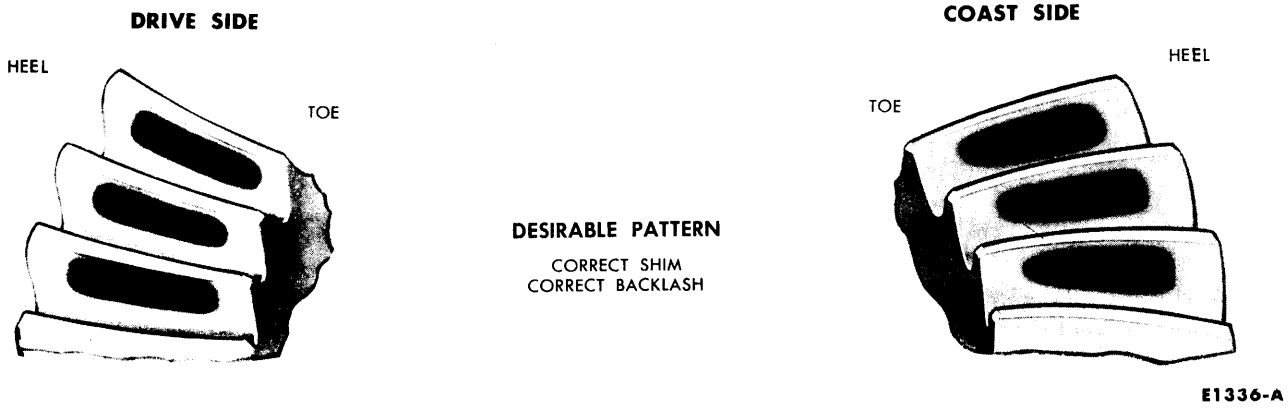

FIG. 2—The Ideal Tooth Pattern

GEAR TOOTH CONTACT PATTERN CHECK

Paint the gear teeth and roll a pattern as described under "Inspection Before Disassembly of Carrier" in Section 3. After diagnosing the tooth pattern as explained here, make the appropriate adjustments as outlined in Section 2.

In making a final gear tooth contact pattern check, it is necessary to recognize the fact that there are three different types of gear sets: hunting, non-hunting, and partial non-hunting. Each type is determined by the ratio and the number of teeth in the gears. Two ratios are available on the Thunderbird: 3.00:1 which is of the non-hunting type: and 3.50:1 which is of the partial non-hunting type. Both of these types can be identified by the paint "timing" marks on the pinion and ring gear teeth (Part 4-2, Fig. 35).

THE IDEAL TOOTH PATTERN

Fig. 2 shows the ideal tooth pattern. **This pattern is not a rigid standard but merely a general norm.**

In general, desirable tooth patterns should have the following characteristics:

1. The drive pattern should be fairly well centered on the tooth.
2. The coast pattern should be centered on the tooth but may be slightly toward the toe.
3. Some clearance between the pattern and the top of the tooth is desirable.
4. There should be no hard lines where the pressure is high.

The individual gear set need not conform exactly to the "ideal" pattern in order to be acceptable.

HUNTING GEAR SET

In a hunting-type gear set, any one pinion gear tooth comes into contact with all drive gear teeth. In this type, several revolutions of the drive gear are required to make all possible gear combinations.

Acceptable Pattern. The drive pattern shown in Fig. 3 was rolled on a hunting-type gear set. Since each pinion tooth came into contact with each drive gear tooth, the pattern is a result of the **combined** tooth contacts. Therefore, the pattern is uniform from tooth to tooth.

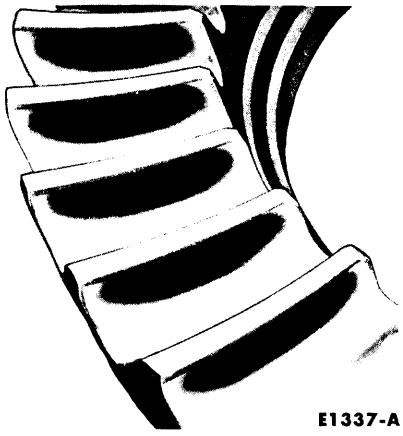

FIG. 3—Acceptable Hunting Gear Pattern

Unacceptable Pattern. An erratic tooth pattern on a hunting gear set indicates gear runout and possible need for gear replacement.

A pattern that is uniform, but off center indicates a change in shim or backlash (Fig. 8).

NON-HUNTING GEAR SET

In a non-hunting type gear set, any one pinion gear tooth comes into contact with only a few drive gear teeth. In this type, only one revolution of the drive gear is required to make all possible tooth contact combinations.

Acceptable Patterns. The drive patterns shown in Figs. 4 and 5 were rolled on two different non-hunting

FIG. 4—Acceptable Non-Hunting Pattern—Center-Toe-Center

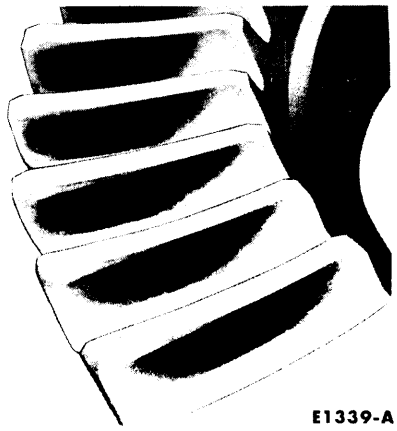

FIG. 5—Acceptable Non-Hunting Pattern—Center-Heel-Center

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FIG. 6—Acceptable Non-Hunting Gear Set—Coast Pattern

type gear sets. The pattern in Fig. 4 runs from the tooth center toward the toe and then back to center. The pattern in Fig. 5 runs from the tooth center toward the heel and then back to center. These patterns are not unusual for non-hunting gear sets and are acceptable. The pattern on any one ring gear tooth was formed by only **one** pinion tooth coming into contact with it. Because of this limited tooth contact, the non-hunting pattern can be more erratic than the hunting pattern and still be acceptable. Likewise, the coast pattern on a non-hunting gear set is usually less uniform tooth to tooth than it would be in a hunting gear set (Fig. 6).

Fig. 7 shows a pattern rolled on another gear set. In this case, the pattern is fairly uniform from tooth to tooth.

Unacceptable Patterns. A non-hunting gear set should be checked for runout and possible replacement if the pattern runs from the tooth center toward the toe and back to center on some gear teeth (Fig. 4) while on other teeth of the same gear, the pattern runs from the tooth center toward the heel and back to center (Fig. 5).

A non-hunting gear set requires a change in shimming or backlash when its pattern tends to concentrate toward the heel or toe, top or bottom of **most** teeth (Fig. 8).

PARTIAL NON-HUNTING GEAR SET

In a partial non-hunting type gear set, any one pinion tooth comes into contact with only part of the drive gear teeth, but more than one revolution of the drive gear is required to make all possible gear tooth combinations.

Tooth to tooth pattern uniformity will usually be in between the hunting and the non-hunting patterns. Partial non-hunting gear set patterns will usually be less uniform than hunting gear set patterns, but more uniform than non-hunting gear set patterns.

SHIM AND BACKLASH CHANGES

The patterns shown in Fig. 8 are typical of gear sets that have either an incorrect backlash or an incorrect shim adjustment. Since each gear set rolls a characteristic pattern, the patterns in Fig. 8 should be considered as typical only and should be used as a guide rather than a rigid standard. The drive pattern is rolled on the convex side of the tooth, and the coast pattern is rolled on the concave side.

The movement of tooth contact patterns with changes in backlash and shimming can be summarized as follows:

1. Thicker shim with the backlash constant moves the pinion further from the ring gear.

a. Drive pattern moves toward the top of the tooth (face contact) and toward the heel.

b. Coast pattern moves toward the top of the tooth and slightly toward the toe.

2. Thinner shim with the backlash constant moves the pinion closer to the ring gear.

a. Drive pattern moves deeper on the tooth (flank contact) and slightly toward the toe.

b. Coast pattern moves deeper on the tooth and toward the heel.

3. Decreasing backlash moves the ring gear closer to the pinion.

a. Drive pattern moves slightly lower and toward the toe.

b. Coast pattern moves lower and toward the toe.

4. Increasing backlash moves the ring gear away from the pinion.

a. Drive pattern moves slightly higher and toward the heel.

b. Coast pattern moves higher and toward the heel.

If the patterns are not correct, make the changes as indicated. The pinion need not be disassembled to change a shim. All that is required is to remove the pinion, bearing, and retainer assembly, and install a different shim. When reinstalling the pinion and retainer assembly, be sure that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 35, Part 4-2). Refer to "Pinion and Ring Gear Tooth Contact Adjustment," Section 2.

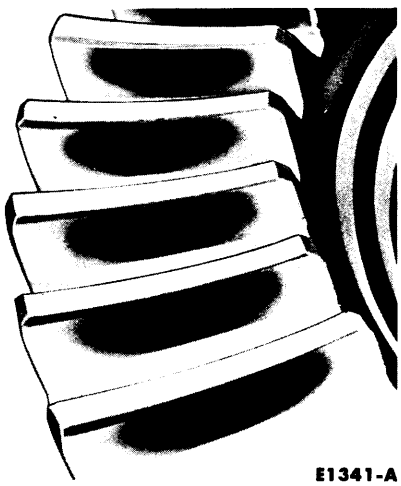

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FIG. 7—Acceptable Non-Hunting Pattern—Uniform

2 COMMON ADJUSTMENTS AND REPAIRS

PINION AND RING GEAR TOOTH CONTACT ADJUSTMENT

Two separate adjustments affect pinion and ring gear tooth contact. They are pinion location and backlash (Fig. 9).

Individual differences in machining the carrier housing and the gear set require a shim between the pinion retainer and the carrier housing to locate the pinion for correct contact with the ring gear. The original factory installed shim is of the correct thickness for a given original carrier and gear set assembly. In service, shims should be added or removed from the original pack only as indicated by the tooth pattern check. Adding shims moves the pinion away from the ring gear; removing shims moves the pinion

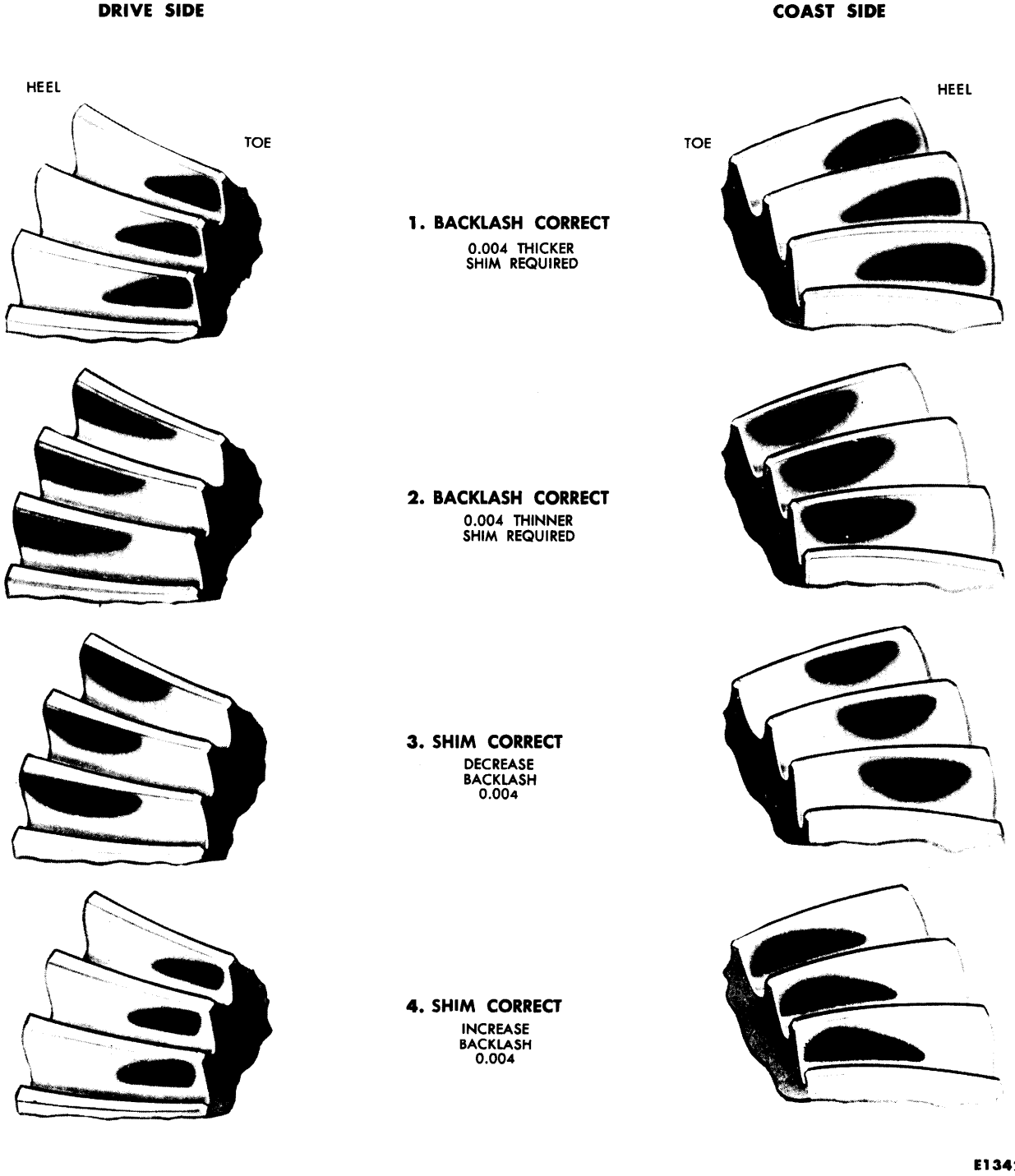

FIG. 8—Typical Gear Tooth Contact Patterns Indicating Shim or Backlash Change

toward the ring gear (Fig. 9).

The tooth pattern check also indicates whether the ring gear should be adjusted away from or toward the pinion to increase or decrease backlash between the gears.

If the tooth pattern check indicates a change in backlash only, follow the procedure under "Backlash Between Ring Gear and Pinion." If the tooth pattern indicates a change in shim thickness follow the procedure under "Pinion Location."

BACKLASH BETWEEN RING GEAR AND PINION

1. Remove the adjusting nut locks, loosen the differential bearing cap bolts. Then torque the bolts to 25 ft-lbs.

2. **The left adjusting nut is on the ring gear side of the carrier. The right nut is on the pinion side.** Loosen the right nut until it is away from the cup. Tighten the left nut until the ring gear is just forced into

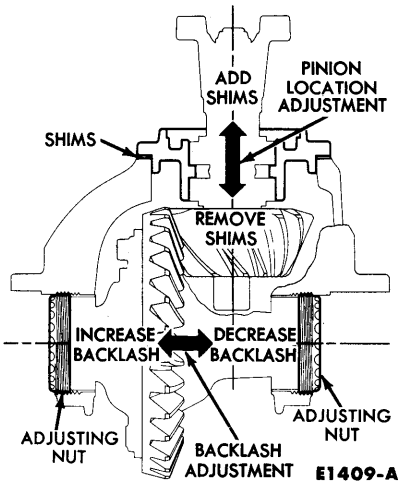

FIG. 9—Pinion and Ring Gear Tooth Contact Adjustment

the pinion with no backlash. (Recheck the right nut at this time to be sure that it is still loose.) **Tightening the left nut moves the ring gear into the pinion to decrease backlash, and tightening the right nut moves the ring gear away.**

3. Tighten the right nut two notches beyond the position where it first contacts the bearing cup. Rotate the ring gear several revolutions in each direction while the bearings are loaded to seat the bearings in their cups. **This step is important.**

4. Again loosen the right nut to release the preload. If there is any backlash between the gears, tighten the left nut just enough to remove this backlash. Carefully tighten the right nut until it just contacts the cup. Set preload of 2½ to 3 notches tight by the right nut. As preload is applied from the right side, the ring gear is forced away from the pinion and usually results in the correct backlash.

5. Torque the differential cap bolts to specification.

6. Measure the backlash as shown in Fig. 11. Measure the backlash on several teeth around the drive gear. If the measurements vary more than 0.003 inch, there is excessive runout in the gears or their mountings, which must be corrected to obtain a satisfactory unit. If the backlash is out of specification, loosen one adjusting nut and tighten the opposite nut an equal amount to move the drive gear away from or toward the pinion. **When moving the adjusting nuts, the final movement should always be made in a tightening direction. For example, if the left nut had to be loosened one notch, loosen the nut two notches, and then tighten it one. This procedure makes it certain that the nut is contacting the bearing cup, and that the cup cannot shift after being put in service.**

7. Again check the tooth contact pattern. If the pattern is still incorrect, a change in pinion location (shim thickness) is indicated.

PINION LOCATION

1. Remove the retaining bolts and the pinion and bearing retainer assembly from the carrier.

2. Measure the original shim thickness with a micrometer. Increase or decrease the shim thickness as indicated by the tooth pattern check described in Section 1.

3. Clean the teeth on both the pinion and ring gear so that the timing marks are visible. Rotate the differential and ring gear assembly in the carrier until the marked teeth on the ring gear are opposite the pinion entry hole.

4. Replace the pinion retainer O-ring (Fig. 23, Part 4-2). Coat the O-ring with axle lubricant before installing. **Do not roll the O-ring into the groove. Snap it into position.**

5. Being careful not to pinch the O-ring, install the pinion and bearing retainer assembly in the carrier with the corrected shim pack. Place the assembly in the carrier so that the marked tooth on the pinion indexes between the marked teeth on the ring gear (Fig. 35, Part 4-2).

In almost every case of improper assembly (gears assembled out of time), the noise level and probability of failure will be higher than they would be with properly assembled gears.

6. Install the retainer - to - carrier mounting bolts and torque to specifications.

7. Adjust the backlash between the ring gear and pinion as outlined in the foregoing procedure.

8. Make a tooth pattern check as outlined in Section 1. If the pattern is still unsatisfactory, repeat this procedure changing the shim thickness each time until a satisfactory tooth pattern is obtained.

3 CLEANING AND INSPECTION

INSPECTION BEFORE DISASSEMBLY OF CARRIER

The differential carrier should be inspected before any parts are removed from it, and it should also be inspected as it is disassembled. These inspections can help to find the cause of the trouble and to determine the corrections needed.

Mount the carrier in the holding fixture shown in Fig. 10. Wipe the lubricant from the internal working parts, and visually inspect the parts for wear or damage.

Rotate the gears to see if there is any roughness which would indicate defective bearings or chipped gears. Check the gear teeth for scoring or signs or abnormal wear.

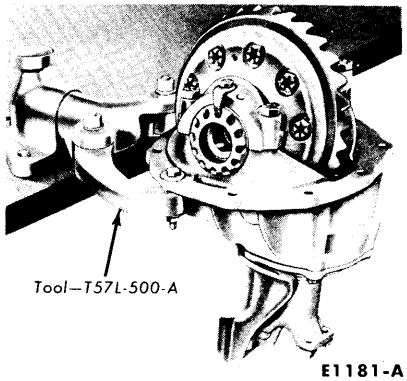

FIG. 10—Bench Fixture for Carrier Overhaul

Set up a dial indicator (Fig. 11) and check the backlash at several points around the ring gear. Backlash should be within specifications.

If no obvious defect is noted, check the gear tooth contact. Paint the gear teeth with suitable gear marking compound, such as a paste made with dry red lead and oil. A mixture that is too wet will run and smear. Too dry a mixture cannot be pressed out from between the teeth. As shown in Fig. 12, wrap a cloth or rope around the drive pinion flange to act as a brake. Rotate the ring gear back and forth (use a

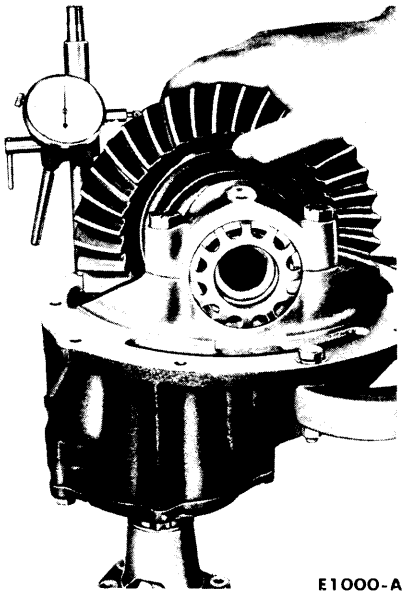

FIG. 11—Backlash Check

box wrench on the drive gear attaching bolts for a lever) until a clear tooth contact pattern is obtained.

Certain types of gear tooth contact patterns on the ring gear indicate incorrect adjustment. Noise caused by incorrect adjustment can often be corrected by readjusting the

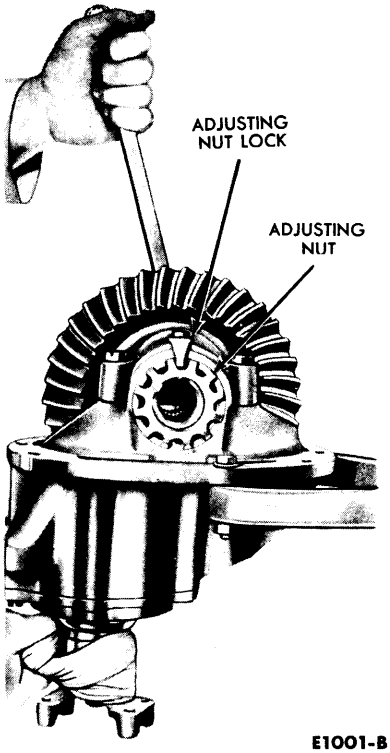

FIG. 12—Gear Tooth Contact Check

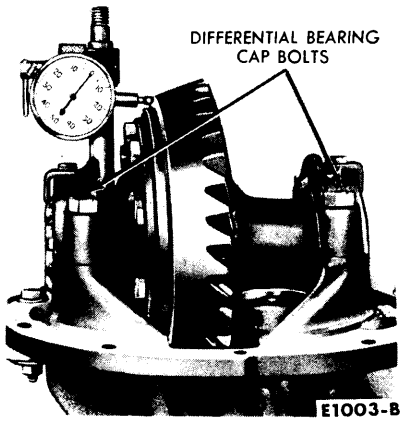

FIG. 13—Ring Gear Runout Check

gears. Typical patterns and the necessary corrections are explained under "Tooth Contact Pattern Check" in Section 1.

Gear tooth runout can sometimes be detected by an erratic pattern on the teeth. However, a dial indicator should be used to measure the runout of the back face of the ring gear, as shown in Fig. 13. If this runout exceeds specifications, disassemble the carrier and replace necessary parts as indicated in Part 4-2, Section 4.

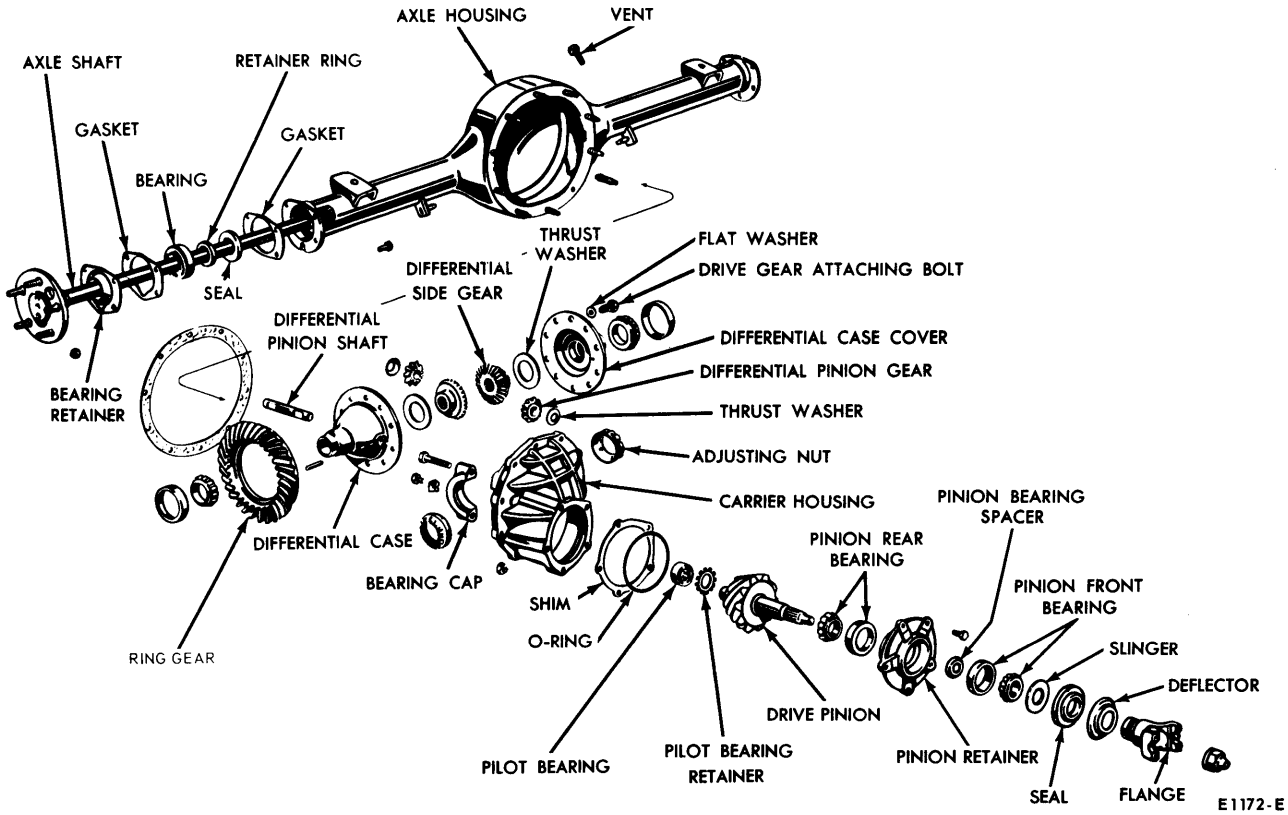

FIG. 14—Rear Axle Disassembled

Loosen the differential bearing cap bolts, and then torque to 25 ft-lbs. Remove the adjusting nut locks. Carefully loosen one of the adjusting nuts to determine if any differential bearing preload remains. If at least one notch of preload remains, the differential bearings may be re-used, provided they are not pitted or damaged.

INSPECTION AFTER DISASSEMBLY

Thoroughly clean all parts (Fig. 14). **Always use clean solvent when cleaning bearings.** Oil the bearings immediately after cleaning to prevent rusting. Inspect the parts for defects. Clean the inside of the carrier before rebuilding it. **When a scored gear set is replaced, the axle housing should be washed thoroughly and steam cleaned.** This can only be done effectively if the axle shafts and shaft seals are removed from the housing. Inspect individual parts as outlined below.

GEARS

Examine the pinion and ring gear teeth for scoring or excessive wear. **Extreme care must be taken not to damage the pilot bearing surface of the pinion.**

The pattern taken during disassembly should be helpful in judging if gears can be re-used. Worn gears cannot be rebuilt to correct a noisy condition. Gear scoring is the result of excessive shock loading or the use of an incorrect lubricant. Scored gears cannot be re-used.

Examine the teeth and thrust surfaces of the differential gears. Wear on the hub of the differential gear can cause a "chucking" noise known as "chuckle" when the car is driven at low speeds. Wear of splines, thrust surfaces, or thrust washers can contribute to excessive drive line backlash.

BEARING CUPS AND CONE AND ROLLER ASSEMBLIES

Check bearing cups for rings, scores, galling, or excessively worn wear patterns. Pinion cups must be solidly seated. Check by attempting to insert a 0.0015-inch feeler between these cups and the bottoms of their bores.

When operated in the cups, cone and roller assemblies must turn without roughness. Examine the roller ends for wear. Step-wear on the roller ends indicates the bearings were not preloaded properly or the rollers were slightly misaligned.

If inspection reveals either a defective cup or a defective cone and roller assembly, **both parts** should be replaced to avoid early failure.

DIFFERENTIAL BEARING ADUSTING NUTS

Temporarily install the bearing caps and test the fit of the adjusting nuts in their threads. The nuts should turn easily when the caps are tightened to 25 ft-lbs. The faces of the nuts that contact the bearing cups must be smooth and square. Replace the nuts or examine the threads in the carrier if their fit is not proper. Be sure that the bearing caps and adjusting nuts are on the side they were machined to fit. Observe the punch marks and scribe marks made during disassembly.

U-JOINT FLANGE

Be sure that the ears of the flange have not been damaged in removing the drive shaft or in removing the flange from the axle. The end of the flange that contacts the oil slinger as well as the flat surface of the pinion nut counterbore must be smooth. Polish these surfaces if necessary. Roughness aggravates backlash noises, and causes wear of the slinger and pinion nut with a resultant loss in pinion bearing preload.

PINION RETAINER

Be sure that the pinion bearing cups are seated. Remove any chips or burrs from the mounting flange. Clean the groove for the O-ring seal and all lubricant passages. If the cups are removed, examine the bores carefully. Any nicks or burrs in these bores must be removed to permit proper seating of the cups.

CARRIER HOUSING

Make sure that the differential bearing bores are smooth and the threads are not damaged. Remove any nicks or burrs from the mounting surfaces of the carrier housing.

DIFFERENTIAL CASE

Make sure that the hubs where the bearings mount are smooth. Carefully examine the differential case bearing shoulders, which may have been damaged when the bearings were removed. The bearing assemblies will fail if they do not seat firmly against the shoulders. Check the fit (free rotation) of the differential side gears in their counterbores. Be sure that the mating surfaces of the two parts of the case are smooth and free from nicks or burrs.

LOCKING DIFFERENTIAL PARTS

Inspect the clutch plates for uneven or extreme wear. The dog-eared clutch plates must be free from burrs, nicks, or scratches which could cause excessive or erratic wear to the bonding material of the internally splined clutch plates. The internally splined clutch plates should be inspected for condition of the bond, bonding material, and wear. Replace the bonded plates if their thickness is less than 0.085 inch or if the bonded material is scored or badly worn. Inspect the bonded plate internal teeth for wear. Replace them, if excessive wear is evident.

Examine all thrust surfaces and hubs for wear. Abnormal wear on these surfaces can contribute to a noisy axle. Bonded plates should be replaced as a set only.

Inspect the Belleville spring for proper free height of ¼ inch.

PART 4-2 REAR AXLE

1 DESCRIPTION AND OPERATION

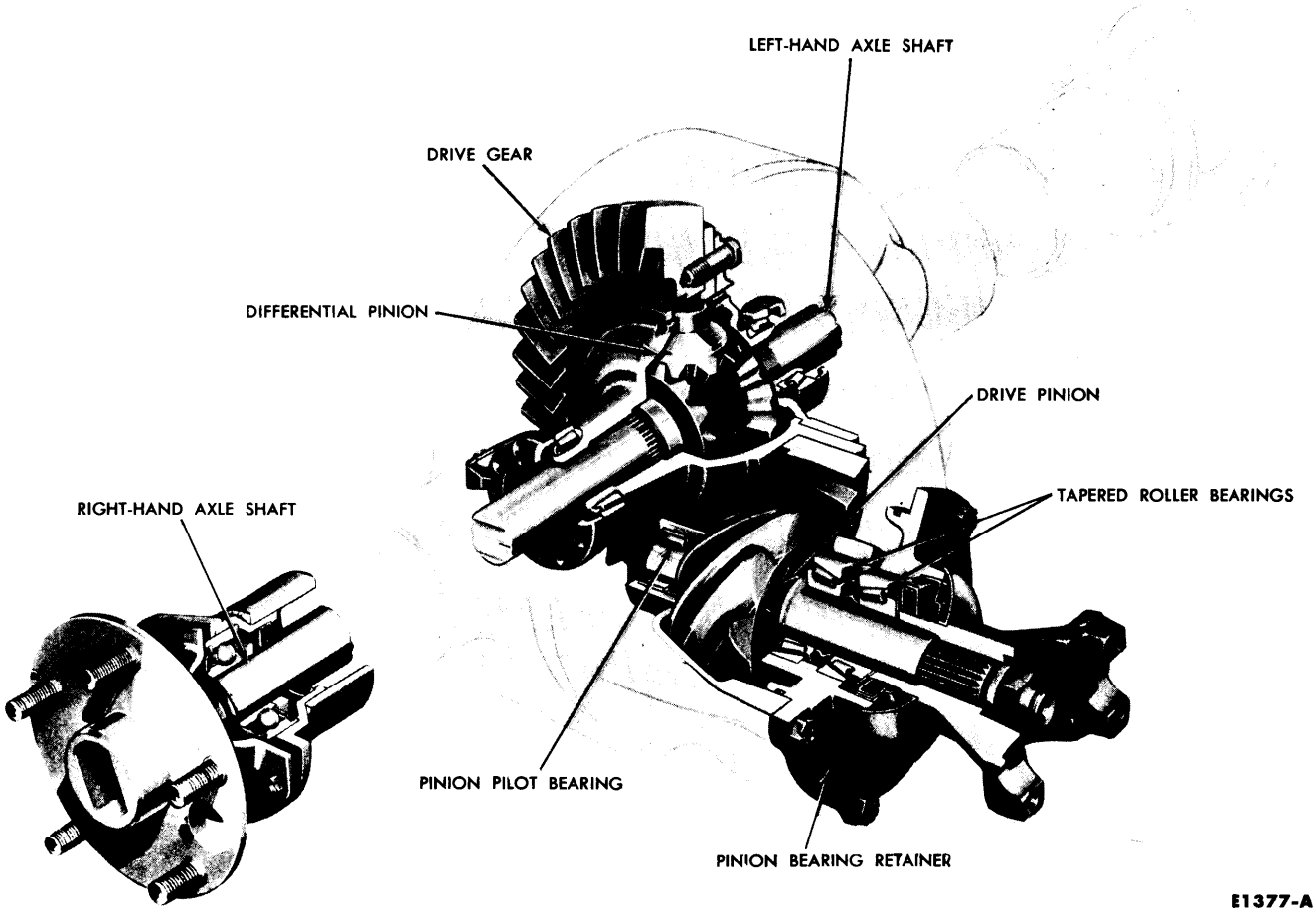

FIG. 1—Rear Axle Assembly

CONVENTIONAL AXLE

DESCRIPTION

The rear axle is of the banjo-housing, hypoid gear removable carrier type, in which the centerline of the pinion is mounted below the centerline of the ring gear (Fig. 1).

The integral pinion gear and shaft and the pinion bearings are assembled in a pinion retainer, which is bolted to the carrier. In this axle, the pinion is straddle mounted; that is, the pinion is supported by bearings both in front of and to the rear of the pinion gear. Two opposed tapered roller bearings support the pinion shaft in front of the pinion gear. A straight roller (pilot) bearing supports the pinion shaft at the rear of the pinion gear. Pinion and ring gear tooth contact is adjusted by shims between the pinion retainer and the carrier housing.

The differential assembly is mounted on two opposed tapered roller bearings, which are retained in the carrier by removable caps. The entire carrier assembly is bolted to the axle housing.

Ball bearing assemblies (rear wheel bearings) are pressed onto the outer ends of the axle shafts and set in the

outer ends of the axle housing. These bearings support the semi-floating axle shafts at the outer ends. The inner ends of the shafts spline to the differential side gears. Bearing retainer plates hold the shafts in the housing. The left and right axle shafts are not interchangeable, because the left axle shaft is shorter than the right.

A metal tag stamped with the model designation and gear ratio is secured to the axle under one of the carrier-to-housing bolts. The first five spaces on the top line are reserved for the model designation. On the Thunderbird, for example, the designation WCD-E signifies a conventional axle with a 2-pinion differential, a 9-inch diameter ring gear, a 3:1 ratio, and large size wheel bearings. It is important, therefore, to use the model designation for obtaining the correct replacement parts.

OPERATION

The rear axle drive pinion receives its power from the engine through the transmission and drive shaft. The pinion gear rotates the differential case through engagement with the ring gear, which is bolted to the case outer flange. Inside the case, two differential pinion gears are mounted on the differential pinion shaft which is pinned to the case. These pinion gears are engaged with the side gears, to which the axle shafts are splined. Therefore, as the differential case turns, it rotates the axle shafts and rear wheels. When it is necessary for one wheel and axle shaft to rotate faster than the other, the faster turning side gear causes the pinions to roll on the slower turning side gear to allow differential action between the two axle shafts.

LOCKING DIFFERENTIAL AXLE

DESCRIPTION

The axle assembly, except for the differential case and its internal components, is identical to the conventional axle.

A constant-friction locking differential, which employs automatic transmission-type clutch plates to control differential action, is available as optional equipment(Fig. 2).

Four dog-eared steel clutch plates are locked into the differential cover. Three bronze, bonded clutch plates are splined to a clutch hub which, in turn, is splined to the left-hand axle shaft. A Belleville spring washer maintains a constant pressure between the steel and bonded clutch plates so that the clutch is always engaged.

OPERATION

The pressure between clutch plates opposes differential action at all times. When the car turns a corner the clutch "slips" allowing normal differential action to take place. Under adverse weather conditions, where one or both wheels may be on a low-traction surface such as snow, ice or mud, the friction between the clutch plates will transfer a portion of the usable torque to the wheel with the most traction. Thus, the wheel that is on ice or snow will not spin, but will have a tendency to operate with the opposite wheel in a combined driving effort.

When performing the following procedures, refer to Part 4-1, Section 3 for cleaning and inspection procedures.

2 IN-CAR ADJUSTMENT AND REPAIR

When performing the following procedures refer to Part 4-1, Section 2, for cleaning and inspection instructions.

REAR AXLE SHAFT, WHEEL BEARING, AND OIL SEAL REPLACEMENT

The rear axle shafts, wheel bearings, and oil seals can be replaced without removing the differential assembly from the axle housing.

1. Remove the wheel and tire from the brake drum.

2. Remove the nuts that secure the brake drum to the axle flange, and then remove the drum from the flange.

3. Working through the hole provided in the axle shaft flange, remove the nuts that secure the wheel bearing retainer. Then pull the axle shaft assembly out of the axle housing (Fig. 3). **Install one nut to hold the brake carrier plate in place after the axle shaft is removed.**

4. If the rear wheel bearing is to be replaced, loosen the inner retainer by nicking it deeply with a cold chisel in several places. It will then slide off easily.

5. Remove the bearing from the axle shaft with the tool shown in Fig. 4.

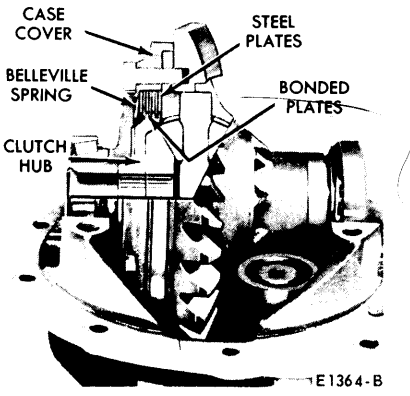

FIG. 2—Locking Differential

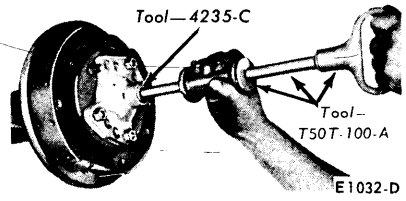

FIG. 3—Axle Shaft Removal

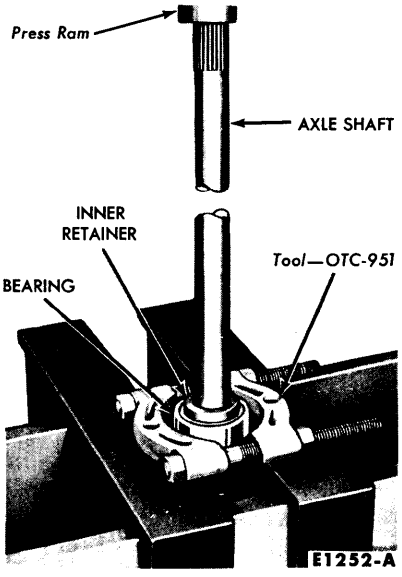

FIG. 4—Wheel Bearing Removal

6. Inspect the machined surface of the axle shaft and the axle housing for rough spots or other irregularities which would affect the sealing action of the oil seal. Carefully remove any burrs or rough spots.

7. Lightly coat the wheel bearing bores with ball joint grease.

8. Press a new rear wheel bearing on the axle shaft (Fig. 5). **Be sure that the inner race of the bearing is supported by the tool as the shaft is pressed through the bearing. The bearing should seat firmly against the shoulder on the shaft.**

9. Adjust the same tool to support the bearing inner retainer, and then press the shaft through the retainer until the retainer seats firmly against the bearing.

10. Whenever a rear axle shaft is removed, the oil seal must be replaced. Remove the seal with tool 1175AB. Soak new seals in SAE 10 oil for ½ hour before use. Install the new seal with tool 1177 or 4245-B. Wipe a small amount of an oil resistant sealer on the outer edge of the seal before it is installed. **Do not put sealer on the sealing lip.**

11. Remove the retaining nut and brake carrier plate, place a new gasket on each side of the brake carrier plate, and install the carrier plate again. Carefully slide the axle shaft into the housing so that the rough forging of the shaft will not damage the oil seal. Start the axle splines into the side gear, and push the shaft in until the bearing bottoms in the housing.

12. Install the bearing retainer and the nuts that secure it. Torque the nuts to specification.

13. Install the brake drum and the drum retaining nuts.

14. Install the wheel and tire on the drum.

DRIVE PINION OIL SEAL REPLACEMENT

The drive pinion oil seal can be replaced without removing the differential carrier assembly from the axle housing. Soak new seals in SAE 10 oil for ½ hour before use.

1. Make scribe marks on the drive shaft end yoke and the axle U-joint flange to insure proper position of the drive shaft at assembly (Fig. 6). Disconnect the drive shaft from the axle U-joint flange. **Be careful to avoid dropping the loose universal joint bearing cups.** Hold the cups on the spider with tape. Mark the cups so that they will be in their original position in relation to the flange when they are assembled. Remove the drive shaft from the transmission extension housing. Install tool T61L-7657-B in the transmission extension housing to prevent transmission leakage.

2. Make punch marks on the end of the pinion shaft, the pinion shaft nuts, and the U-joint flange inner surface for realignment. While holding the flange with the tool shown in Fig. 7, remove the integral pinion nut and washer.

3. Clean the pinion bearing retainer around the oil seal. Place a drain pan under the seal, or raise the front of the car higher than the rear.

4. Using the tool shown in Fig. 8, remove the U-joint flange.

5. Using the tool shown in Fig. 9, remove the drive pinion oil seal.

6. Clean the oil seal seat.

7. Coat the outer edge of the new seal with a small amount of oil resistant sealer. **Do not put any of the sealer on the sealing lip.** Install the seal in the retainer, using the tool shown in Fig. 32.

8. Align the U-joint flange spline mark with the pinion shaft spline mark and install the flange using the tool shown in Fig. 33.

9. Install the integral retaining nut and washer on the pinion shaft. Tighten the nut until the punch mark on the nut is aligned with the punch marks on the end of the pinion shaft and on the inner surface of the U-joint flange.

10. Tighten the nut an additional ¼ turn beyond the alignment marks. Hold the flange with the tool shown in Fig. 6 while the nut is being tightened.

11. Remove tool T61L-7657-B from the transmission extension housing. Install the front end of the drive shaft on the transmission output shaft.

12. Connect the rear end of the drive shaft to the axle U-joint flange, aligning the scribe marks made on the drive shaft end yoke and the axle U-joint flange (Fig. 6).

13. Check the lubricant level, and add whatever amount of specified lubricant is necessary.

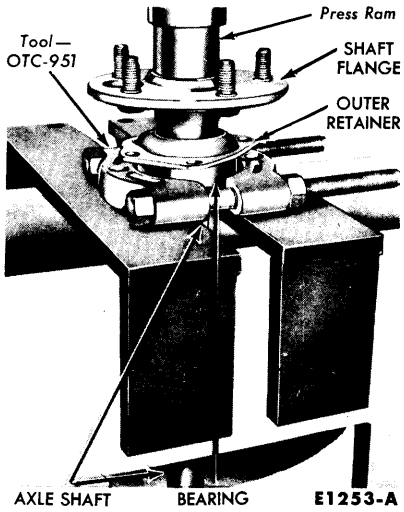

FIG. 5—Wheel Bearing Installation

3 REMOVAL AND INSTALLATION

CARRIER ASSEMBLY

REMOVAL

1. Raise the car on a hoist and remove the two rear wheel and tire assemblies.

2. Remove the two brake drums (3 tinnerman nuts at each drum) from the axle shaft flange studs. If difficulty is experienced in removing the drums, back off the brake shoes as explained in Part 2-2.

3. Working through the hole provided in each axle shaft flange, remove the nuts that secure the rear wheel bearing retainer. Pull each axle shaft assembly out of the axle housing (Fig. 3). Install a nut on one of the brake carrier plate retaining bolts to hold the plate to the axle housing after the shaft has been removed. **Whenever a rear axle shaft is removed the wheel bearing oil seal must be replaced.** Remove both

seals with tool 1175AB.

4. Make scribe marks on he drive shaft end yoke and the axle U-joint flange to insure proper position at assembly. Disconnect the drive shaft at the rear axle U-joint. Hold the cups on the spider with tape. Mark the cups so that they will be in their original position in relation to the flange when they are assembled. Remove the drive shaft from the transmission extension housing, and install tool T61L-7657-B in the housing.

5. Place a drain pan under the carrier and housing, remove the carrier retaining nuts, and drain the axle. Remove the carrier assembly from the axle housing.

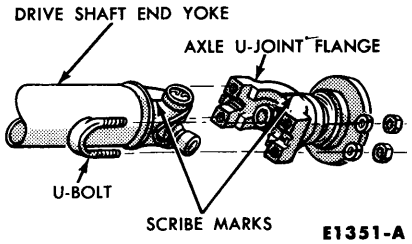

FIG. 6—Drive Shaft-to-Axle U-Joint Connection

INSTALLATION

1. Clean the axle housing and shafts using kerosene and swabs. To avoid contamination of the grease in the sealed ball bearings, do not allow any quantity of solvent directly on the wheel bearings. Clean the mating surfaces of the axle housing and carrier.

2. Position the differential carrier on the studs in the axle housing using a new gasket between carrier and housing. Install the carrier-to-housing retaining nuts, and torque to specifications.

3. Remove tool T61L-7657-B from the transmission extension housing. Position the drive shaft so that the front U-joint slip yoke splines to the transmission output shaft.

4. Connect the drive shaft to the axle U-joint flange, aligning the scribe marks made on the drive shaft end yoke and the axle U-joint flange during the removal procedure (Fig. 6). Install the U-bolts and nuts and torque to specifications.

5. Soak two new rear wheel bearing oil seals in SAE 10 oil for ½ hour before installation. Wipe a small amount of oil-resistant sealer on the outer edge of each seal before it is installed. **Do not put any of the sealer on the sealing lip.** Install the oil seals in the ends of the rear axle housing with tool 1177 or 4245-B.

6. Install the two axle shaft assemblies in the axle housing. The shorter shaft goes into the left side of the housing.

When installing an axle shaft, place a new gasket on each side of the brake carrier plate and carefully slide the axle shaft into the housing so that the rough forging of the shaft will not damage the oil seal. Start the axle splines into the differential side gear, and then push the shaft in until the bearing bottoms in the housing.

7. Install the bearing retainers on the attaching bolts on the axle housing flanges. Install the nuts on the bolts and torque to specifications.

8. Install the two rear brake drums and the drum retaining nuts.

9. Install the rear wheel and tire assemblies.

10. If the rear brake shoes were backed off, adjust the brakes as outlined in Part 2-2.

11. Fill the rear axle with specified lubricant.

AXLE HOUSING

REMOVAL

1. Remove the carrier assembly from the axle housing as outlined in the foregoing procedure.

2. Position safety stands under the rear frame members .

3. Disengage the brake line from the clips that retain the line to the axle housing.

4. Disconnect the vent tube from the rear axle housing.

5. At each rear spring, remove the anti-rattle (coil type) spring that retains the parking brake cable to the spring.

6. Remove the brake carrier plate assemblies from the axle housing, and support them with wire. Do not disconnect the brake line.

7. Disconnect each rear shock absorber from the spring clip plate and position out of the way.

8. Lower the rear axle slightly to reduce some of the spring tension. At each rear spring remove the spring clip (U-bolt) nuts, spring clips, and spring clip plate. Remove the spring lower insulator and retainer. See Part 3-2.

9. Remove the rear axle housing from under the car.

INSTALLATION

1. Install new rear wheel bearing oil seals in the ends of the rear axle housing with tool 1177 or 4245-B. New seals should be soaked in SAE 10 oil for ½ hour before use.

2. Position the rear axle housing on the rear springs. Position the spring upper insulators and retainers between the axle housing and springs with the retainer flange forward.

3. Install the lower insulators and insulator retainers (flange to the rear), and then install the spring clips (U-bolts), spring clip plate, and nuts. **Torque the spring clip nuts evenly to specifications. Make sure that the lower insulator retainer contacts the upper retainer.**

4. If a new axle housing is being installed, remove the bolts that retain the brake carrier plates and bearing retainer from the old housing flanges. Position the bolts in the new housing flanges to hold the brake carrier plates in position. Install the carrier plates with new gaskets to the axle housing flanges.

5. Connect the vent tube to the axle housing.

6. Position the brake line to the axle housing, and secure with the retaining clips.

7. Raise the rear axle housing and springs enough to allow connecting the rear shock absorbers to the spring clip plates. Connect the lower stud of each shock absorber to its spring clip plate, and install the bushing, washer, and nut on the stud. **Be sure the spring clip plate is free of burrs. Tighten the nut to specified torque.**

8. Install the brake cable anti-rattle springs.

9. Install the carrier assembly, and the two axle shaft assemblies to the axle housing as outlined in this section.

10. Install the two rear brake drums and the drum retaining nuts.

11. Install the rear wheel and tire assemblies, and adjust the brakes.

4 MAJOR REPAIR OPERATIONS

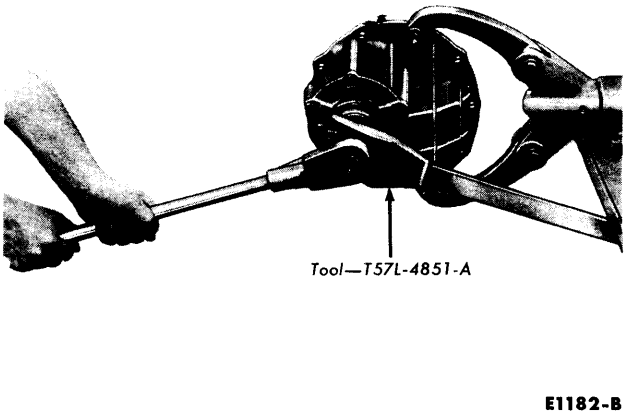

FIG. 7—Pinion Shaft Nut Removal

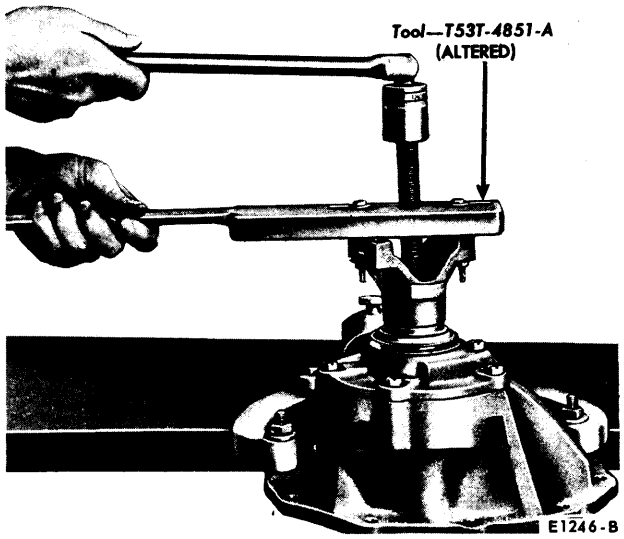

FIG. 8—U-Joint Flange Removal

DISASSEMBLY

Mount the carrier in a holding fixture, and perform the "Inspection Before Disassembly of Carrier" as explained in Part 4-1, Section 2. Then disassemble the carrier as outlined in the following procedures.

REMOVAL OF DIFFERENTIAL CASE AND DRIVE PINION FROM CARRIER

1. Mark the differential bearing cap and the mating bearing support with punch marks to help position the parts properly during assembly of the carrier. Also, mark one of the bearing adjusting nuts and the carrier with scribe marks for proper location during assembly.
2. Remove the adjusting nut locks, bearing caps, and adjusting nuts. Then lift the differential assembly out of the carrier.
3. Turn the carrier housing upright, and remove the pinion shaft nut (Fig. 7). Then remove the U-joint flange (Fig. 8).
4. Remove the seal (Fig. 9) and the slinger.
5. Remove the pinion, bearing and retainer assembly from the carrier housing. Measure the shim thickness with a micrometer. Record this original shim thickness. If a new gear set is installed during assembly, a new shim will have to be installed. The original shim thickness is one of the factors necessary in calculating the new shim thickness. **Extreme care must be taken not to damage the mounting surfaces of the retainer and carrier.**

DISASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. If the differential bearings are to be removed, use the tool shown in Fig. 10.
2. Remove the bolts that attach the ring gear to the differential case. Press the ring gear from the case or tap it off with a soft-faced hammer.
3. With a drift, drive out the differential pinion shaft lock pin (Fig. 11), and separate the 2-piece differential case.
4. Drive out the pinion shaft (Fig. 25) with a brass drift. Remove the gears and thrust washers.

DISASSEMBLY OF LOCKING DIFFERENTIAL CASE

1. Remove the differential case from the carrier and remove the bearings as shown in Fig. 10.
2. Place the differential case in a hydraulic press, and apply about one ton pressure across the case bearing hubs while removing the ring gear attaching bolts. This procedure will contain the spring pressure between the differential case and cover until after the bolts are moved, and thereby prevent stripping of the threads.
3. Release the hydraulic press ram, and remove the differential case cover.
4. Remove the Belleville spring (Fig. 12).

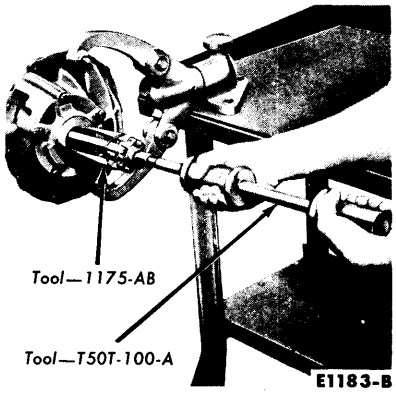

FIG. 9—Pinion Seal Removal

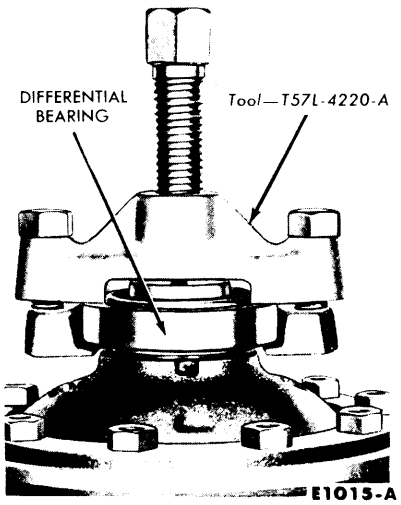

FIG. 10—Differential Bearing Removal

5. Remove the steel and the bonded clutch plates.
6. Remove the differential clutch hub, side gear, and thrust washer.
7. Remove the ring gear from the differential case.
8. Drive out the differential pinion shaft lock pin.
9. With a brass drift, drive out the differential pinion shaft. Then remove the pinion gears, the other side gear, and thrust washers.

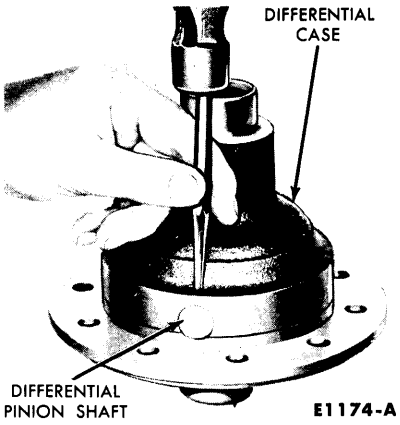

FIG. 11—Differential Pinion Shaft Lock Pin Removal

DISASSEMBLY OF DRIVE PINION AND BEARING RETAINER

1. Place a protective sleeve (hose) on the pinion pilot bearing surface. Press the pinion and rear bearing assembly out of the pinion front bearing cone and retainer (Fig. 13). Separate the front bearing cone from the retainer.
2. Press the pinion out of the rear bearing cone (Fig. 14).

PARTS REPAIR OR REPLACEMENT

Clean and inspect all the parts as outlined in Part 4-1, Section 2. Before assembling the carrier, repair or replace all parts as indicated by the inspection.

The principal replacement operations are covered in the following procedures. All other repair or replacement operations are performed during "Cleaning and Inspection" Part 4-1, Section 3, or during the "Assembly" in this section.

PILOT BEARING

1. Remove the pilot bearing as shown in Fig. 15. Drive out the pilot bearing and the bearing retainer together.
2. Drive the new bearing in until it bottoms (Fig. 16).
3. Using the same tool install a new pilot bearing retainer with the concave side up.

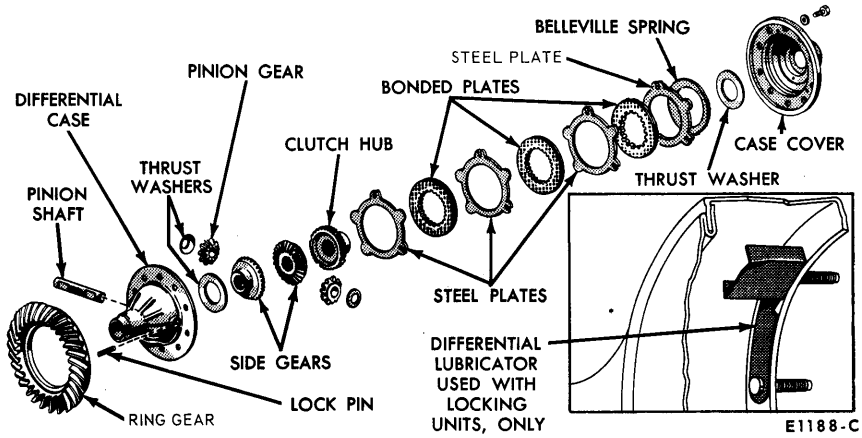

FIG. 12—Locking Differential Assembly

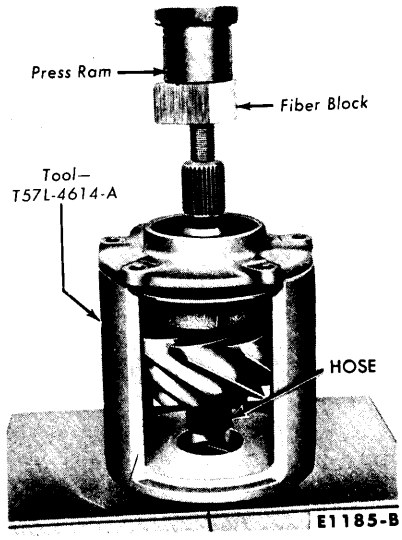

FIG. 13—Pinion Front Bearing Cone Removal

PINION BEARING CUPS

Do not remove the pinion bearing cups from the retainer unless the cups are worn or damaged. The flange and pilot of the retainer are machined during manufacture by locating on these cups after they are installed in their bores. If the cups are worn or damaged, they should be replaced. Remove the old cups as shown in Figs. 17 and 18.

Install the new cups as shown in Figs. 19 and 20.

After the new cups are installed, make sure they are seated in the retainer by trying to insert a 0.0015-inch feeler gauge between the cup and the bottom of the bore. Whenever the cups are replaced, the cone and roller assemblies should also be replaced.

DRIVE PINION AND GEAR SET

When replacing a ring gear and pinion note that the original factory installed shim is of the correct thickness to adjust for individual variations in both the carrier housing dimension and in the original gear set dimension. Therefore, to select the correct shim thickness for the new gear set to be installed, follow these steps:

1. Measure the thickness of the **original shim** with a micrometer.
2. Note the shim adjustment number on both the old pinion and the new pinion. Each pinion gear is marked with an adjustment number such as the +1 marking in Fig. 21.
3. Refer to specifications for the correct amount of shim thickness

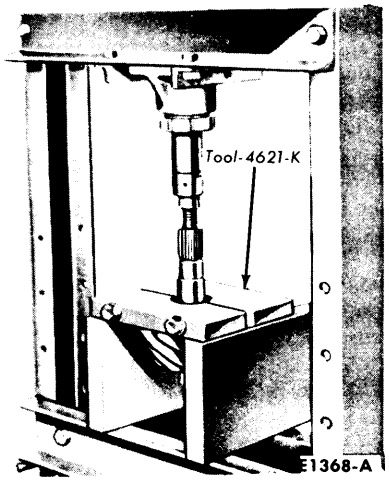

FIG. 14—Pinion Rear Bearing Cone Removal

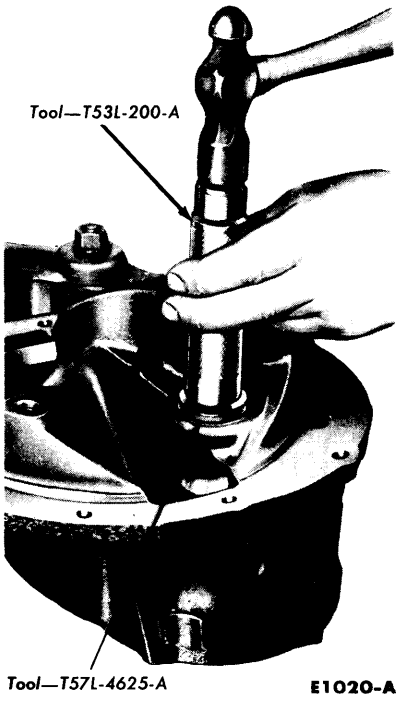

FIG. 15—Pilot Bearing Removal

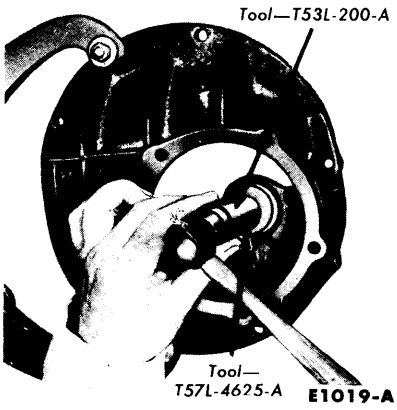

FIG. 16—Pilot Bearing Installation

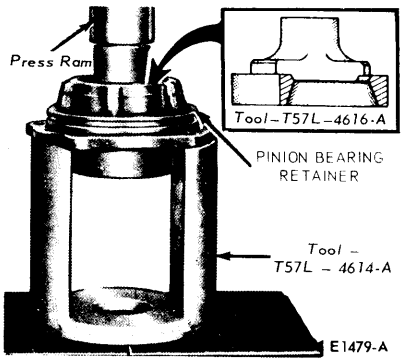

FIG. 17—Pinion Front Bearing Cup Removal

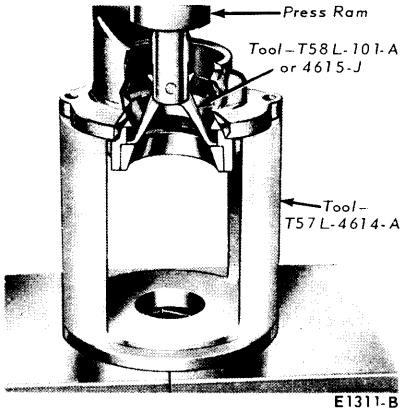

FIG. 18—Pinion Rear Bearing Cup Removal

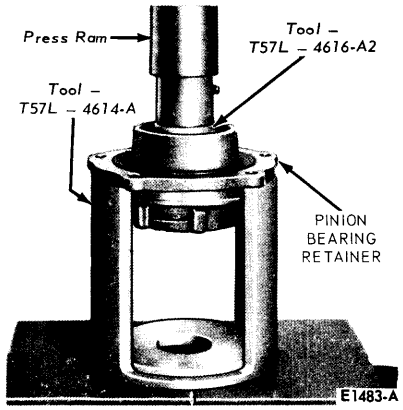

FIG. 19—Pinion Front Bearing Cup Installation

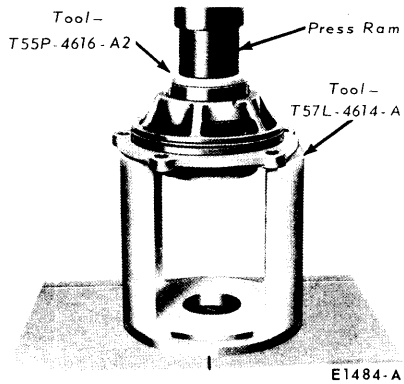

FIG. 20—Pinion Rear Bearing Cup Installation

change. The amount that is shown under the old pinion shim adjustment number and in line with the new pinion number is the amount of **change** that should be made to the **original** shim thickness.

If the old pinion is marked +4, for example, and the new pinion is

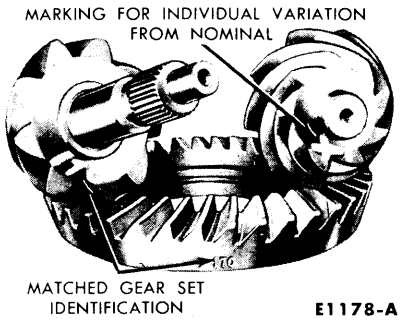

FIG. 21—Pinion and Ring Gear Markings

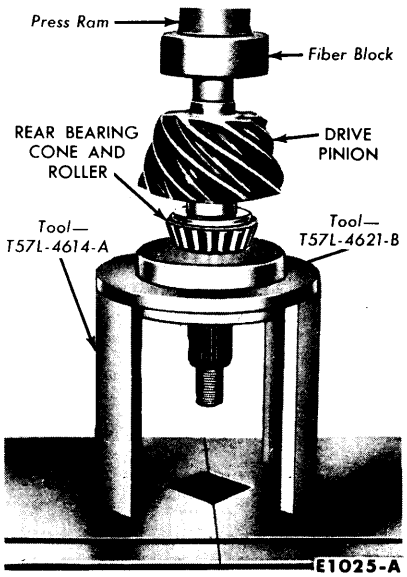

FIG. 22—Pinion Rear Bearing Cone Installation

marked −2, the table indicates that 0.006 inch of shim stock should be removed from the **original** shim pack.

If the **original** shim pack was lost or if a new carrier housing is being installed, substitute a **nominal** 0.020 inch shim for the **original,** and follow the foregoing procedure for a trail build-up. If any further shim change is necessary, it will be indicated in the tooth pattern check.

A new ring gear and pinion should always be installed in an axle as a matched set (never separately). **Be sure that the same matching number appears on both the drive pinion and the ring gear.** Note the number "170" in Fig. 21.

4. After determining the correct shim thickness as explained in the foregoing steps, install the new pinion and ring gear as outlined under "Assembly."

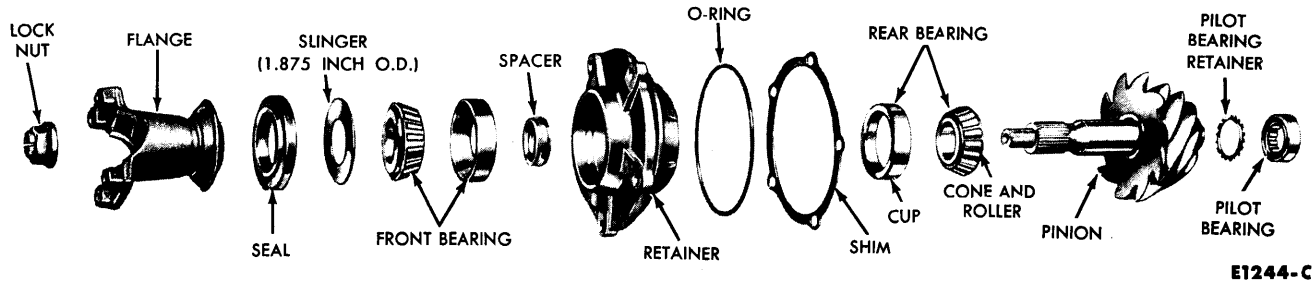

FIG. 23—Pinion and Bearing Retainer

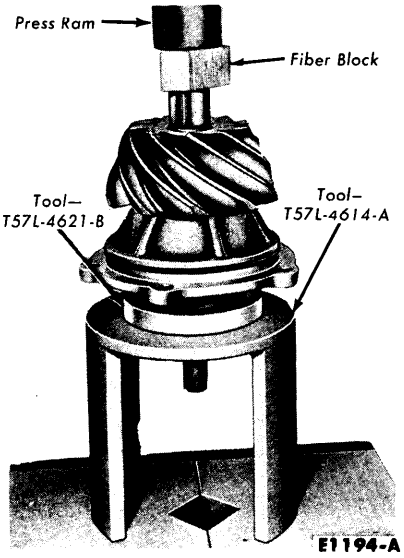

FIG. 24—Pinion Front Bearing Installation

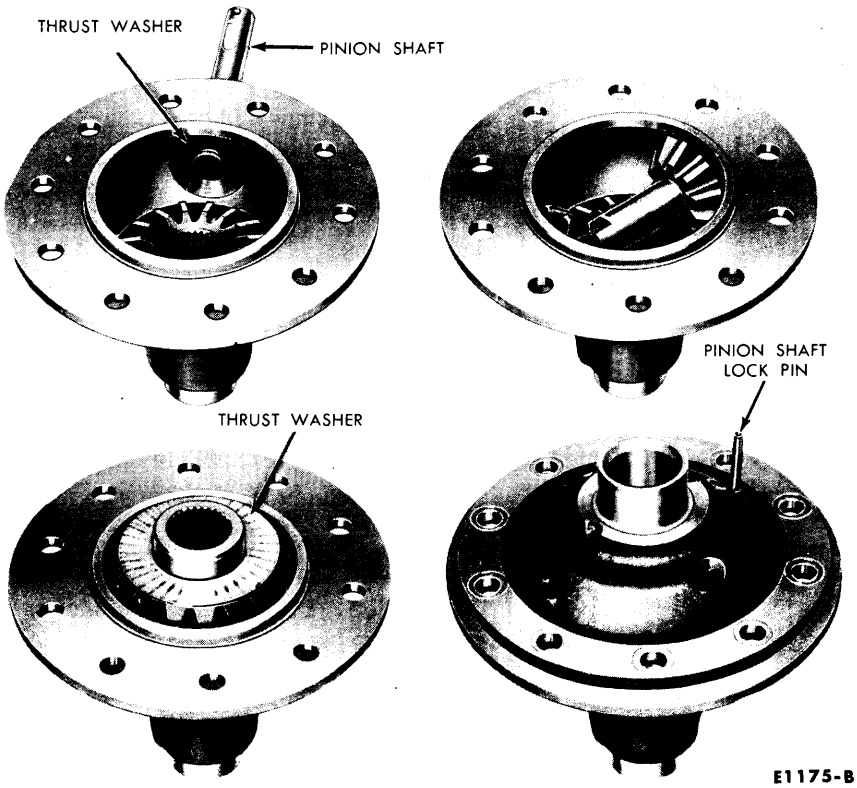

FIG. 25—Assembly of Differential Case

DIFFERENTIAL CASE, BEARINGS AND RING GEAR

If the ring gear runout check before disassembly exceeded specifications, the condition may be caused by a warped gear, a defective case, or by excessively worn differential bearings.

To determine the cause of excessive runout proceed as follows:

1. Assemble the two halves of the differential case together **without** the ring gear, and press the two differential side bearings on the case hubs.
2. Place the cups on the bearings and set the differential case in the carrier.
3. Install the bearing caps and adjusting nuts as outlined in steps 11 thru 14 under "Assembly of Drive Pinion and Differential Case to Carrier" in this section.
4. Tighten the right nut two notches beyond the position where it first contacts the bearing cup. Rotate the differential case several revolutions in each direction while the bearings are loaded to seat the bearings in their cups. **This step is important.**
5. Again loosen the right nut to release the preload. Check to see

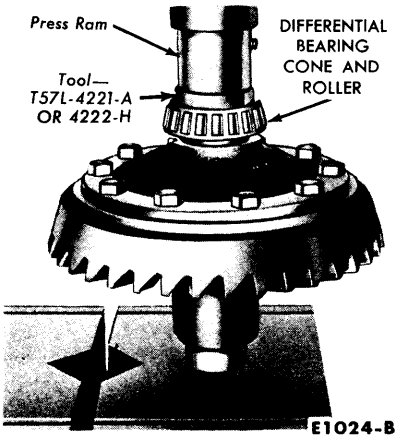

FIG. 26—Differential Bearing Installation

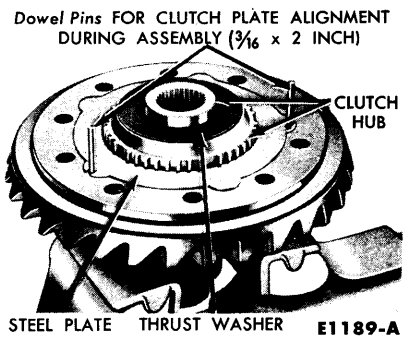

FIG. 27—Clutch Plate Installation

that the left nut contacts the bearing cup, and then set a preload of 2½ to 3 notches tight at the right-hand nut.

6. Check the runout of the differential case flange with a dial indicator. If the runout does **not now** exceed specifications, install a new ring gear. If the runout still exceeds specifications, the ring gear is true and the trouble is due to either a defective case or worn bearings. Continue with steps 7 through 9 which follow.

7. Remove the differential case from the carrier and remove the side bearings from the case.

8. Install **new** bearings on the case hubs, and again install the differential assembly in the carrier **without** the ring gear.

9. Check the case runout again with the new bearings. If the runout is **now** within limits, the old bearings were excessively worn. Use the new bearings for assembly. If the runout is still excessive, the case is defective and should be replaced.

ASSEMBLY

Perform the "Inspection After Disassembly" as explained in Part 4-1, Section 2. Repair or replace parts as indicated by the inspection, and assemble the carrier as outlined in the following procedures.

ASSEMBLY OF DRIVE PINION AND BEARING RETAINER

1. Install the drive pinion rear bearing cone and roller on the pinion shaft (Fig. 22). Place a new spacer on the pinion shaft (Fig. 23).

2. Place the bearing retainer on the pinion shaft, and install the front bearing cone and roller. Press the front bearing cone and roller into position as shown in Fig. 24. Be careful not to crush the bearing spacer.

3. Lubricate the O-ring with axle lubricant and install it in its groove in the pinion retainer. Be careful not to twist it. Snap the O-ring into position.

ASSEMBLY OF CONVENTIONAL DIFFERENTIAL CASE

1. Place a side gear and thrust washer in the differential case bore (Fig. 25). **Lubricate all differential parts liberally with axle lubricant during assembly.**

2. With a soft-face hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.

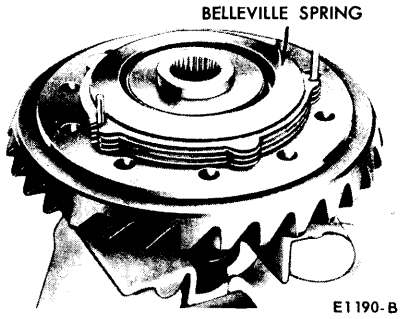

FIG. 28—Belleville Spring Installation

3. Place second pinion and thrust washer in position, and drive pinion shaft into place. **Carefully line up the pinion shaft lockpin holes.**

4. Place the side gear and thrust washer in position (Fig. 25), and install the cover of the differential case. Install the lockpin. A pinion or axle shaft spline can be inserted in the side gear spline to check for free rotation of the differential gears.

5. Insert two 7/16 (N.F.) bolts two inches long through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes. Press or tap the ring gear into position.

6. Install and tighten the ring gear bolts and washers evenly, and torque them alternately across the gear to specification.

7. If the differential bearings have been removed, press them on as shown in Fig. 26.

ASSEMBLY OF LOCKING DIFFERENTIAL CASE

1. Place the inner side gear and thrust washer in the differential case (Fig. 12). **Lubricate all parts liberally with axle lubricant during assembly.**

2. With a soft-faced hammer, drive the pinion shaft into the case only far enough to retain a pinion thrust washer and pinion gear.

3. Place the second pinion and thrust washer in position, and drive the pinion shaft into place. **Carefully line up the pinion shaft lock pin holes.**

4. Install the pinion shaft lock pin. **The lock pin must not extend beyond the surface of the case.**

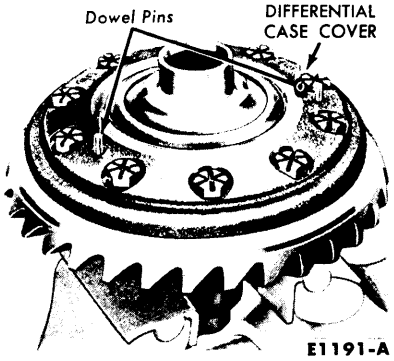

FIG. 29—Differential Cover Installation

5. Insert two 2-inch 7/16 (N.F.) bolts through the differential case flange, and thread them three or four turns into the ring gear as a guide in aligning the ring gear bolt holes. Press or tap the ring gear into position.

6. Clamp the differential case in a soft-jawed vise. Install the differential outer side gear on the differential pinion gears. Place the clutch hub on the side gear. Place the thrust washer on the hub (Fig. 27).

7. To align the clutch plates during assembly, insert two 3/16 x 2-inch dowel pins into the differential case. Place a steel plate on the differential case so that the slots in the locating tabs straddle the dowel pin (Fig. 27). **Lubricate all the locking differential parts with axle lubricant so that an accurate torque check can be made.**

8. Place a bonded plate on the steel plate. Make sure the bonded plate inner spline teeth properly engage the hub spline. Assemble the remaining plates: a steel plate, a bonded plate, a steel plate, a bonded plate, and lastly a steel plate.

9. Place the Belleville spring on the top steel plate. The Belleville spring is assembled with concave side down (Fig. 28). Carefully center the Belleville spring so that it will fit into the cover.

10. Place the differential case cover on the case (Fig. 29). Start the ring gear bolts.

11. Tighten the bolts evenly and alternately across the diameter of the ring gear. As the bolts are tightened the Belleville spring is compressed and the differential case and cover are pulled together.

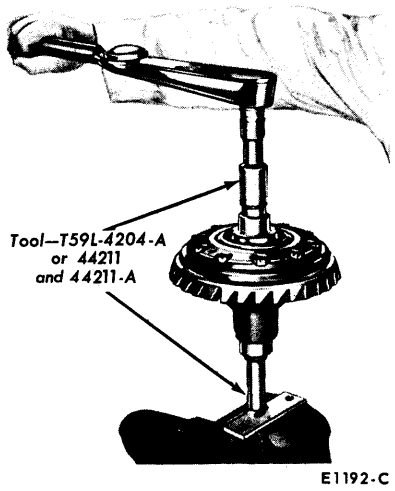

FIG. 30—Differential Torque Check

12. Remove the dowel pins.

13. Torque the case to ring gear bolts to specifications.

14. Check the torque required to rotate one side gear while the other side gear is held (Fig. 30). Ignore the torque required to start the side gear turning. The torque required to keep it moving steadily should be between 155 and 195 ft-lbs, if new clutch plates were installed. The torque should be over 75 ft-lbs, if the original clutch plates were installed. If the required torque is not within these limits, check for improper assembly.

15. Install the side bearings on the differential case as shown in Fig. 26.

ASSEMBLY OF DRIVE PINION AND DIFFERENTIAL CASE TO CARRIER

1. Place the proper shim on the carrier housing and install the pinion and retainer assembly, being careful not to pinch the O-ring (Fig. 31).

2. Install the pinion retainer bolts. Torque the bolts to specification.

3. Place the slinger over the pinion shaft and against the front bearing.

4. Coat the outside edge of a new oil seal with a small amount of oil resistant sealer. **Do not put sealer on the sealing lip.** Install the oil seal in the bearing retainer (Fig. 32). Soak new seals in SAE 10 oil for ½ hour before use.

5. Install the U-joint flange (Fig. 33).

6. Start a new integral nut and washer on the pinion shaft.

7. Hold the flange with the tool shown in Fig. 7, and torque the pinion shaft nut to 175 ft-lbs. **Do not exceed 175 ft-lbs at this time.**

8. Check the pinion bearing preload as shown in Fig. 34. Correct preload will be obtained when the torque required to rotate the pinion in the retainer is as specified in Part 4-3. If the torque required to rotate the pinion is less than specified, tighten the pinion shaft nut a little at a time until the proper preload is established. **Do not overtighten the nut.** If excessive preload is obtained as a result of overtightening, it will be necessary to replace the collapsible bearing spacer.

Do not back off the pinion shaft nut to establish pinion bearing preload. If the torque on the pinion shaft nut is less than 175 ft-lbs after bearing preload is established, a new collapsible spacer must be used.

9. Turn the carrier housing 180° around in the holding fixture and wipe a thin coating of lubricant on the differential bearing bores so that the differential bearing cups will move easily.

10. Place the cups on the differential bearings, and assemble the differential case and drive gear assembly in the carrier so that the marked tooth on the pinion indexes between the marked teeth on the drive gear as shown in Fig. 35.

In almost every case of improper assembly (gears assembled out of time), the noise level and probability of failure will be higher than they would be with properly assembled gears.

11. Slide the assembly along the bores until a slight amount of backlash is felt between the gear teeth.

12. Set the adjusting nuts in the

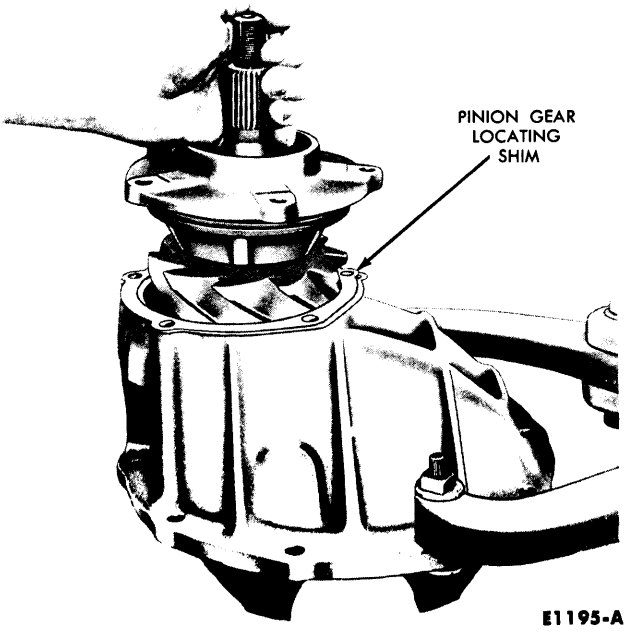

FIG. 31—Pinion and Retainer Installation

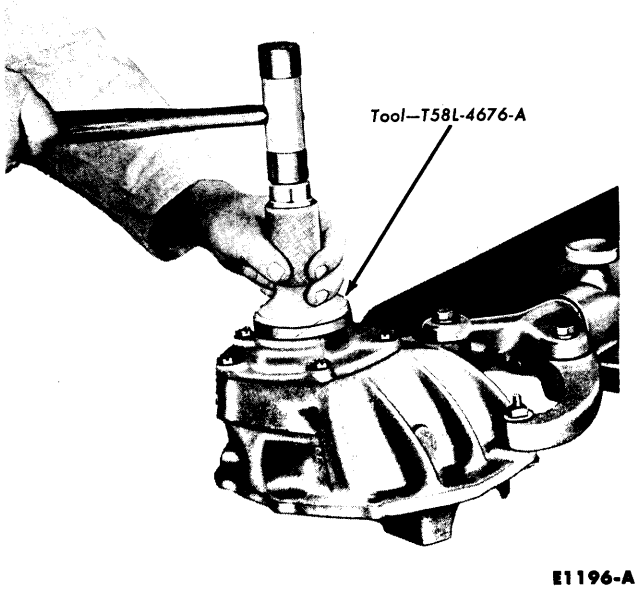

FIG. 32—Oil Seal Installation

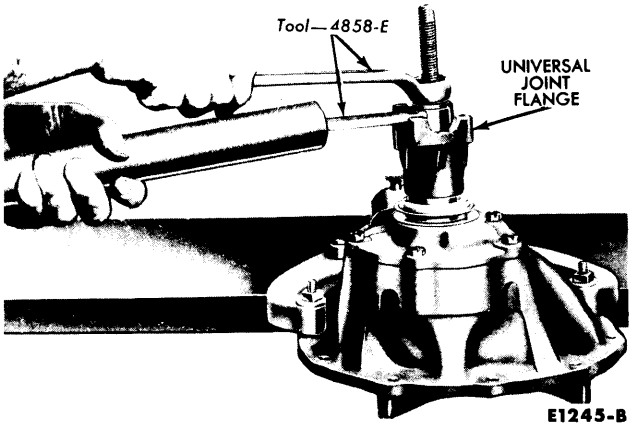

FIG. 33—U-Joint Flange Installation

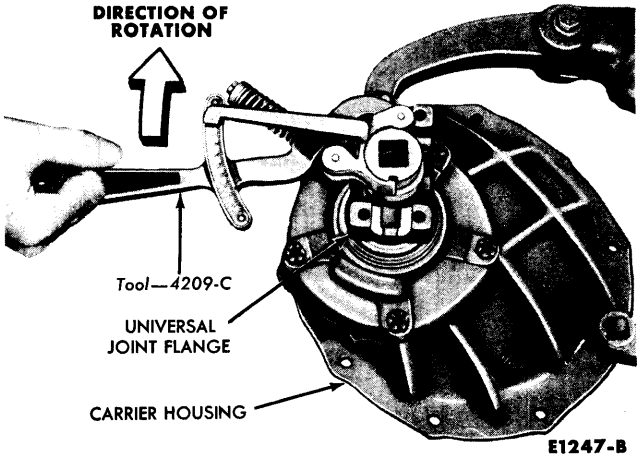

FIG. 34—Pinion Bearing Preload Check

bores so that they just contact the bearing cups. The nuts should be engaging about the same number of threads on each side.

13. Carefully position the bearing caps on the carrier. Match the marks made when the caps were removed.

14. Install the bearing cap bolts and alternately torque them to 70-80 ft-lbs.

15. If the adjusting nuts do not turn freely as the cap bolts are tightened, remove the bearing caps and again inspect for damaged threads or incorrectly positioned caps. Tightening the bolts to the specified torque is done to be sure that the cups and adjusting nuts are seated. Loosen the cap bolts, and torque them to only 25 ft-lbs before making adjustments.

16. Adjust the backlash between the ring gear and pinion as outlined in Part 4-1, Section 2.

17. Be sure to make a final tooth pattern check before installing the carrier assembly in the axle housing.

FIG. 35—Gear Set Timing Marks

PART 4-3 SPECIFICATIONS

REAR AXLE RATIOS, GEAR AND CODE IDENTIFICATION

Identification Tag	Ring Gear Diameter (Inches)	Type of Differential	Axle Ratio	No. of Teeth		Type of Gear Set
				Ring Gear	Pinion	
WCD-E	9	Conventional	3.00:1	30	10	Non-Hunting
WDE-B	9	Locking				
WCD-F	9	Conventional	3.50:1	35	10	Partial Non-Hunting

LUBRICANT

Ford Specification	Ford Part No.	Capacity
M2C57-A*	C2AZ-19580-D	5 Pints (Approx.)

*For all cars equipped with Equa-Lock axles, regardless of engine size, use M-2C50-B, plus (1) ounce of M-2C58-A (C1AA-19B546-A) additive per pint of M-2C50-B (4 oz. for complete refill).

SAE 90 grade lubricants are recommended for all temperatures above —25° F. For temperatures below —25° F, the same type of lubricant, but of an SAE 80 grade, should be used.

REAR AXLES WITH LOCKING DIFFERENTIAL

TORQUE CHECK		
Minimum Torque Required to Turn Axle Shaft and Side Gear With One Wheel on the Ground		75 ft-lbs
Bench Check After Assembly	With New Clutch Plates	155-195 ft-lbs
	With Original Clutch Plates	75 ft-lbs Minimum

ADJUSTMENTS

Description	Inches
Backlash Between Drive Gear and Pinion	0.004-0.009
Maximum Backlash Variation Between Teeth	0.003
Maximum Runout of Backface of Drive Gear as Assembled	0.003
Differential Side Gear Thrust Washers Thickness	0.030-0.032
Differential Pinion Gear Thrust Washers Thickness	0.030-0.032
Nominal Pinion Locating Shim	0.020
Available Shims (In steps of 0.001 inch)	0.010-0.029

TORQUE LIMITS

	Ft-lbs
Differential Bearing Cap Bolts	70-85
Differential Bearing Adjusting Nut Lock Bolts	12-25
Carrier to Housing Stud Nuts	30-40
Pinion Retainer to Carrier Bolts	30-45
Drive Gear Attaching Bolts	65-80
Rear Axle Shaft Bearing Retainer Nuts	30-35
Rear Spring Clip (U-Bolt) Nuts	60-70
Shock Absorber-to-Spring Clip Plate	15-25
Minimum Torque Required to Tighten Pinion Nut to Obtain Correct Pinion Bearing Preload	175
Pinion Bearing Preload	New Bearings & New Seal 22-32 in-lbs Used Bearings & New Seal 10-14 in-lbs
Differential Bearing Preload	2½-3 Notches Tight

DRIVE PINION ADJUSTING SHIM THICKNESS CHANGES (Inches)

New Pinion Marking	Old Pinion Marking								
	−4	−3	−2	−1	0	+1	+2	+3	+4
+4	+0.008	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0
+3	+0.007	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001
+2	+0.006	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002
+1	+0.005	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003
0	+0.004	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004
−1	+0.003	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005
−2	+0.002	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006
−3	+0.001	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007
−4	0	−0.001	−0.002	−0.003	−0.004	−0.005	−0.006	−0.007	−0.008

SPECIAL TOOLS

Ford Tool No.	Former No.	Description
T59L-4204-A	42211 or 42211-A	Locking Differential Check
T57L-500-A	6005-M or 6005-MS	Bench Fixture
T50T-100-A	B-160	Impact Hammer
Tool—4235-C	4235-C	Axle Shaft Remover
OTC-951		Rear Wheel Bearing Remover and Installer
Tool—1177	4245-B	Rear Wheel Bearing Oil Seal Installer
Tool—1175-AB	1175-AB	Rear Wheel Bearing Oil Seal Remover
T57L-4220-A		Differential Bearing Remover
Tool—4221-AE and Tool—4221-AF	4221-AF	Differential Bearing Remover
T57L-4851-A	4851-K	U-Joint Flange Holder
T53T-4851-A	4851-A, D	U-Joint Flange Remover
Tool—4858-D		U-Joint Flange Remover
T57L-4614-A	4614	Drive Pinion Retainer Support
Tool—4621-K	4621-K	Pinion Rear Bearing Cone Remover
T53L-200-A		Handle Adapter
T57L-4625-A	4625-K	Pinion Pilot Bearing Remover and Installer
T57L-4616-A-2 or Tool—4615-D		Pinion Front Bearing Cup Remover and Replacer
T58L-101-A		Pulley Attachment For Bearing Cup Removal
T55P-4616-A2		Pinion Rear Bearing Cup Remover and Replacer
T57L-4621-B or Tool—4621-L		Pinion Front and Rear Bearing Cone Installer
T58L-4676-A	4676-F	Drive Pinion Oil Seal Replacer
Tool—4858-E	4858-E	U-Joint Flange and Pinion Bearing Replacer
T57L-4221-A	4222-H	Differential Bearing Installer
Tool—4209-C	4209-C	Pinion Tension Scale with Socket—Bearing Preload