

ACCEPTABLE TOOTH PATTERN LIMITS

ANY COMBINATION OF DRIVE AND COAST PATTERNS SHOWN PERMISSIBLE

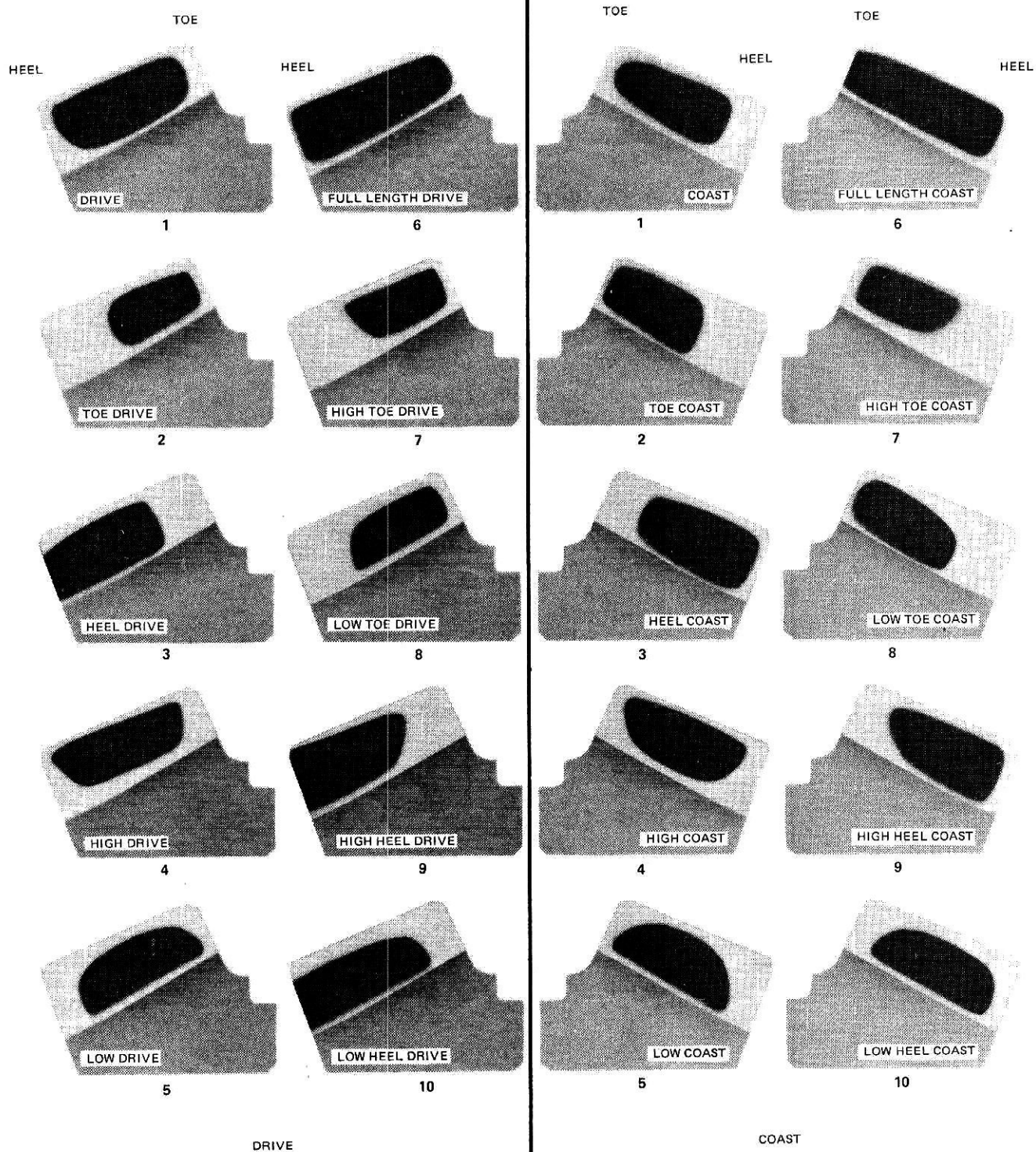
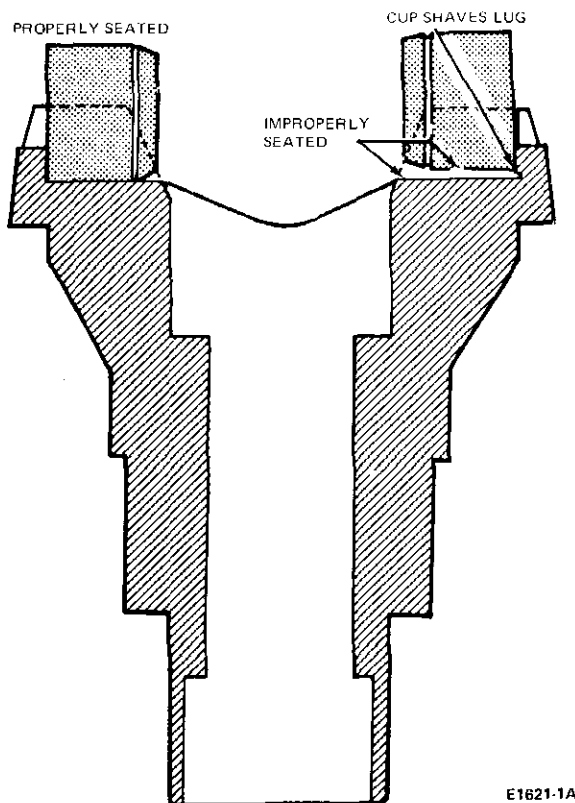


FIG. 3 Acceptable Tooth Pattern Limits

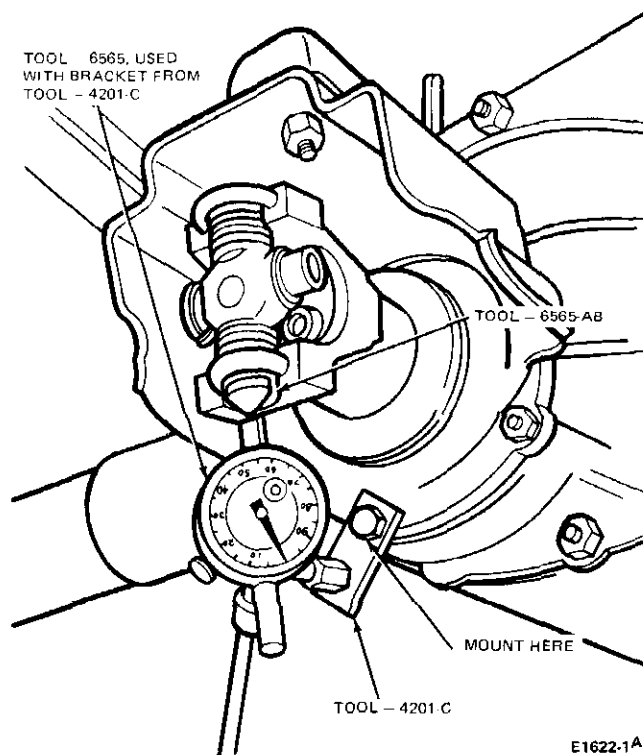
2. Remove the driveshaft assembly (Part 15-60).
3. Check for companion flange damage to the universal joint bearing locating lugs. If the lugs on the companion flange are shaved (worn) or damaged, replace the companion flange (Fig. 4).



E1621-1A

FIG. 4 Checking Companion Flange

4. The rear axle companion flange runout is checked with a modified universal joint (checking tool) dial indicator with 1.000 inch minimum travel, and a cup-shaped dial indicator adapter tool (Fig. 5). **To fabricate the checking tool, modify a universal joint assembly by removing two bearing cups that are opposite each other, and cutting or grinding off one of the universal joint bearing flanges (Fig. 5).**
5. Install the cup-shaped adapter on the dial indicator stem. Install the dial indicator on the pinion retainer or pinion nose bumper bracket. Position the indicator to allow an indication at the ends of the universal joint bearing cups and the remaining exposed journal of the cross-shaft.
6. Turn the companion flange so that the dial indicator cup-type adapter rests on the machined surface of the bearing cup (Fig. 5). Rotate the companion flange side-to-side slightly, to obtain a reading indicating that the bearing cup surface is perpendicular to the indicator cup-type adapter. **This will be the point at which the dial indicator cup is closest to the center of companion flange rotation. It is also the point at which the dial indicator hand will reverse direction as the companion flange is turning. Set the dial indicator to zero.**



E1622-1A

FIG. 5 Flange Bearing Cup Runout Check—Typical

7. Carefully retract the dial indicator stem and rotate the companion flange 180 degrees, to position the machined surface of the opposite universal bearing under the dial indicator adapter tool. Slightly rotate the flange side-to-side, to position the bearing perpendicular to the dial indicator adapter. At this point, the indicator hand will reverse direction as the flange is rotated. Record the flange bearing cup runout reading obtained from the indicator (Fig. 6).

Indicator Reading	Flange Bearing Cup Runout—Inch	Driveshaft Universal Cross-Shaft Runout—Inch
1	0.004	0.005
2	0.002	0.004
3	0.003	0.003
Average	0.003	0.004

CE1943-1B

FIG. 6 Flange Bearing Cup and Cross-Shaft Runout Averaging Chart—Typical Readings

Rotate the companion flange 90 degrees and position the dial indicator adapter on the machined end of the exposed journal (Fig. 7). **Be sure the end surface of the exposed journal is perpendicular to the indicator cup-type adapter.** This requires that the cross-shaft be

moved fore and aft on the flange bearing cups. **Note the point at which the indicator hand reverses direction.** Rotate the flange assembly side-to-side until the cross-shaft is perpendicular to the pinion shaft axis, and the indicator hand reverses direction. Zero the dial indicator and check the zero point again by slightly moving the cross-shaft fore and aft, then rotate the companion flange from side-to-side.

8. With the indicator at zero, carefully retract the dial stem and rotate the flange 180 degrees. Rotate the cross-shaft 180 degrees on the flange bearing cups to position the exposed journal under the dial indicator adapter. Rock the cross-shaft fore and aft and the companion flange side-to-side to establish the point at which the indicator hand reverses direction. This will determine the driveshaft universal cross-shaft run-out. Record this reading (Fig. 7).
9. Repeat Steps 5 through 8 at least three times and average the indicator readings obtained (Fig. 6).
10. To determine the total (combined) companion flange runout, it will be necessary to use the

combined runout chart (Fig. 8). Position a straight edge at the amount of flange bearing cup runout indicated on the left-hand column of the chart. Position another straight edge vertically, at the amount of the universal cross-shaft runout indicated on the top of the chart. The point at which the straight edges cross the chart indicates the combined rear axle flange runout. For example:

With an indicated 0.003 inch flange bearing cup runout and an indicated 0.004 inch universal cross-shaft runout (Fig. 8), the combined companion flange runout will be 0.005 inch, as indicated in the square on the chart (Fig. 8).

11. If the reading obtained in Step 10 exceeds specifications, reposition the companion flange 180 degrees on the pinion shaft and repeat Steps 1 through 10.
12. If the repeat readings still exceed specifications, re-position the flange an additional 90 degrees on the pinion shaft and check the runout (Steps 4 through 10).
13. If the runout is still excessive, replace the companion flange and check the runout. If necessary, rotate the new flange on the pinion shaft until an acceptable runout is obtained.

If excessive runout is still evident after replacement of the companion flange, it will be necessary to replace the ring and pinion gear, and repeat the above checks until runout is within specifications.

14. Install the driveshaft assembly (Part 15-60). **Make sure the universal joint bearing cups are properly positioned between the companion flange lugs.**
15. Lower the vehicle and road test. If drive shaft vibrations are evident, remove the driveshaft from the companion flange and rotate it 180 degrees. Road test the vehicle again.

Lincoln Continental, Continental Mark V, Versailles, Fairmont and Zephyr

1. Raise the vehicle on a hoist that supports the rear axle (twin-post hoist).

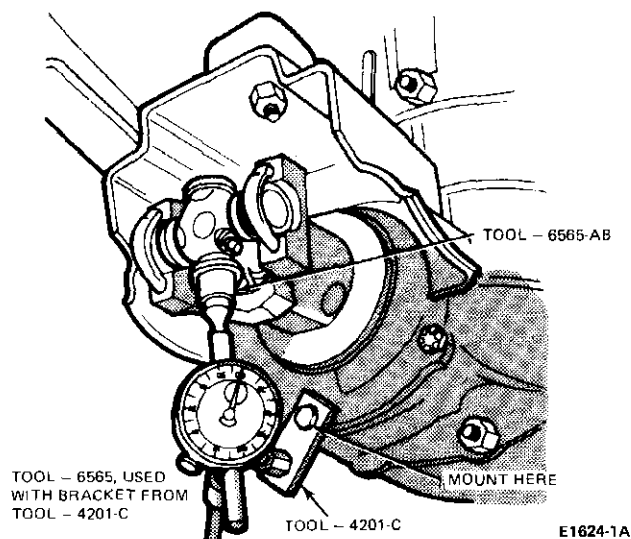


FIG. 7 Cross-Shaft Runout Check—Typical

Flange Bearing Cup Runout	Drive Shaft Universal Cross-Shaft Runout—Inch								
	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008
0.000	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008
0.001	0.001	0.0013	0.0022	0.0032	0.0042	0.0051	0.0061	0.0071	0.0081
0.002	0.002	0.0022	0.0027	0.0037	0.0045	0.0053	0.0062	0.0072	0.0082
0.003	0.003	0.0032	0.0036	0.0042	0.005	0.0058	0.0067	0.0077	0.0085
0.004	0.004	0.0042	0.0045	0.005	0.0057	0.0064	0.0072	0.0081	0.009
0.005	0.005	0.0051	0.0053	0.0058	0.0063	0.0071	0.0078	0.0087	0.0094
0.006	0.006	0.0061	0.0062	0.0068	0.0072	0.0078	0.0085	0.0092	0.010
0.007	0.007	0.0071	0.0073	0.0075	0.0081	0.0087	0.0093	0.0099	0.0103
0.008	0.008	0.0081	0.0082	0.0087	0.009	0.0094	0.010	0.0104	0.011

The total (combined) companion flange runout is located in the square where the columns containing the flange bearing cup runout and universal cross shaft runout readings intersect.

CE1944-2A

FIG. 8 Companion Flange Combined Runout Chart

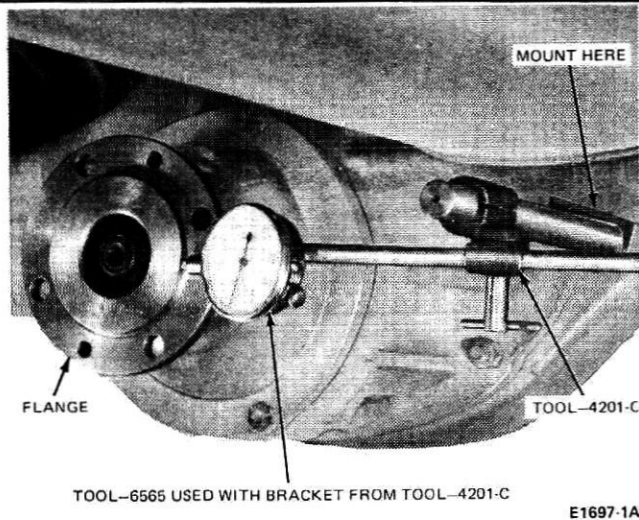


FIG. 9 Checking Companion Flange Radial Runout—Lincoln Continental and Continental Mark V—Typical Versailles, Fairmont and Zephyr

2. Remove the driveshaft assembly (Part 15-66).
3. Check the companion flange for damage.
4. To check radial runout, set up dial indicator as shown in Fig. 9.
5. Rotate the companion flange with the dial indicator in place. If the runout exceeds specifications, remove the flange and reinstall it 180 degrees from original position. Follow the procedure in Part 15-66 for companion flange installation.
6. If the runout is still excessive, remove and reinstall the flange an additional 90 degrees and re-check the runout.
7. To check lateral (face) runout, set up the dial indicator as shown in Fig. 10. Repeat Steps 5 and 6.
8. If the runout is still excessive, replace the companion flange and check the runout. If necessary, rotate the new flange on the pinion shaft until an acceptable runout is obtained.
If excessive runout is still evident after replacement of the companion flange, it will be necessary to replace the ring and pinion gear, and repeat the above checks until runout is within specifications.
9. Install the driveshaft assembly (Part 15-66).

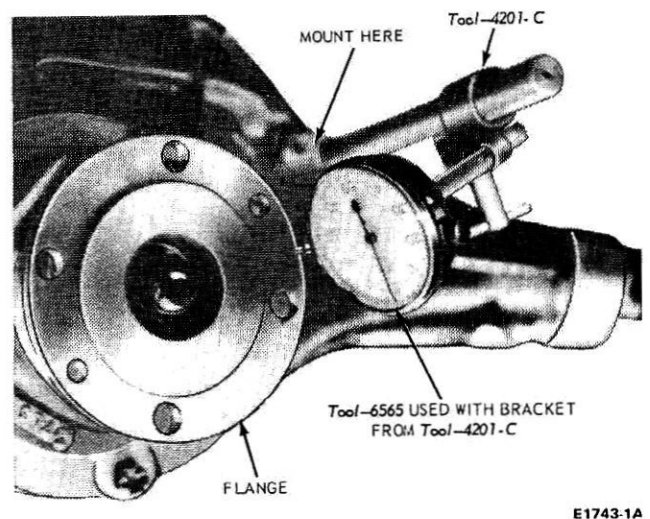


FIG. 10. Checking Companion Flange Lateral Runout—Lincoln Continental and Continental Mark V—Typical Versailles, Fairmont and Zephyr

ADJUSTMENTS

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

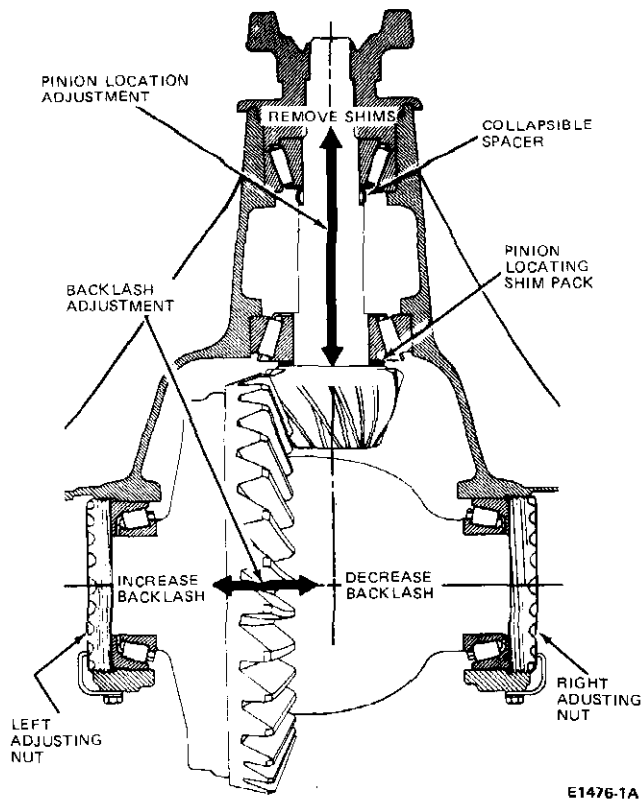
PINION AND RING GEAR TOOTH CONTACT ADJUSTMENT

Two separate adjustments affect pinion and ring gear tooth contact. They are pinion location and backlash (Figs. 11 and 12).

Individual differences in matching the differential housing and the gear set require the use of shims to locate the pinion for correct contact with the ring gear.

When adjusting either type axle, shim thickness should be increased or reduced only as indicated by the tooth pattern check described on preceding pages.

If the tooth pattern check indicates a change in backlash only, follow the procedure under Backlash and Differential Bearing Preload Adjustments. If the tooth pattern indicates a change in shim thickness, follow the procedure for the removable or the integral carrier-type axle, which follows.



E1476-1A

FIG. 11 Pinion and Ring Gear Tooth Contact Adjustment—Integral Carrier-Type Axles

REMOVABLE CARRIER-TYPE AXLE

The shim location for the removable carrier-type axle is between the pinion retainer and the carrier (Fig. 12). When adjusting this type carrier, reducing shim thickness will move the pinion toward the ring gear; increasing shim thickness will move the pinion away from the ring gear (Fig. 12).

INTEGRAL CARRIER-TYPE AXLE

The shim location for the integral carrier-type axle, is between the pinion gear and the pinion rear bearing cone (Fig. 11). When adjusting this type axle, increasing shim thickness moves the pinion toward the ring gear; reducing shim thickness moves the pinion away from the ring gear (Fig. 11).

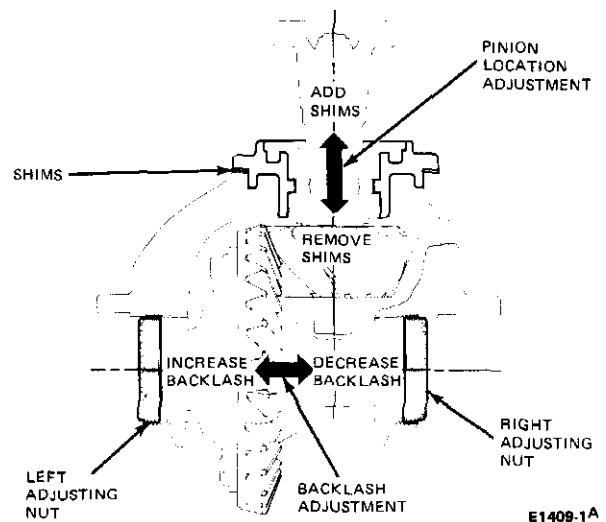
BACKLASH AND DIFFERENTIAL BEARING PRELOAD ADJUSTMENTS

On a WER axle, it is necessary to remove the rear axle shaft prior to performing the adjustment procedures. Refer to *Rear Axle Shaft Wheel Bearing and Oil Seal Replacement—WER Axle, Part 11-11*. To secure a more uniform control of differential side bearing preload in service repairs, a dial indicator set-up is used such as shown in Fig. 13. In both types of axle (Figs. 11 and 12), the ring gear is moved away from or toward the pinion, as described in the following procedure.

1. Remove the adjusting nut locks, loosen the differential bearing cap bolts, then torque the bolts to 15 ft-lb. on integral carrier-type axle; 20 ft-lb.

on removable carrier-type axles before making adjustments.

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

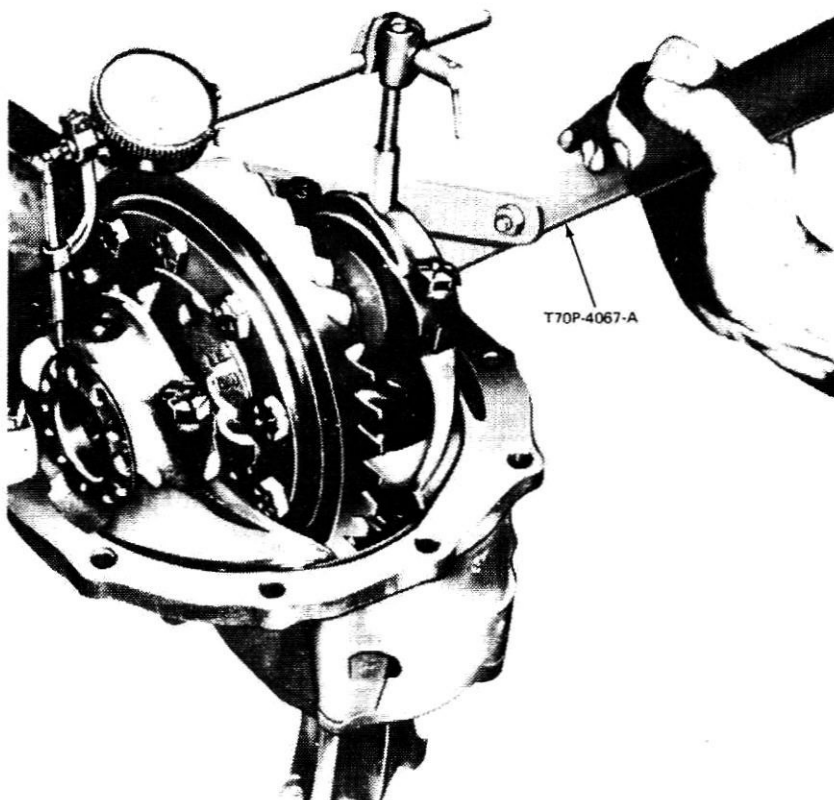


E1409-1A

FIG. 12 Pinion and Ring Gear Tooth Contact Adjustment—Removable Carrier Axles

forced into the pinion with 0.000 backlash, then rotate the pinion several revolutions to be sure no binding is evident. (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. Install a dial indicator as shown in Fig. 13.
4. Tighten the right nut until it first contacts the bearing cup. Then, preload the bearings from 0.008 to 0.012-inch case spread. Turn the pinion gear several times in each direction to seat the bearings in the cups and be sure no bind is evident. **This step is important.**
5. Torque the differential cap bolts to specification.
6. Measure the backlash on several teeth around the ring gear. If the measurements vary more than 0.003 inch (both integral and removable carrier), 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 ring 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, then tighten it one. This insures that the nut is contacting the bearing cup, and that the cup cannot shift after being put in service. After all such adjustments, check to be sure that the case spread remains as specified for the new or original bearings used.



E2173-2A

FIG. 13 Adjusting Side Bearing Preload—Typical

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

Major Repair, under the removable carrier or integral carrier axle involved for the necessary steps.

CLEANING AND INSPECTION

INSPECTION BEFORE DISASSEMBLY OF CARRIER (ALL AXLES)

The differential case or carrier should be inspected before any parts are removed from it. 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. 14. 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 damaged bearings or chipped gears. Check the gear teeth for scoring or signs of abnormal wear. Set up a dial indicator (Fig. 15) 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.

To check the gear tooth contact, paint the gear teeth with the special compound furnished with each ring gear and pinion. 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. 16 rotate the ring gear (use a box wrench on the ring gear attaching bolts for a

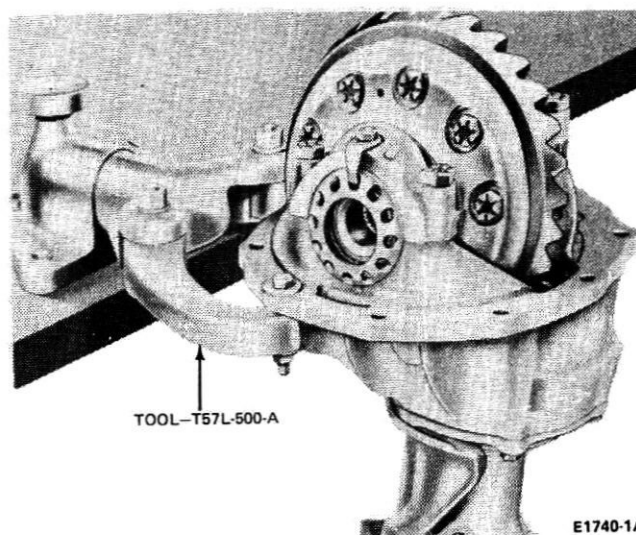


FIG. 14 Bench Fixture for Removable Carrier Overhaul—Typical

lever) five complete revolutions in both directions or until a clear tooth contact pattern is obtained.