

REAR AXLE

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REAR AXLE

MAZDA 616 is equipped with a semi-floating type rear axle with a hypoid ring gear and pinion set. The final reduction ratio is 3.700.

9-A. REAR AXLE SHAFT

9-A-1. Removing of Rear Axle Shaft

1. Remove the rear wheel and brake drum.
2. Remove the brake shoe assembly, as detailed in Par. 11-E.
3. Remove the nuts holding the brake backing plate and bearing retainer to the axle housing.
4. Extract the axle shaft assembly using the puller (49 0223 630A and 49 0259 631).

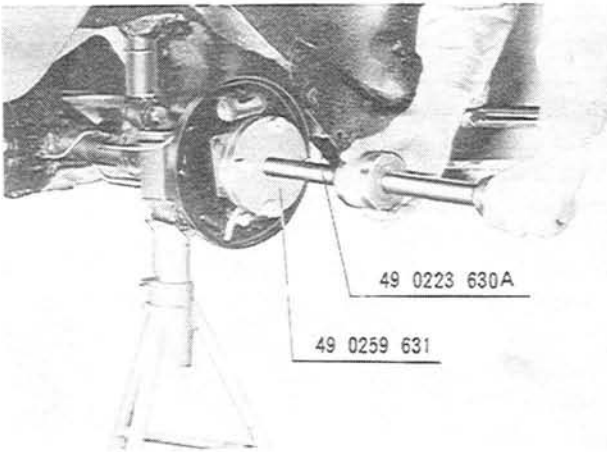


Fig. 9-1 Removing of rear axle shaft

9-A-2. Replacing of Axle Shaft Bearing

1. Remove the rear axle shaft assembly as described in Par. 9-A-1.
2. Using the bearing remover set (49 0259 745), support the spacer and press the axle shaft out of the collar and bearing, as shown in Fig. 9-2.

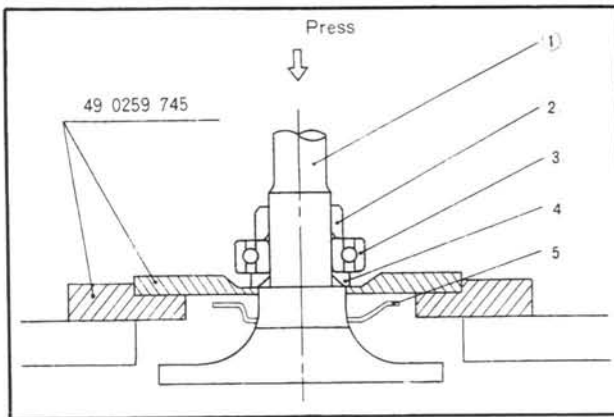


Fig. 9-2 Removing of bearing

- | | |
|--------------------|-------------|
| 1. Rear axle shaft | 4. Spacer |
| 2. Collar | 5. Retainer |
| 6. Bearing | |

Note: In case the pressure necessary to press out the axle shaft exceeds 10 tons (22,000 lb) or if the bearing remover set is not available, grind off the part of

bearing retaining collar and cut it with the use of a chisel, as shown in Fig. 9-3, taking care not to damage the axle shaft.

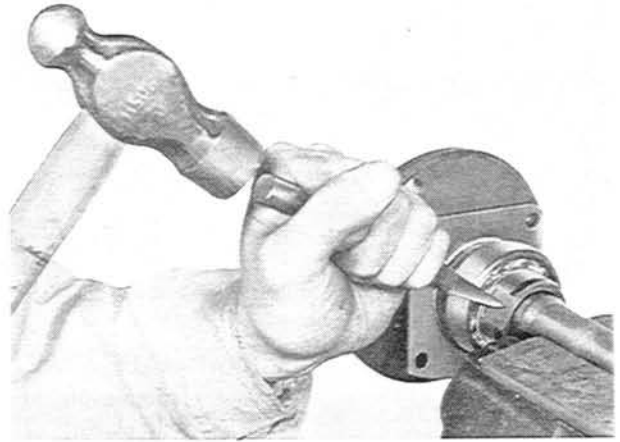


Fig. 9-3 Cutting of bearing collar

3. Remove the bearing retainer from the axle shaft.
4. Clean all parts and check the condition of the collar, spacer, axle shaft and the oil seal located in the axle shaft housing.
5. Install the bearing retainer and spacer onto the axle shaft.
6. Position the bearing on the axle shaft with the sealed side toward the axle shaft flange, and press it on until the spacer comes in contact with the shoulder of the shaft.
7. Press the bearing retaining collar onto the axle shaft using the bearing replacer (49 0259 745) until it is firm contact with the bearing inner race.

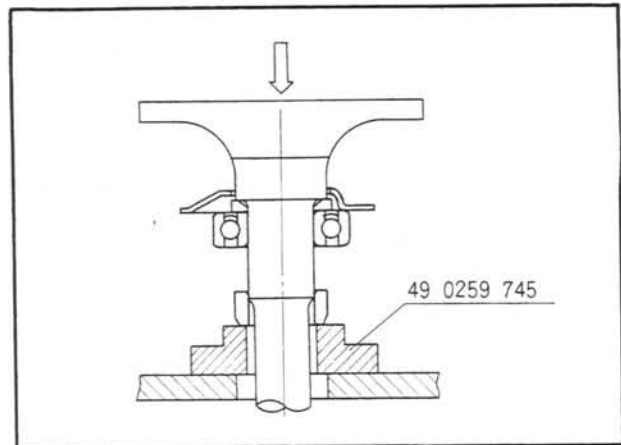


Fig. 9-4 Installing of bearing collar

Note: If the bearing retaining collar is press-fitted with less than 3 tons (6,600 lb), replace the collar with a new one.

9-A-3. Installing of Rear Axle Shaft

1. Apply grease to the oil seal located in the axle housing.
2. Check the rear axle shaft end play as follows: Install the backing plate temporarily and measure the depth of the bearing seat in the axle housing, using a depth gauge as shown in Fig. 9-5.

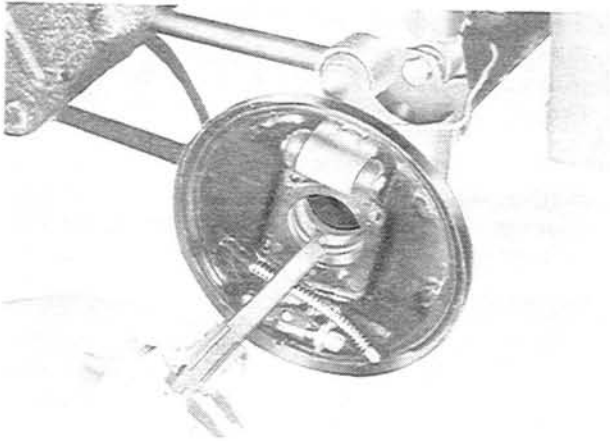


Fig. 9-5 Measuring of depth

Then, measure the width of bearing outer race. The difference between the two measurements indicates the required thickness of the shims.

The maximum permissible end play is **0.1 mm (0.004 in)**. Shims are available in thickness of 0.1 mm and 0.4 mm (0.004 in and 0.016 in).

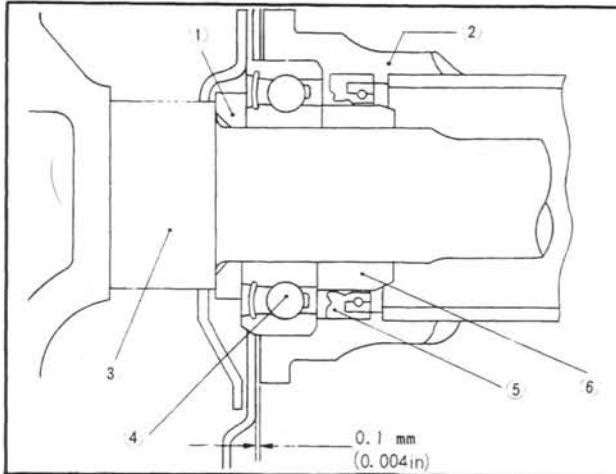


Fig. 9-6 Clearance of backing plate and housing

- | | |
|----------------|-------------|
| 1. Spacer | 4. Bearing |
| 2. Axle casing | 5. Oil seal |
| 3. Axle shaft | 6. Collar |

3. Install the rear axle shaft assembly and shims through the brake backing plate to the rear axle housing so as to fit the splines of the differential side gear and the end of the axle shaft. Tighten the nuts.

4. Install the brake shoe assembly.
5. Install the brake drum and the wheel.

9-B. REAR AXLE REMOVAL

1. Jack up the vehicle until the rear wheels are clear of the ground.
2. Drain the oil by removing the drain plug. Reinstall the drain plug after draining.
3. Remove the rear axle shafts, referring to Par. 9-A-1.
4. Disconnect the propeller shaft at the companion flange of the rear axle.

5. Remove the nuts supporting the rear axle to the rear axle housing and remove the rear axle.

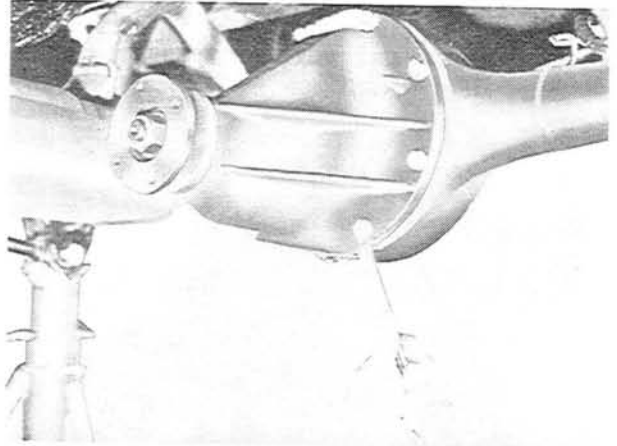


Fig. 9-7 Removing of rear axle

9-C. REAR AXLE DISASSEMBLY

9-C-1. Removing of Differential

1. Mount the rear axle on the stand (49 0164 550D and 49 0223 561).

2. Apply identification punch marks on the carrier, differential bearing cap, and adjuster for reassembly purpose.

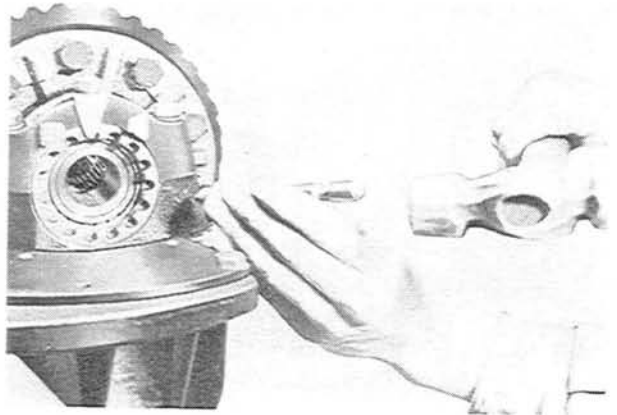


Fig. 9-8 Applying of identification marks

3. Remove the adjuster lock plates.

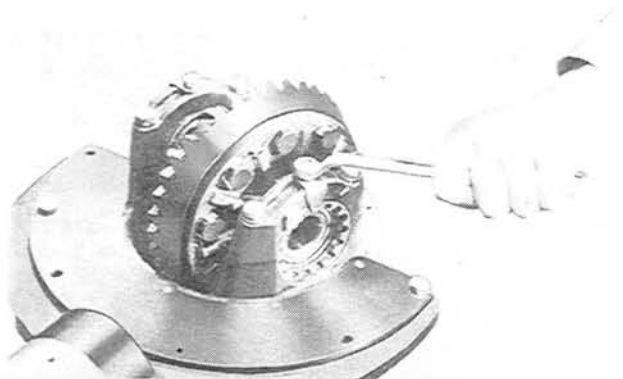


Fig. 9-9 Removing of lock plate

- Loosen the bearing cap attaching nuts and back off the adjuster slightly with the **spanner** (49 0259 720) to relieve differential bearing preload.
- Remove the differential assembly together with the bearing outer races. Make certain that each bearing outer race remains with its respective bearing.

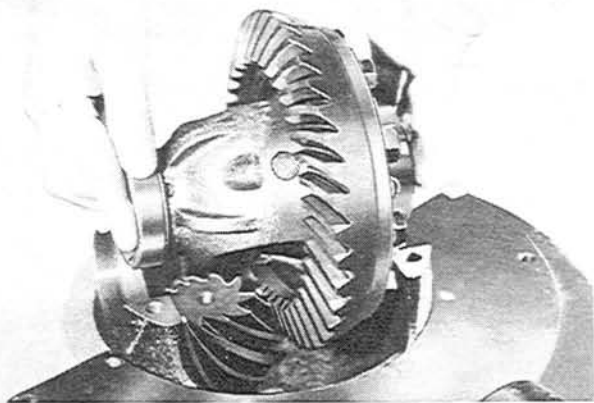


Fig. 9-10 Removing of differential assembly

9-C-2. Disassembling of Differential

- Using a suitable puller, remove the differential bearings from the differential gear case.
- Remove the bolts and lockwashers that attach the ring gear to the gear case. Remove the ring gear.

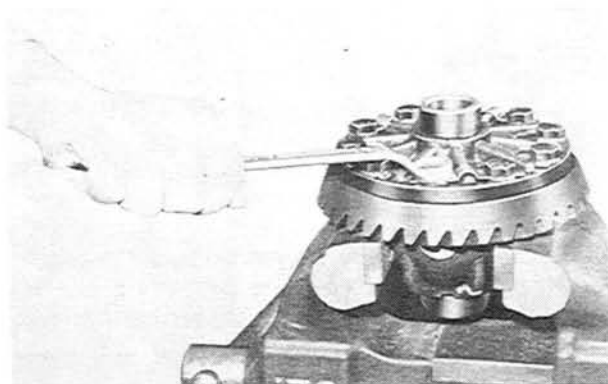


Fig. 9-11 Removing of ring gear

- From the back side of the ring gear flange, drive the pinion shaft lock pin out of the gear case with a suitable drift, as shown in Fig. 9-12.

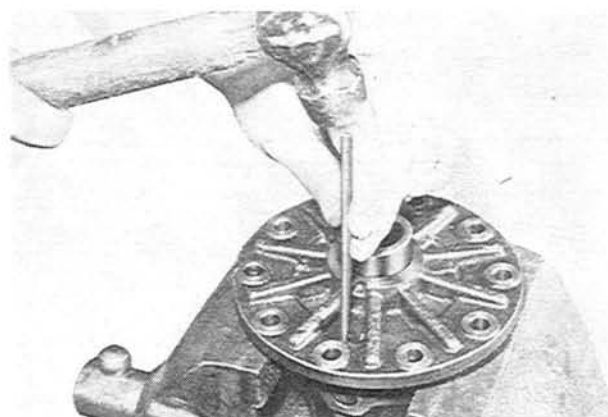


Fig. 9-12 Removing of lock pin

- Remove the pinion shaft.
- Rotate the differential pinion gears 90 degrees and remove each pinion gear and thrust washer.
- Remove the differential side gears and thrust washers.

9-C-3. Removing of Drive Pinion

- Hold the companion flange with the **holder** (49 0259 710) and remove the drive pinion nut.

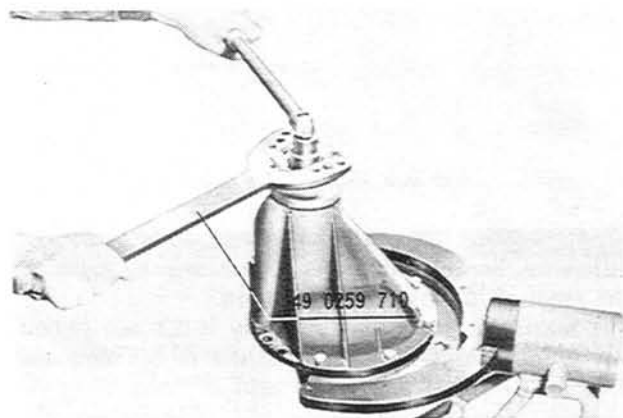


Fig. 9-13 Removing of drive pinion nut

- Remove the companion flange.
- Remove the drive pinion and rear bearing from the carrier. If necessary, tap the pinion out with a plastic hammer, while being careful to guide the pinion with hand to avoid damage.
- Remove the oil seal and the front bearing.

9-C-4. Removing of Pinion Bearing Outer Race

The pinion bearing outer races can be removed from the carrier by using a drift in slots provided for this purpose.

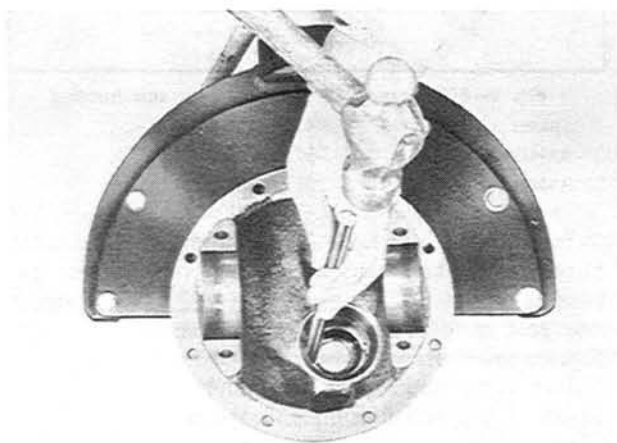


Fig. 9-14 Removing of pinion bearing outer race

9-D. REAR AXLE INSPECTION

9-D-1. Checking of Drive Pinion and Ring Gear

Check the drive pinion for damaged or excessively worn teeth, damaged bearing journals and splines. Inspect the ring gear for worn or chipped teeth. If any of above conditions is found, replace both

drive pinion and ring gear as they are available only in set.

9-D-2. Checking of Differential Gears

Inspect the differential side gears and pinion gears for cracks, chipped teeth or any damage. Replace the side gears, pinion gears or thrust washers if necessary. Check the clearance between the pinion gear and shaft. If excessive clearance is found due to wear, replace with new parts.

Check the spline fit of the side gear and rear axle shaft. If it is **0.3 mm (0.012 in) or more**, replace the side gear or rear axle shaft.

9-D-3. Checking of Bearings

Inspect the differential bearings and pinion bearings for wear, flaking or any damage. If inspection reveals that either bearing cones or outer race are unfit for further service, replace the bearing.

9-D-4. Checking of Oil Seal

Check the oil seal for wear or damage. If there is any possibility of oil leakage, replace the oil seal.

9-D-5. Checking of Companion Flange

Check the companion flange for cracks, worn splines, or rough oil seal contacting surface. Repair or replace the companion flange if necessary.

9-E. REAR AXLE ASSEMBLY

9-E-1. Adjusting of Drive Pinion

The drive pinion should be correctly positioned in relation to the ring gear by the use of spacer which is placed between the drive pinion and the outer race of the pinion rear bearing.

The standard distance between the top of the drive pinion and the center of the ring gear (**mounting distance**) is 90 ± 0.025 mm.

To adjust the drive pinion position, use the **special gauge** (49 0727 570 and 49 0305 555) and proceed as follows:

1. Install the dial indicator to the gauge body. Place the gauge body on the surface plate as shown in Fig.

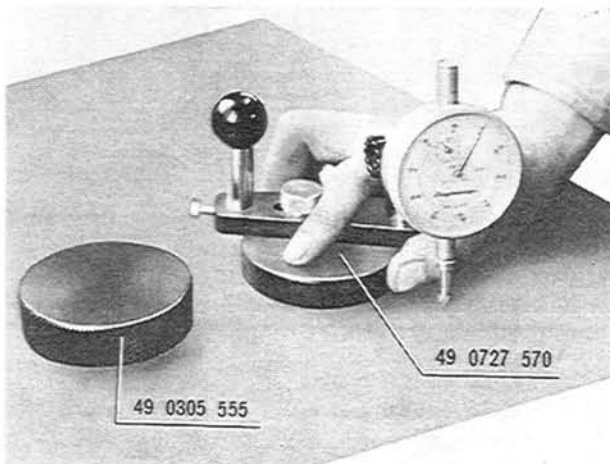


Fig. 9-15 Pinion adjusting gauge

9-15 and lock the dial indicator by the screw to that the needle is pointing toward 1 to 3 mm. Then, set the reading to "Zero" by turning the outer ring of the indicator.

2. Make certain that the differential bearing support bores are free of dirt and burrs.

3. Install the pinion and bearing model together with a spacer into the carrier.

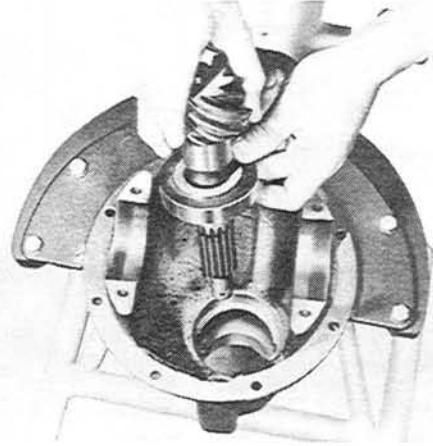


Fig. 9-16 Installing of pinion and bearing model

4. Place the gauge block on the pinion, carefully place the gauge body as adjusted according to Step 1, on the gauge block so that the feeler of the indicator comes in contact with the lowest portion of the differential bearing support bore.

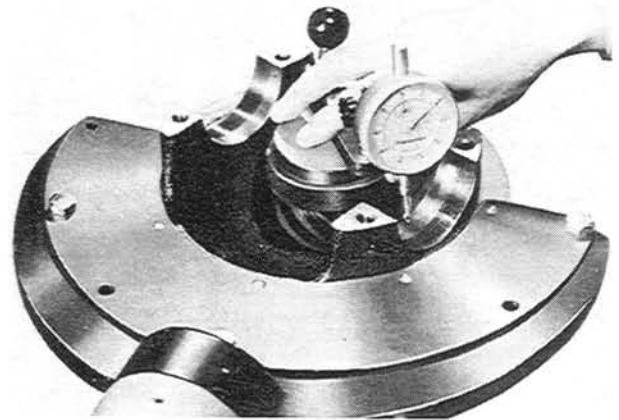


Fig. 9-17 Measuring of pinion height

5. Record the number of hundredths dial indicator moves in a "+" (plus) or "-" (minus) direction from zero. Remove the gauge body and dial indicator from the carrier and check zero setting on the surface plate to make sure this setting was not disturbed by handling.

6. In order to compensate for all of the machining variables, the pinion has a plus or minus reading recorded in hundredth millimeters on the rear face of the pinion.

(a) If the pinion is marked "+" (plus), subtract the amount specified on the pinion.

(b) If the pinion is marked "-" (minus), add the amount specified on the pinion.

7. Place the bearing model and the rear pinion bearing on the surface plate and compare their heights as shown in Fig. 9-18.

(a) If the bearing is higher than the model, subtract the amount equivalent to the difference.

(b) If the bearing is lower than the model, add the amount equivalent to the difference.

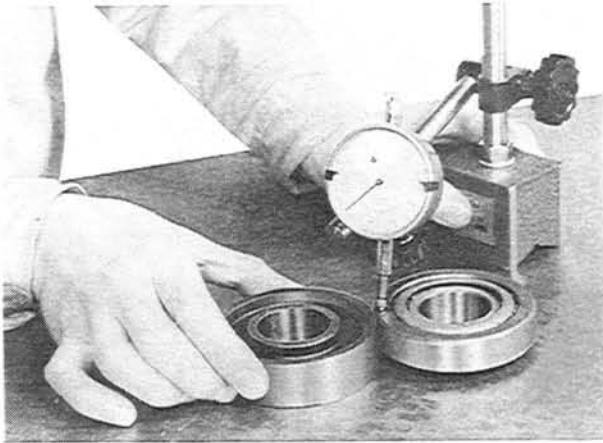


Fig. 9-18 Measuring of bearing height

8. Finally select the correct pinion spacer to be used during pinion assembly by adding or subtracting the amount determined in Step 5, 6 and 7 from the thickness of the spacer used in Step 3.

The spacers are available in the following thickness:

Identification mark	Thickness
08	3.08 mm (0.1213 in)
11	3.11 mm (0.1224 in)
14	3.14 mm (0.1236 in)
17	3.17 mm (0.1248 in)
20	3.20 mm (0.1260 in)
23	3.23 mm (0.1271 in)
26	3.26 mm (0.1283 in)
29	3.29 mm (0.1295 in)
32	3.32 mm (0.1307 in)
35	3.35 mm (0.1319 in)
38	3.38 mm (0.1331 in)
41	3.41 mm (0.1343 in)
44	3.44 mm (0.1354 in)
47	3.47 mm (0.1366 in)

9. Position the correct spacer on the pinion and install the rear pinion bearing.

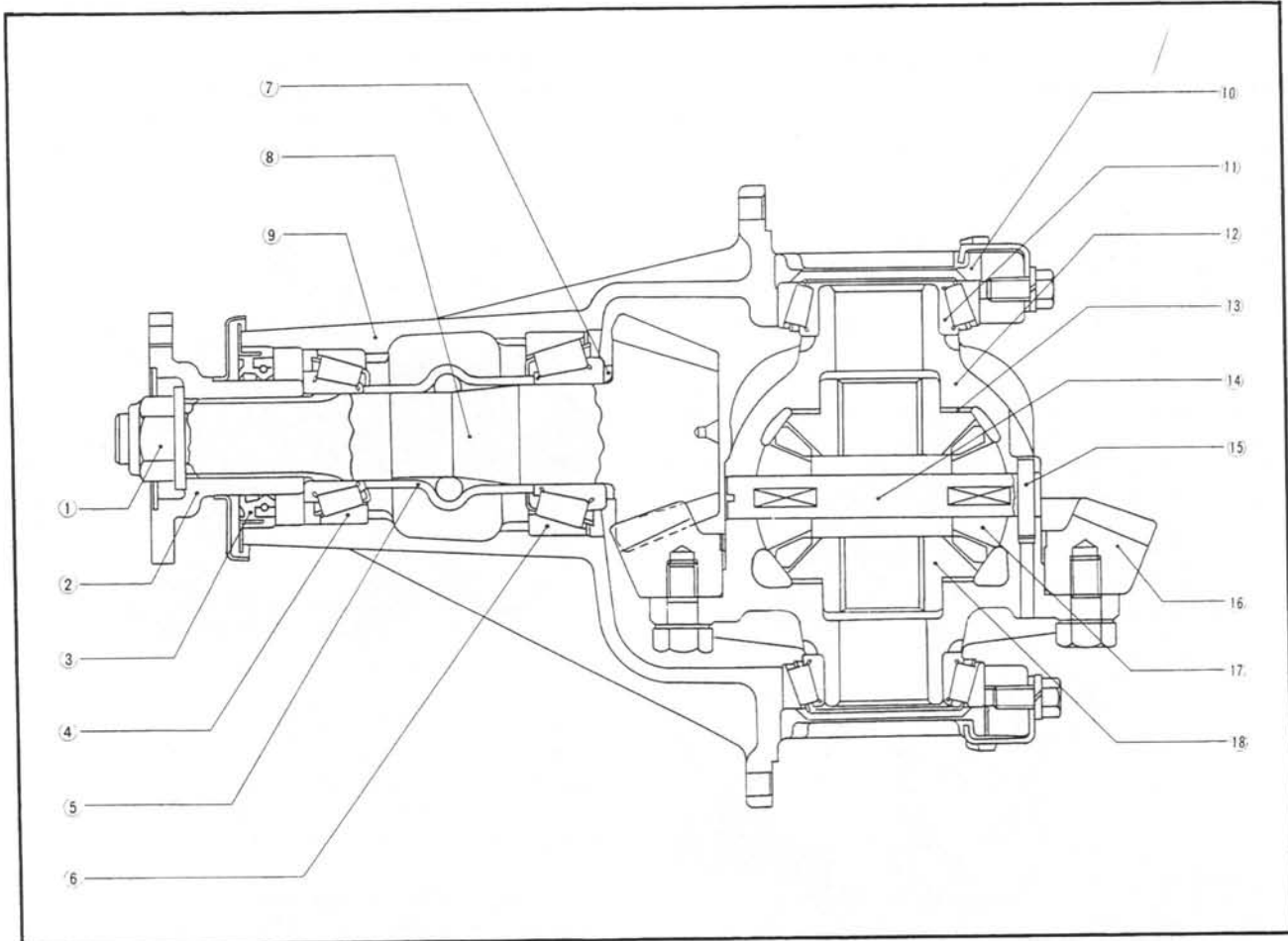


Fig. 9-19 Rear axle

- | | | | |
|-------------------------|------------------------|----------------------------|-----------------|
| 1. Nut | 6. Rear pinion bearing | 11. Differential bearing | 16. Ring gear |
| 2. Companion flange | 7. Spacer | 12. Differential gear case | 17. Pinion gear |
| 3. Oil seal | 8. Drive pinion | 13. Thrust washer | 18. Side gear |
| 4. Front pinion bearing | 9. Carrier | 14. Pinion shaft | |
| 5. Collapsible spacer | 10. Adjuster | 15. Lock pin | |

9-E-2. Adjusting of Pinion Bearing Preload

1. Position the pinion assembly in the carrier and install the collapsible spacer as shown in Fig. 9-20.

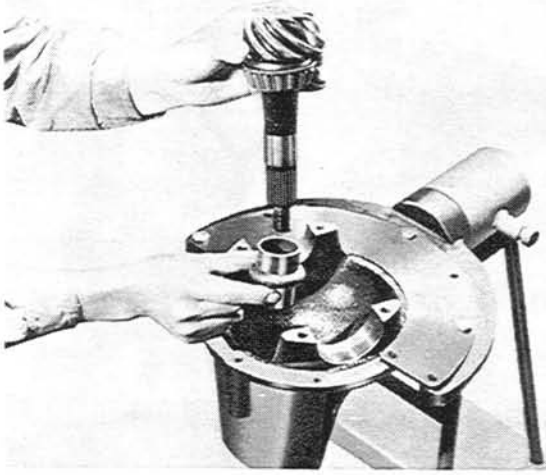


Fig. 9-20 Installing of collapsible spacer

2. Place the front pinion bearing in position on the pinion. Hold the pinion fully forward and drive the pinion bearing over the pinion until seated.
3. Apply grease to the lip of the pinion oil seal and install the pinion oil seal into the carrier.
4. Install the companion flange on the pinion by tapping with a soft hammer.
5. Install the pinion washer and nut. Before tightening the nut (When the pinion preload is Zero), check the drag by the oil seal by using a torque wrench.
6. Tighten the pinion nut to **13 m-kg (94 ft-lb)** and check the preload as shown in Fig. 9-21.

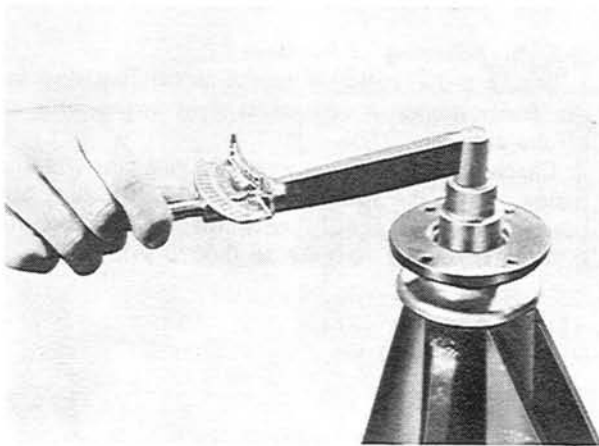


Fig. 9-21 Checking of preload

Note: After preload has been checked, final tightening should be done very cautiously.

The pinion nut should be further tightened only a little at a time and preload should be checked after each slight amount of tightening. Exceeding preload specifications will compress the collapsible spacer too far and requires its replacement.

7. While observing the preceding caution, carefully set the preload drag at **9 to 14 cm-kg (7.8 to 12.2 in-lb)** plus the oil seal drag determined in Step 5.

9-E-3. Assembling of Differential

1. Install the thrust washer on each differential side gear and install these in the gear case.

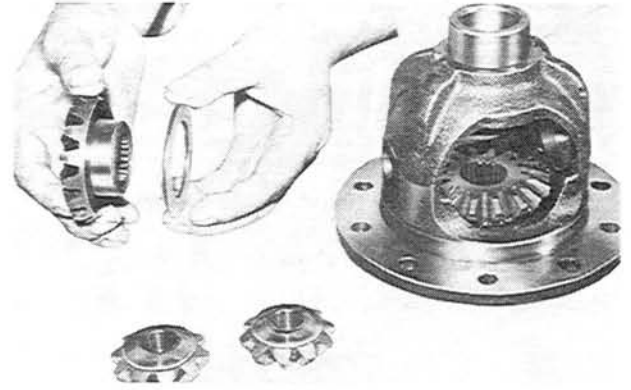


Fig. 9-22 Installing of thrust washer

2. Through the opening of the gear case, insert each of two pinion gears exactly 180 degrees opposite each other.
3. Rotate the gears 90 degrees so that the pinion shaft holes of the case come into alignment with the holes in the pinion gears.

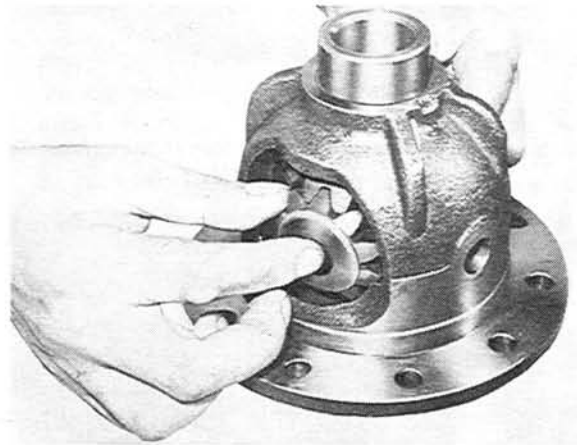


Fig. 9-23 Installing of pinion gears

4. Insert the pinion shaft through the case and pinion gears.
5. Check the backlash of the side gear and pinion gear.

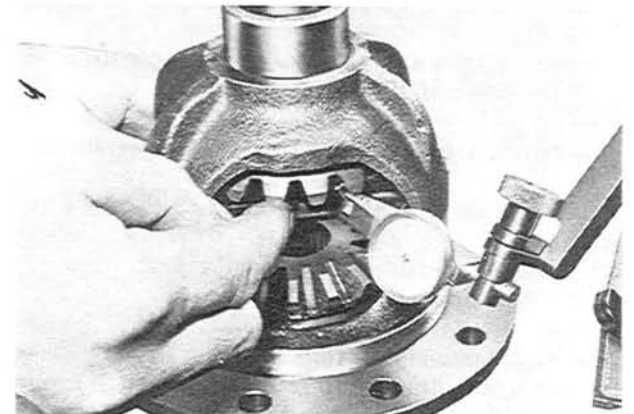


Fig. 9-24 Checking of backlash

The backlash should be 0 to 0.1 mm (0 to 0.004 in). If it is **more than 0.2 mm (0.008 in)**, adjust with the side gear thrust washers.

The following thrust washers are available:

Identification mark	Thickness
0	2.0 mm (0.0787 in)
1	2.1 mm (0.0827 in)
2	2.2 mm (0.0866 in)

6. Install the lock pin to secure the pinion shaft, and in order to prevent the lock pin from working out, stake into position with a punch.

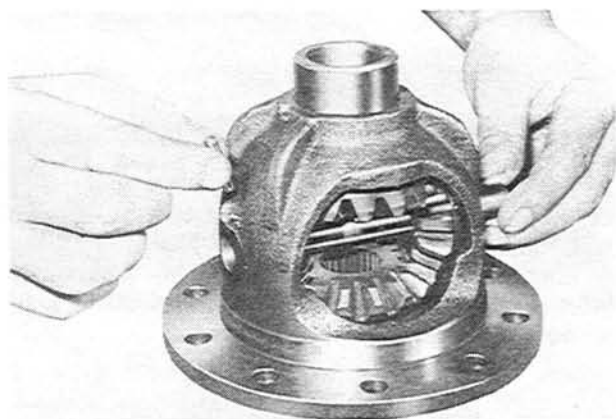


Fig. 9-25 Installing of lock pin

7. Install the ring gear to the case and tighten the bolts to a torque of **5.0 m·kg (35 ft·lb)**.

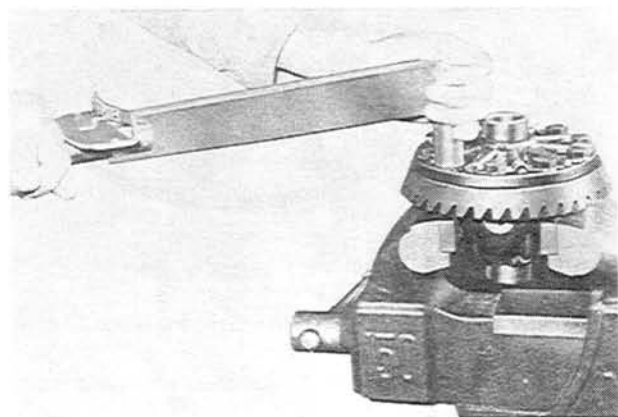


Fig. 9-26 Installing of ring gear

Note: As there are two kinds of bolts, use those which fit the holes of the gear case flange.

8. Bend the tabs of the lock plates to prevent loosening.

9. Install each differential bearing to the hubs of the gear case.

10. Install the differential bearing outer races to its respective bearing.

9-E-4. Installing of Differential

1. Place the differential gear assembly in the carrier, marking ensure that the marks for backlash adjustment on the face of the pinion and ring gear teeth are

aligned each other.

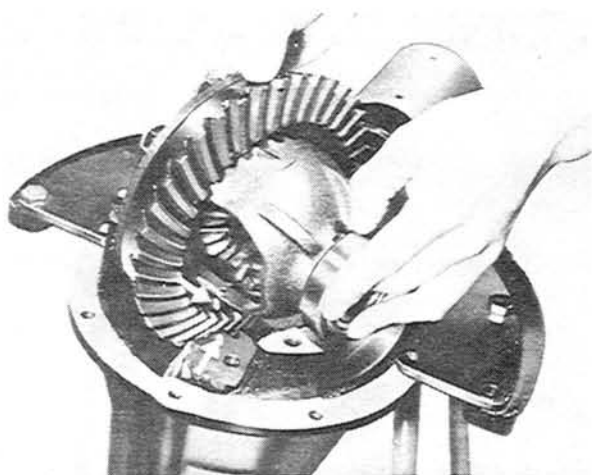


Fig. 9-27 Installing of differential assembly

2. As there are two types of a adjusters, right-hand threaded and left-hand threaded, note the identification marks on the adjusters and install each to its respective side.

3. Install the differential bearing caps making sure that the identification marks on the caps correspond with those on the carrier and install the attaching bolts.

4. Turn the adjusters with the **spanner (49 0259 720)** until the bearings are properly positioned in their respective outer races and the end play is eliminated with some backlash existing between the ring gear and drive pinion.

5. Slightly tighten one of the bearing cap bolts on each side and adjust the backlash, as instructed in the following paragraph.

9-E-5. Adjusting of Backlash

1. Secure a dial indicator to the carrier flange so that the feeler comes in contact at right angles with one of the ring gear teeth.

2. Check the backlash between the ring gear and drive pinion. With the **spanner (49 0259 720)**, turn both bearing adjusters equally until the backlash becomes **0.17 to 0.19 mm (0.0067 to 0.0075 in)**.

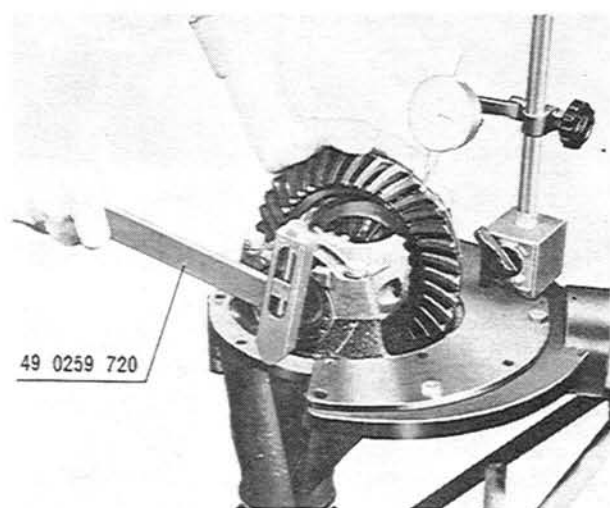


Fig. 9-28 Adjusting of backlash

3. The preload on the differential bearings is obtained by tightening the adjusters. Tighten the adjusters until the distance between both pilot sections on the bearing caps becomes **185.5 mm (7.306 in)**, as shown in Fig. 9-29.

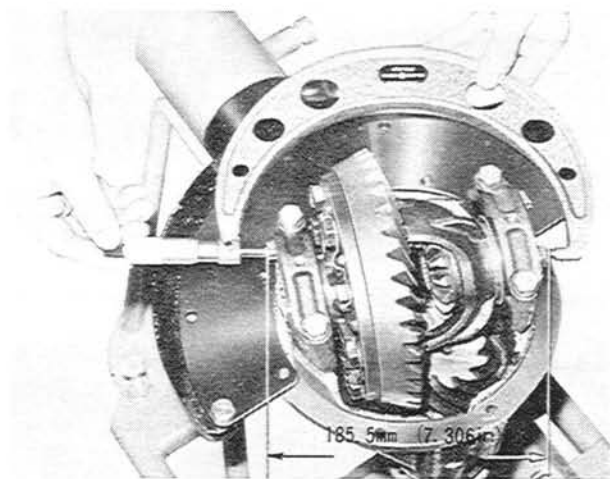


Fig. 9-29 Adjusting of preload

Note: When adjusting the preload, care must be taken not to affect the backlash of the drive pinion and ring gear.

4. Tighten the bearing cap bolts to a torque of **4.0 m-kg (30 ft-lb)**.
5. Install the adjuster lock plates on the bearing caps to prevent the adjuster from loosening.

6. Check the tooth contact of the ring gear and pinion by applying a thin coat of red lead on both sides of about six or eight of ring gear teeth and rotating the ring gear few times to and fro.

If the pinion position and backlash have been correctly set, the contact pattern should be as shown in Fig. 9-30.

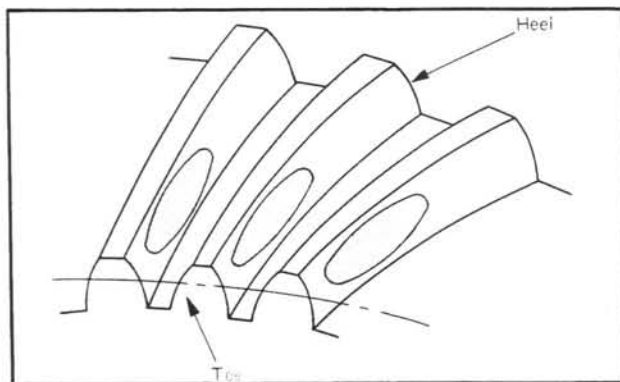


Fig. 9-30 Correct tooth contact

9-F. REAR AXLE INSTALLATION

1. Install the rear axle to the rear axle housing and attaching nuts.
2. Attach the propeller shaft to the companion flange of the rear axle.
3. Install the rear axle shafts and adjust the end play, as instructed in Par. 9-A-5.
4. Refill with the oil up to the level hole.

SPECIAL TOOLS

49 0223 630A	Rear axle shaft puller
49 0259 631	Attachment (for puller)
49 0259 745	Bearing remover set
49 0164 550D	Rear axle stand
49 0223 561	Attachment (for stand)
49 0259 720	Backlash adjusting spanner
49 0259 710	Companion flange holding tool
49 0727 570	Pinion adjusting gauge
49 0305 555	Gauge block and bearing model

