

REAR AXLE

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SPECIFICATIONS

Table 4-1 Differential Specifications

	TA12 (L)-H series	TA10,12,22 (L)-K series	RA20L-KA	OPT	OPT
Reduction ratio	4,111	3,900	3,700	4,111	4,375
Drive pinion teeth	9	10	10	9	8
Ring gear teeth	37	39	37	37	35
Pinion gear teeth	10	10	10	10	10
Side gear teeth	14	14	14	14	14
Pinion gear used	2	4	2	4	2

TROUBLE SHOOTING

Symptoms and Possible Causes	Remedies
Differential damaged (case, gears, bearings, etc.) Foreign matter caught inside, stopping rotation and preventing vehicle travel	
1. Oil insufficient or of wrong variety. 2. Abusive use of vehicle 3. Bearing (side or drive pinion) out-of-adjustment 4. Drive pinion and ring gear out-of-adjustment 5. Side gear thrust washer and pinion thrust washer worn and causing excessive backlash 6. Rear axle housing bent 7. Bolt (ring gear) loose.	Disassemble the differential and inspect all parts thoroughly, replacing any found defective. Adjust bearing preloads, gear backlashes and tooth contacts to specified values, and reassemble. Fill with hypoid gear oil SAE 90 to specified level.
Differential noisy Differential trouble symptoms appear in form of noises. Care must be taken when diagnosing the trouble because engine noise, exhaust noise, and others can be mistaken easily for differential noise.	
Diagnosis Differential noises can be divided into two classes as follows : Gear Noises 1. At starting Ring gear and pinion out-of-adjustment or worn 2. At acceleration Gears meshing improperly or gear damaged 3. At coasting Gears damaged due to maladjustment of bearing (for drive pinion) 4. At normal driving Gears defective or out-of-adjustment	Adjust or replace Adjust or replace Replace Adjust or replace

5. Periodical Ring gear deflection or ring gear bolts loose	Repair or retighten
6. When cornering Side gears and differential pinions damaged or excessive backlash.	Adjust or replace
Bearing Noises	
1. At normal driving Bearing parts (including rear axle shafts) damaged or worn.	Replace
2. At coasting Drive pinion rear bearings damaged or worn.	Replace
3. When cornering Rear axle shaft bearings loose	Adjust or replace

REAR AXLE SHAFT

COMPONENT PARTS

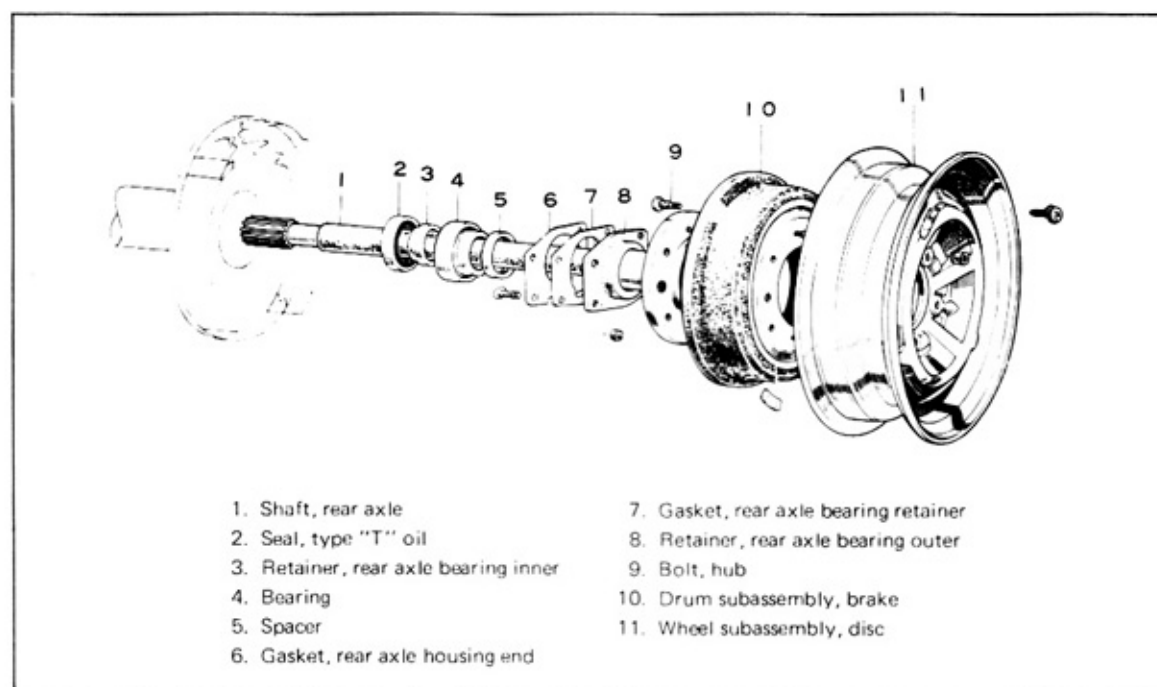


Fig. 4-1 Rear Axle Component Parts

REMOVAL

1. Remove the brake drum, and remove the backing plate set nuts through the work holes in the shaft flange.
2. Remove the rear axle shaft, using Sliding Hammer [09912-00010], Puller Clamp [09911-00010], and Rear Axle Shaft Puller Attachment [09914-00010].

Caution: Take care not to damage the oil seal when pulling out the rear axle shaft.

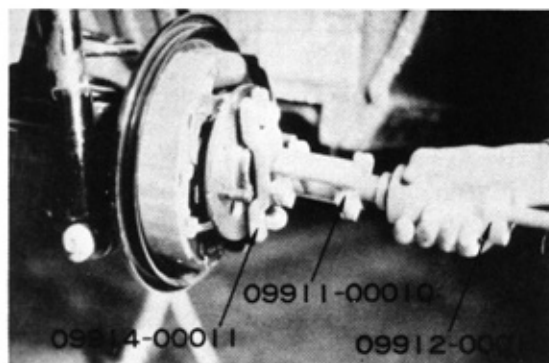


Fig. 4-2 Removing Rear Axle Shaft

INSPECTION

Wash all disassembled parts and inspect them on the following points, replacing any part found defective.

Caution : Do not wash the rear axle bearing as it is of the grease-sealed type.

1. Rear axle shaft
 - (1) Shaft for bending, cracks, or damage.
 - Flange surface deflection limit : 0.2 mm (0.008")
 - Deflection limit at center unmachined

- part : 2 mm (0.08")
- (2) Bearing inner retainer for damage.
- (3) Splines for damage or wear.
- (4) Bearing retainer for deformation.

Note : Repeated use of the bearing retainer will enlarge its fit with the bearing and its oil tightness with the gasket will also become defective so that it should be checked on a surface plate.

- (5) Hub bolts for damage.
2. Bearing for wear, damage, or abnormal noise.

**REAR AXLE SHAFT BEARING REPLACEMENT
REMOVAL**

1. Remove the bearing retainer by grinding off one side.
2. Using Rear Axle Bearing Remover [09527-20011], force out the bearing with a press.

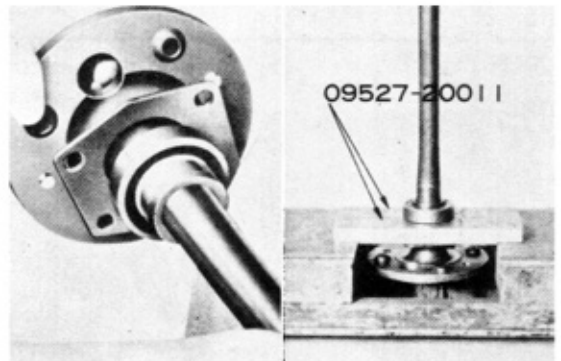


Fig. 4-3 Grinding Bearing Retainer and Removing Bearing

INSTALLATION

1. Insert the rear axle shaft bearing outer retainer, spacer, and bearing over the rear axle shaft and install by using Rear Axle Shaft Bearing Replacer [09515-20010].
2. Heat the rear axle shaft bearing to 140–160°C (284–320°F) in an oven or by other means, and install it quickly by using Rear Axle Shaft Bearing Replacer [09515-20010].

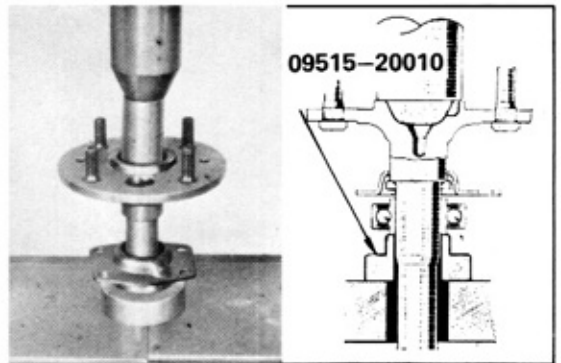


Fig. 4-4 Bearing Installation

Notes :

1. The retainer surface will become faintly yellow when heated up to 150°C (302°C). Do not heat any further.
2. Install by positioning the unchamfered side of the retainer toward the bearing.

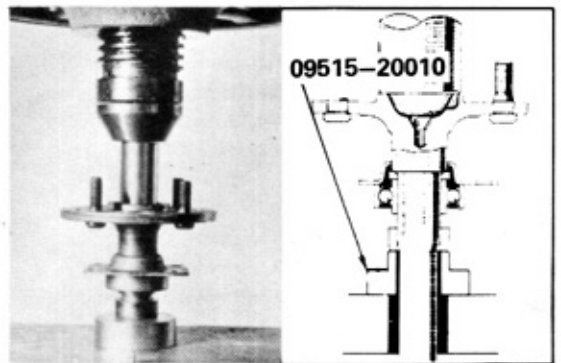


Fig. 4-5 Bearing Retainer Installation

REAR AXLE SHAFT INSTALLATION

Follow the removal procedures in reverse order.

Rear axle bearing retainer set nuts

Tightening torque: 400–500 kg-cm (29–36 ft-lb)

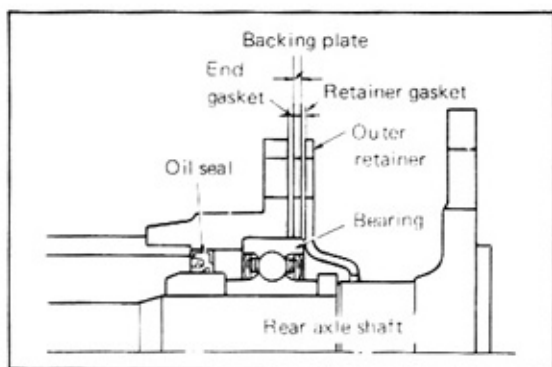
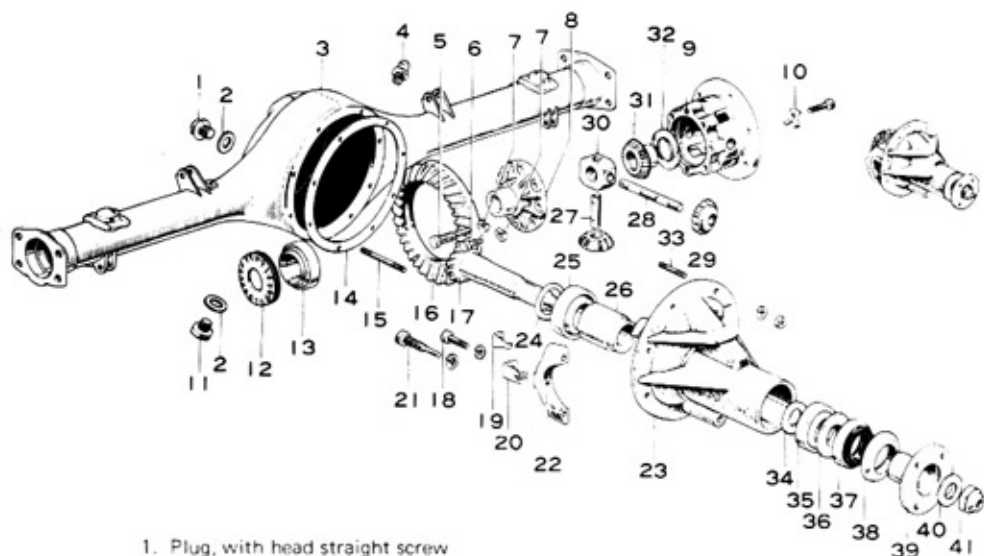


Fig. 4-6 Rear Axle Shaft Installation

DIFFERENTIAL

COMPONENT PARTS



- | | |
|---|---|
| 1. Plug, with head straight screw | 22. Cap, differential bearing |
| 2. Gasket | 23. Carrier assembly, differential |
| 3. Housing assembly, rear axle | 24. Washer |
| 4. Plug, bleed | 25. Bearing, tapered roller |
| 5. Pin, differential pinion shaft | 26. Spacer, differential drive pinion bearing |
| 6. Bolt, hexagon | 27. Shaft, differential pinion |
| 7. Washer, spring | 28. Shaft, differential |
| 8. Cover, differential case | 29. Pinion, differential |
| 9. Case subassy, differential | 30. Holder, pinion shaft |
| 10. Plate, ring gear set bolt lock | 31. Gear, differential side |
| 11. Plug subassy., drain | 32. Washer, differential side gear |
| 12. Nut, differential bearing adjusting | 33. Bolt, stud |
| 13. Bearing, tapered roller | 34. Shim |
| 14. Gasket, differential carrier | 35. Bearing, tapered roller |
| 15. Bolt, stud | 36. Slinger, drive pinion oil |
| 16. Gear, differential ring | 37. Seal, type "T" oil |
| 17. Pinion, differential drive | 38. Deflector, dust |
| 18. Bolt, hexagon | 39. Flange, drive pinion companion |
| 19. Lock, differential bearing | 40. Washer, plate |
| 20. Lock, differential bearing | 41. Nut |
| 21. Bolt, hexagon | |

Fig. 4-7 Differential Component Parts

REMOVAL

1. Remove the rear axle shafts.
(Refer to P4-3 for rear axle shaft removal procedures.)
2. Remove the propeller shaft.
3. Remove the differential carrier assembly.

Notes :

1. In removing the differential, do not damage the differential carrier flange surface by driving in a screwdriver or some other tool.
2. It is advised that after removal the differential carrier be installed on a work stand, using the old gasket removed.

DISASSEMBLY

1. Punch matching marks on the bearing cap (1) and the carrier assembly.
2. Remove the parts (1), (2), and (3).
3. Remove the differential case (4) with the side bearings still attached.

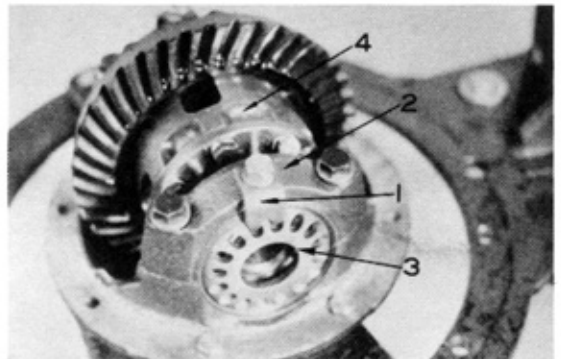


Fig. 4-8 Differential Case Removal

4. Using Universal Joint Flange Holding Tool [09330-00010], remove the nut and take out drive pinion companion flange.

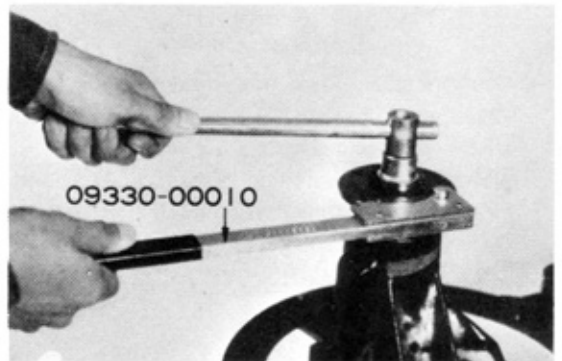


Fig. 4-9 Removing Flange Nut

5. Using Oil Seal Puller [09308-10010], remove oil seal.
6. Remove the differential drive pinion.
Note : Shims for adjusting bearing preload may be found sticking to the bearing cone (front side). Be sure to note the quantity and thickness.

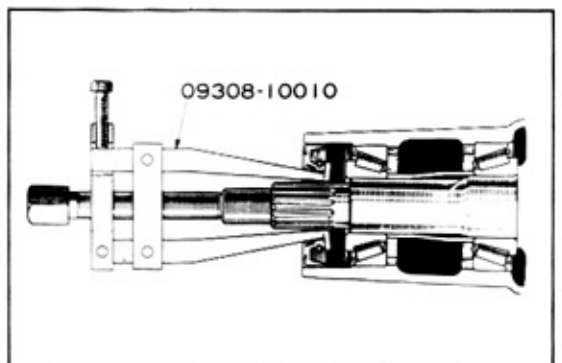


Fig. 4-10 Oil Seal Removal

7. Remove the bearings and bearing cups.
 - (1) Remove the drive pinion bearing cups by using Front Hub & Drive Pinion Bearing Tool Set [09608-20010] handle and remover.

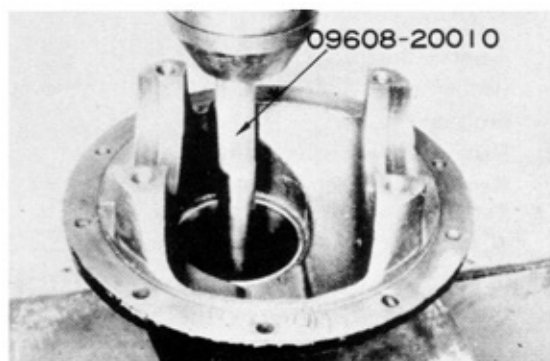


Fig. 4-11 Removing Bearing Cup

- (2) Remove the bearing (1) by using Universal Puller [09950-20010].

Note : Utilize the removal purpose cutaways in differential case for hooking on puller.

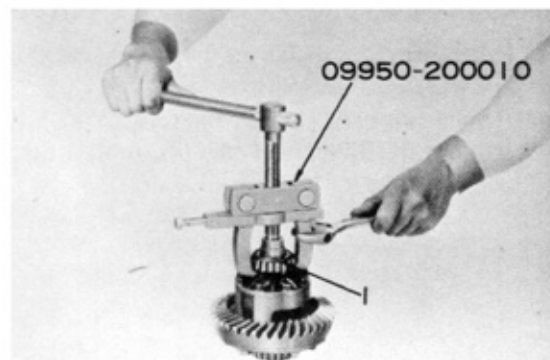


Fig. 4-12 Removing Bearing

- (3) Remove the bearing (1) by using Universal Puller [09950-20010].

Caution : Take care not to damage the shim (2) when removing.

8. Remove the ring gear.

Note : Punch matching marks on case and ring gear to ensure reassembling the parts to former relative position.

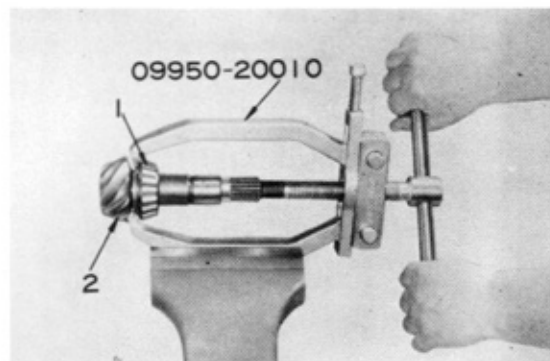


Fig. 4-13 Removing Bearing

9. Disassemble the differential case.

Note : Punch matching marks on case and cover to ensure reassembling the parts to former relative positions.

 - (1) **Two-pinion design**
Separate part (1), pull out part (2), and take out differential pinion side gears and thrust washers.

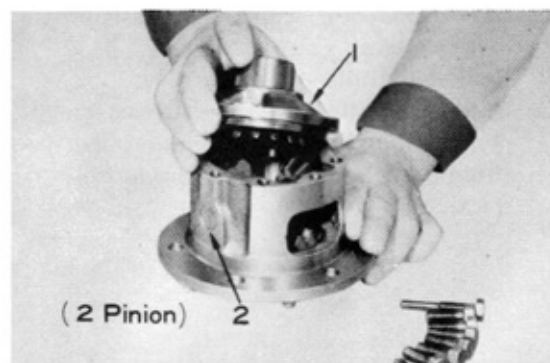


Fig. 4-14 Case Disassembly (2-pinion)

(2) Four-pinion design

After separating the case cover, pull out parts (1) and (2), and take out differential pinions (4 ea.), side gears, and thrust washers.

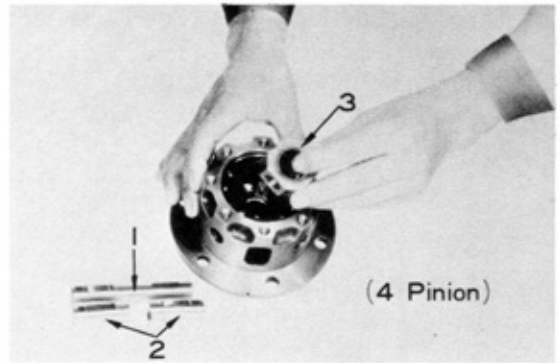


Fig. 4-15 Case Disassembly (4-pinion)

INSPECTION

Wash the disassembled parts and inspect the following points, repairing or replacing any found defective.

1. All bearings for damage, wear, or burning.
2. All bolts for damage or wear.
3. Ring gear and drive pinion tooth surfaces for damage, excessive wear, or burning.
4. Differential case for cracks.
5. Side gear insertion parts and differential side bearing contacting parts for wear.
6. All parts inside the differential case.
 - (1) Two-pinion design
Parts (1), (2), (3), (4), and (5) for damage, wear, or burning.
 - (2) Four-pinion design
Parts (1), (2), (3), (4), (5), (6), and (7) for damage, wear, or burning.

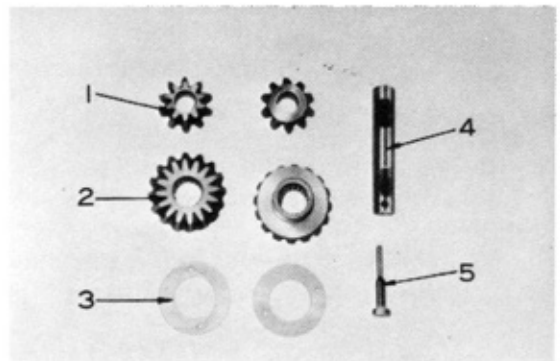


Fig. 4-16 Inspection (2-pinion)

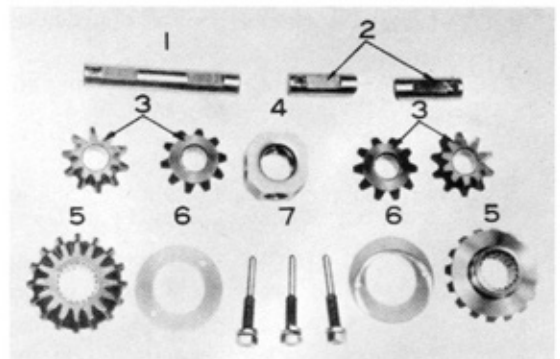


Fig. 4-17 Inspection (4-pinion)

7. Measure the differential case ring gear mounting surface deflection with a dial gauge.
Deflection limit 0.05 mm (0.002")
Note : Make sure that the dial gauge plunger is perpendicular to the surface to be measured and contacting properly.

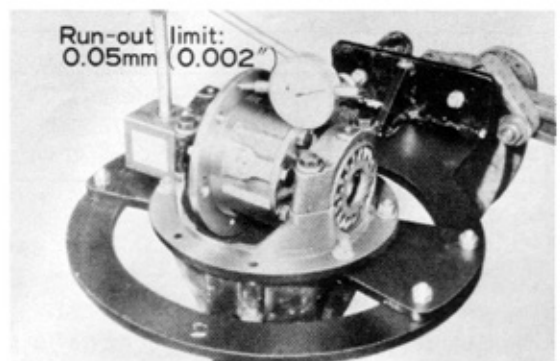


Fig. 4-18 Case Deflection

8. Measure the ring gear deflection in mounted state with a dial gauge.
Deflection limit 0.05 mm (0.002")
9. Repair or replace any other parts found defective.

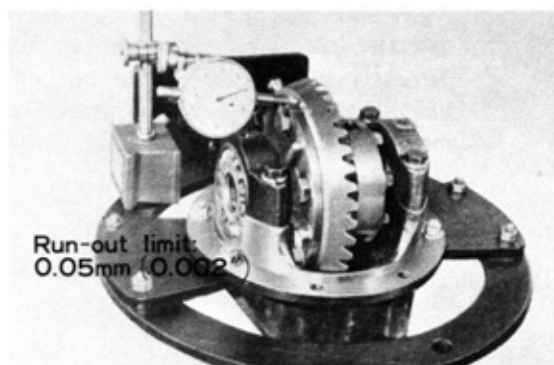


Fig. 4-19 Ring Gear Deflection Inspection

REASSEMBLY AND ADJUSTMENT

1. Reassemble the differential case.
[Two-pinion design]
(1) Place in part (1) together with the thrust washer, fit in parts (2), and insert part (3).

Note : Position the side gear thrust washer so that its grooved side will be facing the side gear.

- (2) Install the differential case cover on the differential case and tighten the bolts at the specified torque.

Bolt torque 280–350 kg-cm
(20–25 ft-lb)

Notes :

1. Line up the matching marks punched on at disassembly.
 2. The long bolt serves to lock the differential shaft.
- (3) After tightening the bolts at the specified torque, measure the side gear backlash. If incorrect, adjust it to the specified value by selecting proper size thrust washer. (Table 11-2)
Reference backlash value 0.05–0.20 mm (0.002"–0.008")

Table 4-2 Side Gear Thrust Washer Sizes

Size	Thickness
No. 1	1.47–1.57 mm (0.0579"–0.0618")
No. 2	1.52–1.58 mm (0.0598"–0.0622")
No. 3	1.57–1.63 mm (0.0618"–0.0642")

[Four-pinion design]

- (1) Place in the side gear and thrust washer, and after fitting in parts (1) and (2), insert parts (3) and (4).

Note : Position the side gear thrust washer so that its grooved side will be facing the thrust washer.

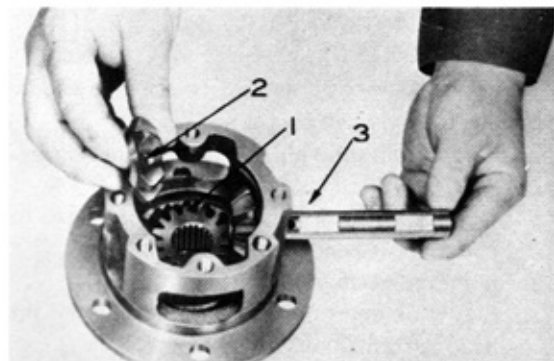


Fig. 4-20 Reassembly of Case (2-pinion)

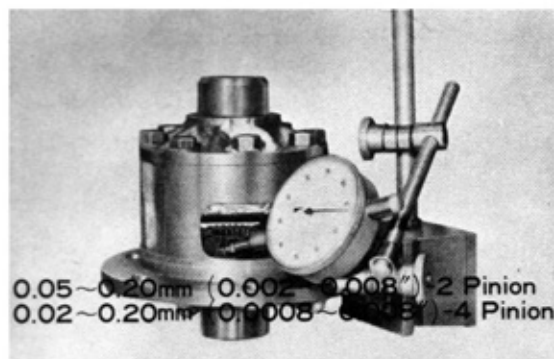


Fig. 4-21 Backlash Measurement

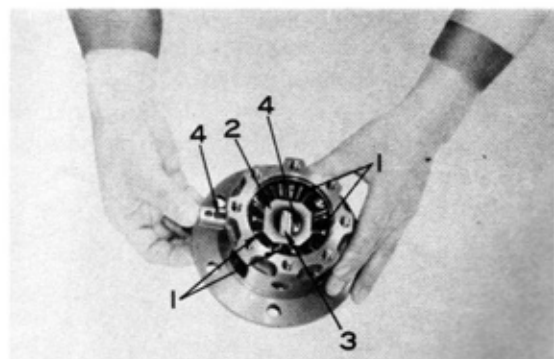


Fig. 4-22 Reassembly of Case (4-pinion)

- (2) Install the differential case cover on the case and tighten the bolts at specified torque.

Bolt torque: 280–350 kg-cm
(20–25 ft-lb)

Notes :

1. Line up the matching marks punched on at disassembly.
2. The three long bolts also serve to lock the differential and pinion shafts.

- (3) Measure the side gear backlash in the same manner as for 2-pinion design, and adjust it to the specified value if found incorrect.

Reference backlash: 0.05–0.20 mm
(0.002"–0.008")

Note : Refer to Table 2-2 for thrust washer sizes.

2. Press in the differential side bearing by using Front Hub and Drive Pinion Bearing Tool Set [09608–20010].
3. Install the ring gear on the differential case. Tighten the bolts at specified torque and lock them with lock plates.
Bolt torque: 700–800 kg-cm (51–58 ft-lb)
Caution : Tighten the bolts uniformly a little at a time.
4. Press the bearing cup into the differential carrier by using Front Hub and Drive Pinion Bearing Tool Set [09608–20010].

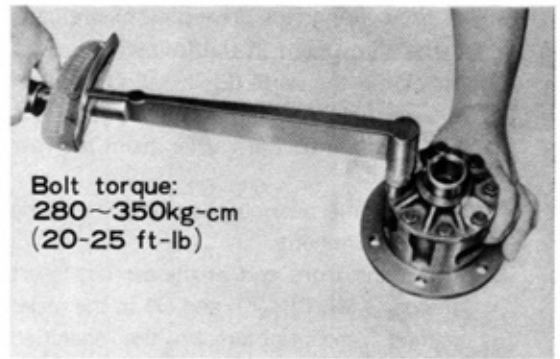


Fig. 4-23 Tightening Case Cover Bolts

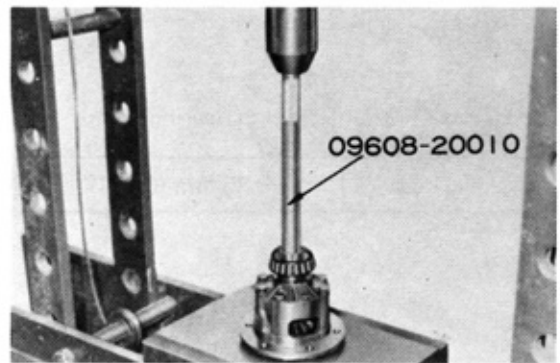


Fig. 4-24 Installing Side Bearing

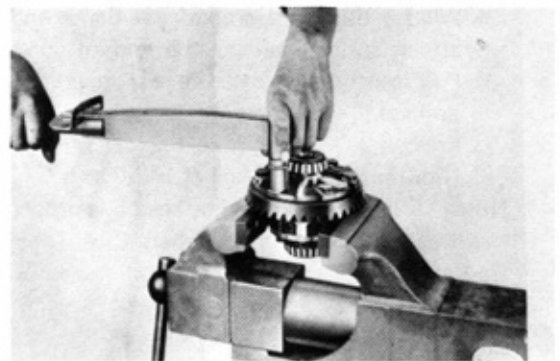


Fig. 4-25 Tightening Ring Gear Bolts

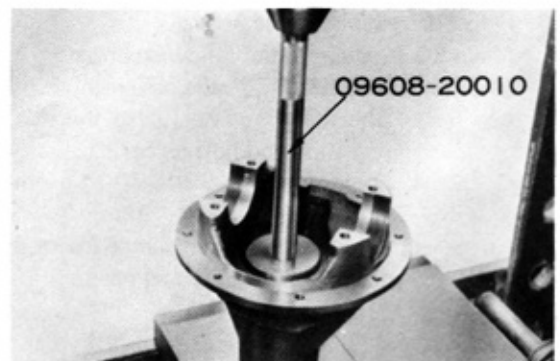


Fig. 4-26 Pressing In Bearing Cup

5. Adjust the bearing (for drive pinion) preload. Make the adjustment in the following order :
- (1) Assemble the parts (2), (3), and shim on differential drive pinion adjust gauge (1) and insert into the carrier from the rear end.

Note : Have the bearing oiled before making preload measurement.

- (2) From the front end of the carrier, insert the parts (4), (5), (6), and (7) in the order named, and tighten at the specified torque.

Nut torque : 1700–2000 kg-cm
(123–145 ft-lb)

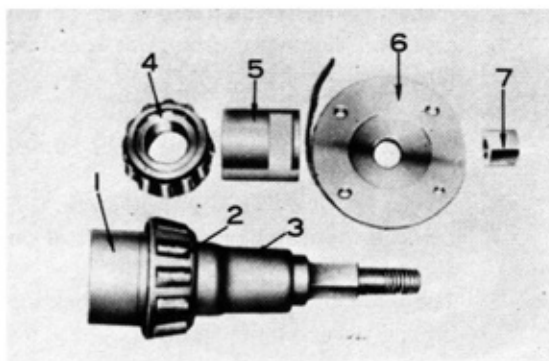


Fig. 4-27 Gauge Assembly Directions

Table 4-3 Drive Pinion Bearing Shim

Thickness	0.25 mm (0.001")
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Table 4-4 Drive Pinion Bearing Spacer

Size	Thickness (mm)	Thickness (in)
No. 1	44.95–44.98	1.7697–1.7709
No. 2	44.99–45.02	1.7713–1.7724
No. 3	45.03–45.06	1.7728–1.7740
No. 4	45.07–45.10	1.7744–1.7756
No. 5	45.11–45.14	1.7760–1.7772
No. 6	45.15–45.18	1.7775–1.7787

- (3) Wind a thin cord around the flange and attach spring scale to the end of cord. Pull gently and measure the operating preload.

Preload 2.0–2.8 kg (4.8–6.2 lb)

(For reuse 0.4–1.2 kg [0.9–2.6 lb])

- Note :** Adjust the preload by selecting proper size bearing spacer and washer. (See Table (4-4))

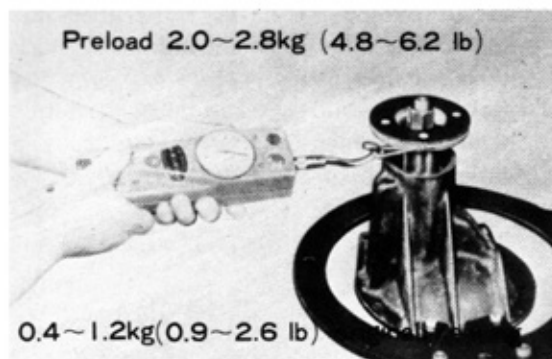


Fig. 4-28 Measuring Preload

6. Select drive pinion plate washer.

Make the selection in the following order :

- (1) Install the head (1) on the base rod.
- (2) Install the master gauge (2) to the side bearing position and bolt on parts (3).

Bolt torque : 500–700 kg-cm
(36–51 ft-lb)

- (3) Select a plate washer that can be inserted between the master gauge and head.

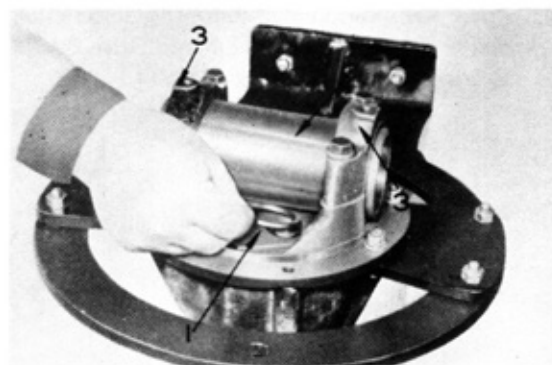


Fig. 4-29 Selecting Plate Washer

7. Remove the master gauge, head, and base rod.

Table 4-5 Drive Pinion Adjust Plate Washer

Size	Thickness (mm)	Thickness (in)
No. 1	2.52–2.54	0.0988–0.1000
No. 2	2.55–2.57	0.1004–0.1012
No. 3	2.58–2.60	0.1016–0.1024
No. 4	2.61–2.63	0.1027–0.1035
No. 5	2.64–2.66	0.1039–0.1047
No. 6	2.67–2.69	0.1051–0.1059
No. 7	2.70–2.72	0.1063–0.1071
No. 8	2.73–2.75	0.1075–0.1083
No. 9	2.76–2.78	0.1087–0.1094

8. Fit the plate washer selected and washer (for drive pinion adjustment) on the drive pinion and press on the bearing cone (for rear bearing), using Differential Drive Pinion Rear Bearing Cone Replacer [09608–20010].

Note : Position the plate washer so that the side with inside chamfer faces the gear.

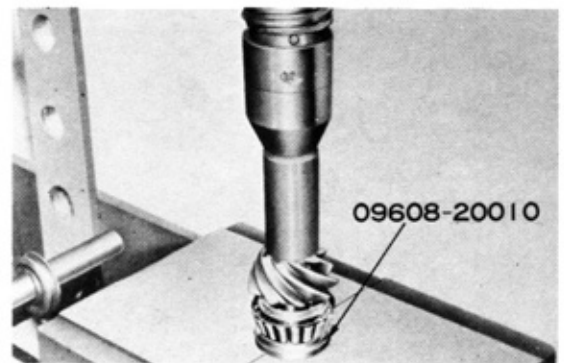


Fig. 4-30 Installing Bearing Cone

9. Fit part (2) on drive pinion (1) and insert from rear end of carrier.

From the other end, insert parts (3), (4), (5), washer, and nut in the order named.

Notes :

1. Assemble the oil slinger so that its depressed side faces the bearing.
2. It would be preferable to use the old nut in making adjustments.
3. Do not have the oil seal installed when making adjustment.

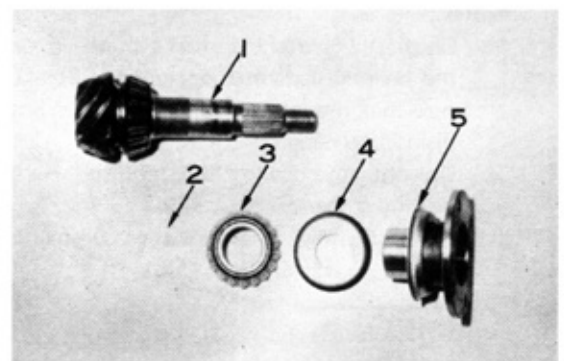


Fig. 4-31 Drive Pinion Reassembly

10. Using Universal Joint Flange Holding Tool [09330–00010], tighten the nut at specified torque.

Nut torque : 1 700–2000 kg-cm (133–145 ft-lb)

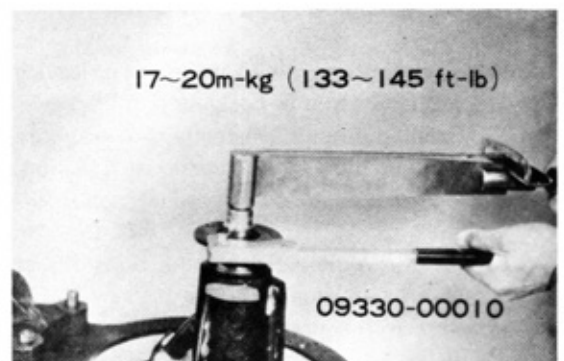


Fig. 4-32 Tightening Drive Pinion Nut

11. Install the differential case on the differential carrier.

- (1) Assemble the bearing cone to the bearing cup and install at state where there is a certain amount of backlash.
- (2) Fit on part (1) and tighten the bolts (2) finger-tight.
- (3) After making sure that the carrier threads are meshing properly with part (1) threads, bolt down part (3) tightening the bolts alternately until the bearing is properly installed in the differential carrier.

Note: Unless the threads are damaged, it should be possible to bolt down part (3) easily with fingers.

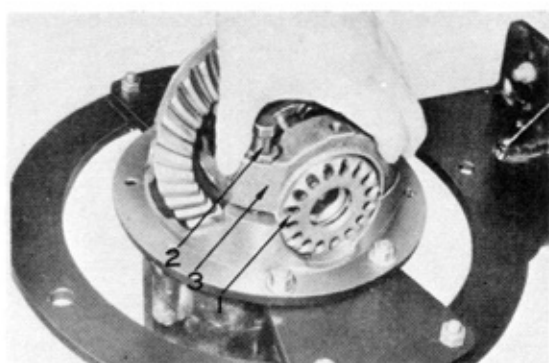


Fig. 4-33 Reassembling Bearing Cap

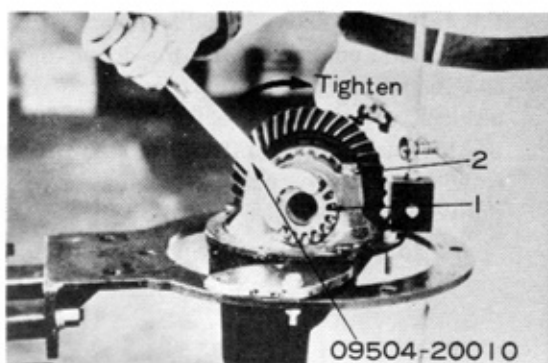


Fig. 4-34 Adjusting Preload

Notes:

1. Check the matching marks punched on the bearing caps at disassembly to make sure that the left and right sides have not been interchanged.
2. Do not interchange the left and right bearing cups.
3. Oil the bearings for preload measurement.

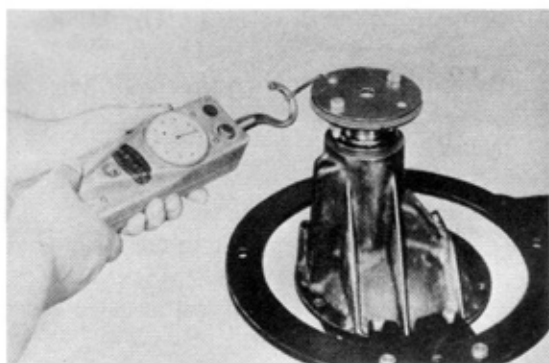


Fig. 4-35 Measuring Preload

12. Adjust the preload on bearing (differential side)

- (1) Tighten part (1) with the intent of leaving proper amount of backlash.
- (2) From the point where there is no more play in differential case axial direction, tighten one to one-and-a-half notch further.
- (3) At this point, tighten the bolts (2) at specified torque.
- (4) Attach the preload flange on the joint flange and measure the preload to see if it is within the specified limits.

Total preload =

Drive pinion preload + 0.4–0.8 kg
(0.9–1.8 lb)

For reuse =

Drive pinion preload + 0.2–0.4 kg
(0.4–0.9 lb)

Note: If not within the reference values, readjust parts (1).

13. Adjust the backlash between the drive pinion and ring gear.
 - (1) Install the dial gauge so that its plunger will be perpendicular to tooth edge.
 - (2) Using Differential and Worm Bearing Adjusting Wrench [09504–20010], adjust the backlash to within the specified limits by shifting the ring gear in axial direction. Backlash : 0.13–0.18 mm (0.005"–0.007")

Notes :

1. In making this adjustment, slightly loosen the cap bolts and turn the left and right adjusting nuts by same amounts. This is in order to prevent disturbing the preload adjusted in 12 above.
2. (Follow the procedure of loosening one side by one notch and then tightening the other side by one notch).
3. Shifting the ring gear by one notch will change the backlash by about 0.06 mm (0.002").

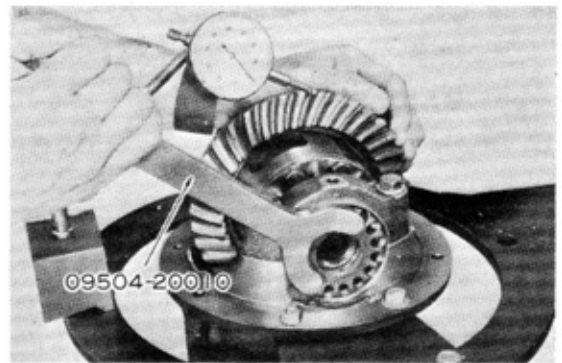


Fig. 4-36 Adjusting Backlash

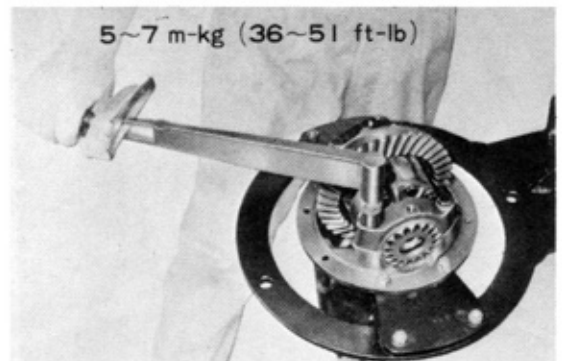


Fig. 4-37 Tightening Bearing Cap

14. Tighten the bearing cap at the specified torque.
Bolt torque : 500–700 kg-cm (36–51 ft-lb)
15. Check ring gear and drive pinion tooth contact.
Readjust if contacting improperly.

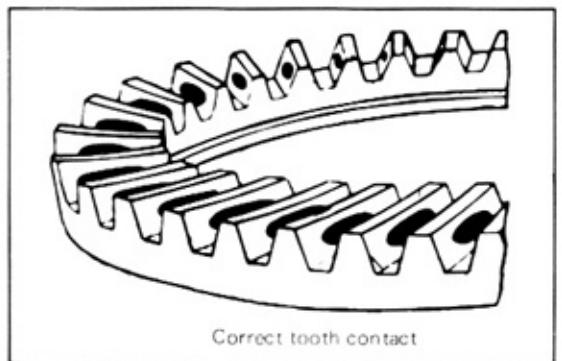


Fig. 4-38 Ring Gear Tooth Contact (1)

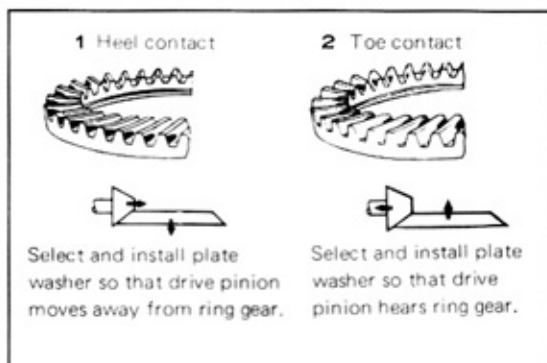


Fig. 4-39 Ring Gear Tooth Contact (2)

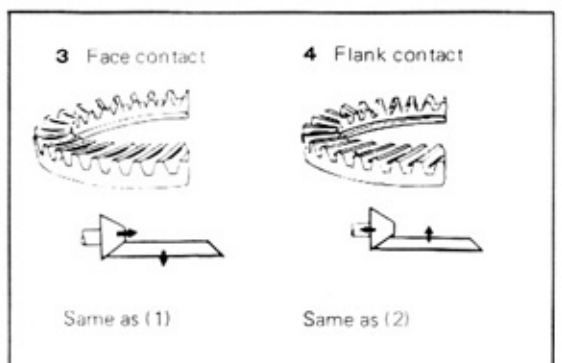


Fig. 4-40 Ring Gear Tooth Contact (3)

16. Using a dial gauge, measure the ring gear deflection to see if it is within the specified limit.
Deflection limit 0.05 mm (0.002")
17. Install the adjusting nut locks.

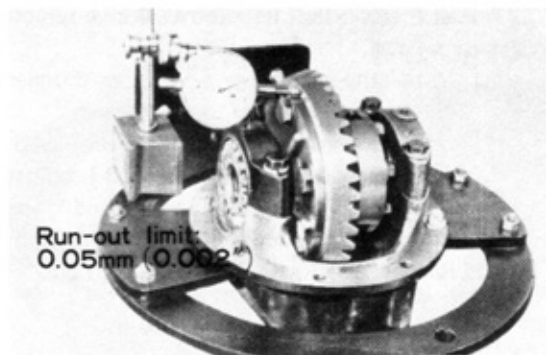


Fig. 4-41 Inspecting Ring Gear Deflection

18. Using Universal Joint Flange Holding Tool [09330-00010], remove the nut, washer, and drive pinion companion flange.

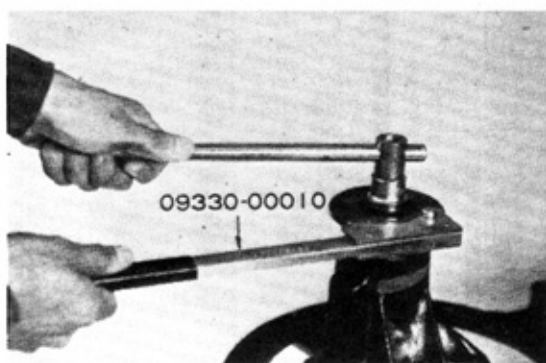


Fig. 4-42 Removing Drive Pinion

19. Combine a suitable replacer with Front Hub and Drive Pinion Bearing Tool Set [09608-20010], and drive in the type "T" oil seal.
20. Perform procedure 18 in reverse order, using a new nut and tightening it to the specified torque.
Nut torque: 1700-2000 kg-cm (123-145 ft-lb)

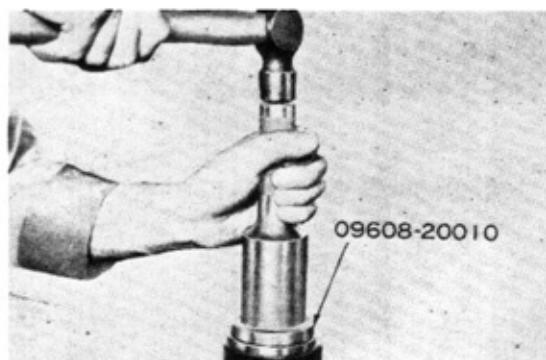


Fig. 4-43 Installing Oil Seal

INSTALLATION

Install the differential assembly.

Notes :

1. In inserting the rear axle shafts, take care not to damage the oil seals. Also have the oil seal lips coated with MP grease beforehand.
2. Make sure that the rear axle shaft bearing retainer and its gasket are positioned vertically correctly (oil hole cutaway pointed downward).

3. Be sure to replace backing plate set nuts as they are of self-locking type.
4. Use hypoid gear oil for housing interior lubrication

Kind of oil	Hypoid gear oil S SAE 90
Quantity	1.0 liter (1.06 U.S. qt.)

REAR AXLE HOUSING REMOVAL AND INSTALLATION

REMOVAL

1. Disconnect the rear brake flexible hose from the tube ahead.
2. Disconnect the propeller shaft.
3. Remove the rear axle shafts.
(Refer to rear axle shaft P4-2)
4. Remove the rear brake backing plates.
5. Disconnect the rear shock absorber lower ends, coil springs, lower control arms, upper control arms, and lateral control rods from the rear axle housing.
6. Remove the rear axle housing.
7. Remove the differential.

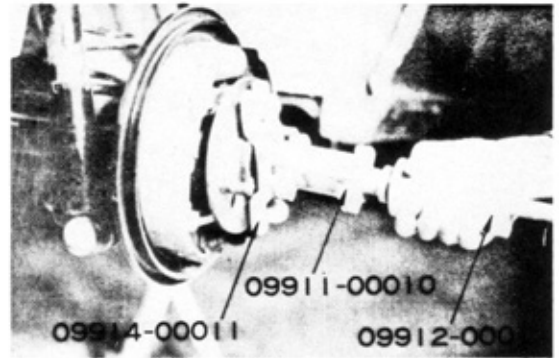


Fig. 4-44 Removing Rear Axle

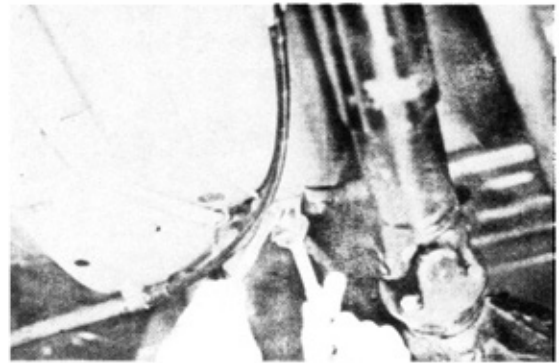


Fig. 4-45 Disconnecting Brake Tube

TYPE "T" OIL SEAL REPLACEMENT

1. With a suitable lever, pry out the type "T" oil seal from the end of axle housing.
2. Using Rear Axle Shaft Oil Seal Replacer [09505-20010], drive the new type "T" oil seal into the axle housing.
Note : Before installing, coat the shaft contacting surface with a liberal amount of MP grease.

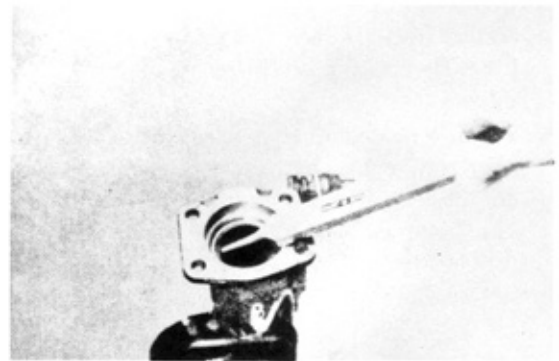


Fig. 4-46 Removing Oil Seal

INSTALLATION

Follow the removal procedures in reverse order.

Notes :

1. Bleed the brake pipe line.
2. Adjust the brakes properly.



Fig. 4-47 Installing Oil Seal