

CHAPTER 4

REAR AXLE & DIFFERENTIAL

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|---------------------------------|------|
| REAR AXLE SHAFT | 4— 1 |
| REAR AXLE HOUSING ASSEMBLY..... | 4— 5 |
| DIFFERENTIAL CARRIER | 4— 5 |
| TOOTH CONTACT PATTERN..... | 4—12 |
| DIFFERENTIAL CASE | 4—13 |

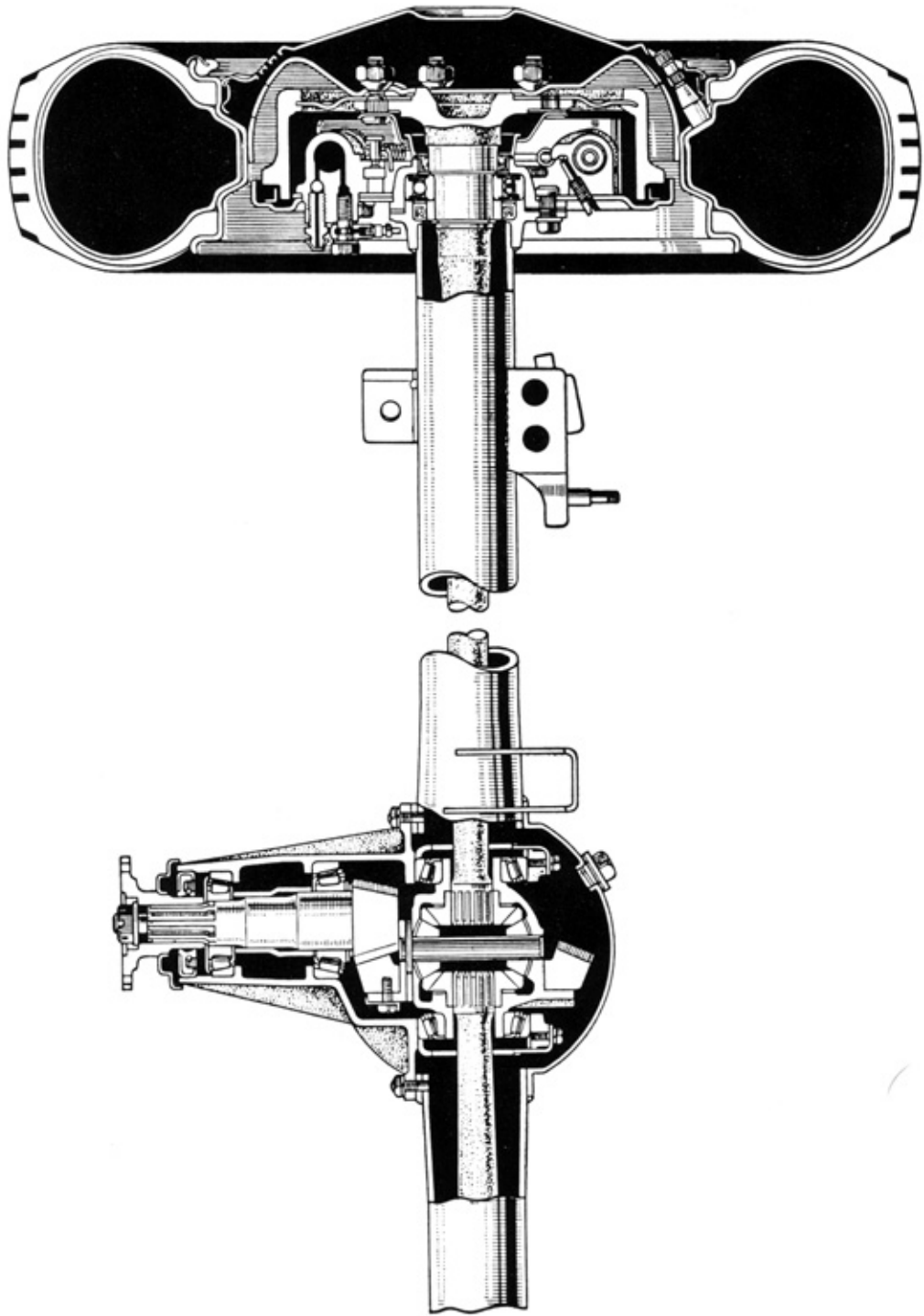


Fig. 4-1 Section of Rear Axle

REAR AXLE SHAFT

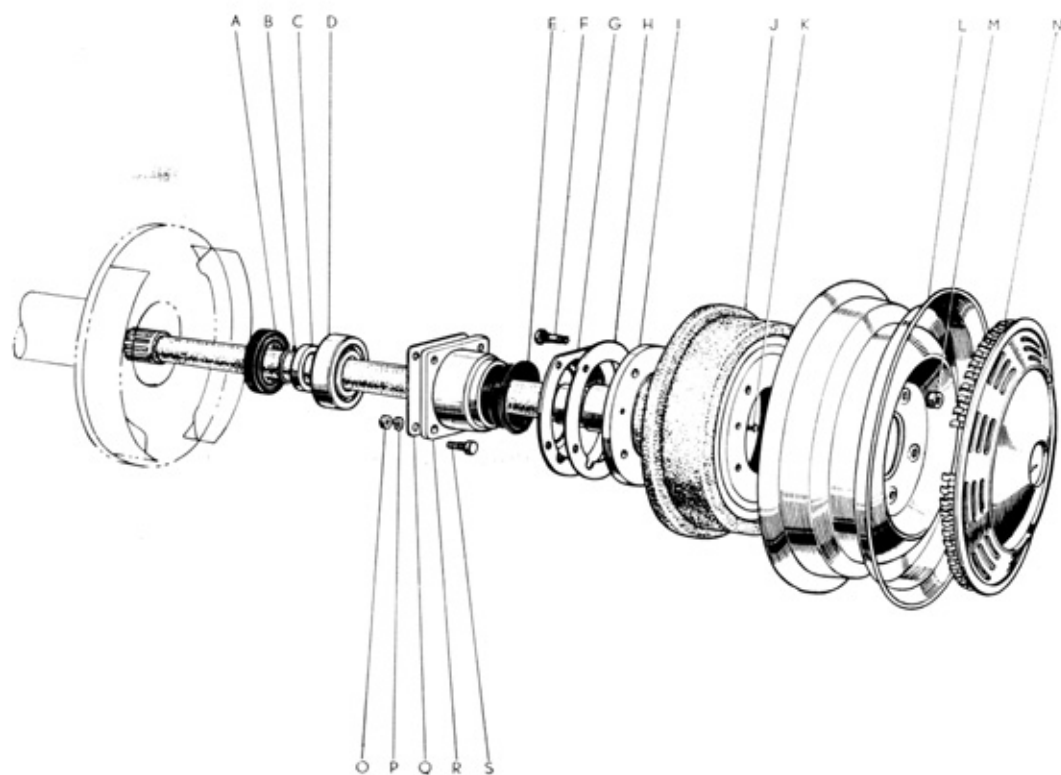


Fig. 4-2 Rear Axle Shaft

- | | |
|--------------------------------------|-----------------------------|
| A Rear Axle Shaft Oil Seal Complete | K Rear Brake Drum Set Screw |
| B Rear Axle Shaft Snap Ring | L Disc Wheel Complete |
| C Rear Axle Shaft Bearing Spacer | M Axle Nut |
| D Rear Wheel Bearing | N Wheel Cap Complete |
| E Rear Axle Shaft Dust Seal Complete | O Nut |
| F Axle Hub Bolt | P Spring Washer |
| G Brake Drum Strap | Q Rear Axle End Packing |
| H Brake Drum Strap Packing | R Rear Wheel Bearing Case |
| I Rear Axle Shaft | S Brake Set Bolt |
| J Brake Drum Complete | |

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Removal

1. Jack up rear axle housing.
2. Remove wheel.
3. Unloosen hand brake rear flexible wire.
4. Remove brake drum.
5. Remove return spring and adjuster spring, and remove brake shoes.
6. Disconnect flexible wire from flange plate.
7. Disconnect oil brake rear pipe.
8. Remove four brake set bolts attaching bearing case and flange plate to rear axle

housing end.

9. Remove rear axle shaft with flange plate.
10. Remove rear axle shaft snap ring using Expander (RS SST-2003).
11. Pull out rear axle shaft from flange plate using Rear Axle Shaft Puller (RS21 SST-2049) and Rear Axle Shaft Puller Wrench (BX SST-2023).

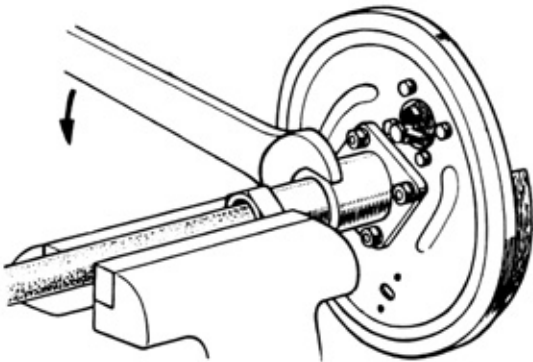


Fig. 4-3 Removing Rear Axle Shaft

Inspection

1. Replace rear axle shaft if it is bent, cracked or damaged.
2. Replace rear wheel bearing if it is worn, damaged or noisy.
3. Replace oil seal if it is damaged.

Installation

Caution: Before installation, replace all

packings.

1. Install flange plate and bearing spacer to rear axle shaft using a press and Rear Wheel Bearing Replacer (RS21 SST-2045).

Caution: Place the large chamfered inside diameter of the bearing spacer to face the bearing.

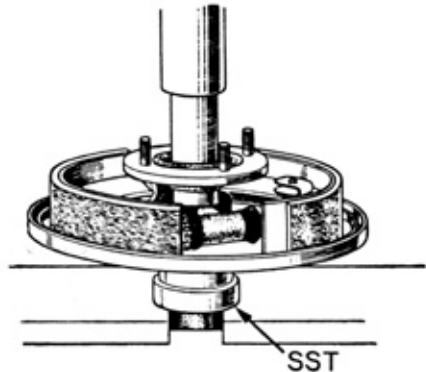


Fig. 4-4 Installing Rear Axle Shaft

2. Install snap ring using Expander (RS SST-2003).
3. Install rear axle shaft, then install brake set bolts.
4. Install flexible wire to flange plate.
5. Install brake shoes.
6. Connect oil brake rear pipe.
7. Install brake drum and install wheel.
8. Adjust brake.
(See page 7-11 "AIR BLEEDING & BRAKE ADJUSTMENT")

REAR AXLE HOUSING & DIFFERENTIAL

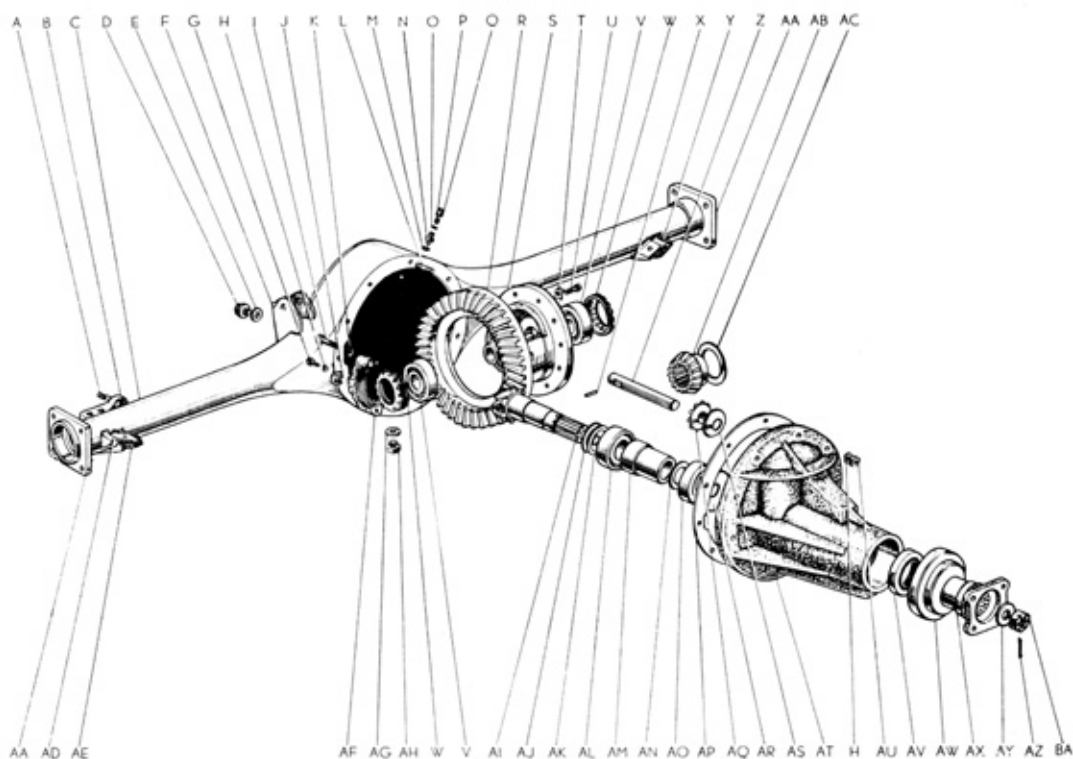


Fig. 4-5 Rear Axle Housing & Differential

- | | |
|-------------------------------------|---|
| A Lateral Rod Pivot Pin | V Differential Side Bearing |
| B Lateral Rod Bracket Complete | W Differential Adjusting Nut |
| C Rear Axle Housing Complete | X Differential Pinion Shaft Set Pin |
| D Filler Plug | Y Rear Shock Absorber Lower Bracket |
| E Rear Axle Filler Plug Packing | Z Differential Pinion Shaft |
| F Upper Control Arm Bracket | AA Rear Axle Housing End |
| G Bolt | AB Differential Side Gear |
| H Spring Washer | AC Differential Side Gear Thrust Washer |
| I Differential Carrier Cap Set Bolt | AD Rear Shock Absorber Lower Bracket |
| J Differential Adjusting Nut Lock | AE Lower Control Rod Bracket Complete |
| K Spring Washer | AF Differential Carrier Cap |
| L Stud Bolt | AG Packing (For drain plug) |
| M Spring Washer | AH Drain Plug |
| N Breather Plug | AI Differential Drive Pinion |
| O Breather Plug Valve | AJ Drive Pinion Thrust Plate |
| P Breather Plug Valve Spring | AK Drive Pinion Adjusting Shim |
| Q Breather Plug Cap | AL Differential Drive Pinion Rear Bearing |
| R Differential Ring Gear | AM Drive Pinion Bearing Spacer |
| S Differential Case | AN Drive Pinion Spacer Adjusting Shim |
| T Ring Gear Set Bolt Lock Plate | AO Drive Pinion Front Bearing |
| U Differential Ring Gear Set Bolt | AP Differential Carrier Packing |

- AQ Differential Pinion
- AR Differential Carrier Oil Slinger
- AS Differential Pinion Thrust Washer
- AT Differential Carrier
- AU Nut
- AV Differential Carrier Oil Seal

- AW Differential Dust Cover
- AX Differential Joint Yoke Retainer
- AY Differential Drive Pinion Washer
- AZ Cotter Pin
- BA Nut

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REAR AXLE HOUSING ASSEMBLY

Removal

1. Remove rear seat and jack up rear axle housing.
2. Drain oil and flush if necessary.
3. Place stands under the vehicle so that the rear end of the vehicle is high enough to permit working under the vehicle.
4. Remove wheels and remove shock absorbers.
5. Unscrew the four bolts holding propeller shaft universal joint yoke to differential joint yoke retainer.
6. Disconnect lateral rod from housing.
7. Remove lower control rod.
8. Disconnect upper control arm from differential housing.
9. Remove hand brake center lever with bracket.
10. Remove flexible tube holder and clip.
11. Disconnect brake flexible hose from intermediate pipe.
12. Remove rear spring shackle.
13. Take out rear axle housing assembly with brake flexible wire.

Inspection

Replace rear axle housing if it is cracked or damaged.

Installation

1. Place rear axle housing assembly under the vehicle.
2. Install rear spring shackles.
3. Attach upper control arm to axle housing.
4. Attach lower control rods.
5. Attach lateral rods to axle housings.
6. Attach universal joint yoke to differential joint yoke retainer and install four bolts.
7. Install shock absorbers.
8. Connect brake flexible hose to inter-

- mediate pipe.
9. Hook hand brake rear flexible wire around the center lever pulley and install center lever and lever bracket.
10. Support rear flexible wire with flexible tube holder and clip.
11. Install wheels.
12. Fill in hypoid gear oil SAE 90. Oil capacity is 1.2 liters (1.3qts.).
13. Bleed air and adjust brakes.
14. Lower vehicle to the floor.
15. Install rear seat.
16. Under standard load, unloosen nuts attaching upper control arm, lower control rod and lateral rod to vehicle until bushings and bushing rubbers have no more twists, and tighten again to specified torque and install cotter pins.

Torque Spec.

Upper Control Arm Nut

9~10 m·kg (65~73 ft·lb)

Lower Control Rod Nut

18~20 m·kg (130~145 ft·lb)

Lateral Rod Nut

11~12 m·kg (80~87 ft·lb)

17. Adjust vehicle height.
(See page 5-3 "VEHICLE HEIGHT ADJUSTMENT").

DIFFERENTIAL CARRIER

Removal

1. Jack up rear axle housing.
2. Drain gear oil and remove wheels.
3. Loosen hand brake rear flexible wire.
4. Pull out rear axle shaft from rear axle housing a little.
5. Unscrew four bolts attaching propeller shaft universal joint yoke to differential joint yoke retainer.
6. Unscrew bolts attaching differential carrier

to rear axle housing, and remove differential carrier assembly.

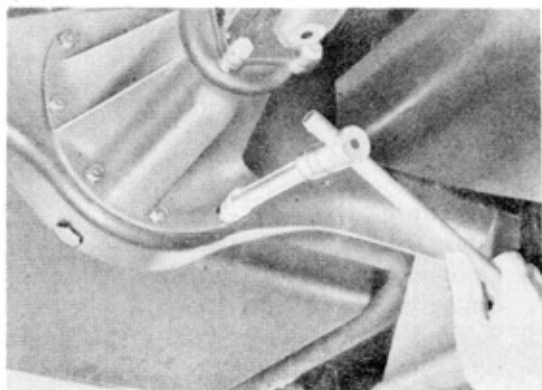


Fig. 4-6 Removing Differential Carrier Assembly

Installation

Follow "REMOVAL" in reverse order.

Disassembly

Before disassembling, inspect the tooth pattern on both the pinion and the ring gears. If the tooth pattern needs adjustment, or the assembly has to be disassembled, proceed as follows.

1. Install differential carrier assembly on repair stand.
2. Remove cotter pin, loosen and remove nut attaching joint yoke retainer to pinion using Joint Yoke Holding Tool (RS SST-2001). Take out joint yoke retainer.

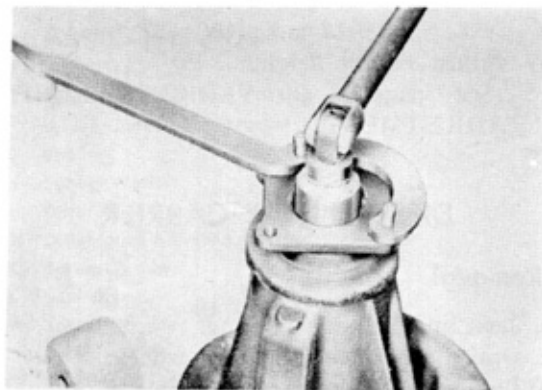


Fig. 4-7 Removing Joint Yoke Retainer

3. Remove dust cover and remove differential carrier oil seal using Extension Housing Oil Retainer Puller (RS SST-1086), and remove front bearing cone and bearing spacer.

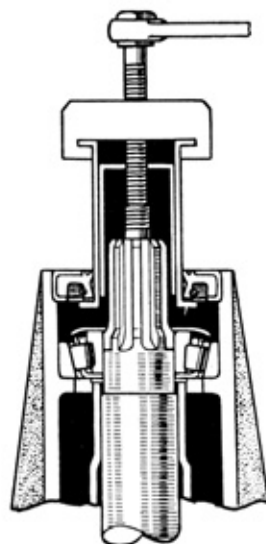


Fig. 4-8 Removing Oil Seal

4. Mark the differential carrier and the caps.

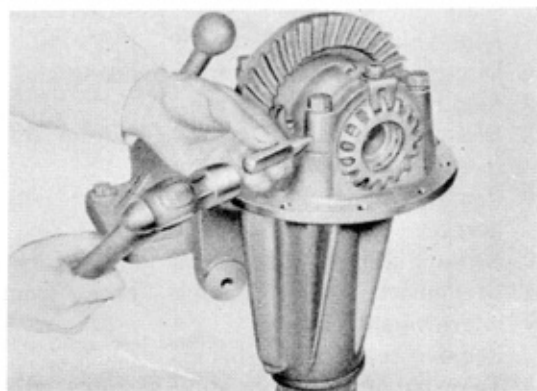


Fig. 4-9 Marking Cap and Carrier

Note: The carrier caps are matched with the carrier when manufactured so that these should not be interchanged.

5. Loosen and remove lock bolts from bearing caps.
6. Remove bolts from bearing caps and remove caps. Then remove the adjusting nuts.
7. Lift out the differential case assembly with bearings from carrier case and push out drive pinion gear to the rear of the carrier with rear bearing attached.
8. Remove drive pinion rear bearing cone from drive pinion using Universal Puller (BX SST-2034).

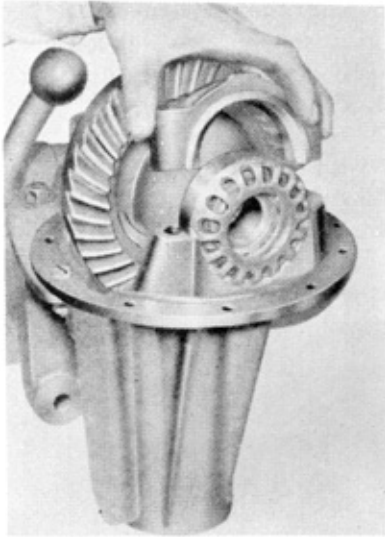


Fig. 4-10 Removing Carrier Cap

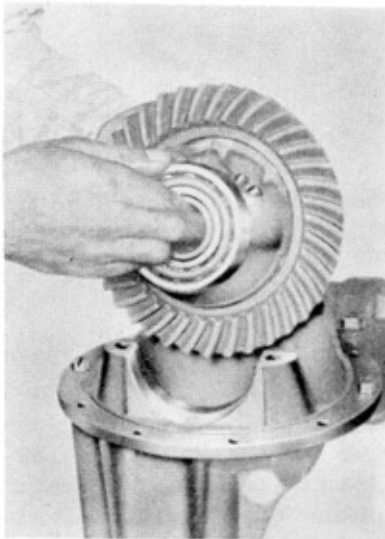


Fig. 4-11 Lifting out Differential Case Assembly

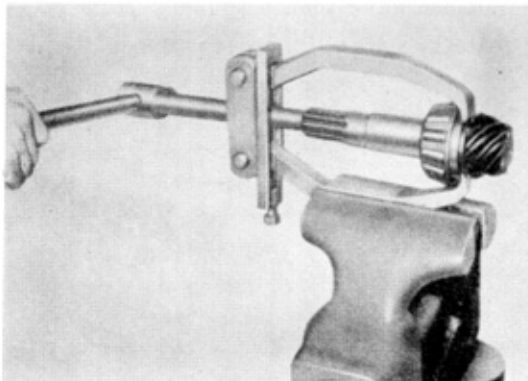


Fig. 4-12 Removing Rear Bearing Cone

9. To disassemble the differential drive pinion front and rear bearing cups, use brass drift and knock out the cups.

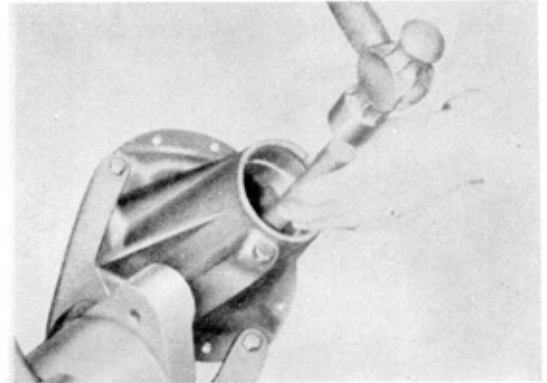


Fig. 4-13 Removing Bearing Cup

Inspection

1. Replace drive pinion front bearing or rear bearing if they are worn, damaged or noisy.
2. Replace oil seal if it is damaged.
3. Check ring gear and drive pinion for wear and damage at tooth surface. If found defective, replace them as a set.
4. Replace differential pinion shaft if it is worn or damaged.
5. Replace differential carrier if it is cracked or damaged.

Assembly

1. To install bearing cups in differential carrier, use Diff. Drive Pinion Front & Rear Bearing Cup Replacer. (RS21 SST 2038).

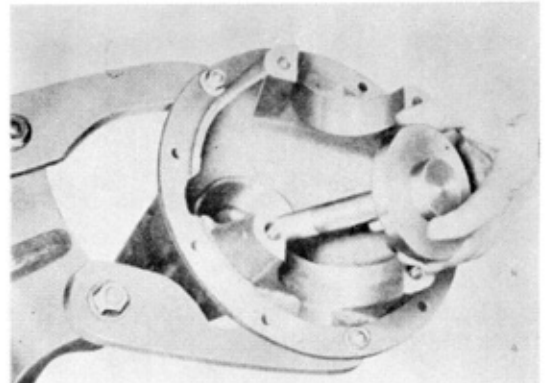


Fig. 4-14 Placing Rear Replacer Plate

2. Insert bearing cups into the carrier and drive them in slightly. Set cups in the recesses, place rear replacer plate over the rear bearing cup with replacer bolt.
3. Place front replacer plate over the front bearing cup.

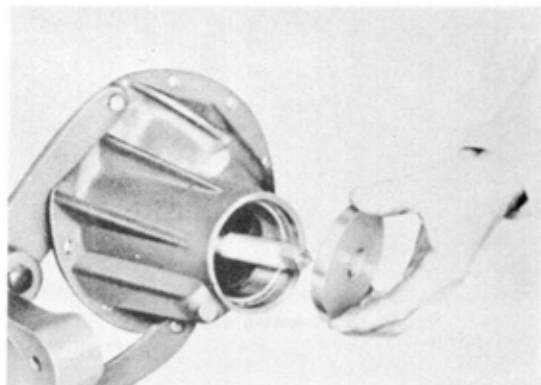


Fig. 4-15 Placing Front Replacer Plate

4. Place thrust bearing over the front plate and insert the washer over the thrust bearing. Screw in nut.
5. Holding the bolt to prevent from turning, tighten the nut until the cups set firmly into the recesses.

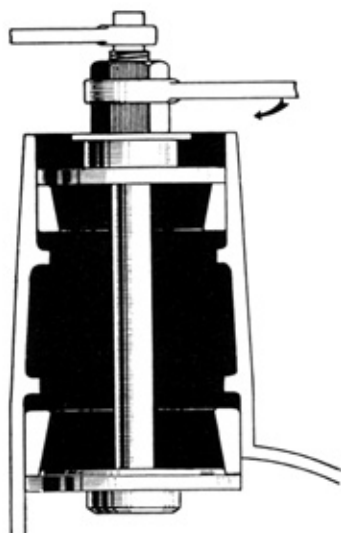


Fig. 4-16 Installing Bearing Cups

6. In making the adjustment between the ring gear and the drive pinion gear mesh, use Diff. Drive Pinion Adjusting Gauge (RS21 SST-2035).
7. Install rear bearing cone on the "Base Rod" with spacer and new adjusting shim or adjusting shims. Install these into the carrier from the rear. Install the front bearing cone on the "Base Rod" in the carrier as shown in the figure.

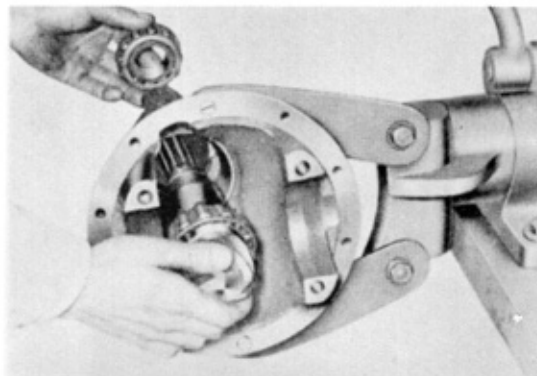


Fig. 4-18 Installing "Base Rod"

8. "Push Collar", "Preload Flange" and "Nut" are installed to "Base Rod". Tighten "Nut" holding the "Push Collar" to the specified torque.

Torque Spec.

16.0~20.7 m·kg (120~150 ft·lb)

9. Check preload by tying a cord around the "Preload Flange", and hook up a scale to the cord. Pull scale and the scale should read from 0.4 to 1.4 kg (14~49oz.). To obtain this reading, the spacer of proper length and spacer adjusting shim of proper thickness must be selected. Do not use more than 4 shims.

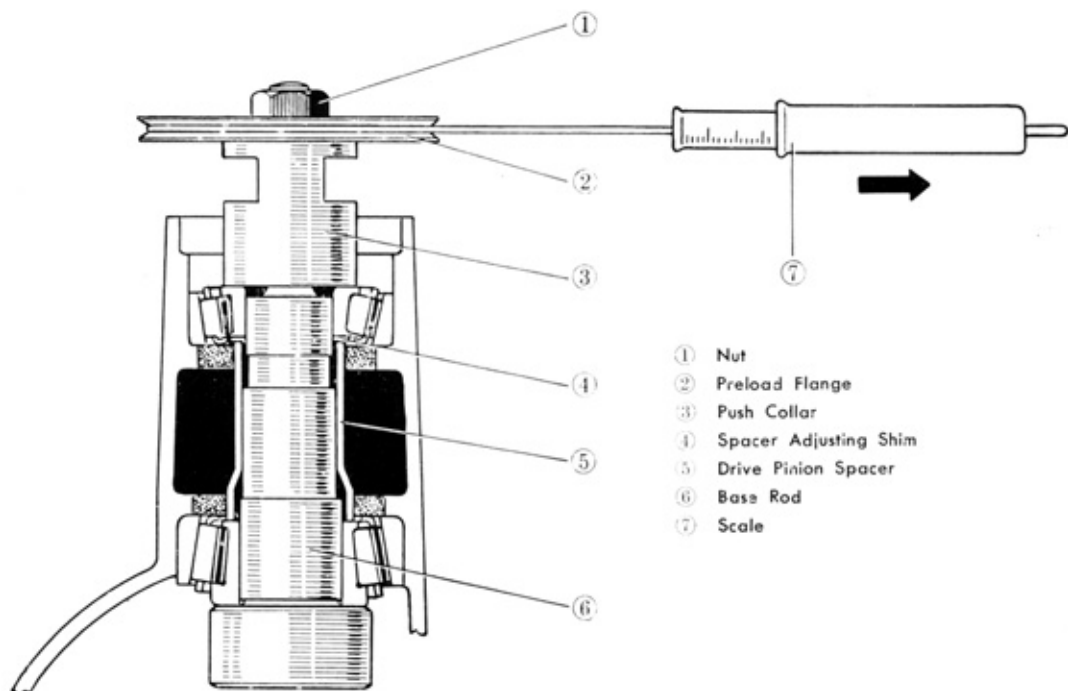


Fig. 4-17 Checking Preload

Caution: When checking preload, differential carrier oil seal should not be installed.

Note:

1. Use longer spacer to decrease preload.
2. Use shorter spacer to increase preload.

Spacer Adjusting Shim Thickness

0.271 mm (0.0107")

10. Attach "Base Rod Head" to "Base Rod". Before installing the "Base Rod Head". Be sure to clean the end of "Base Rod" and the "Base Rod Head" as these will determine the pinion depth. Then tighten "Screw".

Drive Pinion Spacer Length

| | mm | in:th |
|------|---------------|---------------|
| No.1 | 61.000~61.025 | 2.4016~2.4026 |
| No.2 | 61.045~61.070 | 2.4033~2.4043 |
| No.3 | 61.090~61.115 | 2.4051~2.4061 |
| No.4 | 61.135~61.160 | 2.4069~2.4079 |
| No.5 | 61.180~61.205 | 2.4087~2.4096 |
| No.6 | 61.225~61.250 | 2.4104~2.4114 |

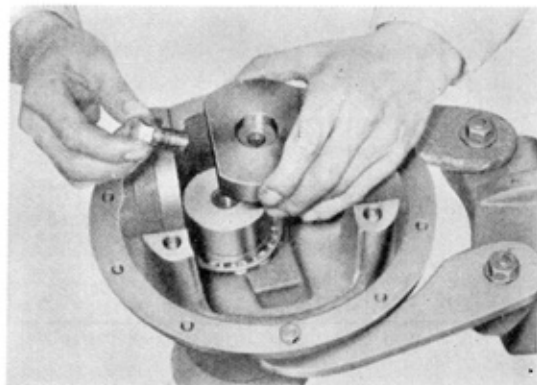


Fig. 4-18 Attaching "Base Rod Head"

11. Place "Master Gauge" in the bearing bores, assemble caps and tighten cap bolts with torque wrench.
Torque Spec. 7.0~9.6 m-kg (50~70 ft-lb)



Fig. 4-19 Tightening Cap Bolts

12. Select drive pinion thrust plate of proper thickness, also several drive pinion adjusting shims, so that they can fit tight between the "Base Rod Head" and "Master Gauge".

Drive Pinion Thrust Plate Thickness

| | mm | inch |
|------|-----------|---------------|
| No.1 | 3.00~3.01 | 0.1181~0.1185 |
| No.2 | 3.03~3.04 | 0.1193~0.1197 |
| No.3 | 3.06~3.07 | 0.1205~0.1209 |
| No.4 | 3.09~3.10 | 0.1217~0.1221 |
| No.5 | 3.12~3.13 | 0.1228~0.1232 |
| No.6 | 3.15~3.16 | 0.1240~0.1244 |
| No.7 | 3.18~3.19 | 0.1252~0.1256 |
| No.8 | 3.21~3.22 | 0.1264~0.1268 |
| No.9 | 3.24~3.25 | 0.1276~0.1280 |

Drive Pinion Adjusting Shim Thickness

0.271 mm (0.0107")

13. After thrust plate and shim are selected, remove "Master Gauge". Also remove "Base Rod" by loosening the "Nut".

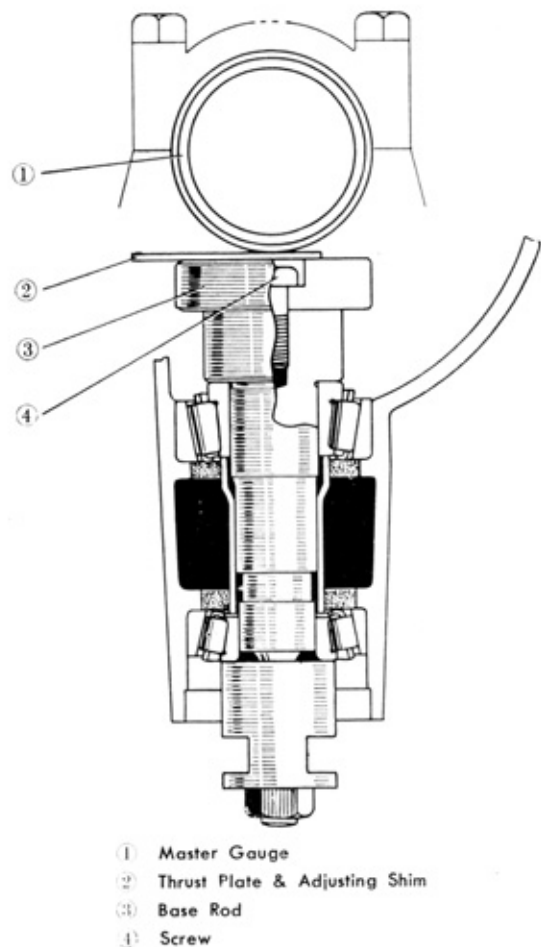
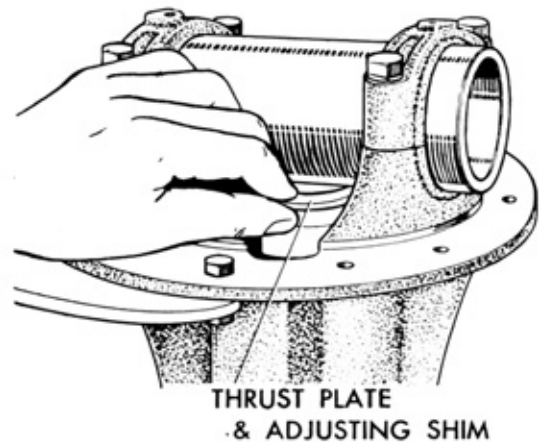


Fig. 4-20 Selecting Drive Pinion Thrust Plate and Shims

14. Install selected thrust plate, adjusting shim, and rear bearing cone on the drive pinion, then install Diff. Drive Pinion Rear Bearing

Cone Replacer (RS21 SST-2037) on the drive pinion and place them in the press. Press the drive pinion to insert it into the rear bearing con

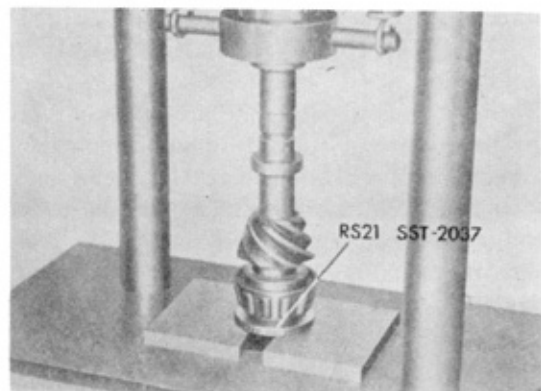


Fig. 4-21 Installing Bearing Cone

15. Insert front bearing cone and oil slinger in differential carrier and install oil seal.
16. When the rear bearing with thrust plate and shims are installed on the drive pinion, install this assembly in the carrier case from the rear.
Then install selected drive pinion spacer and adjusting shims ahead of the rear bearing.
17. Install dust cover.
18. Install joint yoke retainer and tighten nut attaching retainer to pinion using Joint Yoke Holding Tool (RS SST-2001).

Torque Spec.

16.0~20.7 m·kg (120~150 ft·lb)

19. Install differential case assembly on the differential carrier and attach adjusting nuts.
20. Install carrier caps so that the markings on it match with that of the carrier case. Then tighten cap bolts lightly after checking that the screw of the adjusting nut is properly fitted in the screws of the carrier and caps.
21. After assembling the ring gear assembly, attach the "Preload Flange" and check the preload of the drive pinion gear again.
The preload with ring gear attached should be 0.8 to 3.2 kg. (2.76~7.04 lb).
22. Adjust preload of side bearing using Diff. Adjusting Nut Wrench. (RS SST-2033)
Unscrew the right side adjusting nut fully

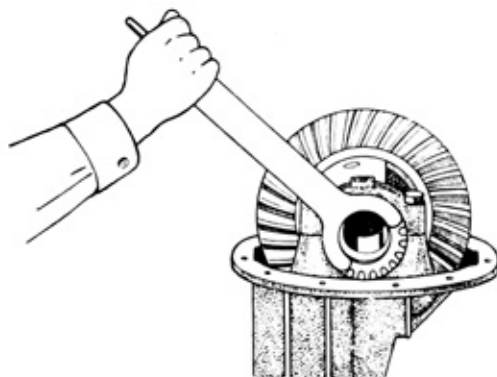


Fig. 4-22 Screwing in Adjusting Nut

and screw in the left side adjusting nut until the ring gear play in the axial direction is eliminated, and finally tighten cap bolts.

Then screw in the right side adjusting nut until the nut contacts the bearing lightly, then screw in the nut 1.5 to 2 noches, and tighten cap bolts.

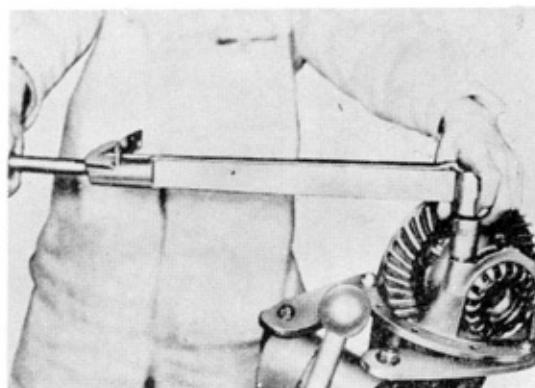


Fig. 4-23 Tightening Cap Bolt

Torque Spec.

Carrier Cap Bolts

7~9.5 m·kg (50~70 ft·lb)

23. Check the backlash between the ring gear and the drive pinion gear using Diff. Adjusting Nut Wrench (RS SST-2033). Place the dial gauge perpendicular to the gear teeth and read the backlash on the ring gear.
If the backlash is too much, the ring gear should be moved toward the drive pinion. To decrease backlash, loosen the adjusting nut on the ring gear teeth side and tighten the adjusting nut in the back of the ring

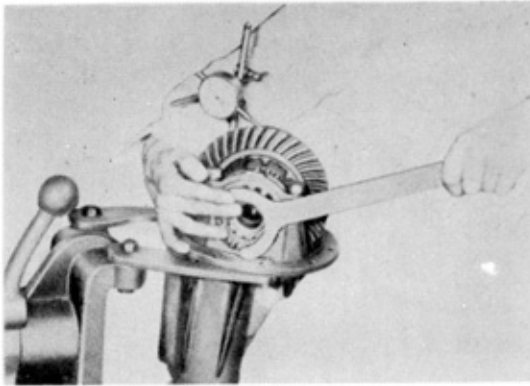


Fig. 4-24 Checking Backlash

gear. If one adjusting nut has to be loosened two notches, tighten two notches on the other one, too.

Backlash 0.05~0.15 mm (0.002"~0.006")

24. After correct backlash is obtained, place the dial gauge against the back of the ring gear and check the deflection of the ring gear

This should not be over 0.1 mm (0.004")

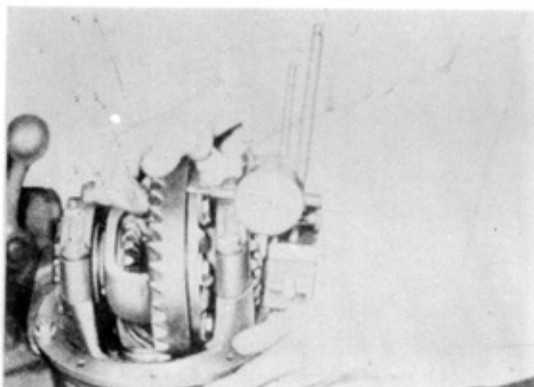


Fig. 4-25 Checking Deflection

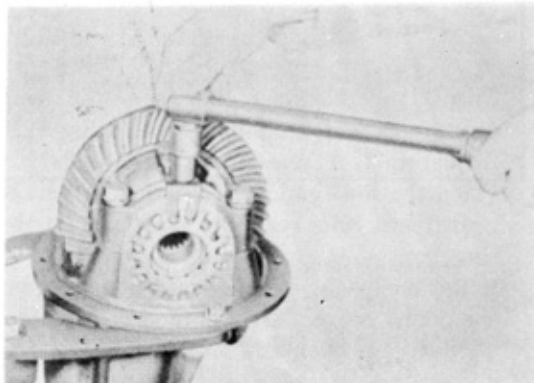


Fig. 4-26 Installing Adjusting Nut

25. Install adjusting nut lock, and lock retainer nut with cotter pin.
26. Check tooth contact pattern between ring gear and drive pinion.

TOOTH CONTACT PATTERN

Proper ring gear and drive pinion adjustment is important to obtain quiet and trouble-free operation of the rear axle assembly. The tooth contact must be tested and corrected as necessary or noisy gears may result. This test must be done before the differential carrier assembly is installed.

Clean the ring gear and drive pinion teeth thoroughly, and coat the ring gear teeth lightly and evenly with red lead. Rock the ring gear back and forth on the ring gear teeth.

Correct Tooth Contact

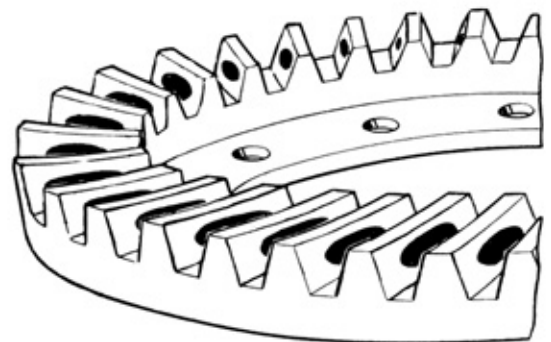


Fig. 4-27 Correct Tooth Contact

The pinion gear tooth contact pattern is evenly shown on the ring gear teeth.

Toe Contact & Flank Contact

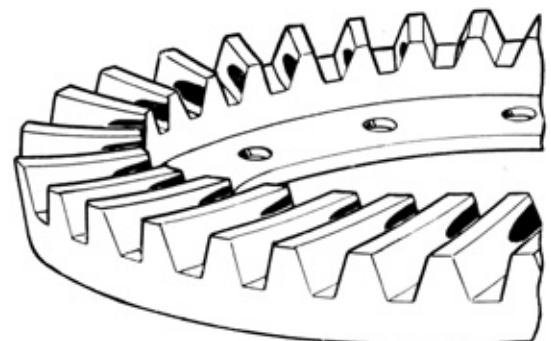


Fig. 4-28 Toe Contact

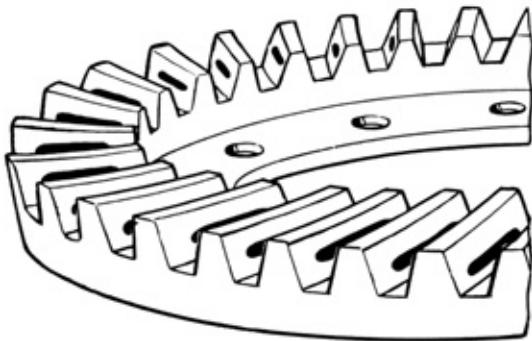


Fig. 4-29 Flank Contact

Excessive contact on tooth toe or tooth flank:
 Move pinion out from ring gear by reducing thickness of thrust plate or adjusting shims under pinion head.

Heel Contact & Face Contact

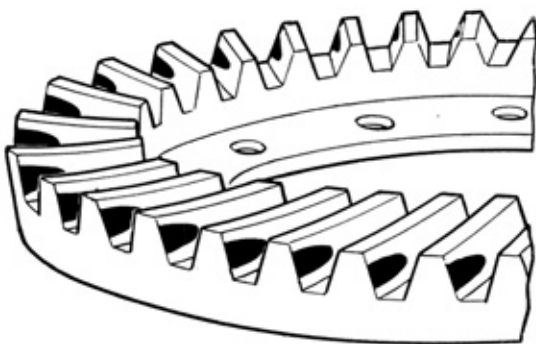


Fig. 4-30 Heel Contact

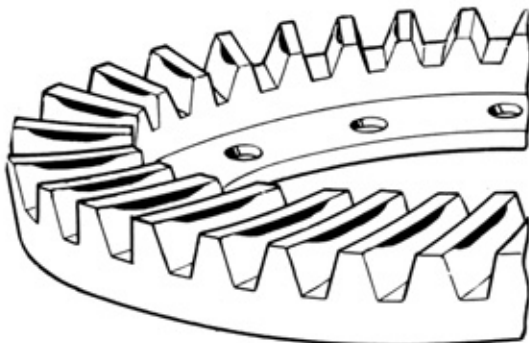


Fig. 4-31 Face Contact

Excessive contact on tooth heel or tooth face:
 Move pinion in toward ring gear by increasing thickness of thrust plate or adjusting shims under pinion head.

In all the above mentioned cases, to adjust pinion by replacing thrust plate or shim, the differential unit must again be disassembled.

When unit is subsequently reassembled, all preload and backlash adjustment operations have to be repeated.

DIFFERENTIAL CASE

Disassembly

Caution: It is not necessary to disassemble the differential case, unless noisy pinion gears or side gears are indicated.

1. Drive out the pinion shaft set pin and remove pinion shaft with thrust washers. The set pin is slightly tapered and should be driven out from the back of the ring gear.

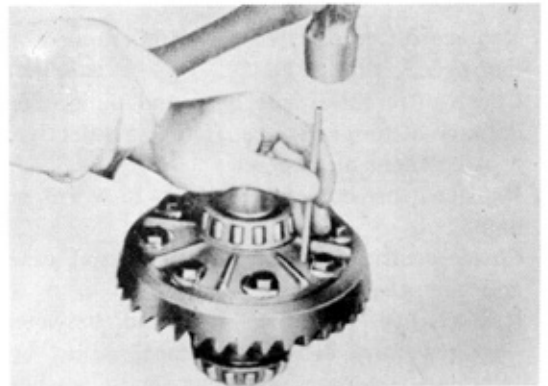


Fig. 4-32 Removing Pinion Shaft Set pin

2. Straighten out locking washers, loosen and remove bolts, then remove ring gear from the case.

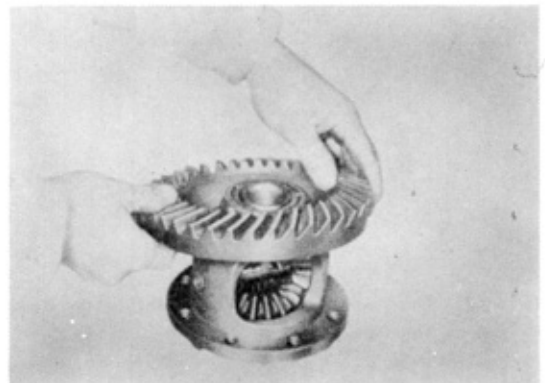


Fig. 4-33 Removing Ring Gear

- Remove side bearing cone using Universal Puller (BX SST-2034).

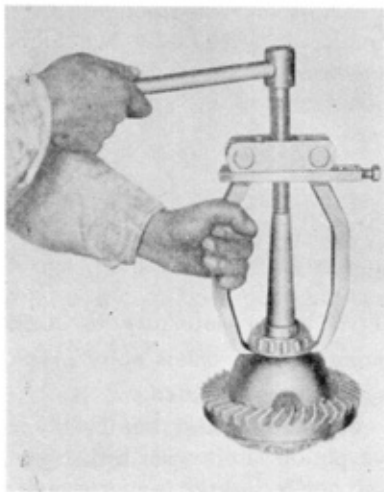


Fig. 4-34 Removing Side Bearing Cone

INSPECTION

- Replace differential case if it is cracked or damaged.
- Check differential side gear and pinion for damage at tooth surface. If found defective, replace them as one set.
- Replace thrust washer if it is worn or damaged.
- Check clearance between differential case and side gear.
If excessive clearance is found between side gear and differential case, adjust by selecting adequate side gear thrust washer and pinion thrust washer.

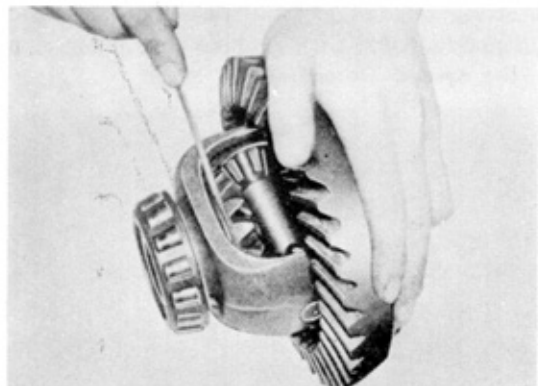


Fig. 4-35 Checking Clearance between Differential Case and Side Gear

Side gear thrust washer and pinion thrust washers are available in two different sizes in thickness.

Clearance 0.15~0.35 mm (.006"~0.013")

Side gear thrust washer thickness

1.4~1.6 mm (0.055"~0.063")

1.6~1.7 mm (0.063"~0.067")

Pinion thrust washer thickness

0.9~1.1 mm (0.035"~0.043")

1.1~1.2 mm (0.043"~0.047")

- Replace differential pinion shaft, if it is worn or damaged.

Assembly

- Install side bearing cone using Side Bearing Cone Replacer (RS21 SST-2036).



Fig. 4-36 Installing Side Bearing Cone

- Install side gear and thrust washer.
Caution: Install thrust washer in position so that oil groove side faces the side gear.
- Assemble pinion shaft, pinion and thrust washer, mating pinion shaft set pin hole with hole in case.
- Install pinion shaft set pin in the ring gear and case from ring gear side.
- Install ring gear.

Torque Spec.

7.0~8.3 m·kg (50~60 ft·lb)