# SERVICE MANUAL

Datsun

MODEL 510 SERIES

CHASSIS and BODY

## SECTION PD

# PROPELLER SHAFT & DIFFERENTIAL CARRIER

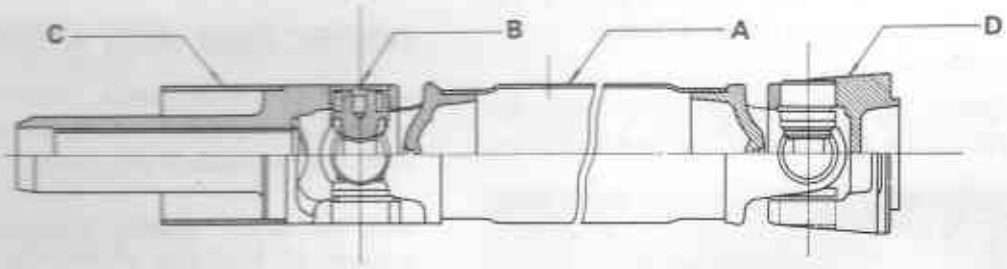
PD



# PROPELLER SHAFT AND UNIVERSAL JOINT

## CONTENTS






| Symbol | Parts nomenclature | Q'ty (per car) |
|---|---|---|
| A | Propeller shaft (for sedan)<br>Propeller shaft (for van, wagon) | 1<br>1 |
| B | Journal (spicer type)<br>Roller bearing | 8 |
| C | Sleeve yoke | 1 |
| D | Flange yoke | 1 |

*Fig. PD-1 Propeller shaft*

## DESCRIPTION

Propeller shafts are of solid tubular steel construction. There are two kinds of propeller shafts; one for sedan car and the other for wagon car. Their comparison is shown in the end of this section.

A correct balance of propeller shaft is obviously very important to obtain a good riding comfort at high speeds. Therefore the propeller shafts in service parts and ones assembled in the vehicle are counterbalanced within an unbalance of 15 gr-cm (0.278 in-oz) at 4,000 r.p.m. at the factory with the best care.

However, by hitting it with a hammer mistakenly when servicing, and flying rocks or bottoming during off-road driving, the balance of the propeller shaft will be broken down. Moreover excessive sleeve yoke spline-to-transmission main spline lash and wear of both front and rear universal joints will be the cause of producing vibrations, thus affecting on riding comfort.

In this journal, a grease nipple does not exist, therefore pack wheel bearing grease every 40,000 km (24,000 mile) running by disassembling the journal.

## REMOVAL

1. Release the hand brake completely.

2. Jack up the rear of the vehicle and support on stands.

3. Turn the exhaust center tube with pre-muffler to the left as shown in Figure PD-2 by loosening its both end clamps. This will allow the sufficient room for the propeller shaft to be removed. (Only for sedan)

4. Remove the hand brake rear cable adjusting nut from the adjuster and then disconnect left hand cable from the hand brake adjuster. (Only for sedan)

5. Disconnect the rear flange yoke from the companion flange by removing the nuts and bolts.

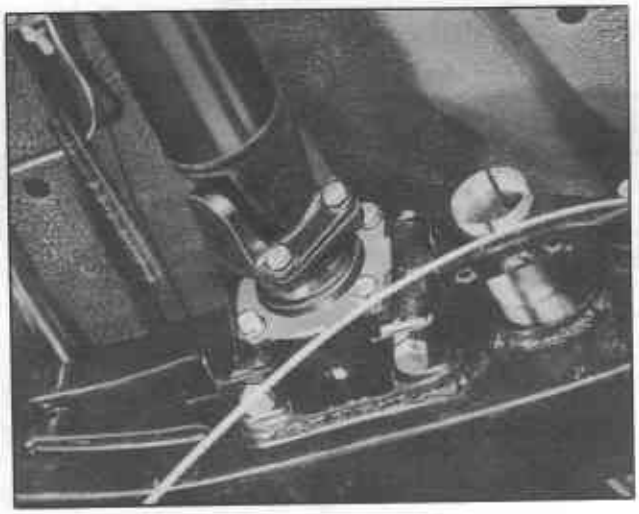


*Fig. PD-2 Removing propeller shaft*

**Note: In this operation care should be takne not to drop the propeller shaft on the ground to avoid that the balance of the unit may be varied.**

6. Draw out the shaft from the transmission main shaft, supporting the weight of the propeller shaft.

**Note: Plug up the transmission rear extension to avoid spilling the lubricants.**

## DISASSEMBLY

Before disassembling, clean and mark all components, so as to assemble them in the original position and avoid that the propeller shaft balance may be somehow affected.

1. Remove four snap rings from journal assembly.

2. Draw out the needle cap by tapping the yoke with an wooden hammer.

**Note: Take care when performing this operation, as the needle rollers are set free.**

## INSPECTION AND REPAIR

Disassembled parts should be carefully cleaned and checked for various conditions and repair or replace if necessary.

1. If the spider journal diameter is worn out in excess of 0.15 mm (0.0059 in.), it should be replaced. The shaft diameter of the new parts is 14.7 mm (0.5787 in.).

2. The spider seal rings should also be checked for damage, and replace if necessary.

3. Check sleeve yoke spline-to-transmission main shaft spline lash.
If radial backlash exceeds 0.5 mm (0.00197 in.) replace the sleeve yoke.

4. Checking run-out

Place the propeller shaft between centers on a fixture and rotate it and, using a dial indicator, check that the run-out of the center of tubular portion does not exceed 0.6 mm (0.0236 in.).
Beyond above limits, the propeller shaft should be straightened using exclusively an arbor press.
Should the run-out rate be excessive, it is advisable to replace the propeller shaft.

5. Checking balance

Check the dynamic balance. Dynamic unbalance should not exceed 15 gr-cm (0.278 in-oz) at 4,000 r.p.m.
If an unbalance of over above limits is detected, eliminate the cause, rebalance or replace the shaft as necessary.

## ASSEMBLY AND INSTALLATION

Assembly and installation can be accomplished in the reverse order of removal and disassembly, paying attention to the following points.

1. With wheel bearing grease applied thoroughly, place the needle rollers in the bearing race.

2. Apply gear oil to inside spline and outside of yoke. Slide the propeller shaft splined yoke onto the transmission main shaft splines.

3. Adjust the axial play of the journal to within 0.02 mm (0.0008 in.), by selecting the snap rings. Seven kinds of snap rings are avaialble.

4. Be sure to align mark on the front sleeve yoke with mark given on the rear flange yoke.

## SERVICE DATA AND SPECIFICATIONS

| | | |
|---|---|---|
| Propeller shaft | | Length x out. dia. x in. dia. mm (in.) |
| For sedan | | 1,082 x 63.5 x 60.3 (42.6 x 2.5 x 2.4) |
| For wagon | | 1,242 x 75.0 x 71.8 (48.9 x 3.0 x 2.8) |
| Axial play of the spider journal | | 0.08 mm (0.0315 in.) |
| Sleeve yoke spline-to-mainshaft | | 0 ~ 0.08 mm (0 ~ 0.0031 in.) |
| Spline lash wear limit | | 0.5 mm (0.0197 in.) |
| Maximum run-out of propeller shaft | | 0.6 mm (0.0236 in.) |
| Spider journal diameter wear limit | | 0.15 mm (0.0059 in.) |
| Permissible unbalance | | |
| Dynamic | | 15 gr-cm (0.278 in-oz) at 4,000 r.p.m. |
| Thickness of available snap rings | | |
| Standard | (white) | 2.00 mm (0.0787 in.) |
| Oversize | (yellow) | 2.02 mm (0.0795 in.) |
| | (red) | 2.04 mm (0.0803 in.) |
| | (green) | 2.06 mm (0.0811 in.) |
| | (blue) | 2.08 mm (0.0819 in.) |
| | (brown) | 2.10 mm (0.0827 in.) |
| | (colorless) | 2.12 mm (0.0835 in.) |
| Tightening torque | | |
| Fixing nuts of flange yoke to comapnion flange | | 4.0 to 8.5 kg-m (28.93 to 61.5 ft-lb) |

## TROUBLE DIAGNOSES AND CORRECTIONS

| Troubles | Possible causes | Remedies |
|---|---|---|
| Noises and vibrations | Distorted propeller shaft. | Using exclusively an arbor press straighten. If distortion are excessive, replace propeller shaft. |
| | Propeller shaft out of balance. | Check for balance, if an unbalance exceeds the limit, replace it. |
| | Incorrectly positioned flange yoke. | Recorrect. |
| | Excessive spline lash. | Replace the sleeve yoke. |
| | Worn or damaged journal. | Replace the journal. |
| | Incorrect snap rings. | Install correct snap ring. |
| | Loose nuts securing the flange yoke to the companion flange. | Tighten nuts to the specified torque. |

# DIFFERENTIAL CARRIER - SEDAN

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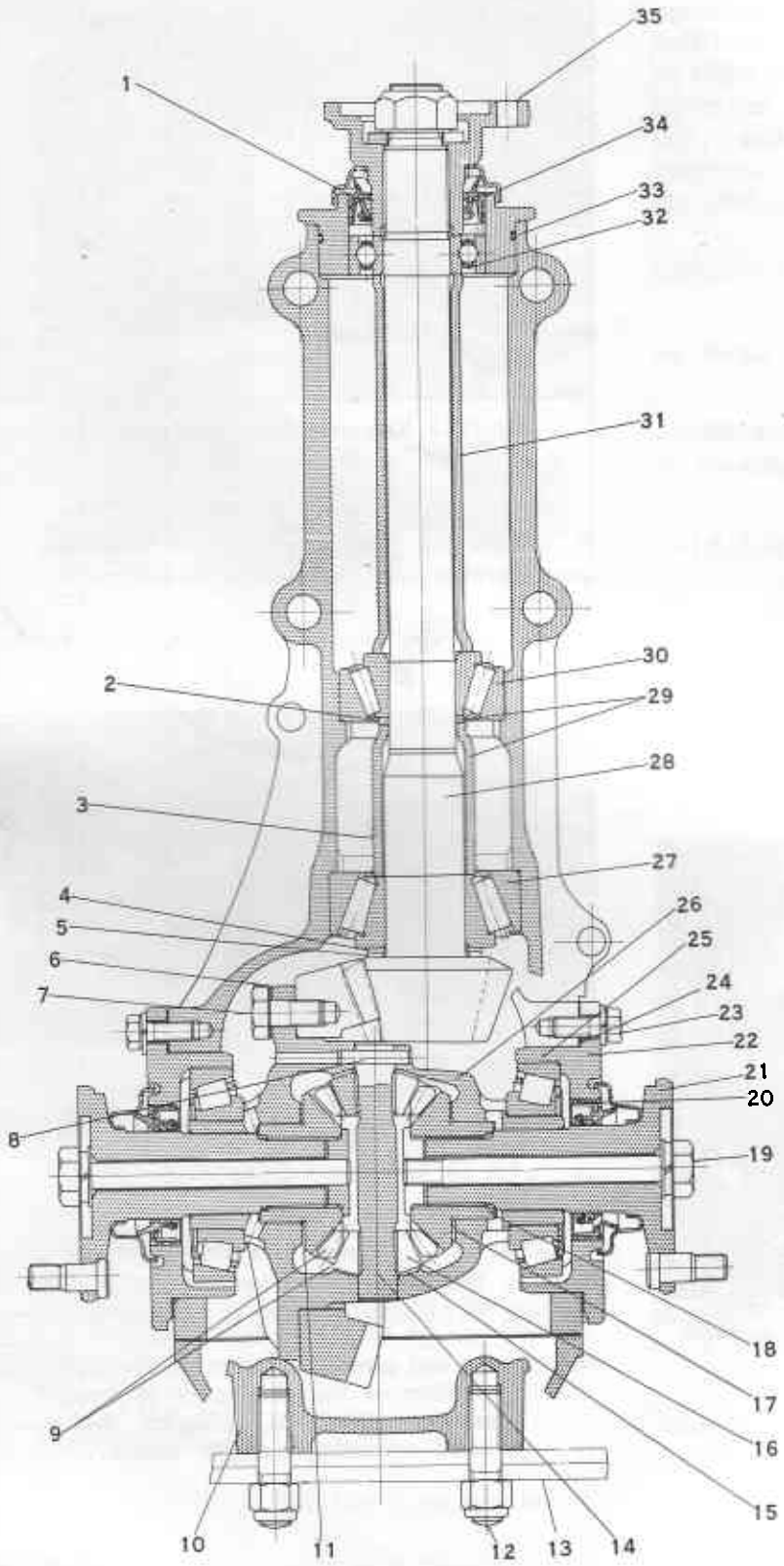
## DESCRIPTION

The gear carrier assembly, designed for use in the rear independent suspension is made of malleable cast iron and the hypoid bevel gear is used. To serve as part of the suspension, its housing is highly rigid, basically in a combined cylindrical and oval form.

Adjustment figures stamped on screws, adjusting shims, washers, differential case, drive pinion and carrier given in meters according to the metric standardization of parts recently adopted.

The front part of the gear carrier assembly is mounted at the center of the rear suspension member with four sets bolts and its rear is mounted on the body through a leaf spring with rubber insulators. This is intended to prevent vibration from the road surface.

The proper lubrication to the gear housing is necessary, otherwise it would shorten the durability of the gear and cause other troubles.




| | |
|---|---|
| 1 | Supply chassis grease to oil seal lip when ass'y. |
| 2 | Pinion bearing adjusting washer |
| 3 | Pinion bearing adjusting spacer |
| 4 | Pinion height adjusting shims |
| 5 | Pinion height adjusting washer |
| 6 | Lock starp |
| 7 | Bolt drive gear T=7.0 ∿ 0.8 kg-m Tighten by tapping bolt head with 1/4 lb. hammer |
| 8 | Lock pin |
| 9 | Tooth contact of differential gear is more than 3/4 of its width and backlash is 0.1 ∿ 0.2 mm (0.0039 ∿ 0.0079 in.) |
| 10 | Rear cover |
| 11 | Adjust the clearance between the differential case and the rear face of the side gear to 0.1 ∿ 0.2 mm (0.0039 ∿ 0.0079 in.) by side gear thrust washer. |
| 12 | Bolt diff. to diff. mounting member T=6.0 ∿ 8.0 kg-m |
| 13 | Diff. mounting member |
| 14 | Shaft pinion mate |
| 15 | Thrust washer |
| 16 | Pinion mate |
| 17 | Thrust washer |
| 18 | Side gear |
| 19 | Bolt side flange T=1.9 ∿ 2.6 kg-m |
| 20 | Oil seal. Supply chassis grease to oil seal lip when ass'y |
| 21 | Side flange |
| 22 | Side retainer |
| 23 | Bolt side retainer T=0.9 ∿ 1.2 kg-m |
| 24 | O-ring |
| 25 | Side bearing |
| 26 | Diff. gear case |
| 27 | Pinion rear bearing |
| 28 | Drive pinion |
| 29 | Adjust pinion bearing preload by selecting pinion bearing adjusting spacer and washer |
| 30 | Pinion front bearing |
| 31 | Spacer-front pilot bearing |
| 32 | Front pilot bearing |
| 33 | O-ring |
| 34 | Oil seal |
| 35 | Companion flange |

*Fig. PD-3 Sectional view of gear carrier*

The lubricant should be checked each 5, 000 km (3, 000 mile) and replenished as necessary.

The lubricant should be drained and refilled at the end of the first 1, 000 km (600 mile) to eliminate any loose material from the sump which results from "breaking". After 1, 000 km (600 mile) drain, differential lubricant should be changed every 50, 000 km (30, 000 mile) maximum.

The following points must be taken into consideration.

1. Nominated hypoid gear oil API. GL-5 be used.

2. It is prohibited to use any gear oil of different viscosity. The same brand must always be selected.

3. The standard oil capacity is about 0. 8 ltr. (2. 0 U. S. gal. ).

## REMOVAL

1. Remove the hand brake rear cable, propeller shaft and drive shaft at the respective positions shown by the arrows in the Figure PD-4.

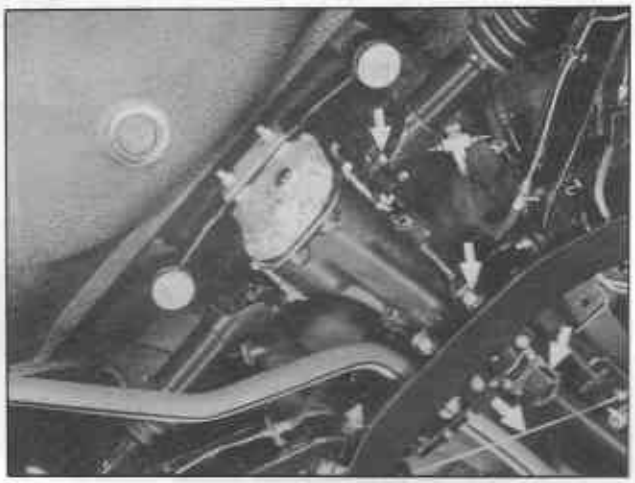


*Fig. PD-4 Removing hand brake rear cable, propeller shaft and drive shaft*

2. With the gear carrier jacked up, remove nuts on both ends of the differential mounting member.

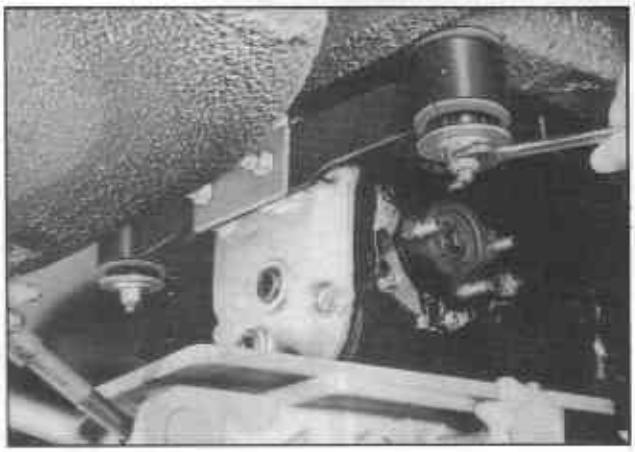


*Fig. PD-5 Removing differential mounting member*

3. Loosen off four fitting bolts that hold the gear carrier onto the suspension member.

4. Pull off the carrier backward, together with the jack.

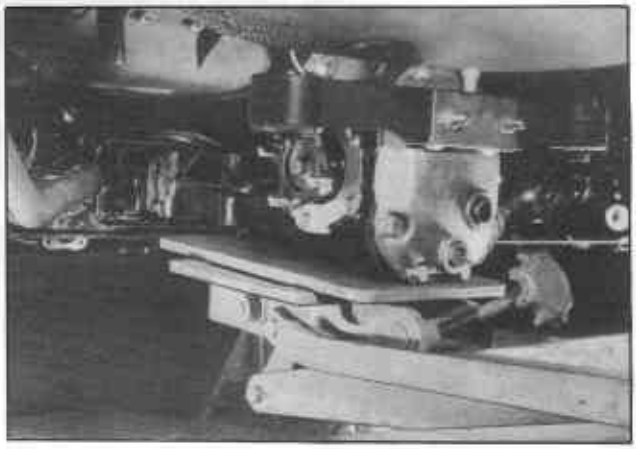


*Fig. PD-6 Removal of differential carrier*

After the gear carrier assembly is removed, support the suspension member on a stand to prevent its insulators being twisted to damage.

**Note:** **Do not place the center of the suspension member on the stand prior to removal operation. Otherwise, difficulty will result when extracting the gear carrier assembly.**

## PRE-DISASSEMBLY INSPECSION

**Check the** respective parts and components **to be disassembled** or being disassembled with **the utmost care**, so the causes for the defects **can be determined** definitely.

**1. Place the carrier** assembly on the Gear Carrier Strut & Steering Gear Box Attachment ST **37400510).**

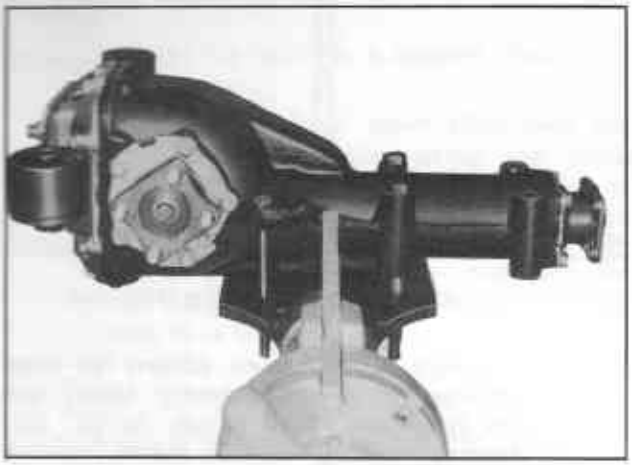


*Fig. PD-7 Holding differential carrier*

2. Check the tooth contact pattern (2 or 3 points) with a lead oxide.

**Note: For the tooth contact pattern, see paragraph dealing with "tooth contact pattern adjustment".**

3. Measure the backlash between the drive gear and pinion using a dial indicator [backlash: 0.10 to 0.20 mm (0.0039 to 0.0079 in.)].

4. Check run-out of the drive gear at the rear of it if the tooth contact pattern or the backlash is found abnormal. (run-out limit: 0.08 mm (0.0031 in.)).

5. Measure the turning torque of the driven pinion. [turning torque: 3 to 15 kg-cm (21.7 to 108.5 lb-ft)].

## DISASSEMBLY

1. Remove the clamp bolt that holds the flange.

2. Attach the Gear Carrier Side Flange Stand ST 49250000) to the side flange and extract the flange using the Sliding Hammer. (ST 4680000)

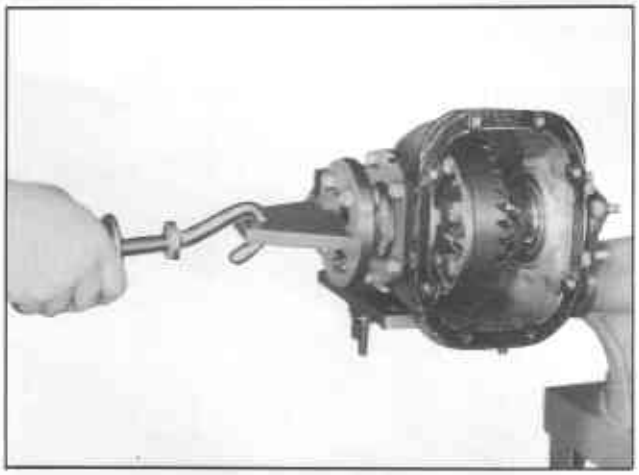


*Fig. PD-8 Removing side flange*

4. Remove the right side retainer after the left one, using the Gear Carrier Side Retainer Attachment. ST 49230000) and standard puller.

**Note:**
**a. Provide the right and left side retainers with identification marking before removal.**
**b. Care should be taken not to confuse the right and left hand side retainers and shims so that reassembly will be with the same parts in the original position.**

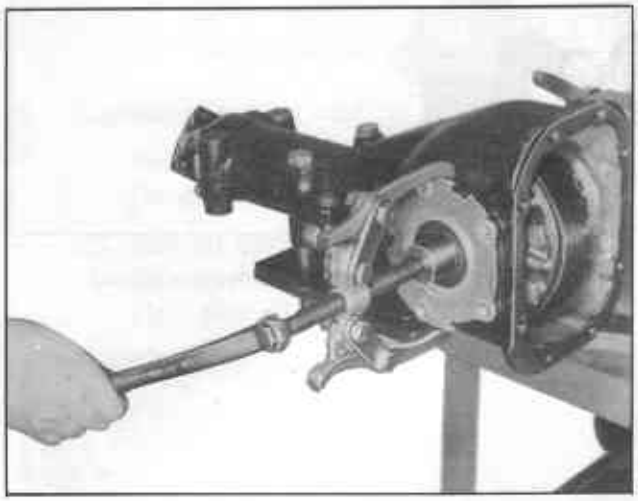


*Fig. PD-9 Removing side retainer*

5. Extract the differential case from the gear carrier as shown in Fig. PD-10.

6. When replacing the side thrust bearing, extract bearing outer race from the side retainer involved using the Gear Carrier Oil Seal Puller (ST 49240000).

*Fig. PD-10 Removing differential case assembly*

7. Loosen the drive pinion nut, holding the companion flange with the Drive Pinion Flange Wrench (ST 47340000).

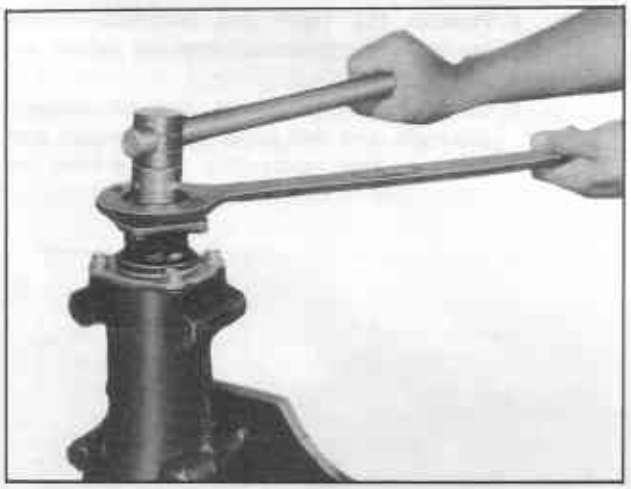


*Fig. PD-11 Removing drive pinion nut*

8. Insert the companion flange into the drive pinion, tighten the pinion nut to the given torque, and check the turning torque of the drive pinion. [pinion nut tightening torque: 17 to 20 kg-m (122.9 to 144.6 ft-lb)].
Loosen the pinion nut and pull off the companion flange.

9. Extract the drive pinion from the gear carrier using a press. The drive pinion can be taken out together with the front and rear bearing inner races, bearing spacers and adjusting washers.

10. Hold the rear bearing inner race with the Drive Pinion Rear Bearing Inner Race Replacer ST 49280000) and extract from the drive pinion with a press.

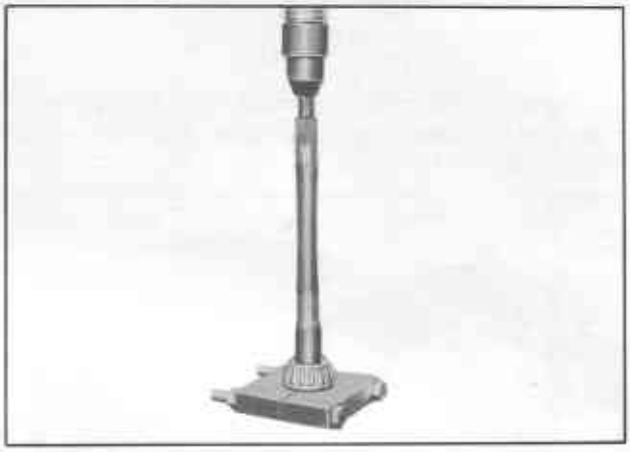


*Fig. PD-12 Removing rear bearing inner race*

**Note:** **If proper tooth contact pattern has been obtained in a predisassembly check, and the drive gear, drive pinion, carrier, rear bearing, washers, etc. are resued without being replaced, the proper tooth contact pattern can be obtained without a pinion height adjustment. Thus, the bearing inner races need not be removed.**

11. Remove the front and rear bearing outer races by a press using the Drive Pinion Outer Race Drift Assembly (ST49290000).

## Disassembling differential case

1. Extract the right hand bearing cone using the Gear Carrier Side Bearing Puller (ST 46860000) and Addpter (ST 46860002)

*Fig. PD-13 Removing side bearing cone*

Remove the left hand one after the drive gear has been detached.

**Note:** **a. The puller should be handled with care in catching the edge of bearing inner race.**
**b. Care should be taken not to confuse the right and left hand parts.**

2. Remove the hypoid drive gear by spreading out the lock strap and loosening the drive gear bolts.

**Note:** **Loosen the bolts in a diagonal line.**

3. Punch off the pinion mate shaft lock pin from the drive gear side, using the Solid Punch (ST 49270000).

**Note:** **The lock pin is caulked at the pin hole mouth on the differential case, and do not punch it off forcibly before checking how it is caulked.**

4. Draw out the pinion mate shaft and remove the pinion mate gears, side gears and thrust washers.

**Note:** **The gear as well as thrust washers should be marked or preserved separately as left and right, front and rear.**

## Replacement of oil seal

Replacement of oil seal with final drive assembly installed on the car

1. Replacing front oil seal

(1) Drain gear oil.

(2) Jack up the rear wheel.

(3) Disconnect the left hand rear cable for hand brake.

(4) Loosen U bolts holding unions before and after the pre-muffler, and turn the muffler so that it will not stand in the way of lowering the propeller shaft.

(5) Detach the propeller shaft from the companion flange of the carrier.

(6) Remove pinion nuts, holding the companion flange with a drive pinion companion flange with a Drive Pinion Flange Wrench. ST 47340000).

(7) Extract the companion flange and then the front retainer, using a standard puller.

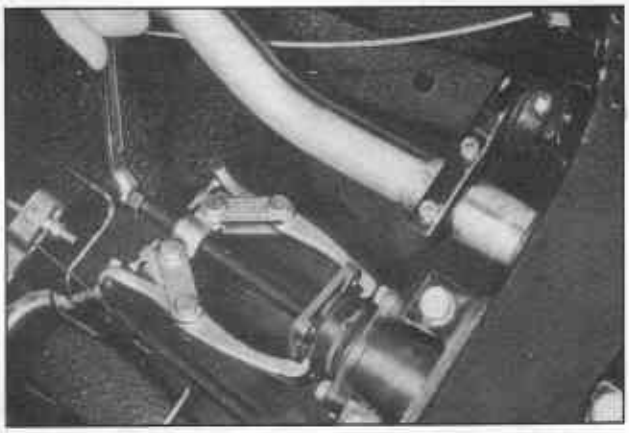


*Fig. PD-14 Removing front retainer*

(8) Remove the oil seal from the front retainer using the Gear Carrier Oil Seal Puller (ST 49240000).

(9) Set the new oil seal in position using the Gear Carrier Oil Seal Drift (ST 49320000).

**Note:** **Apply grease in between the seal lips when driving in the oil seal.**

(10) Re-install the front retainer after the oil seal is replaced, in the reverse to the removal operation.

2. Replacing side oil seal

(1) Detach the drive shaft from the side flange of the gear carrier.

(2) Extract the side flange using the Sliding Hammer (ST 46780000) and Gear Carrier Side Flange Stand (ST 49250000).

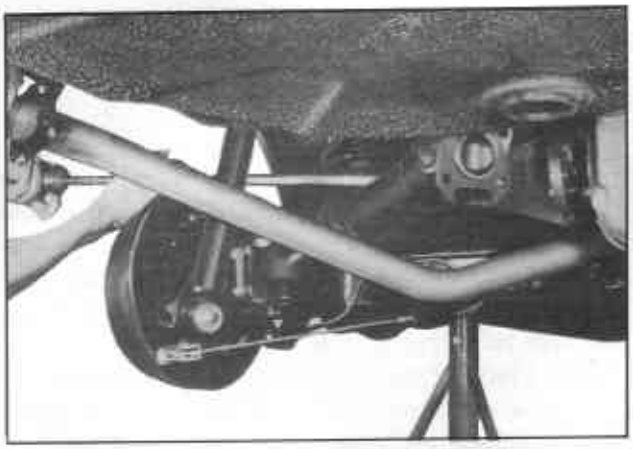


*Fig. PD-15 Removing side flange*

(3) Remove the oil seal.

(4) Set in the new oil seal, using the Gear Carrier Oil Seal Drift (ST 49320000).

**Note: Apply grease in between the oil seal lips.**

## INSPECTION

Wash all disassembled parts clean, and examine them to see if there are worn, damaged or otherwise defective, and how they are affected. Repair or replace all defective parts, whichever is necessary.

1. Check gear teeth for scoring, cracking and chipping, and make sure that tooth contact pattern indicate correct meshing depth.

If any defect is evident, replace parts as required.

**Note: Drive pinion and drive gear are supplied for replacement as a set, therefore, should either parts be damaged, replace as a set.**

2. Check the pinion gear shaft and pinion, gear mating faces for scroing and signs of wear, replace as required.

Follow the same procedure four inner faces of side gear and their seats on differential case.

3. Inspect all bearing races and rollers for scoring, chipping or evidence of excessive wear.

They should be in tiptop condition, that is not worn and with mirror-like surfaces. Replace if there is a shadow of doubt on their efficiency, as an incorrect bearing operation may result in noisiness and gear seizure.

4. Inspect thrust washer faces

Small defects can be corrected with sand paper.

In case of the backlash between the side gear and the pinion mate is over 0.2 mm (0.0079 in.) and the clearance between the side gear and thrust washer exceeds 0.3 mm (0.0118 in.), replace the thrust washer.
Three kinds of thrust washers are available.

5. Measure the run-out of the drive gear at its rear side using a dial indicator.

In case of the run-out is over 0.08 mm (0.0031 in.), replace the drive gear and pinion gear as a set.

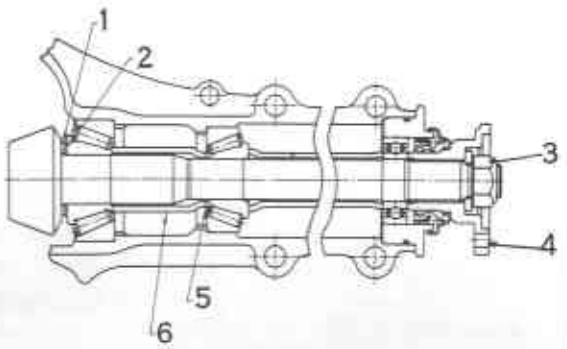
6. Inspect carrier and differential case for cracks or distortion.

If either condition is evident, replace defective parts.

7. As a general rule, oil seal should be replaced every disassembly.

## ASSEMBLY AND ADJUSTMENT

Assembly can be proceeded in the reverse order of disassembling. The following directions as to the adjustment and as to usage of Special tools enable to obtain a perfect differential operation.




1 Pinion bearing adjusting washer
2 Pinion height adjusting shims
3 Tightening torque of nut-drive pinion 17 ∿ 20 kg. m (122.9∿144.6 ft-lb.)
4 Preload for pinion bearing without oil seal and drive 7 ∿ 10 kg. m (50.6∿72.3 ft-lb.)
5 Pinion bearing adjusting washer
6 Pinion bearing adjusting spacer

*Fig. PD-16 Sectional view of drive pinion*

## Precautions in re-assembly

1. Arrange shims, washers and the like in order so that they will be installed correctly.

2. Thoroughly clean the surfaces on which shims, washers, bearings and bearing retainers will be installed.

3. Apply gear oil when installing bearings.

4. Pack grease in between the lips when fitting oil seal.

## Differential case

1. Install the side gear and pinion mate in the differential case using the corresponding thrust washers.

**2. Fit the pinion shaft to the differential case so that it meets the lock pin holes.**

**3. Measure the clearance between the differential case and the rear face of the side gear.**

**If the clearance is found to be outside the normal range, use a suitable side gear thrust washer to bring the clearance to normal.**

**Note: Normal clearance between the side gear and thrust washer is 0.1 to 0.2 mm (0.0039 to 0.0079 in.).**

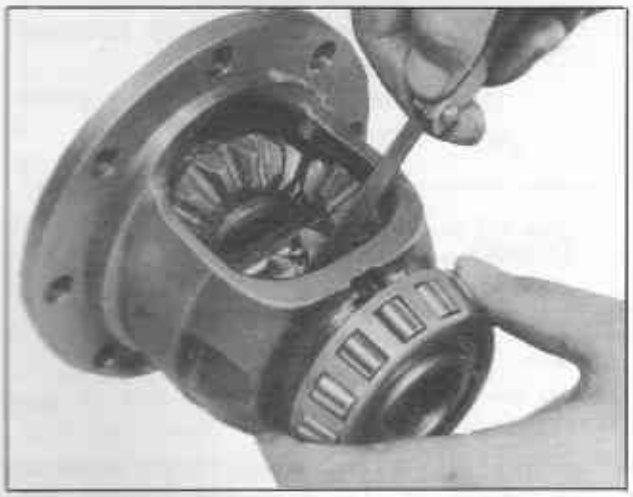


*Fig. PD-17 Measuring the clearance between the the side gear and thrust whaser*

4. Lock the pinion shaft lock pin using a punch after it is secured in to place.

5. Apply oil to the gear tooth surfaces and thrust surfaces and check if they turn properly.

6. Fit the drive gear in the differential case to the given torque. Striking lightly the head of the bolts by hammer.

[Tightening torque: 7.0 to 8.0 kg-m (50.6 to 57.8 ft-lb)]

**Note: a. Only genuine drive gear bolts and new lock bolts straps should be used.**
**b. Fasten the clamp bolts in the diagonal order by tapping on its head.**

7. When replacing the side bearing, measure the bearing width using a 2.5 kg (5.5 lb.) weight block prior to installation.

The normal bearing width is 20.00 mm (0.787 in.).

8. Press fit the side bearing cone in the differential case.

## Adjustment of drive pinion preload

Adjust the preload of the drive pinion with spacer and washer between the front and rear bearing cones, regardless of the thickness of pinion height adjusting washer and shims.

This adjustment must be carried out without the oil seal inserted.

1. Press fit the front and rear bearing outer races into the gear carrier using the drift. (Special Tool Drive Pinion Outer Race Drift Assembly ST49290000)

*Fig. PD-18 Rear bearing outer race installation*

2. Insert pinion height adjusting washer, shims and rear bearing inner race into a dummy shaft to make convenient to adjust the pinion height: Gear Carrier Height Gauge Assembly (ST 49300000).

**Note: Re-use the old washer and shims if they have been found with normal tooth contact pattern in a pre-disassembly check.**

3. Fit drive pinion bearing spacer, washer, Drive Pinion Collar (ST49310000) and companion flange in this order in a dummy shaft and tighten the drive pinion nut to the given torque to secure them.
(Pinion nut tightening torque: 17 to 20 kg-m, 122.9 to 144.6 ft-lb).

**Note: Replace the bearing washer and spacer thicker ones if the pinion cannot be turned by hand while it is being tightened.**

4. Measure the pinion bearing preload, and select the washer and spacer that will provide the required preload.

**Note: a. The initial turning torque is measured by means of the Preload Gauge (ST 46240000)**

**b. Correct pinion bearing preload when using new bearings 7 to 10 kg-cm (97.2 to 138.9 in-oz) when using old bearings 3 to 6 kg-cm (41.7 to 83.3 in-oz).**

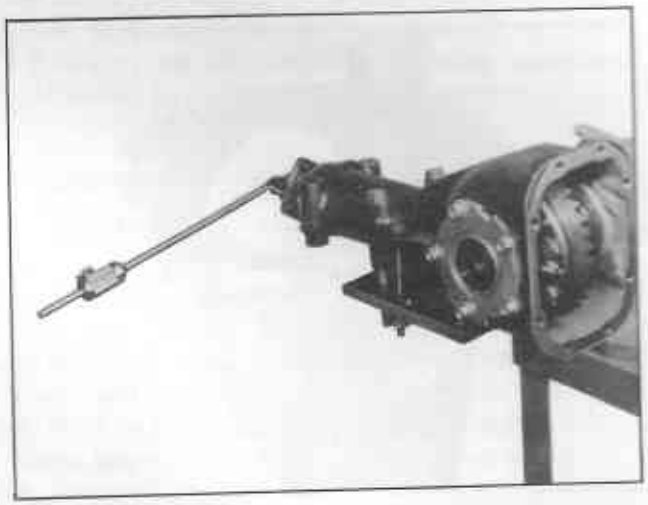


*Fig. PD-19 Measuring pinion preload*

## Adjustment of pinion height

Adjust the pinion height with washer and shims provided between the rear bearing cone and the back of the pinion gear.

1. Install the Height Gauge (ST49300000) on the carrier, with the dummy pinion mounted.

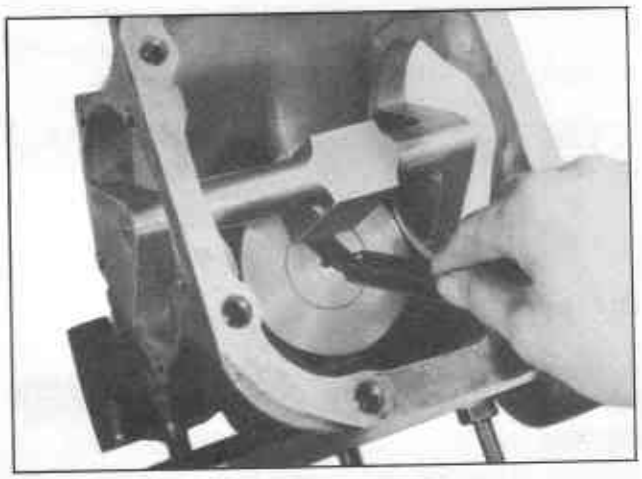


*Fig. PD-20 Measuring the clerarance*

2. Measure the clearance between the tip end of the height gauge and the end surface of the dummy shaft, using a thickness gauge.

3. The thickness of the drive pinion height adjusting shims can be obtained from the following equation:

$$S = W + T - (H \times 0.01) - 0.20$$

Where, W = Thickness of washer and shims inserted.
T = Measured value with thickness gauge.
H = Head figure on drive pinion
S = Required thicknesses of washer and shims used on drive pinion.

Example

$W = 2.20 + 1.20 = 3.40$ mm
$T = 0.24$ mm
$H = -2$
$S = 3.40 + 0.24 - (-2 \times 0.01) - 0.20 = 3.46$ mm

4. Fit the determined pinion height adjusting washer and shims in the drive pinion, and press fit the rear bearing inner race in it.

5. Install the drive pinion on the gear carrier assembly onto which fit the drive pinion bearing spacer and washer, front bearing inner race and front bearing pilot spacer.

6. Install the front retainer with bearing and oil seal in position.

7. Fit the companion flange and flat washer on the drive pinion, and secure them in position by tightening the nut to the given torque.

**Note:** **a. The drive pinion lock nut tightening torque 17 to 20 kg-m (122.9 to 144.6 ft-lb).**
**b. If the drive pinion lock nut is found with wear, replace it.**

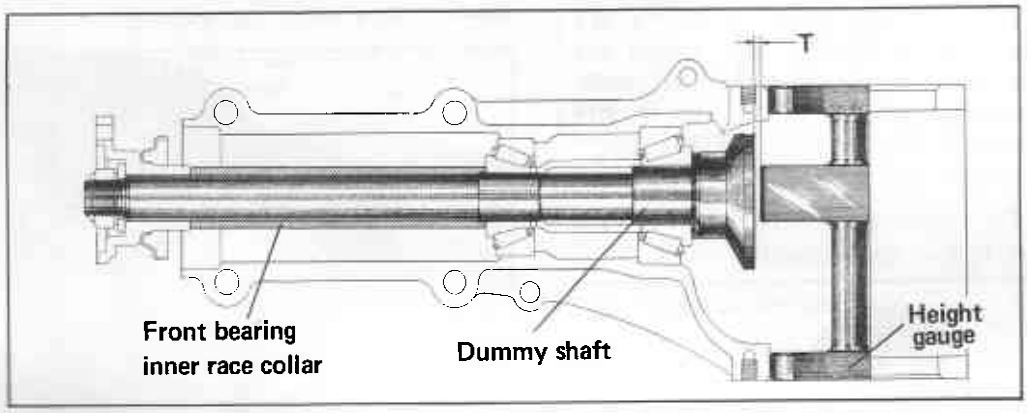



*Fig. PD-21 Adjusting pinion height*

## Adjustment of the side retainer shims

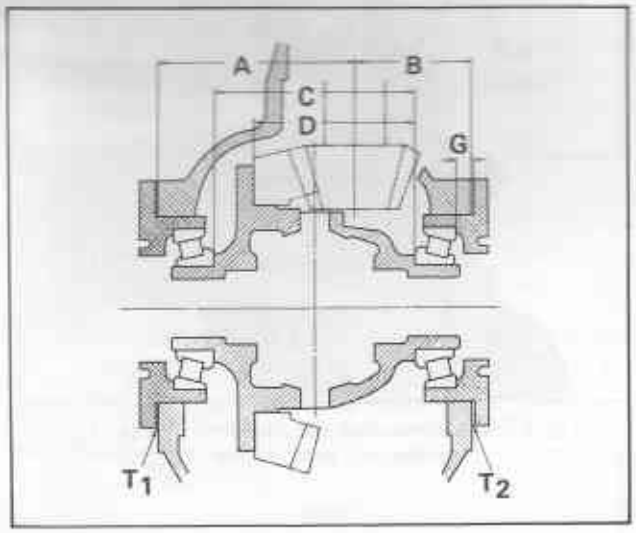



*Fig. PD-22 Thickness of shims on left side*
*Thickness of shims on right side*

1. If the carrier, differential case, side bearing or side bearing retainer have been replaced with new ones, adjust the side bearing preload with adjusting shim. The required thicknesses of the left and right retainer shims can be obtained from the following equations:

$$T1 \text{ (left)} = (A + C + G - D - E + H) \times 0.01 + 0.76$$

$$T2 \text{ (right)} = (B + D + G - F - H) \times 0.01 + 0.76$$

The figure of A, B, C, D, G and H shows the dimension variation in a unit of 1/100 mm against each standard measurement.

Where

A & B = The figure marked on the gear carrier

C & D = The figure marked on the differential case.

E & F = They are the difference of the width of left or right side bearing against the standard width 20.0 mm (0.7874 in.) and have to be given in a unit of 1/100 mm.

G = The figure marked on the side retainer.

H = The figure marked on the drive gear side by an electric pen.

To measure the width of the side bearing, use the standard gauge (20.0 mm, 0.7874 in. thickness) and dial indicator on a small surface plate.

In this case, place load on the bearing with the aid of weight block for about 2.5 kg (5.5 lb.) to acquire the steady figures.

Take the left side bearing, for example. When the measured width is 19.8 mm (0.7795 in.), it is -0.2 mm (-0.008 in.) against the standard width and is, by excluding the minus sign, 20 ( = 0.2 mm ÷ 0.01 mm).

**Note:** **If it is necessary to use the bearing again, the thickness of each adjusting shim of left and right side must be reduced from 0.03 to 0.07 mm (0.001 to 0.003 in.) on the basis of 80% or 60% against the required shims in accordance with the practical condition of use, so as not to give over preload to the side bearing.**

E3 and F3 represent 19.99, 19.98, and 19.97, respectively.

*Fig. PD-23 C & D figures*

G: Numerical figure given on side retainers.

*Fig. PD-24 G figures*

2. Install the differential case assembly in the gear carrier in the reverse order to which it is disassembled.

3. Fit given shims and O-rings in the both side retainers, and install retainers in the carrier using the Gear Carrier Side Retainer Guide (ST49330000).

**Note:** **When installing the retainers, take care that the side bearing outer races are not damaged by the roller.**

4. Measure the backlash of the drive gear and the drive pinion by using the dial indicator and adjust it to 0.10 to 0.20 mm (0.0039 to 0.0079 in.).

If it is below the designated value, move the shim from the right to the left. If it is over it, move it inversely.

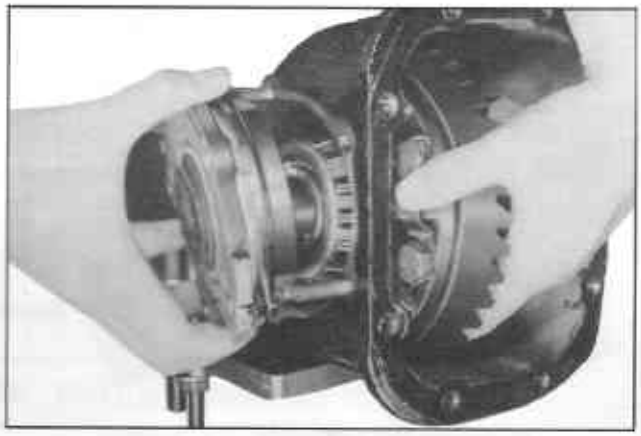


*Fig. PD-25 Installation of side retainer*

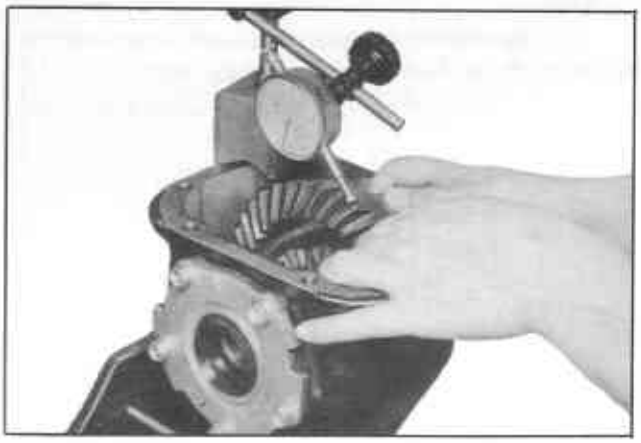


*Fig. PD-26 Measuring the backlash of the drive gear and pinion*

5. At the same time, measure the turning torque of the drive pinion. If the turning torque is not found larger by between 1 and 3 kg-cm (2.12 lb-ft) than before the differential case was installed in the gear carrier, adjust it with side retainer shims.

Incidentally, decrease or increase in the thickness of the shims causes the drive gear and the pinion to change in backlash.

Thus, check if they have the proper backlash.

5. Check and adjust the tooth contact pattern of the drive gear and drive pinion.

Apply thin coat of red lead in oil on 4 to 5 teeth evenly at two places of the drive gear and turn it backward and forward several times by hand. This causes the gear to impress a pattern on the painted section of the gears drive and coast side.

This is the tooth contact pattern that is the final proof of the adjustments.

Incorrect contact pattern of teeth shall be adjusted in the following manner.

a. Heel contact

Increase the thickness of drive pinion adjusting shim and washer in order to bring the drive pinion close to the drive gear.

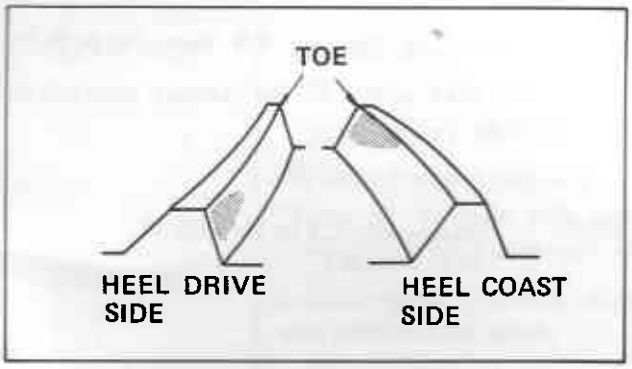



*Fig. PD-27 Heel contact*

b. Toe contact

Reduce the thickness of drive pinion adjusting shim and washer in order to go drive pinion away from drive gear.

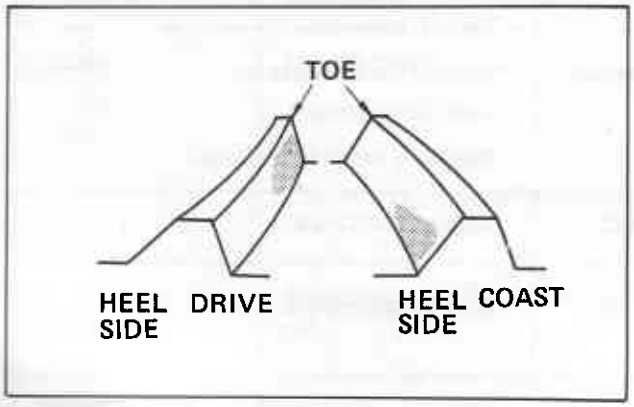



*Fig. PD-28 Toe contact*

c. Flank contact (low and shallow contact)

Adjust similar to b.

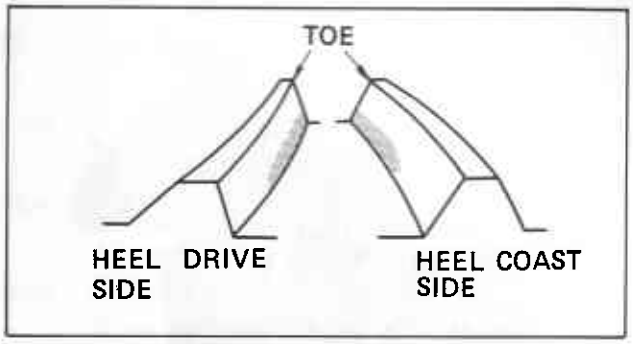



*Fig. PD-29 Flank constant*

d. Face contact (high and shallow contact)

Adjust similar to a.

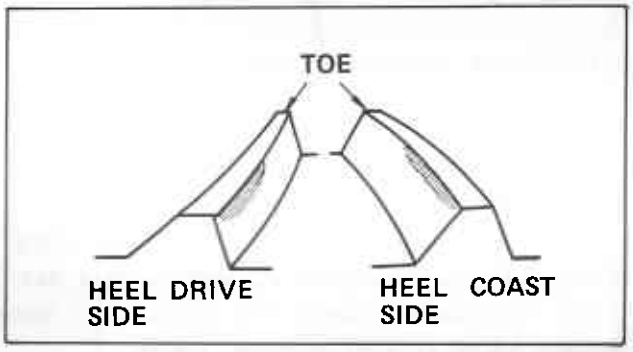



*Fig. PD-30 Face contact*

e. When proper tooth contact is obtained, wipe off red lead from gear face.
A correct contact pattern means that it lies in the range of 2/3 to 3/4 from the tip of the tooth under no load.

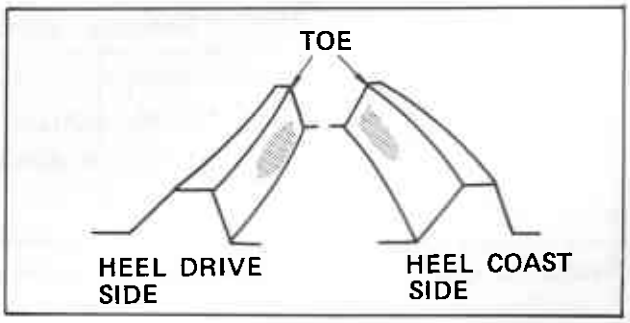



*Fig. PD-31 Correct contact*

Note: Change in the thickness of the adjusting washer or shim is accompanied by change in backlash. Check it when installing the gear.

7. Check if the run out of the drive gear rear side is within 0.08 mm (0.0031 in.).

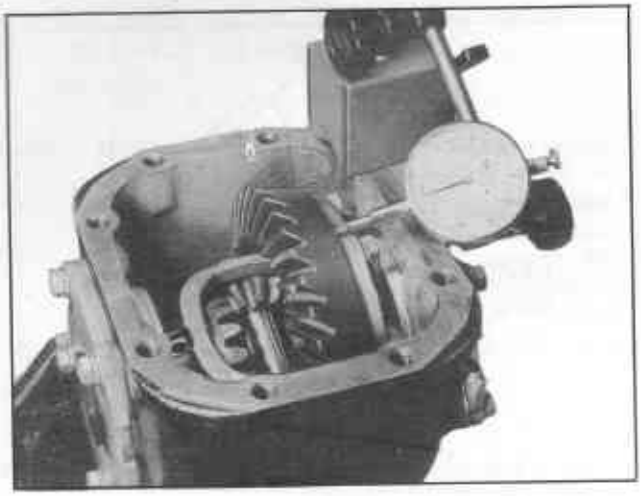


*Fig. PD-32 Measuring run out of the drive gear*

and tighten the nuts to the given torque.

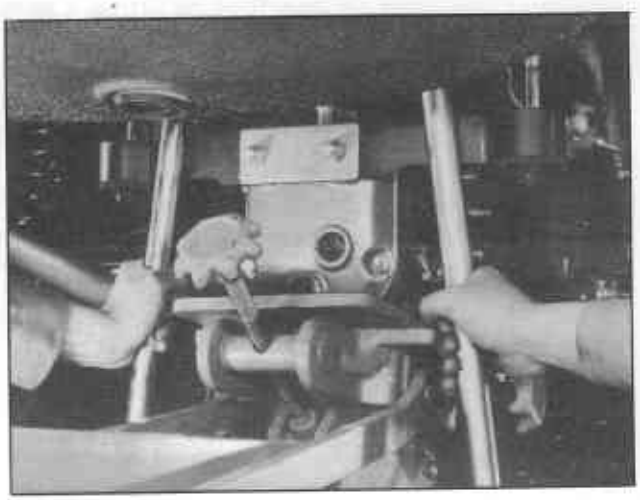


*Fig. PD-33 Installation of differential mounting member*

**Note: Tightening torque: 8.5 kg-m (61.5 lb-ft)**

3. Install other parts on the manner reverse to disassembly.

4. Fill the correct gear oil.

**Note: Oil quantity 0.8 ltr (API.GL-5) (0.21 U.S.gal.)**

## Intsalling gear carrier assembly

1. Secure the gear carrier assembly onto the rear suspension member by tightening four bolts together with washers.

2. Fit the differential mounting member to the fitting hole by pushing it forwards with a bar,

## TROUBLE DIAGNOSES AND CORRECTIONS

There exists always the problem of noises when the rear axle is in trouble and the system of trouble comes out as noises.

However, great care must be taken not to confuse with other noises such as engine noise, transmission noise, exhaust noise, universal joint noise, drive shaft noise, wheel bearing noise and tire noise.

| Troubles | Possible causes | Remedies |
|---|---|---|
| Noise on drive | Shortage of oil. | Supply gear oil. |
| | Incorrect tooth contact between drive gear and drive pinion. | Adjust tooth contact. |
| | Damaged gear. | Replace defective parts. |
| Noise on coast | Incorrect backlash between drive gear and drive pinion. | Adjust backlash. |
| | Incorrect adjustment of drive pinion bearing. | Adjust correctly. |
| Noise on drive and coast | Drive pinion bearings worn or damaged. | Rebuild differential and replace as required. |

| | | |
|---|---|---|
| | Incorrect tooth contact pattern. | Adjust backlash or replace the hypoid gear set. |
| | Damaged side gear, drive gear, drive pinion teeth surface. | Replace required parts. |
| | Seized up drive gear and drive pinion. | Replace hypoid gear set. |
| | Pinion bearing under inadequate preload. | Adjust preload. |
| | Seized up, damaged or broken pinion bearing. | Replace the bearing. |
| | Seized up, damaged or broken side bearing. | Replace the side bearing. |
| | Swinging differential case. | Replace the differential case. |
| | Loosen clamp bolts and nuts holding drive gear, side retainers, etc. | Clamp them to the designated torque. |
| Noise on turn | Side gear jammed in differential case. | Replace defective parts. |
| | Pinion gears too tight on their shaft. | Replace as required. |
| | Worn or damage side gear thrust washer and pinion thrust washer. | Replace. |
| | Interference between side flange and differential case. | Repair the part responsible for interference, or replace the side flange and differential case. |
| | Seized up or damaged side bearing. | Replace the side bearing. |
| Excessive backlash | Incorrect backlash between drive gear and drive pinion. | Adjust backlash. |
| | Worn differential gears or case. | Replace worn parts. |
| | Worn side flange and side gear serration. | Replace worn parts. |
| Seizure | Insufficiently oiled. | Apply Nissan genuine oil. |
| | Unsuited oil used. | API. GL-5 in designated quantity (0. 8 ltr. ) |
| | Excessively small backlash. | Adjust backlash and replace as required. |
| Breakage of differential | Shortage of oil or use of improper oil. | Rebuild differential and replace as required. |
| | Severe service due to an excessive loading, improper use of clutch. | After adjusting preload of bearings, backlash and engaging condition of |

| | | |
|---|---|---|
| | Incorrect adjustment of bearings. | gears, fasten parts and apply specified volume of genuine gear oil. |
| | Incorrect adjustment of drive gear and drive pinion. | Avoid abusing of the car. |
| | Excessive backlash doe to defacement of side gear and thrust washer. | |
| | Loosened bolts and nuts, such as drive gear clamp bolt. | |
| Oil leakage | Worn-out, damaged or improper driven front oil seal, or bruised, dented or abnormally worn slide face of companion flange. | Replace the defective oil seal. |
| | | Ammend the affected flange with sand paper or replace if necessary. |
| | Worn, damaged or improperly driven side flange oil seal, or bruised, dented or abnormally worn slide face of side flange. | Treat as above. |
| | Loosely bolted front retainer, side flanges or side retainers. | Tighten the bolts to the designated torque. |
| | Or defective O-rings for these parts. | Replace defective O-rings with new ones. |
| | Damaged rear cover or rear cover gasket. | Tighten the bolts to the designated torque. |
| | | Replace the defective gasket with new one. |
| | Loose filler or drain plug. | Tighten the plug. |
| | Clogged or damaged breather. | Repair or replace. |

# DIFFERENTIAL CARRIER - STATION WAGON

## CONTENTS

## DESCRIPTION

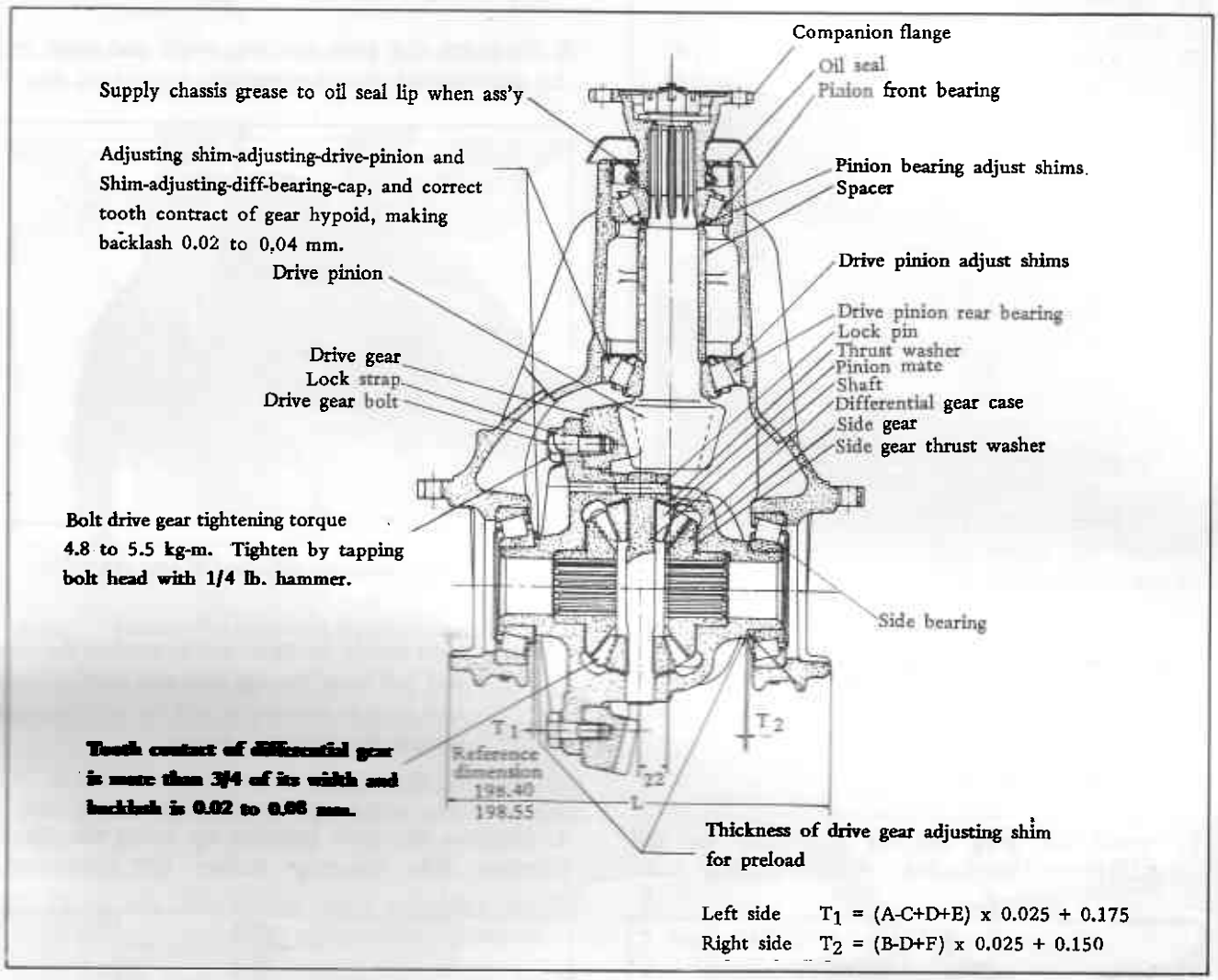



*Fig. PD-34 Sectional view of differential carrier*

The gear carrier is made of light and strong alloy of aluminum and the hypoid bevel gear is used.

Inch standardization still remains for all the screw threads of this unit. Therefore adjustments figures stamped on screws, adjusting shims, washers, differential case, drive pinion and carrier are in inches according to the inch standardization of parts as before.

The proper lubrication to the gear housing is necessary, otherwise it would shorten the durability of the gear and cause other troubles. The lubricant should be checked each 5,000 km (3,000 mile) and replenished as necessary.

The lubricant should be drained and refilled at the end of the first 1,000 km (600 mile) to eliminate any loose material from the sump which results from "breaking". After 1,000 km (600 mile) drain, differential lubricant should be changed every 50,000 km (30,000 mile) maximum.

The following points must be taken into consideration.

1. Nominated hypoid gear oil No. MP 90 must be used.

When temperature is over 32° C (90° F), use gear oil SAE MP 140.

2. It is prohibited to use any gear oil of different viscosity.

The same brand must always be selected.

3. The standard oil capacity is about 1.0 ltr. (0.264 U.S.gal.).

## REMOVAL

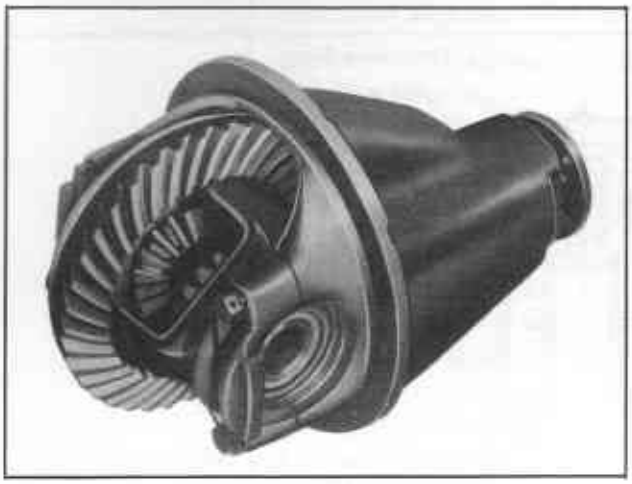


*Fig. PD-35 Differential carrier assembly*

To remove the gear carrier assembly, disconnect the drive pinion companion flange-to-flange yoke connection and remove the two rear axle shafts. These works can be made by referring "REAR AXLE, Removal step 1, 2, 3 and 7, and Disassembly step 3, 4, and 6 in detail.

## DISASSEMBLY

1. Install the gear carrier assembly on the Gear Carrier Attachment. (ST 3740000D)

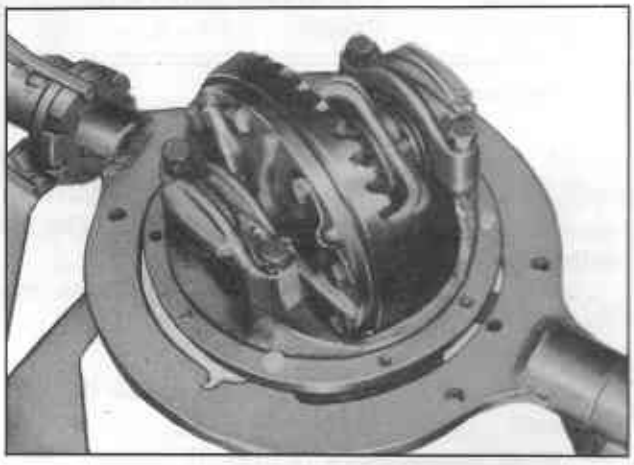


*Fig. PD-36 Holding differential carrier*

2. Inspect the following before disassembling.

(1) Inspect the tooth contact pattern with a lead oxide.

(2) Measure backlash between drive gear and pinion gear using a dial indicator.

3. Remove the side bearing caps and take out the differential case assembly.

*Fig. PD-37 Removing differential case assembly*

**Note:** **Care should be taken not to confuse the right and left hand bearing caps and bearing outer race so that reassembly will be with the same parts in the original position.**

4. Remove the side bearing by using the Gear Carrier Side Bearing Puller (ST 46860000).

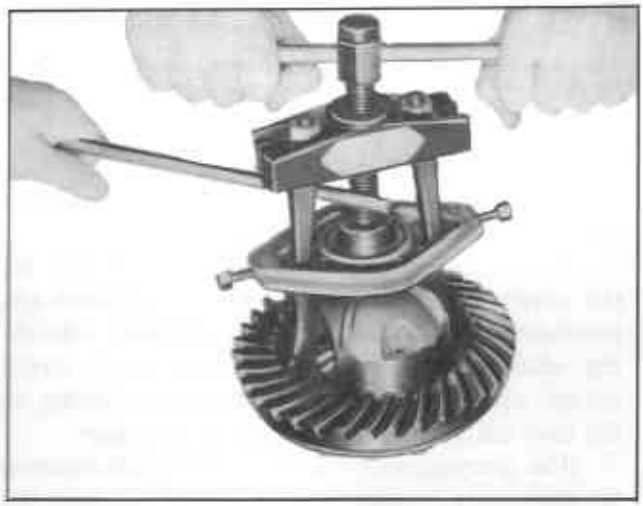


*Fig. PD-38 Removing side bearing*

**Note:** **a. The puller should be handled with care in catching the edge of bearing inner race.**

**b. Care should be taken not to confuse the right and left hand parts.**

5. Remove the hypoid gear by spreading out the lock strap and loosening the drive gear bolts.

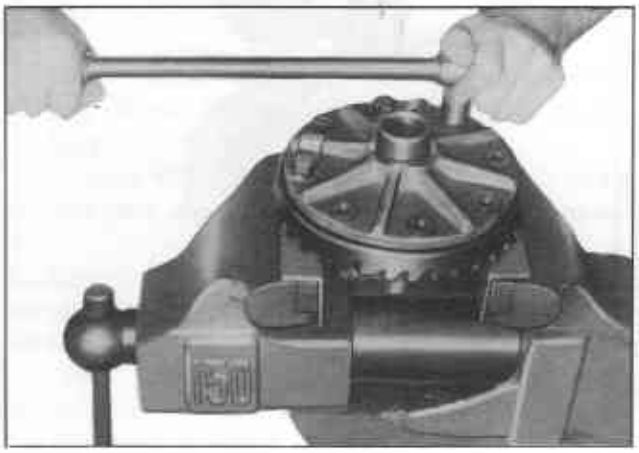


*Fig. PD-39 Removing drive gear*

**Note: Loosen the bolts in a diagonal line.**

**6. Measure backlash between the side gear and the pinion mate using a dial indicator.**

**7. Drive out the pinion shaft lock pin from left side (from the side of the drive gear) to right side.**

8. Draw out the pinion shaft and take out the mate pinions, side gears and thrust washers.

**Note: The gears as well as thrust washers should be marked or preserved separately as left and right, front and rear.**

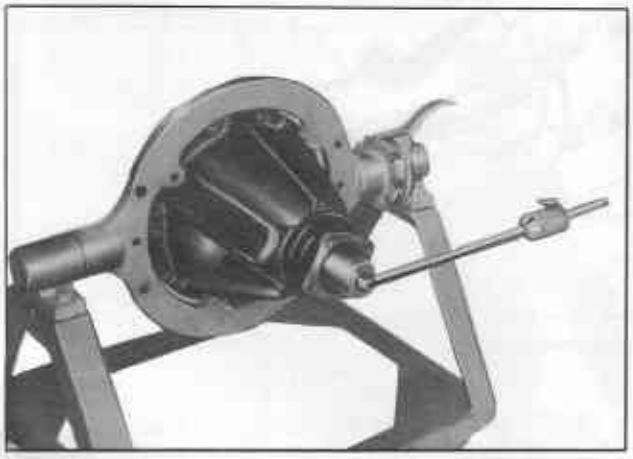


*Fig. PD-40 Measuring initial turning torque of drive pinion*

9. Measure the initial turning torque of drive pinion gear by using the Preload Gauge (ST 46240000) and drive pinion height by using the Drive Pinion Arrangement Gauge (ST 46200000).

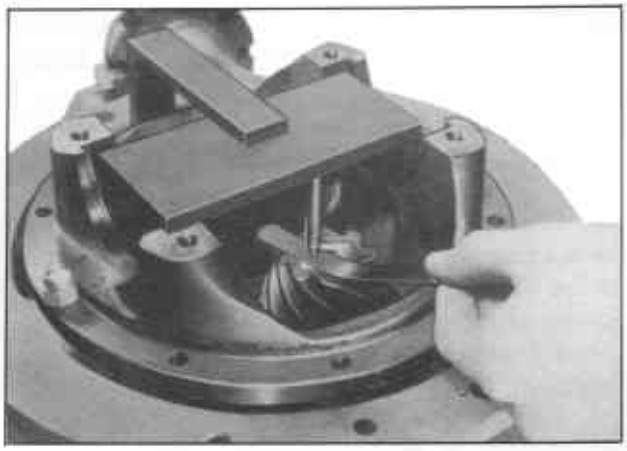


*Fig. PD-41 Measuring pinion gear dipth*

10. Remove the drive pinion nut and draw out the companion flange assembly.

**Note: Use the Drive Pinion Flange Wrench to hold the companion flange. (ST 47340000)**

*Fig. PD-42 Removing drive pinion unit*

11. Remove the drive pinion assembly to the rearwards by tapping the front end with a plastic hammer.

The drive pinion can be taken out together with the inner race of rear bearing, bearing spacer and adjusting washer.

12. **Remove the oil seal** and take out the front **bearing inner race.**

**Note: The removed oil seal should not be reused.**

13. **Draw** out the outer races of both front and **rear bearing** using following special tools.
**Drive Pinion Front, Rear Bearing Outer Race Replacer (ST 47820000).**
**Drive Pinion Front, Rear Bearing Outer Race Replacer Adapter (ST 46310000).**

14. Draw out drive pinion rear bearing inner race using the following special tools.
**Drive Pinion Rear Bearing Inner Race Replacer Adapter (ST 46320000).**
**Drive Pinion Rear Bearing Inner Race Replacer (ST 47120000).**

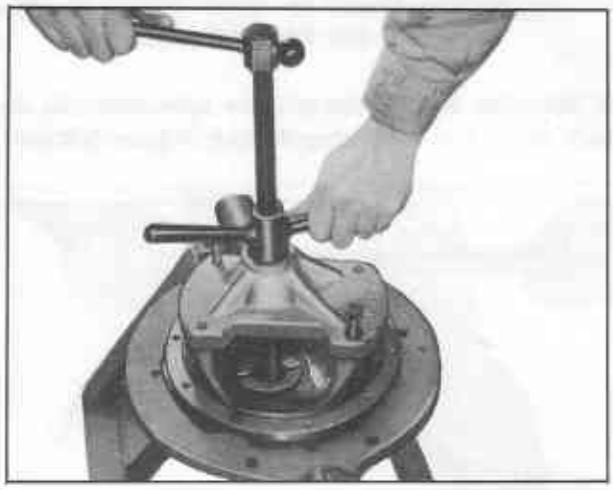


*Fig. PD-43 Drawing out rear bearing outer race*

## INSPECTION AND REPAIR

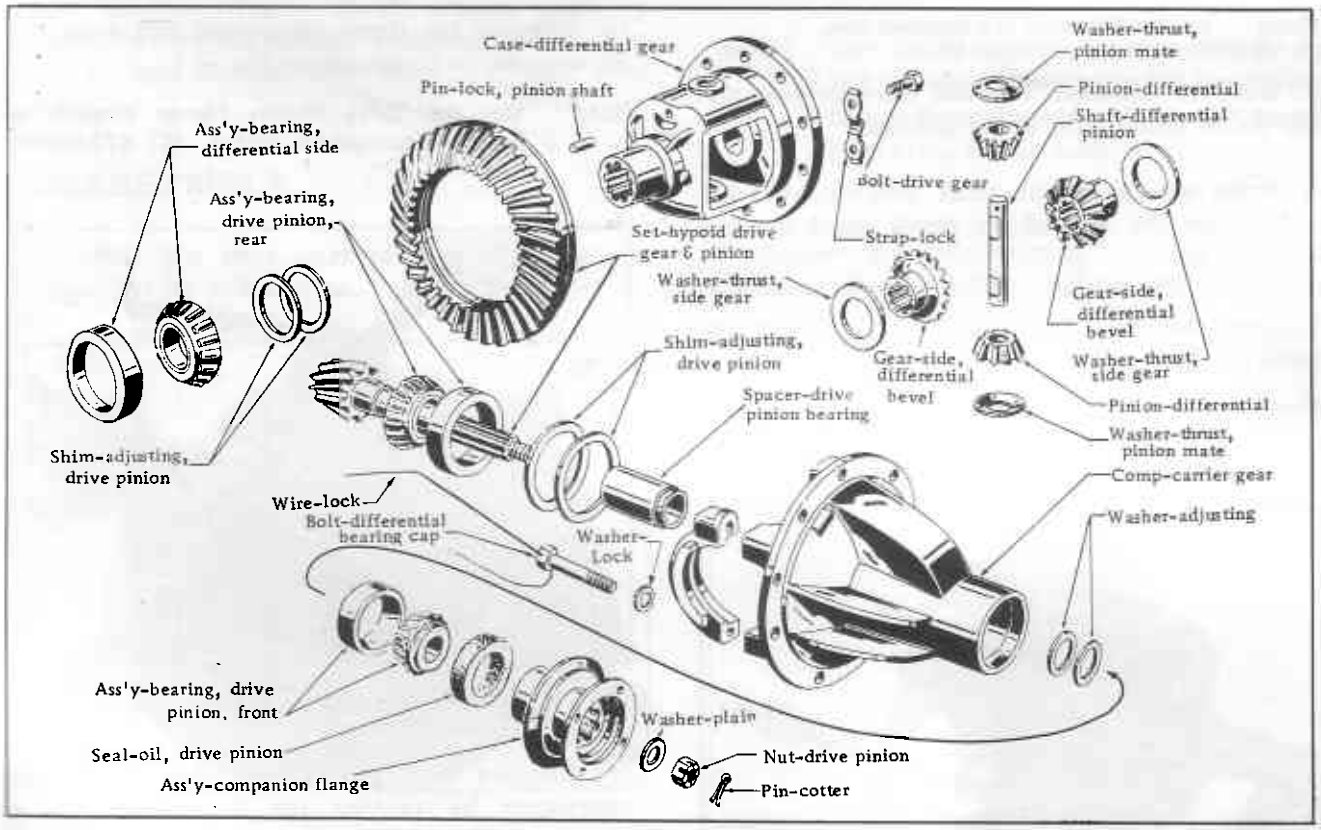



*Fig. PD-44 Gear carrier and gear*

**Prior** to inspecting various parts thoroughly **wash them** in order that damage and wear may **be easily detected.**

**Then proceed** as follows.

1. Check gear teeth for scoring, cracking and chipping, and make sure that tooth pattern indicate correct meshing depth.

If any defect is evident, replace parts as required.

**Note: Drive pinion and drive gear are supplied for replacement as a set, therefore, should either parts be damaged, replace as a set.**

2. Check the pinion gear shaft and pinion gear mating faces for scoring and signs of wear, replace as required.

Follow the same procedure for inner faces of side gear and their seats on differential case.

3. Inspect all bearing races and rollers for scoring, chipping or evidence of excessive wear.

They should be in tiptop condition, that is not worn and with mirror-like surfaces.

Replace if these is a shadow of doubt on their efficiency, as an incorrect bearing operation may result in noisiness and gear seizure.

4. Inspect thrust washer faces

Small defects can be corrected with sand paper. In case of the clearance between the side gear and thrust washer exceeds 0.2 mm (0.0079 in.), replace the thrust washers. Five kinds of thrust washers are available.

5. Measure the run-out the drive gear at the rear side using a dial indicator.

In case of the run-out is over 0.05 mm (0.0020 in.), replace the drive gear and pinion gear as a set.

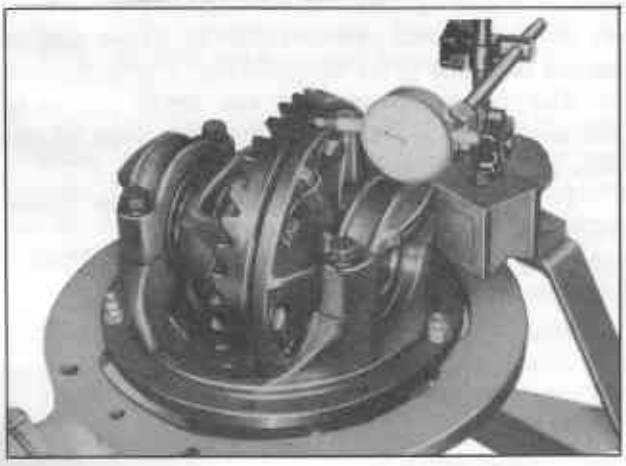


*Fig. PD-45 Measuring run-out of drive gear*

6. Inspect carrier and differential case for cracks or distortion.

If either condition is evident, replace defective parts.

## ASSEMBLY AND ADJUSTMENT

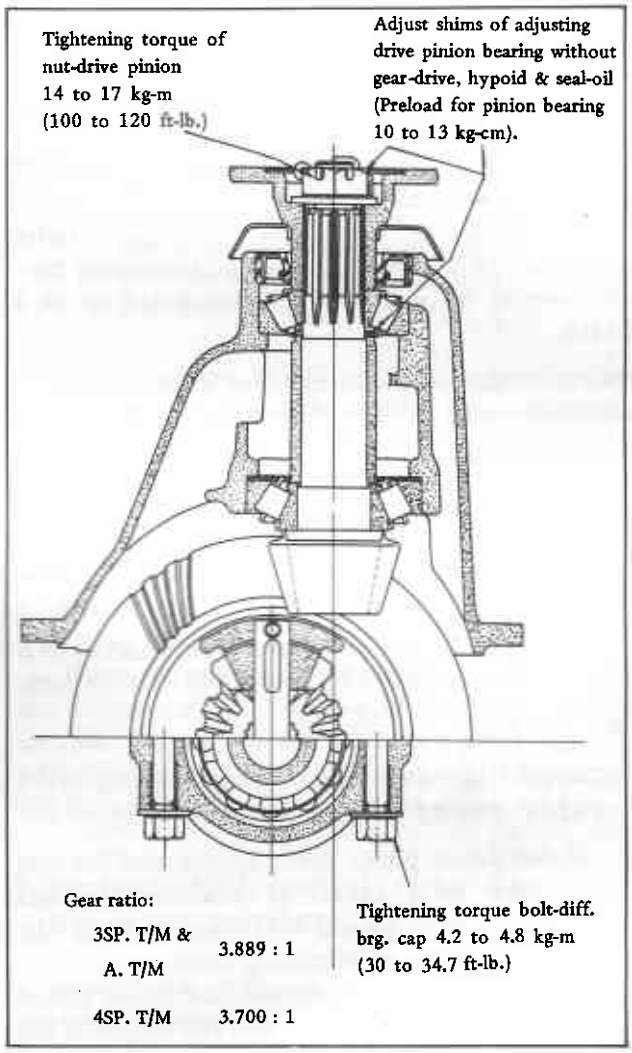



*Fig. PD-46 Carrier section*

Assembling can be proceeded in the reverse order of disassembling. The following directions as to the adjustment and as to usage of special tools enable to obtain a perfect differential operation.

### Assembling differential gear Case assembly

1. Assemble the pinion mate, side gear and thrust washer in the differential case.

2. Adjust the clearance between the side gear and thrust washer within 0.05 to 0.20 mm (0.0020 to 0.787 in.) by selecting the side gear thrust washer.

3. Fit the pinion lock pin from the right side of the case (opposite side of drive gear) and peen the hole rim over to prevent the lock pin vibration loose.

4. Bolt the drive gear to differential case.

Only genuine drive gear bolts and new lock bolt straps should be used.

Tighten the bolts striking lightly the head of the bolt by hammer.

The order of tightening drive gear bolts should be in a diagonal line and tightening torque should be 4.8 to 5.5 kg-m (34.7 to 39.8 ft-lb).

5. Press the side bearing inner race on the differential case using the Gear Carrier Side Bearing Drift. (ST49260000)

**Note: It is important in this case to fit the drive gear adjusting shims behind the bearings to obtain proper preload and mounting of gear teeth.**

**The adjusting procedure is described in later page in detail, no instruction is given here.**

## Assembling drive pinion bearing outer races

If the drive gear, drive pinion and bearing are reused as a result of disassembling and inspection, they should be assembled at the previous condition of adjusting shim.

And if the drive gear and the drive pinion are replaced as a new set and the height of the drive pinion previously used is correct, deduct or add the rear bearing shim of which thickness is equal to the difference in figure of the new drive pinion from the old one. The former is the case of a plus quantity and the later is the case of a minus quantity.

In either case, it will be required to recheck the height of the drive pinion and adjust it, if necessary.

1. Press the drive pinion rear bearing outer race into the gear carrier.

In this case, after inserting the properly selected adjusting shim between the carrier and bearing race, mount the outer race by using the special tools of Drive Pinion Front, Rear Bearing Outer Race Replacer. (ST47820000)

**Note: a. For adjustment of pinion height the shim at the rear side of this outer race is increased or decreased and the race also must be taken off each time for this adjustment, therefore the tools must be handled properly to avoid such a situation as to make the bearing hole of carrier in an oval.**

**b. Referring to handling method of tool, set the adapter ring on the corn to guide the body of tool at the small hole of carrier, put the rear outer race on the corn as bearing surface faces inside and put the split adapter inside race.**
**At the same time, supporting it by the bar, twist up the corn till the adapter and race come to the settled position then screw up the wing nut so the race be housed properly at the settled position.**

2. Press the front bearing outer race into the gear carrier.

Fix the tool with the side bearing cap bolts so as to be the center of the gear carrier, then mount it by using adapter in the same way with mounting the rear outer race.

## Assembling Drive Pinion

Press the rear bearing inner race on the drive pinion.

## Setting and adjusting drive pinion

A provisional adjustment of drive pinion should be made prior assembling.

The fixing position of the drive pinion is accomplished by selecting the thickness of the rear bearing shim.

For determining thickness, use the Drive Pinion Arrangement Gauge.
(ST46200000).

1. Install the drive pinion in the gear carrier and assembled the front bearing inner race and the companion flange on it.

The bearing washer, bearing spacer and oil seal should not be installed.

2. Tighten the drive pinion nut so that the

initial turning torque of the drive pinion is 10 to 13 kg-cm (138.9 to 180.5 in-oz).

**Note:** **The initial turning torque is measured by means of the Drive Pinion Preload Gauge (ST 46240000) installed on the drive pinion nut.**

3. Set the Arrangement Guage seated squarely in the housing bores and measure the clearance between the tip of the gauge center rod and the pinion head by a thickness gauge.

4. Decide the correct pinion depth.

The required thickness of rear bearing adjusting shim can be calculated by the following formula.

$$T = N - (H \times 0.25) - 0.2$$

Where T = Required thickness of rear bearing adjusting shim (mm).
N = Measured clearance between Arrangement Gauge and drive pinion face (mm).
H = Figure marked on the drive pinion head.

Example

N = 0.4 mm
H = -2
T = 0.4 - (-2 x 0.025) - 0.2 = 0.4 - (-0.05) - 0.2 = 0.25 mm

**Note:** **The figure "H" with 0 & + or – sign marked by an electric pen shows the pinion head variation at the unit of 0.001 in (0.025 mm) to decide the thickness of adjusting shim for setting pinion position. (The standard pinion height is 61.0 mm (2.4016 in.) from axle center.).**

5. Take off the drive pinion as well as the rear bearing outer race from the gear carrier and adjust the drive pinion position by increasing or decreasing the number of the rear bearing adjusting shim (Five kinds of adjusting shims are available), considering the above required thickness.

6. Install the drive pinion with a bearing spacer in the gear carrier and tighten up the drive pinion nut by using a torque wrench at the regular torque of 14 to 17 kg-m (101.3 to 130.0 ft-lb).

7. Measure the pinion bearing preload by using the Drive Pinion Preload Gauge and adjust it by selecting the bearing spacers (Three kinds of spacers are available.) and bearing adjusting washers between front bearing inner race and bearing spacer. (Fifteeen kinds)

The initial turning torque should be 10 to 13 kg-cm (138.9 to 180.5 in-oz) without oil seal when drive pinion nut is tightened to 14 to 17 kg-m (101.3 to 130.0 ft-lb).

**Note:** **If it is necessary to fit the used bearing again in assembling, the initial turning torque should be reduced from 20 to 40% against the standard torque in accordance with the conditions of practical use so as not to give over preload.**

8. Inspect pinion height again when the former adjustment of bearing preload is completed. Unless anything wrong is found, remove the pinion drive nut and the companion flange and press new oil seal into the gear carrier. Pack chassis grease between lips of oil seal.

9. Again install the companion flange, washer and pinion nut.

Then nut should be tightened up at the regular torque 14 to 17 kg-m (101.3 to 130.0 ft-lb). In case the cotter pin hole does not align, the adjustment should be made not by over tightening the nut, but by filling the washer.

## Installing differential case assembly into gear carrier

1. Install the differential case assembly into the gear carrier.

*Fig. PD-47 Installing differential case assembly*

2. Install the side bearing caps and tighten the bolts provisionally.

**Note:** **a. There is a engraved mark on the side of cap should be matched with mark on the leg of bearing housing when assembling.**
**b. Tightening torque should be 4.2 to 4.8 kg-m (30.4 to 34.7 ft-lb).**

3. Adjust the side bearing preload with adjusting shim. Five kinds adjusting shims are available.

The required thickness of adjusting shim can be calculated by the following formula.

Left side (Drive gear side)
T1 = A - C + D + E + 7

Right side (Pinion mate side)
T2 = B - D + F + 6

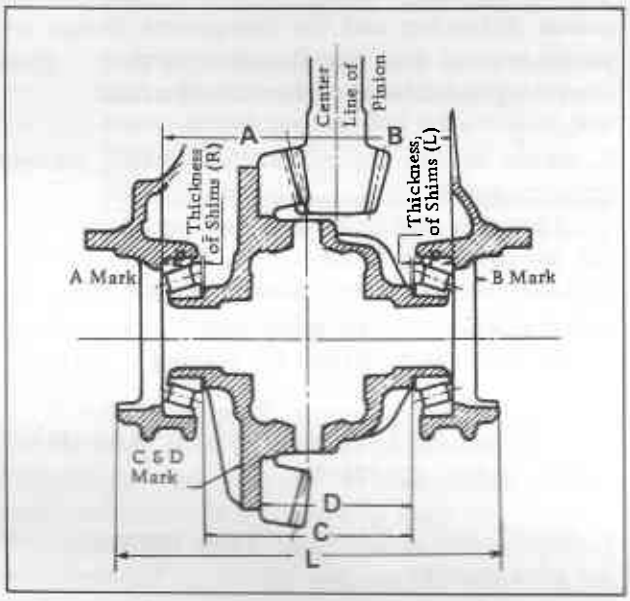



*Fig. PD-48 Thickness of shim on left side Thickness of shim on right side*

The figure of A, B, C, and D shows the dimension variation in a unit of 1/1,000 in. against each standard measurement.

Where A = The figure marked on the left side bearing housing of gear carrier.
B = The figure marked on the right side bearing housing of gear carrier.
C&D = The figure marked on the differential case.
E&F = They are the difference of the width of left or right side bearing against the standard width 20.0 mm (0.7874 in.) and have to be given in a unit of 1/1,000 in.

Example of calculation
A = +1, B = +2, C = -1, D = +3
E = 8 (0.2 mm/0.025 mm = 8)
F = 10 (0.25 mm/0.025 = 10)

Left side
T1 = A - C + D + E + 7 = 1 - (-1) +3
= 0.025 mm x 20 = 0.5 mm

Right side
T2 = B - D + F + 6 = 2 - 3 + 10 + 6 + 15
= 0.025 mm x 15
= 0.375 mm

To measure the width of the side bearing, use the standard gauge (20.0 mm, 0.7874 in. thickness) and dial indicator on a small surface plate.

In this case, place load on the bearing with the aid of weight block for about 2.5 kg (5.5 lb.) to acquire the steady figures.

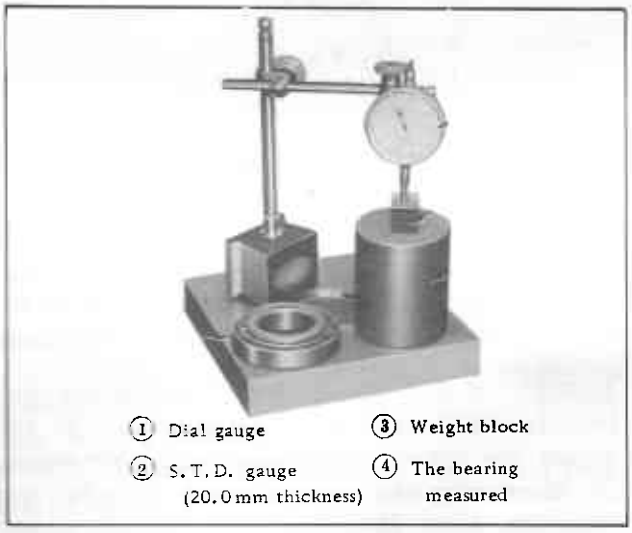



*Fig. PD-49 Measuring for bearing*

Take the left side bearing, for example. When the measured width is 19.8 mm (0.7795 in.), it is -0.2 mm (-0.008 in.) against the standard width and E is, by excluding the minus sing, 8 ( = 0.2 mm ÷ 0.025 mm, 0.008 in. ÷ 1/1.000 in.).

**Note:** **If it is necessary to use the bearing again, the thickness of each adjusting shim of left and right side must be reduced from 0.025 to 0.075 mm (0.001 to 0.003 in.) on the basis of 80% or 60% against the required shim in accordance with the practical condition of use, so as not to give over preload to the side bearing.**

4. Measure the crown gear and pinion gear backlash by using the dial indicator and adjust it to 0.15 to 0.20 mm (0.0059 to 0.0079 in.).

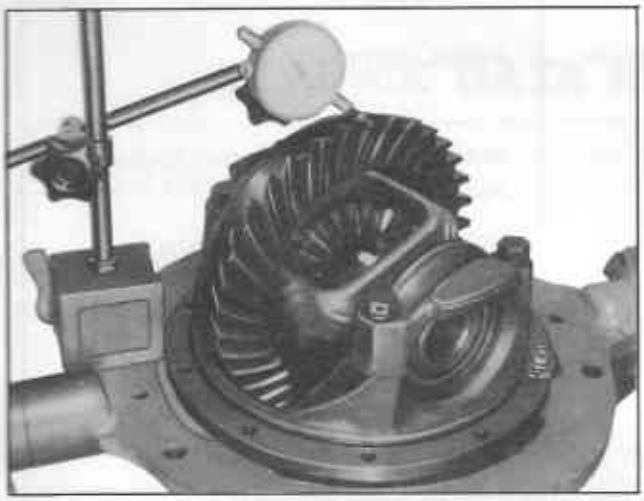


*Fig. PD-50 Measuring backlash*

If the backlash is too much, remove some right side adjusting shims and insert them to left side.

The converse holds good.

When the adjustment has been completed, tighten bearing cap bolts to 4.2 to 4.8 kg-m (30.4 to 34.7 ft-lb).

5. Measure the L dimension by using a large micrometer of Gear Carrier Side Bearing Cap Gauge. (ST46380000)

L dimension should be 198.40 to 198.55 mm (7.8110 to 7.8169 in.).

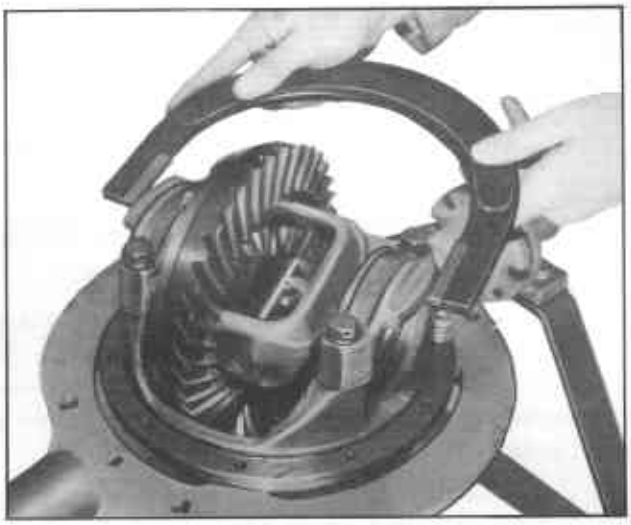


*Fig. PD-51 Measuring "L" dimension*

If it is insufficient, add respectively an additional shim of 0.05 mm (0.0020 in.) on both sides.

6. Check if the run-out of the drive gear rear side is within 0.05 mm (0.0020 in.)

7. Inspect the tooth contact pattern of the drive gear and drive pinion.
(Refer to Page PD-15).

## INSTALLATION

Installation can be accomplished in the reverse order of removal by referring REAR AXLE, installation.

## TROUBLE DIAGNOSES AND CORRECTIONS

There exists always the problem of noises when the rear axle is in trouble and the system of trouble comes out as noises.

However, great care must be taken not to confuse with other noises such as engine noise, transmission noise, exhaust noise, universal joint noise and tire noise.

| Troubles | Possible causes | Remedies |
|---|---|---|
| Noise on drive | Shortage of oil. | Supply gear oil. |
| | Incorrect tooth contact between drive gear and drive pinion. | Adjust tooth contact. |
| | Differential side bearing damaged or out of adjustment. | Replace or adjust. |
| | Axle shaft bearing damaged. | Replace them. |
| | Damaged gear. | Replace defective parts. |
| Noise on coast | Incorrect backlash between drive gear and drive pinion. | Adjust backlash. |
| | Incorrect adjustment of drive pinion bearing. | Adjust correctly. |
| Noise on drive and coast | Drive pinion bearings worn or damaged. | Rebuild differential and replace as required. |
| | Damaged axle shaft bearing or side bearing. | Replace bearing. |
| | Worn universal joint. | Replace worn parts. |
| | Badly worn drive gear or drive pinion teeth. | Replace drive gear and drive pinion. |
| | Drive pinion too deep in drive gear. | Adjust correctly |
| Noise on turn | Loose or worn axle shaft bearing. | Replace bearing collar and or |
| | Side gear jammed in differential case. | Replace defective parts. |
| | Pinion gears too tight on their shaft. | Replace as required. |
| | Worn or damage side gear thrust washer and pinion thrust washer. | Replace. |
| Excessive backlash | Loose wheel nuts. | Tighten nuts securely. |
| | Worn universal joint. | Replace or overhaul joint. |
| | Incorrect backlash between drive gear and drive pinion. | Adjust backlash. |
| | Worn differential gears or case. | Replace worn parts. |
| | Worn axle shaft or differential gear serration. | Replace worn parts. |
| Breakage of differential | Shortage of oil or use of improper oil. | Rebuild differential and replace as required. |
| | Severe service due to an excessive loading, improper use of the clutch. | After adjusting preload of bearings, backlash and engaging condition of |

| | | |
|---|---|---|
| | Incorrect adjustment of bearings.<br>Incorrect adjustment of drive gear and drive pinion.<br>Excessive backlash due to defacement of side gear and thrust washer.<br>Bending of the rear axle case.<br>Loose drive gear bolts. | gears, fasten parts and apply specified volume of genuine gear oil.<br>Avoid abusing of the car. |

# SERVICE DATA AND SPECIFICATIONS

| | |
|---|---|
| Final gear type | Hypoid |
| **Final gear ratio (number of teeth)** | |
| **1.3 liter engine** | |
| **For sedan** | 4.375 : 1 (35 : 8) |
| **1.6 liter engine** | |
| **For sedan with 3-speed T/M** | 3.900 : 1 (39 : 10) |
| **with automatic T/M** | 3.900 : 1 (39 : 10) |
| **with 4-speed T/M** | 3.700 : 1 (37 : 10) |
| **For wagon with 3-speed T/M** | 3.889 : 1 (35 : 9) |
| **with automatic T/M** | 3.889 : 1 (35 : 9) |
| **with 4-speed T/M** | 3.700 : 1 (37 : 10) |
| **Drive pinion** | |
| Initial turning torque (without oil seal) | |
| For sedan | 7 to 10 kg-cm (0.506 to 0.723 ft-lb) |
| For wagon | 10 to 13 kg-cm (0.723 to 0.940 ft-lb) |
| Depth from axle center | |
| For sedan | Approximately 48.5 mm (1.909 in.) |
| For wagon | 61.0 mm (2.402 in.) |
| Thickness of pinion height adjusting washers | |
| For sedan | 2.000, 2.200, 2.400 mm (78.7, 86.6, 94.5 in.) |
| Thickness of pinion height adjusting shims | |
| For sedan | From 1.09 to 1.27 mm spacing 0.02 mm (From 0.0429 to 0.0500 in. spacing 0.0008 in.) |

| | |
|---|---|
| For wagon | 0.75, 0.25, 0.125, 0.075, 0.5 mm (0.0295, 0.0098, 0.0049, 0.0030, 0.0197 in.) |
| Length of drive pinion bearing adjusting spacers | |
| For sedan | From 56.20 to 57.20 mm spacing 0.20 mm (From 2.213 to 2.252 in. spacing 0.0079 in.) |
| For wagon | 59.25, 59.50, 59.70 mm (2.338, 2.343, 2.358 in.) |
| Thickness of drive pinion bearing adjusting washers | |
| For sedan | From 2.31 to 2.57 mm spacing 0.02 mm (From 0.0909 to 0.101 spacing 0.0008 in.) |
| For wagon | From 2.31 to 2.57 mm spacing 0.02 mm (From 0.0909 to 0.101 spacing 0.0008 in.) |

**Drive gear**

| | |
|---|---|
| Backlash between drive gear and pinion | |
| For sedan | 0.10 to 0.20 mm (0.0039 to 0.0079 in.) |
| For wagon | 0.15 to 0.20 mm (0.0059 to 0.0079 in.) |
| Run-out of rear side of drive gear | |
| For sedan | Less than 0.08 mm (0.0031 in.) |
| For wagon | Less than 0.05 mm (0.0020 in.) |

**Side gear and pinion mate**

| | |
|---|---|
| Thickness of side gear thrust washer | |
| For sedan | 0.775, 0.825, 0.875 mm (0.0305, 0.0325, 0.0344 in.) |
| For wagon | 0.78, 0.83, 0.88, 1.03, 1.23 mm (0.00307, 0.0327, 0.0346, 0.0406, 0.0484 in.) |
| Clearance between side gear and thrust washer | |
| For sedan | 0.10 to 0.20 mm (0.0039 to 0.0079 in.) |
| For wagon | 0.05 to 0.20 mm (0.0020 to 0.0079 in.) |

**Side retainer**

| | |
|---|---|
| Thickness of side retainer adjusting shims (sedan) | 0.05, 0.07, 0.10, 0.20, 0.50 mm (0.0020, 0.0028, 0.0039, 0.0079, 0.0200 in.) |
| Thickness of drive gear adjusting shims (wagon) | 0.05, 0.075, 0.125, 0.25, 0.75 mm (0.0020, 0.0030, 0.0049, 0.0098, 0.0295 in.) |

**Tightening torque**

| | Sedan | |
|---|---|---|
| Drive pinion nuts | 17.0 to 20.0 kg-m (122.9 to 144.6 ft-lb) | 14.0 to 17.0 kg-m (101.2 to 122.9 ft-lb) |
| Drive gear bolts | 7.0 to 8.0 kg-m (50.6 to 57.8 ft-lb) | 4.8 to 5.5 kg-m (34.7 to 39.8 ft-lb) |
| Side retainer bolts | 0.9 to 1.2 kg-m (6.5 to 8.7 ft-lb) | - |
| Side bearing cap bolts | - | 4.2 to 4.8 kg-m (30.4 to 34.7 ft-lb) |
| Side flange fix bolts | 1.9 to 2.6 kg-m (13.7 to 18.8 ft-lb) | - |
| Front retainer fix bolts | 0.9 to 1.2 kg-m (6.5 to 8.7 ft-lb) | - |
| Rear cover fix bolts | 1.9 to 2.6 kg-m (13.7 to 18.8 ft-lb) | - |
| Differential to differential mounting member lock nuts | 6.0 to 8.0 kg-m (43.4 to 57.8 ft-lb) | - |
| Differential carrier to suspension member fix bolts | 6.0 kg-m (43.4 ft-lb) | - |
| Differential carrier to axle housing fix nuts | - | 2.0 to 2.2 kg-m (14.5 to 15.9 ft-lb) |
| Comapnion flange to propeller shaft fix nuts | 4.0 to 8.5 kg-m (28.9 to 61.5 ft-lb) | 1.8 to 2.2 kg-m (13.0 to 15.9 ft-lb) |
| Differential to drive shaft fix nuts | 7.0 to 8.0 kg-m (50.6 to 57.8 ft-lb) | - |
| Differential mounting member self lock nuts | 8.5 kg-m (61.5 ft-lb) | - |

# CHASSIS

## SERVICE JOURNAL OR BULLETIN REFERENCE

| DATE | JOURNAL or BULLETIN No | PAGE No. | SUBJECT |
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