SERVICE MANUAL

DATSUN 240Z
MODEL S30 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION PD

PROPELLER SHAFT & DIFFERENTIAL CARRIER

PD

PROPELLER SHAFT AND UNIVERSAL JOINT

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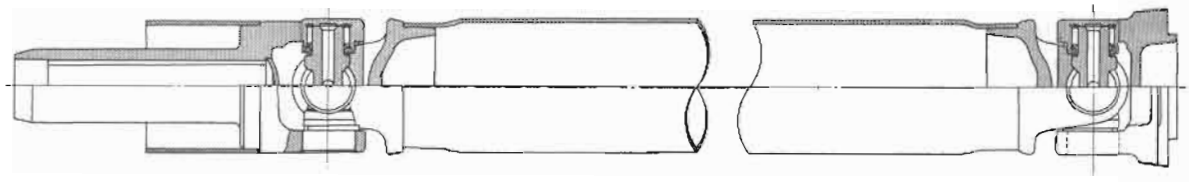

Fig. PD-1 Cross-sectional view of propeller shaft

DESCRIPTION

The propeller shaft is of a 2-joint type. The sliding part is on the rear extension of transmission unit in form of an involute spline, and is lubricated with gear oil.

REMOVAL, INSPECTION, AND REPAIR

1. The propeller shaft is balanced as an assembly. When removing the propeller shaft, verify the spline/flange yoke match marks in two places. When the match marks are unverifiable, put match marks by means of punching for convenience' sake during reassembling.
2. Remove the submuffler, remove four bolts and nuts from the propeller shaft rear end flange yoke and differential carrier flange connecting unit, and remove the propeller shaft.

Note: Carry out this operation carefully so as not to damage the spline and rear oil seal. Take proper action to prevent oil leaking from the transmission rear end.

3. The permissible unbalance of the propeller shaft (in condition of an assembly) is 35 gr-cm (0.49 in-oz) at 5,800 rpm.

Journal

Before disassembling, check the journal (without removing from the propeller shaft) for the movement; and when,

1. The journal does not operate smoothly [Bending resistance: more than 15 kg-cm (13 in-lb)], and/or,
2. The yoke in one side is set stationarily, a load of 10 kg (22 lb) is applied to the other yoke alternately, and the relative displacement toward the yoke axial direction is more than 0.1 mm (0.039 in);

Disassemble the journal and inspect the components and alignment.

Before disassembling the journal, verify the component alignment and relationship so that the yoke direction and snap ring thickness are not changed (When the yoke direction and/or snap ring thickness is changed, the tube and journal center alignment is deviated and the propeller shaft is unbalanced.) because the journal is balanced as an assembly.

It is desired not to disassemble the propeller shaft so that the alignment is not unbalanced.

Removal

1. Lightly tap the yoke unit with a wooden mallet (or copper hammer), and remove the bearing race from the yoke.
2. Tap and remove both bearing races from the yoke, and remove the journal from the yoke carefully so as not to damage the journal.

Inspection and repair

Check the clearance toward the thrust direction (clearance between the journal and bearing assembly) and replace if excessively worn. The clearance of a new journal is 0.006 to 0.037 mm (0.0002 to 0.0015 in).

When the roller is damaged or rusted and/or bearing race and journal sliding surface is pitted, replace the bearing as an assembly.

Reassembly

The component parts are reassembled in reverse sequence of disassembly. When reassembling, select and use a proper snap ring out of the following types (eight types) so that the journal moves under the following conditions:

1. Bending resistance of the journal unit is less than 15 kg-cm (13 in-lb).
2. When a yoke in one side is set stationarily and a load of 10 kg (22 lb) is applied to the other yoke alternately, the relative displacement of the yoke toward the axial direction is less than 0.02 mm (0.0008 in).

Snap rings:	mm (in)
White	2.00 (0.0787)
Yellow	2.02 (0.0795)
Red	2.04 (0.0803)
Green	2.06 (0.0811)
Blue	2.08 (0.0819)
Cream	2.10 (0.0827)
Black	2.12 (0.0835)
Pink	2.14 (0.0843)

SERVICE DATA

Permissible dynamic unbalance	gr-cm (in-oz)/rpm	35 (0.49)/5,800
Axial play of spider journal	mm (in)	Less than 0.02 (0.0008)
Spider journal swinging torque	kg-cm (in-lb)	Less than 15 (13)
Clearance between bearing assembly and journal	mm (in)	0.006 to 0.037 (0.0002 to 0.0015)

Available snap ring thickness mm (in)

White	2.00 (0.0787)	Blue	2.08 (0.0819)
Yellow	2.02 (0.0795)	Cream	2.10 (0.0827)
Red	2.04 (0.0803)	Black	2.12 (0.0835)
Green	2.06 (0.0811)	Pink	2.14 (0.0843)

Tightening torque

Companion flange fixing nuts	kg-m (ft-lb)	2.5 to 3.2 (18 to 23)

DIFFERENTIAL CARRIER

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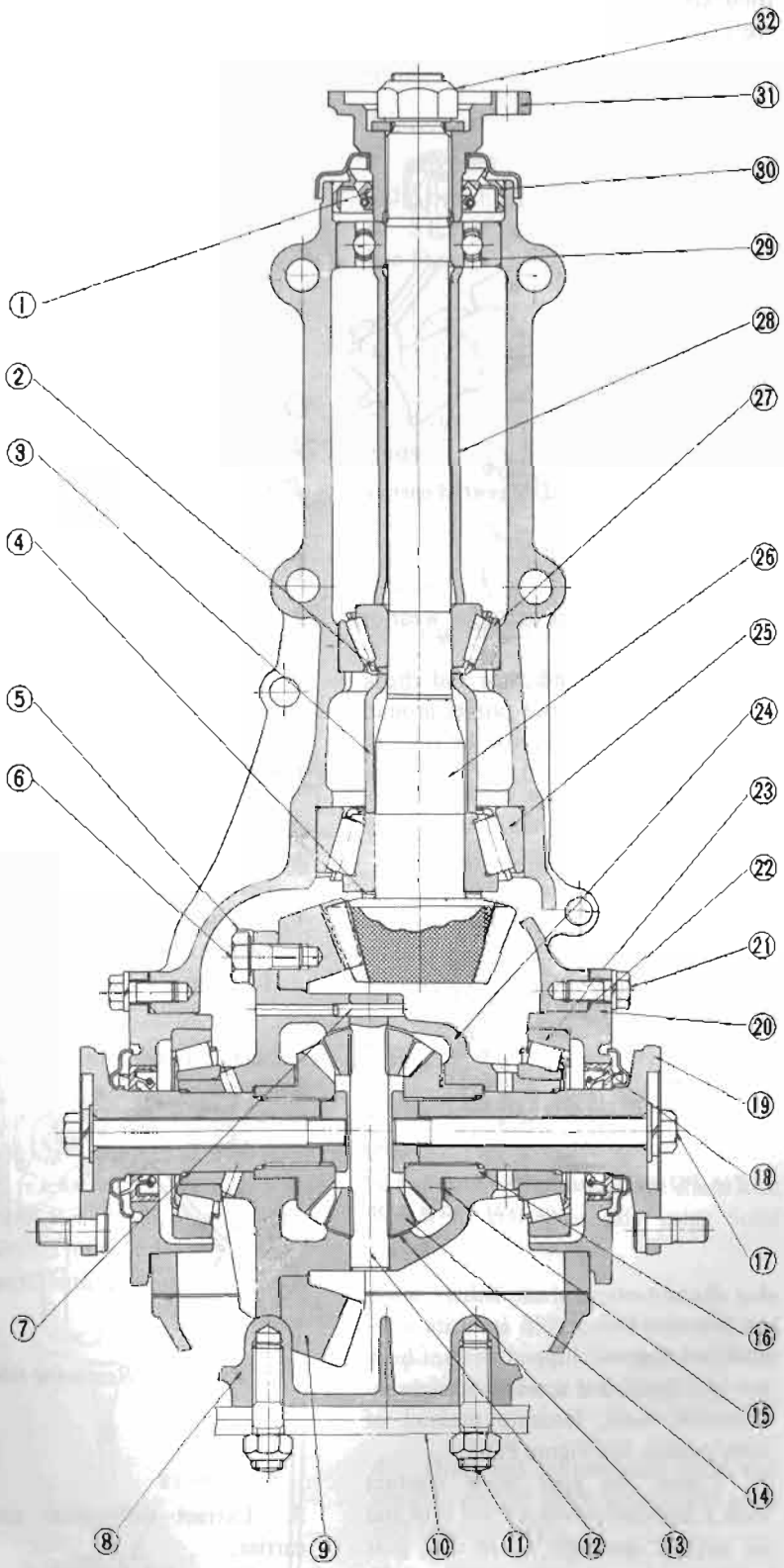

1 Supply multi-purpose grease to oil seal lip when assembly.
2 Pinion bearing adjusting washer
Adjust pinion bearing preload by selecting ②and③.
3 Pinion bearing adjusting spacer
4 Pinion height adjusting washer
5 Lock strap
6 Ring gear bolts
T = 7.0 to 8.0 kg-m (50.6 to 57.8 ft-lb)
Tighten by tapping bolt head with ¾ lb. hammer.
7 Lock pin
8 Rear cover
9 Ring gear
10 Diff. mounting member
11 Bolt diff. to diff. mounting member
T = 7.5 to 9.5 kg-m (54.2 to 68.7 ft-lb)
12 Shaft pinion mate
13 Thrust washer
14 Pinion mate
15 Thrust washer
Adjust the pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) to 0.1 to 0.2 mm (0.0039 to 0.0079 in) by ⑥.
16 Side gear
17 Bolt side flange
T = 1.9 to 2.6 kg-m (13.7 to 18.8 ft-lb)
18 Oil seal
Supply chassis grease to oil seal lip when assembly.
19 Side flange
20 Side retainer
21 Bolt side retainer
T = 0.9 to 1.2 kg-m (6.5 to 8.7 ft-lb)
22 O-ring
23 Side bearing
24 Diff. gear case
25 Pinion rear bearing
26 Drive pinion
27 Pinion front bearing
28 Spacer-front pilot bearing
29 Front pilot bearing
30 Oil seal
31 Companion flange
32 Drive pinion nut
T = 17 to 20 kg-m (122.9 to 144.6 ft-lb)

T: Tightening torque

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Fig. PD-2 Cross-sectional view of differential carrier

DESCRIPTION

The differential gear carrier assembly has a hypoid type drive pinion and ring gear set with a gear ratio of 3.364 for manual transmission equipped models and 3.545 for automatic transmission equipped models.

The drive pinion is mounted with one ball bearing and two tapered roller bearings which are preloaded by pinion bearing adjusting spacer and washer during assembly.

The drive pinion is positioned by a washer located between a shoulder of the drive pinion and the rear bearing.

The differential case is supported in the carrier by two tapered roller side bearings. These are preloaded by inserting shims between the carrier and the side retainers. The differential case assembly is positioned for proper ring gear-to-drive pinion backlash by varying these shims. The ring gear is bolted to the differential case. The case houses two side gears in mesh with two pinions mounted on a pinion shaft. The pinion shaft is anchored in the case by lock pin. The pinions and side gears are backed by thrust washers.

The carrier is of malleable cast iron.

Renew the oil at the first 1,000 km (600 miles) of operation. Then the oil should be changed at least every 50,000 km (30,000 miles). The lubricant should be checked every 5,000 km (3,000 miles) and replenished as necessary.

REMOVAL AND INSTALLATION

This procedure can be accomplished by referring to "REAR AXLE AND REAR SUSPENSION."

Note: Oil quantity; 1 liter (use API GL-5) (1 U.S.qt., ⅞ Imp.qt.).

PRE-DISASSEMBLY INSPECTION

Differential case or carrier should be inspected before any parts are removed from it.

These inspections are helpful to find the cause of the trouble and to determine the corrections needed.

1. Mount carrier on Gear Carrier Attachment ST06270001.

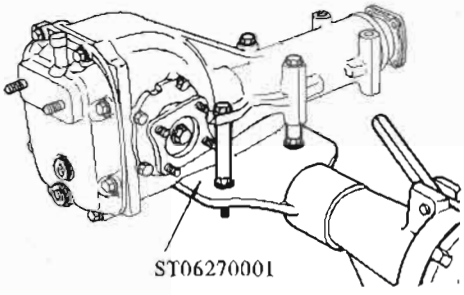

Fig. PD-3 Holding differential carrier

2. Visually inspect parts for wear or damage.
3. Set up a dial indicator and check the backlash at several points around ring gear. Backlash should be 0.15 to 0.2 mm (0.0059 to 0.0079 in). See Figure PD-4.

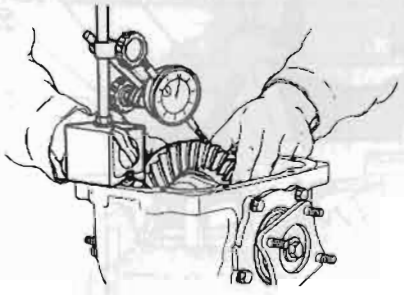

Fig. PD-4 Measuring the backlash of ring gear and pinion

4. Rotate gears to see if there is any roughness which would indicate damaged bearings or chipped gears. Check the gear teeth for scoring or signs of abnormal wear. Measure preload of drive pinion. See Figure PD-5.
5. Check the gear tooth contact with a mixture powdered red lead and oil applied sparingly to all ring gear teeth.

For the tooth contact pattern, see paragraph dealing with tooth contact pattern adjustment.

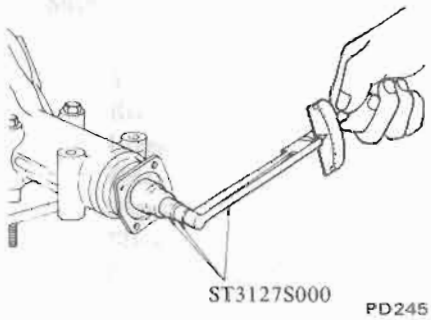

Fig. PD-5 Measuring pinion preload

DISASSEMBLY AND ASSEMBLY/ ADJUSTMENT

Disassembly

1. Remove side flange fixing bolt, and extract side flange.
2. Remove side retainers, using Gear Carrier Side Retainer Attachment ST33710000 and standard puller. See Figure PD-6.

Notes:

a. Mark left and right side retainers before removal.
b. Be careful not to confuse left and right hand side retainers and shims for proper reassembly.

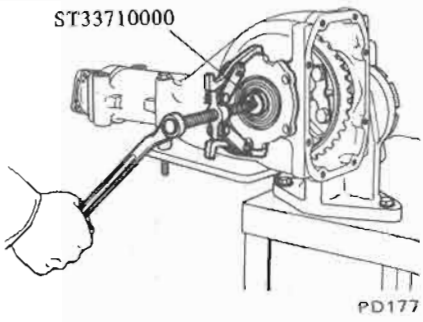

Fig. PD-6 Removing side retainer

3. Extract differential case from carrier.
4. When replacing side bearing, extract bearing outer race from side retainer using Gear Carrier Oil Seal Puller ST33290001. See Figure PD-7.

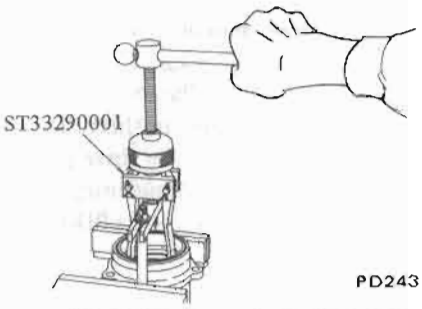

Fig. PD-7 Removing side bearing outer race

5. Loosen drive pinion nut, holding companion flange with Drive Pinion Flange Wrench ST31530000 and pull off companion flange using a standard puller. See Figure PD-8.

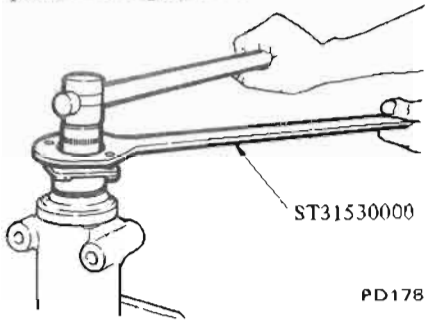

Fig. PD-8 Removing drive pinion nut

6. Extract drive pinion from carrier using a press. Take out drive pinion together with rear bearing cone, bearing spacer and adjusting washers.
7. Remove oil seal.

Note: Oil seal must not be reused.

8. Remove pilot bearing together with pilot bearing spacer and front bearing cone using Pilot Bearing Drift ST30650001.
9. Hold rear bearing inner race with Drive Pinion Rear Bearing Inner Race Puller ST30031000 and extract from drive pinion with a press. See Figure PD-9.

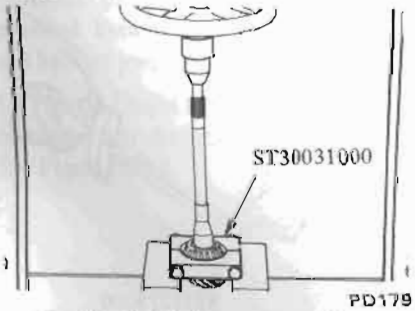

Fig. PD-9 Removing pinion rear bearing inner race

10. To remove front and rear bearing outer races, put a drift to race surface, and withdraw them by tapping the top of drift with a hammer.

Disassembly of differential case

1. Extract bearing using Differential Side Bearing Puller ST3306S000 (set of ST33051001 and ST33061000). See Figure PD-10.

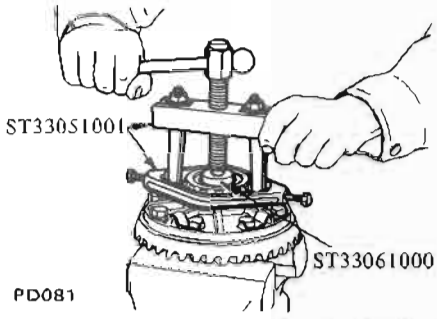

Fig. PD-10 Removing side bearing

Notes:
a. The puller should be handled with care in catching the edge of bearing inner race.
b. Be careful not to confuse the left and right hand parts.

2. Remove ring gear by unfolding lock strap and loosening ring gear bolts.

Note: Loosen bolts diagonally.

3. Punch off pinion mate shaft lock pin from ring gear side using Solid Punch ST23510000.

Note: Lock pin is caulked at pin hole mouth on differential case. Do not punch it off forcibly without checking how it is caulked.

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

Note: Put marks on gear and thrust washer so that they can be reinstalled in their original positions from which they were removed.

Assembly

Precautions in reassembly

1. Arrange shims, washers and the like to install them correctly.
2. Thoroughly clean the surfaces on which shims, washers, bearings and bearing retainers are installed.
3. Apply gear oil when installing bearings.
4. Pack grease cavity between lips when fitting oil seal.

Assembly of differential gear case

1. Assemble pinion mates, side gears and thrust washers in differential case.
2. Fit pinion shaft to differential case so that it meets lock pin holes.
3. Adjust side gear to pinion mate backlash or adjust the clearance between the rear face of side gear and thrust washer. See Figure PD-11.

If above procedure is not effective with existing washer, try with other washers availabe for the purpose.

Normal backlash or clearance:
0.1 to 0.2 mm
(0.0039 to 0.0079 in)

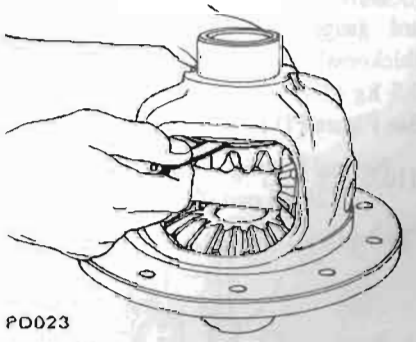

Fig. PD-11 Measuring clearance

Side gear thrust washer

Thickness mm (in)
0.75 to 0.80 (0.0295 to 0.0315)
0.80 to 0.85 (0.0315 to 0.0335)
0.85 to 0.90 (0.0335 to 0.0354)

4. Lock pinion shaft lock pin using a punch after it is secured into place.

5. Apply oil to gear tooth surfaces and thrust surfaces and check if they turn properly.
6. Place ring gear on differential case and install bolts and lock washers.

Tightening torque:
7 to 8 kg-m
(50.6 to 57.8 ft-lb)

Notes:
a. Use only genuine ring gear bolts and new lock washers.
b. Tighten bolts in criss-cross fashion lightly tapping around bolt heads with a hammer. See Figure PD-12.

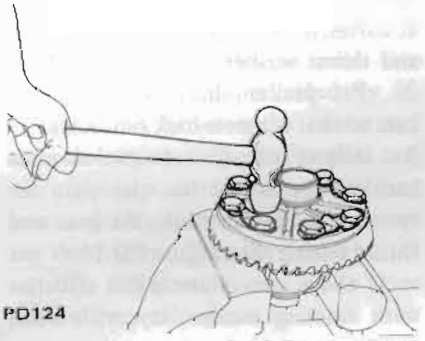

Fig. PD-12 Tapping bolt head

7. When replacing side bearing, measure bearing width using a standard gauge [20.00 mm (0.7874 in) thickness] and a weight block [about 2.5 kg (5.5 lb)] prior to installation. See Figure PD-13.

Normal bearing width:
20.00 mm (0.7874 in)

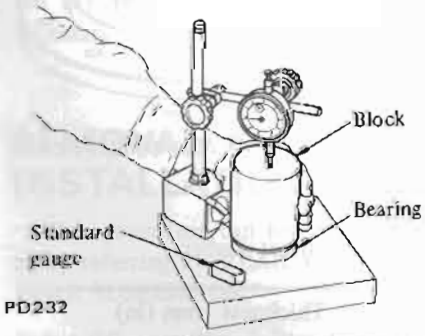

Fig. PD-13 Measuring bearing width

8. Press fit side bearing cone on differential case using Gear Carrier Side Bearing Drift ST33230000 and Adaptor ST33061000. See Figure PD-14.

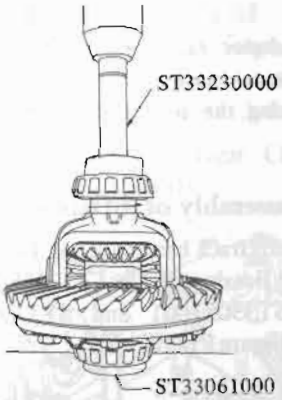

Fig. PD-14 Installing side bearing cone

9. Press fit side bearing outer race into side retainer using Drive Pinion Outer Race Drift Set ST30611000 and ST30621000.
10. Set new oil seal on side retainer using Oil Seal Drift Assembly ST33270000. Apply grease cavity between seal lips.

Adjustment

Adjustment of drive pinion preload

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

This adjustment must be carried out without oil seal inserted.

1. Press fit front and rear bearing outer races into gear carrier using Drive Pinion Outer Race Drift Set ST30611000, ST30612000 and ST30621000.

Front: ST30611000 and ST30612000
Rear: ST30611000 and ST30621000

2. Insert Dummy Shaft Spacer ST31851000, pinion height adjusting washer (use one of 3.09 to 3.27 thickness) and rear bearing cone into Dummy Shaft ST31212000 to make convenient to adjust pinion height. See Figure PD-17.

Note: Reuse the old washer if they have normal tooth contact pattern in a pre-disassembly check.

3. Fit drive pinion bearing spacer, washer, front bearing cone, Drive Pinion Dummy Collar ST31214000 and companion flange in this order on dummy shaft and tighten drive pinion nut to the specified torque using Stopper ST31213000. See Figure PD-15.

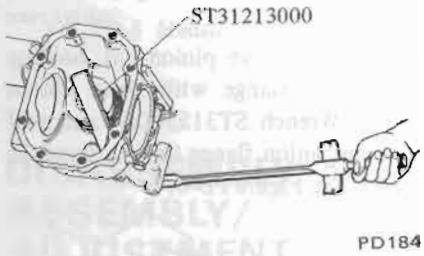

Fig. PD-15 Tightening drive pinion nut

Measure pinion bearing preload using Preload Gauge ST31275000, and select washer and spacer that will provide required preload. See Figure PD-16.

Pinion bearing preload
(without oil seal):
10 to 13 kg-m
(8.7 to 11.4 in-lb)
At companion flange bolt hole:
2.9 to 3.8 kg
(6.4 to 8.4 lb)
Tightening torque of pinion nut:
17 to 20 kg-m
(122.9 to 144.6 ft-lb)

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

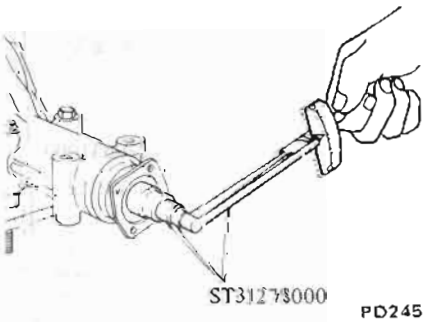

Fig. PD-16 Measuring pinion preload

Pinion bearing adjusting spacer

Length mm (in)
52.20 (2.0551)
52.40 (2.0630)
52.60 (2.0709)
52.80 (2.0787)
53.00 (2.0866)
53.20 (2.0945)

Pinion bearing adjusting washer

Thickness mm (in)
2.30 to 2.32 (0.0906 to 0.0913)
2.32 to 2.34 (0.0913 to 0.0921)
2.34 to 2.36 (0.0921 to 0.0920)
2.36 to 2.38 (0.0929 to 0.0937)
2.38 to 2.40 (0.0937 to 0.0945)
2.40 to 2.42 (0.0945 to 0.0953)
2.42 to 2.44 (0.0953 to 0.0961)
2.44 to 2.46 (0.0961 to 0.0969)
2.46 to 2.48 (0.0969 to 0.0976)
2.48 to 2.50 (0.0976 to 0.0984)
2.50 to 2.52 (0.0984 to 0.0992)
2.52 to 2.54 (0.0992 to 0.1000)
2.54 to 2.56 (0.1000 to 0.1008)
2.56 to 2.58 (0.1008 to 1.1016)
2.58 to 2.60 (0.1016 to 0.1024)

Adjustment of drive pinion height

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

1. Install Height Gauge ST31211000 on carrier with dummy shaft mounted. See Figure PD-17.

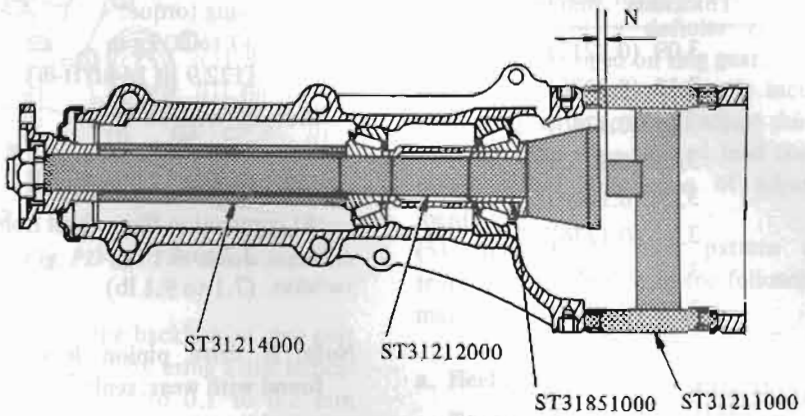

Fig. PD-17 Adjusitng pinion height

2. Measure the clearance (N) between the tip end of height gauge and the end surface of dummy shaft, using a thickness gauge. See Figure PD-18.

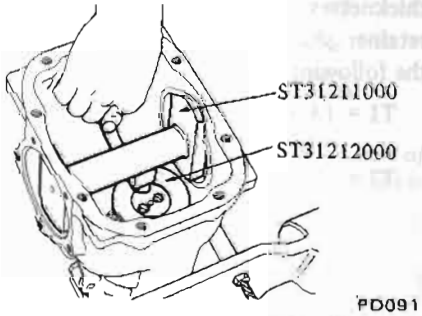

Fig. PD-18 Measuring the clearance

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

$$T = W + N - [(H - D' - S) \times 0.01] - 0.2$$

Where,

T = Required thickness of rear bearing adjusting washers (mm).
W = Thickness of washers temporarily inserted (mm).
N = Measured value with thickness gauge (mm).
H = Figure marked on the drive pinion head. See Figure PD-19.
D′ = Figure marked on the dummy shaft.
S = Figure marked on the height gauge.

Figures for H, D′ and S are dimensional variations in a unit of 1/100 mm against each standard measurement.

Example of calculation

W = 3.09 mm
N = 0.33 mm
H = +2, D′ = −1, S = 0

$$T = W + N - [(H - D' - S) \times 0.01] - 0.2$$
$$= 3.09 + 0.33 - [(2 - (-1) - 0) \times 0.01] - 0.2$$
$$= 3.19 \text{ mm}$$

The correct washer is 3.18 mm thick.

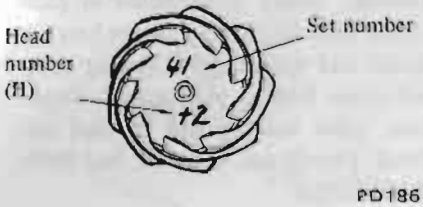

Fig. PD-19 Variation number on drive pinion

Pinion height adjusting washer

Thickness mm (in)
3.09 (0.1217)
3.12 (0.1228)
3.15 (0.1240)
3.18 (0.1252)
3.21 (0.1264)
3.24 (0.1276)
3.27 (0.1287)
3.30 (0.1299)
3.33 (0.1311)
3.36 (0.1323)
3.39 (0.1335)
3.42 (0.1346)
3.45 (0.1358)
3.48 (0.1370)
3.51 (0.1382)
3.54 (0.1394)
3.57 (0.1406)
3.60 (0.1417)
3.63 (0.1429)
3.66 (0.1441)

4. Fit determined pinion height adjusting washer in drive pinion, and press fit rear bearing cone in it using Base ST30901000. See Figure PD-20.

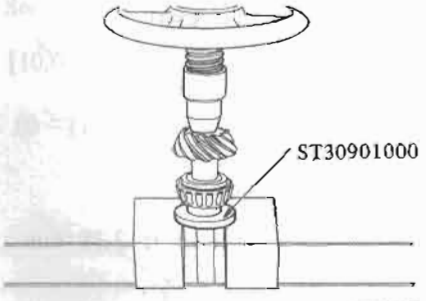

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Fig. PD-20 Pressing rear bearing cone

5. Lubricate pinion front and rear bearings. Install drive pinion in gear carrier into which drive pinion bearing spacer and washer, front bearing cone and front bearing pilot spacer, moreover, pilot bearing and oil seal are fitted. Fit oil seal using Oil Seal Drift ST30720000.

6. Fit companion flange and flat washer on drive pinion, and secure them in position by tightening nut to specified torque confirming preload.

Tightening torque:
17 to 20 kg-m
(122.9 to 144.6 ft-lb)

Preload (with oil seal):
11 to 14 kg-cm
(9.6 to 12.2 in-lb)

At companion flange bolt hole:
3.2 to 4.1 kg
(7.1 to 9.1 lb)

Note: If drive pinion lock nut is found with wear, replace it.

Adjustment of side retainer shims

1. If the hypoid gear set, carrier, differential case, side bearing or side bearing retainer has been replaced with new part, adjust the side bearing preload with adjusting shim. The required thicknesses of the left and right retainer shims can be obtained from the following formula.

$$T1 = (A + C + G1 - D) \times 0.01 + 0.76 - E$$

$$T2 = (B + D + G2) \times 0.01 + 0.76 - F$$

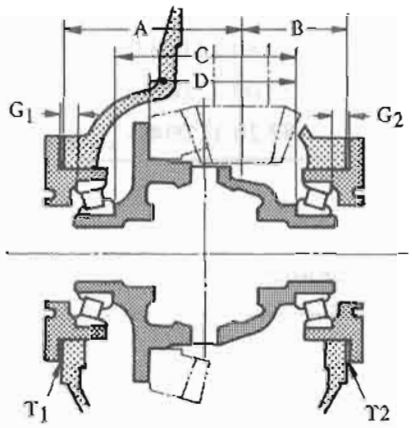
Where,

T1 = Required thickness of left side retainer shim (mm).
T2 = Required thickness of right side retainer shim (mm).
A & B = Figure marked on the gear carrier. See Figure PD-22.
C & D = Figure marked on the differential case. See Figure PD-23.
E & F = These are differences in width of left or right side bearing against the standard width 20.0 mm (0.7874 in).
G1 & G2 = Figure marked on the left or right side retainer. See Figure PD-24.

Figures for A, B, C, D, G1 and G2 are dimensional variations in a unit of 1/100 mm against each standard measurement.

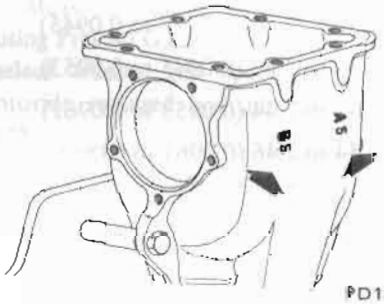
To measure width of side bearing, see differential case assembly procedure.

Note: Preload of the old bearing should be the same as that of a new bearing.



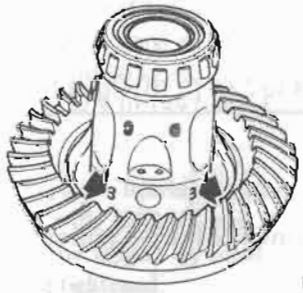
PD093

Fig. PD-21 Thickness of left and right shims



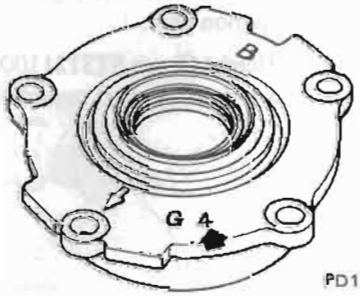
PD187

Fig. PD-22 A & B figure



PD188

Fig. PD-23 C & D figure



PD189

Fig. PD-24 G1 & G2 figure

Example of calculation,

A = 5, B = 5, C = 3, D = 3,
G1 = 4, G2 = 1, E = –0.01 mm,
F = +0.02 mm

Left side:

$$T1 = (A + C + G1 - D) \times 0.01 + 0.76 - E$$
$$= [5 + 3 + 4 - (+3)] \times 0.01 + 0.76 - (-0.01)$$
$$= 0.86 \text{ mm}$$

Right side:

$$T2 = (B + D + G2) \times 0.01 + 0.76 - F$$
$$= (5 + 3 + 1) \times 0.01 + 0.76 - (+0.02)$$
$$= 0.83 \text{ mm}$$

Side retainer adjusting shim

Thickness mm (in)
0.05 (0.0020)
0.07 (0.0028)
0.10 (0.0039)
0.20 (0.0079)
0.50 (0.0197)

2. Install differential case assembly in gear carrier in reverse order of disassembly.

3. Fit given shims and O-rings in both side retainers, and install retainers in carrier using Gear Carrier Side Retainer Guide ST33720000 (See Figure PD-25), and the arrow mark on retainer positioned as shown in Figure PD-26.

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

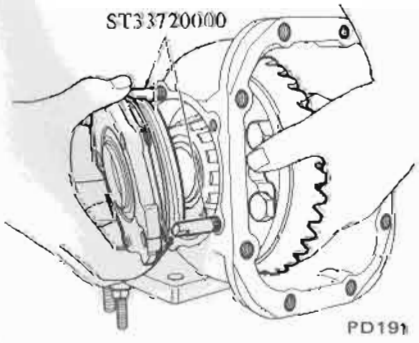


Fig. PD-25 Installing side retainer

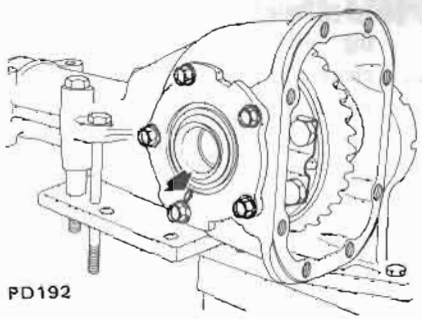


Fig. PD-26 The arrow mark on retainer

4. Measure the backlash of ring gear and drive pinion by using a dial indicator and adjust it to 0.1 to 0.2 mm (0.0039 to 0.0079 in). See Figure PD-27.

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

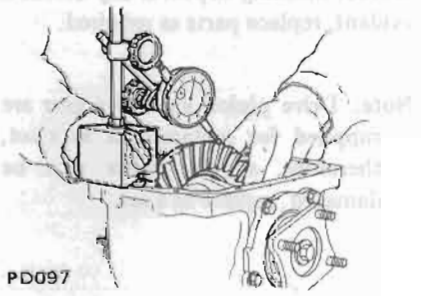


Fig. PD-27 Measuring the backlash of ring gear and pinion

5. At the same time, check side bearing preload. Bearing preload should read 12 to 20 kg-cm (10.4 to 17.3 in-lb) of rotating torque at companion flange [3.5 to 5.8 kg (7.7 to 12.8 lb) at companion flange bolt hole].

If preload is not according to this specification, adjust it with side retainer shims.

Incidentally, decrease or increase in thickness of shims causes change of ring gear-to-pinion backlash.

Thus, check if they have proper backlash.

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

(1) Thoroughly clean ring and drive pinion gear teeth.

(2) Paint ring gear teeth lightly and evenly with a mixture of powdered red lead and oil of a suitable consistency to produce a contact pattern.

(3) Rotate pinion through several revolutions in the forward and reverse directions until a definite contact pattern is developed on ring gear.

(4) When contact pattern is incorrect, readjust thickness of adjust shim.

Be sure to wipe off red lead completely upon completion of adjustment.

(5) Incorrect contact pattern of teeth can be adjusted in the following manner.

a. Heel contact

To correct, increase thickness of drive pinion adjusting washer in order to bring drive pinion close to ring gear. See Figure PD-28.

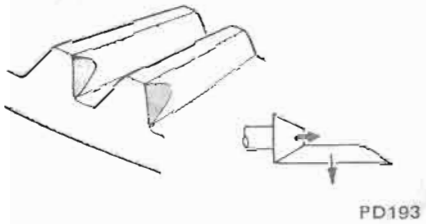


Fig. PD-28 Heel contact

b. Toe contact

To correct, reduce thickness of drive pinion adjusting washer in order to make drive pinion go away from ring gear. See Figure PD-29.

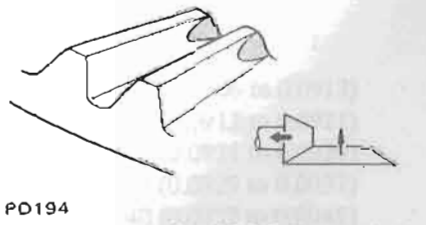


Fig. PD-29 Toe contact

c. Flank contact

Adjust in the same manner as in b. See Figure PD-30.

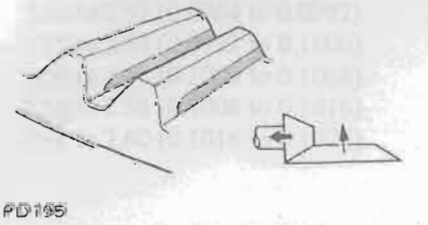
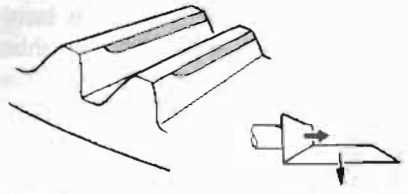


Fig. PD-30 Flank contact

d. Face contact

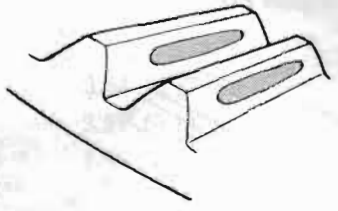
Adjust in the same manner as in a. See Figure PD-31.



PD196

Fig. PD-31 Face contact

e. Correct tooth contact



PD197

Fig. PD-32 Correct contact

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

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see if they 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 indicates 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 part be damaged, replace as a set.

2. Check pinion gear shaft, and pinion gear for scores and signs of wear, and replace as required.

Follow the same procedure for 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 such as 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 noises and gear seizure.

4. Inspect thrust washer faces. Small defects can be corrected with sandpaper. If pinion mate-to-side gear backlash (or the clearance between side gear and thrust washer) exceeds limits 0.1 to 0.2 mm (0.0039 to 0.0079 in), replace thrust washers.

5. Inspect carrier and differential case for cracks or distortion. If either condition is evident, replace defective parts.

6. As a general rule, oil seal should be replaced at each disassembly.

SERVICE DATA AND SPECIFICATIONS

Type			R180
Gear ratio (number of teeth)			
Manual transmission equipped models			3.364 (37/11)
Automatic transmission equipped models			3.545 (39/11)
Material of carrier			Malleable cast-iron
Drive pinion preload adjusted by			Shim
Drive pinion			
Preload	kg-cm (in-lb)		
(without oil seal)			10 to 13 (8.7 to 11.4)
(with oil seal)			11 to 14 (9.6 to 12.2)
At companion flange bolt hole	kg (lb)		
(without oil seal)			2.9 to 3.8 (6.4 to 8.4)
(with oil seal)			3.2 to 4.1 (7.1 to 9.1)
Thickness of pinion height adjusting washer	mm (in)		3.09 (0.1217)
			3.12 (0.1228)
			3.15 (0.1240)
			3.18 (0.1252)
			3.21 (0.1264)
			3.24 (0.1276)
			3.27 (0.1287)
			3.30 (0.1299)
			3.33 (0.1311)
			3.36 (0.1323)
			3.39 (0.1335)
			3.42 (0.1346)
			3.45 (0.1358)
			3.48 (0.1370)
			3.51 (0.1382)
			3.54 (0.1394)
			3.57 (0.1406)
			3.60 (0.1417)
			3.63 (0.1429)
			3.66 (0.1441)
Length of pinion bearing adjusting spacer	mm (in)		52.20 (2.0551)
			52.40 (2.0630)
			52.60 (2.0709)
			52.80 (2.0787)
			53.00 (2.0866)
			53.20 (2.0945)
Thickness of pinion bearing adjusting washer	mm (in)		2.30 to 2.32 (0.0906 to 0.0913)
			2.32 to 2.34 (0.0913 to 0.0921)
			2.34 to 2.36 (0.0921 to 0.0929)
			2.36 to 2.38 (0.0929 to 0.0937)
			2.38 to 2.40 (0.0937 to 0.0945)
			2.40 to 2.42 (0.0945 to 0.0953)
			2.42 to 2.44 (0.0953 to 0.0961)
			2.44 to 2.46 (0.0961 to 0.0969)
			2.46 to 2.48 (0.0969 to 0.0976)
			2.48 to 2.50 (0.0976 to 0.0984)
			2.50 to 2.52 (0.0984 to 0.0992)
			2.52 to 2.54 (0.0992 to 0.1000)
			2.54 to 2.56 (0.1000 to 0.1008)
			2.56 to 2.58 (0.1008 to 0.1016)
			2.58 to 2.60 (0.1016 to 0.1024)

PROPELLER SHAFT & DIFFERENTIAL CARRIER

Side gear and pinion mate		
Thickness of side gear thrust washer	mm (in)	0.75 to 0.80 (0.0295 to 0.0315) 0.80 to 0.85 (0.0315 to 0.0335) 0.85 to 0.90 (0.0335 to 0.0354)
Pinion mate-to-side gear backlash (or clearance between side gear and thrust washer)	mm (in)	0.1 to 0.2 (0.0039 to 0.0079)
Ring gear		
Ring gear-to-drive pinion backlash	mm (in)	0.1 to 0.2 (0.0039 to 0.0079)
Thickness of side retainer adjusting shim	mm (in)	0.05 (0.0020) 0.07 (0.0028) 0.10 (0.0039) 0.20 (0.0079) 0.50 (0.0197)
Side bearing standard width	mm (in)	20.00 (0.7874)
"L" dimension	mm (in)	198.40 to 198.55 (7.8110 to 7.8169)
Oil capacity (about)	liter (U.S.qt., Imp.qt.)	1.0 (1, ⅞)
Adjusting methods		
Variation numbers expressed by		mm (x 0.01)
Dummy shaft		Use
Drive pinion adjusting formula		$T = W + N - [(H - D' - S) \times 0.01] - 0.2$
Side bearing adjsuting formula		$T1 = (A + C + G1 - D) \times 0.01 + 0.76 - E$ $T2 = (B + D + G2) \times 0.01 + 0.76 - F$

Tightening torque	kg-m (ft-lb)	
Drive pinion nut	17 to 20	(122.9 to 144.6)
Ring gear bolt	7 to 8	(50.6 to 57.8)
Side retainer bolt	0.9 to 1.2	(6.5 to 8.7)
Side flange fix bolt	1.9 to 2.6	(13.7 to 18.8)
Rear cover fix bolt	1.9 to 2.6	(13.7 to 18.8)
Rear cover to rear mounting member lock nut	7.5 to 9.5	(54.2 to 68.7)
Differential carrier to front mounting member fix bolt	6 to 8	(43.4 to 57.8)
Differential to drive shaft fix bolt	5 to 6	(36.2 to 43.4)
Companion flange to propeller shat fix bolt	2.5 to 3.2	(18.0 to 23.1)
Oil drain and filler plug	4 to 6	(28.9 to 43.4)

TROUBLE DIAGNOSES AND CORRECTIONS

When a gear carrier is suspected of being noisy, it is advisable to make a thorough test to determine whether the noise originates in the tires, road surface, exhaust, universal joint, propeller shaft, wheel bearings, engine, transmission, or gear carrier. Noise which originates in other places cannot be corrected by adjustment or replacement of parts in the rear axle assembly.

Condition	Probable cause	Corrective action
Noise on drive, coast and float.	Shortage of oil.	Supply gear oil. Rebuild gear carrier if necessary.
	Incorrect tooth contact between ring gear and drive pinion.	Adjust tooth contact or replace the hypoid gear set.
	Incorrect backlash between ring gear and drive pinion.	Adjust backlash or replace the hypoid gear set if necessary.
	Seized up or damaged ring gear and drive pinion.	Replace the hypoid gear set.
	Seized up, damaged or broken drive pinion bearing.	Replace the pinion bearing and defective parts.
	Seized up, damaged or broken side bearing.	Replace the side bearing and defective parts.
	Loosen clamp bolts or nuts holding ring gear, side retainers, etc..	Clamp them to specified torque, and replace defective parts.
Noise on turn.	Seized up, damaged or broken side and pinion gears.	Replace defective parts.
	Seized up, damaged or broken side gear and pinion thrust washer.	Replace defective parts.
	Pinion gears too tight on their shaft.	Replace defective parts.
	Interference between side flange and differential case.	Repair the part responsible for interference, or replace the side flange and differential case.
Knocking sound during starting or gear shifting.	Excessive backlash.	
	Incorrect backlash of ring gear-to-drive pinion or side gear-to-pinion gear.	Adjust backlash.
	Worn gears or case.	Replace worn parts.
	Worn side flange and side gear spline.	Replace worn parts.
	Pinion bearing under preload.	Adjust preload.
	Loosened drive pinion nut.	Repair or replace.
	Loosen clamp bolts or nuts holding ring gear, side retainers, etc.	Tighten them or replace if necessary.
Seizure or breakage.	Shortage of oil or use of unsuitable oil.	Replace defective parts.
	Excessively small backlash.	Adjust backlash and replace as required.
	Incorrect adjustment of bearings or gears.	Replace defective parts.
	Severe service due to an excessive loading, improper use of clutch.	Replace defective parts.
	Loosened bolts and nuts, such as ring gear clamp bolts.	Replace defective parts.

Condition	Probable cause	Corrective action
Oil leakage.	Worn-out, damaged or improperly 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 sandpaper 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.
	Loosened bolts such as side flange, side retainer or rear cover.	Tighten the bolts to specified torque.
	Defective gasket or O-ring.	Replace defective parts with new ones.
	Loose filler or drain plug.	Tighten the plug.
	Clogged or damaged breather.	Repair or replace.