

SERVICE MANUAL

DATSUN
MODEL 330 SERIES
CHASSIS & BODY

SECTION PD

PROPELLER SHAFT & DIFFERENTIAL CARRIER

PD

Z·ONE·DATSUN

PROPELLER SHAFT AND
CENTER BEARING PD- 2

DIFFERENTIAL CARRIER PD- 7

SPECIAL SERVICE TOOLS PD-18

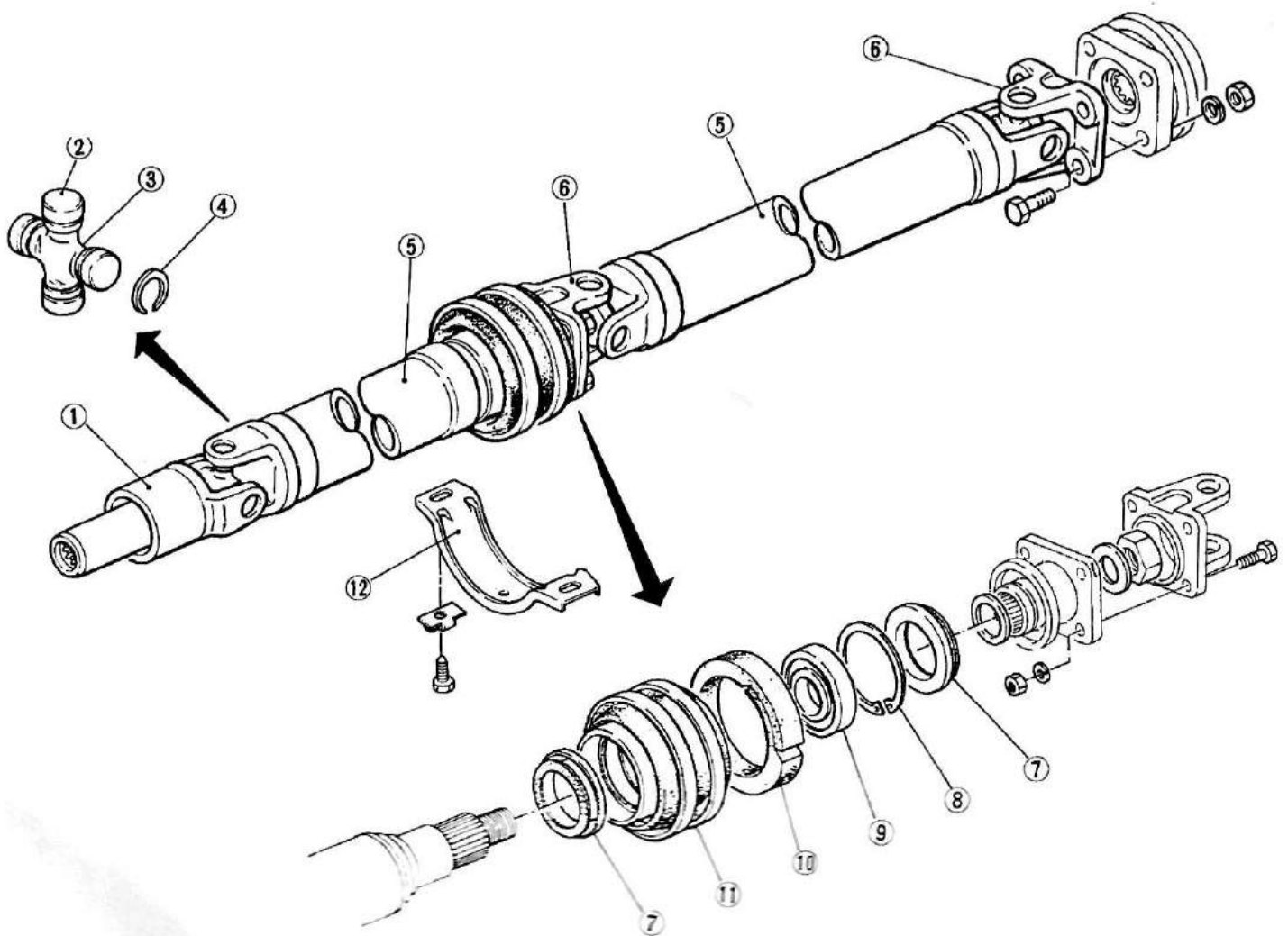
NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

PROPELLER SHAFT AND CENTER BEARING

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- | | |
|-------------------------|-----------------------------|
| 1 Sleeve yoke | 7 Dust seal |
| 2 Bearing race assembly | 8 Snap ring |
| 3 Spider | 9 Ball bearing |
| 4 Snap ring | 10 Cushion |
| 5 Propeller shaft | 11 Center bearing insulator |
| 6 Companion flange | 12 Bracket |

Fig. PD-1 3-joint type propeller shaft for L26 and L20A engines

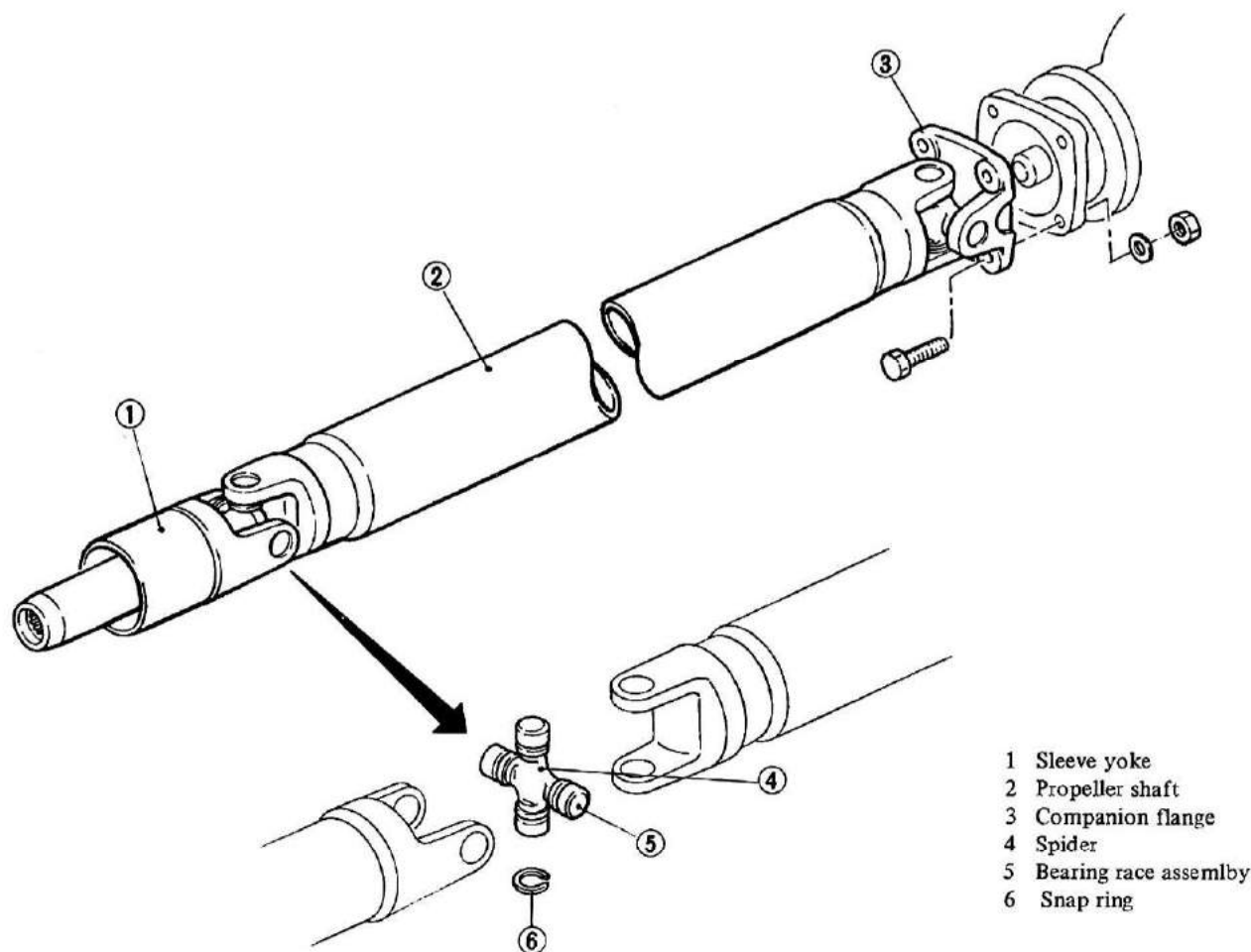


Fig. PD-2 2-joint type propeller shaft for H20 and SD22 engines

DESCRIPTION

On cars equipped with the L26 or L20A engine, the propeller shaft is a 3-joint type to transmit rotary motion of the transmission shaft with the least possible noise and vibration. On cars with the H20 or SD22 engine, the shaft is a 2-joint with a greater tube diameter for improved performance at high speed. In either design, the propeller shaft and universal joint assembly is carefully balanced during original assembly, so that the dynamic unbalance is below 35 gr-cm (0.49 in-oz) at 5,800 rpm for the 3-joint type and 35 gr-cm (0.49 in-oz) at 4,000 rpm for the 2-joint type.

If the propeller shaft has to be disassembled, it must be made carefully so that the above limit is not exceeded. Therefore, when the car is to be undercoated, cover the propeller shaft and universal joints to prevent application of the undercoating material. Careless installation of the journals may also cause unbalance that

would require re-alignment of the parts. The 3-joint shaft utilizes a center bearing complete with a rubber insulator to keep noise and vibration to a minimum.

REMOVAL

1. Release hand brake lever, raise rear axle and support it with safety stands.
2. Put match marks both on propeller shaft and companion flange so that the original balance will be restored at assembly.
3. Remove bolts connecting shaft to companion flange. Remove bolts retaining center bearing support in case of the 3-joint type.
4. Draw out propeller shaft sleeve yoke from transmission by moving shaft rearward, passing it under rear axle.

Plug up rear end of rear extension housing to prevent oil leakage.

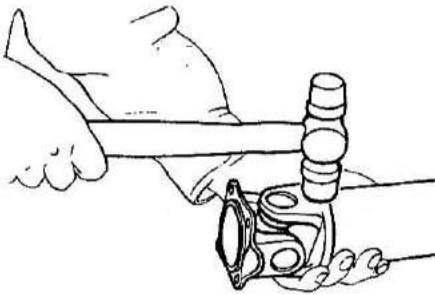
Note: Remove propeller shaft carefully so as not to damage the spline, sleeve yoke and rear oil seal.

DISASSEMBLY

Primarily, do not disassemble propeller shaft because it is balanced as an assembly. Check movement of propeller shaft with journal, and if journal does not move smoothly, disassemble.

JOURNAL

1. Mark propeller shaft and journal so that the original combination can be restored at assembly.
2. Remove snap ring with a standard screwdriver.
3. Lightly tap base of yoke with a hammer, and withdraw bearing race. See Figure PD-3.



PD005

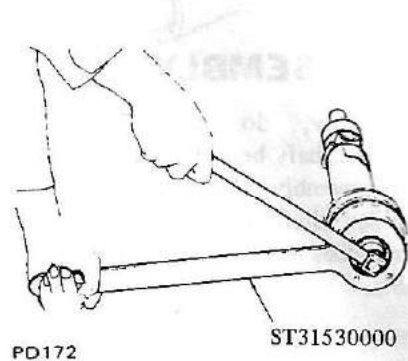
Fig. PD-3 Removing bearing

Note: When removing journal from yoke, be careful not to damage journal and yoke hole.

CENTER BEARING

When disassembling and repairing center bearing are required, the following procedures are applied:

1. Put match marks on flange and front propeller shaft. Remove bolts connecting flange yoke to companion flange.
2. Release caulking on locking nut.
3. Applying Drive Pinion Flange Wrench ST31530000, loosen off locking nut and remove center bearing. See Figure PD-4.



PD172

ST31530000

Fig. PD-4 Removing lock nut

INSPECTION

1. Check journal pin for dent or brinell marks, and yoke hole for sign of wear or damage.

Snap ring, bearing and seal ring should also be inspected to see if these are damaged, worn or deformed. Replace with service kit if necessary.

2. Check center bearing by rotating bearing race. Discard if it is rough, noisy or damaged. Cracked bearing insulator cannot be tolerated here. Replace with service kit if necessary.
3. Check propeller shaft tube surface for dent or crack. Change if necessary.

ASSEMBLY

JOURNAL

To assemble, reverse the foregoing procedure using reference marks prescribed on page PD-3 for Removal and Disassembly.

New bearing need not be lubricated since it is lubricated for life. Fill joint with recommended multi-purpose grease whenever propeller shaft is overhauled.

Two opposite snap rings should be equal in thickness. Be sure that play is below 0.02 mm (0.0008 in).

Available snap ring

Thickness mm (in)	Color identification
2.00 (0.0787)	White
2.02 (0.0795)	Yellow
2.04 (0.0803)	Red
2.06 (0.0811)	Green
2.08 (0.0819)	Blue
2.10 (0.0827)	Light brown
2.12 (0.0835)	Unpainted

Install and assemble components correctly so that joint moves under friction resistance of less than 15 kg-cm (13 in-lb).

When the above steps are complete, place the shaft in a balancing machine and adjust unbalance less than 35 gr-cm (0.49 in-oz) at 5,800 rpm for 3-joint type, or less than 35 gr-cm (0.49 in-oz) at 4,000 rpm for 2-joint type.

CENTER BEARING

Center bearing assembling procedures are as follows:

1. Install center bearing in center

bearing insulator.

2. Install center bearing assembly and companion flange on front shaft using reference marks put in disassembly procedure.

3. Install washer and lock nut on front shaft and tighten nut using Drive Pinion Flange Wrench ST31530000 to specified torque.

Tightening torque:

20 to 24 kg-m
(145 to 174 ft-lb)

4. Using punch, collapse the upper part of lock nut into the groove of shaft.

5. Join companion flange of front shaft with flange yoke of rear shaft and tighten connecting bolts to specified torque.

Tightening torque:

2.5 to 3.2 kg-m
(18 to 23 ft-lb)

INSTALLATION

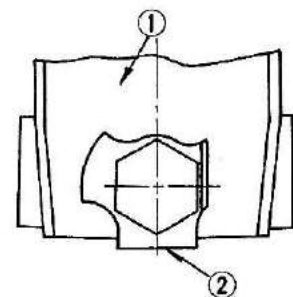
To install, reverse the foregoing removal procedure.

1. Install center bearing with joint portion in center bearing cushion facing upward (floor side).
2. Position lock plate on center bearing bracket with holes properly aligned.
3. Insert bolts through the holes and tighten to specifications to retain center bearing on body.

Tightening torque:

3.2 to 3.7 kg-m
(23 to 27 ft-lb)

Bend up tab of lock plate against side of bolt head to secure the adjustment.



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- 1 Center bearing bracket
- 2 Lock plate

Fig. PD-5 Locking method

Propeller Shaft & Differential Carrier

Align propeller shaft with companion flange using reference marks prescribed in "Removal" procedure and tighten them with bolts.

Tightening torque:

2.5 to 3.2 kg-m
(18 to 23 ft-lb)

PROPELLER SHAFT VIBRATION

To check and correct an unbalanced propeller shaft, proceed as follows:

1. Remove undercoating and other foreign material which could upset shaft balance, and check shaft vibration by road test.

2. If shaft vibration is noted during road test, disconnect propeller shaft at differential carrier companion flange, rotate companion flange 180 degrees and reinstall propeller shaft.

3. Again check shaft vibration. If vibration still persists, replace propeller shaft assembly.

SERVICE DATA AND SPECIFICATIONS

Dynamic unbalance	gr-cm (in-oz)	
3-joint type		35 (0.49) at 5,800 rpm
2-joint type		35 (0.49) at 4,000 rpm
Spider journal axial play	mm (in)	less than 0.02 (0.0008)

Tightening torque:

Propeller shaft to companion flange bolt (Differential carrier side)	kg-m (ft-lb)	2.5 to 3.2 (18 to 23)
Companion flange nut (3-joint type)	kg-m (ft-lb)	20 to 24 (145 to 174)
Flange yoke (rear shaft) to companion flange (front shaft) bolt	kg-m (ft-lb)	2.5 to 3.2 (18 to 23)
Center bearing bracket nut	kg-m (ft-lb)	3.2 to 3.7 (23 to 27)

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
<p>Vibration during at medium or high speed.</p>	<p>Worn or damaged universal joint needle bearing. Unbalance due to bent or dented propeller shaft. Loose propeller shaft installation. Worn transmission rear extension bushing. Damaged center bearing or insulator. Undercoating or mud on the shaft causing unbalance. Tire unbalance. Balance weights missing.</p>	<p>Replace. Replace. Retighten. Replace. Replace. Clean up shaft. Balance wheel and tire assembly. Replace.</p>
<p>Knocking sound during starting or noise during coasting on propeller shaft.</p>	<p>Worn damaged universal joint. Worn sleeve yoke and main shaft spline. Loose propeller shaft installation. Loose joint installation. Damaged center bearing or insulator. Loose or missing bolts at center bearing bracket to body.</p>	<p>Replace. Replace. Retighten. Adjust snap ring. Replace. Replace or tighten bolts.</p>
<p>Scraping noise.</p>	<p>Dust cover on sleeve yoke rubbing on transmission rear extension. Dust cover on companion flange rubbing on differential carrier.</p>	<p>Straighten out dust cover to remove interference.</p>
<p>Whine or whistle.</p>	<p>Damaged center bearing.</p>	<p>Replace.</p>

DIFFERENTIAL CARRIER

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DESCRIPTION

The differential gear carrier assembly has a hypoid type drive pinion and ring gear set with three different gear ratios, as indicated in the following table.

The drive pinion is mounted in 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 bearings and the differential case. The differential case assembly is positioned for proper ring gear and 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 anchored in the case by lock pin. The pinions and side gears are backed by thrust washers.

The oil should be inspected and changed at intervals specified in the "Maintenance Schedule".

- 1 Nut
- 2 Companion flange
- 3 Oil seal
- 4 Front bearing
- 5 Side bearing
- 6 Side bearing adjusting shim
- 7 Thrust washer
- 8 Side gear
- 9 Differential pinion shaft
- 10 Pinion mate

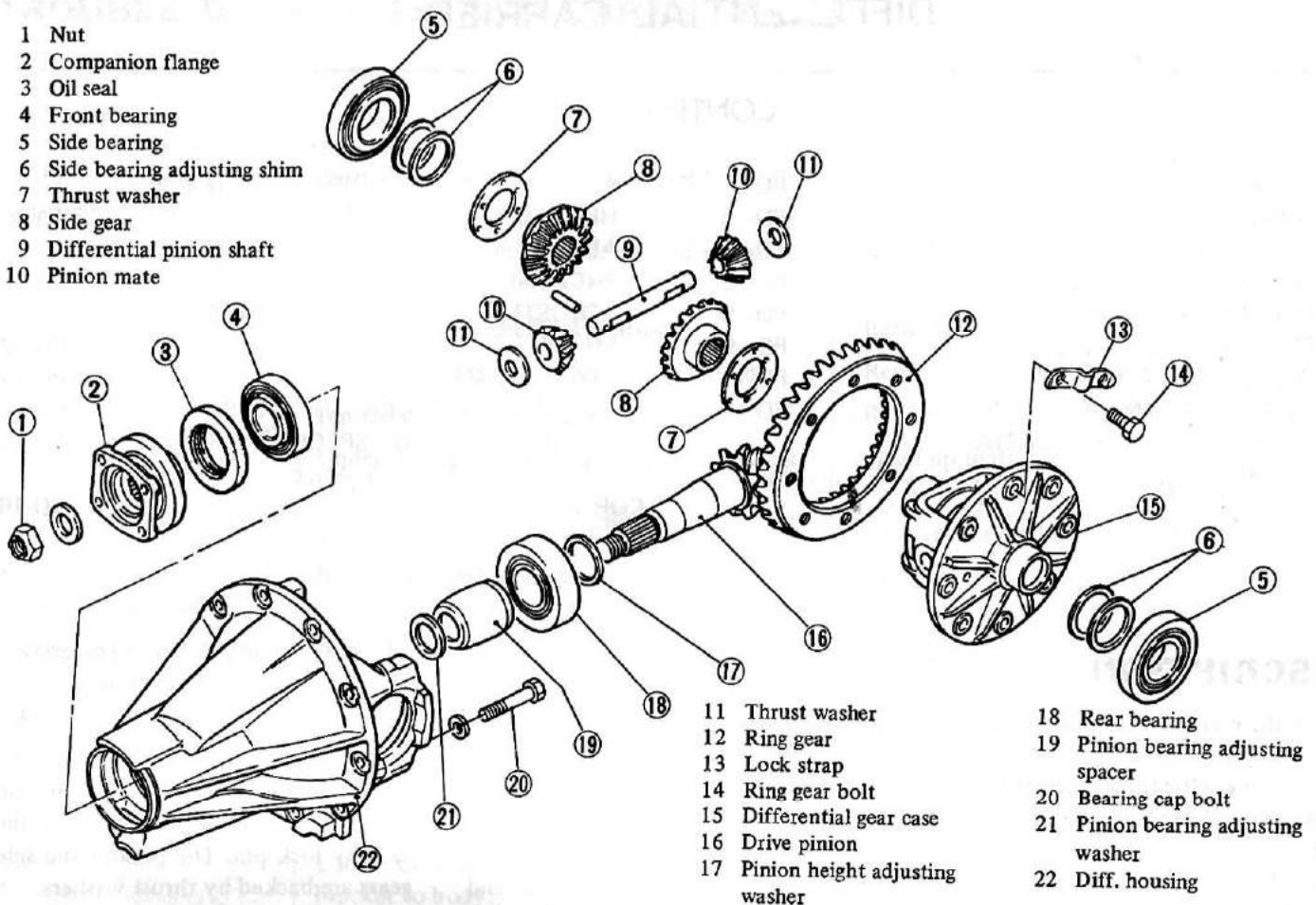


Fig. PD-6 Exploded view of differential gear carrier

REMOVAL

1. Jack up rear of car and support it by placing a safety stand under rear axle case. Drain gear oil.
2. Remove propeller shaft and rear axle shafts. These works can be done by referring to Section RA (Page RA-6) for Removal.
3. Remove rear stabilizer bracket and raise stabilizer center to facilitate removal of differential carrier.
4. Loosen off nuts securing differential carrier to rear axle case, and take out differential gear carrier assembly.

Caution: Make sure press ram, piston pin and press stand are aligned properly.

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.

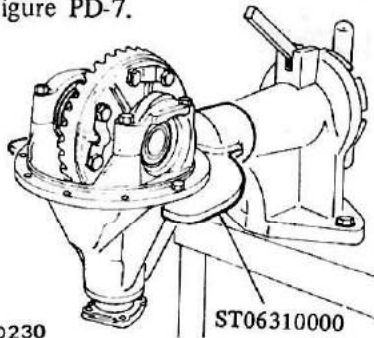


Fig. PD-7 Holding differential carrier

2. Visually inspect parts for wear or damage.
3. 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.
4. 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).

DISASSEMBLY

1. Put match marks on side bearing caps and carrier, and remove side bearing caps and take out differential case assembly. See Figure PD-8.

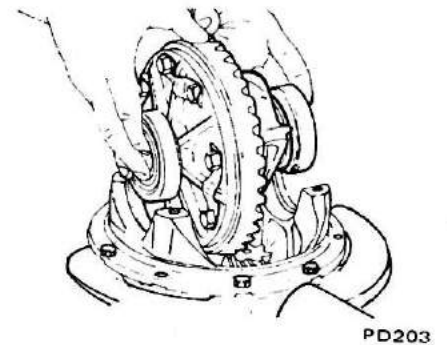


Fig. PD-8 Removing differential case assembly

PRE-DISASSEMBLY INSPECTION

Differential 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.

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

2. Remove drive pinion nut using Drive Pinion Flange Wrench ST31530000, and pull off companion flange using a standard puller. See Figure PD-9.

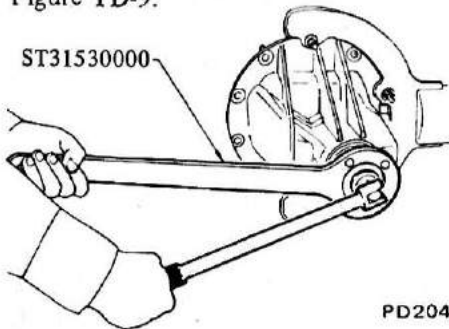


Fig. PD-9 Removing drive pinion nut

3. Extract drive pinion assembly to the rearwards by tapping the front end with a soft hammer. Drive pinion can be taken out together with rear bearing inner race, bearing spacer and washer.

4. Remove oil seal and take out front bearing inner race.

Note: Oil seal must not be reused.

5. 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-10.

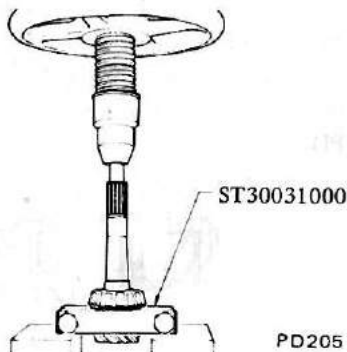


Fig. PD-10 Removing pinion rear bearing inner race

6. To remove outer races of both front and rear bearing, apply a brass drift to race side surface, and withdraw them by tapping the top of drift with a hammer. See Figure PD-11.

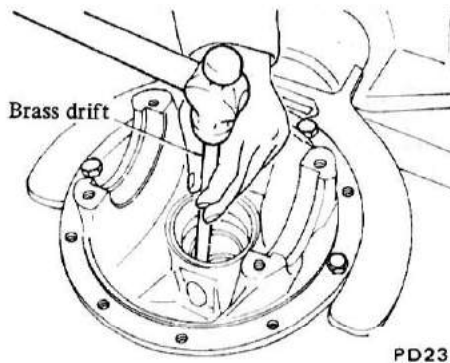


Fig. PD-11 Removing pinion front and rear bearing outer races

DIFFERENTIAL CASE

1. When replacing side bearing, use Gear Carrier Side Bearing Puller ST3306S001 (set of ST33051001 and ST33061000). See Figure PD-12.

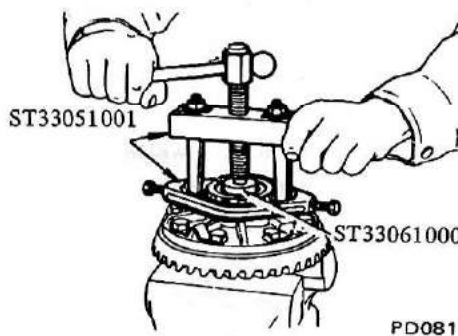


Fig. PD-12 Removing side bearing

Notes:

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

2. Remove ring gear by spreading out lock strap and loosening ring gear bolts in diagonally.

3. Punch off pinion mate shaft lock pin from ring gear side using Solid Punch ST23550001. See Figure PD-13.

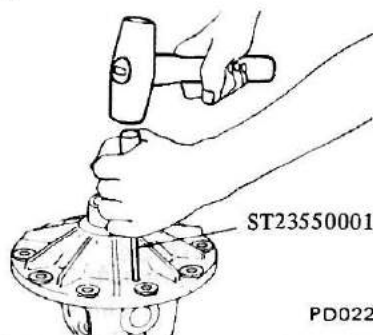


Fig. PD-13 Removing lock pin

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.

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see if they are worn, damaged or otherwise faulty, and how they are affected. Repair or replace all faulty 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 fault 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 faults 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 faulty parts.

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

ASSEMBLY AND ADJUSTMENT

Assembly can be done in the reverse order of disassembly. The following directions for adjustment and usage of special tools enable to obtain a perfect differential operation.

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 caps are installed.
3. Apply gear oil when installing bearings.
4. Pack cavity with recommended multi-purpose grease 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 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 selecting side gear thrust washer.

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)
0.90 to 0.95 (0.0354 to 0.0374)

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. Torque bolts to specification, and bend up lock washers.

Tightening torque:
7 to 8 kg-m
(51 to 58 ft-lb)

Notes:

- a. Use only genuine drive gear bolts and new lock washers.
- b. Tighten bolts in criss-cross fashion lightly tapping around bolt heads with a hammer.

7. When replacing side bearing, measure bearing width using a standard gauge [20.00 mm (0.7874 in) thickness] and a weight block 2.5 kg (5.5 lb) prior to installation. See Figure PD-14.

Standard bearing width:
20.00 mm (0.7874 in)

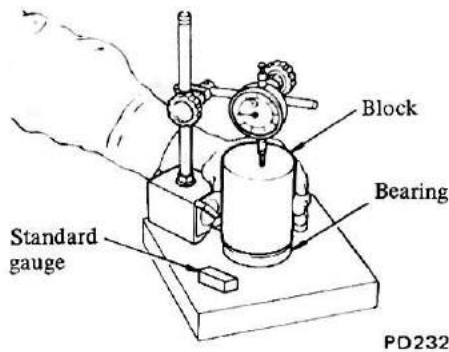
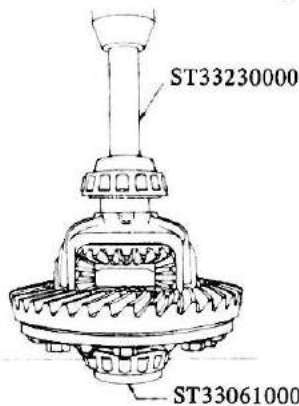


Fig. PD-14 Measuring bearing width

8. Press fit side bearing cone into differential case using Gear Carrier Side Bearing Drift ST33230000 and Adapter ST33061000. See Figure PD-15.



PD244

Fig. PD-15 Installing side bearing cone

ADJUSTMENT OF DRIVE PINION HEIGHT

Adjust the pinion height with washer provided between rear bearing inner race and the back of pinion gear.

1. Press fit front and rear bearing outer races into gear carrier using Drive Pinion Outer Race Drift Set ST30611000, ST30613000 and ST30621000.

Front:

ST30611000 and
ST30613000

Rear:

ST30611000 and
ST30621000

2. Fit rear bearing on carrier and install Dummy Shaft ST31942000 and Collar ST31970000 on rear bearing, and place Height Gauge ST31941000 on carrier. See Figure PD-16.

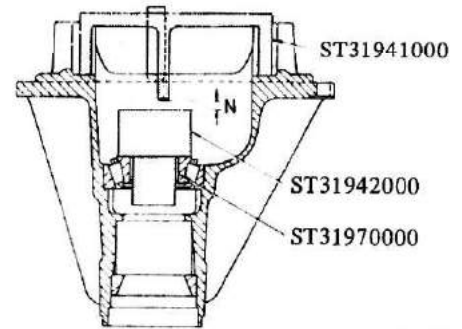


Fig. PD-16 Adjusting pinion height

When using Height Gauge ST31101000, install Dummy Shaft ST31942000, Collar ST31970000 and Spacer ST31102000 on rear bearing, and place Height Gauge ST31101000 (Former ST31100000). See Figure PD-17.

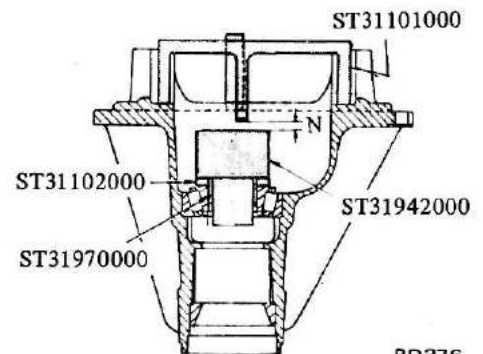
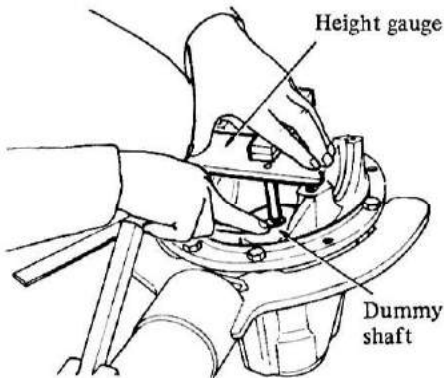


Fig. PD-17 Adjusting pinion height (Use Height Gauge ST31101000)

3. 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.



PD235

Fig. PD-18 Measuring clearance

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

$$T = N - [(H - D' - S) \times 0.01] + 2.18$$

Where,

T : Required thickness of rear bearing adjusting washers (mm).

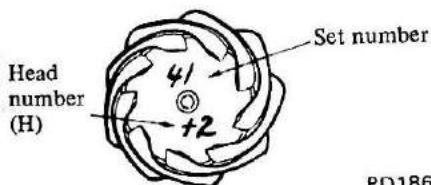
N : Measured value with thickness gauge (mm).

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.



PD186

Fig. PD-19 Variation number on drive pinion

Examples of calculation

Ex. 1 --

$$N = 0.51 \text{ mm}, H = +2, D' = -1, S = 0$$

$$\begin{aligned} T &= N - [(H - D' - S) \times 0.01] + 2.18 \\ &= 0.51 - [((+2) - (-1) - (0)) \times 0.01] + 2.18 \\ &= 0.51 - [(2 + 1 - 0) \times 0.01] + 2.18 \\ &= 0.51 - [3 \times 0.01] + 2.18 \\ &= 0.51 - 0.03 + 2.18 \\ &= 2.66 \text{ mm} \end{aligned}$$

The correct washer is 2.67 mm thick.

Ex. 2 --

$$N = 0.68 \text{ mm}, H = -3, D' = +1, S = -2$$

$$\begin{aligned} T &= N - [(H - D' - S) \times 0.01] + 2.18 \\ &= 0.68 - [((-3) - (+1) - (-2)) \times 0.01] + 2.18 \\ &= 0.68 - [(-3 - 1 + 2) \times 0.01] + 2.18 \\ &= 0.68 - [-2 \times 0.01] + 2.18 \\ &= 0.68 - [-0.02] + 2.18 \\ &= 0.68 + 0.02 + 2.18 \\ &= 2.88 \text{ mm} \end{aligned}$$

The correct washer is 2.88 mm thick.

Ex. 3 --

$$N = 0.70 \text{ mm}, H = 0, D' = 0, S = 0$$

$$\begin{aligned} T &= N - [(H - D' - S) \times 0.01] + 2.18 \\ &= 0.70 - [(0 - 0 - 0) \times 0.01] + 2.18 \\ &= 0.70 - [0 \times 0.01] + 2.18 \\ &= 0.70 - 0 + 2.18 \\ &= 0.70 + 2.18 \\ &= 2.88 \text{ mm} \end{aligned}$$

The correct washer is 2.88 mm thick.

Note: If values signifying H, D' and S are not given, regard them as zero and compute. After assembly, check to see that tooth contact is correct. If not, readjust. For the tooth contact pattern, see page PD-12 for Contact Pattern.

Pinion height adjusting washer

Thickness mm (in)
2.58 (0.1016)
2.61 (0.1028)
2.64 (0.1039)
2.67 (0.1051)
2.70 (0.1063)
2.73 (0.1075)
2.76 (0.1087)
2.79 (0.1098)
2.82 (0.1110)
2.85 (0.1122)
2.88 (0.1134)
2.91 (0.1146)
2.94 (0.1158)
2.97 (0.1169)
3.00 (0.1181)
3.03 (0.1193)
3.06 (0.1205)
3.09 (0.1217)
3.15 (0.1240)
3.18 (0.1252)

5. Fit determined pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it, using Base ST30901000.

ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust the preload of drive pinion with spacer and washer between front and rear bearing inner races.

This procedure has nothing to do with thickness of pinion height adjusting washer.

This adjustment must be carried out without oil seal inserted.

1. Lubricate pinion front and rear bearings. Install drive pinion in gear carrier. Be sure that spacer, washer, front bearing inner race, companion flange and flat washer are fitted on pinion. Tighten nut to specified torque and confirm preload.

Tightening torque:

14 to 17 kg-m

(101 to 123 ft-lb)

Propeller Shaft & Differential Carrier

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

2. Measure pinion bearing preload using Preload Gauge ST3127S000 and select washer and spacer that will provide required preload. See Figure PD-20.

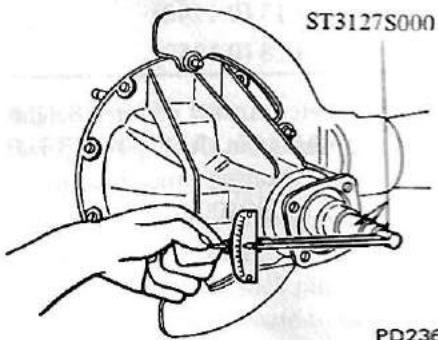
Preload (without oil seal):

10 to 13 kg-cm
(8.7 to 11.3 in-lb)

At companion flange bolt hole:

2.9 to 3.8 kg
(6.4 to 8.4 lb)

Note: Preload of old bearing is the same value as that of a new bearing.



PD236

Fig. PD-20 Measuring pinion preload

Pinion bearing adjusting washer

Thickness mm (in)
3.80 to 3.82 (0.1496 to 0.1504)
3.82 to 3.84 (0.1504 to 0.1512)
3.84 to 3.86 (0.1512 to 0.1520)
3.86 to 3.88 (0.1520 to 0.1528)
3.88 to 3.90 (0.1528 to 0.1535)
3.90 to 3.92 (0.1535 to 0.1543)
3.92 to 3.94 (0.1543 to 0.1551)
3.94 to 3.96 (0.1551 to 0.1559)
3.96 to 3.98 (0.1559 to 0.1567)
3.98 to 4.00 (0.1567 to 0.1575)
4.00 to 4.02 (0.1575 to 0.1583)
4.02 to 4.04 (0.1583 to 0.1591)
4.04 to 4.06 (0.1591 to 0.1598)
4.06 to 4.08 (0.1598 to 0.1606)
4.08 to 4.10 (0.1606 to 0.1614)

3. Inspect pinion height again when former adjustment of bearing preload is completed. Unless anything wrong is found, remove drive pinion nut and companion flange and press new oil seal into gear carrier using Oil Seal Drift ST30720000. Apply grease cavity between seal lips.

4. Again install companion flange and washer, and tighten nut to specified torque 14 to 17 kg-m (101 to 123 ft-lb).

5. Measure preload again.

Preload (with oil seal):

11 to 14 kg-cm
(9.5 to 12.2 in-lb)

At companion flange bolt hole:

3.2 to 4.1 kg
(7.1 to 9.1 lb)

Pinion bearing adjusting spacer

Length mm (in)
54.50 (2.1457)
54.80 (2.1575)
55.10 (2.1693)
55.40 (2.1811)
55.70 (2.1929)
56.00 (2.2047)

ADJUSTMENT OF SIDE BEARING SHIMS

1. If hypoid gear set, carrier, differential case or side bearing have been replaced with new ones, adjust the side bearing preload with adjusting shim.

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

$$T_1 = (A - C + D - H') \times 0.01 + 0.175 + E$$

$$T_2 = (B - D + H') \times 0.01 + 0.150 + F$$

Where,

T_1 : Required thickness of left side bearing adjusting shim (mm).

T_2 : Required thickness of right side bearing adjusting shim (mm).

A : Figure marked on the left side bearing housing of gear carrier.

B : Figure marked on the right side bearing of gear carrier.

C & D : Figure marked on the differential case.

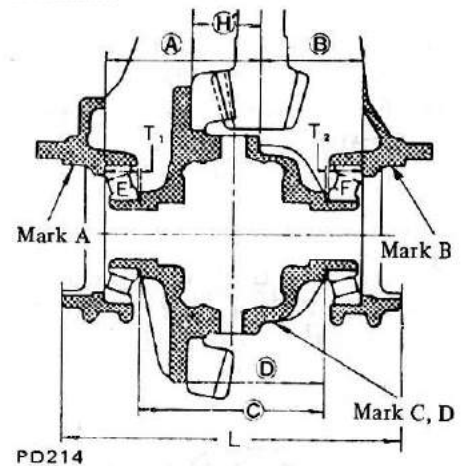
E & F : These are differences in width of left or right side bearing against the standard width (20.00 mm) (mm).

If bearing width is 19.89, the difference will be as follows:

$$20.00 - 19.89 = 0.11$$

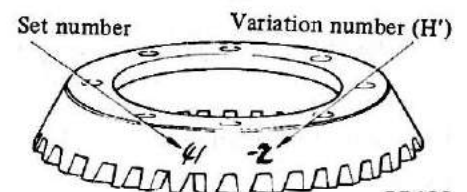
H' : Figure marked on the ring gear. See Figures PD-21 and PD-22.

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



PD214

Fig. PD-21 Thickness of shim on left and right sides



PD190

Fig. PD-22 Variation number on ring gear

Propeller Shaft & Differential Carrier

Examples of calculation

Ex. 1 --

$$A = 1, B = 2, C = 2, D = 3$$

$$E = 0.11 \text{ mm}, F = 0.15 \text{ mm}$$

$$H' = -2$$

Left side:

$$T_1 = (A - C + D - H') \times 0.01$$

$$+ 0.175 + E$$

$$= (1 - 2 + 3 - (-2)) \times 0.01$$

$$+ 0.175 + 0.11$$

$$= (1 - 2 + 3 + 2) \times 0.01$$

$$+ 0.175 + 0.11$$

$$= 4 \times 0.01 + 0.175 + 0.11$$

$$= 0.04 + 0.175 + 0.11$$

$$= 0.325 \text{ mm}$$

The correct shims are as follows:

Thickness	Quantity	
0.07	x 2	= 0.14
0.20	x 1	= 0.20
Total thickness		= 0.34 mm

Right side:

$$T_2 = (B - D + H') \times 0.01$$

$$+ 0.150 + F$$

$$= (2 - 3 + (-2)) \times 0.01$$

$$+ 0.150 + 0.15$$

$$= (2 - 3 - 2) \times 0.01$$

$$+ 0.150 + 0.15$$

$$= -3 \times 0.01 + 0.150 + 0.15$$

$$= -0.03 + 0.150 + 0.15$$

$$= 0.27 \text{ mm}$$

The correct shims are 0.07 plus 0.20 mm thick.

Ex. 2 --

$$A = 0, B = 3, C = 1, D = 0$$

$$E = 0.20 \text{ mm}, F = 0.17 \text{ mm}$$

$$H' = 2$$

Left side:

$$T_1 = (A - C + D - H') \times 0.01$$

$$+ 0.175 + E$$

$$= (0 - 1 + 0 - (+2)) \times 0.01$$

$$+ 0.175 + 0.20$$

$$= (0 - 1 + 0 - 2) \times 0.01$$

$$+ 0.175 + 0.20$$

$$= -3 \times 0.01 + 0.175 + 0.20$$

$$= -0.03 + 0.175 + 0.20$$

$$= 0.345 \text{ mm}$$

The correct shims are 0.05 plus 0.10 plus 0.20 mm thick.

Right side:

$$T_2 = (B - D + H') \times 0.01$$

$$+ 0.150 + F$$

$$= (3 - 0 + (+2)) \times 0.01$$

$$+ 0.150 + 0.17$$

$$= (3 - 0 + 2) \times 0.01$$

$$+ 0.150 + 0.17$$

$$= 5 \times 0.01 + 0.150 + 0.17$$

$$= 0.05 + 0.150 + 0.17$$

$$= 0.37 \text{ mm}$$

The correct shims are 0.07 plus 0.10 plus 0.20 mm thick.

Note: If values signifying A, B, C, D and H' are not given, regard them as zero and compute.

After assembly, check to see that preload and backlash are correct. If not, readjust.

Side bearing 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. Fit determined side bearing adjusting shim on differential case, and press fit left and right side bearing inner races on it, using Side Bearing Drift ST33230000 and Adapter ST33061000.

3. Install differential case assembly into gear carrier, tapping with a rubber mallet.

4. Align mark on bearing cap with that on gear carrier, and install bearing cap on carrier. And tighten bolts to specified torque.

Tightening torque:

$$5 \text{ to } 6 \text{ kg-m}$$

$$(36 \text{ to } 43 \text{ ft-lb})$$

5. Measure "L" dimension (between left and right bearing cap edges) by Side Bearing Cap Gauge ST32110001 or a micrometer. See Figure PD-23.

"L" dimension:

$$198.40 \text{ to } 198.55 \text{ mm}$$

$$(7.8110 \text{ to } 7.8169 \text{ in})$$

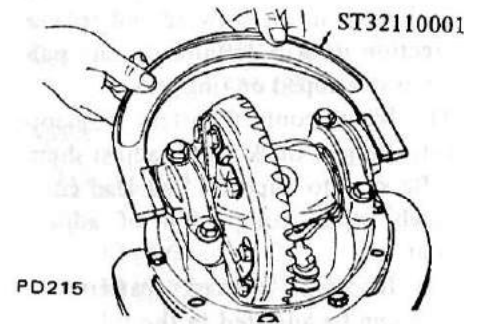


Fig. PD-23 Measuring "L" dimension

6. Measure ring gear-to-drive pinion backlash. See Figure PD-24.

If backlash is too small, remove shims from left side and add them to right side. To reduce backlash, remove shims from right side and add them to left side.

Backlash:

$$0.15 \text{ to } 0.20 \text{ mm}$$

$$(0.0059 \text{ to } 0.0079 \text{ in})$$

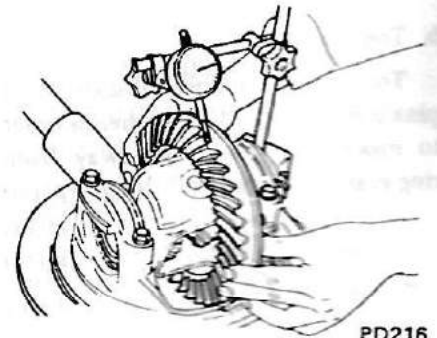


Fig. PD-24 Measuring backlash

7. At the same time, check side bearing preload. Bearing preload should read 12 to 20 kg-cm (10.4 to 17.4 in-lb) of rotating torque, [3.5 to 5.8 kg (7.7 to 12.8 lb) at companion flange bolt hole].

If preload does not accord with this specification, adjust it with side bearing shims.

8. 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 direction 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 pinion height adjusting washer in order to bring drive pinion close to ring gear. See Figure PD-25.

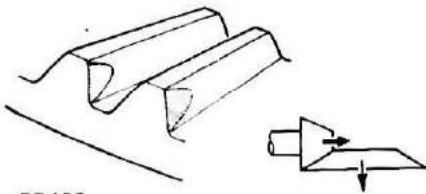


Fig. PD-25 Heel contact

b. Toe contact

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear. See Figure PD-26.

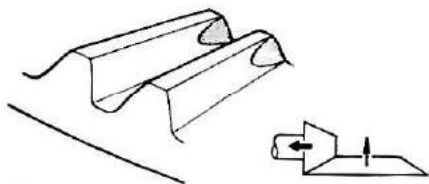


Fig. PD-26 Toe contact

c. Flank contact

Adjust in the same manner as in b. See Figure PD-27.

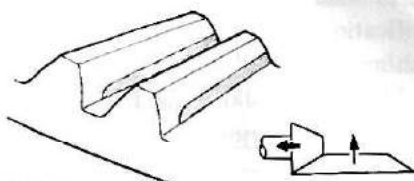


Fig. PD-27 Flank contact

d. Face contact

Adjust in the same manner as in a. See Figure PD-28.

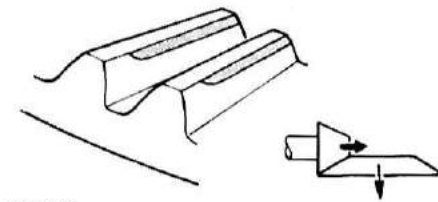


Fig. PD-28 Face contact

e. Correct tooth contact

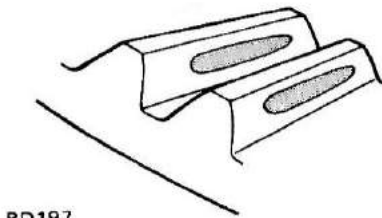


Fig. PD-29 Correct contact

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

INSTALLATION

Installing can be done in the reverse order of removal.

Tightening torque:

Gear carrier to rear axle case:
1.7 to 2.5 kg-m
(12.3 to 18 ft-lb)

Drain and filler plug:
4.2 to 6.9 kg-m
(30 to 50 ft-lb)

Gear oil quantity: 0.9 liter
(1 3/8 U.S.pt., 1 1/8 Imp.pt.)

REPLACEMENT OF FRONT OIL SEAL

When replacing front oil seal, do as follows:

1. Remove differential gear carrier assembly and mount it on Gear Carrier Attachment ST06310000.

This work can be done by referring to "Removal" procedure.

2. Remove side bearing caps and take out differential case assembly. Remove drive pinion nut and extract drive pinion assembly. Remove oil seal.

These works can be done by referring to "Disassembly" procedure.

3. Install a new oil seal in carrier. Lubricate cavity between seal lips with recommended multi-purpose grease when installing.

4. Place adjusting spacer and washer on drive pinion and lubricate pinion rear bearing with gear oil.

5. Insert companion flange into oil seal. Insert drive pinion into companion flange from the rear of the carrier and secure them in position by tightening nut to the given torque confirming specified preload.

These works can be done by referring to "Adjustment of Drive Pinion Preload" procedure.

6. Install differential case assembly into gear carrier. Measure "L" dimension, backlash with specification, adjust them with side bearing shims.

These works can be done by referring to "Adjustment of Side Bearing Shims" procedure.

7. Reinstall differential gear carrier assembly, rear axle shafts and propeller shaft. Fill up differential carrier with correct gear oil.

Notes:

a. Replacement of front oil seal with differential gear carrier assembly installed on the car must not be allowed due to used collapsible spacer on its model.

b. Whenever front oil seal is replaced, collapsible spacer must be replaced.

SERVICE DATA AND SPECIFICATIONS

Type	H190
Final gear ratio (number of teeth)	4.111 (37/9)
	Optional 3.889 (35/9)
	4.375 (35/8)
Drive pinion preload adjusted by	Spacer
Oil capacity liter (US pt, Imp.pt)	0.9 (1 $\frac{3}{8}$, 1 $\frac{5}{8}$)
Drive pinion	
Preload (without oil seal) kg-cm (in-lb)	10 to 13 (8.68 to 11.2)
(with oil seal) kg-cm (in-lb)	11 to 14 (9.5 to 12.2)
At companion flange bolt hole	
(without oil seal) kg (lb)	2.9 to 3.7 (6.4 to 8.2)
(with oil seal) kg (lb)	3.2 to 4.0 (7.1 to 8.8)
Thickness of drive pinion bearing adjust washers mm (in)	3.81 to 4.09 (0.1500 to 0.1611)
	Spacing 0.02 (0.0008)
Length of drive pinion bearing spacers mm (in)	54.50 to 56.00 (2.146 to 2.204)
	Spacing 0.30 (0.0118)
Side gear and pinion mate	
Thickness of side gear thrust washers mm (in)	0.775 (0.0305), 0.825 (0.0325)
	0.875 (0.0344), 0.925 (0.0364)
Clearance between side gear and thrust washer mm (in)	0.1 to 0.2 (0.0039 to 0.0079)
Ring gear	
Backlash between drive gear and pinion mm (in)	0.15 to 0.20 (0.0059 to 0.0079)
Runout of rear side mm (in)	less than 0.07 (0.0028)
Thickness at side bearing adjusting shim mm (in)	0.05 (0.0020), 0.07 (0.0028)
	0.10 (0.0039), 0.10 (0.0039)
	0.50 (0.0197)
“L” dimension mm (in)	198.40 to 198.55 (7.8110 to 7.8169)
Side bearing	
Preload kg-cm (in-lb)	12 to 20 (10.4 to 17.4)
Preload at ring gear bolt kg (lb)	1.7 to 2.8 (3.7 to 6.2)
Standard width mm (in)	20.00 (0.787)
Tightening torque	
Drive pinion nut kg-m (ft-lb)	14 to 17 (101 to 123)
Ring gear bolts kg-m (ft-lb)	7 to 8 (50 to 58)
Side bearing cap bolts kg-m (ft-lb)	4 to 5 (29 to 36)
Differential carrier to axle housing fix nuts kg-m (ft-lb)	1.7 to 2.5 (12 to 18)
Companion flange to propeller shaft bolt kg-m (ft-lb)	2.5 to 3.2 (18 to 23)

Propeller Shaft & Differential Carrier

Adjusting methods

Variable numbers expressed by	mm × 0.01
Dummy shaft	Used
Drive pinion adjusting formula	$T = N - (H - D' - S) \times 0.01 + 2.18$
Side bearing adjusting formula	$T_1 = (A - C + D - H') \times 0.01 + 0.175 + E$ $T_2 = (B - D + H') \times 0.01 + 0.150 + F$

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.

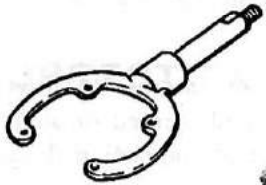
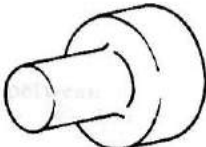
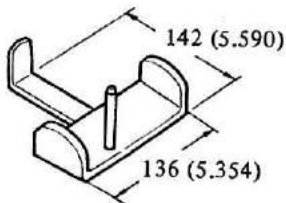
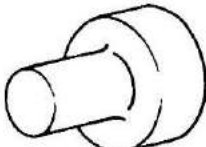
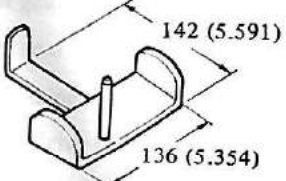
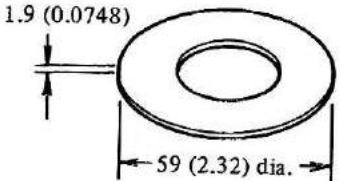
Condition	Probable cause	Corrective action
Noise on drive, coast and float.	Shortage of oil. Incorrect tooth contact between ring gear and drive pinion. Incorrect backlash between ring gear and drive pinion. Seized up or damaged ring gear and drive pinion. Seized up, damaged or broken drive pinion bearing. Seized up, damaged or broken side bearing. Loosen bolts or nuts fixing ring gear, side retainers, bearing cap, etc.	Supply gear oil. Rebuild gear carrier if necessary. Adjust tooth contact or replace the hypoid gear set. Adjust backlash or replace the hypoid gear set if necessary. Replace the hypoid gear set. Replace the pinion bearing and faulty parts. Replace the side bearing and faulty parts. Clamp them to specified torque, and replace faulty parts.
Noise on turn.	Seized up, damaged or broken side and pinion gear. Seized up, damaged or broken side gear and pinion thrust washer. Pinion gears too tight on their shaft.	Replace faulty parts. Replace faulty parts. Replace faulty parts.
Knocking sound during starting or gear shifting.	Excessive backlash. Incorrect backlash ring gear-to-drive pinion backlash, or side-to-pinion gear. Worn gears or case. Worn rear axle shaft and side gear spline. Pinion bearing under preload. Loosened drive pinion nut. Loosen bolts or nuts fixing ring gear, bearing cap, etc.	Adjust backlash. Replace worn parts. Replace worn parts. Adjust preload. Repair or replace. Clamp them or replace if necessary.

Propeller Shaft & Differential Carrier

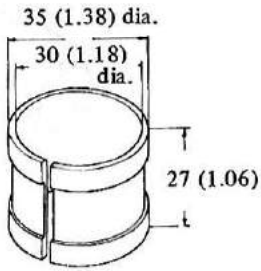
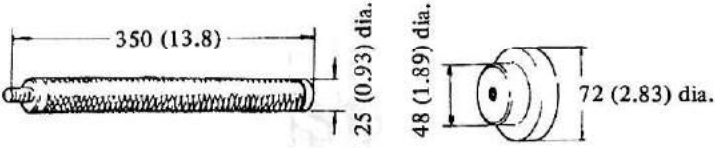
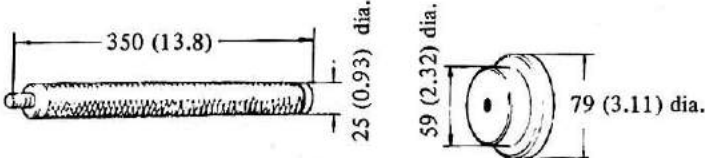
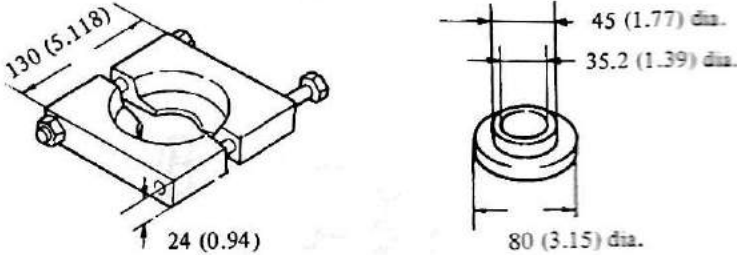
Condition	Probable cause	Corrective action
Seizure of breakage.	Shortage of oil or use of unsuitable oil. Excessively small backlash. Incorrect adjustment of bearings or gears. Severe service due to an excessive loading, improper use of clutch. Loose bolts and nuts, such as ring gear bolts.	Replace faulty parts. Adjust backlash and replace as required. Replace faulty parts. Replace faulty parts. Replace faulty parts.
Oil leakage.	Worn-out, damaged or improperly driven front oil seal, or bruised, dented or abnormally worn slide face of companion flange. Loose bolts fixing gear carrier Faulty gasket. Loose filler or drain plug. Clogged or damaged breather.	Replace faulty oil seal. Repair the affected flange with sandpaper or replace if necessary. Tighten the bolts to specified torque. Replace gasket with a new one. Tighten the plug. Repair or replace.

Z·ONE·DATSUN

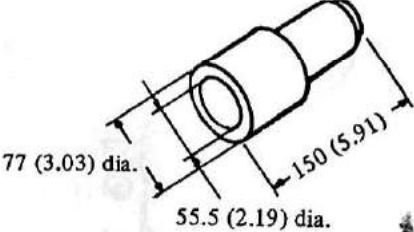
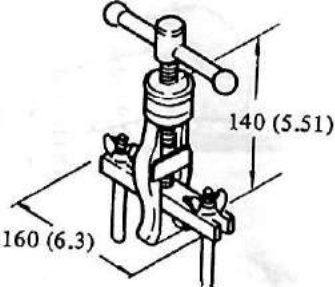
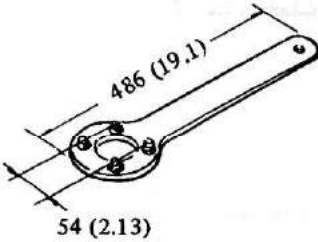
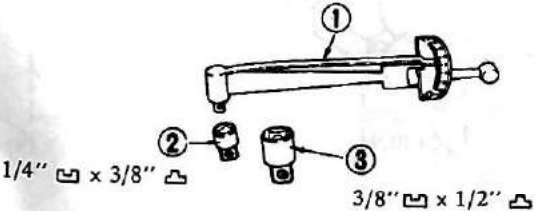
SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
1.	ST06310000 Diff. attachment (H190)	This tool is used for attaching gear carrier to ease disassembly or assembly (ST0501S000).  SE023	330 230 C130 V610 620	Page PD-8
2.	ST3194S000 Drive pinion setting gauge set (H190) ST31942000 Dummy shaft ST31941000 Height gauge	These tools are used to adjust the pinion height.  SE209  SE210	330 230 V610 VC110 (Opt.) C130 620 KSE20	Fig. PD-16 Fig. PD-17
3.	ST3110S000 Drive pinion setting gauge set (H190) ST31942000 Dummy shaft ST31101000 Height gauge ST31102000 Spacer	Same as above.  SE209  SE210  SE211	330 230 V610 VC110 (Opt.) 620 KSE20	Fig. PD-17

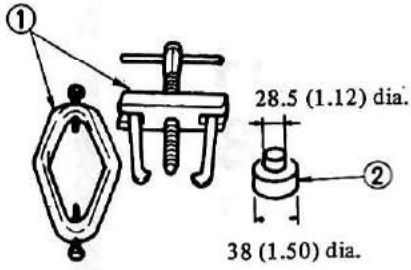
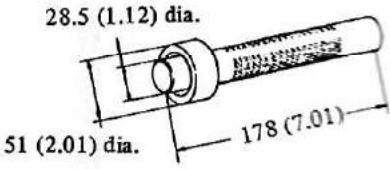
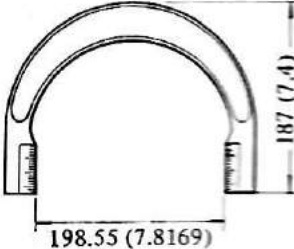
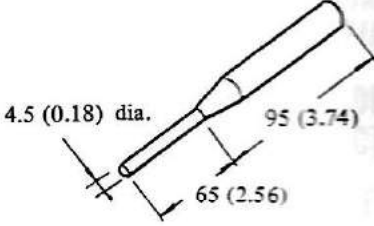
Propeller Shaft & Differential Carrier

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
4.	ST31970000 Collar	<p>This tool is used for Type H190 to adjust the pinion height. This tool is used with ST3194S000 or ST3110S000.</p> 	330 230 V610 VC110 (Opt.) 620 KSE20	Fig. PD-17
5.	Drive pinion outer race drift ST30611000 Bar ST30613000 Adapter	<p>These tools are used when assembling drive pinion outer race.</p> 	(Front) 330 230 C130 RS30 KSE20 VC110 (Opt.) (Rear) 710 (SSS) 610 (All) C110 VC110 620	Page PD-10
	ST30611000 Bar ST30621000 Adapter		(Rear) 330 230 S30 (All) C130 (All) GC110 VC110 (Opt.)	Page PD-10
6.	ST3090S000 Drive pinion rear inner bearing puller assembly ST30031000 Puller ST30901000 Base	<p>These tools are used when assembling drive pinion outer race.</p> 	330 230 S30 (All) GC110 C130 (All) B120 T20 E20 (All)	Fig. PD-10

Propeller Shaft & Differential Carrier

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
7.	ST30720000 Gear carrier front oil seal drift	<p>This tool is used to drive in front oil seal without damaging it.</p> 	330 230 710 (All) 610 (All) C110 (All) C130 (All) S30 620	Page PD-12
8.	ST33290001 Gear carrier oil seal puller	<p>This tool is used to pull out oil seal from gear carrier. This tool also enables to remove side bearing outer race from retainer without damaging.</p> 	All models	
9.	ST31530000 Drive pinion flange wrench	<p>This tool is used to hold the flange to ease the operation of tightening and loosening drive pinion nut.</p> 	330 230 S30(All) 710(All) 610(All) C110 (All) C130 (All) B120 620 T20 E20	Fig. PD-4 Fig. PD-9
10.	ST3127S000 Preload gauge 1 GG91030000 Torque wrench 2 HT62940000 Socket adapter 3 HT62900000 Socket adapter	<p>This tool is used to measure the preload of pinion bearing.</p> 	All models	Fig. PD-20

Propeller Shaft & Differential Carrier

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
11.	ST3306S001 Diff. side bearing puller 1 ST33051001 Body 2 ST33061000 Adapter	This tool is used to pull out side bearing. 	330 230 S30 (All) 710 (SSS) 610 V610 GC110 C130 (All) 620	Fig. PD-12 Fig. PD-15
12.	ST33230000 Diff. side bearing drift	Use of this tool makes it possible to drive in bearing without damaging it. 	330 230 710 (SSS) 610 V610 C130 KC130 620	Fig. PD-15
13.	ST32110001 Diff. side bearing cap gauge	This tool is used to measure the width of side bearing caps after it is tightened to specified torque. 	330 230 V610 C130 620	Fig. PD-23
14.	ST23550001 Solid punch	This tool is used to drive out lock pin of pinion mate shaft. 	330 230 710(All) 610(All) C110 (All) S30(All) C130 (All) B120 620	Fig. PD-13

