

SERVICE MANUAL

Datsun

MODEL 510 SERIES
CHASSIS and BODY



SECTION PD

PROPELLER SHAFT & DIFFERENTIAL CARRIER

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PROPELLER SHAFT & DIFFERENTIAL CARRIER

PROPELLER SHAFT AND UNIVERSAL JOINT

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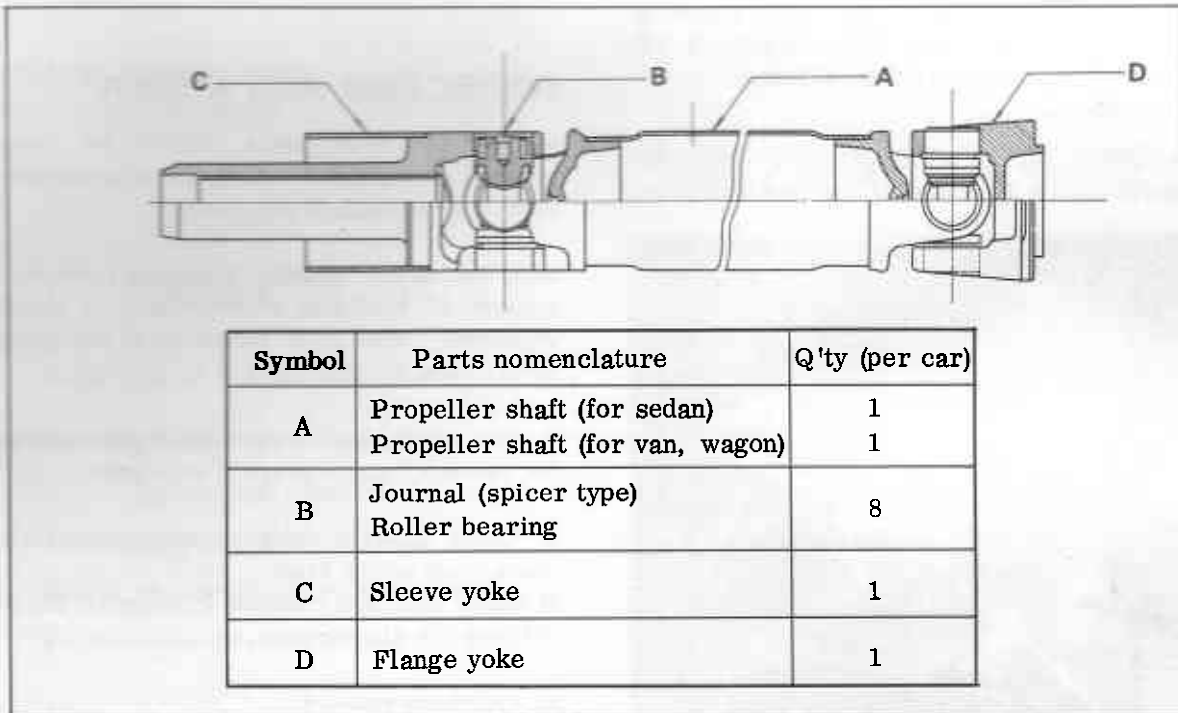


Fig. PD-1 Propeller shaft

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.

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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.

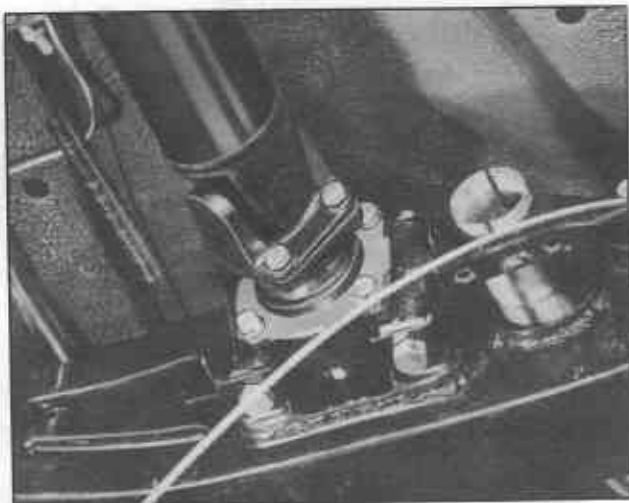


Fig. PD-2 Removing propeller shaft

Note: In this operation care should be taken 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.

PROPELLER SHAFT & DIFFERENTIAL CARRIER

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 available.

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 companion flange		4.0 to 8.5 kg-m (28.93 to 61.5 ft-lb)

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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

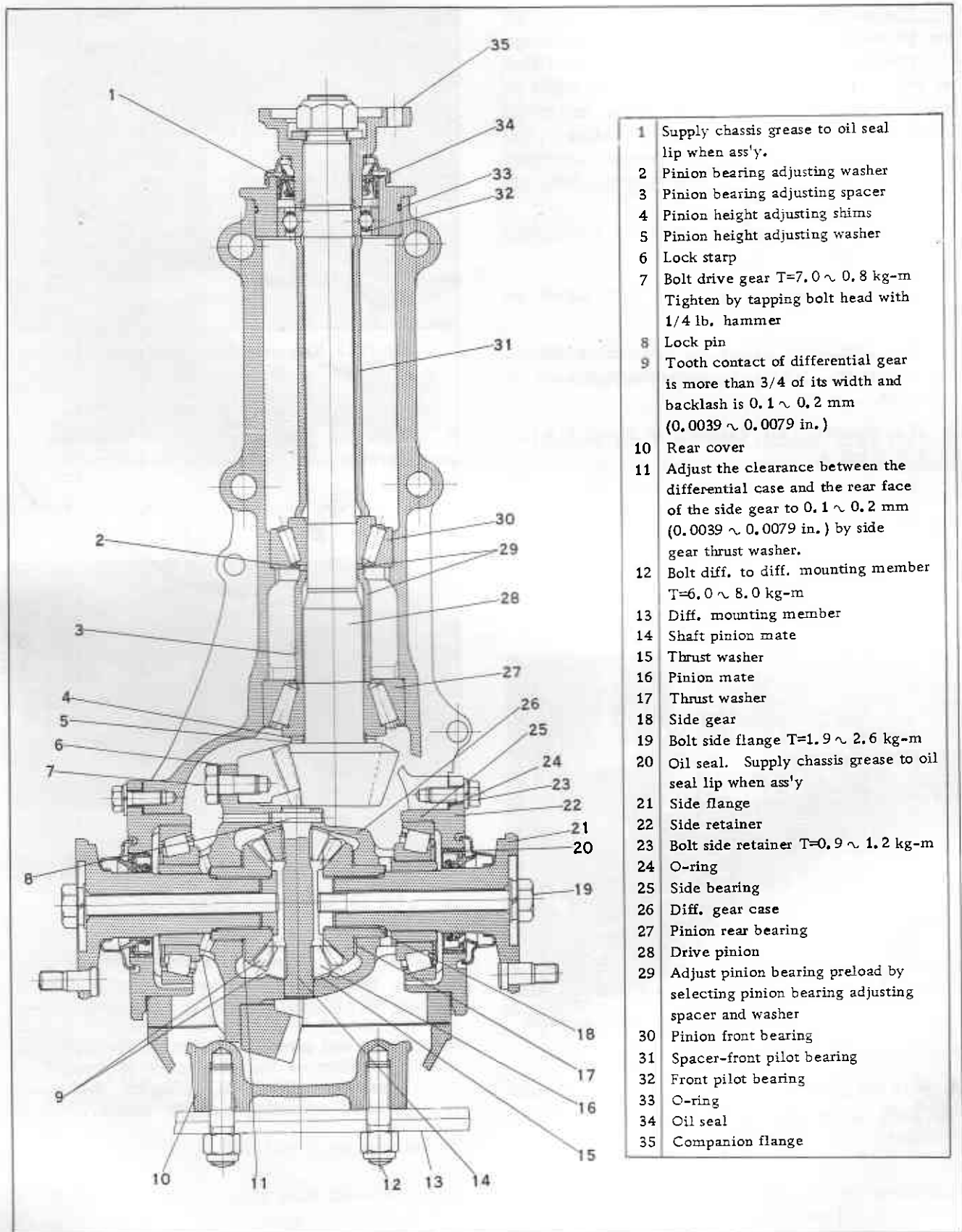
The gear carrier assembly, designed for use in the rear independent suspension is made of malleable cast iron and the hypoid bevel gear is used. To serve as part of the suspension, its housing is highly rigid, basically in a combined cylindrical and oval form.

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.

PROPELLER SHAFT & DIFFERENTIAL CARRIER



- 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 $T=7.0 \sim 0.8 \text{ kg-m}$
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 $0.1 \sim 0.2 \text{ mm}$ ($0.0039 \sim 0.0079 \text{ in.}$)
- 10 Rear cover
- 11 Adjust the clearance between the differential case and the rear face of the side gear to $0.1 \sim 0.2 \text{ mm}$ ($0.0039 \sim 0.0079 \text{ in.}$) by side gear thrust washer.
- 12 Bolt diff. to diff. mounting member $T=6.0 \sim 8.0 \text{ kg-m}$
- 13 Diff. mounting member
- 14 Shaft pinion mate
- 15 Thrust washer
- 16 Pinion mate
- 17 Thrust washer
- 18 Side gear
- 19 Bolt side flange $T=1.9 \sim 2.6 \text{ kg-m}$
- 20 Oil seal. Supply chassis grease to oil seal lip when ass'y
- 21 Side flange
- 22 Side retainer
- 23 Bolt side retainer $T=0.9 \sim 1.2 \text{ kg-m}$
- 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

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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.

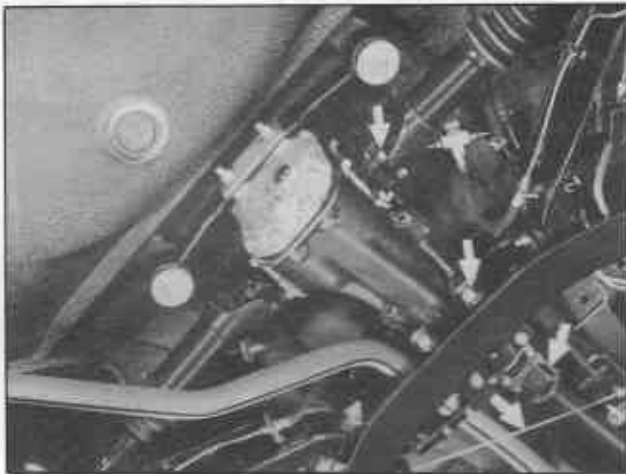


Fig. PD-4 Removing hand brake rear cable, propeller shaft and drive shaft

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

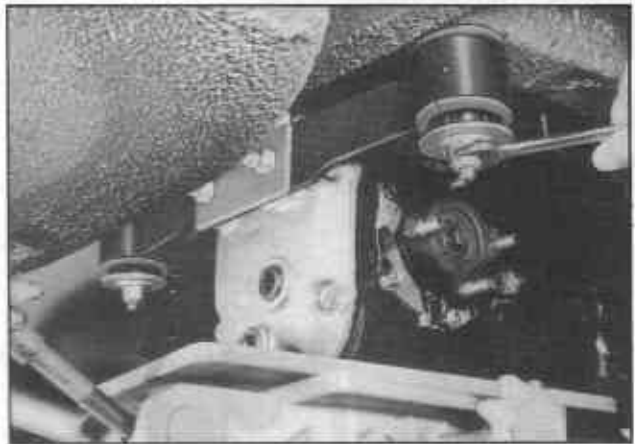


Fig. PD-5 Removing differential mounting member

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.

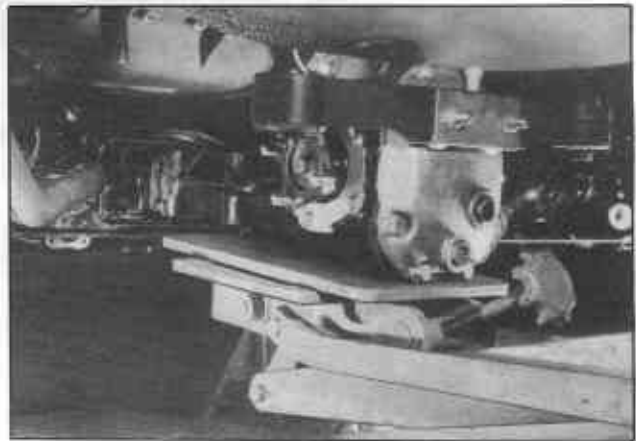


Fig. PD-6 Removal of differential carrier

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.

PROPELLER SHAFT & DIFFERENTIAL CARRIER

PRE-DISASSEMBLY INSPECTION

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).

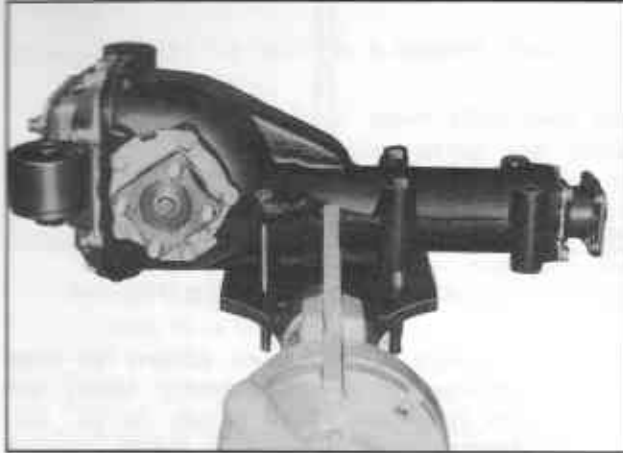


Fig. PD-7 Holding differential carrier

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)

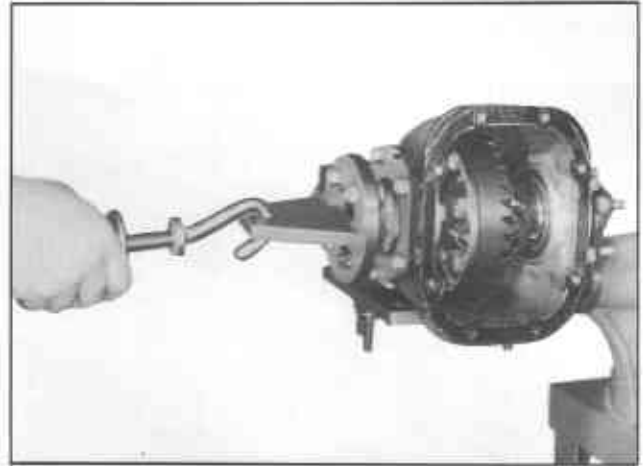


Fig. PD-8 Removing side flange

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.

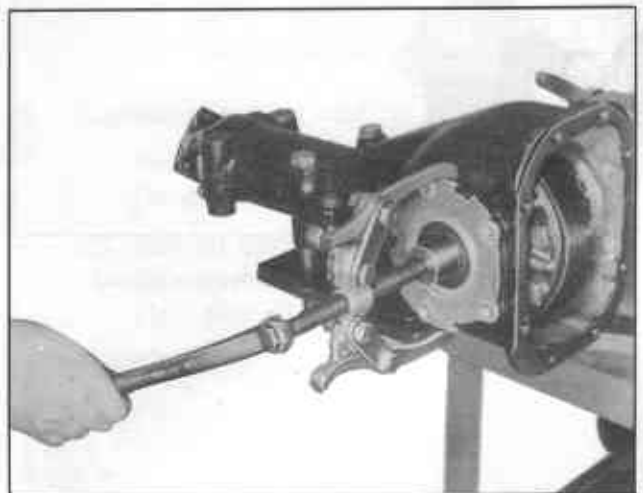


Fig. PD-9 Removing side retainer

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).

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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).

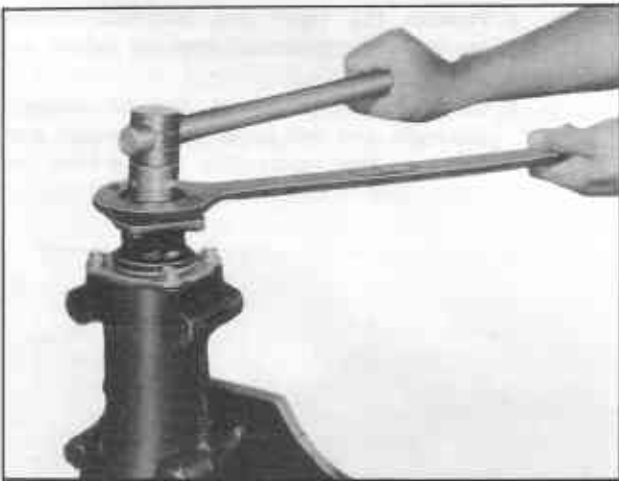


Fig. PD-11 Removing drive pinion nut

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 reused 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

PROPELLER SHAFT & DIFFERENTIAL CARRIER

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

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

- Drain gear oil.
- Jack up the rear wheel.
- Disconnect the left hand rear cable for hand brake.
- 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.
- Detach the propeller shaft from the companion flange of the carrier.
- Remove pinion nuts, holding the companion flange with a drive pinion companion flange with a Drive Pinion Flange Wrench. ST 47340000).

- Extract the companion flange and then the front retainer, using a standard puller.

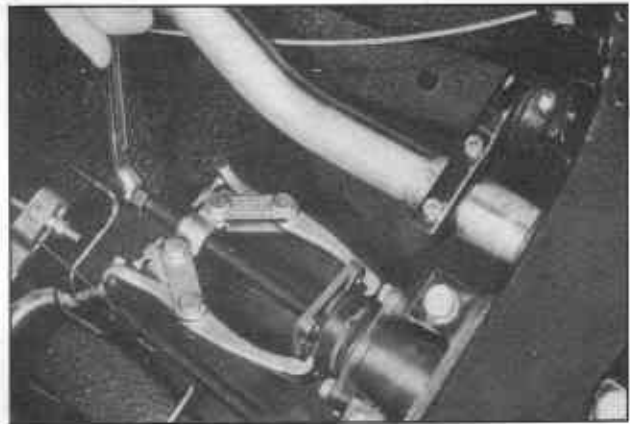


Fig. PD-14 Removing front retainer

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

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

2. Replacing side oil seal

- Detach the drive shaft from the side flange of the gear carrier.
- Extract the side flange using the Sliding Hammer (ST 46780000) and Gear Carrier Side Flange Stand (ST 49250000).

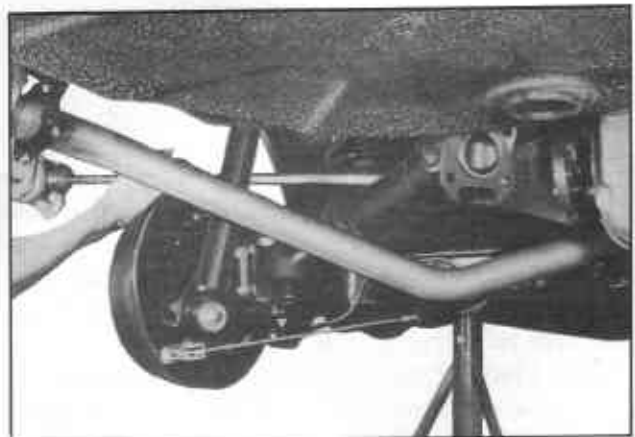


Fig. PD-15 Removing side flange

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- (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.

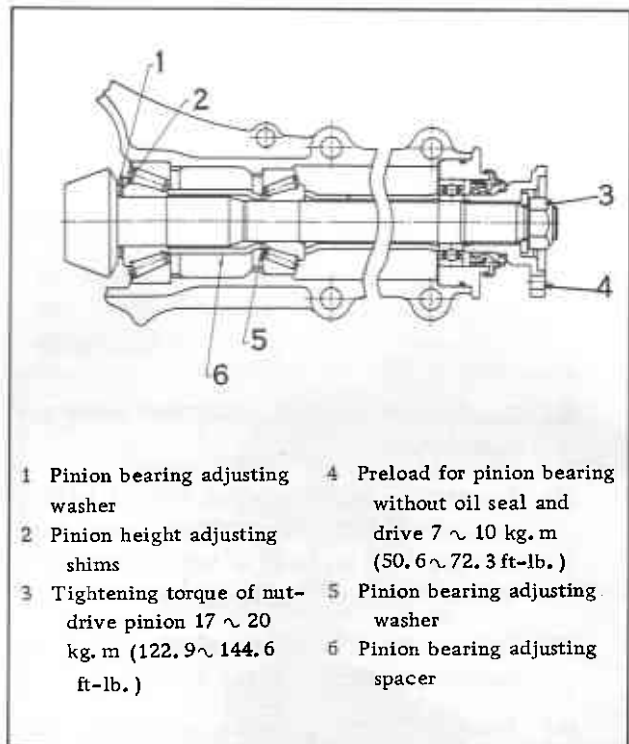


Fig. PD-16 Sectional view of drive pinion

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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.).

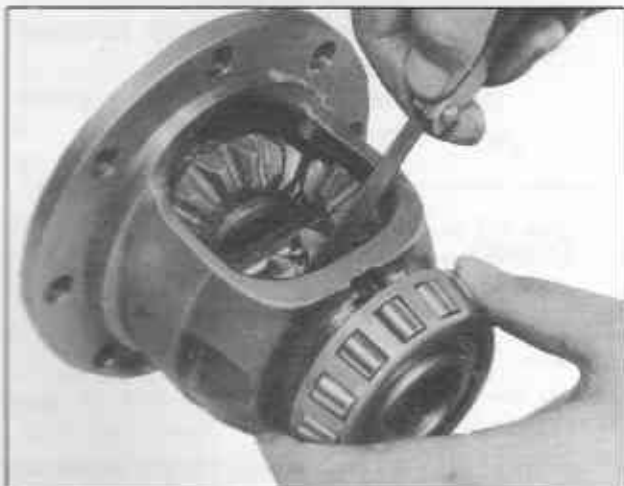


Fig. PD-17 Measuring the clearance between the side gear and thrust washer

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

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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).

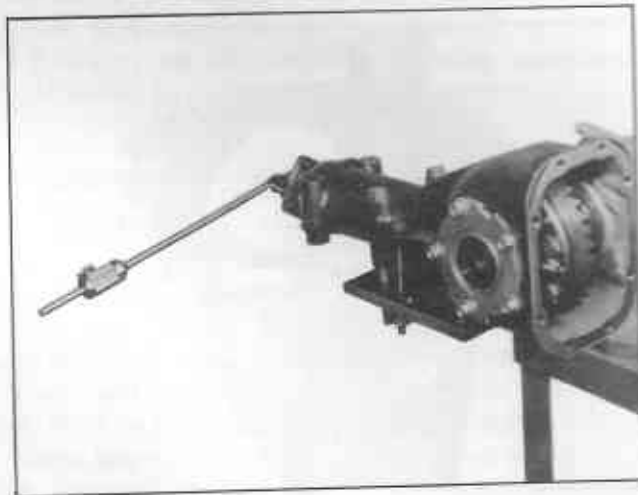


Fig. PD-19 Measuring pinion preload

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.

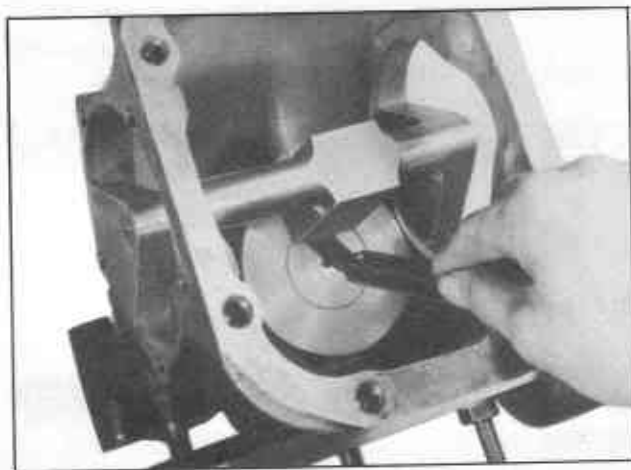


Fig. PD-20 Measuring the clearance

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

$$W = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$T = 0.24 \text{ mm}$$

$$H = -2$$

$$S = 3.40 + 0.24 - (-2 \times 0.01) - 0.20 = 3.46 \text{ mm}$$

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