






# Chapter 8

## Propeller shafts

### Contents

Front propeller shaft rubber gaiter - renewal .....	5	Propeller shaft securing bolt check .....	See Chapter 1A or 1B
General information .....	1	Propeller shaft joint lubrication .....	See Chapter 1A or 1B
Propeller shaft - inspection and overhaul .....	3	Rear propeller shaft rubber coupling -	
Propeller shaft - removal and refitting .....	2	inspection and renewal .....	4

### Degrees of difficulty

<b>Easy</b> , suitable for novice with little experience 	<b>Fairly easy</b> , suitable for beginner with some experience 	<b>Fairly difficult</b> , suitable for competent DIY mechanic 	<b>Difficult</b> , suitable for experienced DIY mechanic 	<b>Very difficult</b> , suitable for expert DIY or professional 
------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------

### Specifications

#### General

Propeller shaft type .....	Tubular, splined joint
End joints .....	Hookes non-constant velocity joints with needle-roller bearings. Later models use flexible rubber coupling in place of universal joint at rear propeller shaft-to-differential flange joint
Shaft diameter .....	51.0 mm

#### Torque wrench settings

	Nm	lbf ft
Propeller shaft securing nuts and bolts .....	47	35
Rear flexible rubber coupling securing nuts and bolts .....	47	35

#### 1 General information

The drive is transmitted from the transfer gearbox to the front and rear axle differentials by two tubular propeller shafts.

The front propeller shaft is fitted with non-constant velocity universal joints at each end, which run in needle-roller bearings. The universal joints cater for the varying angle between the axle and the transmission, caused by suspension movement.

On early models, the rear propeller shaft is fitted with universal joints at each end, as described previously for the front propeller shaft. On later models, the rear propeller shaft is fitted with a universal joint at the front end, and a flexible rubber coupling at the rear end.

To allow for the fore-and-aft movement between the axles and transmission, a sliding, splined joint is incorporated in each propeller shaft.

Grease nipples are fitted to the universal joints, and the universal joints and sliding joints should periodically be lubricated in accordance with the maintenance schedule given in the relevant part of Chapter 1.

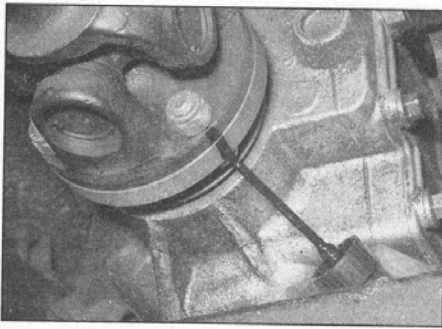
#### 2 Propeller shaft - removal and refitting

##### Front propeller shaft

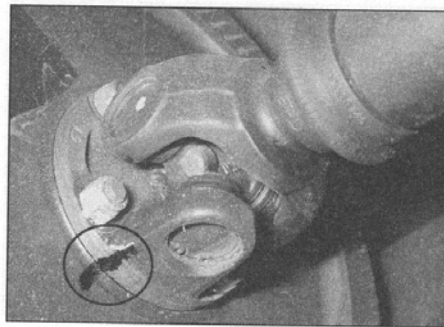
##### Removal

**1** Jack up the vehicle, and support securely on axle stands positioned under the axles, as described in *Jacking and vehicle support*.

**2** If the original propeller shaft is to be refitted, make alignment marks between the front propeller shaft flange and the differential flange.



**2.4 Making alignment marks between the rear propeller shaft flange and the transfer gearbox flange**



**2.10 Make alignment marks between the propeller shaft flange and the handbrake drum**

**3** Counterhold the bolts, and unscrew the nuts securing the front of the propeller shaft to the differential flange.

**4** Again, if the original propeller shaft is to be refitted, make alignment marks between the rear propeller shaft flange and the transfer gearbox flange (see illustration).

**5** Unscrew the nuts securing the rear of the propeller shaft to the transfer gearbox flange.

**6** Remove the bolts from the front shaft flange, then compress the propeller shaft sliding joint until the rear of the shaft can be withdrawn from the studs on the transfer gearbox flange.

**7** Withdraw the propeller shaft from under the vehicle.

**Refitting**

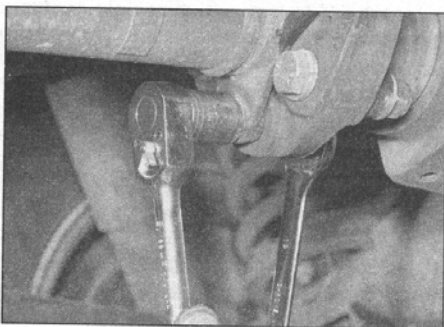
**8** Refitting is a reversal of removal, bearing in mind the following points:

- a) Ensure that the propeller shaft is refitted with the sliding joint towards the transfer gearbox.
- b) If the original propeller shaft is being refitted, align the marks made on the differential flange, transfer gearbox flange, and the propeller shaft flanges before removal.
- c) Tighten the securing nuts and bolts to the specified torque.

**Rear propeller shaft**

**Removal**

**9** Jack up the vehicle, and support securely on axle stands positioned under the axles, as



**2.13 Counterhold the bolts, and unscrew the nuts securing the propeller shaft to the rubber coupling**

described in *Jacking and vehicle support*.

**10** If the original propeller shaft is to be refitted, make alignment marks between the front propeller shaft flange and the handbrake drum at the transfer gearbox (see illustration).

**11** Unscrew the nuts securing the front of the propeller shaft to the handbrake drum.

**12** Again, if the original propeller shaft is to be refitted, make alignment marks between the rear propeller shaft flange and the rear differential flange or rubber coupling, as applicable.

**13** Counterhold the bolts, and unscrew the nuts securing the rear of the propeller shaft to the rear differential flange, or the flexible rubber coupling, as applicable (see illustration).

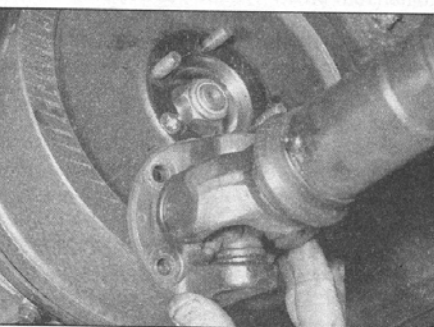
**14** Withdraw the flange bolts, then compress the propeller shaft sliding joint until the front of the propeller shaft can be withdrawn from the studs on the brake drum (see illustration). Note that on models with a rear flexible rubber coupling, the rear of the propeller shaft fits over a spigot on the differential flange - it is therefore necessary to pull the shaft forwards before it can be lowered.

**15** Withdraw the propeller shaft from under the vehicle.

**Refitting**

**16** Refitting is a reversal of removal, bearing in mind the following points:

- a) Ensure that the propeller shaft is refitted



**2.14 Withdraw the front of the propeller shaft from the studs on the brake drum**

- with the sliding joint towards the front of the vehicle (nearest the transfer gearbox).
- b) If the original propeller shaft is being refitted, align the marks made on the handbrake drum, rear differential flange or rubber coupling, and the propeller shaft flanges before removal.
- c) Tighten the securing nuts and bolts to the specified torque.

**3 Propeller shaft - inspection and overhaul**

**Note:** On some later models, sealed propeller shafts are fitted, which cannot be overhauled. In the event of wear in such shafts, it is likely that the complete shaft will have to be renewed. Consult a Land Rover dealer for further information.

**Inspection**

**1** Wear in the universal joint needle roller bearings is characterised by vibration in the transmission, clonks on taking up the drive, and in extreme cases (lack of lubrication), unpleasant metallic noises as the bearings break up.

**2** To test the universal joints for wear with the propeller shaft in place, apply the handbrake, and chock the wheels.

**3** Working under the vehicle, apply leverage between the yokes using a large screwdriver or a flat metal bar. Wear is indicated by movement between the shaft yoke and the coupling flange yoke. Check all the universal joints in this way.

**4** To check the splined sleeve on the front of both shafts, try to push the shafts from side to side, and look for any excessive movement between the sleeve and the shaft. A further check can be made by gripping the shaft and sleeve, and turning them in opposite directions, again looking for excessive movement. As a rough guide, if any movement can be seen, the splines are worn, and the shaft assembly should be renewed.

**5** If a universal joint is worn, a new joint must be obtained and fitted as described later in this Section.

**6** If the sliding joint is excessively worn, the complete shaft assembly must be renewed.

**7** Where applicable, check the condition of the rear propeller shaft flexible rubber coupling, with reference to Section 4.

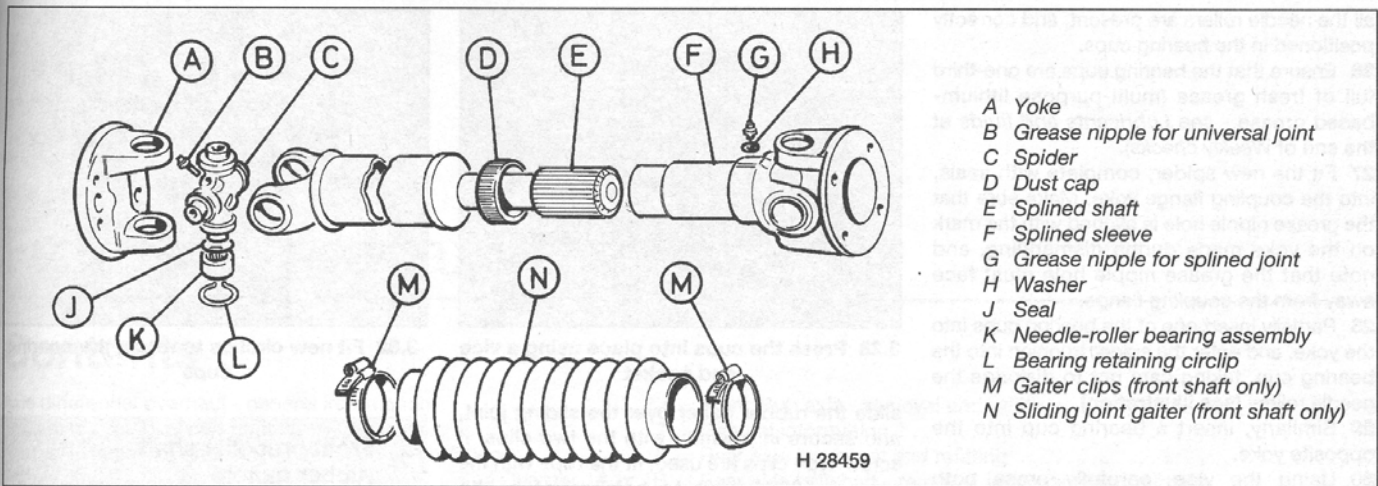
**Overhaul**

**Dismantling**

**8** With the propeller shaft removed as described in Section 2, proceed as follows.

**9** If working on the front propeller shaft, release the clips securing the rubber gaiter over the sliding joint, and slide the gaiter





- A Yoke
- B Grease nipple for universal joint
- C Spider
- D Dust cap
- E Splined shaft
- F Splined sleeve
- G Grease nipple for splined joint
- H Washer
- J Seal
- K Needle-roller bearing assembly
- L Bearing retaining circlip
- M Gaiter clips (front shaft only)
- N Sliding joint gaiter (front shaft only)

H 28459

**3.9 Propeller shaft components**

towards the rear of the shaft (see illustration).

10 Check that alignment marks are visible on the two halves of the shaft (normally two stamped arrows) (see illustration). If no marks can be found, scribe a line along the two halves of the shaft, to ensure that the two halves are reassembled in exactly the same position. This is vital, to ensure that the correct universal joint alignment and shaft balance is maintained.

11 Unscrew the dust cap, and withdraw the front section of the shaft from the splined end of the rear section.

12 Working on one of the universal joints, note the position of the grease nipple on the spider in relation to the adjacent shaft yoke, and coupling flange yoke (make alignment marks on the yokes). This is vital to ensure correct reassembly, and to ensure that the shaft balance is maintained.

13 Clean away all traces of dirt and grease from the circlips located on the ends of the joint spiders, and from the grease nipple.

14 Unscrew the grease nipple.

15 Using a suitable pair of circlip pliers, remove the four joint circlips (see illustration). If a circlip proves difficult to remove, as a last resort, place a drift on the bearing cup, in the centre of the circlip, and

tap the top of the bearing cup to ease the pressure on the circlip.

16 Support the end of the shaft in a vice, with the yoke in a vertical plane. Using a hammer and a suitable drift (a socket of appropriate size, for example), tap the uppermost bearing cup until the bottom bearing cup protrudes from the yoke (see illustration).

17 Remove the shaft from the vice, then securely grip the protruding bearing cup in the vice jaws. Turn the shaft from side to side, at the same time lifting the shaft until the bearing cup comes free.

18 Refit the shaft to the vice, with the exposed spider uppermost. Tap the spider with the hammer and drift until the lower bearing cup protrudes, then remove the cup as described previously.

19 The coupling flange and the spider can now be removed from the shaft, and the remaining two bearing cups can be removed as described previously.

20 Where applicable, repeat the operations described in paragraphs 12 to 19 to remove the remaining joint from the shaft.

**Inspection**

21 With the universal joint dismantled, carefully examine the needle rollers, bearing cups and spider for wear, scoring and pitting

of the surface finish. If any wear is detected, the joint must be renewed (see illustration).

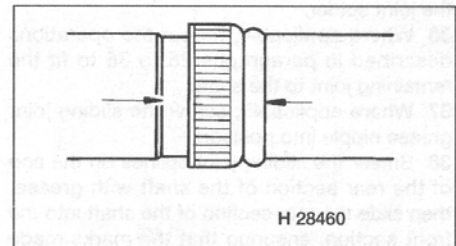
22 Where applicable, unscrew the sliding joint grease nipple, and thoroughly clean the nipple and its hole.

23 If working on the front propeller shaft, examine the condition of the sliding joint rubber gaiter, and renew if necessary.

24 Temporarily fit the front section of the shaft to the rear section, ensuring that the alignment marks are correctly positioned. Grip the front section of the shaft in a vice, and check for wear in the sliding joint splines, as described in paragraph 4.

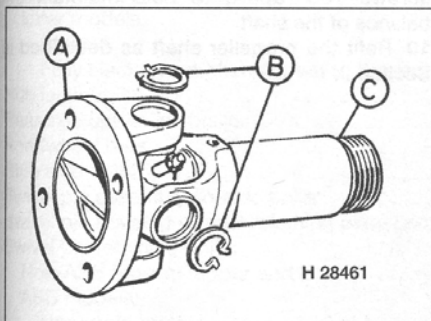
**Reassembly**

25 If a new joint is being fitted, remove the bearing cups from the new spider. Check that



H 28460

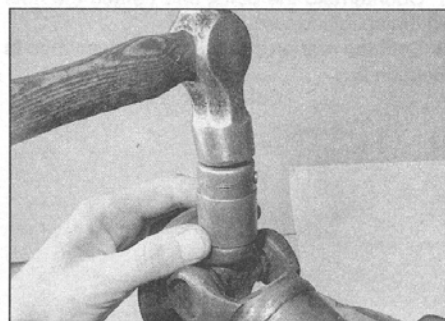
**3.10 Alignment marks on two halves of propeller shaft**



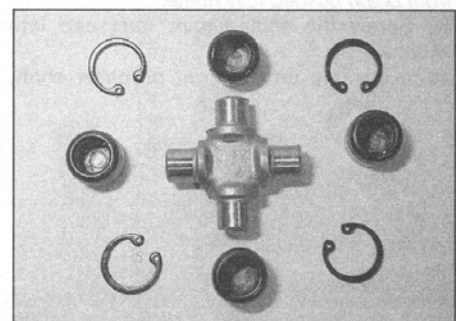
H 28461

**3.15 Propeller shaft universal joint**

- A Coupling flange
- B Circlips
- C Shaft



**3.16 Tapping the uppermost bearing cup**



**3.21 Universal joint bearing components**

all the needle rollers are present, and correctly positioned in the bearing cups.

**26** Ensure that the bearing cups are one-third full of fresh grease (multi-purpose lithium-based grease - see *Lubricants and fluids* at the end of *Weekly checks*).

**27** Fit the new spider, complete with seals, into the coupling flange yoke. Make sure that the grease nipple hole is aligned with the mark on the yoke made during dismantling, and note that the grease nipple hole must face away from the coupling flange.

**28** Partially insert one of the bearing cups into the yoke, and enter the spider trunnion into the bearing cup, taking care not to dislodge the needle rollers (see illustration).

**29** Similarly, insert a bearing cup into the opposite yoke.

**30** Using the vice, carefully press both bearing cups into place, ensuring that the spider trunnions do not dislodge any of the needle rollers.

**31** Using a suitable tube or socket of a slightly smaller diameter than the bearing cups, press each cup into its respective yoke, until the top of the cup just reaches the lower land of the circlip groove. **Do not** press the cups below this point, as damage may be caused to the cups and seals.

**32** Fit the new circlips to retain the bearing cups (see illustration).

**33** Engage the spider with the yokes on the relevant propeller shaft section, then partially fit both bearing cups to the yokes, taking care not to dislodge any of the needle rollers.

**34** Press the bearing cups into position, and fit the new circlips, as described in paragraphs 30 to 32.

**35** Screw the grease nipple into position in the joint spider.

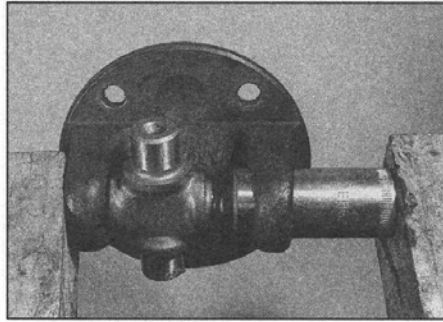
**36** Where applicable, repeat the operations described in paragraphs 25 to 35 to fit the remaining joint to the shaft.

**37** Where applicable, screw the sliding joint grease nipple into position.

**38** Smear the sliding joint splines on the end of the rear section of the shaft with grease, then slide the rear section of the shaft into the front section, ensuring that the marks made during dismantling are aligned. **Note:** *Do not pack grease into the open end of the shaft front section, as this may prevent the shaft from being pushed fully home.*

**39** Screw the sliding joint dust cap into position.

**40** If working on the front propeller shaft,



**3.28** Press the cups into place using a vice and socket

slide the rubber gaiter over the sliding joint, and secure in position with the two clips. If screw-type clips are used, fit the clips with the screws 180°, apart to help maintain the balance of the shaft.

**41** Refit the propeller shaft as described in Section 2, then lubricate the joints using a grease gun applied to the grease nipples (see the relevant part of Chapter 1).

#### 4 Rear propeller shaft rubber coupling - inspection and renewal

##### Inspection

**1** Later models use a flexible rubber coupling to connect the rear of the propeller shaft to the rear differential flange, instead of the universal joint used on earlier models.

**2** Deterioration of the rubber coupling will be self-evident on inspection. Look particularly for cracks around the bolt holes.

##### Renewal

**3** Remove the rear propeller shaft, as described in Section 2.

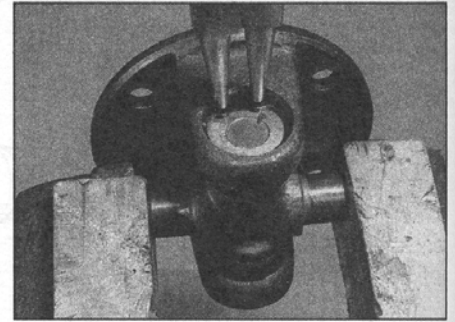
**4** Counterhold the bolts, and unscrew the nuts securing the coupling to the rear differential flange, then withdraw the coupling. Recover the washers.

**5** Thoroughly clean the differential flange and the spigot.

**6** Fit the new coupling, and secure with the nuts and bolts, ensuring that the washers are in place under the nuts.

**7** Counterhold the bolts, and tighten the nuts to the specified torque.

**8** Refit the rear propeller shaft as described in Section 2.



**3.32** Fit new circlips to retain the bearing cups

#### 5 Front propeller shaft rubber gaiter - renewal

**1** Remove the propeller shaft as described in Section 2.

**2** Loosen the two gaiter securing clips, and slide the gaiter towards the rear of the shaft.

**3** Check that alignment marks are visible on the two halves of the shaft (normally two stamped arrows). If no marks can be found, scribe a line along the two halves of the shaft, to ensure that the two halves are reassembled in exactly the same position. This is vital, to ensure that the correct universal joint alignment and shaft balance is maintained.

**4** Unscrew the dust cap, and withdraw the front section of the shaft from the splined end of the rear section.

**5** Slide the gaiter and the clips from the shaft.

**6** Clean the shaft splines, then slide the new gaiter onto the rear section of the shaft.

**7** Smear the shaft splines with fresh grease, and slide the rear section of the shaft onto the front section, ensuring that the marks made during dismantling are aligned. **Note:** *Do not pack grease into the open end of the shaft front section, as this may prevent the shaft from being pushed fully home.*

**8** Screw the sliding joint dust cap into position.

**9** Slide the rubber gaiter over the sliding joint, and secure in position with the two clips. If screw-type clips are used, fit the clips with the screws 180° apart, to help maintain the balance of the shaft.

**10** Refit the propeller shaft as described in Section 2.