Final drive

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Final drive

Introduction

The final drive assembly comprises a central differential gearcase which houses the hypoid crown wheel, pinion, and differential housing gears.

The final drive case is attached to a crossmember, which is mounted to the body by the use of rubber mounts.

Final drive torque reaction is controlled by a torque arm bolted to the final drive case and rear suspension crossmember.

The drive-shafts which are fitted to the final drive gearcase, utilize constant velocity joints (see fig. J2-1).

Warning **Never disconnect the torque arm or the frame tubes connecting the final drive crossmember to the rear suspension crossmember without removing all suspension load from the rear sub-frame assembly.** For details refer to Torque arm – To remove.

A fully adjusted final drive casing assembly is available as a service exchange unit. This is supplied without the drive-shaft assemblies, but is fitted with both side bearing housings.

When fitting a drive-shaft assembly, it is essential that the side bearing housings supplied with the final drive unit are fitted to the drive-shafts. The fitting of any other bearing housing will result in an incorrectly adjusted final drive assembly.

Final drive – To remove

1. Drive the car on a ramp. Securely chock the front road wheels.
2. Switch on the ignition. Select neutral position with the gear range selector lever. Then, remove fuse A6 from fuse panel F2 on the main fuseboard. Switch off the ignition.
3. Insert the spring retainer tool RH9299 into each rear suspension spring (see Chapter H). Compress the springs to remove all spring load from the trailing arms.
4. Depressurize the hydraulic systems as described in Chapter G.

Note Under no circumstances should operations to remove the final drive be carried out while spring or strut loads are applied to the rear sub-frame.

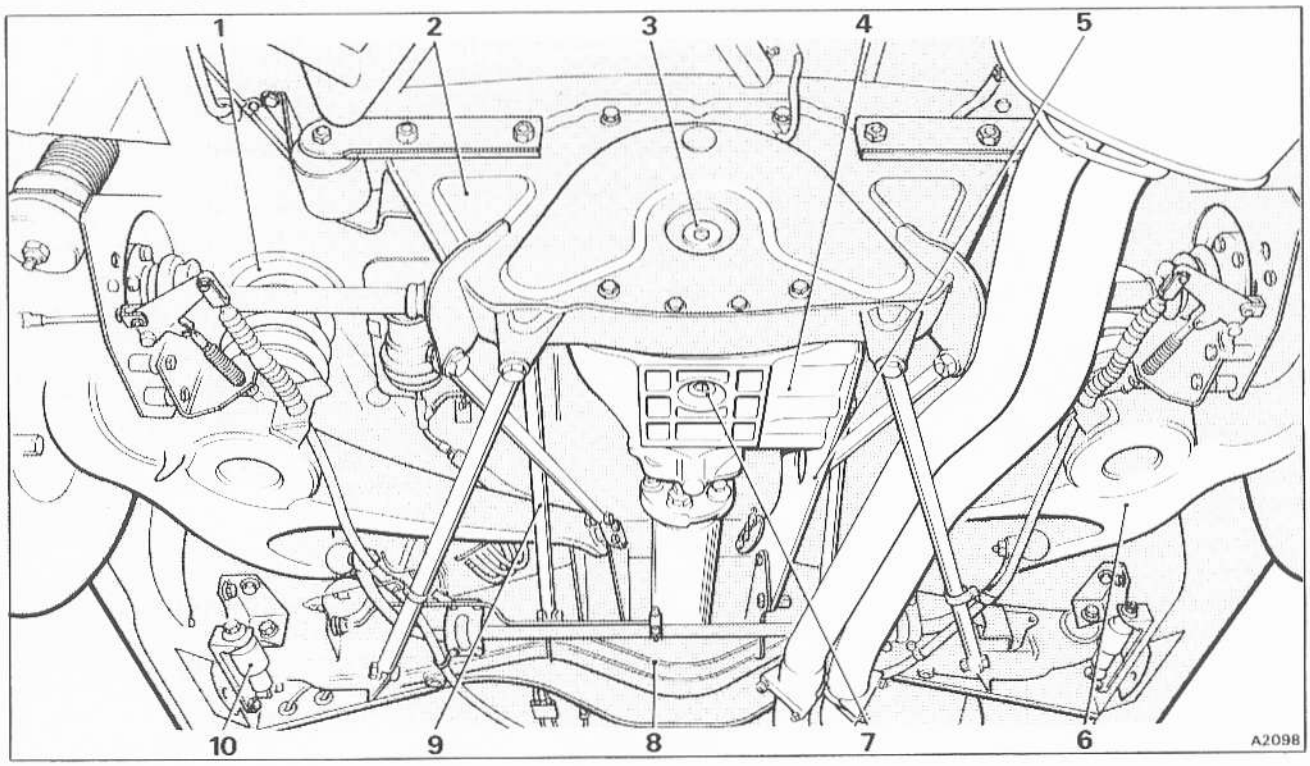

Fig. J2-1 Final drive in position

1 Suspension spring
2 Final drive crossmember
3 Oil filler and level plug
4 Final drive unit
5 Torque arm
6 Trailing arm
7 Oil drain plug
8 Rear suspension crossmember
9 Frame tubes (6)
10 Crossmember damper

5. Remove the wheel discs/trims. Then loosen, but do not remove the wheel nuts.
6. Using a hydraulic jack with an extension piece and hardwood block placed beneath the final drive casing, raise the rear of the car until the road wheels are clear of the ramp.
7. Position sill blocks and beams beneath the car's sills. Lower the jack and allow the blocks to support the car. Support the trailing arms using jacks or suitable blocks.
8. Remove the rear road wheels.
9. Remove the capscrews from the constant velocity joint on each side of the final drive. Care must be taken not to damage the shaft boots.

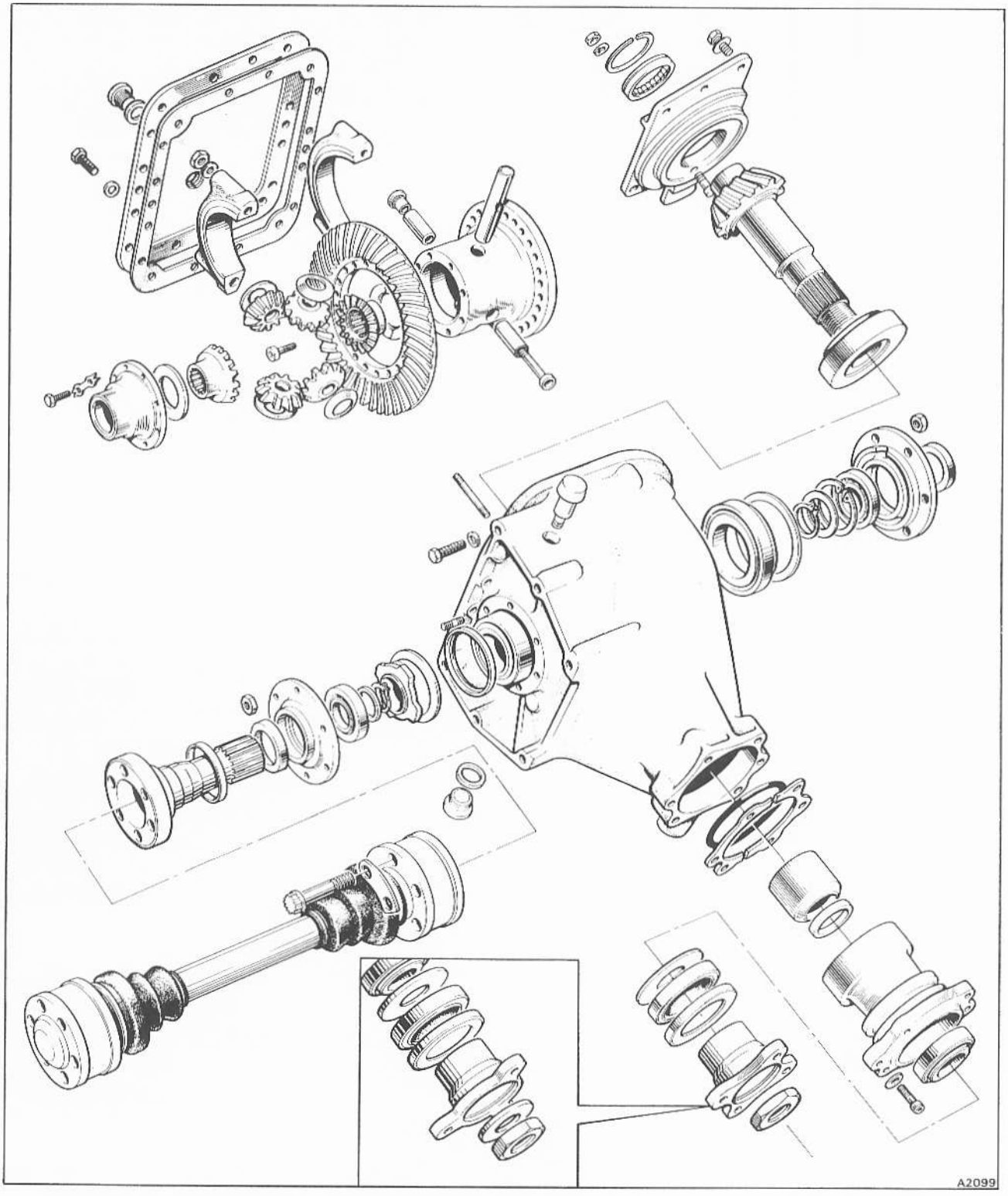

Fig. J2-2 Final drive assembly

10. Carefully ease the constant velocity joint away from its output shaft and support the drive-shaft beneath the body using strong string or wire.
11. Disconnect the propeller shaft from the final drive flange. Slide the shaft as far forward as possible to obtain maximum clearance between the shaft and the final drive pinion flange.
12. Support the final drive unit with a hydraulic jack positioned beneath the centre casing.
13. Remove the two securing bolts from the front end of the torque arm.
14. From the rear face of the final drive crossmember, remove the setscrews securing the final drive assembly.
15. Carefully lower the torque arm and ease the propeller shaft upwards and over the pinion flange. Carefully ease the final drive assembly forwards, then lower the assembly from the car.

Note During this operation care must be taken to ensure that the final drive unit is adequately supported.

Final drive unit – To dismantle (see fig. J2-2)
Ensure that the oil is drained before commencing the dismantling procedure.
1. Remove the nuts securing the bearing housings to each side of the final drive casing. Tap the housings with a nylon headed mallet to break the joint.
2. Withdraw the drive-shafts from the final drive casing.
3. Unscrew the setscrews retaining the final drive casing rear cover. Remove the cover.
4. Remove the nuts and washers from the bearing caps on each side of the crown wheel and differential assembly (see fig. J2-3).

Correlate the caps and casing to ensure that the caps are fitted into their original positions. Then, withdraw the caps.

Note The bearing cap and casing are machined as pairs. Therefore, although the caps cannot be fitted to the incorrect side, they must not be fitted in their reversed positions.

5. The crown wheel and differential assembly can now be raised slightly, moved away from the pinion and carefully removed from the casing.

Note Care should be taken during Operations 4 and 5, to ensure that the two large taper roller bearings are not damaged.

6. Remove the nut securing the pinion flange to the pinion. Collect the washer (if fitted). Withdraw the coupling flange using the hydraulic ram RH 8017 and extractor beam RH 8470.
7. Remove the capscrews which secure the pinion housing to the front flange of the casing. Then, insert extractor screws into the two tapped holes in the pinion housing.
8. Place the casing in an oven having a temperature of 110°C (230°F), for approximately fifteen minutes.
9. Remove the casing from the oven and extract the pinion housing using the two extractor screws. Care should be taken to turn the screws evenly and together.
10. Remove the setscrews from the pinion bearing plate within the gearcase. Withdraw the plate.
11. Withdraw the pinion from within the gearcase.
12. To remove the pinion nose bearing from the bearing plate, remove the two socket headed screws, retaining nuts, and washers. Withdraw the bearing.

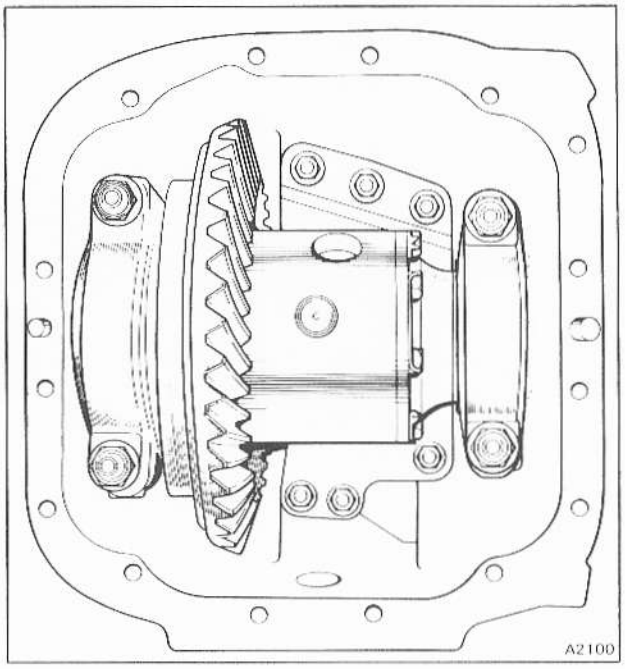

Fig. J2-3 Differential and crown wheel in position

Crown wheel and differential assembly – To dismantle
When dismantling the crown wheel and differential assembly, care should be taken to ensure that all thrust washers and bearing tracks are retained with their appropriate parts. This is to ensure that they are assembled in their original positions.
1. Remove the two bearing outer tracks.
2. Remove the capscrews securing the crown wheel to the differential housing. Remove the crown wheel.
3. Unlock and remove the eight setscrews securing the differential housing end cap. Remove the cap, splined pinion gear, and adjusting washer.
4. Remove the locking-nut and long setscrew from the centre of the split trunnion pin. Remove the trunnion pins, bevel gears, and dished thrust washers.
5. Remove the splined pinion gear and thrust washer from the opposite end of the pinion housing.
6. Wash all parts thoroughly in paraffin and dry with compressed air. If it is necessary to renew the large taper roller bearings, press them off the differential housing and end cap.
7. All components should be thoroughly inspected for wear and damage and any defective items renewed.

Thrust washers should be flat and parallel, **excluding** the four dished thrust washers fitted behind the bevel gears. Ensure that all gears and bearing surfaces are free from damage, pitting, score marks, burrs, and excessive wear.

Crown wheel and differential assembly – To assemble

1. If new taper roller bearings are to be fitted they must be pressed squarely onto their diameters situated on the differential housing and end cap. Note that the larger of the two bearings is fitted to the housing and that both bearings should be seated against their abutment faces.
2. If the adjusting washer positions are not known or new pieces are being fitted, the following procedure described in Operations 3 to 6 inclusive should be carried out.

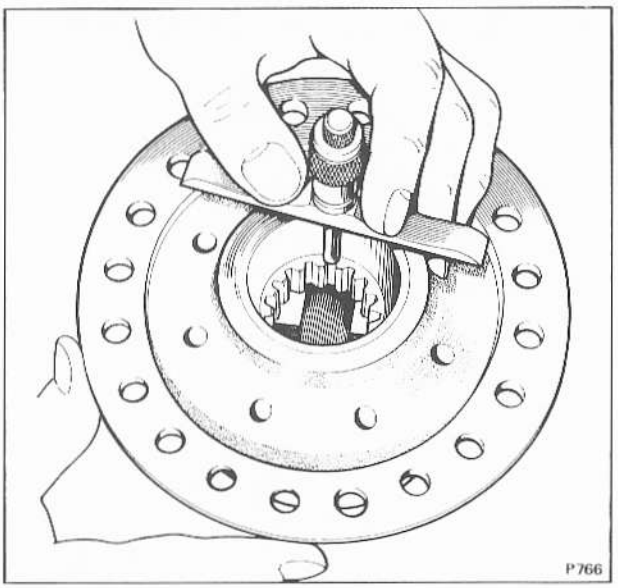

Fig. J2-4 Splined bevel pinion measurement

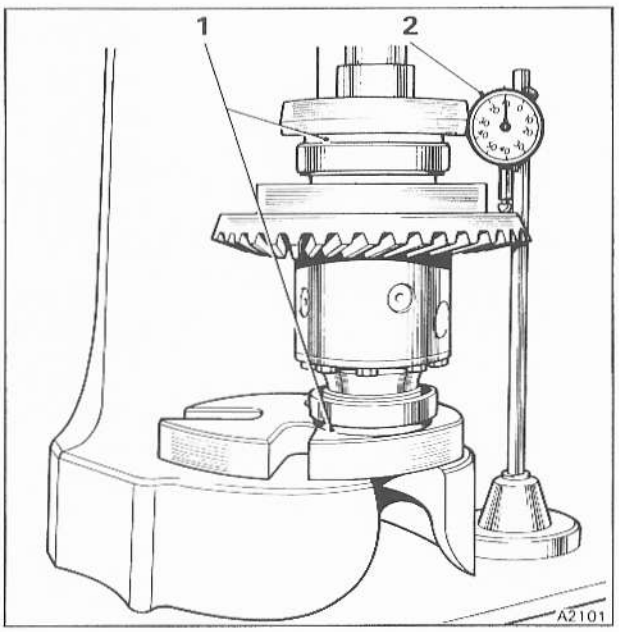

Fig. J2-5 Checking the crown wheel run-out
1 Adjusting washers
2 Dial test indicator

3. Fit the splined bevel pinion into the end of the differential housing without any adjusting washer behind the head.
4. Fit the trunnion pin, dished washers, and bevel gears. The long bolt and nut which connect the split trunnion pin should be torque tightened to the figures quoted in Section J7.
5. Push the splined pinion gear into mesh with the bevel gears as far as possible. Measure the distance from the end of the differential housing to the end face of the pinion gear (see fig. J2-4).

   Pull the pinion gear back out of mesh as far as possible and again measure the distance from the end of the housing to the end of the gear.

   The difference between these two measurements will give the nominal thickness of the adjusting washer required behind the gear head.
6. Dismantle the gears, place the correct adjusting washer behind the bevel pinion and assemble the gears.

   Adjusting washers are available in a range of between 2,13 mm and 2,94 mm (0.084 in and 0.116 in) in 0,10 mm (0.004 in) increments. The washers must be fitted with the chamfer and oil grooves against the back face of the gear.
7. Rotate the gears to ensure that they are free.

   Using the adjusting washers as necessary ensure that there is a backlash of between zero and 0,08 mm (0.003 in). Also ensure that there is no end-float on the bevel gear.
8. Fit the housing end cap and the other splined bevel pinions and repeat Operations 3 to 7 inclusive to determine the adjusting washer required.

Note When the unit is assembled correctly the gear should turn freely with a maximum of 0,08 mm (0.003 in) backlash between the gears and no end-float in the splined bevel pinions.

9. When the differential gears are set correctly, check that the torque tightness of the split trunnion centre bolt is within the figures quoted in Section J7. Then, lock the nut in position.
10. Tighten the end cover setscrews to the figures quoted in Section J7, then lock the tab-washers.
11. Fit the crown wheel to the housing and torque tighten the capscrews to the figures quoted in Section J7.
12. Check the crown wheel for axial run-out.

    Any convenient method may be used to check this e.g. on a mandrel between the centres. Another method which may be used is described in Operations 13 and 14.
13. Place the roller bearing outer tracks in position and stand the assembly on one end. Position the assembly in a press with one adjusting washer fitted to each bearing (see fig. J2-5).
14. Apply light pressure on the end of the assembly and using a dial test indicator, check the run-out of the crown wheel. The run-out should not exceed 0,05 mm (0.002 in).

    If the run-out exceeds this figure vary the crown wheel position relative to the differential housing until the run-out is within limits.

Pinion housing – To dismantle (see fig. J2-6)

1. Remove and discard the 'O' ring fitted to the pinion housing.
2. Remove the pinion oil seal and the oil flinger fitted behind it.
3. Withdraw the taper roller bearing, adjusting washer, and spacer from the housing.
4. If new taper roller bearings are to be fitted, the outer tracks must be removed from the housing using a soft drift and a hammer, taking care to avoid damaging the bearing locating bores.
5. The large taper roller bearing should be removed using a press and the special extraction tool RH 8016.
6. Wash all parts thoroughly in paraffin and dry with compressed air.
7. Inspect all parts for serviceability. Any showing damage, pitting, or excessive wear should be renewed.

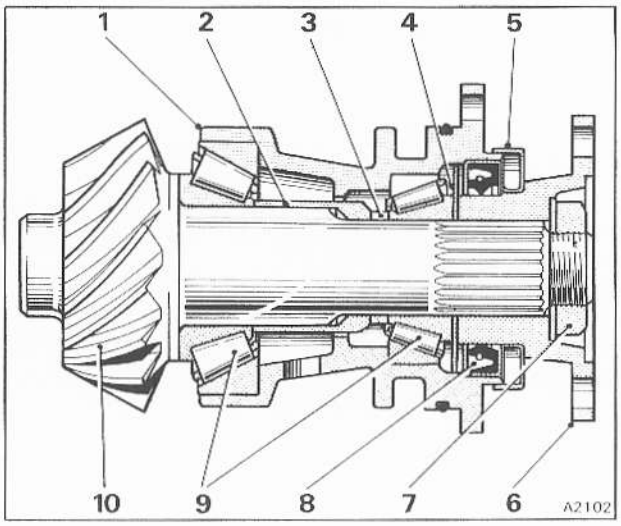

Fig. J2-6 Pinion assembly

1 Pinion housing
2 Spacer
3 Pre-load adjusting washer
4 Oil flinger
5 Shield
6 Pinion flange
7 Pinion flange nut
8 Oil seal
9 Taper roller bearings
10 Pinion

Pinion housing – To assemble

It should be noted that there are two types of pinion flange, dependent upon the type of propeller shaft fitted.

On propeller shafts incorporating universal joints, a four point coupling flange is fitted. On propeller shafts having flexible rubber couplings a three point coupling is fitted.

Note If the assembly is assembled using the original bearings, then the original pre-load adjusting washers should be used. Under no circumstances should the assembly be set to the pre-load figures quoted when new pinion bearings, pinion housing, and adjusting washers are fitted.

1. Lightly lubricate all components, paying particular attention to the roller bearing faces.
2. If new bearings are to be fitted, heat the housing to a temperature of 90°C (194°F) and press the outer bearing tracks into position. Also, press the large roller bearing onto the pinion. Ensure that all bearings are square and seated on their abutment faces.
3. Enter the pinion into the housing, ensuring that the spacer and adjusting washer are fitted on the pinion shank.

The washer determines the pre-load on the pinion bearings.

It is important that the washer is free from defects and is flat and parallel to within 0,012 mm (0.0005 in).

If the pinion bearings have not been renewed, the original washer may be used (see previous note).

If new bearings have been fitted, a new washer having a thickness of between 6,85 mm and 7,10 mm (0.270 in and 0.279 in) should give the best initial setting.

4. Support the pinion and housing. Press the upper bearing onto the pinion shank until it abuts the adjusting washer.
5. Fit the oil flinger.
6. Apply a thin coating of anti-scuffing paste (ASP) to the pinion flange. Enter the pinion flange onto the pinion shank taking care not to damage the pinion threads.
7. Press the coupling flange onto the pinion shank using assembly tool RH 8457. Fit the nut.
8. Tighten the nut to the torque figures quoted in Section J7. Rotate the pinion housing during tightening to check free movement of the bearings.
9. Rotate the pinion in the housing several times in each direction, then check the pre-load.

The pre-load on the pinion bearings when the housing is out of the final drive casing should be between 1,36 Nm and 1,92 Nm (12 lbf in and 17 lbf in). This can be checked using a suitable torque meter.

10. If the pre-load is not correct, the pinion must be extracted from the housing and the adjusting washer changed as necessary to obtain the correct reading.

Adjusting washers are available in a range of between 6,86 mm and 7,24 mm (0.270 in and 0.285 in) in increments of 0,025 mm (0.001 in) and also between 7,37 mm and 7,62 mm (0.290 in and 0.300 in) in increments of 0,127 mm (0.005 in).

Reducing the thickness of the washer will increase the pre-load, increasing the thickness will reduce it. Very small changes to the thickness of the washer have a marked effect on the pre-load figure.

11. When the correct pre-load has been achieved, mark the retaining nut with a centre punch, opposite the first leg of the 'U' of the part number stamped on the pinion.
12. Remove the pinion flange nut and remove the pinion flange.
13. Fit a new oil seal, ensuring that it is fitted squarely with the lip pointing inwards and that the front face

of the seal is 3,20 mm (0.125 in) below the front face of the housing.

Note If a PTFE oil seal is being fitted **do not lubricate.** This type of oil seal is more efficient when fitted dry.

14. Withdraw the pinion from the housing.

Final drive unit – To assemble

To assemble the final drive unit reverse the procedure given for dismantling, ensuring that the crown wheel and pinion are in their correct relative positions. Also, ensure that the amount of backlash between the gears is correct.

All parts must be cleaned thoroughly prior to assembly and all bearings lubricated.

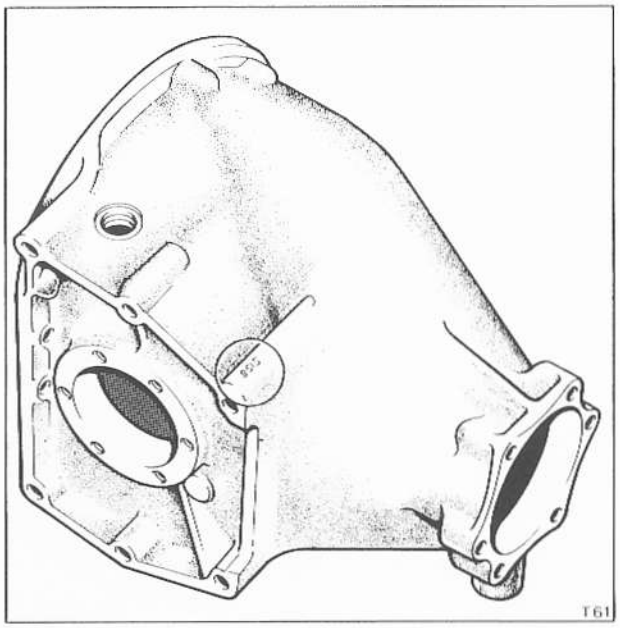

Fig. J2-7 Stamped dimension on case

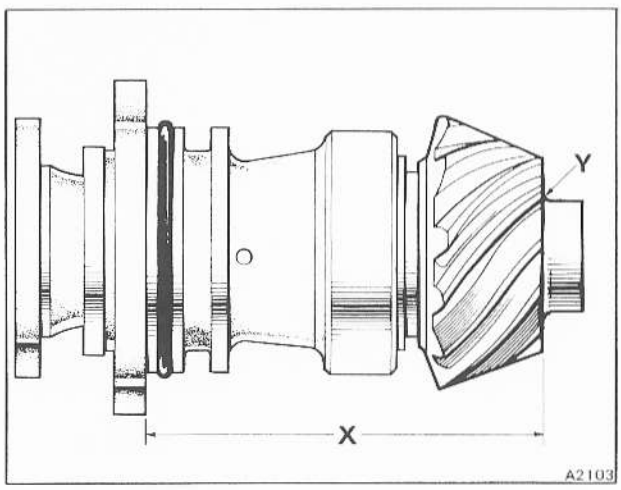

Fig. J2-8 Pinion housing measurement

X Dimension between housing and pinion gear

Y Dimension etched on pinion gear face

1. Before assembling the final drive unit, the stiffening bar RH 8032 should be fitted to the casing.
2. Partially screw two studs into the threaded holes in the front face of the casing. It is sufficient to fit these by hand as they serve only as location pins for the pinion housing.
3. If the pinion nose bearing has been removed from the bearing plate, fit the bearing, snap ring, and the two socket headed retaining screws, nuts, and washers. Tighten the screws in accordance with the standard torque figures quoted in Chapter P. Then, centre punch the nuts in three places to lock them into position.
4. Note the dimension stamped on the final drive casing (see fig. J2-7). Then, place the casing in an oven having a temperature of 110°C (230°F) for approximately thirty minutes.
5. Carefully measure from the back face of the pinion housing front flange to the face of the pinion gear adjacent to the nose bearing diameter (see fig.J2-8, dimension X).

   Add this figure to the dimension etched on the rear face of the pinion (dimension Y).

   The dimension A stamped on the final drive case which was noted previously, must now be subtracted from the total of dimensions X and Y.

   The final dimension gives the thickness of the split adjusting washer which must be used between the pinion housing flange and the case, to place the pinion in the correct position.

   Thickness of washer = X + Y − A.

   The above measurements must be taken carefully and accurately.

   Split adjusting washers are available in the following sizes 3,05 mm (0.120 in), 3,17 mm (0.125 in), 3,30 mm (0.130 in), 3,48 mm (0.137 in), and 3,78 mm (0.149 in).
6. Remove the casing from the oven. Then, fit the split adjusting washers to the pinion housing, retaining them with Keenomax C3 grease.
7. Fit a new 'O' ring to the pinion housing and insert the housing into the case as far as possible.

Note The pinion housing has one offset hole and can therefore only be fitted in one position. It is advisable to establish this position before entering the housing into the case.

8. Remove the locating studs. Fit the four capscrews and tighten them progressively and evenly to the torque figures quoted in Section J7.
9. Fit the pinion into the pinion housing from within the case.
10. Press the drive coupling onto the pinion shaft. Fit the nut and washer (if fitted) and torque tighten so that the centre punch mark on the nut aligns with the first leg of the 'U' of the part number stamped on the pinion. This ensures the correct pre-load.
11. Fit the bearing plate into the case, over the pinion bearing diameter. Torque tighten the bolts to the figures quoted in Section J7.
12. Examine the crown wheel and note the backlash figure etched on the back face.
13. Carefully fit the crown wheel and differential

assembly in position. Fit the bearing caps, but do not fully tighten the nuts.

14. If the two final drive side housings are still connected to the splined shafts, remove the retaining circlips. Then, remove the housings from the shafts.
15. Fit the adjusting washer, with the chamfered face outwards, the belleville washer and spacer assembly, and housing on the right-hand side of the final drive case and torque tighten the housing securing nuts.
16. Fit the adjusting washer behind the crown wheel bearing. Then, fit the left-hand side housing. Progressively tighten the housing nuts whilst rocking the crown wheel back and forth to ensure that there is backlash between the gears.
17. Mount a dial test indicator on the final drive case with the indicator pad on the flank of a crown wheel tooth.
18. Zero the indicator and 'rock' the crown wheel back and forth noting the backlash.
19. The backlash should be checked at four positions around the crown wheel and an average reading taken. This figure should be between 0,13 mm and 0,23 mm (0.005 in and 0.009 in).

If it does not conform, the thickness of the washer behind the bearing must be varied to obtain the correct reading.

Washers are available in a range of between 5,66 mm and 6,60 mm (0.223 in and 0.260 in) in increments of 0,10 mm (0.004 in).

20. In order to obtain the required result, equal amounts may be ground from each side of the washer, taking care to ensure that, after grinding, the washer is still flat and parallel to within 0,02 mm (0.001 in).
21. When the backlash is correct, remove the side housings from the centre case.
22. Accurately measure the distance from the case flange to the taper roller bearing outer track on the right-hand side of the final drive case (see fig. J2-9).
23. Place the right-hand housing, spacer, and belleville washer in the checking jig RH 9578 and tighten the jig until the belleville washer is flat (see fig. J2-10).
24. Using feeler gauges, measure the distances between the housing flange face and the top of the two pins on the gauge. The result added to the nominal pin height marked on the gauge gives the distance from the side housing to the belleville washer.

Subtract this dimension from the dimension previously taken between the case flange and the taper bearing. The result gives the thickness of the adjusting washer which must be fitted between the belleville washer and the taper bearing, to give the correct pre-load.

Adjustment washers are available in a range of between 6,35 mm and 7,87 mm (0.250 in and 0.310 in) in increments of 0,05 mm (0.002 in). Washers may be lightly ground to obtain the correct dimensions, but if this is done, equal amounts must be removed from each side and the washer must be kept flat and parallel.

25. Fit the right-hand housing to the splined shaft.
26. Fit the correct size washer with the chamfered side outwards, also the spacer assembly (spacer and

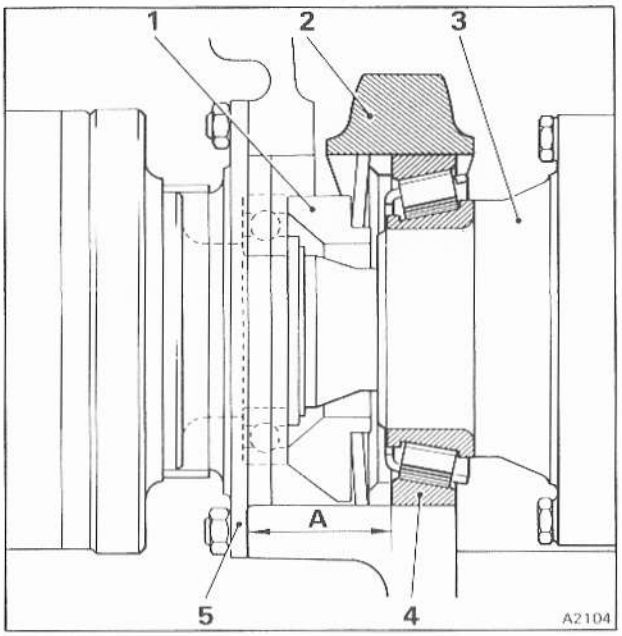

Fig. J2-9 Casing flange to bearing measurement
1 Belleville washer and spacer assembly
2 Bearing cap
3 Differential housing end cap
4 Bearing
5 Side bearing housing

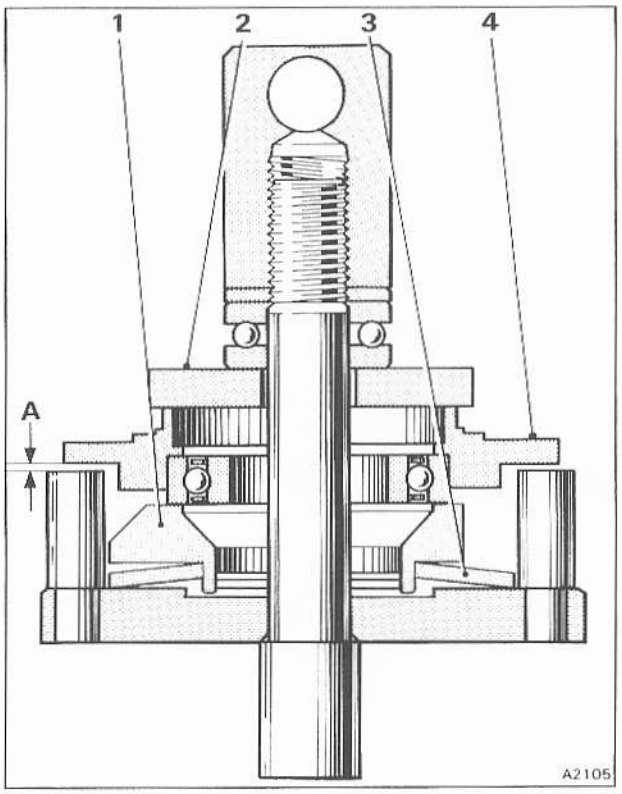

Fig. J2-10 Right-hand housing belleville washer setting
1 Spacer
2 Tool (RH 9578)
3 Belleville washer
4 Right-hand side housing
A Measured gap

belleville washer). Fit the housing and splined output shaft assembly.
27. Fit the left-hand side housing to the splined shaft. Fit the housing and output shaft assembly.
28. Tighten the housing nuts progressively and evenly. Then, torque tighten them to the standard torque figures quoted in Chapter P.
29. Tighten the nuts securing the two large bearing caps in accordance with the torque figures quoted in Section J7.
30. Release the side housing retaining nuts approximately 3,17 mm (0.125 in) to release the case load.
31. Remove the stiffening bar RH 8032. Fit the joint and case rear cover. Two countersunk headed setscrews are used in the top face and four hexagon headed setscrews and washers in the side faces.
32. After applying a light coating of SQ32M jointing compound to the flange faces, progressively tighten the side housing retaining nuts (previously released in Operation 30).
33. Rotate the pinion coupling flange to ensure that there are no tight spots or roughness of operation.

Final drive – To fit

Fit the final drive unit by reversing the removal procedure, noting the following.
1. Each end of the drive-shaft must be clean and free from damage. Ensure that the retaining screws are in good condition.
2. The propeller shaft and pinion flange faces must be clean and free from damage.
3. When tightening the bolts securing the final drive assembly to the final drive crossmember, it is essential that the two torque arm to crossmember bolt holes are in alignment. If the holes do not align, correct alignment **must** be achieved by slackening off the torque arm to axle case securing setscrews. Then, reposition the torque arm.

Note Should any other method be used to force alignment, the resultant higher stresses within the sub-frame members will cause premature failure.

4. All bolts, setscrews, and capscrews should be torque tightened to the figures quoted in Section J7 and Chapter P.
5. This operation should be carried out with the car standing in a levelled condition.

Check that the drain plug has been tightened.

Remove the filler plug from the rear of the final drive case and fill the axle with one of the recommended lubricants (see Chapter D) up to the bottom of the filler plug hole, approximately 2,3 litres (4 Imp pt; 4.8 US pt). Fit the filler plug together with a new washer.
6. Before starting the engine in order to pressurize the hydraulic system, replace fuse A6 on fuse panel F2 on the main fuseboard, switch on the ignition and move the gear range selector lever to the park position. Switch off the ignition and again remove fuse A6 from fuse panel F2 on the main fuseboard.

Pinion flange oil seal – To renew

The pinion flange oil seal can be removed with the final drive unit in position.
1. Drive the car on a ramp and securely chock the front road wheels.
2. Switch on the ignition. Select neutral position with the gear range selector lever. Then, remove fuse A6 from fuse panel F2 on the main fuseboard. Switch off the ignition.
3. Using a hydraulic jack with an extension piece and hardwood block placed beneath the final drive casing, raise the rear of the car until the road wheels are clear of the ramp.
4. Position sill blocks and beams beneath the car's sills. Lower the jack and allow the blocks to support the car. Support the trailing arms using jacks or suitable blocks.
5. Remove the propeller shaft (see Chapter F).
6. Scribe correlation marks across the pinion face and coupling flange.

Note The centre punch mark on the nut aligns with the first leg of the 'U' of the part number stamped on the pinion. This ensures the correct pre-load on the pinion.

7. Remove the nut (and washer if fitted).
8. Using the hydraulic ram RH 8017 and special extractor RH 8470, remove the pinion flange.
9. Using a lever or simple extractor, remove the oil seal from the pinion housing.
10. Fit a new oil seal, ensuring that it is fitted squarely, with the lip pointing inwards until the front face of the seal is 3,20 mm (0.125 in) below the front face of the housing.

Note Ensure that the PTFE seal is fitted dry. No lubricant is necessary, as this type of seal is more efficient when fitted dry.

11. Clean, degrease, and fit the pinion flange, ensuring that the correlation marks are aligned. Fit and tighten the nut (and washer if fitted) until the centre punch mark aligns with the first leg of the 'U' of the part number.
12. Assemble the remaining components by reversing the dismantling procedure.
13. Torque tighten the propeller shaft bolts to the figures quoted in Chapter F.

Torque arm – To remove

1. Drive the car on a ramp and securely chock the front road wheels.
2. Depressurize the hydraulic systems as described in Chapter G.
3. Insert spring retainers RH 9299 through both rear springs.
4. Position a hydraulic jack under the final drive centre case and raise the rear of the car. Position sill blocks and beams beneath the car's sills. Lower the jack and allow the blocks to support the car.
5. Support the final drive by leaving the jack beneath the centre case.
6. Remove one of the small dampers fitted to each side of the rear suspension crossmember. Insert a

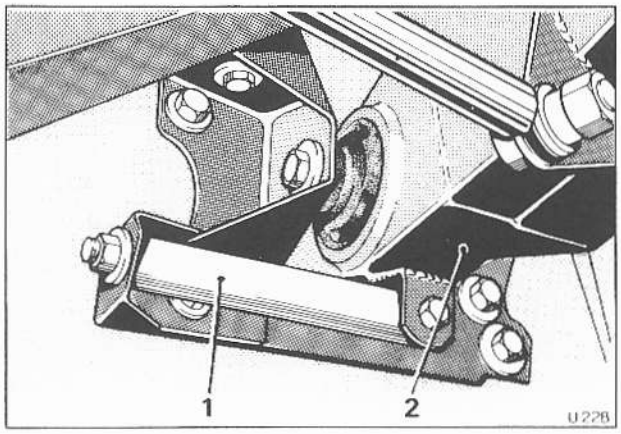

Fig. J2-11 Jury bolt in position
1 Jury bolt
2 Rear suspension crossmember

'Jury bolt' RH 9575 and secure it in position (see fig. J2-11). Ensure that load is not applied to the crossmember by the Jury bolt. Repeat this operation to the other side of the crossmember.

7. Remove the bolts securing the upper and lower frame tubes to the final drive crossmember on the torque arm side of the final drive.

Carefully note the positions of the tubes and to which side of the mounting bracket they are secured. Also, the direction in which the bolts are fitted.

8. Remove the setscrews and bolts securing the torque arm to the final drive casing, and suspension crossmember. Lower the torque arm from the car.

Torque arm – To fit

Fit the torque arm by reversing the procedure given for removal, noting the following.

1. When fitting the torque arm, ensure that the front bolt holes align with the holes in the fixing bracket on the sub-frame, prior to tightening the setscrews to the final drive casing.

Do not use force to align the torque arm as this will create high stress loads in the sub-frame members, which could result in premature component failure.

2. Ensure that the frame tubes are fitted with the centre line of the tube in line with the mating face of the mounting bracket (see Chapter H), and to the same side of the mounting bracket from which they were removed.
3. All frame tube bolts must be torque tightened. Also, the crossmember dampers must be fitted prior to the suspension spring load being released and the suspension struts are pressurized.
4. All other nuts, bolts, and setscrews should be torque tightened in accordance with the figures quoted in Section J7.
5. Care must be taken when removing the sill blocks and lowering the car onto its wheels. Ensure that the rear springs locate correctly into their retainers.

No attempt should be made to remove the spring retainers until the springs are located correctly and the car is standing on its wheels.

Drive-shafts

Introduction

The 'Lobro' drive-shafts utilize constant velocity joints (see fig. J3-1). They can be removed from the car without removal of other components.

Note On turbocharged cars, the drive-shafts are of a larger diameter to compensate for the additional torque produced by the engine.

Drive-shaft – To remove

1. Drive the car onto a ramp and securely chock the front road wheels.
2. Using a hydraulic jack and a hardwood block placed beneath the final drive casing, raise the rear of the car until the road wheel is clear of the ramp.
3. Position sill blocks beneath the car sill. Lower the hydraulic jack to allow the blocks to support the car. Support the trailing arm on a jack.
4. Remove the six retaining screws from each end of the drive-shaft, taking care not to damage the joint and convoluted seals. Collect the retaining screws and load spreading washers. Remove the drive-shaft.
5. Inspect the drive-shaft joints and convoluted seals.

Note If one or both of the convoluted seals are found to be unserviceable, the constant velocity joints must be removed from the shaft in order to fit replacements. However, if more serious damage has occurred, the complete drive-shaft assembly must be renewed.

Convoluted seal – To renew

1. Release the two convoluted seal retaining clips and slide the seal down the shaft.
2. Remove the convoluted seal retainer from the constant velocity joint. Slide the retainer down the shaft.
3. Remove the closed end cap from the end of the constant velocity joint.
4. Remove the circlip from the end of the drive-shaft. Using a suitable press, remove the constant velocity joint from the shaft.
5. Remove the convoluted seal and its retainer from the shaft. Discard the seal.
6. Clean the metal components with a suitable solvent.
7. Examine the components for adverse wear. Replace parts if necessary.
8. Pack the constant velocity joint with Rocol MTS 1000 grease, until the grease is level with the outer faces.
9. Fit and slide the new convoluted seal onto the shaft, followed by its retainer.
10. Press the constant velocity joint onto the shaft. Secure it in place with the circlip.
11. Lightly smear the flange of the convoluted seal retainer with Wellseal sealant.

Fit the retainer to the constant velocity joint.

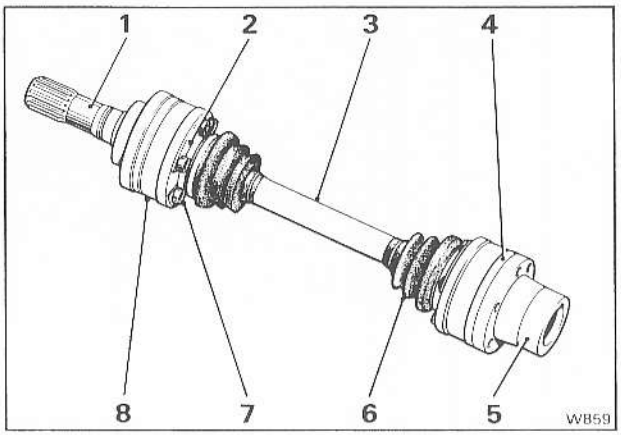

Fig. J3-1 Constant velocity joint

1 Output shaft
2 Load spreading washers
3 Drive-shaft
4 End cap – grease retainer
5 Hub coupling
6 Convoluted seal
7 Retaining screws
8 Constant velocity joint body

Ensure that the bolt holes align correctly.

12. Fit the convoluted seal. Secure in position using new retaining clips.
13. Lightly smear the flange of the joint end cap with Wellseal sealant. Fit to the joint, ensuring that the bolt holes align.

Drive-shaft – To fit

Fit the drive-shaft by reversing the removal procedure noting the following.

1. Always fit the shaft as it is removed. **Never** turn the shaft from end-to-end, or from one side of the car to the other.
2. Ensure that the load spreading washers are fitted beneath the retaining screws.
3. Torque tighten the retaining screws in accordance with the figures quoted in Section J7.

Output shaft oil seal – To renew

The oil seal on the splined output shafts are located in the housings, on each side of the final drive unit and can be renewed with the final drive in position.

1. Remove the drive-shaft as described under Drive-shaft – To remove.
2. Remove the six nuts securing the bearing housing to the final drive casing. If necessary, tap the housing with a nylon mallet to break the joint.
3. Withdraw the output shaft and housing from the final drive casing.
4. Remove the circlip (and washer on the right-hand

housing) located on the output shaft behind the bearing housing. Remove the shaft from the housing.

5. Remove the seal from the housing.

6. Fit a new seal, ensuring that it is fitted squarely into its locating bore and with the lip pointing inwards towards the bearing.

Note If a PTFE oil seal is being fitted **do not lubricate,** this type of oil seal is more efficient when fitted dry.

7. Fit the housing onto the shaft (place the washer in position behind the bearing; right-hand housing only) and fit the circlip. Ensure that the circlip locates correctly into its groove.

8. Fit the output shaft and housing assembly to the final drive casing and secure.

9. Torque tighten the nuts in accordance with the figures quoted in Section J7.

10. Fit the drive-shaft as described under Drive-shaft – To fit.

Output shaft bearing – To renew

1. Carry out Operations 1 to 4 inclusive of Output shaft oil seal – To renew.

2. Remove the bearing from the housing using a mandrel or drift. Remove the seal and discard.

Note The bearing in the left-hand housing is retained with a circlip. Remove this circlip before attempting to remove the bearing.

3. Clean and inspect the housing bore. Lightly stone out any damage marks and burrs.

4. Fit a new bearing. Ensure that it is fitted squarely into the bore and up to its abutment face.

Note The bearing in the left-hand housing is retained with a circlip. Ensure that the bearing is located correctly.

5. Fit a new seal ensuring that it is fitted squarely with the lip pointing inwards.

Note If a PTFE oil seal is being fitted **do not lubricate,** this type of oil seal is more efficient when fitted dry.

6. Lightly smear the output shaft housing sealing face with Wellseal. Fit the assembly onto the final drive casing and secure.

7. Torque tighten the nuts in accordance with the figures quoted in Section J7.

8. Fit the drive-shafts as described under Drive-shaft – To fit.

Final drive crossmember

The final drive crossmember is an integral part of the rear sub-frame assembly.

The sub-frame which consists of the rear suspension crossmember, six frame tubes and the final drive crossmember, is jig assembled. It is adjusted together with the trailing arms, final drive unit, and torque arm during manufacture.

Although certain components can be removed from the assembly as individual items, under no circumstances should the final drive crossmember only be removed from the car.

If removal of the final drive crossmember or renewal of the mounts is necessary, reference should be made to Chapter H prior to work being commenced.

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Rear hubs

Hub unit – To remove

1. Position the car on a ramp and securely chock the front road wheels.
2. Remove the rear wheel disc/trim. Loosen, but do not remove the wheel retaining nuts.
3. Using a hydraulic jack positioned beneath the final drive casing, raise the rear of the car until the road wheels are clear of the ramp.
4. Position sill blocks beneath the body sills. Lower the hydraulic jack and allow the blocks to support the car body. Support the trailing arms with screw jacks.
5. Remove the rear road wheel.
6. Depressurize the hydraulic system as described in Chapter G. Depressurization of the suspension struts is not necessary.
7. Disconnect the parking brake actuation rod from the brake caliper.
8. Disconnect the two pressure feed pipes from the brake caliper. Fit blanks to the pipe ends and caliper ports.
9. Disconnect and remove the brake caliper bridge pipe. Fit blanks to the pipe ends and caliper ports.
10. On cars fitted with anti-lock braking, remove the socket headed setscrew securing the rear wheel sensor to the stub axle. Withdraw the sensor.
11. Remove the capscrews securing the constant velocity joint to the hub coupling. Separate the constant velocity joint from the hub coupling by easing the drive-shaft inwards toward the final drive.
12. If the rear hub assembly is to be dismantled,

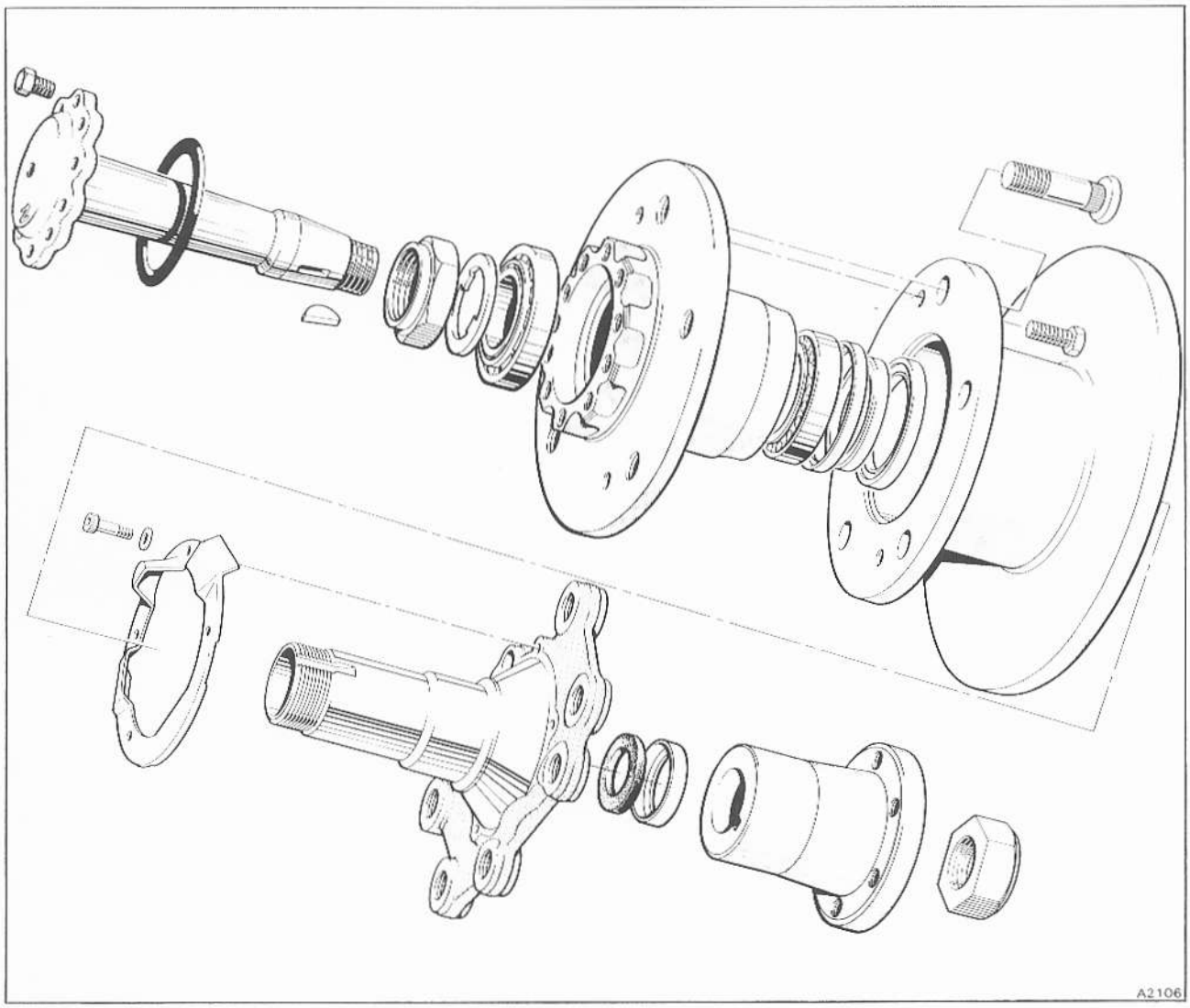


Fig. J5-1 Rear hub (cars other than Bentley Turbo R)

loosen the two setscrews securing the brake caliper to the hub yoke.

13. Remove the two lower setscrews securing the stub axle flange to the trailing arm (see fig. J5-3).

Note To assist in the removal and assembling of the stub axle, screw in two studs to act as guides in the lower setscrew holes.

14. Support the rear hub and brake caliper assembly. Remove the two upper setscrews securing the stub axle to the trailing arm.

15. Carefully withdraw the rear hub and brake caliper assembly from the trailing arm and remove it from the car.

Hub unit – To dismantle

1. Remove the rear hub and brake caliper assembly as described previously.
2. Remove the setscrews securing the brake caliper to the hub yoke.
3. Carefully slide the brake caliper off the brake disc. Fit a distance piece between the brake pads to ensure that the caliper pistons are retained in their bores.
4. Remove the large nut securing the hub coupling to the drive-shaft (see fig. J5-3).
5. On Bentley Turbo R cars, remove the circlip and washer from within the coupling.
6. Using extractor tool RH9690, remove the coupling from the hub drive-shaft.

   On cars other than Bentley Turbo R, collect the Woodruff key.
7. Remove the setscrews securing the outer flange of the drive-shaft to the hub. Withdraw the drive-shaft from the hollow stub axle. Discard the 'O' ring.
8. Unlock and remove the shrouded nut and the key washer from the stub axle.
9. Withdraw the hub complete with bearings from the stub axle. Collect the spacer.
10. Remove the outer bearing inner race. Using a soft metal drift, drive out the inner bearing together with the oil seal.
11. Drive out the outer bearing track from the hub.
12. On cars other than Bentley Turbo R, remove the

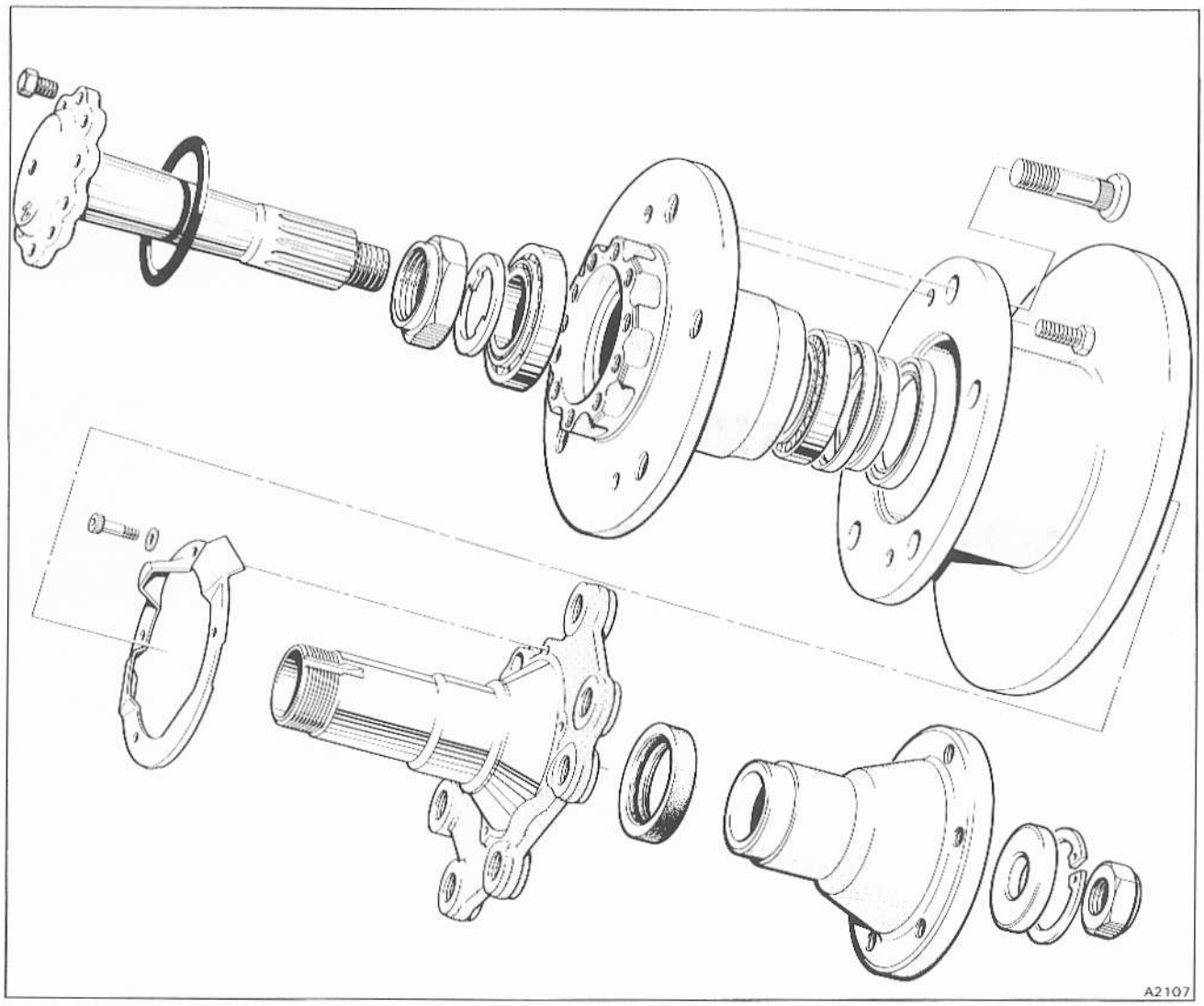


Fig. J5-2 Rear hub (Bentley Turbo R)

retainer and felt seal from the stub axle counterbore.
13. On Bentley Turbo R cars, remove the oil seal from the stub axle counterbore.
14. With the hub dismantled, inspect the brake disc and caliper pads for wear or damage. If it is necessary to remove the brake disc, remove the securing setscrews and withdraw the disc from the hub.
15. Thoroughly clean all hub components and inspect for wear and damage.

Hub unit – To assemble

1. On cars other than Bentley Turbo R, fit a new felt seal and retainer into the stub axle. The seal should be soaked thoroughly in engine oil prior to fitting.
2. On Bentley Turbo R cars, fit a new oil seal into the stub axle. Apply a small quantity of an approved grease (see Chapter D).
3. Fit the spacer (chamfered inner edge leading) onto the stub axle to abut the shoulder.
4. Repack the hub with 57 g (2 oz) of Shell Retinax A grease.
5. After fitting new bearings (if necessary), position the hub on the stub axle. Fit the hardened key washer and a new shrouded nut.
6. Tighten the nut sufficiently to remove any bearing end-float. Using a dial test indicator mounted adjacent to the brake disc, measure the run-out of the disc at the maximum possible radius.

The run-out must not exceed 0,18 mm (0.007 in) total indicator reading. If the run-out exceeds this figure, it will be necessary to dismantle the hub and brake disc to investigate the cause.

7. After checking the run-out, slacken the shrouded nut. Place a 0,05 mm (0.002 in) feeler gauge between the outer bearing and the key washer. Tighten the nut sufficiently to lightly grip the feeler gauge. This gives a bearing end-float of between 0,05 mm and 0,10 mm (0.002 in and 0.004 in), when the feeler gauge is removed.

Alternatively, the required end-float can be obtained by use of suitable dial test indicator equipment secured to the stub axle.

Continuous rotation of the hub is essential during this operation to ensure that the taper rollers seat correctly in the outer races.

8. Peen the shroud of the nut to locate into the grooves of the stub axle. Remove the feeler gauge or dial test indicator.

Note Exerting a load on the bearings or excessive end-float, will promote premature bearing wear.

The remaining operations for fitting the rear hub unit are a careful reversal of the dismantling procedure, noting the following.

9. Fit a new rubber 'O' ring onto the hub drive-shaft, ensuring a small quantity of grease is applied before fitting.
10. On cars other than Bentley Turbo R, fit the Woodruff key to the hub drive-shaft taper. Ensure that the tapers are perfectly clean and dry before fitting the hub coupling.
11. On Bentley Turbo R cars, lubricate the splines of the shaft and coupling with Rocol ASP grease. Then, press the coupling onto the drive-shaft, and secure by fitting the special washer and a new circlip. Torque tighten the nut to the figures quoted in Section J7. Stake the nut into the shaft slot.
12. On cars other than Bentley Turbo R, apply Molytone 265 grease to the shaft threads and abutment face of the hub coupling retaining nut. Torque tighten the nut to the figures quoted in Section J7, using torque spanner RH 8014 and socket RH 8026.
13. Fit the drive-shaft assembly into position and torque tighten the retaining screws in accordance with the figures quoted in Section J7.
14. Prior to fitting the brake pipes and parking brake linkage refer to Chapter G regarding the bleeding procedure and precautions to be taken.
15. Check the adjustment and operation of the parking brake as described in Chapter G.

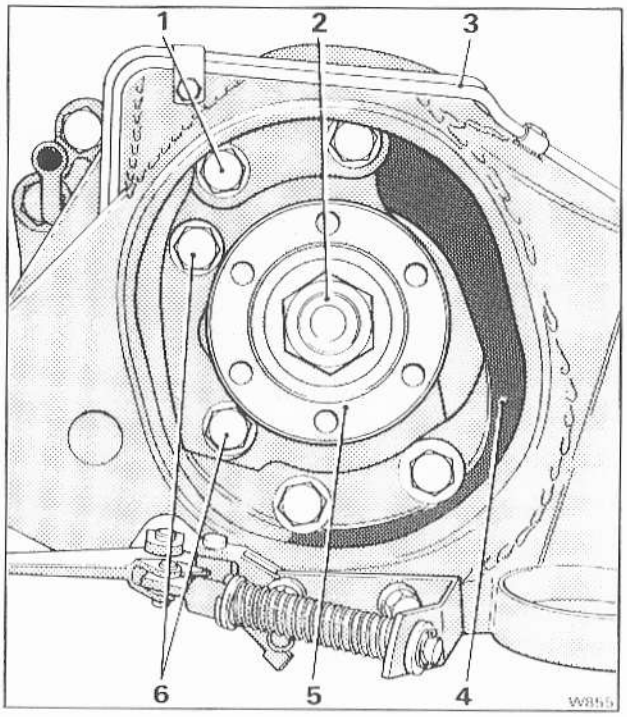


Fig. J5-3 Rear hub and brake caliper mounting
1 Hub mounting setscrew (4)
2 Hub drive-shaft retaining nut
3 Hydraulic brake pipes
4 Trailing arm
5 Hub coupling
6 Brake caliper mounting bolts

Dimensional data

Final drive unit

Backlash – pinion to crown wheel	Etched on crown wheel
Backlash – differential housing pinions	0,0762 mm (0.003 in)
End-float – differential housing pinions	Nil
Crown wheel run-out (maximum)	0,05 mm (0.002 in)
Differential housing – trunnion diameters	19,042 mm - 19,05 mm (0.7497 in - 0.750 in)
Differential housing pinion – bore diameters	19,062 mm - 19,075 mm (0.7505 in - 0.751 in)
Differential housing bevel pinion gear – bearing diameter	44,272 mm - 44,297 mm (1.743 in - 1.744 in)
Differential housing bevel pinion gear – bore diameter	44,450 mm - 44,475 mm (1.750 in - 1.751 in)
Differential housing and end cap – bearing locating diameters	50,85 mm - 50,863 mm (2.002 in - 2.0025 in) 66,732 mm - 66,738 mm (2.62725 in - 2.6275 in)
Differential housing bearings – bore diameters	50,8 mm - 50,812 mm (2.000 in - 2.0005 in) 66,675 mm - 66,687 mm (2.625 in - 2.6255 in)
Differential housing bearings – outside diameters	88,9 mm - 88,925 mm (3.500 in - 3.501 in) 107,950 mm - 107,975 mm (4.250 in - 4.251 in)
Final drive casing – differential housing bearing locating bores	88,925 mm - 88,938 mm (3.501 in - 3.5015 in) 107,975 mm - 108,0 mm (4.251 in - 4.252 in)
Final drive casing – pinion housing locating diameters	105,410 mm - 105,422 mm (4.150 in - 4.1505 in) 105,715 mm - 105,73 mm (4.162 in - 4.1625 in)
Pinion housing – locating diameters	105,410 mm - 105,422 mm (4.150 in - 4.1505 in) 105,753 mm - 105,765 mm (4.1635 in - 4.164 in)
Pinion shaft – bearing locating diameters	34,956 mm - 34,963 mm (1.37625 in - 1.3765 in) 44,481 mm - 44,488 mm (1.75125 in - 1.7515 in)
Pinion bearings – bore diameters	34,925 mm - 34,937 mm (1.375 in - 1.3755 in) 44,450 mm - 44,462 mm (1.750 in - 1.7505 in)
Pinion housing – pinion bearing locating diameters	72,194 mm - 72,219 mm (2.8423 in - 2.8433 in) 95,199 mm - 95,224 mm (3.748 in - 3.749 in)
Pinion bearings – outside diameters	72,232 mm - 72,257 mm (2.8438 in - 2.8448 in) 95,250 mm - 95,275 mm (3.750 in - 3.751 in)
Pinion – splined diameter	37,843 mm - 37,868 mm (1.4899 in - 1.4909 in) over 3,05 mm (0.120 in) diameter rollers
Pinion – nose bearing locating diameter	38,524 mm - 38,536 mm (1.5167 in - 1.5172 in)
Bearing plate – pinion nose bearing bore diameter	61,981 mm - 61,986 mm (2.4402 in - 2.4404 in)
Pinion nose bearing – outside diameter	61,987 mm - 62,000 mm (2.44045 in - 2.44095 in)
Pinion nose bearing – running clearance	0,0127 mm - 0,038 mm (0.0005 in - 0.0015 in)
Pinion bearing housing – oil seal locating diameter	80,9498 mm - 80,9879 mm (3.187 in - 3.1885 in)
Oil seal – pinion bearing housing locating diameter	81,03 mm - 81,13 mm (3.190 in - 3.194 in)

Final drive – drive-shafts

Side housings – bearing locating bore	66,655 mm - 66,661 mm (2.6242 in - 2.62445 in)
Bearing – side housings – outside diameter	66,649 mm - 66,662 mm (2.6240 in - 2.6245 in)
Bearing – side housings – bore diameter	38,092 mm - 38,105 mm (1.4997 in - 1.5002 in)
Right-hand side housing – oil seal locating bore	64,77 mm - 64,81 mm (2.550 in - 2.5515 in)
Oil seal – right-hand	To suit above housing
Left-hand side housing – oil seal locating bore	63,50 mm - 63,54 mm (2.500 in - 2.5015 in)
Oil seal – left-hand	To suit above housing

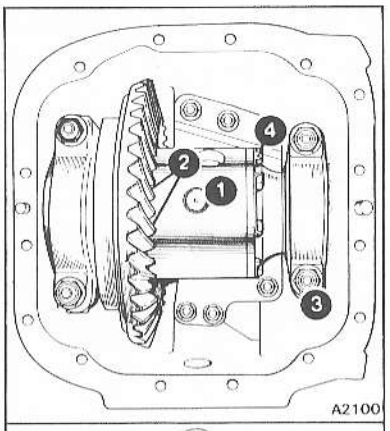
Special torque tightening figures

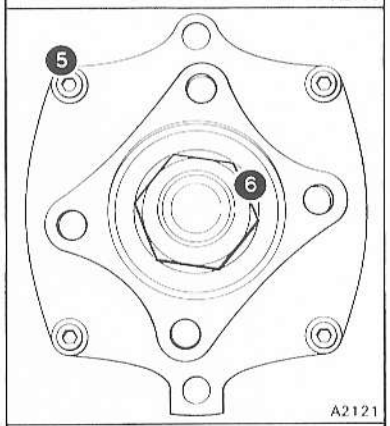
Introduction
This section contains the special torque tightening figures applicable to Chapter J.

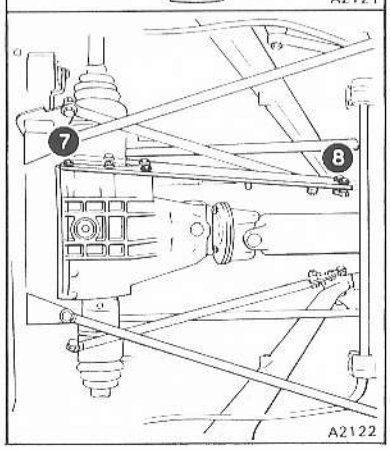
For standard torque tightening figures refer to Chapter P.

Components used during manufacture of the vehicle have different thread formations (Metric, UNF, UNC, etc.). Therefore, when fitting nuts, bolts, and setscrews it is important to ensure that the correct type and size of thread formation is used.

Section J2

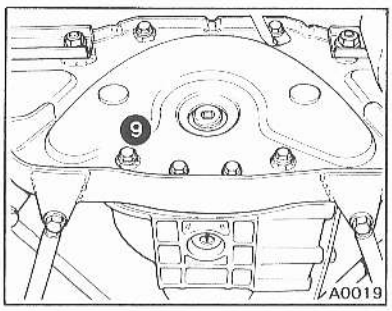






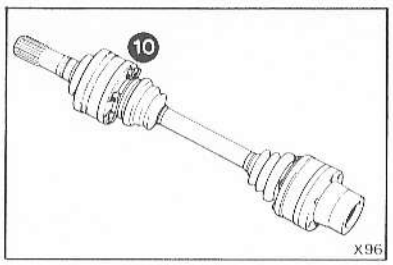
Ref.	Component	Nm	kgf m	lbf ft
1	Differential trunnion – bolt and lock-nut	16-19	1,63-1,94	12-14
2	Crownwheel to differential housing – capscrews	57-61	5,82-6,22	42-45
3	Nut-bearing cap final drive	81-88	8,3-8,9	60-65
4	Setscrew-end cover differential housing	11-13	1,10-1,38	8-10
5	Pinion housing to differential housing casing – capscrews	39-43	3,98-4,38	29-32
6	Input flange to input pinion – nut	271-305	27,7-31,1	200-225
7	Torque arm mount to final drive casing-bolts	46-50	4,70-5,10	34-37
8	Torque arm front mount – nuts and bolts	81-88	8,3-8,9	60-65

Section J2



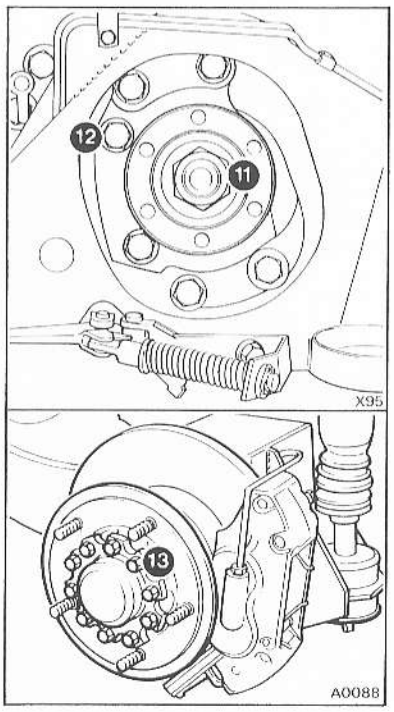
Ref.	Component	Nm	kgf m	lbf ft
9	Setscrew – final drive to crossmember	39-43	3,98-4,38	29-32

Section J3



Ref.	Component	Nm	kgf m	lbf ft
10	Constant velocity joint – bolts (cars other than Bentley Turbo R)	81-88	8,3-8,9	60-65
	Constant velocity joint – capscrews (Bentley Turbo R only)	95-101	9,7-10,3	70-75

Section J5



Ref.	Component	Nm	kgf m	lbf ft
11	Coupling flange to drive-shaft – nut (cars other than Bentley Turbo R)	664-691	67,8-70	490-510
	Coupling flange to drive-shaft – nut (Bentley Turbo R only)	102-108	10,4-11,0	75-80
12	Rear brake caliper to stub axle – setscrew	109-115	11,1-11,5	80-85
13	Setscrew – drive-shaft to rear hub	44-48	4,4-5,0	32-36

Workshop tools

RH 8014	Torque wrench – 0 lbf ft to 600 lbf ft Hub yoke nut
RH 8016	Extractor beam When used in conjunction with RH 8017, RH 8020, RH 8021, and RH 8022, the extractor beam can be used to remove the rear tapered roller bearing from the final drive pinion
RH 8017	Hydraulic ram To be used in conjunction with RH 8016, RH 8020, RH 8021, and RH 8022 as detailed above
RH 8020	Separator See RH 8017 for uses
RH 8021	Bolt – See RH 8017 for uses
RH 8022	Pressure pads See RH 8017 for uses
RH 8026	Socket head 1 11/16 A/F (cars other than Bentley Turbo R) To be used in conjunction with RH 8014
RH 8032	Stiffening bar – Final drive casing
RH 8307	Converter – Torque spanner Converts the 19 mm (0.75 in) square drive of the torque spanner RH 8014 to 25,4 mm (1.0 in) square drive
RH 8308	Applicator – Rear drive-shaft rubber seal
RH 8457	Assembly tool – Pinion coupling flange
RH 8470	Extractor – Pinion coupling flange To be used in conjunction with RH 8017
RH 9005	Hydraulic ram To be used in conjunction with RH 9690
RH 9299	Compression bolt – Rear springs
RH 9575	Jury bolt – Torque arm removal
RH 9578	Pre-loading jig – Belleville washer – Final drive right-hand side housing
RH 9690	Extractor – Rear hub coupling flange To be used in conjunction with RH 9005

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