Steering system

Section

Issue record sheet 1

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Rack and pinion unit

Introduction

The steering unit is a rack and pinion power assisted mechanism with centre connection to solid bar track rods. Toe-in can be set by the movement of an intermediate adjuster linking the track rod inner and outer components. An anti-joggle valve is fitted into the hydraulic pressure line, located in the spool valve housing, to minimise any feedback to the steering wheel caused by road irregularities.

When assembling a steering unit, it must be noted that the main tube and end cap on the pinion box side of the unit are not interchangeable with similar components fitted to cars built to earlier specifications.

The steering rack is fitted with internal lock stops.

To overhaul the rack and pinion assembly, the following kit of parts are available.

Spool valve renewal kit

Rack overhaul kit

Bellows replacement kit

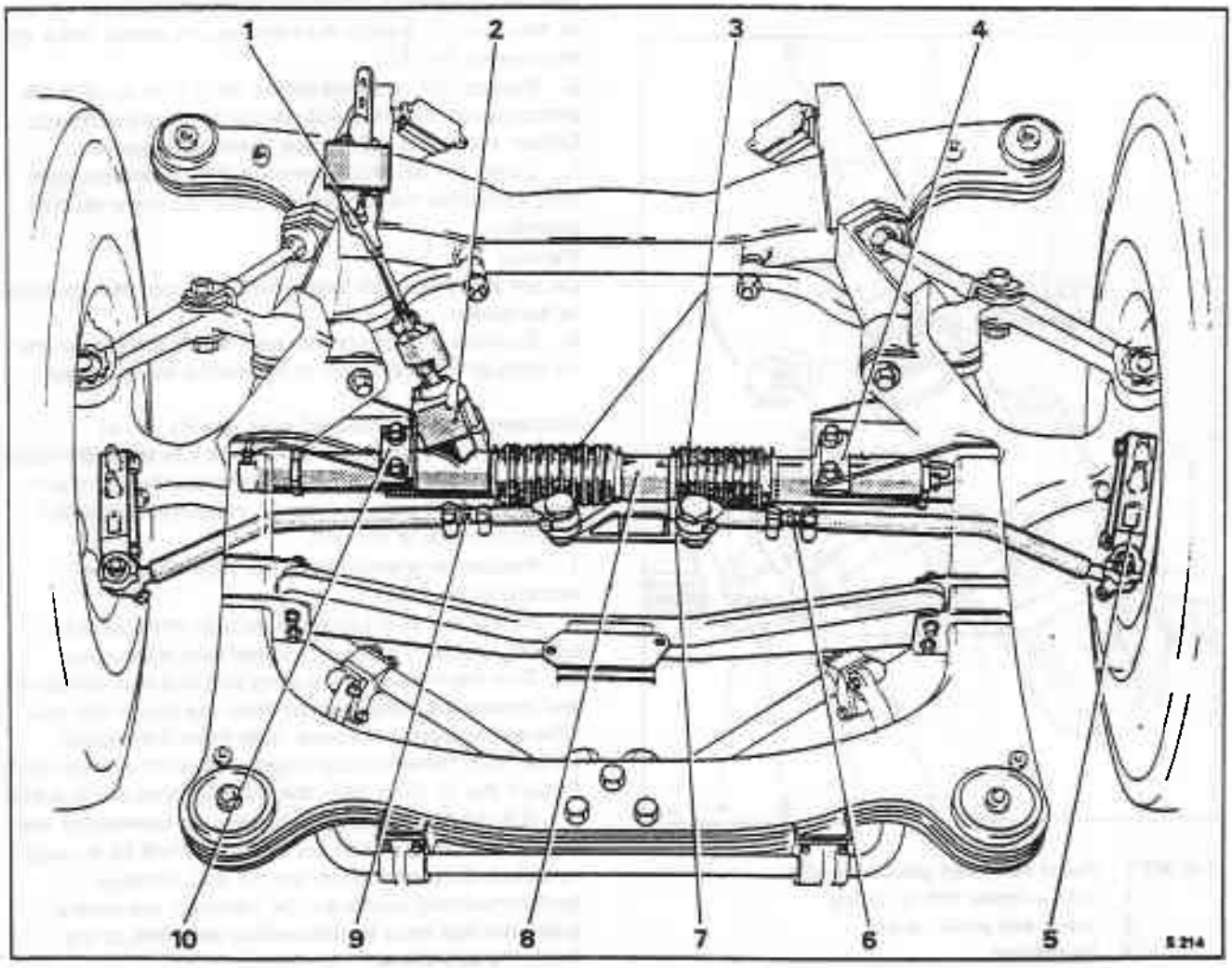


Fig. N1-1 Steering unit mounted in sub-frame

1 Intermediate link
2 Spool valve and pinion
3 Convoluted seals
4 Steering to sub-frame attachment
5 Side steering lever
6 Track rod adjuster
7 Inner ball joint bracket
8 Centre tube and seal
9 Track rod adjuster
10 Steering to sub-frame attachment

Power assistance

Pressure is applied to the steering system rack in varying degrees to provide assistance to the steering wheel, dependent on the effort required to move the road wheels.

The amount of assistance is controlled by the passage or restriction of oil through a series of ports in the upper half of the pinion box. This creates a pressure differential across the rack, proportional to the load applied at the steering wheel.

The system operates by causing a small torsion bar to twist, immediately the steering wheel is moved, rotating the concentric valve components to provide the pressure differential required. A 'fail safe' device prevents the torsion bar from being overstressed by limiting the number of degrees through which it can twist.

Important

The steering unit must be handled with exceptional care. Avoid impact loads on the input shaft, the centre off-take and damage to the convoluted seals which could cause premature failure of the unit.

Do not disturb the end plug or locking nut whilst the rack and pinion unit is fitted into the car.

All threads on the rack assembly are metric, except for the mounting bolts to the sub-frame and the lower steering column linkage, these are unified.

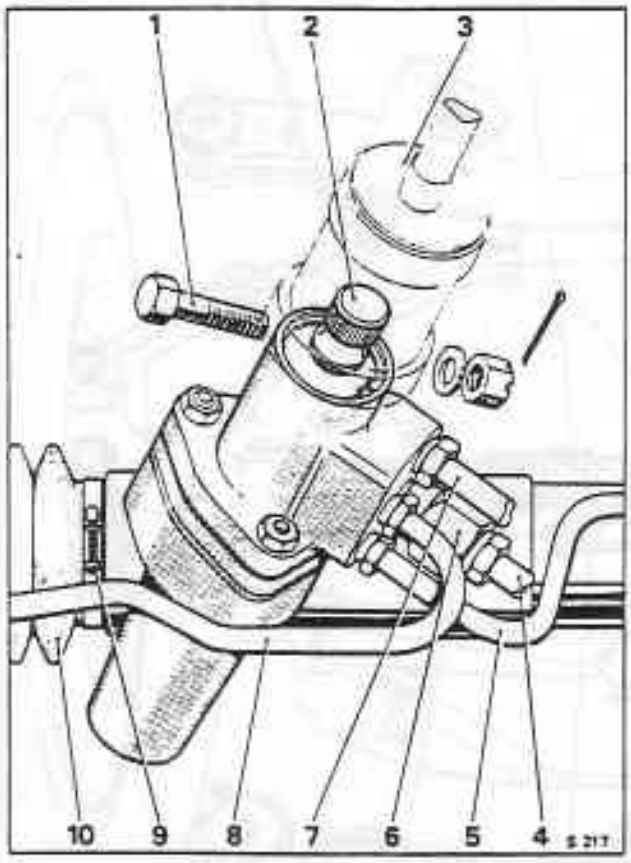


Fig. N1-2 Spool valve and pinion housing

1 Bolt – lower link to spline
2 Valve and pinion shaft
3 Heatshield
4 Hydraulic feed pipework
5 Fluid feed to end of rack
6 Anti-joggle valve adapter
7 Hydraulic return pipework
8 Fluid feed to end of rack
9 Seal attachment clip
10 Convoluted neoprene seal

Rack and pinion unit – To remove from the sub-frame

1. Place the car on a ramp and raise to a convenient working height. Chock the road wheels.
2. Disconnect the battery. Remove the gear range selector thermal cut-out (see Chapter M).
3. Remove the high pressure feed and low pressure unions feeding the external pipework into the spool valve housing. Drain the system using drip trays.

   Fit caps to prevent the ingress of dirt (see fig. N1-2)
4. Remove the split pin, castellated nut and bolt holding the steering pinion box spline (see fig. N1-2).
5. Straighten the tab-washer, unscrew and remove the bolts holding the inner ball joint bracket to the steering unit centre position. When removing the bolts care must be taken not to disturb the steering unit centre block oil seal (see fig. N1-10).
6. Support the rack and pinion unit, then remove the setscrews attaching the unit to the sub-frame brackets. Collect and retain the tapping blocks and washers.
7. Lower the unit from beneath the suspension, carefully extracting the input shaft from the lower column assembly.

Warning

Do not strike this unit with a hammer; any damage could be dangerous.

8. Examine the convoluted seals for deterioration and for leaks of lubricating oil at the centre block oil seal.

Replacement of convoluted seals (see fig. N1-4)

If when a convoluted seal is removed due to splits and/or leakage, there is evidence of the ingress of water and/or road dirt, a complete stripdown, clean and inspection should be made of the unit.

1. Position drip trays under the ends and centre sections of the unit.
2. At the end of the unit opposite to the pinion box housing, carefully remove the hydraulic pipe union.
3. Grip the bracket at the same end in a vice. Unscrew and remove the blanking plug from the end of the rack tube and withdraw the outer tube from the bracket. Collect the dismantled parts and cover with a clean cloth. Discard the 'O' rings from the blanking plug and bracket.

   If it is only necessary to replace the convoluted seal at the dismantled end of the unit, there will be no need to disturb the centre block and oil seal. However, if both convoluted seals are to be removed, the central block and seal must be removed as described in the following operations.
4. Unscrew the capscrew holding the central block in position against the rack gear, withdraw the block and oil seal. Protect the components by covering with a clean cloth.
5. Slacken the ring clips retaining screws that secure the convoluted seals in position.

   Remove the ring clips, seals and central spacer tube.

The spacer tube must be covered to prevent the ingress of dirt.

6. Turn the unit over with the slot facing downwards to enable the lubricating oil to drain from the unit into a suitable tray.

7. Fit new convoluted seals, clipping these to the pinion box, outer tube and the central spacer tube.

To enable service inspection checks on the tightness of the clips when the unit is fitted to the vehicle, ensure that the screw heads of all the retaining clips face downwards and towards the rear of the rack.

Lift the unit higher at the dismantled end and pour 0,057 litre (0.1 Imp pt 0.12 US pt) of new approved lubricating oil (see Chapter D) through the slot in the central spacer tube.

8. Fit the centre block using the flexible bonding agent Silastic 732 RTV sealant on the mating surfaces of the seal, to ensure a leak free joint.

9. Fit a new 'O' ring and position the support bracket onto the outer tube. Fit the blanking plug with a new 'O' ring and carefully screw into position.

Note

To ensure a reasonable control on the parallelism of the two suspension mounting bracket faces, place the assembled unit with the bracket faces downwards onto a surface table or a suitable flat fixture plate.

10. Lightly clamp the two mounting brackets of the unit onto the flat surface.

11. Torque tighten the end plug to the figures quoted in Section N7.

12. Screw the hydraulic pipe union carefully into the end of the blanking plug to form a good seal. Torque tighten to the figures specified in Section N7.

Rack and pinion unit — To dismantle (see figs. N1-8 and N1-9)

If the unit has an internal fault which necessitates the removal of the rack, dismantling to the stage of withdrawing the centre block should be completed before carrying out the following operations. Removal of the centre block is described under the heading Replacement of convoluted seals, Operations 1 to 6 inclusive.

1. After draining the lubricating oil, place the unit onto two 'Vee' shaped wooden blocks.

2. Remove the remaining feed pipe. Blank off the hole in the pinion box and cover.

3. Mark the relationship between the input shaft spline and pinion box housing with the steering in the straight ahead position. Use the screwed plug to ensure a correct setting.

4. Unscrew the three nuts, and release the pinion and valve housing assembly by gripping the pinion spline with one hand, and keeping the two halves of the valve housing together with the other hand. With a turning movement lift the assembly using the splined shaft, clear of the pinion position (see fig. N1-5).

5. Release the lock-nut. Unscrew the remaining end cap. Discard the internal 'O' ring.

6. Using an appropriate sized wooden dowel, carefully press the end of the rack until the P.T.F.E. ring and oil seal appear at the pinion box end of the unit.

7. Support the end of the rack whilst continuing to

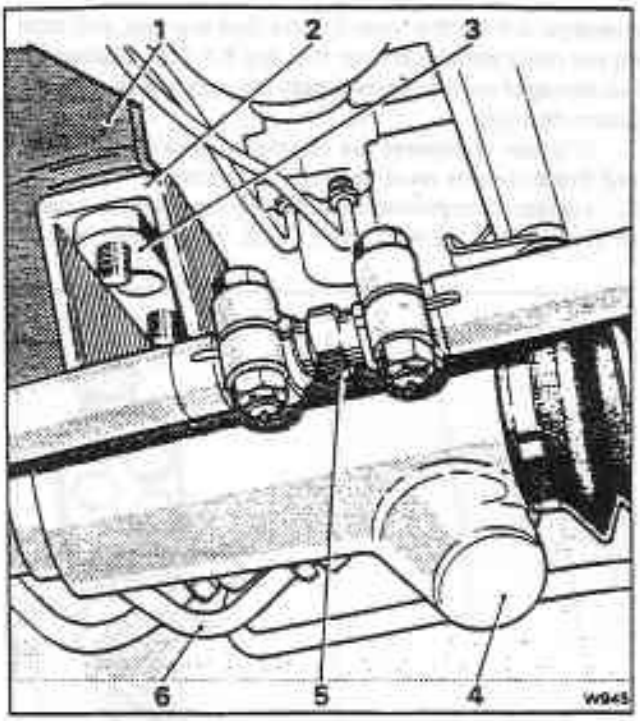


Fig. N1-3 Steering to sub-frame mounting
1 Sub-frame bracket
2 Steering unit mounting foot
3 Tapping block
4 Pinion housing
5 Track rod adjuster
6 Hydraulic pipework

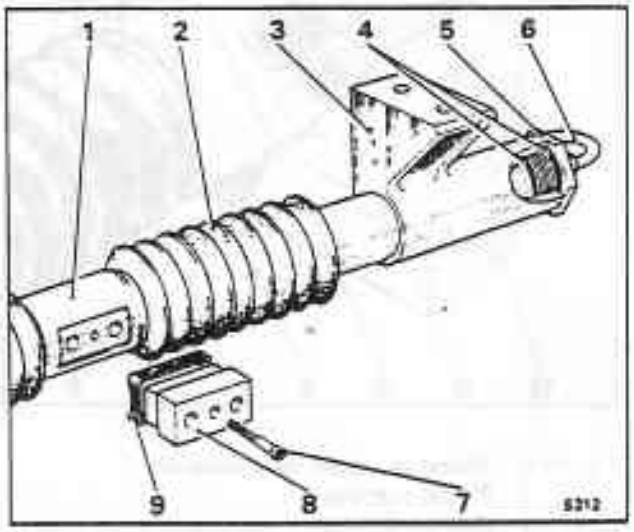


Fig. N1-4 Removal of convoluted seals
1 Centre tube
2 Seal
3 Mounting foot
4 'O' rings
5 Blanking plug
6 Fluid feed pipework
7 Cap head socket screw
8 Centre block
9 Shaped seal

withdraw it from the tube. Ensure that the rack and tube do not make contact and/or that the P.T.F.E. bearing is not damaged during removal past the centre slot and pinion opening.

It is easy to damage the internal surface of the tube and therefore care must be taken at this stage.

8. Inspect all components including the internal faces of the end caps, oil seals and P.T.F.E. bearing carrier.

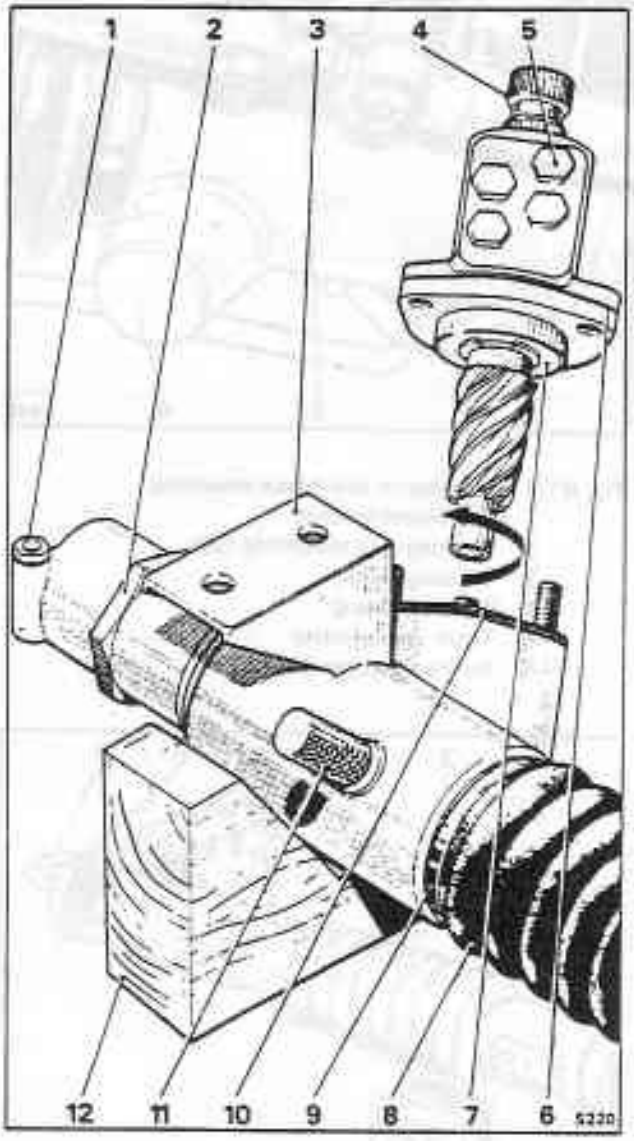


Fig. N1-5 Pinion and spool valve removal

1 Plastic dust cap
2 End cap lock-nut
3 Mounting foot
4 Pinion boss
5 Plastic dust caps
6 Bearing pre-load shim
7 Bearing carrier
8 Convoluted seal
9 Seal clip
10 Pinion pre-load shims
11 Rack centring plug
12 Support

Wash all metal parts in Genklene or an equivalent cleaning fluid.

Pinion and spool valve housing assembly

The pinion and spool valve housing assembly comprises of the following main service items, an upper oil seal, P.T.F.E. sealing rings, lower oil seal, lower oil seal carrier, 'O' rings, paper joint washers, pre-load shims and circlips.

Upper oil seal — To replace

1. Remove the retaining upper circlip and plastic sealing washer. Carefully lift the housing off the spool valve unit ensuring that the P.T.F.E. rings are not damaged.

Record the number and position of the existing paper joint washers, and the pre-load shims between the ball race carrier and pinion housing.

2. Carefully remove the upper oil seal from the housing and discard.
3. Fit a new upper oil seal using applicator tool RH 9121. This seal has a pressure lip and a dirt lip. In the cavity between the two lips, apply molybdenum disulphide grease. Failure to do this could result in a noisy seal action.
4. Tightly wrap a single layer of clear adhesive tape around the spool valve splines.
5. Carefully fit the spool valve back into the housing ensuring that each P.T.F.E. ring enters the bore squarely with no pinching of the edges against the bore. Replace the plastic sealing washer and circlip. Do not use force to assemble.

P.T.F.E. sealing rings — To replace

1. Remove the retaining upper circlip and plastic sealing washer. Carefully lift the housing off the spool valve unit.
2. Cut into the P.T.F.E. sealing rings with a sharp instrument having a smaller dimension than the width of the groove. Take care not to damage the finely machined surfaces of the spool valve. Use 'Vee' shaped wooden blocks to support the end diameters during removal of the rings.
3. Inspect the ring grooves of the valve pinion.
4. Immerse the new P.T.F.E. rings in warm oil prior to fitting onto the applicator RH 9117. Failure to warm-up the rings before fitting could cause cracking.
5. Place the tool over the input shaft spline and adjust until the bottom edge of the tool corresponds with the upper edge of the lowest 'O' ring groove.
6. Slide a P.T.F.E. sealing ring into the groove.
7. Adjust the tool to fit the remainder of the rings into their respective grooves.
8. Remove the sleeve tool then size the rings by carefully pressing the tool RH 9118 over the rings to reduce their diameter.
9. Tightly wrap a single layer of clear adhesive tape around the spool valve splines to protect the upper and lower seals whilst assembling the pinion and spool valve housing.
10. Fit the upper ball race carrier, spacers, and ball

bearings. Locate these components by fitting a new circlip.

11. Carefully assemble the pinion and spool valve housing, secure in place with a new circlip and sealing washer.

Lower oil seal — To replace

1. Remove the retaining upper circlip and plastic sealing washer. Carefully remove the housing off the spool valve unit. Avoid damage to the P.T.F.E. sealing rings.
2. Remove the carrier and lower seal from the housing.
3. Press out the lower oil seal from the carrier.
4. Inspect the carrier for damage.
5. Press a new oil seal into the carrier. Ensure that the lip face of the seal is uppermost. Fit the carrier into the housing.
6. Tightly wrap a single layer of clear adhesive tape around the spool valve splines to protect the upper and lower seals whilst assembling the pinion and spool valve housing.
7. Fit the upper ball race carrier, spacers, and ball bearings. Locate these components by fitting a new circlip.
8. Carefully assemble the pinion and spool valve housing, secure in place with a new circlip and sealing washer.

Thrust ball race

If the spool valve and pinion unit is dismantled to the stage of inspecting the thrust ball race and it is found necessary to replace any thrust race components, the pre-load torque must be reset.

The following table gives a conversion of the spring balance readings quoted in the text, to a figure for use with Nm (lbf in and kgf m) torque spanner.

To protect the components wrap clear adhesive tape over the spline and spool valve rings.

Spring balance and arm		Torque spanner		
kgf	lbf	Nm	kgf m	lbf in
0,0544	0.120	0,054	0,0055	0.480
0,272	0.600	0,316	0,0320	2.400
0,510	1.125	0,508	0,0520	4.500
0,820	1.800	0,813	0,0830	7.200
0,910	2.000	0,904	0,0922	8.000
1,130	2.500	1,131	0,1153	10.010
1,950	4.300	1,943	0,1981	17.200
2,040	4.500	2,034	0,2074	18.000

1. Fit the ball race with any new components required and lubricate the assembly with a light application of new approved EP 90 grade oil. Ensure that the oil does not contaminate the area bounded by the two oil seals.
2. Replace the lower oil seal carrier as described in Lower oil seal — To replace.
3. If a new lower oil seal has been fitted, first place a new paper gasket onto the face of the lower oil seal carrier. Then place the original stack of shims plus one additional shim of at least 0,254 mm (0.010 in) thickness onto the carrier.

This additional shim will effectively remove any bearing pre-load when assembly is completed.

Shims are available in the following sizes:
0,063 mm (0.0025 in)
0,127 mm (0.005 in)
0,254 mm (0.010 in)
1,270 mm (0.050 in)

4. Remove the adhesive tape from the spool valve shaft only and wipe the spool valve assembly with a clean lint free cloth. Lightly lubricate the spool valve assembly with power steering fluid.

Do not fit the lower oil seal carrier 'O' ring at this stage.

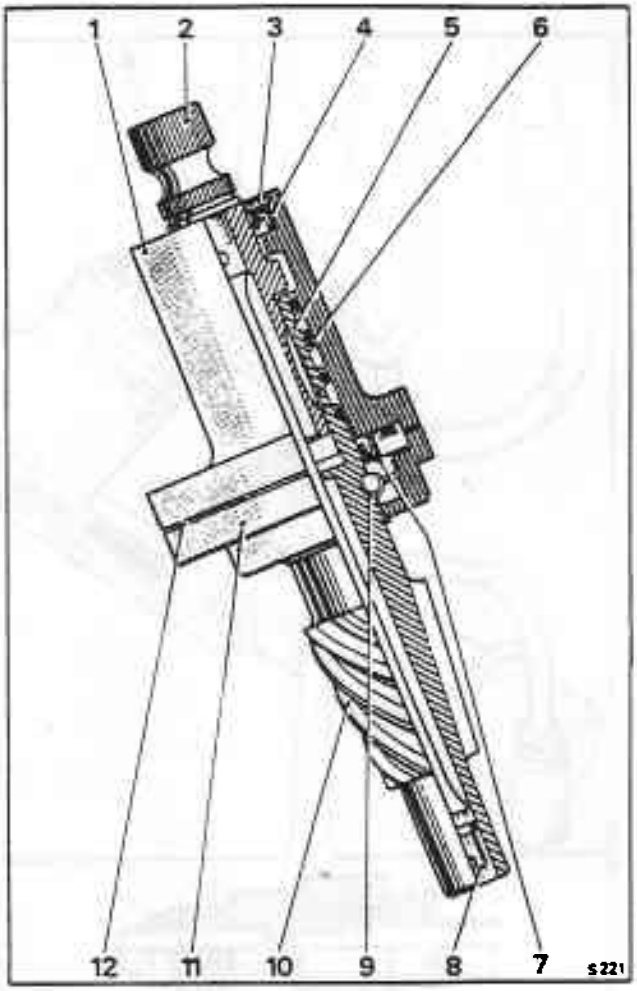


Fig. N1-6 Pinion and spool valve unit — Sectioned view

1 Spool valve housing
2 Spline
3 Circlip and plastic washer
4 Lip-type oil seal
5 Spool valve
6 P.T.F.E. rings (4)
7 Lower oil seal
8 Torque arm
9 Thrust ball race
10 Pinion
11 Ball race carrier
12 Pre-load shim(s)

5. Carefully fit the spool valve housing onto the spool valve shaft. Ensure that each P.T.F.E. sealing ring enters the bore of the housing squarely with no pinching of the ring edges. Do not use force to assemble.
6. Lightly assemble the housing and carrier together using three nuts and bolts then rotate the input shaft a number of turns to reduce initial drag.
7. Grip the sub-assembly in a soft jawed vice and fit the torque arm tool RH 9123 to the input shaft spline.
8. To measure the pinion seal drag and spool valve friction use a spring balance. Note the reading required to rotate the input shaft. This should be between 0,016 kgf and 0,08 kgf (0.120 lbf and 0.60 lbf).

If the reading is above 0,08 kgf (0.60 lbf), bearing pre-load may still exist and it will be necessary to fit an additional shim.

If after fitting additional shims to the extent that no bearing pre-load exists, i.e. end-float appearing in the spool valve, then some other source of tightness such as incorrectly sized P.T.F.E. rings could be the cause.
9. Assemble and test the unit again as described in Operations 5 to 8 inclusive, until a figure within the limits quoted in Operation 8 have been achieved.
10. Dismantle the spool valve housing then, reduce the shims by one 0.063 mm (0.0025 in) shim.

Check that a spring balance reading of 0,510 kgf (1.125 lbf) is required to rotate the shaft. If this reading is not obtained reduce the shims (one at a time) until the correct reading is achieved.

Important

Ensure that this procedure is carried out correctly otherwise excessive pre-load can damage the bearing parts.

11. Remove the spool valve housing to fit an 'O' ring into the lower oil seal carrier.

Ensure that paper gaskets are in good condition and fitted at the top and bottom of the shim stack.
12. Lubricate the spool valve and pinion seals with steering fluid and the upper oil seal with a light coating of molybdenum disulphide grease.
13. Carefully assemble the spool valve housing.
14. Ensure new paper gaskets are fitted to the underside of the ball race carrier and to the steering rack pinion housing face.
15. Fit the original number of shims and carefully fit the complete spool valve assembly into the pinion housing.
16. Ensure that the hydraulic pipe connections of the spool valve housing are in the correct relative position.
17. The correlation mark on the input shaft should align with the mark on the spool valve housing when the assembly is fully engaged with the rack in the central position.
18. Torque tighten the retaining nuts to the figures quoted in Section N7.
19. Replace any rack lubricating oil (EP 90 grade), that may have been lost during dismantling, up to the total amount of 0,057 litre (0.1 Imp pt 0.12 US pt).

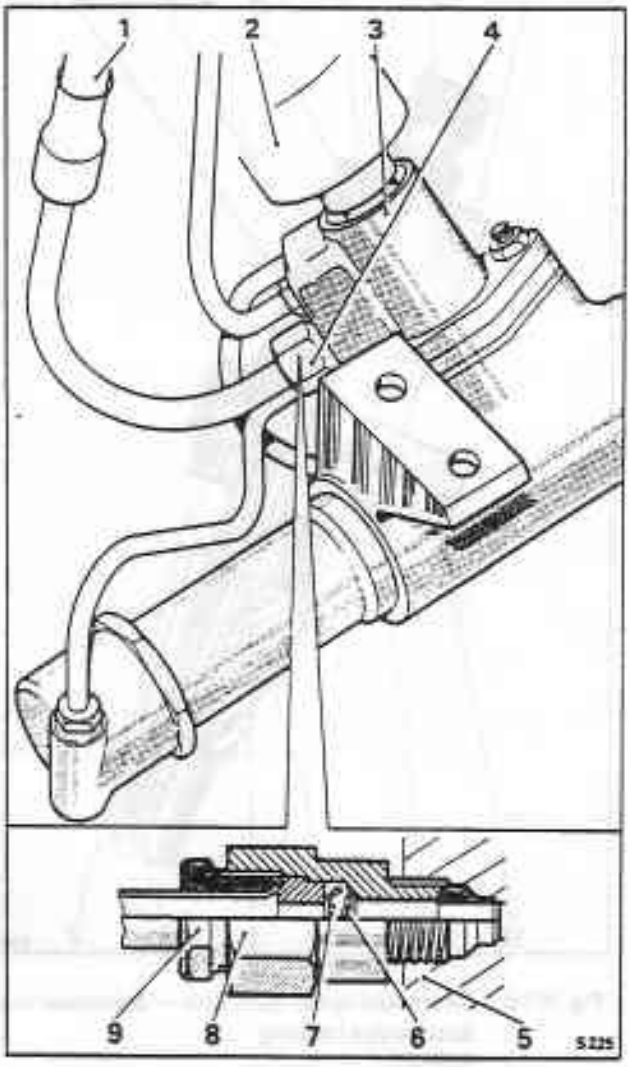


Fig. N1-7 Anti-joggle valve
1 High pressure fluid
2 Heatshield
3 Spool valve housing
4 Anti-joggle valve
5 Spool valve casting
6 Spring
7 Flap valve
8 Adapter
9 Pipe union

Anti-joggle valve (see fig. N1-7)

1. With the steering dismantled remove the anti-joggle valve.
2. Check that the spring and flap are functioning correctly by pressing a probe carefully onto the top of the flap to ensure that adequate compression of the assembly occurs and the flap seats correctly.
3. Wash out the assembly in Genklene or an equivalent cleaning solution. Dry using a controlled jet of dry pressurized air into the male threaded end of the unit only.
4. Fit blanking plugs into each end of the adapter.

Pipe unions

If the olive which forms the seating of the pipe union is found to be damaged it will be necessary to remove the spool valve housing before it can be renewed. It must be

emphasized that cleanliness must be observed when carrying out this procedure.

Rack and pinion unit — To assemble

It is essential that the rack should only be removed or replaced from the pinion end of the unit. This ensures that the P.T.F.E. bearings or oil seals are not damaged by the internal thread of the blanking plug end of the assembly.

At this stage, check the bore of the rack tube for scoring or damage.

1. With the rack unit out of the tube, fit the scarf jointed P.T.F.E. rack bearings into the respective grooves in each end of the rack.
2. Gently press each scarf joint together. Ensure that each gap has an initial (nominal) measurement of 2,03 mm (0.080 in).

In the case where the two ends of the P.T.F.E. ring butt together or in the event of a smaller than nominal gap being observed, it will be necessary to remove the ring and cut one end of the scarf joint until the correct figure is obtained.

3. Using sizing tools RH 9114, RH 9113, and RH 9112, progressively reduce the diameter of the P.T.F.E. bearings until these are a sliding fit in the rack tube.

At this stage ensure that the gap at the scarf joint has not gone below a minimum of 0,25 mm (0.010 in) and is positioned so as not to come into contact with the edges of the centre slot when the rack is assembled.

Remove any burrs from the slot. Wipe the area clean before assembly.

4. From the pinion end, press the rack slowly into the tube until the P.T.F.E. bearing reaches the mid-position of the centre slot.

Ensure that the bearing is not damaged when moving along the slot.

5. With the P.T.F.E. bearing visible in the centre slot, lightly lubricate a rack oil seal. Fit the seal through the slot in the tube and using finger pressure, press the seal onto the end groove of the rack. Turn the rack slowly during this operation, to assist in assembly of the seal.
6. Lubricate the other rack oil seal and again using finger pressure fit this seal onto the pinion end groove.
7. Slide the rack unit slowly into the tube, checking that no nipping occurs when the oil seal passes into the closed portion of the tube. The pinion end seal must be manipulated into the tube by the fingers.
8. Lock the rack into the mid-position using centring plug RH 9119.
9. Manipulate a new 'O' ring and fit into the end cap of the unit ensuring that it sits into its groove. Fit the lock-nut onto the tube. A degree of feel must be applied when screwing on the cap to ensure the 'O' ring fits correctly.
10. Allow the end cap to butt against the inner face then screw back the cap approximately one full turn to allow for hydraulic pipe alignment.
11. Torque tighten the lock-nut to the figures quoted in Section N7 using the open ended torque wrench adapter tool RH 9125.
12. Fit new convoluted seals as described in Replacement of convoluted seals.

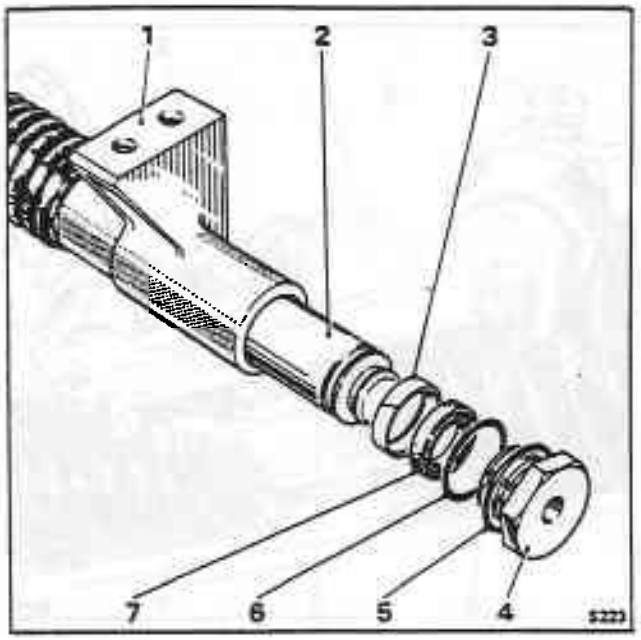


Fig. N1-8 Assembly of free end components

1 Mounting foot
2 Rack spindle
3 P.T.F.E. seal
4 Blanking plug
5 End plug 'O' ring
6 Tube 'O' ring
7 Oil seal

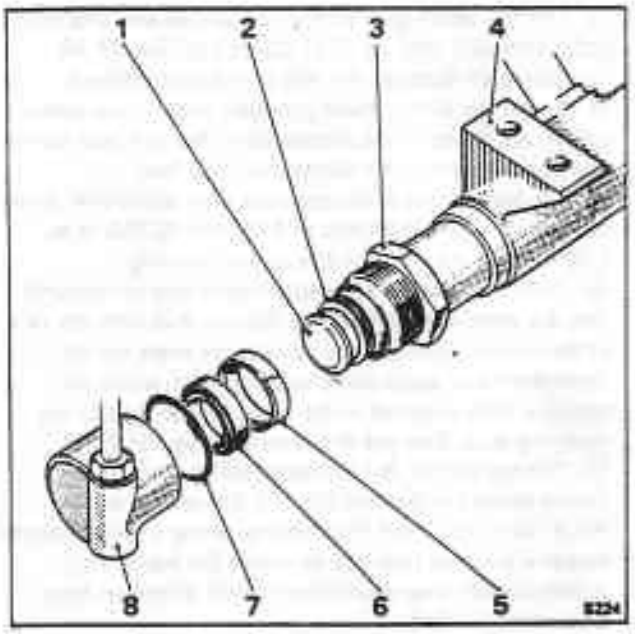


Fig. N1-9 Assembly of pinion box end components

1 Rack spindle
2 P.T.F.E. seal carrier
3 Lock-nut
4 Mounting foot
5 P.T.F.E. seal
6 Oil seal
7 End cap 'O' ring
8 End cap

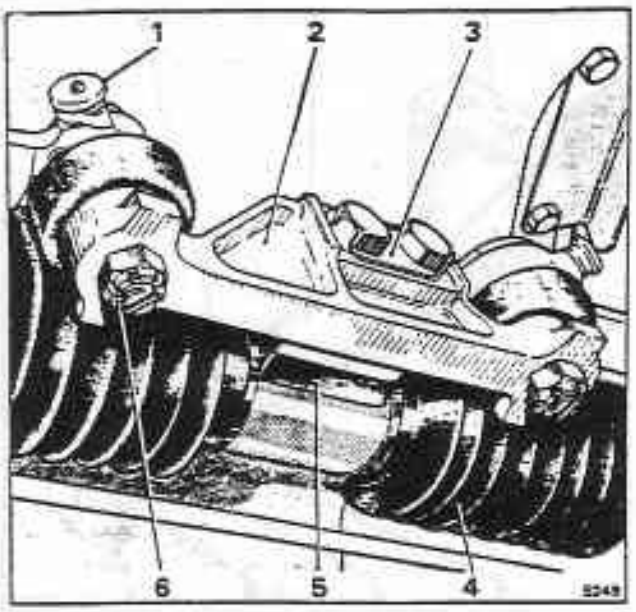


Fig. N1-10 Inner ball joint bracket in position
1 Ball joint grease nipple
2 Bracket
3 Tab-washer
4 Convoluted seal
5 Centre block seal
6 Castellated nut and split-pin

13. Lift the unit higher at the dismantled end and pour 0,057 litre (0.1 Imp pt 0.12 US pt) of new EP 90 lubricating oil through the slot in the centre sleeve.
14. To set the pinion mesh pre-load, ensure new paper gaskets are fitted to the underside of the ball race carrier and to the steering rack pinion housing face.
15. Fit the original shims together with additional shims of approximately 3,80 mm to 5,08 mm (0.150 in to 0.20 in) over the studs of the pinion housing.
16. Carefully assemble the spool valve and pinion unit into the steering rack housing. Ensure that with the rack in the central position, the correlation mark on the input shaft and spool valve housing, align when the pinion is fully engaged in the rack. Finger tighten the retaining nuts. Remove the centring plug RH 9119.
17. Torque tighten the flange retaining nuts to the figures quoted in Section N7 . Fit the special arm RH 9123 to the input shaft spline. Using a spring balance, measure the load required to rotate the input shaft approximately one revolution in each direction from the centre position.

The maximum load necessary to rotate the shaft to overcome both rack seal drag and spool valve friction should be 0,91 kgf (2 lbf).

If the force required is above this figure, then pinion mesh pre-load is still present. Therefore, additional shims must be fitted between the pinion and rack assembly.

Alternatively, the steering rack P.T.F.E. bearings could be incorrectly sized and the rack will have to be withdrawn. Reduce the diameter of the bearings further using sizing tools RH 9114, RH 9113, and RH 9112 in this order.
18. Carefully replace the steering rack ensuring no damage occurs to the P.T.F.E. bearings and oil seals. Fit the pinion unit.

Top-up the system with new lubricating oil, grade EP 90.
19. Using special arm RH 9123 and a spring balance, progressively reduce the number of shims to give a minimum figure of 1,13 kgf (2.50 lbf) above the seal drag and spool valve friction detailed in Operation 17.

The maximum total turning load should not exceed a spring balance reading of 2,04 kgf (4.50 lbf).

Example
If the total rack drag and spool valve friction is equal to 0,82 kgf (1.80 lbf) using a spring balance, then the minimum total load by progressively removing shims will be 0,82 kgf + 1,13 kgf (1.80 lbf + 2.50 lbf) = 1,95 kgf (4.30 lbf).
20. Return the rack to the straight-ahead position. Fit the centring plug RH 9119.
21. Carefully assemble the pinion unit to the steering rack housing. Ensure that the correlation marks on the input shaft and spool valve housing align when the pinion is fully engaged with the rack.
22. Torque tighten the flange retaining nuts to the figures quoted in Section N7
23. Fit the centre block using the flexible bonding agent Silastic 732 RTV sealant on the mating surfaces of the seal to ensure a leak free joint. Secure the centre block in position using the socket headed capscrew.
24. Manipulate new 'O' rings before they are fitted to the blanking plug and lubricate with power steering fluid to ensure that the rings fit correctly into their respective grooves.

Replace the outer tube and bracket assembly.
25. Set the two suspension brackets of the assembly squarely onto a surface table and clamp firmly into position.
26. Screw in the blanking plug to the torque figures quoted in Section N7
27. Fit the pipe runs from the end caps to the pinion valve assembly using the torque figures quoted in Section N7
28. The unit is now ready for fitting to the car, but do not remove the centring plug at this stage.

Rack and pinion unit – To fit to the sub-frame
1. Position and hold the steering wheel in its central position. Carefully fit the pinion box spline into the lower link universal coupling and support the unit in position. Finger tighten the pinch bolt.
2. Fit the setscrews and washers to the sub-frame brackets tapping blocks (see fig. N1-3). Torque tighten the setscrews to the figures quoted in Section N7, using the special tool arm RH 9122.
3. Align the spacer between the inner ball joint bracket and the steering unit centre block seal (see fig. N1-10).
4. Fit the new tab-washer and finger tighten the

setscrews. Remove the centring plug RH 9119.

5. Torque tighten the inner ball joint bracket setscrews to the figures quoted in Section N7, carefully checking that the oil seal is not displaced. Lock the tab-washer to the setscrews, avoiding any impact to the unit. Also, torque tighten the lower linkage universal couplings pinch bolt, in accordance with the figures quoted in Section N7

6. Connect the pipework from the pump and oil cooler to the pinion box, ensuring that the union joints are wiped clean before fitting. Torque tighten in accordance with the figures quoted in Section N7

Important

Correct routing of the pipework is essential.

7. Re-connect the gear range selector thermal cut-out (see Chapter M).

8. Re-connect the battery.

Rack and pinion unit - To assemble (unit incorporating an external adjuster) (see fig. N2-2)

N2-2 Pinion mesh adjustment (rack and pinion unit incorporating an external adjuster)

- 1.) Remove the rack bar from the vice and replace it with the pinion box and tube assembly. Clamp the tube horizontally in the vice with the valve housing mounting face uppermost and the rack slipper hole facing towards the operator.
- 2.) Smear 35 g (1.25 oz) of Rocol Sapphire grease onto the meshing gear of the rack bar, pinion, and pinion thrust ball race.
- 3.) From the pinion box end (smooth bore end) of the tube, push the rack bar into its central position. Ensure that the centralizing hose is in the middle of the rack slipper hole.
- 4.) Assemble the valve and pinion assembly (complete with shim pack, etc.) into the steering box.

Ensure that with the rack in the central position, the flat on the pinion spline is on the same side and at right-angles to the short tube for right-hand drive cars, and the long tube for left-hand drive cars.

- 5.) Fit the three setscrews and screw down. Do not torque tighten at this stage.

The torque required to rotate the valve should not exceed 0,9 Nm (0,09 kgf m; 8 lbf in). If it does exceed this figure, the rack PTFE bearing rings could be incorrectly sized. Withdraw the rack bar and using sizing tools (in the following order) RH 9114, RH 9113, and RH 9112, progressively reduce the diameter of the PTFE bearings.

- 6.) Torque tighten the three retaining setscrews to between 20 Nm and 25 Nm (2,0 kgf m and 2,5 kgf m; 15 lbf ft and 18 lbf ft) whilst rotating the pinion, to ensure that the pinion pre-load is still correct.
- 7.) Fit the rack bar piston seals to each end of the rack using fitting tool RH 12214.

When fitting the seal to the long end tube, ensure that the seal is not damaged by the threaded bore.

Ensure each seal seats correctly in its location groove.

- 8.) Fit the rack slipper, spring, spring seat, gasket, and coverplate. Torque tighten the setscrews to between 20 Nm and 25 Nm (2,0 kgf m and 2,5 kgf m; 15 lbf ft and 18 lbf ft). Then, fit the centre block to the rack.
- 9.) With the rack in the central position, adjust the rack mesh pre-load as follows.

Slacken the lock-nut and unscrew it at least one full turn. Then, screw in the adjuster screw (against spring pressure) until the pressure needed to rotate the screw begins to increase.

The torque required to rotate the valve should be between 1,13 Nm and 1,69 Nm (0,12 kgf m and 0,17 kgf m; 10 lbf in and 15 lbf in), with the rack in the central position.

If this torque figure is too high, screw out the adjuster screw in small steps (i.e. 20° at a time) until the correct torque figure is obtained, tighten the lock-nut. Then, check the centre block radial free play in the rack tube. This should be no more than 0,76 mm (0.030 in). Readjust if necessary.

- 10. Fit the centring plug RH 12465.
- 11. Fit new convoluted seals as described in, Replacement of convoluted seals, Operations 8 to 16 inclusive. Prior to Operation 13, fit the long oil pipe to the valve housing and torque tighten the retaining nut to between 23 Nm and 27 Nm (2,4 kgf m and 2,7 kgf m; 17 lbf ft and 20 lbf ft).
- 12. Screw the lock-nut onto the threaded end of the rack tube. Then, clean and prime the threads with Loctite primer.
- 13. Fit a new 'O' ring into the groove in the end cap.
- 14. Commence to screw the end cap onto the tube. After 2 or 3 complete turns, apply a ring of Loctite 542 to the next three threads. Then, continue to screw on the end cap until it abuts the end of the tube.

Note:
Ensure when carrying out this operation that the 'O' ring is not displaced.

- 15. Fit the short oil pipe to the valve housing. Unscrew the end cap up to one complete turn, until it lines up with the banjo fitting on the oil pipe.
- 16. Tighten the lock-nut to between 47 Nm and 54 Nm (4,8 kgf m and 5,5 kgf m; 35 lbf ft and 40 lbf ft), using spanner RH 9125.
- 17. Torque tighten the short oil pipe into the valve housing to between 23 Nm and 27 Nm (2,4 kgf m and 2,7 kgf m; 17 lbf ft and 20 lbf ft).

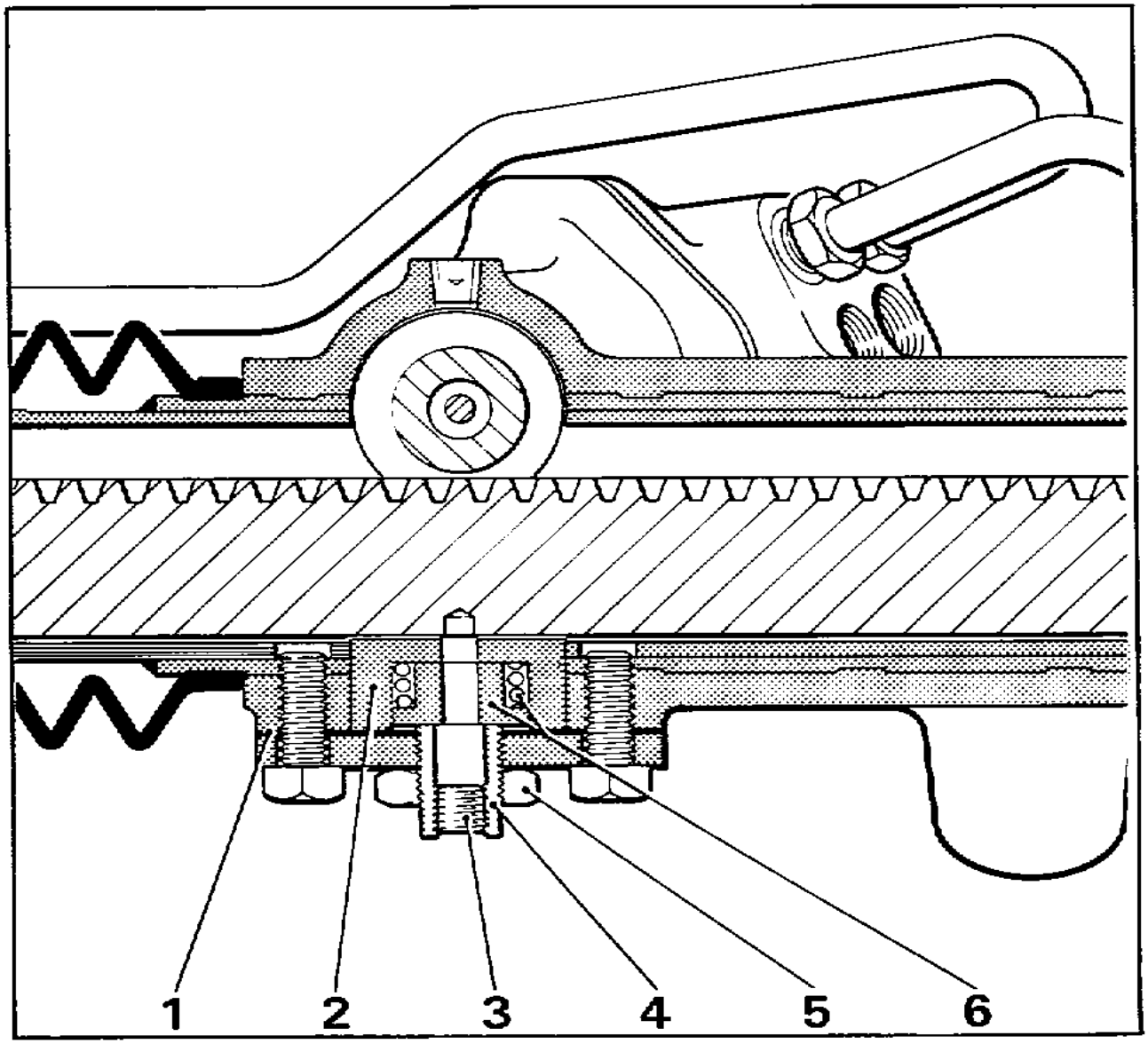
Fit the banjo bolt hydraulic fitting, ensuring new sealing washers are fitted.

Torque tighten the banjo bolts to between 35 Nm and 41 Nm (3,6 kgf m and 4,1 kgf m; 25 lbf ft and 30 lbf ft).

- 18. The unit is now ready for fitting to the car, but do not remove the centring plug at this stage.

Fig N2-2 Steering Rack Mesh Adjustment

Racks fitted with External Adjuster



Steering pump

Introduction

The steering pump incorporates a fluid reservoir which has a dipstick attached to the filler cap.

The pump is powered from the engine crankshaft via twin driving belts. It continually circulates oil to the rack and pinion assembly through a control valve, at a constant flow rate, independent of the pumps operating speed.

A metric designed steering pump is fitted. Therefore, if replacing a pump ensure that the correct type of pump is fitted.

Steering pump — Routine checks and topping-up procedure (see fig. N2-2)

1. Remove the filler cap and check that the fluid level is up to the FULL COLD mark on the dipstick. If necessary add fluid. Use only the approved steering fluids quoted in Chapter D.

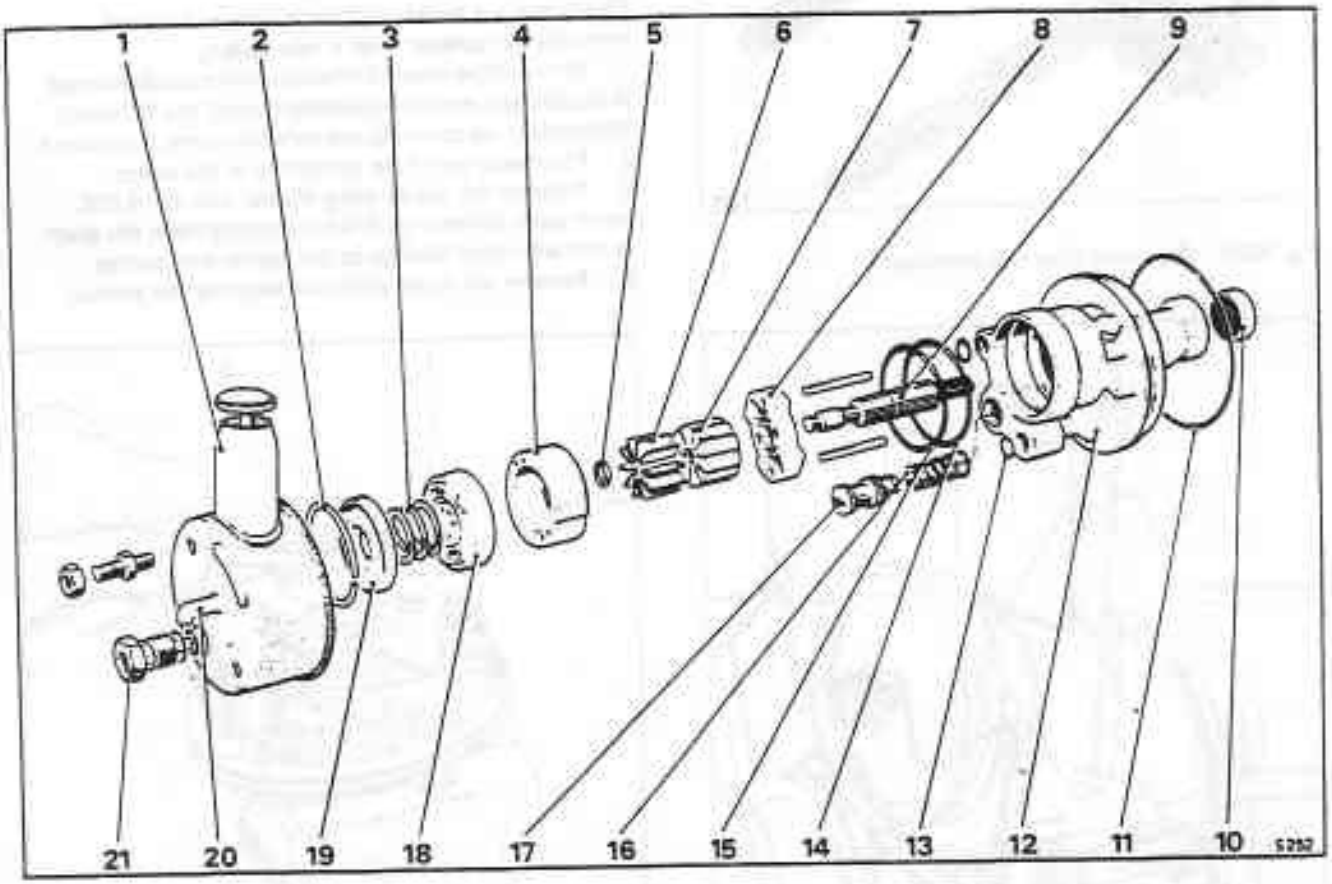


Fig. N2-1 Steering pump — Exploded view

1 Reservoir and filler
2 End plate retaining ring
3 Pressure plate spring
4 Pump ring
5 Snap ring) Supplied in kit form
6 Vanes) as spares
7 Rotor)
8 Thrust plate
9 Drive-shaft
10 Oil seal
11 'O' ring — Reservoir seal
12 Pump housing
13 'O' rings — Reservoir to pump housing seal (2)
14 'O' ring — Pressure plate
15 'O' ring — End plate
16 Return spring — Flow control valve
17 Flow control/pressure relief valve
18 Pressure plate
19 End plate
20 Return pipe
21 Pressure pipe union

2. Start the engine and run until the normal operating temperature is attained, then stop the engine.
3. Remove the filler cap and check the fluid level on the dipstick. If necessary add fluid to raise the level to the FULL HOT mark. Do not overfill.
4. Replace the filler cap.

Belt tension — To check

The steering and refrigeration pumps are driven by a matched pair of belts from the engine pulley.

For belt tensioning figures refer to Chapter E.

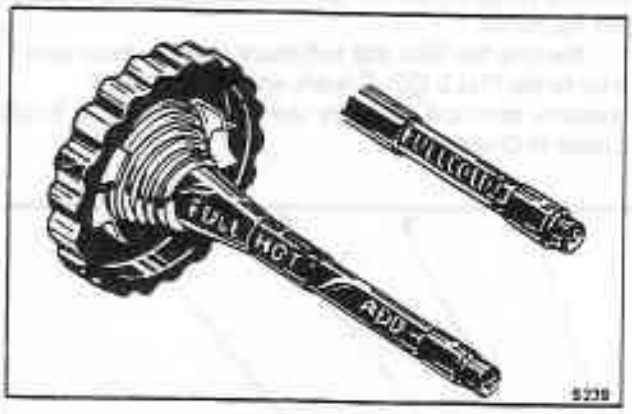


Fig. N2-2 Reservoir filler cap markings

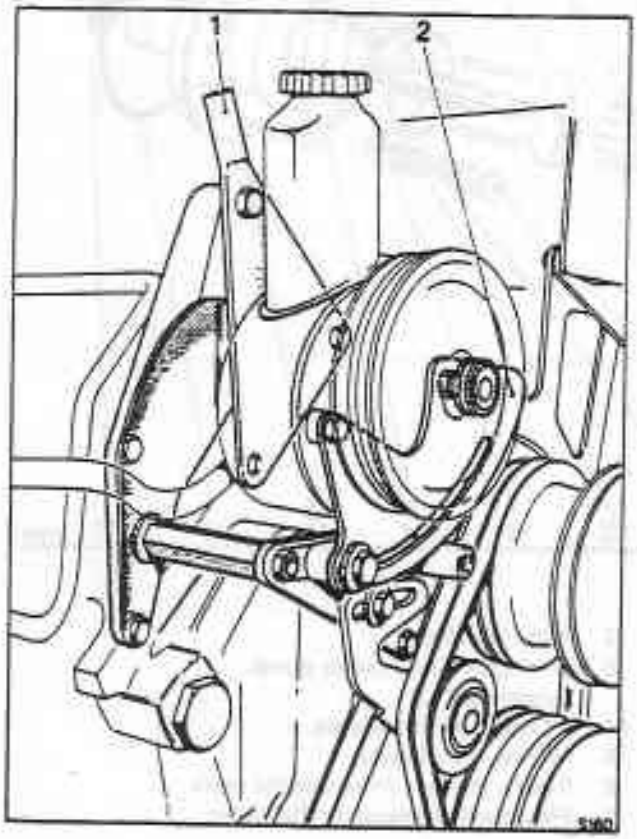


Fig. N2-3 Pump mountings and belt tensioning
1 Rear mounting bracket
2 Pivot plate

Steering pump — To remove

1. Using a syringe, draw off as much fluid as possible from the steering pump reservoir and discard.
2. Slacken the pump belts by loosening the locking screw in the slotted adjustment bracket and the nut on the pivot bracket at the rear of the pump (see fig. N2-3).
3. Unscrew the pressure pipe union.
4. Remove the setscrew and washer from the top hole of the rear plate.
5. Support the pump and remove the locking setscrew of the slotted adjustment bracket.
6. Draw the pump forward to expose the hose connection at the rear of the pump. Disconnect the hose, blanking off the holes in the pipes and the pump body.
7. Remove the pump and secure the hose in a raised position.

Steering pump — To dismantle

This pump is a service exchange item and should normally be replaced with a new pump.

In countries where difficulty may be experienced in obtaining a service replacement unit, the following information on servicing the existing pump is provided.

1. Pour away any fluid remaining in the pump.
2. Remove the pulley using special tool RH 9106. Never use a hammer to drive the pulley from the shaft as this will cause damage to the pulley and pumps.
3. Remove the three setscrews securing the slotted

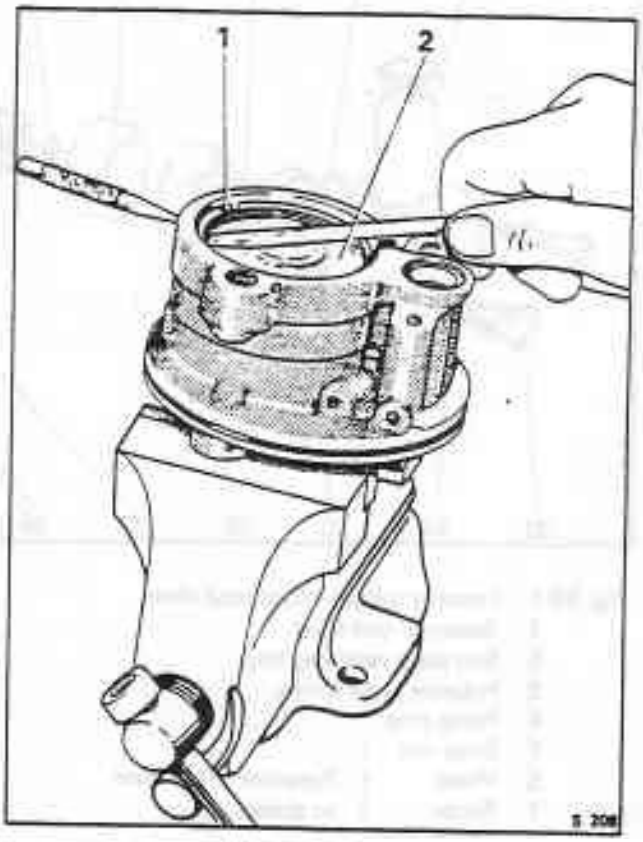


Fig. N2-4 End plate removal
1 Retaining ring
2 End plate

adjustment bracket to the front of the pump. One of the screws is fitted with a distance piece; note the position to facilitate assembly.

4. Using suitable soft-jaw covers lightly clamp the drive-shaft in a vice.

5. Remove the pipe union from the rear of the pump.

Note

Care must be taken not to exert too much pressure on the shaft when removing fittings as this may distort the shaft bearing.

6. Remove the mounting studs from the reservoir housing.

7. Remove the reservoir. Discard the sealing 'O' ring.

8. Remove and discard the 'O' rings sealing the mounting stud and pressure pipe union.

9. Press a centre punch into the small hole situated in the housing rim directly opposite the control valve bore and depress the end plate retaining ring.

10. Using a screwdriver, lever out the retaining ring (see fig. N2-4). Withdraw the centre punch.

11. Remove the end plate.

12. Remove the pump from the vice and invert. The flow control valve and spring can then be removed (see fig. N2-5).

13. Remove the end plate 'O' ring and discard.

14. Place the pump housing onto a bench with the shaft uppermost. Using a soft-headed mallet, tap on the shaft until the pressure plate is freed.

Important

Do not drive the shaft downward into the housing more than is necessary to free the pressure plate.

15. Remove the pressure plate, pump ring, and vanes.

16. Grip the pump shaft in a vice with the open end uppermost.

17. Using a small screwdriver withdraw the snap ring holding the vane rotor and thrust plate.

18. Withdraw the drive-shaft through the pulley end of the housing.

19. Renew the lip-type oil seal.

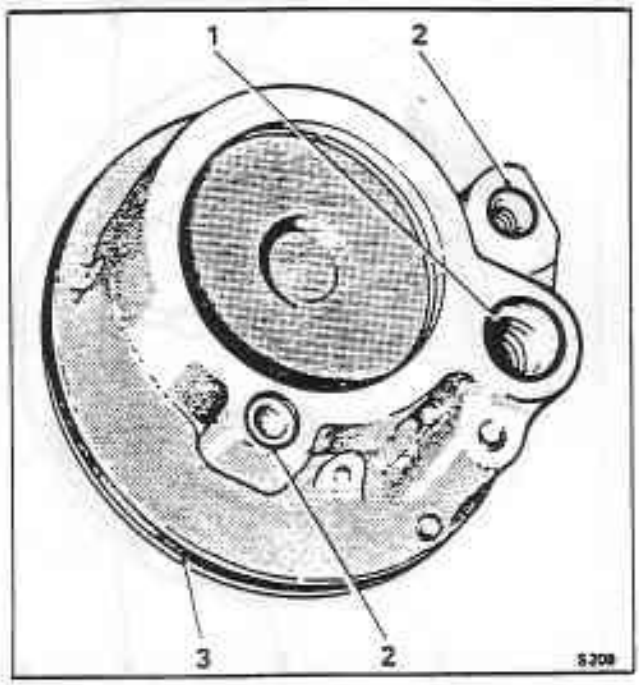


Fig. N2-6 Position of external sealing rings

1 'O' ring – pressure fluid adapter
2 'O' rings – reservoir securing studs (2)
3 'O' ring – reservoir to pump housing

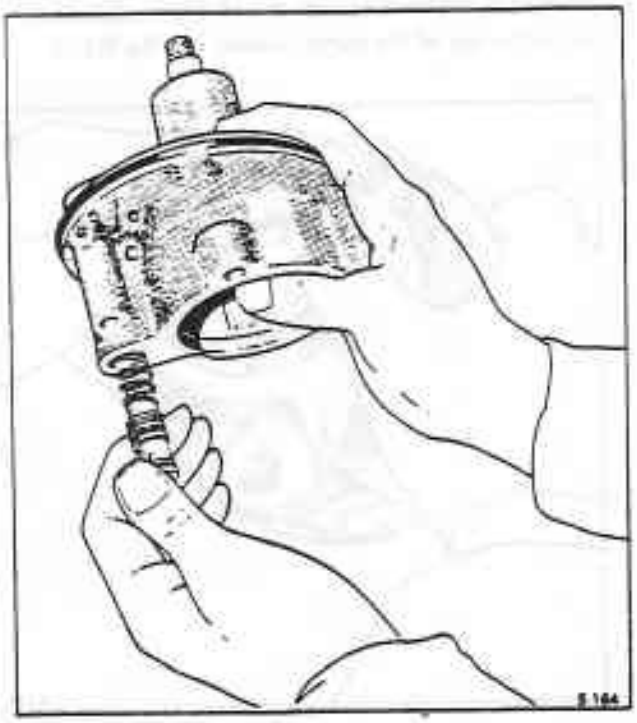


Fig. N2-5 Flow control/relief valve position

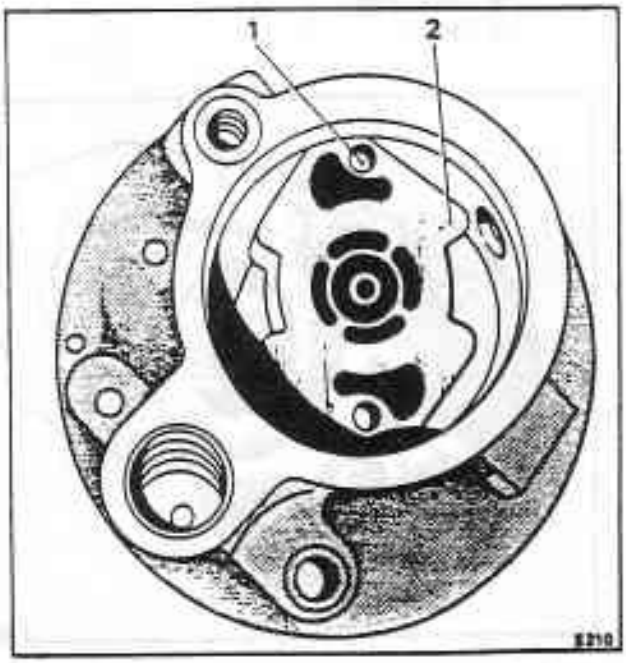


Fig. N2-7 Correct positioning of thrust plate

1 Dowel pin (2)
2 Thrust plate

Steering pump — To inspect

1. Clean all components prior to inspection. Apply air pressure to the pump housing to clean out all the fluid passages.
2. Check the pressure plate, and rotor for scoring.

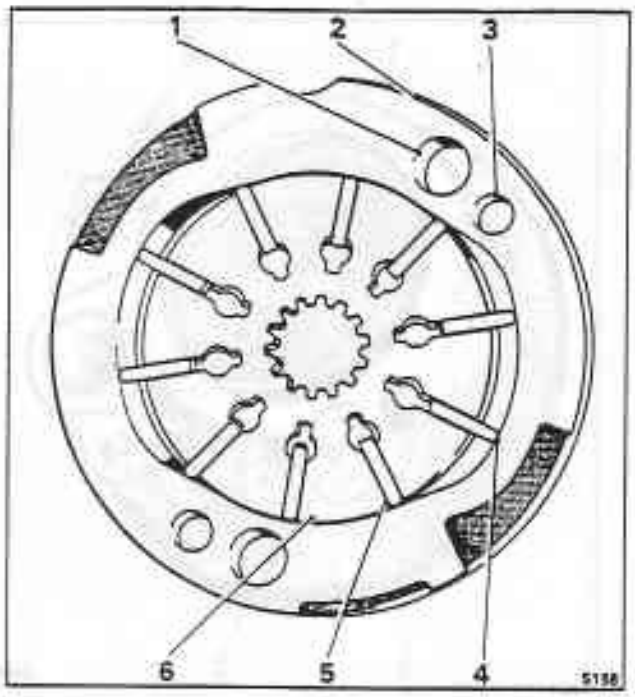


Fig. N2-8 Plan view. Rotor, vanes and pump ring
1 Oil transfer hole (2)
2 Pump ring
3 Dowel hole
4 Radiused edge of vane
5 Vane (10)
6 Rotor

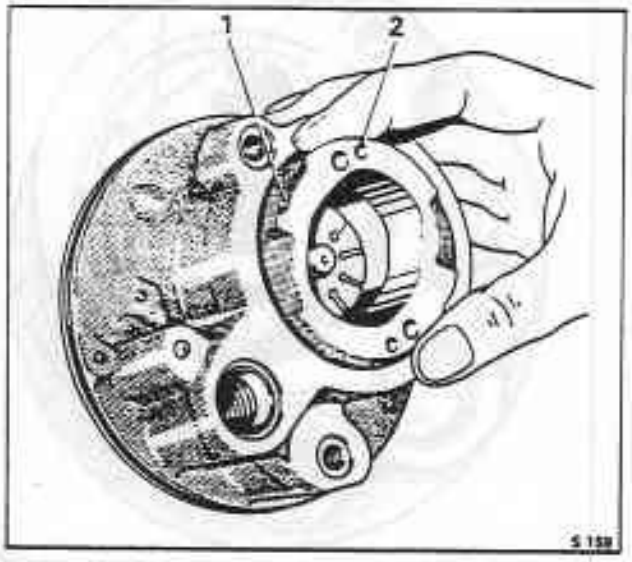


Fig. N2-9 Correct positioning of pump ring
1 Direction of rotation arrow
2 Dowel hole (2)

Light scoring may be removed by lapping with a fine carborundum stone. Heavy scoring will necessitate renewal of the component concerned.

3. Ensure that the pressure plate is flat by checking it against the abuting surface of the pump ring.

Note

A high polish is always present on the inner faces of the thrust and pressure plates as a result of normal wear.

4. Check the contour surface of the pump ring for extreme wear; there may be some scuff marks and uniform wear. This does not increase pump noise and is not detrimental to its function. However, if the wear comprises chatter marks or gouges that can be felt with the finger, renew the pump ring rotor and rotor vanes (these components are supplied as a set).
5. Check the condition of the shaft bush in the pump housing.
6. Check the flow control valve for burrs or dirt which may cause the valve to stick in its bore. Check the flow control valve bore for scouring/gouge marks.
7. Check the small screw on the end of the control valve for tightness. If loose, tighten using extreme care not to damage the machined surfaces.

Steering pump — To assemble

1. Before assembly carefully clean all components with the exception of the 'O' rings, and lip-type oil seal, these should be renewed.
2. Smear the new 'O' rings and shaft seal with petroleum jelly to facilitate correct location and fitting. Lubricate the internal metal components to be assembled with steering fluid.
3. Insert the drive-shaft into the front of the pump housing passing it through the lip-type oil seal.
4. Fit the thrust plate over the dowel pins and into position in the housing with the port face uppermost i.e. to the rear of the pump housing (see fig. N2-7).

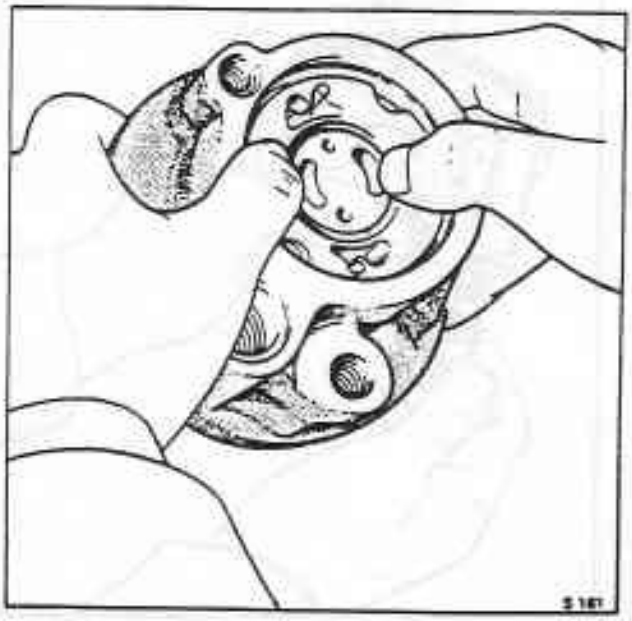


Fig. N2-10 Fitting the pressure plate

5. Fit the rotor to the splines on the shaft with the counterbore towards the thrust plate. The rotor must be a slide fit on the splines.
6. Position the pump ring on the dowel pins with the direction of rotation arrow uppermost.

The direction of rotation is anti-clockwise when viewed from the pump rear as shown in figure N2-9.

7. Fit the drive-shaft snap ring to retain the rotor.
8. Fit the vanes into the rotor slots with the radiused edge facing outwards (see fig. N2-8).
9. Fit the pressure plate 'O' ring. Lubricate the outside diameter of the pressure plate with petroleum jelly to prevent damage to the 'O' ring. Locate the plate onto the dowels, with the port face towards the pump ring.
10. Apply pressure to the plate at its outer edges (see fig. N2-10). Never apply excessive pressure or hammer the centre of the pressure plate as this will cause permanent distortion resulting in pump failure. The pressure plate will compress the seal by approximately 1,59 mm (0.062 in).
11. Position the pressure plate spring, locating the leading coil in the groove on the upper side of the plate.
12. Fit the end plate 'O' ring into the pump housing groove.

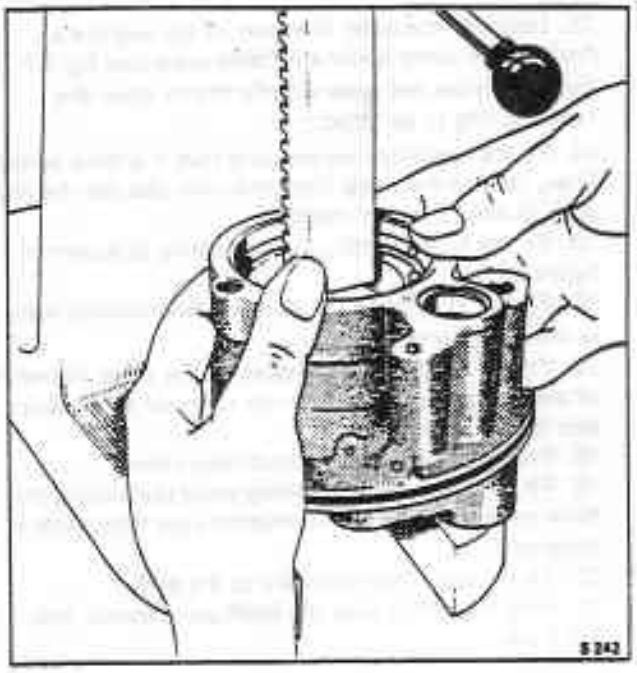


Fig. N2-11 Method of replacing end plate

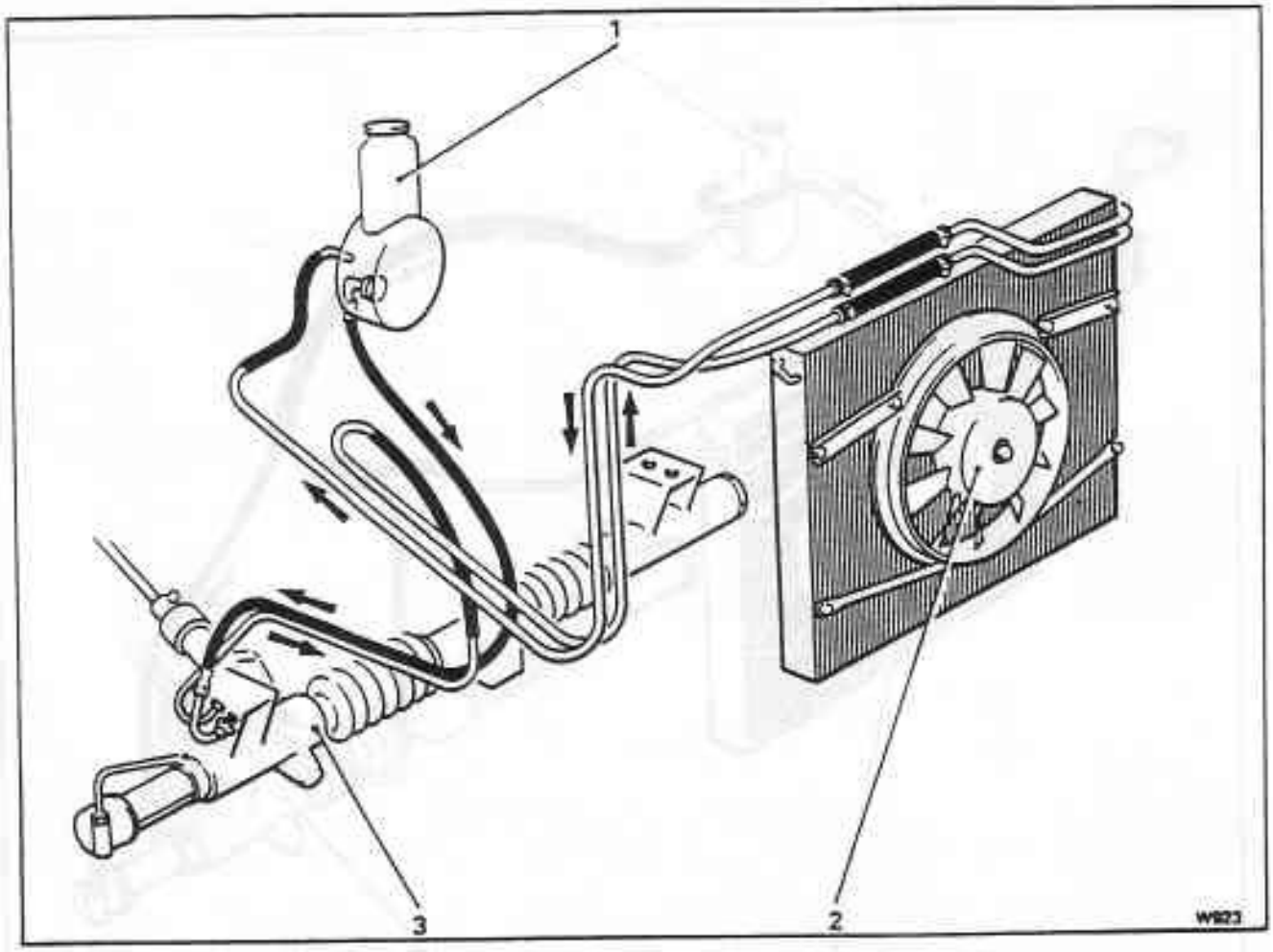


Fig. N2-12 Hydraulic pipe run. Right-hand drive cars
1 Steering pump 2 Booster 3 Steering unit

13. Lubricate the outer diameter of the end plate. Position the pump under a suitable press (see fig. N2-11). Press down the end plate sufficiently to allow the retaining ring to be fitted.
14. Fit the retaining ring ensuring that it is fully seated. Then, remove the pump from the press and tap the end plate to ensure correct sealing.
15. Fit the flow control valve and spring as shown in figure N2-5.
16. Fit the 'O' rings to the stud and flow control valve, as shown in figure N2-6.
17. Fit the 'O' ring to the groove on the outer diameter of the pump housing then fit the reservoir and ensure that it seats correctly.
18. Fit and tighten the two studs and union.
19. Fit the pump front adjusting pivot plate using the three setscrews. Two of the setscrews are fitted with a distance piece.
20. Fit the rear mounting plate to the pump.
21. Press the pulley onto the shaft using special tool RH 9106.

Steering pump – To fit

Fit the steering pump by reversing the removal procedure noting the following.

1. Check that all the steering system hoses and pipes are serviceable. Fit a new 'O' ring to the pressure pipe. Renew any others that are damaged or appear to have deteriorated.
2. Connect the pressure pipe union (discharge) at the rear of the pump. Fit and tighten the hose clip to the rubber tube (reservoir return).
3. Ensure that the bolt distance pieces are fitted.
4. Fit and adjust the driving belts as described in Chapter E.
5. Fit and torque tighten the pipe union nut to the figures quoted in Section N7.

Steering pump – Priming and filling

Important

When refilling an empty system, with the engine running, it is essential that at no time the fluid level in the pump reservoir is allowed to drop sufficiently for air to be drawn into the system. If this does occur, irrepairable damage to the pump will result. Ensure that only an approved fluid is used (see Chapter D).

1. Move the gear range selector lever to the Park position and apply the parking brake.

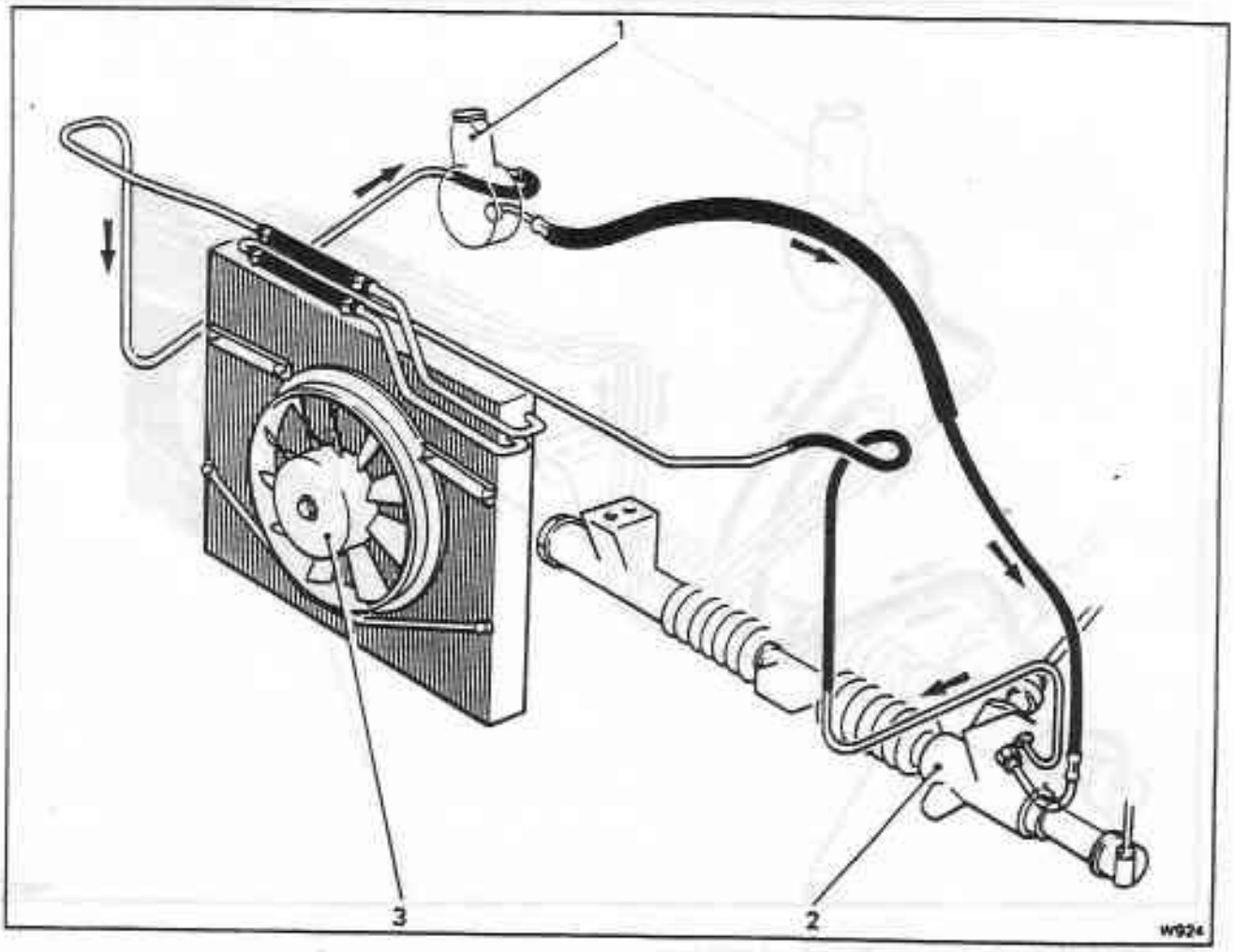


Fig. N2-13 Hydraulic pipe run. Left-hand drive cars

1 Steering pump 2 Steering unit 3 Booster

2. Raise the front road wheels off the ground, securely chock the rear wheels.
3. Remove the white/black supply cable to the ignition coil to prevent the engine from firing when turned over using the starter.
4. Remove the reservoir filler cap. Add sufficient clean steering fluid to approximately 25,40 mm (1 in) from the neck of the reservoir.
5. Turn the engine, using the starter motor for approximately 30 seconds and continue to top-up the reservoir.

   The fluid level drops very quickly. Therefore, it is essential to ensure that it does not drop sufficiently for air to be drawn into the system. Continue this operation until the fluid level remains constant.
6. Replace the white/black supply cable to the ignition coil, start the engine ensuring that it is running at idle speed.
7. Gently turn the steering wheel from side to side, gradually lengthening the stroke, but do not hold against the lock stop.
8. Allow the fluid to settle then top-up the reservoir to the FULL HOT mark on the dipstick.
9. Steadily turn the steering wheel twice from 'lock to lock' to expel any small amounts of air that may remain in the system.
10. Check the fluid level again and top-up if necessary.
11. Switch off the engine and lower the road wheels to the ground.
12. Switch on the engine.
    Check the fluid level again and top-up if necessary.
    Switch off the engine.

Steering wheel and gear range selector unit

Steering wheel — To remove (refer to fig. N3-1)

1. Disconnect the battery.
2. Fit a protective cover to the steering wheel.
3. Feed a 305 mm (12 in) length of strong thin string in a loop into the gap between the horn button and plastic steering wheel surround.
4. Grip the two free ends of the string and with a sharp pull, withdraw the horn button assembly. Retain the coil spring retaining clip.
5. Unscrew and remove the support plate taking care to disconnect the Lucar connection attached to the underside of the plate.
6. Remove the steering wheel centre nut and washer, using a hexagon socket spanner (see fig. N3-2).

Important

Feed the horn wire and connector into the socket body to avoid pinching of the wire.

7. Scribe a mark across the steering wheel lower boss and inner column rim, to ascertain the correct relationship of the wheel to the column splines.
8. Grip the steering wheel spokes and with a straight pull remove the wheel, taking care not to damage the splines.

The wheel must be removed as a unit, part dismantling is not recommended.

9. Inspect the support plate, contact rivet, Lucar blade, bearing pin, and the return spring of the horn assembly. Replace any parts if necessary.

Steering wheel — To fit

1. Fit a protective cover to the steering wheel.
2. Feed the horn wire through the steering wheel centre hub (see fig. N3-2). Align the marks on the lower boss and inner column rim of the steering wheel and fit the wheel firmly onto the splines.
3. Fit the washer and centre nut to secure the steering wheel. Using a hexagon socket spanner (see fig. N3-2), torque tighten in accordance with the figure quoted in Section N7.

If any adjustment of the straight-ahead position is necessary, reference should be made to Section N4 Steering link — To remove and fit.

4. Check that the self-cancelling stalk contacts the flasher switch arms. Also ensure that the end of the stalk does not foul the gear selector lever when this is in the L position.

If a foul does exist, the self-cancelling stalk must be filed down to clear the gear selector lever.

5. After filing, the exposed metal must then be painted with dull nickel paint.
6. Fit the horn wire connector onto the Lucar connection. Secure the support plate to the centre hub.

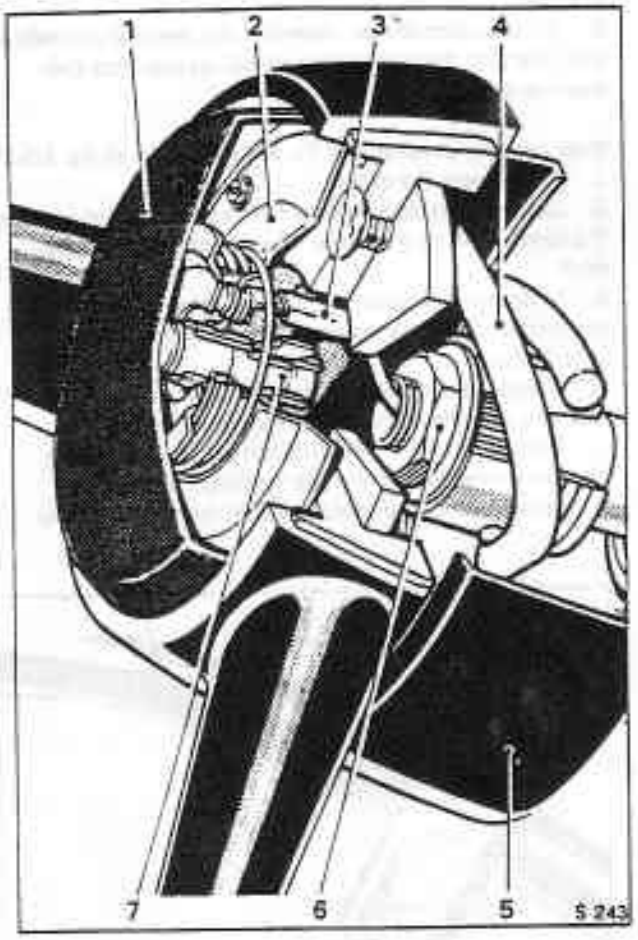


Fig. N3-1 Steering wheel components

1 Horn button
2 Support plate
3 Connector
4 Energy absorbing device
5 Metal shroud
6 Column nut
7 Bearing pin

7. Lightly lubricate the bearing pin of the horn push button assembly with Rocol MTS 1000 grease or any suitable equivalent. Ensure that the spring retaining clip securely holds the bearing pin in place by 'gripping' the necked portion of the bearing pin.

Direction indicator/headlamp flasher lever and windscreen/headlamps washer switch — To remove and fit (refer to fig. N3-3)

1. Disconnect the battery.

2. Unscrew the two Phillips headed screws that secure the lower cowl to the upper cowl. Remove the upper cowl.
3. Unscrew and remove the two clamps holding the lower cowl. Remove the cowl. Secure the clamps back onto the cowl.
4. Disconnect at the 4-way connection.
5. Unscrew the two Phillips headed screws and remove the unit.
6. Fit the assembly by reversing the removal procedure ensuring that the positioning dowel locates into the steering column.

Gear range selector unit — To remove (refer to fig. N3-3)

1. Disconnect the battery.
2. Unscrew the two Phillips headed screws that secures the lower cowl to the upper cowl. Remove the upper cowl.
3. Unscrew and remove the two clamps holding the lower cowl. Remove the cowl. Secure the clamps back onto the cowl.
4. Remove the gear range selector loom from the main loom by disconnecting at the plug connections.

   Disconnect both the horn (screw cap) and earth (Lucar) connections from the steering column.
5. Unscrew the two setscrews that secure the clamp to the quadrant, remove the clamp and quadrant from the column. Collect the setscrews, washers, and clamp. Fasten the clamp back onto the quadrant base.

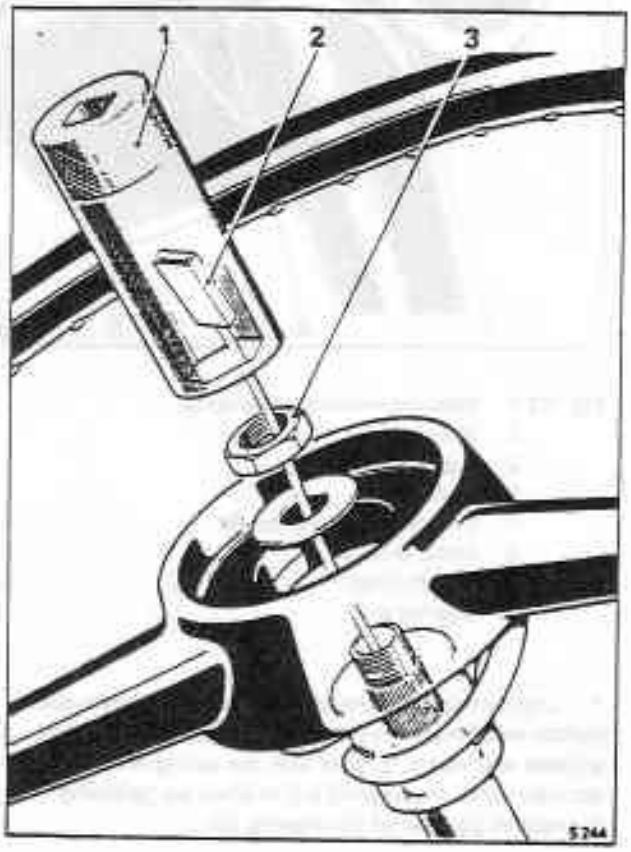


Fig. N3-2 Use of a deep socket on the steering wheel nut

1 Deep body hexagon socket
2 Connector
3 Steering wheel nut

Gear range selector unit — To dismantle

1. Remove the screws securing the micro-switch mounting plate to the front face of the quadrant assembly. Remove the micro-switch from the mounting plate.
2. Move the selector lever to the Intermediate position. Remove the Phillips headed screw now exposed, together with any packing washers. Remove the scale pointer.

   Replace the Phillips headed screw together with any packing washers.

   Care must be taken during this operation not to scratch the pointer or the indicator scale.
3. Disconnect the gear range indicator lamp of the Lucar connection. Remove the filter from the indicator lamp.
4. Remove the two Phillips headed screws and shake proof washers securing the indicator support bracket, and remove the assembly.
5. Remove the two hexagon headed setscrews that secure the gate assembly to the underside of the base.
6. Remove the circlip, clevis pin, and spring securing the selector lever to the quadrant, then remove the lever with the gate assembly attached.
7. Remove the gear change loom by unscrewing the three screws that secure the insulating plate to the quadrant base plate.
8. Remove the two Phillips headed screws securing the phosphor-bronze contact to the quadrant baseplate. Retain the two insulating dowels and the two insulating strips.
9. Disconnect the rocker arm by releasing the tension springs at the quadrant end of the assembly. Remove the circlips and withdraw the clevis pins from each end. Collect and retain the associated components.
10. Unscrew the nut from the quadrant spindle. Remove the quadrant plate from the base and retain together with the washer.

Gear range selector unit — To assemble

1. Fit the quadrant assembly onto the base and 'nip' the nut and washer onto the base spindle. Ensure that the quadrant will rotate.
2. Remove the quadrant and lubricate the spindle with Rocol MTS 1000 grease or any suitable equivalent. Replace the quadrant and fully tighten the nut. Do not overtighten the nut, as the bearing boss tends to spread slightly resulting in a tight bearing.
3. Fit the rocker arm assembly, ensuring that the roller lines up correctly with the detent in the quadrant (see fig. N3-4).
4. Fit the two small tension springs, one either side of the quadrant, to the spindle (see fig. N3-4). Assembly is easier if the quadrant is rotated anti-clockwise clear of the rocker arm so that the springs are not under tension.

Note

Do not fit the retaining clip to the rocker arm at this stage.

5. Move the quadrant to a mid-way position. Fit the phosphor-bronze contacts between the two insulating strips and locate into position using the two insulating dowels. Secure the assembly with the two setscrews and washers.

Important

Extreme caution must be taken with the moving contact, so that it does not become damaged.

6. Before fitting the selector lever assembly, the following checks must be carried out.

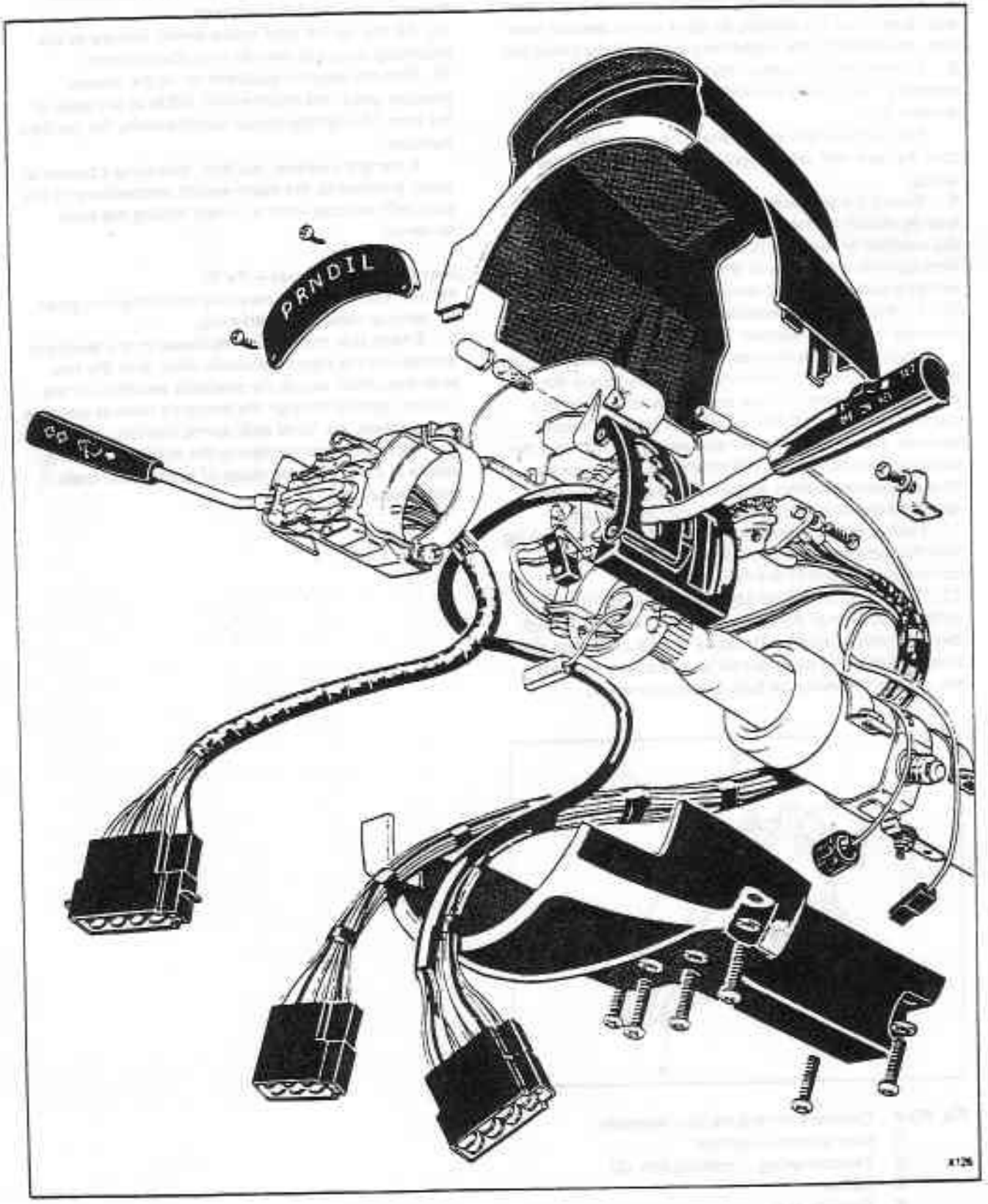


Fig. N3-3 Gear range selector, direction indicator, wash/wipe units, upper and lower cowlings

a) Check that the clevis pin will slide through the fork end on the lever and the holes in the mounting arms on the quadrant.
b) Check that the fork end will also slide between the arms of the quadrant.
7. Lightly smear Rocol MTS 1000 grease or any suitable equivalent onto the bearing surfaces of the selector lever fork, the inside of the supporting arms and the clevis pin.
8. Loosely fit the selector lever through the gate assembly, then locate the fork and spring between the support arms.

Fit the clevis pin and secure with the circlip. Check that the lever will return easily under the load of the spring.
9. Secure the gate assembly to the underside of the base by means of the two setscrews. Check that when the position of the lever is controlled by the detents, it lines up with the profile of the gate liner and that the extreme positions of the lever are limited by the gate.
10. Fit the gear range selector loom/insulating plate by screwing it to the underside of the quadrant assembly.

When the unit is secured, check that the inside leg of the moving contact is positioned centrally across the supply contact and that the pressure is correct when a piece of 0.025 mm (0.001 in) carbon paper is 'nipped' between the contacts. At the extremities of its travel the hemispherical head must still touch the supply contact. This adjustment is most important, to ensure accurate spring weight during travel of the moving contact.
11. Each selection should then be made in turn, checking that the outside leg on the moving contact lines up correctly with each of the feed contacts.
12. Press the plastic filter cap over the bulb. Fit the indicator scale over the support bracket and secure with two self-tapping screws. The scale should drop onto the bracket and its lip must not be forced down. Connect the wire to the indicator bulb Lucar connector.

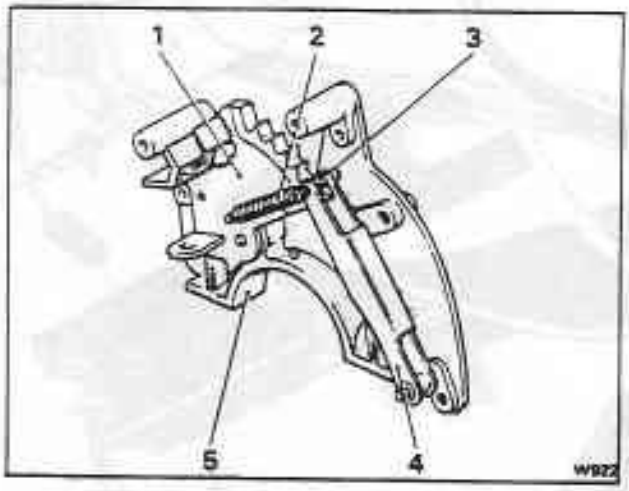


Fig. N3-4 Quadrant to rocking arm assembly
1 Gear selector quadrant
2 Tension spring – rocking arm (2)
3 Roller
4 Rocking arm
5 Base casting

13. Feed the pointer under the indicator scale; then with Intermediate range selected, secure in place with a single screw and any original washers. Care must be taken not to mark either the pointer or indicator scale.
14. Check to ensure that the pointer is positioned correctly over the full gear range.
15. Fit the neutral start micro-switch loosely to the mounting plate and then fit it to the quadrant.
16. With the selector quadrant set in the Neutral position adjust the micro-switch roller to the peak of the cam. This setting should automatically fix the Park position.

A battery powered test box, operating a buzzer or lamp, attached to the micro-switch connections in the plug, will indicate when a correct setting has been achieved.

Gear range selector unit – To fit

Fit the selector unit by reversing the procedure given for removal noting the following.
1. Ensure that the positioning dowel in the quadrant locates into the steering column. Also, that the two setscrews which secure the quadrant assembly to the column, passing through the clamping bracket and into the quadrant, are fitted with spring washers.
2. Take care when tightening the cowling retaining screws as the unit, being made of plastic, will crack if overstressed.

Steering column

Steering column — To remove (see fig. N4-1)

1. Remove the lower trim panel as described in Chapter S.
2. Remove the steering wheel, the cowling, gear range selector lever, and the direction indicator/headlamp flasher lever as described in Section N3.
3. To allow access to the two column fixings remove the speedometer from the facia. Carefully remove the connections and bulb holders noting their positions to facilitate assembly.
4. Slacken the two capscrews from the steering column upper mounting. Hold the tapping plate, washers, etc., through the speedometer aperture.
5. Remove the capscrews and extract the distance pieces and washers from behind the panel.
6. Carefully unscrew the two bolts which secure the steering column link to the steering column unit linkage (see fig. N4-2). Do not use any impact force near to the steering unit, irreparable damage will result.
7. Remove the large circlip and washer from the engine compartment side of the toeboard (see fig. N4-3).
8. Unscrew and remove the horn screwed cap (purple/black wire) and unclip the Lucar connector (black wire) attached to the steering column.
9. Before carrying out Operations 10 to 12 inclusive note that care must be taken when manoeuvring the column to avoid damage to the facia, trim, and upholstery.
10. From inside the car, support the column and unscrew the single capscrew from the lower mounting. Retain the capscrew and washers, but discard the nut.
11. Withdraw the steering column from the toeboard rubber grommet.

    Remove and discard the rubber grommet.
12. Inspect for worn and damaged components.

Steering column — To fit (see figs. N4-3 and N4-4)

Reverse the procedure for removal noting the following.

1. Before fitting the column into the toeboard a new rubber grommet and soft rubber washer should be fitted.
2. Ensure that when replacing the two upper capscrews the spigot rubbers and inner metal tube are not disturbed. Torque tighten in accordance with the figures quoted in Section N7.
3. Locate a new nut to the column lower mounting. Finger tighten the capscrew until the washer just binds against the column locating capsule.
4. At this stage check if the original slotted washer will make up the gap between the capsule and support bracket.
5. If a larger gap is apparent, measure this with feeler gauges and substitute the number of washers as necessary, using the following example.

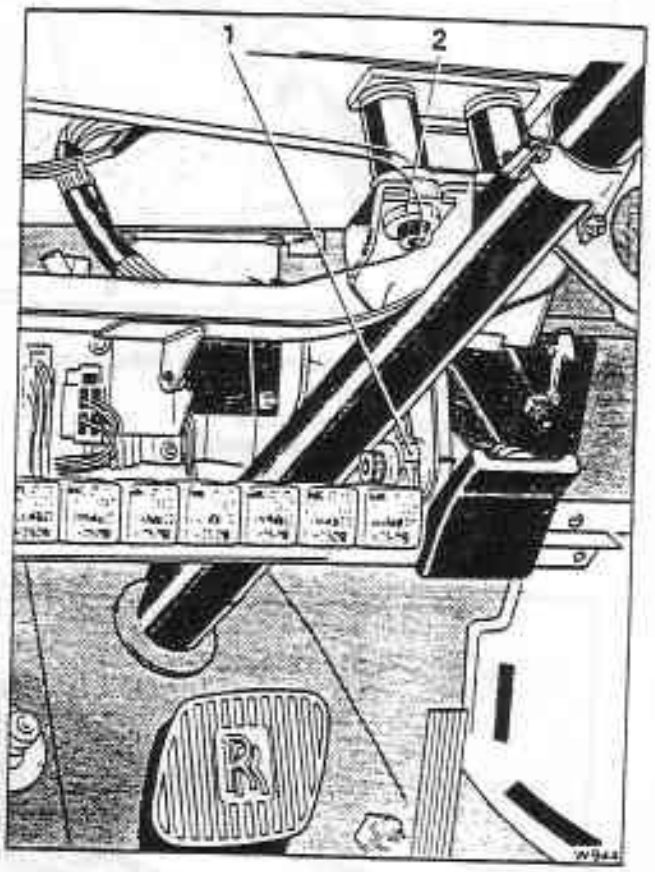


Fig. N4-1 Steering column in position

1 Lower mounting point
2 Upper mounting point

With a measured gap of between zero and 0,35 mm (0.014 in) only one adjusting washer will be necessary. With a larger gap necessitating more than one washer, the following calculation can be applied.

Measured gap divided by 0,35 mm (0.014 in) = Number of washers required to complete the assembly

Slotted adjusting washers are manufactured from 22 swg 0,70 mm (0.028 in) material, the size designed to compensate for the 0,70 mm (0.028 in) compression of the spigot rubbers.

Steering link — To remove and dismantle (see figs. N4-2 and N4-5)

The lower link unit comprises of an upper safety stalk, a bonded coupling, a shaft with a universal joint at the upper end and splined at the lower end. The shaft connects with a lower universal joint which in turn is secured to the spool valve of the steering unit.

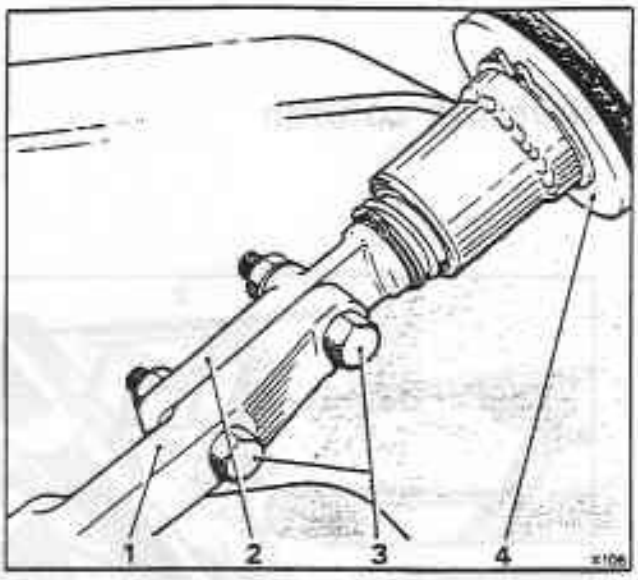


Fig. N4-2 Steering column link to linkage arm
1 Linkage arm
2 Steering column link
3 Securing nuts and bolts
4 Washer - toeboard

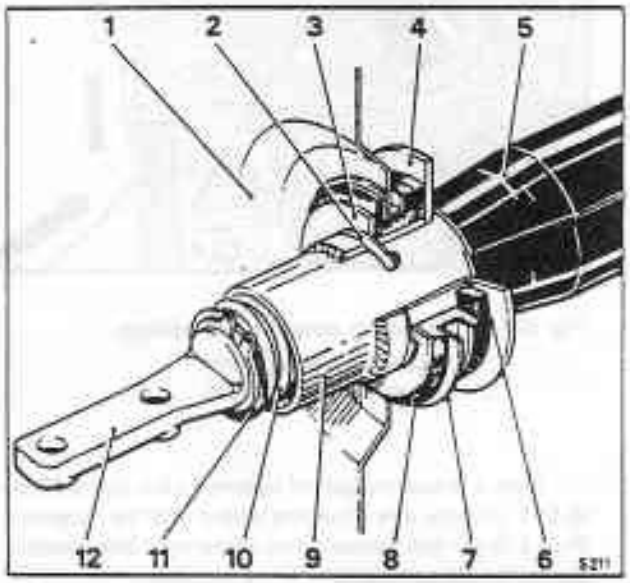


Fig. N4-3 Toeboard fixing
1 Toeboard bulkhead
2 Circlip
3 Washer
4 Flange
5 Plastic cover
6 Soft rubber washer
7 Bulkhead reinforcement
8 Bulkhead grommet
9 Main tube
10 Spring
11 Washer and circlip
12 Linkage arm

Warning
Do not use impact force to remove any joint on or near to the steering unit. Irreparable damage to the unit will result.

1. Disconnect the battery.
2. Chock the rear wheels.
3. Unscrew and remove the two bolts securing the steering unit linkage to the steering column linkage arm. Retain the bolts, nuts and washers.
4. Slacken the pinch bolt securing the universal joint onto the spool valve.
5. Carefully remove the steering linkage from off the spool valve splines.
6. Remove the heatshields from the linkage, and inspect both the universal and bonded couplings.
7. Unscrew and remove the two special capscrews from the splined shafts coupling flange. Collect and retain the capscrews, hollow dowels, nuts, and washers.
   Remove the shaft.
8. Remove the safety stalk from the bonded coupling. Unscrew and remove the two setscrews to release the link from the coupling. Collect and retain the setscrews, nuts, and washers.
9. Slacken the pinch bolt which secures the lower universal coupling to the input shaft. Remove the coupling from the shaft.
10. Inspect the safety stalk, splines, screw threads, bonded coupling, and universal couplings for wear. Replace any damaged components.

Steering link – To assemble and fit (see figs. N4-2 and N4-5)

1. Position and secure the link to the bonded coupling.
2. Fit the safety stalk to the bonded coupling. Line up the holes of the universal coupling flange with the safety stalk and coupling. Fit the two hollow dowels, and secure the assembly using the special capscrews with nuts and washers. Ensure that the washers are fitted between the bonded coupling and the safety stalk baseplate. Torque tighten in accordance with the figures quoted in Section N7.
3. Fit the input shaft to the lower universal coupling, ensuring that the flat on the splined end is in correct relationship to the pinch bolt.
   Fit the pinch bolt, nut, and washer. Finger tighten the pinch bolt.
4. Fit both heatshields (see fig. N4-5).
Torque tighten in accordance with the figures quoted in Section N7.
5. Ensure that the road wheels are in the straight-ahead position. Using the centring plug RH 9119, ensure that the setting mark drilled in the steering rack is positioned centrally to the blanking plug hole.
6. Replace the blanking plug.
7. Ensure that the steering column extension lower link joint face is facing upwards.
8. Fit the steering wheel onto the splines, giving the nearest straight-ahead position. Adjust to give the corrected position by turning the wheel slightly if necessary.
9. Align the column link face to the linkage face. Fit

the splined coupling onto the pinion box spline. Fit the pinch bolt, washers and castellated nut, lightly tighten the nut.

10. Ensure that the two joint faces of the connecting links are parallel to each other. Any further adjustment necessary must be made using the procedure outlined in Operations 8 and 9.

11. Torque tighten the two lower pinch bolts and castellated nuts, utilizing the torque allowance to allow the fitting and securing of new split pins.

12. Fit the two fitted bolts into the underside of the steering column lower extension.

Fit a nut to the bolt adjacent to the bonded coupling, and a nut and washer to the bolt adjacent to

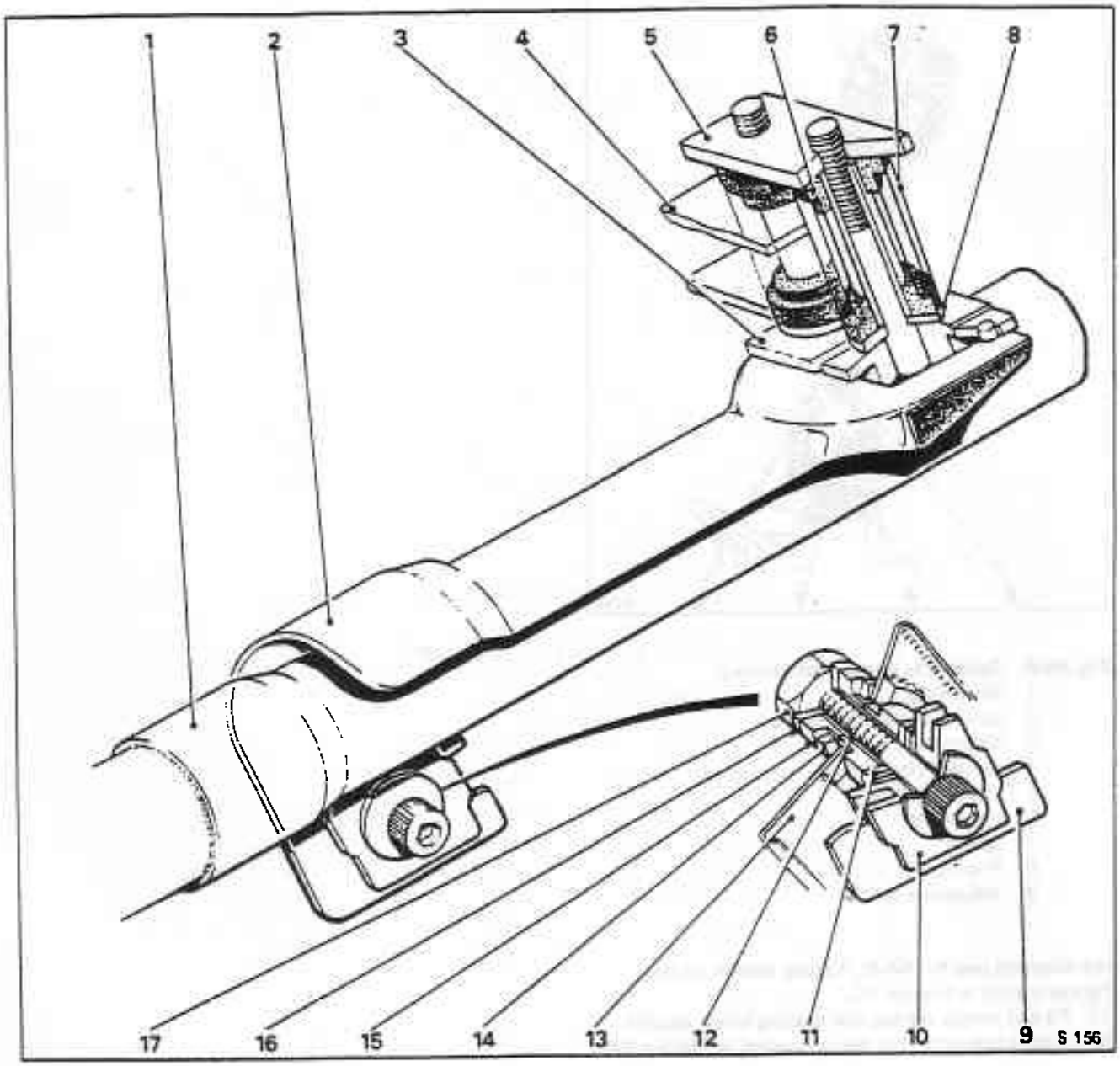


Fig. N4-4 Column mounting points

1 Outer tube
2 Column mounting attachment
3 Captive alloy washers (2)
4 Bulkhead support
5 Tapped plate
6 Flanged bush (Rubber)
7 Distance tube
8 Plain washer
9 Lower flange
10 Captive alloy washer
11 Shim washers (as required)
12 Distance tube
13 Bulkhead support and welded bush
14 Plain washer
15 Flanged bush (Rubber)
16 Plain washer
17 Nut

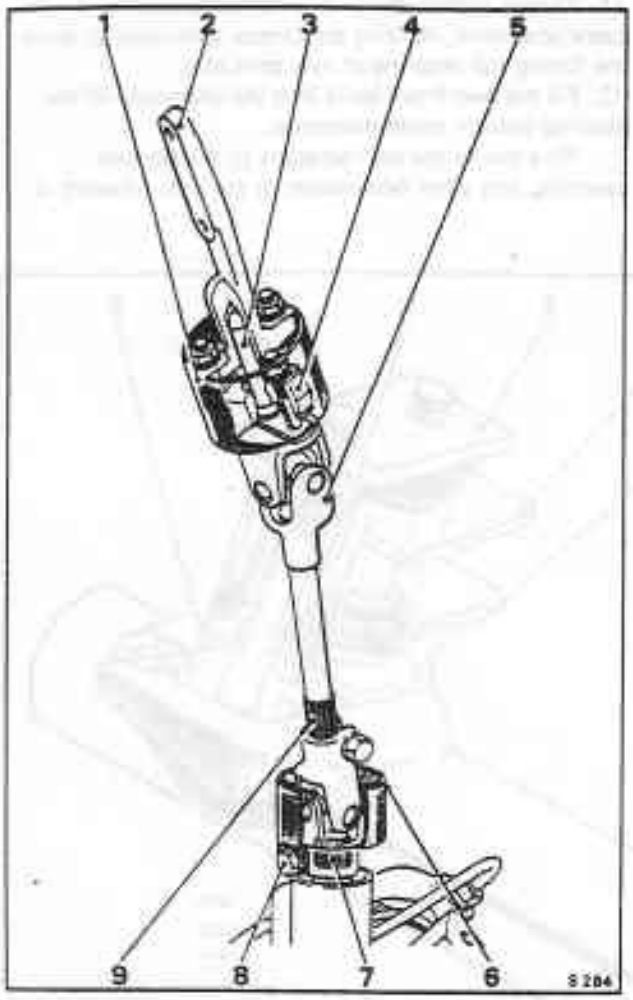


Fig. N4-5 Column to steering unit linkage

1 Heatshield
2 Link to column connector
3 Safety stalk
4 Bonded coupling
5 Universal joint
6 Heatshield
7 Spline
8 Pinch bolt
9 Adjustable spline

the toeboard (see fig. N4-2). Torque tighten to the figures quoted in Section N7.

13. Fit and torque tighten the steering wheel column nut, torque tighten to the figures quoted in Section N7.

Steering linkage

Introduction

Two types of track rod may be fitted. One type can be identified by its hexagon headed retaining plug as shown in figures N5-1 and N5-3.

The other type consists of a one-piece pre-packed assembly as shown in figure N5-2.

Whenever it is necessary to renew a track rod, ensure that the replacement is of the same type as the one removed.

It is possible with the track rod having the hexagon headed retaining plug, (see figs. N5-1 and N5-3) to dismantle the assembly and renew the necessary parts.

Important

The two types of track rod are not interchangeable.

If a track rod(s), inner ball joint bracket, and/or either side steering levers of the type having the hexagon headed retaining plug need replacing and replacement stocks are exhausted, the one-piece type can be fitted. However, if any one of the above mentioned components are to be replaced with one of the later components, all associated parts must also be changed i.e. track rods, inner ball joint bracket, and side steering levers.

Adjustable track rod units - To renew

1. Drive the car onto a ramp. Chock the rear road wheels. Raise the ramp to a suitable working height.
2. Disconnect the battery.
3. Remove the split pin and castellated nut from the inner track rod end and outer track rod end assemblies.
4. On cars fitted with replacement ball-pins (identified by the fitment of a hexagon headed retaining plug). Turn the steering to full lock, release the inner ball-pin from off its taper using the special tool RH 8100.
Turn the steering to the opposite full lock. Remove the remaining inner ball-pin from off its taper using the special tool RH 8100. Withdraw the ball-pin(s) from the inner ball joint bracket.
5. Support the track rod assembly. Using the special tool RH 8080, release the outer ball-pin(s) from off its taper and then withdraw the ball-pin from the track rod end(s).
6. On cars fitted with the one-piece track rods. Turn the steering to full lock, release the inner ball-pin from off its taper using the special tool RH 9710. Turn the steering to the opposite full lock and remove the

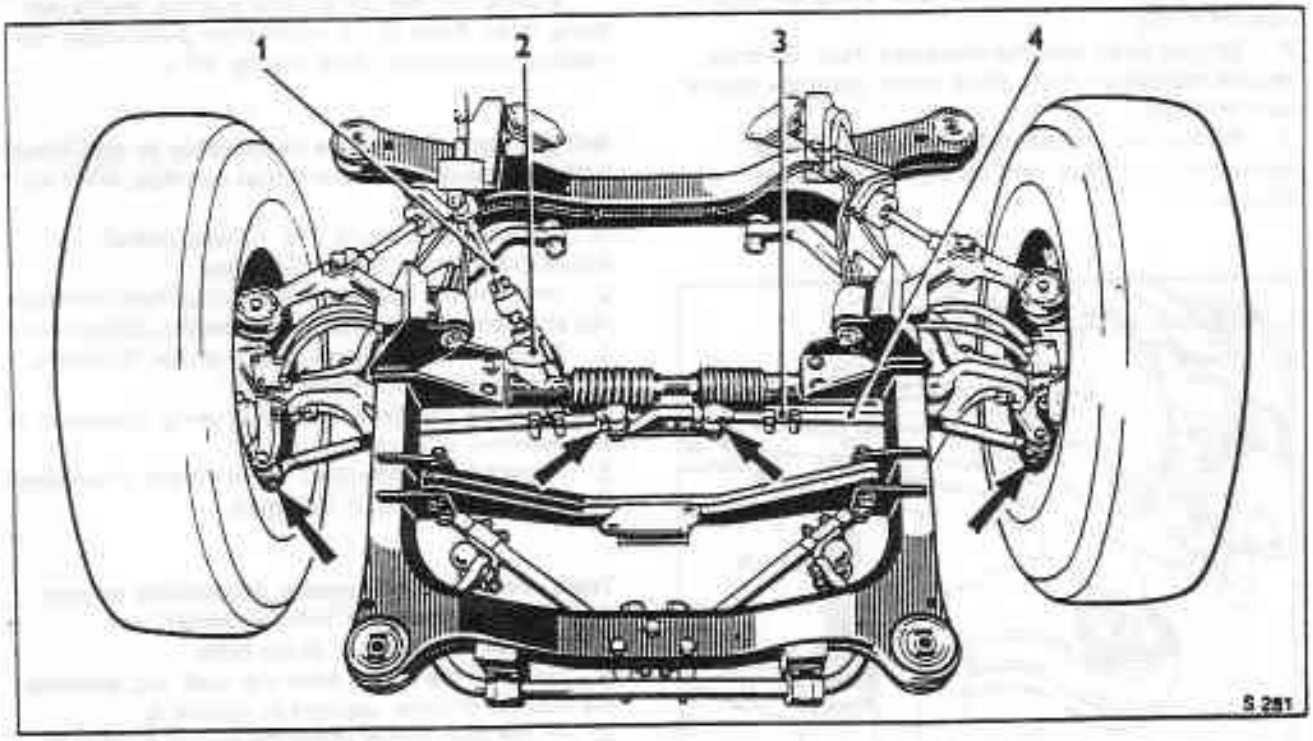


Fig. N5-1 Steering linkage (Applicable to cars fitted with replaceable ball-pin units)

1 Lower link unit
2 Spool valve and pinion box
3 Track rod adjuster
4 Outer track rod
➡ Grease points

remaining inner ball-pin from off its taper using the special tool RH 9710. Withdraw the ball-pin(s) from the inner ball joint bracket.
7. Support the track rod assembly. Using the special tool RH 9710, release the outer ball-pin(s) from off its taper. Withdraw the ball-pin from the track rod end(s).
8. Remove the track rods from beneath the car.
9. Inspect the track rod assembly and associated components, (i.e. inner ball joint bracket and both side steering levers) for any malfunction.
10. Replace any damaged parts after thoroughly reading the information under the heading Introduction.
11. Reverse the procedure for assembly. Torque tighten in accordance with the figures quoted in Section N7.

Inner ball joint bracket - To renew

1. Drive the car onto a ramp. Chock the rear road wheels. Raise the ramp to a suitable working height.
2. Disconnect the battery.
3. Straighten the tab-washer tangs. Unscrew and remove the bolts holding the inner ball joint bracket to the steering unit central position. When removing the bolts care must be taken not to disturb the steering unit centre block oil seal, (see fig. N1-10).
4. Support the track rods either side of the inner ball joint bracket. Remove the split pin and castellated nut from the inner ball-pin and assemblies.
5. On cars fitted with replaceable ball-pins, (identified by the fitment of a hexagon headed retaining plug), release the ball-pin from off its taper using the special tool RH 8100.
6. On cars fitted with the one-piece track rod ends, release the ball-pin from off its taper, using the special tool RH 9710.
7. Reverse the procedure for assembly. Torque tighten in accordance with the figures quoted in Section N7.

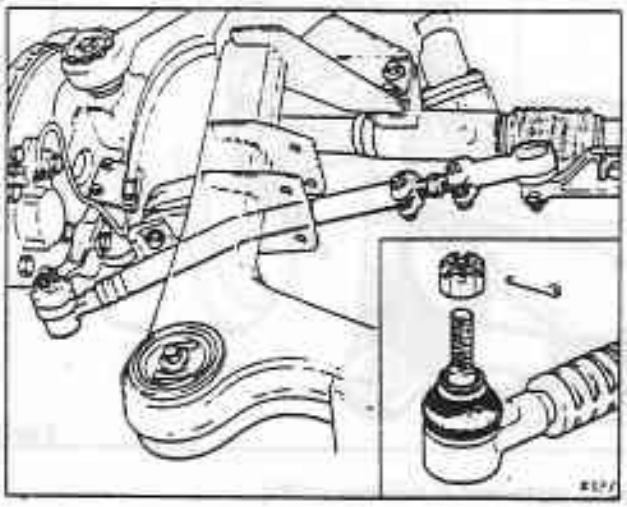


Fig. N5-2 Steering linkage (Applicable to cars fitted with the one-piece track rods)

Important

Ensure that the correct inner ball joint bracket is being fitted. Refer to the information given under the heading Introduction. Also see fig. N5-4.

Side steering levers - To renew

1. Drive the car onto a ramp. Chock the rear road wheels. Raise the ramp to a suitable working height.
2. Disconnect the battery.
3. With care remove the hydraulic pipe mounting plate from off the side steering lever(s) and ease away from the working area.
4. Remove th split pin and castellated nut from the outer track rod assemblies.
5. Support the track rod(s).
6. On cars fitted with replaceable ball-pins (identified by the fitment of a hexagon headed retaining plug), release the ball-pin from off its taper using the special tool RH 8080. Withdraw the ball-pin from the side steering lever.
7. On cars fitted with the one-piece track rod ends, release the ball-pin from off its taper, using the special tool RH 9710. Withdraw the ball-pin from the side steering lever.
8. Straighten the tab-washer tangs. Unscrew and remove the bolts holding the side steering levers to the stub axle.
9. Collect components and retain.
10. Reverse the procedure for assembly. Torque tighten in accordance with the figures quoted in Section N7.

Important

Ensure that the correct side steering lever(s) are being fitted. Refer to the information given under the heading Introduction. Also see fig. N5-5.

Ball-pin unit - To remove (Applicable to cars fitted with replaceable ball-pin units) see figs. N5-1 and N5-3

1. Carry out Operations 1 to 10 inclusive of Adjustable track rod units - To renew.
2. Unscrew the hexagon headed plug from the track rod end socket. Dismantle and retain the components.
3. Remove the dust cover retaining clip. Dismantle, collect and retain the components.
4. Clean out the track rod socket using 'Genklene' or an equivalent solution.
5. Inspect the components for any signs of damage. Replace any found to be damaged.

Track rod socket - To renew (Applicable to cars fitted with replaceable ball-pin units)

1. Release the 'adjuster' pinch bolts.
2. Unscrew the socket from the track rod, counting the number of turns required to remove it.
3. Fit the new socket using the known number of turns to set the socket into an approximate 'toe-in' position. Finger tighten the 'adjuster' pinch bolts. The final 'toe-in' setting must be determined when the track rod assembly has been fitted to the car.

Ball-pin unit - To fit (Applicable to cars fitted with replaceable ball-pin units)

1. Assemble the ball-pin components into the track rod socket in the following sequence. (see fig. N5-3)

a) Fit the tapered portion of the ball-pin through the rectangular hole of the socket, with the shoulder bearing on the inner seat.

b) Smear the ball-bearing seat with an approved grease (see Chapter D). Then fit the ball-bearing, spring seat, spring, alloy joint washer and retaining plug.

2. Apply an approved grease (see Chapter D) to the seal faces of the ball-joint.

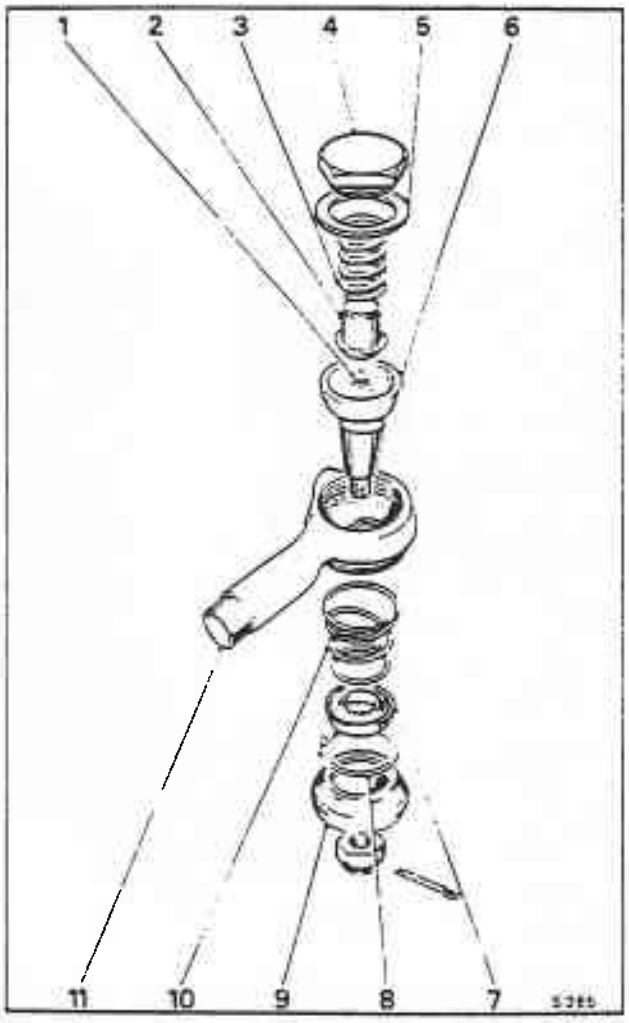


Fig. N5-3 Ball-pin unit (Applicable to cars fitted with replaceable ball-pin units)

1 Ball bearing
2 Spring seat
3 Ball joint spring
4 Screwed plug
5 Alloy washer
6 Ball-pin
7 Spring seat
8 Retaining spring
9 Dust cover
10 Dust cover expander
11 Track rod ball joint housing

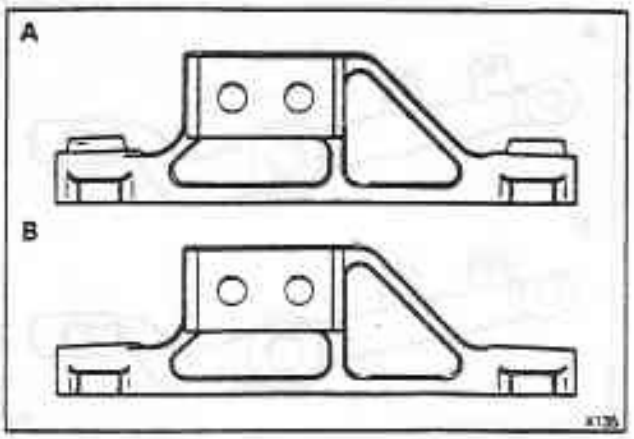


Fig. N5-4 Inner ball joint bracket

A Applicable to cars fitted with replaceable ball-pin units

B Applicable to cars fitted with one-piece track rods

Fit the dust cover, expander, spring seat and retaining clip. Locate the dust cover over the lip of the track rod socket and secure in place with the retaining clip.

3. Fit grease nipples into the sockets. Lubricate each ball-pin unit with an approved grease (see Chapter D), until it exudes from the seals. Each ball-pin unit requires approximately 18.70 gms. (0.66oz) of grease for initial filling.

Adjustable track rod units - To fit (Applicable to both types of track rod ends

1. Clean the tapers of the side steering levers, inner ball-joint bracket, and the ball joint units.
2. Smear the ball-pin tapers with an approved grease (see Chapter D).
3. Fit the inner ball-pin downward into the inner ball joint bracket attached to the steering unit and the outer ball-pin upward into the side steering levers as shown in figures N5-1 and N5-2.
4. Secure the track rod units by tightening the castellated nuts in accordance with the torque figures quoted in Section N7. Use the torque tolerance to enable a new split pin to be fitted.
5. Connect the battery.

Front wheel 'toe-in' - To adjust

1. Place the car on a level surface and set the steering wheel in the straight-ahead position.
2. Remove the gear selector thermal cut-out as described in Chapter M.
3. Move the car forward half a revolution of the road wheels.

Note

Moving the car rearwards will give an incorrect reading.

4. Using optical equipment take a reading.
5. Move the car a further half revolution of the road wheels, take a second reading using the optical equipment. Taking the average of the two readings

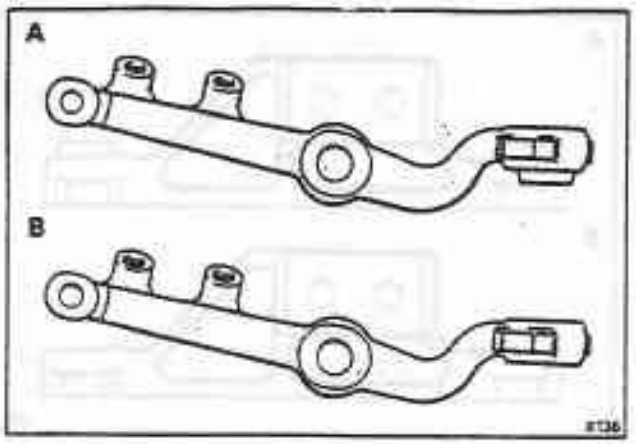


Fig. N5-5 Side steering levers
A Applicable to cars fitted with replaceable Ball-pin units
B Applicable to cars fitted with one-piece piece track rods

(one full revolution of the road wheels), the true 'toe-in' figure will be determined.
6. If a corrected setting is necessary, slacken the two pinch bolts securing the track rod adjusters. Turn the adjusters to bring the wheels into the straight-ahead position, (zero 'toe-in').
7. Turn the adjusters by equal amounts on each side to give an overall 'toe-in', range of 12'±5', with the car in a 'levelled' or 'showroom' condition (see Chapter H).
8. Tighten the adjuster pinch bolts, and again check the 'toe-in' as detailed in Operations 4 and 5.
9. Finally, torque tighten the pinch bolts in accordance with the figures quoted in Section N7.

Fault diagnosis

Symptom	Possible cause	Action
Steering pump and reservoir		
1. Hydraulic fluid leaks.	1. Reservoir cover seal or filler cap seal leaking due to fluid level being too high or air in fluid.	1. Check oil level and top-up if required. Bleed system to remove air by operating steering. Examine cap and cover for damage or distortion.
	2. Faulty hose connections and/or perforated rubber.	2. Renew hoses.
	3. Reservoir to pump 'O' rings leaking.	3. Renew 'O' rings.
	4. Flow control valve plug 'O' rings leaking.	4. Renew 'O' rings.
	5. Steering pump bearing seal leaking.	5. Renew seal. Examine shaft for wear or damage.
	6. Reservoir or filler cap seals damaged.	6. Renew seals.
2. Momentary increase in effort when turning wheel quickly to the right or left.	1. Low fluid level in reservoir.	1. Check fluid level. Top-up if required. Examine system for leaks.
	2. Pump drive belt(s) slipping.	2. Correctly adjust pump drive belt(s). Renew belts if necessary.
	3. Heavy internal fluid leak.	3. Check pump outlet pressure. If pressure is low renew combined flow control and relief valve. If pressure remains low, check system for internal leaks by dismantling the steering unit.
	4. Aerated fluid.	4. Renew fluid or allow system to stand for at least one hour.
Noisy system		
	5. Low fluid level.	5. Fill reservoir to the correct level with an approved fluid and bleed system by operating the steering.
	6. Loose drive belt(s).	6. Correctly adjust drive belt(s).
	7. Pressure hose not correctly fitted.	7. Ensure correct run of hose.
	8. Excessive back pressure due to partially blocked pipes or resistance to steering gear movement.	8. Locate restriction and correct if necessary.
	9. Faulty fluid cooler.	9. Renew cooler.
	10. Scored rotor or rollers.	10. Renew rotor and rollers or fit new pump if required.
	11. Excessive wear on cam ring.	11. Fit new steering pump.
	12. Defective flow control valve.	12. Renew valve.
	13. Scored pressure plate.	13. Lap to remove light scoring. Renew heavily scored components.
	14. Vanes incorrectly fitted.	14. Fit vanes correctly.
	15. Vanes sticking in rotor slots.	15. Free by removing burrs or dirt.

Symptom	Possible cause	Action
Noisy system (continued)	16. Extreme wear on pump ring.	16. Renew pump ring, rotor and vanes.
	17. Face of thrust plate scored.	17. Lap to remove light scoring. Renew rotor, vanes, and pump ring if rotor is heavily scored.
	18. Scored rotor.	18. Lap to remove light scoring. Renew heavily scored components.
	19. Aerated fluid.	19. Change fluid or allow system to stand for at least one hour.
Steering		
3. Car pulls to one side or the other.	1. Front end geometry misaligned.	1. Check steering geometry.
	2. Pump drive belt(s) slipping.	2. Correctly adjust steering pump belt(s).
	3. Flow control valve sticking.	3. Examine flow control valve. Renew valve if necessary.
4. Heavy steering.	1. Incorrect tyre pressures.	1. Check and correct tyre pressures.
	2. Tyre pull.	2. Check by fitting different tyres.
	3. Loose pump drive belt(s).	3. Correctly adjust drive belt(s).
	4. Low fluid level in reservoir.	4. Check level of fluid in reservoir. Top-up if required. Examine system for leaks.
	5. Lack of lubricant in steering joints.	5. Examine all steering joints. Grease with an approved lubricant.
	6. Insufficient fluid pressure.	6. If the preceding checks do not reveal the cause of heavy steering, check the pump pressure.
	7. Faulty or obstructed flow control valve.	7. Renew or replace if necessary.
	8. Incorrect front wheel alignment, (toe-in).	8. Check and adjust if required.
	9. Incorrect castor and/or camber angle.	9. Correct castor and/or camber angle to within specified limits.
	10. Distorted flexible coupling or defective universal joint.	10. Examine flexible coupling. Renew if necessary. Examine universal joint in lower steering column. Renew if necessary.
	11. Triangle levers misaligned.	11. Check wheel castor and camber.
	12. Front sub-frame distorted.	12. Check sub-frame for correct alignment. Correct or renew if required.
	13. Kinks in hoses.	13. Ensure correct run of hoses.
	14. Obstruction in hose. Inner bore of hose swollen, caused by overheated or incorrect fluid.	14. Renew hose.
	15. Pressure loss in rack and pinion unit caused by worn P.T.F.E. seals and scored bores.	15. Overhaul unit.
	16. Leakage at pinion valve.	16. Overhaul unit.
Steering wheel		
5. Excessive play at the steering wheel.	1. Excessive play in the steering linkage.	1. Adjust steering linkage or renew parts if required.
	2. Insufficient pre-load.	2. Strip and rebuild steering unit.
	3. Defective bonded coupling.	3. Renew coupling.
	4. Worn universal joints in lower linkage.	4. Renew joints.
	5. Front wheel bearings incorrectly adjusted or worn.	5. Correctly adjust bearings or renew if required.

Symptom	Possible cause	Action
Steering wheel (continued)	6. Worn check valve in pressure connection.	6. Renew check valve.
Steering linkage	7. Steering linkage loose.	7. Examine linkage pivot points for wear. Renew worn parts if required.
Rack and pinion unit		
6. Oil leak from centre linkage.	1. Loose convoluted seal clips.	1. Tighten clips.
	2. Damaged convoluted rubber boot(s).	2. Renew rubber boot(s).
	3. Defective centre seal.	3. Fit a new seal and bond.
7. Hydraulic fluid leaks from hose connections and pipe unions.	1. Loose hose connections or damaged 'O' rings.	1. Tighten hose connections. If tightening fails to cure the leak, examine ends of hoses for cracks or damage. Renew 'O' rings if necessary.
	2. Damaged hose.	2. Examine hose for fretting, fraying and/or deterioration. Renew hose if required. Ensure that the correct hose run is obtained and that hose clips are correctly fitted.

Special torque tightening figures

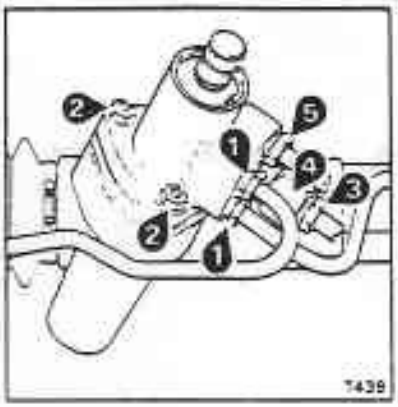
Introduction

This chapter contains the special torque tightening figures applicable to Chapter N.

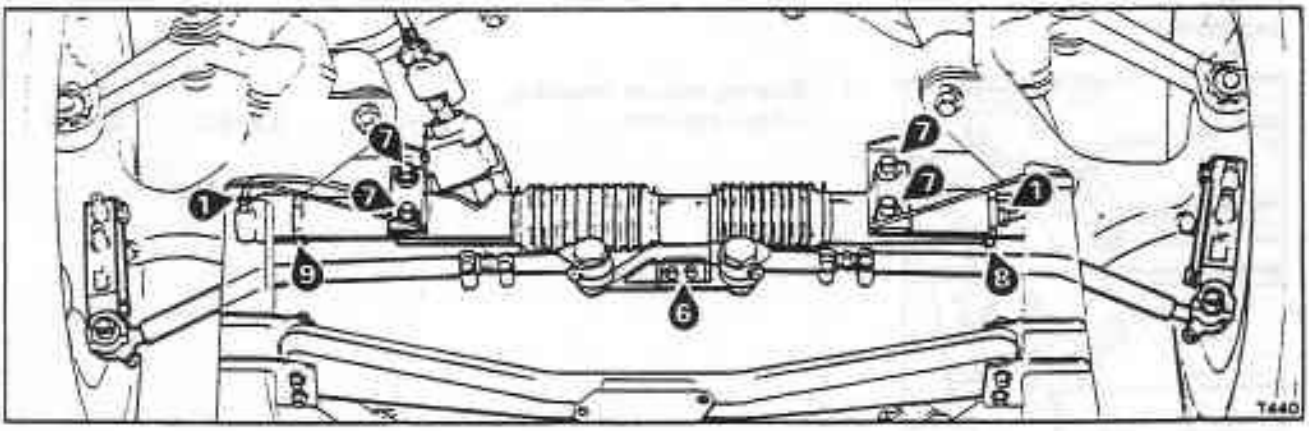
For standard torque tightening figures refer to Chapter P.

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.

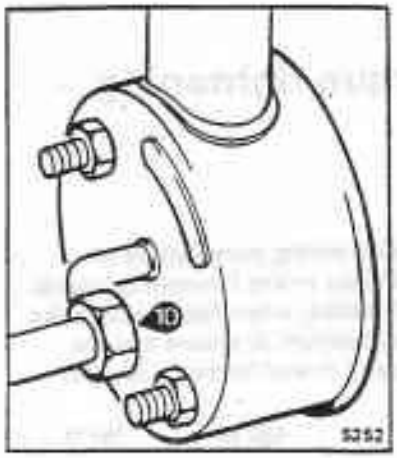
Section N1



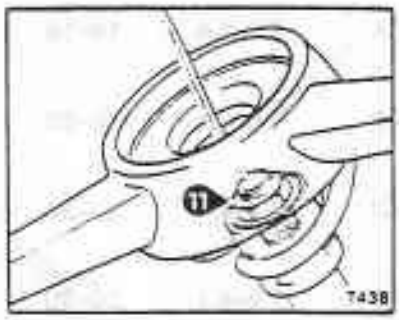
Ref	Component	Nm	kgf m	lbf ft
1	Steering rack to pinion and spool valve pipe assemblies – male nut	19–21	2,0–2,2	14–16
2	Pinion and spool valve housing – retaining nuts	21–24	2,1–2,4	15–18
3	Pump to pinion and spool valve housing – male nut	27–40	2,8–4,1	20–30
4	Anti-joggle valve assembly – housing	27–40	2,8–4,1	20–30
5	Pinion and spool valve housing – male nut	27–40	2,8–4,1	20–30



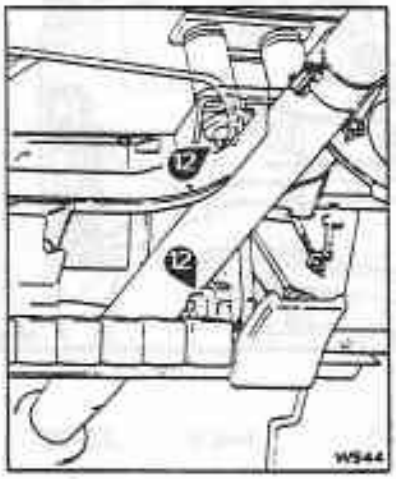
Ref	Component	Nm	kgf m	lbf ft
6	Inner ball joint bracket – setscrew	38–40	3,9–4,1	28–30
7	Steering rack mounting – setscrew	57–61	5,8–6,2	42–45
8	Steering rack – end plug	48–54	4,9–5,5	35–40
9	Steering rack – lock-nut	21–24	2,1–2,4	15–18

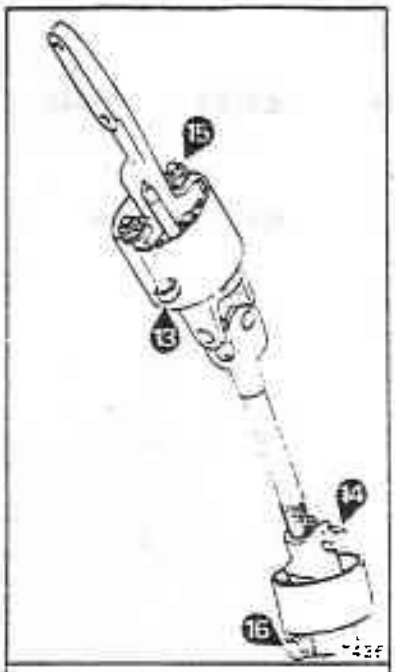
Section N2	Ref	Components	Nm	kgf m	lbf ft
	10	Steering pump pressure pipe – union	50–69	5,1–7,0	37–51

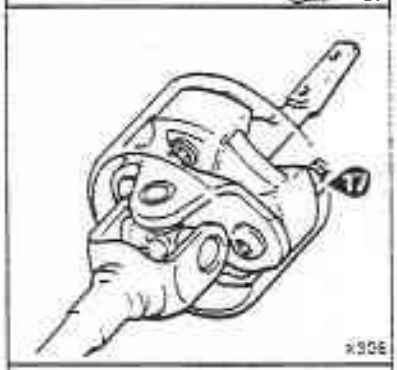
Section N3

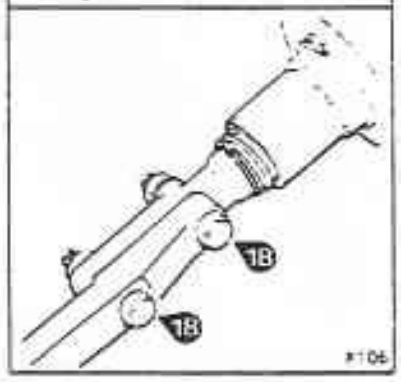
	11	Steering wheel – nut	34–38	3,5–3,8	25–28

Section N4

	12	Steering column mounting – Allen capscrew	29–32	2,9–3,3	21–24

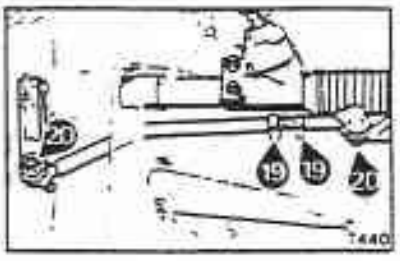




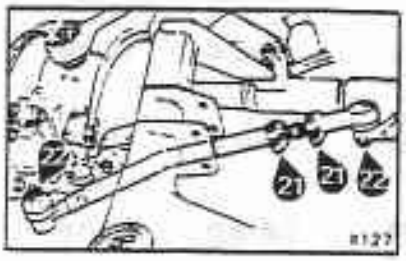


Ref.	Component	Nm	kgf m	lbf ft
13	Bonded coupling to lower link – setscrew and nut	22–24	2,2–2,4	16–18
14	Input shaft – adjusting spline pinch bolt	22–24	2,2–2,4	16–18
15	Heatshield to rubber coupling – lock-nut	18–20	1,8–2,0	13–15
16	Lower coupling to rack – pinch bolt	22–24	2,2–2,4	16–18
17	Input shaft to bonded coupling special capscrew – nut	22–24	2,2–2,4	16–18
18	Steering column linkage – fitted bolts	22–24	2,2–2,4	16–18

Section N5



19	Track rod clamping castellated nut (Applicable to cars fitted with replaceable ball-pins)	22–24	2,2–2,4	16–18
20	Track rod ball-pin castellated nut (Applicable to cars fitted with replaceable ball-pins)	48–54	4,9–5,5	35–40

Section N5	Ref	Component	Nm	kgf m	lbf ft
	21	Track rod clamping – castellated nut (Applicable to cars fitted with the one-piece track rod)	45–54	4.6–5.5	33–40
	22	Track rod ball-pin castellated nut (Applicable to cars fitted with the one-piece track rod)	60	6.1	44

Workshop tools

Spool valve and pinion

RH 9120	Spline cover — Input shaft, upper oil seal
RH 9121	Applicator — Input shaft, upper and lower oil seal
RH 9117	Applicator — P.T.F.E. rings, spool valve
RH 9123	Torque arm — Spool valve ball race pre-load (use with a spring balance)

Steering pump

RH 7674	Pliers (two-way) — Circlip and snap ring
RH 9106	Fitting and extracting tool — Pulley

Rack unit

RH 9112	Sizing tool (small) — P.T.F.E. scarf jointed bearing
RH 9113	Sizing tool (medium) — P.T.F.E. scarf
RH 9114	Sizing tool (large) — P.T.F.E. scarf jointed bearing
RH 9119	Screwed location plug — Rack centring
RH 9125	Spanner (open ended) — To fit torque wrench
RH 9122	Torque wrench extension — Steering rack anchorage

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RH 9125	Spanner (open ended) — To fit torque wrench
RH 9122	Torque wrench extension — Steering rack anchorage

Steering linkage

RH 8080	Ball-pin taper breaker - outer ball-pin (Applicable to cars fitted with replaceable ball-pins).
RH 8100	Ball-pin taper breaker - inner ball-pin (Applicable to cars fitted with replaceable ball-pins).
RH 9710	Ball-pin taper breaker - outer and inner ball-pins (Applicable to cars fitted with one-piece track rods).

Workshop tools

Spool valve and pinion

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