



Steering pump

Introduction

The steering pump is fed from a remote fluid reservoir which has a dipstick attached to the filler cap.

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

Steering pump – Routine checks and topping-up procedure (see fig. N3-2)

The fluid level in the steering pump reservoir should be checked with the fluid at normal operating temperature, approximately 77°C (170°F), with the engine stopped.

1. Remove the filler cap and check that the fluid level is at least up to the MIN mark on the dipstick. If necessary, add fluid. Use only approved steering fluid as quoted in Chapter D.
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 MAX mark. **Do not overfill.**
4. Replace the filler cap.

Belt tension – To check

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

Refer to Chapter E for the belt tensioning figures.

Steering pump – To remove

1. Fit a clamp to the feed hose from the remote reservoir. Slacken the lower wormdrive clip and remove the hose from the pump connection.
2. Slacken the pump belts by loosening the pivot mounting setscrew beneath the alternator. Then, slacken and remove the lower tensioning nut and bolt assembly beneath the pump.
3. Slacken the setscrew securing the pressure pipe to the rear mounting plate. Unscrew the pipe union from the rear face of the pump.

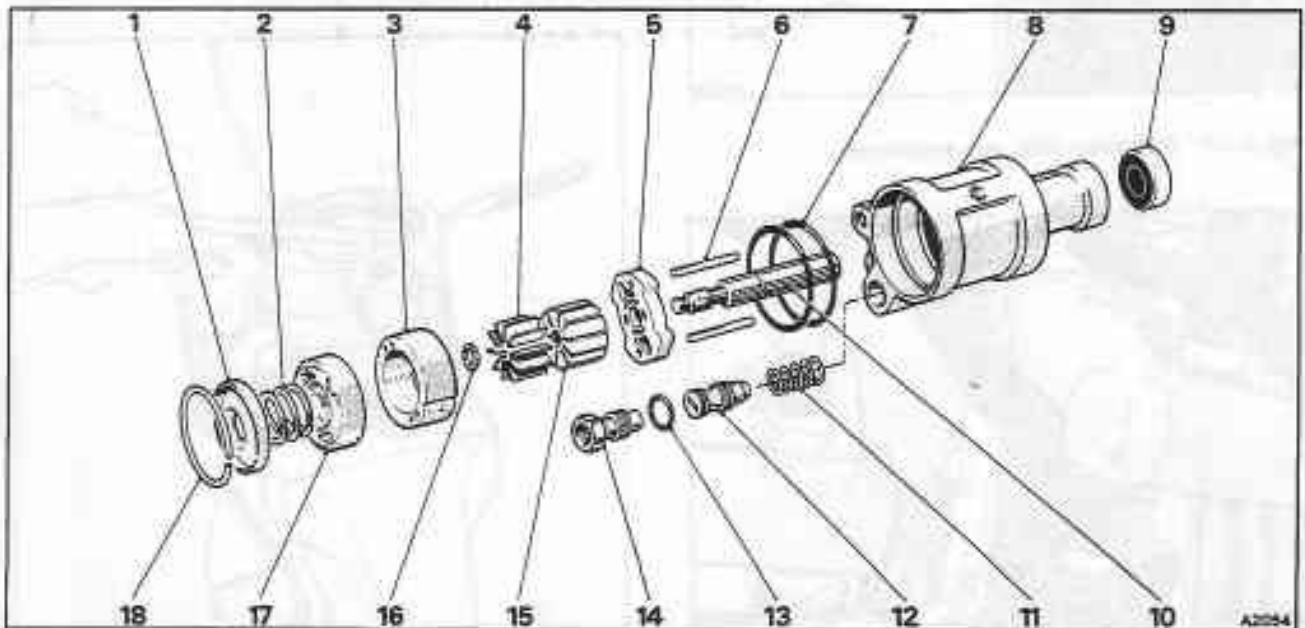


Fig. N3-1 Steering pump

- | | |
|--|--|
| 1 End plate | 10 Drive-shaft |
| 2 Pressure plate spring | 11 Return spring – control valve |
| 3 Pump ring | 12 Control valve/pressure relief valve |
| 4 Vanes | 13 'O' ring – control valve outlet adapter |
| 5 Thrust plate | 14 Control valve outlet adapter |
| 6 Dowel pins | 15 Rotor |
| 7 'O' rings – pressure plate and end plate | 16 Snap ring |
| 8 Pump housing | 17 Pressure plate |
| 9 Oil seal | 18 End plate retaining ring |



4. Remove the bolt securing the rear mounting plate.
5. Support the pump assembly and remove the upper pivot mounting setscrew. Lower the pump from the car and replace the setscrew through the alternator, brackets, etc., into the cylinder head.

Steering pump – To dismantle

The pump is a service exchange unit and should normally be replaced with a new one.

However, if difficulty is experienced in obtaining a service replacement unit, the following information on servicing the existing pump is provided.

1. Drain any fluid remaining in the pump.
2. Remove the pulley using tool RH 9106. **Never use**

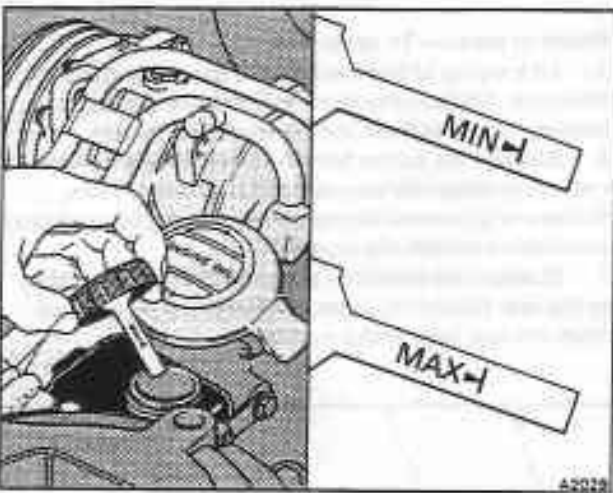


Fig. N3-2 Reservoir filler cap markings

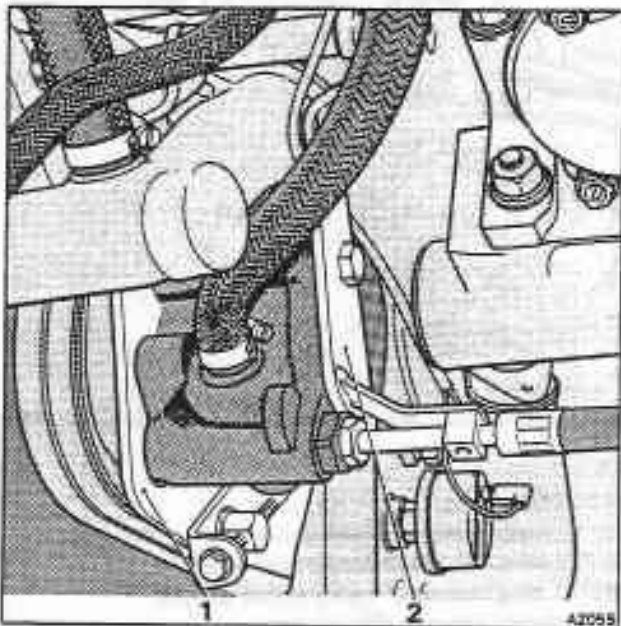


Fig. N3-3 Pump mountings

- 1 Front pivot plate
- 2 Rear mounting plate

a hammer to drive the pulley from the shaft.

3. Remove the three setscrews securing the front pivot plate to the pump housing. Note that distance pieces are fitted between the plate and pump.
 4. Lightly clamp the pump in a vice ensuring suitable soft-jaw covers are used.
 5. Press a centre punch or similar tool into the small hole in the pump housing directly opposite the control valve adapter (see fig. N3-4).
 6. Using a small screwdriver, lever out the retaining ring. Withdraw the centre punch.
- Note** Care should be taken when the retaining ring is removed, due to internal spring pressure.
7. Remove the end plate and spring.
 8. Remove the end plate 'O' ring and discard.
 9. Unscrew the control valve outlet adapter. Discard the 'O' ring.

Note Care should be taken when the adapter is removed, due to internal spring pressure.

10. Remove the pump from the vice and withdraw the control valve assembly and spring.
 11. 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.
- Note** Do not strike the shaft downward into the housing more than is necessary to free the pressure plate.

12. Remove the pressure plate, pump ring, and vanes. Discard the second 'O' ring.



Fig. N3-4 End plate removal

- 1 Retaining ring
- 2 End plate

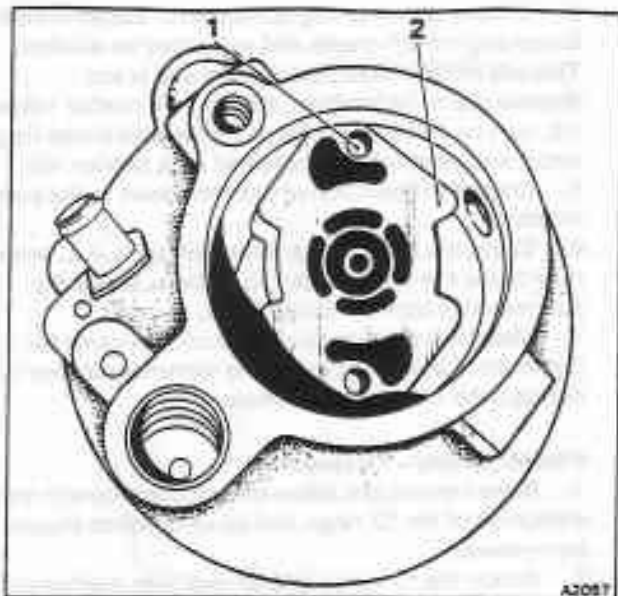


Fig. N3-5 Positioning of thrust plate

- 1 Dowel pin (2)
- 2 Thrust plate

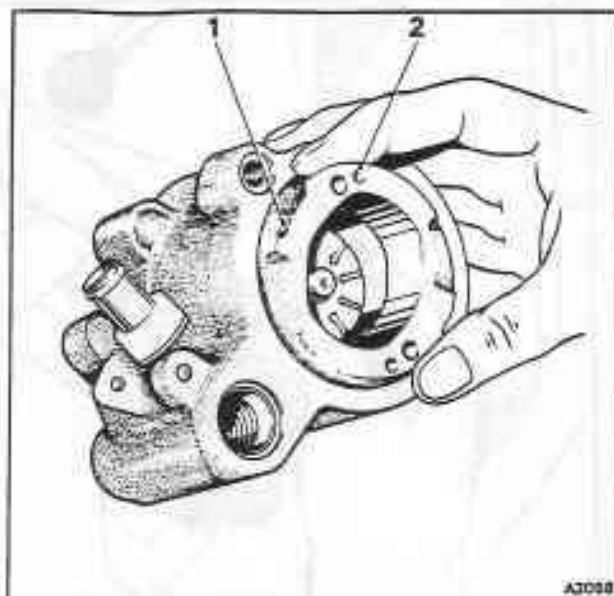


Fig. N3-7 Correct positioning of pump ring

- 1 Direction of rotation arrow
- 2 Dowel hole (2)

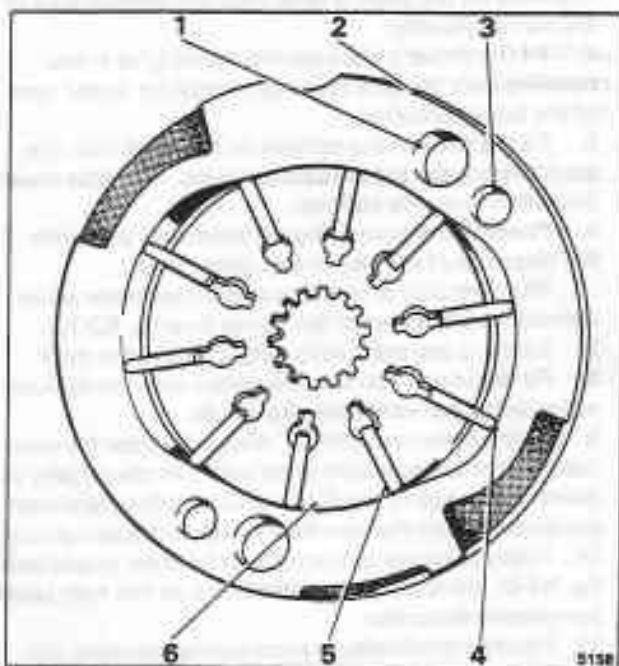


Fig. N3-6 Pump rotor and vanes

- 1 Oil transfer hole (2)
- 2 Pump ring
- 3 Dowel hole
- 4 Radiused edge of vane
- 5 Vane (10)
- 6 Rotor

13. Grip the pump housing in a vice, with the open end uppermost.
14. Remove the snap ring holding the vane rotor and thrust plate.
15. Withdraw the drive-shaft through the pulley end of the housing.

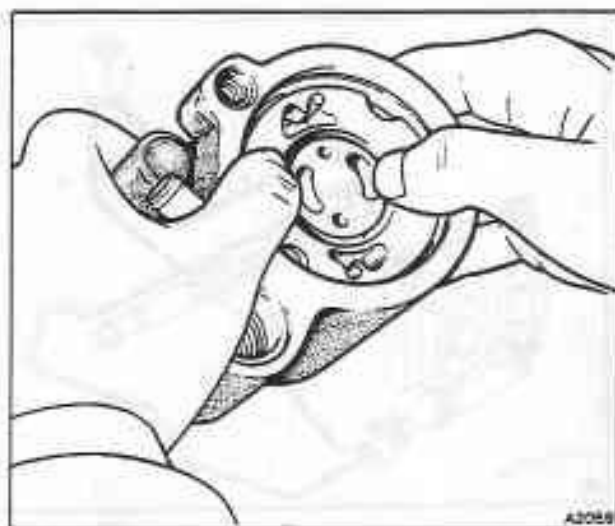


Fig. N3-8 Fitting the pressure plate

16. Renew the oil seal. Avoid excessive force when fitting to prevent dishing the seal.

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. 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 abutting surface of the pump ring.

Note Highly polished surfaces are always present on the inner surfaces of the thrust and pressure plates as a result of normal wear.



Fig. N3-9 Method of replacing end plate

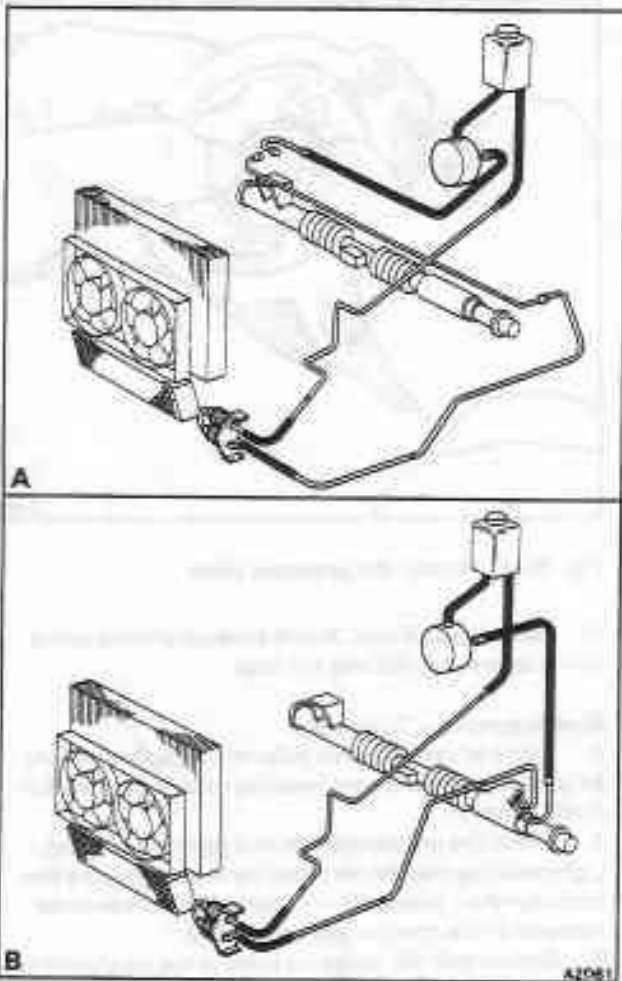


Fig. N3-10 Hydraulic pipe layouts
A Right-hand drive
B Left-hand drive

4. Check the pump ring contours for extreme wear. Some slight scuff marks and wear may be evident. This will not increase pump noise and is not detrimental to its function. However, if chatter marks, etc., can be felt with the finger, renew the pump ring, rotor, and rotor vanes (supplied as a service kit).
5. Check the condition of the shaft bush in the pump housing.
6. Check the flow control valve for burrs, etc., which may cause the valve to stick in its bore. Check the control valve bore for scoring, etc.
7. Check the small screw in the control valve for tightness. If loose, tighten using extreme care not to damage the machined surfaces.

Steering pump – To assemble

1. Before assembly, clean all components with the exception of the 'O' rings and oil seal, which should be renewed.
2. Smear the 'O' rings and oil seal with petroleum jelly to facilitate fitting. Lubricate the internal components with new steering fluid.
3. Insert the drive-shaft into the front of the pump housing, passing it through the oil seal until the shoulder on the shaft is level with the bottom face of the pump housing.
4. Fit the thrust plate over the dowel pins in the housing with the port face uppermost i.e. to the rear of the pump housing.
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 rear of the pump (see fig. N3-7).
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. N3-6).
9. Fit the pressure plate 'O' ring. Lubricate the outer 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. N3-8). Never use excessive force as this may cause permanent distortion.
11. Position the pressure plate spring, locating the leading coil in the groove on the upper side of the pressure plate.
12. Fit the end plate 'O' ring into the pump housing groove.
13. Lubricate the outer diameter of the end plate. Position the pump under a suitable press (see fig. N3-9), and press down the end plate sufficiently to allow the retaining ring to be fitted.
14. Fit the retaining ring ensuring that it is seated fully. Remove the pump from the press and tap the end plate to ensure correct sealing.
15. Fit the control valve assembly and spring. Screw in the outlet adapter, ensuring a new 'O' ring is fitted. Torque tighten the adapter to between 50 Nm and 75 Nm (5,1 kgf m and 7,6 kgf m; 37 lbf ft and 55 lbf ft).



16. Fit the pump front pivot plate using the three setscrews and distance pieces. A distance piece is fitted between the pump and pivot plate on all three setscrews.
17. Press the pulley onto the shaft using tool RH 9106.

Steering pump – To fit

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

1. Check that all the hoses and pipes are serviceable. Renew any that are damaged or worn.
2. Fit and adjust the drive belts as described in Chapter E.
3. Fit and torque/tighten the pipe union to between 28 Nm and 40 Nm (2,8 kgf m and 4,1 kgf m; 20 lbf ft and 30 lbf ft).

Steering pump – Priming and filling

1. Remove the reservoir cap and add sufficient steering fluid to raise the level to the MIN mark on the filler cap dipstick.
2. Remove one end of the upper hose connected to the steering oil cooler. When fluid emerges from both pipes, reconnect the hose. Top-up the fluid level to the MIN mark on the dipstick.
3. Crank the engine over, but switch off immediately it starts to run. Top-up the fluid level to the MIN mark on the dipstick. Repeat, until no more fluid needs to be added between each crank.
4. Start the engine and bleed air from the system by turning the steering wheel gently from side to side, gradually lengthening the stroke, but **do not hold against the lock stops.**

Note Ensure that the fluid level never falls below 50 mm (2.0 in) from the bottom of the reservoir.

5. When satisfied that the fluid level is no longer aerated (no small bubbles visible in the fluid), return the steering to the centre position and run the engine between two and three minutes.
6. Stop the engine. Observe the fluid level in the reservoir; if it rises by more than 3 mm (0.120 in) the fluid is still aerated. Repeat Operation 4.
7. Leave the engine stationary for 5 minutes. Then, add fluid up to the MAX mark on the filler cap dipstick. **Do not overfill.**
8. Replace the filler cap.

Steering wheel and gear range selector unit

Steering wheel – To remove (see fig. N4-1)

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.
5. Remove the screws securing the support plate. Withdraw the support plate and disconnect the Lucar connector from the underside of the plate.
6. Remove the steering wheel centre nut and washer (see fig. N4-2).

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

7. Scribe a line 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 remove the wheel with a straight pull. Take 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 (see fig. N4-2)

1. Fit a protective cover to the steering wheel.
2. Feed the horn wire through the steering wheel centre hub. 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 nut to secure the steering wheel. Using a deep hexagon socket spanner, torque tighten to the figures quoted in Section N8.

If any adjustment to the straight ahead position is necessary, reference should be made to Section N5, 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 range selector lever when in the low (L) position.

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

5. After filing, the exposed metal must be painted with dull nickel paint.
6. Fit the electrical horn connector onto the Lucar connection. Secure the support plate to the centre hub.
7. Lubricate the bearing pin of the horn push button assembly with Rocol MTS 1000 grease or any suitable equivalent. Push the horn button into position through the support plate. Ensure that the retaining clip securely holds the horn button in place by gripping the bearing pin.

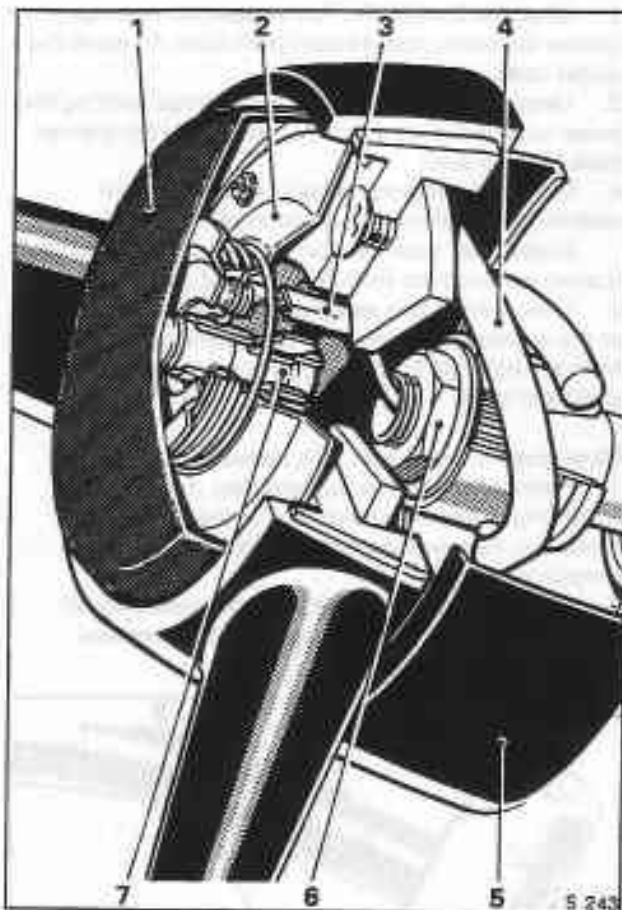


Fig. N4-1 Steering wheel components

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

Direction indicator/headlamp flasher lever and windscreen/headlamps washer switch – To remove and fit (see fig. N4-3)

1. Disconnect the battery.
2. Unscrew the two Phillips headed screws that secure the upper cowl to the lower cowl. Remove the upper cowl.
3. Unscrew and remove the two clamps holding the lower cowl. Remove the cowl and secure the clamps back into the cowl.
4. Disconnect the electrical plug at the main distribution loom plug and socket.
5. Unscrew the two Phillips headed mounting 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 (see fig. N4-3)

1. Disconnect the battery.
2. Unscrew the two Phillips headed screws that secure the upper cowl to the lower cowl. Remove the upper cowl.
3. Unscrew and remove the two clamps holding the lower cowl. Remove the cowl and secure the clamps back into the cowl.
4. Disconnect the electrical plugs at the main distribution loom plugs and sockets.

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. Fasten the clamp back onto the quadrant base.

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 (I) position. Remove the Phillips headed screw now

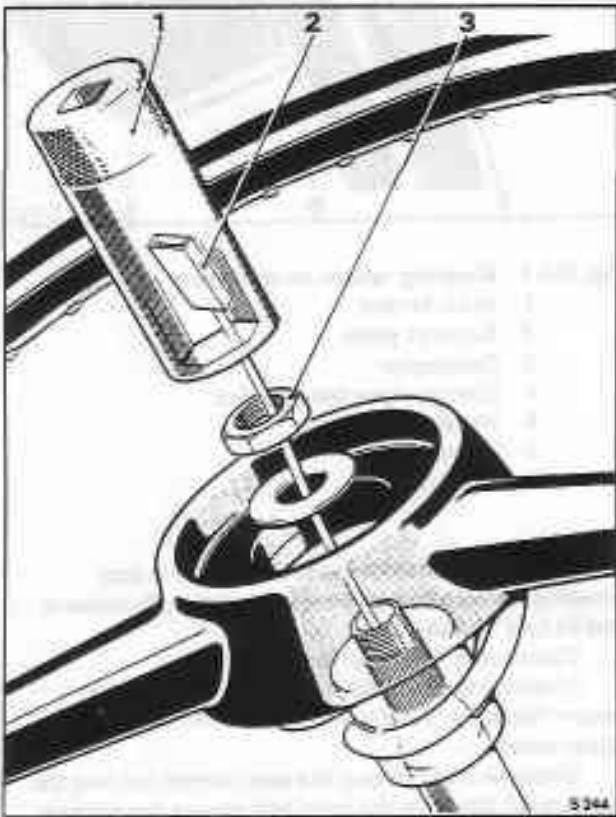


Fig. N4-2 Steering wheel fitting

- 1 Deep bodied hexagon socket
- 2 Electrical horn connector
- 3 Steering wheel nut

exposed, together with any packing washers. Remove the scale pointer.

Replace the Phillips headed screw together with any packing washers.

Take care during this operation not to scratch the pointer or the indicator scale.

3. Disconnect the Lucar connection from the gear range indicator lamp. Remove the filter from the lamp.
4. Remove the two Phillips headed screws securing the indicator support bracket. Remove the assembly.
5. Remove the two hexagon headed setscrews that secure the selector gate assembly to the underside of the base unit.
6. Remove the circlip, clevis pin, and spring securing the selector lever to the quadrant, then remove the lever together with the gate assembly.
7. Remove the gearchange loom by removing the three screws that secure the insulating plate to the quadrant base unit.
8. Remove the two Phillips headed screws securing the phosphor bronze contact to the quadrant base unit. Retain the two insulating dowels and 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.
10. Remove the nut from the quadrant spindle. Remove the quadrant plate from the base unit.

Gear range selector unit – To assemble

1. Fit the quadrant assembly to the base unit and 'nip' the nut and washer. Ensure that the quadrant will rotate freely.
2. Remove the quadrant assembly 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, 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. N4-4).
4. Fit the two small tension springs, one either side of the quadrant, to the spindle. 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 midway 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.
Note Ensure that the moving contact is not damaged.
6. Prior to fitting the selector lever assembly, carry out the following.
 - 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. 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 unit with 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 assembly and that

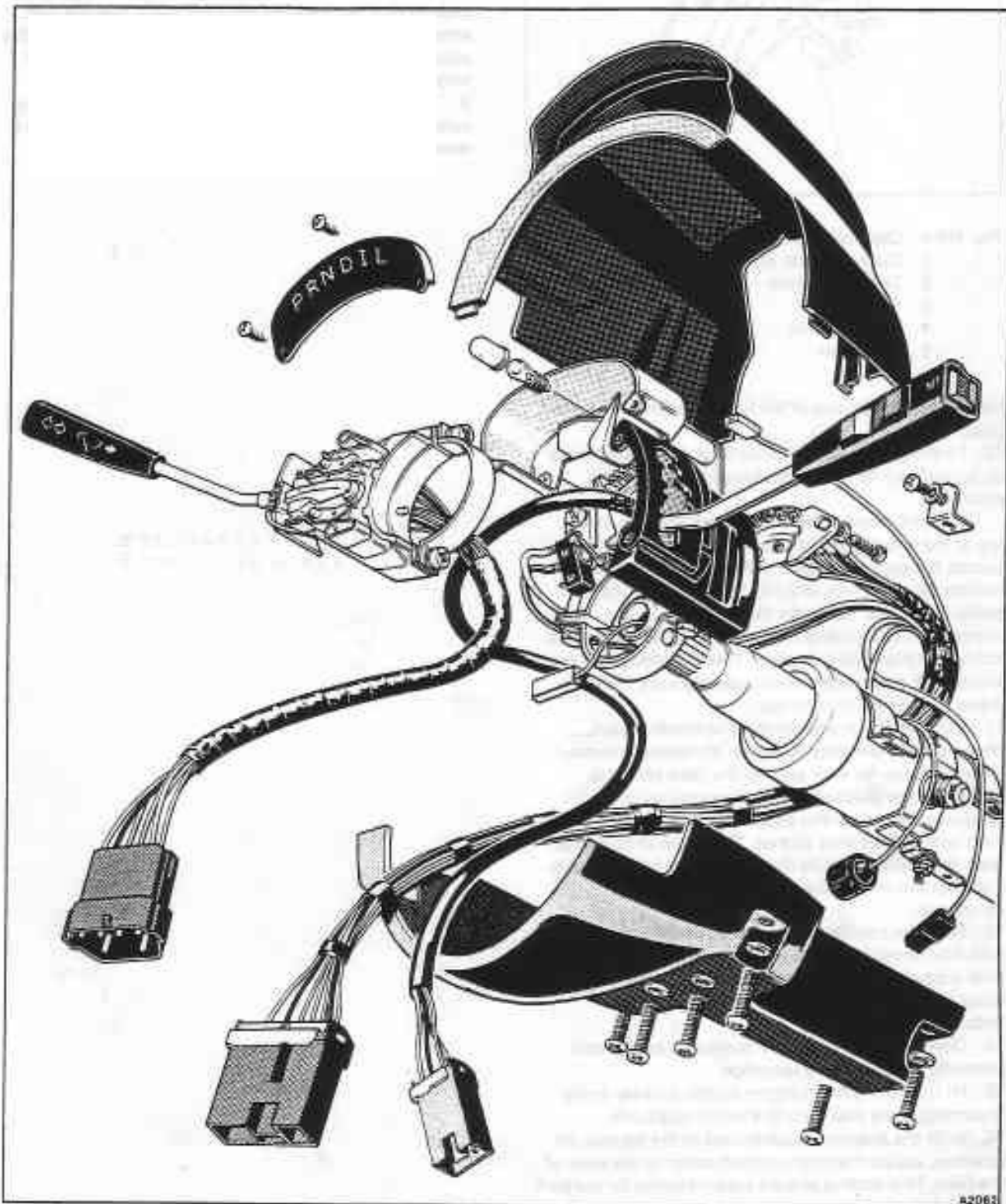


Fig. N4-3 Gear range selector, direction indicator, wash/wipe units, upper and lower cowlings

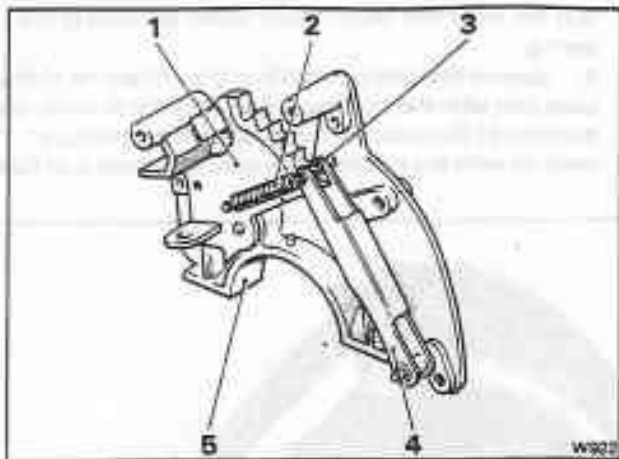


Fig. N4-4 Quadrant to rocking arm assembly

- 1 Gear selector quadrant
- 2 Tension spring – rocking arm (2)
- 3 Roller
- 4 Rocking arm
- 5 Base unit

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.

13. Feed the pointer under the indicator scale. Then, with intermediate (I) range selected, secure in position 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 (N) position, adjust the micro-switch roller to the peak of the cam. This setting should automatically fix the park (P) 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

1. Remove the lower trim panel as described in Chapter S.
2. Remove the steering wheel, cowling, gear range selector lever, and direction indicator assembly as described in Section N4.
3. Slacken the two capscrews from the steering column upper mounting. Hold the tapping plate and washers, and then remove the capscrews. Collect the distance pieces, washers, etc., from the upper mounting.
4. Remove the two bolts which secure the steering column link to the lower steering unit linkage (see fig. N5-1).

Note Care must be taken not to use any impact force near to the steering rack unit, otherwise irreparable damage will result.

5. Remove the large circlip and washer from the engine compartment side of the toeboard (see fig. N5-3).
6. Disconnect both the horn (screw cap) and earth (Lucar) connections from the steering column.
7. From inside the car, support the column and remove the single capscrew from the lower column mounting. Retain the capscrew, washers, etc., but discard the nut.
8. With care, withdraw the steering column from the toeboard rubber grommet. Remove and discard the rubber grommet.
9. Inspect all components for wear or damage.

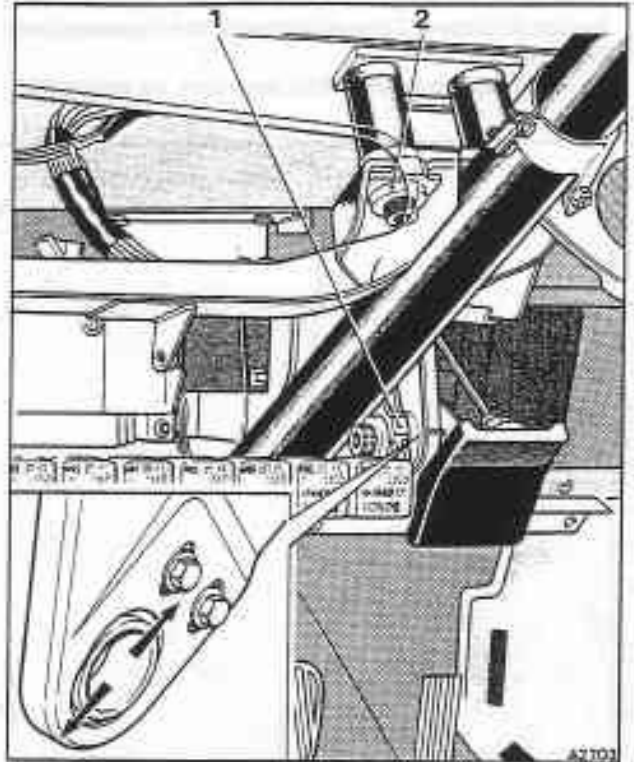


Fig. N5-2 Steering column in position

- 1 Lower mounting point
- 2 Upper mounting point

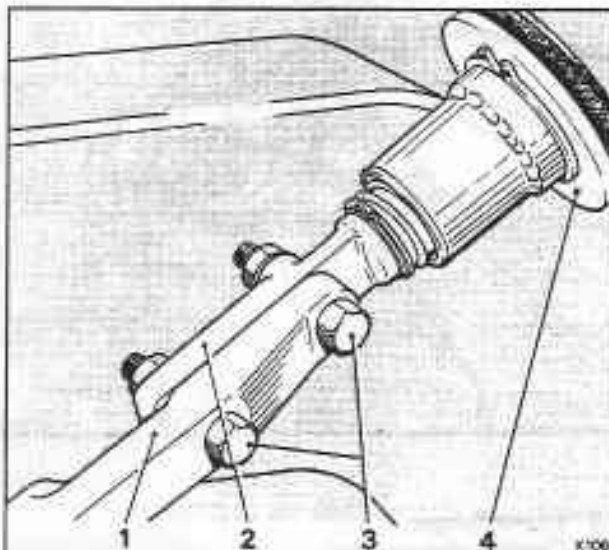


Fig. N5-1 Steering column link to linkage arm

- 1 Linkage arm
- 2 Steering column link
- 3 Securing nuts and bolts
- 4 Washer – toeboard

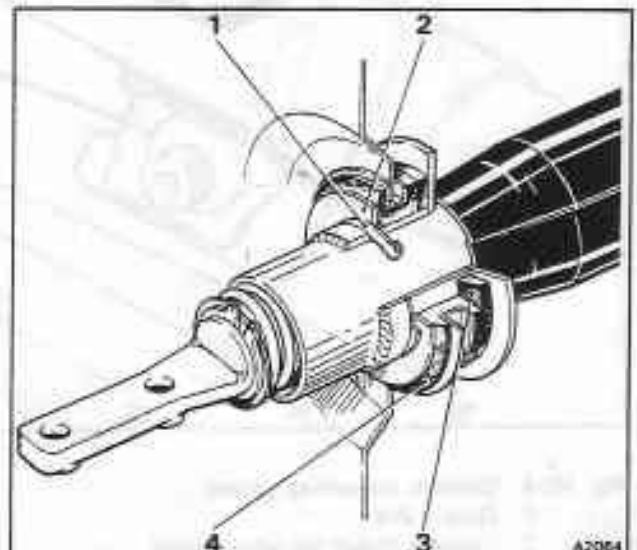


Fig. N5-3 Toeboard fixing

- 1 Circlip
- 2 Washer
- 3 Soft rubber washer
- 4 Bulkhead grommet



Steering column – To fit (see figs. N5-3 and N5-4)
Fit the steering column by reversing the procedure given for removal, noting the following.

1. Always fit a new rubber grommet and soft rubber washer to the toeboard aperture.
2. Ensure that when replacing the two upper capscrews, the spigot rubbers and inner spacer tube are not disturbed. Torque tighten to the figures quoted in Section N8.
3. On 1989 model year four door cars, an adjustable

lower mounting may be fitted to the lower column support bracket (see fig. N5-2, inset). Adjust if necessary.

4. Fit a new nut to the lower mounting assembly. Torque tighten to the figures quoted in Section N8.

Steering link – To remove and dismantle
(see figs. N5-1 and N5-5)

The lower link unit comprises of an upper safety stalk, a bonded coupling, and a shaft with a universal joint at

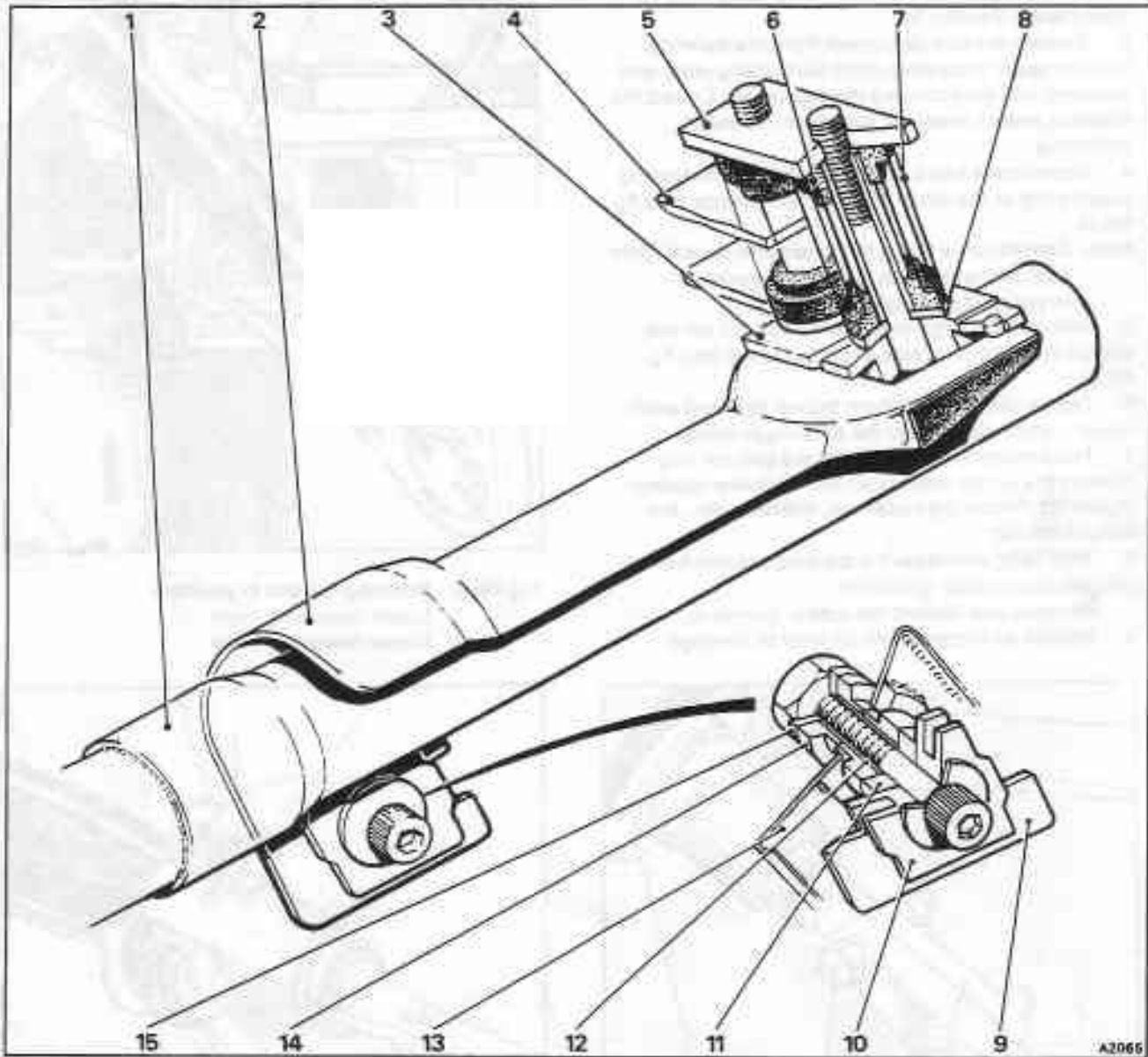


Fig. N5-4 Column mounting points

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

the upper end and splines at the lower end. The shaft connects to a lower universal joint, which in turn is secured to the pinion valve of the steering rack unit.

Note Do not use any impact force to remove a joint on or near to the steering unit, otherwise irreparable damage to the unit will result.

1. Disconnect the battery.
2. Chock the rear wheels.
3. Remove the two bolts securing the steering column link to the steering unit linkage arm.
4. Slacken and remove the pinch bolt securing the linkage arm onto the rack pinion.
5. Carefully remove the steering linkage from the pinion splines.

Cars not fitted with 'one-piece' lower linkage assembly

6. Remove the heatshields from the linkage, and inspect both the universal and bonded couplings.
7. Unscrew and remove the setscrews from the splined shaft coupling flange. Remove the shaft.
8. Remove the safety stalk from the bonded coupling.
9. Remove the pinch bolt which secures the lower universal coupling to the splined shaft. Remove the coupling from the shaft.
10. Inspect the safety stalk, splines, bonded coupling, universal couplings, and screw threads for wear.

Replace any damaged components.

Cars fitted with 'one-piece' lower linkage assembly

The lower steering unit linkage is a 'one-piece' assembly and cannot be dismantled. Therefore, if a fault is suspected, the complete assembly must be replaced.

Steering link – To assemble and fit

(see figs. N5-1, N5-5, N5-6, and N5-7)

Cars not fitted with 'one-piece' lower linkage assembly

1. Fit the linkage arm to the bonded coupling.
2. Fit the safety stalk to the coupling. Line up the holes in the universal coupling flange with the safety stalk and coupling. Fit the two inserts into the universal coupling flange and secure the assembly using the setscrews, washers, and nuts. Torque tighten to the figures quoted in Section N8.
3. Fit the lower universal coupling to the splined shaft, ensuring that the flat on the splined end is in the correct relationship to the pinch bolt. Fit the pinch bolt, washer, and nut.
4. Fit both heatshields.

All cars

5. Ensure that the road wheels are in the straight ahead position. Using either centring plug RH 9119 or RH 12123 (as applicable), ensure that the steering rack is positioned centrally to the blanking plug hole.
6. Replace the blanking plug.
7. Ensure that the steering column link joint face is facing downwards.
8. Fit the steering wheel onto the splines (if removed), giving the nearest straight ahead position. Adjust to give the correct position by turning the wheel slightly (if necessary).

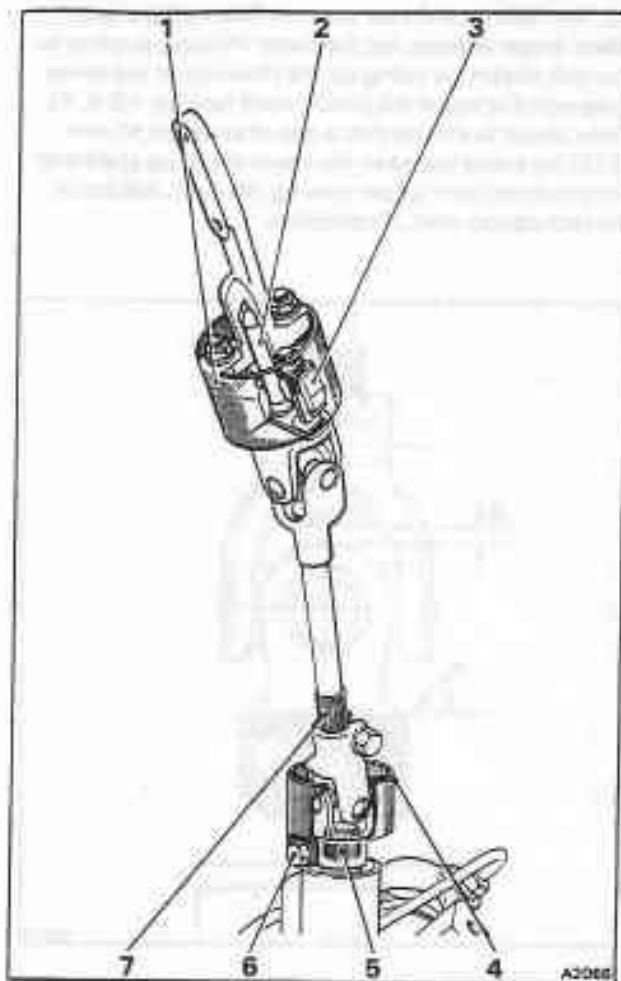


Fig. N5-5 Column to steering unit linkage

- 1 Heatshield
- 2 Safety stalk
- 3 Bonded coupling
- 4 Heatshield
- 5 Spline
- 6 Pinch bolt
- 7 Adjustable spline

9. Align the column link face to the lower linkage arm face (see fig. N5-1). Fit the splined coupling onto the pinion box spline. **Ensure that on 1989 model year cars the pinch bolt aligns with the flat on the 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 must be made by repeating Operations 8 and 9.

11. Fit the two 'fitted' bolts into the underside of the steering column linkage (see fig. N5-1).

Note On cars not fitted with a 'one-piece' lower linkage, fit a nut only to the lower bolt (adjacent to the bonded coupling), and a nut and washer to the upper bolt (adjacent to the toeboard).

On cars fitted with a 'one-piece' linkage, fit nuts and washers to both bolts.

Torque tighten to the figures quoted in Section N8.



12. On 1989 model year cars not fitted with a 'one-piece' lower linkage, set the lower linkage coupling to the rack pinion, by lining up the shoulder of the lower yoke with the top of the pinion shaft (see fig. N5-6, A). Then, check to ensure that a gap of at least 0,50 mm (0.020 in) exists between the lower coupling shaft and the universal joint spider (see fig. N5-6, B). Adjust on the rack pinion shaft, if necessary.

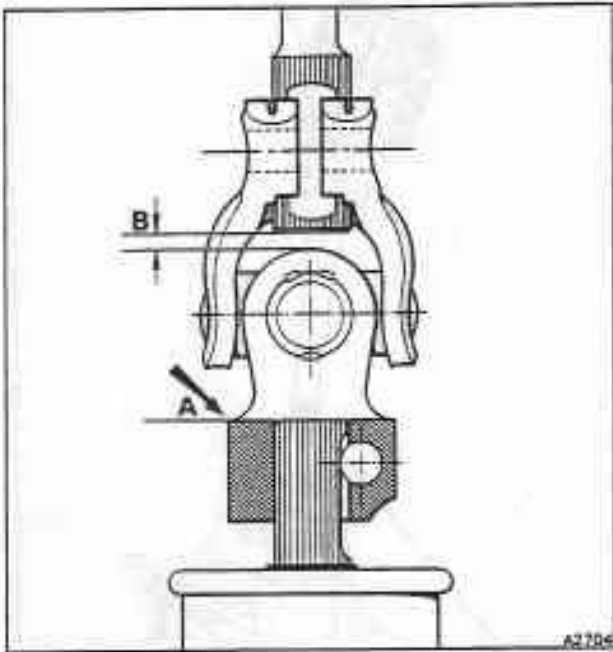


Fig. N5-6 Column to steering unit linkage (1989 model year cars not fitted with 'one-piece' lower linkage)

Note It is important that neither the pinion shaft or lower coupling shaft contact the universal joint spider.

Torque tighten the lower pinch bolts and castellated nuts to the figures quoted in Section N8, utilizing the torque allowance to allow the fitting and securing of the new split pins.

13. On 1989 model year cars fitted with a 'one-piece' lower linkage, set the lower linkage coupling to the rack pinion using tool RH 12122 as follows.

- Slide the lower yoke fully down on the rack input shaft spline.
- Insert tool RH 12122 between the two pivots as shown in figure N5-7.
- Slide the lower yoke up the input shaft until the tool is 'pinched' between the two pivots.
- Tighten the lower pinch bolt.
- Remove the tool RH 12122.
- Check to ensure that a gap of at least 0,50 mm (0.020 in) exists between the top of the pinion input shaft and the lower pivot shaft (see fig. N5-7, A).
- Torque tighten the pinch bolt to the figures quoted in Section N8, utilizing the torque allowance to allow the fitting and securing of a new split pin.

All cars

14. Fit and torque tighten the steering wheel to column nut, to between 34 Nm and 38 Nm (3,5 kgf m and 3,8 kgf m; 25 lbf ft and 28 lbf ft).

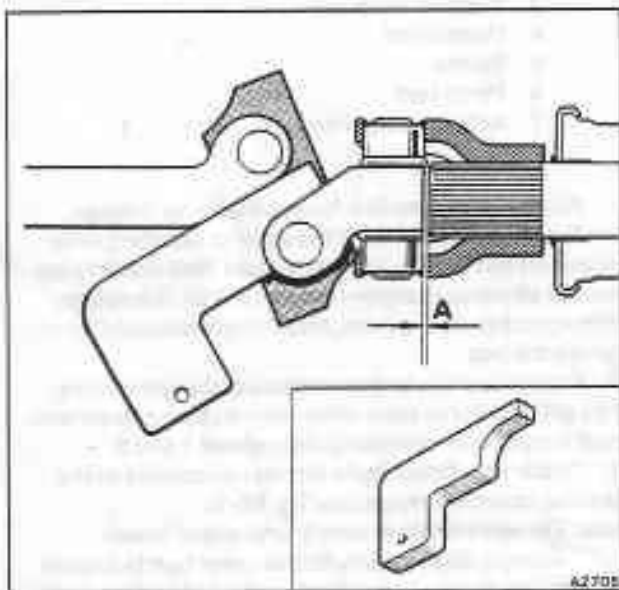


Fig. N5-7 Column to steering unit linkage (1989 model year cars fitted with 'one-piece' lower linkage)



Steering linkage

Introduction

The track rod assemblies incorporate maintenance free ball joints, which are lubricated and sealed for life during manufacture. Therefore, if either of the ball joints is worn, the complete track rod has to be fitted.

The track rods which are 'handed' should be fitted with the adjusters inboard, the clamp bolts to the front of the car, and the bolt head uppermost (see fig. N6-1, inset B).

Track rods – To renew

1. Drive the car onto a ramp. Chock the rear road wheels.
2. Remove fuse A6 from fuse panel F2 on the main fuseboard. Then, raise the ramp to a convenient working height.
3. Remove the split pin and castellated nut from the inner and outer track rod ends.
4. **With the engine running**, turn the steering to full lock. Switch off the engine and release the inner ball-

pin from its taper using tool RH 9710.

With the engine running, turn the steering to the opposite full lock. Switch off the engine and release the remaining inner ball-pin, again using tool RH 9710.

Withdraw the ball-pin(s) from the inner ball joint bracket.

5. Support the track rod assembly. Using tool RH 9710, release the outer ball-pin(s) from its taper.
6. Remove the track rods from beneath the car.
7. Inspect the track rod assembly and associated components for wear or damage.
8. Replace any components, if necessary.
9. Clean the tapers of the side steering levers, inner ball joint bracket, and ball-pin joints.
10. Reverse the procedure for assembly. Torque tighten the nuts to the figures quoted in Section N8.

Inner ball joint bracket – To renew

1. Drive the car onto a ramp. Chock the rear road wheels.

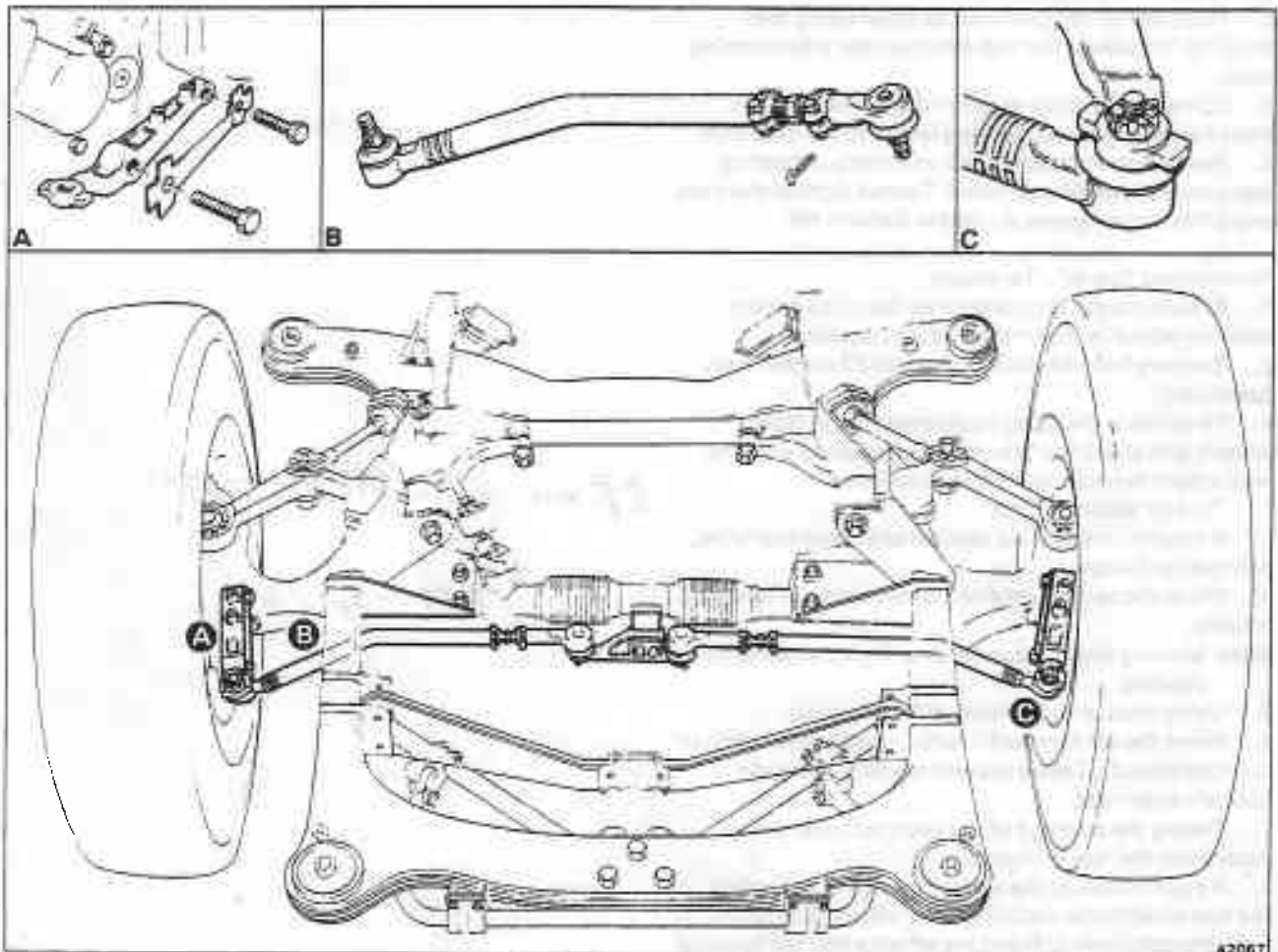


Fig. N6-1 Steering linkage



2. Disconnect the battery. Then, raise the ramp to a convenient working height.
3. Straighten the tab-washer tangs. Remove the bolts holding the inner ball joint bracket to the steering rack. When removing the bolts, care must be taken not to disturb the steering rack centre block oil seal.
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 assemblies.
5. Release the ball-pin from its taper using tool RH 9710.
6. Reverse the procedure for assembly, ensuring that a new tab-washer is fitted.

Torque tighten the nuts and bolts to the figures quoted in Section N8.

Side steering levers – To renew

1. Drive the car onto a ramp. Chock the rear road wheels.
2. Disconnect the battery. Then, raise the ramp to a convenient working height.
3. Carefully remove the hydraulic pipe mounting bracket from the side steering lever(s) and ease away from the working area.
4. Remove the split pin and castellated nut from the outer ball-pin assemblies.
5. Support the track rod(s).
6. Release the ball-pin from its taper using tool RH 9710. Withdraw the ball-pin from the side steering lever.
7. Straighten the tab-washer tangs. Remove the bolts holding the side steering levers to the stub axle.
8. Reverse the procedure for assembly, ensuring that a new tab-washer is fitted. Torque tighten the nuts and bolts to the figures quoted in Section N8.

Front wheel 'toe-in' – To adjust

1. Ensure the car is on a level surface and set the steering wheel in the straight ahead position.
2. Remove fuse A6 from fuse panel F2 on the main fuseboard.
3. Fit suitable checking equipment to the front wheels and check the 'toe-in' in accordance with the equipment manufacturer's instructions.

'Toe-in' setting $12' \pm 5'$.

If electronic checking equipment is not available, proceed as follows.

4. Move the car forward half a revolution of the road wheels.

Note Moving the car rearwards will give an incorrect reading.

5. Using optical equipment, take a reading.
6. Move the car forward a further half a revolution of the road wheels. Take a second reading using the optical equipment.
7. Taking the average of the two readings, will determine the 'toe-in' figure.
8. If a correction to the setting is required, slacken the two pinch bolts securing the track rod adjusters. Turn the adjusters to bring the wheels into the straight ahead (zero 'toe-in') position.
9. Turn the adjusters by equal amounts on each side

of the car to give an overall 'toe-in' range of $12' \pm 5'$, with the car in a 'levelled' condition (see Chapter G).

10. Tighten the adjuster pinch bolts and again check the 'toe-in' as described in Operations 4 to 7 inclusive.
11. Finally, torque tighten the pinch bolts to the figures quoted in Section N8. Use the torque tolerance to enable new split pins to be fitted.

25 mm with 712 mm tyres

712 sin(7')



Fault diagnosis

Symptoms	Possible cause	Action
Steering pump and reservoir Hydraulic fluid leaks	<ol style="list-style-type: none"> 1. Filler cap seal leaking due to fluid level too high, or air in fluid. 2. Faulty hose connections and/or perforated rubber. 3. Flow control valve outlet 'O' ring, or pressure plate/end plate 'O' rings leaking. 4. Steering pump bearing oil seal leaking. 5. Reservoir filler cap seal damaged. 	<ol style="list-style-type: none"> 1. Check oil level and top-up if required. Bleed system of air by operating steering (engine running). Examine cap for damage or distortion. 2. Renew hoses. 3. Renew 'O' rings as necessary. 4. Renew seal. Examine shaft for wear or damage. 5. Renew seal.
Momentary increase in effort when turning wheel quickly	<ol style="list-style-type: none"> 1. Low fluid level in reservoir. 2. Pump drive belts slipping. 3. Heavy internal fluid leak. 4. Aerated fluid. 	<ol style="list-style-type: none"> 1. Check fluid level. Examine system for leaks. Top-up if required. 2. Adjust pump drive belts. Renew belts if necessary. 3. Check pump outlet pressure. If pressure is low, renew combined flow control/relief valve. If pressure remains low, check system for internal leaks by dismantling the steering unit. 4. Renew fluid or allow system to stand for at least one hour.
Noisy system	<ol style="list-style-type: none"> 1. Low fluid level. 2. Loose drive belts. 3. Excessive back pressure due to partially blocked pipes or resistance to steering gear movement. 4. Faulty fluid cooler. 5. Defective flow control valve. 6. Scored pressure plate. 7. Vanes incorrectly fitted. 8. Vanes sticking in rotor slots. 9. Extreme wear on pump ring. 10. Face of thrust plate scored. 11. Scored rotor. 12. Aerated fluid. 	<ol style="list-style-type: none"> 1. Check for leaks. Fill the system with the approved fluid and bleed by operating the steering (engine running). 2. Adjust drive belts. Renew belts if necessary. 3. Locate restriction and correct as necessary. 4. Renew cooler. 5. Renew valve. 6. Lap to remove light scoring. Renew heavily scored components. 7. Fit vanes correctly, radiused ends to pump ring. 8. Free vanes by removing burrs, foreign matter, etc. 9. Renew pump ring, rotor, and vanes. 10. Lap to remove light scoring. Renew rotor, vanes, and pump ring if rotor is heavily scored. 11. Lap to remove light scoring. Renew heavily scored components. 12. Change fluid or allow system to stand for at least one hour.



Symptoms
Steering

Car pulls to one side

Possible cause

1. Front end geometry incorrect.
2. Pump drive belts slipping.
3. Flow control valve sticking.

Action

1. Check steering geometry.
2. Adjust drive belts. Renew belts if necessary.
3. Examine flow control valve. Renew valve if necessary.

Heavy steering

1. Incorrect tyre pressures.
2. Tyre pull.
3. Loose pump drive belts.
4. Low fluid level in reservoir.
5. Insufficient fluid pressure.
6. Faulty or obstructed flow control valve.
7. Incorrect front wheel alignment (toe-in).
8. Incorrect caster and/or camber angle.
9. Distorted flexible coupling or defective universal joint (lower steering column).
10. Triangle levers misaligned.
11. Front sub-frame distorted.
12. Kinks in hoses.
13. Obstruction in hose. Inner casing of hose swollen, caused by overheated or wrong fluid.
14. Pressure loss in rack and pinion unit caused by worn PTFE seals and scored bores.
15. Leakage at pinion valve.

1. Check and correct tyre pressures.
2. Check by fitting different tyres.
3. Adjust drive belts. Renew belts if necessary.
4. Examine system for leaks. Top-up if required.
5. Check the pump outlet pressure.
6. Check and replace if necessary.
7. Check and adjust if necessary.
8. Check and adjust if necessary.
9. Examine and renew if necessary.
10. Check caster and camber angles.
11. Check sub-frame for correct alignment. Correct or renew if necessary.
12. Ensure correct run of hoses.
13. Renew hose.
14. Overhaul unit.
15. Overhaul unit.

Steering wheel

Excessive play at the steering wheel

1. Steering wheel securing nut loose.
2. Excessive play in the steering linkage.
3. Insufficient pre-load.
4. Defective bonded coupling.
5. Worn universal joints in lower linkage.
6. Front wheel bearings incorrectly adjusted or worn.

1. Tighten nut.
2. Adjust steering linkage or renew parts if required.
3. Strip and rebuild steering unit.
4. Renew coupling.
5. Renew joints.
6. Adjust bearings or renew if necessary.

Rack and pinion unit

Oil leak from centre linkage

1. Convuluted seal clips loose.
2. Damaged convoluted rubber boot(s).
3. Defective centre seal.

1. Tighten clips.
2. Renew rubber boot(s).
3. Fit a new seal.

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 hoses for cracks or damage. Renew 'O' rings or hoses if necessary.

Special torque tightening figures

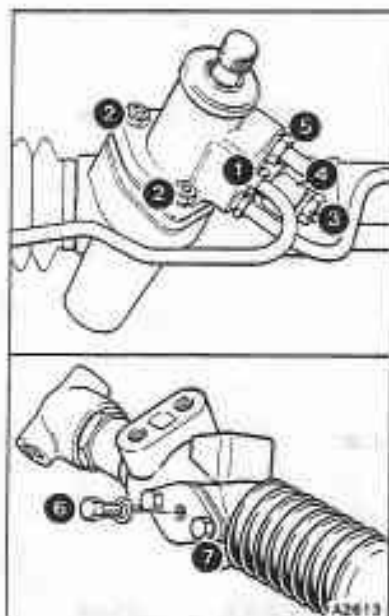
Introduction

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

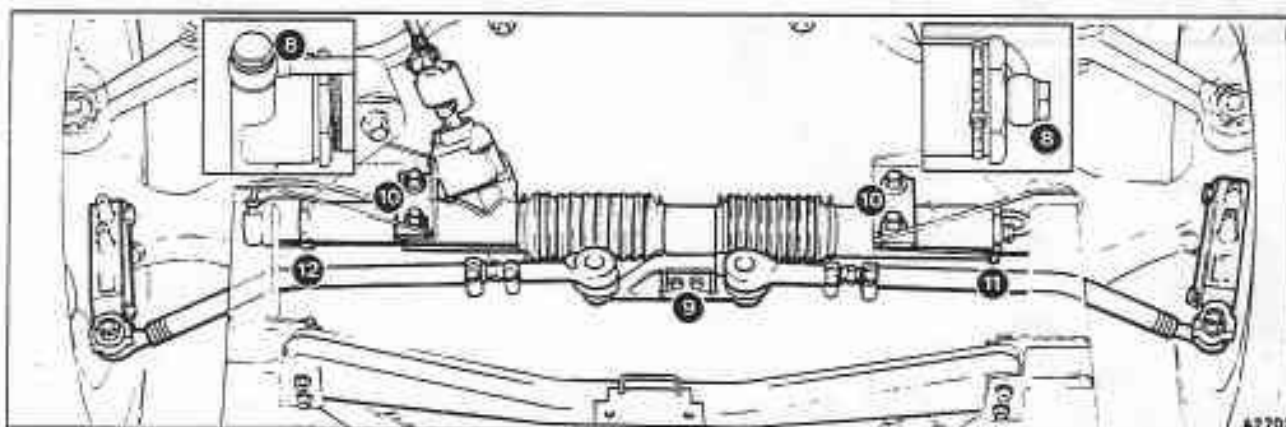
For standard torque tightening figures refer to Chapter P.

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 N2

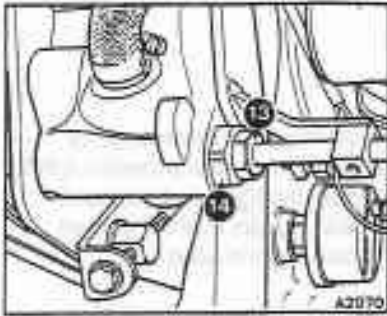


Ref.	Component	Nm	kgf m	lbf ft
1	Steering rack to pinion valve pipe assemblies – male nut	23-27	2,4-2,7	17-20
2	Pinion valve housing – retaining nuts/setscrews	20-25	2,0-2,5	15-18
3	Pump to pinion valve housing – male nut	28-40	2,8-4,1	20-30
4	Anti-joggle valve assembly – housing	28-40	2,8-4,1	20-30
5	Pinion valve housing – male nut	28-40	2,8-4,1	20-30
6	Rack centring – blanking plug	7-11	0,7-1,1	5-8
7	Rack slipper cover plate – setscrews (1989 model year)	20-25	2,0-2,5	15-18
8	Steering rack – banjo bolts (1989 model year)	35-41	3,6-4,1	25-30
9	Inner ball joint bracket – setscrew	38-40	3,9-4,1	28-30
10	Steering rack mounting – setscrew	57-61	5,8-6,2	42-45
11	Steering rack – end plug	73-80	7,5-8,1	54-59
12	Steering rack – lock-nut	47-54	4,8-5,5	35-40



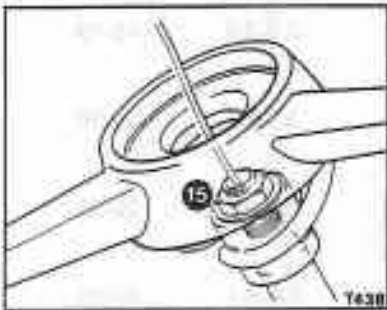


Section N3



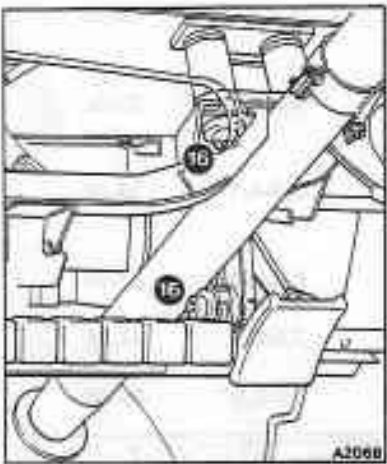
Ref.	Component	Nm	kgf m	lbf ft
13	Steering pump pressure pipe – union	28-40	2,8-4,1	20-30
14	Control valve outlet adapter	50-75	5,1-7,6	37-55

Section N4



15	Steering wheel – nut	34-38	3,5-3,8	25-28
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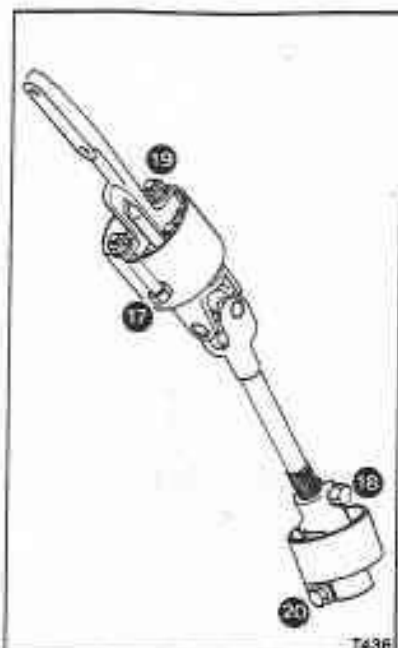
Section N5



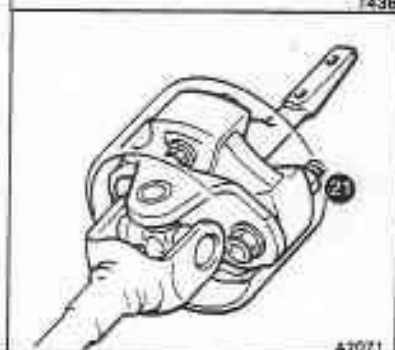
16	Steering column mounting – Allen capscrew	29-32	2,9-3,3	21-24
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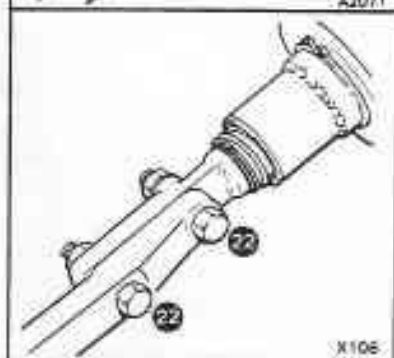
Section N5 (continued)



Ref.	Component	Nm	kgf m	lbf ft
17	Bonded coupling to lower link – setscrew	22-24	2,2-2,4	16-18
18	Input shaft – adjusting spline pinch bolt	15-20	1,5-2,0	11-15
19	Heatshield to rubber coupling – lock-nut	18-20	1,8-2,0	13-15
20	Lower coupling to rack – pinch bolt (pre 1989 model year)	15-20	1,5-2,0	11-15
	Lower coupling to rack – pinch bolt (1989 model year)	15-20	1,5-2,0	11-15

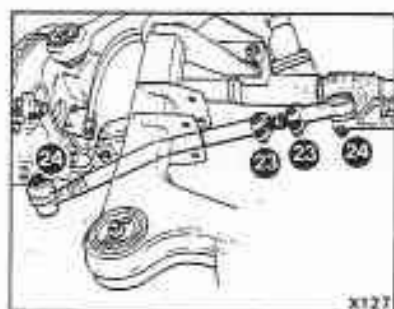


21	Input shaft to bonded coupling – nut	22-24	2,2-2,4	16-18
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22	Steering column linkage – fitted bolts	22-24	2,2-2,4	16-18
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Section N6



23	Track rod clamping – castellated nut	45-54	4,6-5,5	33-40
24	Track rod ball-pin – castellated nut	60 (Then align split pin holes)	6,1	44



Steering racks

Retrospective fitting of the type fitted to 1989 model year cars onto pre 1989 model year cars

The type of steering rack fitted to 1989 model year cars can also be fitted to pre 1989 model year cars, using a special adapter kit. The parts affected are the steering rack and the lower steering column linkage.

Reference must also be made to TSD 4736, Product Support Information N3 and the Parts microfiche.

Procedure

1. Remove the existing rack and lower steering column linkage as described in the relevant sections of this manual.

2. Connect the new lower steering column linkage to the steering column by means of the fitted bolts provided in the kit.

Note On cars not fitted with a 'one-piece' lower linkage, fit a nut only to the lower bolt (adjacent to the bonded coupling), and a nut and washer to the upper bolt (adjacent to the toeboard).

On cars fitted with a 'one-piece' linkage, fit nuts and washers to both bolts.

3. Fit all setscrews and washers provided for the adapter blocks into position, in preparation for fitting the rack. Fit the adapter blocks loosely to the sub-frame (see fig. N9-1).

4. Ensure that the rack is positioned centrally and fit the centralizing tool RH 12123.

5. Fit the rack to the adapter blocks and support it loosely on the setscrews.

6. Centralize the steering wheel and position the

lower steering column linkage onto the rack splines. Ensure that the flat on the splines aligns with the pinch bolt of the lower linkage. Remove the centring tool RH 12123.

7. Torque tighten all the setscrews securing the rack to the sub-frame, using the special spanner RH 12128 and torque wrench extensions RH 12124 and RH 12125 as necessary. Refer to Section N8 for the torque tightening figures.

8. Adjust the lower steering column linkage as described in Section N5.

9. Connect all ancillaries and adjust the steering wheel position if necessary.

Note A clearance of 9 mm (0.350 in) minimum must exist between the top of the track rod ends and the underside of the engine sump. If insufficient clearance exists, use the packing piece provided in the kit, under the front engine mount. Check the clearance again after fitting the packing piece.

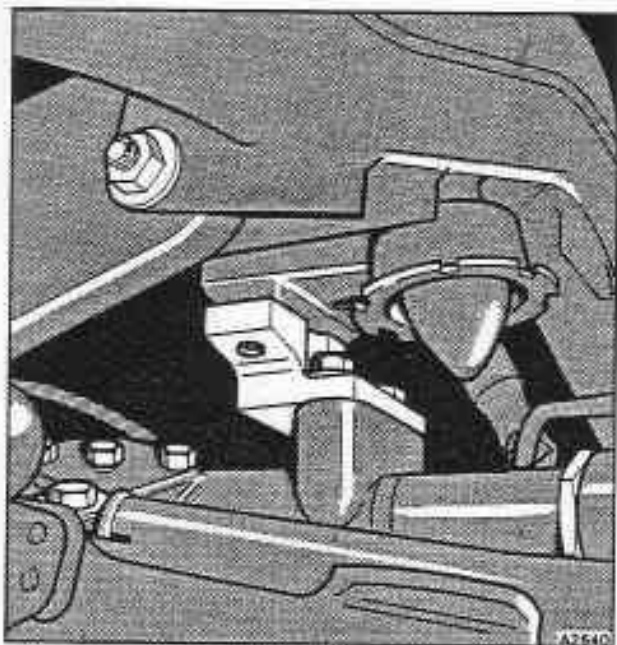


Fig. N9-1 Modified arrangement – adapter blocks to sub-frame



Workshop tools

Rack and pinion unit

RH 9112	Sizing tool (small) – PTFE scarf jointed bearing
RH 9113	Sizing tool (medium) – PTFE scarf jointed bearing
RH 9114	Sizing tool (large) – PTFE scarf jointed bearing
RH 9117	Applicator – PTFE rings and lower seal, pinion valve
RH 9118	Sizing tool – PTFE rings, pinion valve
RH 9119	Screwed location plug – Rack centring (pre 1989 model year)
RH 9120	Spline cover – Input shaft, upper and lower oil seals
RH 9121	Applicator – Input shaft, lower oil seal into carrier
RH 9122	Torque wrench extension – Steering rack anchorage (pre 1989 model year)
RH 9123	Torque arm – Checking pinion valve ball race pre-load; use with a spring balance (pre 1989 model year)
RH 9125	Spanner (open ended) – Torque wrench, rack lock-nut
RH 12122	Setting tool – 'One-piece' lower linkage (1989 model year)
RH 12123	Screwed location plug – Rack centring (1989 model year)
RH 12124/5	Torque wrench extensions – Steering rack anchorages (1989 model year)
RH 12128	Spanner – Steering rack anchorages (1989 model year rack to pre 1989 model year cars)
RH 12212	Clip pliers – Convolute seals (1989 model year)
RH 12213	Removal tool – Fixed bearing carrier, rack bar
RH 12214	Fitting tool – Piston seals, rack bar

Steering pump

RH 9106	Fitting and extraction tool – Pulley
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Steering linkage

RH 9710	Ball-pin taper breaker – Inner and outer ball-pins
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