

CHAPTER 9

FRONT SUSPENSION AND HUBS

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9:1 Description

Independent front wheel suspension is by means of MacPherson struts. These suspension struts incorporate helically coiled springs controlled by double-acting hydraulic telescopic dampers. The damper units also act as pivots for the front wheel hub assemblies to accommodate steering movement. The suspension springs are fitted coaxially to the damper struts between two pressed steel support cups.

The upper ends of the suspension struts are attached to the undersides of the wheel arches, the lower ends being located by means of control arms and trailing links. Some models are additionally equipped with an anti-roll bar fitted between the outer ends of the control arms. An anti-roll bar can be fitted to models not so equipped, if desired, using the mounting points provided at the control arms and on the underbody. Layout of the front suspension components, without anti-roll bar, is shown in **FIG 9:1**.

The suspension ball joints are packed with lubricant on assembly and sealed for life, so apart from a periodic check on the general condition of all suspension components, no routine maintenance is required.

Note that certain special tools will be needed in order to carry out some of the overhaul work described in this

chapter and the owner would be well advised to check on the availability of these tools or suitable substitutes before tackling the items involved.

9:2 Front hubs

The front hubs are mounted on taper roller bearings and the wheel bolts are splined and pressed into the hub flange. A spring-loaded lip-type seal is incorporated in the hub at the inner end and the hub is retained on the stub axle by a special washer, slotted nut and splitpin. **FIG 9:2** shows a section through the front hub assembly.

Checking hub bearings:

Jack up the front of the car so that the road wheels are clear of the ground. Spin the wheels and check that they rotate freely without bearing noise, taking care not to confuse noise from the brake with that from a defective bearing. Grasp the tyre at the top and bottom of the wheel and attempt to rock the top of the wheel in and out while noting the play. Repeat the test with the tyre gripped at each side of the wheel. If excessive play is evident, the wheel bearings should be adjusted first and, if roughness is still apparent, the bearings should be dismantled for inspection.

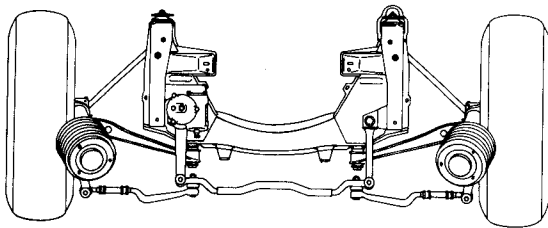


FIG 9:1 Layout of front suspension and steering gear

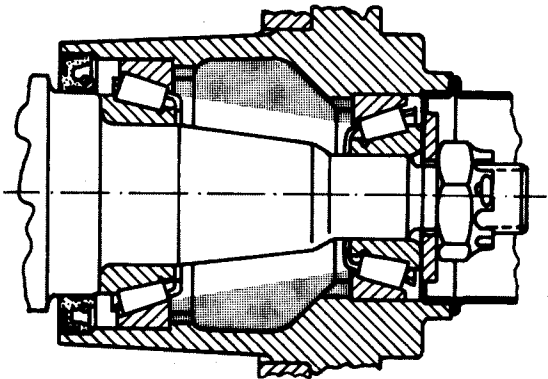


FIG 9:2 Section through front hub assembly

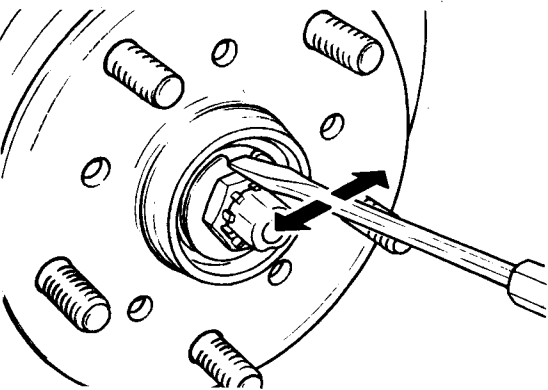


FIG 9:3 Checking movement of special washer

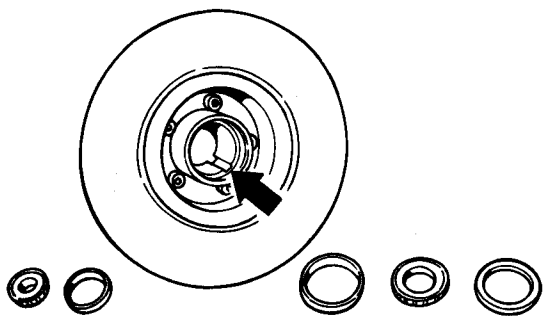


FIG 9:4 Hub and wheel bearing components

Adjustment:

Jack up the front of the car and remove the road wheel. Carefully pull the grease cap from the centre of the hub. Remove the splitpin and tighten the nut to a torque of 1kgm (7.23lb ft) while turning the wheel hub. This aligns the bearing rollers and inner races and presses out any grease which might cause play. Now loosen the nut by approximately a quarter turn and check that the special washer can be moved in each direction without excessive force, using a screwdriver as shown in FIG 9:3. Hub end float should be between 0.02 and 0.06mm (0.0008 and 0.0024in), aiming to obtain the minimum value. End float is best measured using a dial gauge assembly. When the bearings are correctly adjusted, slacken the nut a fraction more if necessary to align the splitpin hole, then insert and lock a new splitpin. 20g (0.7oz) of approved grease should be placed inside the cleaned grease cap, which should then be carefully tapped into position.

Removal:

Slacken the wheel nuts and raise the front of the car on to stands. Remove the road wheel. Remove the brake caliper as described in **Chapter 11** and wire it to the suspension to avoid straining the hoses.

Remove the grease cap from the hub. Remove the splitpin, hub nut and special washer. Remove the hub and brake disc assembly from the stub axle. Collect the inner race of the outer bearing as it comes free. Remove the grease seal from the hub and remove the inner race of the inner bearing.

Servicing:

Wipe the old grease from the hub, bearings and grease cap, then thoroughly degrease the parts in paraffin or a similar solvent. Wash the bearing races separately by rotating them in a bowl of clean solvent. The brake disc must be thoroughly washed with solvent to remove all traces of grease or dirt.

Examine the operating face of the stub axle on which the grease seal operates for scoring or nicks. Light damage can be smoothed with fine grade emerycloth. Check the stub axle for hairline cracks or other damage, which would dictate renewal.

Check the outer races of the bearings in the hub for fretting, scoring or wear. If damage is found, both outer races must be driven out evenly with a suitable copper drift, working through the access slots provided in the hub (see arrow in FIG 9:4). Both bearings must then be renewed complete.

Lubricate the inner races with light oil. Press each inner race firmly back into its outer and rotate the bearing to check for any roughness in operation. Dirt can be a cause of roughness, so wash the bearing again thoroughly before repeating the test. If an air-line is used to dry the bearings, do not allow them to spin in the air blast as this chips the faces. If a bearing is defective, both bearings must be completely renewed, including the outer races in the hub.

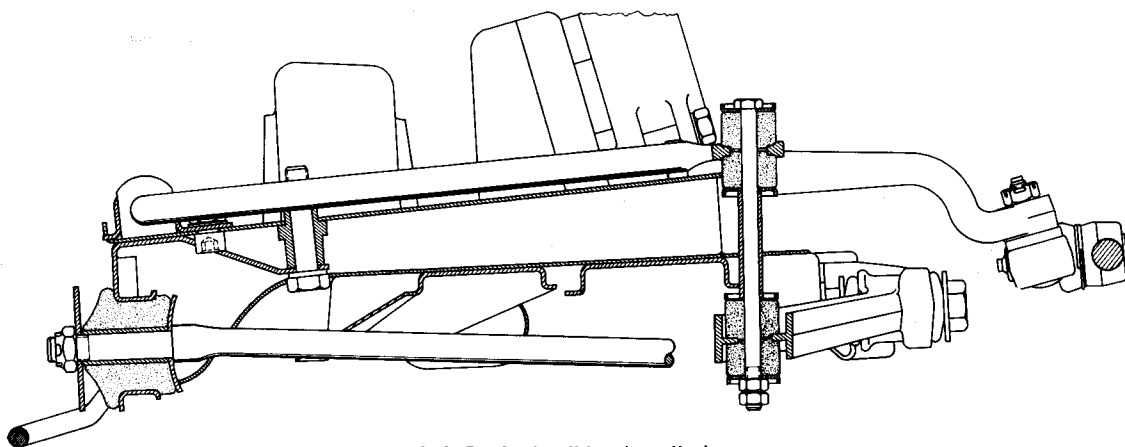


FIG 9:5 Anti-roll bar installation

Reassembly:

If the outer races of the hubs have been removed, they or the new components should be driven back evenly and fully using a suitable drift.

The wheel bearings must be lubricated with approved grease. Evenly pack the inside of the hub between the bearing positions using 50g (1.8oz) of grease. Liberally pack the inner race of the inner bearing, working the grease well into the rollers. Install this bearing into the hub and press a new grease seal into the hub to retain the race in position.

Slide the hub assembly back on to the stub axle, taking care not to damage the seal. Pack the inner race of the outer bearing with grease and fit it back into place, followed by the special washer and nut. Adjust the wheel bearing as described previously. Apply 20g (0.7oz) of grease to the inside of the grease cap, then refit to the wheel hub. Refit the brake caliper as described in **Chapter 11**, then pump the brake pedal hard several times to make sure that the brake is correctly adjusted. Refit the road wheel and lower the car to the ground.

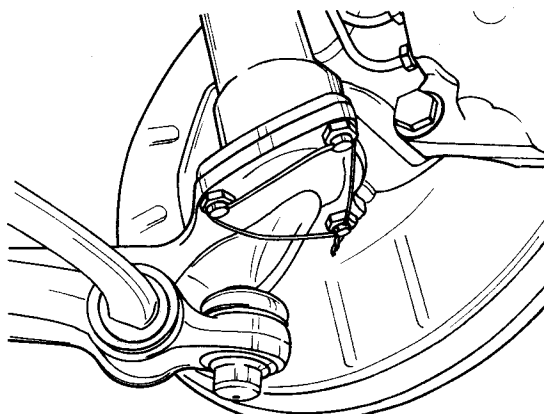


FIG 9:6 Steering arm to suspension strut attachments

9:3 Anti-roll bar

The anti-roll bar, if fitted, is attached to the underbody by rubber bushed mountings and to the outer ends of the control arms by means of rubber bushed links (see FIG 9:5). Removal and installation of the anti-roll bar are straightforward operations. Examine the condition of the rubber bushes and renew any found perished, worn or otherwise damaged. Make sure that the rubber parts are free from grease and dirt.

9:4 Control arms and trailing links

Removal:

Raise the front of the car and support safely on floor stands so that the front suspension is allowed to hang free. If an anti-roll bar is fitted, it must be disconnected on each side of the car by detaching the lower ends of the links from the control arms (see FIG 9:5).

Refer to FIG 9:6. Remove the securing wire and detach the three nuts to disconnect the steering arm from the suspension strut. Remove the securing nut,

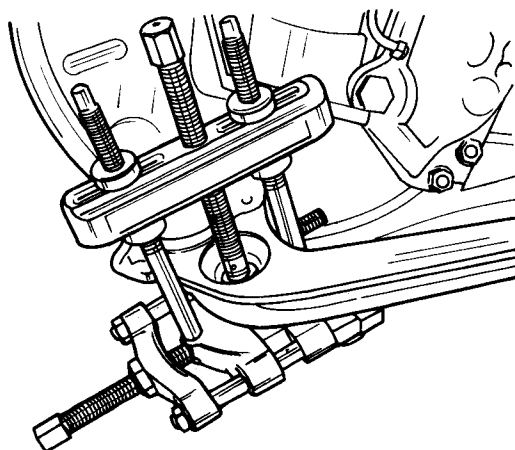


FIG 9:7 Pressing control arm ball joint from steering arm

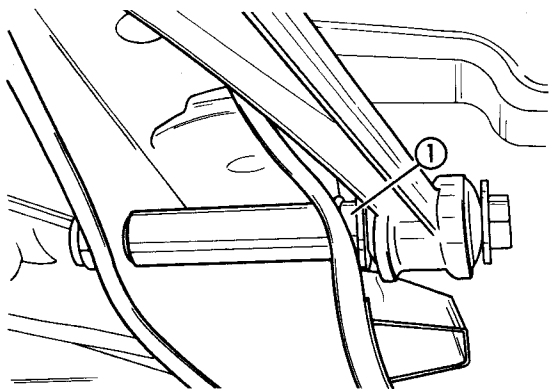


FIG 9:8 Control arm to crossmember mounting

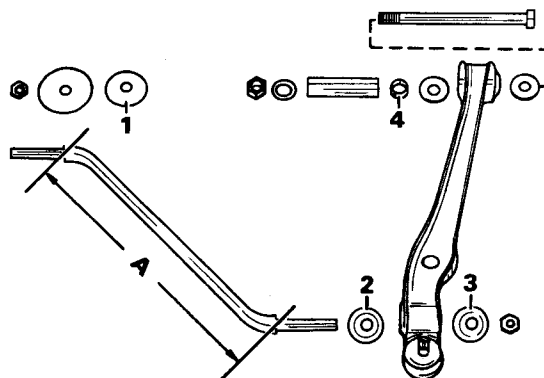


FIG 9:11 Control arm and trailing link components

then press the control arm ball joint from the steering arm using the Kukko extractor or other suitable tool as shown in FIG 9:7.

Refer to FIG 9:8 and disconnect the control arm from the front axle crossmember, noting the position of spacer ring 1. Unlock and remove the slotted nut arrowed in FIG 9:9 to detach the front end of the trailing link from the underbody. Remove the control arm and trailing link complete. If necessary, unlock and remove the slotted nut to detach trailing link from control arm (see FIG 9:10). Note that convex outer radius of washers 1 must face the rubber bush.

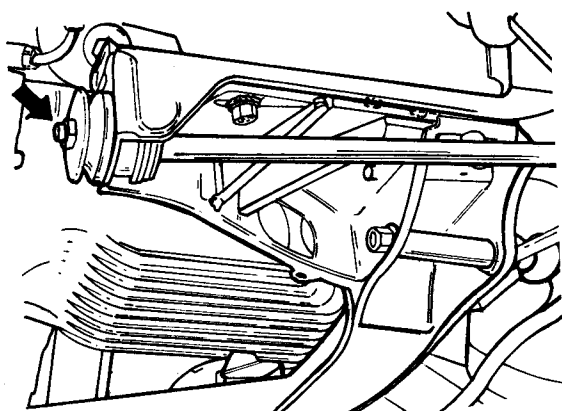


FIG 9:9 Trailing link connection to underbody

Servicing:

Check the axial play of control arm ball joint as shown at S in FIG 9:10. If play exceeds 2.4mm (0.0945in), the ball joint or, possibly the complete control arm assembly, must be renewed. A control arm with a stop as shown at A may be installed in conjunction with a steering arm without a stop, but a control arm without a stop must never be installed in conjunction with a steering arm having a stop (see also Chapter 10).

Examine all trailing link and control arm components, which are shown in FIG 9:11, for wear or damage and renew as necessary. If the trailing link is renewed, note that dimension A must be 355mm (13.977in).

Check the rubber bushes in front axle carrier and control arm for wear, perishing or other damage. To renew the front axle carrier bush, use a suitable bolt, nut, washer, metal plate and tube (see FIG 9:12). Tube internal diameter should be 68mm (2.677in). Use the same tools to install the new bush from the opposite direction, smearing the front edge of the bush with soft soap before pulling into position. In this case, the tube should have an internal diameter of 60mm (2.362in) and 1mm (0.0394in) wall thickness. The control arm rubber bush is renewed in a similar manner to that just described, using a tube with 35mm (1.378in) inside diameter (see FIG 9:13). Smear the front edge of the new rubber bush with soft soap to facilitate installation.

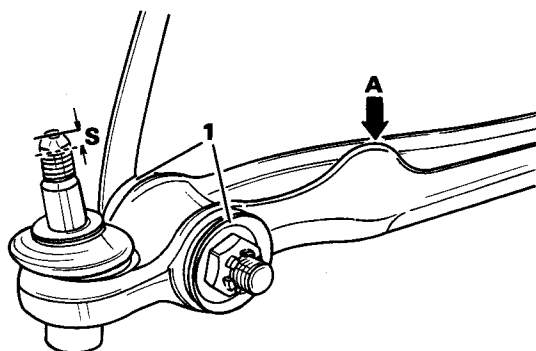


FIG 9:10 Trailing link connection to control arm

Reassembly:

This is a reversal of the removal procedure, noting the following points.

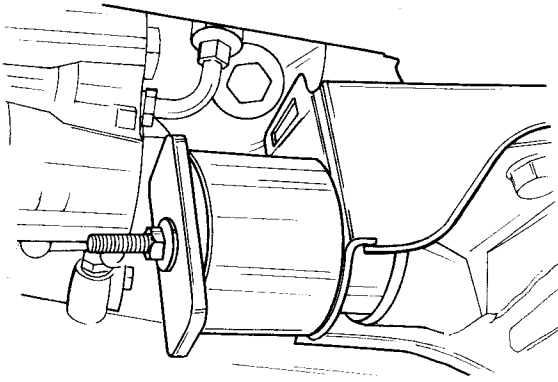


FIG 9:12 Removing front axle carrier bush

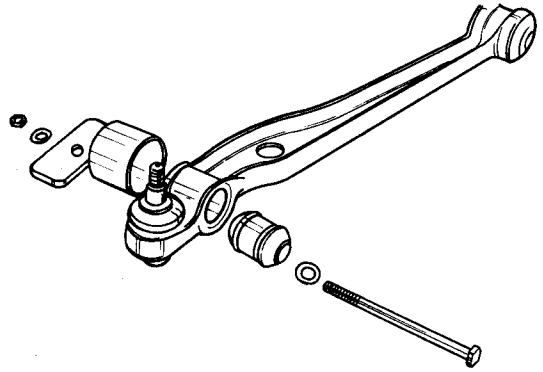


FIG 9:13 Removing control arm bush

The convex outer sides of washers 1, 2 and 3 shown in **FIG 9:11** must face the rubber bushes. Note the correct position of spacer ring 4, which is also shown at 1 in **FIG 9:8**. Tighten the fixings of the control arm to front axle crossmember and trailing link to underbody loosely at first, then fully tighten to the specified torque with the car resting on its road wheels under the correct static load. For these purposes, static load is with a weight of $2 \times 65\text{kg}$ ($2 \times 143\text{lb}$) on front seats, $1 \times 65\text{kg}$ ($1 \times 143\text{lb}$) on rear seat, and 30kg (66lb) in luggage compartment on the lefthand side. Additionally, the fuel tank must be full. Lock the slotted nut securing the trailing link to the underbody with a new splitpin. Use a new piece of soft wire to lock the nuts securing the steering arm to suspension strut (see **FIG 9:6**).

9:5 Suspension struts

Removal:

Raise the front of the car and safely support on floor stands so that the suspension hangs free. Remove the road wheel. Refer to **Chapter 11** and detach the brake caliper, without disconnecting the fluid pipes. Wire the caliper to the underbody to prevent strain on the brake hoses.

Disconnect the outer end of the control arm from the suspension strut as described in **Section 9:4**. Remove the three nuts securing the upper end of the suspension strut to the wheel arch (see **FIG 9:14**), then remove the suspension strut assembly from the car.

Dismantling:

Note that suspension strut assemblies or damper units must only be installed in pairs, so that the components are correctly matched on each side of the car. If necessary, remove the brake disc and wheel hub components as described in **Section 9:2**.

To remove and refit a coil spring it is essential to use a spring compressor tool, as shown in **FIG 9:15**. Never attempt dismantling procedures without the use of such a tool. Tighten the compressor tool until all spring pressure is removed from the upper spring seat, then refer to **FIG 9:16** and remove sealing cap 1 and unscrew locknut 2. Lock the piston rod and remove suspension strut thrust bearing 3. If the bearing is faulty in any way, it must be

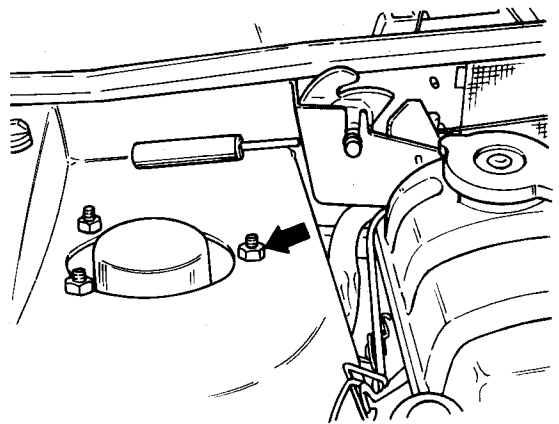


FIG 9:14 Suspension strut upper mounting nuts

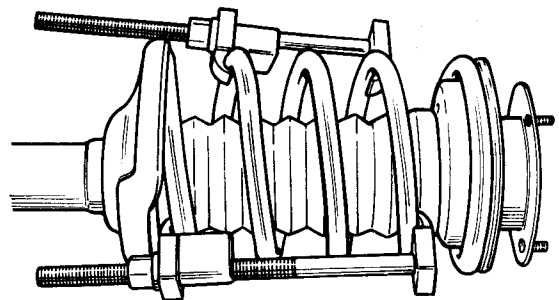


FIG 9:15 Compressing coil spring

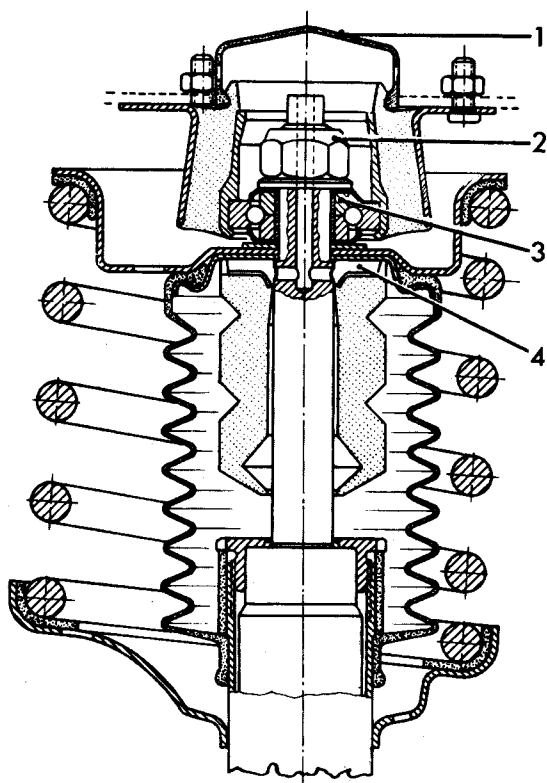


FIG 9:16 Section through suspension strut upper components

renewed complete. Release the spring compressor tool, then remove the coil spring and upper spring seat. If a coil spring is to be renewed, make sure that the springs on each side of the car are properly matched, according to the information given in FIG 9:17. Spring length **A** must be correct according to model type. Spring thickness **B** and spring strength according to markings **C** must be uniform on each side of the car. During installation, the spring ends must be correctly wound into the upper and lower seats.

If the dampers are to be removed, pull the sleeve and auxiliary spring assembly from the suspension strut, then use special tool 6016 or similar to remove the threaded ring, as shown in FIG 9:18. The damper unit can then be lifted from the suspension strut assembly. Note that, before installing a damper to the suspension strut, 50cc of SAE 30 engine oil must be poured into the suspension strut tube. The purpose of this oil is to conduct heat away from the damper unit.

Reassembly:

This is a reversal of the dismantling procedure. Make sure that the bleeder plate is correctly fitted as shown at 4 in FIG 9:16. Ensure that the dished sealing washer then flat washer are installed above the thrust bearing before fitting the locknut, noting that the concave side of the sealing washer must face towards the thrust bearing.

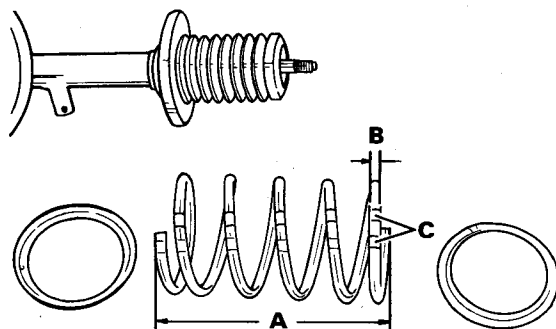


FIG 9:17 Checking coil spring specifications

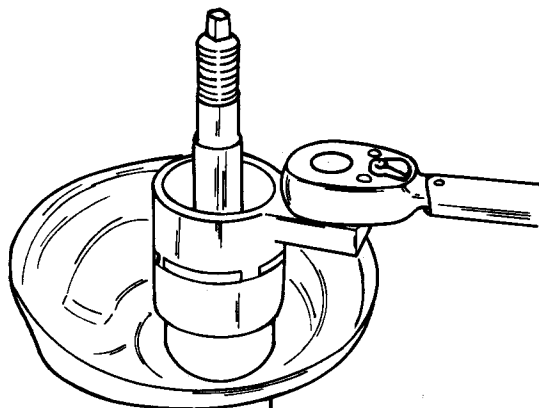


FIG 9:18 Removing threaded ring

Refitting:

This is a reversal of the removal procedure. Use a new piece of soft wire to lock the nuts securing the steering arm to suspension strut assembly (see FIG 9:6). If the wheel hub assembly was dismantled, reassemble and adjust as described in Section 9:2. Refit the brake caliper as described in Chapter 11, not forgetting to pump the brake pedal several times afterwards to correctly adjust the brake.

9:6 Front axle crossmember

Removal:

Refer to Section 9:4 and disconnect the trailing links and control arms from the underbody, supporting the components when detached to prevent strain on the suspension ball joints. Refer to Chapter 10 and detach the steering box from front axle support and tie the unit to the brake servo to prevent damage. Remove the steering idler arm.

Attach suitable lifting equipment to the engine assembly and raise sufficiently to take the weight of the engine from the mountings on the crossmember. Disconnect the crossmember from the underbody at the fixing points arrowed in FIG 9:19 while supporting the weight of the assembly, then remove from beneath the car.

Refitting:

This is a reversal of the removal procedure. Note that the trailing link and control arm attachments must be finally tightened with the car properly loaded, as described in **Section 9:4**.

9:7 Front wheel geometry

Due to the need for special optical measuring equipment for accurate results, the checking and adjusting of front wheel caster and camber angles should be carried out by a fully equipped service station. Correct specifications are given in **Technical Data**. No means of adjustment is provided to compensate for incorrect front wheel geometry, so if faults are found a check should be made for damaged, distorted or incorrectly assembled front suspension components.

The method for setting the correct toe-in of the front wheels is described in **Chapter 10**.

9:8 Fault diagnosis

(a) Wheel wobble

- 1 Worn hub bearings
- 2 Broken or weak front spring
- 3 Uneven tyre wear
- 4 Worn suspension linkage
- 5 Loose wheel fixings
- 6 Incorrect front wheel alignment

(b) Car pulls to one side

- 1 Unequal tyre pressures
- 2 Incorrect suspension geometry
- 3 Defective suspension bushes or damaged parts
- 4 Weak spring on one side
- 5 Fault in steering system

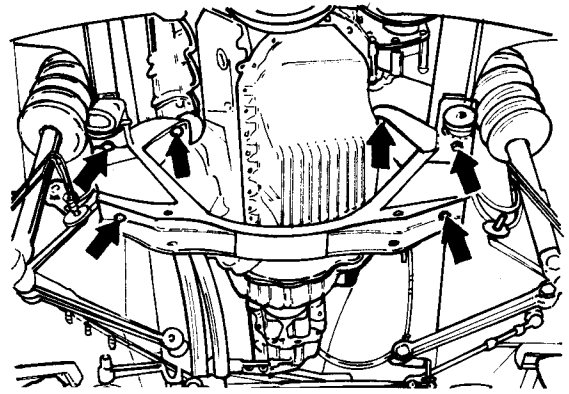


FIG 9:19 Crossmember attachment points

(c) Bottoming of suspension

- 1 Auxiliary suspension units worn or damaged
- 2 Broken or weak coil spring
- 3 Defective damper
- 4 Car overloaded

(d) Excessive body roll

- 1 Check 2 and 3 in (c)
- 2 Defective anti-roll bar (if fitted)

(e) Rattles

- 1 Check 2 and 4 in (a); 2 and 3 in (c)
- 2 Defective mounting bushes
- 3 Loose component fixings

(f) Suspension hard

- 1 Tyre pressures too high
- 2 Springs of wrong specification installed
- 3 Dampers faulty

NOTES