Chapter 10
Suspension and steering

Contents

Degrees of difficulty

Easy, suitable for novice with little experience 

Fairly easy, suitable for beginner with some experience 

Fairly difficult, suitable for competent DIY mechanic 

Difficult, suitable for experienced DIY mechanic 

Very difficult, suitable for expert DIY or professional 

Specifications

General

Front suspension type (all models)	Independent, with MacPherson struts and anti-roll bar
Rear suspension type:	
SOHC models	Semi-independent torsion beam, with trailing arms, coil springs and telescopic shock absorbers. Anti-roll bar on some models. Manual level control system standard on some models, optional on others
DOHC models	Fully independent, with semi-trailing arms, coil springs, telescopic shock absorbers and anti-roll bar
Steering type (all models)	Rack and pinion. Power steering standard on selected models, optional on others
Vehicle condition for “laden” measurements:	
All models	70 kg in each front seat, fuel tank half full
Front suspension (laden):	
Camber	-40’ ± 40’
Castor	+2° ± 1°
Toe in	+15’ ± 10’
Toe out on turns	1° 30’ ± 45’
Max. deviation between wheels on toe out	40’

Vehicle condition for “laden” measurements (continued):	
Rear suspension (laden, after depressing rear of vehicle several times):	
DOHC models:	
Camber	-2° 10’ ± 40’
Toe in	+25’ + 30’/-20’
SOHC models:	
Camber	-1°40’ ± 30’
Toe in	+10’ ± 30’/-20’

Steering

Ratio:	
Manual steering	22 : 1 or 24.5 : 1
Power steering	18 : 1
Power steering fluid type	See Chapter 1 Specifications
Power steering drivebelt tension (measured with Vauxhall gauge):	
New belt	250 to 300 N
Used belt	450 N

Wheels and tyres

Wheel size	5½J x 13, 5½J x 14 or 6J x 15
Tyre size:	
5½J x 13 wheels	165 R13-82T
5½J x 14 wheels	175/70 R14-82T, 195/60 R14-85H, or 195/60 R14-85V
6J x 15 wheels	195/60 R15-87V or 205/55 R15-87V

Torque wrench settings

	Nm	lbf ft
Front suspension - all models		
Anti-roll bar to subframe	20	15
Balljoint to lower arm	60	44
Lower arm to suspension strut balljoint *	70	52
Lower arm to subframe front (horizontal) pivot: *		
Stage 1	100	74
Stage 2	Angle-tighten a further 60°	
Stage 3	Angle-tighten a further 15°	
Lower arm damper weight (where applicable)	20	15
Subframe to underbody bolts: *		
Front	115	85
Centre	170	125
Rear:		
Stage 1	100	74
Stage 2	Angle-tighten a further 75°	
Stage 3	Angle-tighten a further 15°	
Suspension strut upper mounting	55	41
Suspension strut piston rod	55	41
Suspension strut ring	200	148
Rear suspension - SOHC models		
Anti-roll bar	30	22
Rear hub unit (maintenance free type) securing: *		
Stage 1	50	37
Stage 2	Angle-tighten a further 30° to 45°	
Rear hub nut (see Section 10)	25	18
Shock absorber lower mounting	70	52
Shock absorber upper mounting	20	15
Stub axle to trailing arm: *		
Stage 1	50	37
Stage 2	Angle-tighten a further 30° to 45°	
Trailing arm to underbody	105	77
Rear suspension - DOHC models		
Anti-roll bar	22	16
Crossmember mounting bracing bracket to underbody	65	48
Crossmember rear tube to body	60	44
Forward crossmember to body	125	92
Rear hub *	300	221
Semi-trailing arm to crossmember	100	74
Shock absorber lower mounting	110	81
Shock absorber upper mounting	20	15

* = *Use new nuts/locking pins or bolts (as applicable)*

Torque wrench settings (continued)	Nm	lbf ft
Steering		
Steering gear mounting (to bulkhead)	22	16
Steering wheel retaining	25	18
Tie-rod to steering gear	95	70
Tie-rod end clamp	20	15
Tie-rod end to suspension strut balljoint	60	44
Steering shaft to flexible coupling	22	16
Steering gear pinion to flexible coupling	22	16
Steering gear pinion	40	30
Steering gear damper adjuster	60	44
Fluid pipe to power steering gear unions	42	31
Fluid pipe to power steering pump union	28	21
Fluid pipe to pipe and pipe to hose unions	28	21
Power steering pump mounting:		
1.6 litre models (up to 1992)	30	23
1.8 and 2.0 litre models (up to 1992):		
Bolts “A” and “C” (refer to text)	25	18
Bolts “B” (refer to text)	40	30
SOHC models (from 1993)	20	15
DOHC models (from 1993):		
Bolts “1” and “2” (refer to text)	25	18
Bolts “3” and “4” (refer to text)	18	13
Power steering pump pulley (1.6 litre models)	25	18
Steering column to dashboard mounting bracket	22	16
Steering column upper right hand mounting	22	16
Roadwheels		
Roadwheel	110	81

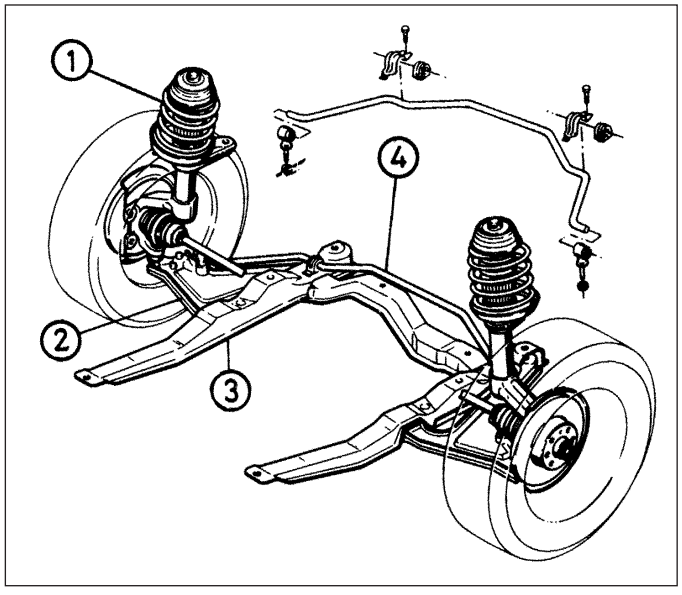
1 General description

1 The front suspension consists of MacPherson struts, lower arms, and an anti-roll bar. The lower arms and the anti-roll bar are mounted on a detachable U-shaped front subframe, which also carried the rear engine/transmission mounting **(see illustration)**.

2 Each lower arm is attached to the subframe by a horizontal front bush and a vertical rear bush. In conjunction with the steering geometry, this arrangement allows the front wheels to steer themselves against any imbalance in the braking forces. This would maintain stability when braking with one side of the vehicle on a slippery surface, and the other on dry tarmac.

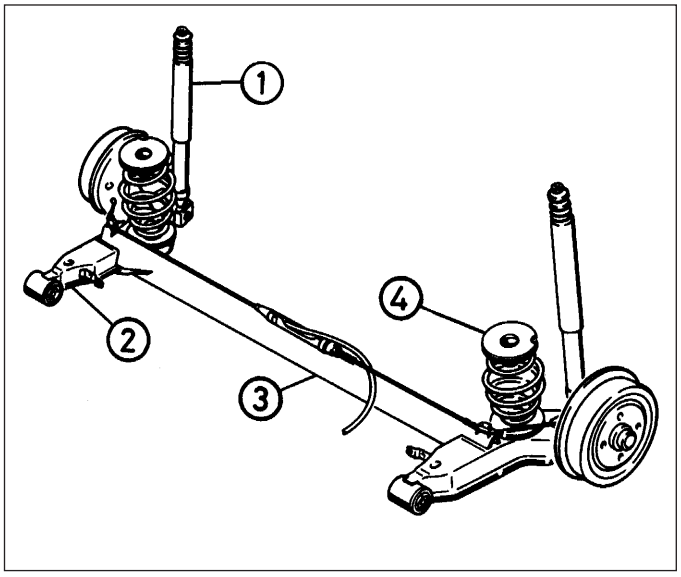
3 The hub carriers are mounted between the lower ends of the MacPherson struts, and the lower arms, and carry the double row ball type wheel bearings and the brake assemblies.

4 The rear suspension on SOHC models is of semi-independent type, consisting of a torsion beam and trailing arms with double-conical coil springs and telescopic shock absorbers. The front ends of the trailing arms are attached to the vehicle underbody by horizontal bushes, and the rear ends are located by the shock absorbers, which are bolted to the underbody at their upper ends.



1.1 Front suspension layout - all models

1 MacPherson strut
2 Lower arm
3 Subframe
4 Anti-roll bar



1.4 Rear suspension layout - SOHC model (model with rear drum brakes shown)

1 Shock absorber
2 Trailing arm
3 Torsion beam
4 Coil spring

The coil springs are mounted independently of the shock absorbers, and act directly between the trailing arms and the underbody. Certain models are fitted with an anti-roll bar, which is mounted between the torsion beam and the rear ends of the trailing arms **(see illustration)**.

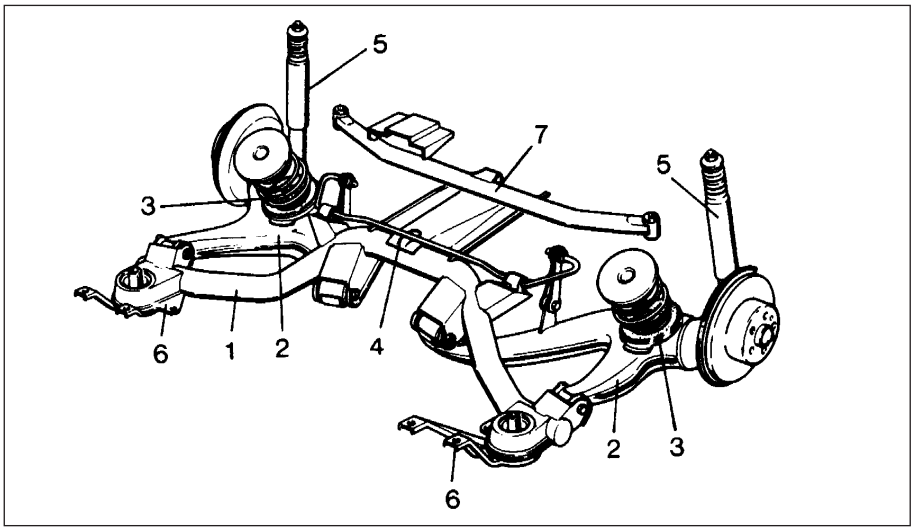
5 A manual rear suspension level control system is available as standard equipment on some models, and as an optional extra on others. The system operates using compressed air filled shock absorbers. The rear suspension level is adjusted by altering the air pressure in the shock absorbers, through a valve located in the luggage compartment.

6 The rear suspension on DOHC models is of fully independent type, consisting of semi-trailing arms, with double-conical coil springs, telescopic shock absorbers and an anti-roll bar. The front end of each semi-trailing arm is attached to a suspension crossmember by two horizontal bushes, and the rear ends are located by the shock absorbers, which are bolted to the underbody at their upper ends. The coil springs are mounted independently of the shock absorbers, and act directly between the semi-trailing arms and the underbody. The anti-roll bar is located on the suspension crossmember, and is attached to each semi-trailing arm by a vertical link. The suspension crossmember is bolted directly to the vehicle underbody at its forward end **(see illustration)**.

7 The steering gear is of rack-and-pinion type. Movement is transmitted to the front wheels through tie-rods, which are connected to the rack through a sliding sleeve at their inner ends, and to the suspension struts through balljoints at their outer ends.

8 The steering column consists of an outer column that incorporates a collapsible section, and a shaft connected to a flexible coupling at its lower end.

9 Power steering is fitted as standard to certain models and is available as an option on others. The power steering is hydraulically operated, and pressure is supplied by a fluid pump driven by way of a drivebelt from the engine crankshaft. On 1.8 and 2.0 Litre models, fluid cooler pipes are mounted beneath the radiator to keep the temperature of the hydraulic fluid within operating limits.



1.6 Rear suspension layout - DOHC model

1 Crossmember
2 Semi-trailing arm
3 Coil springs
4 Anti-roll bar
5 Shock absorber
6 Crossmember mounting bracing bracket
7 Crossmember rear tube

2 Front wheel bearing - renewal

HAYNES HiNT ***The bearing will probably be destroyed during the removal operation. The use of a puller will greatly ease the procedure***

Removal

1 Remove the relevant suspension strut/hub carrier assembly, as described in Section 4.

2 Unscrew the securing screw, and remove the brake disc from the hub.

3 Support the hub carrier on two metal bars positioned as shown **(see illustration)**, then using a metal bar or tube of similar diameter, press or drive the hub from the wheel bearing. Alternatively, screw two roadwheel bolts into the hub and, using progressively thicker packing pieces, tighten the bolts to force the hub from the bearing. Note that one half of the inner bearing race will remain on the hub.

4 Using a puller, pull the half inner bearing race from the hub. Alternatively, support the bearing race on suitably thin metal bars, and press or drive the hub from the bearing race **(see illustration)**.

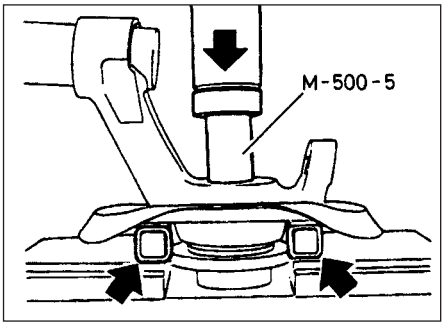
5 Remove the three securing screws, and lift the brake disc shield from the hub carrier **(see illustration)**.

6 Extract the inner and outer bearing retaining circlips **(see illustration)**.

7 Using a puller, pull the bearing from the hub carrier, applying pressure to the outer race. Alternatively, support the hub carrier, and press or drive out the bearing.

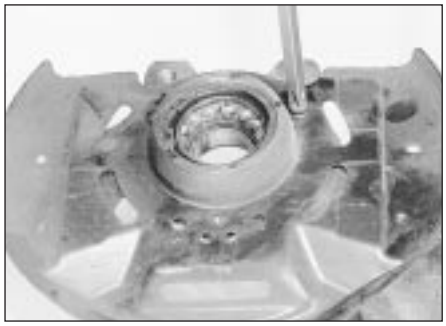
Refitting

8 Before installing the new bearing, thoroughly clean the bearing location in the hub carrier, and fit the outer bearing retaining circlip, "A" **(see illustration)**. Note that the circlip tabs should be positioned towards the bottom of the hub carrier.



2.3 Pressing the front hub from the wheel bearing

2.4 Removing the half inner bearing race from the hub



2.5 Removing a brake disc shield securing screw

2.6 Extracting the outer bearing retaining circlip

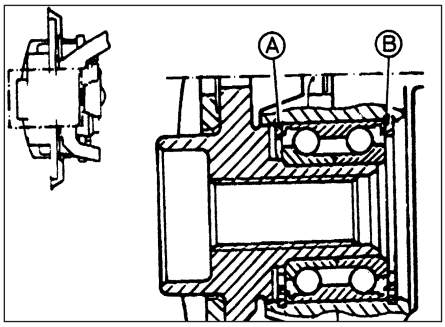
9 Press or drive the new bearing into position until it contacts the outer circlip, applying pressure to the outer race **(see illustration)**.
10 Fit the inner bearing retaining circlip, with the tabs positioned towards the bottom of the hub carrier.
11 Fit the brake disc shield.
12 Press or draw the hub into the bearing. The bearing inner track must be supported during this operation. This can be achieved using a socket, long bolt, washers and a length of bar as shown **(see illustration)**.
13 Refit the brake disc.
14 Refit the suspension strut/hub carrier assembly, as described in Section 4.

3 Front subframe - removal and refitting

Note: *Suitable equipment will be required to support the engine during this procedure. A balljoint separator tool will be required. The lower arm to suspension strut balljoint nut locking pins must be renewed on refitting*

Removal

1 The subframe is removed complete with the lower arms and the anti-roll bar as an assembly.
2 Before removing the subframe, the engine must be supported from its left hand lifting bracket. Ideally, the engine should be supported using a strong wooden or metal beam resting on blocks positioned securely in the channels at the sides of the engine compartment. The Vauxhall special tool designed specifically for this purpose is shown in Chapter 7A. Alternatively, the engine can be supported using a hoist and lifting tackle. However in this case, the hoist must be of such a design as to enable the engine to be supported with the vehicle raised off the ground, leaving sufficient clearance to withdraw the subframe from under the front of the vehicle.
3 Where applicable, remove the wheel trims, then loosen the front roadwheel bolts on both sides of the vehicle. Apply the handbrake, then jack up the front of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the front roadwheels.



2.8 Cross sectional view of front wheel bearing/hub assembly
A Outer bearing retaining circlip
B Inner bearing retaining circlip

4 Remove the front section of the exhaust system, with reference to Chapter 4C. On DOHC models, unbolt the oil cooler hose bracket from the right hand side of the subframe.
5 Working on one side of the vehicle, extract the locking pin, then unscrew the castellated nut from the lower arm to suspension strut balljoint.
6 Using a balljoint separator tool, disconnect the lower arm to suspension strut balljoint.
7 Repeat paragraphs 5 and 6 for remaining lower arm.
8 Ensure that the engine is adequately supported, then unscrew and remove the two nuts and washers securing the rear engine/transmission mounting to the subframe.
9 Support the subframe on a trolley jack, with an interposed wooden beam to prevent the subframe from tipping as it is withdrawn.
10 Unscrew and remove the six bolts securing the subframe to the vehicle underbody. Note that the rear bolts also secure the lower arms to the subframe **(see illustrations)**. The bolts are very tight, and an extension bar will probably be required to loosen them.
11 Lower the jack supporting the subframe, and withdraw the assembly from under the front of the vehicle.
12 If desired, the anti-roll bar and/or the lower arms can be removed from the subframe, with reference to Sections 8 and 5 respectively.

2.9 Fitting a new front wheel bearing using a socket, nut, bolt, washers, and length of bar

2.12 Drawing the hub into the bearing using improvised tools

Refitting

13 Refitting is a reversal of removal, remembering the following points.
14 If the anti-roll bar and/or the lower arms have been removed from the subframe, refit them with reference to Section 8 and/or 5, as applicable.
15 Tighten all nuts and bolts to the specified torques, noting that the rear subframe to underbody bolts must be tightened in stages see Specifications.
16 Secure the lower arm to suspension strut balljoint nuts with new locking pins.
17 Refit the front section of the exhaust system, with reference to Chapter 4C. On DOHC models, refit the oil cooler hose bracket to the right hand side of the subframe.
18 Finally tighten the roadwheel bolts when the vehicle has been lowered to the ground, and where applicable, refit the wheel trims.

3.10A Front subframe front securing bolt

3.10B Front subframe rear securing bolt which also secures rear end of lower arm

4.7 Unscrewing the suspension strut top mounting nut

4.8 Withdrawing a suspension strut

4.13A Lift off the strut upper mounting rubber . . .

4 Front suspension strut - removal, overhaul and refitting

Note: *A balljoint separator tool will be required during this procedure, and a spring compressor tool will be required if the strut is to be overhauled. The tie-rod end balljoint self-locking nut, the driveshaft retaining snap ring, and the hub nut must be renewed on refitting*

Removal

1 Where applicable, remove the wheel trim, then loosen the relevant front roadwheel bolts. Apply the handbrake, then jack up the front of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the relevant front roadwheel.

2 Where applicable, remove the ABS wheel sensor from the hub carrier, referring to Chapter 9, if necessary, and disconnect the wiring from the strut.

3 Remove the brake caliper from the hub carrier, as described in Chapter 9. The caliper can be suspended out of the way, using wire or string, to avoid the need to disconnect the hydraulic fluid hose.

4 Unscrew and remove the self-locking nut from the tie-rod end to suspension strut balljoint.

5 Using a balljoint separator, disconnect the tie-rod end to suspension strut balljoint.

6 Disconnect the outboard end of the driveshaft from the hub carrier, as described in Chapter 8. Support the driveshaft by suspending with wire or string. Do not allow the driveshaft to hang down under its own weight.

7 Working in the engine compartment, unscrew the nut securing the suspension strut to the suspension turret. To unscrew the nut, it will be necessary to counterhold the suspension strut piston rod using a splined key **(see illustration)**. Support the suspension strut as the nut is unscrewed, as once the nut has been removed, the strut is free to drop from the vehicle.

8 Withdraw the suspension strut/hub carrier assembly from the vehicle **(see illustration)**.

9 If desired, the suspension strut can be overhauled as follows, otherwise go on to paragraph 30 for details of the refitting procedure.

Overhaul

10 The hub, wheel bearing and brake disc shield can be removed, as described in Section 2.

11 With the suspension strut resting on a bench or clamped in a vice, fit a spring compressor tool, and compress the coil spring to relieve the pressure on the upper spring seat. Ensure that the compressor tool is securely located on the spring, according to the tool manufacturer's instructions.

12 Hold the strut piston rod with the splined key used during strut removal, and unscrew the piston rod nut.

13 Lift off the strut upper mounting rubber and the bearing **(see illustrations)**.

4.13B . . . and the bearing

14 Lift off the upper spring seat and damper ring, then carefully release the spring compressor and remove the spring **(see illustration)**. Note which way up the spring is fitted.

15 Slide the bellows and the rubber buffer that fits inside the bellows from the strut **(see illustration)**.

16 To remove the shock absorber cartridge, the ring nut must be unscrewed from the top of the strut tube. This nut is extremely tight. One method that can be used to unscrew the nut is to invert the strut and clamp the nut in a vice, then lever the strut round using a long bar and a bolt passed through the tie-rod bracket.

17 With the ring nut removed, the shock absorber cartridge can be withdrawn **(see illustrations)**.

18 The shock absorber can be tested by clamping the lower end in a vice, then fully extending and contracting the shock absorber several times. Any evidence of jerky

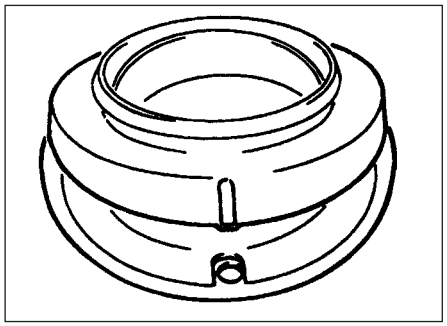
4.14 Lift off the upper spring seat and damper ring

4.15 Slide off the bellows and the rubber buffer

4.17A Remove the ring nut . . .

4.17B . . . and withdraw the shock absorber cartridge

4.22 Lower end of spring rests against lug (arrowed) on lower spring seat



4.24 Mark on suspension strut damper ring aligned with hole in spring seat

movement or lack of resistance indicates the need for renewal.

19 Examine all components for wear or damage and renew as necessary. Pay particular attention to the mounting rubber and the bearing.

20 Begin reassembly by sliding the shock absorber cartridge into the strut, and refitting the ring nut.

21 Clamp the strut in a vice, and tighten the ring nut to the specified torque, using a suitably large long reach socket.

22 Refit and compress the coil spring, ensuring that the lower end of the spring rests against the lug on the lower spring seat **(see illustration)**.

23 Refit the rubber buffer and the bellows.

24 Refit the upper spring seat and the damper ring, ensuring that the mark on the damper ring is aligned with the hole in the spring seat, as shown **(see illustration)**. The spring seat should be positioned with the hole at right angles to (i.e. 90° away from) the end of the spring.

25 Lubricate the bearing with a little grease, then refit it with the visible part of the bearing race uppermost.

26 Refit the strut upper mounting rubber.

27 Counterhold the strut piston rod, and tighten the piston rod nut to the specified torque. This can be achieved by holding the piston rod using the splined key fitted to a torque wrench, and tightening the nut using a spanner until the specified torque is reached **(see illustration)**.

28 Carefully release and remove the spring compressor tool, ensuring that the spring seats correctly at top and bottom. Ensure that the lower end of the spring still rests against the lug on the lower spring seat.

29 The strut can now be refitted to the vehicle as follows.

Refitting

30 Locate the top end of the strut in the suspension turret, then refit the securing nut and tighten it to the specified torque using the method described in paragraph 27.

31 Reconnect the outboard end of the driveshaft to the hub carrier (see Chapter 8).

32 Reconnect the tie-rod end balljoint to the suspension strut, and tighten a new self locking nut to the specified torque.

33 Refit the brake caliper to the hub carrier, as described in Chapter 9.

34 Where applicable, refit the ABS wheel sensor to the hub carrier, with reference to Chapter 9, and reconnect the wiring to the strut.

35 Refit the roadwheel, and lower the vehicle to the ground. Finally tighten the roadwheel bolts with the vehicle resting on its wheels, and where applicable, refit the wheel trim.

36 Check and if necessary adjust the front wheel alignment, as described in Section 45.

5 Front suspension lower arm - removal and refitting

Note 1: *A new lower arm to suspension strut balljoint nut locking pin, and (where applicable) a new anti-roll bar to lower arm nylock nut must be used on refitting.*

Note 2: *Regular inspection of the front suspension lower arms is recommended in order to detect damage or distortion which could eventually lead to failure. Any sign of cracking, creasing or other damage should be investigated and the arm renewed if necessary. If in doubt, consult your Vauxhall/Opel dealer for advice.*

Removal

1 Where applicable, remove the wheel trim, then loosen the relevant front roadwheel bolts. Apply the handbrake, then jack up the front of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the relevant front roadwheel.

2 Unscrew and remove the nut securing the end of the anti-roll bar to the lower arm. Recover the dished washers and mounting rubbers.

3 Extract the locking pin, then unscrew the castellated nut from the lower arm to suspension strut balljoint.

4 Using a balljoint separator tool, disconnect the lower arm to suspension strut balljoint.

5 Unscrew and remove the two pivot bolts securing the lower arm to the subframe **(see illustration)**. Note that the rear pivot bolt also secures the subframe to the underbody. Both

4.27 Tightening the piston rod nut

bolts are very tight, and an extension bar will probably be required to loosen them.

6 Pull the lower arm from the subframe, and withdraw it from the vehicle.

7 Note that certain 2.0 litre models have a damper weight bolted to the right hand lower arm. If the right hand lower arm is to be renewed on such a vehicle, it is important to ensure that the damper weight is transferred to the new arm.

8 Note that the metal sleeves in the rear mounting bush can be discarded when refitting the lower arm.

9 If any sign of damage or distortion of the front suspension lower arm around the front pivot bolt is evident, a modified and strengthened arm is available from Vauxhall dealers.

10 The modified lower arm, which can be identified by the strengthening flange along the seam on the forward facing side of the arm, will be fitted in production from mid-1993 on **(see illustration)**.

5.5 Lower arm front pivot bolt

11 The modified lower arm is fully interchangeable with the earlier version. Note also that if the modified arm is replacing an earlier version that incorporates a damper weight, as described earlier. The damper weight should not be fitted to the modified lower arm.

Refitting

12 Start refitting by pushing the lower arm into position in the subframe.
13 Fit the two pivot bolts, then hold the lower arm in a horizontal position, and tighten the bolts to the specified torque. Note that the rear bolt must be tightened in stages, see Specifications.
14 Reconnect the lower arm to suspension strut balljoint, and tighten the castellated nut to the specified torque. Secure the nut with a new locking pin.
15 Reconnect the end of the anti-roll bar to the lower arm, noting that the dished washer that retain the mounting rubbers should be fitted with their concave sides facing towards the lower arm. Note that on certain models, nylock type nuts are used to secure the anti-roll bar to the lower arms, these nuts should be renewed on refitting.
16 Tighten the anti-roll bar to lower arm nuts to give the specified rubber bush compression shown **(see illustration)**. If necessary, renew the rubber bushes.
17 Refit the roadwheel and lower the vehicle to the ground. Finally tighten the roadwheel bolts with the vehicle resting on its wheels, and where applicable, refit the wheel trim.
18 Check and if necessary adjust the front wheel alignment, as described in Section 45.

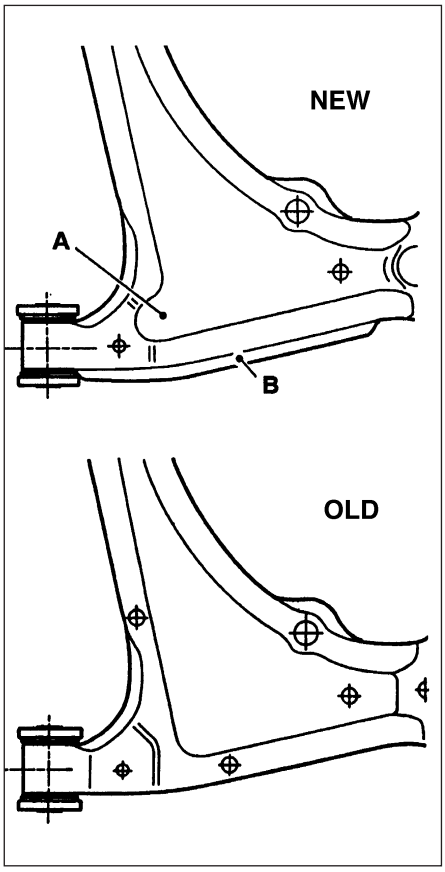
6 Front suspension lower arm bushes - renewal

Removal

1 Remove the lower arm, (Section 5).
2 The bushes are a tight fit in the lower arm, and must be pressed out.
3 If a press is not available, the bushes can be drawn out using a long bolt, nut, washers and a socket or length of metal tubing.
4 The vertical bush should be pressed out through the top of the lower arm, from below, and the horizontal bush should be pressed out towards the front of the lower arm, from the rear.

Refitting

5 Lubricate the new bushes using soapy water, then fit them to the lower arm, reversing the method described in paragraph 3.
6 The new vertical bush should be pressed into the lower arm from below, and the new horizontal bush should be pressed into the lower arm from front to rear. The horizontal bush should project from the lower arm equally at both ends.
7 Refit the lower arm, as described in Section 5.



5.10 Modified front suspension lower arm

A Modified inner profile
B Strengthening flange along seam

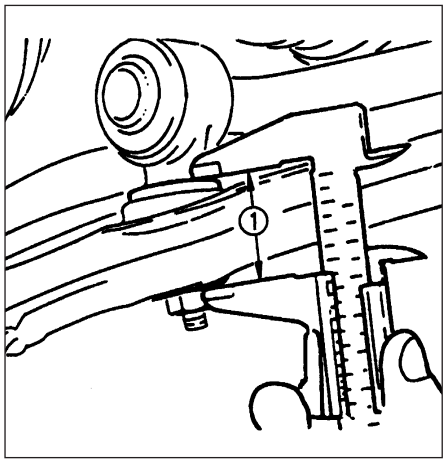
7 Front suspension lower arm balljoint - removal and refitting

Removal

1 Remove the lower arm, as described in Section 5.
2 Mount the lower arm in a vice, then drill the heads from the three rivets that secure the balljoint to the lower arm, using a 12.0 mm (0.47 in) diameter drill.
3 If necessary, tap the rivets from the lower arm, then remove the balljoint.

Refitting

4 The new balljoint should be fitted using three special bolts, spring washers and nuts, available from a Vauxhall parts centre.
5 Ensure that the balljoint is fitted the correct way up, noting that the securing nuts should be positioned on the underside of the lower arm.
6 Tighten the balljoint to lower arm nuts to the specified torque.
7 Refit the lower arm, as described in Section 5.



5.16 Front anti-roll bar rubber bush compression

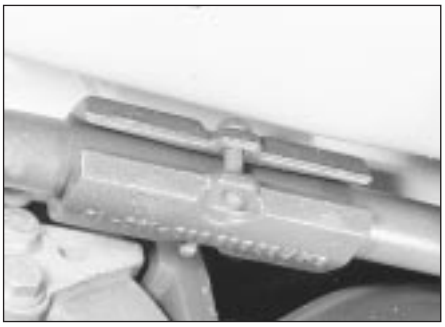
1 38.0 to 39.0 mm

8 Front anti-roll bar - removal and refitting

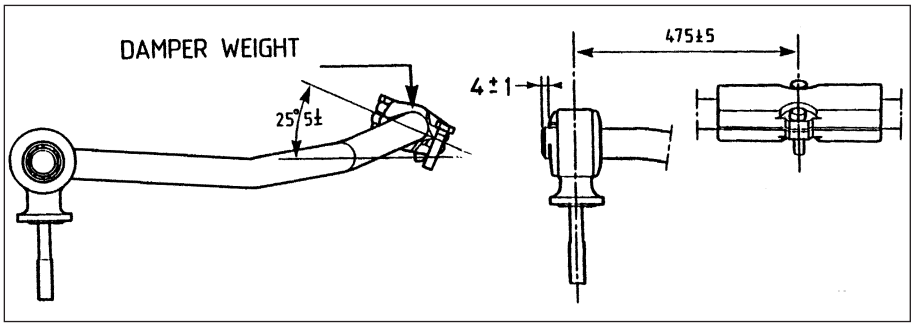
Note: *Where applicable, the nylock type nuts securing the anti-roll bar to the lower arms must be renewed on refitting*

Removal

1 Support the engine, and raise the vehicle as described in Section 3, paragraph's 2 and 3.
2 If desired, remove the front section of the exhaust system, with reference to Chapter 4C.
3 Working under the vehicle, unscrew and remove the locknuts securing the ends of the anti-roll bar to the lower arms. Recover the dished washers and mounting rubbers.
4 Ensure that the engine is adequately supported, then unscrew and remove the two nuts and washers securing the engine/transmission rear mounting to the subframe.
5 Support the subframe on a trolley jack, with an interposed wooden beam to spread the load.
6 Unscrew and remove the two rear and two centre bolts securing the subframe to the vehicle underbody. Note that the rear bolts also secure the lower arms to the subframe. The bolts are very tight, and an extension bar will probably be required to loosen them.
7 Loosen, but do not remove the two front subframe to underbody securing bolts.
8 Carefully lower the subframe until the anti-roll bar to subframe bolts are accessible, then unscrew and remove the bolts.
9 Lift the anti-roll bar from the subframe and the lower arms, and withdraw it from the vehicle.



8.10A Front anti-roll bar damper weight



8.10B Correct position of front anti-roll bar damper weight
(All dimensions in mm)

Refitting

10 Note that on certain models, a damper weight is fitted to the centre of the anti-roll bar **(see illustration)**. If the anti-roll bar is to be renewed, the damper weight (where applicable) must be transferred to the new component, and positioned as shown **(see illustration)**.

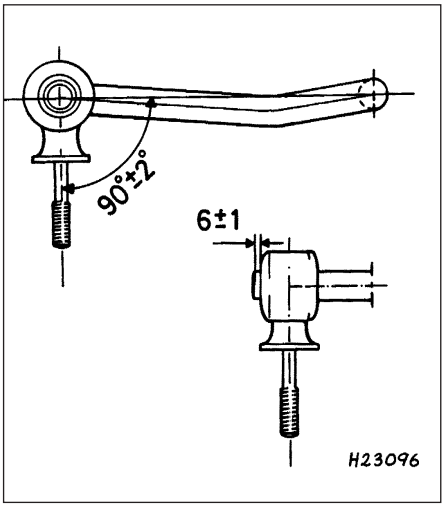
11 If desired, the anti-roll bar mounting bushes can be renewed, (Section 9).

12 Refitting is a reversal of removal, remembering the following points.

13 Reconnect the ends of the anti-roll bar to the lower arm, noting that the dished washers that retain the mounting rubbers should be fitted with their concave sides facing towards the lower arm. Note that on certain models, nylock type nuts are used to secure the anti-roll bar to the lower arms, these nuts should be renewed on refitting.

14 Tighten the anti-roll bar to lower arm nuts to give the specified rubber bush compression, as described in Section 5, paragraph 16. If necessary, renew the rubber bushes.

15 Tighten all nuts and bolts to the specified torques, noting that the rear subframe to underbody bolts must be tightened in stages, see Specifications.



9.7 Correct position of end link on front anti-roll bar
(Dimensions in mm)

16 Where applicable, refit the front section of the exhaust with reference to Chapter 4C.

17 Finally tighten the roadwheel bolts when the vehicle is resting on its wheels, and where applicable, refit the wheel trims.

9 Front anti-roll bar bushes - renewal

1 Remove the anti-roll bar, (Section 8).

2 To renew an anti-roll bar end mounting bush, mount the anti-roll bar in a vice, then light hammer blows on a drift, drive the end link from the anti-roll bar.

3 The bush can now be prised from the end link, using a screwdriver or similar tool.

4 Lubricate the new bush with a little soapy water to aid fitting, then press it into place in the end link.

5 If necessary, repeat the procedure on the remaining end link.

6 With either end link removed, the anti-roll bar to subframe mounting bushes can be renewed if desired, by sliding the bushes along the bar and manipulating them until they can be withdrawn from the end of the bar. Fit the new bushes in the same way.

7 Press or drive the end link(s) onto the anti-roll bar to the position shown **(see illustration)**.

8 Before refitting the anti-roll bar, examine the anti-roll bar to lower arm bushes, and renew if necessary.

9 Refit the anti-roll bar, (Section 8).

10.2 Removing the dust cover from the rear hub - model with rear disc brakes

10 Rear wheel bearing (SOHC models) - adjustment

Note: *A new split pin must be used to secure the hub nut on completion of adjustment*

1 Where applicable, remove the wheel trim, then loosen the rear roadwheel bolts on the relevant side of the vehicle. Chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheel.

2 Prise the dust cover from the centre of the hub **(see illustration)**.

3 Extract the split pin from the end of the stub axle, then loosen the hub nut.

4 Tighten the hub nut to a torque of 25 Nm (18 lbf ft), whilst simultaneously turning the hub.

5 Gradually loosen the hub nut until the spacer washer under the nut can just be moved with a screwdriver, without levering on the hub **(see illustration)**.

6 If the split pin hole in the stub axle is not aligned with any of the slots in the hub nut, tighten the nut until the nearest slots align. Then check that the spacer washer can still be moved as described in paragraph 5. If the washer cannot be moved, slacken the nut until the nearest slots in the nut align with the split pin hole.

7 Secure the hub nut using a new split pin, then refit the dust cover to the centre of the hub.

10.5 Loosen rear hub nut until spacer washer can be moved with a screwdriver - model with rear disc brakes

8 Refit the roadwheel and lower the vehicle to the ground. Finally tighten the roadwheel bolts with the vehicle resting on its wheels, and where applicable, refit the wheel trim.

11 Rear wheel bearing (SOHC models, up to mid-1993) - renewal

Note: *The rear hub oil seal must be renewed on reassembly*

1 If wear in the bearings is evident, indicated by a rumbling sound when the wheel is spun, or a noticeable roughness if the wheel is turned slowly, then the bearings should be renewed as follows. Note that each hub runs on two taper roller bearings, and both the inner and outer bearing should be renewed if wear is evident.

2 Remove the hub, (Section 13).

3 If the outer bearing inner race is still in the hub, prise it out using a screwdriver.

4 Prise the oil seal from the inner end of the hub, and extract the inner bearing inner race **(see illustration)**.

5 Support the hub on blocks or in a vice, then press or drive out the bearing outer races.

6 Thoroughly clean the internal bore of the hub with paraffin or a solvent.

7 Before fitting the new bearings, remove any burrs that may be present in the bore of the hub, using a fine file or scraper.

8 Fit the new bearing outer races, with the larger internal diameters of the races facing outwards from the centre of the hub. Press or tap the races into position, using a metal tube. Take care to keep the races square in the hub bore as they are installed, otherwise they may jam and crack.

9 Pack the bearing races with lithium based grease, and apply a liberal quantity of grease to the space in the hub between the bearing races.

10 Place the inner bearing inner race in position, lubricate the lip of a new oil seal, and tap the seal squarely into place, using a tube or a piece of wood.

11 Refit the hub, and adjust the wheel bearing play, as described in Sections 13 and 10 respectively.

12 Rear hub and wheel bearings (from mid-1993) - removal and refitting

Note: *The hub unit securing nuts must be renewed on refitting*

Removal

1 From 1993-on, all Cavalier models are fitted with a maintenance free rear hub and wheel bearing assembly **(see illustration)**.

2 On these models, the stub axle, hub and wheel bearing are all one assembly. No adjustment is required as the bearing is sealed for life.

11.4 Prise the oil seal from the inner end of the hub - model with rear disc brakes

3 To remove the rear hub, remove the wheel trim, where applicable, then loosen the relevant rear roadwheel bolts and chock the front wheels. Jack up the rear of the vehicle and support on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheel.

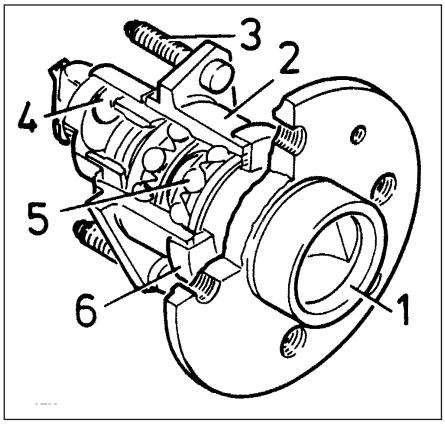
4 Remove the rear disc caliper as described in Chapter 9. The caliper can be suspended out of the way, using wire or string, to avoid the need to disconnect the hydraulic fluid pipe.

5 Disconnect the return spring from the handbrake shoe lever and the brake backplate.

6 Undo the retaining screw and lift off the brake disc.

7 Disconnect the ABS sensor wiring plug at the rear of the hub assembly.

8 Unscrew the four securing nuts and withdraw the hub assembly complete with backplate. Detach the handbrake cable from the handbrake shoe lever as the hub assembly is withdrawn.



12.1 Maintenance-free hub and wheel bearing assembly - later models with ABS

1 Hub
2 Stub axle
3 Threaded bolt
4 Dust cap with integral ABS wheel speed sensor
5 Bearings
6 Oil seal

Refitting

9 Refitting is a reversal of removal, remembering the following points.

10 New hub assembly securing nuts must be used, and they must be tightened in the stages given in the Specifications. Note that a socket extension and a universal joint may be required to enable the use of a torque angle gauge.

11 Make sure that the handbrake cable and return spring are correctly reconnected.

12 With the brake disc in place, refit the disc caliper as described in Chapter 8.

13 Before refitting the roadwheel and lowering the vehicle to the ground, check the handbrake cable adjustment as described in Chapter 9.

13 Rear hub (SOHC models) - removal and refitting

Note: *A new split pin must be used to secure the hub nut on refitting*

Models with rear drum brakes

Removal

1 Where applicable, remove the wheel trim, then loosen the rear roadwheel bolts on the relevant side of the vehicle. Chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheel.

2 Remove the brake drum, with reference to Chapter 9.

3 Prise the dust cover from the centre of the hub.

4 Extract the split pin from the end of the stub axle, then unscrew the hub nut. If the hub nut is tight, counterhold the hub by refitting two roadwheel bolts and inserting a long screwdriver or similar tool between them, although this should not prove necessary unless the nut has been overtightened.

5 Remove the hub nut and the thrustwasher from the stub axle, then withdraw the hub. Be prepared to catch the outer wheel bearing inner race, which may drop out of the hub as it is removed.

Refitting

6 Begin refitting by placing the hub and the outer wheel bearing inner race on the stub axle. Take care not to damage the oil seal at the inner end of the hub.

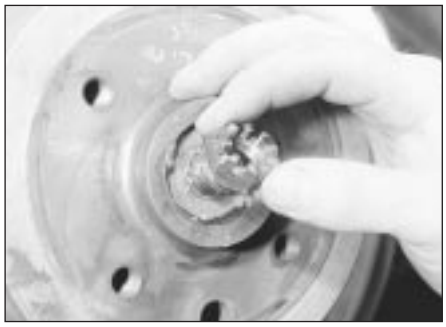
7 Fit the thrustwasher and the hub nut, then adjust the wheel bearing play, as described in Section 10, paragraphs 4 to 6 inclusive.

8 Secure the hub nut using a new split pin, then refit the dust cover to the centre of the hub.

9 Refit the brake drum, with reference to Chapter 9, and check the handbrake adjustment, as described in Chapter 9.

13.16 Refit the hub/disc . . .

13.17A . . . the thrustwasher . . .



13.17B . . . and the hub nut - model with rear disc brakes

10 Finally tighten the roadwheel bolts when the vehicle has been lowered to the ground, and where applicable, refit the wheel trim.

Models with rear disc brakes

Removal

11 On models with rear disc brakes, the hub is integral with the brake disc.
12 Proceed as described in paragraph 1.
13 Remove the brake caliper, as described in Chapter 9, but leave the hydraulic fluid pipe connected. Move the caliper to one side, and suspend it using wire or string to avoid straining the pipe.
14 Proceed as described in paragraphs 3 and 4.
15 Remove the hub nut and the spacer washer from the stub axle, then withdraw the hub/disc. If the hub/disc is tight, collapse the handbrake shoes, by inserting a screwdriver through the adjuster hole in the hub/disc and turning the adjuster wheel. Be prepared to catch the outer wheel bearing inner race, which may drop out of the hub/disc as it is removed.

Refitting

16 Begin refitting by placing the hub/disc and the outer wheel bearing inner race on the stub axle **(see illustration)**. Take care not to damage the oil seal at the inner end of the hub/disc. If necessary, slacken off the brake shoe adjuster wheel, to allow the hub/disc to pass over the brake shoes.
17 Proceed as described in paragraphs 7 and 8 **(see illustrations)**.

14.4 Unscrewing a rear shock absorber top mounting nut - Hatchback model

18 Check the handbrake adjustment, as described in Chapter 9, then refit the brake caliper, as described in Chapter 9.
19 Finally tighten the roadwheel bolts when the vehicle has been lowered to the ground, and where applicable, refit the wheel trim.

14 Rear shock absorber - removal and refitting

Removal

1 On SOHC models, it is important to note that only one shock absorber should be removed at a time. Note that shock absorbers should be renewed in pairs.
2 On models with manual rear suspension level control, depressurise the system, by releasing the air through the valve in the luggage compartment.
3 Working in the luggage compartment, prise off the cap that covers the shock absorber top mounting. On Hatchback models, pull back the flap covering the first aid kit and warning triangle storage compartment for access to the right hand shock absorber.
4 Counterhold the shock absorber piston rod, and unscrew the shock absorber top mounting nut **(see illustration)**. Remove the washer and the upper mounting rubber.
5 Drive the rear wheels up onto ramps, and chock the front wheels. Alternatively, chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") placed under the body side members. If the vehicle is jacked up, the relevant trailing arm (semi-trailing arm DOHC models) must be supported with a jack as the vehicle is raised.
6 Working under the rear of the vehicle, where applicable, disconnect the manual suspension level control air line from the shock absorber.
7 Unscrew and remove the bolt and washer securing the lower end of the shock absorber to the trailing arm (semi-trailing arm on DOHC models), **(see illustration)**.
8 On SOHC models, compress the shock absorber by hand, if necessary prising the lower end to free it from the trailing arm.
9 Withdraw the shock absorber from under the vehicle, and recover the lower mounting rubber and cup from the top of the shock absorber.
10 The shock absorber can be tested by clamping the lower mounting eye in a vice, then fully extracting and contracting the shock absorber several times. Any evidence of jerky movement or lack of resistance indicates the need for renewal.

Refitting

11 Before refitting the shock absorber, examine the mounting rubbers for wear or damage, and renew if necessary.
12 Refitting is a reversal of removal, remembering the following points.
13 Where applicable, ensure that the shock absorber is fitted with the air line union facing the correct way round.
14 Tighten the shock absorber lower mounting bolt to the specified torque.
15 On models with manual rear suspension level control, pressurise the system to 0.8 bar (12.0 lbf/in^2), and check for air leaks.

15 Rear shock absorber mounting rubbers - renewal

1 The shock absorber top mounting rubbers can be renewed without removing the shock absorber as follows. On SOHC models, it is important to note that, due to the design of the rear suspension, only one shock absorber should be disconnected at a time.

14.7 Unscrewing a rear shock absorber lower mounting bolt - SOHC models

2 Proceed as described in Section 14, paragraphs 2 to 4 inclusive.
3 Keeping the roadwheels resting on the ground, jack up the rear of the vehicle slightly, to enable the shock absorber to be compressed sufficiently by hand to release the top mounting from the body.
4 Remove the lower mounting rubber from the top of the shock absorber.
5 Fit the new mounting rubbers using a reversal of the removal procedure.
6 On models with manual rear suspension level control, pressurise the system to 0.8 bar (12.0 lbf/) on completion.

16 Rear suspension coil spring (SOHC models) - removal and refitting

Removal

1 Due to the design of the rear suspension, it is important to note that only one coil spring should be removed at a time. Note that rear springs should be renewed in pairs, and if the springs are to be renewed, it is advisable to renew the spring damping rubbers at the same time.
2 On models with manual rear suspension level control, depressurise the system by releasing the air through the valve in the luggage compartment.
3 Chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") placed under the body side members.
4 Raise the relevant trailing arm slightly ,using a jack.
5 Unscrew and remove the bolt and washer securing the lower end of the shock absorbers to the trailing arm, and free the lower end of the shock absorber.
6 Carefully lower the jack supporting the trailing arm, and remove the coil spring and its damping rubbers. Lever the trailing arm downwards slightly if necessary to remove the spring.

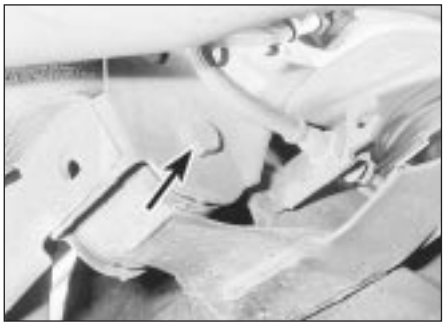
Refitting

7 Refitting is a reversal of removal, ensuring that the spring locates correctly on the trailing arm and the underbody.
8 Tighten the shock absorber lower mounting bolt to the specified torque.
9 If the springs are being renewed, repeat the procedure on the remaining side of the vehicle.
10 On models with manual rear suspension level control, pressurise the system to 0.8 bar on completion.

17 Rear suspension trailing arms assembly (SOHC models) - removal and refitting

Removal

1 Where applicable, remove the wheel trims, then loosen the rear roadwheel bolts on both sides of the vehicle. Chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the rear roadwheels.
2 On models with manual rear suspension level control, depressurise the system by releasing the air through the valve in the luggage compartment.
3 On models with a catalytic converter, unbolt and remove the exhaust heat shield.
4 Measure the length of the thread projecting from the handbrake cable adjuster on the torsion beam, then loosen the adjuster nut to slacken the cable.
5 Disconnect the rear section of the handbrake cable from the underbody cable joiner bracket, and unclip the cable from the underbody.
6 Working in the engine compartment, remove the filler cap from the brake hydraulic fluid reservoir, then place a piece of polythene across the top of the reservoir filler hole, and refit the filler cap. This will minimise fluid loss when the brake lines are disconnected.
7 Disconnect the flexible hoses from the rigid brake pipes at the front edge of each trailing arm. Be prepared for fluid loss, and plug the open ends of the pipes and hoses, to prevent ingress of dirt and further fluid loss.
8 Where applicable, unbolt the ABS sensor brackets, and release the wiring from the brackets on the trailing arms. Support the sensor bracket by suspending with wire or string from the vehicle underbody.
9 Loosen, but do not remove, the nuts and bolts securing the front ends of the trailing arms to the vehicle underbody **(see illustration)**.
10 Support the torsion beam with a trolley jack and interposed block of wood. Position the jack securely under the centre of the torsion beam.

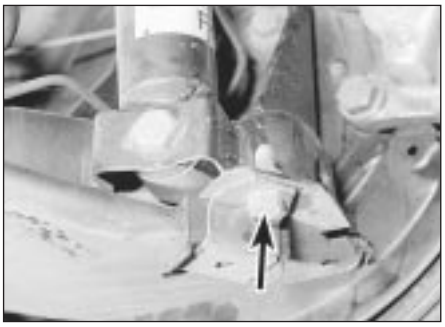


17.9 Trailing arm securing bolt (arrowed)

11 Unscrew and remove the bolts securing the lower ends of the shock absorbers to the trailing arms, then gently lower the jack supporting the torsion beam.
12 Remove the coil springs, referring to Section 16, if necessary.
13 Ensure that the torsion beam is adequately supported, then remove the nuts and bolts securing the front ends of the trailing arms to the vehicle underbody. The help of an assistant will greatly ease this task. Ensure that the torsion beam does not slip off the jack.
14 Withdraw the torsion beam/trailing arms assembly from under the rear of the vehicle.
15 If desired, the brake components can be removed from the trailing arms. The stub axles can be removed with reference to Section 20, and where applicable, the anti-roll bar can be removed with reference to Section 18.
16 If necessary, the trailing arm bushes can be renewed, with reference to Section 19.

Refitting

17 Begin reassembly by refitting any components that were removed from the torsion beam/trailing arms assembly, with reference to the relevant Sections of this Chapter and/or Chapter 9, as applicable.
18 Support the torsion beam/trailing arms assembly on the trolley jack, and position the assembly under the rear of the vehicle.
19 Raise the jack, and fit the bolts and nuts that secure the front ends of the trailing arms to the underbody. Do not fully tighten the fixings at this stage.
20 Refit the coil springs, referring to Section 16 if necessary.
21 Raise the rear ends of the trailing arms, and refit the bolts securing the lower ends of the shock absorbers. Tighten the bolts to the specified torque. Withdraw the jack from under the rear of the vehicle.
22 Where applicable, refit the ABS sensor brackets, and refit the wiring to the brackets on the trailing arms.
23 Remove the plugs from the brake pipes and hoses, and reconnect the unions.
24 Reconnect the handbrake cable to the underbody cable joiner bracket, and refit the cable to the underbody clip(s).
25 Tighten the handbrake cable adjuster nut to expose the length of thread measured during removal, then adjust the handbrake cable, as described in Chapter 9.
26 On models with a catalytic converter, refit the exhaust heat shield.
27 Refit the rear roadwheels, then lower the vehicle to the ground and finally tighten the roadwheel bolts. Where applicable, refit the wheel trims, and remove the chocks from the front wheels.
28 On models with manual rear suspension level control, pressurise the system to 0.8 bar.
29 Ensure that the vehicle is parked on level ground, then with the equivalent of a load of 70.0 kg in each front seat, "bounce" the vehicle to settle the suspension.



18.2 Rear anti-roll bar to trailing arm securing bolt (arrowed)

18.3 Rear anti-roll bar clamp

30 Without disturbing the position of the vehicle, place chocks at the front and rear edges of the front wheels, to prevent the vehicle from moving.
31 Working under the rear of the vehicle, tighten the fixings securing the front ends of the trailing arms to the underbody to the specified torque.
32 Finally, recheck the handbrake cable adjustment, then remove the polythene from beneath the brake hydraulic fluid reservoir cap, and bleed the brake hydraulic system, as described in Chapter 9.

18 Rear anti-roll bar (SOHC models) - removal and refitting

Removal

1 Chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") placed under the body side members.
2 Unscrew and remove the nuts and bolts securing the ends of the anti-roll bar to the trailing arms **(see illustration)**.
3 Unscrew and remove the nuts and bolts securing the anti-roll bar clamps to the torsion beam, and withdraw the anti-roll bar from the vehicle **(see illustration)**.
4 Examine the anti-roll bar mounting bushes for wear or damage, and renew as necessary.
5 To renew the bushes, slide them from the ends of the anti-roll bar.

Refitting

6 Refitting is a reversal of removal.
7 Tighten all fixings to the specified torque.

19 Rear suspension trailing arm bushes (SOHC models) - renewal

1 The trailing arm bushes can be renewed without removing the torsion beam/trailing arms assembly from the vehicle, as follows.
2 Proceed as described in Section 17, paragraphs 1 and 2.
3 Unclip the flexible hoses and the rear ends of the rigid brake pipes from the vehicle underbody.
4 Support the torsion beam with a trolley jack and interposed block of wood. Position the jack under the centre of the torsion beam.
5 Unscrew and remove the nuts and bolts securing the trailing arms to the underbody.
6 Gently lower the jack until the trailing arm bushes are accessible, then support the torsion beam on axle stands. Take care not to strain the brake pipes.
7 A special Vauxhall tool is available for removal and fitting of the bushes, but an alternative can be improvised using a long bolt, nut, washers, and a length metal tubing or a socket.
8 Before removing a bush, cut the flange from the inner end of the bush using a sharp knife, **(see illustration)**.
9 Removal of the bush will be made easier if the bush housing in the trailing arm is heated to approximately 70°C (158°F) using a heat gun or a hair dryer. Do not use a naked flame, due to the proximity of the fuel tank.
10 Draw the bush from the trailing arm, using the tool described in paragraph 7.
11 Lubricate the new bush with a little soapy water, then draw it into position, ensuring that the mouldings in the end of the bush are positioned as shown **(see illustration)**.
12 Repeat the procedure on the remaining trailing arm. The bushes should always be renewed in pairs.
13 Raise the torsion beam using the jack, and fit the bolts and nuts that secure the front ends of the trailing arms to the underbody. Do not fully tighten the fixings at this stage. Withdraw the axle stands.
14 Clip the rigid brake pipes and the flexible hoses to the vehicle underbody.
15 Proceed as described in Section 17, paragraphs 27 to 31 inclusive.

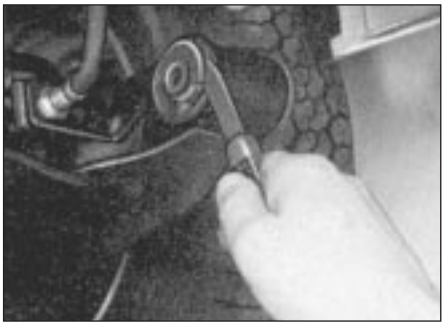
20 Rear stub axle (SOHC models) - removal and refitting

Removal

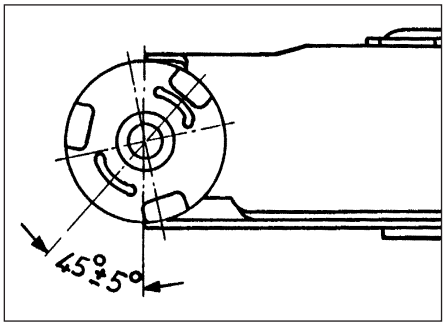
1 Remove the relevant rear hub, as described in Section 13.
2 Working behind the brake backplate, unscrew and remove the four bolts securing the stub axle and the brake backplate to the trailing arm **(see illustration)**. Support the backplate as the bolts are removed, and once the stub axle is free, refit the bolts to locate the backplate, thus avoiding unnecessary strain on the brake fluid pipe.

Refitting

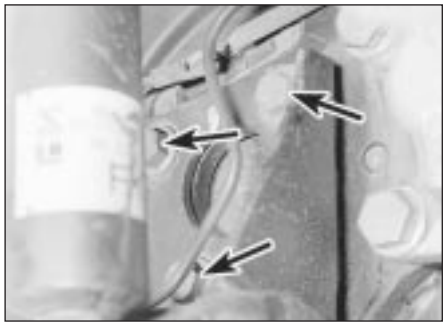
3 Refitting is a reversal of removal, but coat the rear face of the stub axle flange where it contacts the brake backplate with a little lithium based grease, and refit the rear hub as described in Section 13.
4 Tighten the stub axle/brake backplate securing bolts to the specified torque in the stages given in the Specifications.



19.8 Cutting inner flange from trailing arm bush - SOHC models



19.11 Trailing arm bush positioning - SOHC models



20.2 Three of the four stub axle to trailing arm securing bolts (arrowed)

21 Rear suspension level control system - adjustment

1 With the vehicle unladen, use a tyre pressure gauge on the air valve to check that the system pressure is 0.8 bar. Adjust if necessary.
2 With the vehicle standing on a level surface, measure the distance from the centre of the rear bumper to the ground. Subtract 50.0 mm (2.0 in) from the distance measured, and note the new value.
3 Load the vehicle, and if necessary the pressure in the system until the noted value for the bumper height is reached. Do not exceed a pressure of 5.0 bar.
4 After unloading the vehicle, depressurise the system to restore the originally measured bumper height, observing the minimum permissible pressure of 0.8 bar.
5 Do not drive an unladen vehicle with the system fully inflated.

22 Rear suspension level control system components - removal and refitting

Air valve

Removal

1 Working in the luggage compartment, pull back the floor covering for access to the air valve.
2 Fully depressurise the system.
3 Remove the cap and the retaining sleeve from the valve, then compress the retaining lugs and push the valve downwards, taking care not to damage the air lines.
4 Unscrew the air line unions from the valve, and then withdraw the valve from the vehicle.

Refitting

5 Refitting is a reversal of removal, but on completion, pressurise the system and check for air leaks.

Air lines

Removal

6 To remove an air line, first fully depressurise the system.
7 Unscrew the unions at the shock absorber and air valve, then release the air line from the clips on the vehicle underbody.

Refitting

8 Refitting is a reversal of removal, but on completion, pressurise the system and check for air leaks.

Shock absorber

9 Removal and refitting of the shock absorbers is covered in Section 14.

23.6A Prise out the plastic cover (arrowed) . . .

23.6B . . . for access to the rear hub nut - DOHC models

23 Rear wheel bearing (DOHC models) - renewal

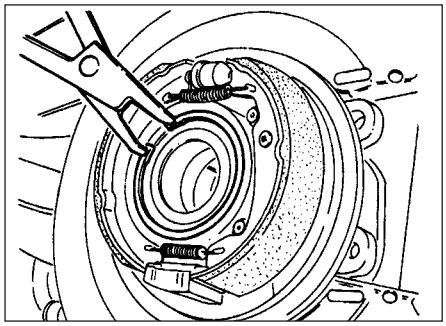
Note: *This is a difficult operation, and it is suggested that this Section is read carefully before beginning work. A torque wrench capable of measuring the high torque of the rear hub nut and a puller will be required. A new hub nut and locking collar must be used on reassembly*

Removal

1 Loosen the relevant rear roadwheel bolts, chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheels.
2 Remove the locking clip and release the brake fluid line from the bracket on the semi-trailing arm. Note that the locking clip also supports the ABS sensor wire.
3 Unscrew the securing bolts, and withdraw the brake caliper and the ABS sensor bracket from the brake backplate. Support the caliper and the ABS sensor bracket out of the way, by suspending with string or wire from the vehicle underbody.
4 Remove the securing screw and withdraw the brake disc. If necessary, retract the handbrake shoes to enable the disc to be removed, by turning the adjuster with a screwdriver inserted through one of the unthreaded holes in the disc, see Chapter 9.
5 Using a splined key inserted through one of the unthreaded holes in the hub flange, unscrew the four brake backplate securing bolts. Note that the upper bolts are shorter than the lower bolts, and are fitted with locking plates.
6 Prise out the plastic cover from the rear of the ABS toothed sensor wheel, to expose the rear hub nut **(see illustrations)**.
7 Relieve the staking on the hub nut locking collar, then prise the locking collar from the ABS sensor wheel.
8 Screw two wheel bolts into the hub flange, and use a long metal bar between the bolts to hold the hub stationary, then unscrew the hub nut using a socket and extension bar. Note that the hub nut is extremely tight.
9 Pull the ABS sensor wheel from the hub, if necessary using a three legged puller.
10 Press the rear hub outwards from the bearing, using a puller attached to the semi-trailing arm. Note that the inner bearing track may stay on the hub as it is removed.
11 Extract the bearing retaining circlip from the outer edge of the semi-trailing arm **(see illustration)**. Then press or drive out the bearing, applying pressure to the bearing outer race. If desired, the bearing can be removed in the same way as the rear hub using a puller, again noting that pressure must be applied to the bearing outer race.
12 If the inner bearing race has remained on the hub, remove it using a puller.

Refitting

13 Clean all components, and examine them for wear and damage.
14 Begin reassembly by pressing the new bearing into the semi-trailing arm, using pressure on the bearing outer track. If necessary, a tube or socket with a long bolt, nut and washers may be used to draw the bearing into position. Press the bearing into the semi-trailing arm until it rests against the shoulder.
15 Fit the bearing retaining circlip, ensuring that it seats correctly in its groove.
16 Have an assistant support the bearing inner track at the inner end of the semi-trailing arm using a metal tube, then carefully drive in the rear hub from outside. Do not use excessively sharp blows, as the bearing is easily damaged.



23.11 Extracting the rear hub bearing retaining circlip - DOHC models

17 Fit the ABS sensor wheel to the inner end of the hub. If necessary, have an assistant support the outer end of the hub, and drive the sensor wheel fully home from the inside. Take care not to damage the teeth on the sensor wheel.
18 Fit a new hub nut and tighten it to the specified torque, holding the hub stationary as during removal.
19 Fit a new locking collar to the hub nut, and stake it to the ABS sensor wheel.
20 Refit the plastic cover to the rear of the ABS sensor wheel.
21 Refit the brake backplate securing bolts, and tighten them to the specified torque. Ensure that the shorter bolts are fitted to the top of the plate, and make sure that the locking plates are fitted.
22 Refit the brake disc and tighten its securing screw, then operate the handbrake several times to operate the adjuster mechanism and bring the shoes to their correct seat position.
23 Refit the brake caliper and the ABS sensor bracket to the bracket backplate, and tighten the securing bolts to the specified torque.
24 Reconnect the brake fluid line to its bracket on the semi-trailing arm, and secure with the locking clip.
25 Refit the roadwheel, then lower the vehicle to the ground. Finally tighten the roadwheel bolts with the vehicle resting on its wheels.

24 Rear hub (DOHC models) - removal and refitting

Removal

1 Removal and refitting of the rear hub is described in Section 23, as part of the wheel bearing renewal procedure.
2 Note that the wheel bearing will almost certainly be destroyed during removal of the hub, and must therefore be renewed.

Refitting

3 Refer to the note at the beginning of Section 23 before proceeding.

25 Rear suspension coil spring (DOHC models) - removal and refitting

Removal

1 Note that the rear springs should be renewed in pairs, and if the springs are to be renewed, it is advisable to renew the spring damping rubbers at the same time.
2 Chock the front wheels, jack up the rear of the vehicle, and support securely on axle stands positioned under the body side members.
3 Working under the rear of the vehicle, remove the locking clips and release the brake fluid lines from their brackets on either side of the vehicle underbody. Note that the locking clips also support the ABS sensor wires.
4 Working on each side of the vehicle in turn, support the semi-trailing arm with a trolley jack, then unscrew and remove the bolt and washer securing the lower end of the shock absorber to the semi-trailing arm. Carefully lower the trolley jack, and withdraw it once the shock absorber as been disconnected from the semi-trailing arm.
5 Disconnect the fuel outlet hose from the fuel filter, located on the right hand side of the underbody in front of the fuel tank. Be prepared for fuel spillage, and take adequate fire precautions. Plug the open ends of the filter and hose, to prevent further fuel spillage and dirt ingress.
6 Support the rear plate of the rear suspension crossmember with a trolley jack, then unscrew and remove the two securing bolts from the crossmember rear tube.
7 Carefully lower the trolley jack supporting the crossmember rear plate, taking care not to strain any of the hoses, pipes or wires, until the coil springs and their rubber dampers can be withdrawn. Note the orientation of the springs as they are removed.

Refitting

8 Begin refitting by positioning the springs and their seats between the semi-trailing arms and the underbody as noted during removal.
9 Carefully raise the jack supporting the crossmember rear plate, then refit the crossmember rear tube to underbody bolts, and tighten them to the specified torque.
10 Reconnect the fuel outlet hose to the fuel filter, and tighten the clamp screw.
11 Reconnect the shock absorbers to the semi-trailing arms, support the semi-trailing arms with a trolley jack as during removal. Tighten the securing bolts to the specified torque.
12 Refit the brake lines to the brackets on the underbody, and secure with the locking clips.
13 Lower the vehicle to the ground.

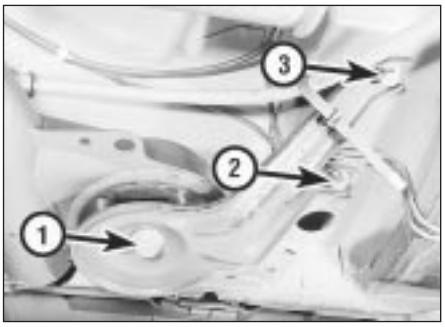
26.5 Brake fluid line/ABS sensor wire bracket and locking clip on semi-trailing arm - DOHC model

26 Rear suspension assembly (DOHC models) - removal and refitting

Removal

1 Loosen the rear roadwheel bolts, chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheels.
2 Remove the rear half of the exhaust system (from the front expansion box rearwards), as described in Chapter 3.
3 Disconnect the handbrake cables and their return springs from the handbrake operating levers, with reference to Chapter 9.
4 Withdraw the handbrake cables from the brackets on the semi-trailing arms.
5 Remove the locking clips and release the brake fluid lines from their brackets on the semi-trailing arms. Note that the locking clips also support the ABS sensor wires **(see illustration)**.
6 Unscrew the securing bolts, and withdraw the brake calipers and the ABS sensor brackets from the brake backplates. Support the calipers and the ABS sensor brackets out of the way by suspending with string or wire from the vehicle underbody.
7 Working on each side of the vehicle in turn, support the semi-trailing arm with a trolley jack, then unscrew and remove the bolt and washer securing the lower end of the shock absorber to the semi-trailing arm. Carefully lower the trolley jack, and withdraw it once the shock absorber has been disconnected from the semi-trailing arm.
8 Disconnect the fuel outlet hose from the fuel filter, located on the right hand side of the underbody in front of the fuel tank. Be prepared for fuel spillage, and take adequate fire precautions. Plug the open ends of the filter and hose, to prevent further fuel spillage and dirt ingress.
9 Support the rear plate of the rear suspension crossmember with a trolley jack, then unscrew and remove the two securing bolts from the crossmember rear tube **(see illustration)**.

26.9 Rear suspension crossmember rear tube securing bolt - DOHC model



26.13 Forward crossmember fixings - DOHC model

1 Securing bolt
2 and 3 Crossmember mounting bracing bracket bolts

10 Carefully lower the trolley jack supporting the crossmember rear plate, until the coil springs and their rubber dampers can be withdrawn. Note the orientation of the springs as they are removed.
11 Make a check to ensure that all relevant hoses, pipes, cables and wires are clear of the rear suspension assembly.
12 With the weight of the rear suspension assembly supported on the trolley jack positioned under the crossmember rear plate, unscrew and remove the two forward crossmember securing bolts. Note that the bolts also pass through the crossmember mounting bracing brackets.
13 Unscrew and remove the two bolts in each case securing the crossmember mounting bracing brackets to the underbody. Then with the help of an assistant, carefully lower the rear suspension assembly and withdraw it from under the vehicle **(see illustration)**.
14 If desired, the assembly can be dismantled with reference to the relevant Sections of this Chapter.
15 The crossmember front mounting bushes can be renewed using a tube or socket, nut, bolt, washers and distance pieces as necessary to draw out the old bushes and fit the new ones. Lubricate the rear bushes with a little soapy water to aid fitting.

Refitting

16 Begin refitting by positioning the rear suspension assembly under the rear of the vehicle, and raising it (with the aid of an assistant) using a trolley jack positioned under the crossmember rear plate as during removal.
17 Refit the two forward crossmember securing bolts, ensuring that they also pass through the crossmember mounting bracing brackets, but do not fully tighten them at this stage.
18 Refit the crossmember mounting bracing bracket to underbody bolts and tighten them to the specified torque, then tighten the two forward crossmember securing bolts to the specified torque.
19 If necessary, lower the trolley jack supporting the crossmember rear plate, and refit the coil springs and their dampers between the semi-trailing arms and the underbody, as noted during removal.
20 Carefully raise the trolley jack supporting the crossmember rear plate, then fit the two crossmember rear tube securing bolts, and tighten them to the specified torque. Withdraw the trolley jack.
21 Reconnect the fuel outlet hose to the fuel filter, and tighten the clamp screw.
22 Working on each side of the vehicle in turn, raise the semi-trailing arm with a trolley jack to allow the lower shock absorber securing bolt and washer to be fitted. Tighten the bolts to the specified torque, then withdraw the trolley jack.
23 Refit the brake calipers and the ABS sensor brackets to the brake backplates, and tighten the securing bolts to the specified torque.
24 Reconnect the brake fluid lines to their brackets on the semi-trailing arms, and secure with the locking clips.
25 Refit the handbrake cables to their brackets on the semi-trailing arms, and reconnect the cable ends and return springs to the handbrake operating levers, then check the handbrake cable adjustment, as described in Chapter 9.
26 Refit the rear half of the exhaust system, with reference to Chapter 3.
27 Refit the roadwheels and lower the vehicle to the ground. Finally tighten the roadwheel bolts with the vehicle resting on its wheels.

27 Rear suspension semi-trailing arm (DOHC models) - removal and refitting

Removal

1 Loosen the relevant rear roadwheel bolts, chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands positioned under the body side members. Remove the roadwheel.
2 Working under the rear of the vehicle, remove the locking clip and release the brake fluid line from its bracket on the semi-trailing arm. Note that the locking clip also supports the ABS sensor wire.
3 Unscrew the two securing bolts, and withdraw the brake caliper and the ABS sensor bracket from the brake backplate. Support the caliper and the ABS sensor bracket out of the way by suspending with string or wire from the vehicle underbody.
4 Disconnect the handbrake cable and its return spring from the handbrake operating lever, with reference to Chapter 9.
5 Withdraw the handbrake cable from the bracket on the semi-trailing arm.
6 Disconnect the anti-roll bar end link from the semi-trailing arm, by unscrewing the single securing nut and bolt. Recover the rubber bush and the spacer sleeve.
7 Support the semi-trailing arm with a trolley jack, then unscrew and remove the bolt and washer securing the lower end of the shock absorber to the semi-trailing arm.
8 Carefully lower the trolley jack sufficiently to enable the coil spring and its rubber dampers to be withdrawn. Note the orientation of the spring as it is removed. Once the spring has been removed, withdraw the jack.
9 Check that all relevant hoses, pipes, cables and wires have been positioned clear of the semi-trailing arm.
10 Unscrew and remove the two self locking nuts and bolts securing the forward end of the semi-trailing arm to the suspension crossmember, then withdraw the semi-trailing arm from under the vehicle.
11 Refer to Section 23 for details of removal and refitting of the rear hub components.
12 The semi-trailing arm mounting bushes can be renewed using a tube or socket, nut, bolt, washers and distance pieces as necessary to draw out the old bushes and fit the new ones. To aid removal of the old bushes, the protruding ends of the bushes can be cut off using a sharp knife. Lubricate the new bushes with a little soapy water to aid fitting.

Refitting

13 Begin refitting by manipulating the forward end of the semi-trailing arm into position in the suspension crossmember brackets.
14 Fit the semi-trailing arm securing bolts, with new self-locking nuts, but do not fully tighten them at this stage. Note that the bolt heads must face each other.
15 Support the semi-trailing arm with a trolley jack, then refit the coil spring and its rubber dampers as noted during removal.
16 Carefully raise the trolley jack to allow the lower shock absorber securing bolt and washer to be fitted. Tighten the bolt to the specified torque then withdraw the trolley jack.
17 Refit the rubber bush and the spacer sleeve, and reconnect the anti-roll bar end link to the semi-trailing arm. Tighten the securing nut to the specified torque while counter-holding the bolt using a spanner.
18 Refit the handbrake cable to the bracket on the semi-trailing arm, and reconnect the cable end and return spring to the handbrake operating lever, then check the handbrake cable adjustment, as described in Chapter 9.
19 Refit the brake caliper and the ABS sensor bracket to the brake backplate, and tighten the securing bolts to the specified torque.
20 Reconnect the brake fluid line to its bracket on the semi-trailing arm, and secure with the locking clip.
21 Refit the roadwheel, then lower the vehicle to the ground. Finally tighten the roadwheel bolts with the vehicle resting on its wheels.
22 With the vehicle resting on its wheels, release the handbrake, and “bounce” the rear of the car to settle the suspension components.

23 Chock the front wheels, and load each front seat with the equivalent of 70 kg. Working under the rear of the vehicle, tighten the semi-trailing arm securing nuts (self-locking) to the specified torque, while counter-holding the bolts using a spanner.

28 Rear suspension crossmember (DOHC models) - removal and refitting

Removal and refitting of the rear suspension crossmember is described in Section 26, where the crossmember is removed as part of the complete rear suspension assembly.

The relevant components can then be removed from the crossmember, with reference to the relevant Sections of this Chapter.

29 Rear anti-roll bar (DOHC models) - removal and refitting

Removal

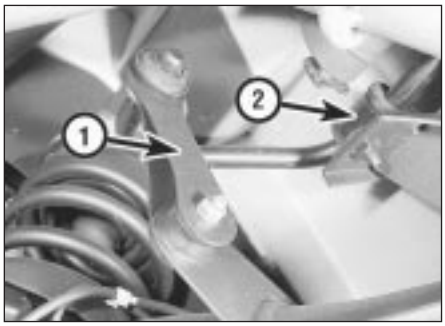
1 Chock the front wheels, then jack up the rear of the vehicle, and support securely on axle stands positioned under the body side members.

2 Working under the rear of the vehicle, remove the locking clips and release the brake fluid lines from their brackets on either side of the vehicle underbody. Note that the locking clips also support the ABS sensor wires.

3 Disconnect the fuel outlet hose from the fuel filter, located on the right hand side of the underbody in front of the fuel tank. Be prepared for fuel spillage, and take adequate fire precautions. Plug the open ends of the filter and hose, to prevent further fuel loss and dirt ingress.

4 Support the rear plate of the rear suspension crossmember using a trolley jack, then unscrew and remove the two securing bolts from the crossmember rear tube.

5 Carefully lower the trolley jack, taking care not to strain any of the hoses, pipes or wires, to allow access to the anti-roll bar to crossmember securing brackets.



29.7 Rear anti-roll bar fixings - DOHC model
1 End link 2 Clamp bracket

6 Disconnect the anti-roll bar end links from the semi-trailing arms by unscrewing the single securing nut and bolt in each case. Recover the rubber bushes and the spacer sleeves.

7 Unscrew and remove the two bolts securing the anti-roll bar clamp brackets to the suspension crossmember, and withdraw the anti-roll bar from the vehicle **(see illustration)**.

8 With the anti-roll bar removed from the vehicle, the end links can be removed by sliding them from the ends of the bar.

9 Examine the anti-roll bar mounting bushes for wear or damage, and renew as necessary.

10 If desired, the rubber bushes can be removed from the end links for renewal by pressing them out using a length of bar, or tube, nut, bolt and washers.

11 The mounting bushes that locate in the clamp brackets can be slid from the end of the anti-roll bar, after removal of one of the end links.

12 Lubricate the new bushes with soapy water to aid fitting.

13 Where applicable, refit the end links to the anti-roll bar.

Refitting

14 Begin refitting by positioning the anti-roll bar under the rear of the vehicle, and securing the end links. Use new rubber bushes and spacer sleeves, and tighten the nuts to the specified torque while counter-holding the bolts using a spanner.

15 Refit the clamps securing the anti-roll bar to the suspension crossmember, and tighten the securing bolts to the specified torque.

16 Carefully raise the jack supporting the crossmember, then refit the bolts securing the crossmember rear tube to the underbody, and tighten them to the specified torque.

17 Reconnect the fuel outlet hose to the fuel filter, and tighten the clamp screw.

18 Reconnect the brake lines to their brackets on the underbody, and secure with the locking clips.

19 Lower the vehicle to the ground.

30 Steering wheel - removal and refitting

Note: *A two legged puller will be required for this operation.*

Warning: If an airbag is fitted, read the warning in Chapter 12, before starting work.

Removal

1 Disconnect the battery negative lead.

2 Set the front wheels in the straight ahead position, and unless unavoidable, do not move them until the steering wheel has been refitted.

3 Prise the horn push pad from the centre of the steering wheel, and disconnect the wiring **(see illustration)**.

4 Using a screwdriver, prise back the tabs on the lockwasher securing the steering wheel retaining nut **(see illustration)**.

5 Unscrew and remove the steering wheel retaining nut and the lockwasher.

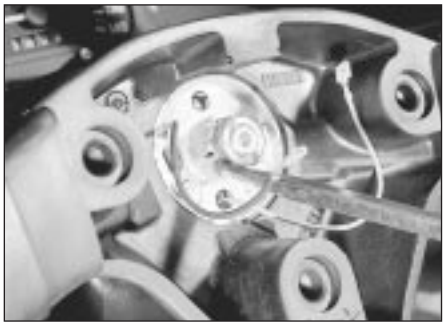
6 Make alignment marks between the steering wheel and the end of the column shaft.

7 A small two legged puller must now be fitted to the steering wheel to pull it from the column shaft **(see illustration)**. Note that the steering wheel is a very tight fit on the shaft.

Refitting

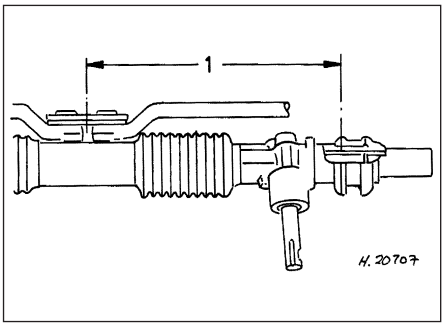
8 Begin refitting by gently tapping the steering wheel into position on the column shaft, using a metal tube or socket, and ensuring that the marks made during removal are aligned. Before tapping the wheel fully home, check the centralisation, as described in Section 31.

30.3 Disconnecting the horn push pad wiring



30.4 Prising back the tabs on the steering wheel retaining nut lockwasher

30.7 Two legged puller fitted to remove steering wheel



31.1A Steering centralised for setting of steering wheel straight ahead position
1 = 325.0 mm (12.8 in)

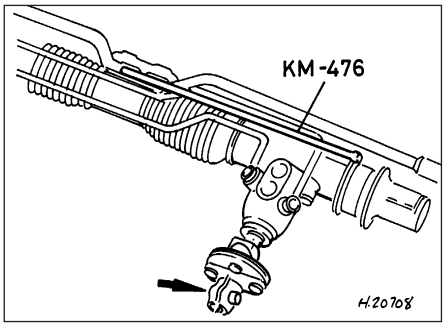
9 Refit the lockwasher and the steering wheel retaining nut, and tighten the nut to the specified torque. Bend up the lockwasher tabs to secure the nut.
10 Refit the horn push pad, ensuring that the wiring is securely connected, and reconnect the battery negative lead.

31 Steering wheel - centralising

1 The steering straight ahead position is achieved when the reference dimension between the centre of the tie-rod to steering gear bolt locking plate(s), and the centre of the rib on the right hand steering gear mounting clamp, is as shown **(see illustration)**. In this position, the flexible rubber coupling upper pinch bolt should lie horizontally on top of the steering shaft **(see illustration)**.
2 Check that the steering wheel is centralised.
3 If the steering wheel is off centre by more than 5°, it should be removed, then moved the required number of splines on the column shaft to achieve centralisation, and refitted as described in Section 30.

32 Steering shaft flexible rubber coupling - renewal

1 Position the front roadwheels in the straight ahead position.
2 Working in the engine compartment, loosen the steering gear mounting bolts.
3 Working in the driver's footwell, remove the lower trim panel by releasing the retaining clips.
4 Unscrew and remove the two pinch bolts from the flexible coupling **(see illustration)**.
5 Push the coupling upwards, remove it from the steering gear pinion shaft, then tilt it and withdraw it from the steering shaft.
6 Before refitting, ensure that the steering gear and the steering wheel are centralised, with reference to Section 31.



31.1B Flexible coupling upper pinch-bolt alignment (arrowed) with steering gear centralised

7 Fit the coupling, and refit the pinch bolts, but do not tighten them at this stage.
8 Push downwards on the coupling, and tighten the lower pinch bolt.
9 Tighten the steering gear mounting bolts to the specified torque.
10 Pull the steering shaft upwards until it contacts the bearing stop, then tighten the coupling upper pinch bolt.
11 Refit the driver's footwell lower trim panel.

33 Steering column - removal and refitting

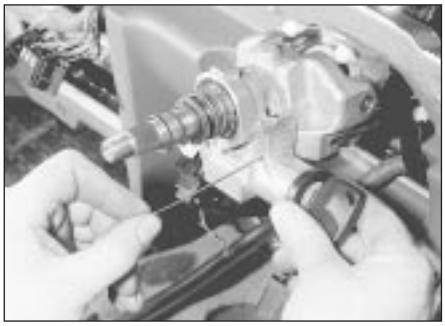
Note: *A bolt extractor will be required during this operation. A new shear head bolt and (where applicable) a new self-locking nut must be used to secure the column on refitting. When removing and refitting the steering column on models equipped with an air bag, read the contents of the following Sections carefully and follow the instructions implicitly. Note that two additional bracing struts, to cater for the additional weight of the air bag assembly, are bolted between the column and centre floor tunnel.*

Removal

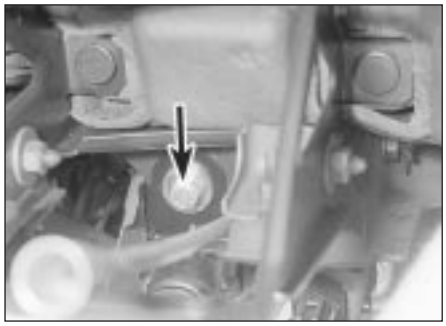
1 Disconnect the battery negative lead.
2 Set the front wheels in the straight ahead position.
3 Working in the driver's footwell, remove the lower trim panel by releasing the retaining clips.

32.4 Steering shaft flexible rubber coupling. Upper pinch-bolt arrowed

4 On models with an adjustable tilt steering column, move the column to its fully raised position, then unscrew the adjuster lever.
5 Remove the steering wheel, as described in Section 30, for improved access.
6 Prise out the screw covers from the front face of the steering column shrouds, then remove the two column shroud securing screws.
7 Remove the three securing screws from the underside of the lower column shroud, then remove both the upper and lower shrouds.
8 Disconnect the wiring plugs from the ignition switch and the indicator and wiper switches, and where applicable, disconnect the horn push wires from the switch housing.
9 On models with a fixed steering column, depress the indicator switch and wiper switch retaining clips and withdraw the switches. On models with an adjustable tilt steering column, unscrew the two Torx screws securing the indicator/wiper switch assembly to the steering column, and remove the switch assembly.
10 Insert the ignition key into the ignition switch, and turn it to position "II".
11 Insert a thin rod into the hole in the lock housing, then press the rod to release the detent spring, and pull out the lock cylinder using the key **(see illustration)**.
12 Working at the lower end of the steering shaft, unscrew and remove the upper pinch bolt securing the steering shaft to the flexible rubber coupling.
13 Unscrew and remove the bolt securing the column to the dashboard mounting bracket **(see illustration)**.



33.11 Removing the lock cylinder - adjustable tilt steering column



33.13 Steering column to dashboard mounting bracket bolt (arrowed)

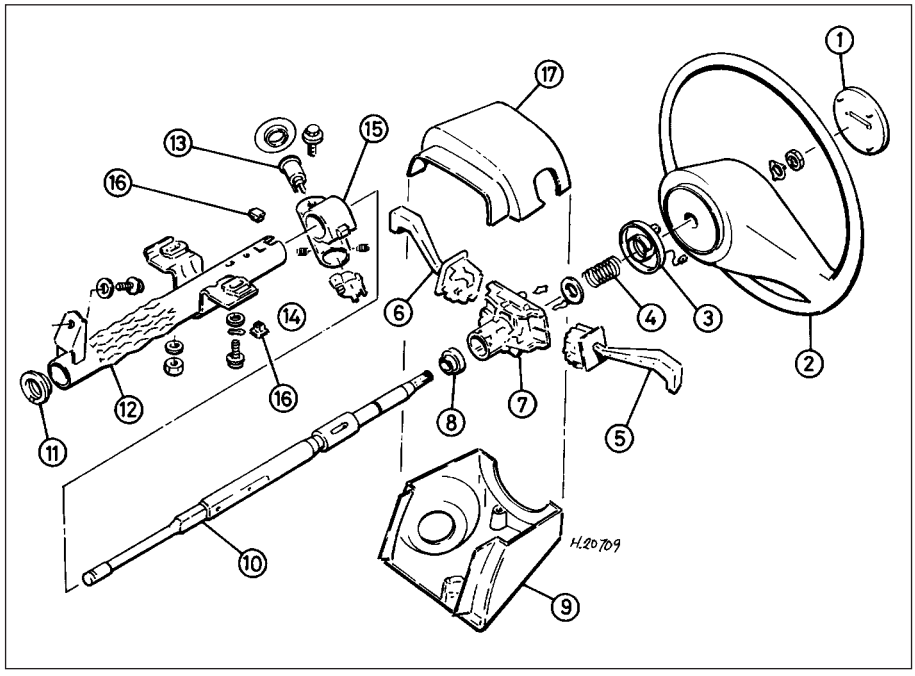
14 Two fixings must now be extracted from the column upper mounting bracket. The right hand bolt is of the shear head type, and must be centre punched, drilled and removed using a bolt extractor **(see illustration)**. A conventional bolt, or a self-locking nut, is used on the left hand side.
15 Withdraw the column assembly into the vehicle interior, and then remove it from the vehicle. Handle the column carefully, avoiding knocks or impact of any kind, which may damage the collapsible section of the column.
16 If desired, the column can be overhauled, as described in Section 34.

Refitting

17 Start refitting by ensuring that the roadwheels are still in the straight ahead position, and that the flexible coupling is positioned so that the upper pinch bolt will be horizontal on top of the steering shaft.
18 If a new column assembly is to be fitted, a large plastic washer will be found at the base of column tube. This washer is used to centre the shaft in the tube, and should be removed when fitting is complete.
19 Offer the column into position, and reconnect the flexible coupling. Refit the pinch bolt, but do not fully tighten it at this stage.
20 Loosely fit the upper mounting fixings, using a new shear head bolt, and (where applicable) a new self-locking nut.

33.14 Column upper mounting shear head bolt (arrowed)

21 Refit the bolt securing the column to the dashboard mounting bracket, and tighten the bolt to the specified torque.
22 Tighten the upper mounting fixings. The shear head bolt should be tightened until the head breaks off, and the conventional bolt or self-locking nut, as applicable, should be tightened to the specified torque.
23 Pull upwards on the steering shaft until the shaft contacts the bearing stop, then tighten the flexible coupling upper pinch bolt.
24 Prise the plastic centring washer from the base of the column tube and remove it from the steering shaft.
25 Further refitting is a reversal of the removal procedure. Refit the steering wheel, as described in Section 30.



34.2 Exploded view of fixed type steering column and associated components

1 Horn push pad
2 Steering wheel
3 Cam assembly
4 Spring
5 Lighting switch
6 Wash/wipe switch
7 Switch housing
8 Bearing
9 Lower column shroud
10 Steering shaft
11 Centralising plastic discs
12 Column tube
13 Lock barrel
14 Ignition switch
15 Lock housing
16 Switch housing safety plugs
17 Upper column shroud

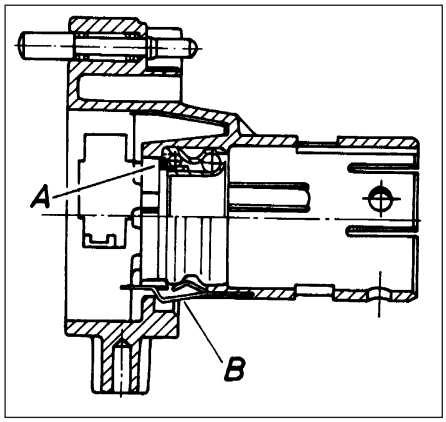
26 On completion, carry out a test drive along a route with several corners, and check that the steering mechanism operates smoothly.

34 Steering column - overhaul

Fixed steering column

Overhaul

1 If the steering column is in position in the vehicle, continue as described in Section 33, paragraphs 1 to 11 inclusive.
2 Prise out the ignition switch housing safety plugs **(see illustration)**, then turn the housing anti-clockwise, and pull it from the steering column.
3 The bearing can be removed from the ignition switch housing by prising apart the two bearing fixing catches, and pressing or driving out the bearing with a piece of tubing on the bearing outer race. When pressing in the new bearing, make sure that the thrustwasher and contact springs are correctly located **(see illustration)**.
4 The ignition switch is secured to the steering lock housing by two grub screws. Remove the screws to extract the switch. It is recommended that the switch and the lock cylinder are not both removed at the same time, so that their mutual alignment is not lost.
5 If the steering column is in position in the vehicle, unscrew and remove the upper pinch bolt from the steering shaft flexible rubber coupling in the driver's footwell.
6 Withdraw the steering shaft from the steering column tube.
7 Begin reassembly by fitting the temporary plastic centring washer, which will be supplied with a new column or steering shaft, into the base of the column tube.
8 Insert the shaft into the column tube. If the column is in position in the vehicle, engage the bottom end of the shaft with the flexible coupling and refit the upper pinch bolt, but do not tighten it at this stage.



34.3 Sectional view of ignition switch housing
A Thrustwasher B Contact springs

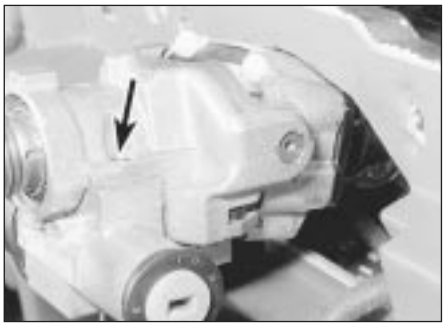
9 Where applicable, refit the ignition switch, and tighten the grub screws.
10 Refit the ignition switch housing, using new safety plugs.
11 If the column is in position in the vehicle, pull upwards on the steering shaft until the shaft contacts the bearing stop, then tighten the flexible coupling upper pinch bolt. Ensure that the roadwheels are still in the straight ahead position, and that the flexible coupling is positioned so that the upper pinch bolt is horizontal on top of the steering shaft.
12 Where applicable, further reassembly is a reversal of dismantling. Refit the steering wheel, as described in Section 30.
13 On completion, carry out a test drive along a route with several corners, and check that the steering mechanism operates smoothly.

Adjustable tilt steering column

Note: *New shear head bolts must be used to secure the lock housing on reassembly*

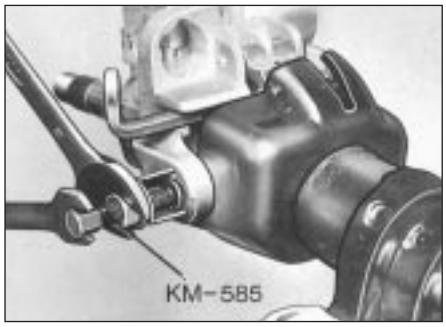
Overhaul

14 If the steering column is in position in the vehicle, continue as described in Section 33, paragraphs 1 to 11 inclusive.
15 The tilt adjuster spring can be removed by simply prising it free using a screwdriver. Be careful, as the spring may fly out.
16 The ignition switch is secured to the lock housing by two grub screws. Access to the "hidden" grub screw is virtually impossible with the steering column installed. For this, and further dismantling, the column must therefore be removed, as described in Section 33.
17 The lock housing is secured to the bearing housing by two shearhead bolts, which must be centre punched, drilled and removed using a bolt extractor, if the two housings are to be separated **(see illustration)**.



34.17 Lock housing shear head bolt location (arrowed) - adjustable tilt steering column

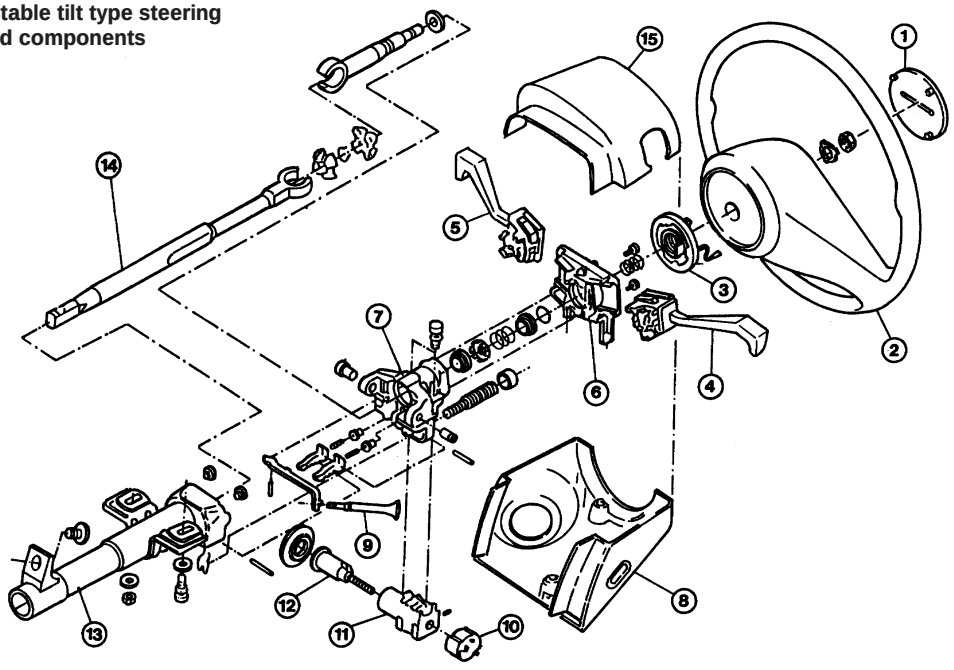
18 The column bearing upper race can be renewed after removing the retaining ring, pressure rings and spring. Note that it may be necessary to compress the spring to remove the retaining ring. Take care, as the spring may fly out as the retaining ring is removed.
19 To remove the bearing housing from the column, the fulcrum pins must be extracted, using a nut and bolt to draw them out. Vauxhall special tool KM-585 is available for this purpose **(see illustration)**.



34.19 Extracting the bearing housing fulcrum pins using special tool KM-585 - adjustable tilt type steering column

20 The column bearing lower race can be driven from the upper shaft using a hammer and a drift or chisel. Press or drive the new race onto the shaft.
21 The column bearings themselves can only be renewed complete with the housing.
22 The shaft universal joint and the tilt mechanism detent components can be dismantled for component renewal if necessary.
23 Reassembly is a reversal of dismantling, noting the following points **(see illustration)**.
24 When reconnecting the steering shaft universal joint, note that the spring clips should be located in the recesses of each half of the joint **(see illustration)**.
25 If the lock housing and bearing housing have been separated, clean out the securing bolt holes with a tap. Apply thread locking compound to new shear head bolts, and tighten the bolts until their heads break off.
26 After fitting the bearing housing fulcrum pins, stake them both in three equidistant places.
27 If the bearings have been renewed, the gaps between the bearing housing and the buffers that limit the movement in the upper position should be checked to ensure that they are equal. Check the gap with a feeler blade. A kit containing different thicknesses of buffer, with instructions, is available if required.

34.23 Exploded view of adjustable tilt type steering column and associated components



1 Horn push pad
2 Steering wheel
3 Cam assembly
4 Lighting switch
5 Wash/wipe switch
6 Switch housing
7 Bearing housing
8 Lower column shroud
9 Tilt adjuster lever
10 Ignition switch
11 Lock housing
12 Lock barrel
13 Column tube
14 Steering shaft
15 Upper column shroud

35 Steering damper - removal and refitting

Removal

1 Certain models are equipped with a steering damper, which is fitted between the rack and the rack housing.
2 Remove the securing nut from the moving end of the damper, and recover the washer.
3 Unbolt the clamp assembly from the rack housing, and withdraw the damper from its tube. Take care not to lose the rubbers and washer from the end of the damper.

Refitting

4 When refitting, secure the clamp assembly to the rack housing first, then tighten the securing nut at the moving end of the damper, to obtain a dimension "A", as shown **(see illustration)**.

36 Steering gear bellows - renewal

Note: *New bellows securing clips will be required for refitting*
1 Remove the steering gear, as described in Section 37 or 39, as applicable.
2 Remove the mounting clamp and rubber from the left hand end of the steering gear.
3 On power steering gear, disconnect the fluid pipe unions from the left hand end of the steering gear.
4 Remove the outer bellows securing clips from each end of the steering gear, then slide off the bellows/tube assembly.
5 Remove the inner bellows securing clips, and separate the bellows from the tube.
6 Fit the new bellows to the tube, using new clips. The clips should be positioned so that when the steering gear is fitted to the vehicle, the ends of the clips point upwards.
7 Fit the bellows/tube assembly to the steering gear, and secure with new clips, again positioned with the ends of the clips pointing upwards. Ensure that the bellows are not twisted.
8 On power steering gear, reconnect the fluid pipe unions, using new O-rings.

34.24 Steering shaft universal joint, adjustable tilt type steering column
Inset Spring clip location

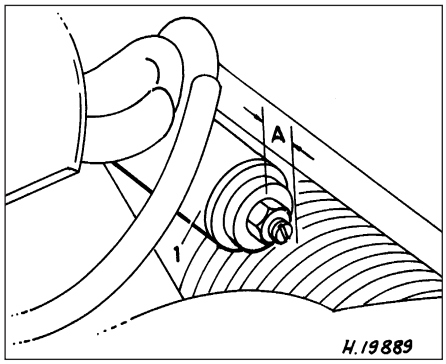
9 Refit the mounting clamp and rubber, then refit the steering gear, (Section 37).

37 Steering gear assembly (manual) - removal, overhaul and refitting

Note: *New steering gear clamp to bulkhead bolts, and new tie-rod to steering gear bolt locking plates, must be used on refitting*

Removal

1 Disconnect the battery negative lead.
2 On carburettor models, for improved access, remove the air cleaner casing from the top of the carburettor. Unbolt and move the brake servo to gain access to the right hand steering gear mounting clamp. It may also be necessary to unbolt the coolant expansion tank and/or the brake master cylinder.
3 Set the front wheels in the straight ahead position.
4 Prise the locking plate(s) from the tie-rod to steering gear bolts, then unscrew and remove the bolts and recover the washers and spacer plate **(see illustrations)**.
5 If a steering damper is fitted, unbolt the clamp assembly from the steering gear, and remove the damper.
6 Working in the driver's footwell, remove the lower trim panel by releasing the retaining clips.
7 On models with an adjustable tilt steering column, move the column to its fully raised position.



35.4 Steering damper securing nut setting
1 Damper tube
A = 12.5 top 13.5 mm

8 Unscrew and remove the upper pinch bolt securing the steering shaft to the flexible rubber coupling.
9 Working in the engine compartment, unbolt the two clamps securing the steering gear to the bulkhead, then manipulate the steering gear out from the left hand side of the engine compartment **(see illustration)**. The help of an assistant may be required to release the flexible rubber coupling from the steering shaft as the steering gear is withdrawn. Note that on some models, various wires and hoses may be secured to the steering gear with cable-ties. Ensure that, where applicable, all wires and hoses are free before the steering gear is removed.

Overhaul

10 Examine the steering gear assembly for signs of wear or damage. Check that the rack moves freely throughout the full length of its travel, with no signs of roughness or excessive free play between the steering gear pinion and rack. It is possible to overhaul the steering gear assembly housing components, but this task should be entrusted to a Vauxhall dealer.
11 The only components that can be renewed easily by the home mechanic are the steering gear gaiters, the track rod balljoints and the track rods. Tie-rod, tie-rod end and steering gear gaiter renewal procedures are covered in Sections 36, 43 and 44.

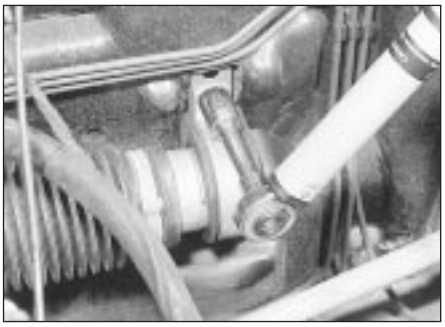
Refitting

12 Refitting is a reversal of removal, remembering the following points.

37.4A Prise off the locking plate . . .

37.4B . . . then unscrew and remove the tie-rod to steering gear bolts

37.9 Removing the steering gear



37.13 Tightening a steering gear mounting bolt

13 Use new mounting bolts to secure the steering gear clamps to the bulkhead **(see illustration)**.
14 The tie-rod to steering gear bolt locking plate(s) must be renewed on refitting.
15 On completion, check the steering wheel centralisation, as described in Section 31.

38 Steering gear assembly (power assisted) - removal, overhaul and refitting

Note: *New steering gear mounting bolts, and new tie-rod to steering gear bolt locking plates, must be used on refitting. New O-rings should be used when reconnecting fluid pipe unions*

Removal

1 Proceed as described in Section 37, paragraphs 1 to 3 inclusive.
2 Disconnect the fluid hoses from the pipes at the left hand end of the steering gear. Be prepared for fluid spillage, and plug the open ends of the pipes and hoses, to prevent dirt ingress and further fluid loss.
3 Where applicable, to provide space for the steering gear to be withdrawn, remove the relay box from the left hand side of the engine compartment, referring to Chapter 12, if necessary.
4 Proceed as described in Section 37, paragraphs 4 to 9 inclusive.

Overhaul

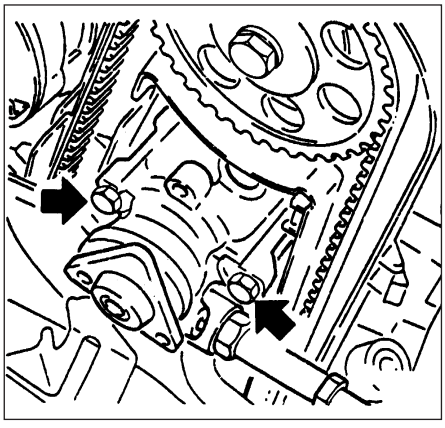
5 Overhaul of the power steering gear is not recommended by the manufacturers.
6 Fluid leaks from the hydraulic fluid pipe unions can normally be corrected by renewing the unions seals with the rack installed.
7 Bellows renewal is covered in Section 36.
8 Adjustment of the power steering gear should not be attempted.
9 Any faults with the steering gear should be referred to a Vauxhall dealer, although renewal of the complete assembly will probably be the only course of action available.

Refitting

10 Refitting is a reversal of removal, remembering the following points.
11 Before refitting, centralise the steering gear by counting the number of turns of the pinion shaft required to move the rack from lock to lock. Then set the rack by turning the pinion shaft from the full lock position through half the number of turns counted. Note that fluid may be ejected from the steering gear pipes as the rack is turned, and it may be necessary to remove the plugs from the ends of the pipes to allow the rack to turn.
12 Use new mounting bolts to secure the steering gear clamps to the bulkhead.
13 The tie-rod to steering gear bolt locking plate(s) must be renewed on refitting.
14 Reconnect the flexible rubber coupling to the steering shaft (with the rack and steering wheel centralised) so that the upper pinch bolt lies horizontally on top of the steering shaft, as described in Section 31, paragraph 1.
15 Renew the O-ring when reconnecting the fluid hose to pipe union.
16 On completion, top-up the fluid level, and bleed the fluid circuit as described in Chapter 1.

39 Power steering fluid circuit - bleeding

1 With the engine stopped, initially fill the reservoir to the level of "MAX" mark on the dipstick attached to the reservoir filler cap.
2 Start the engine, and immediately top-up the fluid level to the "MIN" mark on the dipstick. Do not allow the reservoir to run dry at any time. The help of an assistant will ease this operation.
3 With the engine running at idle speed, turn the steering wheel slowly two or three times approximately 45° left and right of the centre, then turn the wheel twice from lock to lock. Do not hold the wheel on either lock, as this imposes strain on the hydraulic system.
4 Stop the engine, and check the fluid level. With the fluid at operating temperature (80°/176°F) the level should be on the "MAX" mark, and with the fluid cold (20°C/68°F), the level should be on the "MIN" mark. Top-up if necessary.



40.6 Power steering pump mounting bolts (arrowed) - 1.6 litre models, up to 1992

40 Power steering pump - removal and refitting

Note: *A new fluid pipe union O-ring must be used on refitting*

1.6 litre models (up to 1992)

Removal

1 Remove the air cleaner casing from the right hand front wing, as described in Chapters 4A or 4B.
2 Remove the alternator/power steering pump drivebelt, with reference to Chapter 1.
3 Unscrew the three securing bolts, and remove the power steering pump pulley.
4 Unclip and remove the outer timing belt cover.
5 Disconnect the fluid pipe union and the hose from the pump. Be prepared for fluid spillage, and plug the open ends of the pump and the pipes, to prevent dirt ingress and further fluid spillage.
6 Unscrew the two pump securing bolts, and withdraw the pump from the cylinder block towards the alternator **(see illustration)**.
7 No overhaul of the pump is possible, and if faulty, a new unit must be fitted.

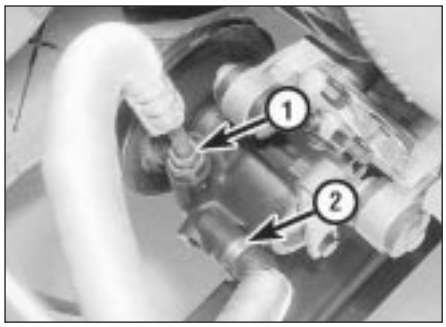
Refitting

8 Refitting is a reversal of removal, but renew the O-ring when reconnecting the fluid pipe union, and tension the alternator/power steering pump drivebelt, (Chapter 1).
9 On completion, top-up the fluid level, and bleed the fluid circuit as described in Chapter 1.

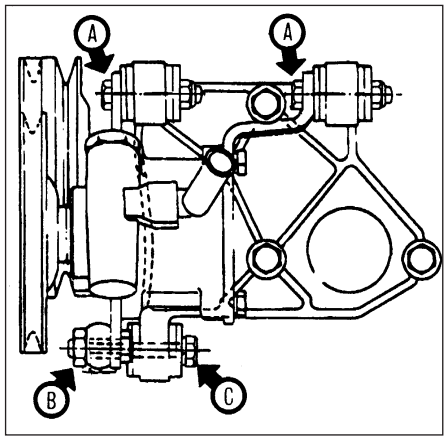
1.6 (from 1993), 1.8 and 2.0 litre models

Removal

10 Remove the power steering pump drivebelt, as described in Chapter 1.
11 Disconnect the fluid pipe union and the flexible fluid hose from the pump **(see illustration)**. Be prepared for fluid spillage, and plug the open ends of the pump, pipe and hose, to prevent dirt ingress and further fluid loss.



40.11 Power steering pump connections - 2.0 litre models
1 Fluid pipe union
2 Flexible hose connection



40.15A Mounting and adjuster bolts (arrowed) must be loosened to adjust drivebelt tension - 1.8 and 2.0 litre models, up to 1992

For A, B and C see "Torque wrench settings" in Specifications

12 Unscrew and remove the four mounting bolts. Recover the nuts, and take care not to lose the rubber insulators that fit into the mounting bracket.

13 Withdraw the pump from the vehicle.

14 No overhaul of the pump is possible, and if faulty, a new unit must be fitted.

Refitting

15 Refitting is a reversal of removal, but renew the O-ring when reconnecting the fluid pipe union. Tension the drivebelt, as described in Chapter 1. Note the different tightening torque settings for the pump mountings **(see illustrations)**.

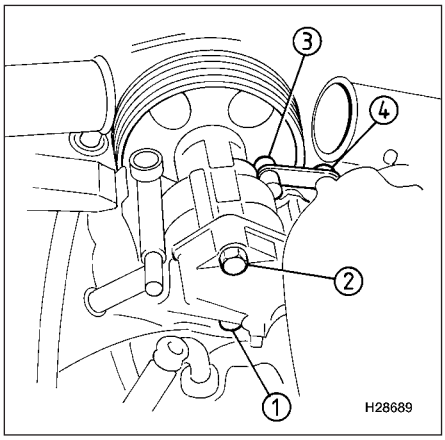
16 On completion, top-up the fluid level, and bleed the fluid circuit (Chapter 1).

41 Power steering fluid reservoir - removal and refitting

Removal

1 The reservoir can be removed for the mounting bracket by unscrewing the clamp screw and removing the clamp.

42.2 Power steering fluid cooler pipe unions in engine compartment - 2.0 litre SOHC model



40.15B Power steering pump mounting (tightening torques shown in Specifications) - DOHC models

1 Pump to support
2 Pump to support
3 Shackle to pump
4 Shackle to engine

2 Have a container ready to catch the fluid, then disconnect the fluid hoses from the reservoir and drain the fluid. Plug the open ends of the hoses, to prevent dirt ingress and further fluid loss.

3 If desired, the mounting bracket can be unbolted from the body panel, but note that on certain models, the bolts securing the bracket also secure the ignition coil and suppressor, refer to Chapter 5. Where applicable, unclip the brake fluid pipes and any wiring from the bracket before removal.

Refitting

4 Refitting is a reversal of removal, but on completion, bleed the fluid circuit (Section 39).

42 Power steering fluid cooler pipes (where fitted) - removal and refitting

Note: *New fluid pipe union O-rings must be used on refitting.*

Removal

1 Remove the radiator, (Chapter 3).

2 Working at the left hand side of the engine compartment, disconnect the fluid cooler pipe unions **(see illustration)**. Be prepared for fluid spillage, and plug the open ends of the pipes to prevent dirt ingress and further fluid loss.

3 Release the three plastic clips securing the pipes to the lower body panel, then manipulate the pipes from the engine compartment **(see illustration)**.

Removal

4 Refitting is a reversal of removal, but renew the O-rings when reconnecting the fluid pipe unions, and refit the radiator as described in Chapter 3.

5 On completion, top-up the fluid level, and bleed the fluid circuit as described in Section 39.

42.03 Removing the power steering fluid cooler pipes - 2.0 litre SOHC model

43 Tie-rod end - removal and refitting

Note: *A balljoint separator tool will be required for this operation. A new tie-rod end balljoint self-locking nut must be used on refitting.*

Removal

1 Where applicable, remove the wheel trim, then loosen the relevant front roadwheel bolts. Apply the handbrake, then jack up the front of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the relevant front roadwheel.

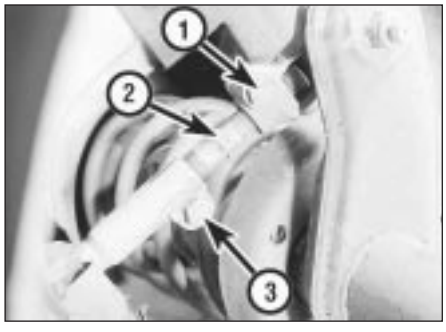
2 Loosen the tie-rod end clamp bolt, which secures the tie-rod end to the threaded adjuster pin on the tie-rod **(see illustration)**.

3 Unscrew the self-locking nut from the tie-rod end to suspension strut balljoint.

4 Using a balljoint separator, disconnect the tie-rod end to suspension strut balljoint **(see illustration)**.

5 Note the position of the tie-rod end on the adjuster pin, either by marking the pin with paint or tape, or by counting the number of threads exposed, then unscrew the tie-rod end from the tie-rod.

6 Note that the tie-rod ends are handed. The right hand tie-rod end is marked "R" but the left hand tie-rod end has no marking.



43.2 Tie-rod end viewed from underneath

1 Tie-rod end clamp bolt
2 Threaded adjuster pin
3 Tie-rod clamp bolt

Refitting

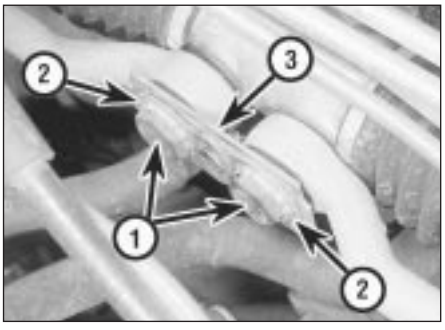
7 Start refitting by screwing the tie-rod end onto the adjuster pin to approximately the same position as was noted during removal.
8 Reconnect the tie-rod end balljoint to the suspension strut, and tighten a new self-locking nut to the specified torque.
9 Tighten the tie-rod end clamp bolt.
10 Refit the roadwheel, and lower the vehicle to the ground. Finally tighten the roadwheel bolts with the vehicle resting on its wheels, and where applicable, refit the wheel trim.
11 Check the front wheel alignment, as described in Section 45, and adjust if necessary. No harm will result from driving the vehicle a short distance to have the alignment checked.

44 Tie-rod - removal and refitting

Note: *A new tie-rod to steering gear bolt locking plate, and where applicable, a new tie-rod end balljoint self-locking nut, must be used on refitting. If the tie-rod is to be removed complete with the tie-rod end, a balljoint separator tool will be required*

Removal

1 The tie-rod can either be removed leaving the tie-rod end in place, or as an assembly with the tie-rod end.
2 Proceed as described in Section 43, paragraph 1.
3 If the tie-rod is to be removed complete with the tie-rod end, continue as described in Section 43, paragraphs 3 and 4.
4 If the tie-rod is to be removed independently of the tie-rod end, loosen the tie-rod clamp bolt, which secures the tie-rod to the threaded adjuster pin on the tie-rod end.
5 Prise the locking plate(s) from the tie-rod to steering gear bolts, then unscrew and remove the bolts, and recover the washers and spacer plate **(see illustration)**.
6 If the tie-rod is being removed complete with the tie-rod end, the assembly can now be withdrawn from the vehicle.
7 If the tie-rod is to be removed independently of the tie-rod end, note the position of the tie-rod end on the adjuster pin.



44.05 Tie-rod to steering gear fixings
1 Fixing bolts 3 Spacer plate
2 Locking plates

43.04 Disconnecting the tie-rod end to suspension strut balljoint

Do this either by marking the pin with paint or tape, or by counting the number of threads exposed, then unscrew the tie-rod from the tie-rod end and withdraw it from the vehicle.

Refitting

8 Refitting is a reversal of removal, remembering the following points.
9 The tie-rod to steering gear bolt locking plate(s) must be renewed on refitting.
10 If the tie-rod is being refitted complete with the tie-rod end, reconnect the tie-rod end balljoint to the suspension strut, and tighten a new self-locking nut to the specified torque.
11 If the tie-rod is being refitted with the tie-rod end already in place on the vehicle, screw the tie-rod onto the adjuster pin to approximately the same position as noted during removal, and tighten the clamp bolt.
12 Finally tighten the roadwheel bolts with the vehicle resting on its wheels, and where applicable, refit the wheel trim.
13 On completion, check the front wheel alignment, as described in Section 45 and adjust if necessary. No harm will result from driving the vehicle a short distance to have the alignment checked.

45 Front wheel alignment - general

1 Accurate front wheel alignment is essential for precise steering and handling, and for even tyre wear. Before carrying out any checking or adjusting operations, make sure that the tyres are correctly inflated. Check also that all steering and suspension joints and linkages are in sound condition and that the wheels are not buckled or distorted, particularly around the rims. It will also be necessary to have the car positioned on flat level ground, with enough space to push the car backwards and forwards through about half its length.
2 Front wheel alignment consists of four factors:

a) Camber is the angle at which the roadwheels are set from the vertical when viewed from the front or rear of the vehicle. Positive camber is the angle (in degrees) that the wheels are tilted outwards at the top from the vertical.
b) Castor is the angle between the steering axis and a vertical line when viewed from each side of the vehicle. Positive castor is indicated when the steering axis is inclined towards the rear of the vehicle at its upper end.
c) Steering axis inclination is the angle, when viewed from the front or rear of the vehicle, between the vertical and an imaginary line drawn between the upper and lower front suspension strut mountings.
d) Toe setting is the amount by which the distance between the front inside edges of the roadwheels differs from that between the rear inside edges, when measured at hub height. If the distance between the front edges is less than that at the rear, the wheels are said to "toe-in". If it is greater than at the rear, the wheels "toe-out."

3 Camber, castor and steering axis inclination are set during manufacture, and are not adjustable. Unless the vehicle has suffered accident damage, or there is gross wear in the suspension mountings or joints, it can be assumed that these settings are correct. If for any reason it is believed that they are not correct, the task of checking them should be left to a Vauxhall dealer, who will have the necessary special equipment needed to measure the small angles involved.
4 It is, however, within the scope of the home mechanic to check and adjust the front wheel toe setting. To do this, a tracking gauge must first be obtained. Two types of gauges are available, and can be obtained from motor accessory shops. The first type measures the distance between the front and rear inside edges of the roadwheels, as previously described, with the car stationary. The second type, known as a scuff plate, measures the actual position of the contact surface of the tyre, in relation to the road surface, with the vehicle in motion. This is achieved by pushing or driving the front tyre over a plate, which then moves slightly according to the scuff of the tyre, and shows this movement on a scale. Both types have their advantages and disadvantages, but either can give satisfactory results if used correctly and carefully. Alternatively, a tracking gauge can be fabricated from a length of steel tubing, suitably cranked to clear the sump and clutch bellhousing, with a set-screw and a locknut at one end.
5 Many tyre specialists will also check toe settings free, or for a nominal charge.
6 Make sure that the steering is in the straight ahead position when making measurements.
7 If adjustment is found to be necessary, clean the ends of the tie-rods in the area of the adjustment pin and clamp bolts.
8 Slacken the clamp bolts (one on each tie-rod balljoint and one on each tie-rod), and turn the adjustment pin on each tie-rod by the same amount in the same direction. Only turn each pin by a quarter turn at a time before rechecking.
9 When adjustment is correct, tighten the clamp bolts to the specified torque. Check that the tie-rod lengths are equal to within 5 mm (0.2 in), and that the steering wheel spokes are in the correct straight ahead position.