Chapter 9
Braking system

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

System type

Models without ABS:	
1.4, 1.6 and 1.8 litre models	Front discs and rear drums, with vacuum servo assistance, dual hydraulic circuit split diagonally, pressure-proportioning valves in rear hydraulic circuit. Cable-operated handbrake on rear wheels
2.0 litre models	Front and rear discs, with vacuum servo assistance, dual hydraulic circuit split diagonally, pressure-proportioning valves in rear hydraulic circuit. Cable-operated handbrake on rear wheels
All models with Anti-lock Braking System (ABS)	Front and rear discs, with vacuum servo assistance, operated via hydraulic modulator, dual hydraulic circuit split front/rear, pressure-proportioning valves in rear hydraulic circuit. Cable-operated handbrake on rear wheels

Front discs

Type:	
1.4, 1.6 and 1.8 litre models	Solid or ventilated (as from 10/91)
2.0 litre models	Ventilated
Diameter:	
1.4, 1.6 and early 1.8 litre models	236 mm
Late (as from 10/91) 1.8 and 2.0 litre models	256 mm
Maximum disc run-out (all models)	0.1 mm
Minimum pad friction material thickness (including backing plate):	
All models	7.0 mm
Minimum disc thickness after machining: *	
1.4, 1.6 and 1.8 litre models (with solid discs)	10.7 mm
1.4, 1.6 and 1.8 litre models (with vented discs)	18.0 mm
2.0 litre models	22.0 mm

** When this dimension is reached, only one further new set of brake pads is permissible, then renew the discs*

Rear discs

Type (all models)	Solid
Diameter (all models)	260 mm
Maximum disc run-out (all models)	0.1 mm
Minimum pad friction material thickness (including backing plate):	
All models	7.0 mm
Minimum disc thickness after machining (all models) *	8.0 mm

** When this dimension is reached, only one further new set of disc pads is permissible, then renew the discs*

Minimum handbrake shoe friction material thickness (lining only)	
All models	1.0 mm

Rear drums

Internal diameter (all models)	200 mm
Minimum shoe friction material thickness (all models)	0.5 mm above rivet heads

Brake fluid type/specification:

All models	See *Lubricants and fluids* in "*Weekly checks*"

Torque wrench settings

	Nm	lbf ft
ABS hydraulic modulator mounting	8	6
ABS wheel sensor mounting	8	6
ABS control unit	1.5	1
Brake fluid line unions	16	12
Caliper and wheel cylinder bleed screws	9	7
Front brake disc securing screw	4	3
Front brake fluid hose to caliper union	40	30
Front caliper bracket to hub carrier	95	70
Front caliper guide	30	22
Front caliper mounting (solid disc models)	95	70
Front caliper to mounting bracket (vented disc models)	30	22
Handbrake lever securing	20	15
Master cylinder mounting	22	16
Master cylinder stop screw (ATE type)	6	4
Pressure proportioning valve to master cylinder:		
ATE type	12	9
GMF type	40	30
Rear brake backplate/stub axle spring:		
Stage 1	50	37
Stage 2	Angle-tighten a further 30º	
Stage 3	Angle-tighten a further 15º	
Rear brake disc securing screw	8	6
Rear caliper mounting	80	59
Rear drum securing screw	4	3
Rear wheel cylinder mounting	9	7
Vacuum servo support bracket to bulkhead	22	16
Vacuum servo to support bracket	20	15

1 General description

The foot brake operates on all four wheels. Solid or ventilated disc brakes are fitted at the front, and self-adjusting drum or solid disc brakes are fitted at the rear, depending on model. Actuation is hydraulic, with vacuum servo assistance. The handbrake is cable-operated, and acts on the rear wheels only.

The hydraulic system is split into two circuits. On non-ABS models, the system is split diagonally, and on ABS models, the system is split front and rear. If there is a hydraulic fluid leak in one circuit, the remaining circuit will still function, so that some braking capability remains.

The hydraulic fluid supply to the rear brakes is regulated so that the front brakes always lock first under heavy braking. The fluid pressure to the rear brakes is controlled by two valves, one for each brake, which are either screwed into the master cylinder or mounted on the rear underbody of the vehicle, depending on model.

The brake servo is of the direct-acting type, fitted between the pedal and the master cylinder. The servo is powered by vacuum developed in the inlet manifold. Should the servo fail, the brakes will still operate, but increased pedal pressure will be required.

2 Anti-lock braking system (ABS) - general

1 ABS is available as an option for all models. When the ignition is switched on, an 'ABS' symbol illuminates in the instrument panel for a short time.

2 The system comprises an electronic control unit, roadwheel sensors, hydraulic modulator, and the necessary valves and relays. Disc brakes are fitted to all four wheels. The purpose of the system is to stop wheel(s) locking during heavy brake applications. This is achieved by automatic release of the brake on the locked wheel, followed by re-application of the brake. This procedure is carried out several times a second by the hydraulic modulator.

3 The modulator is controlled by the electronic control unit, which itself receives signals from the wheel sensors, which monitor the locked or unlocked state of the wheels. The two front brakes are modulated separately, but the two rear brakes are modulated together.

4 The ABS unit is fitted between the brake master cylinder and the brakes, the vacuum servo and master cylinder being of similar type for both non-ABS and ABS models.

5 If the 'ABS' symbol, in the instrument panel stays lit after approximately 4 seconds, or if it comes on sporadically or stays on whilst driving, there is a fault in the system. Should this occur, it is recommended that a complete test is carried out by a Vauxhall dealer, who will have the necessary specialist diagnostic equipment. Due to the special equipment required, it is not practical for the DIY mechanic to carry out the test procedure.
6 To prevent possible damage to the electronic control unit, always disconnect the control unit wiring plug before carrying out electrical welding work.
7 It is recommended that the control unit is removed if the vehicle is being subjected to high temperatures, like for instance, during certain paint-drying processes.
8 If using steam cleaning equipment, do not aim the water/steam jet directly at the control unit.
9 Do not disconnect the control unit wiring plug with the ignition switched on.
10 Do not use a battery booster to start the engine.
11 After working on the ABS components, ensure that all wiring plugs are correctly reconnected, and have the complete system tested by a Vauxhall dealer, at the earliest opportunity.
12 All models up to 1991 that were fitted with ABS, used the ABS-2E system. From 1992 onwards an ABS-2EH system was fitted, which can be identified by the location of the electronic control module, which is bolted to the hydraulic modulator.
13 The main differences between the two systems are in the electrical components and circuits, the most obvious of these being omission of the surge arrester relay on the 2EH system.

3 Hydraulic system - bleeding

HAYNES HiNT ***If brake fluid is spilt on the paintwork, the affected area must be washed down with cold water immediately. Brake fluid is an effective paint stripper!***

General

1 If any of the hydraulic components in the braking system have been removed or disconnected, or if the fluid level in the reservoir has been allowed to fall appreciably, it is certain that air will have entered into the system. The removal of all this air from the hydraulic system is essential if the brakes are to function correctly, and the process of removing it is known as bleeding.
2 Where an operation has only affected one circuit of the hydraulic system (the system is split diagonally on non-ABS models, and front and rear on ABS models), then it will only be necessary to bleed the relevant circuit. If the master cylinder has been disconnected and reconnected, or the fluid level has been allowed to fall appreciably, then the complete system must be bled.
3 One of three methods can be used to bleed the system, although Vauxhall recommend the use of a pressure bleeding kit.

Bleeding - two-man method

4 Obtain a clean jar, and a length of rubber or plastic bleed tubing that will fit the bleed screws tightly. The help of an assistant will be required.
5 Remove the dust cap and clean around the bleed screw on the relevant caliper of wheel cylinder **(see illustration)**, then attach the bleed tube to the screw. If the complete system is being bled, start at the front of the vehicle. When bleeding the complete system on models with ABS, the front brakes must be bled before the rears.
6 Check that the fluid reservoir is topped up, and then destroy the vacuum in the brake servo by giving several applications of the brake pedal.
7 Immerse the open end of the bleed tube in the jar, which should contain two or three inches of hydraulic fluid. The jar should be positioned about 300 mm (12.0 in) above the bleed screw to prevent any possibility of air entering the system down the threads of the bleed screw when it is slackened.
8 Open the bleed screw half a turn, and have the assistant depress the brake pedal slowly to the floor. With the brake pedal still depressed, retighten the bleed screw, and then have the assistant quickly release the pedal. Repeat the procedure.
9 Observe the submerged end of the tube in the jar. When air bubbles cease to appear, tighten the bleed screw when the pedal is being held fully down by the assistant.
10 Top-up the fluid reservoir. It must be kept topped up throughout the bleeding operations. If the connecting holes to the master cylinder are exposed at any time due to low fluid level, the air will be drawn into the system, and the whole bleeding process will have to start again.
11 If the complete system is being bled, the procedure should be repeated on the diagonally opposite rear brake. Then on the front and rear brakes of the other circuit on non-ABS models, or on the remaining front brake and then on the rear brakes on ABS models.
12 On completion, remove the bleed tube, and discard the fluid that has been bled from the system, unless it is required to make up the level in the bleed jar. Never re-use old fluid.
13 On completion of bleeding, top-up the fluid level in the reservoir. Check the action of the brake pedal, which should be firm, and free from any "sponginess" that would indicate that air is still present in the system.

3.5 Removing the dust cap from a rear caliper bleed screw - models with ventilated discs

Bleeding - with one-way valve

14 There are a number of one-man brake bleeding kits currently available from motor accessory shops. It is recommended that one of these kits should be used whenever possible, as they greatly simplify the bleeding operations. They also reduce the risk of expelled air or fluid being drawn back into the system.
15 Proceed as described in paragraphs 5 and 6.
16 Open the bleed screw half a turn, then depress the brake pedal to the floor, and slowly release it. The one-way valve in the bleeder device will prevent expelled air from returning to the system at the completion of each stroke. Repeat the operation until clear hydraulic fluid, free from air bubbles, can be seen coming through the tube. Tighten the bleed screw.
17 Proceed as described in paragraphs 11 to 13 inclusive.

Bleeding - with pressure bleeding kit

18 These are also available from motor accessory shops, and are usually operated by air pressure from the spare tyre.
19 By connecting a pressurised container to the master cylinder fluid reservoir, bleeding is then carried out by simply opening each bleed screw in turn and allowing the fluid to run out. Like turning on a tap, until no air bubbles are visible in the fluid being expelled.
20 Using this method, the large reserve of fluid provides a safeguard against air being drawn into the master cylinder during the bleeding operations.
21 This method of bleeding is recommended by Vauxhall.
22 Begin bleeding with reference to paragraphs 5 and 6, and continue as described in paragraphs 11 to 13 inclusive.

4 Front disc pads - inspection, removal and refitting

Note: *When working on the brake components, take care not to disperse brake dust into the air, or to inhale it, since it may contain asbestos, which can damage your health.*

Inspection

1 Where applicable, remove the wheel trims, then loosen the front roadwheel bolts and apply the handbrake. Jack up the front of the vehicle, and support on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members.
2 Remove the roadwheels. Turn the steering to full right-hand lock, and check the wear of the friction material on the right-hand brake pads. Check that the thickness of the friction material (including the backing plate) is not less than the minimum given in the Specifications.
3 Turn the steering to full left-hand lock, and check the left-hand brake pads in the same way.
4 If any brake pad is worn below the specified minimum thickness, renew all the front pads as a set.
5 If the pads require renewal, continue as follows according to model.

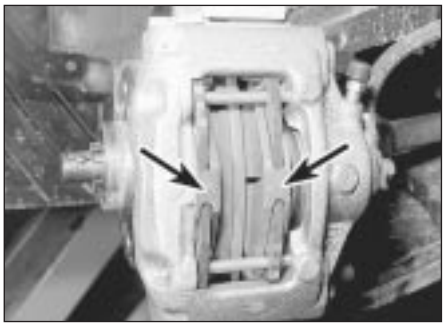
Removal

1.4, 1.6 and 1.8 litre models

6 Note how the anti-rattle springs are located **(see illustration)**, then drive the upper and lower pad retaining pins out from the inboard side of the caliper, using a pin punch.
7 Remove the anti-rattle springs **(see illustration)**.
8 Push the pads away from the disc slightly, then using a pair of pliers, withdraw the outboard pad **(see illustration)**.
9 Withdraw the inboard pad, and the shim that fits between the pad and the caliper piston **(see illustration)**.

Refitting

10 Brush the dust and dirt from the caliper, but take care not to inhale it. Carefully remove any rust from the edge of the brake disc.



4.6 Front disc pad anti-rattle springs (arrowed) - models with solid discs

11 To accommodate the new thicker pads, the caliper piston must be depressed fully into its cylinder bore, using a flat bar of metal such as a tyre lever. The action of depressing the piston will cause the fluid level in the reservoir to rise, so to avoid spillage, syphon out some fluid using an old hydrometer or a teat pipette. Refer to the note at the beginning of Section 3. Do not lever between the piston and disc to depress the piston.
12 Check that the cutaway recesses in the piston are positioned vertically. If necessary, carefully turn the piston to its correct position.
13 Apply a little brake grease to the top and bottom edges of the backplates on the new brake pads.
14 Locate the new pads in the caliper, ensuring that the shim is in place between the inboard pad and the piston. Ensure that the friction material faces the disc, and check that the pads are free to move slightly.
15 Locate the anti-rattle springs on the pads, then insert the pad retaining pins from the outboard side of the caliper, while depressing the springs. Tap the pins firmly into the caliper **(see illustration)**.
16 Repeat the operations on the remaining side of the vehicle.
17 Refit the roadwheels and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.
18 Apply the footbrake hard several times to position the pads against the discs.
19 Check and if necessary top-up the brake fluid level.

4.7 Removing an anti-rattle spring - models with solid discs

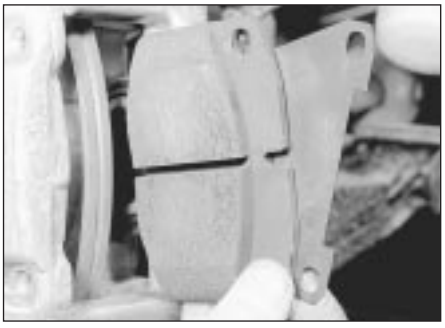
4.8 Withdrawing the outboard disc pad - models with solid discs

20 New brake pads should be carefully bedded in and, where possible, heavy braking should be avoided during the first 100 miles (160 km) or so after fitting new pads.

2.0 litre models

Removal

21 Where applicable, pull the pad wear sensor from the inboard pad, and disconnect the wiring at the connector under the wheel arch, next to the suspension strut **(see illustration)**. Note the wire routing.
22 Using a screwdriver, prise the pad retaining clip from the outboard edge of the caliper, noting how it is located **(see illustration)**.
23 Prise out the two guide bolt dust caps from the inboard edge of the caliper, then using a Allen key or hexagon bit, unscrew the

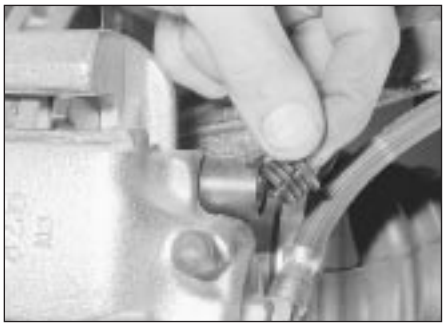


4.9 Withdrawing the inboard disc pad and shim - models with solid discs

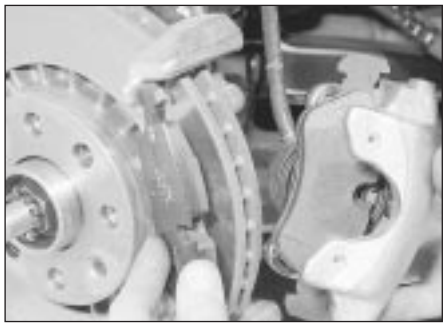
4.15 Fitting a disc pad retaining pin - models with solid discs

4.21 Withdrawing the pad wear sensor from the inboard pad - DOHC model

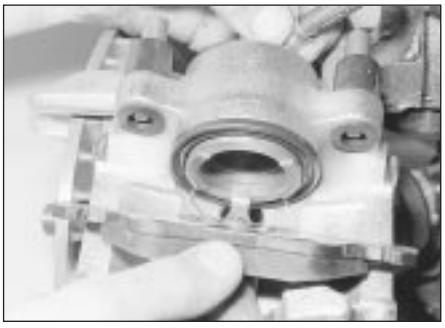
4.22 Prising out the disc pad retaining clip - models with ventilated discs



4.23A Removing a caliper guide bolt dust cap - models with ventilated discs



4.23B Withdrawing the caliper, inboard and outboard pad - models with ventilated discs



4.24 Removing the inboard pad from the caliper piston - models with ventilated discs

4.25 Caliper piston cutaway recess (arrowed) correctly positioned - models with ventilated discs

4.29 Tightening a caliper guide bolt - models with ventilated discs

guide bolts, and lift the caliper and inboard pad from the bracket. Recover the outboard brake pad **(see illustrations)**. Suspend the caliper body with wire or string, to avoid straining the brake fluid hose.

24 Pull the inboard pad from the caliper piston, noting that it is retained by a clip attached to the pad backing plate **(see illustration)**.

Refitting

25 Proceed as described in paragraphs 10 to 12 inclusive **(see illustration)**.

26 Apply a little brake grease to the contact surfaces of the new brake pads.

27 Fit the new inboard pad to the caliper piston, ensuring that the piston is correctly located.

28 Locate the outboard pad on the caliper bracket, with the friction material facing the disc.

29 Refit the caliper to the bracket, and tighten the guide bolts to the specified torque **(see illustration)**.

30 Refit the guide bolt dust caps.

31 Refit the pad retaining clip, locating it as noted before removal.

32 Where applicable, fit a new pad wear sensor to the inboard pad, and connect the wiring at the connector under the wheel arch. Route the wiring as noted during removal.

33 Repeat the operations on the remaining side of the vehicle.

34 Proceed as described in paragraphs 17 to 20 inclusive.

5 Rear disc pads - inspection, removal and refitting

Note: *When working on the brake components, take care not to disperse brake dust into the air, or to inhale it, since it may contain asbestos, which can damage your health.*

Inspection

1 Where applicable, remove the wheel trims, then loosen the 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 roadwheels.

2 Check the wear of the friction material on the brake pads, on both sides of the vehicle. Check that the thickness of the friction material (including the backing plate) is not less than the minimum given in the Specifications.

3 If any brake pad is worn below the specified minimum thickness, renew all the rear pads as a set as follows.

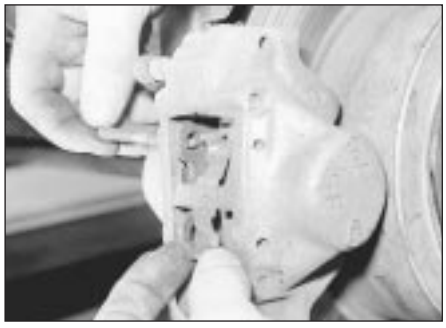
Removal

4 Note how the anti-rattle spring is located, then drive out the upper and lower pad retaining pins from the outside of the caliper using a pin punch **(see illustration)**.

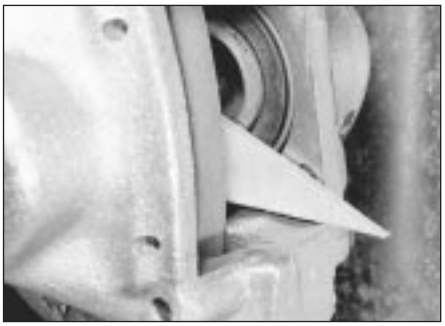
5 Remove the anti-rattle spring **(see illustration)**.

6 Push the pads away from the disc slightly, then using a pair of pliers, withdraw the

5.4 Driving out a rear disc pad retaining pin



5.5 Removing a rear disc pad retaining pin anti-rattle spring



5.9 Checking a rear caliper piston cut away recess angle with a card template

outboard pad and anti-squeal shim that fits between the pad and the caliper body.

7 Withdraw the inboard pad and anti-squeal shim.

Refitting

8 Proceed as described in Section 4, paragraphs 10 and 11.

9 Check that the cutaway recesses in the pistons are positioned downwards, at approximately 23° to the horizontal. A template made of card may be used to check the setting **(see illustration)**. If necessary, carefully turn the pistons to their correct positions.

10 Apply a little brake grease to the top and bottom edges of the backplates on the new brake pads.

11 Locate the new pads and the anti-squeal shims in the caliper. Ensure that the friction material faces the disc, and check that the pads are free to move slightly.

12 Locate the anti-rattle spring on the pads, then insert the pad retaining pins from the inside edge of the caliper, while depressing the spring. Tap the pins firmly into the caliper.

13 Repeat the operations on the remaining side of the vehicle.

14 Proceed as described in Section 4, paragraphs 17 to 20 inclusive.

6 Rear brake shoes (drum brakes) - inspection, removal and refitting

Note: *When working on the brake components, take care not to disperse brake dust into the air, or to inhale it, since it may contain asbestos, which can damage your health.*

Inspection

1 It is recommended that the brake shoes are inspected when necessary by removing the drums. This will enable a proper inspection of the linings to be made, and additionally, the wheel cylinders can be inspected for leaks. If preferred, however, a provisional inspection of the state of wear of the rear shoe linings can be made by removing the plugs from the inspection holes in the brake backplates.

6.6A Extracting a brake drum securing screw

2 Use a torch or inspection lamp, and if necessary a mirror, to check that the friction material has not worn down to less than the specified minimum.

3 If any one of the shoes has worn below the specified limit, all four rear brake shoes must be renewed as a set, as follows.

Removal

4 Where applicable, remove the wheel trims, then loosen the 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 roadwheels.

5 Fully release the handbrake.

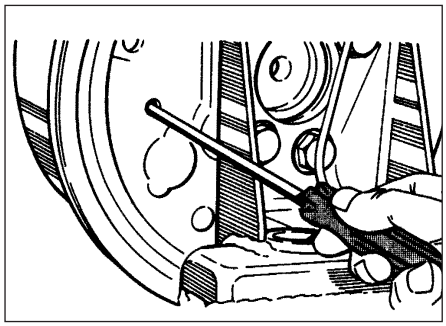
6 Extract the drum securing screw and remove the drum. If the drum is tight, remove the plug from the inspection hole in the brake backplate, and push the handbrake operating lever towards the brake shoe to move the shoes away from the drum. If necessary, slacken the handbrake cable adjuster **(see illustrations)**.

7 Note the location and orientation of all components before dismantling, as an aid to reassembly.

8 Clean the dust and dirt from the drum and shoes, but take care not to inhale it.

9 Remove the shoe hold-down pins, springs and cups by depressing the cups and turning them through 90° using a pair of pliers **(see illustrations)**. Note that the hold-down pins are removed through the rear of the brake backplate.

10 Disconnect the handbrake cable from the operating lever.



6.6B Push the handbrake operating lever to move the shoes away from the drum

11 The upper and lower return springs may now be unhooked and the shoes removed separately, or the assembly of shoes, adjuster strut and springs may be removed together. Remove the hub, refer to Chapter 10, if necessary. Take care not to damage the wheel cylinder rubber boots. Before removing the return springs, note the position and orientation of the springs and adjuster strut.

12 If the shoes are to be removed for some time, fit a stout rubber band or a spring clip to the wheel cylinder, to prevent the pistons from being pushed out of their bores. In any event, do not press the brake pedal while the drum is removed.

Refitting

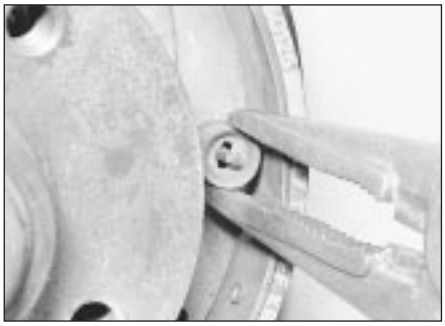
13 Clean the dust and dirt from the brake backplate, but take care not to inhale it.

14 Apply a small amount of brake grease to the shoe rubbing areas on the backplate.

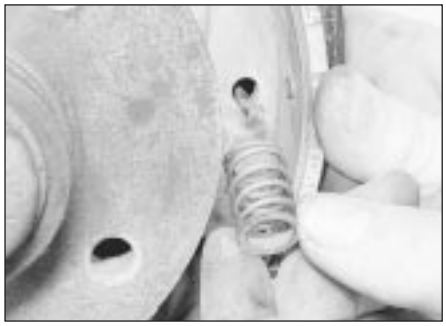
15 Investigate and rectify any source of contamination of the linings (wheel cylinder or hub bearing oil seal leaking).

16 Although linings are available separately (without shoes), renewal of the shoes complete with linings is to be preferred, unless the reader has the necessary skills and equipment to fit new linings to the old shoes.

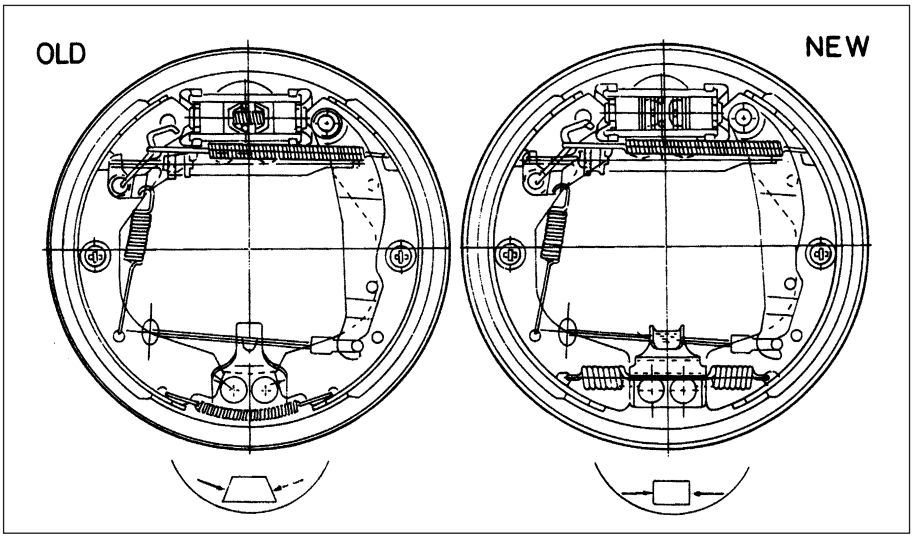
17 If not already done, dismantle the shoes, strut and springs. Note the position and orientation of the components. On later models (1992-on), the brake shoe lower anchorage has been modified so that it is now rectangular, necessitating modified brake shoes and a modified lower return spring **(see illustration)**.



6.9A Release the shoe hold-down cup . . .



6.9B . . . then withdraw the cup and spring



6.17 Modified rear brake shoe lower anchorage - 1992-on models

18 If both brake assemblies are dismantled at the same time, take care not to mix up the components. Note that the left-hand and right-hand adjuster components are marked. The threaded rod is marked "L" or "R", and the other "handed" components are colour-coded black for the left-hand side, and silver for the right-hand side.

19 Dismantle and clean the adjuster strut. Apply a smear of silicone-based grease to the adjuster threads.

20 Examine the return springs. If they are distorted, or if they have seen extensive service, renewal is advisable. Weak springs may cause the brakes to bind.

21 If a new handbrake operating lever was not supplied with the new shoes (where applicable), transfer the lever from the old shoes. The lever may be secured with a pin and circlip, or by a rivet, which will have to be drilled out.

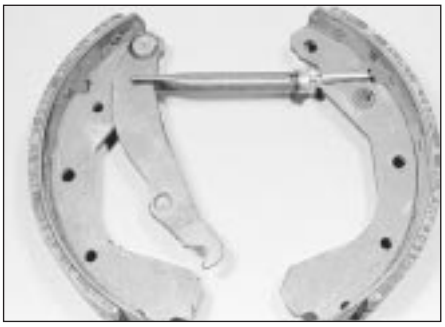
22 If the components are to be refitted as an assembly, assemble the new shoes, springs and adjuster components. Expand the adjuster strut to ease fitting **(see illustrations)**.

23 Offer the shoes to the brake backplate. Be careful not to damage the wheel cylinder boots, or to displace the pistons. Remember to remove the rubber band or spring clip from the wheel cylinder, where applicable.

24 When the shoes are in position, insert the hold-down pins and secure them with the springs and cups **(see illustration)**.

25 Reconnect the handbrake cable, then refit the hub, and adjust the bearing if the hub was removed.

26 Fitting the shoes and springs together as an assembly may be too difficult. It is possible to fit the shoes and secure them with the hold-down pins and then fit the adjuster strut, the return springs and adjuster.



6.22A Right-hand adjuster strut correctly fitted to shoes

6.22B Fitting the upper return spring to the shoes

6.22C Adjuster lever spring fitted to leading shoe

27 Back off the adjuster wheel to reduce the length of the strut, until the brake drum will pass over the shoes.

28 Make sure that the handbrake operating lever is correctly positioned, with the pin on the edge of the shoe web, not riding on top of it, then refit and secure the brake drum.

29 Repeat the operations on the remaining side of the vehicle.

30 Adjust the brakes by operating the footbrake at least fifteen times. A clicking noise will be heard at the drums, as the automatic adjusters operate. When the clicking stops, adjustment is complete.

31 Check the handbrake adjustment, as described in Section 26.

32 Refit the roadwheels, and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

33 New brake linings should be carefully bedded-in and, where possible, heavy braking should be avoided during the first 100 miles (160 km) or so after fitting new linings.

7 Handbrake shoes (rear disc brakes) - inspection, removal and refitting

Note: *When working on the brake components, take care not to disperse brake dust into the air, or to inhale it, since it may contain asbestos, which can damage your health.*

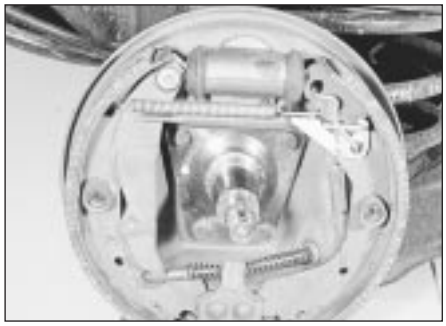
Inspection

1 Although 2.0 litre models are fitted with rear disc brakes, the handbrake operates independently of the footbrake, using brake shoes on the inside of the disc in a similar way to rear drum brake models.

2 To inspect the handbrake shoes on all SOHC models, it is necessary to remove the hub/disc, as described in Chapter 10.

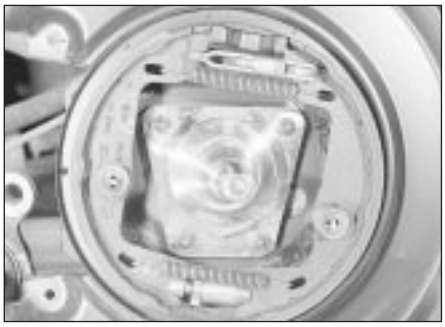
3 To inspect the handbrake shoes on DOHC models it will be necessary to remove the brake disc, as described in Section 10.

4 With the hub/disc or the disc (as applicable) removed, check that the friction material has not worn down to less than the specified minimum.



6.24 Rear brake components correctly assembled (hub removed for clarity)

7.16A Fitting the lower shoe return spring - SOHC models



7.16B Handbrake shoe components correctly assembled - SOHC models

5 If any one of the shoes has worn below the specified limit, all four handbrake shoes must be renewed as a set, as follows.

SOHC models

Removal

6 Clean the dust and dirt from the various components, but take care not to inhale it.
7 Disconnect the handbrake cable and the return spring from the handbrake operating lever at the brake backplate. If necessary, slacken the handbrake cable adjustment, with reference to Section 26.
8 Remove the shoe hold-down pins, springs and cups by depressing the cups and turning them through 90° using a pair of pliers. Note that the hold-down pins are removed through the rear of the brake backplate.
9 The shoes, adjuster, handbrake operating lever and return springs can now be removed together as an assembly.
10 Note the position and orientation of all components, then unhook the upper and lower return springs from the shoes, and recover the handbrake operating lever and the adjuster.

Refitting

11 Apply a little brake grease to the threads of the adjuster, then screw it together to its minimum length. Also apply a little brake grease to the shoe rubbing areas on the lockplate.
12 Fit one of the new brake shoes, and secure it to the backplate with the hold-down pin, spring and cup.
13 Fit the handbrake operating lever in position.
14 Fit the remaining brake shoe, and secure with the hold-down pin, spring and cup.
15 Hook the upper return spring onto the shoes.
16 Fit the adjuster between the lower ends of the shoes, as noted before dismantling, then fit the lower return spring **(see illustrations)**.
17 Reconnect the handbrake cable and the return spring to the handbrake operating lever.
18 Refit the hub/disc, and adjust the wheel bearing play, as described in Chapter 10, but do not refit the roadwheel at this stage.
19 Repeat the operations on the remaining side of the vehicle.
20 Check the handbrake cable adjustment, as described in Section 26.
21 Refit the roadwheels and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

DOHC models

Removal

22 Proceed as described in paragraphs 6 and 7.
23 Remove the shoe hold-down pins, springs and cups by turning the cups through using a screwdriver. Note that the hold-down pins are removed through the rear of the brake backplate. Note also the position and orientation of all components, then unhook the upper and lower return springs from the shoes, and recover the handbrake operating lever and the adjuster.

Refitting

24 Proceed as described in paragraphs 11 to 14 inclusive.
25 Hook the lower return spring onto the shoes.
26 Fit the adjuster between the upper ends of the shoes, as noted before dismantling, then fit the upper return spring **(see illustration)**.
27 Reconnect the handbrake cable and the return spring to the handbrake operating lever.
28 Refit the brake disc as described in Section 10, but do not refit the roadwheel at this stage.
29 Proceed as described in paragraphs 19 to 21 inclusive.

7.26 Handbrake shoe adjuster and upper return spring correctly fitted - DOHC models

8 Front disc caliper - removal, overhaul and refitting

Note: *Refer to the note at the beginning of Section 3 before proceeding. Before dismantling a caliper, check that replacement parts can be obtained, and retain the old components to compare them with the new ones. New sealing rings must be used on the fluid hose union bolt on refitting*

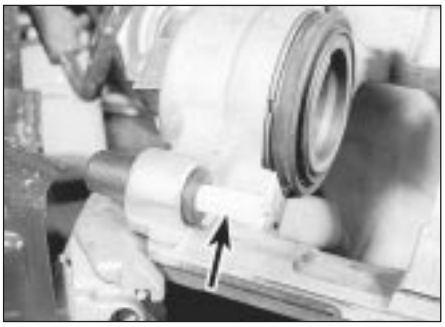
Models with solid discs

Removal

1 Where applicable, remove the wheel trims, then loosen the relevant front roadwheel bolts and apply the handbrake. 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 roadwheel.
2 Remove the brake disc pads, as described in Section 4.
3 Working under the bonnet, remove the brake fluid reservoir cap, and secure a piece of polythene over the filler neck with a rubber band, or by refitting the cap. This will reduce the loss of fluid during the following procedure.
4 Unscrew the brake fluid hose union bolt from the rear of the caliper, and disconnect the hose. Recover the two sealing rings from the union bolt (one either side of the hose end fitting). Be prepared for fluid spillage, and plug the open ends to prevent dirt ingress and further fluid loss.
5 Prise out the two caliper bracket mounting bolt dust caps from the inboard edge of the caliper bracket, then using an Allen key or hexagon bit, unscrew the mounting bolts, and withdraw the caliper assembly from the vehicle.

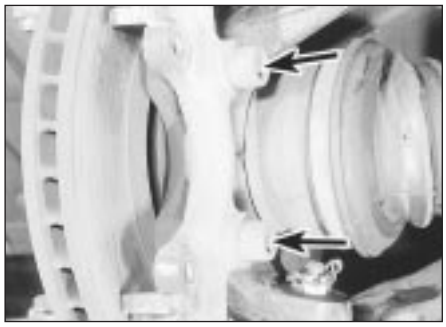
Overhaul

6 If desired, the caliper can be overhauled as follows. Otherwise, go on to paragraph 24 for details of refitting.
7 Brush the dirt and dust from the caliper, but take care not to inhale it.
8 Mount the caliper bracket in a soft-jawed vice. Then separate the caliper body from the mounting bracket by pressing the front face of the caliper body downwards and simultaneously sliding the caliper body from the locating pins on the bracket. Recover the guide springs from the bracket, noting their orientation.
9 Using a screwdriver, prise the dust seal retaining clip from the piston dust seal, then carefully prise off the dust seal.
10 Place a thin piece of wood in front of the piston to prevent it from falling out of its bore and sustaining damage. Then apply low air pressure - e.g. from a foot pump - to the hydraulic fluid union hole in the rear of the caliper body, to eject the piston from its bore.



8.20A Extract the nylon compression sleeve (arrowed) . . .

8.20B . . . then withdraw the caliper locating pin rubber - model with solid discs



8.31 Caliper bracket securing bolts (arrowed) - model with ventilated discs

11 Remove the wood and carefully withdraw the piston.
12 Carefully prise the seal from the groove in the caliper piston bore, using a plastic or wooden instrument.
13 Inspect the surfaces of the piston and its bore in the caliper for scoring, or evidence of metal-to-metal contact. If evident, renew the complete caliper assembly.
14 If the piston and bore are in good condition, discard the seals and obtain a repair kit, which will contain all the necessary renewable items.
15 Clean the piston and cylinder bore with brake fluid or methylated spirit, nothing else!
16 Begin reassembly by fitting the seal into the caliper bore.
17 Locate the dust seal in its groove in the piston. Dip the piston in clean brake fluid and insert it squarely into the cylinder. Check that the cutaway recesses in the piston are positioned horizontally. If necessary, carefully turn the piston to its correct position.
18 When the piston has been partially depressed, engage the dust seal with the rim of the caliper bore, and fit the retaining clip.
19 Push the piston further into its bore, but not as far as the stop, ensuring that it does not jam.
20 If desired, the caliper body locating pin rubbers can be renewed. Extract the nylon compression sleeve from within each rubber, then carefully compress the rubber shoulder, and push the rubber through the hole in the caliper body to remove it from the inboard end **(see illustrations)**.
21 Fit the new rubbers using a reversal of the removal procedure.
22 Secure the caliper bracket in a soft-jawed vice, and refit the guide springs in the positions noted before removal.
23 Engage the caliper body with the locating pins on the bracket, then press the caliper body into position until the locating pin rubbers in the caliper body rest against the bracket.

Refitting

24 Refit the caliper bracket to the hub carrier, and tighten the securing bolts to the specified torque. Refit the dust caps to the bolts.
25 Reconnect the brake fluid hose union, using new sealing rings on the union bolt.
26 Refit the disc pads, as described in Section 4.
27 Remove the polythene from the brake fluid reservoir filler neck, and bleed the relevant brake hydraulic circuit, as described in Section 3.
28 Refit the roadwheel and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

Models with ventilated discs

Removal

29 Proceed as described in paragraphs 1 to 4 inclusive.
30 Withdraw the caliper body from the vehicle.
31 If desired, the caliper bracket can be removed from the hub carrier by unscrewing the two securing bolts **(see illustration)**.

Overhaul

32 To overhaul the caliper, continue as follows. Otherwise, go on to paragraph 42 for details of refitting.
33 Brush the dirt and dust from the caliper, but take care not to inhale it.
34 Using a screwdriver, carefully prise the dust seal from the end of the piston and the caliper body, and remove it.
35 Proceed as described in paragraphs 10 to 15 inclusive.
36 Begin reassembly by fitting the seal into the caliper bore.
37 Locate the dust seal in its groove in the piston. Dip the piston in clean brake fluid and insert it squarely into the cylinder. Check that the cutaway recesses in the piston are positioned vertically. If necessary, carefully turn the piston to its correct position.
38 When the piston has been partially depressed, engage the dust seal with the rim of the caliper bore.
39 Push the piston further into its bore, but not as far as the stop, ensuring that it does not jam.
40 If desired, the guide bolt sleeves can be renewed. Extract the nylon compression sleeve from within each rubber, then carefully compress the rubber shoulder, and push the rubber through the hole in the caliper body to remove it from the inboard end.
41 Fit the new sleeves using a reversal of the removal procedure.

Refitting

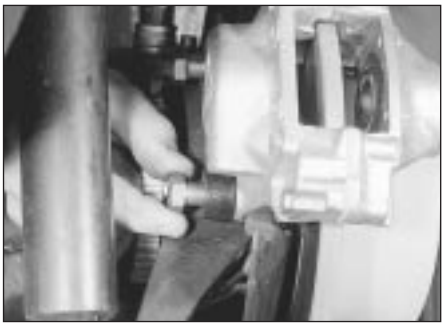
42 Where applicable, refit the caliper bracket to the hub carrier, and tighten the securing bolts to the specified torque.
43 Proceed as described in paragraphs 25 to 28 inclusive.

9 Rear disc caliper - removal, overhaul and refitting

Note: *Refer to the note at the beginning of Section 3 before proceeding. Before dismantling a caliper, check that replacement parts can be obtained, and retain the old components to compare them with the new ones*

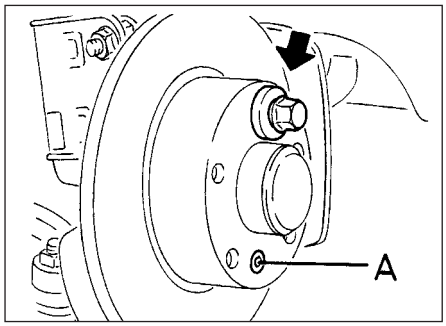
Removal

1 Where applicable, remove the wheel trim, then loosen the relevant rear roadwheel bolts and check 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.
2 Remove the disc pads, as described in Section 5.
3 Working under the bonnet, remove the brake fluid reservoir cap and secure a piece of polythene over the filler neck with a rubber band, or by refitting the cap. This will reduce the loss of fluid during the following procedure.
4 Unscrew the brake fluid pipe union nut from the rear of the caliper, and disconnect the pipe. Take care not to strain the pipe. Be prepared for fluid spillage, and plug the open ends to prevent dirt ingress and further fluid loss.
5 Unscrew the two mounting bolts and withdraw the caliper from the vehicle, noting that on DOHC models, the caliper securing bolts also secure the ABS sensor bracket **(see illustrations)**. Take care not to strain the ABS sensor wiring, where applicable.



9.5A Withdrawing a rear caliper mounting bolt . . .

9.5B . . . which also secures the ABS sensor bracket - DOHC model



10.2 Refit a wheel bolt and spacer (arrowed) opposite the disc securing screw (A) before checking brake disc run-out

Overhaul

6 If desired, the caliper can be overhauled as follows. Otherwise, go on to paragraph 20 for details of refitting.
7 Brush the dirt and dust from the caliper, but take care not to inhale it.
8 Note that no attempt must be made to separate the two halves of the caliper.
9 Using a screwdriver, prise the dust seal retaining clips from the piston dust seals, then carefully prise off the dust seals.
10 Using a clamp, secure one of the pistons in its fully retracted position. Then apply low air pressure (e.g. from a foot pump), to the hydraulic fluid union hole in the rear of the caliper body, to eject the remaining piston from its bore. Take care not to drop the piston, which may result in damage.
11 Temporarily close off the bore of the removed piston, using a flat piece of wood or similar improvised tool. Then remove the clamp from the remaining piston, and again apply air pressure to the caliper union to eject the piston.
12 Carefully prise the seals from the grooves in the caliper piston bores, using a plastic or wooden instrument.
13 Inspect the surfaces of the pistons and their bores in the caliper for scoring, or evidence of metal-to-metal contact. If evident, renew the complete caliper assembly.
14 If the pistons and bores are in good condition, discard the seals and obtain a repair kit, which will contain all the necessary renewable items. Also obtain a tube of brake cylinder paste.
15 Clean the piston and cylinder bore with brake fluid or methylated spirit - nothing else!
16 Apply a little brake cylinder paste to the pistons, cylinder bores and piston seals.
17 Begin reassembly by fitting the seals to the grooves in the caliper bores.
18 Locate the dust seals in their grooves in the pistons, then insert the pistons carefully into their bores until they enter the seals. It may be necessary to rotate the pistons to prevent them from jamming in the seals.
19 When the pistons have been partially depressed, engage the dust seals with the rims of the caliper bores, and fit the retaining clips.

Refitting

20 Refit the caliper and tighten the securing bolts to the specified torque, ensuring that the ABS sensor bracket is in position, where applicable.
21 Reconnect the brake fluid pipe to the caliper, and tighten the union nut.
22 Refit the disc pads, as described in Section 5.
23 Remove the polythene from the brake fluid reservoir filler neck and bleed the relevant brake hydraulic circuit, as described in Section 3.
24 Refit the roadwheel and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

10 Brake disc - inspection, removal and refitting

Inspection

1 Where applicable, remove the wheel trim, then loosen the relevant roadwheel bolts. If checking a front disc, apply the handbrake, and if checking a rear disc, chock the front wheels, then jack up the relevant end of the vehicle and support on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheel.
2 Where applicable, check that the brake disc securing screw is tight. Then fit a spacer approximately 10.0 mm (0.4 in) thick to one of the roadwheel bolts, and refit and tighten the bolt in the hole opposite the disc securing screw **(see illustration).**
3 Rotate the brake disc, and examine it for deep scoring or grooving. Light scoring is normal, but if excessive, the disc should be removed and either renewed or machined (within the specified limits) by an engineering works.
4 Using a dial gauge, or a flat metal block and feeler blades, check that the disc run-out does not exceed the figure given in the Specifications. Measure the run-out 10.0 mm (0.4 in) in from the outer edge of the disc.
5 On all SOHC models, if the rear disc run-out is excessive, check the rear wheel bearing adjustment, as described in Chapter 10.
6 If the front disc run-out (all models), or the rear disc run-out (DOHC models), is excessive, remove the disc as described later in this Section. Check that the disc-to-hub surfaces are perfectly clean. Refit the disc and check the run-out again.
7 If the run-out is still excessive, the disc should be renewed.
8 To remove a disc, continue as follows.

Front disc

Removal

9 Where applicable, remove the roadwheel bolt and spacer used when checking the disc.
10 Remove the disc pads, (Section 4).
11 On 2.0 litre models, unscrew the two securing bolts and remove the caliper bracket.
12 Remove the securing screw and withdraw the disc from the hub, where applicable tilting it to clear the brake caliper **(see illustration)**.

Refitting

13 Refitting is a reversal of removal, but make sure that the mating faces of the disc and hub are perfectly clean, and apply a little locking fluid to the threads of the securing screw. Refit the disc pads, (Section 4).

Rear disc - SOHC models

14 On these models, the disc is integral with the rear hub, and removal and refitting is described in Chapter 10.

10.12 Removing a disc securing screw - SOHC model

10.18 Withdrawing the rear brake disc - DOHC model

Rear disc - DOHC models

Removal

15 Where applicable, remove the roadwheel bolt and spacer used when checking the disc.
16 Remove the disc pads, as described in Section 5.
17 Remove the brake caliper with reference to Section 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.
18 Remove the securing screw and withdraw the disc from the hub **(see illustration)**. If the disc is tight, collapse the handbrake shoes by inserting a screwdriver through the adjuster hole in the disc and turning the adjuster wheel.

Refitting

19 Refitting is a reversal of removal, but make sure that the mating faces of the disc and hub are perfectly clean, and apply a little locking fluid to the threads of the securing screw. Refit the disc pads, as described in Section 5.

11 Brake drum - removal, inspection and refitting

Note: *When working on the brake components, take care not to disperse brake dust into the air, or to inhale it, since it may contain asbestos, which can damage your health.*

Removal

1 Where applicable, remove the wheel trim, 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.
2 Fully release the handbrake.
3 Extract the drum securing screw and remove the drum. If the drum is tight, remove the plug from the inspection hole in the brake backplate, and push the handbrake operating lever towards the brake shoe to move the shoes away from the drums. If necessary, slacken the handbrake cable adjuster.

Inspection

4 Brush the dirt and dust from the drum, taking care not to inhale it.
5 Examine the internal friction surface of the drum. If they are deeply scored, or so worn that the drum has become ridged to the width of the shoes, then both drums must be renewed.
6 Regrinding of the friction surface is not recommended, since the internal diameter of the drum will no longer be compatible with the shoe friction material contact diameter.

Refitting

7 Refit the brake drum and tighten the securing screw. If necessary, back off the adjuster wheel until the drum will pass over the shoes.
8 Adjust the brakes by operating the footbrake a number of times. A clicking noise will be heard at the drum as the automatic adjuster operates. When the clicking stops, adjustment is complete.
9 Refit the roadwheel and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

12 Rear wheel cylinder (drum brakes) - removal, overhaul and refitting

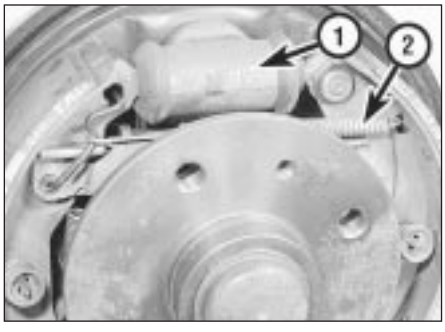
Note: *Refer to the notes* at *the beginning of Sections 3 and 11 before proceeding. Before dismantling a wheel cylinder, check that replacement parts can be obtained, and retain the old components to compare them with the new ones*

Removal

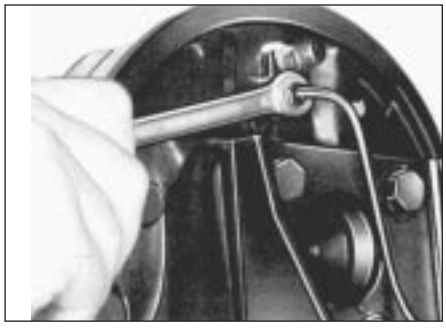
1 Where applicable, remove the wheel trim, then loosen the relevant rear roadwheel bolts and chock the front wheels. Jack up the rear of the vehicle and support on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheel.
2 Fully release the handbrake.
3 Extract the drum securing screw and remove the drum. If the drum is tight, remove the plug from the inspection hole in the brake backplate, and push the handbrake operating lever towards the brake shoe to move the shoes away from the drum. If necessary, slacken the handbrake cable adjuster.
4 Using a pair of pliers, unhook the upper return spring from the brake shoes, noting its orientation, then push the upper ends of the shoes apart until they are clear of the wheel cylinder **(see illustration)**.
5 Working under the bonnet, remove the brake fluid reservoir cap and secure a piece of polythene over the filler neck with a rubber band, or by refitting the cap. This will reduce the loss of fluid during the following procedure.
6 Unscrew the brake fluid pipe union nut from the rear of the wheel cylinder, and disconnect the pipe **(see illustration)**. Take care not to strain the pipe. Be prepared for fluid spillage, and plug the open ends to prevent dirt ingress and further fluid loss.
7 Unscrew the two securing bolts from the rear of the brake backplate, and withdraw the wheel cylinder.

Overhaul

8 If desired, the wheel cylinder can be overhauled as follows. Otherwise, go on to paragraph 17 for details of refitting.
9 Brush the dirt and dust from the wheel cylinder, but take care not to inhale it.
10 Pull the rubber dust seals from the ends of the cylinder body.
11 The pistons will normally be ejected by the pressure of the coil spring. If they are not, tap the end of the cylinder body on a piece of wood, or apply low air pressure (e.g. from a foot pump), to the hydraulic fluid union hole in the rear of the cylinder body, to eject the pistons from their bores.
12 Inspect the surfaces of the pistons and their bores in the cylinder body for scoring, or evidence of metal-to-metal contact. If evident, renew the complete wheel cylinder assembly. Note that the later type of wheel cylinder can be used to replace the early type as a complete unit.



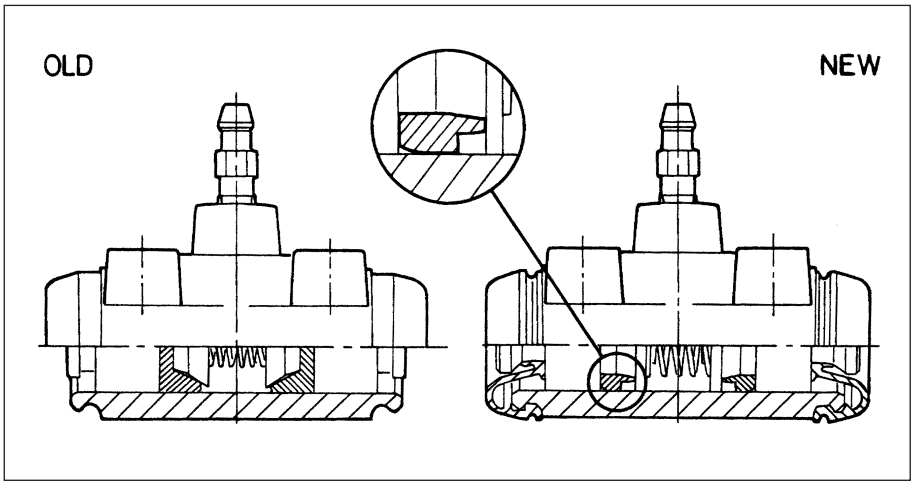
12.4 Rear brake assembly
1 Wheel cylinder
2 Upper shoe return spring (note orientation)



12.6 Unscrewing rear wheel cylinder brake fluid pipe union

12.13A Exploded view of a rear brake wheel cylinder

1 Dust cap
2 Bleed screw
3 Cylinder body
4 Dust seal
5 Piston
6 Piston seal
7 Spring



12.13B Modified rear wheel cylinders - 1992-on models

13 If the pistons and bores are in good condition, discard the seals and obtain a repair kit, which will contain all the necessary renewable items. Later models (1992-on), are fitted with L-shaped piston seals **(see illustrations).** Ensure that the correct repair kit is obtained when overhauling a wheel cylinder, as the early and later components are not interchangeable.
14 Lubricate the piston seals with clean brake fluid, and insert them into the cylinder bores with the spring between them, using finger pressure only.
15 Dip the pistons in clean brake fluid, and insert them into the cylinder bores.
16 Fit the dust seals, and check that the pistons can move freely in their bores.

Refitting

17 Refit the wheel cylinder to the backplate, and tighten the securing bolts.
18 Reconnect the brake fluid pipe to the cylinder, and tighten the union nut.
19 Push the brake shoes against the pistons, then refit the upper return spring as noted before removal.
20 Refit the brake drum and tighten the securing screw. If necessary, back off the adjuster wheel until the drum will pass over the shoes.
21 Remove the polythene from the brake fluid reservoir filler neck, and bleed the relevant brake hydraulic circuit, as described in Section 3.
22 Adjust the brakes by operating the footbrake a number of times. A clicking noise will be heard at the drum as the automatic adjuster operates. When the clicking stops, adjustment is complete.
23 Refit the roadwheel and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

13 Rear brake backplate - removal and refitting

Models with rear drum brakes

Removal

1 Where applicable, remove the wheel trim, 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.
2 Remove the brake drum with reference to Section 11.
3 Remove the rear hub, (Chapter 10).
4 Remove the brake shoes, (Section 6).
5 Remove the brake wheel cylinder, as described in Section 12.
6 Using a screwdriver, prise out the lockplate that secures the handbrake cable in the backplate.
7 Unscrew the four securing bolts, and withdraw the stub axle and backplate.

Refitting

8 Refitting is a reversal of removal, remembering the following points.
9 Coat the rear face of the stub axle flange with a little lithium-based grease.
10 Tighten the brake backplate/stub axle securing bolts to the specified torque, in the three stages given in the Specifications.
11 Refit the brake wheel cylinder, as described in Section 12.
12 Refit the brake shoes, as described in Section 6.
13 Refit the rear hub, as described in Chapter 10.
14 Refit the brake drum with reference to Section 11.
15 Before refitting the roadwheel and lowering the vehicle to the ground, check and if necessary adjust the handbrake, as described in Section 26.

Models with rear disc brakes (SOHC models)

Removal

16 Proceed as described in paragraphs 1 to 7.
17 Remove the rear hub/disc, (Chapter 10).
18 Remove the handbrake shoes, (Section 7).
19 Unscrew the four securing bolts, and withdraw the stub axle and lockplate.

Refitting

20 Refitting is a reversal of removal, remembering the following points.
21 Coat the rear face of the stub axle flange with a little lithium-based grease.
22 Tighten the brake backplate/stub axle securing bolts to the specified torque, in the three stages given in the Specifications.
23 Refit the handbrake shoes, as described in Section 7.
24 Refit the rear hub/disc, (Chapter 10).
25 Before refitting the roadwheel and lowering the vehicle to the ground, check and if necessary adjust the handbrake, as described in Section 26.

DOHC models

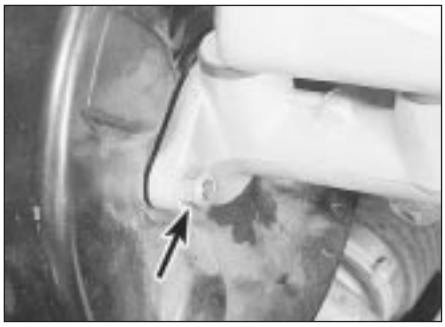
Removal

26 Proceed as described in paragraphs 1 to 7.
27 Remove the brake disc (Section 10).
28 Remove the rear hub, (Chapter 10).
29 Remove the handbrake shoes, (Section 7).
30 Using a splined key, unscrew the four securing bolts and withdraw the backplate.

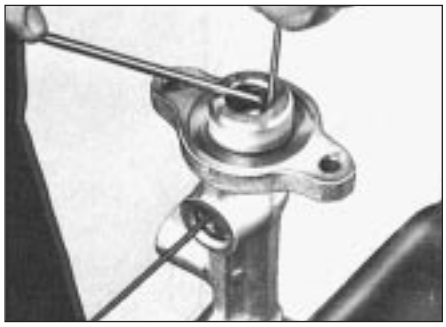
Refitting

31 Refitting is a reversal of removal, remembering the following points.
32 Refit the handbrake shoes, (Section 7).
33 Refit the rear hub, (Chapter 10).
34 Refit the brake disc (Section 10).
35 Before refitting the roadwheel and lowering the vehicle to the ground, check and if necessary adjust the handbrake, as described in Section 26.

14.4 Cutting a section of metal from a new front brake disc shield prior to fitting



15.7 Master cylinder securing nut (arrowed)



16.5 Holding the primary piston depressed while extracting the circlip from the cylinder body - GMF type master cylinder

14 Front brake disc shield - removal and refitting

Removal

1 Where applicable, remove the wheel trim, then loosen the relevant front roadwheel bolts and apply the handbrake. Jack up the front of the vehicle, and support on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheel.
2 Remove the brake disc, as described in Section 10.
3 Using a screwdriver inserted through the holes in the hub flange, extract the three screws securing the disc shield to the hub carrier.
4 Using plate shears or an alternative tool, cut a section of metal from the rear edge of the shield to enable the shield to be withdrawn over the hub, then remove the shield **(see illustration)**.

Refitting

5 If a new shield is to be fitted, cut out a section of metal, as during removal of the old shield, to enable the shield to be fitted. Smooth the cut edges, and coat them with anti-corrosion paint.
6 Further refitting is a reversal of removal, remembering the following points.
7 Refit the brake disc, as described in Section 10.
8 Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

15 Master cylinder - removal and refitting

Note: *Refer to the note at the beginning of Section 3 before proceeding*

Removal

1 Disconnect the battery negative lead.
2 Depress the footbrake pedal several times to dissipate the vacuum in the servo unit.
3 Disconnect the wiring plug from the brake fluid level sensor in the reservoir filler cap.
4 If possible, use a teat pipette or an old hydrometer to remove the brake fluid from the reservoir. This will reduce the loss of fluid later in the procedure.
5 Locate a container beneath the master cylinder, to catch the brake fluid that will be released.
6 Identify the brake fluid pipes for position, then unscrew the union nuts and disconnect the pipes from the master cylinder.
7 Unscrew the two securing nuts, and withdraw the master cylinder from the studs on the vacuum servo unit **(see illustration)**.
8 Clean the external surfaces of the cylinder, then using a screwdriver carefully prise the fluid reservoir and its seals from the top of the cylinder.
9 If desired, on models without ABS, the master cylinder can be overhauled, as described in Section 16.
10 No overhaul of the master cylinder is possible on models with ABS, see Section 17.

Refitting

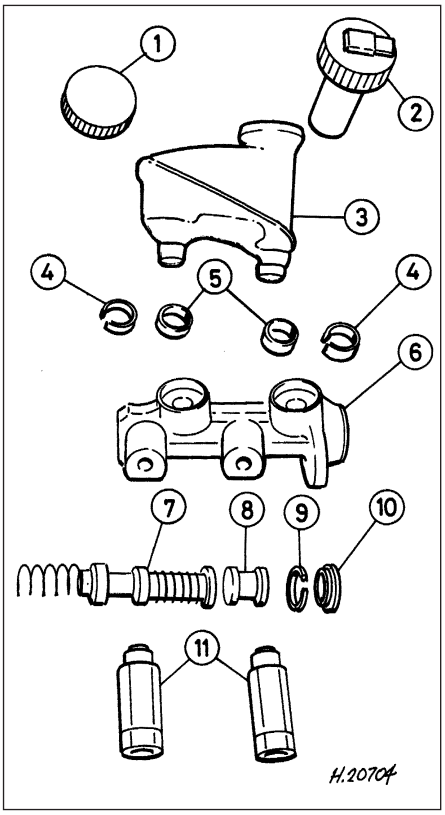
11 Refitting is a reversal of removal, but use new seals when fitting the brake fluid reservoir, and on completion, bleed the complete brake hydraulic system, as described in Section 3.

16 Master cylinder (non-ABS) - overhaul

Note: *Before dismantling the master cylinder, check that replacement parts can be obtained and retain the old components to compare them with the new ones*
1 With the master cylinder removed as described in Section 15, continue as follows, according to type.

GMF type master cylinder

2 Clamp the master cylinder in a soft-jawed vice.
3 Where applicable, unscrew the pressure-proportioning valves from the base of the cylinder.
4 Carefully prise out the sealing ring from the end of the cylinder bore.
5 Depress the primary piston slightly using a piece of wood or plastic. Then hold the piston in the depressed position by inserting a smooth pin or rod of 3.0 mm (0.12 in) diameter through the primary fluid reservoir port in the cylinder **(see illustration)**.
6 Extract the circlip from the end of the cylinder bore using a screwdriver. Take care not to damage the piston or cylinder bore.
7 Withdraw the pin or rod retaining the piston.
8 Withdraw the primary piston assembly from the cylinder, if necessary tapping the cylinder on a wooden block to free the piston from the bore.
9 Apply low air pressure - e.g. from a foot pump - to the front fluid reservoir port in the cylinder, to eject the secondary piston assembly.
10 Clean all the components, in clean brake fluid or methylated spirit only, and examine them for wear and damage. In particular, check the surfaces of the pistons and cylinder bore for scoring and corrosion. If the bore shows signs of wear, renew the complete master cylinder assembly **(see illustration)**.
11 If the cylinder bore is in good condition, obtain a repair kit, which will contain all the necessary renewable items. A Vauxhall dealer will supply a pre-assembled kit of parts, which should be fitted as follows.
12 Lubricate the cylinder bore with clean brake fluid or brake grease, then clamp the cylinder in a soft-jawed vice, with the bore horizontal.
13 Remove the plug from the end of the assembly tube, and insert the short part of the tube into the cylinder bore as far as the shoulder on the tube.
14 Use a piece of wood or plastic to push the components out of the tube and into the cylinder bore. Then hold the primary piston in the depressed position by inserting the pin or rod used during dismantling through the cylinder primary fluid reservoir port.
15 Fit a new circlip to the end of the cylinder bore, ensuring that it seats correctly, and that the piston is free to move.
16 Depress the primary piston, and withdraw the pin or rod from the fluid reservoir port.



16.10 Exploded view of GMF type master cylinder

1 Filler cap (standard)
2 Filler cap (with fluid level sensor)
3 Fluid reservoir
4 Fluid reservoir retaining clips
5 Fluid reservoir seals
6 Cylinder body
7 Secondary piston and springs
8 Primary piston
9 Circlip
10 Sealing ring
11 Pressure-proportioning valves

17 Fit a new sealing ring to the end of the cylinder bore.
18 Where applicable, screw the pressure-proportioning valves into the base of the cylinder.
19 Refit the master cylinder, as described in Section 15.

ATE type master cylinder

20 Clamp the master cylinder in a soft-jawed vice.
21 Where applicable, unscrew the pressure-proportioning valves from the base of the cylinder.
22 Carefully prise out the sealing ring from the end of the cylinder bore.
23 Depress the primary piston slightly using a piece of wood or plastic, then extract the circlip from the end of the cylinder bore.
24 Withdraw the primary piston assembly, noting the location of the stop washers.
25 Depress the secondary piston, again using a piece of wood or plastic, and withdraw the stop screw from the cylinder body **(see illustration)**.
26 Withdraw the secondary piston assembly from the cylinder, if necessary tapping the cylinder on a wooden block to free the piston from the bore.
27 Clean all the components, in clean brake fluid or methylated spirit only, and examine them for wear and damage. In particular, check the surfaces of the pistons and cylinder bores for scoring and corrosion. If the bore shows signs of wear, renew the complete master cylinder assembly **(see illustration)**.

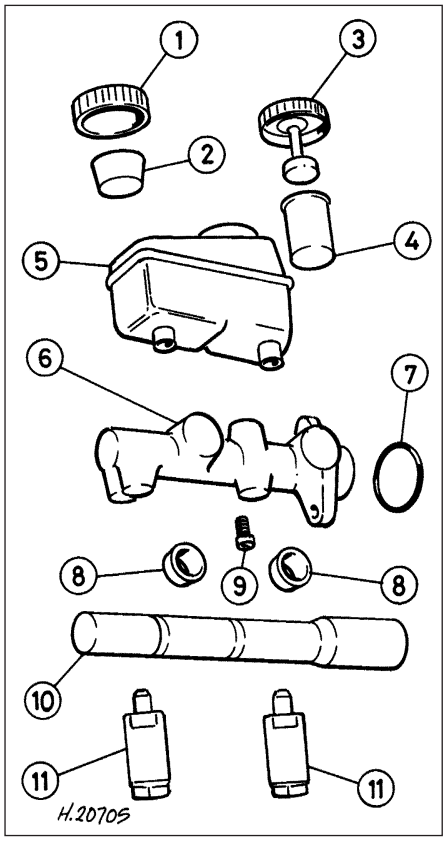
28 If the cylinder bore is in good condition, obtain a repair kit, which will contain all the necessary renewable items. A Vauxhall dealer will supply a complete kit of parts, which should be fitted as follows.
29 Lubricate the cylinder bore with clean brake fluid or brake grease, then clamp the cylinder in a soft-jawed vice, with the bore horizontal.
30 Fit a new sealing ring to the stop screw, then screw it into the cylinder body a little way, but not so far that it protrudes into the bore.
31 Remove the plugs from the ends of the assembly tube, then remove all the components from the short part of the tube, and push the short part into the long part until they are flush.
32 Insert the assembly tube into the cylinder bore as far as the collar on the short sleeve. Then use a piece of wood or plastic to push the secondary piston assembly into the bore until it contacts the end of the cylinder.
33 Lightly tighten the stop screw, then withdraw the piece of wood or plastic and the assembly tube, and fully tighten the stop screw.
34 Reposition the master cylinder in the vice, with the bore facing upwards.
35 Smear the primary piston skirt and the seal grooves with the special grease provided in the repair kit. Fit the stop washer to the piston.
36 Adjust the assembly tube so that the end of the long part is flush with the inner shoulder of the short part.

16.27 Exploded view of ATE type master cylinder

1 Filler cap (standard)
2 Strainer
3 Filler cap (with fluid level sensor)
4 Guide sleeve for float
5 Fluid reservoir
6 Cylinder body
7 Sealing ring
8 Fluid reservoir seals
9 Stop screw
10 Repair kit assembly tube
11 Pressure-proportioning valves

16.25 Depressing the secondary piston while extracting the stop screw - ATE type master cylinder

37 Fit the front seal to the primary piston, with the open end of the seal facing the front of the master cylinder.
38 Place the assembly tube over the cylinder to compress the seal, insert the piston and tube part way into the bore, and withdraw the tube.
39 Place the intermediate ring on the primary piston, then fit the remaining seal using the assembly tube as described previously.
40 Place the stop washer as the primary piston, then depress the piston slightly using a piece of wood or plastic, and fit a new circlip to the end of the cylinder bore. Ensure that the circlip is correctly seated, and that the piston is free to move.
41 Fit a new sealing ring to the end of the cylinder bore.



42 Where applicable, screw the pressure-proportioning valves into the base of the cylinder.
43 Refit the master cylinder, as described in Section 15.

17 Master cylinder (ABS) - general

The master cylinder fitted to models with ABS cannot be dismantled, and no attempt should be made at overhaul.

If faulty, the complete unit must be renewed, as described in Section 15.

18 Vacuum servo - description and testing

Description

1 The vacuum servo is fitted between the brake pedal and the master cylinder, and provides assistance to the driver when the pedal is depressed, reducing the effort required to operate the brakes. The unit is operated by vacuum from the inlet manifold. With the brake pedal released, vacuum is channelled to both sides of the internal diaphragm. However, when the pedal is depressed, one side of the diaphragm is opened to atmosphere, resulting in assistance to the pedal effort. Should the vacuum servo develop a fault, the hydraulic system is not affected, but greater effort will be required at the pedal.

Testing

2 The operation of the servo can be checked as follows.
3 With the engine stopped, destroy the vacuum in the servo by depressing the brake pedal several times.
4 Hold the brake pedal depressed and start the engine. The pedal should sink slightly as the engine is started.
5 If the pedal does not sink, check the servo vacuum hose for leaks.
6 If no defects are found in the vacuum hose, the fault must lie in the servo itself.

19.10A Remove the plugs . . .

19.10B . . . to expose the servo securing bolts

7 No overhaul of the servo is possible, and if faulty, the complete unit must be renewed.

19 Vacuum servo - removal and refitting

Note: *During the 1989 model year, some vehicles were produced with the brake pedal height incorrectly set, resulting in the brake pedal resting approximately 15.0 mm (0.6 in) above the clutch pedal instead of 4.0 mm (0.16 in below). The correct pedal height can be set by adjusting the vacuum servo operating fork dimension, as described in paragraphs 15 and 16*

Removal

1 Disconnect the battery negative lead.
2 Working inside the vehicle, remove the lower trim panel from the driver's footwell.
3 Disconnect the wiring plug from the brake lamp switch, then twist the switch anti-clockwise and remove it from its bracket.
4 Pull the spring clip from the right-hand end of the servo fork-to-pedal pivot pin.
5 Using a pair of pliers, pull back the end of the pedal return spring from the pedal, to enable the servo fork-to-pedal pivot pin to be removed. Withdraw the pivot pin.
6 Remove the windscreen cowl panel, as described in Chapter 11, then remove the windscreen wiper motor and linkage as described in Chapter 12.
7 Remove the coolant expansion tank as described in Chapter 3.
8 Pull the vacuum pipe from the brake servo.
9 Unscrew the two securing nuts, and carefully withdraw the brake master cylinder from the studs on the servo. Move the master cylinder forwards slightly, taking care not to strain the brake pipes.
10 Remove the two plugs covering the servo securing bolts from the cowl panel **(see illustrations)**.
11 Using a Allen key or hexagon bit, unscrew the servo securing bolts and remove them completely, then lift the servo from the bulkhead **(see illustrations)**.
12 If desired, the mounting bracket can be removed from the servo by unscrewing the four securing nuts. Note that the bracket will stick to the servo, as it is fitted with sealing compound.
13 The servo cannot be overhauled, and if faulty, the complete unit must be renewed.

Refitting

14 Before refitting the servo, check that the operating fork dimension is correct as follows.
15 Measure the distance from the end face of the servo casing to the centre of the pivot pin hole in the end of the operating fork. The distance should be 144.0 mm (5.6 in). To make accurate measurement easier, insert a bolt or bar of similar diameter through the pivot pin hole, and measure to the centre of the bolt or bar **(see illustration)**.

19.11A Unscrew the securing bolts . . .

19.11B . . . and withdraw the servo

19.15 Measuring the servo operating fork dimension using a bolt inserted through the pivot pin hole

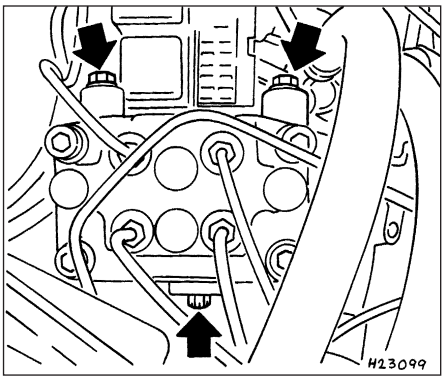
16 If adjustment is necessary, slacken the locknut, turn the fork to give the specified dimension, then tighten the locknut.
17 Where applicable, coat the contact faces of the servo and the mounting bracket with sealing compound, then refit the bracket to the servo, and tighten the securing nuts to the specified torque.
18 Coat the threads of the servo securing bolts with locking fluid, then fit the servo to the bulkhead and tighten the securing bolts.
19 Refit the securing bolt cover plugs to the cowl panel.
20 Refit the master cylinder to the servo, and tighten the securing nuts to the specified torque.
21 Reconnect the vacuum pipe to the servo.
22 Refit the coolant expansion tank, as described in Chapter 3.
23 Refit the windscreen wiper motor and linkage as described in Chapter 12, then refit the windscreen cowl panel.
24 Further refitting is a reversal of removal. On completion, test the operation of the servo, as described in Section 18.

20 ABS hydraulic modulator - removal and refitting

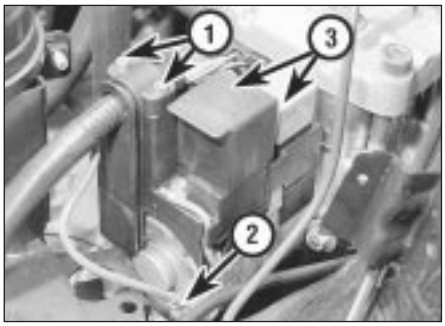
Note: *Refer to Section 2, and the note at the beginning of Section 3, before proceeding*

Removal

1 Disconnect the battery negative lead.
2 Remove the brake fluid reservoir cap, and secure a piece of polythene over the filler neck with a rubber band, or by refitting the cap. This will reduce the loss of fluid during the following procedure.
3 Remove the securing screw, and withdraw the plastic cover from the hydraulic modulator.
4 Remove the two clamp screws, and lift off the modulator wiring harness clamp **(see illustration)**.
5 Disconnect the modulator wiring plug, levering it from the socket with a screwdriver if necessary.



20.7 ABS hydraulic modulator securing screws (arrowed)



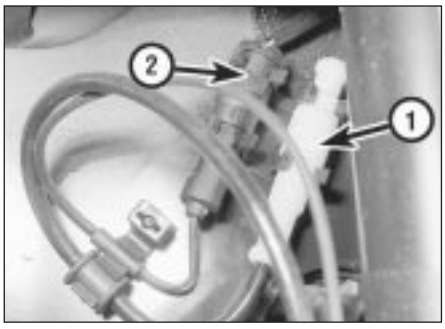
20.4 ABS hydraulic modulator (cover removed)

1 Wiring harness clamp screws
2 Earth lead
3 Relays

6 Unscrew the brake fluid pipe union nuts, and disconnect the pipes from the modulator. Be prepared for fluid spillage, and plug the open ends to prevent dirt ingress and further fluid loss. Move the pipes just clear of the modulator, taking care not to strain them.
7 Unscrew the three modulator securing nuts **(see illustration)**, then tilt the modulator slightly, and withdraw it upwards from its bracket, sufficiently to gain access to the earth lead securing nut at the front lower edge of the modulator.
8 Unscrew the securing nut and disconnect the earth lead, then withdraw the modulator from the vehicle, taking care not to spill brake fluid on the vehicle paintwork.
9 If a new modulator is to be fitted, pull the two relays from the top of the old modulator, and transfer them to the new unit. No attempt must be made to dismantle the modulator.

Refitting

10 Before refitting the modulator, check that the bolts securing the mounting bracket to the body panel are tight, and that the modulator rubber mountings are in good condition. Renew the rubber mountings if necessary.
11 Refitting is a reversal of removal, remembering the following points.
12 Make sure that the earth lead is reconnected before fitting the modulator to its mounting bracket.
13 On completion, remove the polythene sheet from the brake fluid reservoir filler neck, and bleed the complete brake hydraulic system, as described in Section 3.
14 Check that the ABS warning lamp extinguishes when first starting the engine after the modulator has been removed. At the earliest opportunity, take the vehicle to a Vauxhall dealer, and have the complete system tested, using the dedicated ABS test equipment.



21.3 Front wheel sensor wiring under wheelarch - DOHC model

1 ABS sensor connector
2 Disc pad wear sensor wiring connector

21 ABS wheel sensors - removal and refitting

Note: *Refer to Section 2 before proceeding*

Front wheel sensor

Removal

1 Disconnect the battery negative lead.
2 Where applicable, remove the wheel trim, then loosen the relevant front roadwheel bolts and apply the handbrake. Jack up the front of the vehicle, and support on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members. Remove the roadwheel.
3 Unclip the sensor wiring connector from the retaining clip under the wheel arch, then separate the two halves of the wiring connector, prising them apart with a screwdriver if necessary **(see illustration)**.
4 Using a Allen key or hexagon bit, unscrew the bolt securing the wheel sensor to its mounting bracket, then carefully lever the sensor from the bracket using a screwdriver **(see illustration)**. Recover the seal ring.

Refitting

5 Examine the condition of the seal ring, and renew if necessary.
6 Refitting is a reversal of removal, remembering the following points.
7 Smear a little grease on the sensor casing before fitting it to the bracket.
8 Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.
9 Check that the ABS warning lamp extinguishes when first starting the engine after a wheel sensor has been removed. At

21.4 ABS front wheel sensor securing bolt (arrowed) - DOHC model

the earliest opportunity, take the vehicle to a Vauxhall dealer, and have the complete system tested, using the dedicated ABS test equipment.

Rear wheel sensor

Removal

10 Disconnect the battery negative lead.
11 Where applicable, remove the wheel trim, 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.
12 Unclip the sensor wiring connector from the retaining clip on the rear underbody, then separate the two halves of the wiring connector, prising them apart with a screwdriver if necessary **(see illustration)**.
13 Note the routing of the sensor wiring, and, where applicable, release it from the clips on the underbody.
14 Using a Allen key or hexagon bit, unscrew the bolt securing the wheel sensor to the trailing arm (or the mounting bracket on DOHC models), then carefully lever the sensor from its location using a screwdriver **(see illustration)**. Recover the seal ring.

Refitting

15 Proceed as described in paragraphs 5 to 9 inclusive.

22 ABS electronic control module - removal and refitting

Note: *Refer to Section 2 before proceeding*

ABS-2E systems

Removal

1 Ensure that the ignition is switched off, then disconnect the battery negative lead.
2 The control module is located under a cover in the passenger sill, to the left-hand side of the seat.
3 Extract the three securing screws, and lift the cover from the control module. Note that two of the screws are covered by plastic trim plugs.

21.12 ABS rear wheel sensor wiring connectors (arrowed) on rear underbody - DOHC model`

4 Lift the control module from its recess, then release the retaining clip and disconnect the module wiring plug. Withdraw the module **(see illustrations)**.

Refitting

5 Refitting is a reversal of removal.
6 Check that the ABS warning lamp extinguishes when first starting the engine after the module has been removed. At the earliest opportunity, take the vehicle to a Vauxhall dealer, and have the complete system tested, using the dedicated ABS test equipment.

ABS-2EH systems

Removal

7 Ensure that the ignition is switched off, then disconnect the battery negative lead.
8 Remove the cover from the hydraulic modulator.
9 Disconnect both the wiring harness and solenoid valve connectors.
10 Relays can only be removed from control units that have slanted covers **(see illustration).** The relays for the solenoid valve and pump motor, if removable, can now be removed. If the unit has a flat cover, and is faulty, the whole unit will have to be replaced.
11 Undo fixing bolts and remove the control unit.

Refitting

12 Refitting is a reversal of removal. Refer also to paragraph 6.

21.14 ABS rear wheel sensor (arrowed) - DOHC model

23 ABS relays (ABS-2E systems only) - removal and refitting

Note: *Refer to Section 2 before proceeding. For ABS-2EH system relays, refer to paragraphs 7 to 12, in Section 22.*

Solenoid valve and pump motor relays

Removal

1 The solenoid valve and pump motor relays are mounted on the hydraulic modulator.
2 Disconnect the battery negative lead.
3 Remove the securing screw and withdraw the plastic cover from the hydraulic modulator.
4 Pull out the appropriate relay. The small relay is for the solenoid valve, and the large relay is for the pump motor.

Refitting

5 Refitting is a reversal of removal.
6 Check that the ABS warning lamp extinguishes when first starting the engine after a relay has been removed. At the earliest opportunity, take the vehicle to a Vauxhall dealer, and have the complete system tested, using the dedicated ABS test equipment.

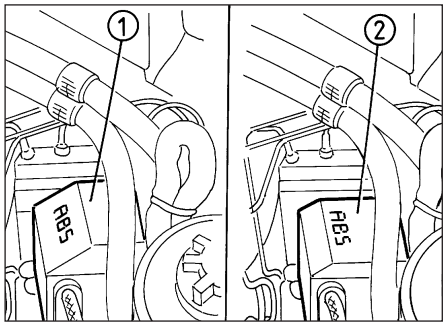
Surge arrester relay

Removal

7 The surge arrester relay is located in the relay box at the left rear of the engine compartment.

22.4A Lift out the ABS control module . . .

22.4B . . . and release the wiring plug retaining clip - ABS-2E system



22.10 ABS-2EH control unit
1 Slanted cover type 2 Flat cover type

8 Disconnect the battery negative lead.
9 Unclip the lid and open the relay box, then pull out the relay **(see illustration)**.

Refitting

10 Refitting is a reversal of removal, with reference to paragraph 6.

24 Rear brake pressure-proportioning valves - removal and refitting

Note: *Refer to the note at the beginning of Section 3 before proceeding. Note also that the valve must only be renewed in pairs, and both valves must be of the same calibration. Ensure that correct type of valves are fitted. The bodies have been stamped for easier identification.*

Master cylinder-mounted valves

Removal

1 Remove the brake fluid reservoir cap, and secure a piece of polythene over the filler neck with a rubber band, or by refitting the cap. This will reduce the loss of fluid during the following procedure.
2 Locate a container beneath the master cylinder, to catch the brake fluid that will be released.
3 Identify the two lower brake pipes for position, then unscrew the union nuts and disconnect the pipes from the proportioning valves in the base of the master cylinder. Plug the open ends of the pipes to prevent dirt ingress.
4 Unscrew the proportioning valves from the master cylinder, and plug the open ends of the cylinder to prevent dirt ingress.

Refitting

5 Refitting is a reversal of removal, but on completion, remove the polythene from the brake fluid reservoir filler neck, and bleed the complete hydraulic system, as described in Section 3.

Rear underbody-mounted valves

Removal

6 Proceed as described in paragraph 1.
7 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.
8 Working under the rear of the vehicle, unscrew the union nut and disconnect the brake pipe from one of the valves. Be prepared for fluid spillage, and plug the open end of the pipe to prevent dirt ingress and further fluid spillage.
9 Similarly, disconnect the flexible hose from the valve.
10 Pull the valve retaining clip from the bracket on the underbody, noting that on certain models, the retaining clip also secures the ABS sensor wiring, and withdraw the valve **(see illustration)**.
11 Repeat the procedure for the other valve.

23.9 ABS surge arrester relay (arrowed)

Refitting

12 Proceed as described in paragraph 5.

25 Brake fluid pipes and hoses - general, removal and refitting

Note: *Refer to the note at the beginning of Section 3, before proceeding.*

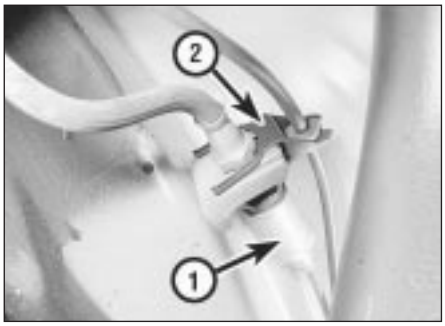
General

1 When checking the condition of the system's pipes and/or hoses, carefully check that they do not foul other components such as the power steering gear pipes (where applicable), so that there is no risk of the pipes chafing. If necessary use clips or ties to secure braking system pipes and hoses well clear of other components.

Rigid pipes

Removal

2 Some of the commonly used brake pipes can be obtained from Vauxhall parts dealers, ready-formed and complete with unions, but other brake pipes must be prepared using 4.75 mm (0.19 in) diameter brake pipe. Kits for making the brake pipes can be obtained from certain motor accessory shops.
3 Before removing a brake pipe, remove the brake fluid reservoir cap, and secure a piece of polythene over the filler neck with a rubber band, or by refitting the cap. This will reduce the loss of fluid when the pipe is disconnected.



24.10 Brake pressure-proportioning valve on rear underbody - DOHC model
1 Valve 2 Retaining clip

4 Jack up the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members.
5 To remove a brake pipe, unscrew the unions at each end, and release the pipe from the retaining clips.

Refitting

6 Refitting is a reversal of removal, taking care not to overtighten the unions.
7 On completion, remove the polythene from the brake fluid reservoir filler neck, and bleed the relevant hydraulic circuit(s), as described in Section 3.

Flexible hoses

Removal

8 Proceed as described previously for the rigid pipes, but note that a flexible pipe must never be installed twisted, although a slight "set" is permissible to give it clearance from adjacent components.

Refitting

9 When reconnecting a flexible hose to a front brake caliper, note that the sealing rings on the union bolt must be renewed.

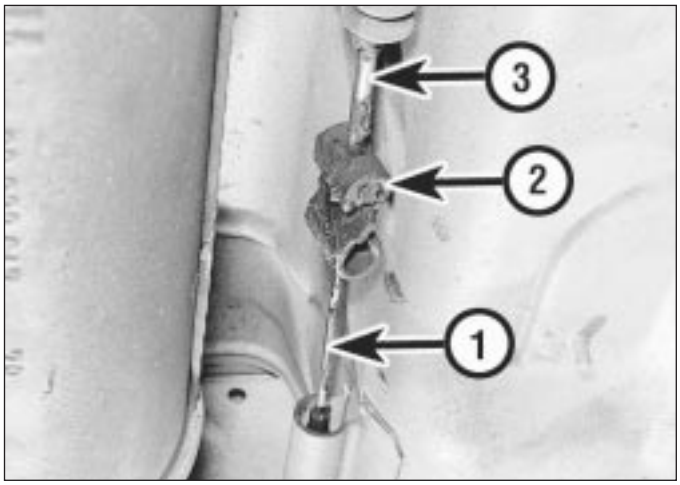
26 Handbrake - adjustment

Models with rear drum brakes

1 The handbrake will normally be kept in correct adjustment by the self-adjusting action of the rear brake shoes. However, due to cable stretch over a period of time, the travel of the handbrake lever may become excessive, in which case the following operations should be carried out.
2 Chock the front wheels, jack up the rear of the vehicle, and support securely on axle stands (see "*Jacking and Vehicle Support*") positioned under the body side members.
3 Fully release the handbrake.
4 Turn the knurled nut on the cable adjuster (mounted on the torsion beam), until the brake shoes can just be heard to rub when the rear wheels are turned by hand in the normal direction of rotation **(see illustration)**.

26.4 Handbrake cable adjuster. Knurled nut arrowed - all SOHC models

26.14 Using a screwdriver to turn the handbrake adjuster wheel - model with rear disc brakes



27.6 Handbrake cable connection to handbrake lever operating rod

1 Handbrake cable
2 Connecting link
3 Handbrake lever operating rod

5 Loosen the adjuster nut until the wheels are just free to turn.
6 The handbrake must start to operate with the lever on the second notch of the ratchet.
7 On completion of adjustment, check the handbrake cables for free movement, and apply a little grease to the adjuster threads to prevent corrosion.
8 Lower the vehicle to the ground.

Models with rear disc brakes

9 Where applicable, remove the wheel trims, then loosen the rear roadwheel bolts and chock the front wheels. 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.
10 Pull the handbrake lever as far as the second notch on the ratchet.
11 On DOHC models fitted with a catalytic converter, unscrew the four securing nuts and withdraw the exhaust centre box heat shield by carefully sliding it round the centre box.
12 On all SOHC models, loosen the knurled nut on the cable adjuster (mounted on the torsion beam).
13 On DOHC models, loosen the nut securing the cable equaliser yoke to the handbrake lever operating rod.
14 Using a screwdriver inserted through the adjuster hole in one of the discs/hubs **(see illustration)**, turn the adjuster wheel until the brake shoes can just be heard to rub when the disc/hub is turned by hand in the normal direction of rotation.
15 Turn the adjuster wheel back until the disc/hub is just free to turn.
16 Repeat paragraphs 14 and 15 on the remaining side of the vehicle.
17 Tighten the nut on the cable adjuster or the equaliser, as applicable, until the brake shoes just begin to operate. Check that the shoes operate equally on both wheels.
18 Fully release the handbrake, then apply it again.
19 The discs/hubs must lock when the handbrake lever reaches the sixth notch on the ratchet. If necessary, turn the nut on the cable adjuster or equaliser, as applicable, to achieve this.
20 Where applicable, refit the exhaust heat shield.
21 Refit the roadwheels and lower the vehicle to the ground. Do not fully tighten the roadwheel bolts until the vehicle is resting on its wheels.

27 Handbrake cable - removal and refitting

Models with rear drum brakes

Removal

1 The handbrake cable is in two sections. The longer section runs from the handbrake operating rod, through the adjuster, to the right-hand brake assembly. The shorter section runs from the adjuster to the left-hand brake assembly. The two sections of the cable can be renewed independently.
2 Where applicable, remove the wheel trim(s), then loosen the relevant rear roadwheel bolts. Chock the front wheels, 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(s).
3 Note the routing of the handbrake cable(s), as an aid to refitting.
4 Remove the relevant brake drum(s), with reference to Section 11.

Longer cable

Removal

5 Note the length of exposed thread at the handbrake cable adjuster on the torsion beam, then unscrew the adjuster nut from the threaded rod.
6 Disconnect the cable from the handbrake lever operating rod on the vehicle underbody **(see illustration)**.
7 Detach the cable from the guides on the underbody. Note that the cable can be fed through certain guides, but in some cases, the guide brackets must be bent away from the underbody to allow the cable to be withdrawn.
8 Detach the cable from the adjuster on the torsion beam.
9 Unhook the cable end from the lever on the brake shoe, then using a screwdriver, prise out the lockplate that secures the handbrake cable in the backplate.
10 Withdraw the cable from the vehicle, releasing it from the guide on the torsion beam.

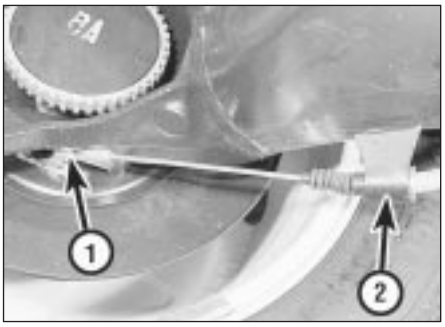
Refitting

11 Refitting is a reversal of removal, remembering the following points.
12 Screw the adjuster nut onto the threaded rod to the position noted before removal.
13 Ensure that the handbrake cable is routed as noted before removal.
14 Refit the brake drum, (Section 11).
15 Before refitting the roadwheel(s) and lowering the vehicle to the ground, adjust the handbrake, as described in Section 26.

Shorter cable

Removal

16 Note the length of exposed thread at the handbrake cable adjuster on the torsion beam, then unscrew the adjuster nut from the threaded rod. Continue as described in paragraphs 8 to 10.



27.27 Handbrake cable end fitting at brake shoe - DOHC model

1 Operating lever
2 Cable bracket on semi-trailing arm

Refitting

17 Proceed as described in paragraphs 11 to 15 inclusive.

Models with rear disc brakes (SOHC)

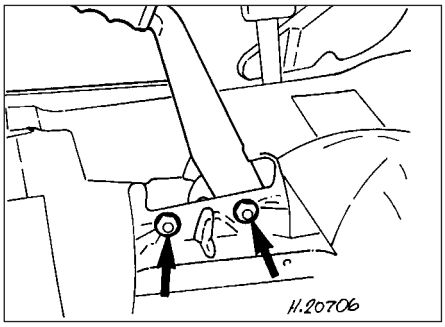
General

18 The procedure is as described for models with rear drum brakes, remembering the following points.
19 Ignore the references to removal and refitting of the brake drum.
20 Note that there is no lockplate securing the handbrake cable to the brake backplate, but the return spring must be unhooked from the cable end.
21 On models with a catalytic converter, when removing the longer cable, unscrew the four securing nuts and withdraw the exhaust centre box heat shield by carefully sliding it round the centre box.

DOHC models

Removal

22 The left and right-hand handbrake cables, and the equaliser yoke, are removed as an assembly on DOHC models.
23 Loosen the rear roadwheel bolts, then chock the front wheels, 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.
24 Note the routing of the handbrake cables, as an aid to refitting.
25 On models with a catalytic converter, unscrew the four securing nuts and withdraw the exhaust centre box heat shield by carefully sliding it round the centre box.
26 Note the length of exposed thread at the cable equaliser yoke, then unscrew the securing nut and disconnect the equaliser yoke from the handbrake lever operating rod.
27 Unhook the cable ends from the brake shoe operating levers and the return springs **(see illustration)**.
28 Detach the cable from the guides on the underbody and the semi-trailing arms. Note that the cables can be fed through certain guides, but in some cases, the guide brackets may have to be bent away from the underbody to allow the cables to be withdrawn.
29 Withdraw the cables and equaliser assembly from the vehicle.



28.9 Handbrake lever securing bolts (arrowed)

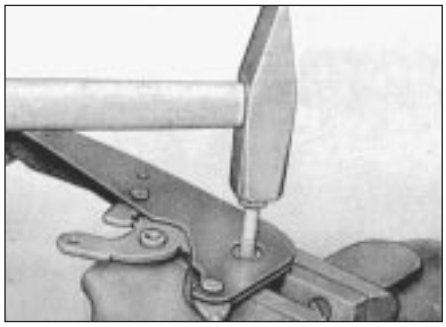
Refitting

30 Refitting is a reversal of removal, remembering the following points.
31 Use a new self-locking nut to secure the equaliser yoke to the handbrake lever operating rod, and screw the nut onto the rod to the position noted before removal.
32 Ensure that the cables are routed as noted before removal.
33 Before refitting the roadwheels and lowering the vehicle to the ground, adjust the handbrake, as described in Section 26.

28 Handbrake lever - removal and refitting

Removal

1 Disconnect the battery negative lead.
2 Jack up the vehicle, and support on axle stands (see "*Jacking and Vehicle Support*") positioned securely under the body side members.
3 On models with a catalytic converter, unscrew the four securing nuts and withdraw the exhaust centre box heat shield by carefully sliding it round the centre box.
4 On all SOHC models, note the length of exposed thread at the handbrake cable adjuster on the torsion beam, then slacken the adjuster to enable the cable to be disconnected from the handbrake lever operating rod. Disconnect the cable from the operating rod and slide the rubber sealing grommet from the underbody and operating rod.
5 On DOHC models, note the length of exposed thread at the handbrake cable equaliser yoke, then unscrew the securing nut and disconnect the equaliser yoke from the handbrake lever operating rod. Slide the rubber sealing grommet from the underbody and operating rod.
6 Remove the front passenger seat, as described in Chapter 11.

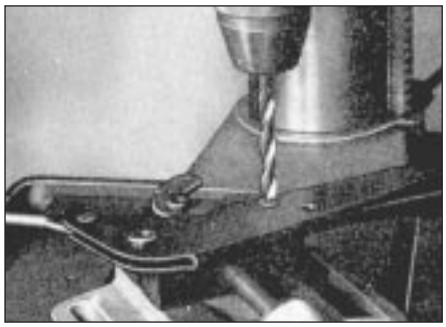


28.11 Driving out the handbrake lever ratchet segment securing sleeve

7 Remove the rear section of the centre console, as described in Chapter 11.
8 Access to the handbrake lever-to-floor mounting bolts is provided by slits in the carpet. If no slits are provided, either carefully cut some, or release and fold back the carpet.
9 Unscrew the mounting bolts, and withdraw the handbrake lever sufficiently to disconnect the handbrake "on" warning lamp switch wiring **(see illustration)**.
10 Disconnect the wiring and withdraw the handbrake lever and operating rod from the vehicle.
11 A worn ratchet segment can be renewed by driving the securing sleeve from the handbrake lever, using a metal rod or a bolt of similar diameter **(see illustration)**.
12 Drive the new sleeve supplied with the new segment into the lever to permit a little play between the segment and lever.
13 If desired, a new pawl can be fitted if the original pivot rivet is drilled out **(see illustration)**.
14 Rivet the new pawl so that the pawl is still free to move.
15 The handbrake "on" warning lamp switch can be removed from the lever assembly after unscrewing the securing bolt.

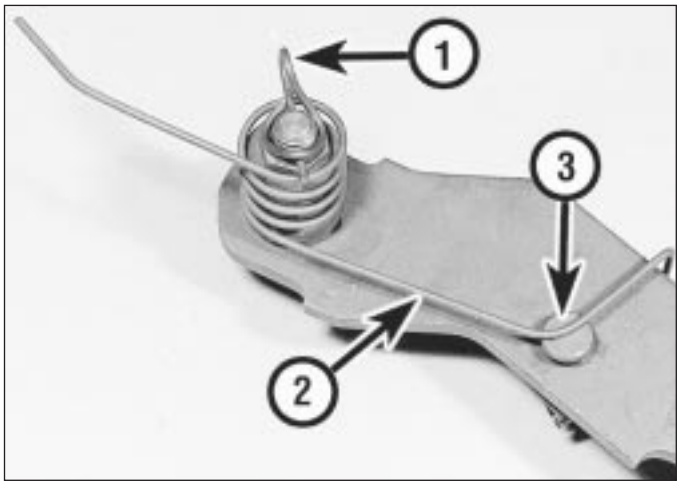
Refitting

16 Refitting is a reversal of removal, remembering the following points.
17 Refit the rear section of the centre console, as described in Chapter 11.
18 Refit the front passenger seat, as described in Chapter 11.



28.13 Drilling out the handbrake lever pawl pivot pin

29.4 Brake servo fork-to-pedal pivot pin spring clip (arrowed)



29.5 Brake pedal assembly removed from vehicle
1 Locking clip 2 Pedal return spring 3 Pedal pivot pin

19 On DOHC models, use a new self-locking nut to secure the equaliser yoke to the handbrake lever operating rod, and screw the nut onto the rod to the position noted before removal.
20 On SOHC models, tighten the cable adjuster to expose the length of thread noted before removal.
21 Before lowering the vehicle to the ground, adjust the handbrake, (Section 26).

29 Brake pedal - removal and refitting

Removal

1 Disconnect the battery negative lead.
2 Remove the lower trim panel from the driver's footwell.
3 Disconnect the wiring plug from the brake lamp switch, then twist the switch anti-clockwise and remove it from its bracket.
4 Pull the spring clip from the right-hand end of the servo fork-to-pedal pivot pin **(see illustration)**.
5 Using a pair of pliers, pull back the end of the pedal return spring from the pedal, to enable the servo fork-to-pedal pivot pin to be removed. Withdraw the pivot pin **(see illustration)**.
6 Pull the locking clip from the left-hand end of the pedal pivot pin.
7 Unscrew the nut from the left-hand end of the pivot pin, then slide the pivot pin from the right-hand end of the pedal mounting bracket. If necessary, tap the end of the pivot pin with a soft-faced hammer to free the splines from the mounting bracket. Recover any washers that may be positioned on the pivot pin, noting their locations.
8 Withdraw the pedal and return spring.

Refitting

9 Refitting is a reversal of removal, remembering the following points.
10 Ensure that the pedal return spring is correctly located on the pedal before refitting.
11 Coat the pedal pivot pin with a little molybdenum disulphide grease.
12 Ensure that any washers on the pedal pivot pin are positioned as noted before removal.