

# Chapter 9 Braking system

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## Degrees of difficulty

<b>Easy</b> , suitable for novice with little experience 	<b>Fairly easy</b> , suitable for beginner with some experience 	<b>Fairly difficult</b> , suitable for competent DIY mechanic 	<b>Difficult</b> , suitable for experienced DIY mechanic 	<b>Very difficult</b> , suitable for expert DIY or professional 
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## Specifications

### Front brakes

Type . . . . .	Solid or ventilated disc, with single-piston sliding calipers
Disc diameter . . . . .	240 or 260 mm
Disc thickness:	
Solid disc . . . . .	10 mm
Ventilated disc . . . . .	20 or 24 mm
Minimum disc thickness:	
Solid disc . . . . .	8 mm
Ventilated disc . . . . .	18 or 22 mm
Maximum disc run-out (disc fitted) . . . . .	0.1 mm
Minimum brake pad thickness . . . . .	1.5 mm
Caliper piston diameter . . . . .	54 mm

### Rear drum brakes

Type . . . . .	Drum with leading and trailing shoes and automatic adjusters
Nominal drum diameter . . . . .	180, 203 or 228.6 mm according to model
Maximum drum diameter . . . . .	1.0 mm above nominal diameter
Minimum brake lining thickness . . . . .	1.0 mm

### Rear disc brakes

Type . . . . .	Solid disc with twin-piston fixed calipers
Disc diameter . . . . .	270 mm
Disc thickness . . . . .	10 mm
Minimum disc thickness . . . . .	8 mm
Maximum disc run-out (disc fitted) . . . . .	0.1 mm
Minimum brake pad thickness . . . . .	1.5 mm
Caliper piston diameter . . . . .	33 mm

## 9•2 Braking system

### Torque wrench settings

	Nm	lbf ft
Master cylinder to servo .....	20 to 25	15 to 18
Servo unit to bracket/bulkhead .....	35 to 45	26 to 33
Drum/hub to rear axle flange .....	56 to 76	41 to 56
Caliper anchor bracket to spindle carrier .....	50 to 66	37 to 49
Caliper piston housing to anchor bracket:		
Bendix caliper .....	45 to 55	33 to 41
Teves caliper .....	20 to 25	15 to 18
Rear caliper mounting bolts .....	50 to 66	37 to 49
ABS hydraulic unit to bracket .....	21 to 25	15 to 18
Roadwheel nuts .....	70 to 100	52 to 74

### 1 General information and precautions

The braking system is of the diagonally split, dual-circuit hydraulic type, with servo assistance to the front disc brakes and rear drum/disc brakes (see illustration). The dual-circuit hydraulic system is a safety feature - in the event of a malfunction somewhere in one of the hydraulic circuits, the other circuit continues to operate, providing at least some braking effort. Under normal circumstances, both brake circuits operate in unison, to provide efficient braking.

The master cylinder (and the vacuum servo unit to which it is bolted) is located on the left-hand side of the bulkhead in the engine compartment. On all right-hand drive variants, they are jointly operated via a transverse cross-link from the brake pedal.

Brake pressure control valves are fitted in-line to each rear brake circuit, their function being to regulate the braking force available at each rear wheel, reducing the possibility of the rear wheels locking up under heavy braking. Van models also have a "light-laden" valve incorporated into the rear braking circuits for the same reason.

The front brake discs are of the ventilated type on all 1.6 litre, 1.8 litre and ABS-equipped models. Solid discs are fitted on all other models. The front brake calipers are of single sliding piston design, which ensures that equal effort is applied through each pair of brake pads to the discs. The calipers are mounted on the front spindle carriers each side.

Each rear brake drum can be simply unbolted from its rear axle flange, together with the integrally-fitted wheel hub, and removed to provide unhindered access to the shoe assemblies. Each rear brake shoe assembly is operated by a twin-piston wheel cylinder. The leading brake shoe in each brake unit has a thicker lining than the trailing shoe, so that they wear proportionally. To take up the brake adjustment as the linings wear, each rear brake assembly incorporates an automatic adjuster mechanism.

On models fitted with rear disc brakes, the brake calipers are of twin-piston fixed type, with handbrake operation by means of

separate handbrake shoes operating within a "drum-in-disc" arrangement.

The cable-operated handbrake acts on both rear brakes, to provide an independent means of brake operation.

An anti-lock braking system (ABS) is available on some models, and has many of the components in common with the conventional braking system. Further details on ABS can be found later in this Chapter.

#### Precautions

When servicing any part of the system, work carefully and methodically; also observe scrupulous cleanliness when overhauling any part of the hydraulic system. Use only genuine Ford replacement parts, or at least those of known good quality.

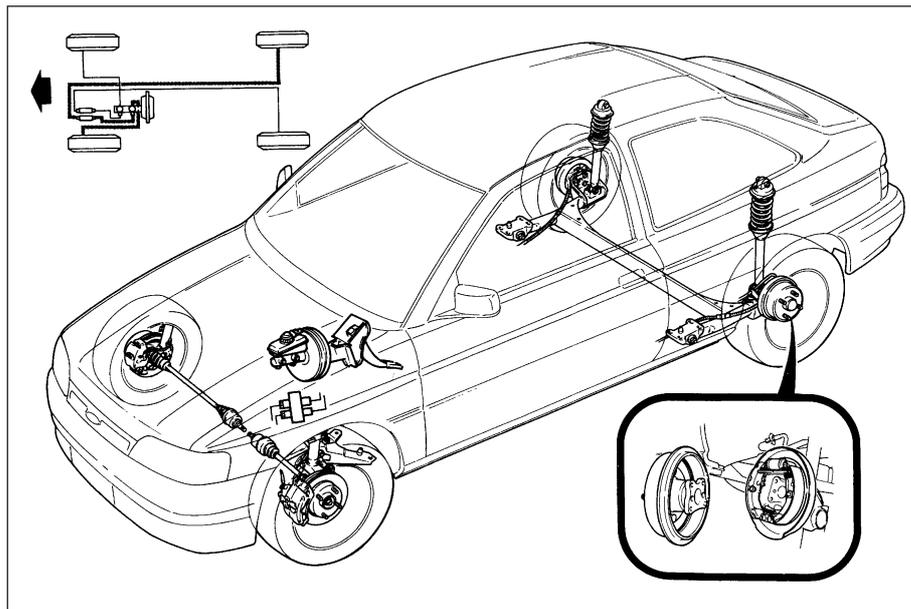


**Warning: Brake components MUST be renewed as axle sets - NEVER renew components on only one wheel, as uneven braking may result. Dust created by wear of brake pads/shoes may contain asbestos, which is a health hazard. Never blow it out with compressed air, and do not inhale any of it. DO NOT use petroleum-based solvents to clean brake**

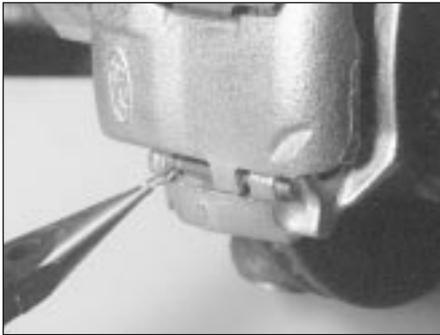
**parts - use brake cleaner or methylated spirit only. DO NOT allow any brake fluid, oil or grease to contact the brake friction surfaces.**



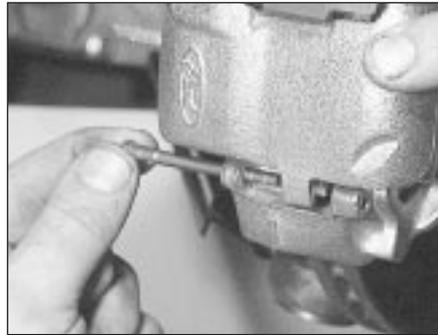
**Warning: Hydraulic fluid is poisonous; wash off immediately and thoroughly in the case of skin contact, and seek immediate medical advice if any fluid is swallowed or gets into the eyes. Certain types of hydraulic fluid are inflammable, and may ignite when allowed into contact with hot components; when servicing the hydraulic system, it is safest to assume that the fluid IS inflammable, and to take precautions against the risk of fire as though it is petrol that is being handled. Hydraulic fluid is also an effective paint stripper, and will attack plastics; if any is spilt, it should be washed off immediately, using copious quantities of fresh water. Finally, it is hygroscopic (it absorbs moisture from the air) - old fluid may be contaminated and unfit for further use. When topping-up or renewing the fluid, always use the recommended type, and ensure that it comes from a freshly-opened sealed container.**



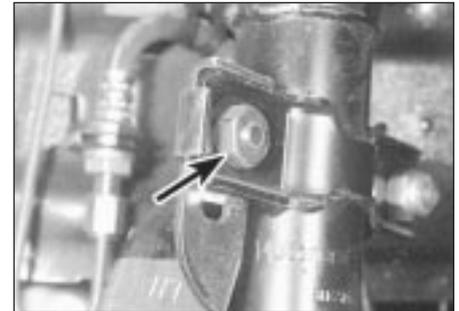
1.1 Standard braking system layout and principal components



2.2A Extract the R-clip from the cross-pin . . .



2.2B . . . and withdraw the pin from the base of the caliper



2.3 Undo the retaining nut (arrowed) and release the brake hose support bracket from the suspension strut

## 2 Front brake pads - renewal



**Warning:** Disc brake pads **MUST** be renewed on both front wheels at the same time - **NEVER** renew the pads on only one wheel, as uneven braking may result. The front brake calipers will be of Bendix or Teves manufacture, and if they or their component parts require renewal, ensure that the correct type is fitted. Dust created by wear of the pads may contain asbestos, which is a health hazard. Never blow it out with compressed air, and do not inhale any of it. **DO NOT** use petroleum-based solvents to clean brake parts - use brake cleaner or methylated spirit only. **DO NOT** allow any brake fluid, oil or grease to contact the brake pads or disc. Also refer to the warning in Section 1 concerning brake fluid.

1 Apply the handbrake, loosen off the front roadwheel nuts, then jack up the front of the car and support it on axle stands. Remove the front roadwheels.

### **Bendix caliper**

2 Extract the R-clip from the cross-pin, and withdraw the pin from the base of the caliper (see illustrations).

3 Undo the retaining nut, and release the brake hose support bracket from the suspension strut (see illustration).



2.5 Withdraw the inner and outer brake pads from the anchor bracket

4 Swing the caliper upwards to allow access to the brake pads, and if necessary, tie the caliper up in the raised position.

5 Withdraw the inner and outer brake pads from the anchor bracket (see illustration). If the old pads are to be refitted, ensure that they are identified so that they can be returned to their original positions.

6 Brush the dust and dirt from the caliper and piston, but **do not inhale it, as it is a health hazard**. Inspect the dust cover around the piston for damage and for evidence of fluid leaks, which if found will necessitate caliper overhaul as described in Section 3. Inspect the anti-rattle plate for corrosion, and if necessary renew it.

7 If new brake pads are to be fitted, the caliper piston will need to be pushed back into its housing, to allow for the extra pad thickness - use a C-clamp to do this. Note that, as the piston is pressed back into the bore, it will displace the fluid in the system, causing the fluid level in the brake master cylinder reservoir to rise and possibly overflow. To avoid this possibility, a small quantity of fluid should be syphoned from the reservoir. If any brake fluid is spilt onto the bodywork, hoses or adjacent components in the engine compartment, wipe it clean without delay.

8 Prior to refitting, check that the pads and the disc are clean. Where new pads are to be installed, peel the protective backing paper from them. If the old pads are to be refitted,

ensure that they are correctly located as noted during their removal.

9 Locate the inner and outer brake pads into position in the caliper anchor bracket.

10 Lower the caliper down, insert the cross-pin and fit the R-clip to secure.

11 Reconnect the brake hose bracket to the suspension strut, making sure that the brake hose is not twisted, stretched or distorted in any way.

12 Repeat the procedure on the opposite front brake.

13 Before lowering the vehicle, check that the fluid level in the brake master cylinder reservoir is up to the Maximum level mark, and top-up with the specified fluid type if required. Depress the brake pedal a few times to position the pads against the disc, then recheck the fluid level in the reservoir and further top-up the fluid level if necessary.

14 Refit the roadwheels, then lower the vehicle to the ground. Tighten the roadwheel retaining nuts to the specified torque setting.

15 To allow the new brake pads to bed-in and reach full efficiency, a running-in period of approximately 100 miles or so should be observed before hard use and heavy braking.

### **Teves caliper**

16 Hold the caliper support spring with a pair of pliers, and prise it out of its location in the caliper housing using a screwdriver (see illustration).

17 Prise free the blanking plugs from the caliper upper and lower mounting bolts.



2.16 Hold the caliper support spring with a pair of pliers, and prise it out of its location in the caliper housing using a screwdriver



2.17A Prise free the blanking plugs from the caliper upper and lower mounting bolts

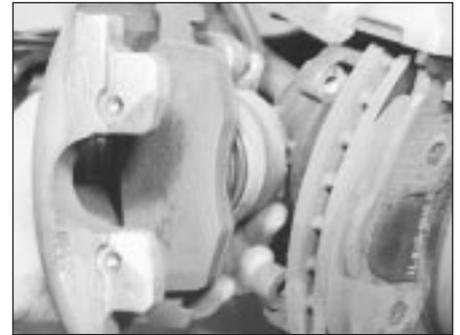
## 9•4 Braking system



2.17B Using a suitable Allen key socket bit . . .



2.17C . . . unscrew and remove the bolts . . .

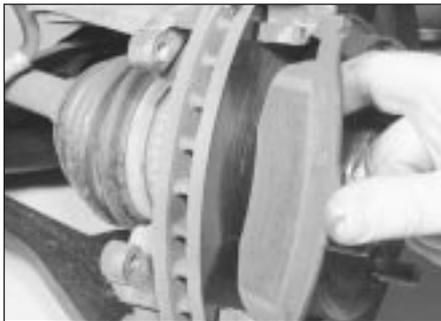


2.17D . . . then withdraw the caliper from the anchor bracket and disc

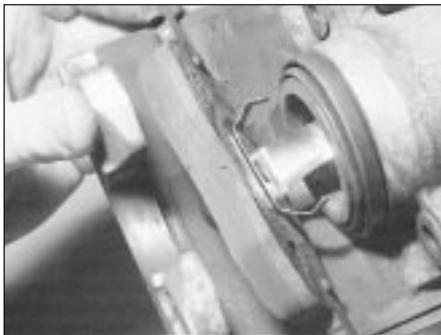
Unscrew the bolts, then withdraw the caliper from the anchor bracket (see illustrations). Suitably support the caliper to avoid straining the brake hose.

18 Withdraw the pads from the caliper piston housing or anchor bracket. The outer pad will normally remain in position in the anchor bracket, but the inner pad will stay attached to the piston in the caliper, and may need to be carefully prised free (see illustrations). If the old pads are to be refitted, ensure that they are identified so that they can be returned to their original positions.

19 Brush the dust and dirt from the caliper and piston, but *do not inhale it, as it is a health hazard*. Inspect the dust cover around the piston for damage and for evidence of fluid leaks, which if found will necessitate caliper overhaul as described in Section 3.



2.18A Withdraw the outer pad from the anchor bracket . . .



2.18B . . . and the inner pad from the piston in the caliper

20 If new brake pads are to be fitted, the caliper piston will need to be pushed back into its housing, to allow for the extra pad thickness - use a C-clamp to do this. Note that, as the piston is pressed back into the bore, it will displace the fluid in the system, causing the fluid level in the brake master cylinder reservoir to rise and possibly overflow. To avoid this possibility, a small quantity of fluid should be syphoned from the reservoir. If any brake fluid is spilled onto the bodywork, hoses or adjacent components in the engine compartment, wipe it clean without delay.

21 Prior to refitting, check that the pads and the disc are clean. Where new pads are to be installed, peel the protective backing paper from them. If the old pads are to be refitted, ensure that they are correctly located as noted during their removal.

22 Locate the inner and outer brake pad into position in the caliper. Relocate the caliper into position on the anchor bracket, and insert the mounting bolts.

23 Tighten the mounting bolts to the specified torque setting, and refit the blanking plugs. Relocate the caliper support spring.

24 Repeat the procedure on the opposite front brake.

25 Before lowering the vehicle, check that the fluid level in the brake master cylinder reservoir is up to the Maximum level mark, and top-up with the specified fluid type if required. Depress the brake pedal a few times to position the pads against the disc, then



3.2 Brake hose clamp fitted to the front flexible brake hose

recheck the fluid level in the reservoir and further top-up the fluid level if necessary.

26 Refit the roadwheels, then lower the vehicle to the ground. Tighten the roadwheel retaining nuts to the specified torque setting.

27 To allow the new brake pads to bed-in and reach full efficiency, a running-in period of approximately 100 miles or so should be observed before hard use and heavy braking.

### 3 Front brake caliper - removal, overhaul and refitting



#### Removal

1 Apply the handbrake, loosen off the front roadwheel nuts on the side concerned, then jack up the front of the vehicle and support it on axle stands. Remove the appropriate roadwheel.

2 Fit a brake hose clamp to the flexible brake hose leading to the front brake caliper. This will minimise brake fluid loss during subsequent operations (see illustration).

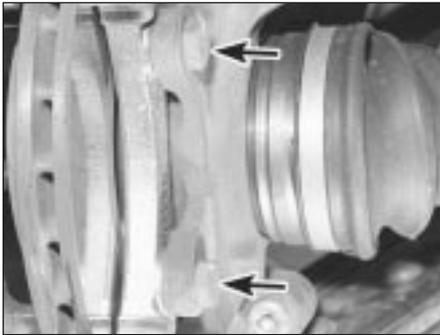
#### Bendix caliper

3 Unscrew the brake hose-to-caliper banjo union bolt, and recover the copper sealing washers (see illustration). Cover or plug the open hydraulic unions to keep them clean.

4 Extract the R-clip from the cross-pin at the base of the caliper, and withdraw the cross-pin.



3.3 Unscrew the brake hose-to-caliper banjo union bolt (arrowed) and recover the copper sealing washers



**3.8 Brake caliper anchor bracket securing bolts (arrowed)**

5 Prise free the blanking plug from the caliper-to-anchor bracket pivot bolt at the top, then support the caliper and unscrew the bolt.

6 Withdraw the caliper from anchor bracket and brake pads, and remove it from the car.

7 To remove the caliper anchor bracket, first withdraw the brake pads. If they are likely to be re-used, mark them for identification (inner and outer, right- or left-hand as applicable) to ensure that they are installed in their original locations when refitting.

8 Unscrew the two retaining bolts, and withdraw the anchor bracket from the spindle carrier (see illustration).

#### Teves caliper

9 Loosen (but do not completely unscrew) the union on the caliper end of the flexible brake hose (see illustration).

10 Remove the front brake pads as described in Section 2.

11 Support the caliper in one hand, and prevent the brake hose from turning with the other hand. Unscrew the caliper from the hose, making sure that the hose is not twisted unduly or strained. Once the caliper is detached, cover or plug the open hydraulic unions to keep them clean.

12 If required, the caliper anchor bracket can be unbolted and removed from the spindle carrier.

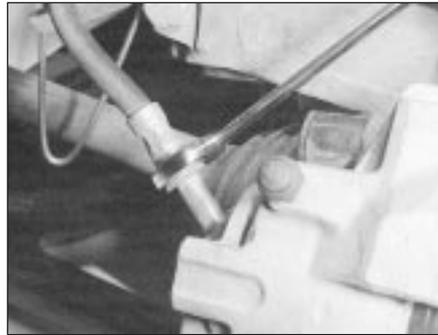
### Overhaul

#### Bendix and Teves calipers

13 With the caliper on the bench, wipe away all traces of dust and dirt, but *avoid inhaling the dust, as it is a health hazard*.

14 Remove the piston from its bore by applying low air pressure (from a foot pump, for example) into the caliper hydraulic fluid hose port. In the event of a high-pressure air hose being used, keep the pressure as low as possible, to enable the piston to be extracted, but to avoid the piston being ejected too quickly and being damaged. Position a suitable piece of wood between the caliper frame and the piston to prevent this possibility. Any fluid remaining in the caliper will probably be ejected with the piston.

15 Using a suitable hooked tool, carefully extract the dust cover from its groove in the



**3.9 Loosening the flexible brake hose at the caliper**

piston and the seal from its groove in the caliper bore, but take care not to scratch or damage the piston and/or the bore in the caliper.

16 Clean all the parts in methylated spirit or clean brake fluid, and wipe dry using a clean lint-free cloth (see illustration). Inspect the piston and caliper bore for signs of damage, scuffing or corrosion. If these conditions are evident, renew the caliper body assembly.

17 If the components are in satisfactory condition, a repair kit which includes a new seal and dust cover must be obtained.

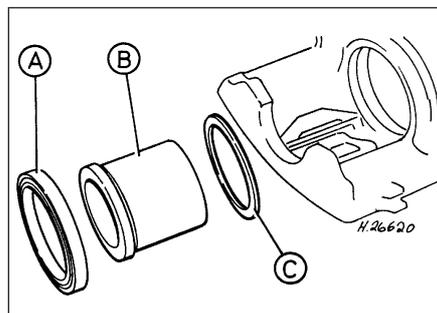
18 Lubricate the piston bore in the caliper and the seal with clean brake fluid. Carefully fit the seal in the caliper bore, using fingers only (no tools) to manipulate it into position in its groove. When in position, check that it is not distorted or twisted.

19 Locate the dust cover over the piston so that its inner diameter is engaged in the piston groove. Smear the area behind the piston groove with the special lubricating grease supplied in the repair kit, then insert the piston into the caliper. Push the piston into position in the bore, and simultaneously press the dust cover into the piston housing so that it is seated correctly (see illustration). Take particular care not to distort or damage the seal or cover as they are fitted.

#### Refitting

#### Bendix caliper

20 If the anchor bracket was removed, fit it into position on the spindle carrier, and



**3.16 Bendix front brake caliper components showing the dust cover (A), piston (B) and piston seal (C)**

tighten the retaining bolts to the specified torque wrench setting.

21 Locate the brake pads into the anchor bracket. Where new pads are to be installed, peel the protective backing paper from them. If the old pads are to be refitted, ensure that they are correctly located in their original positions as noted during their removal.

22 Refit the caliper to the anchor bracket, and loosely locate the caliper-to-anchor bracket pivot bolt. Swing the unit down, and insert the cross-pin and its R-clip. Tighten the caliper-to-anchor bracket bolt to the specified torque.

23 Unplug the hydraulic hose, and check that the unions are clean. Reconnect the hose to the caliper, using new copper washers if necessary. Tighten the brake hose union banjo bolt, then turn the steering from lock-to-lock to ensure that the hose does not foul on the wheel housing or suspension components.

24 Top-up the hydraulic fluid level in the reservoir, and bleed the brake circuit as described in Section 17.

25 Refit the roadwheel, lower the vehicle to the ground, and then tighten the wheel nuts to the specified torque setting.

#### Teves caliper

26 If the anchor bracket was removed, fit it into position on the spindle carrier, and tighten the retaining bolts to the specified torque wrench setting.

27 Unplug the hydraulic hose, and check that the unions are clean. Reconnect the caliper to the hose so that the hose is not twisted or strained. The hose union connection can be fully tightened when the caliper is refitted.

28 Refit the brake pads as described in Section 2.

29 The brake hydraulic hose can now be fully tightened. When secured, turn the steering from lock-to-lock to ensure that the hose does not foul on the wheel housing or suspension components.

30 Top-up the hydraulic fluid level in the reservoir, and bleed the brake circuit as described in Section 17.

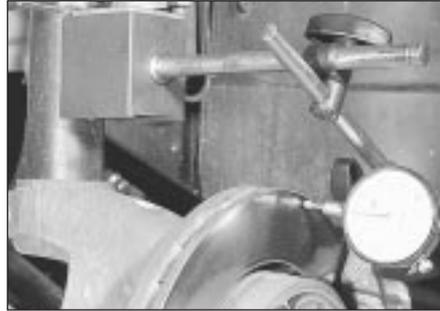
31 Refit the roadwheel, lower the vehicle to the ground, then tighten the wheel nuts to the specified torque setting.



**3.19 Piston and dust seal in position in the caliper**



4.3 Checking the brake disc thickness using a micrometer



4.4 Checking the brake disc run-out using a dial gauge

#### 4 Front brake disc - inspection, removal and refitting



**Note:** To prevent uneven braking, BOTH front brake discs should be renewed or reground at the same time.

##### Inspection

1 Apply the handbrake, loosen off the front roadwheel nuts on the side concerned, then jack up the front of the vehicle and support it on axle stands. Remove the appropriate front roadwheel.

2 Temporarily refit two of the wheel nuts to diagonally-opposite studs, with the flat sides of the nuts against the disc. Tighten the nuts progressively, to hold the disc firmly.

3 Scrape any corrosion from the disc. Rotate the disc, and examine it for deep scoring, grooving or cracks. Using a micrometer, measure the thickness of the disc in several places (see illustration). Light wear and scoring is normal, but if excessive, the disc should be removed, and either reground by a specialist, or renewed. If regrounding is undertaken, at least the minimum thickness must be maintained. Obviously, if the disc is cracked, it must be renewed.

4 Using a dial gauge or a flat metal block and feeler gauges, check that the disc run-out 10 mm from the outer edge does not exceed the limit given in the Specifications. To do this, fix the measuring equipment, and rotate the disc, noting the variation in measurement as the disc

is rotated (see illustration). The difference between the minimum and maximum measurements recorded is the disc run-out.

5 If the run-out is greater than the specified amount, check for variations of the disc thickness as follows. Mark the disc at eight positions 45° apart, then using a micrometer, measure the disc thickness at the eight positions, 15 mm in from the outer edge. If the variation between the minimum and maximum readings is greater than the specified amount, the disc should be renewed.

##### Removal

6 Remove the caliper and its anchor bracket with reference to Section 3, but do not disconnect the hydraulic brake hose. Suspend the caliper assembly from the front suspension coil spring, taking care to avoid straining the brake hose.

7 Remove the wheel nuts which were temporarily refitted in paragraph 2.

8 Using a Torx-type socket bit or driver, unscrew the screw securing the disc to the hub, and withdraw the disc. If it is tight, lightly tap its rear face with a hide or plastic mallet.

##### Refitting

9 Refit the disc in a reversal of the removal sequence. If new discs are being fitted, first remove their protective coating. Ensure complete cleanliness of the hub and disc mating faces and tighten the screw securely.

10 Refit the caliper/anchor bracket with reference to Section 3.

11 Refit the roadwheel, lower the vehicle to the ground, and tighten the wheel nuts to the specified torque wrench setting.

#### 5 Rear brake drum - removal, inspection and refitting



**Note:** To prevent uneven braking, BOTH rear brake drums should be renewed at the same time.

##### Removal

1 Chock the front wheels, loosen off the rear roadwheel nuts on the side concerned, then jack up the rear of the vehicle and support it on axle stands. Remove the appropriate rear roadwheel, and release the handbrake.

2 On all except Van models, undo the four bolts securing the drum/hub to the rear axle flange, then withdraw the drum/hub from the axle (see illustrations). If the brake drum is stuck on the shoes, remove the rubber access plug from the inside face of the brake backplate, and release the automatic brake adjuster by levering the release catch on the adjuster pawl through the backplate.

3 On Van models, prise free the drum retaining clip from the wheel nut stud, then withdraw the drum over the studs and remove it. Note that the retaining clip must be renewed during reassembly.

4 With the brake drum removed, brush or wipe the dust from the drum, brake shoes, wheel cylinder and backplate. *Take great care not to inhale the dust, as it may contain asbestos.*

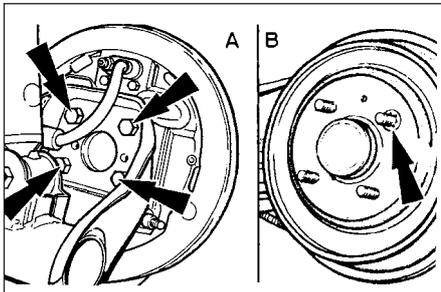
5 If required, remove the hub from the drum (where applicable) as described in Chapter 10.

##### Inspection

6 Clean the inside surfaces of the brake drum and hub, then examine the internal surface of the brake drum for signs of scoring or cracks (see illustration). If any deterioration of the friction surface is evident, renewal of the drum is necessary. To detach the hub from the drum (where applicable), refer to Chapter 10.

##### Refitting

7 Check that the automatic brake adjuster is fully retracted, then according to type, refit the drum/hub to the axle. Tighten the retaining



5.2A Rear brake drum/hub securing methods

A Brake drum/hub retaining bolts

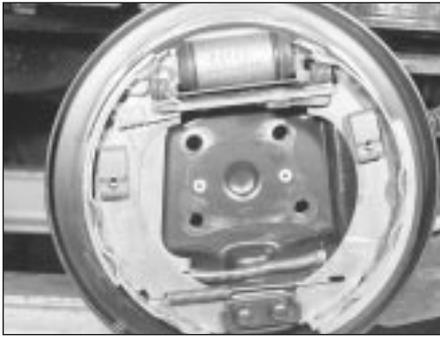
B Brake drum retaining clip on Van models



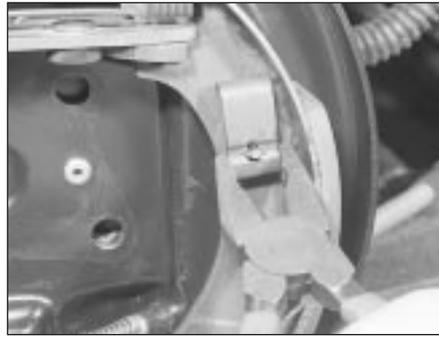
5.2B Removing the rear brake drum/hub



5.6 Examine the inside surfaces of the brake drum for signs of excessive wear and/or cracks



6.2 General view of the rear brake assembly with the drum removed



6.3 Removing a shoe steady spring



6.4 Disengage the leading brake shoe from the bottom anchor . . .

bolts to the specified torque, or fit the drum over the wheel studs, and press a new retaining clip over one of the studs.

8 With the brake drum refitted, refit the roadwheel. Fully depress the brake pedal several times, to actuate the rear brake adjuster and take up the adjustment. Check that the rear wheels spin freely when the brakes are released, then apply the handbrake, lower the vehicle and tighten the wheel nuts to the specified torque wrench setting. Remove the wheel chocks from the front wheels.

1 Remove the rear brake drum with reference to Section 5.

2 Note the fitted positions of the springs and the adjuster strut (see illustration).

3 Remove the shoe steady springs by depressing and turning them through 90° (see illustration). Remove the springs and pins.

4 Pull the leading brake shoe from the bottom anchor, and disconnect the lower return spring (see illustration).

5 Move the bottom ends of the brake shoes towards each other, then disconnect the tops of the shoes from the wheel cylinder. Be careful not to damage the wheel cylinder rubber boots. To prevent the wheel cylinder pistons from being accidentally ejected, fit a

suitable elastic band (or wire) lengthwise over the cylinder/pistons (see illustrations).

6 Disconnect the upper return (pull-off) spring from the brake shoes.

7 Unhook the handbrake cable from the handbrake operating lever on the trailing shoe. Disconnect the support spring from the strut, twist the trailing shoe through 90°, and detach it from the strut (see illustrations).

8 Disconnect the strut from the leading shoe. As the strut is pulled from the shoe, the automatic adjuster will operate and release the pawl from the shoe (see illustration).

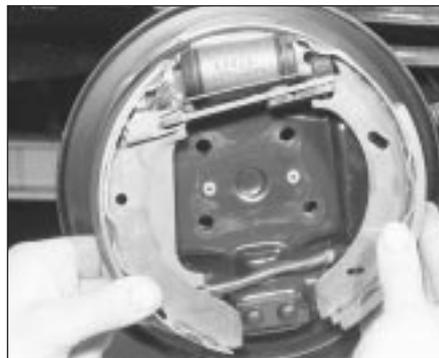
9 Clean the adjuster strut and its associated components.

10 Clean the backplate, then apply a little high-melting-point grease to the shoe contact

## 6 Rear brake shoes - renewal



**Warning:** Drum brake shoes **MUST** be renewed on both rear wheels at the same time - **NEVER** renew the shoes on only one wheel, as uneven braking may result. Also, the dust created by wear of the shoes may contain asbestos, which is a health hazard. Never blow it out with compressed air, and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. **DO NOT** use petroleum-based solvents to clean brake parts - use brake cleaner or methylated spirit only.



6.5A . . . then from the wheel cylinder at the top



6.5B Elastic band fitted round the wheel cylinder to prevent piston ejection



6.7A Disconnecting the handbrake cable from the trailing brake shoe



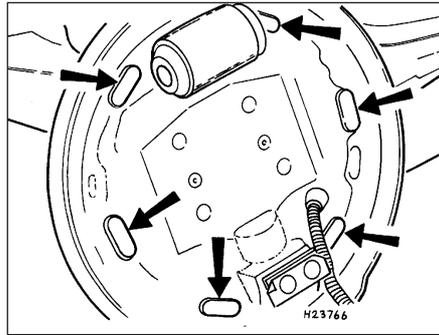
6.7B Disconnecting the support spring from the strut



6.8 Disconnecting the strut from the leading brake shoe



6.10A Applying high-melting-point grease to the brake backplate



6.10B Brake shoe contact points (arrowed) to be lubricated on the backplate



6.11 Reconnect the upper return spring to the leading . . .

points on the backplate and the lower anchor plate (see illustrations).

11 Transfer the strut and the upper return spring onto the new leading shoe (see illustration).

12 Locate the other end of the upper return spring into the new trailing shoe, then twisting the shoe, engage the strut support spring and strut. When reconnected, check that the cam and pawl of the automatic adjuster have engaged (see illustrations).

13 Remove the elastic band (or wire retainer) from the wheel cylinder. Reconnect the handbrake cable to the operating lever on the trailing shoe, and refit the trailing shoe assembly into position on the backplate. As the shoe is engaged over the wheel cylinder, be careful not to damage the rubber dust cover.

14 Reconnect the lower return spring to the trailing shoe and, checking that the handbrake operating lever is resting on the lever stop head (not wedged against the side), locate the shoe in the bottom anchor plate. Refit the steady pin, spring and cup to secure the shoe in position.

15 Offer the leading shoe onto the backplate and insert its steady pin, spring and cup to hold it in place.

16 Reconnect the lower return spring to the leading shoe, using a screwdriver to stretch the spring end into the location hole.

17 Refit the upper return spring, using a

screwdriver to stretch the spring end into the location hole.

18 Check that the brake shoes and their associated components are correctly refitted, then refit the brake drum with reference to Section 5.

19 Repeat the procedure on the remaining rear brake.

## 7 Rear wheel cylinder - removal, overhaul and refitting



### Removal

1 Remove the brake drum as described in Section 5.

2 Pull the brake shoes apart at the top end, so that they are just clear of the wheel cylinder. The automatic adjuster will hold the shoes in this position so that the cylinder can be withdrawn.

3 Using a brake hose clamp or self-locking wrench with protected jaws, clamp the flexible brake hose forward of the shock absorber (midway between the hose protective sleeve and the hose rigid connection bracket on the underside of the body). This will minimise brake fluid loss during subsequent operations.

4 Wipe away all traces of dirt around the brake hose union at the rear of the wheel

cylinder, then loosen off the hose-to-wheel cylinder union nut (see illustration).

5 Unscrew the two bolts securing the wheel cylinder to the backplate.

6 Withdraw the wheel cylinder from the backplate so that it is clear of the brake shoes, then holding the brake hose steady to prevent it twisting, unscrew and detach the wheel cylinder from the hose. Plug the hose, to prevent the possible ingress of dirt and to minimise further fluid loss whilst the cylinder is detached from it.

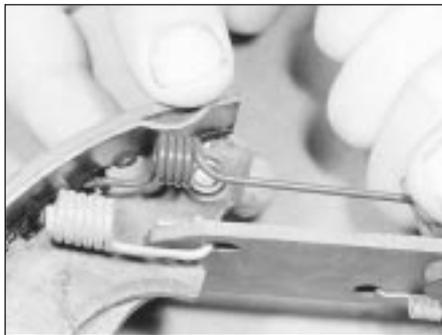
### Overhaul

7 Clean the external surfaces of the cylinder, then pull free the dust cover from each end of the cylinder.

8 The pistons and seals will probably shake out; if not, use a foot pump to apply air pressure through the hydraulic union and eject them.

9 Clean the pistons and the cylinder by washing in fresh hydraulic fluid or methylated spirits (not petrol, paraffin or any other mineral-based fluid). Examine the surfaces of the pistons and the cylinder bores. Look for any signs of rust, scoring or metal-to-metal rubbing, which if evident, will necessitate renewal of the wheel cylinder (see illustration).

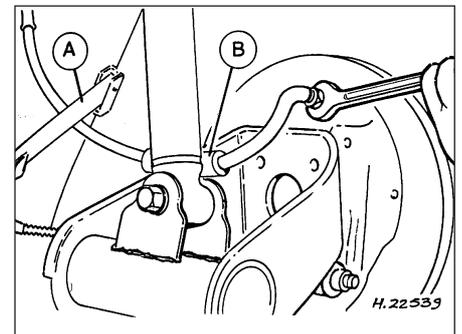
10 Begin reassembly by lubricating the first piston in clean hydraulic fluid. Manipulate its



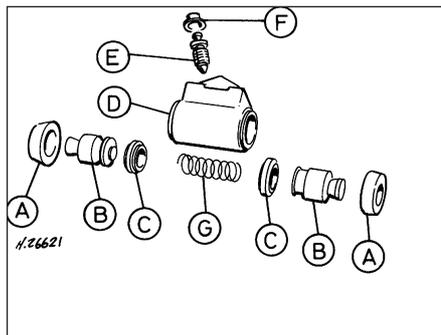
6.12A . . . and trailing shoe



6.12B Brake shoes, strut and upper springs reconnected



7.4 Disconnecting the hydraulic hose from the rear wheel cylinder. Note the hose clamp (A) and the protective sleeve on the hose (B)



7.9 Rear wheel cylinder components

A Dust cover	E Bleed nipple
B Piston	F Dust cap
C Piston seal	G Spring
D Wheel cylinder body	

new seal into position so that its raised lip faces away from the brake shoe bearing face of the piston.

11 Insert the piston into the cylinder from the opposite end of the cylinder body, and push it through to its normal location in the bore.

12 Insert the spring into the cylinder, then fit the second new seal into position on the second piston (as described for the first) and fit the second piston into the wheel cylinder. Take care not to damage the lip of the seal as the piston is inserted into the cylinder - additional lubrication and a slight twisting action may help. Only use fingers (no tools) to manipulate the piston and seal into position.

13 Fit the new dust covers to each end of the piston.

### Refitting

14 Wipe clean the backplate, and remove the plug from the end of the hydraulic hose. Carefully screw the cylinder onto the hose connector, and then fit the cylinder onto the backplate. Tighten the retaining bolts to securely, then fully tighten the hydraulic hose union.

15 Retract the automatic brake adjuster mechanism so that the brake shoes engage with the pistons of the wheel cylinder.

16 Remove the clamp from the flexible brake hose. Ensure that the protective sleeve on the

hose is adjacent to the shock absorber (see illustration 7.4).

17 Refit the brake drum with reference to Section 5.

18 Bleed the brake hydraulic system as described in Section 17. Providing suitable precautions were taken to minimise loss of fluid, it should only be necessary to bleed the relevant rear brake.

## 8 Rear brake backplate - removal and refitting

### Drum brake models

#### Removal

1 On Hatchback/Saloon/Estate models, remove the brake drum/hub assembly as described in Section 5. On Van models, remove the brake drum as described in Section 5, then remove the rear hub assembly as described in Chapter 10.

2 Remove the rear brake shoes as described in Section 6.

3 Remove the wheel cylinder from the backplate as described in Section 7.

4 Compress the three retaining lugs, and release the handbrake cable from the backplate by pushing it back through the plate.

5 Drill out the pop-rivets securing the backplate to the rear axle, and remove the backplate (see illustration).

#### Refitting

6 Refit in the reverse order of removal. Check that the plate is correctly located (with the wheel cylinder aperture at the top) before riveting it into position.

7 Refit the handbrake cable, and ensure that the retaining lugs are secure.

8 Refit the wheel cylinder as described in Section 7.

9 Refit the rear brake shoes as described in Section 6.

10 Refit the brake drum/hub as described in Section 5, or the rear hub assembly as described in Chapter 10, according to model.

11 On completion, bleed the brake hydraulic system as described in Section 17.

### Disc brake models

#### Removal

12 Remove the rear brake disc as described in Section 11, then remove the rear hub assembly as described in Chapter 10.

13 Remove the handbrake shoes as described in Section 20.

14 Drill out the pop-rivets securing the backplate to the rear axle, and remove the backplate.

#### Refitting

15 Refit in the reverse order of removal, securing the backplate with new pop-rivets.

16 Refit the handbrake shoes as described in Section 20.

17 Refit the rear brake disc as described in Section 11, and the rear hub assembly as described in Chapter 10.

## 9 Rear brake pads - renewal

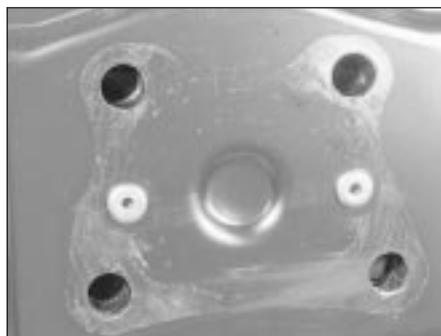


**Warning:** Disc brake pads must be renewed on BOTH rear wheels at the same time - NEVER renew the pads on only one wheel, as uneven braking may result. Dust created by wear of the pads may contain asbestos, which is a health hazard. Never blow it out with compressed air, and do not inhale any of it. DO NOT use petroleum-based solvents to clean brake parts - use brake cleaner or methylated spirit only. DO NOT allow any brake fluid, oil or grease to contact the brake pads or disc. Also refer to the warnings at the start of Sections 1 and 17 concerning brake fluid.

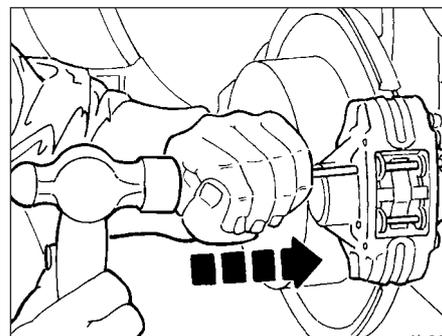
1 Chock the front wheels, then jack up the rear of the car and support it on axle stands. Remove the rear roadwheels.

2 Using a hammer and suitable punch, drift out the two brake pad retaining pins, and lift away the anti-rattle plate (see illustration).

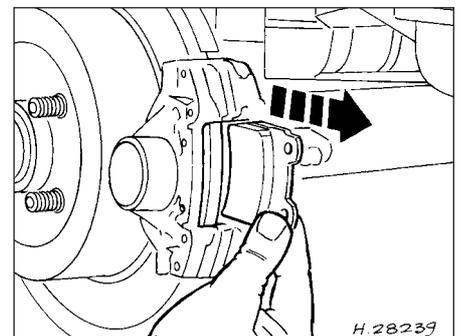
3 Withdraw the inner and outer brake pads from the caliper (see illustration). If the old pads are to be refitted, ensure that they are identified so that they can be returned to their original positions.



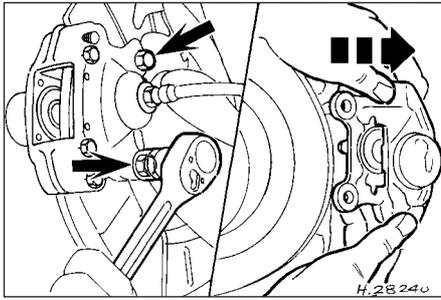
8.5 Backplate-to-stub axle rivets



9.2 Drift out the two rear brake pad retaining pins using a punch



9.3 Withdraw the inner and outer rear brake pads from the caliper



### 10.5 Undo the two caliper retaining bolts and withdraw the caliper from the disc

4 Brush the dust and dirt from the caliper and pistons, but *do not inhale it, as it is a health hazard*. Inspect the dust cover around the pistons for damage and for evidence of fluid leaks, which if found will necessitate caliper overhaul as described in Section 10. Inspect the anti-rattle plate for corrosion, and if necessary renew it.

5 If new brake pads are to fitted, the caliper pistons will need to be pushed back into their bores, to allow for the extra pad thickness. Use a C-clamp or suitably-protected screwdriver as a lever to do this. Note that, as the pistons are pressed back, they will displace the fluid in the system, causing the fluid level in the brake master cylinder reservoir to rise and possibly overflow. To avoid this possibility, a small quantity of fluid should be syphoned from the reservoir. If any brake fluid is spilt onto the bodywork, hoses or adjacent components in the engine compartment, wipe it clean without delay.

6 Prior to refitting, check that the pads and the disc are clean. Where new pads are to be installed, peel the protective backing paper from them. If the old pads are to be refitted, ensure that they are correctly located as noted during their removal.

7 Locate the inner and outer brake pads into position in the caliper, and refit the upper retaining pin.

8 Locate the anti-rattle plate in position, and refit the lower retaining pin.

9 Repeat the procedure on the opposite rear brake assembly.

10 Before lowering the vehicle, check that the fluid level in the brake master cylinder reservoir is up to the "Maximum" level mark, and top-up with the specified fluid type if required. Depress the brake pedal a few times to position the pads against the disc, then recheck the fluid level in the reservoir and further top-up the fluid level if necessary.

11 Refit the roadwheels, then lower the vehicle to the ground. Tighten the roadwheel retaining nuts to the specified torque setting.

12 To allow the new brake pads to bed-in and reach full efficiency, a running-in period of approximately 100 miles or so should be observed before hard use and heavy braking.

## 10 Rear brake caliper - removal, overhaul and refitting



### Removal

1 Chock the front wheels, then jack up the rear of the car and support it on axle stands. Remove the appropriate rear roadwheel.

2 Remove the rear brake pads as described in Section 9.

3 Fit a brake hose clamp to the flexible brake hose leading to the rear brake caliper. This will minimise brake fluid loss during subsequent operations.

4 Loosen (but do not completely unscrew) the union on the caliper end of the flexible brake hose.

5 Undo the two caliper retaining bolts, and withdraw the caliper from the disc (see illustration).

6 Support the caliper in one hand, and prevent the brake hose from turning with the other hand. Unscrew the caliper from the hose, making sure that the hose is not twisted unduly or strained. Once the caliper is detached, cover or plug the open hydraulic unions to keep them clean.

### Overhaul

7 With the caliper on the bench, wipe away all traces of dust and dirt, but *avoid inhaling the dust, as it is a health hazard*.

8 Remove the pistons from their bores by applying air pressure from a foot pump into the caliper hydraulic fluid hose port. In the event of a high-pressure air hose being used, keep the pressure as low as possible, to avoid the pistons being ejected too quickly and being damaged. Any fluid remaining in the caliper will probably be ejected with the pistons.

9 Using a suitable hooked tool, carefully extract the dust covers from their grooves in the pistons, and the seals from their grooves in the caliper bore, but take care not to scratch or damage the pistons and/or the bores in the caliper.

10 Clean all parts in methylated spirit or clean brake fluid, and wipe dry using a clean lint-free cloth. Inspect the pistons and caliper bores for signs of damage, scuffing or corrosion; if these conditions are evident, renew the caliper assembly.

11 If the components are in satisfactory condition, a repair kit which includes new seals and dust covers must be obtained.

12 Lubricate the caliper bores and the seals with clean brake fluid, and carefully fit the seals in the caliper bore. Use the fingers only (no tools) to manipulate them into position in their grooves. When in position, check that the seals are not distorted or twisted.

13 Locate the dust covers over the pistons so that their inner diameters are engaged in the piston grooves. Insert the pistons into the caliper. Push the pistons into position in the

bore, and simultaneously press the dust covers into the caliper so that they are seated correctly. Take particular care not to distort or damage the seals or dust cover as they are fitted.

### Refitting

14 Unplug the hydraulic hose, check that the unions are clean, then reconnect the caliper to the hose, reversing the disconnection procedure so that the hose is not twisted or strained. The hose union connection can be fully tightened when the caliper is refitted.

15 Slide the caliper over the brake disc, and secure with the two retaining bolts tightened to the specified torque.

16 The brake hydraulic hose can now be fully tightened. When secured, ensure that the hose does not foul on the wheel arch or suspension components.

17 Refit the brake pads as described in Section 9.

18 Top-up the hydraulic fluid level in the reservoir, and bleed the brake circuit as described in Section 17.

19 Refit the roadwheel, lower the vehicle to the ground, and then tighten the wheel nuts to the specified torque setting.

## 11 Rear brake disc - inspection, removal and refitting



**Note:** To prevent uneven braking, BOTH rear brake discs should be renewed or reground at the same time.

### Inspection

1 Chock the front roadwheels, then jack up the rear of the vehicle and support it on axle stands. Remove the appropriate rear roadwheel.

2 Remove the brake pads as described in Section 9, then undo the two brake caliper retaining bolts. Withdraw the caliper from the disc, and tie it up using string or wire from a convenient location. Avoid straining the brake hose.

3 Temporarily refit two of the wheel nuts to diagonally-opposite studs, with the flat sides of the nuts against the disc. Tighten the nuts progressively, to hold the disc firmly.

4 Scrape any corrosion from the disc. Rotate the disc, and examine it for deep scoring, grooving or cracks. Using a micrometer, measure the thickness of the disc in several places. Light wear and scoring is normal, but if excessive, the disc should be removed, and either reground by a specialist, or renewed. If regrinding is undertaken, the minimum thickness must be maintained. Obviously, if the disc is cracked, it must be renewed.

5 Using a dial gauge or a flat metal block and feeler gauges, check that the disc run-out 10 mm from the outer edge does not exceed the limit given in the Specifications. To do this, fix the measuring equipment, and rotate

the disc, noting the variation in measurement as the disc is rotated (see illustration 4.4). The difference between the minimum and maximum measurements recorded is the disc run-out.

6 If the run-out is greater than the specified amount, check for variations of the disc thickness as follows. Mark the disc at eight positions 45° apart, then using a micrometer, measure the disc thickness at the eight positions, 15 mm in from the outer edge. If the variation between the minimum and maximum readings is greater than the specified amount, the disc should be renewed.

### Removal

7 With the caliper removed as previously described, remove the wheel nuts which were temporarily refitted in paragraph 3.

8 Ensure that the handbrake is fully released, then using a Torx-type socket bit or driver, unscrew the screw securing the disc to the hub and withdraw the disc. If it is tight, lightly tap its rear face with a hide or plastic mallet.

### Refitting

9 Refit the disc in a reversal of the removal sequence. If new discs are being fitted, first remove their protective coating. Ensure complete cleanliness of the hub and disc mating faces, and tighten the screw securely.

10 Refit the caliper and secure with the retaining bolts tightened to the specified torque.

11 Refit the rear brake pads as described in Section 9.

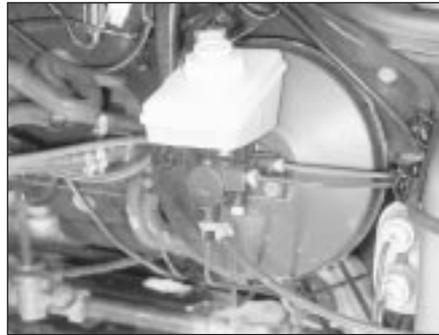
12 Refit the roadwheel, lower the vehicle to the ground, and tighten the wheel nuts to the specified torque wrench setting.

## 12 Master cylinder - removal and refitting

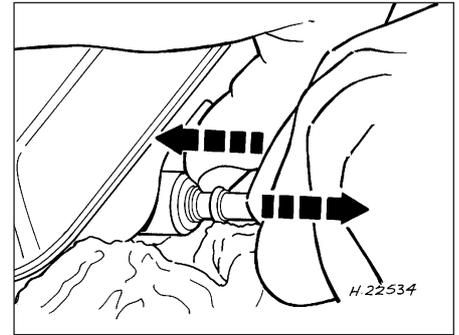
### Removal

1 Disconnect the wiring multi-plug from the fluid level warning indicator in the reservoir filler cap, then remove the filler cap from the reservoir. Note that the filler cap must not be inverted. The reservoir should now be emptied by syphoning or drawing out the fluid with a pipette.

2 Identify each brake pipe and its connection to the master cylinder (see illustration). Unscrew the fluid line to master cylinder union nuts and disconnect the fluid lines. On models equipped with ABS, when disconnecting the fluid return pipes from the reservoir, press the retaining boss into the reservoir and pull free the fluid line (see illustration). Plug the connections and tape over the pipe ends, to prevent the entry of dust and dirt.



12.2A Brake master cylinder and hydraulic line connections



12.2B Disconnecting the brake fluid return pipes from the reservoir on ABS-equipped models

3 Unscrew the mounting nuts and withdraw the master cylinder from the servo unit.

4 If required, the master cylinder can be dismantled for inspection and the seals renewed as described in the following Section.

### Refitting

5 Before refitting the master cylinder, clean the mounting faces.

6 Refitting is a reversal of removal. Ensure that the vacuum servo unit seal is in position, and tighten the master cylinder retaining nuts to the specified torque wrench setting. Finally bleed the hydraulic system as described in Section 17.

## 13 Master cylinder - inspection and overhaul

1 With the master cylinder removed, empty any remaining fluid from it, and clean it externally.

2 Secure the master cylinder in a vice fitted with soft-faced jaws to avoid damaging the cylinder.

3 Withdraw the hydraulic fluid reservoir from the top of the master cylinder by pulling and rocking it free from its retaining seals.

4 Extract the reservoir seals from the top face of the master cylinder.

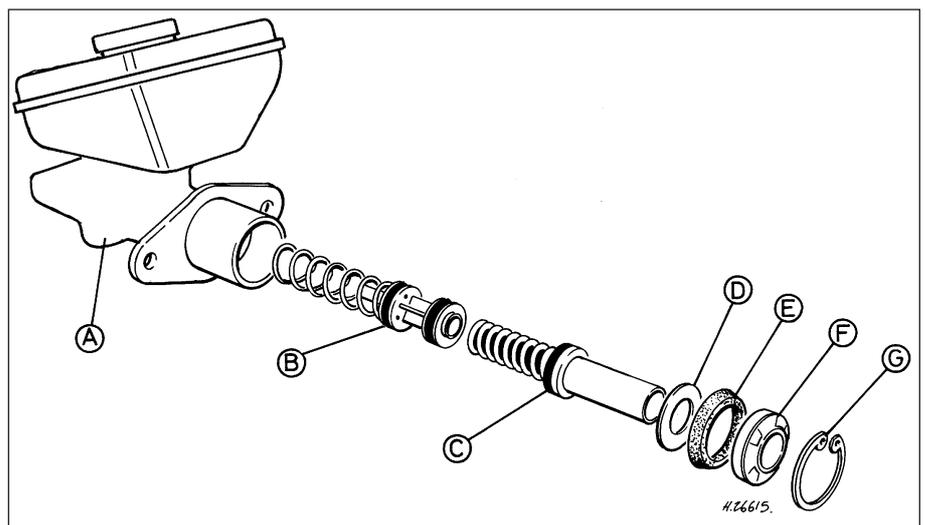
5 Extract the circlip from its groove in the inner port at the rear of the master cylinder.

6 Pull free the primary piston from the rear end of the master cylinder bore, together with the spacer, seal and steel washer.

7 Extract the secondary piston assembly by shaking or lightly tapping it free from the cylinder (see illustration).

8 To dismantle the primary piston and to remove its seal, undo the retaining screw and detach the spring from the piston. Lever the seal retainer tabs free using a suitable screwdriver and remove the seal. As it is removed, note the fitted direction of the seal on the piston (see illustrations).

9 To dismantle the secondary piston, pull free the spring (note its orientation), remove the



13.7 Exploded view of the master cylinder

A Master cylinder body

B Secondary piston

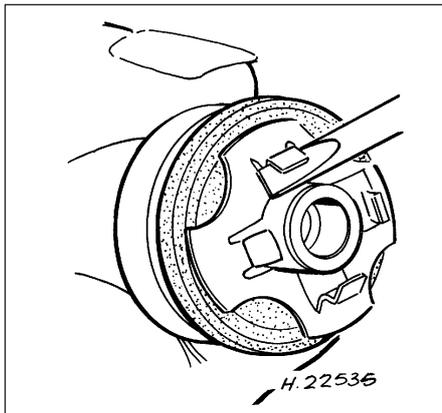
C Primary piston

D Steel washer

E Seal

F Plastic spacer

G Circlip



13.8A Release the seal retainer tabs on the primary piston

seal retainer using the same method as that for the primary piston seal, and remove the seal (noting its direction of fitting). Prise free the seal from the other end of the secondary piston, again noting its direction of fitting (see illustration).

10 Wash all components of the cylinder in methylated spirit or clean hydraulic brake fluid of the specified type. Do not use any other type of cleaning fluid.

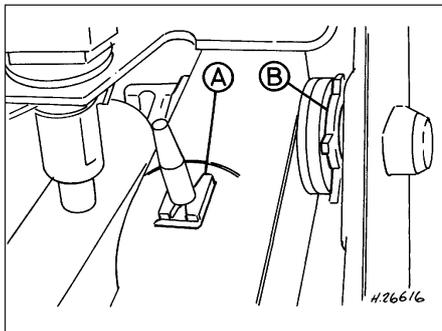
11 Inspect the master cylinder and piston assemblies for any signs of excessive wear or damage. Deep scoring in the cylinder bore and/or on the piston surfaces will necessitate a new master cylinder being fitted.

12 If the cylinder is in a serviceable condition, obtain a cylinder seals/repair kit. Once removed, the seals must always be renewed.

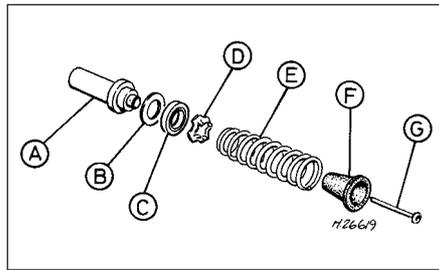
13 Check that all components are perfectly clean before they refitted. Smear them in new brake fluid of the specified type as they are assembled. *Do not allow grease, old fluid or any other lubricant to contact the components during reassembly.*

14 Reassemble each piston in the reverse order of dismantling. Ensure that the seals are correctly orientated, and that the retainers are securely fitted.

15 Lubricate the pistons before refitting them

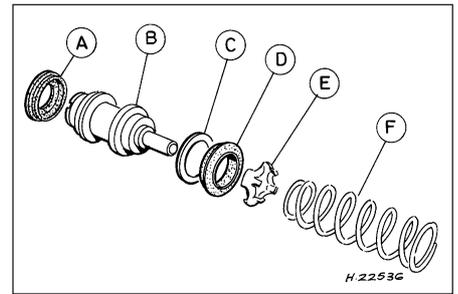


14.4 Brake pedal-to-cross-link circlip (A) and the brake pedal cross-link retaining clip (B)



13.8B Primary piston components

- |                 |                   |
|-----------------|-------------------|
| A Piston        | E Spring          |
| B Shim          | F Boot            |
| C Seal          | G Retaining screw |
| D Seal retainer |                   |



13.9 Secondary piston components

- |          |                 |
|----------|-----------------|
| A Seal   | D Seal          |
| B Piston | E Seal retainer |
| C Shim   | F Spring        |

to the cylinder and as they are inserted, use a twisting action to assist in pushing them into position.

16 With the secondary and primary pistons in position, fit the steel washer, a new seal, and the spacer; secure them with the circlip. Ensure that the circlip is fully engaged into its retaining groove in the rear end of the cylinder.

17 Refit the master cylinder, top-up the reservoir with the specified fluid, and bleed the brake hydraulic system (see Sections 12 and 17 for details).

## 14 Brake pedal - removal and refitting

### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 2 Working inside the car, move the driver's seat fully to the rear, to allow maximum working area.
- 3 Disconnect the wiring connector from the stop-light switch, then twist the switch and release it from the mounting bracket.
- 4 Using a suitable hooked tool, extract the

circlip from the pedal cross-link (see illustration).

5 Prise free and remove the retaining clip securing the pedal-to-cross-link rod.

6 Press the brake pedal pivot shaft through the mounting box just far enough the release and remove the pedal and spacers.

7 Prise the bushes out from each side of the brake pedal, and renew them if necessary (see illustration).

### Refitting

8 Prior to refitting, apply a small amount of molybdenum disulphide grease to the brake pedal pivot shaft.

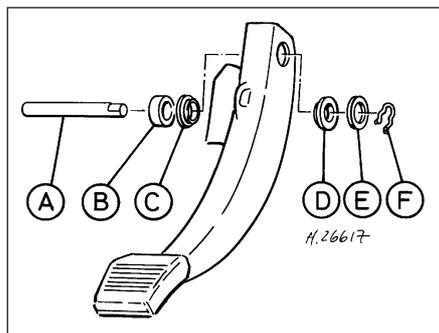
9 Refit in the reverse order to removal. Ensure that the pedal bushes are correctly located, and that the pedal shaft "D" section locates in the pedal box right-hand support.

10 On completion, refit the stop-light switch, and adjust it as described in Chapter 12.

## 15 Brake pedal-to-servo cross-link - removal and refitting

### Removal

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 2 Remove the vacuum servo unit as described in Section 18.
- 3 Where necessary, remove the air cleaner as described in Chapter 4 to allow increased access to the cross-link assembly.
- 4 Working inside the vehicle, prise free and remove the retaining clip from the brake pedal-to-cross-link pushrod.
- 5 Arrange for an assistant to support the weight of the cross-link assembly on the engine compartment side of the bulkhead. Fold down the bulkhead trim covering in the footwell on each side, to allow access to the cross-link support bracket securing nuts on the bulkhead. Unscrew the nuts on each side of the bulkhead, and remove the cross-link



14.7 Brake pedal components

- |               |          |
|---------------|----------|
| A Pivot shaft | D Bush   |
| B Spacer      | E Washer |
| C Bush        | F Clip   |



15.5 Brake system cross-link mounting to the bulkhead

assembly from the bulkhead in the engine compartment (see illustration).

6 Clean the linkage components, and examine the bushes for excessive wear. Renew the bushes if necessary (see illustration).

### Refitting

7 Refitting of the cross-link assembly is a reversal of the removal procedure. Refer to Section 18 to refit the vacuum servo unit.

8 Top-up the fluid level in the master cylinder reservoir, and bleed the brake hydraulic system as described in Section 17.

## 16 Hydraulic pipes and hoses - inspection, removal and refitting



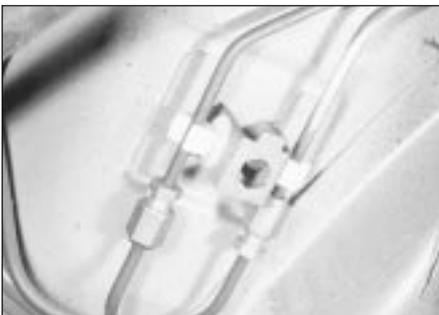
### Inspection

1 Jack up the front and rear of the vehicle, and support on axle stands.

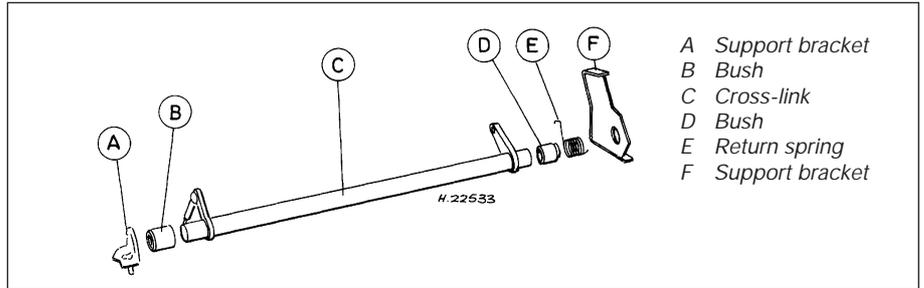
2 Check for signs of leakage at the pipe unions, then examine the flexible hoses for signs of cracking, chafing and fraying.

3 The brake pipes should be examined carefully for signs of dents, corrosion or other damage. Corrosion should be scraped off, and if the depth of pitting is significant, the pipes renewed. This is particularly likely in those areas underneath the vehicle body where the pipes are exposed and unprotected.

4 Renew any defective brake pipes and/or hoses.



16.6 Typical rigid brake pipe connections and securing clips to the body



15.6 Brake pedal cross-link assembly

### Removal

5 If any section of pipe or hose is to be removed, the loss of fluid may be reduced by removing the hydraulic fluid reservoir filler cap, placing a piece of polythene over the filler neck, and securing it with an elastic band. If a section of pipe is to be removed from the master cylinder, the reservoir should be emptied by syphoning out the fluid or drawing out the fluid with a pipette. If any brake fluid is spilt onto the bodywork, it must be wiped clean without delay.

6 To remove a section of pipe, hold the adjoining hose union nut with a suitable spanner to prevent it from turning, then unscrew the union nut at the end of the pipe and release it (see illustration). Repeat the procedure at the other end of the pipe, then release the pipe from the clips attaching it to the body. Where the union nuts are exposed to the full force of the weather, they can sometimes be quite tight. If an open-ended spanner is used, burring of the flats on the nuts is not uncommon, and for this reason it is preferable to use a split ring spanner which will engage all the flats. If such a spanner is not available, self-locking grips may be used, although this is not recommended.

7 To further minimise the loss of fluid when disconnecting a flexible brake line, clamp the hose as near to the joint to be detached as is possible using a brake hose clamp, or failing this, a self-locking wrench fitted with protective jaws. To remove a flexible hose, first clean the ends of the hose and the surrounding area, then unscrew the union nut(s) from the hose end(s). Recover the spring clip and withdraw the hose from the

serrated mounting in the support bracket. Where applicable, unscrew the hose from the caliper (see illustrations).

8 Brake pipes with flared ends and union nuts in place can be obtained (individually or in sets) from Ford dealers or accessory shops. The pipe is then bent to shape, using the old pipe as a guide, and is ready for fitting to the car.

### Refitting

9 Refitting the pipes and hoses is a reversal of removal. Make sure that all brake pipes are securely supported in their clips, and ensure that the hoses are not kinked. Check also that the hoses are clear of all suspension components and underbody fittings, and will remain clear during movement of the suspension and steering. After refitting, remove the polythene from the reservoir, and bleed the brake hydraulic system as described in Section 17.

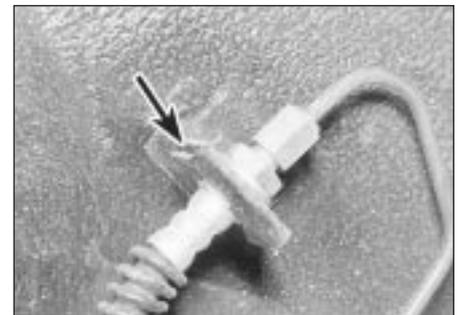
## 17 Hydraulic system - bleeding



**Warning:** Hydraulic fluid is poisonous; wash off immediately and thoroughly in the case of skin contact, and seek immediate medical advice if any fluid is swallowed or gets into the eyes. Certain types of hydraulic fluid are inflammable, and may ignite when allowed into contact with hot components; when servicing the hydraulic system, it is safest to assume that the fluid IS inflammable, and to take precautions against the risk of fire as though it is petrol



16.7A Brake hose clamp fitted to minimise fluid loss



16.7B Flexible-to rigid hydraulic brake line connection. Securing clip to location bracket is arrowed

*that is being handled. Finally, it is hygroscopic (it absorbs moisture from the air) - old fluid may be contaminated and unfit for further use. When topping-up or renewing the fluid, always use the recommended type, and ensure that it comes from a freshly-opened sealed container.*



**Hydraulic fluid is an effective paint stripper, and will attack plastics; if any is spilt, it should be washed off immediately, using copious quantities of fresh water.**

1 The correct operation of any hydraulic system is only possible after removing all air from the components and circuit; and this is achieved by bleeding the system.

2 During the bleeding procedure, add only clean, unused hydraulic fluid of the recommended type; never re-use fluid that has already been bled from the system. Ensure that sufficient fluid is available before starting work.

3 If there is any possibility of incorrect fluid being already in the system, the brake components and circuit must be flushed completely with uncontaminated, correct fluid, and new seals should be fitted throughout the system.

4 If hydraulic fluid has been lost from the system, or air has entered because of a leak, ensure that the fault is cured before proceeding further.

5 Park the vehicle on level ground, and apply the handbrake. Switch off the engine, then (where applicable) depress the brake pedal several times to dissipate the vacuum from the servo unit.

6 Check that all pipes and hoses are secure, unions tight and bleed screws closed. Remove the dust caps (where applicable), and clean any dirt from around the bleed screws.

7 Unscrew the master cylinder reservoir cap, and top-up the master cylinder reservoir to the "Maximum" level. *Remember to maintain the fluid level at least above the "Minimum" level line throughout the procedure, otherwise there is a risk of further air entering the system.*

8 There are a number of one-man, do-it-yourself brake bleeding kits currently available from motor accessory shops. It is recommended that one of these kits is used whenever possible, as they greatly simplify the bleeding operation, and also reduce the risk of expelled air and fluid being drawn back into the system. If such a kit is not available, the basic (two-man) method must be used, which is described in detail below.

9 If a kit is to be used, prepare the vehicle as described previously, and follow the kit manufacturer's instructions, as the procedure may vary slightly according to the type being used; generally, they are as outlined below in the relevant sub-section.

10 Whichever method is used, the same sequence must be followed (paragraphs 11 and 12) to ensure the removal of all air from the system.

### Bleeding sequence

11 If the system has been only partially disconnected, and suitable precautions were taken to minimise fluid loss, it should be necessary to bleed only that part of the system (ie the primary or secondary circuit).

12 If the complete system is to be bled, then it is suggested that you work in the following sequence:

- Right-hand rear wheel.
- Left-hand rear wheel.
- Right-hand front wheel.
- Left-hand front wheel.

### Bleeding - basic (two-man) method

13 Collect a clean glass jar, a suitable length of plastic or rubber tubing which is a tight fit over the bleed screw, and a ring spanner to fit the screw. The help of an assistant will also be required.

14 Remove the dust cap from the first screw in the sequence (if not already done) (see illustration). Fit a suitable spanner and tube to the screw, place the other end of the tube in the jar, and pour in sufficient fluid to cover the end of the tube.

15 Ensure that the master cylinder reservoir fluid level is maintained at least above the "Minimum" level throughout the procedure.

16 Have the assistant fully depress the brake pedal several times to build up pressure, then maintain it down on the final downstroke.

17 While pedal pressure is maintained, unscrew the bleed screw (approximately one turn) and allow the compressed fluid and air to flow into the jar. The assistant should maintain pedal pressure, following the pedal down to the floor if necessary, and should not release the pedal until instructed to do so. When the flow stops, tighten the bleed screw again. Have the assistant release the pedal slowly, and recheck the reservoir fluid level.

18 Repeat the steps given in paragraphs 16 and 17 until the fluid emerging from the bleed screw is free from air bubbles. If the master cylinder has been drained and refilled, and air

is being bled from the first screw in the sequence, allow at least five seconds between cycles for the master cylinder passages to refill.

19 When no more air bubbles appear, tighten the bleed screw securely, remove the tube and spanner, and refit the dust cap (where applicable). Do not overtighten the bleed screw.

20 Repeat the procedure on the remaining screws in the sequence, until all air is removed from the system and the brake pedal feels firm again.

### Bleeding - using a one-way valve kit

21 As their name implies, these kits consist of a length of tubing with a one-way valve fitted, to prevent expelled air and fluid being drawn back into the system; some kits include a translucent container, which can be positioned so that the air bubbles can be more easily seen flowing from the end of the tube.

22 The kit is connected to the bleed screw, which is then opened (see illustration). The user returns to the driver's seat, depresses the brake pedal with a smooth, steady stroke, and slowly releases it; this is repeated until the expelled fluid is clear of air bubbles.

23 Note that these kits simplify work so much that it is easy to forget the master cylinder reservoir fluid level; ensure that this is maintained at least above the "Minimum" level at all times.

### Bleeding - using a pressure-bleeding kit

24 These kits are usually operated by the reservoir of pressurised air contained in the spare tyre. However, note that it will probably be necessary to reduce the pressure to a lower level than normal; refer to the instructions supplied with the kit.

25 By connecting a pressurised, fluid-filled container to the master cylinder reservoir, bleeding can be carried out simply by opening each screw in turn (in the specified sequence), and allowing the fluid to flow out until no more air bubbles can be seen in the expelled fluid.

26 This method has the advantage that the large reservoir of fluid provides an additional



17.14 Rear brake bleed nipple and dust cap (arrowed)



17.22 Bleeding a front brake using a one-way valve kit

safeguard against air being drawn into the system during bleeding.

27 Pressure-bleeding is particularly effective when bleeding "difficult" systems, or when bleeding the complete system at the time of routine fluid renewal.

### All methods

28 When bleeding is complete, and firm pedal feel is restored, wash off any spilt fluid, tighten the bleed screws securely, and refit their dust caps.

29 Check the hydraulic fluid level in the master cylinder reservoir, and top-up if necessary (Chapter 1).

30 Discard any hydraulic fluid that has been bled from the system; it will not be fit for re-use.

31 Check the feel of the brake pedal. If it feels at all spongy, air must still be present in the system, and further bleeding is required. Failure to bleed satisfactorily after a reasonable repetition of the bleeding procedure may be due to worn master cylinder seals.

## 18 Vacuum servo unit - testing, removal and refitting



### Testing

1 To test the operation of the servo, depress the footbrake four or five times to exhaust the vacuum, then start the engine while keeping the footbrake depressed. As the engine starts, there should be a noticeable "give" in the brake pedal as vacuum builds up. Allow the engine to run for at least two minutes, and then switch it off. If the brake pedal is depressed again, it should be possible to detect a hiss from the servo when the pedal is depressed. After about four or five applications, no further hissing will be heard, and the pedal will feel considerably firmer.

2 Before assuming that a problem exists in the servo itself, check the non-return valve as described in the next Section.



19.2 Detaching the vacuum hose from the servo unit

### Removal

3 Refer to Section 12 and remove the master cylinder.

4 Disconnect the vacuum hose at the servo non-return valve by pulling it free. If it is reluctant to move, assist it by prising it free using a screwdriver with its blade inserted under the elbow flange.

5 Working inside the vehicle, move the front passenger seat fully rearwards, then peel back the footwell trim from the inner bulkhead on that side, to gain access to the two servo bracket retaining nuts. Unscrew and remove the nuts.

6 Unscrew and remove the four nuts securing the servo unit to the mounting bracket (see illustration).

7 Withdraw the servo unit so that its studs are clear of the bracket and pivot the inner bracket to one side. Extract the clevis pin to release the actuating rod from its shaft, then remove the servo unit.

8 Note that the servo unit cannot be dismantled for repair or overhaul and, if faulty, must be renewed.

### Refitting

9 Refitting is a reversal of removal. Refer to Section 12 for details of refitting the master cylinder.

## 19 Vacuum servo unit vacuum hose and non-return valve - removal, testing and refitting

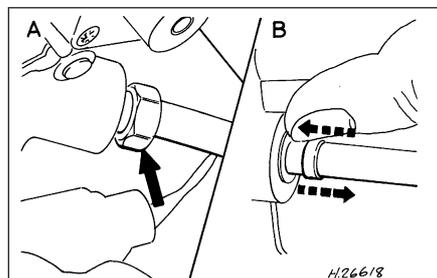


### Removal

1 Depress the brake pedal three or four times to exhaust any remaining vacuum from the servo unit.

2 Carefully pull free and detach the servo vacuum hose from the servo unit (see illustration). If the hose is reluctant to move, prise it free with the aid of a screwdriver, inserting its blade under the flange of the elbow.

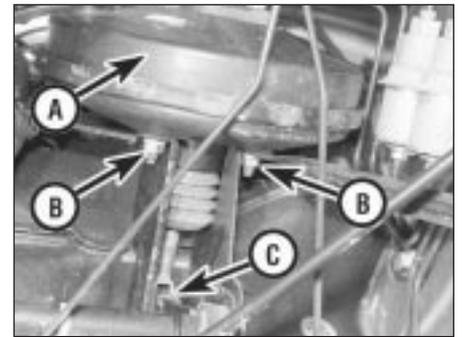
3 Detach the vacuum hose from its inlet manifold connection. Depending on the fixing (see illustration), undo the union nut and withdraw the hose, or press the hose and its



19.3 Servo vacuum hose detachment from the manifold

A Hose secured by union nut

B Hose secured by retaining collar



18.6 Underside view of the servo unit (A) mounting bracket nuts (B) and the actuating rod connection (C)

retaining collar inwards, then holding the collar in, withdraw the hose.

4 If the hose or the fixings are damaged or in poor condition, they must be renewed.

### Non-return valve testing

5 Examine the non-return valve for damage and signs of deterioration, and renew it if necessary (see illustration). The valve may be tested by blowing through its connecting hoses in both directions. It should only be possible to blow from the servo end to the manifold end.

### Refitting

6 Refitting is a reversal of removal. If fitting a new non-return valve, ensure that it is fitted the correct way round.

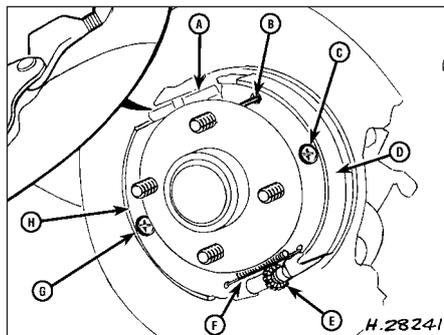
## 20 Handbrake shoes (disc brake models) - renewal



**Warning:** The dust created by wear of the shoes may contain asbestos, which is a health hazard. Never blow it out with compressed air, and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. DO NOT use petroleum-based solvents to clean brake parts - use brake cleaner or methylated spirit only.



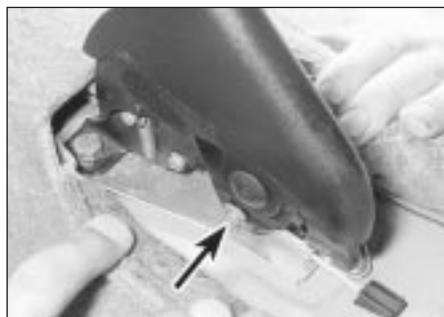
19.5 Non-return valve in the servo vacuum hose



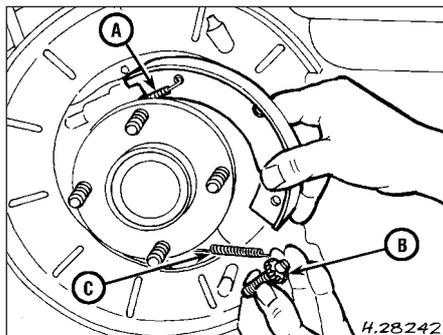
20.2 Handbrake shoe components (rear disc brake models)

- |                         |                         |
|-------------------------|-------------------------|
| A Relay lever           | E Adjuster              |
| B Upper pull-off spring | F Lower pull-off spring |
| C Steady spring         | G Steady spring         |
| D Brake shoe            | H Brake shoe            |

- 1 Remove the rear brake disc as described in Section 11.
- 2 Note the fitted positions of the springs, adjuster and handbrake shoes (see illustration).
- 3 Release the handbrake cable from the relay lever, referring to Section 23 if necessary.
- 4 Remove the shoe steady springs by depressing and turning them through 90°. Remove the springs and pins.
- 5 Pull the lower ends of the shoes apart to release the adjuster, then disconnect the lower pull-off spring from both shoes (see illustration).
- 6 Detach the upper ends of the shoes from the handbrake cable relay lever, then disconnect the upper pull-off spring and remove the two handbrake shoes.
- 7 Renew the handbrake shoes if they are significantly worn or in any way contaminated.
- 8 Clean the adjuster and its associated components.
- 9 Clean the backplate, then apply a little high-melting-point grease to the shoe contact points.
- 10 Refitting the handbrake shoes is a reversal of removal.
- 11 Repeat the procedure on the remaining rear brake.
- 12 On completion, adjust the handbrake as described in Chapter 1.



21.6 Handbrake primary cable-to-lever pin and retaining clip (arrowed)



20.5 Handbrake shoe upper pull-off spring (A), adjuster (B) and lower pull-off spring (C)

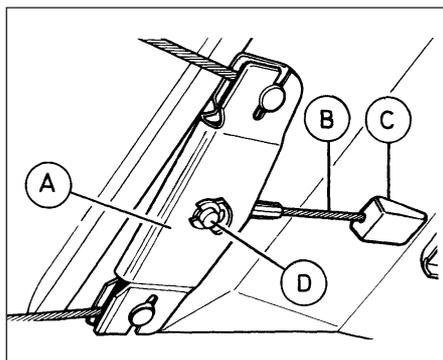
## 21 Handbrake lever - removal and refitting

### Removal

- 1 Chock the roadwheels to secure the vehicle.
- 2 Remove the front seats as described in Chapter 11.
- 3 Where applicable, remove the centre console as described in Chapter 11.
- 4 Peel back the carpet from the area around the handbrake lever to provide suitable access the lever and fittings (see illustration). Release the handbrake.
- 5 Detach the handbrake warning light lead from the switch.
- 6 Prise free the retaining clip and remove the primary cable pin (see illustration).
- 7 Undo the two retaining bolts, and remove the handbrake lever and spreader plate.

### Refitting

- 8 Refit in the reverse order of removal. Ensure that the retaining bolts are securely tightened. Check the handbrake adjustment as described in Chapter 1 to complete.



22.4 Handbrake cable equaliser components

- |                 |                                 |
|-----------------|---------------------------------|
| A Equaliser     | D Equaliser pin and spring clip |
| B Primary cable |                                 |
| C Cable guide   |                                 |



21.4 Prise back the carpet for access to the handbrake warning light switch lead connection and lever mounting bolts

## 22 Handbrake primary cable - removal and refitting

### Removal

- 1 Release the primary cable from the handbrake lever, as described in the previous Section.
- 2 Chock the front roadwheels, then jack up the vehicle at the rear and support it on axle stands.
- 3 Where applicable, detach the exhaust system and remove the heat shields from the underside floorpan to allow access to the primary cable connections underneath the vehicle (see Chapter 4).
- 4 Release the spring clip securing the pin, and extract the equaliser/cable pin. Detach the equaliser from the primary cable (see illustration).
- 5 Detach the cable guide from the floorpan, then withdraw the cable rearwards from the vehicle.

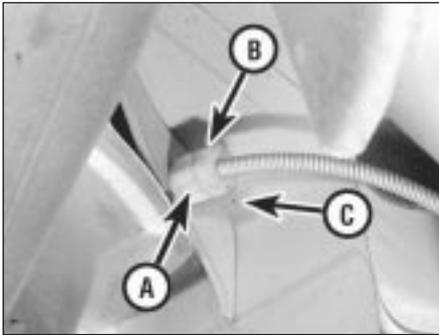
### Refitting

- 6 Refit in the reverse order of removal. Ensure that the cable guide is secured in the floorpan, and lubricate the pivot pin with a liberal amount of high-melting-point grease.
- 7 Refit the exhaust system and heat shields with reference to Chapter 4 (where applicable).
- 8 Refer to Chapter 1 for details, and adjust the handbrake as required before lowering the vehicle to the ground.

## 23 Handbrake cable - removal and refitting

### Removal

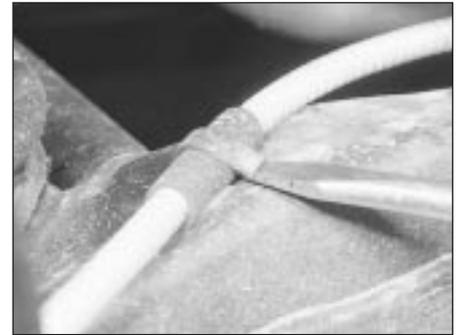
- 1 Chock the front wheels, then jack up the rear of the car and support it on axle stands. Fully release the handbrake lever, and remove the rear wheel(s).
- 2 Refer to the previous Section for details,



23.4 Handbrake cable adjuster nut (A) locknut (B) and lockpin (C)



23.6A Compress the handbrake cable retaining lugs to release the cable from the brake backplate



23.6B Release the handbrake cable from its locating clips

and release the handbrake primary cable from the equaliser.

3 Disengage the right/left-hand cable(s) from the equaliser (as required).

4 Remove the lockpin from the adjuster, and the spring clip from the cable guides on the side concerned, then detach them from the underbody (see illustration).

#### Drum brake models

5 Remove the rear brake drum(s) and shoes as described in Sections 5 and 6 respectively.

6 Compress the handbrake cable retainer lugs and release the cable from the backplate, then pull the cable through. Release the cable from the underbody fixings, and remove it from the vehicle (see illustrations).

#### Disc brake models

7 Detach the handbrake return spring, then disconnect the cable end from the handbrake shoe relay lever.

8 Extract the circlip securing the handbrake outer cable to the support bracket, and withdraw the cable.

9 Release the cable from the underbody fixings, and remove it from the vehicle.

### Refitting

#### All models

10 Refitting is a reversal of the removal procedure. Where applicable, refer to the appropriate Sections for details on the refitting of the brake shoes and drums.



24.1 Brake pressure control valves

11 When the cable is fully refitted (but before lowering the vehicle rear wheels to the ground) check and adjust the handbrake as described in Chapter 1.

### 24 Brake pressure control valves - removal and refitting



**Warning: Hydraulic fluid is poisonous; wash off immediately and thoroughly in the case of skin contact, and seek immediate medical advice if any fluid is swallowed or gets into the eyes. Certain types of hydraulic fluid are inflammable, and may ignite when allowed into contact with hot components; when servicing the hydraulic system, it is safest to assume that the fluid IS inflammable, and to take precautions against the risk of fire as though it is petrol that is being handled. Hydraulic fluid is also an effective paint stripper, and will attack plastics; if any is spilt, it should be washed off immediately, using copious quantities of fresh water. Finally, it is hygroscopic (it absorbs moisture from the air) - old fluid may be contaminated and unfit for further use. When topping-up or renewing the fluid, always use the recommended type, and ensure that it comes from a freshly-opened sealed container.**

#### Removal

1 The pressure control valves are located in the engine compartment, fixed to the left-hand inner wing panel (see illustration).

2 To remove the valve assembly, first detach the rigid brake pipes from the valves. As the pipes are disconnected, tape over the exposed ends, or fit plugs, to prevent the ingress of dirt and excessive fluid loss.

3 Unscrew and remove the valve support bracket retaining nut (under the wheel arch), and remove the valve assembly from the vehicle.

4 To remove the valves from the bracket,

slide free the retaining clips and detach the valve(s).

5 Check the general condition of the insulators; if necessary, renew them before refitting.

### Refitting

6 Refitting is a reversal of the removal procedure.

7 On completion, bleed the complete hydraulic system as described in Section 17.

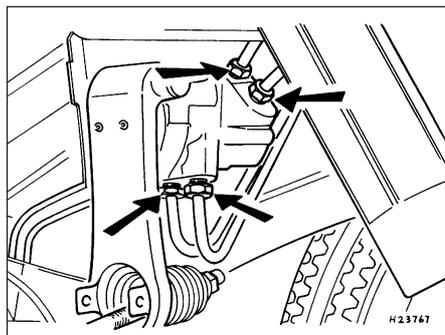
### 25 Light-laden valve (Van models) - removal and refitting



**Warning: Hydraulic fluid is poisonous; wash off immediately and thoroughly in the case of skin contact, and seek immediate medical advice if any fluid is swallowed or gets into the eyes. Certain types of hydraulic fluid are inflammable, and may ignite when allowed into contact with hot components; when servicing the hydraulic system, it is safest to assume that the fluid IS inflammable, and to take precautions against the risk of fire as though it is petrol that is being handled. Hydraulic fluid is also an effective paint stripper, and will attack plastics; if any is spilt, it should be washed off immediately, using copious quantities of fresh water. Finally, it is hygroscopic (it absorbs moisture from the air) - old fluid may be contaminated and unfit for further use. When topping-up or renewing the fluid, always use the recommended type, and ensure that it comes from a freshly-opened sealed container.**

#### Removal

1 For this operation, the vehicle must be raised for access underneath at the rear, but must still be resting on its wheels. Suitable ramps (or an inspection pit) will therefore be required. If positioning the vehicle on a pair of ramps, chock the front roadwheels.

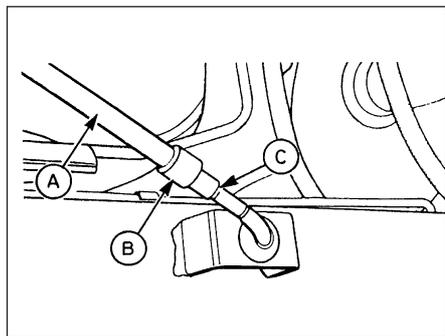


25.2 Brake pipe connections to the light-laden valve

- 2 Detach the brake pipes from the valve (see illustration), and drain the fluid into a suitable container for disposal. Due to its location, care will be needed not to spill the fluid onto the hands - wear suitable protective gloves.
- 3 Detach the spring clip from the link rod at the axle end. Withdraw the washer and the valve link rod from the bracket on the axle, but take care not to dismantle the spacer tube from the link rod.
- 4 The axle bracket bush must be removed for renewal if it is worn or damaged.
- 5 Unscrew and remove the two retaining bolts, then withdraw the valve and the link rod from the mounting bracket.

### Refitting

- 6 Where applicable, fit the new bush into the axle bracket.
- 7 Relocate the valve on the mounting bracket, and fit the retaining bolts.
- 8 Check that the brake pipe connections are clean, then reconnect the pipes.
- 9 Smear the axle bush end of the link rod with a small amount of general-purpose grease. Fit the link rod into the bush, refit the washer, and secure with the spring clip.
- 10 Top-up the fluid level in the master cylinder reservoir, then bleed the brake hydraulic system as described in Section 17. If the original valve has been refitted, ensure that the valve is held fully open whilst bleeding. If a new valve has been fitted, the bleed clip must be left in position whilst the



26.2A Light-laden valve linkage adjustment

- A Spacer tube      C Setting groove  
B Rubber seal

system is completely bled, then removed. The valve will need to be adjusted as described in the following Section.

## 26 Light-laden valve (Van models) - adjustment



- 1 For this operation, the vehicle must be raised for access underneath at the rear, but must be standing on its wheels. Suitable ramps (or an inspection pit) will therefore be required. If positioning the vehicle on a pair of ramps, chock the front roadwheels. The vehicle must be empty, and the fuel tank no more than half-full.
- 2 To adjust an original light-laden valve linkage, grip the flats on the end of the rod to prevent it from rotating, and turn the adjuster nut to position the end face of the rubber seal within the setting groove width (see illustrations).
- 3 To adjust a new light-laden valve, rotate the spacer tube to position the end face of the rubber seal within the setting groove width, then crimp over the end of the spacer tube against the threaded rod flats (next to the knurled section) (see illustration).

## 27 Anti-lock braking system (ABS) - description

An anti-lock braking system is available on certain models in the range. The system only becomes operational over speeds in excess of 7 mph (4 kph). It comprises an actuation unit (servo unit and special tandem master cylinder), a hydraulic unit, an ABS module, and a sensor on each front wheel hub.

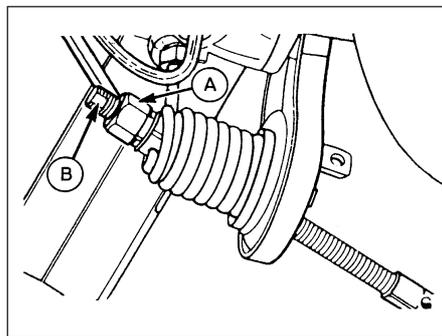
The hydraulic unit consists of a twin-circuit electric pump which is controlled by a speed sensor and modulator twin valve block (one valve for each channel).

The module is located in the engine compartment, and has four main functions: to control the ABS system; to measure the

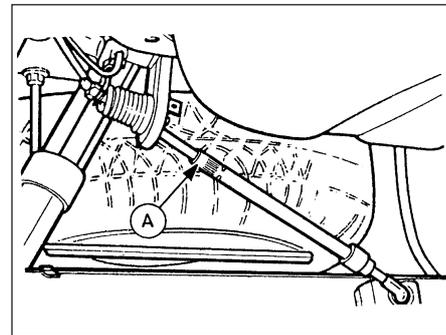
vehicle speed; to monitor the electric components in the system; and to provide "On-board" system diagnosis. The electrical functions of the ABS module are continuously monitored by two microprocessors, and these also periodically check the solenoid-operated valves by means of a test pulse during the operation of the system. The module checks the signals sent by the system sensors to provide a means of fault diagnosis. In the event of a fault occurring in the ABS system, a warning light on the instrument panel will come on and remain on until the ignition is switched off. A particular fault is represented by a two-digit code system stored within the module memory. A "STAR" type tester is required to read the fault diagnosis system, so in the event of a fault being indicated, the vehicle must be taken to a Ford garage for analysis.

The ABS system functions as follows. During normal braking, pressure from the brake pedal (and the servo unit) closes the master cylinder valves, and hydraulic pressure is applied through the brake circuits in the conventional manner. The rotational speed of each front wheel is continuously monitored by the system via the wheel sensors, and this is compared to the vehicle speed information being supplied from the speed sensor. When a wheel is about to lock up, its rotational speed drops more rapidly than the vehicle speed, and when this condition is met, the anti-lock side of the system cuts in. The circuit inlet valve in the hydraulic unit is closed off, to prevent further pressure being applied through that circuit. In the event of this failing to prevent excessive deceleration, the outlet valve opens to reduce the pressure in that circuit, thus preventing the wheel from locking up. Both valves are then modulated on and off (open and shut) to maintain the required pressure in that circuit, to provide the maximum possible hydraulic pressure (from the master cylinder) without locking up the wheel.

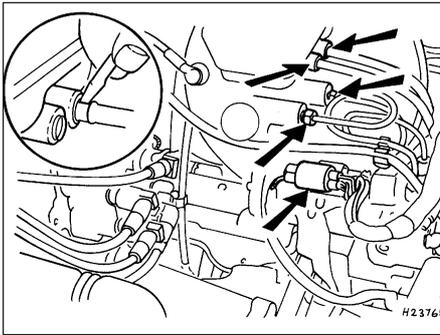
Slight pulsations will be felt through the brake pedal when the anti-lock system cuts in, and this is quite normal. To reduce excessive brake pedal pulsations, a pedal travel sensor monitors any slight increase in



26.2B Light-laden valve linkage adjustment on a used valve, showing adjuster nut (A) and flats on the end of the rod (B)



26.3 Light-laden valve adjustment on a new valve showing the crimping point (A)



28.1 Detach the hydraulic lines and the wiring multi-plug from the points indicated

pedal pressure, and causes the pump to be switched on and off to maintain the pedal position. When emergency braking is applied, the pedal is pressed back to a predetermined "safety position". When the brake pedal is released, the anti-lock mode is automatically cancelled.

The rear wheels are not fitted with sensors, but are prevented from locking up (under all braking conditions) by means of a load-apportioning valve incorporated in each rear circuit. These valves are housed in a common casting, and are actuated by an arm connected to the rear axle. The load-apportioning valve is checked for adjustment and set during the vehicle pre-delivery inspection using a special tool. Any further checks or adjustments required must therefore be entrusted to a Ford dealer.

## 28 Hydraulic unit (ABS) - removal and refitting

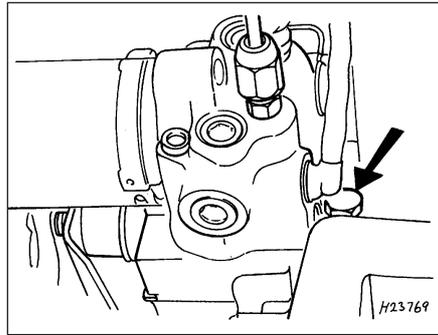


### Removal

1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1). Also disconnect the wiring multi-plugs from the fluid warning indicator in the reservoir filler cap, and the hydraulic lines from the hydraulic unit connection (see illustration). Remove the filler cap from the reservoir (noting that the filler cap must not be inverted). The reservoir should now be emptied by syphoning or drawing out the fluid with a pipette before disconnecting the hydraulic lines from the master cylinder. Identify each brake pipe and its connection to the master cylinder, then unscrew the union nuts and disconnect them. When disconnecting the fluid return pipes from the reservoir, press the retaining boss into the reservoir, and pull free the fluid line. Plug the connections, and tape over the pipe ends, to prevent the entry of dust and dirt.

2 Unscrew the union nuts, and disconnect the fluid pipes from the hydraulic unit at the rear. Plug the connections.

3 Unscrew the nut securing the multi-plug connector bracket, and the nut and bolt



28.3 ABS hydraulic unit-to-bracket retaining bolt location

securing the hydraulic unit to the bracket (see illustration). Withdraw the hydraulic unit from the bracket, and remove it from the vehicle.

4 Prise free and detach the fluid return lines from the hydraulic unit (see illustration). Plug the connections, and tape over the pipe ends, to prevent the entry of dust and dirt.

### Refitting

5 Remove the plugs from the connections as the pipes and fluid return lines are refitted. Refit in the reverse order of removal, noting the torque settings for the unit-to-bracket nut and bolt. Ensure that all connections are clean and secure.

6 On completion, top-up the hydraulic fluid level in the reservoir, and bleed the system as described in Section 17. Inspect the hydraulic line connections at the master cylinder/hydraulic unit for any sign of leaks.

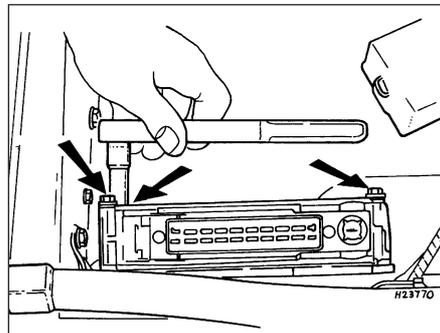
## 29 Module (ABS) - removal and refitting



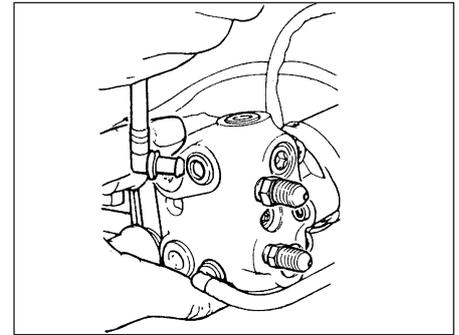
### Removal

1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).

2 The module is situated opposite the battery, at the rear of the engine compartment. Swing the retaining clip out of the way, and disconnect the wiring multi-plug from the module.



29.3 Location of the ABS module retaining bolts



28.4 Disconnect the fluid return lines from the ABS hydraulic unit

3 Unscrew and remove the three retaining bolts, and withdraw the module from the vehicle (see illustration).

### Refitting

4 Refit in the reverse order of removal, but take particular care when reconnecting the multi-plug.

## 30 Wheel sensor (ABS) - removal and refitting



### Removal

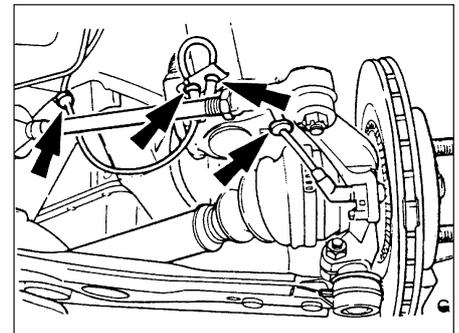
1 An ABS wheel sensor is fitted in the front spindle carrier on each side. To remove a sensor, apply the handbrake, then raise and support the vehicle at the front end on axle stands so that the front wheels are clear of the ground.

2 Unclip and detach the sensor cable from the wiring loom (see illustration). Unscrew the retaining bolt, and withdraw the sensor from its location in the spindle carrier. Remove the sensor and lead from the vehicle.

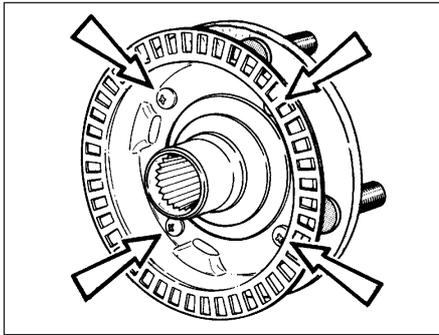
3 If renewing the sensor, the replacement must have the correct lead length (on models fitted with an anti-roll bar, the lead is longer).

### Refitting

4 Refit in the reverse order of removal. When inserting the sensor into position, ensure that



30.2 ABS wheel sensor cable and securing clips



31.2 ABS sensor ring-to-wheel hub retaining bolts

the mating surfaces are clean, free from oil and grease. Feed the cable through the wheel arch, and ensure that it is clipped in position. Secure the cable with any ties provided. When the sensor is refitted, turn the steering from

lock to lock, to ensure that the sensor lead does not foul on any steering or suspension components before lowering the vehicle to the ground.

**31 Wheel sensor ring (ABS) - removal and refitting**



**Removal**

- 1 Referring to Chapter 10 for details, remove the spindle carrier, then remove the wheel hub from the spindle carrier.
- 2 Where applicable, unscrew and remove the sensor ring-to-hub retaining bolts, then detach the sensor ring from the hub (**see illustration**). In some instances, the sensor ring will be press-fitted on the hub, and will require a suitable withdrawal tool to remove it.

**Refitting**

- 3 Refitting is a reversal of the removal procedure. Ensure that the sensor and hub mating faces are clean. Refer to the appropriate Sections in Chapter 10 for details on refitting the hub and spindle carrier.

**32 Load-apportioning valve (ABS) - removal and refitting**



The removal of the load-apportioning valve on ABS-equipped models is not recommended, since a special resetting tool is required to adjust the valve when it is refitted. The removal and refitting of the load-apportioning valve is therefore a task to be entrusted to a suitably-equipped Ford dealer.