






Chapter 9 Braking system

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Degrees of difficulty

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

General

System type	Diagonally-split, dual-circuit hydraulic with pressure-reducing valve in rear hydraulic circuit and cable operated handbrake. Anti-lock braking system (ABS) available as standard or optional equipment on later models.
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Front brakes

Type	Ventilated disc with single-piston sliding calipers
Disc diameter:	
4-cylinder engine models without turbo	262.0 mm
4-cylinder turbo engine models and V6 engine models	285.0 mm
Disc thickness:	
New	21.0 mm
Minimum	19.0 mm
Maximum thickness variation	0.015 mm
Maximum disc run-out	0.040 mm
Brake pad thickness (including backing but excluding shims):	
New	17.4 mm
Minimum	8.2 mm
ABS wheel speed sensor-to-reluctor ring clearance	0.30 to 1.02 mm

Rear brakes

Type	Solid disc with single-sliding calipers
Disc diameter	260.0 mm
Disc thickness:	
New	10.0 mm
Minimum	8.0 mm
Maximum thickness variation	0.015 mm
Maximum disc run-out	0.040 mm
Brake pad thickness (including backing):	
New	14.5 mm
Minimum	7.2 mm
ABS wheel speed sensor-to-reluctor ring clearance	0.055 to 1.11 mm

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Handbrake

Handbrake linkage lever-to-stop pin clearance 0.5 to 2.0 mm

Torque wrench settings

	Nm	lbf ft
Caliper guide pin bolts	33	24
Front caliper carrier bracket to steering knuckle	75	55
Rear caliper carrier bracket to hub carrier	45	33
Caliper bleed screws	10	7
Brake hose banjo union bolts	35	26
Brake pipe union nuts:		
M10	15	11
M12	22	16
Brake disc retaining screws	12	9
Handbrake linkage cover to rear caliper	10	7
Handbrake lever to floor	25	18
Handbrake front cable guide plate bolts	25	18
Handbrake rear cable support clip bolts	10	7
Master cylinder to servo unit nuts	25	18
Servo unit to bulkhead nuts	25	18
Brake pedal pivot bolt	25	18
Pressure reducing valve mounting bracket bolts	10	7
Hydraulic modulator mounting nuts (ABS)	10	7
Wheel speed sensor to sensor bracket bolt (ABS)	10	7
Wheel speed sensor bracket bolts (ABS)	25	18
Wheel speed sensor wiring clips and bracket bolts (ABS)	10	7
Copy valve mounting bracket bolts (ABS)	10	7
Roadwheel nuts	110	81

1 General information

The braking system is of the servo-assisted, dual-circuit hydraulic type, incorporating disc brakes at the front and rear. A diagonally-split dual circuit hydraulic system is employed, in which each circuit operates one front and one diagonally opposite rear brake from a tandem master cylinder. Under normal conditions, both circuits operate in unison; however, in the event of hydraulic failure in one circuit, full braking force will still be available at two wheels. A pressure-reducing valve is incorporated in the rear brake hydraulic circuit. This valve regulates the hydraulic pressure applied to each rear brake, and reduces the possibility of the rear wheels locking under heavy braking.

Self-adjusting single-piston sliding type calipers are used in conjunction with ventilated and solid discs at the front and rear respectively. A cable-operated handbrake provides an independent mechanical means of rear brake application.

An anti-lock braking system (ABS) is available on some models and features many of the components in common with the conventional braking system. Further details on the ABS can be found later in this Chapter. **Note:** When servicing any part of the system, work carefully and methodically; also observe scrupulous cleanliness when overhauling any part of the hydraulic system. Always renew

components (in axle sets, where applicable) if in any doubt about their condition, and use only genuine Rover or Unipart replacement parts, or at least those of known good quality. Note the warnings given in "Safety First" at the beginning of this manual and at relevant points in this Chapter concerning the dangers of asbestos dust and hydraulic fluid.

2 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 any 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. Finally, it is hygroscopic (it absorbs moisture from the air). The more moisture is absorbed by the fluid, the lower its boiling point becomes, leading to a dangerous loss of braking under hard use. 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 clean water.

General

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

2 During the bleeding procedure, add only clean, fresh hydraulic fluid of the specified 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 used in the system, the brake lines and components must be completely flushed with uncontaminated fluid and new seals fitted to the components.

4 If brake fluid has been lost from the master cylinder due to a leak in the system, ensure that the cause is traced and rectified before proceeding further.

5 Park the vehicle on level ground, switch off the ignition and select first gear (manual transmission) or Park (automatic transmission) then chock the wheels and release the handbrake.

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

7 Unscrew the master cylinder reservoir cap, and top up the reservoir to the "MAX" level line. Do not invert the cap or hydraulic fluid may short out the cap contacts causing the warning light on the instrument panel to flash. Refit the cap loosely, and remember to maintain the fluid level at least above the "MIN" 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 wherever 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 correct sequence must be followed (paragraphs 11 to 15) to ensure the removal of all air from the system.

Bleeding sequence

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

12 If the complete system is to be bled, then it should be done in the following sequence:

Non-ABS models

- (a) Left-hand front wheel.
- (b) Right-hand rear wheel.
- (c) Right-hand front wheel.
- (d) Left-hand rear wheel.

ABS-models

13 Two types of ABS system may be fitted to models covered by this manual. Although generally similar in operation, the bleeding sequence is different for each, and it is necessary to identify the system being worked on before proceeding.

14 The easiest way to distinguish between the two types is to locate the hydraulic modulator unit in the engine compartment and note the arrangement of the hydraulic pipe connections. On the early type modulator there are six pipe connections; four on the upper face and two on the front face. On the later modulator there are also six pipe connections but all are on the front face of the unit.

15 Having identified the unit fitted, the bleeding sequence is as follows:

Early type modulator

- (a) Left-hand front wheel.
- (b) Right-hand rear wheel.
- (c) Right-hand front wheel.
- (d) Left-hand rear wheel.

Later type modulator

- (a) Left-hand front wheel.
- (b) Right-hand front wheel.
- (c) Left-hand rear wheel.
- (d) Right-hand rear wheel.

Bleeding - basic (two-man) method

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

17 If not already done, remove the dust cap from the bleed screw of the first wheel to be bled and fit a spanner and tube to the screw.

18 Immerse the other end of the bleed tube in the jar, which should contain enough fluid to cover the end of the tube.

19 Ensure that the master cylinder reservoir fluid level is maintained at least above the "MIN" level line throughout the procedure.

20 Open the bleed screw about half a turn, and have your assistant depress the brake pedal with a smooth steady stroke down to the floor, and then hold it there. When the flow of fluid through the tube stops, tighten the bleed screw and have your assistant release the pedal slowly.

21 Repeat this operation (paragraph 20) until clean brake fluid, free from air bubbles, can be seen flowing from the end of the tube.

22 When no more air bubbles appear, tighten the bleed screw, remove the bleed tube and refit the dust cap. Repeat these procedures on the remaining bleed screws in sequence until all air is removed from the system and the brake pedal feels firm again.

Bleeding - using a one-way valve kit

23 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 incorporate a translucent container, which can be positioned so that the air bubbles can be more easily seen flowing from the end of the tube.

24 The kit is connected to the bleed screw, which is then opened. 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.

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

Bleeding - using a pressure-bleeding kit

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

27 By connecting a pressurised, fluid-filled container to the master cylinder reservoir, bleeding is carried out by opening each bleed screw in turn (in the specified sequence) and allowing fluid to run out, rather like turning on a tap, until no air bubbles can be seen in the expelled fluid.

28 This method has the advantage that the large reservoir of fluid provides an additional safeguard against air being drawn into the system during bleeding.

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

All methods

30 When bleeding is completed, check and top up the fluid level in the master cylinder reservoir.

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 indicated. Failure to bleed satisfactorily after a reasonable repetition of the bleeding operations may be due to worn master cylinder seals.

32 Discard brake fluid which has been bled from the system; it will not be fit for re-use.

3 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

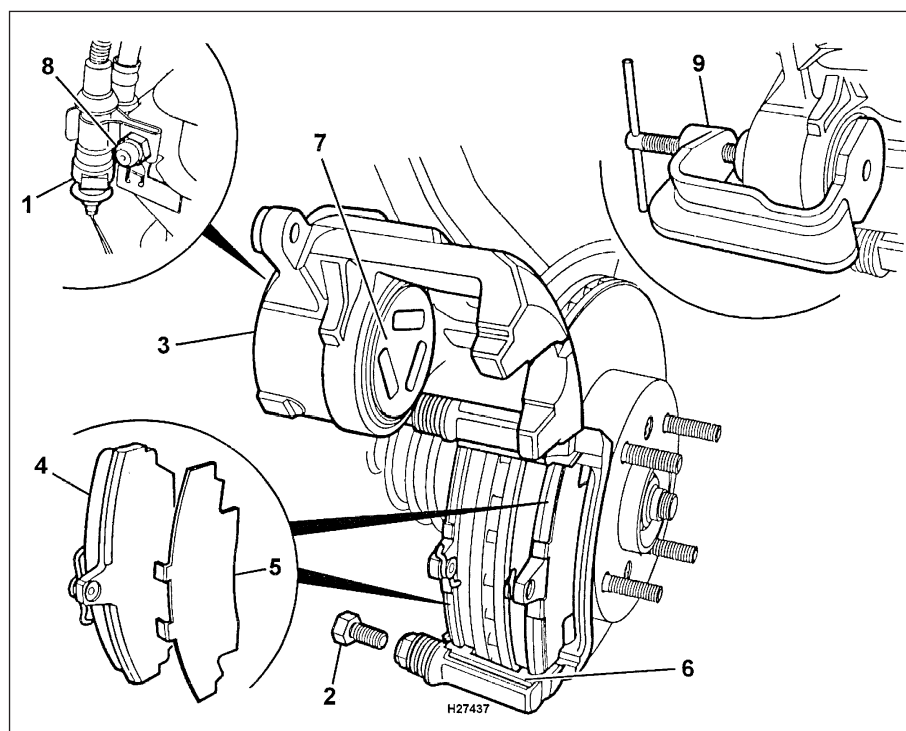
wheel as uneven braking may result. Dust created by wear of the pads may contain asbestos, which is a health hazard. Never blow it out with compressed air and do not inhale any of it. DO NOT use petroleum-based solvents to clean brake parts. Use brake cleaner or methylated spirit only. DO NOT allow any brake fluid, oil or grease to contact the brake pads or disc. Also refer to the warning at the start of Section 2 concerning the dangers of hydraulic fluid.

Note: New caliper lower guide pin bolts will be required for refitting.

1 Apply the handbrake, remove the front wheel trim and slacken the wheel nuts. Jack up the front of the car and support it on axle stands. Remove the front roadwheels.

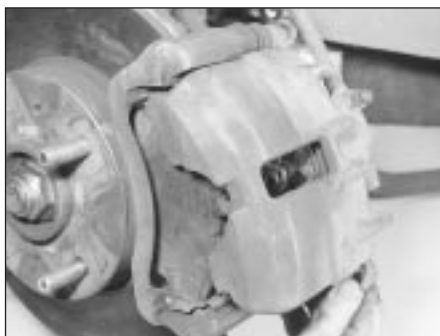
2 Where fitted, disconnect the pad wear warning light wiring plug (left-hand caliper only) and using a spanner, unscrew the lower

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3.2a Front brake pad renewal

- | | | |
|---|-----------------------------------|---|
| 1 Pad wear warning light wiring plug (where fitted) | 4 Brake pads | 7 Piston heat shield |
| 2 Lower guide pin bolt | 5 Pad shims | 8 Bleed screw |
| 3 Caliper body | 6 Anti-rattle shim (where fitted) | 9 Using a G-clamp to retract the caliper piston |



3.3 Pivot the caliper body upwards



3.4a Lift out the brake pads together with their shims



3.4b Remove the upper anti-rattle shim ...



3.4c ... and lower anti-rattle shim



3.2b Unscrew the caliper lower guide pin bolt

guide pin bolt while holding the guide pin with a second spanner (see illustrations).

3 Pivot the caliper body upwards and tie it up, using a length of string, under the wheelarch (see illustration).

4 Lift out the two brake pads together with their shims then, where fitted, remove the upper and lower anti-rattle shims from the caliper carrier bracket (see illustrations). If the pads are to be re-used, identify them so that they can be refitted in their original positions.

5 Remove the heat shield from the caliper piston (see illustration).

6 Brush the dust and dirt from the caliper, piston, disc, and pads, but **do not** inhale it, as it is injurious to health.

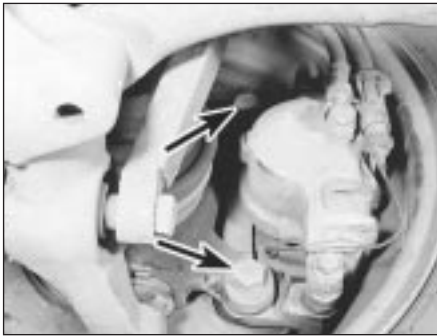
7 Rotate the disc by hand, and scrape away any rust and scale. Carefully inspect the entire surface of the disc, and if there are any signs of cracks, deep scoring or severe abrasions, the disc must be renewed.

8 Inspect the caliper for fluid leaks around the piston, signs of corrosion, or other damage. Check the guide pin rubber boots for condition, and the pins themselves for free movement in the carrier bracket. Renew any suspect parts as necessary, with reference to Section 5.

9 If new pads are to be fitted, it will be necessary to push the caliper piston back into its bore to accommodate the new, thicker pads. To do this first remove the dust cap, then fit a tube over the end of the bleed



3.5 Remove the heat shield from the caliper piston



4.7 Carrier bracket-to-steering knuckle retaining bolts (arrowed)

screw. Submerge the free end of the tube in a jar containing a small quantity of brake fluid.

10 Open the bleed screw approximately half a turn, then push the piston back into its bore, as far as it will go, using a G-clamp, or pieces of wood, as levers. When the piston has fully retracted, close the bleed screw, remove the tube and refit the dust cap.

11 To refit the pads, first place the anti-rattle shims (where fitted) in position in the carrier bracket and fit the heat shield to the piston.

12 Place the shims against the backs of the pads, then fit the pads to the carrier bracket. If working on the left-hand caliper, the pad with the warning light lead must be fitted nearest to the centre of the car.

13 Swing the caliper down over the pads and secure it with a new guide pin bolt. Tighten the bolt to the specified torque.

14 Reconnect the warning light wiring plug (where applicable).

15 Repeat the above procedure on the opposite front brake caliper.

16 Refit the roadwheels and lower the car to the ground.

17 Tighten the roadwheel nuts to the specified torque and refit the wheel trims.

18 Depress the brake pedal several times to bring the pistons into contact with the pads then check, and if necessary top up, the fluid in the master cylinder reservoir.

4 Front brake caliper - removal and refitting

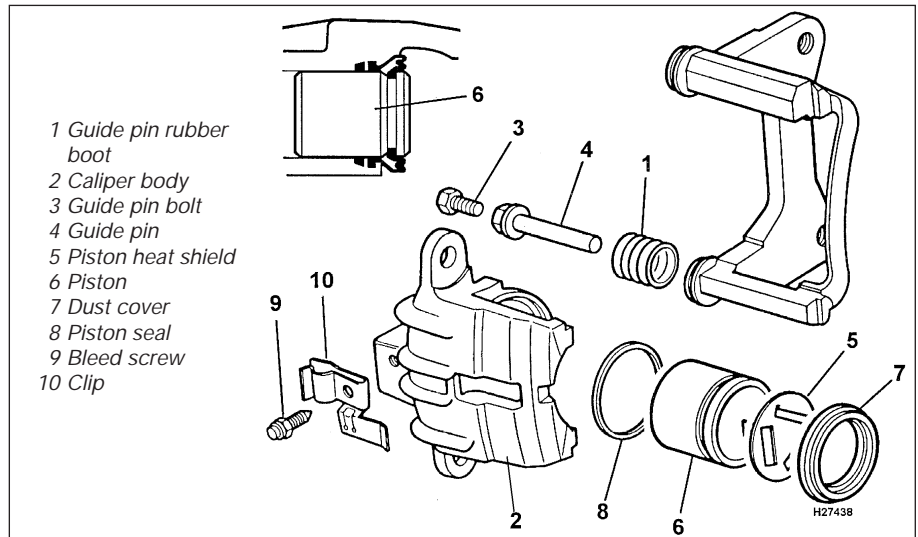


Note: Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid, and to the warning at the beginning of Section 3 concerning the dangers of asbestos dust.

Note: New caliper guide pin bolts and brake hose copper washers will be required for refitting.

Removal

1 Apply the handbrake, remove the front wheel trim and slacken the wheel nuts. Jack up the front of the car and support it on axle stands. Remove the front roadwheel.



5.3 Front brake caliper components

2 If working on the left-hand caliper, disconnect the pad wear warning light wiring plug (where fitted) and release the wiring harness from the support clip.

3 Using a brake hose clamp, or self-locking wrench with protected jaws, clamp the flexible brake hose. This will minimise fluid loss during subsequent operations.

4 Wipe clean the area around the brake hose connection at the caliper then unscrew the brake hose banjo union bolt at the caliper body, and recover the two copper washers. Tape over the hose union and caliper orifice to prevent dirt ingress.

5 Using a spanner, unscrew the lower guide pin bolt while holding the guide pin with a second spanner.

6 Unscrew the upper guide pin bolt in the same way, then lift away the caliper, leaving the brake pads and carrier bracket in place.

7 If the carrier bracket is to be removed, undo the two bolts securing it to the steering knuckle, and remove the bracket complete with brake pads (see illustration). The pads can be removed, if required, with reference to Section 3.

Refitting

8 Refitting is a reversal of removal. Ensure that new guide pin bolts are fitted and tighten all fastenings to the specified torque. Use new copper washers on the brake hose banjo union, and bleed the hydraulic system as described in Section 2.

5 Front brake caliper - overhaul



1 Remove the caliper from the car as described in the previous Section.

2 With the caliper on the bench wipe away all traces of dust and dirt, but **do not** inhale it, as it is injurious to health.

3 Remove the heat shield from the caliper piston (see illustration).

4 Using low air pressure, such as from a tyre foot pump, eject the piston by holding the pump hose against the caliper fluid inlet port.

5 Remove the dust cover from the piston.

6 Using a blunt instrument such as a knitting needle, carefully extract the piston seal from the caliper bore.

7 Clean all the parts in methylated spirit, or clean brake fluid, and dry with a lint-free cloth. Inspect the piston and caliper bore for signs of damage, scuffing or corrosion, and if these conditions are evident, renew the caliper assembly complete. Renew the guide pins in the carrier bracket if they are bent or damaged, or if their rubber boots are split or perished.

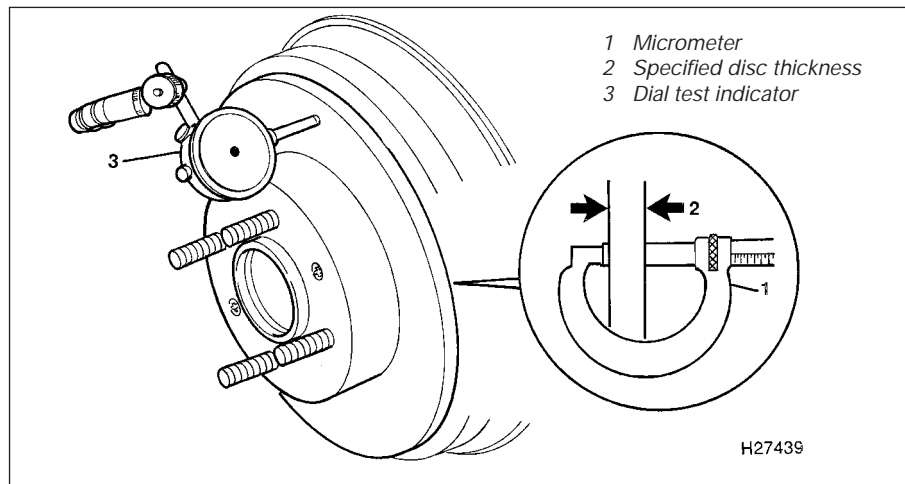
8 If the components are in a satisfactory condition, a repair kit consisting of new seals and dust cover should be obtained.

9 Thoroughly lubricate the caliper bore, piston, piston seal and dust cover with clean brake fluid, and carefully fit the seal to the caliper bore.

10 Position the dust cover over the innermost end of the piston, so that the caliper bore sealing lip protrudes beyond the base of the piston. Using a blunt instrument, if necessary, engage the sealing lip of the dust cover with the groove in the caliper. Now push the piston into the caliper bore until the other sealing lip of the dust cover can be engaged with the groove in the piston. Having done this, push the piston fully into its bore. Ease the piston out again slightly, and make sure that the dust cover lip is correctly seating in the piston groove.

11 Remove the guide pins from the carrier bracket, if not already done, and smear them with high-melting-point brake grease. Fit new rubber boots to the guide pins if necessary, and refit them to the carrier bracket.

12 The caliper can now be refitted as described in the previous Section.



6.5 Checking front brake disc thickness and run-out

6 Front brake disc - inspection, removal and refitting

Note: Before starting work, refer to the warning at the beginning of Section 3 concerning the dangers of asbestos dust.

Inspection

1 Apply the handbrake, remove the front wheel trim and slacken the wheel nuts. Jack up the front of the car and support it on axle stands. Remove the front roadwheel.



6.9a Undo the two retaining screws (arrowed) . . .



6.9b . . . and withdraw the disc from the hub flange

2 Undo the two bolts securing the brake caliper carrier bracket to the steering knuckle.
3 Withdraw the carrier bracket, complete with caliper and brake pads, from the disc and steering knuckle. Tie the caliper assembly from a convenient place under the wheelarch to avoid straining the brake hose.

4 Rotate the disc and examine it for deep scoring or grooving on both sides. Light scoring is normal, but if excessive the disc must be renewed.

5 Using a micrometer, measure the disc thickness at four places around the disc at about 10.0 mm in from the outer edge (see illustration). Compare the thickness with the figures given in the Specifications.

6 If a dial test indicator is available, check the

disc run-out by mounting the indicator with its probe positioned about 6.0 mm in from the outer edge of the disc. Rotate the disc slowly, noting the reading on the indicator. Compare this with the figures given in the Specifications.

7 If the disc thickness, or thickness variation, is outside the figures given in the Specifications, the disc must be renewed. If the disc run-out is excessive, remove the disc, turn it through 180°, refit it and check the run-out once more. If still excessive, renewal of the disc is necessary.

Removal

8 Remove the brake caliper and carrier bracket as described in paragraphs 1 to 3.

9 Undo the two retaining screws and withdraw the disc from the hub flange (see illustrations). If it is tight, tap it lightly from behind using a hide or plastic mallet.

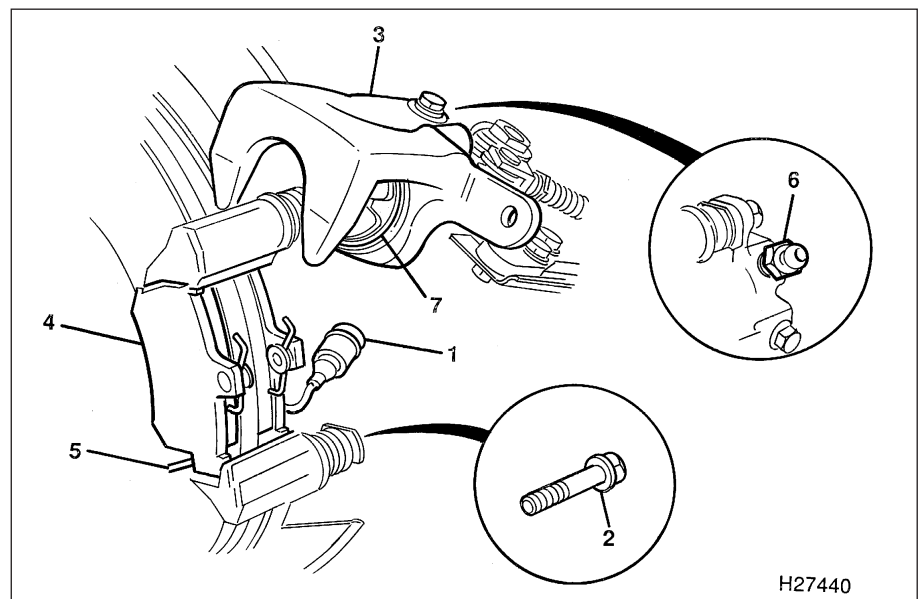
Refitting

10 Refitting is a reversal of removal. Ensure that the mating face of the disc and hub flange are thoroughly clean, and tighten all retaining bolts to the specified torque.

7 Rear brake pads - renewal



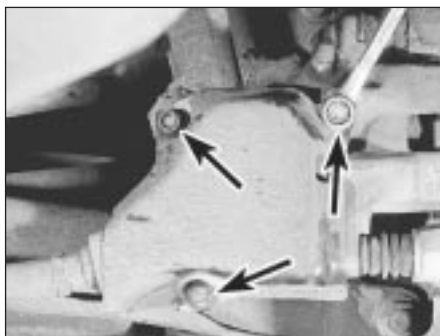
Warning: Disc brake pads must be renewed on both rear wheels at the same time - never renew the pads on only one wheel as uneven braking may result. Dust created by wear of the pads may contain asbestos, which is a health hazard. Never blow it out



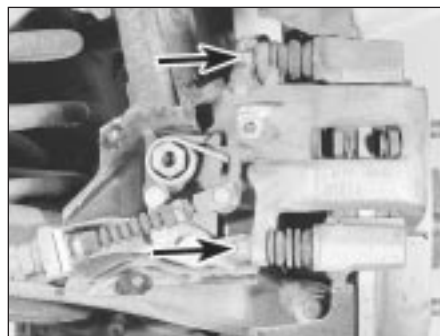
7.2a Rear brake pad renewal

1 Pad wear warning light wiring plug (where fitted)
2 Guide pin bolt
3 Caliper body

4 Brake pad
5 Anti-rattle shim (where fitted)
6 Bleed screw
7 Piston



7.2b Undo the three handbrake linkage cover retaining bolts (arrowed)



7.4 Rear caliper upper and lower guide pin bolt locations (arrowed)



7.6a Lift out the two brake pads . . .

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 at the start of Section 2 concerning the dangers of hydraulic fluid. **Note:** New caliper guide pin bolts will be required for refitting.

1 Chock the front wheels, remove the wheel trim and slacken the rear wheel nuts. Jack up the rear of the car and support it on axle stands. Remove the rear roadwheels and ensure that the handbrake is released.

2 On early models, undo the three handbrake linkage cover securing bolts and remove the cover from the caliper (see illustrations).

3 Where fitted, disconnect the pad wear warning light wiring plug (left-hand caliper).

4 Using a spanner, unscrew the upper and lower guide pin bolts (see illustration).

5 Withdraw the caliper and handbrake linkage assembly from the brake pads and carrier bracket.

6 Lift out the two brake pads, then, where fitted, remove the upper and lower anti-rattle shims from the caliper carrier bracket (see illustrations). If the pads are to be re-used, identify them so that they can be refitted in their original positions.

7 Brush the dust and dirt from the caliper, piston, disc, and pads, but **do not** inhale it, as it is injurious to health.

8 Rotate the disc by hand, and scrape away any rust and scale. Carefully inspect the entire surface of the disc, and if there are any signs of cracks, deep scoring or severe abrasions, the disc must be renewed.

9 Inspect the caliper for fluid leaks around the piston, signs of corrosion, or other damage. Check the guide pin rubber boots for condition, and the pins themselves for free movement in the carrier bracket. Renew any suspect parts as necessary, with reference to Section 9.

10 If new pads are to be fitted, it will be necessary to screw the caliper piston into its bore to accommodate the new, thicker pads. Remove the dust cap and fit a tube over the end of the bleed screw. Submerge the free end of the tube in a jar containing a small quantity of brake fluid.

11 Open the bleed screw approximately half a turn, then screw the piston back fully into its bore by turning it clockwise with a pair of angled circlip pliers or other similar tool (see illustration). If necessary, turn the piston up to 1/4 turn anti-clockwise so that one of the cutouts will align with the projection on the inboard pad. Now close the bleed screw, remove the tube and refit the protective cap.

12 To refit the pads, first place the anti-rattle shims (where fitted) in position in the carrier bracket.

13 Fit the pads to the carrier bracket, noting that the pad with the warning light lead (left-

hand caliper only) must be fitted nearest to the centre of the car.

14 Place the caliper over the pads, and secure with new guide pin bolts, tightened to the specified torque.

15 Refit the warning light wiring plug (where applicable) and the handbrake linkage cover.

16 Depress the brake pedal several times to automatically adjust the brake pads and the handbrake linkage. *Do not apply the handbrake until the rear pads have self-adjusted otherwise incorrect brake operation will result.*

17 Repeat the above procedure on the opposite rear brake unit.

18 Check, and if necessary top up, the fluid in the master cylinder reservoir then refit the roadwheels and lower the car to the ground. Tighten the roadwheel nuts to the specified torque and refit the wheel trim.

8 Rear brake caliper - removal and refitting



Note: Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid, and to the warning at the beginning of Section 7 concerning the dangers of asbestos dust.

Note: New caliper guide pin bolts and brake hose copper washers will be required for refitting.



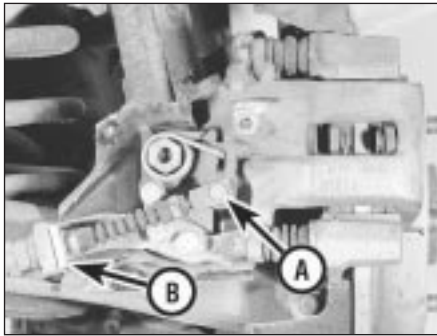
7.6b . . . followed by the upper anti-rattle shim . . .



7.6c . . . and lower anti-rattle shim



7.11 Using angled circlip pliers to screw the piston back into the caliper. Note the position of the cut-outs



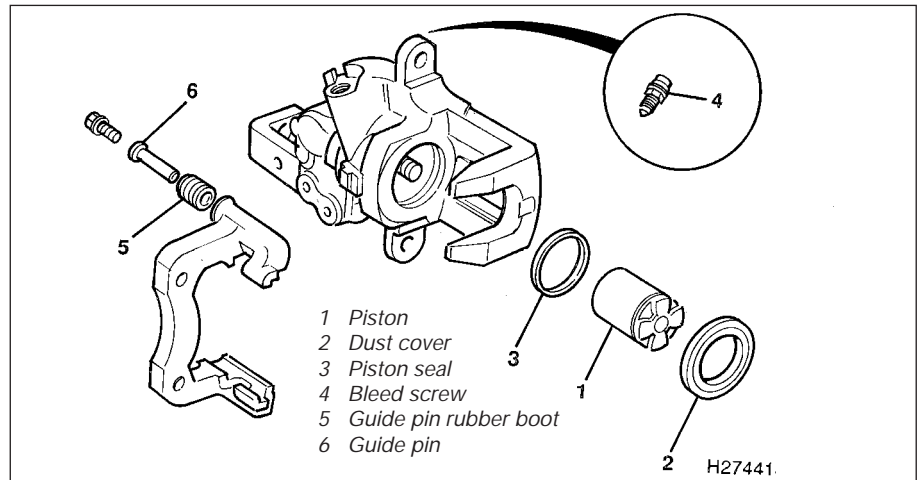
8.5 Handbrake cable clevis pin (A) and cable retaining clip (B)

Removal

- 1 Chock the front wheels, remove the wheel trim and slacken the rear wheel nuts. Jack up the rear of the car and support it on axle stands. Remove the rear roadwheel and ensure that the handbrake is released.
- 2 Undo the three bolts securing the handbrake linkage cover, and remove the cover from the side of the caliper.
- 3 On the left-hand caliper, disconnect the pad wear warning light wiring plug (where fitted) and release the wiring from the support clip.
- 4 Undo the two bolts and remove the front half of the handbrake linkage cover.
- 5 Extract the retaining clip and withdraw the clevis pin from the end of the handbrake cable (see illustration).
- 6 Prise off the handbrake cable retaining clip and withdraw the cable from the mounting bracket.
- 7 To minimise fluid loss, clamp the flexible hose using a brake hose clamp, or self-locking wrench with protected jaws.
- 8 Wipe clean the area around the brake hose connection at the caliper then unscrew the brake hose banjo union bolt at the caliper body, and recover the two copper washers. Tape over the hose union and caliper orifice to prevent dirt ingress.
- 9 Using a spanner, unscrew the upper and lower guide pin bolts.
- 10 Withdraw the caliper and handbrake linkage assembly from the brake pads and carrier bracket, and remove it from the car.
- 11 If the carrier bracket is to be removed, undo the two bolts securing it to the hub carrier, and remove the bracket complete with brake pads. The pads can be removed, if required, with reference to Section 7.

Refitting

- 12 Refitting is a reversal of removal, but tighten all bolts to the specified torque. Use new copper washers on the brake hose banjo union, and bleed the hydraulic system as described in Section 2. *Do not apply the handbrake until the rear brakes have been bled otherwise incorrect brake operation will result.*



9.5 Rear brake caliper components

9 Rear brake caliper - overhaul

- 1 Remove the caliper from the car as described in the previous Section.
- 2 With the caliper on the bench wipe away all traces of dust and dirt, but **do not** inhale it, as it is injurious to health.
- 3 Undo the two bolts and remove the handbrake linkage bracket assembly from the caliper.
- 4 Using a pair of angled circlip pliers or other similar tool, turn the piston anti-clockwise to unscrew it from the caliper.
- 5 Remove the dust cover from the piston (see illustration).
- 6 Using a blunt instrument such as a knitting needle, carefully extract the piston seal from the caliper bore.
- 7 Clean all the parts in methylated spirit, or clean brake fluid, and dry with a lint-free cloth. Inspect the piston and caliper bore for signs of damage, scuffing or corrosion, and if these conditions are evident, renew the caliper assembly complete. Renew the guide pins in the carrier bracket if they are bent or damaged, or if their rubber boots are split or perished.
- 8 If the components are in a satisfactory condition, a repair kit consisting of new seals and dust cover should be obtained.
- 9 Thoroughly lubricate the caliper bore, piston, piston seal and dust cover with clean brake fluid, and carefully fit the seal to the caliper bore.
- 10 Position the dust cover over the innermost end of the piston, so that the caliper bore sealing lip protrudes beyond the base of the piston. Using a blunt instrument, if necessary, engage the sealing lip of the dust cover with the groove in the caliper. Screw the piston into the caliper bore until the other sealing lip of the dust cover can be engaged with the groove in the piston. With the piston screwed in all the way, make sure that the dust cover is

correctly located in the piston and caliper grooves.

- 11 Remove the guide pins from the carrier bracket, if not already done, and smear them with high-melting-point brake grease. Fit new rubber boots to the guide pins and refit them to the carrier bracket. Ensure that the guide pin with the rubber insert is fitted in the rearmost position.
- 12 Attach the handbrake linkage bracket assembly to the caliper and secure with the two bolts.
- 13 The caliper can now be refitted to the car as described in the previous Section.

10 Rear brake disc - inspection, removal and refitting

Note: Before starting work, refer to the warning at the beginning of Section 7 concerning the dangers of asbestos dust.

Inspection

- 1 Chock the front wheels, remove the wheel trim and slacken the rear wheel nuts. Jack up the rear of the car and support it on axle stands. Remove the rear roadwheel and ensure that the handbrake is released.
- 2 Undo the two bolts securing the brake caliper carrier bracket to the rear hub carrier (see illustration).



10.2 Carrier bracket-to-rear hub carrier retaining bolts (arrowed)



10.3 Release the rear flexible brake hose support clip from the suspension strut



10.4 Tie up the caliper assembly to avoid straining the brake hose



10.7a Undo the two retaining screws . . .

3 Undo the retaining bolt and release the flexible brake hose support clip from the suspension strut (*see illustration*).

4 Withdraw the carrier bracket, complete with caliper and brake pads, from the disc and hub carrier. Tie the caliper assembly from a convenient place under the wheelarch to avoid straining the brake hose (*see illustration*).

5 The inspection procedures are the same as for the front brake disc, and reference should be made to Section 6, paragraphs 4 to 7 inclusive.

Removal

6 Remove the brake caliper and carrier bracket as described in paragraphs 1 to 4.

7 Undo the two retaining screws and withdraw the disc from the hub flange (*see illustrations*). If it is tight, tap it lightly from behind using a hide or plastic mallet.

Refitting

8 Refitting is a reversal of removal. Ensure that the mating face of the disc and hub flange are thoroughly clean, and tighten all retaining bolts to the specified torque.

11 Master cylinder - removal and refitting



Note: Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

Removal

1 Disconnect the wiring multiplug 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 Place rags beneath the master cylinder to absorb any remaining brake fluid when the pipe unions are undone. If any brake fluid is spilled on the car paintwork, wash it off immediately with copious amounts of cold water.

3 On manual transmission models, detach the clutch fluid supply hose from the side of the reservoir.

4 Unscrew the two brake pipe union nuts, and carefully withdraw the pipes from the master cylinder (*see illustration*). Tape over the pipe ends to prevent dirt ingress.

5 Undo the two nuts, remove the washers, and withdraw the master cylinder from the servo unit. Recover the O-ring seal between master cylinder and servo.

Refitting

6 Refitting is a reversal of removal. Renew the master cylinder-to-servo O-ring seal, and tighten all retaining nuts to the specified torque. Bleed the brakes as described in Section 2. On manual transmission models, bleed the clutch hydraulic system as described in Chapter 6.

12 Master cylinder (non-ABS models) - overhaul



Note: Two different types of master cylinder have been fitted to non-ABS equipped Rover models covered by this manual (*see illustrations*). The following procedures are mainly applicable to the early unit fitted until approximately October 1991. The later unit is similar, but at the time of writing no specific

overhaul information was available from the manufacturer.

1 Remove the master cylinder from the car as described in the previous Section. Drain any fluid remaining in the reservoir, and prepare a clean, uncluttered working surface ready for dismantling.

2 Hold the cylinder body firmly, and push the reservoir sideways to release it from its seals. Lift the reservoir off, and remove the two seals from the fluid inlet ports.

3 Push the primary piston down the cylinder bore slightly, and hold it there. Locate the stop-pin in the secondary inlet port, and withdraw the pin using pointed-nose pliers.

4 With the piston held down, extract the circlip, using circlip pliers, from the cylinder bore end, and remove the washer behind the circlip.

5 Using a small blunt screwdriver, hook out the O-ring seal from the groove in the cylinder bore.

6 Remove the primary piston.

7 Lubricate the cylinder bore with clean hydraulic fluid to aid removal of the secondary piston.

8 Tap the cylinder body on a block of wood to release the secondary piston, then withdraw the piston from the cylinder bore.

9 Remove the secondary piston spring, seal retainer, rear seal, washer and front seal.

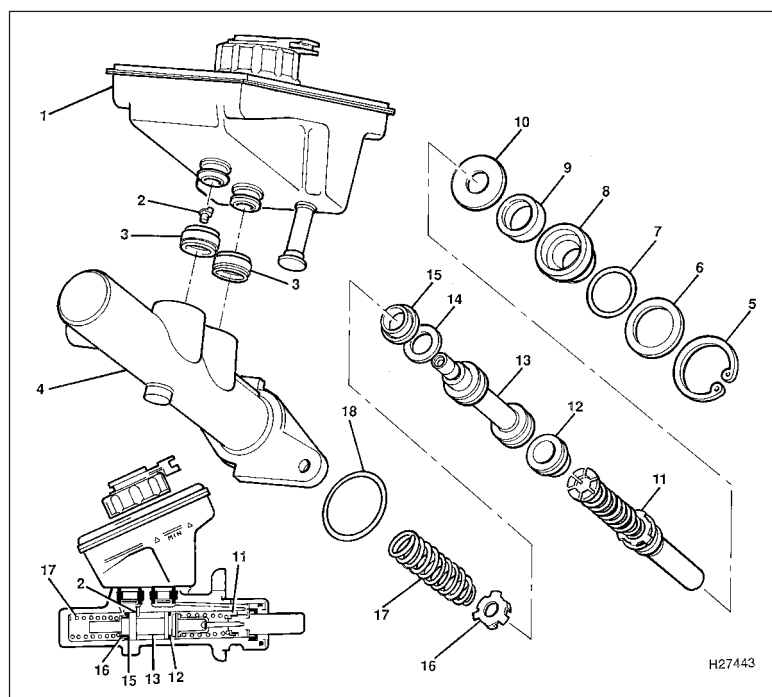
10 Remove the seal housing, seal and washer from the primary piston. Do not dismantle the primary piston further, as seals



10.7b . . . and withdraw the rear disc from the hub flange

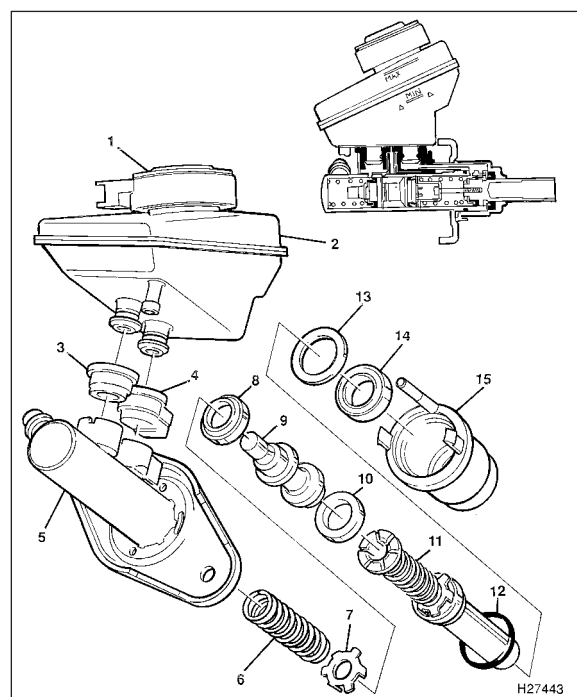


11.4 Unscrew the two brake pipe unions (arrowed) at the master cylinder



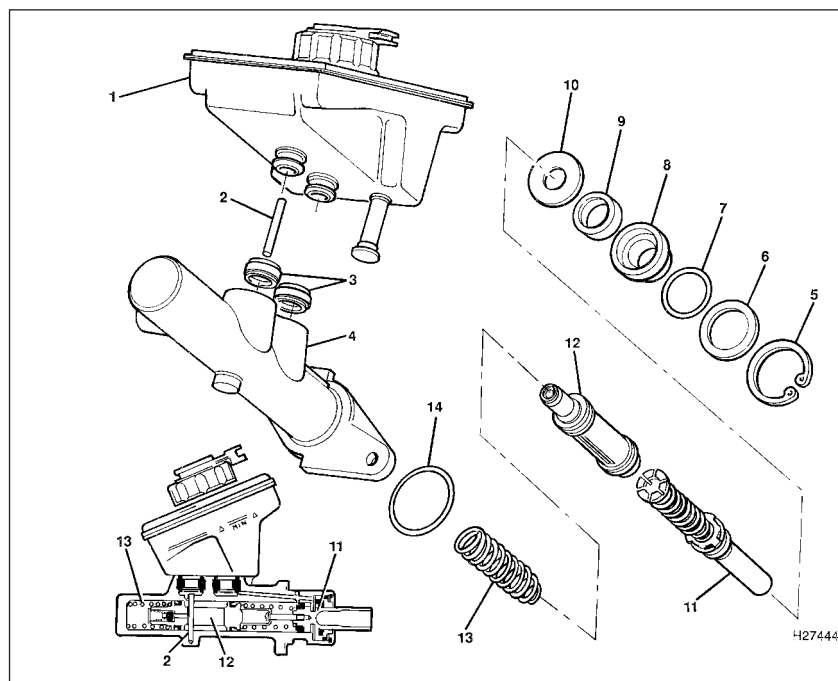
12.0a Exploded view of the early type master cylinder - non-ABS models

- | | |
|-------------------------------|-----------------------------------|
| 1 Reservoir | 10 Primary piston washer |
| 2 Stop-pin | 11 Primary piston assembly |
| 3 Reservoir seals | 12 Secondary piston front seal |
| 4 Cylinder body | 13 Secondary piston |
| 5 Piston retaining circlip | 14 Secondary piston washer |
| 6 Washer | 15 Secondary piston rear seal |
| 7 O-ring seal | 16 Secondary piston seal retainer |
| 8 Primary piston seal housing | 17 Secondary piston spring |
| 9 Primary piston seal | 18 O-ring |



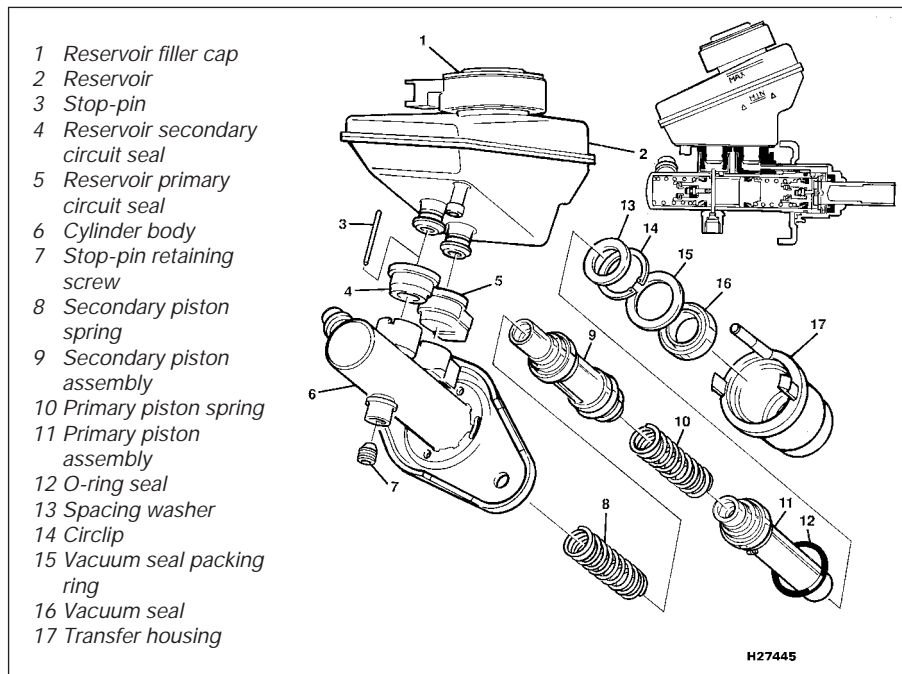
12.0b Exploded view of the later type master cylinder - non-ABS models

- | | |
|------------------------------------|--------------------------------|
| 1 Reservoir filler cap | 8 Secondary piston rear seal |
| 2 Reservoir | 9 Secondary piston |
| 3 Reservoir secondary circuit seal | 10 Secondary piston front seal |
| 4 Reservoir primary circuit seal | 11 Primary piston assembly |
| 5 Cylinder body | 12 O-ring seal |
| 6 Secondary piston spring | 13 Vacuum seal packing ring |
| 7 Secondary piston seal retainer | 14 Vacuum seal |
| | 15 Transfer housing |



13.0a Exploded view of the early type master cylinder - ABS models

- | |
|-------------------------------|
| 1 Reservoir |
| 2 Stop-pin |
| 3 Reservoir seals |
| 4 Cylinder body |
| 5 Piston retaining circlip |
| 6 Washer |
| 7 O-ring seal |
| 8 Primary piston seal housing |
| 9 Primary piston seal |
| 10 Primary piston washer |
| 11 Primary piston assembly |
| 12 Secondary piston assembly |
| 13 Secondary piston spring |
| 14 O-ring |



13.0b Exploded view of the later type master cylinder - ABS models

are not available separately. If the master cylinder is in a serviceable condition, and is to be re-used, a new primary piston assembly is included in the repair kit.

11 With the master cylinder dismantled, clean all the components in methylated spirit, or clean hydraulic fluid, and dry with a lint-free cloth.

12 Carefully examine the cylinder bore and secondary piston for signs of wear, scoring or corrosion, and if evident, renew the complete master cylinder assembly.

13 If the components are in a satisfactory condition, obtain a repair kit consisting of new seals, springs and primary piston assembly.

14 Lubricate the cylinder bore, pistons and seals thoroughly in clean hydraulic fluid, and assemble them wet.

15 Using your fingers only, fit the front seal to the secondary piston, followed by the washer, rear seal, seal retainer and spring.

16 Fit the washer, seal housing and seal to the primary piston.

17 Insert the secondary piston into the cylinder bore, using a circular rocking motion to avoid turning over the lips of the seals.

18 Fit the primary piston in the same way.

19 Fit a new O-ring seal to the groove in the cylinder bore, then refit the washer and circlip.

20 Push the primary piston down the bore, and refit the stop-pin to the secondary inlet port.

21 Fit two new seals to the reservoir fluid inlet ports, then push the reservoir firmly into place.

22 Fit a new seal to the reservoir filler cap, then refit the master cylinder to the car as described in Section 11.

13 Master cylinder (ABS models) - overhaul



Note: Two different types of master cylinder have been fitted to ABS equipped Rover models covered by this manual (see *illustrations*). The following procedures are mainly applicable to the early unit fitted until approximately October 1991. The later unit is similar, but at the time of writing no specific overhaul information was available from the manufacturer.

1 Remove the master cylinder from the car as described in Section 11. Drain any fluid remaining in the reservoir, and prepare a clean, uncluttered working surface ready for dismantling.

2 Hold the cylinder body firmly, and push the reservoir sideways to release it from its seals. Lift the reservoir off, and remove the two seals from the fluid inlet ports.

3 Push the primary piston down the cylinder bore slightly, and hold it there. Locate the stop-pin in the secondary inlet port, and withdraw the pin using pointed-nose pliers.

4 With the piston held down, extract the circlip, using circlip pliers, from the cylinder bore end, and remove the washer behind the circlip.

5 Using a small blunt screwdriver, hook out the O-ring seal from the groove in the cylinder bore.

6 Remove the primary piston.

7 Lubricate the cylinder bore with clean hydraulic fluid to aid removal of the secondary piston.

8 Tap the cylinder body on a block of wood to release the secondary piston, then withdraw the piston from the cylinder bore.

9 Remove the seal housing, seal and washer from the primary piston. Do not dismantle either of the pistons further as seals are not available separately. If the master cylinder is in a serviceable condition, and is to be re-used, a repair kit including new primary and secondary piston assemblies will be required.

10 With the master cylinder dismantled, clean all the components in methylated spirit, or clean hydraulic fluid, and dry with a lint-free cloth.

11 Carefully examine the cylinder bore for signs of wear, scoring or corrosion, and if evident, renew the complete master cylinder assembly.

12 If the components are in a satisfactory condition, obtain a repair kit and two new piston assemblies.

13 Lubricate the cylinder bore, pistons and seals thoroughly in clean hydraulic fluid, and assemble them wet.

14 Fit the washer, seal housing and seal to the primary piston.

15 Insert the secondary piston into the cylinder bore, using a circular rocking motion to avoid turning over the lips of the seals. Align the slot in the piston with the stop-pin hole in the cylinder secondary inlet port.

16 Fit the primary piston in the same way.

17 Fit a new O-ring seal to the groove in the cylinder bore, then refit the washer and circlip.

18 Push the primary piston down the bore, and refit the stop-pin to the secondary inlet port.

19 Fit two new seals to the reservoir fluid inlet ports, then push the reservoir firmly into place.

20 Fit a new seal to the reservoir filler cap, then refit the master cylinder to the car as described in Section 11.

14 Pressure-reducing valve - general information, removal and refitting



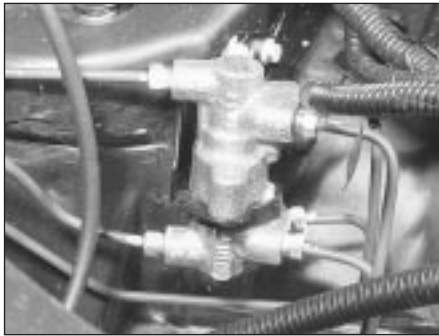
Note: Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

General information

1 The pressure-reducing valve is mounted on the left-hand side of the engine compartment behind the battery.

2 The purposes of the valve is to distribute brake fluid to the front and rear brakes (rear brakes only on cars fitted with ABS), and to limit the fluid pressure supplied to the rear brakes under heavy braking.

3 The operation of the valve may be suspect if one or both rear wheels continually lock under heavy braking. It is essential, however,



14.6 Pressure-reducing valve mountings and pipe attachments

before condemning the valve to ensure that the brake assemblies themselves, or adverse road conditions, are not causing this condition. In the event of a valve internal failure, brake fluid will be seen seeping from the vent plug on the front of the valve which is covered by a plastic strap. Repair or overhaul of the valve is not possible, and the unit must be renewed as a complete assembly if faulty.

Removal

4 Remove the master cylinder reservoir filler cap, place a piece of polythene over the filler neck, and seal it tightly with an elastic band. This will minimise hydraulic fluid loss during subsequent operations.

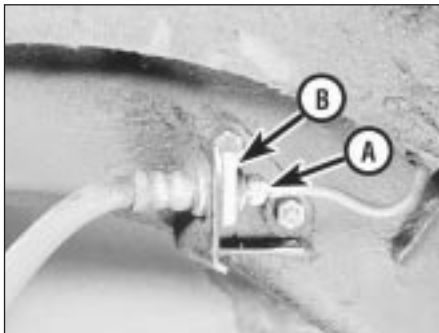
5 Place rags beneath the valve to collect any hydraulic fluid that may escape when the pipe unions are undone. If any hydraulic fluid is spilled on the car paintwork, wash it off immediately with copious amounts of cold water.

6 Identify the locations of each of the brake pipe unions, unscrew the union nuts and carefully withdraw the pipes clear of the valve (see illustration). Tape over the pipe ends and valve orifices to prevent dirt ingress.

7 Undo the two bolts securing the valve mounting bracket to the inner wing, and remove the valve assembly.

Refitting

8 Refitting is a reversal of removal. Bleed the hydraulic system as described in Section 2 on completion.



15.8 Flexible brake hose rigid pipe union nut (A) and hose retaining clip (B)

15 Hydraulic pipes and hoses - inspection, removal and refitting



Note: Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

Inspection

1 Jack up the front, then the rear of the car in turn, and securely support it on axle stands so that the pipes and hoses under the wheelarches and on the suspension assemblies can be inspected.

2 First check for signs of leakage at the pipe unions. Examine the flexible hoses for signs of cracking, chafing or deterioration of the rubber.

3 The brake pipes must be examined carefully and methodically. They must be cleaned off and checked for signs of dents, corrosion or other damage. Corrosion should be scraped off and, if the depth of pitting is significant, the pipes renewed. The pipes are however protected by a plastic sleeve, and any corrosion that does occur is likely to be near the pipe unions where the sleeve protection ends.

4 Renew any defective brake pipes and/or hoses.

Removal

5 If any section of pipe or hose is to be removed, first unscrew the master cylinder reservoir filler cap and place a piece of polythene over the filler neck. Secure the polythene with an elastic band, ensuring that an airtight seal is obtained. This will minimise hydraulic fluid loss when the pipe or hose is removed.

6 As the front-to-rear brake pipes run inside the car, it will be necessary to determine the route of the pipe, then remove any interior trim panels as necessary for access (see Chapter 11). Once this is done, the union nuts at each end can be unscrewed, the pipe and union pulled out, and the pipe removed from the car or underbody clips as applicable. Where the union nuts are exposed, unprotected from the full force of the weather, they can sometimes

be quite tight. As only an open-ended spanner can be used, burring of the flats on the nuts is not uncommon when attempting to undo them. For this reason, a self-locking wrench is often the only way to separate a stubborn union.

7 To remove a flexible hose, wipe the unions and brackets free of dirt and undo the union nut at the brake pipe end.

8 Next extract the hose retaining clip, and lift the end of the hose out of its bracket (see illustration).

9 If a front hose is being removed, undo the two bolts securing the hose support bracket to the steering knuckle (see illustration). At the rear, a single bolt secures the support bracket to the shock absorber strut.

10 Undo the banjo bolt securing the hose to the brake caliper, recover the two copper washers, one on each side of the union, and remove the hose (see illustration). Use new copper washers when refitting.

11 Brake pipes can be obtained individually, or in sets, from Rover dealers or larger accessory shops, cut to length and with the end flares and union nuts in place. The pipe is then bent to shape, using the old pipe as a guide, and is ready for fitting to the car.

Refitting

12 Refitting the pipes and hoses is a reversal of removal. Make sure that the hoses are not kinked when in position, and will not chafe any suspension or steering component with suspension movement. Ensure also that the brake pipes are securely supported in their clips. After refitting, remove the polythene from the reservoir and bleed the hydraulic system as described in Section 2.

16 Brake pedal - removal and refitting



Removal

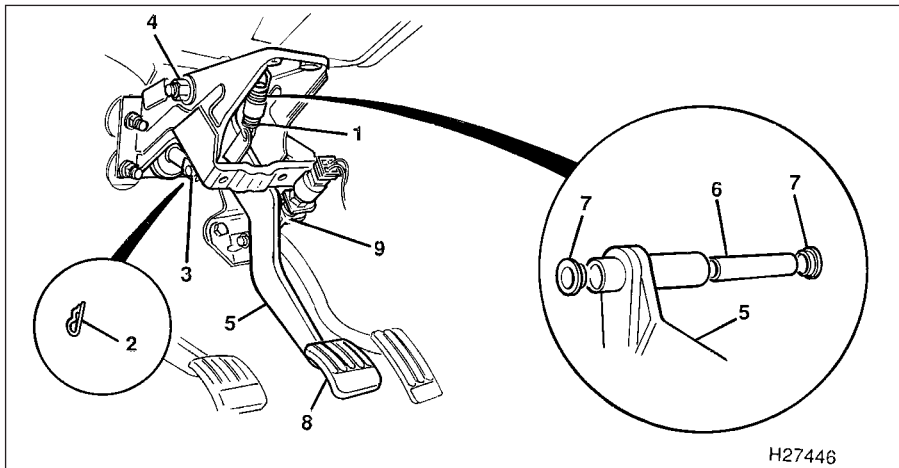
1 From inside the car, release the turnbuckles and lift out the trim panel over the clutch, brake and accelerator pedals.



15.9 Front brake hose support bracket on the steering knuckle



15.10 Front brake hose-to-caliper banjo union bolt (arrowed)



16.2 Brake pedal mounting details

- | | | |
|--------------------------|--------------------|---------------------|
| 1 Return spring | 4 Pedal pivot bolt | 7 Pedal bushes |
| 2 Clevis pin spring clip | 5 Brake pedal | 8 Pedal pad |
| 3 Clevis pin | 6 Spacer tube | 9 Stop-light switch |

2 Disconnect the return spring from the brake pedal and pedal bracket (**see illustration**).

3 Extract the retaining spring clip and withdraw the clevis pin securing the brake servo pushrod to the pedal.

4 Undo the nut, remove the washer and withdraw the brake pedal pivot bolt from the pedal bracket. Remove the pedal from the car.

5 Prise out the two pedal bushes and withdraw the spacer tube.

6 Check the condition of the components, and renew as necessary.

Refitting

7 Refitting is a reversal of removal.

17 Handbrake - adjustment



1 Due to the self-adjusting action of the rear brakes, adjustment of the handbrake should normally only be necessary after removal and refitting of any of the handbrake components.

2 To check the adjustment, chock the front wheels, remove the rear wheel trim and slacken the roadwheel nuts. Jack up the rear of the car and support it on axle stands. Remove both rear roadwheels and release the handbrake.

3 On early models, undo the three bolts each side securing the handbrake linkage covers to the rear brake calipers, and remove the covers.

4 Check the clearance between the handbrake linkage lever and the stop-pin on both calipers (**see illustration**). If the clearance on either side is outside the tolerance given in the Specifications, adjust the handbrake using the following procedure. If the clearance is satisfactory, proceed to paragraph 9.

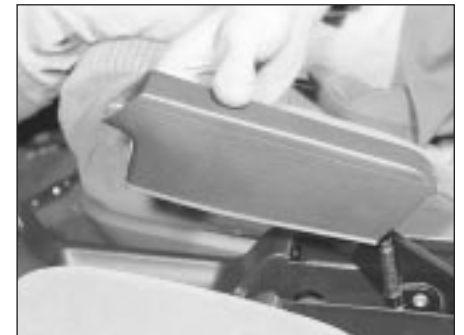
5 On later models it will be necessary to remove the centre console, as described in Chapter 11, for access to the handbrake adjuster. On early models it is only necessary to remove the handbrake lever trim cover as follows. From inside the car, carefully prise out the coin holders or switch panels on each side of the centre console, then raise the lid on the cassette holder at the rear of the console.

6 Using a screwdriver as a lever, carefully prise up the rear of the handbrake lever trim cover, and remove the cover from the lever (**see illustrations**).

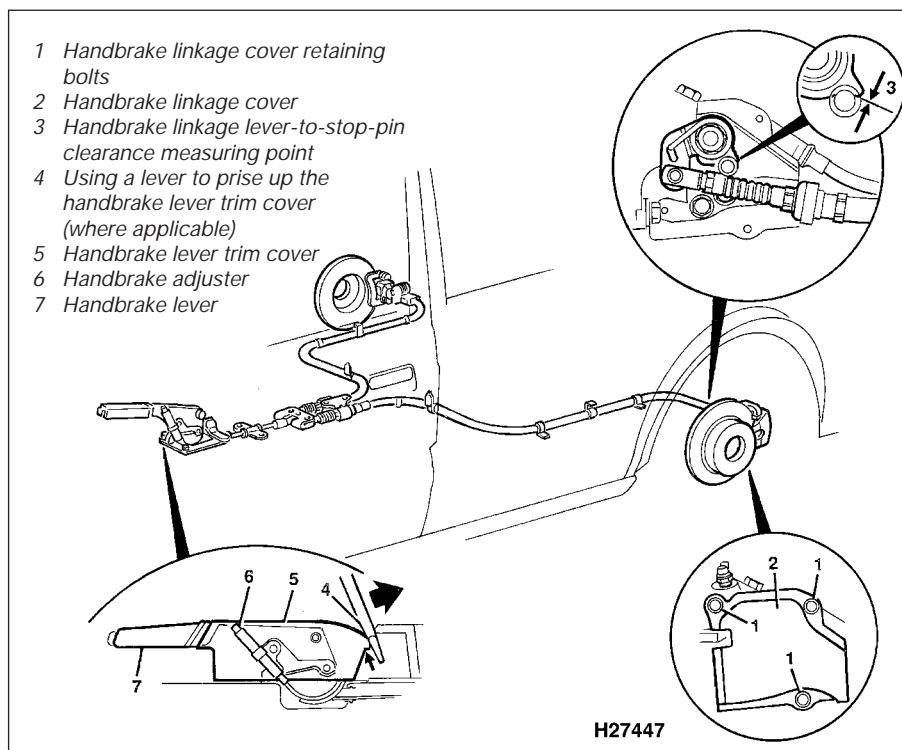
7 Turn the handbrake adjuster on the side of the handbrake lever to increase or decrease the previously-measured clearance, as



17.6a Prise up the rear of the handbrake lever trim cover . . .



17.6b . . . and remove the cover from the lever



17.4 Handbrake adjustment details

- 1 Handbrake linkage cover retaining bolts
- 2 Handbrake linkage cover
- 3 Handbrake linkage lever-to-stop-pin clearance measuring point
- 4 Using a lever to prise up the handbrake lever trim cover (where applicable)
- 5 Handbrake lever trim cover
- 6 Handbrake adjuster
- 7 Handbrake lever

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17.7 Handbrake adjuster location (arrowed)

necessary (see illustration). Turning the adjuster clockwise will decrease the clearance, and turning it anti-clockwise will increase it.

8 Operate the handbrake two or three times, and recheck the clearance once more. Make a final adjustment if required, then refit the trim cover to the lever, or refit the centre console, as applicable.

9 Refit the linkage covers to the brake calipers, refit the roadwheels and lower the car to the ground. Tighten the wheel nuts and refit the wheel trim.

18 Handbrake lever - removal and refitting



Removal

1 Refer to Chapter 11 and remove the centre console.

2 Chock the front wheels, remove the rear wheel trim and slacken the wheel nuts. Jack up the rear of the car and support it on axle stands. Remove the rear roadwheels and release the handbrake.

3 From inside the car, unscrew the handbrake adjuster on the side of the lever, and remove the adjuster and spacing washer from the front cable (see illustration).

4 Detach the front cable from the handbrake lever.



18.3 Unscrew the handbrake adjuster on the side of the lever

5 Disconnect the wiring plug from the warning light switch on the other side of the lever (see illustration).

6 Undo the four bolts securing the lever assembly to the floor (see illustration).

7 Lift up the lever assembly, release the cable and gaiter, and recover the lever-to-floor gasket. Remove the lever assembly from the car.

8 If required, the warning light switch can be removed after undoing the two screws.

Refitting

9 Refitting is a reversal of removal. Adjust the handbrake as described in Section 17 before lowering the car to the ground.

19 Handbrake cable (front) - removal and refitting



Removal

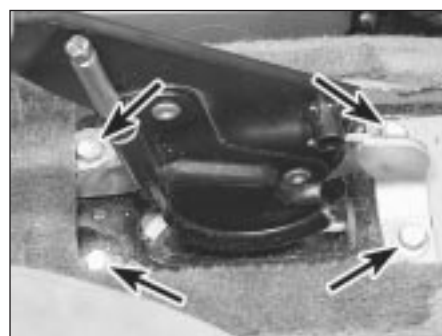
1 Refer to Chapter 11 and remove the centre console.

2 Chock the front wheels, remove the rear wheel trim and slacken the wheel nuts. Jack up the rear of the car and support it on axle stands. Remove the rear roadwheels and release the handbrake.

3 Undo the bolts securing the exhaust system front heat shield to the underbody. Release the exhaust system front rubber



18.5 Disconnect the warning light switch wiring plug (arrowed)



18.6 Undo the four handbrake lever retaining bolts (arrowed)

mountings, and remove the heat shield by twisting it around the exhaust system (see illustration).

4 Extract the spring clip and withdraw the clevis pin securing the front handbrake cable to the compensator (see illustration).

5 Undo the two bolts securing the front cable guide plate to the underbody (see illustration).

6 From inside the car, undo the four bolts securing the handbrake lever assembly to the floor.

7 Disconnect the wiring plug from the warning light switch on the side of the handbrake lever, then remove the lever assembly, complete with front cable, from the car. Recover the lever-to-floor gasket.

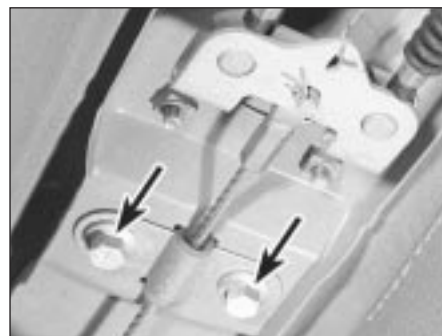
8 Unscrew the handbrake adjuster on the



19.3 Removing the front heat shield from the exhaust system



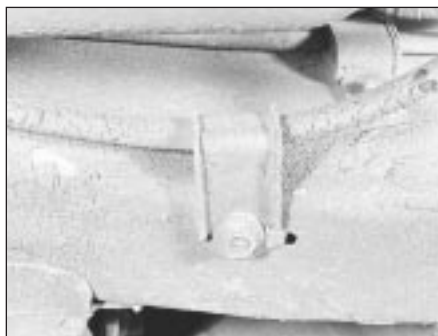
19.4 Extract the cable retaining spring clip and clevis pin (arrowed)



19.5 Undo the front cable guide plate retaining bolts (arrowed)



20.3 Removing the rear heat shield from the exhaust system



20.7a Cable support on the chassis member . . .



20.7b . . . and rear underbody

side of the lever, and remove the adjuster and spacing washer from the front cable.

9 Release the front cable and gaiter from the handbrake lever assembly, then remove the cable from the gaiter.

Refitting

10 Refitting is a reversal of removal. Adjust the handbrake as described in Section 17 before lowering the car to the ground.

20 Handbrake cable (rear) - removal and refitting



Removal

1 Chock the front wheels, remove the rear wheel trim and slacken the wheel nuts. Jack up the rear of the car and support it on axle stands. Remove the rear roadwheels and release the handbrake.

2 Release the exhaust system rubber mountings, lower the system at the rear, and support it on blocks to avoid straining the front flexible joint.

3 Undo the retaining bolts and remove the front and rear exhaust system heat shields (see illustration).

4 On early models, undo the three bolts and remove the handbrake linkage cover from the brake caliper.

5 Extract the spring clip and withdraw the

clevis pin securing the handbrake cable to the linkage lever on the caliper (see illustration 8.5).

6 Withdraw the spring clip securing the cable to the abutment bracket, and remove the cable from the caliper.

7 Undo the bolts and release the cable support clips on the suspension arm, chassis member and underbody (see illustrations).

8 Disconnect the return spring, extract the spring clip and withdraw the clevis pin securing the front handbrake cable to the compensator (see illustration).

9 Turn the rear cable end through 90°, and release it from the slot in the compensator.

10 Withdraw the cable from the abutment bracket, and remove it from under the car. Remove the support clips from the cable.

Refitting

11 Refitting is a reversal of removal. Adjust the handbrake as described in Section 17 before lowering the car to the ground.

21 Stop-light switch - removal, refitting and adjustment



Removal

1 From inside the car, release the turnbuckles and lift out the trim panel over the clutch, brake and accelerator pedals.

2 Disconnect the switch wiring multiplug, then slacken the locknut and unscrew the switch from the brake pedal bracket (see illustration).

Refitting and adjustment

3 Refit the switch to the brake pedal bracket then adjust its position as follows.

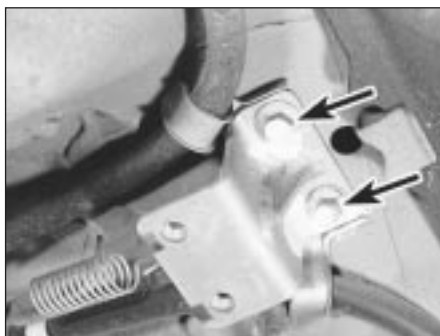
4 Temporarily reconnect the wiring multiplug so that the switch terminals connected to the green/purple, and purple or purple/pink wires can be noted.

5 Remove the multiplug once more and connect an ohmmeter across the switch green/purple terminal, and purple or purple/pink terminal.

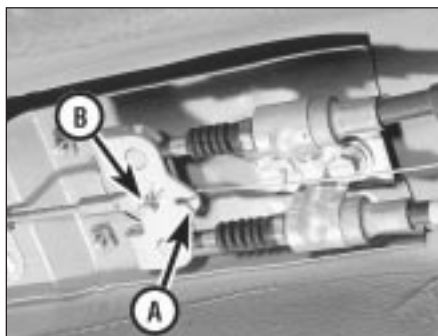
6 Turn the switch anti-clockwise until the ohmmeter reads zero. Now turn the switch clockwise until the ohmmeter reads infinity. On cars equipped with cruise control, turn the switch clockwise one further turn. On cars without cruise control, turn the switch clockwise a further half a turn. Hold the switch in this position and tighten the locknut.

7 Disconnect the ohmmeter and reconnect the switch wiring multiplug. Ensure that the multiplug is correctly connected otherwise the stop lights will illuminate whenever the ignition is switched on.

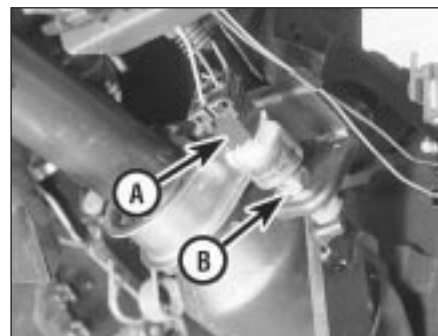
8 Refit the trim panel over the pedals.



20.7c Front cable support retaining bolts (arrowed)



20.8 Handbrake cable return spring (A) and retaining clevis pin (B)



21.2 Stop-light switch wiring multiplug (A) and locknut (B)

22 Vacuum servo unit - general information and testing



General information

1 A vacuum servo unit is located between the brake pedal and master cylinder, to provide assistance to the driver when the brake pedal is depressed. This reduces the effort required by the driver to operate the brakes under all braking conditions.

2 The unit operates by vacuum obtained from the inlet manifold, and consists basically of a diaphragm, control valve and non-return valve.

3 With the brake pedal released, vacuum is channelled to both sides of the diaphragm, but when the pedal is depressed, one side is opened to atmosphere. The resultant unequal pressures are harnessed to assist in depressing the master cylinder pistons.

4 Normally, the servo unit is very reliable, but if the unit becomes faulty it must be renewed complete, as repair is not possible. In the event of failure, the hydraulic system is in no way affected, except that higher pedal pressures will be necessary.

Testing

5 To test the servo unit, depress the brake pedal several times with the engine switched off, to destroy the vacuum.

6 Apply moderate pressure to the brake pedal, then start the engine. The pedal should move down slightly as the vacuum is restored, if the servo is operating correctly.

7 Now switch off the engine and wait five minutes. Vacuum should still be available for at least one assisted operation of the pedal.

23 Vacuum servo unit - removal and refitting



Removal

1 Remove the master cylinder as described in Section 11.

2 From inside the car, release the turnbuckles and lift out the trim panel over the clutch, brake and accelerator pedals.

3 Extract the retaining clip and withdraw the clevis pin securing the servo pushrod to the brake pedal.

4 From within the engine compartment, remove the vacuum hose elbow from the front

face of the servo by prising it out of its grommet.

5 Unscrew the four retaining nuts inside the car, and withdraw the servo unit from the engine compartment bulkhead.

6 With the servo removed, the air filter can be renewed if necessary. Withdraw the dust cover over the air filter and pushrod. Hook out the washer and old filter, and cut the filter to allow removal over the pushrod fork. Similarly cut the new filter, place it in position in the housing, and refit the washer and dust cover.

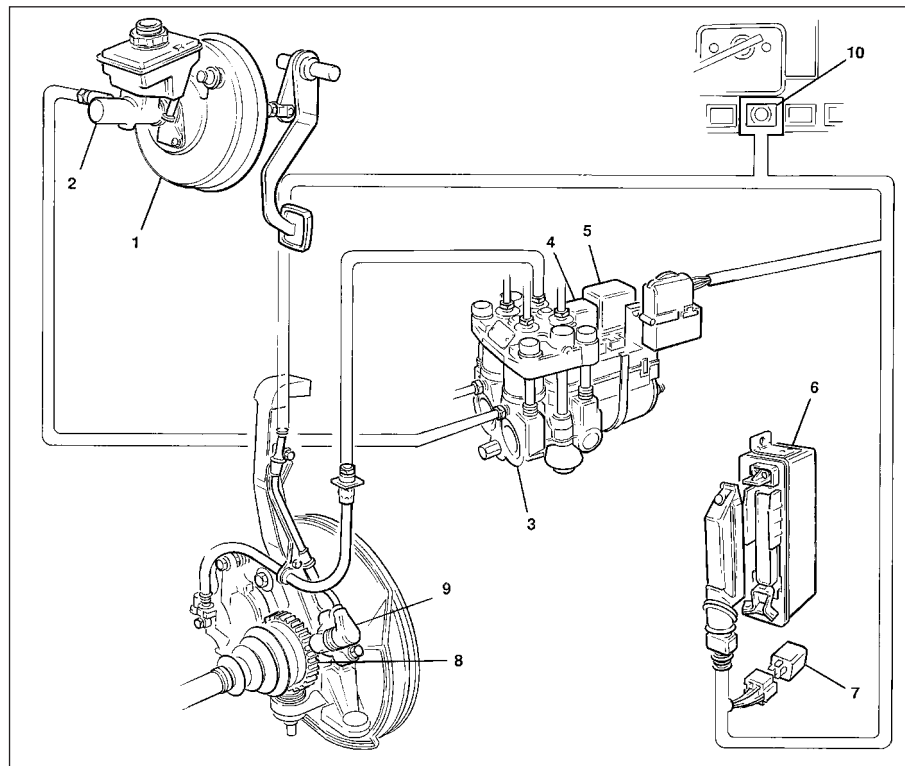
Refitting

7 Refitting is a reversal of removal. Use a new gasket on the servo-to-bulkhead mating face, and tighten the retaining nuts to the specified torque. Refit the master cylinder as described in Section 11.

24 Anti-lock braking system - general information

Later Rover 800 series models are available with an anti-lock braking system (ABS) as standard equipment or an optional extra. The system is used in conjunction with the normal braking system to provide greater stability, improved steering control and shorter stopping distances under all braking conditions. Two different ABS systems have been used, the later type introduced for the 1992 model year, operates in basically the same way as the early system but incorporates modifications to the hydraulic modulator and electronic control unit. A brief description of the operation of both systems is as follows (see illustration). Each wheel is provided with a wheel speed sensor, which monitors the wheel rotational speed. The sensor consists of a magnetic core and coil, and is mounted at a predetermined distance from a toothed reluctor ring. The reluctor rings for the front wheels are pressed onto the driveshaft outer constant velocity joints, and those for the rear wheels are pressed onto the rear hubs. When each hub turns, the magnetic field of the sensor is altered as the reluctor ring teeth pass the sensor head, thus inducing an alternating voltage, the frequency of which varies according to wheel speed.

Signals from the wheel speed sensors are sent to an electronic control unit, which can accurately determine whether a wheel is accelerating or decelerating in relation to a reference speed. Information from the electronic control unit is sent to the hydraulic modulator which, on the early system, contains four solenoids each operating one inlet and one exhaust valve for each brake. On the later system, the modulator contains one solenoid for each front brake, plus one solenoid and a copy valve for the rear brakes. On both systems the solenoids all work independently of each other in three distinct phases:



24.1 Anti-lock braking system main components (pre-1992 model year version shown, later version similar)

- | | | |
|--|---|--|
| 1 Vacuum servo unit | 5 Modulator control relay - return pump operation | 8 Front wheel speed sensor reluctor ring |
| 2 Master cylinder | 6 Electronic control unit | 9 Front wheel speed sensor |
| 3 Hydraulic modulator | 7 Over-voltage protection relay | 10 ABS warning light |
| 4 Modulator control relay - solenoid valve operation | | |

Pressure build-up phase: The solenoid inlet valves are open, and hydraulic pressure from the master cylinder is applied directly to the brake calipers.

Constant pressure phase: The solenoid inlet and exhaust valves are closed, and hydraulic pressure at the calipers is maintained at a constant level, even though master cylinder pressure may increase.

Pressure reduction phase: The solenoid inlet valve is closed to prevent further hydraulic pressure reaching the caliper and, in addition, the exhaust valve is open, to reduce existing pressure and release the brake. Fluid is returned to the master cylinder in this phase via the return pump in the hydraulic modulator.

The braking cycle for one wheel is therefore as follows, and will be the same for all four wheels, although independently.

Wheel rotational speed is measured by the wheel speed sensors, the information is processed by the electronic control unit. By comparing the signals received from each wheel, the control unit can determine a reference speed, and detect any variation from this speed, which would indicate a locking brake. Should a lock-up condition be detected, the control unit initiates the constant pressure phase, and no further increase in hydraulic pressure is applied to the affected brake. If the lock-up condition is still detected, the pressure reduction phase is initiated to allow the wheel to turn. The control unit returns to the constant pressure phase until the wheel rotational speed exceeds a predetermined value, then the cycle repeats with the control unit re-initiating the pressure build-up phase. This control cycle is continuously and rapidly repeated, until the brake pedal is released or the car comes to a stop.

Additional circuitry within the electronic control unit monitors the functioning of the system, and informs the driver of any fault condition by means of a warning light. Should a fault occur, the system switches off allowing normal braking, without ABS, to continue.

25 Anti-lock braking system - component removal and refitting



ABS main relays

- 1 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 2 Undo the screw and lift off the plastic cover over the hydraulic modulator.
- 3 Remove the relays by pulling them out of their location. The relay nearest the hydraulic pipe connection end of the modulator controls the solenoid valve operation, and the relay furthest away from the hydraulic pipe connections controls the return pump operation.
- 4 Refitting is the reversal of removal.

Over-voltage protection relay

- 5 An over-voltage protection relay is only used on the early systems.
- 6 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 7 Working in the luggage compartment, release the turnbuckle and lift off the cover over the electronic control unit.
- 8 Withdraw the relay from its socket which is located below the ECU on Saloon models, and to the side of the ECU, behind the trim panel on Fastback models.
- 9 Refitting is a reversal of removal.

Electronic control unit

Early system

- 10 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 11 Working in the luggage compartment on the left-hand side, release the turnbuckle and lift off the control unit cover.
- 12 Disconnect the wiring multiplug by depressing the spring tab at the cable end, lift the plug up at the cable end, then disengage the tab at the other end.
- 13 Undo the retaining bolts and remove the unit from its location.
- 14 Refitting is a reversal of removal, but ensure that the wiring multiplug engages securely with an audible click from the spring tab.

Later system

- 15 On the system fitted to later models, the ECU is attached to the hydraulic modulator.
- 16 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 17 Undo the screw and lift off the plastic cover over the hydraulic modulator.
- 18 Release the metal clip securing the main wiring harness to the ECU then disconnect the three wiring multiplugs.

- 19 Undo the six Torx screws and withdraw the ECU from the top of the hydraulic modulator.

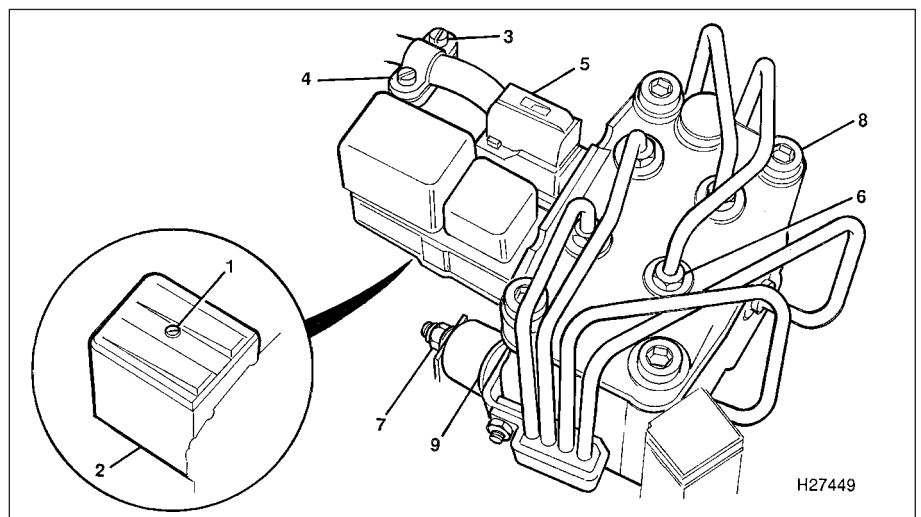
20 Refitting is a reversal of removal.

Hydraulic modulator

Note: Before starting work, refer to the warning at the beginning of Section 2 concerning the dangers of hydraulic fluid.

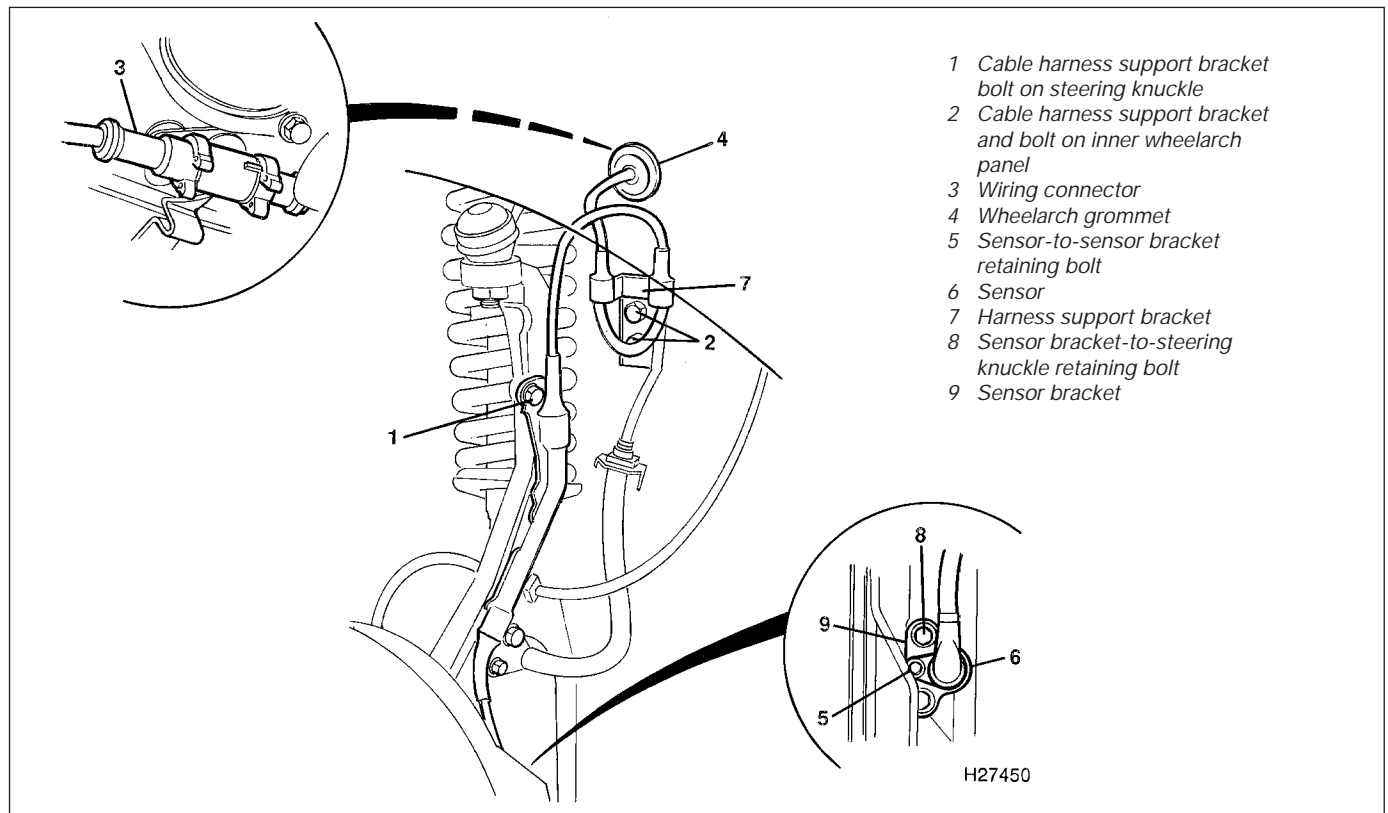
Early system

- 21 Disconnect the battery negative (earth) lead (refer to Chapter 5, Section 1).
- 22 Undo the screw and lift off the plastic cover over the hydraulic modulator. Unscrew the cable clamp and disconnect the modulator wiring multiplug. Undo the earth terminal nut and disconnect the earth lead from the modulator (see illustration).
- 23 Remove the master cylinder reservoir filler cap, and place a piece of polythene over the filler neck. Seal the polythene with an elastic band, ensuring that an airtight seal is obtained. This will minimise brake fluid loss during subsequent operations. Place rags beneath the modulator as an added precaution against fluid spillage.
- 24 If no identification labels are present on the modulator brake pipe unions, identify each pipe and its location as an aid to refitting. The modulator ports should be stamped on the modulator body with a two-letter code as follows:
VR Right-hand front
VL Left-hand front
HR Right-hand rear
HL Left-hand rear
- 25 Unscrew each brake pipe union at the modulator, withdraw the pipe, and immediately plug the pipe end and orifice. Release the pipe support bracket from the side of the modulator, and carefully ease the pipes clear.



25.22 ABS hydraulic modulator attachments (early version shown)

- | | | |
|-------------------------|---------------------|--------------------|
| 1 Cover retaining screw | 4 Cable clamp | 7 Mounting nuts |
| 2 Modulator relay cover | 5 Multiplug | 8 Modulator |
| 3 Cable clamp screws | 6 Brake pipe unions | 9 Mounting rubbers |



25.37 Front wheel speed sensor attachments

26 Slacken the modulator mounting nuts and remove the unit from its location. Do not attempt to dismantle the modulator, as it is a sealed unit, and no repairs are possible.

27 Refitting is a reversal of removal. Bleed the hydraulic system as described in Section 2 on completion.

Later system

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

29 Remove the electronic control unit from the modulator as described previously.

30 Undo the earth terminal nut and disconnect the earth lead from the modulator.

31 Remove the master cylinder reservoir filler cap, and place a piece of polythene over the filler neck. Seal the polythene with an elastic band, ensuring that an airtight seal is obtained. This will minimise brake fluid loss during subsequent operations. Place rags beneath the modulator as an added precaution against fluid spillage.

32 If no identification labels are present on the modulator brake pipe unions, identify each pipe and its location as an aid to refitting. The modulator ports should be stamped on the modulator body with a two-letter code as follows:

RF Right-hand front

LF Left-hand front

RR Right-hand rear

LR Left-hand rear

33 Unscrew each brake pipe union at the modulator, withdraw the pipe, and immediately plug the pipe end and orifice.

34 Slacken the three modulator mounting nuts and remove the unit from its location. Do not attempt to dismantle the modulator, as it is a sealed unit, and no repairs are possible.

35 Refitting is a reversal of removal. Bleed the hydraulic system as described in Section 2 on completion.

Front wheel speed sensor

36 Apply the handbrake, remove the front wheel trim and slacken the wheel nuts. Jack up the front of the car and support it on axle stands. Remove the front roadwheel.

37 Undo the bolts securing the cable harness support brackets to the steering knuckle and inner wheelarch panel (see illustration).

38 From within the engine compartment, release the wiring connector from its holder, and separate the connector. Release the wheelarch grommet and pull the wiring through to the wheelarch.

39 Undo the bolt securing the sensor to the sensor bracket on the steering knuckle, and carefully prise the sensor out of the bracket.

40 Release the sensor wiring from the support bracket, and remove the unit from the car.

41 Undo the two bolts and remove the sensor bracket from the steering knuckle.

42 Prior to refitting, clean the sensor, sensor

bracket and the mounting area on the steering knuckle, removing all traces of dirt and grit.

43 Refitting is a reversal of removal. Lubricate the sensor and sensor bracket with Rocol J166 or Molykote FB180, and ensure that the bracket bosses face the hub when fitting. Tighten all bolts to the specified torque, and check the sensor-to-reluctor ring clearance, which should be as given in the Specifications.

Rear wheel speed sensor

44 Chock the front wheels, remove the rear wheel trim and slacken the wheel nuts. Jack up the rear of the car and support it on axle stands. Remove the rear roadwheel.

45 Working in the luggage compartment on the left-hand side, release the turnbuckle and lift off the cover over the electronic control unit (early systems only) (see illustration).

46 Remove the left-hand side inner trim panel.

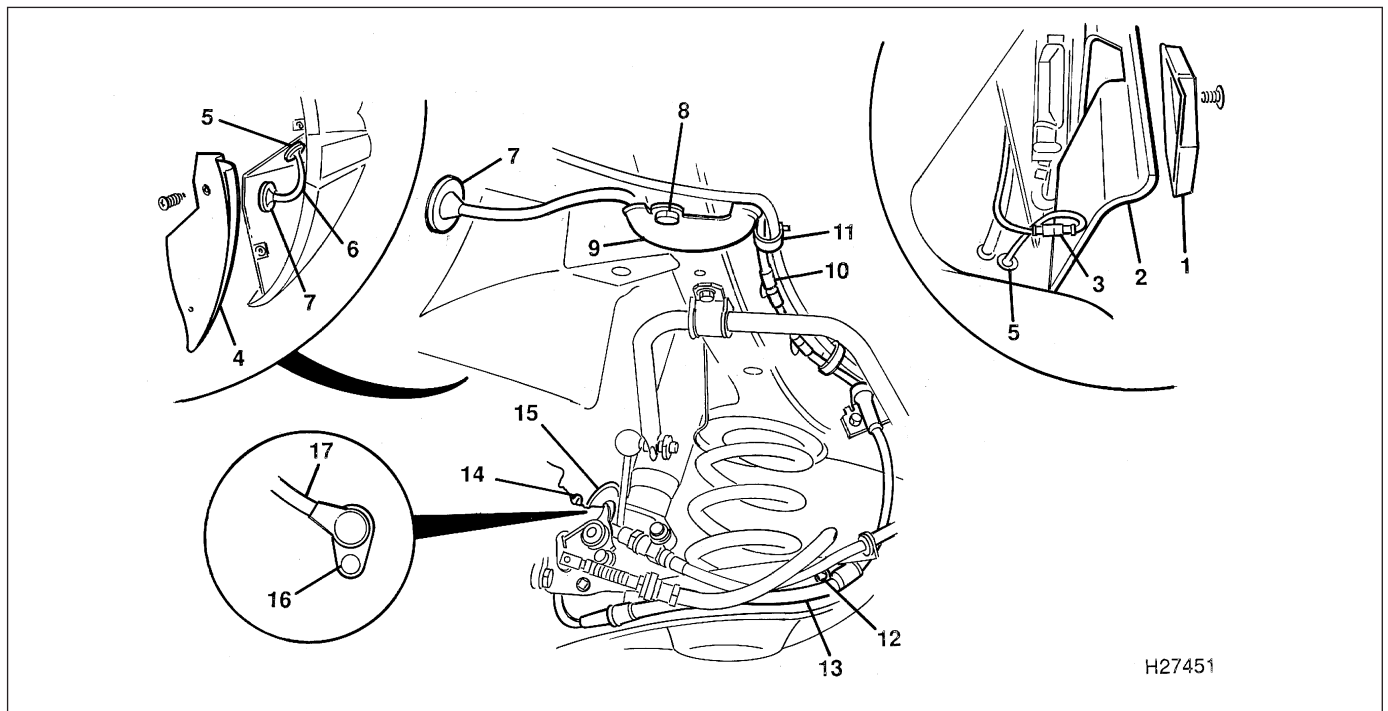
47 Disconnect the wheel speed sensor wiring at the cable connector.

48 Undo the two screws and remove the plastic liner on the front face of the rear wheelarch.

49 Release the grommets in the luggage compartment floor and inner wheelarch, then pull the wiring through to the wheelarch.

50 Undo the two bolts and remove the cable cover and guide from the chassis member.

51 Release the cable ties and retaining clips



25.45 ABS rear wheel speed sensor attachments

- | | | |
|-------------------------------------|---------------------------|--|
| 1 Electronic control unit cover | 7 Inner wheelarch grommet | 13 Cable harness support bracket on suspension arm |
| 2 Left-hand side trim panel | 8 Cover bolts | 14 Handbrake linkage cover bolts |
| 3 Cable connector | 9 Cable cover and guide | 15 Handbrake linkage cover |
| 4 Rear wheelarch plastic liner | 10 Cable retaining clip | 16 Sensor-to-bracket retaining bolt |
| 5 Luggage compartment floor grommet | 11 Cable tie | 17 Wheel speed sensor |
| 6 Sensor wiring | 12 Support bracket bolt | |

securing the sensor wiring to the chassis member.

52 Undo the three bolts securing the cable harness support bracket to the rear suspension arm.

53 Undo the three bolts and remove the handbrake linkage cover from the brake caliper.

54 Undo the bolt securing the sensor to the sensor bracket on the hub carrier, and carefully prise the sensor out of the bracket.

55 Manipulate the sensor and wiring out from under the wheelarch, and remove it from car.

56 Prior to refitting, clean the sensor, sensor

bracket and the mounting area on the hub carrier, removing all traces of dirt and grit.

57 Refitting is a reversal of removal. Lubricate the sensor and sensor bracket with Rocol J166 or Molykote FB180, and tighten all bolts to the specified torque. Check the sensor-to-reluctor ring clearance, which should be as given in the Specifications.

Wheel speed sensor reluctor rings

58 The reluctor rings for the front and rear wheel speed sensors are an integral part of the driveshaft outer constant velocity joints

(front) and rear wheel hub flanges (rear), and cannot be renewed separately.

59 If a reluctor ring is damaged, or in any way unserviceable, a new driveshaft outer constant velocity joint or rear hub flange must be obtained as applicable. Removal and refitting procedures are covered in Chapters 8 and 10 respectively.

ABS copy valve

60 Removal and refitting procedures for the copy valve fitted to the later type ABS system are the same as those for the pressure-reducing valve used on the standard braking system. Refer to Section 14 for details.