

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



Specifications

Front brakes

Type	Disc with single-piston sliding calipers
Disc diameter	257 mm
Disc thickness (new):	
1.2, 1.4 and 1.6 litre (manual) models	11.80 to 12.10 mm
1.6 litre (automatic) and 1.8 litre models	19.80 to 20.10 mm
Minimum disc machining thickness:	
1.2, 1.4 and 1.6 litre (manual) models	11.10 mm
1.6 litre (automatic) and 1.8 litre models	18.55 mm
Minimum disc thickness (wear limit):	
1.2, 1.4 and 1.6 litre (manual) models	10.20 mm
1.6 litre (automatic) and 1.8 litre models	18.20 mm
Maximum disc runout	0.15 mm (2.0 mm from outer edge)
Brake pad friction material minimum thickness	1.5 mm

Rear drum brakes

Drum inner diameter (new):	
1.2 and 1.4 litre models (without ABS)	180.00 to 180.25 mm
1.2 and 1.4 litre models (with ABS)	203.10 to 203.40 mm
1.6 and 1.8 litre models	203.10 to 203.40 mm
Maximum drum machining diameter:	
1.2 and 1.4 litre models (without ABS)	180.95 mm
1.2 and 1.4 litre models (with ABS)	204.10 mm
1.6 and 1.8 litre models	204.10 mm
Maximum drum diameter (wear limit):	
1.2 and 1.4 litre models (without ABS)	181.35 mm
1.2 and 1.4 litre models (with ABS)	204.70 mm
1.6 and 1.8 litre models	204.70 mm
Minimum shoe lining thickness	1.5 mm

Anti-lock braking system

Type	Teves MK20	
Torque wrench settings	Nm	lb ft
Bleed screw	6	4
Brake disc locating studs	12	9
Brake drum locating studs	12	9
Brake pedal pivot bolt	30	22
Brake pipe union	14	10
Caliper heat shield securing bolts	5	4
Front caliper bracket-to-hub carrier bolts	53	39
Front caliper-to-caliper bracket guide bolts	12	9
Hub carrier to strut	70	52
Pedal bracket mounting	15	11
Rear wheel cylinder mounting bolts	10	7
Roadwheel bolts	86	63

1 General information

1 The braking system is of vacuum servo-assisted, dual-circuit hydraulic type. The arrangement of the hydraulic system is such that each circuit operates one front and one rear brake from a tandem master cylinder. Under normal circumstances, both circuits operate in unison. However, in the event of hydraulic failure in one circuit, full braking force will still be available at two diagonally-opposite wheels.

2 All models are fitted with front disc brakes and rear drum brakes. The front disc brakes are actuated by single-piston sliding type calipers. The rear drum brakes incorporate leading and trailing shoes, which are actuated by twin-piston wheel cylinders. A self-adjust mechanism is incorporated, to automatically compensate for brake shoe wear. As the brake shoe linings wear, the footbrake operation automatically operates the adjuster mechanism, which effectively lengthens the shoe strut and repositions the brake shoes, to remove the lining-to-drum clearance.

3 The mechanical handbrake linkage operates the brake shoes via a lever attached to the trailing brake shoe.

4 Load sensitive proportioning valves operate on the rear brake hydraulic circuits, to prevent the possibility of the rear wheels locking before the front wheels under heavy braking.

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 doubt about their condition, and use only genuine FIAT replacement parts, or at least those of known good quality. Note the warnings given in *Safety first!* and at relevant points in this Chapter concerning the dangers of asbestos dust and hydraulic fluid.

Models with anti-lock braking system (ABS)

5 Available as an option on certain models, the anti-lock braking system prevents skidding

which not only optimises stopping distances but allows full steering control to be maintained under maximum braking. The ABS system is operative while the vehicle is travelling both forwards and rearwards. During aquaplaning the ABS system temporarily switches itself off, as it detects a faulty condition where the driving wheels rotate at a higher speed than the driven wheels.

6 By electronically monitoring the speed of each roadwheel in relation to the other wheels, the system can detect when a wheel is about to lock-up, before control is actually lost. The brake fluid pressure applied to that wheel's brake caliper is then decreased and restored (or modulated) several times a second until control is regained.

7 The system components comprise an Electronic Control Unit (ECU), four wheel speed sensors, a hydraulic unit, recycling pump, brake lines and dashboard mounted warning lamps. The ECU is located beneath the hydraulic unit, and the recycling pump is located on top of the hydraulic unit, the assembly being mounted in the left-hand side of the engine compartment.

8 The hydraulic unit incorporates a tandem master cylinder, a valve block which modulates the pressure in the brake hydraulic circuits during ABS operation, an accumulator which provides a supply of highly pressurised brake fluid, a hydraulic pump to charge the accumulator and an integral electronic control unit (ECU).

9 The four wheel sensors are mounted on the wheel hubs. The ECU uses the signals produced by the sensors to calculate the rotational speed of each wheel.

10 The ECU has a self-diagnostic capability and will inhibit the operation of the ABS if a fault is detected, lighting the dashboard mounted warning lamp. The braking system will then revert to conventional, non-ABS operation. If the nature of the fault is not immediately obvious upon inspection, the vehicle must be taken to a FIAT dealer, who will have the diagnostic equipment required to interrogate the ABS ECU electronically and pinpoint the problem.

11 As from 10/97 (chassis number 4535478-on) an additional electronic control was added to the ABS. The system is referred to as EBD

(Electronically-operated Brake force Distribution) and it automatically controls the brake pressure between the front and rear brake hydraulic circuits at all times, as against control only during emergency braking for the ABS. Models with EBD are not fitted with a load sensitive proportioning valve.

12 On models with EBD, the failure warning light function is slightly different to that on models with only ABS. Failure of the ABS system only, causes the ABS warning light to come on. Failure of the EBD system causes both the ABS and handbrake warning lights to come on. If the handbrake warning light only comes on, this indicates that the hydraulic brake fluid is low or that the handbrake lever is not fully released.

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. 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.

General

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 switch off the engine. Alternatively, position the car over a pit or on car ramps.

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 MAX level line; refit the cap loosely. 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 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 should be done working in the following sequence:

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

Note: When bleeding the rear brakes on a vehicle fitted with load proportioning valves: if the rear of the vehicle has been jacked up to allow access to the brake wheel cylinder, the rear suspension must be compressed so that the load proportioning valves remain open throughout the bleeding process.

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. 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 MIN level line throughout the procedure.

16 Unscrew the bleed screw approximately half a turn, then have the assistant fully depress the brake pedal and hold it down. Tighten the bleed screw and have the brake pedal slowly released. The assistant should maintain pedal pressure, following the pedal down to the floor, 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 (**see illustration**).

17 Repeat the procedure given in paragraph 16, 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 approximately five seconds between cycles for the master cylinder passages to refill. It may also be necessary to 'pump' the brake pedal vigorously initially, in order to force the fluid into the brake lines.

18 When no more air bubbles appear, tighten the bleed screw securely, remove the tube and spanner, and refit the dust cap. Do not overtighten the bleed screw.

19 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

20 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.

21 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.

22 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 MIN level line at all times.

Bleeding - using a pressure-bleeding kit

23 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.

24 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.

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

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

All methods

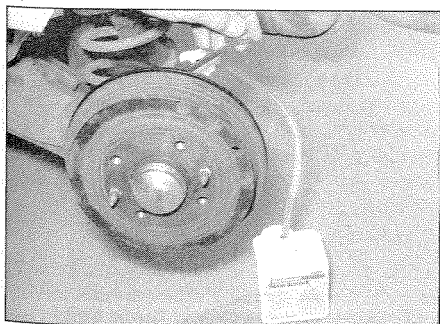
27 When bleeding is complete, and firm pedal feel is restored, wash off any spilt fluid, tighten the bleed screws securely, and refit their dust caps.

28 Check the hydraulic fluid level in the master cylinder reservoir, and top-up if necessary (*Weekly checks*).

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

30 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.

31 On models with ABS, the brake hydraulic system is bled using exactly the same method as for non-ABS models, however it will take longer.

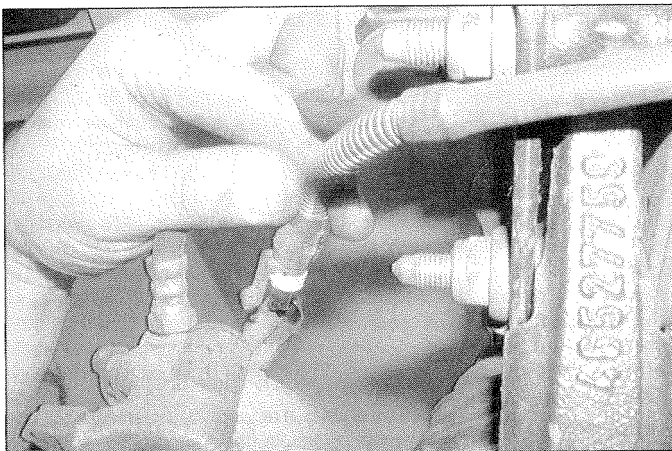


2.16 Bleeding a rear brake line

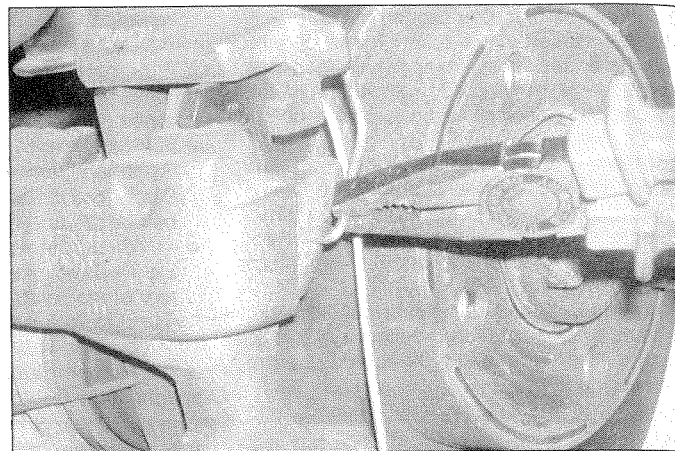
3 Hydraulic pipes and hoses - renewal

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

1 If any pipe or hose is to be renewed, minimise fluid loss by first removing the



4.2 Disconnecting the brake pad wear sensor wiring



4.3 Removing the anti-rattle spring from the front brake caliper

master cylinder reservoir cap, then tighten the cap down onto a piece of polythene to obtain an airtight seal. Alternatively, flexible hoses can be sealed, if required, using a proprietary brake hose clamp. Metal brake pipe unions can be plugged (if care is taken not to allow dirt into the system) or capped immediately they are disconnected. Place a wad of rag under any union that is to be disconnected, to catch any spilt fluid.

2 If a flexible hose is to be disconnected, unscrew the brake pipe union nut before removing the spring clip which secures the hose to its mounting bracket.

3 To unscrew the union nuts, it is preferable to obtain a special brake pipe split spanner. These are available from most motor accessory shops. Failing this, a close-fitting open-ended spanner will be required, though if the nuts are tight or corroded, their flats may be rounded-off if the spanner slips. In such a case, a self-locking wrench is often the only way to unscrew a stubborn union, but it follows that the pipe and the damaged nuts must be renewed on reassembly. Always clean a union and surrounding area before disconnecting it. If disconnecting a component with more than one union, make a careful note of the connections before disturbing any of them.

4 If a brake pipe is to be renewed, it can be obtained, cut to length and with the union

nuts and end flares in place, from FIAT dealers. All that is then necessary is to bend it to shape, following the line of the original, before fitting it to the vehicle. Alternatively, most motor accessory shops can make up brake pipes from kits, but this requires very careful measurement of the original, to ensure that the replacement is of the correct length. The safest answer is usually to take the original to the shop as a pattern.

5 On refitting, do not overtighten the union nuts. If possible, use a torque wrench to ensure they are tightened correctly.

6 Ensure that the pipes and hoses are correctly routed, with no kinks, and that they are secured in the clips or brackets provided. After fitting, remove the polythene from the reservoir, and bleed the hydraulic system as described in Section 2. Wash off any spilt fluid, and check carefully for fluid leaks.

4 Front brake pads - renewal



Warning: Renew BOTH sets of front brake pads at the same time - NEVER renew the pads on only one wheel, as uneven braking may result. Note that the dust created by wear of the pads 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 petrol or petroleum-based solvents to clean brake parts; use proprietary brake cleaner or methylated spirit only.

1 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the front roadwheels.

2 If removing the left-hand front brake pads, disconnect the wiring connector from the brake pad wear sensor connector, and release the wire from the clip (see *illustration*).

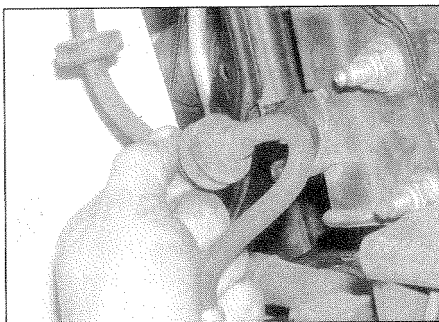
3 Using a pair of pliers, unclip the anti-rattle spring and remove it from the brake caliper (see *illustration*).

4 Release the hydraulic line support grommet from the strut (see *illustration*).

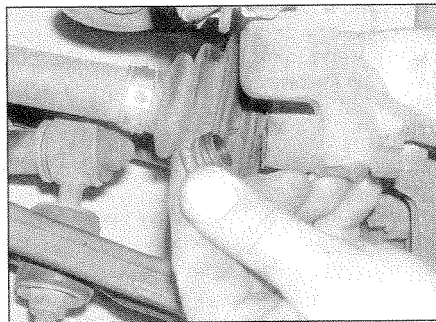
5 Remove the end caps from the guide bushes to gain access to the caliper guide pin bolts (see *illustration*).

6 Unscrew and remove the caliper guide bolts, then lift the caliper and inner pad away from the mounting bracket (see *illustrations*). Tie the caliper to the suspension strut using a piece of wire. Do not allow it to hang unsupported on the flexible brake hose.

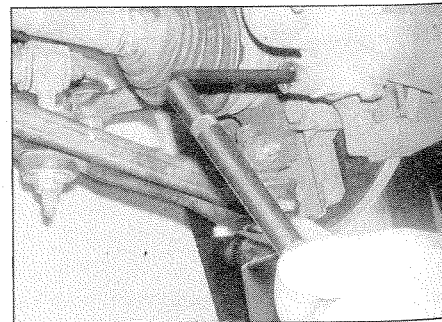
7 Unclip the inner pad from the caliper piston



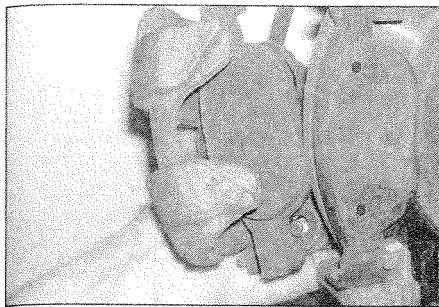
4.4 Releasing the hydraulic line support grommet from the strut



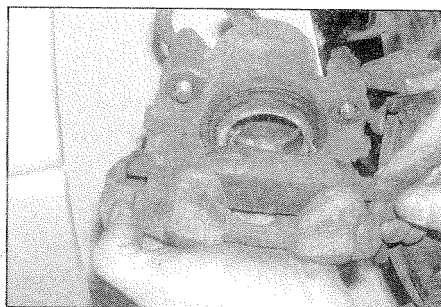
4.5 Removing the guide bush end caps



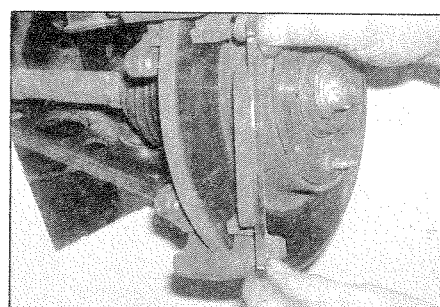
4.6a Unscrew the caliper guide bolts ...



4.6b ... then lift the caliper and inner pad from the mounting bracket



4.7a Unclip the inner pad from the caliper piston ...



4.7b ... and the outer pad from the mounting bracket

and remove the outer pad from the mounting bracket (see illustrations).

8 Measure the thickness of each brake pad's friction material. If either pad is worn at any point to the specified minimum thickness or less, all four pads must be renewed. Also, the pads should be renewed if any are contaminated with oil or grease.

9 If the brake pads are still serviceable, carefully clean them using a clean, fine wire brush or similar, paying particular attention to the sides and back of the metal backing. Clean out the grooves in the friction material, and pick out any large embedded particles of dirt or debris. Clean the pad locations in the caliper mounting bracket.

10 Prior to fitting the pads, check that the guide pin bolts are free to slide easily in the caliper body bushes, and are a reasonably tight fit. Brush the dust and dirt from the caliper and piston, but **do not** inhale it, as it is injurious to health. Inspect the dust seal around the piston for damage, and the piston for evidence of fluid leaks, corrosion or damage. If attention to any of these components is necessary, refer to Section 8.

11 If new brake pads are to be fitted, the caliper piston must be pushed back into the cylinder to make room for them. Either use a G-clamp or similar tool, or use suitable pieces of wood as levers. Provided that the master cylinder reservoir has not been overfilled with hydraulic fluid, there should be no spillage, but keep a careful watch on the fluid level while retracting the piston. If the fluid level rises above the MAX level line at any time, the surplus should be siphoned off or ejected via a plastic tube connected to the bleed screw. **Note:** Do not

siphon the fluid by mouth, as it is poisonous; use a syringe or an old poultry baster.

12 Apply a little brake copper grease to the back of the outer brake pad and to the upper and lower edges of both pads which contact the caliper. Do not apply excessive amounts.

13 Clip the inner pad into the caliper piston and fit the outer pad to the mounting bracket, ensuring its friction material is against the brake disc.

14 Manoeuvre the caliper into position over the pads, then apply a little copper grease to the caliper guide bolts, insert them, and tighten them to the specified torque setting.

15 Refit the end caps to the caliper guide bushes and locate the brake pad wear wiring in its clip.

16 Fit the anti-rattle spring, ensuring its ends are correctly located in the caliper body holes.

17 Ensure the wiring is correctly routed then reconnect the brake pad wear wiring to the main loom.

18 Depress the brake pedal repeatedly, until the pads are pressed into firm contact with the brake disc, and normal (non-assisted) pedal pressure is restored.

19 Repeat the above procedure on the remaining front brake caliper.

20 Refit the roadwheels, then lower the vehicle to the ground and tighten the roadwheel bolts to the specified torque setting.

21 Check the hydraulic fluid level as described in *Weekly Checks*.

Note: New pads will not give full braking efficiency until they have bedded in. Be prepared for this, and avoid hard braking as far as possible for the first hundred miles or so after pad renewal.

5 Rear brake shoes - renewal



Warning: Renew **BOTH** sets of rear brake shoes at the same time - **NEVER** renew the shoes on only one wheel, as uneven braking may result. Note that 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 petrol or petroleum-based solvents to clean brake parts; use proprietary brake cleaner or methylated spirit only.

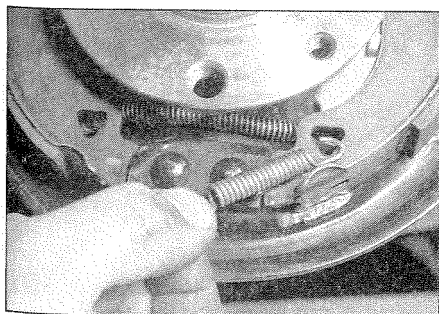
Early models (with round steady springs)

1 Remove the rear brake drums, as described in Section 7.

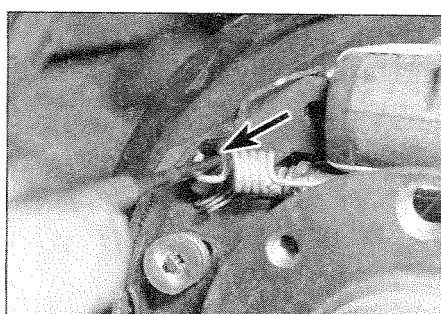
2 Working on one side of the vehicle, brush the dirt and dust from the brake shoes and backplate, and from the drum. Avoid inhaling the dust, as it may contain asbestos, which is a health hazard.

3 Note the position of each shoe, and the location of the return and steady springs. Also make a note of the adjuster component locations, to aid refitting later. It is advisable, at this stage to wrap a stout rubber band or a cable tie over the wheel cylinder to prevent the pistons from being accidentally ejected.

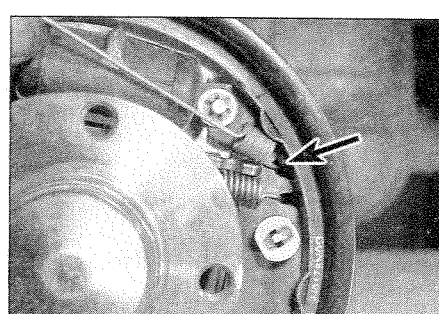
4 Detach the upper and lower return springs from both brake shoes (see illustrations).



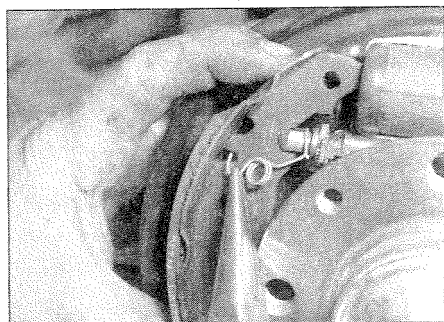
5.4a Detaching the lower return spring



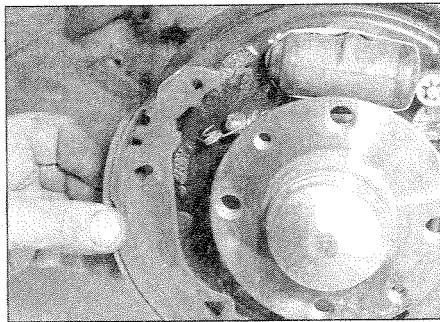
5.4b Detaching the upper return spring from the leading ...



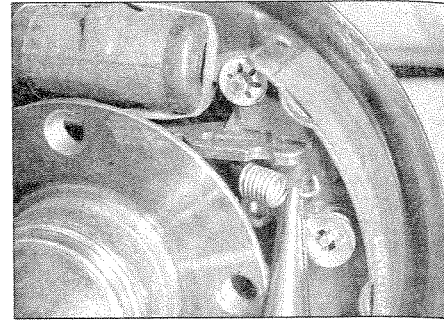
5.4c ... and trailing brake shoes



5.5 Unhook the self-adjuster mechanism return spring from the leading brake shoe



5.6 Carefully pull the leading brake shoe away from the backplate and remove it



5.7a Unhook the self-adjuster mechanism from the trailing shoe . . .

5 Unhook the self-adjuster mechanism return spring from the leading brake shoe (**see illustration**). Remove the hold-down cup and spring from the leading shoe. The spring cups are a bayonet-style fit - use a large pair of pliers to depress and then turn them through 90°. Remove the pin.

6 Carefully pull the leading brake shoe away from the backplate and remove it (**see illustration**).

7 Using a suitable pair of pliers, unhook the self-adjuster mechanism from the trailing shoe and remove it (**see illustrations**).

8 Remove the hold-down cup and spring from the trailing shoe, using a large pair of pliers, as described for the leading shoe.

Remove the pin. Lift the trailing shoe away from the backplate, and disconnect the handbrake cable from the brake shoe lever (**see illustration**).

9 Thoroughly clean the surface of the backplate using brake component cleaner to remove all traces of dust and old lubricant. Examine all components for signs of corrosion.

10 Apply brake grease sparingly to the shoe contact surfaces of the brake backplate (**see illustration**).

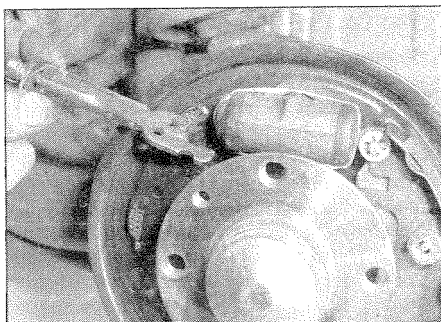
11 Connect the handbrake cable to the lever on the trailing brake shoe, locate the trailing shoe on the backplate and secure in position with the pin, hold down

spring and cup. Using pliers, turn the cup through 90° and then release it, to lock it in position.

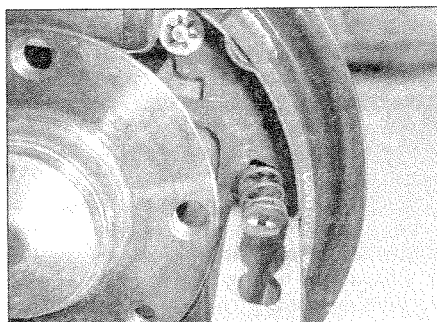
12 Fit the self-adjuster mechanism into the recess in the trailing brake shoe and anchor the retaining spring in the slot provided in the shoe (**see illustration**).

13 Fit the leading shoe in position on the backplate and secure it with the hold down pin, spring and cup as described for the trailing shoe. Engage the end of the self-adjuster mechanism with the recess in the leading brake shoe. Hook the retaining spring into the slot provided.

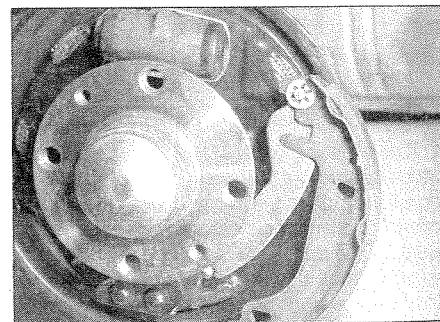
14 Fit the upper and lower shoe return springs, engaging them with the slots in the



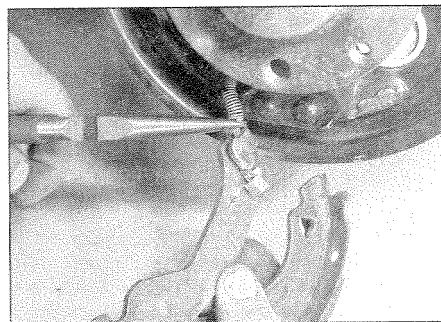
5.7b . . . and remove it



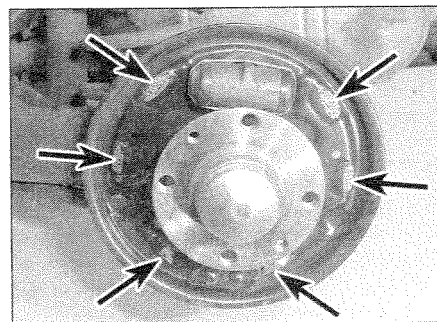
5.8a Remove the hold-down cup and spring from the trailing shoe



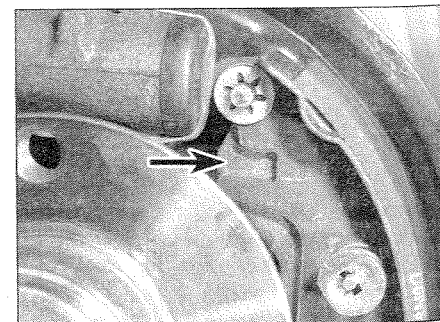
5.8b Lift the trailing shoe away from the backplate . . .



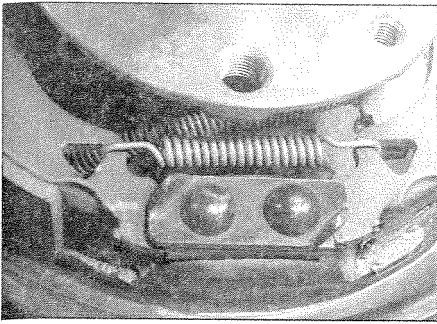
5.8c . . . and disconnect the handbrake cable from the brake shoe lever



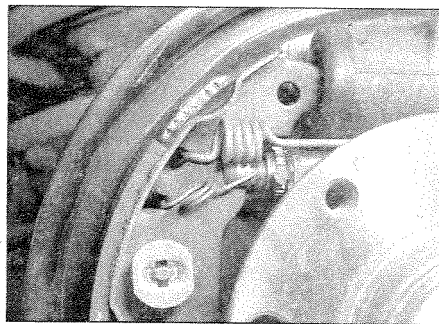
5.10 Apply brake grease sparingly to the shoe contact surfaces (arrowed) of the brake backplate



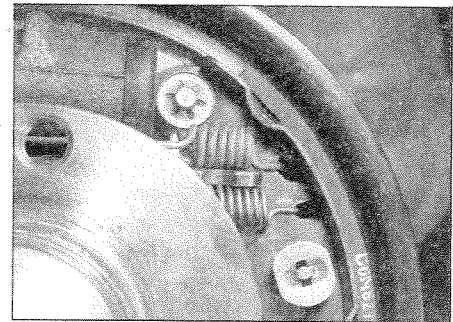
5.12 Fit the self-adjuster mechanism into the recess (arrowed) in the trailing brake shoe



5.14a Lower return spring fitted in place



5.14b Correct location of upper return spring in leading shoe ...



5.14c ... and trailing shoe

shoes as shown (**see illustrations**). Remove the elastic band from the wheel cylinder.

15 Turn the serrated wheel at the end of the self-adjuster mechanism, to retract the brake shoes - this will give additional clearance to allow the drum to pass over the shoes during refitting.

16 Repeat the procedure on the remaining side of the vehicle.

17 Refit the brake drums as described in Section 7. Check and if necessary adjust the operation of the handbrake, as described in Section 14.

18 Apply the brake pedal and handbrake lever several times to settle the self-adjusting mechanism. With both rear roadwheels refitted and the rear of the vehicle still raised,

turn the wheels by hand to check that the brake shoes are not binding.

19 Lower the vehicle to the ground and thoroughly check the operation of the braking system.

Late models (with square steady springs)

20 Remove the rear brake drums, as described in Section 7.

21 Working on one side of the vehicle, brush the dirt and dust from the brake shoes and backplate, and from the drum. Avoid inhaling the dust, as it may contain asbestos, which is a health hazard.

22 Note the position of each shoe, and the location of the return and steady springs. Also make a note of the adjuster component

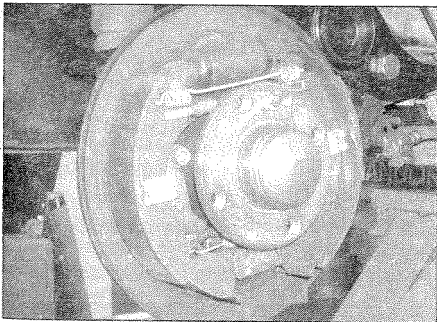
locations, to aid refitting later (**see illustration**). It is advisable, at this stage to wrap a stout rubber band or a cable tie over the wheel cylinder to prevent the pistons from being accidentally ejected.

23 Using a pair of pliers, release the leading brake shoe steady spring from its pin, and remove the pin (**see illustrations**).

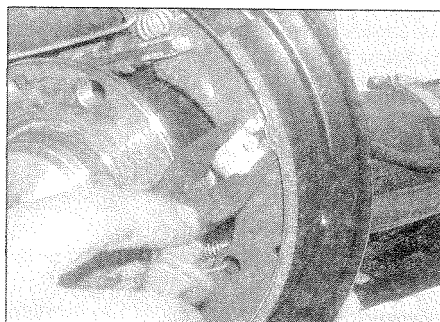
24 Lever the bottom of the leading brake shoe from its anchor, then disconnect the bottom return spring from both brake shoes (**see illustration**).

25 Move the bottom end of the leading shoe rearwards to expand the top end from the wheel cylinder (**see illustration**).

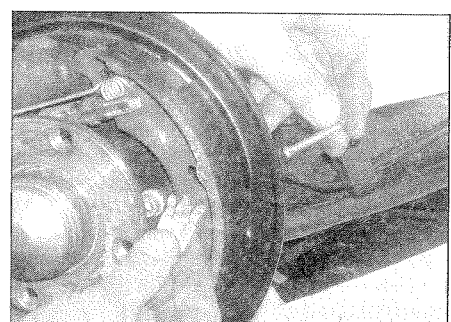
26 Unhook and remove the upper return spring from both shoes, then remove the leading brake shoe (**see illustration**).



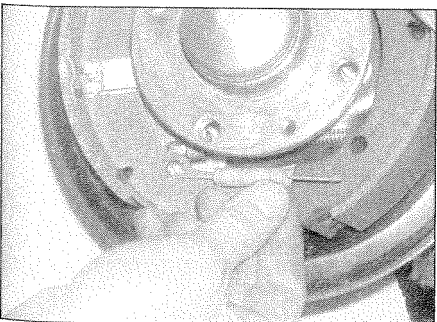
5.22 Note the position of the brake shoes and springs before removing them



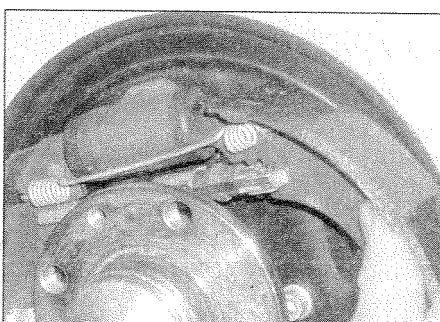
5.23a Use a pair of pliers to release the leading brake shoe steady spring from its pin ...



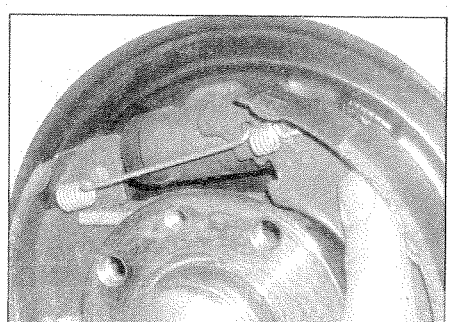
5.23b ... then remove the spring and pin



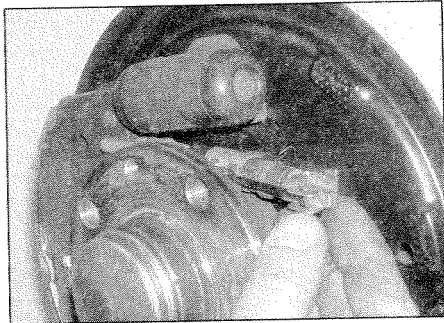
5.24 Disconnecting the bottom return spring



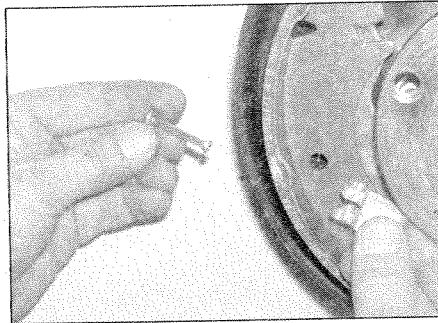
5.25 Releasing the top end of the leading shoe from the wheel cylinder



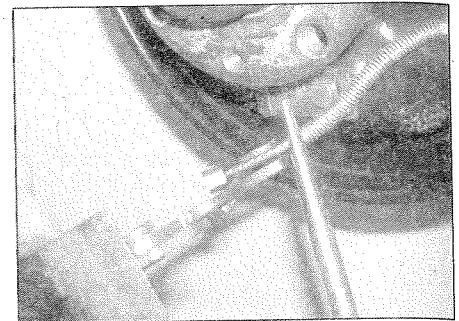
5.26 Unhooking the upper return spring and removing the leading shoe



5.27 Removing the self-adjuster mechanism from the trailing shoe



5.28 Removing the trailing brake shoe steady spring and pin



5.29 Disconnecting the handbrake cable from the lever on the back of the trailing shoe

27 Remove the self-adjuster mechanism from the trailing shoe (see illustration).

28 Using the pliers, release the trailing brake shoe steady spring from its pin, and remove the pin (see illustration).

29 Turn over the trailing brake shoe and use a pair of pliers to disconnect the handbrake cable from the lever on the back of the shoe (see illustration).

30 Thoroughly clean the surface of the backplate using brake component cleaner to remove all traces of dust and old lubricant. Examine all components for signs of corrosion.

31 Apply brake grease sparingly to the shoe contact surfaces of the brake backplate (see illustration 5.10).

32 Connect the handbrake cable to the lever on the back of the new trailing brake shoe. Use a pair of long-nosed pliers to hold the spring away from the end of the cable while it is being connected.

33 Offer the trailing shoe up to the backplate and secure in position with the pin and steady spring.

34 Before refitting the self-adjuster mechanism, fully screw in the adjustment screw so that the mechanism is set to its minimum length. Apply a little brake grease to the metal contact faces of both brake shoes, self-adjuster mechanism and handbrake lever (see illustration).

35 Refit the self-adjuster mechanism to the trailing shoe, making sure it is the correct way round.

36 Locate the leading shoe on the backplate

and engage it with the self-adjuster mechanism. Refit the upper return spring.

37 Locate the bottom of the trailing shoe on its anchor, then refit the bottom return spring and lever the leading shoe onto the anchor.

38 Refit the steady spring and pin to the leading shoe. Remove the elastic band from the wheel cylinder.

39 Repeat the procedure on the remaining side of the vehicle.

40 Refit the brake drums as described in Section 7. Check and if necessary adjust the operation of the handbrake, as described in Section 14.

41 Apply the brake pedal and handbrake lever several times to settle the self-adjusting mechanism. With both rear roadwheels refitted and the rear of the vehicle still raised, turn the wheels by hand to check that the brake shoes are not binding.

42 Lower the vehicle to the ground and thoroughly check the operation of the braking system.

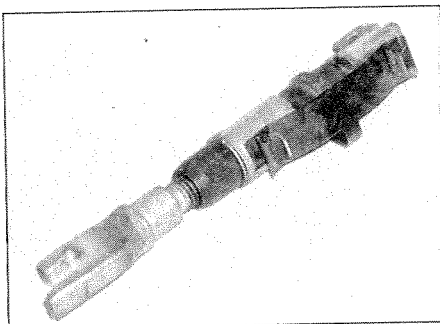
6 Front brake disc - inspection, removal and refitting



Warning: Before starting work, refer to the warning at the beginning of Section 4 concerning the dangers of asbestos dust.

Inspection

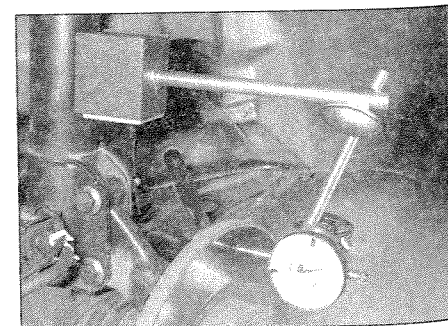
Note: If either disc requires renewal, BOTH



5.34 The rear brake self-adjuster mechanism



6.3 Measuring the brake disc thickness with a micrometer



6.4 Brake disc runout measurement - DTI gauge method

should be renewed at the same time, to ensure even and consistent braking. New brake pads should also be fitted.

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

2 Slowly rotate the brake disc so that the full area of both sides can be checked; remove the brake pads if better access is required to the inboard surface. Light scoring is normal in the area swept by the brake pads, but if heavy scoring or cracks are found, the disc must be renewed.

3 It is normal to find a lip of rust around the disc's perimeter, and this can be scraped off if required. If, however, a lip has formed due to excessive wear of the brake pad swept area, then the disc's thickness must be measured using a micrometer (see illustration). Take measurements at several places around the disc, at the inside and outside of the pad swept area. If the disc has worn at any point to the specified minimum thickness or less, the disc must be renewed.

4 If the disc is thought to be warped, it can be checked for run-out. First make sure that the two disc retaining studs are tight. Either use a dial gauge mounted on any convenient fixed point, while the disc is slowly rotated, or use feeler blades to measure (at several points all around the disc) the clearance between the disc and a fixed point, such as the caliper mounting bracket (see illustration). If the measurements obtained are at the specified maximum or beyond, the disc is excessively

warped, and must be renewed. However, it is worth checking first that the hub bearing is in good condition.

5 Check the disc for cracks, especially around the wheel bolt holes, and any other wear or damage, and renew if necessary.

Removal

6 Remove the brake pads (Section 4) then unbolt and remove the caliper mounting bracket from the hub carrier. Alternatively, leave the caliper attached to the mounting bracket and unbolt the bracket from the hub carrier (see illustrations).

7 Unscrew and remove the two disc retaining studs and withdraw the disc from the hub (see illustrations). If it is tight, lightly tap its rear face with a hide or plastic mallet to free it from the hub.

Refitting

8 Refitting is the reverse of the removal procedure, noting the following points:

- Ensure that the mating surfaces of the disc and hub are clean.
- If a new disc has been fitted, use a suitable solvent to wipe any preservative coating from the disc, before refitting the caliper. Note that new brake pads should be fitted when the disc is renewed.
- Tighten all bolts to the specified torque where given.

7 Rear brake drum - removal, inspection and refitting

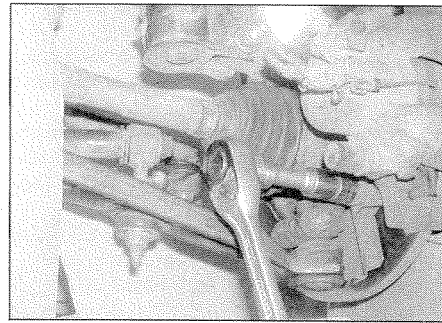


Warning: Before starting work, refer to the warning at the beginning of Section 4 concerning the dangers of asbestos dust.

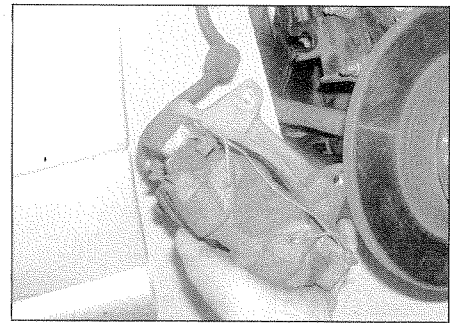
Removal

1 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove both rear roadwheels. Fully release the handbrake.

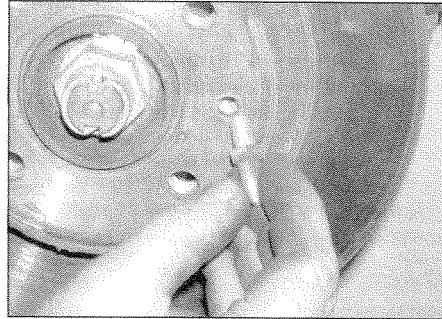
2 Unscrew and remove the two studs and pull the drum from the hub. If the drum is binding on the brake shoes, back off the handbrake adjustment nut located on the



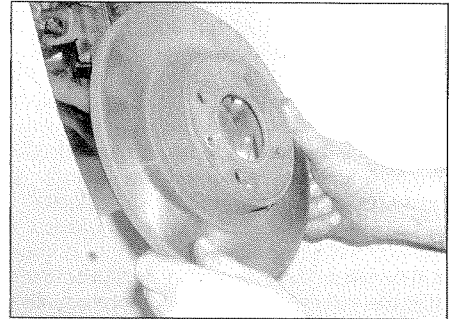
6.6a Unscrew the mounting bolts ...



6.6b ... and withdraw the caliper and mounting bracket from the hub carrier



6.7a Unscrew and remove the disc locating studs ...



6.7b ... and lift off the disc

handbrake lever and try again. If this is unsuccessful, prise the cover from the inside of the backplate, and use a pair of pliers to disconnect the handbrake cable from the lever on the trailing shoe. Using a screwdriver through one of the roadwheel bolt holes, press the handbrake lever from the outside so that it slides down behind the trailing shoe and retracts the shoes. It should now be possible to remove the drum, however if the drum is rusted to the hub, screw two bolts into the drum at the stud locations (the drum threads are larger than the stud threads), and progressively tighten them to force the drum from the hub (see illustrations).

Inspection

Note: If either drum requires renewal, BOTH should be renewed at the same time, to ensure even and consistent braking. New brake shoes should also be fitted.

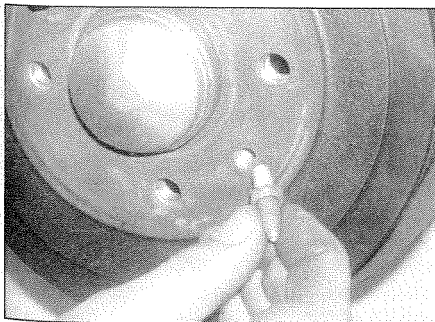
3 Brush all traces of brake dust from the drum and shoes, but *avoid inhaling the dust, as it is a health hazard*.

4 Clean the outside of the drum, and check it for obvious signs of damage. Renew the drum if necessary.

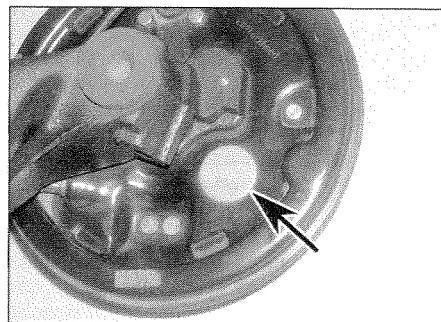
5 Carefully examine the inside of the drum. Light scoring of the friction surface is normal, but if heavy scoring is found, the drum must be renewed.

6 It is usual to find a lip of rust on the drum's inboard edge, which is not in contact with the shoe linings. This rust should be scraped away, otherwise it may cause the brake drum to bind on the shoes when it is being removed at a later date.

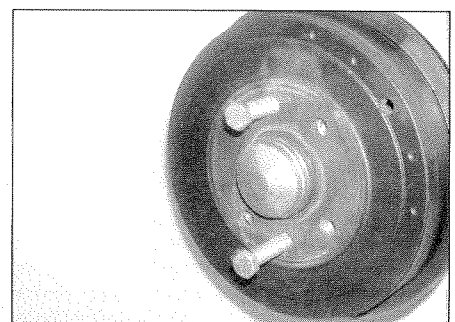
7 If the drum is thought to be excessively worn or oval, its internal diameter must be measured at several points using an internal micrometer. Take measurements in pairs, the second at right-angles to the first, and



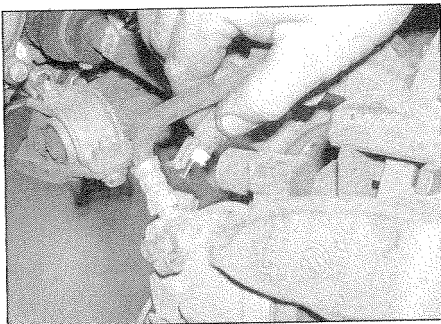
7.2a Removing the drum studs



7.2b Plastic cover on the inside of the backplate



7.2c Using two bolts to force the drum from the hub



8.4 Disconnecting the wiring connector from the brake pad wear sensor

compare the two, to check for signs of ovality. Provided that it does not enlarge the drum beyond the specified maximum diameter, it may be possible to have the drum refinished by skimming or grinding. If this is not possible, the drums on both sides must be renewed. Note that if the drum is to be skimmed, BOTH drums must be refinished to maintain a consistent internal diameter on both sides.

Refitting

8 If a new brake drum is to be fitted, use a suitable solvent to remove any preservative coating that may have been applied to its internal friction surfaces. Note that it may also be necessary to shorten the adjuster strut length, by rotating the strut wheel, to allow the drum to pass over the brake shoes (see Section 5).

9 Refit the brake drum over the shoes and onto the hub, then insert the two locating studs and tighten securely.

10 Depress the footbrake repeatedly to expand the brake shoes against the drum, and check that normal pedal pressure is restored.

11 Check and if necessary adjust the handbrake cable as described in Section 14.

12 Refit the roadwheels, and lower the vehicle to the ground.

8 Front brake caliper - removal, overhaul and refitting



Warning: Before starting work, refer to the notes at the beginning of Sections 2 and 4 concerning the dangers of handling hydraulic fluid and asbestos dust.

Removal

1 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the appropriate front roadwheel.

2 To minimise fluid loss during the following operations, fit a brake hose clamp to the flexible brake hose running to the caliper. Alternatively, remove the master cylinder fluid reservoir cap, and tighten it down onto a

piece of polythene sheeting to obtain an airtight seal.

3 Clean the area around the brake hose union on the caliper, then loosen the union nut half a turn.

4 Disconnect the wiring connector from the brake pad wear sensor connector, and release the wire from the clip (see *illustration*).

5 Using a pair of pliers, unclip the anti-rattle spring and remove it from the brake caliper.

6 Remove the end caps from the guide bushes to gain access to the caliper guide pin bolts.

7 Unscrew and remove the caliper guide bolts, then lift the caliper over the brake pads and away from the mounting bracket.

8 Unscrew the caliper from the hose and place it on the workbench. Plug the hose outlet to prevent loss of brake fluid.

9 Remove the brake pads from the mounting bracket (refer to Section 4 if necessary).

10 Unbolt the caliper mounting bracket from the hub carrier. Note that the bracket mounting bolts are self-locking and should be renewed whenever they are removed.

Overhaul

Note: Before commencing work, ensure that the appropriate caliper overhaul kit is obtained.

11 Clean the exterior of the caliper, then mount it in a vice.

12 Place a small block of wood between the caliper body and the piston. Remove the piston by applying a jet of compressed air (such as that produced by a tyre foot pump) to the fluid inlet port.



Warning: Protect your hands and eyes when using compressed air in this manner - brake fluid may be ejected under pressure when the piston pops out of its bore.

13 Remove the dust seal from the piston, then use a soft, blunt instrument (ie **not** a screwdriver) to extract the piston seal from the caliper bore. Unscrew and remove the bleed screw.

14 Thoroughly clean all components, using only methylated spirit or clean hydraulic fluid. Never use mineral-based solvents such as petrol or paraffin, which will attack the hydraulic system rubber components.

15 The caliper piston seal, the dust seal and the bleed screw dust cap, are only available as part of a seal kit. Since the manufacturers recommend that the piston seal and dust seal are renewed whenever they are disturbed, all of these components should be discarded on disassembly and new ones fitted on reassembly as a matter of course.

16 Carefully examine all parts of the caliper assembly, looking for signs of wear or damage. In particular, the cylinder bore and piston must be free from any signs of scratches, corrosion or wear. If there is any doubt about the condition of any part of the

caliper, the relevant part should be renewed. Note that the piston surface is plated, and **must not** be polished with emery or similar abrasives to remove corrosion or scratches. In addition, the pistons are matched to the caliper bores and can only be renewed as a part of a complete caliper assembly.

17 Check that both guide pins are in good condition and undamaged. They must be a reasonably tight sliding fit in the mounting bracket bores. Remove and clean them, then apply some copper grease and refit them. If necessary, renew the rubber boots.

18 Use compressed air from the tyre pump to blow clear the fluid passages.



Warning: Wear eye protection when using compressed air.

19 Before commencing reassembly, ensure that all components are spotlessly-clean and dry.

20 Dip the new piston seal in clean hydraulic fluid, and fit it to the groove inside the cylinder bore, using your fingers only to manipulate it into place.

21 Fit the new dust seal to the piston groove, then smear clean hydraulic fluid over the surfaces of the piston and cylinder bore. Insert the piston into the cylinder bore with a twisting action to ensure it enters the internal seal correctly. With the piston fully entered, locate the dust seal in the groove on the caliper.

Refitting

22 Clean the mating surfaces, then refit the caliper mounting bracket to the hub carrier. Insert the new self-locking bolts and tighten to the specified torque. Make sure the guide pins are correctly fitted.

23 Carefully screw the caliper onto the hose, and moderately tighten the union nut.

24 Apply a little copper grease to the brake pad backplates as described in Section 4, and locate them on the mounting bracket.

25 Locate the caliper over the brake pads, then refit the guide bolts and tighten to the specified torque while holding the pins stationary with a further spanner. **Note:** Make sure that the flexible brake hose is not twisted. It must not touch any surrounding components throughout its movement from lock to lock.

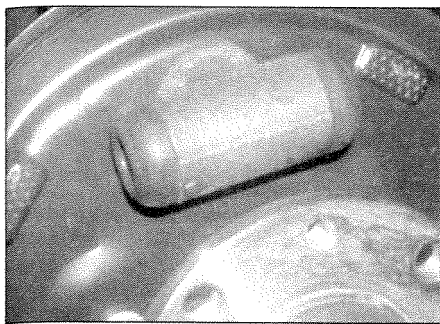
26 Fully tighten the hose union nut to the specified torque.

27 Refit the end caps to the guide bushes.

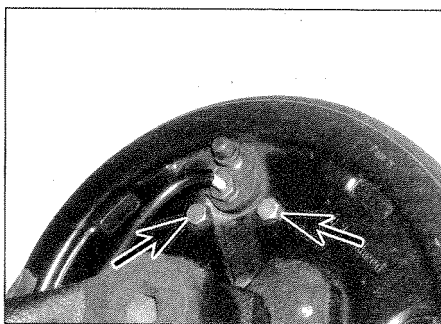
28 Refit the anti-rattle spring making sure that its ends are correctly located in the bracket holes.

29 Reconnect the brake pad wear sensor wiring and secure it in the clip.

30 Remove the brake hose clamp or polythene sheeting, and top up the brake fluid level in the reservoir. Bleed the hydraulic system as described in Section 2. Note that if no other part of the system has been disturbed, it should only be necessary to bleed the relevant front circuit.



9.2 Rear wheel cylinder



9.5 Rear wheel cylinder mounting bolts

31 Refit the roadwheel and lower the vehicle to the ground.

32 Depress the brake pedal repeatedly to bring the pads into contact with the brake disc, and ensure that normal pedal pressure is restored.

9 Rear wheel cylinder - removal, overhaul and refitting



Warning: Before starting work, refer to the notes at the beginning of Sections 2 and 4 concerning the dangers of handling hydraulic fluid and asbestos dust.

Removal

1 Remove the brake drum as described in Section 7.

2 Remove the brake shoes as described in Section 5. Alternatively, pull the upper ends of the brake shoes apart so that the automatic adjustment mechanism holds them away from the wheel cylinder (see illustration).

3 To minimise fluid loss during the following operations, fit a brake hose clamp to the flexible brake hose running to the rear wheel cylinder. Alternatively, remove the master cylinder fluid reservoir cap, and tighten it down onto a piece of polythene sheeting to obtain an airtight seal.

4 Clean the brake backplate around the wheel cylinder mounting bolts and the hydraulic pipe union, then unscrew the union nut and disconnect the hydraulic pipe. Cover the open ends of the pipe and the master cylinder to prevent dirt ingress.

5 Unscrew the mounting bolts (see illustration) then withdraw the wheel cylinder from the backplate.

Overhaul

Note: Before commencing work, obtain the appropriate wheel cylinder overhaul kit.

6 Remove both rubber dust covers from the grooves in the wheel cylinder, then use paint or similar to mark one of the pistons so that the pistons are not interchanged on reassembly.

7 Withdraw both pistons and the spring from the wheel cylinder. Unscrew and remove the bleed screw.

8 Remove and discard the rubber piston seals and the dust covers. These should be renewed as a matter of course, and are available as part of an overhaul kit, which also includes the bleed nipple dust cap.

9 Clean the components thoroughly, using only methylated spirit or clean brake fluid.

10 Check the condition of the cylinder bore and piston surfaces which must be free of scratches, scoring and corrosion. Renew the complete wheel cylinder if there is any doubt.

11 Ensure that all components are clean and dry. The pistons, spring and seals should be fitted wet, using hydraulic fluid as a lubricant.

12 Fit the seals to the pistons, ensuring that they are the correct way round. Use only your fingers to manipulate the seals into position.

13 Fit the first piston to the cylinder, taking care not to distort the seal. If the original pistons are being re-used, the marks made on dismantling should be used to ensure that the pistons are refitted to their original bores.

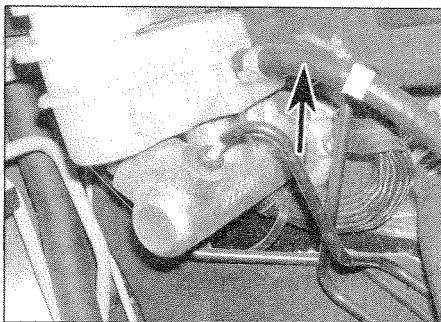
14 Refit the spring and the second piston.

15 Apply a smear of rubber grease to the exposed end of each piston and to the dust cover sealing lips, then fit the dust covers to each end of the wheel cylinder.

Refitting

16 Refitting is a reversal of removal, bearing in mind the following points:

- a) Tighten the mounting bolts to the specified torque.



10.7 Clutch fluid supply pipe on the brake fluid reservoir

b) Refit the brake shoes as described in Section 5, and the brake drum as described in Section 7.

c) Before refitting the roadwheel and lowering the vehicle to the ground, bleed the hydraulic system as described in Section 2. Note that if no other part of the system has been disturbed, it should only be necessary to bleed the relevant rear circuit.

10 Master cylinder - removal, overhaul and refitting



Warning: Before starting work, refer to the note at the beginning of Section 2 concerning the dangers of handling hydraulic fluid.

Removal

Right-hand drive models

1 Loosen the clips and disconnect the throttle body air duct from the air cleaner. Disconnect the crankcase ventilation hose from the duct, then unscrew the nuts and remove the duct from the top of the throttle body.

2 Undo the screw and remove the relay cover.

3 Unscrew the two bolts holding the relay bracket to the bulkhead, then disconnect the small wiring plug beneath it, and move the bracket to one side. Make sure that any electrical terminals are kept insulated from the surrounding components.

4 Release the retaining stud and pull out the lining from the right-hand side of the bulkhead for access to the master cylinder.

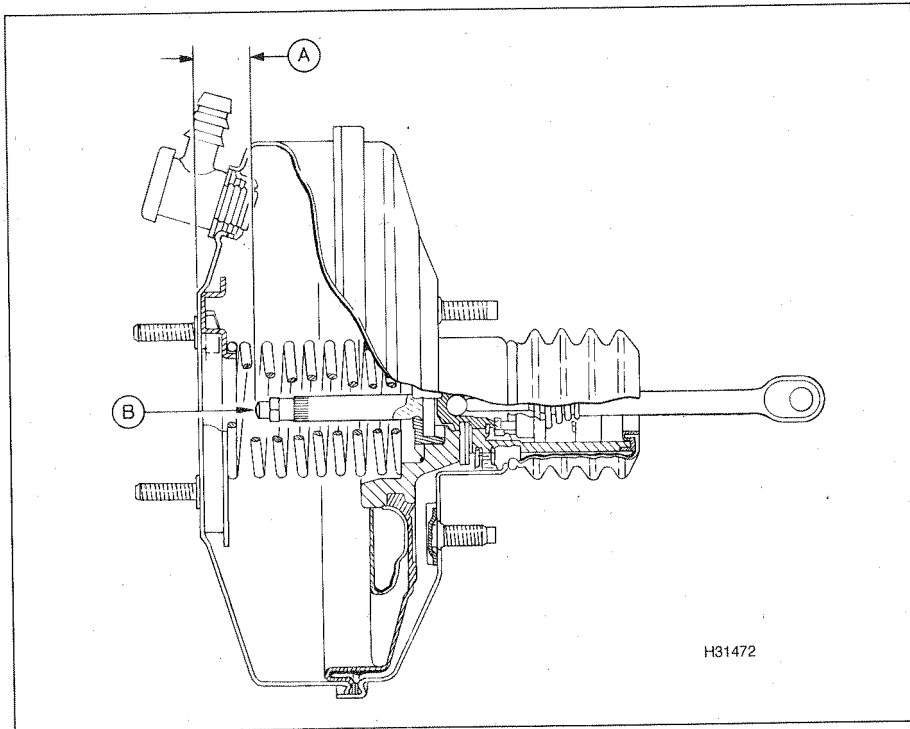
5 Disconnect the wiring from the low fluid level unit, then unscrew and remove the cap from the top of the reservoir.

6 Syphon or draw the brake fluid from the reservoir. **Note:** Do not syphon the fluid by mouth, as it is poisonous; use a syringe or an old poultry baster. Place some cloth rags beneath the master cylinder to catch any spilt fluid. Alternatively, fit hose clamps to the two supply pipes.

7 On models where the reservoir is located remotely on the bulkhead, using a screwdriver, carefully lever the fluid supply pipes from the top of the master cylinder. On models where the reservoir is located on the master cylinder, loosen the clip and disconnect the clutch fluid supply pipe from the the reservoir (see illustration). Plug the pipe(s) to prevent entry of dust and dirt.

Left-hand drive models

8 Remove the master cylinder fluid reservoir cap, and syphon or draw the hydraulic fluid from the reservoir. **Note:** Do not syphon the fluid by mouth, as it is poisonous; use a syringe or an old poultry baster. Alternatively, open any convenient bleed screw in the system, and gently pump the brake pedal to expel the fluid



10.13 Cross-sectional view of vacuum servo unit

A 22.45 to 22.65 mm

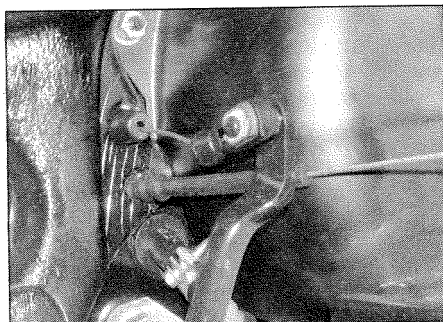
B Adjustment nut

through a tube connected to the screw (see Section 2). Disconnect the wiring connector from the brake fluid level sender unit, and position the reservoir cap to one side.

9 Carefully prise the fluid reservoir from the seals and release it from the top of the master cylinder.

All models

10 Wipe clean the area around the brake pipe unions on the master cylinder. Make a note of the correct fitted positions of the unions, then unscrew the union nuts and carefully withdraw the pipes. Where adapters are bolted to the master cylinder, unscrew the unions from the adapters. Plug or tape over the pipe ends and master cylinder orifices, to minimise the loss of brake fluid, and to prevent the entry of dirt into the system. Wash off any spilt fluid immediately with cold water.



11.2a Accelerator cable attachment to the top of the pedal extension arm

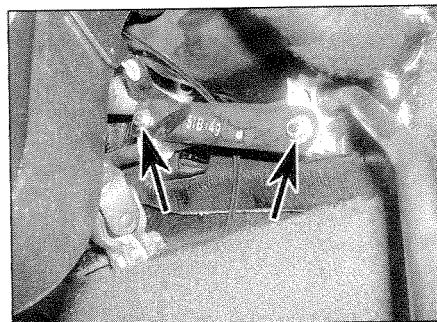


Cut the finger tips from an old rubber glove and secure them over the open ends of the brake pipes with elastic bands - this will help to minimise fluid loss and prevent the ingress of contaminants.

11 Unscrew and remove the nuts securing the master cylinder to the vacuum servo unit, then withdraw the unit from the engine compartment.

12 Where applicable, recover the gasket from the rear of the master cylinder, and discard it. Obtain a new one.

13 With the master cylinder removed, check that the distance between the end of the vacuum servo unit pushrod and the master cylinder mating surface is as shown in the diagram. If necessary, the distance may be



11.2b Accelerator pedal mounting nuts

adjusted by turning the nut at the end of the servo unit pushrod (see illustration).

Overhaul

14 If the master cylinder is faulty, it must be renewed. Repair kits are not available from FIAT dealers.

15 The only items that can be renewed are the mounting seals for the fluid reservoir; obtain new ones if necessary.

Refitting

16 Clean the mating surfaces of the master cylinder and vacuum servo unit, then locate a new gasket on the mounting studs.

17 Refit the master cylinder and secure with the nuts tightened securely.

18 Wipe clean the brake pipe unions, then refit them to the correct master cylinder ports, as noted before removal, and tighten the union nuts securely.

Right-hand drive models

19 Smear a little brake fluid on the supply pipes then press them firmly into the top of the master cylinder.

20 Remove the hose clamps where fitted, then fill the master cylinder reservoir with new fluid, and bleed the complete hydraulic system as described in Section 2.

21 Screw on the cap and reconnect the low fluid level unit wiring.

22 Refit the lining to the bulkhead, and secure with the stud.

23 Refit the relay bracket and tighten the bolts. Reconnect the small wiring plug.

24 Refit the relay cover.

25 Refit the air duct to the throttle body and air cleaner.

Left-hand drive models

26 Locate new mounting seals in the cylinder apertures, then smear some hydraulic fluid on the reservoir port extensions and press the reservoir firmly into position.

27 Reconnect the wiring to the brake fluid level sender unit.

28 Refill the master cylinder reservoir with new fluid, and bleed the complete hydraulic system as described in Section 2.

11 Brake pedal - removal and refitting

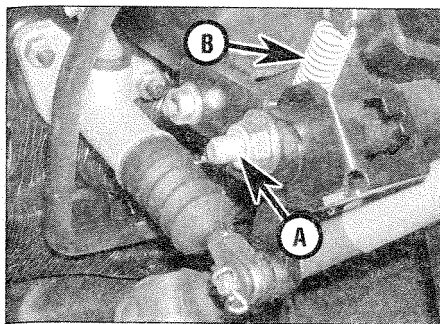
Removal

Right-hand drive models

Note: If it is required to remove the pedal bracket, proceed as described in Section 12 for the removal of the vacuum servo unit.

1 Unclip and remove the lower fusebox trim panel located beneath the right-hand side of the fascia.

2 Disconnect the accelerator cable from the top of the accelerator pedal extension arm, then unscrew the nuts and remove the accelerator pedal (see illustrations).



11.5 Pedal pivot bolt (A) and clutch pedal return spring (B)

3 Extract the split pin, and disconnect the clutch master cylinder pushrod from the clutch pedal.

4 Remove the stop-light switch from the pedal bracket with reference to Section 17.

5 Unscrew the pedal pivot bolt and withdraw it slowly to the right until it is possible to remove the clutch pedal from the bracket. Disconnect the clutch pedal return spring (see illustration).

6 Extract the split pin, and disconnect the link from the arm on the brake pedal.

7 Withdraw the pivot bolt and lower the brake pedal from the bracket.

8 If necessary, remove the link and intermediate lever as follows. Extract the split pin, and disconnect the servo unit pushrod from the intermediate lever. Unscrew the pivot bolt and remove the assembly from the pedal bracket.

9 Clean and examine the components for wear and damage (see illustration). Renew as necessary.

Left-hand drive models

10 Extract the split pin, and disconnect the brake servo unit pushrod from the pin on the brake pedal.

11 Position the clutch pedal for access to the brake pedal pivot bolt. Unscrew the bolt and withdraw the pedal from the bracket.

12 Recover the bushes, spacer and washers as necessary.

13 Clean and examine the components for wear and damage. Renew as necessary.

Refitting

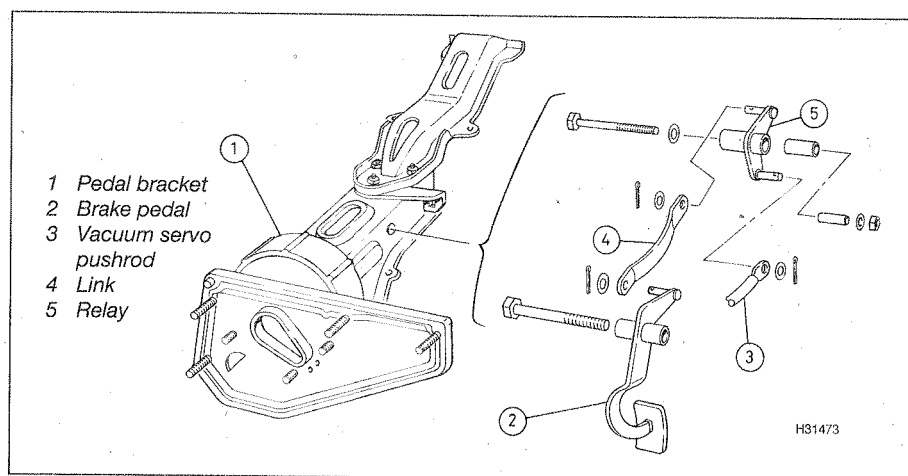
14 Refitting is a reversal of removal, but apply a little grease to the pedal bushes before reassembling them.

12 Vacuum servo unit - testing, removal and refitting



Testing

1 To test the operation of the servo unit, depress the footbrake several times to exhaust the vacuum, then start the engine whilst keeping the pedal firmly depressed. As the engine starts, there should be a noticeable



11.9 Brake pedal components

give in the brake pedal as the vacuum builds up. Allow the engine to run for at least two minutes, then switch it off. If the brake pedal is now depressed it should feel normal, but further applications should result in the pedal feeling firmer, with the pedal stroke decreasing with each application.

2 If the servo does not operate as described, inspect the servo unit check valve as described in Section 13.

3 If the servo unit still fails to operate satisfactorily, the fault lies within the unit itself. Repairs to the unit are not possible - if faulty, the servo unit must be renewed.

Removal

Right-hand drive models

4 Remove the facia panel from inside the car as described in Chapter 11.

5 Loosen the clips and disconnect the throttle body air duct from the air cleaner. Disconnect the crankcase ventilation hose from the duct, then unscrew the nuts and remove the duct from the top of the throttle body.

6 Undo the screw and remove the relay cover.

7 Unscrew the two bolts holding the relay bracket to the bulkhead, then disconnect the small wiring plug beneath it, and move the bracket to one side. Make sure that any electrical terminals are kept insulated from the surrounding components.

8 Release the retaining stud and pull out the lining from the right-hand side of the bulkhead for access to the master cylinder.

9 Unscrew the two nuts securing the brake master cylinder to the vacuum servo unit. Carefully withdraw the master cylinder from the servo unit taking care not to bend the brake pipes excessively. Move it just enough to provide room to remove the servo unit. There is no need to remove the reservoir cap or disconnect the wiring from the low fluid warning unit.

10 Release the clip and move the fuel injection wiring to one side, then carefully remove the vacuum hose from the servo unit.

The use of a screwdriver may be needed to do this.

11 Working inside the car, undo the screws and remove the footrest located next to the clutch pedal.

12 Unscrew and remove the clamp bolt securing the steering inner column to the steering gear pinion.

13 Remove the steering column as described in Chapter 10.

14 Disconnect the wiring from the stop-light switch located on the brake pedal bracket.

15 Unscrew the accelerator pedal bracket retaining nuts, and unhook the clutch pedal return spring.

16 Disconnect the accelerator cable from the pedal, and withdraw the pedal from the car.

17 Extract the rubber plug from the bonnet opening lever, then disconnect the cable.

18 Extract the split pin and disconnect the pushrod from the clutch pedal.

19 Release the wiring and support from the pedal bracket.

20 Extract the split pin and disconnect the servo unit pushrod from the brake pedal link.

21 Unscrew the mounting nuts and withdraw the pedal bracket and servo unit from inside the car.

22 With the pedal bracket and servo unit on the bench, unscrew the nuts and separate the servo unit from the bracket. Make sure that the washer remains in position on the end of the servo pushrod.

Left-hand drive models

23 Working in the engine compartment, unscrew the nuts securing the master cylinder to the vacuum servo unit. Carefully move the master cylinder away from the servo unit taking care not to bend the brake pipes excessively. Move it just enough to provide room to remove the servo unit. There is no need to remove the reservoir cap or disconnect the wiring from the low fluid warning unit.

24 Carefully lever out the vacuum servo unit check valve from the servo unit with a screwdriver.

25 Working inside the car, reach up over the pedal bracket and disconnect the accelerator cable from the top of the accelerator pedal. Unscrew the nuts and remove the accelerator pedal and plate.

26 Extract the retainers and move the floor covering to one side. **Note:** The retainers are destroyed during removal, and must be renewed.

27 Extract the split pin and disconnect the servo pushrod from the pin on the pedal.

28 Unscrew the mounting nuts securing the servo unit to the bulkhead.

29 Working in the engine compartment, withdraw the servo unit from the car.

Refitting

30 Check and if necessary adjust the distance between the end of the vacuum servo unit pushrod and the master cylinder mating surface as described in Section 10.

31 Refitting is a reversal of removal, but apply a little grease to the brake pedal link and clutch pedal pin before reconnecting them. Finally, test the vacuum servo unit as described at the beginning of this Section.

13 Vacuum servo unit check valve - removal, testing and refitting

Removal

1 On some models the valve is an integral part of the servo unit vacuum hose and is not available separately. On other models the valve is fitted separately in the vacuum hose or in the servo unit itself.

2 To remove the valve from the hose, first loosen the clips and disconnect the air inlet duct from between the air cleaner and throttle body. Disconnect the vacuum hoses from each end of the valve and remove the valve. Note which way round it is fitted to ensure correct refitting. The valve should be marked with an arrow pointing towards the inlet manifold.

3 To remove the valve from the servo unit, first disconnect the vacuum hose, then carefully lever the valve from the rubber grommet in the servo unit. Remove the rubber grommet.

4 To remove the complete vacuum hose, first remove the throttle body air duct from the air cleaner, then remove the duct from the top of the throttle body. Remove the relay cover; and move the bracket to one side. Release the retaining stud and pull out the lining from the right-hand side of the bulkhead. Release the wiring from the clip and pull out the vacuum hose from the servo unit. Loosen the clip and disconnect the vacuum hose from the inlet manifold.

Testing

5 The valve may be tested by blowing through it in both directions. Air should flow through the valve in one direction only - when blown through from the servo unit end of the valve. Renew the valve if this is not the case.

6 Examine the servo unit rubber sealing grommet and hose(s) linking the main hose to the inlet manifold for signs of damage or deterioration, and renew as necessary.

Refitting

7 Refitting is a reversal of removal, but make sure that the valve is fitted the correct way round, with the arrow pointing towards the engine inlet manifold.

14 Handbrake - checking and adjustment

Checking

1 Apply the handbrake by pulling it through three clicks of the ratchet mechanism and check that this locks the rear wheels, holding the vehicle stationary on an incline. If not, the handbrake mechanism is in need of adjustment.

Adjustment

2 Chock the front wheels, then jack up the rear of the vehicle and support it on axle stands (see *Jacking and vehicle support*).

3 Release the gaiter from the centre console and remove it from the handbrake lever.

4 Unscrew the adjustment nut located under the handbrake lever until the cable is slack.

5 Select neutral, then start the engine and allow it to idle. Fully depress the brake pedal at least 30 times. This will operate the rear brake self-adjusting mechanism and ensure the brake shoes are set at their normal position.

6 Pull the handbrake lever through three clicks of the ratchet mechanism and leave it in this position.

7 Tighten the adjustment nut until the handbrake is fully applied at three or four clicks, and the rear wheels are locked.

8 Release the handbrake lever and check that the rear wheels are free to turn. There should be no binding or dragging.

9 Reapply the handbrake and check the adjustment again.

10 Refit the gaiter and lower the car to the ground.

15 Handbrake lever - removal and refitting

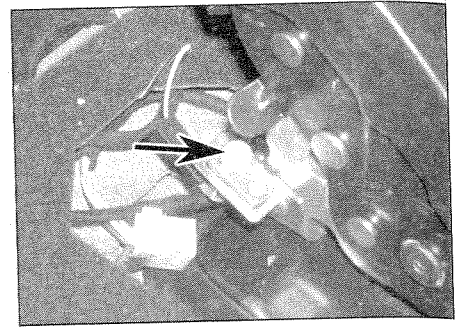
Removal

1 Release the gear lever gaiter from the centre console, then pull the gear lever knob and gaiter together from the top of the gear lever.

2 Chock the rear roadwheels, then fully unscrew the adjustment nut located beneath the handbrake lever.

3 Disconnect the wiring from the handbrake-on warning lamp switch, then undo the screw and remove the switch (see *illustration*).

4 Jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*).



15.3 Handbrake 'on' warning lamp switch

5 Working under the car, unscrew the nuts and remove the exhaust heatshield from its location beneath the handbrake lever.

6 Unscrew the bolts securing the handbrake lever to the underbody. Also unscrew the bolts securing the handbrake cable guide to the underbody.

7 Working inside the car, withdraw the handbrake lever upwards from the floor.

Refitting

8 Refitting is a reversal of removal, but adjust the handbrake as described in Section 14.

16 Handbrake cables - removal and refitting

Removal

1 There is one primary handbrake cable between the lever and equaliser, and two secondary cables between the equaliser and rear brake shoes.

2 Chock the front wheels, then jack up the rear of the vehicle and support it on axle stands (see *Jacking and vehicle support*).

Primary cable

3 Release the gaiter from the centre console and remove it from the handbrake lever.

4 Fully unscrew the adjustment nut located beneath the handbrake lever. Remove the washer and the spring which operates the warning light switch.

5 Working under the car, unscrew the nuts and remove the exhaust heatshield from its location beneath the handbrake lever.

6 Unbolt and remove the handbrake cable guide from the underbody.

7 Unhook the secondary cables from the equaliser bar (see *illustration*).

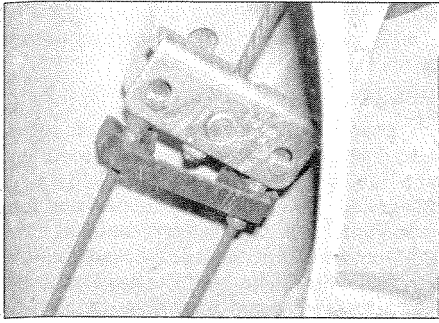
8 Remove the rubber grommet from the underbody, then withdraw the primary cable from under the car.

9 Unscrew the nut and remove the equaliser bar from the primary cable.

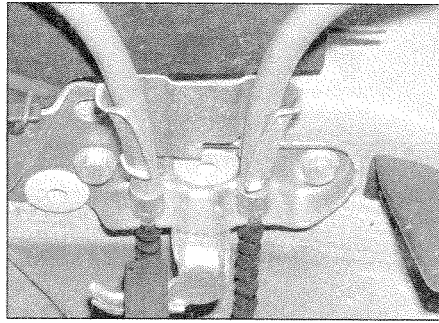
Secondary cables

10 Release the gaiter from the centre console and remove it from the handbrake lever.

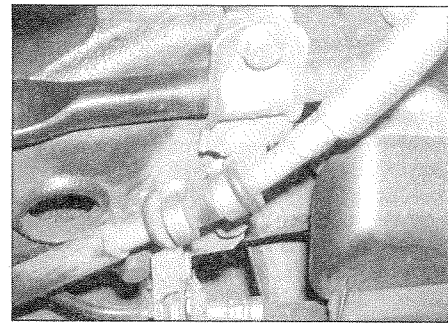
11 Unscrew the adjustment nut located under the handbrake lever until the cable is slack.



16.7 Handbrake cable equaliser bar



16.14a Rear underbody support for the handbrake cables



16.14b Handbrake cable support on the trailing arms

12 Working under the car, unscrew the nuts and remove the exhaust heatshield from its location beneath the handbrake lever.

13 Unhook the secondary cables from the equaliser bar.

14 Release the cables from the support clips on the underbody (see illustrations). Where necessary, use a screwdriver to prise the clips apart.

15 Prise the covers from the apertures on the inside the rear brake backplates (see illustration).

16 Using a pair of pliers, unhook the inner cables from the levers on the trailing shoes (see illustration). Note the location of the springs on the inner cables. If difficulty is experienced, remove the rear brake shoes as described in Section 5.

17 Pull the outer cables from the rear brake backplates (see illustration). If they are rusted in position, remove the rear brake shoes as described in Section 5, then use a thin punch to drive them out.

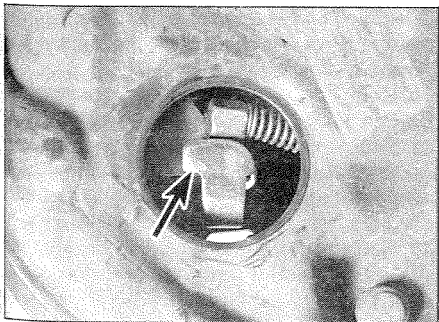
Refitting

18 Refitting is a reversal of removal, but adjust the handbrake as described in Section 14.

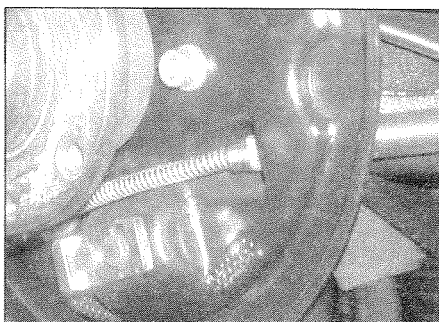
17 Stop-light switch - adjustment, removal and refitting

Adjustment

1 The switch plunger operates on a ratchet.



16.16 Unhook the cable end from the brake shoe lever (arrowed)



16.17 Handbrake cable attachment to the rear brake backplates

2 If adjustment is required, pull the plunger fully out - the switch then self-adjusts as the brake pedal is applied and released.

Removal

3 Ensure that the ignition is switched to OFF.

4 Unclip and remove the lower fusebox trim panel located beneath the right-hand side of the fascia.

5 Disconnect the wiring plug from the switch.

6 Twist the switch anti-clockwise through about 60°, and withdraw the switch from the pedal bracket. If necessary, use a spanner on the hexagon section. Note the position of the spacer and fitting bush.

Refitting

7 Depress the brake pedal and hold it in this position.

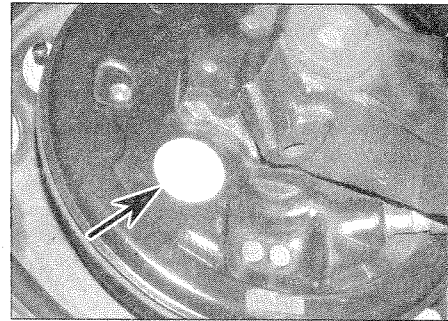
8 Fit the bush and spacer over the end of the switch, then insert the switch into its mounting bracket. Rotate the switch body clockwise through 60° until the locating lug is felt to engage in its recess (see illustration).

9 Release the brake pedal and allow it to rest against the switch spacer tab - this adjusts the position of the switch body inside the bush.

10 Now depress the brake pedal again - this has the effect of breaking off the spacer tab and fixes the position of the switch inside the bush. Discard the spacer tab.

11 Reconnect the wiring plug to the switch, and refit the lower fusebox trim panel.

12 Switch on the ignition and test the operation of the brake lights.



16.15 Cover for access to the handbrake cable attachment on the trailing brake shoe

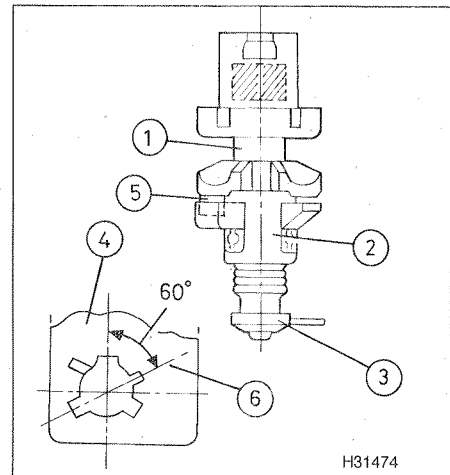
18 Rear brake pressure proportioning valve - removal and refitting



Note: Adjustment of a new valve requires a special tool only available at a FIAT dealer.

Removal

1 Chock the front wheels, then jack up the rear of the vehicle and support it on axle stands (see *Jacking and vehicle support*).



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17.8 Brake light switch assembly

- | | |
|---------------------|--------------------|
| 1 Hexagonal section | 4 Mounting bracket |
| 2 Bush | 5 Locating lug |
| 3 Spacer | |

- 2 Unbolt the exhaust rear and intermediate mountings from the underbody.
- 3 Unbolt the heat shield for access to the rear brake pressure proportioning valve.
- 4 Unscrew the cap from the brake fluid reservoir and tighten it down onto a piece of polythene sheeting. This will help reduce the loss of fluid from the system. Also place a container beneath the valve to catch spilt fluid.
- 5 Identify the pipe locations on the valve, then unscrew the union nuts and disconnect them. If possible, plug the ends of the pipes to prevent loss of fluid.
- 6 Disconnect the spring from the lever on top of the valve.
- 7 Unscrew the mounting bolts and withdraw the valve from under the vehicle (see illustration).

Refitting

- 8 Refitting is a reversal of removal, but bleed the hydraulic system as described in Section 2, and have the valve adjusted by a FIAT dealer.

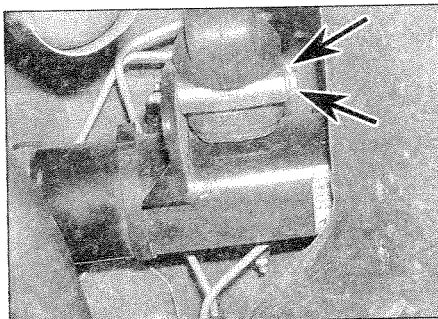
19 Anti-lock braking system (ABS) components - removal and refitting

Caution: Disconnect the battery before disconnecting any ABS system hydraulic union and do not reconnect the battery until after the hydraulic system has been reconnected and the fluid reservoir topped up. Failure to take this precaution could lead to air entering the hydraulic unit. New hydraulic units are supplied pre-filled with brake fluid.

Note: The manufacturers state that the operation of the ABS system should be checked by a FIAT dealer using special test equipment after refitting any of the components in this Section.

Electro-hydraulic control unit

- 1 The electro-hydraulic control unit is located on the left-hand side of the engine compartment. The ECU and recycling pump are also part of the control unit.
- 2 Except on 1.3 and 1.4 litre models, remove the air inlet duct from between the air cleaner and throttle body, by loosening the clips and also disconnecting the crankcase ventilation hose.
- 3 Remove the battery and battery tray (Chapter 5A), then unbolt and remove the battery mounting bracket. Move the relay holder box to one side after removing the cover and unscrewing the mounting bolts.
- 4 Unscrew and remove the filler cap from the top of the brake fluid reservoir, then syphon or draw out the hydraulic fluid. Alternatively, fit hose clamps to the hoses attached to the bottom of the reservoir.
- 5 Unbolt the fluid reservoir from the bulkhead and position it safely to one side.
- 6 Remove the two fuses located on the side of the fusebox on the left-hand side of the



18.7 Rear brake pressure proportioning valve mounting bolts

- bulkhead. Unscrew the mounting nut, and move the fusebox to one side.
- 7 Identify all the brake pipes attached to the hydraulic unit, then unscrew the union nuts and pull out the pipes so that they are just clear of the unit. Ideally, a split brake pipe spanner should be used to unscrew the nuts.
- 8 Unscrew the front mounting nut and the side mounting bolt.
- 9 Pull up the locking device and disconnect the wiring, then withdraw the electro-hydraulic control unit from the engine compartment.
- 10 Using an Allen key, unscrew the bolts and remove the mounting bracket from the unit.

Refitting

- 11 Refit the mounting bracket and tighten the bolts.
- 12 Refit the electro-hydraulic control unit in the engine compartment and tighten the nut and bolt.
- 13 Reconnect the wiring and secure with the locking device.
- 14 Reconnect the brake pipes and tighten securely. Do not overtighten them.
- 15 Refit the fusebox and tighten the nut, then refit the two side fuses.
- 16 Refit the fluid reservoir to the bulkhead.
- 17 Refit the battery mounting bracket and tighten the mounting bolts. Refit the relay box.
- 18 Refit the battery and tray (Chapter 5A).
- 19 Except on 1.3 and 1.4 litre models, refit the air inlet duct and crankcase ventilation hose.
- 20 Fill the fluid reservoir with fresh fluid (see *Weekly Checks*).
- 21 Bleed the complete hydraulic system as described in Section 2. Have the operation of the ABS system checked by a FIAT dealer at the earliest possible opportunity.

Front wheel sensor

Removal

- 22 Apply the handbrake, then jack up the front of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the appropriate front wheel.
- 23 At the rear left-hand side of the engine compartment, disconnect the front wheel sensor wiring at the fusebox. Feed the wiring through into the front wheel arch area.
- 24 Using an Allen key, unscrew the mounting bolt, then withdraw the sensor from the hub carrier.

- 25 Release the wiring from the support on the bottom of the front suspension strut and remove the front wheel sensor.

Refitting

- 26 Ensure that the sensor and hub carrier location are clean, then insert the sensor and secure with the bolt.
- 27 Locate the wiring in the support and feed it through into the engine compartment.
- 28 Reconnect the wiring at the fusebox.
- 29 Using a feeler blade, check that the clearance between the wheel sensor and the serrated wheel on the front driveshaft is $0.9 \text{ mm} \pm 0.4 \text{ mm}$. The clearance is not adjustable; if outside the tolerance, check the sensor and serrated wheel for damage.
- 30 Refit the wheel and lower the vehicle to the ground.

Rear wheel sensor

Removal

- 31 Chock the front wheels, then jack up the rear of the vehicle and support it on axle stands (see *Jacking and vehicle support*). Remove the appropriate rear wheel.
- 32 Remove the rear seat cushion as described in Chapter 11, Section 19.
- 33 Lift the sound proofing material, then disconnect the sensor wiring on the appropriate side.
- 34 If removing the right-hand side wheel sensor, unbolt the fuel filter cover under the rear of the car.
- 35 Prise out the rubber grommet and withdraw the sensor wiring from under the car.
- 36 Remove the brake drum with reference to Section 7. This is not strictly necessary for the removal of the sensor unless it is rusted in position, but it is necessary to check the gap between the sensor and serrated wheel on the hub during refitting.
- 37 Using an Allen key, unscrew the mounting bolt, then withdraw the sensor from the rear stub axle body and remove from the car.

Refitting

- 38 Ensure that the sensor and rear stub axle body are clean, then insert the sensor and secure with the bolt.
- 39 Using a feeler blade, check that the clearance between the wheel sensor and the serrated wheel on the rear hub is $0.9 \text{ mm} \pm 0.4 \text{ mm}$. The clearance is not adjustable; if outside the tolerance, check the sensor and serrated wheel for damage.
- 40 Refit the brake drum with reference to Section 7.
- 41 Feed the wiring through the floor into the car, and reposition the rubber grommet.
- 42 On the right-hand side, refit the fuel filter cover.
- 43 Reconnect the wiring located beneath the seat cushion, and refit the sound proofing. Refit the rear seat cushion with reference to Chapter 11, Section 19.
- 44 Refit the rear wheel and lower the car to the ground.