

### 5.2 Check the thickness of the pad friction material through the hole on the front of the caliper

should be removed and cleaned. The operation of the caliper can then also be checked, and the condition of the brake disc itself can be fully examined on both sides. Refer to Chapter 9 for further information.

4 If any pad's friction material is worn to the specified thickness or less, all four pads must be renewed as a set. Refer to Chapter 9.

5 On completion refit the roadwheels and lower the car to the ground

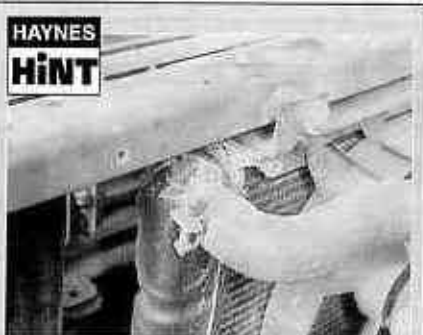
## 6 Underbody sealant check

1 Jack up the front and rear of the car and support it securely on axle stands (see *Jacking and vehicle support*). Alternatively position the car over an inspection pit.

2 Check the underbody, wheel housings and side sills for rust and/or damage to the underbody sealant. If evident, repair as necessary.

## 7 Hose and fluid leak check

1 Visually inspect the engine joint faces, gaskets and seals for any signs of water or oil leaks. Pay particular attention to the areas around the camshaft cover, cylinder head, oil filter and sump joint faces. Bear in mind that,



**HAYNES HINT**  
A leak in the cooling system will usually show up as white or rust-coloured deposits on the area adjoining the leak

over a period of time, some very slight seepage from these areas is to be expected - what you are really looking for is any indication of a serious leak (see **Haynes Hint**). Should a leak be found, renew the offending gasket or oil seal by referring to the appropriate Chapters in this manual.

2 Also check the security and condition of all the engine-related pipes and hoses. Ensure that all cable-ties or securing clips are in place and in good condition. Clips which are broken or missing can lead to chafing of the hoses, pipes or wiring, which could cause more serious problems in the future.

3 Carefully check the radiator hoses and heater hoses along their entire length. Renew any hose which is cracked, swollen or deteriorated. Cracks will show up better if the hose is squeezed. Pay close attention to the hose clips that secure the hoses to the cooling system components. Hose clips can pinch and puncture hoses, resulting in cooling system leaks.

4 Inspect all the cooling system components (hoses, joint faces etc.) for leaks. A leak in the cooling system will usually show up as white- or rust-coloured deposits on the area adjoining the leak. Where any problems of this nature are found on system components, renew the component or gasket with reference to Chapter 3.

5 Where applicable, inspect the automatic transmission fluid cooler hoses for leaks or deterioration.

6 With the vehicle raised, inspect the fuel tank and filler neck for punctures, cracks and other damage. The connection between the filler neck and tank is especially critical. Sometimes a rubber filler neck or connecting hose will leak due to loose retaining clamps or deteriorated rubber.

7 Carefully check all rubber hoses and metal fuel lines leading away from the fuel tank. Check for loose connections, deteriorated hoses, crimped lines, and other damage. Pay particular attention to the vent pipes and hoses, which often loop up around the filler neck and can become blocked or crimped. Follow the lines to the front of the vehicle, carefully inspecting them all the way. Renew damaged sections as necessary.

8 From within the engine compartment,



9.1 Checking the condition of a driveshaft gaiter

check the security of all fuel hose attachments and pipe unions, and inspect the fuel hoses and vacuum hoses for kinks, chafing and deterioration.

9 Where applicable, check the condition of the power steering fluid hoses and pipes.

## 8 Exhaust system check

1 With the engine cold (at least an hour after the vehicle has been driven), check the complete exhaust system from the engine to the end of the tailpipe. The exhaust system is most easily checked with the vehicle raised on a hoist, or suitably supported on axle stands (see *Jacking and vehicle support*), so that the exhaust components are readily visible and accessible.

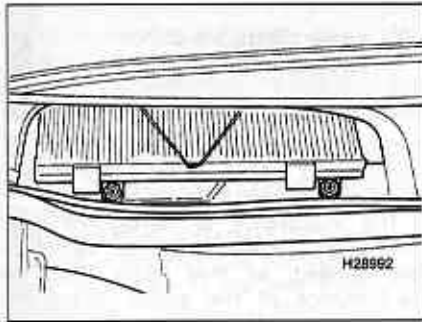
2 Check the exhaust pipes and connections for evidence of leaks, severe corrosion and damage. Make sure that all brackets and mountings are in good condition, and that all relevant nuts and bolts are tight. Leakage at any of the joints or in other parts of the system will usually show up as a black sooty stain in the vicinity of the leak.

3 Rattles and other noises can often be traced to the exhaust system, especially the brackets and mountings. Try to move the pipes and silencers. If the components are able to come into contact with the body or suspension parts, secure the system with new mountings. Otherwise separate the joints (if possible) and twist the pipes as necessary to provide additional clearance.

## 9 Driveshaft gaiter check

1 With the vehicle raised and securely supported on stands (see *Jacking and vehicle support*), turn the steering onto full lock, then slowly rotate the roadwheel. Inspect the condition of the outer constant velocity (CV) joint rubber gaiters, squeezing the gaiters to open out the folds. Check for signs of cracking, splits or deterioration of the rubber, which may allow the grease to escape, and lead to water and grit entry into the joint. Also check the security and condition of the retaining clips. Repeat these checks on the inner CV joints (see illustration). If any damage or deterioration is found, the gaiters should be renewed (see Chapter 8, Section 3).

2 At the same time, check the general condition of the CV joints themselves by first holding the driveshaft and attempting to rotate the wheel. Repeat this check by holding the inner joint and attempting to rotate the driveshaft. Any appreciable movement indicates wear in the joints; wear in the driveshaft splines, or a loose driveshaft retaining nut.



10.5 Location of pollen filter

10 Pollen filter renewal

- 1 The pollen filter (where fitted) is located under the engine bulkhead cover panel.
- 2 Refer to Chapter 12 and remove both windscreen wiper arms.
- 3 Unclip the rubber seal from the relevant end of the top of the engine compartment bulkhead.
- 4 Unscrew the retaining fastener screws and pull out the fasteners securing the bulkhead cover panel in position. Release the cover panel from the base of the windscreen and remove it from the vehicle.
- 5 Pivot the pollen filter cover upwards and away then release the retaining clips and withdraw the filter from its housing (see illustration).
- 6 Wipe clean the filter housing then fit the new filter. Clip the filter securely in position and refit the cover.
- 7 Refit the trim cover, securing it in position with the fasteners, and seat the rubber seal on the bulkhead.

11 Idle speed and CO content check and adjustment

- 1 The idle speed is controlled by the ECU via a stepper motor located on the side of the throttle body and is not adjustable.
- 2 The exhaust gas oxygen content is constantly monitored by the ECU via the Lambda sensor, which is mounted in the exhaust downpipe. The ECU then uses this information to modify the injection timing and duration to maintain the optimum air/fuel ratio.

13 Auxiliary drivebelt(s) check and renewal

Note: Fiat specify the use of a special tool to correctly set the drivebelt tension. If access to this equipment cannot be obtained, an

3 Experienced home mechanics with a considerable amount of skill and equipment (including a good-quality tachometer and a good-quality, carefully calibrated exhaust gas analyser) may be able to check the exhaust CO level and the idle speed. However, if these are found to be in need of adjustment, the car must be taken to a suitably-equipped Fiat dealer for testing using the special test equipment which is plugged into the diagnostic connector.

12 Steering and suspension check

Front suspension and steering check

- 1 Raise the front of the vehicle, and securely support it on axle stands (see *Jacking and vehicle support*).
- 2 Inspect the balljoint dust covers and the steering rack-and-pinion gaiters for splits, chafing or deterioration. Any wear of these will cause loss of lubricant, together with dirt and water entry, resulting in rapid deterioration of the balljoints or steering gear.
- 3 On vehicles with power steering, check the fluid hoses for chafing or deterioration, and the pipe and hose unions for fluid leaks. Also check for signs of fluid leakage under pressure from the steering gear rubber gaiters, which would indicate failed fluid seals within the steering gear.
- 4 Grasp the roadwheel at the 12 o'clock and 6 o'clock positions, and try to rock it (see illustration). Very slight free play may be felt, but if the movement is appreciable, further investigation is necessary to determine the source. Continue rocking the wheel while an assistant depresses the footbrake. If the movement is now eliminated or significantly reduced, it is likely that the hub bearings are at fault. If the free play is still evident with the footbrake depressed, then there is wear in the suspension joints or mountings.
- 5 Now grasp the wheel at the 9 o'clock and 3 o'clock positions, and try to rock it as before. Any movement felt now may again be caused by wear in the hub bearings or the steering track-rod balljoints. If the inner or outer balljoint is worn, the visual movement will be obvious.



12.4 Rocking a roadwheel to check for wear in the steering/suspension components

- 6 Using a large screwdriver or flat bar, check for wear in the suspension mounting bushes by levering between the relevant suspension component and its attachment point. Some movement is to be expected as the mountings are made of rubber, but excessive wear should be obvious. Also check the condition of any visible rubber bushes, looking for splits, cracks or contamination of the rubber.
- 7 With the car standing on its wheels, have an assistant turn the steering wheel back and forth about an eighth of a turn each way. There should be very little, if any, lost movement between the steering wheel and roadwheels. If this is not the case, closely observe the joints and mountings previously described, but in addition, check the steering column universal joints for wear, and the rack-and-pinion steering gear itself.

Suspension strut/shock absorber check

- 8 Check for any signs of fluid leakage around the suspension strut/shock absorber body, or from the rubber gaiter around the piston rod. Should any fluid be noticed, the suspension strut/shock absorber is defective internally, and should be renewed. Note: Suspension struts/shock absorbers should always be renewed in pairs on the same axle.
- 9 The efficiency of the suspension strut/shock absorber may be checked by bouncing the vehicle at each corner. Generally speaking, the body will return to its normal position and stop after being depressed. If it rises and returns on a rebound, the suspension strut/shock absorber is probably suspect. Examine also the suspension strut/shock absorber upper and lower mountings for any signs of wear.

1A

Every 20 000 miles (30 000 km) or 2 years

approximate setting can be achieved using the method described below. If the method described is used, the tension should be checked using the special tool at the earliest possible opportunity.

- 1 Depending on equipment fitted, one, two or three auxiliary drivebelts may be fitted. The alternator, power steering pump and air

conditioning compressor, as applicable, are each driven by an individual drivebelt.

Checking

- 2 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).
- 3 Firmly apply the handbrake, then jack up

the front of the car and support it securely on axle stands (see *Jacking and vehicle support*).

4 Remove the right-hand front wheel.

5 Remove the inner cover from under the right-hand wheelarch for access to the right-hand side of the engine.

6 Using a socket on the crankshaft sprocket bolt, rotate the crankshaft so that the full length of the auxiliary drivebelt(s) can be examined. Look for cracks, splitting and fraying on the surface of the belt; check also for signs of glazing (shiny patches) and separation of the belt plies. If damage or wear is visible, the relevant belt should be renewed.

7 If the condition of the belt is satisfactory, check the drivebelt tension as described below.

## Renewal

### Alternator drivebelt

**Note:** On certain models with power steering but without air conditioning, it will be necessary to remove the power steering pump drivebelt first, as described below.

8 Where fitted, undo the bolts and remove the belt guard from the alternator.

9 Loosen the pivot and adjustment bolts then swivel the alternator towards the engine and slip off the drivebelt.

10 Unbolt and remove the crankshaft sensor from the front of the engine (refer to Chapter 4A, Section 5, if necessary).

11 Remove the drivebelt from the engine.

12 When renewing a drivebelt, ensure that the correct type is used. Fit the belt around the two pulleys then swivel the alternator outwards to take up any slack in the belt. Adjust the tension correctly as described below.

### Power steering pump drivebelt

13 Slacken the bolts securing the power steering pump to the mounting bracket.

14 Slacken the adjusting bolt locknut and turn the adjusting bolt until all the tension is removed from the drivebelt.

15 Undo the bolts and remove the pulley guard from the power steering pump then slip the drivebelt off the pulleys.

16 Ensuring that the correct type of drivebelt is used, fit the belt around the pulleys and turn the adjusting bolt to just take up the slack in the belt. Adjust the tension correctly as described below.

### Air conditioning compressor drivebelt

17 Remove the alternator and power steering pump drivebelts as described previously.

18 Slacken the bolts securing the compressor to the mounting bracket.

19 Slacken the adjusting bolt locknut and turn the adjusting bolt until all the tension is removed from the drivebelt, then slip the belt off the pulleys.

20 Ensuring that the correct type of drivebelt is used, fit the belt around the pulleys and turn the adjusting bolt to just take up the slack in the belt. Adjust the tension correctly as described below.



15.7 Checking a valve clearance with a feeler blade

## Tensioning

21 Correct tensioning of the belt will ensure that it has a long life. A belt which is too slack will slip and perhaps squeal. Beware, however, of overtightening, as this can cause wear in the alternator, power steering pump or air conditioning compressor bearings. **Note:** Fiat recommend use of their special tensioning tool however the following procedure will set the tension correctly.

22 The belt(s) should be tensioned so that, under firm thumb pressure, there is approximately 5.0 mm of free movement at the mid-point between the pulleys. To adjust the alternator drivebelt, slightly tighten the adjustment bolt then swivel the alternator outwards until the belt tension is correct. Fully tighten the adjustment bolt followed by the pivot bolt then refit the rpm sensor.

23 On models with power steering and/or air conditioning, fit the relevant drivebelt over the pulleys then turn the adjusting bolt until the tension is correct. Secure the adjusting bolt by tightening the locknut, then tighten the remaining mounting bolts. Refit any remaining drivebelts and all the components removed.

24 Refit the inner cover and wheel, lower the vehicle to the ground, then reconnect the battery negative terminal.

## 14 Clutch adjustment check

Refer to Chapter 6, Section 2.



15.11 Using a modified C-spanner and a screwdriver to remove a shim

## 15 Valve clearance check and adjustment

**Note:** The following procedure is not applicable to 1242 cc, 16-valve engines which utilise self-adjusting hydraulic tappets.

1 The importance of having the valve clearances correctly adjusted cannot be overstressed, as they vitally affect the performance of the engine. Adjustment should only be necessary when the valve gear has become noisy, after engine overhaul, or when trying to trace the cause of power loss. The clearances are checked as follows. The engine must be cold for the check to be accurate.

2 Apply the handbrake then jack up the right-hand front of the vehicle and support on an axle stand (see *Jacking and vehicle support*). Engage 4th gear. The engine can now be rotated by turning the right-hand front roadwheel.

3 Remove all spark plugs as described in Section 19.

4 Remove the camshaft cover as described in Chapter 2A.

5 Each valve clearance must be checked when the high point of the cam lobe is pointing directly upward away from the cam follower.

6 Check the clearances in the firing order 1-3-4-2, No 1 cylinder being at the timing belt end of the engine. This will minimise the amount of crankshaft rotation required.

7 Insert the appropriate feeler blade between the heel of the cam and the cam follower shim of the first valve (see illustration). If necessary alter the thickness of the feeler blade until it is a stiff, sliding fit. Record the thickness, which will, of course, represent the valve clearance for this particular valve.

8 Turn the engine, check the second valve clearance and record it.

9 Repeat the operations on all the remaining valves, recording their respective clearances.

10 Remember that the clearance for inlet and exhaust valves differs - see *Specifications*. Counting from the timing cover end of the engine, the valve sequence is:

Inlet	2-4-5-7
Exhaust	1-3-6-8

11 Where clearances are incorrect, the particular shim will have to be changed. To remove the shim, turn the crankshaft until the high point of the cam is pointing directly upward. The cam follower will now have to be depressed so that the shim can be extracted. Special tools are available from your Fiat dealer to do the job, otherwise you will have to make up a forked lever to locate on the rim of the cam follower. This must allow room for the shim to be prised out by means of the cut-outs provided in the cam follower rim (see illustration).

12 Once the shim is extracted, establish its thickness and change it for a thicker or thinner one to bring the previously recorded

clearance within specification. For example, if the measured valve clearance was 1.27 mm too great, a shim *thicker* by this amount will be required. Conversely, if the clearance was 1.27 mm too small, a shim *thinner* by this amount will be required.

**13** Shims have their thickness (mm) engraved on them; although the engraved side should be fitted so as not to be visible, wear still occurs and often obliterates the number. In this case, measuring their thickness with a metric micrometer is the only method to establish their thickness (see illustration).

**14** In practice, if several shims have to be changed, they can often be interchanged, so avoiding the necessity of having to buy more new shims than is necessary.

**15** If more than two or three valve clearances are found to be incorrect, it will be more convenient to remove the camshaft for easier removal of the shims.

**16** Where no clearance can be measured, even with the thinnest available shim in position, the valve will have to be removed and the end of its stem ground off squarely. This will reduce its overall length by the minimum amount to provide a clearance. This job should be entrusted to your dealer as it is important to keep the end of the valve stem square.

**17** On completion, refit the camshaft cover and gasket, air cleaner and duct, and spark plugs.

**18** Lower the vehicle to the ground.



**15.13** Shim thickness is marked on the lower face (here 4.20 mm)

*at the beginning of this manual, and follow them implicitly. Petrol is a highly-dangerous and volatile liquid, and the precautions necessary when handling it cannot be overstressed.*

**Note:** 1242 cc (8-valve) engine models from 1998 onwards are equipped with a modified fuel system incorporating a fuel filter integral with the fuel pump. On these engines fuel filter renewal is not required.

**1** The fuel filter is situated underneath the rear of the vehicle, on the right-hand side of the fuel tank (see illustration). To gain access to the filter, chock the front wheels, then jack up the rear of the vehicle and support it on axle stands (see *Jacking and vehicle support*).

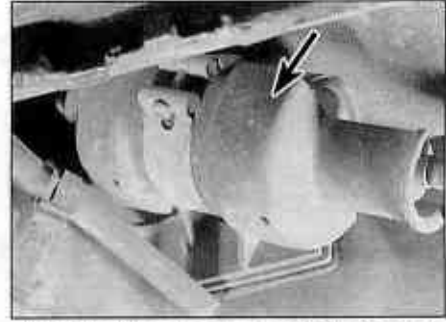
**2** Unscrew the bolt securing the filter to its support bracket.

**3** Noting the fitted position of the filter body, release the retaining clips and disconnect the fuel hoses from the filter. The correct position is indicated by an arrow marked on the filter body

**4** Remove the filter from the vehicle. Dispose safely of the old filter; it will be highly flammable, and may explode if thrown on a fire.

**5** Locate the new filter into position, ensuring that the arrow on the filter body is pointing in the direction of the fuel flow, as noted when removing the old filter. The flow direction can otherwise be determined by tracing the fuel hoses back along their length.

**6** Connect the fuel hoses to the filter and tighten the clips, then locate it in the support bracket and tighten the mounting bolt.



**17.1** Fuel filter location on the right-hand side of the fuel tank

**7** Start the engine, check the filter hose connections for leaks, then lower the vehicle to the ground.

## 18 Air filter renewal

### 1108 cc and 1242 cc (8-valve) engines

**1** Prise open the spring clips and withdraw the air cleaner cover a little way from the main body (see illustration). Leave the cover attached to the hot air tube and inlet duct.

**2** Lift out the filter element (see illustration).

**3** Remove any debris that may have collected inside the air cleaner and wipe the inner surfaces clean.

**4** Fit a new air filter element in position, ensuring that the edges are securely seated.

**5** Refit the air cleaner top cover and snap the retaining clips into position.

### 1242 cc (16-valve) engines

**6** Undo the three bolts securing the front of the air cleaner cover to the main body. Lift the cover up at the front, disconnect the rear retainers and move it clear of the main body (see illustration). Leave the cover attached to the hot air tube and inlet duct.

**7** Lift out the filter element (see illustration).

**8** Remove any debris that may have collected inside the air cleaner and wipe the inner surfaces clean.

## 16 Manifold mounting check

Refer to Chapters 4A, 4B and 4D and check the tightness of the nuts and bolts securing the inlet and exhaust manifolds.

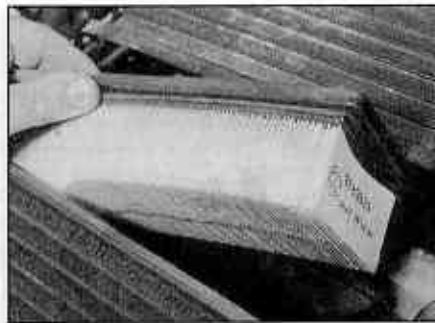
## 17 Fuel filter renewal



**Warning:** Before carrying out the following operation, refer to the precautions given in *Safety first!*



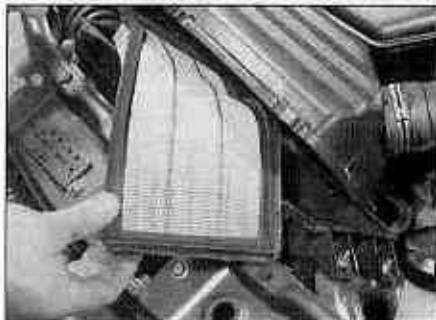
**18.1** Prise open the spring clips ...



**18.2** ... and remove the filter element (8-valve engines)



**18.6** Undo the three bolts (arrowed) and disconnect the air cleaner cover rear retainers (16-valve engines)



18.7 Lift up the cover and remove the filter element (16-valve engines)

9 Fit a new air filter element in position, ensuring that the edges are securely seated.

10 Refit the air cleaner cover, engage the rear retainers and secure with the three bolts.

## 19 Spark plug renewal

1 The correct functioning of the spark plugs is vital for the correct running and efficiency of the engine. It is essential that the plugs fitted are appropriate for the engine (a suitable type is specified at the beginning of this Chapter). If this type is used and the engine is in good condition, the spark plugs should not need attention between scheduled replacement intervals. Spark plug cleaning is rarely necessary, and should not be attempted

unless specialised equipment is available, as damage can easily be caused to the firing ends.

2 To remove the plugs first remove the air cleaner assembly (8-valve engines) or the air cleaner, resonator and inlet air duct (16-valve engines) with reference to Chapter 4A or 4B. If the marks on the original-equipment spark plug (HT) leads cannot be seen, mark the leads 1 to 4, to correspond to the cylinder the lead serves (No 1 cylinder is at the timing belt end of the engine). Pull the leads from the plugs by gripping the end fitting, not the lead, otherwise the lead connection may be fractured (see illustrations).

3 It is advisable to remove the dirt from the spark plug recesses using a clean brush, vacuum cleaner or compressed air before removing the plugs, to prevent dirt dropping into the cylinders.

4 Unscrew the plugs using a spark plug spanner, suitable box spanner or a deep socket and extension bar (see illustration). Keep the socket aligned with the spark plug - if it is forcibly moved to one side, the ceramic insulator may be broken off. As each plug is removed, examine it as follows.

5 Examination of the spark plugs will give a good indication of the condition of the engine. If the insulator nose of the spark plug is clean and white, with no deposits, this is indicative of a weak mixture or too hot a plug (a hot plug transfers heat away from the electrode slowly, a cold plug transfers heat away quickly).

6 If the tip and insulator nose are covered with hard black-looking deposits, this

indicates that the mixture is too rich. If the plug is black and oily, then it is likely that the engine is fairly worn, as well as the mixture being too rich.

7 If the insulator nose is covered with light tan to greyish-brown deposits, then the mixture is correct and it is likely that the engine is in good condition.

8 The spark plug electrode gap is of considerable importance as, if it is too large or too small, the size of the spark and its efficiency will be seriously impaired. The gap should be set to the value given in the Specifications at the beginning of this Chapter.

9 To set the gap, measure it with a feeler blade and then bend open, or closed, the outer plug electrode until the correct gap is achieved. The centre electrode should never be bent, as this may crack the insulator and cause plug failure, if nothing worse. If using feeler blades, the gap is correct when the appropriate-size blade is a firm sliding fit (see illustration).

10 Special spark plug electrode gap adjusting tools are available from most motor accessory shops, or from some spark plug manufacturers.

11 Before fitting the spark plugs, check that the threaded connector sleeves are tight, and that the plug exterior surfaces and threads are clean (see Haynes Hint).

12 Remove the rubber hose (if used), and tighten the plug to the specified torque using the spark plug socket and a torque wrench. Refit the remaining spark plugs in the same manner.

13 Connect the HT leads in their correct order, and refit any components removed for access.



19.2a Disconnecting the HT leads from the spark plugs on 8-valve engines ...



19.2b ... and on 16-valve engines



19.4 Removing the spark plugs



19.9 Adjusting a spark plug electrode gap



**HAYNES HINT**  
*It is very often difficult to insert spark plugs into their holes without cross-threading them. To avoid this possibility, fit a short length of 5/16 inch internal diameter rubber hose over the end of the spark plug. The flexible hose acts as a universal joint to help align the plug with the plug hole. Should the plug begin to cross-thread, the hose will slip on the spark plug, preventing thread damage to the cylinder head*

**20 Ignition system check**



**Warning:** Voltages produced by an electronic ignition system are considerably higher than those produced by conventional ignition systems. Extreme care must be taken when working on the system with the ignition switched on. Persons with surgically-implanted cardiac pacemaker devices should keep well clear of the ignition circuits, components and test equipment.

1 The ignition system components should be checked for damage or deterioration as follows.

**General component check**

2 The spark plug (HT) leads should be checked whenever new spark plugs are fitted.  
3 Pull the leads from the plugs by gripping the end fitting, not the lead, otherwise the lead connection may be fractured.



Ensure that the leads are numbered before removing them, to avoid confusion when refitting

4 Check inside the end fitting for signs of corrosion, which will look like a white crusty powder. Push the end fitting back onto the spark plug, ensuring that it is a tight fit on the plug. If not, remove the lead again and use pliers to carefully crimp the metal connector inside the end fitting until it fits securely on the end of the spark plug.

5 Using a clean rag, wipe the entire length of the lead to remove any built-up dirt and grease. Once the lead is clean, check for burns, cracks and other damage. Do not bend the lead excessively, nor pull the lead lengthways - the conductor inside might break.

6 Disconnect the other end of the lead from the ignition coil. Again, pull only on the end fitting. Check for corrosion and a tight fit in the same manner as the spark plug end. Refit the lead securely on completion.

7 Check the remaining leads one at a time, in the same way.

8 If new spark plug (HT) leads are required, purchase a set for your specific car and engine.

9 Even with the ignition system in first-class condition, some engines may still occasionally experience poor starting attributable to damp ignition components. To disperse moisture, a water-dispersant aerosol should be liberally applied.

**Ignition timing - check and adjustment**

10 Check the ignition timing as described in Chapter 5B.

**21 Engine management system check**

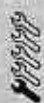


1 This check is part of the manufacturer's maintenance schedule, and involves testing the engine management system using special dedicated test equipment. Such testing will allow the test equipment to read any fault codes stored in the electronic control unit memory.

2 Unless a fault is suspected, this test is not essential, although it should be noted that it is recommended by the manufacturers.

3 If access to suitable test equipment is not possible, make a thorough check of all ignition, fuel and emission control system components, hoses, and wiring, for security and obvious signs of damage. Further details of the fuel system, emission control system and ignition system can be found in the relevant parts of Chapters 4 and 5.

**22 Hinge and lock lubrication**



1 Lubricate the hinges of the bonnet, doors and tailgate with a light general-purpose oil. Similarly, lubricate all latches, locks and lock strikers. At the same time, check the security and operation of all the locks, adjusting them if necessary (see Chapter 11).

2 Lightly lubricate the bonnet release mechanism and cable with a suitable grease.

**23 Headlight beam adjustment**



1 Accurate adjustment of the headlight beam is only possible using optical beam-setting equipment, and this work should therefore be carried out by a Fiat dealer or service station with the necessary facilities. In an emergency, however, the following procedure will provide an acceptable light pattern.

2 Position the car on a level surface with tyres correctly inflated, approximately 10 metres in front of, and at right-angles to, a wall or garage door.

3 Draw a horizontal line on the wall or door at headlamp centre height. Draw a vertical line corresponding to the centre line of the car, then measure off a point either side of this, on the horizontal line, corresponding with the headlamp centres.

4 Switch on the main beam and check that the areas of maximum illumination coincide with the headlamp centre marks on the wall. If not, turn the adjustment screw located on the upper inside edge of the headlight unit to adjust the beam laterally, and the adjustment screw located on the upper outside edge of the headlight unit to adjust the beam

vertically. On models with electric headlight adjustment, make sure that it is set at its basic setting before making the adjustment.

**24 Road test**



**Instruments and electrical equipment**

1 Check the operation of all instruments and electrical equipment.

2 Make sure that all instruments read correctly, and switch on all electrical equipment in turn, to check that it functions properly.

**Steering and suspension**

3 Check for any abnormalities in the steering, suspension, handling or road feel.

4 Drive the vehicle, and check that there are no unusual vibrations or noises.

5 Check that the steering feels positive, with no excessive sloppiness, or roughness, and check for any suspension noises when cornering and driving over bumps.

**Drivetrain**

6 Check the performance of the engine, clutch (where applicable), transmission and driveshafts.

7 Listen for any unusual noises from the engine, clutch and gearbox/transmission.

8 Make sure that the engine runs smoothly when idling, and that there is no hesitation when accelerating.

9 Check that, where applicable, the clutch action is smooth and progressive, that the drive is taken up smoothly, and that the pedal travel is not excessive. Also listen for any noises when the clutch pedal is depressed.

10 On manual gearbox models, check that all gears can be engaged smoothly without noise, and that the gear lever action is not abnormally vague or notchy.

11 On automatic transmission models, check that all the gear positions can be selected with the vehicle at rest. If any problems are found, they should be referred to a Fiat dealer.

12 Listen for a metallic clicking sound from the front of the vehicle, as the vehicle is driven slowly in a circle with the steering on full-lock. Carry out this check in both directions. If a clicking noise is heard, this indicates wear in a driveshaft joint, in which case renew the joint if necessary.

**Check the braking system**

13 Make sure that the vehicle does not pull to one side when braking, and that the wheels do not lock prematurely when braking hard.

14 Check that there is no vibration through the steering when braking.

15 Check that the handbrake operates correctly without excessive movement of the lever, and that it holds the vehicle stationary on a slope.

## 1A•14 Every 20 000 miles - petrol models

16 Test the operation of the brake servo unit as follows. With the engine off, depress the footbrake four or five times to exhaust the vacuum. Hold the brake pedal depressed, then start the engine. As the engine starts,

there should be a noticeable give in the brake pedal as vacuum builds up. Allow the engine to run for at least two minutes, and then switch it off. If the brake pedal is depressed now, it should be possible to detect a hiss

from the servo as the pedal is depressed. After about four or five applications, no further hissing should be heard, and the pedal should feel considerably harder.

## Every 30 000 miles (45 000 km) or 3 years

### 25 Lambda/oxygen sensor check



If the CO level at the exhaust tailpipe is too high or low, the vehicle should be taken to a Fiat dealer so that the complete fuel-injection and ignition systems, including the Lambda/oxygen sensor, can be thoroughly checked using the special diagnostic equipment. Once these have been checked and are known to be free from faults, the fault must be in the catalytic converter, which must be renewed as described in Chapter 4D, Section 6.

### 26 Manual transmission oil level check



1 Park the vehicle on a level surface, if possible over an inspection pit or on a ramp as the filler/level plug is best reached from under the engine compartment. The oil level must be checked before the car is driven, or at least 5 minutes after the engine has been switched off. If the oil is checked immediately after driving the car, some of the oil will remain distributed around the transmission components, resulting in an inaccurate level reading.

2 Wipe clean the area around the filler/level plug, which is situated on the front of the

transmission (see illustration). Using an Allen key, unscrew the plug and clean it.

3 The oil level should reach the lower edge of the filler/level hole. A certain amount of oil will have gathered behind the filler/level plug, and will trickle out when it is removed; this does not necessarily indicate that the level is correct. To ensure that a true level is established, wait until the initial trickle has stopped, then add oil as necessary until a trickle of new oil can be seen emerging. The level will be correct when the flow ceases; use only good-quality oil of the specified type. Make sure that the vehicle is completely level when checking the level and do not overfill.

4 When the level is correct refit and tighten the plug and wipe away any spilt oil.

Park the car on level ground, then switch off the ignition.

2 Firmly apply the handbrake, then jack up the front of the car and support it securely on axle stands (see *Jacking and vehicle support*). Note that, when refilling and checking the fluid level, the car must be lowered to the ground, and level, to ensure accuracy.

3 Remove the dipstick, then position a suitable container under the transmission. Unscrew the sump drain plug and allow the fluid to drain for at least 10 minutes. Refit and tighten the drain plug when the fluid has completely drained.



**Warning:** The transmission fluid may be very hot and precautions must be taken to avoid scalding.

### 27 Evaporative loss system check

Refer to Chapter 4D Section 2 and check that all wiring and hoses are correctly connected to the evaporative loss system components.

### 28 Automatic transmission filter and fluid change



1 Take the vehicle on a short run, to warm the transmission up to operating temperature.

4 Clean around the transmission sump mating flange. Unbolt and remove the sump and remove the gasket.

5 Remove the two bolts and withdraw the transmission fluid filter (see illustration).

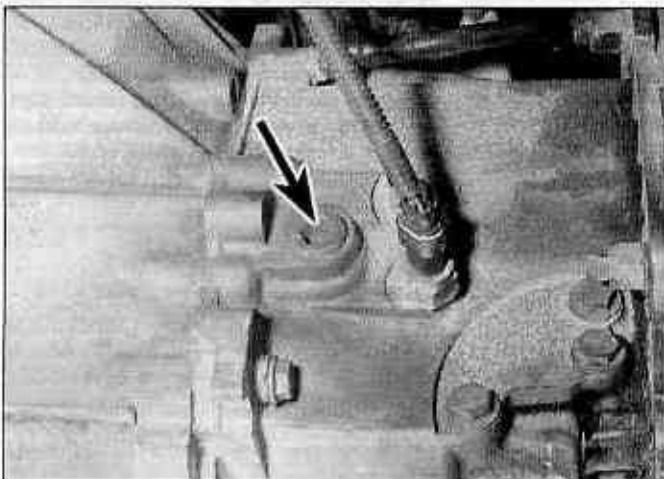
6 Fit the new filter, and secure it with the two bolts.

7 Refit the sump using a new gasket, then lower the vehicle to the ground.

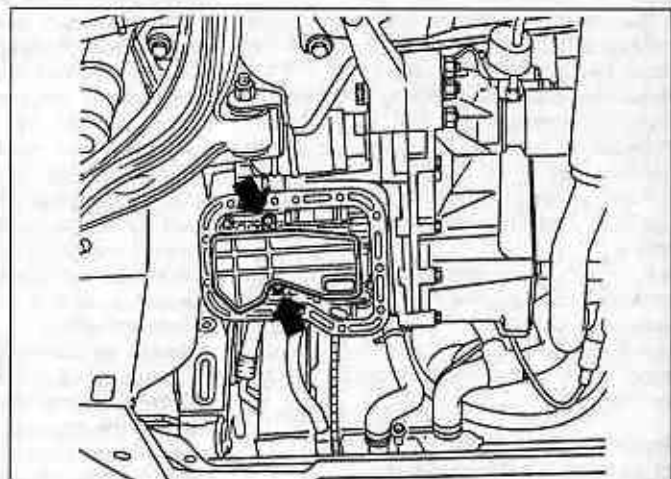
8 Fill the transmission with the specified quantity of fluid via the dipstick tube, using a funnel with a fine mesh filter.

9 Run the engine to normal operating temperature, then check the fluid level as described in *Weekly checks*.

10 Dispose of the old fluid safely.



26.2 Transmission filler/level plug location



28.5 Automatic transmission fluid filter retaining bolts

## Every 40 000 miles (60 000 km) or 4 years

### 29 Rear brake shoe check



1 Check the front wheels then jack up the rear of the car and support it on axle stands (see *Jacking and Vehicle Support*). Remove the rear roadwheels.

2 Using the inspection hole at the edge of the brake drum, check that the linings are not worn below the minimum thickness given in the *Specifications* (see *illustration*). If necessary use a torch.

3 If the friction material on any shoe is worn down to the specified minimum thickness or less, all four shoes must be renewed as a set.

4 At the same time check for signs of brake fluid leakage.

5 For a comprehensive check, the brake drum should be removed and cleaned. This

will allow the wheel cylinders to be checked, and the condition of the brake drum itself to be fully examined (see Chapter 9).

6 Refit the rubber plugs then lower the car to the ground.

### 30 Timing belt renewal

Refer to Chapter 2A or 2B.

**Note:** Although the normal interval for timing belt renewal is 70 000 miles (105 000 km), it is strongly recommended that the interval is reduced on vehicles which are subjected to intensive use, ie, mainly short journeys or a lot of stop-start driving. The actual belt renewal interval is therefore very much up to the individual owner. That being said, it is highly recommended to err on the side of safety, and



29.2 Check the thickness of the shoe friction material through the hole on the edge of the drum (arrowed)

renew the belt at 40 000 miles (60 000 km), bearing in mind the drastic consequences resulting from belt failure.

## Every 60 000 miles (90 000 km) or 6 years

### 31 Emission control system check

Refer to Chapter 4D. A full check of the emissions control systems must be made by a Fiat dealer.

## Every 80 000 miles (120 000 km)

### 32 Manual transmission oil renewal



1 Park the vehicle on a level surface, if possible over an inspection pit or on a ramp as the filler/level and drain plugs are accessed from under the engine compartment. If necessary jack up the vehicle and support on axle stands (see *Jacking and vehicle support*).

2 Wipe clean the area around the filler/level and drain plugs, which are on the front and bottom of the transmission (see *illustration*).

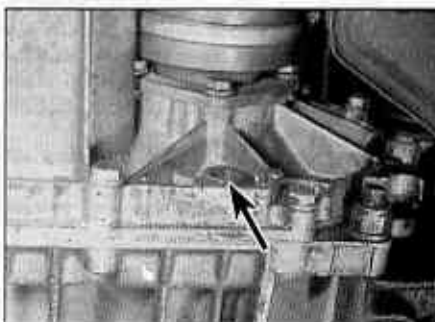
3 Using an Allen key, unscrew the filler/level plug and clean it.

4 Position a suitable container beneath the transmission, then use the Allen key to unscrew the drain plug. Allow the oil to completely drain.

5 Wipe clean the drain plug then refit and tighten it.

6 Fill the transmission with the correct grade and quantity of oil, referring to Section 26 when checking the level. Refit and tighten the filler/level plug.

7 Where applicable lower the vehicle to the ground.



32.2 Transmission drain plug location (viewed from under the vehicle)

## Every 2 years (regardless of mileage)

### 33 Coolant renewal



#### Cooling system draining

**Warning:** Wait until the engine is cold before starting this procedure. Do not allow antifreeze to come in contact with your skin, or with the painted surfaces of the vehicle. Rinse off spills immediately with plenty of water. Never leave antifreeze lying around in an open container, or in a puddle in the

driveway or on the garage floor. Children and pets are attracted by its sweet smell, but antifreeze can be fatal if ingested.

1 With the engine completely cold, cover the expansion tank cap with a wad of rag, and slowly turn the cap anti-clockwise to relieve the pressure in the cooling system (a hissing sound will normally be heard). Wait until any pressure remaining in the system is released, then continue to turn the cap until it can be removed.

2 Position a suitable container beneath the radiator bottom hose connection, then release the retaining clip and ease the hose from the radiator stub (see *illustration*). If the hose



33.2 Disconnecting the radiator bottom hose to drain the coolant



joint has not been disturbed for some time, it will be necessary to gently manipulate the hose to break the joint. Do not use excessive force, or the radiator stub could be damaged. Allow the coolant to drain into the container.

**3** Certain models are fitted with cooling system bleed plugs, which should be opened to aid the draining process and help prevent airlocks. These are located on the top right hand edge of the radiator, on the heater inlet hose and additionally, on 16-valve engines, on the heater outlet hose (see illustrations). If the coolant has been drained for a reason other than renewal, then provided it is clean and less than two years old, it can be re-used, though this is not recommended.

**4** Once all the coolant has drained, reconnect the hose to the radiator and secure it in position with the retaining clip.

### Cooling system flushing

**5** If coolant renewal has been neglected, or if the antifreeze mixture has become diluted, then in time, the cooling system may gradually lose efficiency, as the coolant passages become restricted due to rust, scale deposits, and other sediment. The cooling system efficiency can be restored by flushing the system clean.

**6** The radiator should be flushed independently of the engine, to avoid contamination.

### Radiator flushing

**7** To flush the radiator disconnect the top and bottom hoses and any other relevant hoses from the radiator, with reference to Chapter 3.

**8** Insert a garden hose into the radiator top inlet. Direct a flow of clean water through the radiator, and continue flushing until clean water emerges from the radiator bottom outlet.

**9** If after a reasonable period, the water still does not run clear, the radiator can be flushed with a good proprietary cooling system

cleaning agent. It is important that their manufacturer's instructions are followed carefully. If the contamination is particularly bad, insert the hose in the radiator bottom outlet, and reverse-flush the radiator.

### Engine flushing

**10** To flush the engine, remove the thermostat as described in Chapter 3 then temporarily refit the thermostat cover.

**11** With the top and bottom hoses disconnected from the radiator, insert a garden hose into the radiator top hose. Direct a clean flow of water through the engine, and continue flushing until clean water emerges from the radiator bottom hose.

**12** On completion of flushing, refit the thermostat and reconnect the hoses with reference to Chapter 3.

### Cooling system filling

**13** Before attempting to fill the cooling system, make sure that all hoses and clips are in good condition, and that the clips are tight. Note that an antifreeze mixture must be used all year round, to prevent corrosion of the engine components (see below).

**14** Remove the expansion tank filler cap, and fill the system by slowly pouring the coolant into the expansion tank to prevent airlocks from forming. Ensure that all bleed plugs/screws are open.

**15** If the coolant is being renewed, begin by pouring in a couple of litres of water, followed by the correct quantity of antifreeze, then top-up with more water.

**16** Once the level in the expansion tank starts to rise, squeeze the radiator top and bottom hoses to help expel any trapped air in the system. Once all the air is expelled, top-up the coolant level to the MAX mark and refit the expansion tank cap. Close all bleed plugs. Continue the filling procedure as follows according to engine type.

### 1108 cc and 1242 cc (8-valve) engines

**17** Start the engine and run it until it reaches normal operating temperature, then stop the engine and allow it to cool.

**18** Check for leaks, particularly around disturbed components. Check the coolant level in the expansion tank, and top-up if necessary. Note that the system must be cold before an accurate level is indicated in the expansion tank. If the expansion tank cap is removed while the engine is still warm, cover the cap with a thick cloth, and unscrew the cap slowly to gradually relieve the system pressure (a hissing sound will normally be heard). Wait until any pressure remaining in the system is released, then continue to turn the cap until it can be removed.

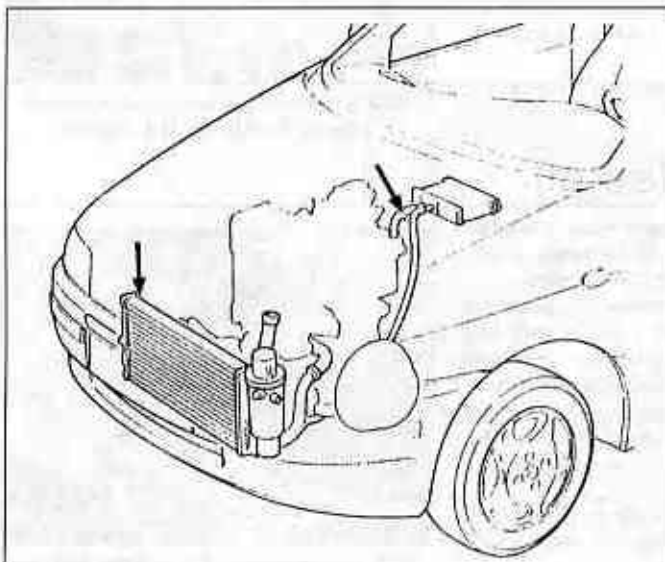
### 1242 cc (16-valve) engines

**19** Remove the expansion tank filler cap, start the engine and run it at idling speed for two to three minutes. Allow the engine to continue running until the electric cooling fan operates, but during this time, briefly increase the engine speed to 2000 to 3000 rpm every 30 seconds. Maintain the coolant level in the expansion tank to the MAX mark during this procedure, adding more coolant as necessary.

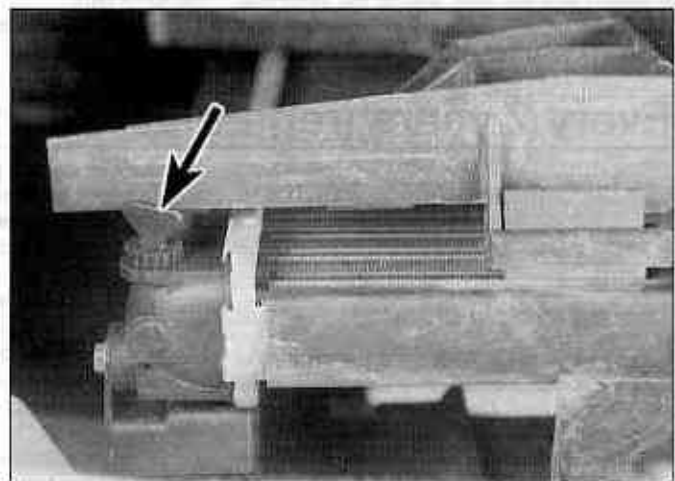
**20** On models without air conditioning, with the engine still idling, carefully unscrew the bleed plug on the top of the radiator. Increase the engine speed until fluid emerges from the bleed plug, then close the plug and return the engine to idle.

**Warning:** Take suitable precautions against scalding when opening the bleed plug as the coolant will be very hot.

**21** On all models, allow the engine to continue running at idle for a further five minutes. After this time, switch the engine off, allow it to cool completely and when cool



33.3a Location of cooling system bleed plugs (arrowed)



33.3b Bleed screw located on the top right hand edge of the radiator

check, and if necessary top-up, the level in the expansion tank. Refit the cap on completion.

## Antifreeze mixture

22 The antifreeze should always be renewed at the specified intervals. This is necessary not only to maintain the antifreeze properties, but also to prevent corrosion which would otherwise occur as the corrosion inhibitors become progressively less effective.

23 Always use an ethylene-glycol based antifreeze which is suitable for use in mixed-metal cooling systems. The quantity of antifreeze and levels of protection are indicated in the *Specifications*.

24 Before adding antifreeze, the cooling system should be completely drained, preferably flushed, and all hoses checked for condition and security.

25 After filling with antifreeze, a label should be attached to the expansion tank, stating the type and concentration of antifreeze used, and the date installed. Any subsequent topping-up should be made with the same type and concentration of antifreeze.

26 Do not use engine antifreeze in the windscreen/tailgate washer system, as it will

cause damage to the vehicle paintwork. A screenwash additive should be added to the washer system in the quantities stated on the bottle.

## 34 Brake fluid renewal



**Warning:** Brake hydraulic fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it. Do not use fluid that has been standing open for some time, as it absorbs moisture from the air. Excess moisture can cause a dangerous loss of braking effectiveness.

1 The procedure is similar to that for the bleeding of the hydraulic system as described in Chapter 9, except that the brake fluid reservoir should be emptied by siphoning, using a clean poultry baster or similar before starting, and allowance should be made for the old fluid to be expelled when bleeding a section of the circuit.

2 Working as described in Chapter 9, open the first bleed screw in the sequence, and

pump the brake pedal gently until nearly all the old fluid has been emptied from the master cylinder reservoir.



**Old hydraulic fluid is invariably much darker in colour than the new, making it easy to distinguish the two.**

3 Top-up to the MAX level with new fluid, and continue pumping until only the new fluid remains in the reservoir, and new fluid can be seen emerging from the bleed screw. Tighten the screw, and top the reservoir level up to the MAX level line.

4 Work through all the remaining bleed screws in the sequence until new fluid can be seen at all of them. Be careful to keep the master cylinder reservoir topped-up to above the MIN level at all times, or air may enter the system and greatly increase the length of the task.

5 When the operation is complete, check that all bleed screws are securely tightened, and that their dust caps are refitted. Wash off all traces of split fluid, and recheck the master cylinder reservoir fluid level.

6 Check the operation of the brakes before taking the car on the road.

## Degree of difficulty

Easy - suitable for a competent DIYer



Partly with advice from a professional



Difficult - requires specialist tools and equipment



Very difficult - requires specialist tools and equipment



Extremely difficult - requires specialist tools and equipment



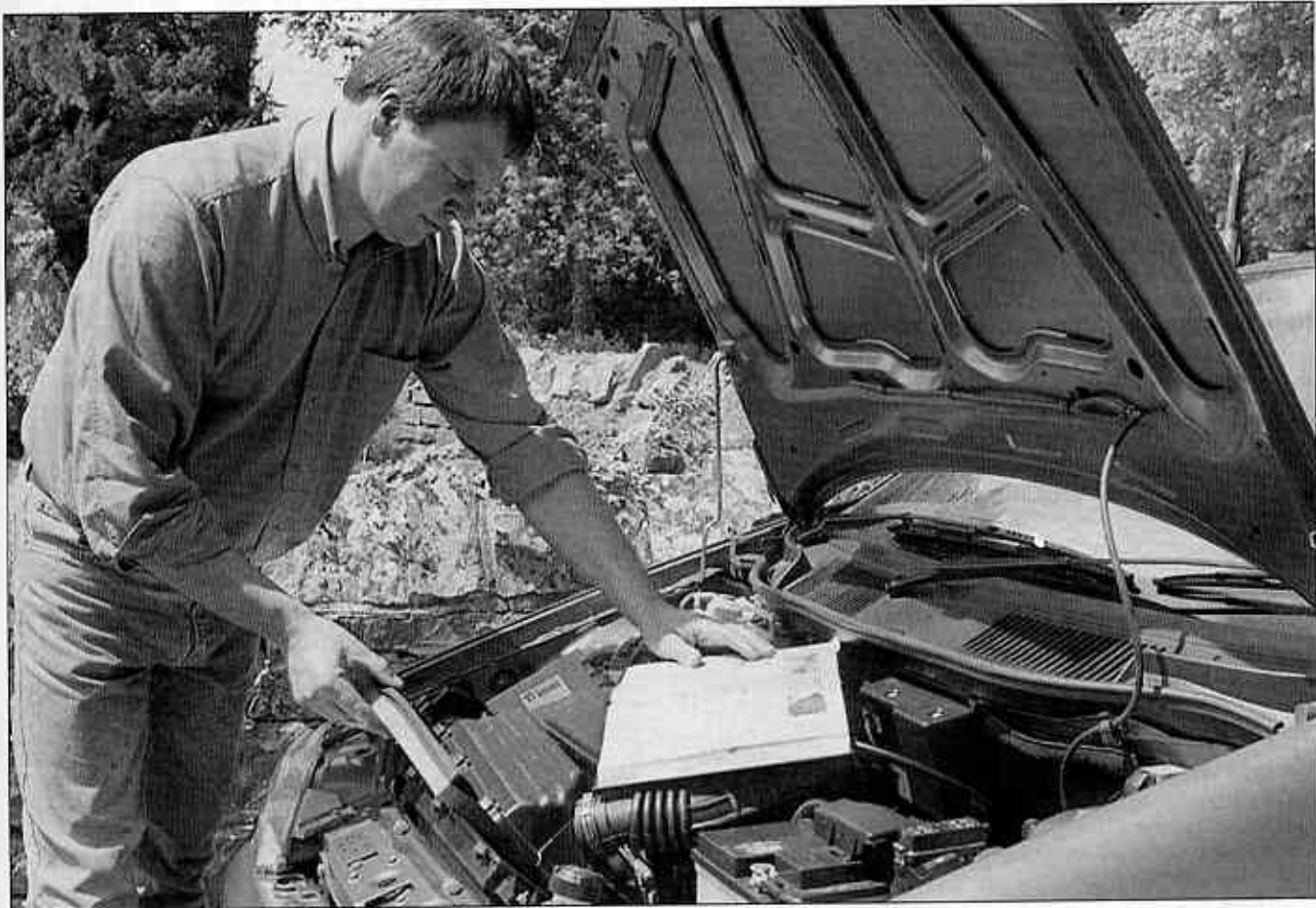
Very difficult - requires specialist tools and equipment

# Chapter 1 Part B:

## Routine maintenance & servicing - diesel models

### Contents

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Auxiliary drivebelt(s) check and renewal	16	Hose and fluid leak check	8
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Driveshaft gaiter check	10	Pollen filter renewal	14
Emissions control systems check	25	Rear brake shoe check	23
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Fuel filter water draining	4	Underbody sealant check	7
Headlight beam adjustment	20	Valve clearance check and adjustment	18



1B

### 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



# 1B•2 Servicing specifications - diesel models

## Lubricants and fluids

Refer to end of *Weekly checks* on page 0•17

## Capacities

<b>Engine oil (including filter)</b>	
Non-turbo diesel engine	4.95 litres
Turbo diesel engine	4.84 litres
<b>Cooling system</b>	
	7.2 litres
<b>Manual transmission</b>	
Non-turbo diesel engine	2.37 litres
Turbo diesel engine	1.98 litres
<b>Power-assisted steering</b>	
	0.65 litres
<b>Fuel tank</b>	
	47 litres
<b>Washer reservoir</b>	
Without headlight washers	2.5 litres
With headlight washers	7.0 litres

## Engine

Oil filter	Champion C112
<b>Engine idle speed:</b>	
Non-turbo diesel engine	810 ± 40 rpm
Turbo diesel engine	900 ± 20 rpm
Auxiliary drivebelt tension	5.0 mm deflection midway between pulleys
<b>Valve clearances - engine cold:</b>	
Inlet	0.30 mm ± 0.05 mm
Exhaust	0.35 mm ± 0.05 mm

## Cooling system

<b>Antifreeze mixture:</b>	
50% antifreeze	Protection down to -35°C
<b>Note:</b> Refer to antifreeze manufacturer for latest recommendations.	

## Fuel system

<b>Air filter element:</b>	
Non-turbo diesel engine (with Lucas/CAV injection)	Champion U611
Turbo diesel engine (with Bosch injection)	Champion U579
Fuel filter	Champion L120

## Brakes

Brake pad lining minimum thickness	1.5 mm
Brake shoe friction material minimum thickness	2.0 mm

## Tyre pressures

See end of *Weekly checks* on page 0•18

## Torque wrench settings

	Nm	lbf ft
Fuel filter bracket to body	18	13
Fuel filter to bracket	24	18
<b>Manual transmission oil drain plug:</b>		
Non-turbo diesel engine:		
Stage 1	12	9
Stage 2	Angle-tighten a further 180°	
Turbo diesel engine	46	34
Manual transmission oil filler plug	46	34
Roadwheel bolts	86	63

The maintenance intervals in this manual are provided with the assumption that you, not the dealer, will be carrying out the work. These are the minimum maintenance intervals recommended by us for vehicles driven daily.

If you wish to keep your vehicle in peak condition at all times, you may wish to perform some of these procedures more often. We encourage frequent maintenance, because it enhances the efficiency,

performance and resale value of your vehicle.

When the vehicle is new, it should be serviced by a factory-authorised dealer service department, in order to preserve the factory warranty.

## Every 250 miles (400 km) or weekly

- Refer to *Weekly checks*

## Every 5000 miles (7500 km) or 6 months - whichever comes first

- Renew the engine oil and filter (Section 3)
- Drain any water from the fuel filter (Section 4)

## Every 10 000 miles (15 000 km) or 12 months - whichever comes first

*In addition to the items listed above, carry out the following:*

- Check the operation of the brake warning lamp (Section 5)
- Check the front brake pads for wear (Section 6)
- Check the underbody and sealant for damage (Section 7)
- Hose and fluid leak check (Section 8)
- Check the condition of the exhaust system and its mountings (Section 9)
- Check the condition of the driveshaft gaiters (Section 10)
- Check and adjust the idle speed (Section 11)
- Renew the fuel filter (Section 12)
- Renew the air filter element (Section 13)
- Renew the pollen filter (Section 14)
- Check the steering and suspension components for condition and security (Section 15)

## Every 20 000 miles (30 000 km) or 2 years - whichever comes first

*In addition to the items listed above, carry out the following:*

- Check and if necessary adjust the tension of the auxiliary drivebelt(s) (Section 16)
- Check the freeplay and height of the clutch pedal (Section 17)
- Check and if necessary adjust the valve clearances (Section 18)
- Lubricate all hinges and locks (Section 19)
- Check the headlight beam adjustment (Section 20)
- Carry out a road test (Section 21)

## Every 30 000 miles (45 000 km) or 3 years - whichever comes first

*In addition to the items listed above, carry out the following:*

- Check and if necessary top-up the manual transmission oil level (Section 22)

## Every 40 000 miles (60 000 km) or 4 years - whichever comes first

*In addition to the items listed above, carry out the following:*

- Check the rear brake shoes for wear (Section 23)
- Renew the timing belt (Section 24)\*

**\*Note:** Although the normal interval for timing belt renewal is 70 000 miles (105 000 km), it is strongly recommended that the belt is renewed at 40 000 miles (60 000 km) on vehicles which are subjected to intensive use, ie. mainly short journeys or a lot of stop-start driving. The actual belt renewal interval is therefore very much up to the individual owner, but bear in mind that severe engine damage will result if the belt breaks.

## Every 60 000 miles (90 000 km) or 6 years - whichever comes first

*In addition to the items listed above, carry out the following:*

- Check the condition and operation of the emission control system components (Section 25)

## Every 80 000 miles (120 000 km)

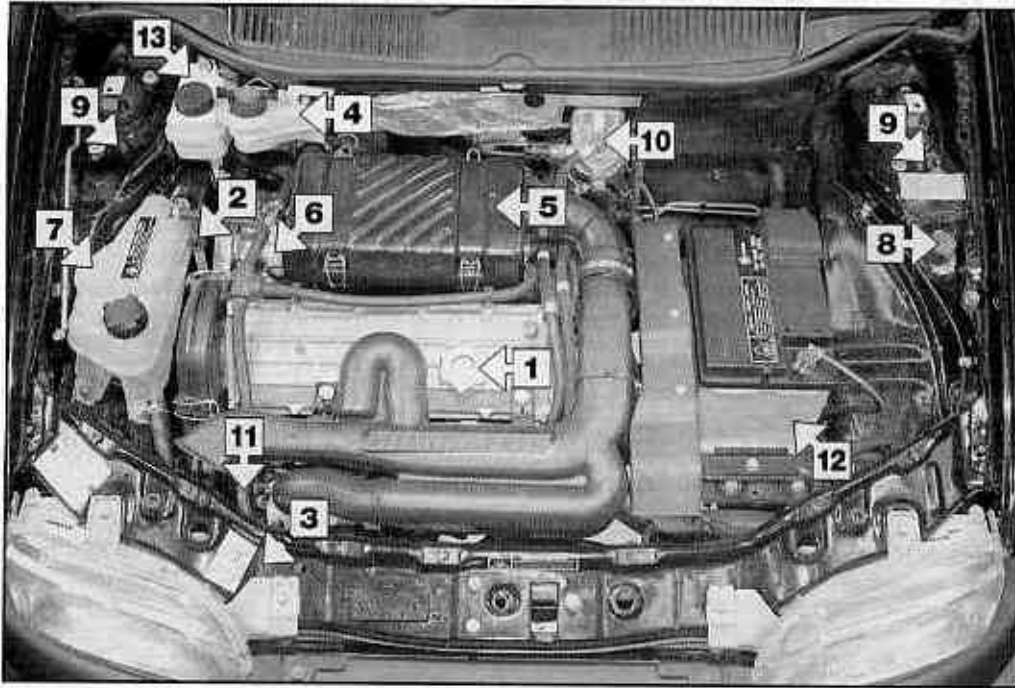
- Renew the manual transmission oil (Section 26)

## Every 2 years (regardless of mileage)

- Renew the engine coolant (Section 27)
- Renew the brake fluid (Section 28)

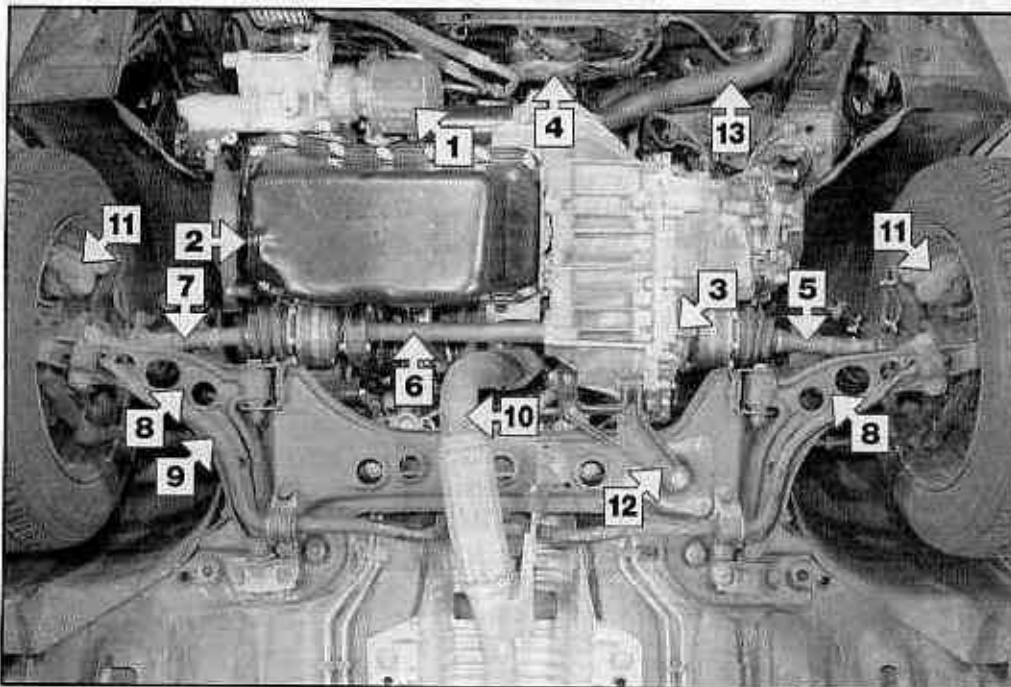
## 1B\*4 Component location - diesel models

### Underbonnet view - turbo diesel model



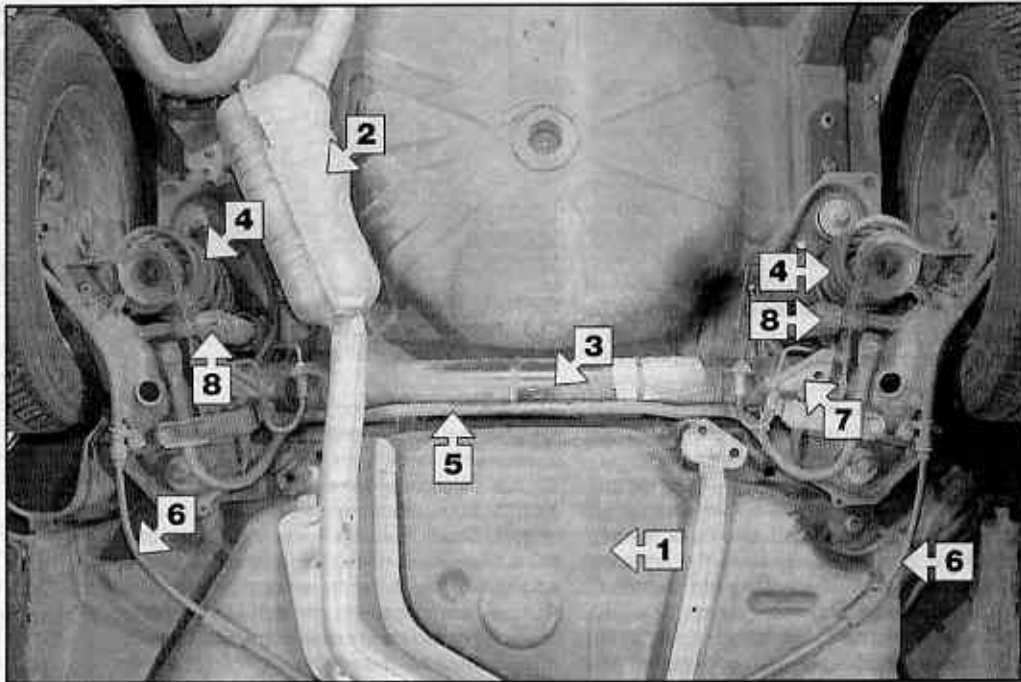
- 1 Engine oil filler cap
- 2 Engine oil dipstick
- 3 Oil filter
- 4 Brake/clutch fluid reservoir
- 5 Air cleaner cover
- 6 Power steering pump
- 7 Coolant expansion tank
- 8 Windscreen washer fluid reservoir
- 9 Front suspension strut upper mounting
- 10 Fuel filter/heater housing
- 11 Fuel injection pump
- 12 Battery
- 13 Power steering fluid reservoir

### Front underbody view - turbo diesel model



- 1 Oil filter
- 2 Sump drain plug
- 3 Transmission drain plug
- 4 Electric cooling fan unit
- 5 Left-hand driveshaft
- 6 Intermediate shaft
- 7 Right-hand driveshaft
- 8 Front suspension lower arms
- 9 Front anti-roll bar
- 10 Exhaust downpipe
- 11 Front brake calipers
- 12 Rear engine mounting
- 13 Radiator bottom hose

- 1 Fuel tank
- 2 Exhaust tailpipe and silencer
- 3 Rear axle
- 4 Coil springs
- 5 Rear anti-roll bar
- 6 Handbrake cables
- 7 Rear brake pressure regulating valve
- 8 Rear shock absorber lower mountings



## Maintenance procedures

### 1 Introduction

This Chapter is designed to help the home mechanic maintain his/her vehicle for safety, economy, long life and peak performance.

The Chapter contains a master maintenance schedule, and Sections dealing specifically with each task in the schedule. Visual checks, adjustments, component renewal and other helpful items are included. Refer to the accompanying illustrations of the engine compartment and the underside of the vehicle for the locations of the various components.

Servicing your vehicle in accordance with the mileage/time maintenance schedule and the following Sections will provide a planned maintenance programme, which should result in a long and reliable service life. This is a comprehensive plan, so maintaining some items but not others at the specified service intervals, will not produce the same results.

As you service your vehicle, you will discover that many of the procedures can, and should, be grouped together, because of the particular procedure being performed, or because of the proximity of two otherwise-unrelated components to one another. For example, if the vehicle is raised for any reason, the exhaust can be inspected at the same time as the suspension and steering components.

The first step in this maintenance programme is to prepare yourself before the

actual work begins. Read through all the Sections relevant to the work to be carried out, then make a list and gather all the parts and tools required. If a problem is encountered, seek advice from a parts specialist, or a dealer service department.

### 2 Regular maintenance

**1** If, from the time the vehicle is new, the routine maintenance schedule is followed closely, and frequent checks are made of fluid levels and high-wear items, as suggested throughout this manual, the engine will be kept in relatively good running condition, and the need for additional work will be minimised.

**2** It is possible that there will be times when the engine is running poorly due to the lack of regular maintenance. This is even more likely if a used vehicle, which has not received regular and frequent maintenance checks, is purchased. In such cases, additional work may need to be carried out, outside of the regular maintenance intervals.

**3** If engine wear is suspected, a compression test (refer to Chapter 2C) will provide valuable information regarding the overall performance of the main internal components. Such a test can be used as a basis to decide on the extent of the work to be carried out. If, for example, a compression test indicates serious internal engine wear, conventional maintenance as

described in this Chapter will not greatly improve the performance of the engine, and may prove a waste of time and money, unless extensive overhaul work is carried out first.

**4** The following series of operations are those usually required to improve the performance of a generally poor-running engine:

#### Primary operations

- a) Clean, inspect and test the battery (See *Weekly checks*).
- b) Check all the engine-related fluids (See *Weekly checks*).
- c) Drain the water from the fuel filter (Section 4).
- d) Check the condition and tension of the auxiliary drivebelt(s) (Section 16).
- e) Check the condition of the air filter, and renew if necessary (Section 13).
- f) Check the condition of all hoses, and check for fluid leaks (Section 8).
- g) Check the engine idle speed setting (Section 11).
- h) Check the exhaust gas emissions (Section 25).

**5** If the above operations do not prove fully effective, carry out the following secondary operations:

#### Secondary operations

All items listed under *Primary operations*, plus the following:

- a) Check the charging system (Chapter 5A, Section 4).
- b) Renew the fuel filter (Section 12) and check the fuel system (see Chapter 4C).

## Every 5000 miles (7500 km) or 6 months

## 3 Engine oil and filter renewal



1 Frequent oil and filter changes are the most important preventative maintenance procedures which can be undertaken by the DIY owner. As engine oil ages, it becomes diluted and contaminated, which leads to premature engine wear.

2 Before starting this procedure, gather all the necessary tools and materials. Also make sure that you have plenty of clean rags and newspapers handy, to mop up any spills. Ideally, the engine oil should be warm, as it will drain better, and more built-up sludge will be removed with it. Take care, however, not to touch the exhaust or any other hot parts of the engine when working under the vehicle. To avoid any possibility of scalding, and to protect yourself from possible skin irritants and other harmful contaminants in used engine oils, it is advisable to wear gloves when carrying out this work. Access to the underside of the vehicle will be greatly improved if it can be raised on a lift, driven onto ramps, or jacked up and supported on axle stands (see *Jacking and vehicle support*). Whichever method is chosen, make sure that the vehicle remains level, or if it is at an angle, that the drain plug is at the lowest point.

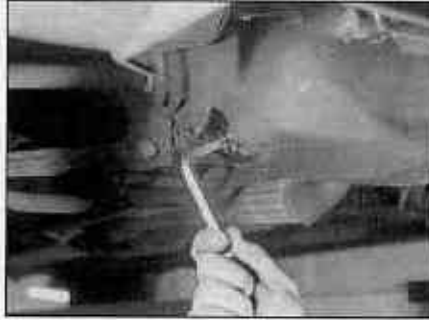
3 Slacken the drain plug about half a turn using a 12 mm Allen key (see illustration). Position the draining container under the drain plug, then remove the plug completely (see *Haynes Hint*).

4 Allow some time for the old oil to drain, noting that it may be necessary to reposition the container as the oil flow slows to a trickle.

5 After all the oil has drained, wipe off the drain plug with a clean rag, then clean the area around the drain plug opening and refit the plug. Tighten the plug securely.

6 If the filter is also to be renewed, move the container into position under the oil filter, which is located on the front right-hand side of the engine.

7 Using an oil filter removal tool if necessary, slacken the filter initially, then unscrew it by hand the rest of the way (see illustrations).



3.3 Using a 12 mm Allen key to loosen the engine oil drain plug

Empty the oil in the old filter into the container.

8 Use a clean rag to remove all oil, dirt and sludge from the filter sealing area on the engine. Check the old filter to make sure that the rubber sealing ring has not stuck to the engine. If it has, carefully remove it.

9 Apply a light coating of clean engine oil to the sealing ring on the new filter, then screw it into position on the engine. Tighten the filter firmly by hand only - **do not** use any tools (see illustration).

10 Remove the old oil and all tools from under the vehicle then lower the vehicle to the ground (if applicable).

11 Remove the dipstick, then unscrew the oil filler cap from the cylinder head cover. Fill the engine, using the correct grade and type of oil (see *Weekly checks*). An oil can spout or funnel may help to reduce spillage. Pour in half the specified quantity of oil first, then wait a few minutes for the oil to fall to the sump. Continue adding oil a small quantity at a time until the level is up to the MAX mark on the dipstick. Refit the filler cap.

12 Start the engine and run it for a few minutes; check for leaks around the oil filter seal and the sump drain-plug. Note that there may be a delay of a few seconds before the oil pressure warning light goes out when the engine is first started, as the oil circulates through the engine oil galleries and the new oil filter before the pressure builds up.

HAYNES  
HINT



*Keep the drain plug pressed into the sump while unscrewing it by hand the last couple of turns. As the plug releases, move it away sharply so that the stream of oil issuing from the sump runs into the container, not up your sleeve.*

13 Switch off the engine, and wait a few minutes for the oil to settle in the sump once more. With the new oil circulated and the filter completely full, recheck the level on the dipstick, and add more oil as necessary.

14 Dispose of the used engine oil safely, with reference to *General repair procedures* in the reference Sections of this manual.

## 4 Fuel filter water draining



1 A water drain screw is provided at the base of the fuel filter.

2 Position a suitable container under the fuel filter. Loosen the bleed screw on the top of the filter, and open the drain screw at the base of the filter by turning it anti-clockwise. Allow fuel and water to drain until fuel, free from water, emerges from the drain screw outlet. Close the drain and bleed screws and tighten them securely.

3 Dispose of the drained fuel safely.

4 Start the engine. If difficulty is experienced, bleed the fuel system (see Chapter 4C).



3.7a Using an oil filter removal chain strap



3.7b Removing the oil filter



3.9 New oil filter tightened by hand



## Every 10 000 miles (15 000 km) or 12 months

### 5 Brake warning lamp operation check

- 1 With the ignition key inserted and turned to the MAR position, open the bonnet and depress the button on the top of the brake fluid reservoir cap (see illustration).
- 2 As the button is pressed, the brake warning lamp on the instrument panel should light.
- 3 If the lamp fails to illuminate, check the operation of the level switch using a continuity tester, then refer to Chapter 12, Section 5, and check the instrument panel bulb.



5.1 Depress the button on the top of the brake fluid reservoir cap



6.2 Check the thickness of the pad friction material through the hole on the front of the caliper

### 6 Front brake pad check

- 1 Firmly apply the handbrake, then jack up the front of the car and support it securely on axle stands (see *Jacking and vehicle support*). Remove the front roadwheels.
- 2 Using a steel rule, measure the thickness of the friction material of the brake pads on both front brakes. This must not be less than 1.5 mm. Check the thickness of the pad friction material through the hole on the front of the caliper (see illustration).
- 3 For a comprehensive check, the brake pads should be removed and cleaned. The operation of the caliper can then also be checked, and the condition of the brake disc itself can be fully examined on both sides. Refer to Chapter 9 for further information.
- 4 If any pad's friction material is worn to the specified thickness or less, *all four pads must be renewed as a set*. Refer to Chapter 9.
- 5 On completion refit the roadwheels and lower the car to the ground.

around the camshaft cover, cylinder head, oil filter and sump joint faces. Bear in mind that, over a period of time, some very slight seepage from these areas is to be expected - what you are really looking for is any indication of a serious leak (see **Haynes Hint**). Should a leak be found, renew the offending gasket or oil seal by referring to the appropriate Chapters in this manual.

2 Also check the security and condition of all the engine-related pipes and hoses. Ensure that all cable-ties or securing clips are in place and in good condition. Clips which are broken or missing can lead to chafing of the hoses, pipes or wiring, which could cause more serious problems in the future.

3 Carefully check the radiator hoses and heater hoses along their entire length. Renew any hose which is cracked, swollen or deteriorated. Cracks will show up better if the hose is squeezed. Pay close attention to the hose clips that secure the hoses to the cooling system components. Hose clips can pinch and puncture hoses, resulting in leaks.

4 Inspect all the cooling system components (hoses, joint faces etc.) for leaks. A leak in the cooling system will usually show up as white or rust-coloured deposits on the area adjoining the leak. Where any problems of this nature are found on system components, renew the component or gasket with reference to Chapter 3.

5 With the vehicle raised, inspect the fuel tank and filler neck for punctures, cracks and other damage. The connection between the filler neck and tank is especially critical. Sometimes a rubber filler neck or connecting hose will leak due to loose retaining clamps or deteriorated rubber.

6 Carefully check all rubber hoses and metal fuel lines leading away from the fuel tank. Check for loose connections, deteriorated hoses, crimped lines, and other damage. Pay particular attention to the vent pipes and hoses, which often loop up around the filler neck and can become blocked or crimped. Follow the lines to the front of the vehicle, carefully inspecting them all the way. Renew damaged sections as necessary.

7 With the vehicle raised, check along the length of the underside for leaks from the metal brake lines, caused by damage or corrosion.

8 At each front brake caliper, check the area around the brake pipe unions and the bleed nipples for hydraulic fluid leakage.

9 Remove the front roadwheels and check for fluid leakage from the area around the caliper piston seal. Check that the lip of the piston dust seal is correctly located in its groove. If it has been displaced, the brake caliper should be removed and overhauled as described in Chapter 9, to check for internal dirt ingress or corrosion.

10 Check the area surrounding the master cylinder and vacuum servo unit for signs of corrosion, insecurity or hydraulic fluid leakage. Examine the vacuum hose leading to the servo unit for signs of damage or chafing.

11 From within the engine compartment, check the security of all fuel hose attachments and pipe unions, and inspect the fuel hoses and vacuum hoses for kinks, chafing and deterioration.

12 Where applicable, check the condition of the power steering fluid hoses and pipes.

### 7 Underbody sealant check

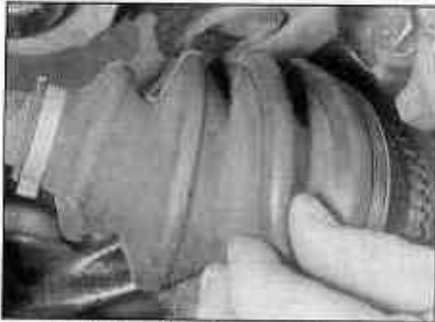
- 1 Jack up the front and rear of the car and support on axle stands (see *Jacking and vehicle support*). Alternatively position the car over an inspection pit.
- 2 Check the complete underbody, wheel housings and side sills for corrosion and/or damage to the underbody sealant. If evident, repair as necessary.

### 8 Hose and fluid leak check

- 1 Visually inspect the engine joint faces, gaskets and seals for any signs of water or oil leaks. Pay particular attention to the areas



A leak in the cooling system will usually show up as white or rust coloured deposits on the area adjoining the leak.



10.1 Checking the condition of a driveshaft gaiter

## 9 Exhaust system check

1 With the engine cold (at least an hour after the vehicle has been driven), check the complete exhaust system from the engine to the end of the tailpipe. The exhaust system is most easily checked with the vehicle raised on a hoist, or suitably supported on axle stands (see *Jacking and vehicle support*), so that the exhaust components are readily visible and accessible.

2 Check the exhaust pipes and connections for evidence of leaks, severe corrosion and damage. Make sure that all brackets and mountings are in good condition, and that all relevant nuts and bolts are tight. Leakage at any of the joints or in other parts of the system will usually show up as a black sooty stain in the vicinity of the leak.

3 Rattles and other noises can often be traced to the exhaust system, especially the brackets and mountings. Try to move the pipes and silencers. If the components are able to come into contact with the body or

suspension parts, secure the system with new mountings. Otherwise separate the joints (if possible) and twist the pipes as necessary to provide additional clearance.

## 10 Driveshaft gaiter check

1 With the vehicle raised and securely supported on stands (see *Jacking and vehicle support*), turn the steering onto full lock, then slowly rotate the roadwheel. Inspect the condition of the outer constant velocity (CV) joint rubber gaiters, squeezing the gaiters to open out the folds. Check for signs of cracking, splits or deterioration of the rubber, which may allow the grease to escape, and lead to water and grit entry into the joint. Also check the security and condition of the retaining clips. Repeat these checks on the inner CV joints (see *illustration*). If any damage or deterioration is found, the gaiters should be renewed (see Chapter 8, Section 3).

2 At the same time, check the general condition of the CV joints themselves by first holding the driveshaft and attempting to rotate the wheel. Repeat this check by holding the inner joint and attempting to rotate the driveshaft. Any appreciable movement indicates wear in the joints, wear in the driveshaft splines, or a loose driveshaft retaining nut.

## 11 Idle speed check and adjustment

1 The usual type of tachometer (rev counter), which works from ignition system pulses, cannot be used on diesel engines. A

diagnostic socket is provided for the use of Flat test equipment, but this will not normally be available to the home mechanic. If it is not felt that adjusting the idle speed by ear is satisfactory, it will be necessary to purchase or hire an appropriate tachometer, or else leave the task to a Flat dealer or other suitably equipped specialist.

2 Before making adjustments, warm up the engine to normal operating temperature. Make sure that the accelerator cable is correctly adjusted (see Chapter 4C).

3 The adjustment must be made with all electrical components (including the cooling fan) switched off. If the fan comes on during the adjustment, wait until it switches off automatically before proceeding.

4 The idle adjustment screw is located on the top of the fuel injection pump (see *illustration*). To adjust the idle speed loosen the locknut and turn the screw as required then tighten the locknut.

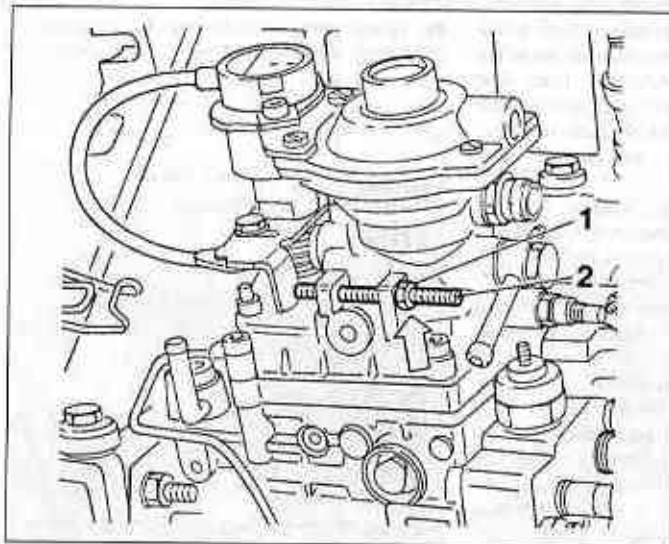
5 On completion switch off the engine.

## 12 Fuel filter renewal

1 The fuel filter is located on the bulkhead in the engine compartment. An electrically-operated heater is located between the filter and the housing.

2 Position a suitable container under the fuel filter. Loosen the bleed screw on the top of the filter, then disconnect the wiring from the water sensor and loosen the water drain screw on the bottom of the filter. Allow the fuel to drain completely (see *illustration*).

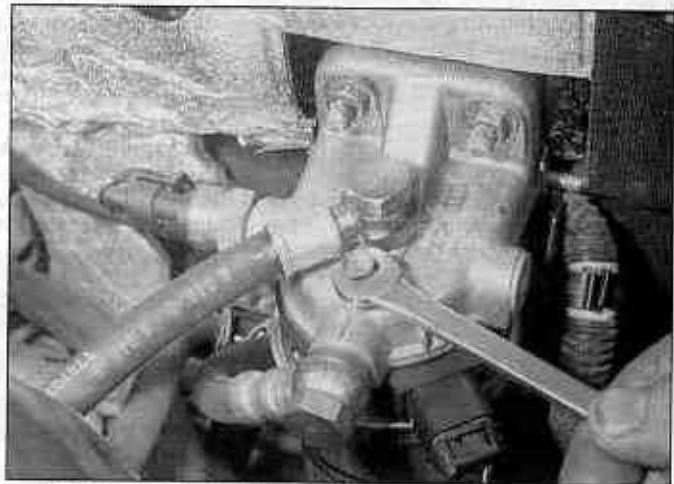
3 Tighten the drain and bleed screws, then use an oil filter strap to loosen the fuel filter (see *illustration*).



11.4 Idle speed adjustment

1 Locknut

2 Adjustment screw



12.2 Loosening the bleed screw on the top of the fuel filter

4 Completely unscrew the filter and pour the remaining contents into the container. Ensure that the rubber sealing ring comes away with the filter and unscrew the drain screw from the bottom of the filter (see illustrations).

5 Wipe clean the contact surfaces then smear a little fuel on the sealing rubber of the new filter.

6 Screw on the new filter fully using the hands only.

7 Prime the fuel system and start the engine with reference to Chapter 4C. Check for any signs of fuel leakage around the new filter.



12.3 Using an oil filter strap to loosen the fuel filter



12.4a Removing the fuel filter

### 13 Air filter renewal



1 Release the retaining clips and withdraw the air cleaner cover a little way from the main body. Leave the cover attached to the inlet duct.

2 Lift out the filter element (see illustration).

3 Remove any debris that may have collected inside the air cleaner and wipe the inner surfaces clean.

4 Fit a new air filter element in position, ensuring that the edges are securely seated.

5 Refit the air cleaner top cover and snap the retaining clips into position.

### 14 Pollen filter renewal



1 The pollen filter (where fitted) is located under the engine bulkhead cover panel.

2 Refer to Chapter 12 and remove both windscreen wiper arms.

3 Unclip the rubber seal from the relevant end of the top of the engine compartment bulkhead.

4 Unscrew the retaining fastener screws and pull out the fasteners securing the bulkhead cover panel in position. Release the cover panel from the base of the windscreen and remove it from the vehicle.

5 Pivot the pollen filter cover upwards and away then release the retaining clips and withdraw the filter from its housing (see illustration).



13.2 Removing the air filter element

6 Wipe clean the filter housing then fit the new filter. Clip the filter securely in position and refit the cover.

7 Refit the trim cover, securing it in position with the fasteners, and seat the rubber seal on the bulkhead.

### 15 Steering and suspension check



#### Front suspension and steering check

1 Raise the front of the vehicle, and securely support it on axle stands (see *Jacking and vehicle support*).

2 Visually inspect the balljoint dust covers and the steering rack-and-pinion gaiters for splits, chafing or deterioration. Any wear of these components will cause loss of lubricant, together with dirt and water entry, resulting in rapid deterioration of the balljoints or steering gear.

3 On vehicles with power steering, check the fluid hoses for chafing or deterioration, and the pipe and hose unions for fluid leaks. Also check for signs of fluid leakage under pressure from the steering gear rubber gaiters, which would indicate failed fluid seals within the steering gear.

4 Grasp the roadwheel at the 12 o'clock and 6 o'clock positions, and try to rock it (see illustration). Very slight free play may be felt, but if the movement is appreciable, further investigation is necessary to determine the

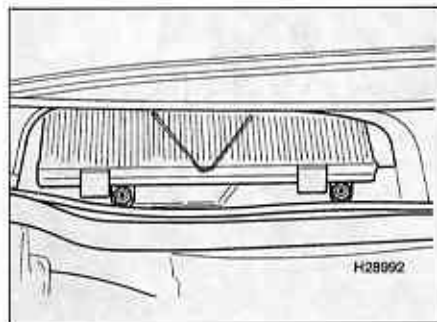


12.4b Showing the drain screw components on the bottom of the fuel filter

source. Continue rocking the wheel while an assistant depresses the footbrake. If the movement is now eliminated or significantly reduced, it is likely that the hub bearings are at fault. If the free play is still evident with the footbrake depressed, then there is wear in the suspension joints or mountings.

5 Now grasp the wheel at the 9 o'clock and 3 o'clock positions, and try to rock it as before. Any movement felt now may again be caused by wear in the hub bearings or the steering track-rod balljoints. If the inner or outer balljoint is worn, the visual movement will be obvious.

6 Using a large screwdriver or flat bar, check for wear in the suspension mounting bushes by levering between the relevant suspension component and its attachment point. Some movement is to be expected as the mountings are made of rubber, but excessive wear should be obvious. Also check the condition of any visible rubber bushes, looking for splits, cracks or contamination of the rubber.



14.5 Location of pollen filter



15.4 Rocking a roadwheel to check for wear in the steering/suspension components

7 With the car standing on its wheels, have an assistant turn the steering wheel back and forth about an eighth of a turn each way. There should be very little, if any, lost movement between the steering wheel and roadwheels. If this is not the case, closely observe the joints and mountings previously described, but in addition, check the steering column universal joints for wear, and the rack-and-pinion steering gear itself.

**Suspension strut/shock absorber check**

8 Check for any signs of fluid leakage around the suspension strut/shock absorber body, or from the rubber gaiter around the piston rod. Should any fluid be noticed, the suspension strut/shock absorber is defective internally, and should be renewed. **Note:** Suspension struts/shock absorbers should always be renewed in pairs on the same axle.

9 The efficiency of the suspension strut/shock absorber may be checked by bouncing the vehicle at each corner. Generally speaking, the body will return to its normal position and stop after being depressed. If it rises and returns on a rebound, the suspension strut/shock absorber is probably suspect. Examine also the suspension strut/shock absorber upper and lower mountings for any signs of wear.

**Every 20 000 miles (30 000 km) or 2 years**

**16 Auxiliary drivebelt(s) check and renewal**



**Note:** Fiat specify the use of a special tool to correctly set the drivebelt tension. If access to this equipment cannot be obtained, an approximate setting can be achieved using the method described below. If the method described is used, the tension should be checked using the special tool at the earliest possible opportunity.

1 Depending on equipment fitted, one, two or three auxiliary drivebelts may be fitted. The alternator, power steering pump and air conditioning compressor, as applicable, are each driven by an individual drivebelt.

**Checking**

2 Disconnect the battery negative terminal (refer to *Disconnecting the battery* in the Reference Section of this manual).

3 Firmly apply the handbrake, then jack up the front of the car and support it securely on axle stands (see *Jacking and vehicle support*).

4 Remove the right-hand wheel.

5 Remove the inner cover(s) from under the right-hand wheelarch for access to the right-hand side of the engine.

6 Using a socket on the crankshaft sprocket bolt, rotate the crankshaft so that the full length of the auxiliary drivebelt(s) can be examined. Look for cracks, splitting and fraying on the surface of the belt; check also for signs of glazing (shiny patches) and

separation of the belt plies. If damage or wear is visible, the belt should be renewed.

7 If the condition of the belt is satisfactory, check the drivebelt tension as described below.

**Renewal**

**Alternator drivebelt**

8 On models with air conditioning, remove the compressor drivebelt as described below.

9 Unclip and remove the upper timing belt cover, then unbolt and remove the lower timing belt cover.

10 Loosen the pivot bolt and adjustment lockbolt then unscrew the adjustment bolt to move the alternator towards the engine so that the drivebelt may be slipped off the alternator, crankshaft, and, on models with air conditioning, the idler pulley (see illustrations).

11 When renewing a drivebelt, ensure that the correct type is used. Fit the belt around the pulleys then tighten the adjustment bolt to take up any slack in the belt. Adjust the tension correctly as described below.

**Power steering pump drivebelt**

12 Remove the alternator drivebelt as described previously.

13 Slacken the bolts securing the power steering pump to the mounting bracket.

14 Slacken the adjusting bolt locknut and turn the adjusting bolt until all the tension is removed from the drivebelt.

15 Undo the bolts and remove the pulley guard from the power steering pump then slip the drivebelt off the pulleys.

16 Ensuring that the correct type of drivebelt is used, fit the belt around the pulleys and turn the adjusting bolt to just take up the slack in the belt. Adjust the tension correctly as described below.

**Air conditioning compressor drivebelt**

17 Slacken the bolts securing the adjustment pulley bracket to the engine.

18 Slacken the adjusting bolt locknut and turn the adjusting bolt until all the tension is removed from the drivebelt, then slip the belt off the pulleys.

19 Ensuring that the correct type of drivebelt is used, fit the belt around the pulleys and turn the adjusting bolt to just take up the slack in the belt. Adjust the tension correctly as described below.

**Tensioning**

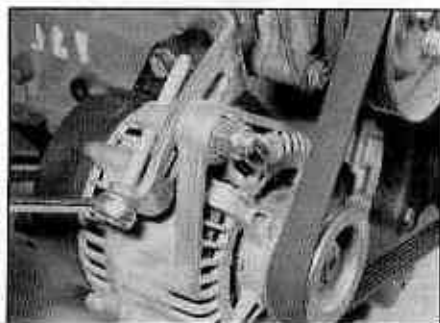
20 Correct tensioning of the belt will ensure that it has a long life. A belt which is too slack will slip and perhaps squeal. Beware, however, of overtightening, as this can cause wear in the alternator, power steering pump or air conditioning compressor bearings. **Note:** Fiat recommend use of their special tensioning tool however the following procedure will set the tension correctly.

21 The belt(s) should be tensioned so that, under firm thumb pressure, there is approximately 5.0 mm of free movement at the mid-point between the pulleys. To adjust, tighten or loosen the relevant adjustment bolt until the tension is correct. Fully tighten the pivot and adjustment lockbolts. Repeat this procedure for any remaining drivebelts removed for access.

22 Refit the lower timing belt cover and tighten the mounting bolts.

23 Refit the upper timing belt cover and secure with the clips.

24 Refit the inner cover and wheel, lower the vehicle to the ground, then reconnect the battery negative terminal.



16.10a Loosening the alternator drivebelt adjustment bolt



16.10b Removing the drivebelt from the alternator pulley

**17 Clutch adjustment check**

Refer to Chapter 6, Section 2.



18.7 Using feeler blades to check the valve clearances



18.11 Valve clearance adjustment shim



18.13 Measuring the thickness of a shim using a micrometer

## 18 Valve clearance check and adjustment



1 The importance of having the valve clearances correctly adjusted cannot be overstressed, as they vitally affect the performance of the engine. Adjustment should only be necessary when the valve gear has become noisy, after engine overhaul, or when trying to trace the cause of power loss. The clearances are checked as follows. The engine must be cold for the check to be accurate.

2 Apply the handbrake then jack up the right-hand front of the vehicle and support on an axle stand (see *Jacking and vehicle support*). Engage 4th gear. The engine can now be rotated by turning the right-hand front roadwheel.

3 Remove all four glow plugs as described in Chapter 5C.

4 Remove the air cleaner cover and air duct then remove the camshaft cover as described in Chapter 2C.

5 Each valve clearance must be checked when the high point of the cam is pointing directly upward away from the cam follower.

6 Check the clearances in the firing order 1-3-4-2, No 1 cylinder being at the timing belt end of the engine. This will minimise the amount of crankshaft rotation required.

7 Insert the appropriate feeler blade between the heel of the cam and the cam follower shim of the first valve (see *illustration*). If necessary alter the thickness of the feeler blade until it is a stiff, sliding fit. Record the thickness, which will, of course, represent the valve clearance for this particular valve.

8 Turn the engine, check the second valve clearance and record it.

9 Repeat the operations on all the remaining valves, recording their respective clearances.

10 Remember that the clearance for inlet and exhaust valves differs - see *Specifications*. Counting from the timing cover end of the engine, the valve sequence is:

Inlet	2-4-5-7
Exhaust	1-3-6-8

11 Where clearances are incorrect the particular shim will have to be changed. To remove the shim, turn the crankshaft until the high point of the cam is pointing directly upward. The cam follower will now have to be depressed so that the shim can be extracted. Special tools are available from your Fiat dealer to do the job, otherwise you will have to make up a forked lever to locate on the rim of the cam follower. This must allow room for the shim to be prised out by means of the cut-outs provided in the cam follower rim (see *illustration*).

12 Once the shim is extracted, establish its thickness and change it for a thicker or thinner one to bring the previously recorded clearance within specification. For example, if the measured valve clearance was 1.27 mm too great, a shim *thicker* by this amount will be required. Conversely, if the clearance was 1.27 mm too small, a shim *thinner* by this amount will be required.

13 Shims have their thickness (mm) engraved on them; although the engraved side should be fitted so as not to be visible, wear still occurs and often obliterates the number. In this case, measuring their thickness with a metric micrometer is the only method to establish their thickness (see *illustration*).

14 In practice, if several shims have to be changed, they can often be interchanged, so avoiding the necessity of having to buy more new shims than is necessary.

15 If more than two or three valve clearances are found to be incorrect, it will be more convenient to remove the camshaft for easier removal of the shims.

16 Where no clearance can be measured, even with the thinnest available shim in position, the valve will have to be removed and the end of its stem ground off squarely. This will reduce its overall length by the minimum amount to provide a clearance. This job should be entrusted to your dealer as it is important to keep the end of the valve stem square.

17 On completion, refit the camshaft cover and gasket, air cleaner and duct, and glowplugs.

18 Lower the vehicle to the ground.

## 19 Hinge and lock lubrication



1 Lubricate the hinges of the bonnet, doors and tailgate with a light general-purpose oil. Similarly, lubricate all latches, locks and lock strikers. At the same time, check the security and operation of all the locks, adjusting them if necessary (see Chapter 11).

2 Lightly lubricate the bonnet release mechanism and cable with a suitable grease.

## 20 Headlight beam adjustment



1 Accurate adjustment of the headlight beam is only possible using optical beam-setting equipment, and this work should therefore be carried out by a Fiat dealer or service station with the necessary facilities. In an emergency, however, the following procedure will provide an acceptable light pattern.

2 Position the car on a level surface with tyres correctly inflated, approximately 10 metres in front of, and at right-angles to, a wall or garage door.

3 Draw a horizontal line on the wall or door at headlamp centre height. Draw a vertical line corresponding to the centre line of the car, then measure off a point either side of this, on the horizontal line, corresponding with the headlamp centres.

4 Switch on the main beam and check that the areas of maximum illumination coincide with the headlamp centre marks on the wall. If not, turn the adjustment screw located on the upper inside edge of the headlight unit to adjust the beam laterally, and the adjustment screw located on the upper outside edge of the headlight unit to adjust the beam vertically. On models with electric headlight adjustment, make sure that it is set at its basic setting before making the adjustment.

21 Road test



**Instruments and electrical equipment**

- 1 Check the operation of all instruments and electrical equipment.
- 2 Make sure that all instruments read correctly, and switch on all electrical equipment in turn, to check that it functions properly.

**Steering and suspension**

- 3 Check for any abnormalities in the steering, suspension, handling or road feel.
- 4 Drive the vehicle, and check that there are no unusual vibrations or noises.
- 5 Check that the steering feels positive, with no excessive sloppiness, or roughness, and check for any suspension noises when cornering and driving over bumps.

**Drivetrain**

- 6 Check the performance of the engine, clutch, transmission and driveshafts.

- 7 Listen for any unusual noises from the engine, clutch and transmission.
- 8 Make sure that the engine runs smoothly when idling, and that there is no hesitation when accelerating.
- 9 Check that the clutch action is smooth and progressive, that the drive is taken up smoothly, and that the pedal travel is not excessive. Also listen for any noises when the clutch pedal is depressed.
- 10 Check that all gears can be engaged smoothly without noise, and that the gear lever action is not abnormally vague or notchy.
- 11 Listen for a metallic clicking sound from the front of the vehicle, as the vehicle is driven slowly in a circle with the steering on full-lock. Carry out this check in both directions. If a clicking noise is heard, this indicates wear in a driveshaft joint, in which case renew the joint if necessary.

**Check the braking system**

- 12 Make sure that the vehicle does not pull to one side when braking, and that the wheels do not lock prematurely when braking hard.

- 13 Check that there is no vibration through the steering when braking.
- 14 Check that the handbrake operates correctly without excessive movement of the lever, and that it holds the vehicle stationary on a slope.
- 15 Test the operation of the brake servo unit as follows: With the engine off, depress the footbrake four or five times to exhaust the vacuum. Hold the brake pedal depressed, then start the engine. As the engine starts, there should be a noticeable give in the brake pedal as vacuum builds up. Allow the engine to run for at least two minutes, and then switch it off. If the brake pedal is depressed now, it should be possible to detect a hiss from the servo as the pedal is depressed. After about four or five applications, no further hissing should be heard, and the pedal should feel considerably harder. **Note:** The vacuum for the servo unit is provided by the vacuum pump mounted on the left-hand end of the cylinder head.

**Every 30 000 miles (45 000 km) or 3 years**

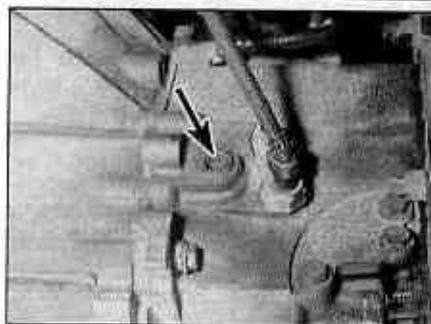
22 Manual transmission oil level check



- 1 Park the vehicle on a level surface, if possible over an inspection pit or on a ramp as the filler/level plug is best reached from under the engine compartment. The oil level must be checked before the car is driven, or at least 5 minutes after the engine has been switched off. If the oil is checked immediately after driving the car, some of the oil will remain distributed around the transmission components, resulting in an inaccurate level reading.
- 2 Wipe clean the area around the filler/level plug, which is situated on the front of the

transmission (see illustration). Using an Allen key, unscrew the plug and clean it.

- 3 The oil level should reach the lower edge of the filler/level hole. A certain amount of oil will have gathered behind the filler/level plug, and will trickle out when it is removed; this does not necessarily indicate that the level is correct. To ensure that a true level is established, wait until the initial trickle has stopped, then add oil as necessary until a trickle of new oil can be seen emerging. The level will be correct when the flow ceases; use only good-quality oil of the specified type. Make sure that the vehicle is completely level when checking the level and do not overfill.
- 4 When the level is correct refit and tighten the plug and wipe away any spilled oil.



22.2 Transmission filler/level plug location

**Every 40 000 miles (60 000 km) or 4 years**

23 Rear brake shoe check



- 1 Check the front wheels then jack up the rear of the car and support it on axle stands (see *Jacking and Vehicle Support*). Remove the rear roadwheels.
- 2 Using the inspection hole at the edge of the brake drum, check that the linings are not worn below the minimum thickness given in the Specifications (see illustration). If necessary use a torch.
- 3 If the friction material on any shoe is worn down to the specified minimum thickness or less, all four shoes must be renewed as a set.
- 4 At the same time check for signs of brake fluid leakage.
- 5 For a comprehensive check, the brake

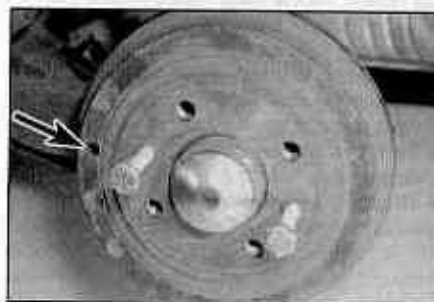
drum should be removed and cleaned. This will allow the wheel cylinders to be checked, and the condition of the brake drum itself to be fully examined (see Chapter 9).

- 6 Refit the rubber plugs then lower the car to the ground.

24 Timing belt renewal

Refer to Chapter 2C.  
**Note:** Although the normal interval for timing belt renewal is 70 000 miles (105 000 km), it is strongly recommended that the interval is reduced on vehicles which are subjected to intensive use, ie, mainly short journeys or a lot of stop-start driving. The actual belt renewal interval is therefore very much up to the individual owner.

That being said, it is highly recommended to err on the side of safety, and renew the belt at this earlier interval, bearing in mind the drastic consequences resulting from belt failure.



23.2 Check the thickness of the shoe friction material through the hole on the edge of the drum (arrowed)

## Every 60 000 miles (90 000 km) or 6 years

### 25 Emissions control systems check

Refer to Chapter 4D. A full check of the emissions control systems must be made by a Fiat dealer.

## Every 80 000 miles (120 000 km)

### 26 Manual transmission oil renewal



1 Park the vehicle on a level surface, if possible over an inspection pit or on a ramp as the filler/level and drain plugs are accessed from under the engine compartment. If necessary jack up the vehicle and support on axle stands (see *Jacking and vehicle support*).

2 Wipe clean the area around the filler/level and drain plugs, which are situated on the front and bottom of the transmission (see illustration).

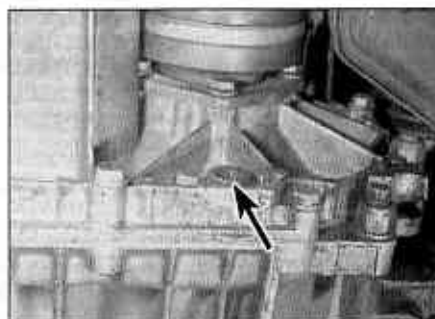
3 Using an Allen key, unscrew the filler/level plug and clean it.

4 Position a suitable container beneath the transmission, then use the Allen key to unscrew the drain plug. Allow the oil to completely drain.

5 Wipe clean the drain plug then refit and tighten it.

6 Fill the transmission with the correct grade and quantity of oil, referring to Section 22 when checking the level. Refit and tighten the filler/level plug.

7 Where applicable lower the vehicle to the ground.



26.2 Transmission drain plug location (viewed from under the vehicle)

## Every 2 years (regardless of mileage)

### 27 Coolant renewal



#### Cooling system draining

**Warning:** Wait until the engine is cold before starting this procedure. Do not allow antifreeze to come in contact with your skin, or with the painted surfaces of the vehicle. Rinse off spills immediately with plenty of water. Never leave antifreeze lying around in an open container, or in a puddle in the driveway or on the garage floor. Children and pets are attracted by its sweet smell, but antifreeze can be fatal if ingested.

1 With the engine completely cold, cover the expansion tank cap with a wad of rag, and slowly turn the cap anti-clockwise to relieve the

pressure in the cooling system (a hissing sound will normally be heard). Wait until any pressure remaining in the system is released, then continue to turn the cap until it can be removed.

2 Position a suitable container beneath the radiator bottom hose connection, then release the retaining clip and ease the hose from the radiator stub (see illustration). If the hose joint has not been disturbed for some time, it will be necessary to gently manipulate the hose to break the joint. Do not use excessive force, or the radiator stub could be damaged. Allow the coolant to drain into the container.

3 Certain models are fitted with cooling system bleed plugs, which should be opened to aid the draining process and help prevent airlocks. These are located on the heater inlet hose and on the top right hand edge of the radiator (see illustrations). If the coolant has

been drained for a reason other than renewal, then provided it is clean and less than two years old, it can be re-used, though this is not recommended.

4 Once all the coolant has drained, reconnect the hose to the radiator and secure it in position with the retaining clip.

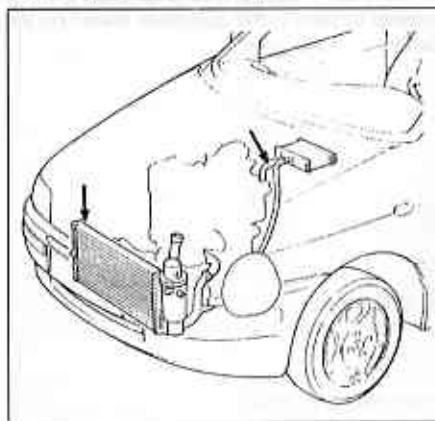
#### Cooling system flushing

5 If coolant renewal has been neglected, or if the antifreeze mixture has become diluted, then in time, the cooling system may gradually lose efficiency, as the coolant passages become restricted due to rust, scale deposits, and other sediment. The cooling system efficiency can be restored by flushing the system clean.

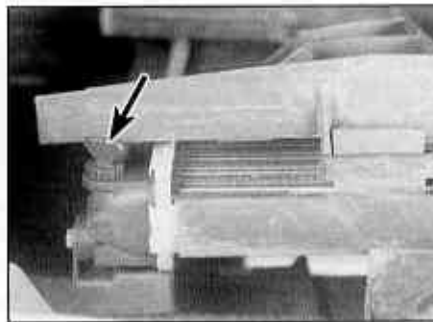
6 The radiator should be flushed independently of the engine, to avoid unnecessary contamination.



27.2 Disconnecting the radiator bottom hose to drain the coolant



27.3a Location of cooling system bleed plugs (arrowed)



27.3b Bleed screw located on the top right hand edge of the radiator

**Radiator flushing**

7 To flush the radiator disconnect the top and bottom hoses and any other relevant hoses from the radiator, with reference to Chapter 3.

8 Insert a garden hose into the radiator top inlet. Direct a flow of clean water through the radiator, and continue flushing until clean water emerges from the radiator bottom outlet.

9 If after a reasonable period, the water still does not run clear, the radiator can be flushed with a good proprietary cooling system cleaning agent. It is important that their manufacturer's instructions are followed carefully. If the contamination is particularly bad, insert the hose in the radiator bottom outlet, and reverse-flush the radiator.

**Engine flushing**

10 To flush the engine, remove the thermostat as described in Chapter 3.

11 With the bottom hose disconnected, direct a clean flow of water through the engine, and continue flushing until clean water emerges from the radiator bottom hose.

12 On completion of flushing, refit the thermostat and reconnect the hose with reference to Chapter 3.

**Cooling system filling**

13 Before attempting to fill the cooling system, make sure that all hoses and clips are in good condition, and that the clips are tight. Note that an antifreeze mixture must be used all year round, to prevent corrosion of the engine components (see following sub-Section).

14 Remove the expansion tank filler cap, and fill the system by slowly pouring the coolant into the expansion tank to prevent airlocks from forming. Ensure that all bleed plugs/screws are open.

15 If the coolant is being renewed, begin by pouring in a couple of litres of water, followed by the correct quantity of antifreeze, then top-up with more water.

16 Once the level in the expansion tank starts to rise, squeeze the radiator top and bottom hoses to help expel any trapped air in

the system. Once all the air is expelled, top-up the coolant level to the MAX mark and refit the expansion tank cap. Close all bleed plugs.

17 Start the engine and run it until it reaches normal operating temperature, then stop the engine and allow it to cool.

18 Check for leaks, particularly around disturbed components. Check the coolant level in the expansion tank, and top-up if necessary. Note that the system must be cold before an accurate level is indicated in the expansion tank. If the expansion tank cap is removed while the engine is still warm, cover the cap with a thick cloth, and unscrew the cap slowly to gradually relieve the system pressure (a hissing sound will normally be heard). Wait until any pressure remaining in the system is released, then continue to turn the cap until it can be removed.

**Antifreeze mixture**

19 The antifreeze should always be renewed at the specified intervals. This is necessary not only to maintain the antifreeze properties, but also to prevent corrosion which would otherwise occur as the corrosion inhibitors become progressively less effective.

20 Always use an ethylene-glycol based antifreeze which is suitable for use in mixed-metal cooling systems. The quantity of antifreeze and levels of protection are indicated in the *Specifications*.

21 Before adding antifreeze, the cooling system should be completely drained, preferably flushed, and all hoses checked for condition and security.

22 After filling with antifreeze, a label should be attached to the expansion tank, stating the type and concentration of antifreeze used, and the date installed. Any subsequent topping-up should be made with the same type and concentration of antifreeze.

23 Do not use engine antifreeze in the windscreen/tailgate washer system, as it will cause damage to the vehicle paintwork. A screenwash additive should be added to the washer system in the quantities stated on the bottle.

**28 Brake fluid renewal**

**Warning:** Brake hydraulic fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it. Do not use fluid that has been standing open for some time, as it absorbs moisture from the air. Excess moisture can cause a dangerous loss of braking effectiveness.

1 The procedure is similar to that for the bleeding of the hydraulic system as described in Chapter 9, except that the brake fluid reservoir should be emptied by siphoning, using a clean poultry baster or similar before starting, and allowance should be made for the old fluid to be expelled when bleeding a section of the circuit.

2 Working as described in Chapter 9, open the first bleed screw in the sequence, and pump the brake pedal gently until nearly all the old fluid has been emptied from the master cylinder reservoir.



**Old hydraulic fluid is invariably much darker in colour than the new, making it easy to distinguish the two.**

3 Top-up to the MAX level with new fluid, and continue pumping until only the new fluid remains in the reservoir, and new fluid can be seen emerging from the bleed screw. Tighten the screw, and top the reservoir level up to the MAX level line.

4 Work through all the remaining bleed screws in the sequence until new fluid can be seen at all of them. Be careful to keep the master cylinder reservoir topped-up to above the MIN level at all times, or air may enter the system and greatly increase the length of the task.

5 When the operation is complete, check that all bleed screws are securely tightened, and that their dust caps are refitted. Wash off all traces of spilt fluid, and recheck the master cylinder reservoir fluid level.

6 Check the operation of the brakes before taking the car on the road.








# Chapter 2 Part A: SOHC (8-valve) petrol engine in-car repair procedures

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Camshaft - removal and refitting	See Chapter 2D	Location of TDC on No 1 cylinder	2
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Cylinder head - removal and refitting	9	Timing belt tensioner and sprockets - removal, inspection and refitting	5
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Engine oil and filter - renewal	See Chapter 1A		

## Degrees of difficulty

<b>Easy, suitable for novice with little experience</b> 	<b>Fairly easy, suitable for beginner with some experience</b> 	<b>Fairly difficult, suitable for competent DIY mechanic</b> 	<b>Difficult, suitable for experienced DIY mechanic</b> 	<b>Very difficult, suitable for expert DIY or professional</b> 
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2A

## Specifications

### General

Engine code:	
1108 cc engine (55 models):	
Up to May 1997	176.A6.000
May 1997 onwards	176.B2.000
1242 cc engine (60 models):	
Up to May 1997	176.B1.000
May 1997 onward	176.B4.000
1242 cc engine (75 models)	176.A8.000
<i>*Note: See Vehicle Identification for the location of code marking on the engine.</i>	
Bore:	
1108 cc engine	70.0 mm
1242 cc engine	70.8 mm
Stroke:	
1108 cc engine	72.0 mm
1242 cc engine	78.86 mm
Compression ratio:	
1108 cc engine	9.6:1
1242 cc engine with single-point injection	9.6:1
1242 cc engine with multi-point injection	9.8:1
Firing order	1-3-4-2
No 1 cylinder location	Timing belt end of engine
Timing belt tension	See text

### Lubrication system

Oil pump type	By-rotor driven from front of crankshaft
Outer rotor-to-housing clearance	0.080 to 0.186 mm
Axial clearance	0.025 to 0.056 mm