1 General information

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

The Chapter contains a master maintenance schedule, followed by 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 car for the locations of the various components.

Servicing your car 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 car, 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 car 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 Routine maintenance

If, from the time the car 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.

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 car, 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.

If engine wear is suspected, a compression test (refer to Chapter 2A or 2B) 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.

The following series of operations are the most often required to maintain the performance of a generally sound engine:

Primary operations

a) Clean, inspect and test the battery (refer to 'Weekly checks').
b) Check all the engine-related fluid levels (refer to 'Weekly checks').
c) Check the condition of the auxiliary drivebelt (Section 8).
d) Renew the spark plugs (Section 24).
e) Check the condition of the air filter, and renew if necessary (Section 25).
f) Renew the fuel filter (Section 31).
g) Check the condition of all hoses, and check for fluid leaks (Section 7).

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

Secondary operations

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

a) Check the charging system (refer to Chapter 5A).
b) Check the ignition system (refer to Chapter 5B).
c) Check the fuel system (refer to Chapter 4A or 4B).

Every 5000 miles (7500 km) or 6 months

3 Engine oil and filter renewal



1 Frequent oil changes are the best preventive maintenance the home mechanic can give the engine, because ageing oil becomes diluted and contaminated, which leads to premature engine wear.

2 Make sure that you have all the necessary tools before you begin this procedure. You should also have plenty of rags or newspapers handy, for mopping-up any spills. The oil should preferably be changed when the engine is still fully warmed-up to normal operating temperature, just after a run; warm oil and sludge will flow out more easily. Take care, however, not to touch the exhaust or any other hot parts of the engine when working under the car. 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.



3.4 Unscrew the sump drain plug . . .



3.5 . . . and allow the oil to drain into the container

3 Access to the underside of the car is greatly improved if the car can be lifted on a hoist, driven onto ramps, or supported on axle stands (see *Jacking and vehicle support*). Whichever method is chosen, make sure that the car remains level, or if it is at an angle, that the sump drain plug is at the lowest point. On some models, it will be necessary to remove the engine undershield for access to the sump and filter.

4 Position the draining container under the drain plug, and unscrew the plug **(see illustration)**. If possible, try to keep the plug pressed into the sump while unscrewing it by hand the last couple of turns.

> **HAYNES HINT** *As the drain plug releases from the threads, move it away sharply, so the stream of oil issuing from the sump runs into the container, not up the sleeve.*

5 Wait until all the old oil has drained into the container, noting that it may be necessary to reposition the container as the oil flow reduces to a trickle **(see illustration)**.

6 When the oil has completely drained

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

Capacities

Engine oil (including filter)	
Models up to 1997	5.3 litres
Models from 1998, except GDI engine	5.4 litres
GDI engine models	3.8 litres
Cooling system	
From dry:	
Non-turbo models, except GDI engine	6.3 litres
GDI engine models	6.0 litres
Turbo models	5.7 litres
Drain and refill (approximate)	5.0 litres
Manual transmission	
Non-turbo models, except GDI engine	3.4 litres
GDI engine models	2.2 litres
Turbo models	2.1 litres
Automatic transmission	
4-speed:	
Total (including fluid cooler and hoses)	7.7 litres
Torque converter only	2.5 litres
Difference between MAX and MIN levels on dipstick	0.5 litres
5-speed:	
Total (including fluid cooler and hoses)	7.5 litres
Difference between MAX and MIN levels on dipstick	0.2 litres
Washer fluid reservoir	
Without headlight washers	3.5 litres
With headlight washers	4.5 litres
Fuel tank	60 litres

Cooling system

Antifreeze mixture:	
50% antifreeze	Protection down to -37°C (5°F)
55% antifreeze	Protection down to -45°C (-22°F)

Note: *Refer to antifreeze manufacturer for latest recommendations.*

Ignition system

	Spark plug type	Gap
1.6 litre models	Bosch FGR 7 DQE 0	1.4 mm
1.8 litre models:		
Except GDI	Bosch FGR 7 DQE 0	1.4 mm
GDI	Bosch FR 7 DTC	0.8 mm
1.9 litre models	Bosch FR 7 DPP 10	0.7 mm
2.0 litre:		
Non-turbo models	Bosch FGR 7 DQE 0	1.4 mm
Turbo models	Bosch FR 7 DPP 10	0.7 mm

Brakes

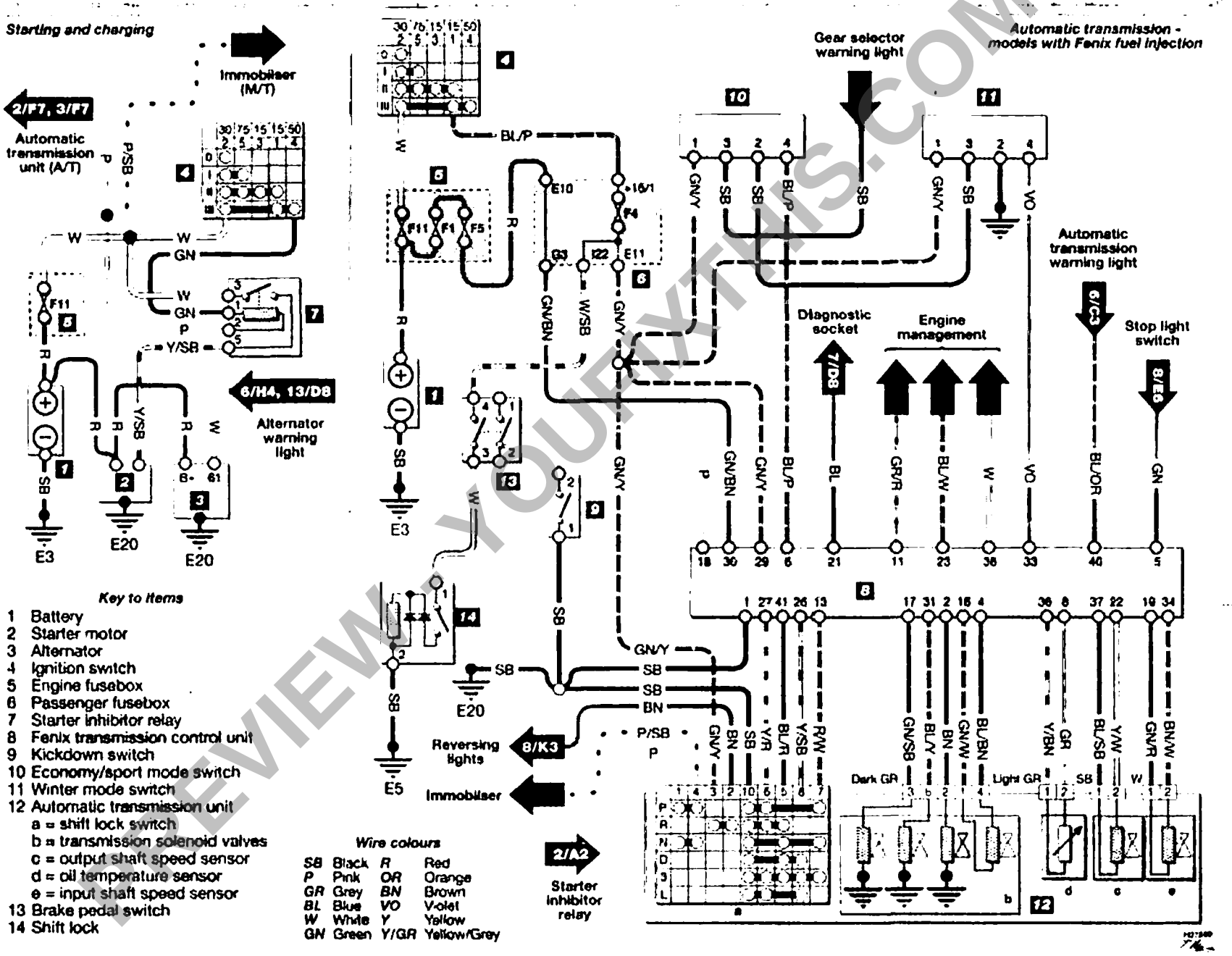
Brake pad material minimum thickness (front/rear)	2.0 mm

Torque wrench settings

	Nm	lbf ft
Alternator pivot nut	44	32
Engine sump drain plug:		
Except GDI engine	35	26
GDI engine	39	29
Ignition coil mounting bolts	10	7
Oil filter (models with renewable filter cartridge):		
Except GDI engine	25	18
GDI engine	14	10
Manual transmission drain plug:		
Non-turbo models, except GDI	22	16
GDI models	32	24
Turbo models	35	26
Manual transmission filler/level plug:		
Non-turbo models except GDI (plastic plug)	Finger-tight	Finger-tight
GDI models	32	24
Turbo models	35	26
Roadwheel nuts	110	81
Spark plugs	25	18

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Diagram 2 : Starting, charging and automatic transmission (models with Fenix fuel injection)

The pages which follow provide an easy-reference guide to the more common problems which may occur during the operation of the vehicle. These problems and their possible causes are grouped under headings denoting various components or systems, such as Engine, Cooling system, etc. The general Chapter which deals with the problem is also shown in brackets; refer to the relevant part of that Chapter for system-specific information. Whatever the fault, certain basic principles apply. These are as follows:

Verify the fault. This is simply a matter of being sure that you know what the symptoms are before starting work. This is particularly important if you are investigating a fault for someone else, who may not have described it very accurately.

Don't overlook the obvious. For example, if the vehicle won't start, is there fuel in the tank? (Don't take anyone else's word on this particular point, and don't trust the fuel gauge either!) If an electrical fault is indicated, look for loose or broken wires before digging out the test gear.

Cure the disease, not the symptom. Substituting a flat battery with a fully-charged one will get you off the hard shoulder, but if the underlying cause is not attended to, the new battery will go the same way. Similarly, changing oil-fouled spark plugs for a new set will get you moving again, but remember that the reason for the fouling (if it wasn't simply an incorrect grade of plug) will have to be established and corrected.

Don't take anything for granted. Particularly, don't forget that a 'new' component may itself be defective (especially if it's been rattling around in the boot for months), and don't leave components out of a fault diagnosis sequence just because they are new or recently-fitted. When you do finally diagnose a difficult fault, you'll probably realise that all the evidence was there from the start.

Consider what work, if any, has recently been carried out. Many faults arise through careless or hurried work. For instance, if any work has been performed under the bonnet, could some of the wiring have been dislodged or incorrectly routed, or a hose trapped? Have all the fasteners been properly tightened? Were new, genuine parts and new gaskets used? There is often a certain amount of detective work to be done in this case, as an apparently-unrelated task can have far-reaching consequences.

Engine

Engine fails to rotate when attempting to start

- ☐ Battery terminal connections loose or corroded (see *Weekly checks*)
- Battery discharged or faulty (Chapter 5A)
- ☐ Broken, loose or disconnected wiring in the starting circuit (Chapter 5A)
- ☐ Defective starter solenoid or ignition switch (Chapter 5A or 12)
- ☐ Defective starter motor (Chapter 5A)
- ☐ Starter pinion or flywheel ring gear teeth loose or broken (Chapter 2 or 5A)
- ☐ Engine earth strap broken or disconnected (Chapter 5A)
- Engine suffering 'hydraulic lock' (eg from water ingested after traversing flooded roads, or from a serious internal coolant leak) – consult a Volvo dealer for advice
- ☐ Automatic transmission not in position P or N (Chapter 7B)

Engine rotates, but will not start

- ☐ Fuel tank empty
- Battery discharged (engine rotates slowly) (Chapter 5A)
- ☐ Battery terminal connections loose or corroded (see *Weekly checks*)
- ☐ Ignition components damp or damaged (Chapter 1 or 5B)
- ☐ Immobiliser fault, or 'uncoded' ignition key being used (Chapter 12 or 'Roadside repairs')
- ☐ Crankshaft sensor fault (Chapter 4A or 4B)
- Broken, loose or disconnected wiring in the ignition circuit (Chapter 1 or 5B)
- ☐ Worn, faulty or incorrectly-gapped spark plugs (Chapter 1)
- ☐ Fuel injection system fault (Chapter 4A or 4B)
- Major mechanical failure (eg timing belt snapped) (Chapter 2A or 2B)

Engine difficult to start when cold

- ☐ Battery discharged (Chapter 5A)
- ☐ Battery terminal connections loose or corroded (see *Weekly checks*)
- ☐ Worn, faulty or incorrectly-gapped spark plugs (Chapter 1)
- Other ignition system fault (Chapter 1 or 5B)
- ☐ Fuel injection system fault (Chapter 4A or 4B)
- ☐ Wrong grade of engine oil used (*Weekly checks* or Chapter 1)
- ☐ Low cylinder compressions (Chapter 2A or 2B)

Engine difficult to start when hot

- ☐ Air filter element dirty or clogged (Chapter 1)
- Fuel injection system fault (Chapter 4A or 4B)
- ☐ Low cylinder compressions (Chapter 2A or 2B)

Starter motor noisy or excessively-rough

- ☐ Starter pinion or flywheel ring gear teeth loose or broken (Chapter 2 or 5A)
- ☐ Starter motor mounting bolts loose or missing (Chapter 5A)
- Starter motor internal components worn or damaged (Chapter 5A)

Engine starts, but stops immediately

- Loose or faulty electrical connections in the ignition circuit (Chapter 1 or 5B)
- ☐ Vacuum leak at the throttle body or inlet manifold (Chapter 4A or 4B)
- ☐ Blocked injectors/fuel injection system fault (Chapter 4A or 4B)

Engine idles erratically

- ☐ Air filter element clogged (Chapter 1)
- Vacuum leak at the throttle body, inlet manifold or associated hoses (Chapter 4A or 4B)
- ☐ Worn, faulty or incorrectly-gapped spark plugs (Chapter 1)
- Uneven or low cylinder compressions (Chapter 2A or 2B)
- ☐ Camshaft lobes worn (Chapter 2A or 2B)
- ☐ Timing belt incorrectly fitted (Chapter 2A or 2B)
- ☐ Blocked injectors/fuel injection system fault (Chapter 4A or 4B)

Engine misfires at idle speed

- ☐ Worn, faulty or incorrectly-gapped spark plugs (Chapter 1)
- Faulty spark plug HT leads – non-GDI engines (Chapter 1)
- ☐ Vacuum leak at the throttle body, inlet manifold or associated hoses (Chapter 4A or 4B)
- ☐ Blocked injectors/fuel injection system fault (Chapter 4A or 4B)
- ☐ Uneven or low cylinder compressions (Chapter 2A or 2B)
- ☐ Disconnected, leaking, or perished crankcase ventilation hoses (Chapter 4C)

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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 cars driven daily. If you wish to keep your car 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 car.

If the car is driven in dusty areas, used to tow a trailer, or driven frequently at slow speeds (idling in traffic) or on short journeys, more frequent maintenance intervals are recommended.

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

Every 5000 miles (7500 km) or 6 months

- ☐ Renew the engine oil and filter (Section 3)
- ☐ Reset the service reminder indicator (Section 4)

Note: *Frequent oil and filter changes are good for the engine. We recommend changing the oil at the mileage specified here, or at least twice a year if the mileage covered is less.*

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

- ☐ Renew the pollen filter (Section 5)
- ☐ Check the operation of the starter inhibitor – models with automatic transmission (Section 6)
- ☐ Check all components, pipes and hoses for fluid leaks (Section 7)
- ☐ Check the condition of the auxiliary drivebelt (Section 8)
- ☐ Check the condition of the coolant (Section 9)
- ☐ Check the manual transmission oil level (Section 10)
- ☐ Check the automatic transmission fluid level (Section 11)
- ☐ Check the operation of the handbrake (Section 12)
- ☐ Check the brake pads and discs for wear (Section 13)
- ☐ Check the condition of the exhaust system (Section 14)
- ☐ Check the condition of the driveshaft gaiters (Section 15)
- ☐ Check the steering and suspension components for condition and security (Section 16)
- ☐ Lubricate all door locks and hinges, door stops, bonnet lock and release, and tailgate lock and hinges (Section 17)
- ☐ Check and if necessary adjust the headlight beam alignment (Section 18)
- ☐ Check the operation of the wiper/washer systems (Section 19)
- ☐ Clean the electric aerial (Section 20)
- ☐ Carry out a road test (Section 21)

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

- ☐ Renew the brake/clutch fluid (Section 22)
- ☐ Check the underbody sealant for signs of damage (Section 23)

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

- ☐ Renew the spark plugs (Section 24)
- ☐ Renew the air filter element (Section 25)

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

- ☐ Renew the automatic transmission fluid – only on cars used for towing or stop-start driving (Section 26)
- ☐ Clean the brake servo vacuum pipes and ports – GDI engine only (Section 27)
- ☐ Clean the throttle housing – GDI engine only (Section 28)
- ☐ Check the engine crankcase ventilation system and renew the flame trap (Section 29)

Every 80 000 miles (120 000 km) or 8 years, whichever comes first

- ☐ Renew the fuel filter (Section 30)
- ☐ Renew the timing belt (Section 31)*
- ☐ Renew the auxiliary drivebelt (Section 32)

*** Note**: *Although this is the normal interval for timing belt renewal, it is strongly recommended that the interval is reduced to 40 000 miles/ 4 years on cars 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 2 years, regardless of mileage

- ☐ Renew the coolant (Section 33)

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The following pages are intended to help in dealing with common roadside emergencies and breakdowns. You will find more detailed fault finding information at the back of the manual, and repair information in the main chapters.

If your car won't start and the starter motor doesn't turn

- ☐ If it's a model with automatic transmission, make sure the selector is in the P or N position.
- ☐ Open the bonnet and make sure that the battery terminals are clean and tight (unclip the battery cover for access).
- ☐ Switch on the headlights and try to start the engine. If the headlights go very dim when you're trying to start, the battery is probably flat. Get out of trouble by jump starting (see next page) using another car.

If your car won't start even though the starter motor turns as normal

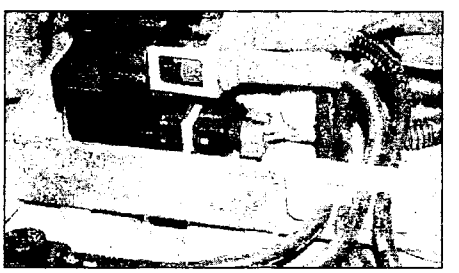
- ☐ Is there fuel in the tank?
- ☐ Has the engine immobiliser been deactivated? This should happen automatically, on inserting the ignition key. However, if a replacement key has been obtained (other than from a Volvo dealer), it may not contain the transponder chip necessary to deactivate the system.
- ☐ Is there moisture on electrical components under the bonnet? Switch off the ignition, then wipe off any obvious dampness with a dry cloth. Spray a water-repellent aerosol product (WD-40 or equivalent) on ignition and fuel system electrical connectors like those shown in the photos. Pay special attention to the ignition coils wiring connector.



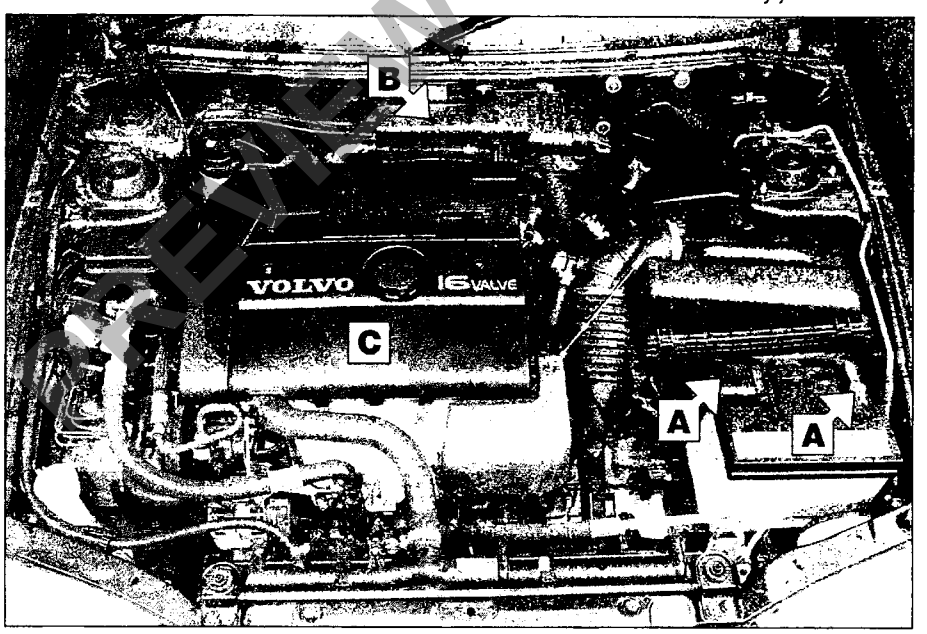
A Check the condition and security of the battery connections



B Unclip the plastic cover from the centre of the bulkhead and check that the engine management system wiring connectors are all securely joined



C1 If possible, remove the engine cover to . . .



Check that electrical connections are secure (with the ignition switched off) and spray them with a water dispersant spray like WD-40 if you suspect a problem due to damp.



C2 . . . check that the ignition coil wiring connectors are securely connected . . .



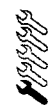
C3 . . . and the HT leads (non-GDI engines) are securely connected to both the coils and spark plugs

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rubber gaiter around the piston rod. Should any fluid be noticed, the shock absorber is defective internally, and should be renewed.
Note: *Shock absorbers should always be renewed in pairs on the same axle.*
11 The efficiency of the shock absorber may be checked by bouncing the car 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 shock absorber is probably suspect. Also examine the shock absorber upper and lower mountings for any signs of wear.

17 Hinge and lock lubrication



1 Work around the car and lubricate the hinges of the bonnet, doors and tailgate with light oil.
2 Lightly lubricate the bonnet release mechanism and exposed section of inner cable with a smear of grease.
3 Check carefully the security and operation of all hinges, latches and locks, adjusting them where required. Check the operation of the central locking system.
4 Check the condition and operation of the boot lid/tailgate struts, renewing them if either is leaking or no longer able to support the boot lid/tailgate securely when raised.

18 Headlight beam alignment check

Refer to Chapter 12 for details.

19 Wiper/washer system check



1 Check that each of the washer jet nozzles are clear and that each nozzle provides a strong jet of washer fluid. The jets should be aimed to spray at a point slightly above the centre of the screen/headlight. On the windscreen washer nozzles where there are two jets, aim one of the jets slightly above then centre of the screen and aim the other just below to ensure complete coverage of the screen. If necessary, adjust the jets using a pin, noting that only vertical adjustment is possible.

20 Electric aerial cleaning



1 If an electric aerial is fitted, extend the aerial and remove all traces of dirt from its mast.
2 Lubricate the aerial mast with a silicone-spray type lubricant (Volvo recommend the use of spray P/N 1161398 – available from your Volvo dealer) then retract and extend the aerial several times. Wipe off all excess lubricant and retract the aerial.

21 Road test



Braking system

1 Make sure that the car does not pull to one side when braking, and that the wheels do not lock when braking hard.
2 Check that there is no vibration through the steering when braking. On models equipped with ABS brakes, if vibration is felt through the pedal under heavy braking, this is a normal characteristic of the system operation, and is not a cause for concern.
3 Check that the handbrake operates correctly, without excessive movement of the lever, and that it holds the car stationary on a slope.
4 With the engine switched off, test the operation of the brake servo unit as follows. Depress the footbrake four or five times to exhaust the vacuum, 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 now depressed again, 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.

Steering and suspension

5 Check for any abnormalities in the steering, suspension, handling or road feel.
6 Drive the car, and check that there are no unusual vibrations or noises.
7 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

8 Check the performance of the engine, transmission and driveline.
9 Check that the engine starts correctly, both when cold and hot.
10 Listen for any unusual noises from the engine and transmission.
11 Make sure that the engine runs smoothly when idling, and that there is no hesitation when accelerating.
12 On manual transmission models, check that all gears can be engaged smoothly without noise, and that the gear lever action is smooth and not abnormally vague or notchy.
13 On automatic transmission models, make sure that the drive seems smooth without jerks or engine speed flare-ups. Check that all the gear positions can be selected with the car at rest.

Clutch

14 Check that the clutch pedal moves smoothly and easily through its full travel, and that the clutch itself functions correctly, with no trace of slip or drag. If the movement is uneven or stiff in places, check the system components with reference to Chapter 6.

Instruments and electrical equipment

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

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

22 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.

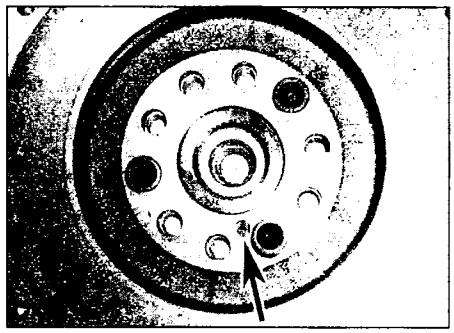
1 The procedure is similar to that for the bleeding of the hydraulic system as described in Chapter 9, except that the brake fluid reservoir should be emptied by syphoning, using a clean poultry baster or similar before starting, and allowance should be made for the old fluid to be expelled when bleeding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

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

3 Top-up to the upper (MAX) level mark 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 upper (MAX) level line.

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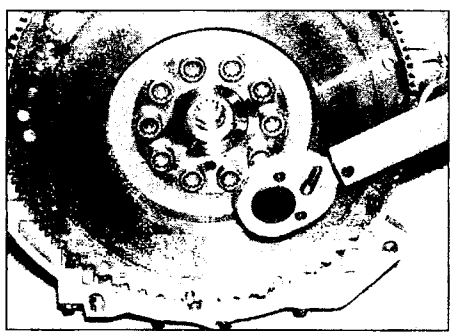
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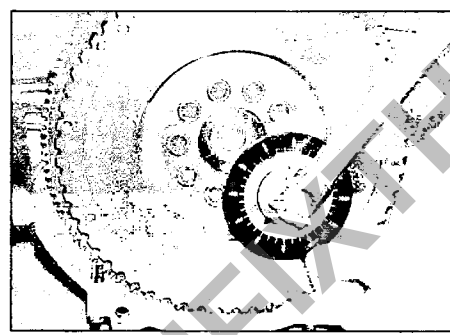
10.12a The flywheel is located by a roll-pin pressed into the crankshaft mating surface



10.12b Insert the new flywheel retaining bolts . . .



10.12c . . . and tighten them to the specified torque . . .



10.12d . . . and through the specified angle

located by a roll-pin pressed into the crankshaft mating surface. Apply thread-locking fluid to the threads of the new flywheel retaining bolts, and then tighten them to the specified torque and angle **(see illustrations)**.

13 Refit the clutch as described in Chapter 6, and the transmission as described in Chapter 7A.

Driveplate

14 Proceed as described above for manual transmission models but ignoring any references to clutch. Refit the transmission as described in Chapter 7B.

11 Engine mountings – removal and refitting

Inspection

1 If improved access is required, raise the front of the car and support it securely on axle stands.

2 Check the rubber section of the relevant mounting to see if it is cracked, hardened or separated from the metal at any point; renew the mounting if any such damage or deterioration is evident.

3 Check that all the mounting's fasteners are securely tightened; use a torque wrench to check if possible.

4 Using a large screwdriver or a crowbar, check for wear in the mounting by carefully levering against it to check for free play. Where this is not possible, enlist the aid of an assistant to move the engine/transmission unit back-and-forth, or from side-to-side, while you watch the mounting. While some free play is to be expected even from new components, excessive wear should be obvious. If excessive free play is found, check first that the fasteners are correctly secured, then renew any worn components as described below.

Renewal

Right-hand mounting

5 Disconnect the battery negative lead (see *Disconnecting the battery*).

6 Place a jack beneath the engine (but not under the sump), with a block of wood on the jack head. Raise the jack until it is supporting the weight of the engine. Alternatively, position a lifting beam across the engine compartment and attach the jib to the right-hand engine lifting eyelet, located on the side of the cylinder head.

7 Slacken and remove the through-bolt securing the rubber mounting to the vehicle body bracket **(see illustration)**. Note that on models with air conditioning, it will be necessary to unbolt the refrigerant pipe support bracket from the bodywork to gain access to the engine mounting. Access can be further improved by unbolting the power steering fluid reservoir and moving it one side.

8 Slacken and remove the three bolts securing the right-hand mounting to the engine bracket and then remove the mounting from the vehicle **(see illustration)**. If required, the bracket fitted to the engine can also be removed (after removing the timing belt upper cover as described in Section 3) by removing the four mounting bolts; the bracket is located on a dowel, which can make removal difficult.

9 Check carefully for signs of wear or damage on all components, and renew them where necessary.

10 On reassembly, offer the mounting up to the engine bracket, then insert the three bolts and tighten them to the specified torque.

11 Fit the through-bolt to secure the engine mounting to the bodywork bracket, fit the nut, but do not tighten it yet.

12 Lower the engine lifting equipment or jack as applicable, until the weight of the engine is resting on the engine mounting. Rock the engine back-and-forth to settle the mounting, then tighten the through-bolt nut to the specified torque. Remove the lifting equipment or jack as applicable, then reconnect the battery negative lead.

Left-hand mounting

13 Refer to Chapter 4A and remove the complete air cleaner assembly and inlet ducts as necessary for clear access to the left-hand engine mounting, at the top of the transmission casing.

14 Place a jack beneath the transmission, with a block of wood on the jack head. Raise the jack until it is supporting the weight of the transmission. Take care to avoid damaging the gearshift mechanism. On some models it may be necessary to first remove the plastic cover panel from the underside of the transmission.



11.7 Slacken and remove the through-bolt securing the rubber mounting to the vehicle body bracket



11.8 Slacken and remove the three bolts securing the right-hand mounting to the engine bracket

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25 Unbolt the earth lead from the transmission and position it to one side.
26 On models with air conditioning, unbolt the refrigerant compressor, with reference to Chapter 3. Tie the compressor to the front of the engine compartment away from the engine; note that there is no need to disconnect the refrigerant pipes from the compressor.
27 On models with automatic transmission, undo the union bolts and disconnect the transmission fluid cooler pipes from the transmission – be prepared for some fluid loss. Plug the open ports and pipes to minimise fluid loss and to prevent the ingress of dirt. Unbolt the fluid pipe support bracket from the transmission casing.
28 With reference to Chapter 4A, carry out the following:

a) Disconnect the accelerator cable from the throttle housing and mounting bracket.
b) Depressurise the fuel system (Section 2).
c) Disconnect the fuel supply and return hoses at the quick-release connectors to the right of the cylinder head.

29 Disconnect the evaporative loss system vacuum hose from the port on the inlet manifold.
30 On non-turbo models with manual transmission, remove the clutch slave cylinder from the top of the transmission casing with reference to Chapter 6. Wrap a cable-tie around the slave cylinder to prevent the piston from being pushed out.
31 On turbo models with manual transmission, undo the union and disconnect the slave cylinder hydraulic pipe at the coupling at the top of the transmission casing; be prepared for some hydraulic fluid spillage.
32 Extract the spring clip and release the clutch hydraulic pipe from the support bracket on the front of the transmission casing.
33 Refer to Chapter 3 and carry out the following:

a) Remove the electric cooling fan(s) from the radiator.
b) Slacken the hose clips and disconnect the heater supply and return hoses from the connections at the engine compartment bulkhead.
c) Slacken the hose clips and remove the radiator top and bottom hoses.
d) Slacken the hose clips and disconnect the coolant hose from the expansion tank.
e) Remove the radiator.

34 With reference to Chapter 10, unbolt the power steering pump from its mounting bracket, and tie it to the front of the engine compartment. Note that there is no need to disconnect the hydraulic fluid pipes from the pump.
35 Disconnect the brake servo vacuum hose from the inlet manifold, with reference to Chapter 9.
36 Locate the main engine wiring harness, at the front right-hand corner of the engine compartment. Trace each branch of the wiring to all sensors, actuators and ancillaries on the engine and unplug the wiring at the connector. Label each connector to ensure correct refitting.
37 Disconnect the vacuum hoses from the manifold pressure sensor (where applicable).
38 Disconnect the vacuum hoses from the EGR and evaporative loss system solenoid valves (where applicable).
39 Check that the hoist is supporting the weight of the engine and transmission, then remove the right- and left-hand engine mountings as described Chapter 2A.
40 Check that no wires, hoses, etc, have been overlooked. Raise the engine and transmission as a unit, and manipulate it to clear all adjacent components with the aid of an assistant (**see illustration**). In particular, take great care to avoid damaging the ABS hydraulic modulator on the right-hand side of the engine compartment as the engine is being manoeuvred. If not already done, removing the engine mounting brackets will provide more clearance. The engine will need to be angled upwards slightly at the timing belt end to clear the engine bay.
41 When sufficient height exists, lift it over the front panel, clear of the engine bay, and lower it to the ground or onto a workbench.

Separation

42 With the engine/transmission removed, support the assembly on suitable blocks of wood, on a workbench (or failing that, on a clean area of the workshop floor).
43 Remove the starter motor.

Manual transmission models

44 Remove the bolts securing the transmission to the engine.
45 With the aid of an assistant, draw the transmission off the engine (**see illustration**). Once it is clear of the dowels, do not allow the input shaft to hang on the clutch driven plate.

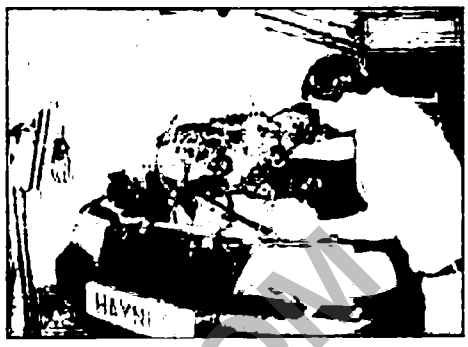
Automatic transmission models

46 Rotate the crankshaft using a socket on the pulley nut, until one of the torque converter-to-driveplate retaining bolts becomes accessible through the opening on the rear facing side of the engine. Working through the opening, undo the bolt. Rotate the crankshaft as necessary and remove the remaining bolts in the same way. Note that new bolts will be required for refitting.
47 Remove the bolts securing the transmission to the engine.
48 With the aid of an assistant, draw the transmission squarely off the engine dowels making sure that the torque converter remains in position on the transmission. Use the access hole in the transmission housing to hold the converter in place.

Refitting

Manual transmission models

49 Where removed, refit the clutch to the engine using the information given in Chapter 6. Make sure that the clutch is correctly centred



3.40 Raise the engine and transmission as a unit

and that the clutch release components are fitted to the transmission bellhousing. Do not apply any grease to the transmission input shaft, the guide sleeve, or the release bearing itself as these components have a friction-reducing coating which does not require lubrication.
50 Manoeuvre the transmission squarely into position and engage it with the engine dowels. Refit the bolts securing the transmission to the engine, and tighten them to the specified torque. Refit the starter motor.

Automatic transmission models

51 Before refitting the transmission, flush out the oil cooler with fresh transmission fluid. To do this, attach a hose to the upper union, pour ATF through the hose, and collect it in a container positioned beneath the return hose.
52 Clean the contact surfaces on the torque converter and driveplate, and the transmission and engine mating faces. Lightly lubricate the torque converter guide projection and the engine/transmission locating dowels with grease.
53 Check that the torque converter is fully seated by measuring the distance from the edge of the transmission housing face to the retaining bolt tabs on the converter. The dimension should be approximately 14 mm.
54 Manoeuvre the transmission squarely into position and engage it with the engine dowels. Refit the bolts securing the transmission to the engine and tighten lightly first in a diagonal sequence, then again to the specified torque.



3.45 Withdrawing the transmission from the engine

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48 Refitting is the reverse of removal, ensuring the hose and wiring connectors are securely refitted.

Blower motor

49 Refer to paragraphs 10 to 13.

Blower motor control module

50 Slacken and remove the retaining screws, and remove the passenger's side lower panel from the facia. The control module is fitted to the side of the evaporator housing.
51 Disconnect the wiring connector then undo the retaining screws and remove the module from the car. Note that access to the upper retaining screw is very limited but can only be improved by removing the complete facia panel (see Chapter 11).
52 Refitting is the reverse of removal.

Heater matrix

53 Refer to paragraphs 17 to 36.

Air recirculation flap servo motor

54 Refer to paragraphs 37 to 42.

Air temperature flap and distribution flap servo motors

55 Removal and refitting of these servo motors should be entrusted to a Volvo dealer. Once the new motor has been installed it will be necessary to have the control module reprogrammed to ensure the ECC system functions correctly. This can only be done using the special Volvo Scan Tool which is plugged into the diagnostic socket (see Section 8).

System control module

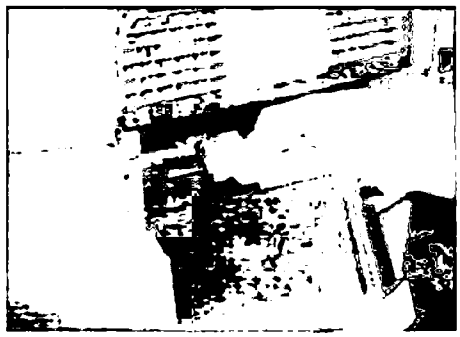
56 The control module is an integral part of the control panel assembly and cannot be renewed separately.

Interior temperature sensor

57 The interior temperature sensor is an integral part of the control panel assembly and cannot be renewed separately.

Outside air temperature sensor

58 Remove the facia panel assembly as described in Chapter 11.
59 Disconnect the wiring connectors from the blower motor and the air recirculation flap servo motor.
60 Slacken and remove the evaporator housing mounting nut and bolts.
61 Slacken and remove the mounting nuts then free the blower motor housing assembly from the evaporator housing and manoeuvre it out of position.
62 The outside air temperature sensor is clipped to the blower motor side of the evaporator. Disconnect the wiring connector then carefully unclip the sensor and ease it out from the evaporator housing.
63 Refitting is the reverse of removal making sure the sensor is securely clipped in position. Ensure the evaporator housing and blower motor housing seals are all securely joined before tightening the mounting nuts and bolts to the specified torque.



9.47b . . . then disconnect its wiring connector . . .



9.47c . . . and hose

Evaporator temperature sensor

64 Remove the heating/ventilation housing as described in paragraphs 17 to 26.
65 The outside air temperature sensor is clipped to the heating/ventilation housing side of the evaporator. Disconnect the wiring connector then carefully unclip the sensor and ease it out from the evaporator housing.
66 Refitting is the reverse of removal making sure the sensor is securely clipped in position. Refit the heating/ventilation housing as described in paragraphs 31 to 36.

Coolant temperature sensor

67 Undo the retaining screw and remove the passenger's side trim panel from the front of the centre console.
68 Undo the retaining screws and remove the passenger's side lower panel from the facia.
69 Locate the coolant temperature sensor, which is fitted to the base of the heating/ventilation housing, directly beneath the heater matrix.
70 Disconnect the wiring connector, then pull the sensor out from the housing.
71 Refitting is the reverse of removal, making sure the sensor is correctly located in the housing and making good contact with the heater matrix.

Sun sensor

72 Carefully ease the loudspeaker grille out from the top of the passenger's end of the facia panel to gain access to the sun sensor.
73 Unclip the sensor from the facia and disconnect it from the wiring connector.
74 Refitting is the reverse of removal.

10 Air conditioning system – general information and precautions

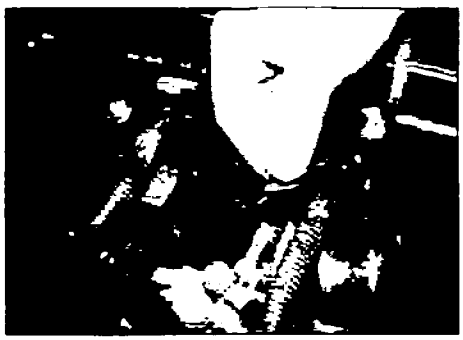
1 An air conditioning system is available on certain models. It enables the temperature of incoming air to be lowered, and also dehumidifies the air, which makes for rapid demisting and increased comfort.
2 The cooling side of the system works in the same way as a domestic refrigerator. Refrigerant gas is drawn into a belt-driven compressor (the compressor is fitted with an electrically-operated clutch to enable it be switched on and off as required), and passes into a condenser mounted on the front of the radiator, where it loses heat and becomes liquid. The liquid passes through an expansion valve to an evaporator, where it changes from liquid under high pressure to gas under low pressure. This change is accompanied by a drop in temperature, which cools the evaporator. The refrigerant returns to the compressor, and the cycle begins again.
3 Air blown through the evaporator passes to the heating/ventilation housing, where it is mixed with hot air blown through the heater matrix to achieve the desired temperature in the passenger compartment.
4 The heating side of the system works in the same way as on models without air conditioning (see Section 8).
5 Any problems with the air conditioning system should be referred to a Volvo dealer.

Precautions

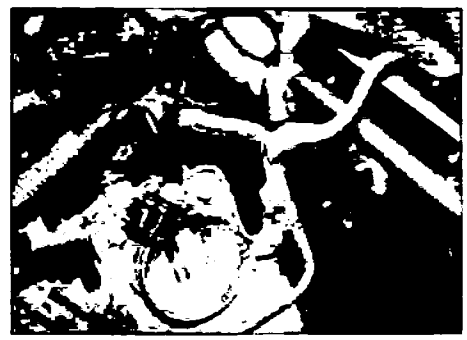
6 When an air conditioning system is fitted, it is necessary to observe special precautions when dealing with any part of the system, or its associated components.
• Never attempt to open any air conditioning system pipe/hose union – the system is under constant pressure. If for any reason the system must be disconnected, the car should be taken to a Volvo dealer or air conditioning system specialist with the necessary equipment to safely discharge the refrigerant before opening the circuit. Once the work is complete, they can then safely recharge the circuit with the correct type and amount of fresh refrigerant.
• The refrigerant is potentially dangerous, and should only be handled by qualified persons. Uncontrolled discharging of the refrigerant is dangerous for the following reasons:
a) If it is splashed onto the skin, it can cause frostbite.
b) The refrigerant is heavier than air and so displaces oxygen. In a confined space which is not adequately ventilated, this could lead to a risk of suffocation. The

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10.38a Disconnect the throttle position sensor on top . . .



10.38b . . . and the throttle control motor at the side



10.39 Coolant hose connection to the throttle housing

head, and four around the 'mouth' of the housing (which secure the housing to the bracket). Strictly speaking, only the four housing-to-bracket bolts need be removed, but taking out the remaining three bolts will allow movement in the bracket itself, and this improves working room, especially if the throttle housing is being removed as part of another procedure. Remove the bolts, then lift away the housing and its gasket – a new gasket must be used when refitting (see illustrations).

Refitting

41 Refit by reversing the removal operations, using a new gasket. Tighten the throttle housing bolts to the specified torque. On completion, check and if necessary top-up the coolant.

Injector pump

Removal

42 Depressurise the fuel system as described in Section 2.

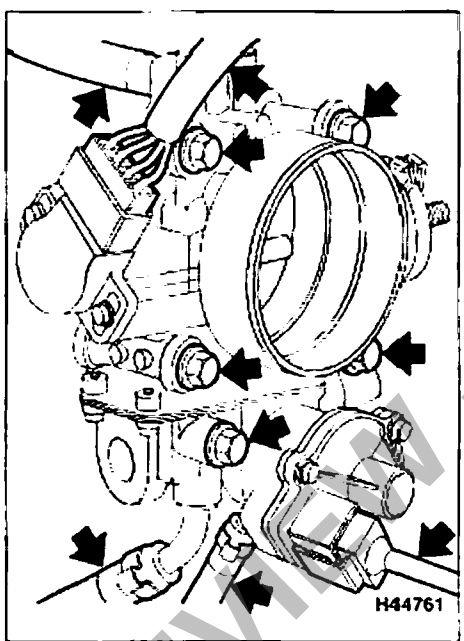
43 Remove the engine top cover to expose the injector pump.

44 Release the spring-type hose clips, and pull off the two fuel return hoses from the injector pump, noting their respective positions for refitting (see illustration). Carefully move the two hoses to one side. If the spring-type hose clips are in poor condition, obtain some new Jubilee hose clips for use when refitting.

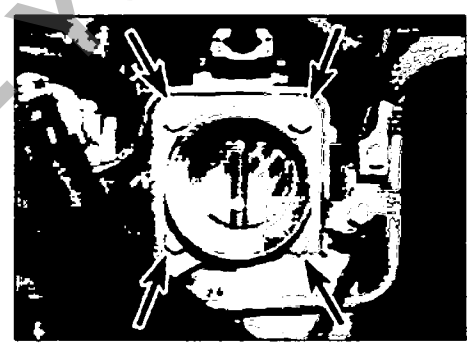
45 Wrap some absorbent towel around the base of the fuel supply line flange, then undo the two bolts securing the flange and separate the joint (see illustration). Recover the O-ring seal from the flange joint – a new one should be used when refitting. Move the fuel line away without bending it excessively.

46 Remove the throttle housing as described previously in this Section, and the inlet manifold as described in Section 11.

47 Remove the rigid fuel delivery pipe fitted between the injector pump and the fuel rail. The pipe is secured by a two-bolt flange at either end – remove the bolts and take off the pipe (careful prising will be needed to free the flanges) (see illustrations). Recover the O-ring and washer from each flange, noting that the split washer is fitted at the bottom.



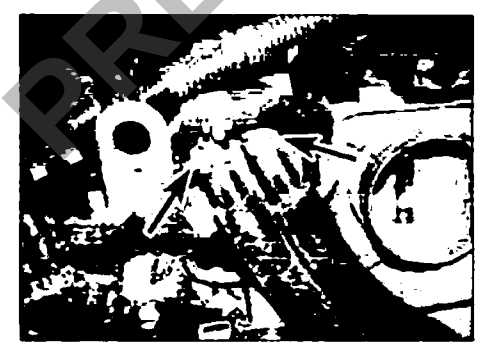
10.40a Throttle housing removal details



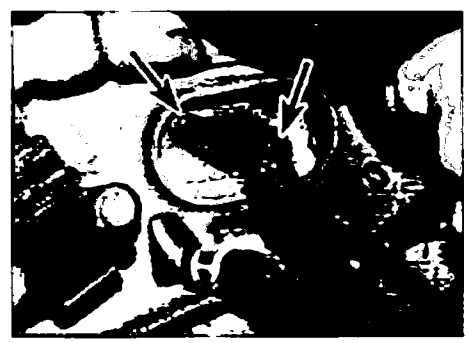
10.40b Throttle housing-to-bracket bolts (arrowed)



10.40c Separate the housing from its mounting bracket, and recover the gasket



10.44 Release the spring clips (arrowed) and disconnect the fuel return hoses



10.45 Undo the two flange bolts (arrowed) and disconnect the fuel supply pipe



10.47a Prise the flange carefully to release the O-rings . . .

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Chapter 6
Clutch

Contents

Clutch assembly – removal, inspection and refitting 6
Clutch fluid level check ..... See *Weekly checks*
Clutch hydraulic system – bleeding 5
Clutch master cylinder – removal and refitting 3
Clutch pedal – removal, refitting and adjustment 2
Clutch release bearing – removal, inspection and refitting 7
Clutch slave cylinder – removal and refitting 4
General information 1
Hose and fluid leak check ..... See Chapter 1

Degrees of difficulty

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

Specifications

General

Clutch type	Single dry plate, diaphragm spring, hydraulic actuation (self-adjusting on turbo models)

Pressure plate

Warp limit	0.2 mm

Driven plate (friction disc)

Diameter:	
Non-turbo models:	
Up to 1998	220 mm
1998 onwards	215 mm
Turbo models	240 mm

Clutch pedal

Height*	162.5 mm
Free play	1 to 3 mm
Travel (at rest – fully depressed)	136 mm

**With a clearance of 1 to 3 mm between the pedal and the stop-bolt*

Torque wrench settings	Nm	lbf ft
Master cylinder retaining nuts	13	10
Pressure plate retaining bolts:		
Non-turbo models	21	15
Turbo models	25	18
Slave cylinder retaining bolts:		
Non-turbo models, except GDI engine	30	22
GDI engine models	18	13
Turbo models	10	7

1 General information

A single dry plate diaphragm spring clutch is fitted to all manual transmission models. The clutch is hydraulically operated via a master and slave cylinder.

The main components of the clutch are the pressure plate, the driven plate (sometimes called the friction plate or disc) and the release bearing. The pressure plate is bolted to the flywheel, with the driven plate sandwiched between them. The centre of the driven plate has a splined hub, which engages with the splines on the transmission input shaft. The release bearing slides along a sleeve fitted over the transmission input shaft and acts on the diaphragm spring fingers of the pressure plate.

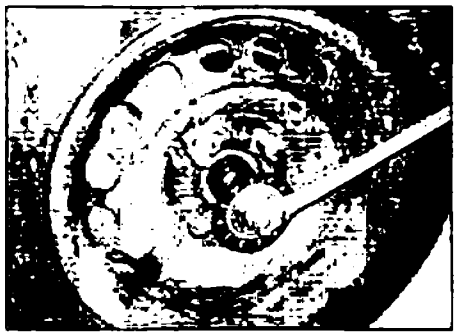
When the engine is running and the clutch pedal is released, the diaphragm spring clamps the pressure plate, driven plate and flywheel firmly together. Drive is transmitted through the friction surfaces of the flywheel and pressure plate to the linings of the driven plate and thus to the transmission input shaft.

When the clutch pedal is depressed, the pedal movement is transmitted hydraulically to the release bearing, which is pressed against the diaphragm spring fingers. Spring pressure on the pressure plate is relieved, and the flywheel and pressure plate spin without moving the driven plate. As the pedal is released, spring pressure is restored and the drive is gradually taken up.

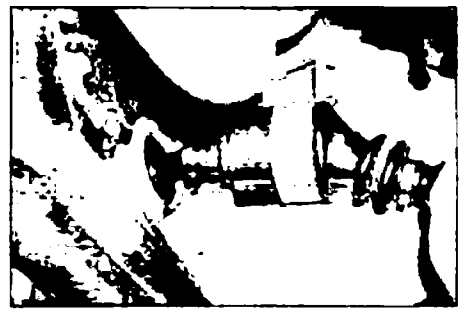
The clutch hydraulic system consists of a master cylinder, a slave cylinder and the

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2.33b ... then, where applicable, tighten further through the Stage 2 angle



2.36 Engage the inner joint with the sun wheel, making sure the roll-pin holes are correctly aligned

type and amount of oil, and check the level using the information given in Chapter 1.

Right-hand shaft – manual transmission

35 Before installing the driveshaft, examine the differential oil seal for signs of damage or deterioration and, if necessary, renew it, as described in Chapter 7A, Section 4. It is highly recommended that the seal is renewed, regardless of its apparent condition.

36 Ensure that the inner constant velocity joint and sun wheel shaft splines are clean and dry then fit the sealing ring to the shaft. Ensure the dust shield is correctly fitted to the driveshaft inner joint then engage the driveshaft splines with those of the sun wheel shaft. Make sure that the roll-pin holes are correctly aligned then slide on the driveshaft (see illustration).

37 Drive in the roll-pins with their slots 180° apart, then seal the ends of the pins with sealing compound (Volvo recommend the use of sealing agent 1161058-1 – available from your Volvo dealer) (see illustrations).

38 If the crossmember was removed, ensure the upper and lower mounting rubbers and the spacers are correctly fitted to the engine/transmission crossmember holes, then manoeuvre the crossmember into position (refer to Chapter 2A or 2B if in doubt). Refit the mounting bolts, tightening them to the specified torque, then refit the through-bolts to the engine/transmission mountings. Remove the support bar/hoist/jack (as applicable) and rock the engine to settle it in position. Tighten the engine/transmission rear mounting through-bolt to the specified torque setting, then tighten the front mounting through-bolt to the specified torque.

39 Refit the exhaust heat shield to the cylinder block, and tighten its retaining bolts to the specified torque (Chapter 4C).

40 Carry out the procedures described in paragraphs 24 to 33. On completion check and, if necessary, top-up the transmission oil level as described in Chapter 1.

Left-hand shaft – automatic transmission

41 Before installing the driveshaft, examine the differential oil seal for signs of damage or deterioration and, if necessary, renew it, as described in Chapter 7A, Section 4. It is highly recommended that the seal is renewed, regardless of its apparent condition. Also inspect the inner joint circlip for signs of damage and renew if necessary.

42 Thoroughly clean the driveshaft splines, and the apertures in the transmission and hub assembly. Apply a thin film of grease to the oil seal lips, and to the driveshaft splines and shoulders. Check that all gaiter clips are securely fastened.

43 Offer up the driveshaft, and locate the inner joint splines with those of the differential sun wheel, taking great care not to damage the oil seal. Push the joint fully into position and check that it is securely retained by the circlip.

44 Carry out the procedures described in paragraphs 25 to 33. On completion check and, if necessary, top-up the transmission fluid level as described in Chapter 1.



2.37a Tap the roll-pins fully into position ...



2.37b ... then seal each end of the pin with a smear of sealing compound

Right-hand shaft – automatic transmission

45 Refit the driveshaft to the transmission as described in paragraphs 41 to 43.

46 Refit the engine/transmission crossmember as described in paragraphs 38 and 39.

47 Carry out the procedures described in paragraphs 25 to 33. On completion check and, if necessary, top-up the transmission fluid level as described in Chapter 1.

3 Driveshafts (turbo engines) – removal and refitting

Note: *A new hub nut will be required on refitting.*

Removal

Right-hand shaft

1 Remove the wheel trim/hub cap (as applicable) then slacken the hub nut with the car resting on its wheels (see illustration 2.1). Also slacken the wheel nuts.

2 Chock the rear wheels of the car, firmly apply the handbrake, then jack up the front of the car and support it on axle stands. Remove the appropriate front roadwheel then undo the retaining screws/fasteners (as applicable) and remove the undershield from beneath the engine/transmission. Where necessary, also remove the wheel arch liner.

3 Slacken and remove the hub nut and (where fitted) washer. If the nut was not slackened with the wheels on the ground (see paragraph 1), have an assistant firmly depress the brake pedal to prevent the front hub from rotating, whilst you slacken and remove the hub nut. Alternatively, a tool can be fabricated from two lengths of steel strip (one long, one short) and a nut and bolt; the nut and bolt forming the pivot of a forked tool.

4 Remove the anti-lock braking system (ABS) sensor from the hub as described in Chapter 9.

5 Slide out the retaining clip(s) and free the front brake caliper hose from its bracket(s) (see illustration 2.5)

6 Extract the split pin, then slacken and remove the nut securing the steering gear track rod end balljoint to the swivel hub. Release the balljoint tapered shank using a universal balljoint separator.

7 Slacken and remove the two nuts from the bolts securing the swivel hub to the suspension strut. Withdraw the upper bolt, but leave the lower bolt in position at this stage (see illustration 2.7).

8 Support the driveshaft assembly, then slacken and remove the retaining bolts and remove the support bearing bracket clamp.

9 Carefully free the inner end of the driveshaft from the transmission, taking care not to damage the oil seal, and position it clear.

10 Remove the lower bolt securing the swivel hub to the suspension strut. Taking care not to damage the driveshaft gaiters or strain the brake hoso, release the outer constant

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Torque wrench settings (continued)	Nm	lbf ft
Steering (continued)		
Steering gear:		
Mounting bolts	69	51
Hydraulic pipe union nuts	15	11
Steering wheel retaining nut	43	32
Track rod:		
Balljoint locknut	42	31
Balljoint-to-swivel hub nut*	24	18
Inner balljoint-to-steering rack	88	65
Roadwheels		
Wheel nuts	110	81

** If the split pin holes are not correctly aligned at the specified torque, tighten the nut slightly more to bring the holes into alignment.*

1 General information

The independent front suspension is of the MacPherson strut type, incorporating coil springs and integral telescopic shock absorbers. The MacPherson struts are located by transverse lower suspension arms, which utilise rubber inner mounting bushes, and incorporate a balljoint at the outer ends. The front swivel hubs, which carry the wheel/hub bearings, brake calipers and the hub/disc assemblies, are bolted to the MacPherson struts, and connected to the lower arms via the balljoints. A front anti-roll bar is fitted to all models. The anti-roll bar is rubber-mounted onto the subframe, and is connected to each suspension strut via a connecting link.

In May 2000 (the time of the Phase 2 facelift), the front suspension was modified, with new lower arms, hubs, struts and changes to the front geometry, intended principally to improve ride comfort. After 2001, various Sport models were added to the range, featuring further tweaks to the suspension. In neither case was the fundamental suspension layout changed, however, and repair procedures are hardly affected.

The independent rear suspension incorporates trailing arms and suspension struts. The trailing arms are connected to the body by transverse lower suspension arms and by upper links and control links. The suspension struts incorporate coil springs and integral telescopic shock absorbers and link the lower arm to the body. A rear anti-roll bar is fitted to reduce body roll. The anti-roll bar is rubber mounted onto the underbody and is connected to each lower arm via a connecting link.

The steering column is secured to the steering gear pinion by means of a clamp bolt. The lower end of the column incorporates two universal joints in between which a collapsible section is fitted. In the event of impact, this section of steering column is designed to deform and, if necessary, break in an effort to prevent the steering column being forced towards the driver.

The steering gear is mounted onto the subframe and is connected by two track rods, with balljoints at their outer ends, to the steering arms projecting rearwards from the swivel hubs. The track rod ends are threaded, to facilitate adjustment. The hydraulic steering system is powered by a pump which is belt-driven off the crankshaft pulley.

Note: *Self-locking (Nyloc) nuts are used to secure many components in position, and it is recommended that these are renewed whenever they are disturbed. This is particularly important if resistance cannot be felt when the locking portion passes over the bolt or stud thread.*

2 Front suspension swivel hub – removal and refitting

Note: *A new hub nut and new brake caliper mounting bolts will be required on refitting.*

Note: *On non-turbo manual transmission models, the driveshaft outer joint splines may be coated with sealing agent prior to refitting. Where this is the case, it is likely that a puller/extractor will be required to draw the hub assembly off the driveshaft end on removal.*

Removal

1 Remove the wheel trim/hub cap (as applicable) then slacken the hub nut with the car resting on its wheels (see illustration). Also slacken the wheel nuts.

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

3 Slacken and remove the hub nut and (where fitted) washer; discard the nut, a new one should be used on refitting. If the nut was not slackened with the wheels on the ground (see paragraph 1), have an assistant firmly depress the brake pedal to prevent the front hub from rotating, whilst you slacken and remove the hub nut. Alternatively, a tool can be fabricated from two lengths of steel strip (one long, one short) and a nut and bolt; the nut and bolt forming the pivot of a forked tool.

4 Remove the anti-lock braking system (ABS) sensor from the hub as described in Chapter 9.

5 Slide out the retaining clip(s) and free the front brake caliper hose from its bracket(s).

6 Remove the brake disc as described in Chapter 9. Discard the brake caliper mounting bolts – they must be renewed whenever they are disturbed.

7 Extract the split pin, then slacken and remove the nut securing the steering gear track rod end balljoint to the swivel hub (see illustration). Release the balljoint tapered shank using a universal balljoint separator.



2.1 Remove the wheel trim/hub cap and slacken the hub nut with the car standing on its wheels



2.7 Extract the split pin, then slacken and remove the track rod balljoint nut

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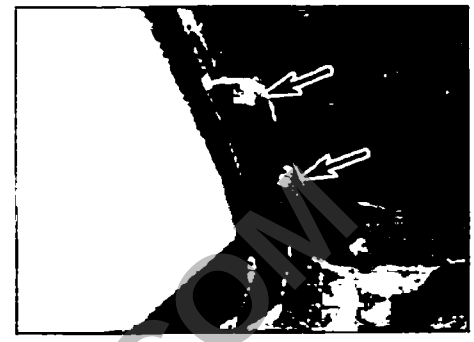
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8.3 Disconnect the washer hose from the bonnet



8.4 Support the bonnet then unclip the support strut from its balljoint



8.5 Slacken and remove the hinge bolts (arrowed) and remove the bonnet

Refitting

10 Refitting is a reverse of the removal procedure, tightening the retaining nuts and bolts to their specified torques.

8 Bonnet – removal, refitting and adjustment

Removal

1 Open the bonnet and place a wad of rag underneath each corner of the bonnet, to protect against possible damage should the bonnet slip.

2 Using a pencil or felt tip pen, mark the outline of each hinge relative to the bonnet, to use as a guide on refitting.

3 Disconnect the washer hose from the bonnet (see illustration).

4 Have an assistant support the bonnet then, using a small flat-bladed screwdriver, carefully lift the retaining clips and unhook the support strut from bonnet balljoint (see illustration).

5 Remove the left- and right-hand hinge-to-bonnet bolts, and carefully remove the bonnet from the car (see illustration).

6 Inspect the bonnet hinges for signs of wear and free play at the pivots, and if necessary renew. The hinges are bolted to the body; remove the windscreen wiper motor cover panel (see Chapter 12) to gain access to the hinge fixings.

Refitting and adjustment

7 With the aid of an assistant, align the bonnet with the hinges and refit the retaining bolts, tightening them by hand only. Align the hinges with the marks made on removal, then tighten the retaining bolts to the specified torque.

8 Clip the support strut back onto the balljoint and check it is securely retained by the spring clip.

9 Securely reconnect the washer hose.

10 Close the bonnet, and check for alignment with the adjacent panels. If necessary, slacken the hinge bolts and re-align the bonnet to suit; the height of the bonnet can be altered by screwing the rubber stoppers into/out of the bonnet lock crossmember. Once the bonnet is correctly aligned, tighten the bonnet bolts to the specified torque.

9 Bonnet release cable – removal and refitting

Removal

1 Unbolt the bonnet lock from the crossmember, and detach the cable from the lock.

2 Firmly apply the handbrake, then loosen the driver's side front wheel nuts. Jack up the front of the car and remove the wheel.

3 Remove the retaining screws and fasteners, and manoeuvre out the wheel arch liner from under the driver's side wing (see illustration).

4 Free the bonnet release cable from its clips and ties, and pull it through under the wheel arch, noting its correct routing.

5 Working inside the car, undo the retaining screws (the lower screw is hidden behind a trim cap) and remove the driver's side lower facia panel, disconnecting the wiring connector from the footwell light (see illustrations).

6 Remove the retaining screws, then free the bonnet release lever from the body and unhook it from the end of the cable.

7 Return to the outside of the car, and withdraw the cable from underneath the wheel arch.

Refitting

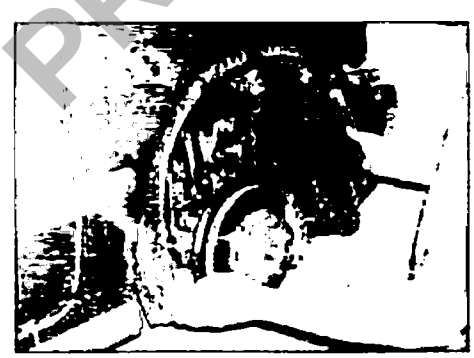
8 Feed the cable back in through the bulkhead grommet and into the passenger compartment.

9 Reconnect the release lever to the cable then refit the lever to the body, tightening its retaining screws securely. Refit the lower panel to the facia.

10 Route the cable correctly underneath the wing and through to the front of the car, securing it in position with all the necessary clips and ties.

11 Refit the bonnet lock as described in Section 10.

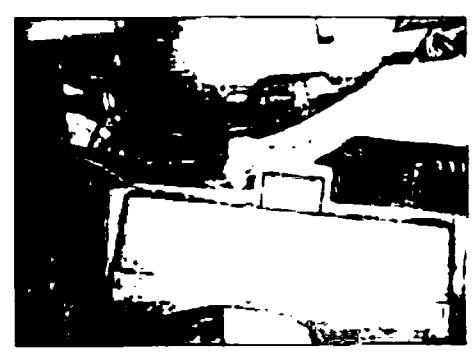
12 Check the operation of the lock, then refit the wheel arch liner and roadwheel. Lower the car to the ground, and tighten the wheel nuts to the specified torque.



9.3 Remove the screws/fasteners and take out the driver's side wheel arch liner



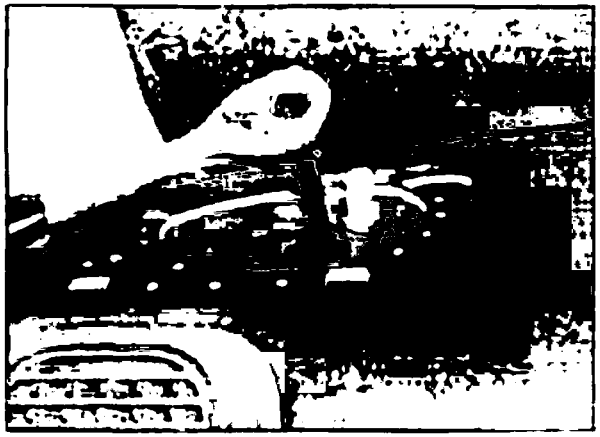
9.5a Remove the screws (arrowed) and take off the driver's side lower panel from the facia . . .



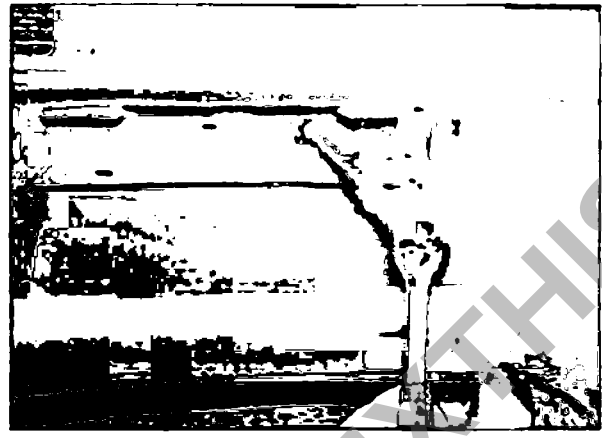
9.5b . . . disconnecting the wiring from the footwell illumination light

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31.18b . . . tho loudspeaker apertures . . .



31.18c . . . and the glovebox aperture



31.19a Prise out the trim cap and remove the passenger-side facia bolt . . .



31.19b . . . and the two centre retaining bolts (arrowed)



31.20 Removing the facia

apertures and the glovebox insert aperture (see illustrations).

19 Work along the bottom edge of the facia, and remove the lower retaining bolts located on each end of the facia (the passenger side bolt is hidden behind a trim cap) and the two bolts located in the centre of the facia (see illustrations).

20 With the aid of an assistant, manoeuvre the facia away from the bulkhead and remove it from the car, freeing its wiring from any relevant retaining clips (see illustration).

Refitting

21 Refitting is a reversal of the removal procedure. Prior to refitting the facia retaining bolts, ensure the centre vent cable and all the necessary wiring is correctly routed. Refit the bolts and tighten them all by hand at first before going around and tightening them to the specified torque. On completion, reconnect the battery and check that all the electrical components and switches function correctly.

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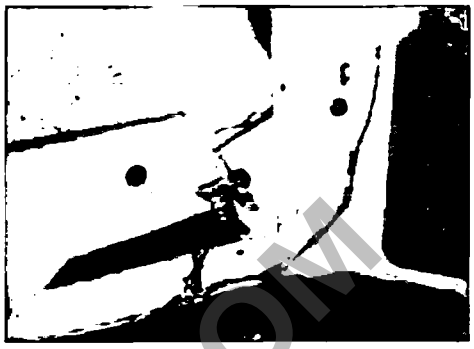
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20.4a On Saloon models, disconnect the aerial lead . . .



20.4b . . . and unbolt the earth lead from the body



20.5 Free the drain tube grommet from the body so it can be removed with the aerial

screws and remove the luggage compartment floor panel.

2 Peel the boot lid sealing strip away from the left-hand side and base of the boot lid aperture, then carefully unclip the luggage compartment rear trim panel upwards and remove it.

3 Remove the luggage compartment left-hand side trim panel rear fasteners (loosen the centre screws a few turns, then pull out the complete fastener) and fold the rear of trim panel inwards to gain access to the aerial. To improve access, remove the front fasteners (located behind the rear seat back) and remove the panel completely.

4 Disconnect the aerial lead, then undo the retaining bolt securing the aerial earth lead to the body (see illustrations)

5 Trace the drain tube back from the base of the aerial and free its sealing grommet from body (see illustration).

6 Slacken and remove the mounting bolt, then disconnect the wiring connector from the aerial (see illustrations).

7 Free the upper end of the aerial from the sealing grommet and remove it from the car. Remove the sealing grommet from the body and store it with the aerial (see illustrations).

8 Refitting is the reverse of removal. Prior to refitting the mounting bolt, ensure the sealing grommet is correctly fitted and the aerial mounting lug is correctly located in its slot in the body.

Estate models

9 Using a small, flat-bladed screwdriver, carefully prise the rear courtesy light unit out from the headlining to gain access to the base of the aerial.

10 Unclip the connectors from the roof, then disconnect both the aerial lead and wiring connector. Take care not to allow the vehicle end of the lead/wiring to disappear behind the roof lining.

11 Unscrew the retaining nut and lift the aerial off from the roof, noting its rubber seal.

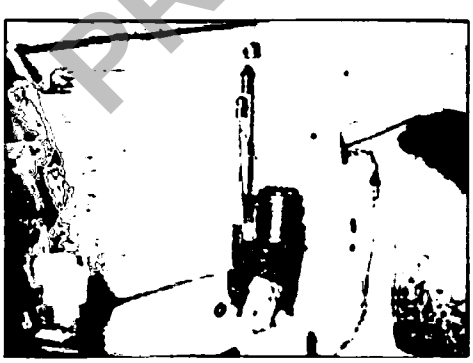
12 Refitting is the reverse of removal, ensuring the rubber seal is in good condition.



20.6a Unscrew the mounting bolt (note locating lug – arrowed) . . .



20.6b . . . then disconnect the aerial wiring connector



20.7a Remove the aerial assembly from the boot . . .



20.7b . . . and recover the sealing grommet from the body

21 Cruise control system – general information and component renewal

Refer to Chapter 4A.

22 Alarm/engine immobiliser system – general information

Note: *This information is applicable only to the anti-theft alarm and immobiliser systems fitted by Volvo as standard equipment.*

Alarm system

1 Most models fitted with remote central locking are also equipped with an anti-theft alarm system. The alarm is automatically armed and disarmed when the car is locked/unlocked with the remote central locking transmitter. When the car is locked, the indicator lights will stay on for 1 second and the alarm system LED on the facia will flash slowly; the alarm system will become active approximately 25 seconds (50 seconds, on early models) after locking the doors. If the LED stays on continuously when the doors are locked this indicates that either a door, the bonnet or the tailgate/boot lid are not correctly shut, or the ultrasonic sensors have detected movement within the car.

2 The alarm system has switches on the bonnet, tailgate/boot lid and each of the doors, and ultrasonic sensors on the door pillar to detect movement inside the car. Should a door, the tailgate/boot lid or the bonnet be opened without first using the remote central locking transmitter to unlock the doors, or movement be detected within the car, the alarm system will be triggered. When the system is triggered, the horn will sound and the indicator lights will flash for approximately 30 seconds. After this time the

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Introduction

A selection of good tools is a fundamental requirement for anyone contemplating the maintenance and repair of a motor vehicle. For the owner who does not possess any, their purchase will prove a considerable expense, offsetting some of the savings made by doing-it-yourself. However, provided that the tools purchased meet the relevant national safety standards and are of good quality, they will last for many years and prove an extremely worthwhile investment.

To help the average owner to decide which tools are needed to carry out the various tasks detailed in this manual, we have compiled three lists of tools under the following headings: *Maintenance and minor repair*, *Repair and overhaul*, and *Special*. Newcomers to practical mechanics should start off with the *Maintenance and minor repair* tool kit, and confine themselves to the simpler jobs around the vehicle. Then, as confidence and experience grow, more difficult tasks can be undertaken, with extra tools being purchased as, and when, they are needed. In this way, a *Maintenance and minor repair* tool kit can be built up into a *Repair and overhaul* tool kit over a considerable period of time, without any major cash outlays. The experienced do-it-yourselfer will have a tool kit good enough for most repair and overhaul procedures, and will add tools from the *Special* category when it is felt that the expense is justified by the amount of use to which these tools will be put.

Maintenance and minor repair tool kit

The tools given in this list should be considered as a minimum requirement if routine maintenance, servicing and minor repair operations are to be undertaken. We recommend the purchase of combination spanners (ring one end, open-ended the other); although more expensive than open-ended ones, they do give the advantages of both types of spanner.

- ☐ *Combination spanners:*
  Metric - 8 to 19 mm inclusive
- ☐ *Adjustable spanner - 35 mm jaw (approx.)*
- ☐ *Spark plug spanner (with rubber insert) - petrol models*
- ☐ *Spark plug gap adjustment tool - petrol models*
- ☐ *Set of feeler gauges*
- ☐ *Brake bleed nipple spanner*
- ☐ *Screwdrivers:*
  Flat blade - 100 mm long x 6 mm dia
  Cross blade - 100 mm long x 6 mm dia
  Torx - various sizes (not all vehicles)
- ☐ *Combination pliers*
- ☐ *Hacksaw (junior)*
- ☐ *Tyre pump*
- ☐ *Tyre pressure gauge*
- ☐ *Oil can*
- ☐ *Oil filter removal tool*
- ☐ *Fine emery cloth*
- ☐ *Wire brush (small)*
- ☐ *Funnel (medium size)*
- ☐ *Sump drain plug key (not all vehicles)*

Repair and overhaul tool kit

These tools are virtually essential for anyone undertaking any major repairs to a motor vehicle, and are additional to those given in the *Maintenance and minor repair* list. Included in this list is a comprehensive set of sockets. Although these are expensive, they will be found invaluable as they are so versatile - particularly if various drives are included in the set. We recommend the half-inch square-drive type, as this can be used with most proprietary torque wrenches.

The tools in this list will sometimes need to be supplemented by tools from the *Special* list:

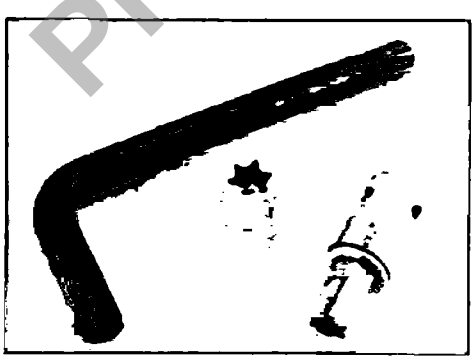
- ☐ *Sockets (or box spanners) to cover range in previous list (including Torx sockets)*
- ☐ *Reversible ratchet drive (for use with sockets)*
- ☐ *Extension piece, 250 mm (for use with sockets)*
- ☐ *Universal joint (for use with sockets)*
- ☐ *Flexible handle or sliding T "breaker bar" (for use with sockets)*
- ☐ *Torque wrench (for use with sockets)*
- ☐ *Self-locking grips*
- ☐ *Ball pein hammer*
- ☐ *Soft-faced mallet (plastic or rubber)*
- ☐ *Screwdrivers:*
  Flat blade - long & sturdy, short (chubby), and narrow (electrician's) types
  Cross blade – long & sturdy, and short (chubby) types
- ☐ *Pliers:*
  Long-nosed
  Side cutters (electrician's)
  Circlip (internal and external)
- ☐ *Cold chisel - 25 mm*
- ☐ *Scriber*
- ☐ *Scraper*
- ☐ *Centre-punch*
- ☐ *Pin punch*
- ☐ *Hacksaw*
- ☐ *Brake hose clamp*
- ☐ *Brake/clutch bleeding kit*
- ☐ *Selection of twist drills*
- ☐ *Steel rule/straight-edge*
- ☐ *Allen keys (inc. splined/Torx type)*
- ☐ *Selection of files*
- ☐ *Wire brush*
- ☐ *Axle stands*
- ☐ *Jack (strong trolley or hydraulic type)*
- ☐ *Light with extension lead*
- ☐ *Universal electrical multi-meter*



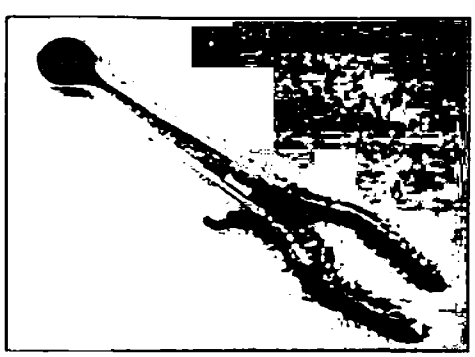
Sockets and reversible ratchet drive



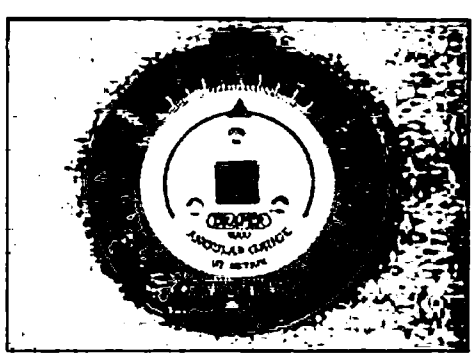
Brake bleeding kit



Torx key, socket and bit



Hose clamp



Angular-tightening gauge

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