GASOLINE ENGINE TUNE-UP SPECIFICATIONS

gine VIN	Engine Displacement Liters (cc)	Spark Plugs Gap (in.)	Ignition Timing (deg.) MT	Ignition Timing (deg.) AT	Fuel Pump (psi)	Idle Speed (rpm) MT	Idle Speed (rpm) AT	C In.
0F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.01
FT/87	2.3 (2316)	0.028-0.032	12B	12B	43	750	750	0.01 0.01
4F/89	2.3 (2316)	0.028	15B	15B	42	850	850	HYD
0F/69	2.8 (2849)	0.024-0.028	—	16B	36	—	750	0.00 0.00
0F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.01
FT/87	2.3 (2316)	0.028-0.032	12B	12B	43	750	750	0.01 0.01
4F/89	2.3 (2316)	0.028	15B	15B	42	850	850	HYD
0F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.01 0.01
FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.01 0.01
4F/89	2.3 (2316)	0.028	—	15B	42	—	850	HYD
4F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD
0F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.01 0.01
FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.01 0.01
4F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD
4S/55	2.4 (2435)	0.028	—	10B	43	—	750-850	HYD
0F/88	2.3 (2316)	0.028	—	12B	43	775	775	0.01 0.01
FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.01 0.01
4F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD
4S/55	2.4 (2435)	0.028	—	10B	43	—	750-850	HYD
4T/57	2.3 (2319)	0.028	—	6B	58	—	800-900	HYD
0F/88	2.3 (2316)	0.028	—	12B	43	775	775	0.01 0.01
FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.01 0.01
4F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD
4S/55	2.4 (2435)	0.028	—	10B	43	—	750-850	HYD
4T/57	2.3 (2319)	0.028	—	6B	58	—	800-900	HYD

GASOLINE ENGINE TUNE-UP SPECIFICATIONS

Year	Engine ID/VIN	Engine Displacement Liters (cc)	Spark Plugs Gap (in.)	Ignition Timing (deg.) MT	Ignition Timing (deg.) AT	Fuel Pump (psi)	Idle Speed (rpm) MT	Idle Speed (rpm) AT	Valve Clearance In.	Valve Clearance Ex.
1996	B-5254S/55	2.4 (2435)	0.028	3-7B	10B	43	750-850	750-850	HYD	HYD
	B-5254T/56	2.4 (2435)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5234T/57	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254FT/58	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-6304F/96	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
1997	B-5254S/55	2.4 (2435)	0.028	3-7B	10B	43	750-850	750-850	HYD	HYD
	B-5254T/56	2.4 (2435)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5234T/57	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254FT/58	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-6304F/96	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
1998	B-5234T3/53	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254S/55	2.4 (2435)	0.028	3-7B	10B	43	750-850	750-850	HYD	HYD
	B-5254T/56	2.4 (2435)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5234T/57	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-6304F/96	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD

B = Before Top Dead Center (TDC)

HYD = Hydraulic valve tappets

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The air cleaner assembly, on non-turbocharged engines, is located on the driver's side of the vehicle, near the radiator. On turbocharged engine, the air cleaner assembly is located on the passenger side of the vehicle, near the radiator.

1. Disconnect the negative battery cable.
2. Unsnap the clips retaining the air cleaner housing halves.
3. Separate the air cleaner housing halves.
4. Remove the air cleaner cartridge.

To install:

5. Install the air cleaner cartridge in the lower housing.
6. Place housing halves together and snap retaining clips into place.
7. Connect the negative battery cable.

Fig. 1: Unsnap the retaining clips . . .

Fig. 2: . . . and lift up the air cleaner lid . . .

Fig. 3: . . . then remove the filter from the housing

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Although the A/C system should not be serviced by the do-it-yourselfer, preventive maintenance can be practiced and A/C system inspections can be performed to help maintain the efficiency of the vehicle's A/C system. For preventive maintenance, perform the following:

- The easiest and most important preventive maintenance for your A/C system is to be sure that it is used on a regular basis. Running the system for five minutes each month (no matter what the season) will help ensure that the seals and all internal components remain lubricated.

NOTE: Some newer vehicles automatically operate the A/C system compressor whenever the windshield defroster is activated. When running, the compressor lubricates the A/C system components; therefore, the A/C system would not need to be operated each month.

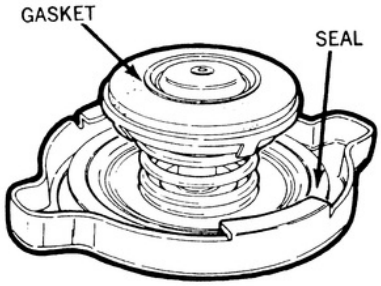
- In order to prevent heater core freeze-up during A/C operation, it is necessary to maintain proper antifreeze protection. Use a hand-held coolant tester (hydrometer) to periodically check the condition of the antifreeze in your engine's cooling system.

Fig. 1: A coolant tester can be used to determine the freezing and boiling levels of the coolant in your vehicle

NOTE: Antifreeze should not be used longer than the manufacturer specifies.

- For efficient operation of an air conditioned vehicle's cooling system, the radiator cap should have a holding pressure which meets manufacturer's specifications. A cap which fails to hold these pressures should be replaced.

Fig. 2: To ensure efficient cooling system operation, inspect the radiator cap gasket and seal



- Any obstruction of or damage to the condenser configuration will restrict air flow which is essential to its efficient operation. It is, therefore, a good rule to keep this unit clean and in proper physical shape.

NOTE: Bug screens which are mounted in front of the condenser (unless they are original equipment) are regarded as obstructions.

- The condensation drain tube expels any water which accumulates on the bottom of the evaporator housing into the engine compartment. If this tube is obstructed, the air conditioning performance can be restricted and condensation buildup can spill over onto the vehicle's floor.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

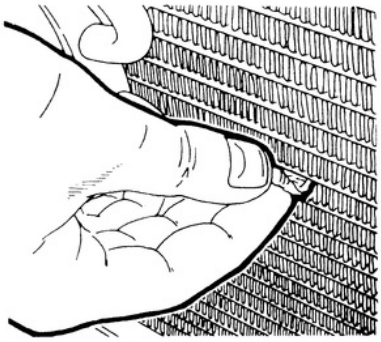
The easiest and often most important check for the air conditioning system consists of a visual inspection of the system components. Visually inspect the air conditioning system for refrigerant leaks, damaged compressor clutch, abnormal compressor drive belt tension and/or condition, plugged evaporator drain tube, blocked condenser fins, disconnected or broken wires, blown fuses, corroded connections and poor insulation.

A refrigerant leak will usually appear as an oily residue at the leakage point in the system. The oily residue soon picks up dust or dirt particles from the surrounding air and appears greasy. Through time, this will build up and appear to be a heavy dirt impregnated grease.

For a thorough visual and operational inspection, check the following:

- Check the surface of the radiator and condenser for dirt, leaves or other material which might block air flow.

Fig. 1: Periodically remove any debris from the condenser and radiator fins



- Check for kinks in hoses and lines.
- Check the system for leaks.
- Make sure the drive belt is properly tensioned. When the air conditioning is operating, make sure the drive belt is free of noise or slippage.
- Make sure the blower motor operates at all appropriate positions, then check for distribution of the air from all outlets with the blower on **HIGH** or **MAX**.

NOTE: Keep in mind that under conditions of high humidity, air discharged from the A/C vents may not feel as cold as expected, even if the system is working properly. This is because vaporized moisture in humid air retains heat more effectively than dry air, thereby making humid air more difficult to cool.

- Make sure the air passage selection lever is operating correctly. Start the engine and warm it to normal operating temperature, then make sure the temperature selection lever is operating correctly.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

NOTE: It is recommended that the A/C system be serviced by an EPA Section 609 certified automotive technician utilizing a refrigerant recovery/recycling machine.

The do-it-yourselfer should not service his/her own vehicle's A/C system for many reasons, including legal concerns, personal injury, environmental damage and cost. The following are some of the reasons why you may decide not to service your own vehicle's A/C system.

According to the U.S. Clean Air Act, it is a federal crime to service or repair (involving the refrigerant) a Motor Vehicle Air Conditioning (MVAC) system for money without being EPA certified. It is also illegal to vent R-12 and R-134a refrigerants into the atmosphere. Selling or distributing A/C system refrigerant (in a container which contains less than 20 pounds of refrigerant) to any person who is not EPA 609 certified is also not allowed by law.

State and/or local laws may be more strict than the federal regulations, so be sure to check with your state and/or local authorities for further information. For further federal information on the legality of servicing your A/C system, call the EPA Stratospheric Ozone Hotline.

NOTE: Federal law dictates that a fine of up to $25,000 may be levied on people convicted of venting refrigerant into the atmosphere. Additionally, the EPA may pay up to $10,000 for information or services leading to a criminal conviction of the violation of these laws.

When servicing an A/C system you run the risk of handling or coming in contact with refrigerant, which may result in skin or eye irritation or frostbite. Although low in toxicity (due to chemical stability), inhalation of concentrated refrigerant fumes is dangerous and can result in death; cases of fatal cardiac arrhythmia have been reported in people accidentally subjected to high levels of refrigerant. Some early symptoms include loss of concentration and drowsiness.

NOTE: Generally, the limit for exposure is lower for R-134a than it is for R-12. Exceptional care must be practiced when handling R-134a.

Also, refrigerants can decompose at high temperatures (near gas heaters or open flame), which may result in hydrofluoric acid, hydrochloric acid and phosgene (a fatal nerve gas).

R-12 refrigerant can damage the environment because it is a Chlorofluorocarbon (CFC), which has been proven to add to ozone layer depletion, leading to increasing levels of UV radiation. UV radiation has been linked with an increase in skin cancer, suppression of the human immune system, an increase in cataracts, damage to crops, damage to aquatic organisms, an increase in ground-level ozone, and increased global warming.

R-134a refrigerant is a greenhouse gas which, if allowed to vent into the atmosphere, will contribute to global warming (the Greenhouse Effect).

It is usually more economically feasible to have a certified MVAC automotive technician perform A/C system service on your vehicle. Some possible reasons for this are as follows:

- While it is illegal to service an A/C system without the proper equipment, the home mechanic would have to purchase an expensive refrigerant recovery/recycling machine to service his/her own vehicle.
- Since only a certified person may purchase refrigerant — according to the Clean Air Act, there are specific restrictions on selling or distributing A/C system refrigerant — it is legally impossible (unless certified) for the home mechanic to service his/her own vehicle. Procuring refrigerant in an illegal fashion exposes one to the risk of paying a $25,000 fine to the EPA. The A/C identification label should be checked before any repairs are made

R-12 Refrigerant Conversion

If your vehicle still uses R-12 refrigerant, one way to save A/C system costs down the road is to investigate the possibility of having your system converted to R-134a. The older R-12 systems can be easily converted to R-134a refrigerant by a certified automotive technician by installing a few new components and changing the system oil.

The cost of R-12 is steadily rising and will continue to increase, because it is no longer imported or manufactured in the United States. Therefore, it is often possible to have an R-12 system converted to R-134a and recharged for less than it would cost to just charge the system with R-12.

If you are interested in having your system converted, contact local automotive service stations for more details and information.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Check the battery electrolyte level at least once a month, or more often in hot weather or during periods of extended vehicle operation. On non-sealed batteries, the level can be checked either through the case on translucent batteries or by removing the cell caps on opaque-cased types. The electrolyte level in each cell should be kept filled to the split ring inside each cell, or the line marked on the outside of the case.

If the level is low, add only distilled water through the opening until the level is correct. Each cell is separate from the others, so each must be checked and filled individually. Distilled water should be used, because the chemicals and minerals found in most drinking water are harmful to the battery and could significantly shorten its life.

If water is added in freezing weather, the vehicle should be driven several miles to allow the water to mix with the electrolyte. Otherwise, the battery could freeze.

Although some maintenance-free batteries have removable cell caps for access to the electrolyte, the electrolyte condition and level on all sealed maintenance-free batteries must be checked using the built-in hydrometer "eye." The exact type of eye varies between battery manufacturers, but most apply a sticker to the battery itself explaining the possible readings. When in doubt, refer to the battery manufacturer's instructions to interpret battery condition using the built-in hydrometer.

NOTE: Although the readings from built-in hydrometers found in sealed batteries may vary, a green eye usually indicates a properly charged battery with sufficient fluid level. A dark eye is normally an indicator of a battery with sufficient fluid, but one which may be low in charge. And a light or yellow eye is usually an indication that electrolyte supply has dropped below the necessary level for battery (and hydrometer) operation. In this last case, sealed batteries with an insufficient electrolyte level must usually be discarded.

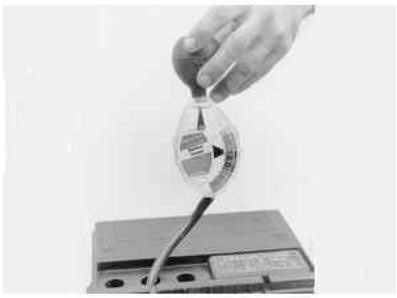
Checking the Specific Gravity

A hydrometer is required to check the specific gravity on all batteries that are not maintenance-free. On batteries that are maintenance-free, the specific gravity is checked by observing the built-in hydrometer "eye" on the top of the battery case. Check with your battery's manufacturer for proper interpretation of its built-in hydrometer readings.

Fig. 1: On non-maintenance-free batteries, the fluid level can be checked through the case on translucent models; the cell caps must be removed on other models

Fig. 2: If the fluid level is low, add only distilled water through the opening until the level is correct

Fig. 3: Check the specific gravity of the battery's electrolyte with a hydrometer



CAUTION

Battery electrolyte contains sulfuric acid. If you should splash any on your skin or in your eyes, flush the affected area with plenty of clear water. If it lands in your eyes, get medical help immediately.

The fluid (sulfuric acid solution) contained in the battery cells will tell you many things about the condition of the battery. Because the cell plates must be kept submerged below the fluid level in order to operate, maintaining the fluid level is extremely important. And, because the specific gravity of the acid is an indication of electrical charge, testing the fluid can be an aid in determining if the battery must be replaced. A battery in a vehicle with a properly operating charging system should require little maintenance, but careful, periodic inspection should reveal problems before they leave you stranded.

As stated earlier, the specific gravity of a battery's electrolyte level can be used as an indication of battery charge. At least once a year, check the specific gravity of the battery. It should be between 1.20 and 1.26 on the gravity scale. Most auto supply stores carry a variety of inexpensive battery testing hydrometers. These can be used on any non-sealed battery to test the specific gravity in each cell.

The battery testing hydrometer has a squeeze bulb at one end and a nozzle at the other. Battery electrolyte is sucked into the hydrometer until the float is lifted from its seat. The specific gravity is then read by noting the position of the float. If gravity is low in one or more cells, the battery should be slowly charged and checked again to see if the gravity has come up. Generally, if after charging, the specific gravity between any two cells varies more than 50 points (0.50), the battery should be replaced, as it can no longer produce sufficient voltage to guarantee proper operation.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Once a year (or as necessary), the battery terminals and the cable clamps should be cleaned. Loosen the clamps and remove the cables, negative cable first. On batteries with posts on top, the use of a puller specially made for this purpose is recommended. These are inexpensive and available in most auto parts stores. Side terminal battery cables are secured with a small bolt.

Clean the cable clamps and the battery terminal with a wire brush, until all corrosion, grease, etc., is removed and the metal is shiny. It is especially important to clean the inside of the clamp thoroughly (an old knife is useful here), since a small deposit of foreign material or oxidation there will prevent a sound electrical connection and inhibit either starting or charging. Special tools are available for cleaning these parts, one type for conventional top post batteries and another type for side terminal batteries. It is also a good idea to apply some dielectric grease to the terminal, as this will aid in the prevention of corrosion.

After the clamps and terminals are clean, reinstall the cables, negative cable last; DO NOT hammer the clamps onto battery posts. Tighten the clamps securely, but do not distort them. Give the clamps and terminals a thin external coating of grease after installation, to retard corrosion.

Check the cables at the same time that the terminals are cleaned. If the cable insulation is cracked or broken, or if the ends are frayed, the cable should be replaced with a new cable of the same length and gauge.

Fig. 1: Maintenance is performed with household items and with special tools like this post cleaner

Fig. 2: The underside of this special battery tool has a wire brush to clean post terminals

Fig. 3: Place the tool over the battery posts and twist to clean until the metal is shiny

Fig. 4: A special tool is available to pull the clamp from the post

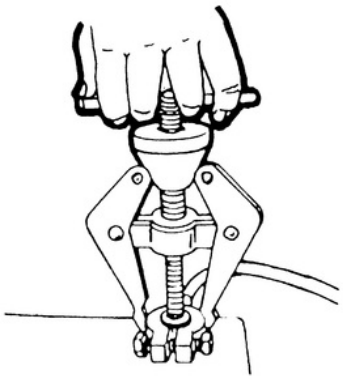


Fig. 5: The cable ends should be cleaned as well

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

CAUTION

The chemical reaction which takes place in all batteries generates explosive hydrogen gas. A spark can cause the battery to explode and splash acid. To avoid serious personal injury, be sure there is proper ventilation and take appropriate fire safety precautions when connecting, disconnecting, or charging a battery and when using jumper cables.

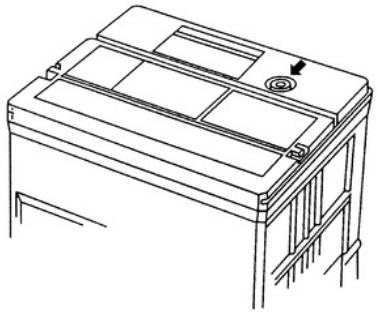
A battery should be charged at a slow rate to keep the plates inside from getting too hot. However, if some maintenance-free batteries are allowed to discharge until they are almost "dead," they may have to be charged at a high rate to bring them back to "life." Always follow the charger manufacturer's instructions on charging the battery.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

A battery that is not sealed must be checked periodically for electrolyte level. You cannot add water to a sealed maintenance-free battery (though not all maintenance-free batteries are sealed); however, a sealed battery must also be checked for proper electrolyte level, as indicated by the color of the built-in hydrometer "eye."

Fig. 1: A typical location for the built-in hydrometer on maintenance-free batteries



Always keep the battery cables and terminals free of corrosion. Check these components about once a year. Refer to the removal, installation and cleaning procedures outlined in this section.

Keep the top of the battery clean, as a film of dirt can help completely discharge a battery that is not used for long periods. A solution of baking soda and water may be used for cleaning, but be careful to flush this off with clear water. DO NOT let any of the solution into the filler holes. Baking soda neutralizes battery acid and will de-activate a battery cell.

Batteries in vehicles which are not operated on a regular basis can fall victim to parasitic loads (small current drains which are constantly drawing current from the battery). Normal parasitic loads may drain a battery on a vehicle that is in storage and not used for 6–8 weeks. Vehicles that have additional accessories such as a cellular phone, an alarm system or other devices that increase parasitic load may discharge a battery sooner. If the vehicle is to be stored for 6–8 weeks in a secure area and the alarm system, if present, is not necessary, the negative battery cable should be disconnected at the onset of storage to protect the battery charge.

Remember that constantly discharging and recharging will shorten battery life. Take care not to allow a battery to be needlessly discharged.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Always use caution when working on or near the battery. Never allow a tool to bridge the gap between the negative and positive battery terminals. Also, be careful not to allow a tool to provide a ground between the positive cable/terminal and any metal component on the vehicle. Either of these conditions will cause a short circuit, leading to sparks and possible personal injury.

Do not smoke, have an open flame or create sparks near a battery; the gases contained in the battery are very explosive and, if ignited, could cause severe injury or death.

All batteries, regardless of type, should be carefully secured by a battery hold-down device. If this is not done, the battery terminals or casing may crack from stress applied to the battery during vehicle operation. A battery which is not secured may allow acid to leak out, making it discharge faster; such leaking corrosive acid can also eat away at components under the hood.

Always visually inspect the battery case for cracks, leakage and corrosion. A white corrosive substance on the battery case or on nearby components would indicate a leaking or cracked battery. If the battery is cracked, it should be replaced immediately.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

1. Disconnect the negative and then the positive battery cables.
2. Loosen the hold-down clamp or strap retainers.
3. Remove the battery hold-down device.
4. Remove the battery from the vehicle.

Fig. 1: Loosen the battery hold-down device retainer . . .

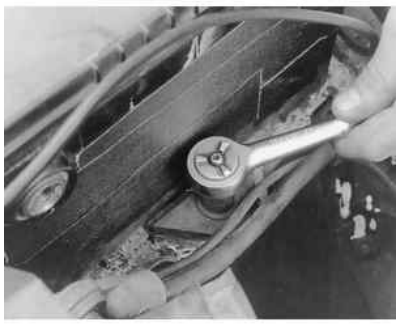


Fig. 2: . . . then remove the battery hold-down device

Fig. 3: Remove the battery from the vehicle

While the battery is removed, it is a good idea and opportunity to check the condition of the battery tray. Clear it of any debris, and check it for soundness (the battery tray can be cleaned with a baking soda and water solution). Rust should be wire brushed away, and the metal given a couple coats of anti-rust paint.

Fig. 4: Use a wire brush to clean any rust from the battery tray

Fig. 5: Brush on a solution of baking soda and water to clean the tray

Fig. 6: After cleaning the tray thoroughly, wash it off with some water

To install:

5. Install the battery and tighten the hold-down clamp or strap securely. Do not overtighten, as this can crack the battery case.
6. Connect the positive and then the negative battery cables.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

When it becomes necessary to replace the battery, select one with an amperage rating equal to or greater than the battery originally installed. Deterioration and just plain aging of the battery cables, starter motor, and associated wires makes the battery's job harder in successive years. The slow increase in electrical resistance over time makes it prudent to install a new battery with a greater capacity than the old.

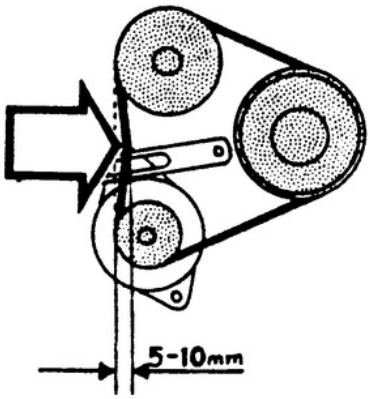
1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

V-Belts

1. Perform the inspection before adjusting the drive belts.
2. Loosen the adjusting bolt(s) and using a suitable tool, rotate the accessory in the proper direction to increase belt tension.
3. Check the tension while still supporting the accessory; if the tension is okay, tighten the adjusting bolts, then recheck the tension.

Fig. 1: Check the drive belt tension at the arrowed location on vehicles with a V-belt



Serpentine Belt

All engines with a serpentine belt use an automatic drive belt tensioner. No adjustment is necessary.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Inspect the belts for signs of glazing or cracking. A glazed belt will be perfectly smooth from slippage, while a good belt will have a slight texture of fabric visible. Cracks will usually start at the inner edge of the belt and run outward. All worn or damaged drive belts should be replaced immediately. It is best to replace all drive belts at one time, as a preventive maintenance measure, during this service operation.

Tension of the drive belts is done by depressing a flat part of the belt, midway between two components. If the belt moves $^{1}/_{4}$ — $^{3}/_{8}$ of an inch, it has proper tension, if not, proceed to adjustment or replacement if the belt is old and stretched.

Fig. 1: There are typically 3 types of accessory drive belts found on vehicles today

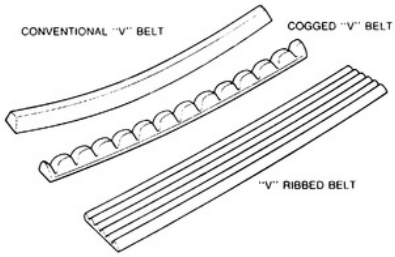


Fig. 2: An example of a healthy drive belt

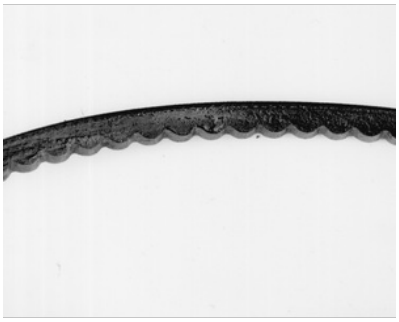


Fig. 3: Deep cracks in this belt will cause flex, building up heat that will eventually lead to belt failure

Fig. 4: The cover of this belt is worn, exposing the critical reinforcing cords to excessive wear

Fig. 5: Installing too wide a belt can result in serious belt wear and/or breakage

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

V-Belts

1. Disconnect the negative battery cable.
2. Loosen the mounting and adjusting bolts on the accessory and move it to its extreme loosest position, generally by moving it toward the center of the motor.
3. Remove the old belt. Some belts run around a third or idler pulley, which acts as an additional pivot in the belt's path. It may be possible to loosen the idler pulley as well as the main component, making your job much easier. Depending on which belt(s) you are changing, it may be necessary to loosen or remove other interfering belts to get at the one(s) you want.
4. Check the pulleys for dirt or built-up material which could affect belt contact.
5. Carefully install the new belt. Gentle pressure in the direction of rotation is helpful.
6. Adjust the belt tension.
7. Retighten the mounting bolts and recheck the tension.
8. Connect the negative battery cable.

Serpentine Belt

1. Disconnect the negative battery cable.
2. Using a suitable tool attached to the drive belt tensioner pulley, rotate the tensioner to release the tension.
3. Remove the drive belt from the pulley, and remove the drive belt from the accessory and crank pulleys, noting its proper routing.

To install:

4. Install the new belt (if being replaced) around the accessories and the crankshaft.
5. Rotate the automatic tensioner to release the tension and slip the belt under the tensioner pulley.
6. Check the belt for proper routing and tension.
7. Connect the negative battery cable.

Fig. 1: The automatic belt tensioner is tough to access; a special serpentine belt tool may be helpful

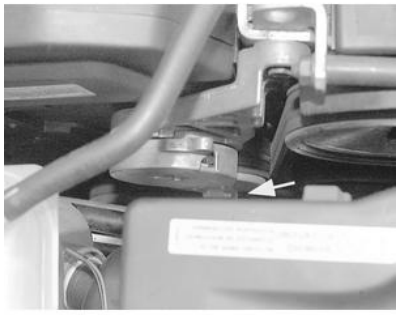


Fig. 2: Usually a $^{3}/_{8}$ drive tool is used to relieve the belt tensioner on the 2.9L 6-cylinder engine

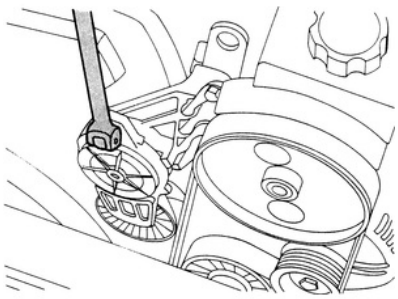
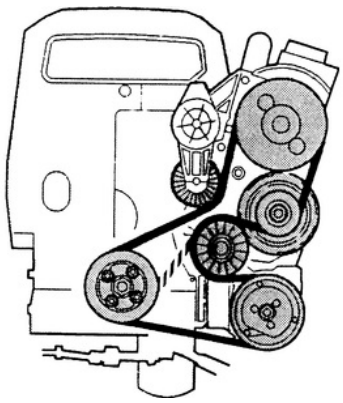
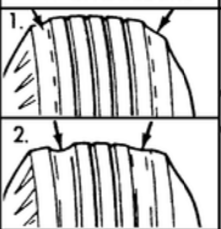
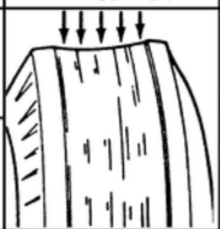
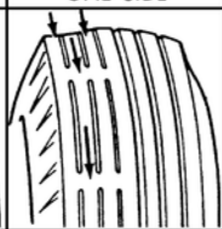
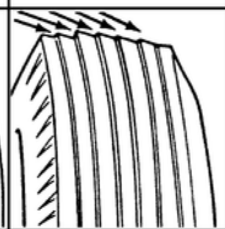
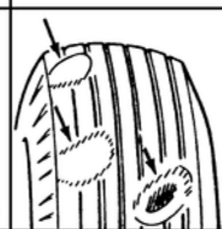
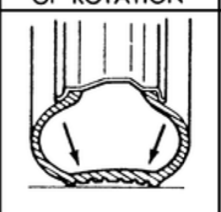
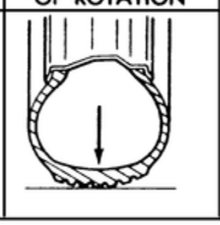
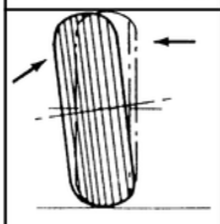
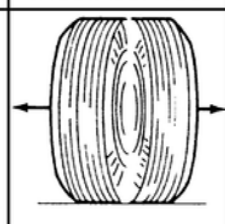
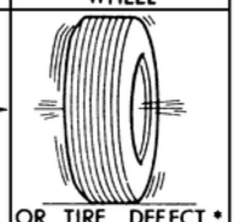


Fig. 3: Typical serpentine belt routing



RAPID WEAR AT SHOULDERS	RAPID WEAR AT CENTER	CRACKED TREADS	WEAR ON ONE SIDE	FEATHERED EDGE	BALD SPOTS	SCALL
1. 2. 						
UNDER-INFLATION OR LACK OF ROTATION	OVER-INFLATION OR LACK OF ROTATION	UNDER-INFLATION OR EXCESSIVE SPEED*	EXCESSIVE CAMBER	INCORRECT TOE	UNBALANCED WHEEL	R R(WOR OF- SU
					 OR TIRE DEFECT *	
ADJUST PRESSURE TO SPECIFICATIONS WHEN TIRES ARE COOL ROTATE TIRES			ADJUST CAMBER TO SPECIFICATIONS	ADJUST TOE-IN TO SPECIFICATIONS	DYNAMIC OR STATIC BALANCE WHEELS	ROT INSPEC

PECTED FOR FURTHER USE.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The CV (Constant Velocity) boots should be checked for damage each time the oil is changed and any other time the vehicle is raised for service. These boots keep water, grime, dirt and other damaging matter from entering the CV-joints. Any of these could cause early CV-joint failure which can be expensive to repair. Heavy grease thrown around the inside of the front wheel(s) and on the brake caliper/drum can be an indication of a torn boot. Thoroughly check the boots for missing clamps and tears. If the boot is damaged, it should be replaced immediately. Please refer to Section 7 for procedures.

Fig. 1: CV-boots must be inspected periodically for damage

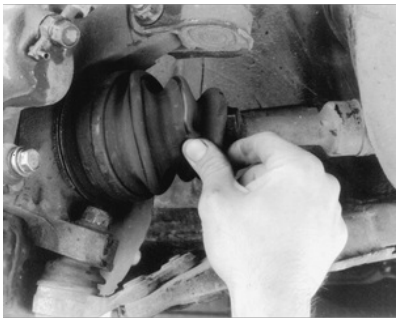


Fig. 2: A torn boot should be replaced immediately

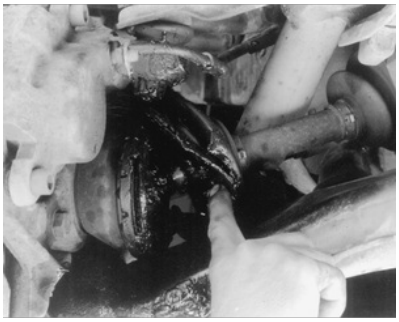


Fig. 3: This CV-boot is leaking; notice the wet residue on the inside part of the boot

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

After removing the distributor cap and rotor, clean the components (both inside and outside of the cap) using soap and water. If compressed air is available, carefully dry the components (wearing safety goggles) or allow the parts to air dry. You can dry them with a clean, soft cloth, but don't leave any lint or moisture behind.

Once the cap and rotor have been thoroughly cleaned, check for cracks, carbon tracks, burns or other physical damage. Make sure the distributor cap's carbon button is free of damage. Check the cap terminals for dirt or corrosion. Always check the rotor blade and spring closely for damage. Replace any components where damage is found.

Fig. 1: Inspect the distributor cap for cracks, burns, wear and damage

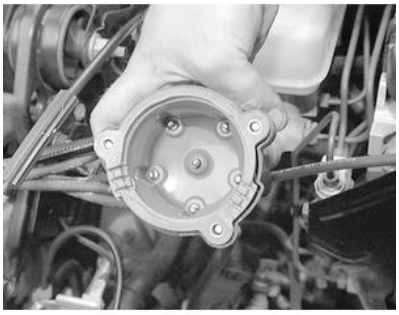


Fig. 2: Inspection points for the distributor cap

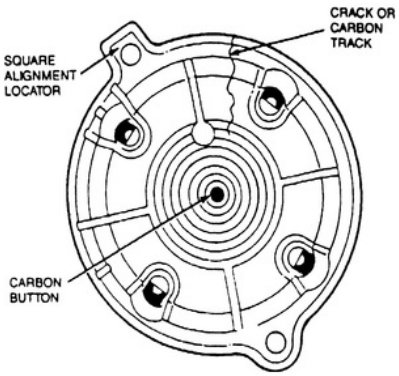
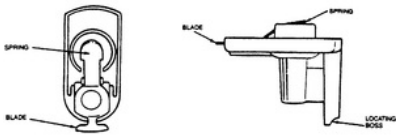


Fig. 3: Inspection points for the distributor rotor



1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

NOTE: Depending on the reason you have for removing the distributor cap, it may (in some cases) make more sense to leave the spark plug wires attached. This is the case, for example, if you are testing spark plug wires, or if removal is necessary to access other components (and wire play allows you to reposition the cap out of the way).

1. Disconnect the negative battery cable.
2. On some models, it is necessary to remove the air cleaner housing and attaching hoses.
3. Remove the retaining screws for the distributor cap.
4. Carefully lift the distributor cap STRAIGHT up and off the distributor, in order to prevent damage to the rotor blade.
5. Remove and label the spark plug wires from the distributor cap.
6. If equipped, remove the screws retaining the rotor to the distributor shaft.
7. Remove the rotor from the distributor shaft, noting its position for reinstallation.
8. Inspect both the distributor cap and rotor for damage; replace as necessary.

To install:

9. Install the rotor on the distributor shaft, in the correct position.
10. Install and tighten the retaining bolt on the rotor (if equipped).
11. Install the distributor cap on the distributor.
12. Install and tighten the distributor cap retaining screws.
13. Install the spark plug wires in the correct locations on the distributor cap.
14. Install the air cleaner housing and hoses if removed.
15. Start the vehicle and ensure that it starts and runs normally.
16. Connect the negative battery cable.

Fig. 1: To remove the air cleaner housing, remove the heated air intake tube from the exhaust manifold . . .

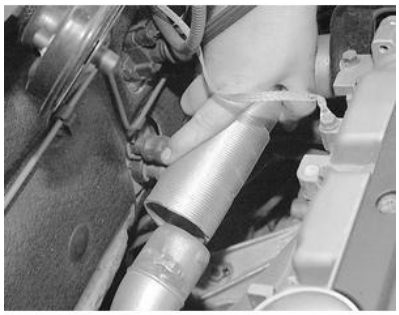


Fig. 2: . . . and the air intake pickup tube from the front of the vehicle, next to the radiator . . .

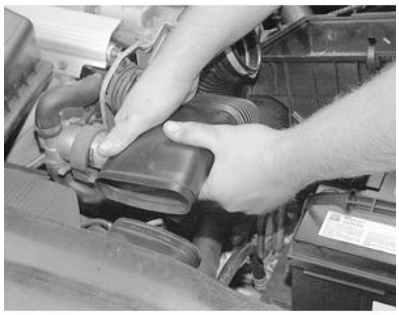


Fig. 3: . . . along with the air cleaner retaining bolt, then lift the housing out of the engine compartment

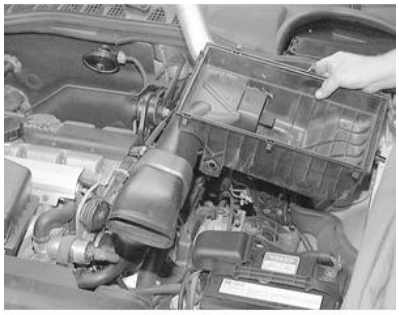


Fig. 4: A flat bladed screwdriver usually works best to remove the distributor cap retaining screws

Fig. 5: Gently pull the cap outward to remove it from the distributor

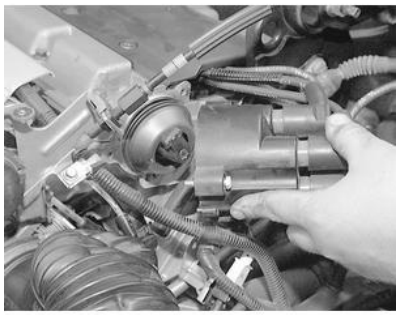


Fig. 6: Matchmark the plug wires to avoid confusion during installation

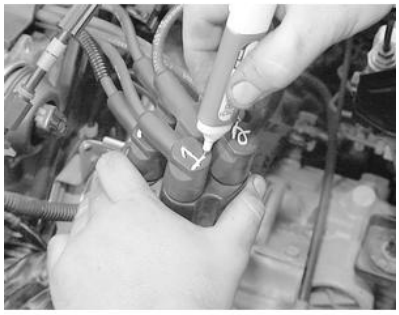
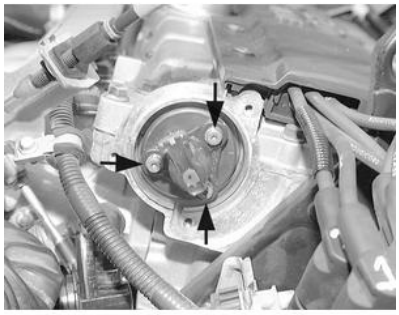


Fig. 7: Rotate the wires to loosen them, then separate them from the cap

Fig. 8: Remove the rotor cover before unfastening the bolts

Fig. 9: The rotor is attached to the shaft by three bolts



Typically, a 3mm Allen wrench is used to remove the bolts

Fig. 10: After the bolts are removed, separate the rotor from the distributor

1993 Volvo 940

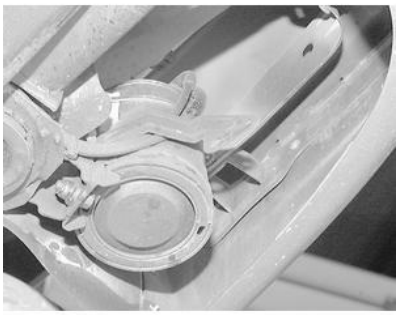
Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

NOTE: For more information on the Evaporative Emissions system, please refer to Section 4 of this manual.

The fuel evaporative emission control system stores gasoline vapors which rise from the sealed fuel tank. The system prevents these unburned hydrocarbons from polluting the atmosphere. It consists of a charcoal vapor storage canister, check or purge valves and the interconnecting vapor lines.

The canister is located in the engine compartment, or under the wheelwell trim. The canister and vapor lines should be inspected for damage or leaks at least every 24,000 miles (38,600 km). Repair or replace any old or cracked hoses. Replace the canister if it is cracked or damaged in any way. Other than inspecting the lines and the canister for damage, there is no periodic maintenance for this item.

Fig. 1: The evaporative canister is accessed from underneath the vehicle — 850 series



1993 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3
Fuel Delivery: FI | Fuel: GAS

The fuel filter is located underneath the vehicle near the fuel tank, or on the driver's side of the firewall. It is recommended that the fuel filter be replaced every 60,000 miles (96,000 km). The fuel filter should be replaced, immediately, upon evidence of dirt in the fuel system.

1. Properly relieve the fuel system pressure.
2. Disconnect the negative battery cable.
3. Raise and safely support the vehicle.
4. Remove the fuel filter cover (if equipped).

NOTE: Have a container ready when loosening the fuel lines. Residual fuel in the lines will come out.

5. Place a suitable container in position.
6. Loosen the fuel filter connections. If your vehicle has threaded type fittings:
   A. Remove the lines from the filter using the proper size wrenches.

WARNING
Always use flared wrenches (special hex wrench) to grip fuel lines or filter connections, when loosening.

7. If your vehicle is equipped with quick-connect fittings:
   A. Using a 17mm wrench, depress the retaining tab on the fitting, and remove the line. Repeat for the filter's other line.
8. Remove the clamp retaining the fuel filter to the bracket.

To install:

9. Transfer the bracket to the new filter.
10. Note the direction on the fuel filter and install the filter to the bracket.
11. Connect the fuel lines to the fuel filter. If your vehicle has threaded type fittings:
    A. Install the lines on the filter.
    B. Check to ensure that the copper seals are correctly installed.
    C. Tighten the lines to the proper torque.
12. If your vehicle has quick-connect fittings:
    A. Push the fittings onto the ends of the filter.
    B. There should be an audible click when the fittings are engaged.
13. Install the fuel filter cover (if equipped).
14. Lower the vehicle.
15. Reconnect the negative battery cable.

Fig. 1: Typical fuel filter location near the fuel tank

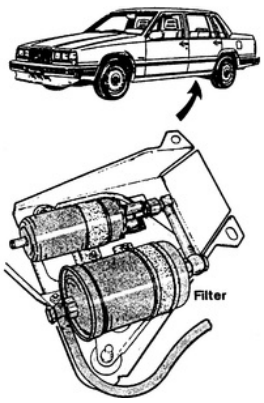


Fig. 2: A Schrader valve is installed in the fuel feed line to relieve fuel pressure before changing the filter

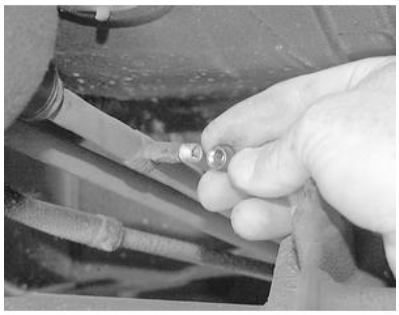


Fig. 3: Use a 17mm wrench to depress the tabs on the quick-connect fittings

Fig. 4: Plugging the line and filter will result in less fuel being spilled, as well as prevent dirt from entering

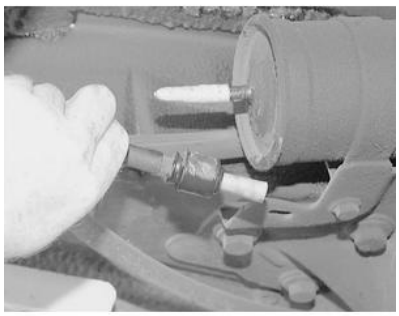


Fig. 5: Unfasten the clamp holding the filter . . .

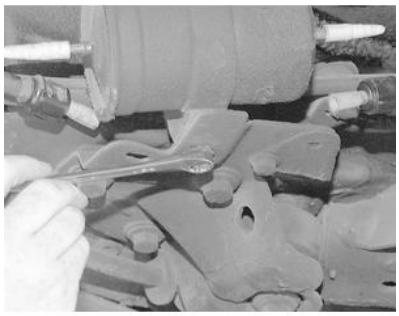
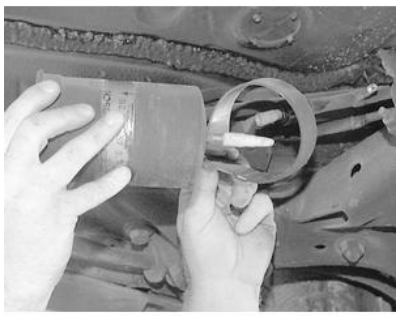


Fig. 6: . . . and remove the filter



1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Upper and lower radiator hoses, along with the heater hoses, should be checked for deterioration, leaks and loose hose clamps at least every 15,000 miles (24,000 km). It is also wise to check the hoses periodically in early spring and at the beginning of the fall or winter when you are performing other maintenance. A quick visual inspection could discover a weakened hose which might have left you stranded if it had remained unrepaired.

Whenever you are checking the hoses, make sure the engine and cooling system are cold. Visually inspect for cracking, rotting or collapsed hoses, and replace as necessary. Run your hand along the length of the hose. If a weak or swollen spot is noted when squeezing the hose wall, the hose should be replaced.

Fig. 1: The cracks developing along this hose are a result of age-related hardening

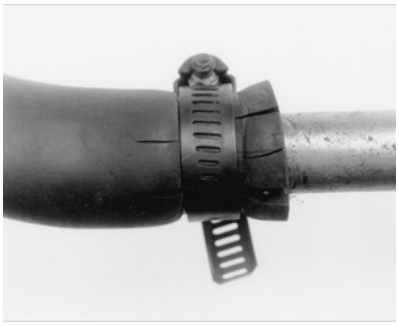


Fig. 2: A hose clamp that is too tight can cause older hoses to separate and tear on either side of the clamp

Fig. 3: A soft spongy hose (identifiable by the swollen section) will eventually burst and should be replaced

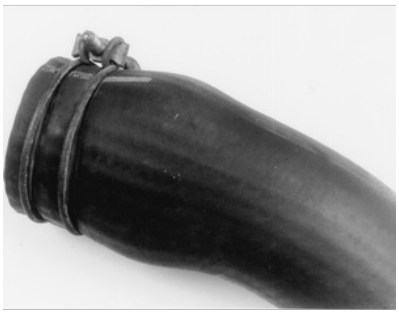


Fig. 4: Hoses are likely to deteriorate from the inside if the cooling system is not periodically flushed

1. Disconnect the negative battery cable.
2. Remove the radiator pressure cap.

   CAUTION
   Never remove the pressure cap while the engine is running, or personal injury from scalding hot coolant or steam may result. If possible, wait until the engine has cooled to remove the pressure cap. If this is not possible, wrap a thick cloth around the pressure cap and turn it slowly to the stop. Step back while the pressure is released from the cooling system. When you are sure all the pressure has been released, use the cloth to turn and remove the cap.
3. Position a clean container under the radiator and/or engine draincock or plug, then open the drain and allow the cooling system to drain to an appropriate level. For some upper hoses, only a little coolant must be drained. To remove hoses positioned lower on the engine, such as a lower radiator hose, the entire cooling system must be emptied.

   CAUTION
   When draining coolant, keep in mind that cats and dogs are attracted by ethylene glycol antifreeze, and are quite likely to drink any that is left in an uncovered container or in puddles on the ground. This will prove fatal in sufficient quantity. Always drain coolant into a sealable container. Coolant may be reused unless it is contaminated or several years old.
4. Loosen the hose clamps at each end of the hose requiring replacement. Clamps are usually either of the spring tension type (which require pliers to squeeze the tabs and loosen) or of the screw tension type (which require screw or hex drivers to loosen). Pull the clamps back on the hose away from the connection.
5. Twist, pull and slide the hose off the fitting, taking care not to damage the neck of the component from which the hose is being removed.

   NOTE: If the hose is stuck at the connection, do not try to insert a screwdriver or other sharp tool under the hose end in an effort to free it, as the connection and/or hose may become damaged. Heater connections especially may be easily damaged by such a procedure. If the hose is to be replaced, use a single-edged razor blade to make a slice along the portion of the hose which is stuck on the connection, perpendicular to the end of the hose. Do not cut deep so as to prevent damaging the connection. The hose can then be peeled from the connection and discarded.
6. Clean both hose mounting connections. Inspect the condition of the hose clamps and replace them, if necessary.

   To install:
7. Dip the ends of the new hose into clean engine coolant to ease installation.
8. Slide the clamps over the replacement hose, then slide the hose ends over the connections into position.
9. Position and secure the clamps at least $^{1}/_{4}$ in. (6.35mm) from the ends of the hose. Make sure they are located beyond the raised bead of the connector.
10. Close the radiator or engine drains and properly refill the cooling system with the clean drained engine coolant or a suitable mixture of ethylene glycol coolant and water.
11. If available, install a pressure tester and check for leaks. If a pressure tester is not available, run the engine until normal operating temperature is reached (allowing the system to naturally pressurize), then check for leaks.

    CAUTION
    If you are checking for leaks with the system at normal operating temperature, BE EXTREMELY CAREFUL not to touch any moving or hot engine parts. Once temperature has been reached, shut the engine OFF, and check for leaks around the hose fittings and connections which were removed earlier.
12. Connect the negative battery cable.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Although the idle speed may be checked, it is not adjustable. All idle speed functions are carried out by the ECU.

GASOLINE ENGINE TUNE-UP SPECIFICATIONS

Year	Engine ID/VIN	Engine Displacement Liters (cc)	Spark Plugs Gap (in.)	Ignition Timing (deg.) MT	Ignition Timing (deg.) AT	Fuel Pump (psi)	Idle Speed (rpm) MT	Idle Speed (rpm) AT	Valve Clearance IN.	Valve Clearance EX.
1990	B-230F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.016	0.016
	B-230FT/87	2.3 (2316)	0.028-0.032	12B	12B	43	750	750	0.014-0.018	0.014-0.018
	B-234F/89	2.3 (2316)	0.028	15B	15B	42	850	850	HYD	HYD
	B-280F/89	2.8 (2849)	0.024-0.028	—	16B	36	—	750	0.006-0.008	0.012-0.014
1991	B-230F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.016	0.016
	B-230FT/87	2.3 (2316)	0.028-0.032	12B	12B	43	750	750	0.014-0.018	0.014-0.018
	B-234F/89	2.3 (2316)	0.028	15B	15B	42	850	850	HYD	HYD
1992	B-230F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.014-0.018	0.014-0.018
	B-230FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.014-0.018	0.014-0.018
	B-234F/89	2.3 (2316)	0.028	—	15B	42	—	850	HYD	HYD
	B-6304F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
1993	B-230F/88	2.3 (2316)	0.028	12B	12B	43	775	775	0.014-0.018	0.014-0.018
	B-230FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.014-0.018	0.014-0.018
	B-6304F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
	B-5254S/S5	2.4 (2435)	0.028	—	10B	43	—	750-850	HYD	HYD
1994	B-230F/88	2.3 (2316)	0.028	—	12B	43	775	775	0.014-0.018	0.014-0.018
	B-230FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.014-0.018	0.014-0.018
	B-6304F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
	B-5254S/S5	2.4 (2435)	0.028	—	10B	43	—	750-850	HYD	HYD
	B-5254T/S7	2.3 (2319)	0.028	—	6B	58	—	800-900	HYD	HYD
1995	B-230F/88	2.3 (2316)	0.028	—	12B	43	775	775	0.014-0.018	0.014-0.018
	B-230FT/87	2.3 (2316)	0.028-0.032	—	12B	43	—	750	0.014-0.018	0.014-0.018
	B-6304F/95	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
	B-5254S/S5	2.4 (2435)	0.028	—	10B	43	—	750-850	HYD	HYD
	B-5254T/S7	2.3 (2319)	0.028	—	6B	58	—	800-900	HYD	HYD

GASOLINE ENGINE TUNE-UP SPECIFICATIONS

Year	Engine ID/VIN	Engine Displacement Liters (cc)	Spark Plugs Gap (in.)	Ignition Timing (deg.) MT	Ignition Timing (deg.) AT	Fuel Pump (psi)	Idle Speed (rpm) MT	Idle Speed (rpm) AT	Valve Clearance IN.	Valve Clearance EX.
1996	B-5254S/S5	2.4 (2435)	0.028	3-7B	10B	43	750-850	750-850	HYD	HYD
	B-5254T/S6	2.4 (2435)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254T/S7	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254T/S8	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-6304F/96	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
1997	B-5254S/S5	2.4 (2435)	0.028	3-7B	10B	43	750-850	750-850	HYD	HYD
	B-5254T/S6	2.4 (2435)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254T/S7	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254T/S8	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-6304F/96	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD
1998	B-5254T3/S3	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5254S/S5	2.4 (2435)	0.028	3-7B	10B	43	750-850	750-850	HYD	HYD
	B-5254T/S6	2.4 (2435)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-5234T/S7	2.3 (2319)	0.028	3-7B	6B	58	800-900	800-900	HYD	HYD
	B-6304F/96	2.9 (2922)	0.024-0.028	—	16B	43	—	700-800	HYD	HYD

B = Before Top Dead Center (TDC)
HYD = Hydraulic valve tappets

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Ignition timing is the measurement, in degrees of crankshaft rotation, of the point at which the spark plugs fire in each of the cylinders. It is measured in degrees before or after Top Dead Center (TDC) of the compression stroke.

Ideally, the air/fuel mixture in the cylinder will be ignited by the spark plug just as the piston passes TDC of the compression stroke. If this happens, the piston will be at the beginning of the power stroke just as the compressed and ignited air/fuel mixture forces the piston down and turns the crankshaft. Because it takes a fraction of a second for the spark plug to ignite the mixture in the cylinder, the spark plug must fire a little before the piston reaches TDC. Otherwise, the mixture will not be completely ignited as the piston passes TDC and the full power of the explosion will not be used by the engine.

The timing measurement is given in degrees of crankshaft rotation before the piston reaches TDC (BTDC). If the setting for the ignition timing is 10 BTDC, each spark plug must fire 10 degrees before each piston reaches TDC. This only holds true, however, when the engine is at idle speed. As the engine speed increases, the pistons go faster. The spark plugs have to ignite the fuel even sooner if it is to be completely ignited when the piston reaches TDC.

If the ignition is set too far advanced (BTDC), the ignition and expansion of the fuel in the cylinder will occur too soon and tend to force the piston down while it is still traveling up. This causes engine ping. If the ignition spark is set too far retarded, or after TDC (ATDC), the piston will have already started on its way down when the fuel is ignited. The piston will be forced down for only a portion of its travel, resulting in poor engine performance and lack of power.

Timing marks or scales can be found on the rim of the crankshaft pulley and the timing cover. The marks on the pulley correspond to the position of the piston in the No. 1 cylinder. A stroboscopic (dynamic) timing light is hooked onto the No. 1 cylinder spark plug wire. Every time the spark plug fires, the timing light flashes. By aiming the light at the timing marks while the engine is running, the exact position of the piston within the cylinder can be easily read (the flash of light makes the mark on the pulley appear to be standing still). Proper timing is indicated when the mark and scale are in specified alignment.

WARNING
When checking timing with the engine running, take care not to get the timing light wires tangled in the fan blades and/or drive belts.

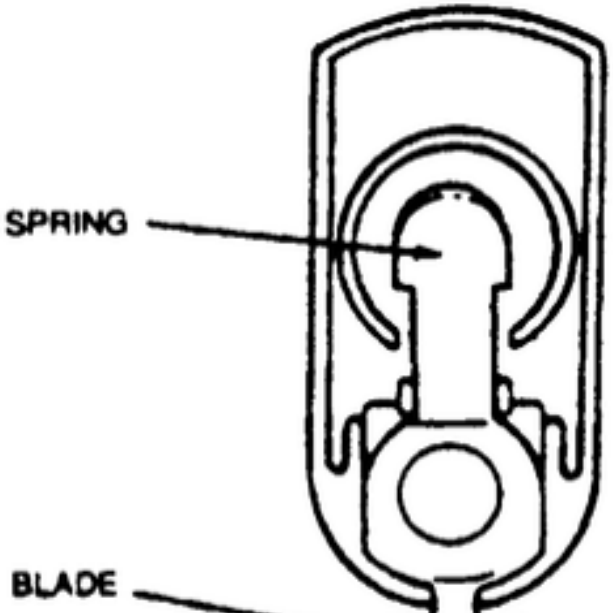
1993 Volvo 940

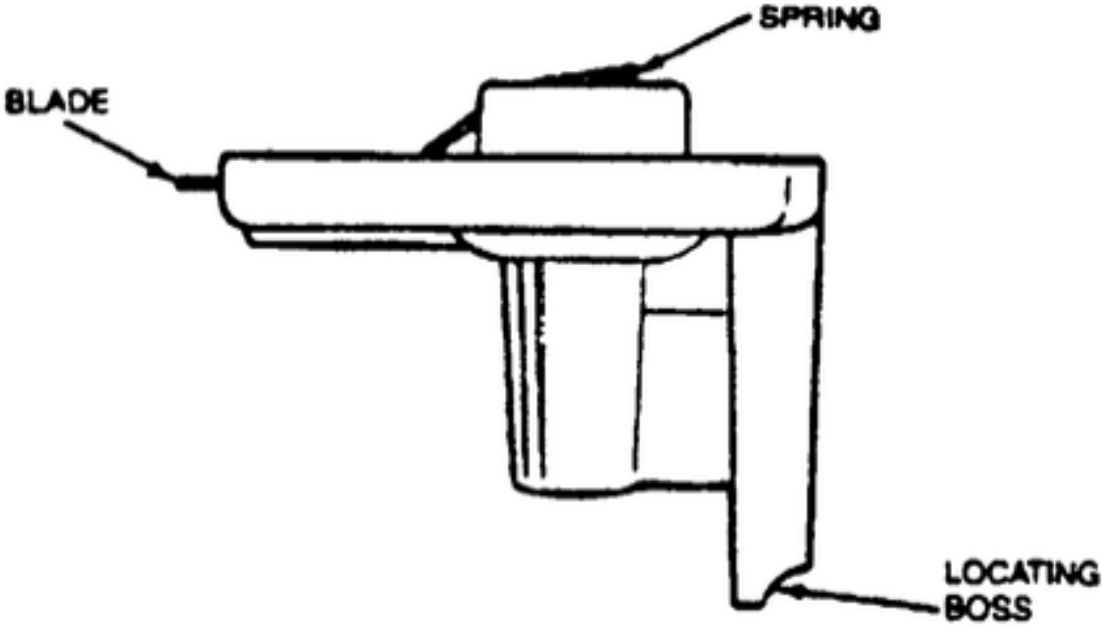
Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Although the timing may be checked on the Bosch Motronic system, it is not adjustable. All timing functions are carried out by the ECU. The ignition timing may be checked with a conventional inductive timing light.

Ignition timing on vehicles equipped with the EZ115K, EZ116K, or REX-1 ignition system may be checked with a conventional timing light. The timing, however, cannot be adjusted. If the ignition setting is wrong, use the following procedure:

1. Check the throttle switch.
2. Check that the wiring to the crank sensor is correctly connected at the connector in the firewall.
3. Open the cover of the test connector and connect the cable to terminal 6.
4. Turn the ignition **ON**. Select Test Function 1 by pushing button once for more than 1 second and count the number of blinks. Note the number and press again in case there are more fault codes (up to 3). Note the fault codes to begin troubleshooting.
    - **Code 1** –1–1 — No fault codes in memory.
    - **Code 1** –4–2 — Fault in control unit. Engine runs with safety-retarded ignition timing (approximately 10 degrees).
    - **Code 1** –4–3 — Knock sensor faulty. Engine runs with safety-retarded ignition timing (approximately 10 degrees).
    - **Code 1** –4–4 — Load signal missing (from fuel system control unit). Control unit selects full-load ignition.
    - **Code 2** –1–4 — Engine speed sensor faulty.
    - **Code 2** –2–4 — Coolant temperature sensor inoperative.
    - **Code 2** –3–4 — Throttle switch for idling faulty. Engine runs with safety-retarded ignition timing (does not apply to REX 1 ignition system).
    - **Code 3** –3–4 — Throttle switch in idle position — okay (REX 1 ignition only).
5. If fault Code 1–1–1 (no fault in memory) appears, check the fuel system.
6. If the LED does not light when the button is pressed, or no code is blinked out, check the connection at the ECU.


SPRING
BLADE


SPRING
BLADE
LOCATING
BOSS

1993 Volvo 940

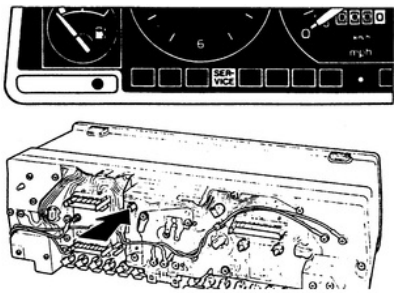
Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

1990 740 and 780; 1990–92 240

The Service Reminder Indicator (SRI) zeroing knob is located at the rear of the instrument panel. The indicator light illuminates after approximately 5,000 miles (8,000 km). It goes on for 2 minutes each time the engine is started until the oil and filter have been changed and the counter reset.

Reach up behind the dashboard and push the knob to reset the reminder light.

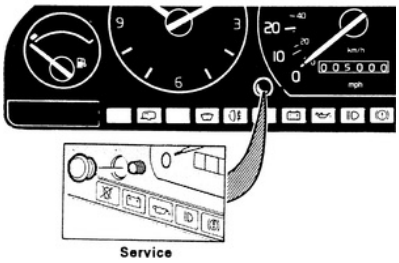
Fig. 1: Reset knob location



760 and All 1991–95 Models Except 850 and 1991–92 240

The SRI zeroing knob is located on the front of the instrument cluster, underneath a rubber grommet. Remove the rubber grommet; then using a small screwdriver, depress the knob to reset.

Fig. 2: Service reminder light reset button location on the front of the instrument cluster



1993–95 850

The SRI is reset using the Data Link Connector (DLC). The procedure is as follows:

1. Turn the ignition switch to the **ON** position.
2. At the DLC, select position 7 and place the diagnostic connector in the socket.
3. Depress the button on the DLC four times.
4. When the Light Emitting Diode (LED) glows steadily, the system is ready to be reset.
5. Depress the button once, and wait for the LED to light again.
6. Depress the button five times, and wait for the LED to light again.
7. Depress the button once again, and wait for the LED to light again.
8. Turn the ignition **OFF**.
9. Start the engine and verify the maintenance light goes out.

Fig. 3: The Data Link Connector (DLC) is located in the passenger side front of the engine compartment

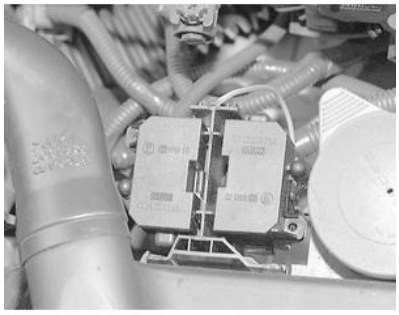


Fig. 4: Remove the cover to reveal the socket and button on the DLC

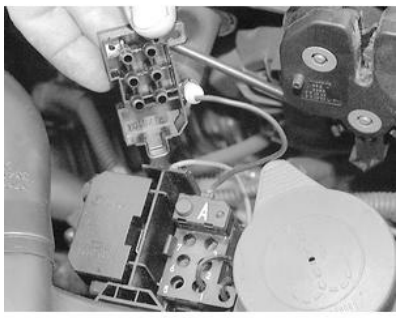


Fig. 5: Install the diagnostic connector in socket 7 . . .

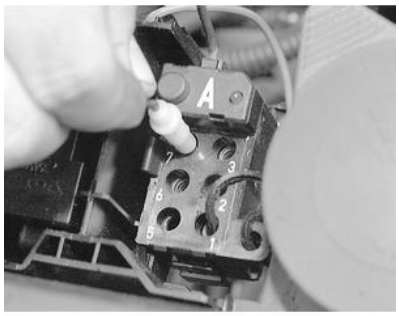
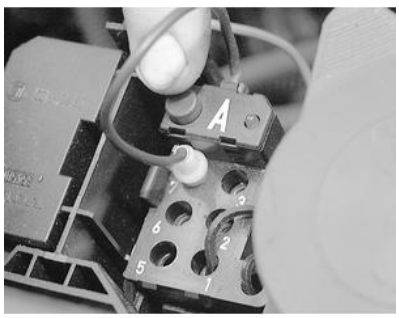


Fig. 6: . . . and press the button in the sequence listed in the procedure to reset the light



1996–98 Vehicles (OBD-II)

1996–98 models incorporate the OBD-II diagnostic system. The SRI is reset using the Volvo Scan tool or equivalent. Follow the scan tool manufacturer's instructions to reset the SRI.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Volvo refers to the filter element in the Crankcase Ventilation system as the flame guard.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

B230F, B230FT and B280F Engines

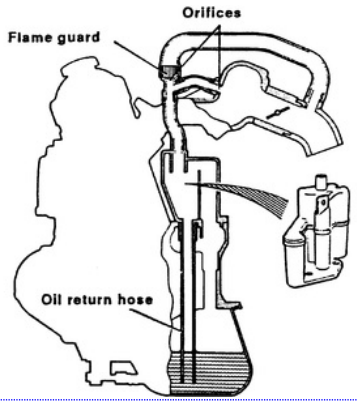
NOTE: Replace the flame guard at stated intervals.

1. Disconnect the negative battery cable.
2. Remove the hose from the nipple on the intake manifold.
3. Check the hoses and nipples for condition and clogging. Failure to do so can result in loss of oil.
4. Remove the flame guard.

To install:

5. Clean out the nipple in the intake manifold.
6. Install the flame guard in the nipple.
7. Install the hose on the nipple.
8. Connect the negative battery cable.

Fig. 1: Positive Crankcase Ventilation (PCV) system — B230F and B230FT engines



B5254S, B5234T, B5254T, B5254FT and B5234T3 Engines

1. Disconnect the negative battery cable.
2. Remove the throttle pulley cover.
3. Undo the hose clamp and remove the inlet hose to air cleaner housing.
4. Remove the flame trap from the hose by rotating it 0.59 inches (15mm) to the left.
5. Remove the flame trap from the inlet hose using a small screwdriver or pick.

To install:

6. Inspect the hoses for clogs, and clean out if necessary.
7. Insert a new flame trap into the inlet hose and rotate it back to the original position.
8. Install the inlet hose onto the air cleaner housing and install the hose clamp.
9. Install the throttle pulley cover.
10. Connect the negative battery cable.

Fig. 2: Unfasten the retaining bolt from the throttle pulley cover and remove the cover

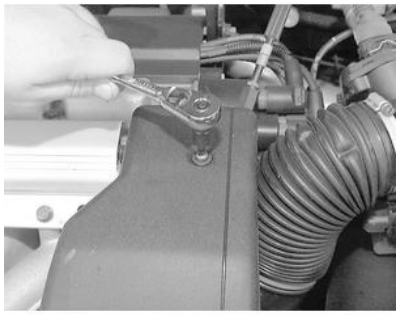


Fig. 3: Rotate the flame trap housing to remove it from the intake hose

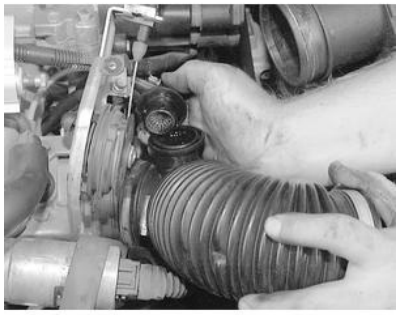


Fig. 4: Remove the flame trap from its housing

Fig. 5: Inspect the O-ring in the intake hose before installing the flame trap

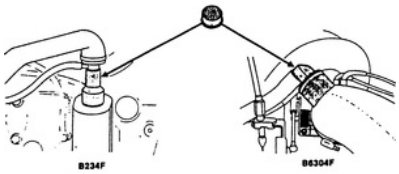
B6304F and B234F Engines

1. Disconnect the negative battery cable.
2. Rotate the flame trap outer casing 0.59 inches (15mm) to the left and remove the inlet hose.
3. Remove the flame trap from the inlet hose.

To install:

4. Inspect the hoses for clogs, and clean out if necessary.
5. Insert a new flame trap into the inlet hose.
6. Install the inlet hose onto the manifold and rotate the outer casing back to its original position.
7. Connect the negative battery cable.

Fig. 6: PCV system — B6304F and B234F engines


B234F
B6304F

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Proper maintenance and tune-up are the key to long and trouble-free vehicle life, and the work can yield its own rewards. Studies have shown that a properly tuned and maintained vehicle can achieve better gas mileage than an out-of-tune vehicle. As a conscientious owner and driver, set aside a Saturday morning, say once a month, to check or replace items that could cause major problems later. Keep your own personal log to jot down which services you performed, how much the parts cost you, the date, and the exact odometer reading at the time. Keep all receipts for such items as engine oil and filters, so that they may be referred to in case of related problems or to determine operating expenses. As a do-it-yourselfer, these receipts are the only proof you have that the required maintenance was performed. In the event of a warranty problem, these receipts will be invaluable.

The literature provided with your vehicle when it was originally delivered includes the factory recommended maintenance schedule. If you no longer have this literature, replacement copies are usually available from the dealer. A maintenance schedule is provided later in this section, in case you do not have the factory literature.

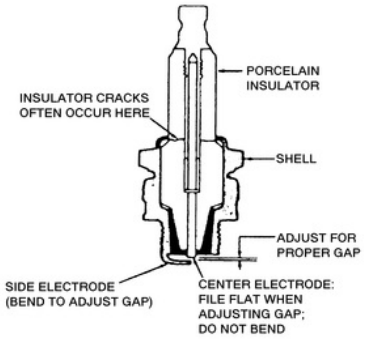
1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

A typical spark plug consists of a metal shell surrounding a ceramic insulator. A metal electrode extends downward through the center of the insulator and protrudes a small distance. Located at the end of the plug and attached to the side of the outer metal shell is the side electrode. The side electrode bends in at a 90ï¿½ angle so that its tip is just past and parallel to the tip of the center electrode. The distance between these two electrodes (measured in thousandths of an inch or hundredths of a millimeter) is called the spark plug gap.

The spark plug does not produce a spark, but instead provides a gap across which the current can arc. The coil produces anywhere from 20,000 to 50,000 volts (depending on the type and application) which travels through the wires to the spark plugs. The current passes along the center electrode and jumps the gap to the side electrode, and in doing so, ignites the air/fuel mixture in the combustion chamber.

Fig. 4: Cross-section of a spark plug



1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Check the plugs for deposits and wear. If they are not going to be replaced, clean the plugs thoroughly. Remember that any kind of deposit will decrease the efficiency of the plug. Plugs can be cleaned on a spark plug cleaning machine, which can sometimes be found in service stations, or you can do an acceptable job of cleaning with a stiff brush. If the plugs are cleaned, the electrodes must be filed flat. Use an ignition points file, not an emery board or the like, which will leave deposits. The electrodes must be filed perfectly flat with sharp edges; rounded edges reduce the spark plug voltage by as much as 50%.

Check spark plug gap before installation. The ground electrode (the L-shaped one connected to the body of the plug) must be parallel to the center electrode and the specified size wire gauge (please refer to the Tune-Up Specifications chart for details) must pass between the electrodes with a slight drag.

CAUTION
NEVER adjust the gap on a used platinum type spark plug.

Always check the gap on new plugs as they are not always set correctly at the factory. Do not use a flat feeler gauge when measuring the gap on a used plug, because the reading may be inaccurate. A round-wire type gapping tool is the best way to check the gap. The correct gauge should pass through the electrode gap with a slight drag. If you're in doubt, try one size smaller and one larger. The smaller gauge should go through easily, while the larger one shouldn't go through at all. Wire gapping tools usually have a bending tool attached. Use that to adjust the side electrode until the proper distance is obtained. Absolutely never attempt to bend the center electrode. Also, be careful not to bend the side electrode too far or too often as it may weaken and break off within the engine, requiring removal of the cylinder head to retrieve it.

Fig. 1: A variety of tools and gauges are needed for spark plug service

Fig. 2: Checking the spark plug gap with a feeler gauge

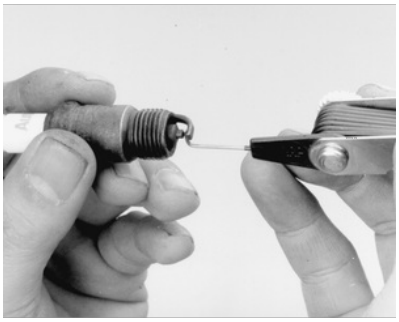


Fig. 3: Adjusting the spark plug gap

Fig. 4: If the standard plug is in good condition, the electrode may be filed flat — WARNING: do not file platinum plugs

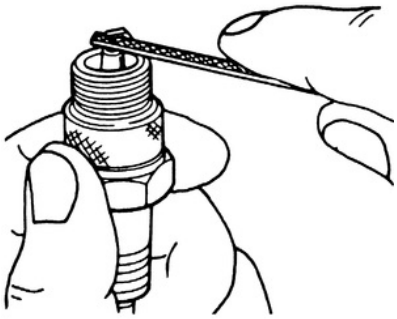


Fig. 5: Used spark plugs which show damage may indicate engine problems

1993 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3
Fuel Delivery: FI | Fuel: GAS

A set of spark plugs usually requires replacement after about 20,000–30,000 miles (32,000–48,000 km), depending on your style of driving. In normal operation plug gap increases about 0.001 in. (0.025mm) for every 2500 miles (4000 km). As the gap increases, the plug's voltage requirement also increases. It requires a greater voltage to jump the wider gap and about two to three times as much voltage to fire the plug at high speeds than at idle. The improved air/fuel ratio control of modern fuel injection combined with the higher voltage output of modern ignition systems will often allow an engine to run significantly longer on a set of standard spark plugs, but keep in mind that efficiency will drop as the gap widens (along with fuel economy and power).

When you're removing spark plugs, work on one at a time. Don't start by removing the plug wires all at once, because, unless you number them, they may become mixed up. Take a minute before you begin and number the wires with tape.

1. Disconnect the negative battery cable, and if the vehicle has been run recently, allow the engine to thoroughly cool.
2. If equipped, remove the spark plug cover.
3. Carefully twist the spark plug wire boot to loosen it, then pull upward and remove the boot from the plug. Be sure to pull on the boot and not on the wire, otherwise the connector located inside the boot may become separated.
4. Using compressed air, blow any water or debris from the spark plug well to assure that no harmful contaminants are allowed to enter the combustion chamber when the spark plug is removed. If compressed air is not available, use a rag or a brush to clean the area.

   NOTE: Remove the spark plugs when the engine is cold, if possible, to prevent damage to the threads. If removal of the plugs is difficult, apply a few drops of penetrating oil or silicone spray to the area around the base of the plug, and allow it a few minutes to work.
5. Using a spark plug socket that is equipped with a rubber insert to properly hold the plug, turn the spark plug counterclockwise to loosen and remove the spark plug from the bore.

   WARNING
   Be sure not to use a flexible extension on the socket. Use of a flexible extension may allow a shear force to be applied to the plug. A shear force could break the plug off in the cylinder head, leading to costly and frustrating repairs.

   To install:
6. Inspect the spark plug boot for tears or damage. If a damaged boot is found, the spark plug wire must be replaced.
7. Using a wire feeler gauge, check and adjust the spark plug gap. When using a gauge, the proper size should pass between the electrodes with a slight drag. The next larger size should not be able to pass while the next smaller size should pass freely.
8. Carefully thread the plug into the bore by hand. If resistance is felt before the plug is almost completely threaded, back the plug out and begin threading again. In small, hard to reach areas, an old spark plug wire and boot could be used as a threading tool. The boot will hold the plug while you twist the end of the wire and the wire is supple enough to twist before it would allow the plug to crossthread.

   WARNING
   Do not use the spark plug socket to thread the plugs. Always carefully thread the plug by hand or using an old plug wire to prevent the possibility of crossthreading and damaging the cylinder head bore.
9. Carefully tighten the spark plug. If the plug you are installing is equipped with a crush washer, seat the plug, then tighten about $^{1}/_{4}$ turn to crush the washer. If you are installing a tapered seat plug, tighten the plug to specifications provided by the vehicle or plug manufacturer.
10. Apply a small amount of silicone dielectric compound to the end of the spark plug lead or inside the spark plug boot to prevent sticking, then install the boot to the spark plug and push until it clicks into place. The click may be felt or heard, then gently pull back on the boot to assure proper contact.
11. Install the spark plug cover (if equipped).
12. Connect the negative battery cable.

Fig. 1: The spark plug cover is usually retained by six bolts .
. .

Fig. 2: . . . which normally are removed with a T25 Torx® head bit

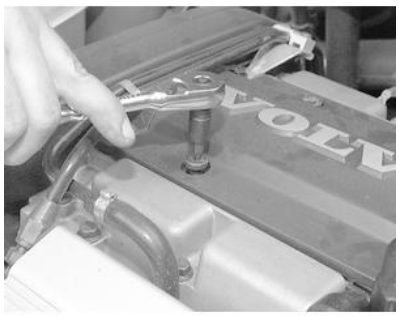


Fig. 3: After the bolts are removed, lift the cover off and carefully set it aside

Fig. 4: Remove the spark plug wire by first gently twisting the boot loose

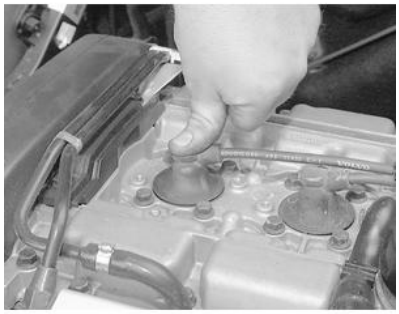


Fig. 5: After the plug wire is loosened, carefully lift it out of the cylinder head

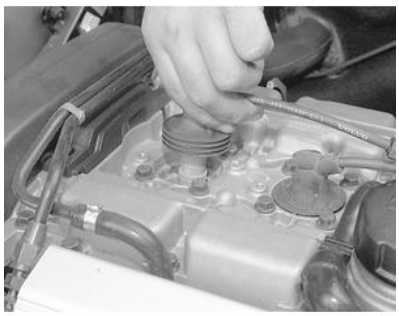


Fig. 6: The spark plug as mounted in the cylinder head — B5254S engine

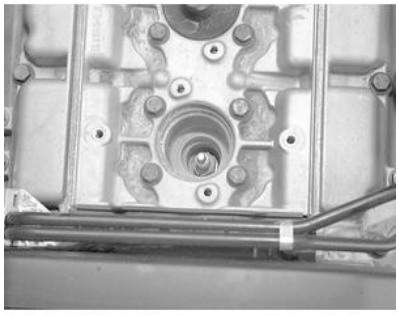


Fig. 7: Typically, the spark plugs are removed using a $^{5}/_{8}$ inch spark plug socket

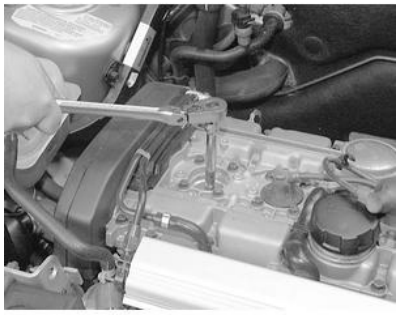


Fig. 8: Inspect the plugs, even if you are replacing them, as they will reveal information about the condition of your engine

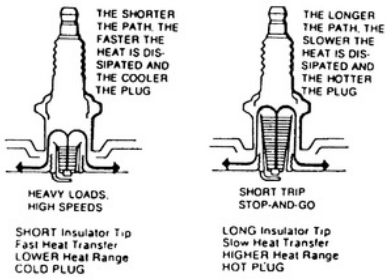
Fig. 9: A piece of hose is a good tool for starting the threads of the spark plugs upon installation

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Spark plug heat range is the ability of the plug to dissipate heat. The longer the insulator (or the farther it extends into the engine), the hotter the plug will operate; the shorter the insulator (the closer the electrode is to the block's cooling passages) the cooler it will operate. A plug that absorbs little heat and remains too cool will quickly accumulate deposits of oil and carbon since it is not hot enough to burn them off. This leads to plug fouling and consequently to misfiring. A plug that absorbs too much heat will have no deposits but, due to the excessive heat, the electrodes will burn away quickly and might possibly lead to preignition or other ignition problems. Preignition takes place when plug tips get so hot that they glow sufficiently to ignite the air/fuel mixture before the actual spark occurs. This early ignition will usually cause a pinging during low speeds and heavy loads.

Fig. 1: Spark plug heat range



The general rule of thumb for choosing the correct heat range when picking a spark plug is: if most of your driving is long distance, high speed travel, use a colder plug; if most of your driving is stop and go, use a hotter plug. Original equipment plugs are generally a good compromise between the 2 styles and most people never have the need to change their plugs from the factory-recommended heat range.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The best possible method for installing a new set of wires is to replace ONE AT A TIME, so there can be no mix-up. On distributor equipped engines, don't rely on wiring diagrams or sketches, since the position of the distributor can be changed (unless the distributor is keyed for installation in only one position). Start by replacing the longest wire first. Install the boot firmly over the spark plug. Route the wire in exactly the same path as the original and connect it to the distributor or coil pack (as applicable). Repeat the process for each successively shorter wire.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Visually inspect the spark plug cables for burns, cuts, or breaks in the insulation. Check the spark plug boots and the nipples on the distributor cap and coil. Replace any damaged wiring. If no physical damage is obvious, the wires can be checked with an ohmmeter for excessive resistance.

Every 50,000 miles (80,000 km) or 60 months, the resistance of the wires should be checked with an ohmmeter. Wires with excessive resistance will cause misfiring, and may make the engine difficult to start in damp weather.

1. Remove the spark plug wires one at a time.
2. Measure the length of the spark plug wire with a suitable tool. Write down the length.
3. Connect one lead of an ohmmeter to one end of the spark plug wire on the metal conductor, and the other lead to the other end.
4. Replace any wire which shows over 5,000–7,000 ohms per foot.

Fig. 1: Checking plug wire resistance through the distributor cap with an ohmmeter

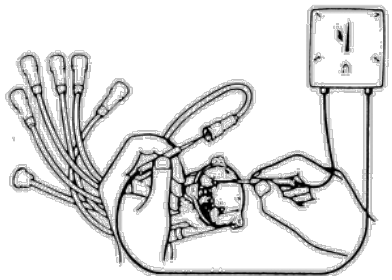


Fig. 2: Checking individual plug wire resistance with a digital ohmmeter

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Most Volvo engines utilize a timing belt to drive the camshaft from the crankshaft's turning motion and to maintain proper valve timing. Some manufacturers schedule periodic timing belt replacement to assure optimum engine performance, to make sure the motorist is never stranded should the belt break (as the engine will stop instantly) and, for some (manufacturers with interference motors), to prevent the possibility of severe internal engine damage should the belt break.

Volvo recommends replacing the belt at different times on different models; refer to the maintenance charts to cross reference the vehicle you own or are working on.

Whether or not you decide to replace it, you would be wise to check it periodically to make sure it has not become damaged or worn. Generally speaking, a severely worn belt may cause engine performance to drop dramatically, but a damaged belt (which could give out suddenly) may not give as much warning. In general, anytime the engine timing cover(s) is (are) removed, you should inspect the belt for premature parting, severe cracks or missing teeth.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Common sense and good driving habits will afford maximum tire life. Fast starts, sudden stops and hard cornering are hard on tires and will shorten their useful life span. Make sure that you don't overload the vehicle or run with incorrect pressure in the tires. Both of these practices will increase tread wear.

NOTE: For optimum tire life, keep the tires properly inflated, rotate them often and have the wheel alignment checked periodically.

Inspect your tires frequently. Be especially careful to watch for bubbles in the tread or sidewall, deep cuts or underinflation. Replace any tires with bubbles in the sidewall. If cuts are so deep that they penetrate to the cords, discard the tire. Any cut in the sidewall of a radial tire renders it unsafe. Also look for uneven tread wear patterns that may indicate the front end is out of alignment or that the tires are out of balance.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

If you have invested money in magnesium, aluminum alloy or sport wheels, special precautions should be taken to make sure your investment is not wasted and that your special wheels look good for the life of the vehicle.

Special wheels are easily damaged and/or scratched. Occasionally check the rims for cracking, impact damage or air leaks. If any of these are found, replace the wheel. But in order to prevent this type of damage and the costly replacement of a special wheel, observe the following precautions:

- Use extra care not to damage the wheels during removal, installation, balancing, etc. After removal of the wheels from the vehicle, place them on a mat or other protective surface. If they are to be stored for any length of time, support them on strips of wood. Never store tires and wheels upright; the tread may develop flat spots.
- When driving, watch for hazards; it doesn't take much to crack a wheel.
- When washing, use a mild soap or non-abrasive dish detergent (keeping in mind that detergent tends to remove wax). Avoid cleansers with abrasives or the use of hard brushes. There are many cleaners and polishes for special wheels.
- If possible, remove the wheels during the winter. Salt and sand used for snow removal can severely damage the finish of a wheel.
- Make certain the recommended lug nut torque is never exceeded or the wheel may crack. Never use snow chains on special wheels; severe scratching will occur.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The importance of proper tire inflation cannot be overemphasized. A tire employs air as part of its structure. It is designed around the supporting strength of the air at a specified pressure. For this reason, improper inflation drastically reduces the tire's ability to perform as intended. A tire will lose some air in day-to-day use; having to add a few pounds of air periodically is not necessarily a sign of a leaking tire.

Two items should be a permanent fixture in every glove compartment: an accurate tire pressure gauge and a tread depth gauge. Check the tire pressure (including the spare) regularly with a pocket type gauge. Too often, the gauge on the end of the air hose at your corner garage is not accurate because it suffers too much abuse. Always check tire pressure when the tires are cold, as pressure increases with temperature. If you must move the vehicle to check the tire inflation, do not drive more than a mile before checking. A cold tire is generally one that has not been driven for more than three hours.

Fig. 1: The tire label on the fuel filler door should be consulted for various tire information

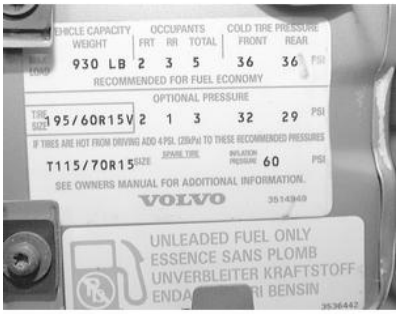


Fig. 2: Some Volvos have a tire label on the passenger side front door

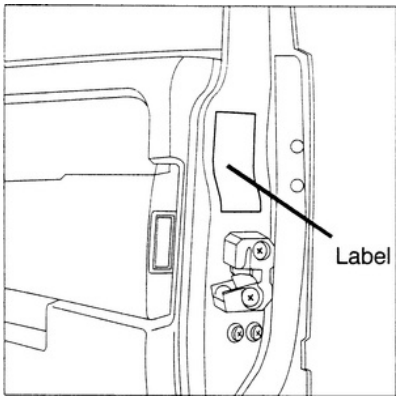


Fig. 3: Tires should be checked frequently for any sign of puncture or damage

Fig. 4: Tires with deep cuts, or cuts which bulge, should be replaced immediately

Fig. 5: Examples of inflation-related tire wear patterns

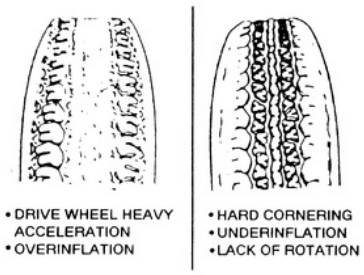


Fig. 6: Radial tires have a characteristic sidewall bulge; don't try to measure pressure by looking at the tire. Use a quality air pressure gauge

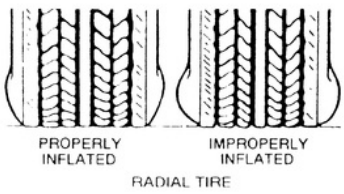
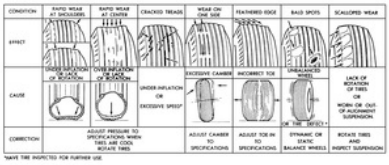


Fig. 7: Common tire wear patterns and causes



A plate or sticker is normally provided somewhere in the vehicle (door post, hood, tailgate or trunk lid) which shows the proper pressure for the tires. Never counteract excessive pressure build-up by bleeding off air pressure (letting some air out). This will cause the tire to run hotter and wear quicker.

CAUTION

Never exceed the maximum tire pressure embossed on the tire! This is the pressure to be used when the tire is at maximum loading, but it is rarely the correct pressure for everyday driving. Consult the owner's manual or the tire pressure sticker for the correct tire pressure.

Once you've maintained the correct tire pressures for several weeks, you'll be familiar with the vehicle's braking and handling personality. Slight adjustments in tire pressures can fine-tune these characteristics, but never change the cold pressure specification by more than 2 psi. A slightly softer tire pressure will give a softer ride but also yield lower fuel mileage. A slightly harder tire will give crisper dry road handling but can cause skidding on wet surfaces. Unless you're fully attuned to the vehicle, stick to the recommended inflation pressures.

All tires made since 1968 have built-in tread wear indicator bars that show up as $^{1}/_{2}$ in. (13mm) wide smooth bands across the tire when $^{1}/_{16}$ in. (1.5mm) of tread remains. The appearance of tread wear indicators means that the tires should be replaced. In fact, many states have laws prohibiting the use of tires with less than this amount of tread.

Fig. 8: Tread wear indicators will appear when the tire is worn

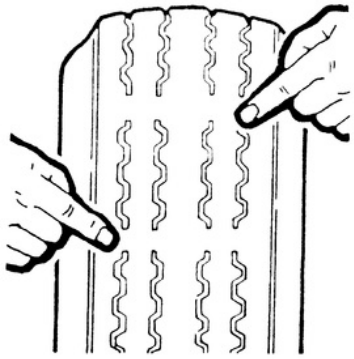
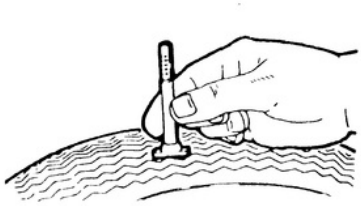


Fig. 9: Accurate tread depth indicators are inexpensive and handy



You can check your own tread depth with an inexpensive gauge or by using a Lincoln head penny. Slip the Lincoln penny (with Lincoln's head upside-down) into several tread grooves. If you can see the top of Lincoln's head in 2 adjacent grooves, the tire has less than $^{1}/_{16}$ in. (1.5mm) tread left and should be replaced. You can measure snow tires in the same manner by using the "tails" side of the Lincoln penny. If you can see the top of the Lincoln memorial, it's time to replace the snow tire(s).

Fig. 10: A penny works well for a quick check of tread depth

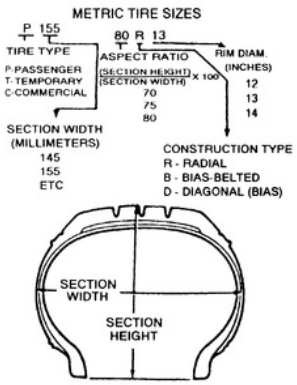
1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

For maximum satisfaction, tires should be used in sets of four. Mixing of different types (radial, bias-belted, fiberglass belted) must be avoided. In most cases, the vehicle manufacturer has designated a type of tire on which the vehicle will perform best. Your first choice when replacing tires should be to use the same type of tire that the manufacturer recommends.

When radial tires are used, tire sizes and wheel diameters should be selected to maintain ground clearance and tire load capacity equivalent to the original specified tire. Radial tires should always be used in sets of four.

Fig. 1: P-Metric tire coding



CAUTION
Radial tires should never be used on only the front axle.

When selecting tires, pay attention to the original size as marked on the tire. Most tires are described using an industry size code sometimes referred to as P-Metric. This allows the exact identification of the tire specifications, regardless of the manufacturer. If selecting a different tire size or brand, remember to check the installed tire for any sign of interference with the body or suspension while the vehicle is stopping, turning sharply or heavily loaded.

Snow Tires

Good radial tires can produce a big advantage in slippery weather, but in snow, a street radial tire does not have sufficient tread to provide traction and control. The small grooves of a street tire quickly pack with snow and the tire behaves like a billiard ball on a marble floor. The more open, chunky tread of a snow tire will self-clean as the tire turns, providing much better grip on snowy surfaces.

To satisfy municipalities requiring snow tires during weather emergencies, most snow tires carry either an M + S designation after the tire size stamped on the sidewall, or the designation "all-season." In general, no change in tire size is necessary when buying snow tires.

Most manufacturers strongly recommend the use of 4 snow tires on their vehicles for reasons of stability. If snow tires are fitted only to the drive wheels, the opposite end of the vehicle may become very unstable when braking or turning on slippery surfaces. This instability can lead to unpleasant endings if the driver can't counteract the slide in time.

Note that snow tires, whether 2 or 4, will affect vehicle handling in all non-snow situations. The stiffer, heavier snow tires will noticeably change the turning and braking characteristics of the vehicle. Once the snow tires are installed, you must re-learn the behavior of the vehicle and drive accordingly.

NOTE: Consider buying extra wheels on which to mount the snow tires. Once done, the "snow wheels" can be installed and removed as needed. This eliminates the potential damage to tires or wheels from seasonal removal and installation. Even if your vehicle has styled wheels, see if inexpensive steel wheels are available. Although the look of the vehicle will change, the expensive wheels will be protected from salt, curb hits and pothole damage.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

Tires must be rotated periodically to equalize wear patterns that vary with a tire's position on the vehicle. Tires will also wear in an uneven way as the front steering/suspension system wears to the point where the alignment should be reset.

Rotating the tires will ensure maximum life for the tires as a set, so you will not have to discard a tire early due to wear on only part of the tread. Regular rotation is required to equalize wear.

When rotating "unidirectional tires," make sure that they always roll in the same direction. This means that a tire used on the left side of the vehicle must not be switched to the right side and vice-versa. Such tires should only be rotated front-to-rear or rear-to-front, while always remaining on the same side of the vehicle. These tires are marked on the sidewall as to the direction of rotation; observe the marks when reinstalling the tire(s).

Fig. 1: Volvo's recommended tire rotation pattern

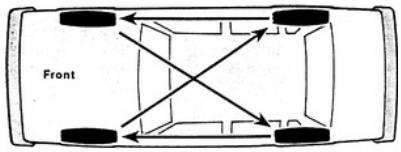


Fig. 2: Compact spare tires must NEVER be used in the rotation pattern

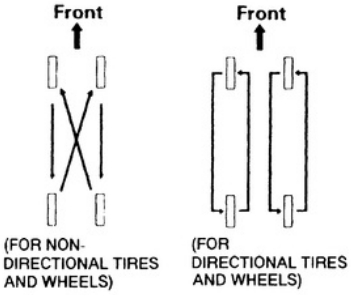


Fig. 3: Unidirectional tires are identifiable by sidewall arrows and/or the word "rotation"

Some styled or "mag" wheels may have different offsets front to rear. In these cases, the rear wheels must not be used up front and vice-versa. Furthermore, if these wheels are equipped with unidirectional tires, they cannot be rotated unless the tire is remounted for the proper direction of rotation.

NOTE: The compact or space-saver spare is strictly for emergency use. It must never be included in the tire rotation or placed on the vehicle for everyday use.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

If they are mounted on wheels, store the tires at proper inflation pressure. All tires should be kept in a cool, dry place. If they are stored in the garage or basement, do not let them stand on a concrete floor; set them on strips of wood, a mat or a large stack of newspaper. Keeping them away from direct moisture is of paramount importance. Tires should not be stored upright, but in a flat position.

A normally worn spark plug should have light tan or gray deposits on the firing tip.

A carbon fouled plug, identified by soft, sooty, black deposits, may indicate an improperly tuned vehicle. Check the air cleaner, ignition components and engine control system.

This spark plug has been **left in the engine too long,** as evidenced by the extreme gap. Plugs with such an extreme gap can cause misfiring and stumbling accompanied by a noticeable lack of power.

An oil fouled spark plug indicates an engine with worn piston rings and/or bad valve seals allowing excessive oil to enter the chamber.

A physically damaged spark plug may be evidence of severe detonation in that cylinder. Watch that cylinder carefully between services, as a continued detonation will not only damage the plug, but could also damage the engine.

A bridged or almost bridged spark plug, identified by a build-up between the electrodes caused by excessive carbon or oil build-up on the plug.

1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

The recommended maintenance interval for valve clearance adjustment is 30,000 miles (48,000 km). The clearance may be checked with the engine hot or cold.

1993 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3
Fuel Delivery: FI | Fuel: GAS

NOTE: Not all Volvo engines have adjustable valves. The following engines have adjustable valves, all others use hydraulic tappets and are non-adjustable.

B230F and B230FT Engines

Valve clearance adjustment requires the following special tools:

- Valve tappet depressor tool (Volvo tool 5022 or equivalent) to push down the tappet sufficiently to remove the adjusting disc.
- A special designed pair of pliers (Volvo tool 5026 or equivalent) to actually remove and install the valve adjusting disc.
- A set of varying-thickness valve adjusting discs (sometimes called shims) to make the necessary corrections.
- Feeler gauge to check valve clearance.

WARNING
The use of the correct special tools or their equivalent is required for this procedure.

1. Disconnect the negative battery cable.
2. Remove the valve cover.
3. Rotate the engine, using the crankshaft center bolt, until the No. 1 cylinder is at Top Dead Center (TDC). Both cam lobes for the No. 1 cylinder should point up at equally large angles, and the pulley timing mark should be at 0 degrees.
4. Insert the correct size feeler gauge, as indicated, and check the No. 1 cylinder valve clearance.

   NOTE: Always check valve clearance with cylinder at TDC. Always turn $^{1}/_{4}$ turn after TDC to set.
5. If the clearance is incorrect, line up valve depressors. Turn the valve depressors so that the notches are at right angle to the engine center line.
6. Attach valve depressor tool 5022 or equivalent and depress the valve. Screw down the tool spindle until the depressor groove is just above the edge and accessible with the pliers. Use tool 5026 or equivalent to remove the disc.
7. Using a micrometer, measure the disc thickness. Calculate the thickness of disc to be used. Discs are available from 0.130–0.180 inch (3.30–4.50mm), in increments of 0.001 inch (0.05mm). Use the following example:

   A. The measured clearance is 0.02 in. (0.50mm), and the correct clearance is 0.016 inch (0.40mm); therefore, the difference is 0.004 inch (0.10mm).
   B. The measured thickness of the existing disc is 0.150 inch (3.80mm). Therefore, the correct thickness of the new disc will be 0.150 + 0.004 inch = 0.154 inch (3.80 + 0.10mm = 3.90mm).

   NOTE: It is advisable to use metric measurements to simplify calculations.
8. Lubricate the new disc with clean engine oil and place into position.
9. Remove valve depressor tool 5022 or equivalent.

   NOTE: Install the discs with their marks facing DOWN.
10. Rotate the engine crankshaft until the No. 3 cylinder is at the correct position. Both cam lobes for the No. 3 cylinder should point up at equally large angles. Check and adjust the clearance as described previously.
11. Repeat Step 7 for cylinder No. 4 and then for cylinder No. 2.
12. Rotate the engine a few turns, then recheck all cylinders.
13. Install the valve cover, using a new valve cover gasket.
14. Connect the negative battery cable.
15. Check engine operation.

Fig. 1: The pulley timing mark should be at "0" when adjusting the valves — B230F and B230FT engines

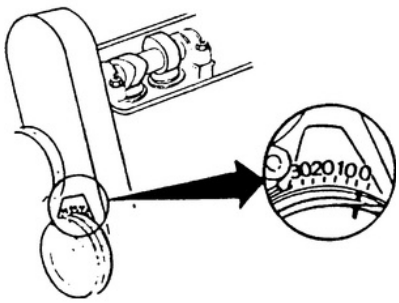


Fig. 2: Checking valve clearance for the No. 1 cylinder — B230F and B230FT engines

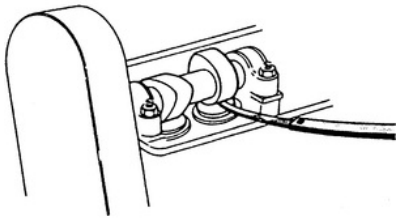


Fig. 3: Line up the valve depressors — B230F and B230FT engines

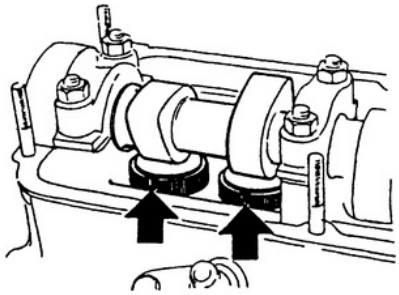


Fig. 4: Attach tool 5022, or an equivalent valve depressor, and remove the disc — B230F and B230FT engines

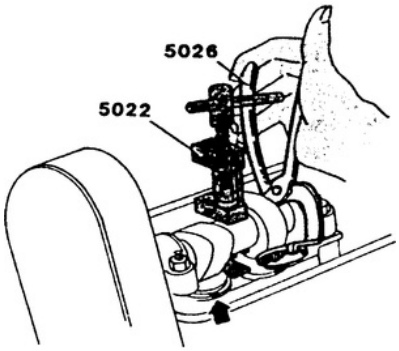


Fig. 5: Measure the disc thickness using a micrometer — B230F and B230FT engines

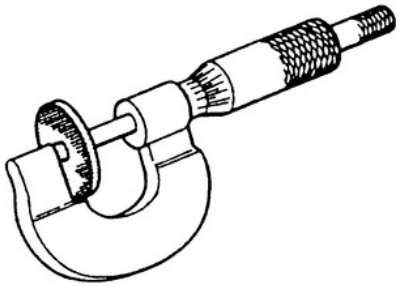


Fig. 6: View of a typical disc — B230F and B230FT engines

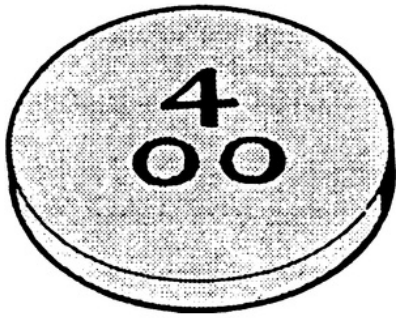
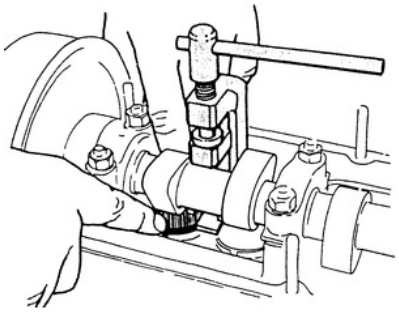


Fig. 7: Positioning a new disc — B230F and B230FT engines



B280F Engine

1. Disconnect the negative battery cable.
2. On right side of engine:
    A. Remove the oil filler cap with hoses.
    B. Remove the air conditioning compressor with bracket, and position aside.
    C. Remove the oil dipstick.
    D. Disconnect the wire bundle from the clamps on the valve cover.
3. On left side of engine:
    A. Disconnect the air inlet hose.
    B. Disconnect the main wiring harness clamp from the valve cover.
    C. Remove the spark plug wires and fuel lines from the valve cover.
4. Remove the valve covers.
5. Using a 36mm hex socket on the crankshaft pulley bolt, rotate the crankshaft until the mark on the pulley is opposite the **0** mark on the engine shoulder. Both rocker arms for No. 1 cylinder should have clearance.
6. Insert the proper size feeler gauge between the valve and adjusting screw. Check and, if necessary, adjust the following valves: Intake 1, 2 and 4 and Exhaust 1, 3 and 6.
7. Rotate the crankshaft one complete turn (valve overlapping No. 1 cylinder), so that the mark on the pulley is again opposite **0** mark on the engine shoulder.
8. Check and if necessary, adjust the following valves: Intake 3, 5 and 6 and Exhaust 2, 4 and 5.
9. Install the valve covers, using a new valve cover gaskets.
10. Reinstall all removed components.
11. Connect the negative battery cable.
12. Check engine operation.

Fig. 8: Adjust these valves with the No. 1 piston at TDC — B280F engine

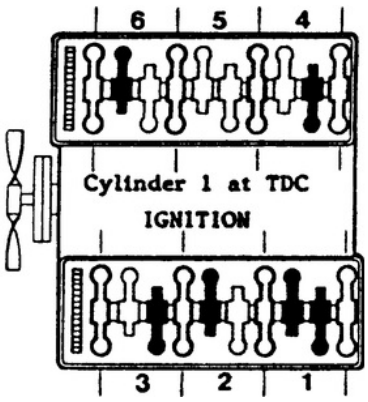


Fig. 9: Adjust these valves with the No. 1 piston at TDC "OVERLAP" — B280F engine

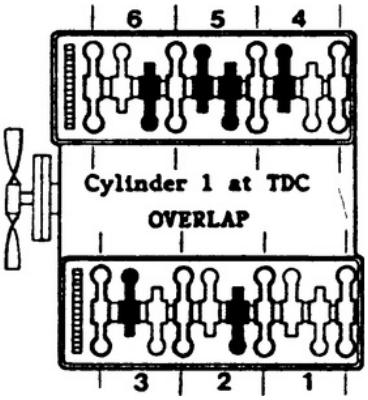


Fig. 10: The pulley timing mark should be at the "0" mark on the engine shoulder when adjusting the valves — B280F engine

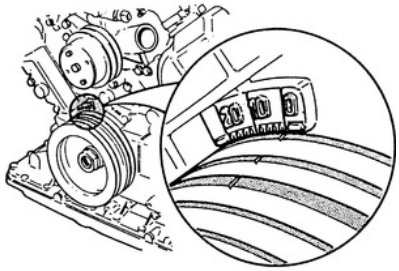
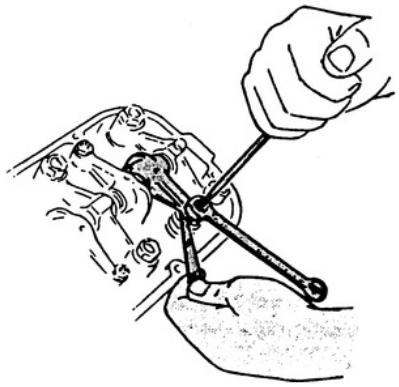


Fig. 11: Adjusting the valves



1993 Volvo 940

Submodel: | **Engine Type:** L4 | **Liters:** 2.3
Fuel Delivery: FI | **Fuel:** GAS

For maximum effectiveness and longest element life, the windshield and wiper blades should be kept clean. Dirt, tree sap, road tar and so on will cause streaking, smearing and blade deterioration if left on the glass. It is advisable to wash the windshield carefully with a commercial glass cleaner at least once a month. Wipe off the rubber blades with the wet rag afterwards. Do not attempt to move wipers across the windshield by hand; damage to the motor and drive mechanism will result.

To inspect and/or replace the wiper blade elements, place the wiper switch in the **LOW** speed position and the ignition switch in the **ACC** position. When the wiper blades are approximately vertical on the windshield, turn the ignition switch to **OFF**.

Examine the wiper blade elements. If they are found to be cracked, broken or torn, they should be replaced immediately. Replacement intervals will vary with usage, although ozone deterioration usually limits element life to about one year. If the wiper pattern is smeared or streaked, or if the blade chatters across the glass, the elements should be replaced. It is easiest and most sensible to replace the elements in pairs.

If your vehicle is equipped with aftermarket blades, there are several different types of refills and your vehicle might have any kind. Aftermarket blades and arms rarely use the exact same type blade or refill as the original equipment. Here are some typical aftermarket blades; not all may be available for your vehicle:

The Anco® type uses a release button that is pushed down to allow the refill to slide out of the yoke jaws. The new refill slides back into the frame and locks in place.

Some Trico® refills are removed by locating where the metal backing strip or the refill is wider. Insert a small screwdriver blade between the frame and metal backing strip. Press down to release the refill from the retaining tab.

Other types of Trico® refills have two metal tabs which are unlocked by squeezing them together. The rubber filler can then be withdrawn from the frame jaws. A new refill is installed by inserting the refill into the front frame jaws and sliding it rearward to engage the remaining frame jaws. There are usually four jaws; be certain when installing that the refill is engaged in all of them. At the end of its travel, the tabs will lock into place on the front jaws of the wiper blade frame.

Another type of refill is made from polycarbonate. The refill has a simple locking device at one end which flexes downward out of the groove into which the jaws of the holder fit, allowing easy release. By sliding the new refill through all the jaws and pushing through the slight resistance when it reaches the end of its travel, the refill will lock into position.

To replace the Tridon® refill, it is necessary to remove the wiper blade. This refill has a plastic backing strip with a notch about 1 in. (25mm) from the end. Hold the blade (frame) on a hard surface so that the frame is tightly bowed. Grip the tip of the backing strip and pull up while twisting counterclockwise. The backing strip will snap out of the retaining tab. Do this for the remaining tabs until the refill is free of the blade. The length of these refills is molded into the end and they should be replaced with identical types.

Regardless of the type of refill used, be sure to follow the part manufacturer's instructions closely. Make sure that all of the frame jaws are engaged as the refill is pushed into place and locked. If the metal blade holder and frame are allowed to touch the glass during wiper operation, the glass will be scratched.

Fig. 1: Bosch® wiper blade and fit kit

Fig. 2: Lexor® wiper blade and fit kit

Fig. 3: Pylon® wiper blade and adapter

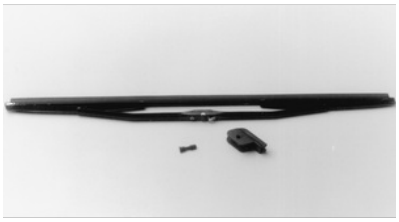


Fig. 4: Trico® wiper blade and fit kit

Fig. 5: Tripledge® wiper blade and fit kit

Fig. 6: To remove and install a Lexor® wiper blade refill, slip out the old insert and slide in a new one

Fig. 7: On Pylon® inserts, the clip at the end has to be removed prior to sliding the insert off

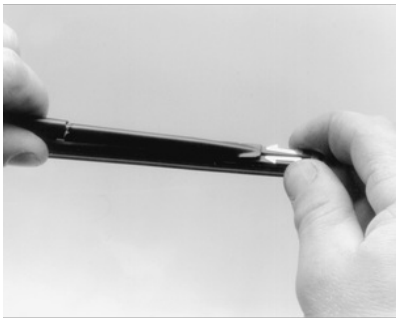


Fig. 8: On Trico® wiper blades, the tab at the end of the blade must be turned up . . .

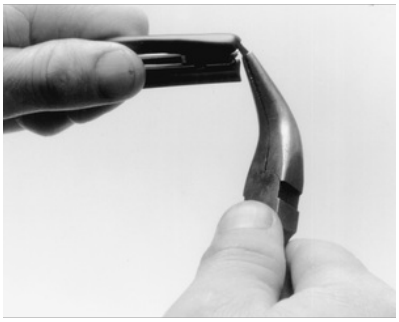


Fig. 9: . . . then the insert can be removed. After installing the replacement insert, bend the tab back

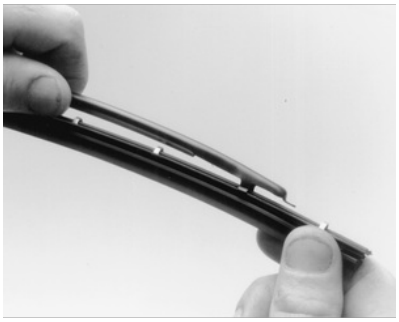


Fig. 10: The Tripledge® wiper blade insert is removed and installed using a securing clip