

1993 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

CAUTION

Do not immediately drain the transmission fluid, if the vehicle was recently driven. Oil can be scalding hot.

1. Disconnect the negative battery cable.
2. Raise and support the vehicle safely.
3. Place a suitable drain pan beneath the transmission/transaxle.
4. Remove the drain plug and drain the fluid.
5. Reinstall the drain plug.
6. Lower the vehicle.
7. Fill the transmission with the proper fluid.
8. Connect the negative battery cable.
9. Firmly apply the parking brake and block the drive wheel. Start the engine and allow it to reach operating temperature. Check for leaks.
10. Move the gear selector lever through all ranges.
11. Wait approximately 2 minutes and check the fluid level with the engine running and the gear selector in the **Park** position. Adjust the fluid level as required.

Fig. 1: The drain plug on most Volvo transaxles is loosened with a 22mm wrench



Fig. 2: After the drain plug is loose, unscrew it by hand while keeping inward pressure against the plug

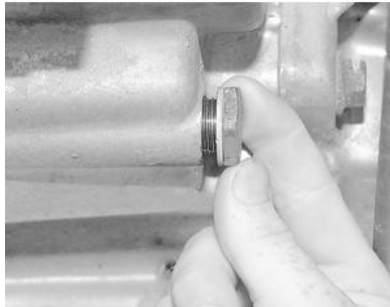


Fig. 3: Remove the drain plug and let the fluid drain into a suitable container



Fig. 4: Inspect the drain plug gasket for cracks; replace if

necessary, or a leak could occur



Fig. 5: Some drain plugs are magnetic and will attract metallic particles. If the magnet is full, serious problems are likely



Fig. 6: With the dipstick removed, install a funnel into the dipstick tube to refill the transmission/transaxle



Fig. 7: Pour the proper ATF into the funnel and fill the transmission/transaxle



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Dexron III® type Automatic Transmission Fluid (ATF) is recommended for all automatic transmissions/transaxles.

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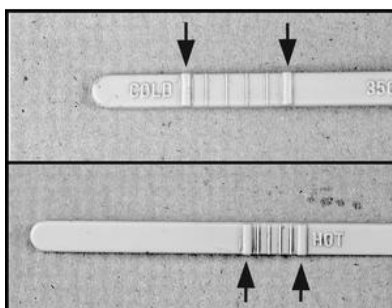
The fluid level should be checked at 10,000 mile (16,000 km) intervals.

1. Check the transmission fluid level with the vehicle on level ground, with the transmission/transaxle in the **Park** position, with the engine idling.
2. Remove the dipstick and wipe it clean, using a lint-free rag.
NOTE: The dipstick has graduations for hot and cold transmission/transaxle fluid levels.
3. Reinstall the dipstick. Remove it and check the dipstick markings.
 - A. Cold fluid: At fluid temperatures below 105°F (40°C), the level may be below the **MIN** mark.
 - B. Operating temperature: At fluid temperatures above 195°F (90°C), the level may be above the **MAX** mark.
4. Check the condition of the ATF. Discoloration and smell can be caused by heavy engine loads, such as towing. In this case, remove and clean oil pan, oil strainer and magnet. Refer to the Pan & Filter Service procedure later in this section.
5. If topping up is necessary, fill through the dipstick tube.

Fig. 1: Remove the dipstick from the tube and check the fluid level



Fig. 2: The dipstick is marked on both sides; one side is for checking while cold, the other side while hot



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NOTE: Automatic transmissions contain a strainer (filter), but automatic transaxles do not. Removal of the pan is only required for repair. Refer to the preceding drain and refill procedure.

CAUTION

Do not immediately drain the transmission fluid, if the vehicle was recently driven. Oil can be scalding hot.

1. Disconnect the negative battery cable.
2. Raise and support the vehicle safely.
3. Place a suitable drain pan beneath the transmission.
4. Remove the drain plug and drain the fluid.
5. Install the drain plug.

NOTE: On some models, it may be necessary to remove the dipstick tube from the pan for access.

6. Unfasten the oil pan retaining bolts and remove the pan.
7. Unfasten the strainer retaining bolts.
8. Remove the strainer from the valve body.

To install:

9. Clean the oil pan and particle magnet(s).

NOTE: According to the manufacturer, the strainer can be cleaned, but we recommend replacement with a new one.

10. Install the replacement strainer onto the valve body and tighten the bolts.
11. Install the particle magnet(s) into the pan.
12. Place a new gasket onto the transmission pan.
13. Place the pan into position on the transmission, and tighten the bolts.
14. If removed, install the dipstick tube.
15. Lower the vehicle.
16. Fill the transmission with the proper fluid.
17. Connect the negative battery cable.
18. Firmly apply the parking brake and block the drive wheel. Start the engine and allow it to reach operating temperature. Check for leaks.
19. Move the gear selector lever through all ranges.
20. Wait approximately 2 minutes and check the fluid level in **Park** position. Adjust as required.

Fig. 1: Remove the drain plug and allow the transmission fluid to drain

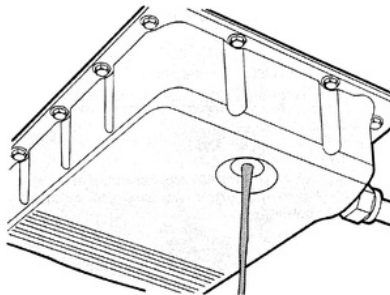


Fig. 2: Remove the transmission pan, particle magnet(s) and strainer

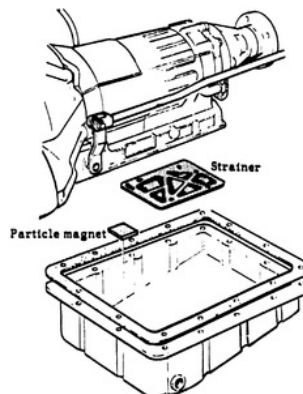
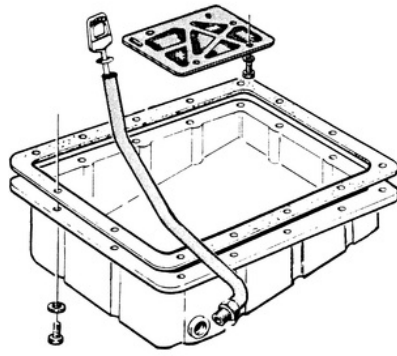


Fig. 3: Install the replacement strainer, particle magnet(s) and pan, along with the dipstick tube, if removed



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The car should be washed at regular intervals to remove dirt, dust, insects, and tar and other possibly damaging stains that can adhere to the paint and may cause damage. Proper exterior maintenance also helps in the resale value of the vehicle by maintaining its like-new appearance.

NOTE: It is particularly important to frequently wash the car in the wintertime to prevent corrosion, when salt has been used on the roads.

There are many precautions and tips on washing, including the following:

- When washing the car, do not expose it to direct sunlight.
- Use lukewarm water to soften the dirt before you wash with a sponge, and plenty of water, to avoid scratching.
- A detergent can be used to facilitate the softening of dirt and oil.
- A water-soluble grease solvent may be used in cases of sticky dirt. However, use a washplace with a drainage separator.
- Dry the car with a clean chamois and remember to clean the drain holes in the doors and rocker panels.
- If equipped with a power radio antenna, it must be dried after washing.

CAUTION

Never clean the bumpers with gasoline or paint thinner, always use the same agent as used on the painted surfaces of the vehicle.

- Tar spots can be removed with tar remover or kerosene after the car has been washed.
- A stiff-bristle brush and lukewarm soapy water can be used to clean the wiper blades. Frequent cleaning improves visibility when using the wipers considerably.
- Wash off the dirt from the underside (wheel housings, fenders, etc.).
- In areas of high industrial fallout, more frequent washing is recommended.

CAUTION

During high pressure washing the spray nozzle must never be closer to the vehicle than 13 inches (30cm). Do not spray into the locks.

- When washing or steam cleaning the engine, avoid spraying water or steam directly on the electrical components or near the distributor or ignition components. After cleaning the engine, the spark plug wells should be inspected for water and blown dry if necessary.
- Special car washing detergent is the best to use. Liquid dishwashing detergent can remove wax and leave the car's paint unprotected and in addition some liquid detergents contain abrasives which can scratch the paint.
- Bird droppings should be removed from the paintwork as soon as possible, otherwise the finish may be permanently stained.

WARNING

When the car is driven immediately after being washed, apply the brakes several times in order to remove any moisture from the braking surfaces.

WARNING

Engine cleaning agents should not be used when the engine is warm, a fire risk is present as most engine cleaning agents are highly flammable.

Automatic car washing is a simple and quick way to clean your car, but it is worth remembering that it is not as thorough as when you yourself clean the car. Keeping the underbody clean is vitally important, and some automatic washers do not contain equipment for washing the underside of the car.

When driving into an automatic wash, make sure the following precautions have been taken:

- Make sure all windows are up, and no objects that you do not want to get wet are exposed.
- In some cases, rotating the side view mirrors in can help to avoid possible damage.
- If your car is equipped with a power antenna, lower it. If your vehicle has a solid mounted, non-power antenna, it is best to remove it, but this is not always practical. Inspect the surroundings to reduce the risk of possible damage, and check to see if the antenna can be manually lowered.

WARNING

Most manufacturers do not recommend automatic car washing in the first six months due to the possibility of insufficient paint curing; a safe bet is to wait until after six months of ownership (when purchased new) to use an automatic car wash.

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[Upholstery](#)

Fabric can usually be cleaned with soapy water or a proper detergent. For more difficult spots caused by oil, ice cream, soda, etc., use a fabric cleaner available at most parts stores. Be sure when purchasing the cleaner to read the label to ensure it is safe to use on your type of fabric. A safe method of testing the cleaner is to apply a small amount to an area usually unseen, such as under a seat, or other areas. Wait a while, perhaps even a day to check the spot for fading, discoloring, etc., as some cleaners will only cause these problems after they have dried.

Leather uphdstery requires special care, it can be cleaned with a mild soap and a soft cloth. It is recommended that a special leather cleaner be used to clean but also treat the leather surfaces in your vehicle. Leather surfaces can age quickly and can crack if not properly taken care of, so it is vital that the leather surfaces be maintained.

[Floor Mats and Carpet](#)

The floor mats and carpet should be vacuumed or brushed regularly. They can be cleaned with a mild soap and water. Special cleaners are available to clean the carpeted surfaces of your vehicle, but take care in choosing them, and again it is best to test them in a usually unseen spot.

[Dashboard, Console, Door Panels, Etc.](#)

The dashboard, console, door panels, and other plastic, vinyl, or wood surfaces can be cleaned using a mild soap and water. Caution must be taken to keep water out of electronic accessories and controls to avoid shorts or ruining the components. Again special cleaners are available to clean these surfaces, as with other cleaners care must taken in purchasing and using such cleaners.

There are protectants available which can treat the various surfaces in your car giving them a "shiny new look", however some of these protectants can cause more harm than good in the long run. The shine that is placed on your dashboard attracts sunlight accelerating the aging, fading and possibly even cracking the surfaces. These protectants also attract more dust to stick to the surfaces they treat, increasing the cleaning you must do to maintain the appearance of your vehicle. Personal discretion is advised here.

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The body has several points that require periodic lubrication to maintain their quality operation. These points include the following:

- Hood hinges: lubricate every 10,000 miles (16,000 km), use heavy oil.
- Hood latch mechanism: lubricate every 10,000 miles (16,000 km), use general purpose grease.
- Door hinges, stop and striker plates: lubricate every 10,000 miles (16,000 km). Lubricate the door hinges with heavy oil. Use door wax to lubricate the striker plates. Check that the latches lock in both outer and inner positions.
- Check that the door stops are in working order and provide positive locking in intermediate and outer positions.
- Power Antenna: service the power antenna every 5,000 miles (8,000 km). Clean the antenna rod with ATF or other suitable lubricating oil. Wipe the rod clean and apply more oil on the antenna; then run the antenna up/down a few times. Repeat as necessary, until the antenna is clean and functions properly.

Fig. 1: Lubricate any pivots or joints in the hood hinges

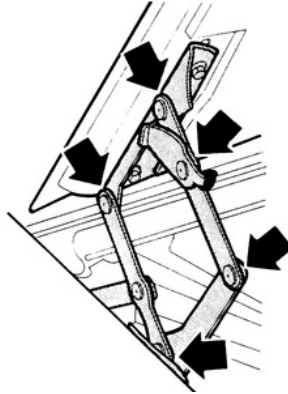


Fig. 2: Door hinge lubrication points

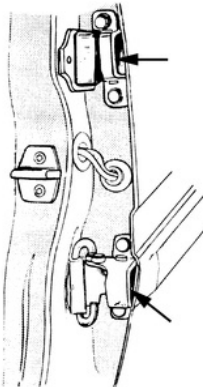


Fig. 3: Use a heavy oil to lubricate the door hinges

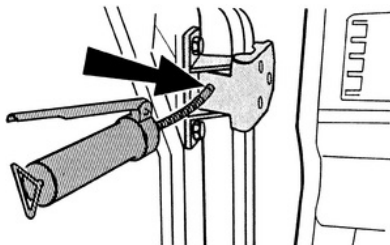


Fig. 4: Use wax on the striker latches

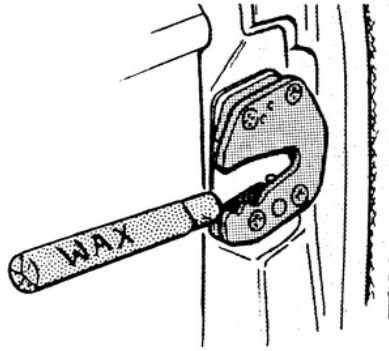


Fig. 5: Wipe the antenna clean and lightly lubricate with a mild lubricant such as ATF to increase antenna motor life



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NOTE: Before applying wax, the vehicle must be washed and thoroughly dried.

Waxing a vehicle can help to preserve the appearance of your vehicle. A wide range of polymer-based car waxes are available today. These waxes are easy to use and produce a long-lasting, high gloss finish that protects the body and paint against oxidation, road dirt, and fading.

Sometimes, waxing a neglected vehicle, or one that has sustained chemical or natural element damage (such as acid rain) require more than waxing, and a light-duty compound can be applied. For severely damaged surfaces, it is best to consult a professional to see what would be required to repair the damage.

Waxing procedures differ according to manufacturer, type, and ingredients, so it is best to consult the directions on the wax and/or polish purchased.

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It is recommended that only brake fluid meeting the specification DOT 4+ (DOT 4) be used in the brake system. AVOID mixing different types of brake fluid.

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The fluid level should be checked at every 5,000 mile (8,000 km) intervals. It is recommended that the fluid be replaced at 30,000 mile (48,000 km) intervals. If the vehicle is subjected to particularly hard wear, such as driving in mountainous regions, it should be changed at least once a year or every 15,000 miles (24,000 km).

CAUTION

Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes and wash your hands thoroughly after handling brake fluid. If you do get brake fluid in your eyes, flush your eyes with clean, running water for 15 minutes. If eye irritation persists, or if you have taken brake fluid internally, IMMEDIATELY seek medical assistance.

1. Position the vehicle on a level surface.
2. Locate the brake fluid reservoir in the engine compartment. Check the fluid reservoir and brake lines for leaks.
3. Check the brake fluid without removing the cap. Adjust the level if necessary, using the recommended fluid. When filling the master cylinder, extreme cleanliness should be observed to prevent dirt entering the system.

NOTE: Low fluid level may indicate worn brakes.

Fig. 1: The master cylinder reservoir is marked with MIN and MAX levels



Fig. 2: Wipe the top of the master cylinder reservoir clean before opening the cap to prevent contamination



Fig. 3: Pour the proper brake fluid directly into the reservoir; if you use a funnel, be sure not to mix fluids



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Check the suspension and driveline every 10,000 miles (16,000 km) intervals. Use regular chassis lube on applicable joints if binding is noticed.

Ball joints, suspension bushings and driveline joints are permanently lubricated at the factory and require no periodic lubrication. However, check the rubber seals of these parts for cracking or damage. Replace any damaged seal with a new one, making sure to pack the new seal with multipurpose chassis grease. Many aftermarket parts used to replace these components will contain a provision for lubrication. The easiest way to determine if a component can be lubricated is to look for a grease (Zerk) fitting.

On most models the steering stops require lubricating or a noise will be heard when the vehicle is turned all the way in either direction. To grease the stops, simply spread some a multi-purpose grease, usually bearing grease over the surface.

Fig. 4: Lubricate the steering stops at every oil change interval



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1. Raise and support the vehicle safely.
2. Locate all grease fittings on the vehicle. They are usually located on the at ball joints, suspension bushings and universal joints.
NOTE: Some grease fittings may be obscured by road dirt or grease from an over zealous chassis lubrication.
3. Inspect the boot or seal for damage and replace as necessary. It is useless to attempt filling a damaged boot with grease as it will probably leak out.
4. Remove the grease fitting cap.
5. Clean the area around the grease fitting with a rag.
6. Connect a grease gun to the fitting and pump grease into the joint until the boot or seal swells slightly. On a well maintained vehicle, this should be no more than 3–4 pumps.
NOTE: Do not overfill the component with grease. If grease exits the boot or seal, it is overfill.
7. Remove the grease gun and install the grease fitting cap.
8. Lower the vehicle.

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The clutch master cylinder is located on the firewall, below the brake master cylinder, and adjacent to the power brake booster.

On some models, the clutch and brake fluid share the same reservoir and, therefore, the same fluid requirements. The clutch fluid level is checked when the brake fluid level is checked. The fluid level in the reservoir has **MIN** and **MAX** markings, and the fluid level is OK if it is between these two lines.

NOTE: Low fluid level may indicate worn brakes.

CAUTION

Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes and wash your hands thoroughly after handling brake fluid. If you do get brake fluid in your eyes, flush your eyes with clean, running water for 15 minutes. If eye irritation persists, or if you have taken brake fluid internally, IMMEDIATELY seek medical assistance.

On models with a separate clutch master cylinder, the fluid should be in between the **MIN** and **MAX** levels.

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It is recommended that the coolant be replaced at 30,000 mile (48,000 km) intervals. Perform this operation with the engine cold.

1. Remove the expansion tank cap and set the heater controls to **HOT**.
2. Raise the vehicle and support it safely.
3. Open the petcock on the bottom of the radiator. If the coolant is to be reused, collect it in a clean container.
4. Completely drain the radiator of all the coolant.
5. Close the petcock and lower the vehicle.
6. On models with an expansion tank, either use a siphon or unfasten the tank and hold it up so that all of the coolant in it flows into the radiator.
7. Add coolant to the expansion tank until coolant is level with the **MAX** mark on the tank.
8. Start the engine and let it idle until normal operating temperature is reached and check for leaks.
9. Bleed the cooling system by leaving the cap off the expansion tank and the vehicle reaches normal operating temperature. The atmospheric pressure will aid in the removal of air pockets from the system.
10. Check the coolant level and refill if necessary.
11. Install the expansion tank cap.

Fig. 1: The radiator petcock is accessible through an opening in the gravel shield

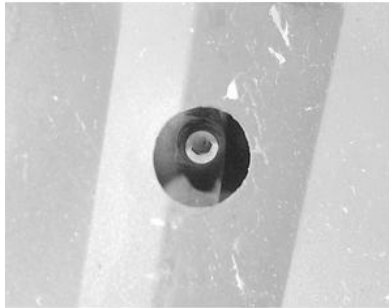


Fig. 2: Loosen the petcock using the proper size tool; most vehicles require a 6mm Allen head wrench



Fig. 3: After the petcock is loose, coolant will start to drain out

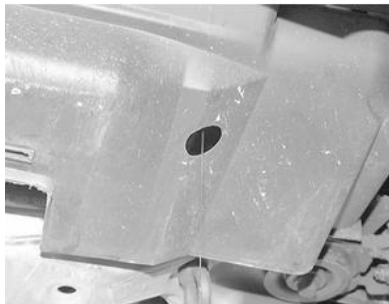


Fig. 4: When the coolant is drained, remove the petcock, then clean and inspect it before installation



Fig. 5: Pour the proper 50/50 coolant mixture into the expansion tank to refill the system



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Volvo's all-weather antifreeze Type C (blue-green color) or equivalent should be used on a year round basis. The cooling system should always contain 50% antifreeze solution and 50% water. Studies have shown that extremely weak antifreeze solutions (10–20%) provide poor rust protection, while antifreeze solutions in excess of 70% provide less effective boil over protection.

Fig. 1: A tag is usually placed on the expansion tank or the strut tower indicating the type of coolant to be used

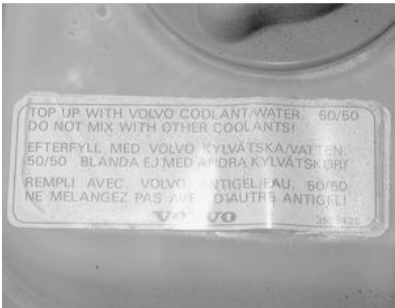
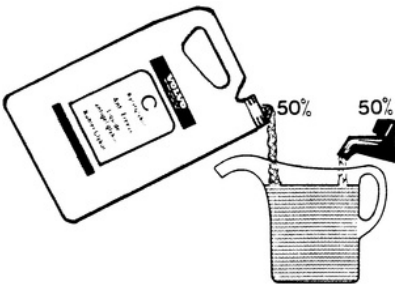


Fig. 2: Volvo recommends mixing 50% coolant and 50% water to fill the cooling system



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1. Proceed with draining the system as previously outlined.
2. When the system has drained, reconnect the hoses and secure as necessary.
3. Move the temperature control for the heater to its hottest position; this allows the heater core to be flushed as well.
4. Using a garden hose, fill the radiator and allow the water to run out the engine draincocks. Continue until the water runs clear.
5. Be sure to clean the expansion tank as well.

NOTE: If the system is badly contaminated with rust or scale, you can use a commercial flushing solution to clean it out. Follow the manufacturer's instructions. Some causes of rust are air in the system, failure to change the coolant regularly, use of excessively hard or soft water, and/or failure to use the correct mix of antifreeze and water.

6. After the system has been flushed, continue with the refill procedures outlined above.
7. Check the condition of the radiator cap and its gasket, replacing the cap if anything looks improper.

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The coolant level should be checked at every 5,000 mile (8,000 km) intervals. The level should appear between the maximum and minimum marks of the translucent expansion tank. Do not remove the expansion tank filler cap except to top up the system, as air might become trapped in the system and reduce cooling efficiency. Top up the system with a mixture of 50% anti-freeze and 50% water; use this mixture all year round. If the engine is warm when you top up the cooling system, remove the filler cap slowly in order to allow any excess pressure to escape.

CAUTION

Never open, service or drain the radiator or cooling system when hot; serious burns can occur from the steam and hot coolant. Also, when draining engine coolant, keep in mind that cats and dogs are attracted to ethylene glycol antifreeze and could drink any that is left in an uncovered container or in puddles on the ground. This will prove fatal in sufficient quantities. Always drain coolant into a sealable container. Coolant should be reused unless it is contaminated or is several years old.

Fig. 1: The expansion tank is marked with MIN/MAX levels; the fluid should be between them



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Drain and refill the rear axle housing every 100,000 miles (161,000 km) or any time the vehicle is driven in high water (up to the axle). Although some fluid can be removed using a suction gun, the best method is to remove the rear cover to ensure that all of any present contaminants are removed. As with any fluid change, the oil should be at normal operating temperature to ensure the best flow/removal of fluid and contaminants.

1. Drive the vehicle until the lubricant reaches normal operating temperature.
2. If necessary for access, raise and support the vehicle safely using jackstands, but be sure that the vehicle is level so you can properly refill the axle when you are finished.
3. Use a wire brush to clean the area around the differential. This will help prevent dirt from contaminating the differential housing while the cover is removed.
4. Position a drain pan under the rear axle.
5. Loosen and remove all but one or two of the rear cover upper or side retaining bolts. The remaining bolt(s) should then be loosened to within a few turns of complete removal. Use a small prytool to carefully break the gasket seal at the base of the cover and allow the lubricant to drain. Be VERY careful not to force or damage the cover and gasket mating surface.
6. Once most of the fluid has drained, remove the final retaining bolt(s) and separate the cover from the housing.

To fill the differential:

7. Carefully clean the gasket mating surfaces of the cover and axle housing of any remaining gasket or sealer. A putty knife is a good tool to use for this. You may want to cover the differential gears using a rag or piece of plastic to prevent contaminating them with dirt or pieces of the old gasket.
8. Install the rear cover using a new gasket and sealant. Tighten the retaining bolts using a crisscross pattern.

NOTE: Make sure the vehicle is level before attempting to add fluid to the rear axle, otherwise an incorrect fluid level will result.

9. Refill the rear axle housing using the proper grade and quantity of lubricant, then install the filler plug.
10. Lower the vehicle, if applicable, then operate the vehicle and check for any leaks.

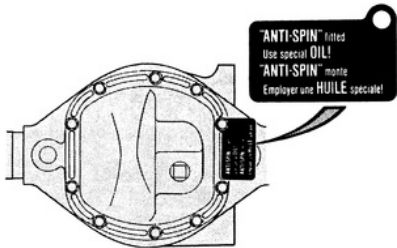
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The rear axle should be serviced with API GL-5, MIL-L-2105 B or C or equivalent, with a viscosity rating of SAE 90. When temperatures are below 15°F (-10°C), use SAE 80. Use oils with the proper additives for vehicles equipped with a limited slip differential.

Fig. 1: If the vehicle is equipped with a limited slip rear axle as noted by this tag, the proper oil or additive must be used



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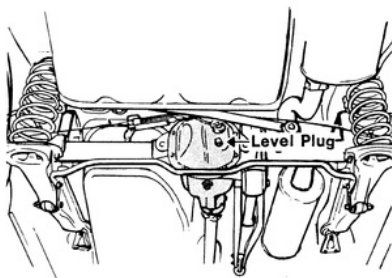
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The fluid level should be checked at 10,000 mile (16,000 km) intervals.

1. Raise and support the vehicle safely.
2. Remove the rear axle level plug.
3. Check that the oil level is up to the level plug hole. Top up, if necessary.
4. Reinstall the rear axle level plug.
5. Lower the vehicle.

Fig. 1: Location of the rear axle level plug on vehicles with a solid rear axle



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The engine oil and filter should be replaced according to your driving habits. Consult the maintenance intervals chart later in this section.

1. Operate the engine for a few minutes. This increases the engine oil temperature and allows the oil to flow more rapidly.

CAUTION

The EPA warns that prolonged contact with used engine oil may cause a number of skin disorders, including cancer! You should make every effort to minimize your exposure to used engine oil. Protective gloves should be worn when changing the oil. Wash your hands and any other exposed skin areas as soon as possible after exposure to used engine oil. Soap and water, or waterless hand cleaner should be used.

2. Raise and support the vehicle safely.
3. Position a suitable drain pan under the engine oil pan drain plug.
4. On most Volvos, use a 17mm wrench to remove the oil pan drain plug.
5. Allow the oil to drain completely.
6. Reinstall and tighten the drain plug. DO NOT OVERTIGHTEN. Make sure you install the drain plug gasket before tighten the drain plug.
7. Position the drain pan under the engine oil filter.
8. Clean around the oil filter mounting surface with a shop rag.
9. Using the an oil filter wrench, remove the oil filter.
10. Lubricate the rubber oil seal of the new filter. Screw the filter on by hand; retighten with a wrench only if necessary.
11. Lower the vehicle.
12. Refill the crankcase to the normal oil level.
13. Replace the filler cap.
14. Start the engine and check for leaks.
15. Shut **OFF** the engine. Wait a few minutes and check the oil level. Add oil if necessary.
16. Reset the service indicator, as described earlier in this section.

WARNING

Operating the engine without the proper amount and type of engine oil will result in severe engine damage.

Fig. 1: Use a 17mm wrench to loosen the drain plug



Fig. 2: Unscrew the drain plug by hand, while keeping inward pressure on it to prevent leakage



Fig. 3: Make sure the drain pan is positioned before you remove the drain plug

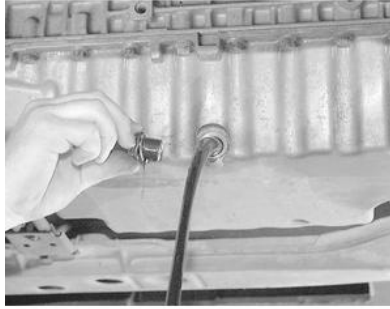


Fig. 4: Inspect the drain plug gasket for cracks; it should be replaced if necessary, or an oil leak will occur



Fig. 5: Use an appropriate size oil filter wrench to remove the filter. (A cap type wrench is shown, but a strap type is also okay)



Fig. 6: Loosen the filter slowly until . . .



Fig. 7: . . . oil starts to drain out; remove the wrench and let the filter drain, then unscrew the filter by hand



Fig. 8: After the filter is removed, inspect the threads on the filter mounting boss (1) and clean the gasket surface (2)

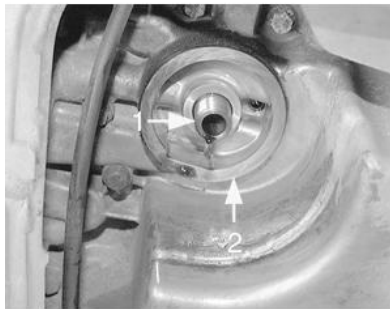


Fig. 9: Remove the oil filler cap . . .



Fig. 10: . . . and place a funnel in the opening to fill the crankcase with oil



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

CAUTION

The EPA warns that prolonged contact with used engine oil may cause a number of skin disorders, including cancer! You should make every effort to minimize your exposure to used engine oil. Protective gloves should be worn when changing the oil. Wash your hands and any other exposed skin areas as soon as possible after exposure to used engine oil. Soap and water, or waterless hand cleaner should be used.

It is a good idea to check the engine oil each time or at least every other time you fill your fuel tank. Check the engine oil level with the vehicle on level ground and the transmission in **PARK**. When checking fluid level, use a clean rag that will not leave lint.

- 1. Be sure the vehicle is on level surface.
- 2. Shut **OFF** the engine and wait a few minutes to allow the oil to drain back into the oil pan.
- 3. Remove the engine oil dipstick and wipe clean with a lint-free rag.
- 4. Reinstall the dipstick and push it down until it is fully seated in the tube.
- 5. Once again, remove the dipstick and note the level on the indicator. If necessary, fill to the normal level.

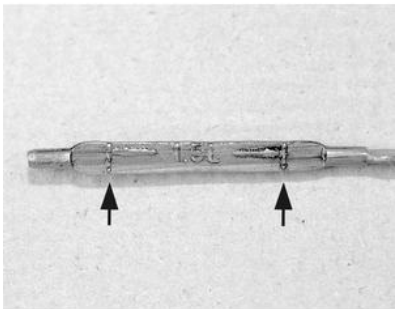
Fig. 1: Remove the dipstick from the engine



Fig. 2: The tag on the dipstick indicates that the oil level should be between the . . .



Fig. 3: . . . MIN and MAX markings on the dipstick, as shown by the arrows



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Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

Used fluids such as engine oil, transmission fluid, antifreeze and brake fluid are hazardous wastes and must be disposed of properly. Before draining any fluids, consult with your local authorities; in many areas, waste oil, antifreeze, etc. is being accepted as a part of recycling programs. A number of service stations and auto parts stores are also accepting waste fluids for recycling.

Be sure of the recycling center's policies before draining any fluids, as many will not accept different fluids that have been mixed together.

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Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

NOTE: Some fuel additives contain chemicals that can damage the catalytic converter and/or oxygen sensor. Read all of the labels carefully before using any additive in the engine or fuel system.

All vehicles covered by this manual are designed to run on unleaded fuel. The use of a leaded fuel in a vehicle requiring unleaded fuel will plug the catalytic converter and render it inoperative. It will also increase exhaust backpressure to the point where engine output will be severely reduced. Obviously, use of leaded fuel should not be a problem, since most companies have stopped selling it for quite some time.

The minimum octane rating of the unleaded fuel being used must be at least 87 (as listed on the pumps), which usually means regular unleaded. Some areas may have even lower octane available, which would make 87 a midgrade fuel. In these cases a minimum fuel octane of 87 should STILL be used.

Fuel should be selected for the brand and octane which performs best with your engine. Judge a gasoline by its ability to prevent pinging, its engine starting capabilities (cold and hot) and general all weather performance. The use of a fuel too low in octane (a measurement of anti-knock quality) will result in spark knock. Since many factors such as altitude, terrain, air temperature and humidity affect operating efficiency, knocking may result even though the recommended fuel is being used. If persistent knocking occurs, it may be necessary to switch to a different brand or grade of fuel. Continuous or heavy knocking may result in engine damage.

NOTE: Your engine's fuel requirement can change with time, mainly due to carbon buildup, which will in turn change the compression ratio. If your engine pings or knocks switch to a higher grade of fuel. Sometimes just changing brands will cure the problem.

The other most important quality you should look for in a fuel is that it contains detergents designed to keep fuel injection systems clean. Many of the major fuel companies will display information right at the pumps telling you that their fuels contain these detergents. The use of a high-quality fuel which contains detergents will help assure trouble-free operation of your vehicle's fuel system.

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Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

The recommended oil viscosity for sustained temperatures ranging from below -20°F (-30°C) to above 100°F (40°C) are listed in the section. The only oil type shown is multi-viscosity. Multi-viscosity oils are recommended because of their wider range of acceptable temperatures and driving conditions.

When adding oil to the crankcase or changing the oil and filter, it is important that oil of an equal quality to original equipment be used in your vehicle. The use of inferior oils may void the warranty, damage your engine, or both.

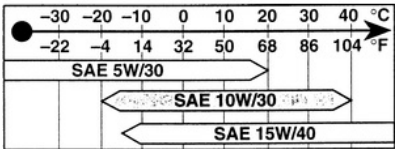
The Society of Automotive Engineers (SAE) grade number of the oil indicates the viscosity of the oil — its ability to lubricate at a given temperature. The lower the SAE number, the lighter the oil; the lower the viscosity, the easier it is to crank the engine in cold weather, but the less the oil will lubricate and protect the engine at high temperatures. This number is marked on every oil container.

When using engine oil, there are two types of ratings with which you should be familiar: viscosity and service (quality). There are several service ratings, resulting from tests established by the American Petroleum Institute. The most current rating, SJ, is recommended for use in all engines. The SJ rating supersedes all other ratings.

Oil viscosity should be chosen from those oils recommended for the lowest anticipated temperatures during the oil change interval. Due to the need for an oil that embodies both good lubrication at high temperature and easy cranking in cold weather, multi-grade oils have been developed. Basically, a multi-grade oil is thinner at low temperatures and thicker at high temperatures. For example, a 10W-40 oil (the W stands for winter) exhibits the characteristics of a 10-weight (SAE 10) oil when the vehicle is first started and the oil is cold. Its lighter weight allows it to travel to the lubricating surfaces quicker and offer less resistance to starter motor cranking than a heavier oil. But after the engine reaches operating temperature, the 10W-40 oil begins acting like straight 40-weight (SAE 40) oil. It behaves as a heavier oil, providing greater lubrication and protection against foaming than lighter oils.

The American Petroleum Institute (API) designations, also found on oil containers, indicates the classification of engine oil used for given operating conditions. Only oils designated Service SJ (or the latest superseding designation) heavy-duty detergent should be used in your vehicle. Oils of the SJ-type perform many functions inside the engine besides their basic lubrication. Through a balanced system of metallic detergents and polymeric dispersants, the oil prevents high and low temperature deposits and also keeps sludge and dirt particles in suspension. Acids, particularly sulfuric, as well as other by-products of engine combustion are neutralized by the oil. If these acids are allowed to concentrate, they can cause corrosion and rapid wear of the internal engine parts.

Fig. 1: Volvo's recommended oil viscosity chart



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M46 Transmission

1. Raise and support the vehicle safely.
2. Place a suitable container into position.
3. Drain the oil by removing the transmission drain plug and overdrive cover.
4. After the oil is completely drained, reinstall the drain plug.
5. Clean the strainer before reinstalling the overdrive cover.
6. Remove the level plug, then fill the transmission with the recommended lubricant through the filler hole. The oil level should be up to the filler hole.
7. Install the level plug.
8. Lower the vehicle.

M47 and M90 Transmissions

1. Raise and support the vehicle safely.
2. Place a suitable container into position.
3. Drain the oil by removing the transmission drain plug.
4. After the oil is completely drained, reinstall the drain plug.
5. Remove the level plug, then fill the transmission with the recommended lubricant through the filler hole. The oil level should be up to the filler hole.
6. Install the level plug.
7. Lower the vehicle.
8. Road test the vehicle and check for leaks.

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Fuel Delivery: FI | Fuel: GAS

Automatic Transmission Fluid (ATF) type F is recommended for manual transmissions. On the M46, engine oil SAE 10W-40 is recommended for use in areas where temperature seldom drops below 14°F (10°C).

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Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

The fluid level should be checked at 10,000 mile (16,000 km) intervals.

1. Raise and support the vehicle safely.
2. Remove the transmission level plug.
3. Check that the oil level is up to the filler hole. Top up, if necessary.
4. Install the transmission level plug and lower the vehicle.

Fig. 1: Level (fill) and drain plug locations — M46 transmission

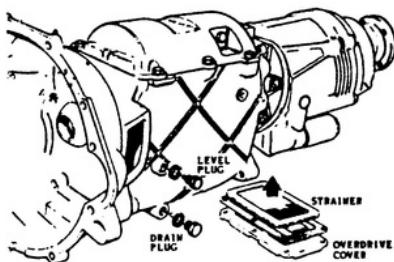
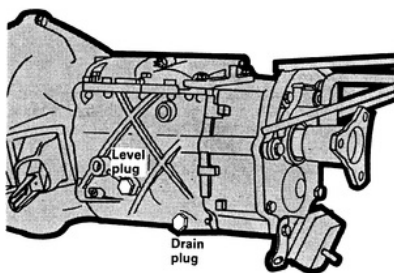


Fig. 2: Level (fill) and drain plug locations — M47 and M90 transmissions



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Fuel Delivery: FI | Fuel: GAS

Automatic Transmission Fluid (ATF) type F is recommended for the power steering system.

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Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

The fluid level should be checked at every 5,000 mile (8,000 km) intervals.

1. Operate the vehicle until normal operating temperature is reached.
2. Check the fluid level, with the engine idling, while fluid is still hot.
3. Wipe the reservoir housing clean.
4. Check that the fluid level is within the markings (MIN/MAX) on the dipstick which is attached to the cover.
5. Adjust if necessary.

Fig. 1: The dipstick is built into the filler cap, located on top of the reservoir



Fig. 2: The dipstick is marked with H (for Hot), C (for Cold) and an ADD range



Fig. 3: Pour the fluid directly into the reservoir, using a funnel if necessary



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Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

The transfer case cannot be drained while still attached to the transmission. However, an alternative method is to use a hand-held vacuum pump with a piece of hose and suck out the fluid. Refill with the appropriate grade of oil.

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

The recommended oil for the transfer case is API-GL-5/SAE 80W, or equivalent.

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Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

There is a plug to the left side of the flange for the rear wheel driveshaft. The level is checked by removing this plug and checking the fluid level. The fluid should be no more than $\frac{1}{2}$ inch (13mm) below this plug. If your finger is unable to fit in this opening, a small screwdriver works.

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Fuel Delivery: FI | Fuel: GAS

NOTE: Sodium based grease is not compatible with lithium based grease. Read the package labels and be careful not to mix the two types. If there is any doubt as to the type of grease used, completely clean the old grease from the bearing and hub before replacing.

Before handling the bearings, there are a few things that you should remember to do and not to do.

DO the following:

- Remove all outside dirt from the housing before exposing the bearing.
- Treat a used bearing as gently as you would a new one.
- Work with clean tools in clean surroundings.
- Use clean, dry gloves, or at least clean, dry hands.
- Clean solvents and flushing fluids are a must.
- Use clean paper when laying out the bearings to dry.
- Protect disassembled bearings from rust and dirt. Cover them up.
- Use clean, lint-free rags to wipe the bearings.
- Keep the bearings in oil-proof paper when they are to be stored or are not in use.
- Clean the inside of the housing before replacing the bearing.

Do NOT do the following:

- Do not work in dirty surroundings.
- Do not use dirty, chipped or damaged tools.
- Do not work on wooden work benches or use wooden mallets.
- Do not handle bearings with dirty or moist hands.
- Do not use gasoline for cleaning. Use a safe solvent.
- Do not spin dry bearings with compressed air. They will be damaged.
- Do not use cotton waste or dirty cloths to wipe bearings.
- Do not scratch or nick bearing surfaces.
- Do not allow the bearing to come in contact with dirt or rust at any time.

The front wheel bearings only on rear drive Volvo models require periodic maintenance. A premium high melting point grease or equivalent must be used. Long fiber type greases must not be used. This service is recommended every 30,000 miles (48,000 km).

NOTE: For information on Wheel Bearing removal and installation, refer to Section 8 of this manual.

1. Remove the wheel bearing.
2. Clean all parts in a non-flammable solvent and let them air dry.

NOTE: Only use lint-free rags to dry the bearings. Never spin-dry a bearing with compressed air, as this will damage the rollers.

3. Check for excessive wear and damage. Replace the bearing as necessary.

NOTE: Packing wheel bearings with grease is best accomplished by using a wheel bearing packer (available at most automotive parts stores).

4. If a wheel bearing packer is not available, the bearings may be packed by hand.
 - A. Place a "healthy" glob of grease in the palm of one hand.
 - B. Force the edge of the bearing into the grease so that the grease fills the space between the rollers and the bearing cage.
 - C. Keep rotating the bearing while continuing to push the grease through.
 - D. Continue until the grease is forced out the other side of the bearing.
5. Place the packed bearing on a clean surface and cover it until it is time for installation.
6. Install the wheel bearing.