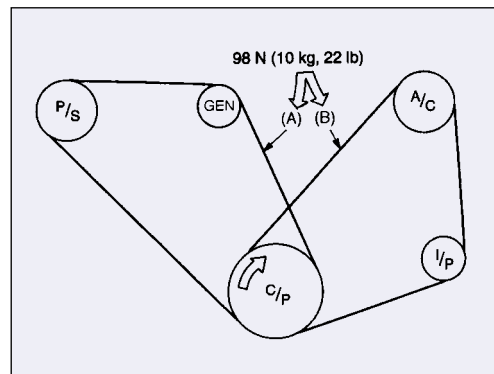


Subaru Engine Maintenance

The amount of maintenance that late model Subaru vehicles require is small when compared to the vehicles of previous generations. However, long vehicle service life and reliable performance depends on the owner's willingness to adhere to a schedule of regular maintenance. This article summarizes the key points to consider when inspecting a Subaru engine and its ancillary components and performing regularly scheduled maintenance operations.

Drive Belt Inspection



Drive Belt Tension

Drive belts should be inspected at 30,000 mile or 30 month intervals, whichever comes first. Belt replacement is recommended at 60,000 mile or 60 month intervals. Replace belts, if cracks, fraying or wear is found. In



Drive Belt Inspection

California, inspect and replace as necessary. Check drive belt tension and adjust it if necessary by changing alternator installing position and/or idler pulley installing position.

Belt Tension

Front Belt

Replaced: 7-9 mm (0.276 - 0.354 in)

Reused: 9- 11 mm (0.354 - 0.433 in)

Rear Belt

Replaced: 7.5 - 8.5 mm (0.295 - 0.335 in)

Reused: 9.0- 10.0 mm (0.354 - 0.394 in)

Drive Belt Replacement

Remove the v-belt cover.

Front Belt (Driving Power Steering Oil Pump and Alternator)

Caution: Wipe off any oil or water on the belt and pulley.

Loosen the lock bolt on the slider bolt. Loosen the slider bolt. Remove the front side belt. Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension. Tighten the lock bolt. Tighten the slider bolt.



Alternator Slider Bolt

Tightening torque: Lock bolt, through bolt: 25 ± 2 Nm (18 ± 1.5 ft-lb) Slider bolt: 8 ± 2 Nm (5.5 ± 1.5 ft-lb)

Rear Belt (Driving Air Conditioner)

Caution: Wipe off any oil or water on the belt and pulley.



A/C Idler Adjustment

Note: Before removing the rear side belt, remove the front side belt.

Loosen the lock bolt on the slider bolt. Loosen the slider bolt. Remove the rear side belt. Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension. Tighten the lock bolt. Tighten the slider bolt.

Tightening torque (lock bolt): 22.6 ± 2.9 Nm (16.6 ± 2.2 ft-lb)

Camshaft Timing Belt Replacement

The timing belt should be inspected for wear or damage at 30,000 mile or 30 month intervals. Recommended timing belt replacement for all states is at 105,000 miles or 105 months, whichever comes first. Timing belt replacement procedures for the 2.5 liter DOHC engine were covered in the Fall 2000 issue of *End Wrench*. Timing belt replacement procedures for the 2.2 liter SOHC engine were covered in the Winter 2001 issue of *End Wrench*.

The following initial steps should be followed to gain access to the front of the engine to begin timing belt replacement:

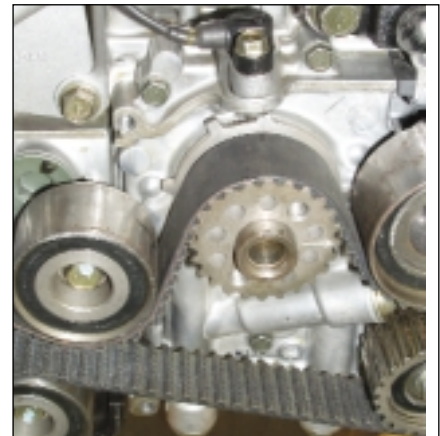
- Disconnect ground cable (-) from the battery.
- Remove the undercover.
- Remove radiator reserve tank.
- Remove the radiator fan motor connector and air conditioner fan

motor connector.

- Loosen the four bolts from the lower side of the shroud.
- Remove the four bolts from the upper side of the shroud.
- Remove radiator fan and air conditioner fan.
- Remove the v-belt cover.
- Remove the v-belts.



Radiator Fan Shroud



Timing Belt Replacement

Engine Oil Replacement

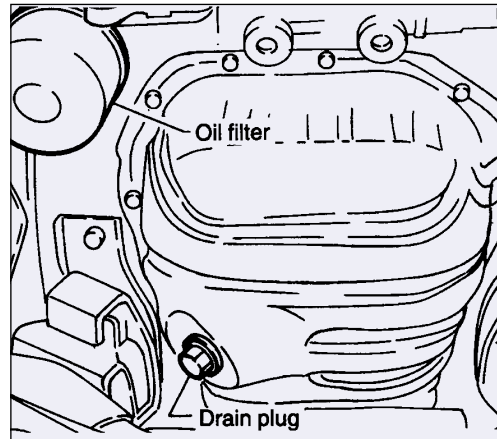
The normal engine oil change interval is 7500 miles or 7.5 months, whichever comes first. However, the following should be considered when determining the proper oil and filter change intervals:

- When the vehicle is used under severe driving conditions, the engine oil should be changed more often.

Examples of severe driving conditions:

Subaru Engine Maintenance

- Repeated short distance driving.
- Driving on rough and/or muddy roads.
- Driving in dusty conditions.
- Driving in extremely cold weather.
- Driving in areas where roads salts or other corrosive materials are used.
- Living in coastal areas.
- Towing a trailer.



Oil Filter and Oil Drain

To change the oil, drain engine oil by loosening engine oil drain plug. Open the engine oil filler cap for quick draining of the engine oil. Tighten the engine oil drain plug after draining the engine oil.

Tightening torque: 44 Nm (33 ft-lb)

Note: Replace the drain plug gasket with a new one.

Fill the engine oil through the filler pipe up to the upper point on the level gauge. Make sure the vehicle is level when checking oil level. Use engine oil of the proper quality and viscosity.

Recommended Oil

API classification: SJ or SH with the words “Energy Conserving or Energy Conserving II”, or New API certification mark is displayed on the container should be used.

The proper viscosity helps car get good cold and hot starting by reducing viscous friction and thus increasing cranking speed.

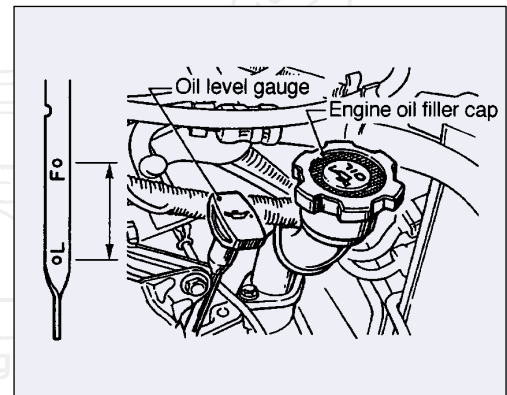
When replenishing oil, it does not matter if the oil to be added is a different brand from that in the engine.

However, use oil having the API classification and SAE viscosity number designated by Subaru.

Close the engine oil filler cap. Start engine and warm it up for a time. Stop the engine and recheck the oil level. If necessary, add engine oil up to upper level on level gauge.

Oil Level Inspection

Park the vehicle on a level surface. Remove oil level gauge and wipe it clean. Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper orientation. Remove it again and note the reading. If the engine oil level is below the “L” line, add oil to bring the level up to the “F” line. After turning off the engine, wait a few minutes for the oil to drain back into the oil pan before checking the level. Just after driving or while the engine is warm, engine oil level may show in the range between the “F” line and the notch mark. This is caused by thermal expansion of the engine oil. To prevent overfilling the engine oil, do not add oil above the “F” line when the engine is cold.



Oil Filter and Oil Drain

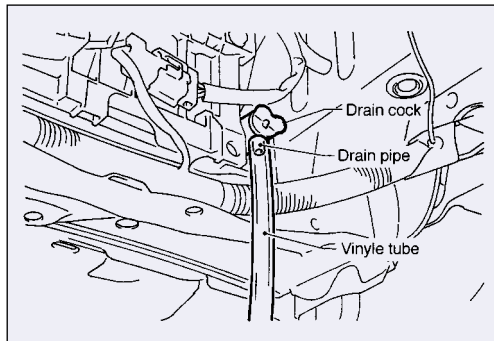
Oil Filter Replacement

Use an oil filter wrench to remove the oil filter. Apply a thin coat of engine oil to the seal rubber on the new oil filter. Install the oil filter by turning it by hand, being careful not to damage the seal rubber. Tighten approximately $\frac{3}{4}$ to $\frac{1}{2}$ turn after the seal rubber contacts the oil pump case. Do not tighten excessively, or oil may leak. After installing oil filter, run engine and make sure that no oil is leaking around the seal rubber.

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Coolant Replacement

Warning: The radiator is pressurized. Do not attempt to open the radiator cap immediately after the engine has been stopped.



Coolant Drain

To drain the cooling system, raise the vehicle. Fit a vinyl tube to the drain pipe. Place a container under vinyl tube. Loosen the drain cock to drain engine coolant into the container. To drain coolant from the engine, remove the drain plugs located on both sides of the lower engine castings. For quick draining, open the radiator cap. Drain the coolant from the reservoir tank. Tighten radiator drain plug securely after draining coolant. (Drain tube may face downward.)



Radiator Air Bleeder

To refill the cooling system, remove air bleeder plug from radiator. Pour engine coolant into the radiator up to the filler neck position. Add engine coolant into the reservoir tank up to the "FULL" level. Coolant capacity (up to "FULL" level) is approximately 6.0 liters (6.3 US qt).

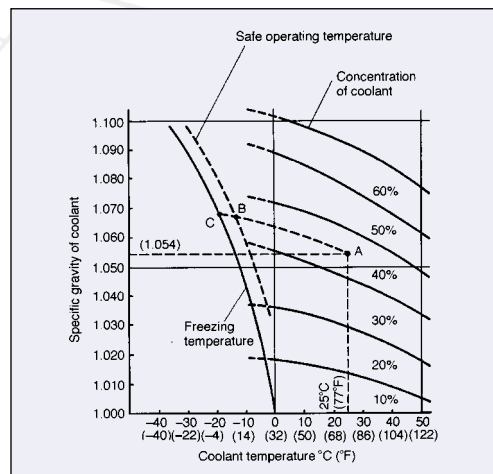
Caution: Subaru Genuine Coolant contains antifreeze and antirust agents specially made for the aluminum crankcase used on all Subaru engines. Always use Subaru Genuine Coolant, as other coolants may cause corrosion.

To finish the coolant replacement, securely install the radiator cap and reservoir tank cap. Run the engine for more than five minutes at 2,000 to 3,000 rpm. (Run the engine until the radiator becomes hot in order to purge air trapped in the cooling system.) Stop the engine and wait until the coolant temperature lowers. Then open radiator cap to check coolant level and add coolant up to the radiator filler neck. Next, add coolant into the reservoir tank up to "FULL" level. Securely install the air breather plug. Securely install radiator and reservoir tank caps.

Relationship Between Subaru Coolant Concentration And Freezing Temperature

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

Refer to the diagram. For example, if the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



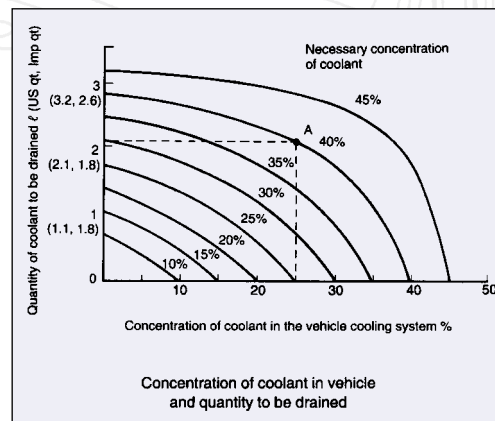
Coolant Concentration

Subaru Engine Maintenance

Coolant Concentration Adjustment Procedure

To adjust the concentration of the coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of Subaru genuine coolant.

The amount of coolant that should be replaced can be determined using the diagram. For example, assume that the coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of coolant concentration intersects with the 40% curve of the necessary coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 liters (2.2 US quart). Drain 2.1 liters (2.2 US quart) of coolant from the cooling system and add 2.1 liters (2.2 US quart) of the undiluted solution of Subaru coolant. If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



Adjusting Coolant Concentration

Cooling System Inspection

Check radiator for leakage, filling it with coolant and attach radiator cap tester to the filler neck. Then apply a pressure of 157 kPa (1.6 kg/cm², 23 psi) and check the following points:

- Each portion of radiator for leakage.
- Hose joints and other connections for leakage.

Caution: When attaching or detaching tester and when operating tester, use special care not to deform radiator filler neck.

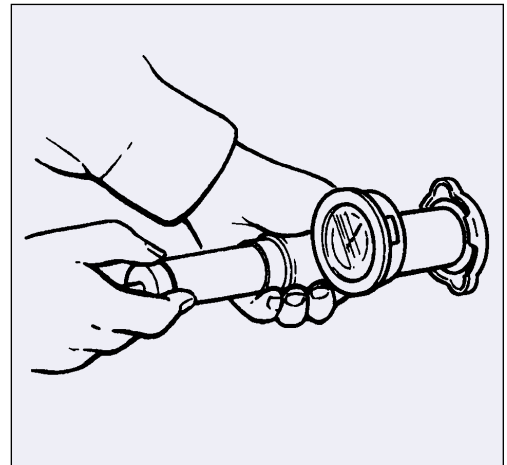
When performing this check, the engine must be off and the radiator must be filled with coolant. Wipe off check points before applying pressure. Use care not to spill coolant when detaching the tester from radiator. Check the radiator cap valve open pressure using a radiator cap tester.



Radiator Cap Inspection

Caution: Rust or dirt on the cap may keep the valve from functioning normally. Be sure to clean the cap before testing.

Raise the pressure until the gauge needle stops and see if the pressure can be retained for five to six seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.



Radiator Cap Test

Radiator cap valve open pressure standard value: 78-98 kPa (11-14 psi)
Service limit: 69 kPa (10 psi)

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If the coolant temperature exceeds 76.0-80.0°C (169 to 176°F) and the radiator is not hot, check the thermostat. If the thermostat does not open at 76.0-80.0°C (169-176°F), replace it with a new one.

If the electric fan does not operate when the coolant temperature exceeds 90-94°C (194-201°F), check the thermostat or fan motor.

Fuel Filter Replacement

Warning: Place “No Fire” signs near the working area. Be careful not to spill fuel on the floor.

Disconnect the ground cable from the battery. Before removing the hose, filter, pump, etc., be sure to release the fuel pressure, as follows:

- Disconnect the fuel pump wiring connector or remove the fuel pump fuse.
- Crank the engine for more than five seconds. If the engine starts, let the engine run until it stops.
- After turning the ignition switch OFF, connect the fuel pump wiring connector or reinstall the fuse.

Loosen the screw of the hose clamp and pull off the hose from the filter. Remove the filter from the holder. Replace fuel filter with a new one. Install the fuel hoses.



Fuel Filter Hose Clamps

Tightening torque: 1.0-1.5 Nm
(0.71.1 ft-lb).

Caution: If the hose is damaged at the clamping portion, replace the hose with a new one. If the hose clamp is deformed too much, replace with a new one.

Correct the hose position by removing any twist so that it will not interfere with the filter body or washer tank, before tightening the screw of the hose clamp. Install the fuel filter bracket to the vehicle body and tighten the bolts to the specified torque.

Tightening torque: 5.4-9.3 Nm
(4.0-6.9 ft-lb)

Inspecting Fuel Piping And Connections

Check the fuel piping and connections for leakage, scratches, swelling and corrosion.

Air Filter Inspection

The air filter should be replaced at 60,000 mile or 60 month intervals.

However, if the vehicle is operated under severe conditions, the replacement interval should be modified as follows:

- When the vehicle is used in extremely cold or hot weather areas, contamination of the filter may occur and filter replacement should be performed more often.
- When the vehicle is frequently operated under severe driving conditions, replacement should be performed every 15,000 miles.
- When the vehicle is frequently operated under severe driving conditions, such as mountain driving replacement should be performed every 24,000 km (15,000 miles).

Air Filter Replacement

Do not attempt to clean the air cleaner element. The filter paper of the element is wetted with a special slow-evaporating viscous liquid. It is resistant to cold weather and has a long service life. Dirt adhering to this filter paper forms porous laminations with the viscous liquid, which function as a filtration layer to reduce dust penetration into the filter paper. If this filter paper is cleaned, the filtration layer thus formed will be lost along with the viscous liquid.

Spark Plug Replacement

Several different engines have been installed in Subaru models. Removal and replacement instructions can be found in the appropriate service manual.