



1. Description

This procedure describes methods for the removal and installation of water pumps. Inspection and evaluation requirements are also included.



2. Purpose

The purpose of this procedure is to provide industry-accepted requirements for performing high-quality repair of engine cooling systems. This procedure is intended for use by professionals who are qualified through training and experience.



3. Referenced Documents

The following documents are also considered part of this procedure by reference.

3.1 Procedures

- CO01 Radiator Assembly
- CO21 Fan, Mechanical
- CO22 Fan, Electric
- HM01 Hazardous Materials
- PS01 Personnel Safety

3.2 Other Information

- Vehicle-specific repair information
- Equipment-specific information



4. Equipment And Material Requirements

4.1 Coolant

Coolant used in this procedure must have these characteristics:

- correct type for the specific vehicle
- approved for aluminum if used with an aluminum engine block, cylinder head, radiator, or heater core
- new or properly recycled

Follow the vehicle maker's recommendations for the use of recycled coolant.

4.2 Special Equipment

The use of this special equipment may be required when replacing internally driven water pumps:

- engine timing light
- tachometer
- vehicle-specific service tools



5. Damage Analysis

5.1 General Damage

Inspect a water pump for these conditions:

- coolant leaks
- bent or loose drive-belt pulley or impeller shaft
- excessive noise when the engine is running
- damaged housing or mounting locations
- damaged drive belt
- excessive end play

Determine whether the water pump is to be repaired or replaced.



6. Personnel Safety

6.1 General Safety

General safety information is in **PS01**.

6.2 Cooling System Safety

To prevent injury when repairing a cooling system:

- Do not open the cooling system when it is warm and under pressure.
- Protect eyes and skin from contact with coolant under pressure.
- Work in a well-ventilated area.
- Keep away from hot or moving engine parts.
- Be aware that electric cooling fans can operate even when the ignition switch is OFF.



7. Environmental Safety

7.1 Hazardous Materials

Hazardous material safety information is in **HM01**.

7.2 Coolant

Properly collect and recycle or dispose of coolant.



8. Vehicle Protection

8.1 Electronic Parts

To protect computers and other sensitive parts from damage:

- Follow the vehicle maker's recommendations for recording and resetting electronic memories.
- Ensure that the ignition switch is in the LOCK position, and the key is removed.
- Disconnect and isolate the negative battery cable, and disarm the passive restraint system. Follow the vehicle maker's recommendations.
- Protect computer modules, connectors, and wiring from dirt, heat, static electricity, and moisture.
- Loosen or remove any wiring harnesses or electrical parts that could be damaged during the repair process.

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8. Vehicle Protection (cont'd)

8.2 Fan And Adjacent Areas

To protect the cooling fan and adjacent areas:

- Use care when removing or installing fasteners.
- Do not damage the shroud, fan blades, or wiring when handling or storing the fan assembly.
- Protect adjacent areas during removal and installation.

8.3 Vehicle Finish

To protect the vehicle finish:

- Use fender covers.
- Carefully handle removed parts to avoid spilling any coolant.
- Immediately rinse off and dry any spilled coolant.



9. Repair Procedure

9.1 Removal Of An External, Belt-Driven Pump

To remove an external, belt-driven water pump:

1. Disconnect the electric cooling fan, if it is near the repair area.
2. Drain and collect or recycle the coolant. Follow the vehicle maker's recommendations.
3. Remove the radiator, if necessary.
4. Loosen or remove the drive belts, as needed, to clear the water pump pulley.
5. Mark the alignment and remove the water pump pulley (and fan, if equipped).
6. Loosen or remove the hose clamp on the lowest hose on the water pump, and collect any additional coolant.
7. Remove the lower hose from the water pump.
8. Loosen the hose clamps and disconnect all other coolant hoses attached to the water pump.
9. Remove bolted parts, as necessary for access.
10. Remove the water pump attaching fasteners, following the vehicle maker's recommendations.
11. Remove the water pump. Be careful not to damage nearby parts.

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9. Repair Procedure (cont'd)

9.2 Installation Of An External, Belt-Driven Pump

To install an external, belt-driven water pump:

- 1. Clean any gasket material from the mating surfaces.
- 2. Inspect the replacement water pump for the correct size and appearance.
- 3. Transfer parts to the replacement water pump (pulley, studs, plugs, etc.), if required. Match up the old and new gaskets to insure proper water passage location.
- 4. Install the replacement pump, using new gaskets, O-rings, or sealing material.
- 5. Reattach all the coolant hoses.
- 6. Return and fasten any wires and hoses previously moved.
- 7. Reinstall the bolted parts in their original location. Torque all clamps and fasteners, following the vehicle maker's recommendations.
- 8. Align and reinstall the drive-belt pulley (and fan, if equipped).
- 9. Reinstall the drive belts and adjust the tension to the vehicle maker's recommendations.
- 10. Close the drain valve.
- 11. Fill the radiator with coolant.
- 12. Reconnect the electric cooling fan, if equipped.
- 13. Reconnect the battery.
- 14. Start the engine and check for leaks.
- 15. Bleed the cooling system, following the vehicle maker's recommendations.
- 16. Fill the coolant recovery tank to the proper level.
- 17. Road-test the vehicle.
- 18. Perform a leak test.
- 19. Check the fan operation and engine operating temperature.
- 20. Recheck the coolant level.

9.3 Removal Of An Internally Driven Pump

To remove an internally driven water pump:

- 1. Disconnect the electric cooling fan, if it is near the repair area.
- 2. Drain and collect or recycle the coolant. Follow the vehicle maker's recommendations.
- 3. Remove the air cleaner duct and hoses, and the air cleaner assembly, if necessary.
- 4. Remove bolted parts (brackets, shroud, vacuum or electrical harnesses, etc.) as necessary.
- 5. Disconnect the upper and lower radiator hoses from the radiator, if necessary.
- 6. Remove the radiator, if necessary.
- 7. Loosen or remove the drive belts, as necessary.
- 8. Remove the lower radiator hose assembly and thermostat. Collect or recycle any additional coolant.
- 9. Remove the timing belt, if necessary. Follow the vehicle maker's recommendations.
- 10. Remove the camshaft pulley(s), if necessary. Follow the vehicle maker's recommendations.

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9. Repair Procedure (cont'd)

- 11. Remove or loosen the heater hoses, or water bypass, as required. Follow the vehicle maker's recommendations.
- 12. Remove the idler pulley, if required. Follow the vehicle maker's recommendations.
- 13. Remove the water pump attaching fasteners, following the vehicle maker's recommendations.
- 14. Remove the water pump. Do not damage adjacent parts.

9.4 Installation Of An Internally Driven Pump

To install an internally driven water pump:

- 1. Clean any gasket material from the mating surfaces.
- 2. Inspect the replacement water pump for the correct size and appearance.
- 3. Transfer any required parts to the replacement water pump (pulley, studs, plugs, etc.). Match up the old and new gaskets to ensure proper water passage location.
- 4. Install the replacement water pump, using new gaskets, O-rings, or sealing material.
- 5. Install the idler pulley, if required, following the vehicle maker's recommendations.
- 6. Reattach all hoses and bypass tubes that were removed.
- 7. Install the camshaft pulley, if required. Follow the vehicle maker's recommendations.
- 8. Install the timing belt, following the vehicle maker's recommendations.
- 9. Reinstall the thermostat, if required, using a new gasket. Reattach the hoses, if necessary.
- 10. Install the fan, drive belt, and other bolted parts that were removed, as required.
- 11. Adjust the drive-belt tension following the vehicle maker's recommendations.
- 12. Install the radiator assembly, if required.
- 13. Reconnect the radiator hoses, if required.
- 14. Reinstall the fan shroud and other bolted parts in their original locations. Torque the clamps and fasteners to the vehicle maker's recommendations.
- 15. Reinstall the air cleaner assembly, if required.
- 16. Close the drain valve.
- 17. Fill the radiator with coolant.
- 18. Reconnect the electric cooling fan, if equipped.
- 19. Reconnect the battery.
- 20. Start the engine and check for leaks.
- 21. Bleed the cooling system, following the vehicle maker's recommendations.
- 22. Fill the coolant recovery tank to the proper level.
- 23. Check the ignition timing, following the vehicle maker's recommendations.
- 24. Road-test the vehicle.
- 25. Perform a leak test.
- 26. Check the fan operation and engine operating temperature.
- 27. Recheck the coolant level.



10. Use Of Recycled (Salvage) Parts

10.1 Salvage Parts Requirements

Do not install a salvage water pump.



11. Inspection And Testing

11.1 Inspection Of A Replaced Water Pump

After installation of a water pump, inspect the vehicle for these conditions:

- proper routing of hoses and wiring
- proper installation of hoses, clamps, and mounting fasteners
- proper alignment and tension of drive belts
- proper coolant level, condition, and freeze protection
- visible coolant, engine oil, and transmission fluid leaks
- proper engine operating temperature
- proper automatic transmission fluid level
- proper operation of cooling fans

Correct any defects.