



1. Description

This procedure describes methods for the removal and installation of a radiator assembly. 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 considered part of this procedure by reference.

3.1 Procedures

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

3.2 Other Information

- Recycled parts information
- Vehicle-specific repair information



4. Equipment And Material Requirements

4.1 Equipment

To test coolant protection, use one of these:

- hydrometer
- refractometer

Use a pump-type pressure tester to test system pressure and check for leaks.

4.2 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.



5. Damage Analysis

5.1 General Damage

Inspect a radiator assembly for these conditions:

- movement from its original position
- twisted or bent core or tanks
- damaged cooling fins
- leaks in the cooling tubes, tanks, or filler neck
- damaged cap
- restricted airflow
- crushed or loose hose fittings
- damaged oil cooler fittings
- damaged bleeder fittings
- cracks or leaks at the hose connections
- corrosion
- blocked tubes

Determine whether the radiator 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.
- 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 Coolant Leak Test

To test for coolant leaks:

- 1. Remove the radiator cap when cool and not under pressure.
- 2. Add water or coolant mixture to fill the radiator, if needed.
- 3. Attach a pressure tester to the radiator filler neck.
- 4. Refer to the vehicle-specific service manual to determine the cooling system's pressure limit.
- 5. Pump the tester to pressurize the system to the recommended pressure.
- 6. Inspect for leaks in the radiator (cooling tubes, tanks, and filler neck), hoses, engine block, freeze plugs, heater core, drain valves, etc.
- 7. Wait for 10 minutes. If the pressure holds at the recommended pressure, the cooling system has no leaks.

9.2 Radiator Assembly Removal

To remove a damaged radiator assembly:

- 1. Disconnect and isolate the negative battery cable. Follow the vehicle maker's recommendations.
- 2. Remove the radiator cap when cool and not under pressure.
- 3. Disconnect and isolate the electric cooling fan connector, if equipped.

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9. Repair Procedure (cont'd)

- 4. Drain and collect or recycle the coolant. Follow the vehicle maker's recommendations.
- 5. Disconnect the hose to the coolant recovery tank.
- 6. Loosen or remove the hose clamps.
- 7. Carefully remove all hose ends from the radiator inlet and outlet.
- 8. Disconnect and temporarily cap or plug the automatic transmission cooler lines, if equipped.
- 9. Disconnect the low-coolant sensor, if equipped.
- 10. Remove bolted parts such as shroud, fan, deflectors, etc.
- 11. Remove attaching brackets or fasteners.
- 12. Remove the radiator. Be careful not to damage the radiator or air conditioning condenser.

9.3 Radiator Assembly Installation

To install a radiator assembly:

- 1. Inspect the radiator assembly for correct size, number of cooling tubes, location and size of sending unit fittings, and material (steel, aluminum, or plastic).
- 2. Transfer the low-coolant sensor and temperature sending unit to the replacement radiator, if equipped.
- 3. Transfer and close the drain valve, and any other fittings that will be reused.
- 4. Set the replacement radiator into the vehicle onto the lower insulators. Be careful not to damage the fins of the radiator or air conditioning condenser.
- 5. Install the attaching brackets or bolts.
- 6. Connect the automatic transmission cooler lines, if equipped. Torque the lines to the vehicle maker's recommendations.
- 7. Attach all hoses and clamps.
- 8. Reinstall the bolted parts, such as the shroud, fan and deflectors. Torque all clamps and fasteners to the vehicle maker's recommendations.
- 9. Reconnect the low-coolant sensor and temperature sending unit, if equipped.
- 10. Fill the radiator with a proper mixture of water and coolant.
- 11. Reconnect the electrical cooling fan connector, if equipped.
- 12. Reconnect the battery.
- 13. Start the engine.
- 14. Bleed the cooling system, following the vehicle maker's recommendations.
- 15. Continue to fill the radiator as the engine warms and the thermostat opens.
- 16. When the coolant level stabilizes, install the radiator cap.
- 17. Fill the coolant recovery tank to the level shown on the tank.
- 18. Road-test the vehicle.
- 19. Perform a leak test. See **9.1**.
- 20. Check fan operation and engine operating temperature.
- 21. Recheck the coolant level.



10. Use Of Recycled (Salvage) Parts

10.1 Condition Of Salvage Parts

Do not install a salvage radiator assembly having any of these defects:

- damaged hose connections
- corrosion damage
- blocked tubes
- unrepairable damaged cooling fins
- damaged threads for automatic transmission cooler lines

Salvage radiators should be cleaned, flow-tested, and pressure-tested before installation. Do not install a salvage radiator cap.



11. Inspection And Testing

11.1 Inspection Of A Repaired Or Replaced Radiator

After installation of a radiator assembly, inspect the vehicle for these conditions:

- proper radiator position and alignment
- proper attachment of lines, hoses, clamps, and other fasteners
- damaged tanks or cooling fins
- visible coolant and transmission fluid leaks
- proper installation of sensors
- proper coolant level
- proper engine operating temperature
- proper automatic transmission fluid level
- proper operation of cooling fans

Correct any defects.