

# Electric Powertrain Cooling - Overview

## General Information

The cooling system consists of three separate circuits, the electric motor circuit, the high voltage battery circuit and the cabin heater circuit. Each circuit uses an electric coolant pump to move the coolant through the circuit. Three diverter valves allow for coolant exchange between the circuits and to allow coolant to flow through the radiator. A coolant filter filters out small particles from the coolant.

## Electric Motor Circuit

The electric motor circuit cools the electric motor and the DC/ DC converter (converts high voltage to low voltage to power the 12 volt system). The electric motor diverter valve acts as a system thermostat, allowing the coolant to flow within the motor circuit while the motor warms. As the coolant warms, the diverter valve slowly opens to allow coolant flow to the battery radiator.

The upper temperature limit for the electric motor circuit is 80 degrees C (176 degrees F). An ECT sensor in the electric motor circuit provides the PCM with coolant temperature information.

## High Voltage Battery Circuit

The high voltage battery circuit uses coolant to both cool and heat the high voltage batteries. The batteries operate best when the battery temperature is between 10 degrees C (50 degrees F) and 35 degrees C (95 degrees F). When the vehicle is charging and the high voltage battery circuit coolant temperature is below 10 degrees C (50 degrees F), a PCM-controlled in-line coolant heater warms the coolant flowing through the high voltage battery circuit. During driving, if the electric motor coolant is warmer than the high voltage battery circuit coolant, the battery circuit diverter valve allows coolant from the motor circuit to enter the battery circuit to help heat the batteries.

When the battery circuit is above 35 degrees C (95 degrees F), a PCM-controlled in-line chiller that uses the vehicle's A/C system cools the coolant flowing through the high voltage battery circuit.

The upper temperature limit for the high voltage battery circuit is 50 degrees C (122 degrees F). An ECT sensor in the high voltage battery circuit provides the PCM with coolant temperature information.

The in-line coolant filter is part of the high voltage battery circuit. Install a new filter:

- when replacing the coolant for scheduled maintenance (10 years/150,000 miles).
- when a vehicle collision damages the radiator enough to require radiator replacement.
- when any coolant pump fails and there are impeller fragments in the coolant.

## Cabin Heater Circuit

The cabin heater circuit provides warm coolant to the heater core to warm the passenger compartment.

The upper temperature limit for the cabin heater circuit is 80 degrees C (176 degrees F). An ECT sensor in the cabin heater circuit provides the PCM with coolant temperature information.

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Diagnosis and Testing