

2022 CHEVROLET CORVETTE SERVICE MANUAL

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Cooling System Description and Operation

Cooling Fan Control

For information regarding cooling fan operation, refer to Cooling Fan Description and Operation.

Engine Coolant Indicator(s)

COOLANT OVER TEMP

The following will occur if an engine over temperature circumstance is present:

- The powertrain control module (PCM) detects that the engine coolant temperature exceeds 124°C (256°F). The instrument panel cluster (IPC) receives a message from the PCM indicating high coolant temperature.
- The driver information center (DIC) will display a warning message.
- The engine coolant temperature gauge will illuminate red.
- An audible chime will be heard.

Cooling System

The cooling system's function is to maintain an efficient engine operating temperature during all engine speeds and operating conditions. The cooling system is designed to remove approximately one-third of the heat produced by the burning of the air-fuel mixture. When the engine is cold, the system cools slowly or not at all. This allows the engine to warm quickly.

Cooling Cycle

Coolant is drawn from the radiator outlet and into the water pump inlet by the water pump. Some coolant will then be pumped from the water pump, to the heater core, then back to the water pump. This provides the passenger compartment with heat and defrost.

Coolant is also pumped through the water pump outlet and into the engine block. In the engine block, the coolant circulates through the water jackets surrounding the cylinders where it absorbs heat.

The coolant is then forced through the cylinder head gasket openings and into the cylinder heads. In the cylinder heads, the coolant flows through the water jackets surrounding the combustion chambers and valve seats, where it absorbs additional heat.

Coolant also flows directly from the water pump to the engine oil cooler and transmission oil cooler to remove excess heat.

Coolant flow will either be stopped at the engine inlet thermostat until the engine is warmed, or it will flow through the engine inlet thermostat and into the radiator where it is cooled and the coolant cycle is completed.

Operation of the cooling system requires proper functioning of all cooling system components. The cooling system consists of the following components:

Coolant

The engine coolant is a solution made up of a 40-60 mixture of 40% DEX-COOL and 60% clean drinkable water. The coolant solution carries excess heat away from the engine to the radiator, where the heat is dissipated to the atmosphere.

Radiators (LT2)

The vehicle may be equipped with up to four radiators based on cooling options. Two will always be located in the front and, depending on vehicle option content, may have one behind each of the rear quarter panels.

The radiator is a heat exchanger. It consists of a core and two tanks. The aluminum core is a crossflow tube and fin design. This is a brazed tube with convoluted louvered fin design. Separate tubes and fins are stacked together with a manifold at each end. The entire assembly is then brazed

forming a homogeneous unified structure. The fins allow for efficient heat transfer from the coolant to the atmosphere. The inlet and outlet tanks are molded with a high temperature, glass reinforced nylon plastic. The tank and gasket is supplied as an assembly with silicone gasket attached to the tank. The tanks are clamped to the core with clinch tabs. The tabs are part of the aluminum header at each end of the core. The radiator also has a drain cock which is located in the bottom tank. The drain cock includes the drain cock and drain cock seal.

The radiator removes heat from the coolant passing through it. The fins on the core absorb heat from the coolant passing through the tubes. As air passes between the fins, it transfers heat to the atmosphere and cools the coolant.

During vehicle use, the coolant heats and expands. The coolant that is displaced by this expansion flows into the surge tank. As the coolant circulates, air is allowed to exit and collect in the surge tank. Coolant without bubbles absorbs heat much better than coolant with bubbles.

Pressure Cap

The pressure cap allows pressure in the cooling system to build up. As the pressure builds, the boiling point of the coolant goes up as well. Therefore, the coolant can be safely run at a temperature higher than the boiling point of the coolant at atmospheric pressure. The hotter the coolant is, the faster the heat moves from the radiator to the cooler passing air. However, if the pressure exceeds 20 psi, the pressure valve rises so that the excess pressure can escape. When the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum causes the vacuum valve to open, allowing outside air into the cooling system. This equalizes the pressure in the cooling system with atmospheric pressure, thus preventing the radiator hoses from collapsing.

Surge Tank

The surge tank is a plastic tank with a pressure cap mounted to it. The tank is mounted at a point higher than all other coolant passages. The surge tank provides an air space in the cooling system. The air space allows the coolant to expand and contract. The surge tank also provides a coolant fill point and a central air bleed location.

During vehicle use, the coolant heats and expands. The coolant that is displaced by this expansion flows into the surge tank. As the coolant circulates, air is allowed to exit. This is an advantage to the cooling system. Coolant without bubbles absorbs heat much better than coolant with bubbles.

Air Baffles and Seals

The cooling system uses deflectors, air baffles and air seals to increase system cooling. Deflectors are installed under the vehicle to redirect airflow beneath the vehicle to flow through the radiator and increase cooling. Air baffles are also used to direct airflow into the radiator and increase cooling. Air seals prevent air from bypassing the radiator and A/C condenser. Air seals also prevent recirculation of the air for better hot weather cooling and A/C condenser performance.

Water Pump

The water pump is a centrifugal vane impeller type pump. The pump consists of a housing with coolant inlet and outlet passages and an impeller. The impeller is a flat plate mounted on the pump shaft with a series of flat or curved blades or vanes. When the impeller rotates, the coolant between the vanes is thrown outward by centrifugal force. The impeller shaft is supported by one or more sealed bearings. These sealed bearings never need to be lubricated. With a sealed bearing, grease cannot leak out, and dirt and water cannot get in.

The purpose of the water pump is to circulate coolant throughout the cooling system. The water pump is driven by the crankshaft via the drive belt.

Thermostat

The thermostat is a coolant flow control component. Its purpose is to regulate the operating temperature of the engine. It utilizes a temperature sensitive wax-pellet element. The element connects to a valve through a piston. When the element is heated, it expands and exerts pressure against a rubber diaphragm. This pressure forces the valve to open. As the element is cooled, it contracts. This contraction allows a spring to push the valve closed.

When the coolant temperature is below 87 $\text{^\circ}\text{C}$ (187 $\text{^\circ}\text{F}$), the thermostat valve remains closed. This prevents circulation of the coolant from the radiator to the water pump and allows the engine to warm up quickly. As the coolant temperature approaches 87 $\text{^\circ}\text{C}$ (187 $\text{^\circ}\text{F}$), the thermostat valve will begin to open and will be fully open once that temperature is reached. The coolant is then allowed to circulate from the radiator return hose, through the thermostat, and back into the water pump. The thermostat provides a restriction in the cooling system, even after it has opened. This restriction creates a pressure difference which prevents cavitation at the water pump and forces coolant to circulate through the engine block.

Transmission Fluid Auxiliary Cooler

The transmission fluid auxiliary cooler is a oil to water style heat exchanger mounted on top of the transmission just below the air cleaner assembly.

Engine Oil Cooler

The engine oil cooler is an oil to water style heat exchanger and is mounted on the engine oil cooler adapter on the oil pan.