

## **Cooling System General Overview**

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### Overview:

The 2020-2021 cooling system is a three component cooling system designed to be used in the Acopian dyno room and installed inside of the car. It is used to cool the motor and motor controller and is vital in completing the endurance events. The cooling system is currently located in the dyno room.

**NOTE:** This document is only a general overview of the cooling system. For a more comprehensive description of the cooling system, see the [user manual](#) and [maintenance manual](#).

### Google Drive File Path:

G:\Shared drives\FSAE EV\FSAE EV 2020-2021\Subsystem Folders\Drivetrain\Cooling System Inventor Models\Cooling Assembly

(inventor model can also be found in the latest 2020-2021 full car model)

**(NOTE:** all 2020-2021 cooling information can be found in the drivetrain subsystem folder since drivetrain and cooling were a combined team)

### Resources:

<https://sites.lafayette.edu/motorsports/cooling/>

### Design Features:

The cooling system divided into three subparts:

1. Cooling system panel
  - Koolance PMP-500 pump
  - Koolance TPL010K temperature sensor
  - YF-S201 flow sensor
2. Yamaha Raptor 660 Radiator w/12V fan
3. One liter reservoir with fill cap

The panel is mounted to the side of the frame of the car via three u bolts for easy installation. The radiator and fan are mounted just in front of the drivetrain, near the panel, also using u bolts for more versatility in its placement if problems arose during assembly of the car. Air is drawn into the radiator from the underside of the car and is blown through the radiator using a pusher fan configuration. The cooling system panel and radiator are mounted directly under the Carman in order to avoid possible spillage as well as to keep the center of mass of the car low. The reservoir currently does not have a mounting solution to attach to the frame.

### Current State of Design:

The cooling system was designed to have a very high heat capacity and heat dissipation rate, something that was found to not be achievable with the use of the small radiator and fan. The cooling system also is controlled by TSI such that the fan is only active when the temperature of the water is between 35C and 38C. The cooling system was initially tested outside of the dyno room by filling it with hot tap water (~40C) and letting it run for 10 minutes. It was found to be very successful in this test. The results of the test can be found [here](#). The cooling system was also tested in the dyno room with the motor controller where it is currently located.

### Future Team Recommendations:

One possible issue may be in the location of the radiator which may not be able to draw in enough air in its current location. Possible solutions could be to add ducts from either the sides or the bottom to direct air more directly into the radiator or to relocate the radiator to a more desirable location in the car. It should also be noted that a better solution for mounting the fan to the radiator should be found given that it is currently zip tied to the radiator (radiator doesn't have too many good mounting points so the radiator may need to be modified). Something else to consider would be to control the radiator's fan more gradually allowing the temperature of the water to be managed more effectively. However, this may require a more energy efficient fan to be used. The radiator has a vent just below the fill cap which should be either plugged or attached to a catch can for rules compliance (T8.2.2).