

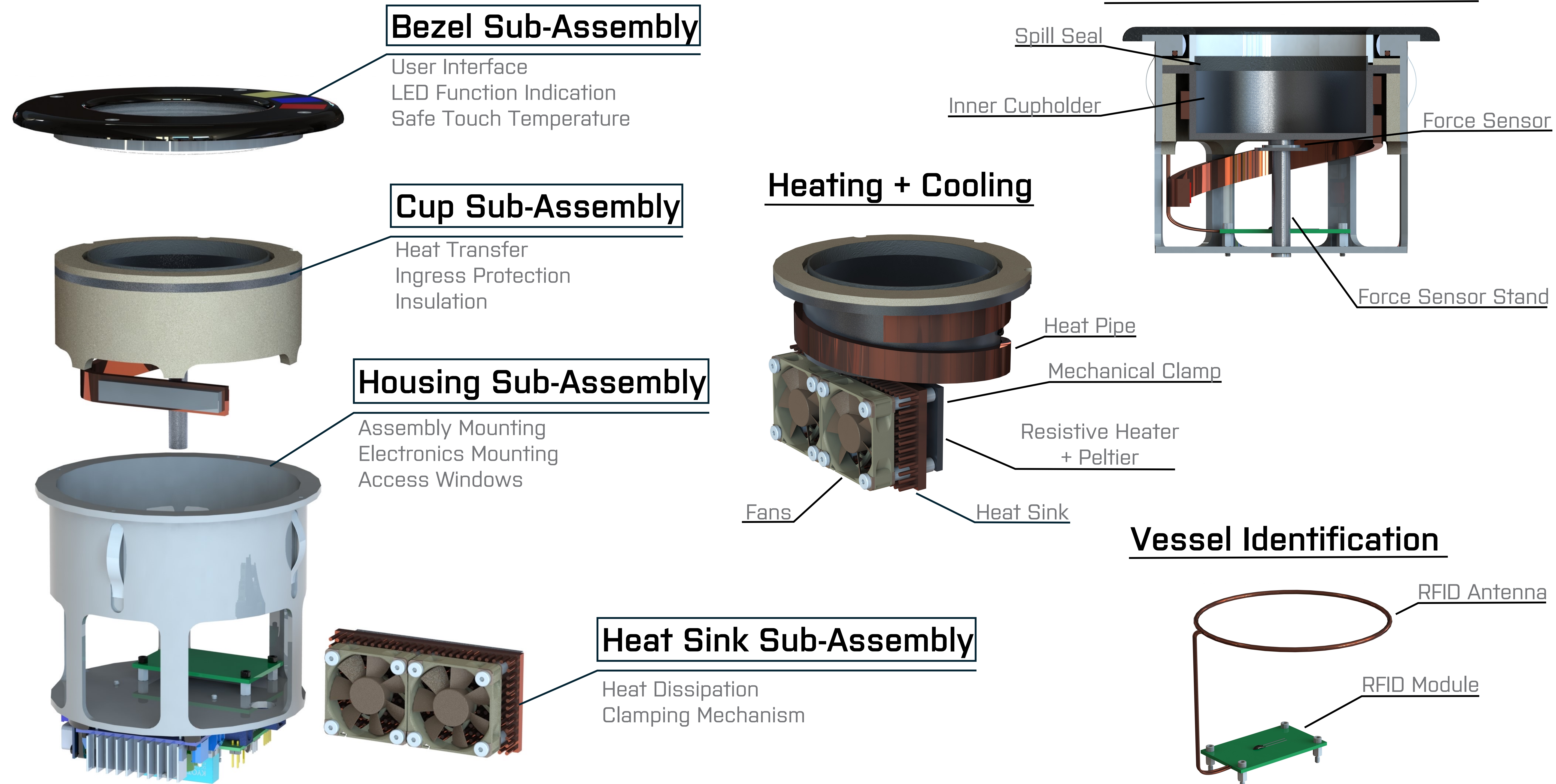
Design Purpose:

Develop a smart aviation cupholder device with the ability to heat, cool, identify beverage vessels, and detect beverage level

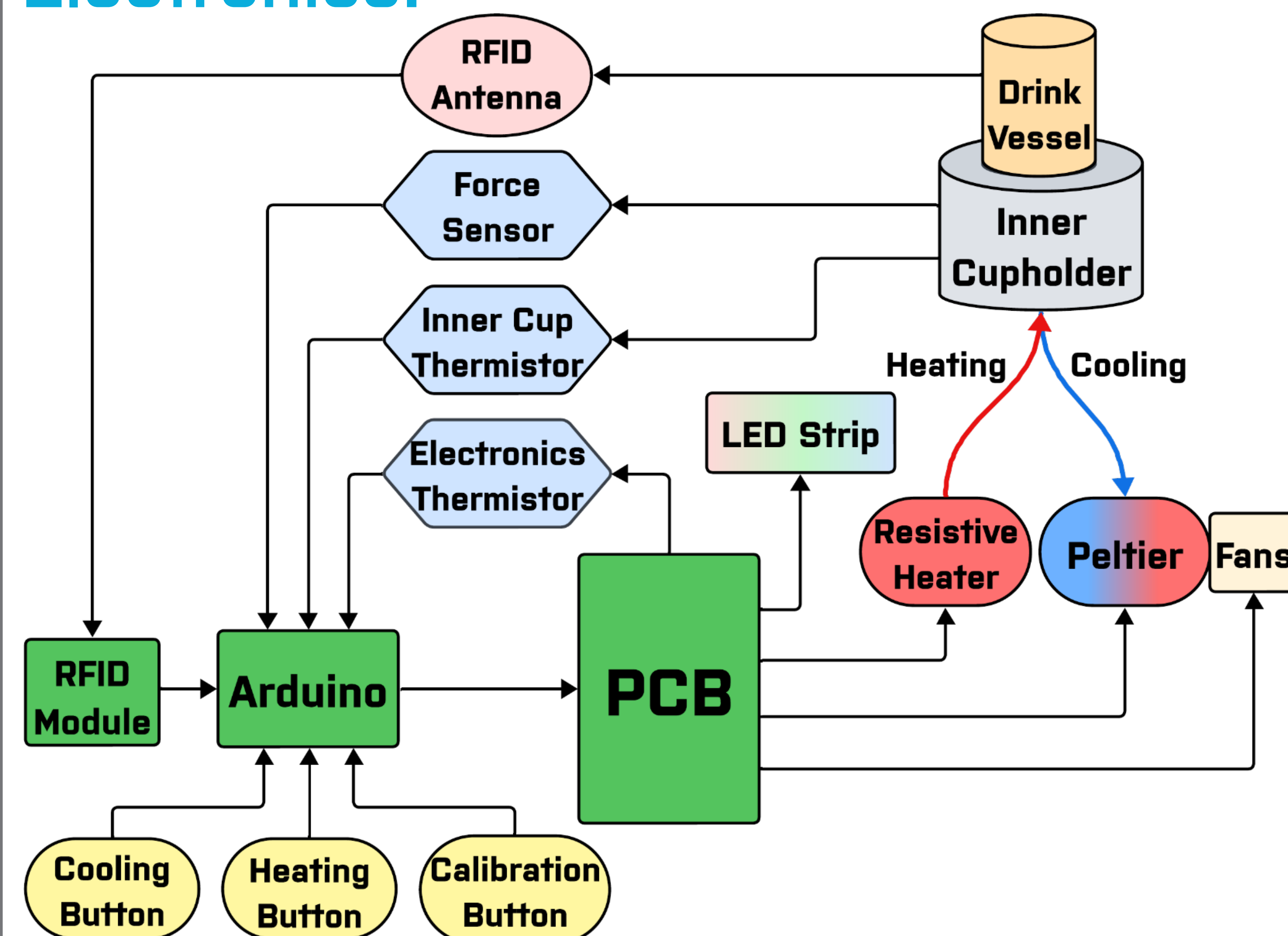
Critical Specifications:

- ✗ **Heating** – Coffee served at 120°F stays within 3°F of serving temperature over 20 minutes
- ✗ **Cooling** – A 12 oz can served at 38°F stays within 5°F of serving temperature over 20 minutes
- ✓ **Vessel ID** – Detect from preset in-flight beverage containers
- ✓ **Beverage Level Sensing** – Cupholder can detect a 1 Fl oz change in liquid contents
- ✓ **Small Package Size & Weight** – Assembly fits within a 6" diameter and 6" height cylindrical envelope and weighs less than 1200 g
- ✓ **Low Power Consumption** – Cupholder consumes an average continuous power of less than 50 W over 20 minutes

Design Overview:



Electronics:

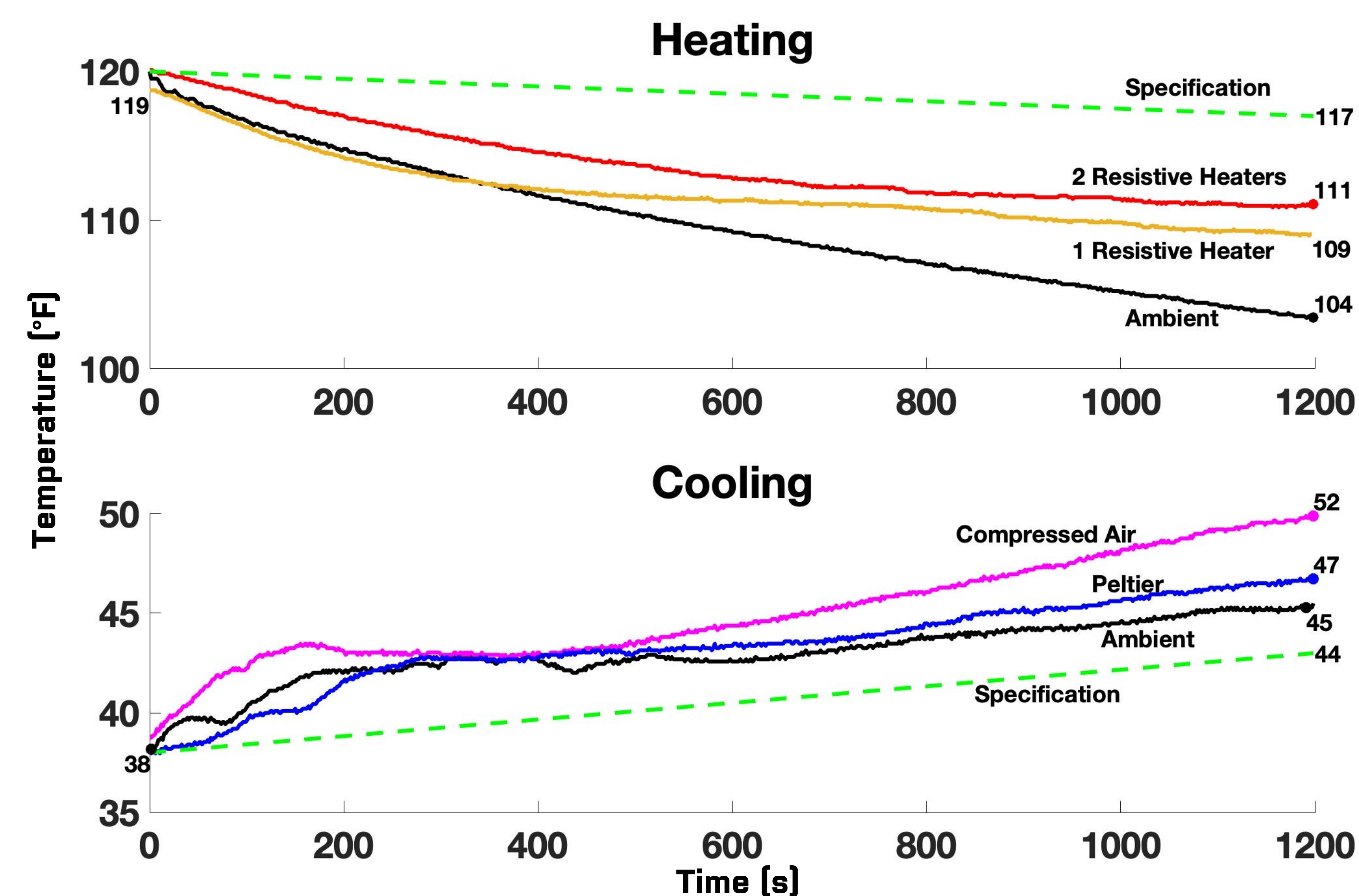


Results:

Level Sensing
5.7g resolution

Power Consumption
28/39W

Assembly Weight
1090g
Production Cost
(50 units/yr)
\$527/unit



Future Design Changes:

Components

- Use a larger heat sink, increase convection airflow, and improve inner cup insulation
- Use a higher quality resistive heater

Assembly

- Maintain surface contact between the force sensor and inner cupholder
- Improve wire routing
- Combine all electrical circuits into one unit

Manufacturing

- Nickel plate the inner cupholder and solder the heat pipe
- Metal plate the bezel top surface