

Vertical Profiler

Mechanical Design

Our Vertical Profiler (VP) uses a custom-made enclosure that is machined from PVC. PVC was chosen for its low glass point at -30 Celsius and its chemical resistance to glycol-based antifreezes. Both endcaps are designed to release if the pressure inside ever exceeds the exterior pressure and create an opening larger than 2.5 cm. Our buoyancy engine uses a syringe to vary our volume; the syringe is controlled by a servo motor. The servo motor is attached to the plunger of the syringe using a rack and pinion.



Figure 1. The battery configuration

Electrical Design

4 AA NiMH batteries in series power our vertical profiler; this gives 6 volts and a maximum of 2 amperes. They are held in with a store-bought battery holder. The battery holder has large wire gauges and sufficient insulation to handle the voltage and current the VP is rated for. The Vertical profiler uses a low-profile mini blade fuse set at 2 amperes. It is visible through the clear top door and is easily accessible once the vertical profiler is opened.



Figure 2. The top PCB showing the fuse used



Mechanical Design

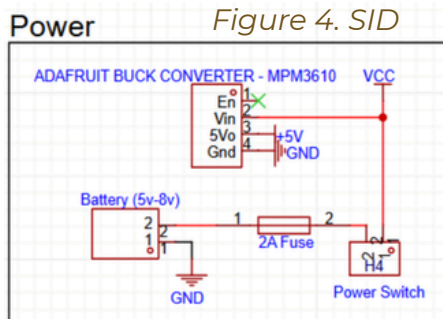
The Vertical profiler uses the built-in Wi-Fi antenna and capabilities on the ESP32 that we have chosen. It hosts an access point wifi network so that any device that can connect to wifi and can use a web browser will be able to control our VP without any client-side software. The VP can still be communicated with after deployment if there is a good enough connection. The only thing that can be done is to abort the mission, end the mission, or put it into diagnostic mode.



Figure 3. The overall design

SID

Figure 4. SID



Fuse Calculations

Bouyancy Engine: 550 mA
 RTC: 1.5 mA
 Pro Micro ESP32: 240 mA
 NeoPixel Jewel: 420 mA
 Pressure Sensor: 0.0 mA

Total Max Current Draw (T): 1,211 mA
 Recommended Fuse Size (T*1.5): 1,817 mA

Battery Type: AA NiMH
 Maximum Fuse Size: 2,000 mA

Fuse Choice: 2,000 mA

