Vertical Profiler Design Documentation

For the 2024 Request for Proposal, Eastern Edge Robotics (EER) has created an all-new vertical profiling float designed to do two profilers in the water column, transmitting the time since deployment, company number, depth, and pressure to the topside control station. The profiler is to be moved into place by the ROV, Beaumont, using the claw attachment. After this, it will receive a signal from the receiver on topside to begin the profiles, which it will do completely autonomously.

A 76.2 mm acrylic tube with two custom HDPE end caps functions as the enclosure for the vertical profiler. All components within the device are supported using custom 3D printed PLA+ plastic parts and two 5 mm steel rods. A syringe moved by a DC motor assembly is used for water intake and outflow, modifying the overall density of the system. This modification of density allows the device to sink and float in water as needed. Once the vertical profiler receives the signal from the receiver box, it will draw the plunger from the syringe and take in water, causing it to sink. Figure 1 shows the final mechanical design in a 3D model.

This year, EER has created an all-new PCB allowing for a more space-efficient electrical system inside the enclosure. While the PCB is more compact, it is also designed for easier debugging, with test points located throughout the board. The vertical profiler is powered by 4 AA batteries connected in series to provide 6V to the board. The electricals on board have voltage regulators of at least 12V and an output voltage of 3.3-5V, making 6 volts more than enough. The microcontroller on board, the ESP-32 WROOM-32E, has a voltage regulator of up to 12V and a fixed output voltage of 3.3V. Also, the board contains a DC motor driver and a stepper motor driver, allowing the user to choose which motor they prefer. The vertical profiler houses a Blue Robotics depth/pressure sensor to send information to the receiver, which will be graphed and displayed for the deck crew. The receiver on deck utilizes an ESP-32 development kit with an antenna used to communicate with the device via ESP-NOW.

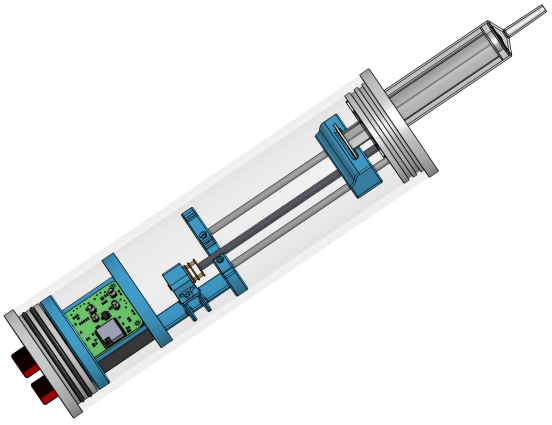

Figure 1: 3D model of the vertical profiler

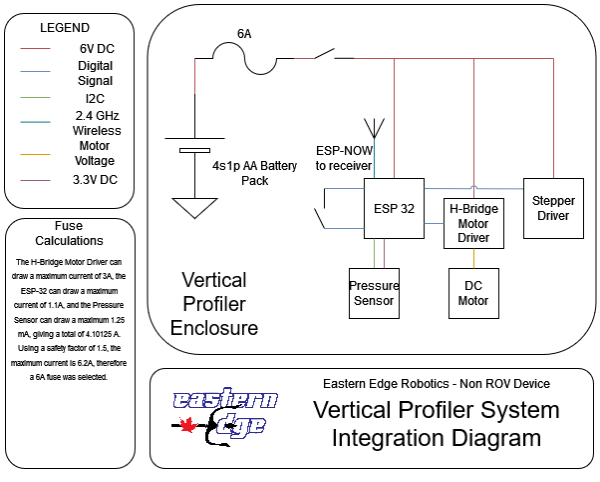

Figure 2: SID of the vertical profiler