

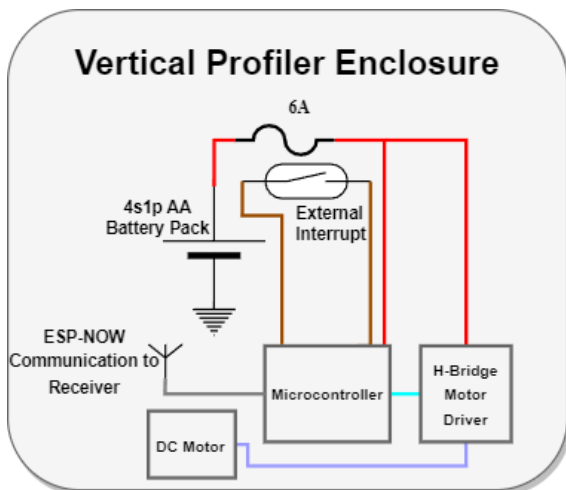
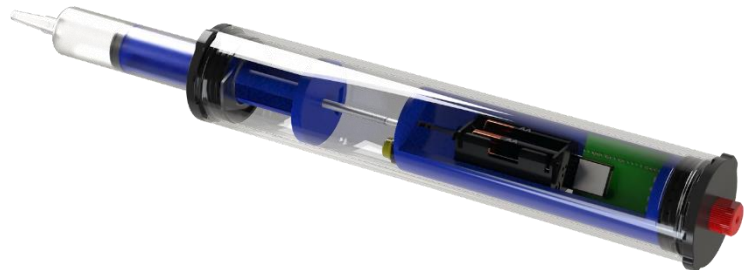
# Vertical Profiler Design Documentation

For the 2023 Request for Proposal, Eastern Edge has upgraded the previous buoyancy engine vertical profiler. The vertical profiler is designed to do two profiles in the water column, sending the current time and company ID after each profile. The profiler will be moved into place by Caribou using the claw attachment. After this, it will receive a signal from the receiver to begin its profiles, which it will do entirely autonomously.

A 50 mm diameter Blue Robotics tube is used for the enclosure of the vertical profiler. This enclosure holds all of the components of the device. A syringe is used for water intake and outflow, modifying the overall density of the system. This allows for the profiler to sink and float as needed. Once the 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 XX shows the final profiler design.

Eastern Edge upgraded last year's vertical profiler by swapping out the previous Arduino Nano with an ESP32 WROVER dev kit. The profiler is powered by 4 AA batteries connected in series to provide 6V to the new dev kit. The dev-kit has a built-in regulator with a max input voltage of 12V and a fixed output voltage of 3.3V. This should be more than sufficient to handle the 6V input. The ESP32 will be kept in a deep sleep state, consuming only 10µA of current. A Reed switch will allow the company to wake it up when a magnet is brought nearby, putting it into standby mode until a signal is sent from the receiver box. The ESP32 microcontroller has an onboard antenna that will allow it to send the required data to the receiver box when the float reaches the surface and receive the activation signal from the receiver box via the ESP-NOW protocol. The receiver also utilizes an ESP32 microcontroller with an onboard antenna to communicate with the vertical profiler.

To prevent any dangerous buildup of pressure, the end caps are non-locking. This way, if the internal pressure exceeds the external pressure, the end caps will disengage and prevent any potentially explosive pressures.



Legend	
<span style="color: red;">—</span>	Battery Voltage, 6V <sub>DC</sub> Max
<span style="color: cyan;">—</span>	Digital Signal
<span style="color: blue;">—</span>	Motor Drive Voltage
<span style="color: brown;">—</span>	3.3VDC
<span style="color: grey;">—</span>	ESP-NOW

**Fuse Calculations**

The H-bridge motor driver can deliver a maximum output current of 3A, and the ESP-32 has a maximum IO output current of 1.1A, giving a total maximum output current of 4.1A. Using a safety factor of 1.5, the maximum current is 6.2A, therefore a 6A fuse was selected

	<b>Eastern Edge Robotics - Non ROV Device Vertical Profiler System Integration Diagram</b>	<b>Revision History</b> <small>2023-05-10 - Originally Drawn - ZB</small>