ASTERIA

NON-ROV DEVICE DOCUMENTATION

Asteria is constructed from a 3-inch clear acrylic tube, a 500 mL syringe, and a lead screw mechanism creating a buoyancy engine that adjusts buoyancy by injesting or expelling water upon operator command.

Employees chose to separate the batteries from the electronics and place the weight near the bottom for stability and serviceability. The separation allows the batteries to be easily replaced without affecting the main electronic components. The electrical system is powered by four C-cell NiMH batteries in series. This battery pack provides 4.8V and is protected by a 1A fuse. Additionally, a pressure release plug is added in the lower compartment to ensure the safety of the float's surroundings should pressure build up in the battery compartment.

Asteria's use of a custom PCB and Raspberry Pi Zero provides a compact and powerful set of electronics and an efficient processing system optimized for the cylindrical tube. The PCB acts as a Pi "hat" with a 2x20 header for seamless integration. The PCB also includes three LEDs to indicate the following: buoyancy engine powered on, motor is operating, and batteries are low. The syringe is moved using a continuously rotating servo motor.

Asteria begins the mission at the surface and streams a webpage to a device on deck over a closed WiFi network. The use of a webpage for control and data readout ensures that *Asteria* can be controlled from a range of devices without any special software. Pressing the 'DIVE' button triggers water intake, decreasing buoyancy and initiating data collection with a Blue Robotics Bar02 pressure sensor, recording pressure, depth, and time. As the float approaches a depth of 2.5m, a PID algorithm adjusts the plunger, increasing the buoyancy to stabilize the buoyancy engine at 2.5m depth. After 45 seconds, the buoyancy engine surfaces, and transmits the pressure, depth and time data. This cycle is repeated twice.

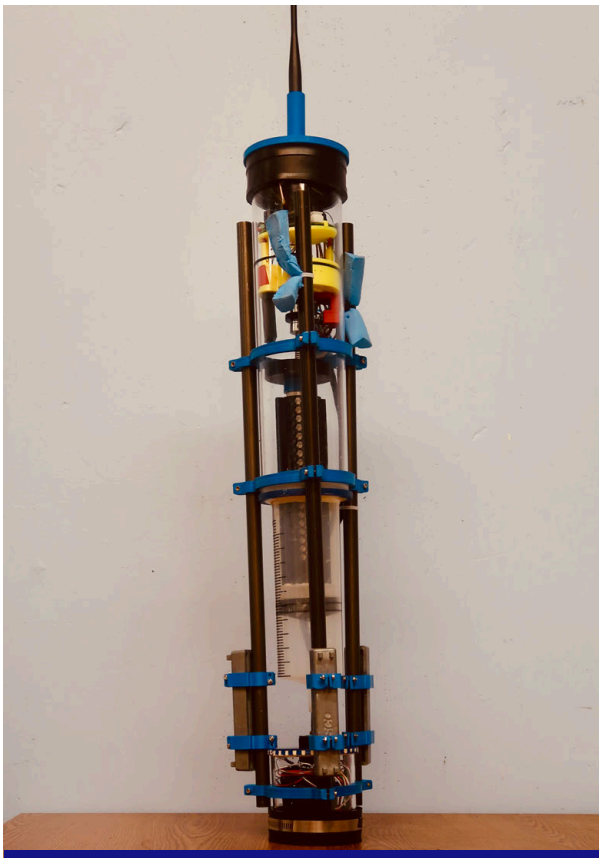

FIGURE 1. *ASTERIA* FLOAT

FIGURE 2. *ASTERIA* BATTERY AND FUSE

Idle Load Current	0.150A
Full Load Current	0.250A
Fuse Selection	1.0A

FIGURE 3. *ASTERIA* FUSE MEASUREMENTS

Idle Load Current: 0.150A
Full Load Current: 0.250 A
Fuse Selection: 1A

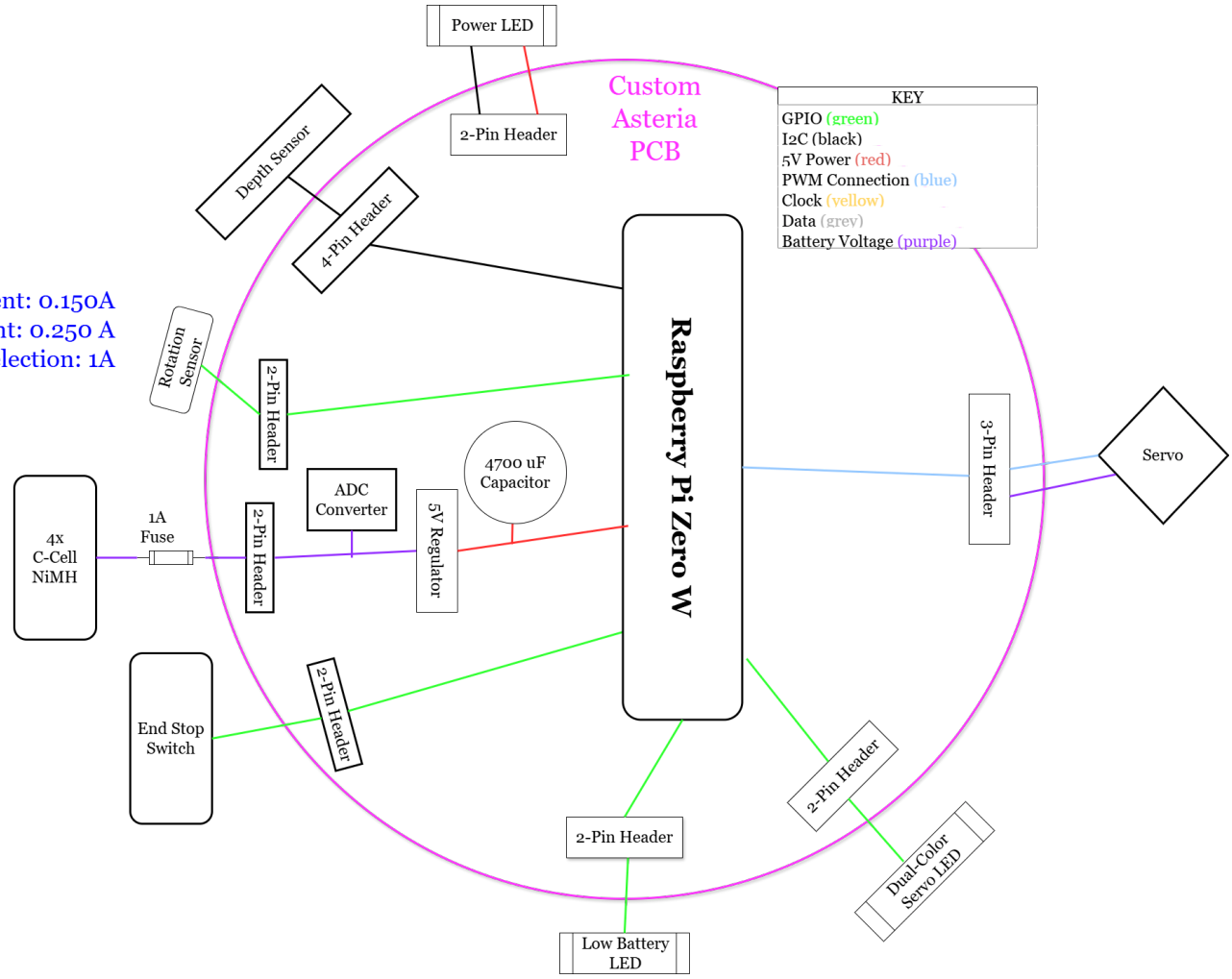

FIGURE 4. *ASTERIA SID*