



HEART INNOVATORS

NON-ROV DEVICE DOCUMENTATION



Electronics Compartment

The electronics compartment of Heart's Content contains a Raspberry pi zero with a breakout board, a depth sensor, and a motor driver. The compartment was designed with simplicity in mind to minimizing moving parts.

Battery

Heart's Content uses a 12V 3000mAh NiMH battery pack comprised of Sub C cells. This battery was chosen because it provides enough voltage to power every component along with a high capacity to ensure stable amperage. The positive wire leads directly into a 3A fuse, and then connects to a switch.



Figure 1: Battery.
(Photo: Noah Macdonald, 2026)

Buoyancy Engine

Heart's Content is propelled by a buoyancy engine consisting of a 12V 100 mm stroke linear actuator connected to a 300 mL syringe. When the actuator retracts, water is drawn into the syringe, increasing the float's density and causing it to descend. When the actuator extends, water is expelled from the syringe, decreasing the float's density and causing it to ascend.



Figure 2: Buoyancy Engine Syringes.
(Photo: Nolan Ash, 2026)

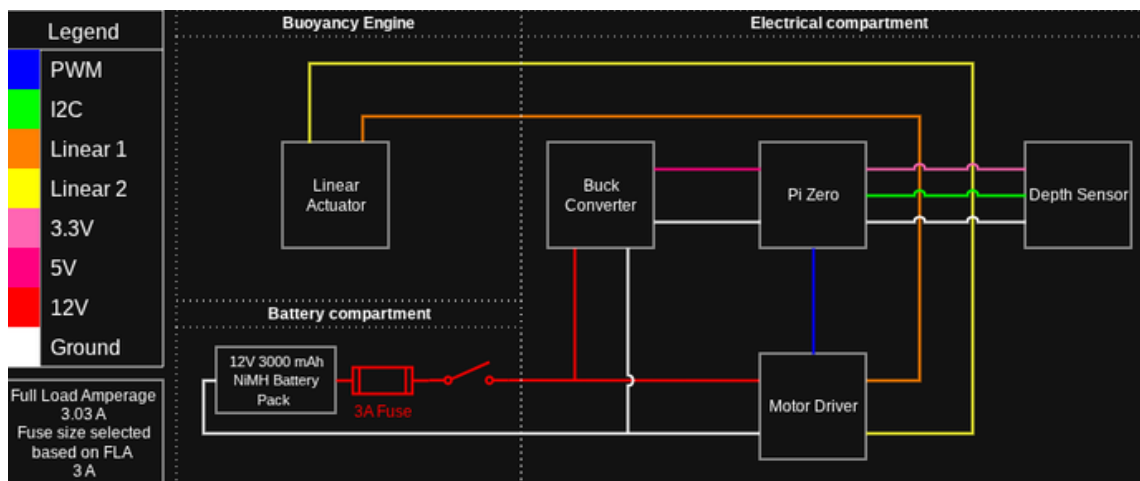


Figure 4: Heart's Content. (Photo: Nolan Ash, 2026)



Figure 3: Heart's Content.
(Photo: Abbey Janes, 2026)

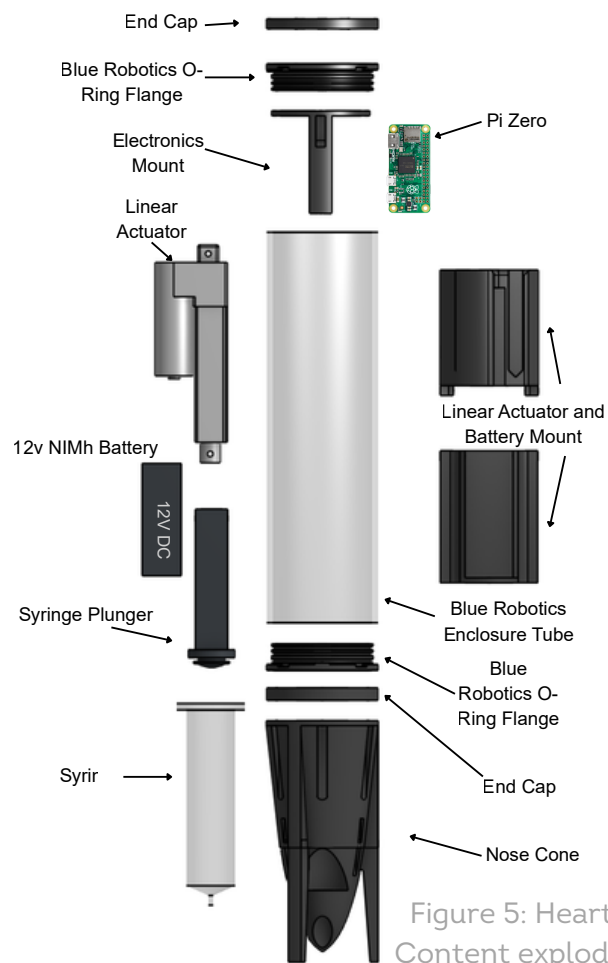


Figure 5: Heart's Content exploded.
(Photo: Nathan Stanley, 2026)

Communications

Heart's Content uses peer-to-peer networking (UDP) to communicate over WiFi, enabling fast and reliable communication between the float and the topside system. To support autonomous operation, all data is transmitted as JSON packets for their simplicity and flexibility. These packets contain mission data and callable functions through a "command" argument, allowing remote actions to be executed. A custom GUI is used for float testing and mission control. The interface includes a command box where operators can send commands such as "extend" and "contract" to verify communication and actuator response before starting a mission.

Operations

Heart's Content begins a profiling mission when the operator sends a packet containing a company number, the target depths, durations, and the interval between data captures for each profile. Once these instructions are received, the float autonomously performs the profiling sequence by descending and collecting data at the specified depths and times. Throughout the mission, sensors record depth data, which is stored onboard until the mission is complete. After Heart's Content finishes profiling, the float resurfaces and repeatedly transmits all recorded data back to topside through WiFi packets to ensure reliable communication and successful data recovery. The collected information is displayed through a custom GUI, which includes a live depth-over-time graph that allows operators to clearly visualize the float's movement and analyze profiling performance throughout the mission.

Graphical User Interface



Figure 6: Graphical User Interface
(Photo: Vlad Yarovenko, 2026)