

Triton NON-ROV Device



Quick Specs
Company ID: 0247A
Cost: \$884.50

Height: 50.8cm
Width: 18cm
Weight: 4.95 kg

Triton is a GO-BGC-inspired vertical profiling float developed by ROVOTICS to operate in cold temperatures beneath sea ice. It uses a peristaltic pump to fill and expel water from an internal bladder, altering its density to ascend and descend while collecting oceanographic data at targeted depths.

System Architecture

Electrical

Triton contains two custom Printed Circuit Boards (PCBs), an ESP32 daughter board and a powerboard. Custom PCBs were designed to fit within Triton's compact cylindrical housing while meeting the electrical specifications. The ESP32 daughter board (Figure 4) is located in the upper section, enabling the ESP32 to interface with the pump, lights, and pressure sensor.

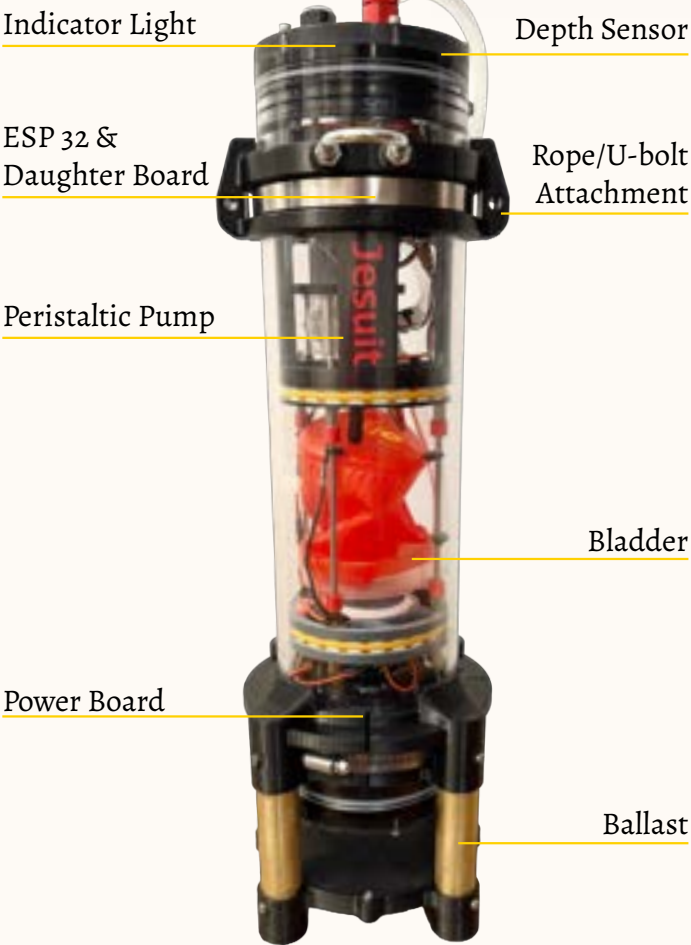
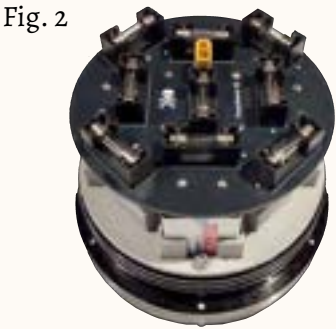


Fig. 3 ROVOTICS Float



In-Water FLA Table of Measurements

Condition	Amperage(A)
Stagnant	0.2A
Buoyancy Change	1.6A

Master Fuse: 2A **Individual Fuses:** 250mA
Battery Type: Nickel Metal Hydride (NiMH)



Fig. 4 ESP 32 & Daughter Board

In the lower section, eight high capacity 9V Nickel Metal Hydride (NiMH) batteries (Figure 1) are connected in parallel via the Power Board (Figure 2). This battery pack can safely supply up to 2A of current ($8 \times 250\text{mAh} = 2\text{Ah}$). To prevent damage to the electronics, the battery pack is protected by a 2A cartridge fuse on the common 9V rail, less than 5cm from the pack. Additionally, there are individual 250mA cartridge fuses located on each of the batteries' 9 volt terminals. The maximum voltage onboard is set to 9V.

Mechanical

The mechanical design of the float focuses on creating a compact, durable, and efficient system capable of reliable underwater operation. Brass ballasts are integrated into the exterior leg assembly to offset the buoyant interior, making the float neutrally buoyant. Brass was used for its high density and corrosion resistance. Positioning the brass in the legs improves stability and lowers the center of mass. An adjustable buoyancy trim system was added to the leg assembly to accommodate the density of the EGADS (ethylene glycol, aliphatic detergent, and sugar) solution. To comply with the MATE recovery specifications, a 5 cm U-bolt is located near the top of the float with a rope attachment for ease of handling. Triton's internal components are housed in a 4-inch Blue Robotics clear locking tube, secured by two custom polycarbonate end caps with O-ring seals that keep the housing watertight.

Software

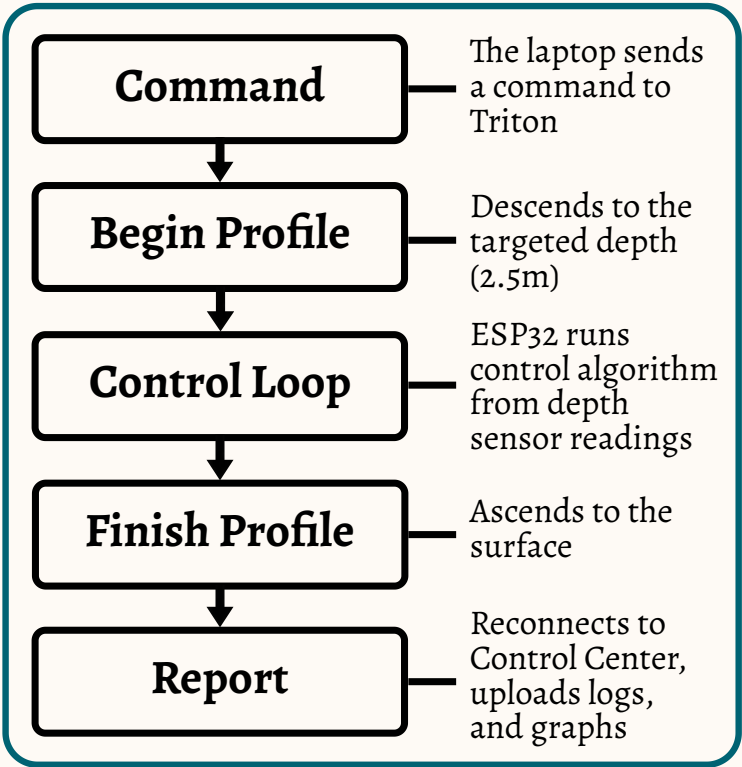
Triton features software that accurately tracks its vertical velocity. This data is fed into a control system that adjusts the peristaltic pump's speed and direction, enabling predictable mission runs while minimized control error. ROVOTICS enhanced the control center's Graphical User Interface (GUI) by implementing graphing, data logging, and over-the-air (OTA) update capabilities. These features work together to reduce testing, operation, and debugging times.

Operation

To begin profiling, the control center (laptop) sends a command through WiFi to a web server on the ESP32. When the ESP32 receives the command, it begins profiling to the targeted depth of 2.5 m. To maintain a depth of 2.5 m, a feed-forward control system is used to determine the pump's direction. This feed-forward control approach improves stability by anticipating system response rather than adjusting for error. When Triton resurfaces, the control center

reconnects to the ESP32, retrieves and logs the collected data, and generates a graph for analysis. In the event of a pump failure, software turns off power to the pump to prevent flooding.

Operation Flow



Safety

Triton's design satisfies MATE safety standards while incorporating additional operational safety features. In the lower section of the float, 250mA fuses are placed on each 9V battery with a 2A fuse on the common 9V rail located less than 5 cm from the battery pack. A 2.54 cm pressure-release rubber cork is press-fit into the bottom to ensure that pressure will not accumulate within the float body. This year, ROVOTICS incorporated signal lights in the float body to work in conjunction with the indicator light on top. These indicators help the team on deck monitor operations and address potential failures before they occur.

SID NON-ROV Device

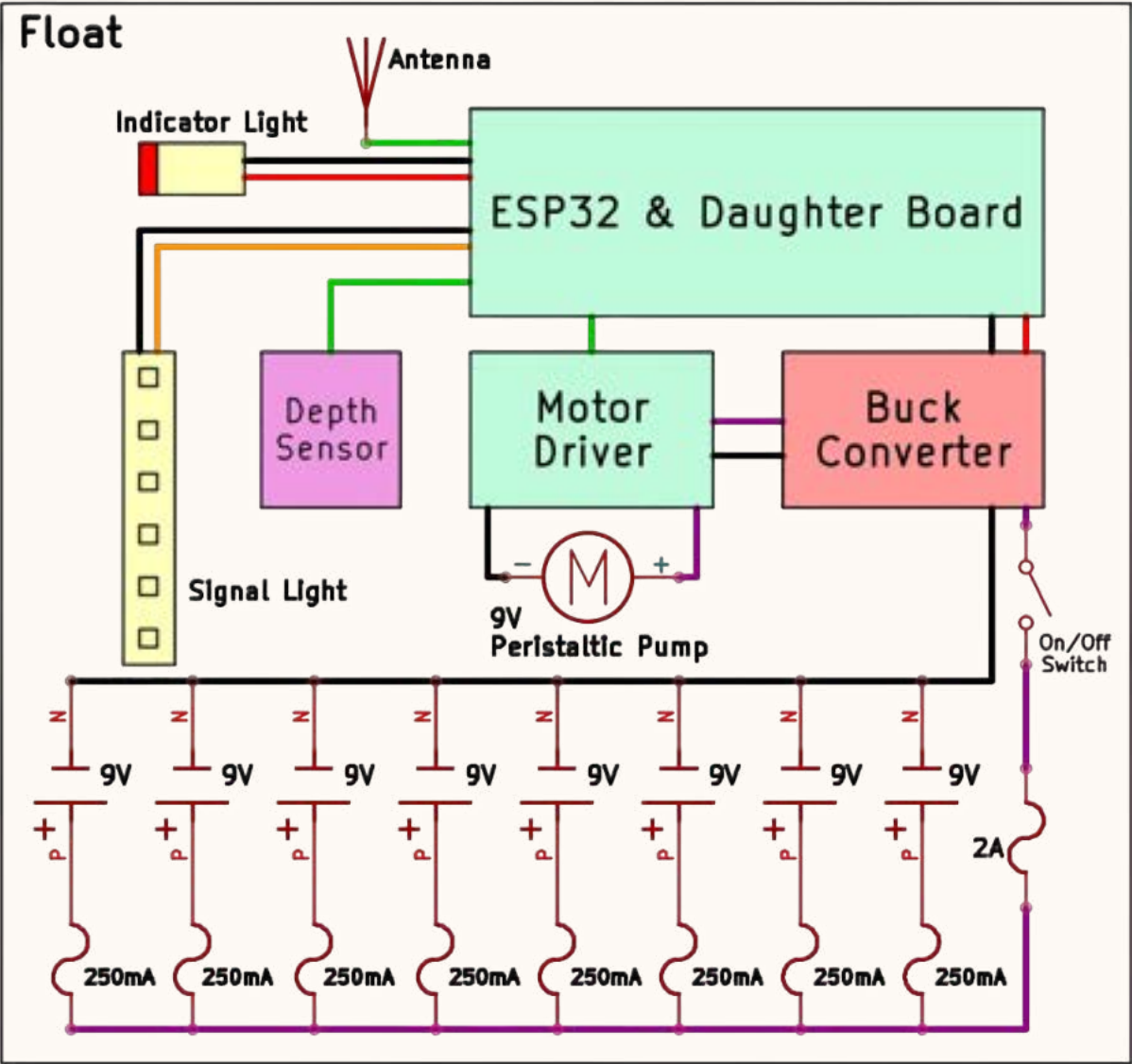
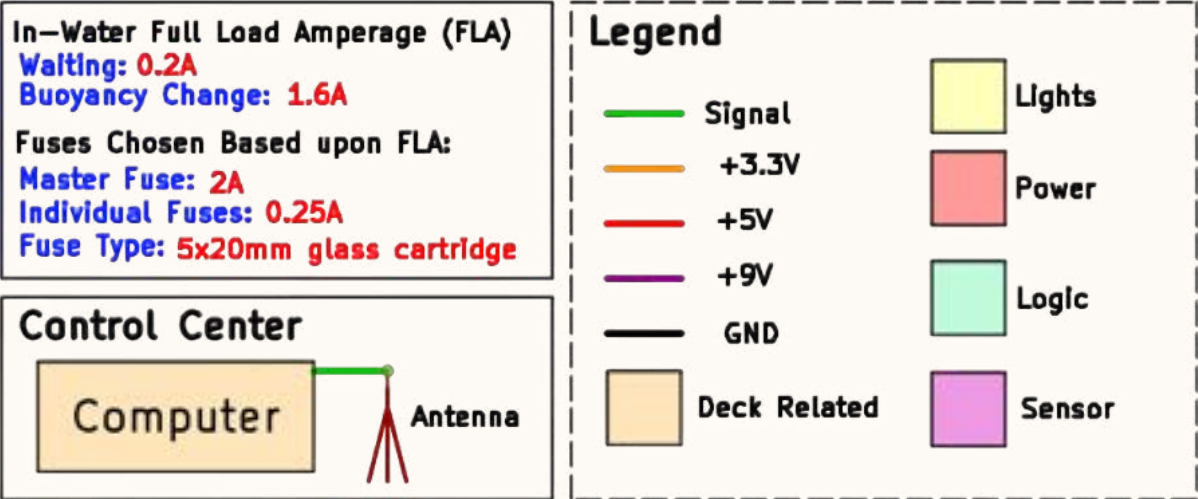


Fig. 5 Triton SID