

Oceaners Non-ROV Device Document

Tulkun

1. Mechanical Design

Tulkun uses an acrylic cylindrical enclosure as its main pressure housing. Both ends are sealed using metal flanges and O-rings to prevent water ingress into the electronics compartment. To improve operational safety, the endcaps also function as pressure-release components and can detach when internal pressure becomes excessively high.

Before deployment, Tulkun is configured to have slight positive buoyancy. The buoyancy adjustment system consists of a peristaltic pump and a 500 mL water bladder. When the peristaltic pump transfers water into the bladder, the overall weight of Tulkun increases, reducing buoyancy and causing the float to descend. When water is pumped out of the bladder, the overall weight decreases, allowing the float to rise. This system enables Tulkun to dynamically adjust buoyancy and perform vertical profiling tasks.

To simplify deployment and recovery in the ice pool environment, a U-shaped handle was installed on the top of the float. In addition, a circular support structure was added to the bottom of Tulkun to elevate the intake and outlet ports when resting on the pool floor, preventing blockage that could interfere with water transfer operations.



Figure 1: Tulkun Float

2. Electrical and Control Design

Tulkun uses an ESP32 microcontroller as the main control unit for receiving and processing depth sensor data. The ESP32 is connected to a motor driver board to control the peristaltic pump. Combined with a PID control algorithm, the system dynamically adjusts the float position according to the target depth to perform vertical profiling measurements.

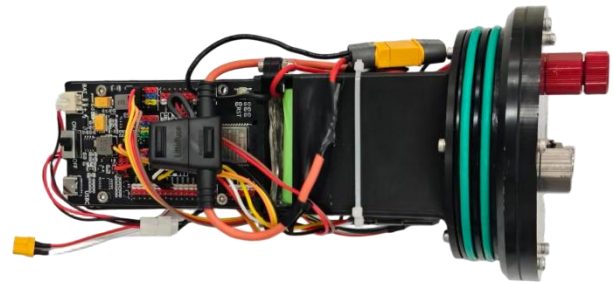


Figure 2: Tulkun internal electronic components

After completing the profiling task, the ESP32 transmits collected data to the topside workstation

through its built-in WiFi module. Operators can connect to Tulkun's web interface via WiFi to view automatically generated data graphs and measurement results in real time.



Figure 3: Battery and Fuse

The electronic system of Tulkun is powered by ten 2300 mAh NiMH batteries connected in series to provide a 12V power supply, meeting the operational requirements of the peristaltic pump and control electronics. To improve electrical safety, a 2A fuse was installed on the battery pack output line. When the system current exceeds the rated limit, the fuse automatically disconnects power to protect the onboard electronics and electrical system.

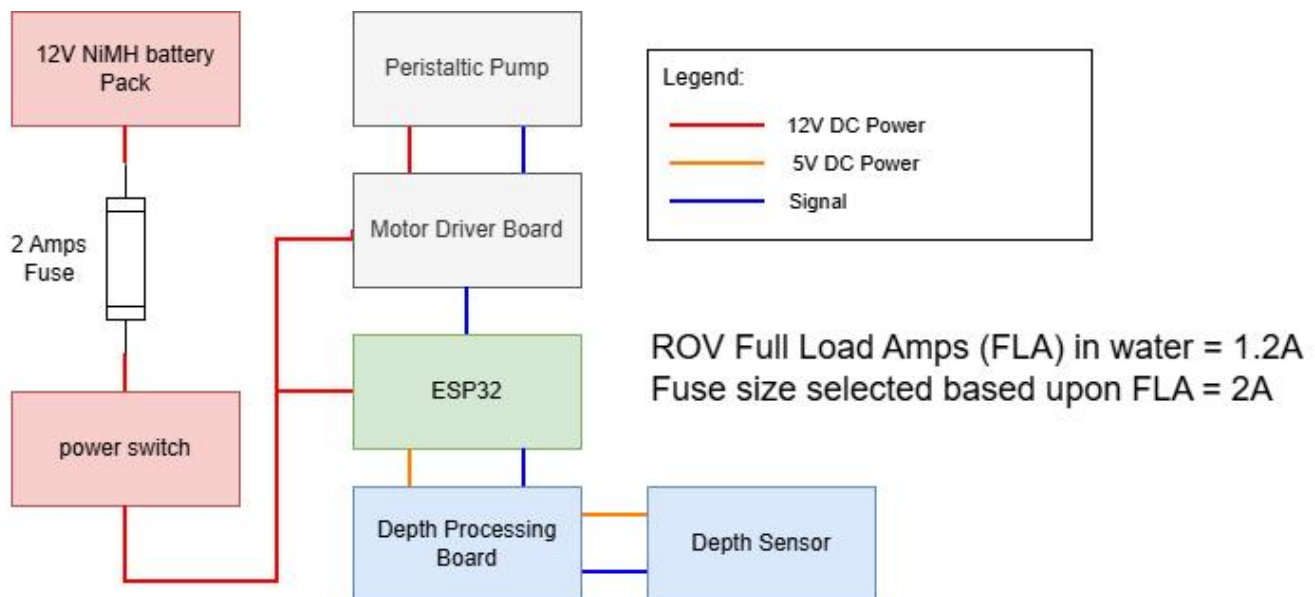


Figure 4: Tulkun Electronics Systems Integration Diagram (SID)