

NON-ROV Design Documentation

Our Float features a simple and intuitive design, divided into **three distinct areas**:

- **WiFi Antenna**: for data transmission and command reception
- **Control Electronics and Sensors**: for motor power management, data collection and processing, and command interpretation
- **Motor** -> NEMA 17

Mechanical System

The system relies entirely on a fluid displacement mechanism (no thrusters). The descent and ascent are based on the **filling** and **emptying** of two **syringes**, which changes the density of the prototype. The Float's mechanical system is based on a **lead screw and nut mechanism** a **NEMA 17 stepper motor** rotates a threaded rod, which moves a nut up and down. This nut drives a support where the syringe plungers are securely fixed.

Electronics

The system is fully powered by a **12V battery pack (NiMh)**. The 12V powers the motor and the internal components of the Float, where a 5V power supply is generated to run the control logic and sensors. The electronics consist of a SoC with a WiFi module (**ESP32-32UE model**) for communication with the Control Station on shore, a **driver device** for the stepper motor (**DRV-8825**), a pressure sensor (**Bar02**) for descent control and a ToF sensor (**VL53L7CX**) to create a logic end stop.

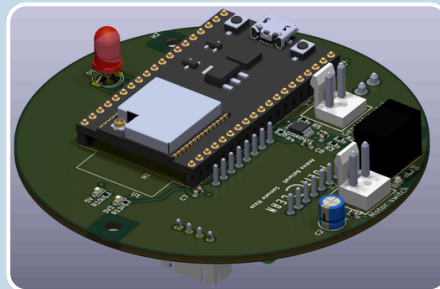
FLA = 1.7 A

FUSE = 22A

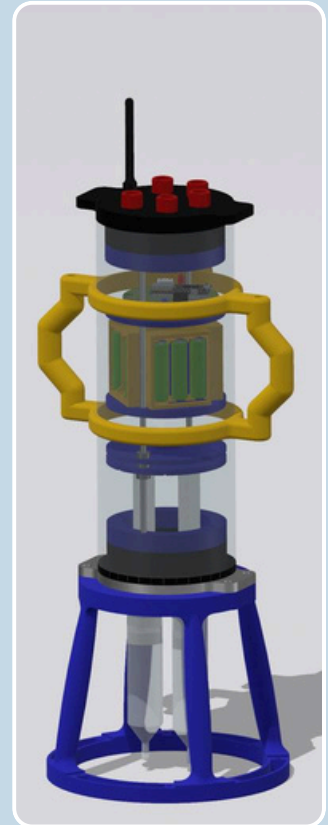
1 - Power Supply



2 - Fuse and Battery Pack



3 - Float PCB



4 - Float 3D model

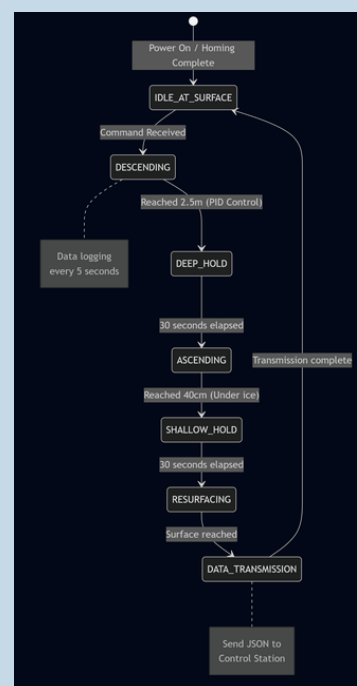
Working Routine

The Float operates via a state machine to autonomously complete two vertical profiles under a simulated ice sheet:

- **Pre-Dive**: Transmits the required MATE identification and time data packet.
- **Descent**: Uses PID control to reach exactly 2.5m depth, maintaining it steady for 30 seconds.
- **Ascent**: Rises and holds steady at 40cm depth for 30 seconds without touching the surface ice.
- **Data Logging**: Samples pressure/depth every 5 seconds, storing it on an onboard microSD card.
- **Auto Mode**: If WiFi is lost underwater, the float continues and commits to the mission autonomously.
- **Resurfacing**: Once the routine is complete, the syringes are emptied and the device resurfaces, where it sends the microSD content to the Control Station to plot the final depth graph.

Safety

- **Main Switch & Debugging**: Power flows through a Main Switch that connects the electronics and the stepper motor to the battery. The INA220 sensor monitors current sinked into the board, which is useful for onboard debugging.
- **LED Status**: An onboard RGB LED displays information about the machine state and the battery charge (e.g., Green for Idle, Cyan for PID active, Red for low battery, Purple for TOF homing).



5 - Float Flow chart