Non-ROV Device Design Document (DOC-004)

UIU MARINER

MATE ROV 2025 - Pioneer Class

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Float Requirement Fulfilment Checklist:

- ✅ Less than 1 Meter Overall Height
- ✅ Length & Width less than 18 cm
- ✅ No Rope/Line/Tether to the Surface
- ✅ Moves & Operates Independently from ROV
- ✅ All Electrical Power Goes through a Single Fuse
- ✅ Uses a Buoyancy Engine
- ✅ Follows Non-ROV Device Power Specifications

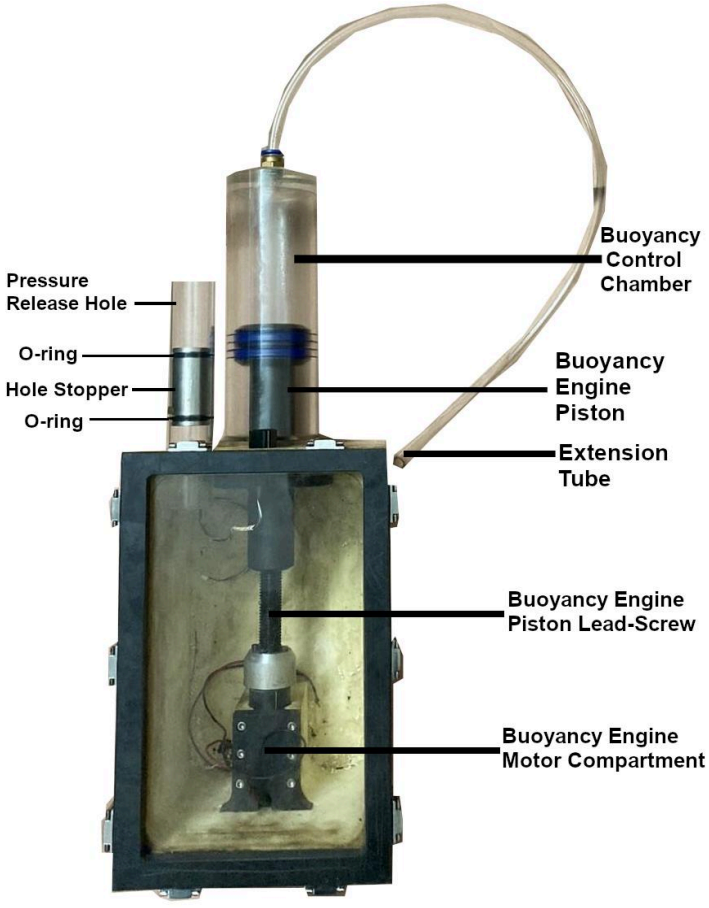


Figure 1: NRD (Float) Image Diagram

Battery Specifications:
Battery Type: AA Ni-MH
Used Quantity: 10
Capacity Rating: 2500 mAh
Amps: 5A
Max Continuous Amps: 5A
Battery Photo:

Maximum Fuse Size: 5A
Fuse Link: ATO5
Fuse Photo:

Table 1: Full load current measurement table

Float Load Measurement Table(12V)				
SL No.	**Depth (M)**	**AVG Amps**	**Max Amps**	**Float Buoyancy Engine Action**
1	2.5	3.17	3.81	Buoyancy Change, Com. Off
2	0	3.43	**4.18**	Buoyancy Change, Communicating
3	2.5	0.92	1.14	Motor & Com. Off
4	0	1.08	1.33	Motor Off, Communicating

SYSTEM DESIGN

Non-ROV Device Overview:

In response to **MATE ROV 2025 Task 3: *MATE Floats!***, **UIU MARINER** developed a **Vertical Profiling Float** based on the **2025 Pioneer Manual**. As a first attempt, the design prioritized simplicity without sacrificing functionality. The system runs on **12V**, powered by **ten 1.2V AA Ni-MH batteries**, and uses a **12V gear motor** with l**ead screw actuation** to drive a **piston** for **buoyancy control**. All design, safety, and regulatory requirements from the **2025 Pioneer Manua**l and **NRD Inspection Sheet** were strictly followed.

Buoyancy Engine Description:

The buoyancy engine contains 4 Major Components. They are: **1) Buoyancy Engine Motor Compartment**, **2) Buoyancy Engine Piston Lead Screw**, **3) Buoyancy Engine Piston**, **4) Buoyancy Control Chamber**. The Buoyancy Engine Motor Compartment Holds the **waterproofed motor** that drives a lead screw, achieving **linear actuation**, to push/pull a large **syringe piston** than **pulls in/pushes out water** inside the Buoyance Control Chamber to **alter the buoyancy** of the Float, thus diving in and surfacing out to perform vertical profiling and send collected data. The motor can be **precisely controlled** to **regulate** the exact amount of **piston movement**, thus ensuring c**ontrolled and precise alteration of Float buoyancy**.

Communication Method:

The Float uses an **nRF24L01+** with an external antenna to communicate with the shore-side receiver, which also includes an nRF2401+ module. After powering on the float, the System boots up and initiates a **2.4 GHz** connection at **250 kbps** mode using the nRF module, establishing communication with the receiver. After communication is established, the float sends the message **"Communication Established"** to the receiver. No additional command is required from the surface station. As a **real-time clock** ensures timing accuracy, the data is sent with accurate time stamps to the surface station and an **HTTP** web server via **HTML POST**. The received data is processed and displayed on the control station laptop.

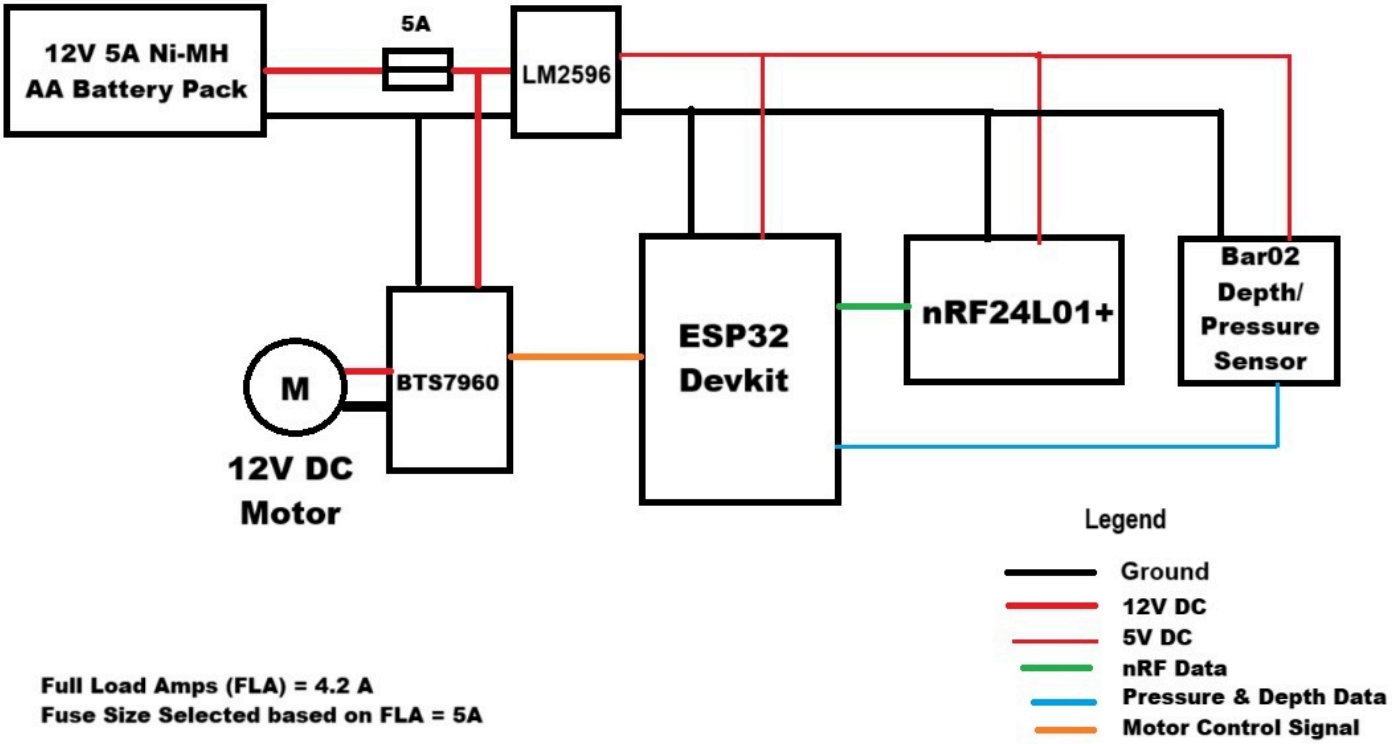
Battery Pack Safety:

The battery pack contains **10** reliable, high-quality **Ni-MH 2600mAh AA batteries** rated for **7.5A intermittent** current and **5A continuous** current. The battery pack is arranged to be stable, with secured connections, and the pack wrapped in a heatshrink to cover the batteries properly. The battery pack is not enclosed in a tight space, allowing **proper ventilation** and **heat dissipation**.

Battery Pack Photo:

Figure 2: Float Battery Pack

Electrical SID:



Full Load Amps (FLA) = 4.2 A
Fuse Size Selected based on FLA = 5A