Red Sea Robotics

Float Documentation

2025

Design Rationale


Figure 1: Float top view

Bloom Balloon IV is constructed from a self-design capsule which is printed from PLA material, a 100cc syringe, and a 70mm hex bolt that is attached to a M200 DC motor. These components allow for the buoyancy of the syringe to be changed by intaking or expelling water.

Inside the capsule, the electronics consist of an Arduino Nano that is powered by a 9V battery, as well as an external Pressure Sensor. Wireless communication is facilited by the HC-05 Bluetooth module. There is also a M200 DC motor controlled by an ESC which is powered in parallel by the 9V battery. The Arduino Nano supplies power for the HC-05 and the ESC. The HC-05 facilitates a Bluetooth connection to a laptop on the surface, from which commands are sent and data is processed. The pilot on the surface can send a message to the float wirelessly to perform a vertical profile, and the float can then transmit relevant data which can then be graphed over time on the surface. The electronics layout can be seen in **Figure 2 (Page 3)**.

Safety

In terms of safety the team utilised strong waterproofing and electrical security techniques to ensure all members remained safe in the development of the *Bloom Balloon III.* This was crucial to ensure a functioning and reliable float that does not harm or interfere with marine life. The watertight capsule can be seen in **Figure 1**. The end cap situated at the top of the capsule is secured with double o-rings, and is coated with silicon grease to ensure a robust watertight seal. The PLA capule was coated in epoxy to ensure

water would not leak into the capsule, ensuring the internal components remained safe, as well as the opening in which the syringe was located. To test the capsule's internal pressure, we used a vacuum gauge to test the seal of the capule.

Payload and Tools

This year, we decided to develop a buoyancy engine to explore alternative solutions of thrust, rather than using a standard prop motor. The decision to develop a functioning buoyancy engine was justified by its ideal price as well as its reliability. We also use an Arduino Nano rather than alternative solutions, as we believed it best fit the needs of the float, as the onboard computer requires runs on low power or memory. We designed and 3D printed the float capsule for the internal electronics and mechanics to suit our design best. The float features the Blue Robotics Pressure Sensor, which can be used to evaluate the effectiveness of the float in profiling and recording data.

MATERIALS:

- PLA Capule (inner diameter 3")
- M8x1.25 Hex Bolt (70mm)
- 100cc Syringe
- Arduino Nano
- Breadboard
- Blue Robotics M200 DC Motor
- Blue Robotics Basic ESC
- KCD1 Switch
- Blue Robotics Pressure Sensor
- 9V Battery
- HC-05 Bluetooth Module

Battery/Fuse used:

M200 Thruster	1 x 4 = 4 A
Other (board overall)	0.6 A
Estimated FLA in water	4.6 A
Real FLA in water	4.8 A

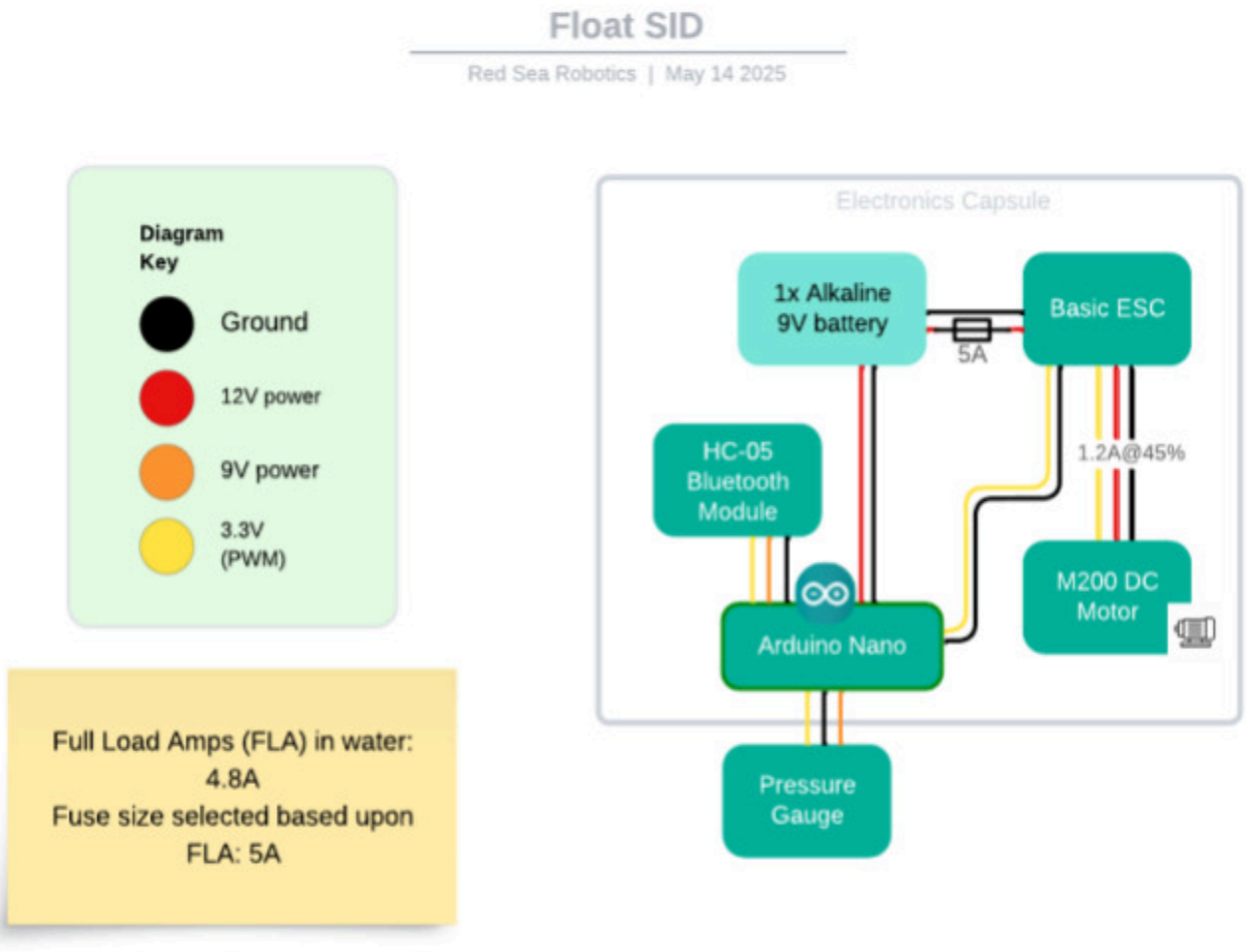

Figure 2: Float SID