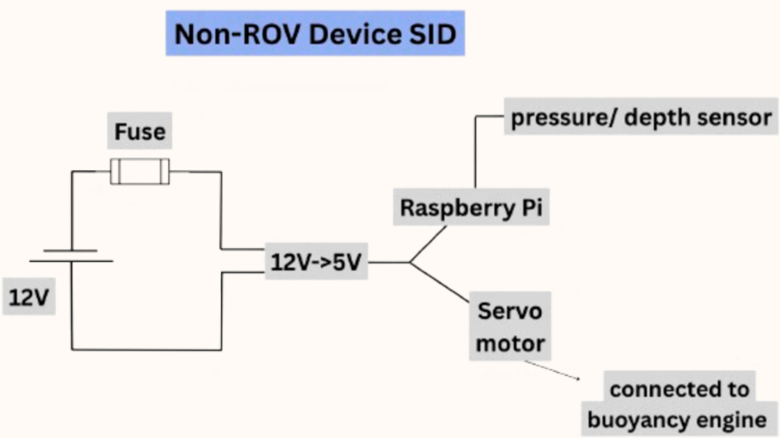
# Riptide: Non-ROV Device Technical Documentation

Riptide uses Bingo to accomplish Task Three, where it needs to execute two vertical profiles of the water column and establish communication with the mission station upon surfacing from each of the profiles. Bingo integrates two most critical subsystems: the control system and the buoyancy engine, where both are housed within waterproof housing purchased from Blue Robotics. Overall, the system has a 30cm height and a 10.4cm diameter. Bingo is a vertically profiling float that uses a buoyancy engine made by a 100ml syringe, a 30cm plastic tube, weighted steel balls, and a stainless-steel screw. After deployment, Bingo is designed to perform a vertical profiling during its descent to a programmed depth of 2.5 metres autonomously, managed by a Python code programmed on a Raspberry Pi 4. All the electronics are housed in a water-tight capsule. In order for the structure to maintain watertight, waterproofing is achieved through O-rings, silicone grease, and heat-shrink sealing critical joints and penetrations for cables. Upon startup, Bingo transmits a data packet containing the current local time, company number, and the current pressure. After transmission, the servomotor, connected via GPIO pins on the Raspberry Pi, activates the buoyancy engine to begin descent. When a depth of 2.5m is reached, the servo stops at the calibrated neutral buoyancy and the float remains stationary for 45 seconds. Once the float reaches a depth of zero (or the initial depth value), the servo stops at neutral buoyancy again. Utilising Raspberry Pi's inbuilt wifi, we establish a connection with the on-shore computer, which is able to remotely start the program and receive data from the non-ROV device through a remote terminal.




Inside the waterproof enclosure, a 12V, 3A, NiMH nested battery powers all the components of the control system. These include a servomotor, Raspberry Pi 4, pressure sensor, and a voltage regulator. The battery and buoyancy engine are held and supported by a custom 3D-printed circular locking plate. A servo, mounted on top via another custom 3D-printed bracket, rotates a stainless-steel screw to adjust the height of the plunger inside the syringe. All 3D prints were made with PLA Tough filament due to its strength and stability. The system controls the intake and expulsion of water, hence the buoyancy of the float. A transparent plastic tube comes out from the nozzle of the syringe, going through the waterproof end cap, facilitating water exchange between the syringe and the external environment. Adding up the maximum current of the components in our circuit, we find that the Full Load Amplitude (FLA) is 2.00125 Amps. Therefore, a 3V fuse was selected. The battery selected was to exceed this requirement while being one of the committed battery types. Our battery provides a higher voltage and higher current than needed, so we have a transformer to reduce the voltage provided to the Raspberry Pi as protection of the system.