Non-ROV Device Documentation (FLOAT)

Design:

Our float uses a syringe powered buoyancy engine powered by a Nema-17 stepper motor and lead screw to actuate the plunger. The syringe plunger is controlled using an ESP32-S3, 2 DC motor control boards, and a voltage regulator circuit. To measure buoyancy data, we use a barometer mounted at the top of the enclosure where we collect water pressure data and convert it to depth readings. For communications, we use a WiFi broadcast and antenna mounted near the top of the enclosure. The float is powered by 8 AA batteries arranged in parallel to achieve 12 volts of power.

Operation:

Our float is fully self contained and only requires WiFi connection to operate. Once we deploy the profiler, our three syringes open to take in water which will change the float buoyancy to a negative state to start its decent. Upon reaching the desired depth, the plungers will compress, flushing out the water and placing the float into positive buoyancy mode and ascending the vehicle. When ascended, the antennae connects via WiFi to the control station and broadcasts communications and data gathered throughout the mission profile.

Waterproofing:

Our float uses a system of 3 inch PVC piping to waterproof the internal electronics. We use caps on either end to secure wires and facilitate easy internal access to device electronics. The cap on the top is a PVC end cap with 4 watertight penetrators sealed allowing for tubing and wires to be inserted into the system. This tubing is then routed down towards the base of the float on the exterior to ensure submersion below the waters surface. The bottom end cap acts as a pressure release valve, in the event of excessive internal pressure accumulation, the base cap will pop off releasing any internal pressure.

Safety:

We designed our float with safety as our top priority, and to do this we used a variety of components to assure typical and safe functioning. We have securely mounted our batteries in a rotating-drum style holder, with a clip cable connecting it to a 7.5A fuse positioned within 5cm of the battery. To relieve internal pressure if needed, our 3 inch rubber end plug will pop off releasing any internal pressure. On the exterior, the edges of the tube are rounded and safe to hold, and each component is securely attached using fasteners.