

Non-ROV Device Documentation: Float

Colorado Robosub



Figure 1: Float CAD without PVC Hull (left), Float internals (middle), and Float with PVC Hull (right)

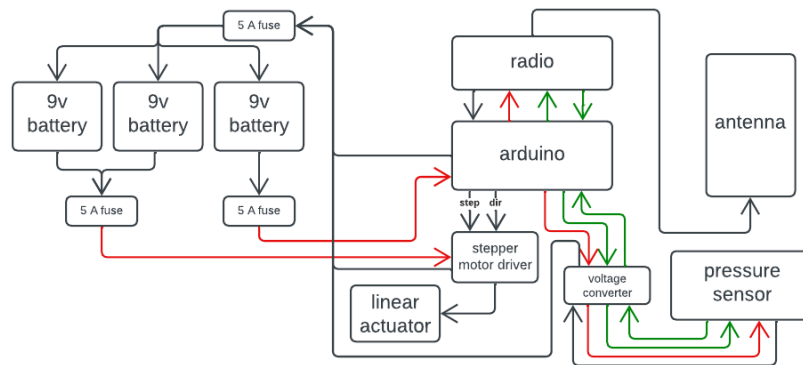


Figure 2: electrical diagram of the float

Design:

Our float is built inside a piece of 4in PVC pipe with two Blue Robotics O-ring flanges capping the PVC pipe. The basis of our float's buoyancy engine is a 500 mL syringe, that is actuated by an Acme NEMA 17 non captive linear stepper motor, pulling water into and out of the float from the pool. This is a huge improvement over our design from last year which utilized four 100mL syringes which left a lot of empty space between the 4 syringes. When full of water the float has a density of $1.07 \text{ [g/cm}^3\text{]}$ and when empty it has a density of $0.97 \text{ [g/cm}^3\text{]}$. The float uses a Blue Robotics bar 02 depth sensor to log the current pressure and depth. The stepper motor and depth sensor are controlled by an onboard Arduino Uno microcontroller. The microcontroller and motor are powered by three 9V alkaline batteries; two in parallel powering the motor and the other providing power to the microcontroller. The batteries are secured by a 3D printed mount that they snap into. The float has a maximum width of 13 cm and a height of 45 cm.

Safety:

Connected to each of our 9V battery's positive terminals are 5 amp fuses. The batteries share a common ground wire, also equipped with a 5 amp fuse to shut off power to the entire electrical system in the event of a short circuit. On both ends of our float we have 4in O-ring flanges from Blue Robotics. Because flanges are not secured by fasteners if there is a pressure build up inside of the float either flange can separate from the PVC housing and work as a pressure relief plug.

Communication

The float uses 2 nRF24 2.4 Ghz digital radios to communicate depth and pressure data from the float to the mission station. Both radios are connected to Arduino uno microcontrollers using an SPI interface. The microcontroller at the mission station is connected to a computer via usb, depth data is displayed using a custom app written in Matlab which retrieves the data over serial.