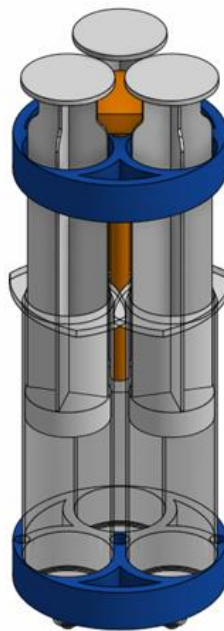


The East Tennessee State Buccaneers have designed and created a vertical profiling float (VPF) capable of completing multiple vertical profiles, maintaining set depths, and transmitting data wirelessly to the control station on the surface. The frame of the VPF consists of a 3-inch Blue Robotics acrylic watertight enclosure. One endcap contains a Blue Robotics Bar02 sensor and a Blue Robotics enclosure switch. Within the enclosure, a linear actuator is mounted to three syringes. When the actuator extends or retracts, the plunger is either lowered or raised. When the plunger is retracted, the buoyancy changes as the water enters the syringes. This lowers the float to the target depth of 2.5 meters. After staying at the desired depth for 30 seconds, the float then extends the syringe, changing the buoyancy causing the float to rise to the target depth of 0.5 meters. After the VPF is recovered, data is transmitted to the mission station.

The VPF has a Nickel-Metal Hydride 9.6-volt battery pack, containing 4 AA batteries. This provides sufficient power to the linear actuator, ESP32 microcontroller, and Bar02. All components receive power only after it is passed through a 1-amp fuse, switch, and DC-DC buck converter. This regulates power to a stable 3 volts, which is usable by all the components.

Once the switch is turned on, the ESP32 communicates with the shore side receiver through a TCP (transmission control protocol) socket over WiFi to get the start signal. After starting, the ESP32 actuates the syringe and catalogs the pressure and depth from the Bar02 sensor along with the current time and company number. Once the depth of 2.5 meters is reached, the syringe actuates once again to the middle to attain neutral buoyancy. After holding for 30 seconds at the target depth, the syringe actuates again to reach a depth of 0.5 meters. After holding again for 30 seconds, the VPF can be recovered.

At the surface, the logged data is transmitted from the ESP32 to the shore side receiver using the TCP socket over WiFi, as mentioned, where it can be viewed as a graph or table. The battery pack was designed with 20-gauge wires, as it can safely handle the full load current of 501.25 milliamps. These wires can safely handle high voltages as well, so the 9 volts utilized by the circuit are well within specifications.



Top: Battery pack used to provide power to the VPF.

Bottom left: 1-amp fuse protecting excessive current flow.

Bottom right: Buoyancy engine design.

