

Palos Verdes High School, PVIT, NRD Device Overview, 2023

DOC-004 Ranger Class Non-ROV Device Safety Description

Float for the *Besh Lo*



Figure 1: Bumblebee

The vertical profiling float is constructed with a 5" PVC pipe and operated with a buoyancy engine comprised of a micro linear actuator and a membrane. The Float, affectionately called the *Bumblebee*, is 73cm tall with an outside diameter of 17 cm. The float is comprised of 2 major sections. The lower section contains a mounted 6V DC micro linear actuator with an extending range of 10cm. The actuator is screwed on to a swimming cap which acts as an expanding membrane. The membrane has 5 centimeter expansion both upwards and downwards. The upper section of the float houses the electronic components including the Arduino Portenta and battery. The cap on the upper section has a push button to activate the float. There is a waterproof antenna attached to the Portenta, which transmits via Wi-Fi the current UTC time and ROV team number to the desk using the team router and designated webpage. There is also a bilge switch, which is used to communicate to the Portenta that the float is on the surface, and that the signal should be sent to the desk.

Following safety spec ELEC-008R, a 5amp fuse is attached within five centimeters of the power wire of the battery of the Float. Our company reviewed all the specifications of ELEC-NRD-004 and made sure to comply with all of them. In adherence with spec MECH-001, the housing for the *Bumblebee* can withstand pressure up to 100 pounds. A rubber plug with a diameter of 1 inch is located on the cap, and acts as a pressure relief system. Additional measures were taken to cover sharp edges, including the ends of metal bracings and the ends of zipties.

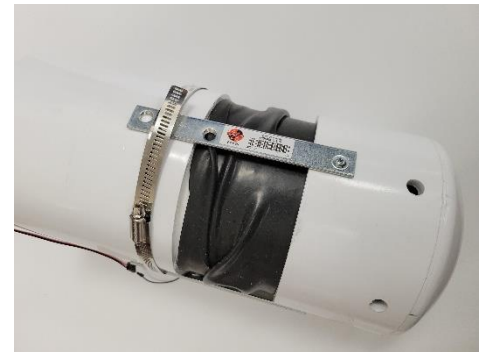


Figure 2: Swim Cap Membrane



Figure 3: Linear Actuator, top view

A member of the deck crew begins a timer preset in the Portenta by pressing the push button. The activated Portenta signals the linear actuator to retract five centimeters pulling the swimming cap inwards inside the housing. During this phase, the tensioned cap forms a truncated cone with a volume of 211cm^3 displacing approximately negative 211 grams of water. After the first timer on the linear actuator is activated, a set timer programmed onto the Arduino Portenta will extend the linear actuator and start the Float's ascent. During this phase, the actuator extends 5cm allowing the swimming cap to stretch displacing the identical amount of volume except outward. The increased volume of air in the float increases buoyancy and allows a consistent and smooth rise to the surface. The float will complete as many vertical profiles as it takes for the signal from the antenna to be relayed twice.

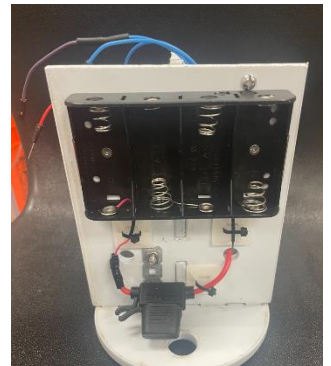


Figure 4: 1 Battery Pack, Fuse location