

Warrenton Aquatic Robotics - The Rays

Non-ROV device - Torpedo Ray

Torpedo Ray got its name from a species of ray called “Torpedo Rays”; it also goes with the team name The Rays.

Torpedo Ray uses custom-built PCBs (Printed Circuit Board) that house a Teensy 4.1, pressure sensor, PWR monitor, and JST ports for all other inputs. Torpedo Ray is also equipped with a buoyancy engine, made with a syringe attached to a linear actuator. The buoyancy engine pulls in water when diving and pushes it out when ascending. Torpedo Ray is run by six C cell batteries, helping maintain a constant voltage.

The software utilizes a state machine, which runs Torpedo Ray through different states during the dive. These states include Waiting, Descend, Ascend, and Relay.

Our float communicates via the use of two Reyax Lo-Ra radio modules, which use serial AT commands to interface with the microcontroller and the base station, which allows for a simple, streamlined communication design and protocol. Our communication protocol is as follows: for base-to-float commands, a single ASCII character is sent. This single-character approach allows for simple parsing index-based. Since our float is programmed in C++, this allows for fewer options regarding string manipulation. Messages from the float to the base station can be more complex, since Python has more functionality when it comes to string manipulation. Because of this, our base station program uses regex to parse incoming radio signals over serial.

For depth measurement, we chose to use a Blue Robotics Bar 02 pressure high-resolution pressure sensor because of its ease of integration with our other Blue Robotics penetrators. These pressure sensors also have integrated thermometers to calculate a more accurate depth value from the pressure information.

We use six NiMH (nickel-metal hydride) batteries because of their rechargeability and output current. We designed a custom battery pack that fits within the space in our hull. Our battery pack also has hollow sections for storing ballast material. Our custom battery pack lays out our six NiMH batteries in series to achieve the necessary voltage and amperage, such that our float can run smoothly.



Item	Max Current (A)
Teensy 4.1	0.1
Arduino Nano Every	0.03
Temp & Pressure Sensor	0.02
Level Converter	0.002
REYAX RYLR890	0.14
Actuonix L12-R Servo	0.65
NeoPixels 66 LEDs	3.96
TOTAL MAX	4.902

Fuse we chose

5A

