WhaleTech Robotics

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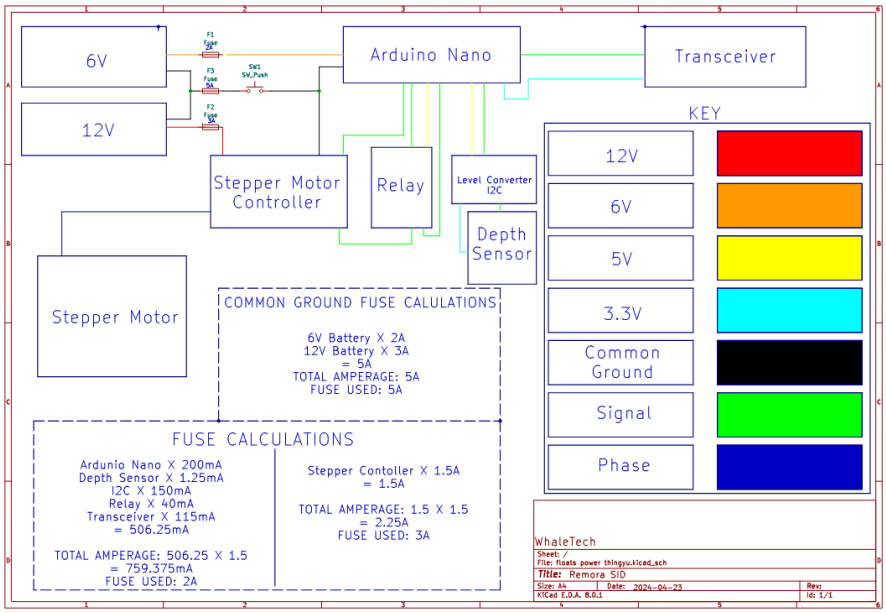
MATE WORLD COMPETITION 2024

Non-ROV Device Design Documentation

WhaleTech's Remora is deployed to complete task four, which calls for completing two vertical profiles along the water column and communicating with the mission station after each surface. The Remora consists of two systems: the control system, and the buoyancy engine. Both systems are encased within a 3" diameter PVC tube, with a 3" to 4" coupler on the bottom. The Remora is 60 cm in height. To waterproof the structure, 3" and 4" Blue robotics end caps are used. Inside the housing, three sets of four Triple-A (AAA) alkaline batteries are used to power all control system components; an Arduino Nano, transceiver, pressure sensor, I2C converter, relay, and stepper motor, which in turn powers the buoyancy engine.

The 12 AAA batteries are housed in three four-slot AAA battery holders, mounted securely within a custom 3D printed battery pack holder. Five centimeters from both battery compartments is a 5A common ground fuse, combining the ground wires from each holder. In addition, there are two more fuses attached to the positive ends of the both compartments, one being 3A, and the other being 2A. The buoyancy engine consists of a 1MPa rated pneumatic cylinder modified to utilize mechanical power provided by a NEMA (National Electrical Manufacturers Association) 17 stepper motor. The cylinder pumps in and out water altering the interior volume of the Remora, changing the density above and below that of the water it is in, causing it to sink or float respectively. While the Remora is underwater, it collects and stores pressure data to be sent to the mission station when it reaches the surface.



When at the surface, the Remora will communicate with the mission station using two paired transceivers, one within the Remora and the other within the surface receiver box. The transceiver is capable of interfacing with Arduino, which allows for the information communicated to be easily modified. When the information is communicated with the mission station, an Arduino Uno reads it and sends it to the laptop to be graphed.

All systems are housed in a piece of PVC to ensure the safety of marine life as well as all components inside. It serves as protection from collisions for all components in addition to serving as a waterproof housing. The rubber boot at the bottom ensures that the enclosure does not damage the environment and has a soft descent. The end caps also serve as additional pressure releases should the build-up of pressure occur.