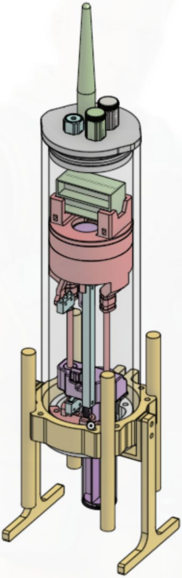
Jonesy MK2



Non-Sensor Electronics

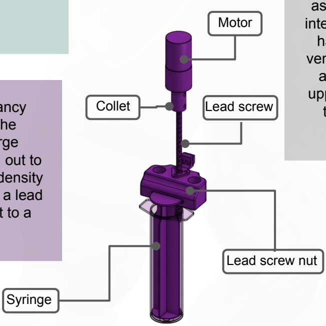
The Profiler uses a custom ESP board for all on board processing and control. This board has an attached 2.4GHz antenna to communicate to the ground station which is another ESP. These two ESP's communicate via ESP-now and transmit depth, time, and company name. The profiler is powered by four AA [1] batteries wired in series [2] and has a 750mA fuse [3].

Sensors

The sensor payload for the profiler consists of two limit switches at either end of the syringe travel, a linear potentiometer coupled to the syringe and a pressure sensor mounted in the top end cap. The limit switches and the linear potentiometer work together to determine the location of the syringe and the pressure sensor is used to detect the profiliers depth. Combining this two pieces of data allow the profiler to hover at a fixed depth.

Propulsion

The Profiler uses a buoyancy engine for propulsion. The buoyancy engine is a large syringe which moves in and out to increase and decrease the density of the profiler. It is driven by a lead screw attached via a collet to a brushed gear motor.



External Frame

The external frame of the profiler was developed to hold the weights needed to fix buoyancy to neutral, and to create an attachment point for the legs of the profiler so that it can easily be set down out of water, and to avoid shock load on the syringe that could break the epoxy seal.

Internal Frame

The purpose of the internal frame of the profiler is to position all important components and to hold the motor so that it will have the leverage necessary to push the syringe. It was designed so that the motor could be slid up and down in order to make sure the worm gear will fit properly into its lower bearing

Enclosure

The enclosure is made from a 4in blue robotics tube, and two custom end caps. The lower end cap has one large hole where the syringe exterior is potted, as well as two attachment points for the internal frame. The upper end cap has four penetrator holes for a vent plug, antenna, power switch, and the pressure sensor. This upper end cap is free to pop of in the case of pressure buildup within the enclosure.

Fig 1

Fig 2

Fig 3

Fuse calculations and Battery Decisions

The Important considerations for the battery pack were its voltage, current capacity, and size. The two significant power draws in the system are the DC motor which has a max current draw of ~550mA and the ESP which has a max draw of ~250mA. These two loads should never happen at the same time since the motor will be drawing its maximum current at the lowest point of the profile and the ESP will be drawing its peak power when transmitting which happens at the top of a profile. This means that the 700mA supplied by a 4s1p AA [1] battery pack is sufficient. This battery pack also fulfills the criteria of being small and operates within the voltage needed for the converters and motor. The AA batteries chosen for the pack were standard energizer AA's [2]. For the standby FLA the profiler was partial disassembled and max current was directly measured as ~115mA**.** This is more challenging to do during buoyancy change mode since the force on the motor is less out of water then in water, therefore a scale was employed to resist the motors motion and the current was noted when the scale reached 10.5kg which is the force on the syringe head at 6m for a value of ~672mA. Due to this a 750mA fuse was chosen which is also the maximum fuse size specified for a AA battery pack.