

Jonesy MK3

Communication Electronics

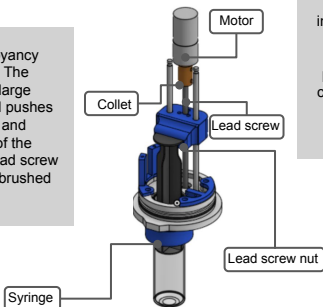
The Profiler uses an Arduino MK1010 for all on board processing and control. The board has its own wifi module which is set up as an access point for communication. The profiler also uses a strip of LEDs near the bottom to communicate its profile status. Communication is further discussed on the next page.

Sensors

The sensor payload for the profiler consists of two limit switches and a pressure sensor mounted in the top end cap. The limit switches are used to detect when the syringe is at the end of its travel and the pressure sensor is used to detect the profiler's 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 pulls in and pushes out water 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 redesigned this year to accommodate new components required for this years tasks and to fix previous issues.

Enclosure

The enclosure is made from a 4 in polycarbonate 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 three penetrator holes for a vent plug, power switch, and pressure sensor. This upper end cap is free to pop off in the case of pressure buildup within the enclosure.

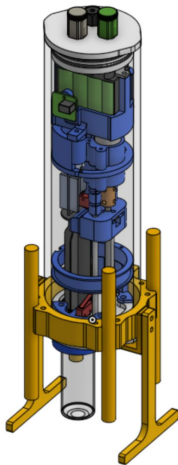




Fig 1



Fig 2



Fig 3

Battery Decisions

Full load current draw of the profiler was calculated by testing individual components in air under nominal and maximum loading conditions, and then calculating totals for the system. Current draw of arduino and peripherals is highest when transmitting. Max motor current is calculated at motor stall due to difficulties with replicating underwater forces on motor in air. Max LED current is calculated by turning all LED's to full white. The 8S1P NIMH battery pack (Fig. 1) was chosen since it is safely able to discharge 2A which is above the needed amount in maximum current draw scenario. The Battery pack of 8 1.2v AA cells has a nominal voltage of 9.6v and a maximum voltage of 12V when fully charged. This voltage allows quick response of the motor while also staying within MATE spec. Battery voltage is converted down to 5v for the arduino and peripherals by a buck converter.

Float Communication

When activated, the float creates an access point, like a router. The user can connect to it and load the web page interface in a browser. This control panel allows the user to set the PID values, the liquid density, and the steps for the profile.

Upon pressing the launch button, the info is sent via HTML requests. The float confirms receiving by sending a data point, then proceed to do each step of the profile. The possible steps are sink, surface, dive to a specific depth, and activate the LED.

At the same time, a data point is saved onto an SD card each second. The file has a different name each launch allowing the user to return to the data later.

Once the profile is completed, the float maintains the last instruction of the profile.

The user can then reconnect to it and press the "Get Data" button, which will display the data points of the last profile.

Fuse calculations and Float SID

Table 1.0 Full Load Amps Calculation for Fuse Size

Component	Voltage (V)	Nominal current (mA)	Max current (mA)	Current at 9.6V (mA)
Arduino MK1010 and Peripherals	5	142	396	206
Motor and driver	9.6	186	820	820
LED's	5	233	582	303
			Total	1329mA

Since the total current (1329mA) exceeds the maximum permitted fuse size of 1A, a 1A fuse was chosen.

