

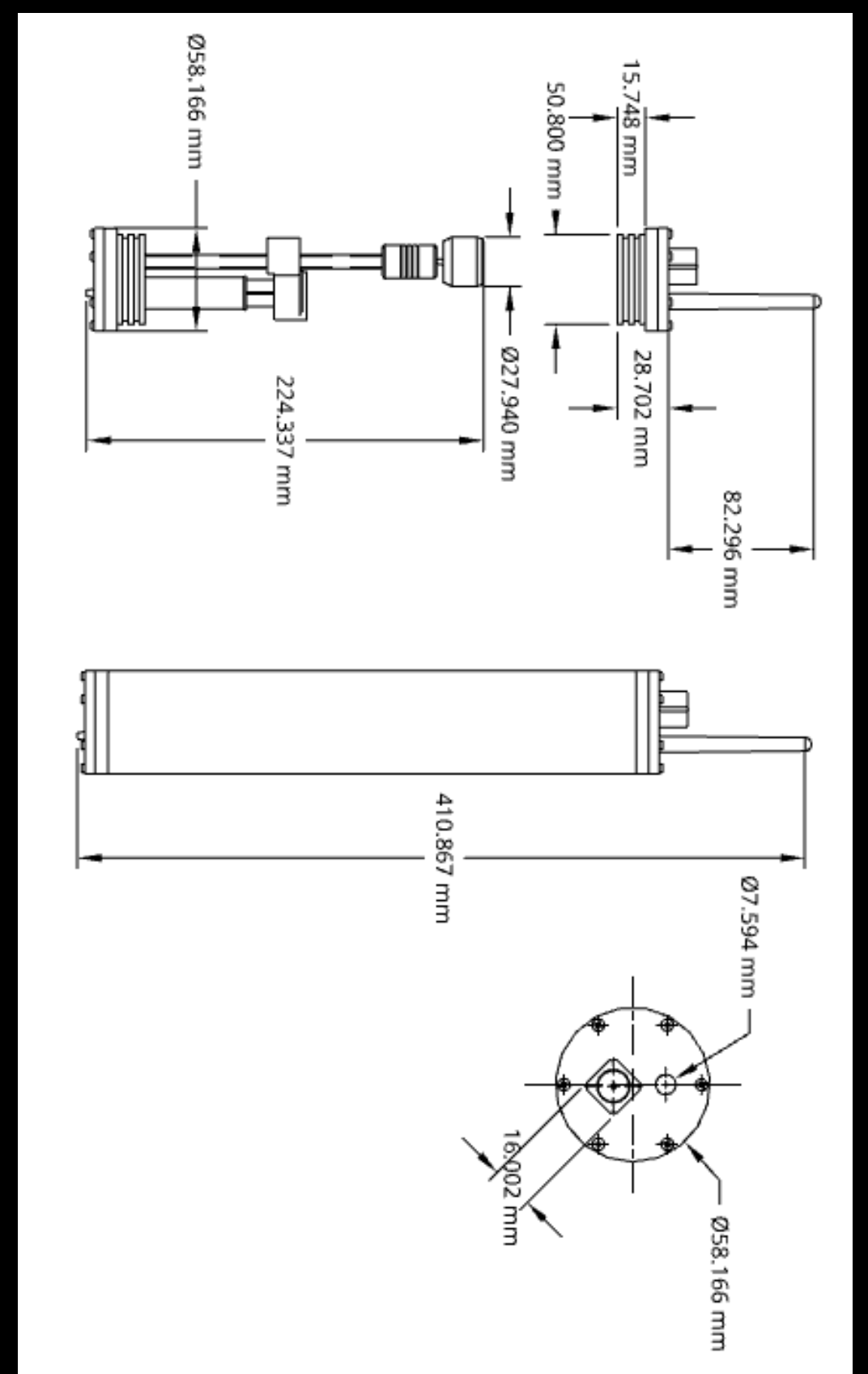
Mussel Cyclone Robotics

General Overview: Mussel is the fourth iteration of a vertical profiling float attempted by Cyclone Robotics. It weighs .876 kg. Its hull consists of an acrylic tube from Blue Robotics with 2 end caps made of acrylics. It costs around \$500 and is very mobile as it's a tube with 50 mm diameter and 300 mm height. Equipment of the profiling float includes a Blue Robotics Bar 30 pressure/temperature/depth sensor and a buoyancy engine made up of a syringe and motor. The control system consists of an arduino portenta c33, a stepper motor driver, a 12V battery pack, and I2C converters.

Design and Function: The hull consists of an acrylic tube from blue robotics. We selected this hull for its strength, light weight, and small volume. The buoyancy is calculated using the formula $F = pVg$. Our lid hosts the sensor and the antenna. The pressure relief consists of o-ring flanges and a pressure relief vent. Our braces were custom cut from acrylic sheeting to hold our various components. We've selected a small 12V motor to power our syringe drive buoyancy engine. The motor draws the plunger on the syringe up and down, varying the amount of water inside the float and thus causing it to move up and down over time. We've chosen to make the float slightly positively buoyant with the syringe empty so that if retrieval becomes an issue we can remove the water and it will come straight to the surface.

Electronics and Wiring: The electronics system of the Vert-Float is centered around an Arduino Portenta C33 microcontroller. The 12V battery connects to a fuse and then to a screw strip, which distributes power to both the stepper motor driver and a 12V-to-5V buck converter. The buck converter supplies power to the Portenta C33, which outputs variable 3.3V signals to both the I2C converter and the stepper motor driver. The I2C converter powers and communicates with the sensor at 3.3V, while the stepper motor driver controls the motor using variable 12V power. The electronics are all hooked up with a 5V fuse to avoid any dangerous burn outs of components and such. Our code, written in Arduino IDE, uses a series of while loops that monitor depth readings from the sensor. These readings trigger the float's descent and ascent cycles. Once the descent is completed, the collected measurements are transmitted to the LightBlue app.

Operation: Using the float is very simple. To begin, the end cap must be screwed on. Care should be taken to ensure a proper seal on the cap. Next, a technician should place the float in the pool, taking care to avoid falling in or placing the float sideways. Then, the light blue app should be connected to the portenta and the key (1) should be input to trigger the descent. From there, data should be recorded periodically. After the float completes 2 profiles, the technician should remove the float from the water.



Mussel CAD by
Anna Blackwell



Mussel full view
by Ryan Darnell