

Squirt Vertical Profiler

Non ROV Device Design Doc

Design Philosophy

The original design philosophy of Squirt was to create a vertical profiler that is made out of readily available materials using basic tools and simple techniques that could possibly be developed into a kit that can be used for outreach

Mechanical Design

Squirt, is an underwater vertical profiler that is constructed from standard pvc fittings with a **buoyancy engine based on a modified slide repair coupling that is driven with a gear motor sliding in and out changing the profiler's volume.**

Pressure relief is provided by a slip-o-ring fitting built into the slide repair fitting that is designed to open in the event of over pressure. Adjustable Ballast is provided by stainless steel washers located in the lower part of the buoyancy engine that can be easily replaced.

Access to the enclosure is provided by an acrylic top plate located in a PVC union fitting and at the split between the Buoyancy engine and Float Body.

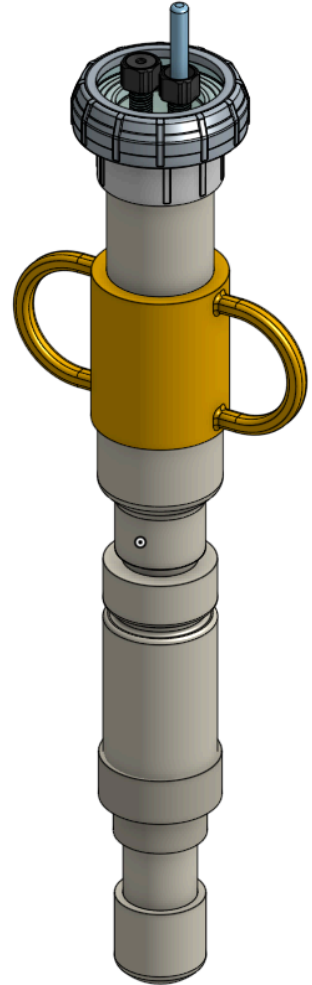
A 3d printed fitting is bonded to the outside with u-bolt shaped grabs at around 2in to allow for easy recovery by ROV assets

Electrical Design

Squirt Utilizes 2 ESP32C3s completing two separate tasks. The main ESP32 interfaces with the pressure sensor and the external antenna to communicate with the base station while computing the buoyancy engine position required to reach and maintain depth. While the second ESP32 is used as a motor controller taking in the desired position, limit switch, and encoder feedback then using a PID loop to command the motor driver to move the gear motor. These functions are separated to allow a more simple programming experience of the Main ESP32. Allowing the profiler to be programmed easily during workshops and outreach.

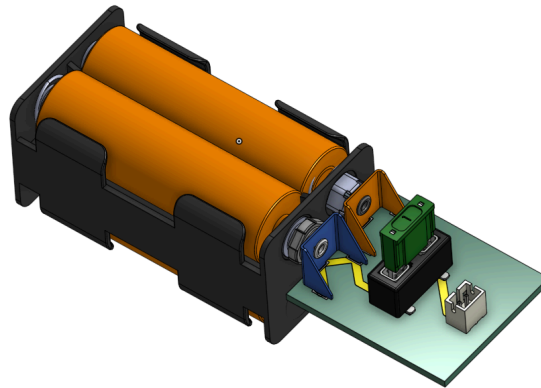
The battery pack is 4xAA batteries placed in a standardized battery holder able support the current and voltage requirements. This is then connected to a custom PC that contains the a industry standard 1amp Minifuse sized to adequately protect the vertical Profiler.

Communication is done through the Main ESP32 using ESP NOW, a broadcast style wifi packet radio standard that allows for easy communication with the top side. A profile cycle is initiated with a profile command then data is transmitted with a data request command



Safety Requirements Verification:

ELEC-NRD-001: The Vertical Profiler is entirely powered from a 4.8V nominal battery pack comprising of 4xAA NiMH Batteries placed in a battery holder with 9V battery clips. A Power fuse board is directly connected to the 9v battery clips with a 1amp mini Fuse. These fall below the



ELEC-NRD-002: The vertical Profiler makes use of a buoyancy engine and does not contain thrusters or any cameras complying with the requirement

ELEC-NRD-003: Batteries are 4xAA NiMH Batteries that are fused at 1 amp below the maximum of 2A for AA NiMH Batteries

ELEC-NRD-004: Batteries are fused with a 1 amp Mini fuse colored black consistent with industry color codes and is within 1.5 cm of the battery positive terminal connected to a PCB that is directly connected to the battery.

Maximum of 12v and 5Amps

ELEC-NRD-005: The full load amps value is estimated to be as shown in Table 1 below

Mode	Full Load Amps (mA)
Loitering/Transmitting	>100ma
Activated Motor Mode	500ma

ELEC-NRD-006: Pressure relief is provided by a slip-o-ring fitting built into the slide repair fitting that is designed to open in the event of over pressure. The diameter is approx 26mm at that point