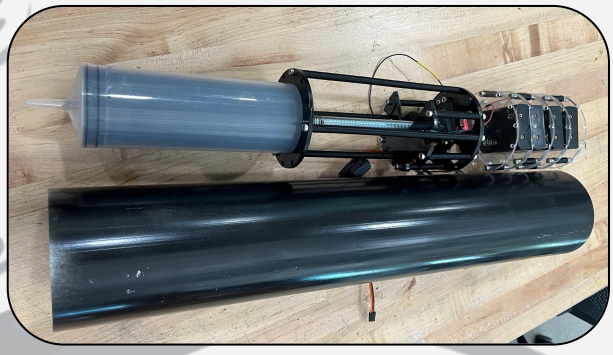
Night Owls
Vertical Profiling Float

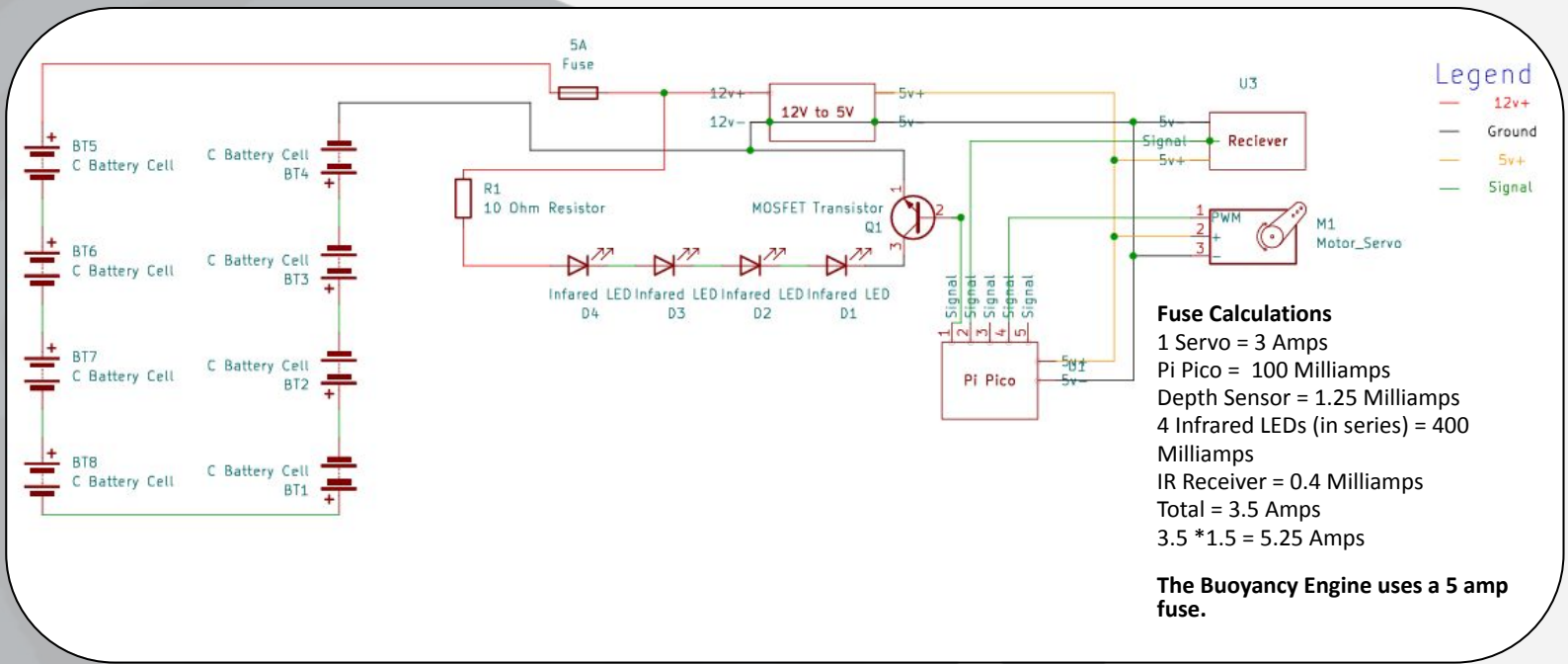
The buoyancy engine consists of six main parts: the engine itself, a depth sensor, a Pi Pico, a custom PCB, a battery, and an infrared LED array. This year, a larger buoyancy engine was chosen over last year's model, which only displaced 50 ml. The small displacement of the previous engine required precise tuning to the water chemistry, resulting in inconsistent performance. The new engine is designed to displace 500 ml of water, accomplished using a 500 ml syringe powered by a 35 kg continuous servo. Two redundant limit switches in the syringe ensure the accurate travel distance needed to displace the desired 500 ml of water, enhancing the float's reliability.

A Blue Robotics depth sensor is used to measure pool depth, with the sensor data transmitted to the surface via the infrared LED array, allowing for graphing of depth over time. Additionally, an infrared receiver is used to wirelessly turn the engine on and off, conserving battery power when the engine is not in water. All components are managed by a Pi Pico with a custom PCB for organization. To handle the high amperage draw of these components, a custom 12V battery was created using eight C batteries in series. This setup allows the infrared LEDs to run at 12V while other components operate at 5V. The buoyancy engine requires a 5 amp fuse, placed after the battery and before any power distribution.



Inside Components of Buoyancy Engine, photo by Isabella Wong.

Buoyancy Engine, photo by Ava Palazzolo.



Fuse Calculations
1 Servo = 3 Amps
Pi Pico = 100 Milliamps
Depth Sensor = 1.25 Milliamps
4 Infrared LEDs (in series) = 400 Milliamps
IR Receiver = 0.4 Milliamps
Total = 3.5 Amps
3.5 *1.5 = 5.25 Amps

The Buoyancy Engine uses a 5 amp fuse.