GO-BGC Float Design

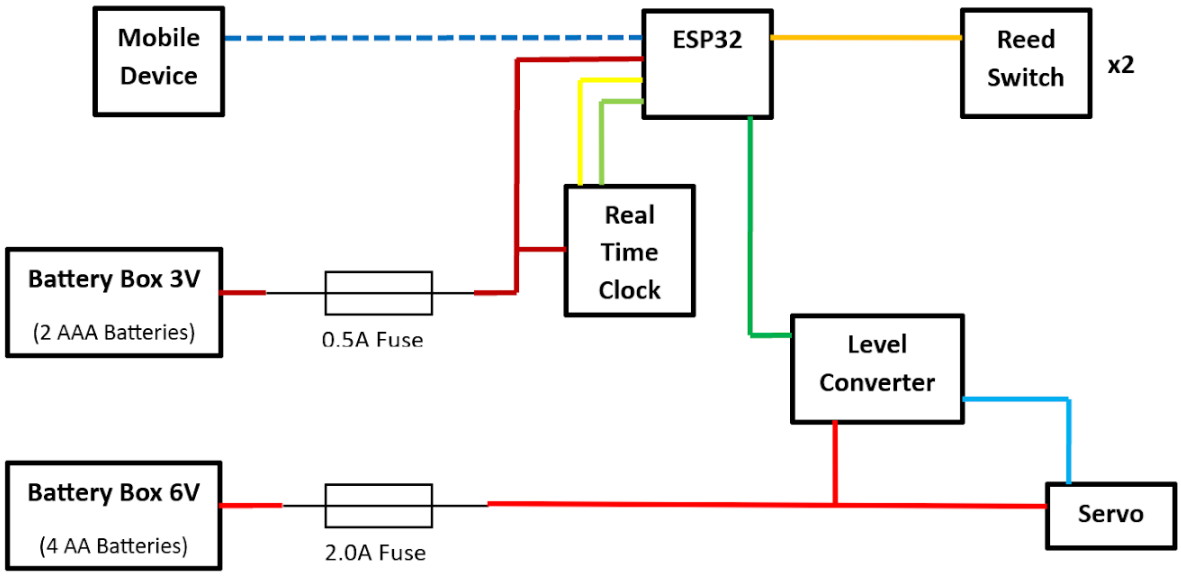
The Southwest Virginia Community College Robotics GO-BGC float is constructed from 4” PVC pipe roughly 2.5’ (30.48cm) in length with one 4” PVC test plug cap on each end. Inside the float is a 500ml syringe with plunger attached to a ¼ x 20 all thread rod. Threaded onto the all thread rod is a nut with a 3D printed gear around it; the nut will be captured between two plates preventing it from moving, thus forcing the plunger to move up and down in reference to the nut. The gear around the nut is meshed with the gear on the 360-degree servo, which results in a 3:1 gear reduction, giving the float more than enough torque to fill and empty the syringe of water. The gear reduction also reduces the workload of the servo, which in turn lowers the current draw and keeps the servo at a lower operating temperature, which increases the efficiency of the servo. To prevent the plunger from traveling too far and binding the servo up, our team decided to place magnets around the outside perimeter of the plunger and a reed switch on each end of the syringe. When fully extended or retracted, the magnets on the plunger would trip the reed switch, causing the ESP to stop the movement of the servo so that the servo would not put itself into a bind and no damage would occur. The servo is controlled by an ESP32 with Bluetooth and Wi-Fi capabilities. While the float is on the surface of the water, the user is able to connect via Bluetooth to the ESP32 and control the descent of the float as well as receive the current time from the on-board real time clock. In order to power the float our team used two AAA batteries for the ESP32 and four AA batteries to power the servo. Both power supplies are fused separately based off of their individual current draw and have their grounds tied together.

Figure 1: CAD rendering of GO-BGC float

Figure 2: Constructed GO-BGC float

Figure 3: GO-BGC float encased in PVC tube

GO-BGC Float SID



Legend

- 6V
- 3V
- Bluetooth
- SDA line
- SCL line
- Servo Signal
- Converted Servo Signal

Fuse 1 Calculations

1 Servo, 1.25A each = 1.25A

Total = 1.25A

1.25A x 150% = 1.875

Fuse Used = 2.0A

Fuse 2 Calculations

1 ESP32, 0.25A each = 0.25A

1 Real Time Clock, N/A

1 Level Converter, N/A

2 Reed Switches, N/A

Total = 0.25A

0.25A x 150% = 0.375

Fuse Used = 0.5A