Float – Non-ROV Device

Kelpie Robotics developed a vertical profiling float in order to meet contract requirements. This vertical profiling float operates using AA batteries, a pressure transducer, a float switch, a linear actuator, and 200mL syringes (SID and concept diagram found below).

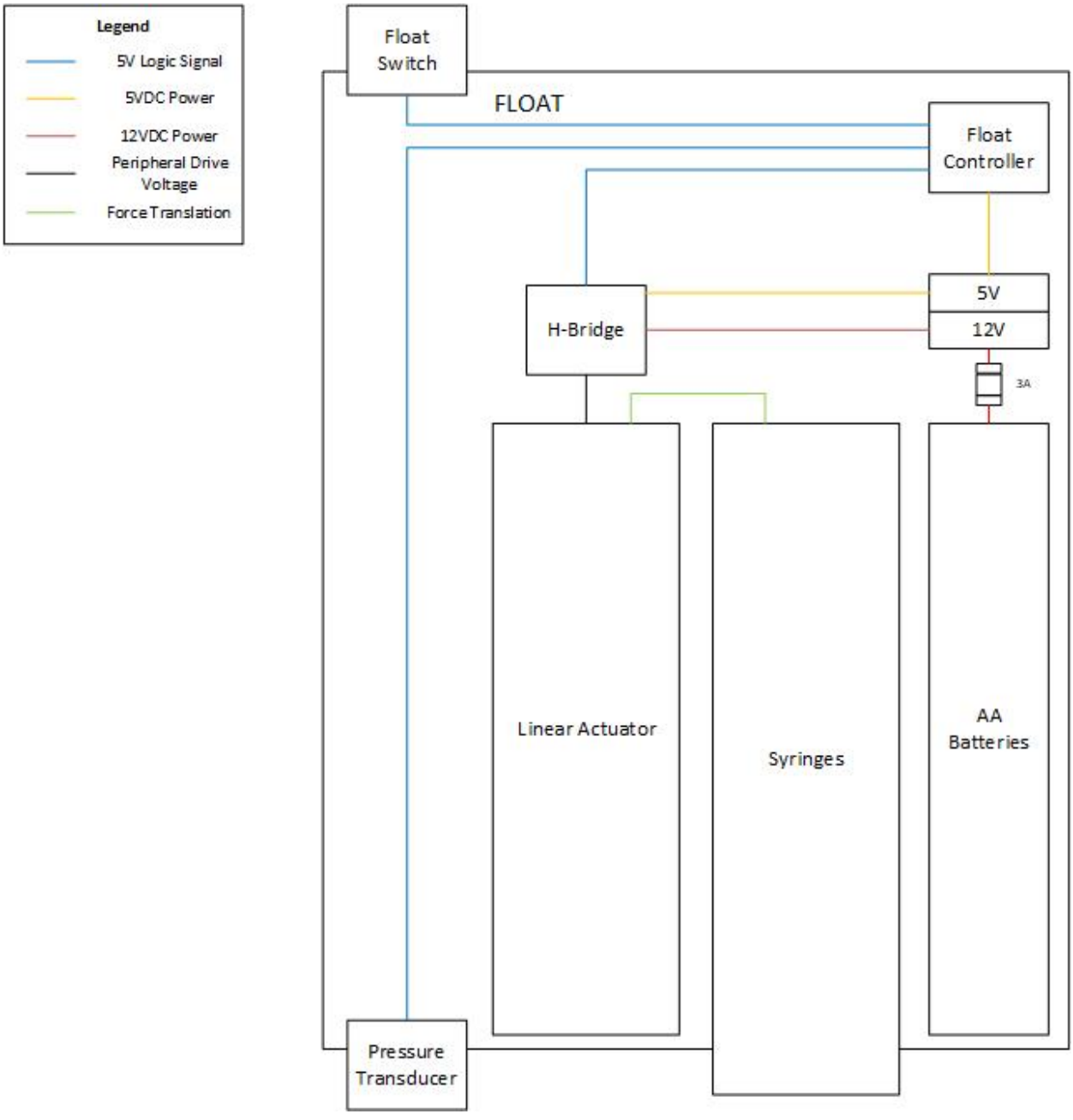

Figure 1 – Float SID

Figure 2 – Float concept CAD (internals only, some parts modelled to low degree of accuracy)

Float fuse calculations:

Linear actuator power draw: 1.3A @ 12V = 15.6W
Arduino Nano max power draw: 200mA (assuming all pins delivering max current) + 2.4mA (for microprocessor) = 202.4mA @ 5V = 1.012W
Pressure Transducer: powered by Nano, thus ignored by this calculation

Total power draw = 15.6 + 1.012 = 16.612W

Max current draw = 16.612W * 150% / 12V = 2.07A

Due to this, we went with a 3A blade fuse.

The float uses the following logic in order to perform vertical profiles:

- On startup, the float enters the “SURFACE” state, where it polls the float switch performing a rolling average until it receives a consistent enough signal indicating that the float is above the surface to enter the “DESCENDING” state.
- Once in the “DESCENDING” state, the float controller sends a signal to the linear actuator to push, filling the syringes with water and causing the float to sink. While sinking, the float polls the pressure transducer on a set interval to determine if the water pressure has increased enough to constitute considerable movement. If the pressure difference is below a certain threshold, the float enters the “BOTTOM” state.
- Once in the “BOTTOM” state, the float polls the pressure transducer for pressure differences performing a rolling average to confirm that the pressure is staying within a certain small enough threshold to consider the float stationary at the bottom of the pool. At this point, the float enters the “RISING” state.

- Once in the “RISING” state, the float controller sends a signal to the linear actuator to retract, emptying the syringes of water and causing the float to rise. While rising, the float polls the float switch until it receives a signal indicating that the float is at the surface, at which point it re-enters the “SURFACE” state and re-starts the cycle.

A state machine can be found below illustrating the logic used by the float controller.

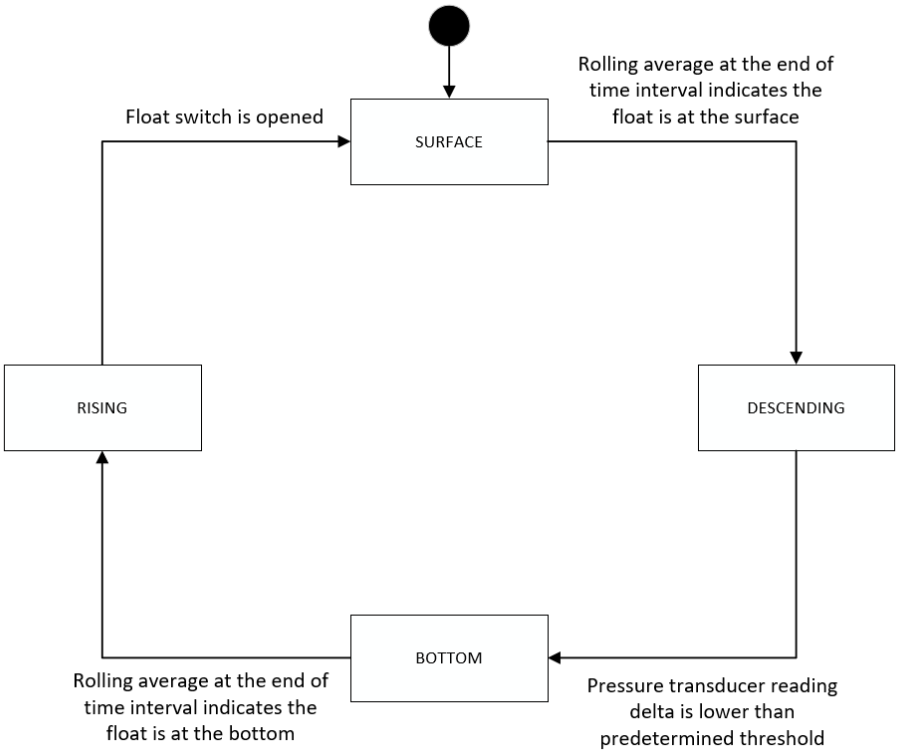

Figure 2 – Float State Machine