NON-ROV DEVICE DESIGN DOCUMENT

Buoyancy Engine

The movement of the float is powered by the buoyancy engine. The engine mechanism is driven by a DC motor and a water-sealing piston. By changing the piston's position, the volume of the closed compartment of the float decreases. In terms of buoyancy force (i.e., FB =(gravitational constant) × (density of water) × (volume of container), the buoyancy force of the float will decrease, and the gravitational force acting on the float will cause it to sink into the water until the buoyancy force and gravitational force are equal—and vice versa.

Figure 1. Non-ROV Device

Float Communication

The float communicates with the shore via a radio signal. The collected data is formatted into a graph and converted into an NTSC video output signal. Then, the video signal is broadcast via the TS5823 transmitter on a specified radio frequency. This broadcasted radio signal is received by the monitor on the shore, which displays the data on the screen. Before performing any diving task, the float will remain on the surface and broadcast a radio signal to the shore for 20 seconds to establish inital communication.

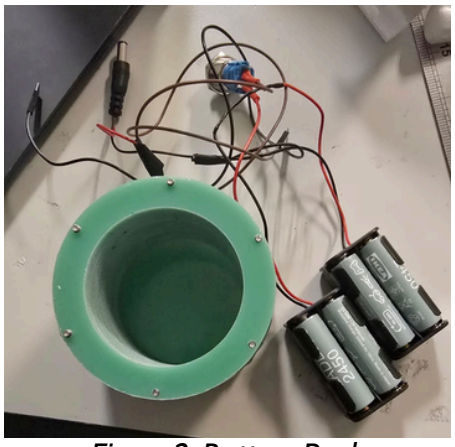

Figure 2. Battery Pack

Figure 3. 32V 3A blade fuse

Battery Safety

The battery pack's output is intended to be 12V and 2A, with 8 NiMH batteries connected in series. When there is short circuit, it is protected by a 32V 3A blade fuse. The battery pack's output is 12V and the highest voltage of the components is 12V. Additionally, the float device's full load current requirements are about 1.8A, which is less than the battery pack's maximum current of 2A. As a result, in normal situation, the battery pack can manage the float device's entire load current and voltage requirements, and the blade fuse ensures operating safety.

System Interconnection Diagram (SID) of Non-ROV Device

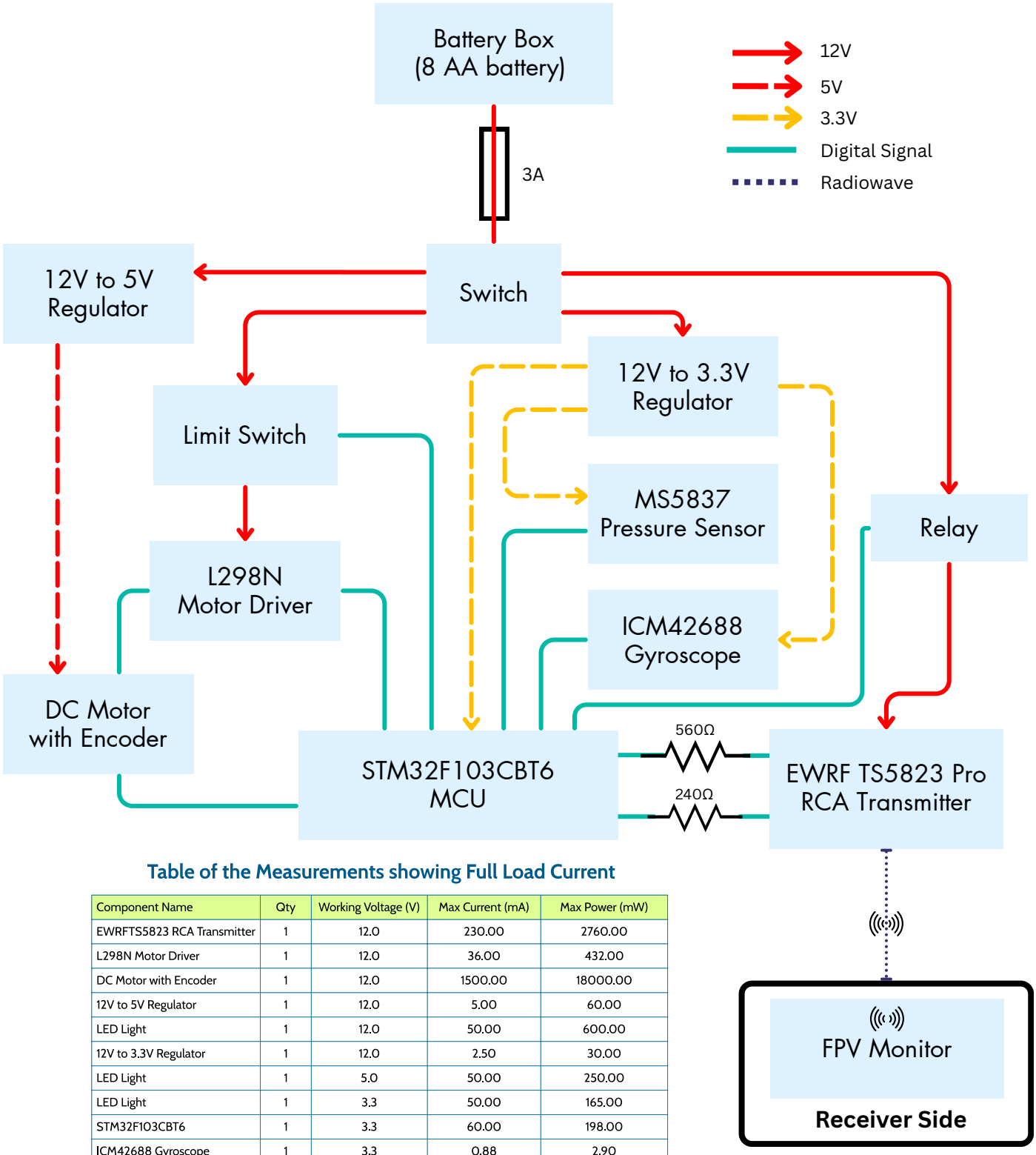

Table of the Measurements showing Full Load Current

Component Name	Qty	Working Voltage (V)	Max Current (mA)	Max Power (mW)
EWRFTS5823 RCA Transmitter	1	12.0	230.00	2760.00
L298N Motor Driver	1	12.0	36.00	432.00
DC Motor with Encoder	1	12.0	1500.00	18000.00
12V to 5V Regulator	1	12.0	5.00	60.00
LED Light	1	12.0	50.00	600.00
12V to 3.3V Regulator	1	12.0	2.50	30.00
LED Light	1	5.0	50.00	250.00
LED Light	1	3.3	50.00	165.00
STM32F103CBT6	1	3.3	60.00	198.00
ICM42688 Gyroscope	1	3.3	0.88	2.90
MS5837 Pressure Sensor	1	3.3	1.50	4.95

Full load amps for waiting mode (mA)	449.88
Full load amps for buoyancy change mode (A)	1.99
Power consumption for waiting mode (mW)	4070.85
Power consumption for buoyancy change mode (W)	22.50
Fuse calculation (150%) (A)	2.98
Fuse size (A)	3.00

The full load amps in water for non-ROV device is 1.99A and a 32V 3A blade fuse is used.