Overview

The Autonomous Underwater Vehicle Interdisciplinary Club (AUVIC) competes in an annual international competition where teams build autonomous underwater vehicles (AUVs) to complete an underwater obstacle course. AUVIC is in need of a new power and battery management board for the 2021 Autonomous Underwater Vehicle (AUV).

Specifications

The power board should have the following main functions

Battery Management

- Input voltage range should be 18V to 28V
- Should use two 6 cell LiPo batteries as its power source. The battery currently used by AUVIC is the MultiStar12000mAh 6S 10C Lipo Pack XT90
- Should have the ability to monitor battery pack voltage, individual cell voltage and pack current
- Should have LEDs to indicate if the battery is connected
- Should have the ability to run the two batteries in parallel to use the full capacity of the batteries
- Each battery should have fuses. 80A regular sized automotive fuses are recommended

Power Distribution

- Output voltages:
    - 5V: 1A; general purpose; to power external 5V systems
    - 12V: 5A; general purpose; to power external 12V systems
    - 16V: 3A; dedicated for AUV computer
    - Vbatt: 60A; general purpose; to power external HV systems
- Should be able to switch on/off all external power using the microcontroller
- Should have the ability to monitor current for each output
- Should have LEDs to indicate if the output is on or off
- Each output should have fuses. Regular sized automotive fuses are recommended

Microcontroller, Communication

- Should use a STM32F413 microcontroller
- Should use a CAN bus to communicate to external systems. CAN 2.0 Low Speed should be used
- Should have a RS232 transceiver to communicate with a IMU
- Should have LEDs connected to the microcontroller for debugging and to show system status

Sensors

- Should connect to a reed switch to power on/off the AUV
- Should connect to a water sensor to detect leaks in the AUV's housing
- Should measure internal pressure, temperature, and humidity
- Should connect to an external water pressure sensors used to determine the AUV's depth in the water