Functionality

The Motorvator's Low Voltage Power Supply is a compact and rechargeable, dual-output power supply that will assist the Aztec Electric Racing team by powering the vehicle's on-board, low-voltage electronics during competition. The internal battery management system protects the power supply against short circuits, overcharging and over-discharging, and damage from high temperatures. The microcontroller interfaces with the BMS integrated circuit through the I2C protocol and data bus to extract and process power supply data, namely voltage, current, and temperature. This data will be sent to the built-in display to indicate when the power supply must be charged and to allow the AER team to determine the current status of the device. As a backup storage, the microcontroller will also write this data to a log in the micro-SD card.

Inputs and Outputs

As an external input, The AC-DC wall adapter provides direct current to the battery cells, allowing for easily rechargeable functionality from any standard 120V or 240V AC outlet. As an external output, the six 18650 lithium ion battery cells shown in the diagram of the device outputs 24V at a max of 10A and 12V at a max of 5A to the AER race car's low-voltage electronics. Internally, these cells also supply 3.3V to power the ESP32 microcontroller through the ground and header pins as well as supplying 3.3V to the TI-BQ769 series BMS IC through the wires outlined in the diagram. The BMS outputs digital data encompassing voltage and current levels as well as temperature to the data bus from which the microcontroller reads and processes using the I2C protocol. The microcontroller then outputs this digital data to a micro SD breakout board using the serial peripheral interface (SPI) protocol. This micro-SD card stores power supply information that can be extracted and read through an external computer. The microcontroller is also responsible for outputting the digital data to the lcd screen for display using the I2C protocol once again.