The low voltage power supply will be built about inside 3.4 inches by 6.7 inches container to follow FSAE Rule guidelines, and we have a budget of 1,000 dollars. The battery management system inside the container powers on the dual output for 24 V at max 10 A and 12V max 5A. The components procured for the low voltage power supply include BMS(Battery Management) IC(Integrated Circuit), ESP 32-S2 Development Kit, cell stacks, data bus, power adapter(AC-DC wall adaptor), dual port to power the SAE race car, SD card, SD Card module, and voltage regulator. We will also procure additional subcomponents needed to support the main components, including power MOSFETs, current sense resistors, resistors, thermistor, fuse holders, Icd wire, momentary switch, Schottky diodes, complementary capacitors, barrel jack, and Deutsch connector. We will develop our own embedded software to control and support components like the ESP 32 microcontroller, data bus, and potentially our android app.

BMS IC

Our BMS(Battery Management system) has multiple requirements, including battery cell charging, battery cell discharging, and temperature readings of the battery cells, and to be able to meet these requirements, we need to procure the BMC IC. The BMS IC has EEPROM(Erasable Programmable Read-Only memory) capabilities and a control unit that will be needed as part of our development to store information like displaying temperature readings, and it's also compatible with our microcontroller. Also, building our BMS through the assistance of essential components like BMS IC allows us to become more familiar with Battery Management Systems.

ESP 32-S2 WROVER Development KIT

Our low-voltage power supply needs a microcontroller compatible with our BMS IC. The ESP 32-S2 WROVER development kit will be procured one of the reasons being because the ESP32-S2 WROVER Development kit is compatible with our BMS IC. Also, the ESP32-S2 WROVER can be configured to provide functionalities needed for our development, including ADC and DAC. Also, The ESP 32-S2 WROVE development kit comes with an ESP 32-S2 module that SoC with IO capabilities and 4MB of Flash, and 2MB PSRAM. Another benefit of this development kit is that we can provide the reflashable firmware we develop to the SAE team if they want to replace the MCU in the future. Also, while we can technically make our own microcontroller from scratch that would distract from our objective of being able to build and maintain our BMS.

Lithium Ion cell stacks

We will procure more than 6 Lithium cell stacks because the BMS IC that we purchase depends on Lithium cell stacks. Also, the capacity of the batteries we need is about 200 Wh to ensure that the Low Voltage Power supply can be used during competition.

Data bus

We will develop/implement various data buses on our PCB (Printed Board Circuit) to interconnect our (slave) devices, including the BMS IC, SD Card Breakout Board, ESP32-S2 Development Kit(Microcontroller), and display to the host device.

Dual output Port to power SAE race car

The battery management system inside the container powers the dual output port, which powers the SAE race car's low voltage electronics at 24 V at max 10 A or 12V max 5A. The container (that will house the BMS) already has a dual output Port, so we do not need to procure or develop the output port.

DC to DC Conversion

We will procure a DC to DC Convertor to control the voltage and current, which will serve as a dual output to charge the car for 24 V at max 10 A and 12V max 5A, which will be done by splitting the voltage of the batteries into two different rails. Therefore, we will procure a DC to DC Convertor because our Low Voltage Power supply must have dual output capabilities.

Power Adapter (AC to DC wall Adapter)

We will procure an AC Power Adapter, which will be needed to recharge the batteries.

MicroSD card

We will procure a MicroSD card to read and collect data like the voltage, current, and temperature. The MicroSD is inexpensive and needed to collect and read data for our Low Voltage Power Supply Project.

SD Card Module

We will also procure an SD Card Module to facilitate the connection between our Micro SD card and Microcontroller.