PIRM II - Automated Battery Characterization

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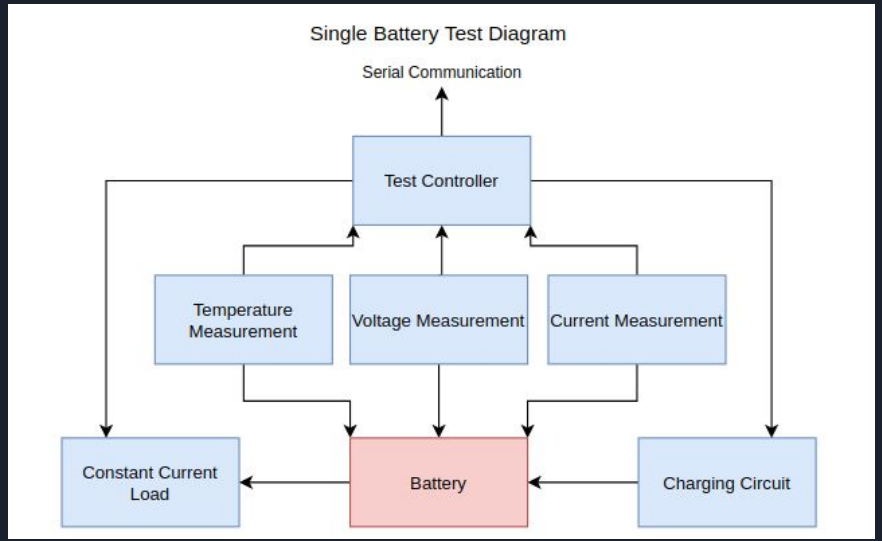
Project Overview - Recap

- Best performance with matched batteries
- PrISUm Solar Car currently does not have an efficient way of characterizing batteries on a battery pack scale.
    - Currently the procedure is to measure the open circuit voltage of each battery and group them based on that measurement.
- Process is time consuming on large scale (1000 or more batteries)
- We will design and build an automated lithium battery characterizer

Block Diagram - Recap

- Test Controller- Microcontroller
  - Will communicate with pi via CAN
- The micro will control charging/discharging
  - Enabling for each battery independently
- The micro takes all the information and sends it to a pi via CAN
  - The pi handles the user interface



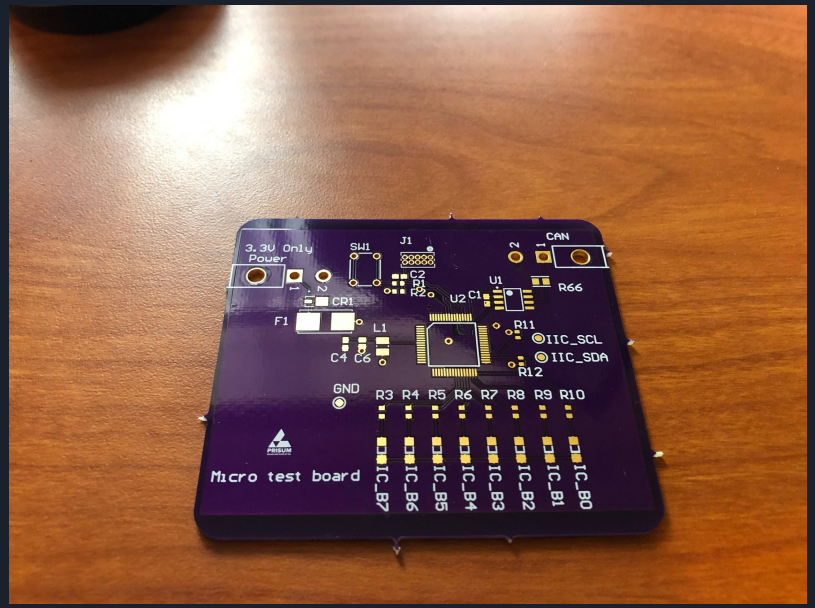
Current Status

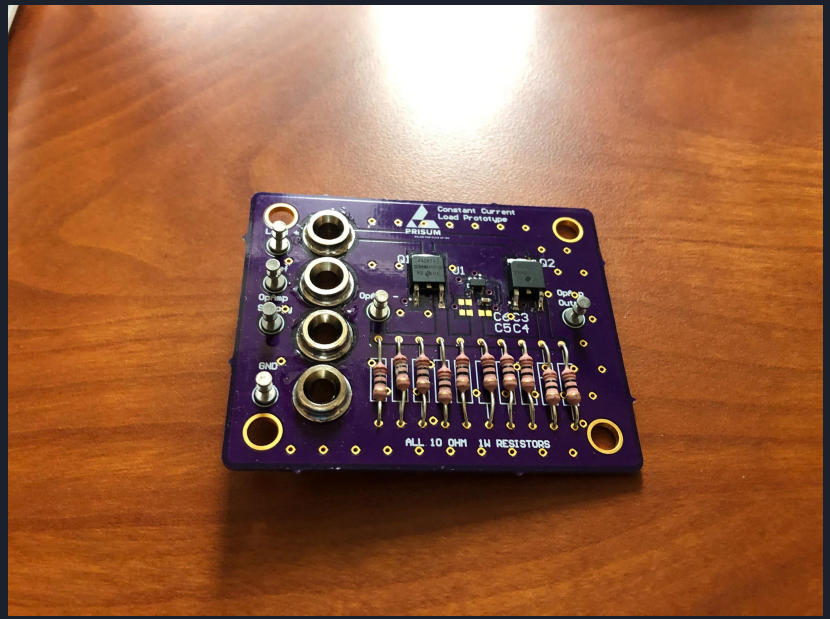
Hardware:

- A couple of prototypes have been ordered and tested
  - Microcontroller development board
  - Load Circuit
- Schematic for Rev 1 finalized
- Rev 1 PCB Layout Complete
  - Ready to order on 10/5/2020

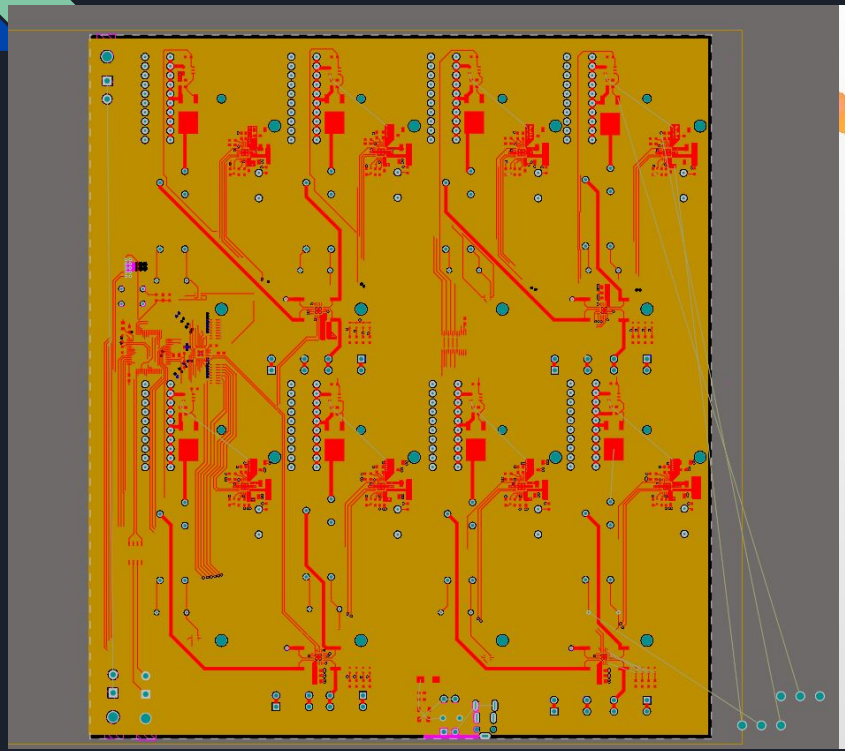
Software:

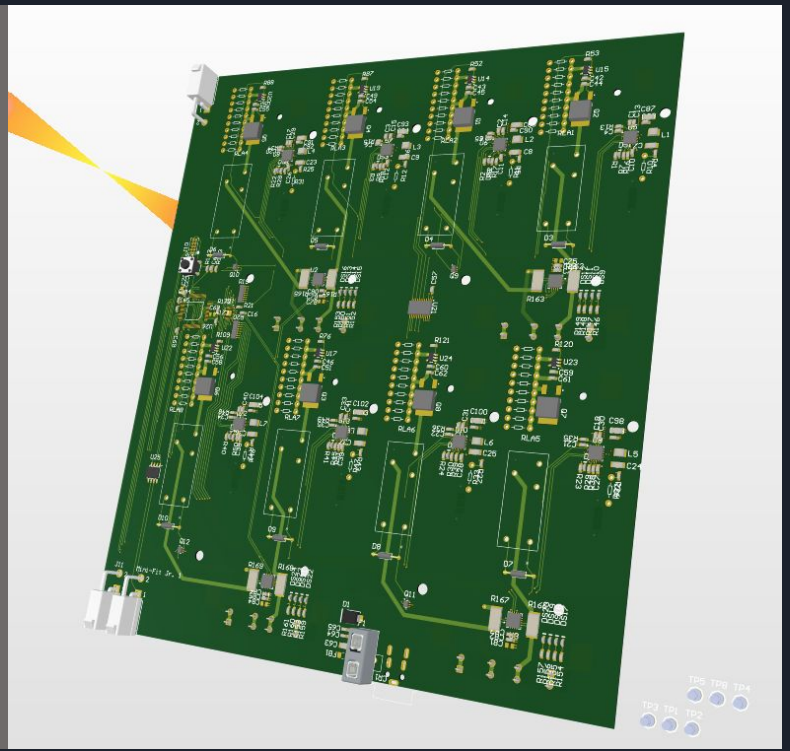
- Flask app setup and running
  - Including database
- Microcontroller communication libraries being written


3.3V Only
Power
SW1
J1
CAN
C2
R1
R2
U2
C1
U1
R66
CR1
F1
L1
R11
IIC_SCL
IIC_SDA
C4 C6
R12
GND
R3 R4 R5 R6 R7 R8 R9 R10
Micro test board
IC_B7 IC_B6 IC_B5 IC_B4 IC_B3 IC_B2 IC_B1 IC_B0

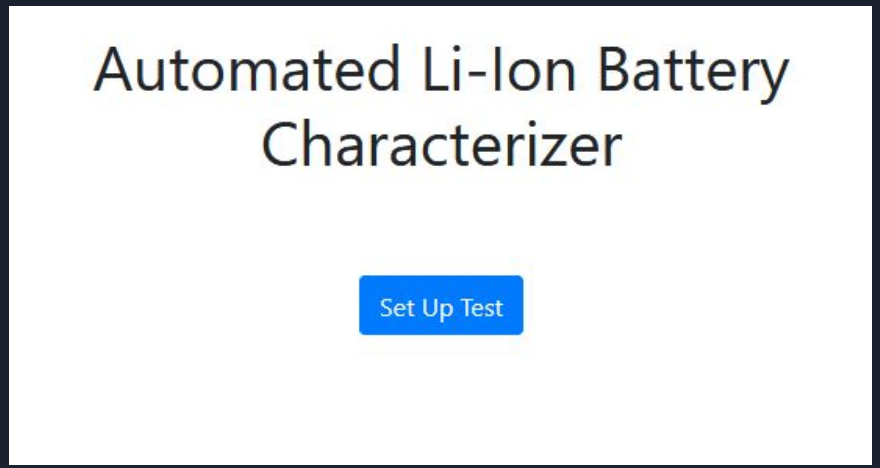

Constant Current
Load Prototype
PRISUM
Q1
Q2
C6 C3
C5 C4
GND
ALL 10 OHM 1W RESISTORS

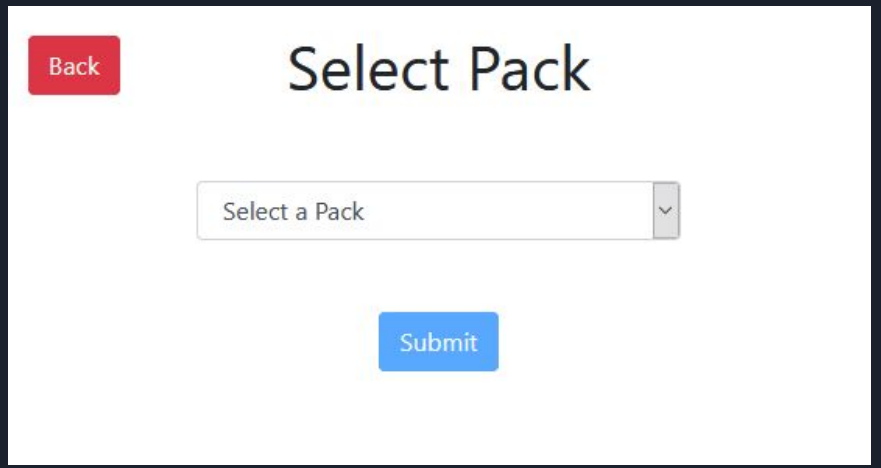
PCB Layout





Flask App


Automated Li-Ion Battery Characterizer
Set Up Test


Back
Select Pack
Select a Pack
Submit

Technical Challenges

- Board Layout
  - High current design
  - Thermal management
  - Physical Size of PCB
- Flask App
  - Two very different use case environments
    - PI - Touchscreen only, used for starting/stopping the test
    - Computer - More configuration options and fetching test data

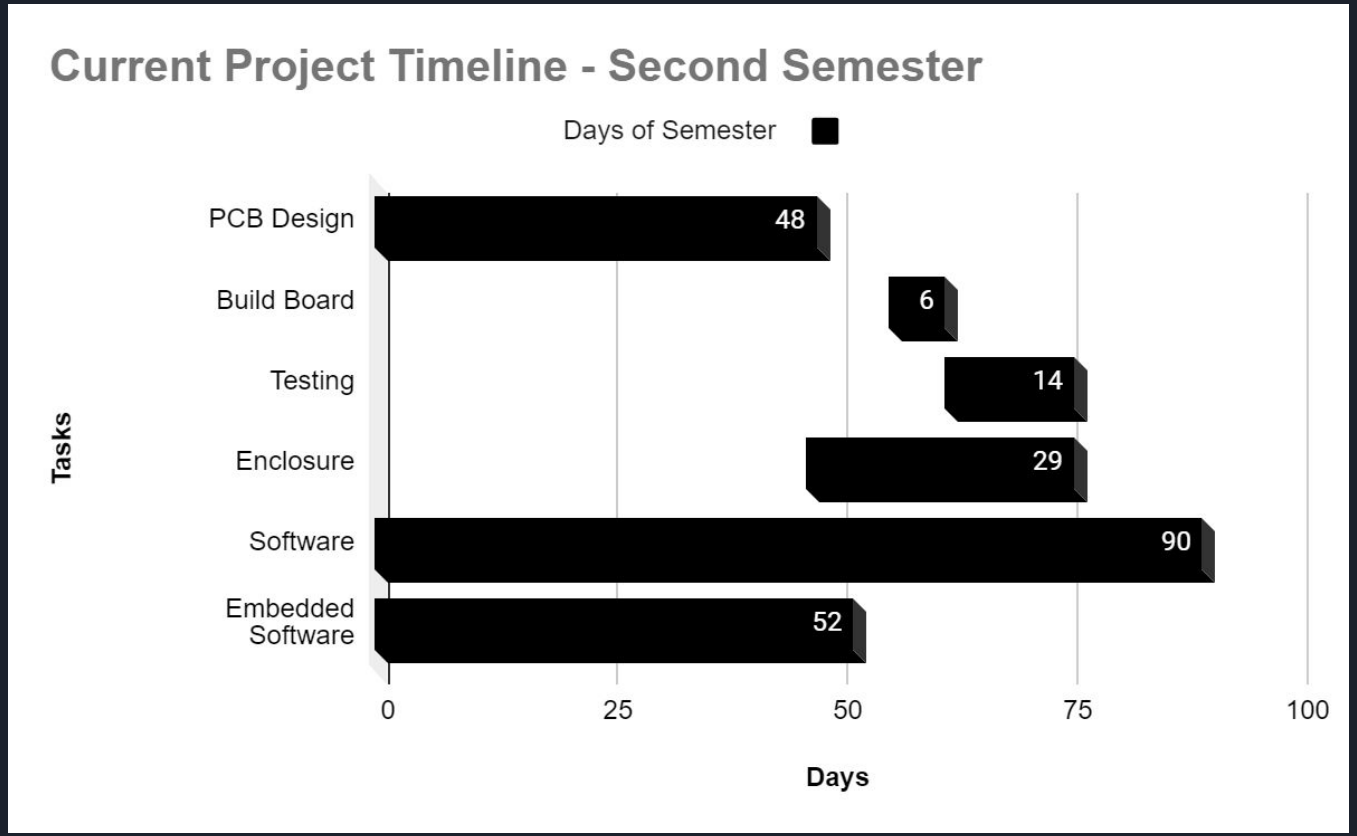
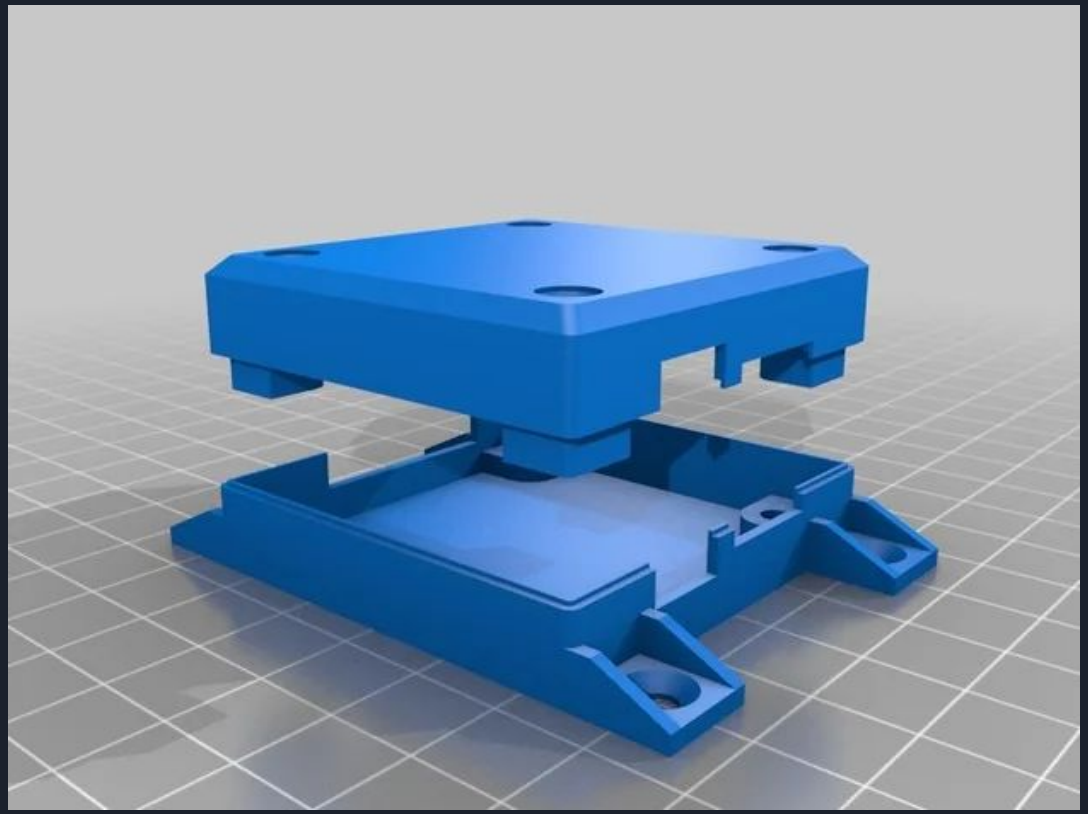
Semester Goals-Updated

- Have Revision 1 Hardware
  - Completed PCB design and have ordered rev1
- Completed Embedded Code
  - Code was started and currently in development
- Enclosure Designed
  - With finalized board dimensions, designing the enclosure has started
- Test Hardware
  - Will be done when rev 1 comes in
- Test Hardware and Software interaction
  - Will be done when rev 1 comes in
- Communicate between modules and app
  - Will be done when rev 1 comes in

Next Steps

- Hardware
  - Order Board and parts
  - Test Test Test Test Test
- Software
  - Create final firmware for batter characterizer
  - Communicate between modules and pi
  - Finish more pages for Flask app
- Enclosure Design

Timeline


Current Project Timeline - Second Semester
Days of Semester
PCB Design
Build Board
Testing
Enclosure
Software
Embedded Software
48
6
14
29
90
52
Tasks
0
25
50
75
100
Days

Enclosure