Hardware.Astronomy Housekeeping Box (h.aHKBox) Chassis

As Worked On By Adam Stammer

Context

Project Goal

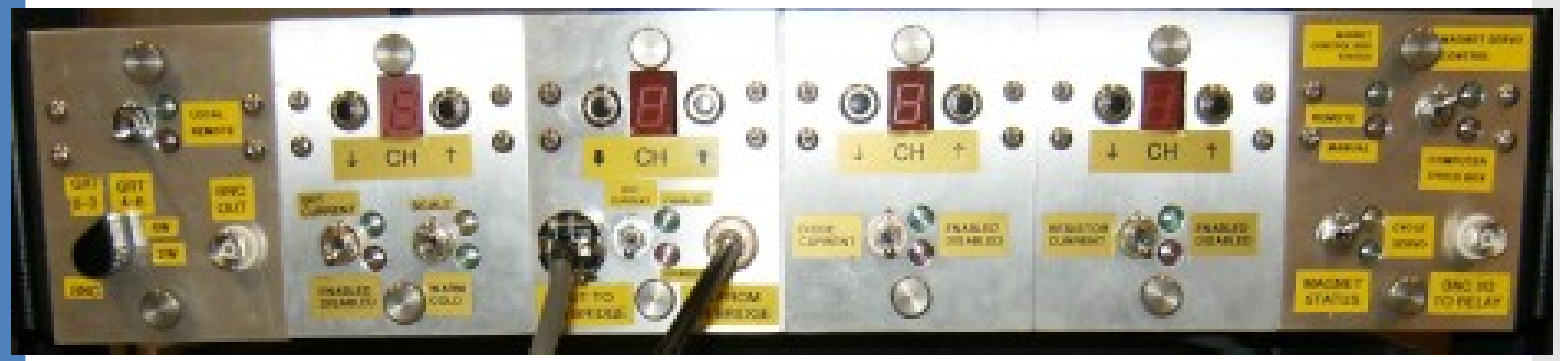
To design and build an open source, modular Eurocard system to be used as astronomical control/housekeeping equipment

To replace existing ZEUS2 housekeeping equipment with a cheaper, simpler, more robust system

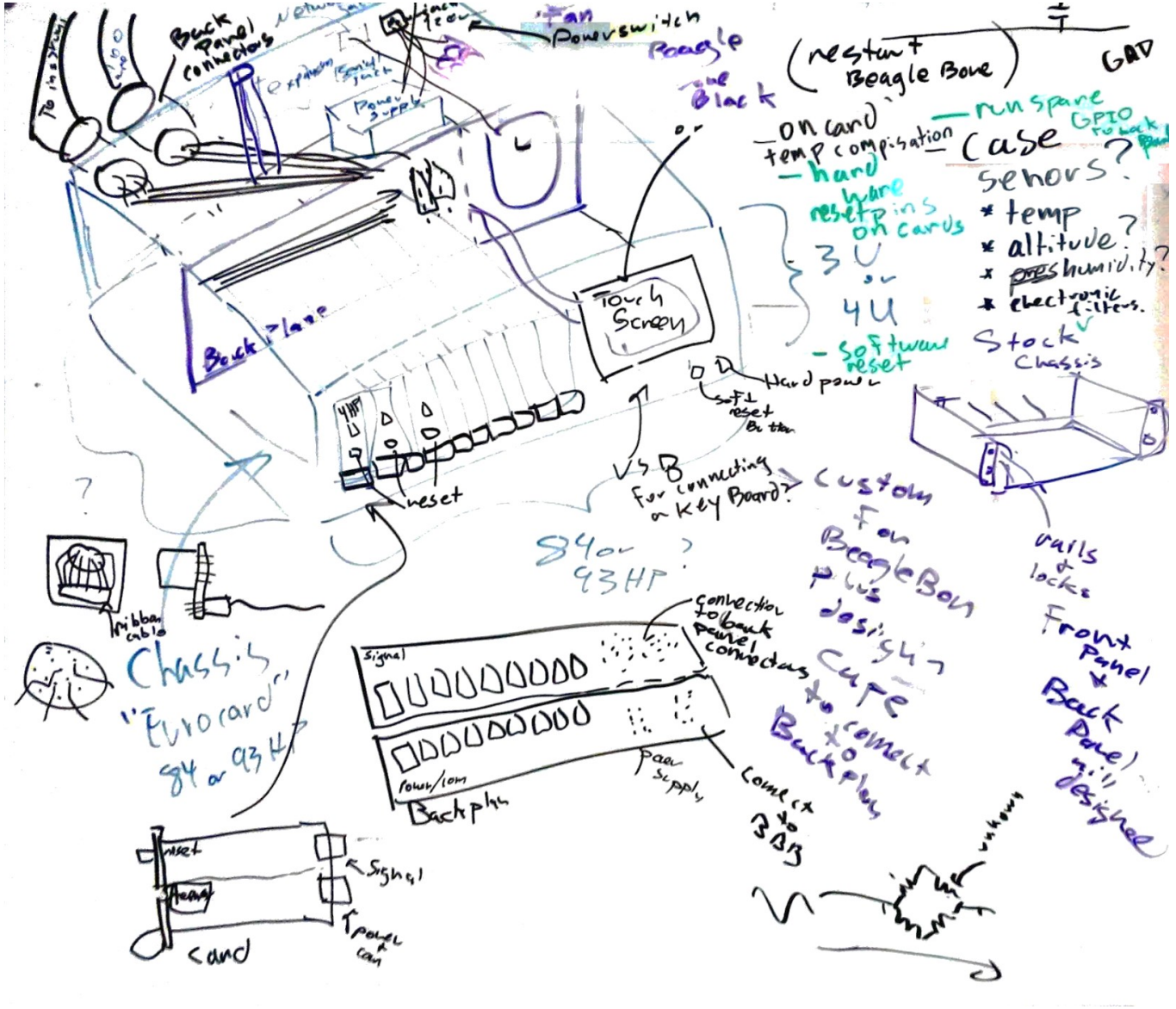
My Goals

- Design Prototyping Daughtercard (P-Card) to aid in development
- Design Eurocard Backplane to connect and control modular cards
- Choose Power Supplies
- Put it all together in the case
- Program Controllers as foundation for card interaction

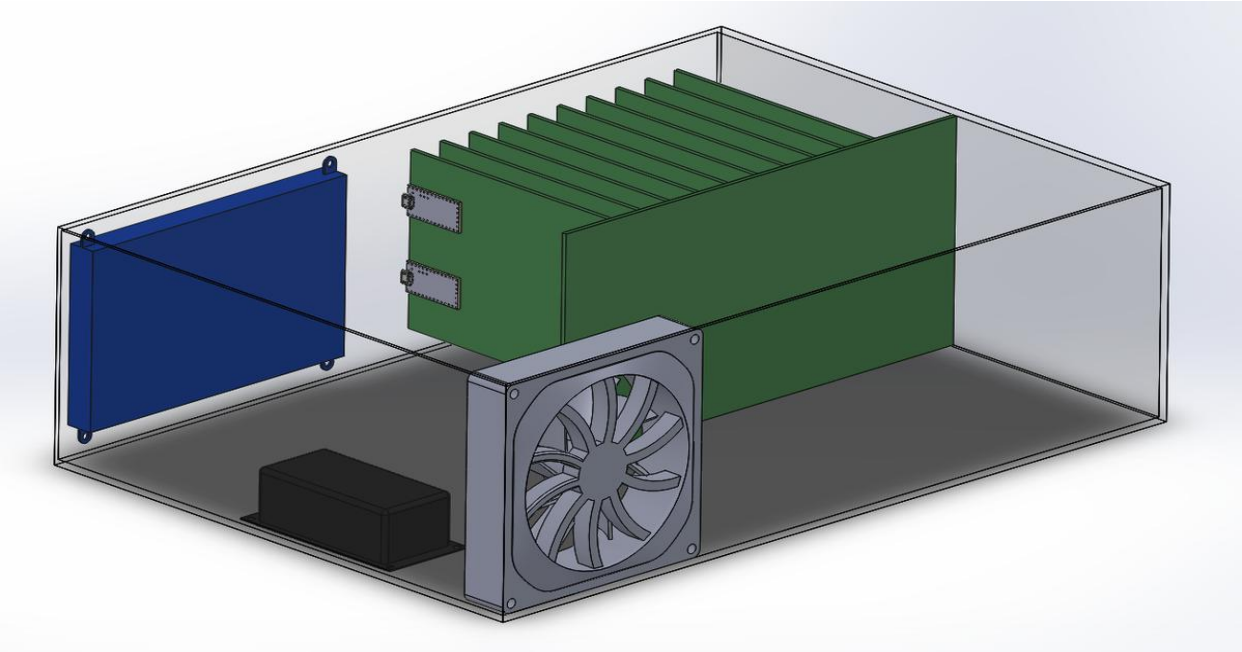
Existing Housekeeping Equipment

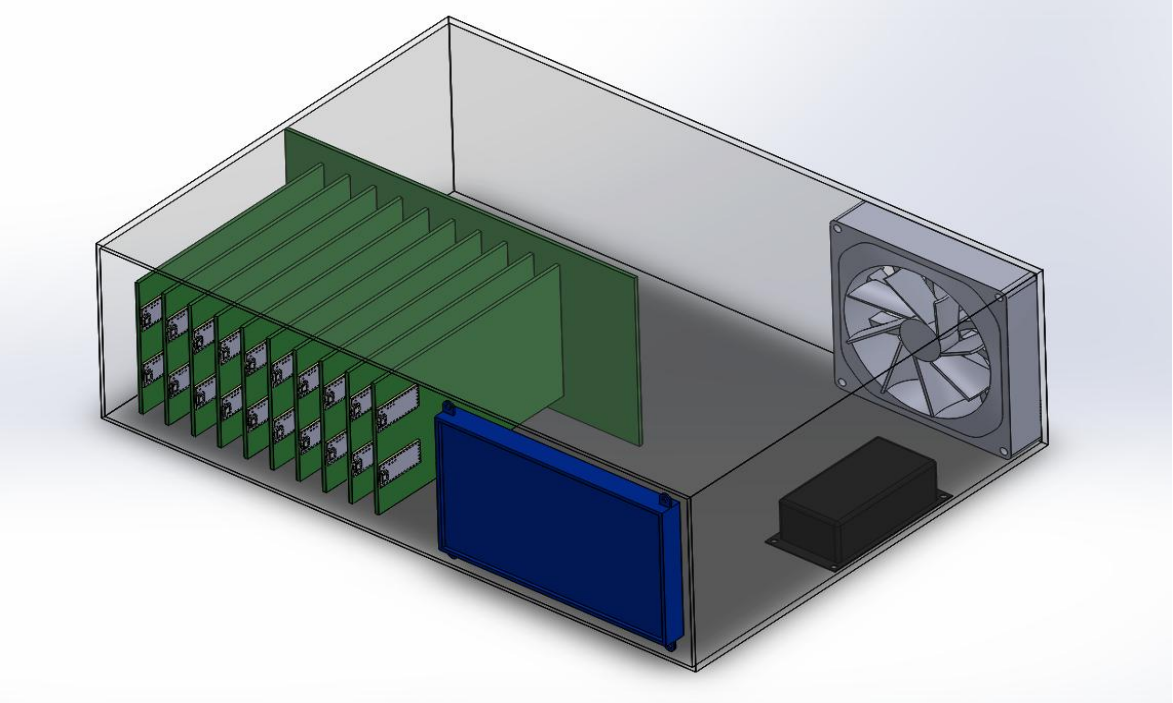


Whiteboarding of the H.aHK Box



Draft model of H.aHK Box





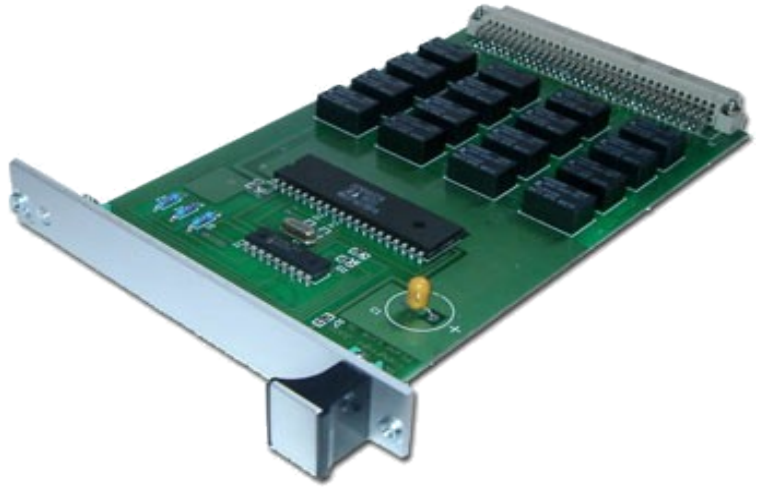
Blue = touch screen

Black = power supply

Grey = cooling fan

Green = circuit boards (big is the bus, and slam are the cards)

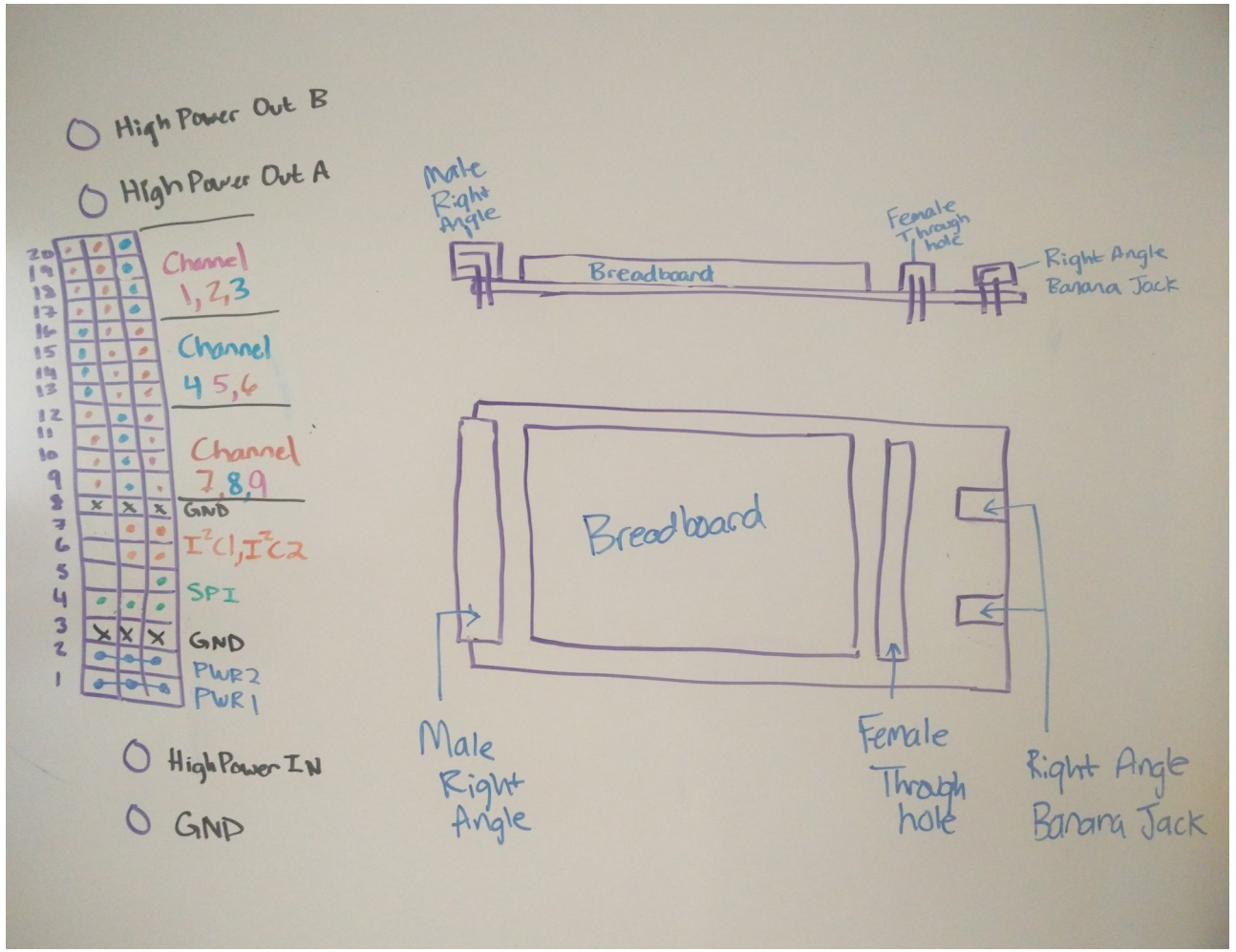
Device	Processor	RAM/ Storage	Other	Software	Ref.
Raspberry Pi 3 $39.95	64-bit 1.2 GHz ARM	1 GB/ 32GB	40GPIO, SPI, I2C, HDMI, 4 - USB, Ethernet, Serial	Debian Linux	[5]
Teensy 3.2 $19.80	72 MHz ARM Cortex-M4	64KB/ 256 KB	34 GPIO, 21 ADC (13-Bit), Serial (3), SPI, I2C (2),	Arduino IDE	[6]



Similar cases and cards as the H.aHK Box as found commercially.

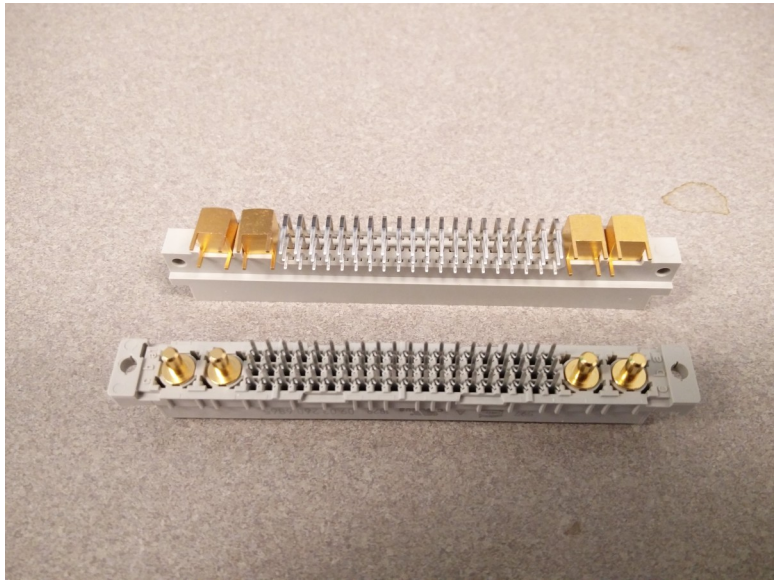
Prototyping Card (P-Card) Sketch

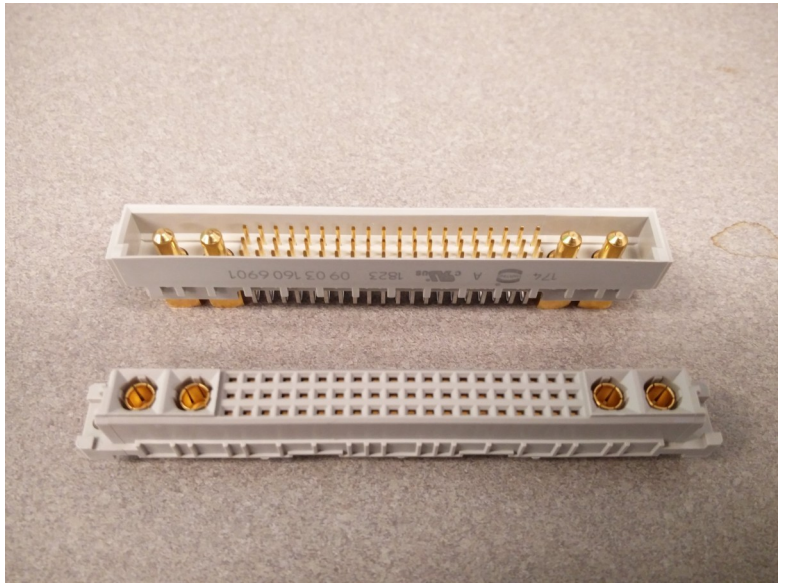
- Male Socket, Female Socket, Breadboard, High Power Banana Jacks, Double Length For Easy Access



Sockets

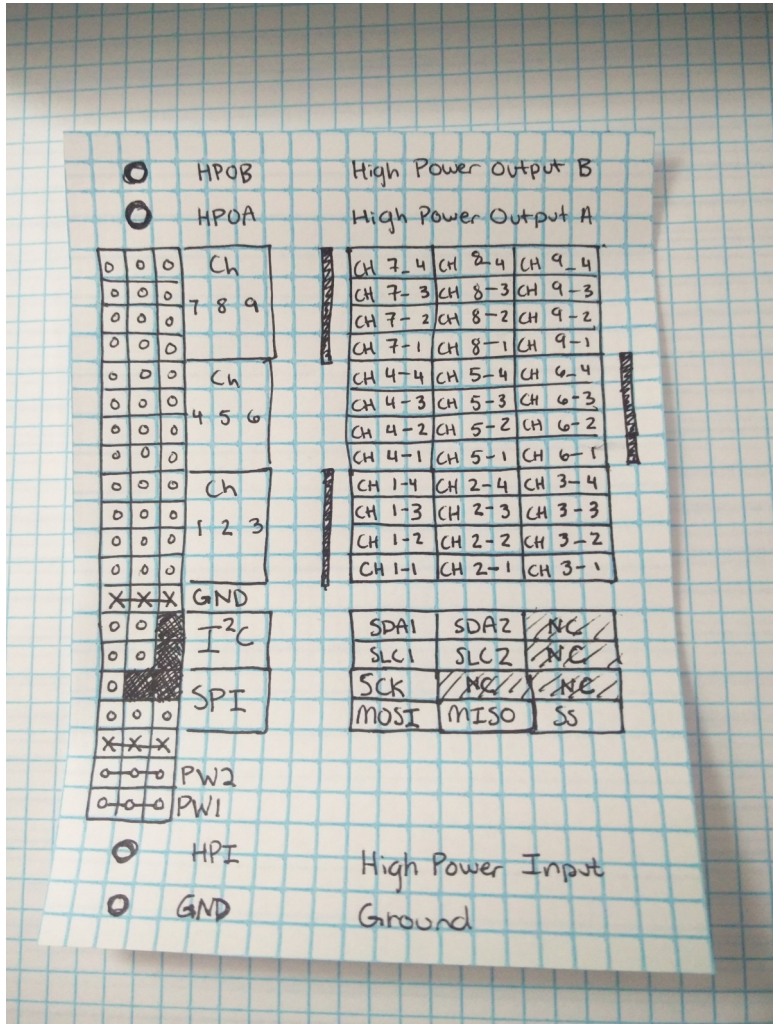
- 60 Pins @ 2 Amps and 4 High Current Pins @ 20 Amps





Socket Pinout

- 2 HP IO, 9 4pin IO Channels, 2 I2C Channels, 1 SPI Channel, Low Power Input, High Power Input, Ground



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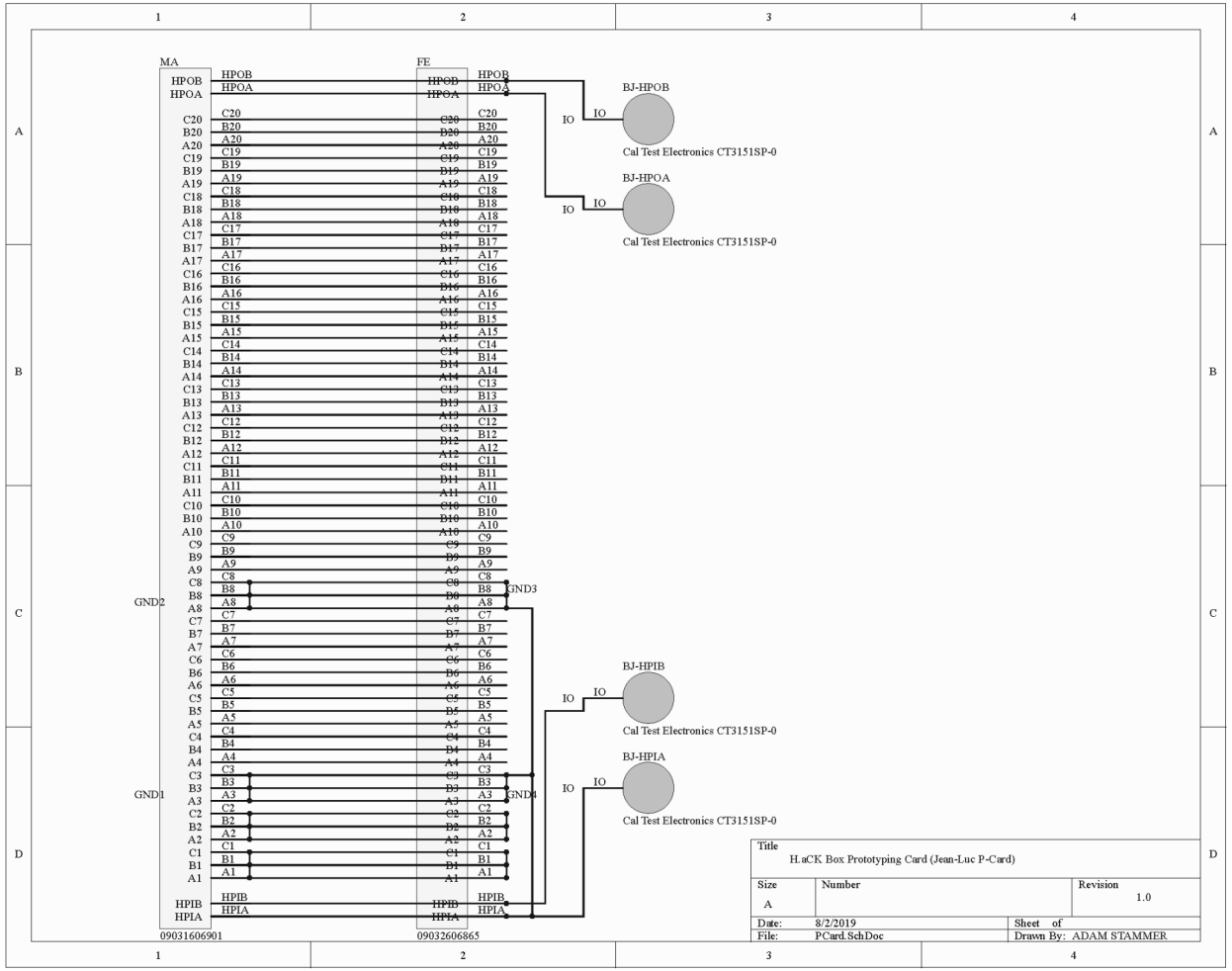
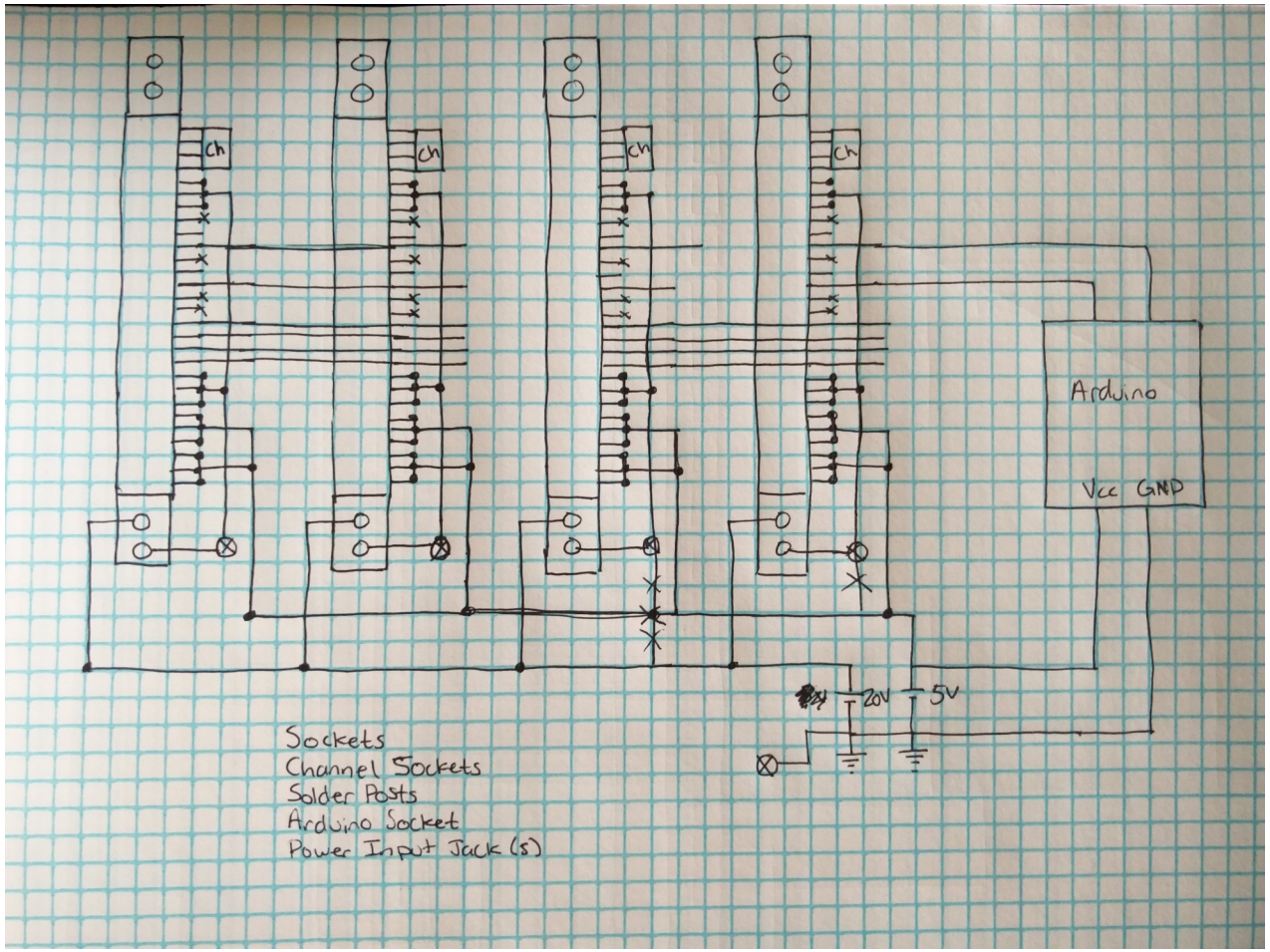


Prototyping Card (P-Card)

- Male Socket, Female Socket, Breadboard, High Power Banana Jacks, Double Length For Easy Access

Backplane Simplified Schematic Sketch

- Sockets, Power, SPI, HP Signal I/O, 9 4-pin signal I/Os per card, Arduino Controller (with I2C), On board Temperature Sensors, 7-segment digit display, 5Volt and 20Volt Power, Raspberry Pi (with I2C), Interrupts from Arduino and Pi



Backplane Schematic

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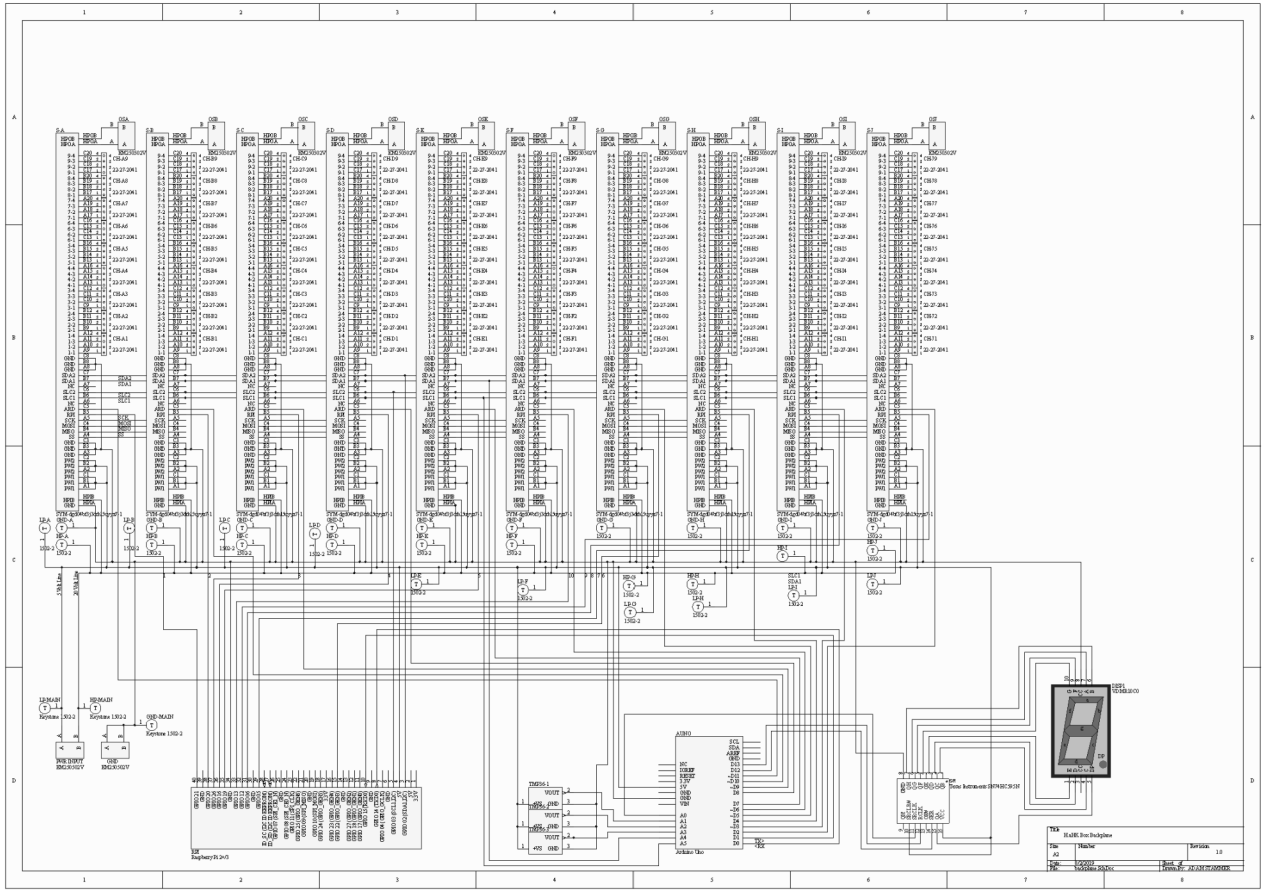
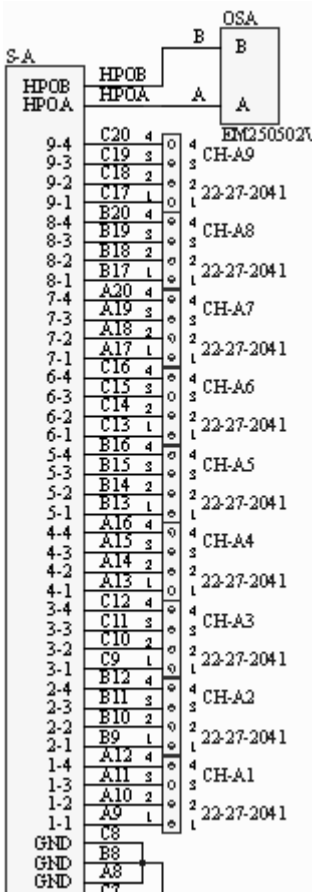
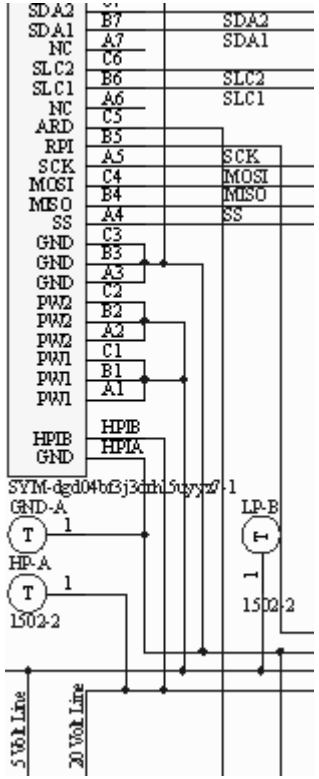


Backplane Schematic Closeup

- Sockets, Power, SPI, HP Signal I/O, 9 4-pin signal I/Os per card, Arduino Controller (with I2C), On board Temperature Sensors, 7-segment digit display, 5Volt and 20Volt Power, Raspberry Pi (with I2C), Interrupts from Arduino and Pi



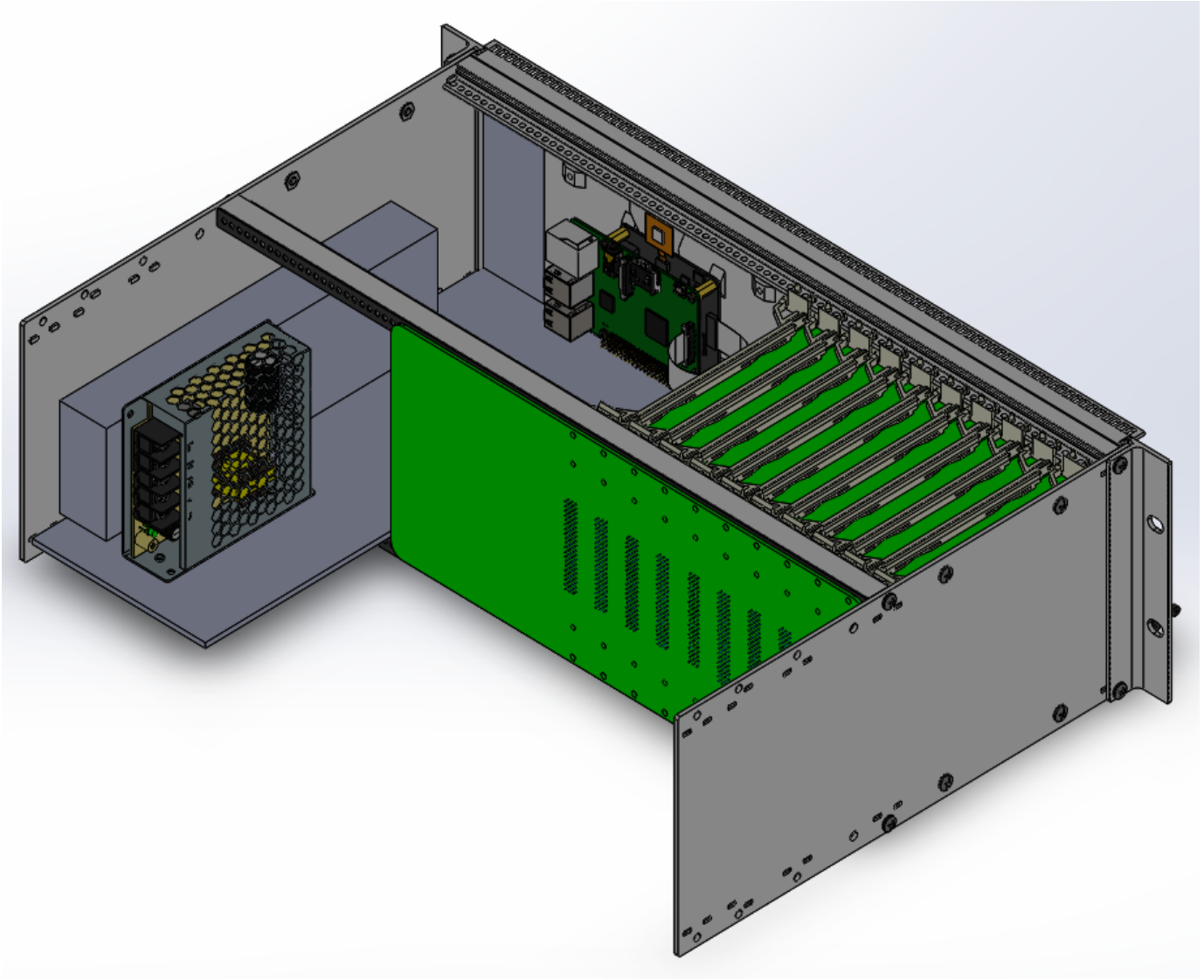


A

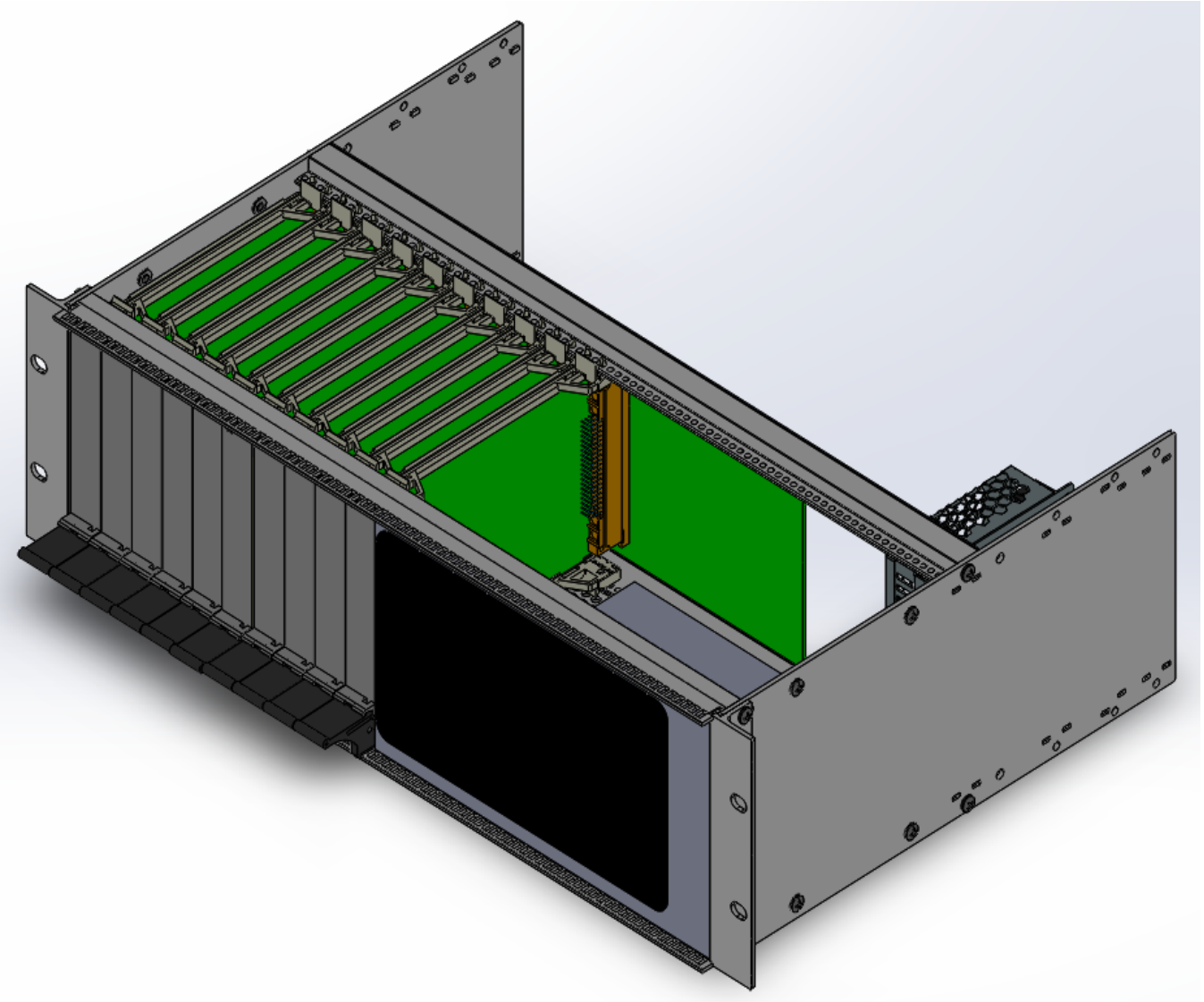
B

C

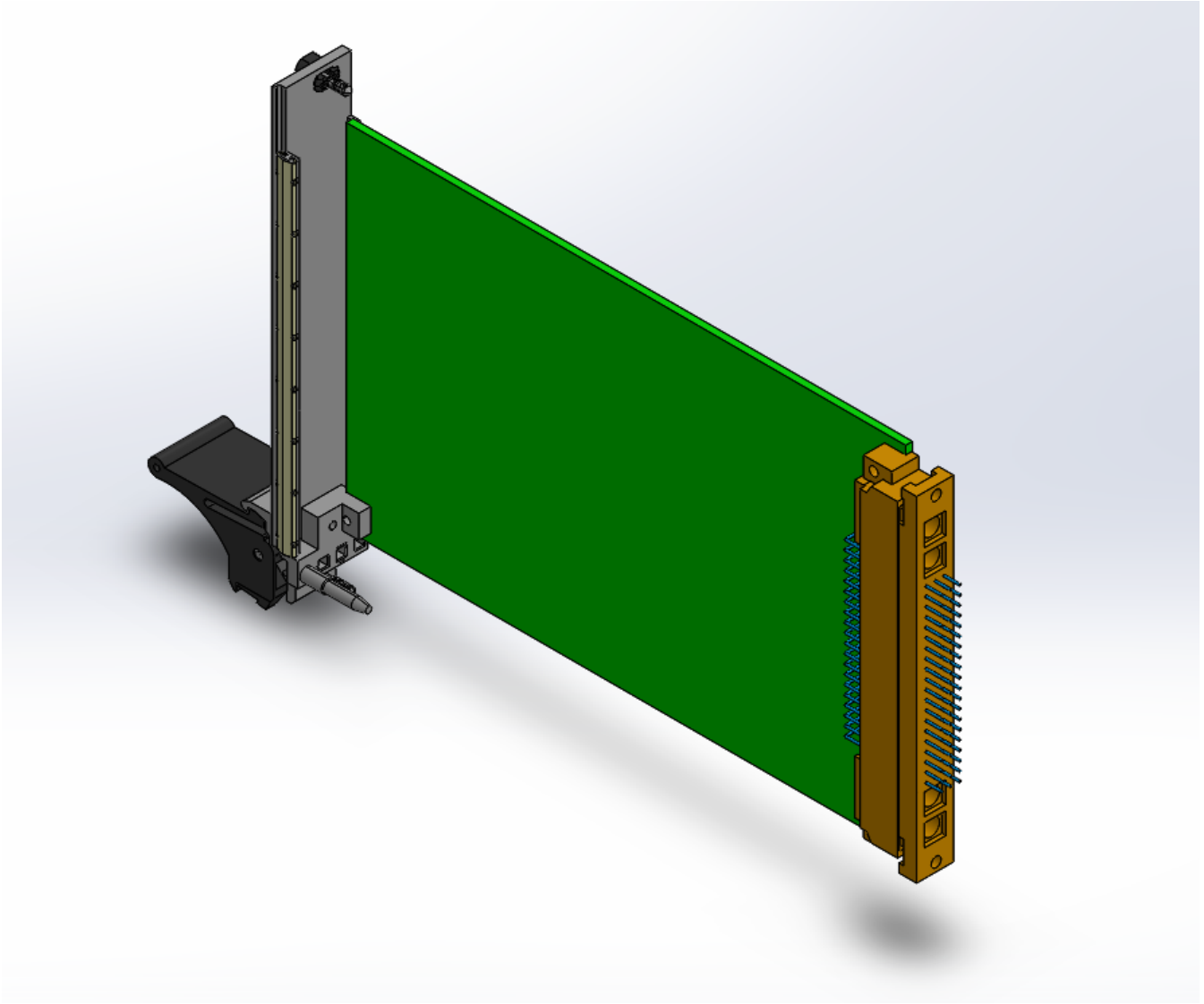
Chassis Render Back



Chassis Render Front



Card Render



Next Steps

Finish Technical Guide

- Summarize completed work
- Guide future designers and end users

Finish Backplane PCB Layout

Build and Test Everything

Program Controllers

Design/Build Cards