Balance Bot Build Guide

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Introduction

Purpose: To provide an economic robotic platform that utilizes many CTRE control system products for programming entertainment, while being cheap and easy to manufacture with just a 3D printer and hand tools.

Port layout:

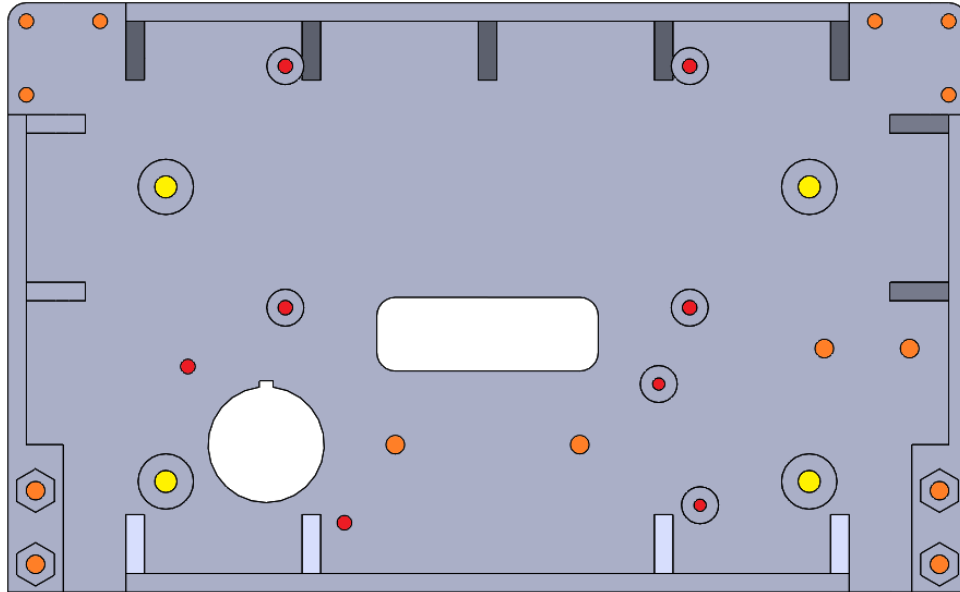- USB Mini is accessible from the top of the robot.

Tools:
- Drill Bits
  - #43 (#4 Tap)
  - ⅛ (#4 through hole)
  - #25 (#8 tap)

- Allen wrenches (recommended : Harbor Freight)
  - 3/32 (#4 socket head bolt)
  - 9/64 (#8 Socket head bolt)
- Needle Nose Pliers
- Electrical
  - Wire strippers
  - Ferrule Crimper
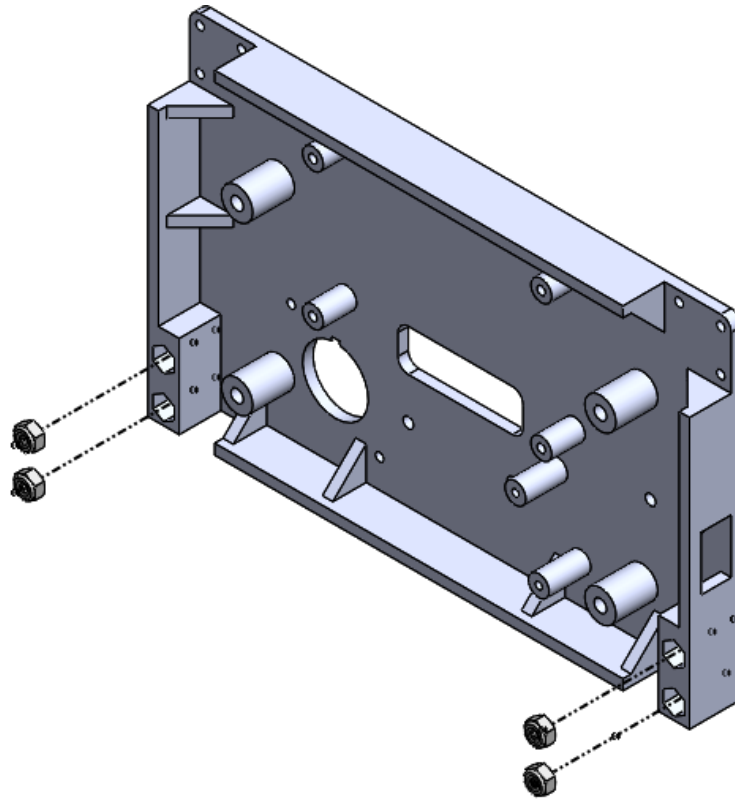 - Anderson Crimper
  - Snips

Material:
- .9lbs PLA Filament

Printing Parts

1. Print a Back Cover

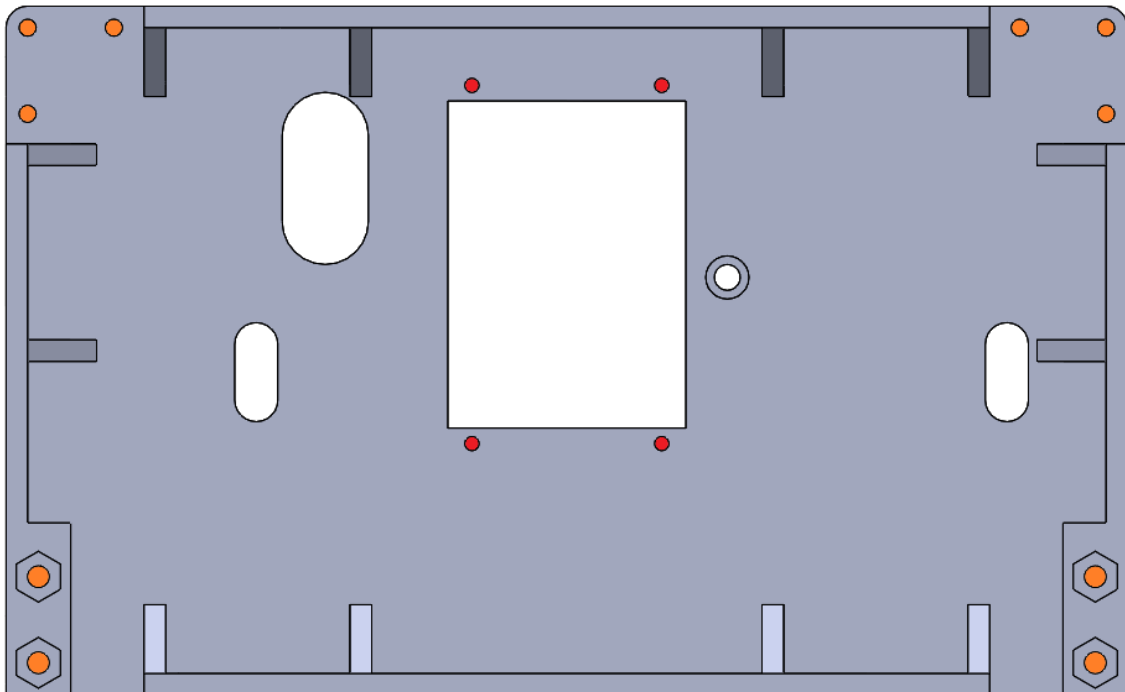a. Drill RED holes with #43 drill
b. Drill ORANGE holes with ⅛ drill
c. Drill YELLOW holes with #25 drill

d. Press #4 lock nuts into hex

2. Print a Front Cover
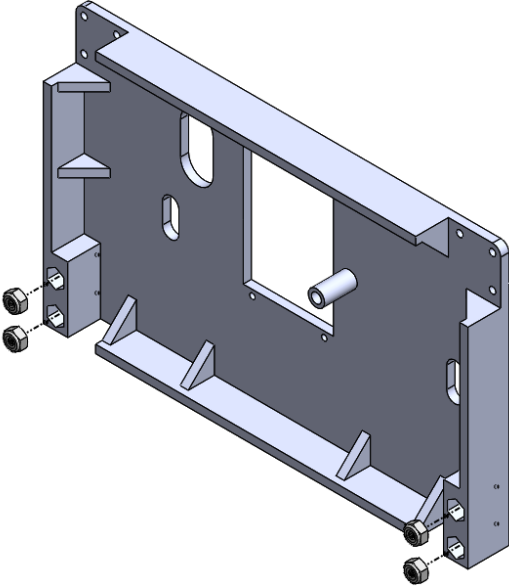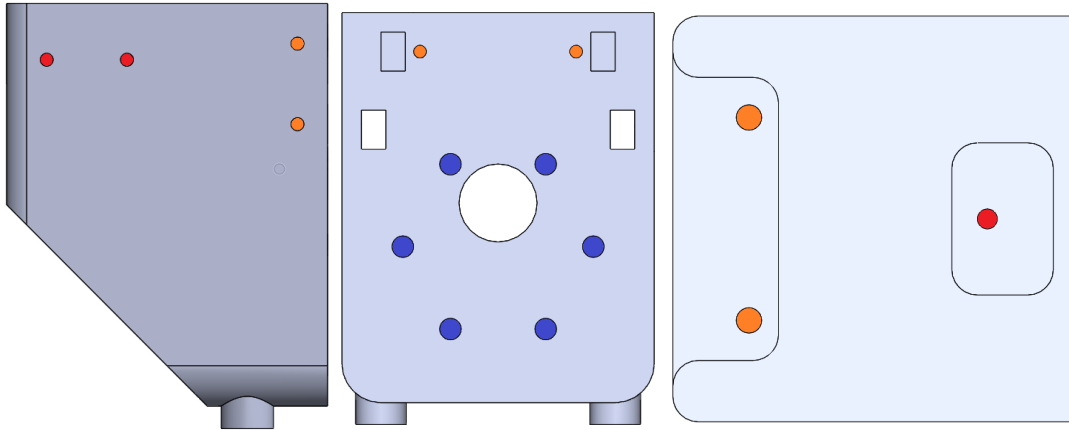

a. Drill RED holes with #43 drill

b. Drill ORANGE holes with ⅛ drill
c. Drill YELLOW holes with #25 drill

3. Press in #4 Nuts into hex grove

*make sure the nylon on the nut is facing the correct direction
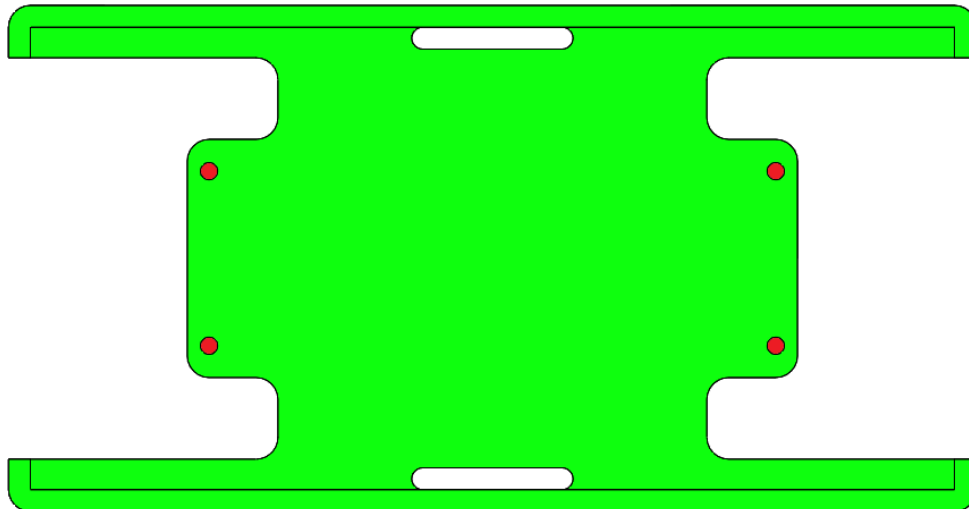
4. Print two Motor Mounts

    a. Drill RED holes with #43 drill
    b. Drill ORANGE holes with ⅛ drill
    c. Blue holes are for M4 bolts

5. Print two Side Supports

    a. Drill out ORANGE holes with ⅛ drill
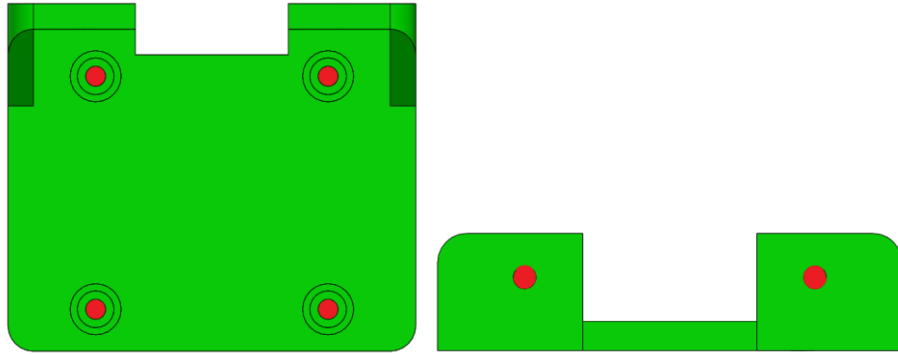
6. Print a Cross Beam
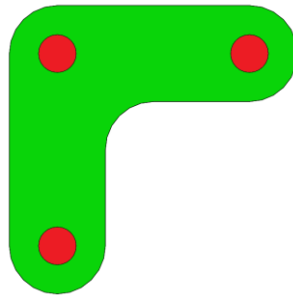

    a. Drill RED holes with a #43 drill

7. Print a Pigeon Mount

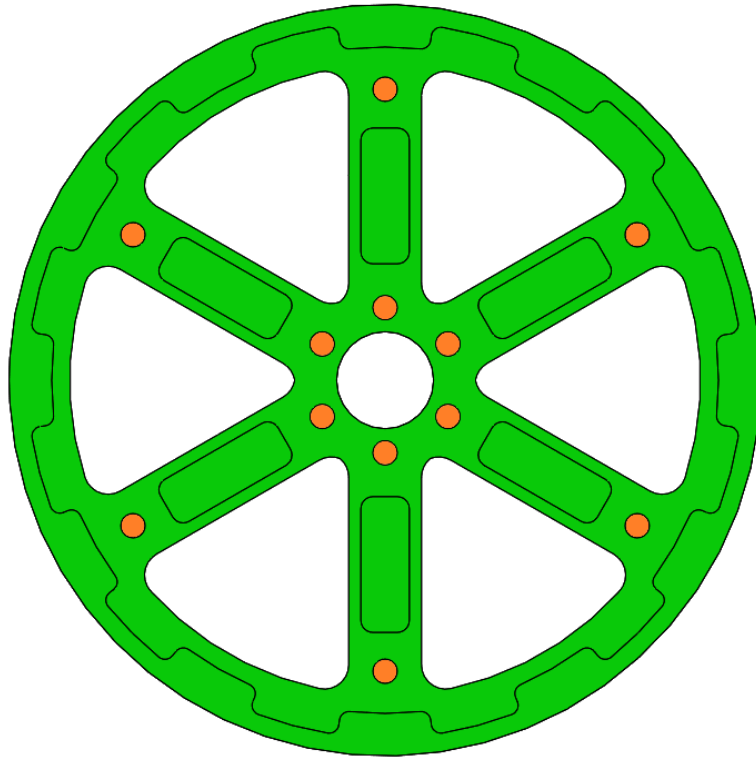   a. Drill RED holes with #43 drill

8. Print two Corner Supports

    a. Drill RED holes with a #43 drill on both sides

9. Print two Front Supports
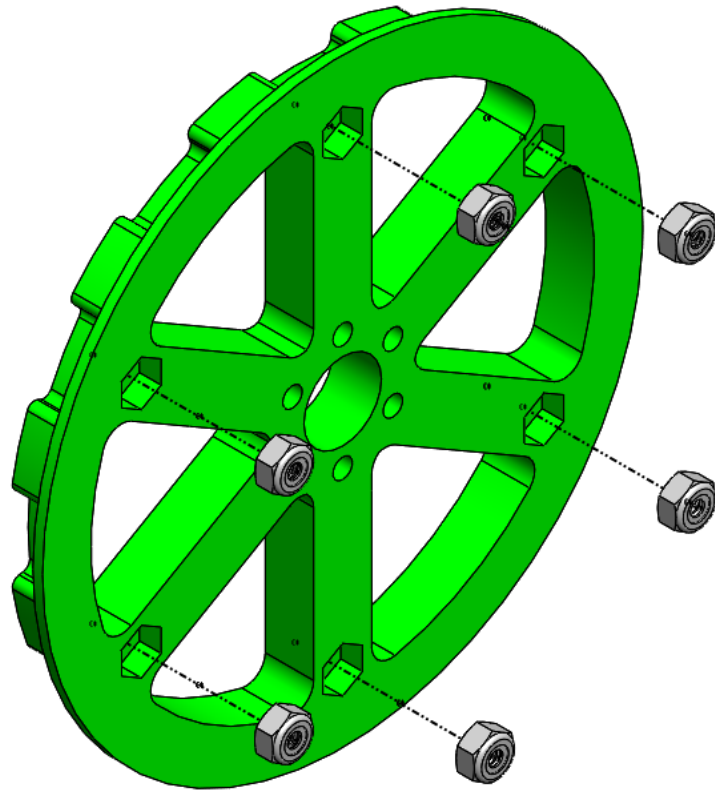

    a. Drill ORANGE holes with ⅛ drill

10. Print two 4in Traction Hub

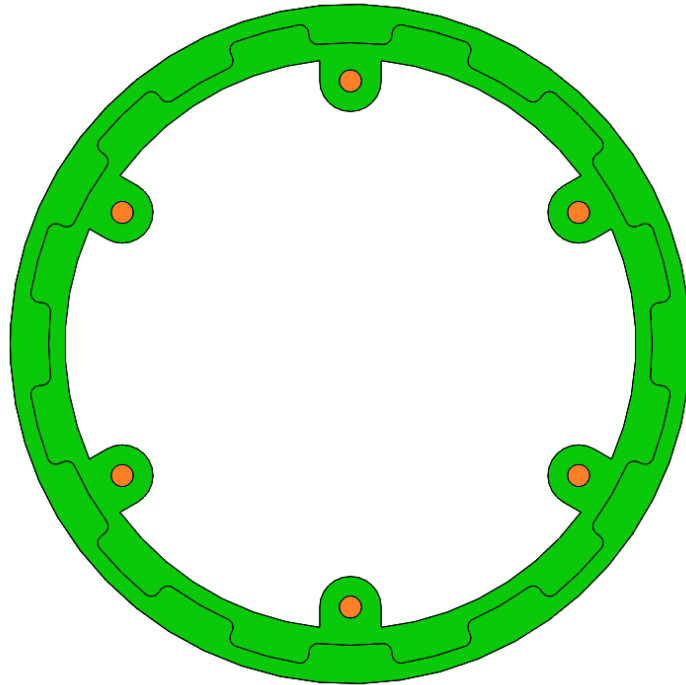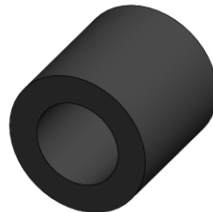a. Drill ORANGE holes with ⅛ drill

b. Press in #4 nuts into hex groove

11. Print two 4in Traction Flange
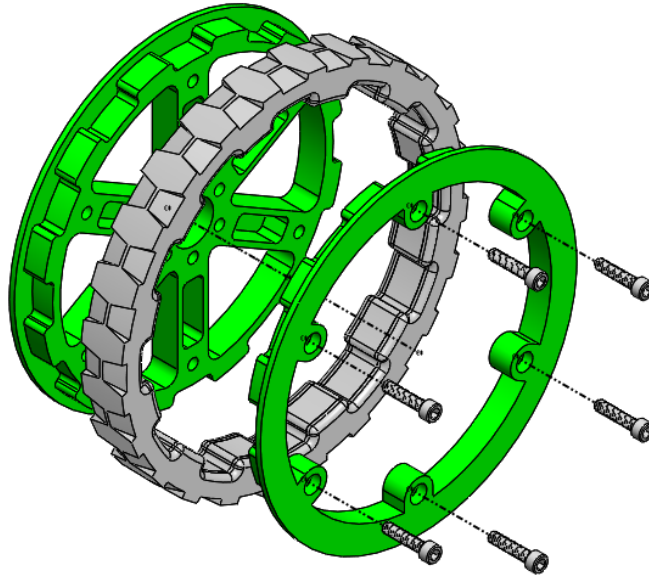

a. Drill ORANGE holes with ⅛ drill

12. Print four spacer
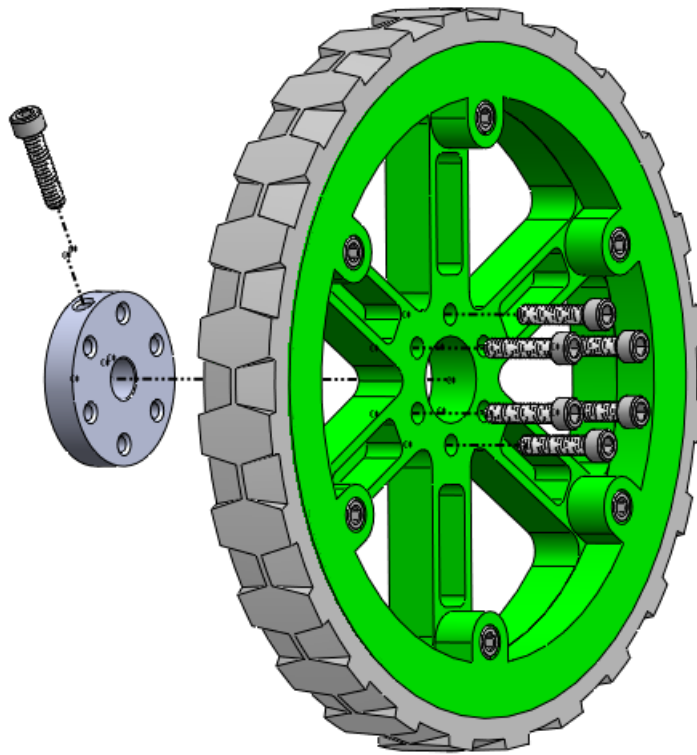
Assembly

1. Assemble Wheel
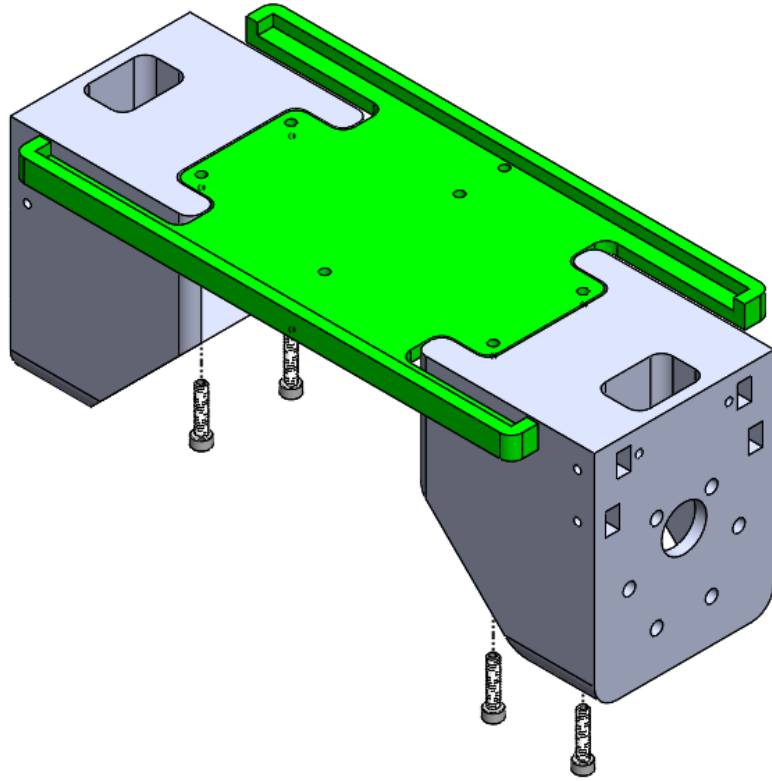

   a. Sandwich the Traction wheel between the Hub and Flange, Secure with .5" 4-40
       bolts
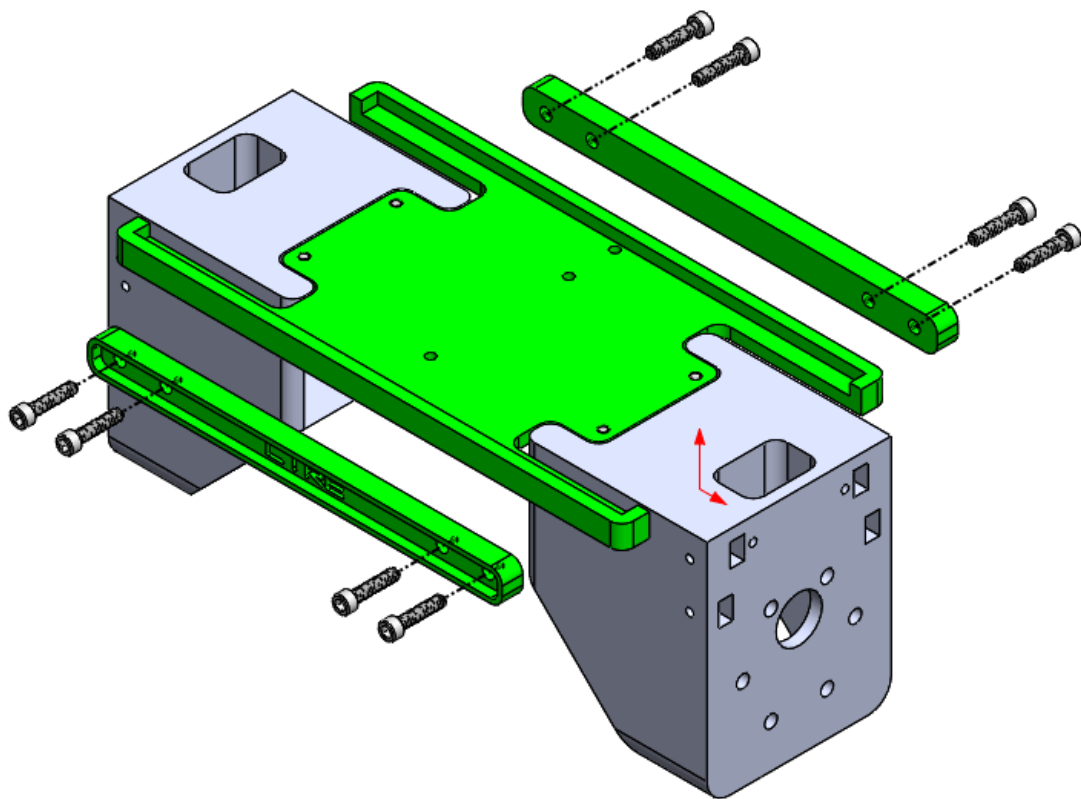
b. Attach the Pololu Mounting Hub to the Hub using .5" 4-40 bolts

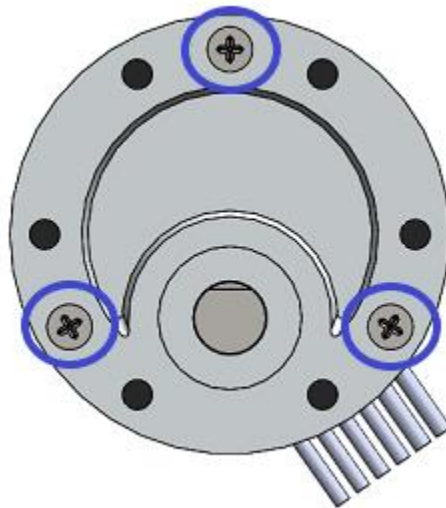c. Insert an additional .5" 4-40 into the Pololu Mount Hub to use as a set screw

2. Assemble Lower Frame

a. Attach the Motor Mounts to the Cross Beam using .5" 4-40 bolts
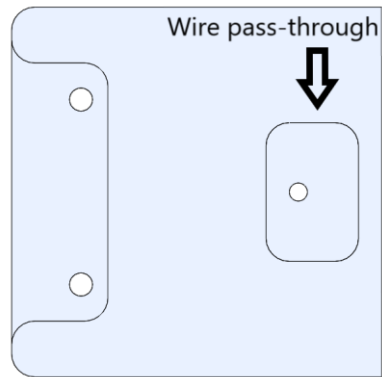
b. Attach Front Support using .5" 4-40 bolts to both sides

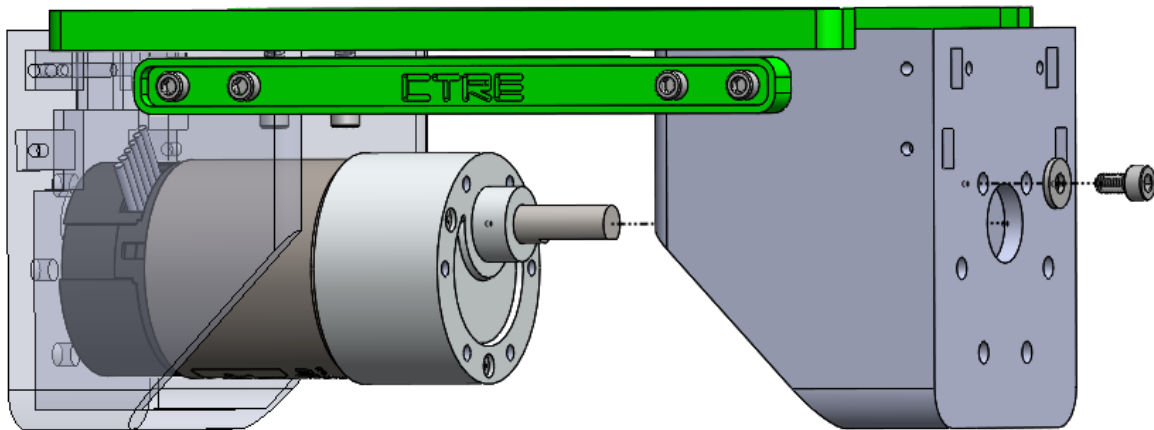c. Remove and Loctite philips screws indicated by blue circles.

Wire pass-through

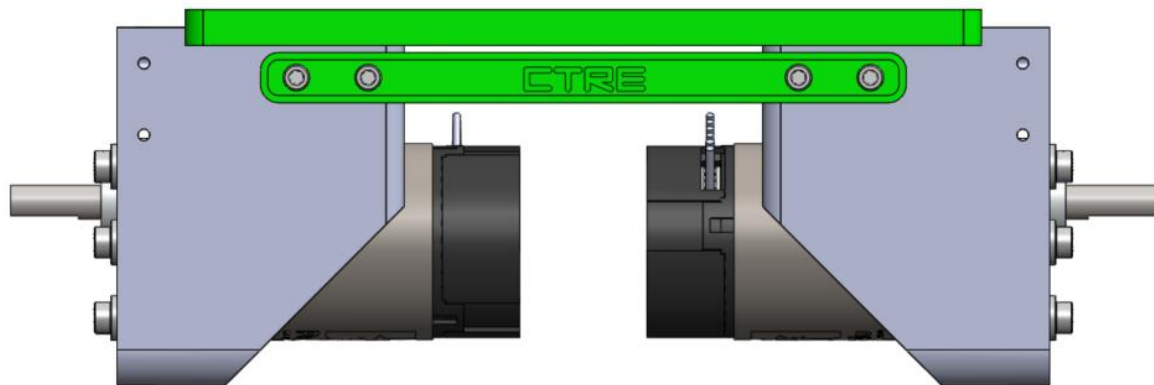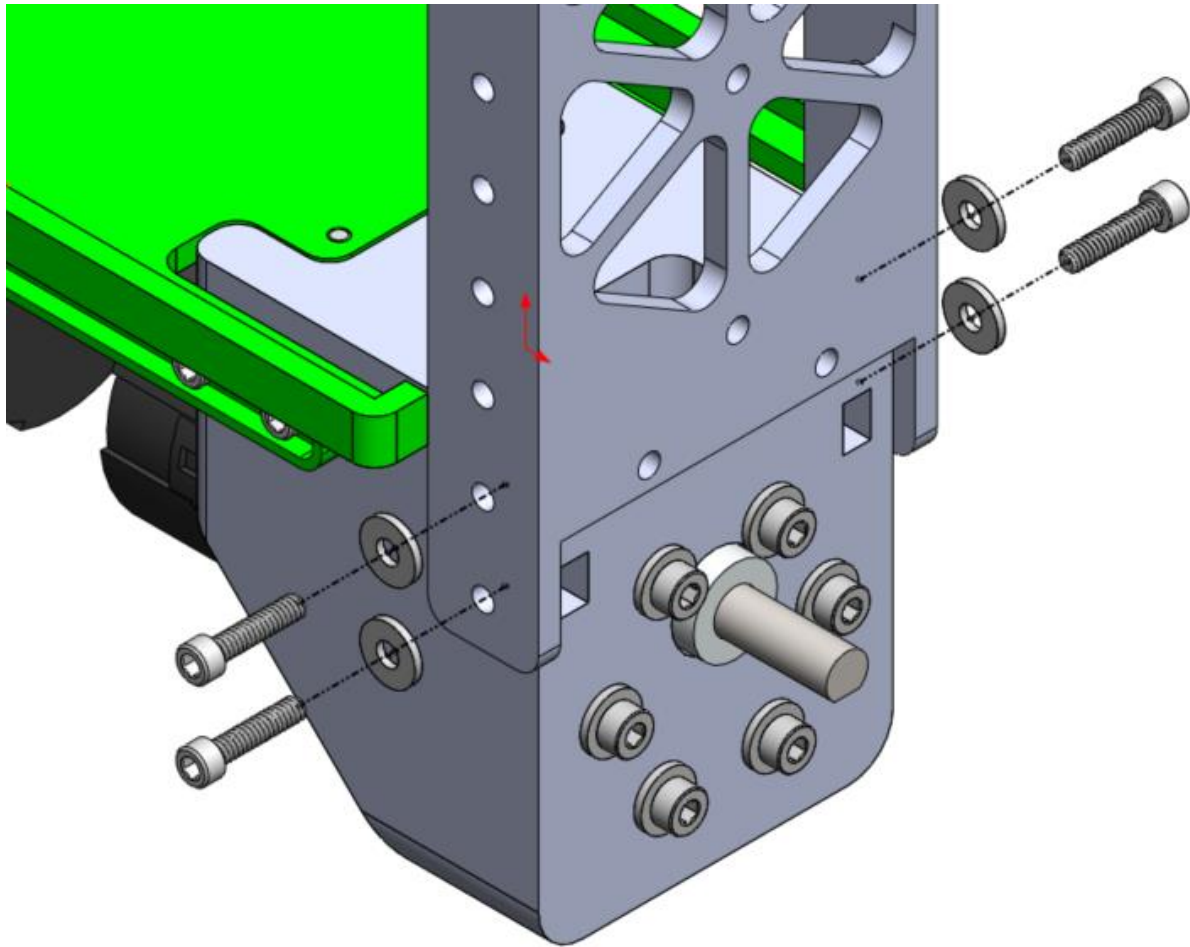d. Feed wires through the pass through on top of the Motor Mount

e. Insert the motor inside the mount and attach with a #4 washer and M3 bolt, do this for all 6 holes.

f. Repeat this process for the opposite side

g. Attach the Side Supports using #4 washers and .5" 4-40 bolts(with nuts already installed)
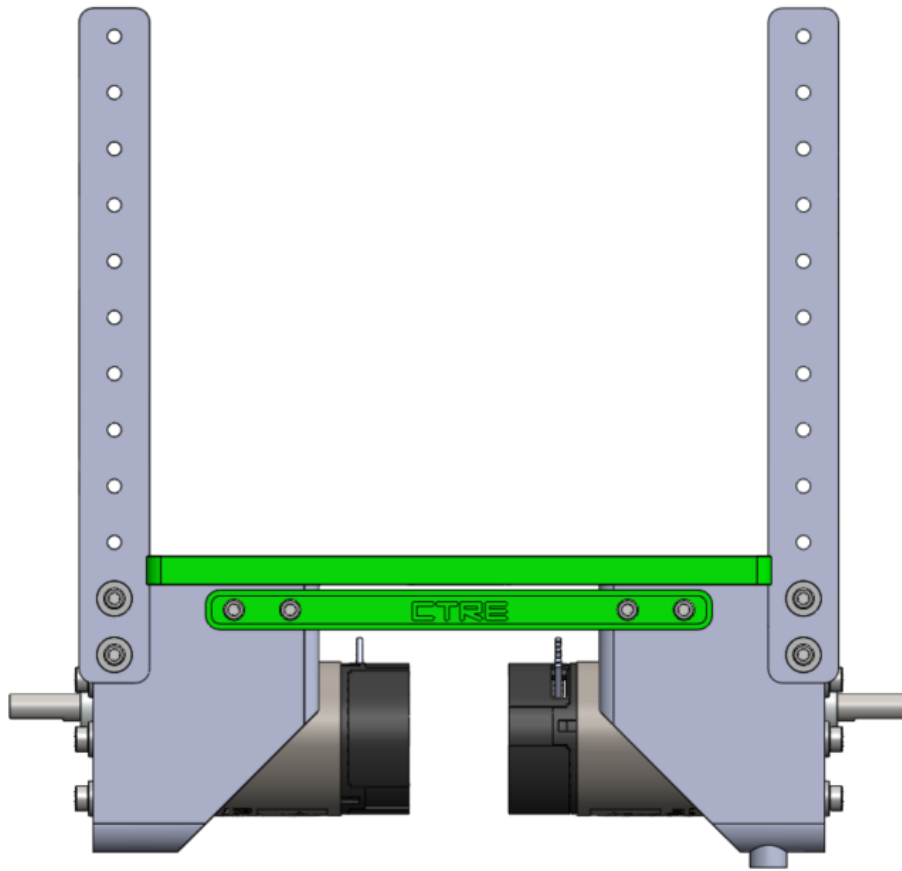
h. Repeat this process for both side

i. Attach Bottom Support with .25" 4-40 bolts

3. Assemble Back Cover

       a.   Attach Corner Support with .5" 4-40 bolts

Wire Electronics

Power Wiring Diagram
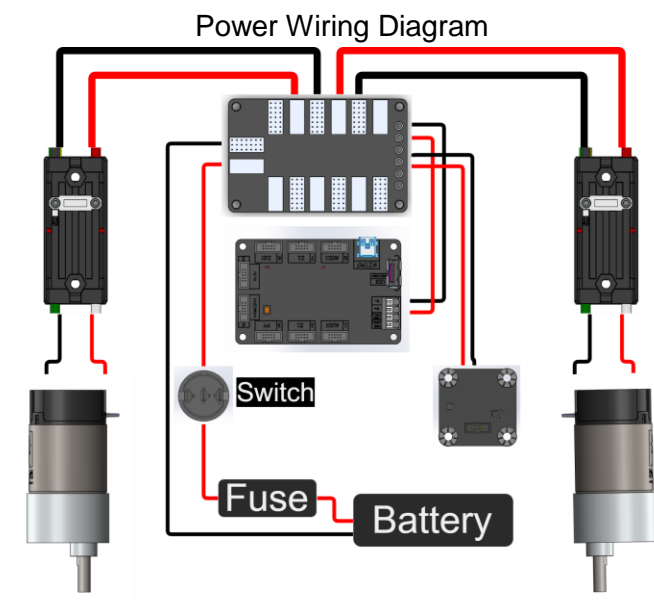
Signal Wiring Diagram

120 ohm Resister
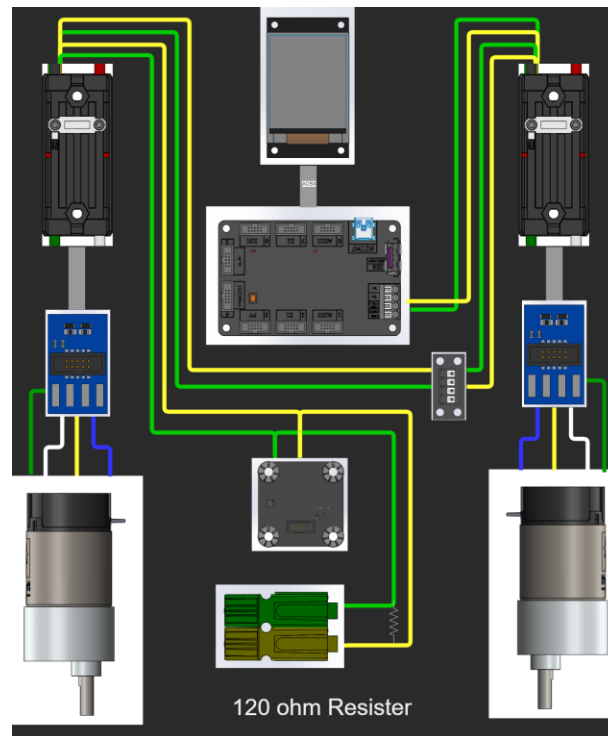
1. Electronics Box

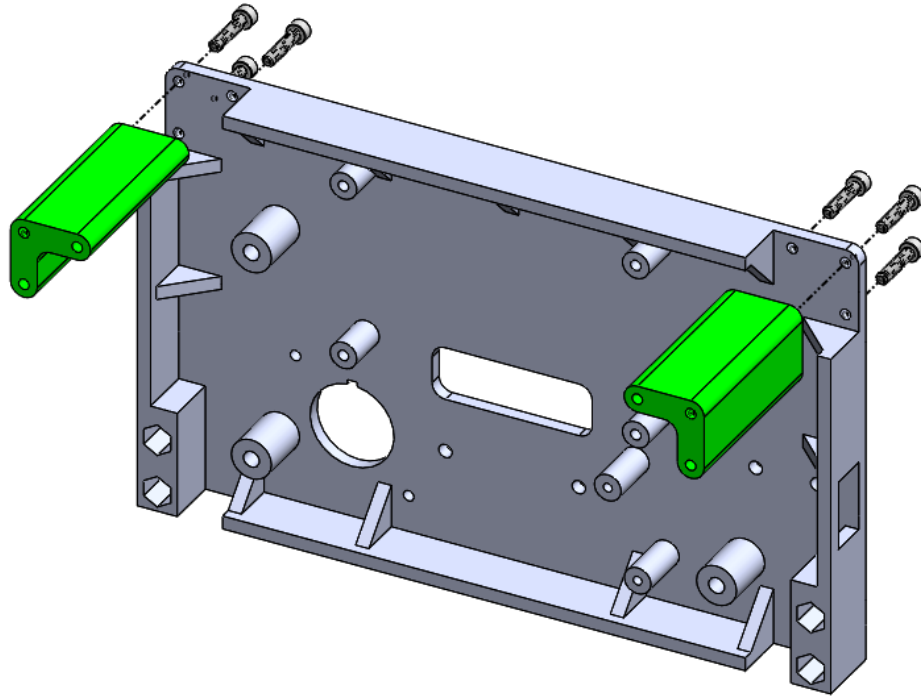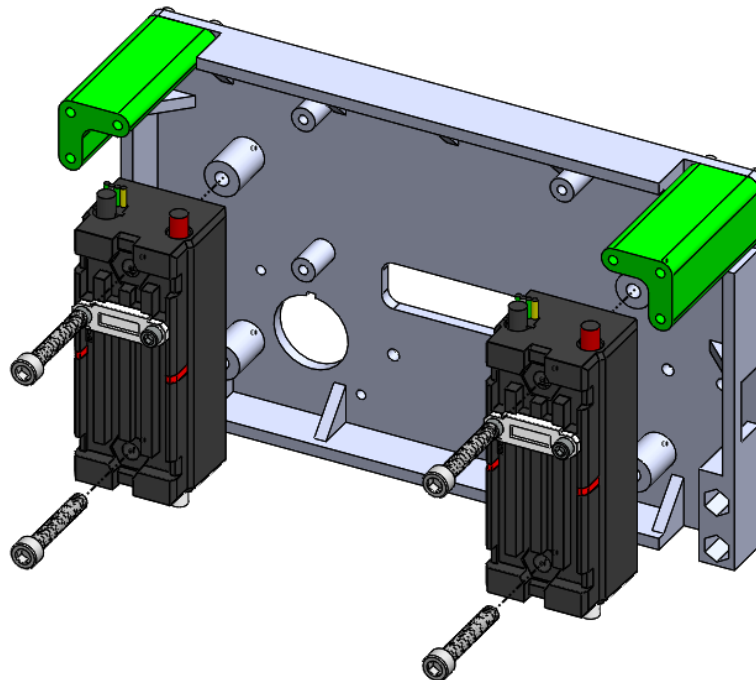a. Attach Talon SRX's to Back Cover with 1in 8-32 bolts
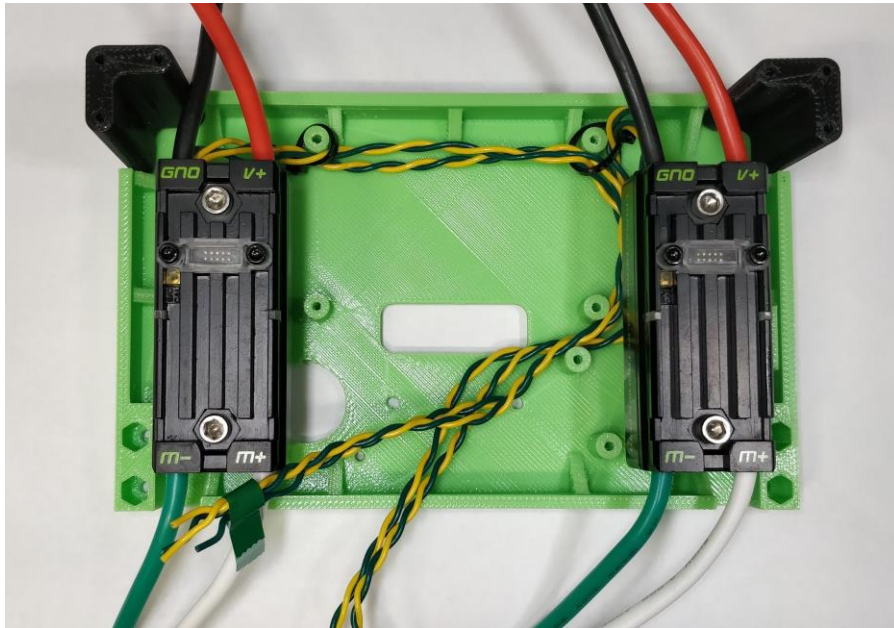
    i. Route CAN wires

b. Solder 2 pairs of 22 AWG wires to Power Distribution Breakout PCB
    i. Twisting the pairs together will help organize wires
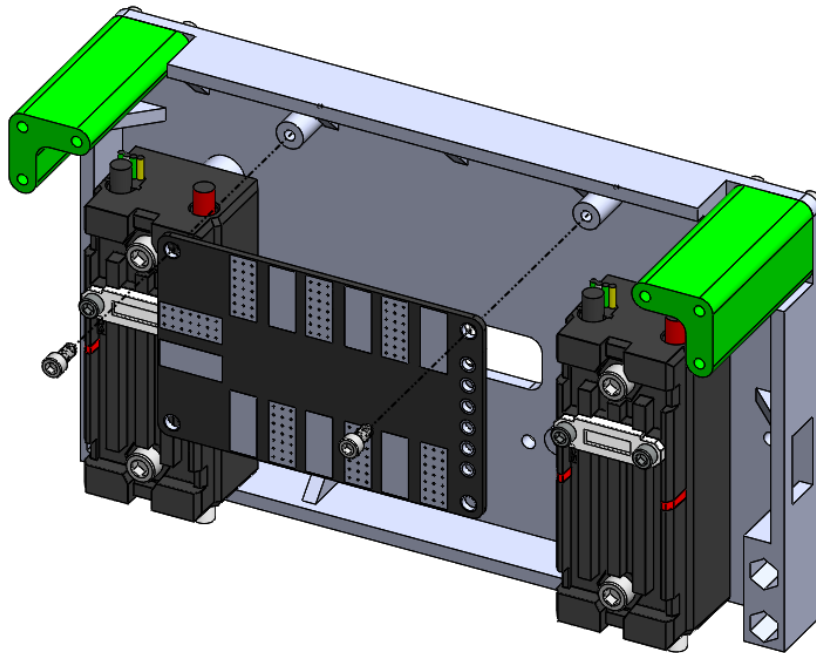
c. Temporarily attach Power Distribution Breakout PCB using two .25in 4-40 bolts

d. Attach CAN Connecter using .25in 4-40 bolts
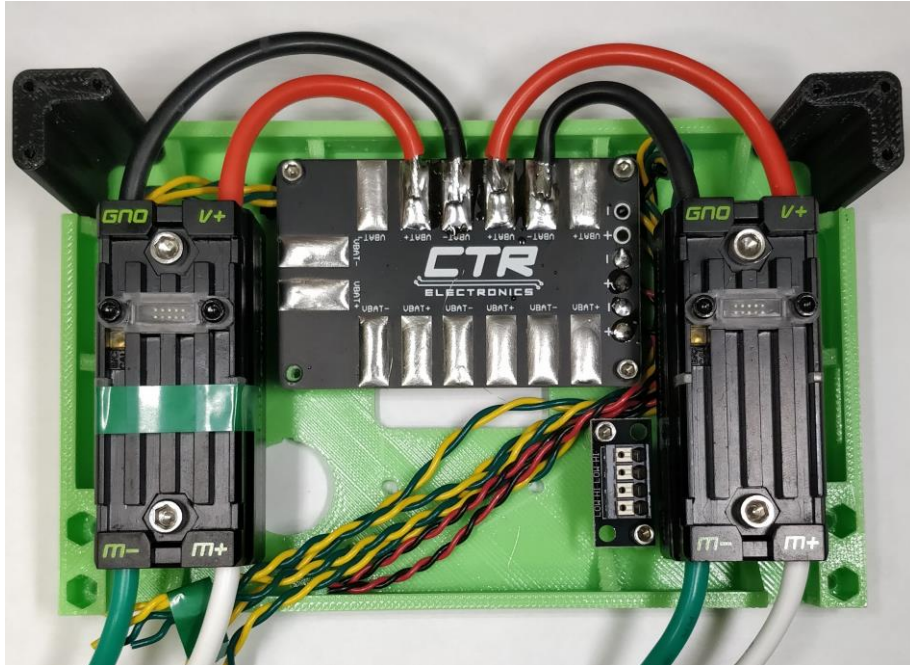
e. Solder Talon SRX power wires to PCB
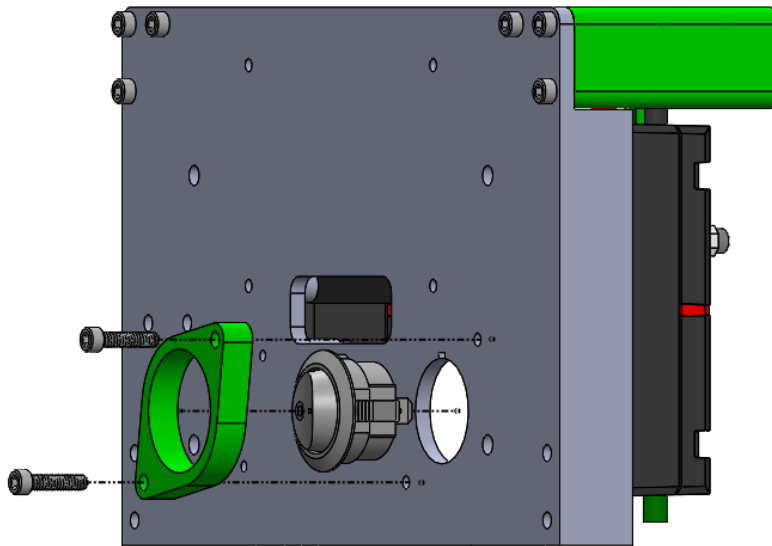
f. Attach Switch to Back Cover, along with switch cover

g. Solder 12 AWG wire from the Switch to the PCB and route battery cable and attach Andersons
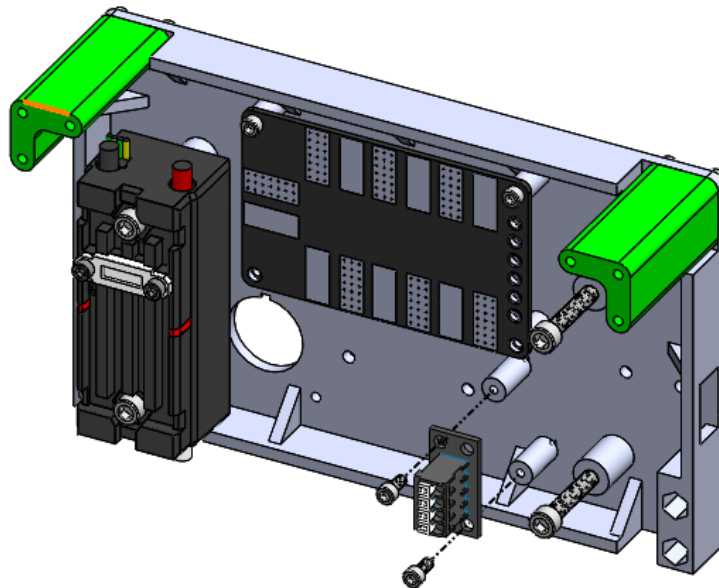h. Take out the two temporary .25in 4-40 bolts
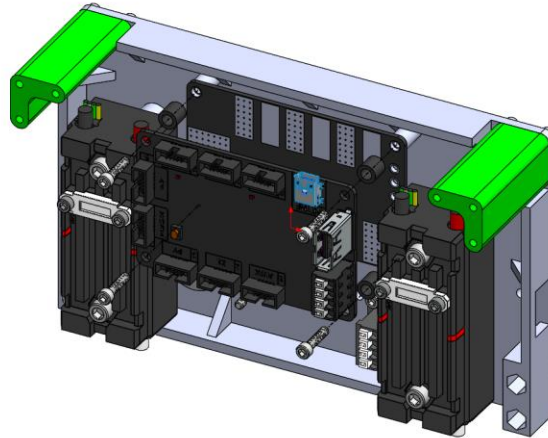
i. Attach the HERO Development board using .5in Spacers and .5in 4-40 bolt
j. Use Ferrules to plug in CAN to HERO and CAN Connector. Along with with Power to HERO

k. Solder power and CAN wires to Pigeon and mount Pigeon
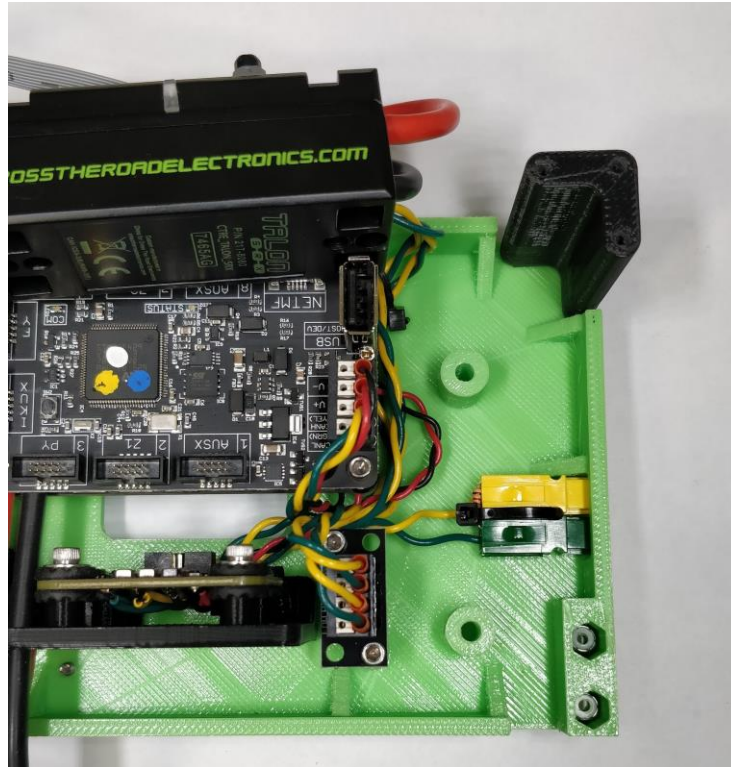
l. Anderson CAN
   i. Optional 120 Ohm resistor with Anderson

Final Assembly

1. Assemble Upper frame
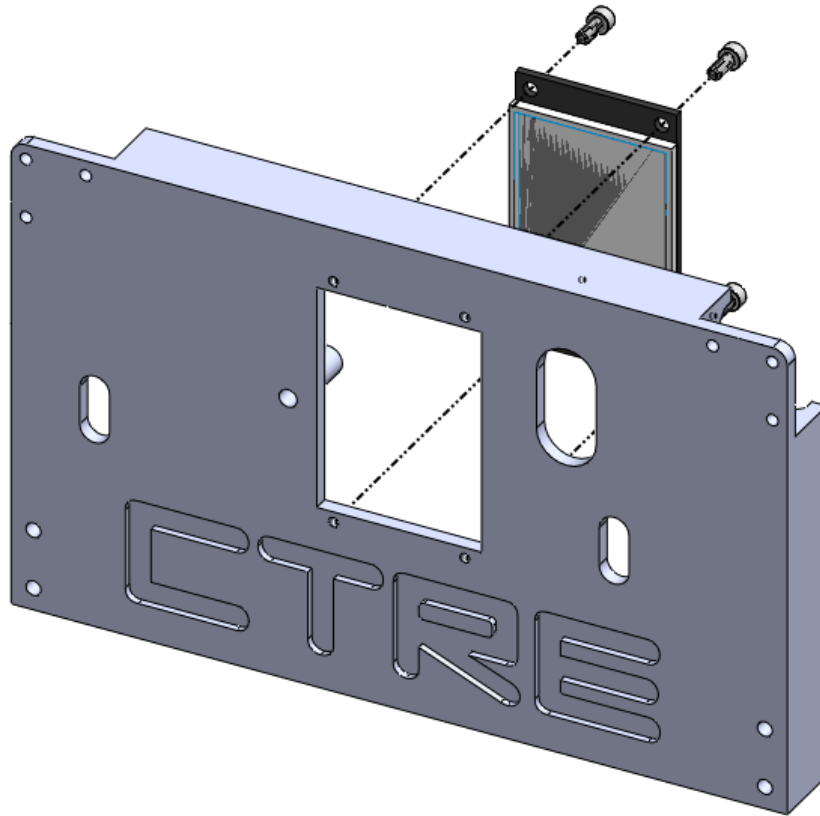
       a. Attach Display to Front Cover with .25in 4-40 bolts
           i.   Plug in display module using a 4in Gadgeteer Data Cable
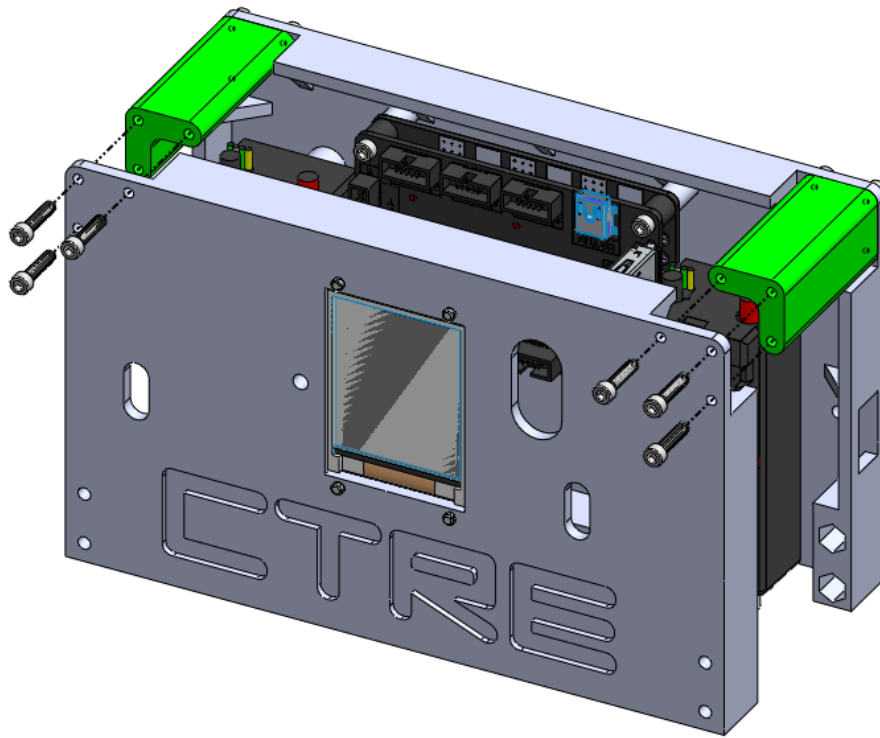
b. Attach Front Cover to Corner Support with .5in 4-40 bolts
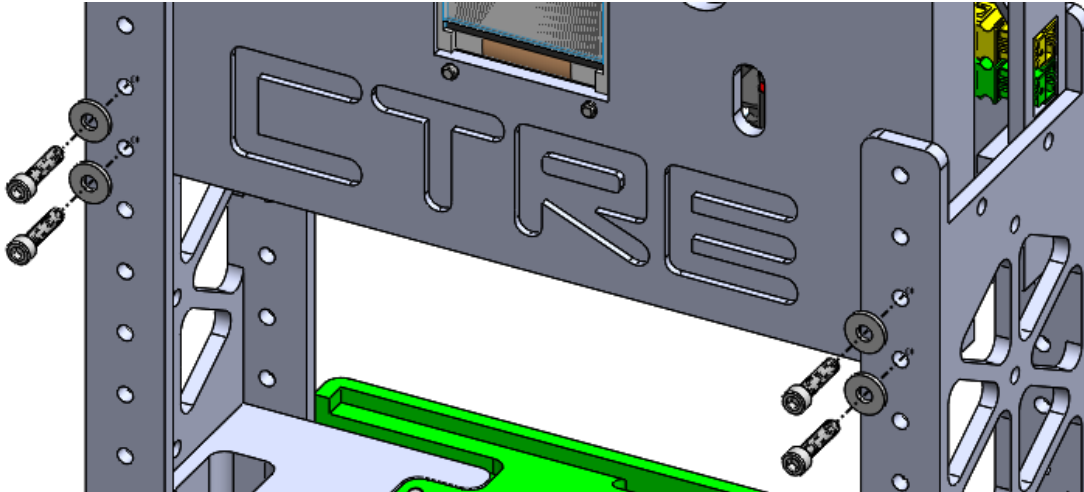
c. Attach Upper frame to Lower frame using #4 washers and .5in 4-40 bolts in the front and back

2. Motor Wiring

a. Solder encoder wires to breakout board, attach breakout board to Talon SRX using a Gadgeteer Data Cable

b. Attach Anderson connectors to motor wires and motor output of Talon SRX

| Color	Function
Red	motor power (connects to one motor terminal)
Black	motor power (connects to the other motor terminal)
Green	encoder GND
Blue	encoder Vcc (3.5 – 20 V)
Yellow	encoder A output
White	encoder B output

3. Battery Wiring

a. Attach the fuse holder to the positive terminal of the battery
b. Attach a segment of Black Silicon wire to the negative terminal of the battery
c. Attach Anderson Connectors to each end.

4. Battery Mount

    a.   Loop a piece of Velcro down through the front slot. Continue under the Cross Beam. Then, back up the the back slot.
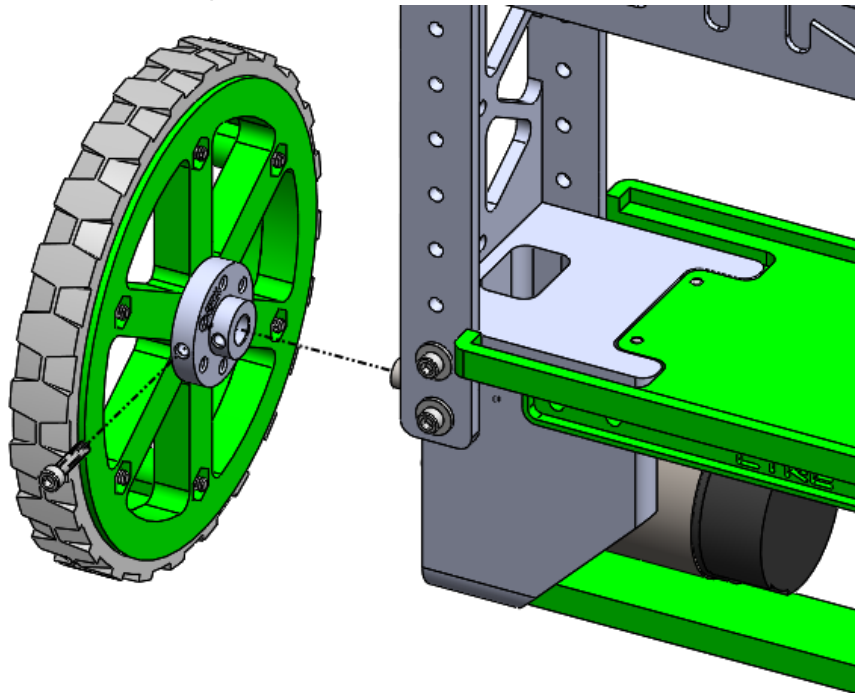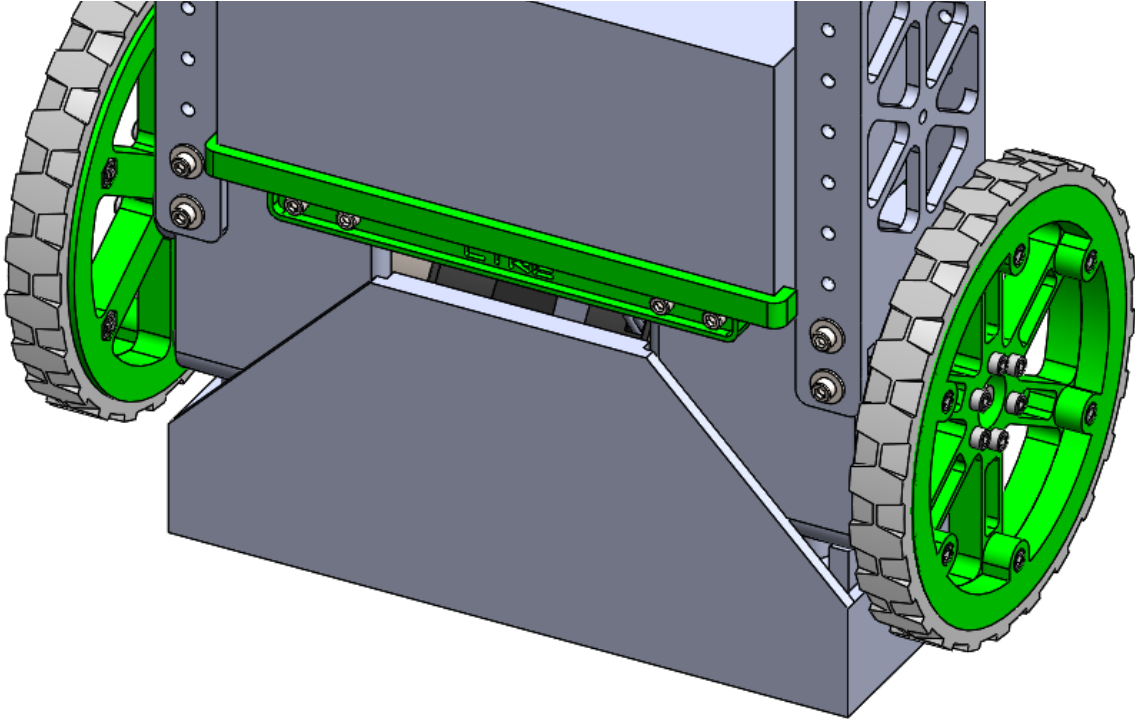

5. Wheels Attachment

    a.   Attach wheels with .5in 4-40 bolt as a set screw. Apply loctite to prevent screw from loosening.
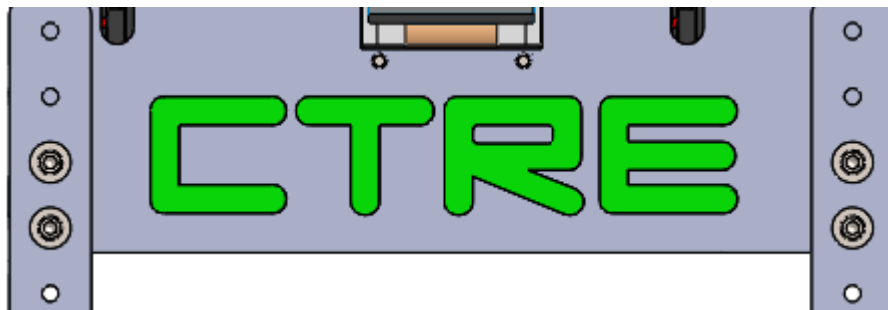
Optional Hardware

1. Dock

     a.   To help with zeroing the gyro and storage, print a simple dock for the robot.

2. "CTRE" Lettering

    a.   For extra effects, print and glue in these letters.

Revisions

Rev	Date	Description
1.0	18-Aug-2018	First Release of document