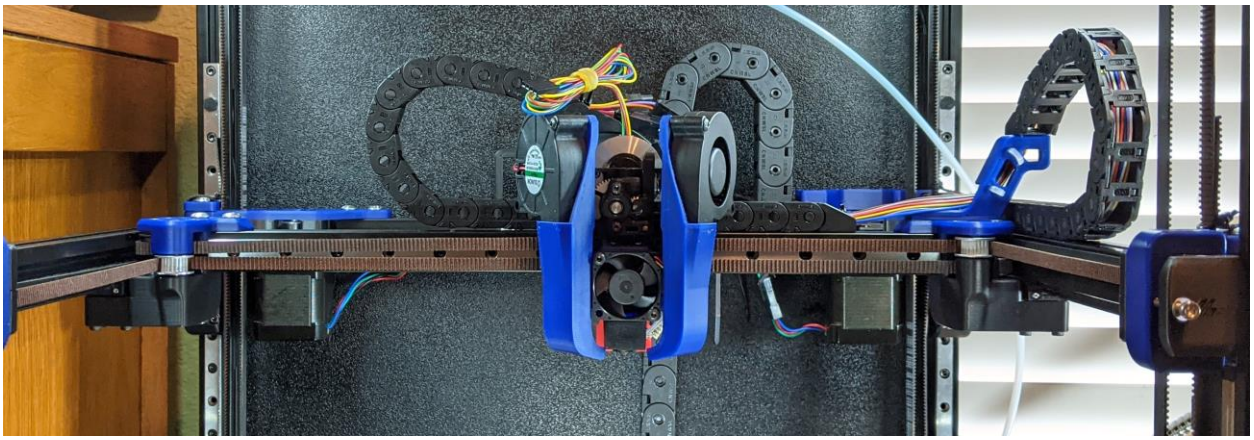
# Mantis (Dual 5015 Toolhead) by Long



**Features:**

- Compatible with MGN12 X-Rail.  Dragon Hotend only right now.
- Dual 5015
    - Left to Right airflow balance is no longer an issue
    - Single piece ducts without splitting and fewer bends mean less losses
    - Total airflow is probably ~3x more than Longs fang using the same fan.
- Lighter
    - This entire tool head weighs ~290g including the carriage
    - Spec AB is ~470g.  Spec AB with gailieo is ~375g.
- Stiffer
    - Single piece carriage and hotend mounts are significantly stiffer than spec.
- Detachable Bed Probe (magprobe)
    - Allows direct probing of the bed surface.  Allows usage of any bed surface.
    - Bed with embedded magnets becomes a possibility.
- More balanced
    - Hotend is moved closer the rail +y, and upwards +z
    - Gain in Y and Z travel (~5mm each)
- Decreased length from extruder to hotend
    - Bowden from mini-sherpa to Dragon is 19mm
- X-endstop relocated to carriage.  Easy to transition to umbilical if desired .
    - Y-endstop can still be from the spec endstop pod on the right xy-joint.
- Area around heat block is very open.  Ducts give wide berth to block.  Duct shouldn't have any issues with melting.  Josh Murrah has been printing ABS at 300c without duct melt.

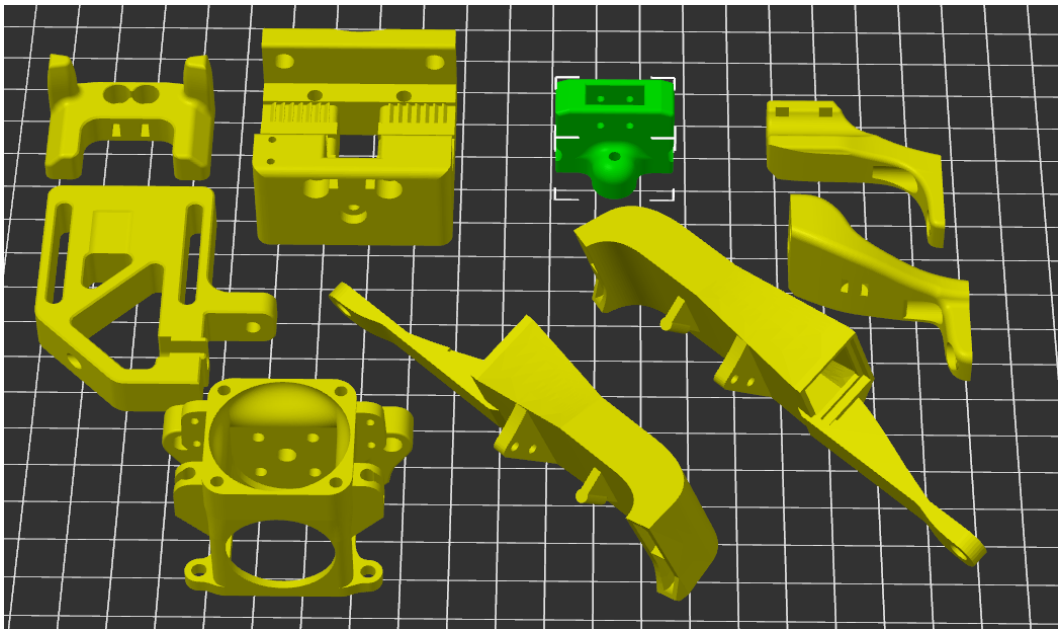
**Cons:**

- You will lose some space at the front idlers.
    - Make sure you change your homing override to home Y first, then X.
- Some parts like the ducts and hotend mount are a bit tricky to print.
- Thumb screw for the mini-sherpa will not fit.  Use a buttonhead to save space.
    - I bought 6mm diameter x 1mm coil diameter x 10mm length springs for extra clearance.
    - Cutting the bondtech spring will also work.

**BOM, References, Thanks:**

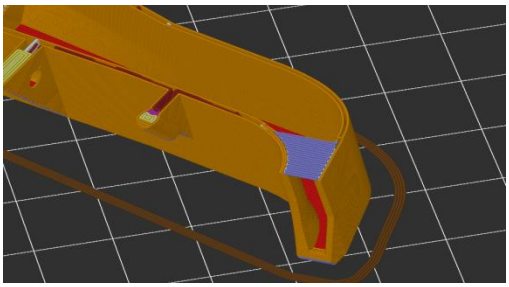
- **Fasteners**
  - m2 x 10 (or m2 x 12) self tapping screws
    - This is a standard Voron part used to attach the Omron microswitches
  - m3x6x4 heatsets
  - m3x20 SHCS x2 (upper screws to attach hotend mount to carriage)
  - assorted BHCS (all other screws can be button head to save weight)
- **Other**
  - m6x3 magnets x11
  - larger magnet stack (used if soldering directly to the m6x3 magnets) so that magnetic field loss is minimized during soldering)
  - D2F-5 Omron microswitch for magprobe
- **Fans**
  - 5015 fans x2
    - I recommend Sunon (12v) or Delta (24v) however any 5015s should be fine.
    - Sunon: https://www.digikey.com/short/zrwpw9
    - Delta>Sunon>GDSTime>Winsinn
  - 3010 Hotend Fan
    - I'm using Sunon 3010v1 (12v) currently https://www.digikey.com/short/t5dpqw4w
    - I think the Sunon 3010v2 (12v) will work as a quieter option, but haven't tested yet https://www.mouser.com/ProductDetail/Sunon/MF30101V2-1000U-A99?qs=EU6FO9ffTwfZ4Kz3LWY0zg%3D%3D
- **Mini-Sherpa**
  - See the Annex guide for its instructions and BOM.
  - https://github.com/Annex-Engineering/Sherpa_Mini-Extruder
  - https://www.youtube.com/watch?v=3WogD5IUwAM
- **Mag Probe**
  - Mag probe is modified from Annex's work.
  - https://github.com/Annex-Engineering/Annex-Engineering_Other_Printer_Mods/tree/master/All_Printers/Microswitch_Probe
- **JoshMurrah**
  - Just wanted to note him here as he has been extremely helpful in some insane stress testing. His speed benchies have been fun as hell to watch and a motivation for me to keep improving.

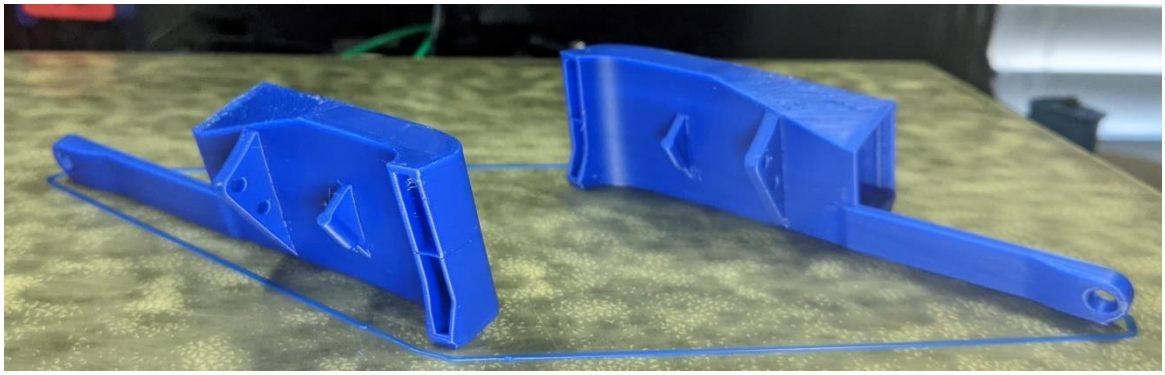
**Print Orientation:**



**Slicer Tips:**

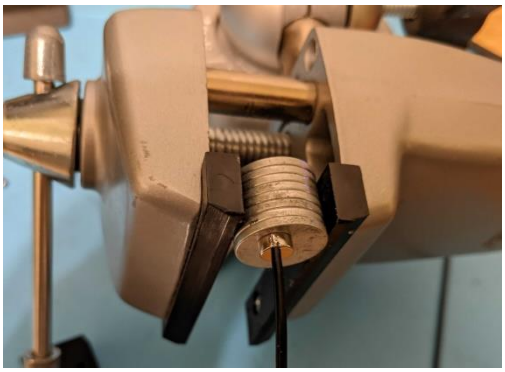
- **Perimeters/Shells**
  - 3-4 Perimeters and low infill is adequate.
  - Josh Murrah is using 3perim/40% on his toolhead used in speedruns.
  - I've been using 4 perimeters/15%
- **Ducts**
  - Check that this outlet divider is sliced in a sane way.
  - In superslicer, I find the "keep only bridges" option under "Perimeters & Shell" works well for the ducts
  - The ducts have some tough overhangs, so orient the part so the over hangs print the best for you. Prioritize good quality for the outlet. The 5015 mount surface will generally be rough, but that's ok.



**Carriage Assembly:**

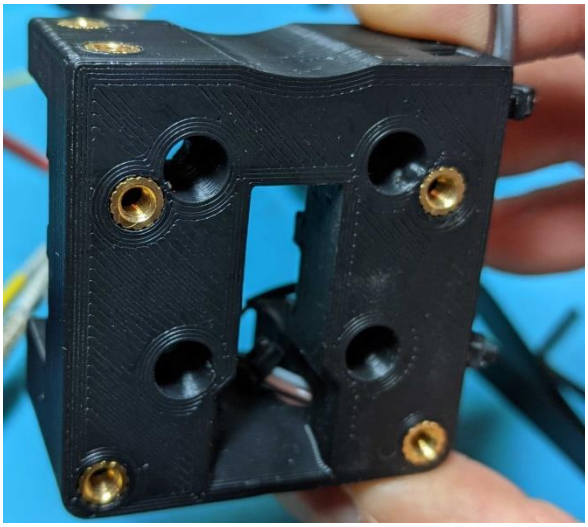
**Magnets**

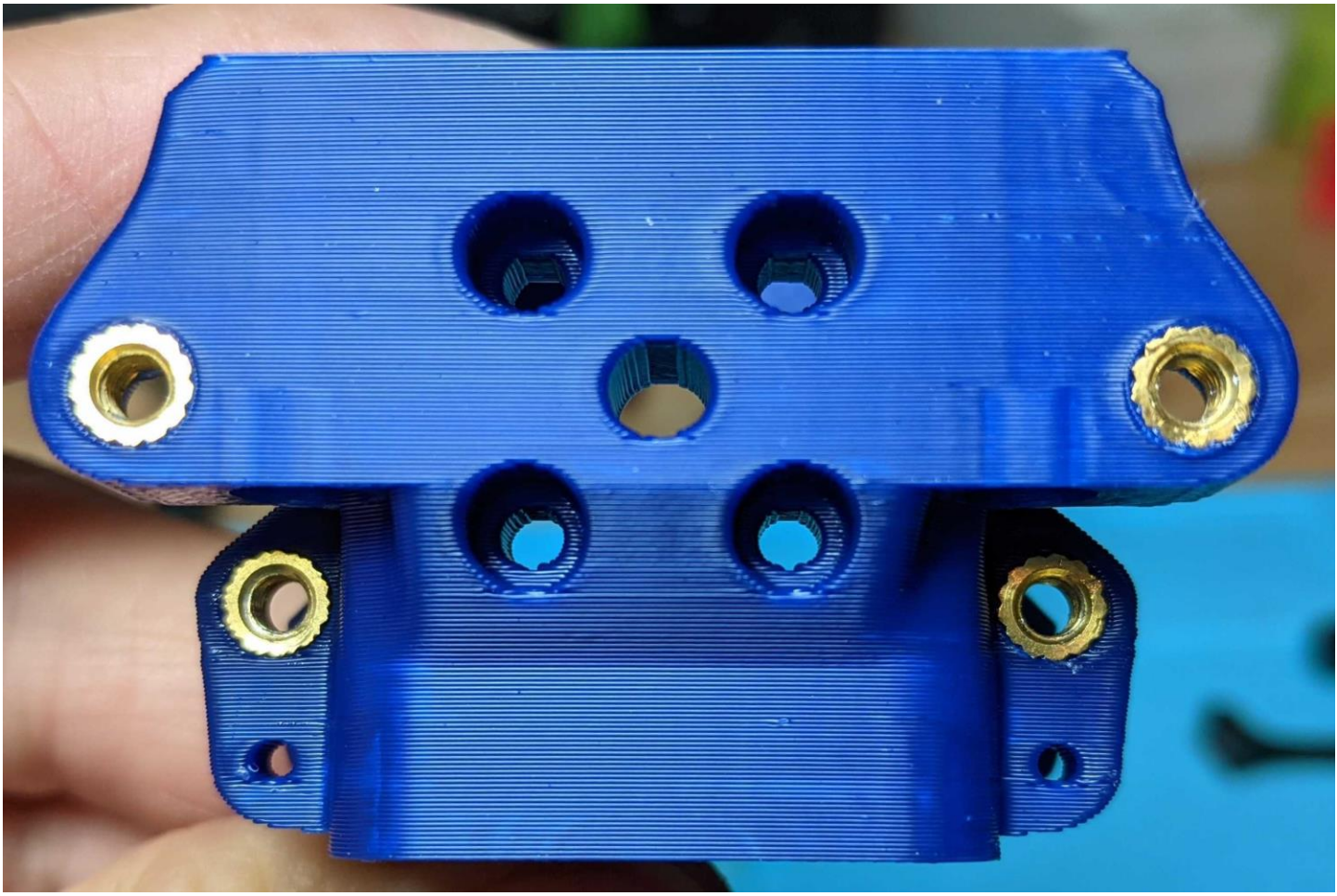


- **Solder Method**
    - Sand the side of 4 m6x3 magnets. Place a magnet on a bigger stack of magnets then solder a piece of wire to the side as shown.
    - If you don't have the magnet on the bigger stack, your magnet will lose some of its magnetic field. It'll probably be ok, but I haven't tried.
- **Wire Pinch**
    - Josh Murrah was able to attach his magnets by fanning out the wire then compressing the wire between the carriage and magnet and gluing in place. This method appears to be working fine for him.
    - The carriage uses 2 stacks of 2 magnets and a m3x6 button head
    - Adjust the tilt of your magprobe by screwing in and out the button head screw
- **USE GLUE IN THE CARRIAGE PRIOR TO PRESSING IN THE MAGNETS**

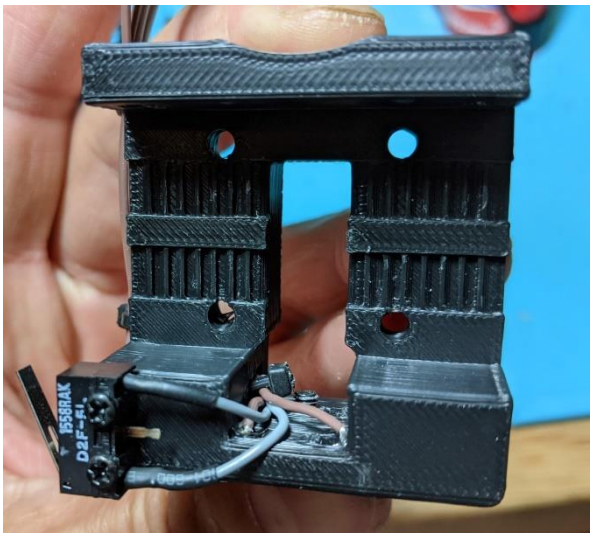
**Heatsets**

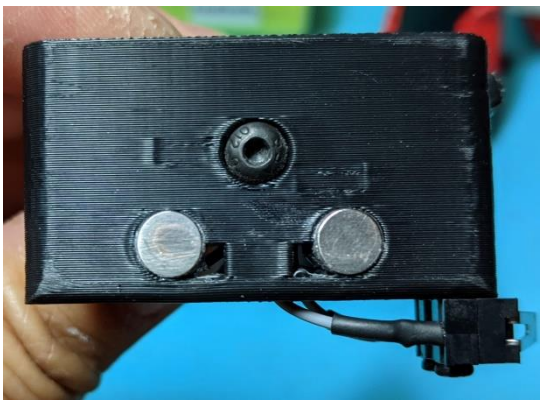
- As shown on front and top. There will be an extra hole. This is a

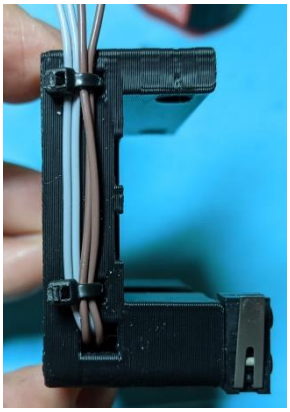




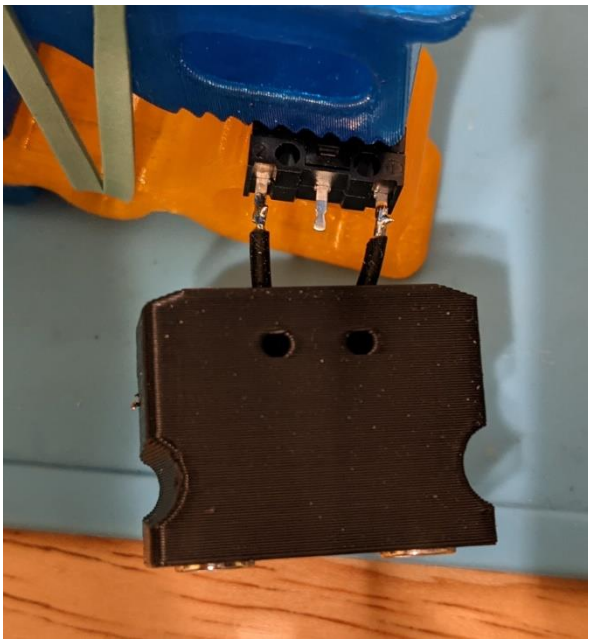
n extra hole in case something else needs to be mounted (power distribution or something) later.



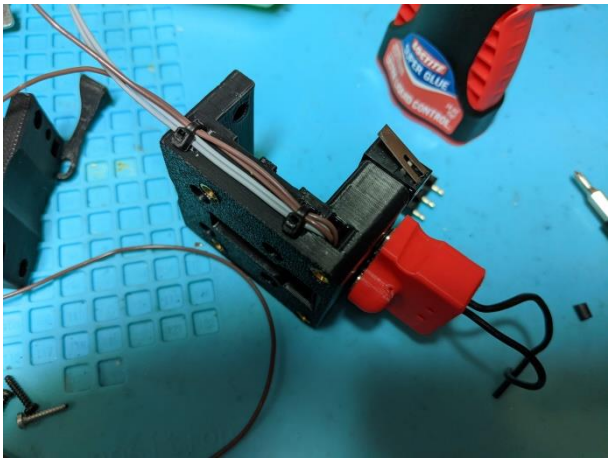




**Mag Probe:**

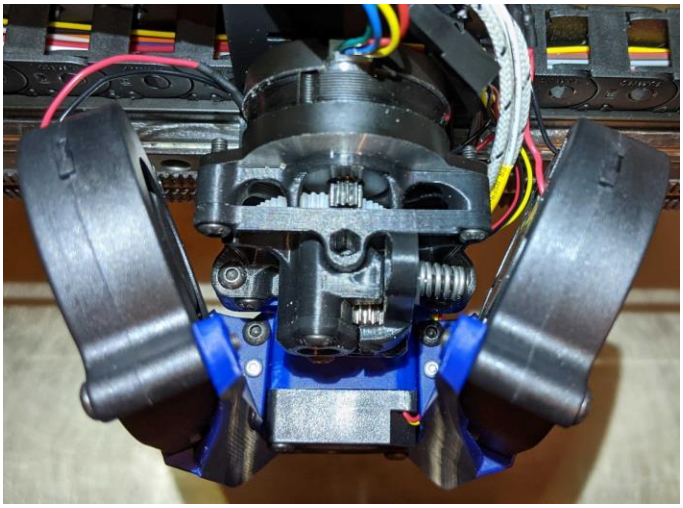


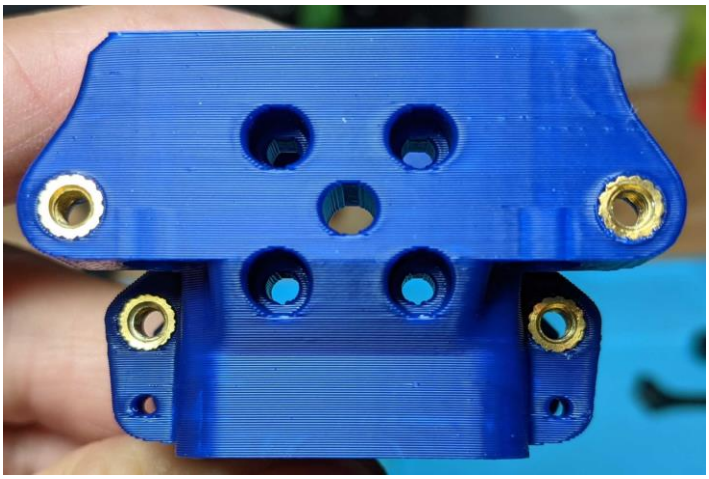
- Solder a short length of flexible wire to two m6x3 magnets then press the magnets into the holes.
- Alternatively, fan out the wire and press/glue in the magnets.
- When pressing in the magnets, I used a clamp and a flat surface to try to get the magnets flat.
- Screw in two of the m2x10 or m2x12 self tapping screws (silver ones on the red magprobe) prior to soldering the microswitch in. Take care not to damage the wires.
- Solder the other ends of the wires to the **outer prongs (NC)** of the D2F-5 microswitch. Note the image with the black magprobe is an older version.
- Press in the D2F-5 microswitch now and screw in two more m2x10 or m2x12 to secure the microswitch. If there is any play in the microswitch, use some superglue to remove the play.
- Test fit the magprobe to the carriage and adjust the level of the probe using the m3 button head on the bottom of the carriage.
- Insert magnets into dock arms and secure to bed extrusion.
- You don't have to remove your bat85 diode when wiring in the wires to the magnets on the carriage
- Video of docking and undocking. Build your own macros or see annex engineering for their macros.
    - https://youtu.be/hdD8uaDW-pA

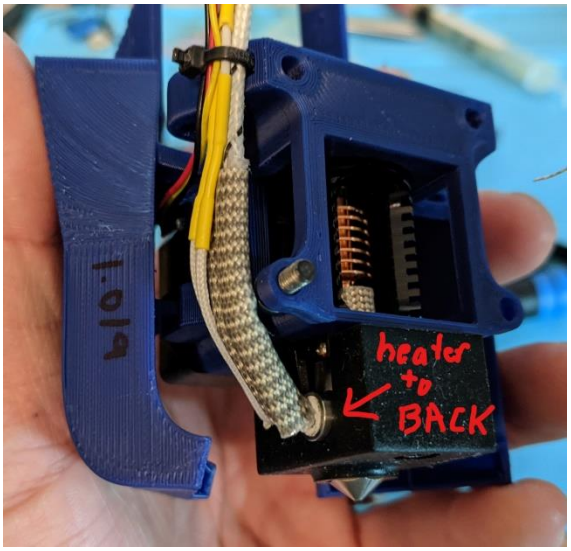


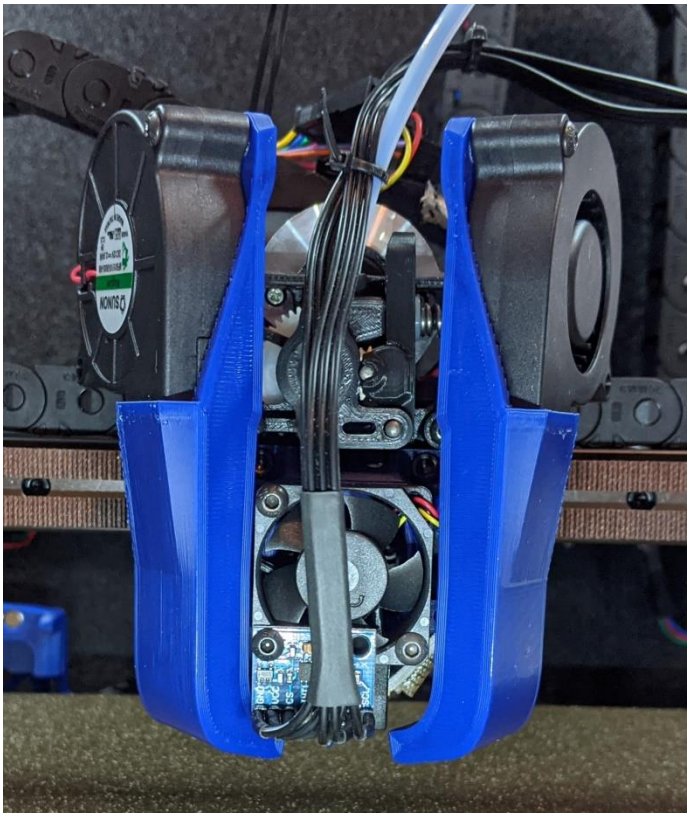
**Final Assembly:**

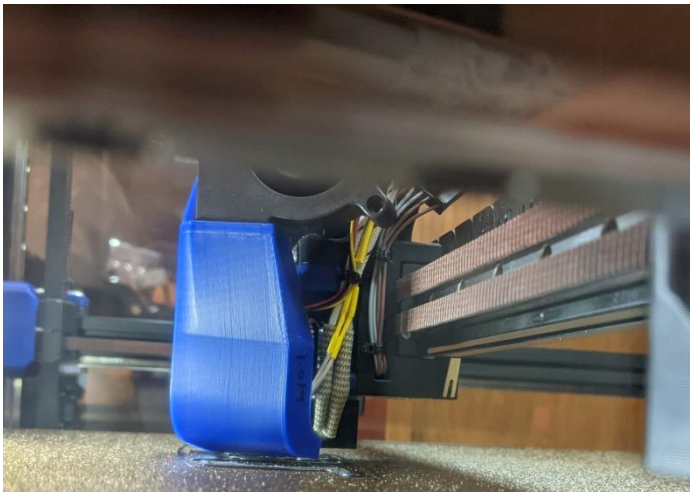
- Use button heads for everything if possible.
- ****note the heater cartridge location****









**Firmware Settings:**

- With my Sunon I have been able to pwm down to 7% using these settings
    - kick_start_time: 0.5
      ## Depending on your fan, you may need to increase this value
      ## if your fan will not start
      off_below: 0.05
      cycle_time: 0.008

**Slicer settings:**

- This is currently what I've been using for ABS as far as cooling.