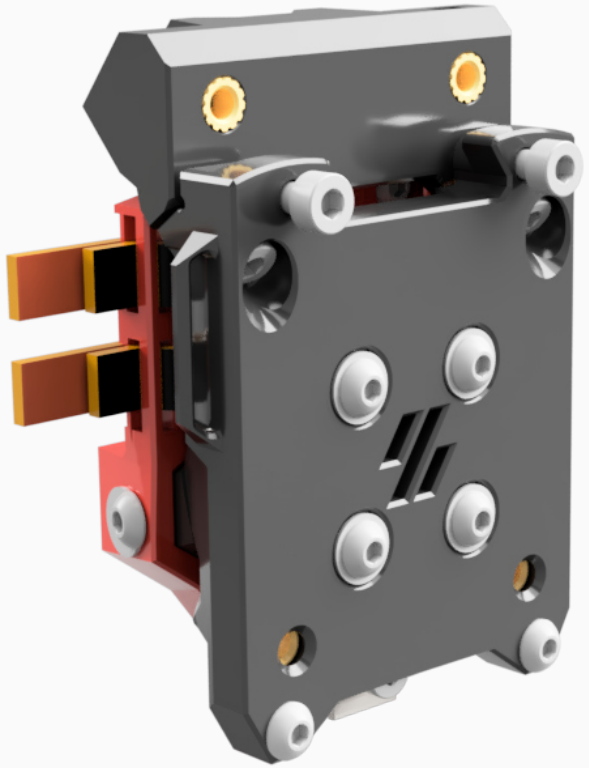
VORON



VORON TAP

We build space shuttles with gardening tools
so anyone can have a space shuttle of their own.

VERSION 2022-12-16

Before you begin this journey, a word of caution.

In the comfort of your own home, you are about to assemble a robot. This machine can maim, burn, and electrocute you if you are not careful. This machine can start a fire.

Please do not become the first VORON fatality. There is no special Reddit flair for that.

Please read the entire manual before you start assembly. As you begin wrenching, please check our Discord channels for any tips and questions that may halt your progress.

Most of all, good luck!

PART PRINTING GUIDELINES

The Voron Team has provided the following print guidelines for you to follow in order to have the best chance at
success with your parts. There are often questions about substituting materials or changing printing standards, but we recommend you follow these:

3D PRINTING PROCESS

Fused Deposition Modeling (FDM)

MATERIAL

ABS or ABS+

LAYER HEIGHT

Recommended: 0.2mm

EXTRUSION WIDTH

Recommended: Forced 0.4mm

INFILL TYPE

Grid, Gyroid, Honeycomb, Triangle or Cubic

INFILL PERCENTAGE

Recommended: 40%

WALL COUNT

Recommended: 4

SOLID TOP/BOTTOM LAYERS

Recommended: 5

FILE NAMING

The STL files for our parts are available in our Github repository. The parts use this naming convention:

PRIMARY COLOR

Example Tap_Front_r1.stl

These files will have nothing at the start of the filename.

ACCENT COLOR

Example [a]Tap_Center_r1.stl

We have added "[a]" to the front of any STL file that is intended to be printed with accent color. The parts are marked with a heart in the manual.

PART VERSIONING

Example Tap_Front_r1.stl

Part names will have a revision number at the end (e.g., "r1"). It is normal for revision numbers to not match up: not all parts are changed for every revision. Always see the Github repository for the latest parts.

HOW TO GET HELP

If you need assistance with your build, we're here to help. Head on over to our Discord group, Forum, or to Reddit and post your questions. We have a great community that can help you if you get stuck.

DISCORD https://discord.gg/voron

VORON FORUM https://forum.vorondesign.com/

https://www.reddit.com/r/VORONDesign

REPORTING ISSUES

Should you find an issue in the documentation or have a suggestion for an improvement, please consider opening an issue on GitHub (https://github.com/VoronDesign/Voron-Tap/issues). When raising an issue, please include the relevant page numbers and a short description. Annotated screenshots are also very welcome and helpful. We periodically update the manual based on the feedback we get.

THIS IS JUST A REFERENCE

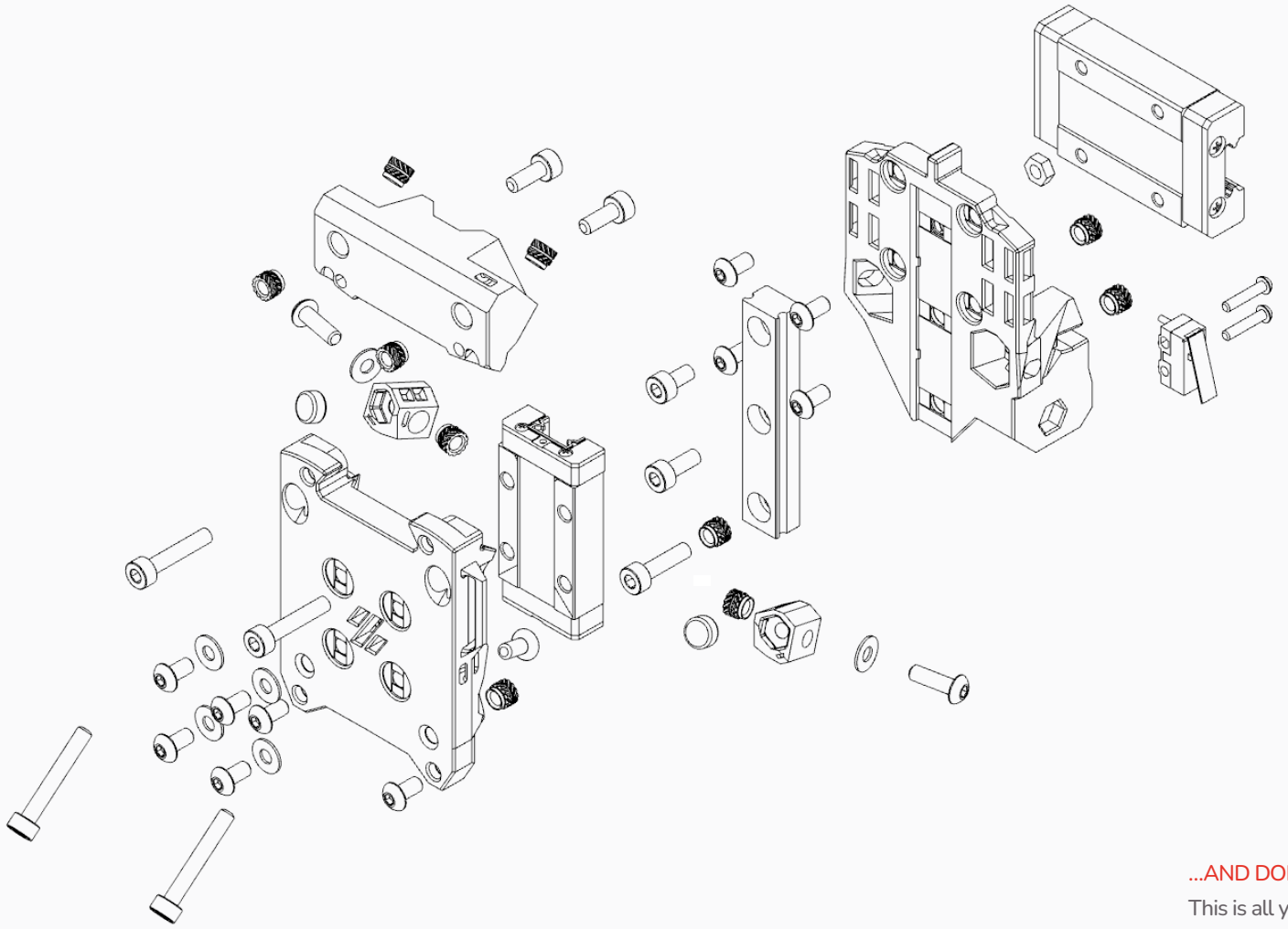
This manual is designed to be a simple reference manual. For additional information, we recommend downloading the CAD file from our Github repository. It can sometimes be easier to follow along when you have the whole assembly in front of you.

GitHub https://github.com/vorondesign

DOCS https://docs.vorondesign.com

AN ASSEMBLY MANUAL?

We need to write an assembly manual?



...AND DONE.

This is all you need to see, really.
But, just in case though, read
through this document carefully.

WHAT IS TAP?

Tap is a nozzle-based z-probe for the V2 and Trident printer designs. The entire toolhead moves to trigger an optical switch.
Tap offers many advantages over other z-probes; Here are a few examples:

EXTREME PRECISION

A well constructed Tap, when in service on a well-constructed printer, will be able to measure your Z position reliably with a precision of 0.4 µm (0.0004 mm). This precision will help you better use and maintain your printer.

ANY BUILD SURFACE, CHANGE AT WILL

Tap can measure any securely mounted build surface. Print on Glass, Garolite, Alumina, Moon dust...it no longer matters. Textured plates are ideal for Tap, but adhesive PEI sheets may also be used. Tap is unaffected by beds with magnetic fluctuations (note: magnets may affect the build surface Tap is sensing, such as pulling the plate tighter over the magnet). Once Tap is setup, you should not need to recalibrate after changing nozzles or build plates.

VORON DURABILITY, HIGH TEMPERATURE OPERATIONS (OPTICAL SENSOR VERSIONS)

Tap uses light to detect movement and will never wear out. The sensor in Tap is rated to operate at 70C to 100C and will not degrade over time the way a contact switch or inductive probe can. Even if you brought your chamber temperature to 100C, it will accurately and reliably record your printer melting (assuming you printed in ABS). We tested dozens of printers and thousands of print hours. Hundreds of PIF quality kits were printed using Tap. Some test printers had over 1,000,000 probe cycles to test durability.

NO COMPLICATED MACROS

For consistent probing temperatures, Tap uses a single 'activate_gcode' macro in the [probe] config. Tap is always ready to probe and requires no docking or undocking moves.

Z ENDSTOP ELIMINATION

There is no need for a separate Z endstop. Once the offset is configured, it will hold without appreciable drift. It is normal to need slightly different offsets when switching between filament types.

CRASH PROTECTION

With Tap installed, the nozzle and bed are protected from minor crashes (such as accidentally setting your Z to 1 mm below the build surface, or running into a curled up print). In extreme crashes, Tap can break away completely, saving you from a hidden break elsewhere in your printer.

SPECIAL WARNING ON Y POSITION:

Tap is ~3 mm thicker than the stock 2.4R2 and Trident X carriages. This places the toolhead closer to your doors. Make sure you have clearance, and you may need to adjust your bed position on V2 or Y travel on Trident.

HARDWARE REQUIREMENTS:

YOU MUST USE THE MGN12H X-AXIS

You must already be using the MGN12 based X-Axis.Tap does not fit on the older MGN9 based X-axis.

CW2 STYLE MOUNTED EXTRUDER REQUIRED

Tap replaces the X-carriage mount, and requires that the mounting screws come in from the front of the carriage like CW2, not the back like CW1. There are mounts for LGX and Galileo available.

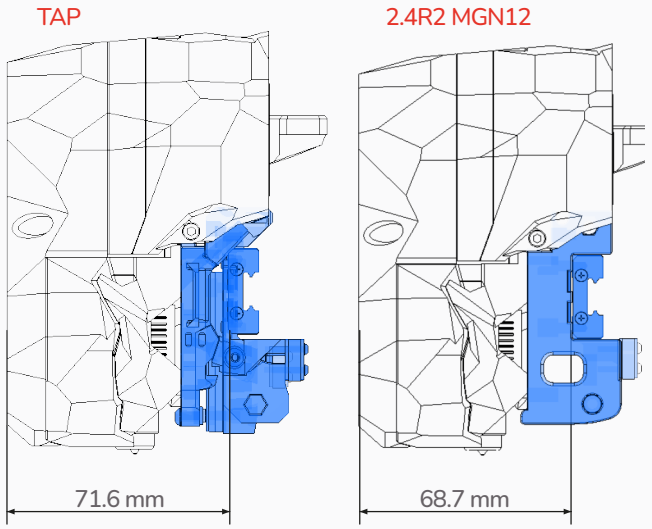
BED MOUNT MUST BE SECURE

When Tap is probing, the nozzle will contact the bed with a force of approximately 500-800 grams. Your bed should not move during this. Bed motion compromises the accuracy of Tap, so it is not recommended for Voron 1.8, Legacy, or Switchwire designs.

If you want to know if Tap is right for you, tap your finger on the bed firmly. If the bed moves, Tap is not right for you.

GOOD MECHANICAL CONDITION

Tap is far more precise than previous Z sensing systems, and we have found it can reveal previously unnoticed problems in a printer. If your printer has known mechanical issues (such as cracked components) fix them before attempting Tap.



TOOLHEAD ON A RAIL

With Tap, the entire toolhead (including Extruder) can move in the Z direction on a short MGN9 rail with a MGN9H carriage. In normal printing operation, the toolhead is held in place by a pair of magnets, acting on a pair of screws. During probing the toolhead lifts up slightly, activating a photointerrupter switch concealed in the mechanism.

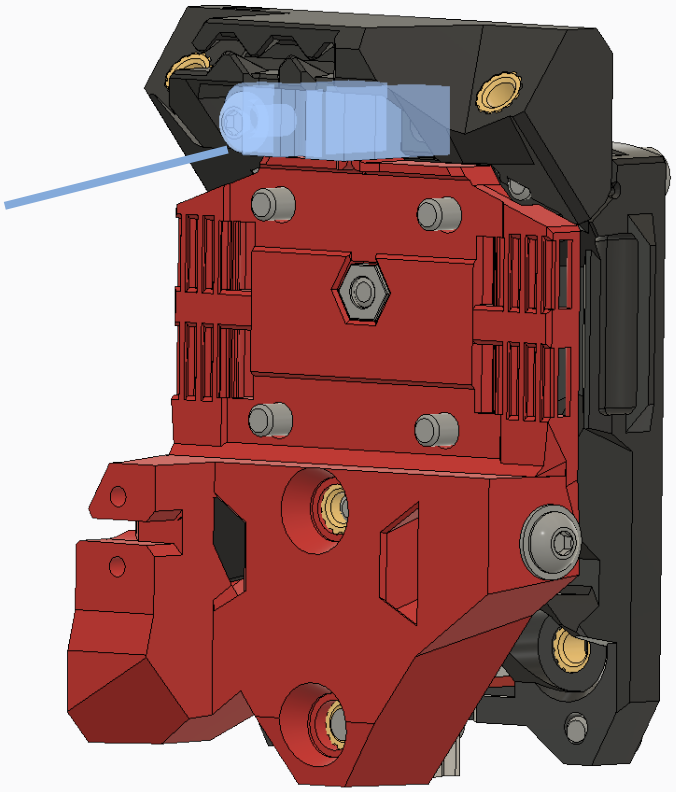
OPTICAL SENSOR OR MECHANICAL SWITCH

See the BOM for the sensor part numbers. These are all tested and are known to work. If you ignore this advice and buy a random sensor off Amazon, it may not work.

The mechanical switch option is provided in case you cannot find the optical sensors.

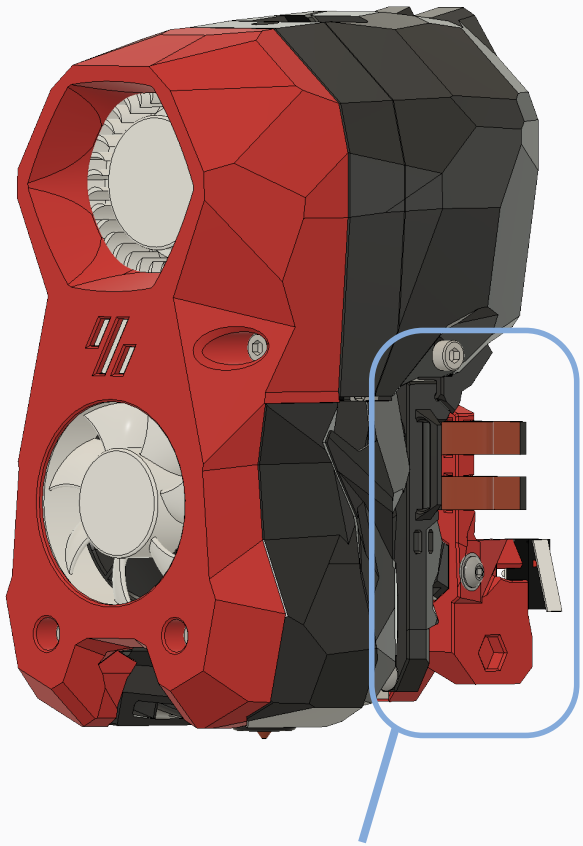
CENTER (RED)

Houses magnets, retains belts, and is connected to the MGN12H X-axis. Up top, there's a plastic tab that triggers the optical sensor.



FRONT (BLACK)

Connects to the toolhead and extruder, rides on a MGN9 Rail, and houses the sensor.

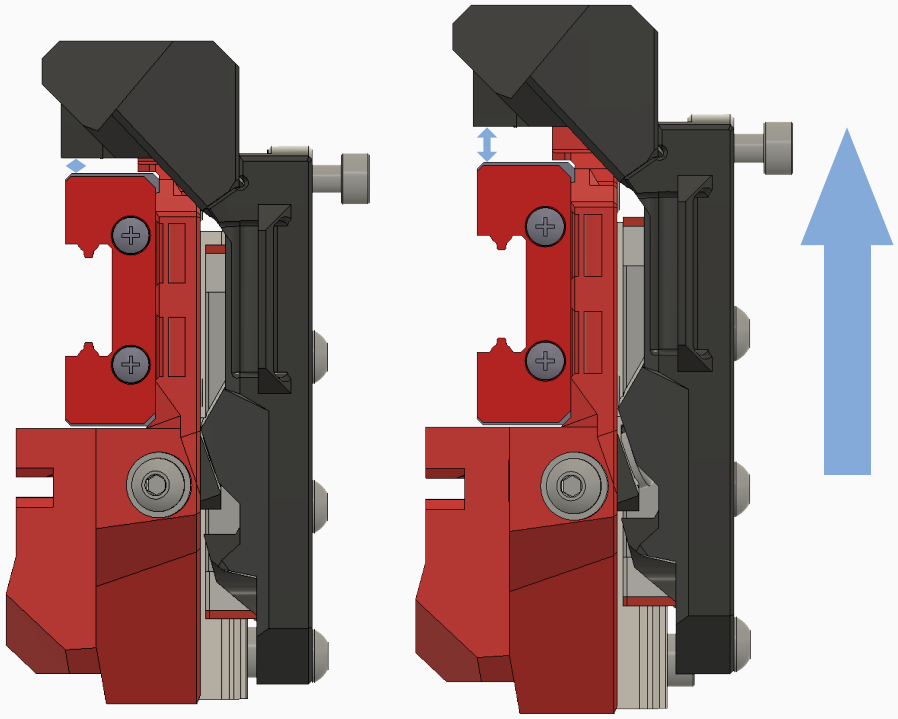


TAP REPLACES THE X CARRIAGE

Tap is a drop in replacement for the X Carriage. The toolhead and extruder mount to Tap, which is mounted to the MGN12 X axis.

NORMAL OPERATING POSITION

TRIGGERED



Magnetic and gravitational forces keep the toolhead from shifting during printing. If the nozzle contacts something solid (like the bed), the black section of Tap and toolhead move up, and the optical sensor will trigger. There are stops built in to prevent it from moving too far, unless you really want the front to fall off.

SENSOR OPTIONS

CHOOSE TO USE EITHER THE WIRED OPTICAL SENSOR OR THE PCB-BASED SENSOR

WIRED OPTICAL SENSOR:

Tap was designed to use and Optek OPB991 sensor (see BOM for part numbers)

Pre-release versions of Tap used OPB990 sensors. We switched to 991 because some MCU's were shown to be sensitive to having +5v on a signal pin.

These sensors are pre-wired, but you will have to add a 220 Ohm resistor to the wiring as a current limiter. The exact resistance is not critical, it can be +/- 10% of 220 Ohms, and should be rated for ¼ watt or higher. Soldering this resistor is no harder than adding the diode for the old inductive sensors...but soldering isn't for everyone. See next page for details on soldering this together.

PCB-BASED SENSOR:

Recognizing that soldering is difficult for some builders, Voron engineers designed a PCB-based sensor. This mounts an Optek OPB666N or OPB971N sensor. This PCB has the advantage of having an indicator light on the board. The files for making this may be found on the Voron Github. https://github.com/VoronDesign/Voron-Tap/tree/main/OptoTap

MECHANICAL SWITCH D2HW-C203MR

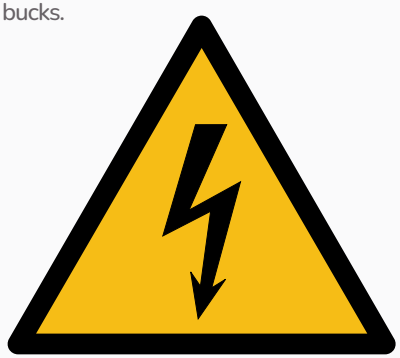
We've had a lot of supply issues with the optical switches. The mechanical switch is inferior to the optical choices, but still better than staying with a non-tap sensor. The only mechanical swich I can reccomend is the Omron D2HW-C203MR (D2HW-C203MRS is identical for our purposes)

WHICH ONE IS BETTER?

Both opticals and the mechanical are capable of 0.4 µm accuracy (assuming the rest of the printer is in good condition). If you can, get the optical PCB-based sensor. Having an indicator light is a big plus, and the OPB666N sensor is good to 100° Celsius operating temperature. The OPB991 and OPB971 sensors are rated to 70° Celsius which should be fine for most Voron printers. The sensor is away from significant sources of heat.

IF YOU PURCHASE A PREBUILT PCB-BASED SENSOR

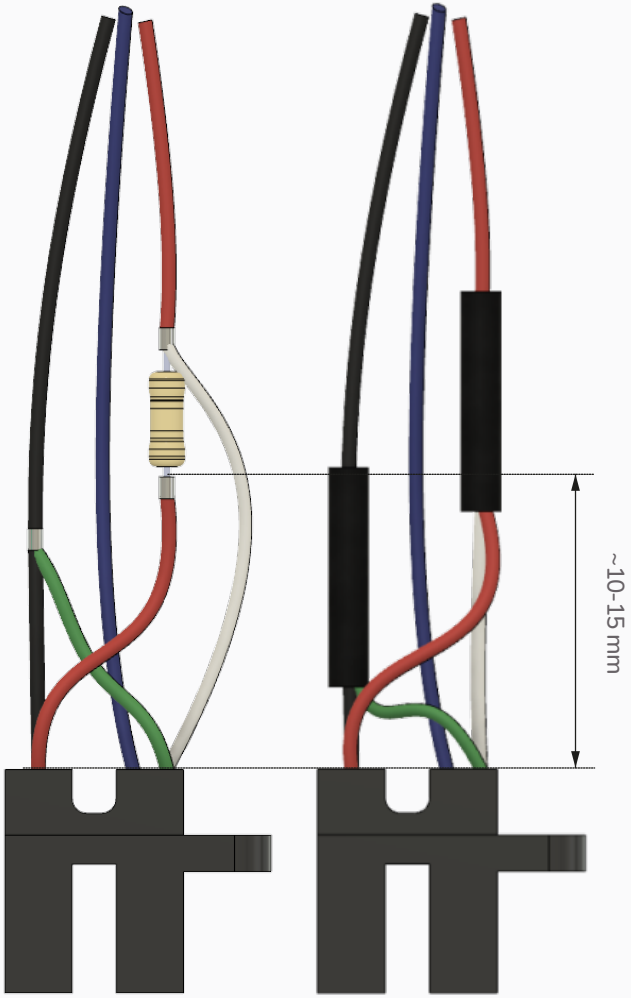
Make sure it's based on either an Optek 971N51 or OPB666N sensor, and its designed to work with Tap. Don't buy a generic sensor and expect it to work, this is not the place to save a couple of bucks.



MAKE SURE YOUR SENSOR CAN HANDLE YOUR VOLTAGE

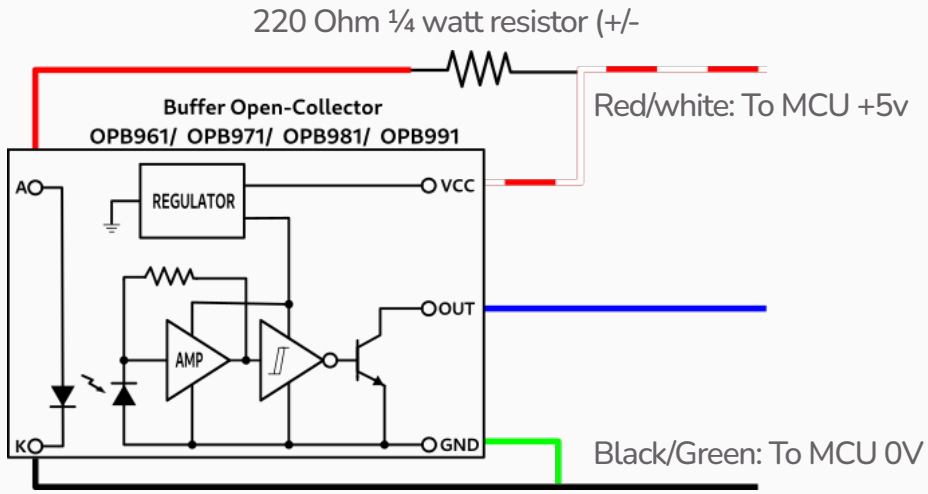
V1 PCBs and the wired optical sensors were designed for 5 volts, 24 volts is more than 5 volts.

Connecting to 24 volts may appear to work at first, but the sensor will burn out.



HOW TO CONNECT THE WIRED OPTICAL SENSOR

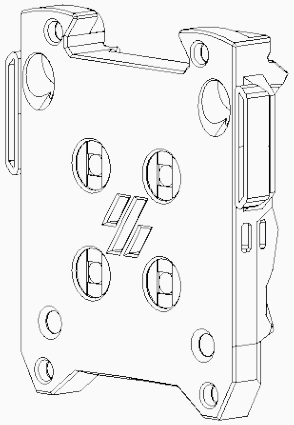
1. Solder the red wire to one side of resistor.
   (Approx. 10-15 mm away from the sensor body)
2. Solder the white wire to the other side of resistor.
3. Solder the black and green wires together.
4. Cover all solder joints and the resistor with shrink tube.
5. Connect the red wire to +5 volts, blue wire to the signal pin of your MCU, and the black wire to ground (0 volts).



PRINT THESE FOUR PARTS

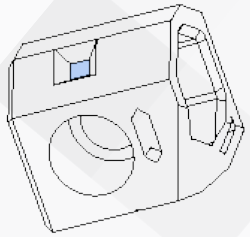
FRONT

Tap_Front_r1.stl



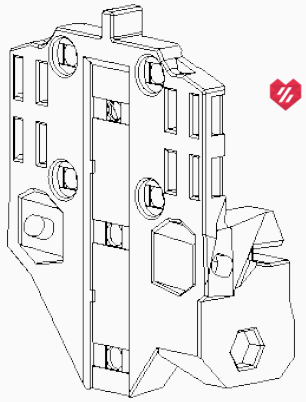
RIGHT MAGNET HOLDER

Tap_Magnet_Right_r1.stl. Notice one dot (blue) on the right.



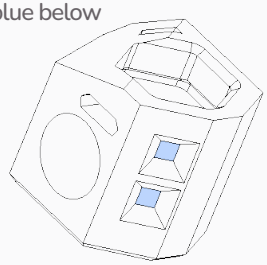
CENTER

[a]Tap_Center_r1.stl



LEFT MAGNET HOLDER

Tap_Magnet_Left_r1.stl. Note the left has 2 dots marked in blue below

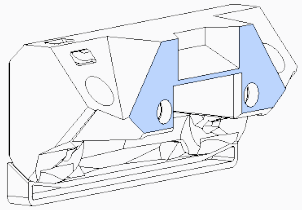


PRINT ONE UPPER

Which upper to print depends on the sensor choice:

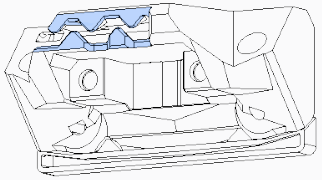
PCB-BASED SENSOR:

Use **Tap_Upper_PCB_r1.stl** if you use the PCB-based sensor.



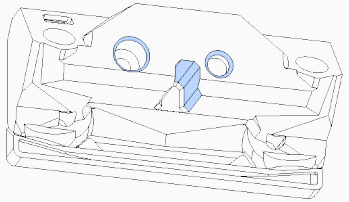
WIRED SENSOR:

Use **Tap_Upper_Wired_r1.stl** if you use the wired sensor. Notice the wiring channel in blue.



D2HW-C203MR SWITCH

Use **Tap_Upper_D2HW_r1.stl** if you use the mechanical switch.

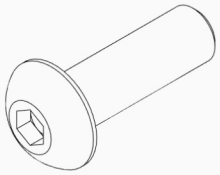


Qty	Description	Notes
1	50 mm MGN9 rail	See cutting guide in this manual for details.
1	MGN 9H carriage	Medium preload (Z1) is preferred, light or no preload will also work. Carriage must be removable from rail.
2	6 mm x 3 mm magnet	6 mm diameter by 3 mm tall cylinder. N52 strength is preferred , N35 or higher strength is required.
11-12	M3 heat-set insert	These are standard Voron inserts, 5 mm diameter 4 mm long. 11 for optical versions, 12 for the D2HW version.
1	M3 hex nut	ISO 4032 / DIN 934
6	M3 washer	ISO 7089 / DIN 125 7 mm outer diameter, 0.5 mm thickness
2	M3 x 20 SHCS	ISO 4762 / DIN 912 socket head cap screw
2	M3 x 16 SHCS	ISO 4762 / DIN 912 socket head cap screw
1	M3 x 12 SHCS	ISO 4762 / DIN 912 socket head cap screw
3	M3 x 8 SHCS	ISO 4762 / DIN 912 socket head cap screw
1	M3 x 6 SHCS	ISO 4762 / DIN 912 socket head cap screw
2	M3 x 6 FHCS	ISO 10642 / DIN 7991 flat head cap screw MUST BE MAGNETIC, NO STAINLESS!
2	M3 x 10 BHCS	ISO 7380-1 button head cap screw
10	M3 x 6 BHCS	ISO 7380-1 button head cap screw

PCB-Based Sensor option		
1	OptoTap PCB	See Github repository https://github.com/VoronDesign/Voron-Tap/tree/main/OptoTap
1	OPB Sensor	Two known good part numbers: OPB 666 N, OPB 971 N51

Wired Sensor option		
1	220 Ohm resistor	¼ Watt, +/- 10% (or better) tolerance resistor. For example, CFR-25JB-52-220R
1	OPB Sensor	Four known good part numbers: OPB 991 P51Z , OPB 991 L51Z, OPB 991 T51Z, OPB 991 T11Z

OMRON D2HW-C203MR Switch option		
1	D2HW-C203MR	Can substitute D2HW-C203MRS, they are identical except the “S “has a UL rating. Digikey US link
1	M3x8 BHCS	If you have sufficient clearance to the cable chain, a SHCS can be used here instead



BUTTON HEAD CAP SCREW (BHCS)

Metric fastener with a domed shape head and hex drive.

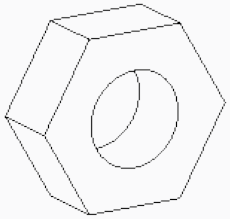
ISO 7380-1

FLAT HEAD COUNTERSUNK SCREW (FHCS)

Metric fastener with a cone shaped head and a flat top.

MUST BE MAGNETIC, NO STAINLESS!

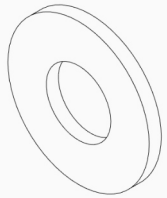
ISO 10642



AW, NUTS!

Actually, its just the one nut.
We don't like nut pockets either, but sometimes its the right move.
Metric fastener. Only used in M3 size.

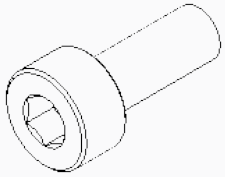
ISO 4032



WASHER

Usually stamped from sheet metal, this type of spacer is not as consistent in thickness as the shims are. Only used in M3 size.

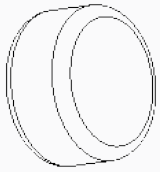
DIN 125



SOCKET HEAD CAP SCREW (SHCS)

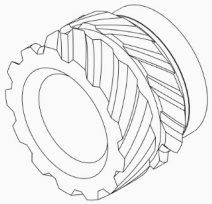
Metric fastener with a cylindrical head and hex drive. The most common fastener used on the Voron.

ISO 4762



MAGNETS

How do they work?
These are round 6mm in diameter by 3 mm tall. Shorter ones are OK. (down to 2.7 mm)
N52 are preferred, but N35 can work
Lower strength might cause ringing at high acceleration.



HEAT-SET INSERT

These are made of brass , threaded on the inside and and has ridges on the outside. Heat them up to approx 250C with a soldering iron and push them into the plastic.
As the plastic cools, it solidifies around the knurls and ridges on the insert for excellent resistance to both torque and pull-out.

SOLDERING IRON

We use this for setting heat-set inserts into parts. Depending on your sensor choice, you might be soldering some wires together.

ANGLE GRINDER/DREMEL

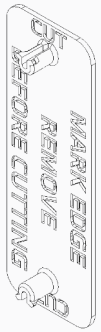
If you can't find a pre-cut 50 mm MGN9 rail, you'll need to cut down a longer one. Leave your grandfather's trusty hacksaw in the toolbox: rails are usually hardened steel.

VISE

A vise is handy if you have to cut your MGN9 rail. A vise may also be helpful when putting magnets in their holders.

WIRING CRIMPER

You'll need this to wire up the sensor. Or maybe theres a turnkey solution out there you can buy, check Discord. If you got this far without learning how to crimp, we don't judge.

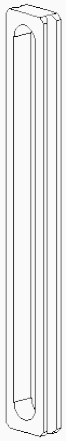


PRINTED CUT GUIDE

If you have to cut your MGN9 yourself, this can help you mark the places to cut. Remove the tool before cutting, or you will melt it to the rail.

SUPERGLUE

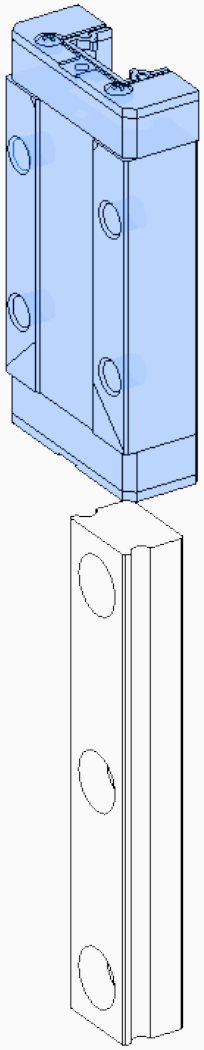
Yes, we consider this a tool. Superglue is useful as a plastic safe threadlock, and magnet glue. Cheap, single-use gel tubes are fine.



MGN9 ASSEMBLY TOOL

We love this thing. Print it. You will need it.

Marvel at its simplicity and wonder why you never thought of it before.



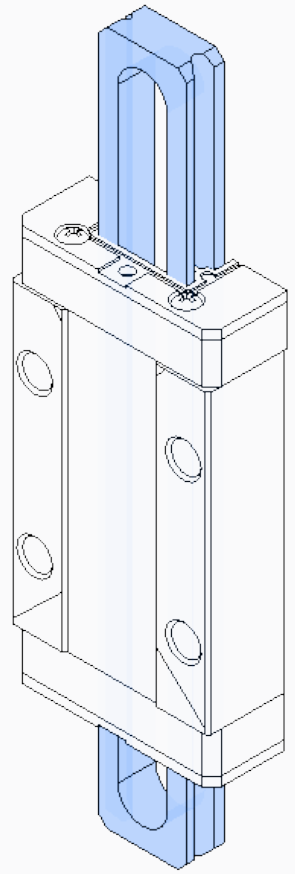
CAREFULLY REMOVE THE CARRIAGE

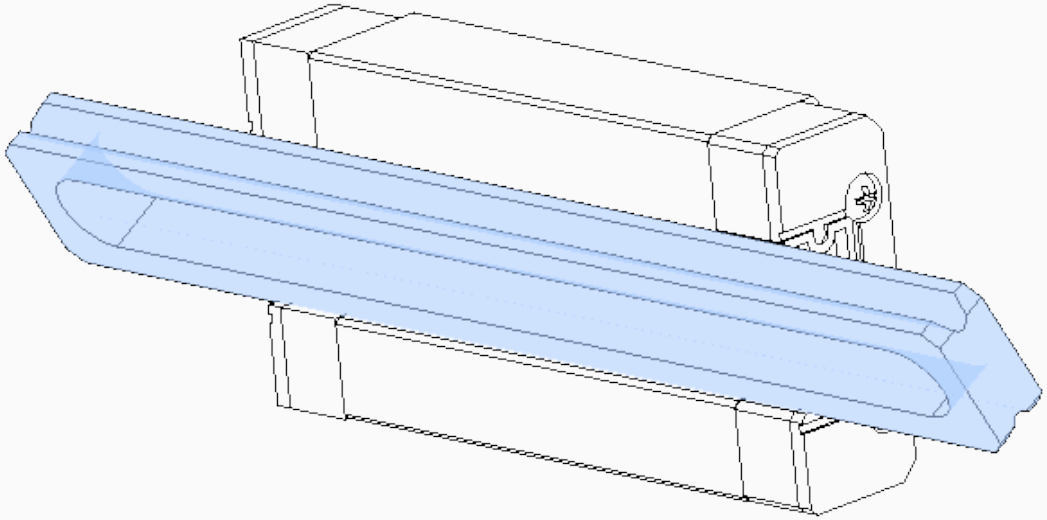
Do this over a bowl or other container, just in case a ball drops out. If some do, don't panic! They can be pushed back in, just add the balls back to the middle of the carriage.

MGN9 ASSEMBLY TOOL

Fit the tool over the bearings on one side. Squeeze the sides of the tool and rotate it to fit it over the other side's bearings, then release pressure.

The tool serves to hold the balls in place when not installed on a rail, and will help you reinstall the carriage later. Not bad for a 7 minute print, right?

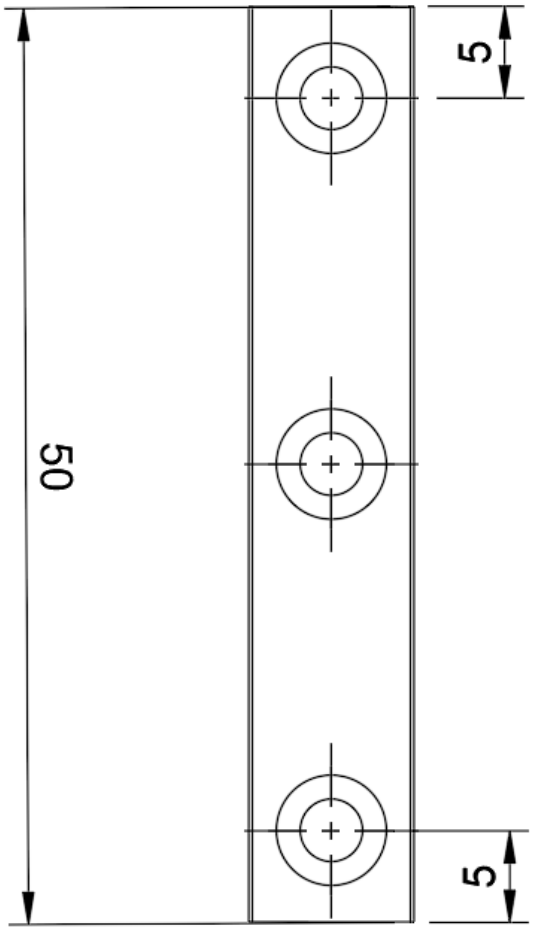


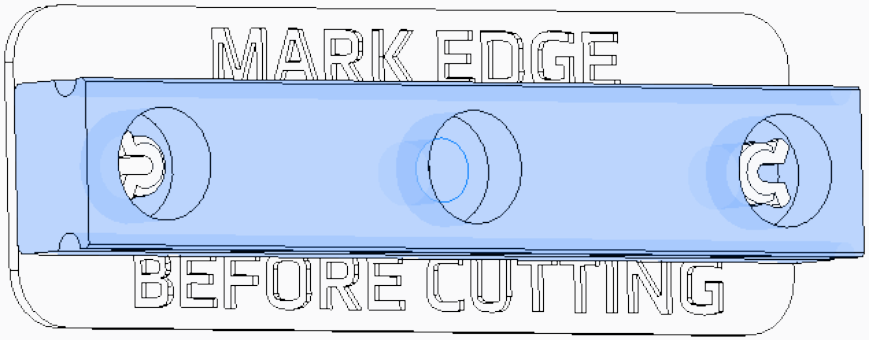


MGN9 CUTTING GUIDE

ENDS CAN BE +/- 1 MM OFF FROM THIS DRAWING

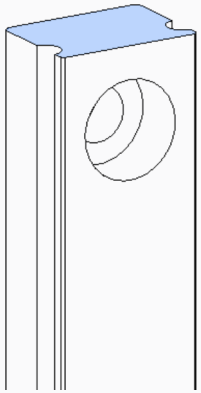
Just make sure you have 3 holes spaced like so. One in the center, and the other two ~ 5 mm from the ends.





USE THE GUIDE TO MARK WHERE TO CUT

If you have a longer rail you are cutting. Install this guide on the rail, mark the ends where you will cut.
Don't forget to remove the guide before cutting, it will melt.



DEBURR AND CLEAN AFTER CUTTING

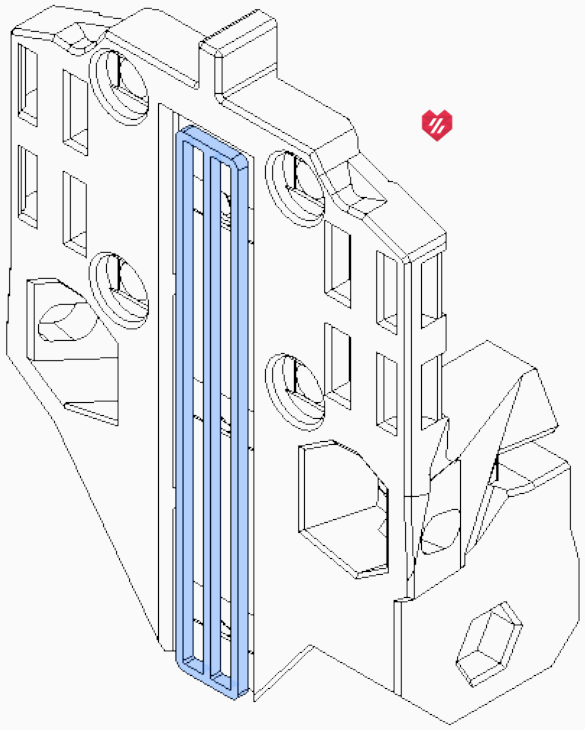
Smooth over any sharp edges on the cut surfaces with a file, and clean the rail carefully.

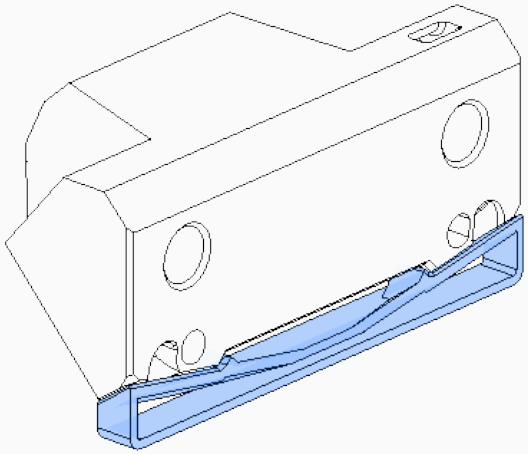
You don't want slivers of metal getting into the carriage or damaging the ball bearings.

WE DON'T ALWAYS USE SUPPORTS, BUT WHEN WE DO:

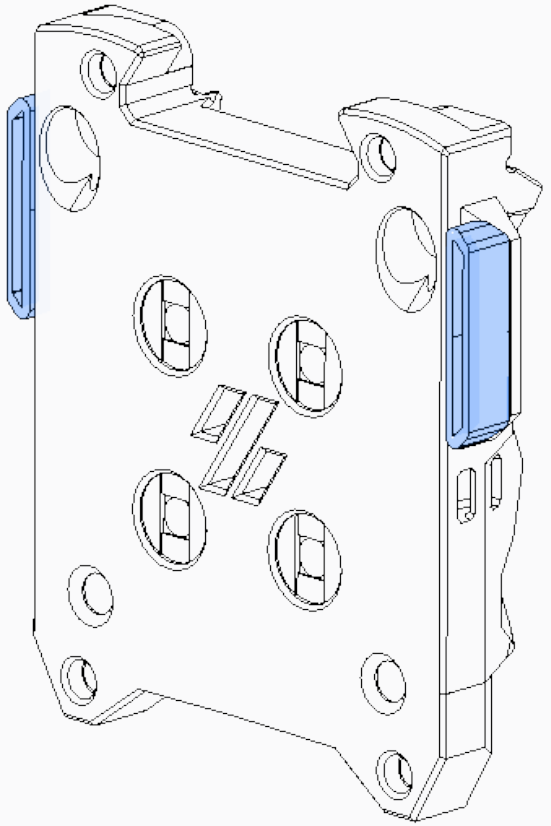
...There is a good reason, the support is well designed, and it is easily removable.

Remove the indicated supports and discard them.

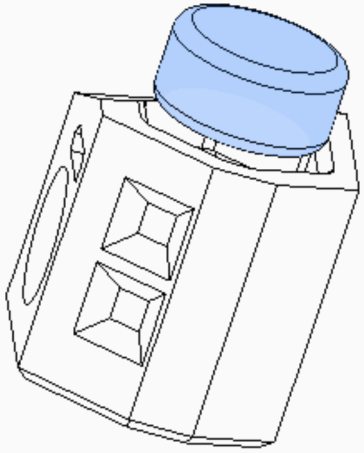


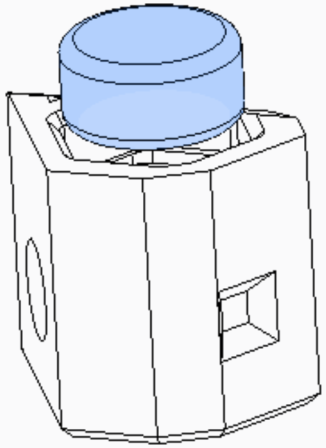


Bonus points if the support makes a face.



(2) 6x3 magnets
2 drops RTV or Superglue





DO YOU SMELL...GLUE?

Yes, yes you do. Specifically superglue, but you could also use RTV silicone, just a drop. Is all that is needed. Despite our best efforts, the magnets can still come loose without it.

MAGNET PRESS

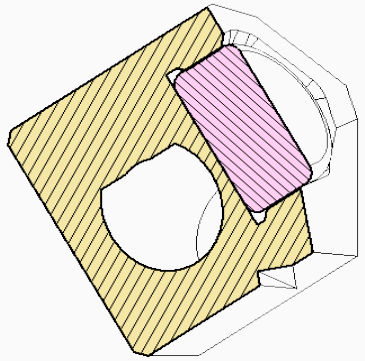
1. Place magnet on a flat surface (polarity doesn't matter)
2. Place a drop of CA glue on top of the magnet
3. Place magnet holder on magnet.
4. Using a strong flat tool, firmly press magnet holder down over magnet.

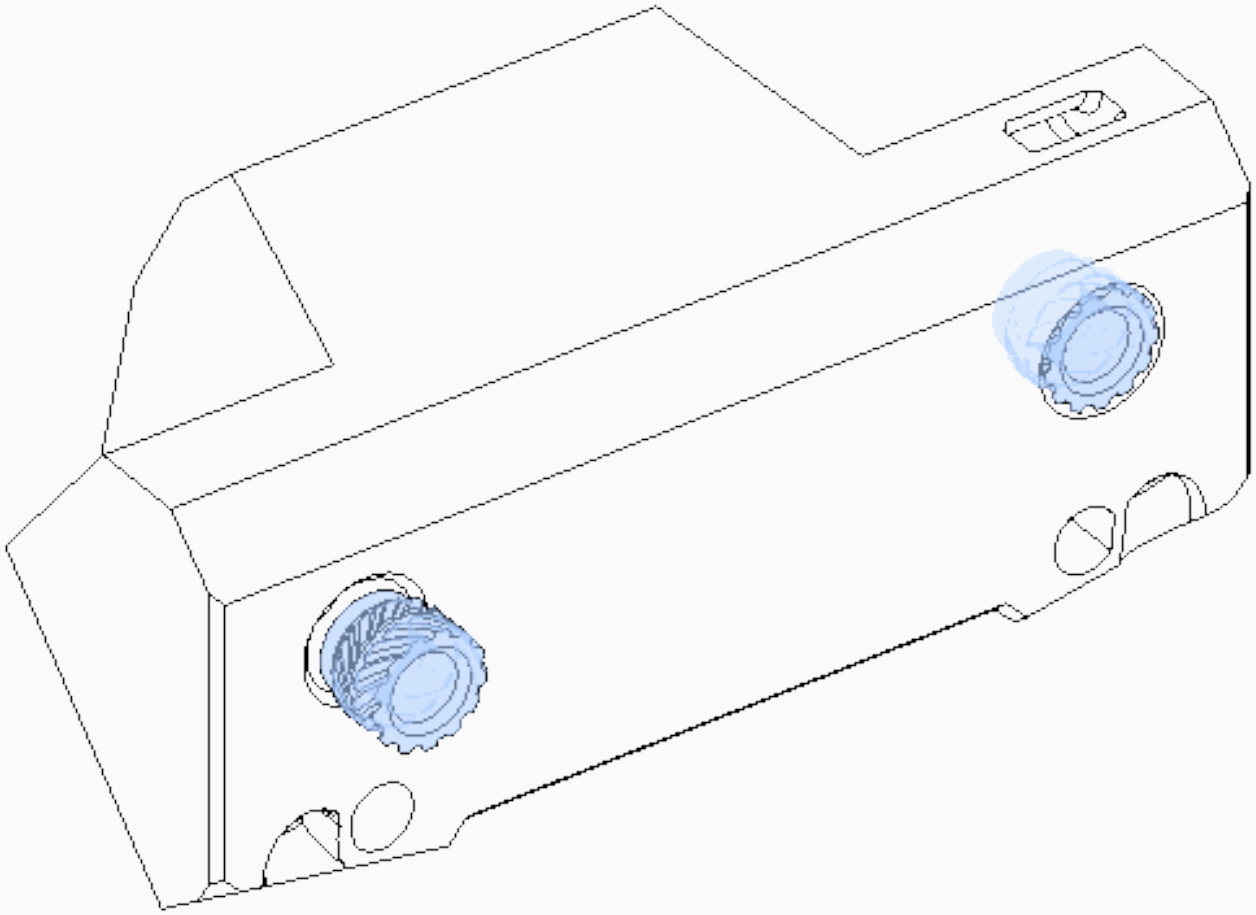
Do this for both left and right magnet holders.

Alternately you can use channel lock pliers (or a vise) for this,. Whatever tool you use please go slow and don't crush the parts or your fingers!

ROUND MAGNET, HEX HOLE

The magnet seats here hold much better than a round hole. The seats have been carefully designed and tested to maximize holding power.





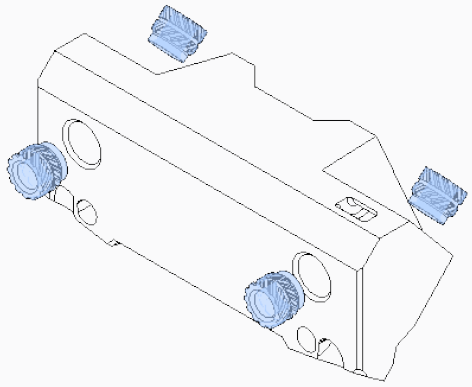
HEAT-SET INSERTS

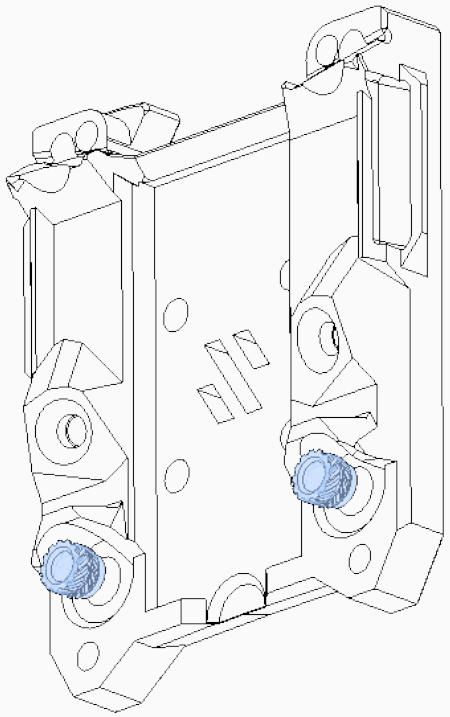
This design relies on heat-set inserts. Make sure you have the proper inserts (check the hardware reference for a close up picture and the BOM for dimensions).

If you've never worked with heat-set inserts before, we recommend you watch the linked guide.

https://voron.link/m5ybt4d

HEAT-SET INSERTS AND M3 NUT

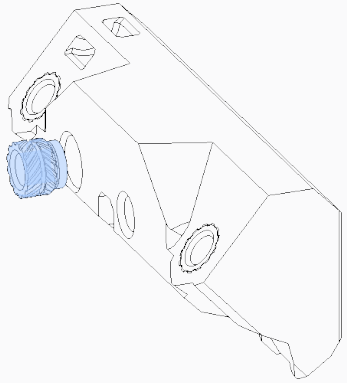


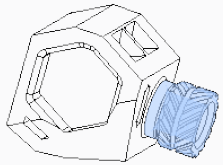


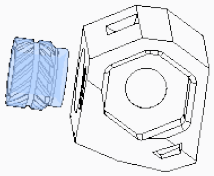
(10) Heat-set Inserts
(1) M3 Hex Nut

TAP_UPPER_D2HW HAS ONE MORE INSERT

This option (for the mechanical switch version) has one extra heatset insert in the back.

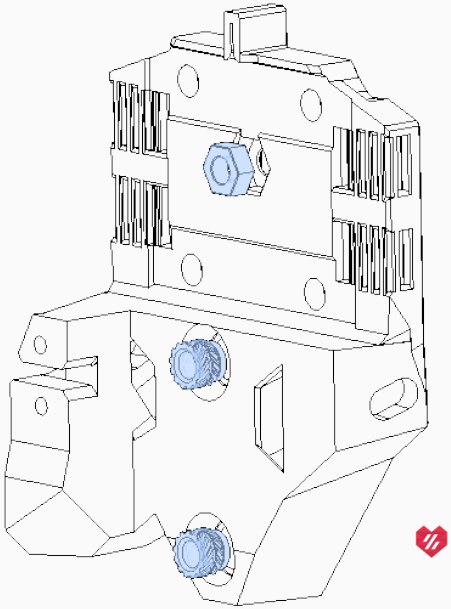


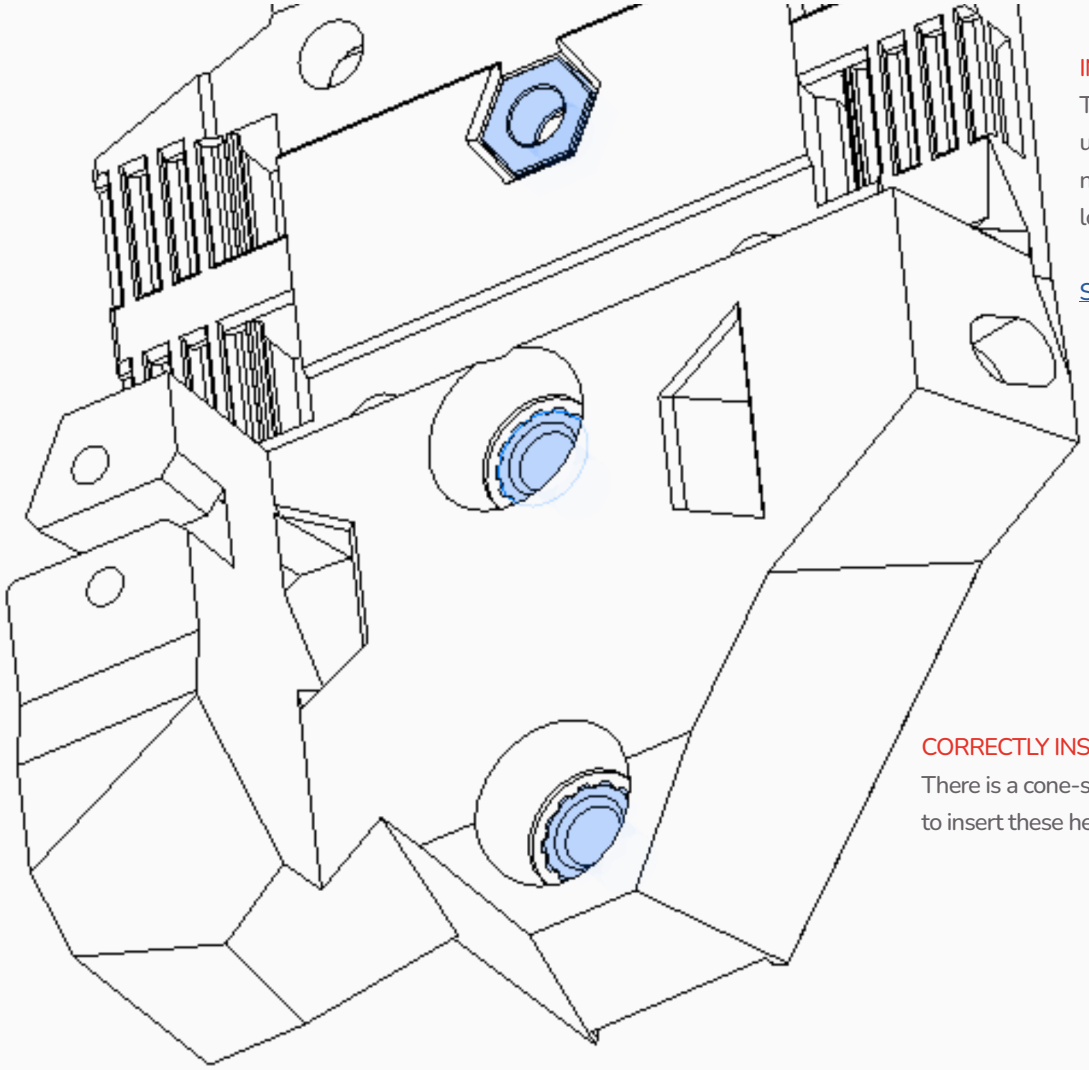




INSERT... FROM THE BACK?

Some of these inserts might seem backwards to you. Trust us, this is the way. Pay attention that you don't push them too far.
The inserts should sit flush with the surface they are embedded in.





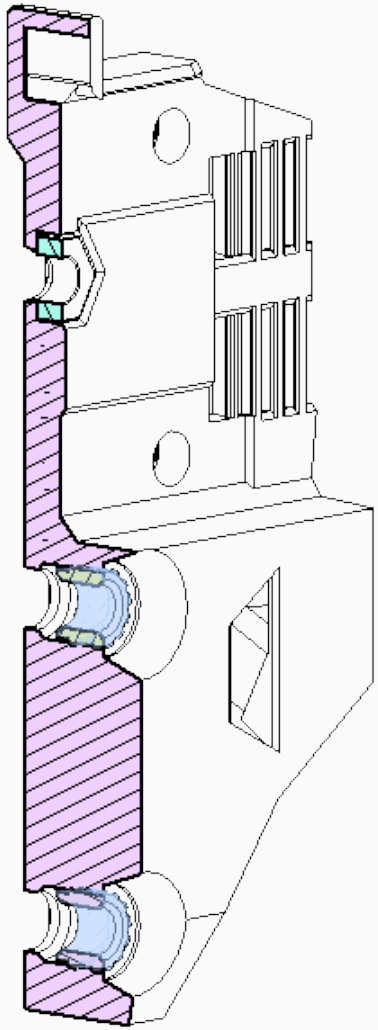
INSERTING HEX NUTS

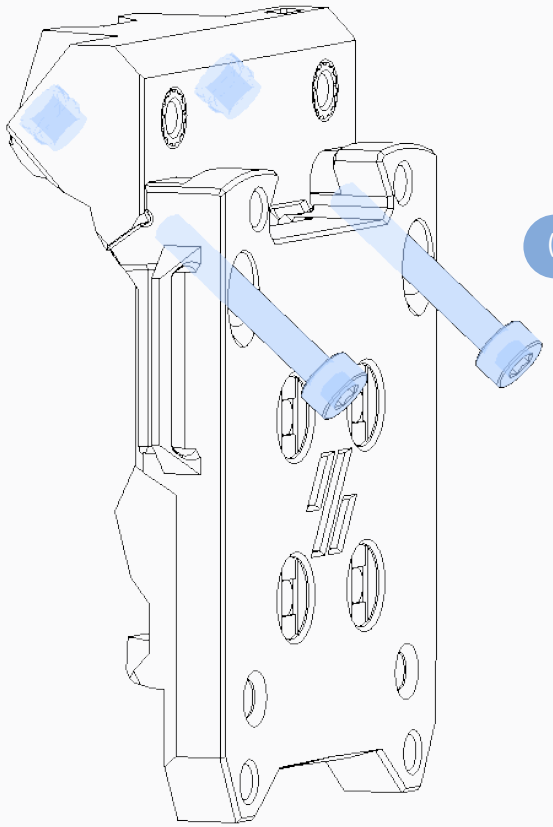
This can often be helped along by using a longer screw to draw the nut into the cup, then removing the long screw and using the M3 x 6

See here for details from Prusa

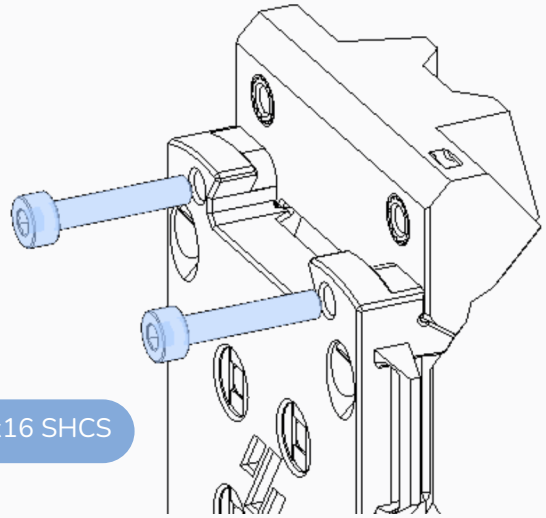
CORRECTLY INSERTED

There is a cone-shaped access hole to allow you to insert these heat-sets to the correct depth.

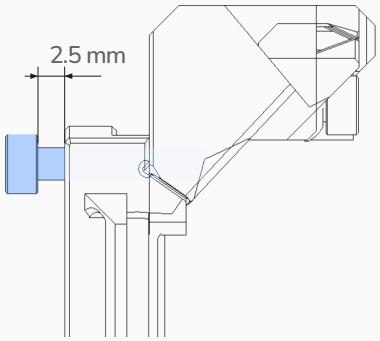




(2) M3x20 SHCS

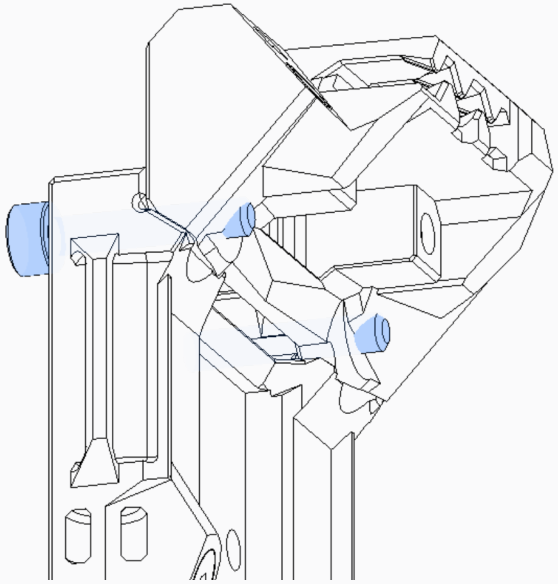


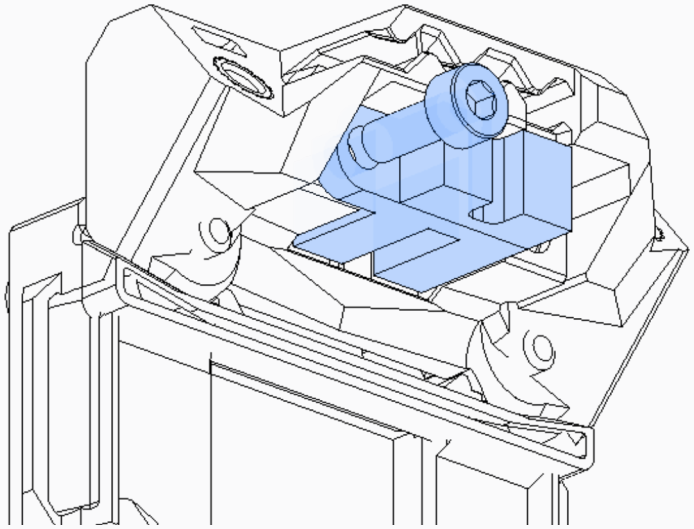
(2) M3x16 SHCS



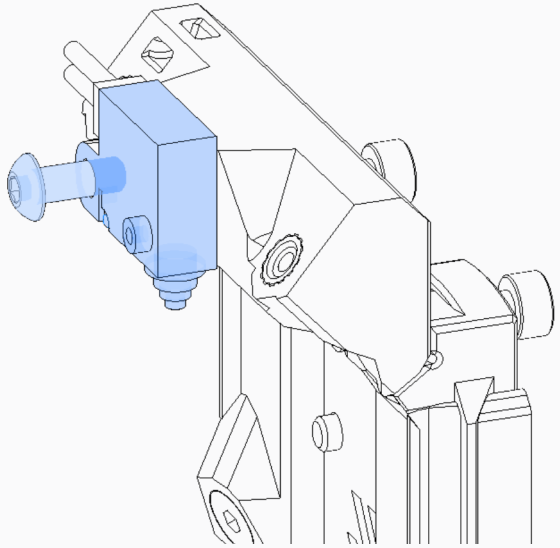
LEAVE ROOM FOR THE TOOLHEAD

The M3x16's thread into the plastic directly. Don't tighten fully, leave approximately 2.5 mm for the toolhead to mate with them.





Optical Wired

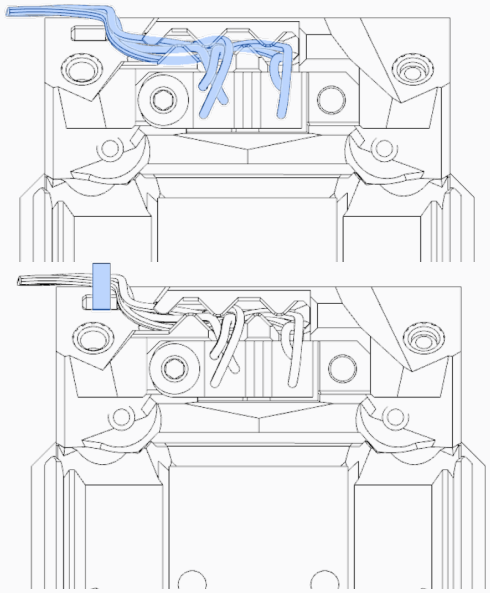


D2HW Switch

OPTICAL SENSOR SCREWS INTO PLASTIC, BE GENTLE

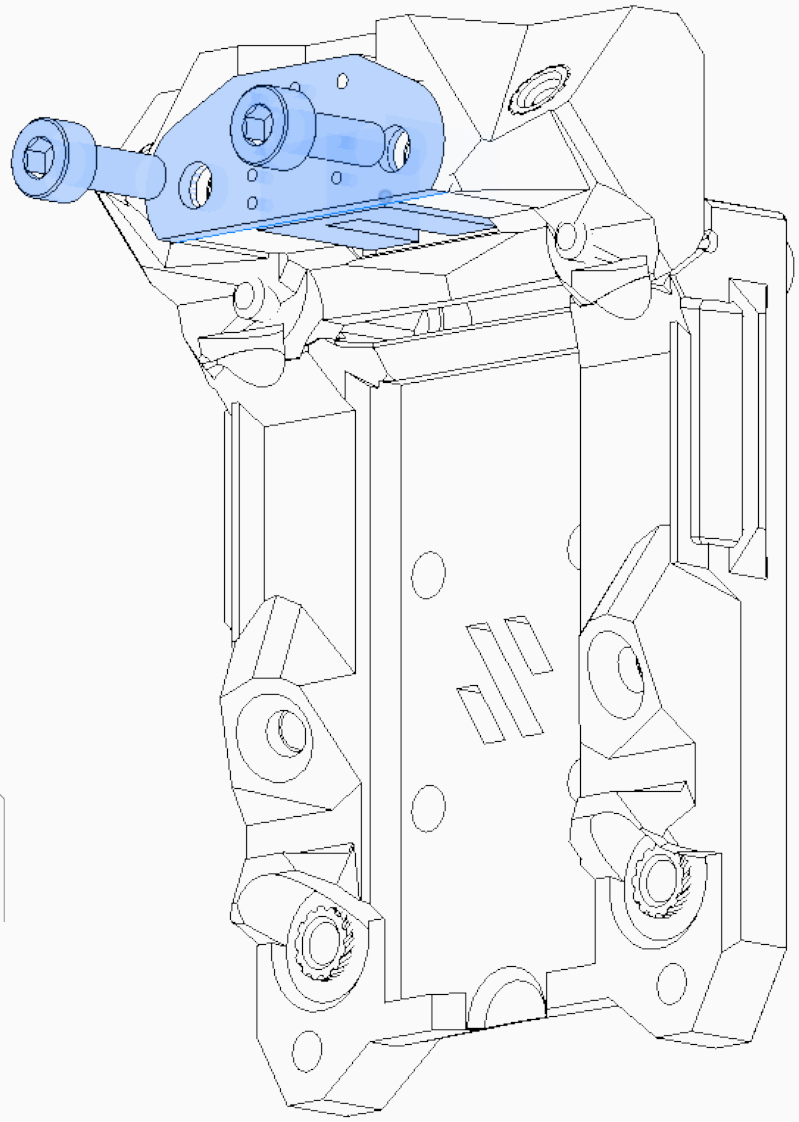
Note that OPB991P or OPB991L wired sensors will only have one M3x8 here, while the wired OPB991T and all PCB-based sensors have two screws.

(1 or 2) M3x8 SHCS

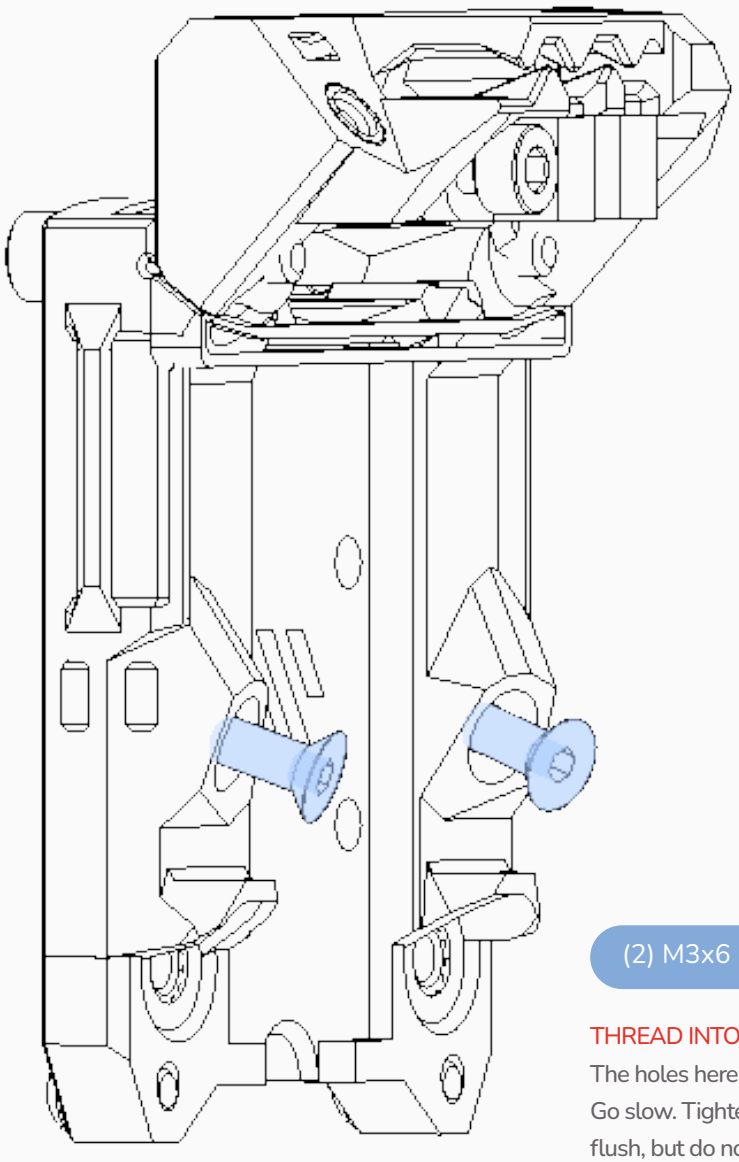


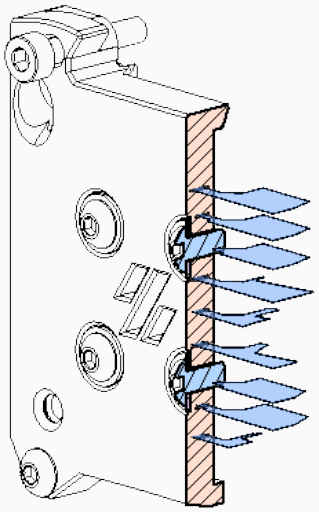
POINTS FOR NEATNESS

Voron takes wiring seriously, and you should too. Use a zip-tie to secure wires to the upper . On the Wired sensor option, use the printed channel to tuck the wires away safely from moving parts.



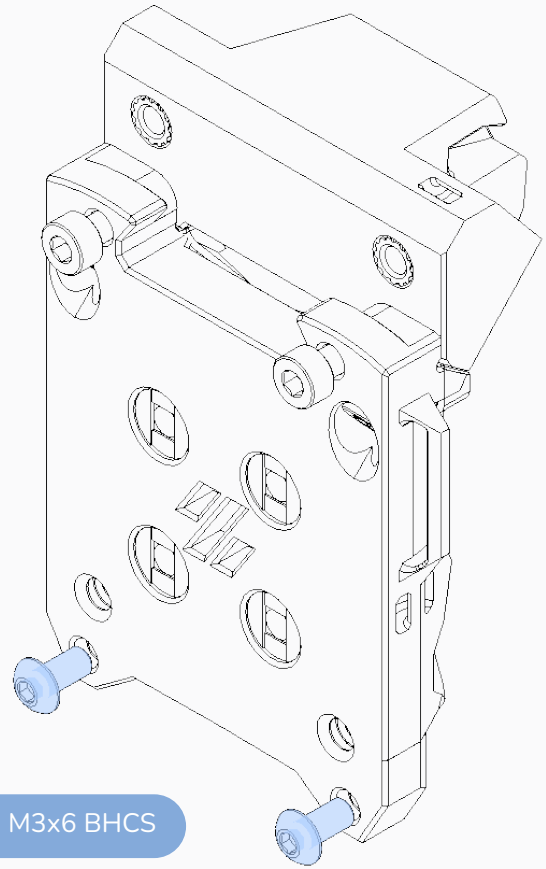
Optical PCB option





FUN FACT

This part has thin voids inside it (blue). When the part is sliced, these produce internal ribs which strengthen the part. If your slicer closes these up, recheck your slicer settings for hole size compensation. Default slicer profiles are available for Voron printers in the github repository.



(2) M3x6 FHCS

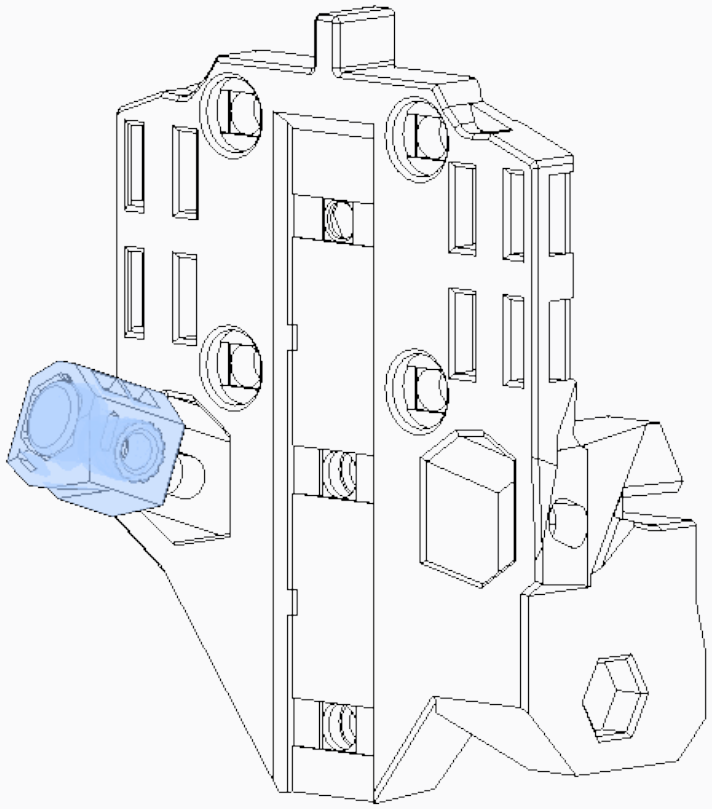
THREAD INTO PLASTIC AT AN ANGLE

The holes here are designed at an angle. Go slow. Tighten the FHCS until they are flush, but do not over tighten.

(2) M3x6 BHCS

WHAT ARE THESE FOR?

When you install the toolhead, the bottom of the toolhead should rest on these screw heads.

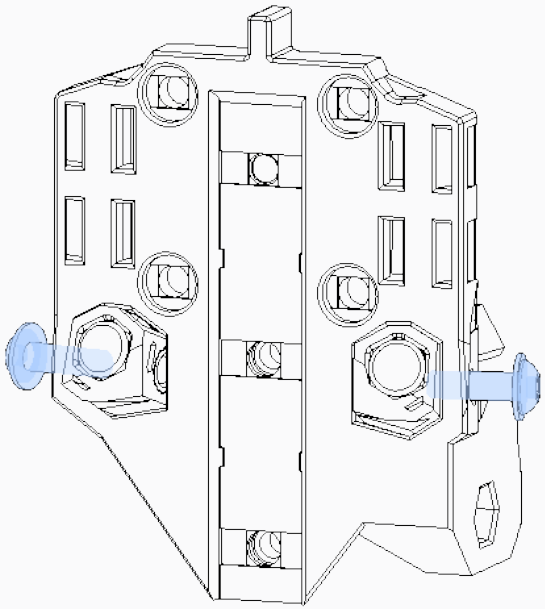


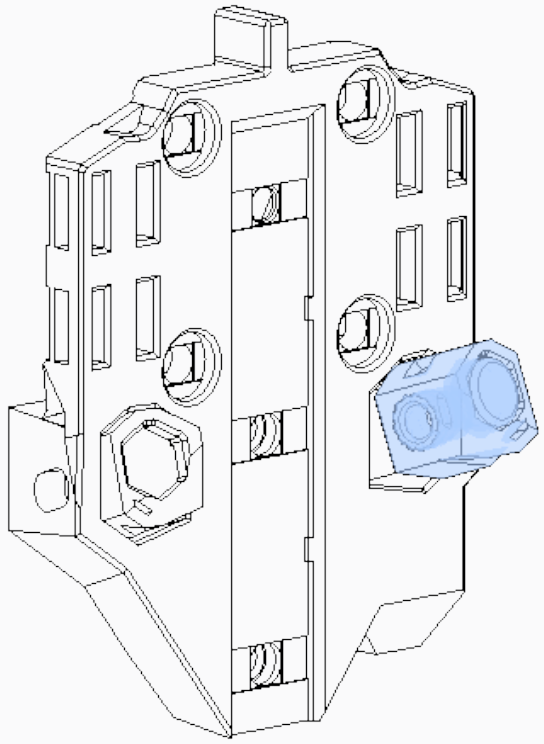
M3x10 BHCS
+ M3 washer

2 DOTS LEFT, ONE DOT RIGHT

The magnet holders are marked with dots. The left has two dots, the right has one dot.

We could say that there is only one way they fit, but we don't want to underestimate you.





SNUG IN FARTHEST BACK POSITION

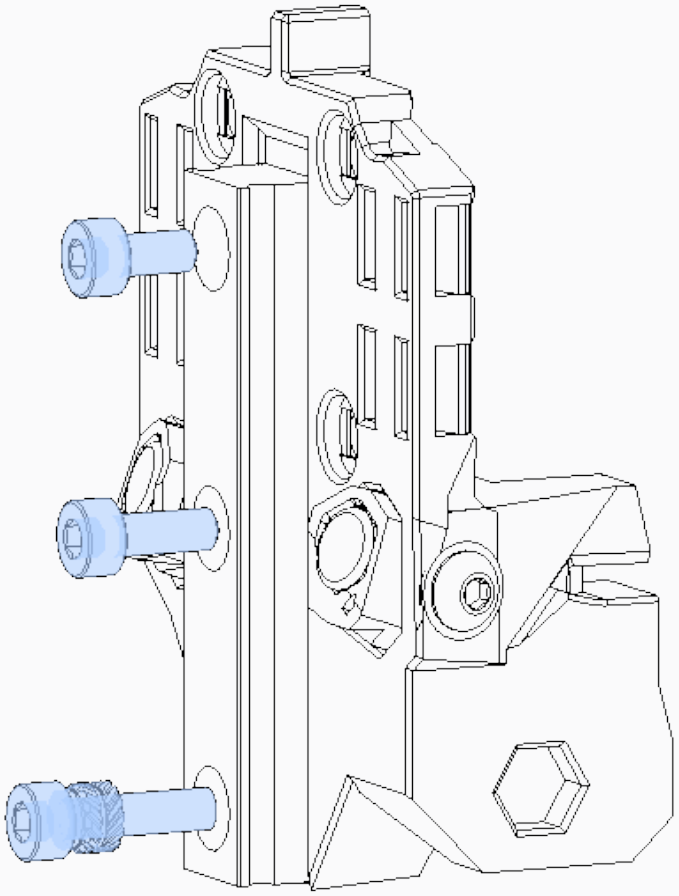
These are the magnet adjustment screws. For now, just snug them up with the magnet holders as far back as they will go. We'll adjust them later.

M3x10 BHCS
+ M3 washer

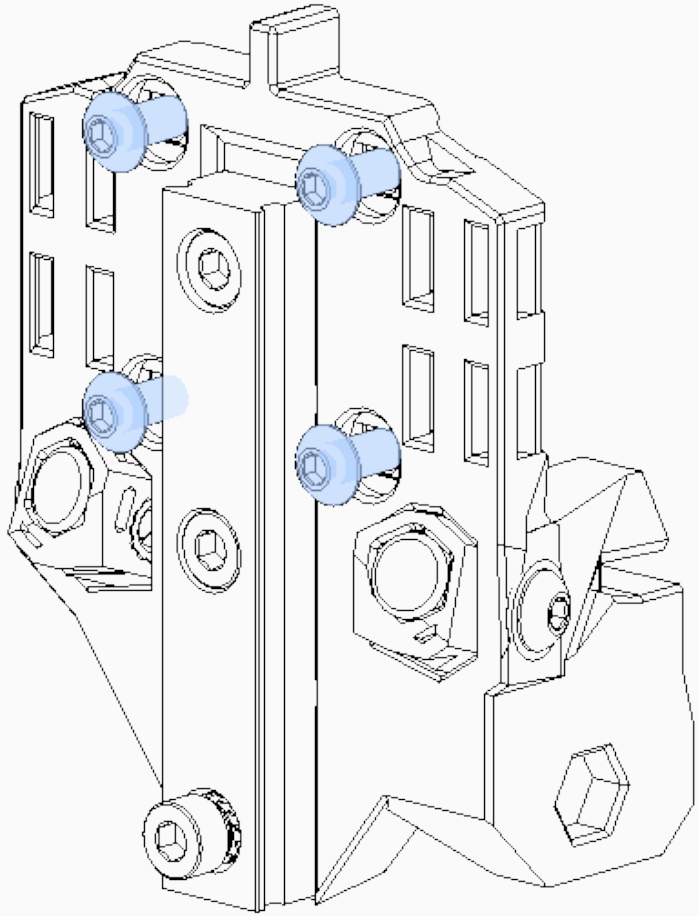
M3x6 SHCS

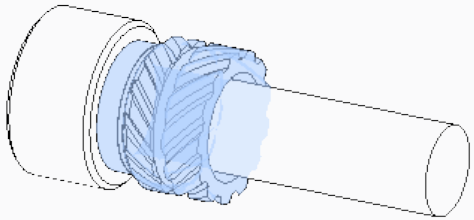
M3x8 SHCS

M3x12 SHCS
+ heatset



(4) M3x6 BHCS





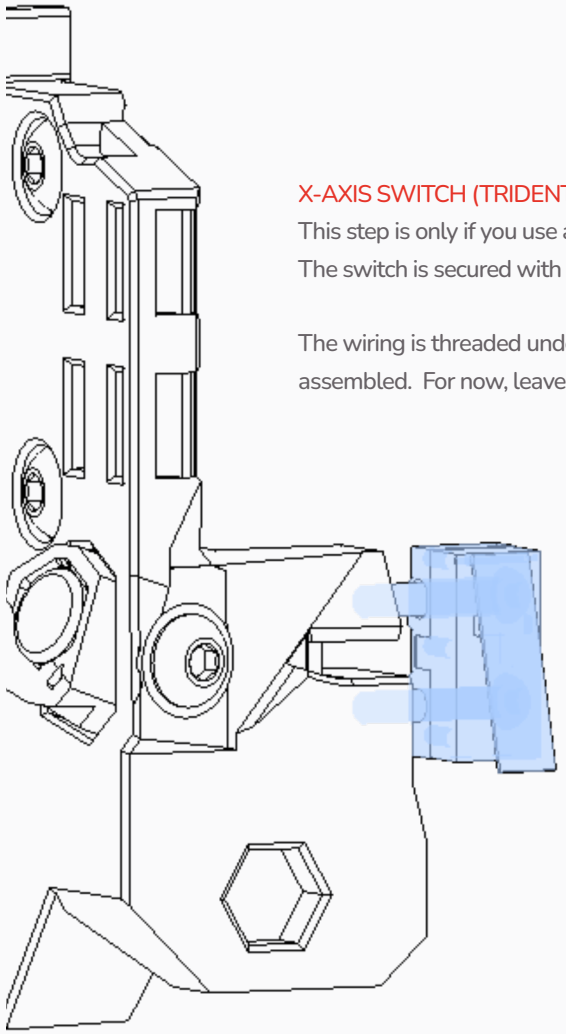
HEATSET USED AS STANDOFF

This heatset is used as a standoff. Thread it onto the M3x12 as shown before using the M3x12 to secure the rail to the center. When tightened, the M3x12 head will still be above the rail surface and act as a carriage stop.

INSTALL X-SWITCH/ HALL MAGNET (OPTIONAL)

IF YOU USE THE STANDARD XY ENDSTOP POD FROM V2, SKIP THIS PAGE

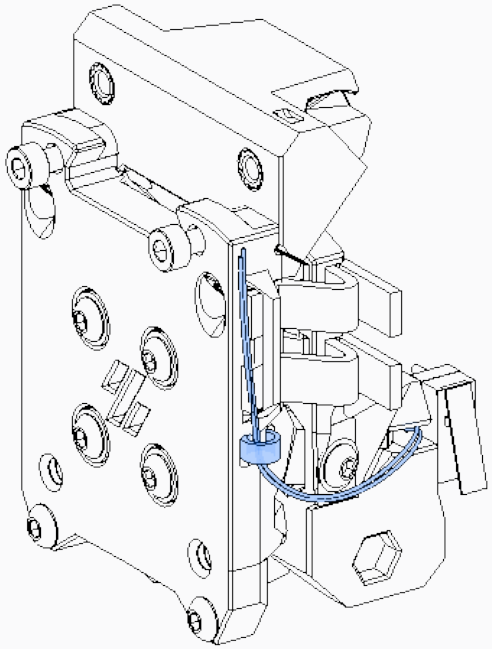
These steps are only for printers that use either a carriage mounted X switch or need a magnet for the x-axis hall effect endstop



X-AXIS SWITCH (TRIDENT STYLE)

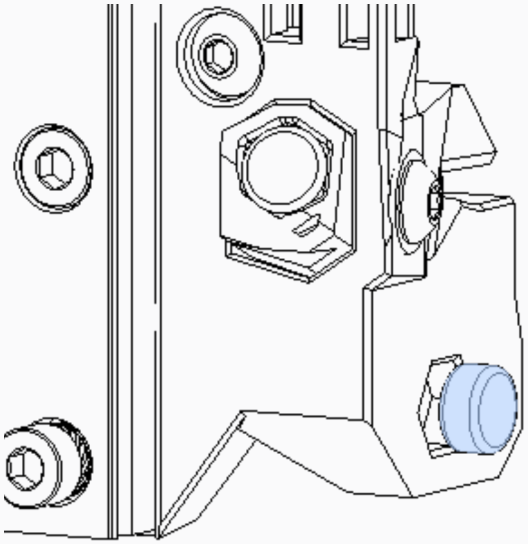
This step is only if you use an X-carriage mounted switch, such as used in the Trident. The switch is secured with 2 screws threaded directly into the plastic.

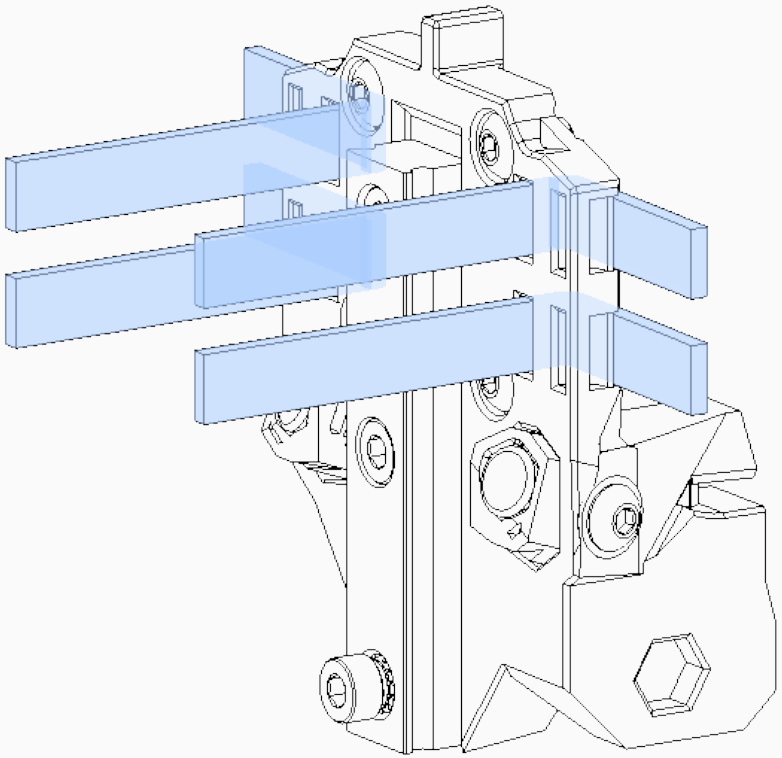
The wiring is threaded under the switch, and should be zip-tied to the front when fully assembled. For now, leave it loose.



HALL EFFECT X-AXIS MAGNET INSTALL

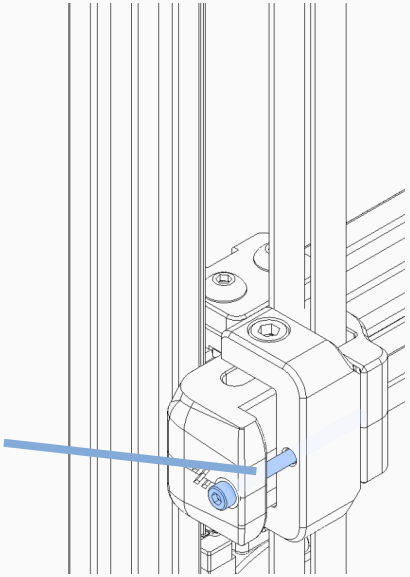
Press the magnet into the hexagon shaped recess here. A hex shape is better at holding round magnets than a round hole because the walls can flex to accommodate slightly different magnets.





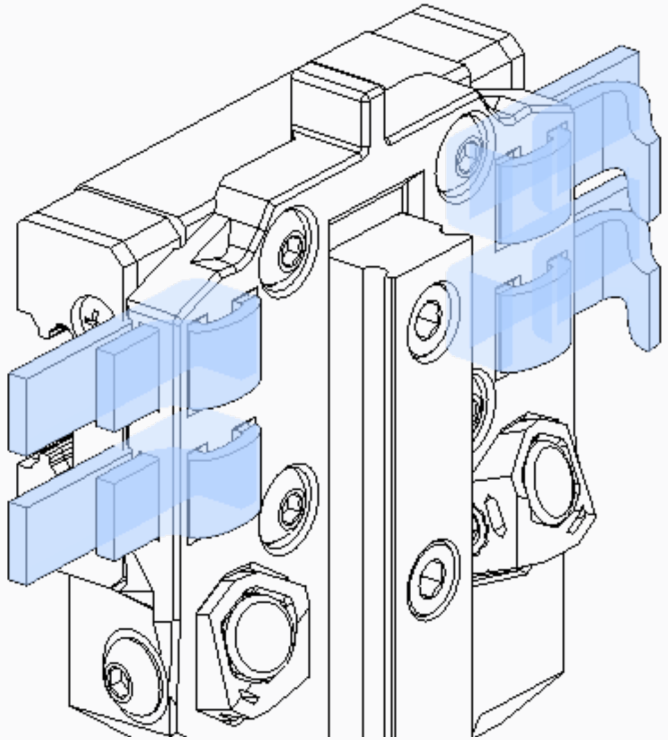
THREAD BELT ENDS THROUGH CENTER

Make sure the belt adjustment screws on the front idlers are loosened completely. Pull the belts taut through the center section of Tap. Secure center to X-Axis MGN 12 using 4 M3x6 BHCS. Retension the belts using the adjustment screws on the front idlers.

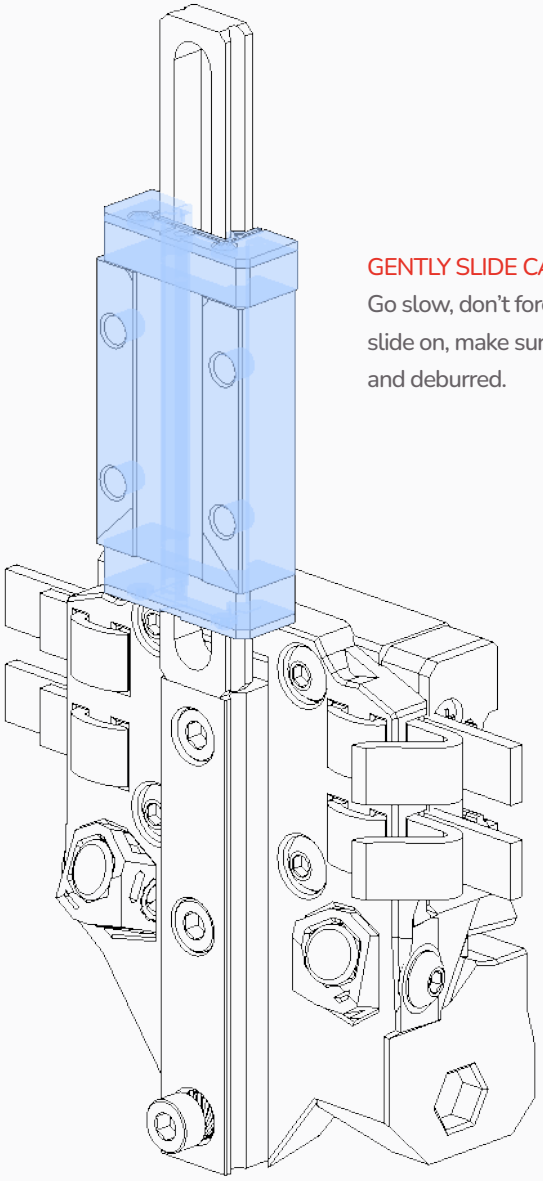


TUCK BELTS BACK THROUGH SLOTS

Tuck the belts back into the center and pull them out to sides. Don't worry if they stick out. We'll manage that in a later step when we put the front on.

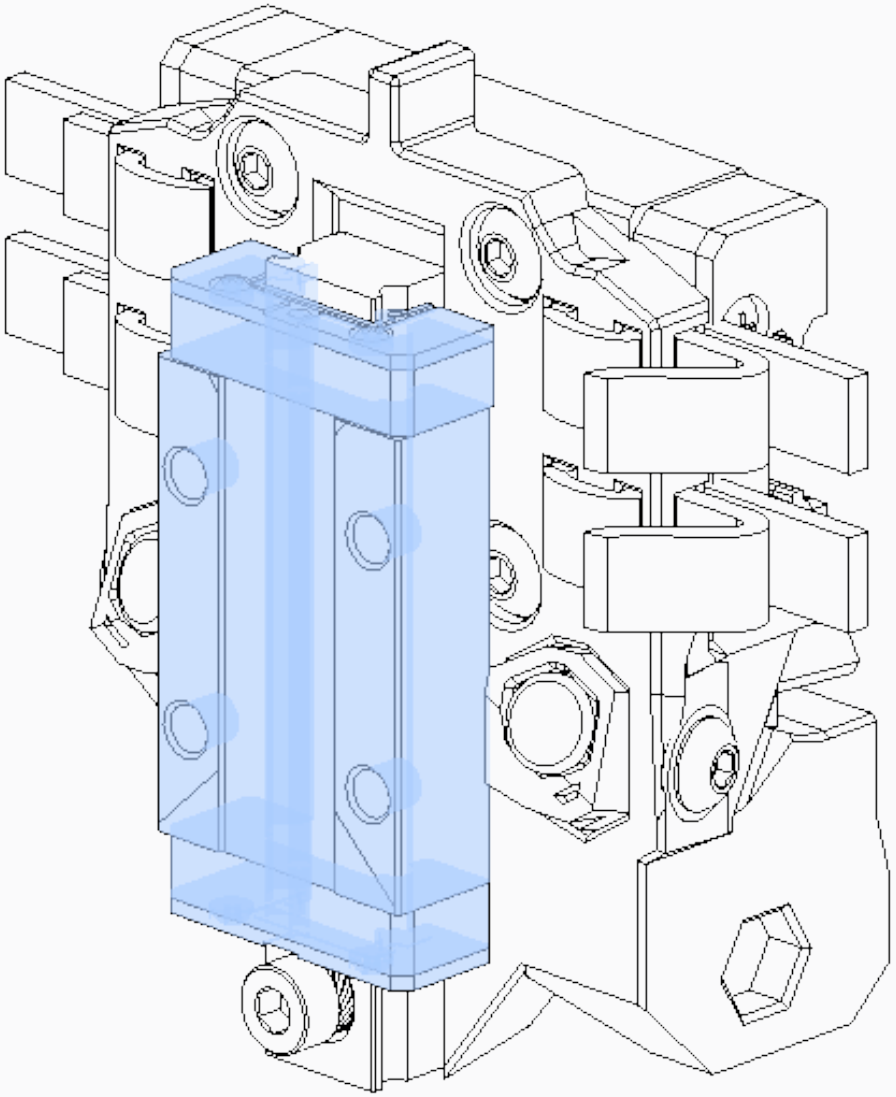


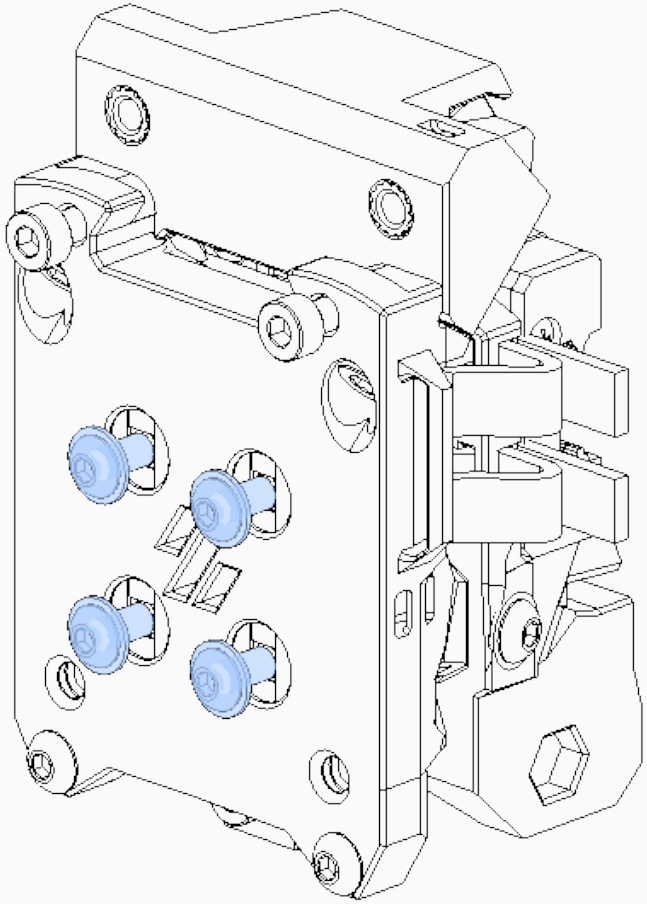
INSTALL MGN9H CARRAGE



GENTLY SLIDE CARRIAGE ON TO RAIL

Go slow, don't force it. If it's difficult to slide on, make sure the cut rail is smooth and deburred.





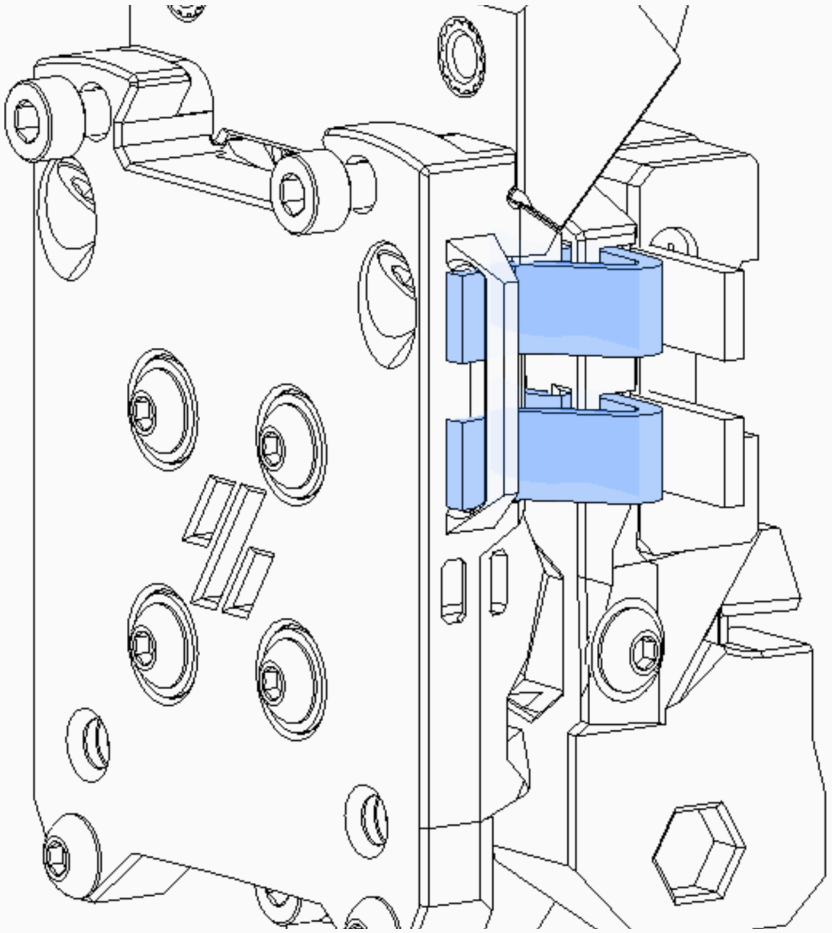
(4) M3x6 BHCS
+
(4) M3 Washers

DON'T FORGET THESE WASHERS!

Without them, there is a possibility the carriage won't be tight. Make sure these are tight.

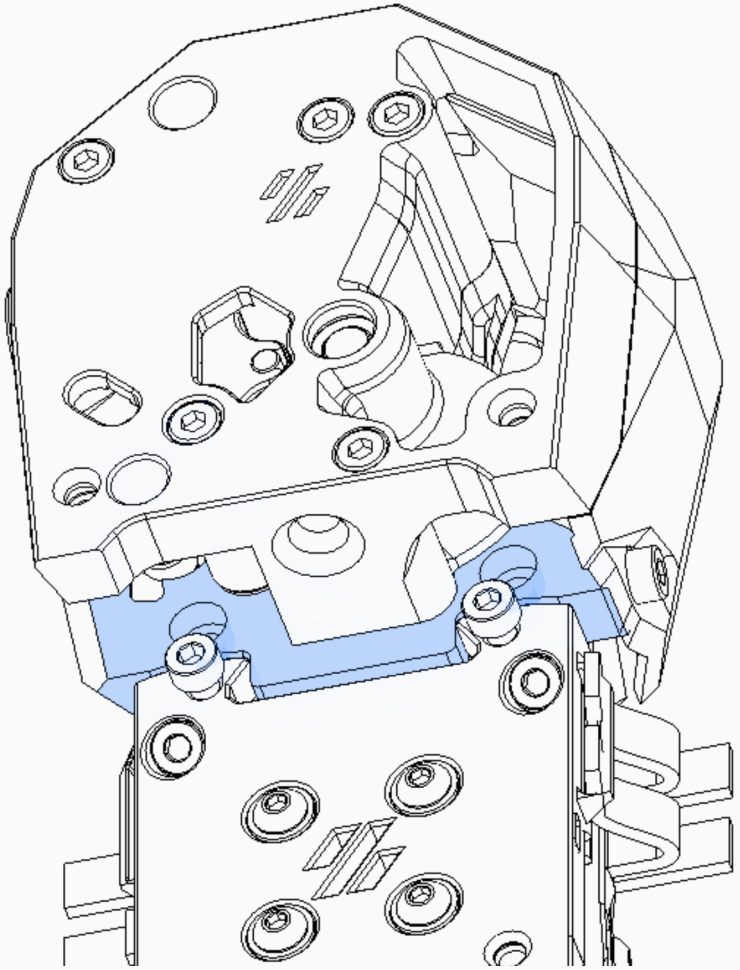
IF YOU HAVE BELT EXCESS, TUCK.

This should be a loose tuck, leave enough of a loop that the mechanism can move. It's just meant to keep the belt out of the way. On both sides, of course.

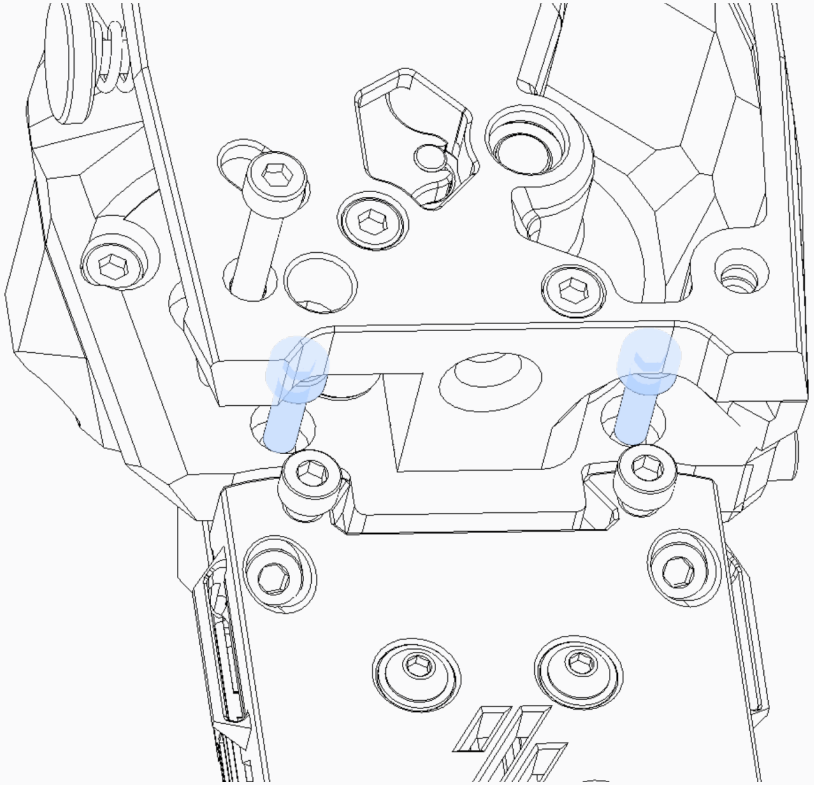


EXTRUDER INSTALL

The extruder motor plate should fit tightly on top of Tap.

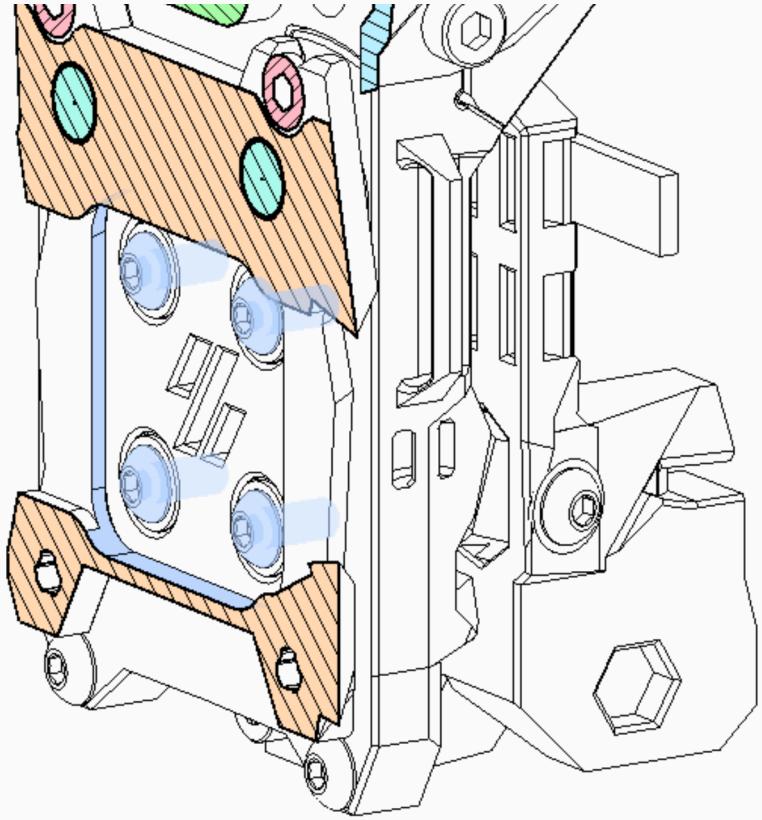


(2) M3x8 SHCS



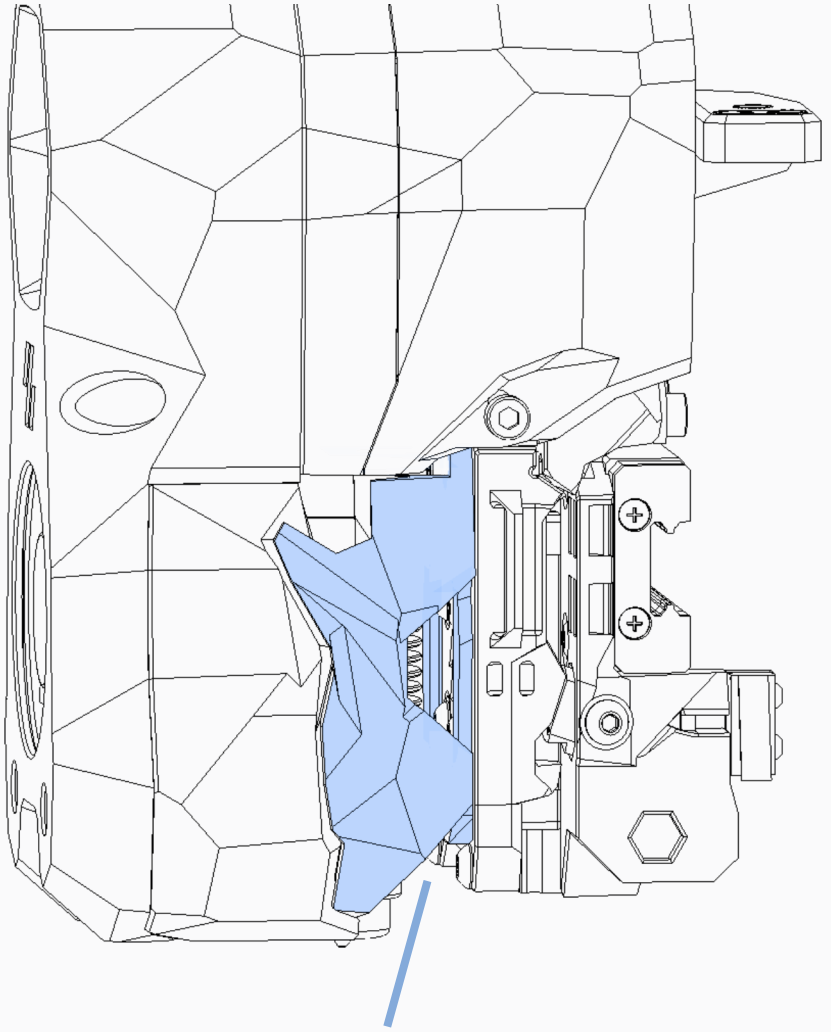
CHECK TOOLHEAD CLEARANCE

The toolhead rear rests on the lowermost 2 screws, but must clear the four screws that secure the front of Tap. Some toolheads may need to be carved back to avoid hitting these screws.



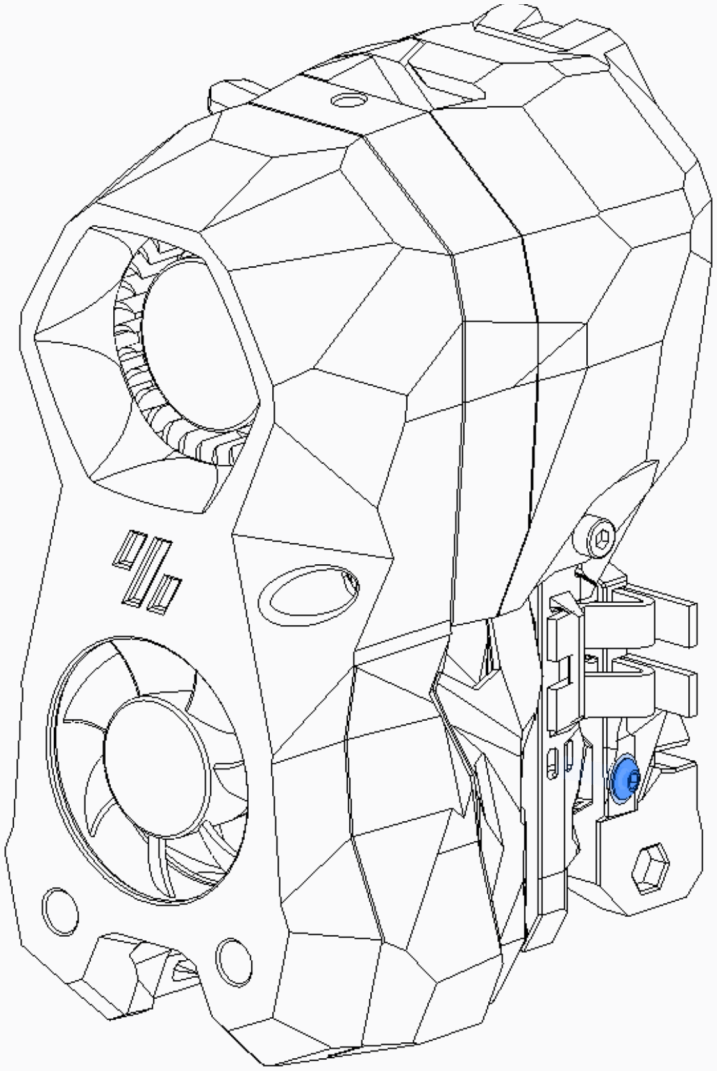
CUTAWAY VIEW

In blue are the four screws and the surface that may need to be trimmed back.



CORRECT INSTALLATION

Toolhead is flat against Tap, and can be firmly secured.

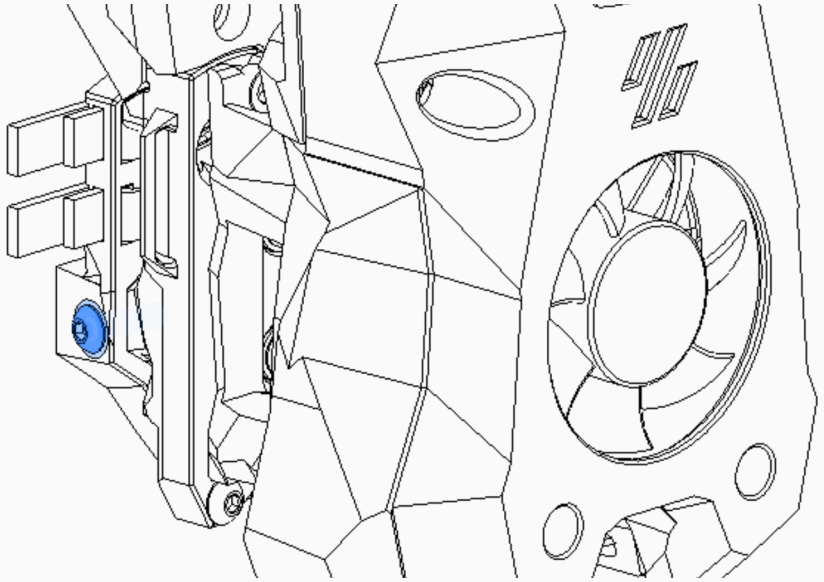


WITH TOOLHEAD ASSEMBLED

Loosen the 2 magnet alignment screws (one on each side). The magnets will pull themselves into alignment with the FHCS. Give the toolhead a little shake, then tighten these down.

With the magnets aligned and screws tightened, you should be able to push up on the entire toolhead, and it will move 1-2 mm before hitting it's stop. If your sensor has an indicator light and is connected, it should change state when you push up on the toolhead by hand.

It is important to test the tap before homing!



ASSEMBLY COMPLETED! ... NEXT STEP: SETUP & CALIBRATION

This manual is designed to be an assembly guide for Voron Tap. Additional details about the build and background on advanced topics can be found on our documentation page linked below.

The software setup and other initial setup steps with your new printer can also be found on our documentation page. We recommend starting with the Tap-Klipper Instructions on our Github.

https://docs.vorondesign.com

https://github.com/VoronDesign/Voron-Tap

HOW TO GET HELP

If you need assistance with your build, we're here to help. Head on over to our Discord group and post your questions. This is our primary medium to help VORON users. We have a great community that can help you out if you get stuck. Alternatively, you can use our forums or subreddit.

https://discord.gg/voron

https://forum.vorondesign.com/

https://www.reddit.com/r/VORONDesign

REPORTING ISSUES

Should you find an issue in this document or have a suggestion for an improvement please consider opening an issue on GitHub (https://github.com/VoronDesign/Voron-Tap/issues).
When raising an issue, please include the relevant page numbers and a short description. Annotated screenshots are also very welcome and helpful.
We periodically update the manual based on the feedback we get.