



## VORON TRIDENT ASSEMBLY

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

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VERSION 2021-08-16



Before you begin on your 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. 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!

THE VORON TEAM

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### 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

#### 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

### PRINT IT FORWARD (PIF)

Often times community members that have issues printing ABS will bootstrap themselves into a VORON using our Print It Forward program. This is a service where approved members with VORON printers can make you a functional set of parts to get your own machine up and running.

Check Discord if you have any interest in having someone help you out.

**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 and we have a great community that can help you out if you get stuck.



<https://discord.gg/voron>

**THIS IS JUST A REFERENCE**

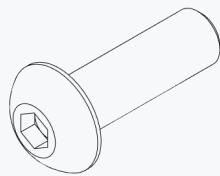
This manual is designed to be a simple reference manual. Building a Voron can be a complex endeavour and for that reason we recommend downloading the CAD files off our Github repository if there are sections you need clarification on. It can be sometimes be easier to follow along when you have the whole assembly in front of you.



<https://github.com/vorondesign>



<https://docs.vorondesign.com/>

**BUTTON HEAD CAP SCREW (BHCS)**

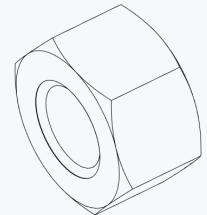
Metric fastener with a domed shape head and hex drive. Most commonly found in locations where M5 fasteners are used.

ISO 7380-1

**FLAT HEAD COUNTERSUNK SCREW (FHCS)**

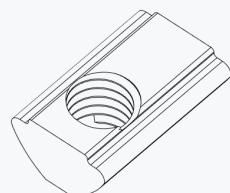
Metric fastener with a cone shaped head and a flat top.

ISO 10642

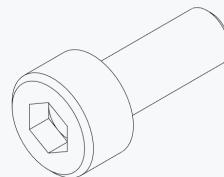
**HEX NUT**

Hex nuts couple with bolts to create a tight, secure joint. You'll see these used in both M3 and M5 variants throughout this guide.

ISO 4032

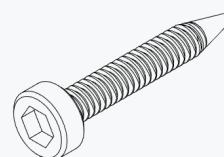
**POST INSTALL T-SLOT NUT (T-NUT)**

Nut that can be inserted into the slot of an aluminium profile. Used in both M3 and M5 variants throughout this guide.

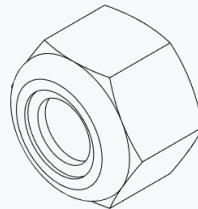
**SOCKET HEAD CAP SCREW (SHCS)**

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

ISO 4762

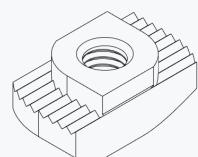
**SELF TAPPING SCREW**

Fastener with a pronounced thread profile that is screwed directly into plastic.

**LOCK NUT**

Hex nut with a nylon filled center which prevents the components from loosening.

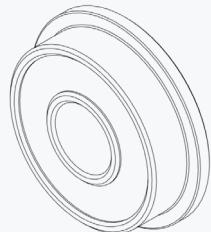
ISO 10511 / DIN 982

**HAMMER HEAD NUT**

Nut that can be inserted into the slot of an aluminium profile. Used exclusively for panel mounting, all other components use T-Slot nuts.

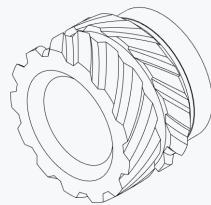
## HARDWARE

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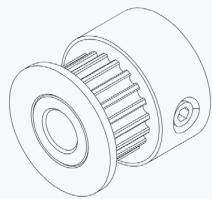
### F695 BEARING

A ball bearing with a flange used in various gantry locations.



### HEAT SET INSERT

Heat inserts with a soldering tip so that they melt the plastic when installed. As the plastic cools, it solidifies around the knurls and ridges on the insert for excellent resistance to both torque and pull-out.



### PULLEY

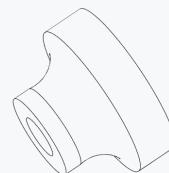
GT2 pulley used on the motion system of the Voron.



### SHIM

Not to be confused with stamped washers. These are used in all M5 call-out locations in this manual.

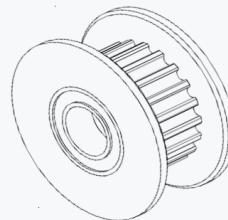
DIN 988



### THUMB NUT

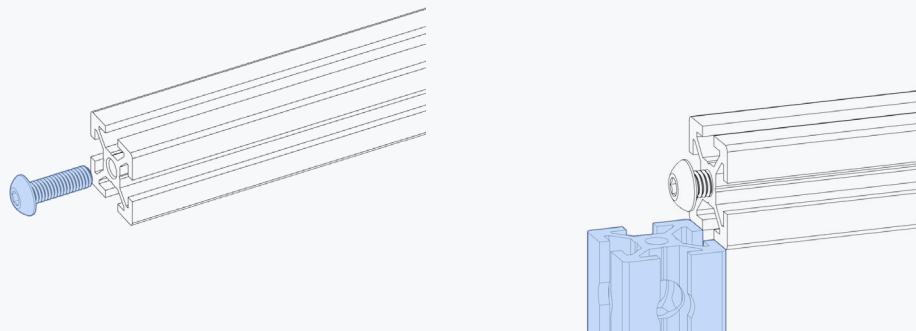
Used in the print bed as a spacer.

DIN 466-B



### IDLER

GT2 idler used in the motion system of the Voron.



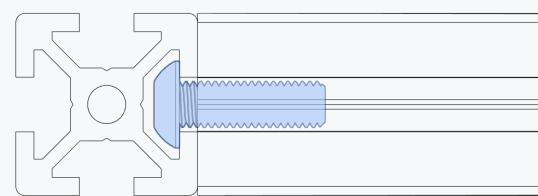
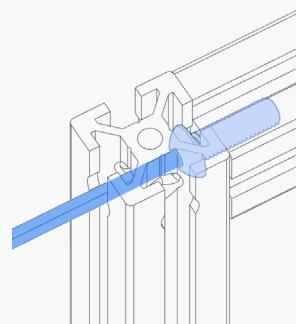
### BLIND JOINT BASICS

Blind Joints provide a cost effective and rigid assembly method.

The head of the BHCS is slid into the channel of another extrusion and securely fastened through a small access hole in the extrusion.

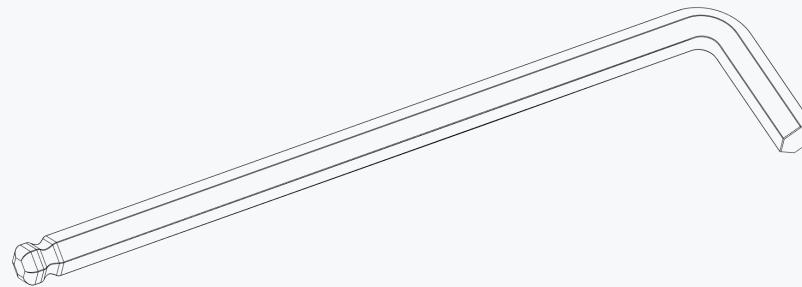


<https://voron.link/onjwmcd>



### BALL-END DRIVER

Some parts of this design require the use of a ball-end hex driver for assembly. We recommend you get a 2.5mm and 3mm one.



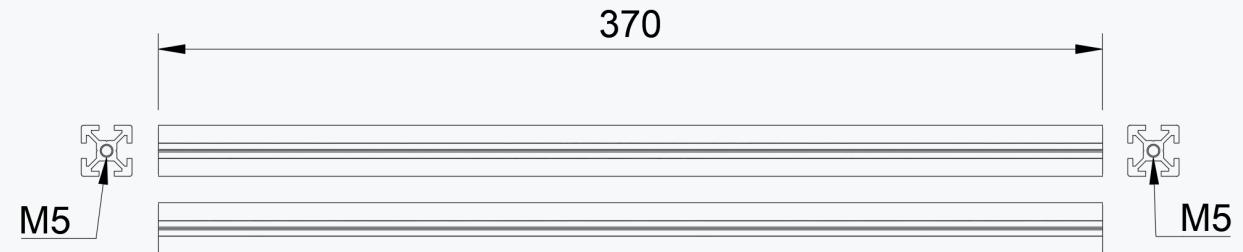
### 2.5MM HEX DRIVER

The 2.5mm hex driver will see a lot of use in this build. A quality driver is strongly recommended. Refer to the sourcing guide for suggestions.

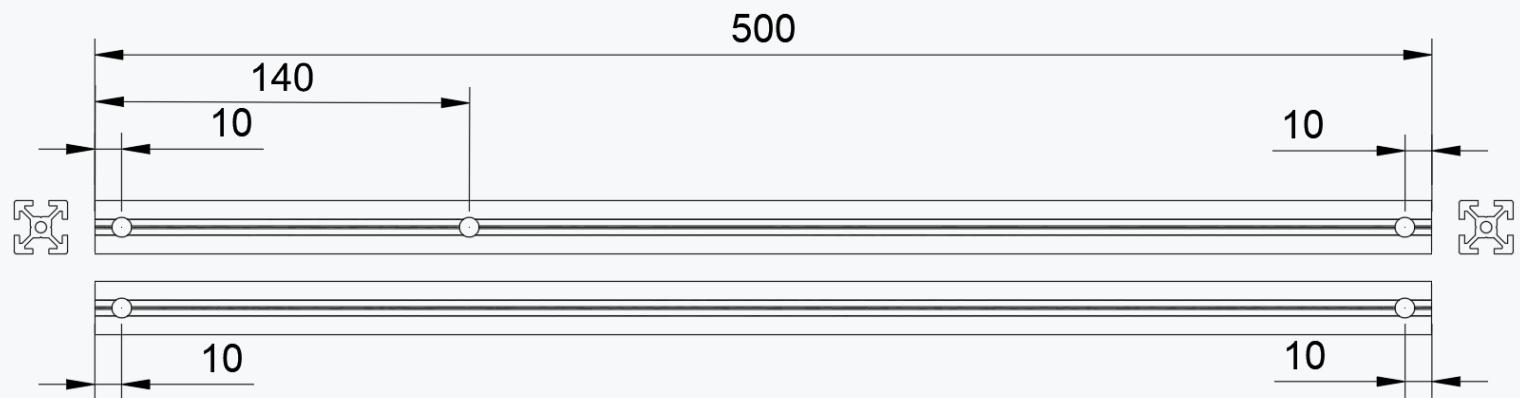


**"A EXTRUSION"**

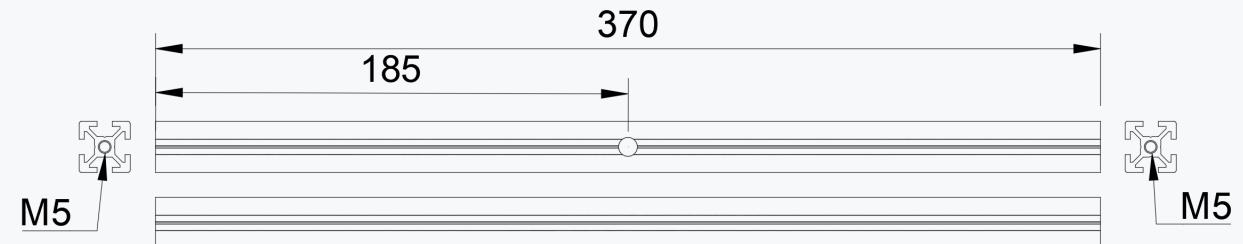
Qty 9

**"B EXTRUSION"**

Qty 4

**"C EXTRUSION"**

Qty 1

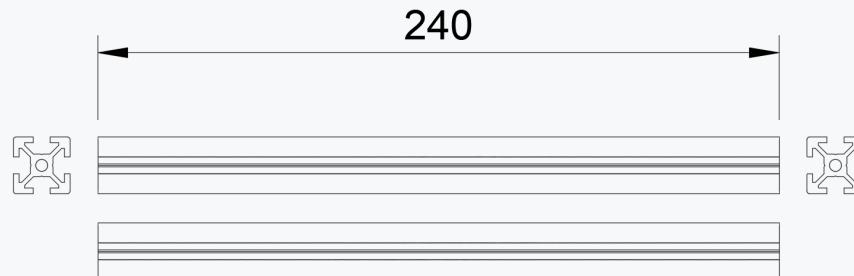


## EXTRUSION REFERENCE

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"D EXTRUSION"

Qty 1



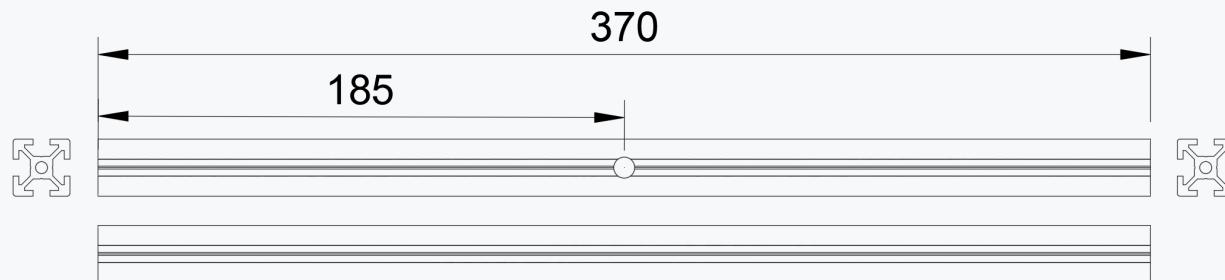
"E EXTRUSION"

Qty 1



"F EXTRUSION"

Qty 1



### EXTRUSION CALL OUTS

To avoid confusion we will call out the extrusions by the names shown on these reference pages.

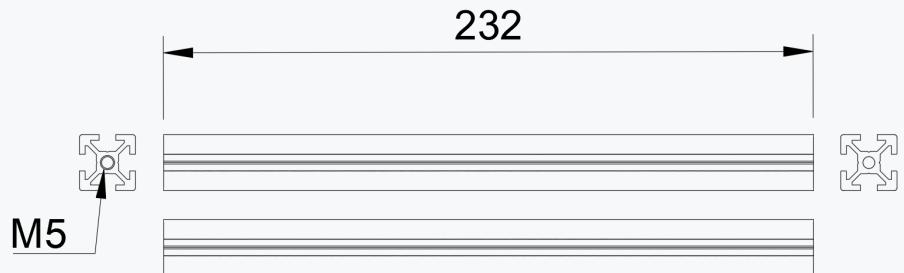
To help assembly along you may want to label the extrusions or print the reference for a faster lookup.

### ALL UNITS ARE METRIC

If a unit is not specified assume it's metric.

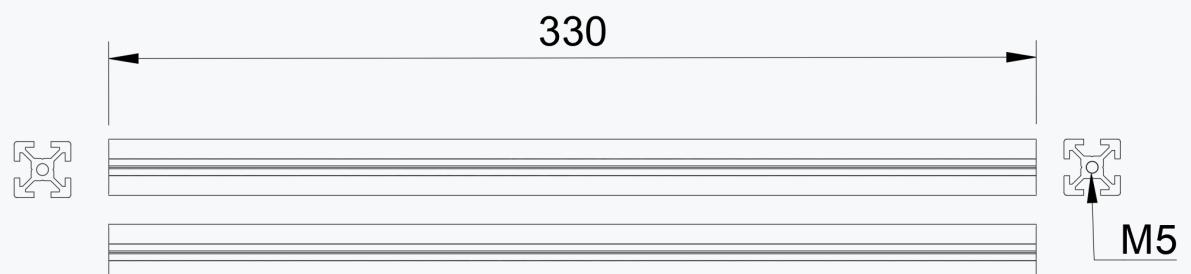
"G EXTRUSION"

Qty 1



"H EXTRUSION"

Qty 1



FOR WHAT SIZE IS THIS? WHAT ABOUT OTHER SIZES?

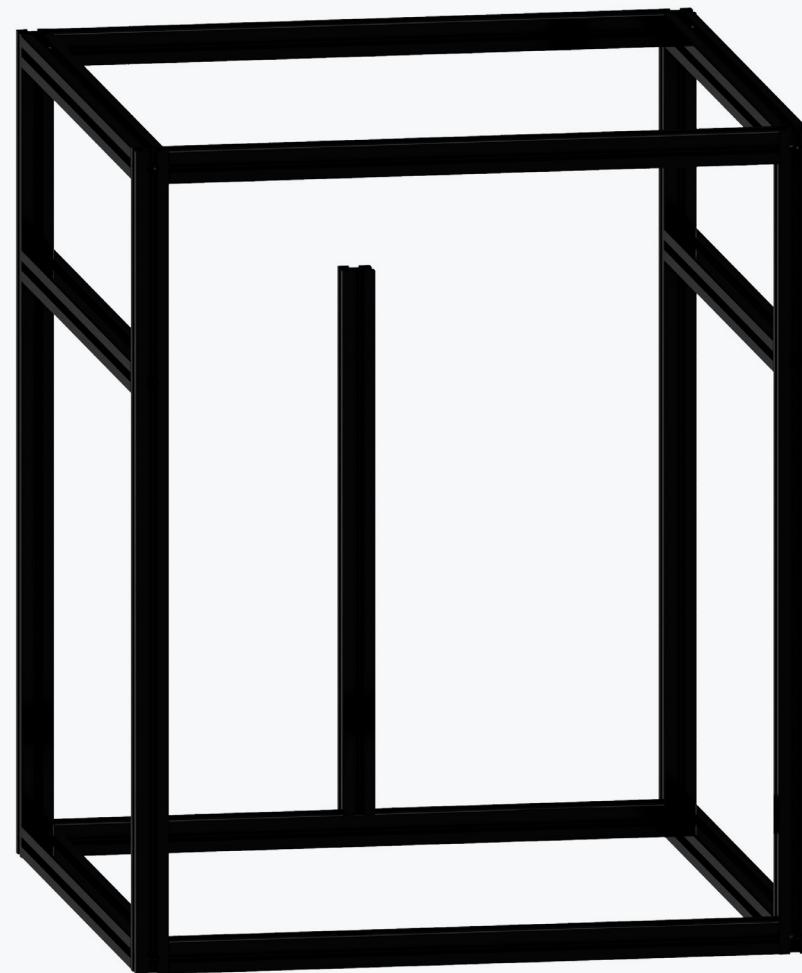
The graphics shown here as well as the dimensions called out in this manual are for the 250mm version of the design.

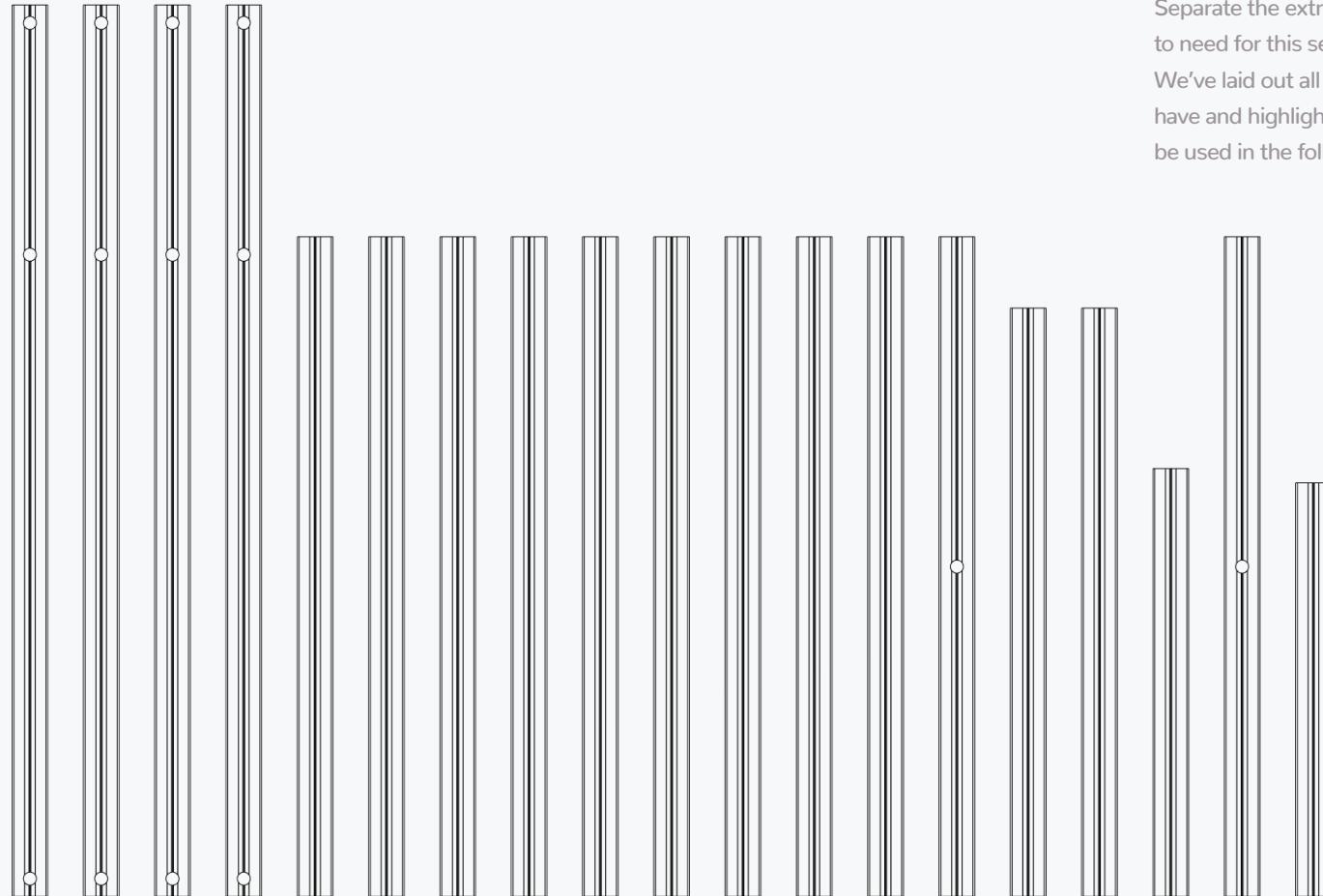
For other sizes please consult the configuration on the Voron website.

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FRAME

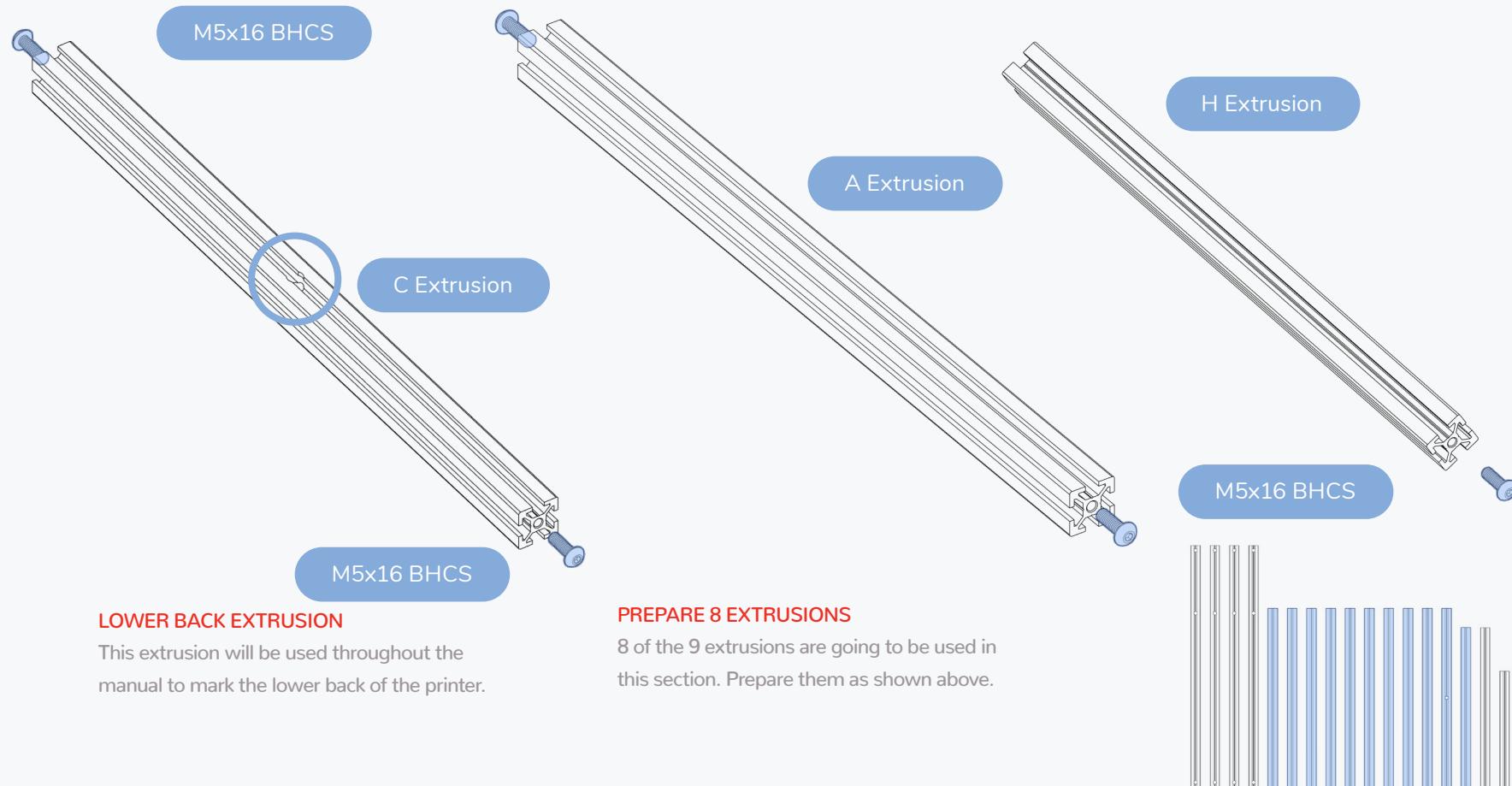
WWW.VORONDESIGN.COM

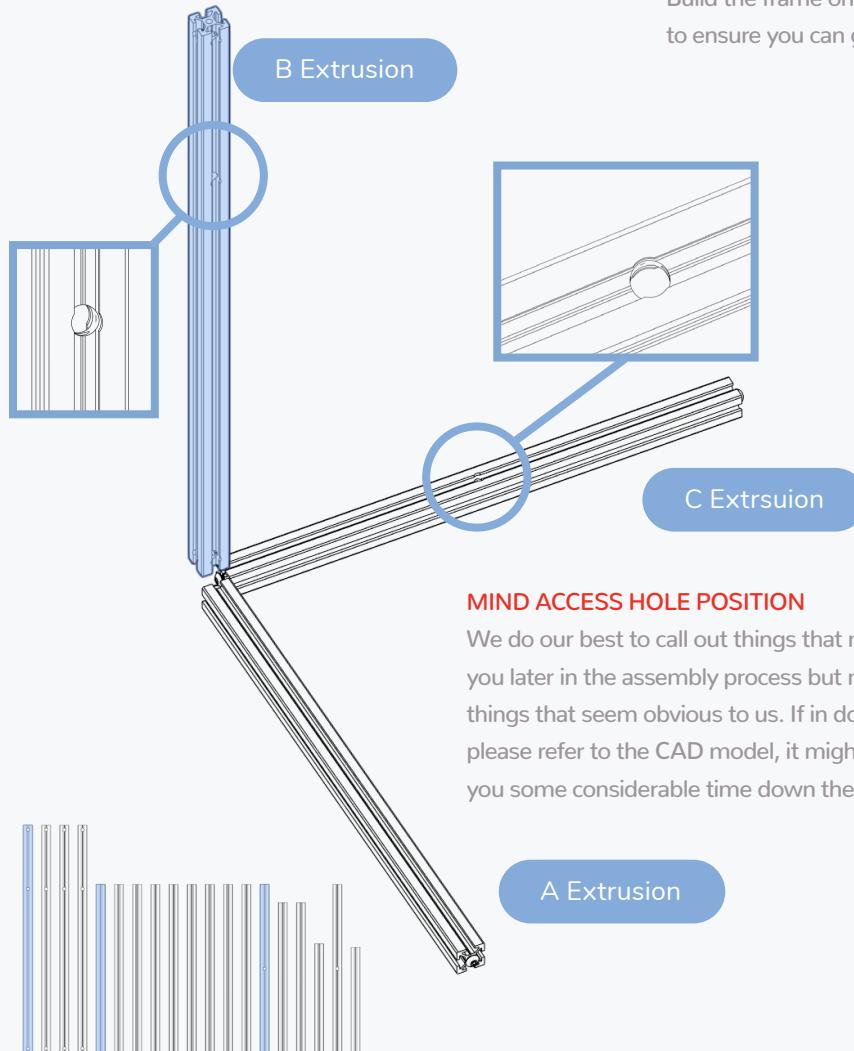


**GETTING EXTRUSIONS TOGETHER**

Separate the extrusions you're going to need for this section of the build.

We've laid out all the parts you should have and highlighted the ones that will be used in the following sections.





#### BUILD ON A FLAT SURFACE

Build the frame on a glass or granite surface to ensure you can get it as square as possible.

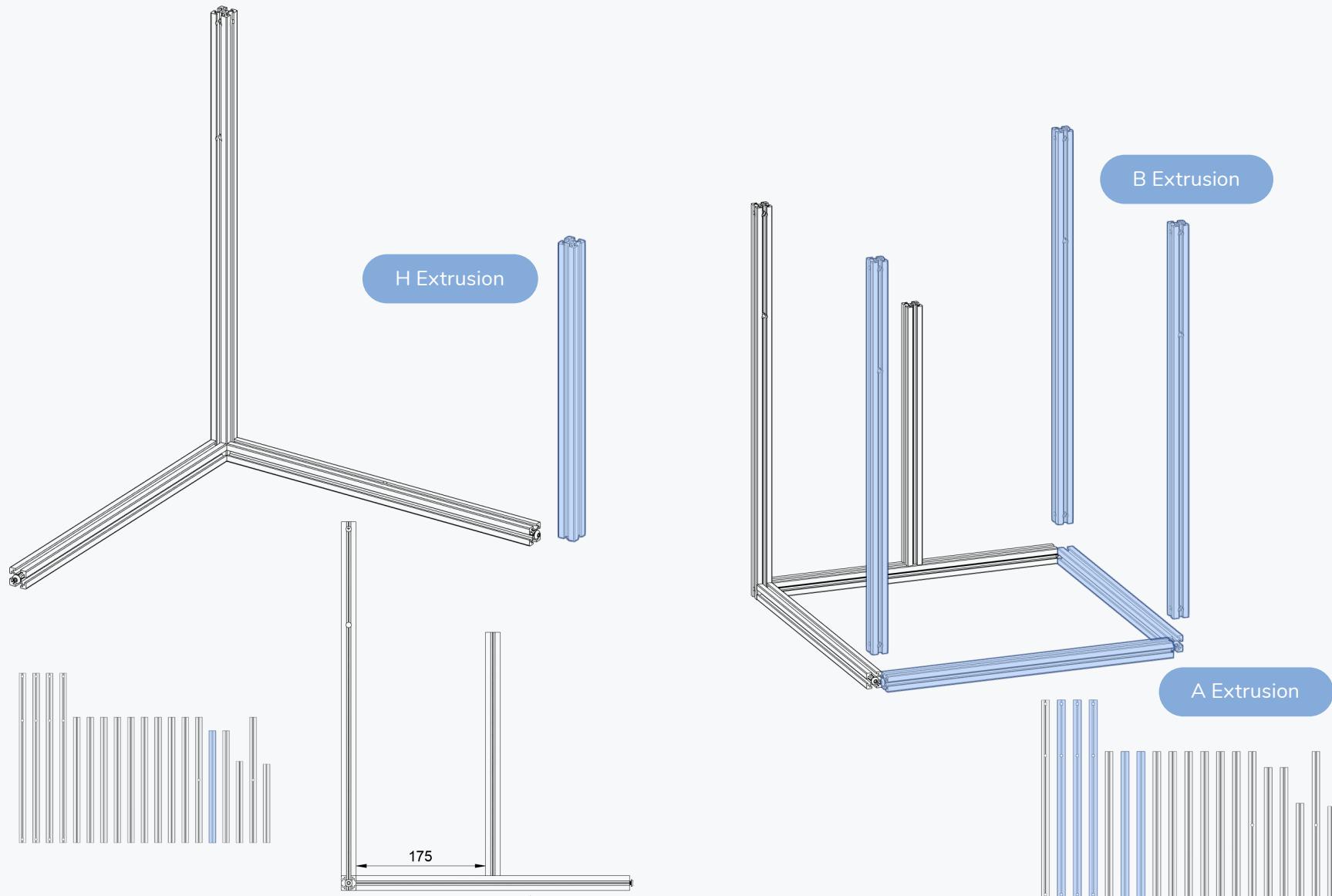
#### FIRST BLIND JOINT

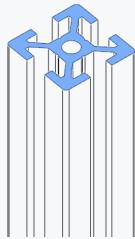
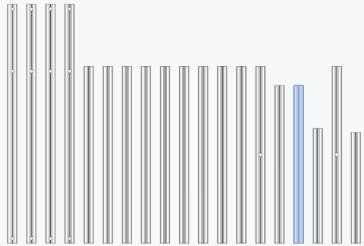
This design relies on blind joints to assemble the frame. We outlined the basics of blind joints on page 8.

If you've never assembled one before we recommend you watch the linked guide.



<https://voron.link/onjwmcd>





E Extrusion

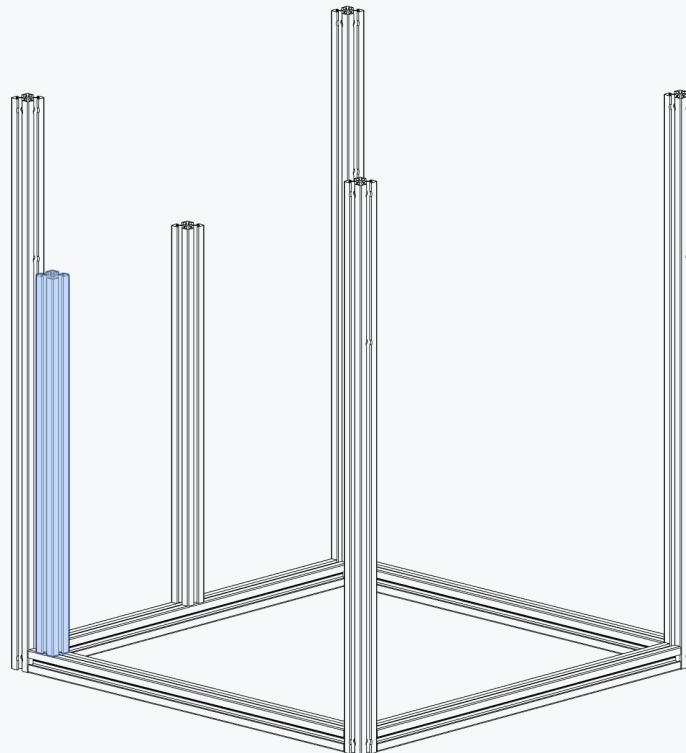


#### COVER IN TAPE

We'll be using an extrusion as a spacer.

Apply a single layer of tape to the ends to prevent scratches.

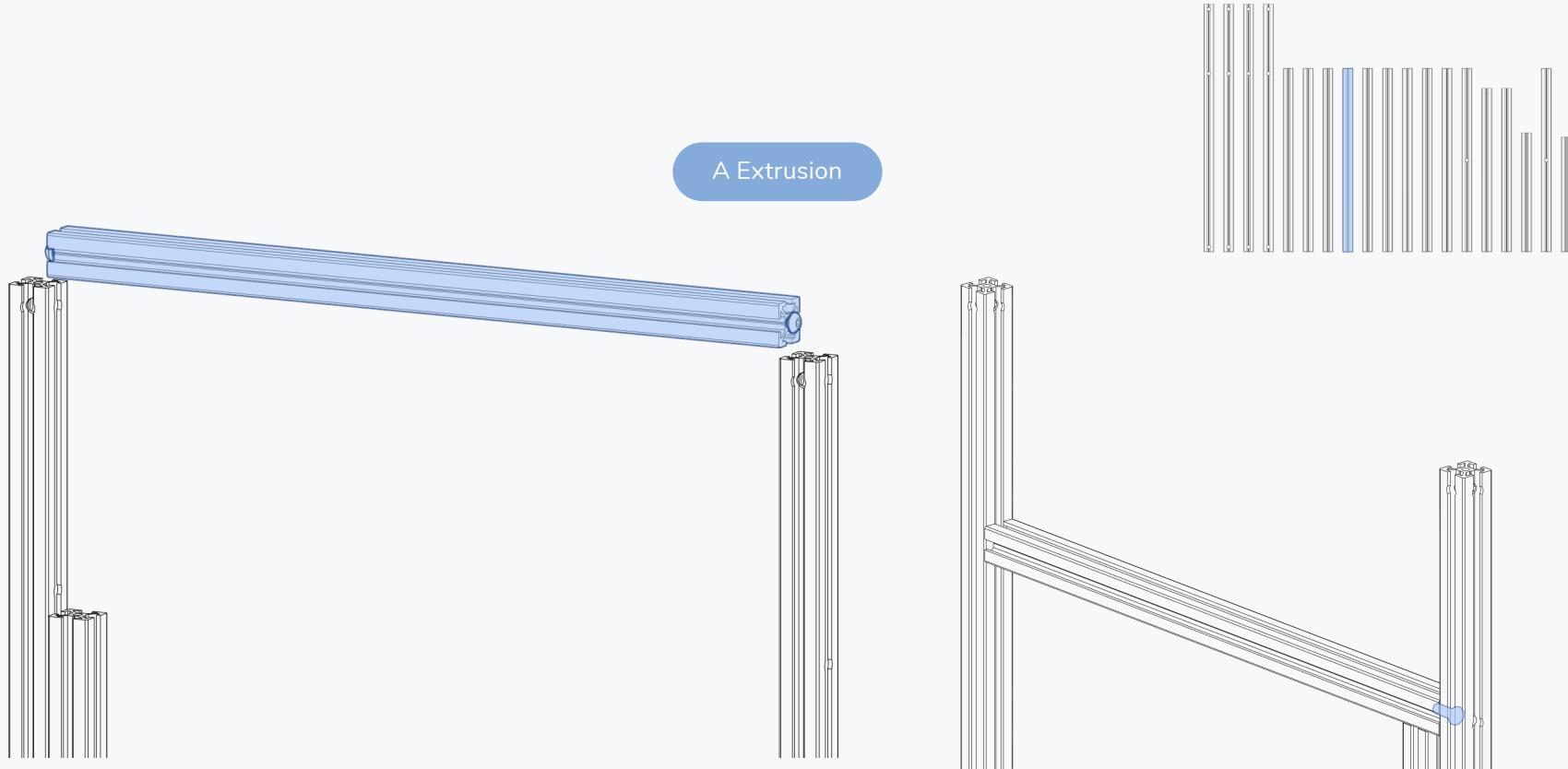
If you're not confident in the length and squareness of your extrusions print the included spacer instead.



#### FINDING THE RIGHT POSITION

We'll use a 330mm extrusion as a spacer to locate the Y extrusions.

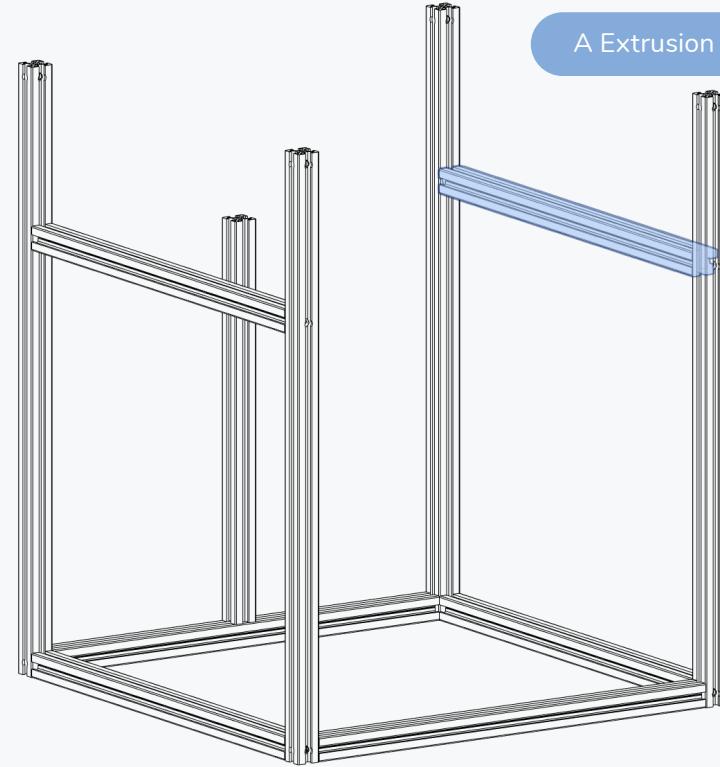
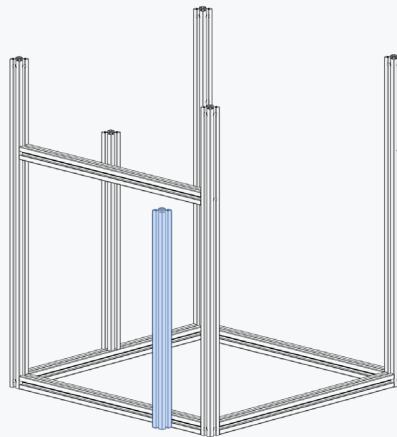
Alternatively you can print the spacer that is included in the released files.



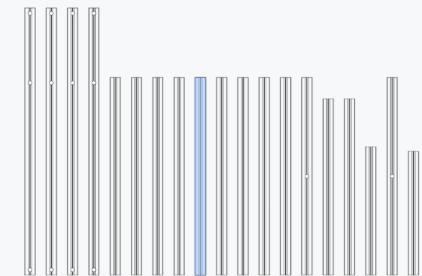
#### FINDING THE RIGHT POSITION

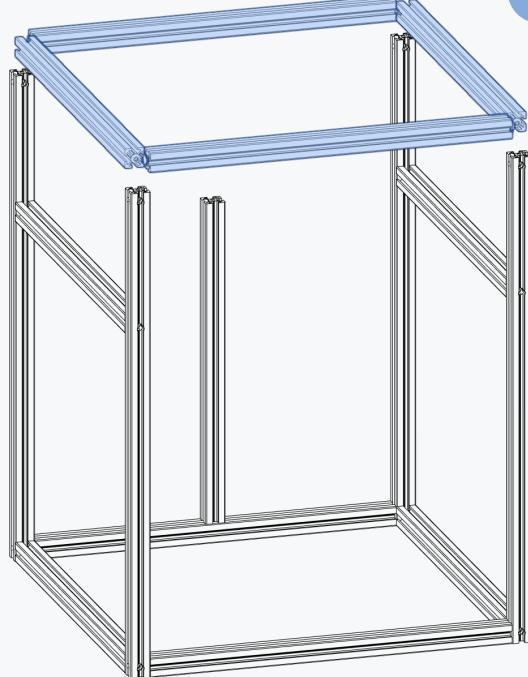
Using the 330mm extrusion as a spacer insert the Y rail and secure it using the access holes in the upright extrusions.

Make sure that the extrusions sit at an 90° angle and are free of any rotation/twist. The outsides of the extrusions should be flush.

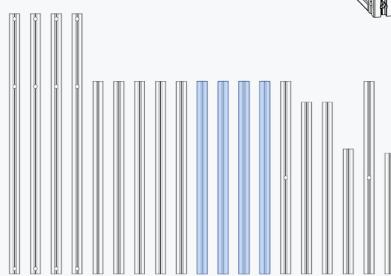
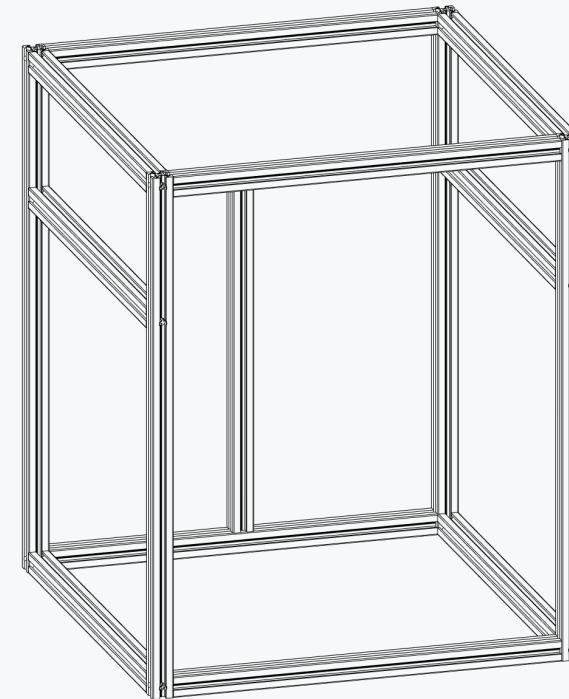
**RINSE AND REPEAT**

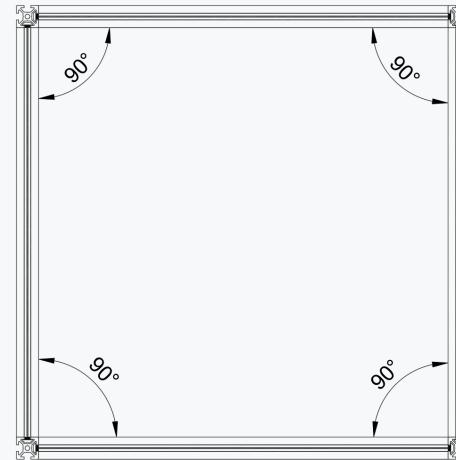
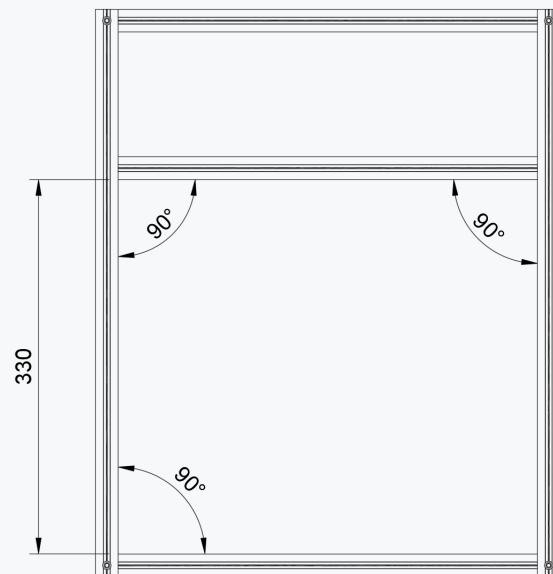
Remove the spacer and repeat the steps for the other Y extrusion.





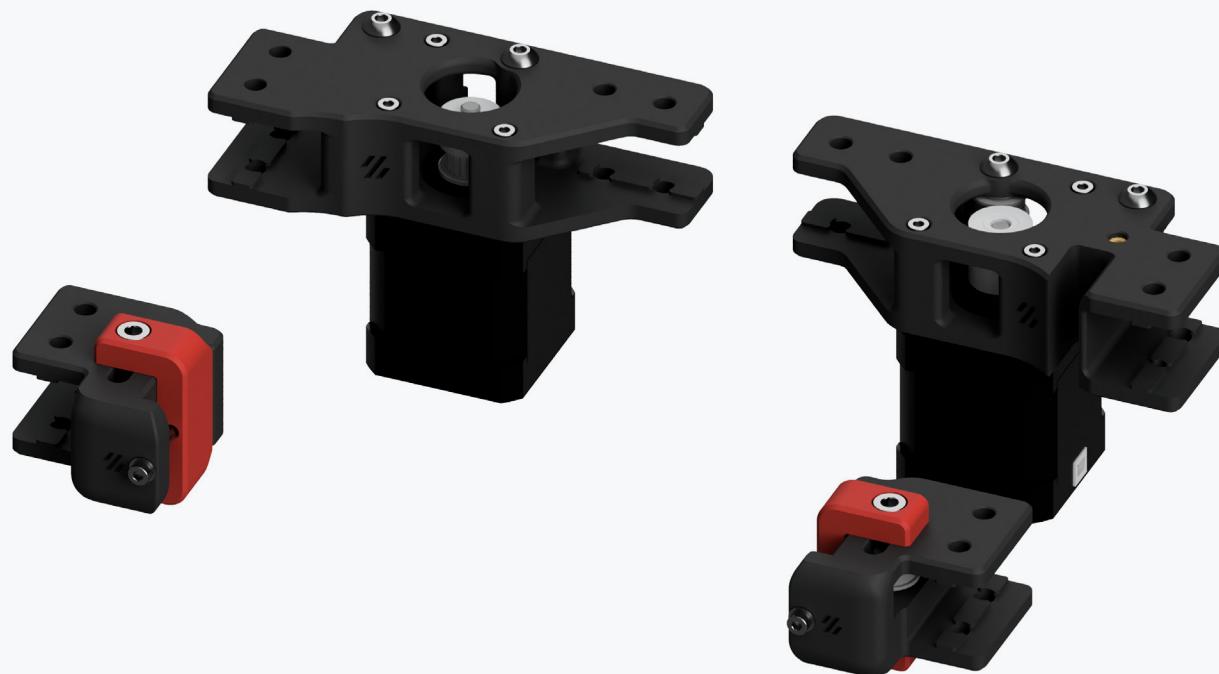
A Extrusion

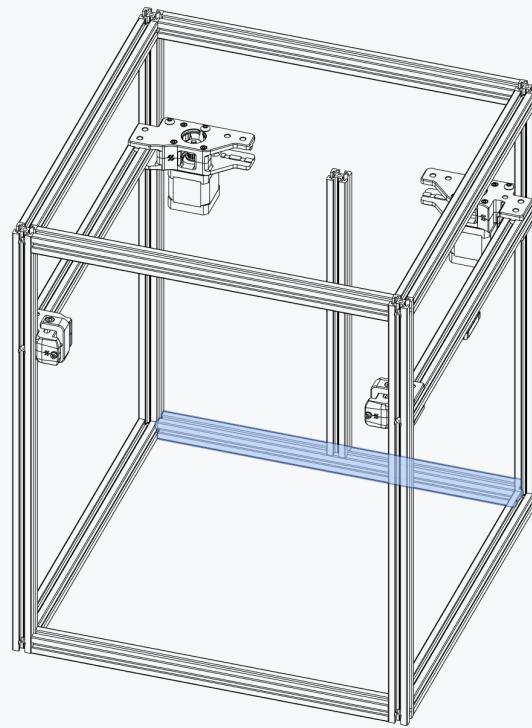




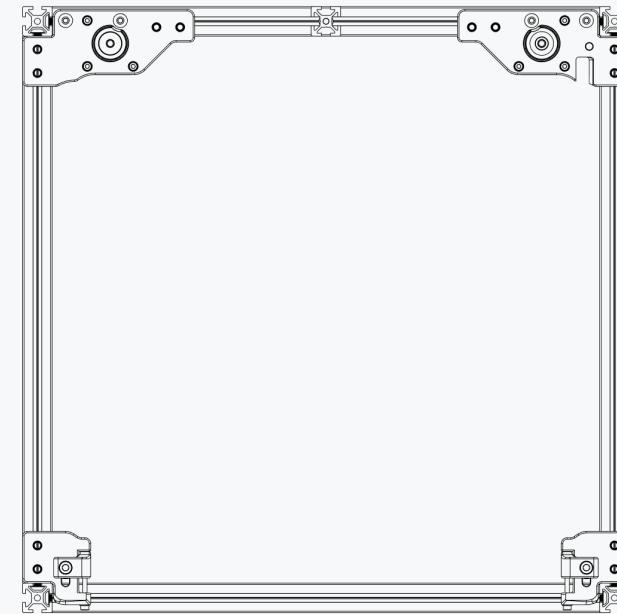
A/B DRIVE AND IDLER

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B Drive



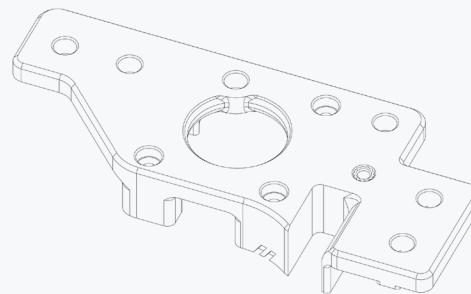
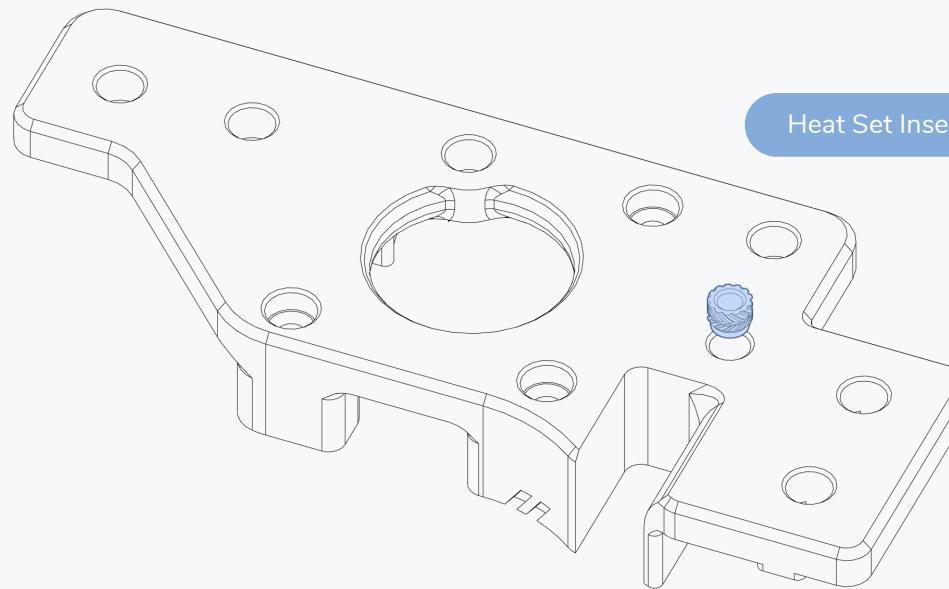
B Idler

A Drive

A Idler

**WHY IS THAT HERE?**

As you likely skipped right over the advice to flip through the entire manual we added graphics like these to allow you get a sense of the part orientation before you actually put them on the printer.



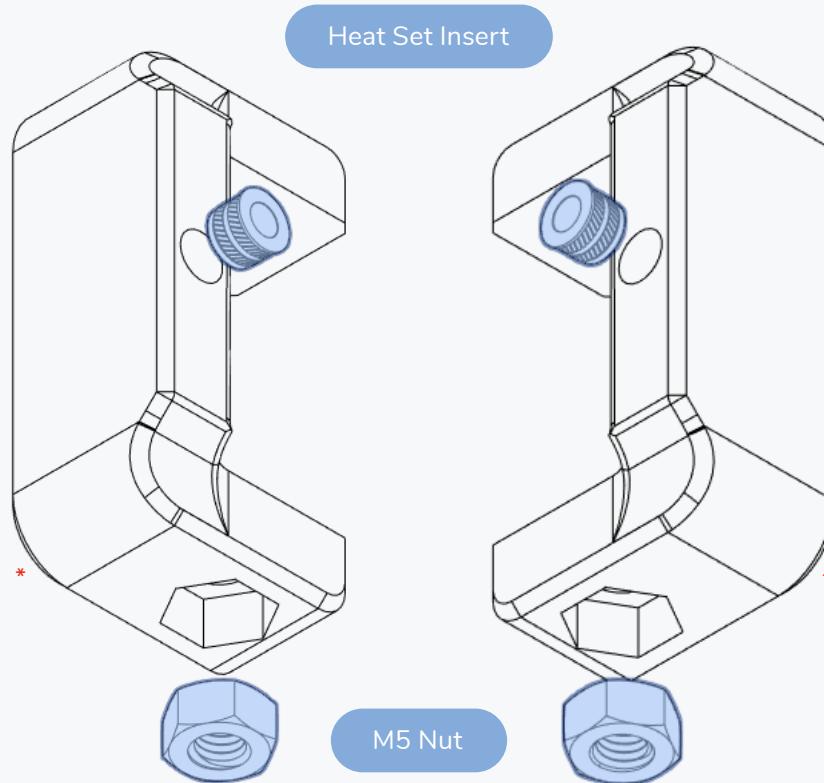
#### HEAT SET INSERTS

This design relies heavily on heat set inserts. Make sure you got the proper inserts (check the hardware reference for a close up picture).

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

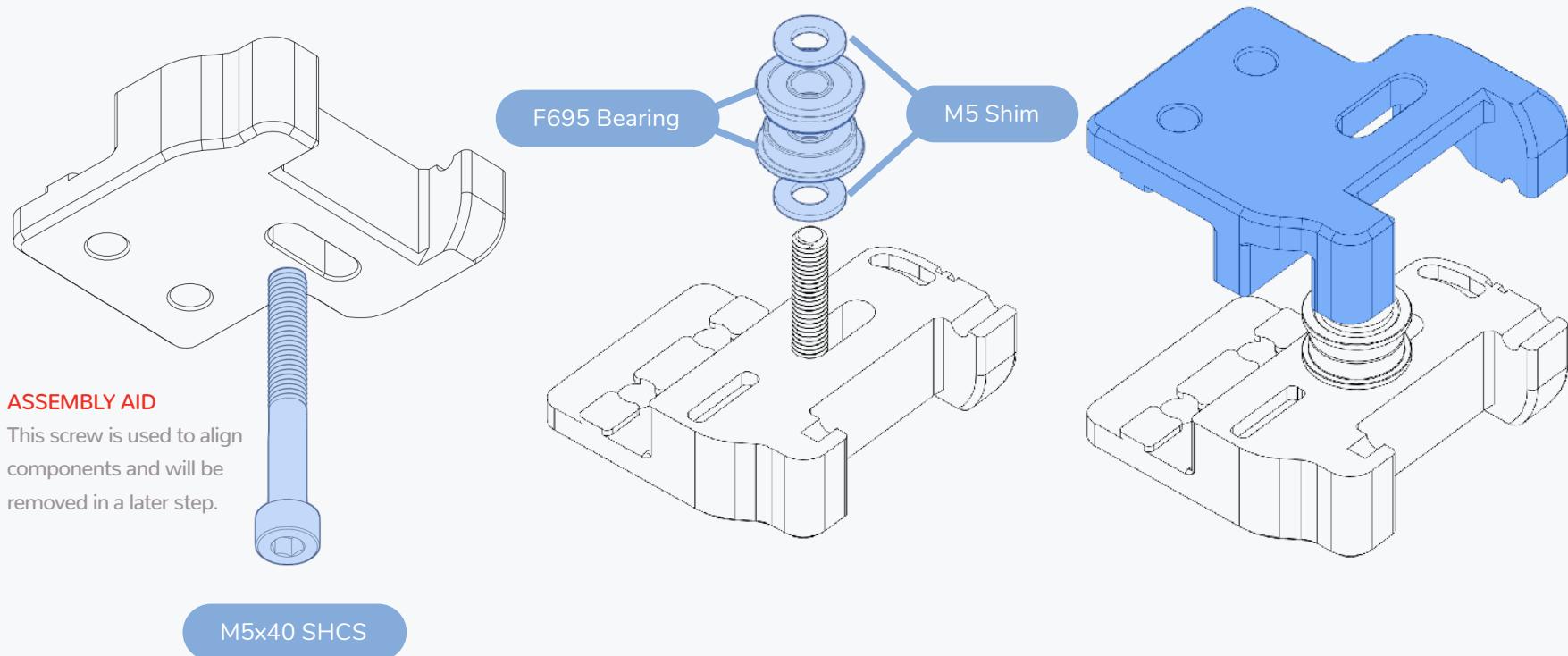


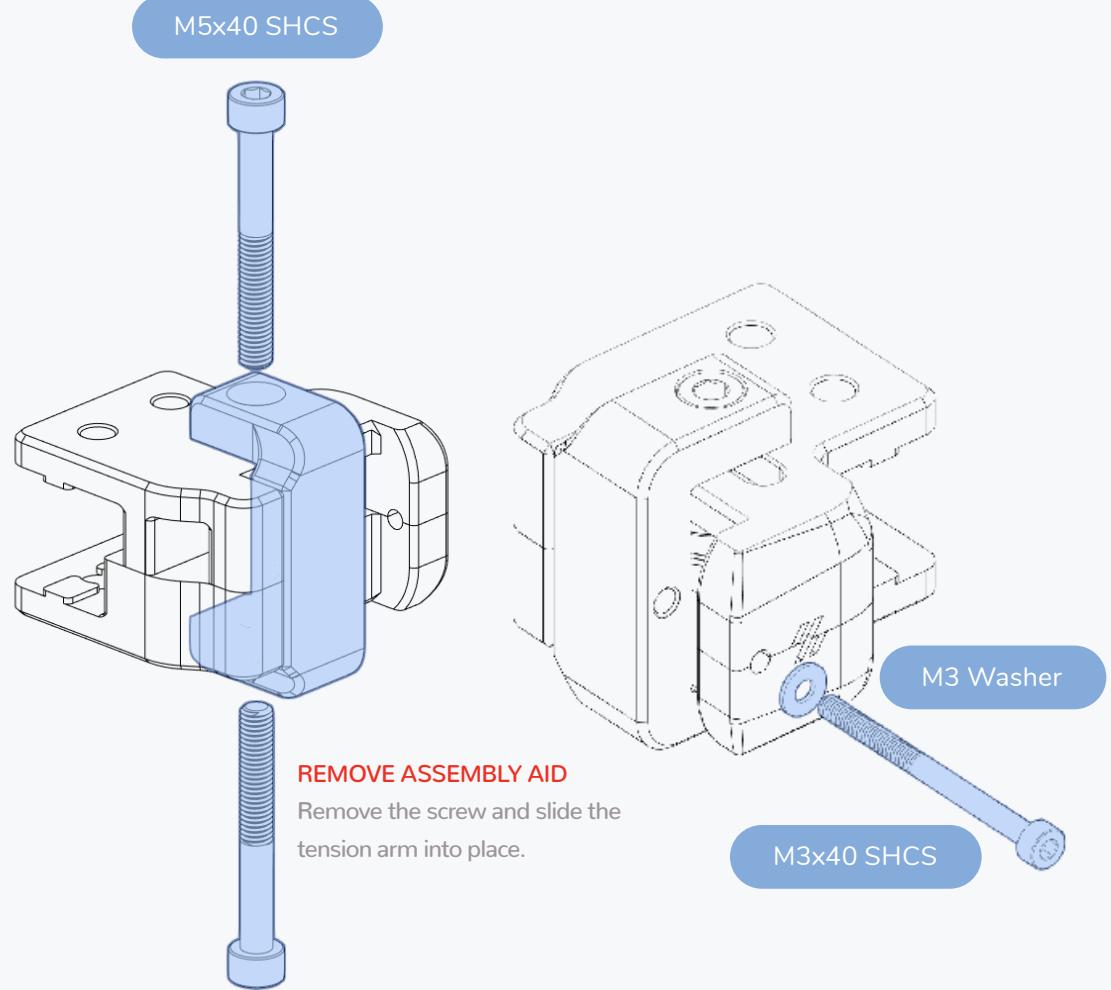
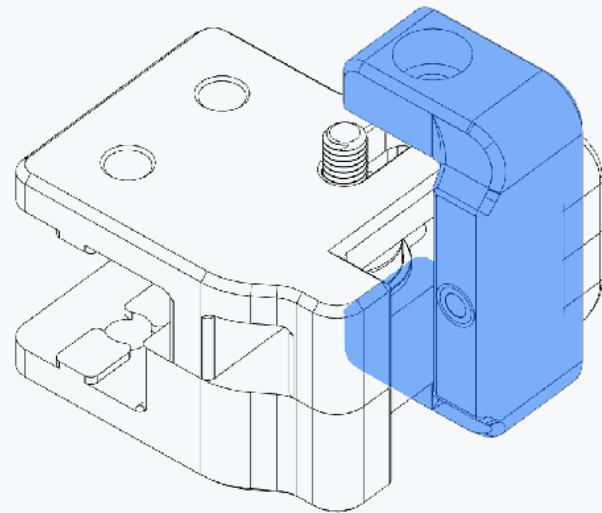
<https://voron.link/m5ybt4d>

**WHERE'S THAT PRINT PART?**

Look for asterix next to the part.

It indicates that this is an accent part.





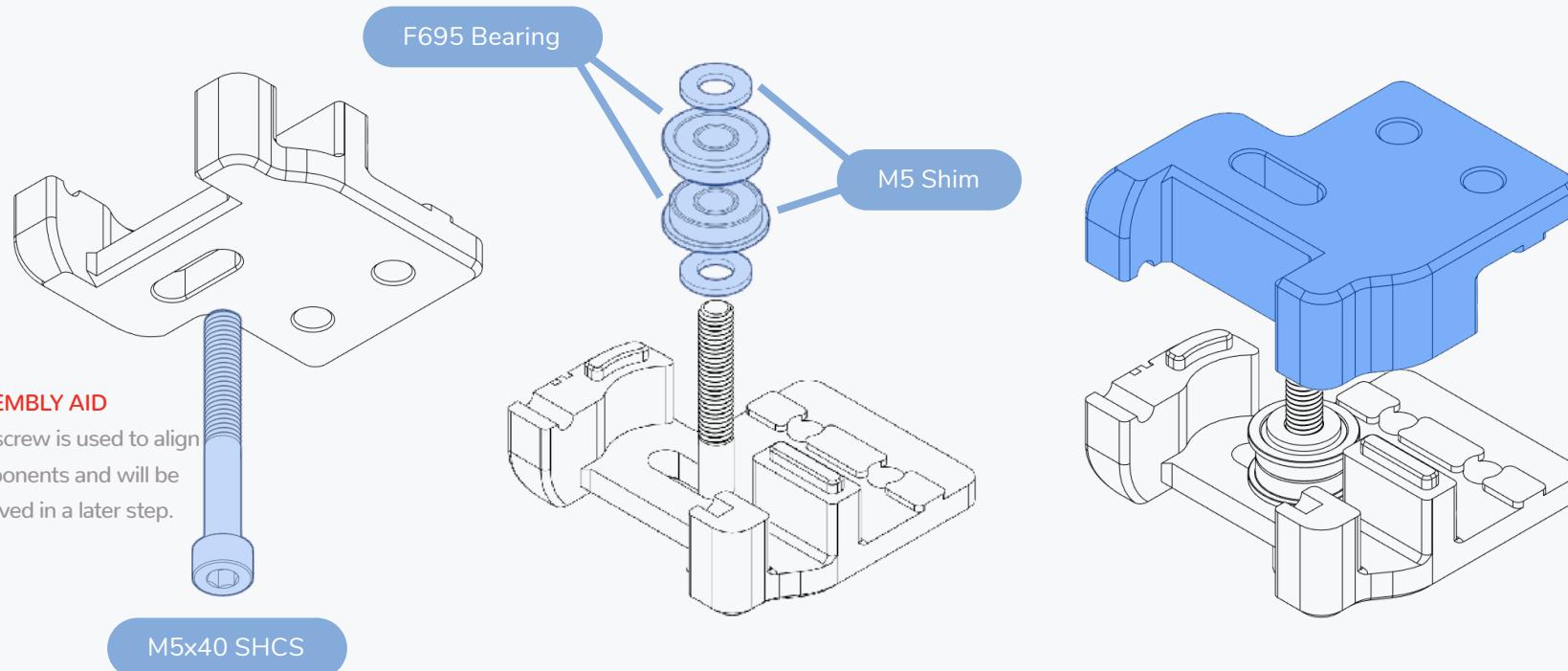
M5x40 SHCS

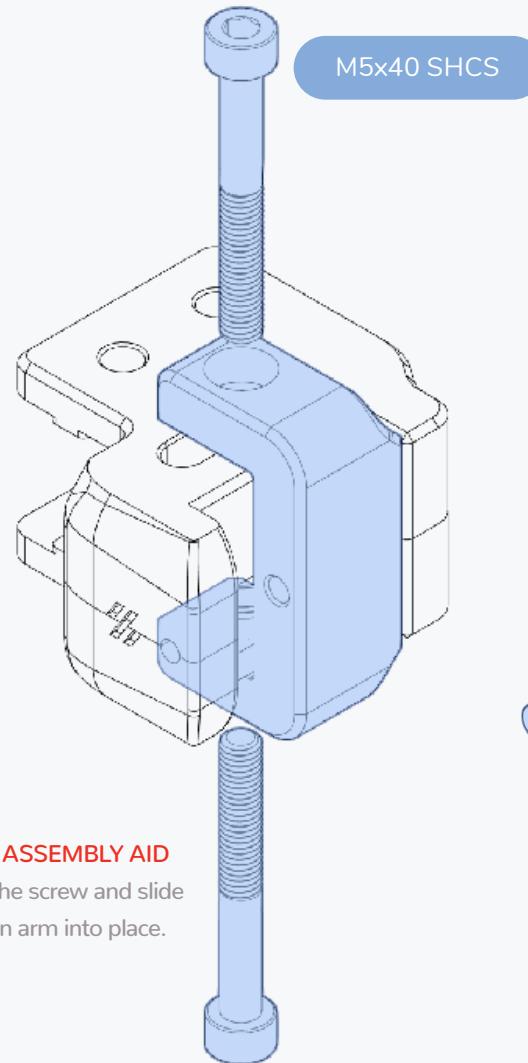
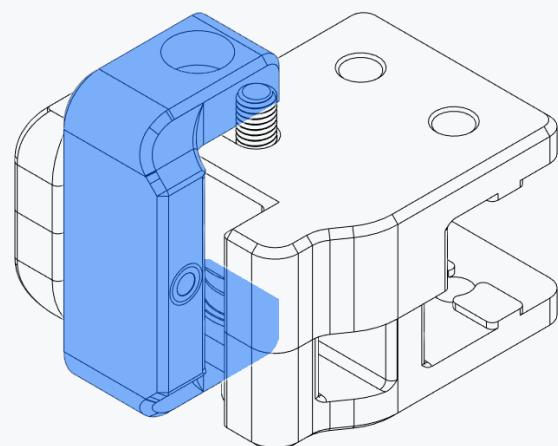
**REMOVE ASSEMBLY AID**

Remove the screw and slide the tension arm into place.

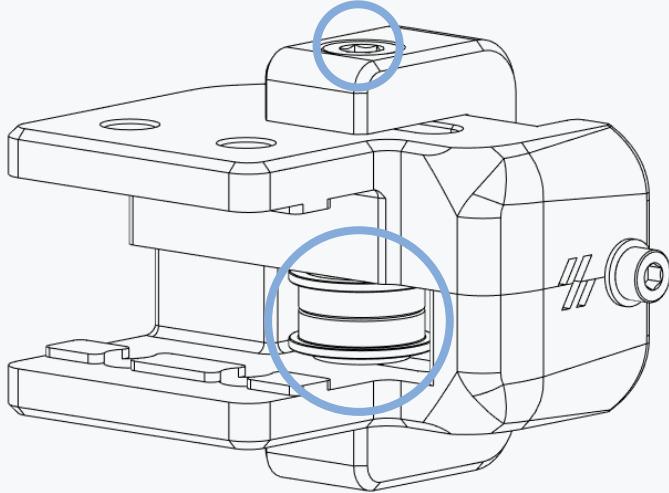
M3 Washer

M3x40 SHCS



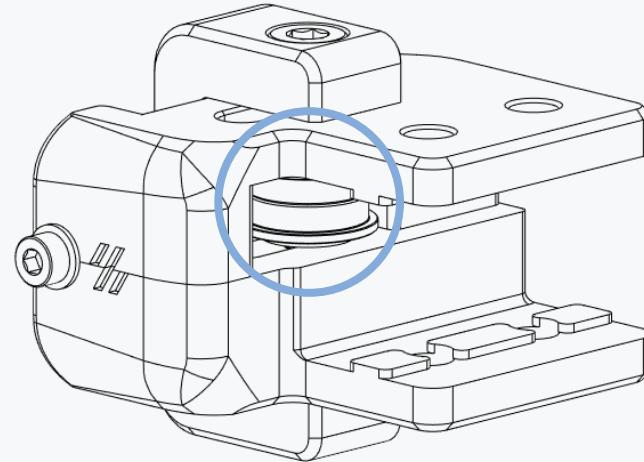
**REMOVE ASSEMBLY AID**

Remove the screw and slide  
the tension arm into place.

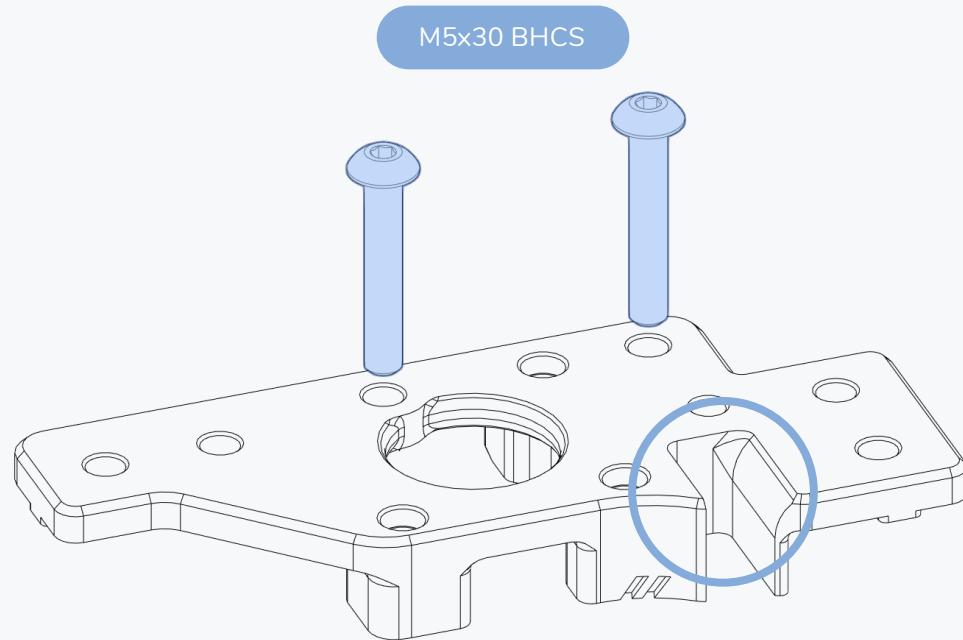
**WHAT ARE THOSE CIRCLES?**

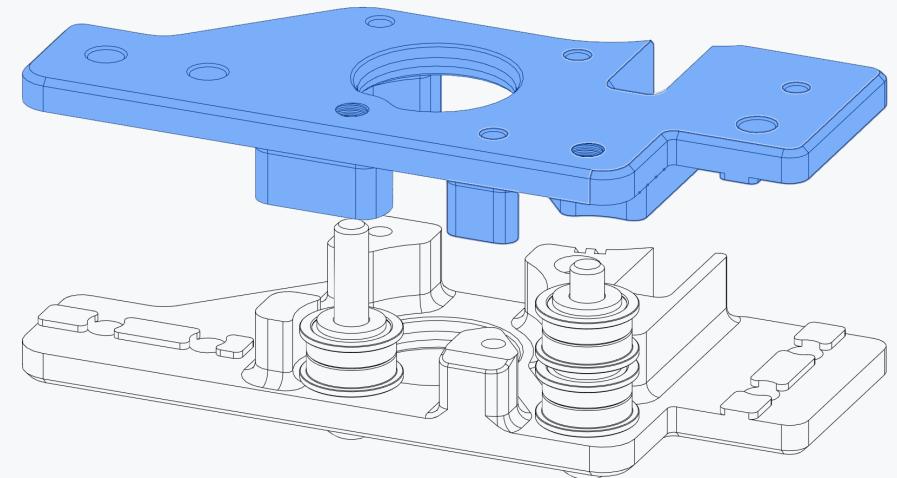
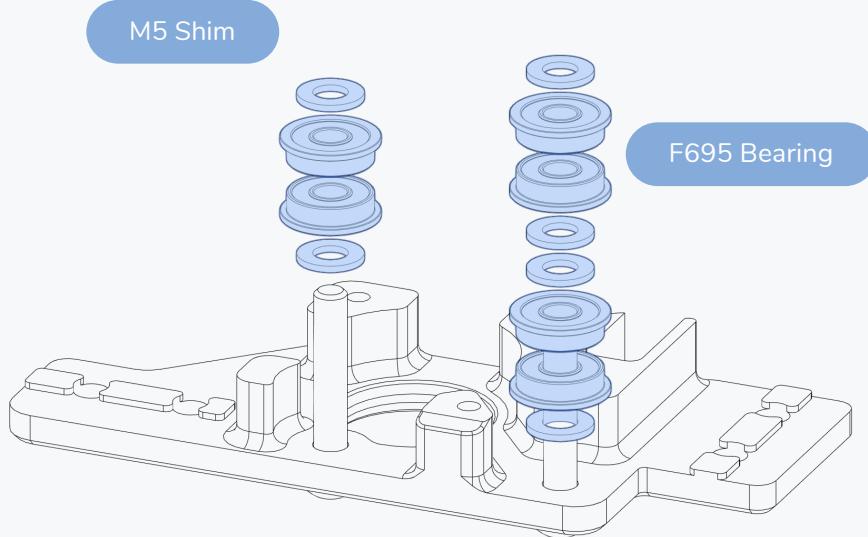
We use those circles to draw your attention to a certain feature/orientation/important bit .. quite often without adding additional text.

If you see any of those pay attention.

**CHECK YOUR WORK**

Compare your assembled parts to the graphics shown here.



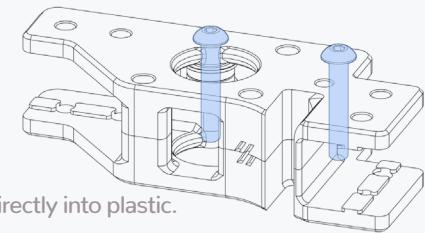


#### UPSIDE DOWN ASSEMBLY

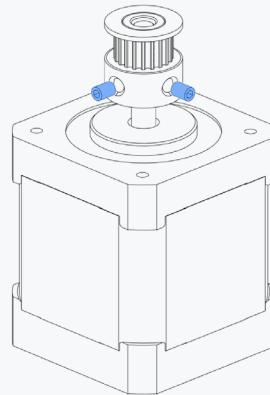
For ease of assembly we recommend to assemble the A and B drives upside down.

#### DON'T OVER TIGHTEN

The M5 screws are threaded directly into plastic.



GT2 20 Tooth Pulley



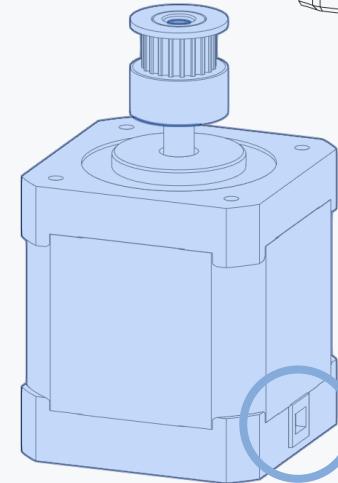
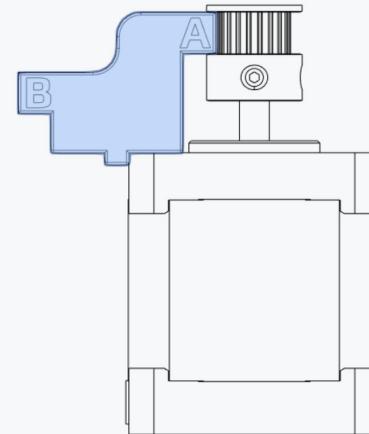
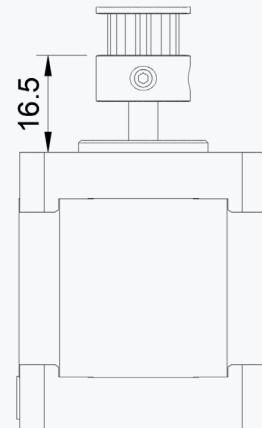
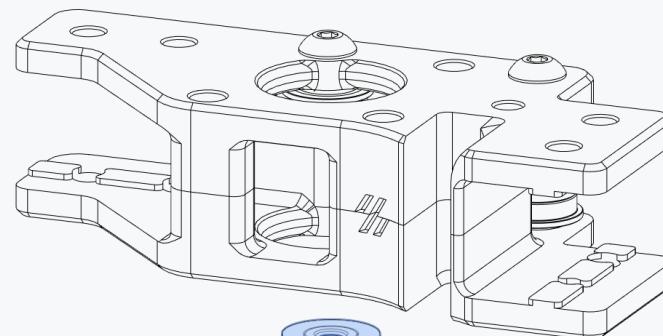
NEMA17 Stepper

**GRUB SCREWS****AKA THE ROOT OF ALL ISSUES**

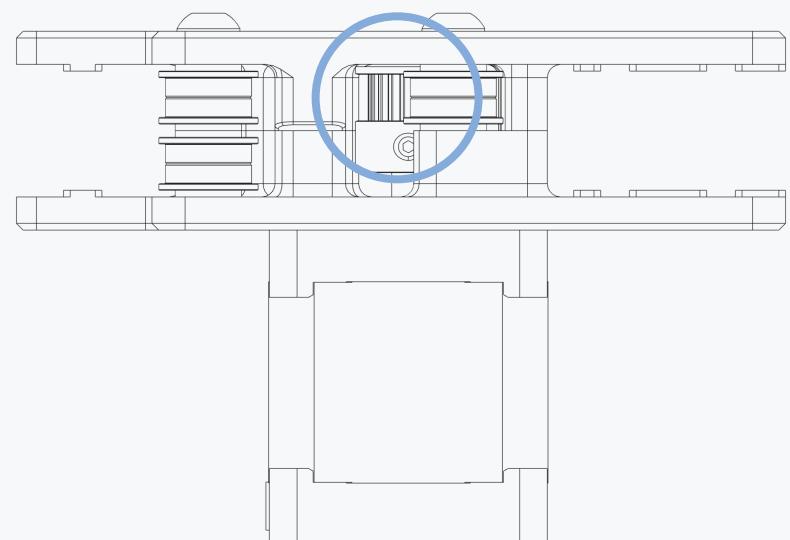
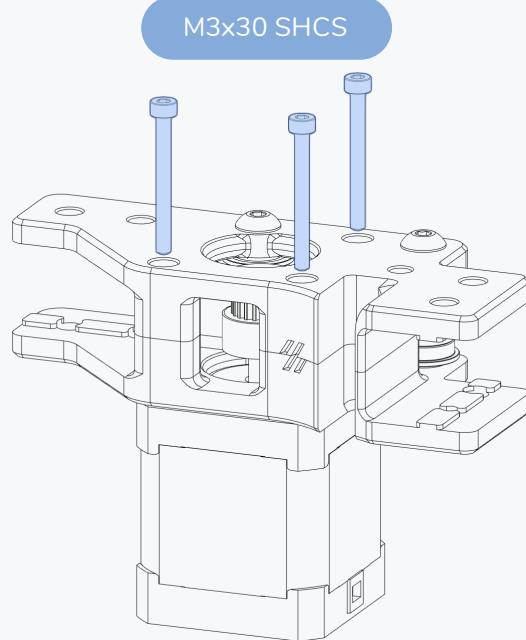
Insert both grub screws and use thread locker on all grub screws.

Loose grub screws account for the majority of issues that our users report. Save yourself hours of troubleshooting and apply thread locker to all grub screws during the build.

See the products application notes for instructions.

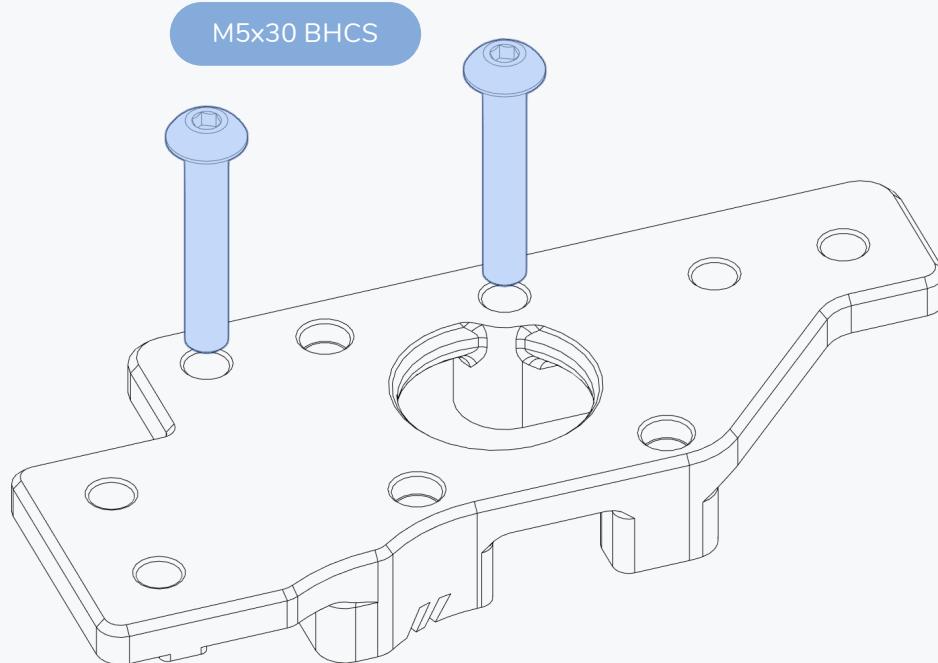
**MOTOR ORIENTATION**

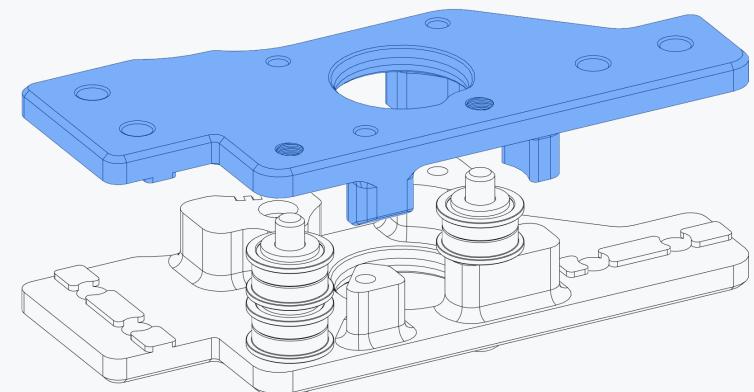
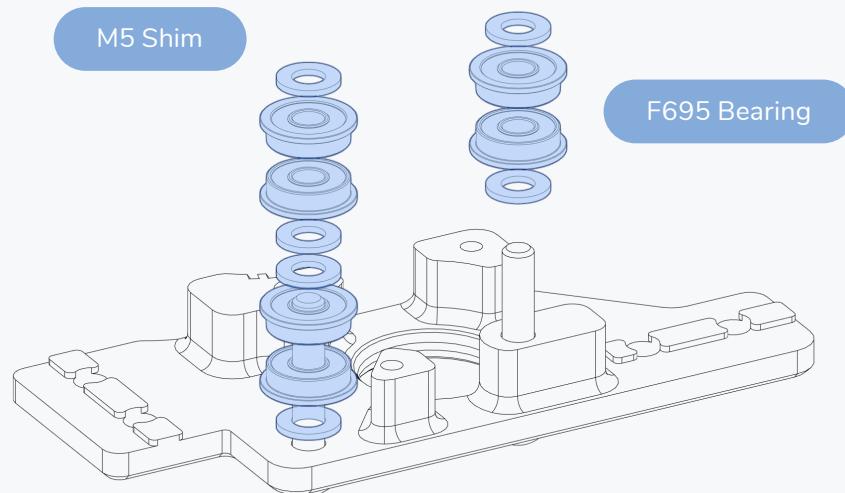
Pay attention to the orientation of the cable exit.

**CHECK YOUR WORK**

Compare your assembled part to the graphic shown here.

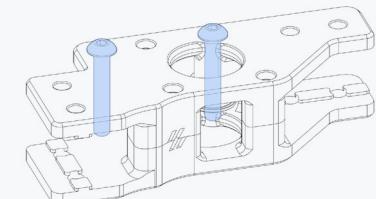
Pay attention to the pulley orientation and alignment with the bearing stack ups.





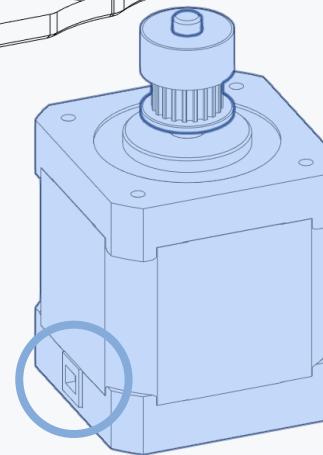
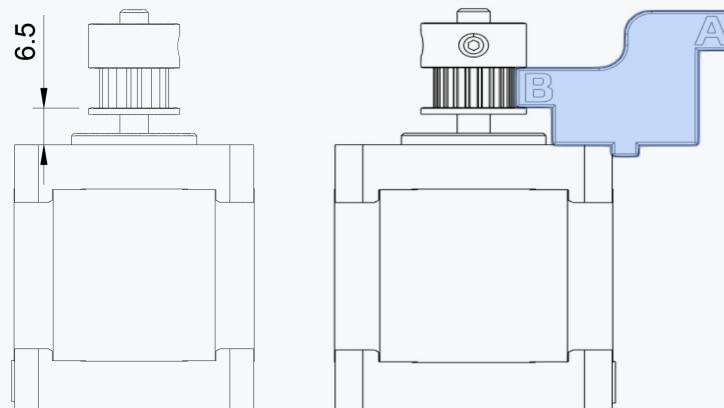
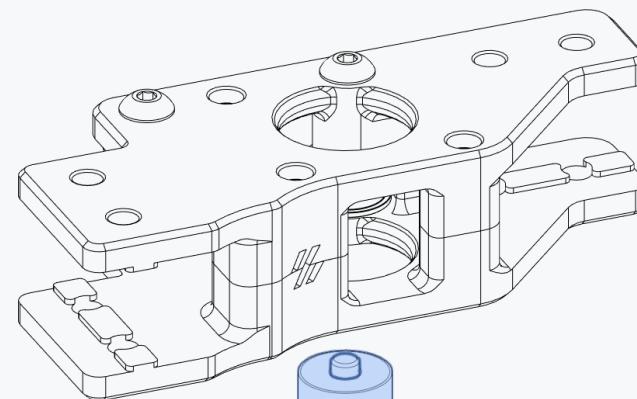
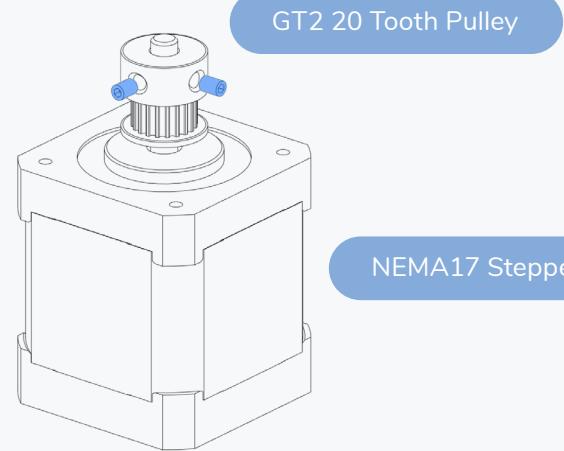
#### UPSIDE DOWN ASSEMBLY

For ease of assembly we recommend to assemble the A and B drives upside down.



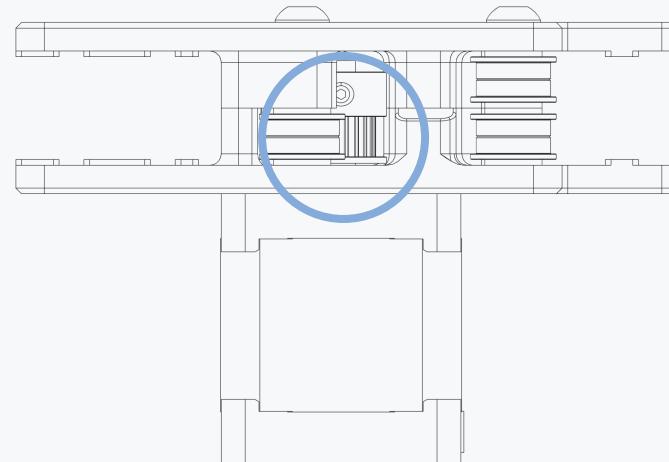
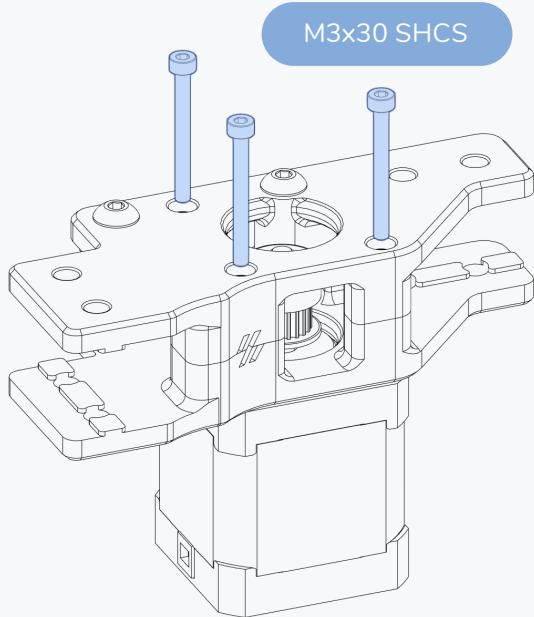
#### DON'T OVER TIGHTEN

The M5 screws are threaded directly into plastic.



#### MOTOR ORIENTATION

Pay attention to the orientation of the cable exit.



#### CHECK YOUR WORK

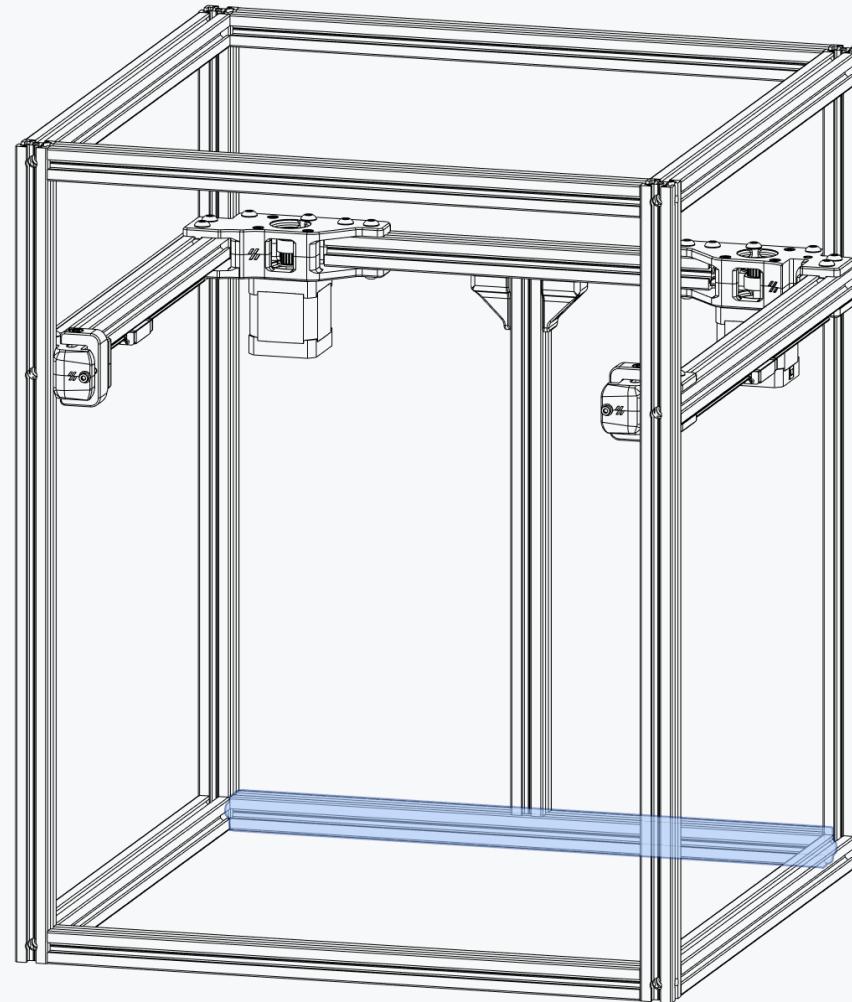
Compare your assembled part to the graphic shown here.  
Pay attention to the pulley orientation and alignment with the bearing stack ups.

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Y AXIS

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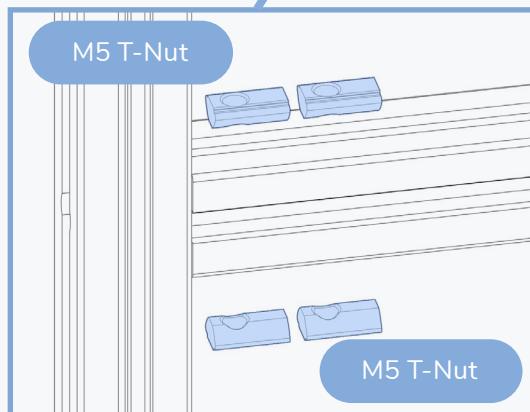
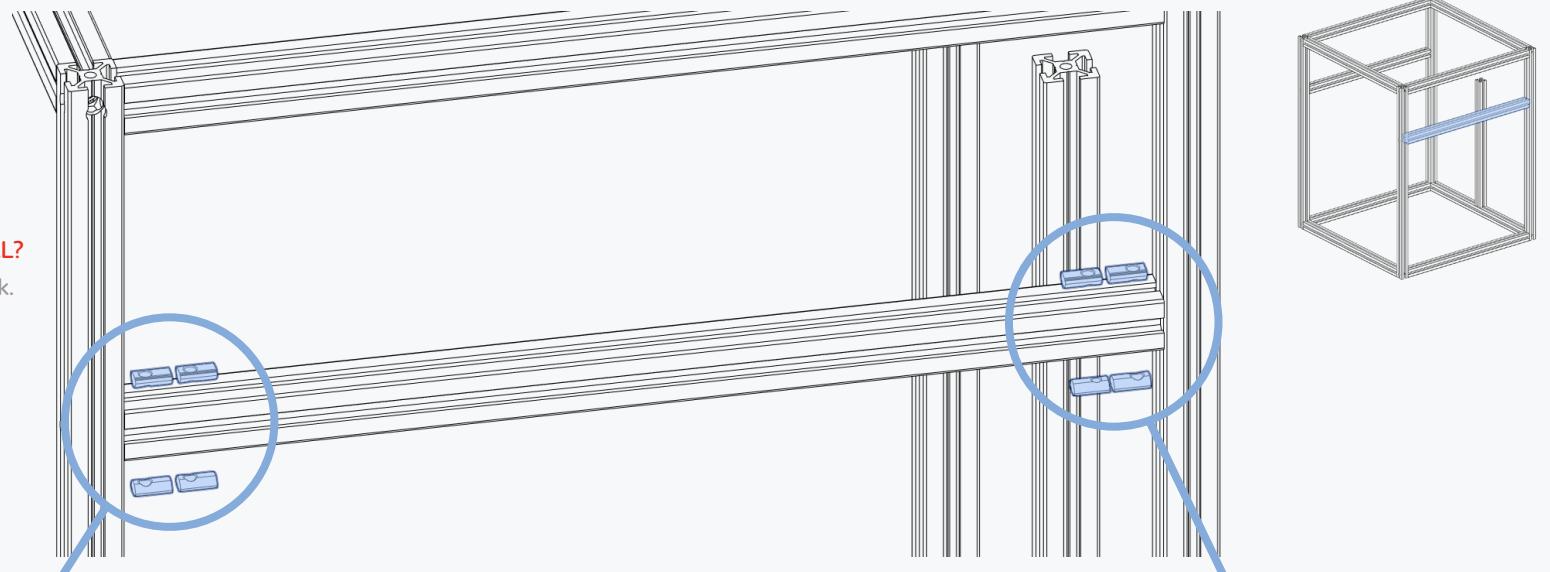




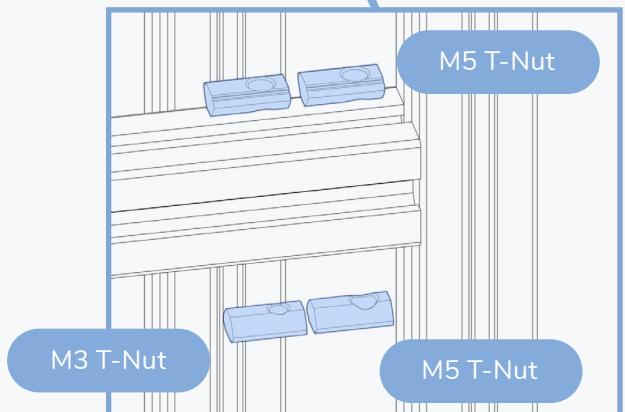
**T-NUTS? IN A VORON MANUAL?**

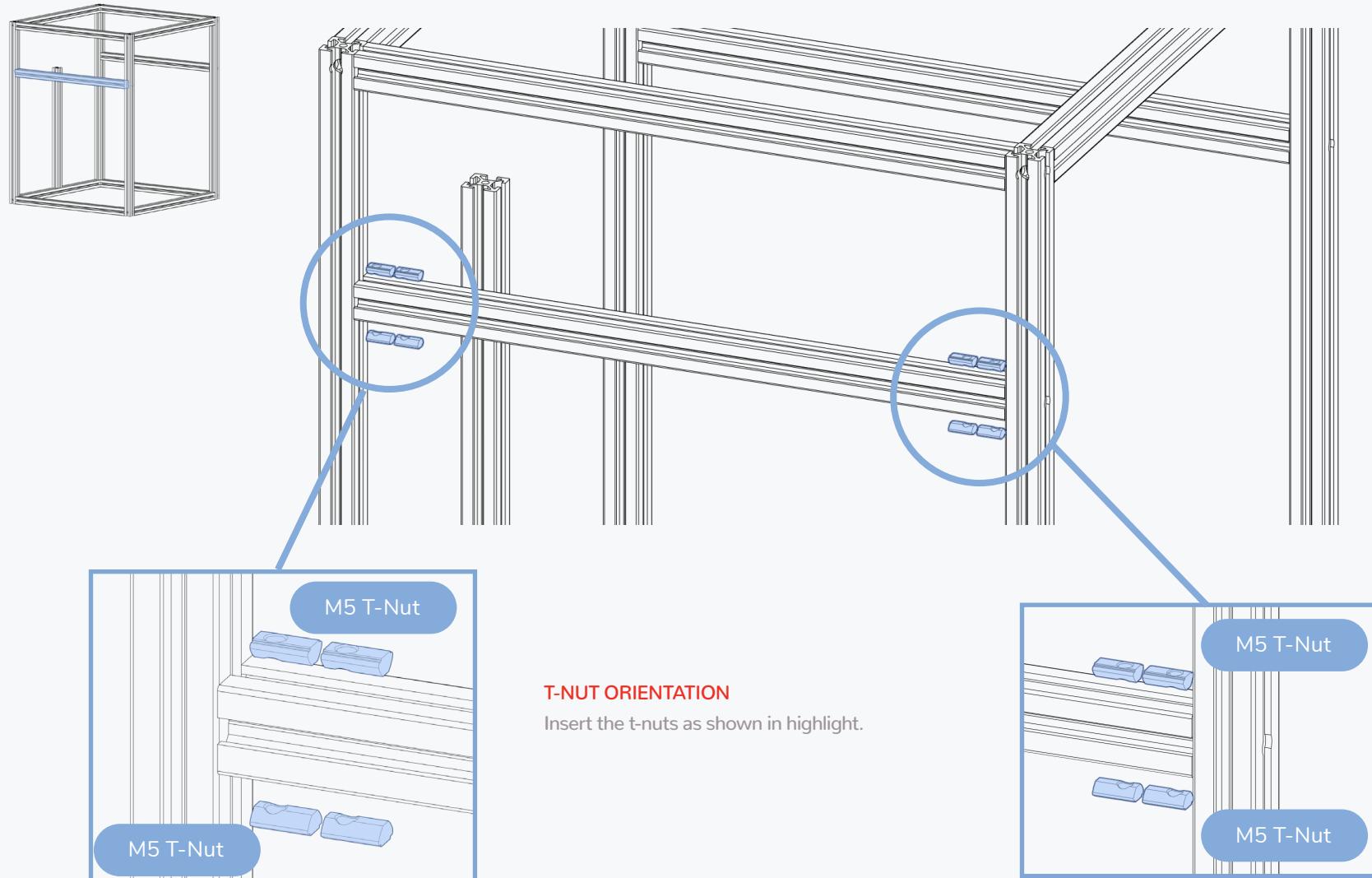
Please let us know what you think.

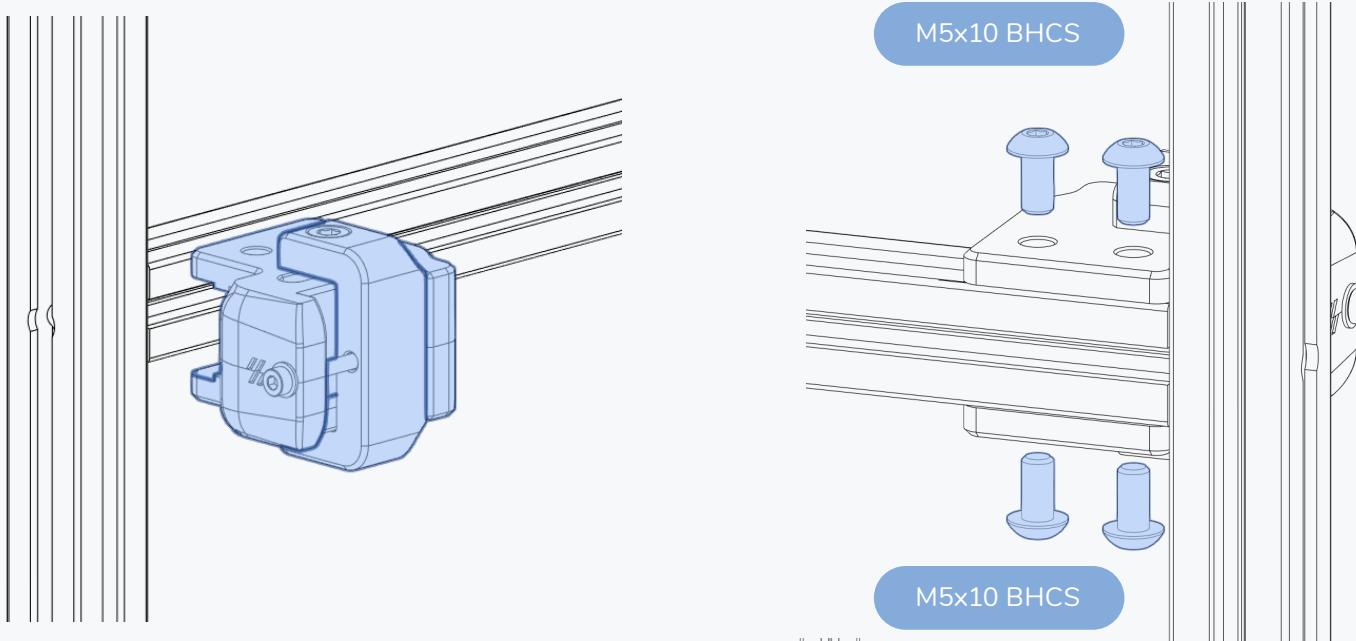
Are they really required?

**T-NUT ORIENTATION**

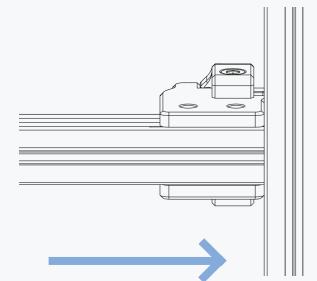
Insert the t-nuts as shown in highlight.

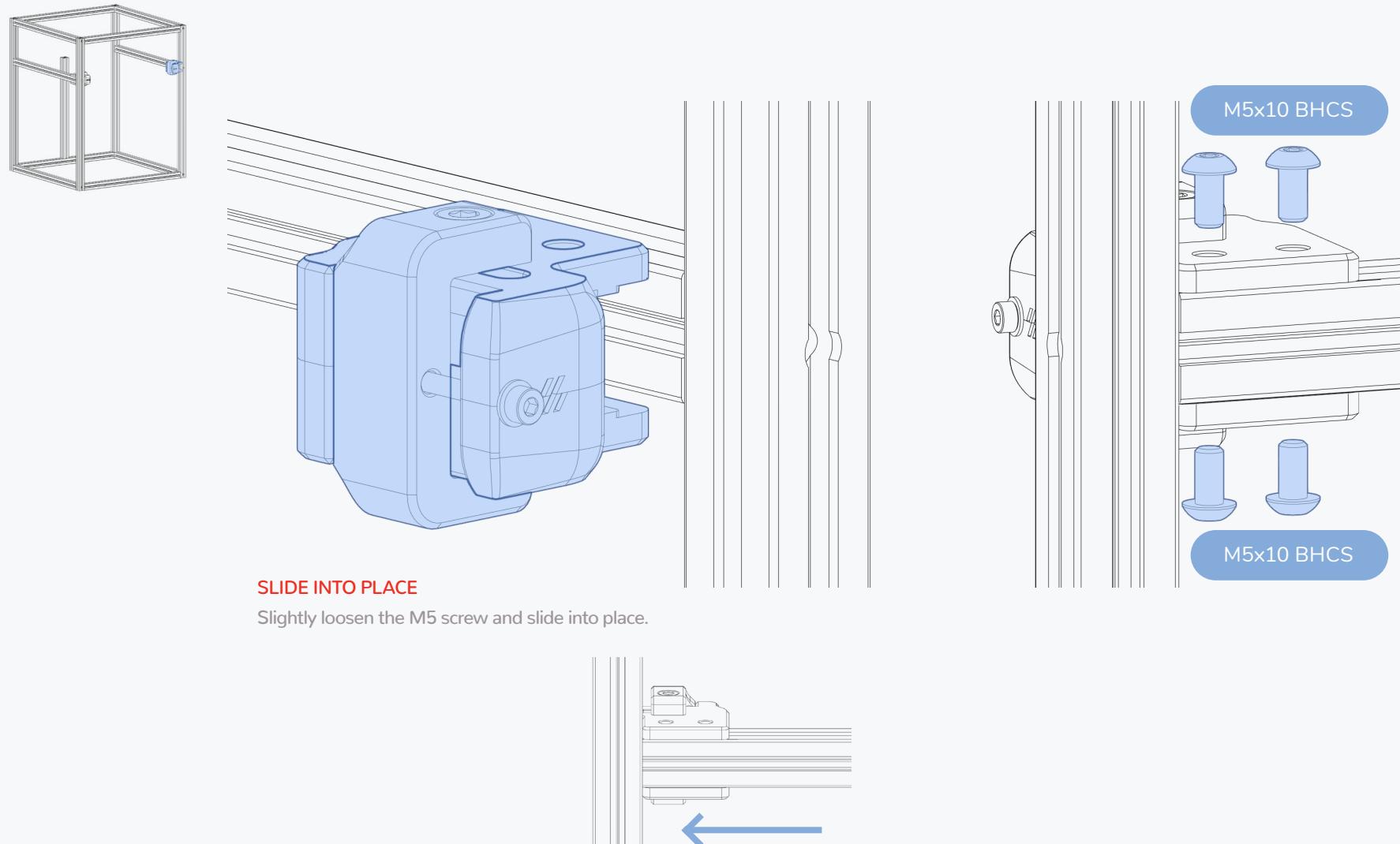


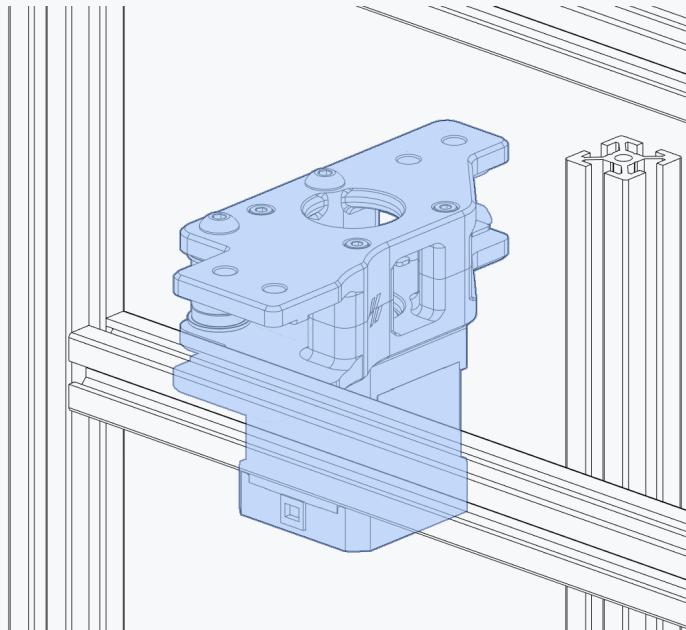


**SLIDE INTO PLACE**

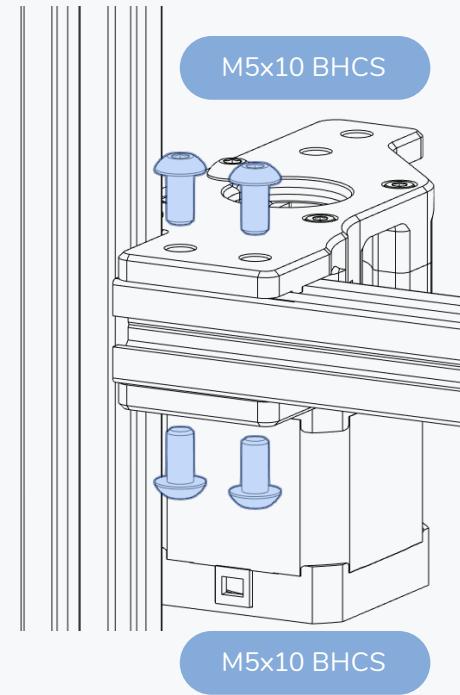
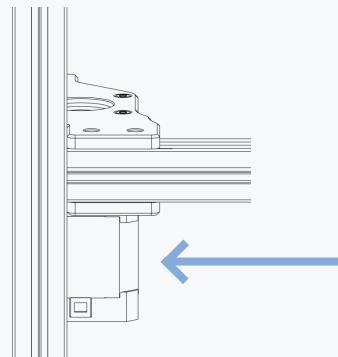
Slightly loosen the M5 screw and slide into place.

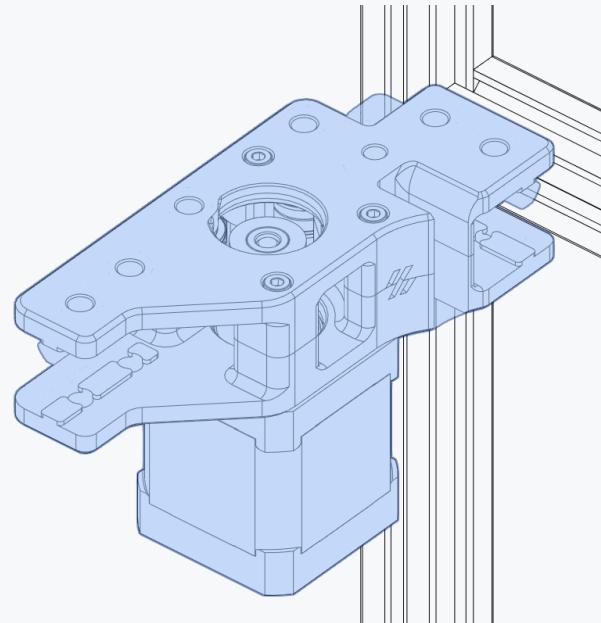




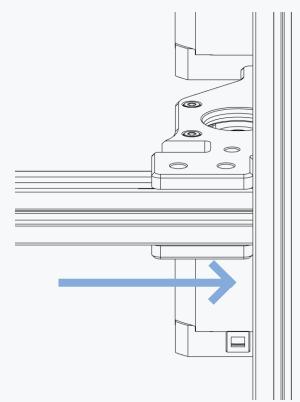
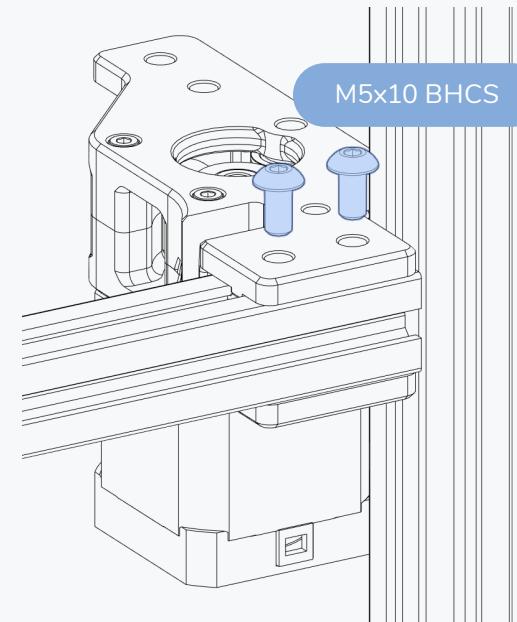
**SLIDE INTO PLACE**

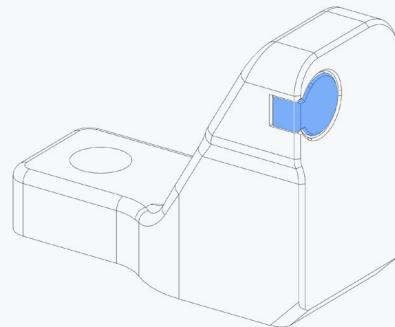
Loosen the screws and slide into place.



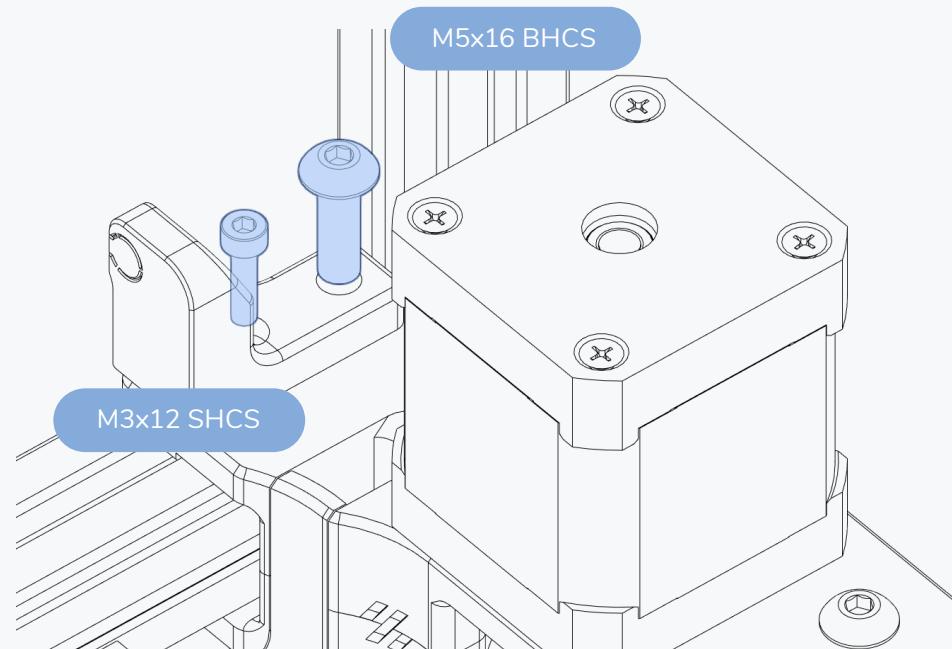
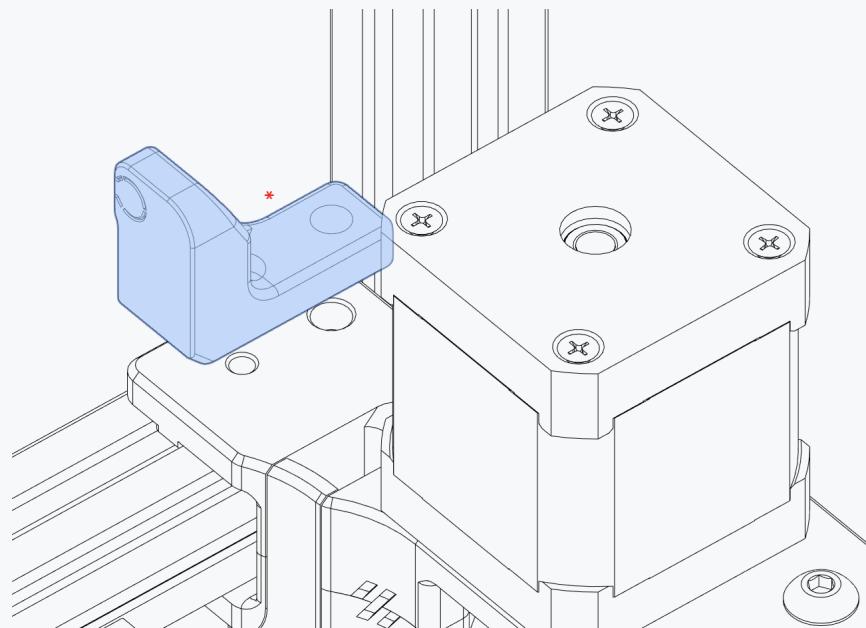
**SLIDE INTO PLACE**

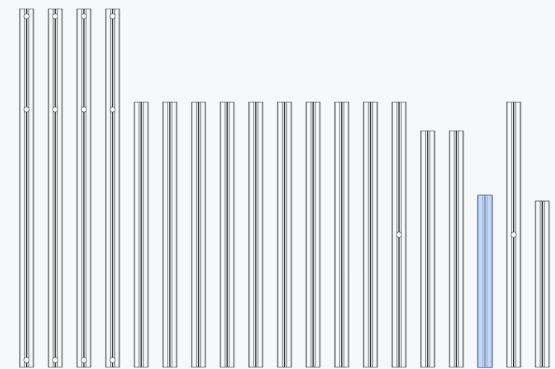
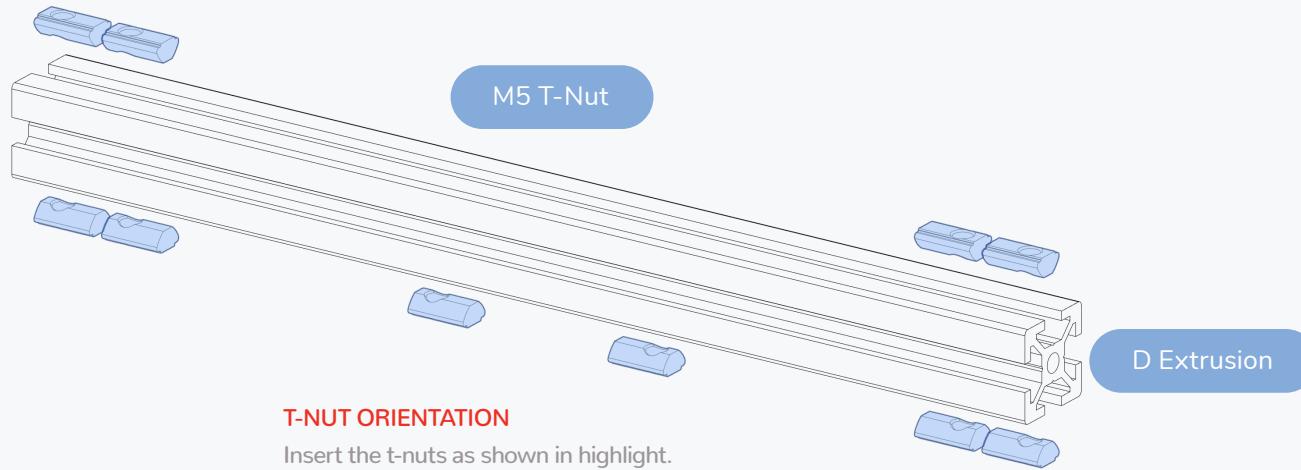
Loosen the screws and slide into place.

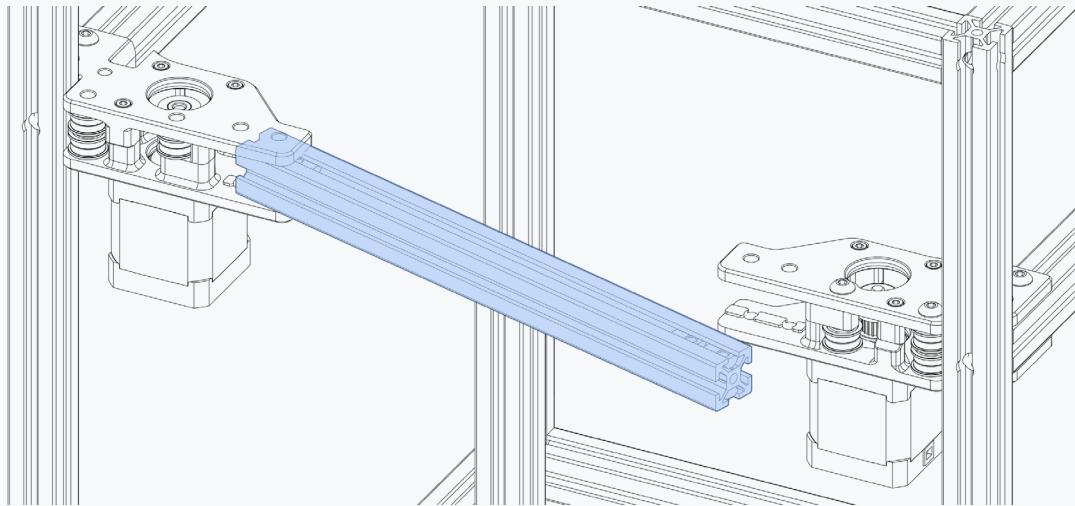


**HALL EFFECT ENDSTOP?**

If you are using a Hall Effect Endstop board remove the highlighted part and insert a magnet in its place.





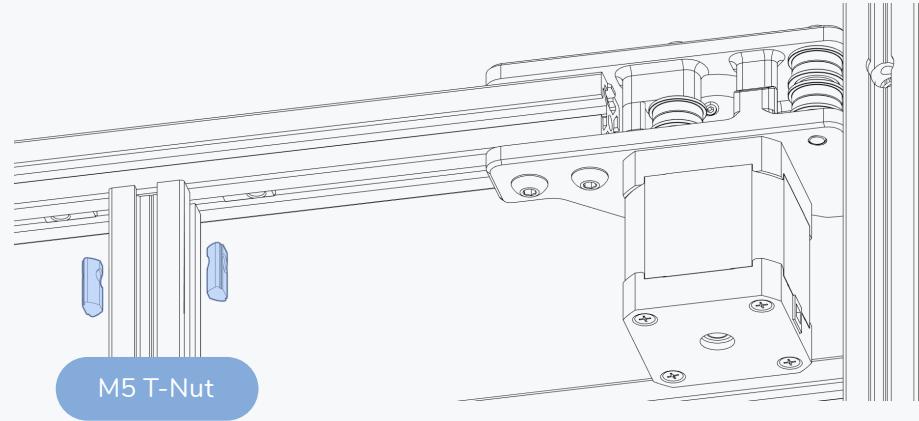
**SLIDE INTO PLACE**

The rear crossbar can be slid into place. You may need to loosen the M5 screws.

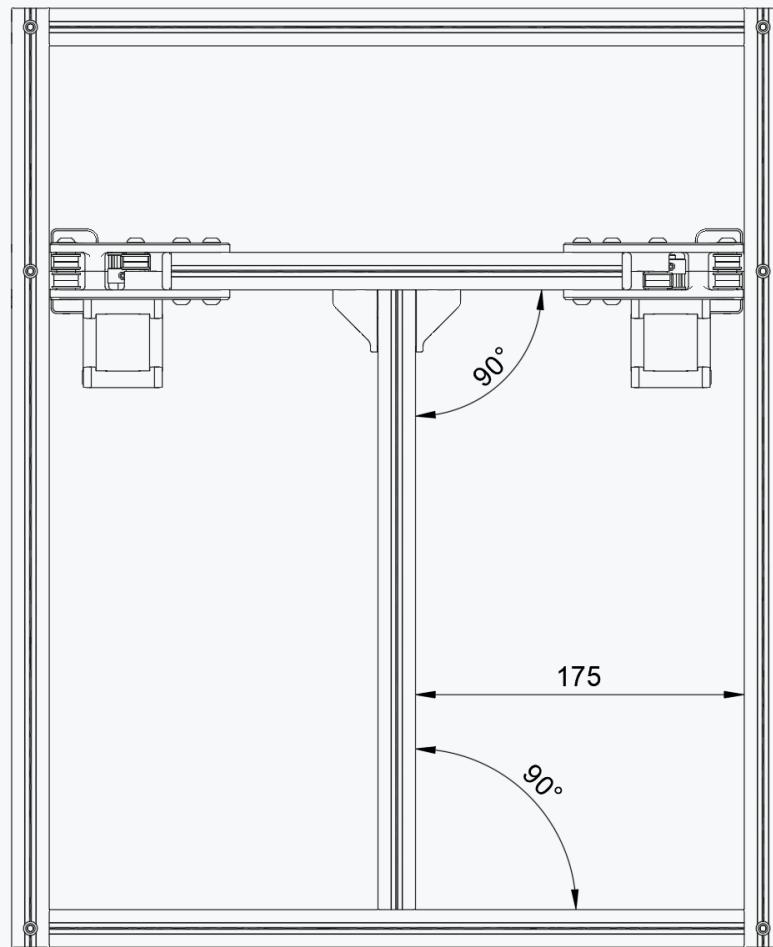


## REAR BRACE

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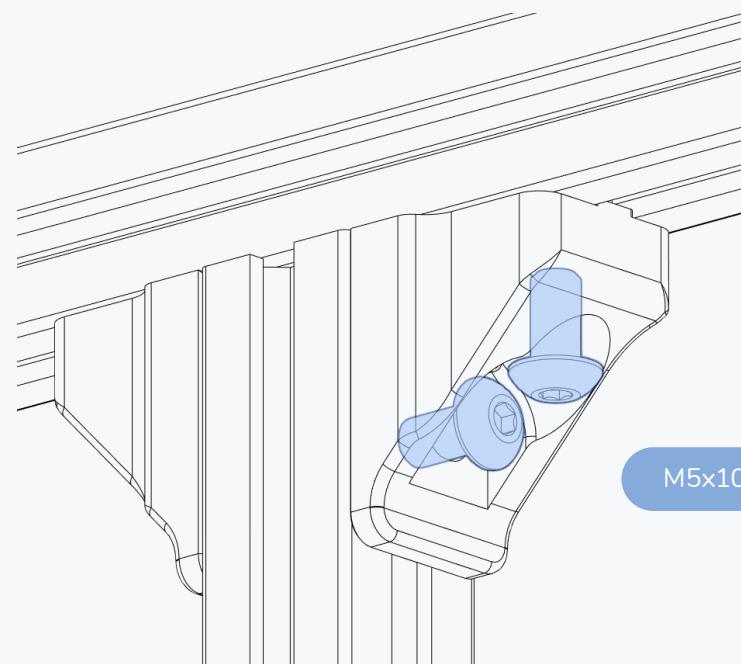
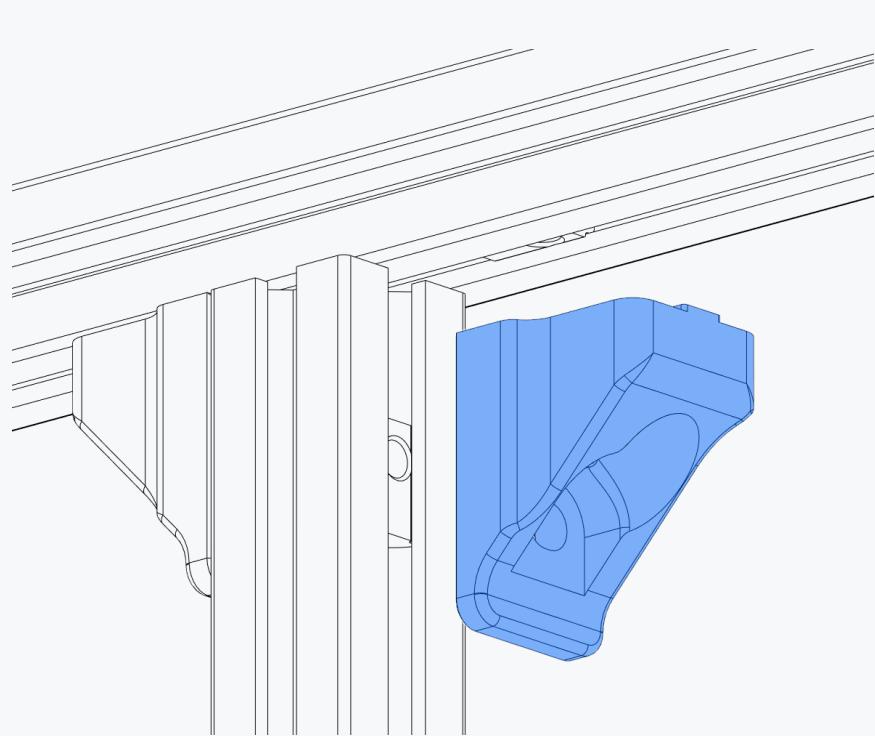


M5x10 BHCS

**ADJUST POSITIONING**

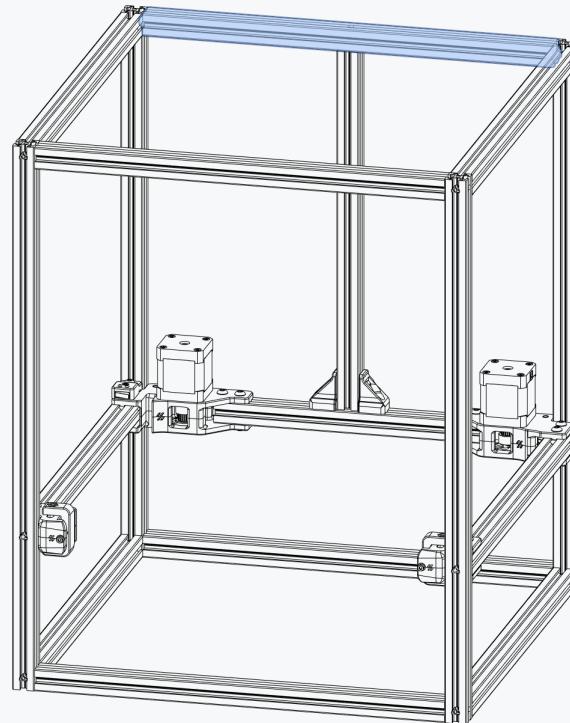
Adjust the position of the rear extrusion to match the dimensions shown on the right.

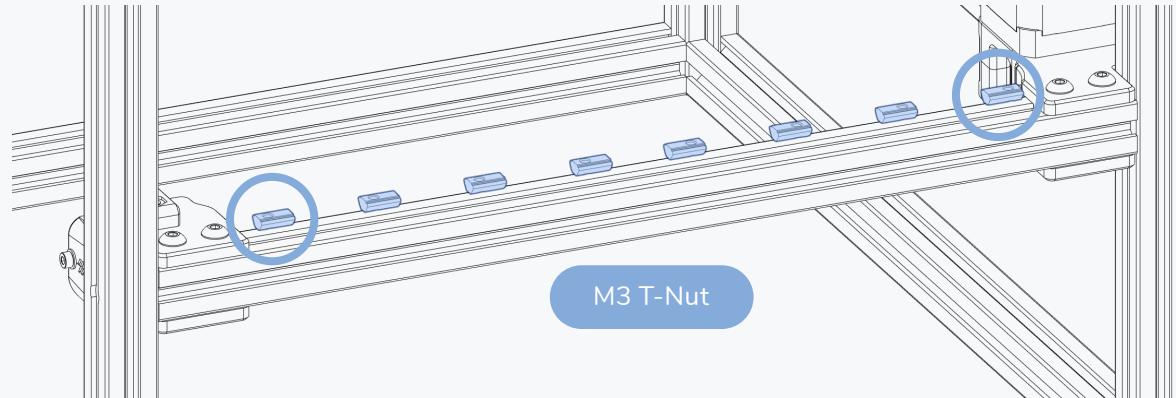
Ensure that the rear is parallel with the frame uprights.



**UPSIDE DOWN ASSEMBLY**

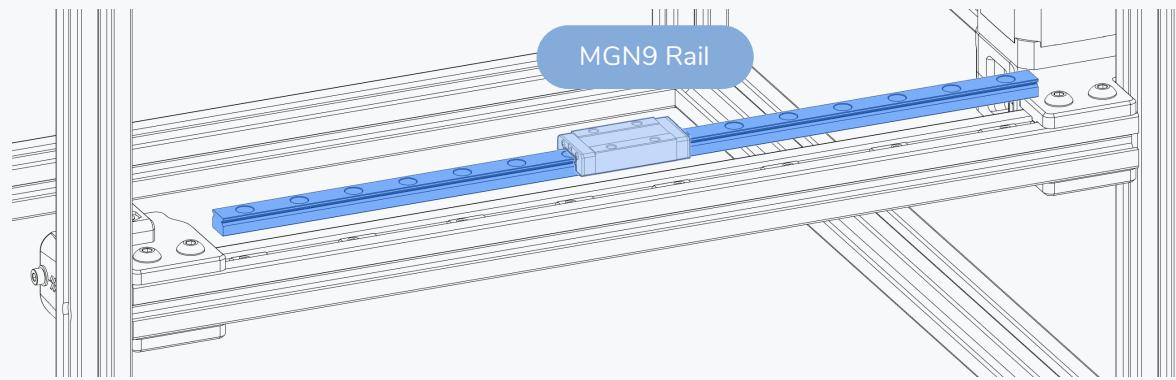
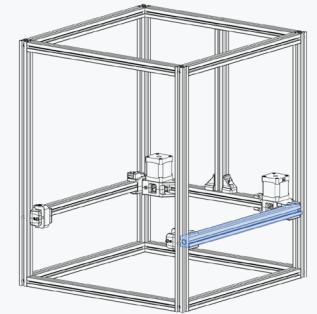
For ease of assembly we recommend to flip the printer on its head for the next steps.





#### T-NUT ORIENTATION

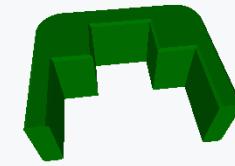
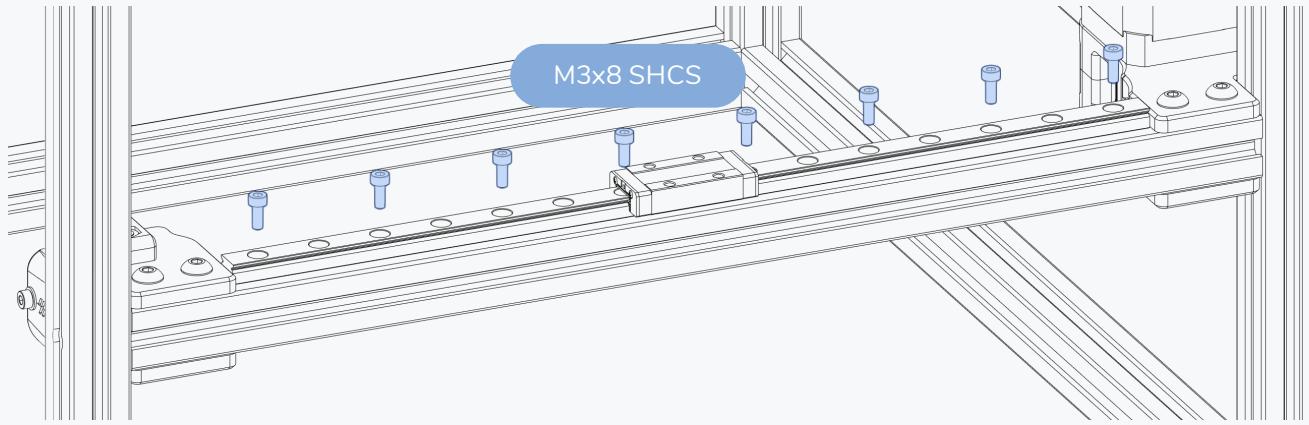
Insert the t-nuts as shown in highlight.  
Every other hole in the rail will be left empty.



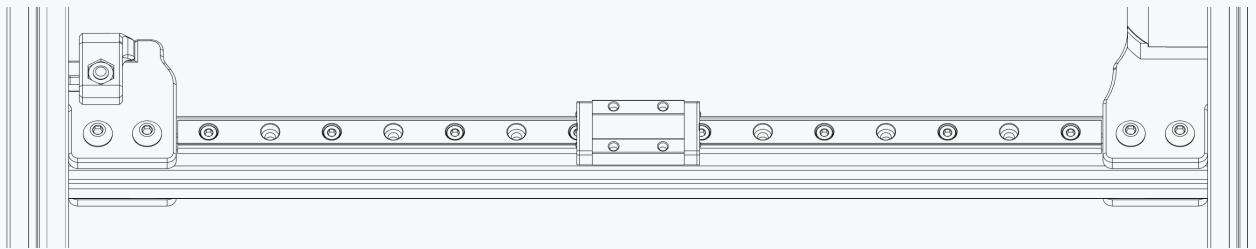
#### MIND THE CARRIAGE

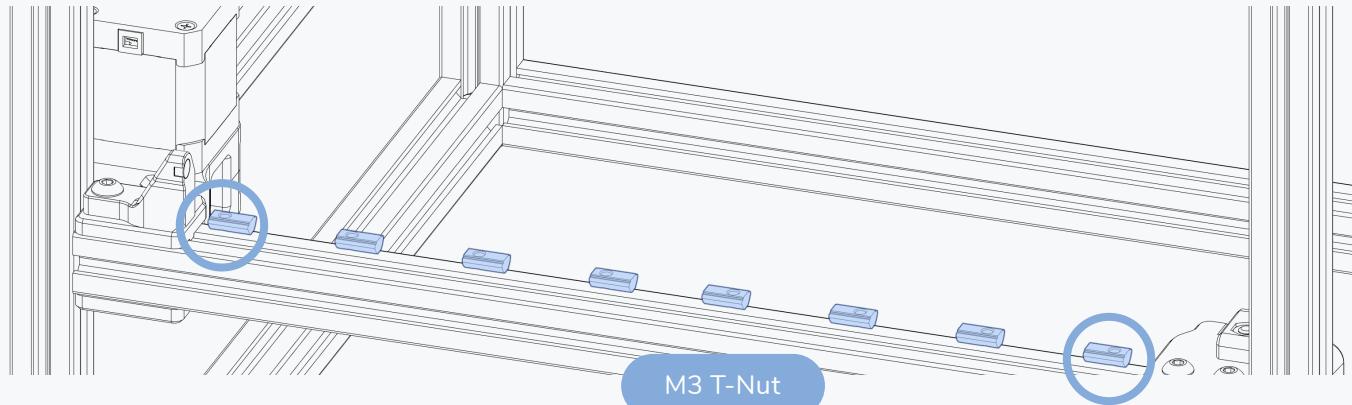
The carriages are designed to slide along the rail easily.  
This unfortunately also includes sliding off the rails.

Dropping the carriage likely irreparably damages it.

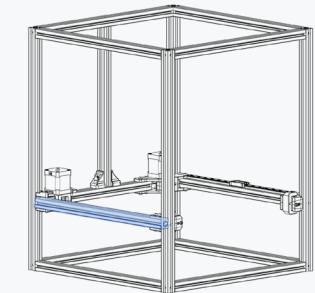
**CENTERED RAIL INSTALLATION GUIDE**

Use the guides to position the rail in the center of the extrusion prior to fastening the screws.

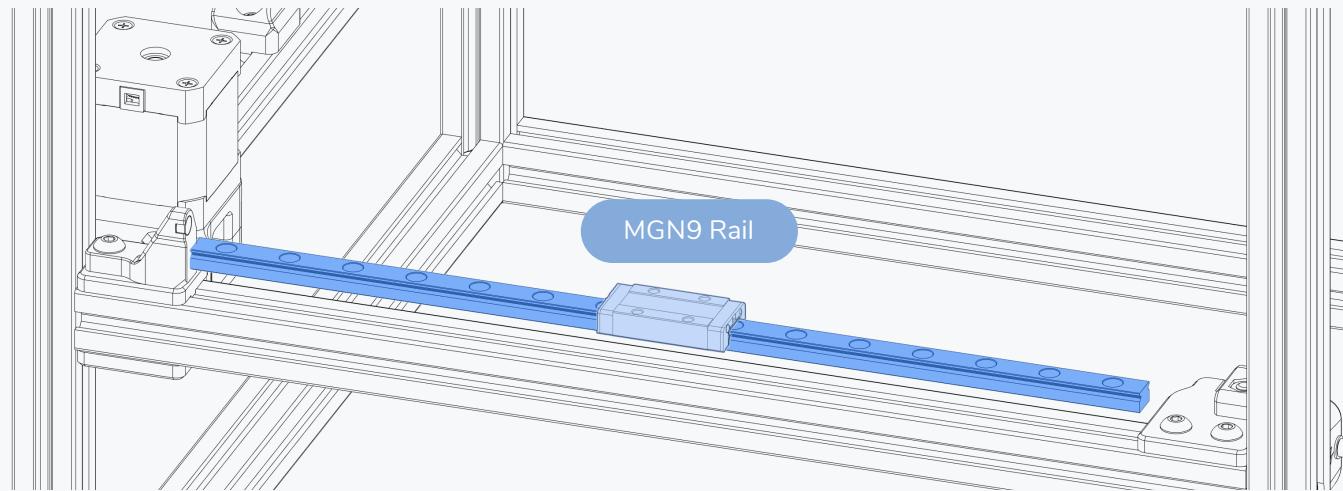




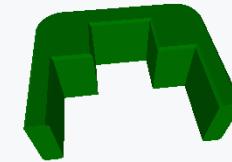
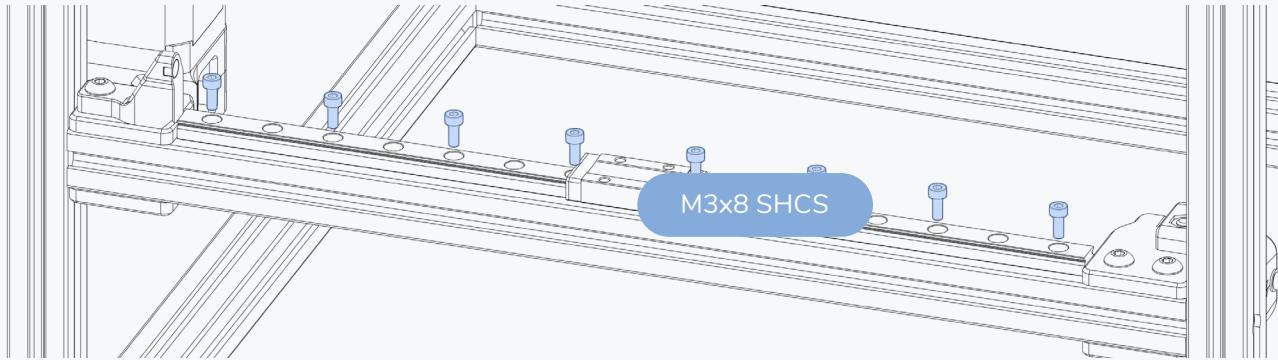
M3 T-Nut

**T-NUT ORIENTATION**

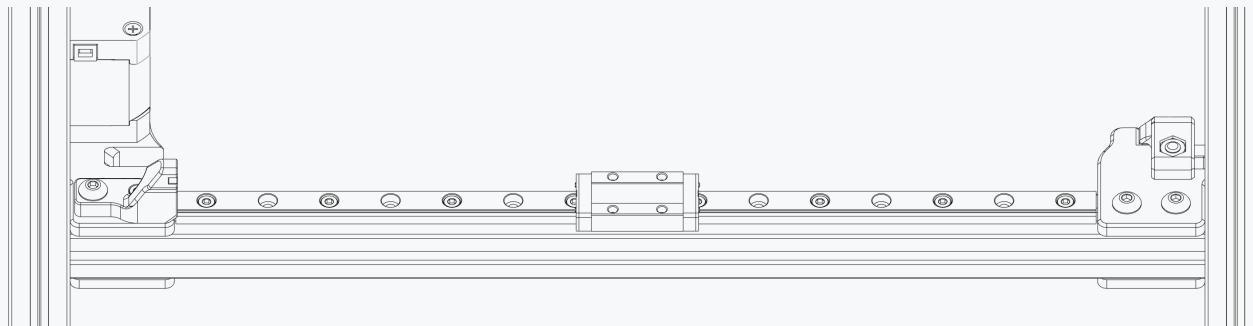
Insert the t-nuts as shown in highlight.



MGN9 Rail

**CENTERED RAIL INSTALLATION GUIDE**

Use the guides to position the rail in the center of the extrusion prior to fastening the screws.

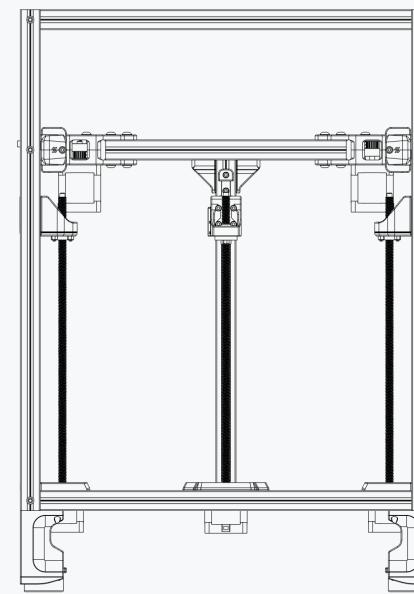
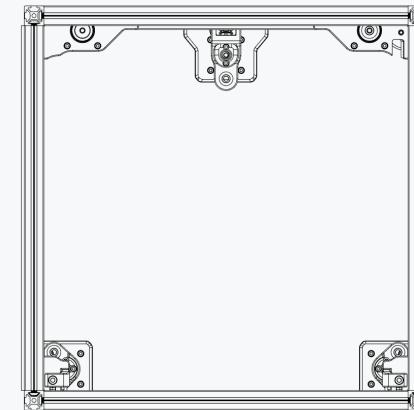
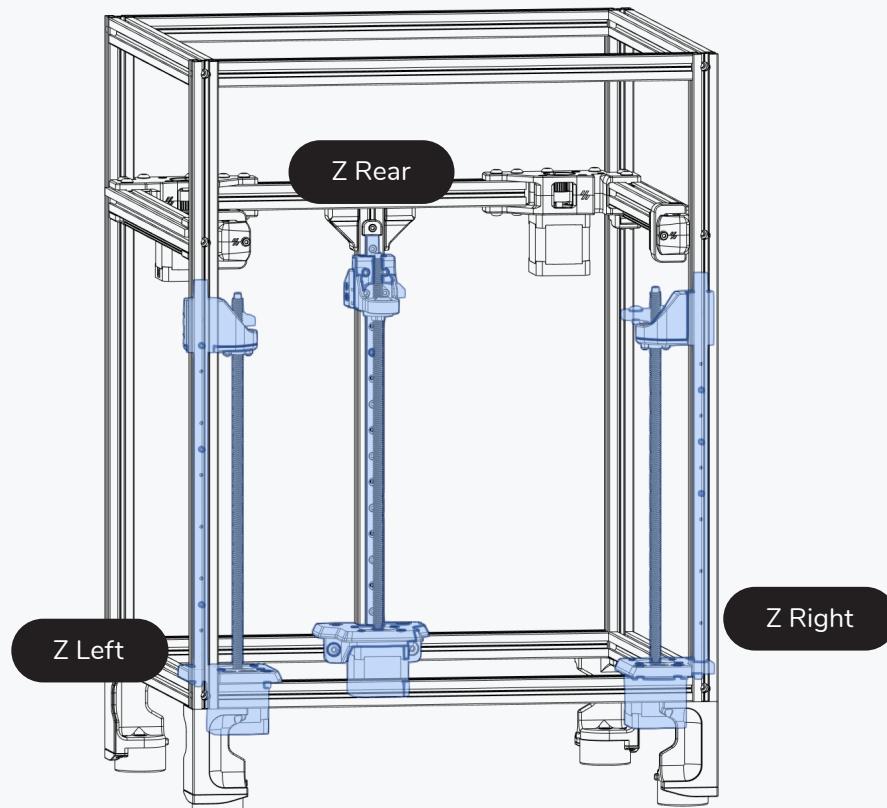


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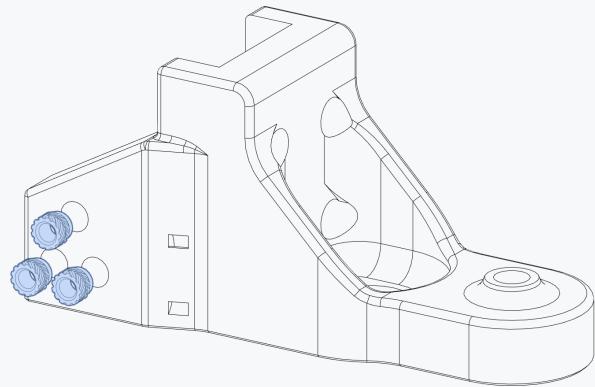
Z AXIS

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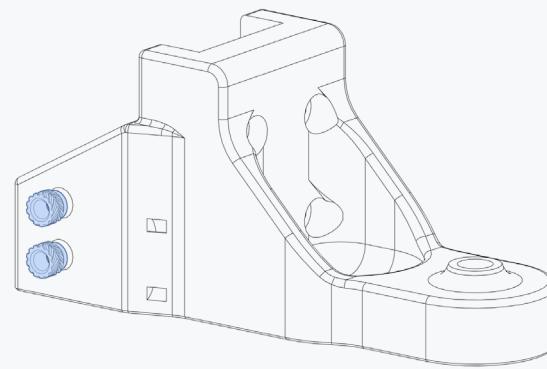


Heat Set Insert



#### GENERIC CABLE CHAIN

The 3 hole pattern is usually found on generic cable chains.



#### IGUS CABLE CHAIN

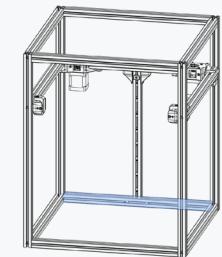
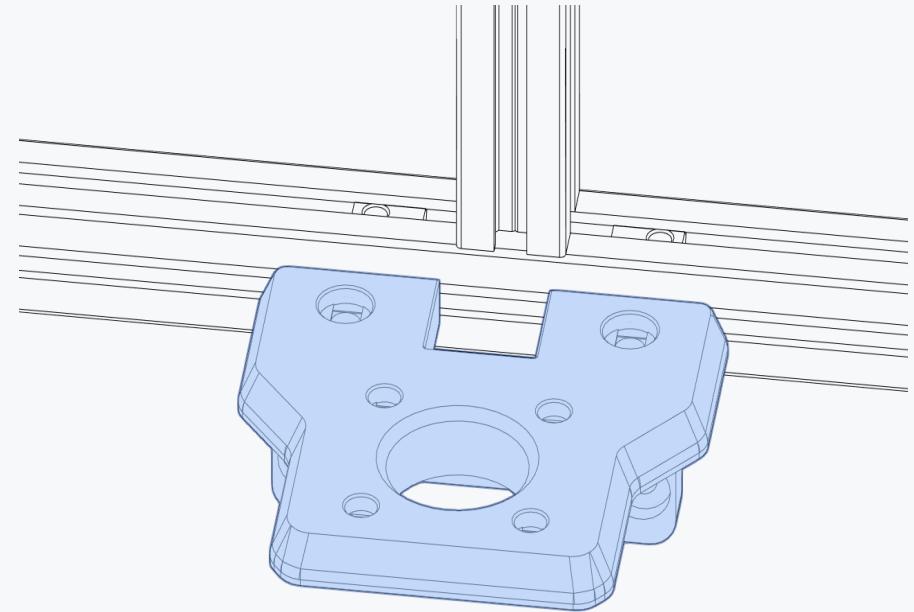
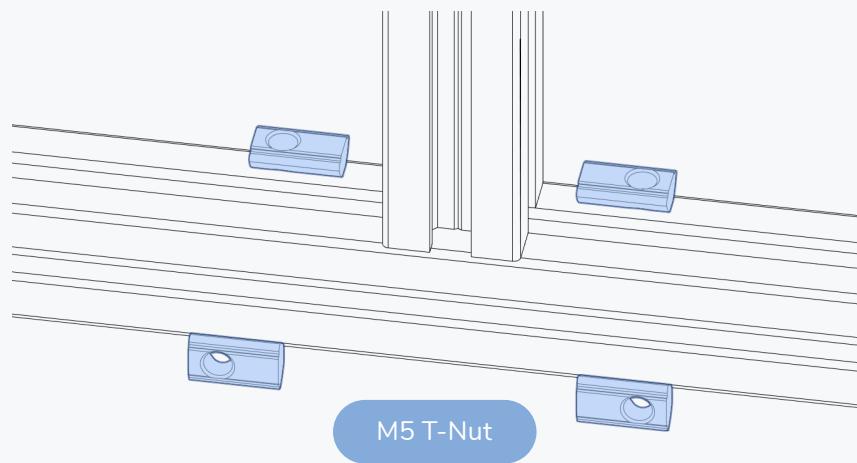
IGUS chain have 2 mounting holes.

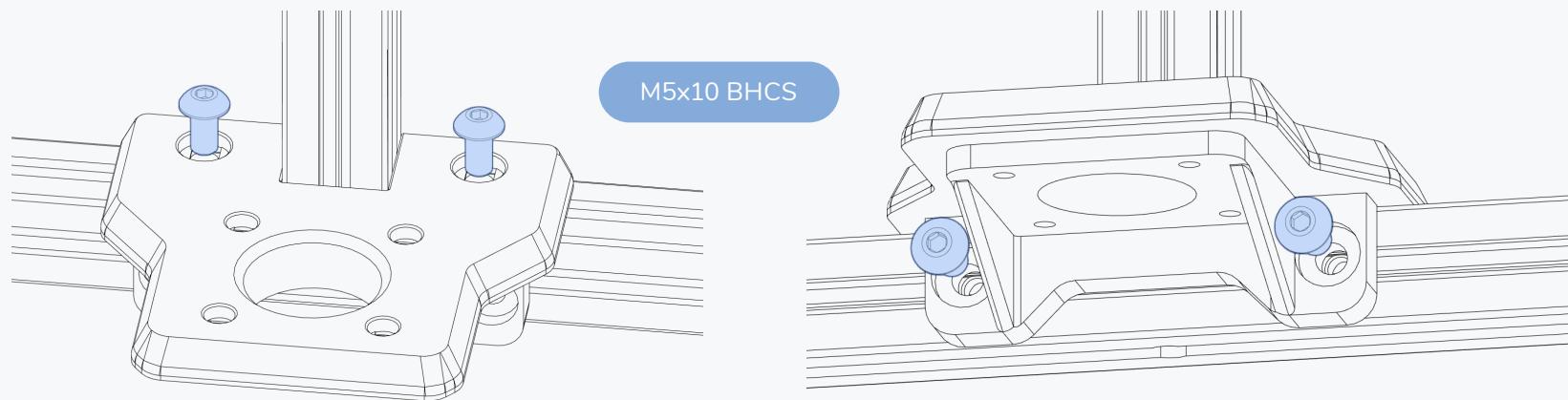
#### CABLE CHAIN MOUNTING PATTERN

There are multiple mounting patterns for cable chains on the market. Pick the part that matches with the hole pattern on your mounting chain. The remainder of the manual will only show the “generic” pattern.

Z AXIS

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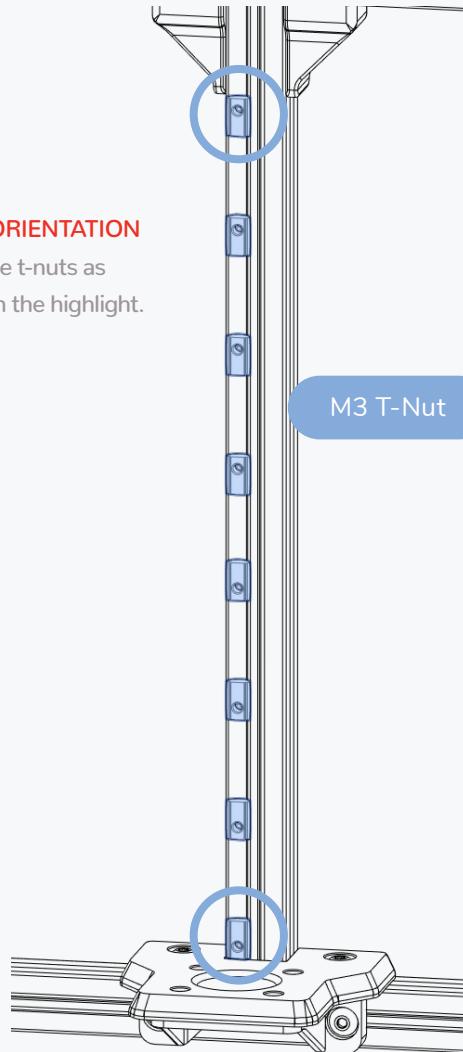
Z AXIS

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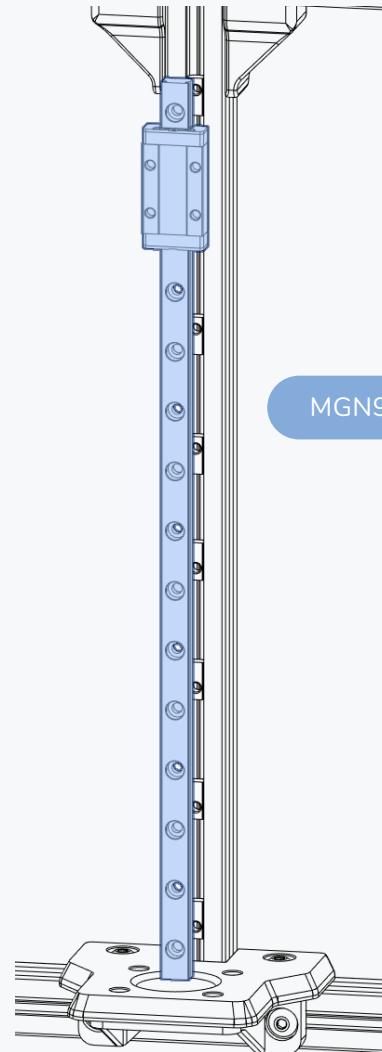
**T-NUT ORIENTATION**

Insert the t-nuts as shown in the highlight.

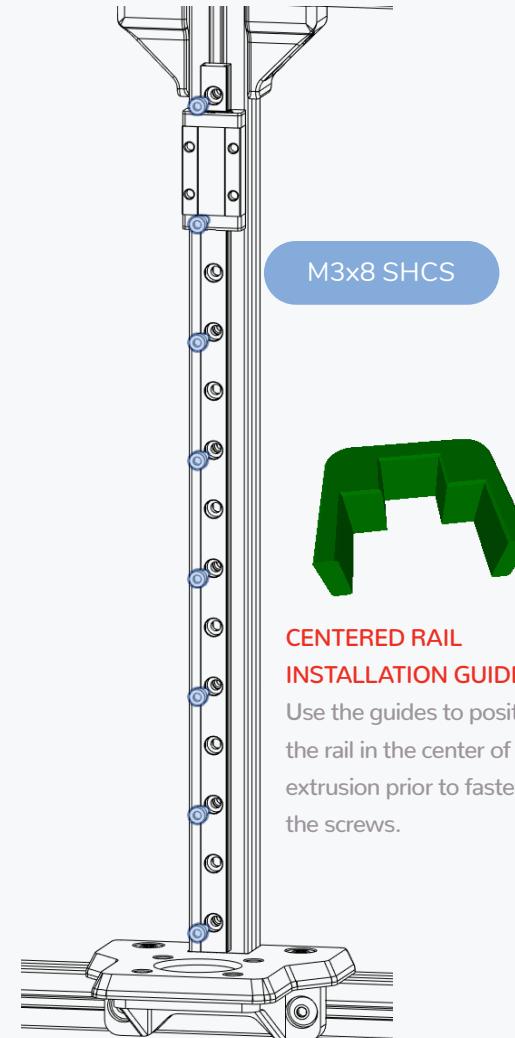
M3 T-Nut



MGN9 Rail

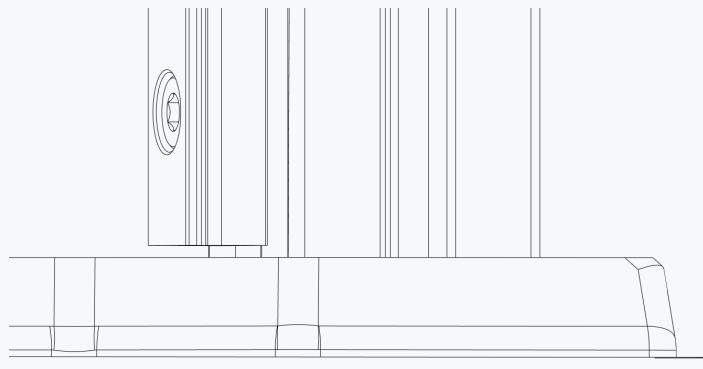


M3x8 SHCS

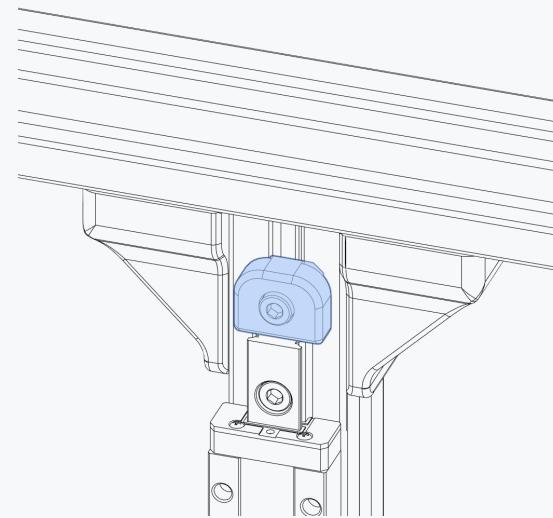


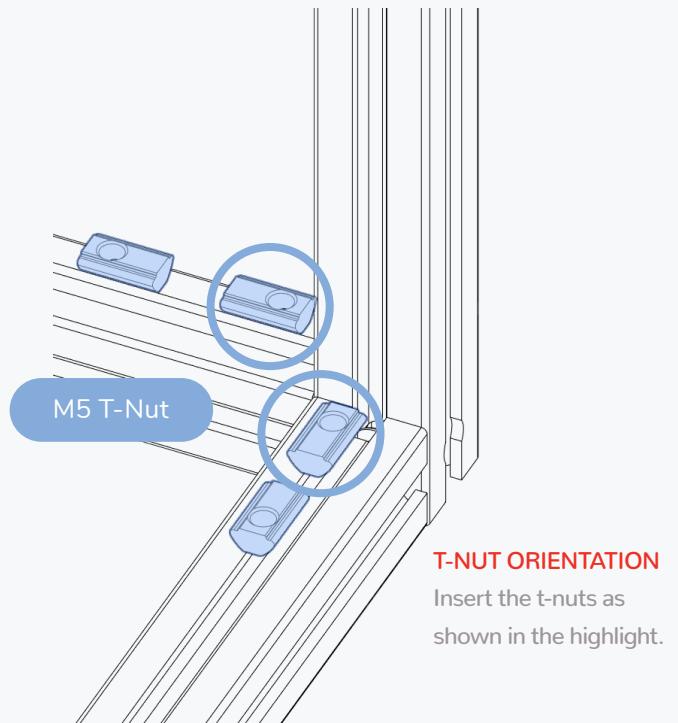
**CENTERED RAIL  
INSTALLATION GUIDE**

Use the guides to position the rail in the center of the extrusion prior to fastening the screws.

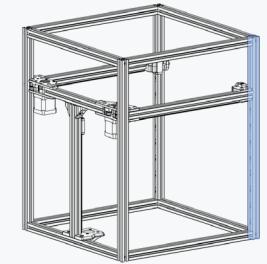
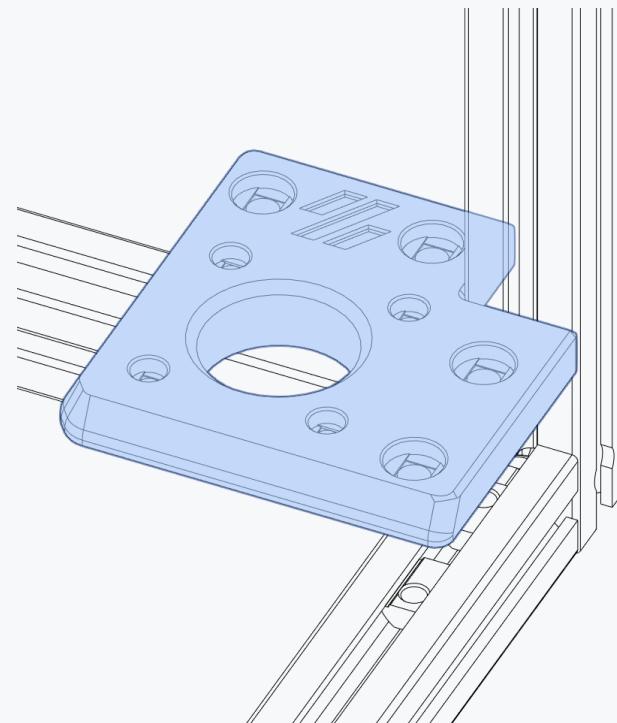
**BOTTOM GAP**

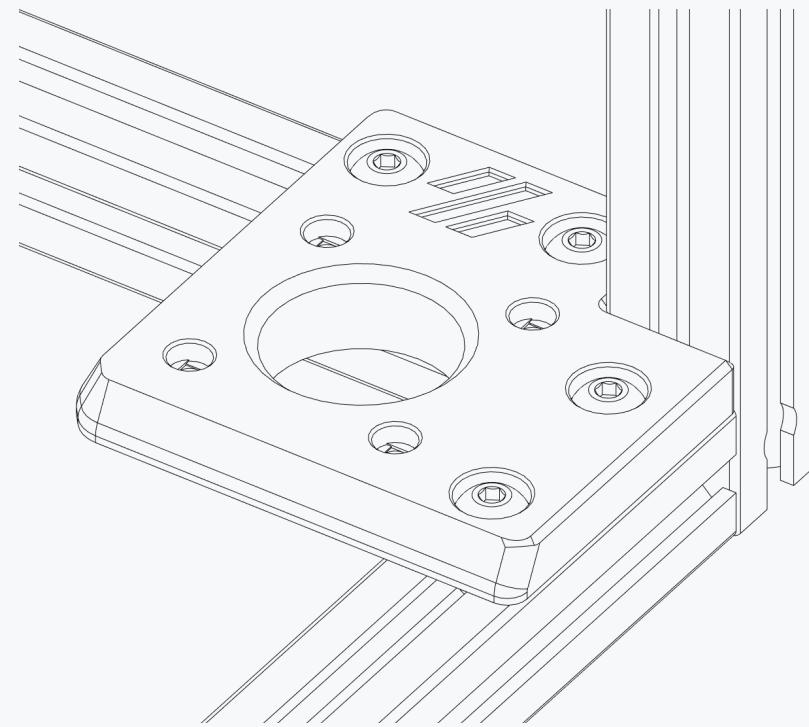
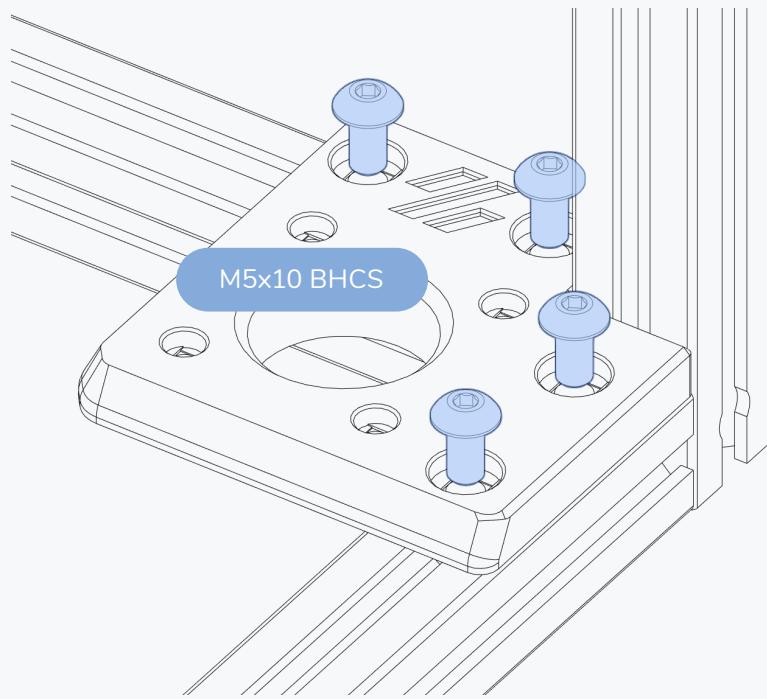
Leave a small gap between the printed part and the rail. 1-2mm are fine.

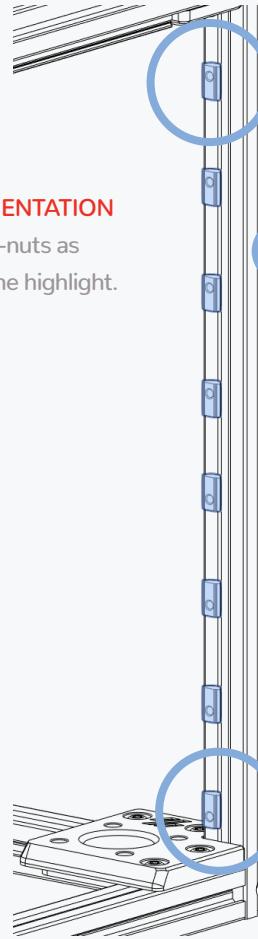


**T-NUT ORIENTATION**

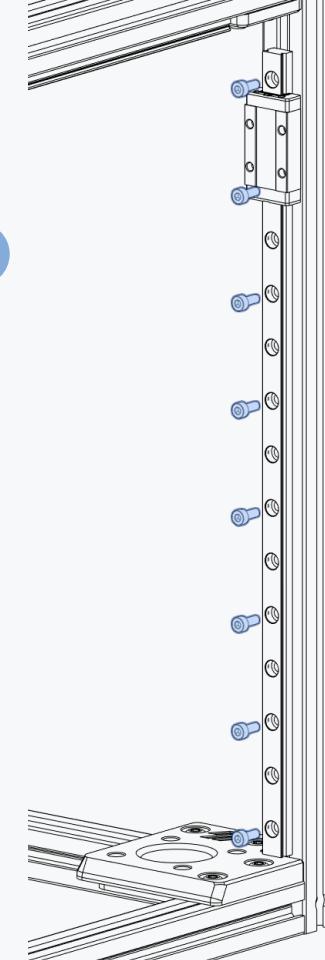
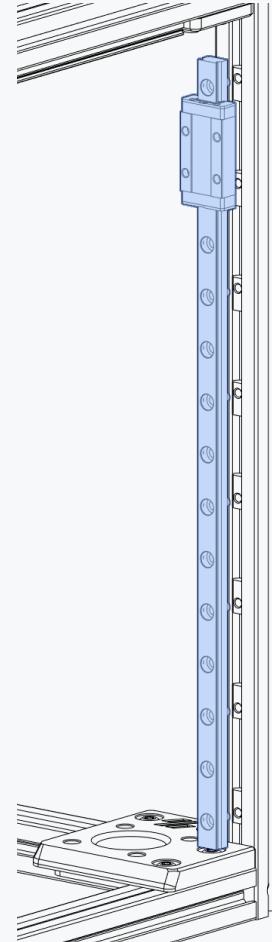
Insert the t-nuts as  
shown in the highlight.

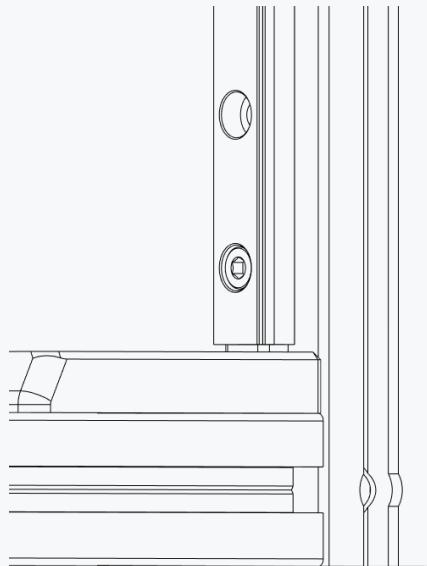




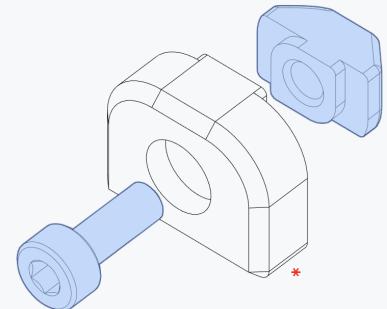
**T-NUT ORIENTATION**

Insert the t-nuts as shown in the highlight.



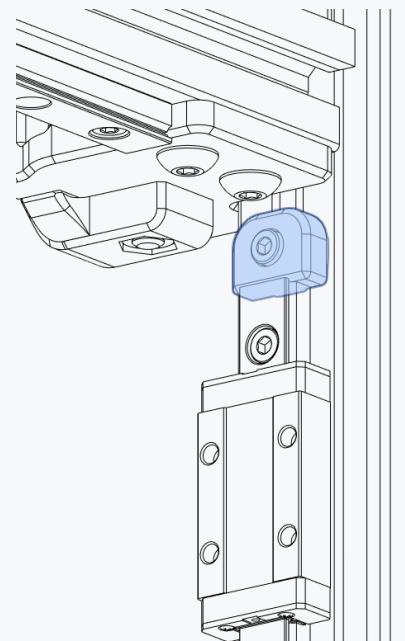
**BOTTOM GAP**

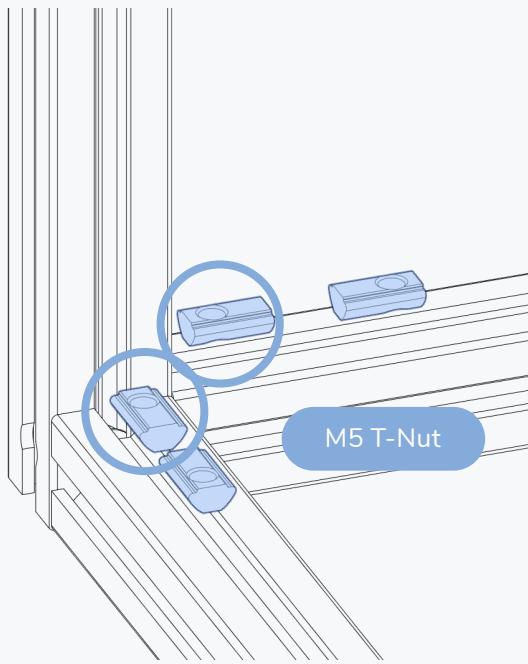
Leave a small gap between the printed part and the rail. 1-2mm are fine.



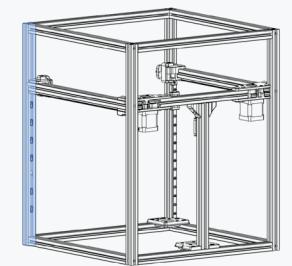
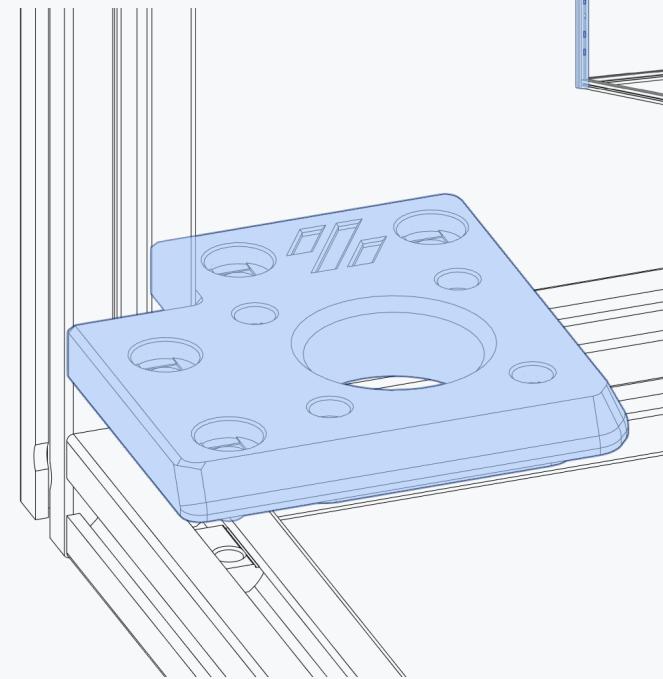
M3 Hammerhead Nut

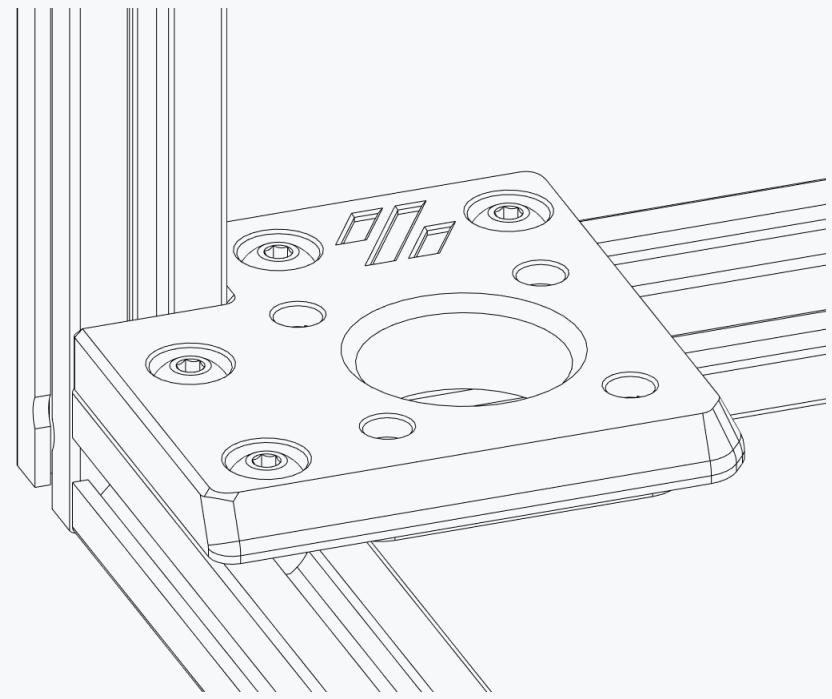
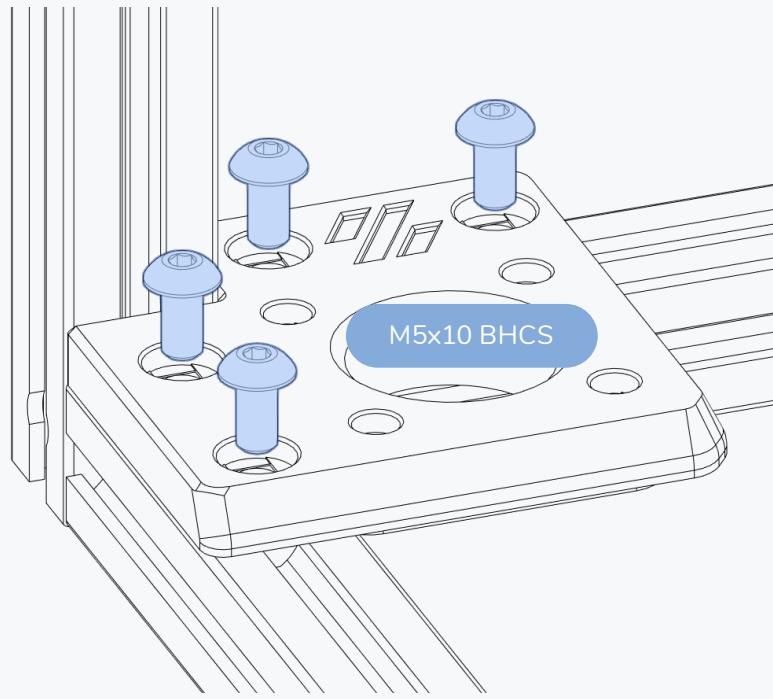
M3x8 SHCS

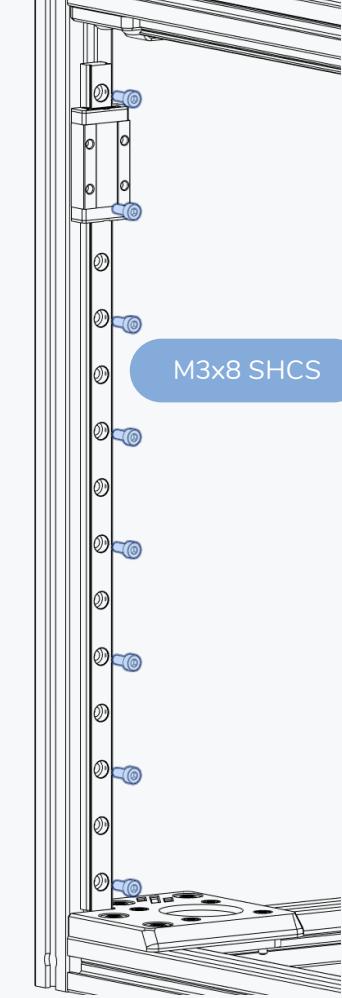
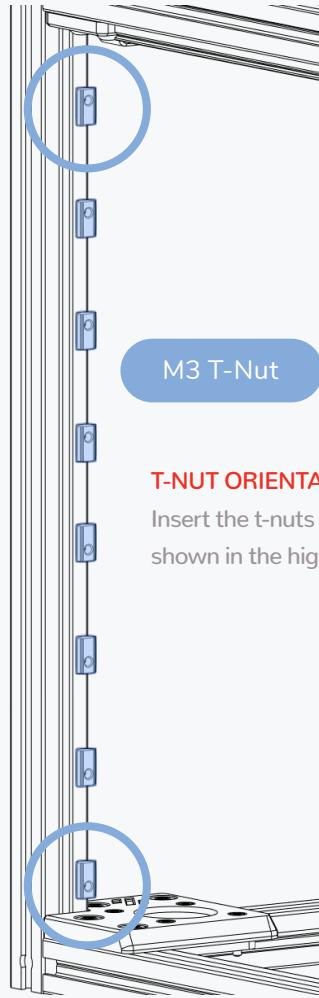


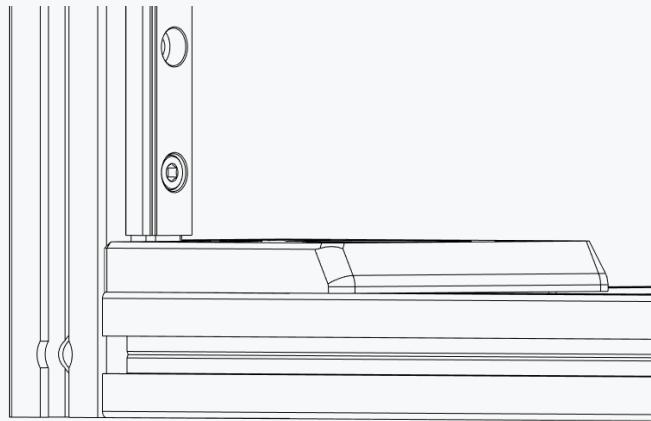
**T-NUT ORIENTATION**

Insert the t-nuts as  
shown in the highlight.

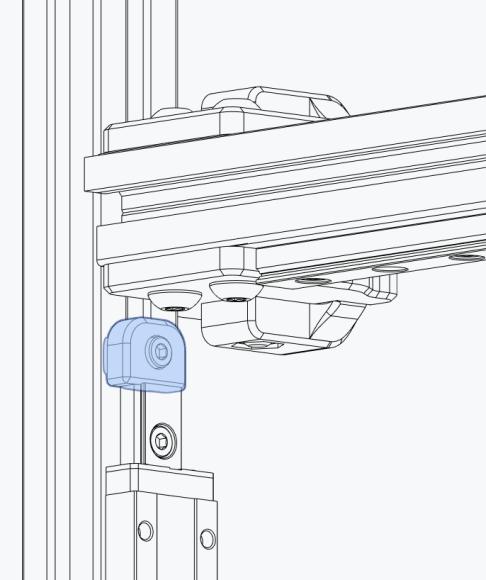






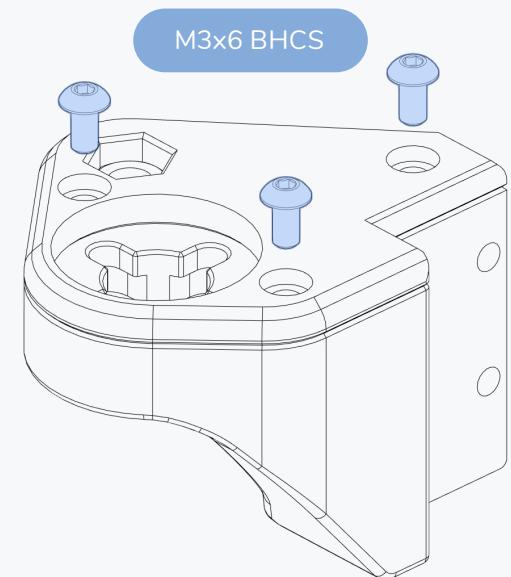
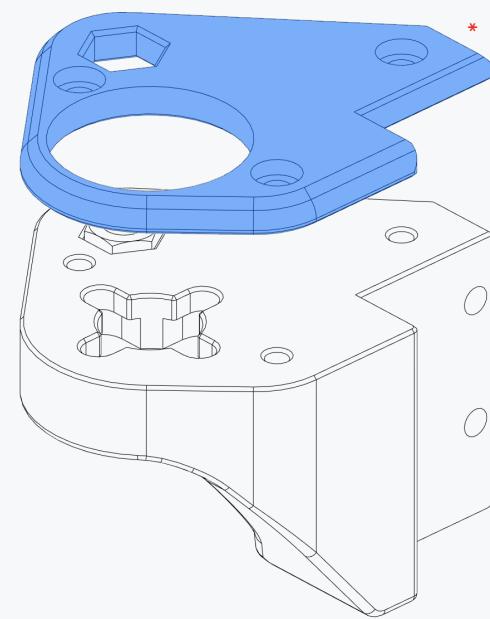
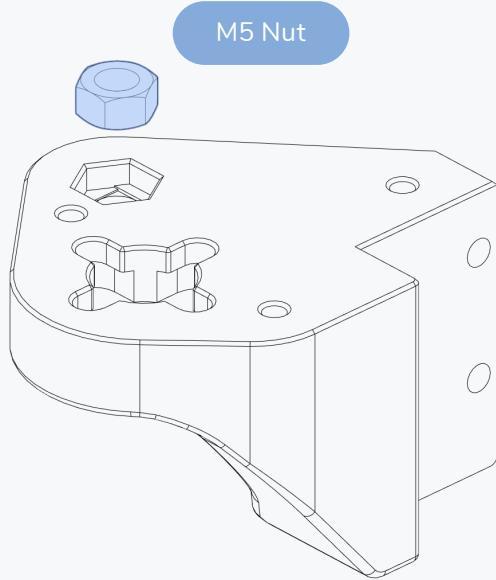
**BOTTOM GAP**

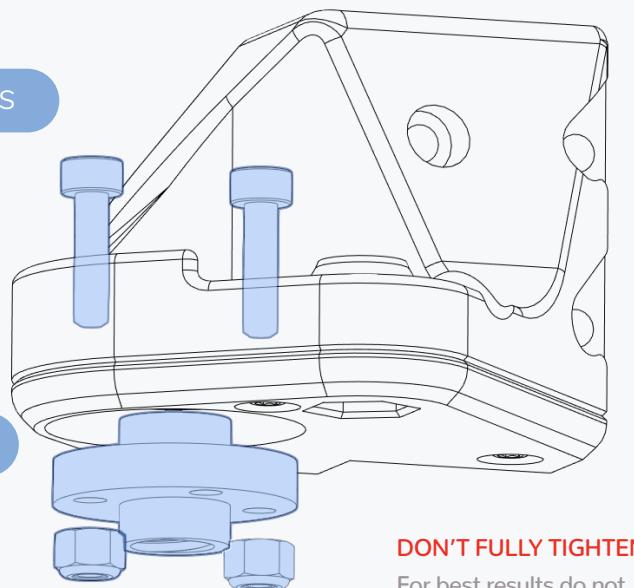
Leave a small gap between the printed part and the rail. 1-2mm are fine.



LEFT Z JOINT

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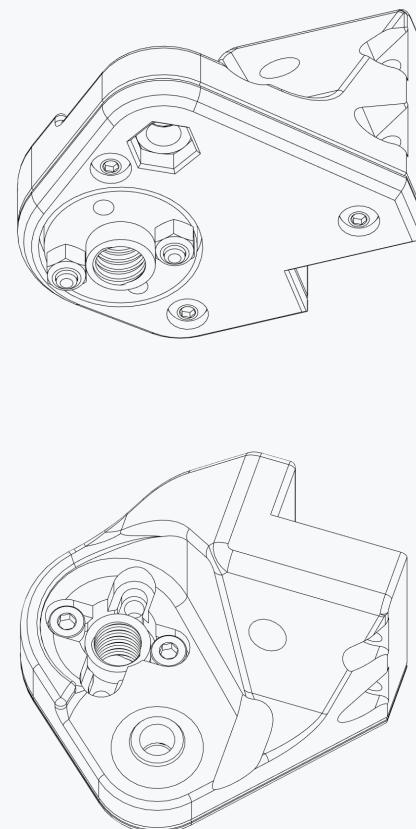
M3x12 SHCS

Leadscrew Nut

M3 Lock Nut

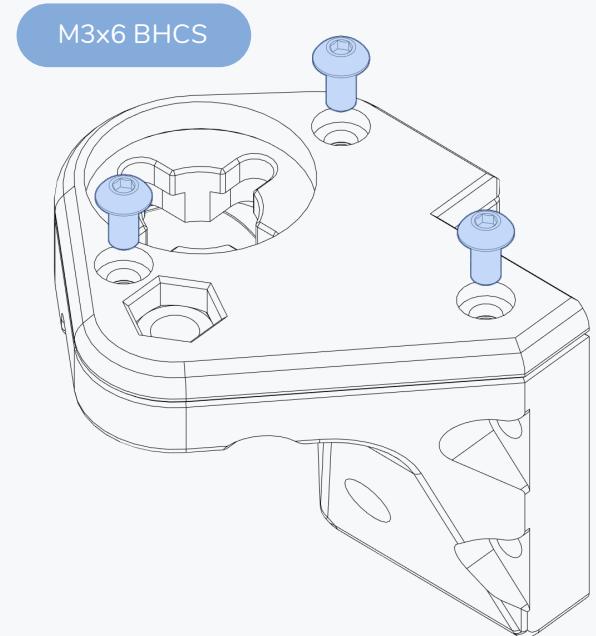
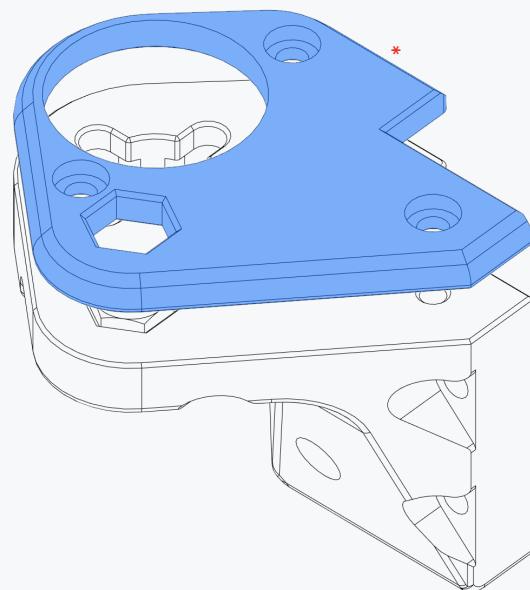
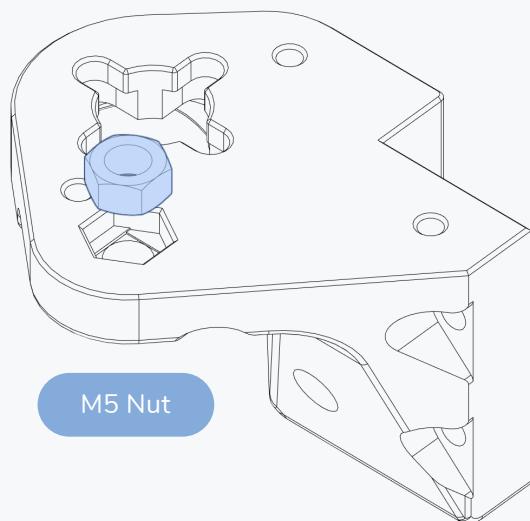
**DON'T FULLY TIGHTEN**

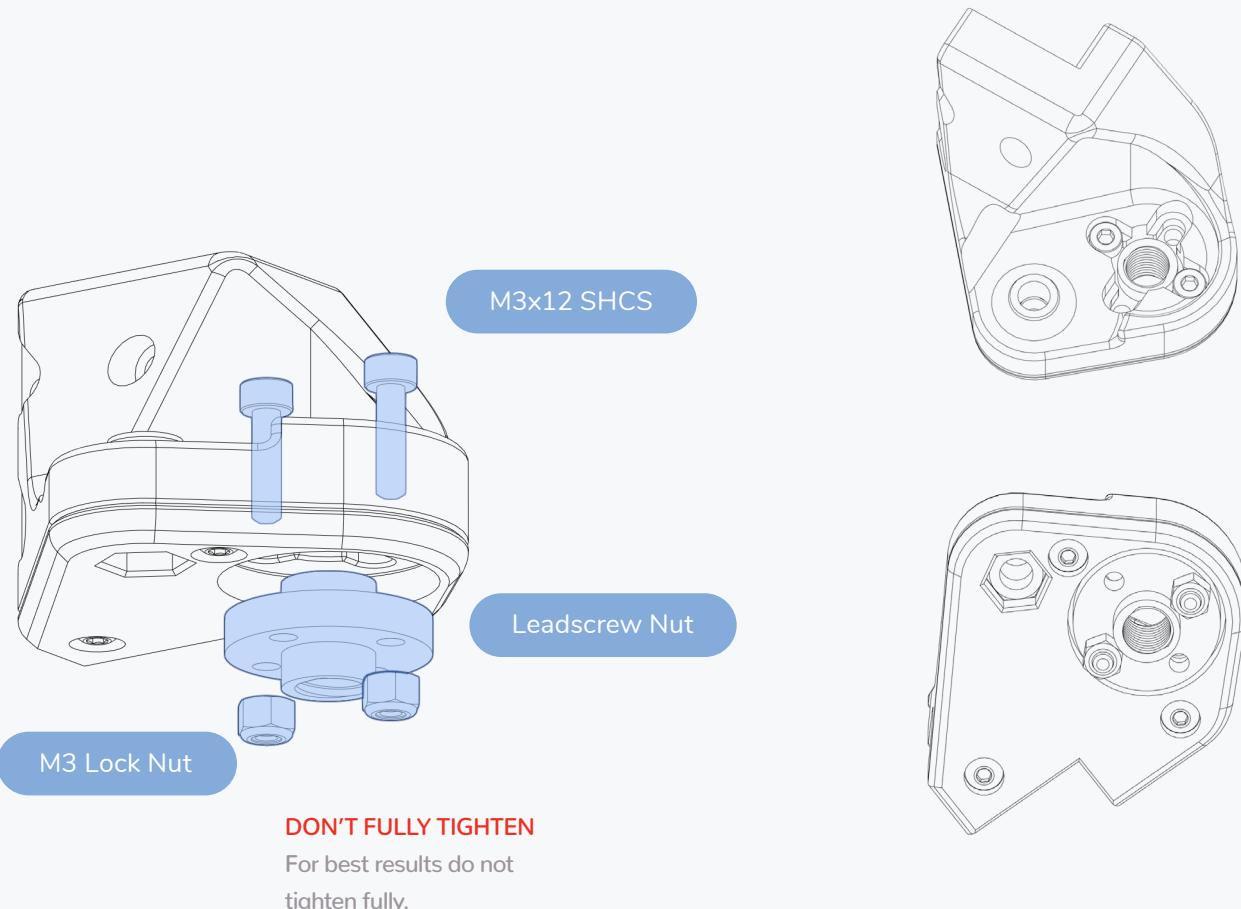
For best results do not  
tighten fully.

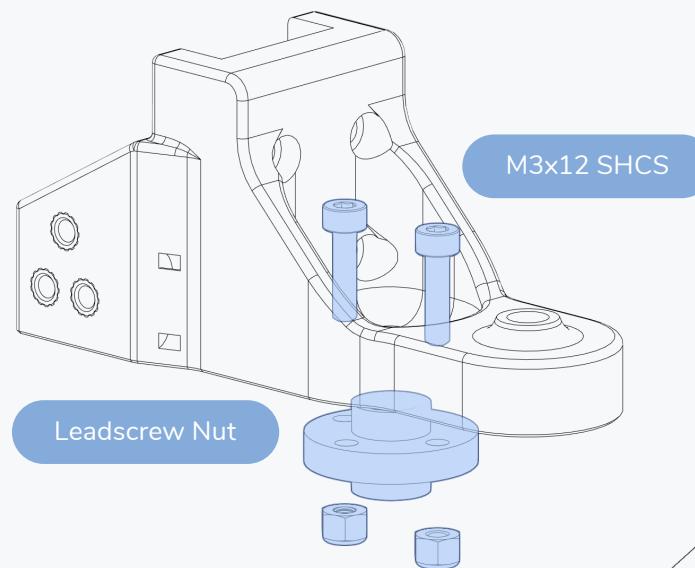
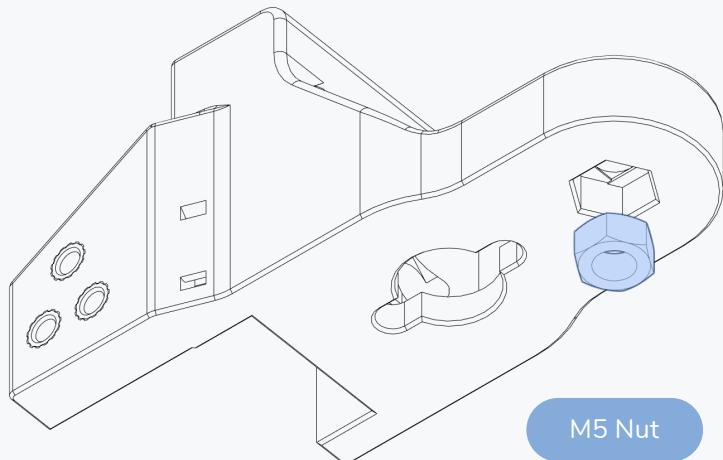


RIGHT Z JOINT

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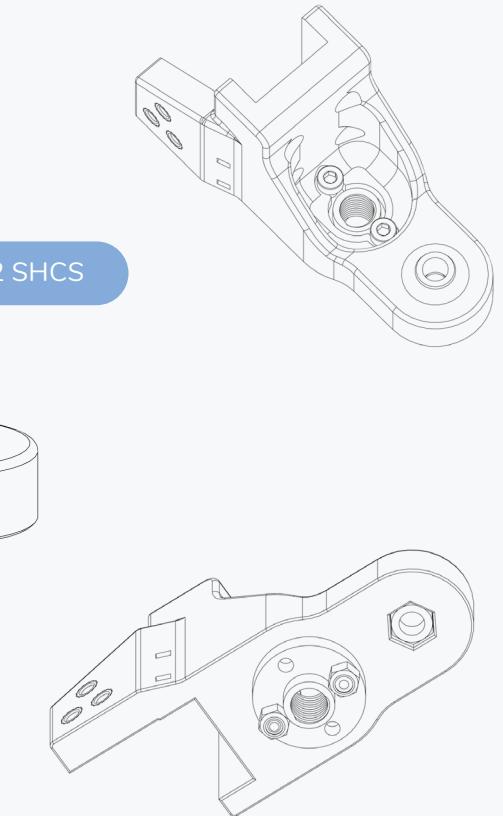


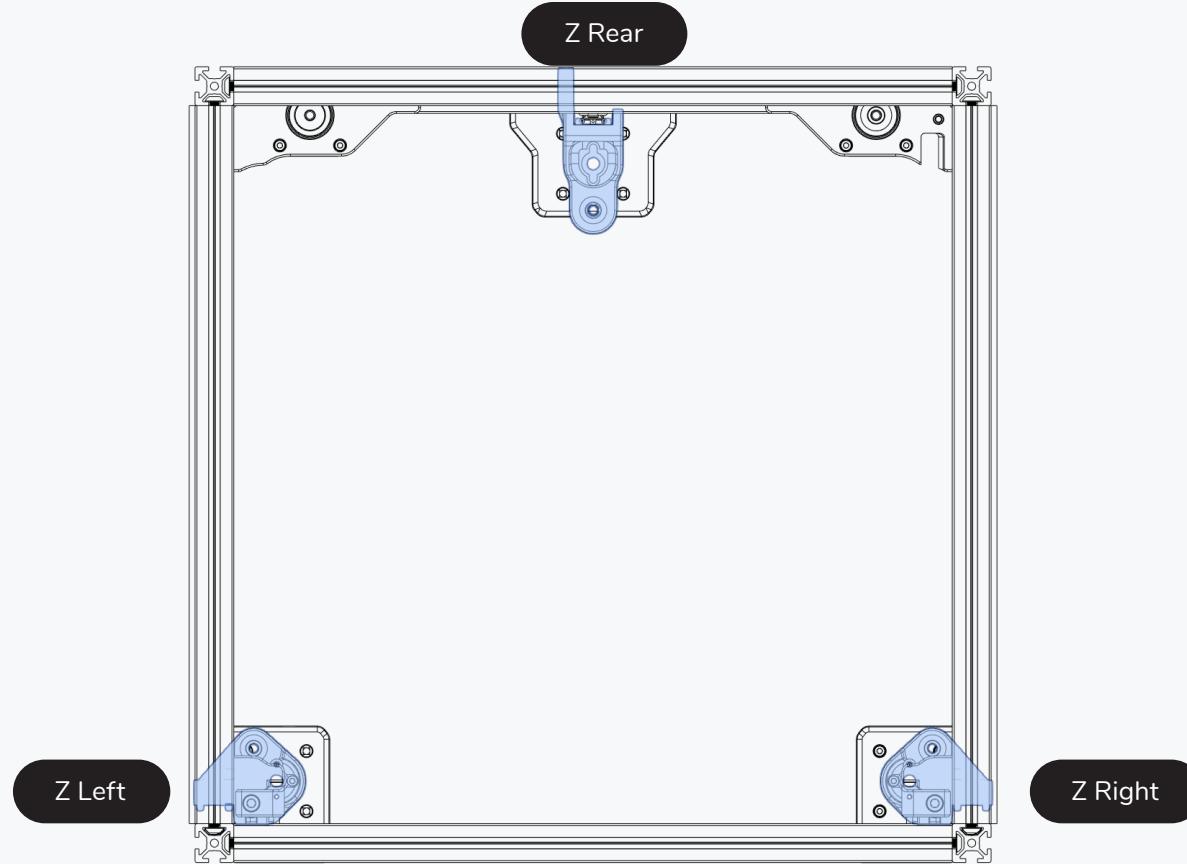




**DON'T FULLY TIGHTEN**

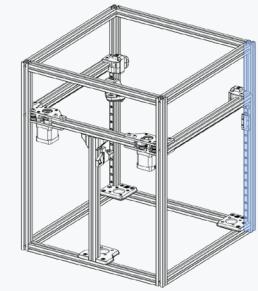
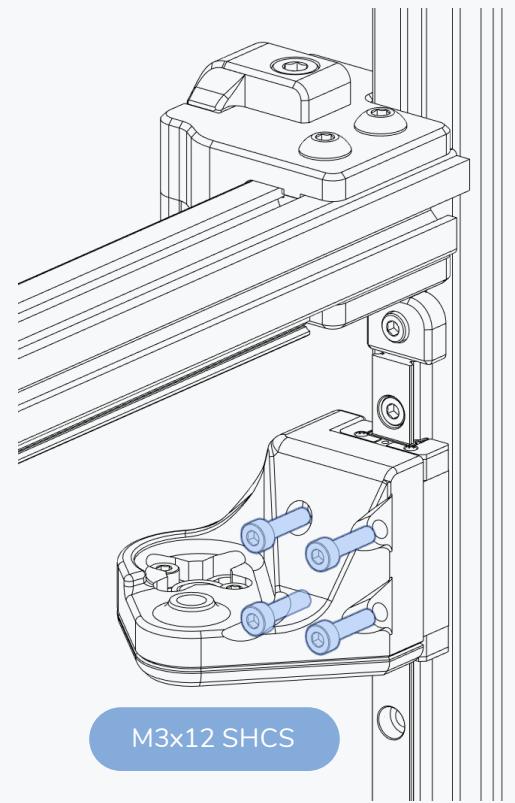
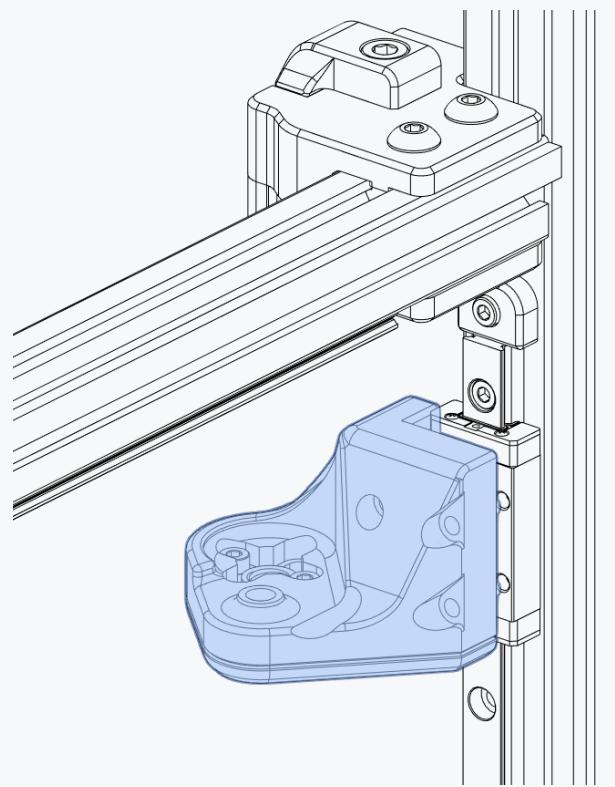
For best results do not  
tighten fully.





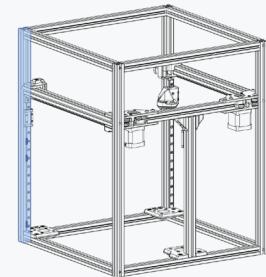
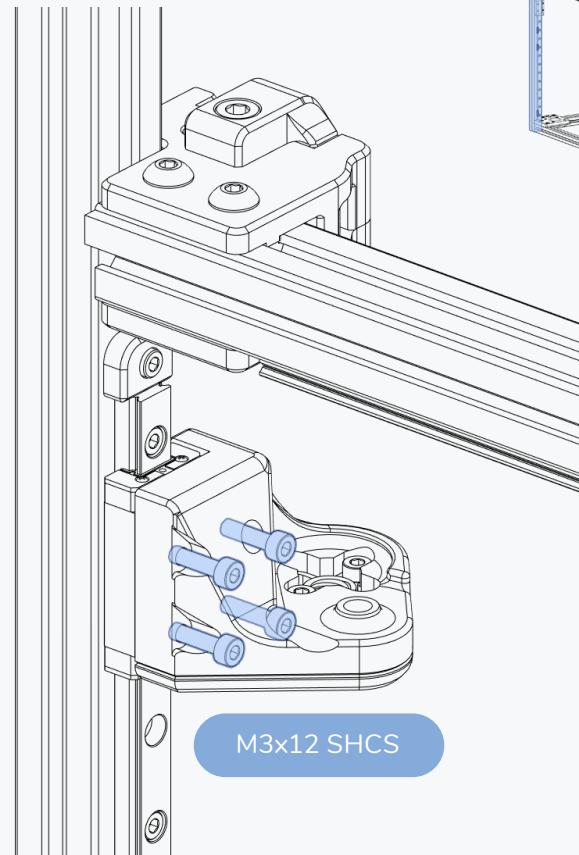
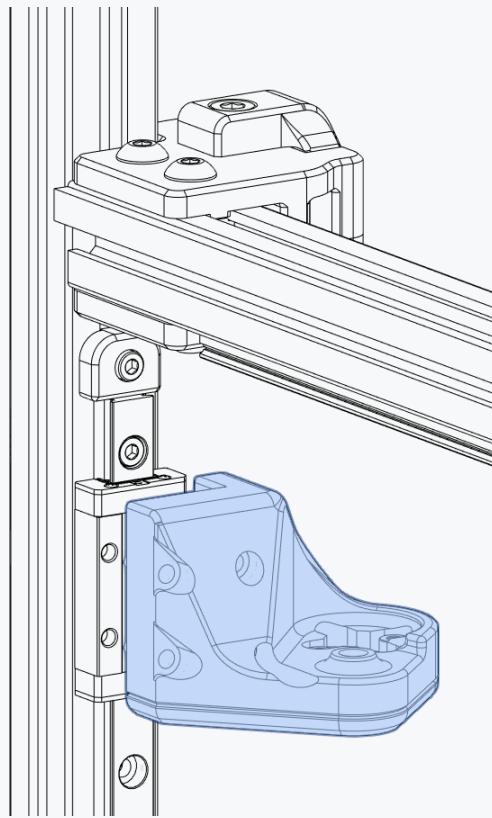
LEFT Z JOINT

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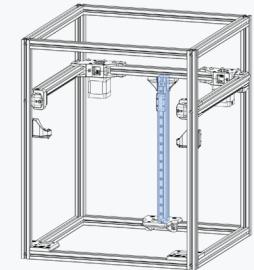
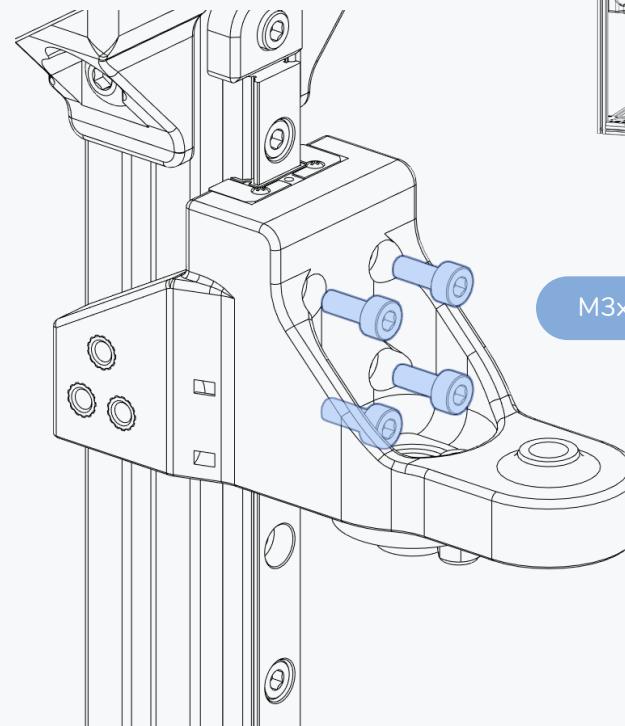
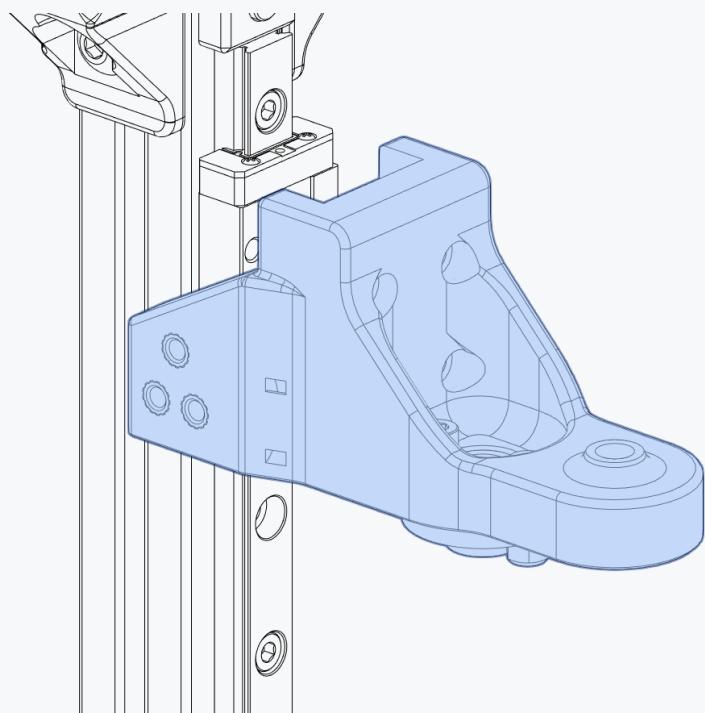
RIGHT Z JOINT

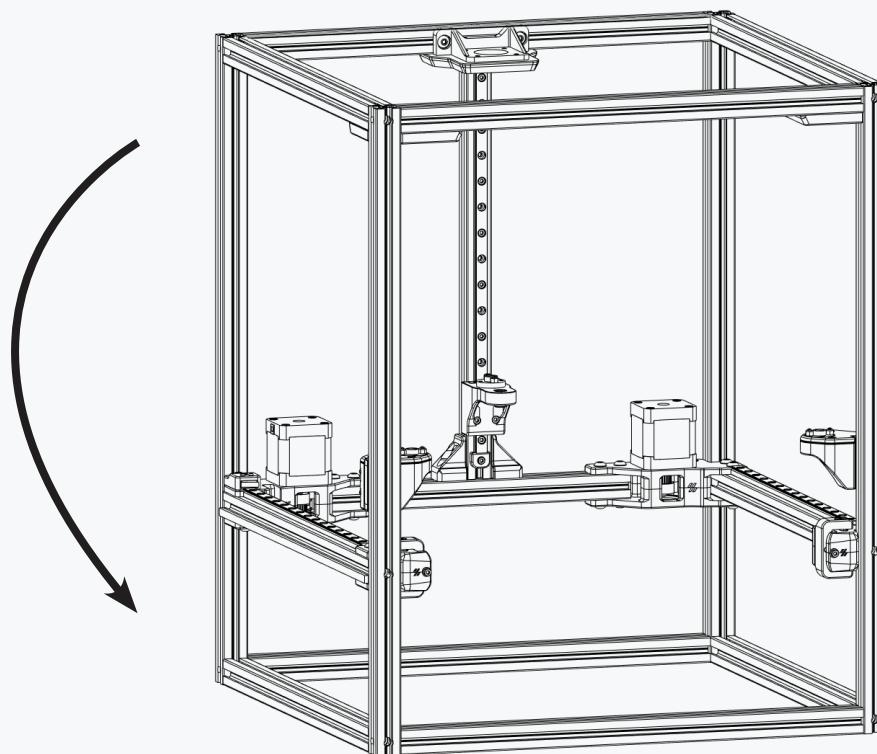
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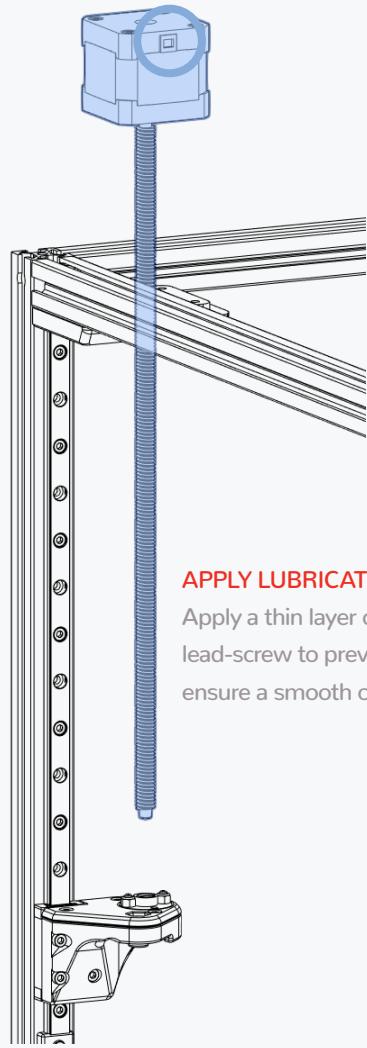
REAR Z JOINT

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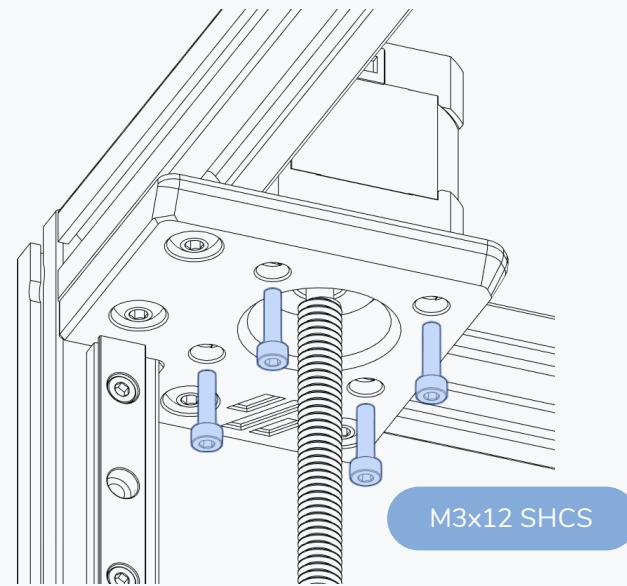


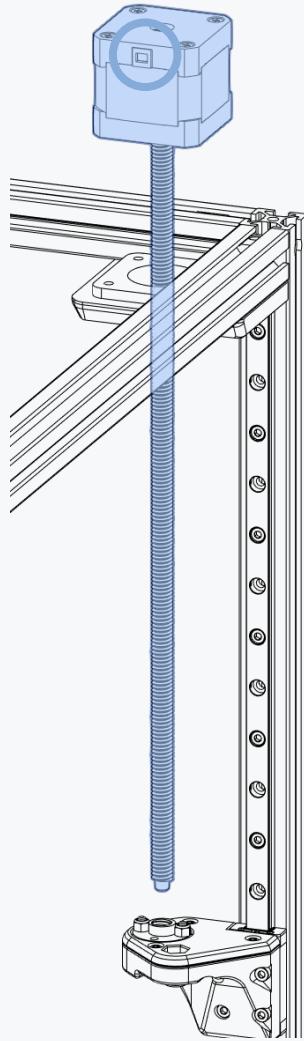
**FLIP UPSIDE DOWN**

Turn the printer upside down for the next assembly steps.

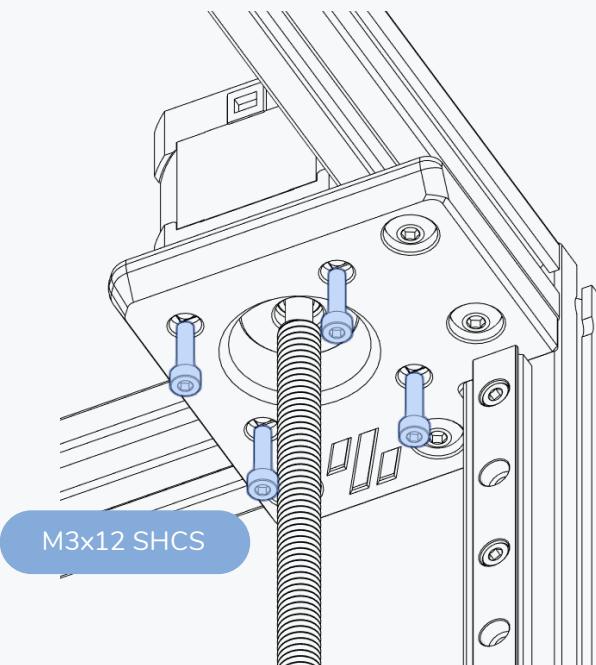
**APPLY LUBRICATION**

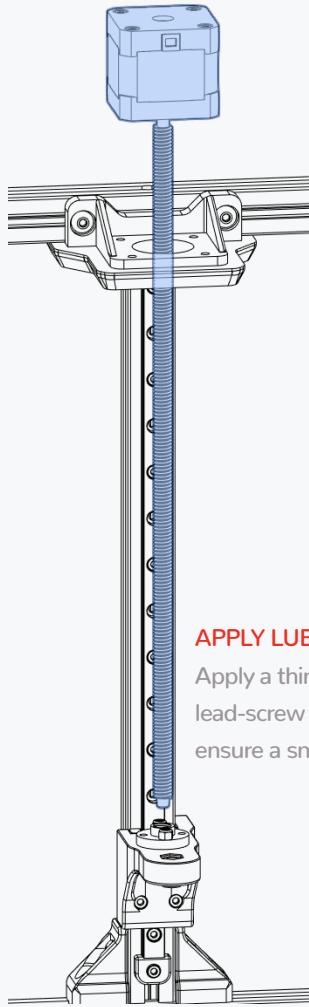
Apply a thin layer of grease to the lead-screw to prevent rust and ensure a smooth operation.



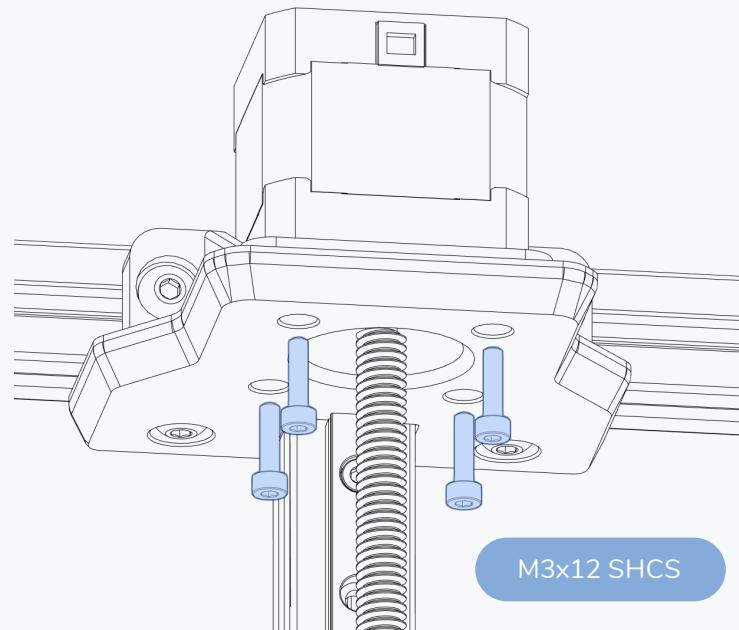
**APPLY LUBRICATION**

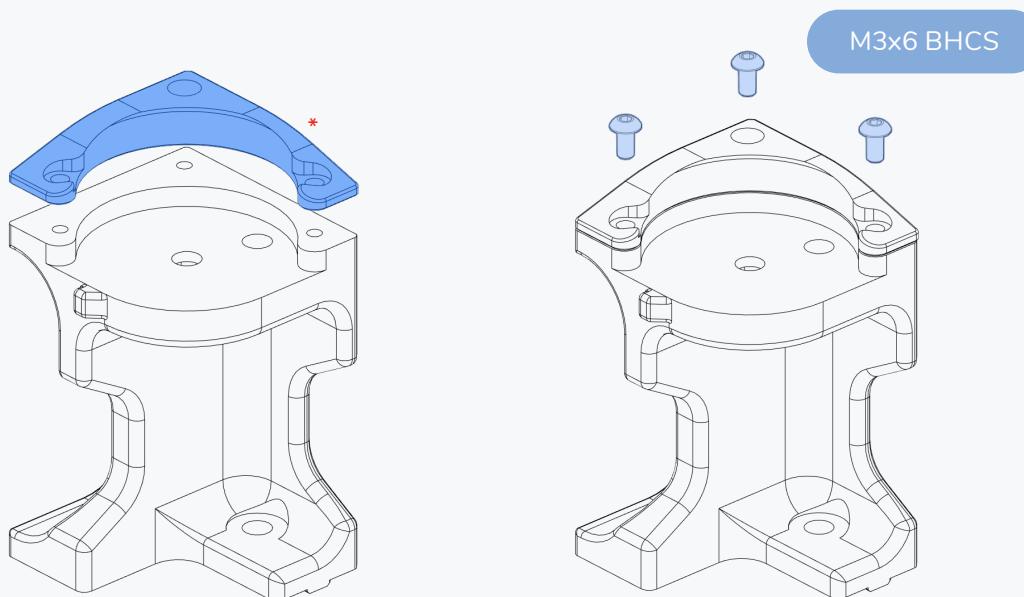
Apply a thin layer of grease to the lead-screw to prevent rust and ensure a smooth operation.



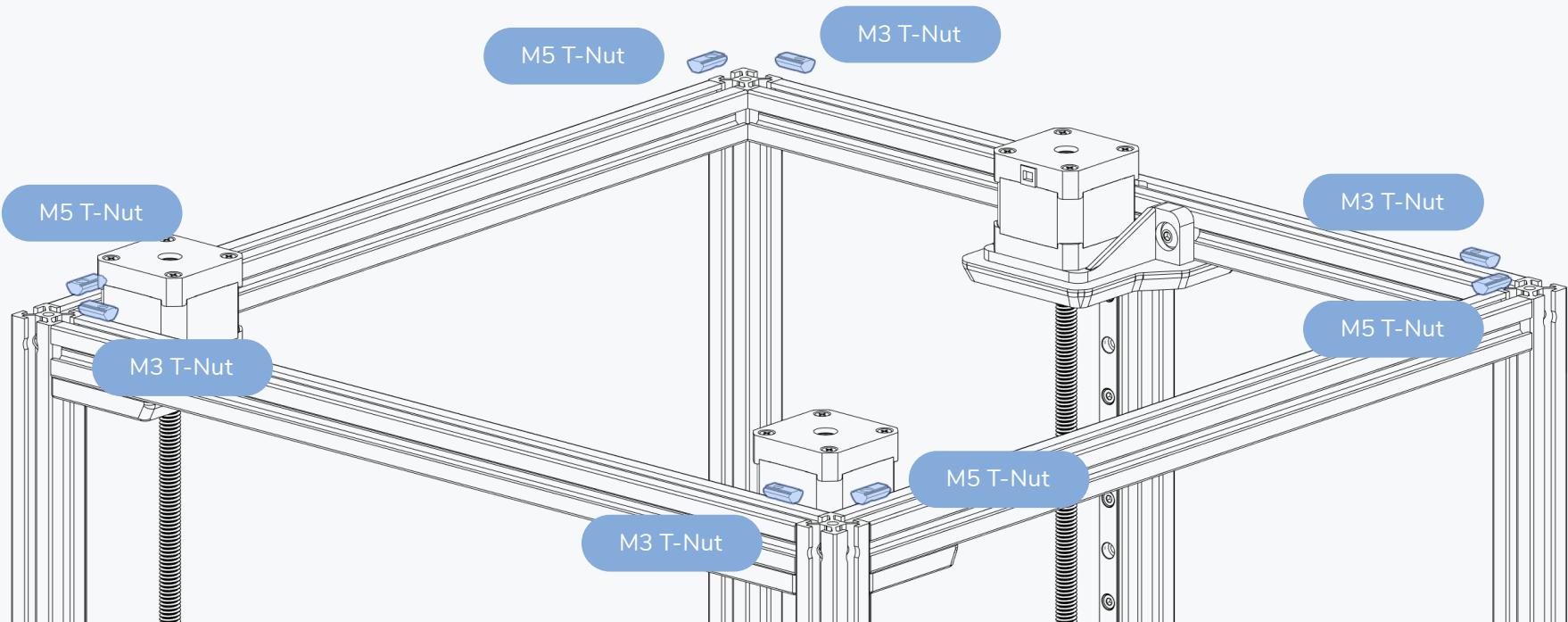
**APPLY LUBRICATION**

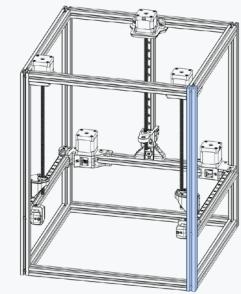
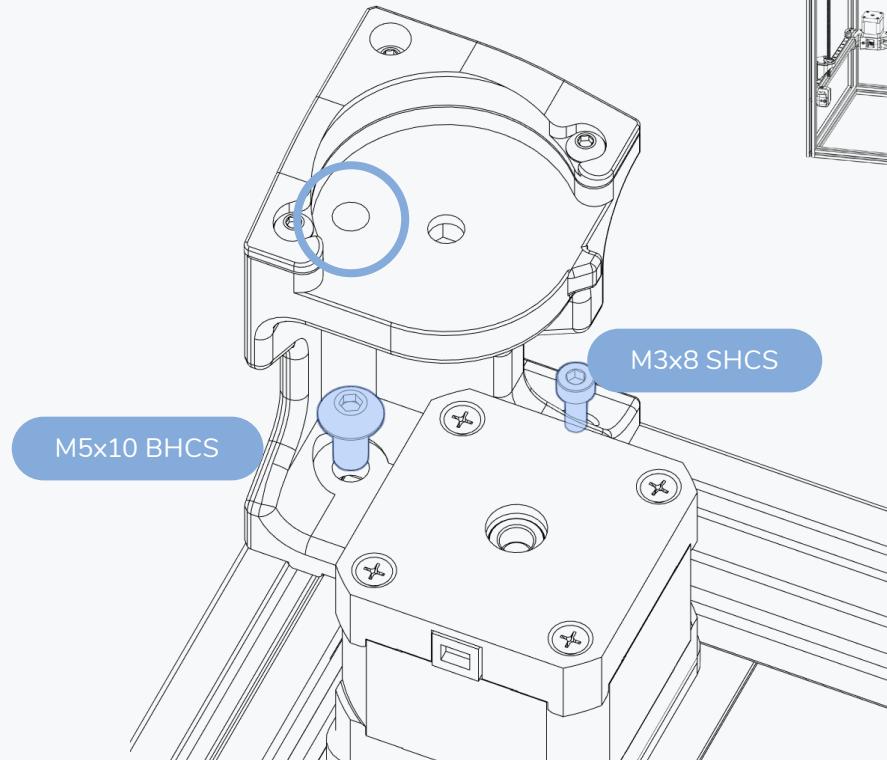
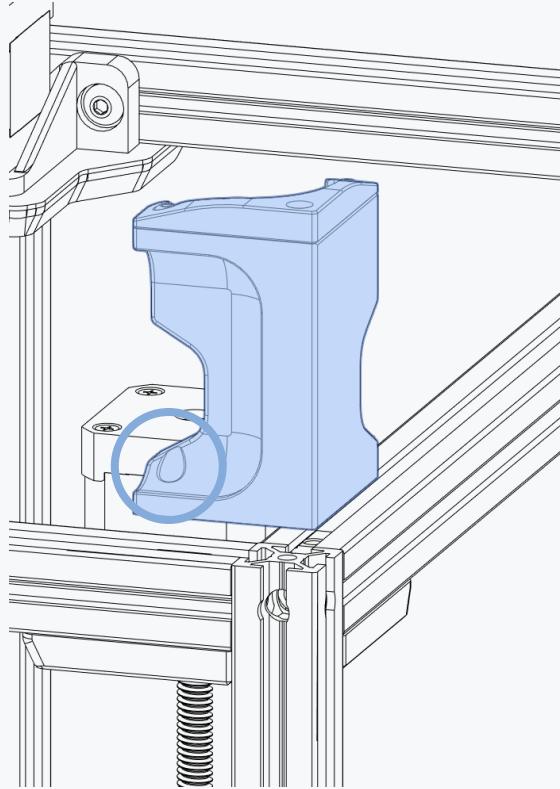
Apply a thin layer of grease to the lead-screw to prevent rust and ensure a smooth operation.

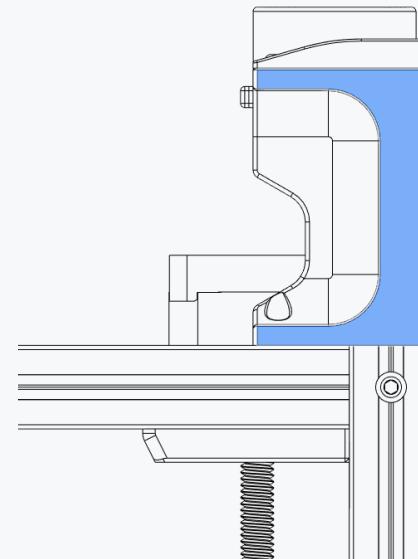
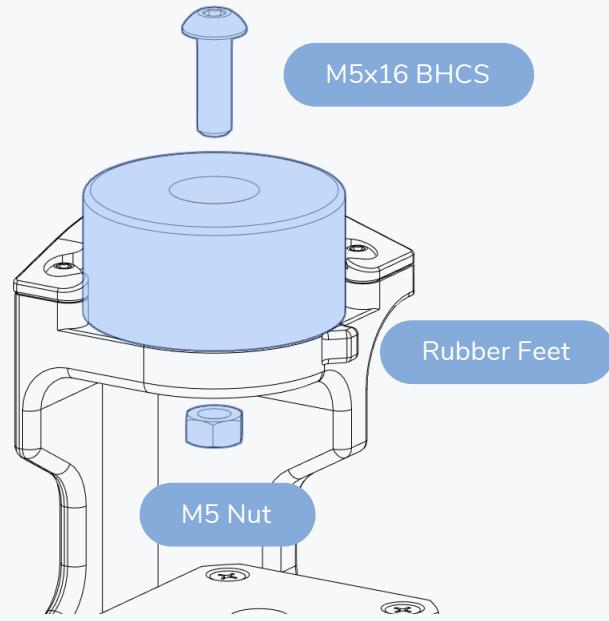


**ASSEMBLE FOUR FEET**

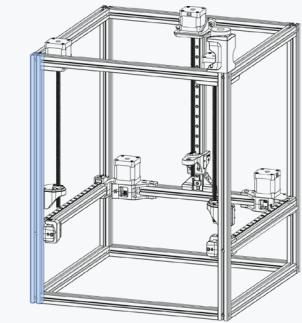
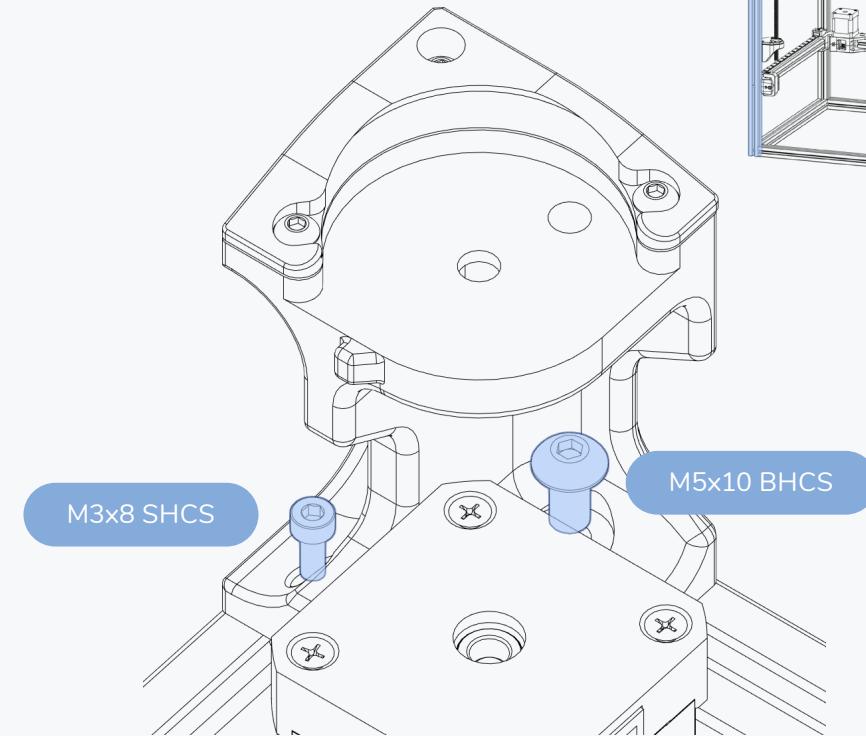
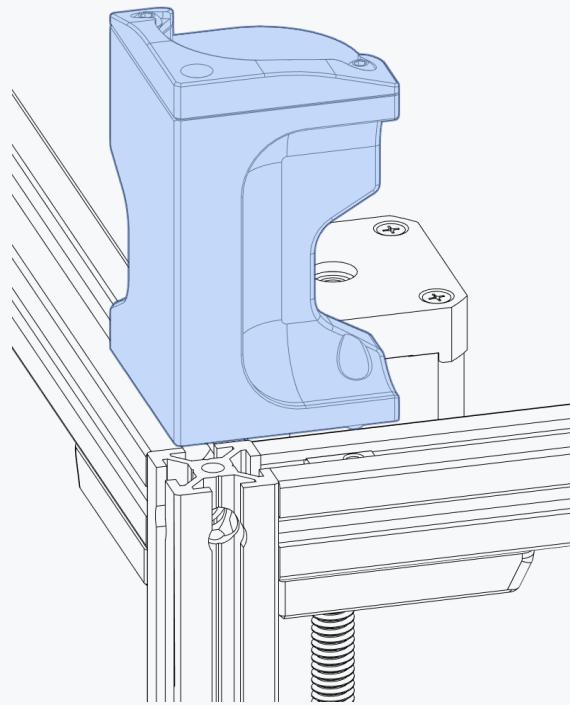
Repeat the instructions and assemble all four feet.

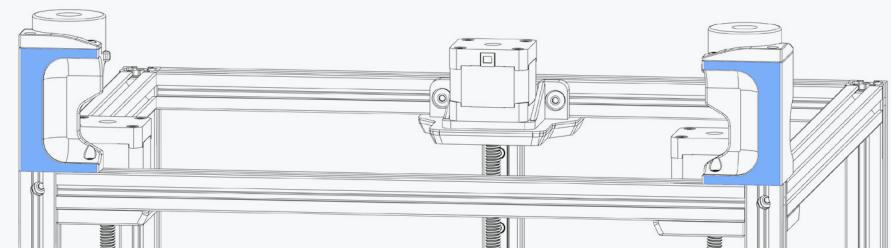
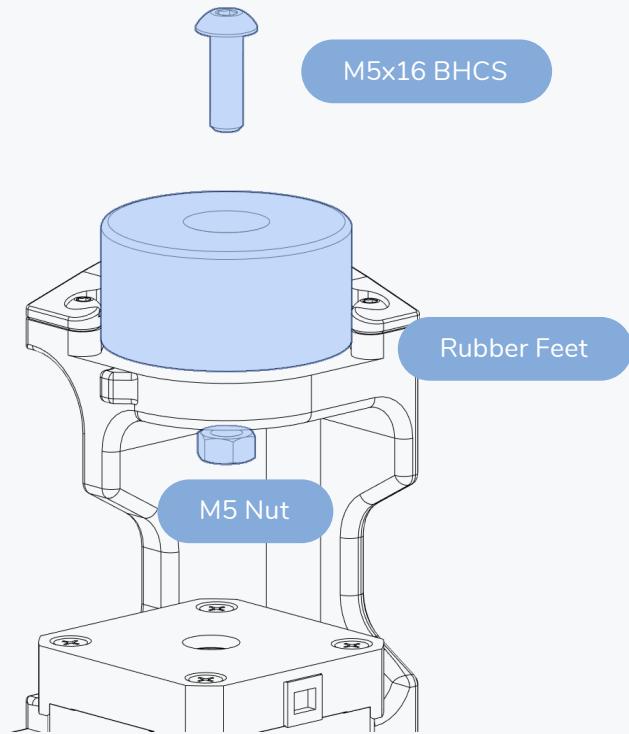




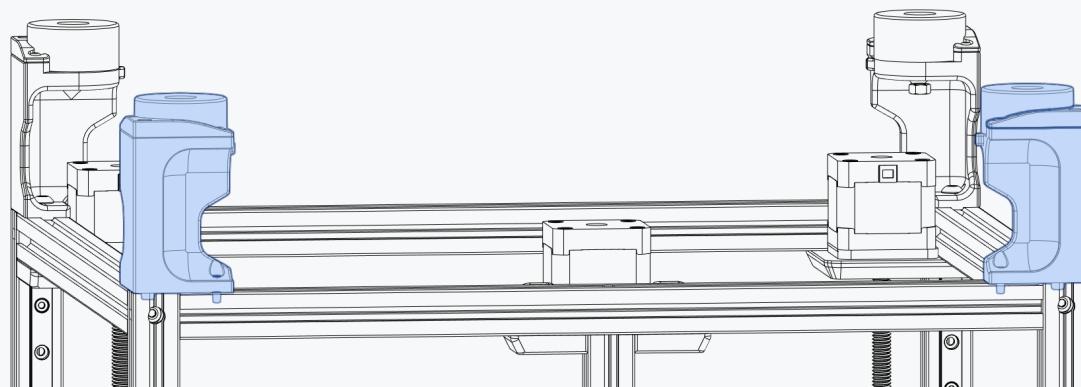
**MIND THE PART ORIENTATION**

The profile shown above are towards the front and rear of the printer.

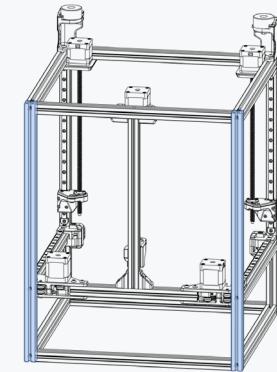


**MIND THE PART ORIENTATION**

The profile shown above are towards the front and rear of the printer.

**MIND THE PART ORIENTATION**

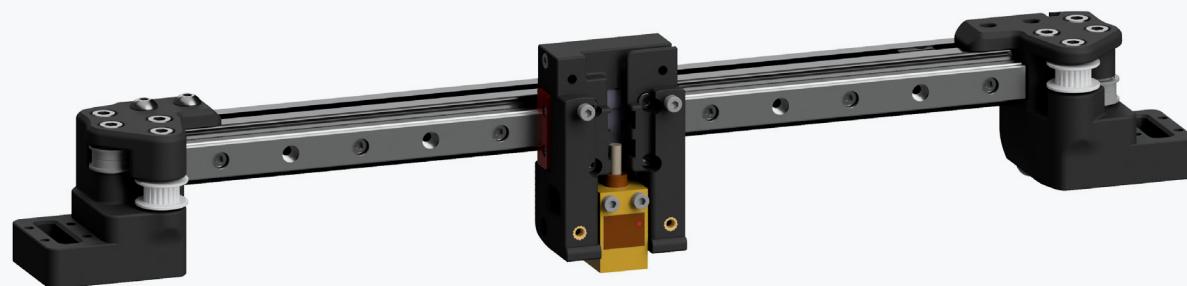
The profile shown above are towards  
the front and rear of the printer.

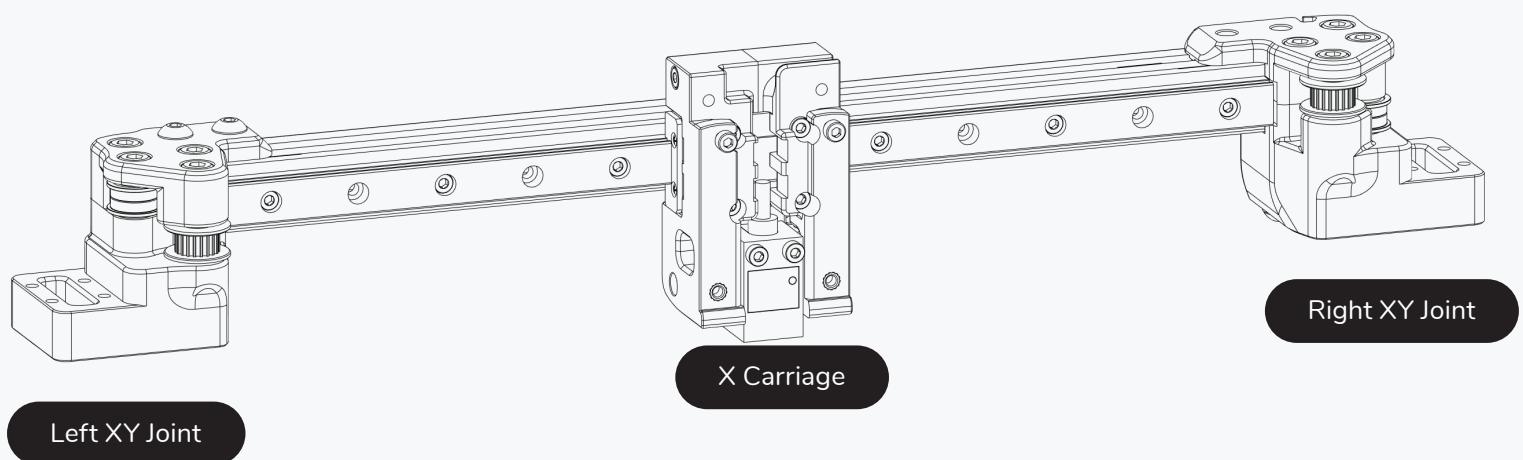


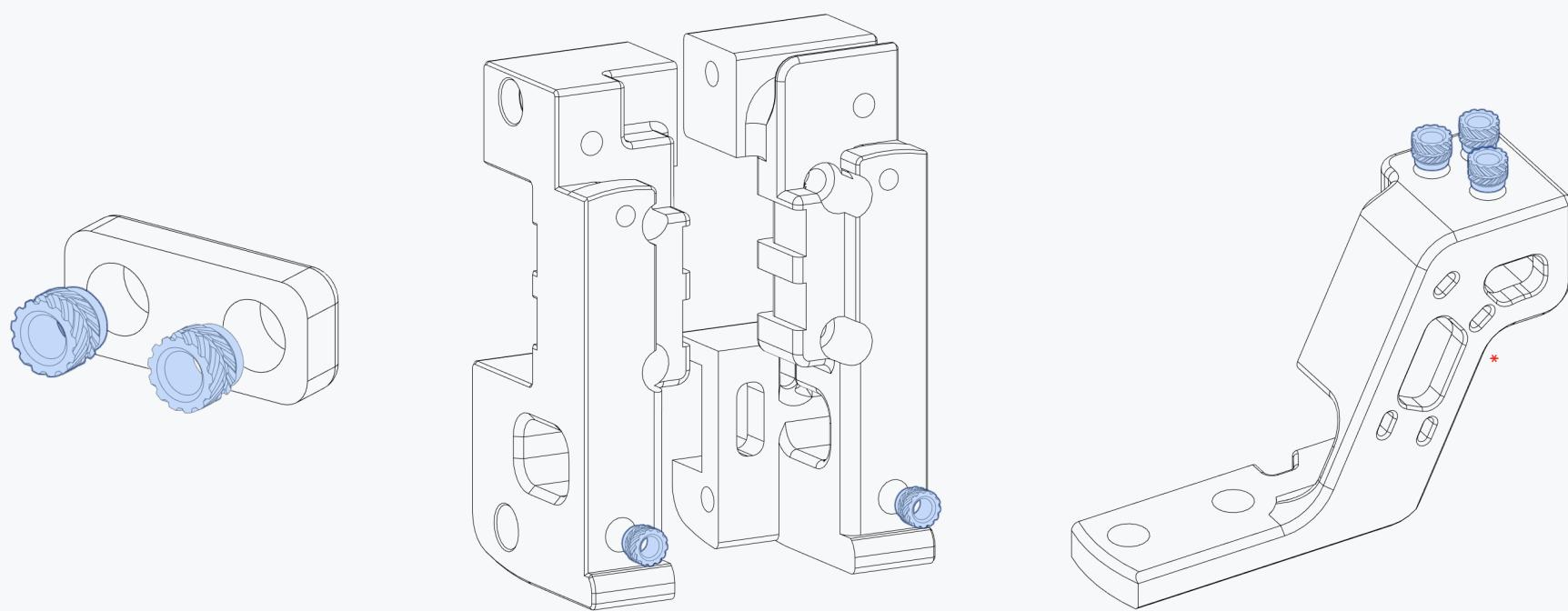
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X AXIS

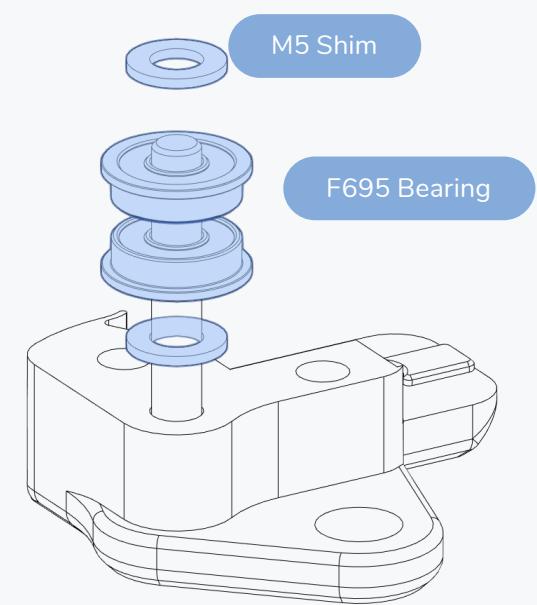
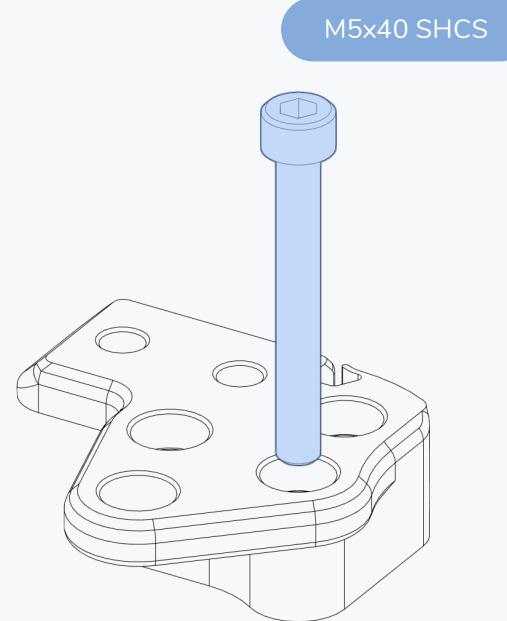
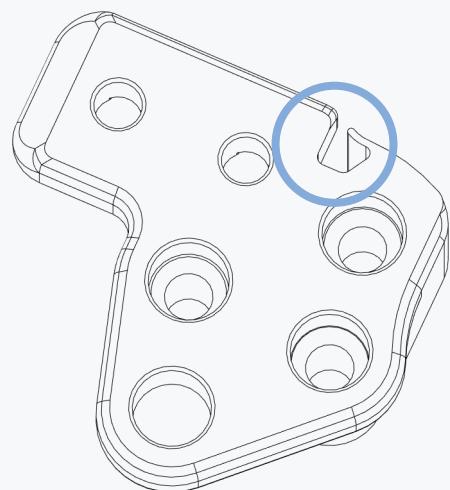
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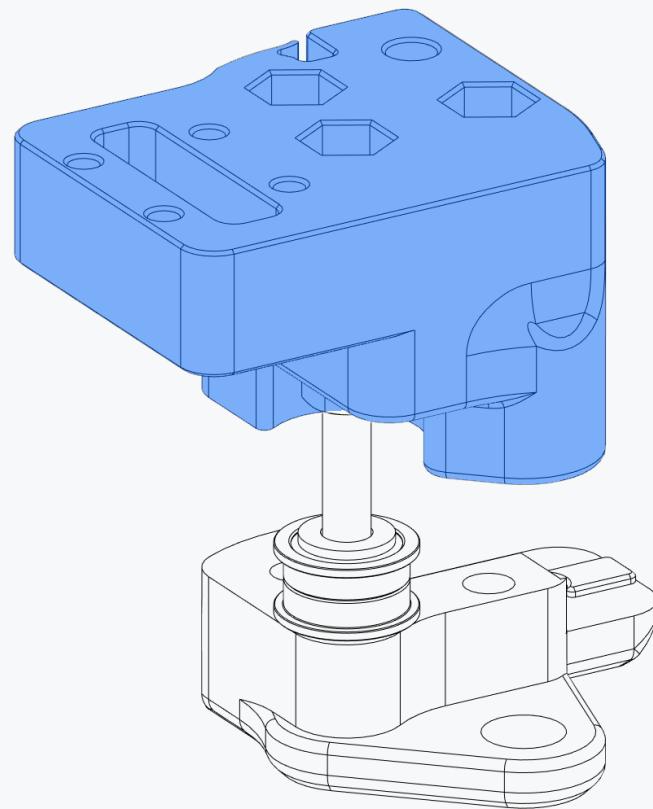
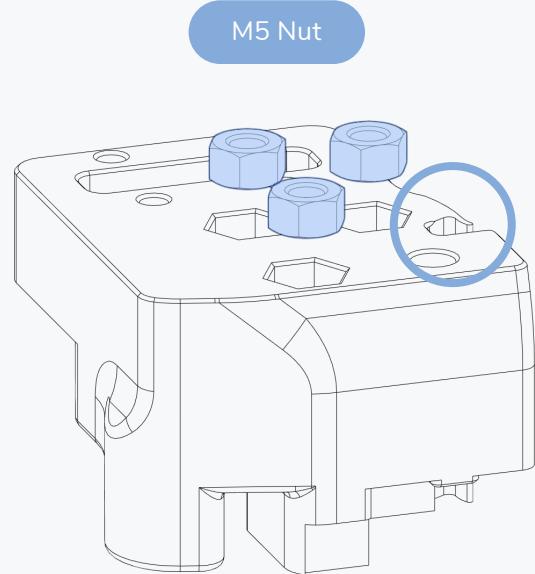


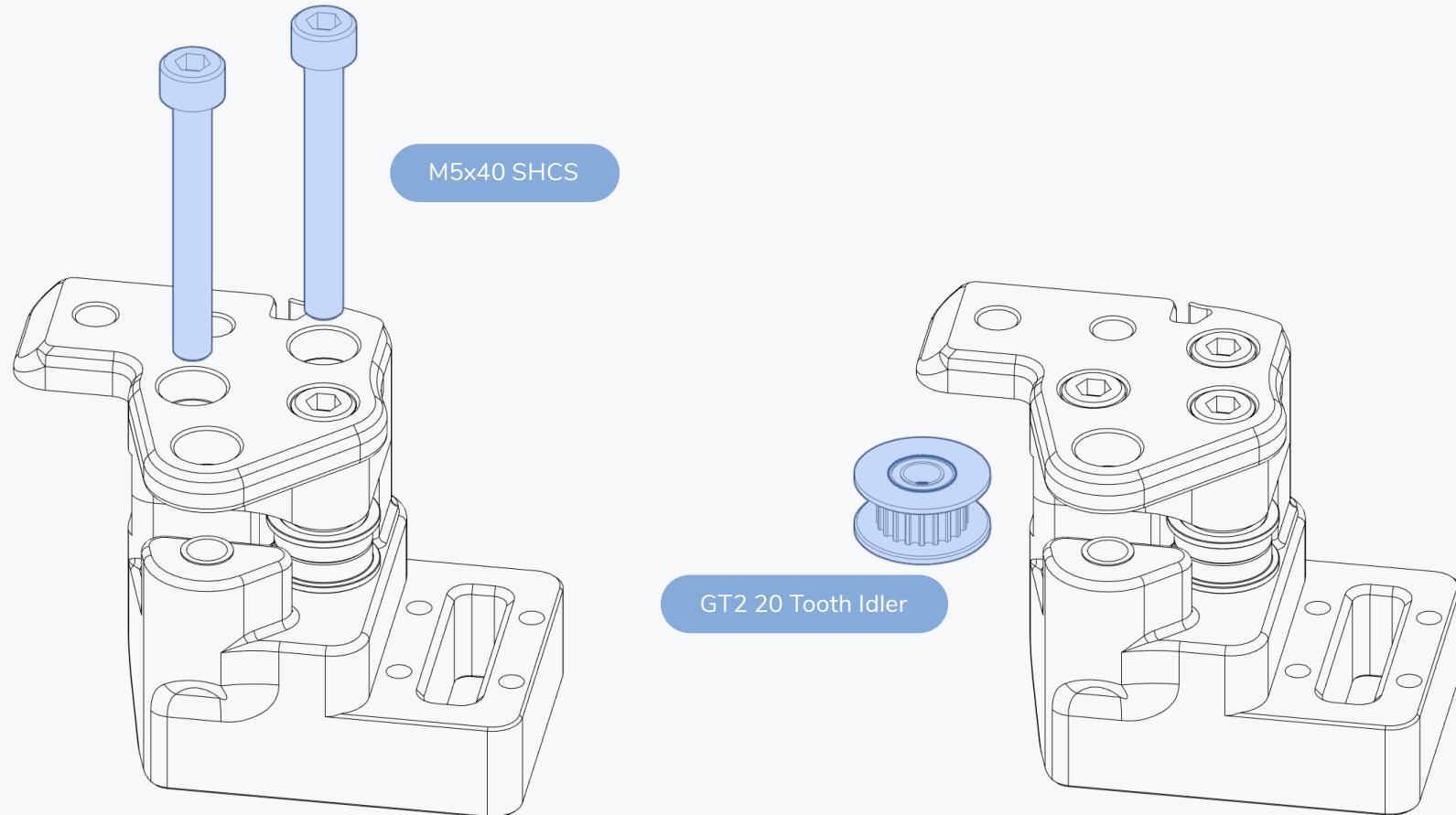


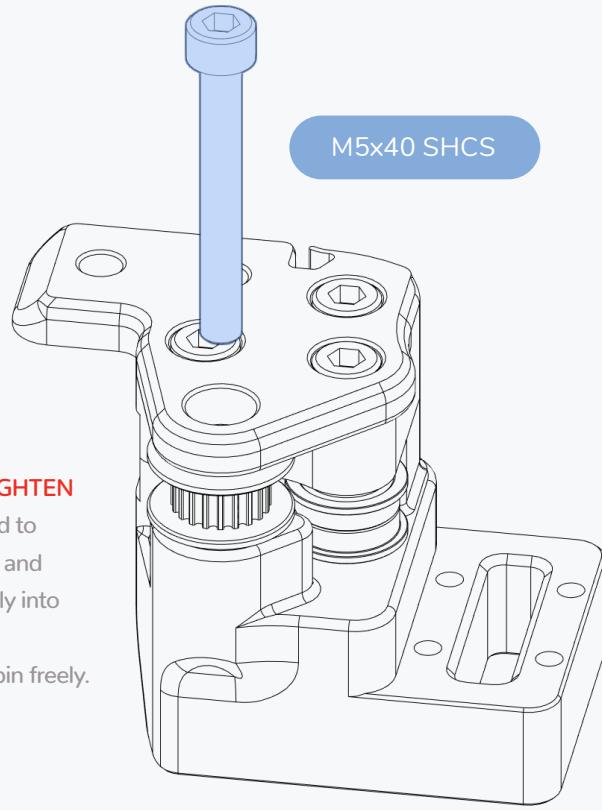


Heat Set Insert

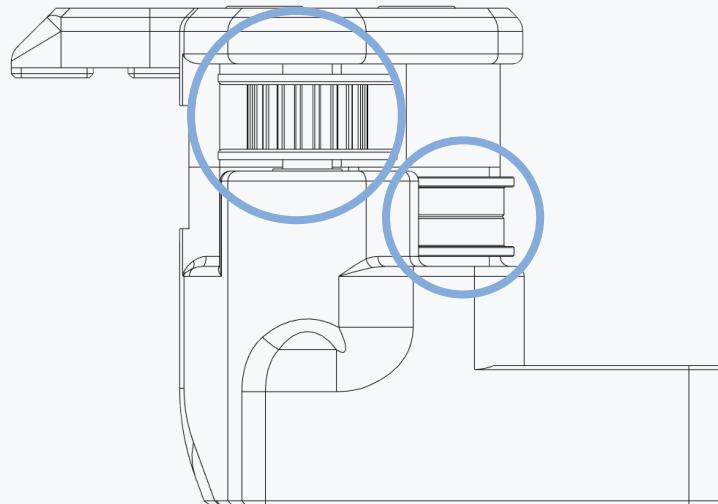


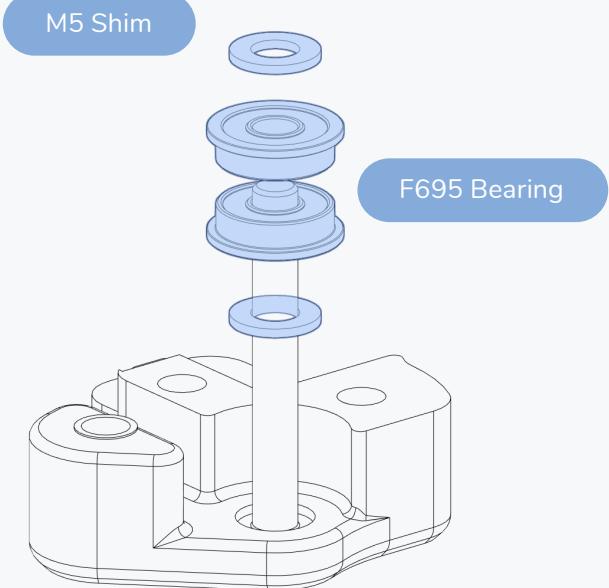
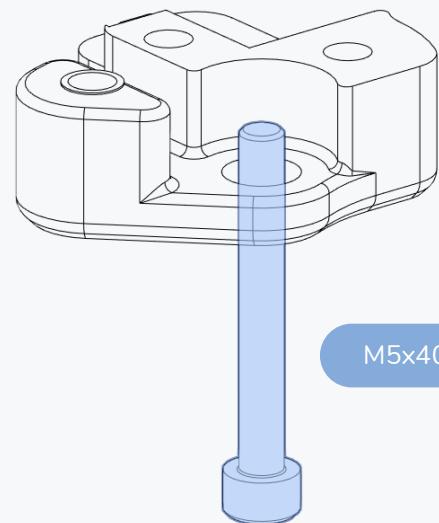
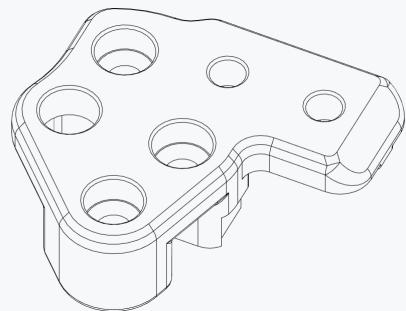




**DON'T OVER TIGHTEN**

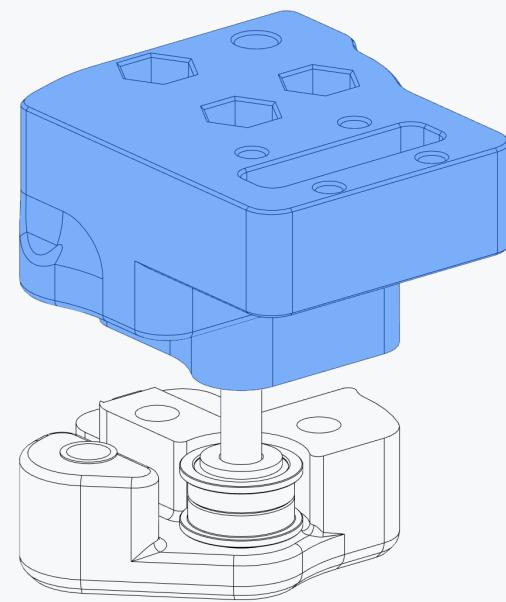
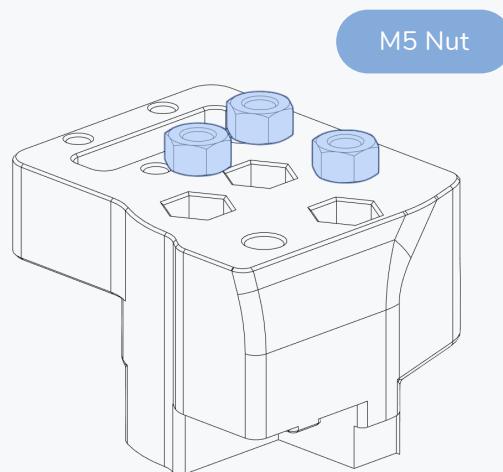
The screw is used to position the idler and is screwed directly into plastic.  
The idler must spin freely.





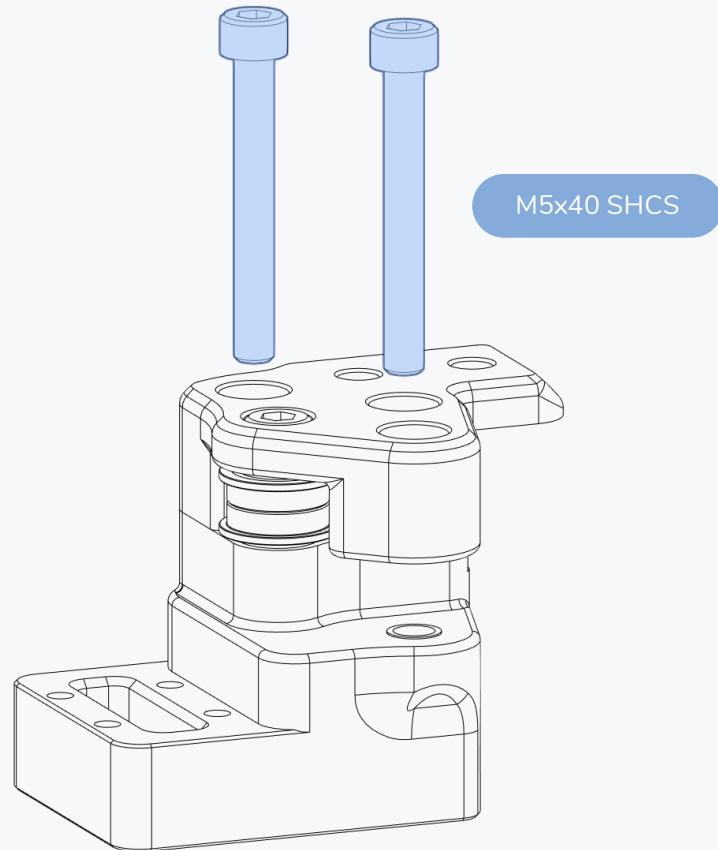
LEFT XY JOINT

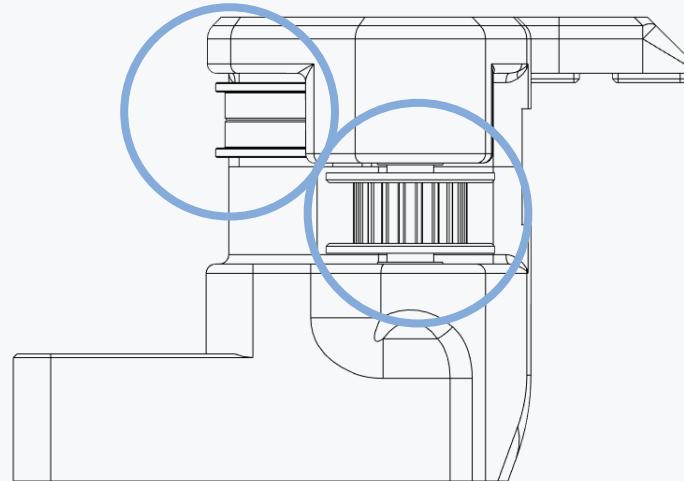
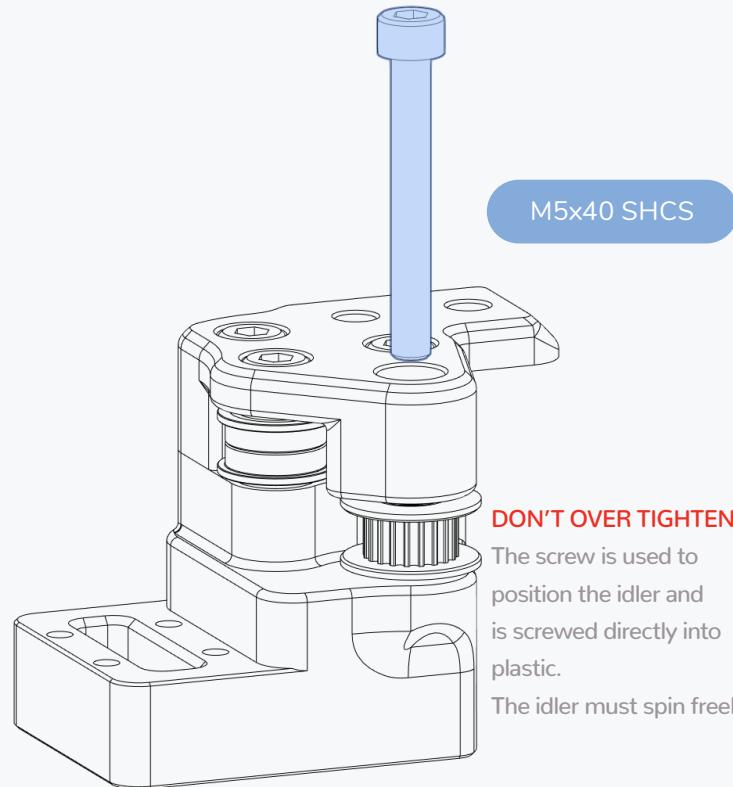
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LEFT XY JOINT

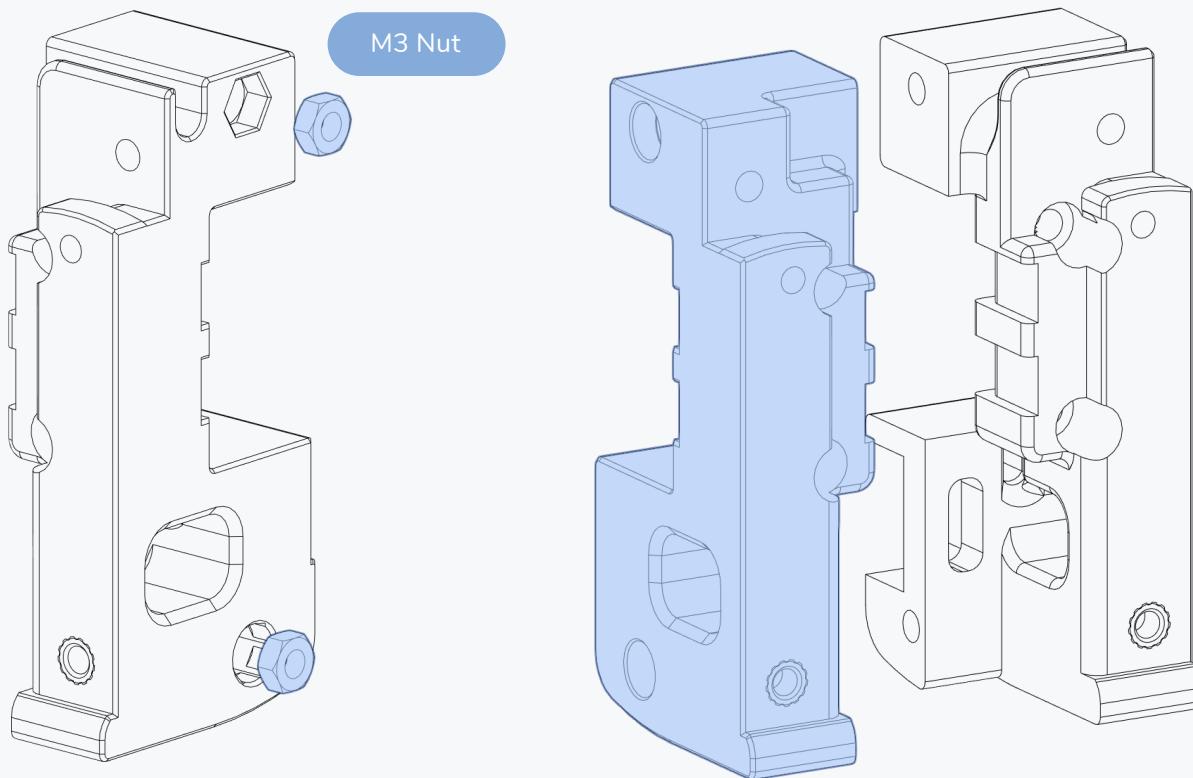
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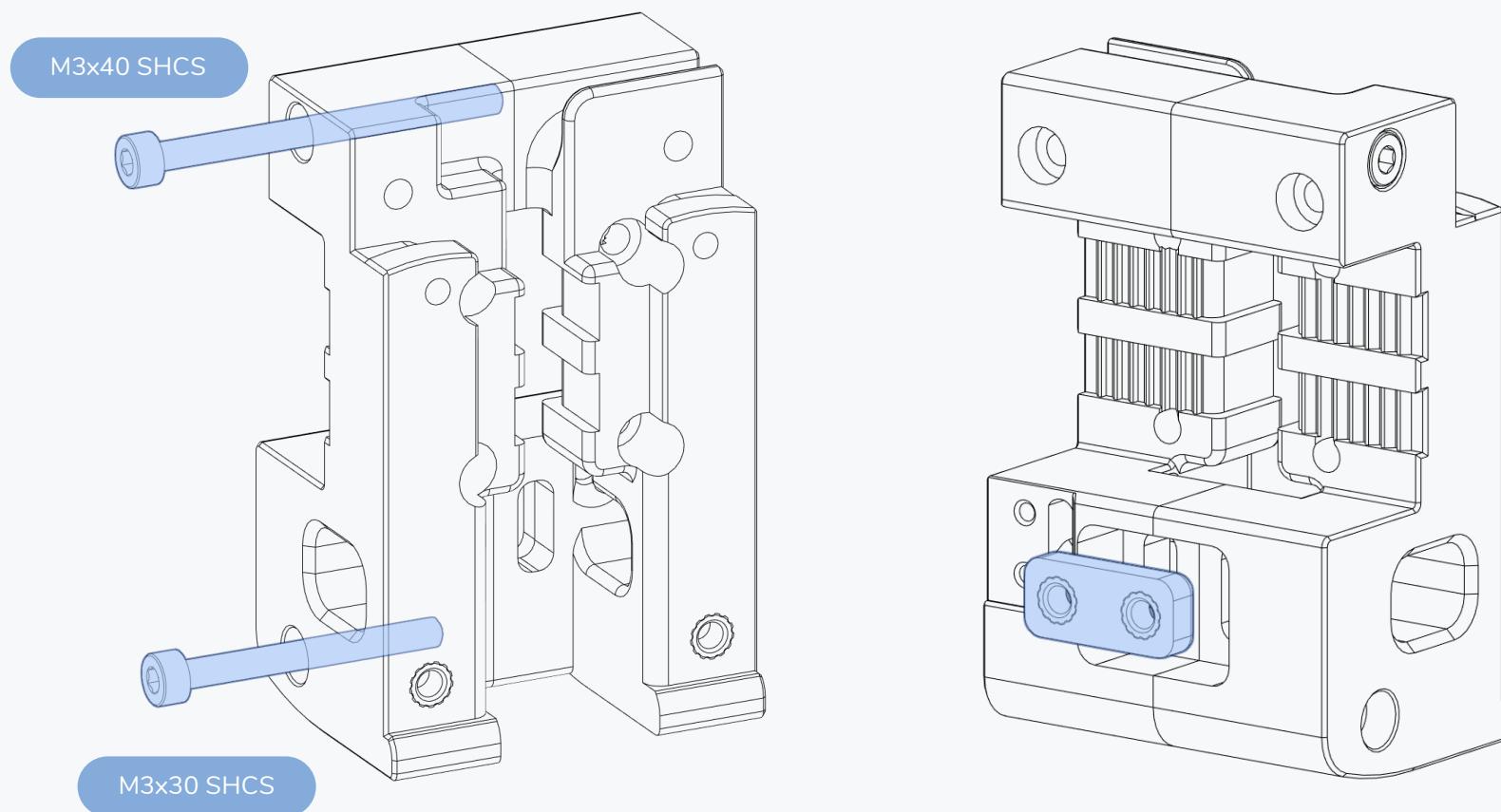


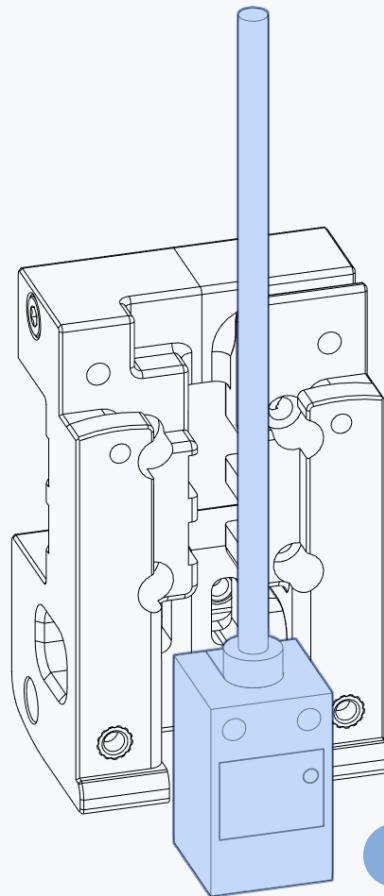


X CARRIAGE

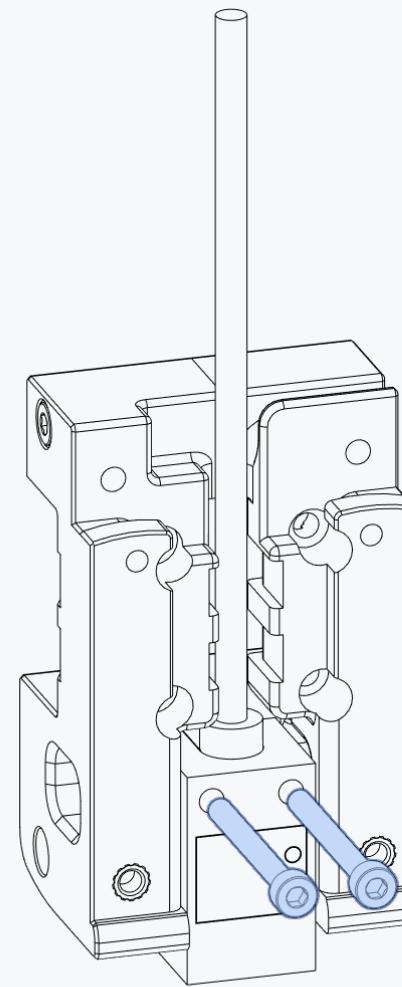
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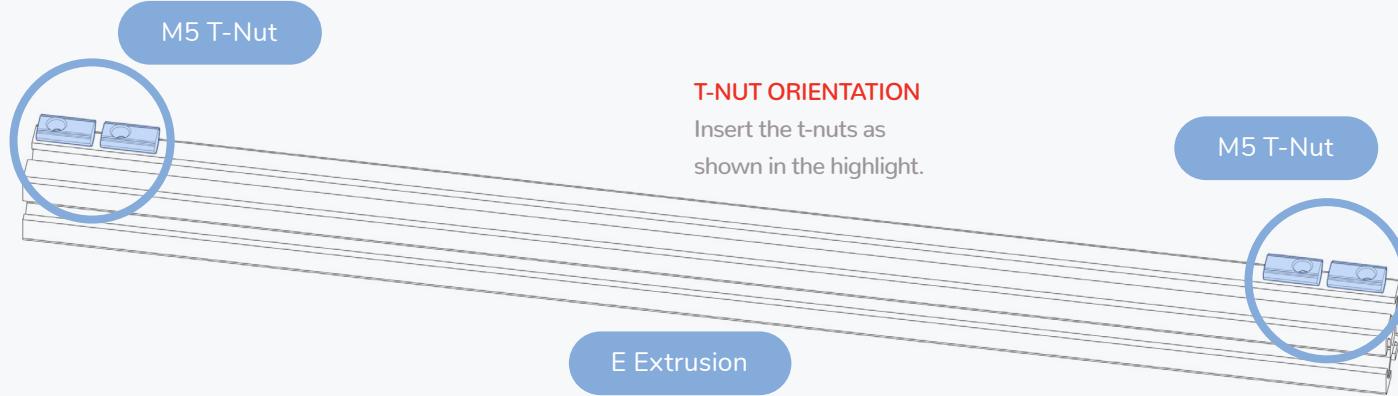




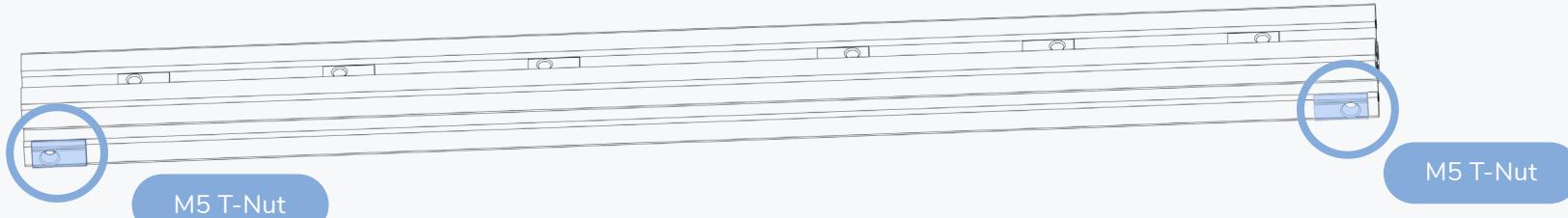
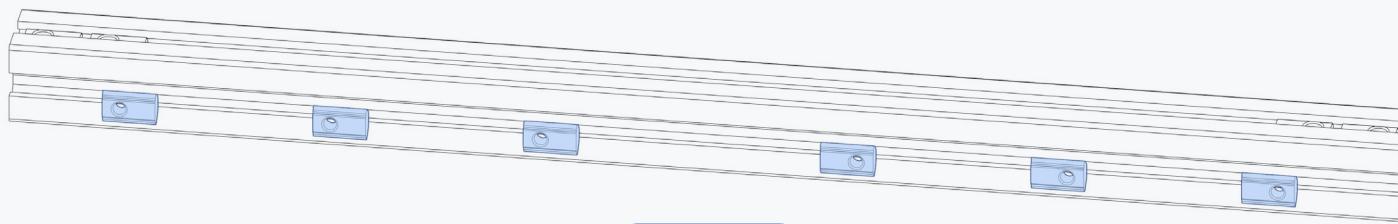
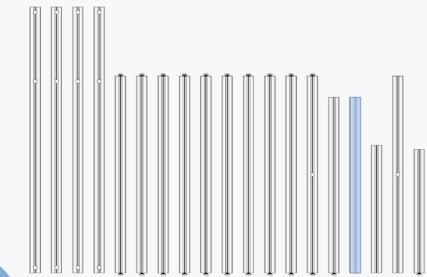
**PROBE WIRES**

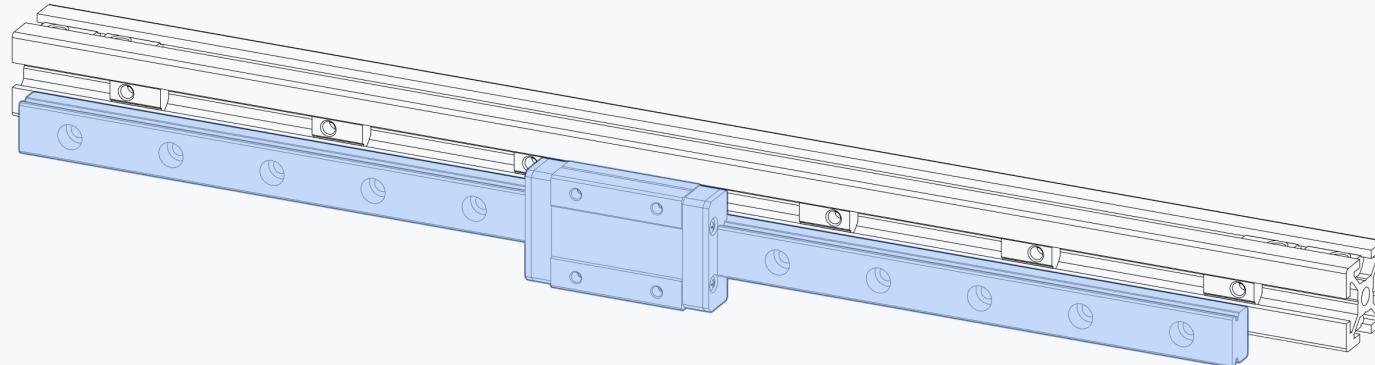
Cut the probes wires to about 15cm.



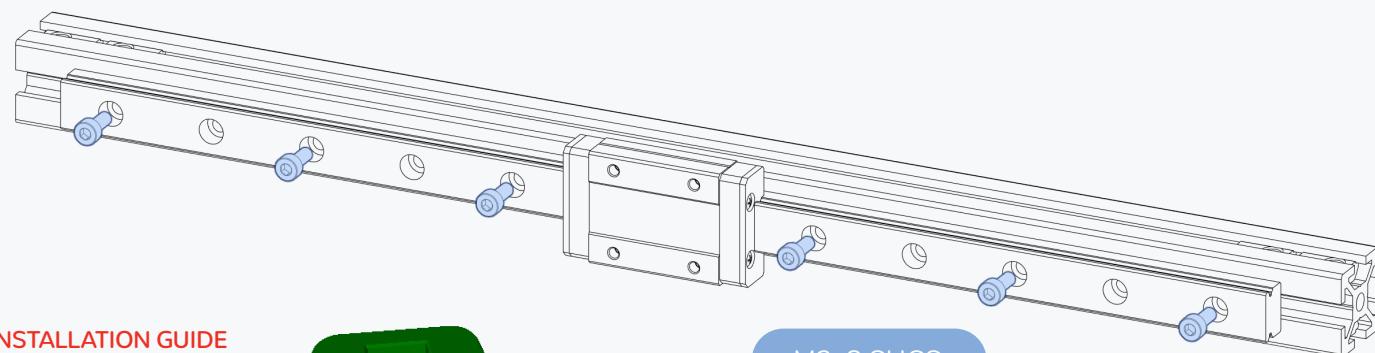
**T-NUT ORIENTATION**

Insert the t-nuts as shown in the highlight.





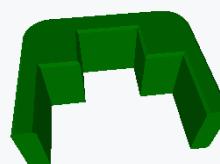
MGN 12 Rail

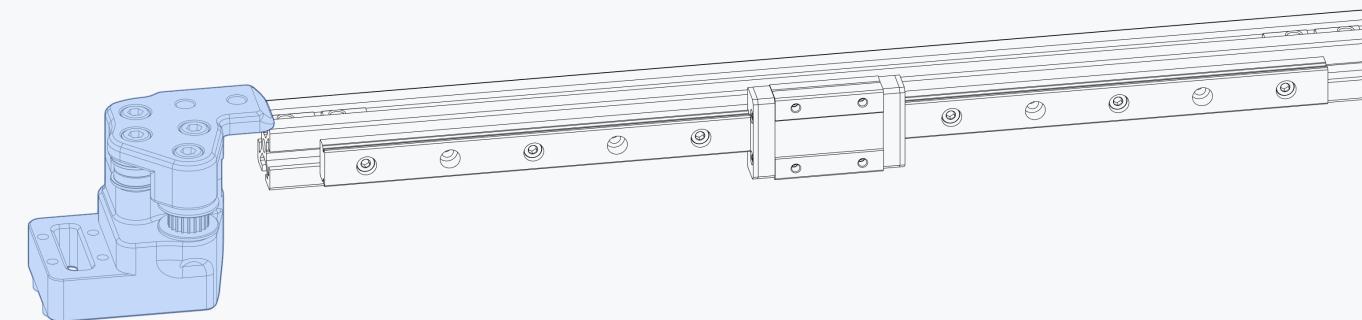


M3x8 SHCS

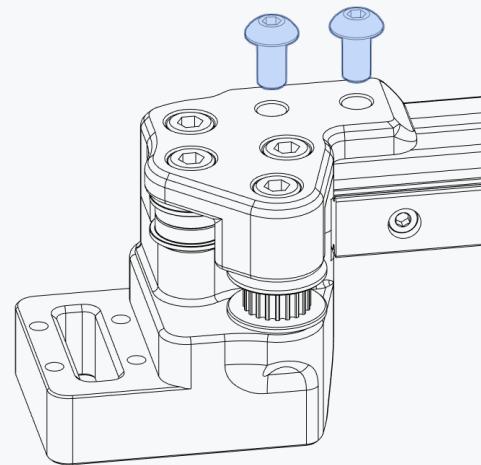
**CENTERED RAIL INSTALLATION GUIDE**

Use the guides to position the rail in the center of the extrusion prior to fastening the screws.

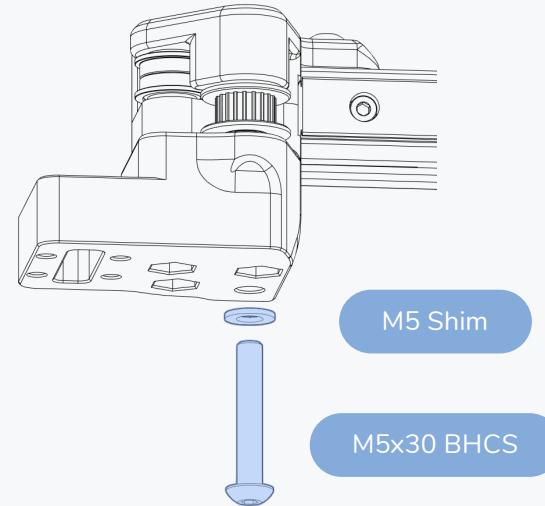




M5x10 BHCS

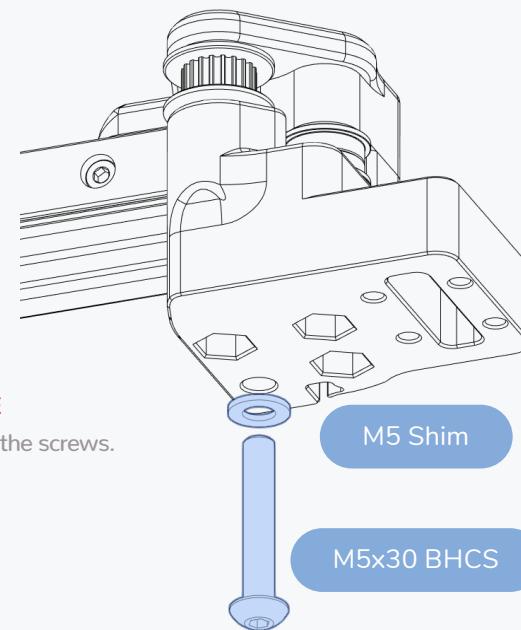
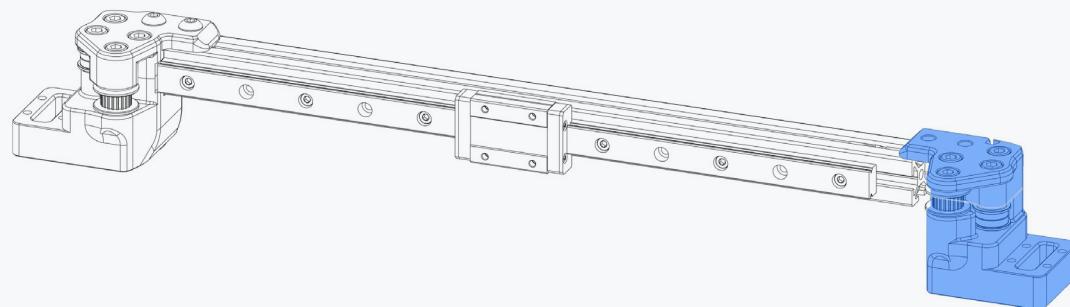
**LEAVE LOOSE**

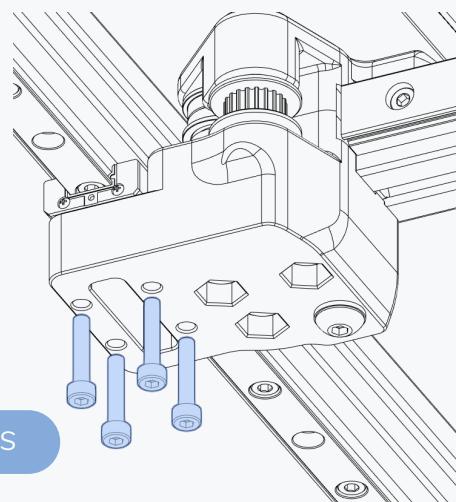
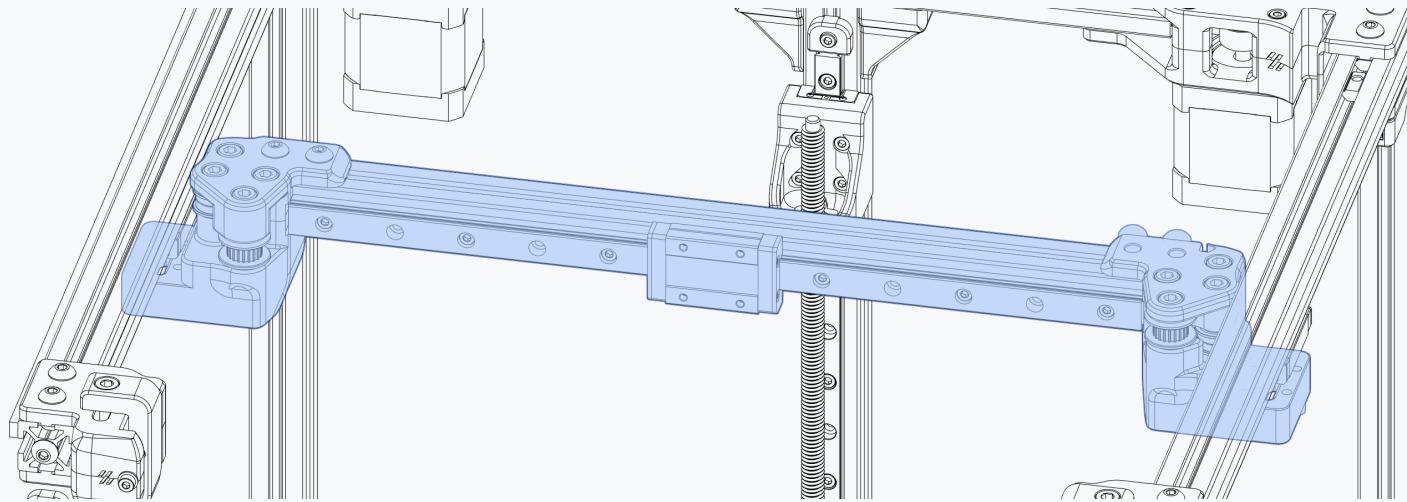
Lightly tighten the screws.



M5 Shim

M5x30 BHCS

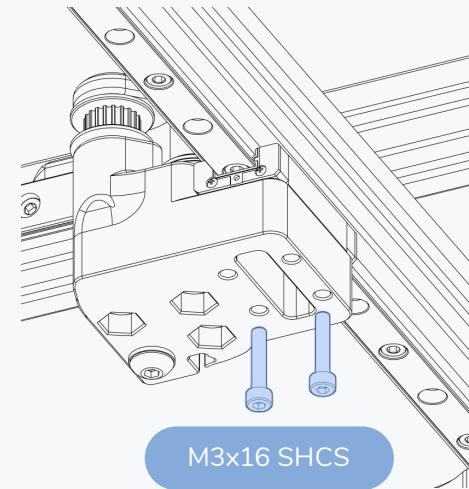




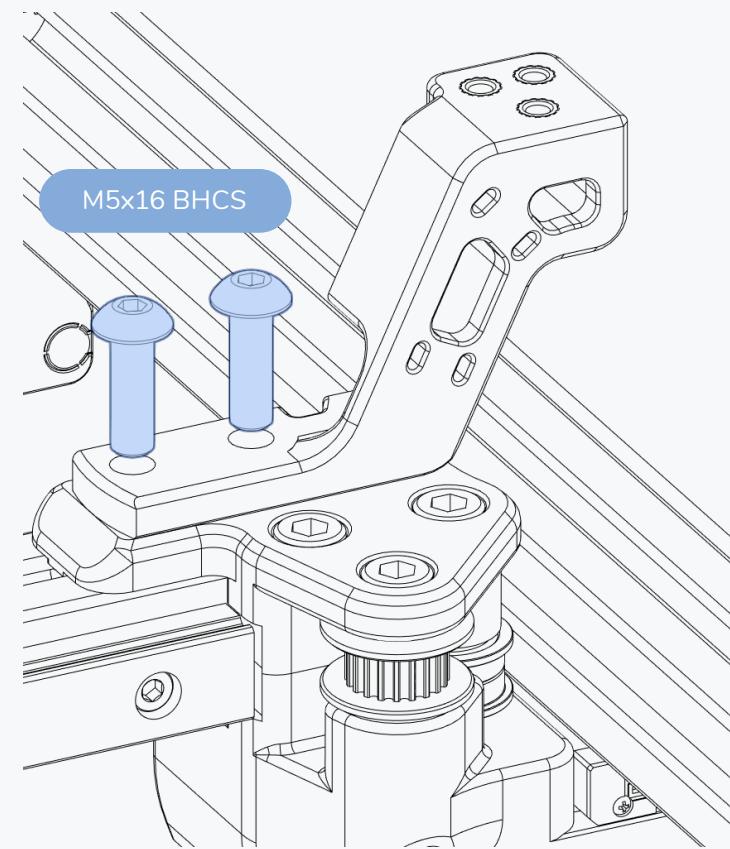
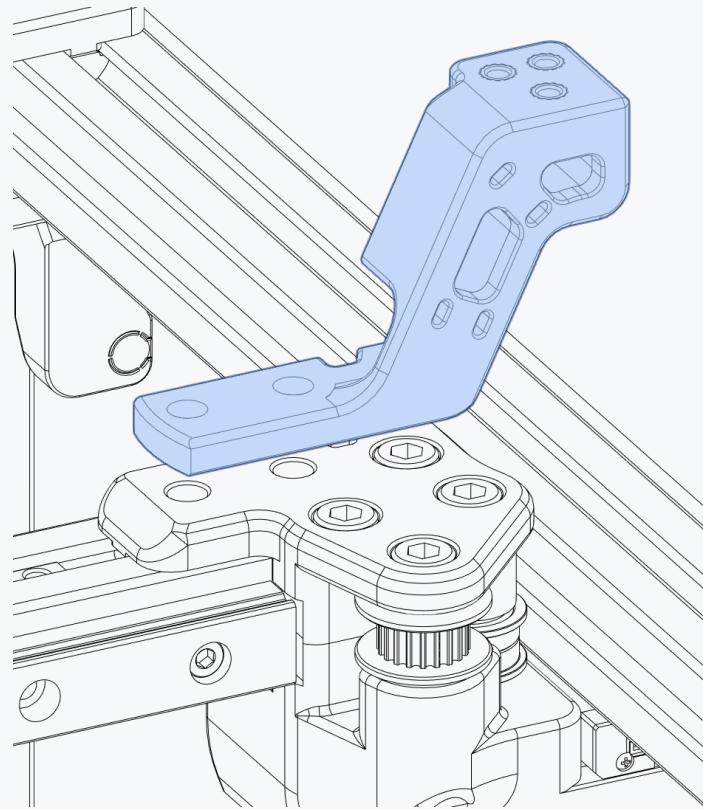
M3x16 SHCS

**MISSING SOME SCREWS?**

The other two screws will be installed later.



M3x16 SHCS



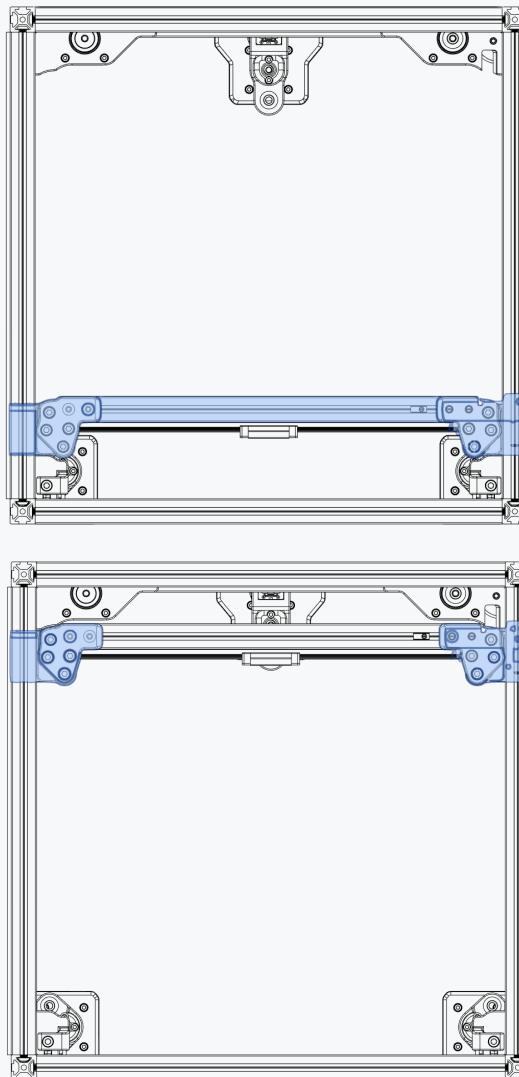
### SQUARING THE GANTRY

Move the gantry all the way back until it hits the A and B drive on both sides.

Fully tighten all screws on the X axis.



<https://voron.link/cekh81>

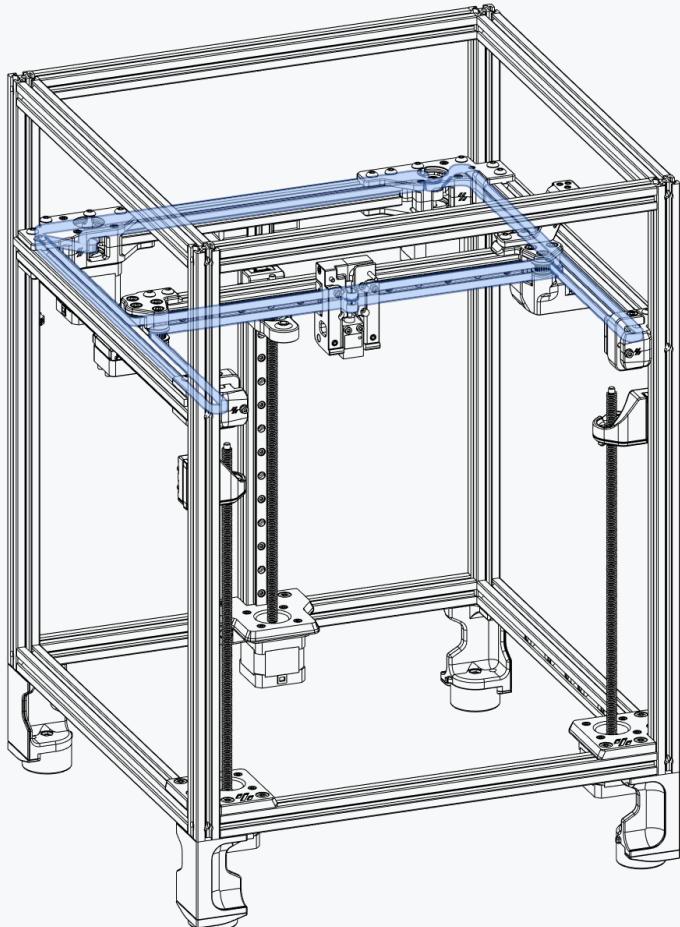


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BELTS

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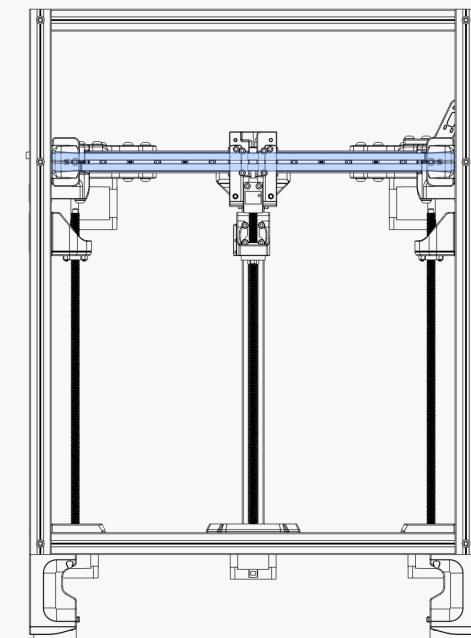
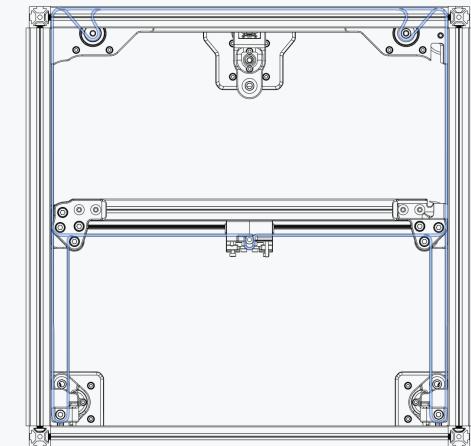
### THE VORON BELT PATH

Voron printers use a belt path based on the popular CoreXY pattern.

The individual belt paths are stacked on top of each other and the crossing often found in CoreXY designs is omitted. Compared to many other implementations, the motors are moved to a less intrusive position. To learn more about the principles behind CoreXY visit <https://voron.link/ef72dd6>

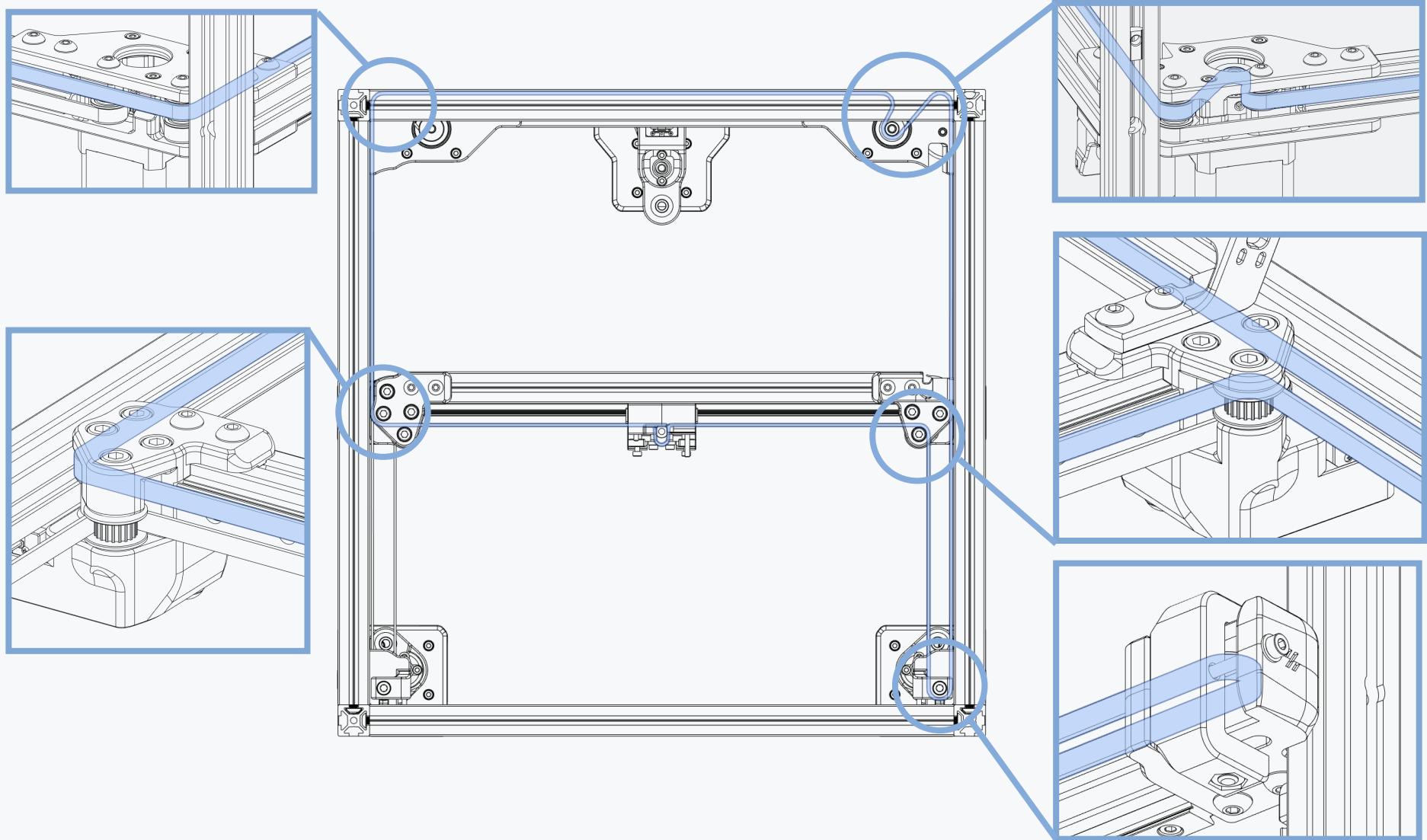
Equal belt tension is important to the proper function of a CoreXY motion system.

We recommend to run one belt to get the required length, remove the belt from the printer and cut the second belt to the exact same length.  
As both belt paths have the same length this is an easy way of getting a consistent tension.



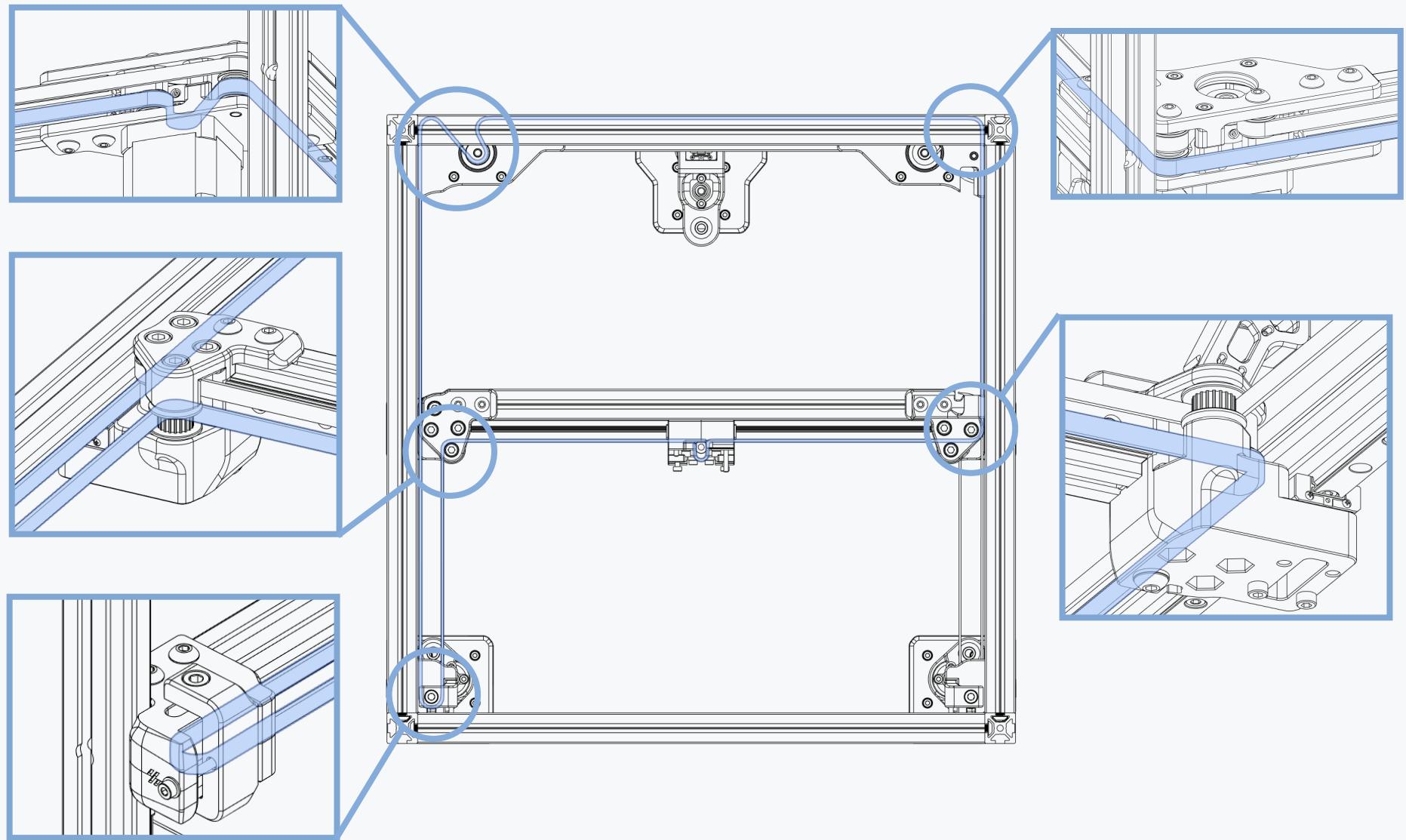
## BELTS

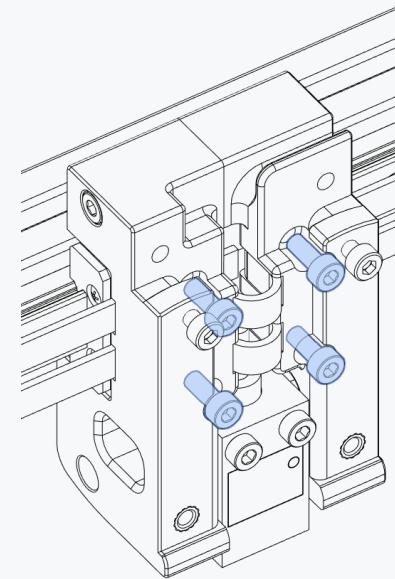
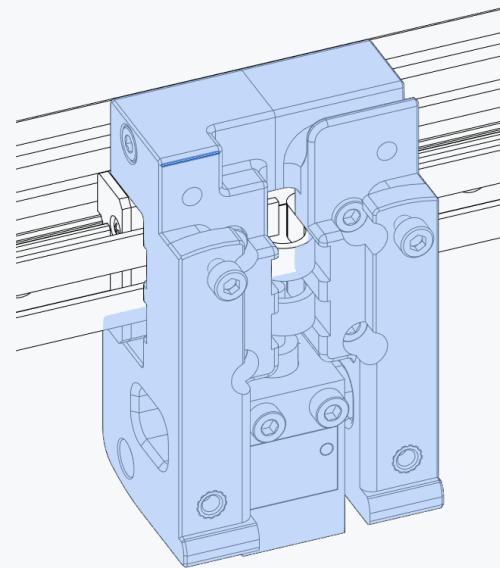
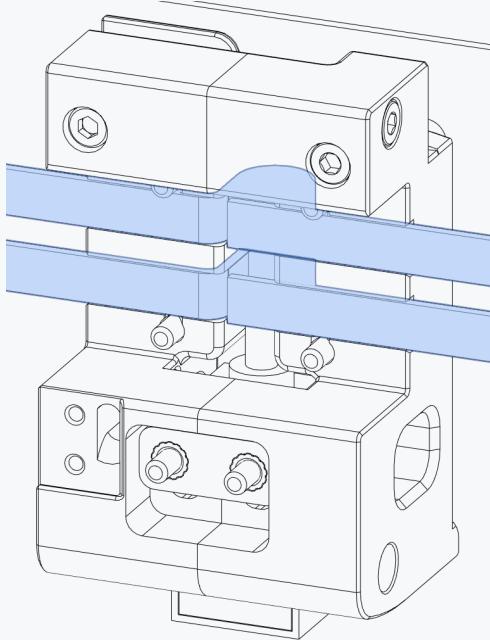
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BELTS

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M3x8 SHCS

**BELT CLAMP?**

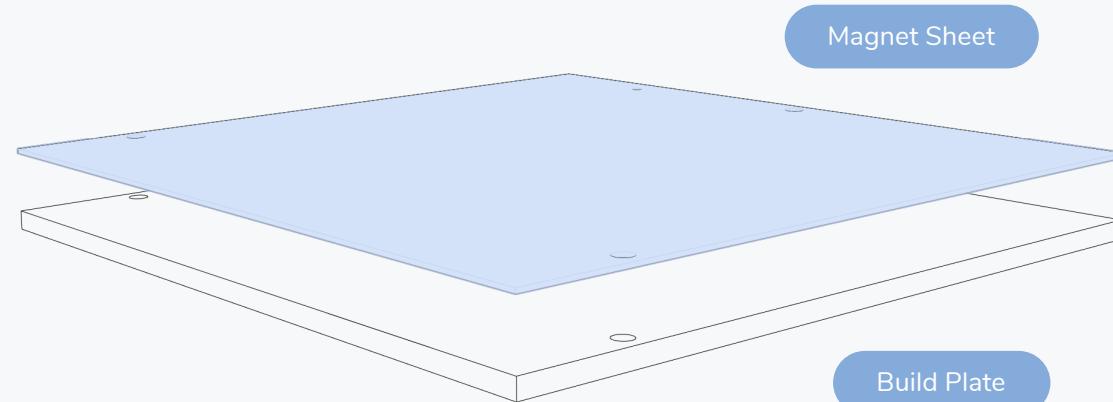
The belt is clamped against the rail carriage. There are no extra parts.  
To initially tighten the belts leave the mounting screws slightly loose  
and pull the belt taut.

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PRINT BED

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Magnet Sheet

Build Plate

#### MAGNET APPLICATION

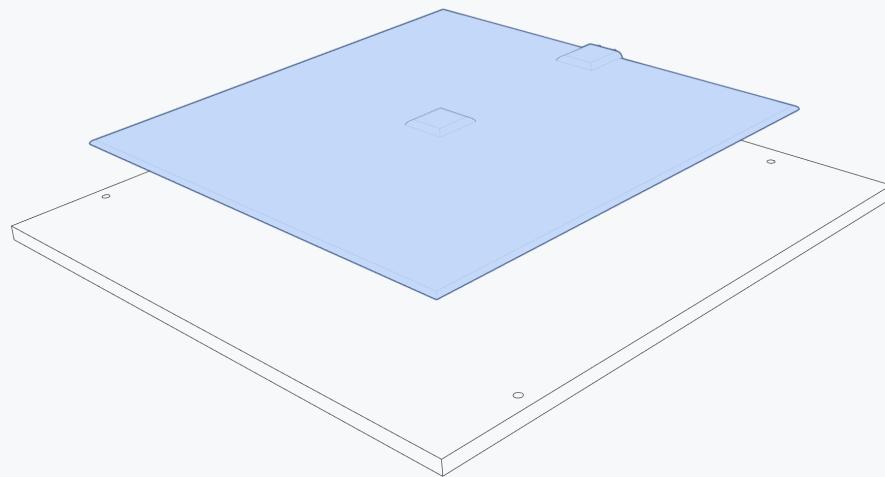
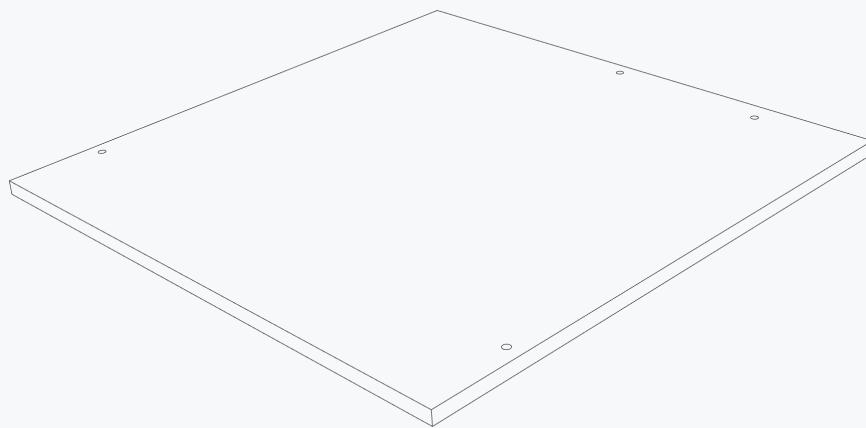
Clean the plate with isopropyl alcohol or similar cleaner prior to applying the magnet.

Use the edge of a plastic object or a small roller to firmly press the magnet on the plate to get a good bond.

If you have never done this before we recommend you watch the linked guide.



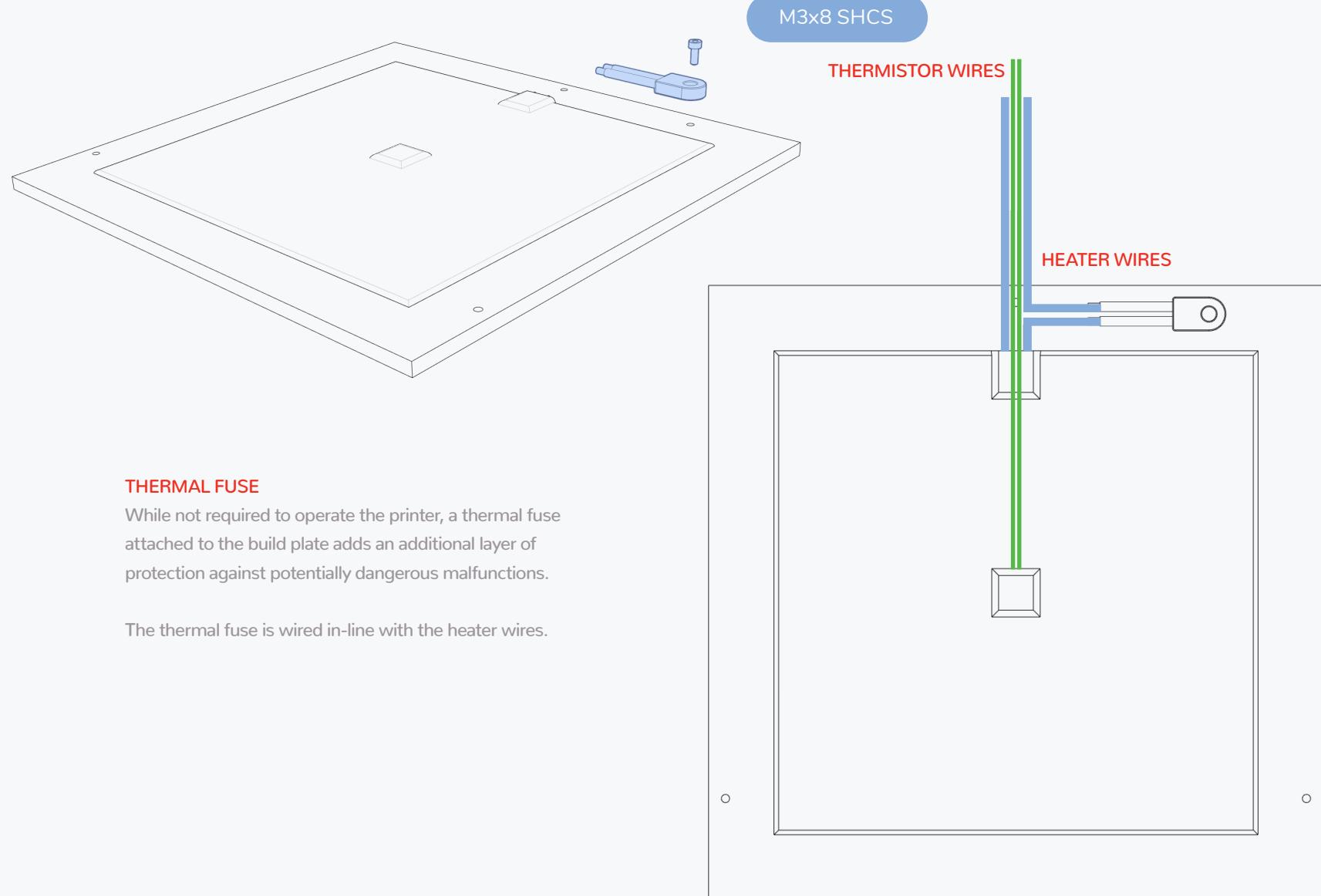
<https://voron.link/rm6tpld>



#### HEATER APPLICATION

The heater is installed in the same fashion as the magnet.

Centre it on the underside of the build plate and make sure to firmly press it on the build plate.

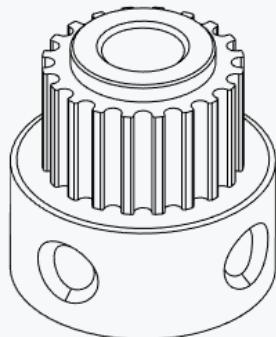


#### THERMAL FUSE

While not required to operate the printer, a thermal fuse attached to the build plate adds an additional layer of protection against potentially dangerous malfunctions.

The thermal fuse is wired in-line with the heater wires.

GT2 Pulley

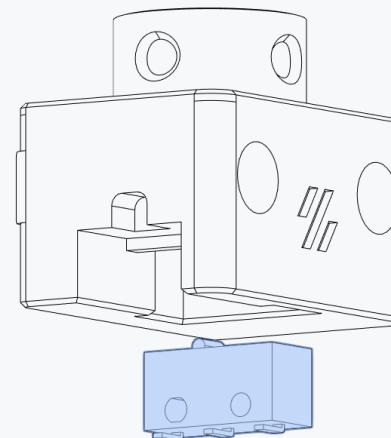
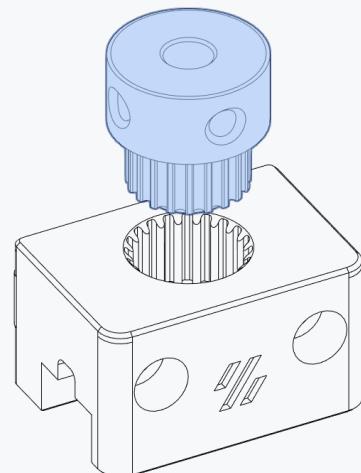
**REMOVE FLANGE & GRUB SCREWS**

Use a bottle opener or some pliers to remove the top flange.

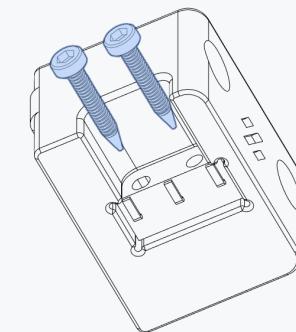
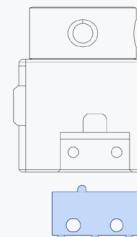
Remove the grub screws from the pulley.

**PRESS FIT**

Apply the required force to fully seat the pulley in the printed part.



Microswitch

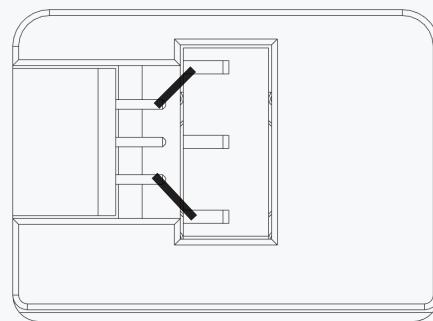
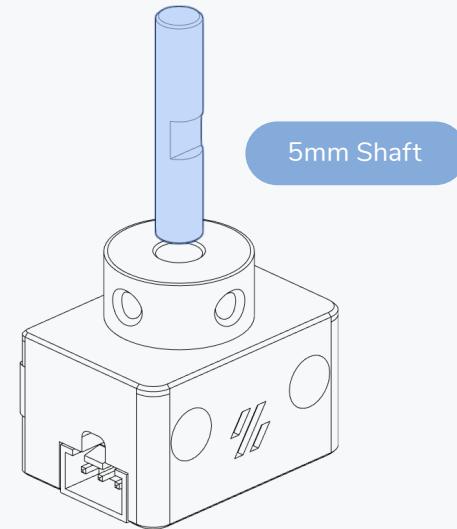
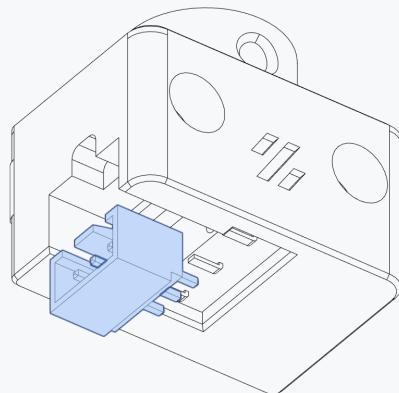


M2x10 Self Tapping

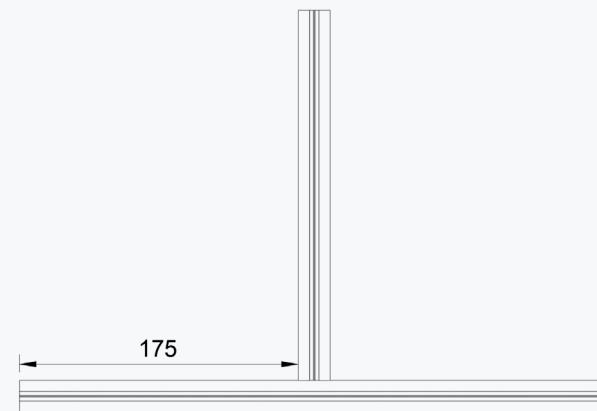
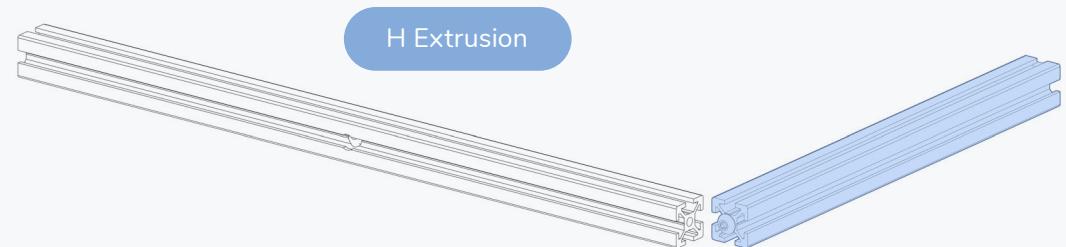
**SWITCH W/OUT LEVER**

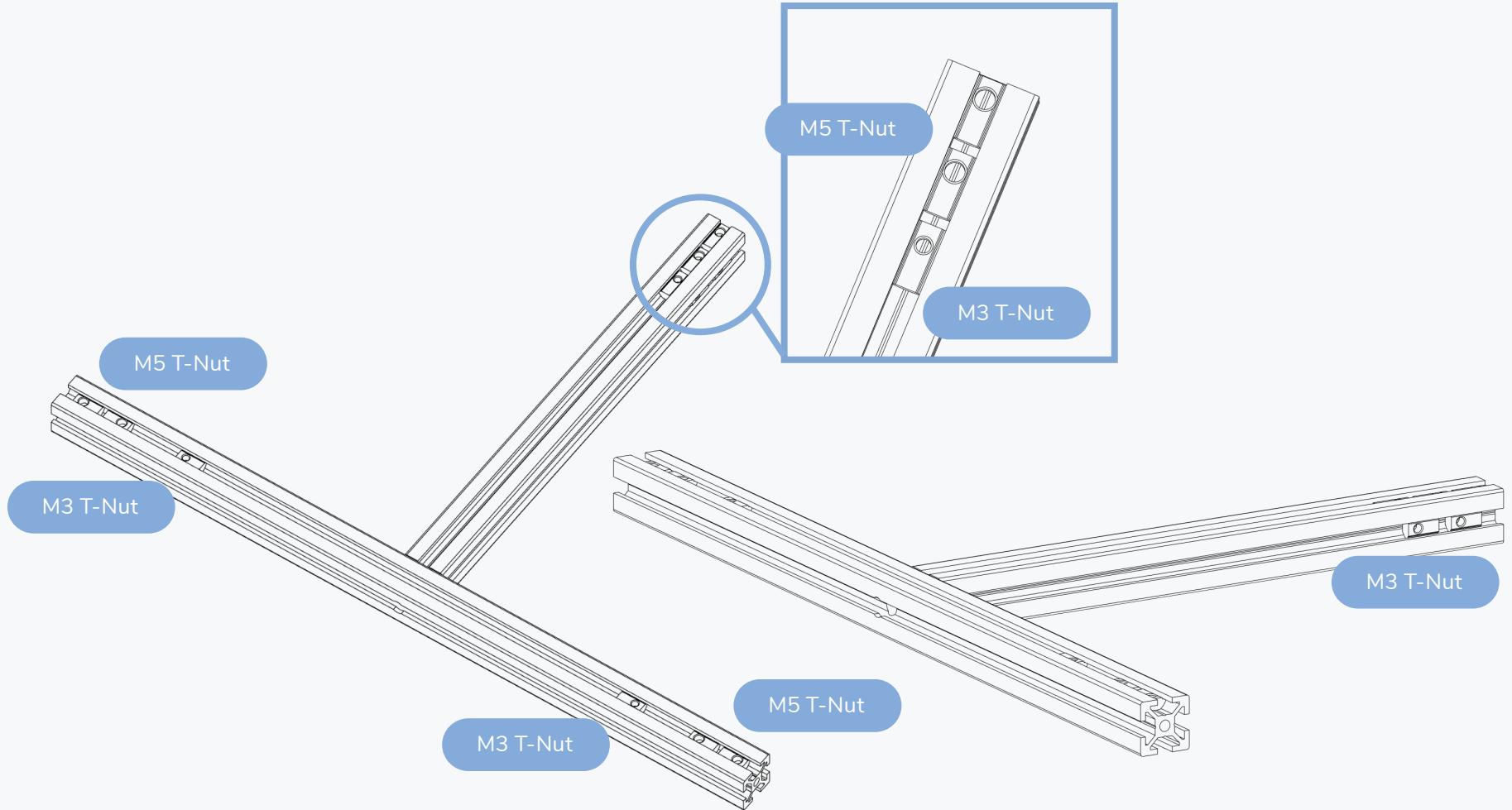
This parts requires a switch without lever to be installed in the shown orientation.

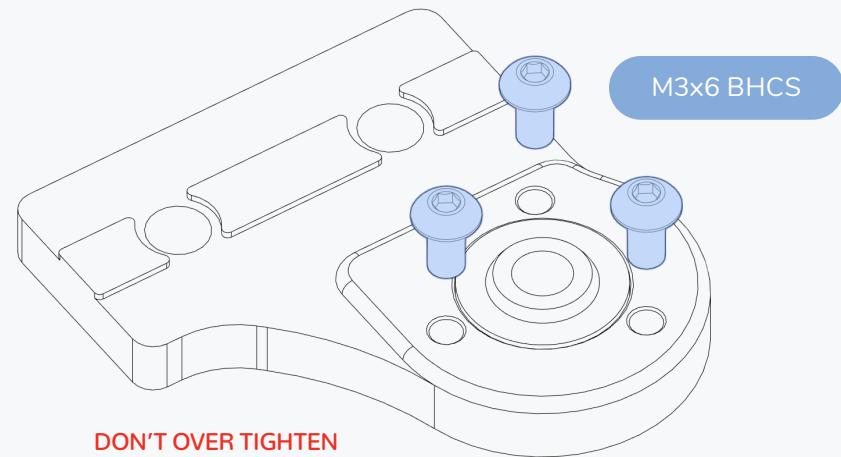
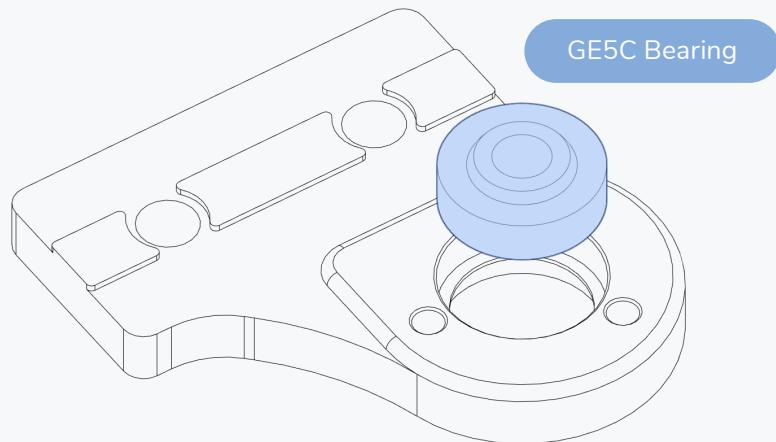
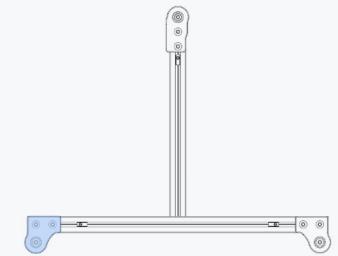
You can remove the lever from microswitches by gently pressing on the levers hinge point.

**SOLDER CONNECTOR**

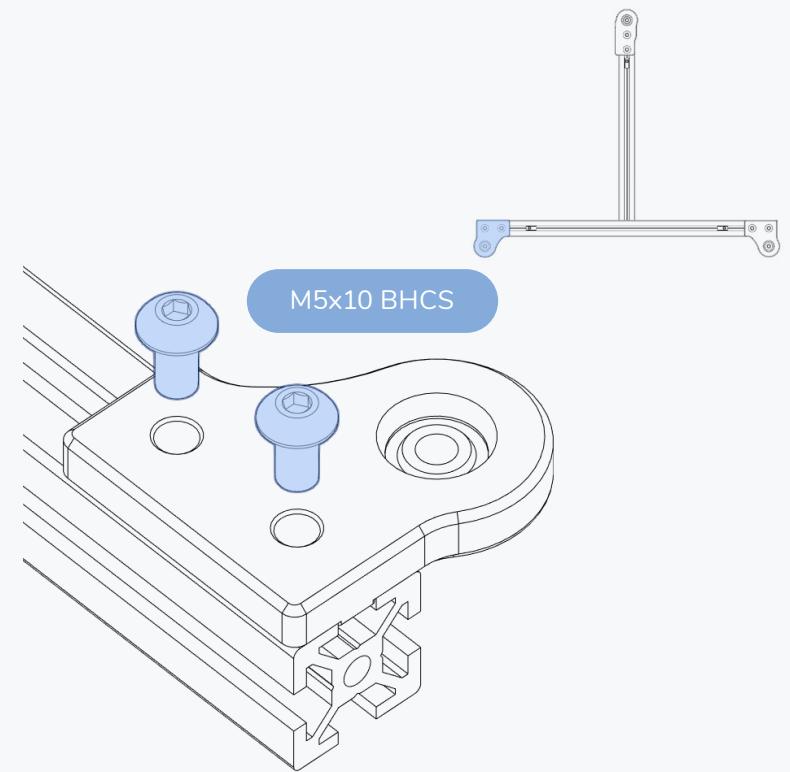
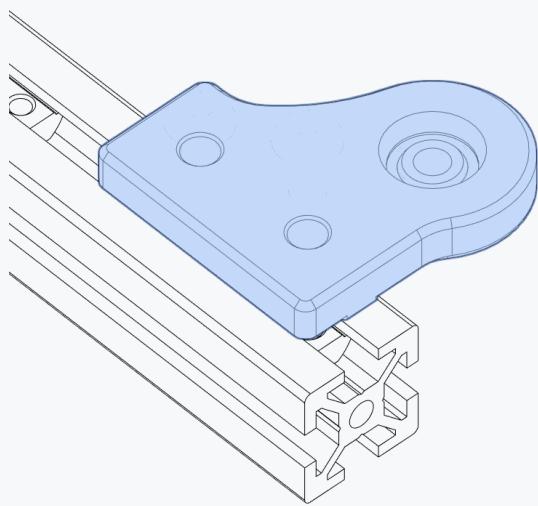
Solder a connect from the outer two terminals of the microswitch to the connector.

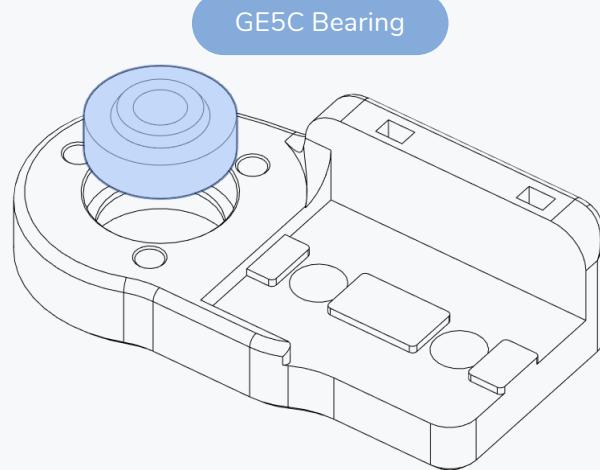




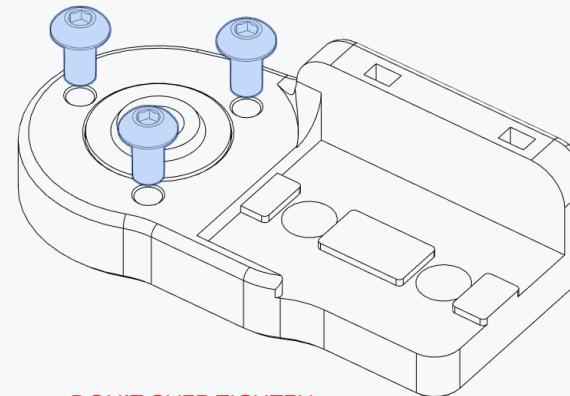
**DON'T OVER TIGHTEN**

The screws are used to position the bearing and are screwed directly into plastic.



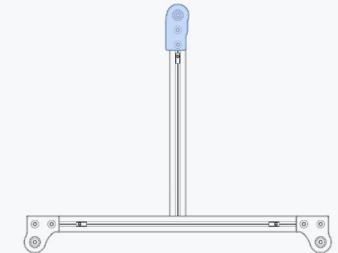


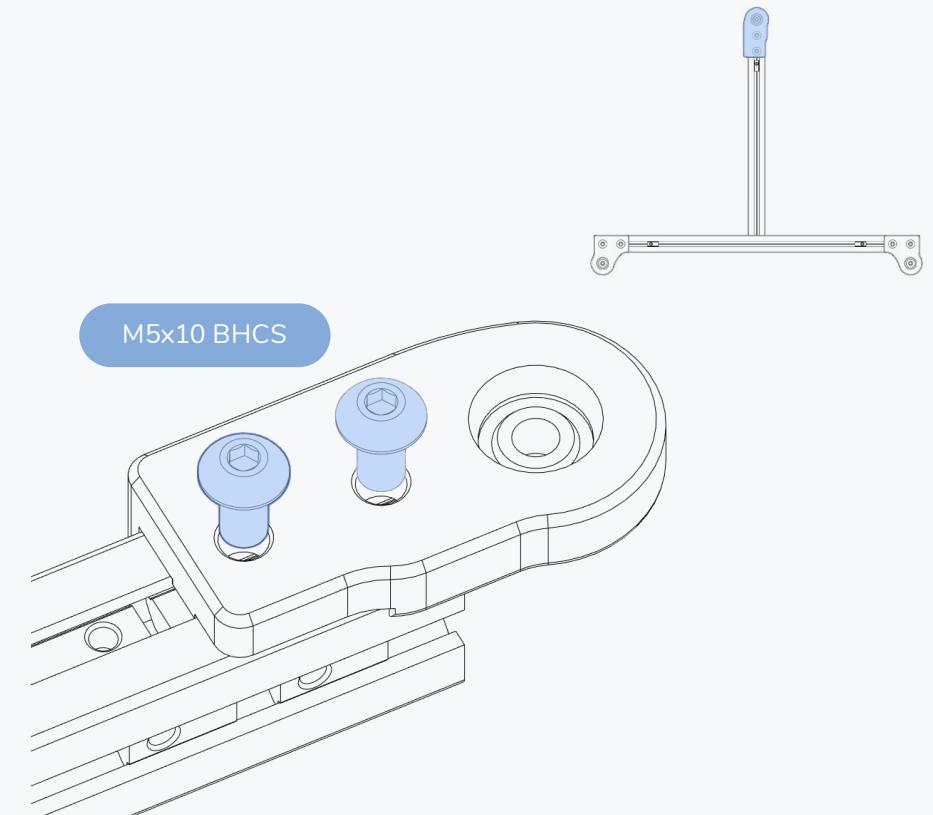
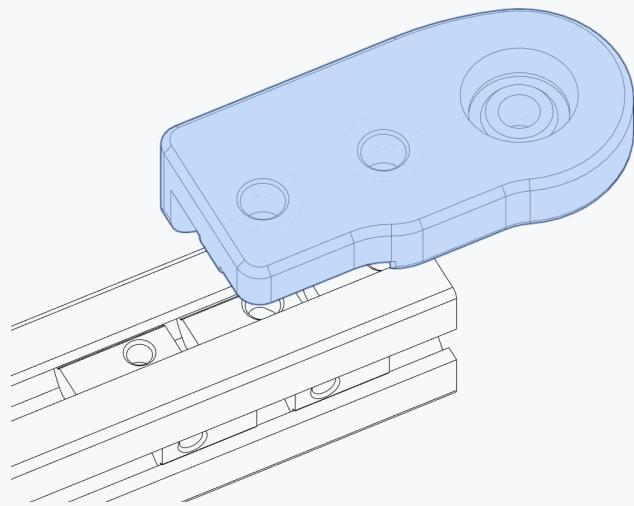
M3x6 BHCS

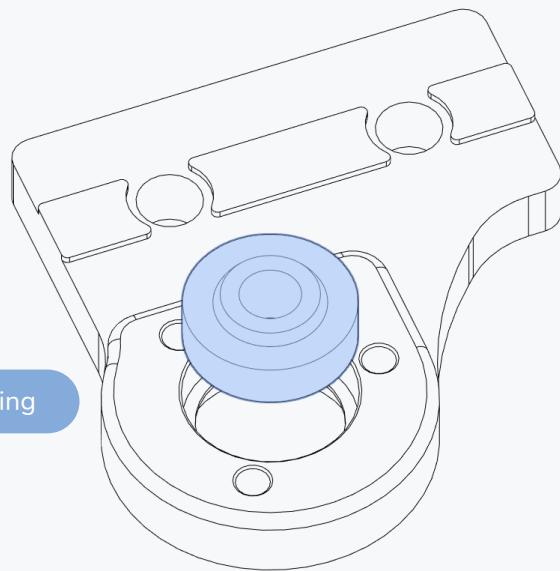


**DON'T OVER TIGHTEN**

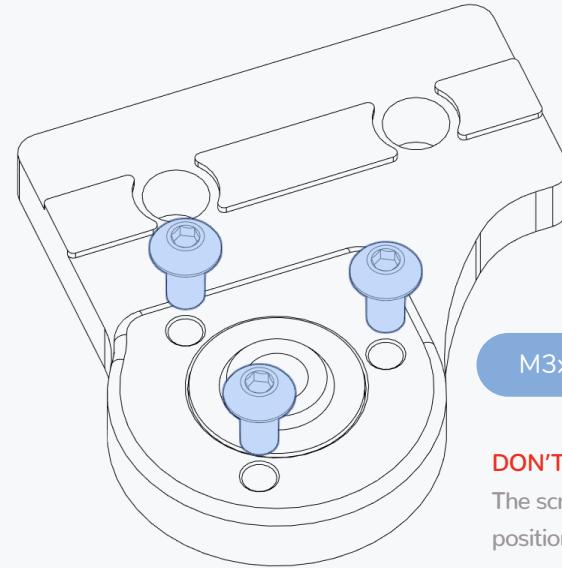
The screws are used to position the bearing and are screwed directly into plastic.







GE5C Bearing



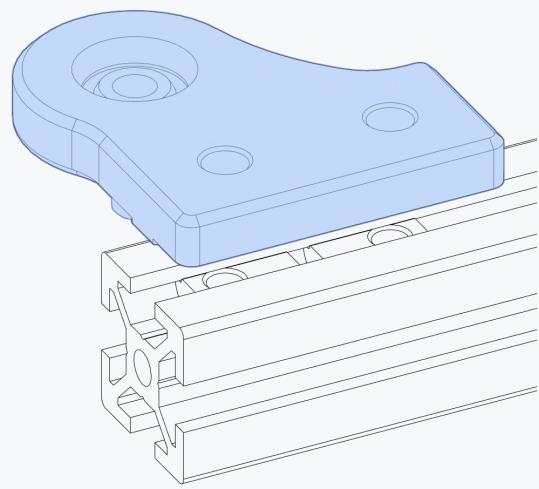
M3x6 BHCS

**DON'T OVER TIGHTEN**

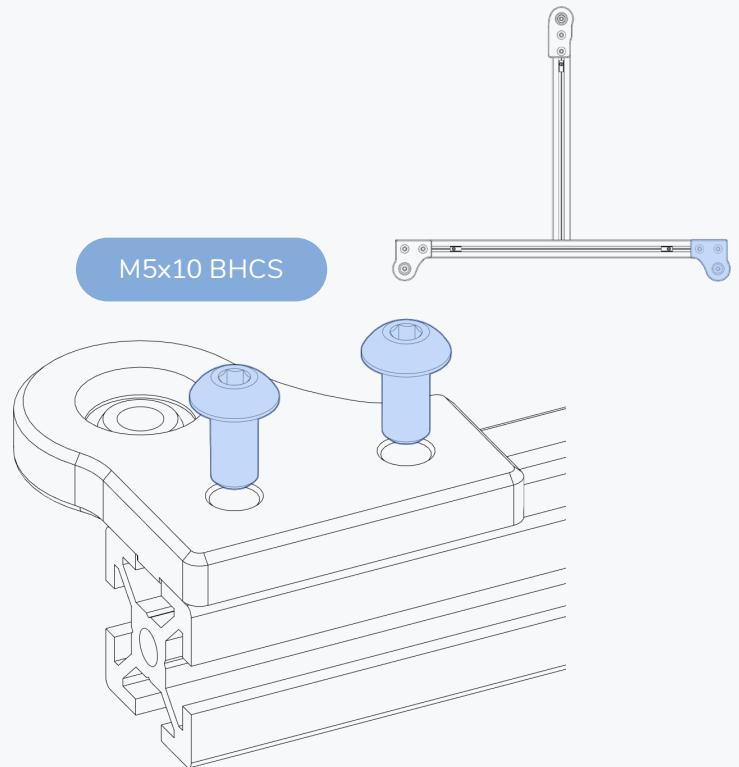
The screws are used to position the bearing and are screwed directly into plastic.

BED FRAME

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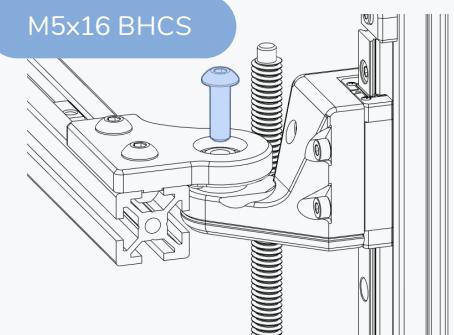
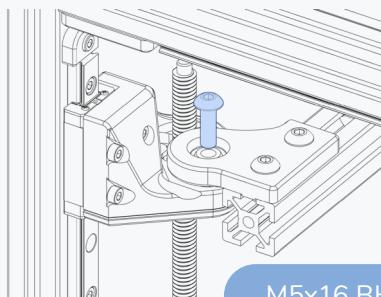
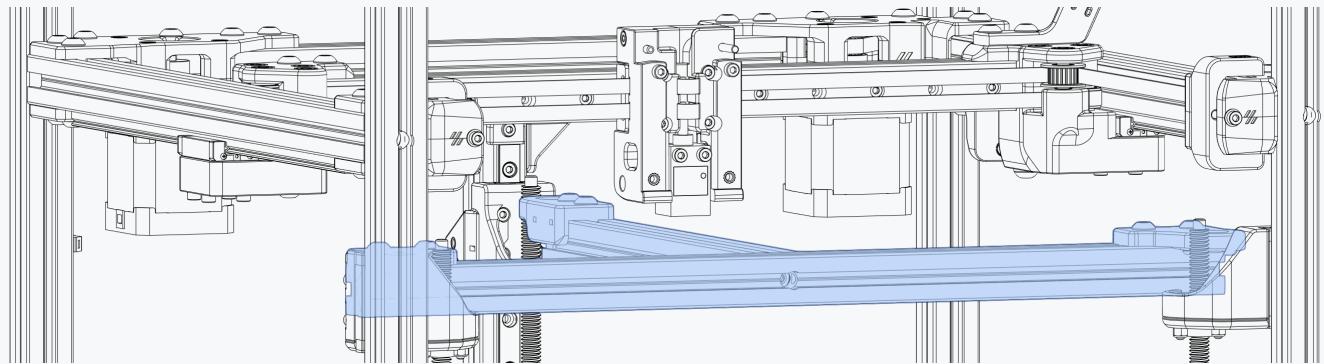
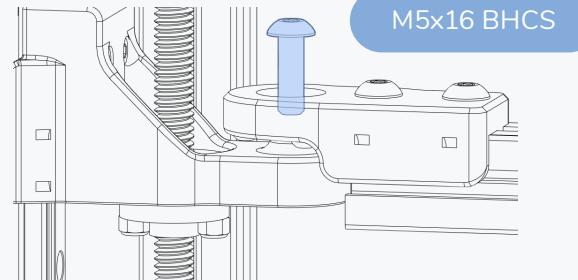


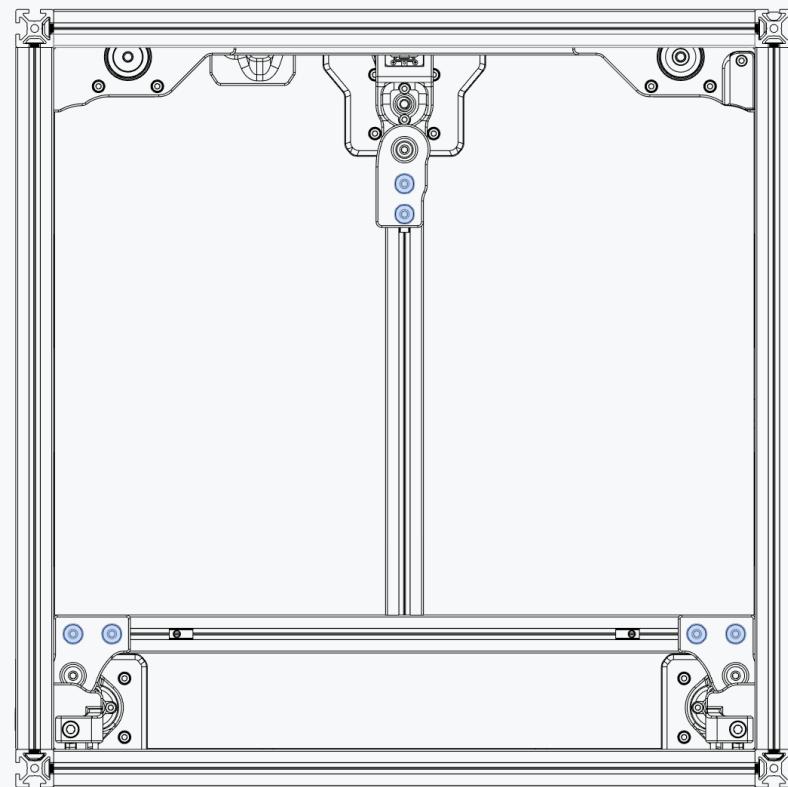
M5x10 BHCS



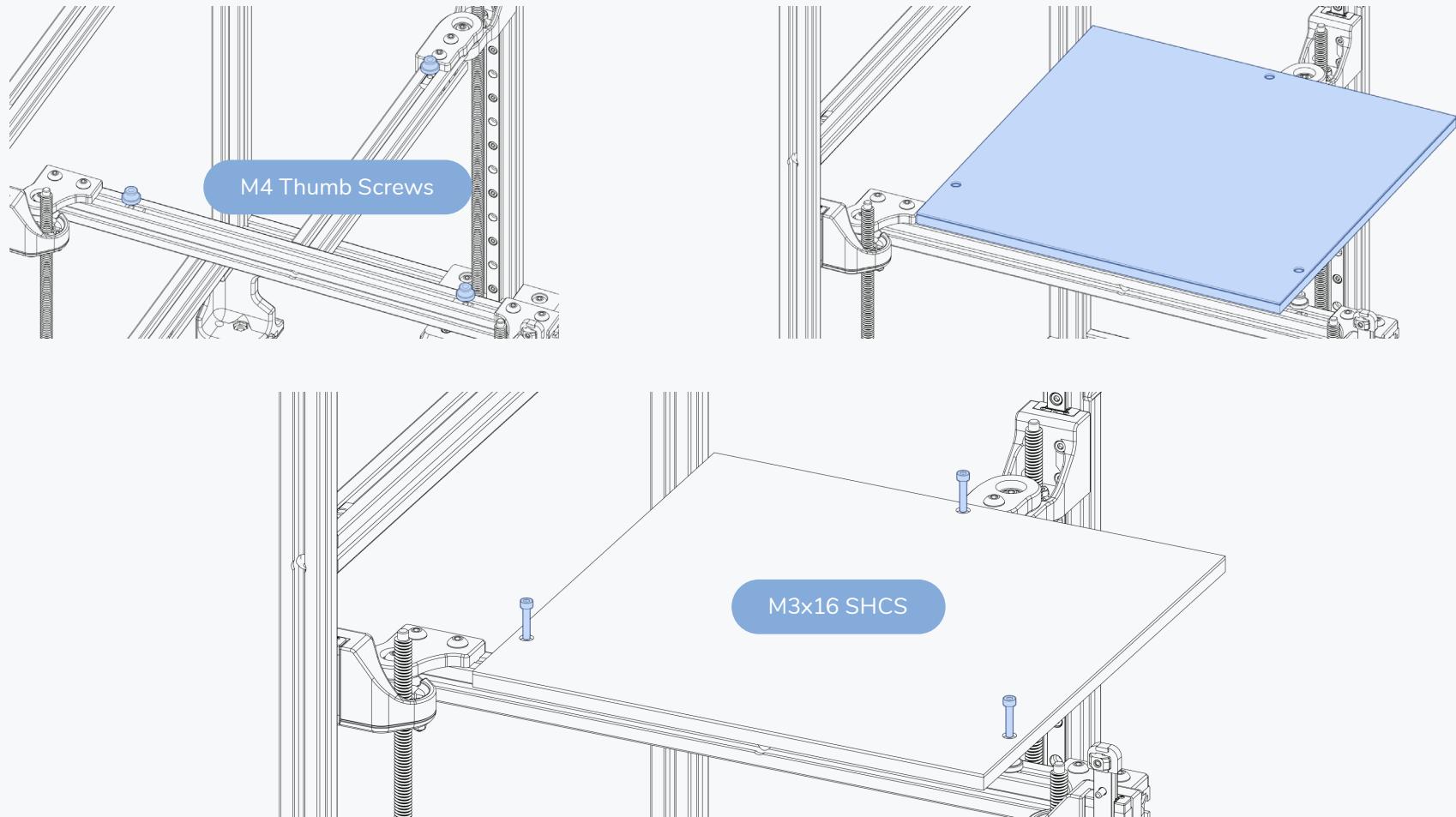
## BED FRAME

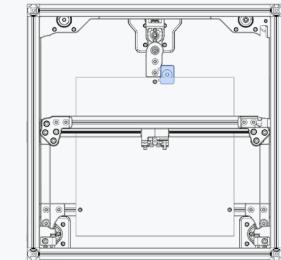
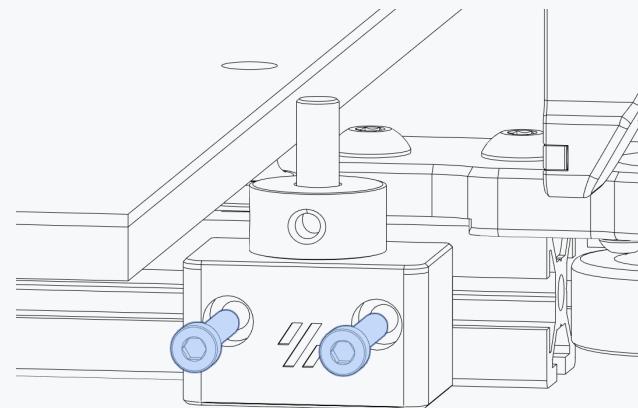
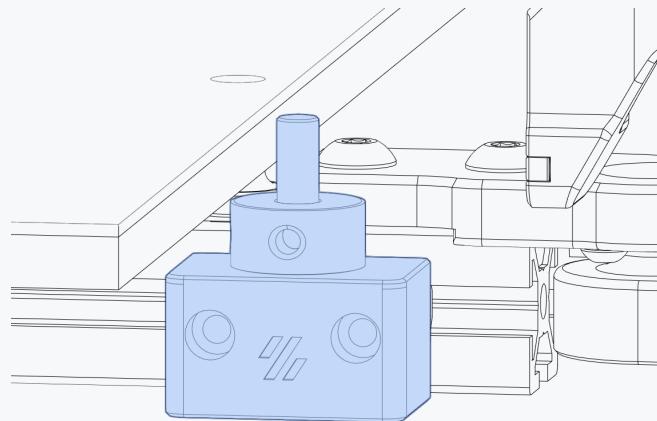
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**LOOSEN AND RETIGHTEN**

Slightly loosen the screws that hold the bed frame to the printed parts and gently shake the bed frame before retightening them.

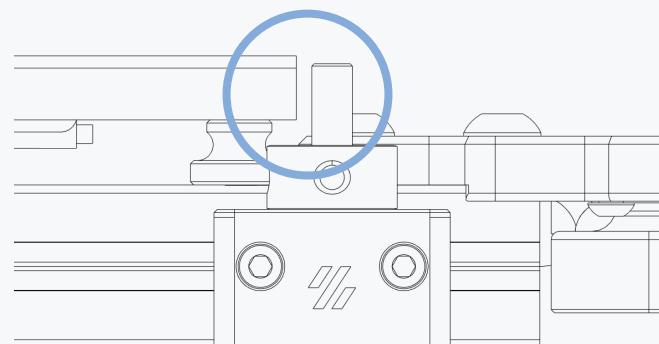




M3x20 SHCS

#### ADJUST Z ENDSTOP POSITION

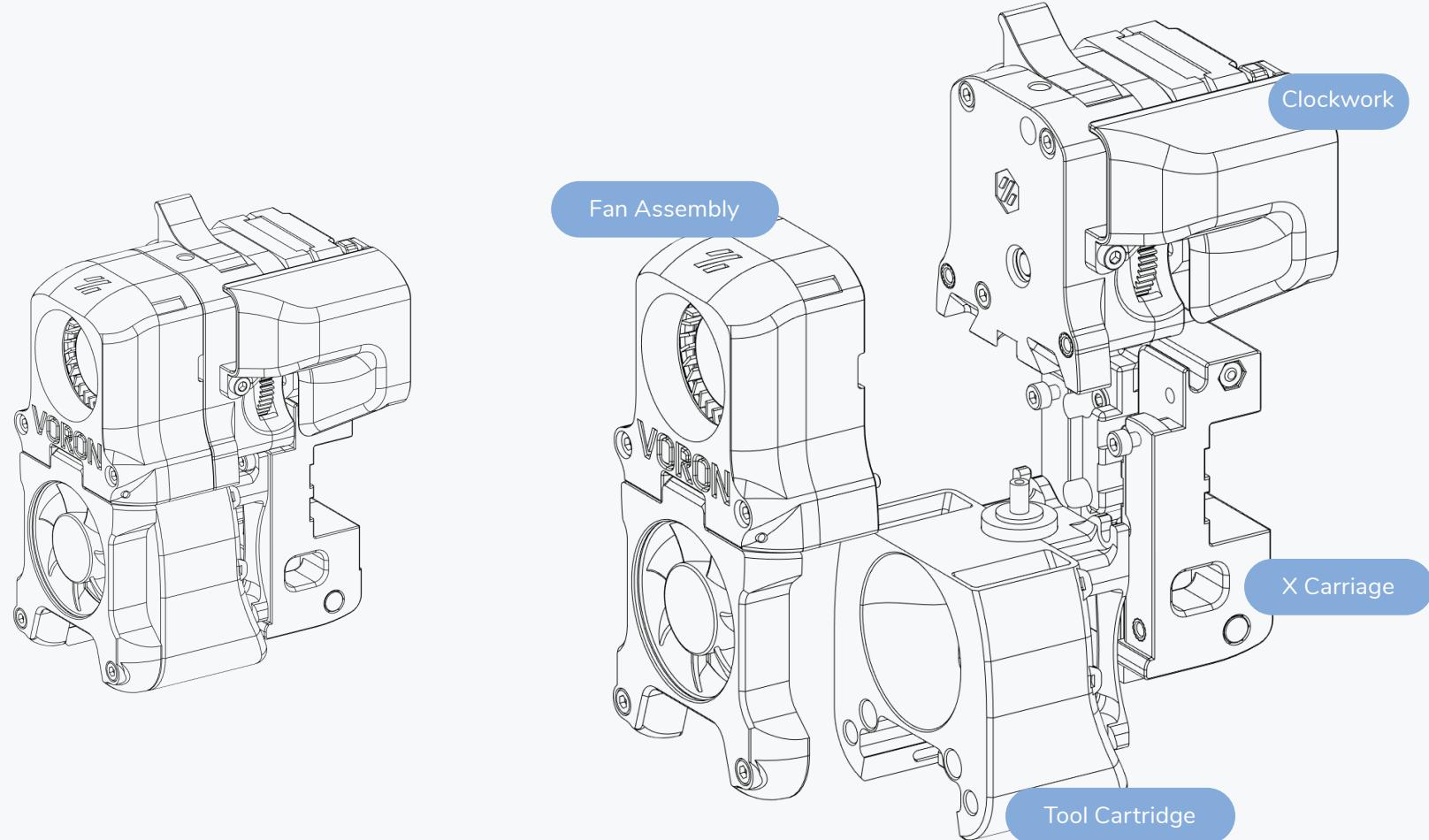
The shaft of the Z Endstop must not touch the print bed.  
Adjust the position if required.

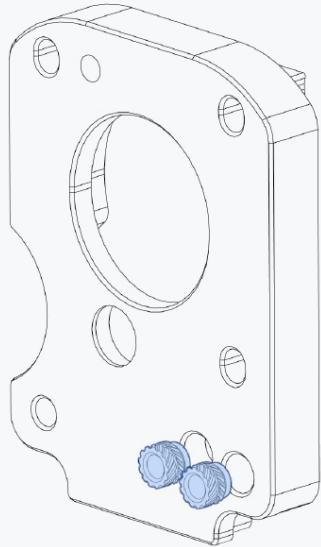


AFTERRUNNER

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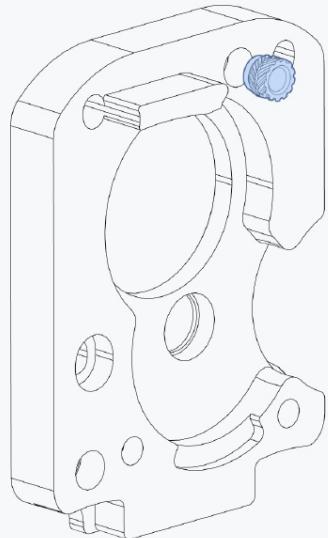




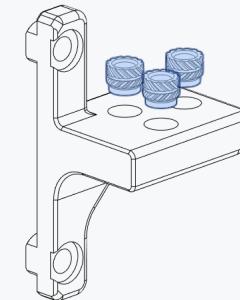
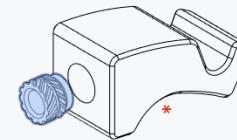
### HEAT SET INSERTS

You will need to install heat set inserts into various plastic parts.

If you need help on the correct procedure, ask in Discord.

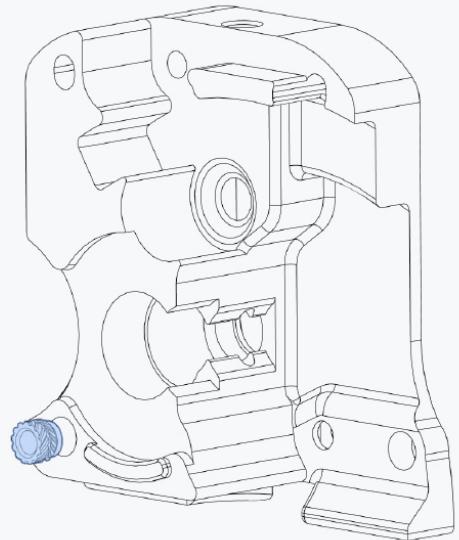


Heat Set Insert

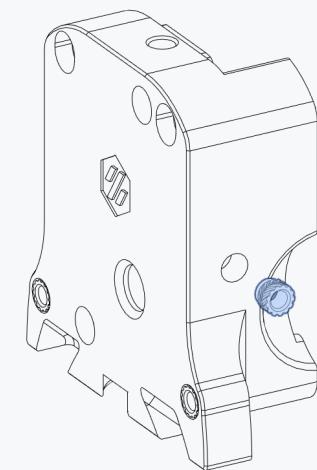
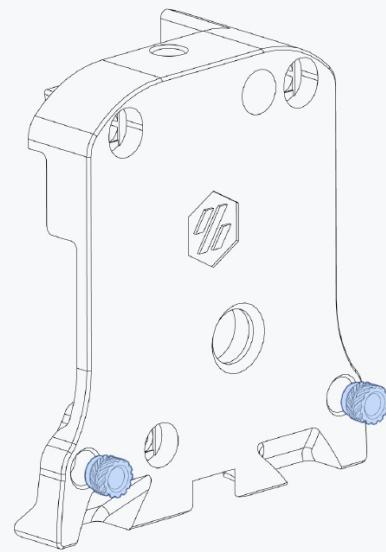


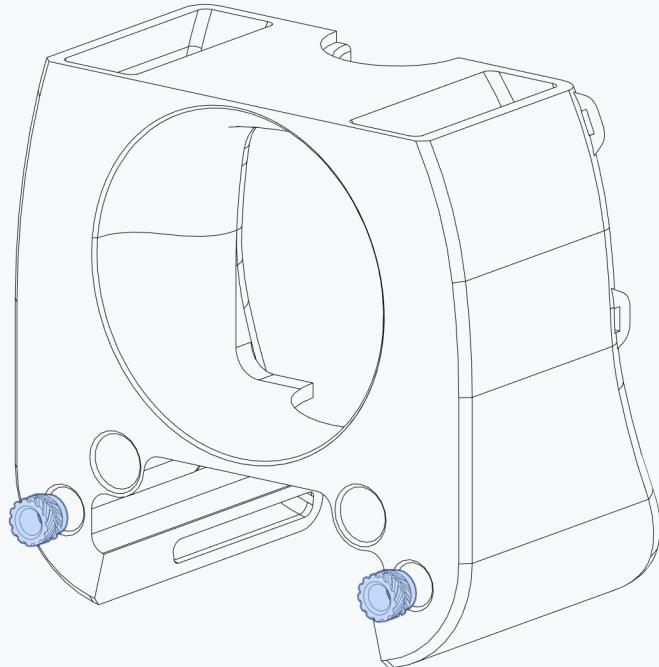
## HEAT SET INSERTS

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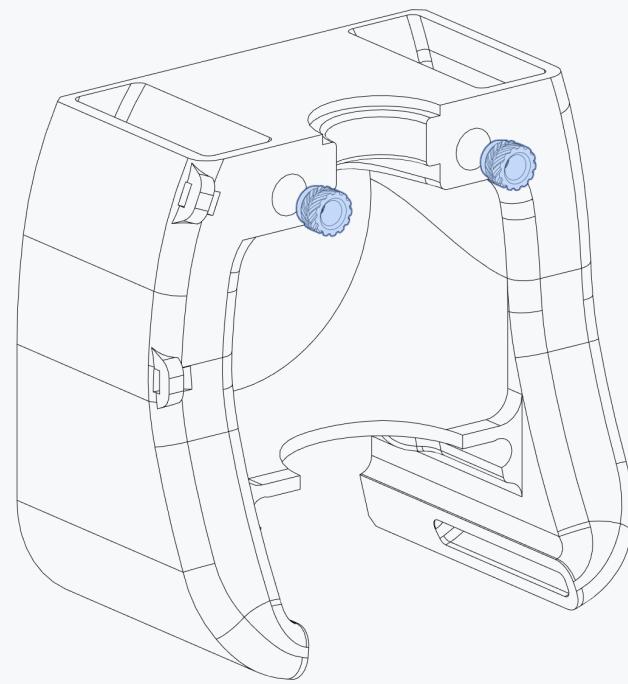


Heat Set Insert



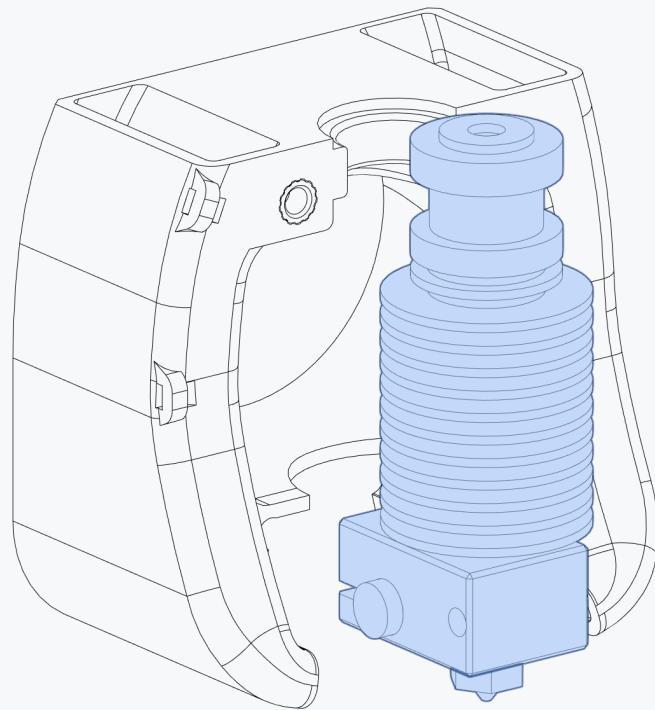


Heat Set Insert

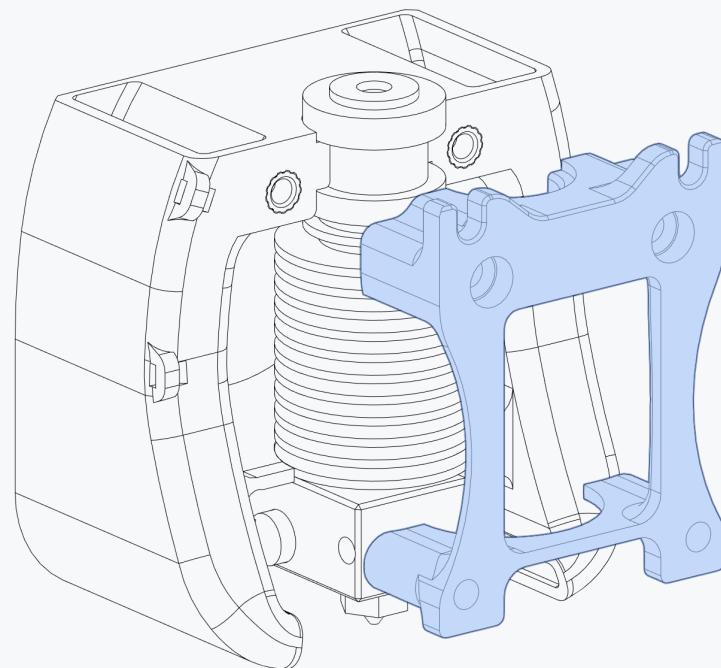


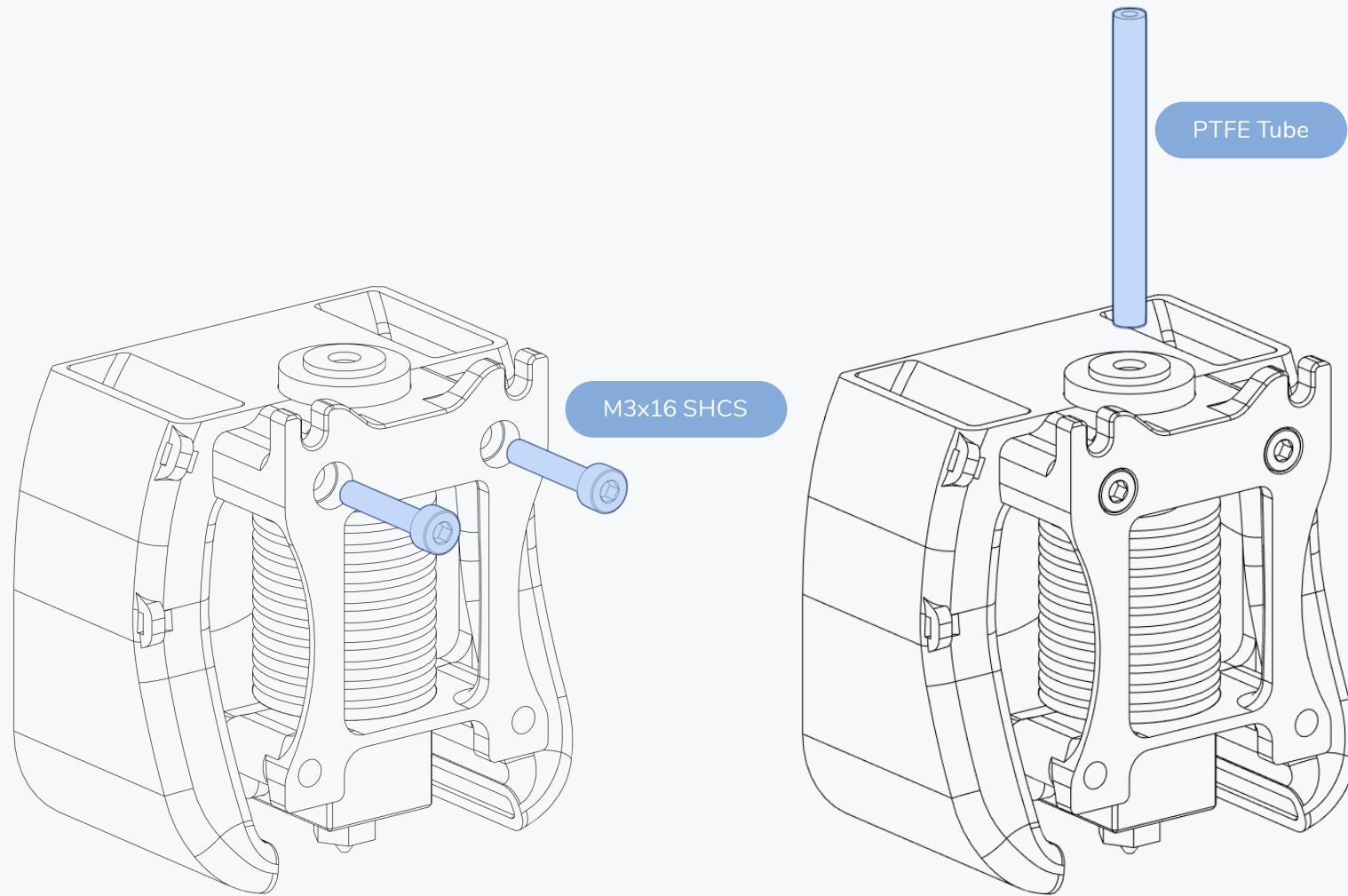
#### AVAILABLE MOUNTS

We also provide mounts for the Slice Engineering Mosquito and TriangleLab/Phaetus Dragon Hotend. They are assembled in a similar manner.

**HEATER AND SENSOR**

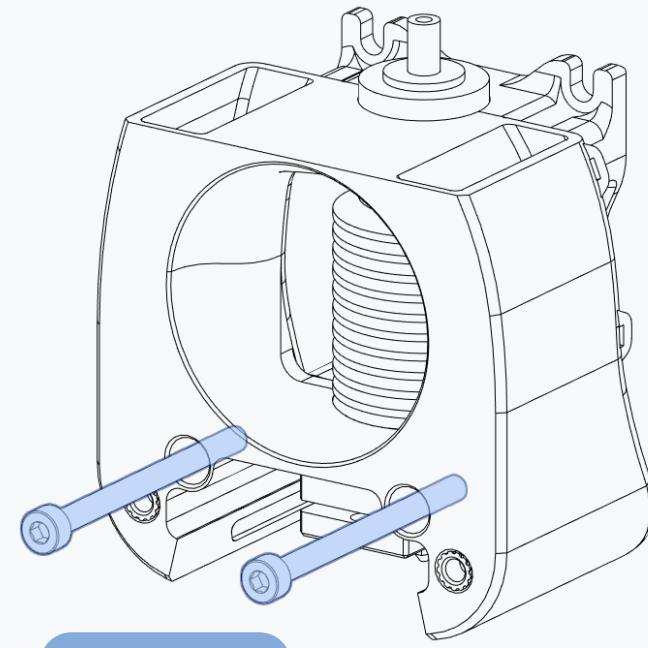
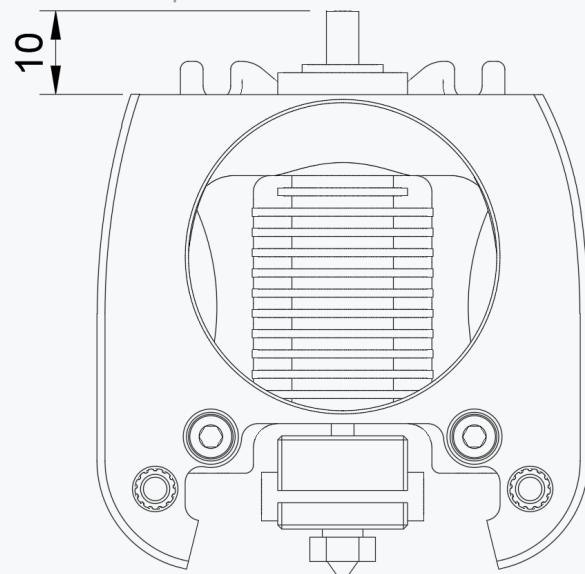
We do not show the heater and temperature sensor cartridge in the drawing. Install them prior to assembling the toolhead.

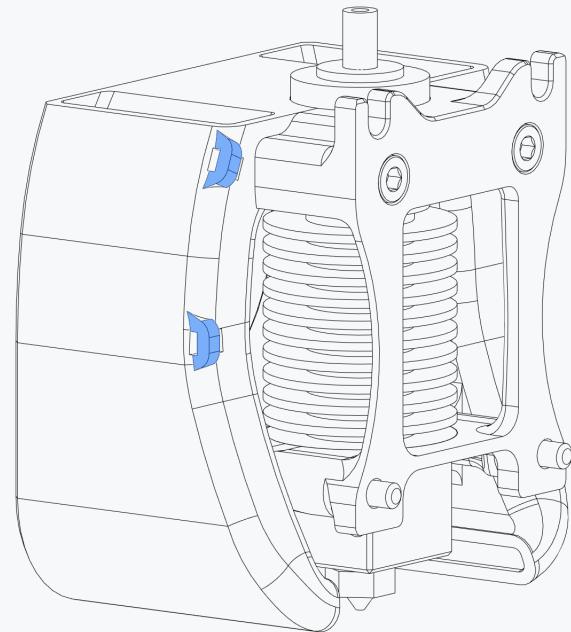
**E3D V6 Hot End**



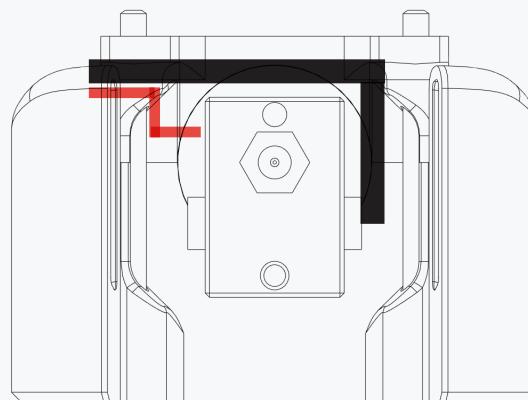
**PTFE STICKOUT**

The PTFE tube should end 10mm above the surface of the printed part.

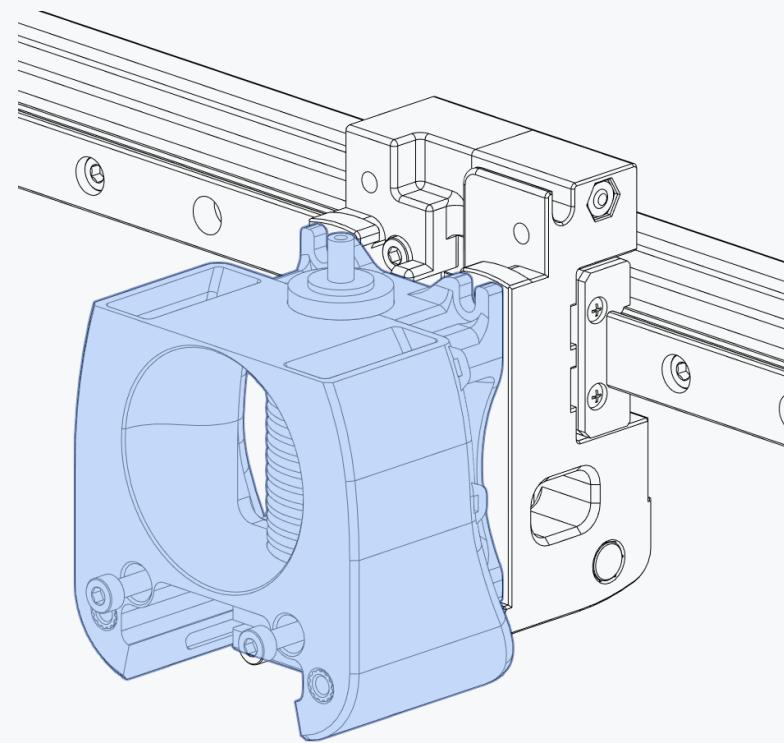
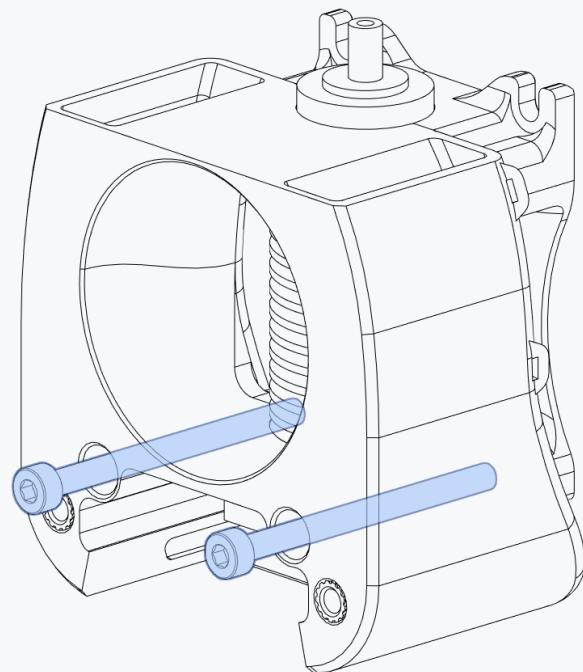


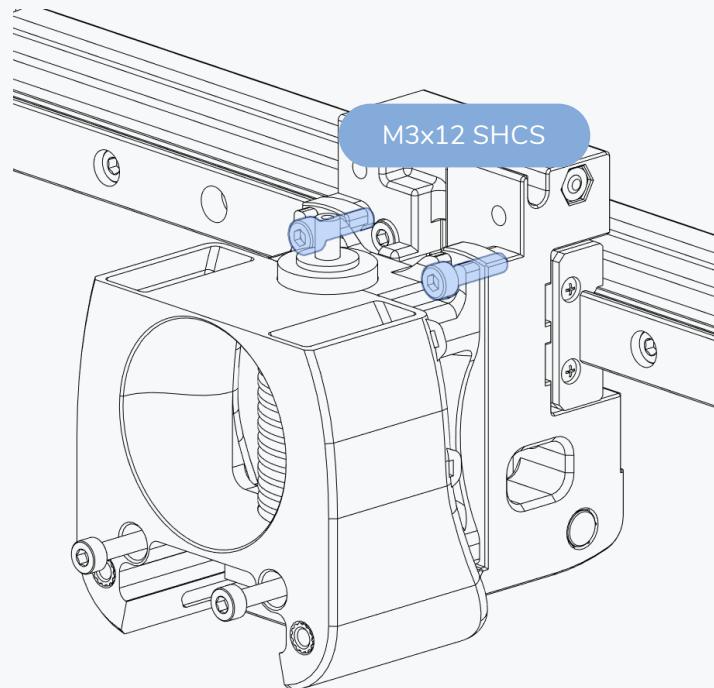
**WIRING PATH**

Guide the wires in the highlighted path.

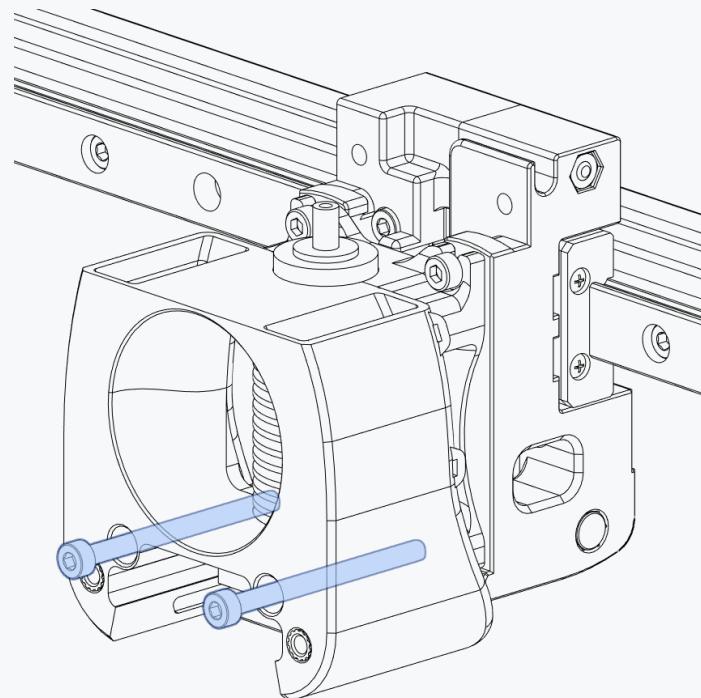
**CHECK ORIENTATION**

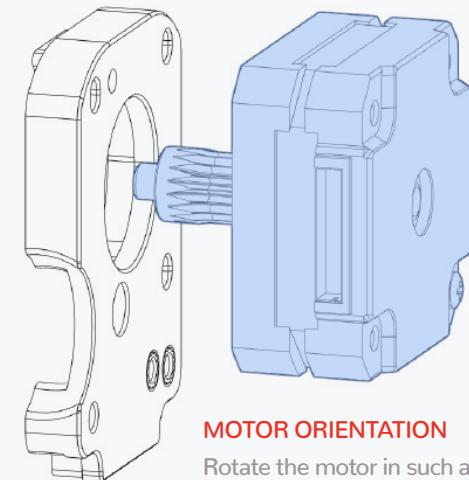
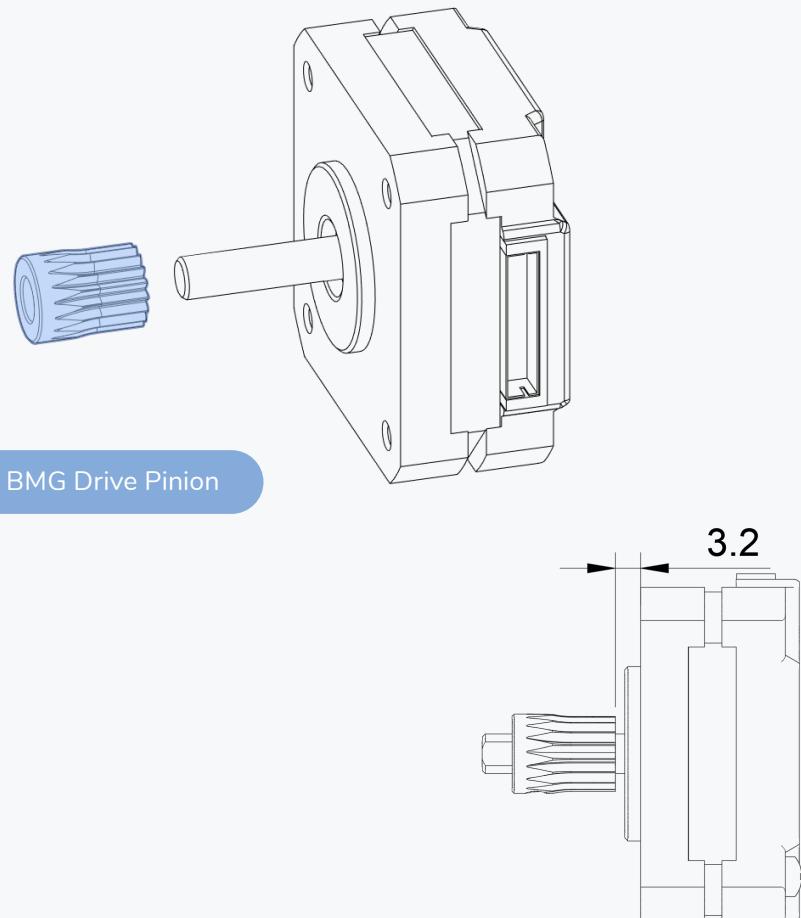
The heater block must point forwards.



**MOTOR ORIENTATION**

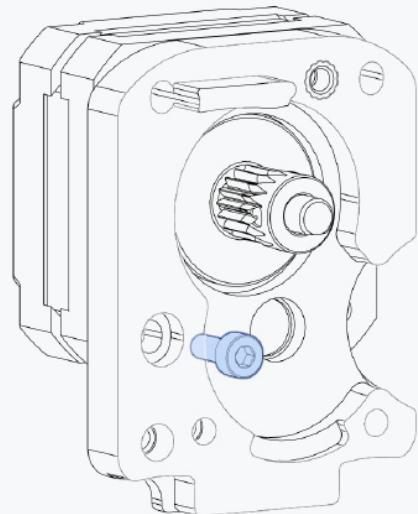
The screws are used to index the tool cartridge. Leave them slightly loose so that the cartridge can be slid out.



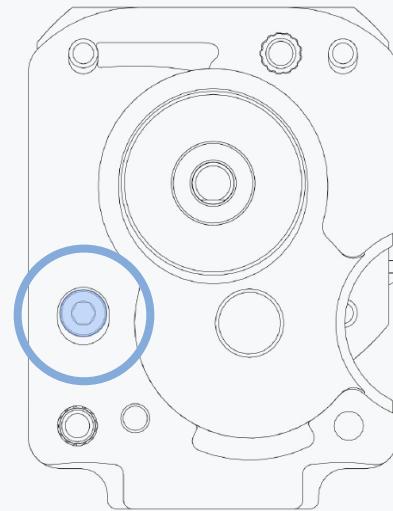
**MOTOR ORIENTATION**

Rotate the motor in such a way that the connector/wires are on the left side when looking at it from the back.

This side will be covered by the cable cover later.



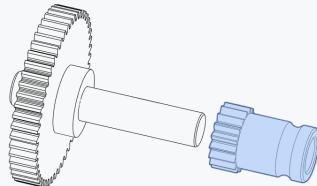
M3x8 SHCS



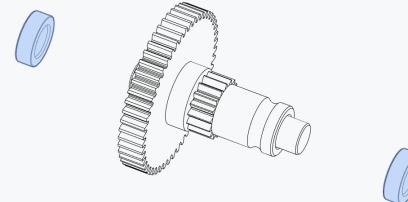
#### ADJUSTABLE MOTOR POSITION

The motor position is adjustable to allow for a proper meshing of the drive gears.

Start in the top most position of the slot.



BMG Drive Gear



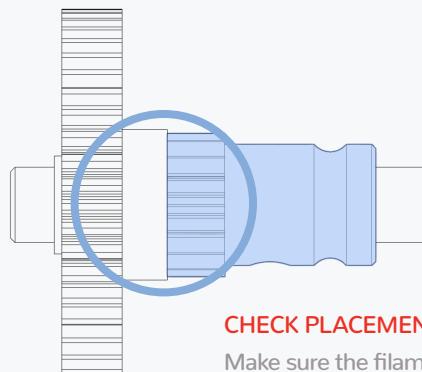
MR85 Bearing

**CHECK BEARING FIT**

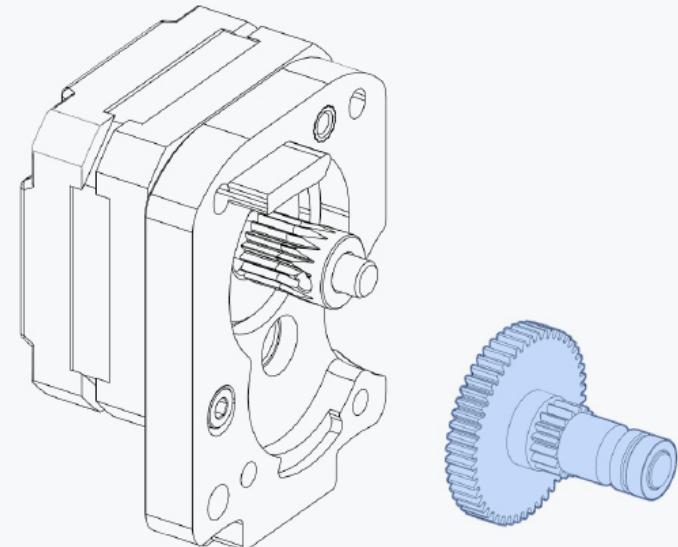
The bearings must slip on and off the shaft easily to allow the gear to self centre. Do not shim into position.

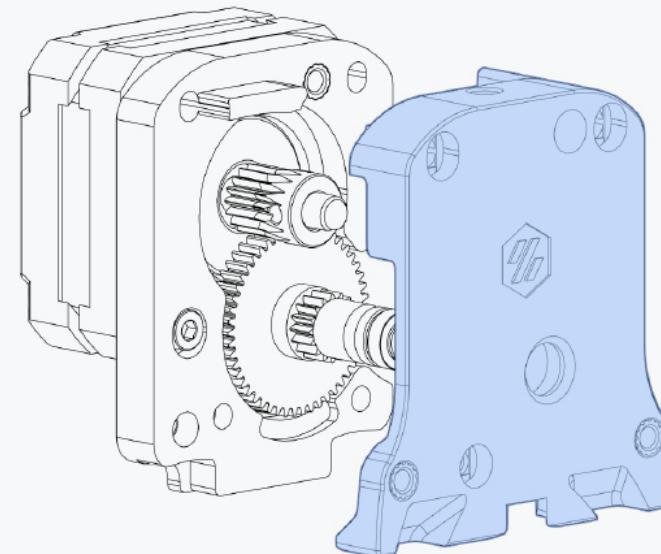
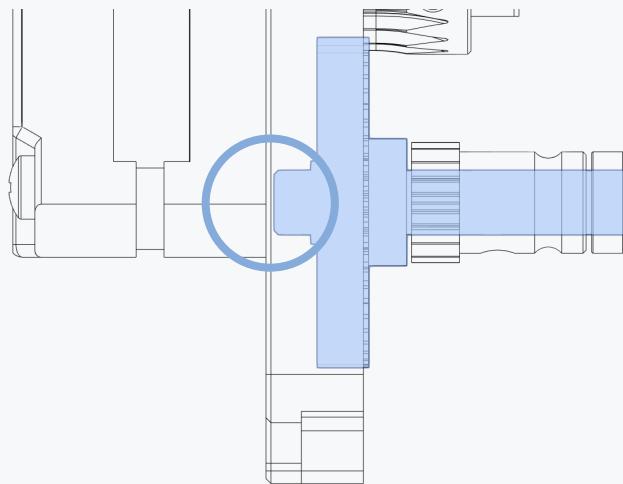
Pressing the bearings on the shaft will damage them.

Lightly sand the shaft if required.

**CHECK PLACEMENT**

Make sure the filament drive gear is fully seated against the drive shaft gear.





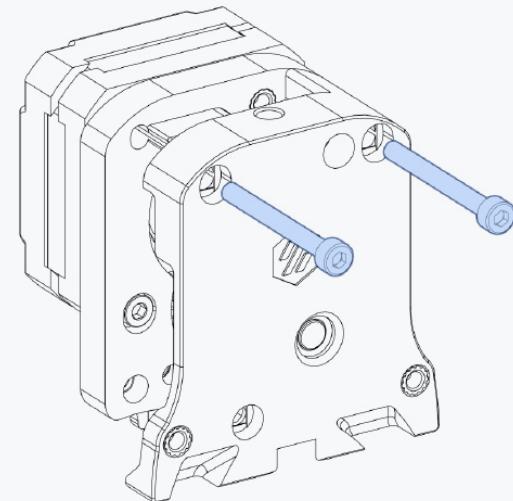
M3x30 SHCS

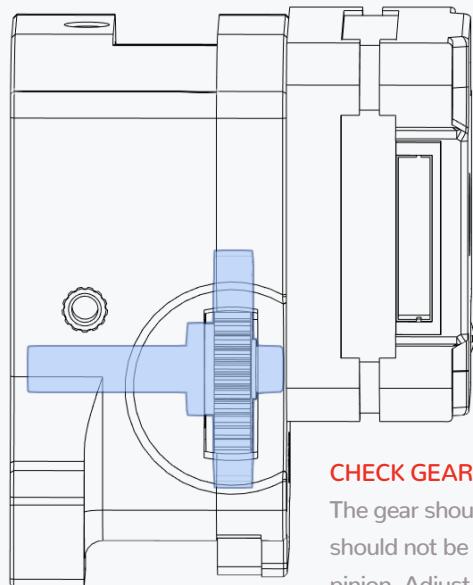
#### CHECK FOR CLEARANCE

The drive shaft must not touch the motor housing.

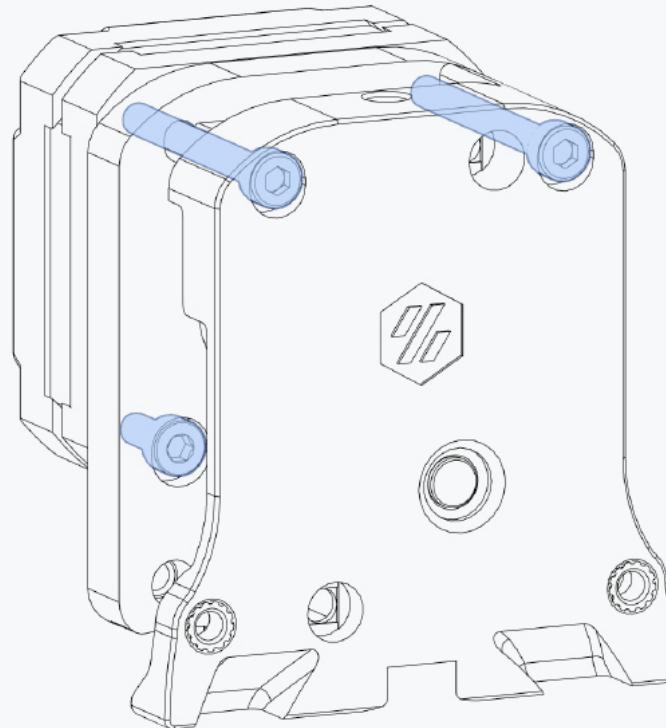
Check if the shaft has sufficient clearance when fully seated.

Sand the face of shaft if required.

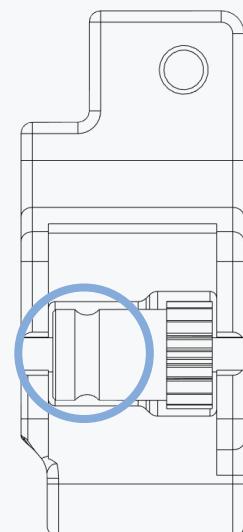
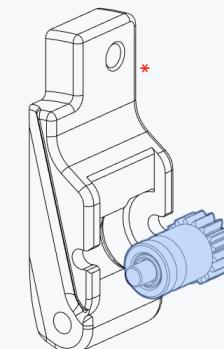
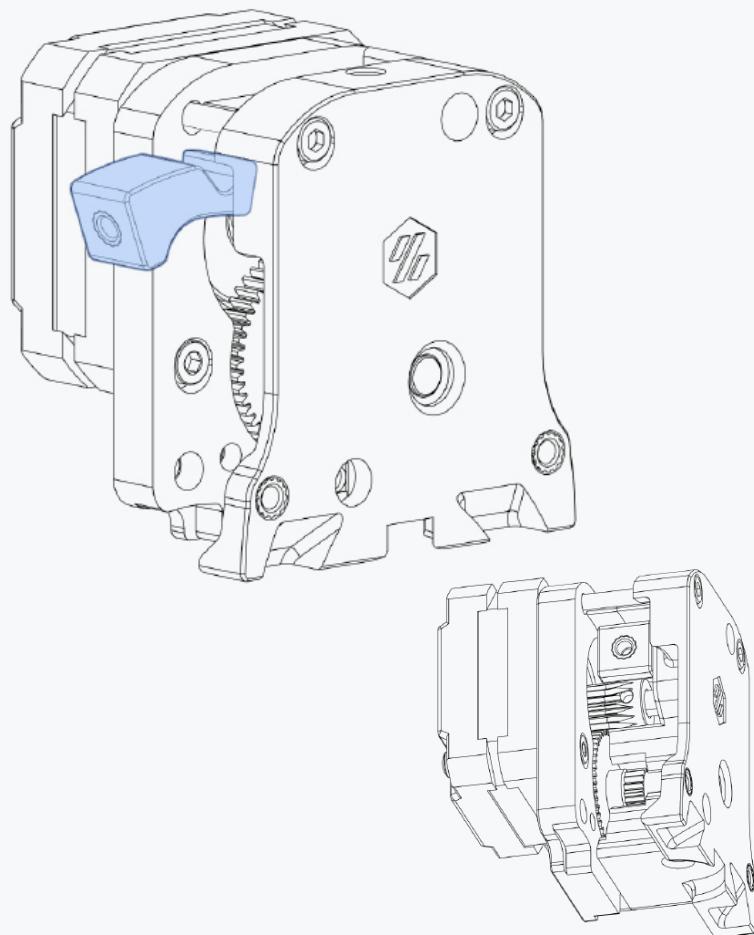


**CHECK GEAR PLAY**

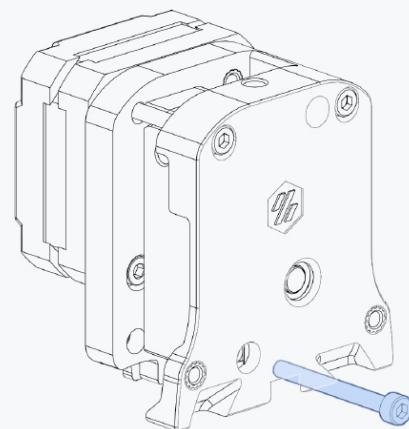
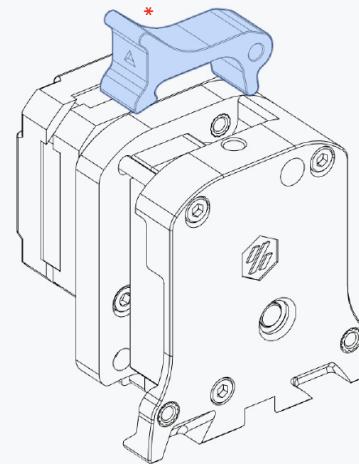
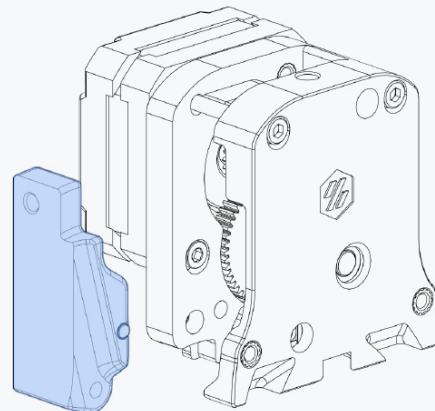
The gear should have a slight play and should not be fully tight against the pinion. Adjust the position of the motor until you have a faint play.



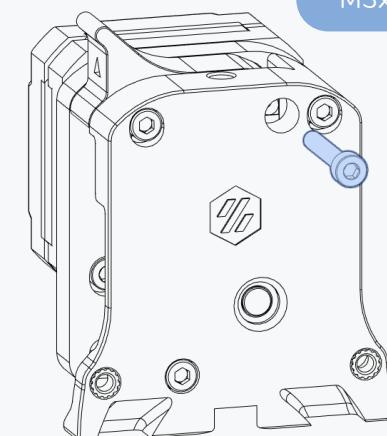
BMG Idler Assembly

**LUBRICATE BEARINGS**

A lubrication film is required to ensure smooth operation and longevity.  
Refer to the BOM for lubricant options.

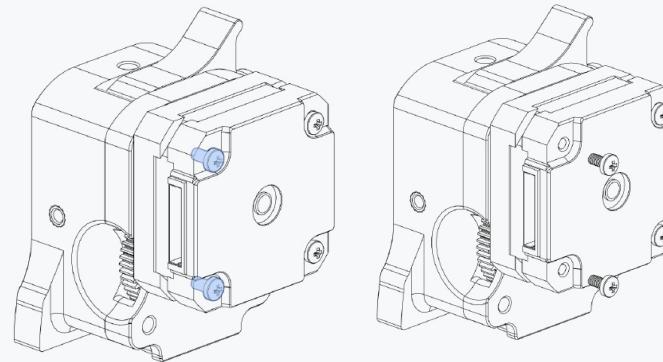


M3x30 SHCS

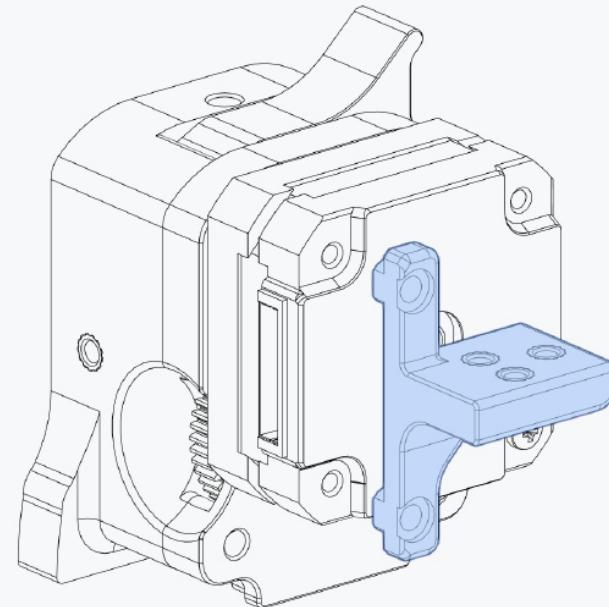
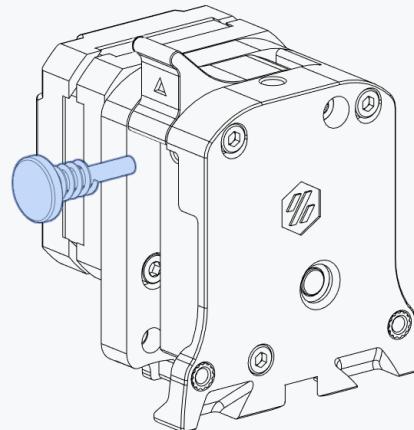


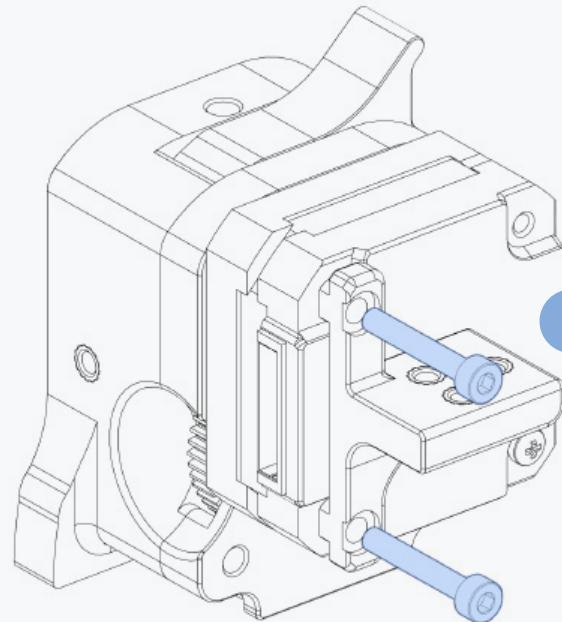
M3x20 SHCS

BMG Thumb Screw

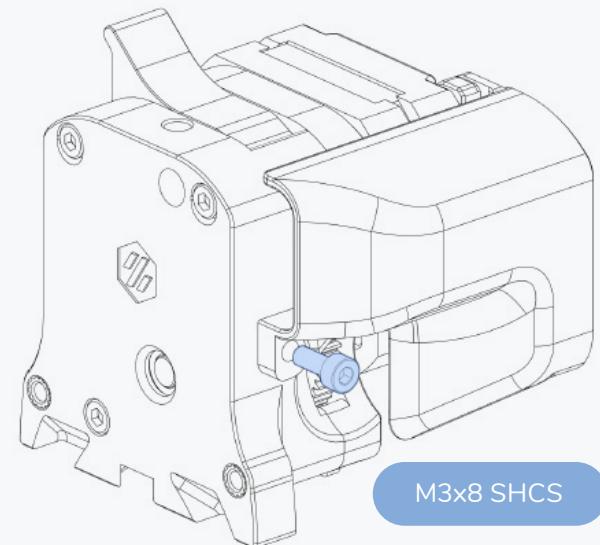
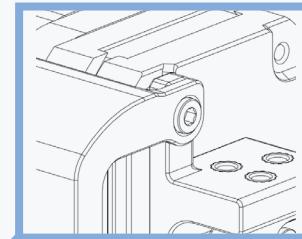
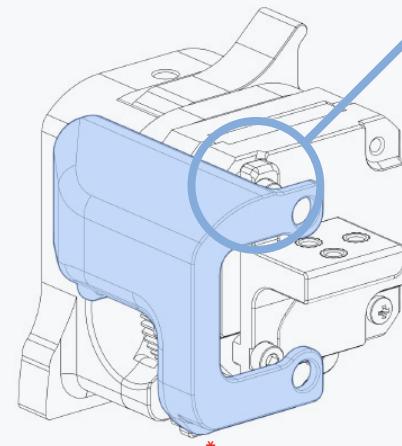
**REMOVE SCREWS**

Carefully remove the screws from the left side of the motor. They will be replaced with new screws in the next step.





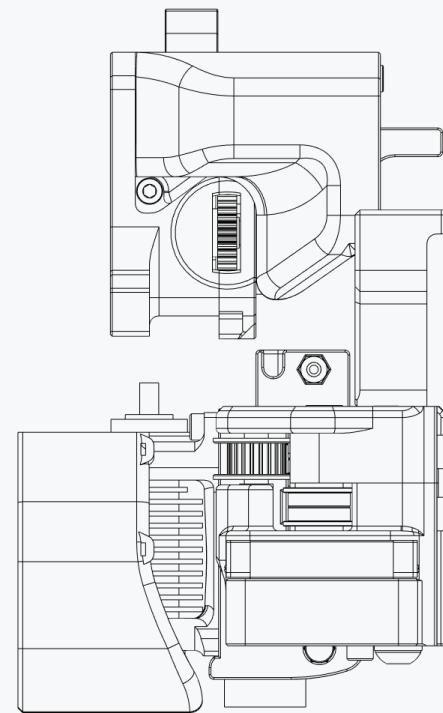
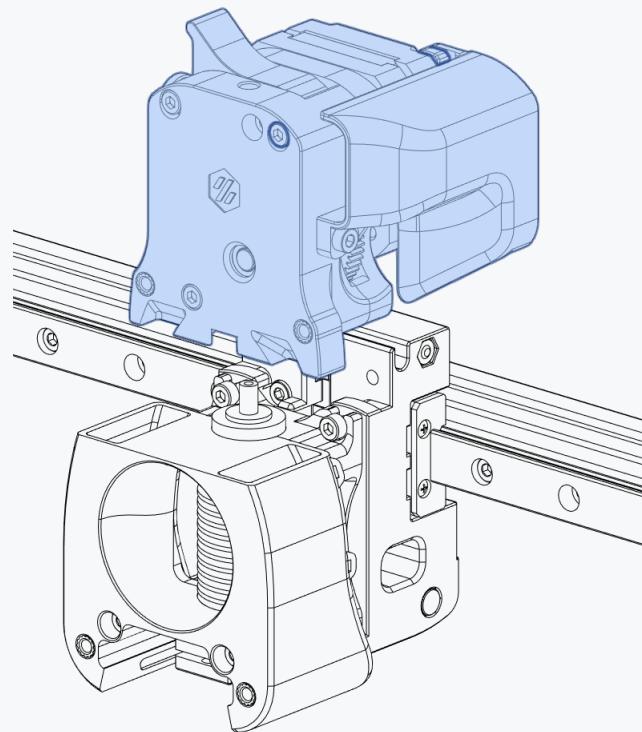
M3x20 SHCS

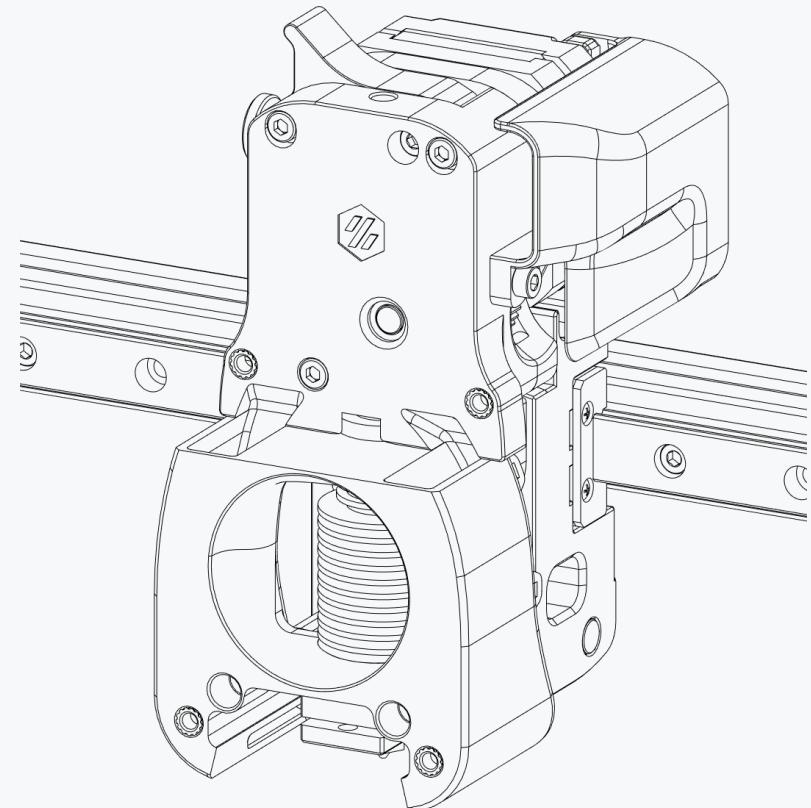
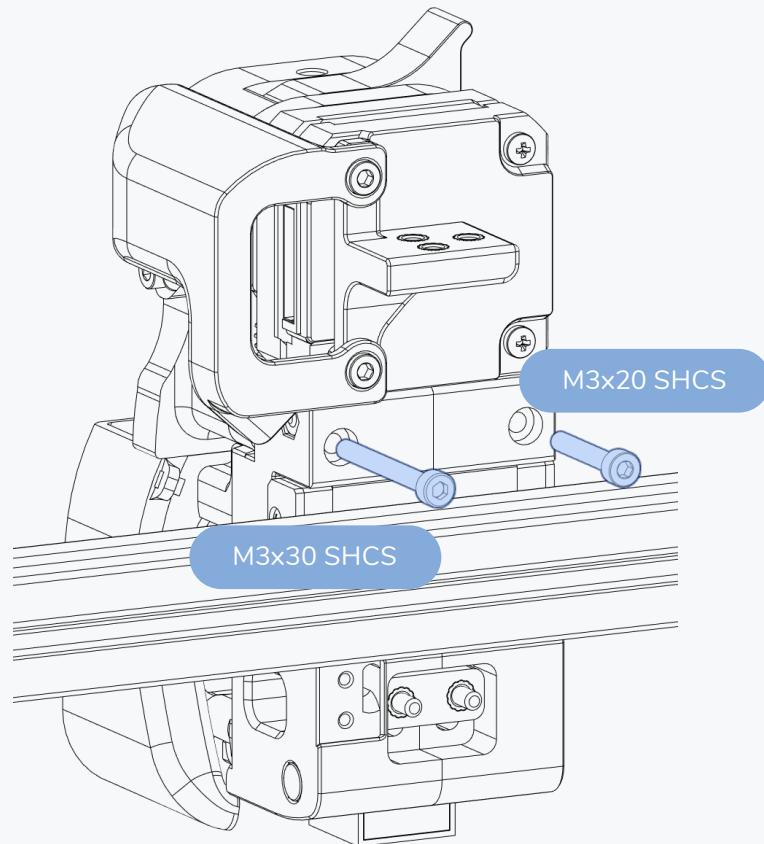


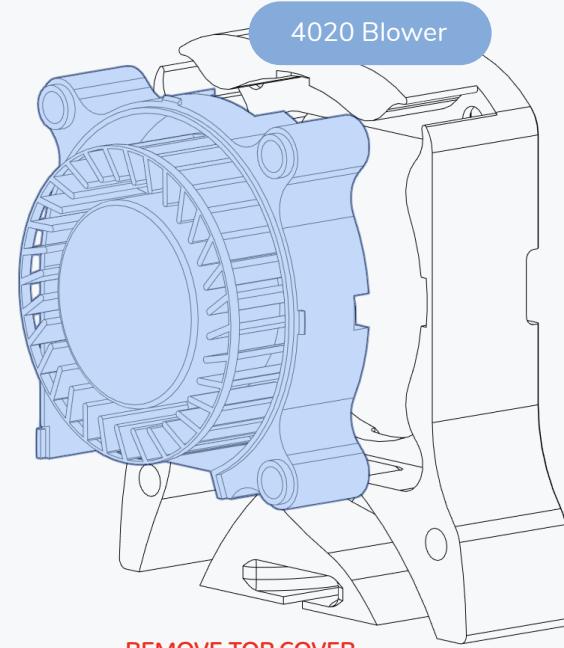
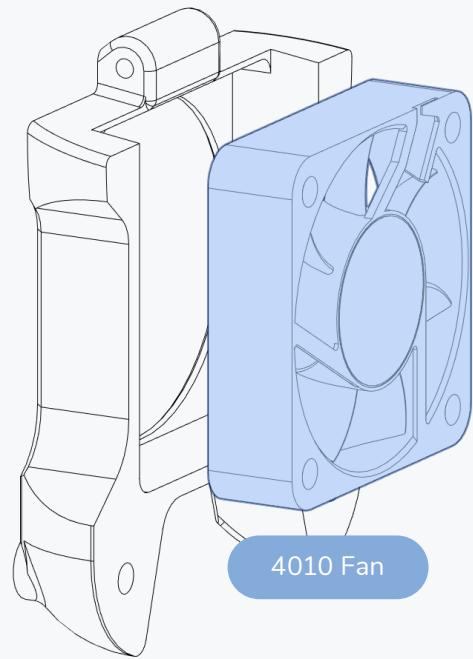
M3x8 SHCS

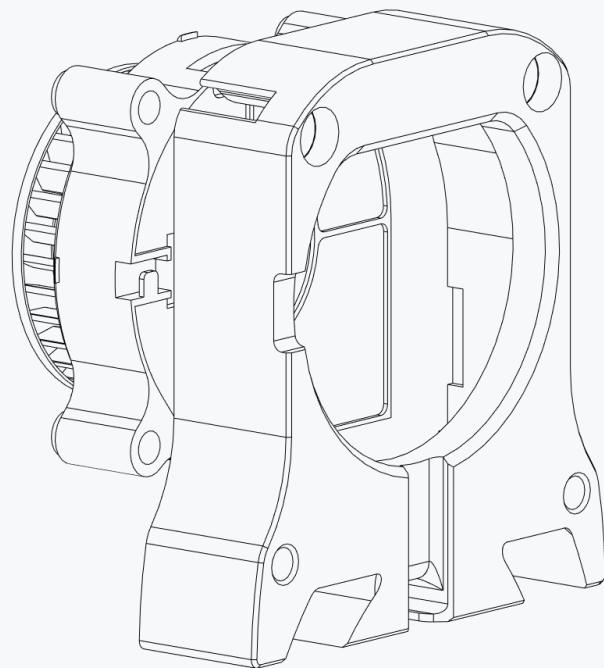
CLOCKWORK

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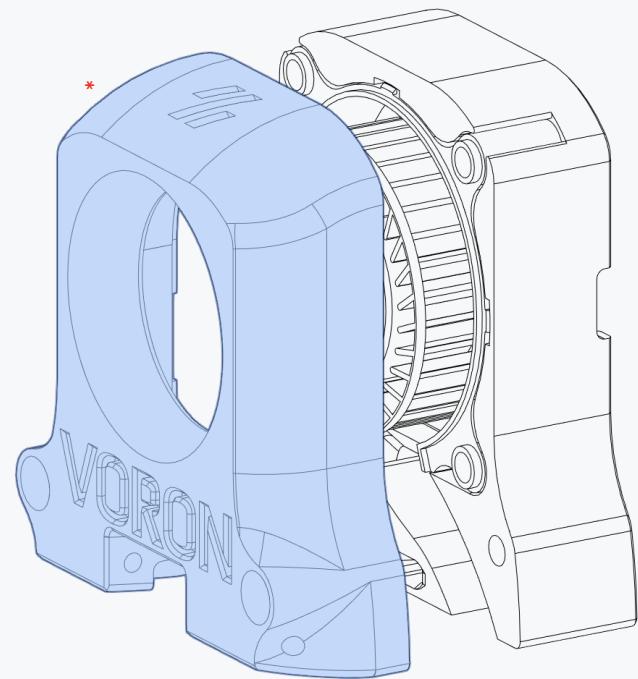






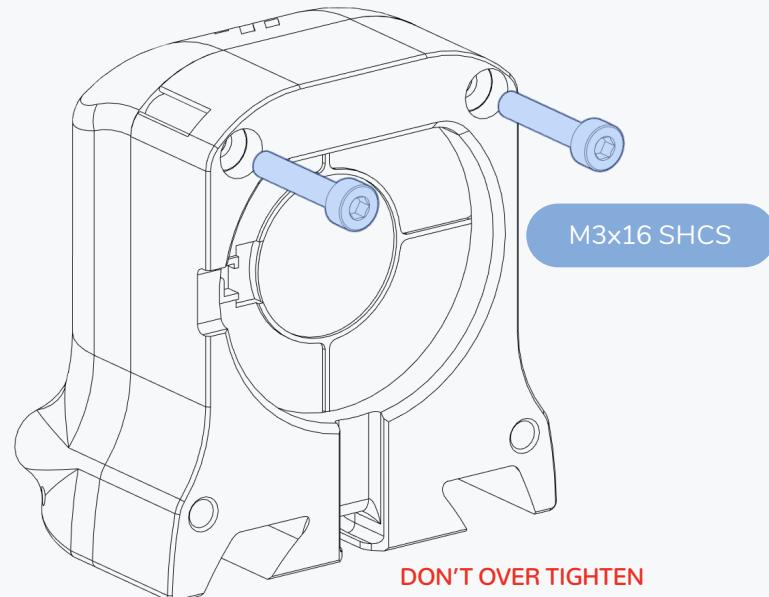
**WIRING PATH**

Route the wires through the large opening in the back.



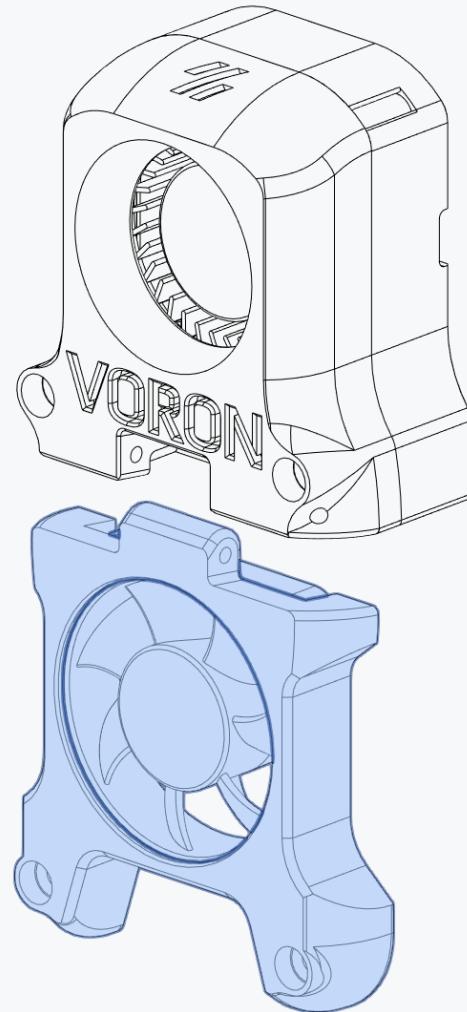
## FAN ASSEMBLY

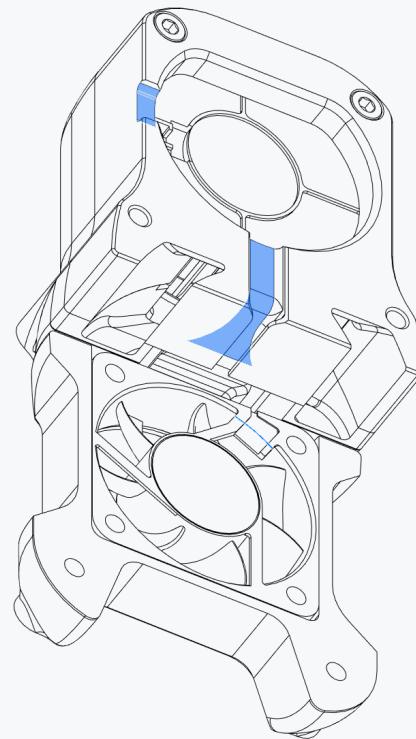
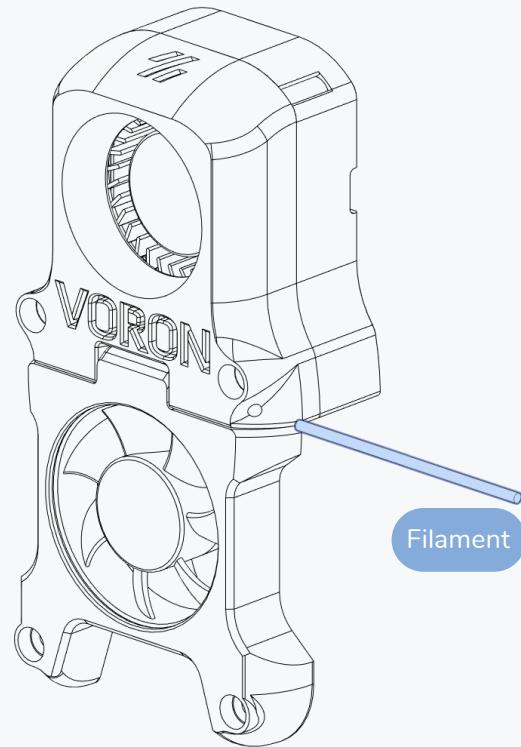
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**DON'T OVER TIGHTEN**

The screws are threaded  
directly into plastic.



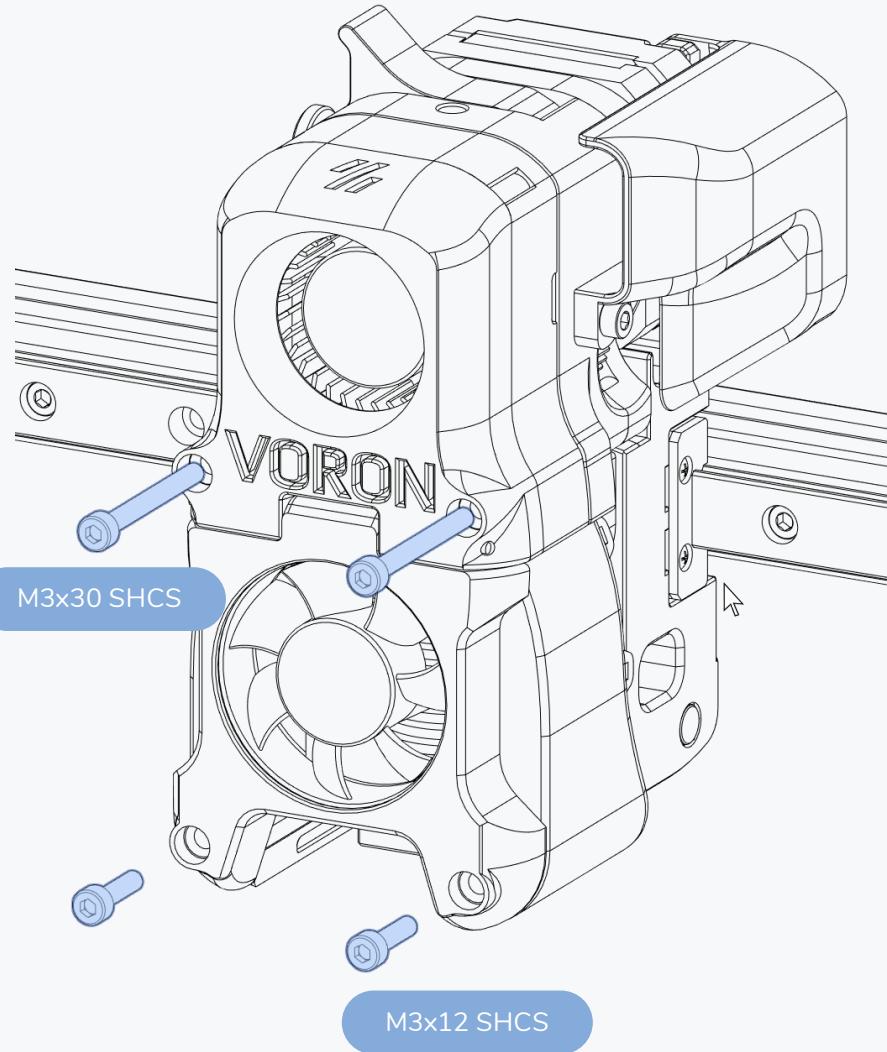
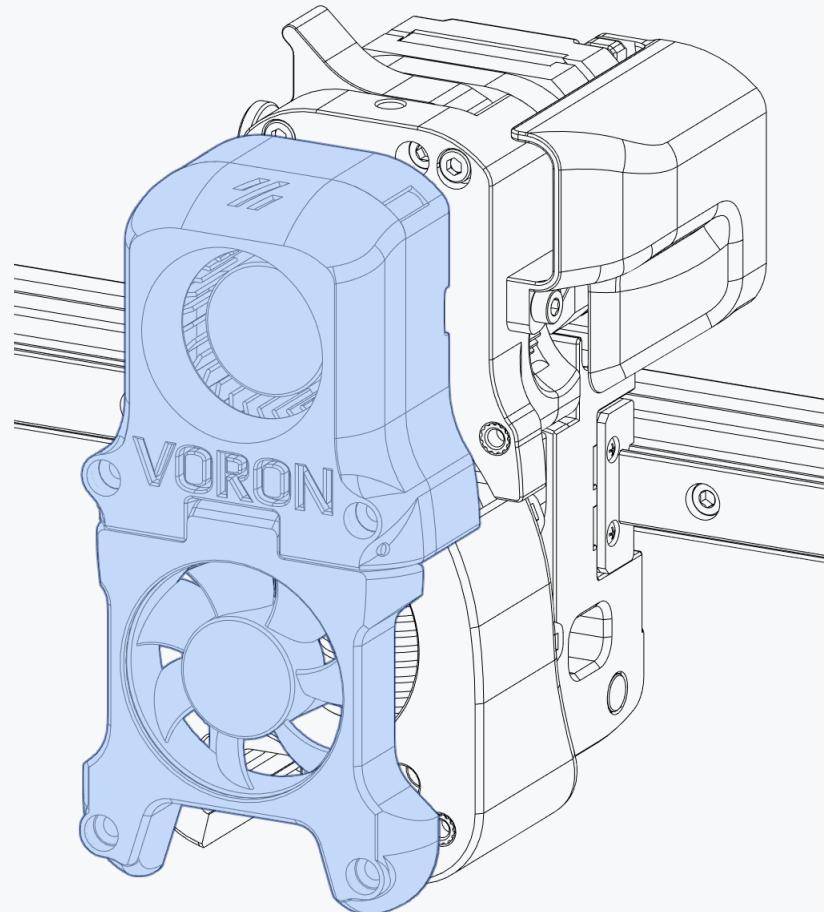


**WIRING PATH**

Guide the wires in the highlighted path.

FAN ASSEMBLY

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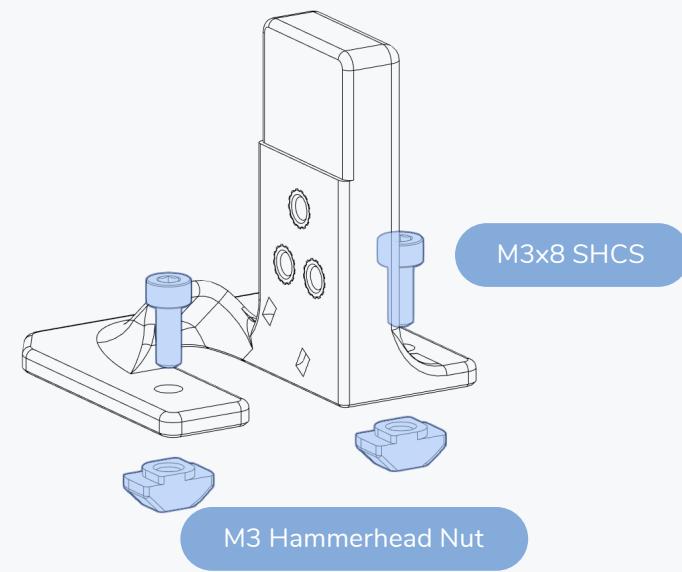
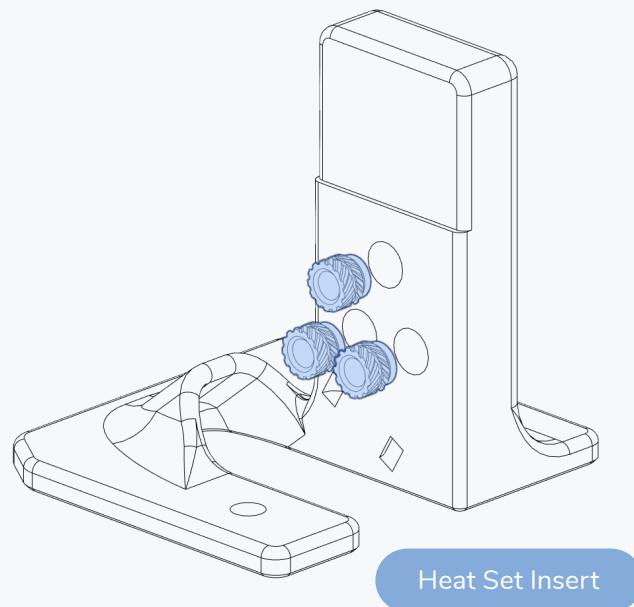


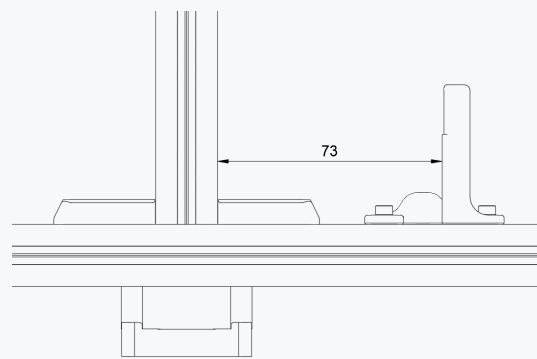
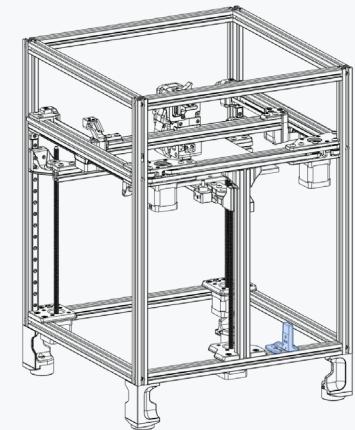
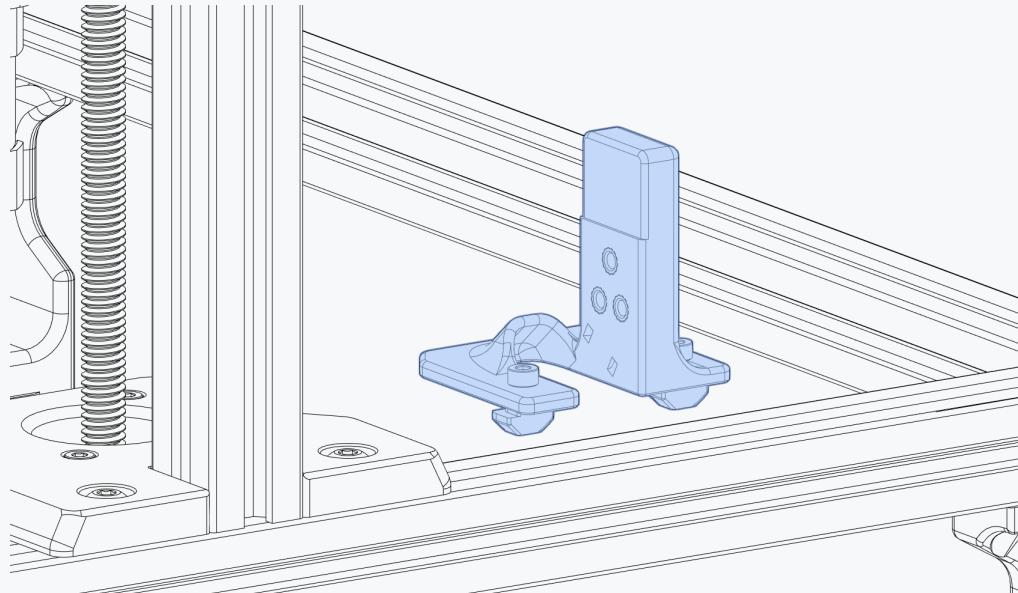
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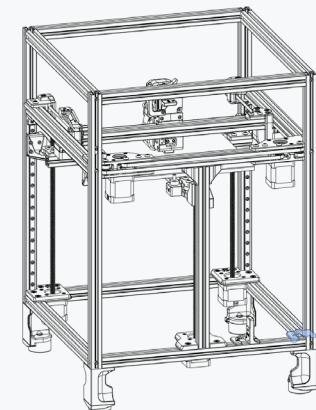
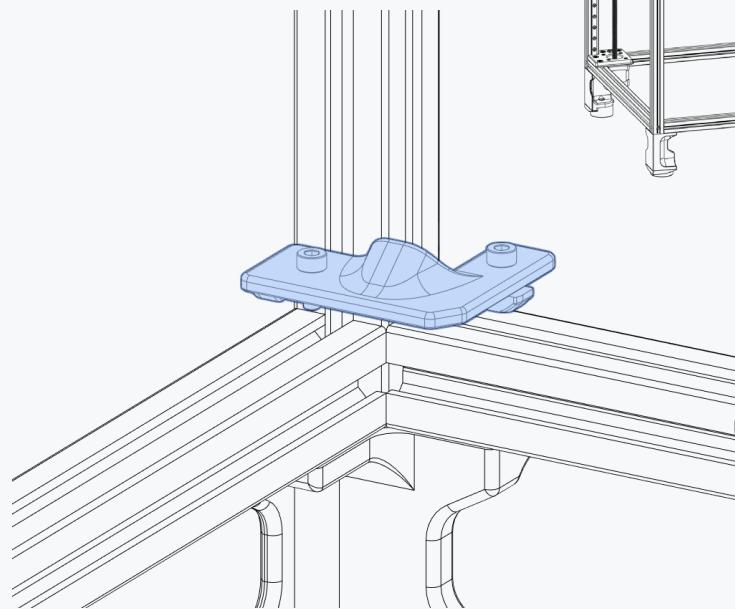
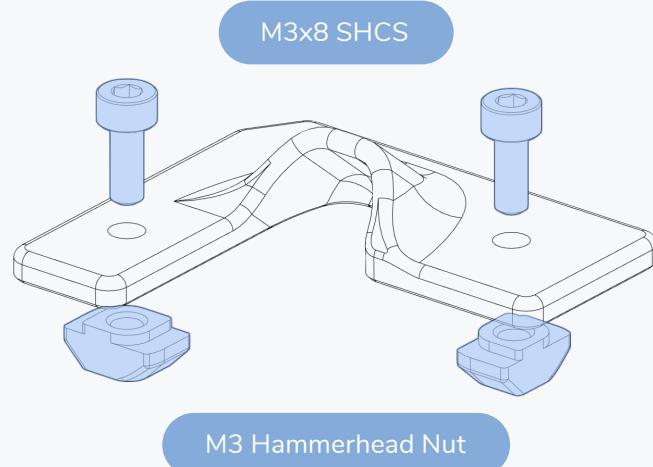
WIRING PREP

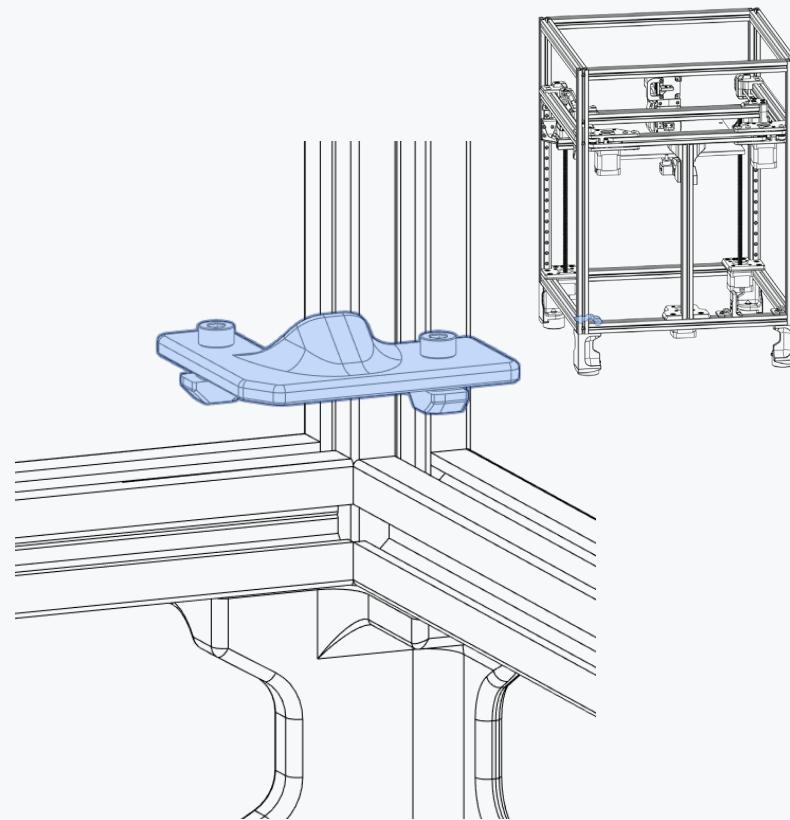
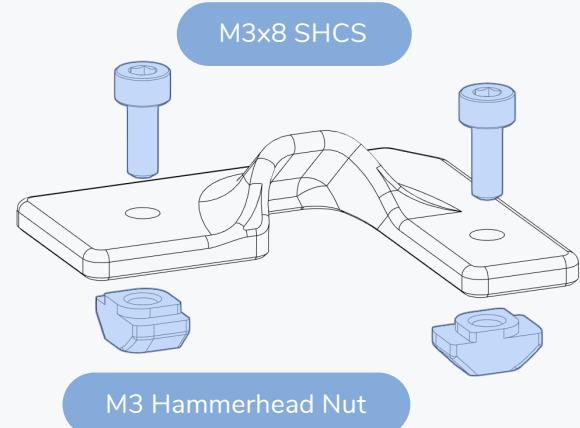
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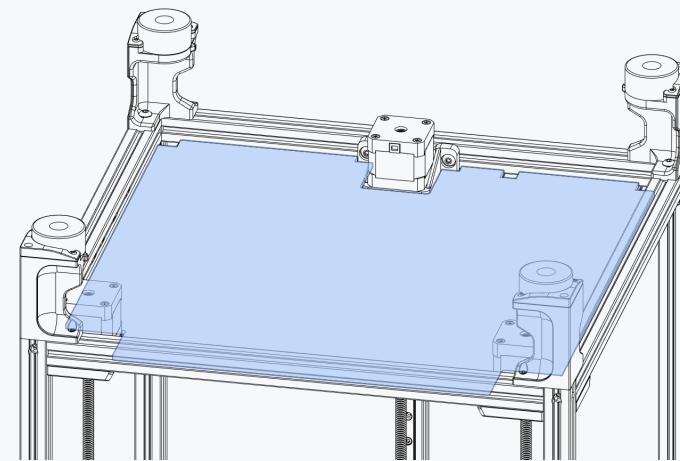
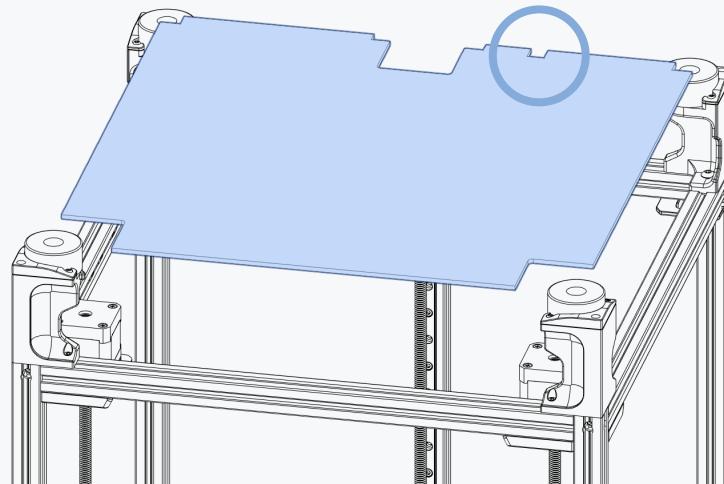


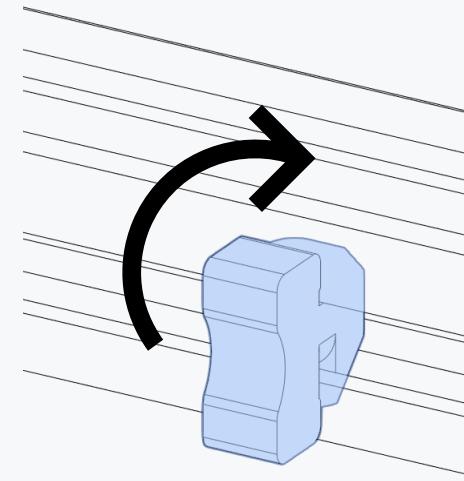
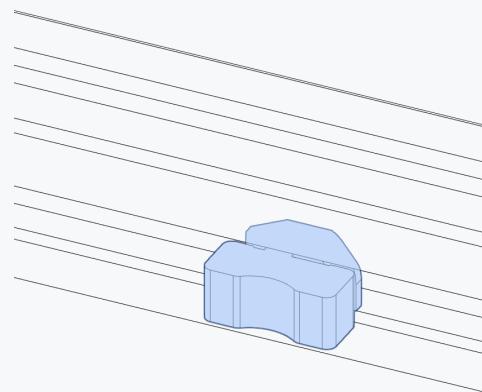
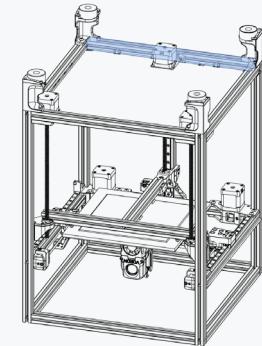
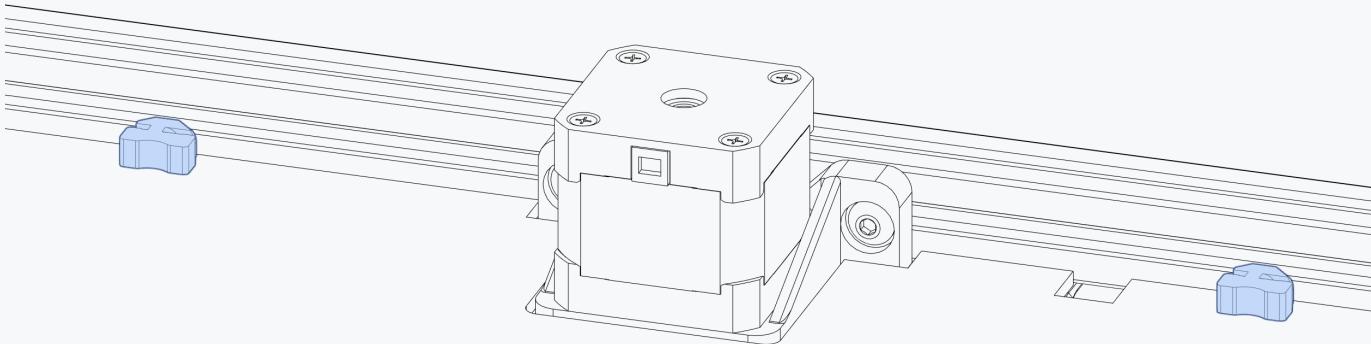




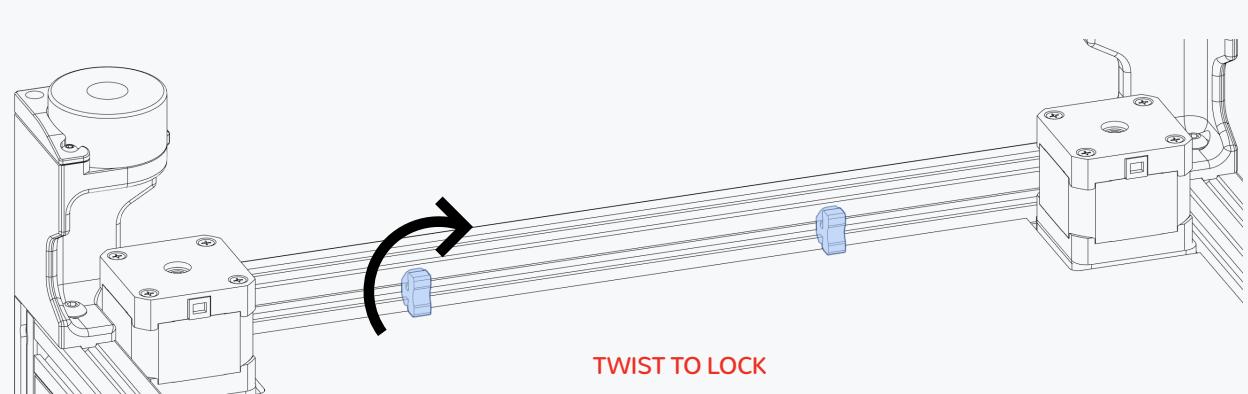
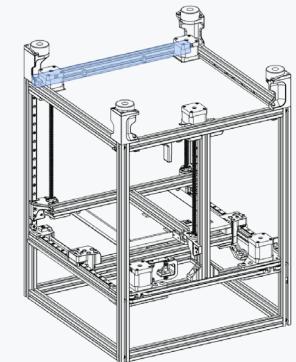
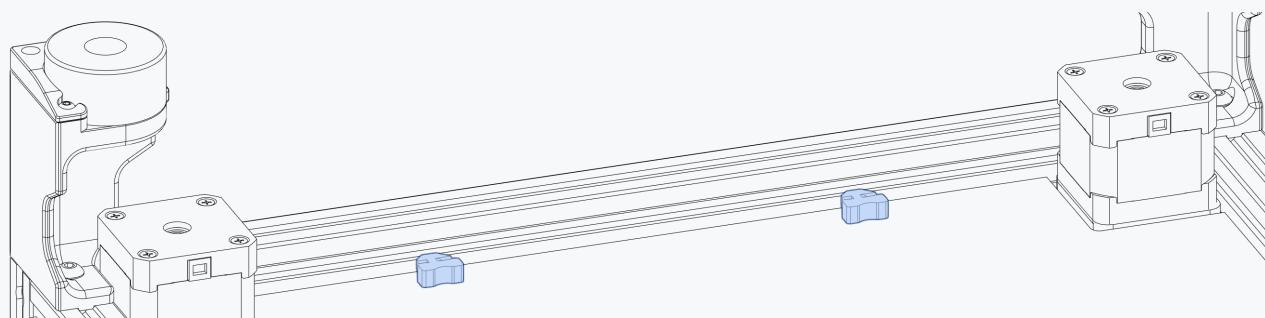
DECK PANEL

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**TWIST TO LOCK**

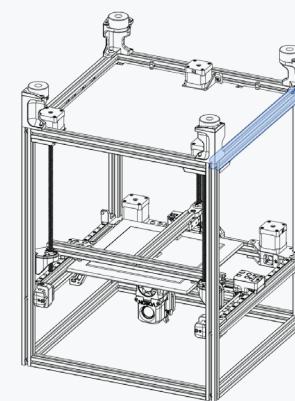
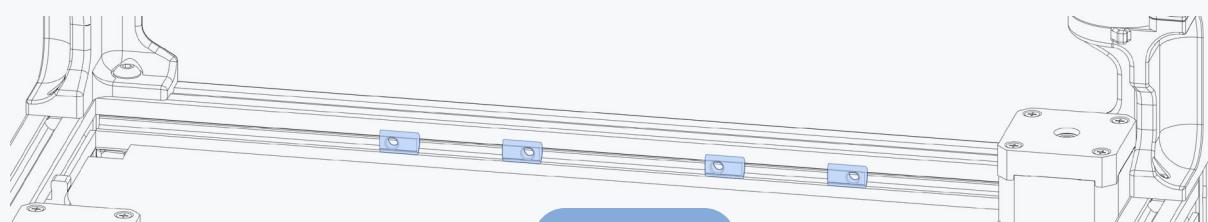
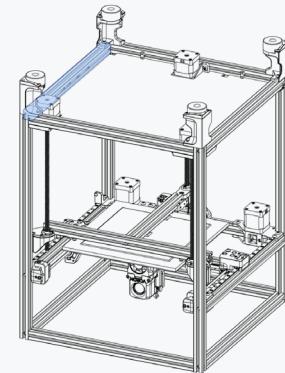
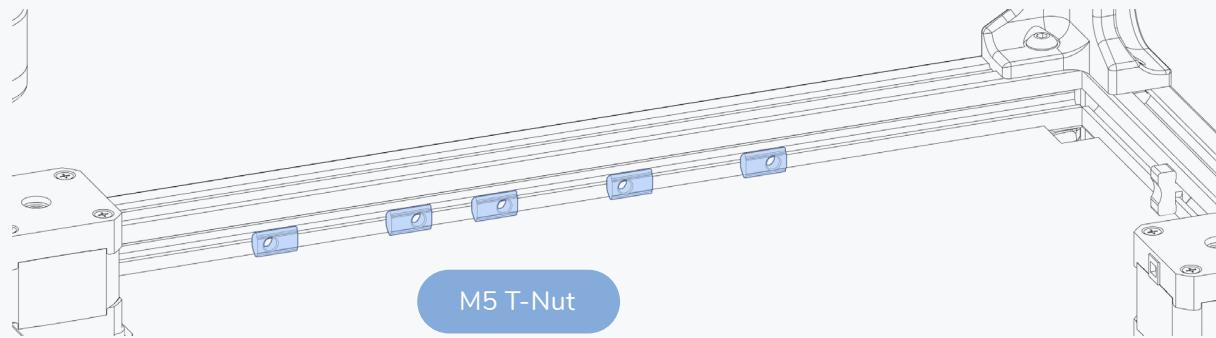
Rotate the deck supports by 90° to lock them in place.

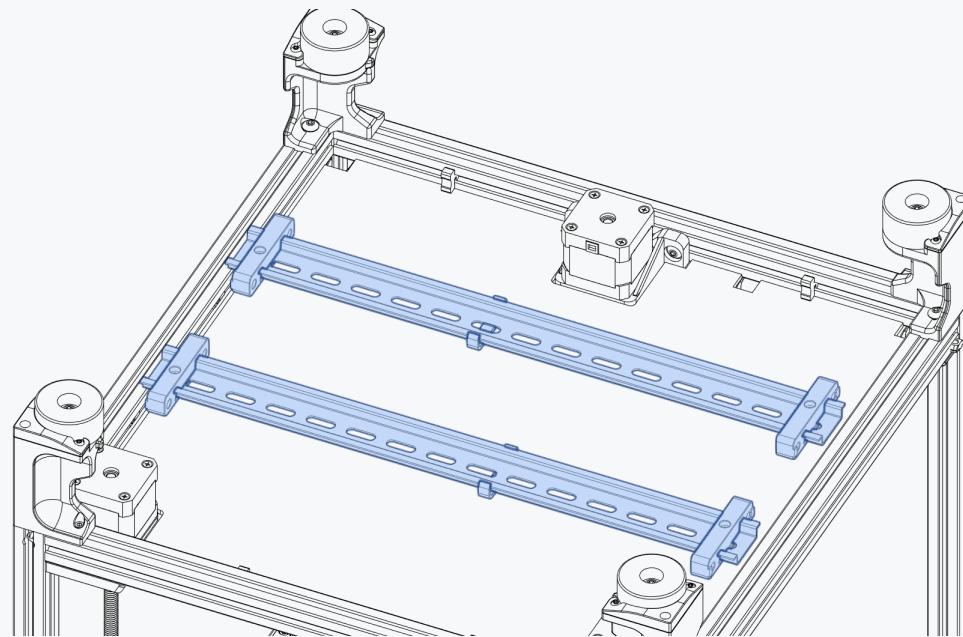
**TWIST TO LOCK**

Rotate the deck supports by 90° to lock them in place.

## DIN RAILS

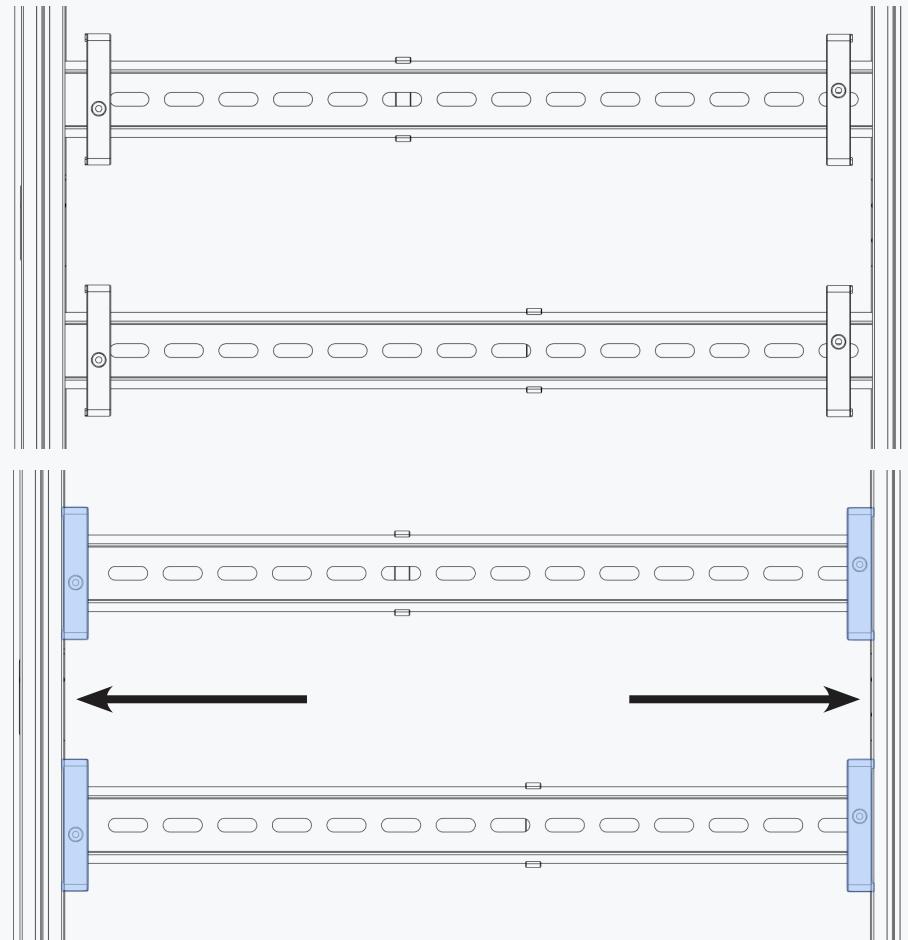
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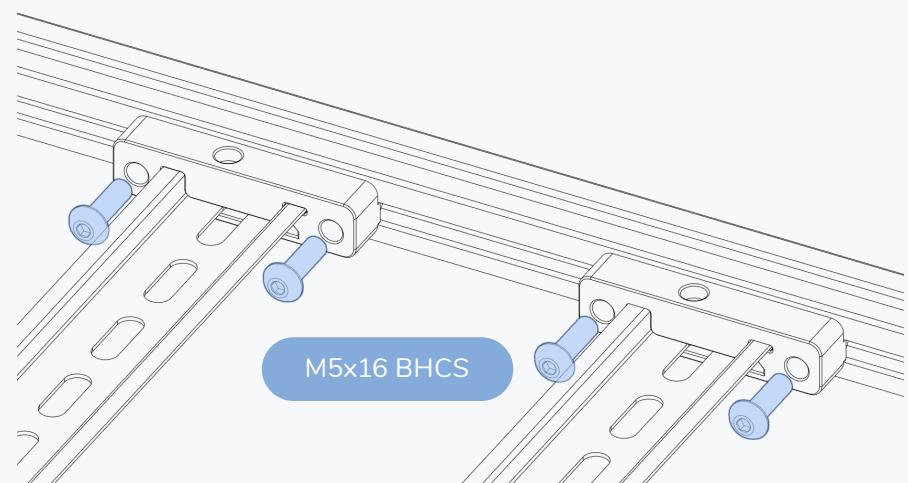
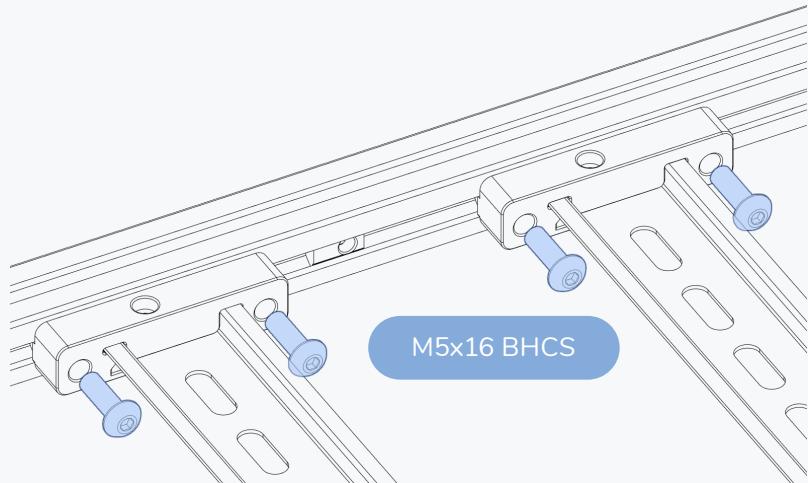


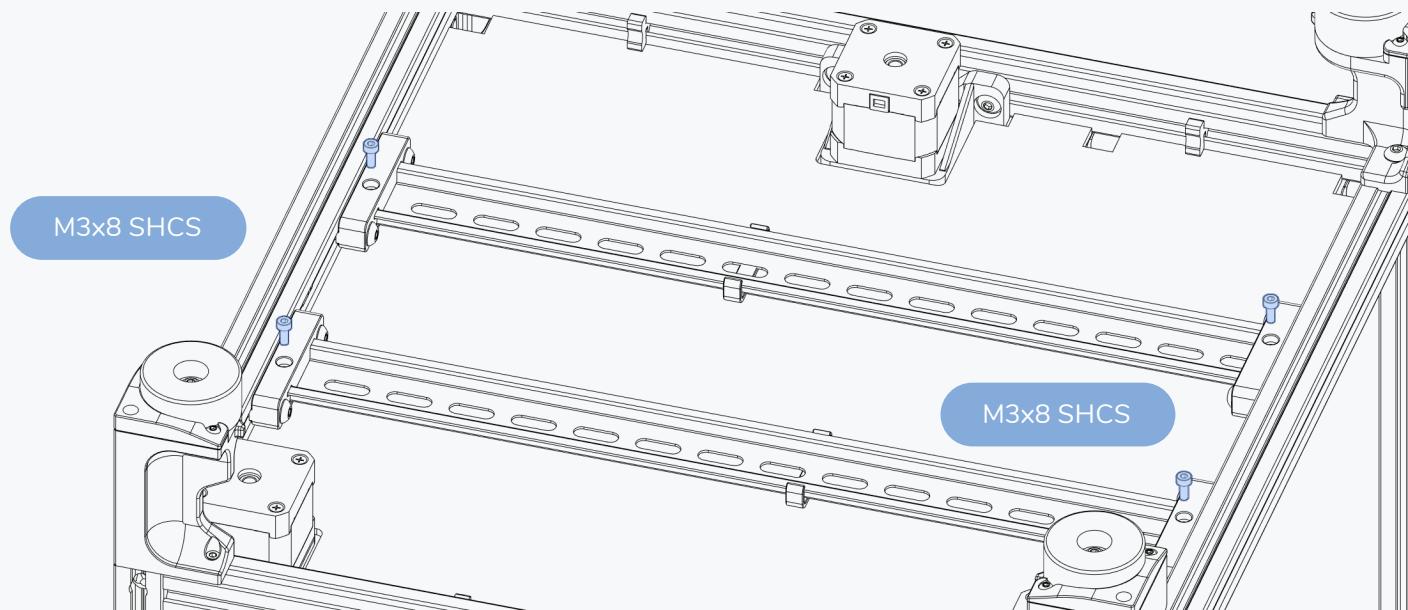
**SPACING**

Roughly centre the DIN rails and space them about 80mm apart.

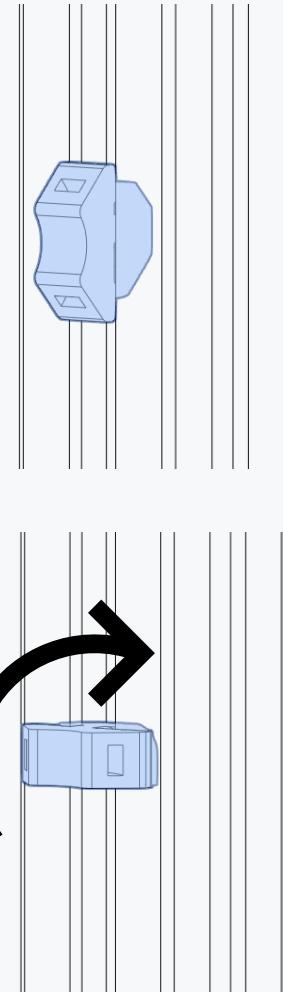
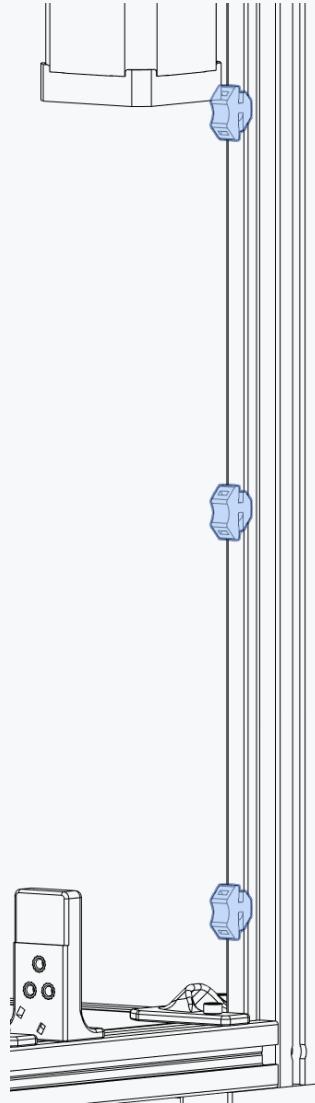
**SLIDE INTO POSITION**

Slide the mounts all the way to the extrusions.

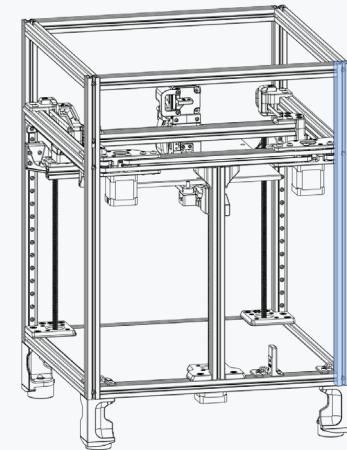


**DON'T OVER TIGHTEN**

The screws are used to keep the DIN rails from sliding and are screwed directly into plastic.

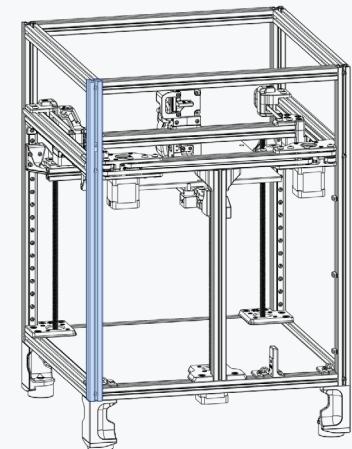
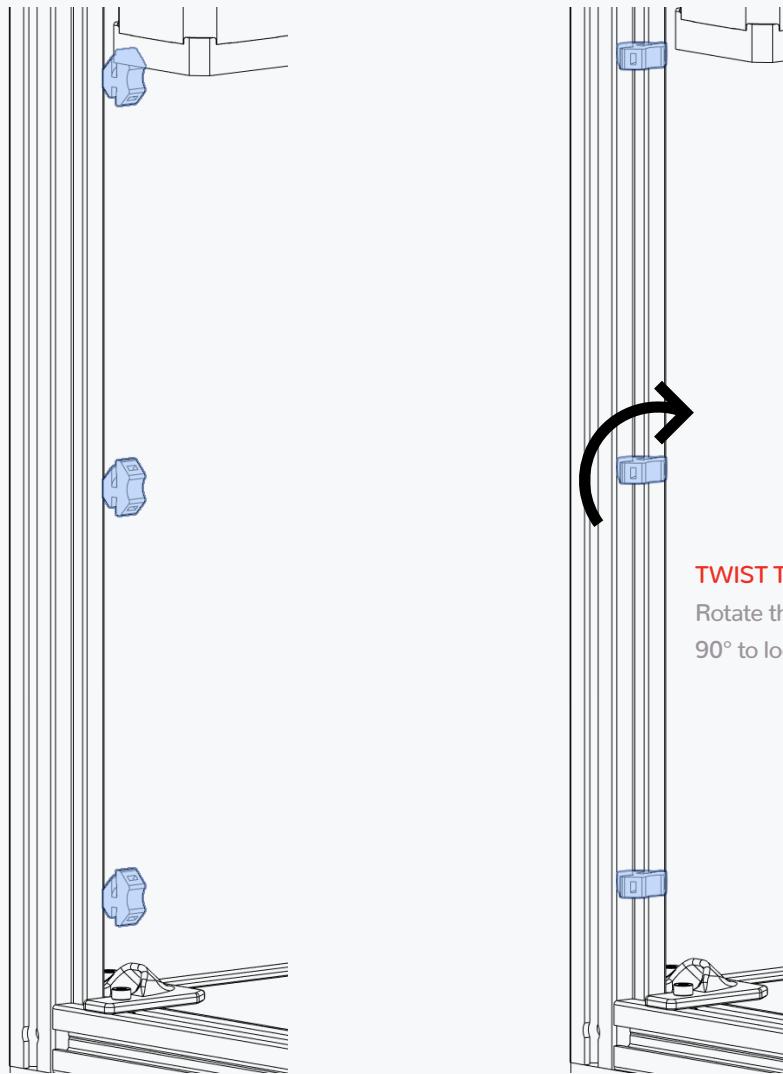
**TWIST TO LOCK**

Rotate the zip tie loops by 90° to lock them in place.

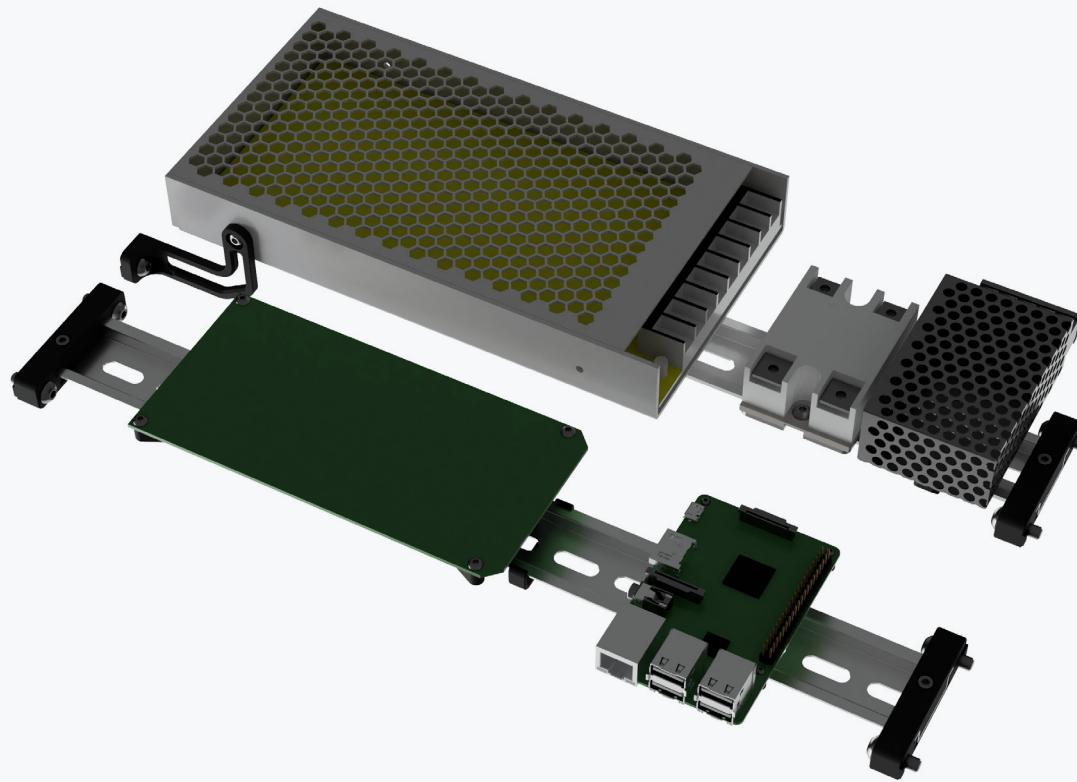


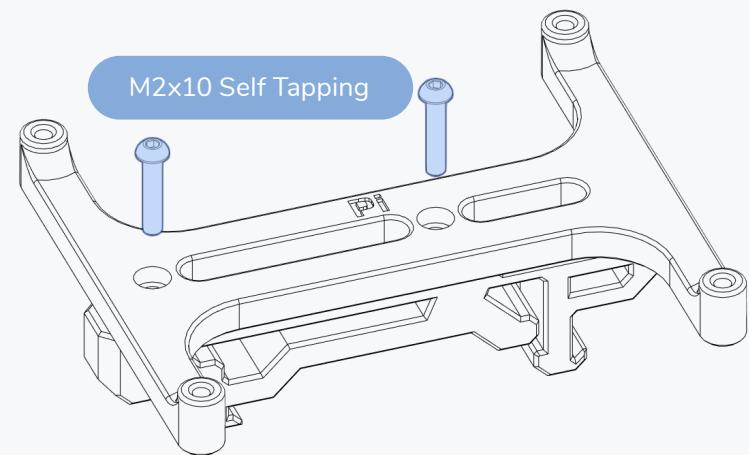
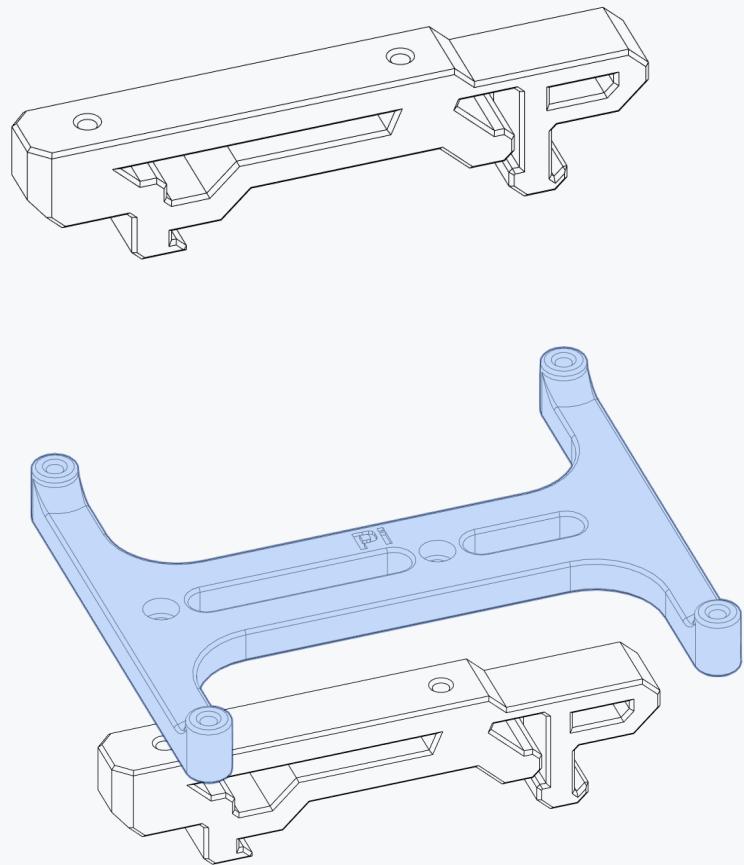
## ZIP TIE LOOPS

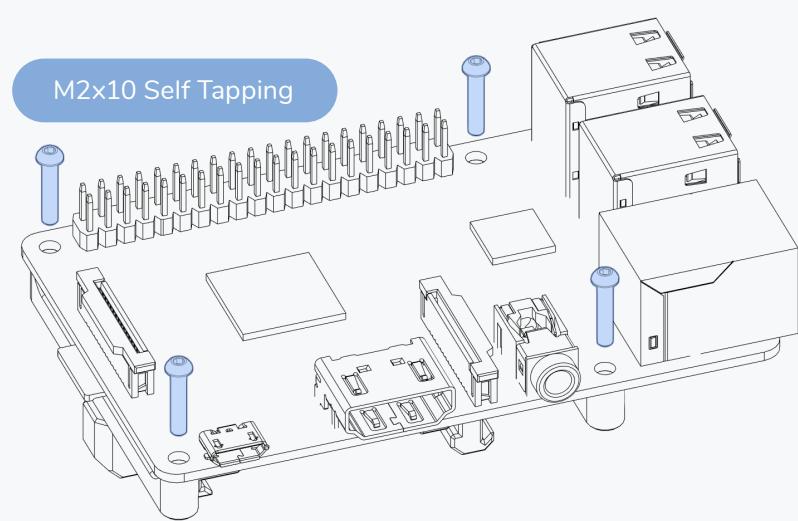
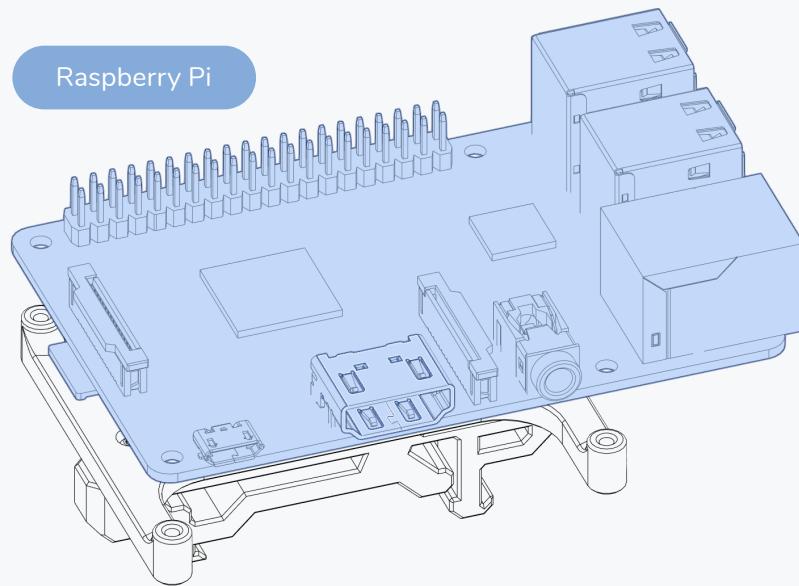
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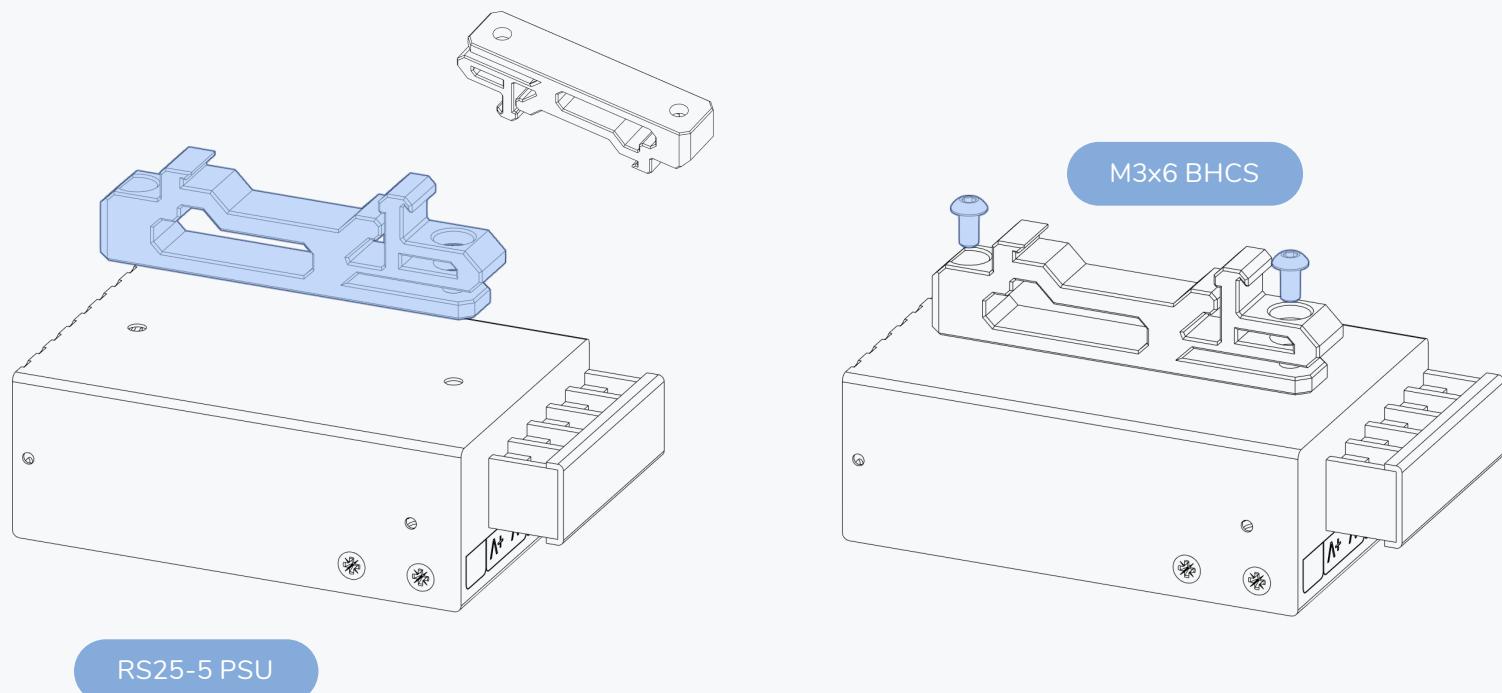


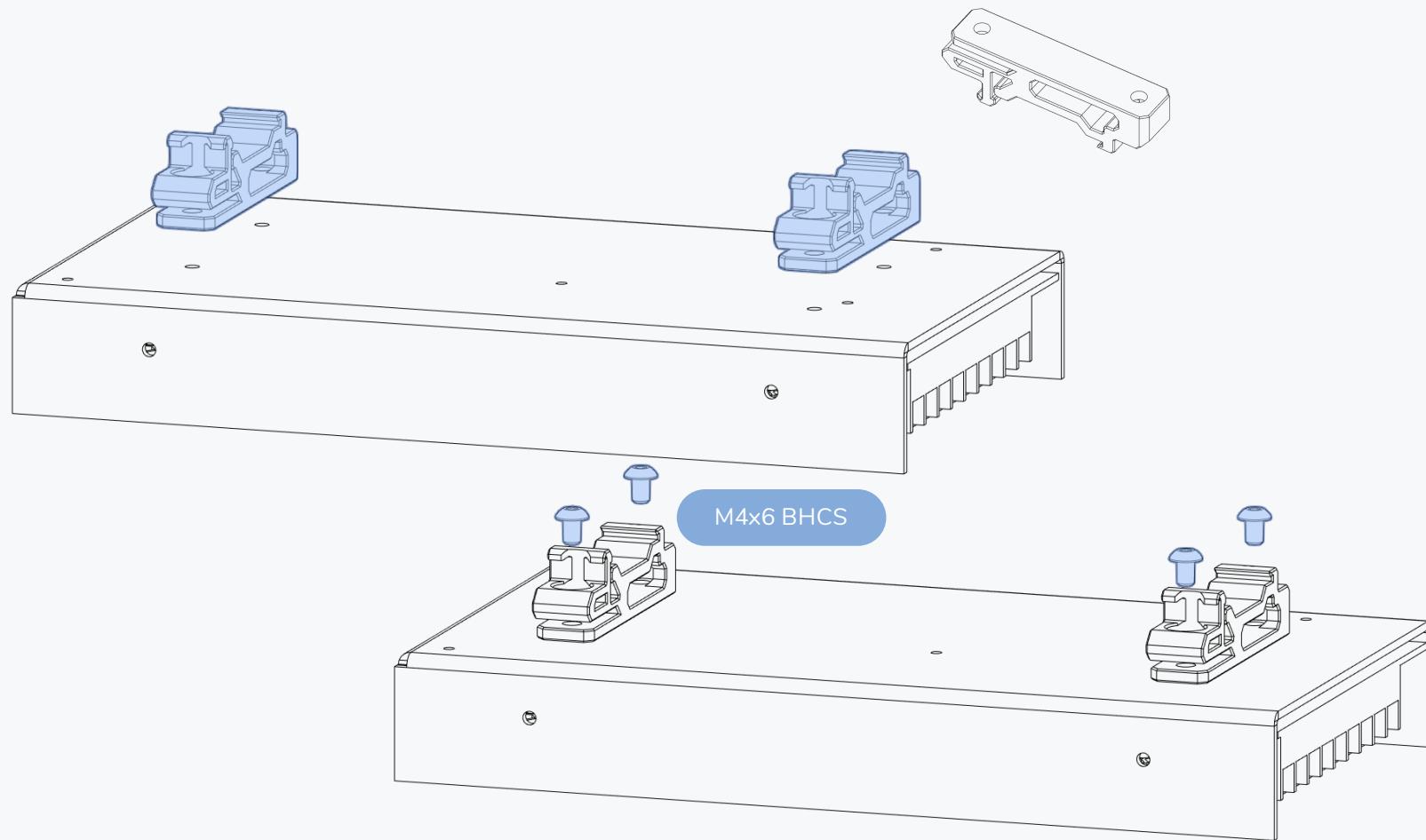


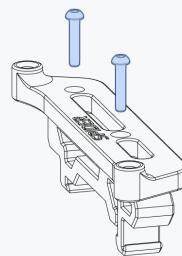
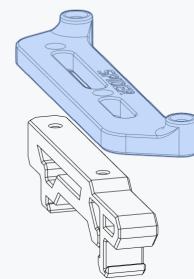
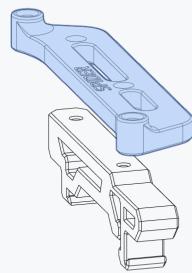
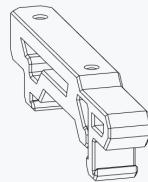
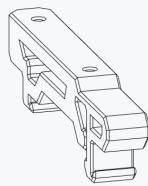


5V PSU

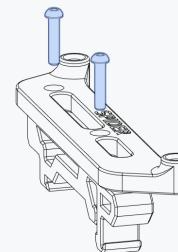
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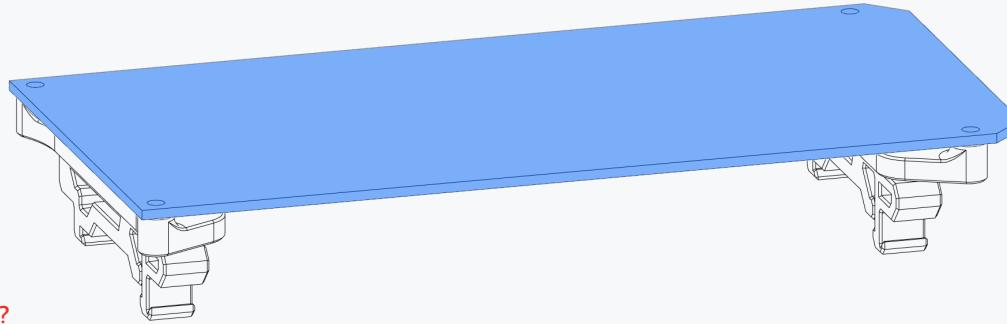




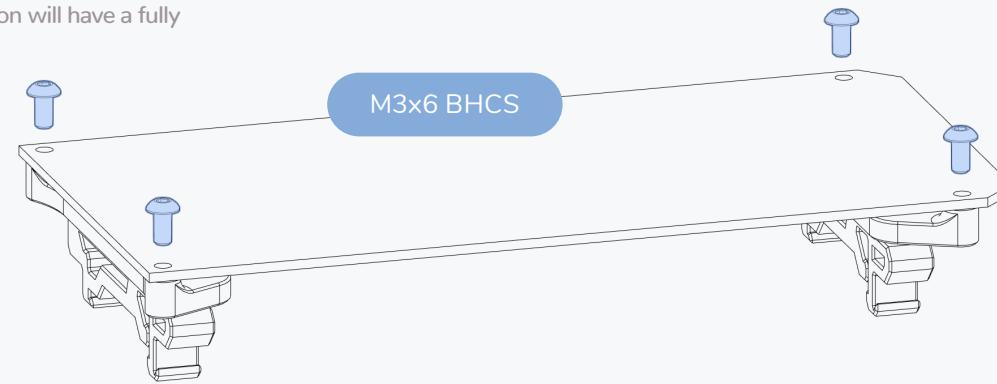


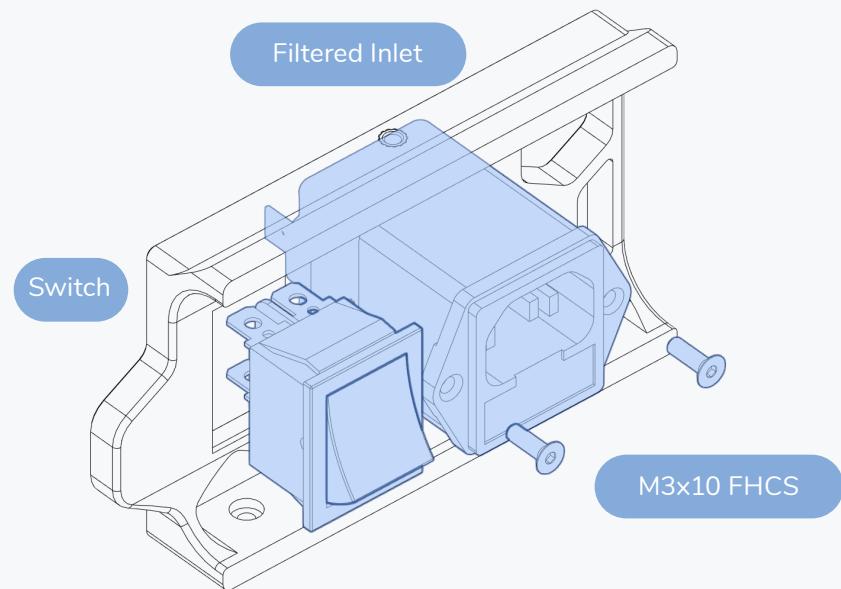
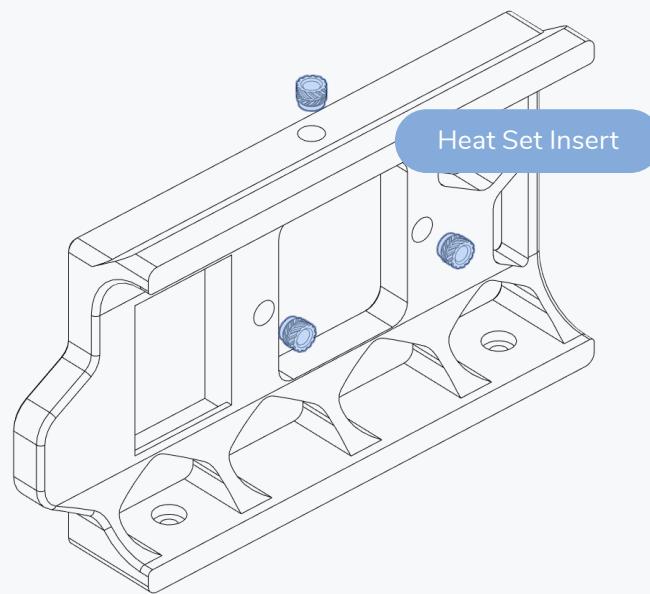
M2x10 Self Tapping



**WHY DOES IT LOOK THAT WAY?**

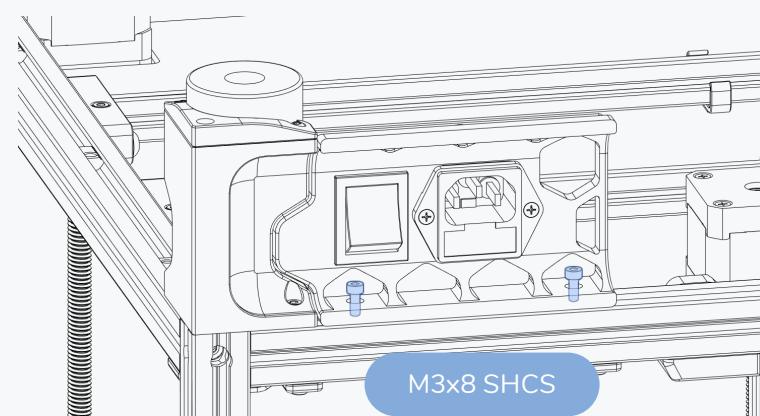
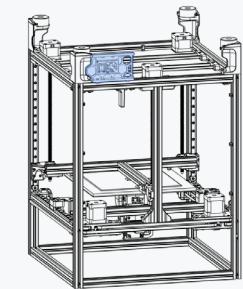
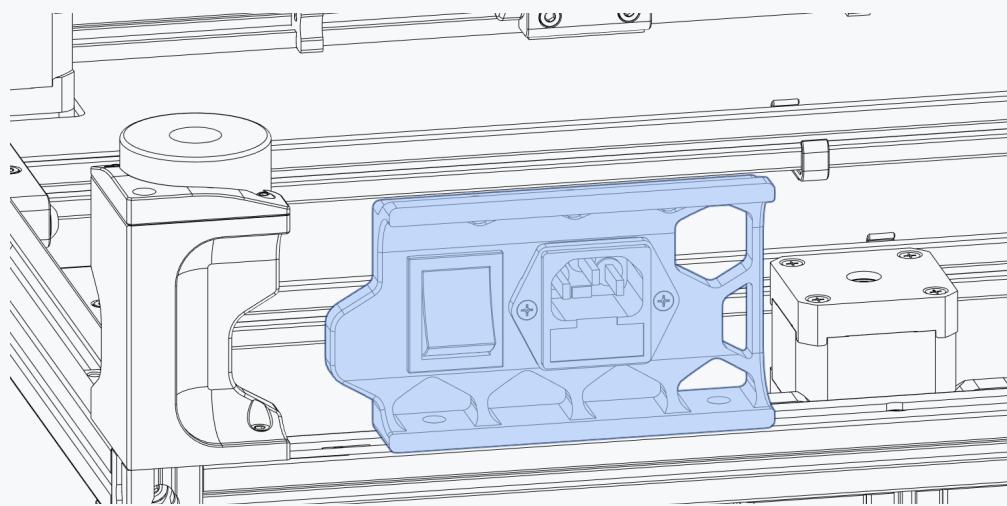
We used a dummy to keep the file size of the printers cad manageable. The wiring section will have a fully featured image.

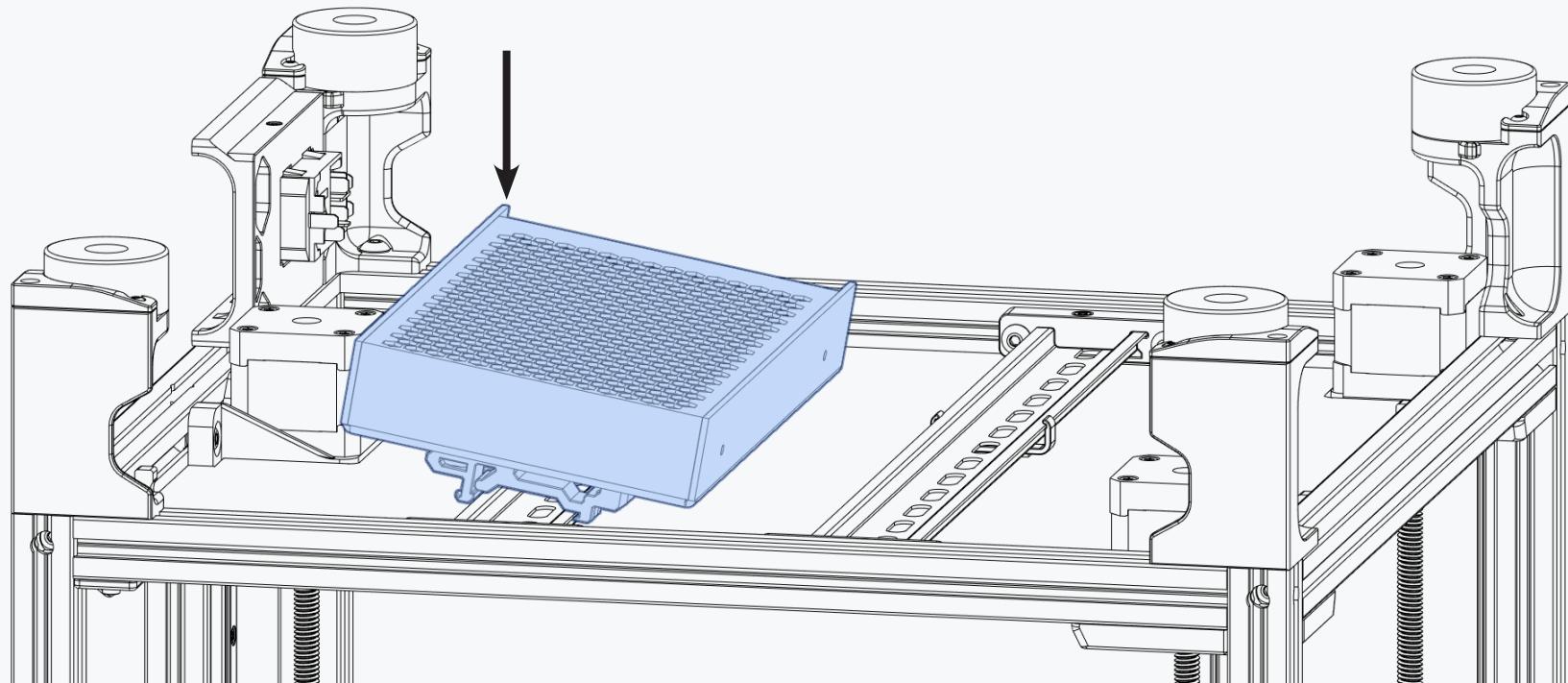


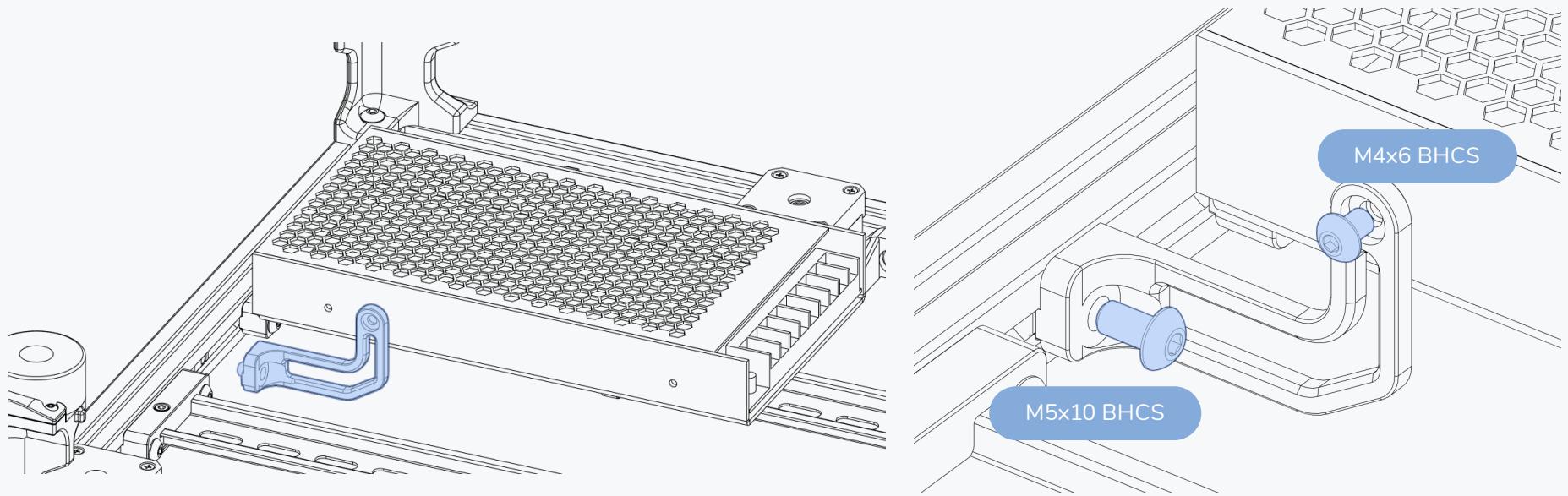


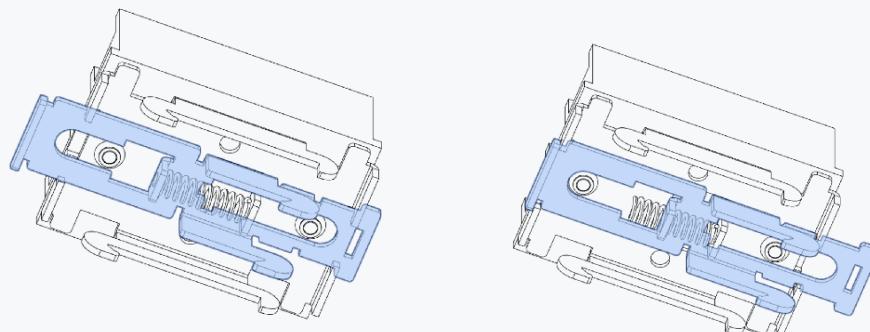
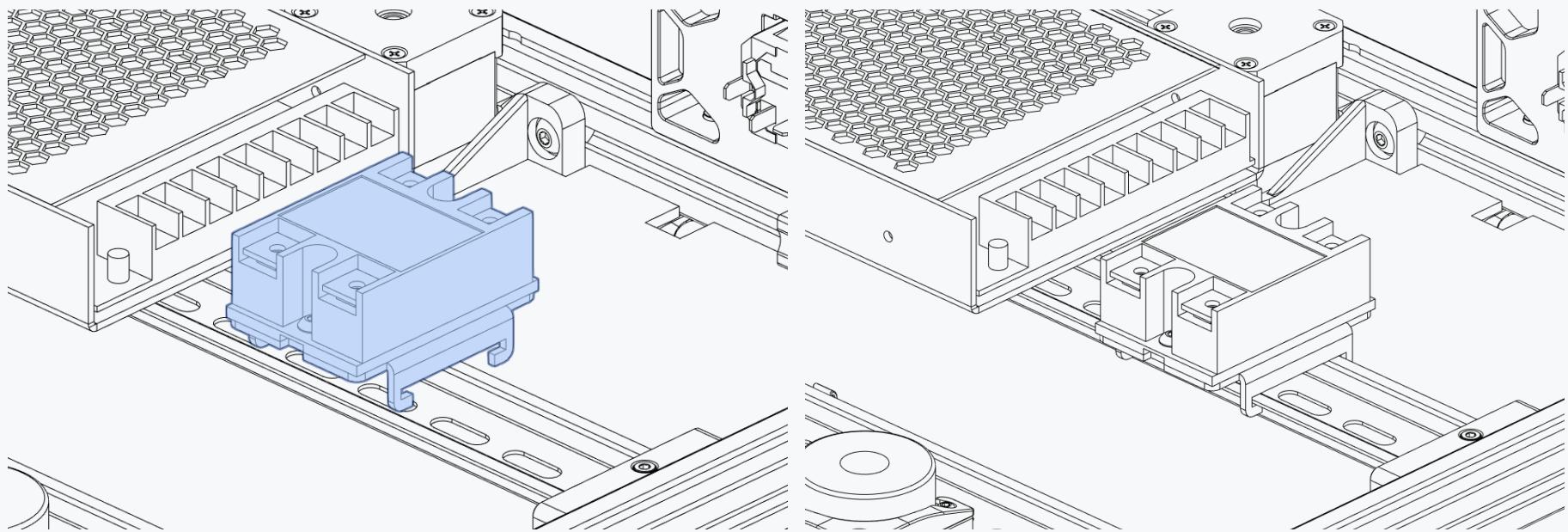
POWER INLET

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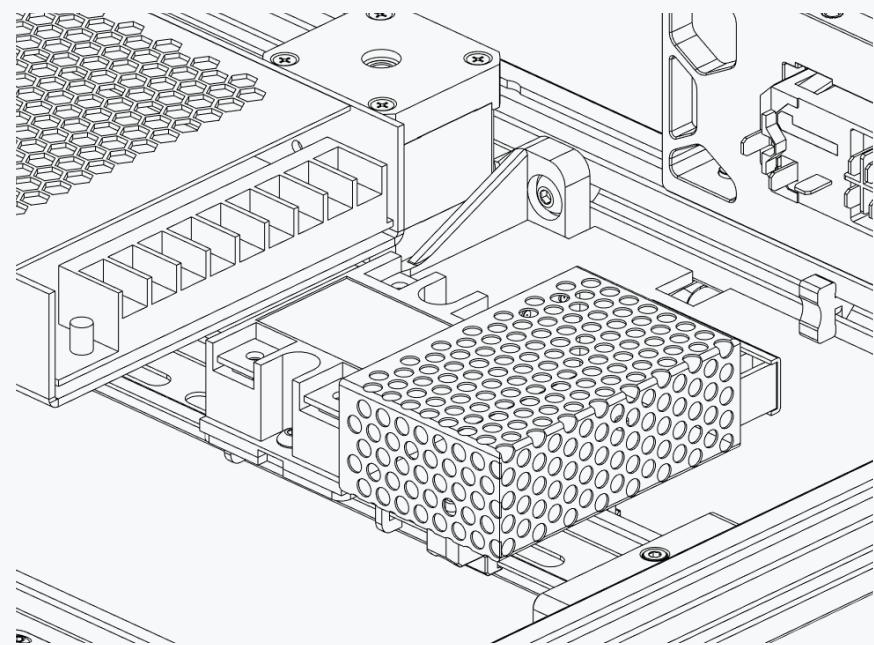
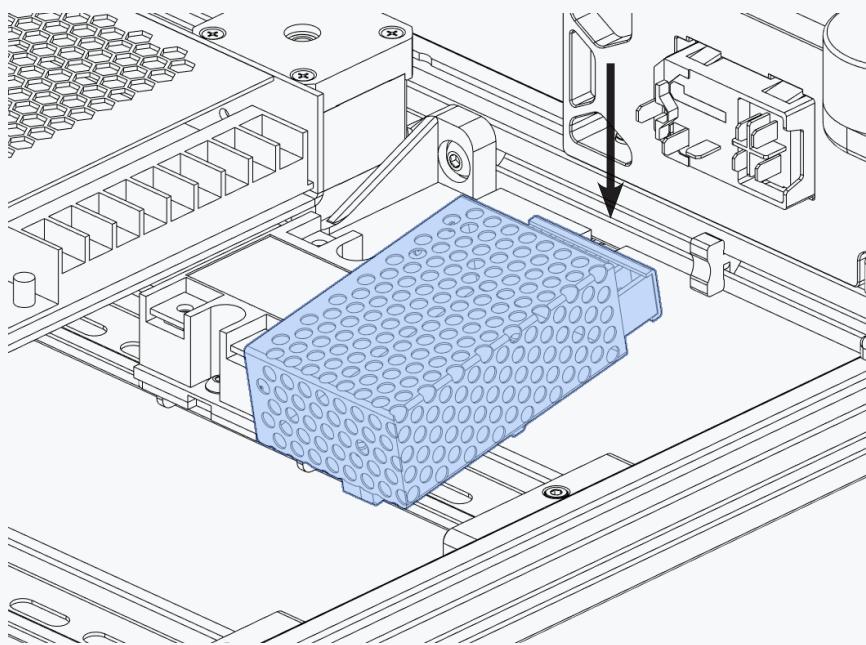
#### SPRING LOADED

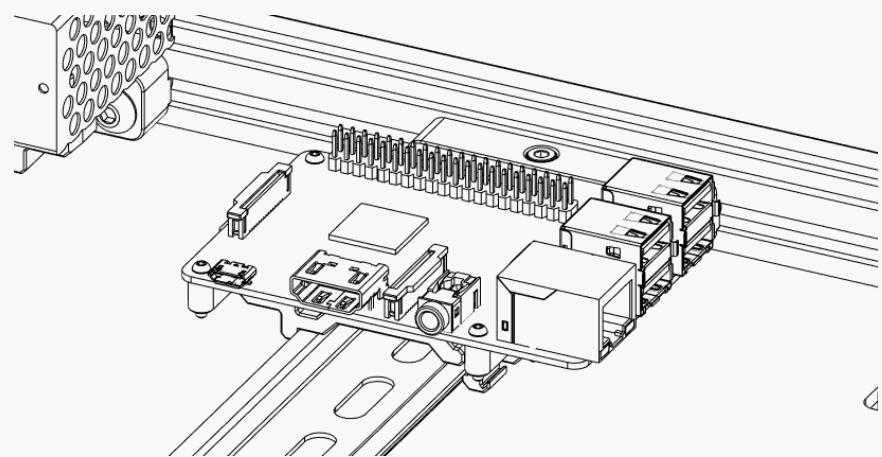
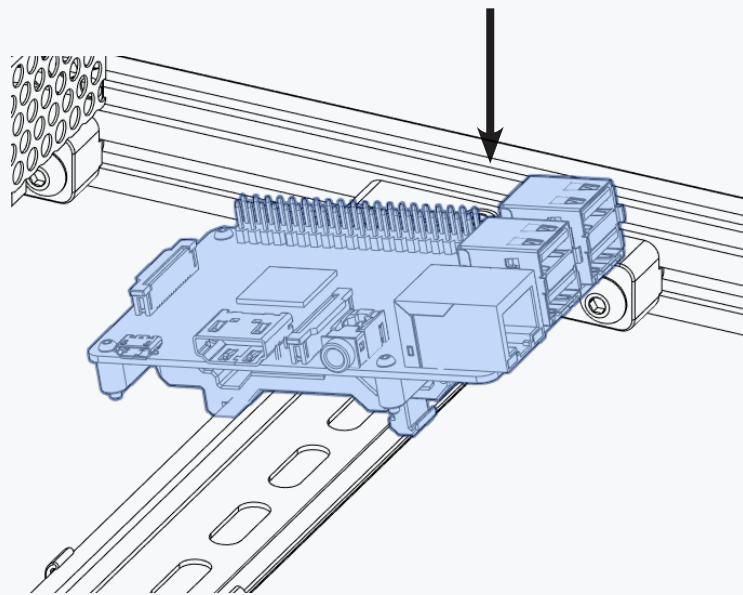
Use a flat head screw driver to pull the latch open. It will lock open.

Be careful when releasing the latch, it will snap back into place.  
Mind your fingers.

## PSU MOUNTING

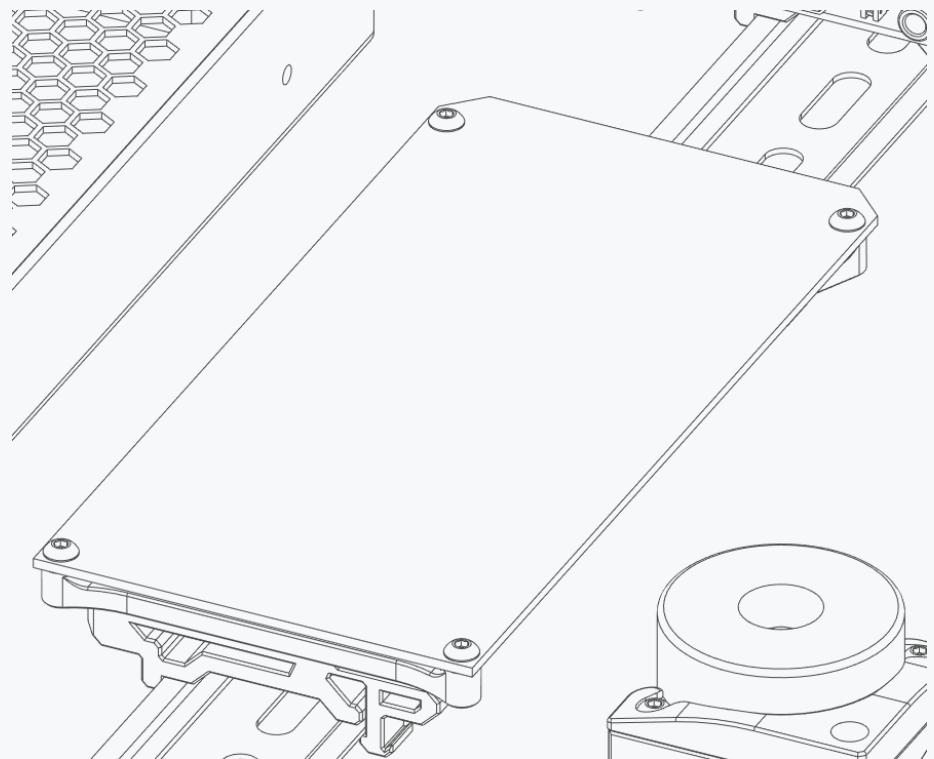
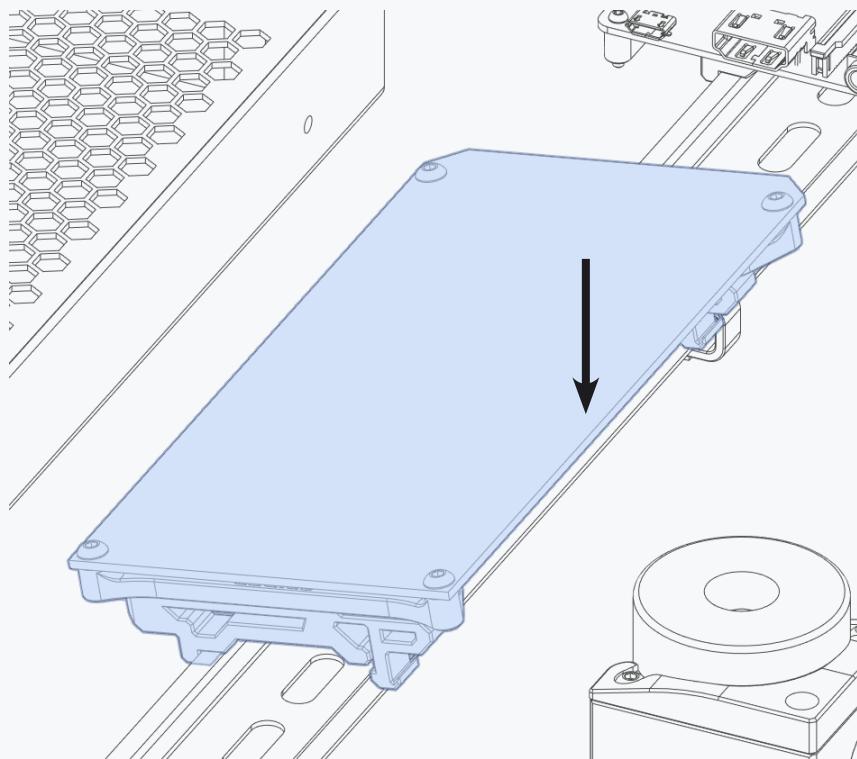
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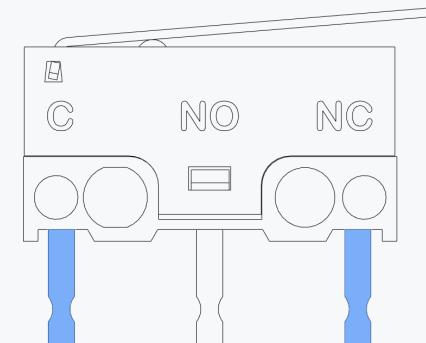
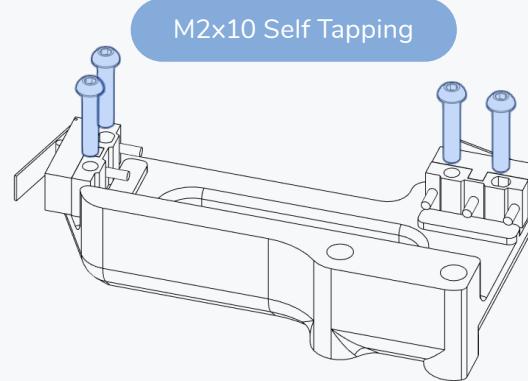
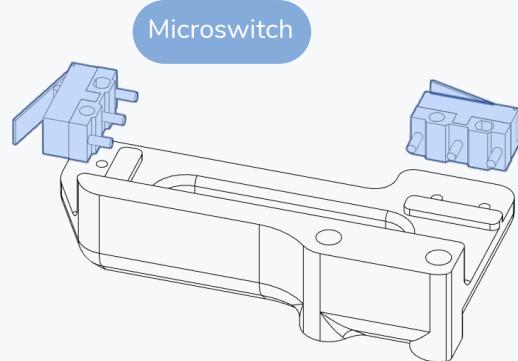




## CONTROLLER BOARD MOUNTING

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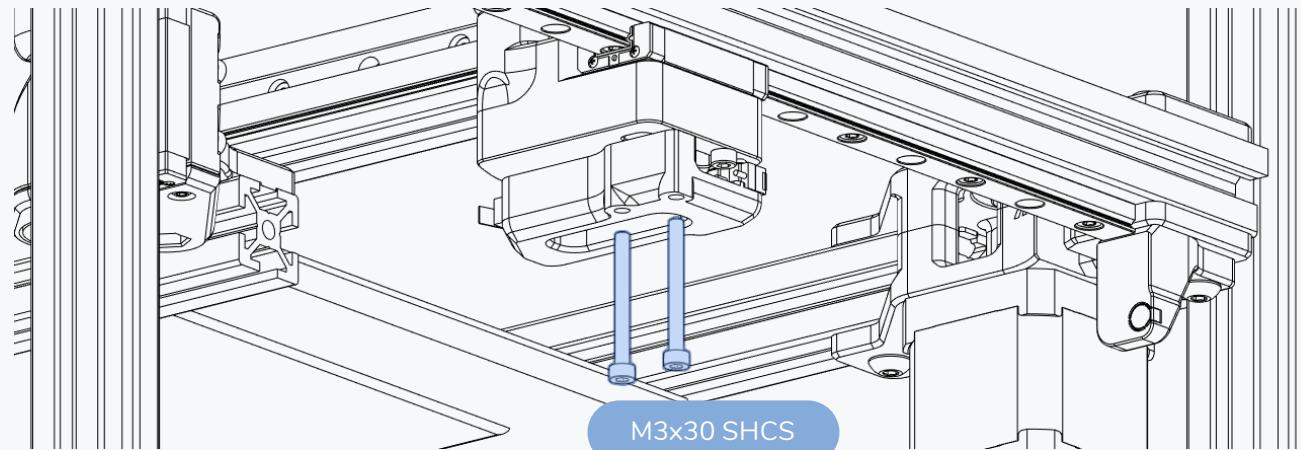
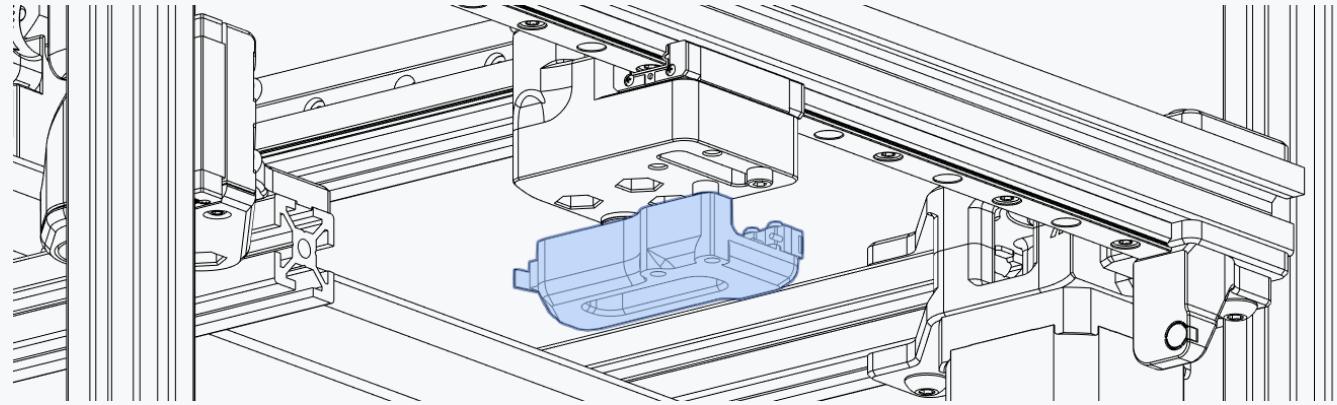




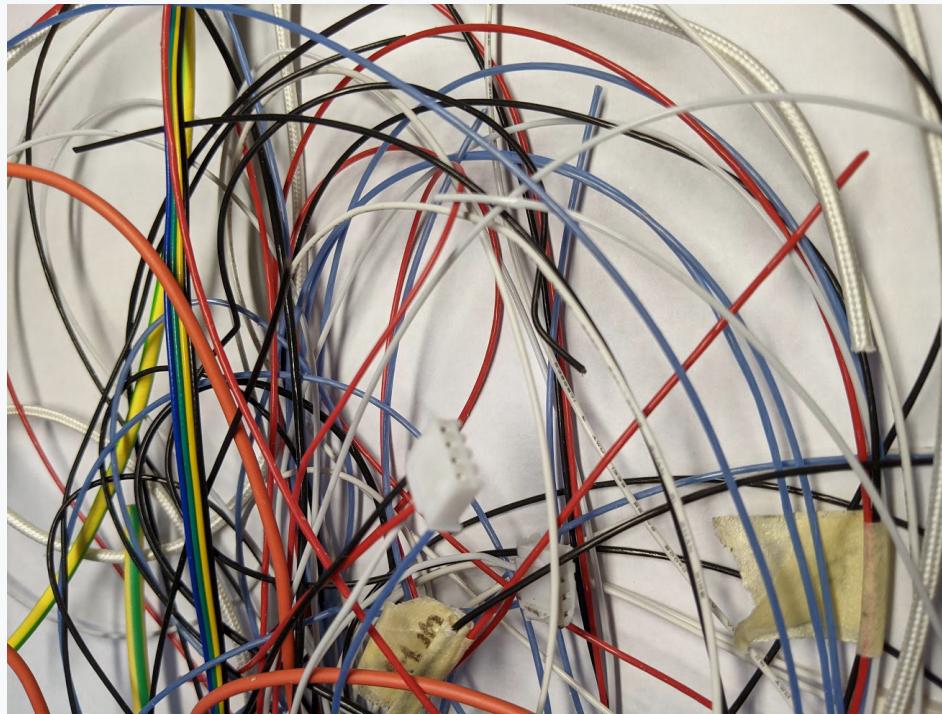
#### END-STOP SWITCHES FOR X AND Y

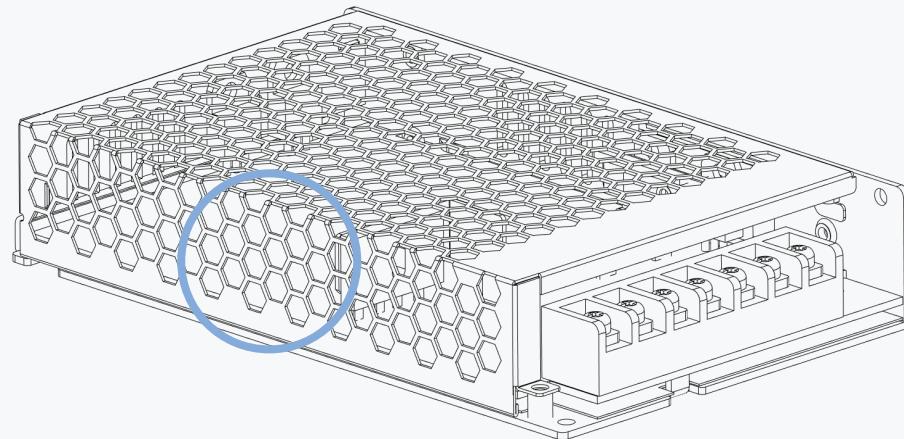
End-stops are wired in a “Normally Closed” configuration. On microswitches those are the 2 outer terminals indicated by C and NC.

Prepare the switches for X and Y by soldering 150mm of wire to each of the outer terminals.



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#### INPUT VOLTAGE SWITCH

Check the input voltage switch of the power supply. It is located in the highlighted area behind the metal mesh.

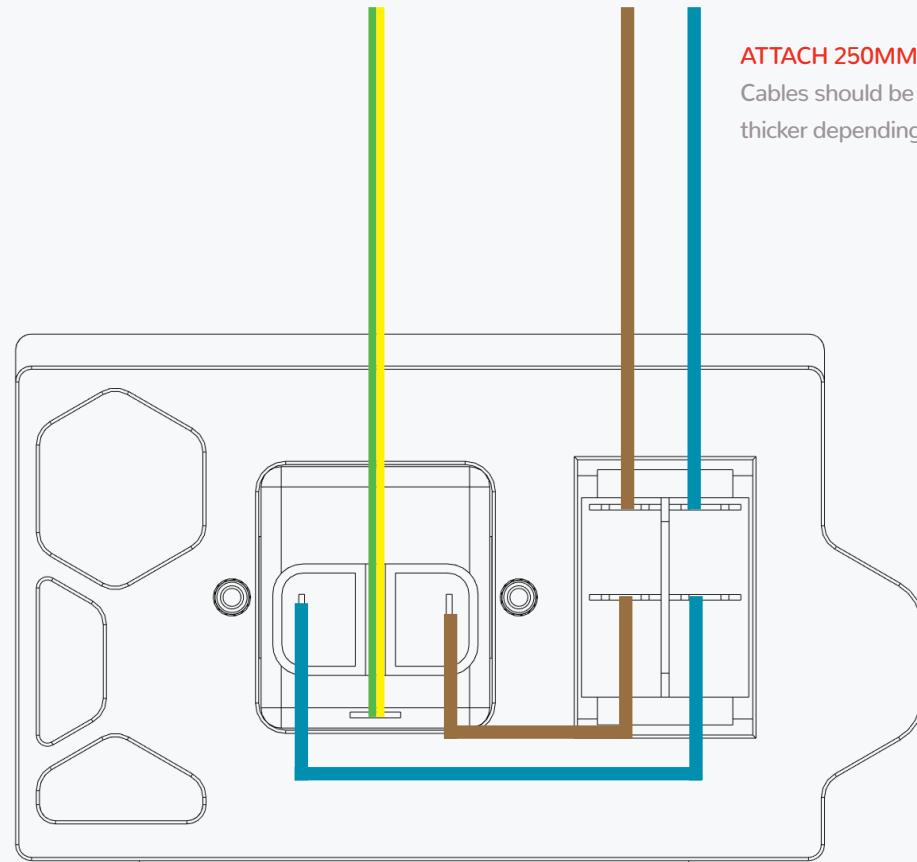
Make sure the selection matches your local mains voltage. Refer to the Mean Well LRS-200 datasheet for possible settings (<https://voron.link/e0szdyh>).

**MAINS INLET WIRING**

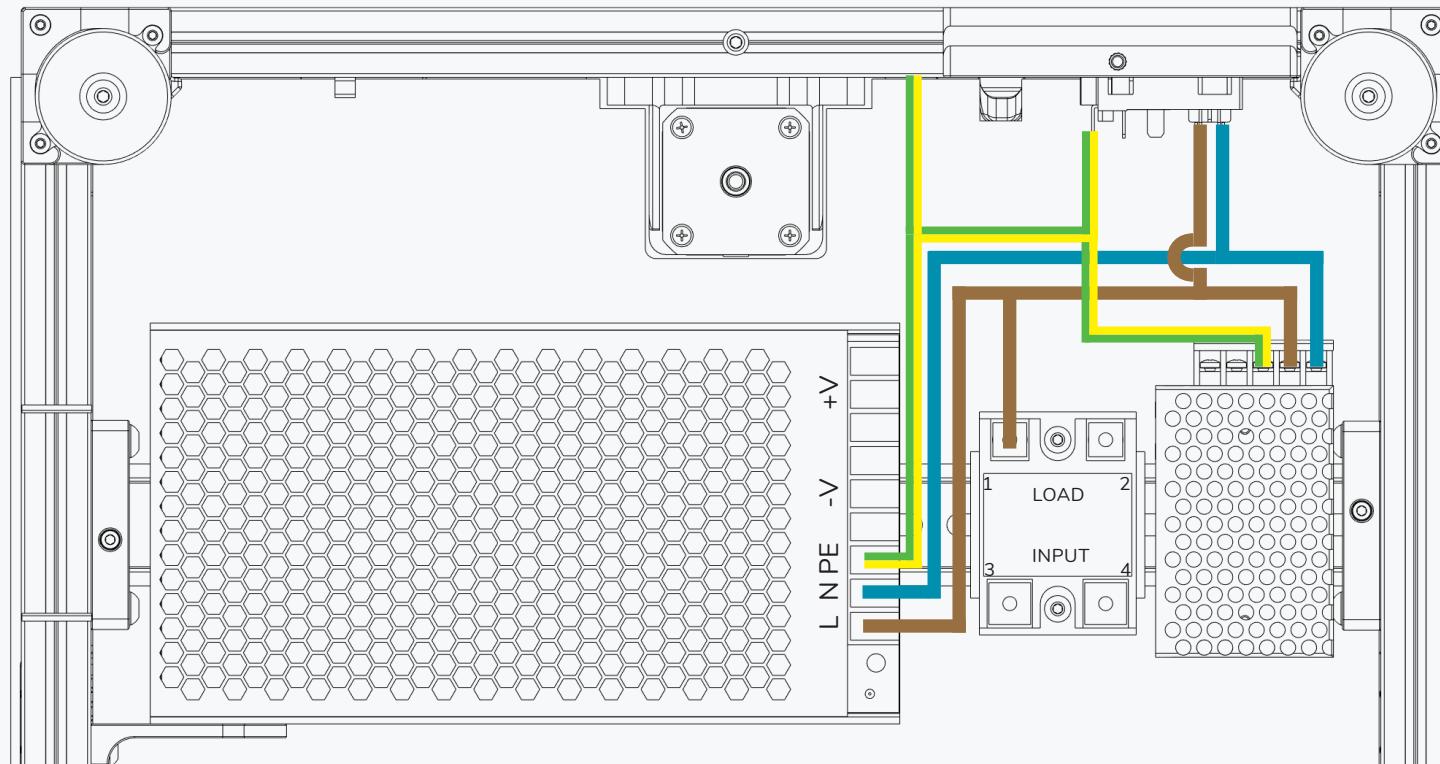
We show the wiring in the IEC colour scheme. Depending on your region the colour scheme and wiring standards will differ.

Mains wiring should only be done by qualified personnel trained in local regulations and safety standards.

Failure to observe those could result in bodily harm.

**ATTACH 250MM OF WIRE**

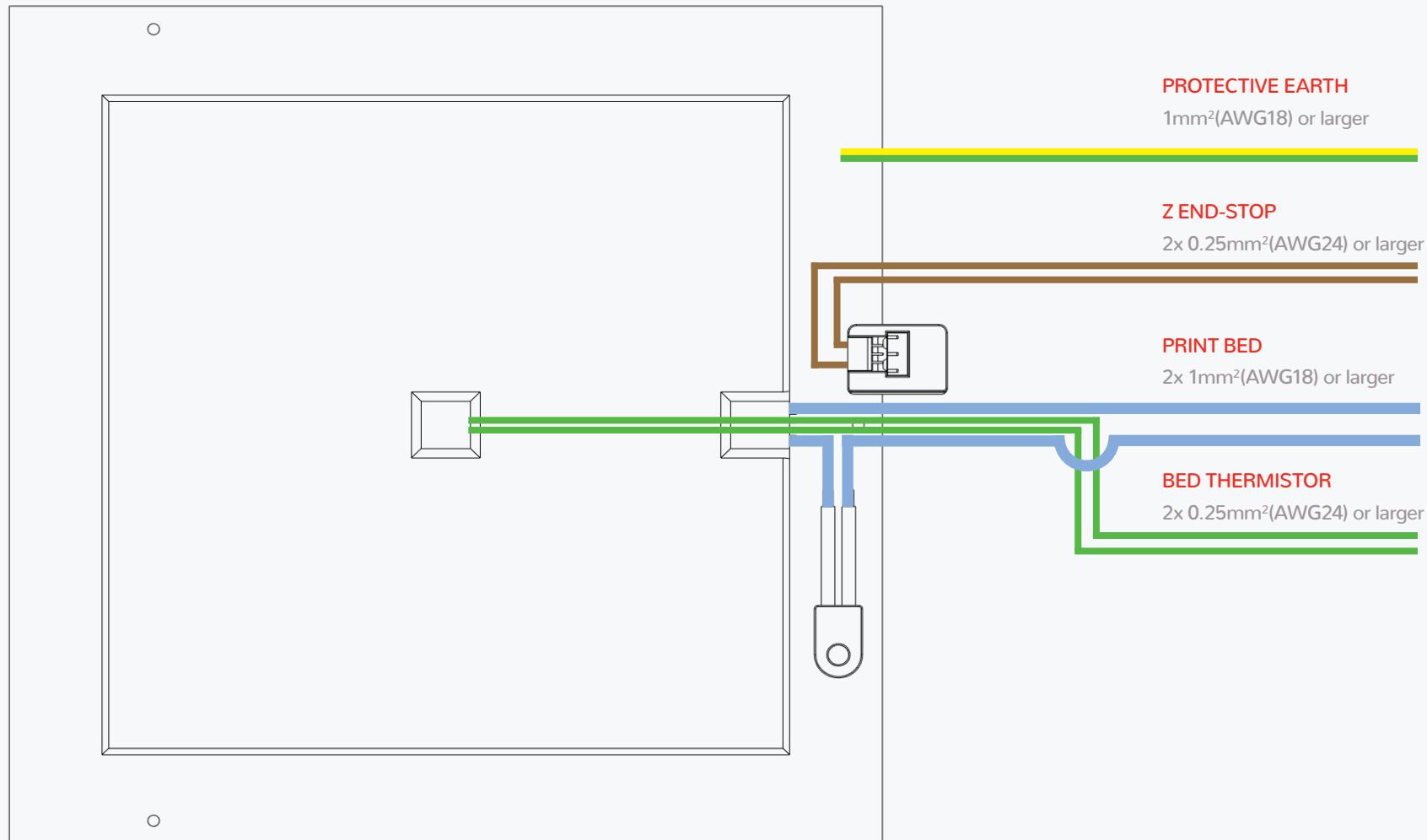
Cables should be at least  $0.75\text{mm}^2$  (AWG18) or thicker depending on local regulations.

**MAINS WIRING CONTINUED**

Secure the wires with cable clips / cable tie anchors.

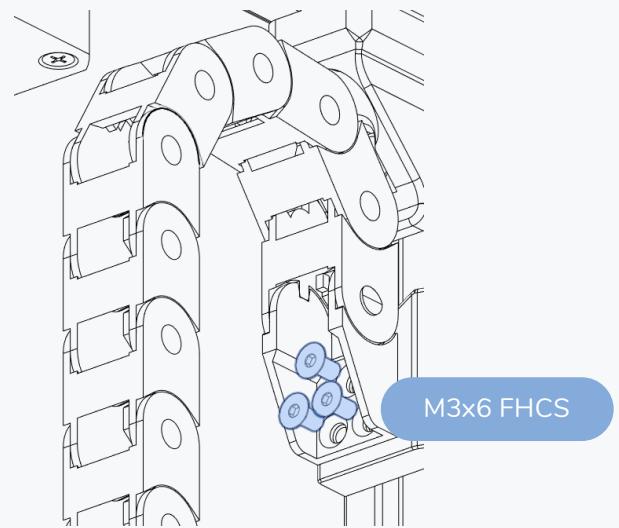
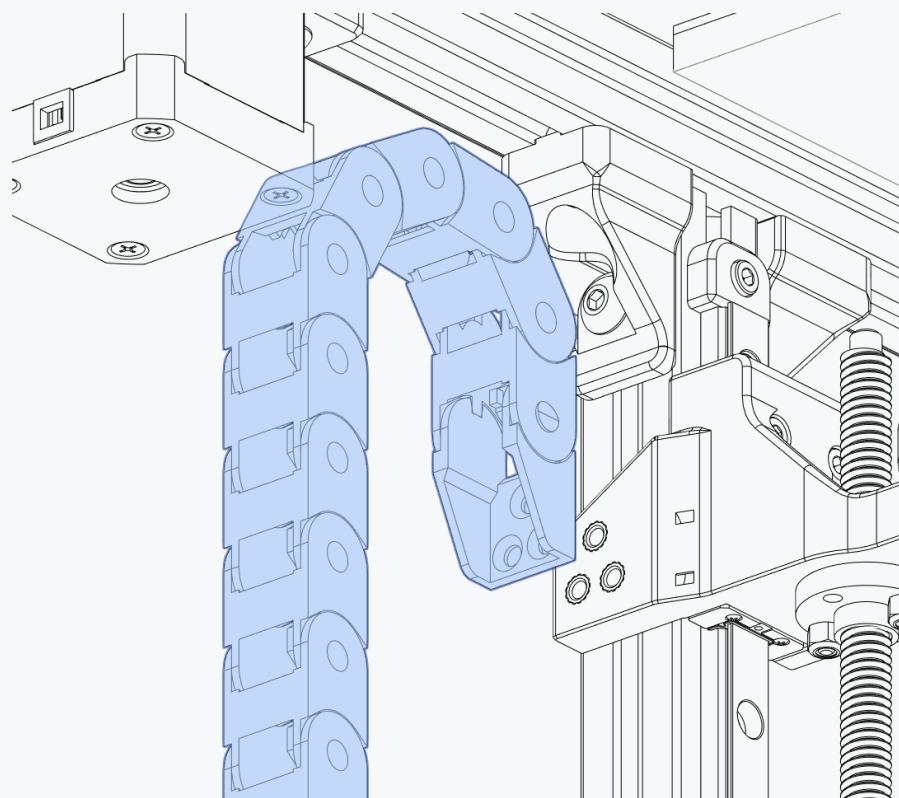
The bed heater is powered by AC voltage and is grounded in a later step.

Observe your local regulations in regards to grounding the frame/other components.

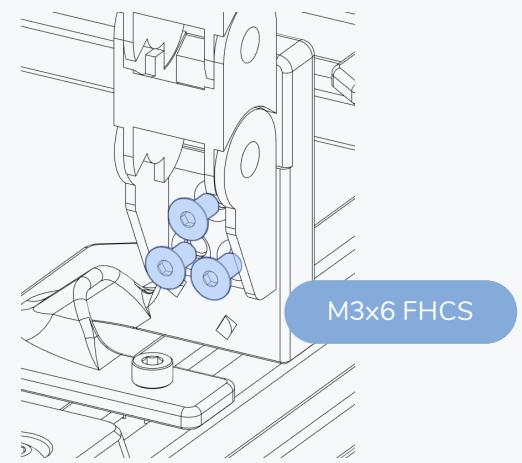


## BED CABLE ROUTING

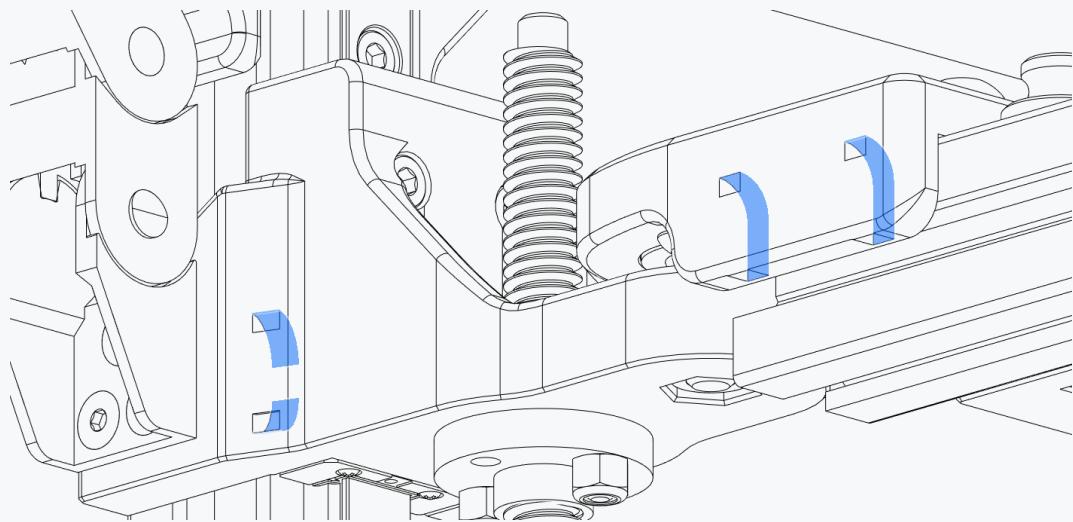
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M3x6 FHCS

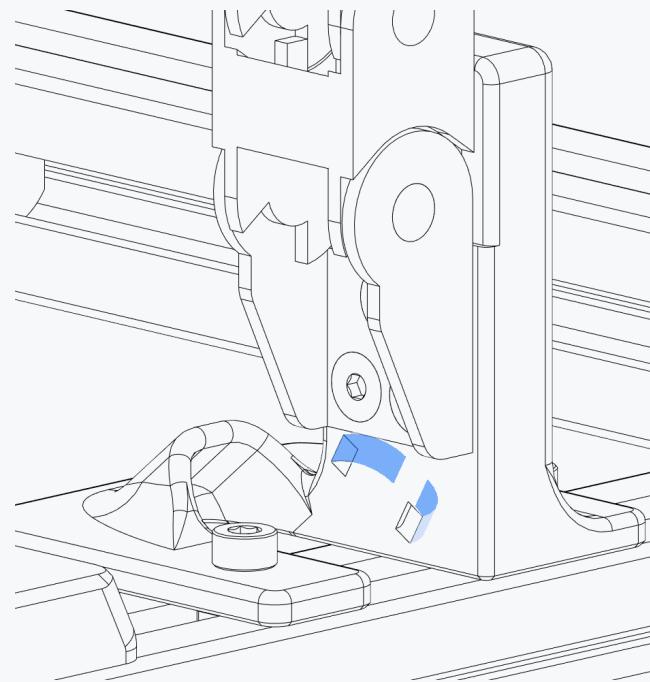


M3x6 FHCS



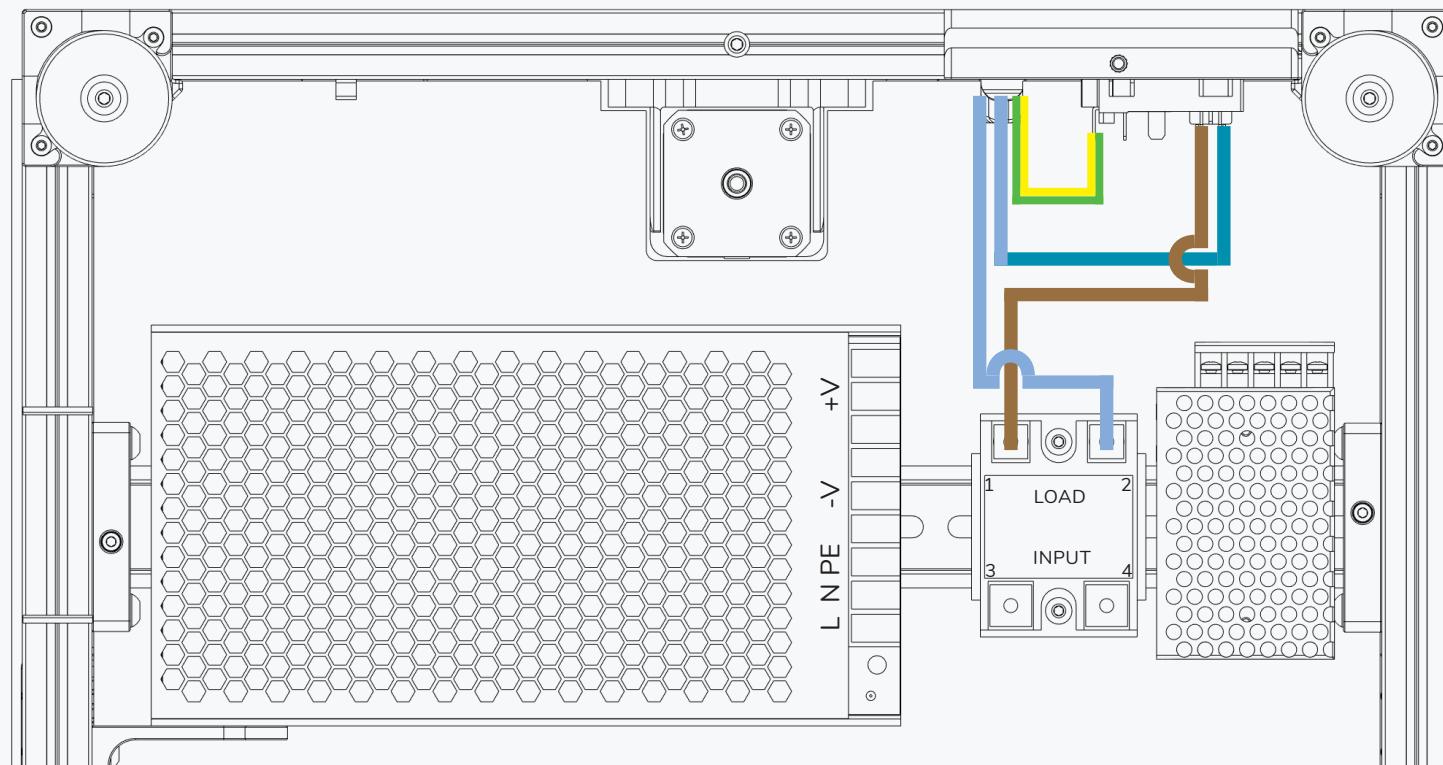
**ZIP TIE LOOPS**

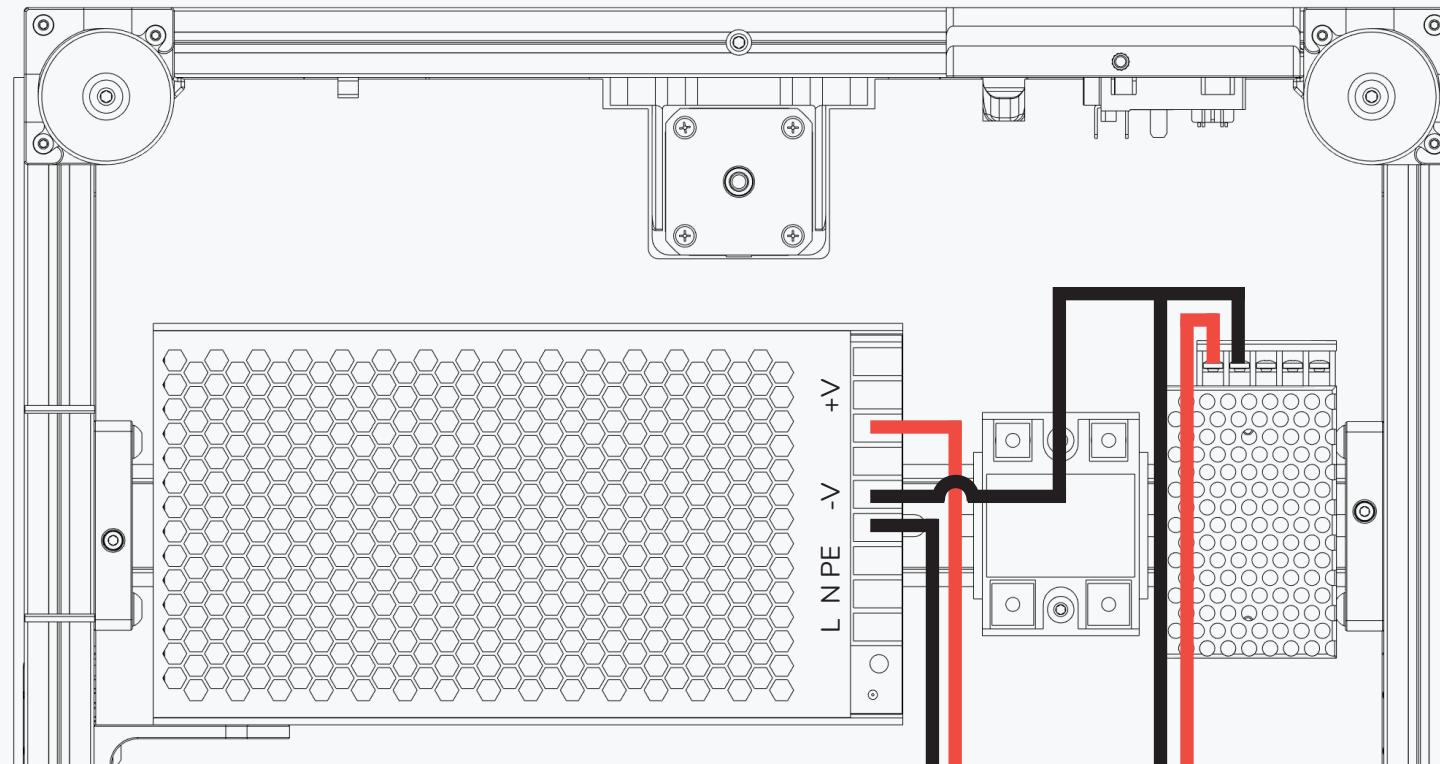
Secure the wire bundle to the strain relief using small zip ties.



BED CABLE HOOKUP

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**CABLE CROSS SECTION**

Cables to the controller board should be 1mm<sup>2</sup> (AWG18) or larger.

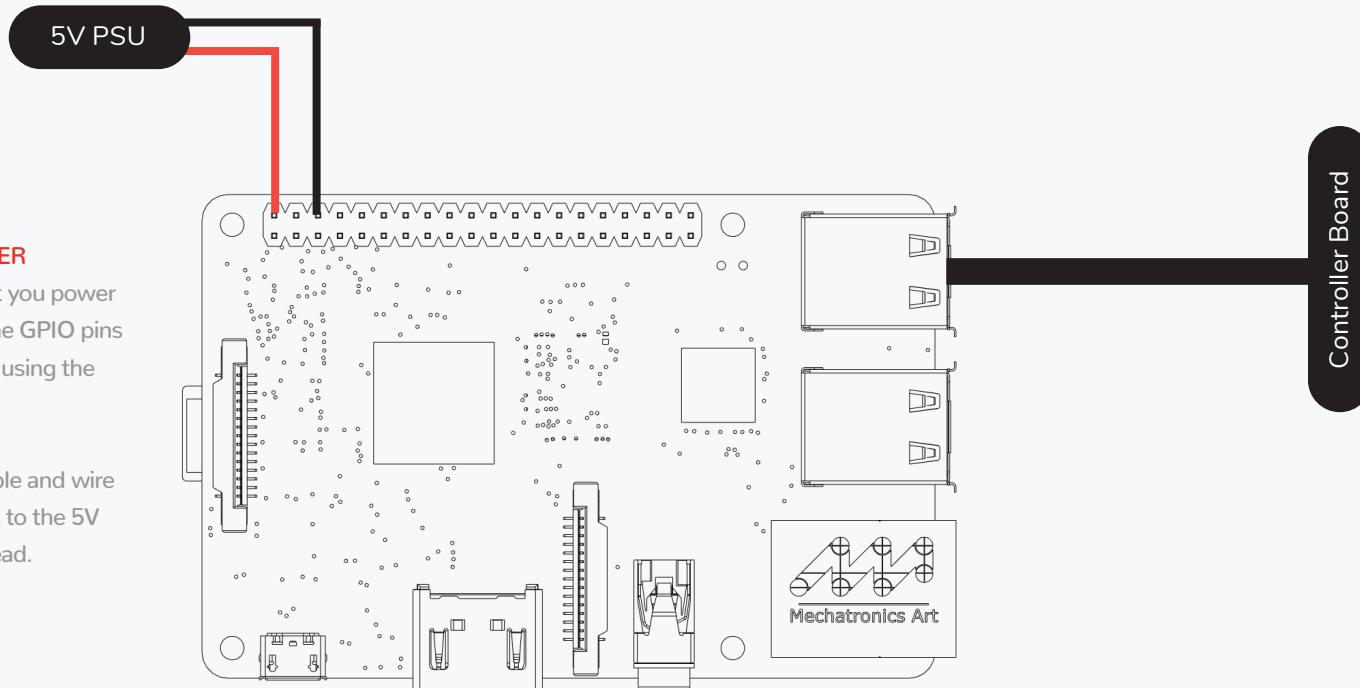
0.5mm<sup>2</sup> (AWG20) is sufficient for the connection to the Raspberry Pi.

**24V Controller Board****5V Raspberry Pi**

**RASPBERRY PI POWER**

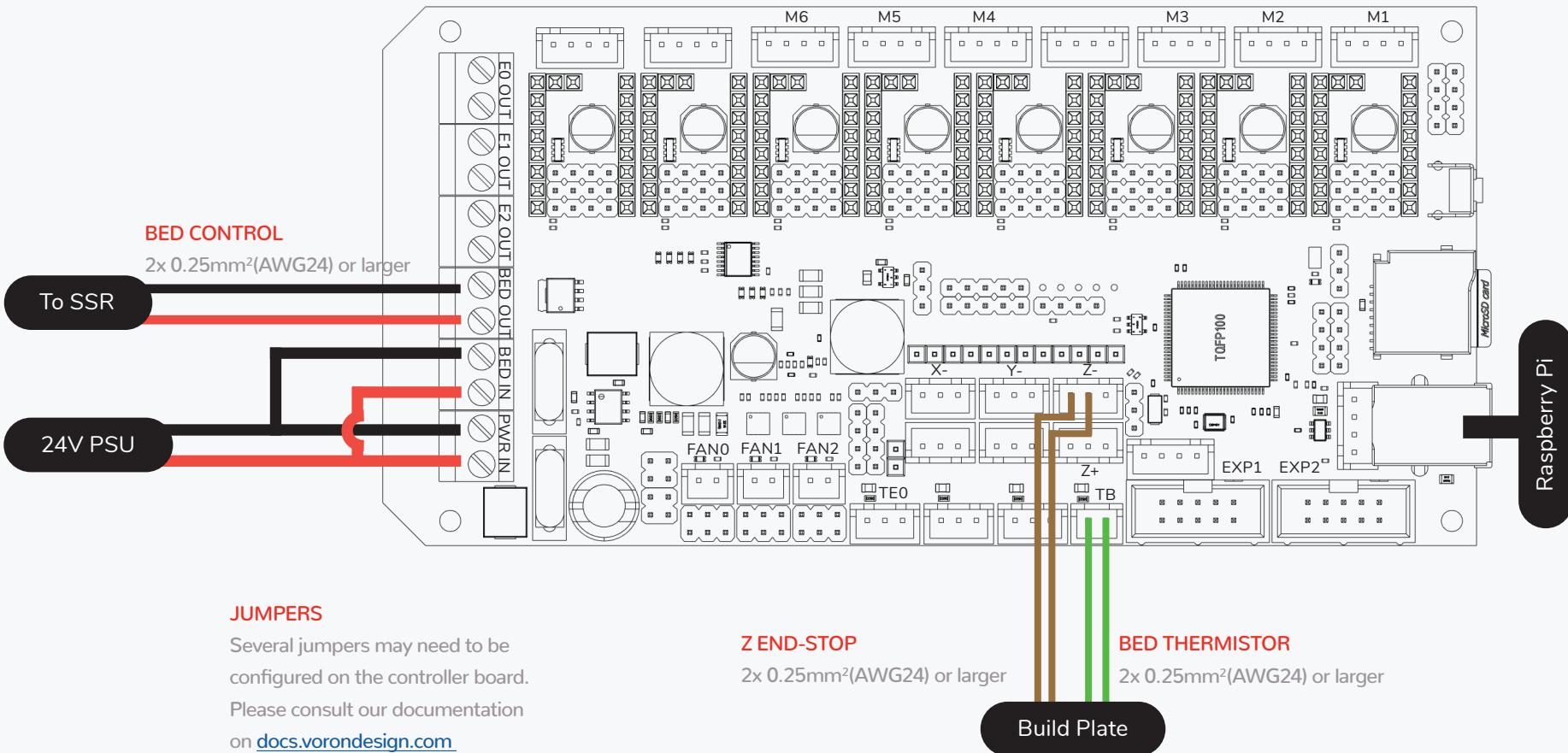
While we suggest that you power the Raspberry Pi via the GPIO pins you may also power it using the "Power-In" USB port.

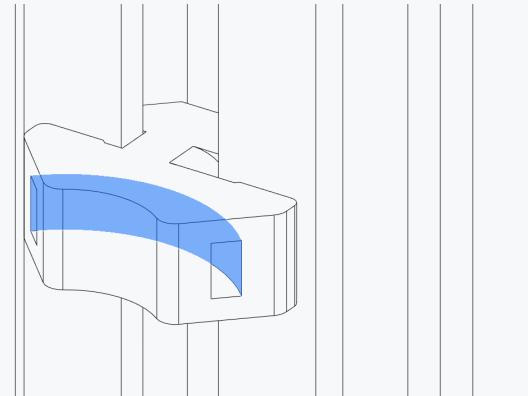
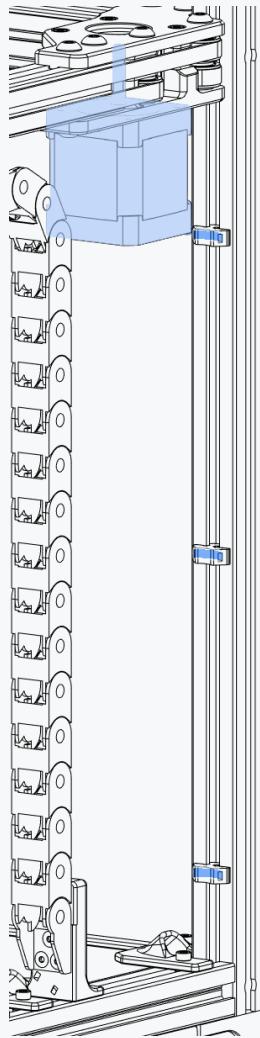
Cut a suitable USB cable and wire the + and ground lines to the 5V DC/DC converter instead.



**CONTROLLER BOARD**

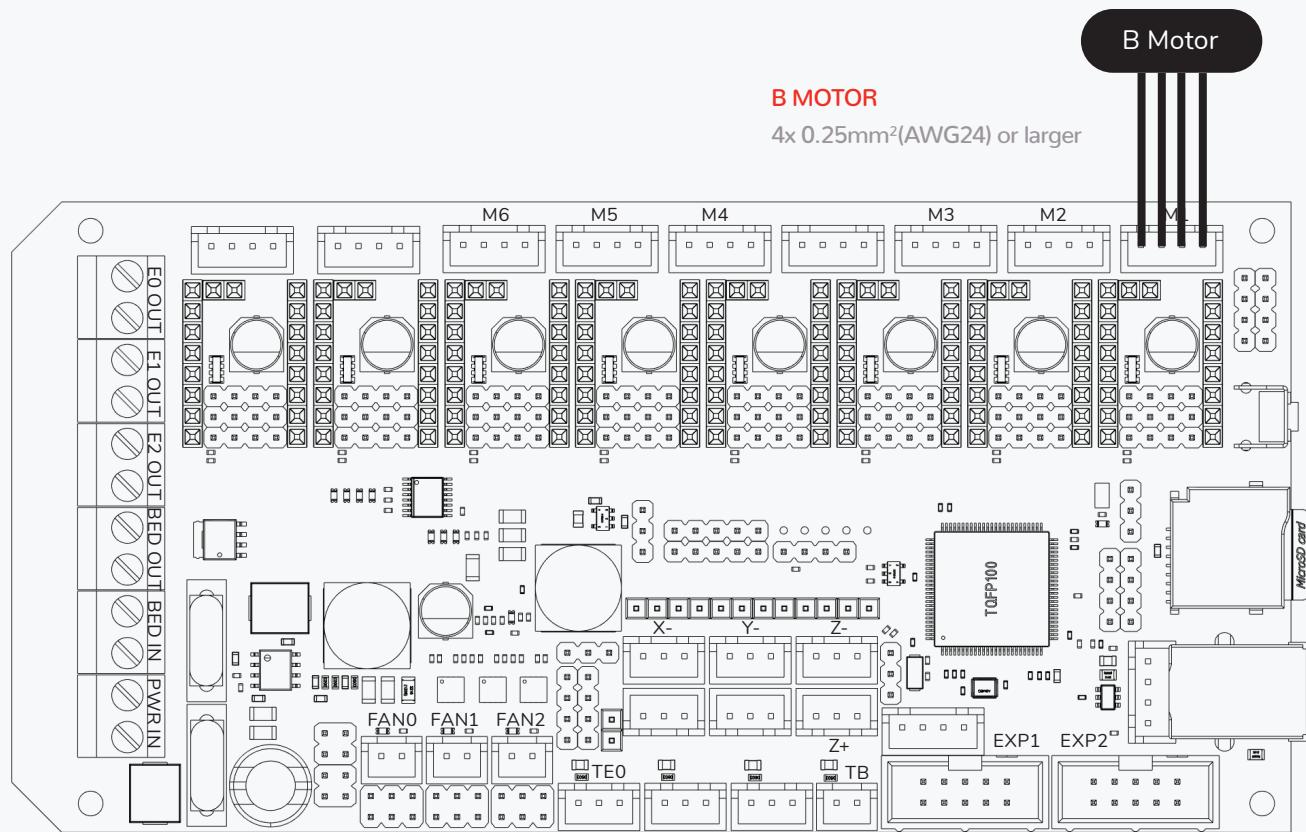
The assembly manual will outline the wiring for a Fysetc Spider. You can find additional documentation and alternative configurations on [docs.vorondesign.com](https://docs.vorondesign.com)

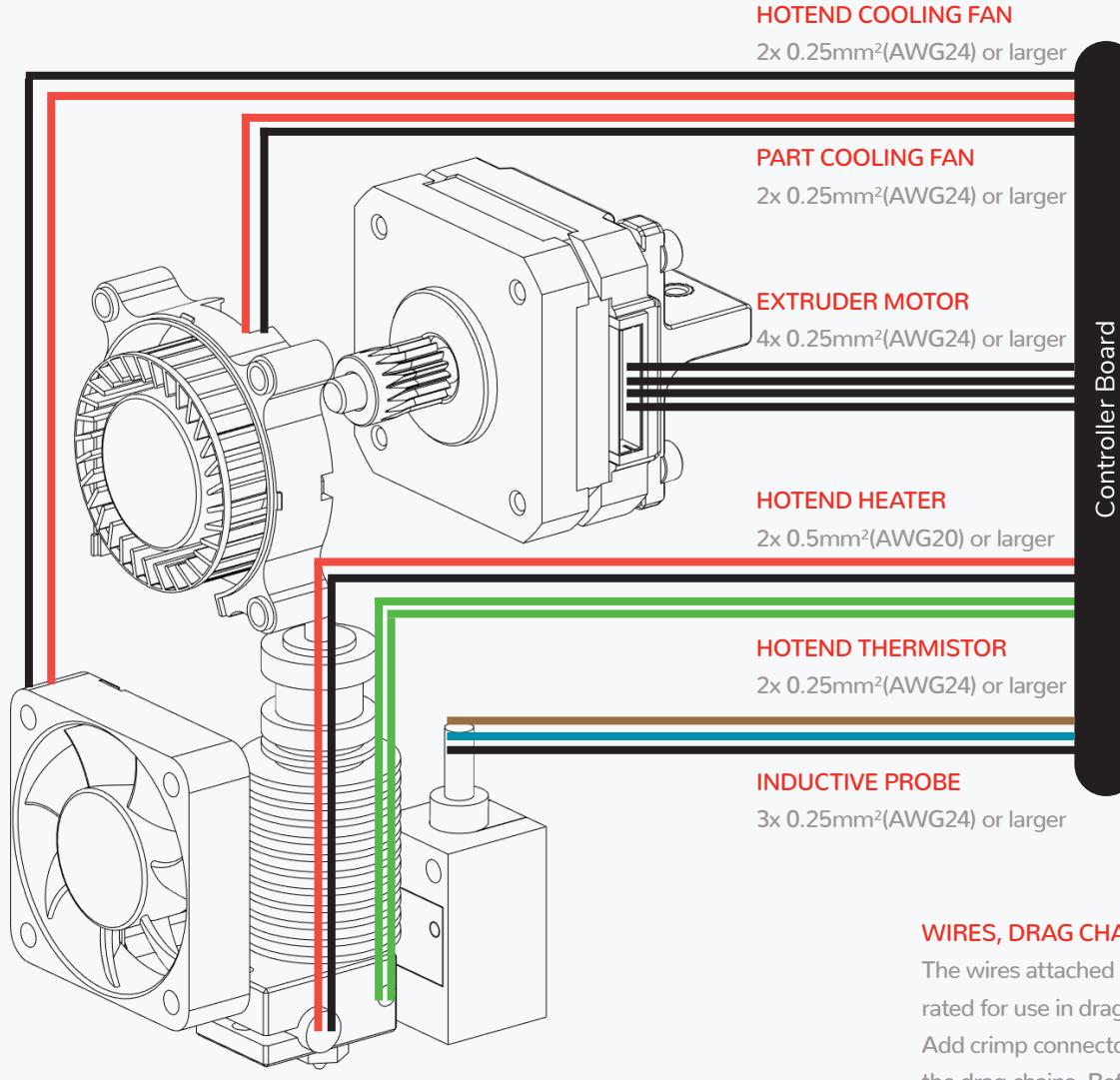


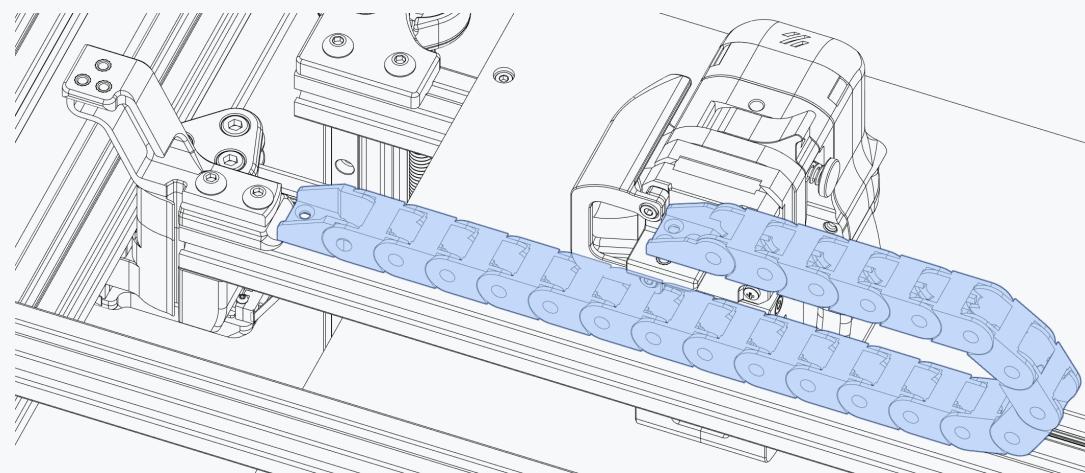
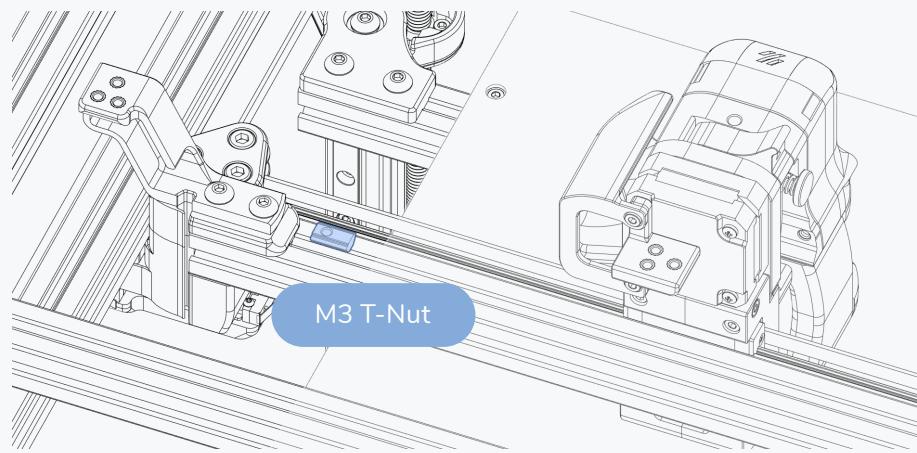


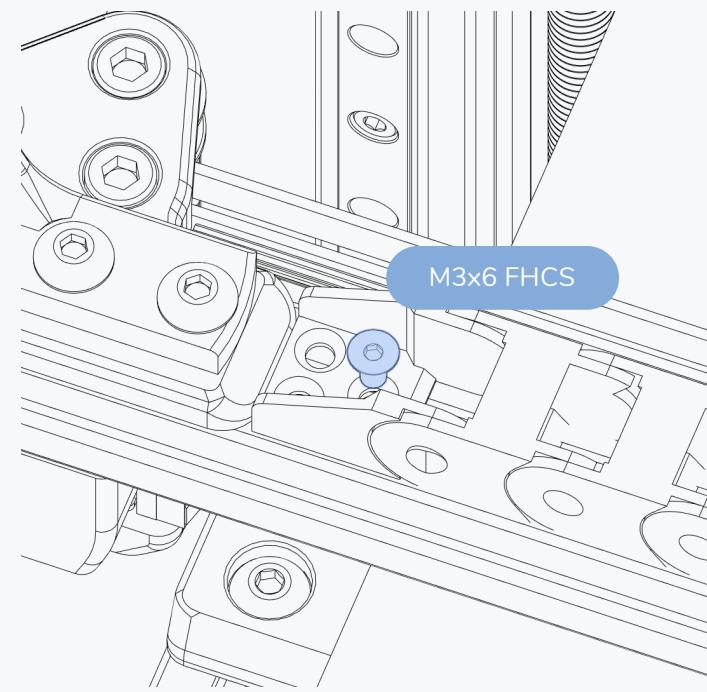
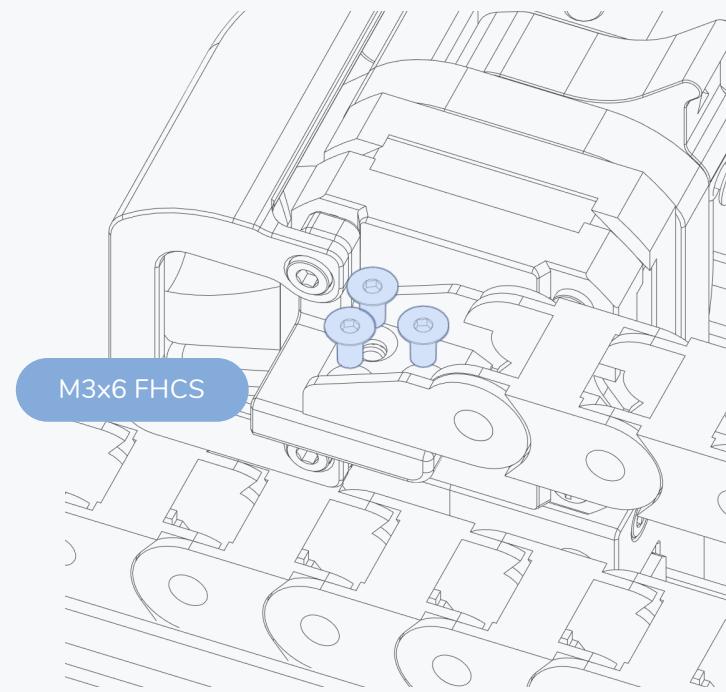
#### ZIP TIE LOOPS

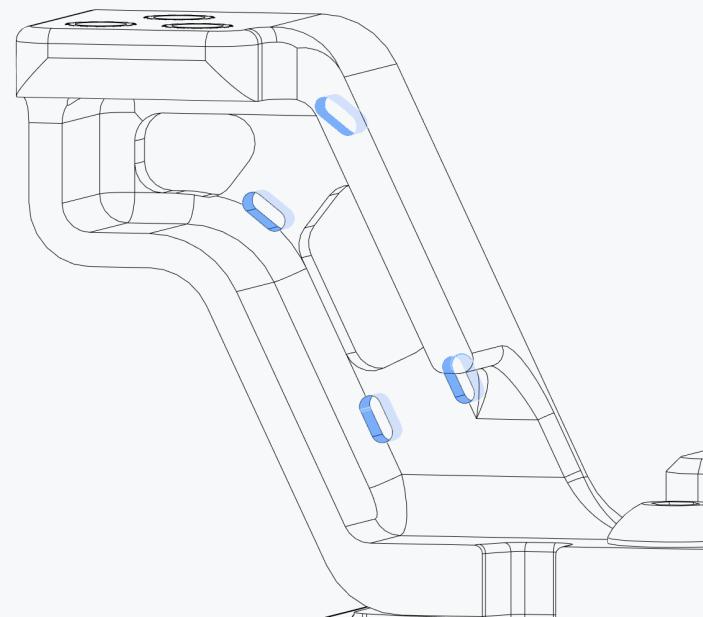
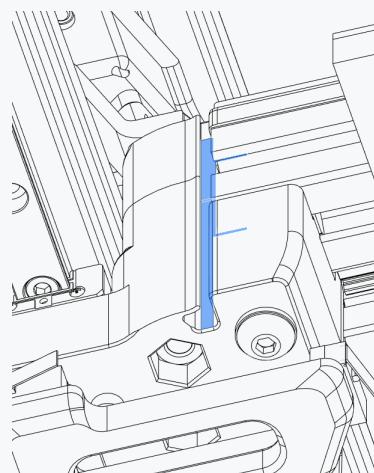
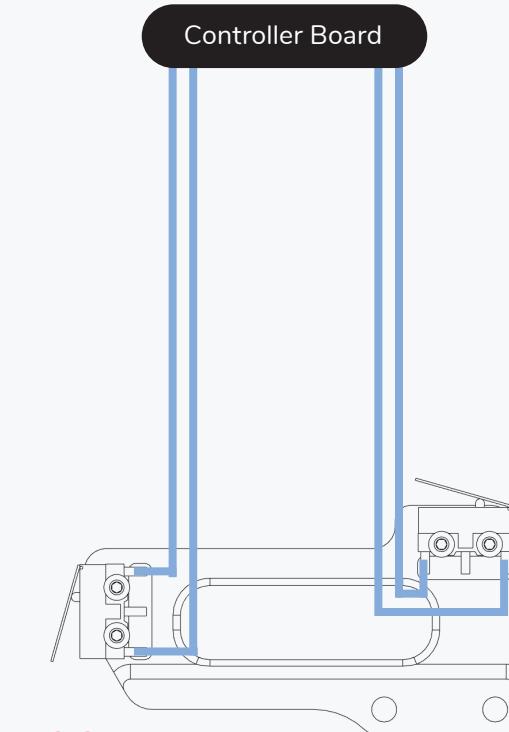
Secure the wire bundle to the strain relief using small zip ties.





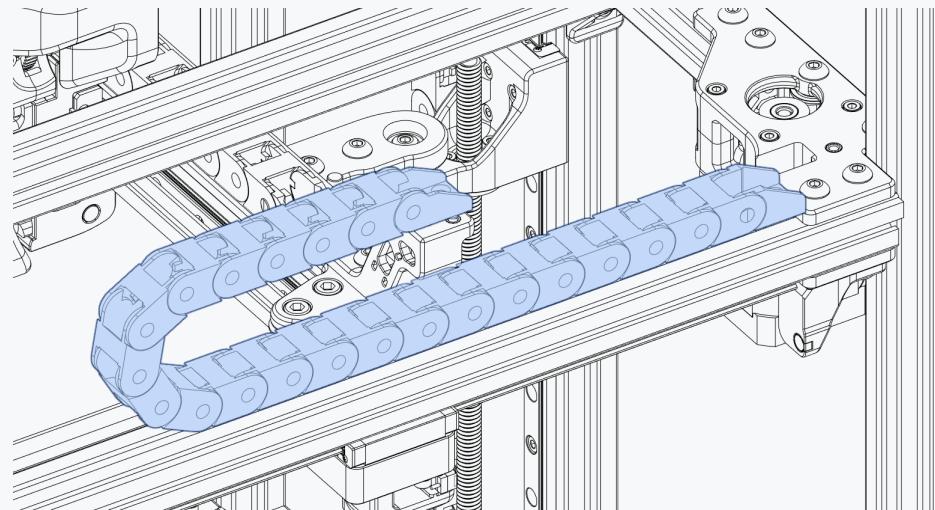
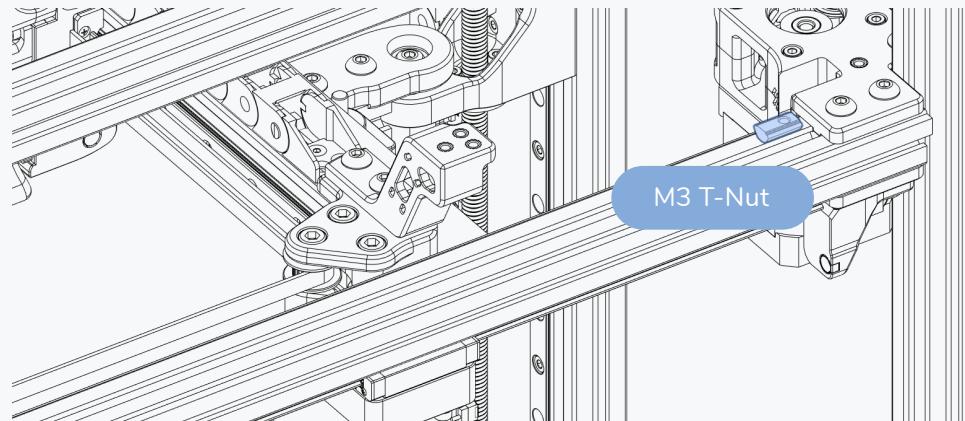


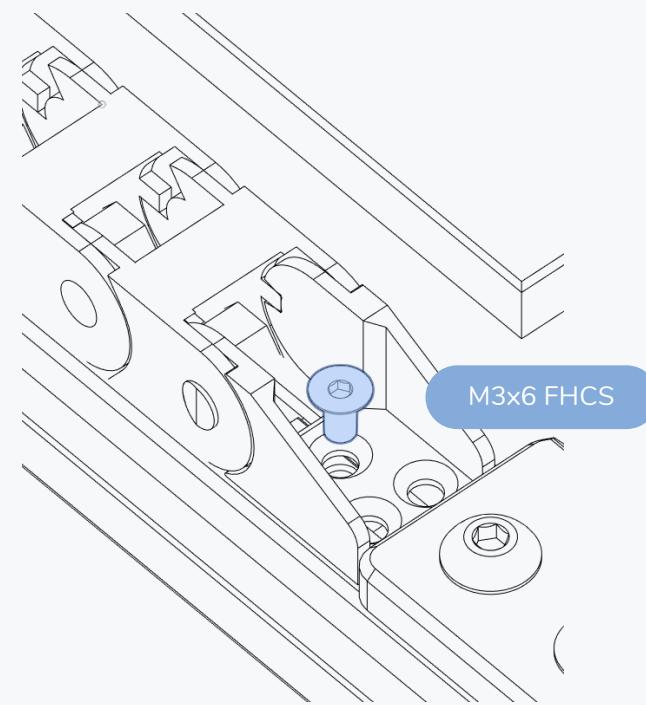
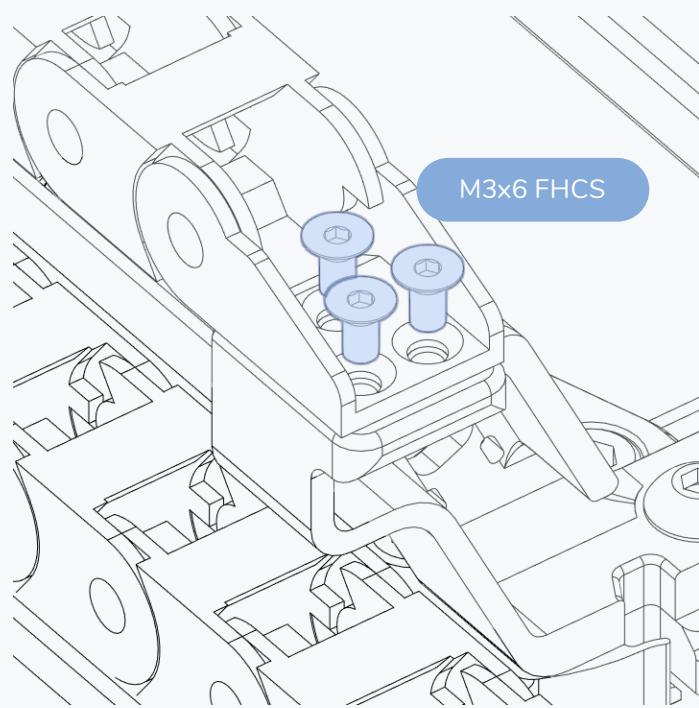


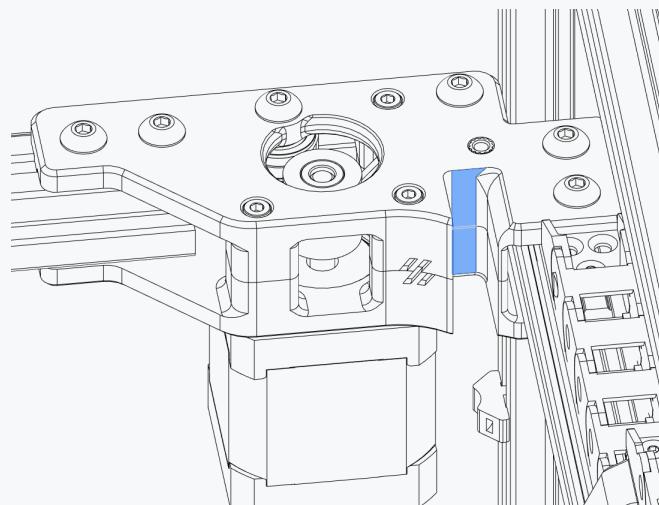


#### ZIP TIE LOOPS

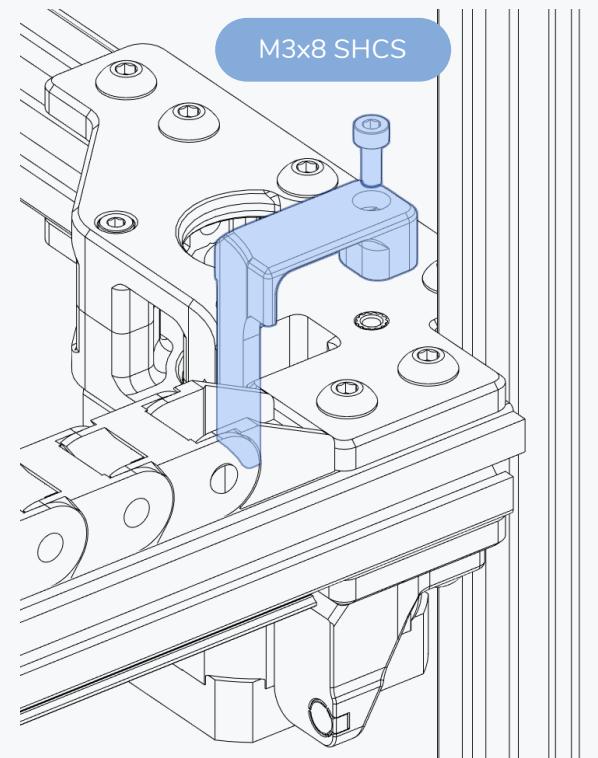
Secure the wire bundle to the strain relief using small zip ties.

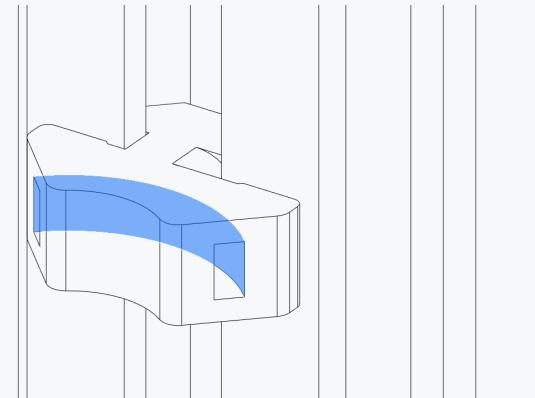
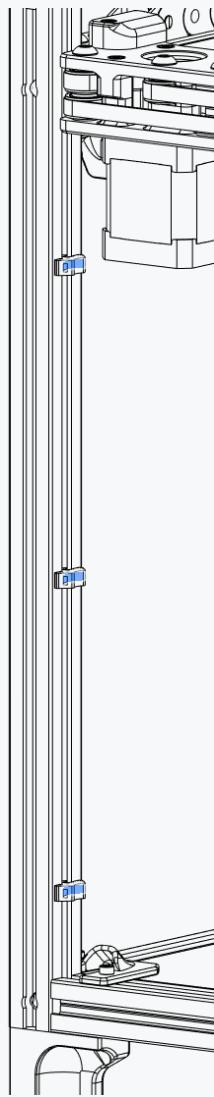




**WIRING PATH**

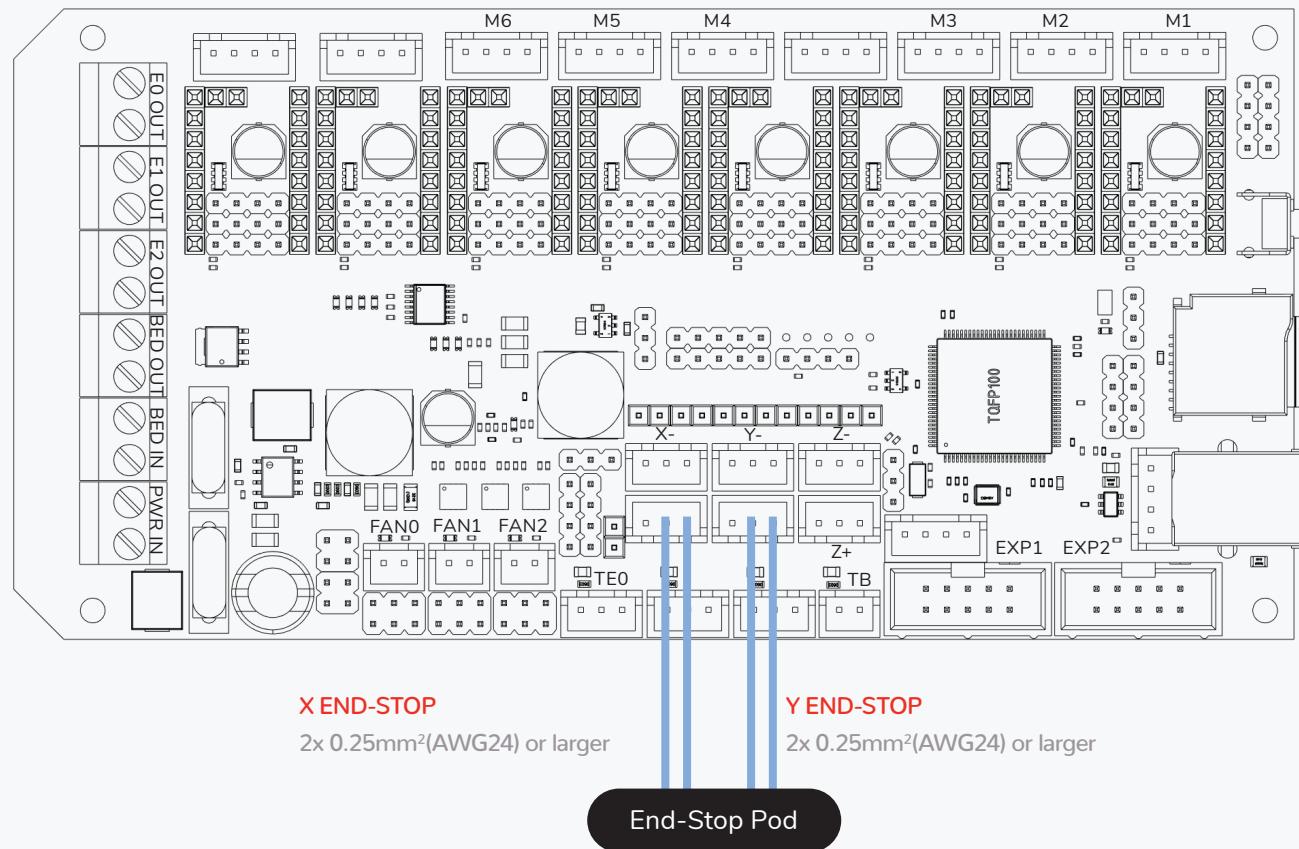
Guide the wires in the highlighted path.

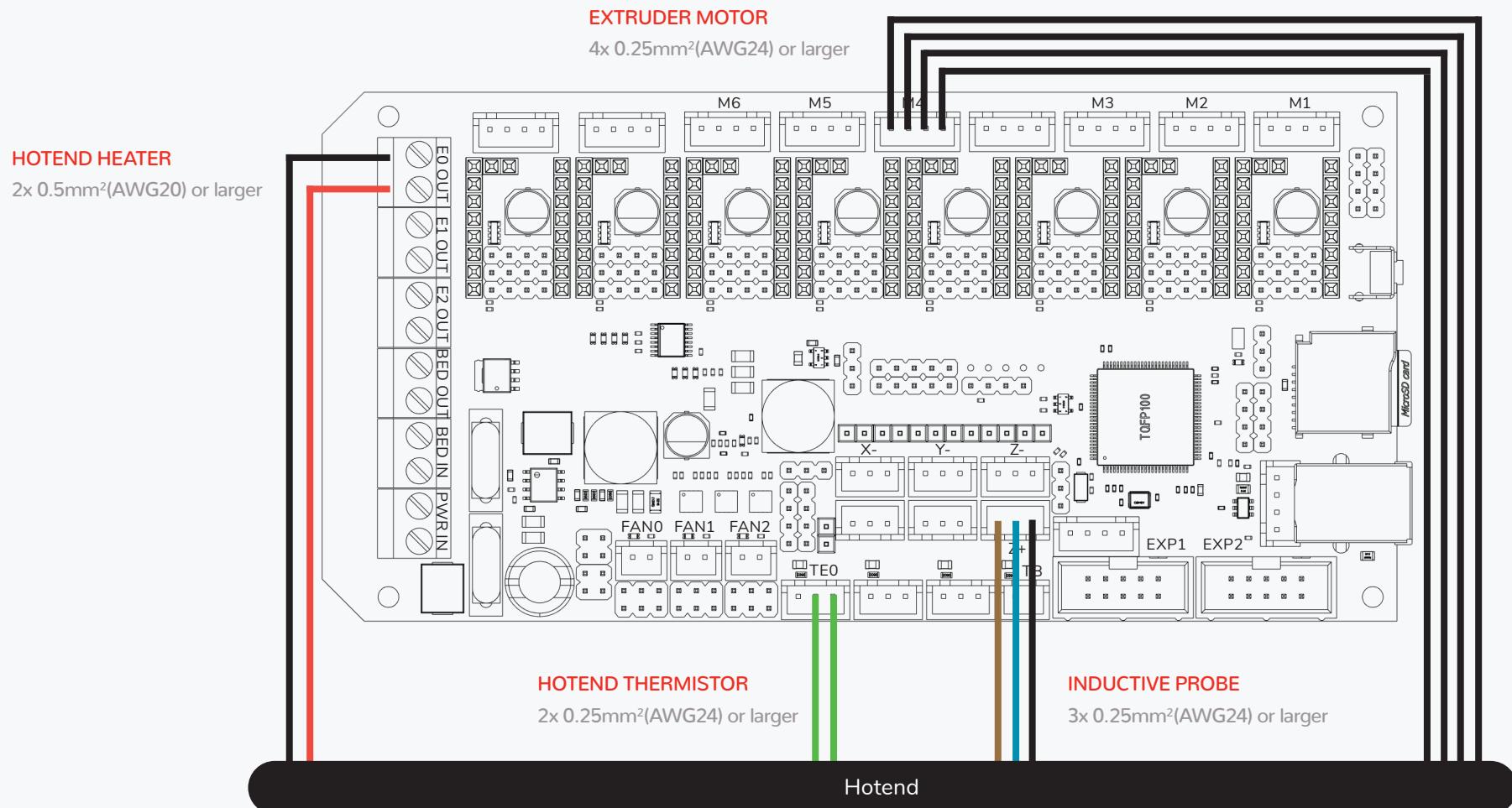


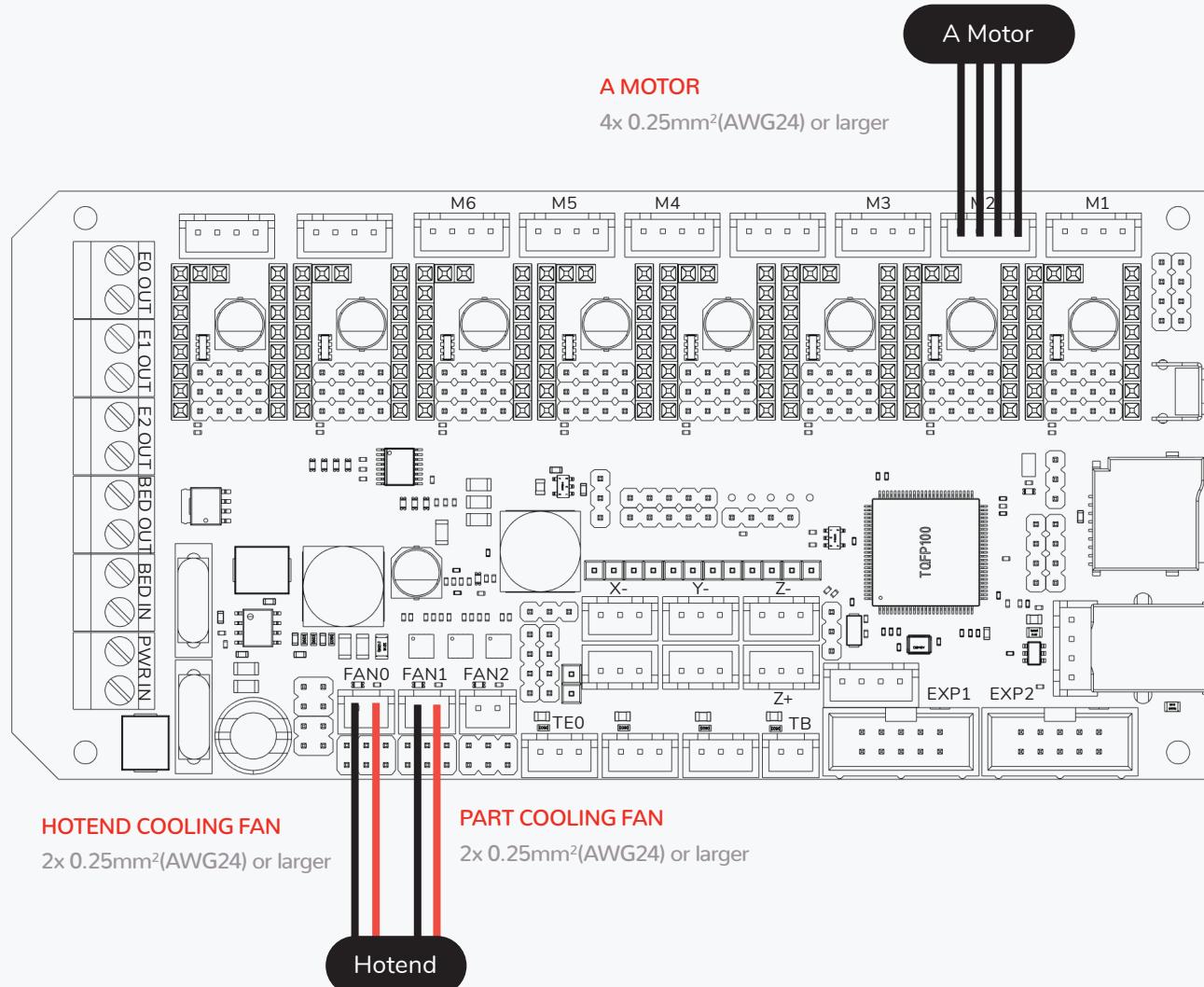


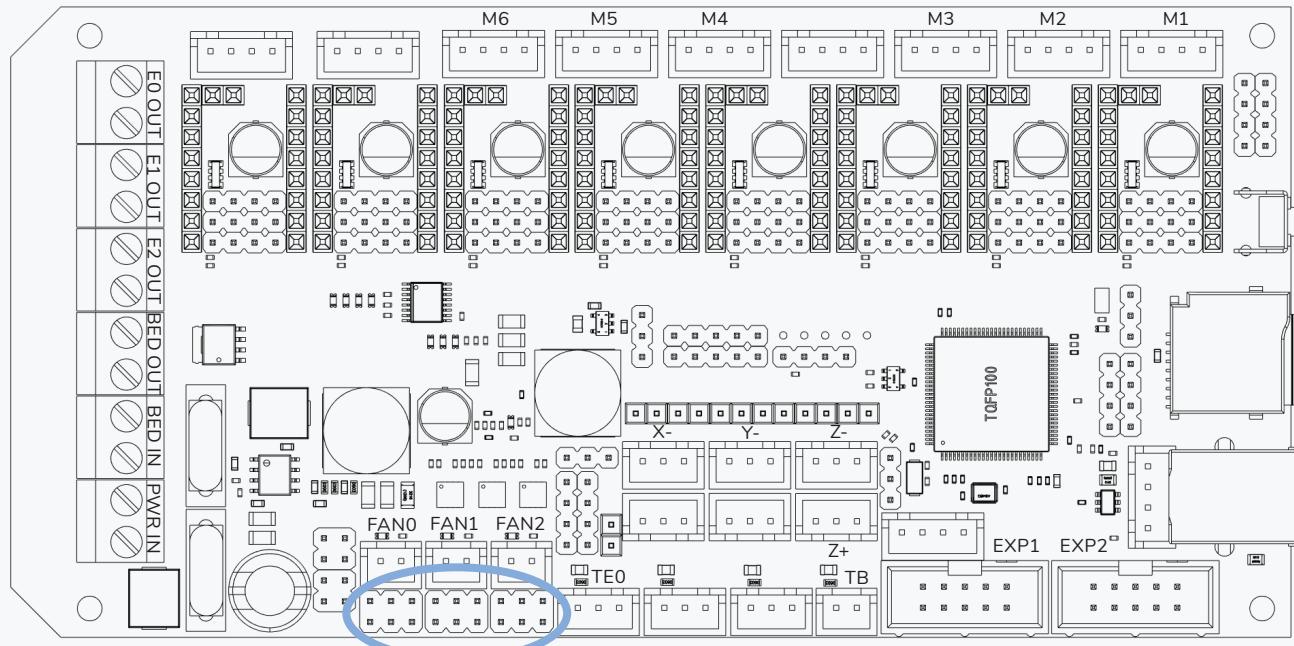
**ZIP TIE LOOPS**

Secure the wire bundle to the strain relief using small zip ties.





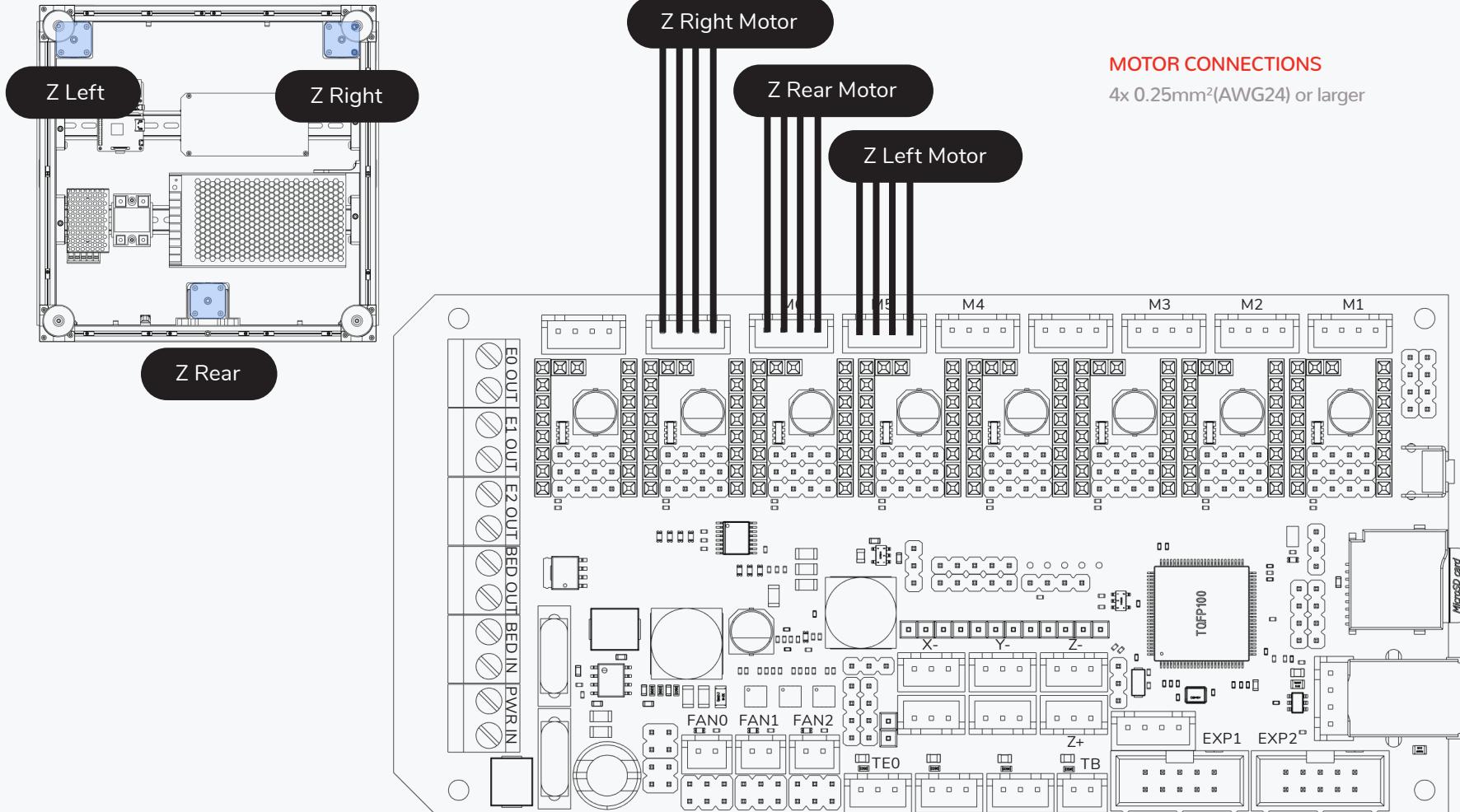




### FAN VOLTAGE

The fans recommended in the sourcing guide are 24V fans.

Please check your hotend cooling (40x40x10 axial), part cooling (40x40x20 blower) and exhaust/electronics (60x60x20 axial) fans for their voltage rating and jumper the voltage selection accordingly. Refer to the Fysetc Spider manual for possible settings.



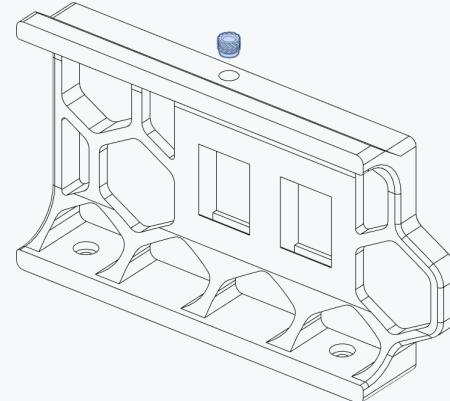
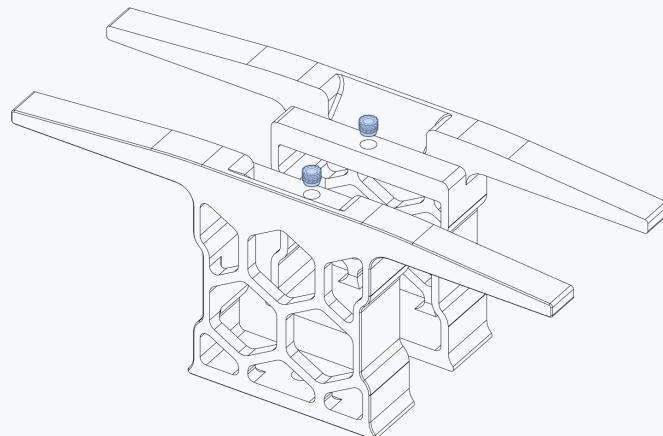
SKIRTS

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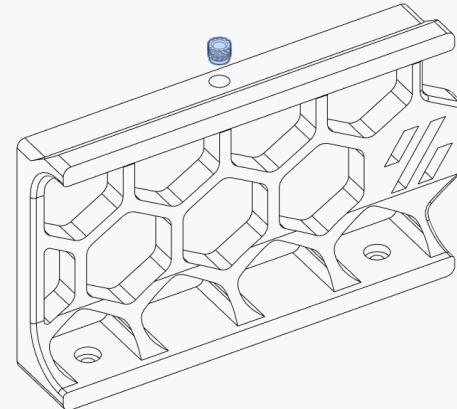
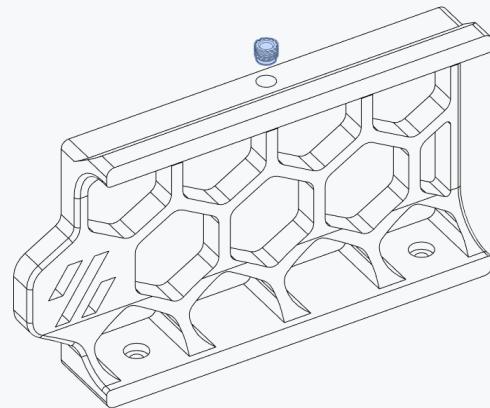


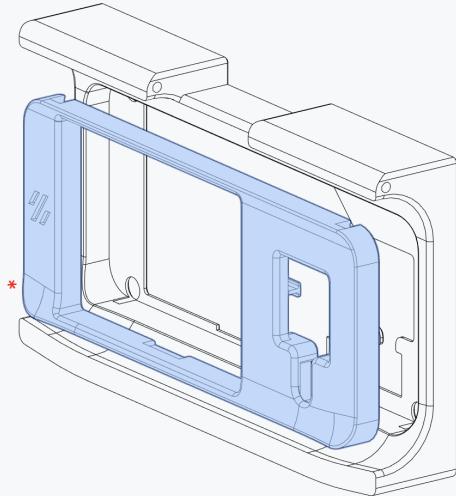
## HEAT SET INSERT

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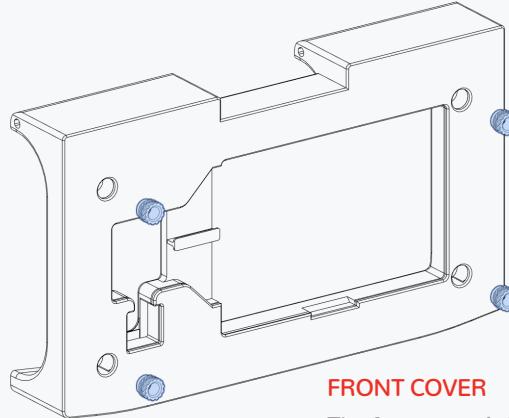


Heat Set Insert

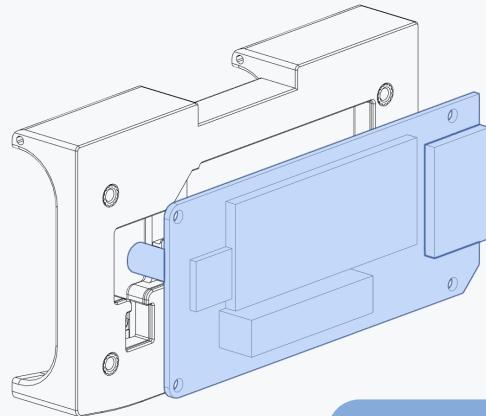




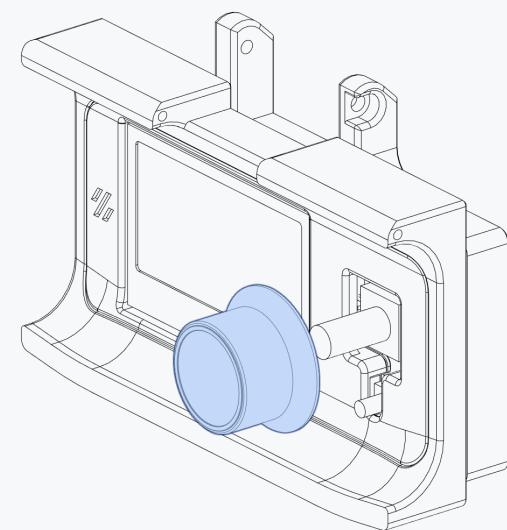
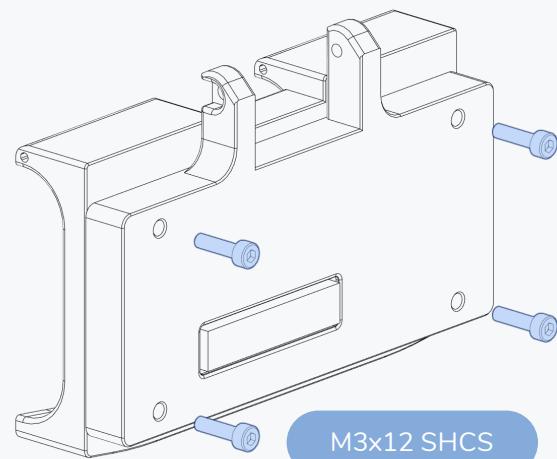
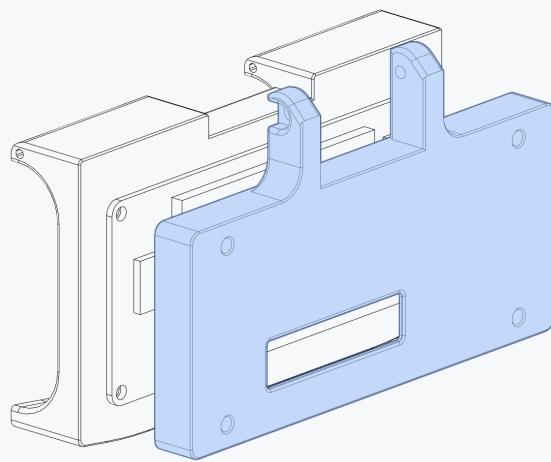
Heat Set Insert

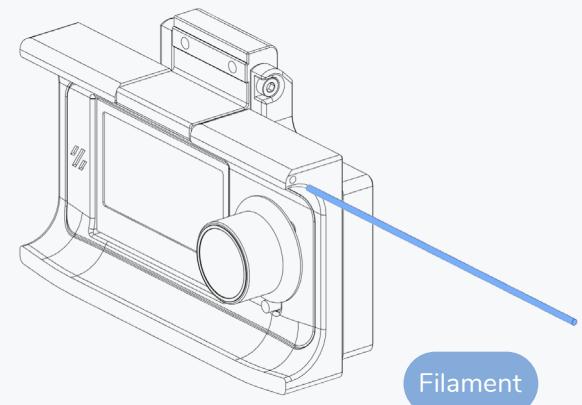
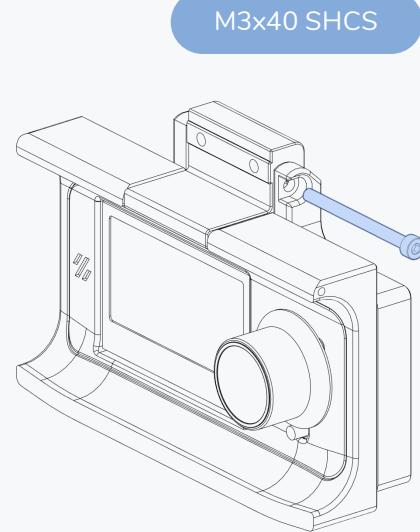
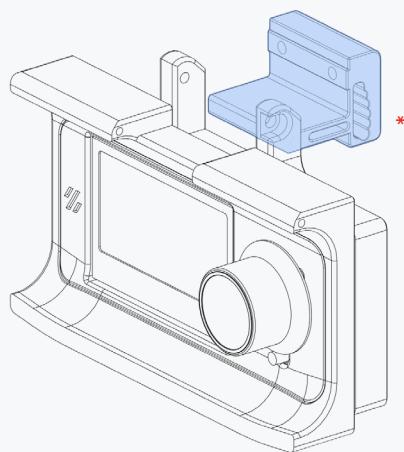
**FRONT COVER**

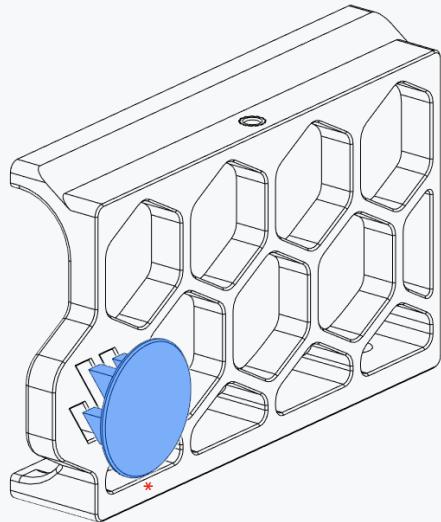
The front cover is held in place by the heat set inserts. Hold the front face firmly in place while inserting the heat set inserts.



Mini 12864 Screen

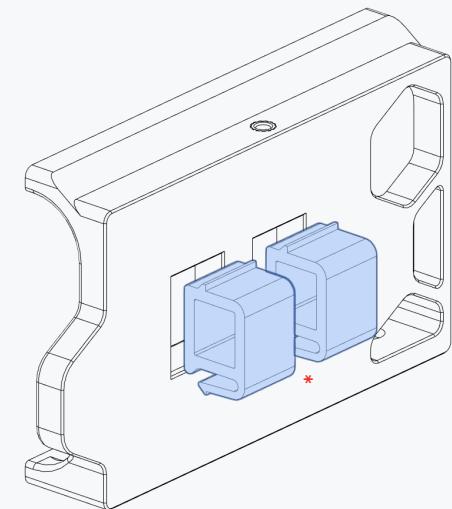
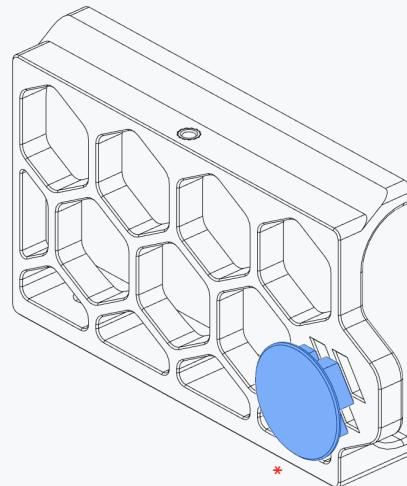


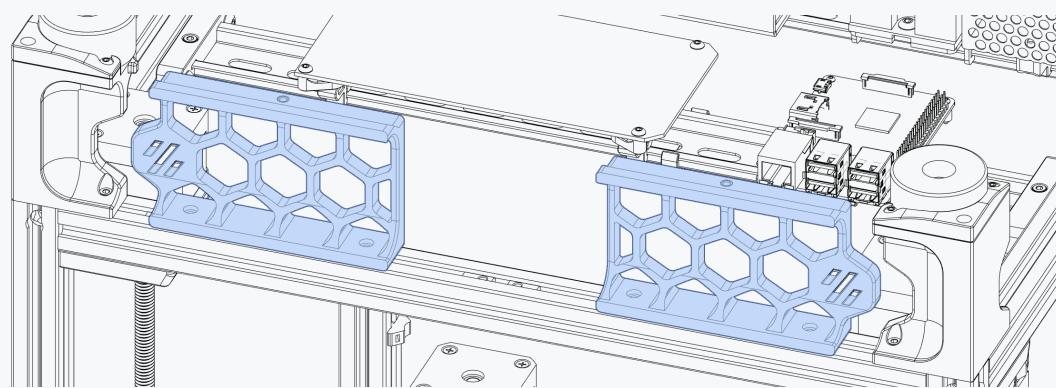
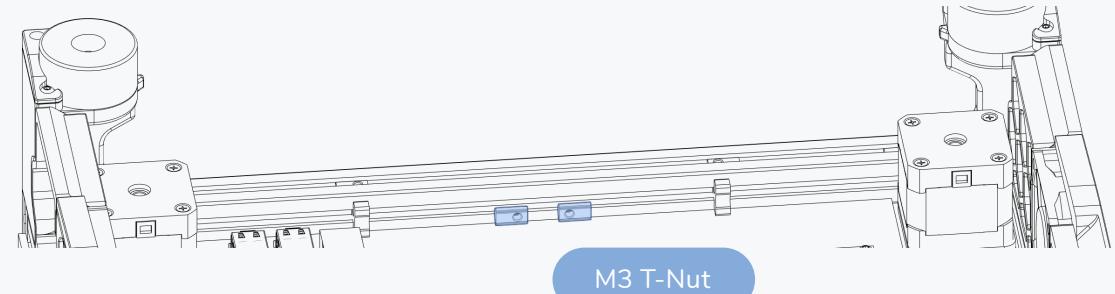
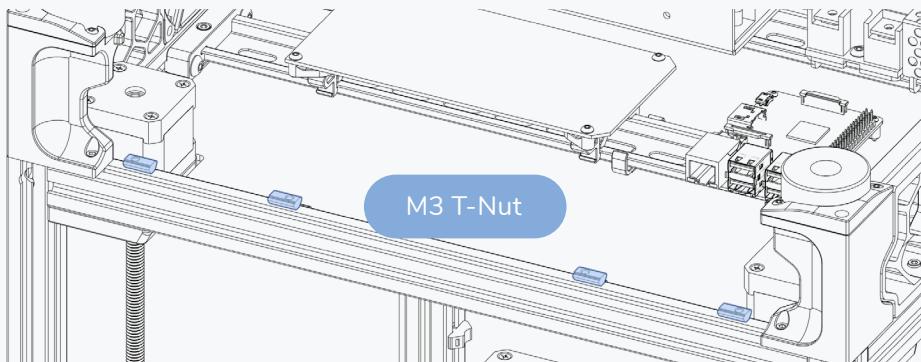


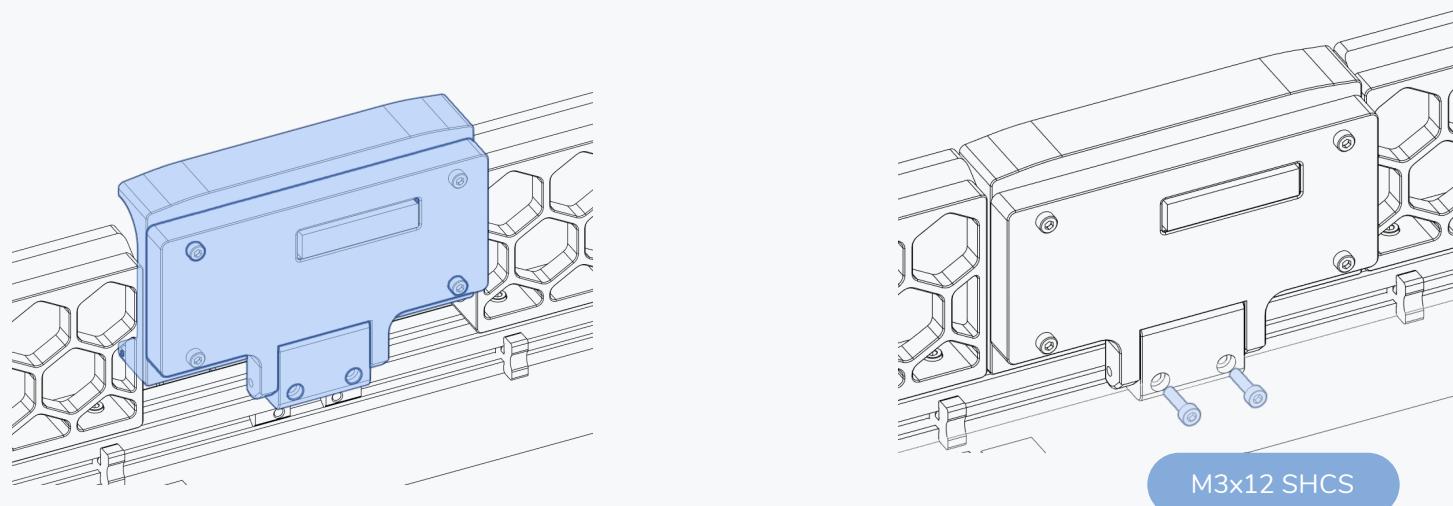
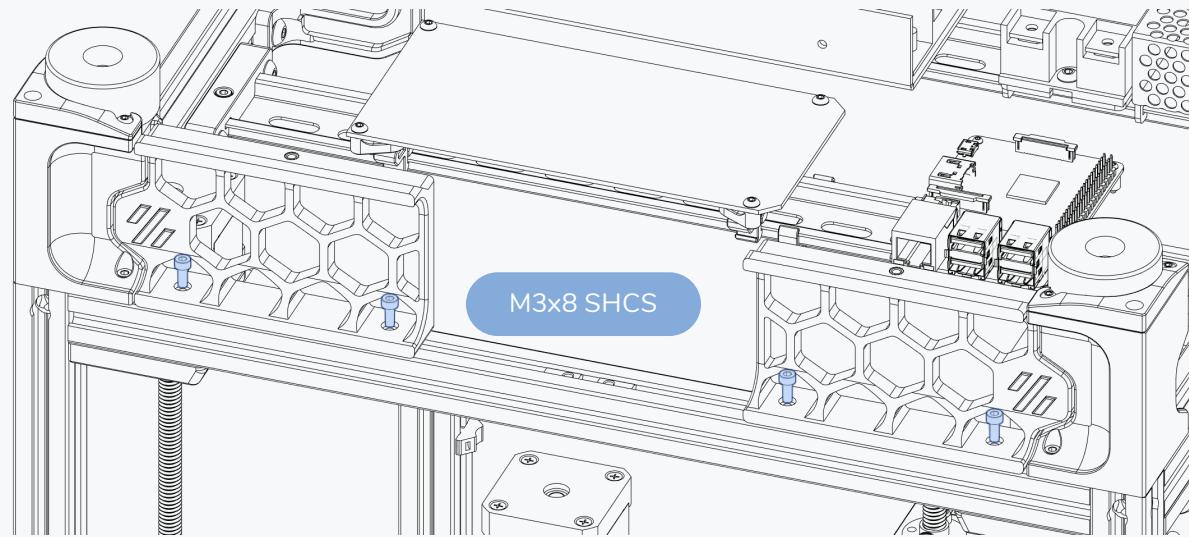
**LOGO INSERTS**

These will stay in place without any adhesive.

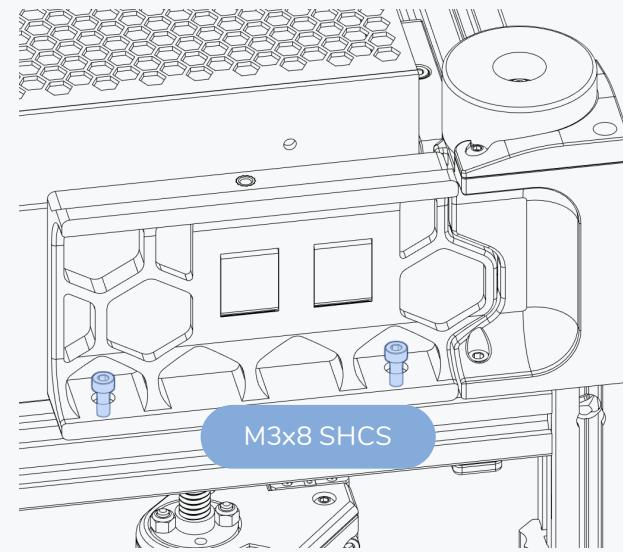
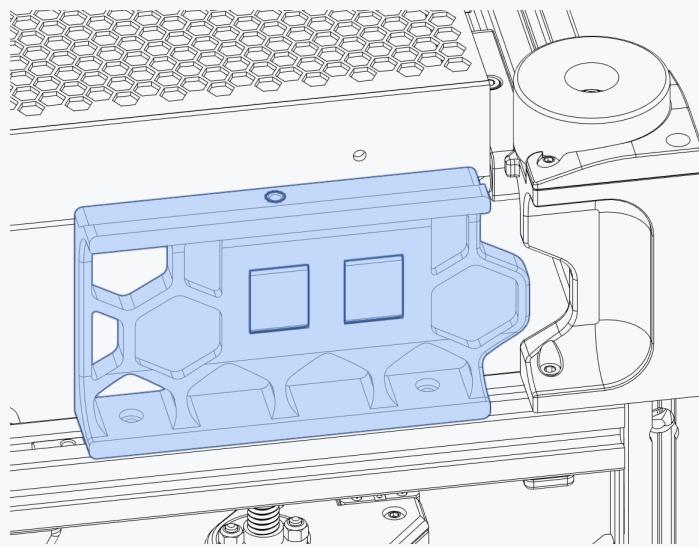
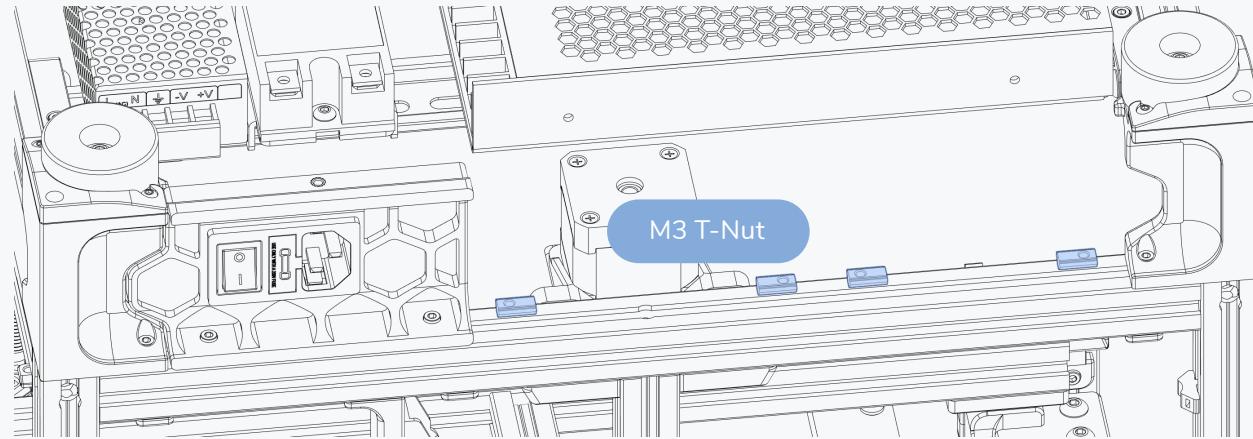
Alternatively can be glued in place.

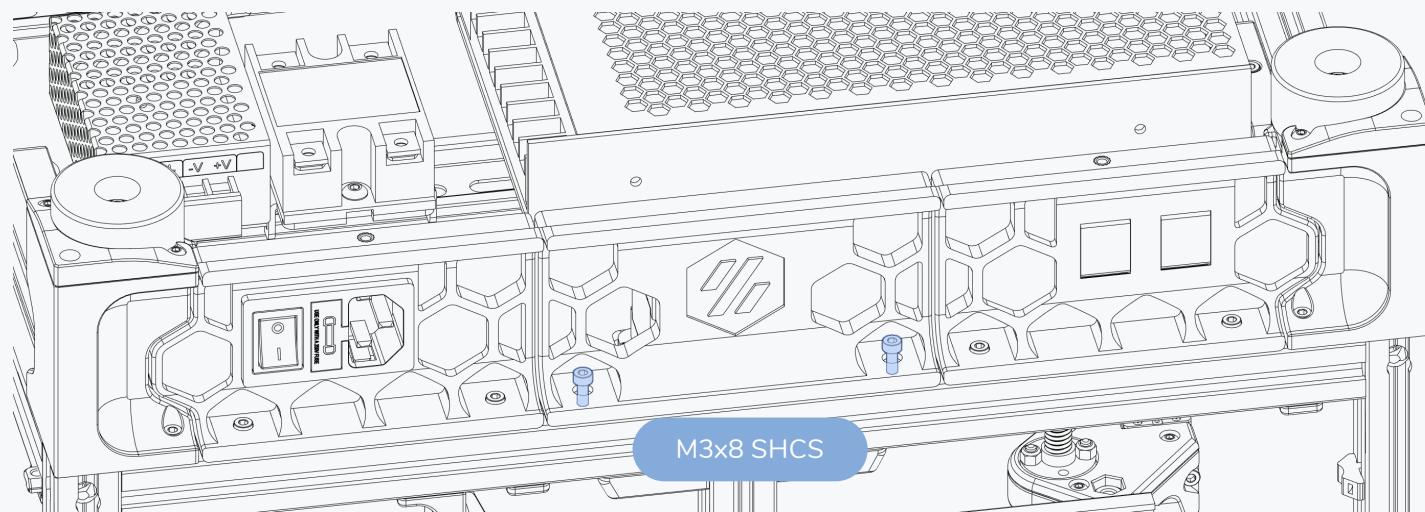
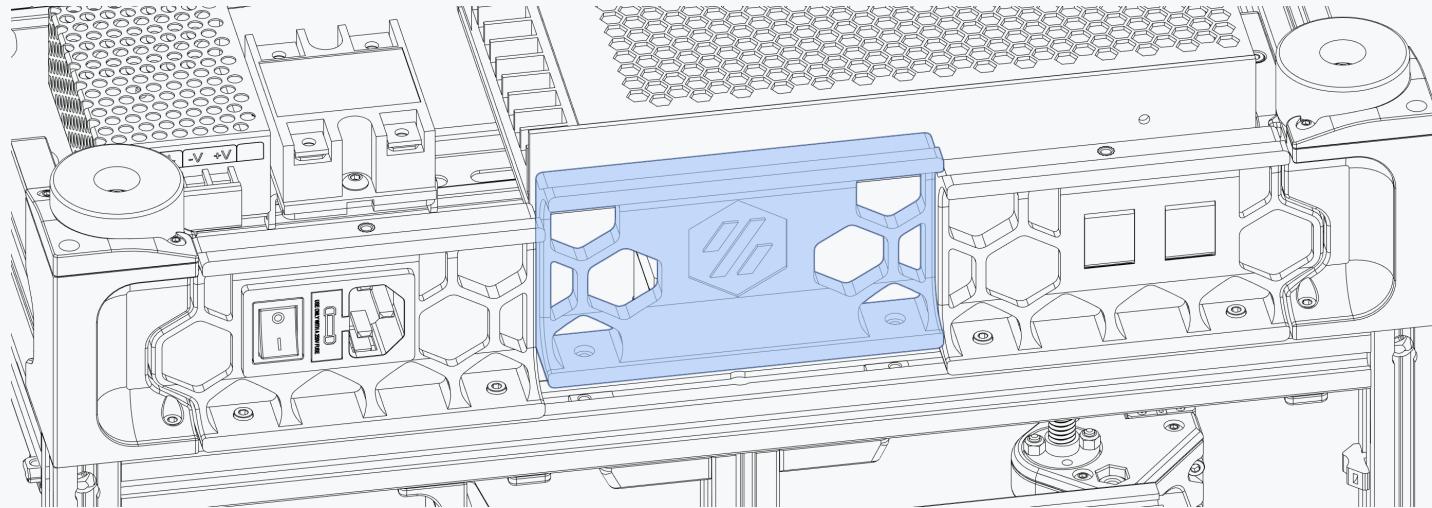




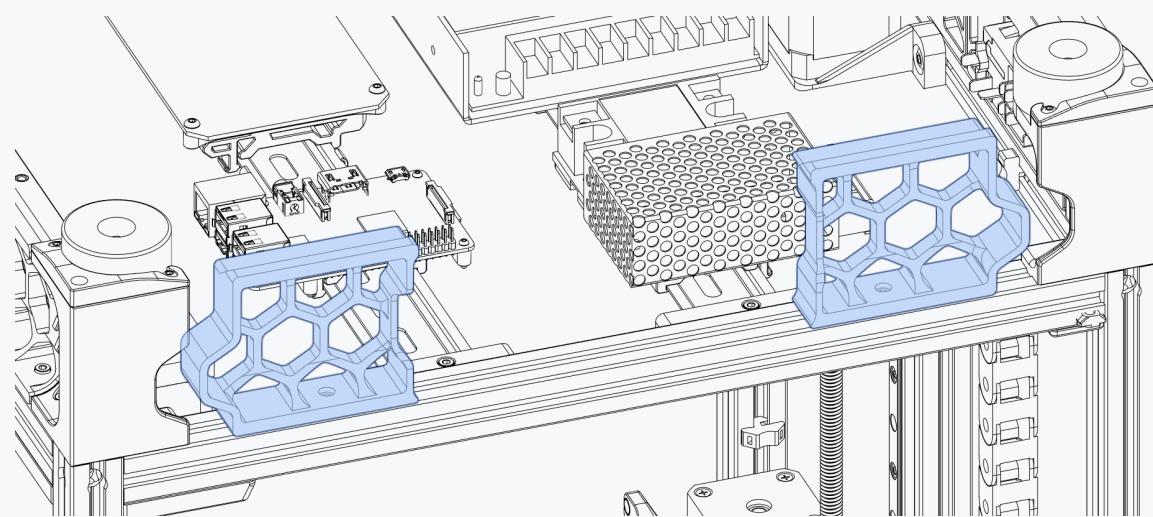
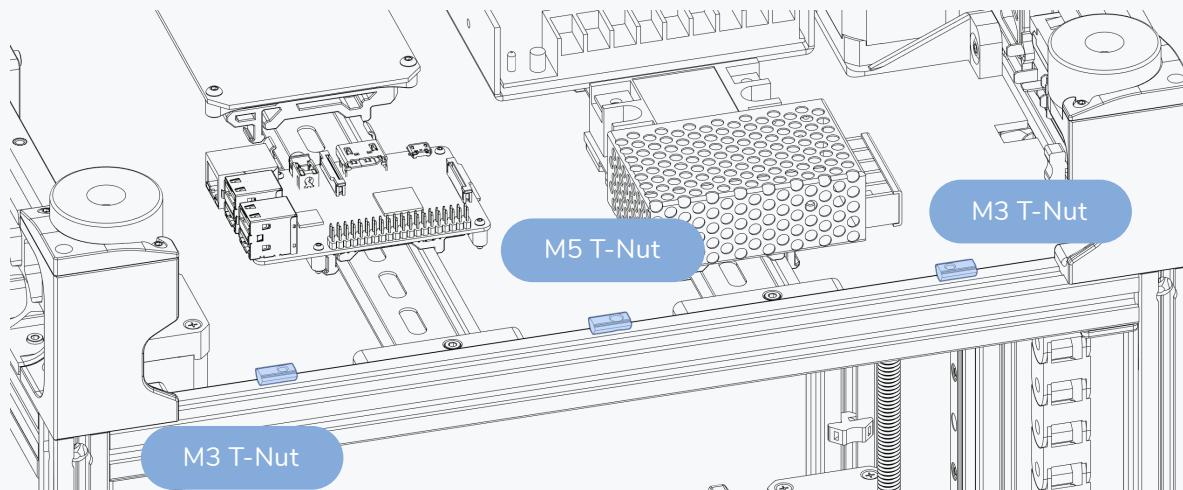


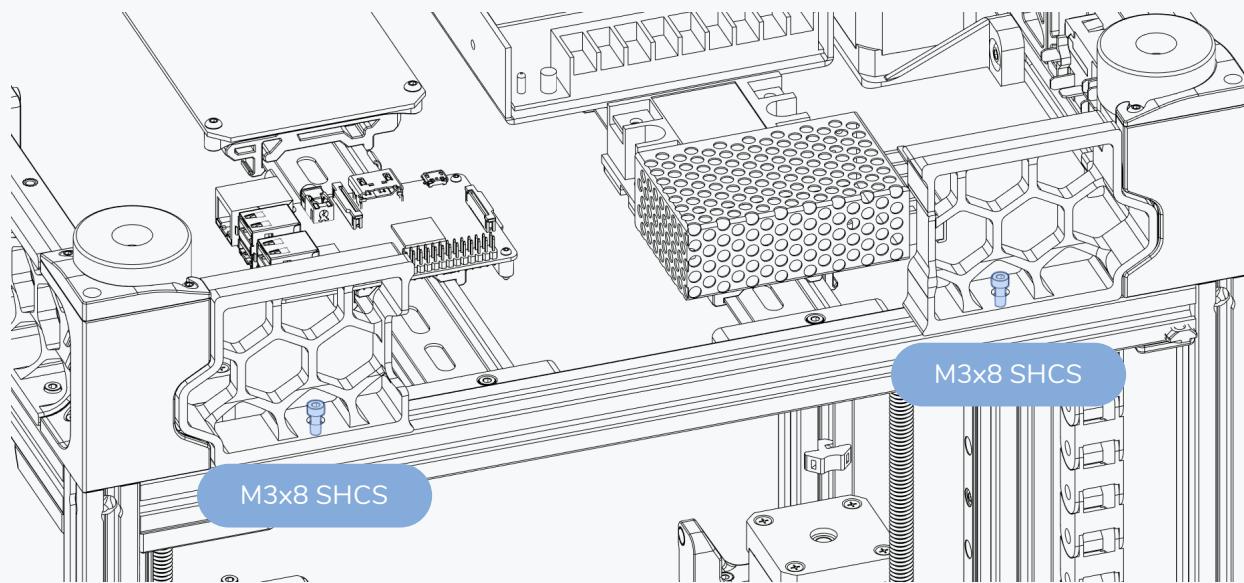
M3x12 SHCS

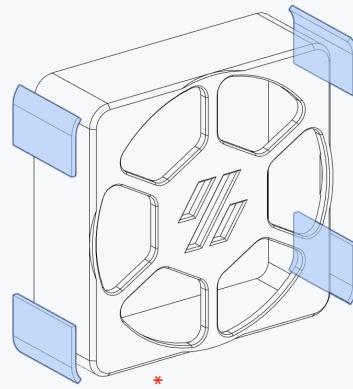




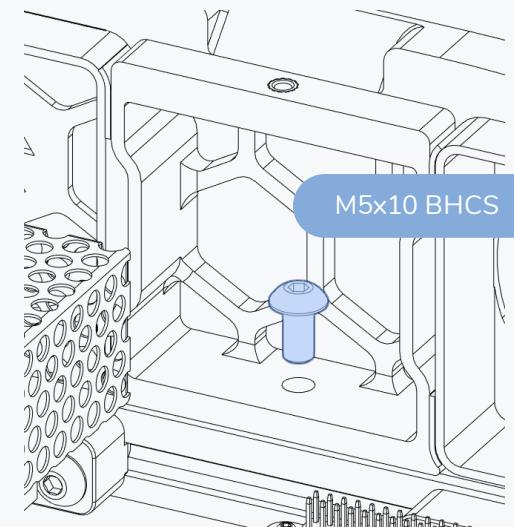
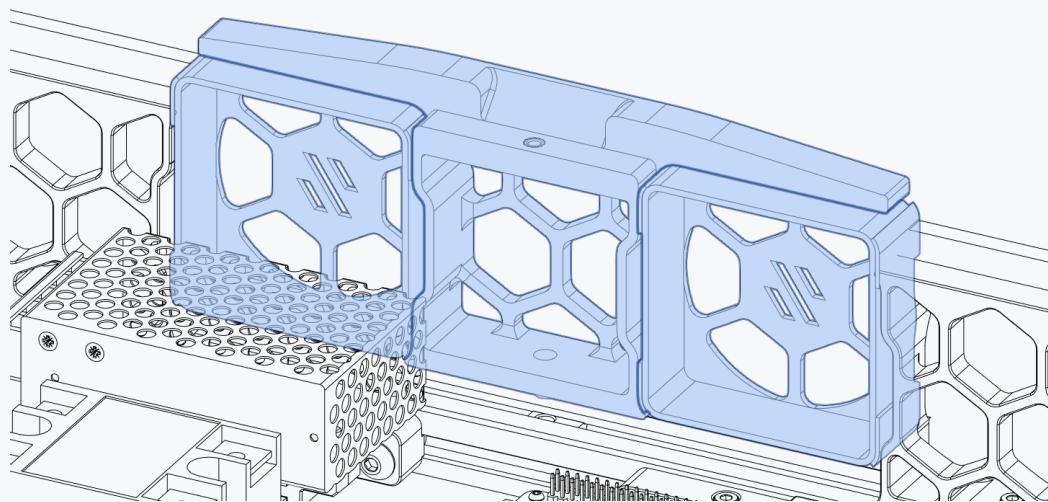
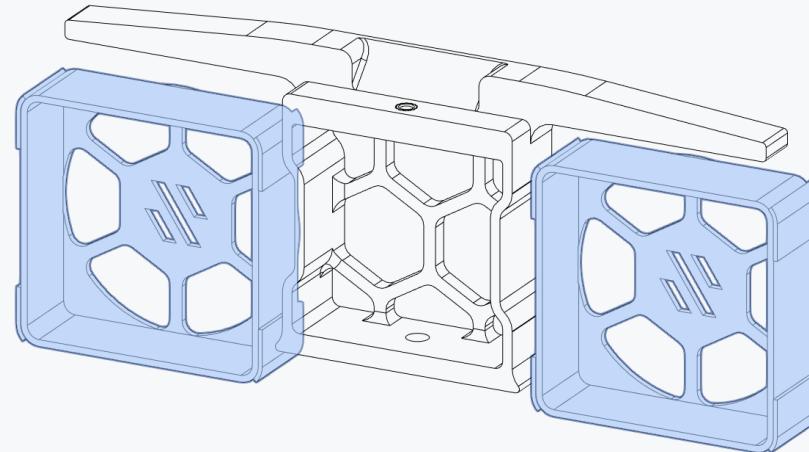
M3x8 SHCS

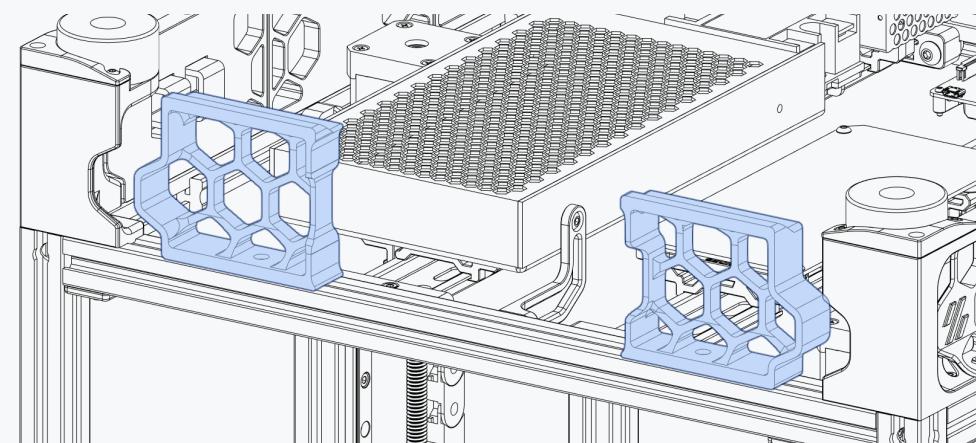
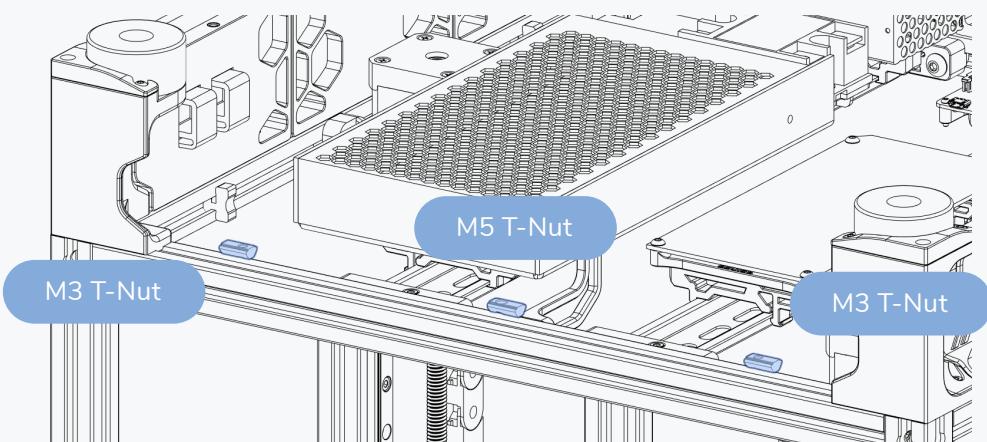


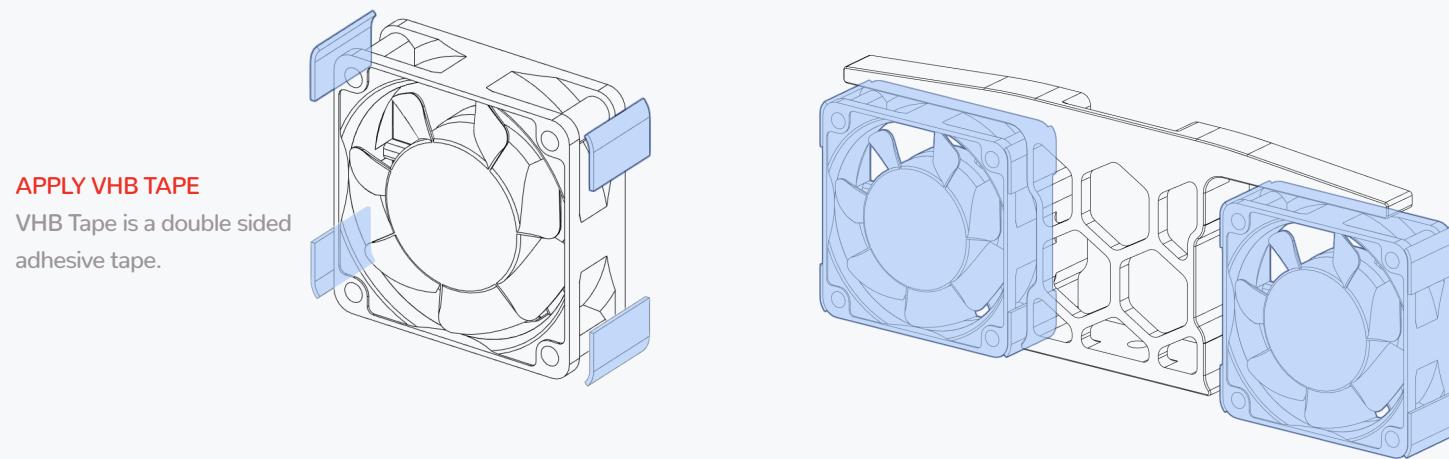
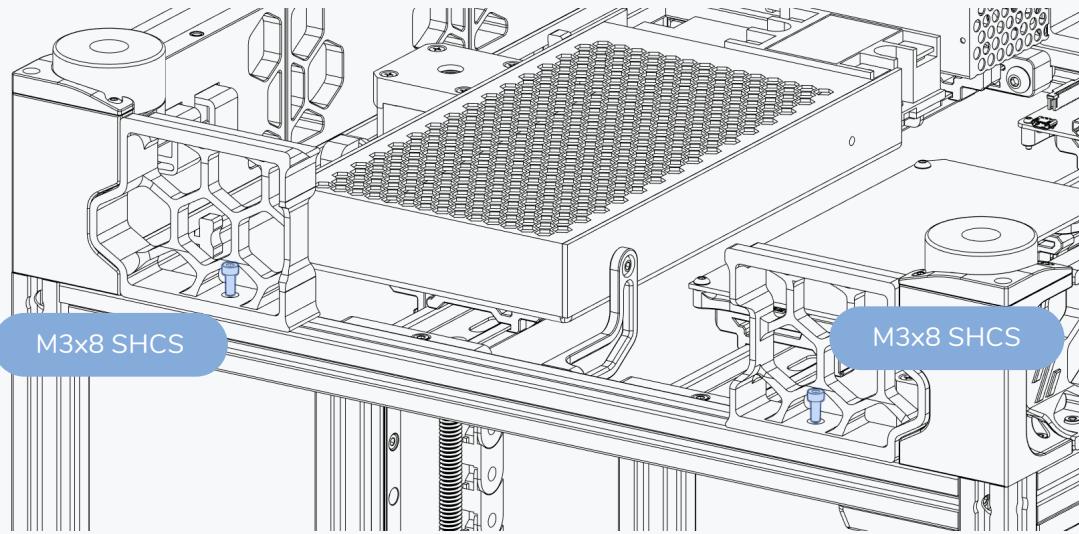


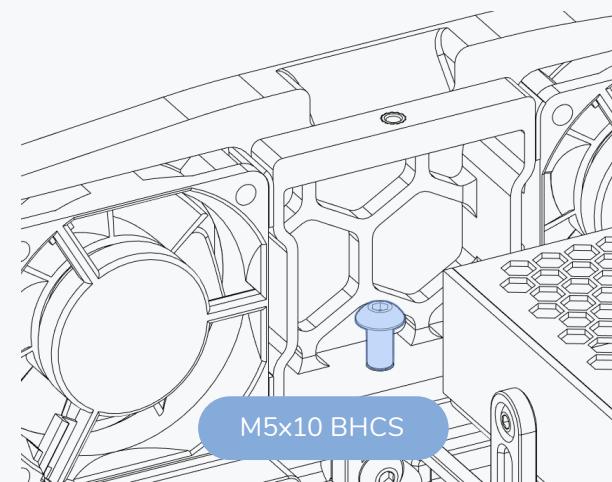
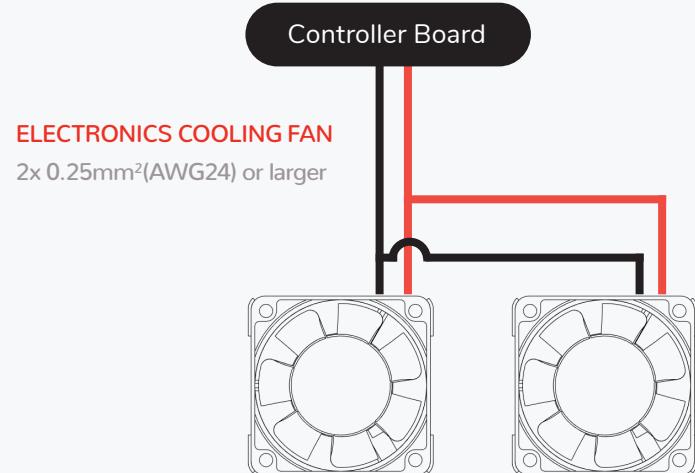
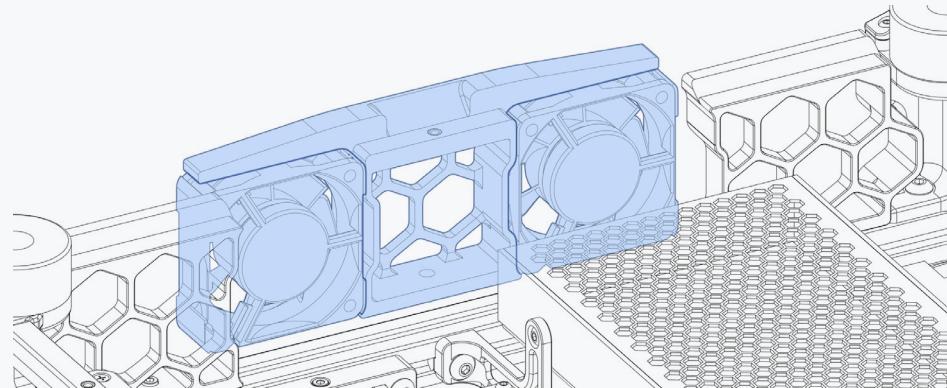
**APPLY VHB TAPE**

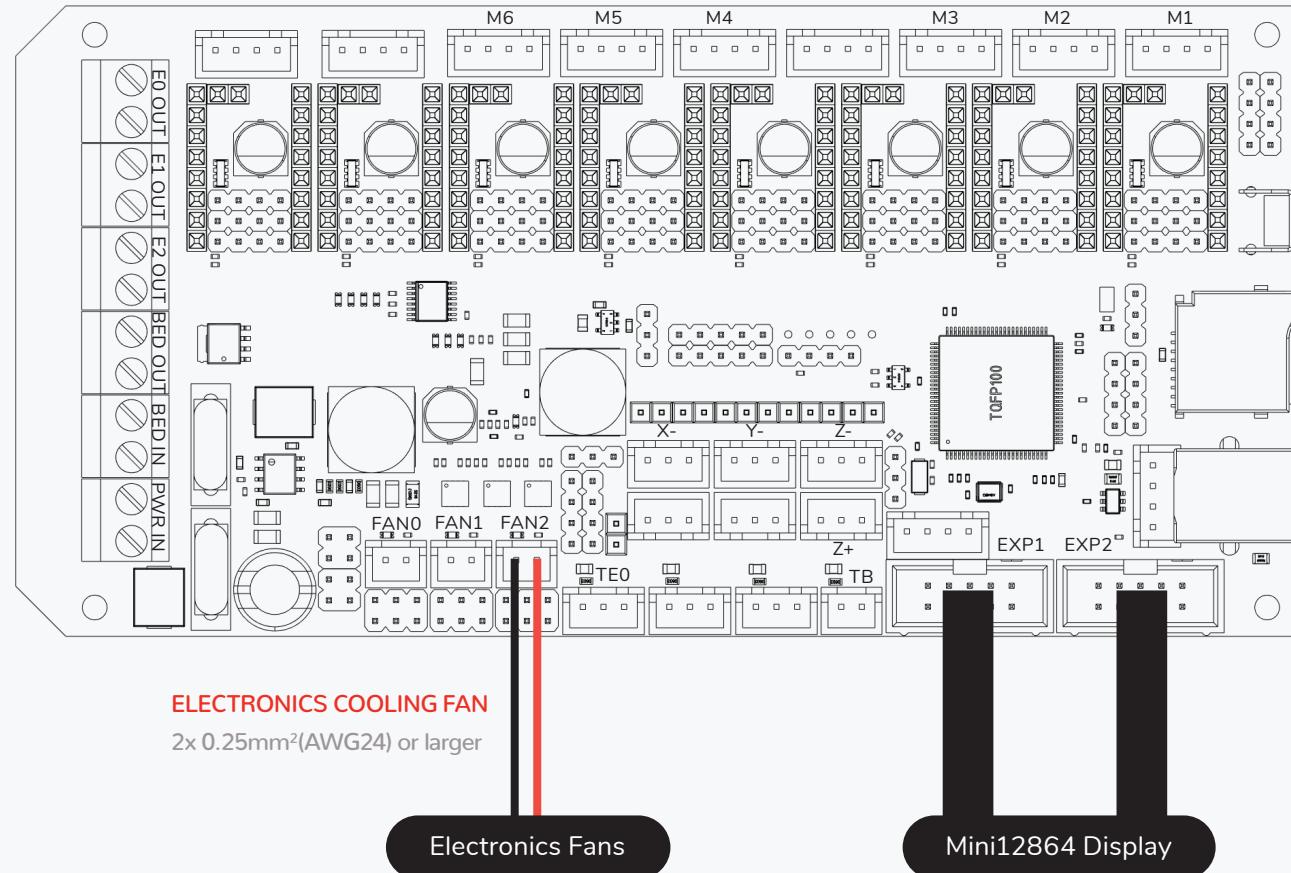
3M VHB tape is a double sided adhesive tape. Other vendors have similar products that you can use as a substitute.









**WARNING: DISPLAY HOOKUP**

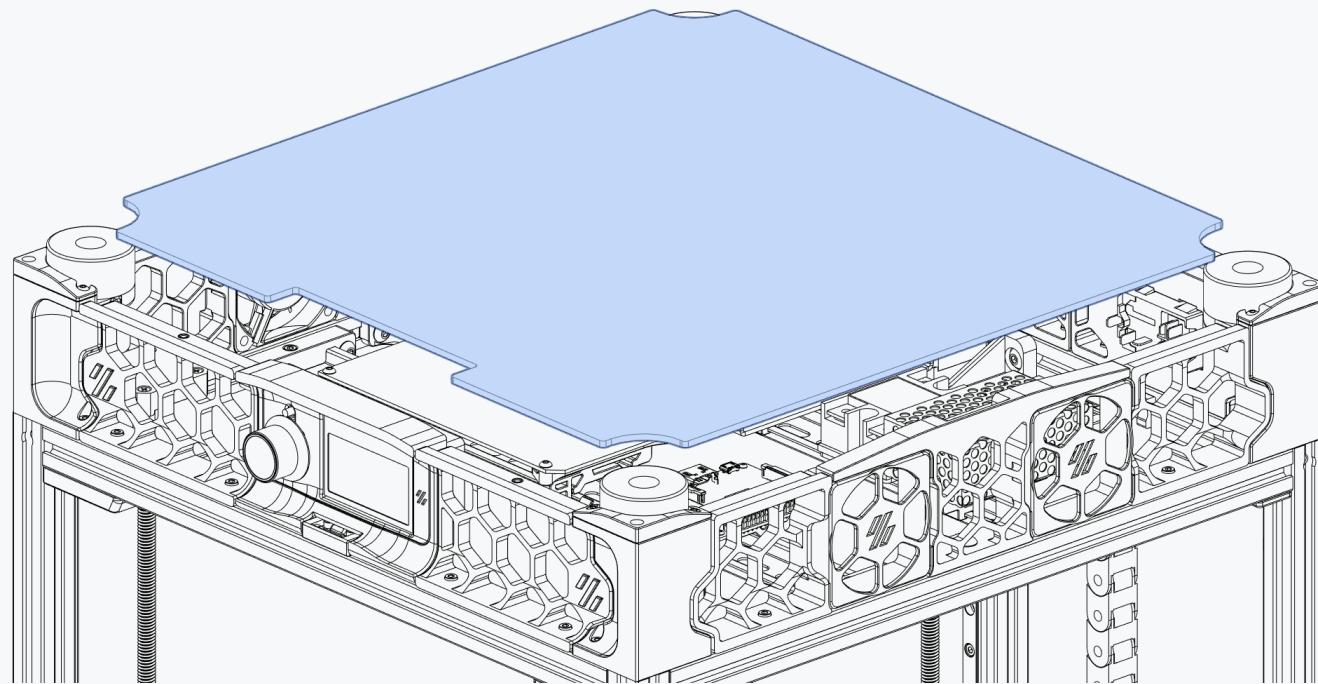
Before connecting the display make sure to review the documentation on the Voron documentation site (<https://voron.link/ypdmcb2>).

If you are using a "FYSETC mini12864" please review section 3.3 of the FYSETC Spider documentation (<https://voron.link/m6wtwnl>).



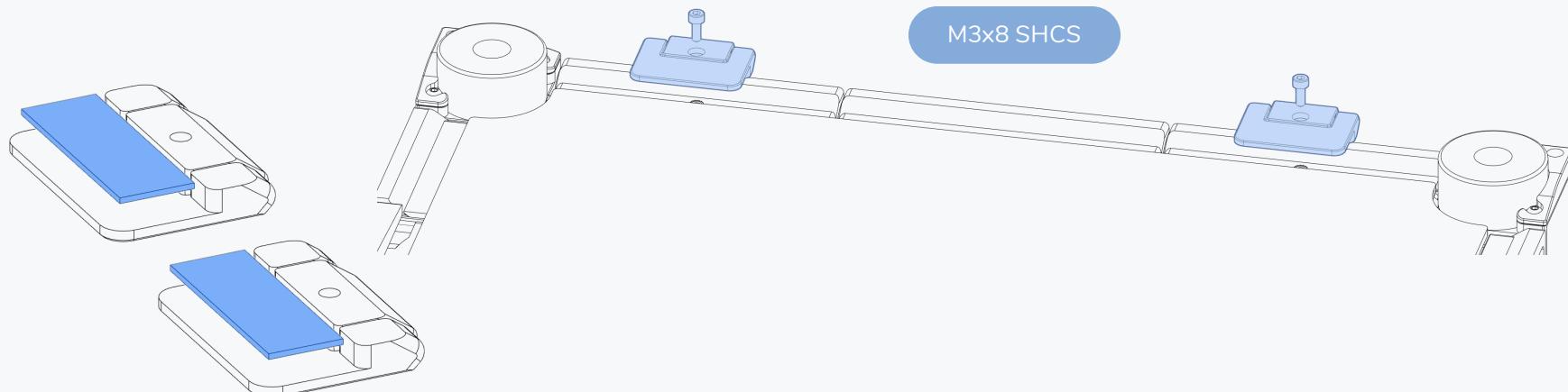
BOTTOM PANEL

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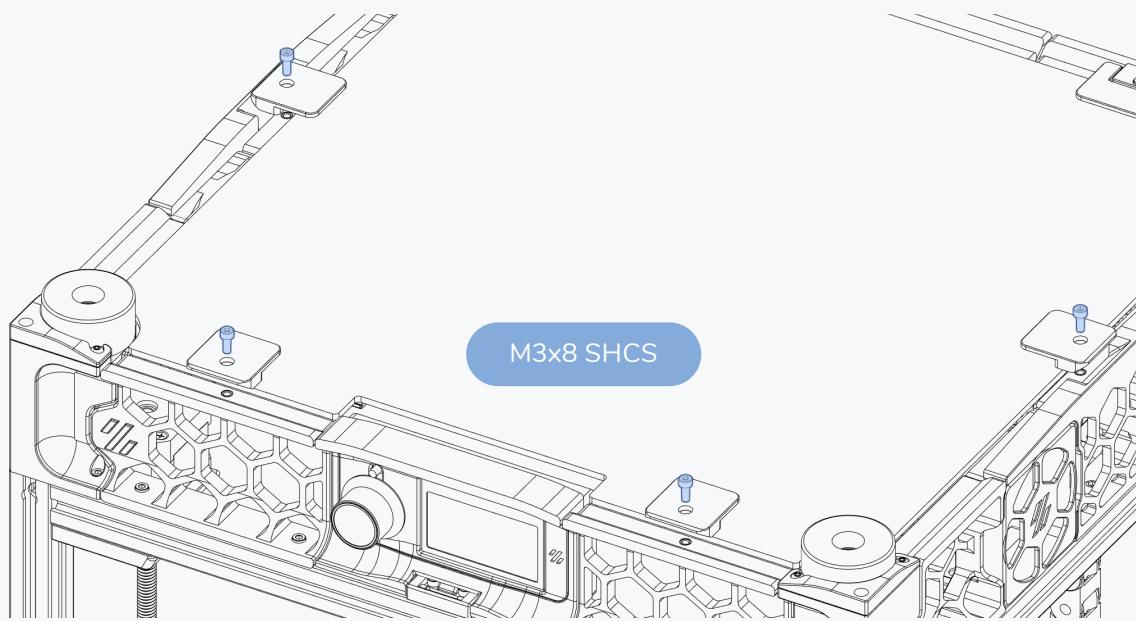


BOTTOM PANEL

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APPLY VHB TAPE

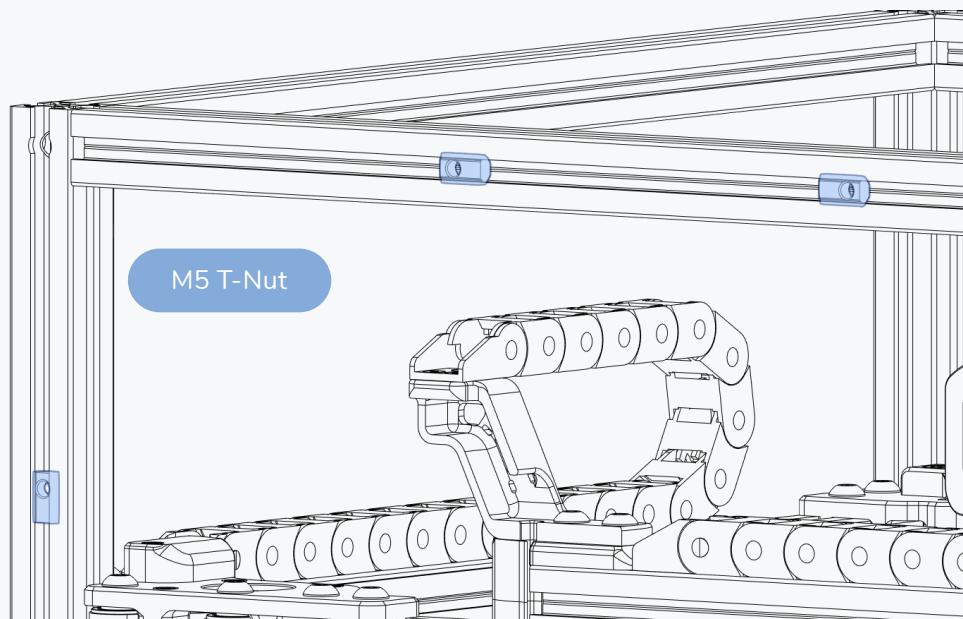


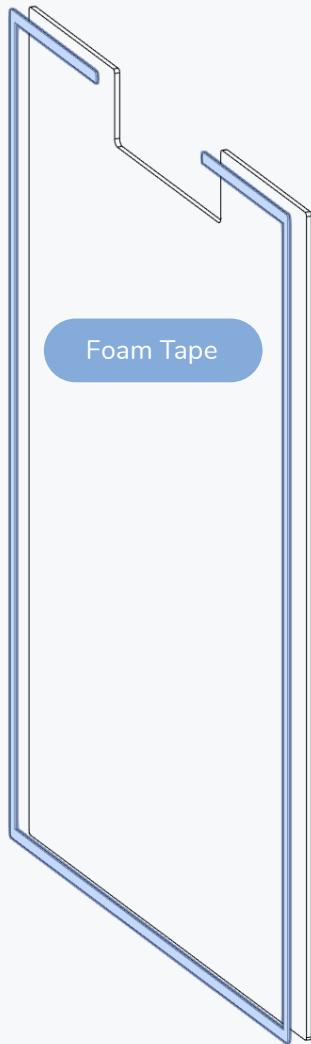
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PANELS & FINISHING TOUCHES

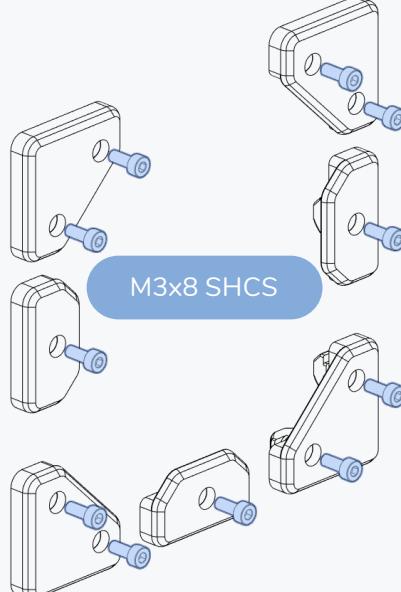
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**APPLY FOAM TAPE**

Use foam tape on the contact areas between the panels and the frame to mitigate noise from vibrations.

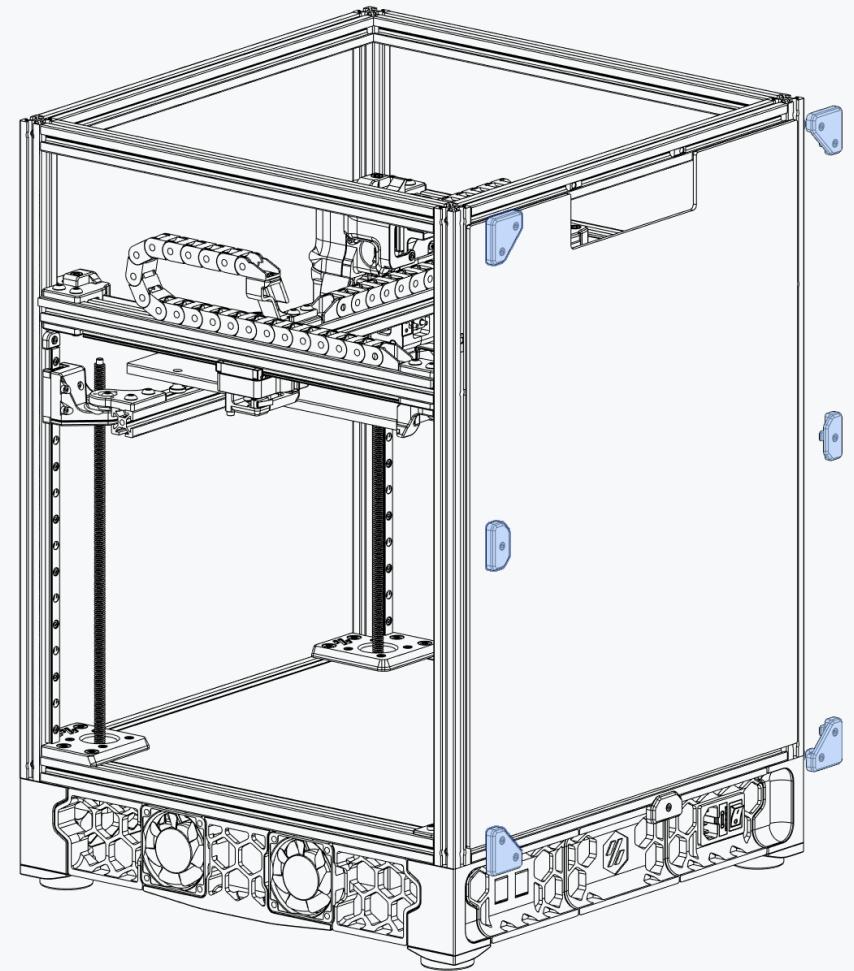
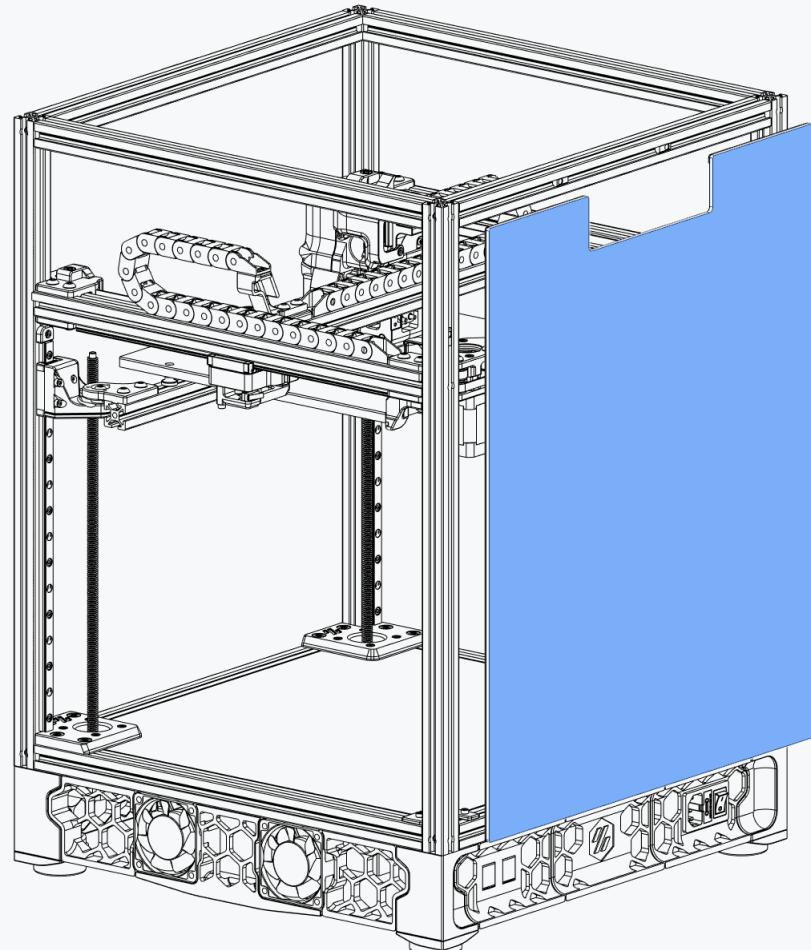
**HAMMERHEAD NUTS?**

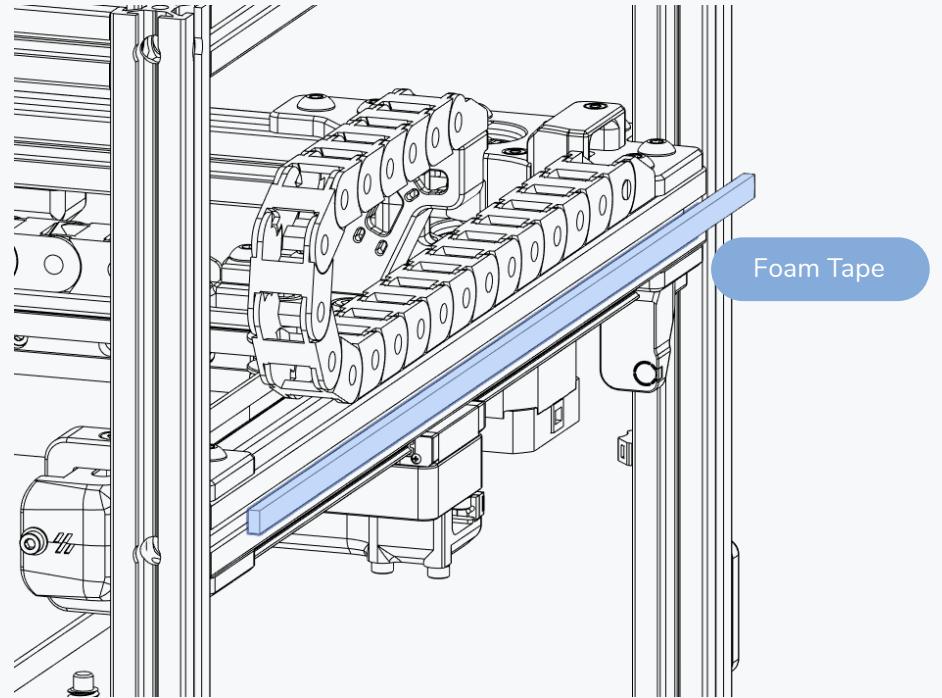
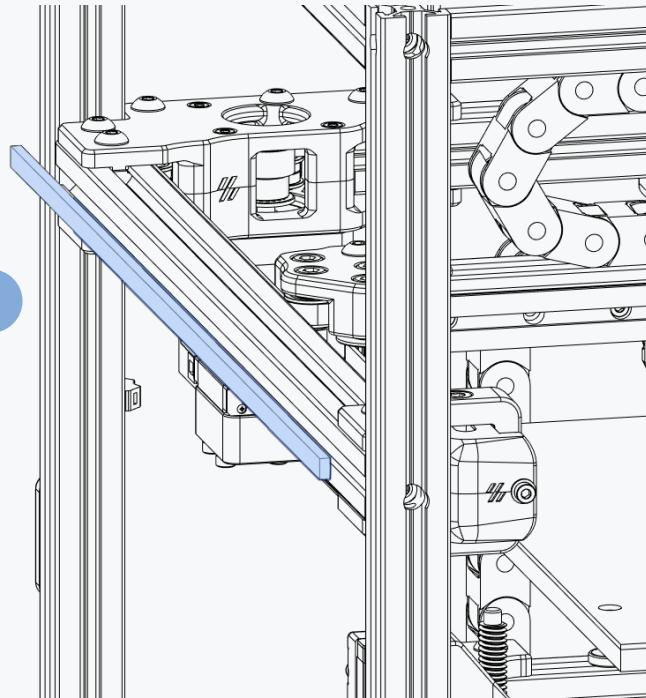
A drop of thread locker will turn the hammerhead nuts into a 1/4 turn quick release for the panels. Best done once the assembly is finished.



PANELS

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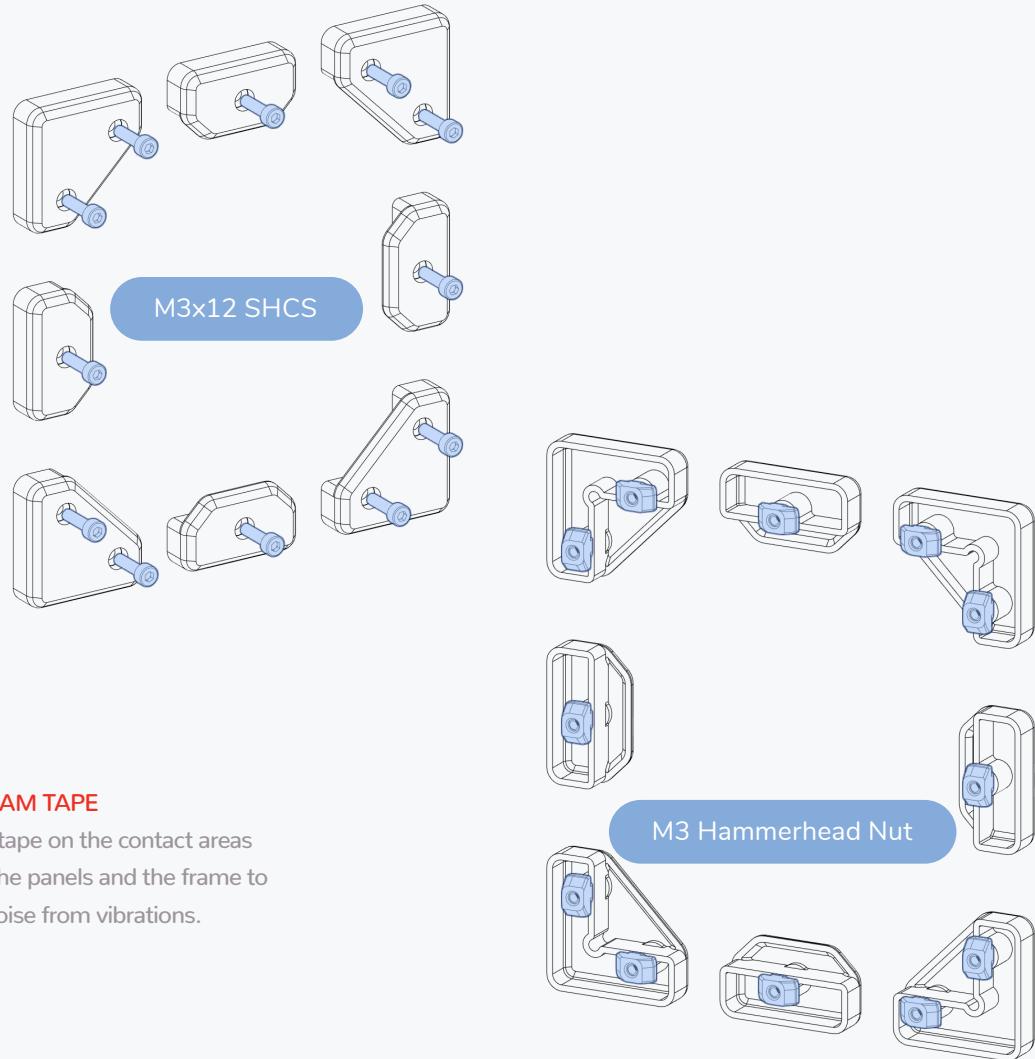


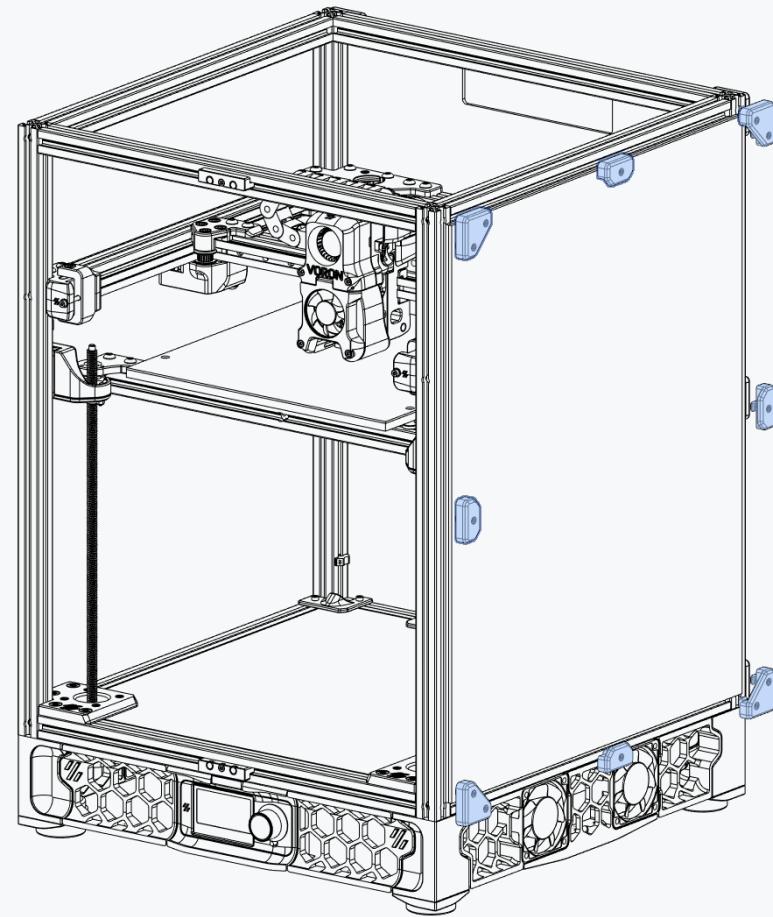
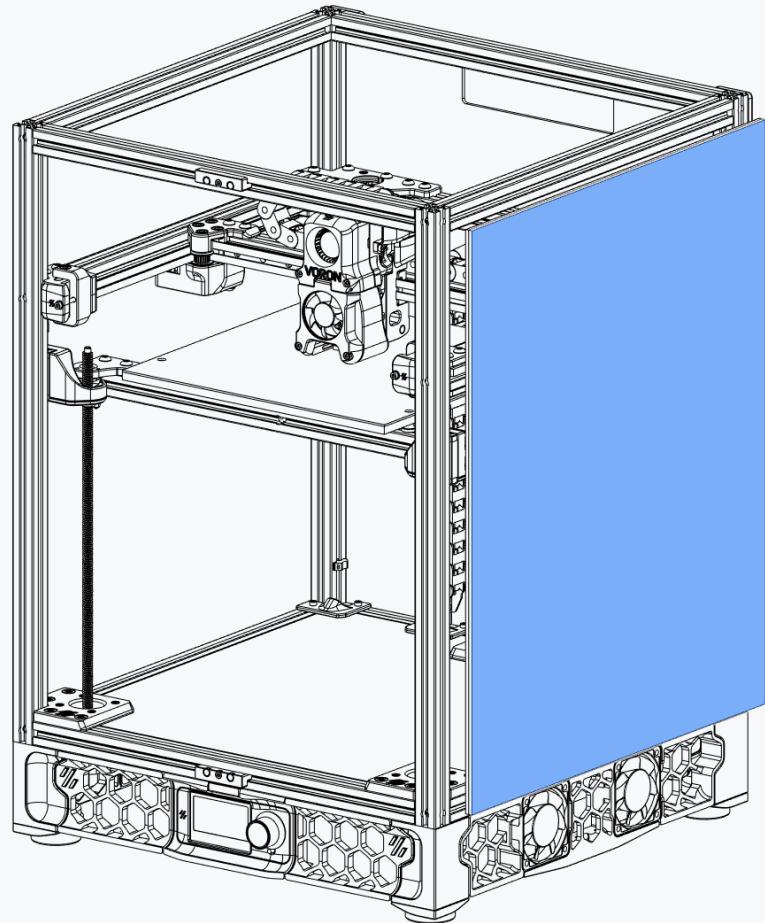
**APPLY FOAM TAPE**

Use foam tape on the contact areas between the panels and the frame to mitigate noise from vibrations.

**APPLY FOAM TAPE**

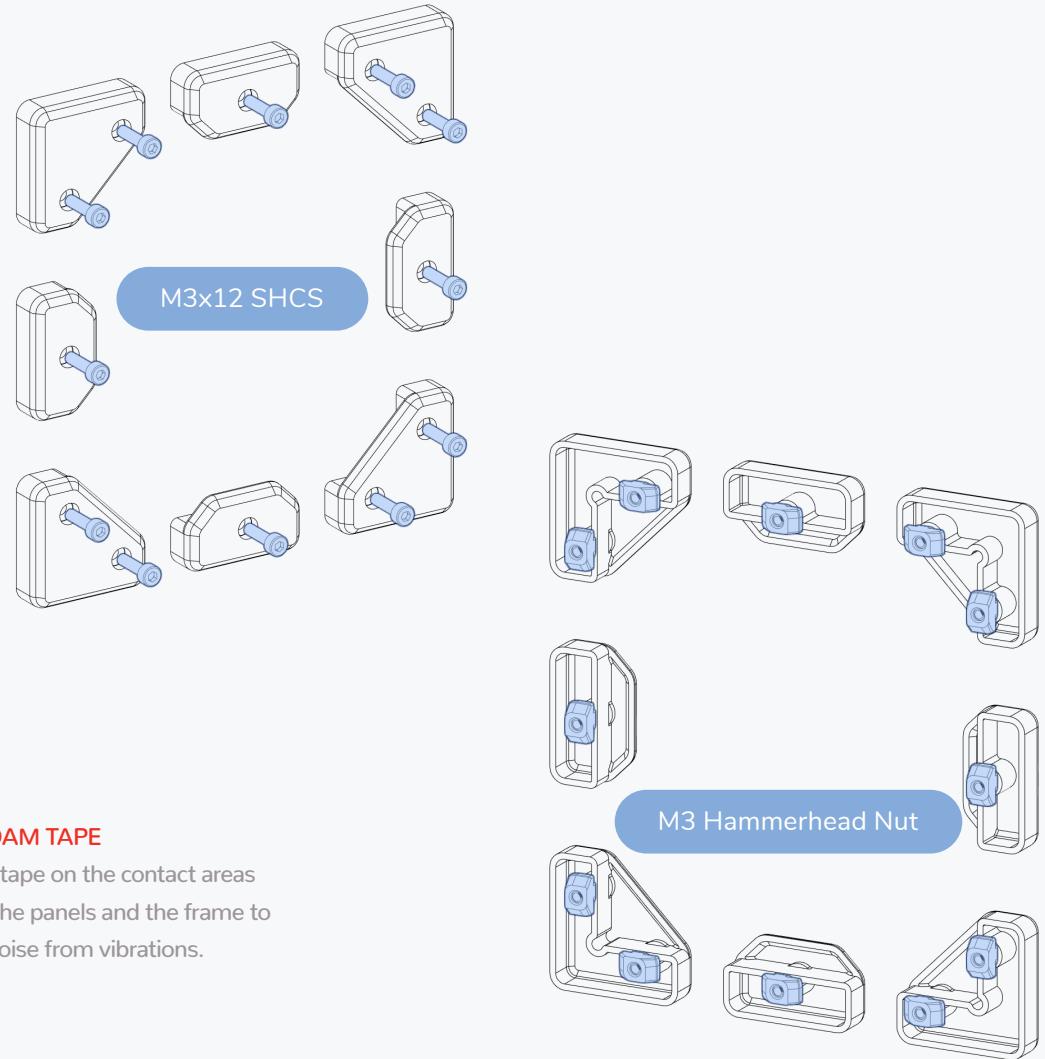
Use foam tape on the contact areas between the panels and the frame to mitigate noise from vibrations.

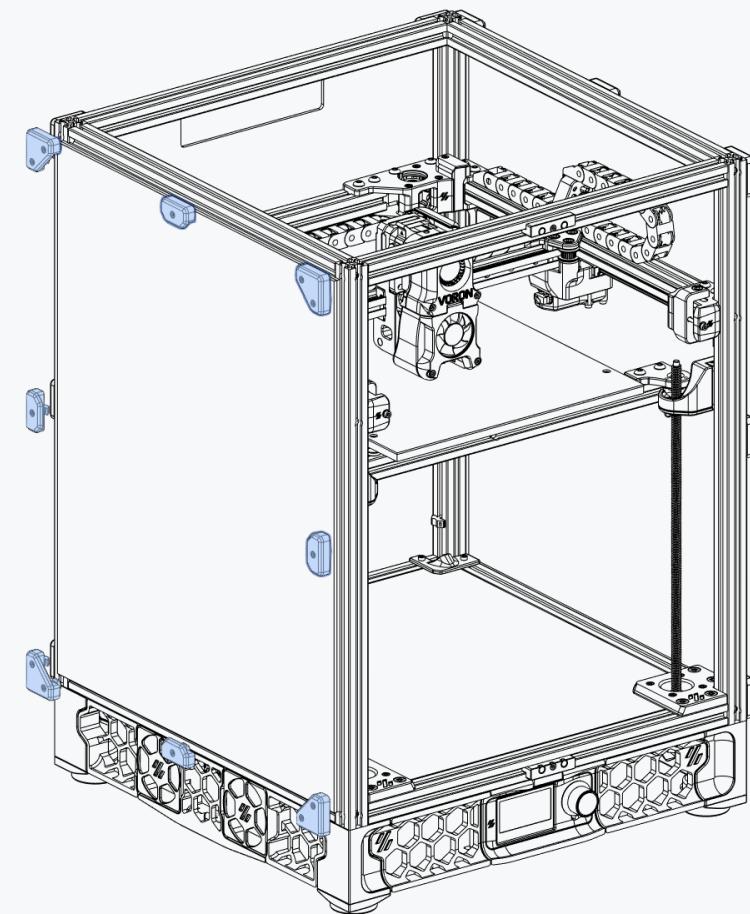
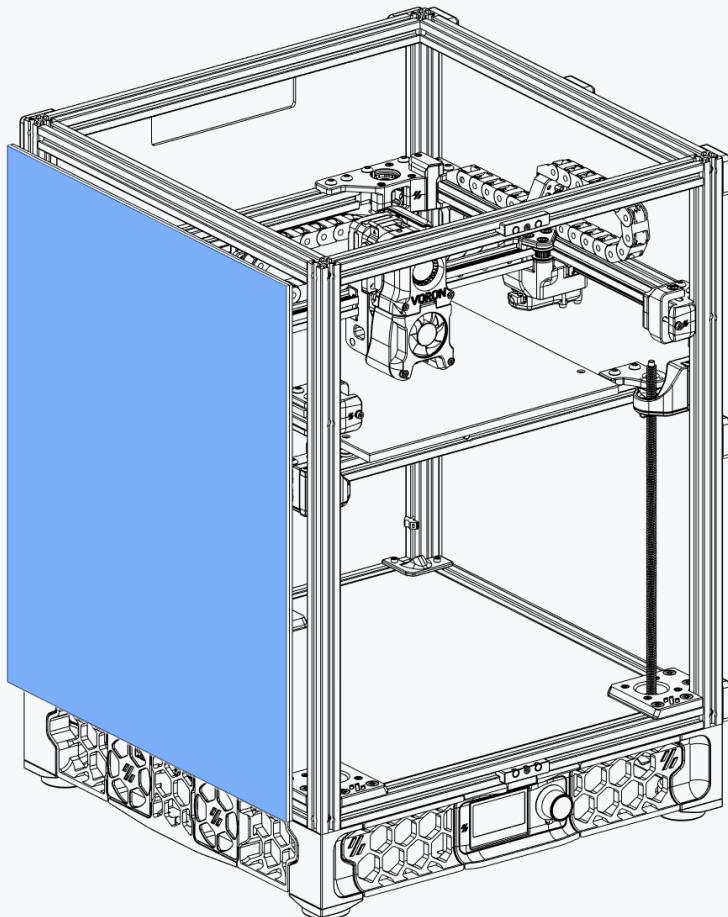


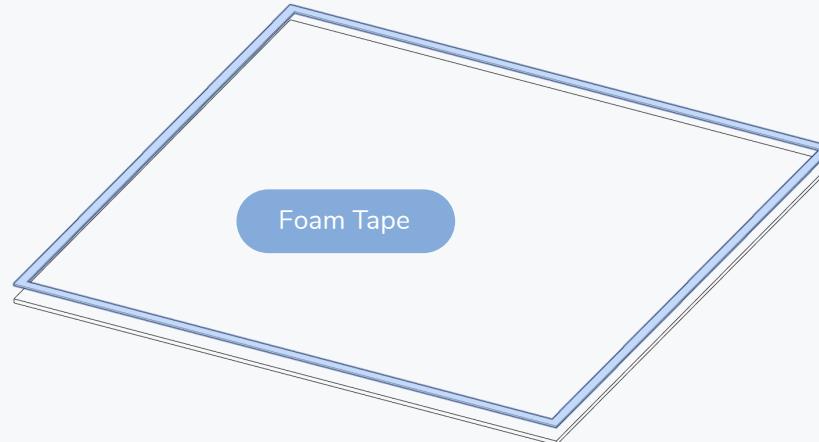


**APPLY FOAM TAPE**

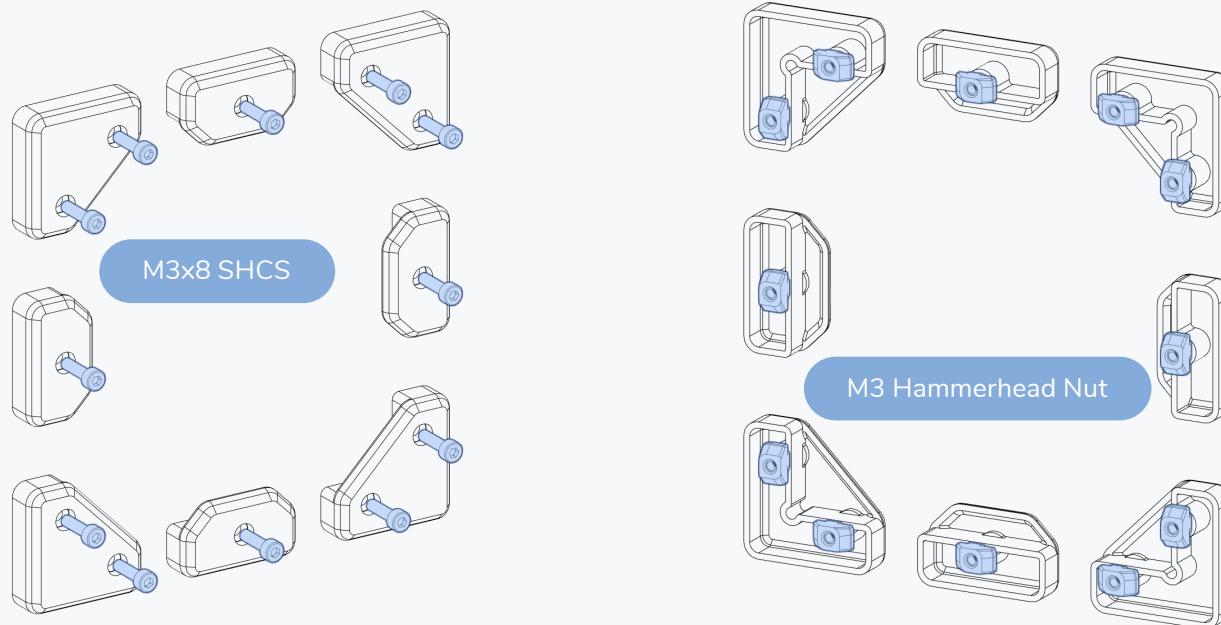
Use foam tape on the contact areas between the panels and the frame to mitigate noise from vibrations.

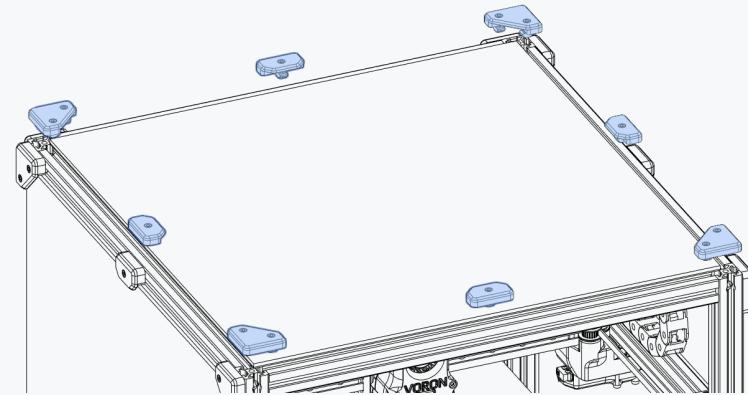
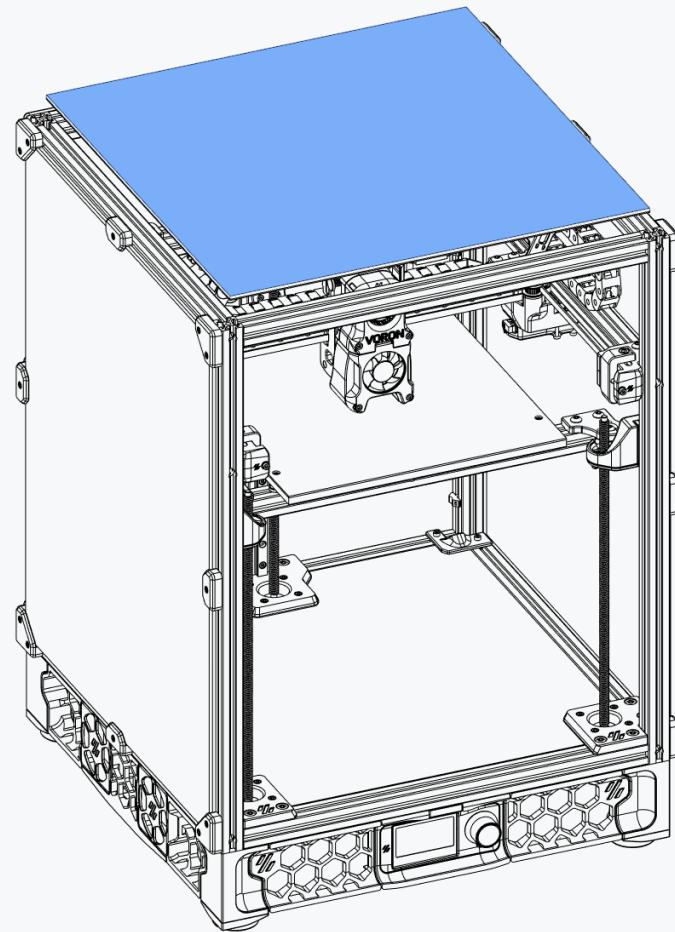


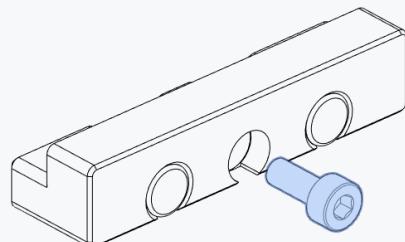


**APPLY FOAM TAPE**

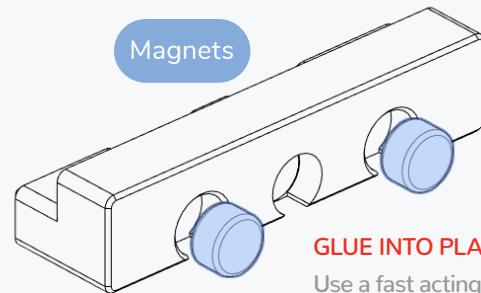
Use foam tape on the contact areas between the panels and the frame to mitigate noise from vibrations.



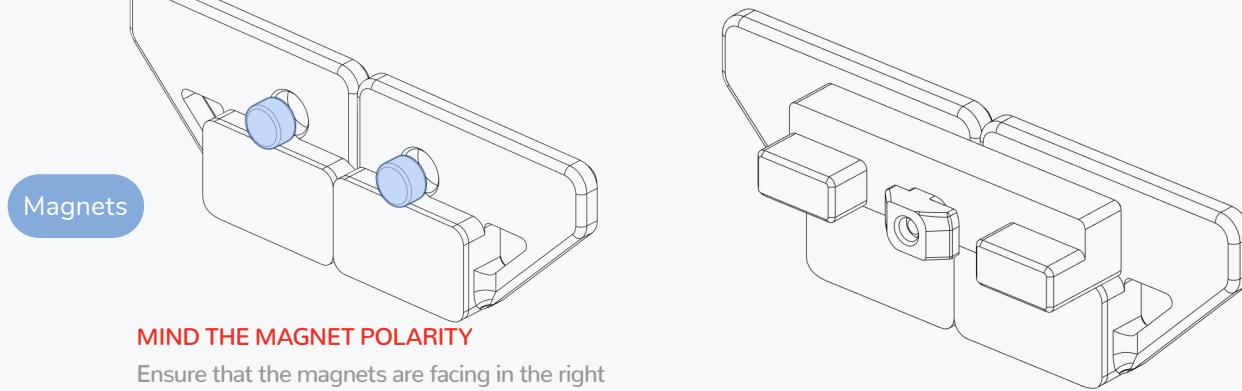
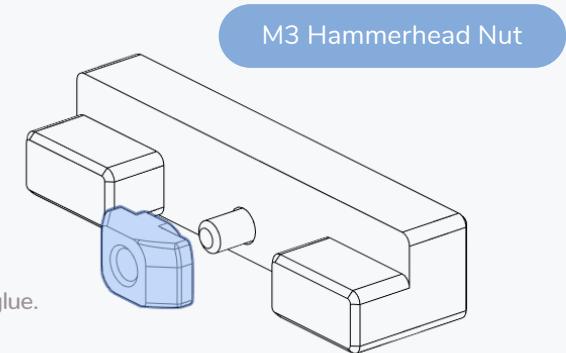




M3x8 SHCS

**GLUE INTO PLACE**

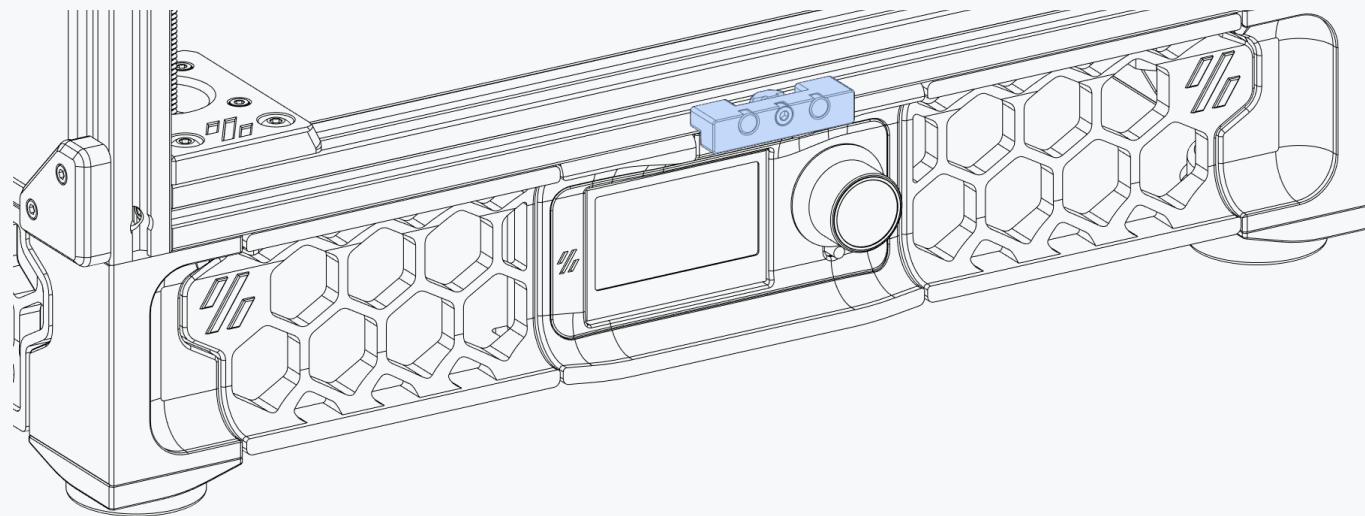
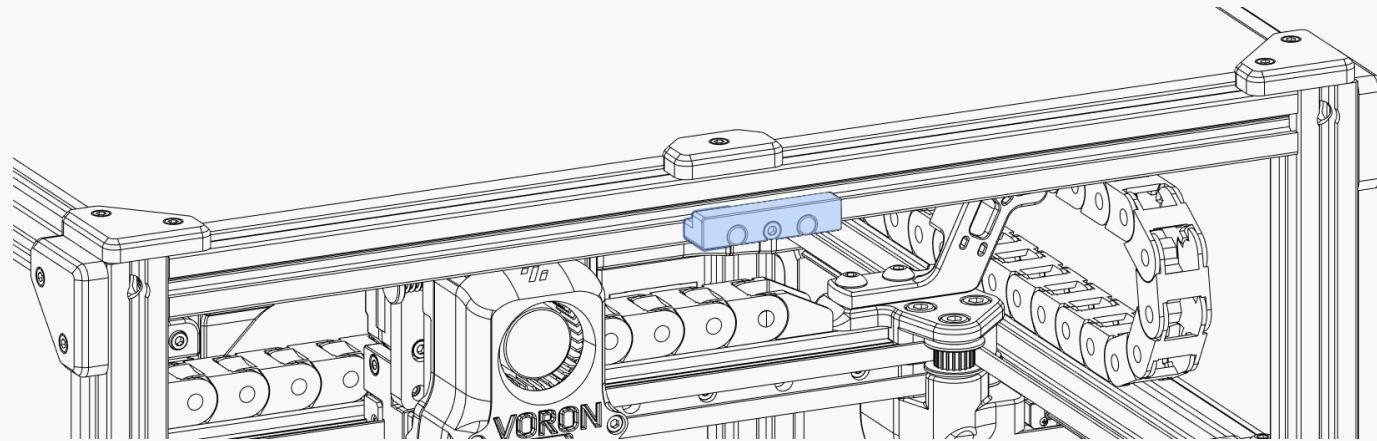
Use a fast acting glue like super-glue.

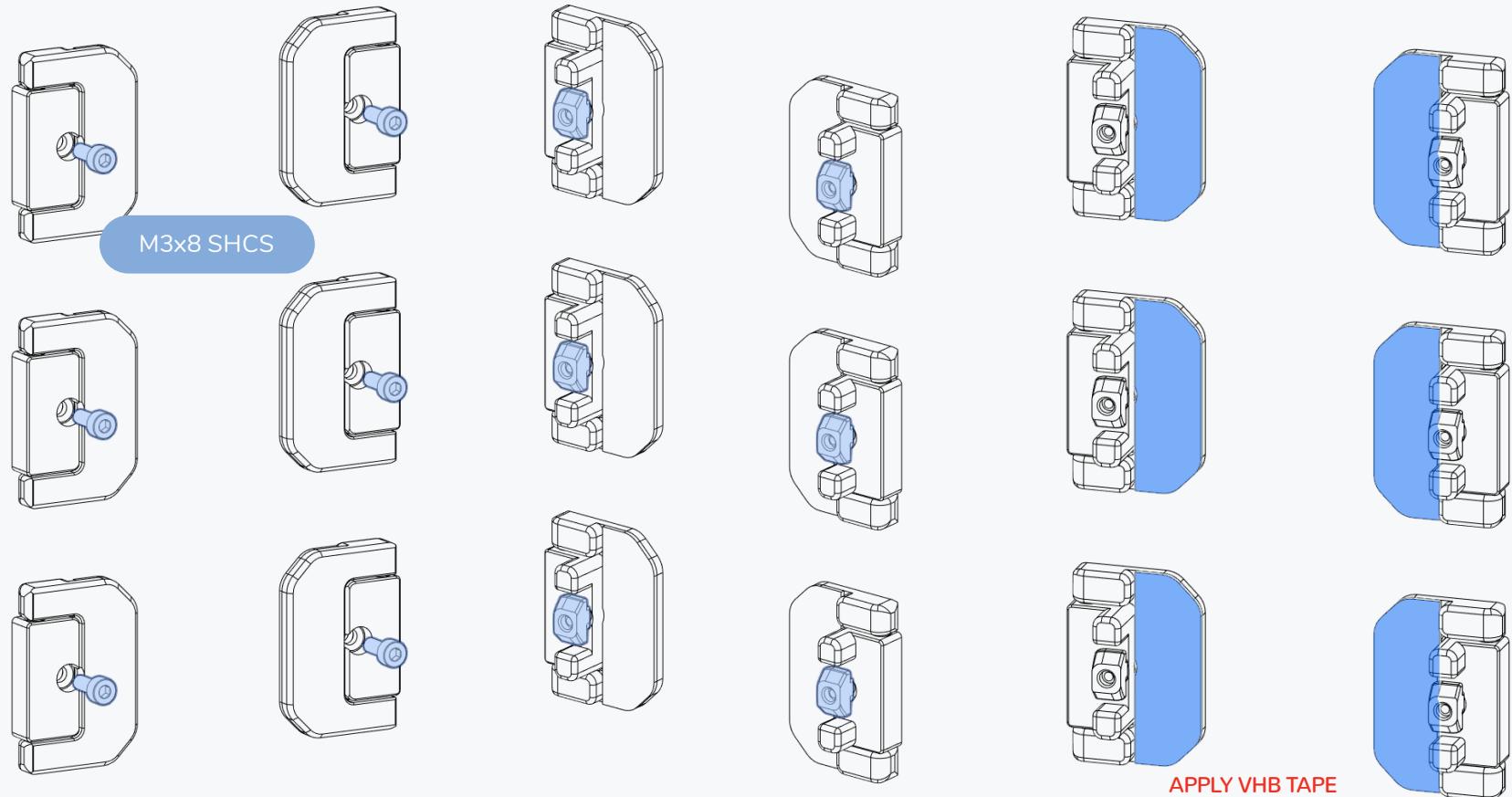


Magnets

**MIND THE MAGNET POLARITY**

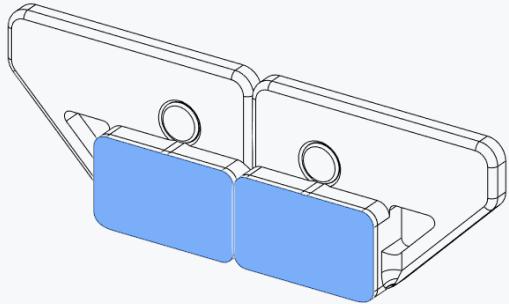
Ensure that the magnets are facing in the right direction prior to glueing them into place.



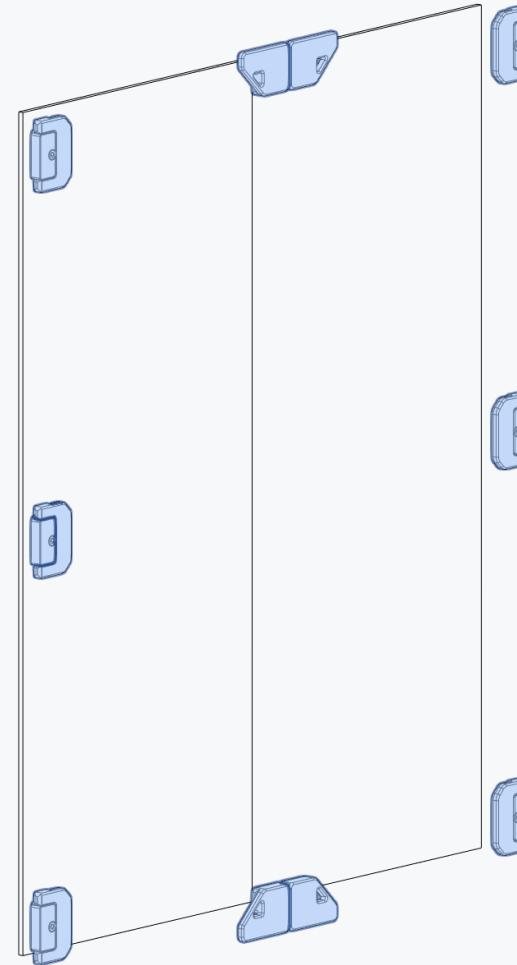
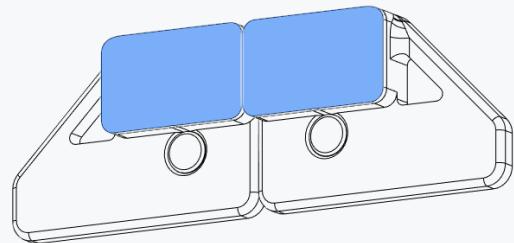


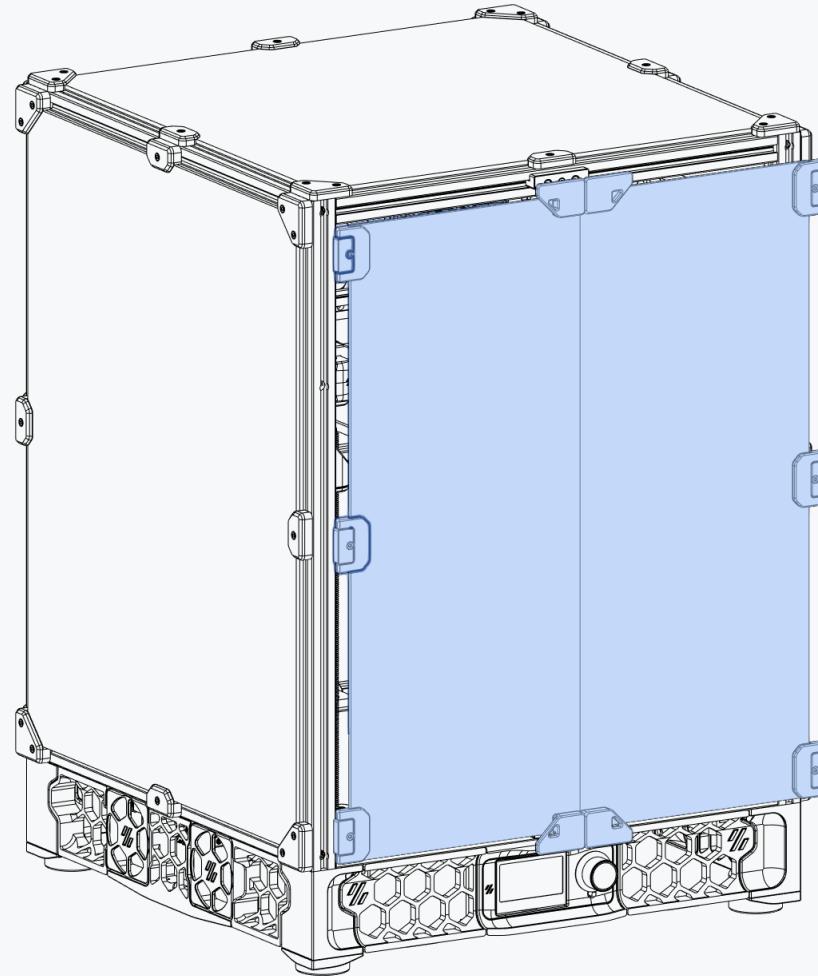
APPLY VHB TAPE

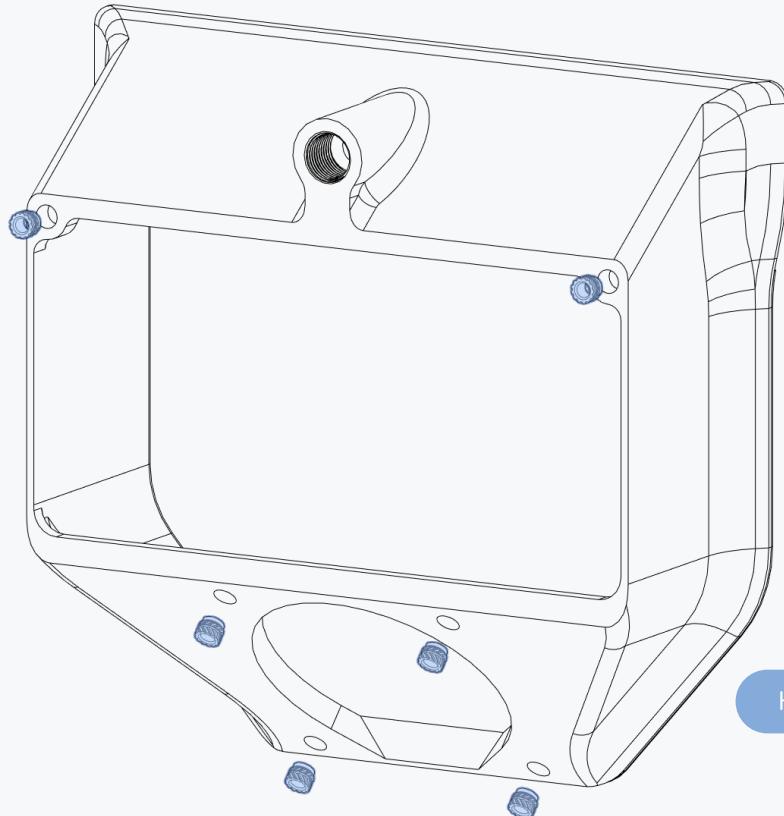
VHB Tape is a double sided  
adhesive tape.

**APPLY VHB TAPE**

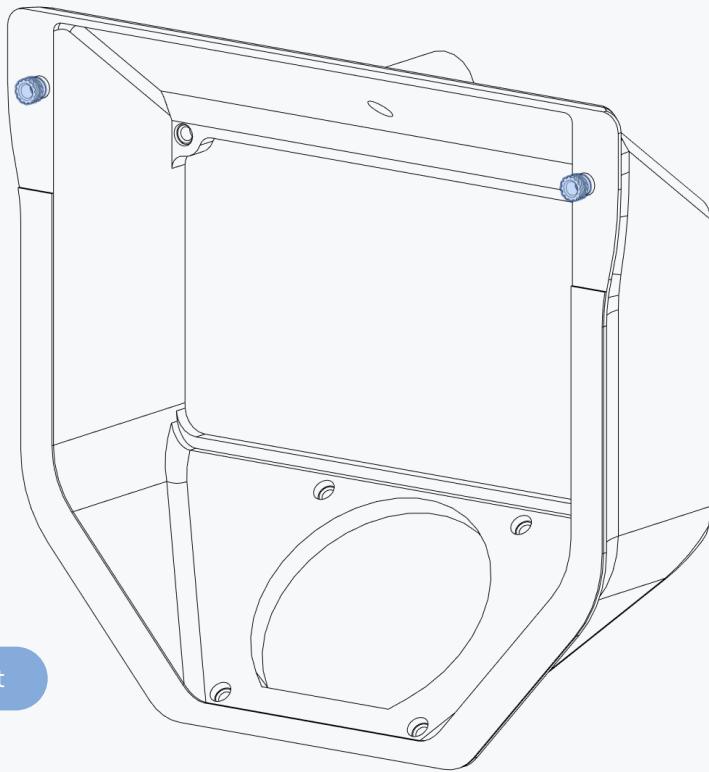
VHB Tape is a double sided adhesive tape.

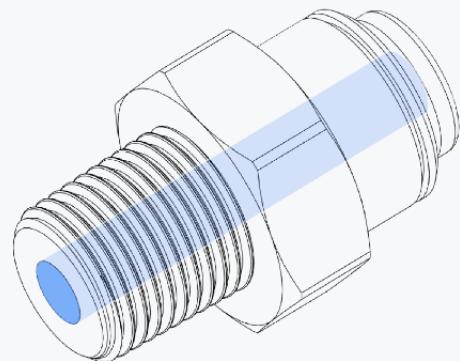






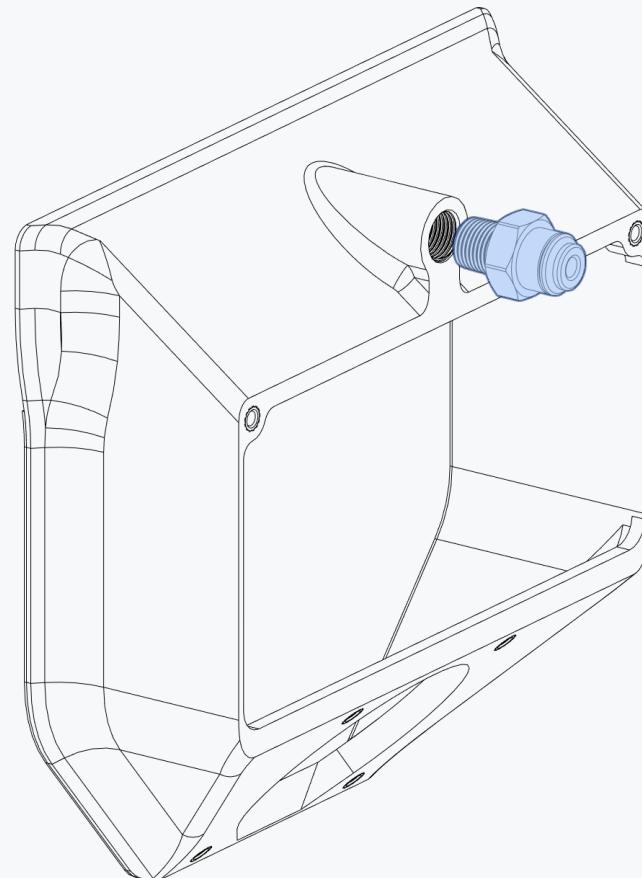
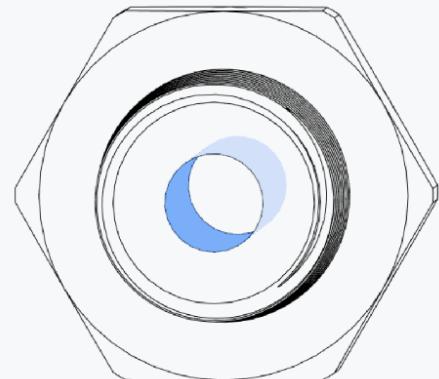
Heat Set Insert

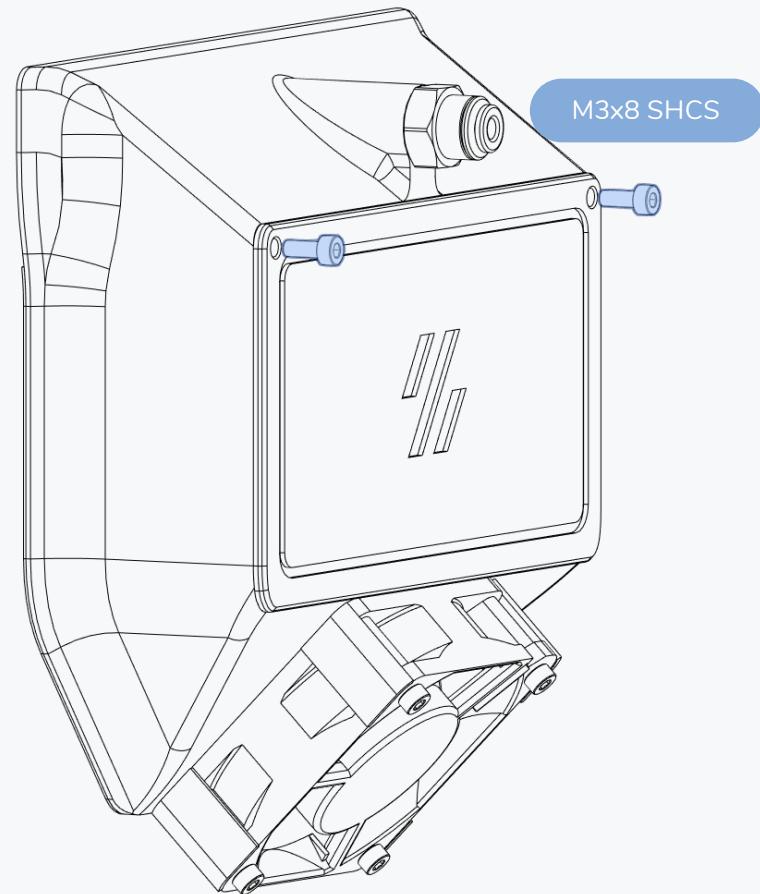
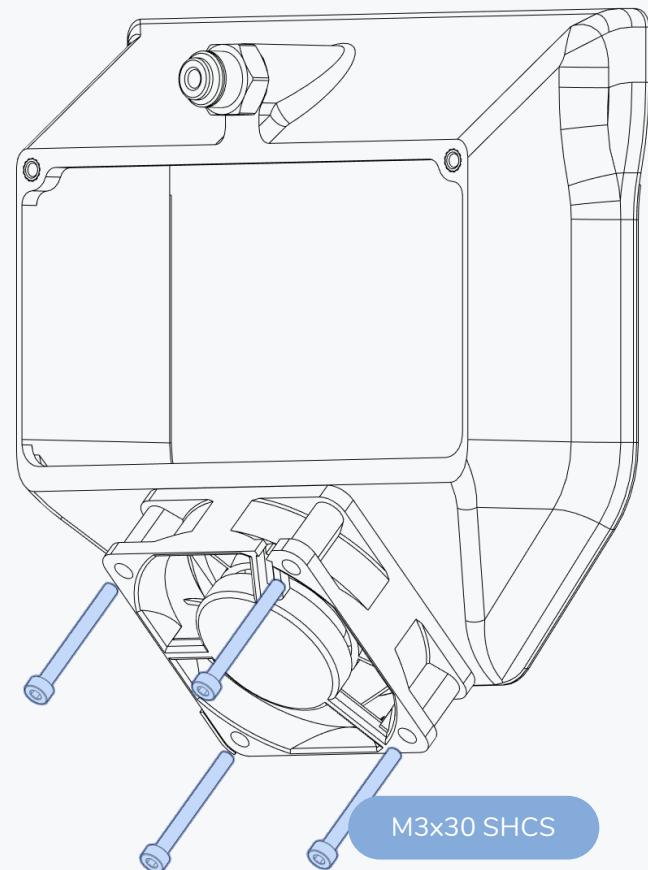


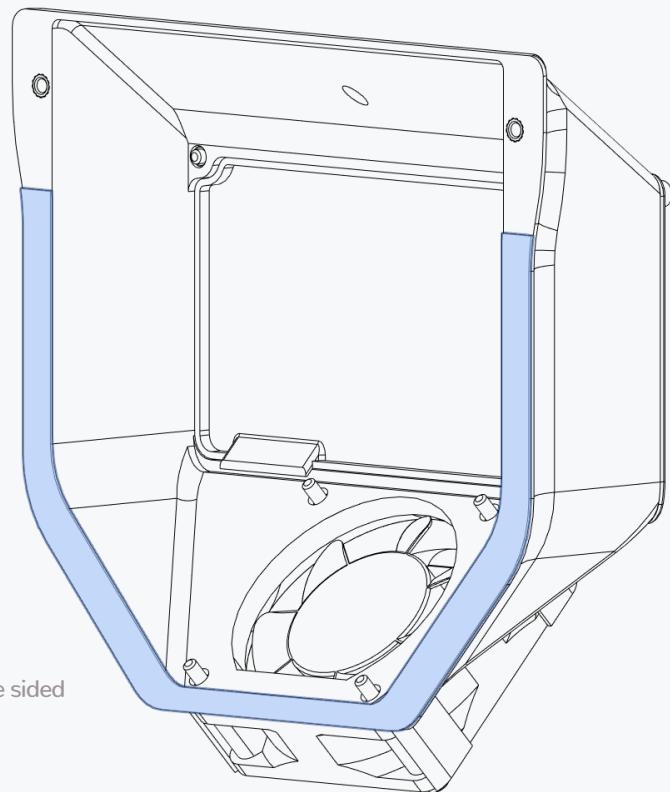
**BSPP ADAPTER**

Some adapters have a small lip that prevents the PTFE tube from passing through.

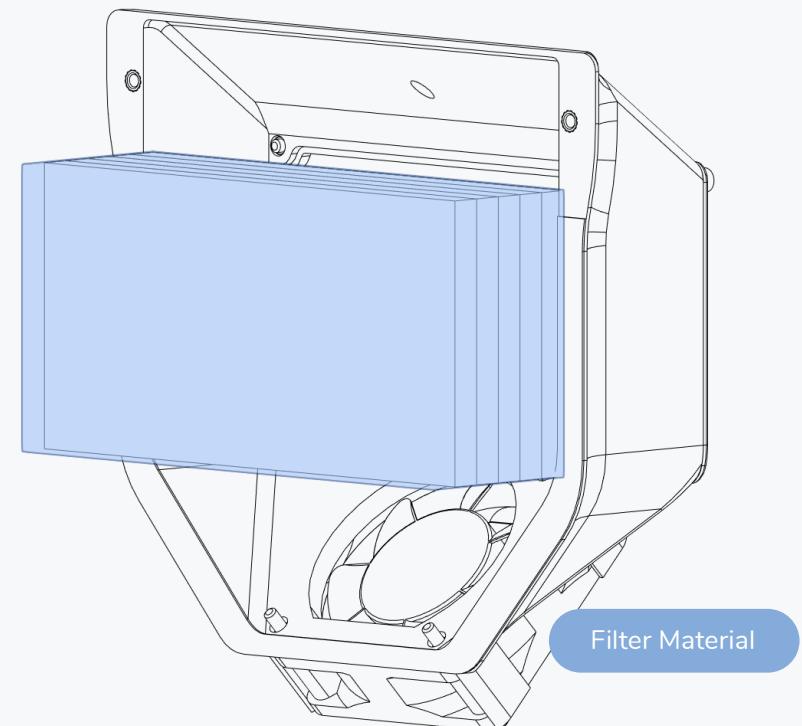
Inspect the adapter and if necessary use a drill to carefully remove the lip.

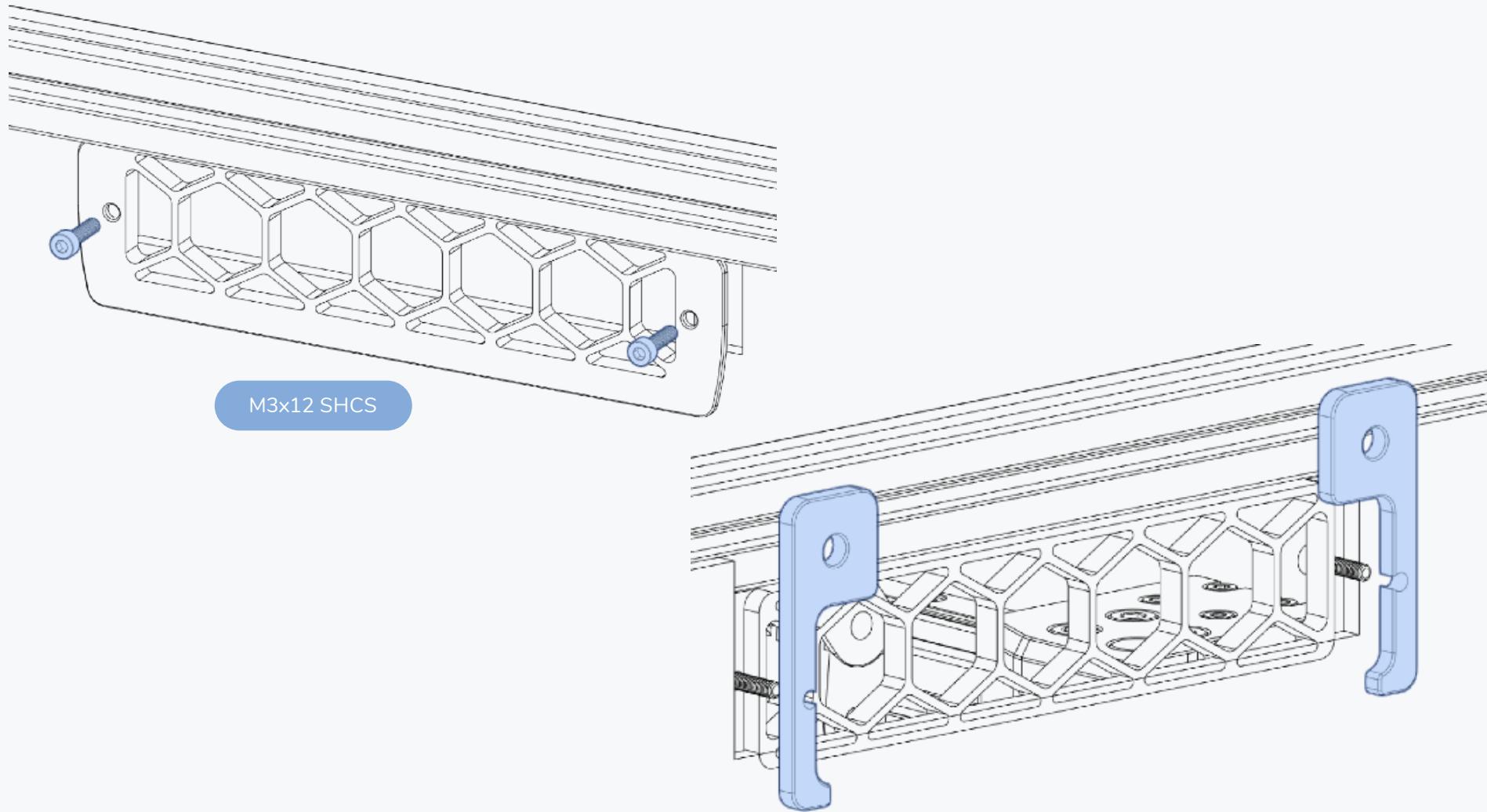




**APPLY VHB TAPE**

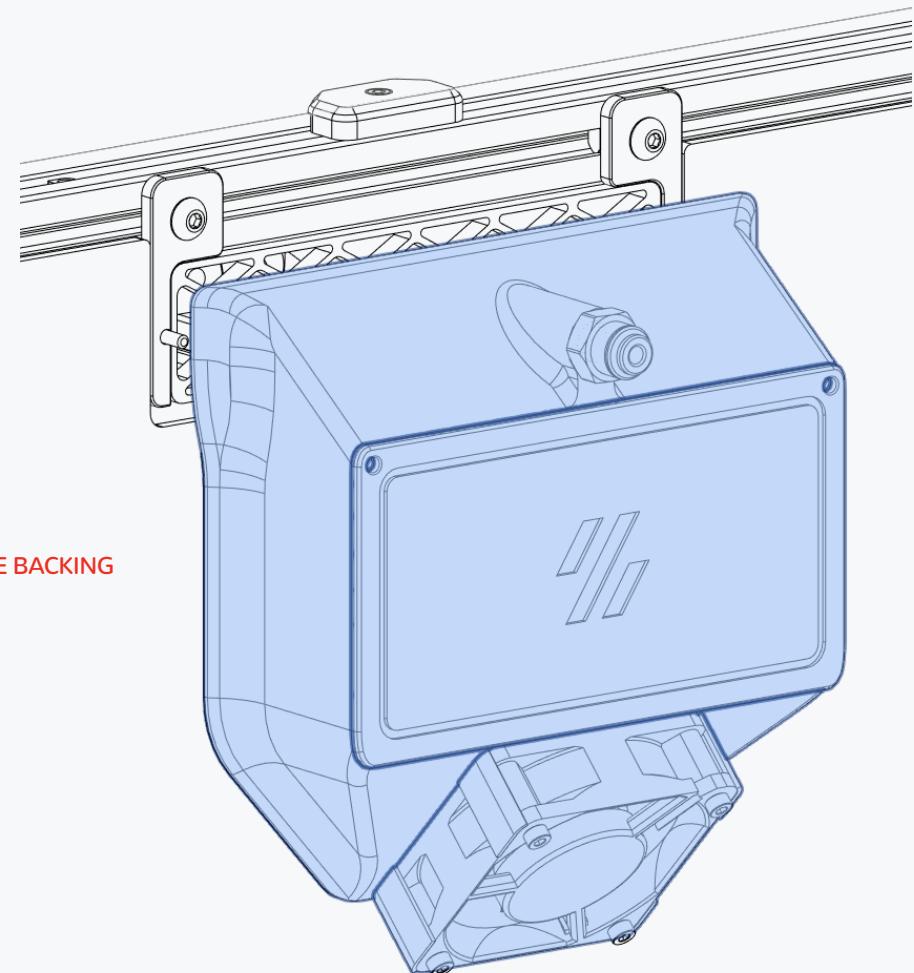
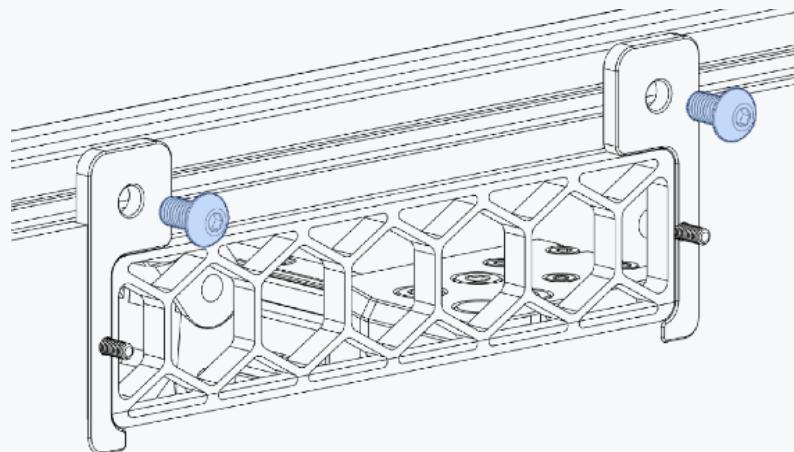
VHB Tape is a double sided adhesive tape.

**Filter Material**

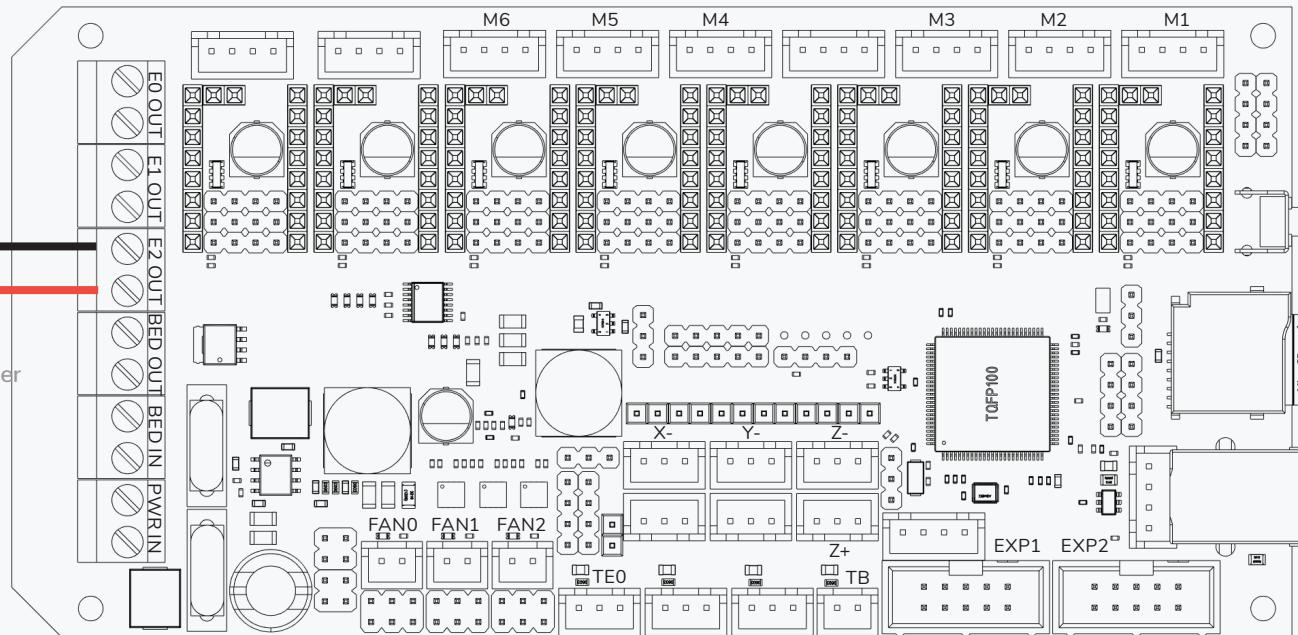


EXHAUST

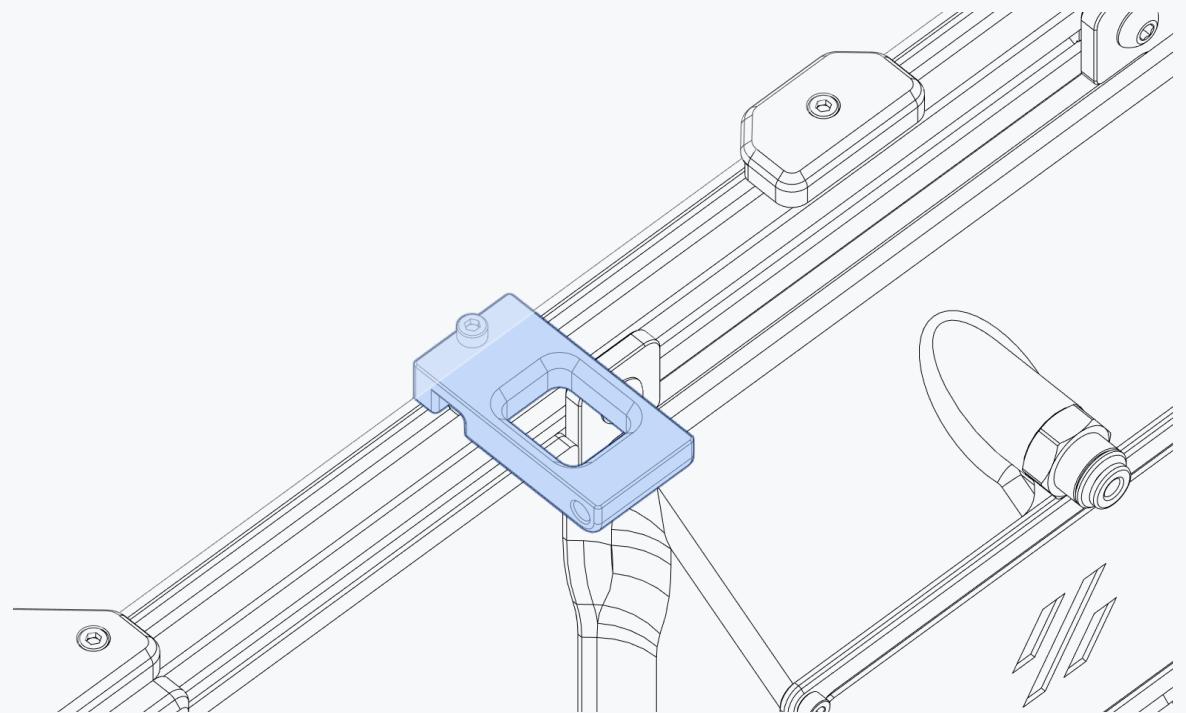
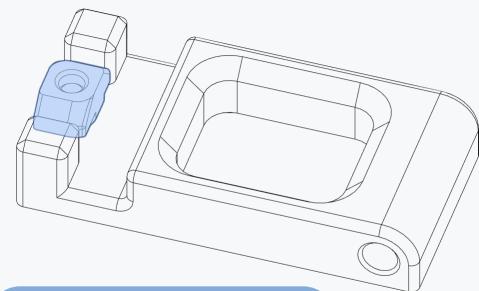
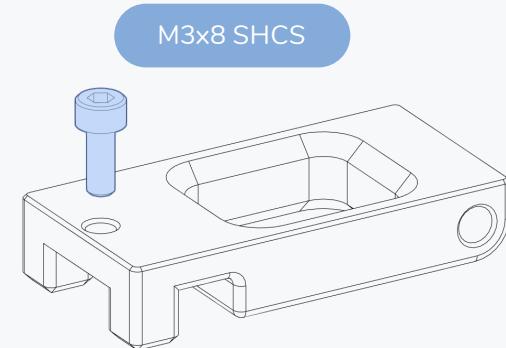
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REMOVE TAPE BACKING

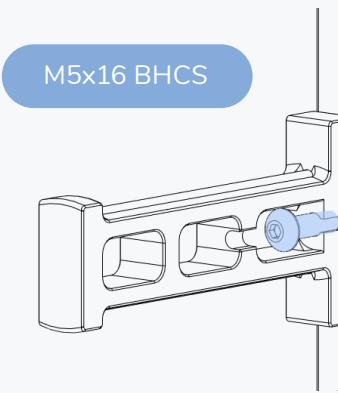
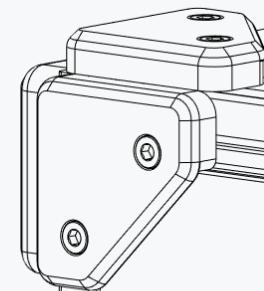
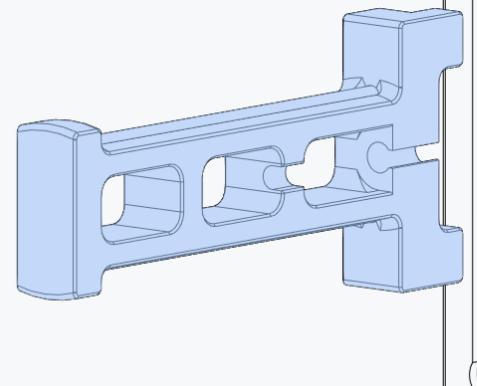
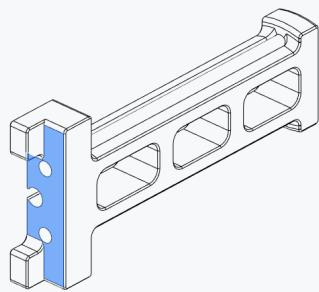
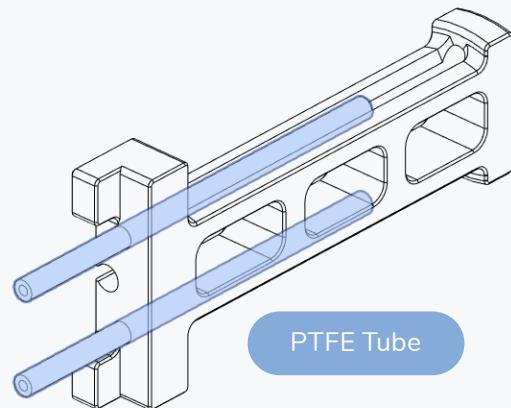
**EXHAUST FAN**

2x 0.25mm<sup>2</sup>(AWG24) or larger



## SPOOL HOLDER

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**ASSEMBLY COMPLETED ... NEXT STEP SETUP & CALIBRATION**

This manual is designed to be a simple reference manual for the build process.

For details on the setup of the electronics and other initial steps of your new printer please visit our documentation available on github and docs.vorondesign.com.



<https://docs.vorondesign.com/>



<https://github.com/VoronDesign/Voron-1>

**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 and we have a great community that can help you out if you get stuck.



<https://discord.gg/voron>



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**Website**  
www.vorondesign.com

**Github**  
<https://github.com/vorondesign>

**Discord**  
<https://discord.gg/voron>

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