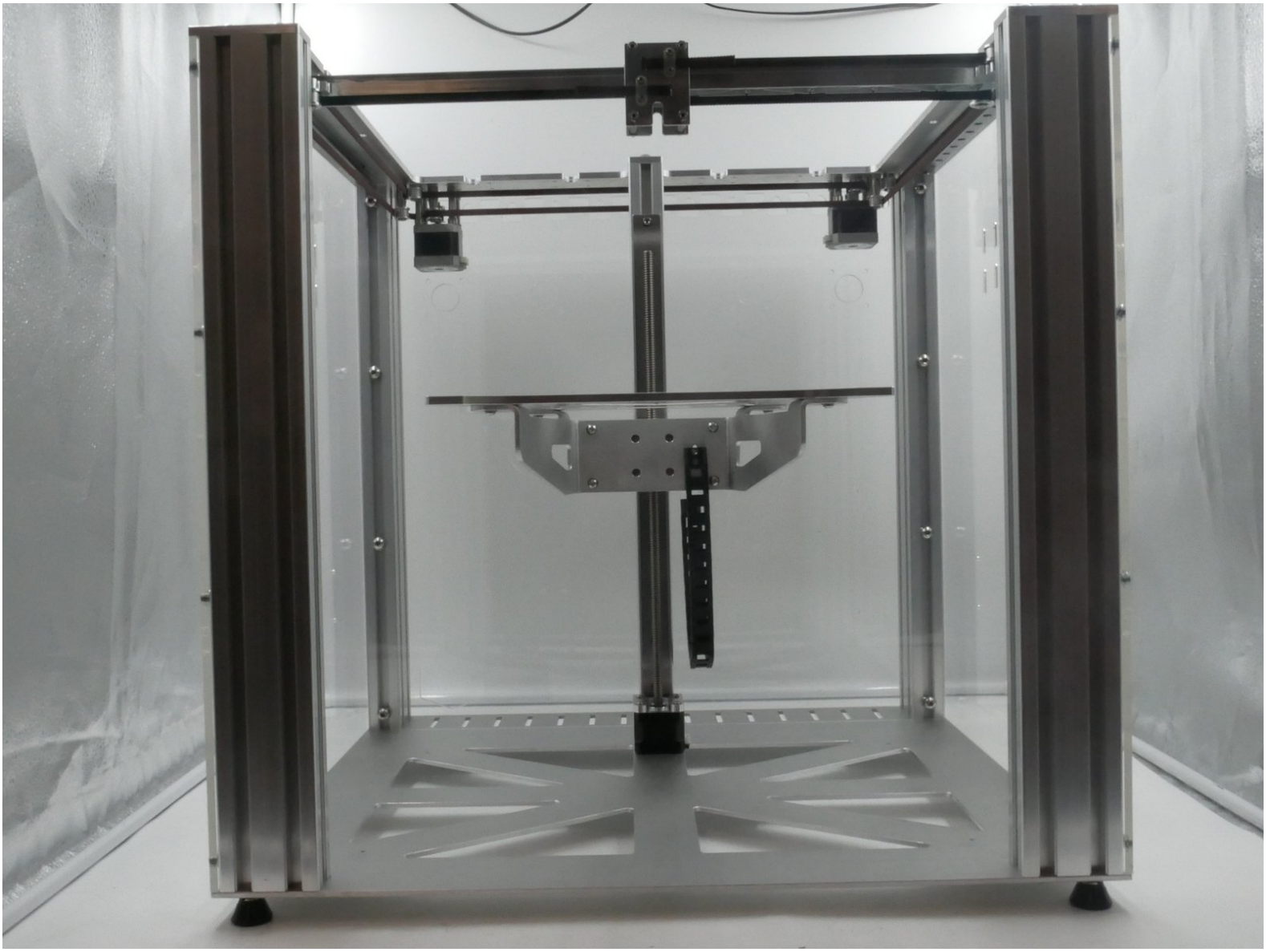
01 - Motion System Assembly.

The guide is for building the Motion System. Certain steps maybe skipped in the initital instance and later refered to again.

Written By: Dan Rock



Step 1 — Suggested Tools

The guide is for building the Motion System. Certain steps may be skipped in the initital instance and later refered to again.

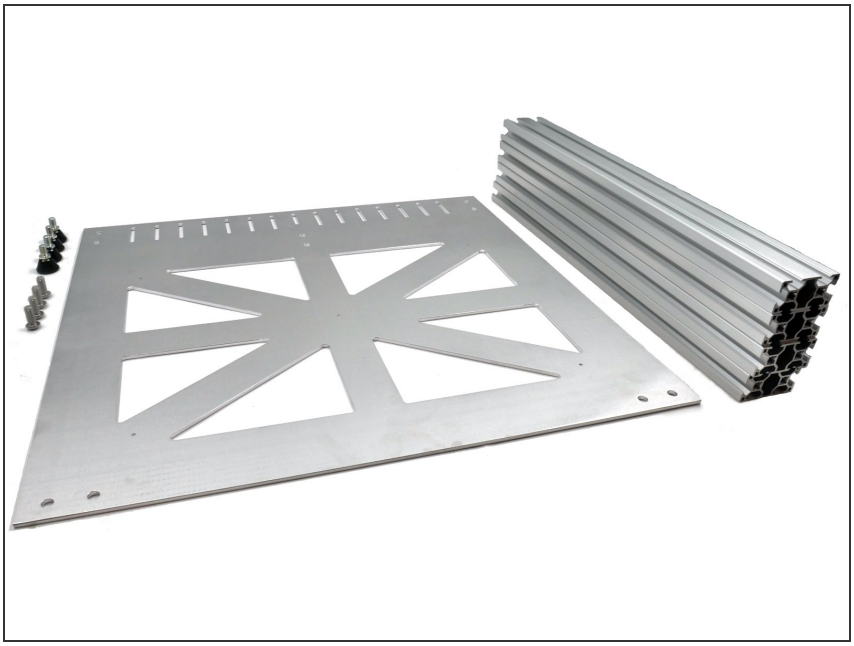
- 5mm, 4mm, 2.5mm & 2mm allen keys
- 12mm Spanner
- Knife.
- Set Square.

Some parts require printing, check GitHub for the STLs and details. https://github.com/e3donline

Please do **NOT** use any thread-lock during the assembly of the Motion System frame as this can lead to cracking of the acrylic panels. For more information read through this forum post.

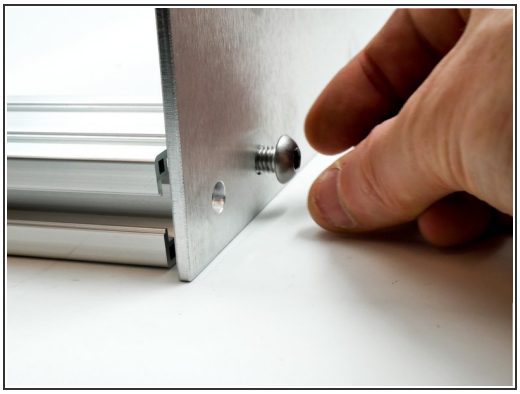
We are now including Patch-Locked bolts as part of the frame Fixing Kits. Using thread-lock, even in close promixity to the acrylic, can cause cracking of the panel.

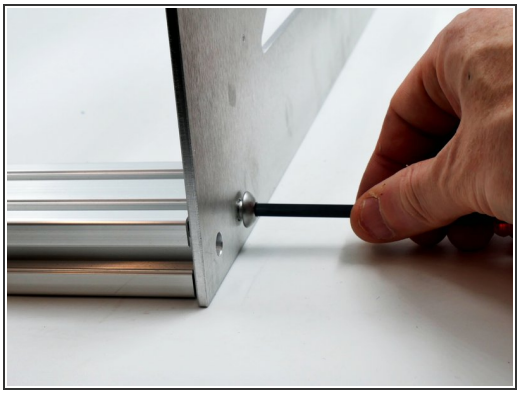
Step 2 — Gather Parts



- 4 x M8 Patch-Locked Button Head Screws.
- 4 x M8 Patch-Locked Feet.
- 1 x Bottom Plate.
- 4 x Aluminium Extrusions.

Step 3 — Screw In The Bottom.



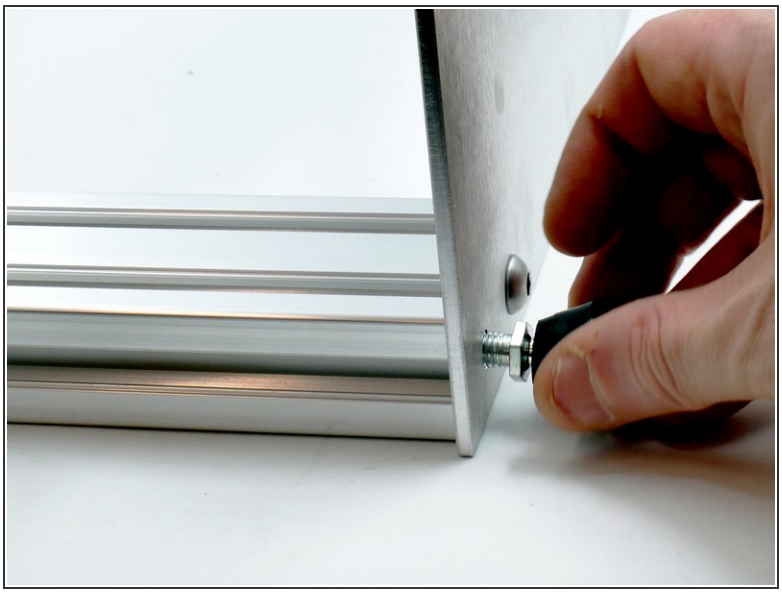


- Screw the M8 Button head screw into extrusion on the underside of the bottom frame.

ⓘ Starting with the front of the base plate will be the easiest (the non-slotted side).

- You do not need to fully fasten at this point, we will be tightening up later.

Step 4 — Bottom.

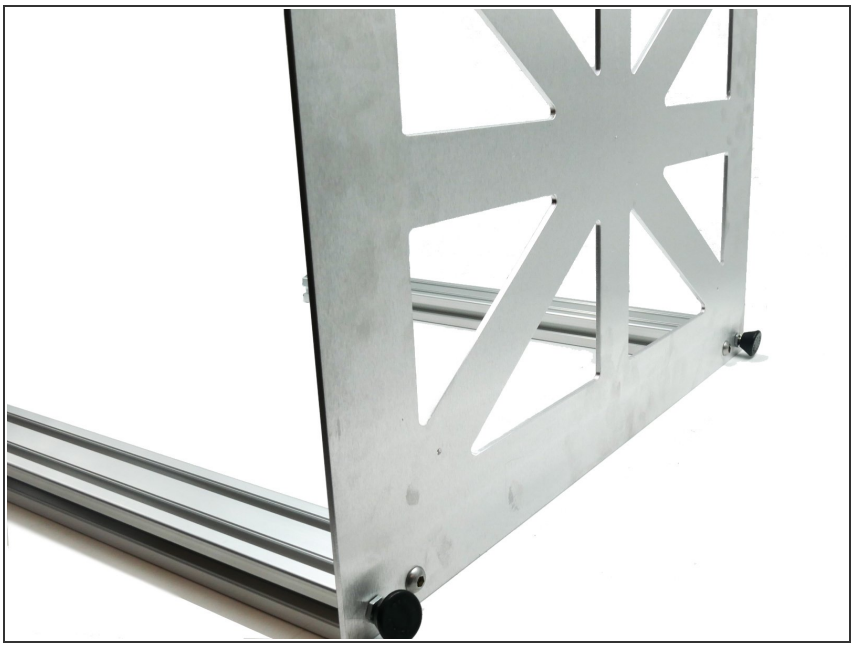


- Screw the feet into extrusion through the frame.

Step 5 — Bottom.

- Fasten the button head screw on the other side.

Step 6 — Bottom.



- The front extrusions should look like this.

Please note the lack of slots, if the back slots are visible you have started the wrong way round.

Step 7 — Base.

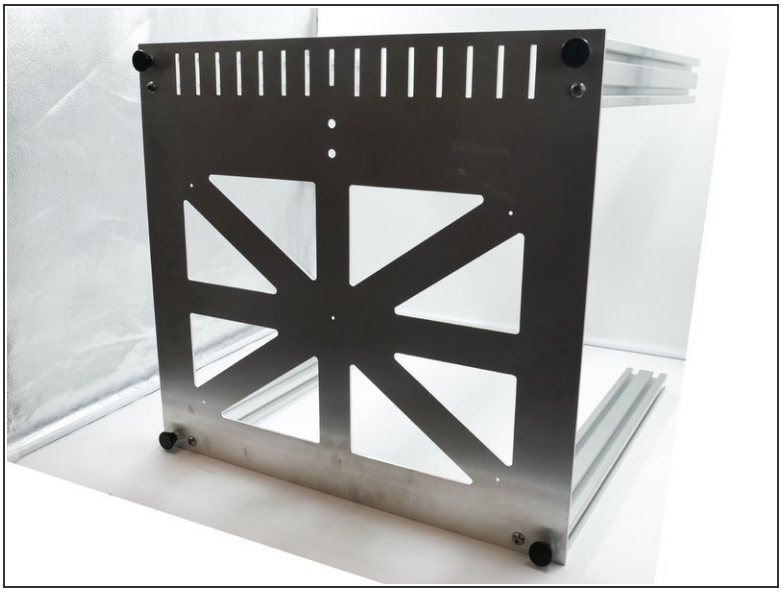
- Now the bottom plate is supported by the front extrusions you can begin fastening the back extrusions in place.

Make sure the feet are screwed into the outer holes.

Step 8 — Extrusion.

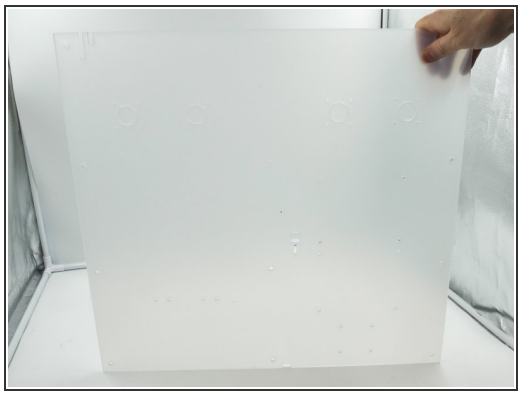
- Screw in the final button head screw and foot.

Step 9 — Double Check.



⚠ Double check to make sure the feet are on the outside corners.

Step 10 — Electronics Panel.



- Peel the protective film off.
- You may need to use a blade to peel up the corners initially.

⚠ Be careful not to cut yourself or, more importantly, scratch the panel.

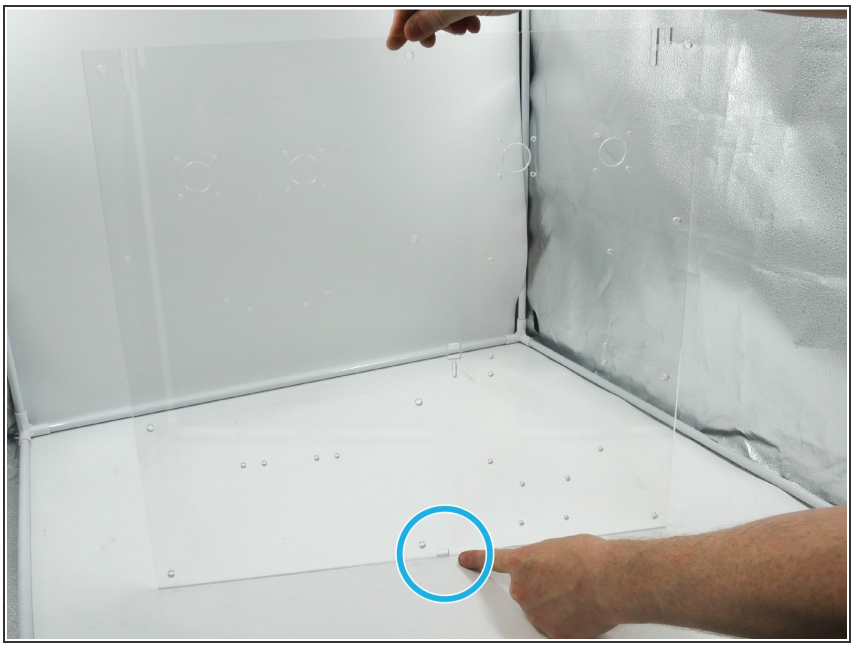
Step 11 — Clear.

- The panels should be completely clear. If the panel still looks white or cloudy then you still have some film to peel off.

ⓘ Please note there are two versions of the Electronics Panel. The Titan version has four round holes and the Hemera version has four square holes.

- Titan Bowden Electronics Panel.
- Hemera Bowden Electronics Panel.

Step 12 — Slot.



- Please note of the orientation of the panel here.
- The slot (Highlighted) needs to be on the right hand side of the centre when facing you.

Step 13 — Gather.

- 8 x M6 T-Nuts.
- 8 x M6 12mm Patch-Locked Button Head Screw.

ⓘ The supplied M6 screws are now 12mm and patched locked. The fixings in the photo are 10mm and not supplied with Patch-Lock.

- 8 x M6 Washers.

Step 14 — Washers.

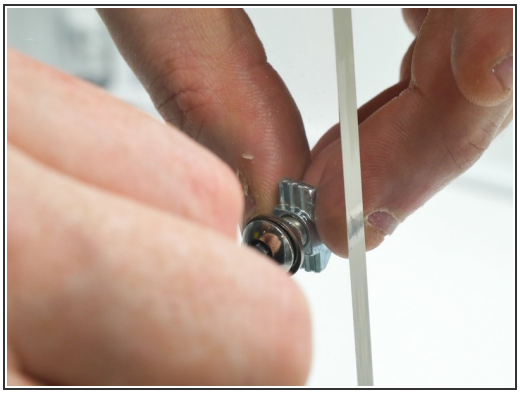
- Place the washers on the screws.

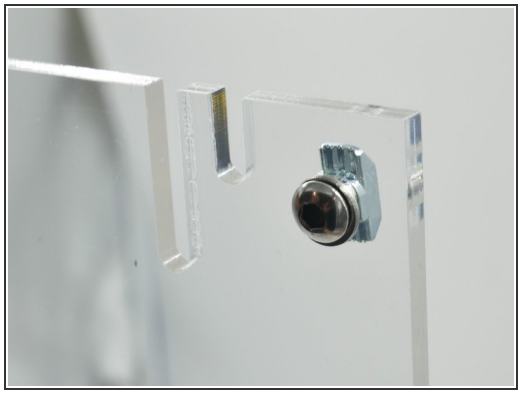
⚠ Do not use Thread Lock on the Acrylic panels, or anywhere else on the Motion System as this can lead to cracking of the acrylic panels.

ⓘ These fixings are now supplied with Patch-Lock.

- See this Forum Post for more information.

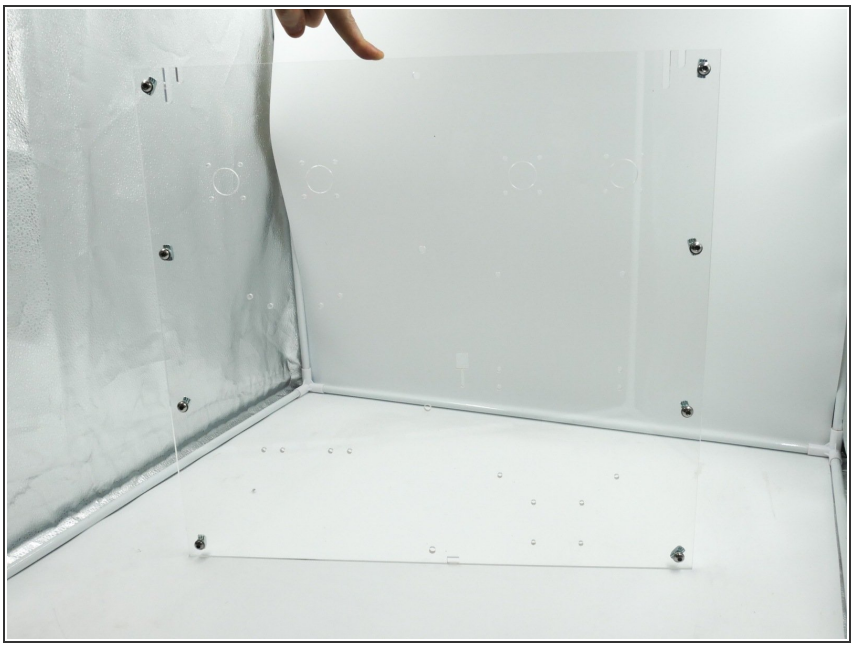
Step 15 — Nuts.





- With the panel oriented as above the button head screw and the washer should be on the side closest to you with the T nut on the opposing side.
- Do this for all the holes on the right hand side.

Step 16 — More Nuts.



- Do the same for the other side.

Step 17 — Flip.

- Flip the panel so that the t nuts are facing you now.

ⓘ Make sure the slot is now on the left hand side.

Step 18 — Gather Parts

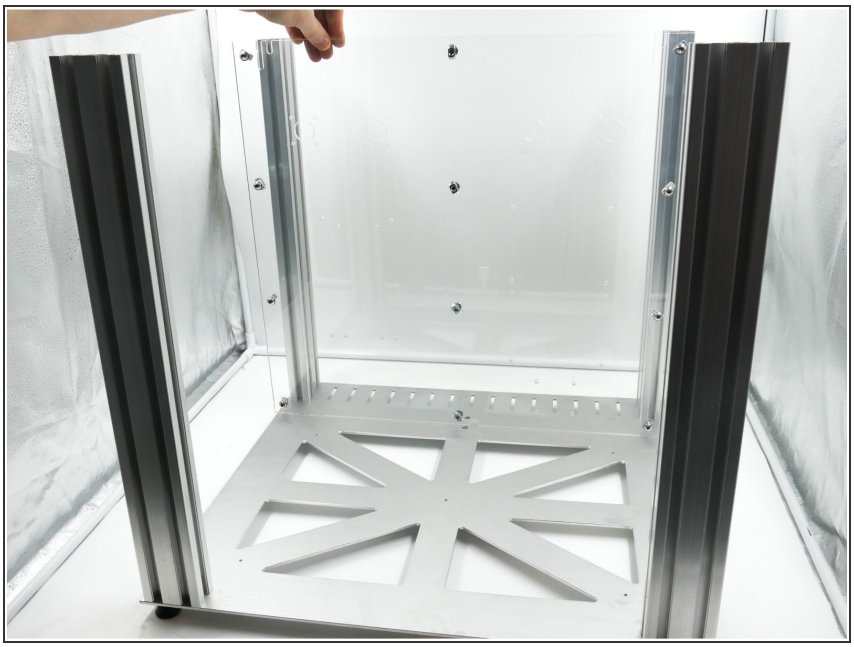
- 4 x M6 Washers.
- 4 x M6 Patch-Locked Button Head Screws.
- 4 x M6 T-Nuts.

Step 19 — Nutted.

- Insert all the bolts washers and nuts along the central column of holes.
- Make sure that they are in the opposite orientation to the outside columns.

⚠ Do not use Thread Lock on the Acrylic Panels, or anywhere else on the Motion System.

Step 20 — Offer Up The Panel.

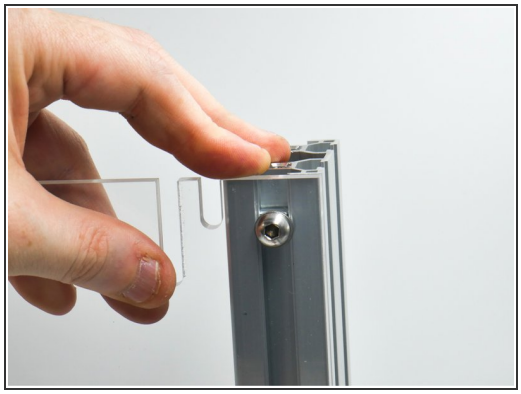


- Offer up the Electronics Panel that you just prepared, to the frame.

ⓘ Please note the position of the slots at the back of the base panel.

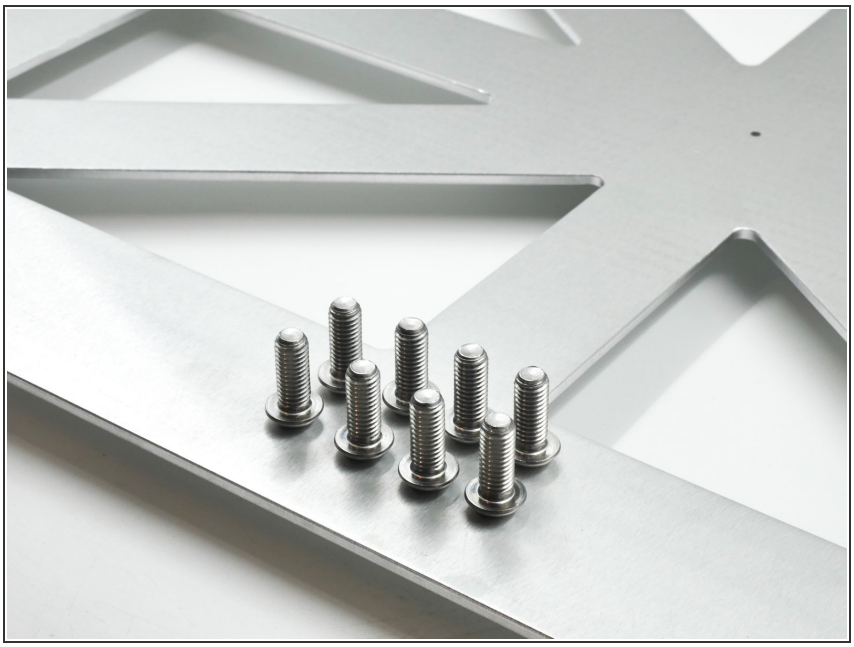
ⓘ The panel is going on the inside of the extrusion.

Step 21 — Screw.



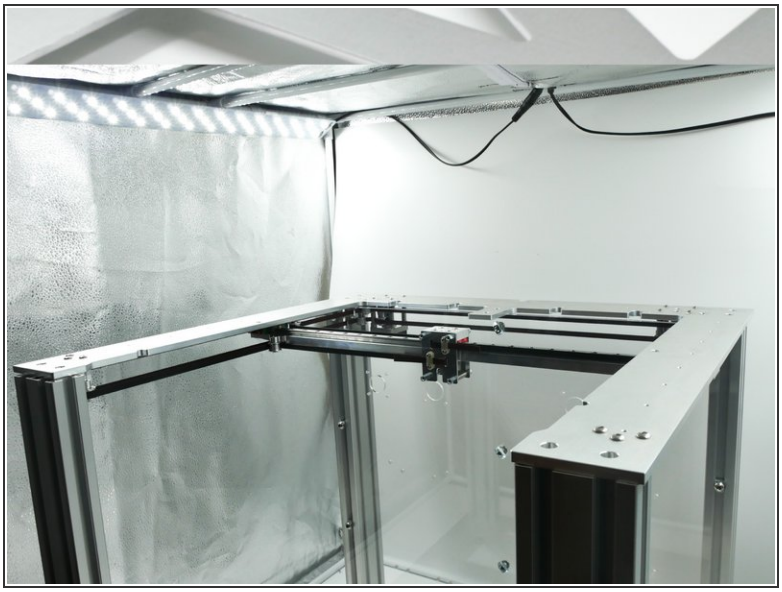
- Start with the T-Nuts in the vertical position.
- Hold the panel flat against the extrusions.
- Check all T-Nuts have aligned inside the slots in the extrusion.
- Finger tighten the screws.

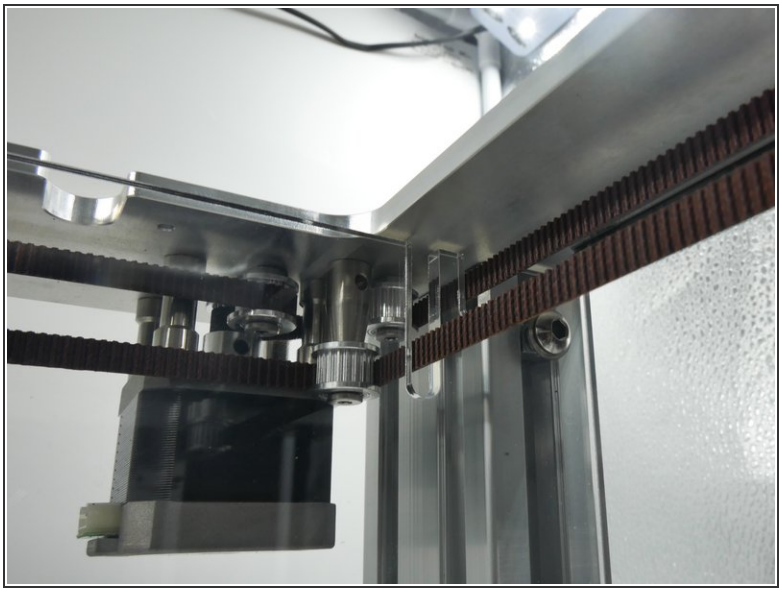
Step 22 — Gather Parts.



- 8 X M8 Patch-Locked Button Head Screws.

Step 23 — Top Plate.

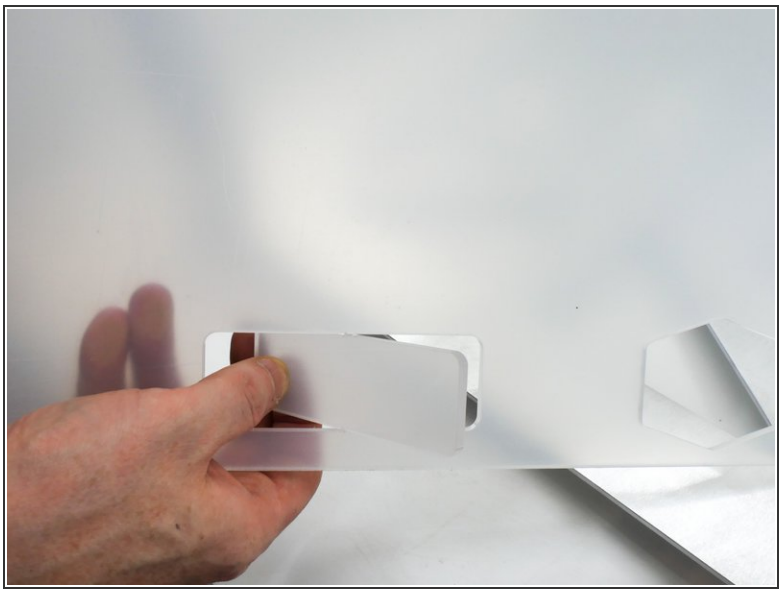


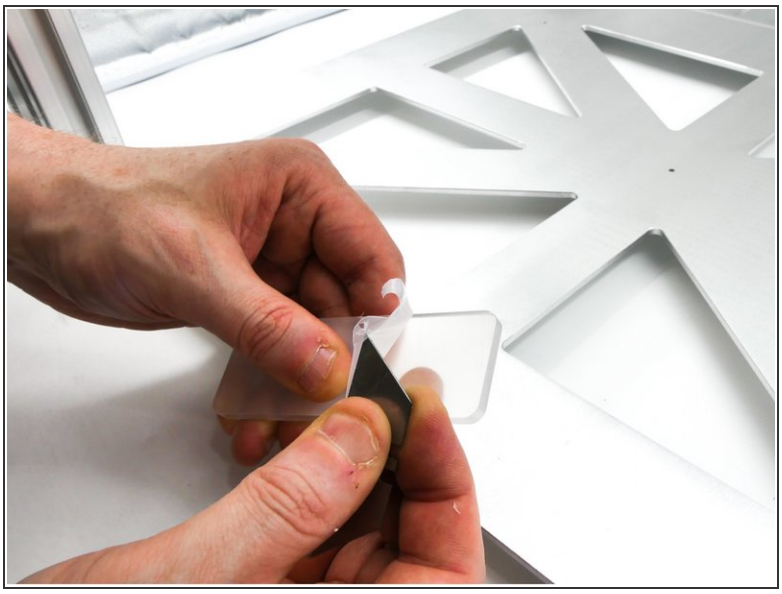


- Place the top plate on the frame.

⚠ Check to make sure the belts are sitting in the slots and are not trapped.

Step 24 — Rear Panel.

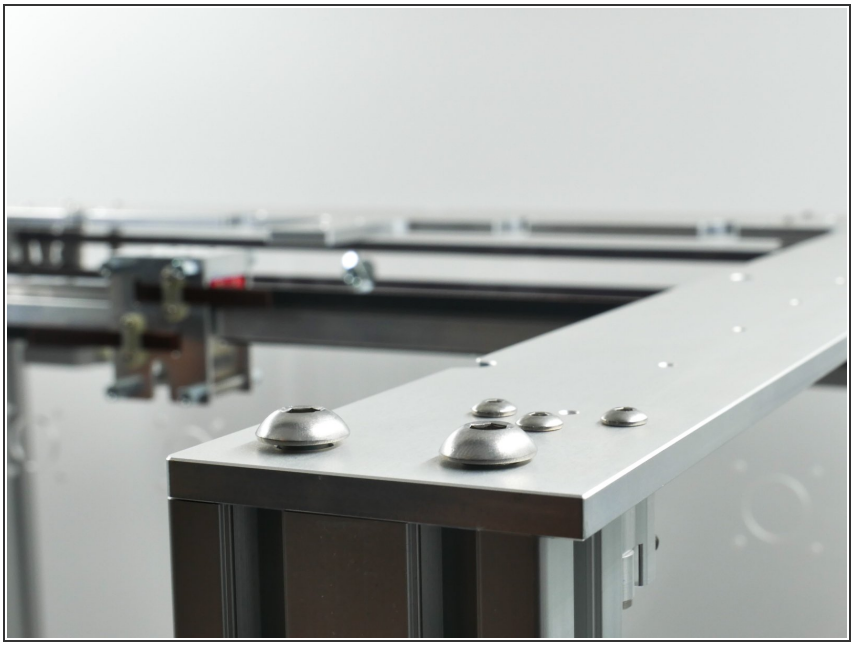




- To the Rear Panel and remove the rectangle.
- Remove the film from both sides.

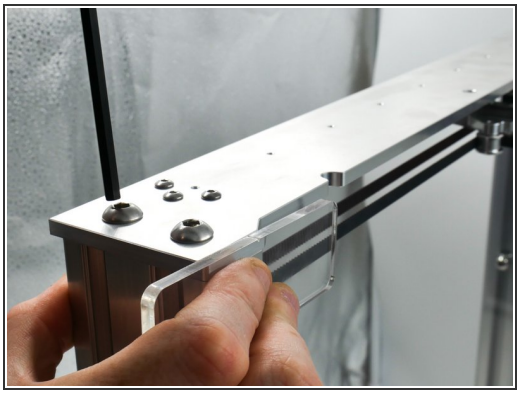
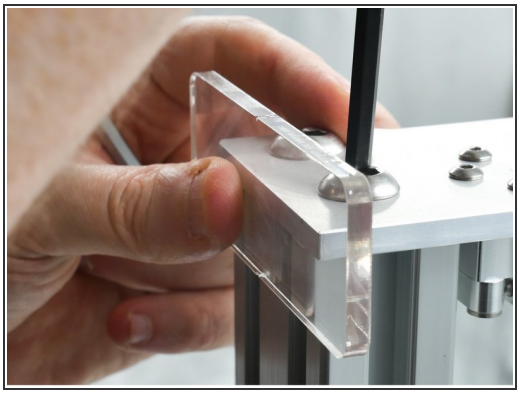
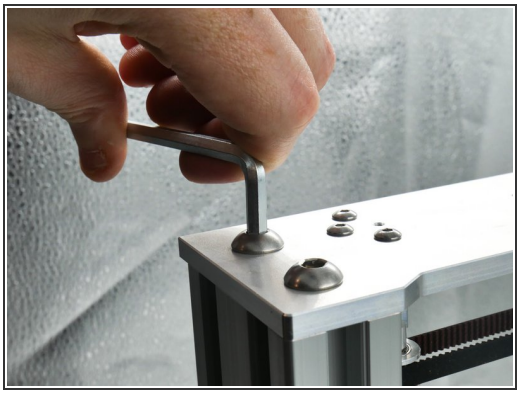
ⓘ This piece will be used to align the frame and ensure it is all square.

Step 25 — Screws



⚠ Finger tighten the screws in the Top Plate.

Step 26 — Front Alignment.

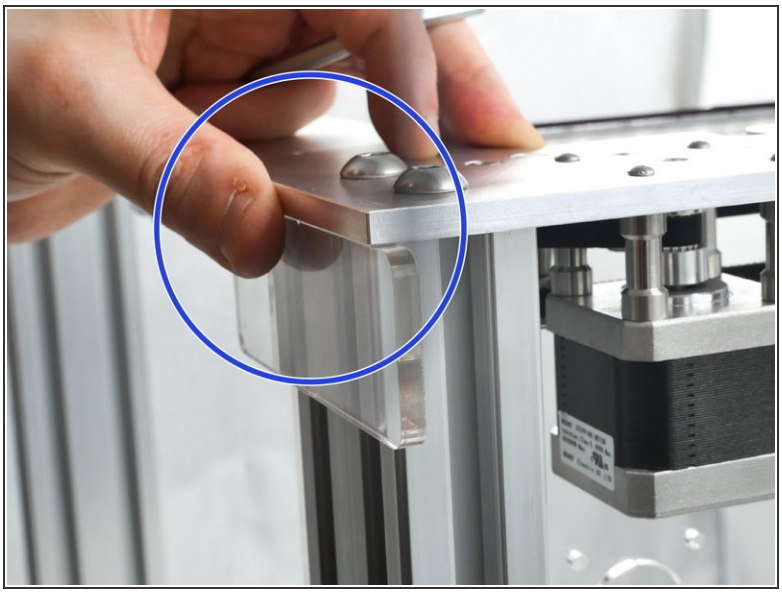
- Using the rectangle as a guide make sure that the edges of the top plate are parallel with the edges of the extrusion.
- When the edges are lined up perfectly fasten down the Button Head Screws.

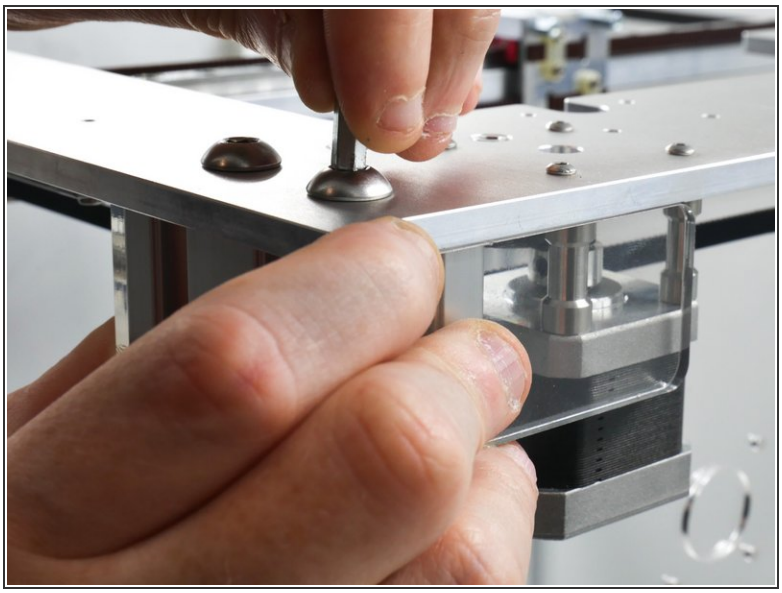
If you fully fasted the button head screws earlier you will need to loosen them in order to provide enough adjustment.

- You will want to use a 90 degree allen key in order to fully fasten the button head screws at this point.

Incrementally tightening the screws will help with any potential slipping of the parts during tightening.

Step 27 — Rear Alignment.



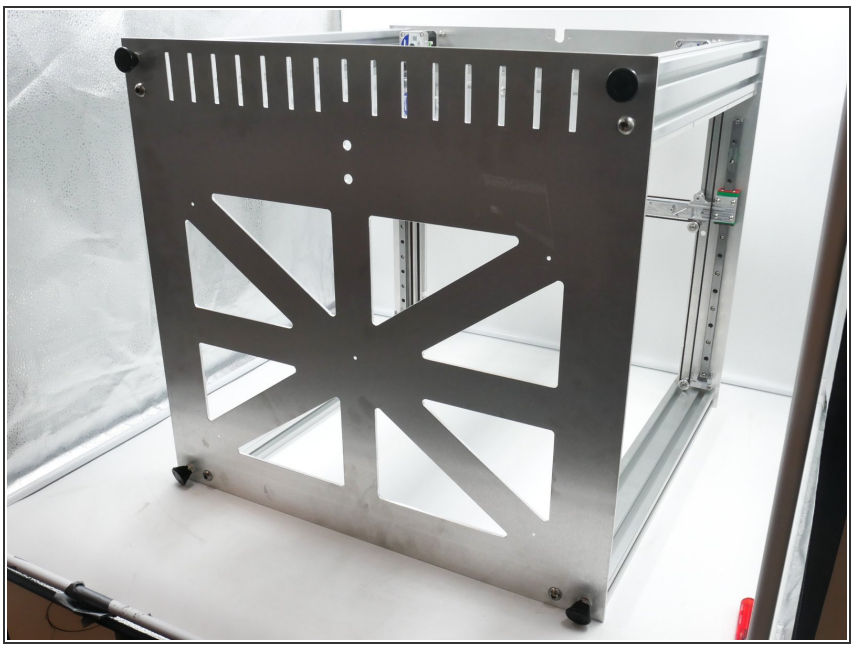


- Do the same for the Back of the frame.

Note the difference in plastic guide placement for the back of the frame.

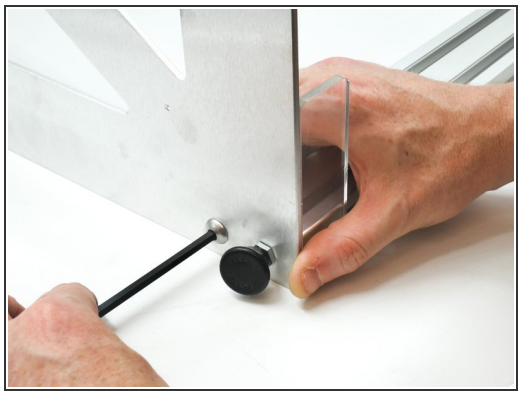
- In this case you want the edge of the top plate to be flush with the face of the plastic guide.

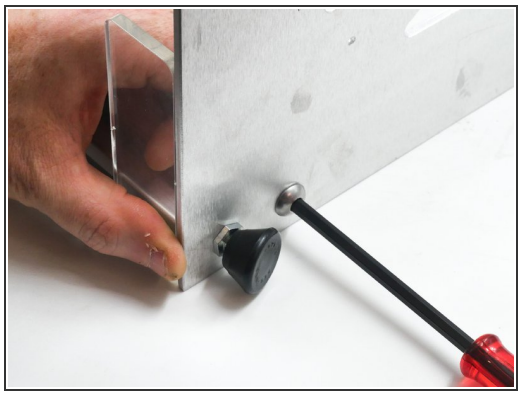
Step 28 — Manoeuvre.



- Maneuver the frame so that the bottom panel is facing you.

Step 29 — Alignment.



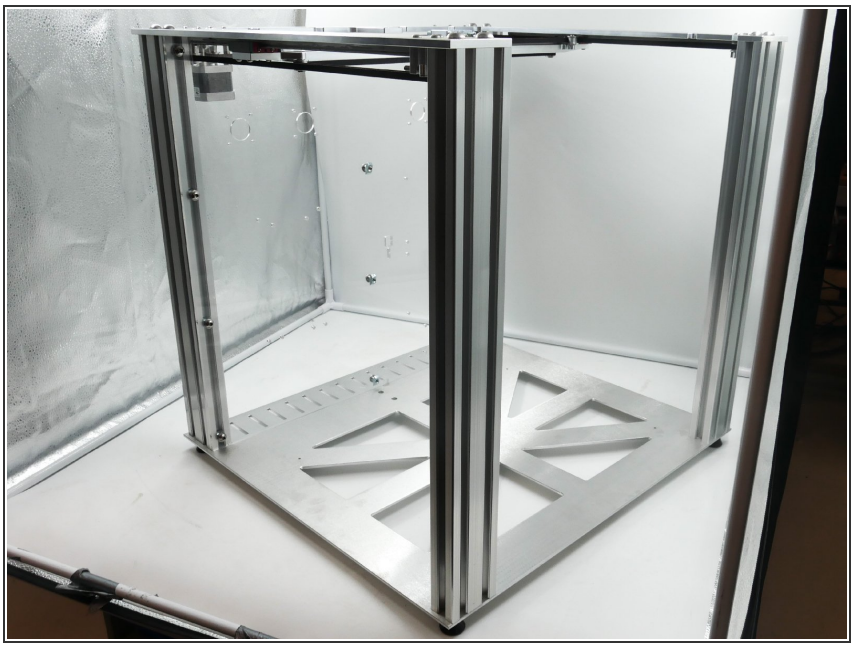



- Using the plastic guide as before, carefully tighten the screw and foot.
- Use a 12mm spanner to fasten the foot.

Step 30 — Tighten.

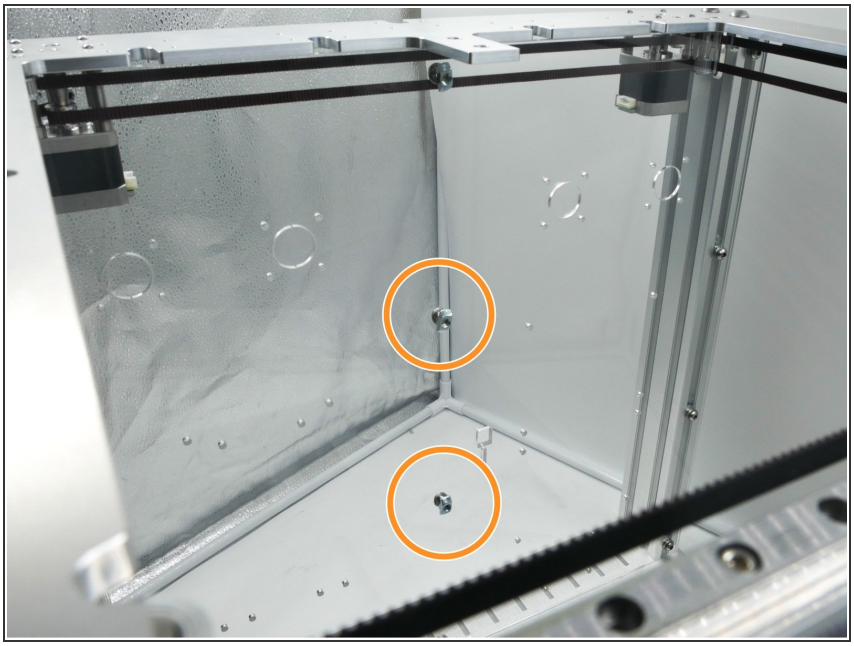

- Repeat the process for the other three feet and screws.

Step 31 — Upright.



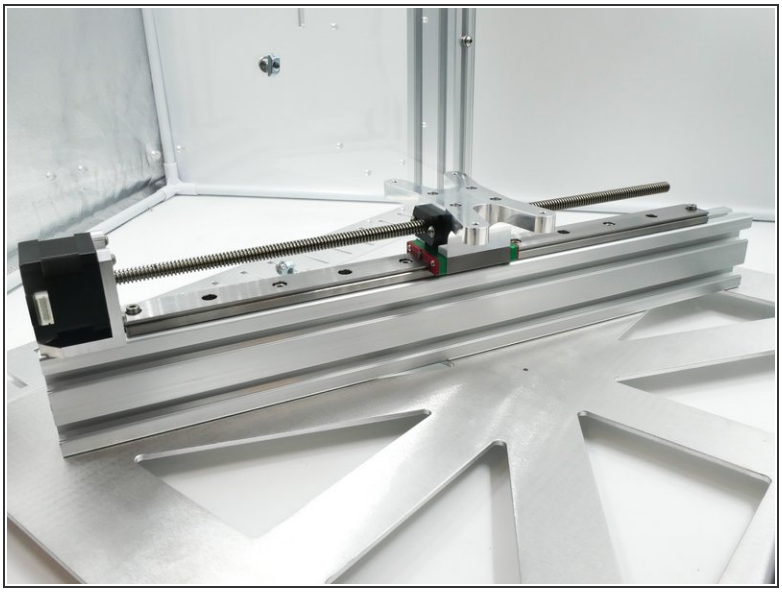
- Maneuver the frame the correct way round with the feet on the bottom.

Step 32 — Electronics Panel.



- Rotate the centreT-Nuts so they are positioned vertically.

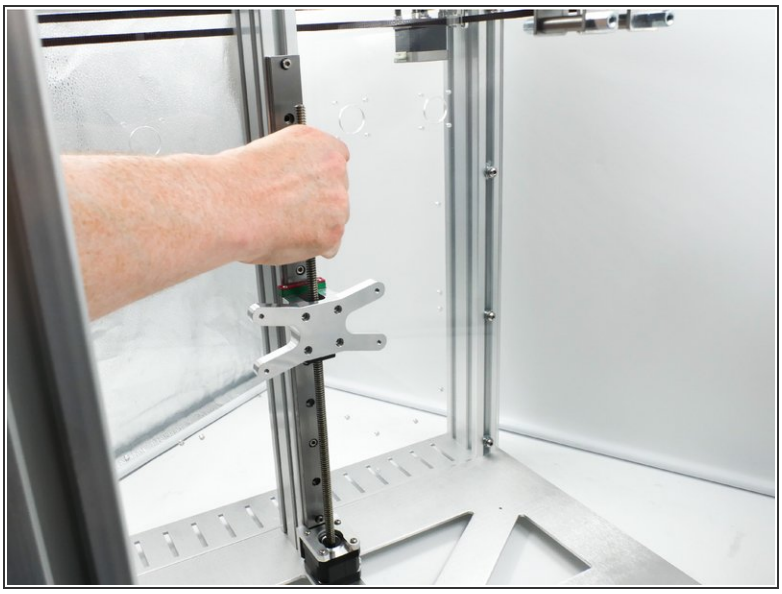
Step 33 — Gather Parts.



- The Z-Axis Assembly.
- 3 x M8 Patch-Locked Button Head Screws.
- 1 x M8 Patch-Locked Foot.

⚠ Do not pick up or hold the Z-Axis by the leadscrew.

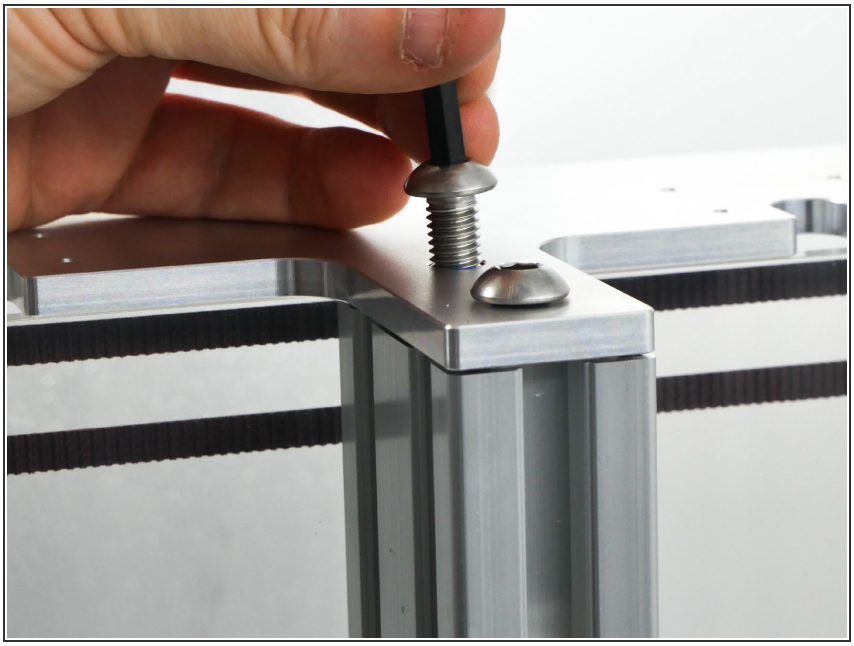
Step 34 — Position.



- While holding the Z-Axis upright carefully slide it into position between the Top and base plates.

⚠ Take extra care not to scratch anything and double check the T-Nuts are in the correct position in the extrusion's slot at the rear.

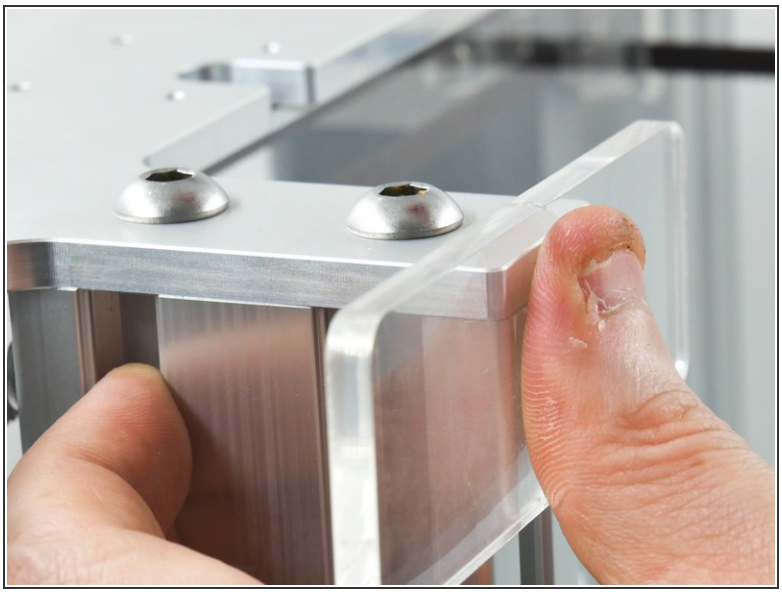
Step 35 — Bolts.

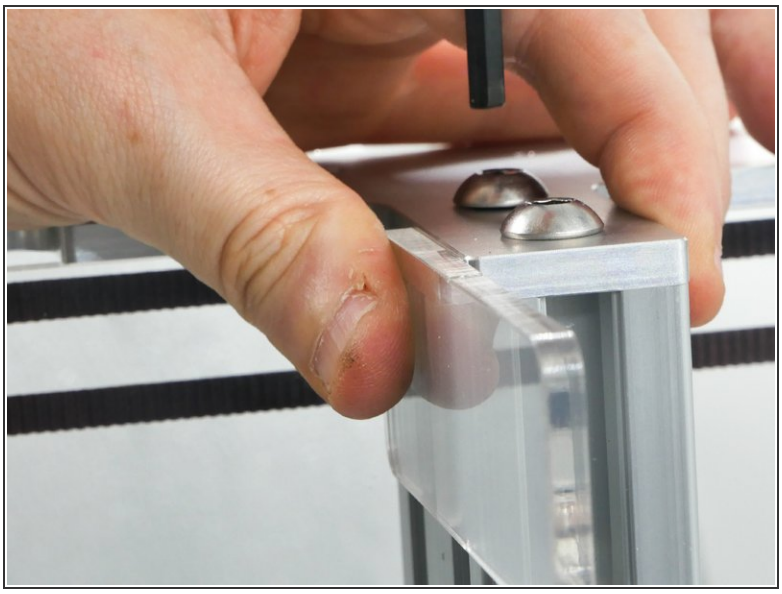


- Fit the screws into the Top Plate.

⚠ Only finger tighten the screws.

Step 36 — Alignment.



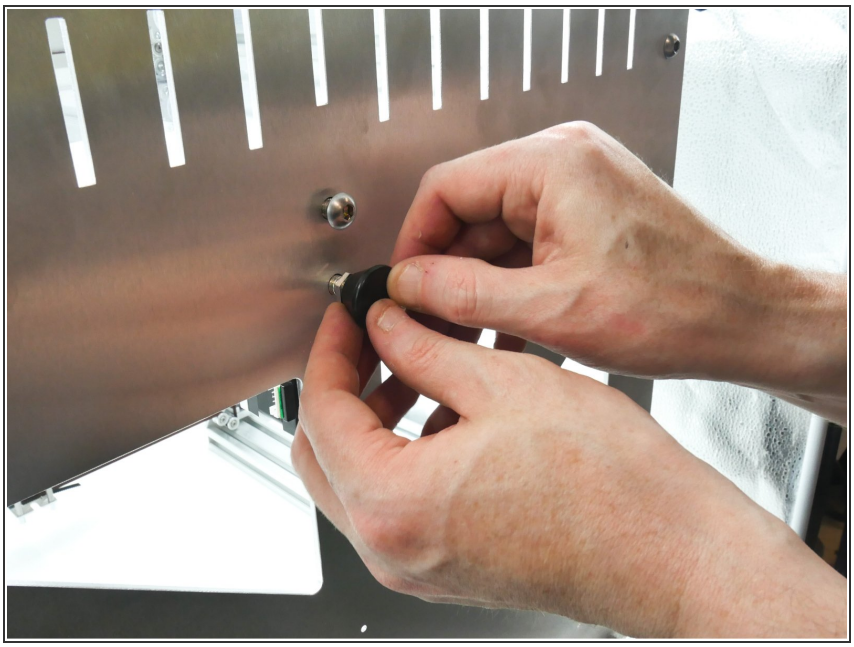


- Using the plastic guide ensure that the edges of the top plate are flush with the edges of the extrusions.
- Slowly tighten the screws checking the Z-Axis has not moved out of alignment.

Step 37 — Face Down..

- Maneuver the Motion System so that the Bottom Plate is facing you as shown.

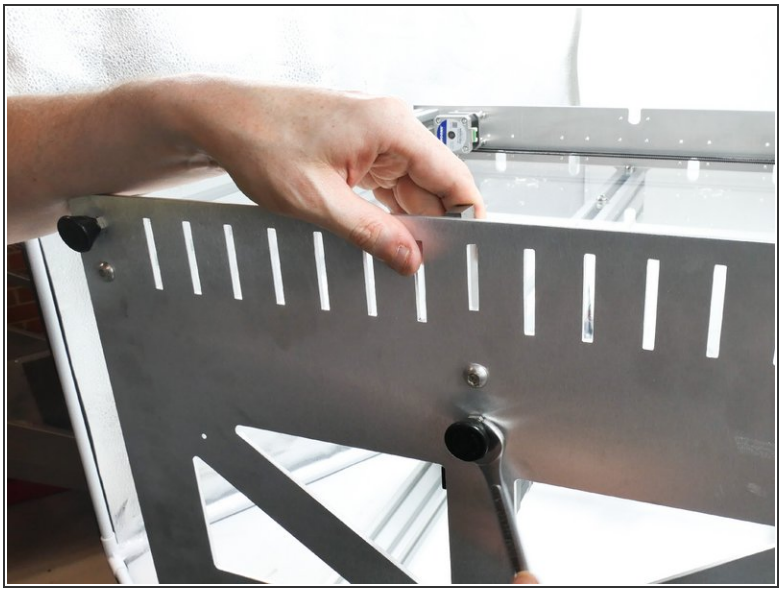
Step 38 — Screwed.



- Whilst supporting the motor to get correct alignment screw in the M8 button head screw.

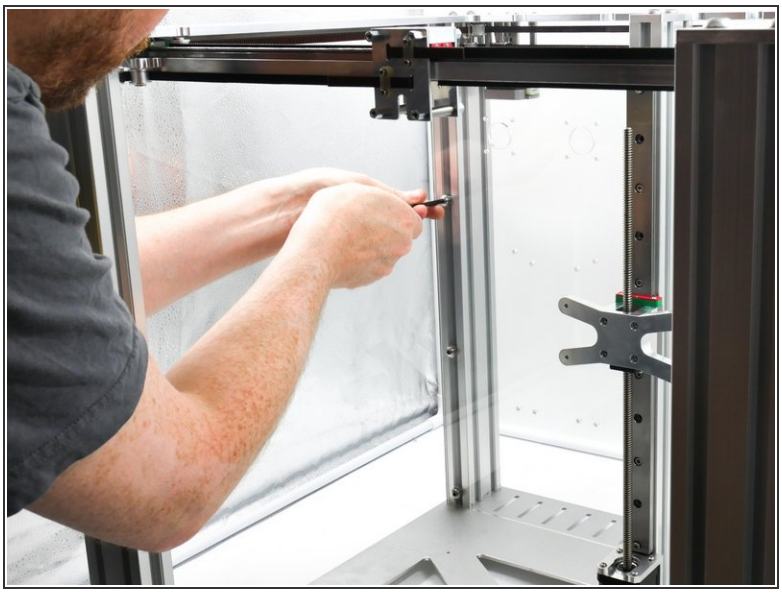
⚠ Only finger tighten the screw and foot.

Step 39 — Alignment.



- Using a Set-Square make sure that the Z-Axis is sitting at 90° to the Base Plate.
- Gradually tighten the screw and foot taking care to ensure the Z-Axis does not move out of alignment.

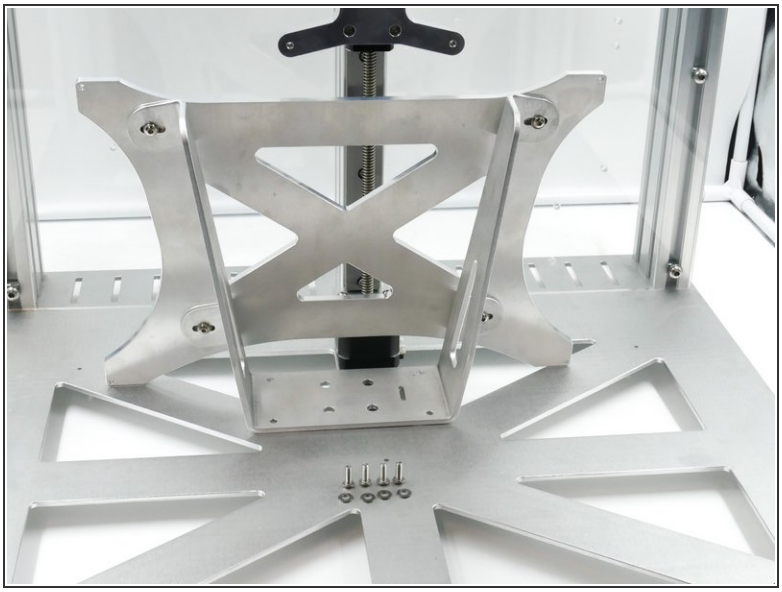
Step 40 — Nuts.



- Fully fasten all of the T-Nuts on both the middle and two side extrusions.

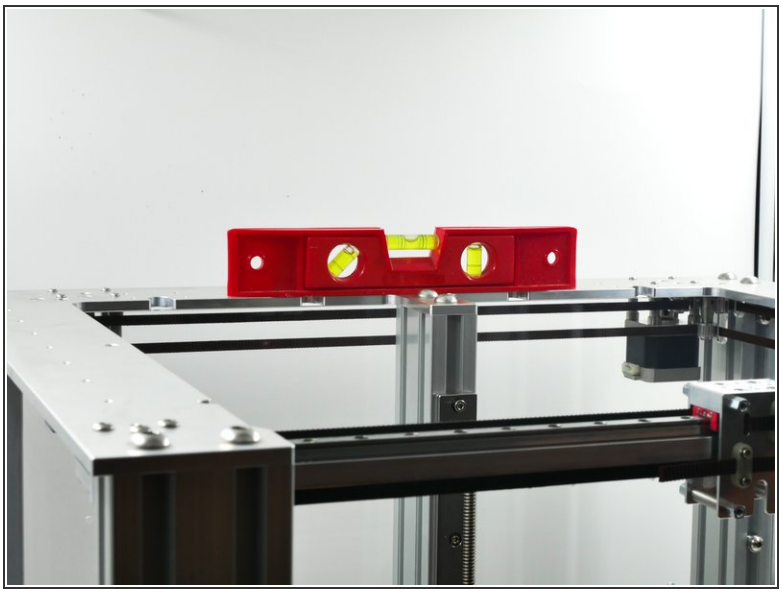
⚠ Be careful not to over tighten as you may crack the panel.

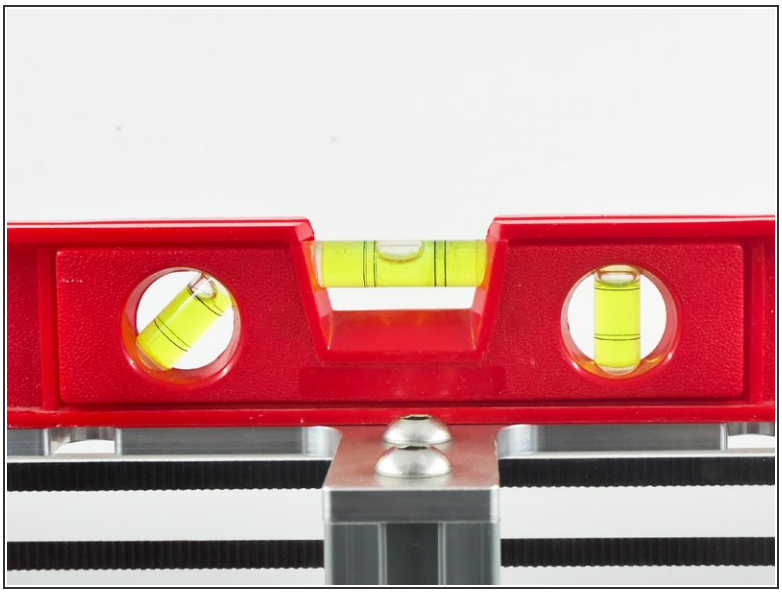
Step 41 — Gather.



- 1 x Bed frame.
- 4 x M4 12mm Button Head Screws.
- 4 M4 Washers.

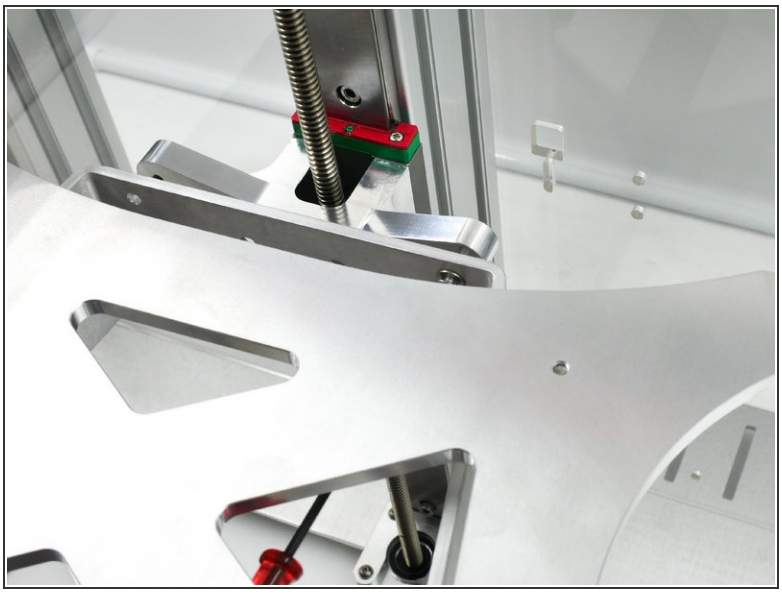
Step 42 — Check Level.





- In this next step you are looking to make sure the bed is parallel to the frame.
- In this example the surface the tool changer frame is sitting on is not perfectly level. Make note of the off-angle as you will need to match it in a later step.

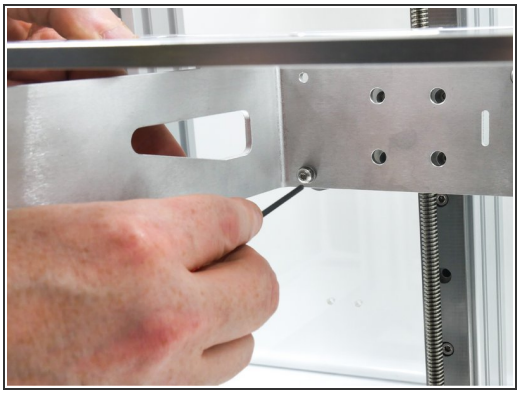
Step 43 — Bed.

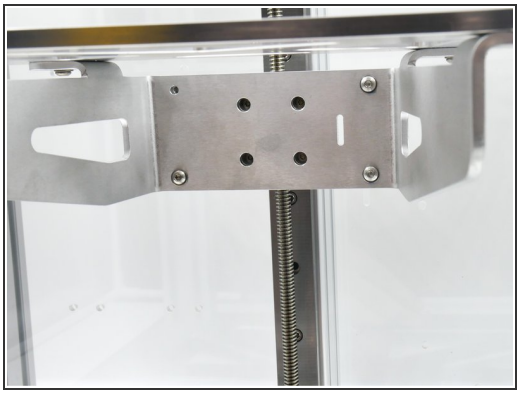


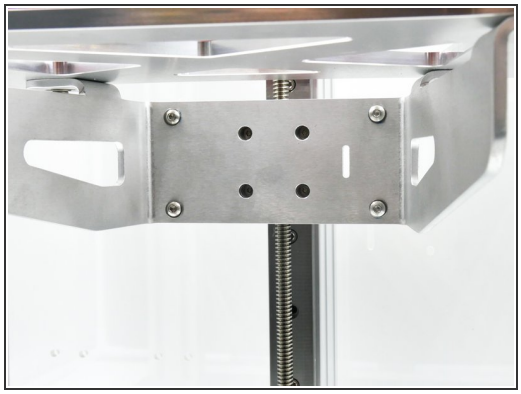
- To each M4 screw place on a washer and apply Thread Lock.
- Pass a screw through a mounting hole in the Bed Bracket as shown.
- Attach the Bed Bracket to the Z-Axis.

⚠ Only finger tighten the screws.

Step 44 — Bed.



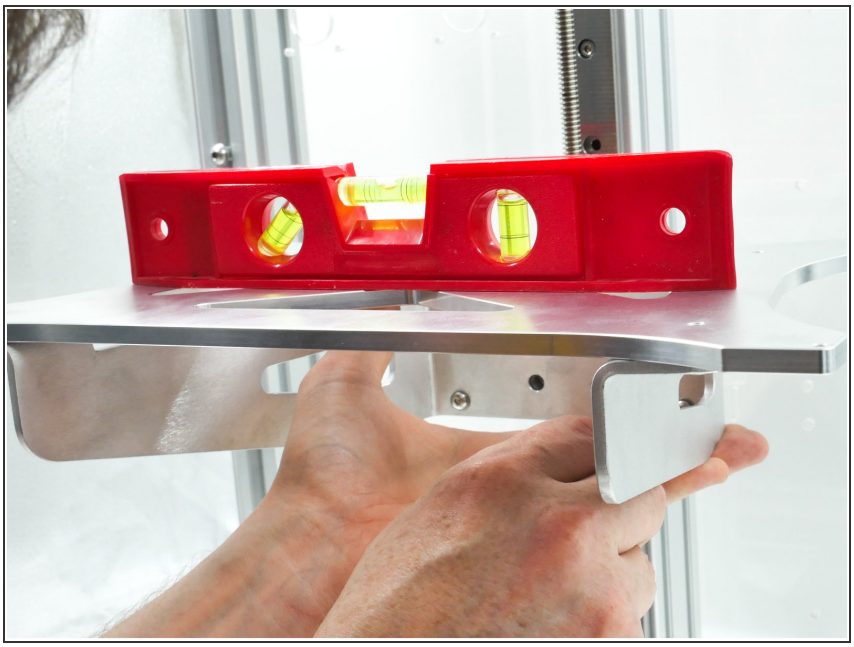




- Fit the remaining screws to hold the Bed to the Z-Axis.

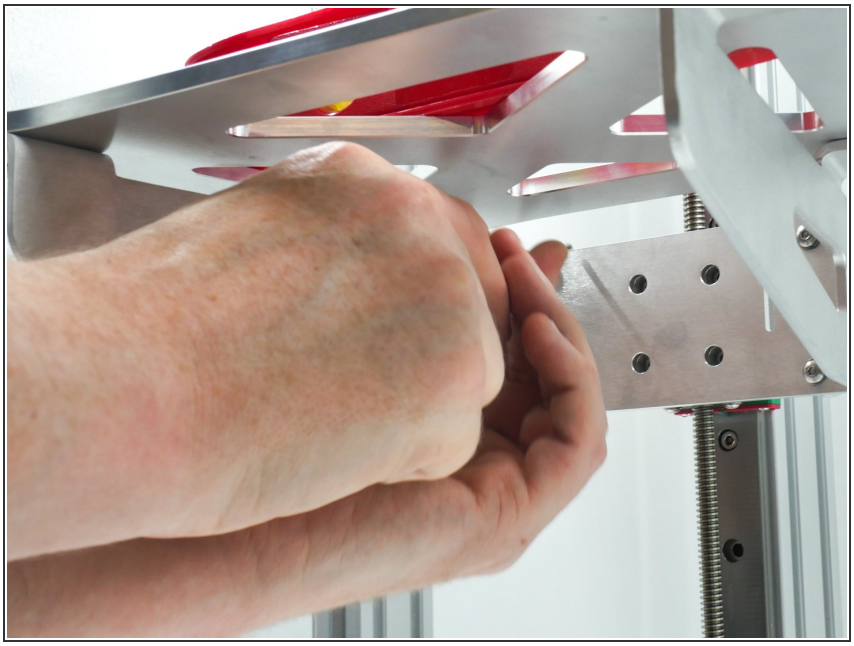
⚠ Only finger tighten the screws.

Step 45 — Align.



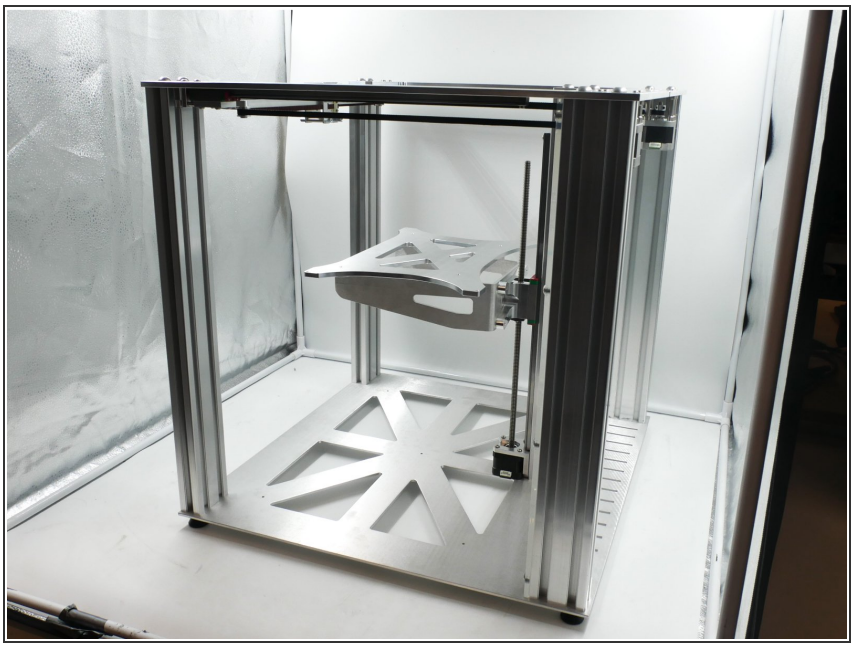
- Place the level on the Bed.
- Adjust the angle of the Bed so it closely matches the angle measured previously.

Step 46 — Tighten.



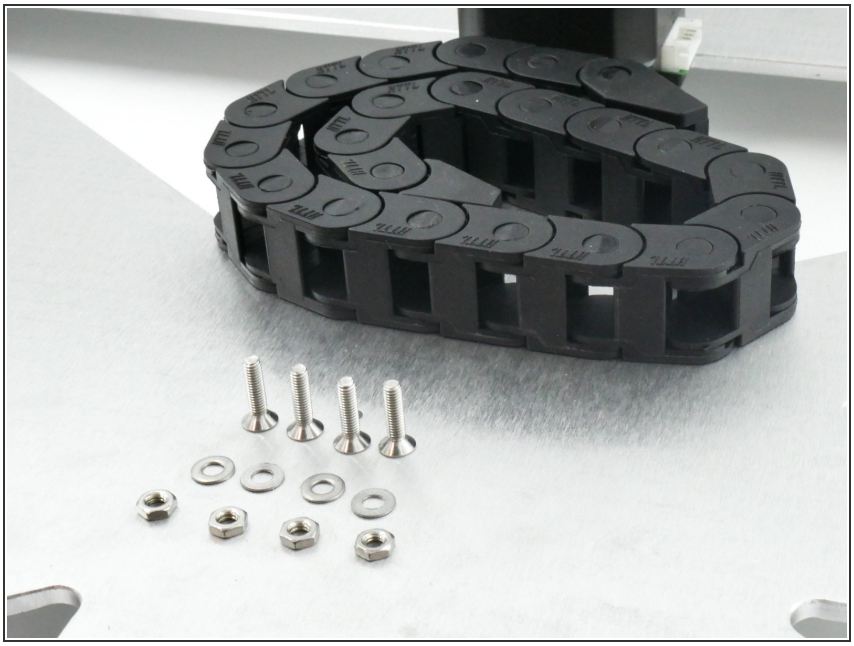
- After the bed is level slowly tighten the four screws.

Step 47 — Rotate.



- Rotate the frame to that the right hand side is facing you.

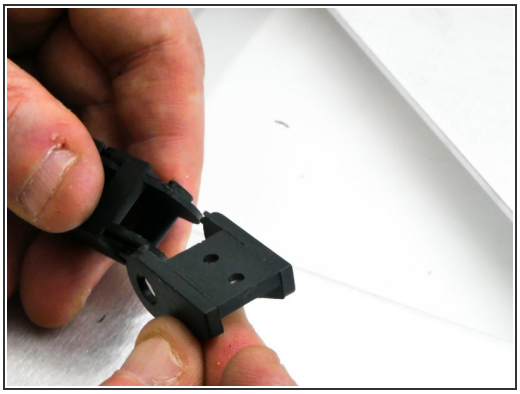
Step 48 — Gather Parts



ⓘ Fitting the Dragchain may be skipped as it will be removed later on when fitting the wiring.

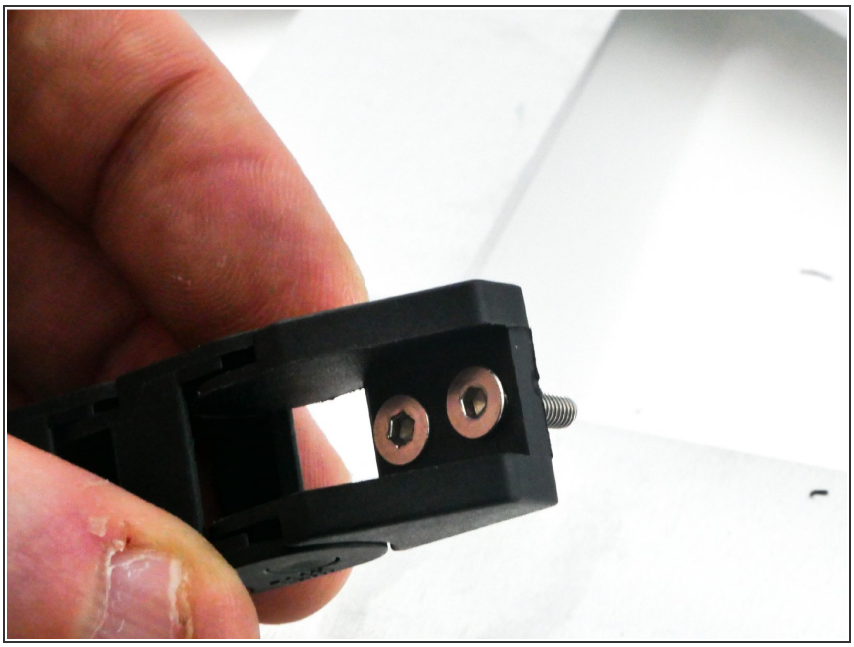
- 1 x Dragchain.
- 4 x M3 12mm Counter Sunk Screws.
- 4 x M3 Washers.
- 4 x M3 Hex Half nuts.

Step 49 — Unclip.

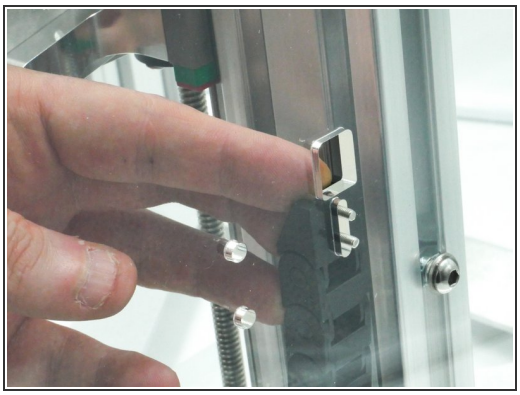

- Unclip one of the Dragchain ends.
- Rotate it around.
- Refit the end.

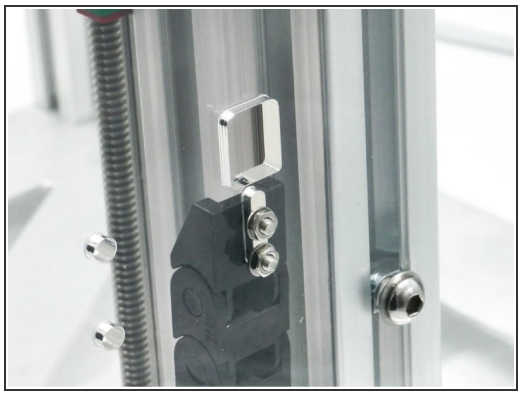
Step 50 — Dragchain.



- Insert the M3 counter sunk screws into the Dragchain.

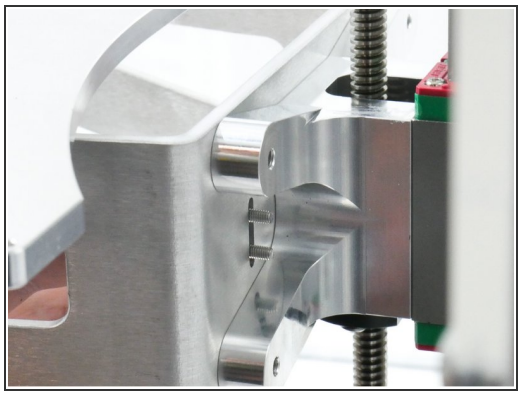
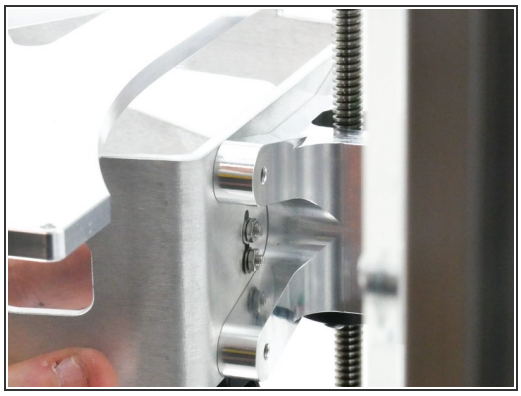
Step 51 — Dragchain.





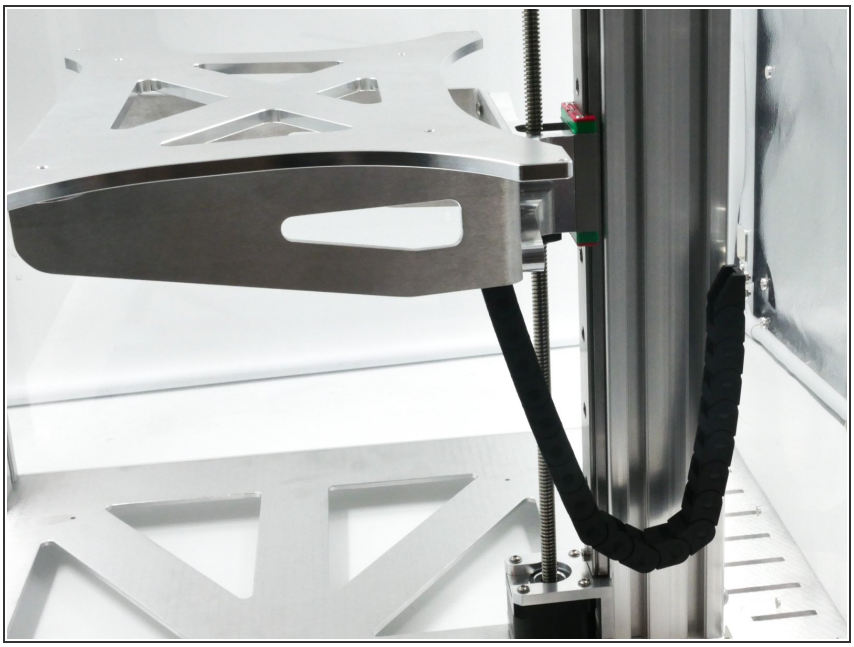
- Place the Dragchain with the inserted screws through the panel.
- Place the stainless steel washers on the other side.
- Place the nuts on the thread and fasten.

Step 52 — Dragchain.

- The other end of the Dragchain will attach to the bed frame.

Step 53 — Dragchain.



- The installed Dragchain should look like this.

Step 54 — Side Panel.

ⓘ Installation of the side panels can wait until the final states of the build. Please refer back to these steps when installing them.

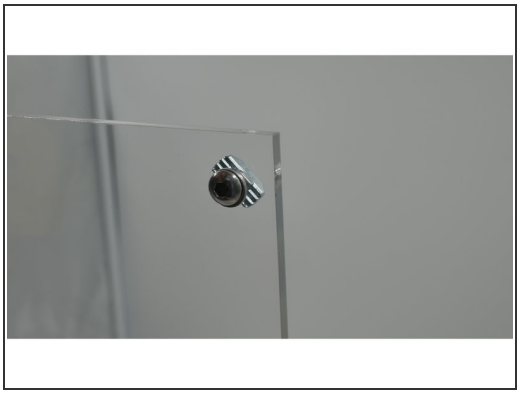
- Strip the protective film off one of the Side Panels.

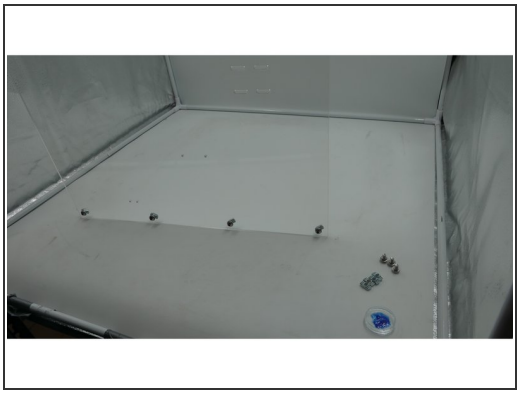
Step 55 — Parts.

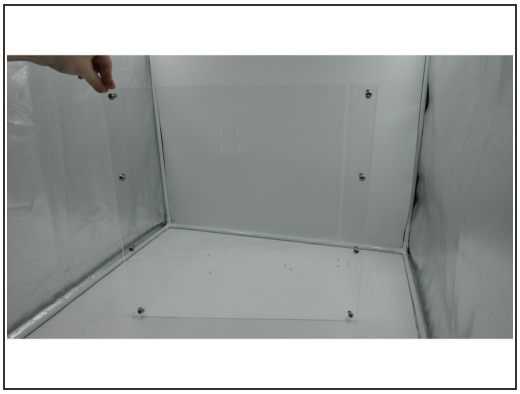
- Gather the parts shown.
- Place a washer over each M6 Patch-Locked screw.

⚠ Do not use Thread Lock on the Acrylic Panels.

Step 56 — Panel.







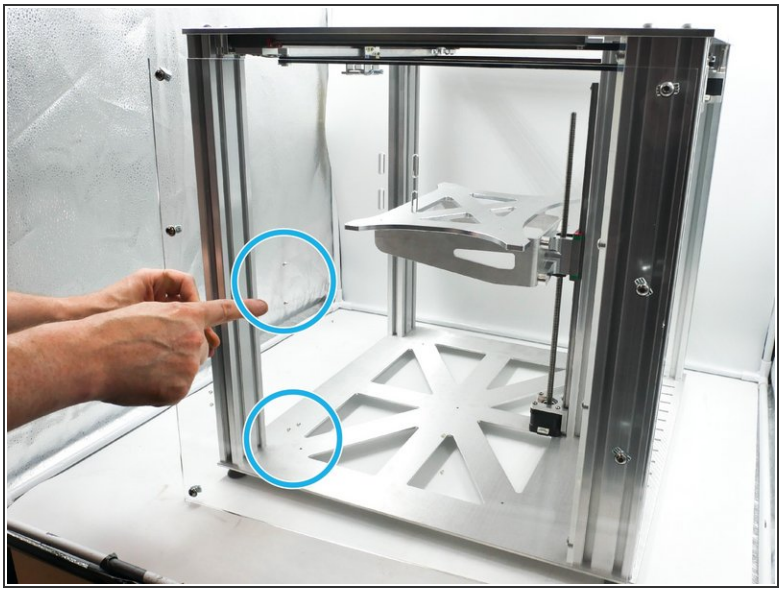
- Fit the parts into the Side Panel.

Step 57 — Side Panels.

- Repeat the process with the other Side panel.
- The side Panels need to be mirrors of each other.

⚠ Check they have been built correctly!

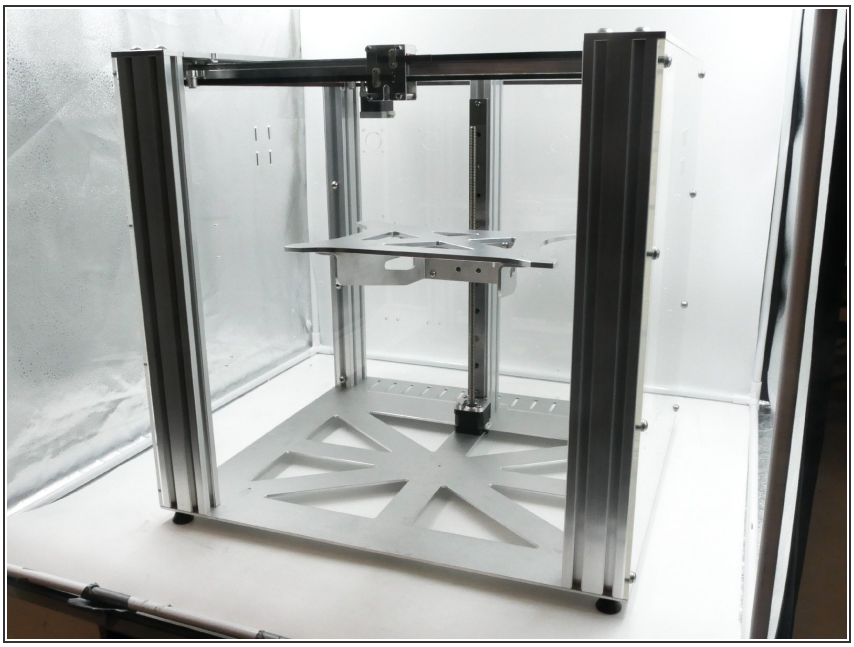
Step 58 — Fitting.



- Offer up the right side panel to the right hand side of the frame.

ⓘ Check the orientation of the panel.

Step 59 — Sides.



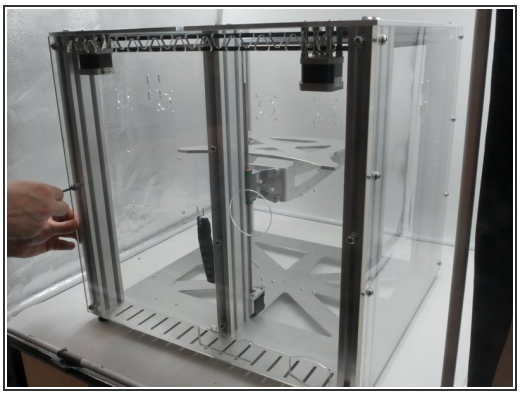
- Fit the other Side Panel.

Step 60 — Rear Panel.

- Installation of the rear panel can be completed during the final stages of the full assembly. Please refer back to this guide when installing the Rear Panel.
- Remove the protective film from the Rear Panel.

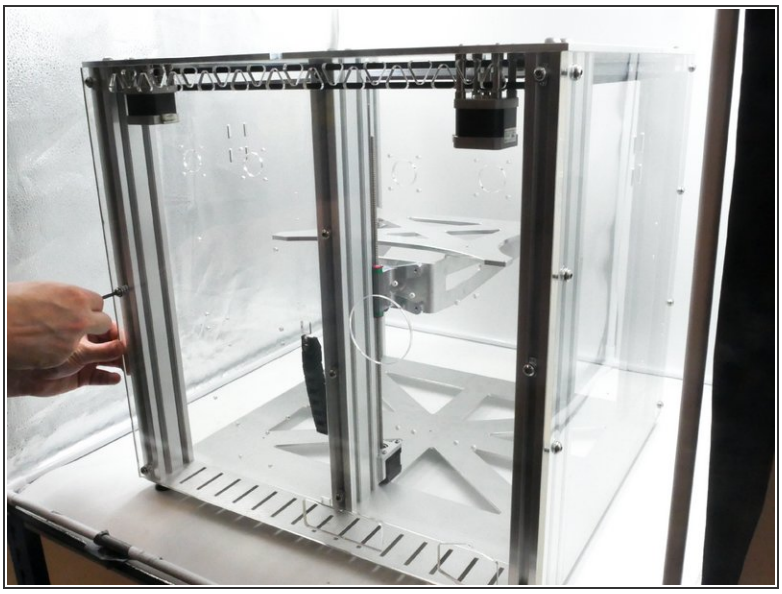
Step 61 — Rear Panel.





- Gather the required parts.
- Install the parts into the Rear Panel.
- Fit the Rear Panel with the openings to the right side.

Step 62




- Offer up the outer back panel to the back of the frame.
- Fasten the panel to the frame.