

SK-Go / SK-Mini

Assembly Manual

SecKit, All-Metal CoreXY 3DP Kit

SK-Go, SK-Mini

Web <https://seckit3dp.design>

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Something You
Need to Know
Before Getting
Too Excited...

Something You Need to Know

Please note that SecKit tries to be helpful and provides as clear instructions as we can, but we will not be responsible for any of your loss caused during your assembly process.

Linear Blocks



Every linear block comes with a **plastic rail**.

ALWAYS keep a rail under the block.

NEVER leave the block along.

Those tiny steel balls will fall out and you will cry.

How to move linear blocks onto linear rails?



Connect plastic rail and linear rail



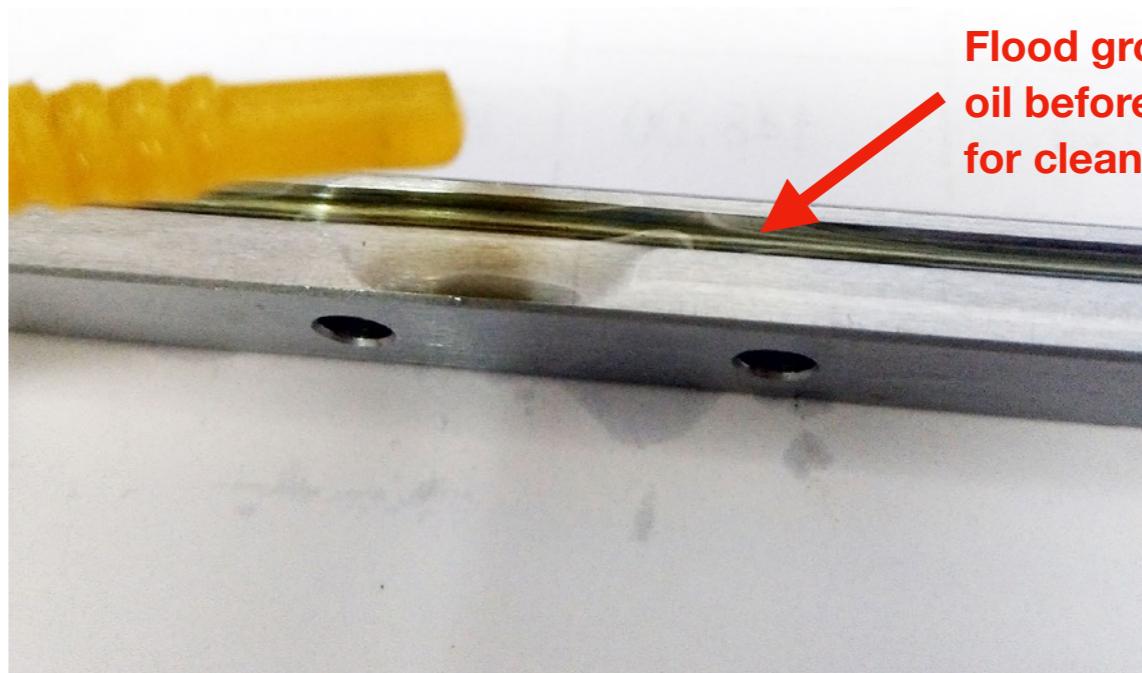
Carefully move linear block across the rails



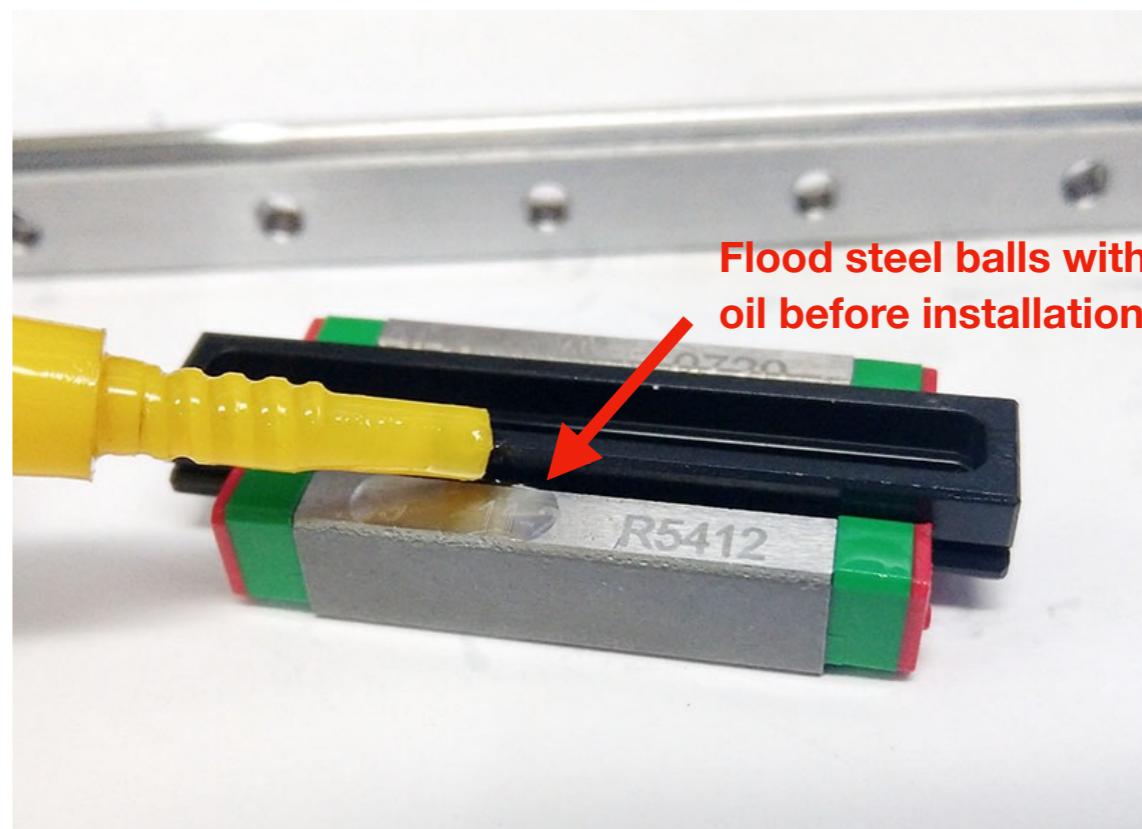
Remove plastic rail

Clean & lubricate linear rails and lead screws

- Cleaning
 - Light oil or WD-40
- Lubricating
 - Automobile use lubricants
 - Lubricants for metal-to-metal contact
- Tissue or cotton swabs
- Do not use
 - Silicone based lubricants
 - PTFE dry lube



Flood grooves with light oil before installation for cleaning reason.



Flood steel balls with light oil before installation too.

Action

See next page for steps.

According to HIWIN spec linear blocks and rails must be lubricated before installation. After manufacturing some invisible particles, dirt or larger debris will be left inside the block or on the surface of grooves, so **before installation cleaning with light oil is a must.**

For **maintenance**, in the spec **lithium soap based grease** is used, but **light liquid-type oil** could be better because for hobby usage the linear blocks don't run everyday and grease-type lubricant might dry out after months. So choose lubricant according to your scenario.

Some tips for installation:

1. Flood the grooves of the rail as shown in the pic in previous page and then gently wipe them with tissues.
2. Flood steel balls from underside of the block, make them wet.
3. Move the block very slowly and carefully from the dummy rail to linear rail.
4. Slowly move the linear block, let oil push the dirt inside the block out.

Some possible reasons that cause linear block failure:

- During installation the plastic dummy rail and linear rail are not parallel, so the first few steel balls or a certain contact surface are damaged by the cutting edge of grooves.
- If improper lubricant are used or not lubricated before installation, it will accelerates wearing of steel balls, especially preload grade Z0 (no clearance between steel balls and linear rail and with light preload) was chosen to improve print quality.

Make sure you build it right in each step

Errors will accumulate along with each step in your assembly progress. To get a solid machine you must build it correctly.

Each page in this manual is written in a similar structure. You can ignore if you already know how to do, but you must read the “Exam” step to ensure you do it correctly.

Parts to be prepared



Actions



Exam

MUST double check!

Assemble on a flat & solid surface

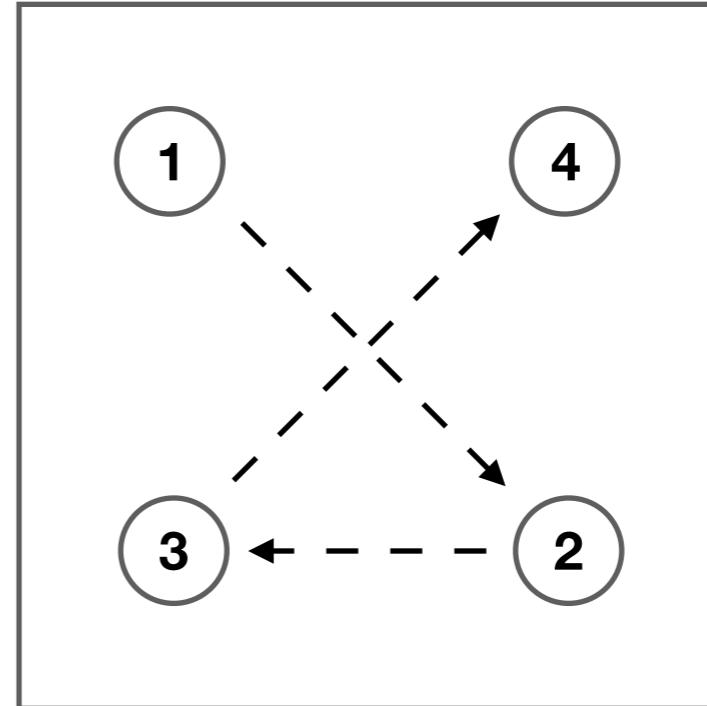
- (O) Stiff and heavy table, large tile, granite table, etc.
- (X) Carpet, thin and unstable desk, etc.

Tighten bolts diagonally

If there are multiple bolts, tighten them in a diagonal sequence.

Also tighten screws with proper force to prevent from damaging threads.

For the torque used on linear rails and blocks, please refer to HIWIN spec for detailed information.



HIWIN Linear Guideway Technical

Information

[https://www.hiwin.tw/download/
tech_doc/gw/Linear_Guideway-\(E\).pdf](https://www.hiwin.tw/download/tech_doc/gw/Linear_Guideway-(E).pdf)

○ Tightening torque of bolts for installation

Improper tightening of rail mounting bolts will seriously affect the accuracy of the linear guideway. The following table lists the recommended tightening torque for the specific bolt sizes.

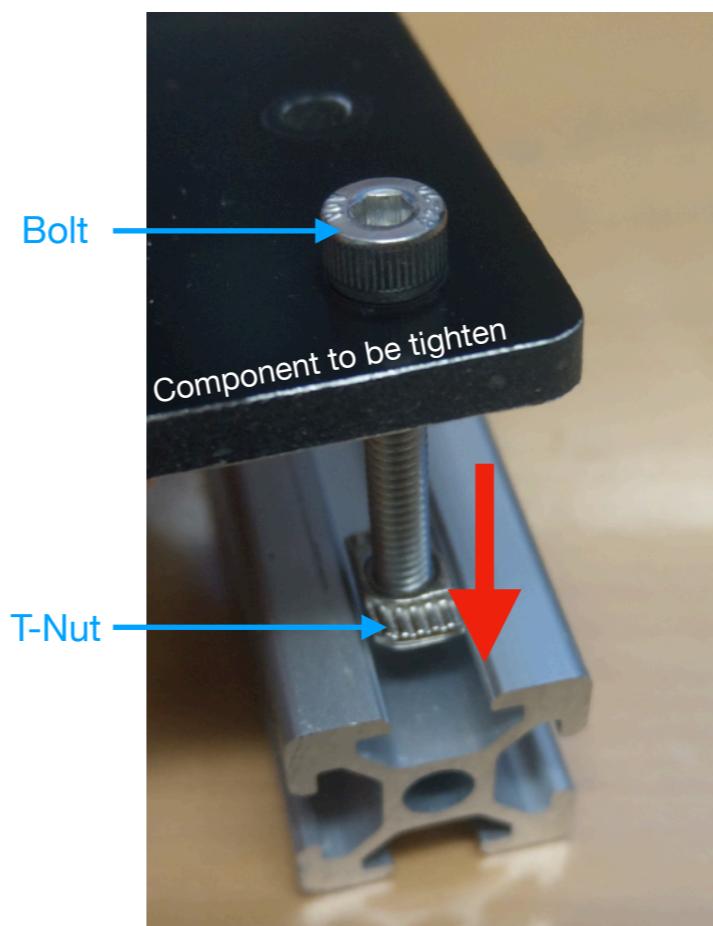
Table 2-4-12 Tightening Torque

Size	Bolt size	Torque, N-cm (kgf-cm)		
		Iron	Casting	Aluminum
MGN5	M2×0.4P×6L	57(5.9)	39.2(4)	29.4(3)
MGN7	M2×0.4P×6L	57(5.9)	39.2(4)	29.4(3)
MGN9	M3×0.5P×8L	186(19)	127(13)	98(10)
MGN12	M3×0.5P×8L	186(19)	127(13)	98(10)

Adopted from p.83 in HIWIN spec.

How to tighten components with T-nut

To lock a component onto aluminum extrusion, make sure a T-nut is inserted in to the groove of the extrusion and turned 90 degree, and then tighten the bolt.



Insert T-nut into
aluminum extrusion



P.S. the bolt here is too long and is just for easier inspection.

Always Turn ON with steppers CONNECTED!

The stepping motor driver board needs an electronic load to function normally.

It's highly possible to damage the drivers if steppers do not exist or are not connected well.

Don't drink and drive

Feedbacks show some took 10 working hours and other spent 3 working days to complete their machine.

If you feel hungry, go eat.

If you feel sleepy, go sleep.

If wife is calling you, go help.

Keep a clear head you'll get a sturdy and stable machine.

Still Not Understand?

If you still have problems or find any issue, drop us a message here:

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Email seckit.3dp@gmail.com

Enjoy!

During assembly you'll feel the rigidity
and be confident of this machine.

1

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2

Tools

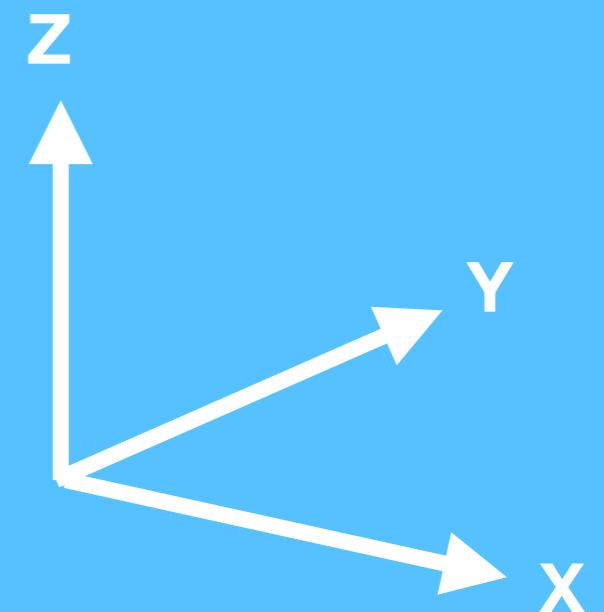
Prepare Your Tools

- Wrench #6, #7 (need two), #8, #16.
- Allen wrench #1.5, #2, #2.5, #3, #4, #5
- Phillips and flat head screw driver
- Small needle nose plier
- Ruler

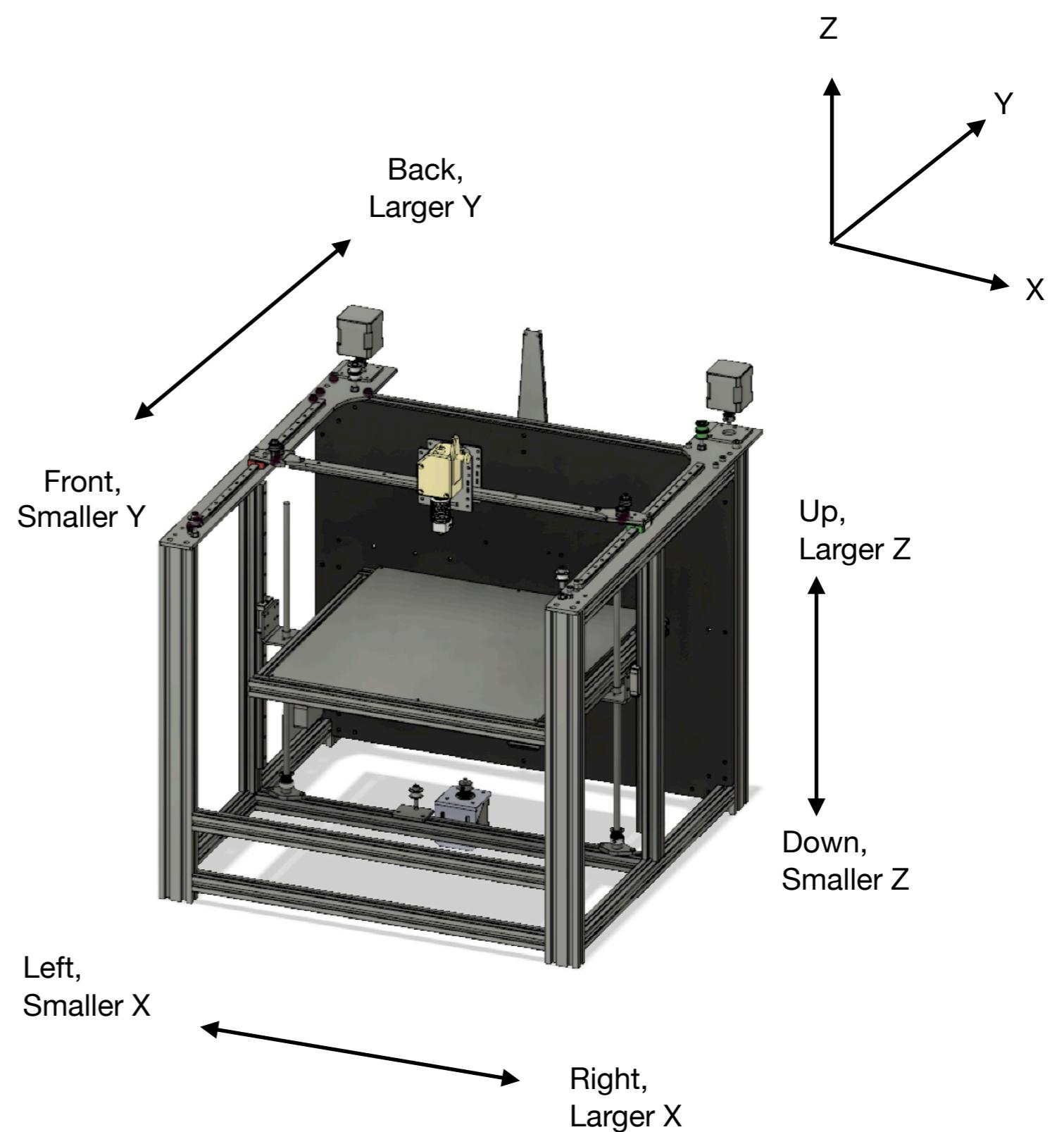
- Lubricating oil or grease
- Tissue or cotton swab

3

Direction Definition



Direction Definition

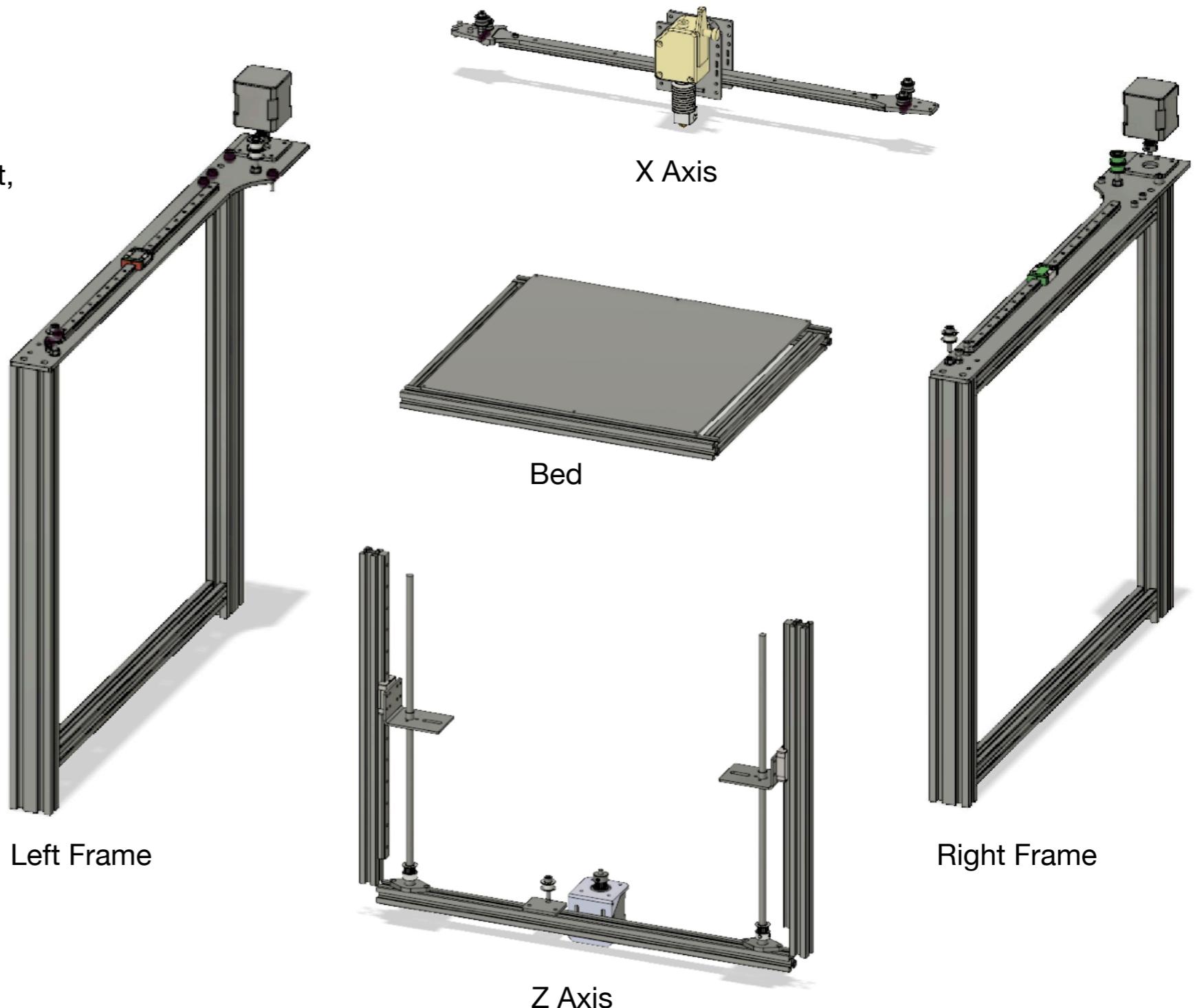


4

Structure Overview

Major Parts

You will assemble each major part first, and then combine them together.



5

Frame



Pre-assemble ACM Brackets

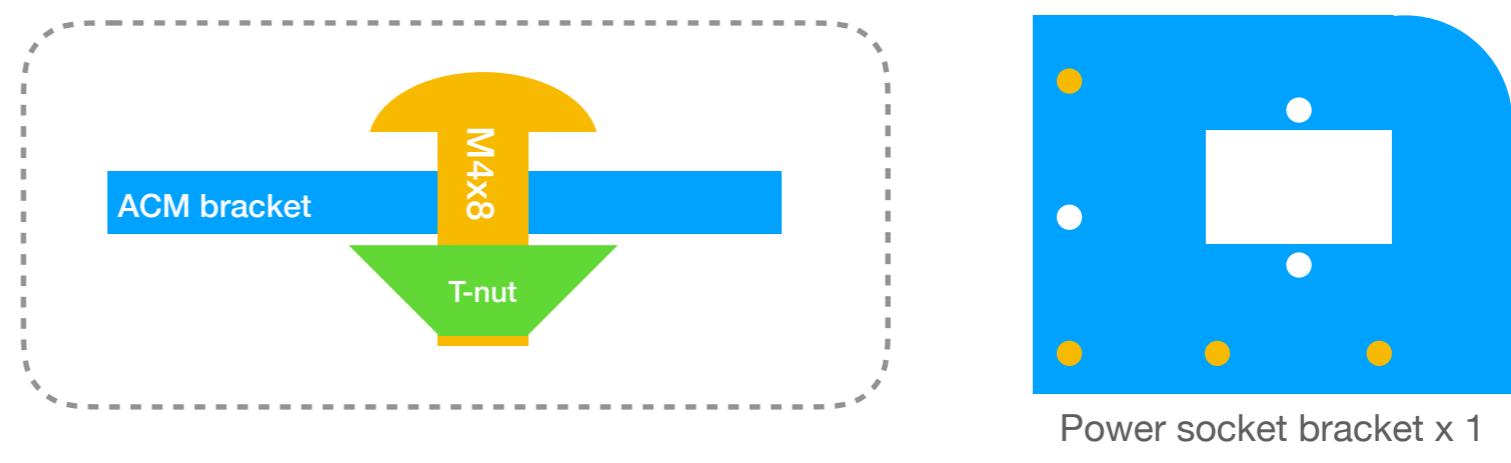
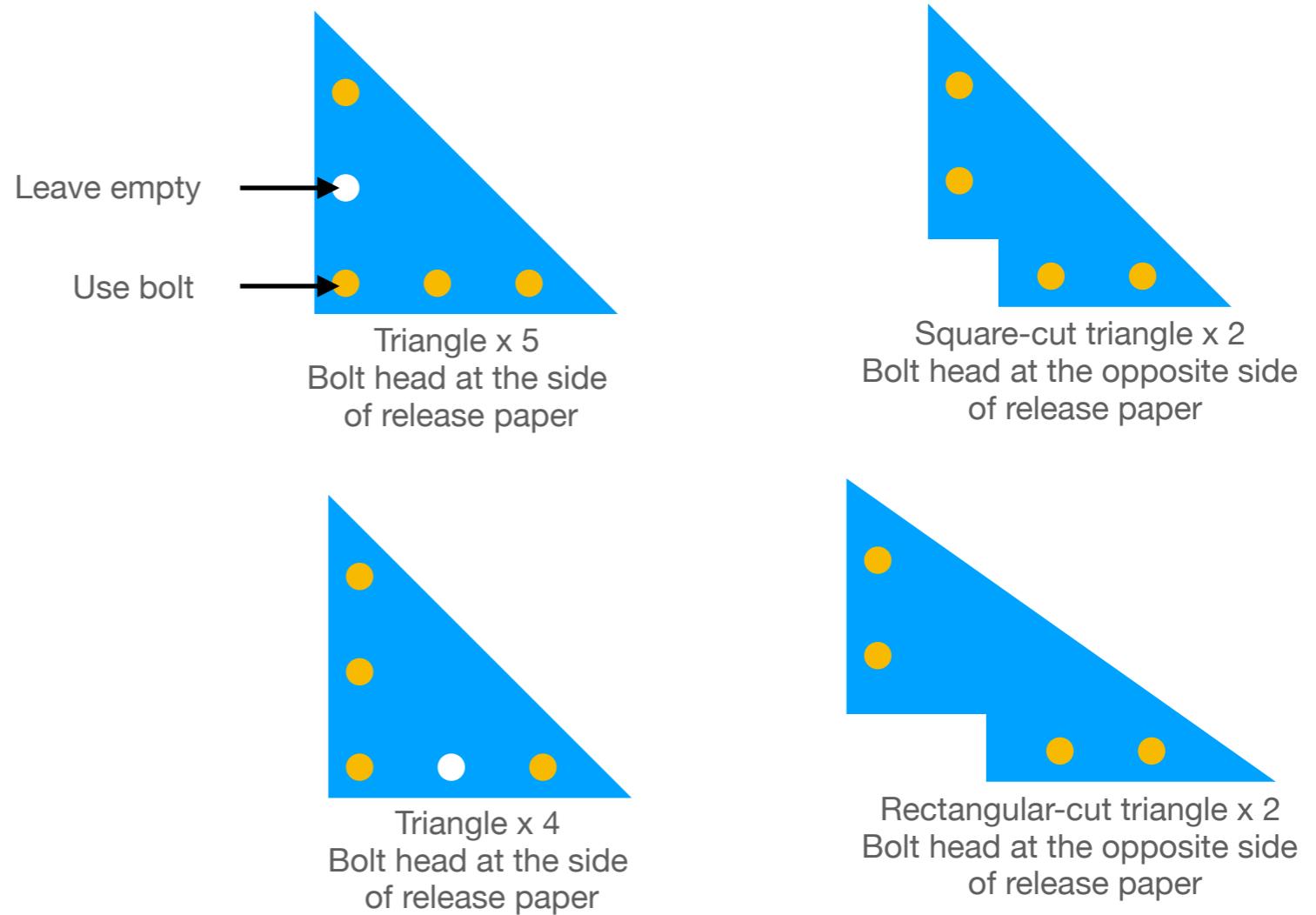
- ACM (Aluminum Composite Material) board
 - Triangle x 9
 - Square-cut triangle x 2
 - Rectangular-cut triangle x 2
 - Power socket bracket x 1
- Parts per set
 - 1 ACM bracket
 - 4 round-head bolt M4 x 8
 - 4 T-nut M4

Action

ACM board comes in a sandwich structure: 2 thin aluminum layers and 1 thick plastic in-between. Only 1 side of ACM is film protected.

Peel the protecting film off on the ACM board before use.

Assemble 14 brackets. Put T-nuts on but don't tighten them for later use.



Pre-assemble 2020 Brackets

- Parts per set
 - 1 2020 bracket
 - 2 round-head bolts M4 x 8
 - 2 T-nuts M4
 - 2 washers M4 x 12 x 1

Action

Make 12 sets of bracket. Put T-nuts on but don't tighten them for later use.



Assemble Right Frame

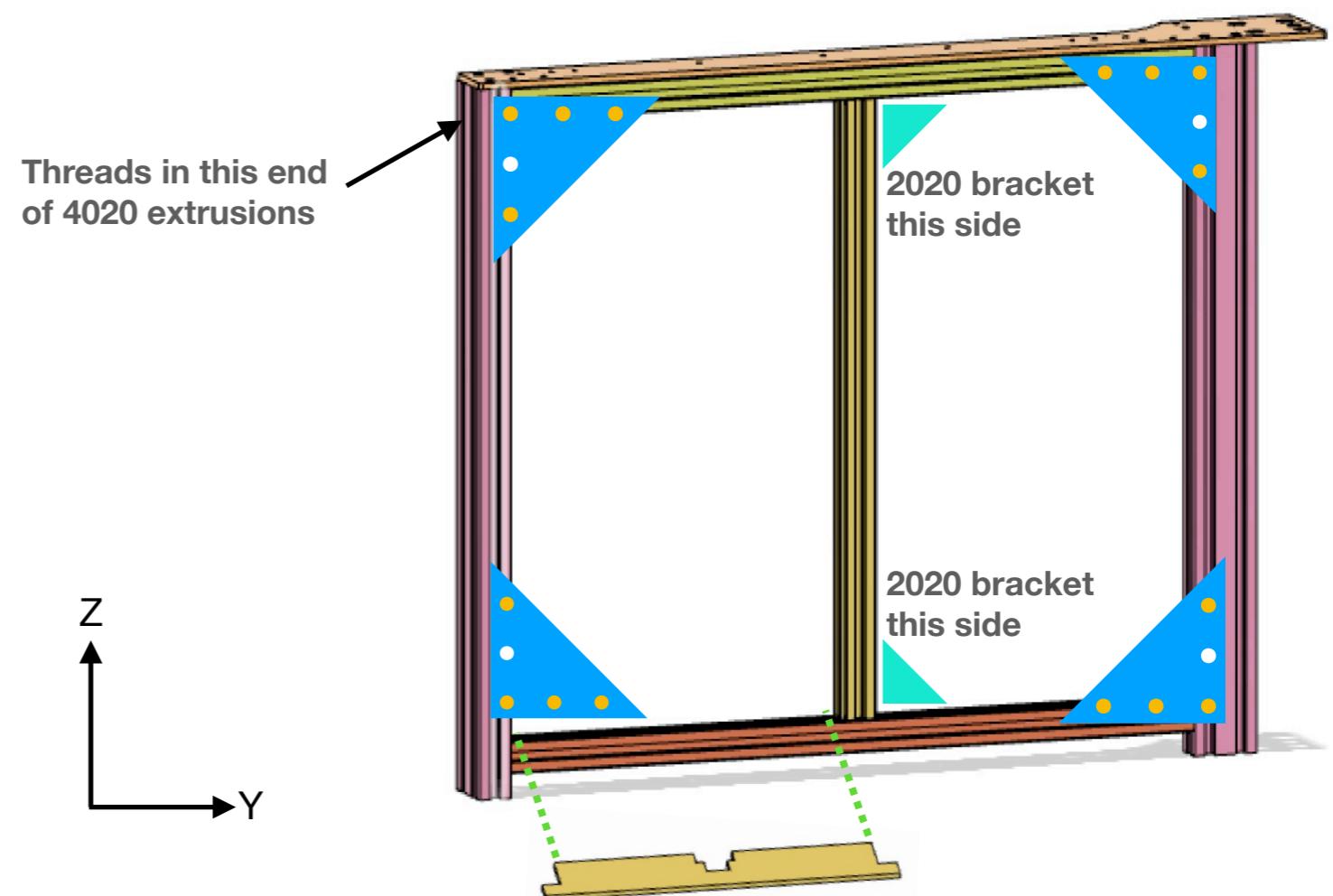
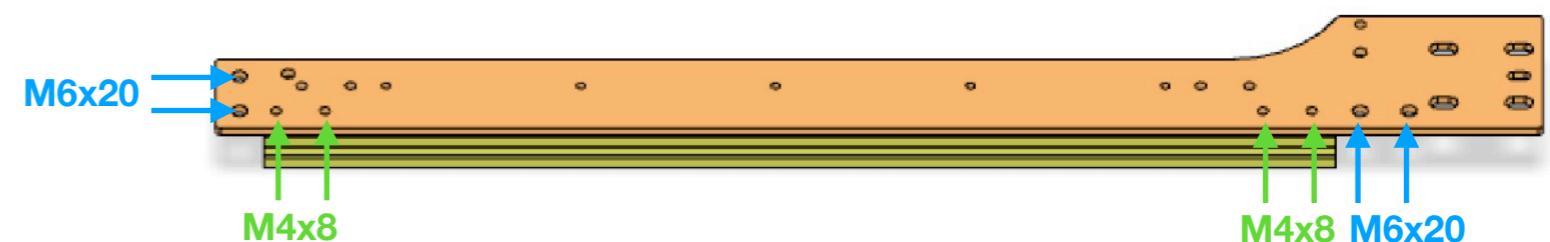
- 1 Aluminum Y plate
- 2 4020 aluminum extrusions (Z leg)
- 1 aluminum extrusion (Z)
 - SK-Go z350: 430mm
 - SK-Go z300: 380mm
 - SK-Mini: 330mm
- 2 aluminum extrusions (Y)
 - SK-Go: 440mm
 - SK-Mini: 330mm
- 4 ACM triangle brackets
- 2 pre-assembled 2020 brackets
- 4 bolt M6 x 20
- 4 round head bolt M4 x 8
- 4 T-nut M4
- Printed Assembly Guide

Action

Use assembly guide to find the gap between middle Z extrusion and front Z leg.

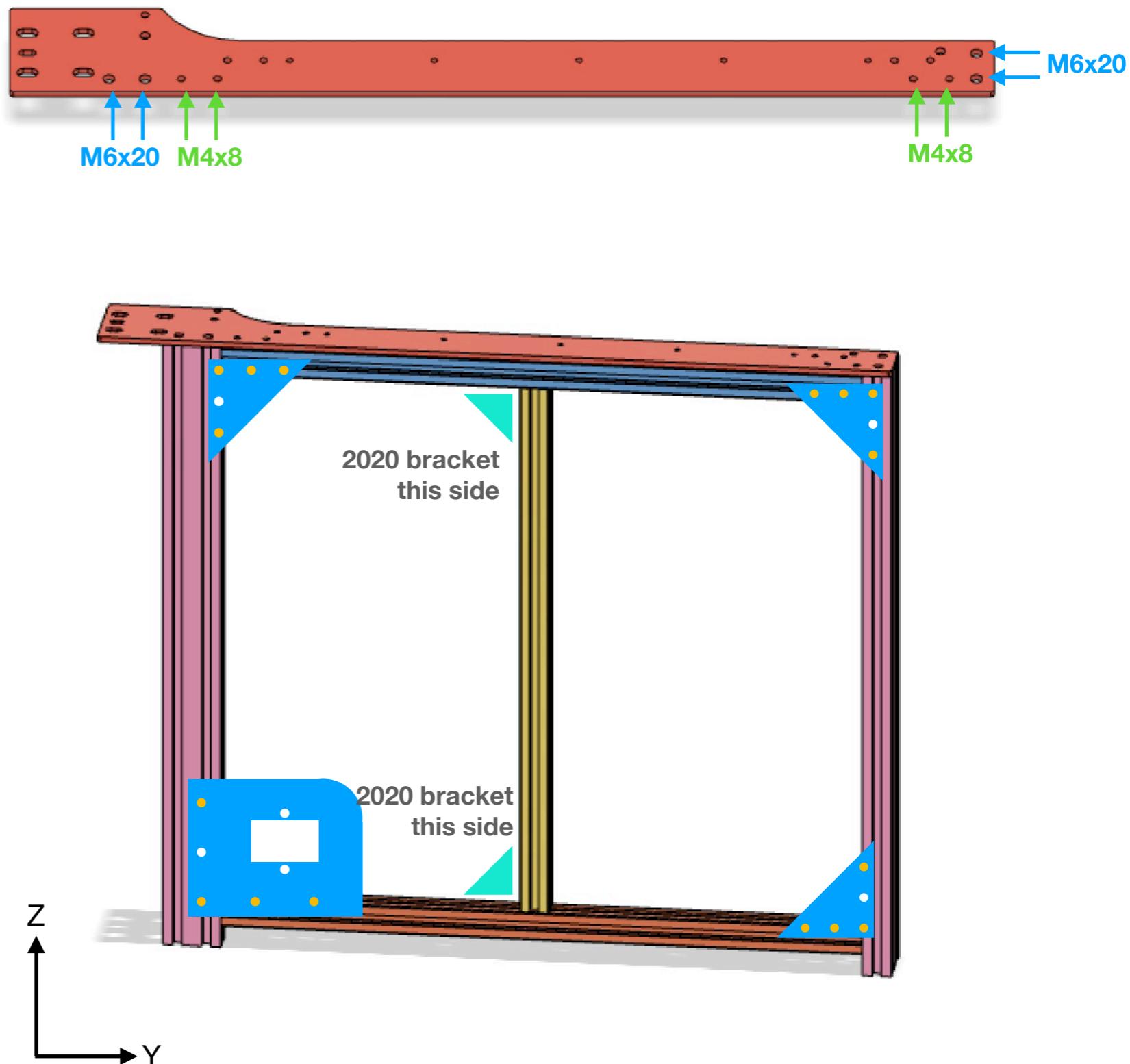
Exam

Make sure each aluminum extrusion has 2 bolts locked.



Assemble Left Frame

- 1 Aluminum Y plate
- 2 4020 aluminum extrusions (Z legs)
- 1 aluminum extrusion (Z)
 - SK-Go z350: 430mm
 - SK-Go z300: 380mm
 - SK-Mini: 330mm
- 2 aluminum extrusions (Y)
 - SK-Go: 440mm
 - SK-Mini: 330mm
- 3 ACM triangle brackets
- 1 power socket bracket
- 2 pre-assembled 2020 brackets
- 4 bolt M6 x 20
- 4 round head bolt M4 x 8
- 4 T-nut M4
- Printed Assembly Guide



Exam

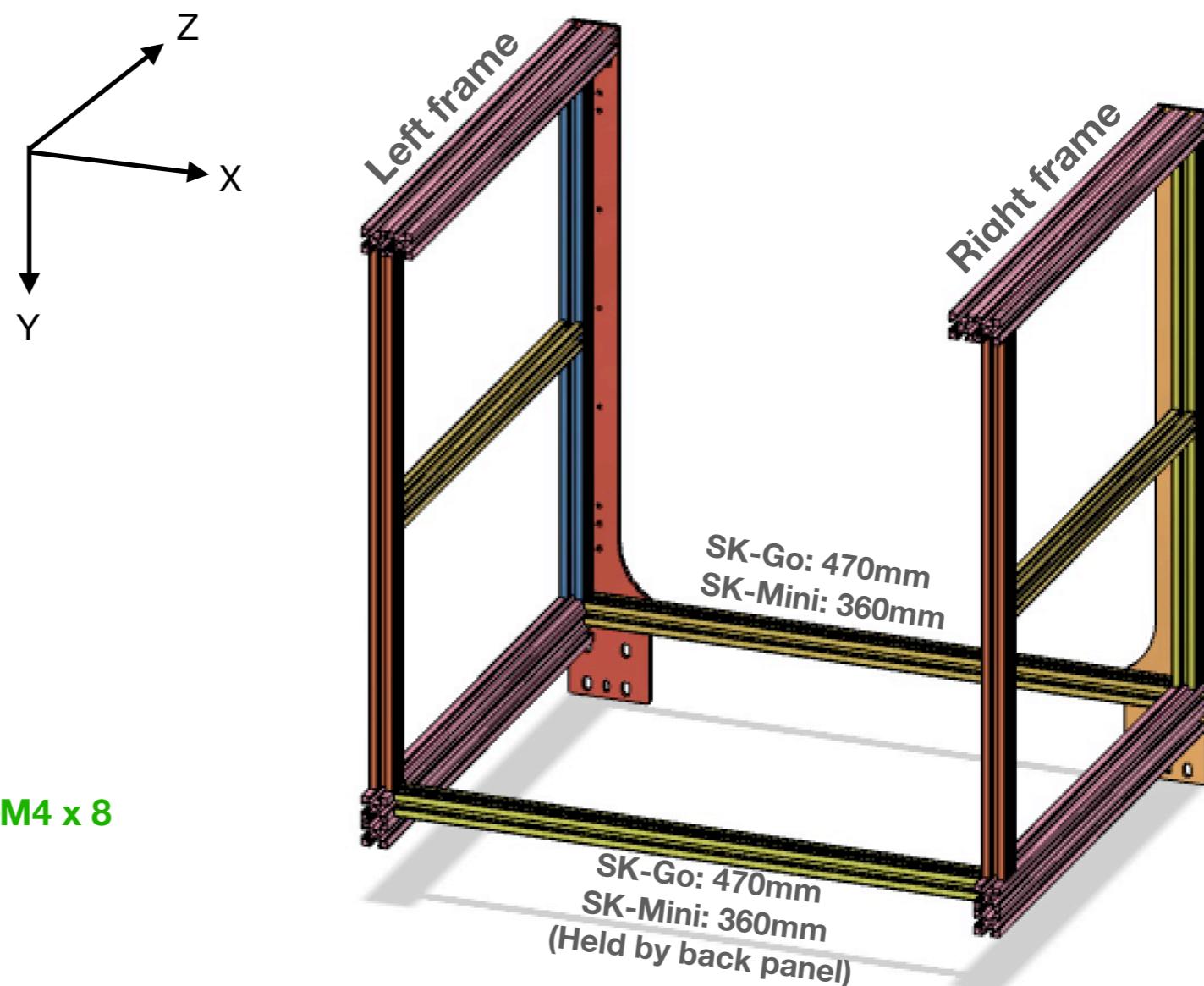
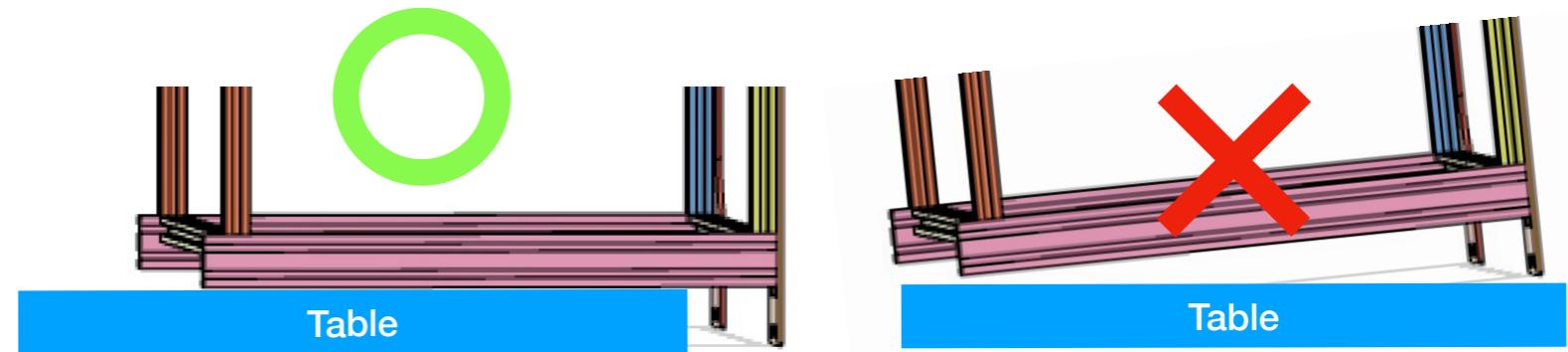
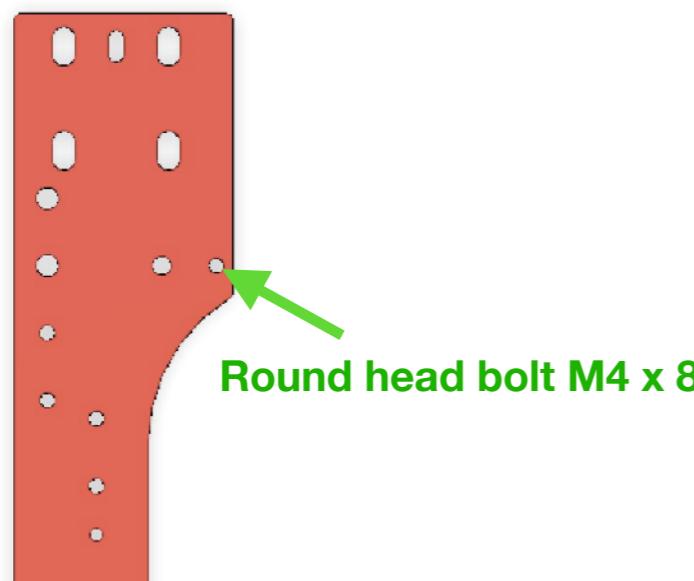
Make sure each aluminum extrusion has 2 bolts locked.

Assemble Back Panel

- 2 aluminum extrusions (rear X)
 - SK-Go: 470mm
 - SK-Mini: 360mm
- 1 ACM back panel
- 18 round head bolt M4 x 8
- 18 T-nut M4

Action

Place another temporary extrusion under rear X extrusion help maintain their position when assembly.



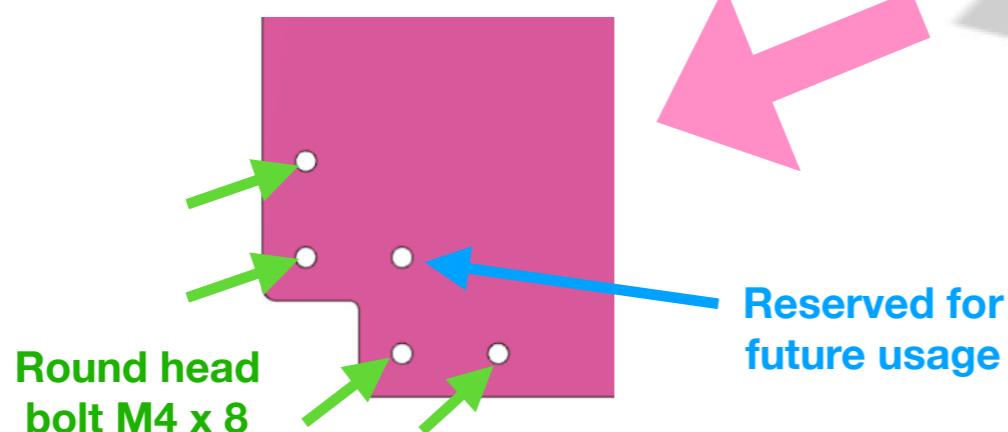
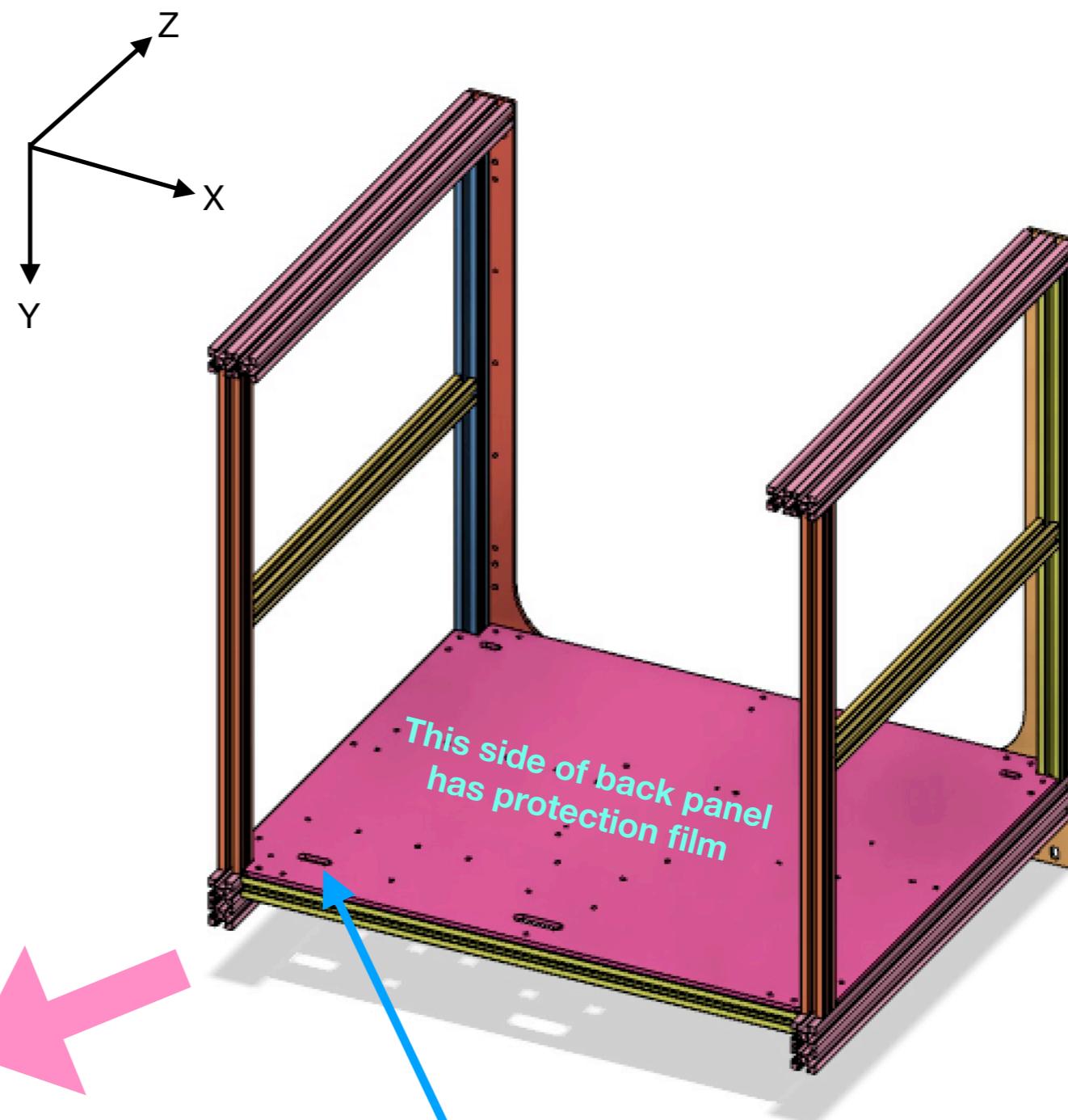
Assemble Back Panel

Action

Check the direction and place the panel on as shown in the picture. Lock the panel.

Exam

Make sure T-nuts have been rotated 90-degree. You can slightly push the back panel to know if it's locked properly.



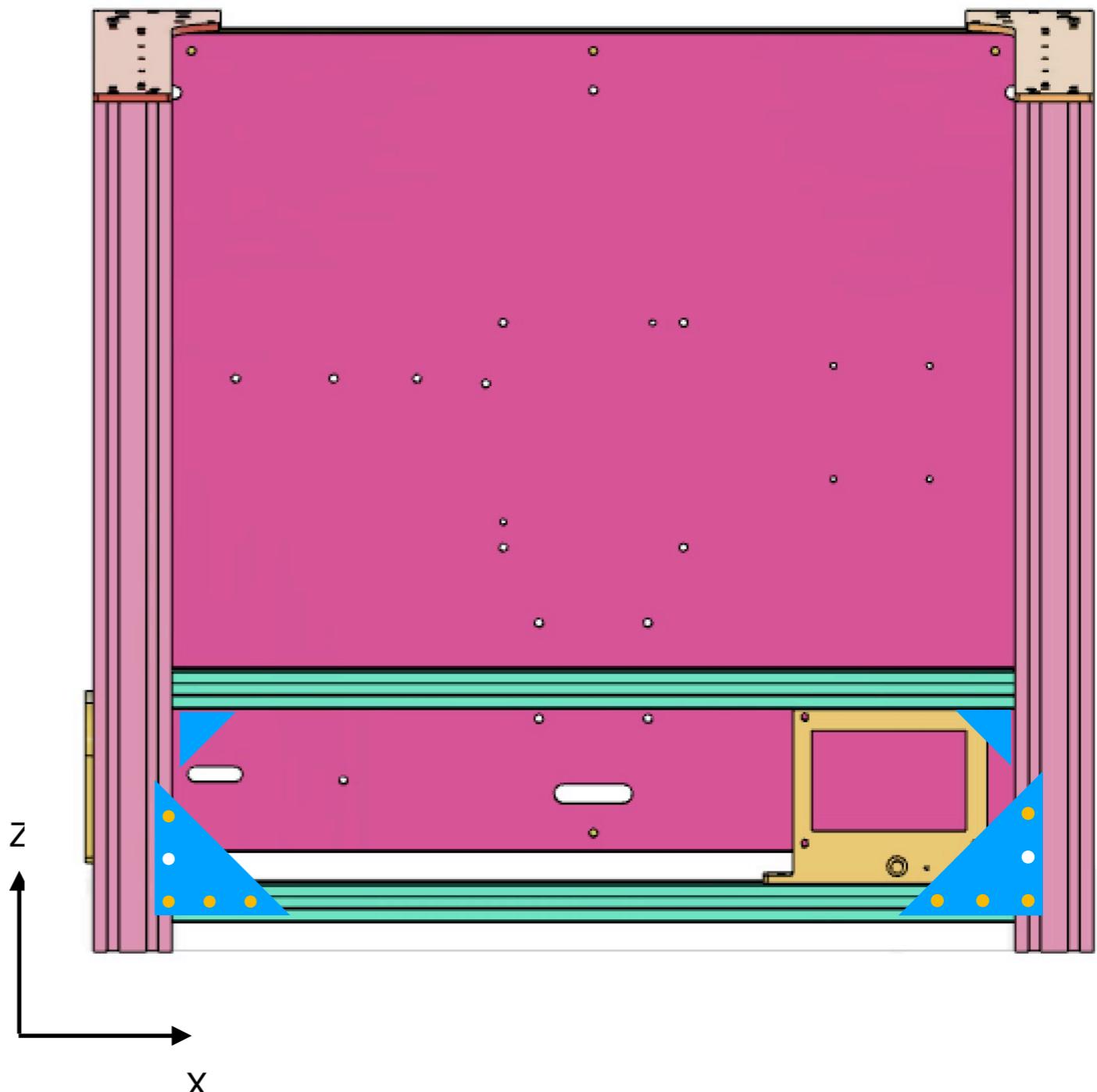
Assemble Front Frame

- Display
 - 12864 display panel
 - Printed display cover
 - Printed reset button
 - 4 bolts M3 x 20
 - 4 nuts M3
 - 2 round head bolts M4 x 8
 - 2 T-nuts M4
- Front Frame
 - 2 aluminum extrusions (front X)
 - SK-Go: 430mm
 - SK-Mini: 320mm
 - 2 ACM triangle brackets
 - 2 2020 brackets
- Printed Assembly Guide

Action

Pull out the knob at the display panel and assemble panel and cover with M3 x 20 bolts. Don't lock them too tight to prevent PCB from being bended.

Assemble front frame and display panel as in the picture.

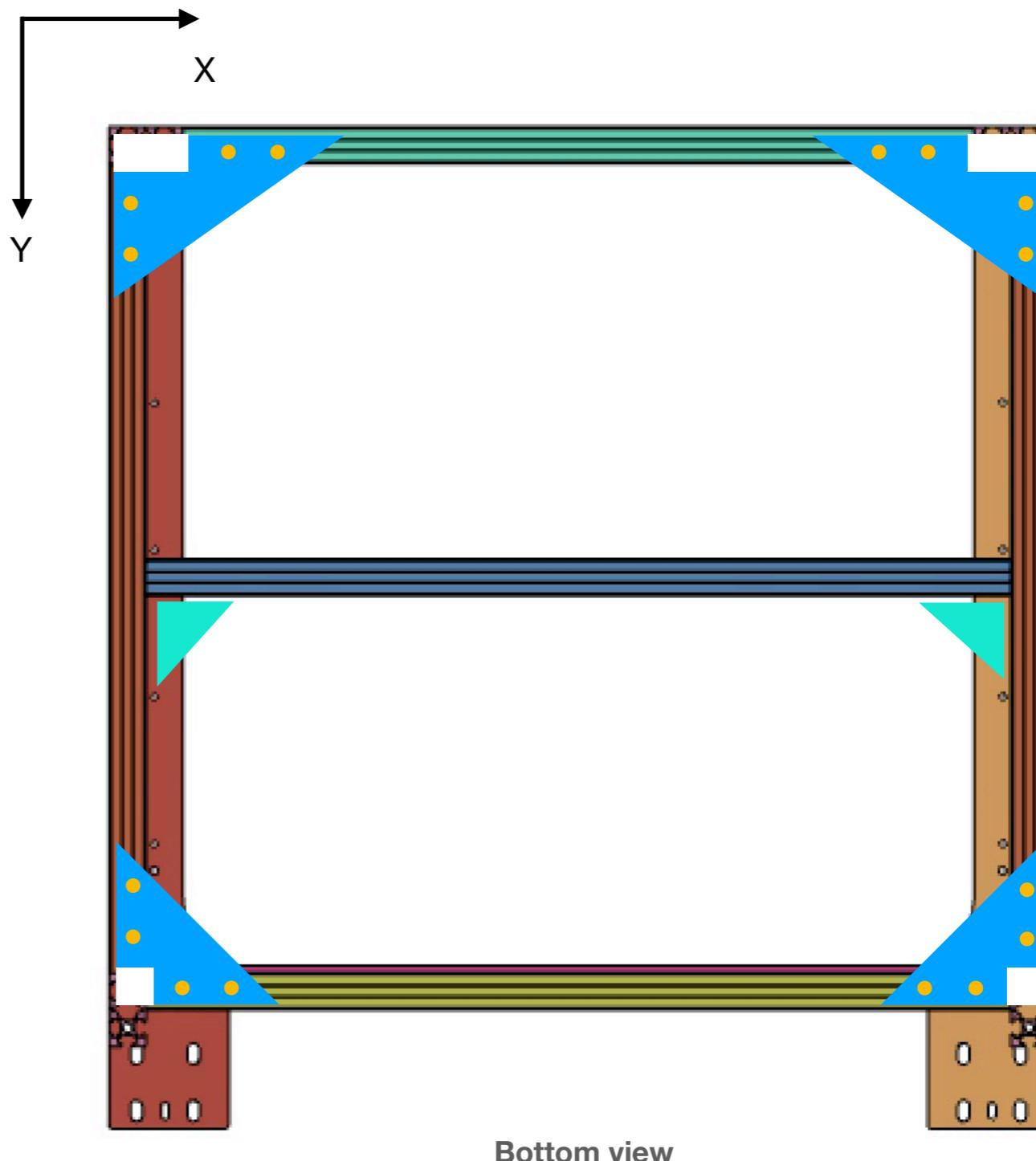


Assemble Bottom Frame

- ACM board
 - Square-cut triangle x 2
 - Rectangular-cut triangle x 2
- 1 aluminum extrusion (bottom X)
 - SK-Go: 470mm
 - SK-Mini: 360mm
- 2 pre-assembled 2020 brackets

Action

Assemble ACM triangles at bottom of the frame as supports.

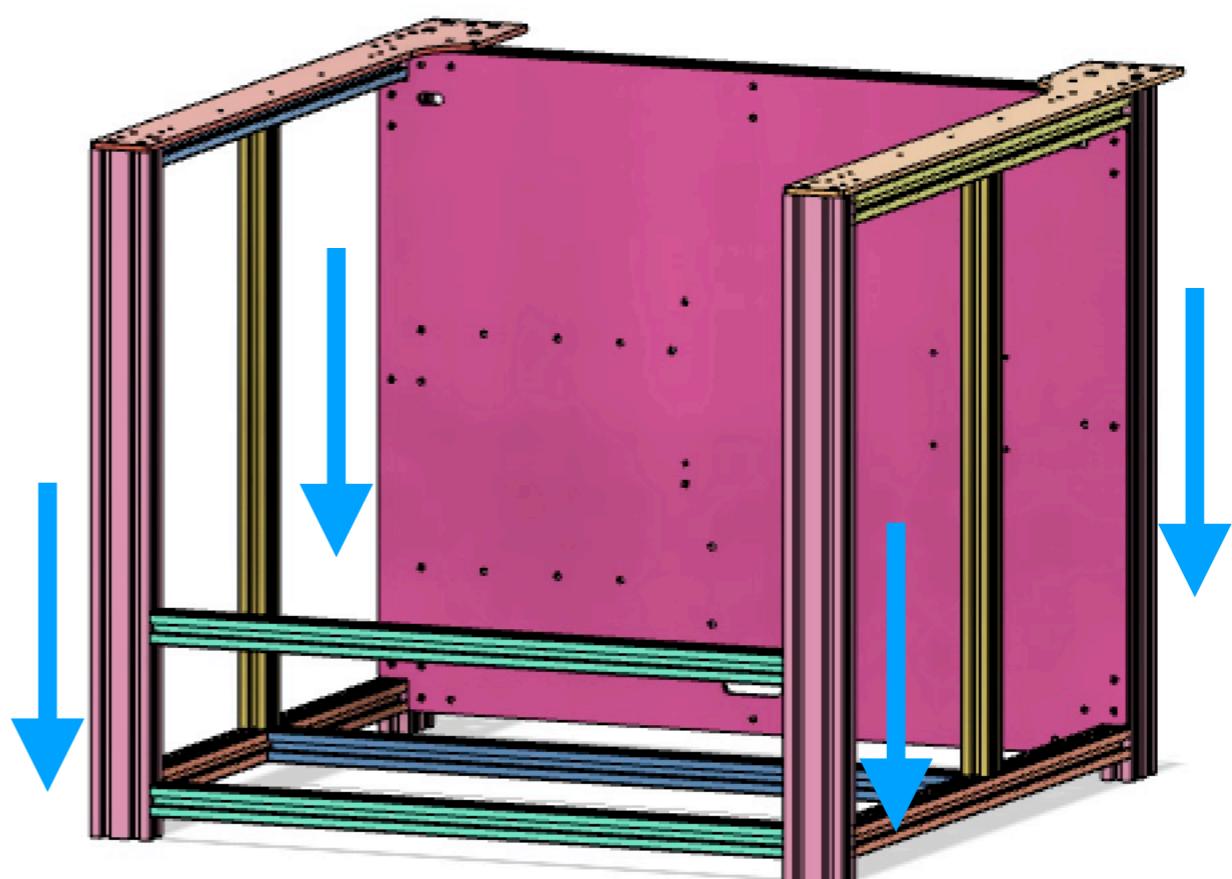


Bottom view

Adjust the whole frame if need

Action

If you find not all four legs are touching the ground, you can loosen bolts, push the frame down to a flat surface and then re-tighten bolts.

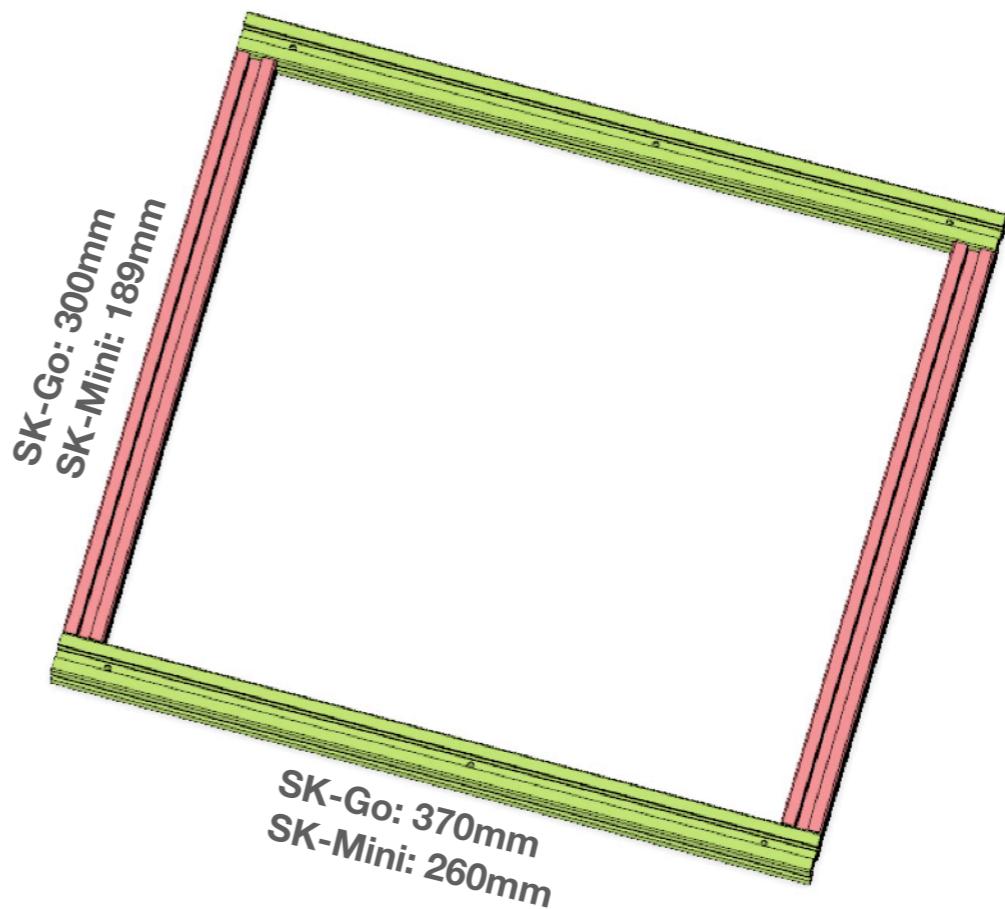


Assemble Bed Frame

- 2 aluminum extrusions
 - SK-Go: 370mm
 - SK-Mini: 260mm
- 2 aluminum extrusions
 - SK-Go: 300mm
 - SK-Mini: 189mm
- 4 pre-assembled 2020 brackets

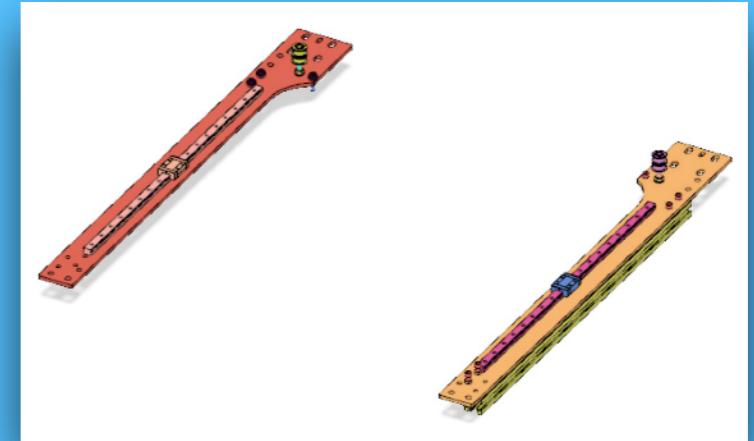
Action

Assemble bed frame with the holes facing up and lock them with 2020 brackets.



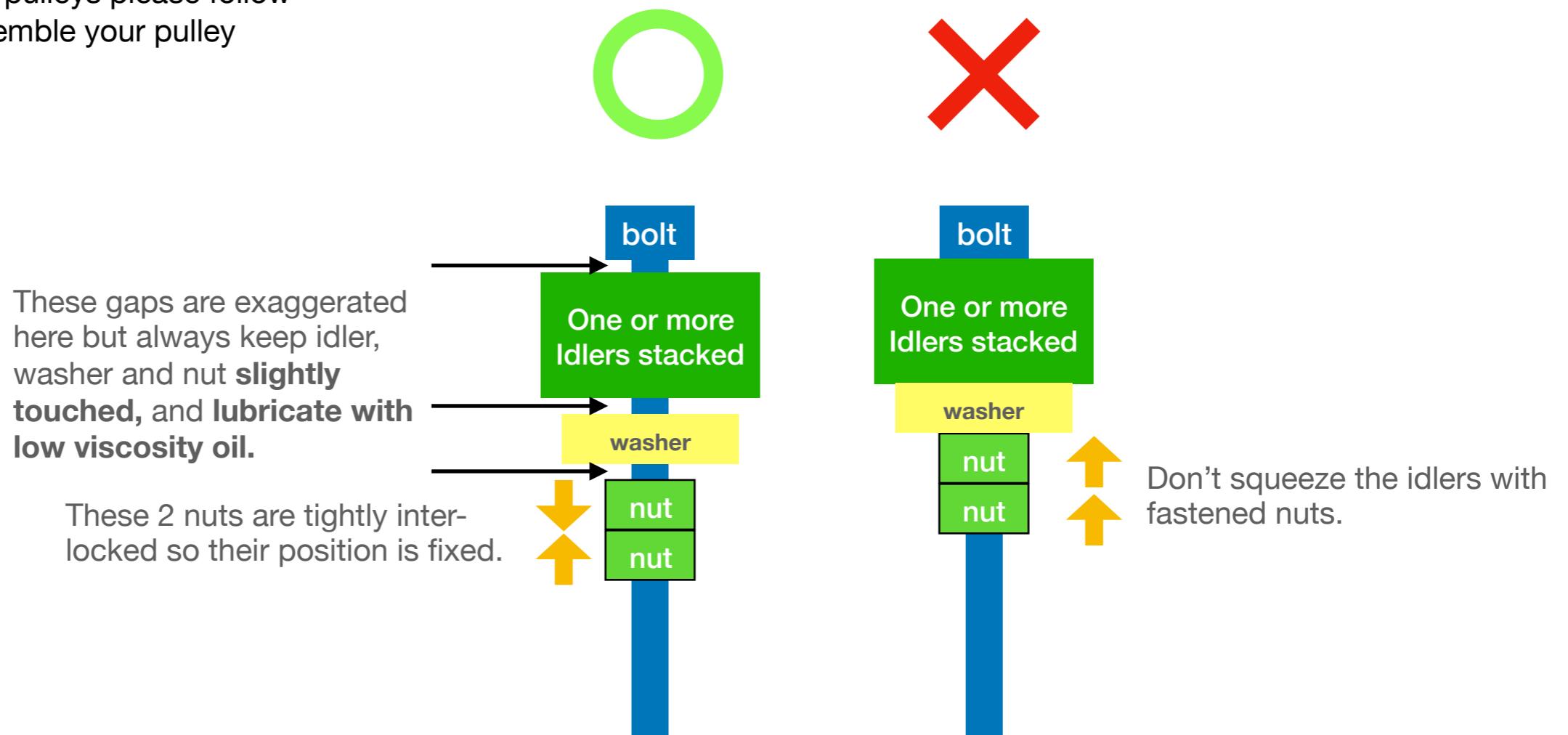
6

Y plane



About Pulley Set

Many pulley sets are used in SK-Go. To ensure longevity of pulleys please follow this method to assemble your pulley pillars.



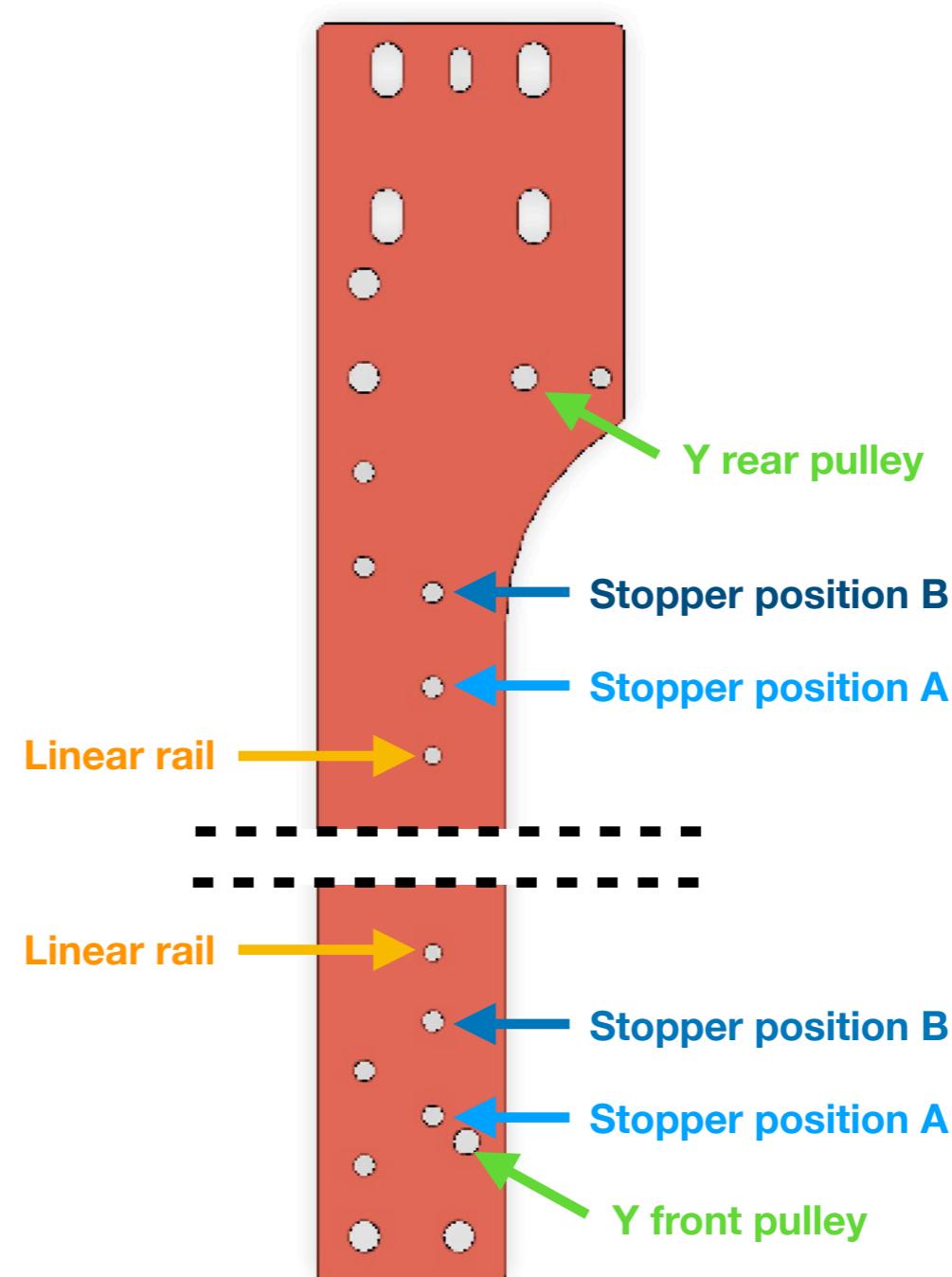
Assemble Linear Block Stoppers & Linear Rails

- Y linear block stopper set
 - 1 bolt M4 x 16
 - 2 nuts M4
- Make 2 sets of stoppers
- Y linear rail
 - SK-Go: MGN9 rail (360mm)
 - SK-Mini: MGN9 rail (250mm)
 - 2 MGN9C linear blocks (not MGN9H)
 - 5 bolts M3 x 10
 - 5 nuts M3

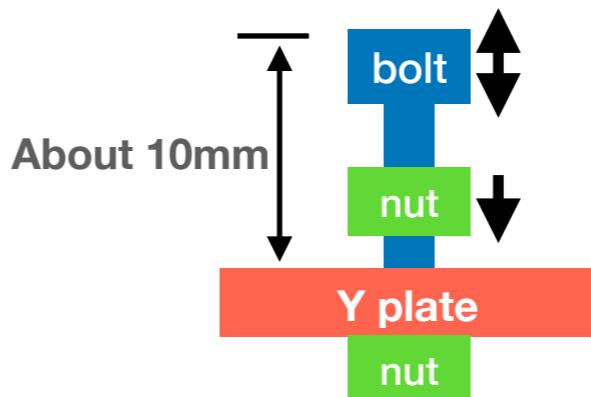
Action

Install stoppers either in position A or B.
Both will work but A reserves more space at rear side for future usage.

Install rails onto Y plates but don't tighten the nuts for later adjustment.



Assemble Y Stoppers & Linear Rails



1. Adjust bolt head position with top nut so that the bolt head can touch linear block as in the pic

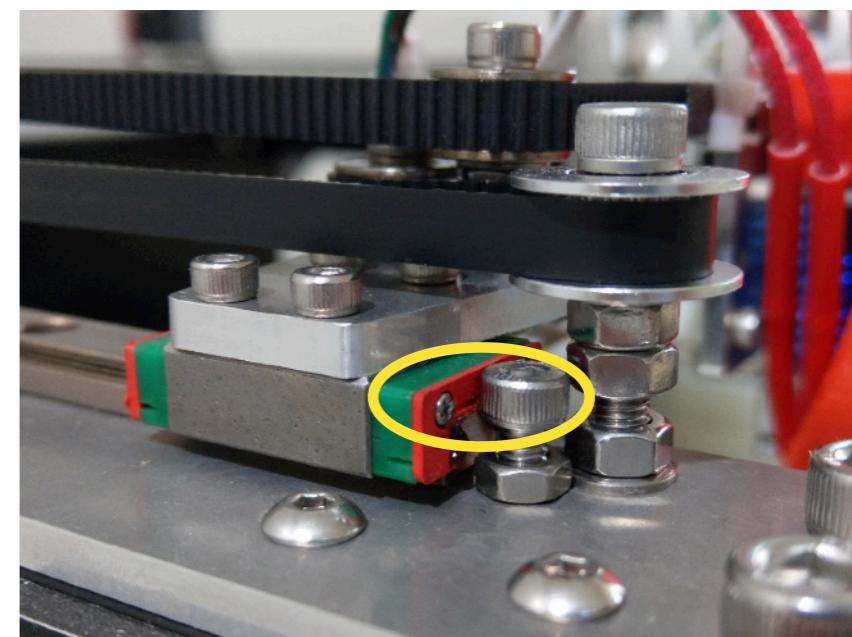
2. Tighten the top nut while maintaining the position of bottom nut and bot.

Exam

Y stoppers are to prevent linear blocks from falling out of the rails.

Assemble and **tighten** bolts and nuts of the **stoppers**

Don't tighten nuts at the **rails** yet. You'll have to adjust parallel of both Y rails.



Y Front Pulley

- Y front pulley set
 - 1 idler **with 20T gear**, 5mm bore
 - 1 bolt M5 x 45
 - 4 (or 6) nuts M5
 - 1 nylon washer M5 x 8 x 1
 - 2 washers M5 x 10 x 1.0
- Left and right front pulley are different.
Make one for each pulley set.

Action

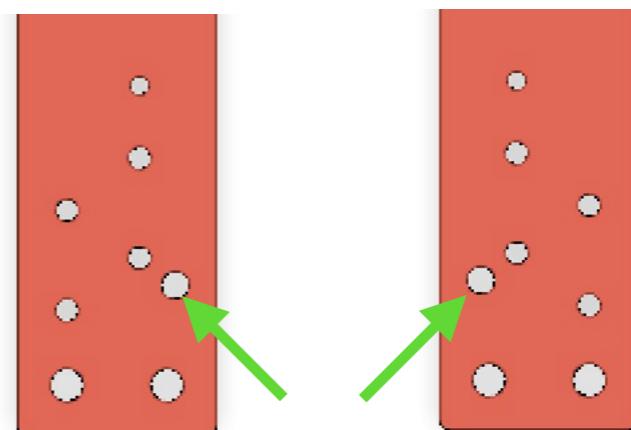
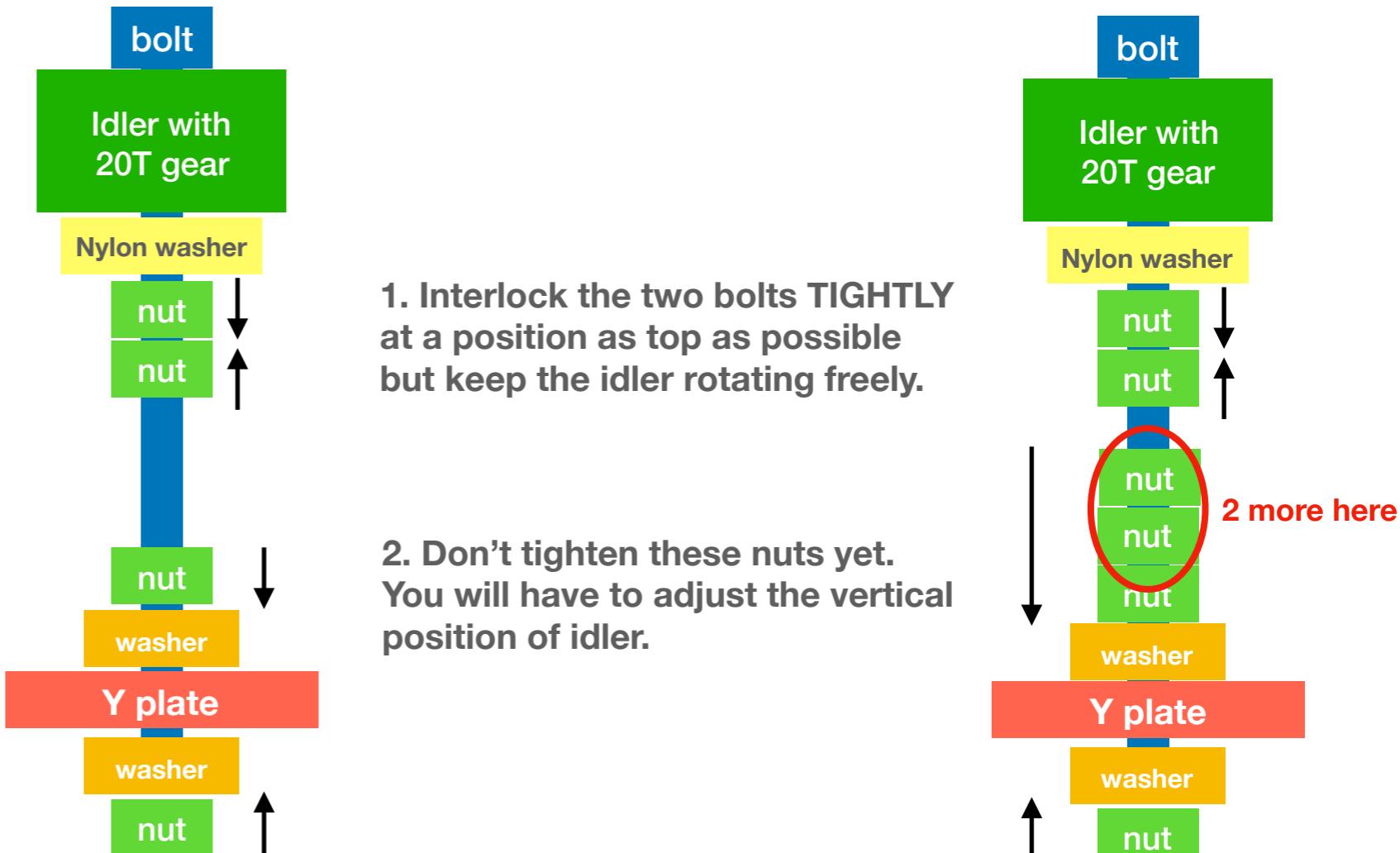
Assemble front pulley and install it at Y plate.

The right front pulley set has 2 more nuts to make the pillar stiffer.

Exam

Left and right front pulley are different.
The right one has 2 more nuts.

Don't tighten those nuts on Y plate yet.
You will have to adjust the vertical position



Y Rear Pulley

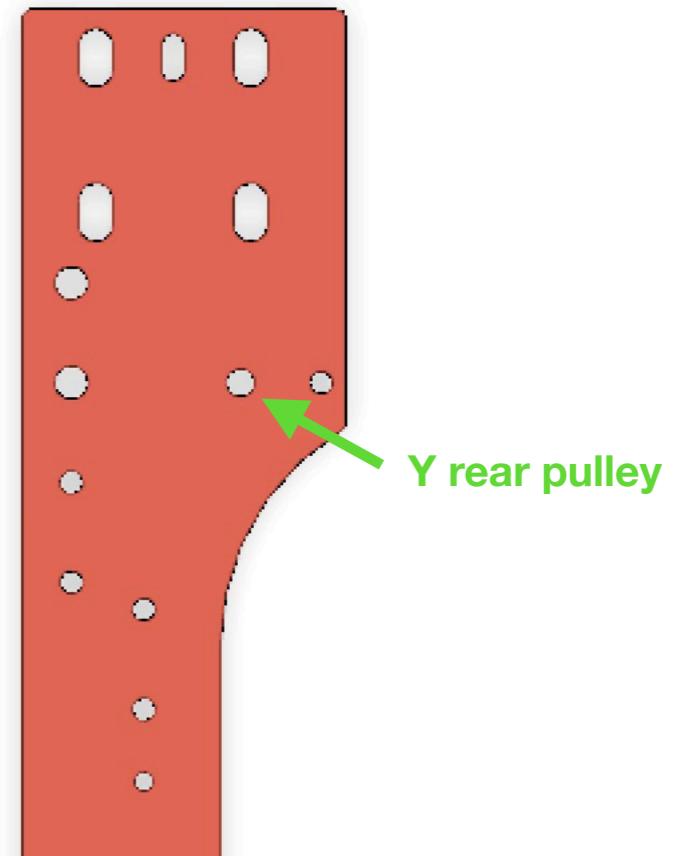
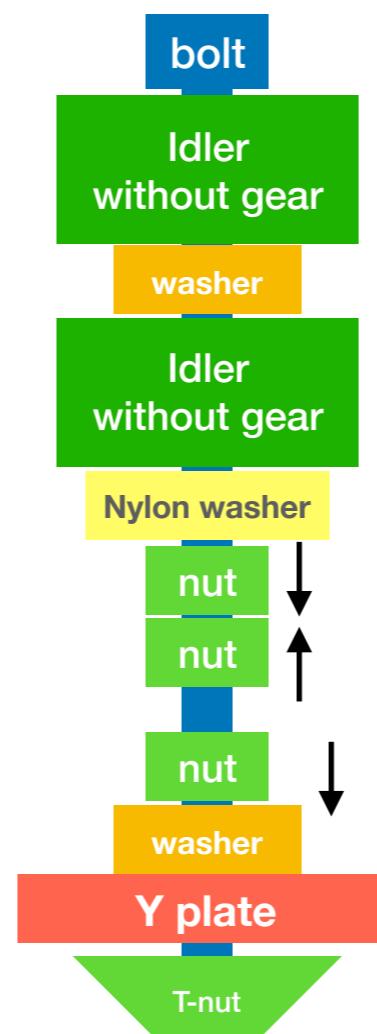
- Y front pulley set
 - 2 idlers without gear, 5mm bore
 - 1 bolt M5 x 40
 - 3 nuts M5
 - 1 T-nut M5
 - 1 nylon washer M5 x 8 x 1
 - 2 washers M5 x 10 x 1.0
- Make 2 sets

Action

Assemble rear pulley and install it at Y plate.

Exam

Don't tighten the nut on Y plate yet. You will have to adjust the vertical position of idler.



1. Interlock the two bolts at a position as top as possible but keep the idler rotating freely.
2. Don't tighten this nut yet. You will have to adjust the vertical position of idler.

XY Stepper with Belt Tensioner

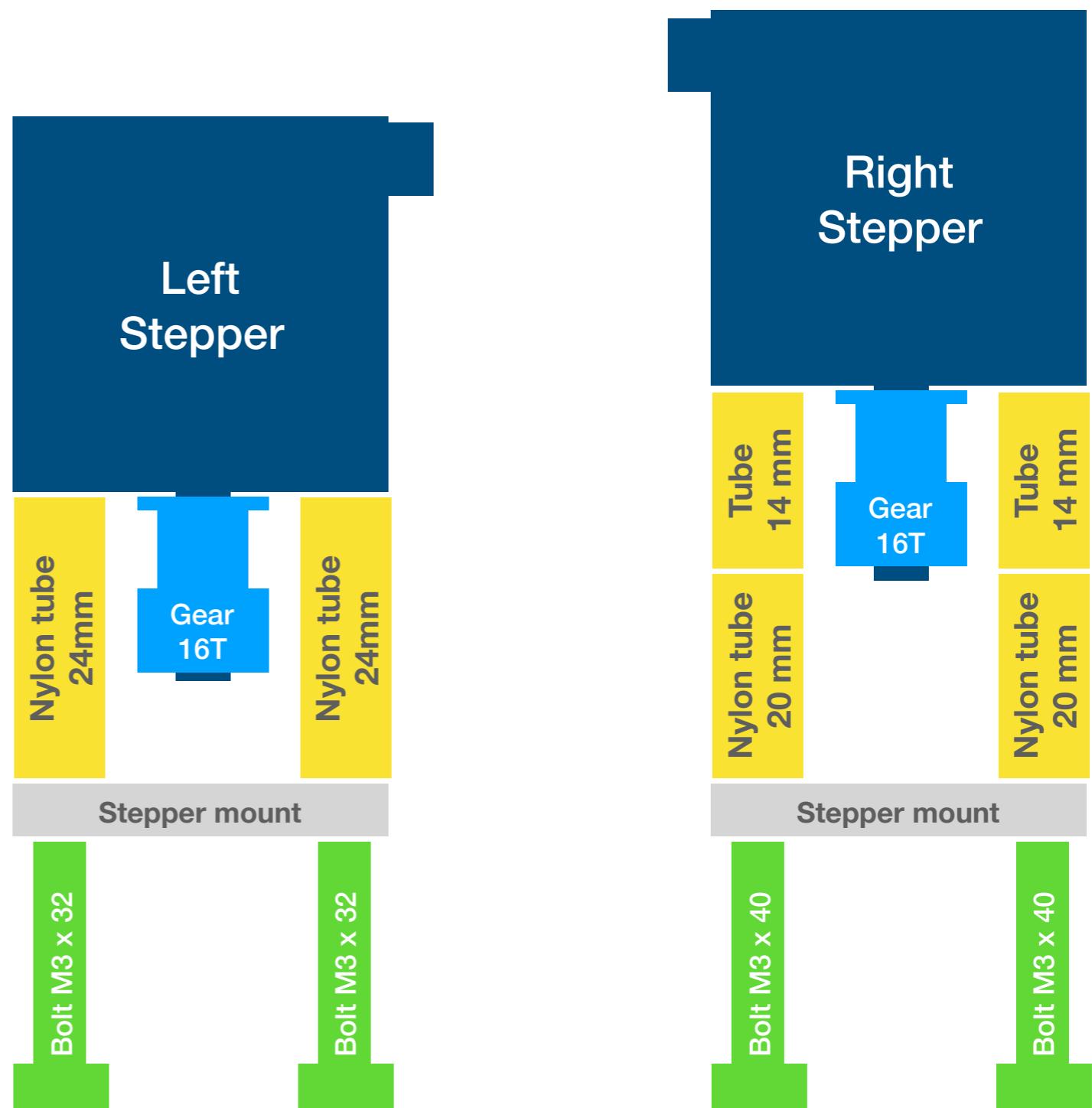
- Left stepper
 - 1 aluminum stepper mount
 - 4 nylon tube M3 x 7 x 24
 - 4 bolts M3 x 32
 - 1 16T gear, 5mm bore
- Right stepper
 - 1 aluminum stepper mount
 - 4 nylon tube M3 x 7 x 14
 - 4 nylon tube M3 x 7 x 20
 - 4 bolts M3 x 40
 - 1 16T gear, 5mm bore

Action

Assemble left and right steppers as shown.

Adjust gear positions later in **chapter 10**.

Core XY belts. Just leave them attached here.

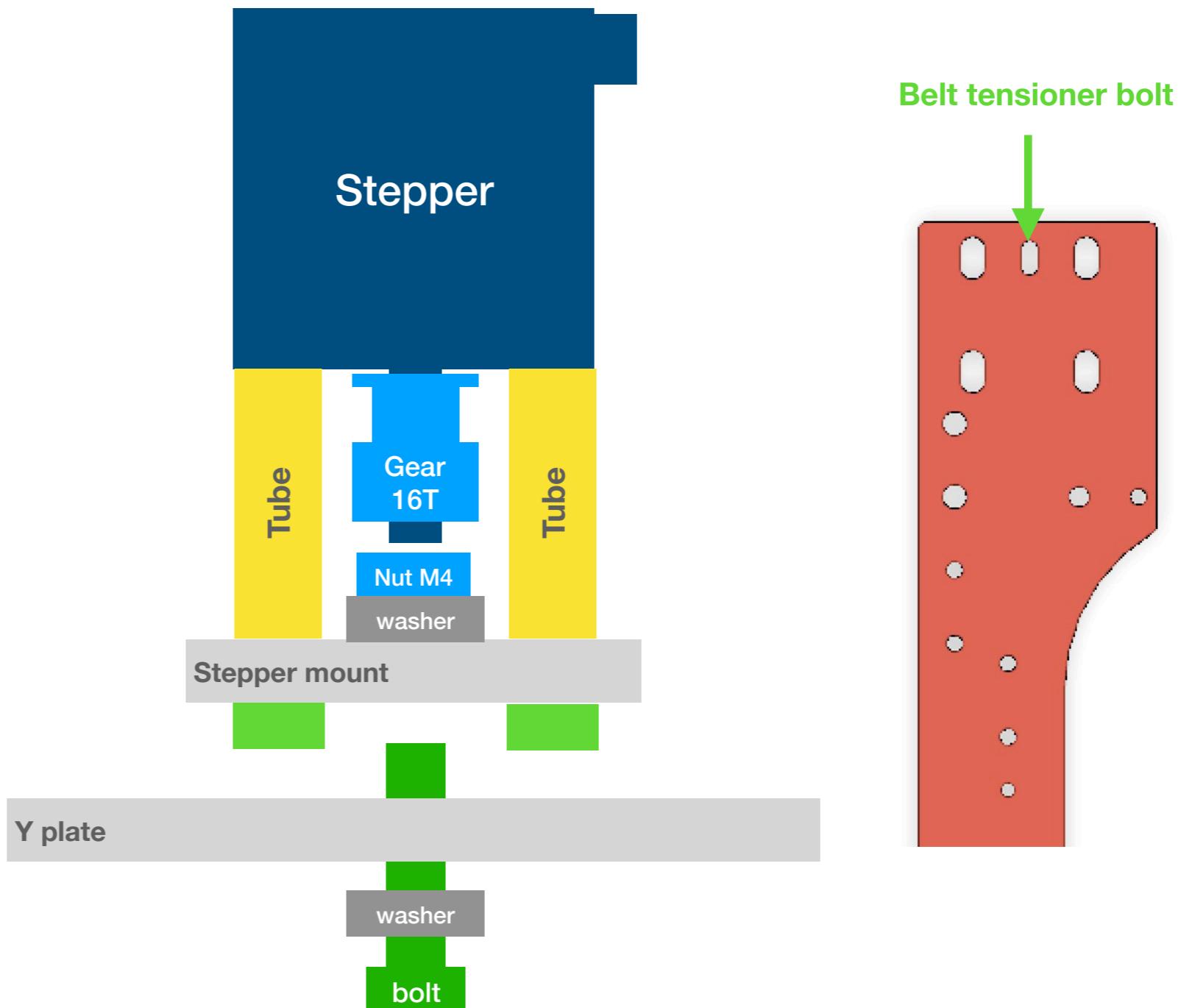


XY Stepper with Belt Tensioner

- Belt tensioner set
 - Bolt M4 x 16
 - Washer M4 x 12 x 1
 - Nut M4
- Make 2 sets

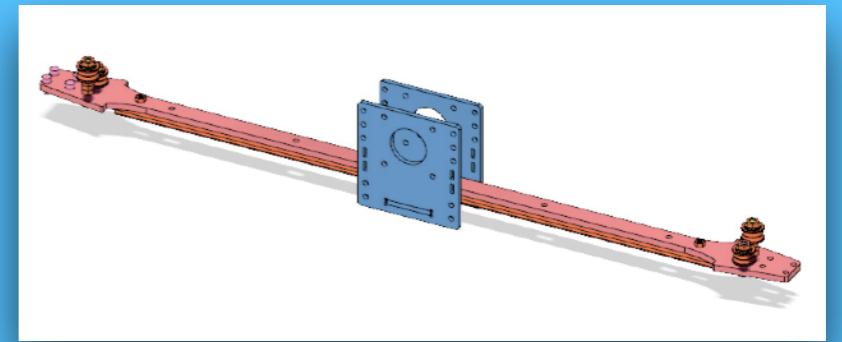
Action

Attach the stepper onto Y plate. Don't tighten the nut yet for later adjustment.



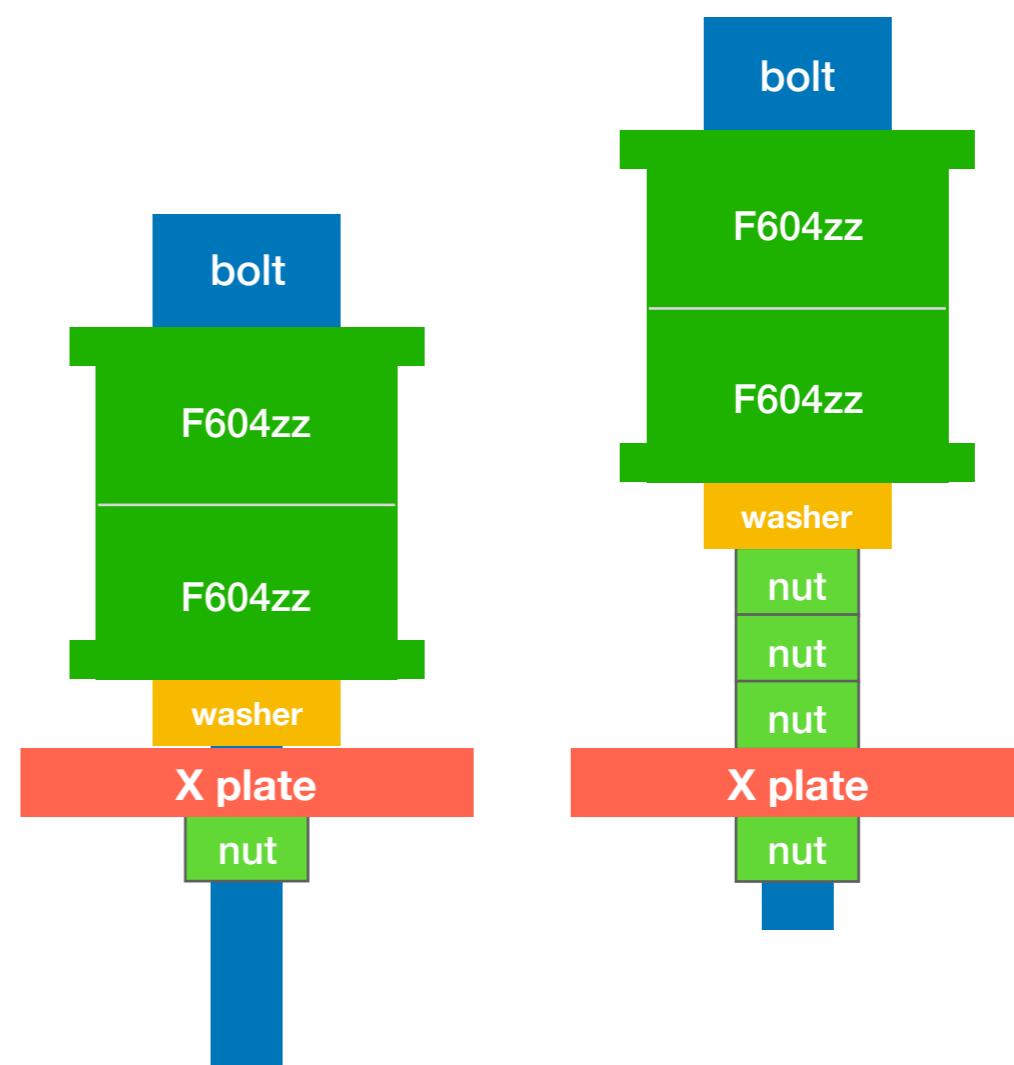
7

X Plane



XY joiner pulley set

- Shorter pulley set
 - 1 bolt M4 x 25
 - **1 nuts M4**
 - 1 washer M4 x 9 x 0.8
 - 2 F604zz bearings
- Taller pulley set
 - 1 bolt M4 x 25
 - **4 nuts M4**
 - 1 washer M4 x 9 x 0.8
 - 2 F604zz bearings
- Make 2 for each set

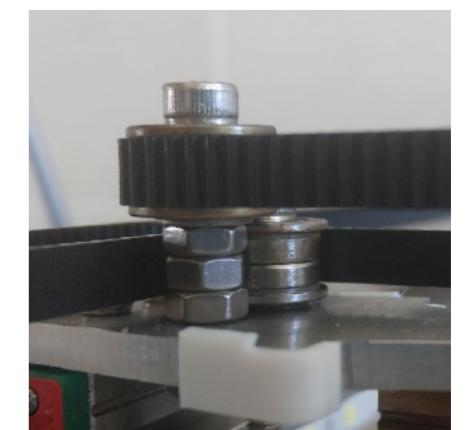


Action

Tightly stack all nuts, washer and bearings while keeping bearings rotate freely. The height of bearings here will act as a reference for other gears/idlers.

Exam

Make sure pulleys rotate freely.

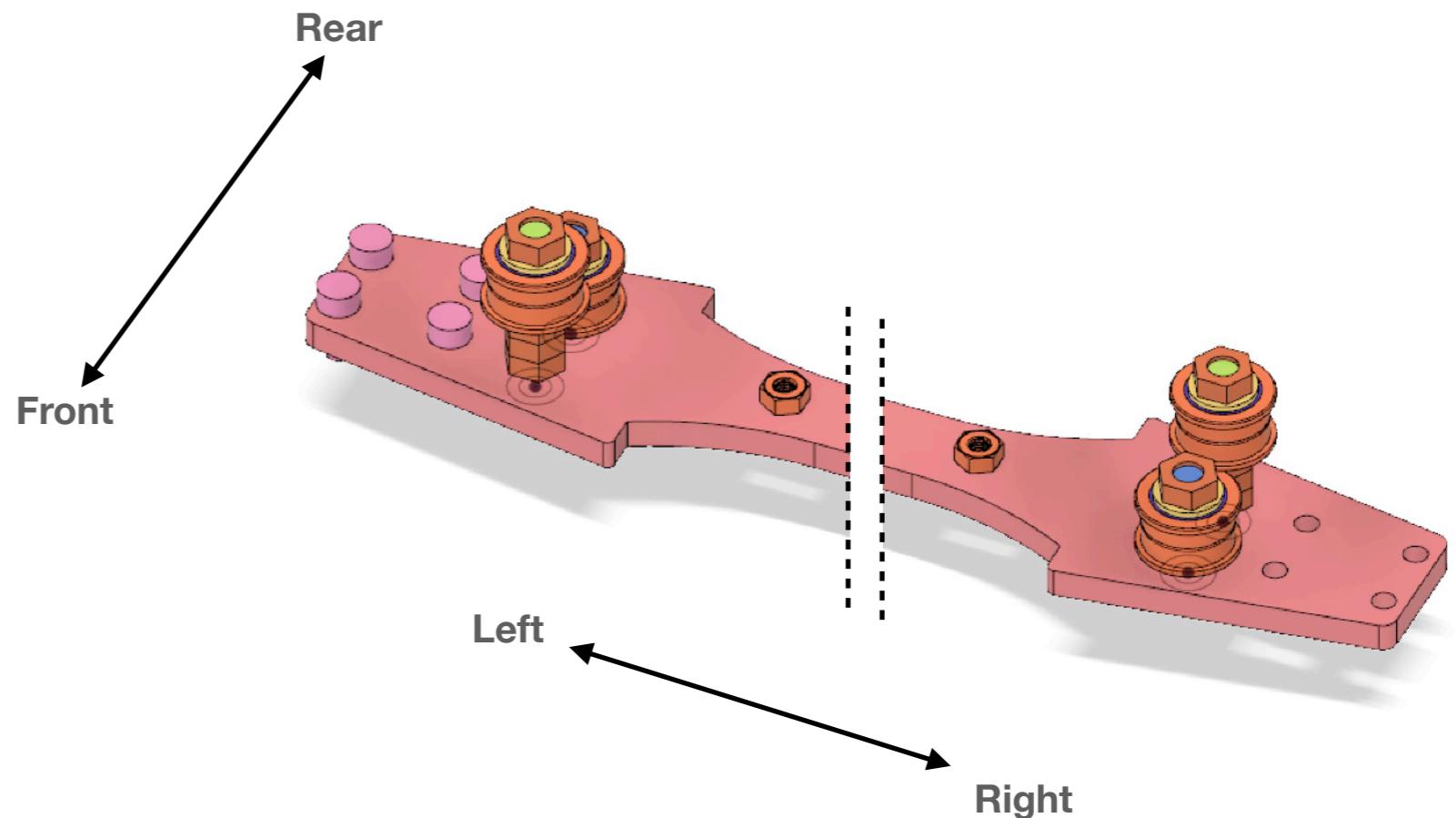


XY joiner pulley set

- 2 shorter pulley sets
- 2 taller pulley sets
- X plate

Action

Install each tall and short pulley set exactly in the place as shown in the picture.

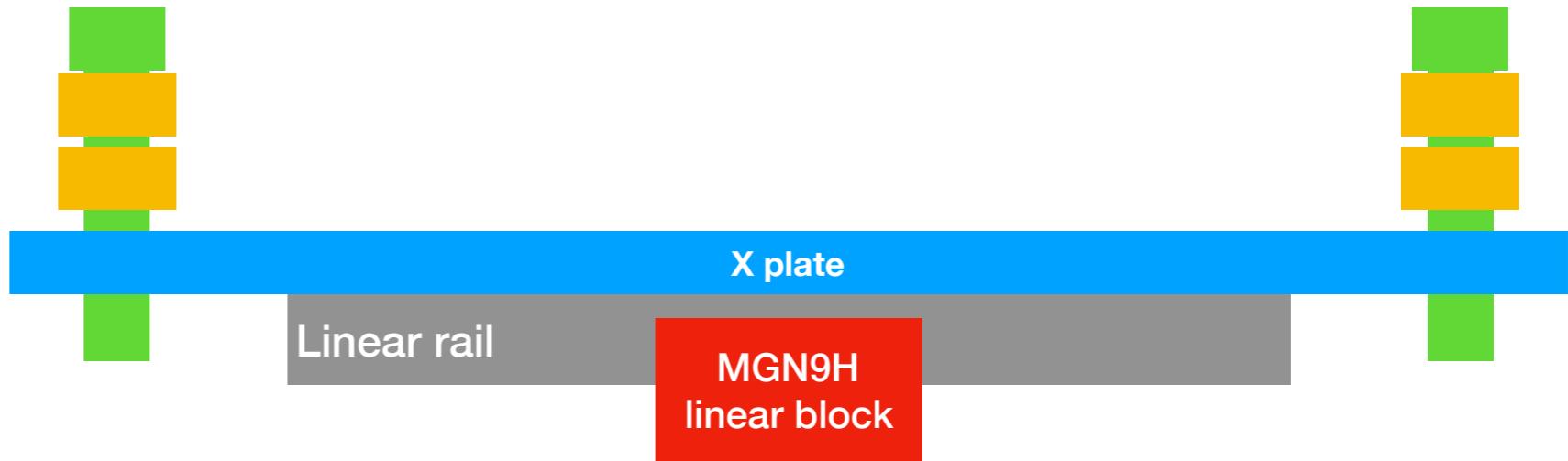


Exam

Make sure pulleys rotate freely.

X Linear Rail

- X plate
- Printed X-Min bumper
- MGN9H (not shorter MGN9C) block
- Linear rail
 - SK-Go: 390 mm
 - SK-Mini: 280 mm
- 7 bolts M3 x 10
- 7 nuts M3



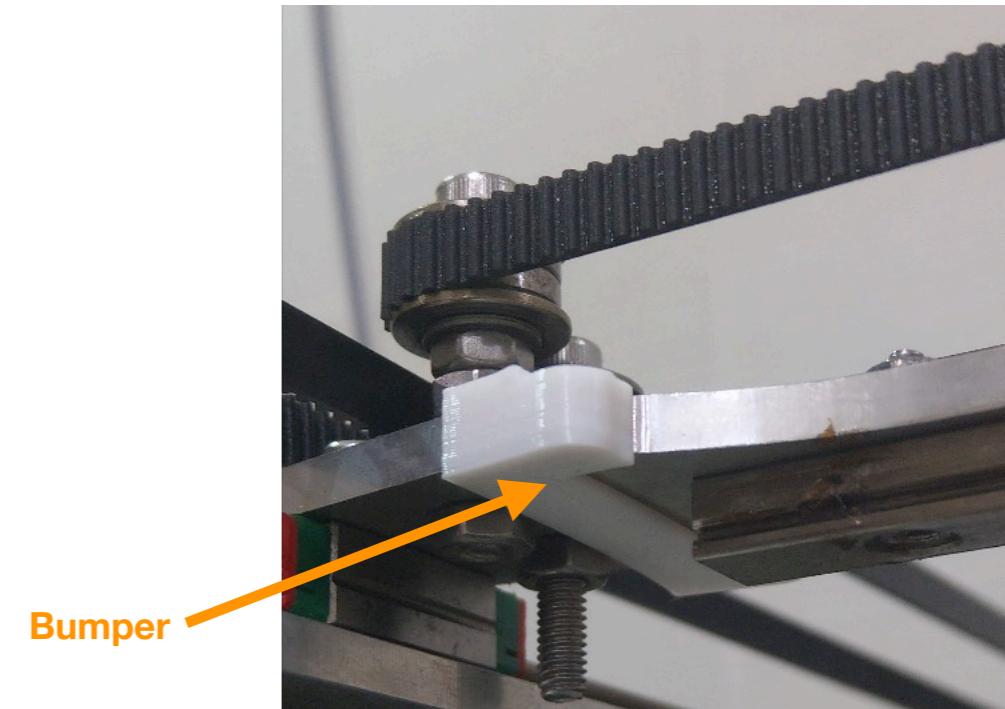
Action

Install linear rail and block under X plate.

Clip the number to X-Min position from bottom side.

Exam

Fix the linear block temporarily with tape or cable tie to prevent it from falling out of rail.



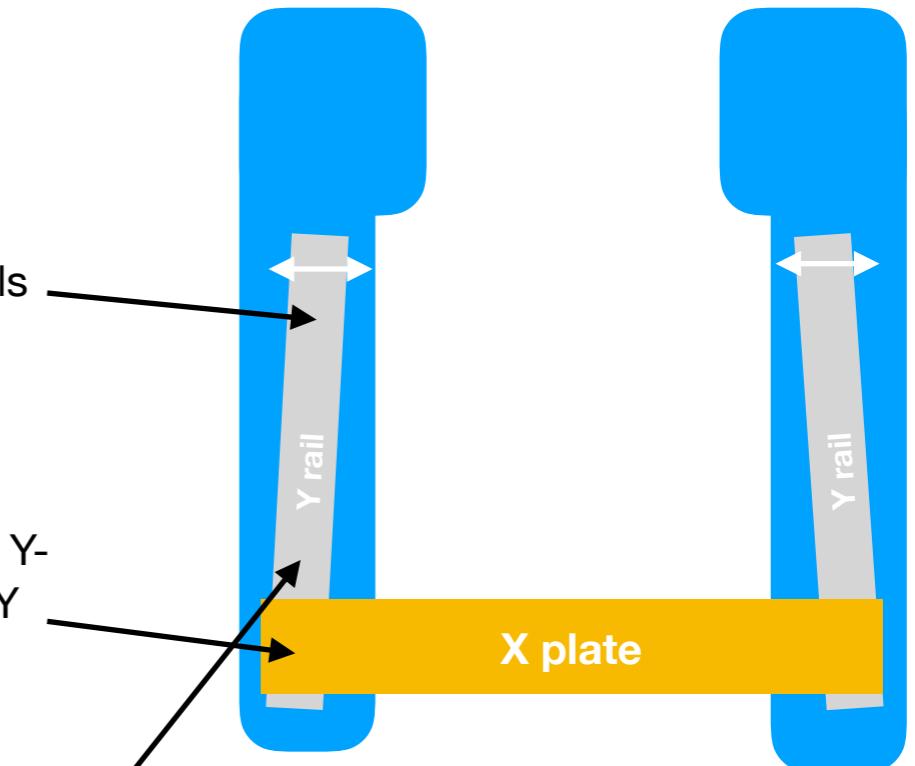
Attach X to Y Axis

- 8 bolts M3 x 8
- 8 washers M3 x 6 x 1.0

Exam

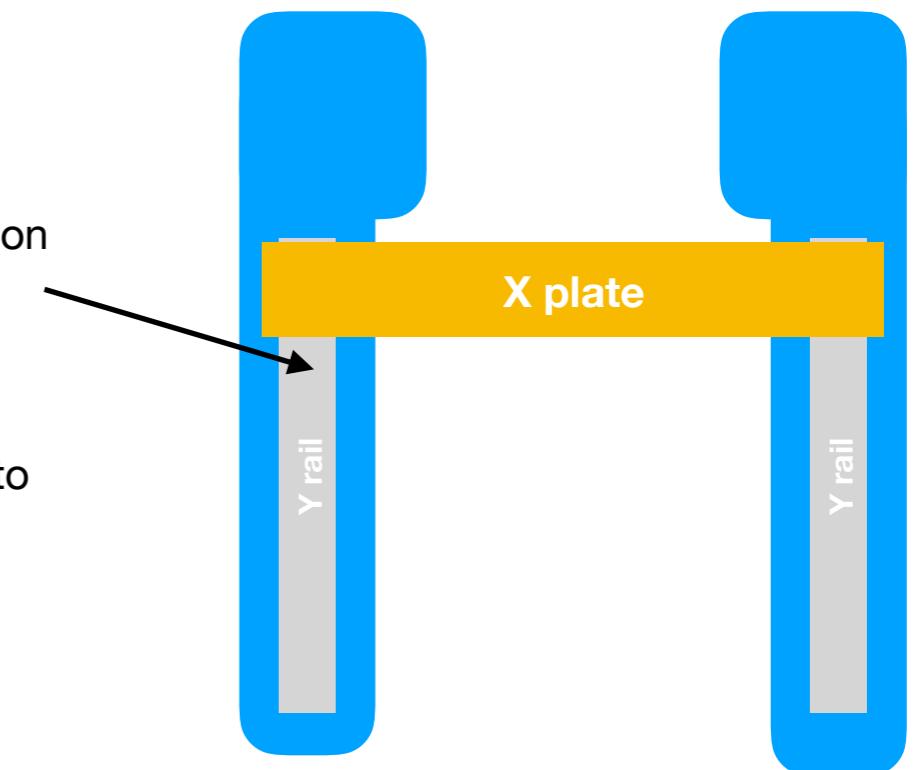
Make sure X plate slide smoothly across the whole Y stroke, and X and Y are perpendicular to each other.

1. Loosen all bolts at both Y rails so the rails can slightly move.



2. Move both Y linear blocks to Y-Min position. Attach X plate to Y blocks and gradually tighten 4 bolts at left/right end.

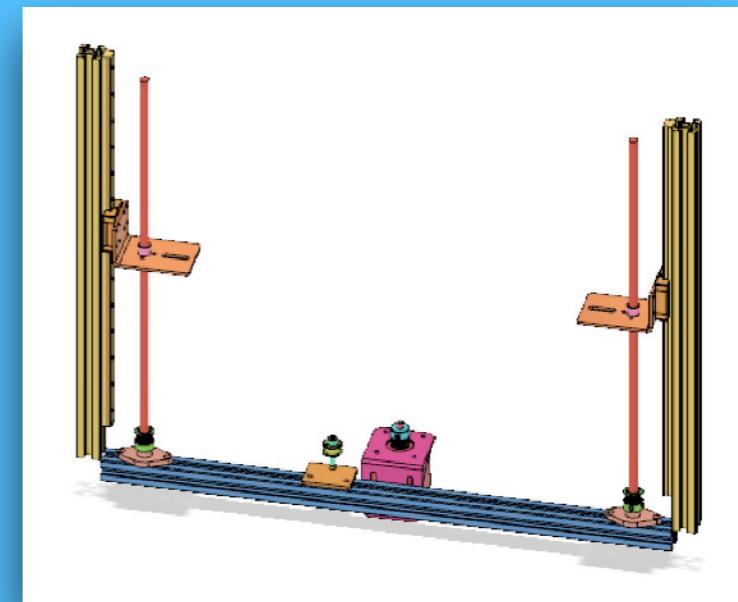
3. Tighten the bolts of the rail near Y-Min position.



4. Move X plate to Y-Max position and tighten those bolts nearby.

5. Might need to repeat step 1 to 4 a few times to ensure X plate slide smoothly.

8 Z Plane



Z Linear Rail

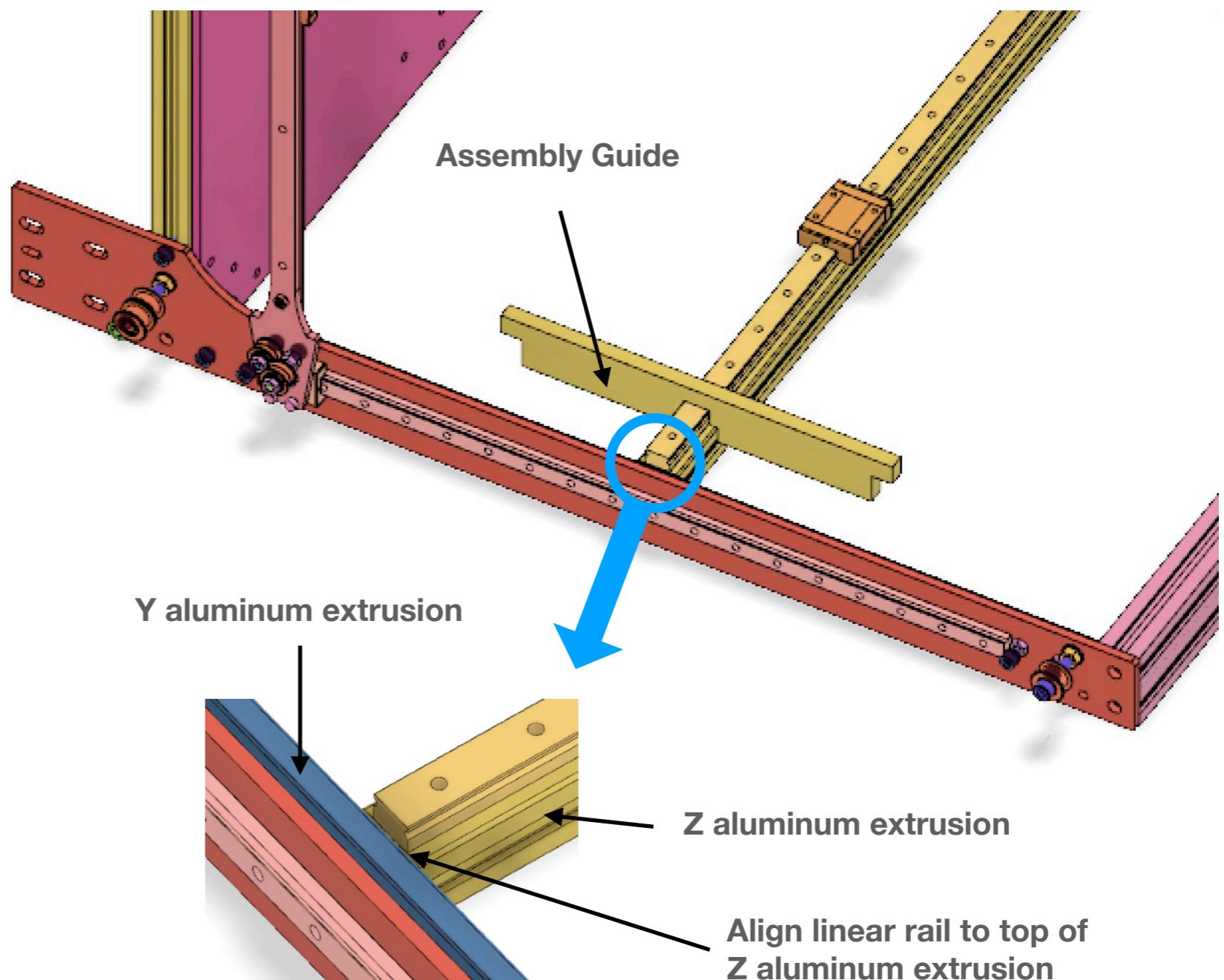
- Linear rail
 - MGN12C linear blocks
 - MGN12 linear rails
 - 4 bolts M3 x 8
 - 4 T-nuts M3
- Printed Assembly Guide

Action

Use Assembly Guide to help linear rail

Exam

Fix the linear block temporarily with tape or cable tie to prevent it from falling out of rail.



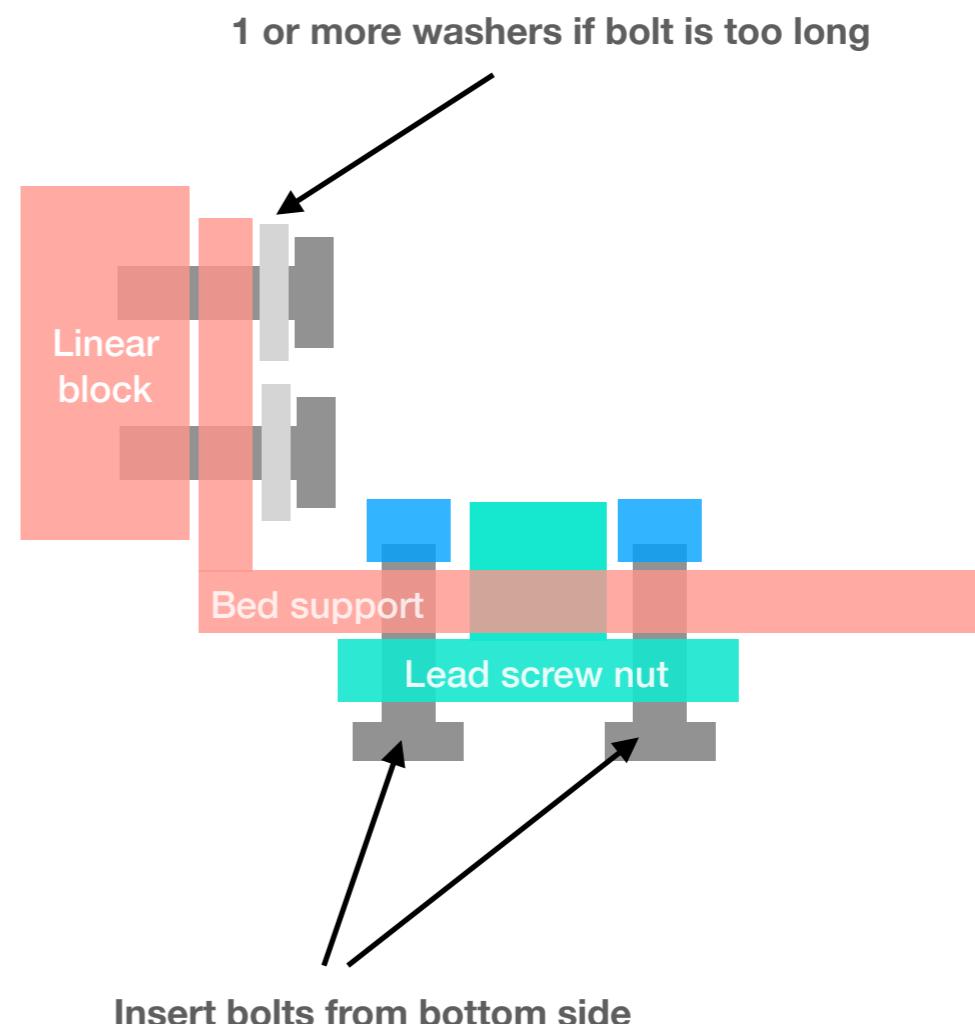
Assemble Bed Support

- L-shape bed support
- Lead screw nut
- Bed support to MGN12
 - 4 bolts M3 x 8
 - 4 washers M3 x 6 x 1.0
- Bed support to lead screw nut
 - 3 bolts M3 x 10
 - 3 nuts M3

Action

Assemble the bed support as shown in the pic, and to insert bolts from bottom side to reserve more space at the bottom.

Use 1 or more washers if bolt is too long.



Assemble Lead Screw

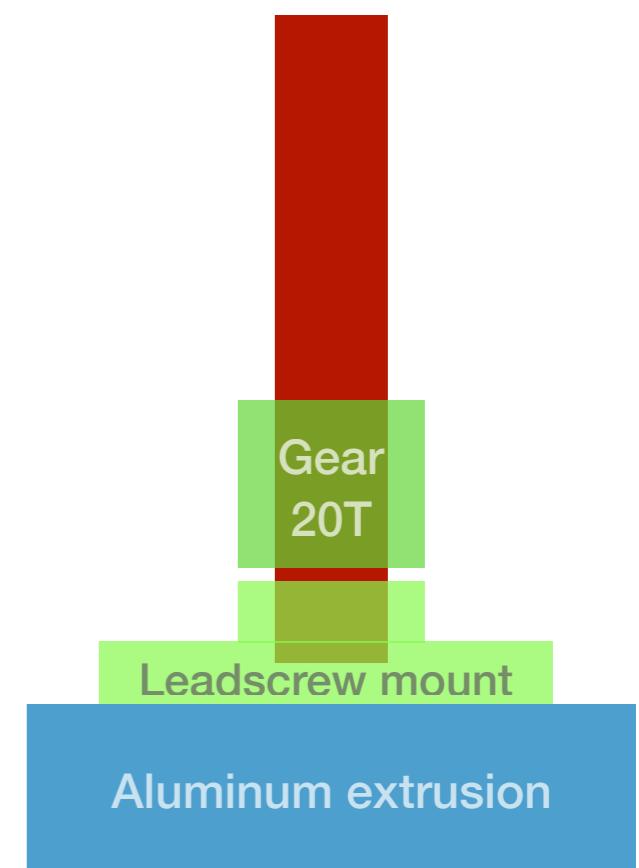
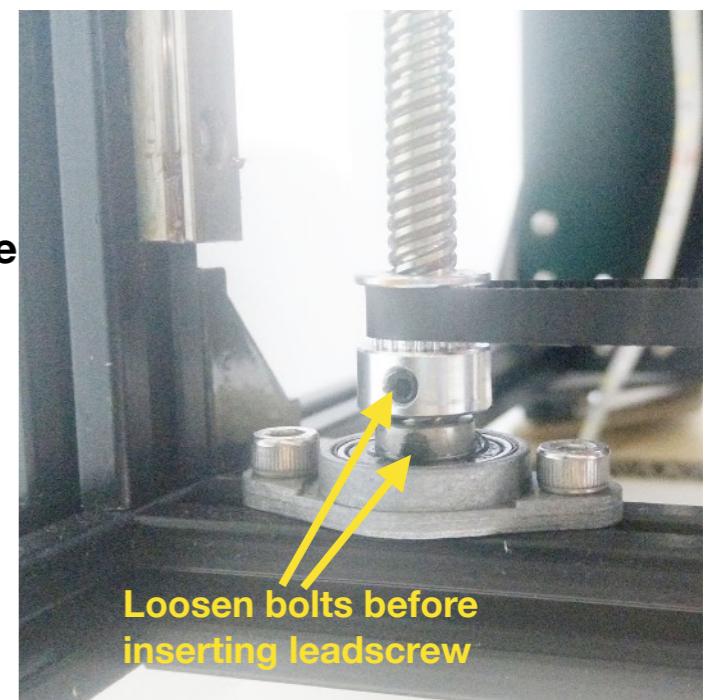
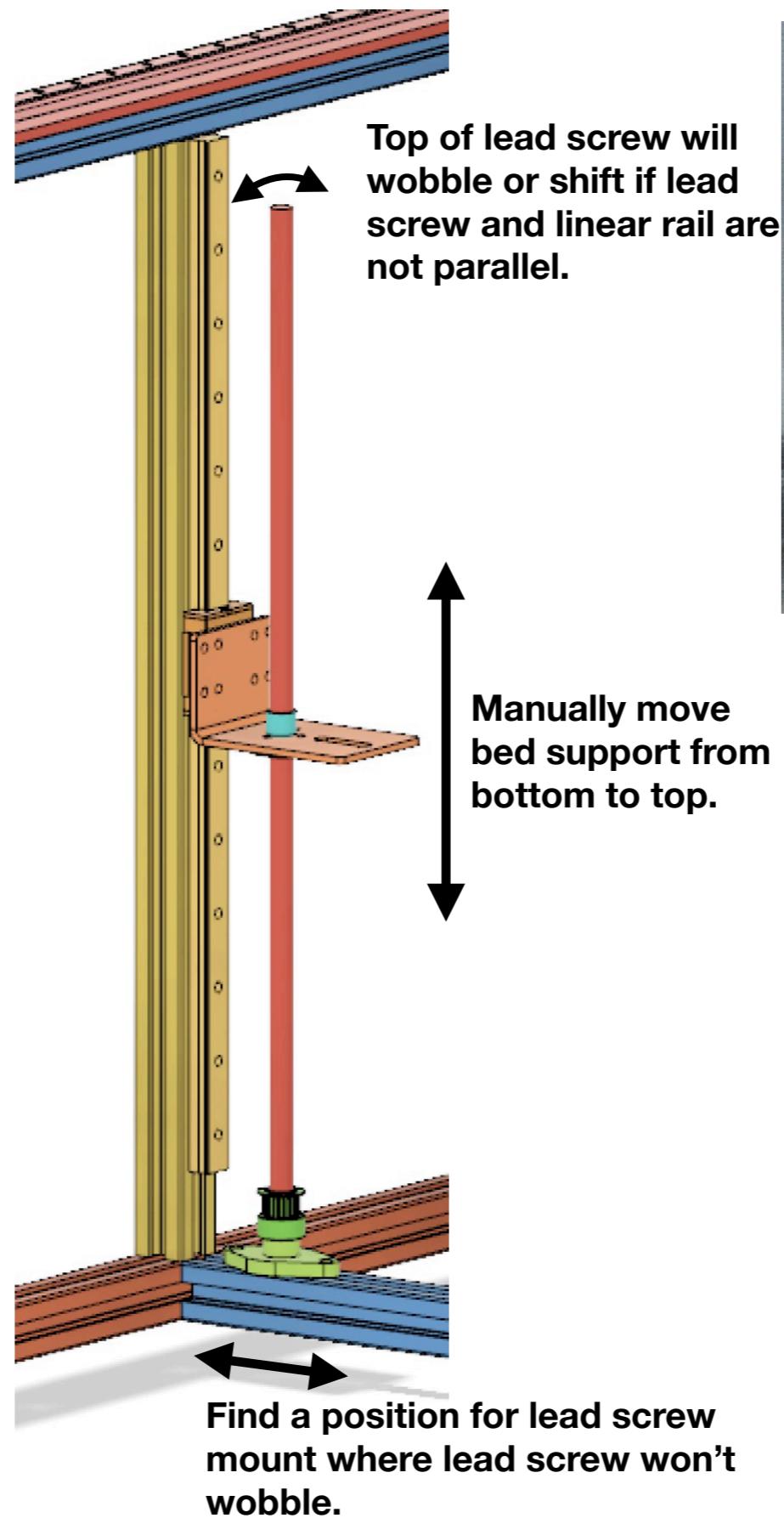
- Lead screw
- Lead screw mount
- Gear 20T, 8mm bore
- Close-loop belt
- 2 bolts M5 x 8
- 2 T-nuts M5

Assemble

1. Lubricate the lead screw before using it.
2. Insert lead screw through lead screw nut, gear, **belt**, and lead screw mount. Don't tighten the bolts yet.
3. You'll see the lead screw wobble when you move the bed support up and down. Find a position of the lead screw mount where the top of lead screw doesn't wobble or shift.
4. Tighten the bolts on 20T gear and lead screw mount.

Exam

Make sure that you can manually move the bed supports up and down with your hand, and the lead screws are spinning freely without wobbling. If binding happens, try lubricating and re-adjusting.



Tips of Adjusting Lead Screws

From owners feedback adjusting lead screw is the most challenging step during the whole assembly. Here are some adjustable places which affect squareness:

- Make sure both top and bottom of the Z 2020 extrusions have the same offsets from front Z 4020 legs.
- Make sure both Z 2020 extrusions are aligned with left and right side of frame.
- The bearing inside Z lead screw mount (Fig. A) is rotatable, as shown in the picture, so make it flat and aligned with bottom.
- If the tiny bolts in the bearings (Fig. B) are fastened too tightly at adjusting stage, the lead screw could be tilted.
- Don't let lead screw touch the underside extrusion. This will create friction.

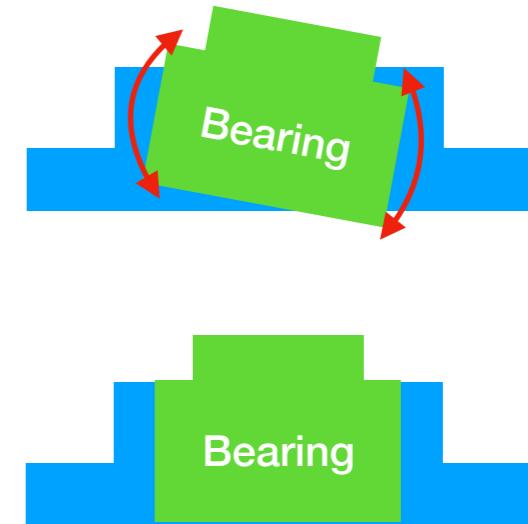


Fig. A
The bearing inside lead screw mount is rotatable.

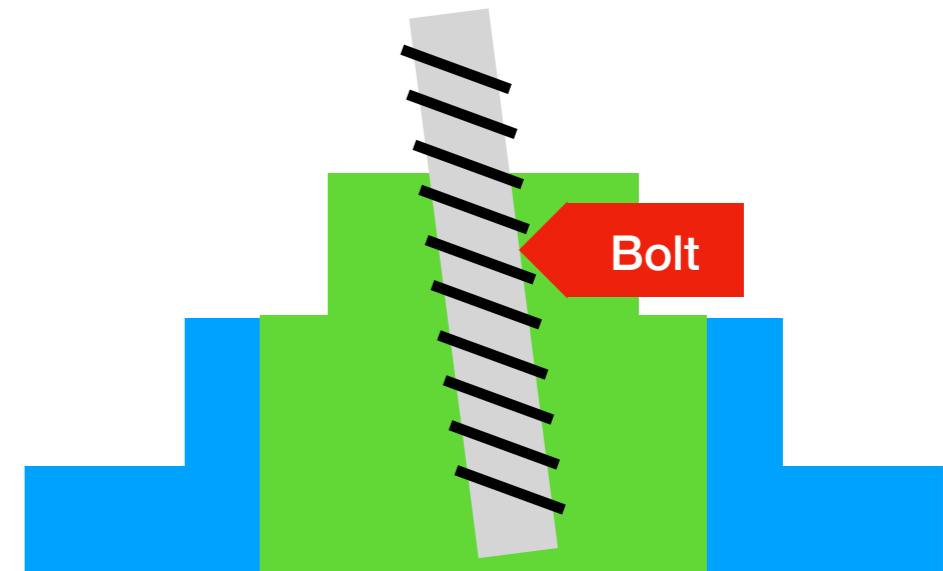
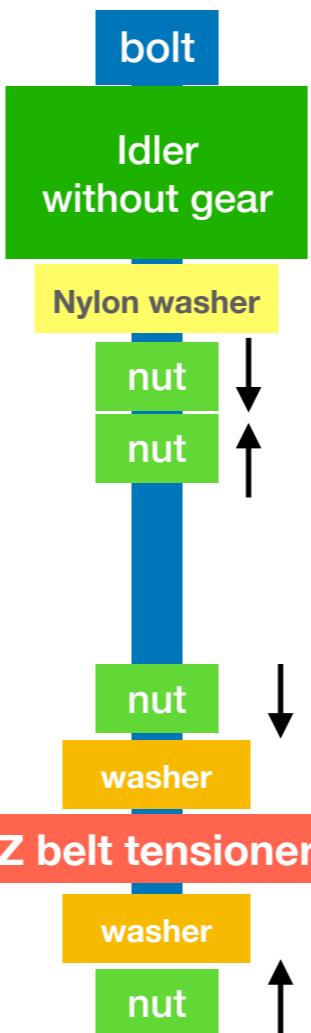


Fig. B
Fasten the 2 tiny bolts too tightly might tilt the lead screw.

Z Belt Tensioner

- 1 idler **without gear**, 5mm bore
- 1 bolt M5 x 40
- 4 nuts M5
- 1 nylon washer M5 x 8 x 1
- 2 washers M5 x 10 x 1



1. Interlock the two bolts **TIGHTLY** at a position as top as possible but keep the idler rotating freely.

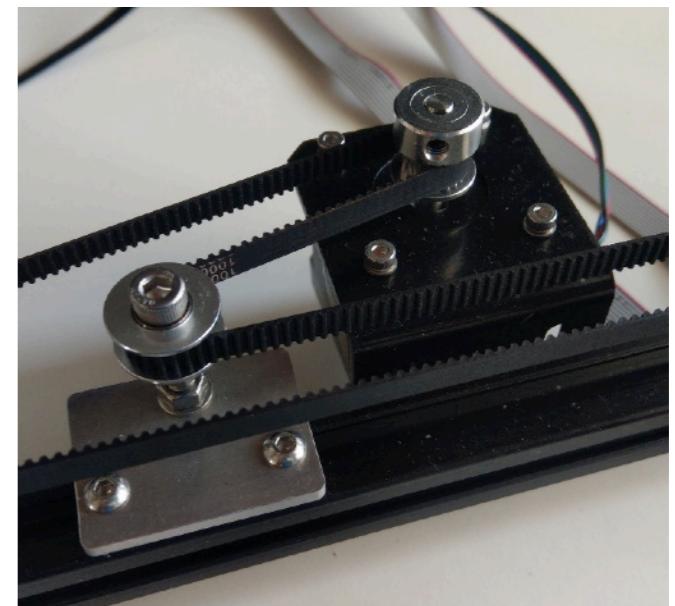
2. Don't tighten these nuts yet. You will have to adjust the vertical position of idler.

Action

Assemble Z belt tensioner as shown in the picture.

Exam

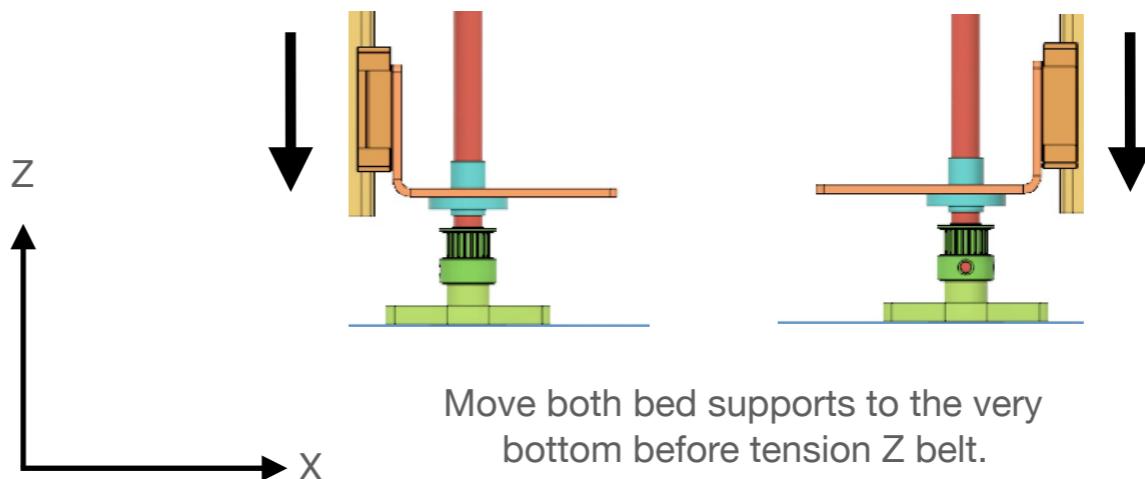
Make sure the idler can rotate freely.



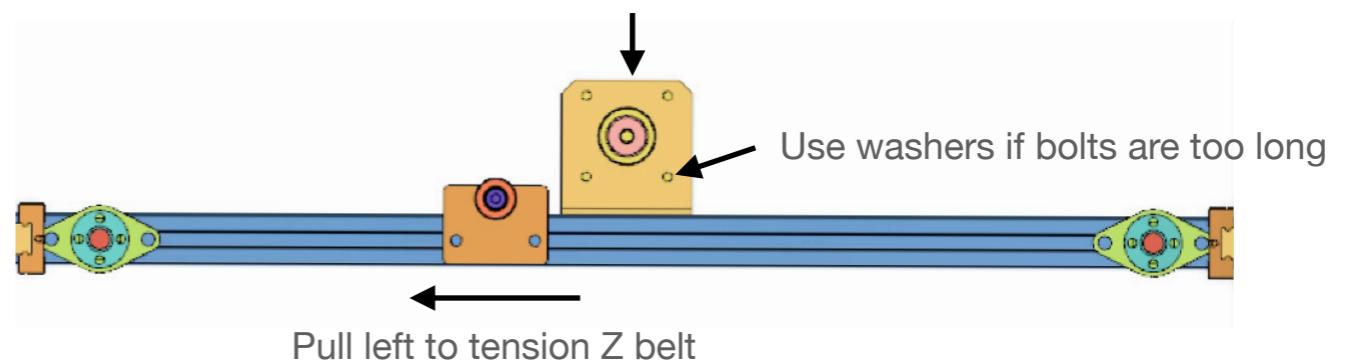
Z Plane

Z Stepper & Belt Tensioner

- Z stepper
 - 1 NEMA17 stepper
 - 1 20T gear, 5mm bore
 - 1 stepper mount
 - 4 bolts M3 x 8
 - 4 washers M3 x 6 x 1.0
 - 2 round head bolt M4 x 8
 - 2 T-nuts M4
- Z belt tensioner
 - 2 round head bolt M4 x 8
 - 2 T-nuts M4
- 4 4020 aluminum extrusion foot pads



Attach Z stepper mount at rough center. No need to be exact because the belt is tensioned by relative position of stepper mount and belt tensioner.

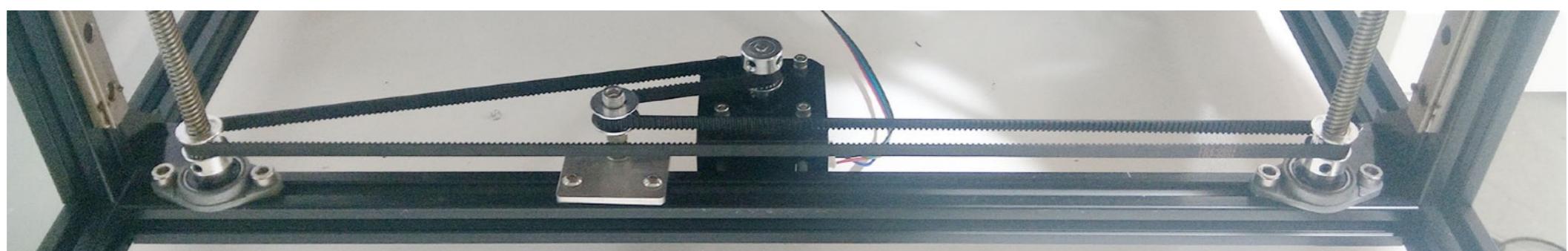
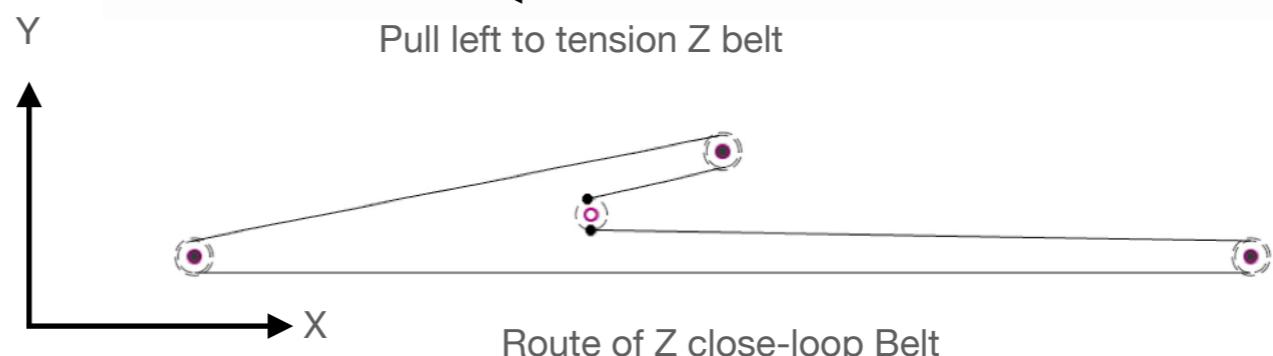


Action

Attach 4 foot pads under frame legs before installing Z stepper mount.

Attach Z stepper and belt tensioner as shown in the picture.

Move both bed support to the very bottom before tension Z belt.

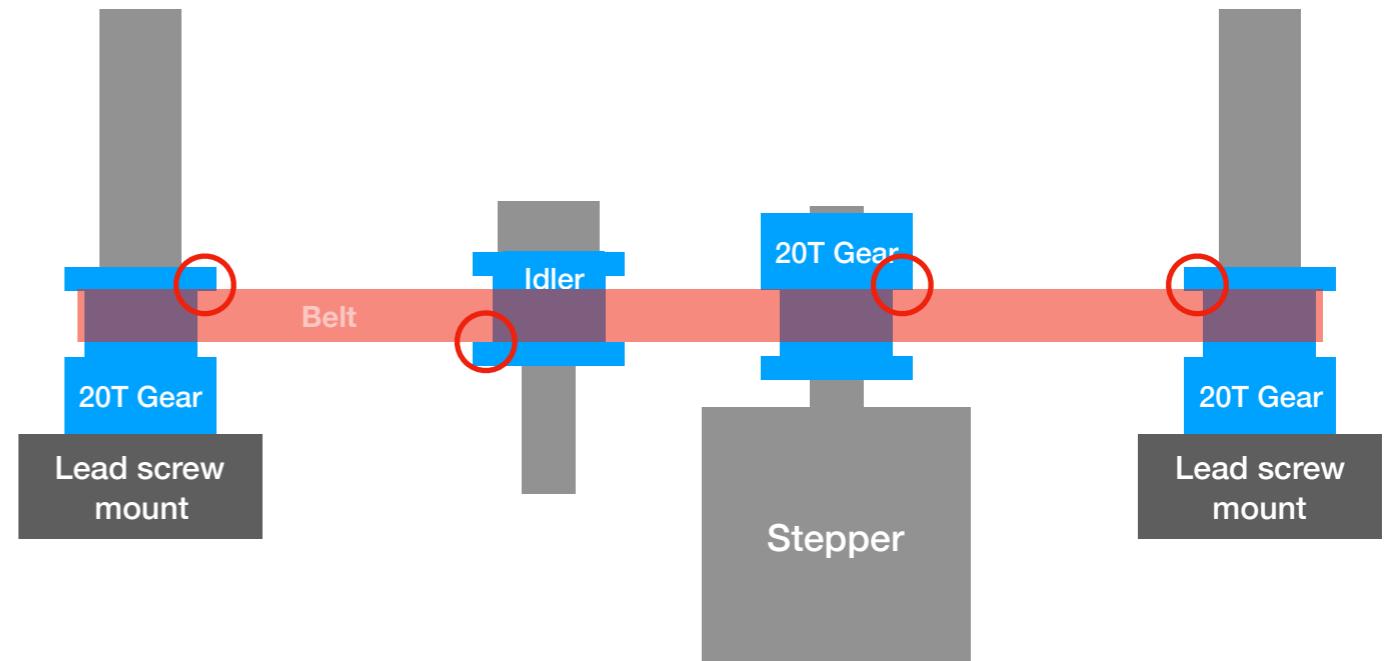


Adjust Position of Gear & Idler

Action

The Z belt should maintain in the middle of all gears and idler to prevent from wearing.

Since the left and right 20T gears are fixed at bottom as reference points, we adjust vertical positions of 20T gear and idler.

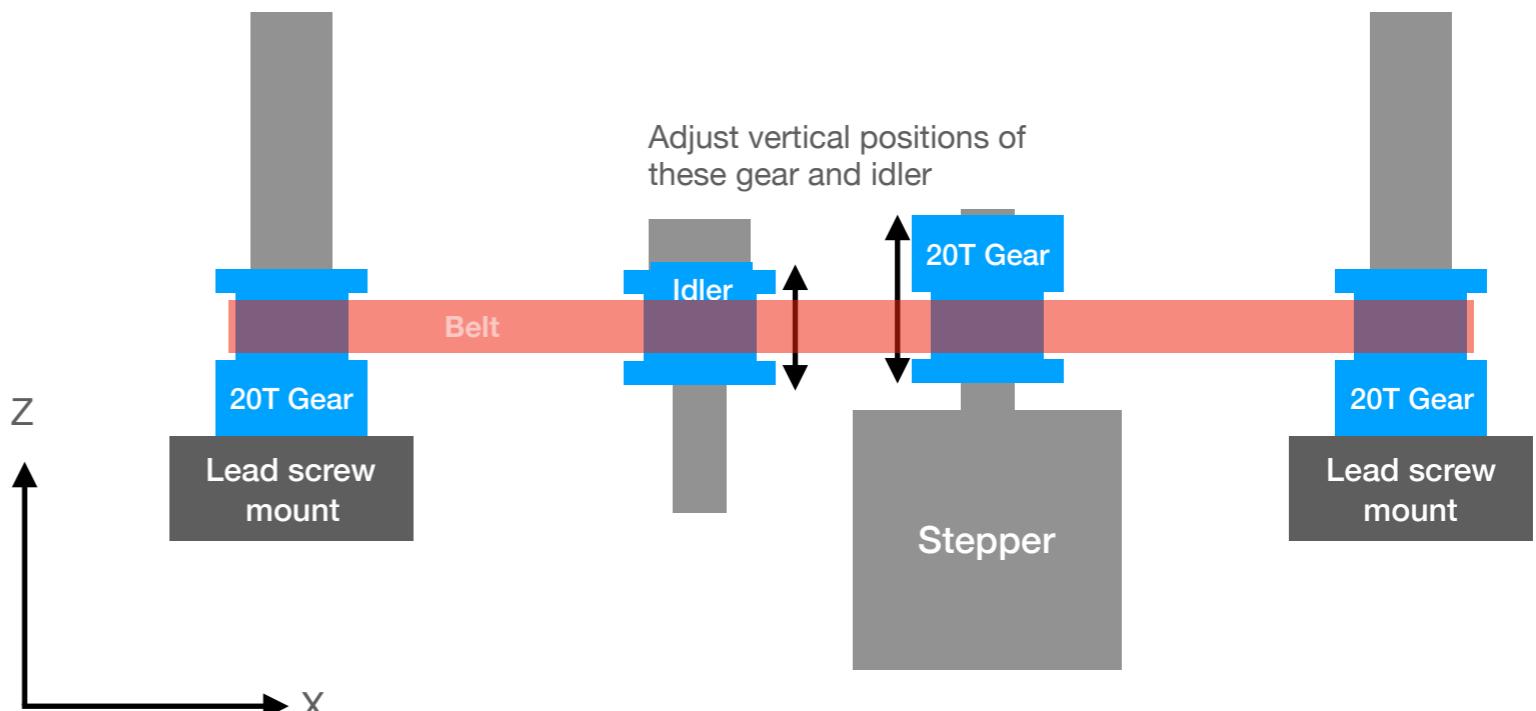
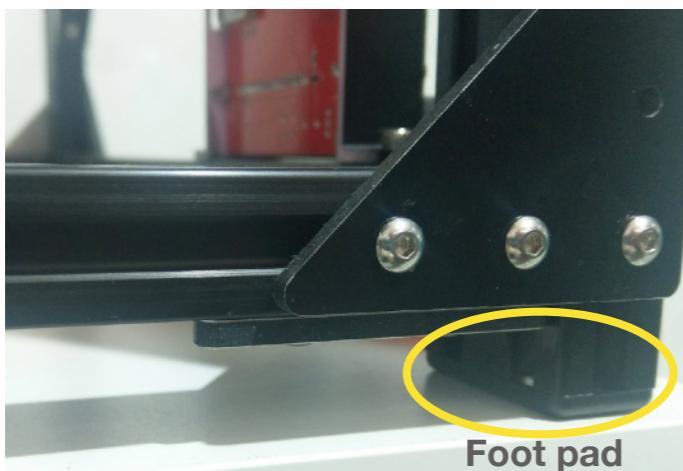


Belt is not in the middle of gears and idler.

Exam

4 foot pads should be attached to ensure the frame is lifted so that the belt can run in the same horizontal plane.

Execute Z-moving G-code and make sure the belt is running in the middle of gears and idler.



Adjust vertical positions of these gear and idler

Belt is the middle of gears and idler.

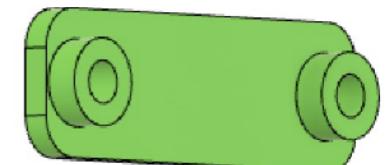
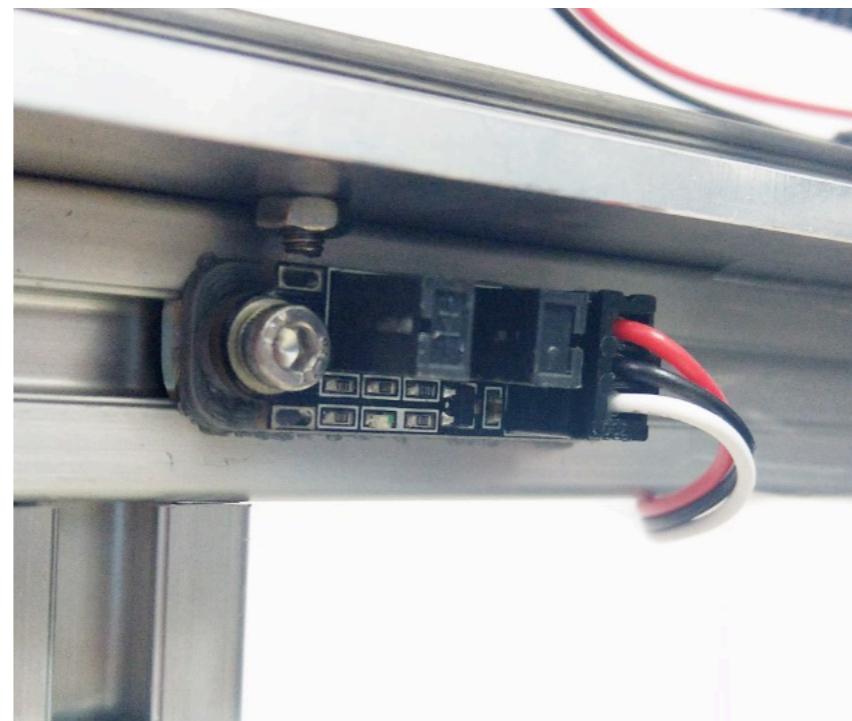
Z-Min Endstop

- 1 optical endstop module
- 1 printed endstop mount
- 1 printed endstop trigger stick
- 4 bolts M3 x 10
- 2 T-nuts M3
- 2 nuts M3

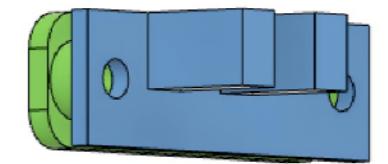
Action

Assemble optical endstop and mount as shown in the picture.

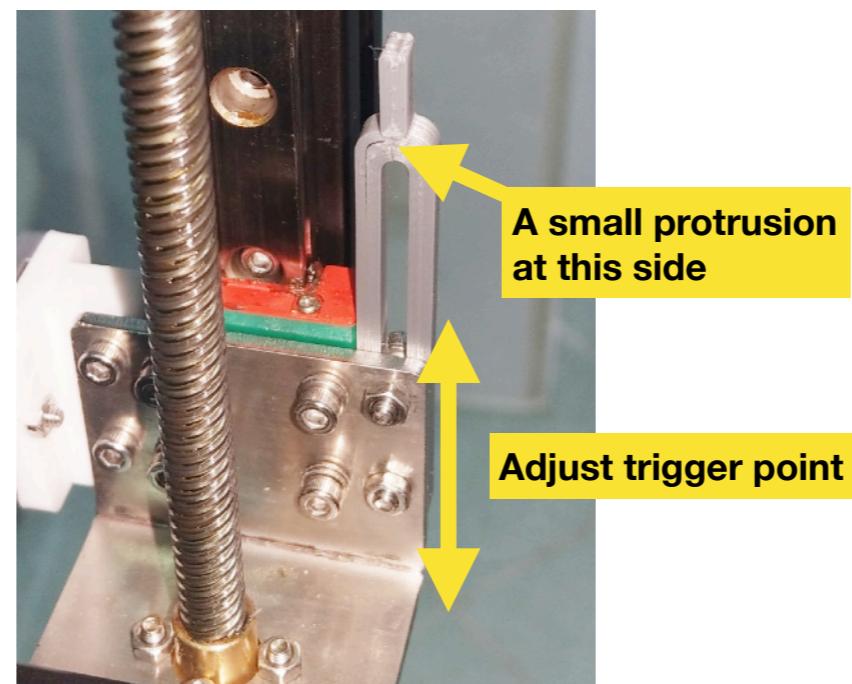
Don't fasten bolts at the trigger stick, you'll need to adjust trigger point later.



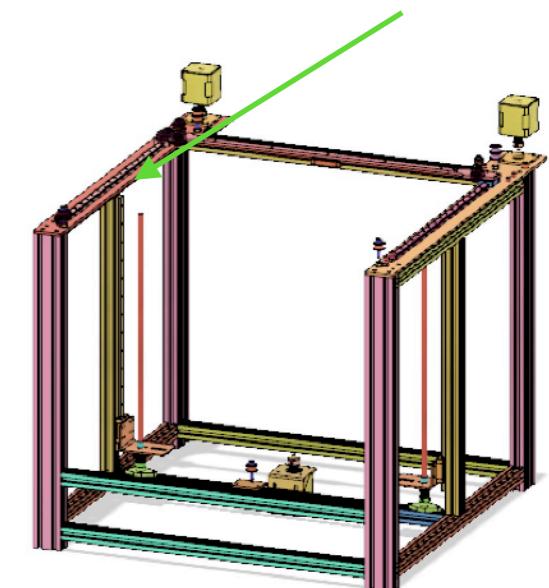
Optical endstop mount



Attach the endstop mount behind endstop

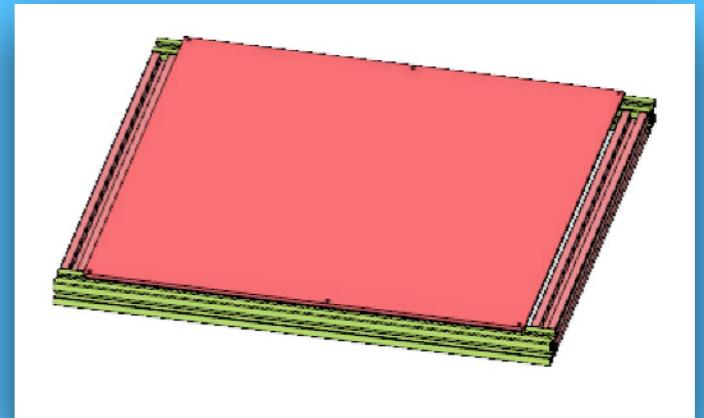


Attach endstop here



9

Heated Bed



Heated Bed

Attach AC-powered Silicone Rubber Heater (SK-Go only)

- Aluminum bed
- AC-powered silicone rubber heater
- Magnetic rubber or PEI plate (option)

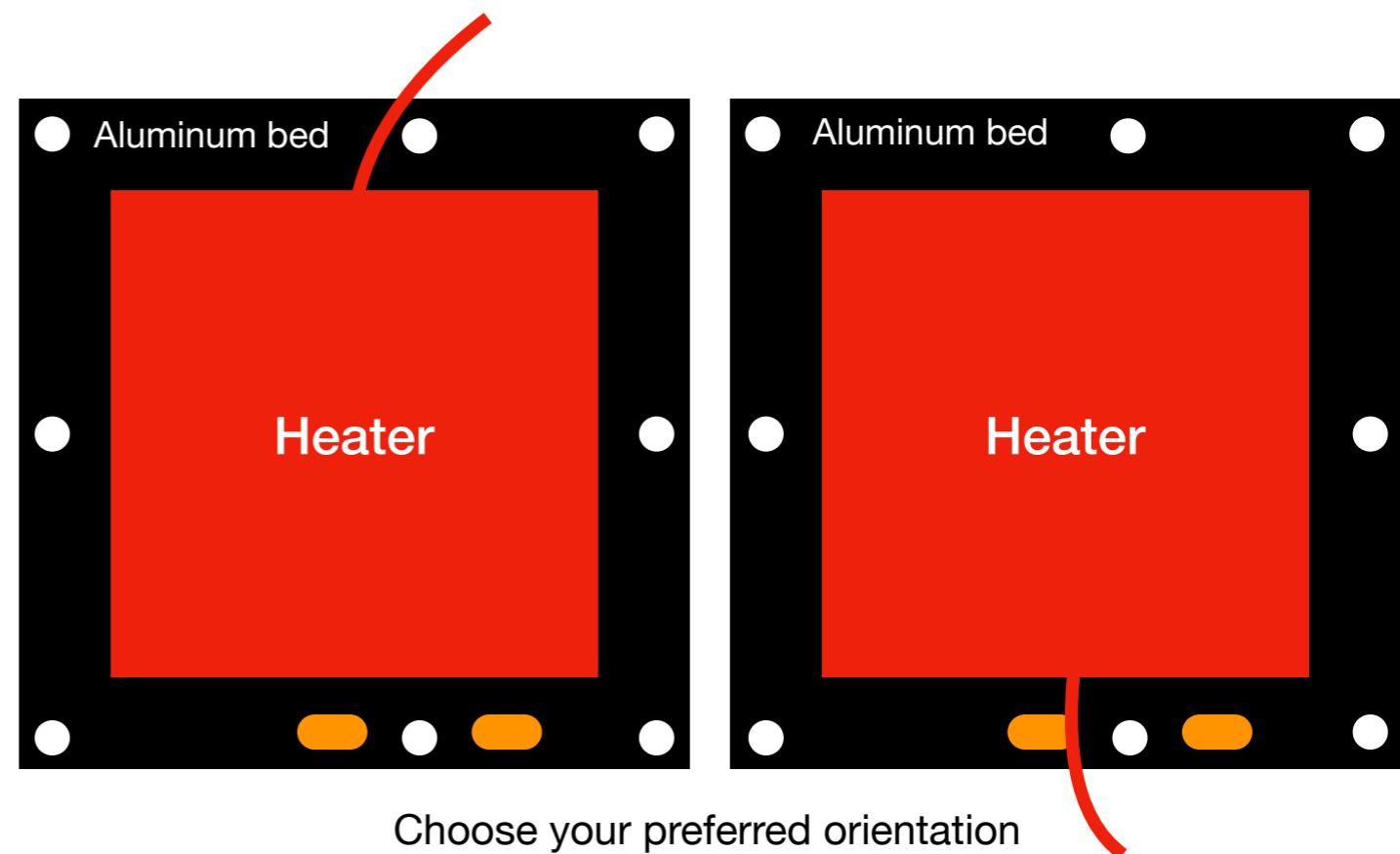
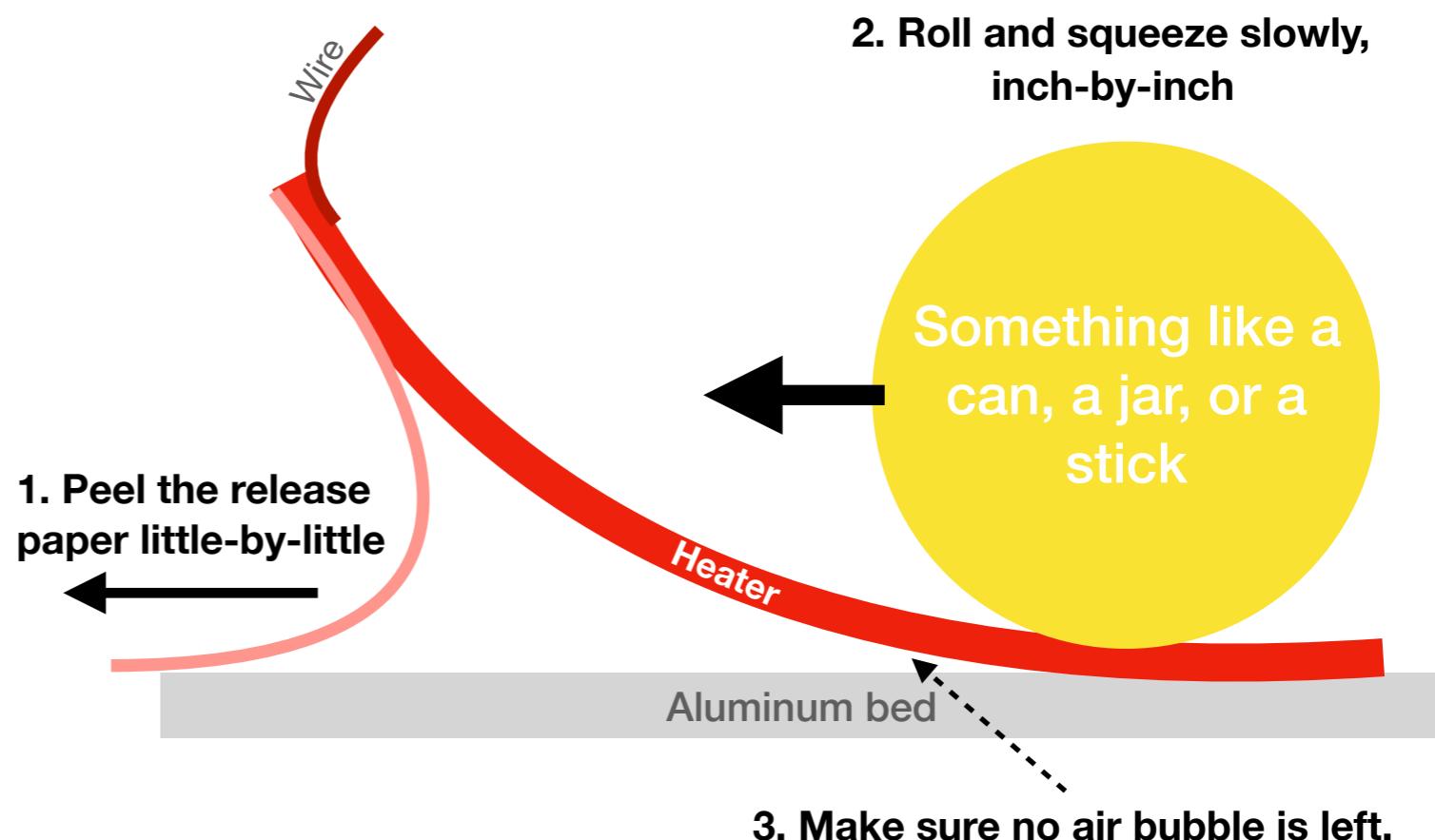
Action

Repeat step 1 to 3 as shown in the picture and attach the magnetic rubber to the **bare metal side** of aluminum bed first. (if you ordered it), and then attach the silicone rubber heater to the **printed side** of aluminum bed.

Make sure no air bubble between heater and bed. If air bubble exists, heat will accumulate at that point due to no metal to conduct heat. Glue on the heater will vaporize and bubble will continue growing until you notice the awful smell. Then you'll have to peel the whole heater off, clean the glue and re-install it.

Exam

NO BUBBLE IS ALLOWED!

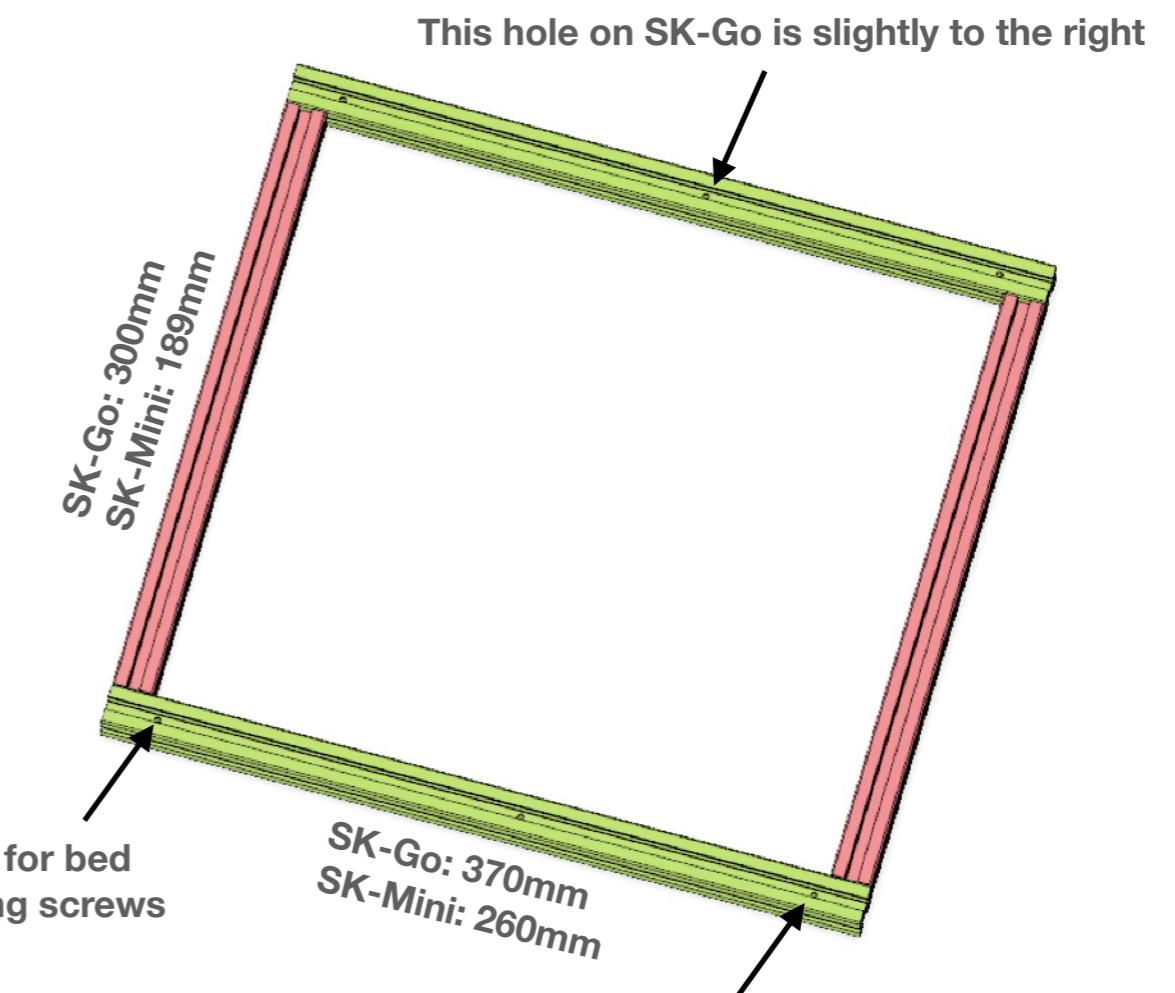


Assemble Heater to Bed Frame

- Aluminum bed
- Bed frame

Action

Only 3 holes (arrowed in the pic) will be used for supporting the bed.

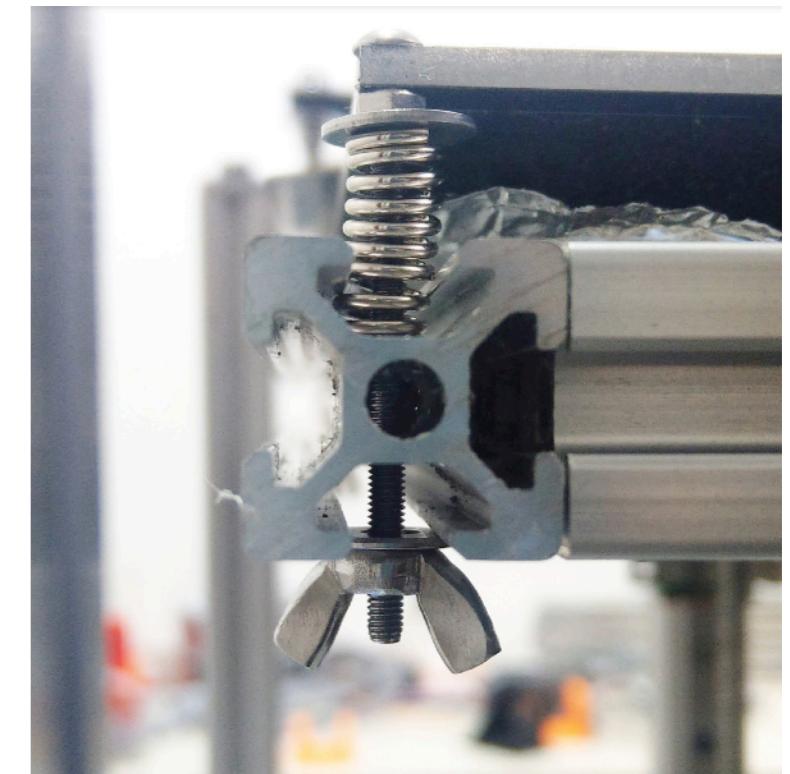
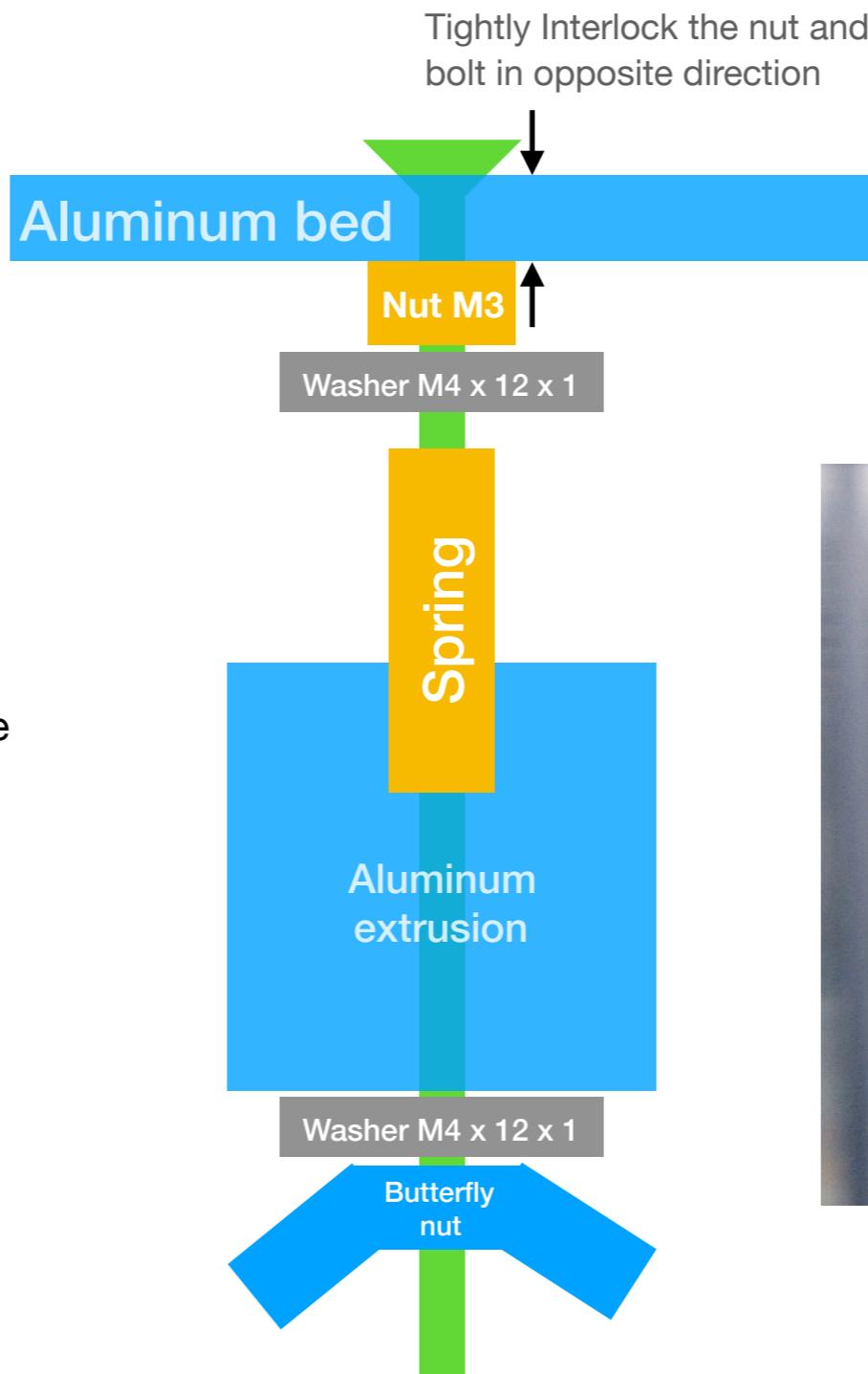


Bed Leveling Screw

- Bed leveling screw set
 - Bolt M3 x 45 counter sunk
 - Nut M3
 - 2 washer M4 x 12 x 1
 - Butterfly nut
 - Spring
- Make 3 sets

Action

Assemble bed leveling screw as shown. Use the 3 the holes mentioned in the previous page.



Attach Bed Frame to Bed Supports

- 2 round head bolts m4 x 8
- 2 T-nuts M4

Assemble

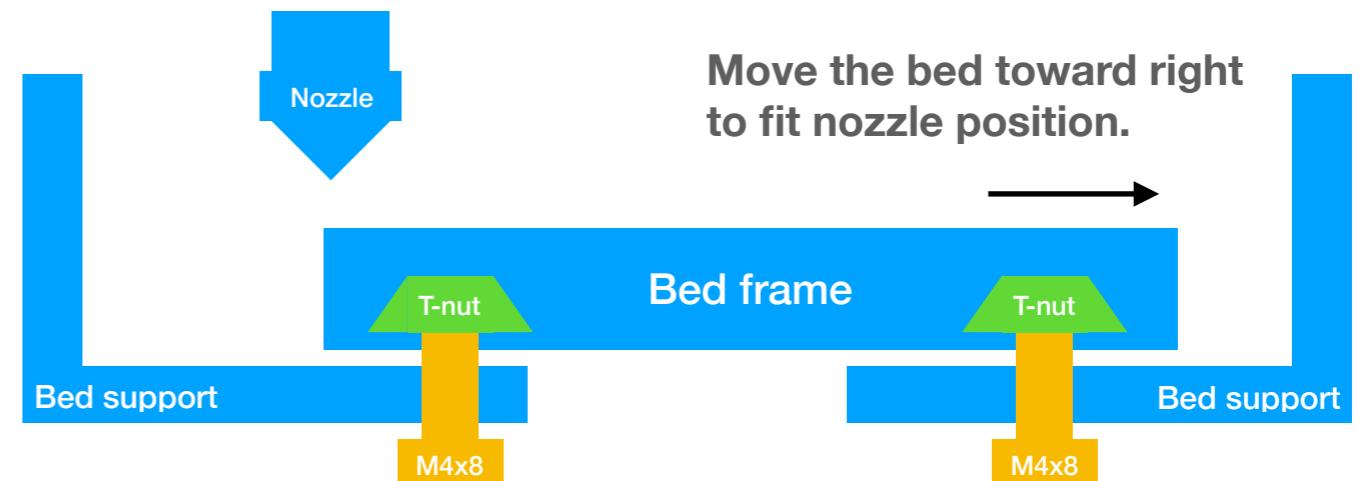
Manually pull Z close-loop belt to raise both bed supports to an upper position.

Put T-nut and bolt onto bed support first and then put heated bed on.

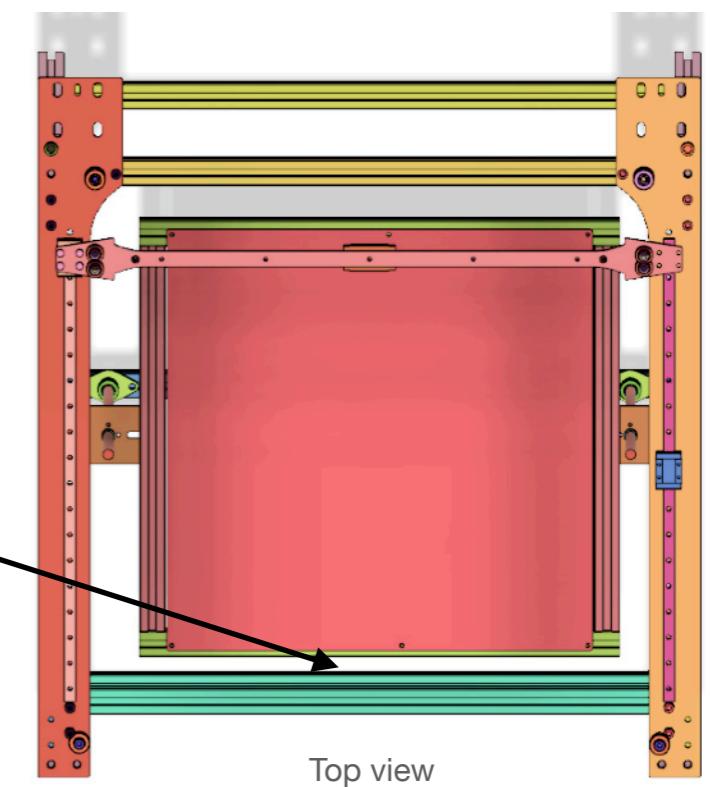
When tighten the bolts, you may need a thin flat head screw driver to help rotate T-nuts.

Exam

Make sure there is a gap between heated bed and front frame.

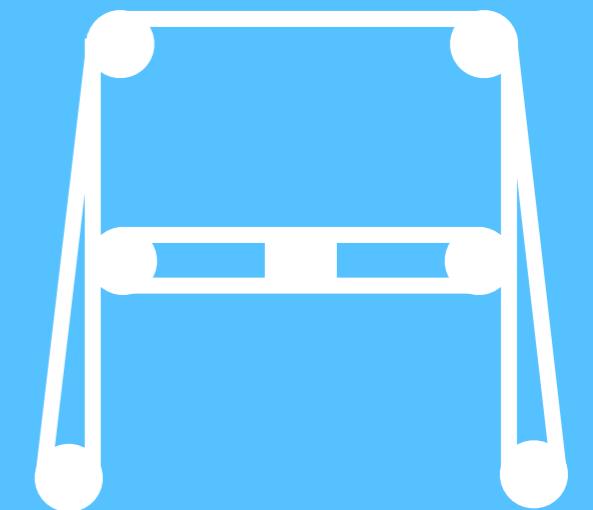


Make sure there is a gap between heated bed and front frame



10

CoreXY Belts

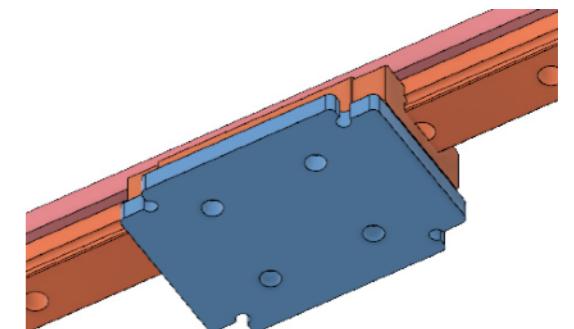
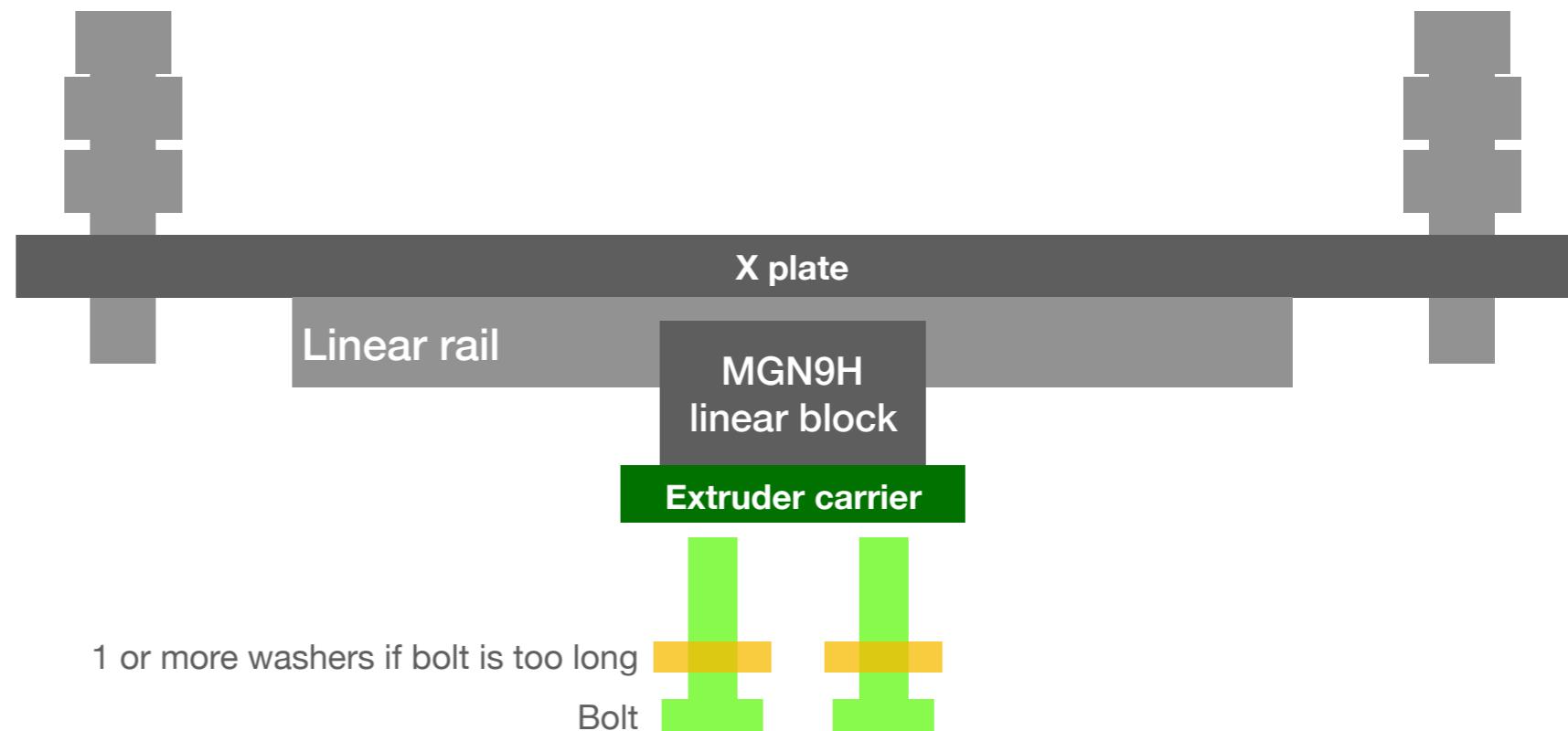


Extruder Carrier

- 1 Aluminum extruder carrier
- 4 bolts M3 x 8
- 4 washers M3 x 6 x 1.0

Action

Use washers if the bolts are too long for MGN9H linear block.



Extruder Plate

- NEMA17 pancake stepper
- 4 bolts M3 x 35
- 4 nuts M3
- 4 nylon tubes M3 x 7 x 24

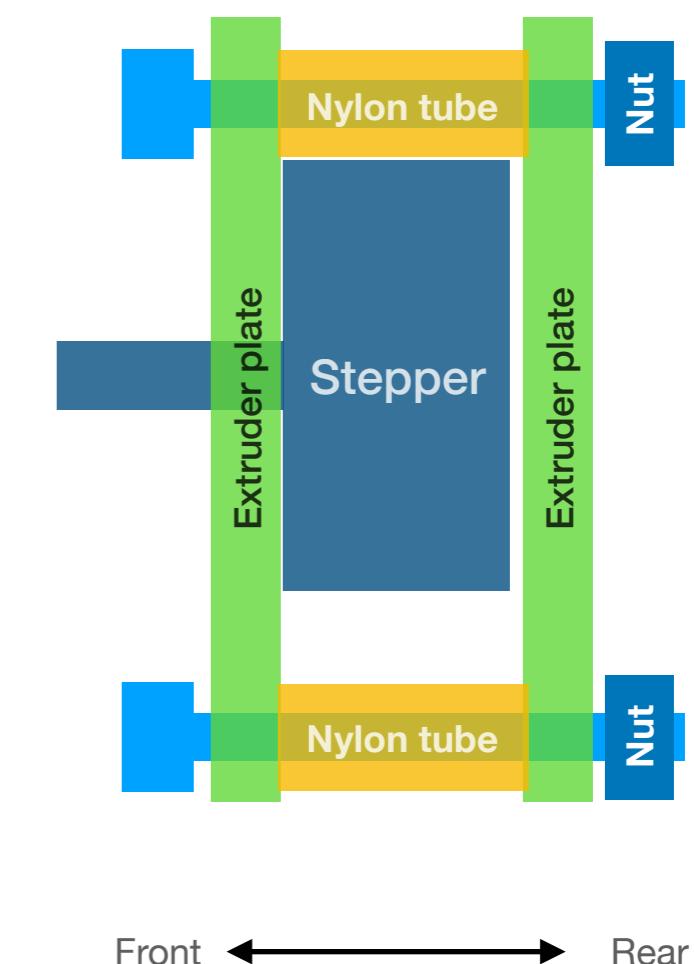
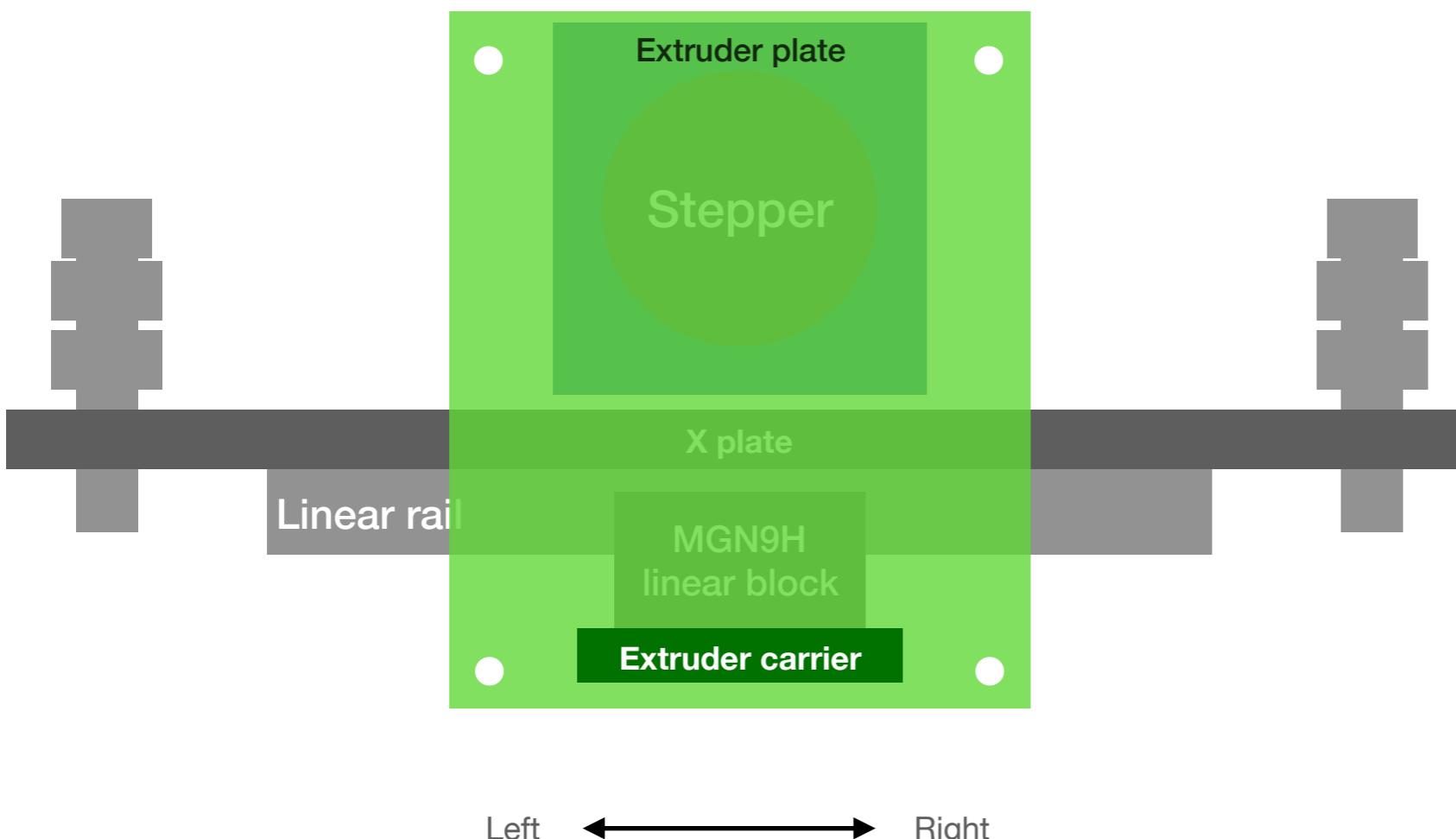
Action

1. Carefully and evenly press extruder carrier a little bit into both holes on extruder plates.
2. Put the stepper in between the plates.
3. Then you can squeeze the extruder plates in position by gradually and evenly tighten those 4 bolts and nuts.

Tip

If you still find it's difficult to assemble extruder plates, put extruder **carrier** into refrigerator for 10 minutes, and heat up extruder **plates** with hot water, then assemble them immediately.

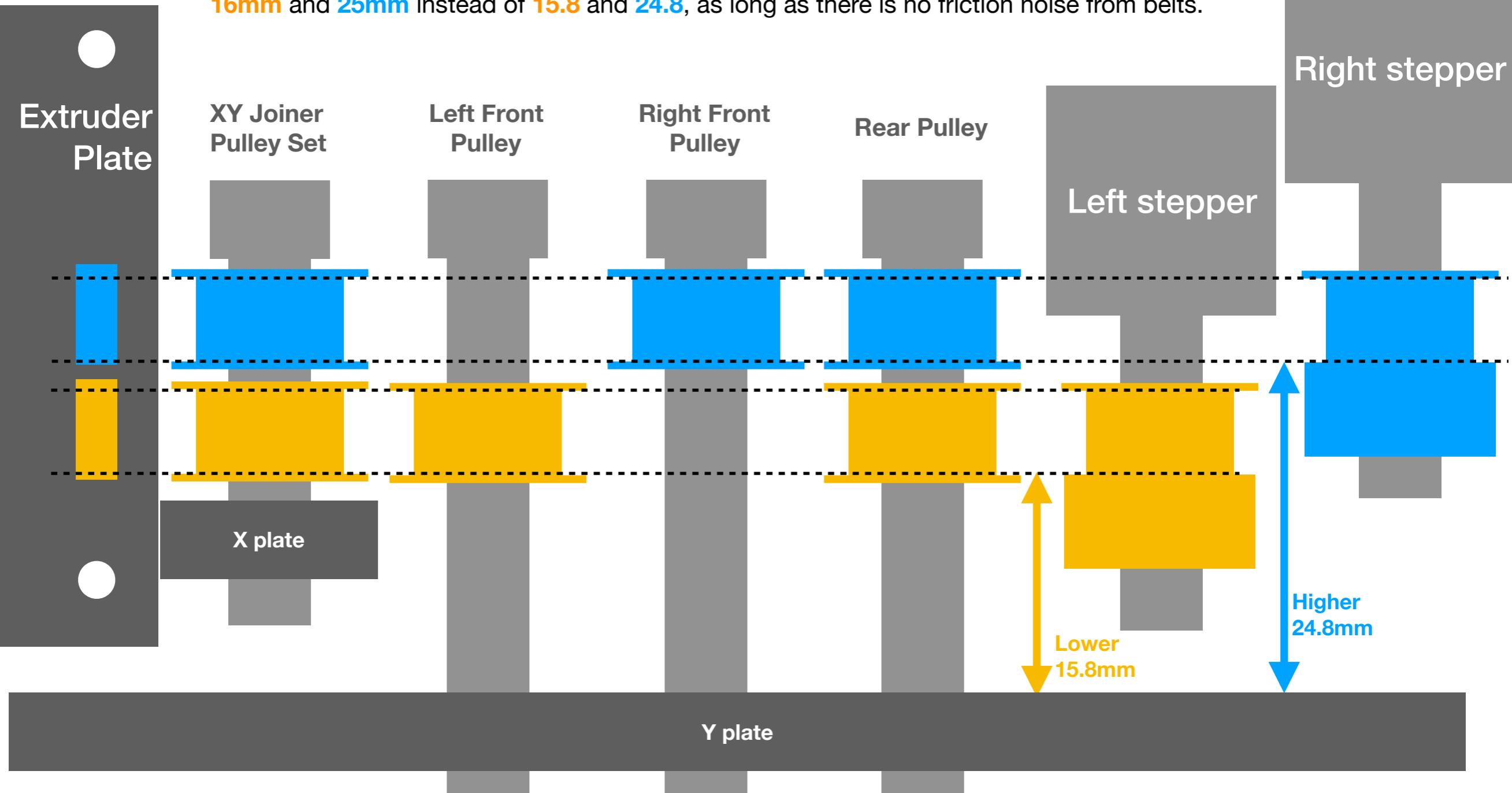
(Thermal expansion and contraction)



Heights of Gears & Pulleys

To make CoreXY mechanism work correctly and maximize belt life, all segments of a single belt should run in the same horizontal plane.

Adjust **lower** and **higher** heights of gears and pulleys with the number as shown. You can use **16mm** and **25mm** instead of **15.8** and **24.8**, as long as there is no friction noise from belts.



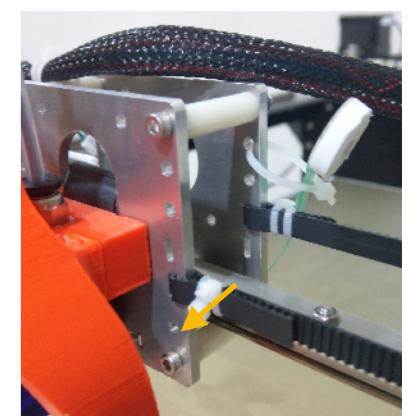
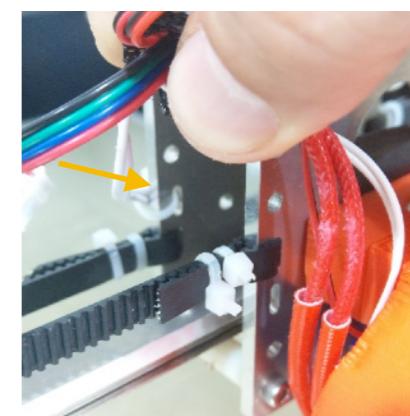
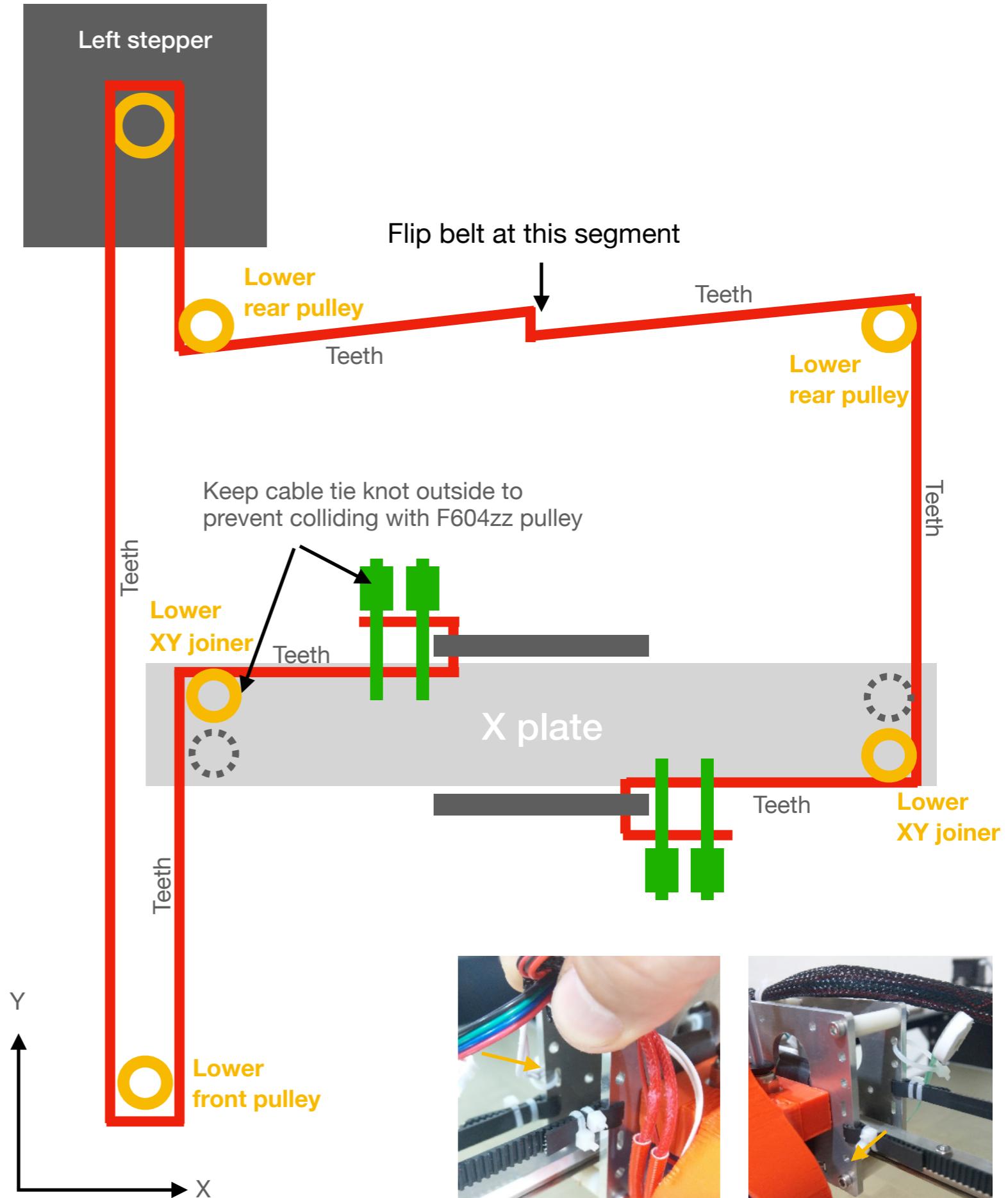
Attach Belt For Left Stepper

- 2GT 6mm belt
 - SK-Go: about 2 meter
 - SK-Mini: about 1.5 meter
- Cable ties

The face of belt teeth is indicated in the picture. Also note the segment for you to flip belt.

Actions

1. Push left stepper mount toward Y-min direction before attaching the belt.
2. Trim the belt as shown below. Pass it through the **lower holes** and **pulleys** as shown in the picture and tie it up.
3. Pull stepper mount toward Y-max direction to tighten the belt.

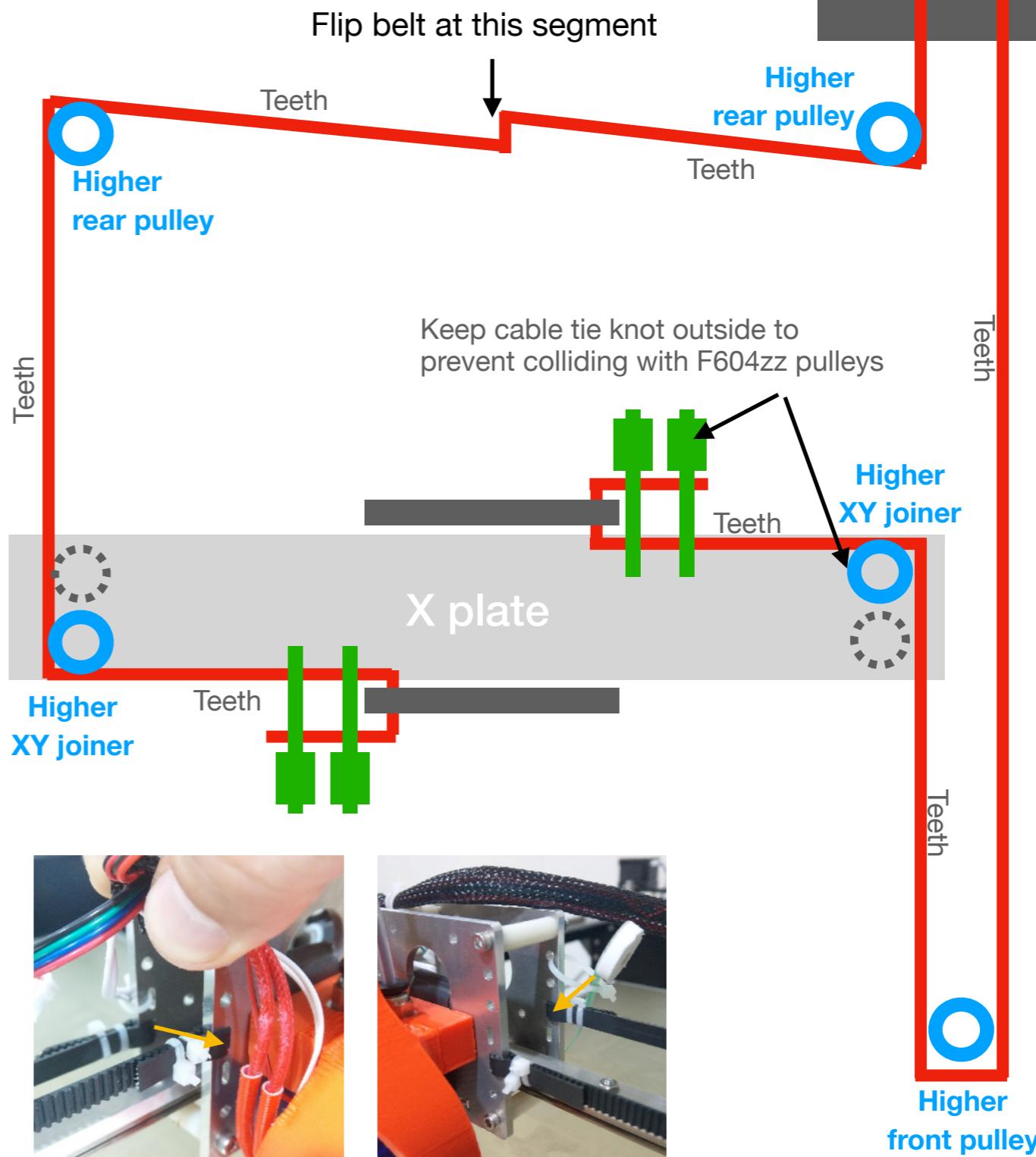


Attach Belt For Right Stepper

- 2GT 6mm belt about 2 meter
- Cable ties

Actions

Pass the belt through the **upper holes** and **pulleys** as shown in the picture and tie it up.

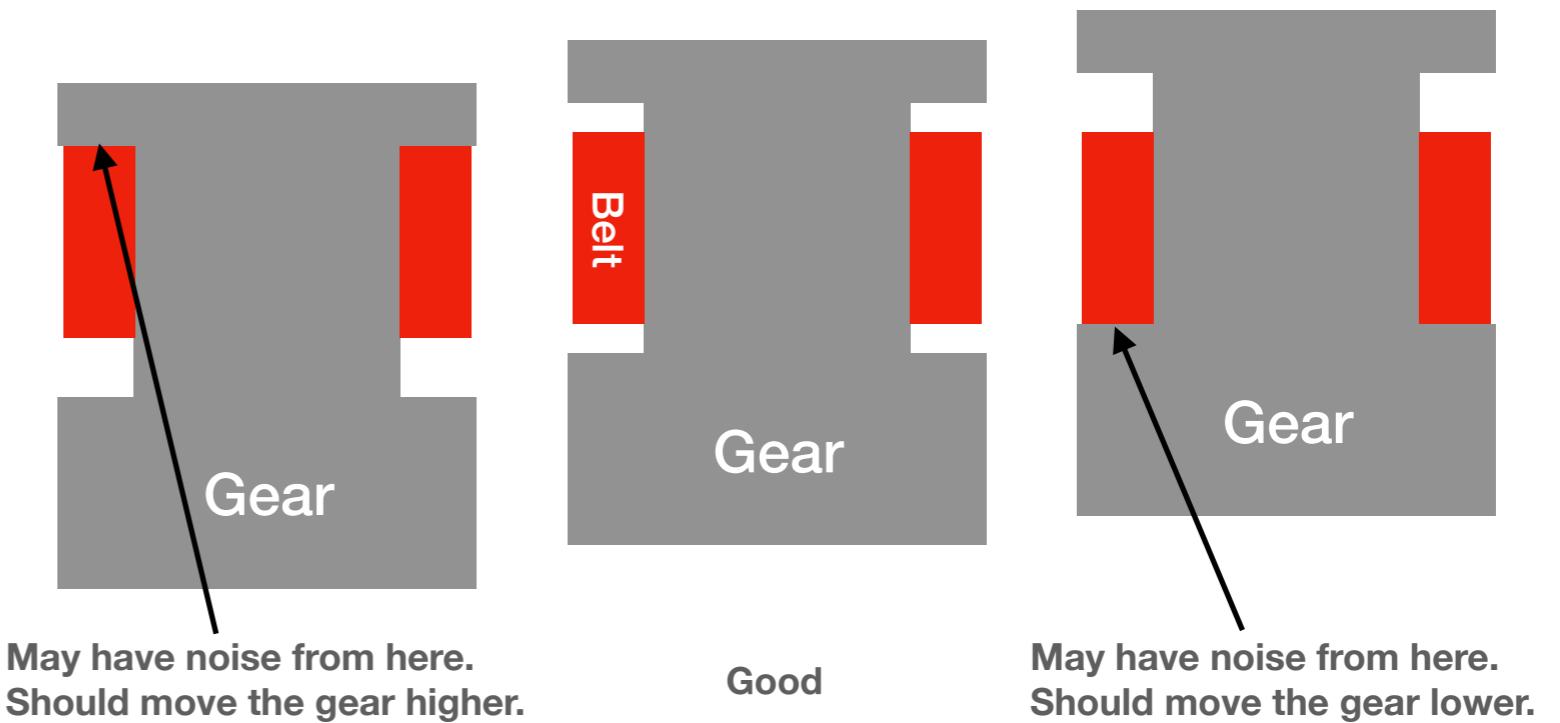


Adjust Heights of Gears & Pulleys

Exam

With correct adjustment, there should be no friction noise from between belt and pulleys when manually pulling the extruder.

Remember to tighten screws on the gears.



11

Extruder

Assembly the Extruder

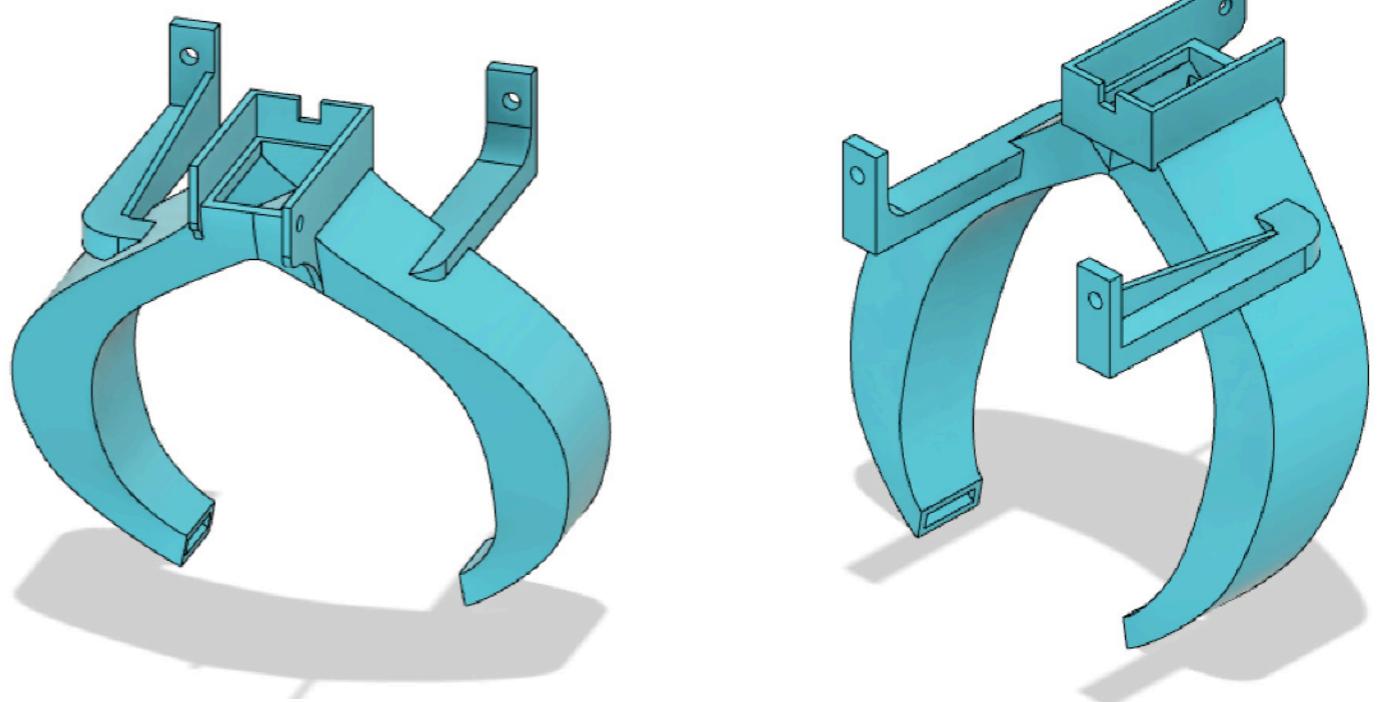
Please search the according assembly instructions online.

Part-cooling Fan Duct

- 1 4cm blower
- 1 bolt M3 x 20
- 2 bolts M3 x 8
- 3 nuts M3

Action

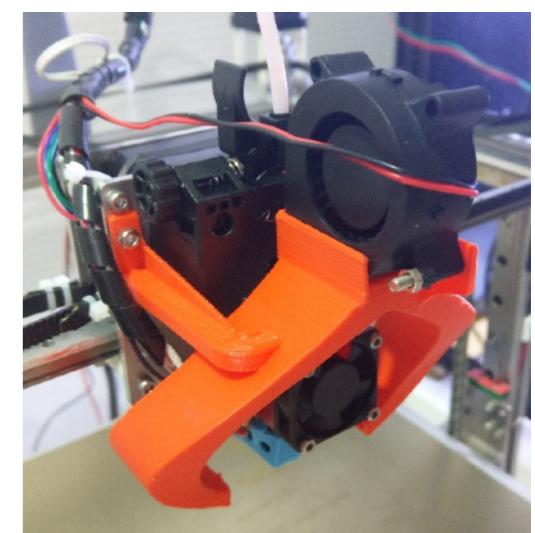
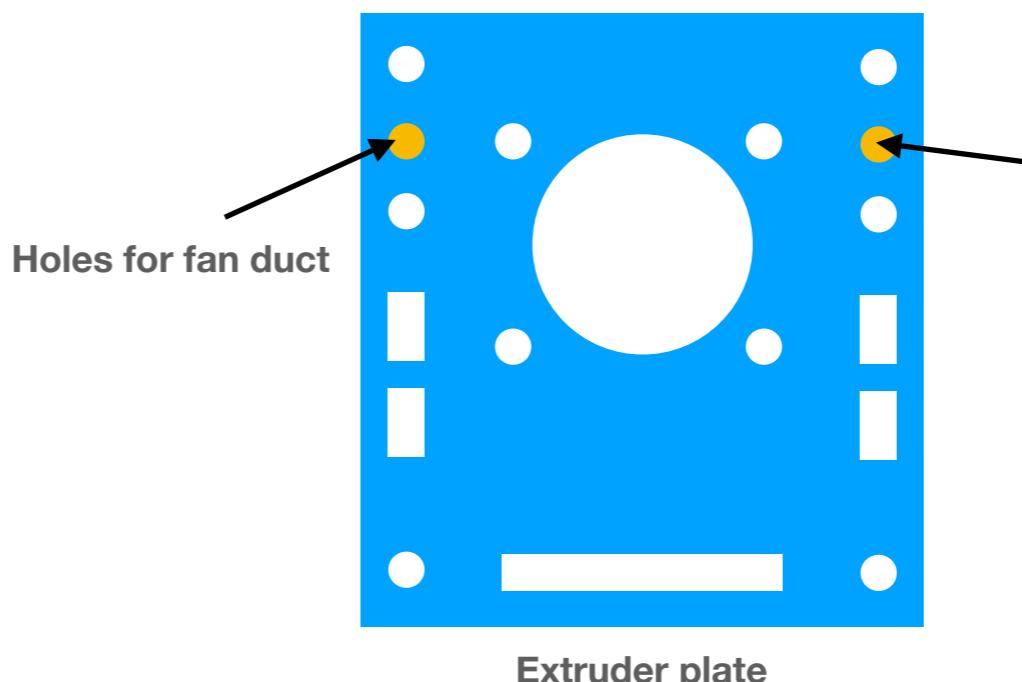
The printed fan duct is shipped with supports attached for more protection. Carefully remove those supports with a plier.



Assemble the blower and fan duct onto extruder plate.

If you want fan duct for Titan bowden setup, or for direct E3D volcano hot-end, please download STLs and print them by yourself.

<https://seckit3dp.design/docs/>



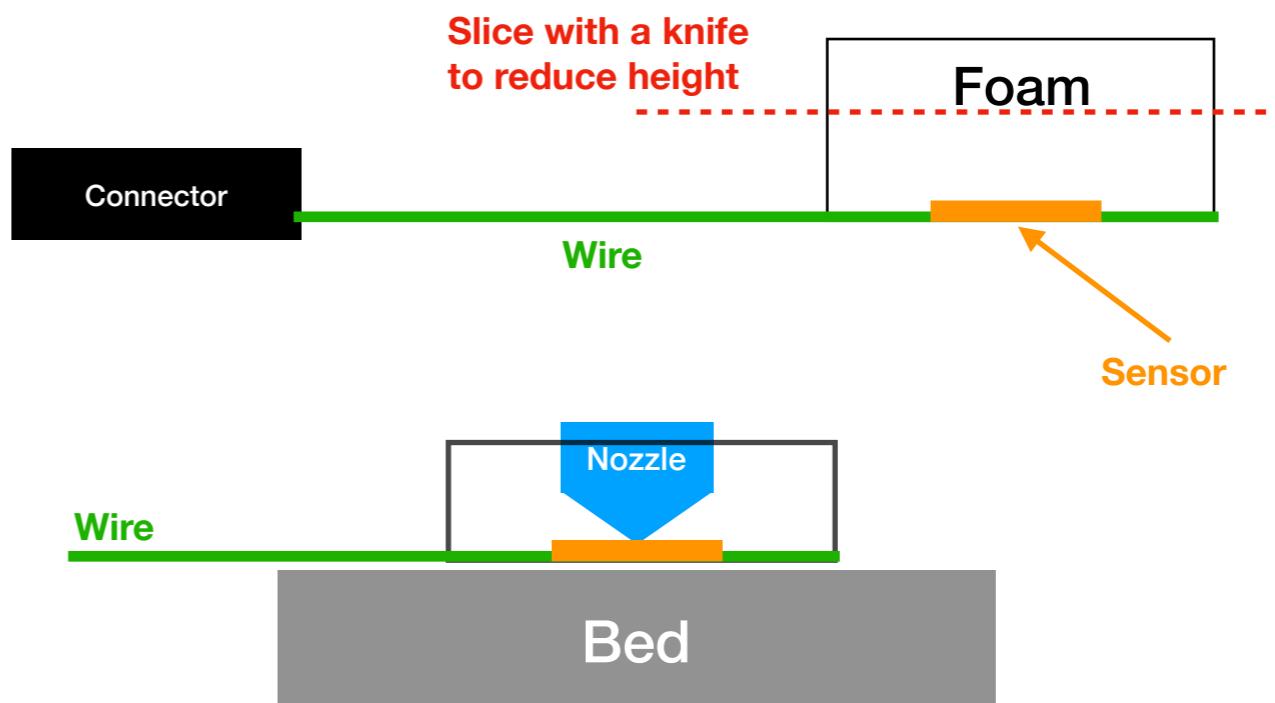
Auto Bed Leveling Sensor

- ABL sensor

Action

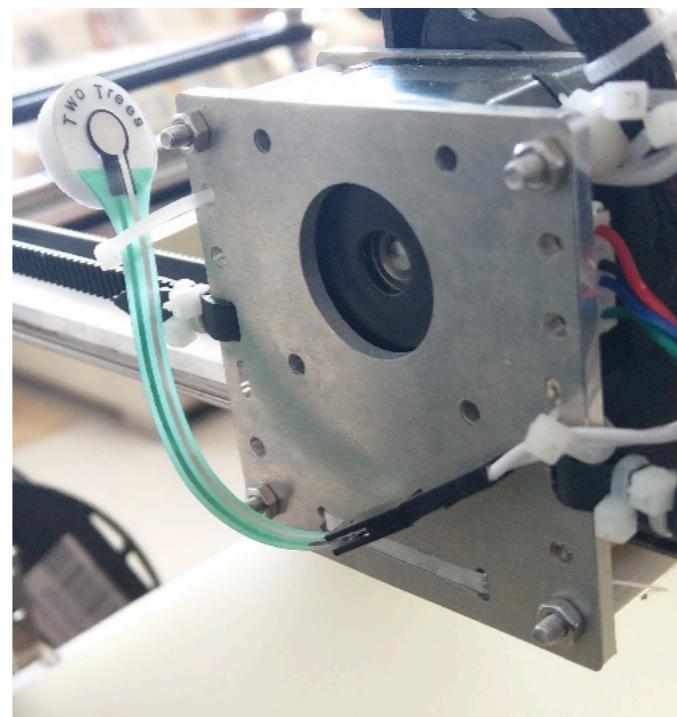
Considering the usage frequency and to minimum the weight of extruder, a “force sensitive resistor” (FSR) type of sensor is used as auto bed leveling sensor.

Remove extra foam so the nozzle can touch sensor when it is capped onto nozzle.

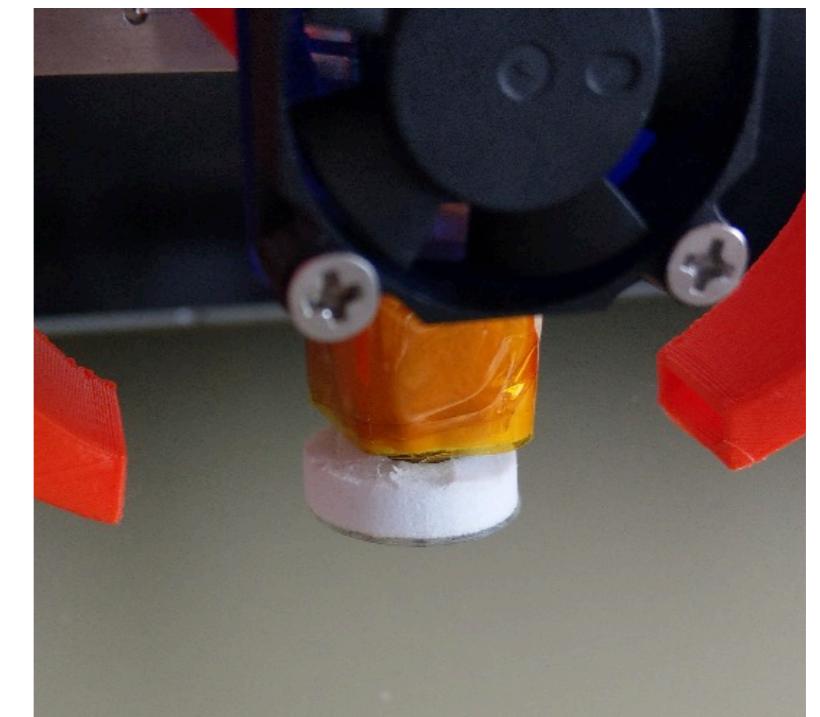


Exam

Use the ABL sensor only when the nozzle is cooled down, or the foam and plastic will be melt.



Piggyback the sensor at the extruder plate when not in-use

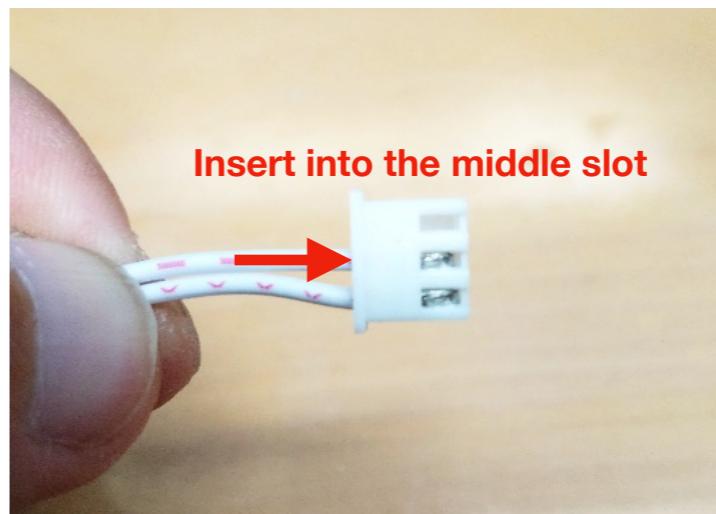
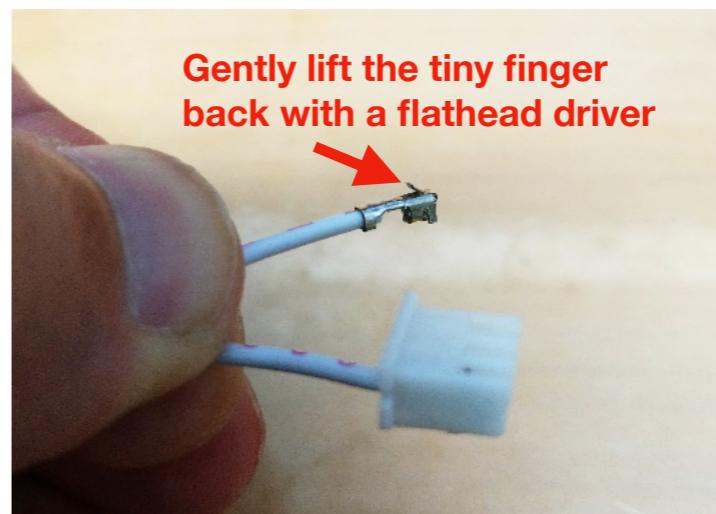
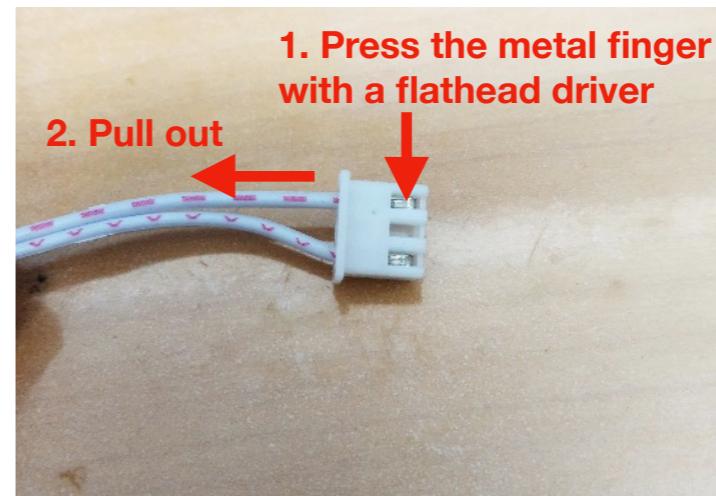


Cap the sensor at cooled-down nozzle to build bed leveling mesh

Auto Bed Leveling Sensor

Action

Move the pointed wire of FSR to the middle slot of XH2.54 male connector for SKR v1.3 to be triggered correctly.

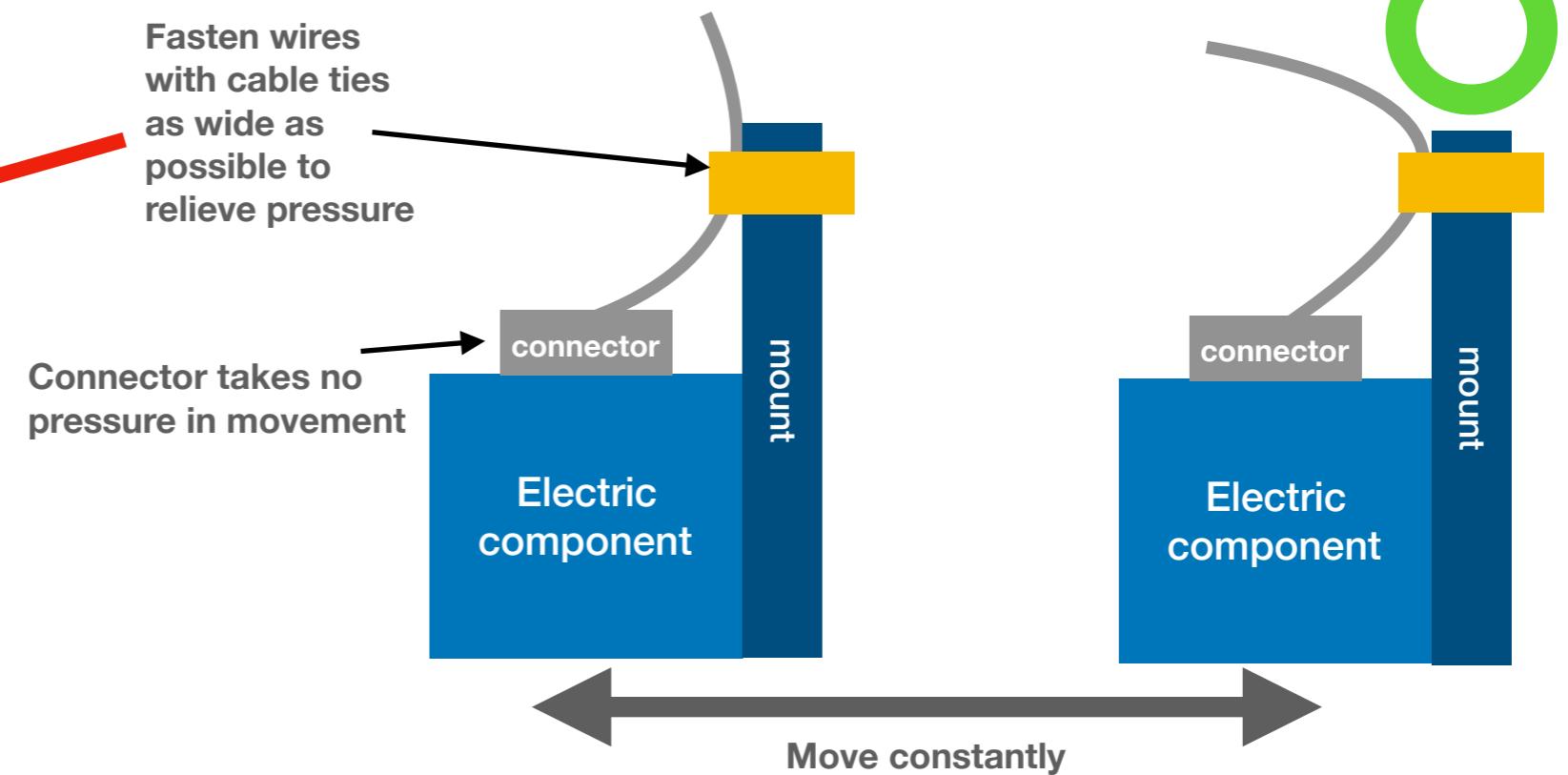
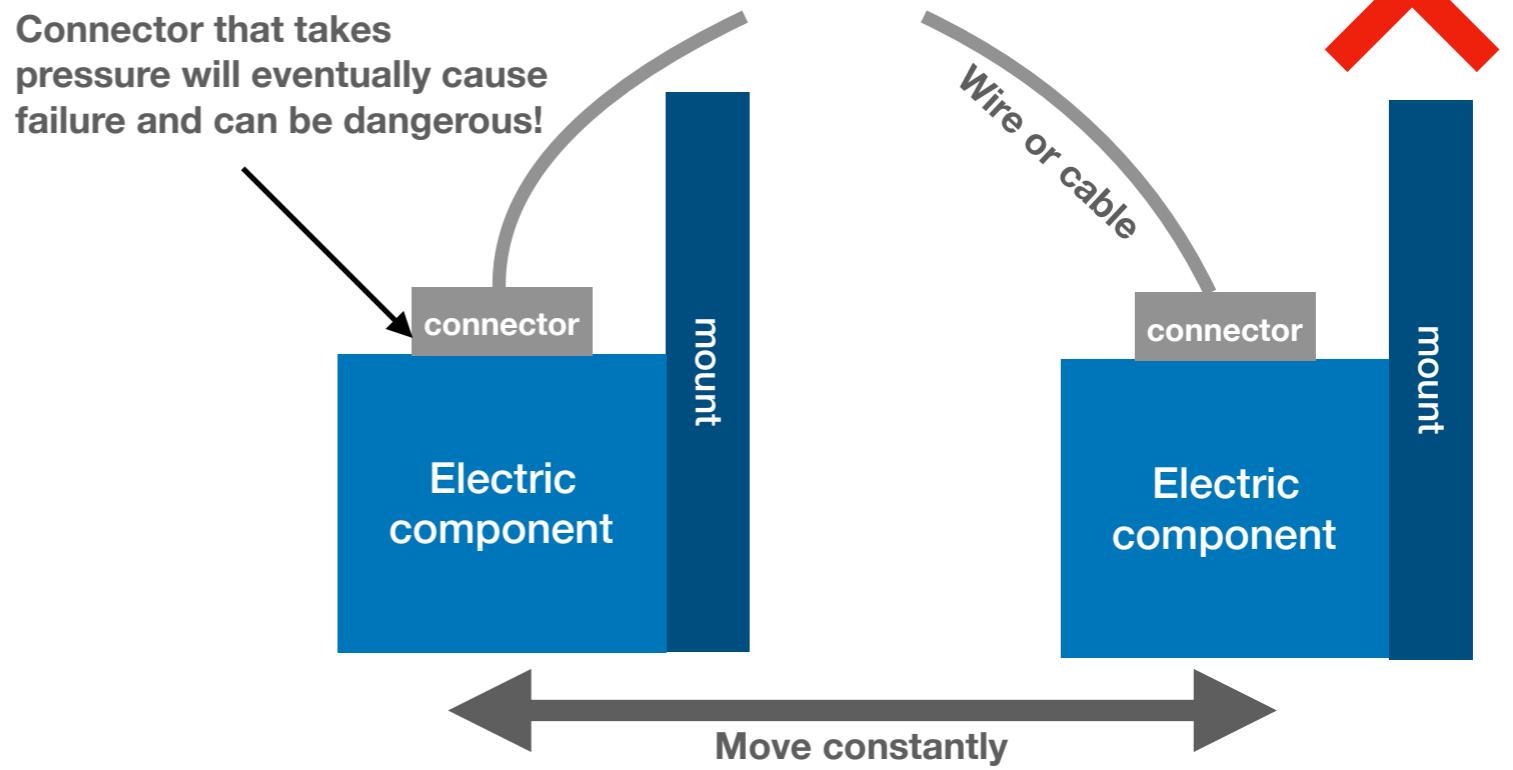
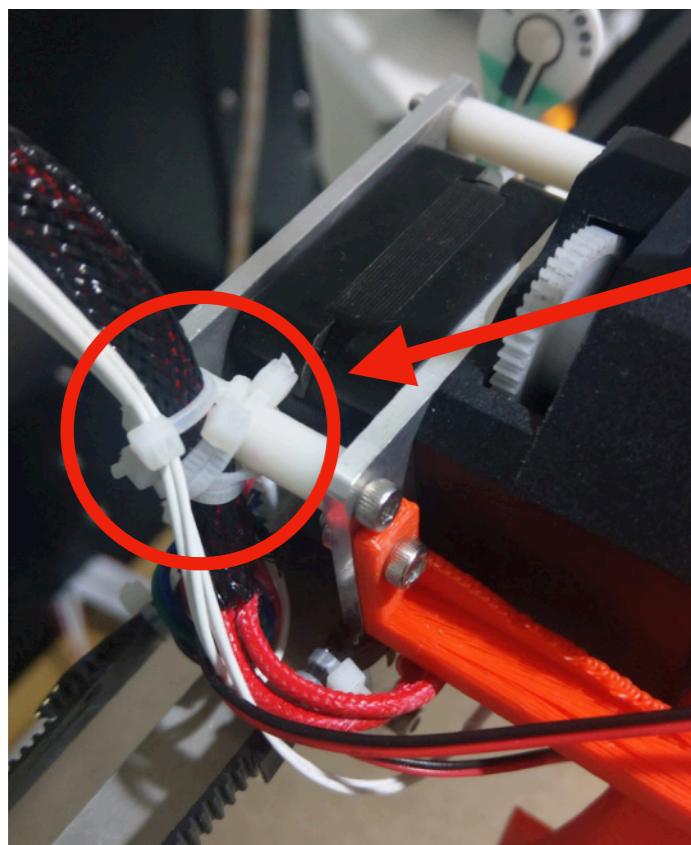


Secure Wires Safely

Action

Any movement on connectors will eventually cause failure. **Ensure all wires attached to moving components are securely held/fixed in position to relieve pressure on connectors** and help prevent damage to connectors and/or wires.

Also avoid sharp bending which might break shielding or wire, and cause short-circuit.



12

Wiring Diagram

DANGER!
Electric shock risk

Electricity can be fatal and you should be qualified
and confident to carry out any electric work.

Power Socket Bracket — Power Supply Unit

Caution! Wrong connection might cause short circuit and electric shock!

Action

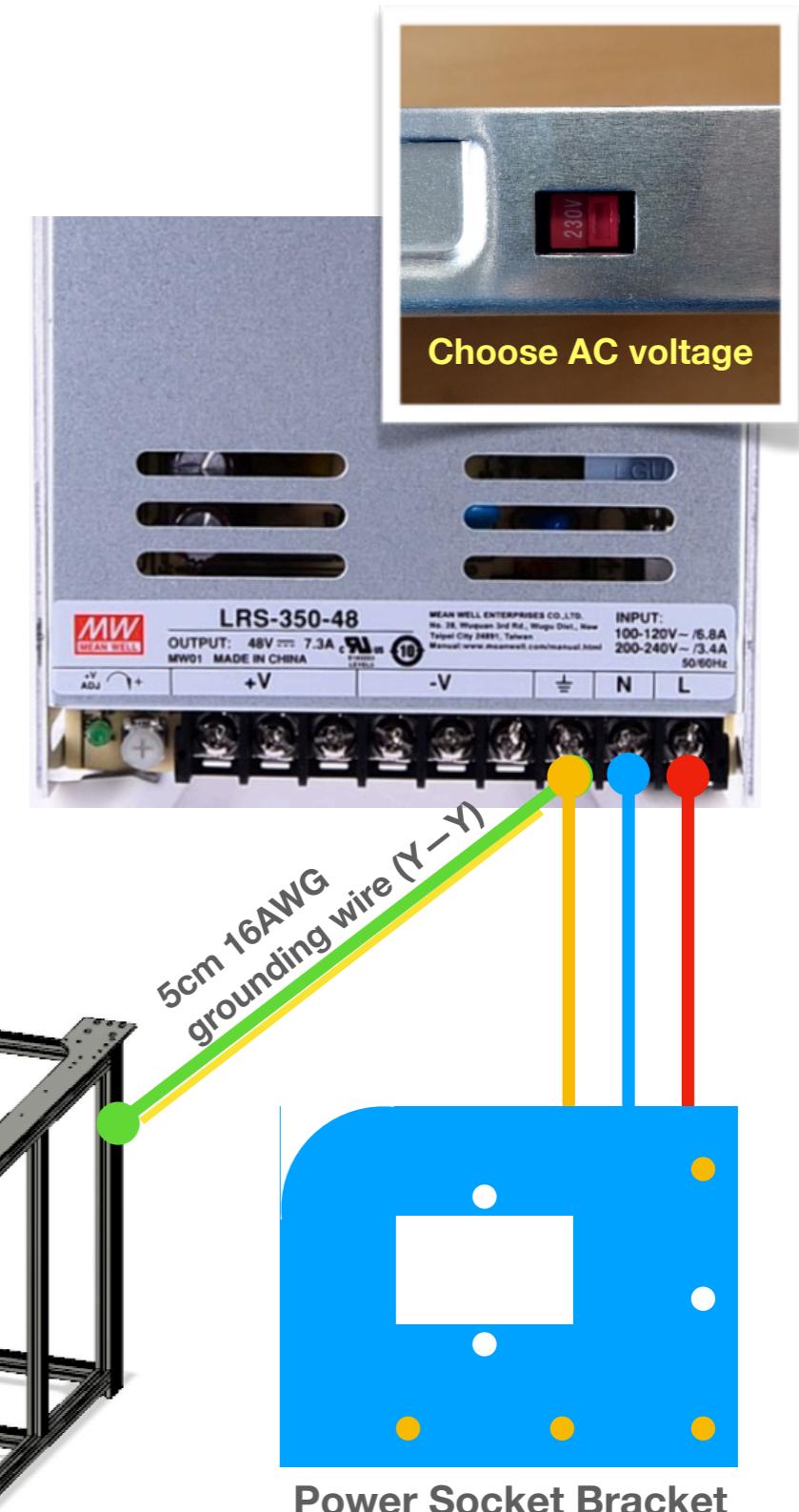
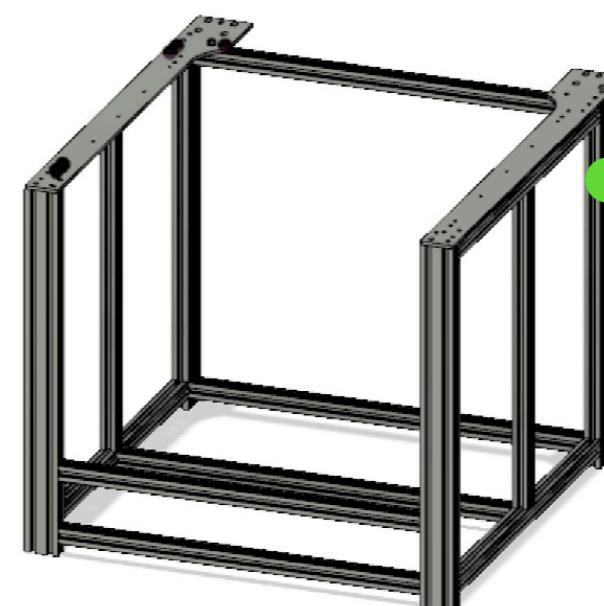
Before connecting other electronic components, test the power supply unit independently first.

1. Make sure you have chosen the AC voltage in the PSU suitable for your country.
2. Connect the red, black and blue wires of the power socket to L, N, and \pm (ground) terminals on the PSU.
3. Connect the 15cm grounding wire to the frame
4. Turn the switch ON and see if the indicator is lit. The fan will turn only when temperature condition is met.
5. If you have a multi-meter, verify voltages of each terminal.

Connect the grounding wire to the frame. If your frame is black, grind the black layer off so the wire contacts with bare aluminum material.

Under normal condition there is NO electricity at the grounding wire and frame. The grounding wire provides a bypass path in short circuit condition and prevent you from electric shock.

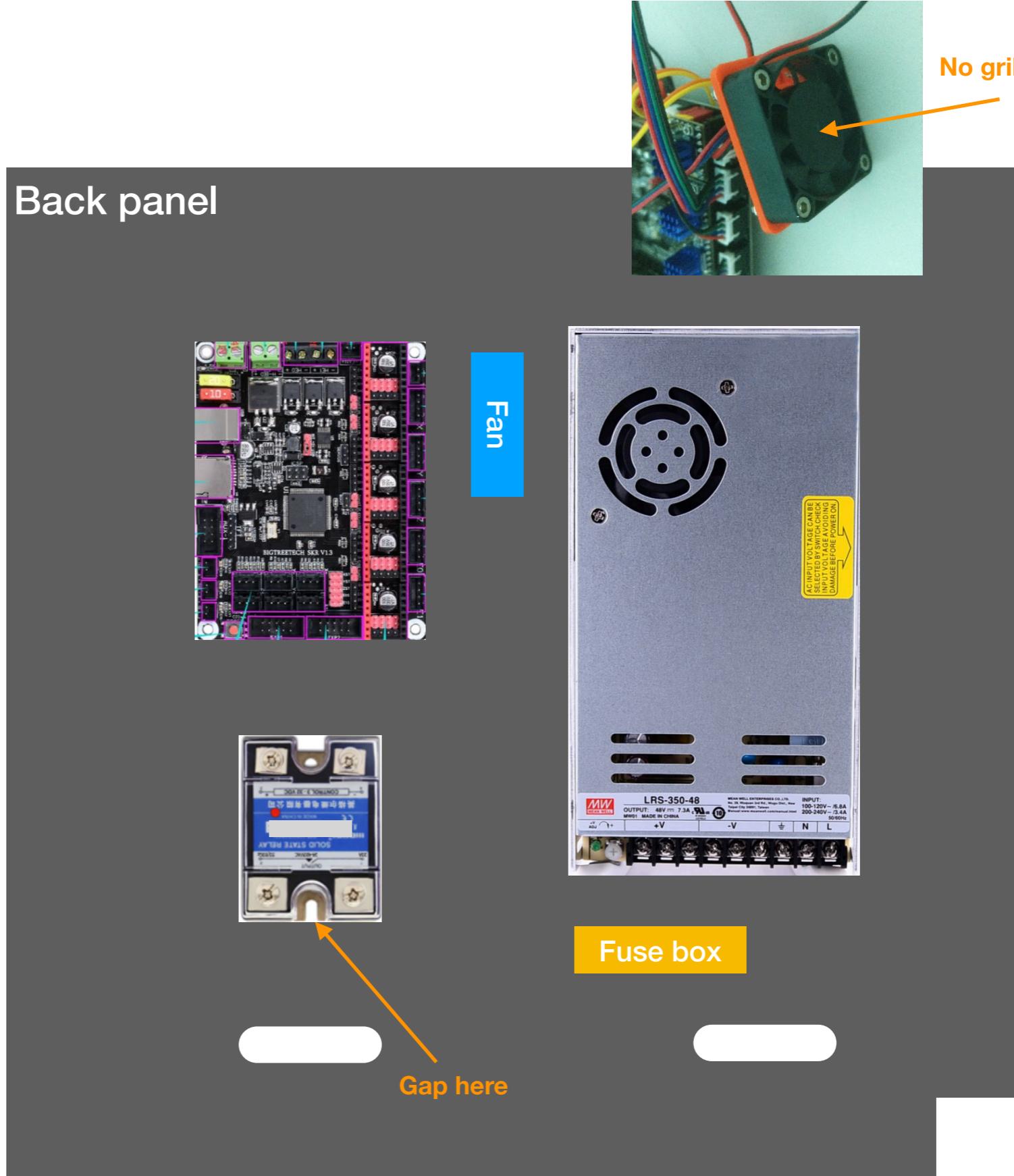
If an abnormal short circuit condition happens, the circuit breaker in your house breaks and stops providing electricity immediately.



Attach Electronics

- Power Supply Unit
 - 4 round head bolts m4 x 8
- Control board
 - 4 bolts M3 x 20
 - 4 nuts M3
 - 4 nylon tubes M3 x 7 x 10
 - 4 washers M3 x 6 x 1.0
- Solid State Relay (SK-Go only)
 - 2 bolts M4 x 10
 - 2 nuts M4
 - 2 washers M4 x 12 x 1
- Fuse Box
 - 1 bolts M4 x 10
 - 1 washers M4 x 9 x 0.8
- 4010 Driver-cooling fan
 - Printed driver-cooling fan mount
 - 2 bolts m3 x 20
 - 1 bolts m4 x 10
 - 2 nuts m3
 - 1 nuts m4
 - 1 washers m4 x 12 x 1

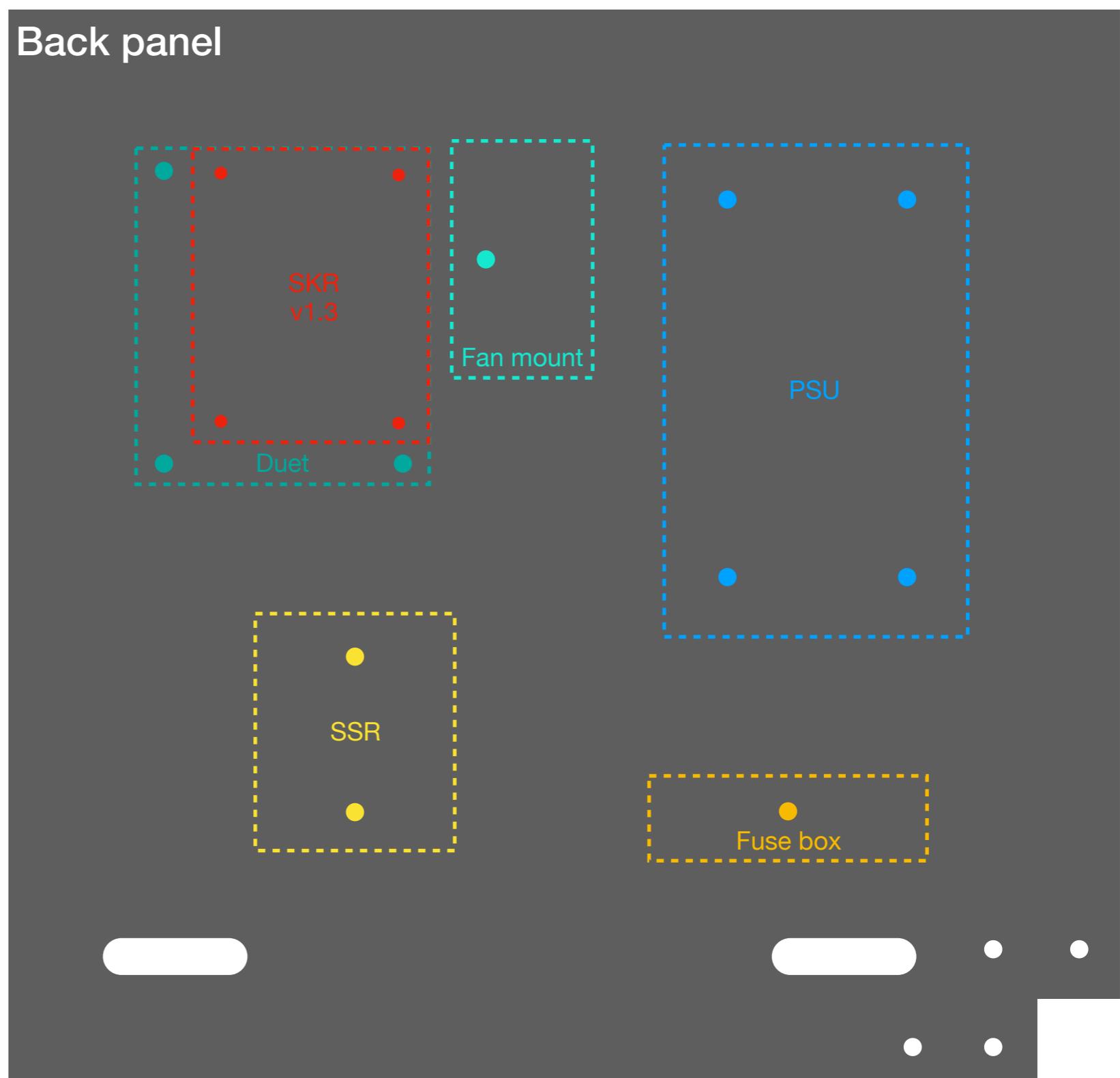
Back panel



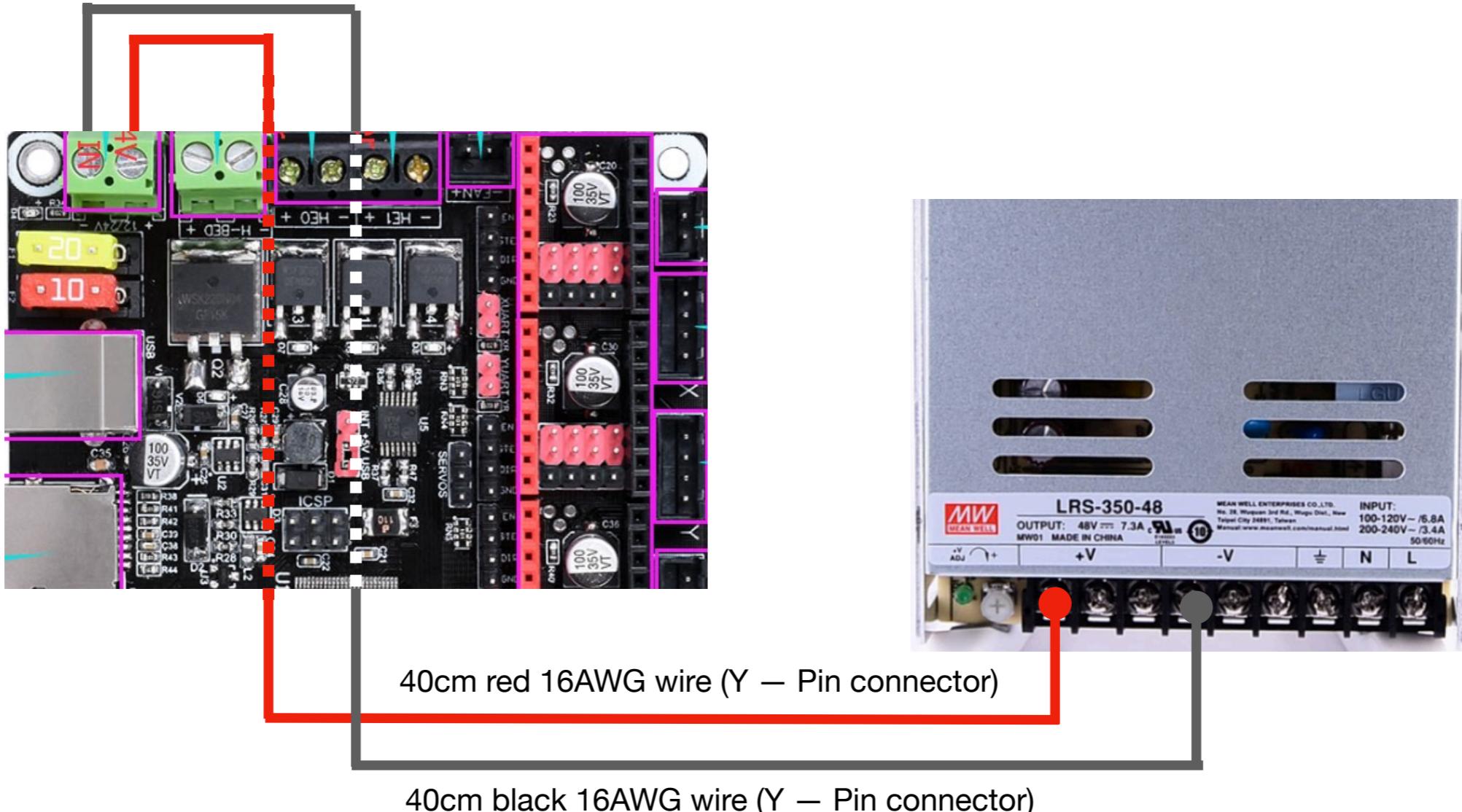
Attach Electronics

Bolt electronics onto back panel using holes shown as in the picture.

If you need more holes, ACM board is easy to be drilled by yourself.



PSU – SKR v1.3 (SK-Go)

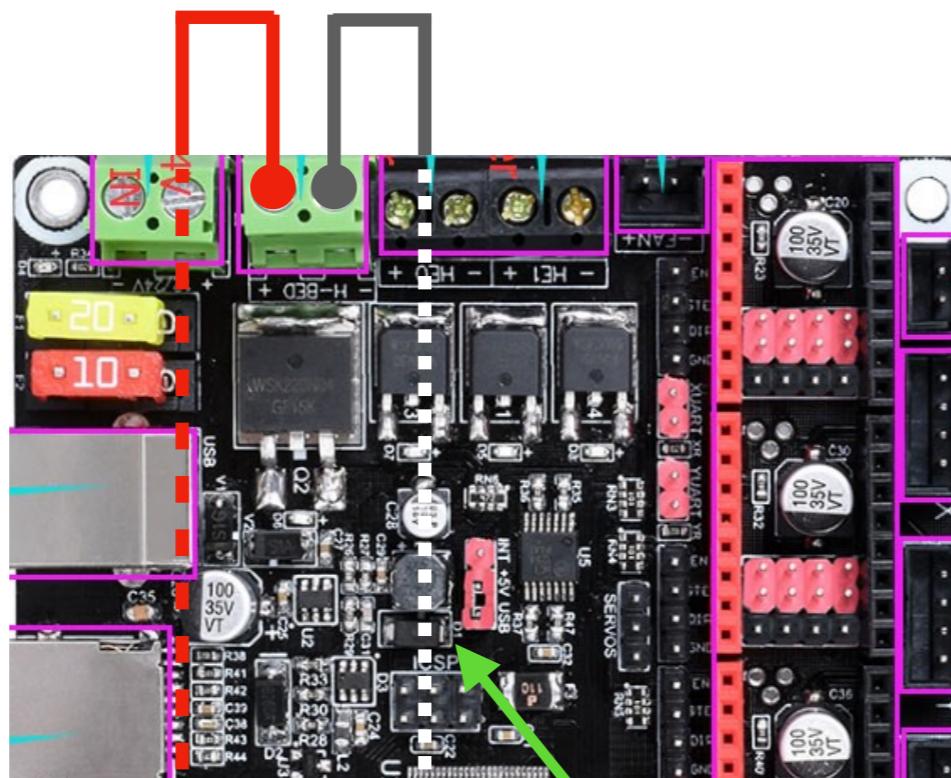


AC-Powered Bed Heater (SK-Go)

Some SK-Go kits shipped in Jan and Feb 2020 have shorter wires on bed heater. Please follow the figure in the doc below for bed heater wiring:

[\[en\] Workarounds for short bed heater wire on SK-Go.pdf](#)

22cm 20AWG red wire (pin–pin connector)
22cm 20AWG black wire (pin–pin)



Wires from heater have no polarity since they are AC powered.



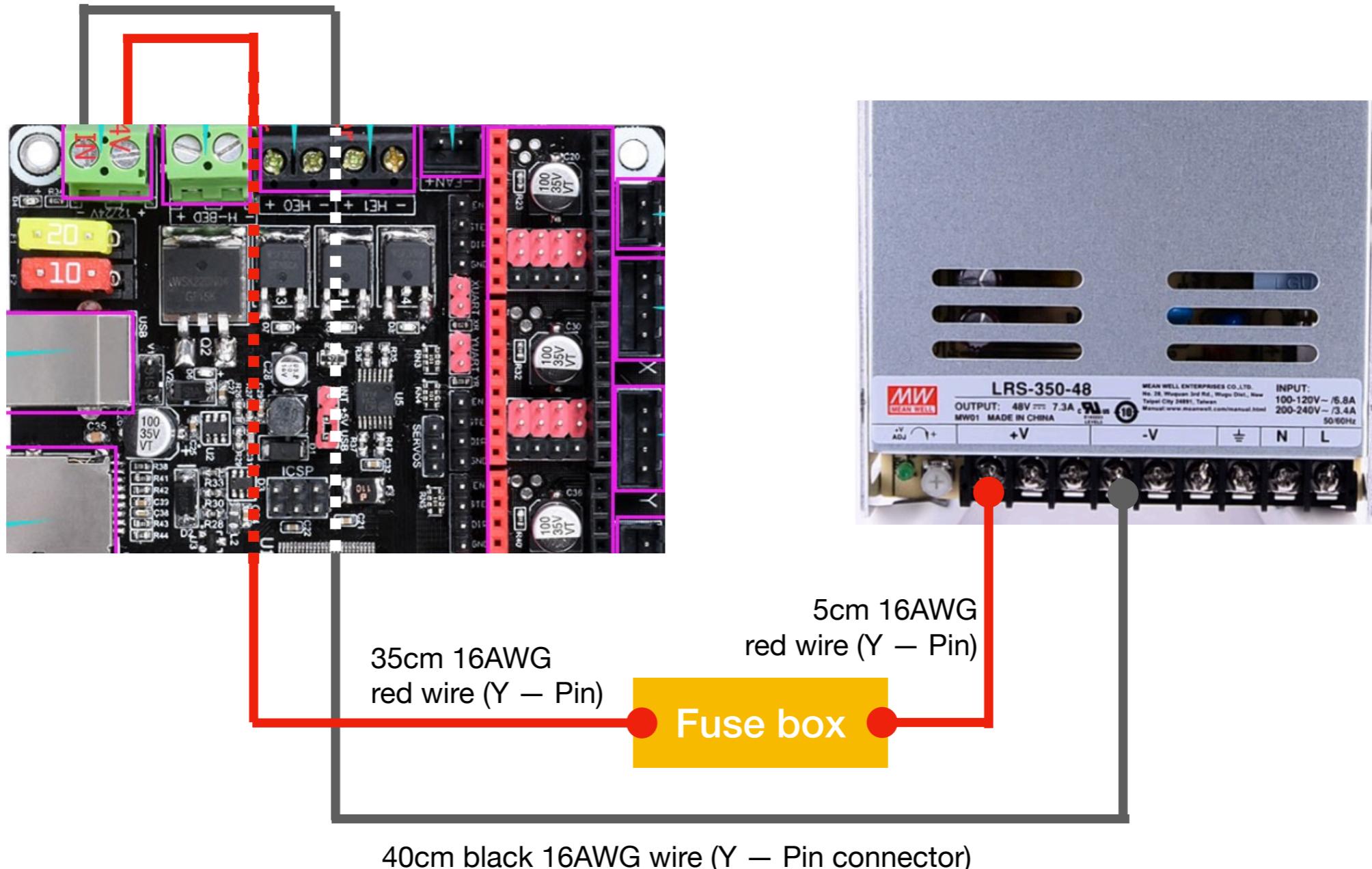
Pass wires under SKR

8cm 16AWG
red wire (Y–Y)

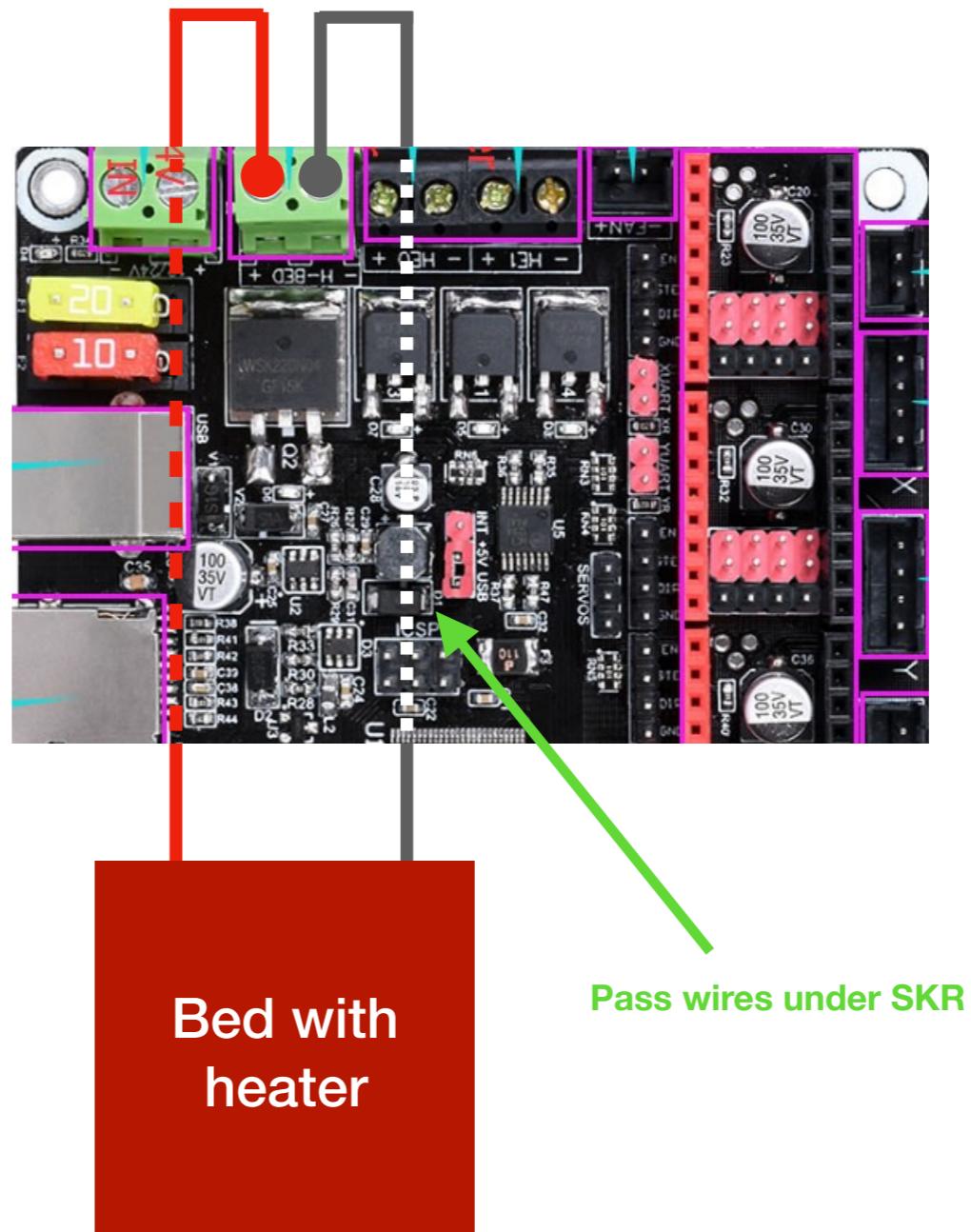
Fuse box

8cm 16AWG
red wire (Y–Y)

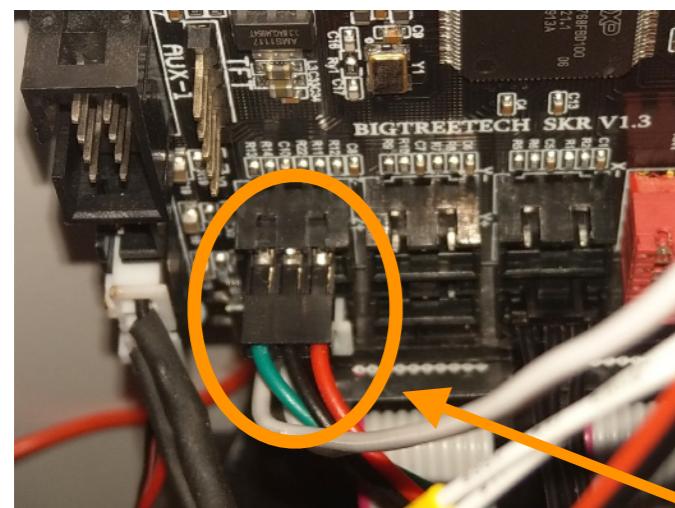
PSU – SKR v1.3 (SK-Mini)



DC-Powered Bed Heater (SK-Mini)

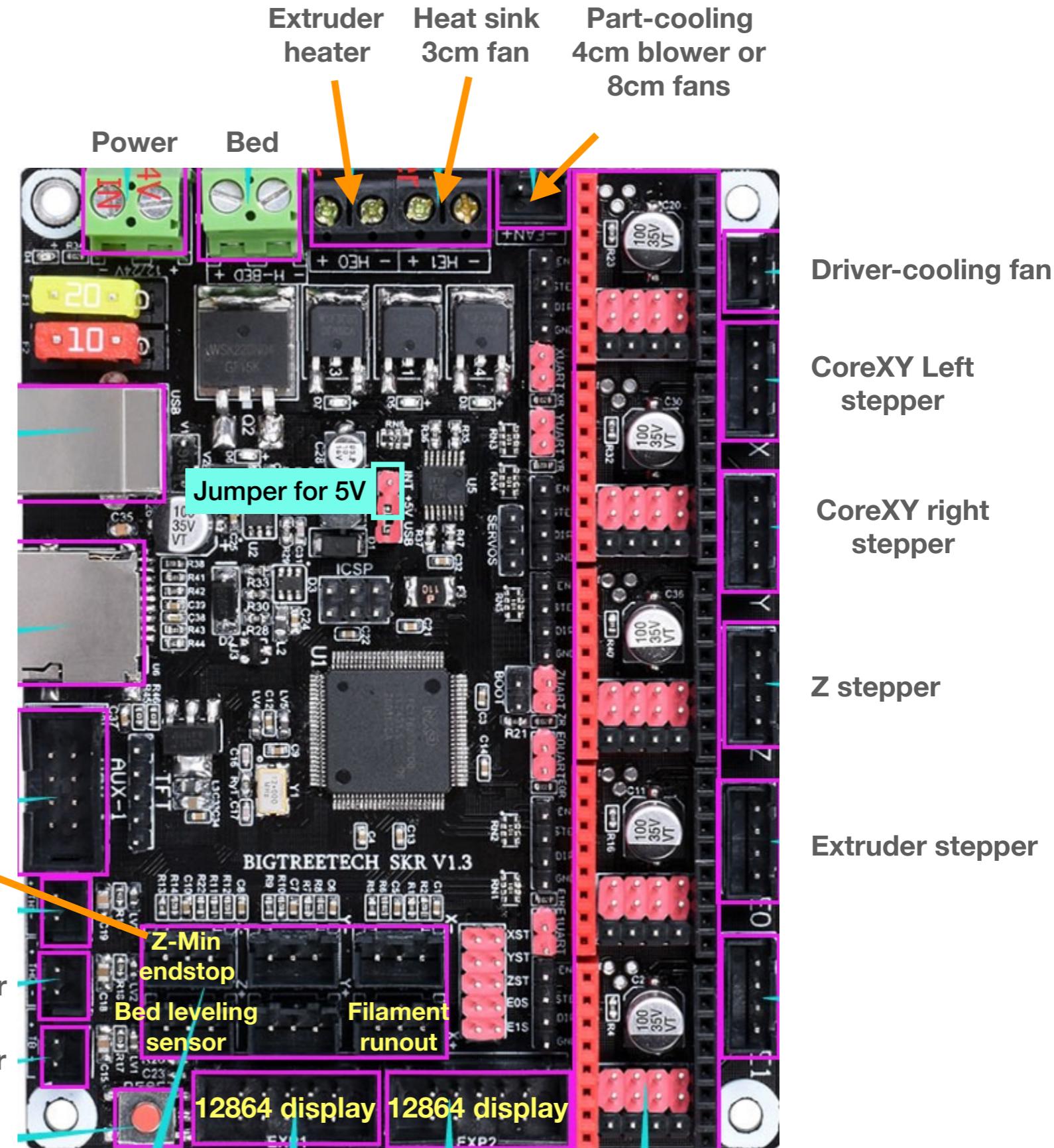


SKR v1.3 Pins

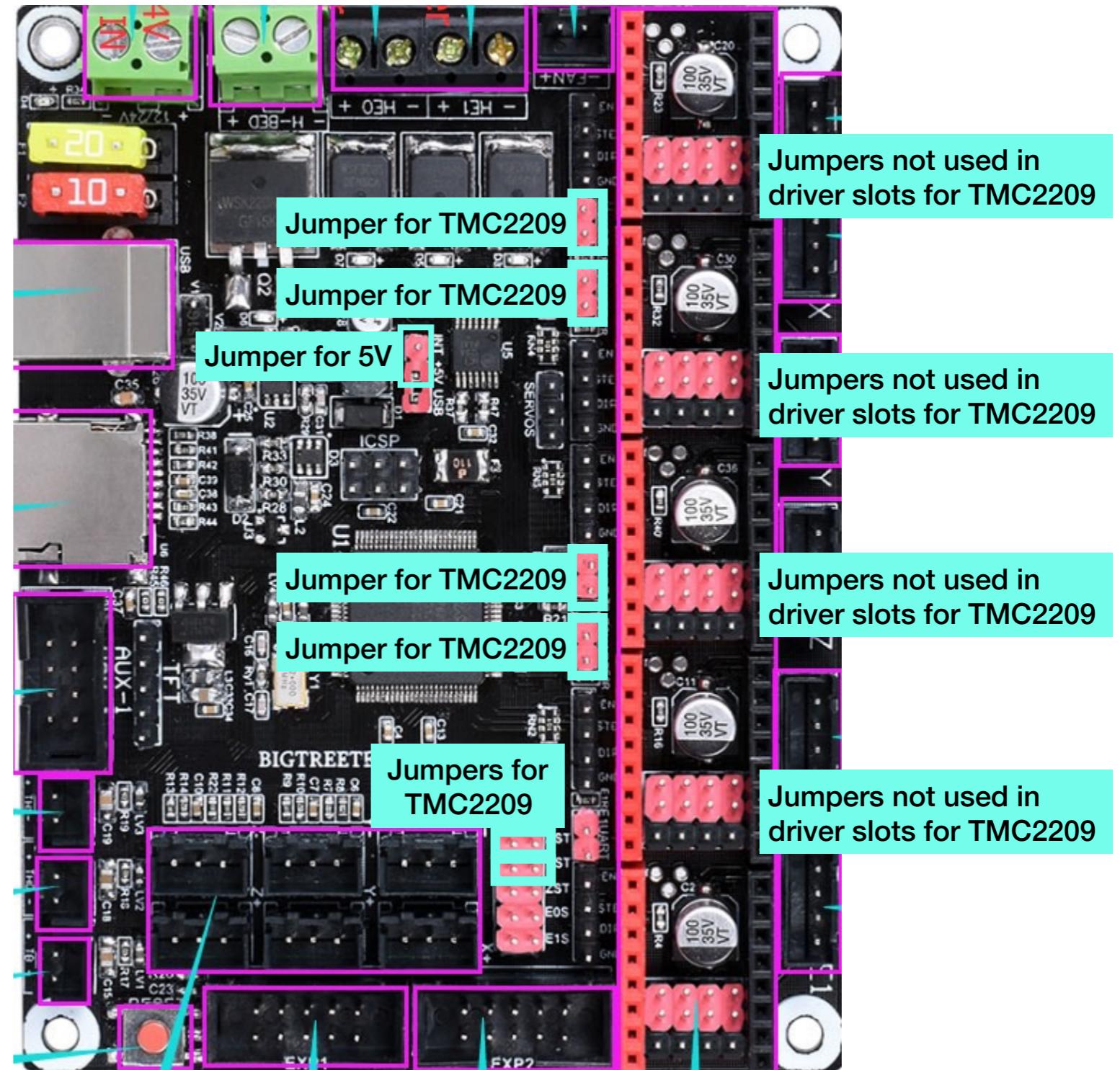


Extruder thermistor

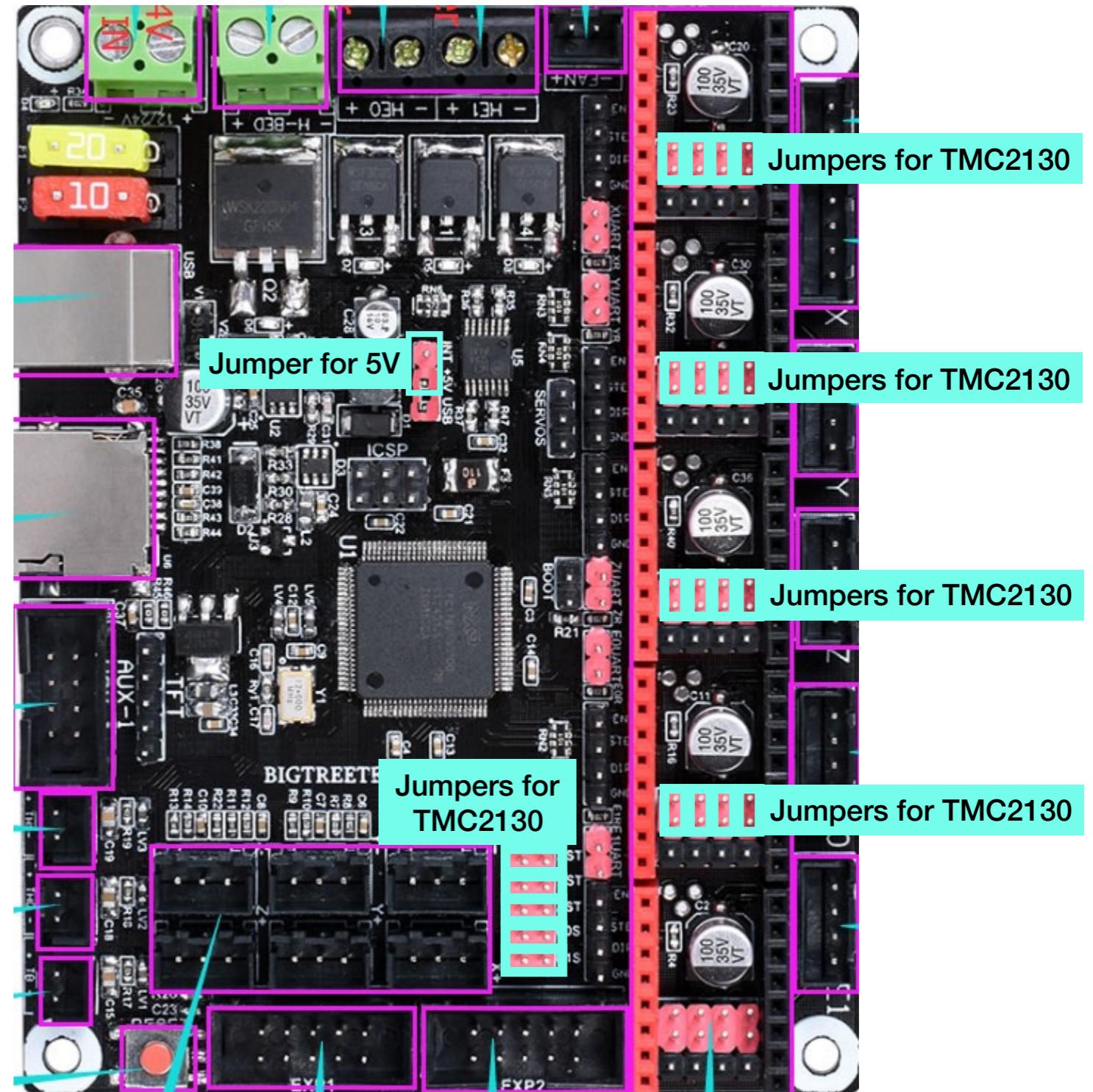
Bed thermistor



SKR v1.3 Jumpers for TMC2209



SKR v1.3 Jumpers for TMC2130



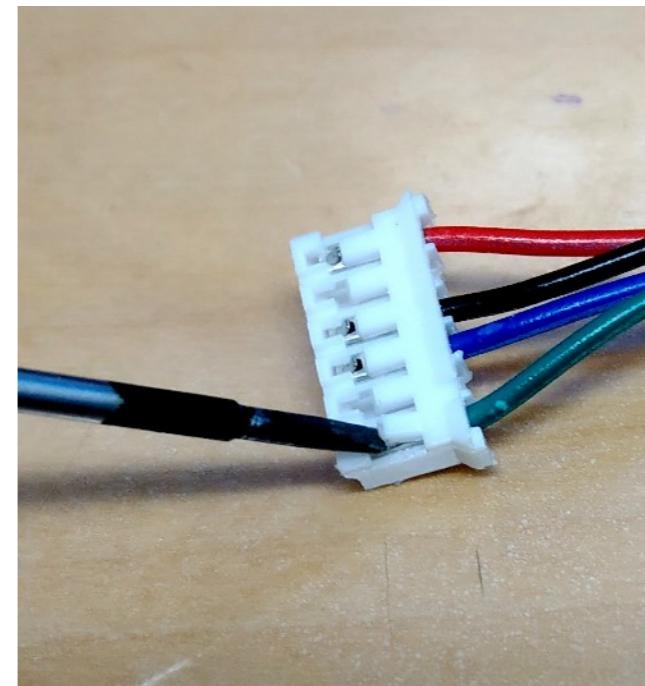
Stepper Cable

Action

Wire sequence of stepper cable differ from various suppliers.

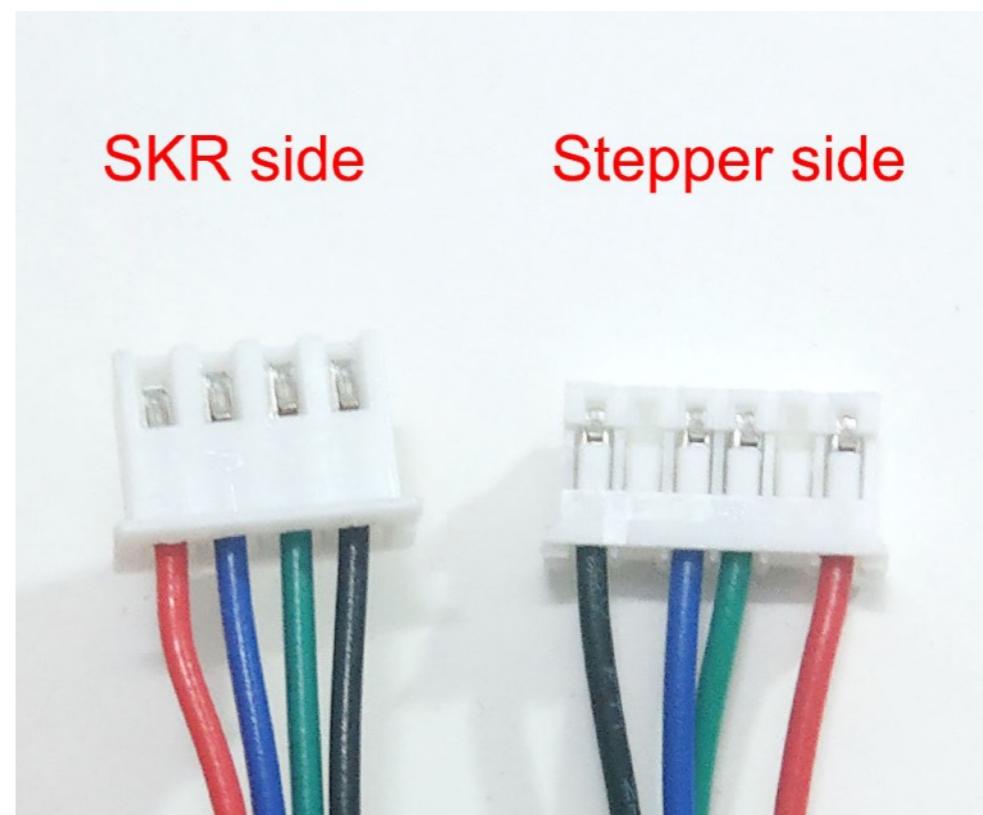
With default SK-Go firmware please make sure your stepper cables are of the same color sequence as shown in the pictures. Gently swap the wire with a small flathead screwdriver if the sequence is different.

Or, you can change INVERT_?_DIR parameters in Marlin *Configuration.h* file and compile a customized binary.



SKR side

Stepper side



Exam

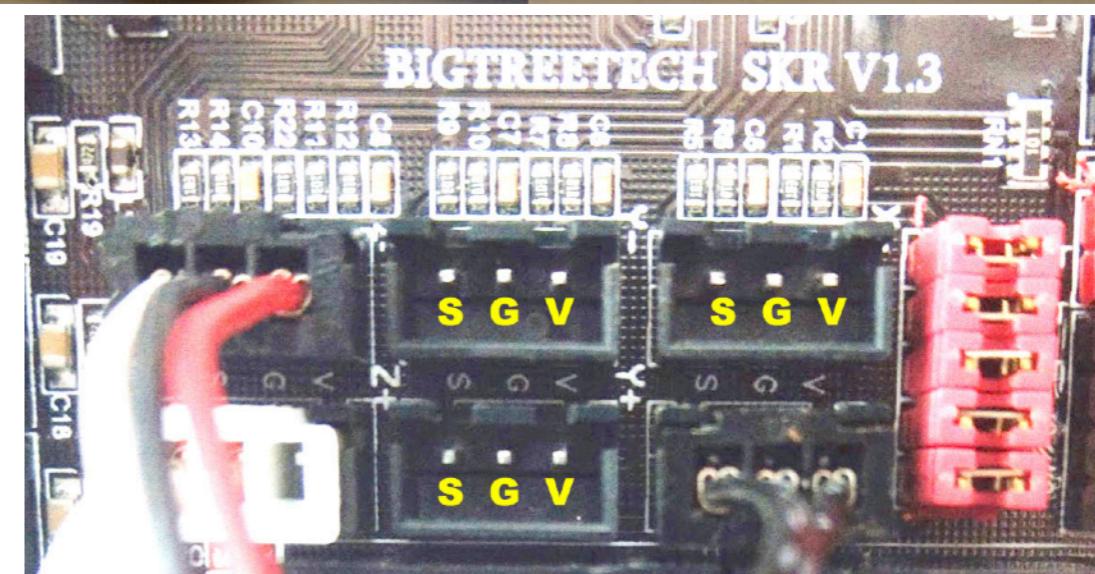
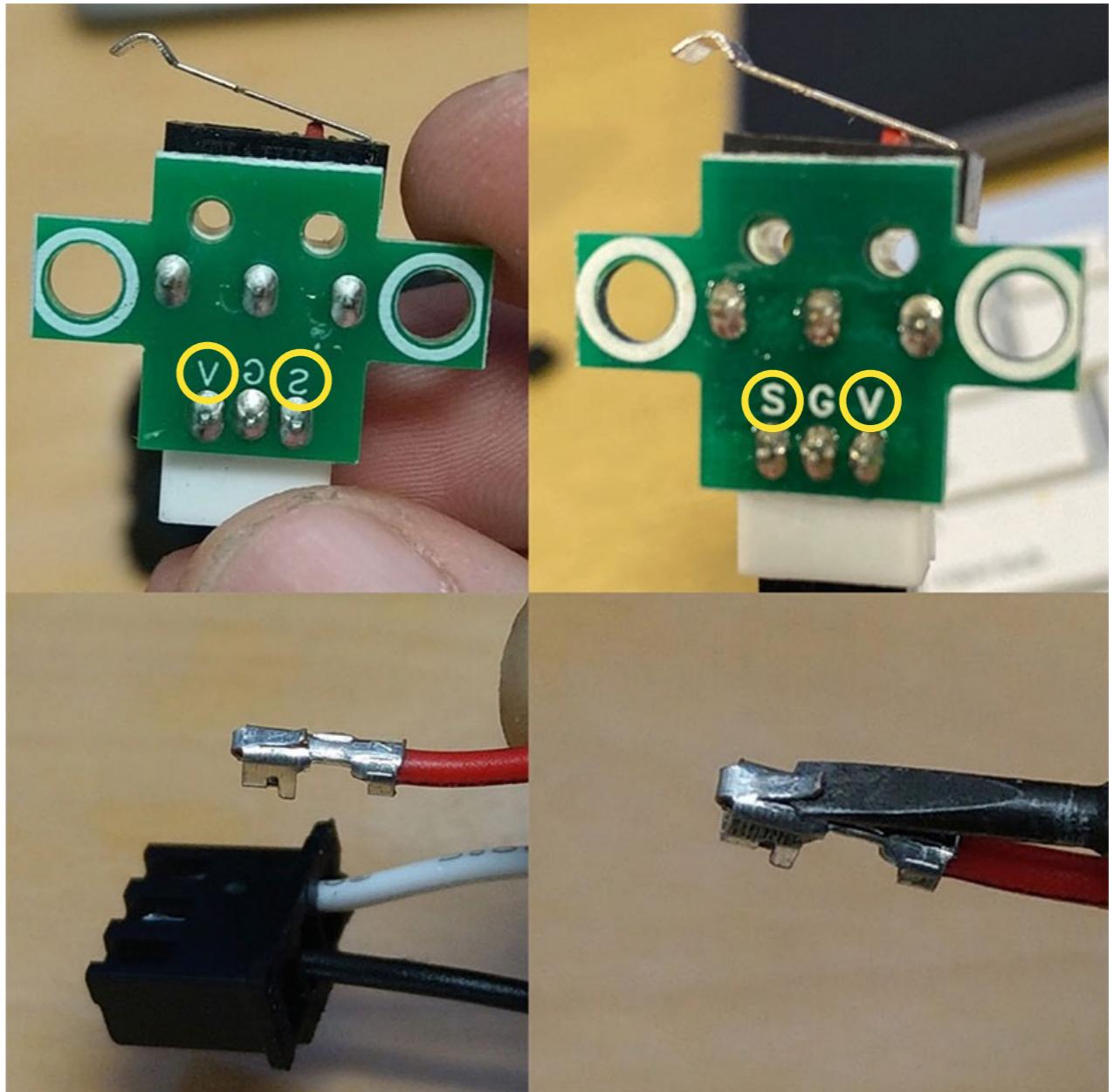
Incorrect sequence may result in reverse direction or jittering.

Filament Runout Sensor

Action

If your SKR v1.3 shutdowns when the cable of filament runout sensor is inserted into SKR v1.3 and with no filament is inserted, please swap the wires at V and S terminal.

A small flat-head driver helps remove and re-insert the connector.



Z-Min Optical Endstop

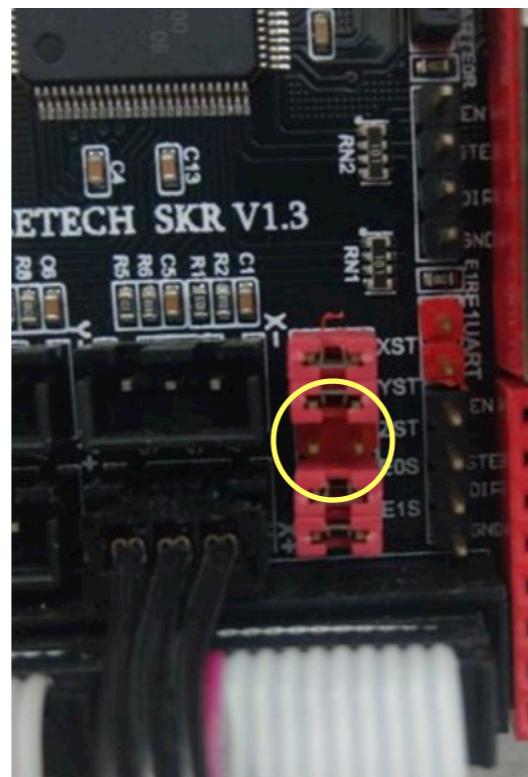
Action

Swap wire sequence at optical endstop side to meet the pin order on the optical endstop.

Remove jumper ZST on SKR v1.3 for endstop to take effect.

Exam

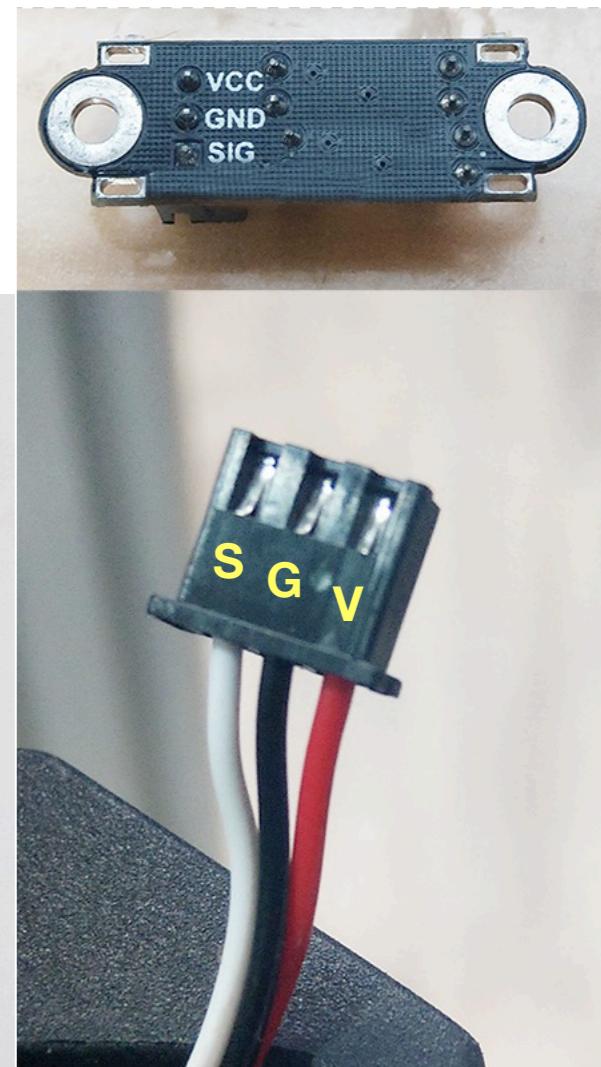
Remove jumper ZST on SKR v1.3.



Remove jumper ZST



SKR V1.3 side



Optical endstop side

Exam

Double check polarities of all wires.

About the SSR

For the solid state relay (SSR), if the polarities of input wires are inverted, the bed will be heated with full power after power-ON and without control. Wrong polarity of inputs of SSR won't damage SSR in short time, but still should be corrected immediately.

With full power, the temperature of AC-powered heater of SK-Go can be raised very quickly in seconds, so you must be careful.

About the stepper drivers

Always power ON with a step motor connected to a stepper driver. If stepper drivers are powered ON without steppers connected, stepper drivers might be burned immediately.

13

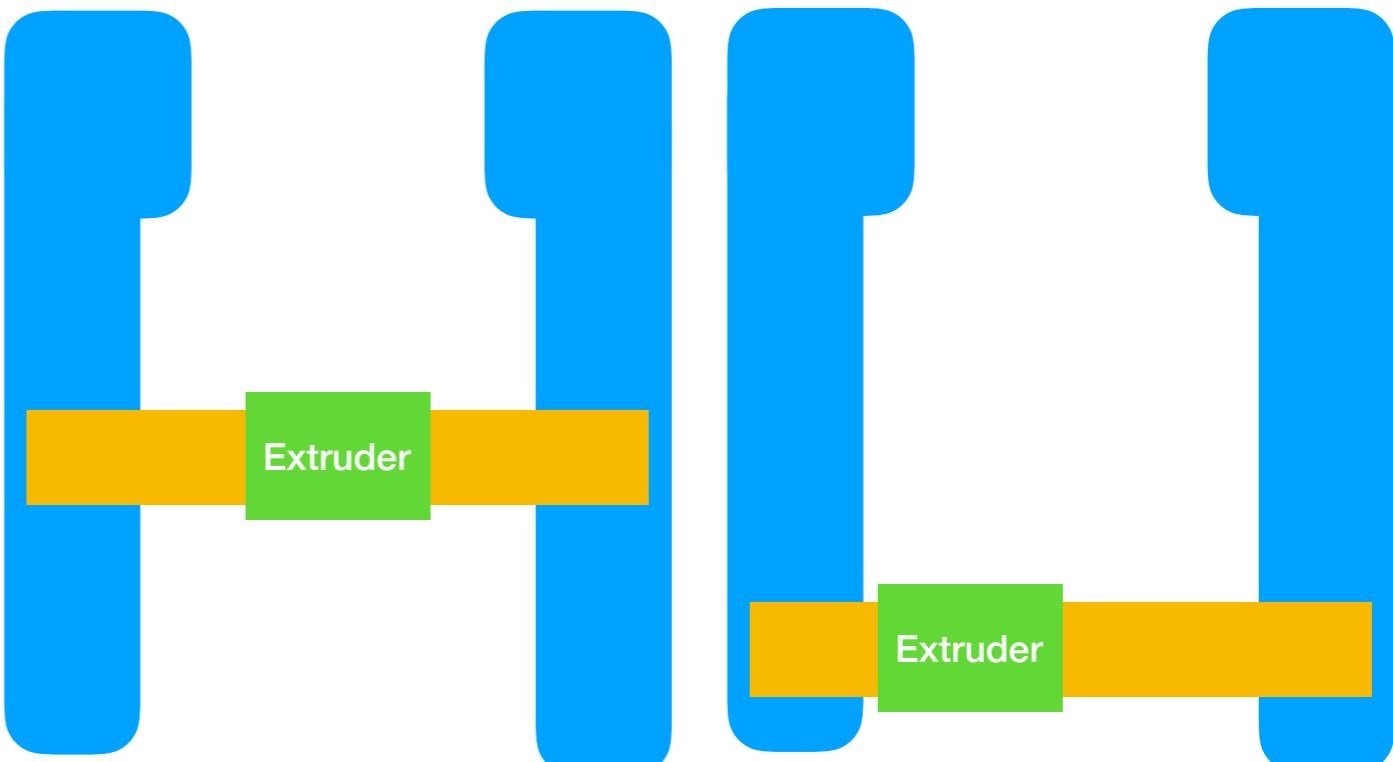
Tuning

Adjust threshold of sensorless homing

TMC drivers detect the change of driver loading to sense if the extruder touches X or Y ends, and there is a threshold for you to adjust the sensitivity.

Browse into **display menu -> Configuration -> Adv. Settings -> TMC drivers -> Sensorless homing**, adjust X and Y values. G-code **M914** does the same task.

Remember to save new values with **Menu -> Configuration -> Store settings**, or with G-code **M500**.



When homing, the extruder stops in the middle if threshold is too small.

Find a proper value for extruder to home and stop with proper force.

TMC2209

This value ranges from 0 to 255. **Larger** values mean **more sensitive** and the extruder tends to stop moving rather returning to the min point. A too small value make the extruder hit stoppers violently.

For direct extrusion it's about 140. The exact value depends on your extruder weight.

TMC2130

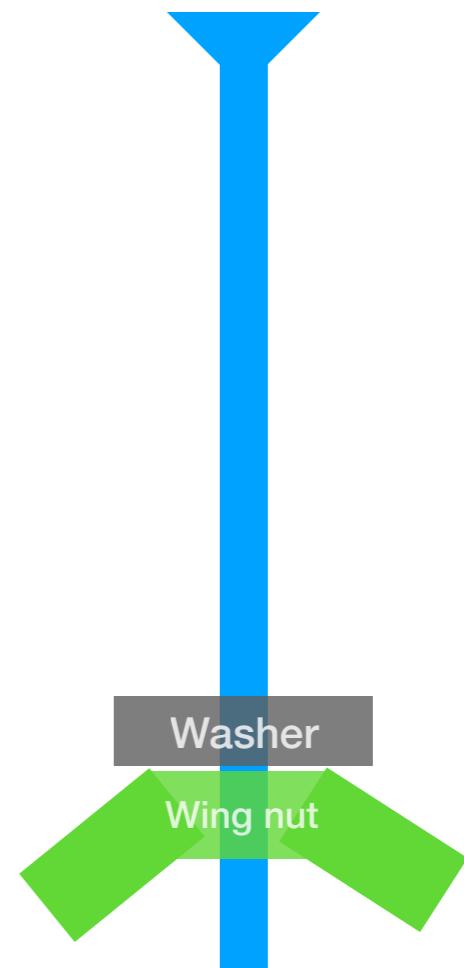
This value ranges from -64 to 63. **Smaller** values mean **more sensitive** and the extruder tends to stop moving rather returning to the min point. A too larger value make the extruder hit stoppers violently.

For direct extrusion it's usually between 0 and 3. For lighter remote extruder -2 to 0 will do. The exact value depends on your extruder

Bed Level Screw

Shift (mm)	Turn	Degree
0.1	1/5	72
0.125	1/4	90°
0.2	2/5	144°
0.25	1/2	180°
0.0625	1/8	45°
0.5	1	360°

M3 bolt
Thread pitch 0.5mm



Parameters for Marlin 2.0 bug-fix

We configured the firmware in a more conservative way in XY motion for better print quality, but there is still space to make it move more aggressively.

If you know how to compile and update firmware, download the reference source code from SecKit website and make your own firmware binary.

<https://seckit3dp.design/docs>

Use on your own risk. :-)

Auto PID tuning

To get a better quality of temperature control of heaters, run following command in OctoPrint Terminal or similar place. It takes minutes and will show a set of P, I, D numbers. Save PID numbers into your configuration file or EEPROM of control board.

Auto-tune extruder PID at 200°C.

M303 E0 S200 ; auto-tune extruder PID at 200°C.

Set part-cooling fan speed at 80% (204/255=0.8) and auto-tune heated bed PID at 50°C.

M106 P0 204 ; set fan speed at 204 of 255

M303 E-1 S50 ; auto-tune heated bed PID at 50°C.

P.S. The 24V 3.5W fan is an overkill, so 50% ~ 80% speed is fast enough for normal printing, also not too loud.

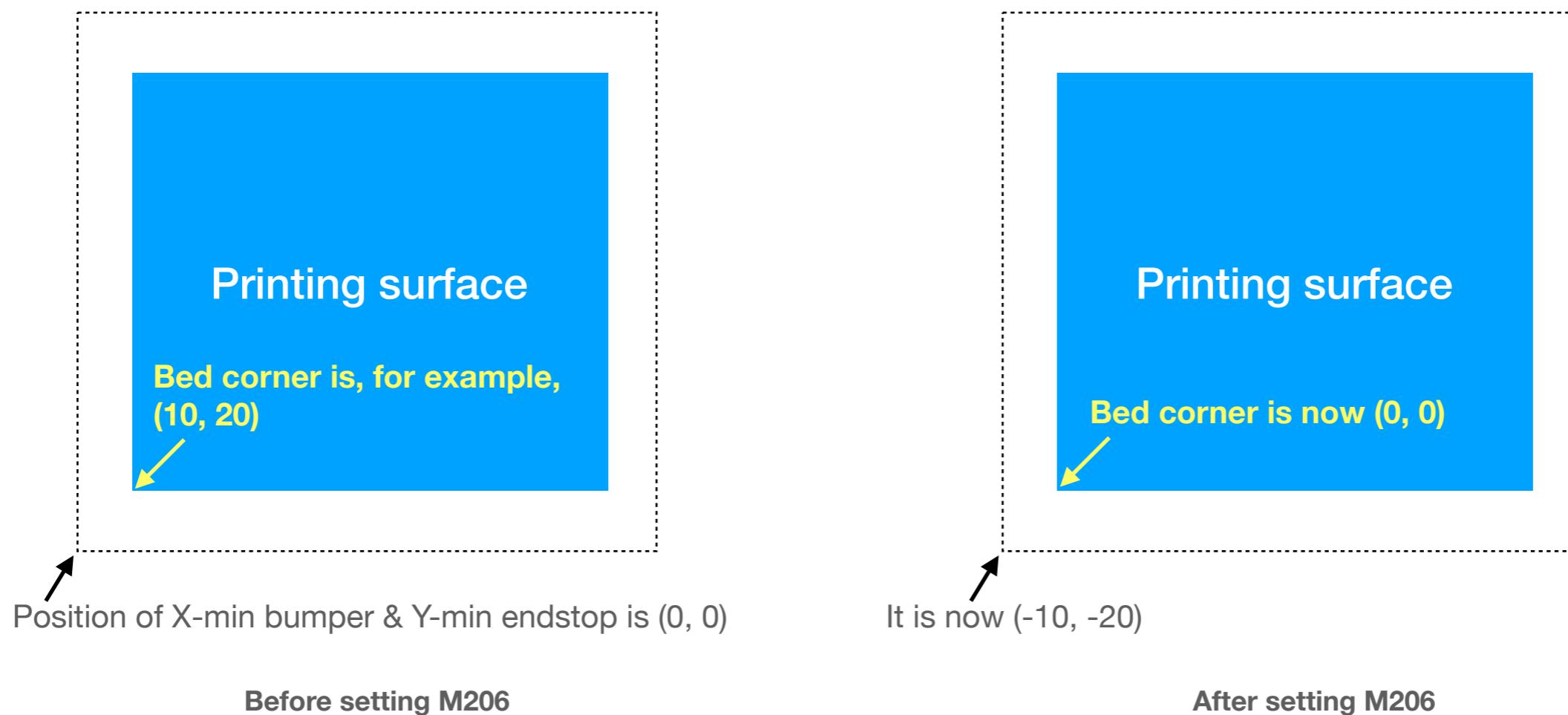
Exam

Sometimes while auto-tuning bed PID the procedure won't stop and the temperature just climbs up slowly and endlessly. Make sure your fan is ON and try it again.

Set Home Offsets with M206

There is always an offset between the point of TMC2130 endless homing (or limit switches) triggered, and the coordinate of minimum point of printing surface. Use M206 command to set home offsets, and then save it into EEPROM with M500.

```
M206 X-10 Y-20 ; adjust home offsets  
M500           ; save into EEPROM
```



TMC driver mode-switching noise

If you choose to run TMC2130 drivers in hybrid mode, there will be always a “chuck” sound when the driver switches between StealthChop and SpreadCycle mode.

If some of your travel speed, inner/outer wall printing speed are located at each side of hybrid speed threshold, this chuck sound will be very annoying, although it does not affect printing quality.

To prevent the noise, either adjust your printing speed in slicer, or turn StealthChop mode OFF (always run in SpreadCycle mode).

Please use advanced configuration menu in the display or G-code command M122, M569, M913 to configure TMC driver.

<http://marlinfw.org/docs/gcode/M569.html>

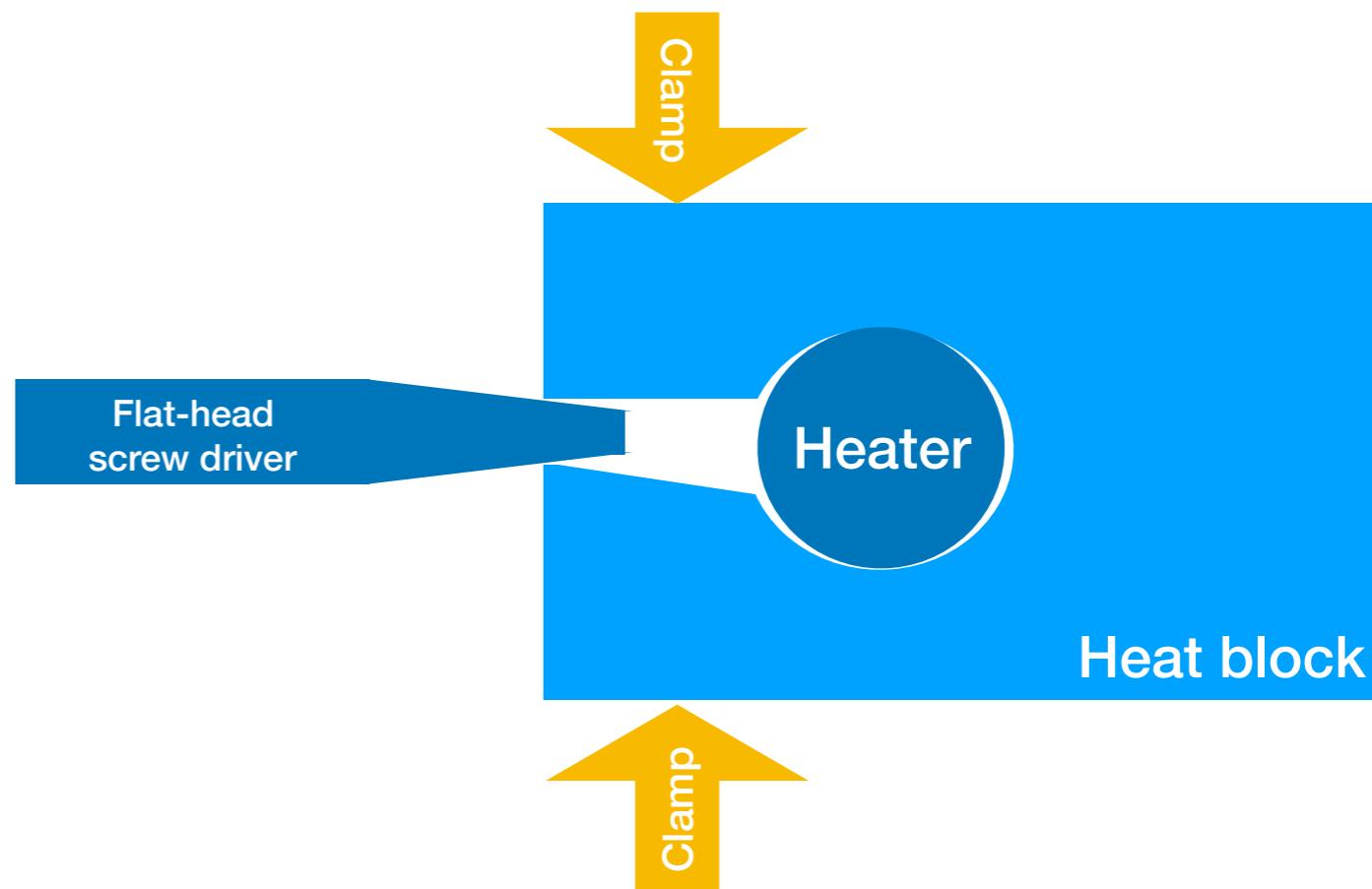
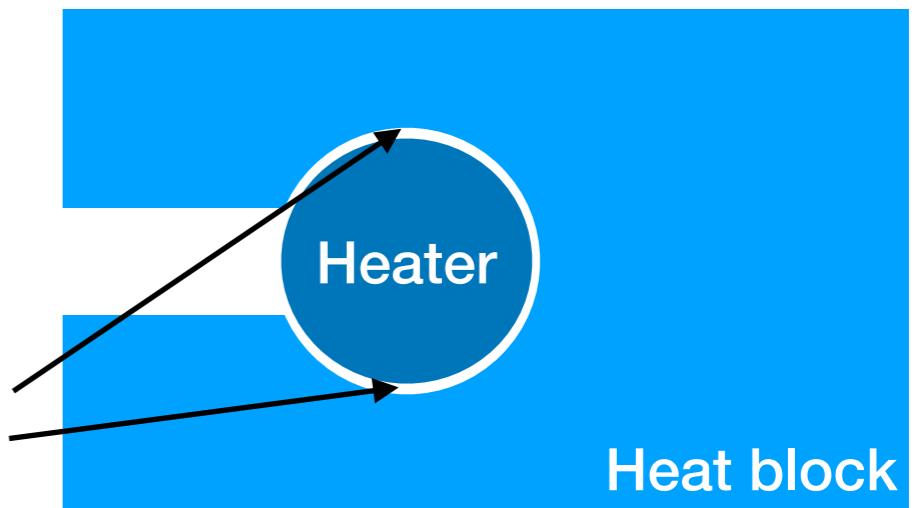
DO NOT change driver mode during printing. It is highly possible that layer shift happens.

BMG clone heat block

Note that we only try to provide a possible workaround to deal with that manufacturer's error, but are not responsible for it. Please decide if you will adopt this method or not, and use on your own risk.

If you're using a BMG clone extruder and the hole on the heat block is too large for the heater, carefully clamp the heat block with a plier and deform the aluminum a little before it breaks. If you clamp it too much, re-expand the hole by inserting a flat-head screw driver and pry.

After the bolts are tightened, the heat block still doesn't bind the heater due to too large hole diameter.



Enable Auto Bed Leveling (1/3)

Unified Bed Leveling (UBL) is one of the auto bed leveling (ABL) mechanisms written in Marlin. UBL is chosen because it is the most generalized and powerful bed leveling mechanism among all.

To use UBL in your print, firstly you use the function in the “Motion” menu to build a set of bed level mesh points when the nozzle is at cold temperature, and save these mesh points into EEPROM. Then you enable bed leveling in every G-code files by adding an extra G29 command in your slicer, and then print as usual.

Enable Auto Bed Leveling (2/3)

At your printer:

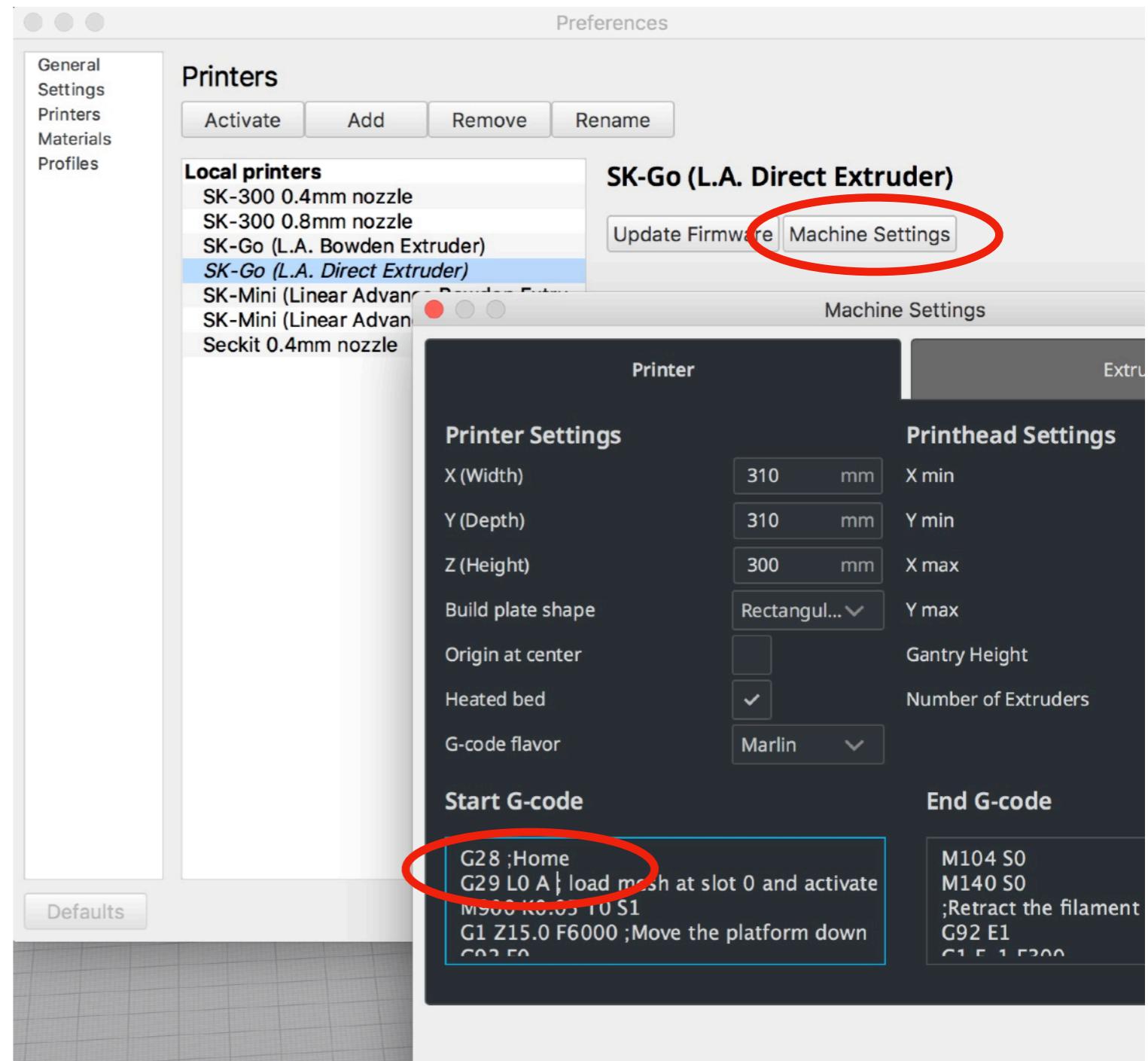
1. Cool down the nozzle to prevent sensor from being melt
2. Deploy ABL sensor
3. Build mesh points in the menu: **Motion > Unified Bed Leveling > Step-by-step UBL > Build cold mesh.** The nozzle will start moving and sense 25 points across the whole bed.
4. Save mesh points in the menu: **Motion > Unified Bed Leveling > Step-by-step UBL > Save mesh**
5. **Remove ABL sensor from nozzle** 
6. Print and observe
7. Might need to refine the height of **whole bed leveling mesh** by manually adjust 3 bed level screws (recommended method), or refine **each mesh point** by using the function in “Step-by-step UBL”

Enable Auto Bed Leveling (2/3)

At your slicer, add G29 command right after G28 to every G-code file produced.

G28 ; Home

G29 L0 A ; Load slot 0, Activate UBL



Cura 4.2 Preference

Keep Components Lubricated

Always keep linear rails & lead-screws, pulleys lubricated!

Either vehicle oil or grease work, since applications in a 3D printer is less critical than in an car engine.

You can clean the metal with thin oil, dry it with tissue and then apply heavier oil or grease.

Please note that greases with solid particles such as graphite or MOS2 must not be used.

If you want to be more rigorous, follow the lubricating instructions from HIWIN:

https://www.hiwin.com/pdf/lubricating_instructions.pdf

SecKit, All-Metal CoreXY 3DP Kit

Web <https://seckit3dp.wix.com>

FB <https://facebook.com/seckit.3dp>

Email seckit.3dp@gmail.com