

SK-Go²

Assembly Manual

SecKit, All-Metal CoreXY 3DP Kit

SK-Go²

Web <https://seckit3dp.design>

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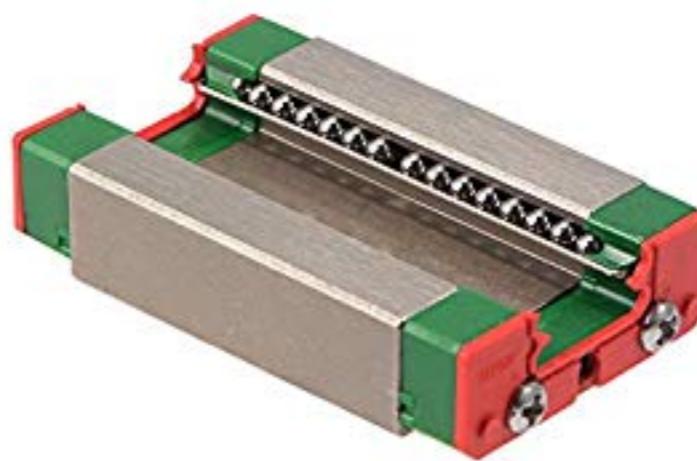
Ver 1.08

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



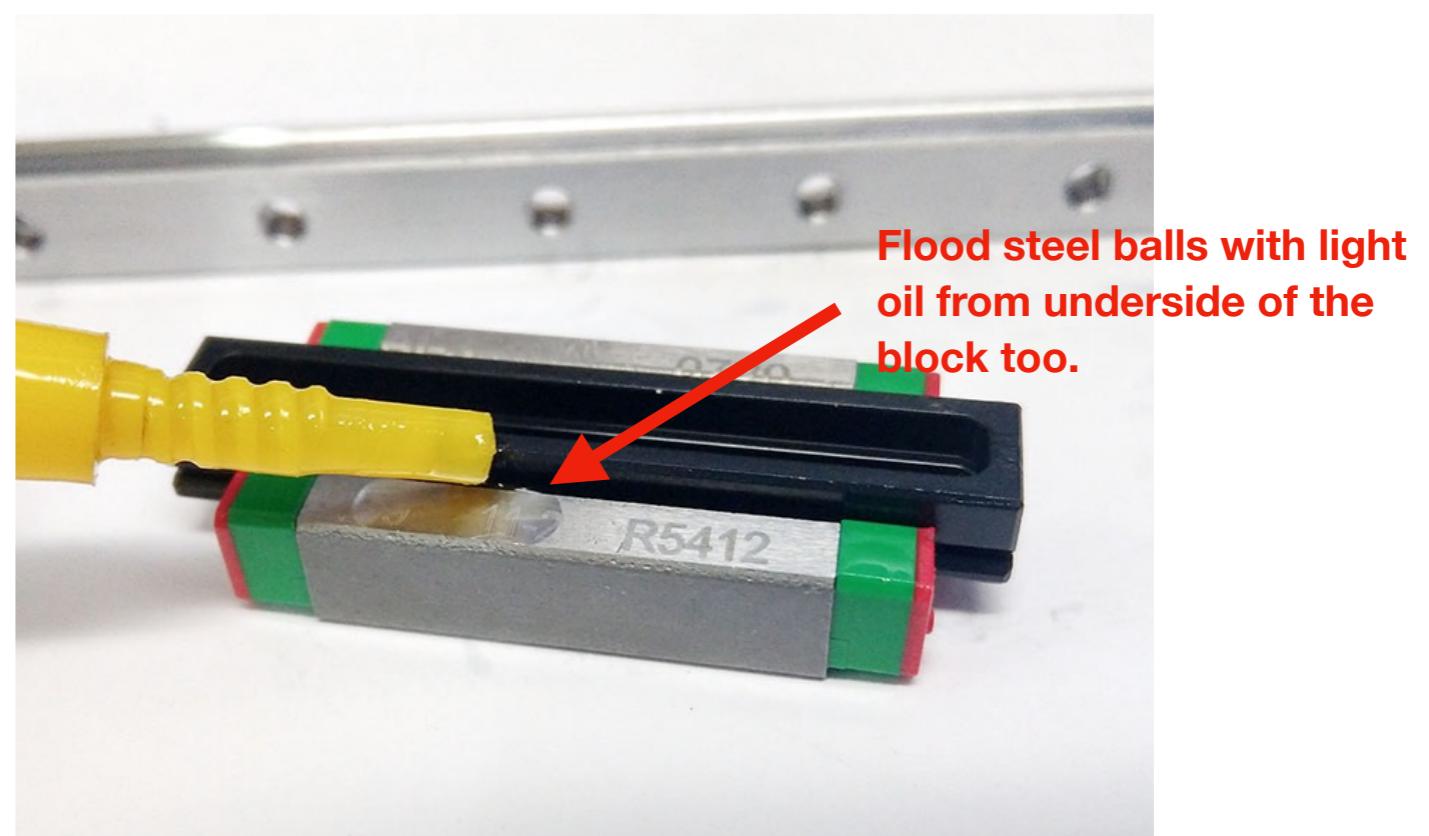
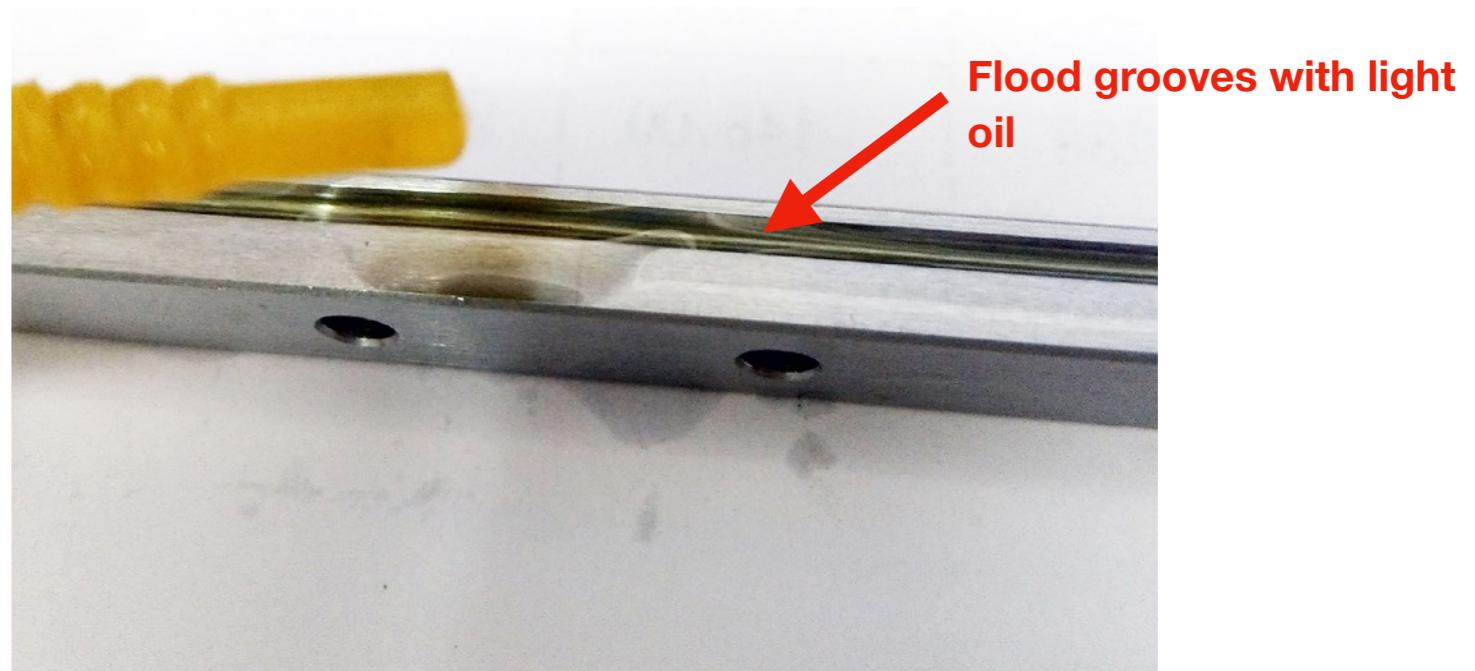
NEVER leave the block alone.

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

Clean & lubricate linear rails and lead screws

Linear rails and blocks come as installed pairs and have been cleaned. Those tiny ball bearings are also selected and paired. If not necessary, don't remove a linear block from its rail.

- Cleaning
 - Light oil or WD-40
- Lubricating
 - Automobile-use lubricants
 - Lubricants for metal-to-metal contact
- Do not use
 - Silicone based lubricants
 - PTFE dry lube
 - Lubricants with solid particles



Something You Need to Know

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 and harden after months. So choose lubricant according to your scenario.

Some tips for maintenance:

1. After a period of operation the oil will become dirty due to dust in the air are mixed into the oil. Flooding 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. Slowly move the linear block, let oil push the dirt inside the block out.
4. Always keep rails, linear blocks, pulleys lubricated, also for anti-rust reason.

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.

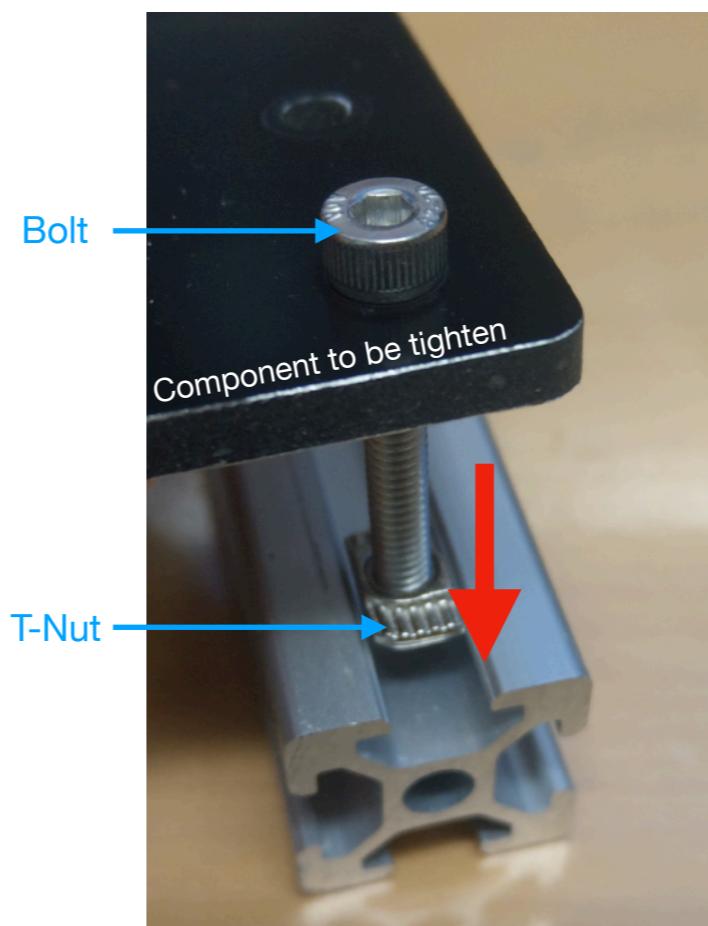
Table 2-4-12 Tightening Torque

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:

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

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

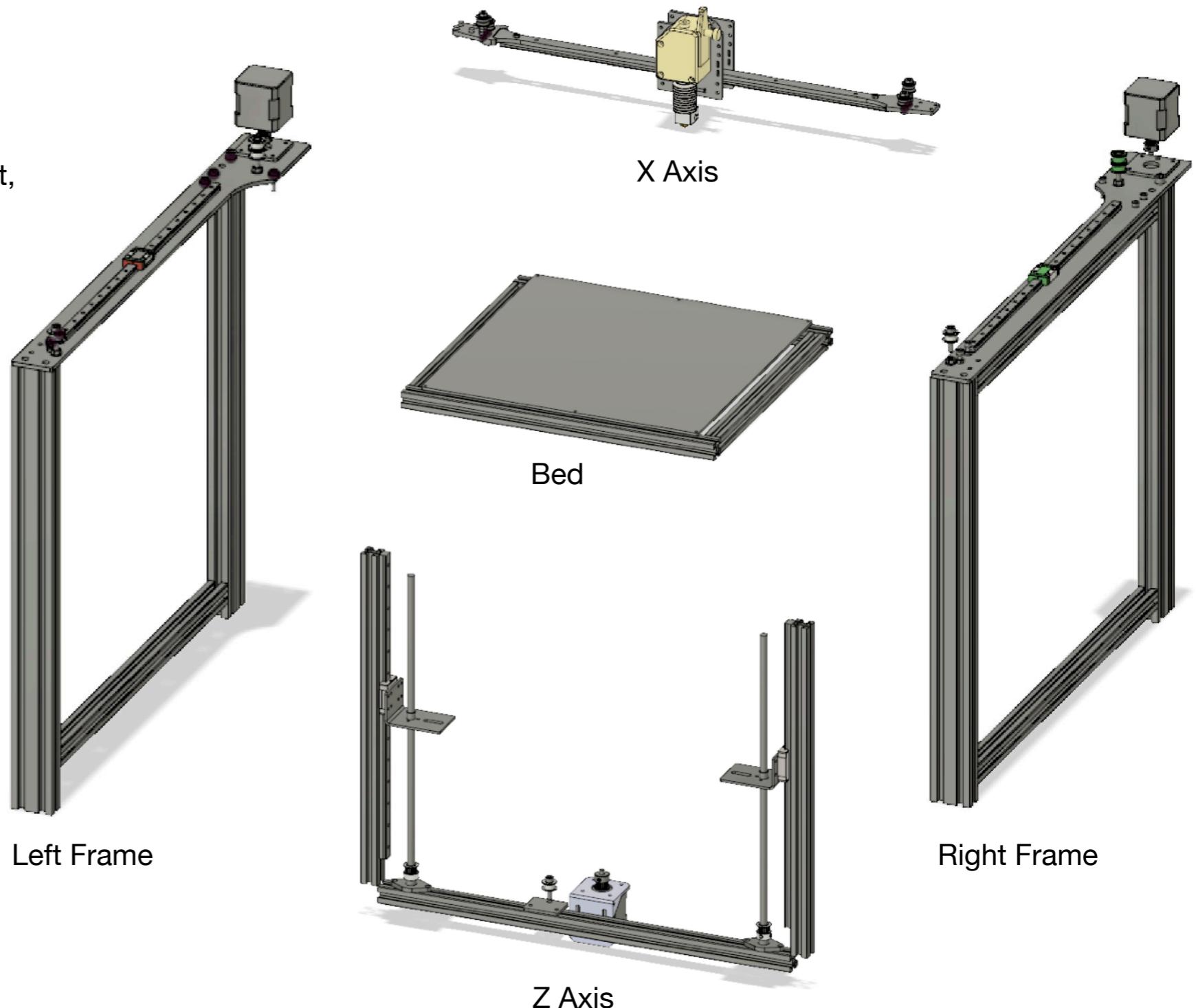


4

Structure Overview

Major Parts

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



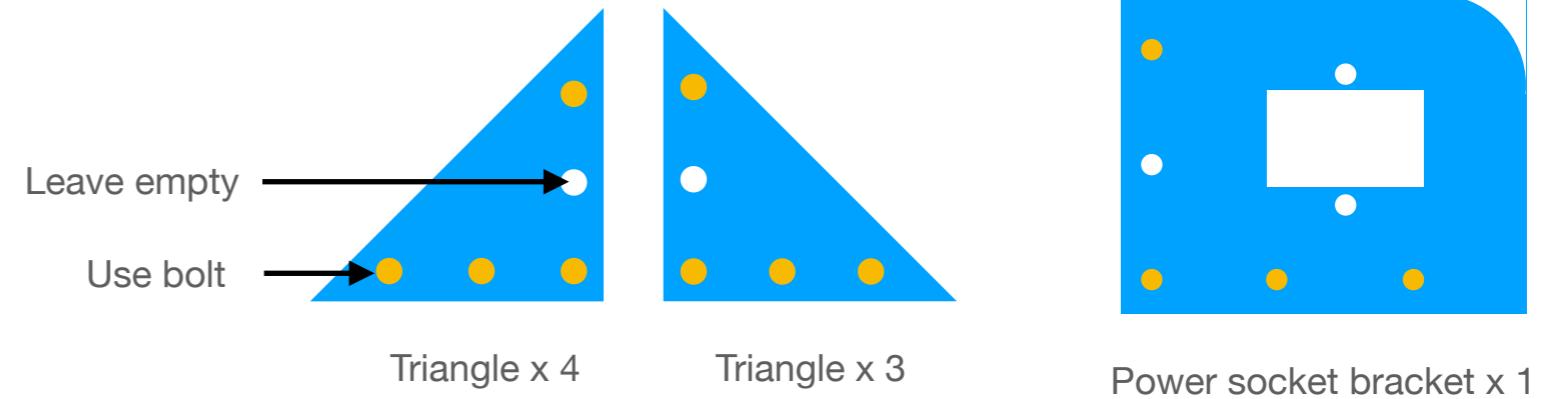
5 Frame



Frame

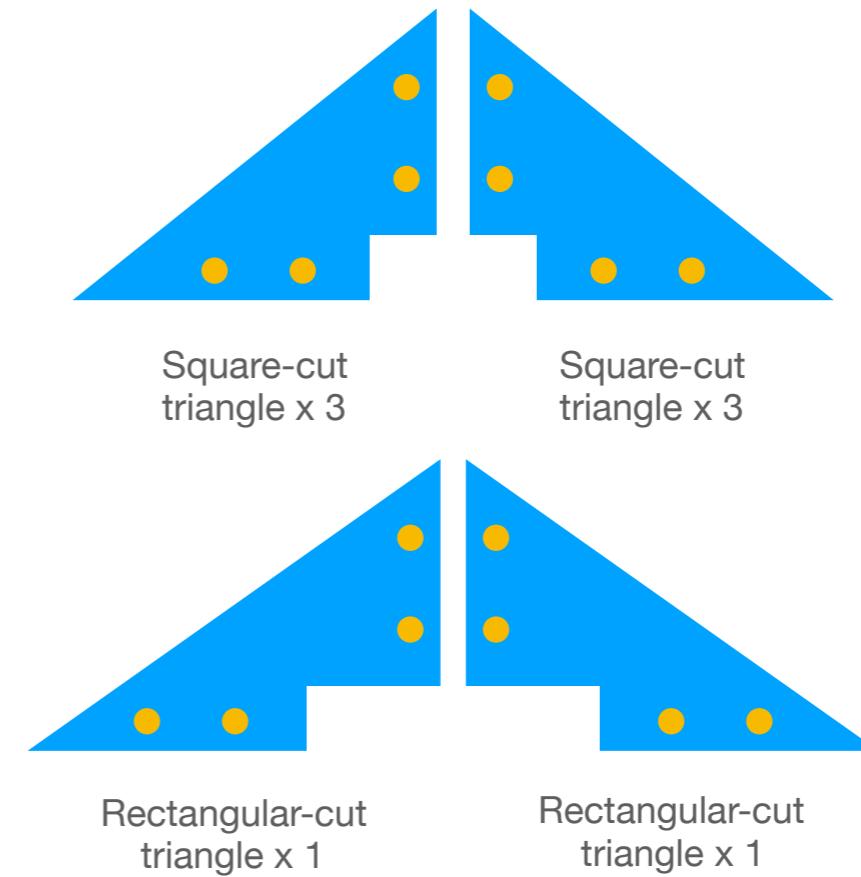
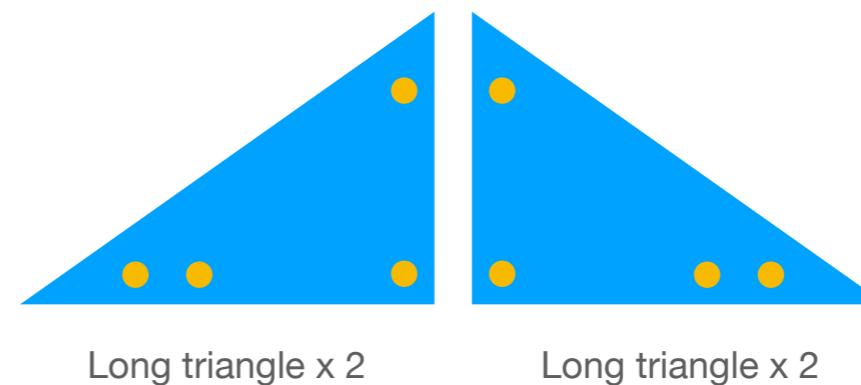
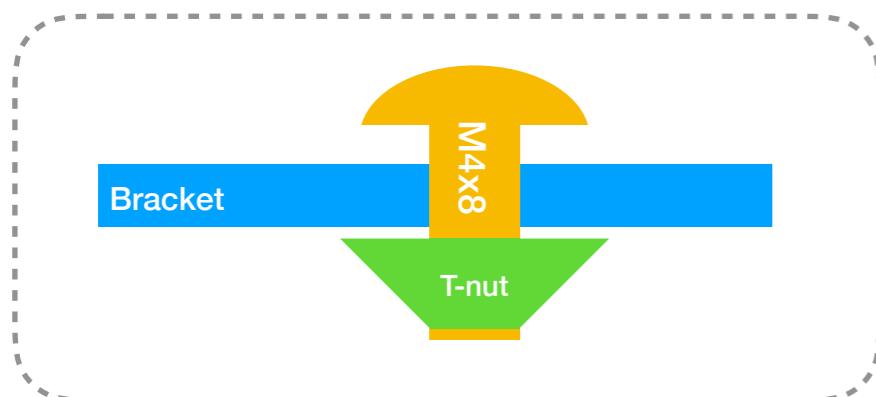
Pre-assemble Aluminum Brackets

- Aluminum brackets
 - Triangle x 7
 - Long triangle x 4
 - Square-cut triangle x 6
 - Rectangular-cut triangle x 2
 - Power socket bracket x 1
- Parts per set
 - 1 bracket
 - 4 round-head bolt M4 x 8
 - 4 T-nut M4



Action

Assemble 20 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 6 sets of bracket. Put T-nuts on but don't tighten them for later use.



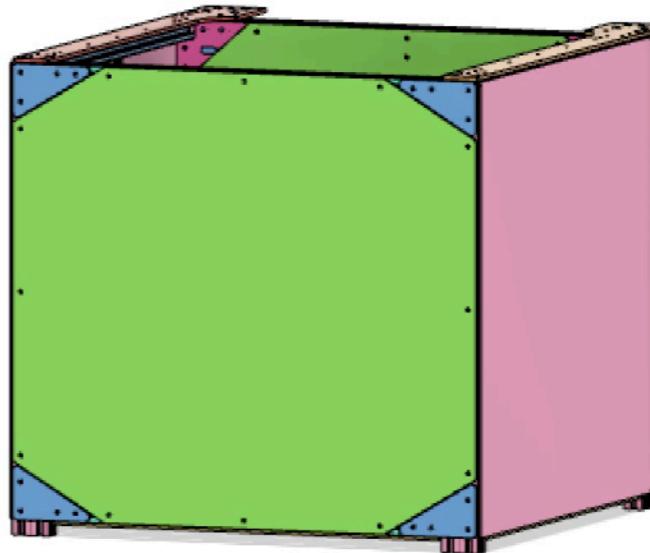
Decide Your Frame Setup

Different setups of the frame can be used for your liking, and **Setup A** and **B** will be denoted in later sections.

(A) With Surrounding Panels

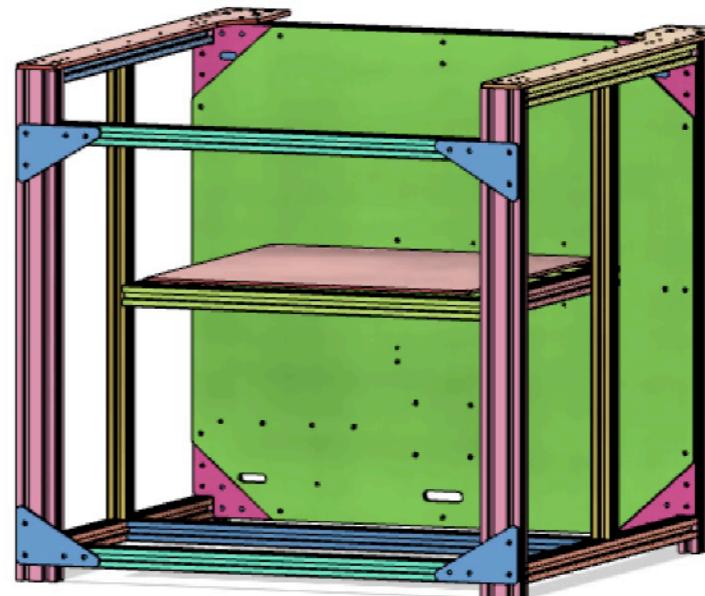
Download the drawings of panels from [SecKit GitHub repository](#) and create personal style exterior to your 3D printer.

With this setup your Y rails and the bed are placed more backward, and the extruder is attached at the back side of extruder carriage.



(B) Without Surrounding Panels

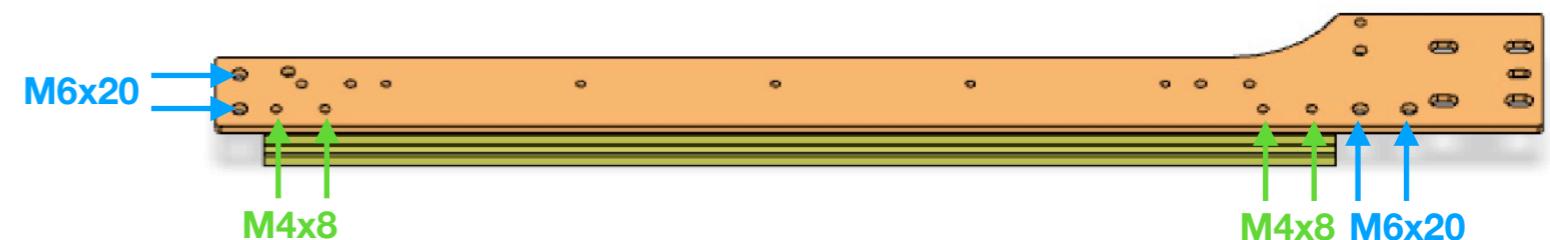
To access to your prints more easily, you can lower the front X extrusion a little bit, move Y rails and bed assembly more forward, and attach extruder at the front side of extruder carriage.



(C) Customize by yourself 😊

Assemble Right Frame

- 1 Aluminum Y plate
- 2 4020 aluminum extrusions (Z leg)
- 1 aluminum extrusion 430mm (Z)
- 2 aluminum extrusions 440mm (Y)
- 4 triangle brackets
- 2 pre-assembled 2020 brackets
- 4 bolt M6 x 20
- 4 round head bolt M4 x 8
- 4 T-nut M4
- Ruler or the printed assembly guide



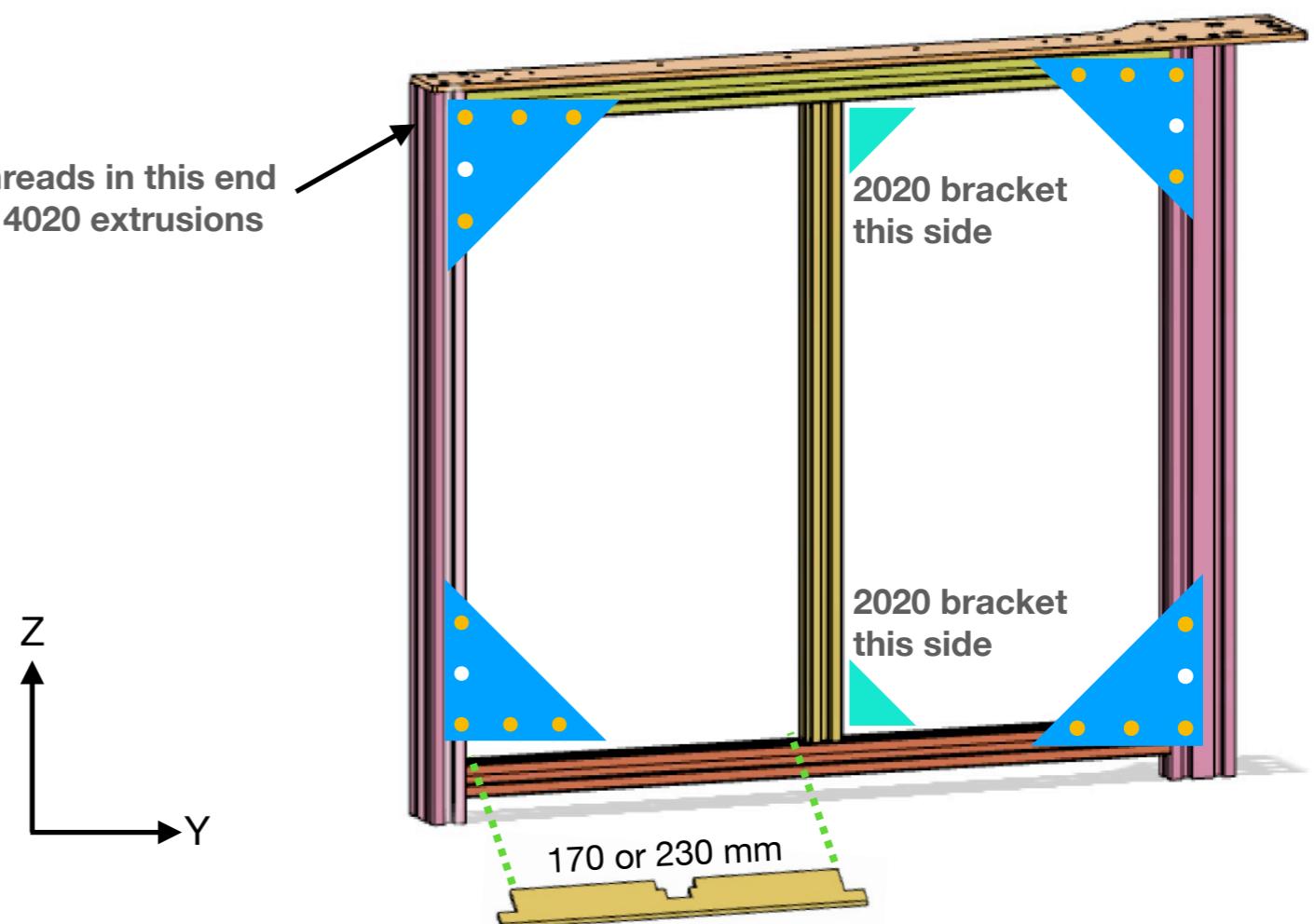
Action

For frame setup A, make a **230mm**-gap between middle Z extrusion and front Z leg.

For setup B **170mm** is used, the same as the width of assembly guide.

Exam

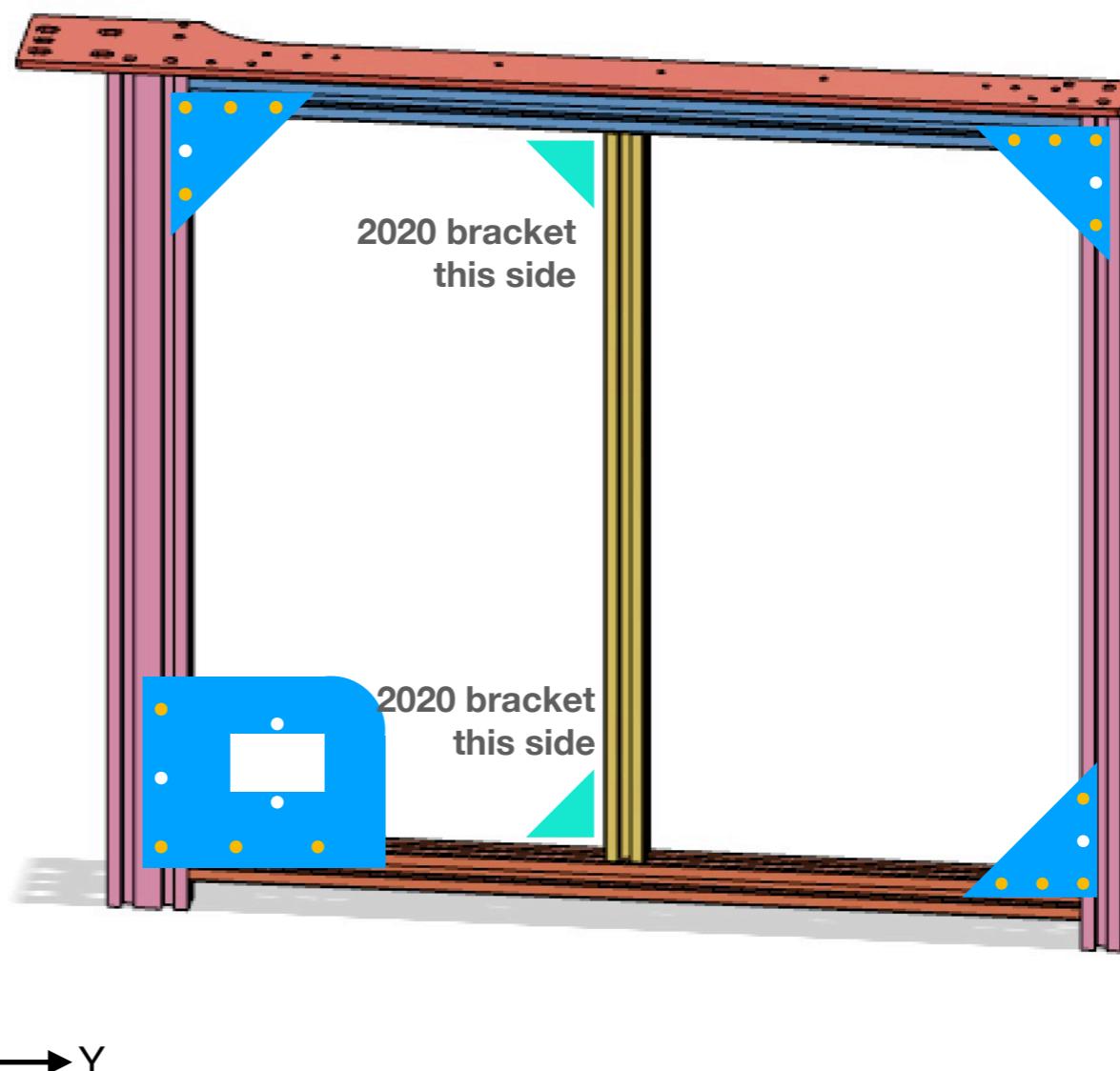
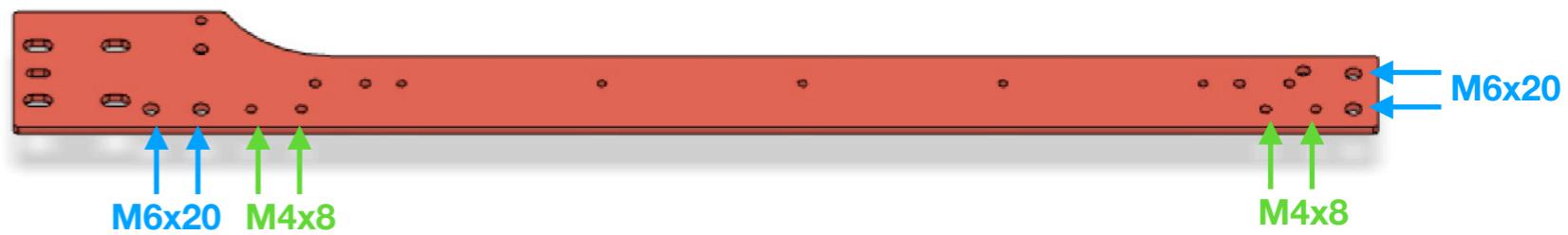
Make sure each aluminum extrusion has 2 bolts locked.



This gap size won't affect print quality as long as the gaps are the same at both left and right frames, and the center of gravity of the bed remains on L-shape bed supports.

Assemble Left Frame

- 1 Aluminum Y plate
- 2 4020 aluminum extrusions (Z legs)
- 1 aluminum extrusions 430mm (Z)
- 2 aluminum extrusions 440mm (Y)
- 3 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

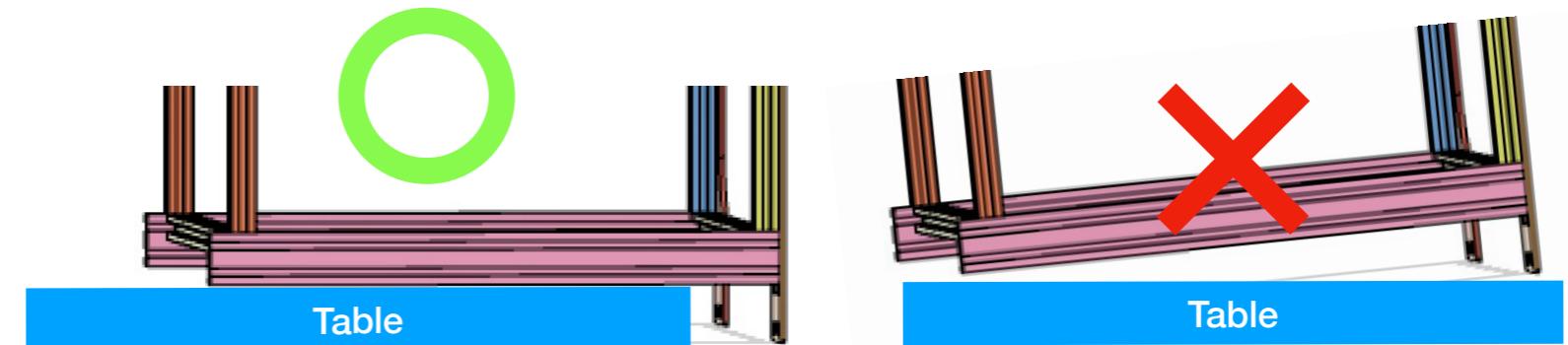


Exam

Make sure each aluminum extrusion has 2 bolts locked.

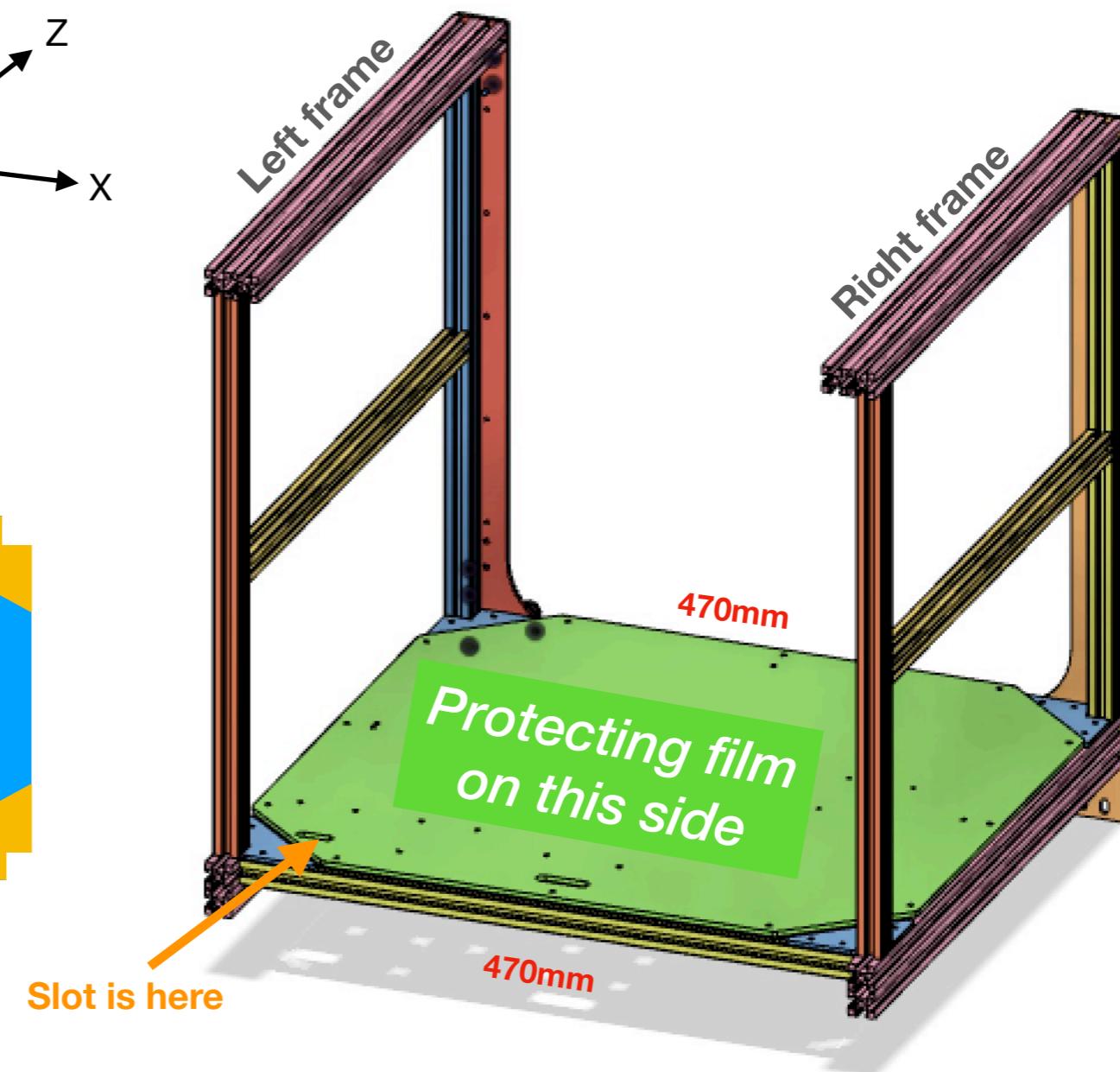
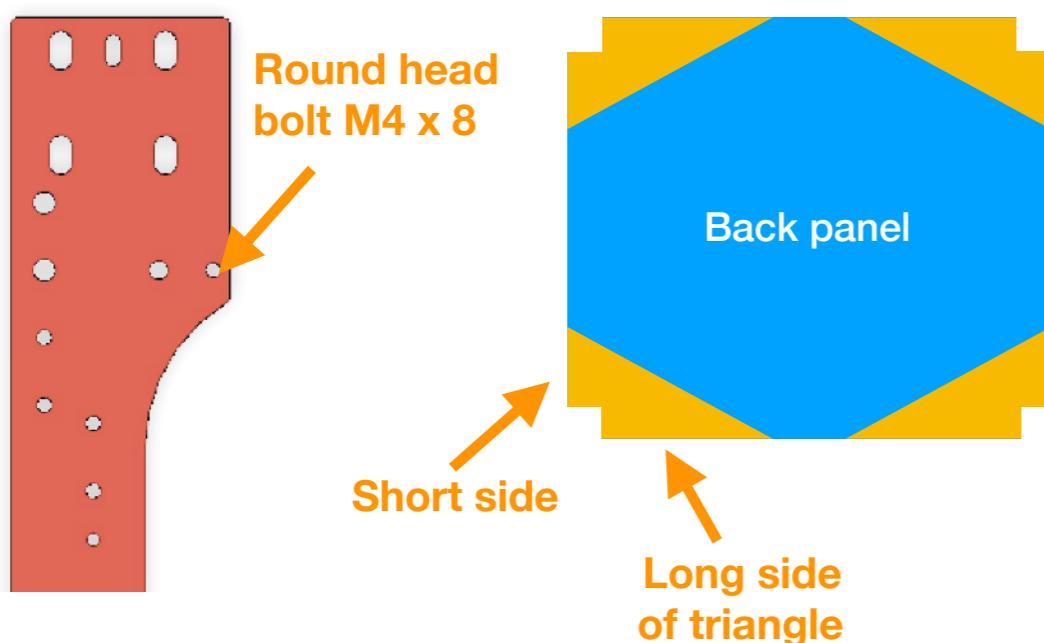
Assemble Back Panel

- 2 aluminum extrusions 470mm (rear X)
- 4 square-cut triangles
- 1 ACM back panel
- 14 round head bolt M4 x 8
- 14 T-nut M4



Action

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



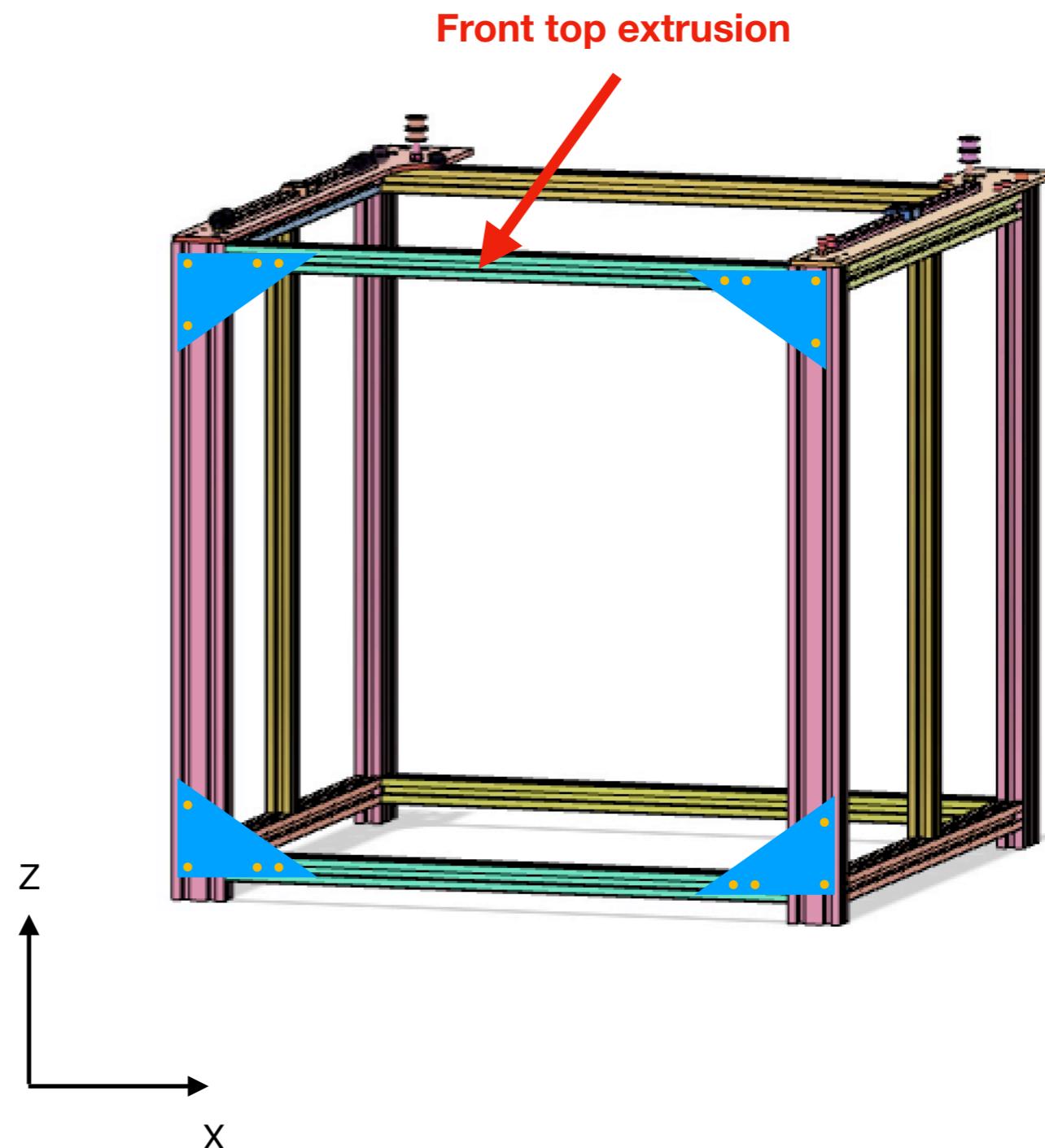
Assemble Front Frame

- Front Frame
 - 2 aluminum extrusions 430mm
 - 4 long triangle brackets

Action

Assemble front top extrusion as in the picture if you go frame setup (A).

Lower it **5cm or more** if you go frame setup (B)

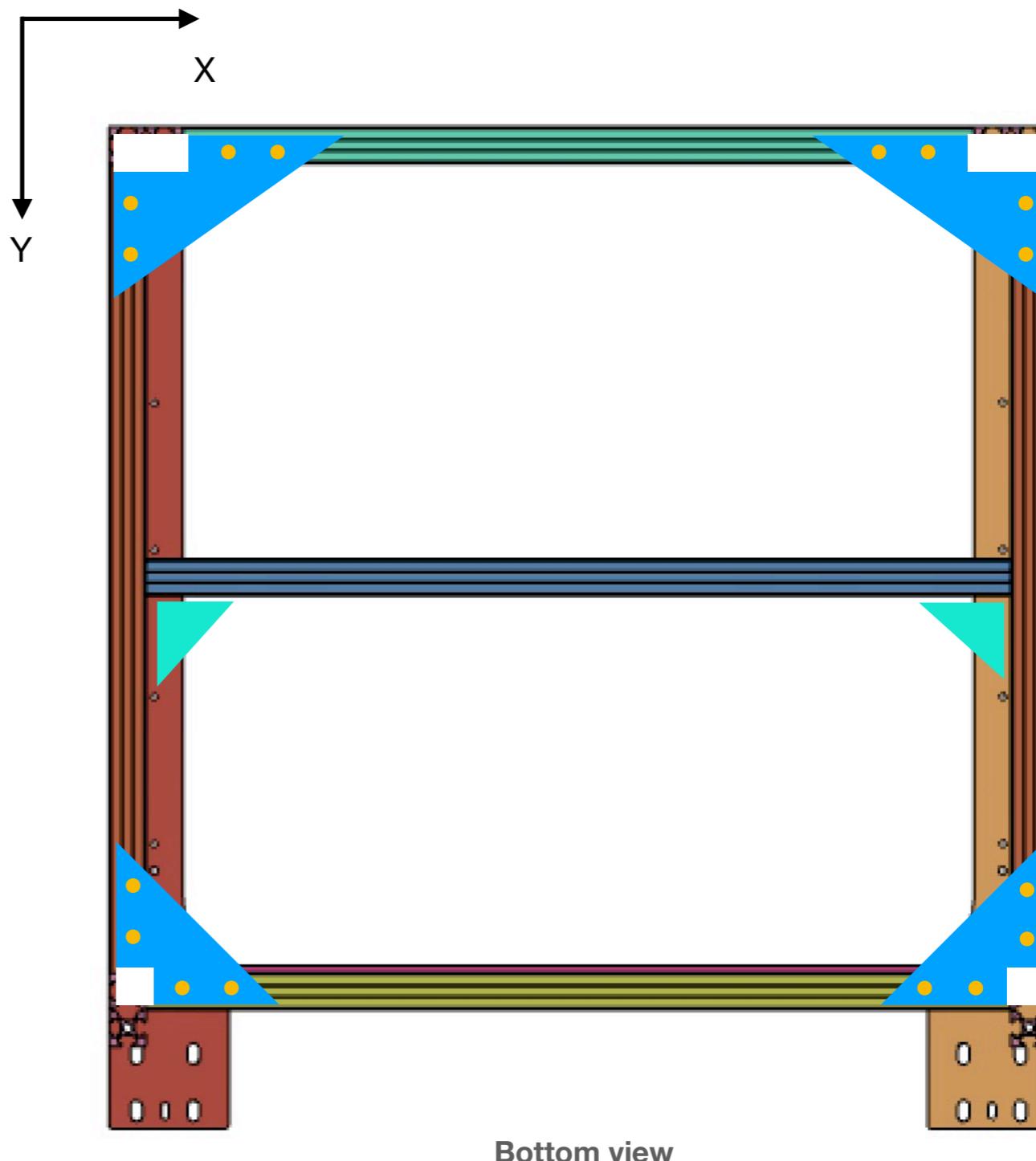


Assemble Bottom Frame

- Brackets
 - Square-cut triangle x 2
 - Rectangular-cut triangle x 2
- 1 aluminum extrusion 470mm (bottom X)
- 2 pre-assembled 2020 brackets

Action

Assemble triangles at bottom of the frame as supports.

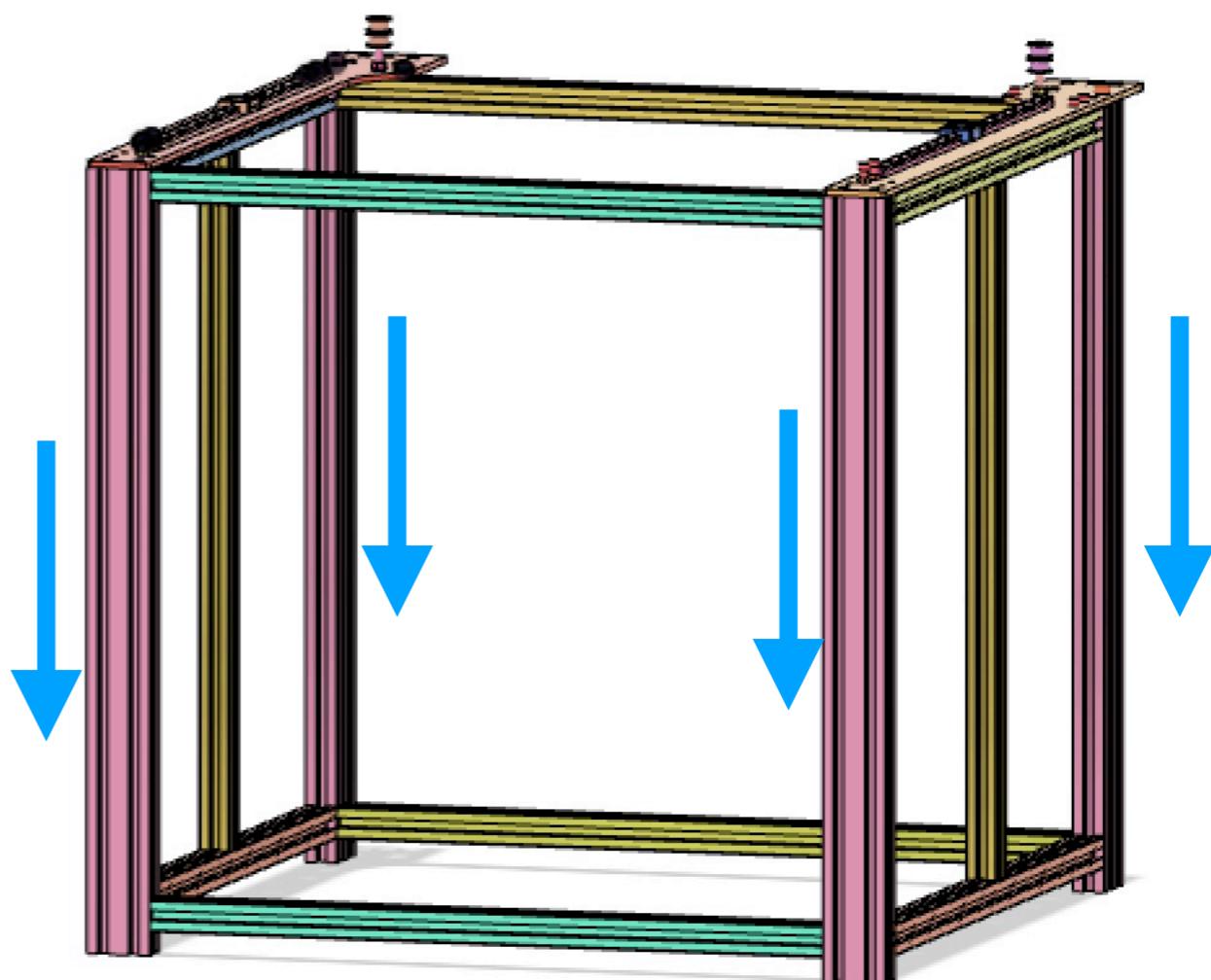


Bottom view

Adjust the whole frame if need

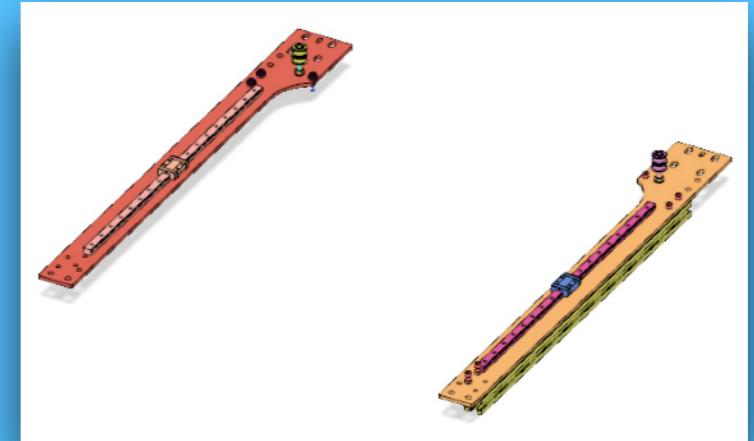
Action

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.



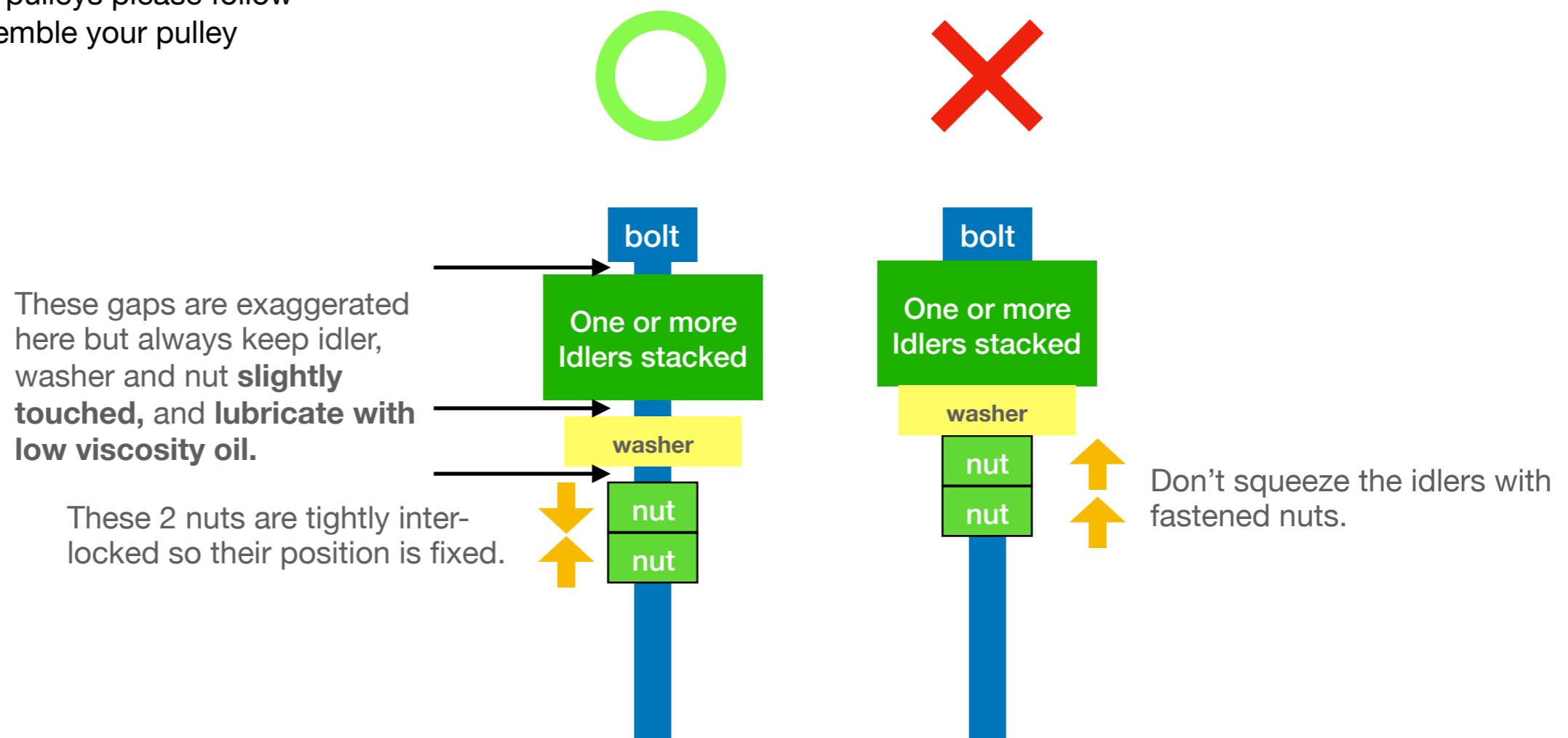
6

Y plane



About Pulley Set

Many pulley sets are used in SK-Go². To ensure longevity of pulleys please follow this method to assemble your pulley pillars.



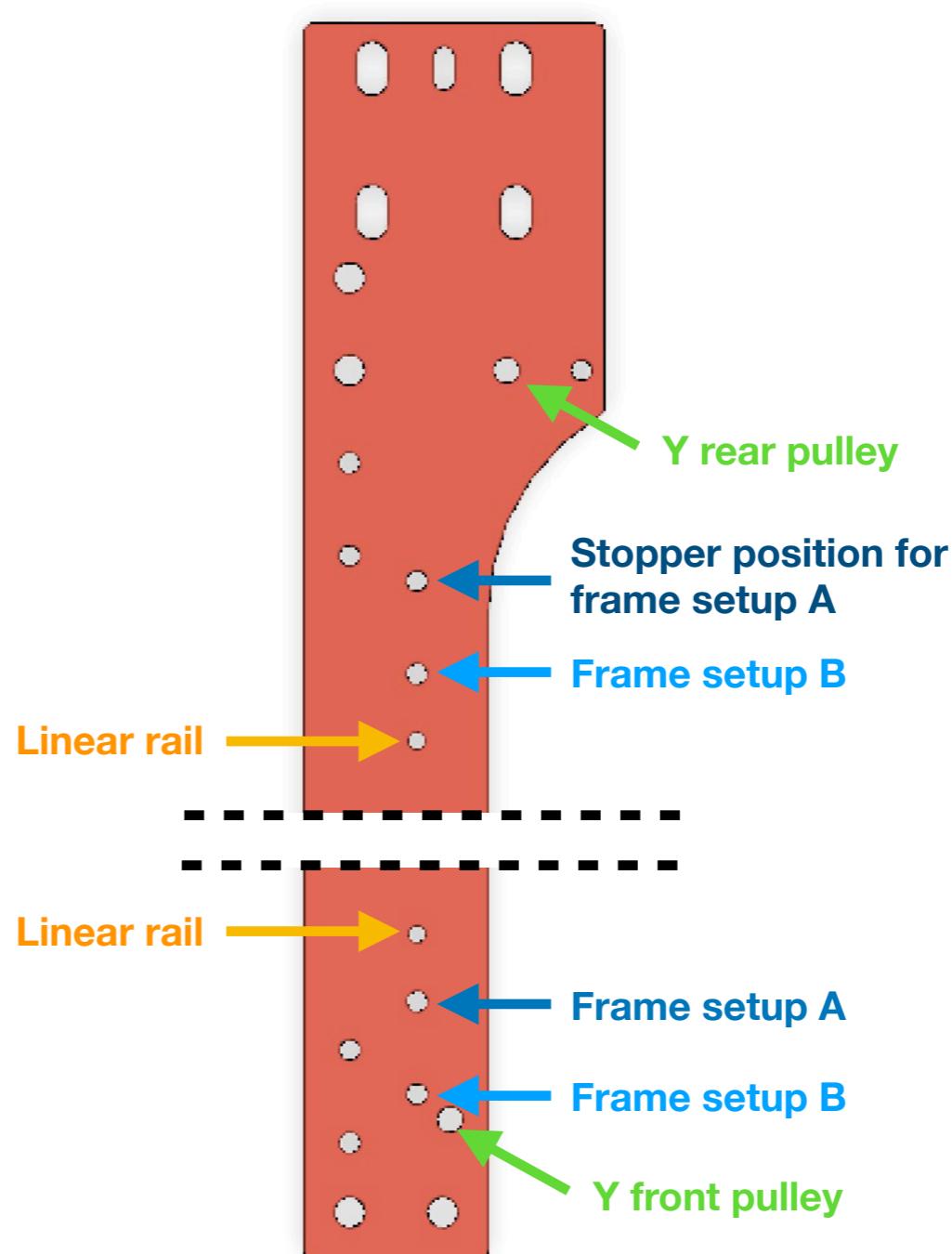
Assemble Linear Block Stoppers & Linear Rails

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

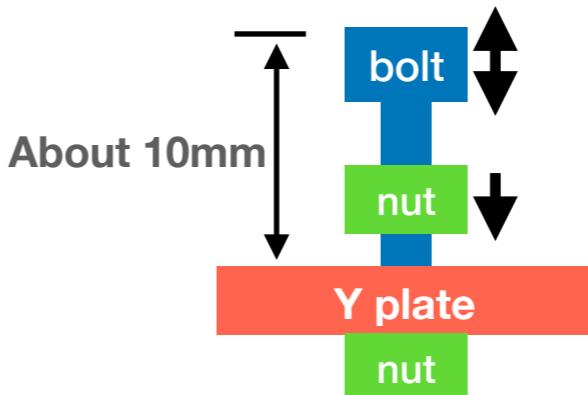
Action

Install stoppers in the positions for frame setup A or B. Both will work.

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

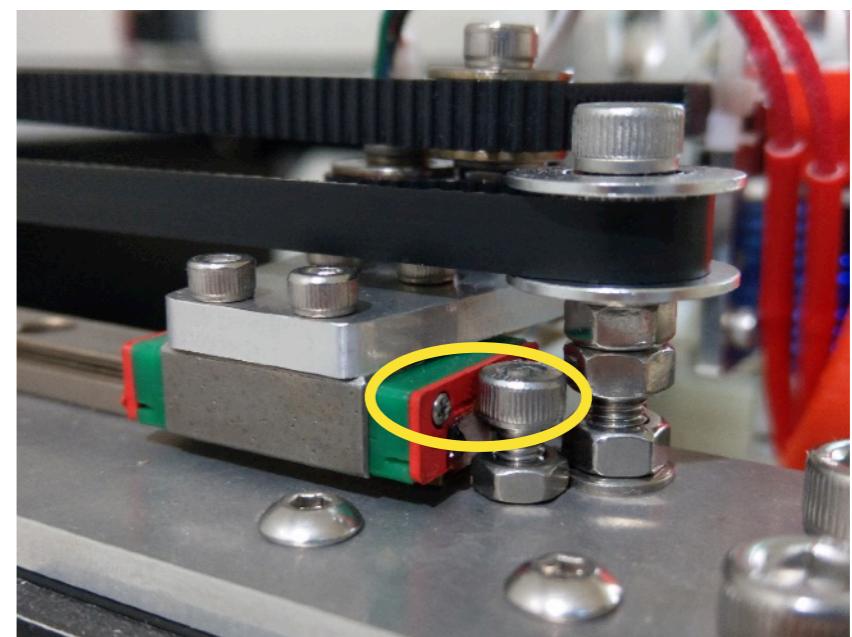
2. Tighten the top nut while maintaining the position of bottom nut and bot.

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

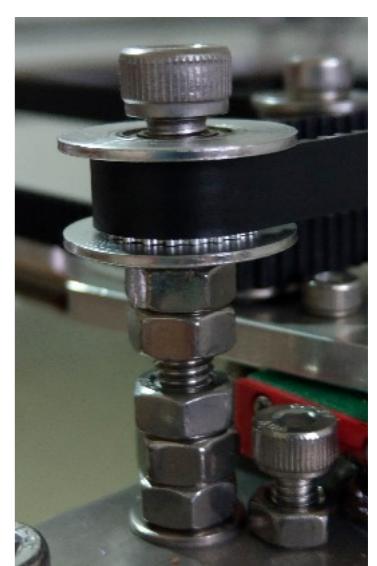
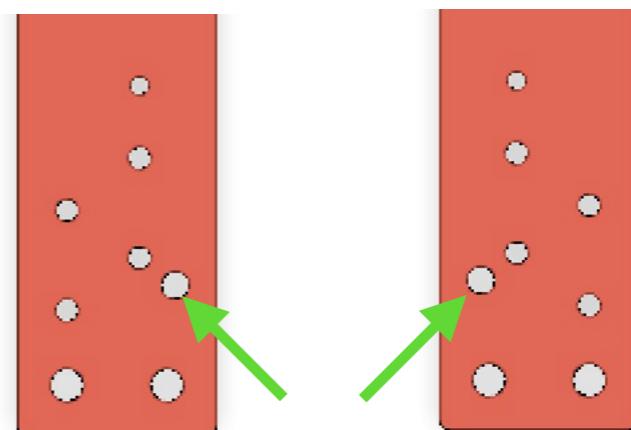
Assemble front pulley and install it at Y plate.

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

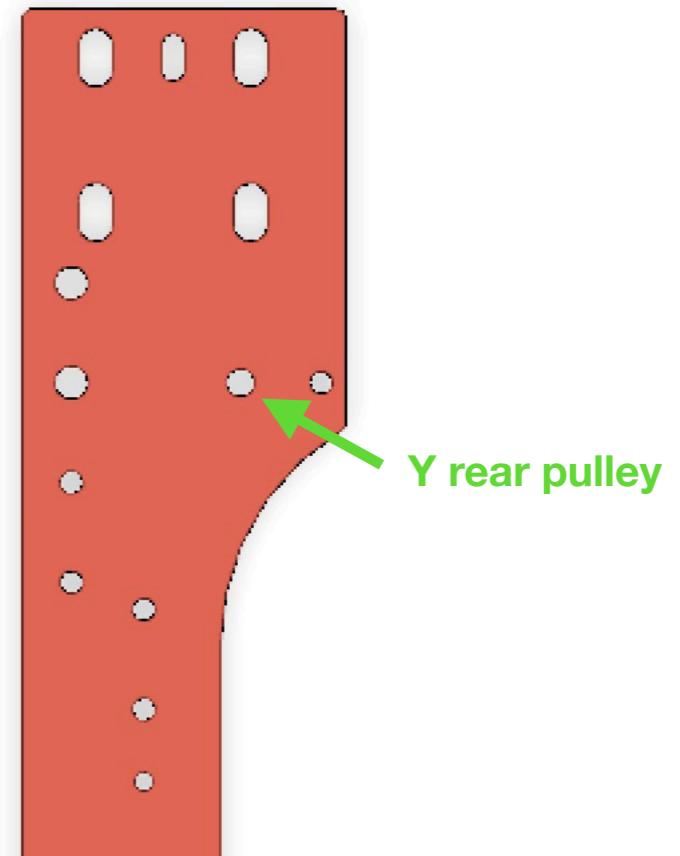
- Y front pulley set
 - 2 idlers without gear, 5mm bore
 - 1 bolt M5 x 40
 - 3 nuts M5
 - 1 T-nut M5
 - 1 nylon washer M5 x 8 x 1
 - 2 washers M5 x 10 x 1.0
- Make 2 sets

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

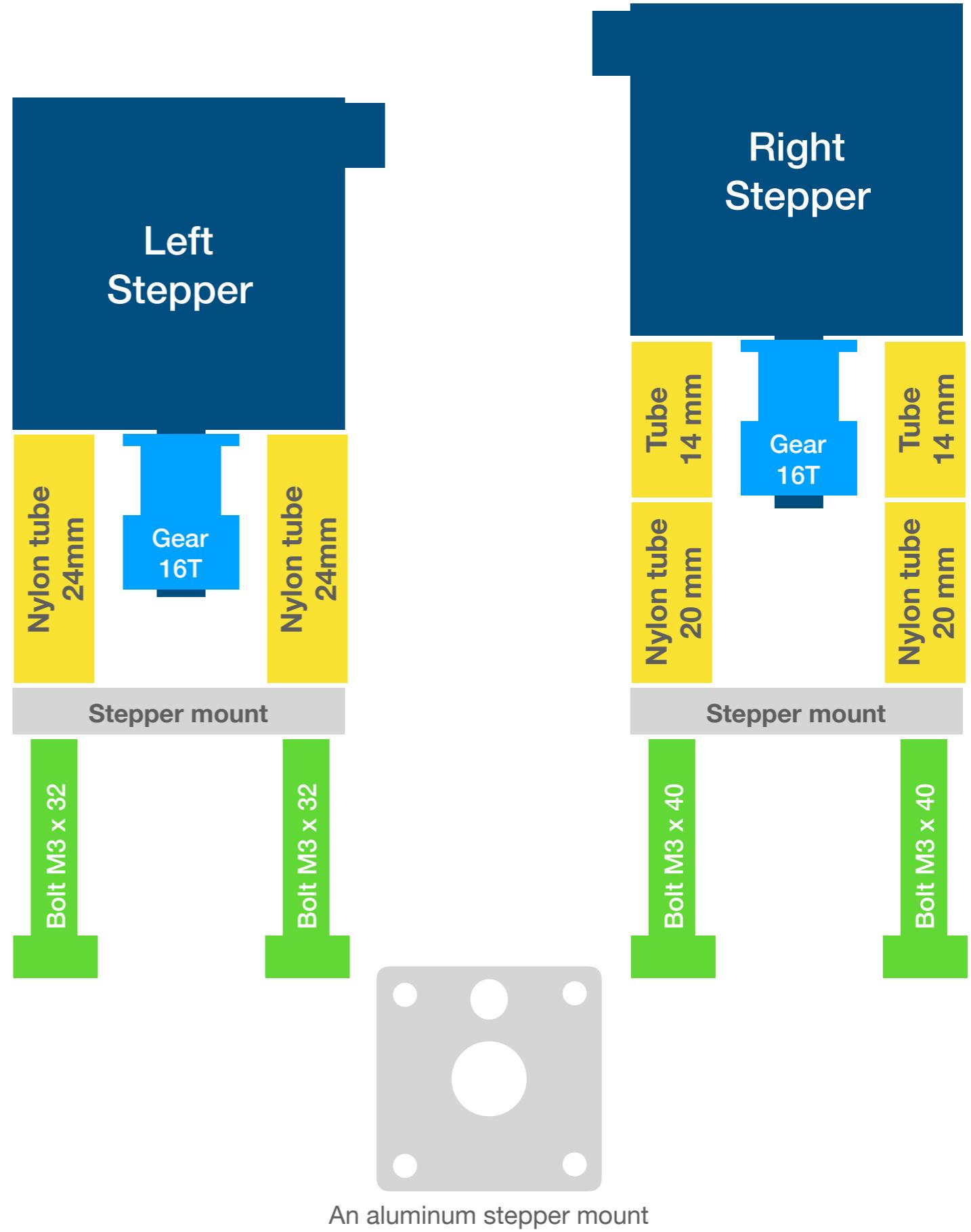
- Left stepper
 - 1 aluminum stepper mount
 - 4 nylon tube M3 x 7 x 24
 - 4 bolts M3 x 32
 - 1 16T gear, 5mm bore
- Right stepper
 - 1 aluminum stepper mount
 - 4 nylon tube M3 x 7 x 14
 - 4 nylon tube M3 x 7 x 20
 - 4 bolts M3 x 40
 - 1 16T gear, 5mm bore

Action

Assemble left and right steppers as shown.

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

Core XY belts. Just leave them attached here.



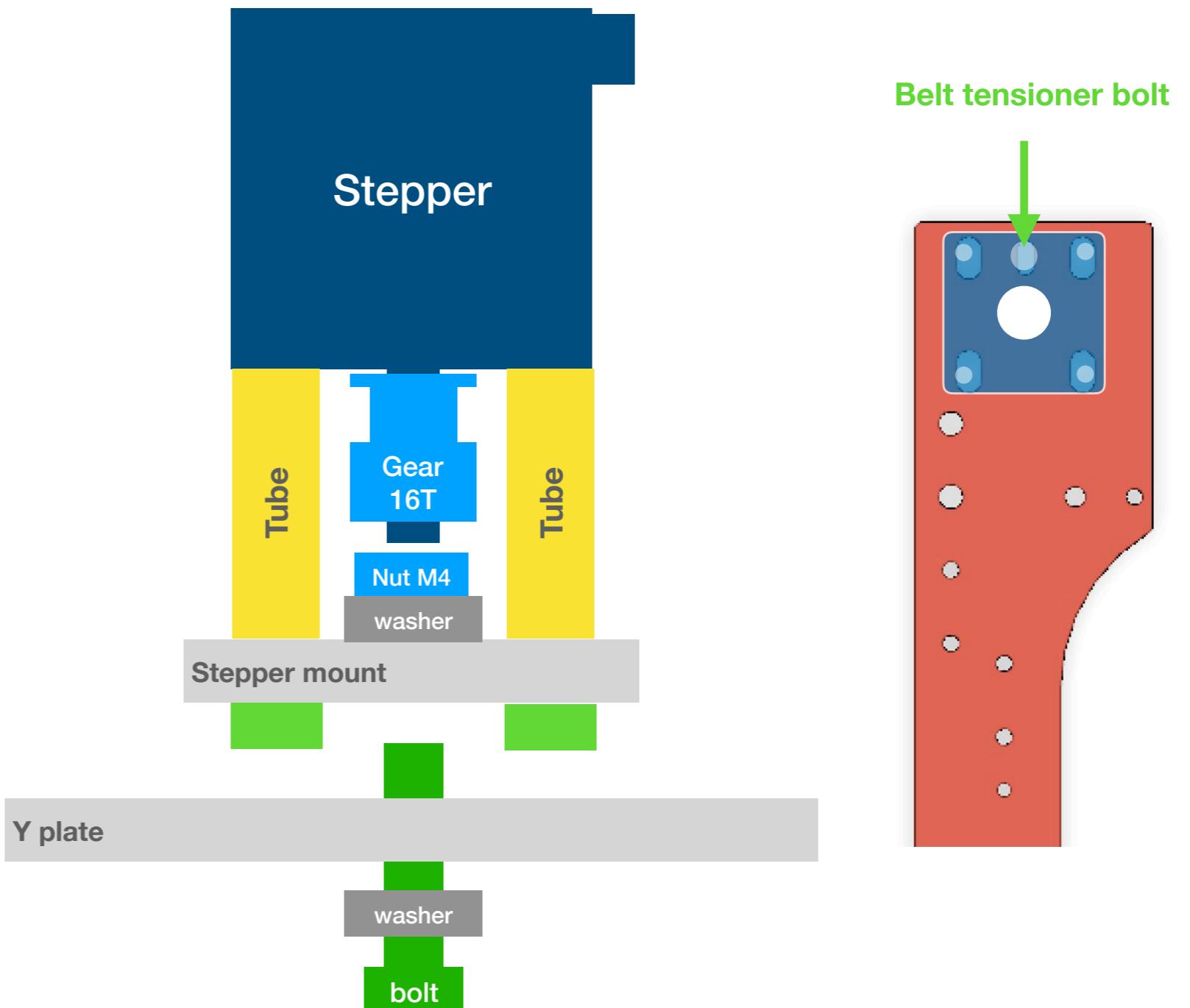
An aluminum stepper mount

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

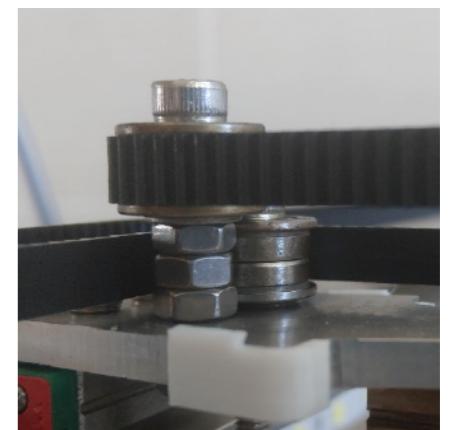


Action

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.

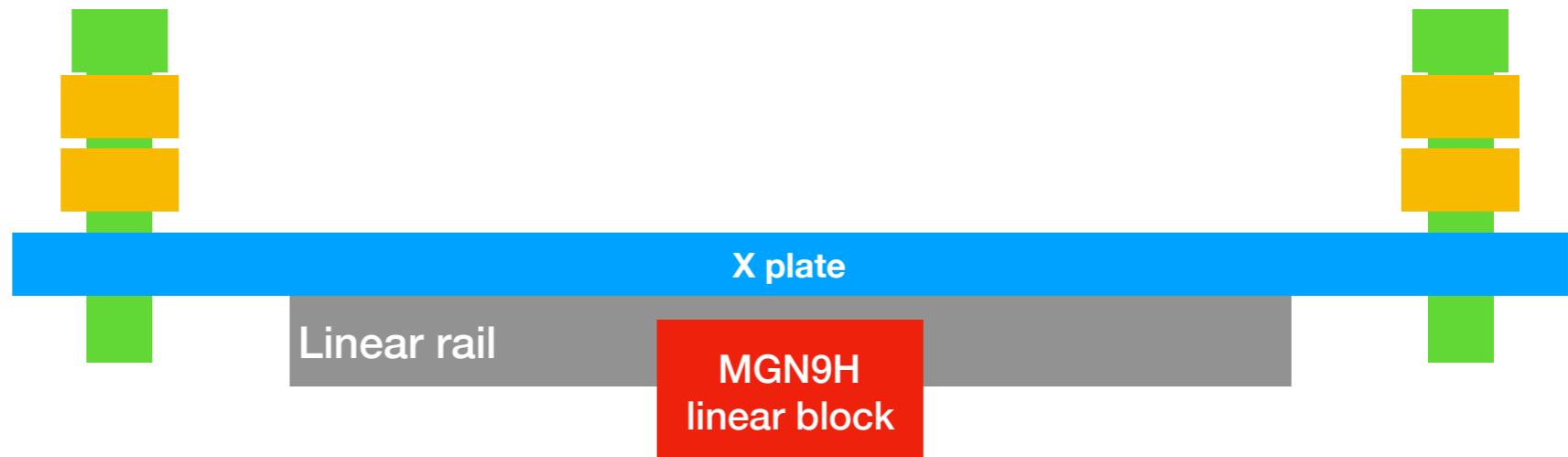


Exam

Make sure pulleys rotate freely.

X Linear Rail

- X plate
- Printed X-Min bumper (Not included. Please print it by yourself)
- MGN9H (not shorter MGN9C) block
- Linear rail
 - SK-Go²: 390 mm
- 7 bolts M3 x 10
- 7 nuts M3



Action

Install linear rail and block under X plate.

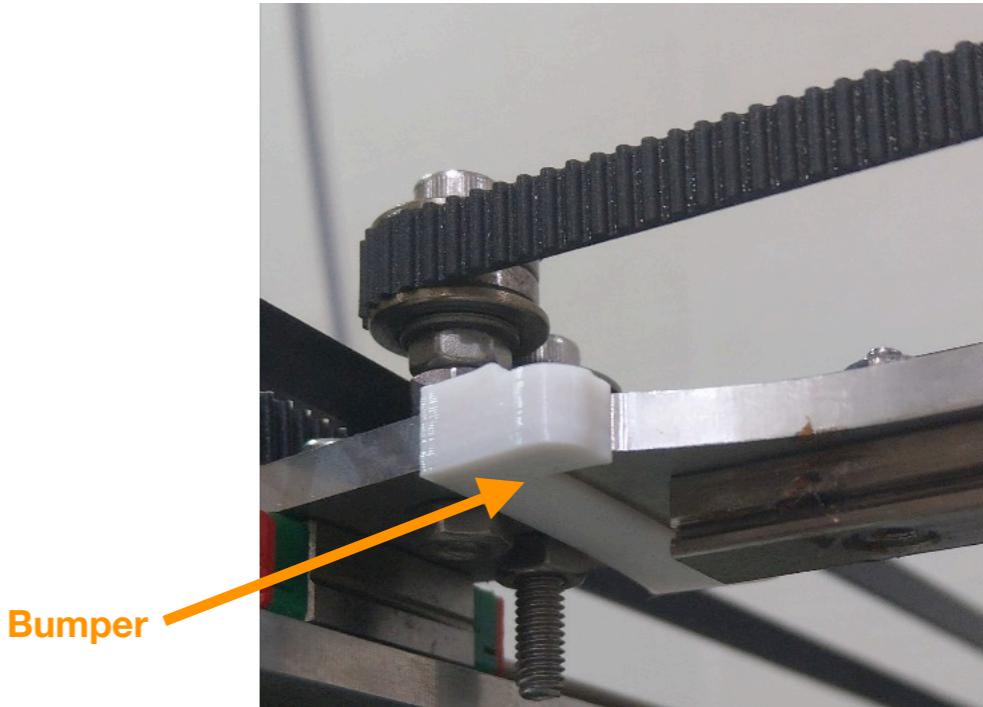
Download and print the X-Min bumper:

https://github.com/SecKit/SK-Go_SK-Mini/tree/master/printed%20parts%20STL/2.%20Recommended/5.%20X-min%20sensorless%20homing%20bumper

Clip the bumper 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.



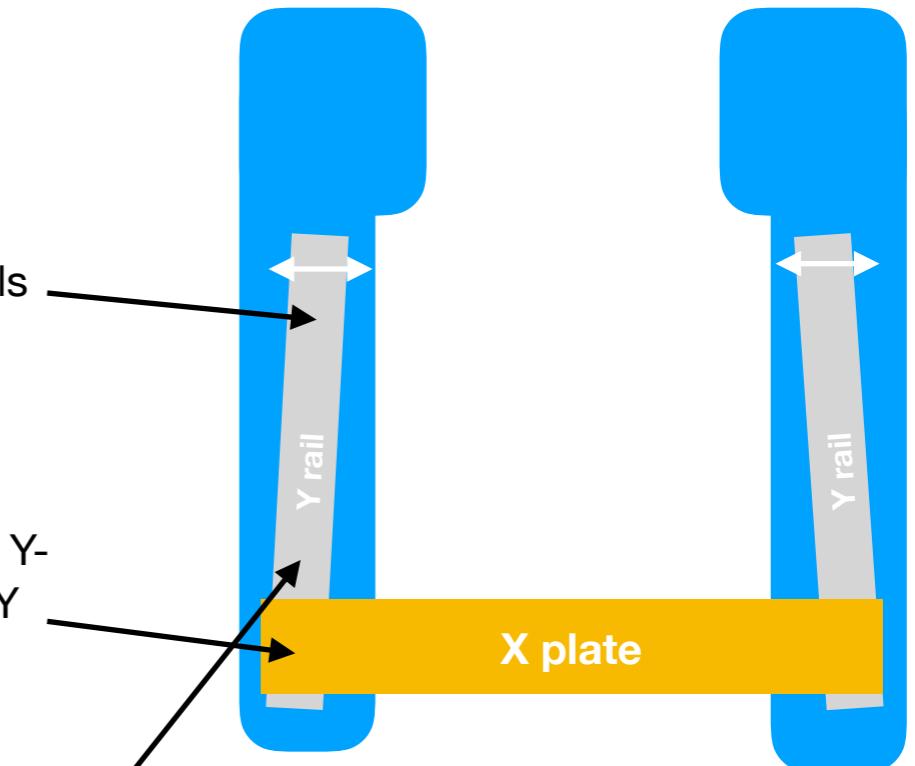
Attach X to Y Axis

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

Exam

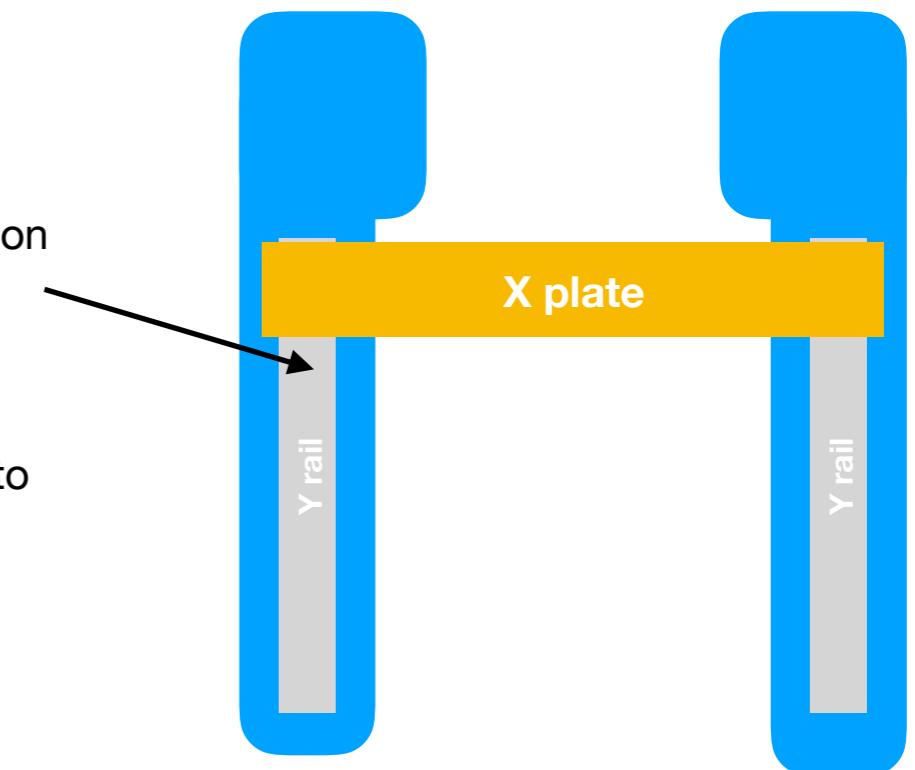
Make sure X plate slide smoothly across the whole Y stroke, and X and Y are perpendicular to each other.

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

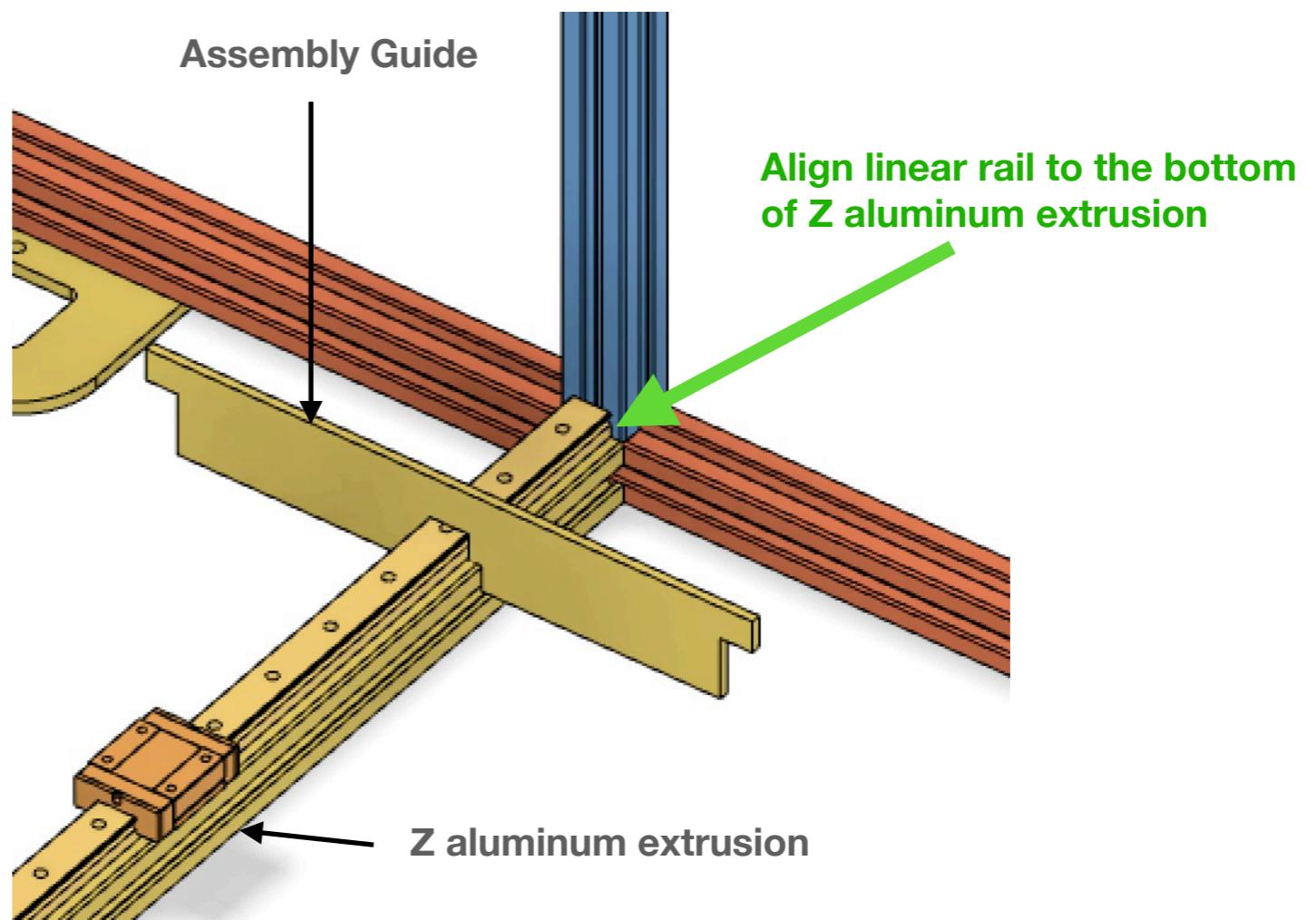
Use Assembly Guide (please print it by yourself) to help align Z linear rail, and move the rail to bottom of Z extrusion.

STL of Assembly Guide:

https://github.com/SecKit/SK-Go_SK-Mini/tree/master/printed%20parts%20STL/2.%20Recommended/1.%20Assembly%20guide

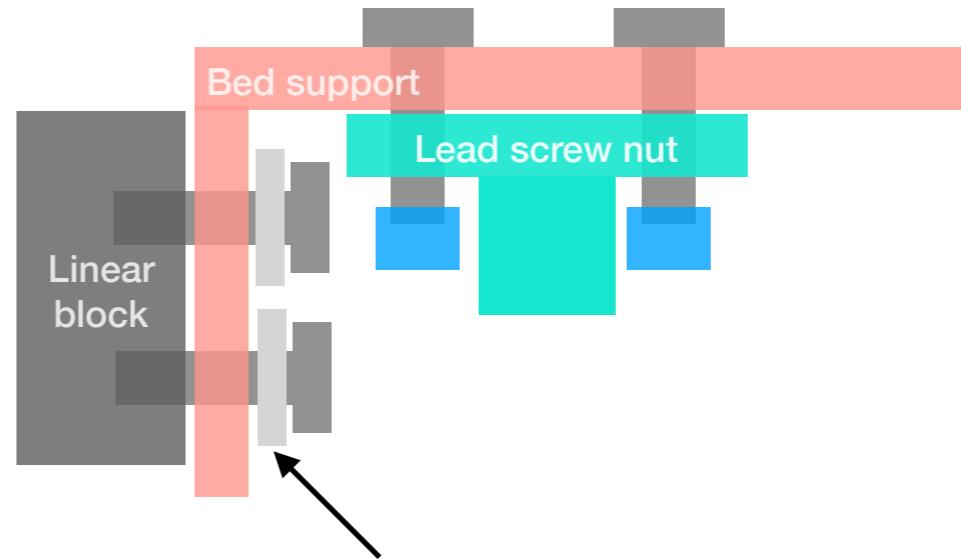
Exam

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 8 x 1.0
- Bed support to lead screw nut
 - 3 bolts M3 x 10
 - 3 nuts M3



1 or more washers if bolt is too long

Action

Assemble the bed supports as shown in the picture.

Use 1 or more washers if bolt is too long.



Bed support

Invert bed support if someday you use
a longer hotend like Super Volcano

Assemble Lead Screw

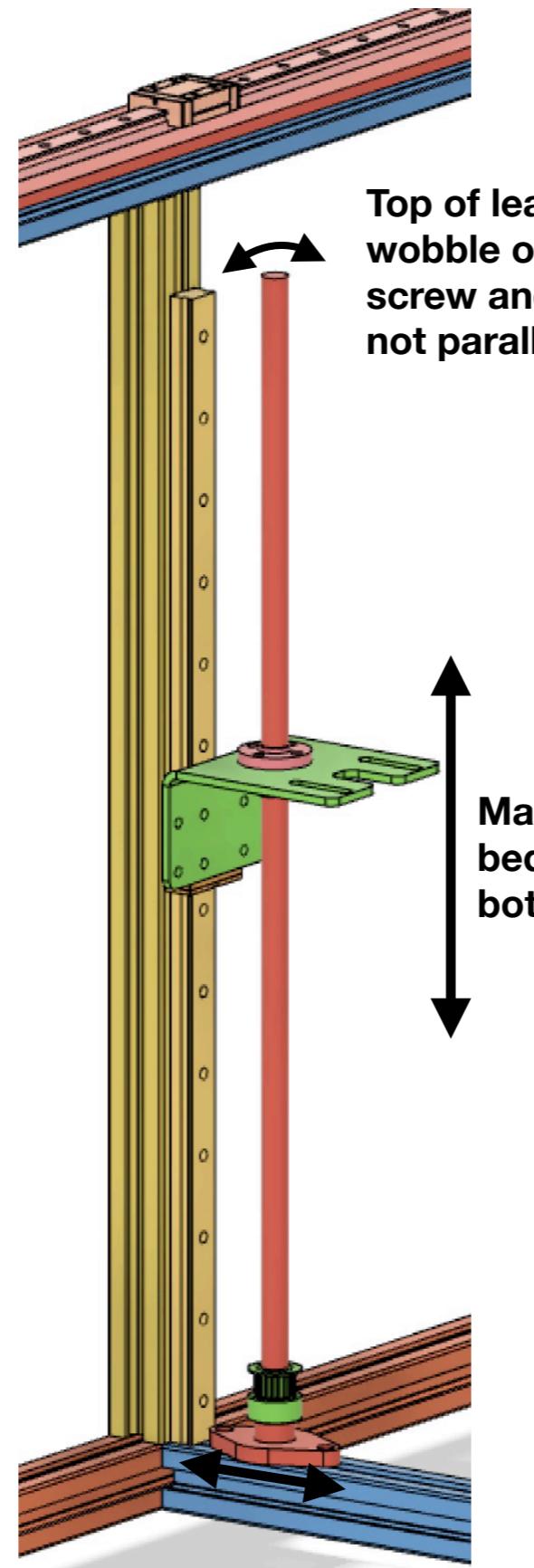
- Lead screw
- Lead screw mount
- Gear 20T, 8mm bore
- Close-loop belt
- 2 bolts M5 x 8
- 2 T-nuts M5

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

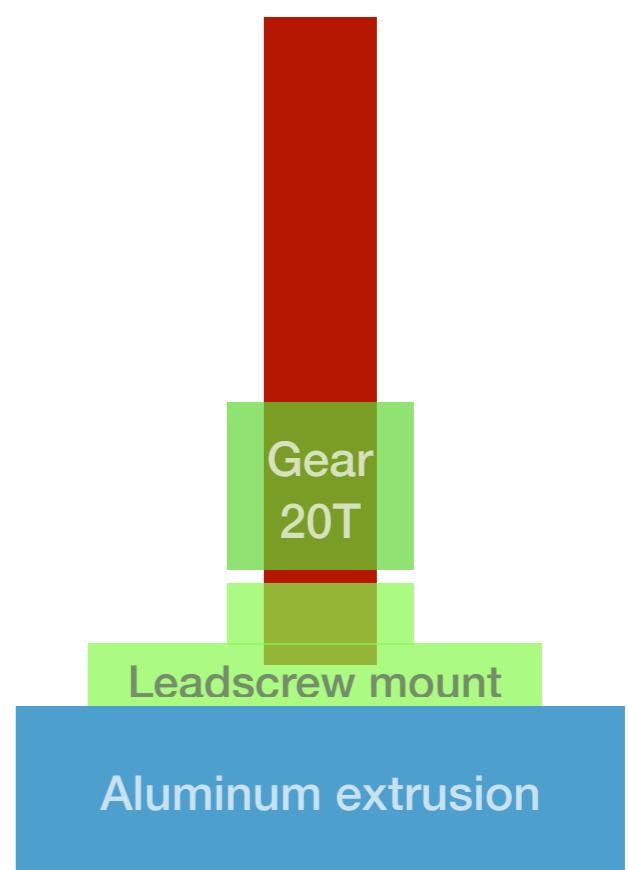
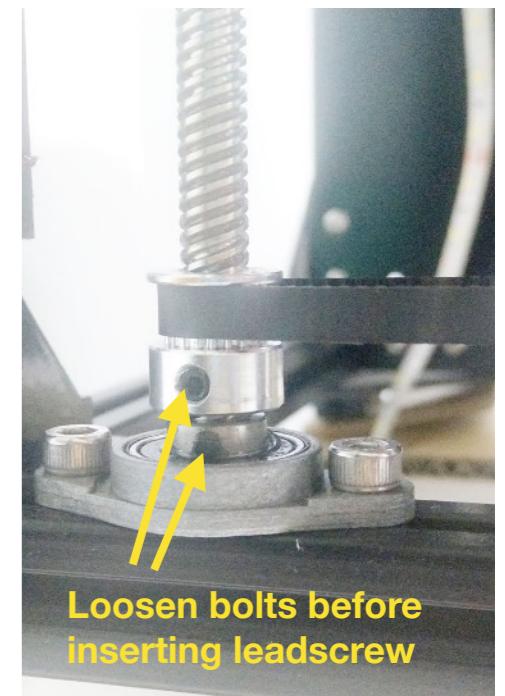
Make sure that you can manually move the bed supports up and down with your hand, and the lead screws are spinning freely without wobbling. If binding happens, try lubricating and re-adjusting.



Find a position for lead screw mount where lead screw won't wobble.

Top of lead screw will wobble or shift if lead screw and linear rail are not parallel.

Manually move bed support from bottom to top.



Aluminum extrusion

Gear
20T

Leadscrew mount

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.

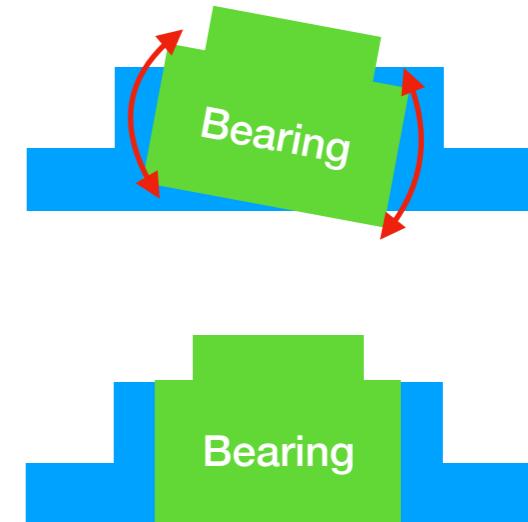


Fig. A
The bearing inside lead screw mount is rotatable.

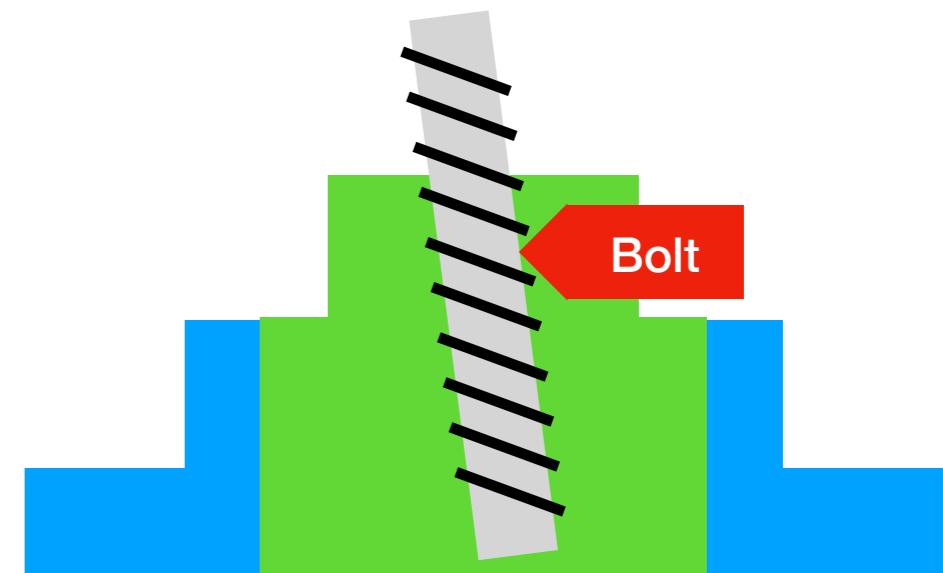


Fig. B
Fasten the 2 tiny bolts too tightly might tilt the lead screw.

Z Belt Tensioner

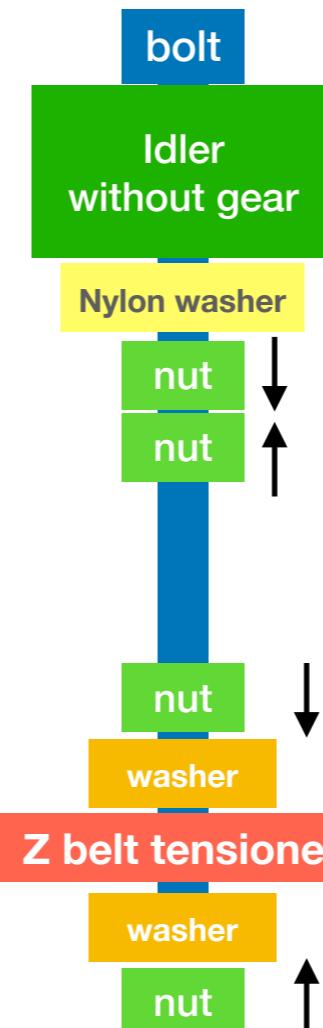
- 1 idler **without gear**, 5mm bore
- 1 bolt M5 x 40
- 4 nuts M5
- 1 nylon washer M5 x 8 x 1
- 2 washers M5 x 10 x 1

Action

Assemble Z belt tensioner as shown in the picture.

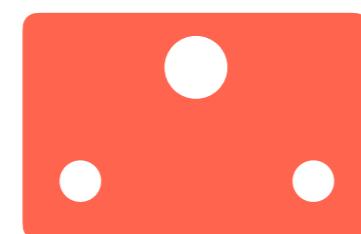
Exam

Make sure the idler can rotate freely.

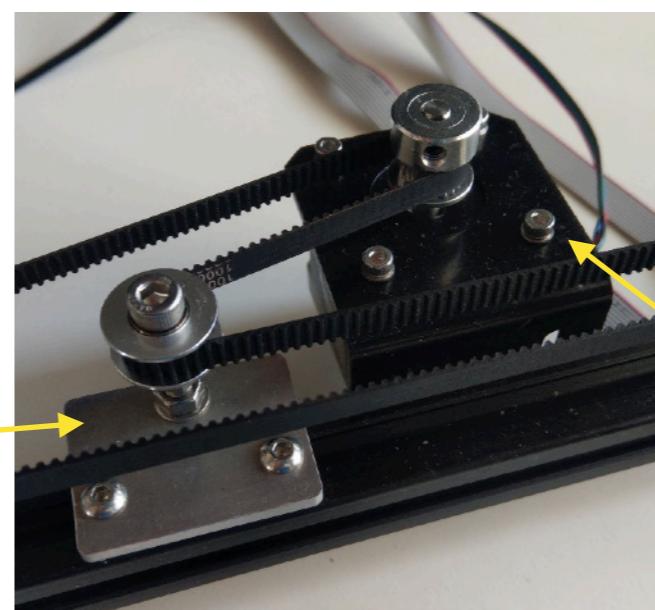


1. Interlock the two bolts **TIGHTLY** at a position as top as possible but keep the idler rotating freely.

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



An aluminum Z belt tensioner

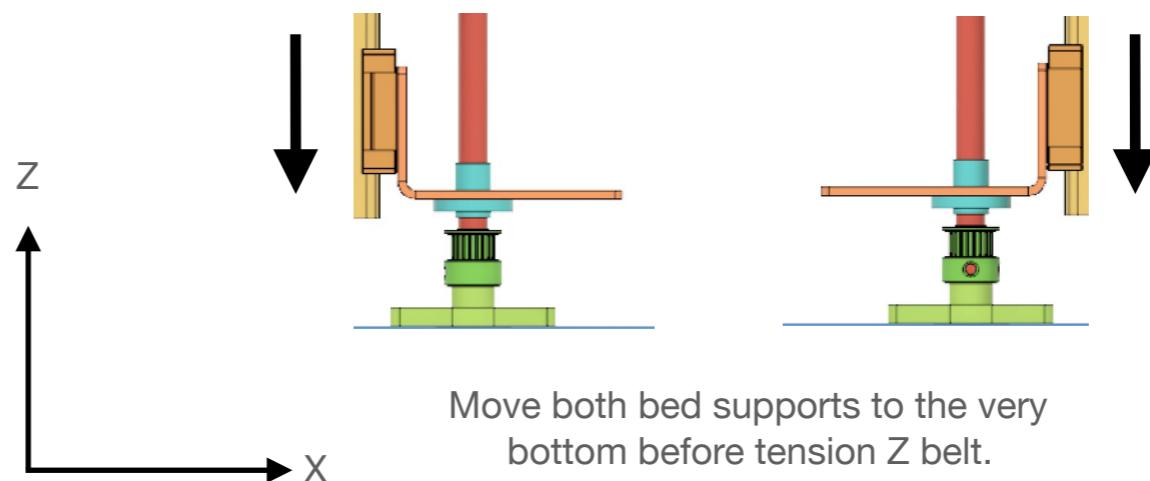


A NEMA17 stepper mount

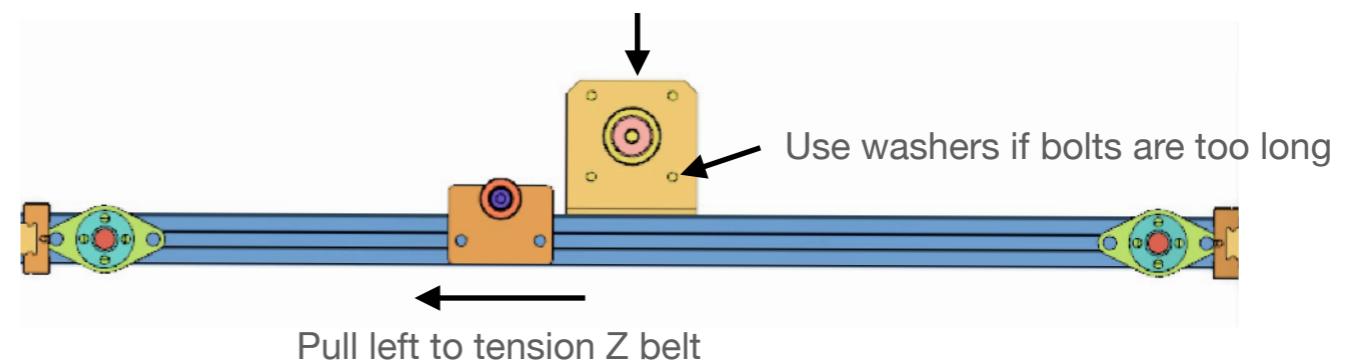
Z Plane

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 8 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 about the center. No need to be exact because the belt is tensioned by relative position of stepper mount and belt tensioner.

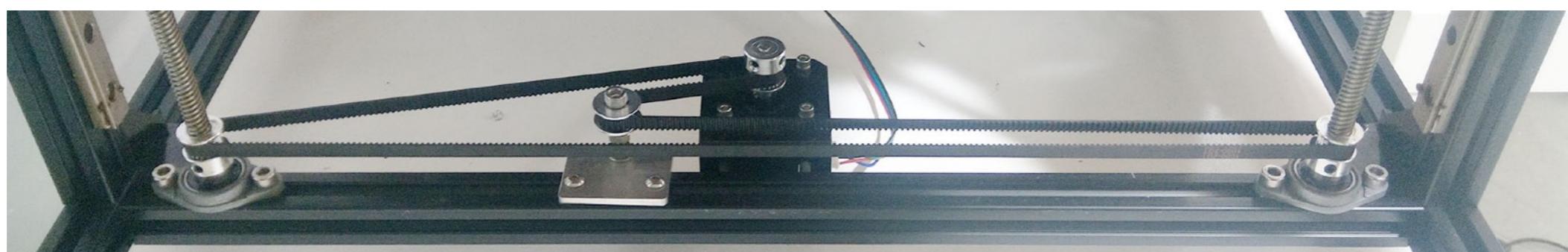
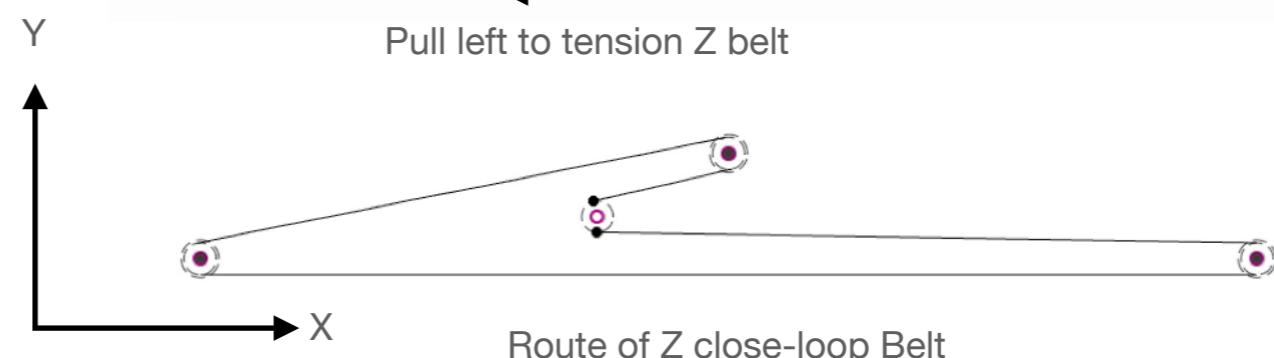


Action

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.

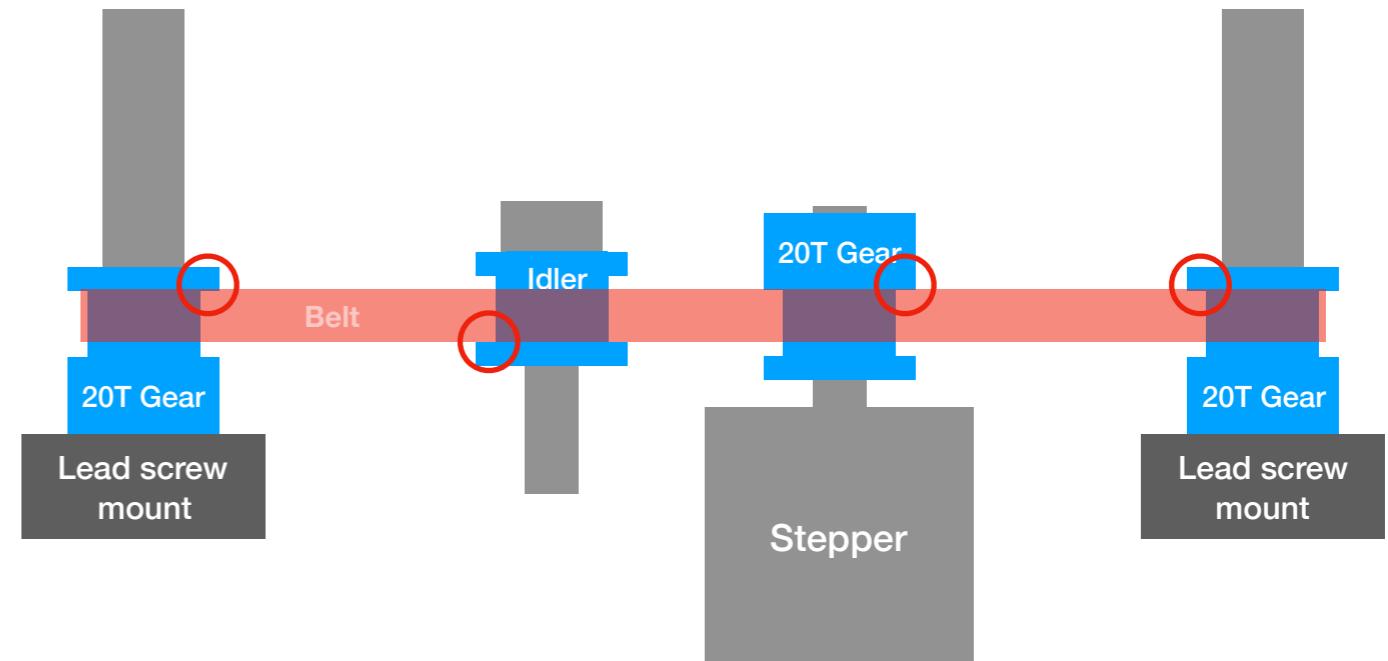


Adjust Position of Gear & Idler

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.

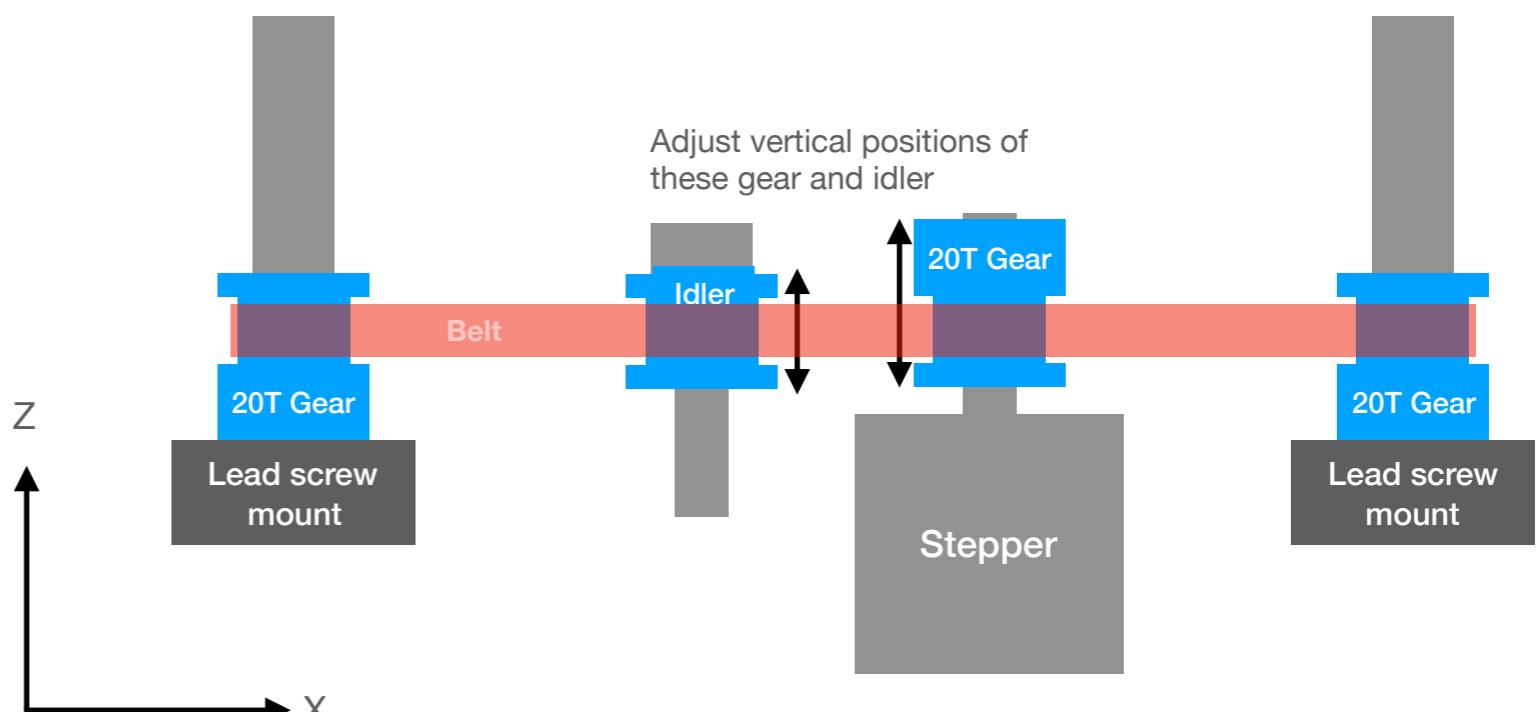


Belt is not in the middle of gears and idler.

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.



Belt is the middle of gears and idler.

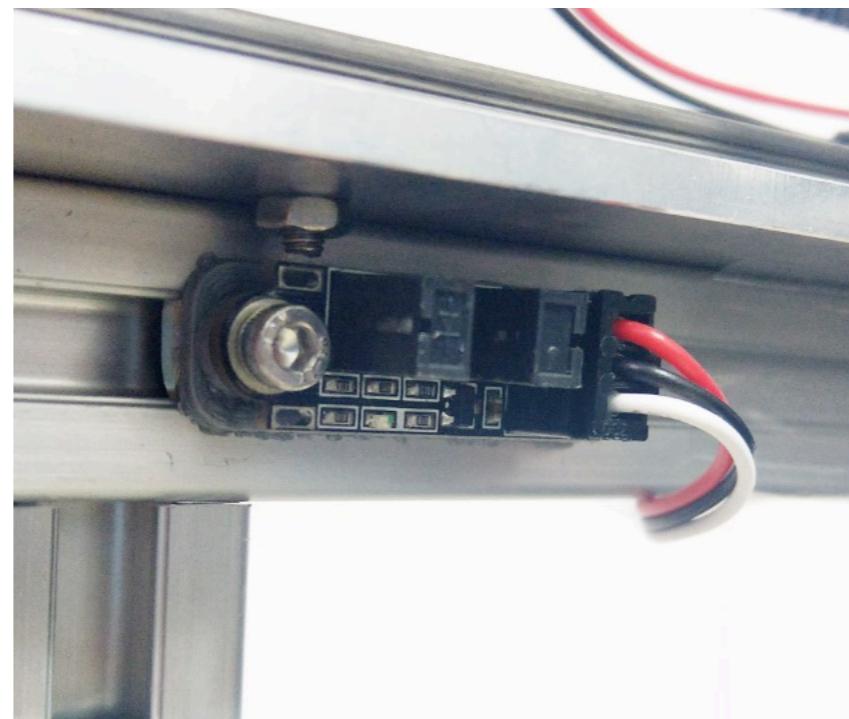
Z-Min Endstop

- 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

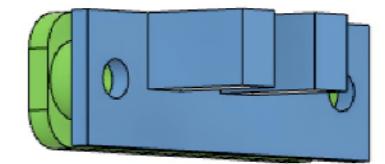
Action

Assemble optical endstop and mount as shown in the picture.

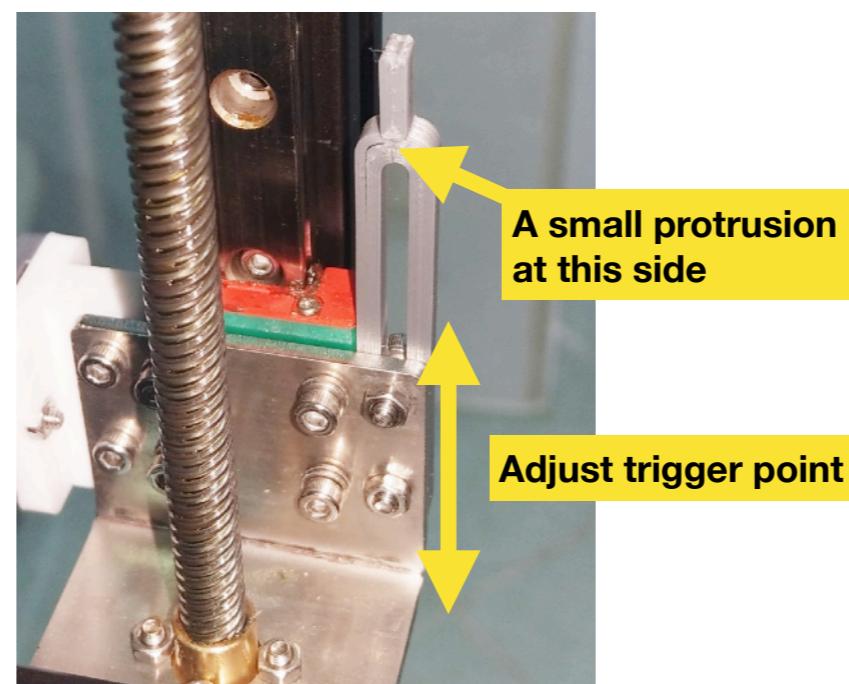
Don't fasten bolts at the trigger stick, you'll need to adjust trigger point later.



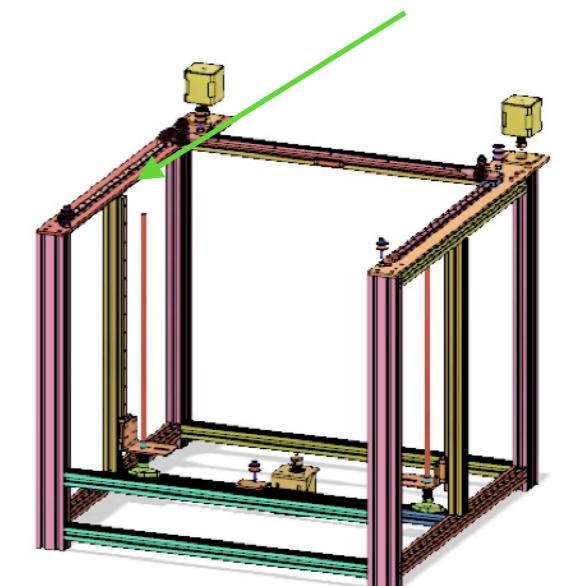
Optical endstop mount



Attach the endstop mount behind endstop



Attach endstop here



9

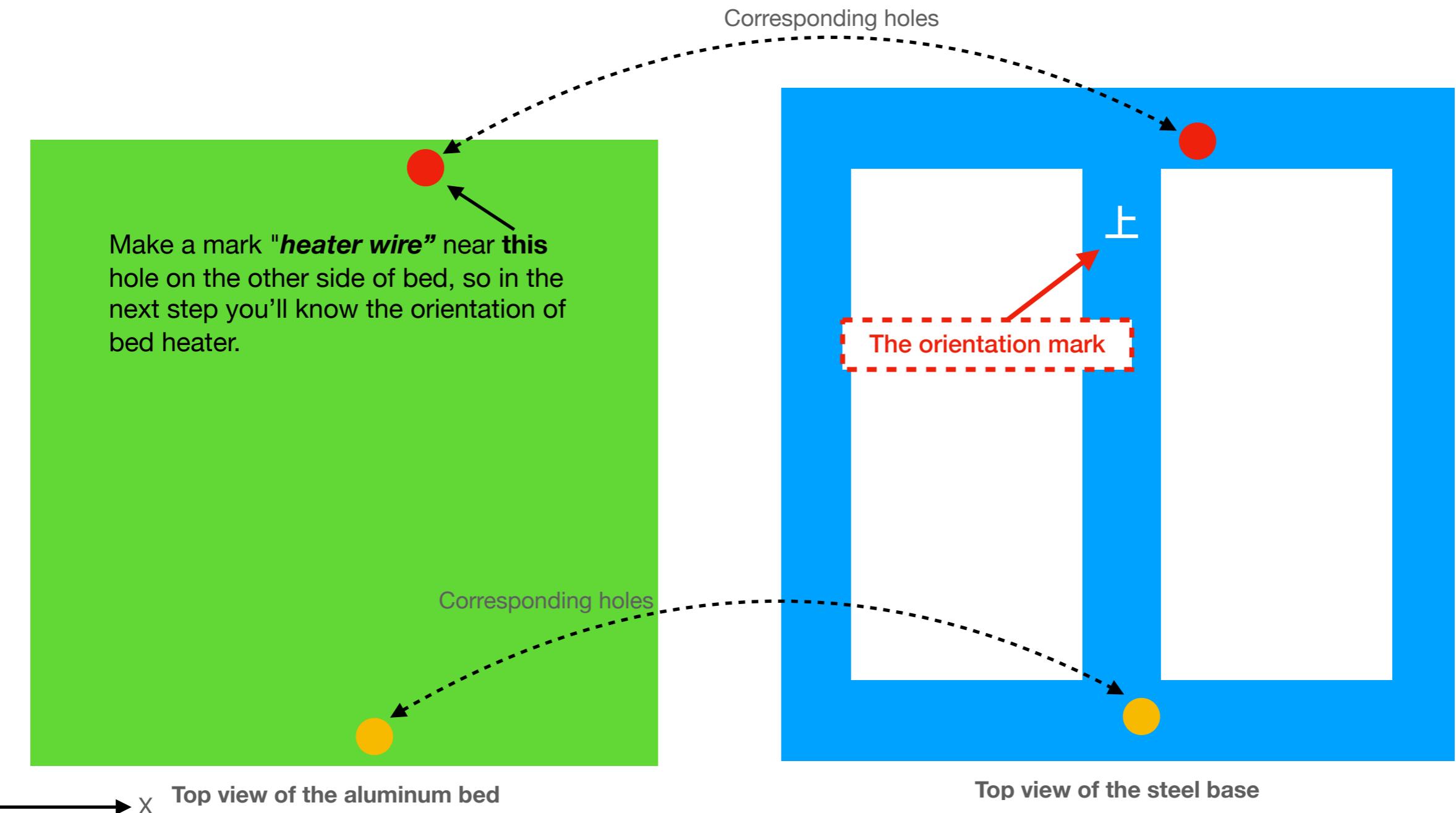
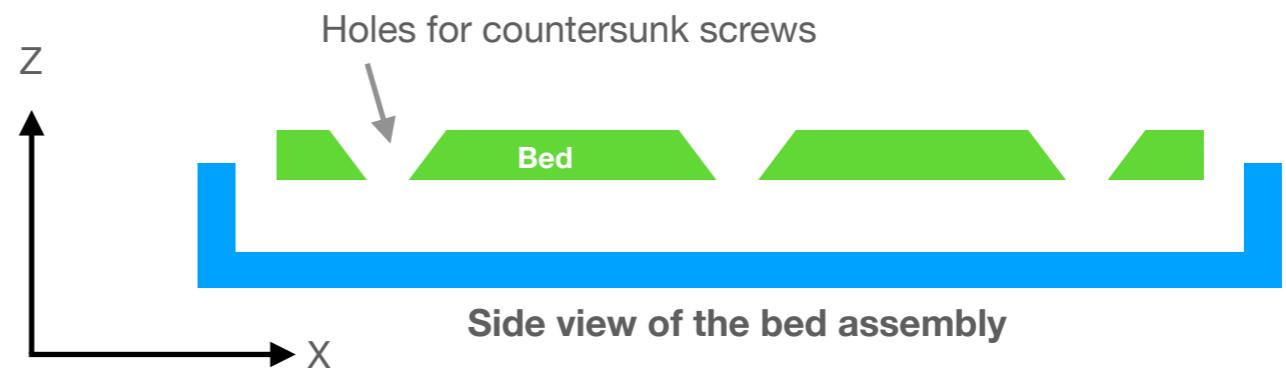
Heated Bed



Heated Bed

Find Orientation

- Aluminum bed
- Steel base



Attach AC-powered Silicone Rubber Heater

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

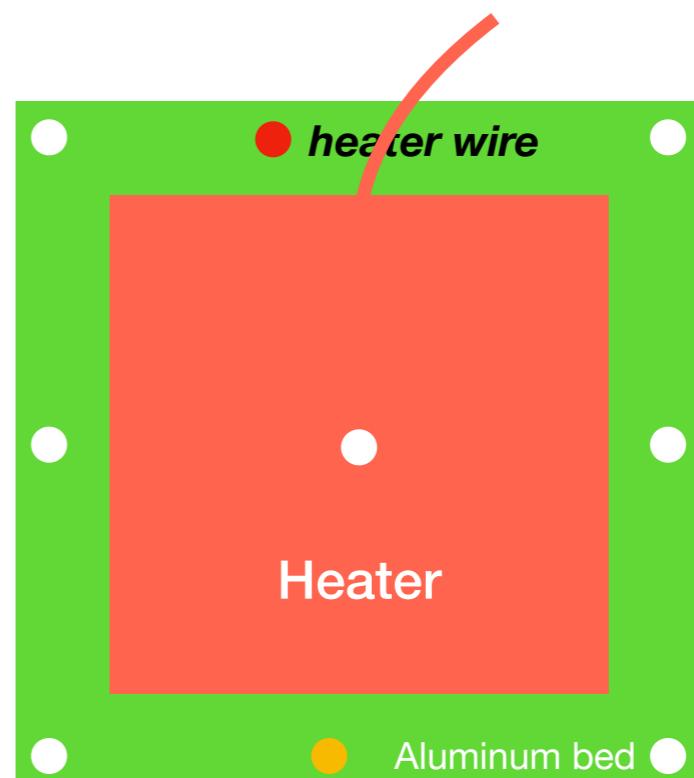
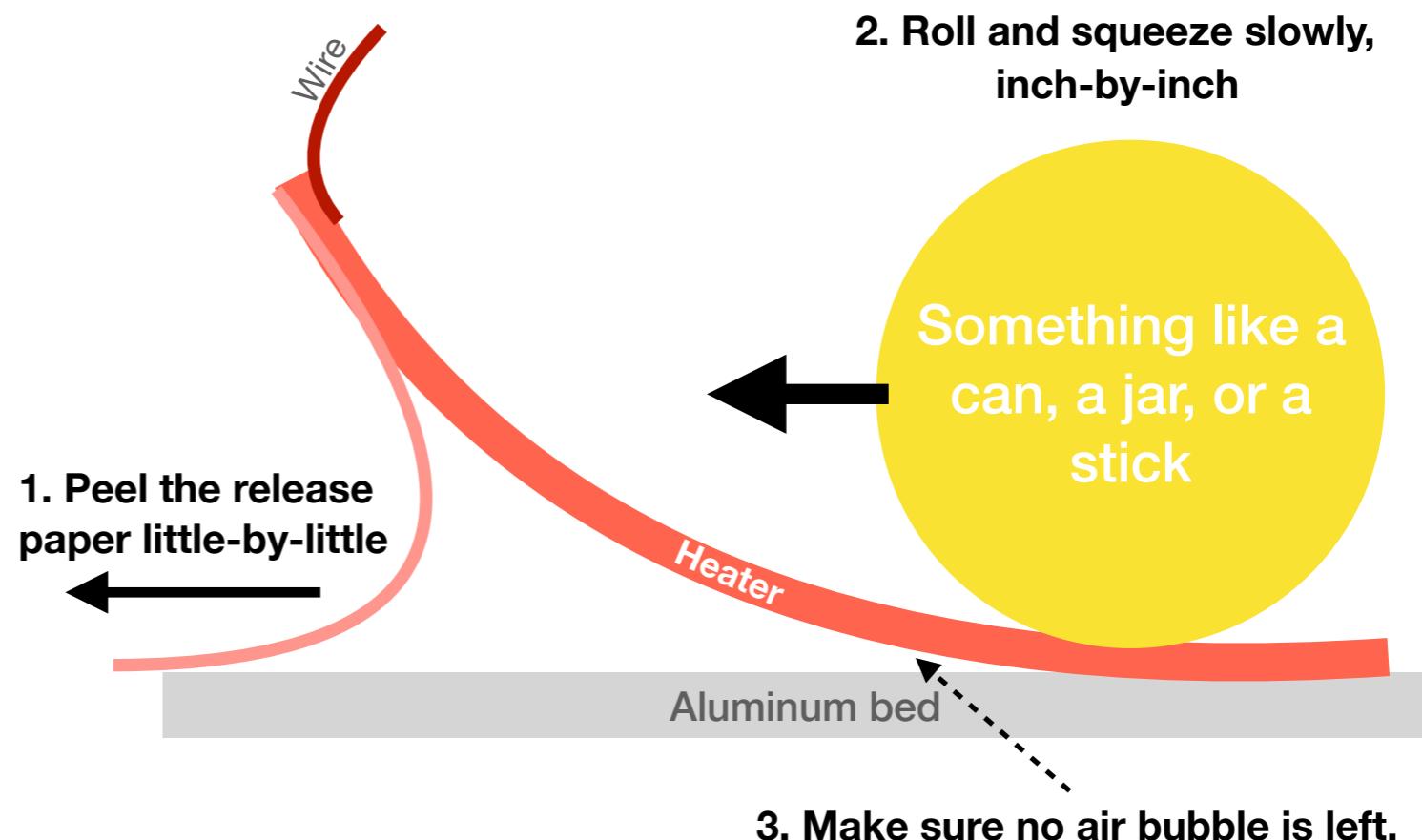
Action

Repeat step 1 to 3 as shown in the picture and attach the silicone rubber heater to the **bottom side** of aluminum bed. If you have ordered a PEI sheet, attach the magnetic rubber to the **top side** of aluminum bed **after** the whole bed assembly is completed so it covers the center leveling screw.

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!



Connect Thermal Fuse

- 1 thermal fuse 130°C
- 2 round head bolts M4 x 8
- 2 nut M4
- Heater
- Polyimide tape (a.k.a. Kapton tape, heat-resistant tape. Self-sourcing.)
- Thermal paste (optional, self-sourcing.)

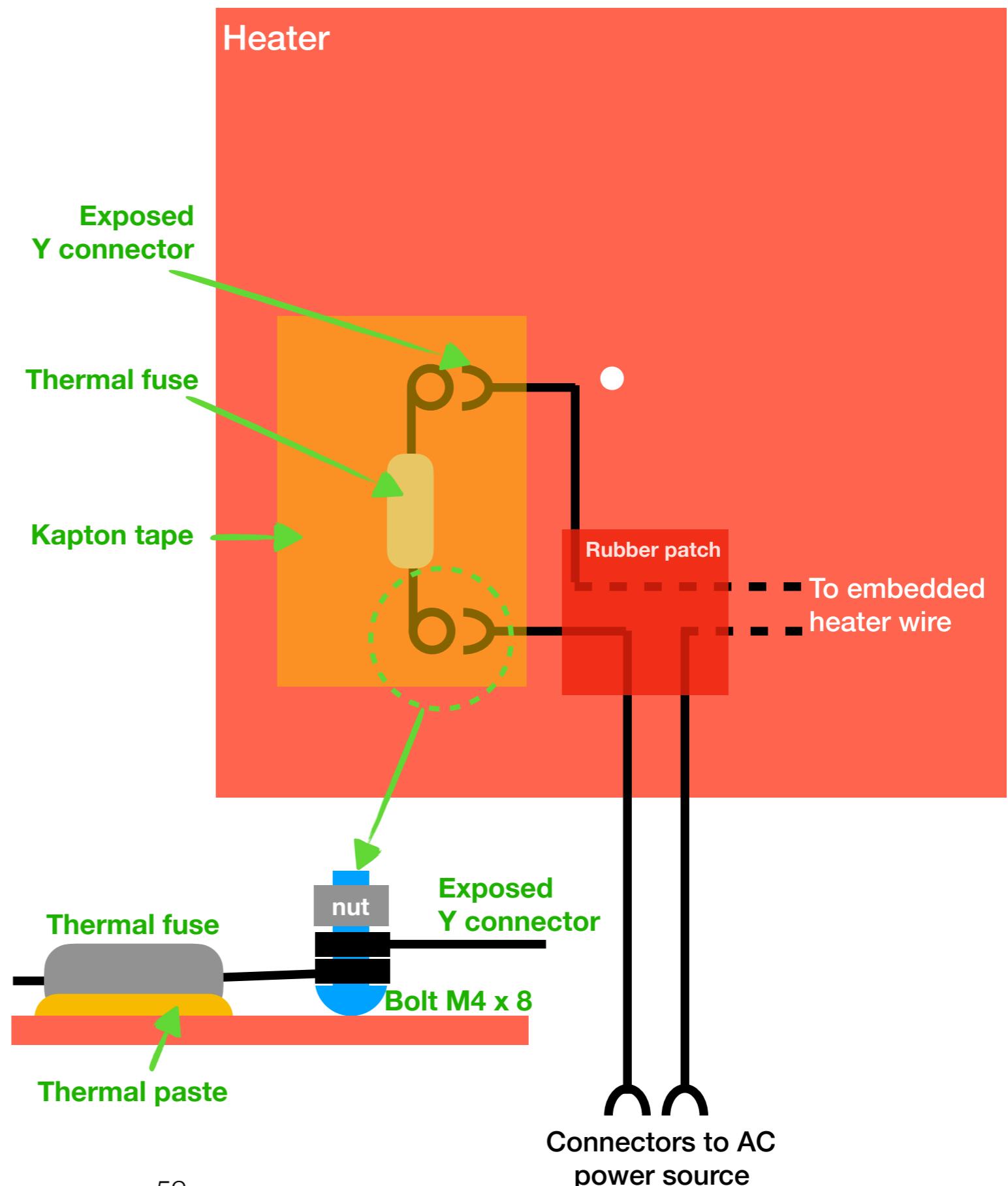
Action

Make a small circle at both ends of wires of the thermal fuse. Connect the fuse with the 2 exposed Y connectors, and attached the fuse firmly onto heater with polyimide tape. Multiple layers of tape are recommended.

Exam

(1) Both exposed connectors are well covered to prevent electric shock, and (2) the white cylindrical body is fully contacted with the heater so heat can be conducted to the fuse inside faster. Applying some thermal paste around the fuse helps heat conduction.

Measure the resistance with a multimeter at the 2 connectors to AC power source. The resistance should be around 30 ohm for a 110V heater, or 121 ohm for a 220V heater.



Bed Leveling Screw

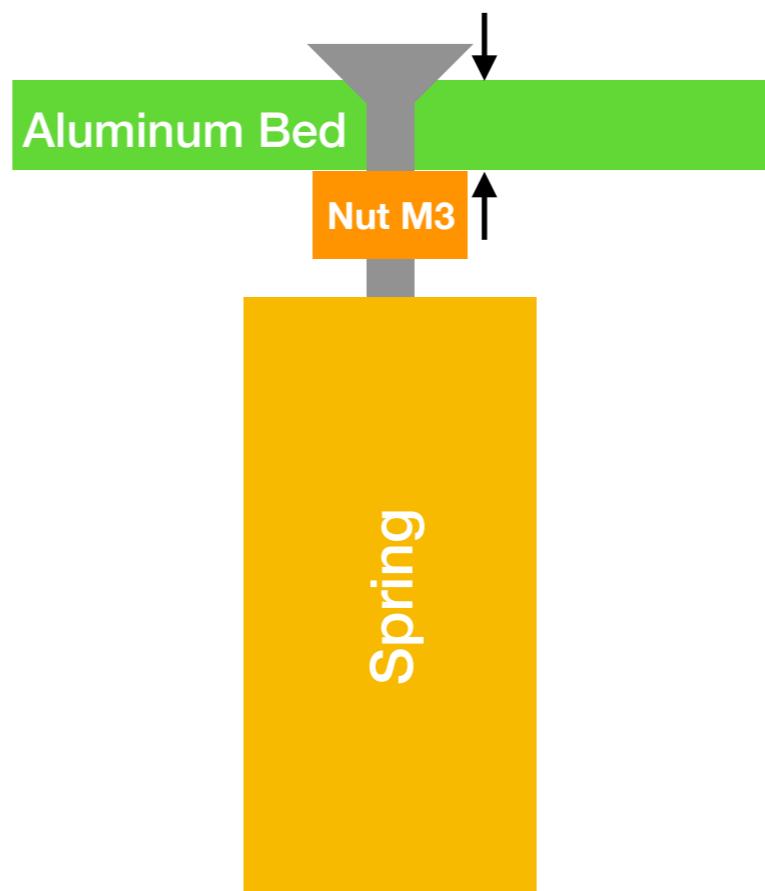
- Bed leveling screw set
 - Bolt M3 x 35 counter sunk
 - Nut M3
 - 1 washer M4 x 12 x 1
 - Butterfly nut
 - Spring
- 2 nylon tube 7x3x10
- Make 9 sets

Action

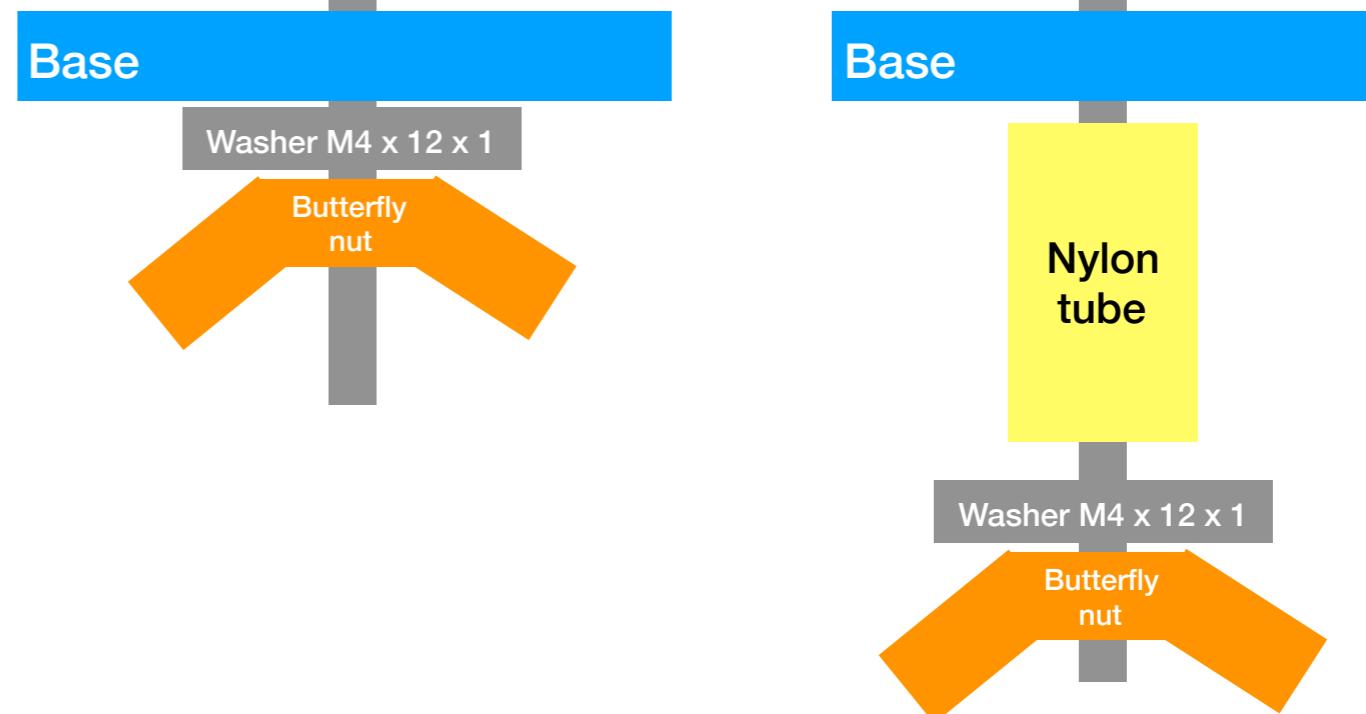
Assemble bed leveling screw as shown. Compress 9 springs little by little evenly to prevent deforming the aluminum bed dramatically.

The 9-point leveling mechanism treats the bed as a soft surface and levels the bed with traditional paper method. It works with or without ABL sensor. If you want, assemble the bed with only 3 leveling screws as a triangle and rely purely on ABL mechanism.

Tightly interlock the nut and bolt in opposite direction



Use a nylon tube as spacer for the leveling screws at the L-shape bed supports.



Attach Bed Frame to Bed Supports

- 4 round head bolts m4 x 8
- 4 nuts M4

Assemble

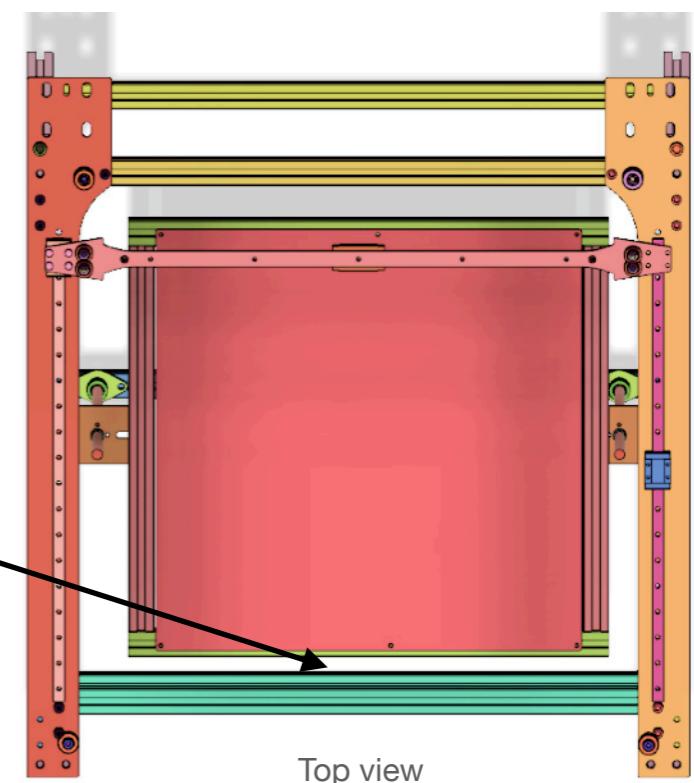
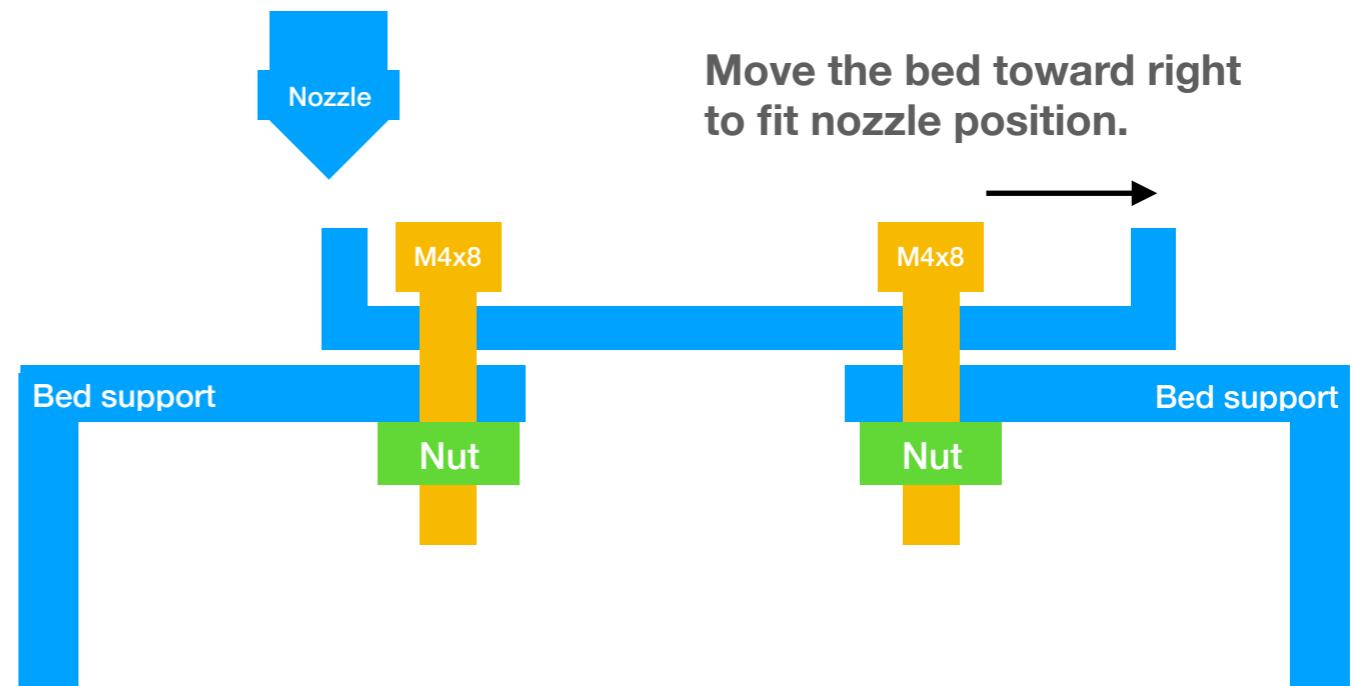
Manually pull Z close-loop belt to raise both bed supports to an upper position.

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.



10

CoreXY Belts

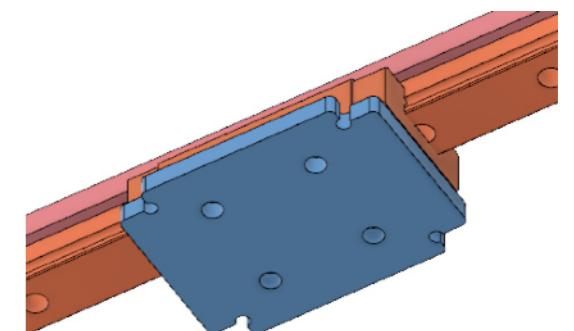
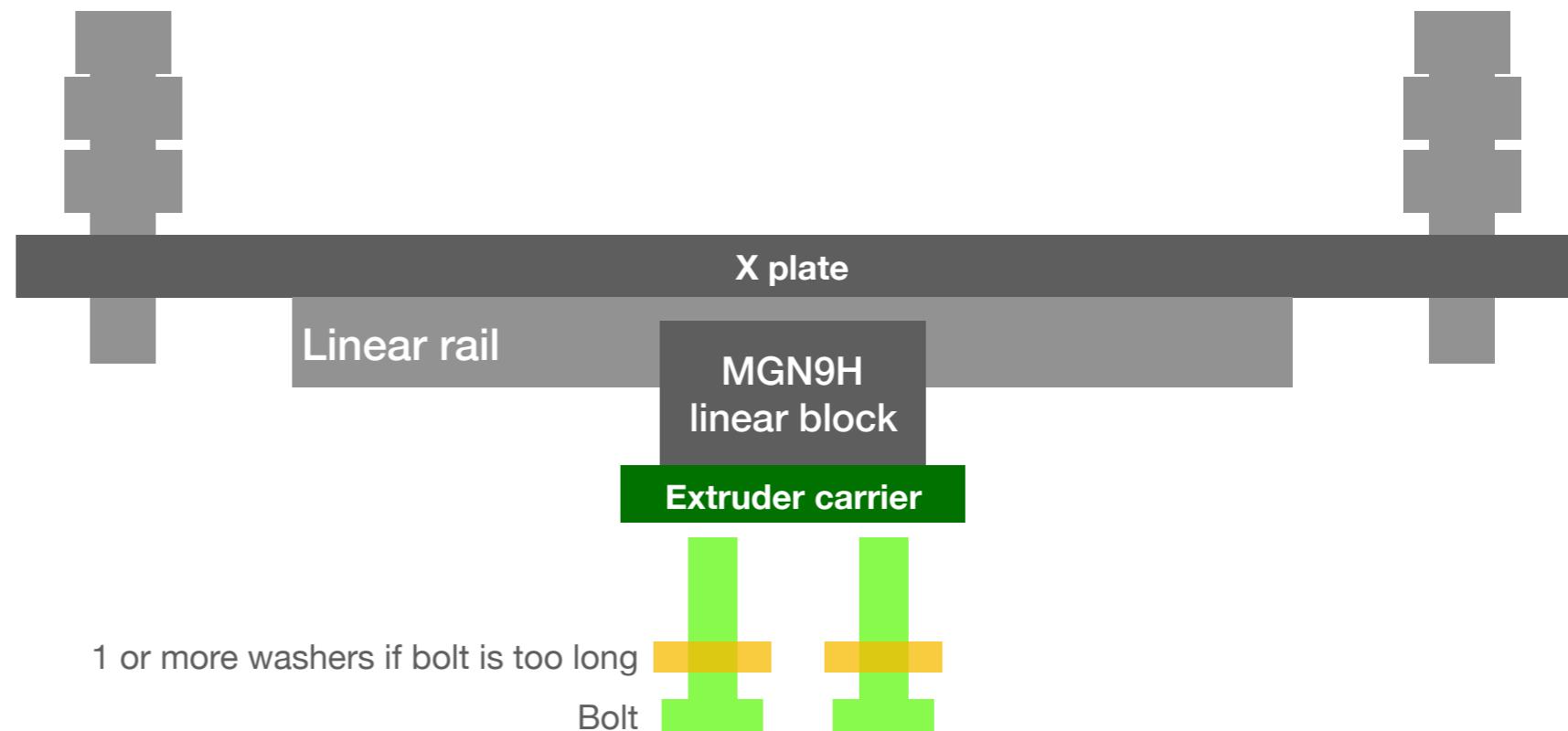


Extruder Carrier

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

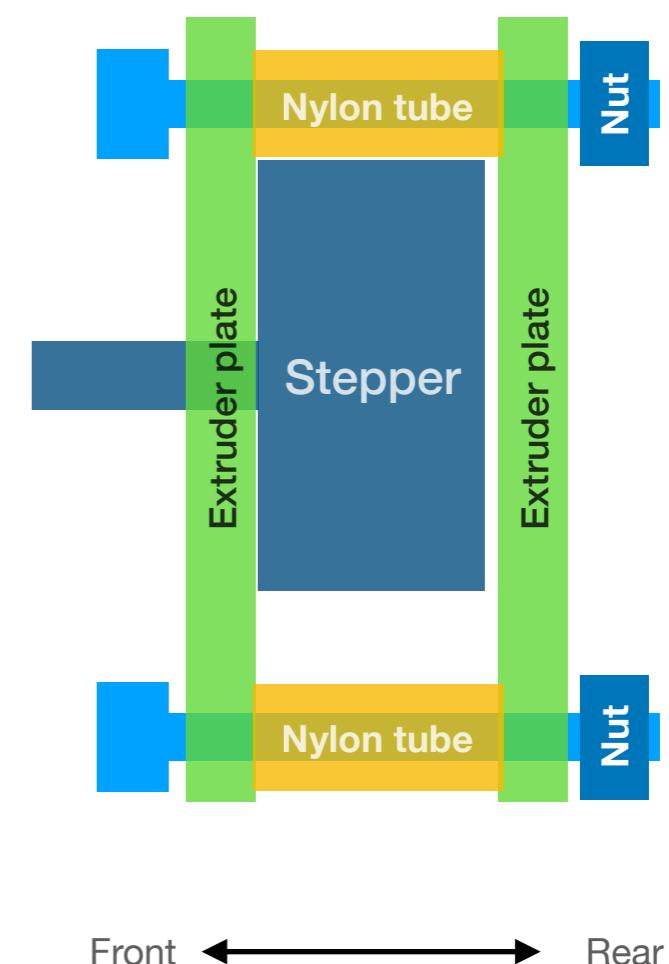
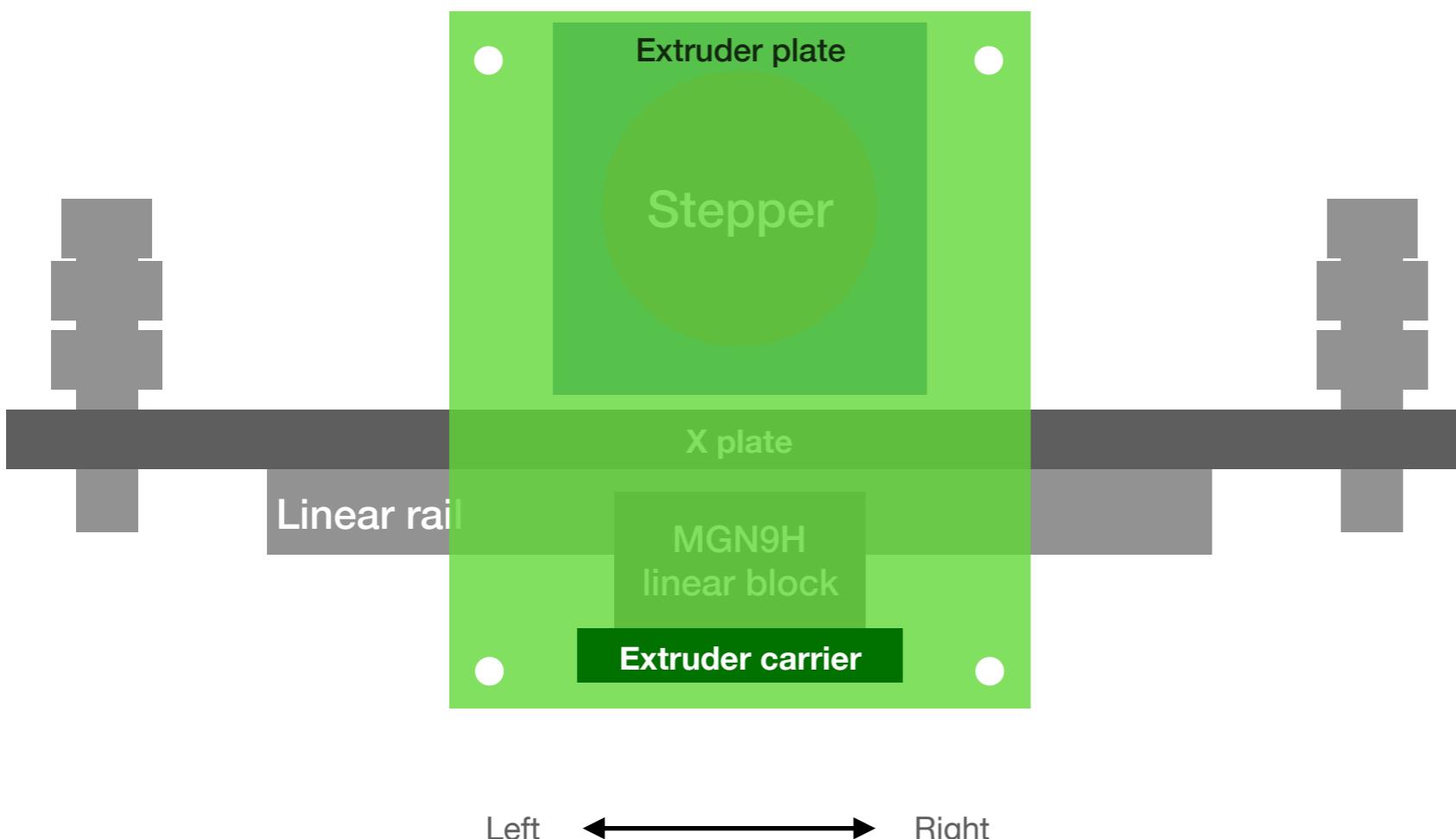
Action

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.

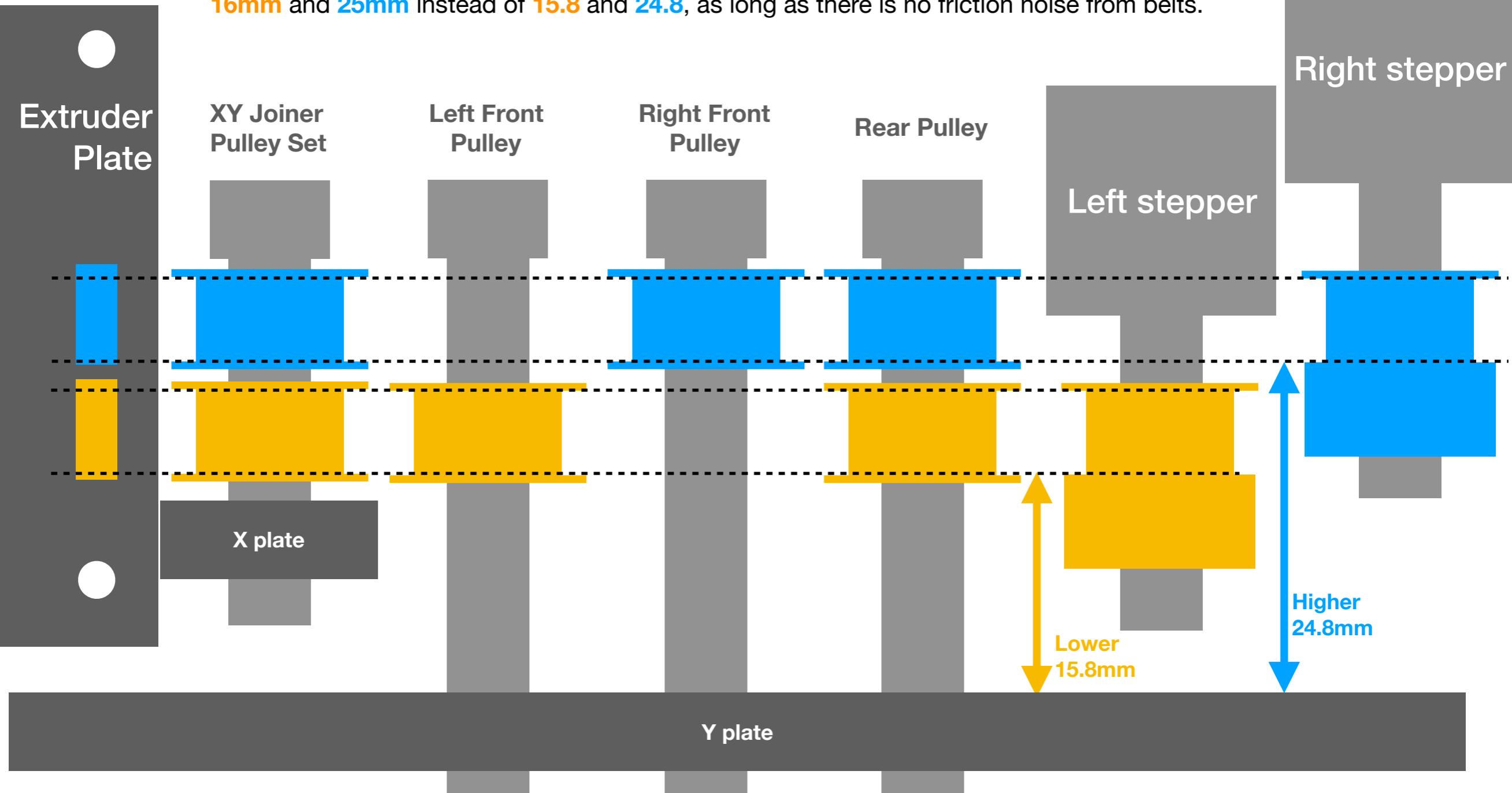
(Thermal expansion and contraction)



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.



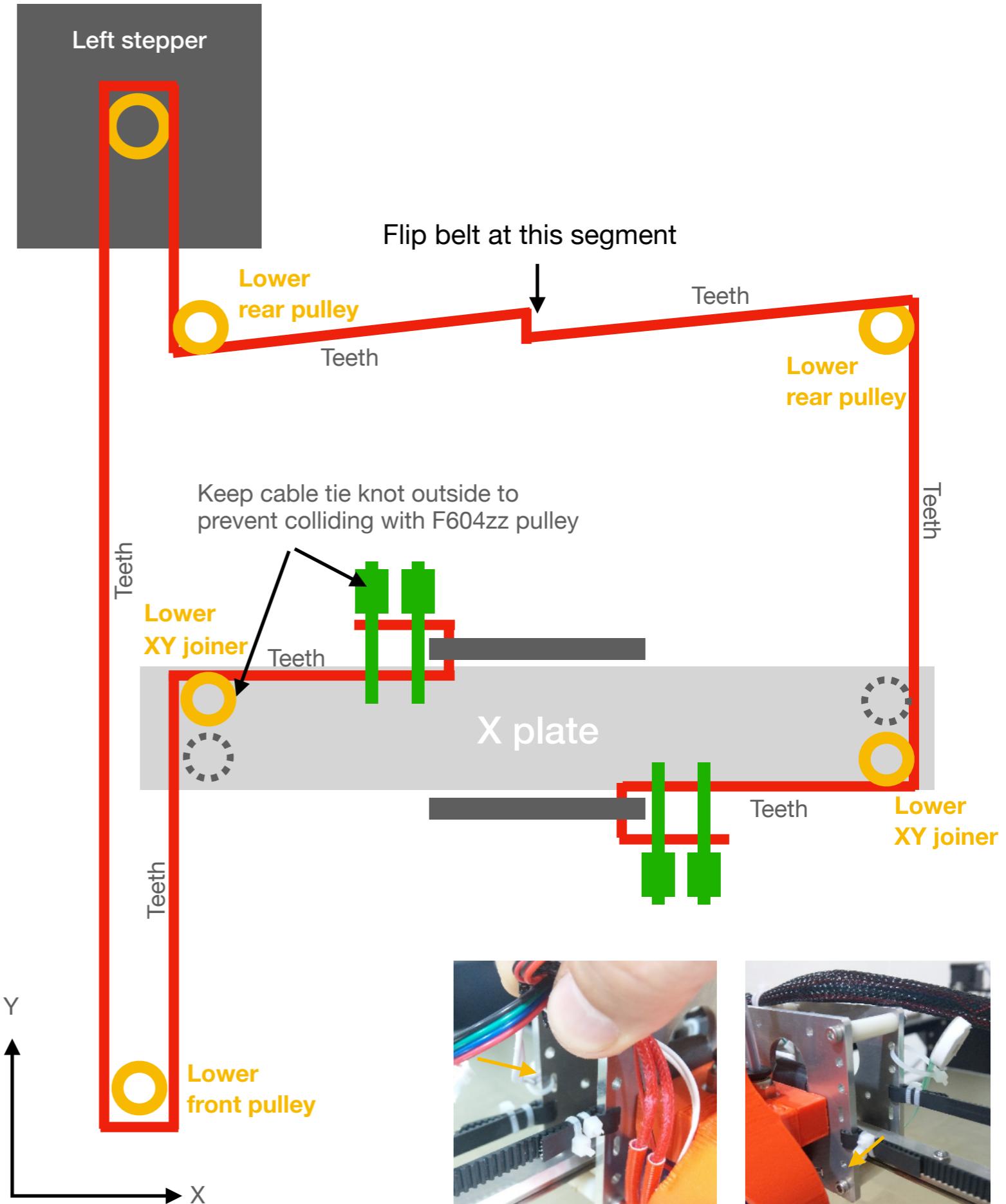
Attach Belt For Left Stepper

- 2GT 6mm belt
 - SK-Go²: about 2 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.

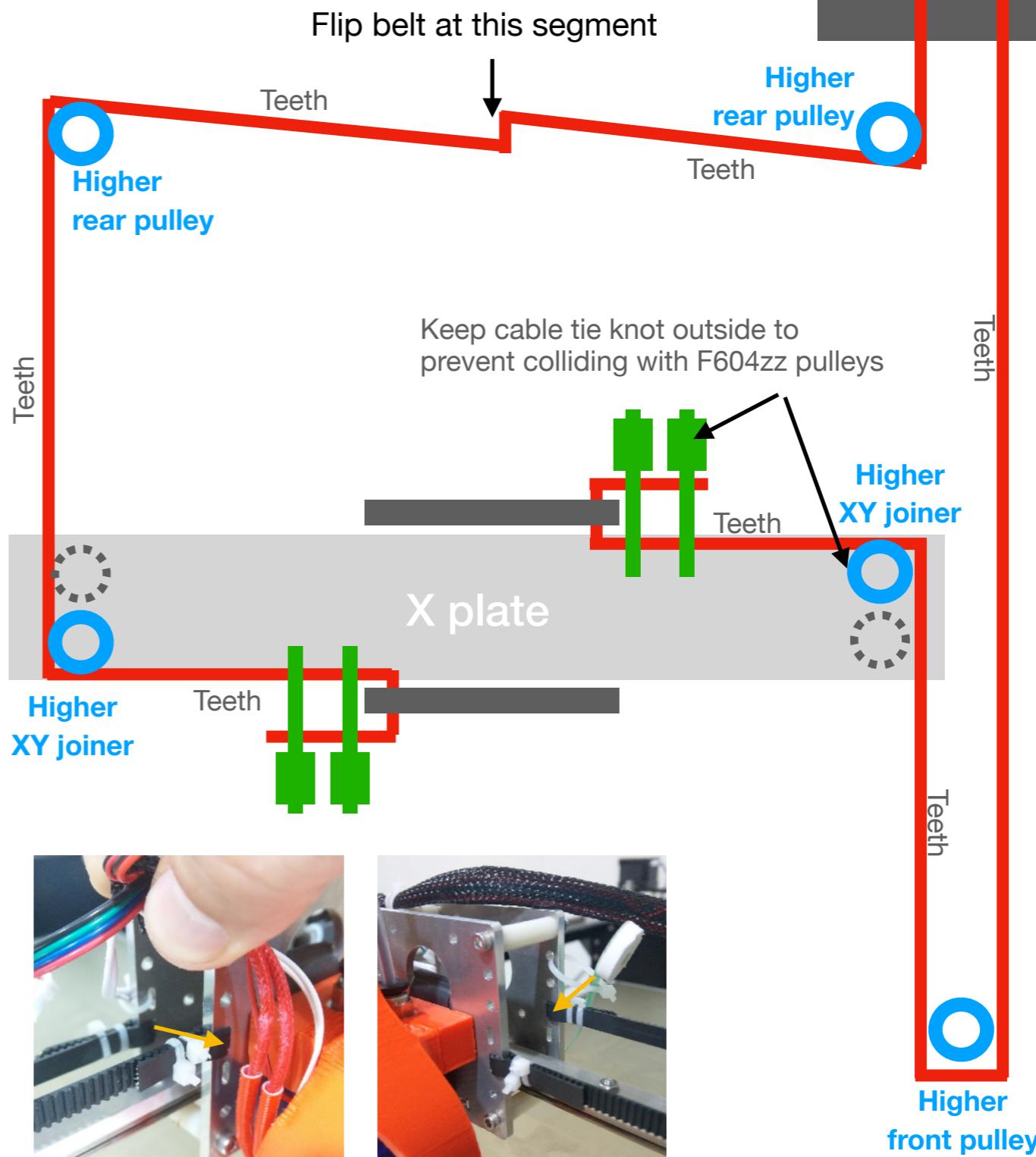


Attach Belt For Right Stepper

- 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.

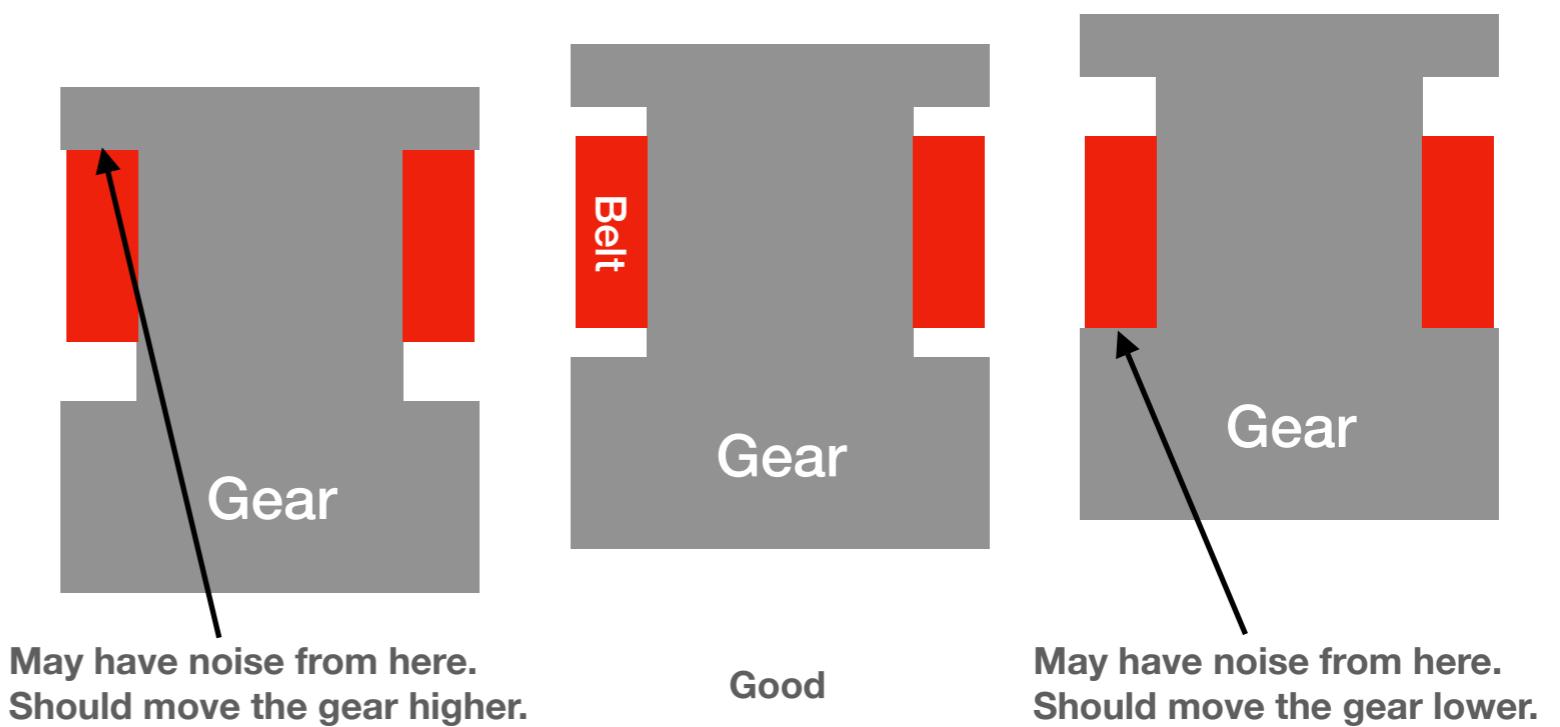


Adjust Heights of Gears & Pulleys

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.

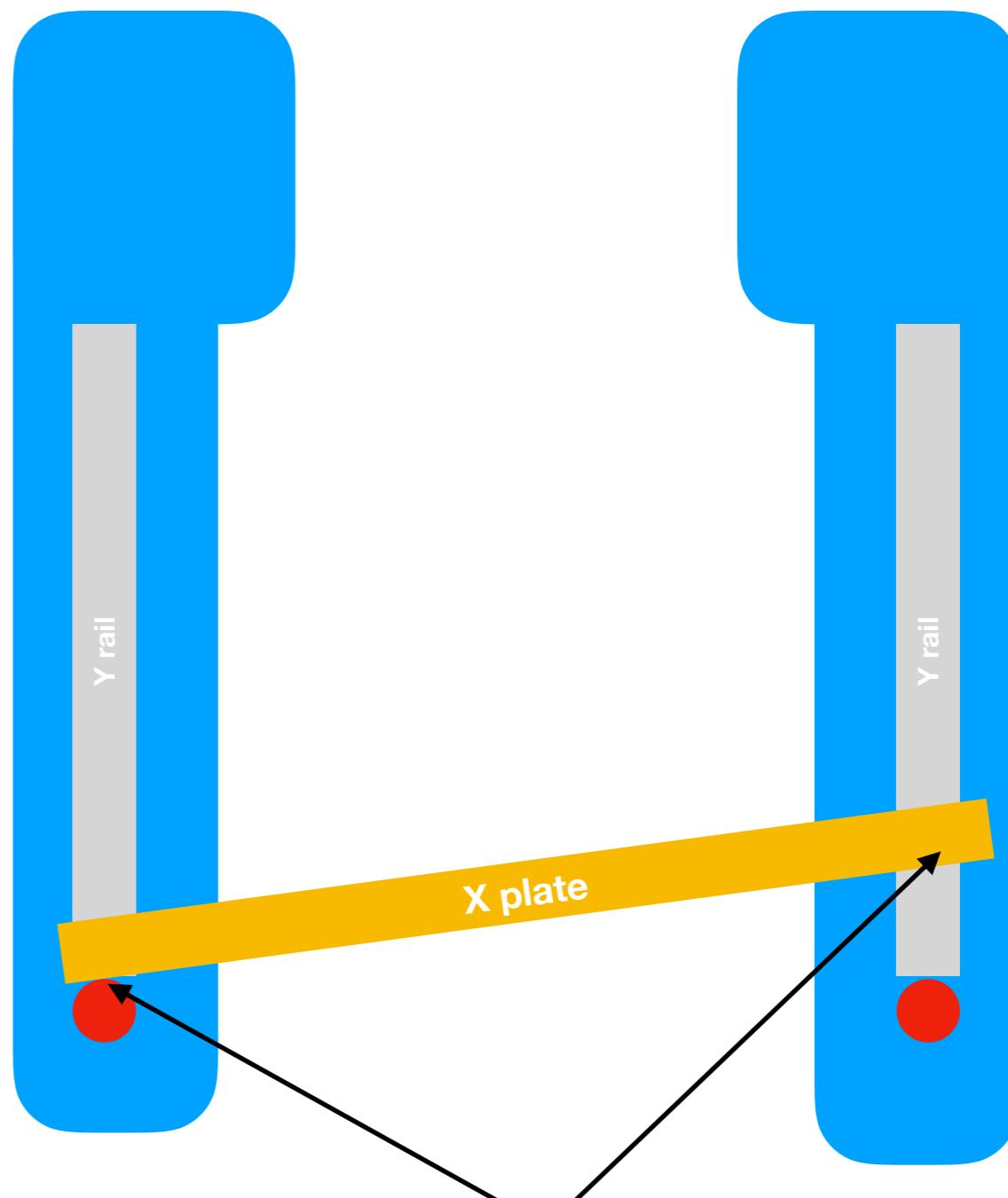


Squareness between XY axes

The squareness of XY axes in a CoreXY relies on all of the three: assembly of **linear rails**, **linear blocks**, and especially, **belt tension**.

Make sure both Y linear blocks can touch front stoppers. If not,

1. Loosen both belts and all bolts on Y linear blocks, move X plate to the front and re-tighten bolts and belts.
2. Make sure both belts have the about the same tension.



11

Extruder

Assembly the Extruder

Please search the according assembly instructions online.

Part-cooling Fan Duct

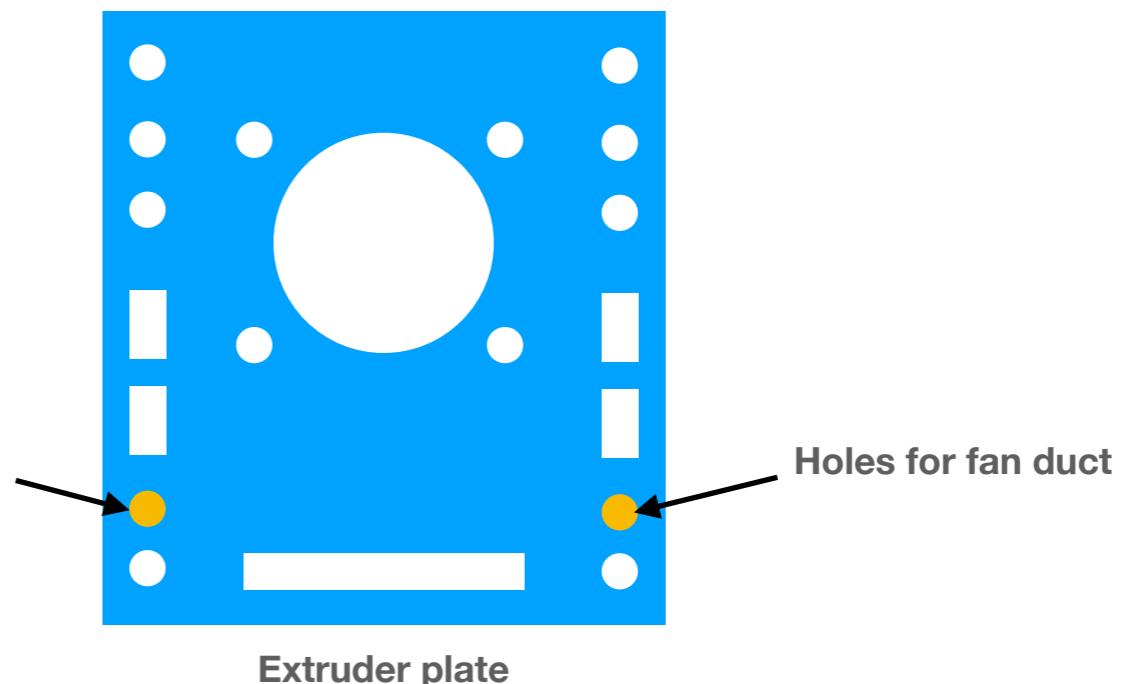
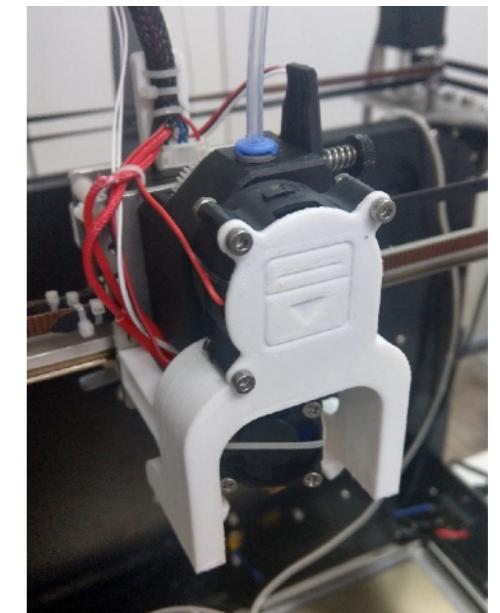
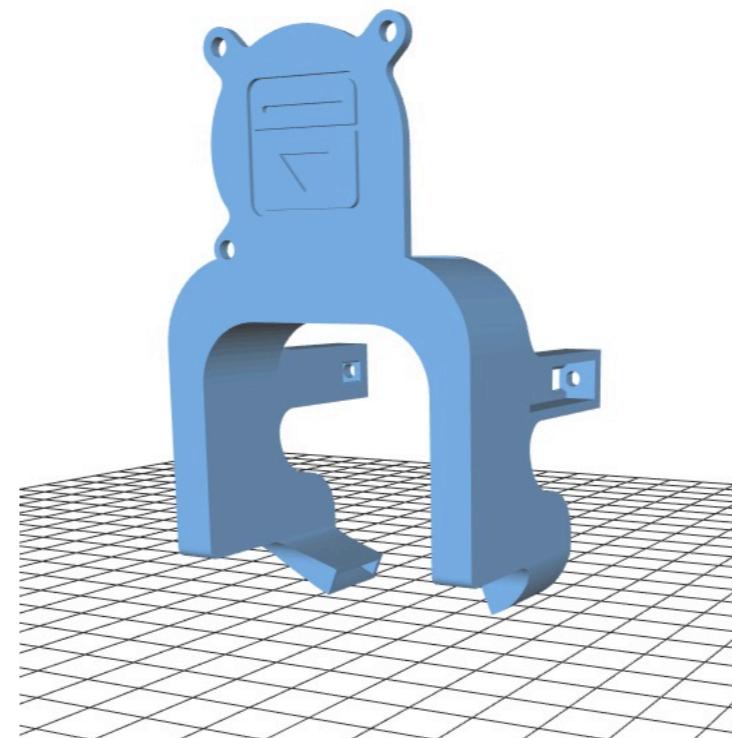
- 1 4cm blower
- 3 bolt M3 x 20
- 2 bolts M3 x 8
- 5 nuts M3

Action

Please download fan duct STL and print it by yourself.

STLs of fan ducts

https://github.com/SecKit/SK-Go_SK-Mini/tree/master/printed%20parts%20STL/2.%20Recommended/4.%20Part-cooling%20fan%20duct/Direct.v2

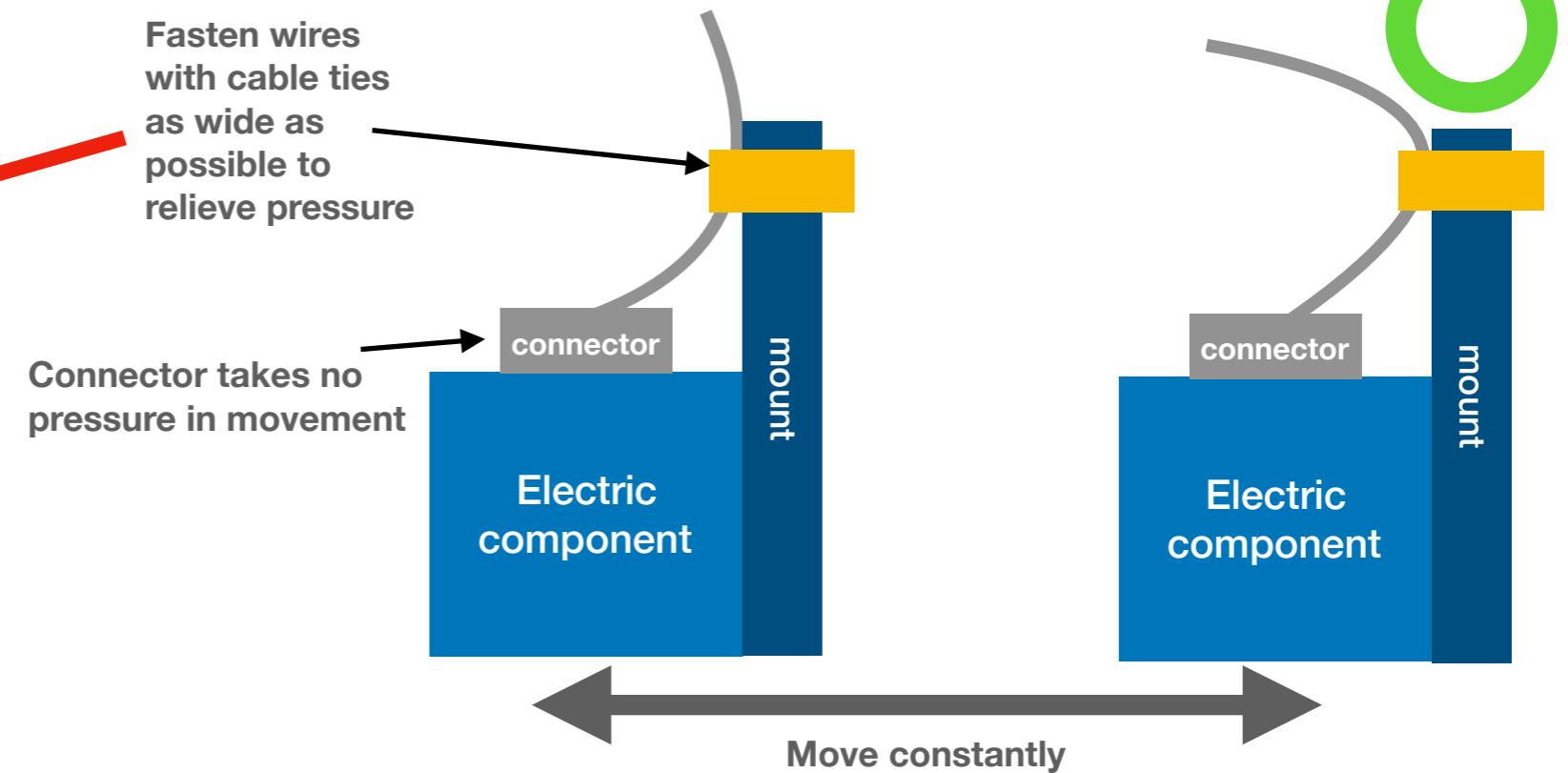
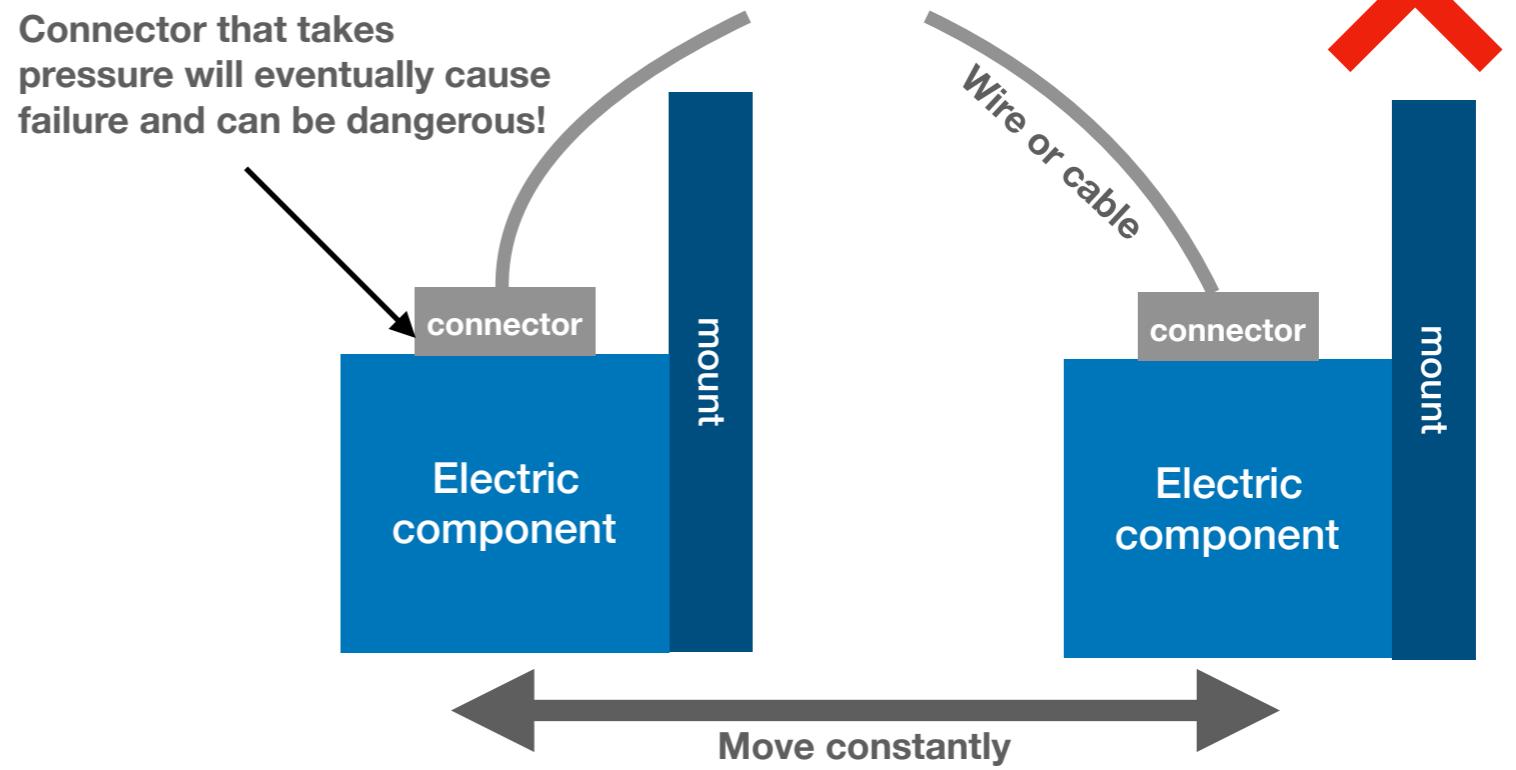
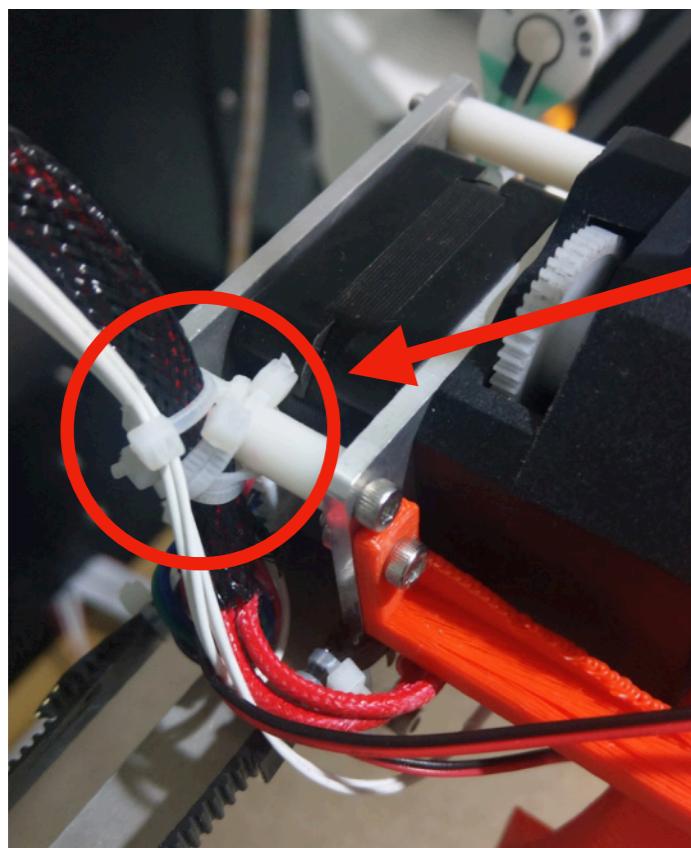


Secure Wires Safely

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

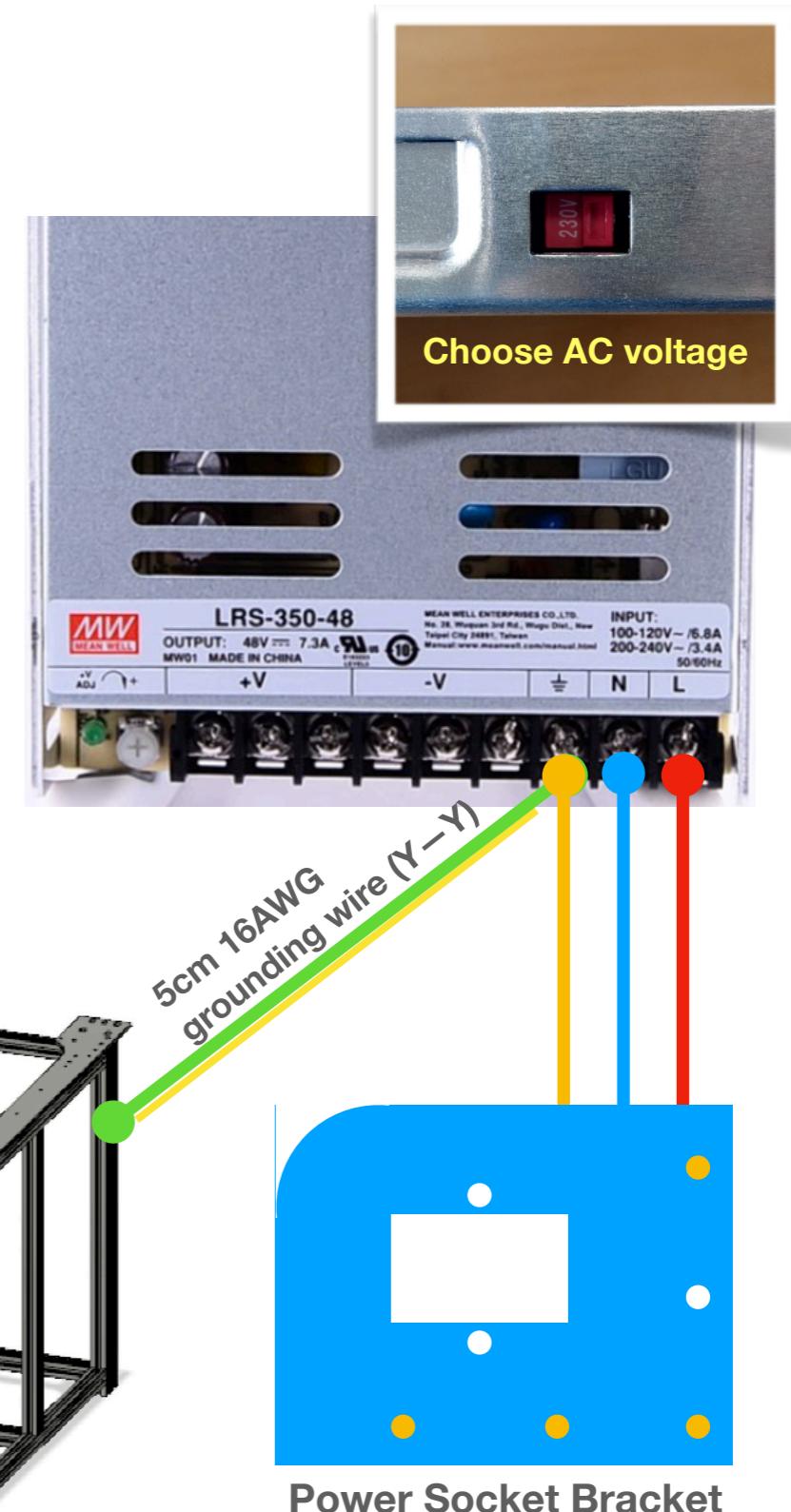
Before connecting other electronic components, test the power supply unit independently first.

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.

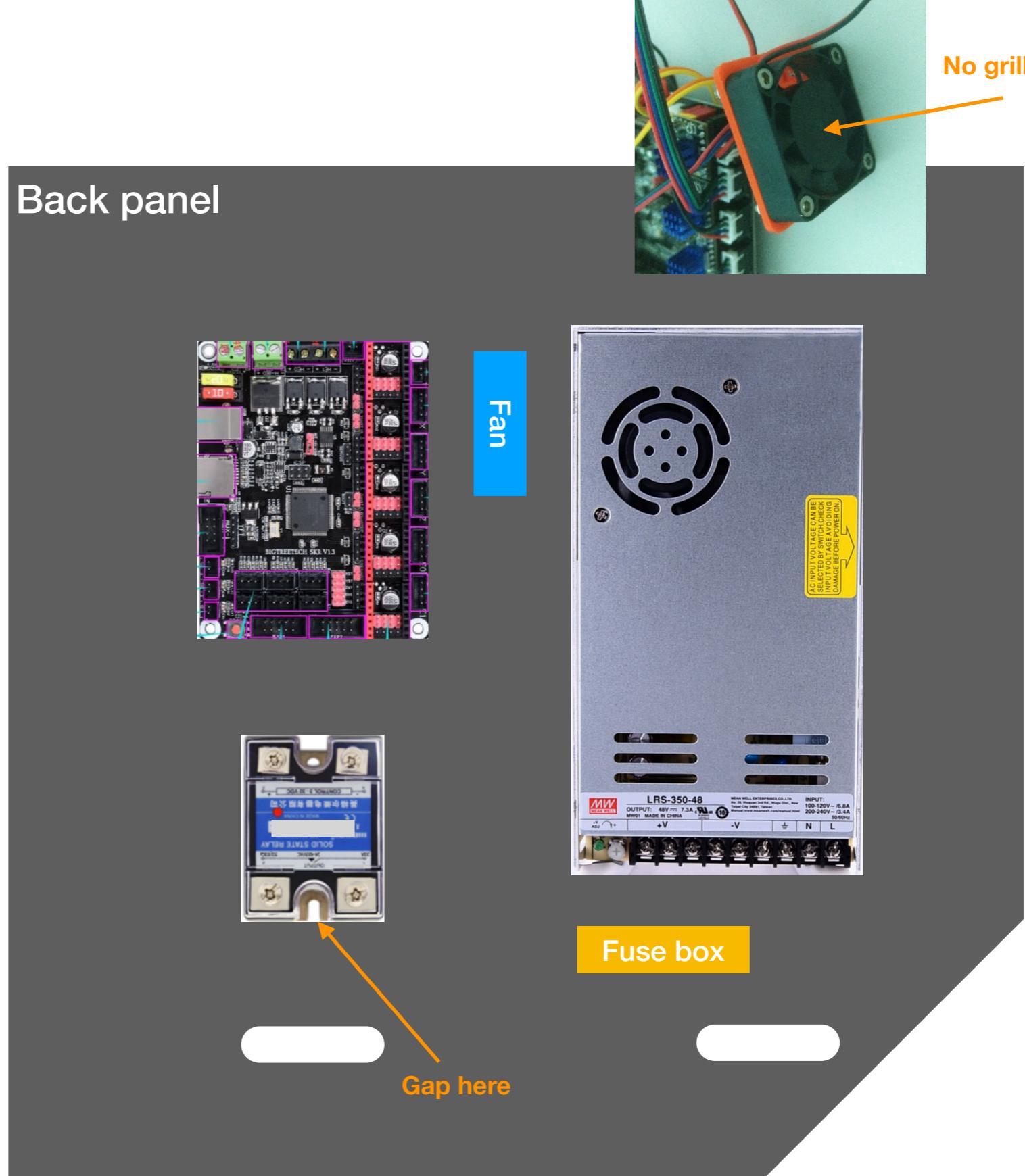
If an abnormal short circuit condition happens, the circuit breaker in your house breaks and stops providing electricity immediately.



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 8 x 1.0
- Solid State Relay
 - 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
(please print it by yourself)
 - 2 bolts m3 x 20
 - 1 bolts m4 x 10
 - 2 nuts m3
 - 1 nuts m4
 - 1 washers m4 x 12 x 1

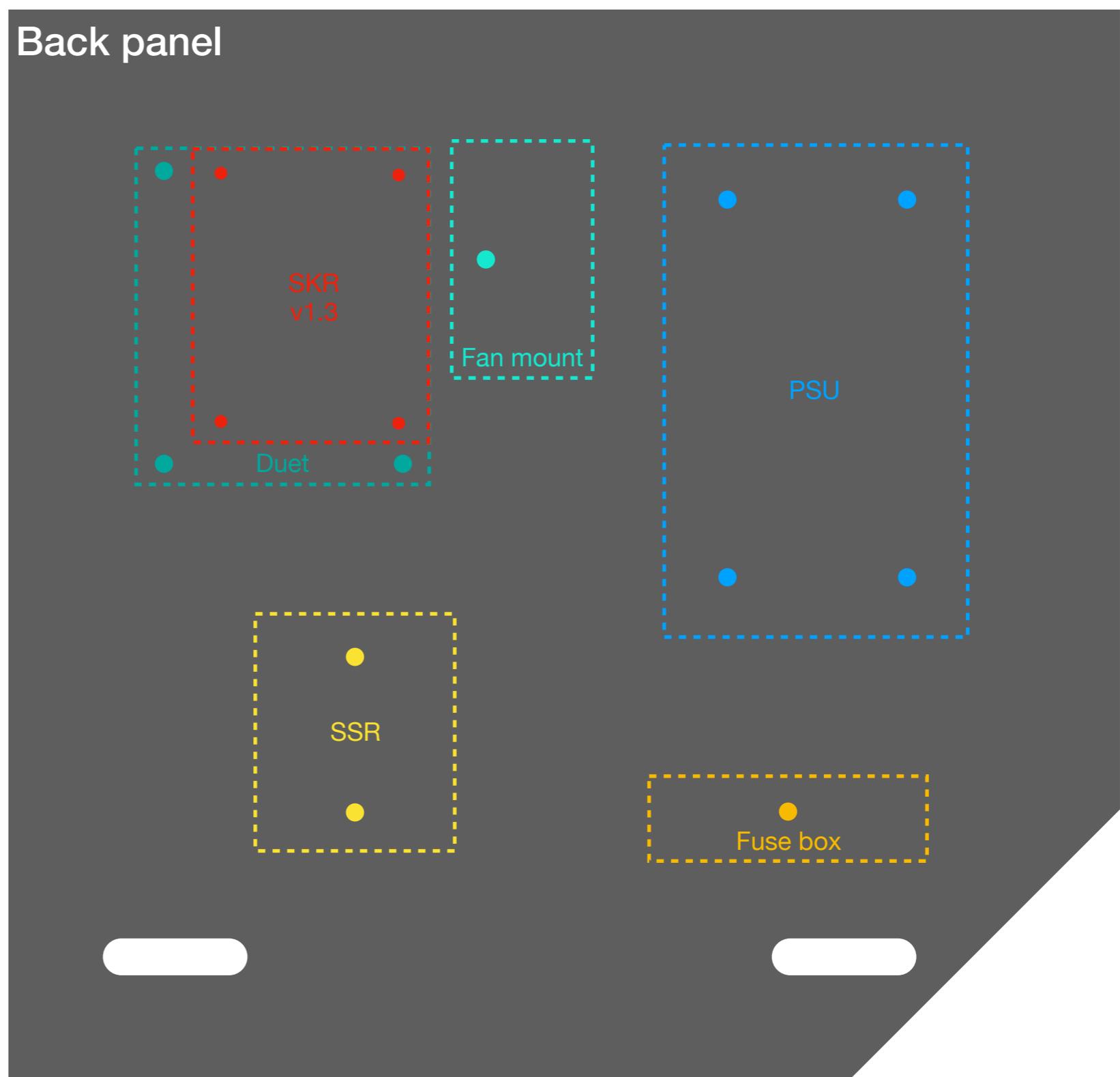
Back panel



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



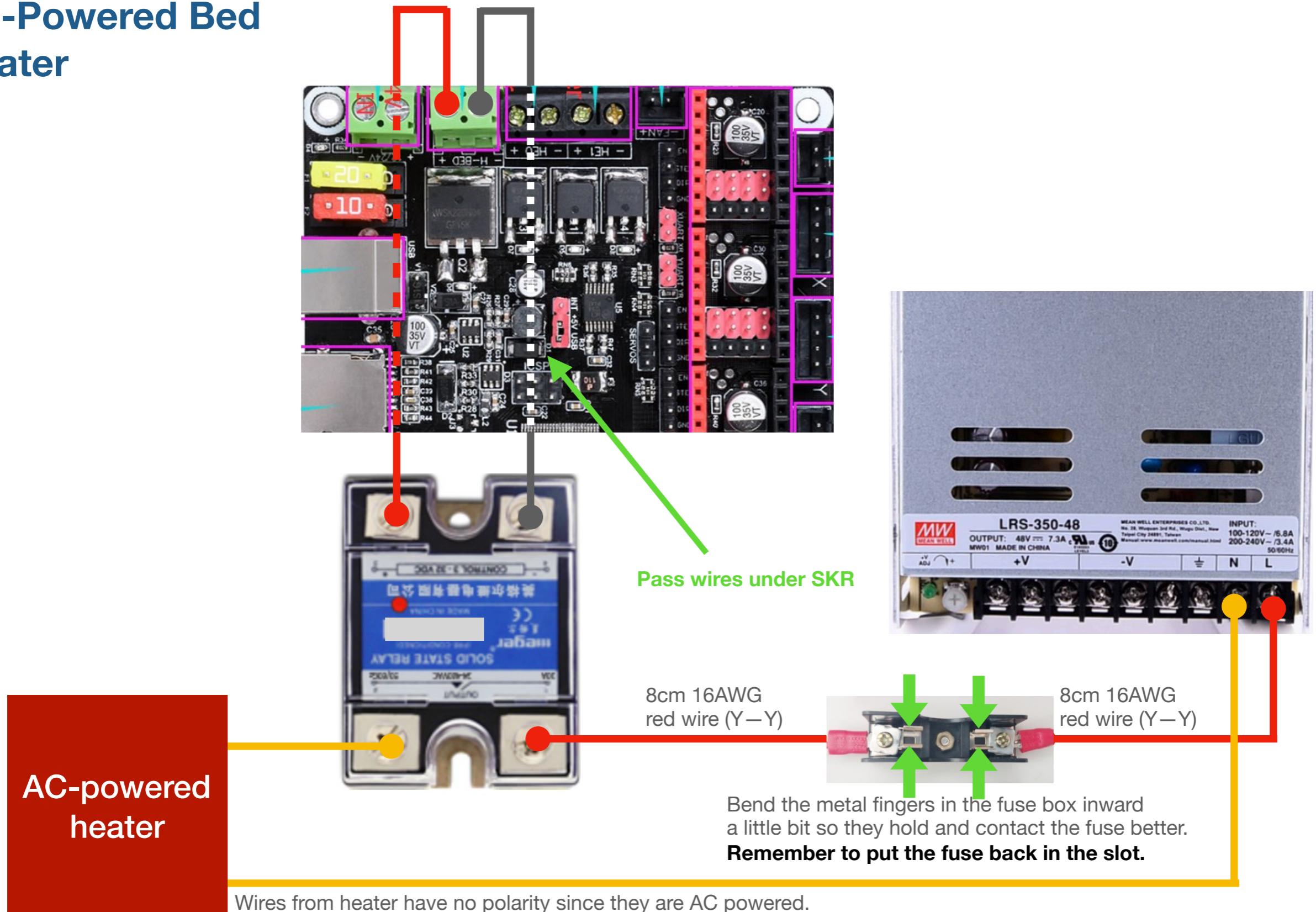
40cm red 16AWG wire (Y – Pin connector)

40cm black 16AWG wire (Y – Pin connector)

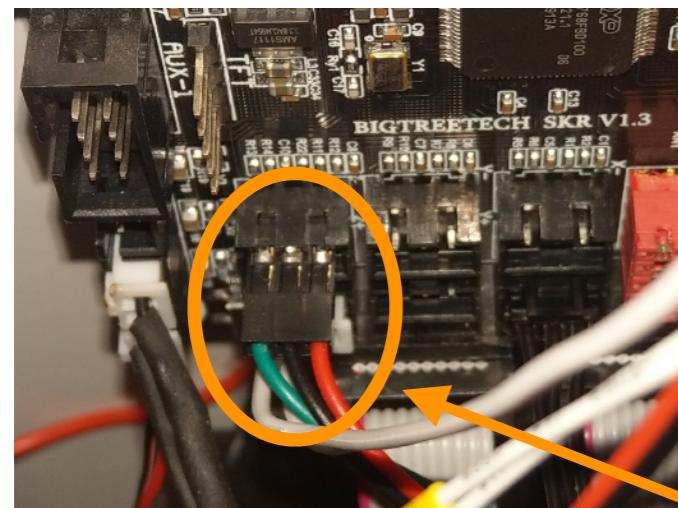
Wiring Diagram

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

AC-Powered Bed Heater

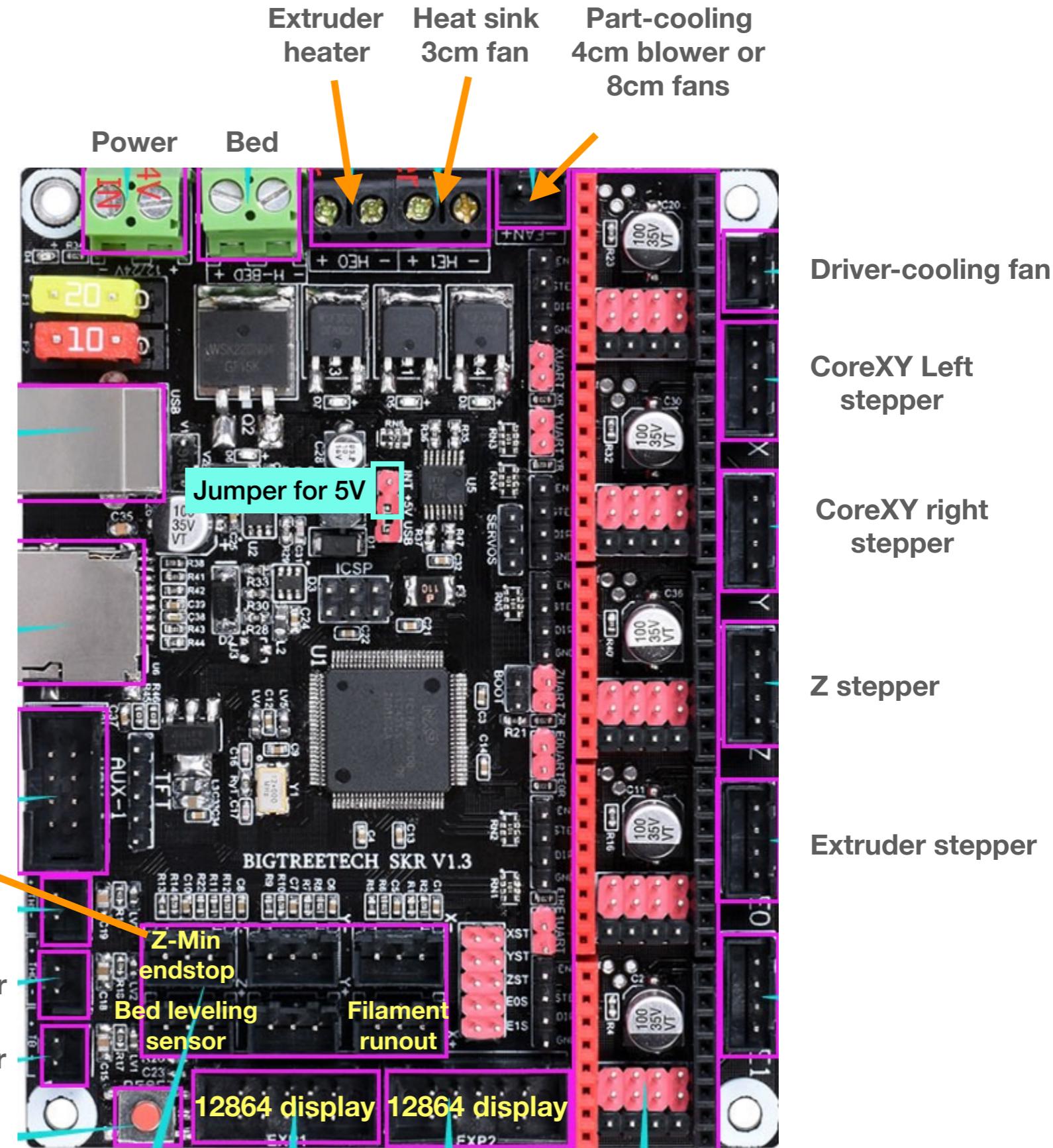


SKR v1.3 Pins

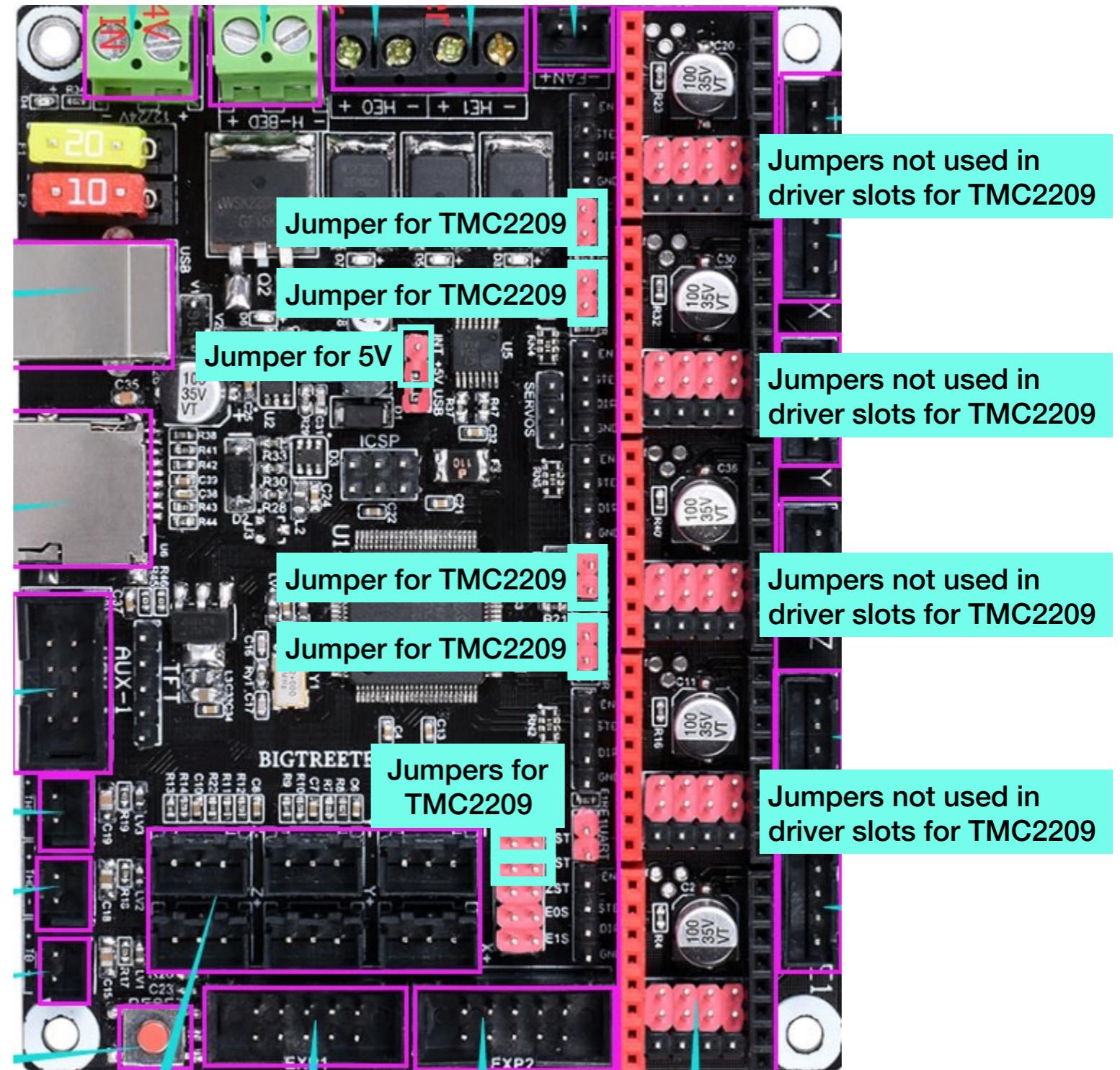


Extruder thermistor

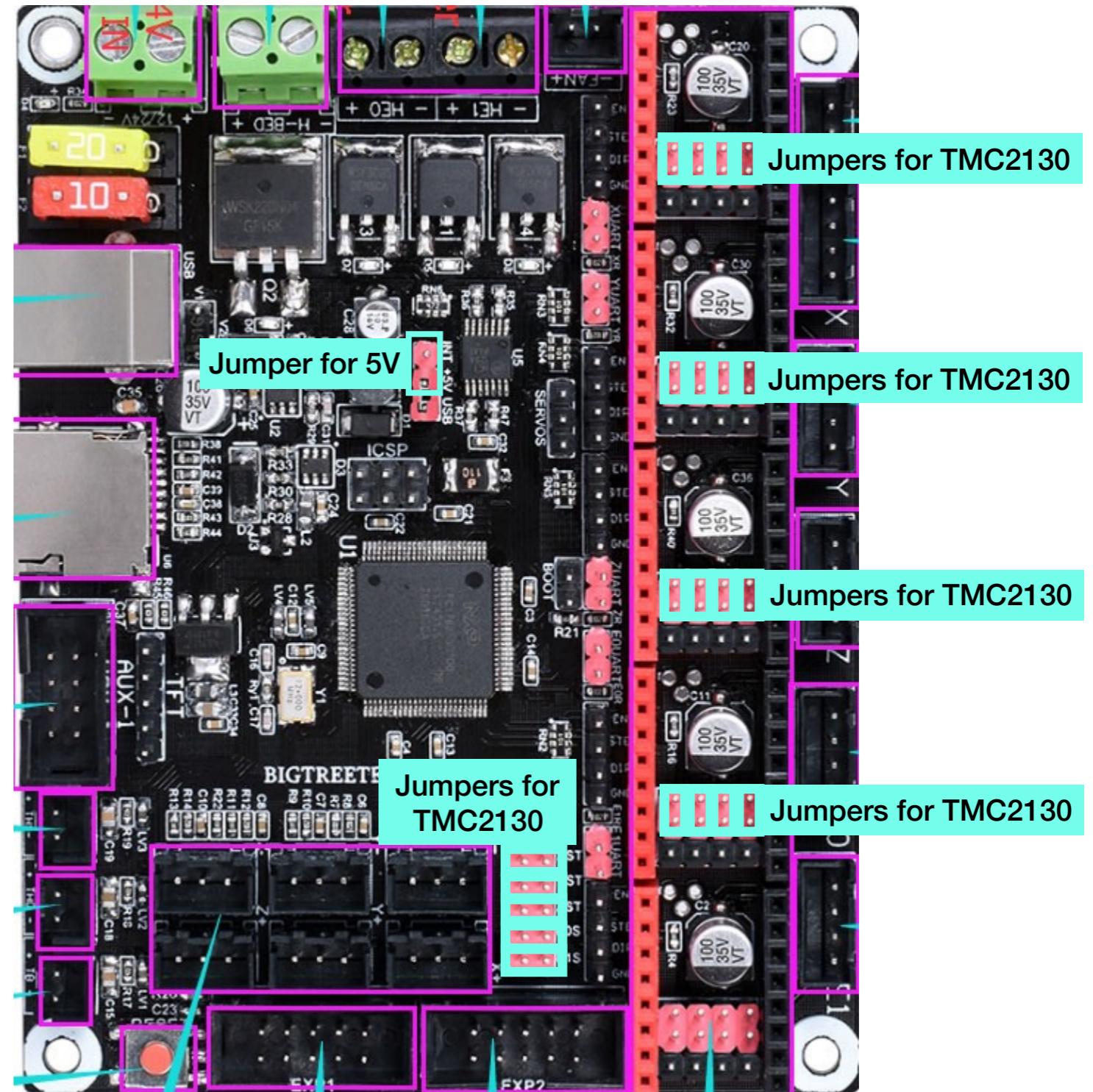
Bed thermistor



SKR v1.3 Jumpers for TMC2209

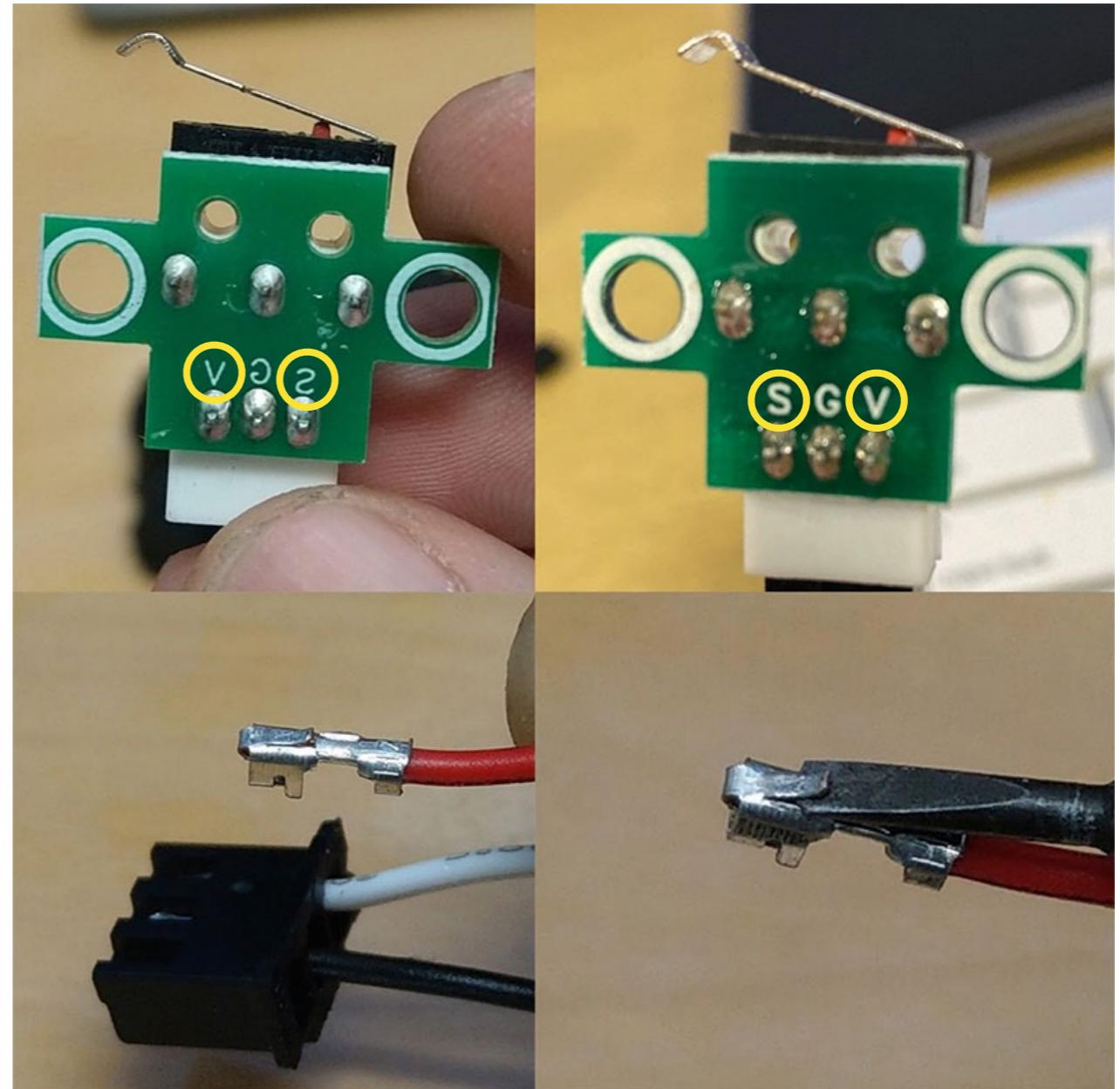


SKR v1.3 Jumpers for TMC2130



Filament Runout Sensor

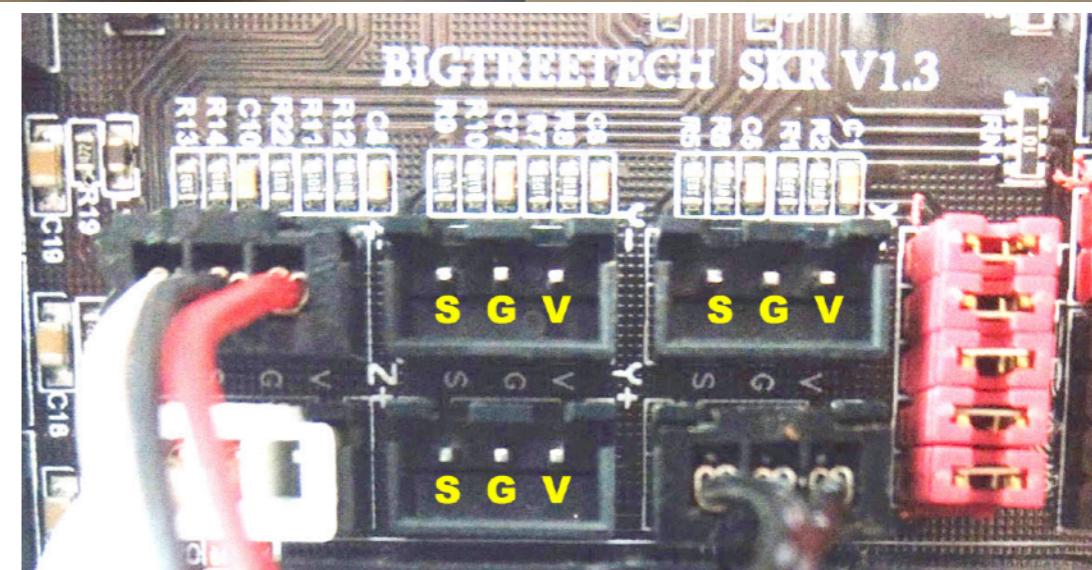
Common symptom: **SKR v1.3 not powered up due to wrong wire sequence here.**



Action

If your SKR v1.3 is not powered up when there is no filament in the sensor, and the sensor cable is inserted into SKR, please swap the wires at V and S terminal.

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



Part-Cooling Blower

Common symptom: **the blower not functioning** due to wrong wire sequence here.

+ GND



Stepper Cable

Action

Wire sequence of stepper cable differ from various suppliers.

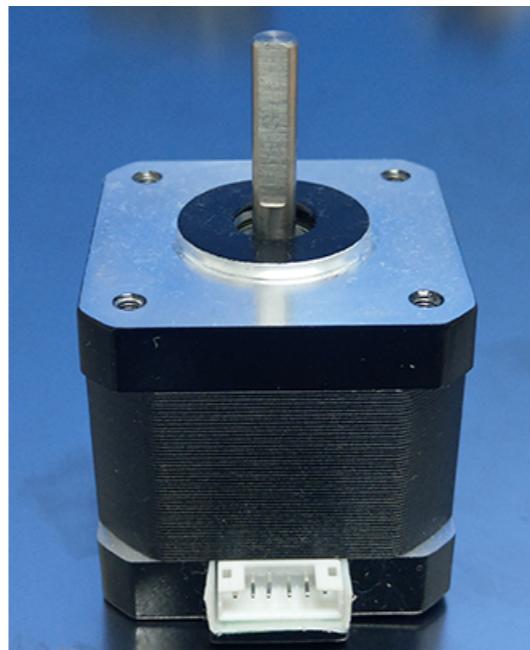
With default SK-Go² firmware please make sure your stepper cables are of the same color sequence as shown in the pictures. Gently swap the wire with a small flathead screwdriver if the sequence is different.

If your stepper rotates inversely, change the `INVERT_?_DIR` parameters in Marlin `Configuration.h` file and compile a customized binary. Or, swap the wires of one of the **Red-Blue** or **Black-Green** pair. If you swap both pairs, it rotates as wires not swapped.

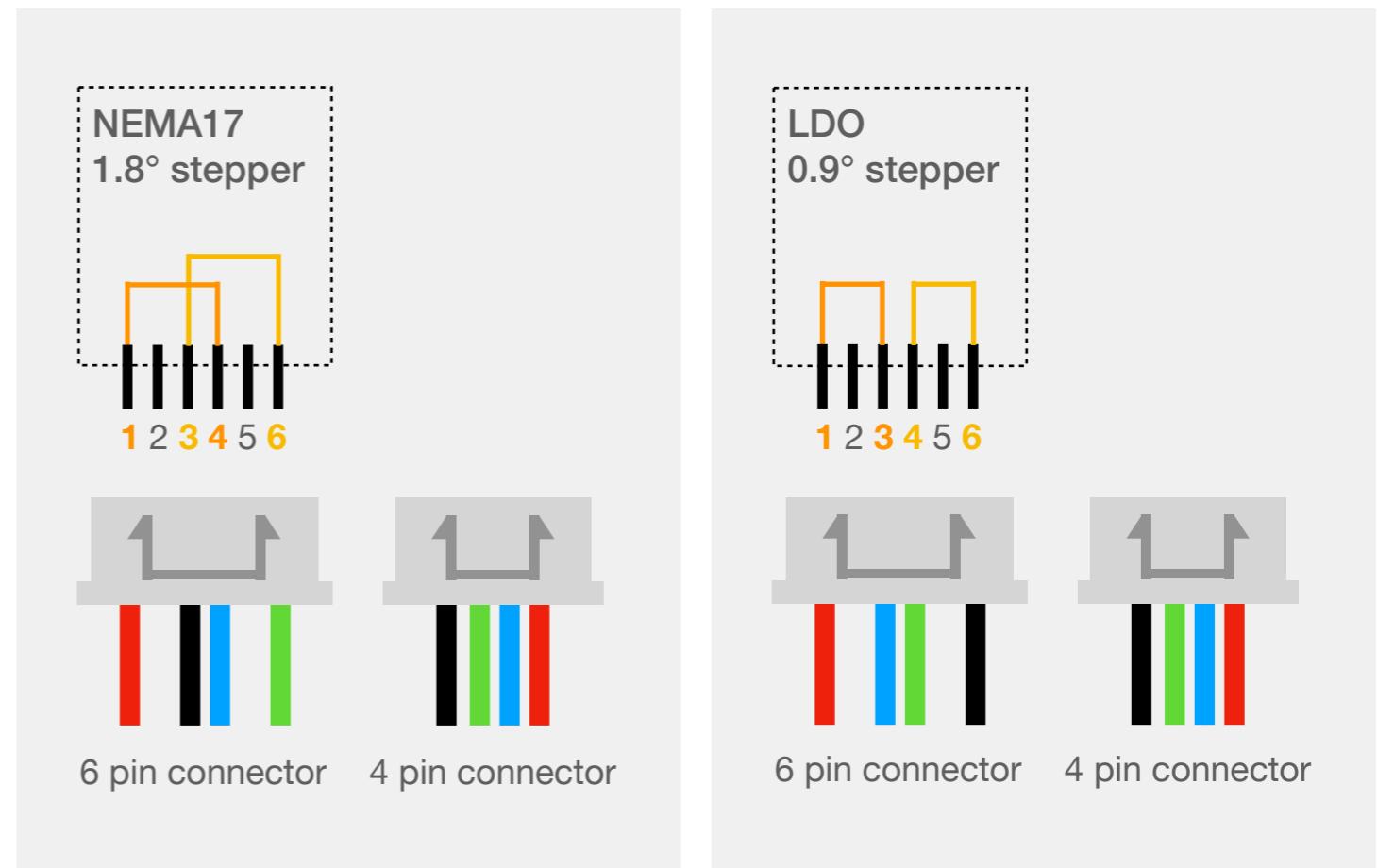
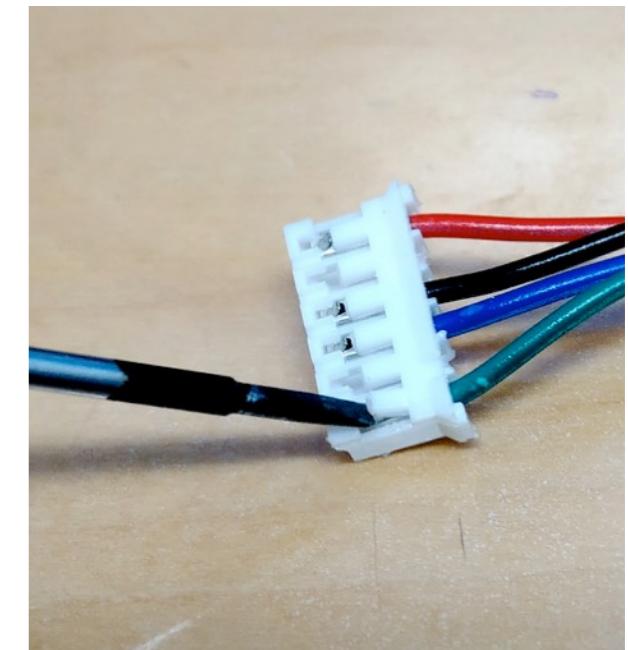
Exam

Incorrect sequence may result in reverse direction or jittering.

Note that the wire sequence of steppers from different suppliers might change. You can verify a same-coil pin pair by a resistance meter with (almost) zero ohm.



From left to right: pin 1 to 6



Z-Min Optical Endstop

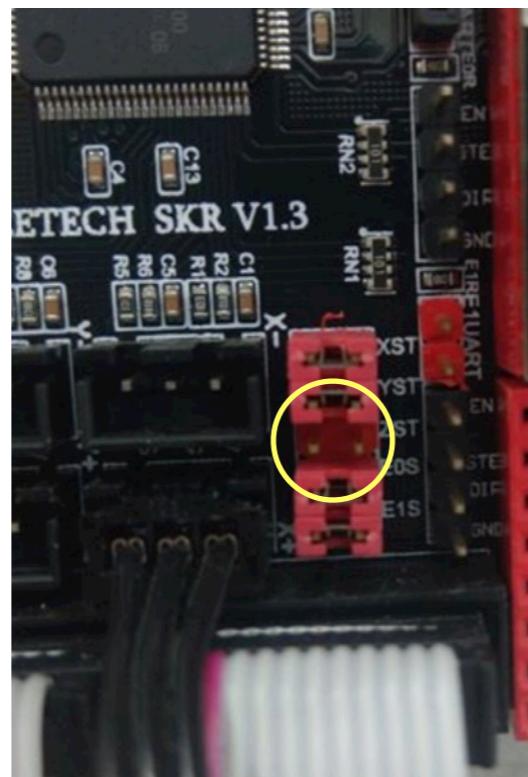
Action

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

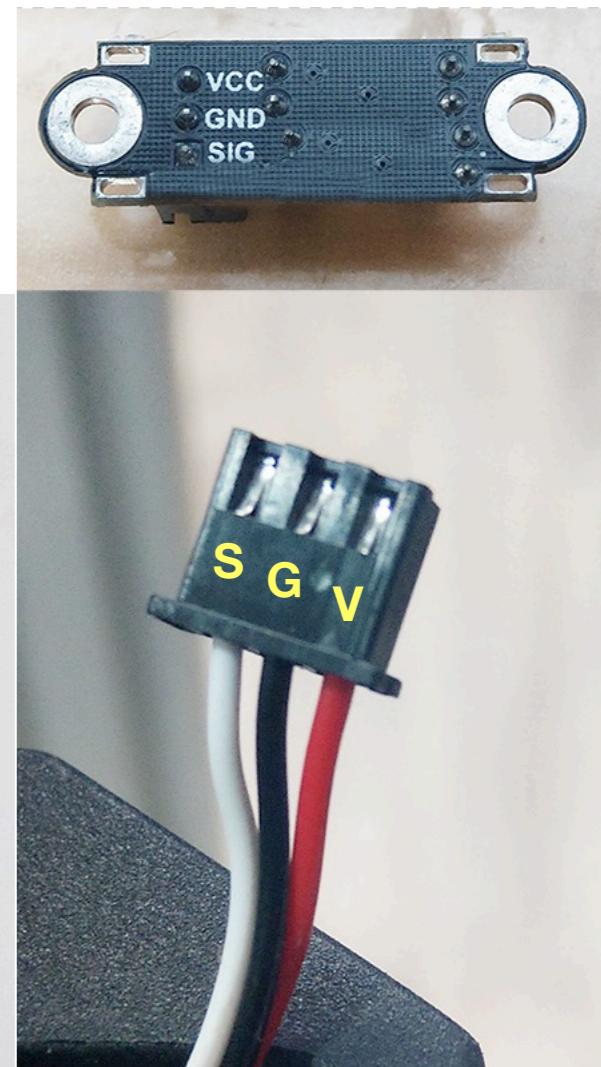
Remove jumper ZST on SKR v1.3.



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 DC** 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-Go² can be raised very quickly in seconds, so you must be careful.

However, if **AC wires are connected to DC terminals**, the SSR will be damaged immediately.

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 detects the change of driver loading to sense if the extruder touches X or Y ends, **it works only in StealthChop mode** and there are thresholds for you to adjust the sensitivity. These values are also related to the overall friction of motion system (1.8° or 0.9° steppers, belt tension, lubrication in the pulleys, driving current, weight of extruder, etc.), so please just take the sensitivity values as a reference.

```
M914 X100 Y100 // adjust sensitivity
G1 X10 Y10 F6000 // move extruder to X10 Y10
M569 S1 X Y // enable StealthChop mode
G28 X Y // home XY
```

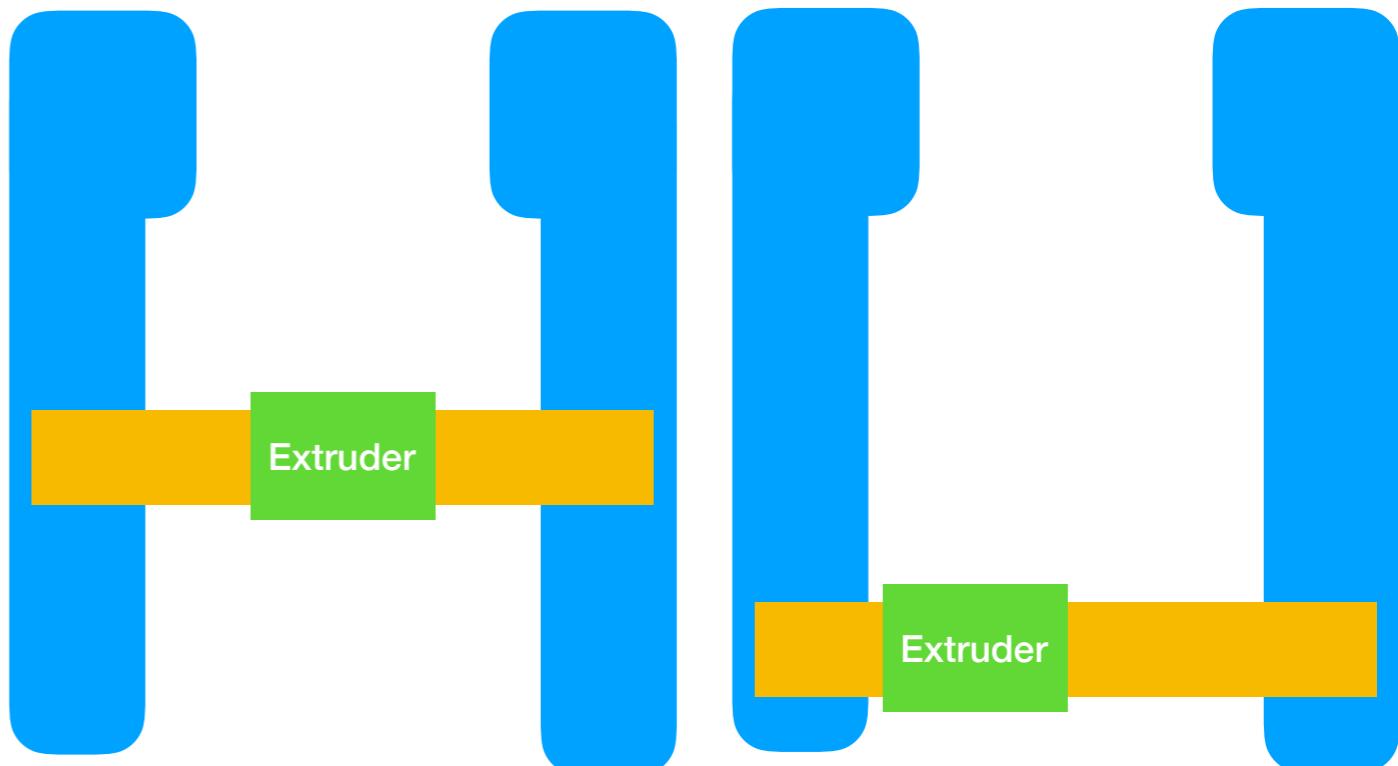
M500 // save values into EEPROM

To ensure TMC returns to StealthChop mode, add the above M569 command in the end G-code in your slicer setting.

```
End G-code

M569 S1 X Y; go StealthChop for homing
M104 S0
M140 S0
G92 E1
G1 E-1 F300
G1 X10 Y290 F3600
M18 ; disable motors
M84 ; disable motors
M106 P0 S0 ; fan0 off

Return to StealthChop for
sensorless homing to work
```



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

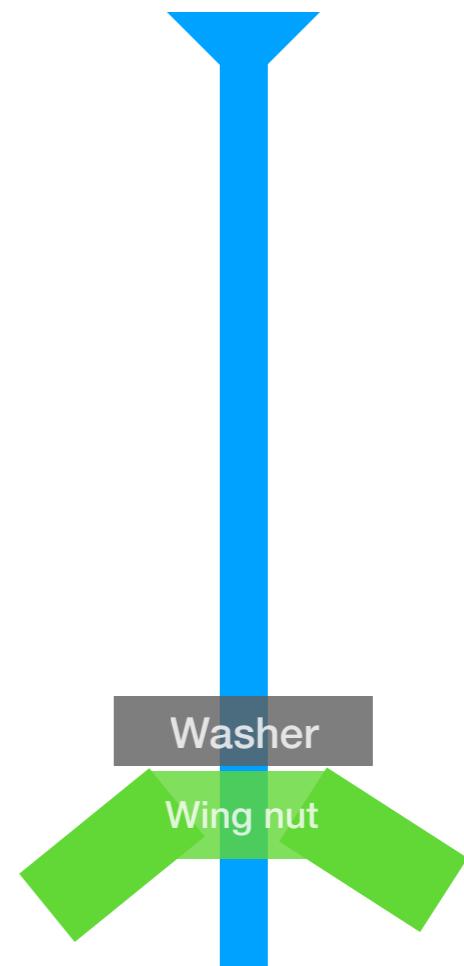
This value ranges from -64 to 63. **Smaller** values mean **more sensitive** and the extruder tends to stop moving rather returning to the min point. A too larger value make the extruder hit stoppers violently.

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



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.

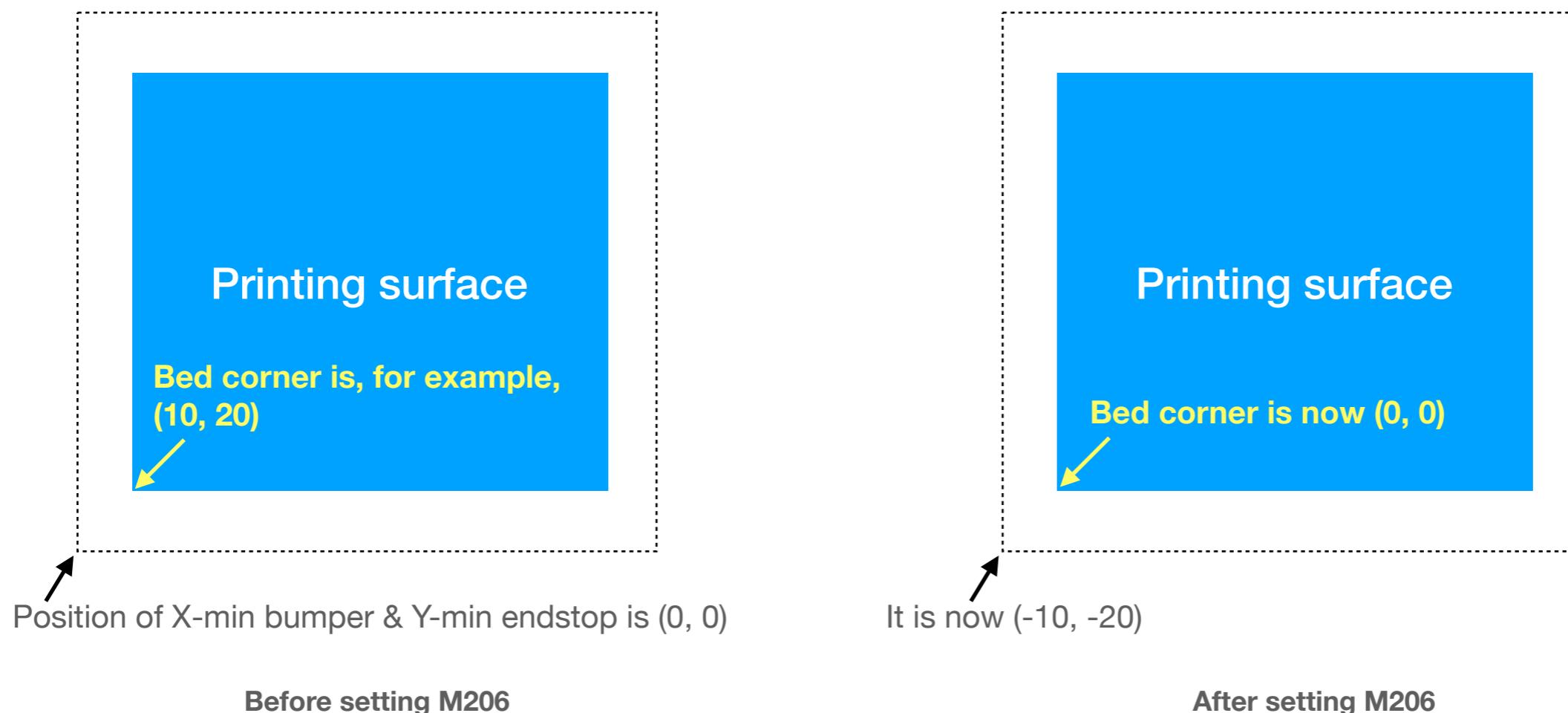
Exam

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 TMC drivers in hybrid mode, there will be always a rattling 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 chattering 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>

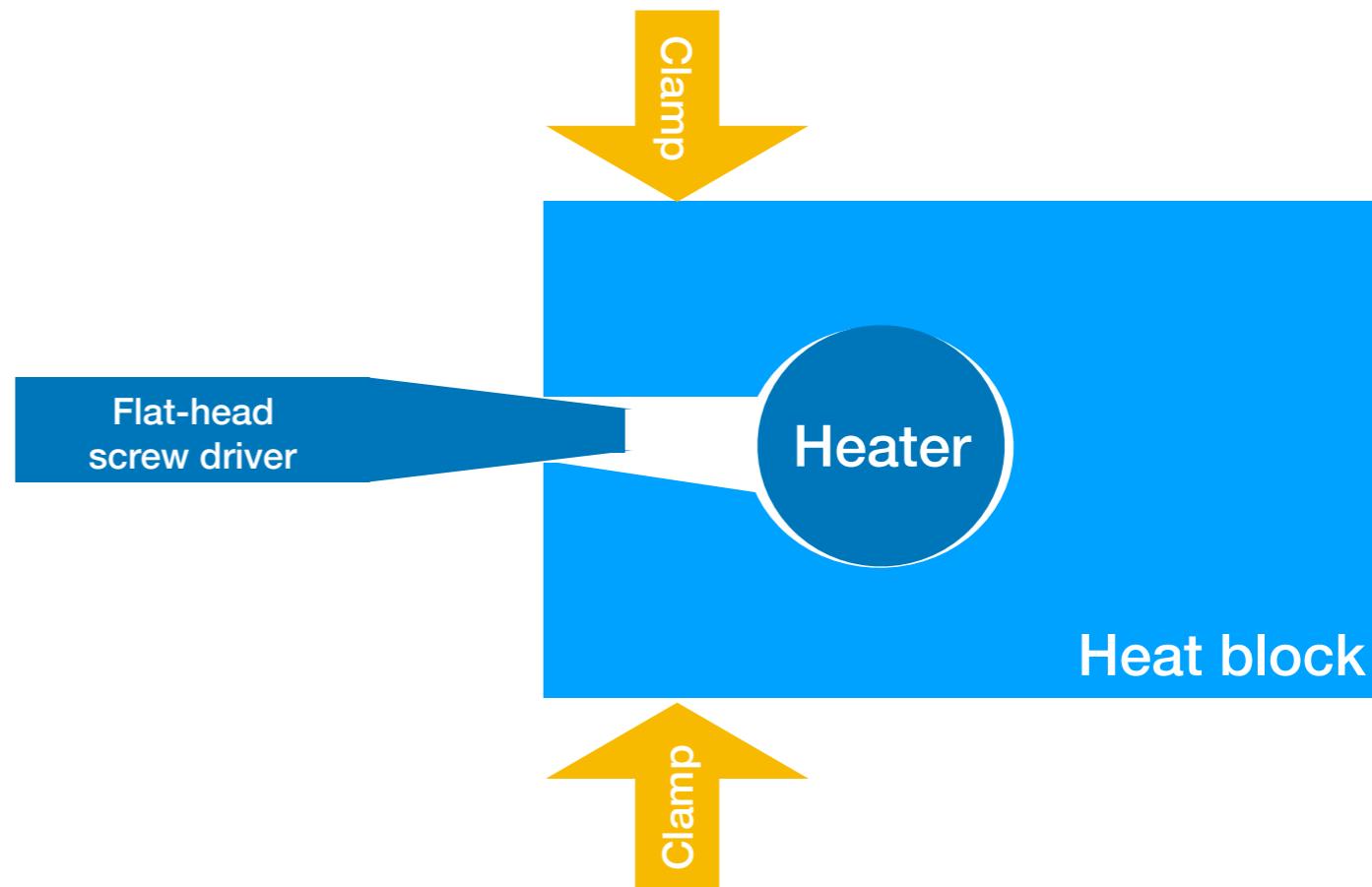
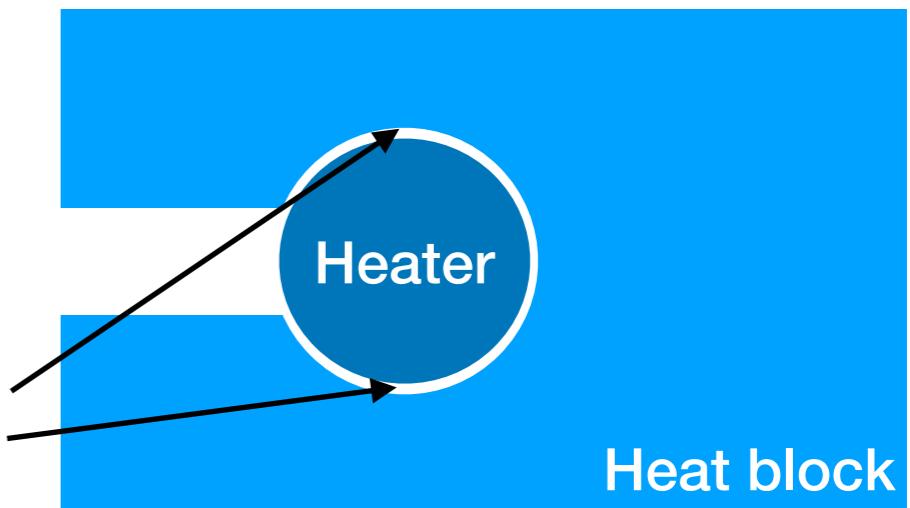
DO NOT change driver mode during printing. It is highly possible that layer shift happens.

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:

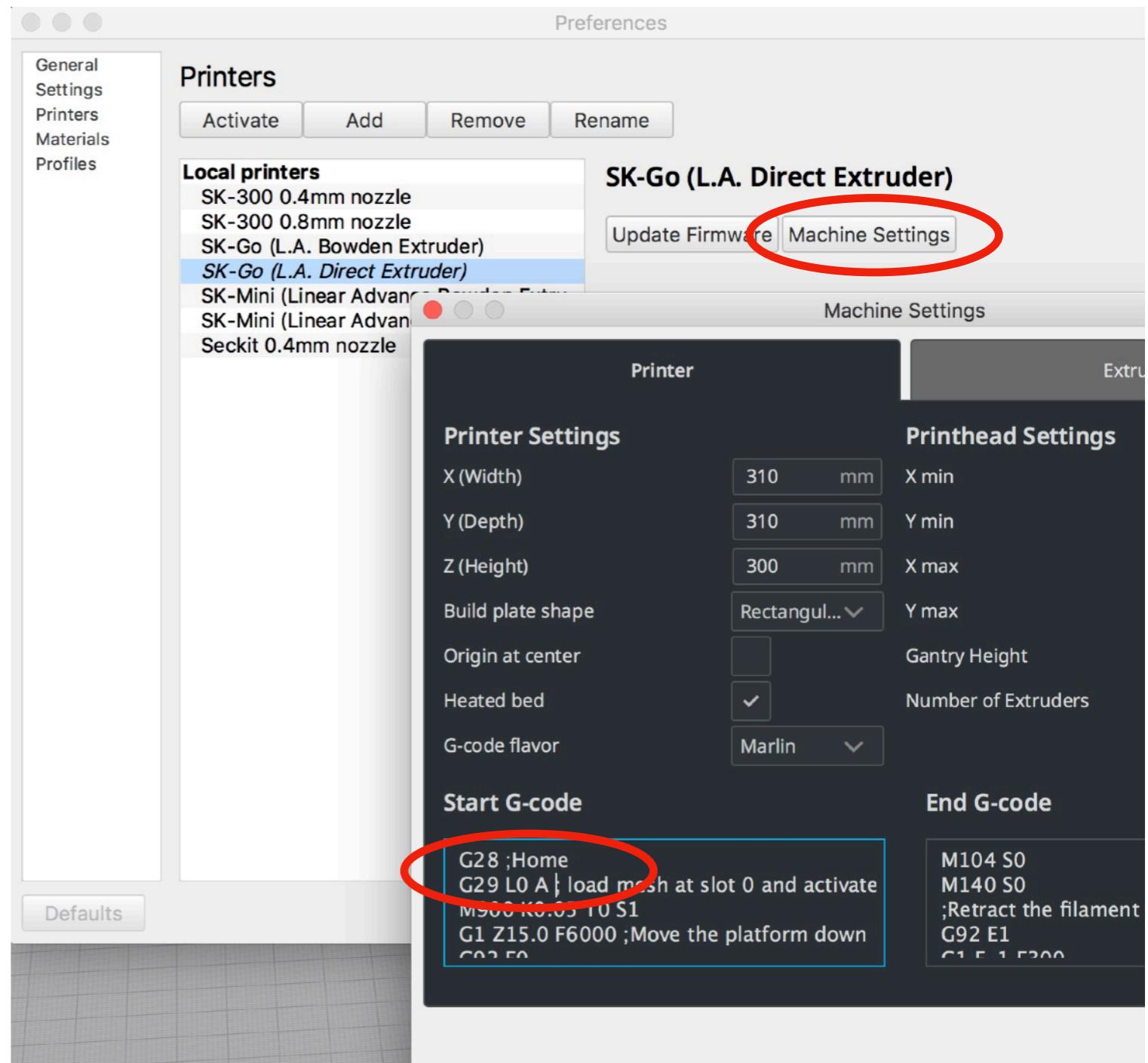
1. Cool down the nozzle to prevent sensor from being melt
2. Deploy ABL sensor
3. Build mesh points in the menu: **Motion > Unified Bed Leveling > Step-by-step UBL > Build cold mesh.** The nozzle will start moving and sense 25 points across the whole bed.
4. Save mesh points in the menu: **Motion > Unified 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

Parameters for Marlin

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. :-)

SecKit, All-Metal CoreXY 3DP Kit

Web <https://seckit3dp.design>

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

Email seckit.3dp@gmail.com