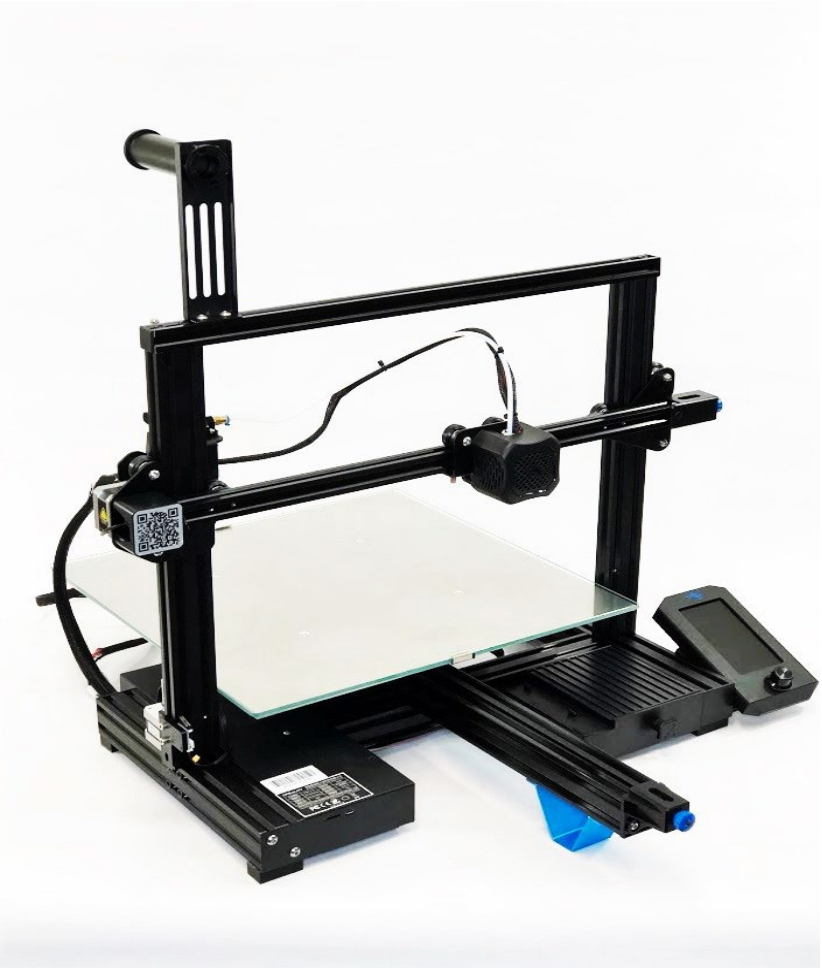


Ender Extender Installation Guide

Extension Kit for the Ender 3 V2, Ender 3 Pro and Ender 3

Installation Guide

www.enderextender.com

3/26/23

Table of Contents

Important Safety Instructions

WARNING: ALWAYS DISCONNECT ELECTRICAL POWER FROM THE MACHINE BEFORE PERFORMING ANY MAINTENANCE.

SKILL LEVEL: INTERMEDIATE

This product is an intermediate level project and requires detailed knowledge of the mechanical nature of a 3D printer. Throughout the project, you will be challenged at many levels in order to successfully complete the project.

Machine Safety

Never reach into the machine's working area while it is running. Always shut off and unplug the printer to perform maintenance, adjustments, or repairs.

Sharp Edges

Some parts may have sharp edges and care should be exercised when handling all metal parts. Should you discover sharp edges, the best treatment is a sanding block of 80 grit sandpaper. Carefully rub the edges with the sandpaper until the sharp edge is reduced to a friendly edge.

Electrical Wiring

The increased size of the printer will necessitate lengthening some of the wires for the printer's power supply, motors and end-stop switches. Suitable replacement wires have been included in your kit; however, you may need to trim, cut wires and crimp wire connectors. These steps require tools that are not included in the kit. These tools will be identified in the Required Tools section. Care should be taken that all connections are secure before powering on the printer.

THE MAJORITY OF THIS GUIDE SHOWS ENDER 3 V2 PICTURES. THERE ARE SUBTLE DIFFERENCES BETWEEN ENDER 3, PRO AND V2. NOTE THAT THE BELT TENSIONERS AND MOTOR MOUNTS ARE DIFFERENT AND IMPROVISE WHERE NEEDED.

Take many pictures of your 3D printer, especially detail areas such as motors, wire connections, switches, screws, nuts, belts, etc. While we have included detailed photos of every step, it is very helpful for you to recall how your specific printer was set up prior to disassembly in preparation for installing the kit.

Inventory all parts of the kit before disassembly of your printer. You may need to print a missing part, or if there is an issue with the kit contents, there may be a delay in addressing the problem.

About build surface choices and options

To date, none of the kits have included print surface materials.

Available options are:

410x410 Black Carbon coated glass, Creality

https://enderextender.com/products/ender-extender-ultrabase-410-410-4mm-carbon-silicon-glass-plate-platform

310x310 Black Carbon coated glass, Creality

https://enderextender.com/products/creality-cr-10-glass-bed-upgraded-310x310x4mm

Smooth, single sided 410x410mm PEI build sheet
https://enderextender.com/products/pei-spring-steel-sheet-with-magnetic-sticker-sheet-410x410

Double sided (smooth, textured) 410x410 PEI build sheet

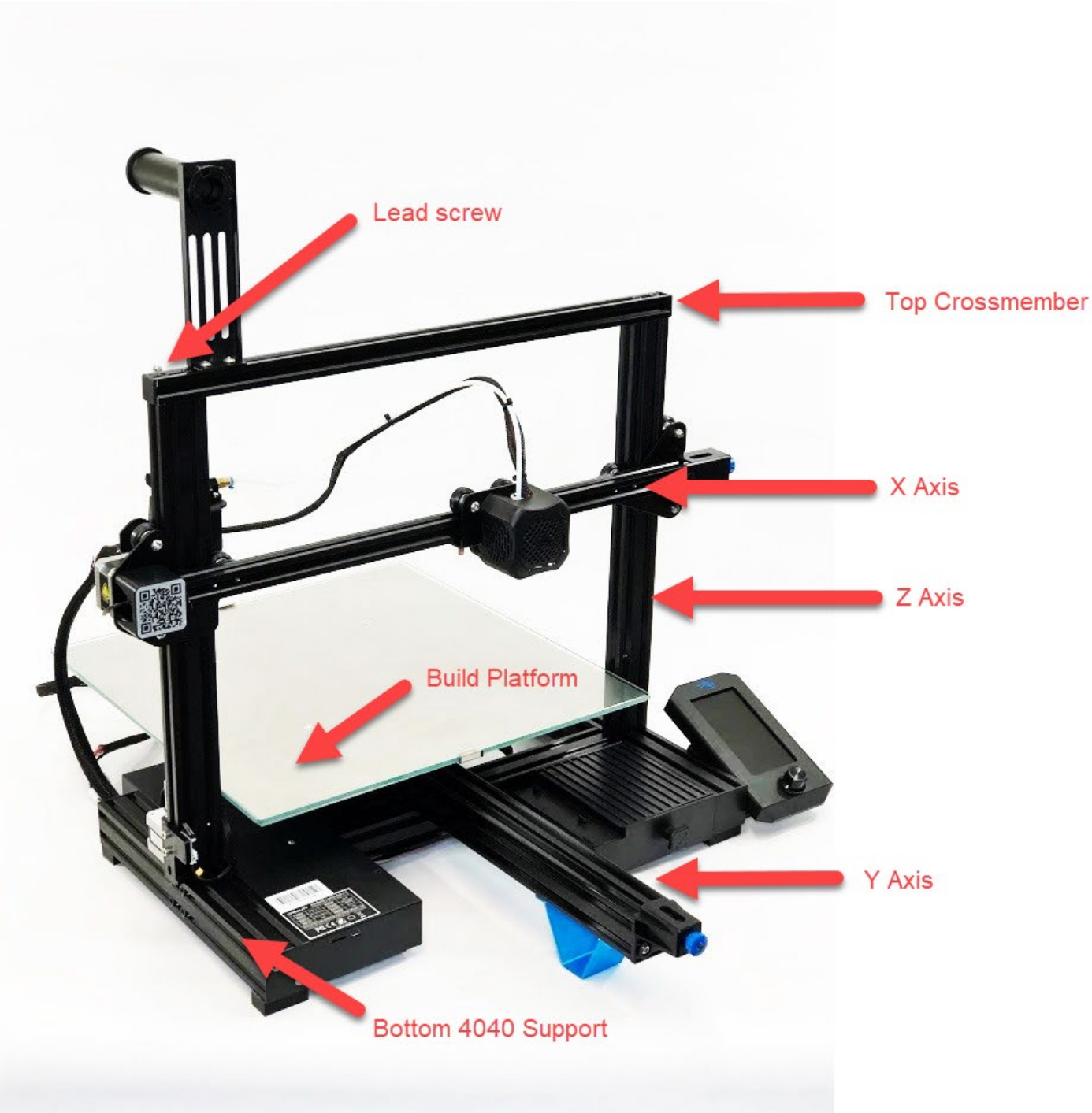
https://enderextender.com/products/double-sided-pei-spring-steel-sheet-with-magnetic-sticker-sheet-410x410

Smooth single sided 310x310 PEI build sheet

https://enderextender.com/products/pei-spring-steel-sheet-with-magnetic-sticker-sheet-310x310

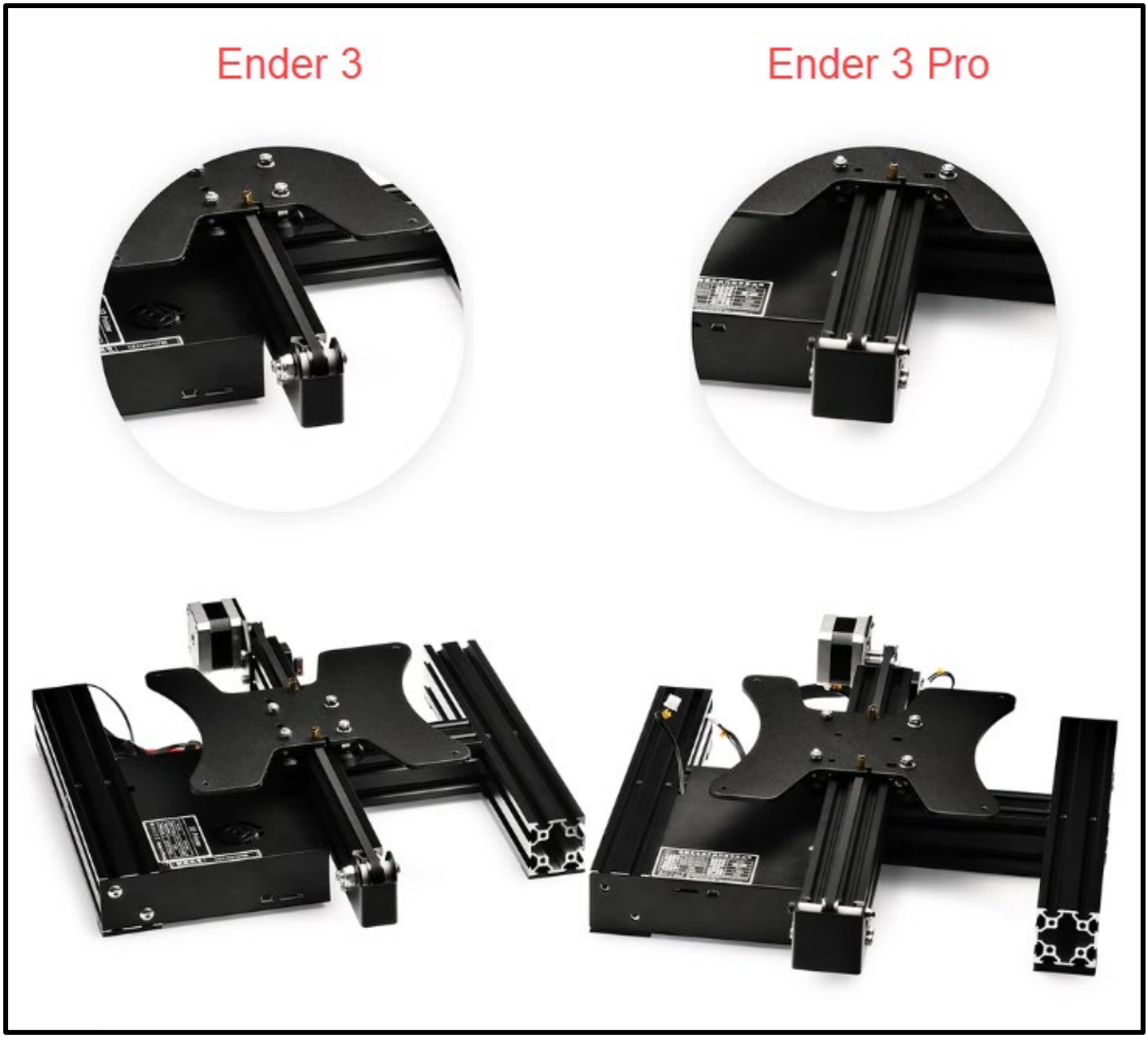
Ender 3 Machine Overview

In order to successfully install the Ender Extender kit, it is necessary to review the overall machine structure to become familiar with several of the parts within the kit. The photos below display the Ender 3 V2, however these concepts apply to all variants of the Ender 3.



(Example Completed build pictured, glass not included*)

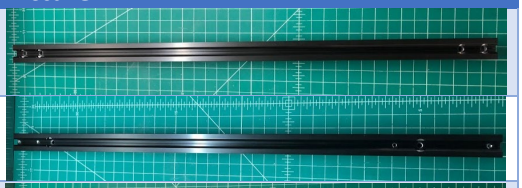
Figure 1-1



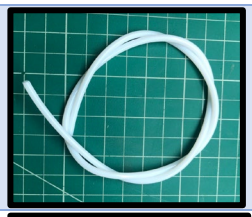
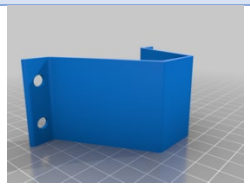
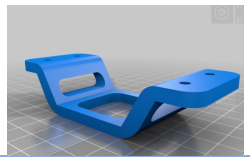
Comparing Original Ender 3 and Ender 3 Pro, note the Y axis.

Step 1: Inventory the Kit Contents

Your Ender Extender kit includes all the required screws, frame parts, belts and wires that you need for a typical installation. **There are many variations that you could choose to build, which may require additional components.** We've included links to a 3D printable LCD box that mounts to the left of the frame, and the wires supplied have appropriate length for this configuration. Alternative configurations may require longer wires than those supplied in the kit.

Quantity	Description	Picture
1	Top Frame Crossmember	
1	X Axis	
1	Y Axis	
1	Bottom Crossmember (no longer engraved, sorry!)	
1	Y axis belt	
1	X axis belt	
1 ea	Heated bed wire extension. We do not provide high current couplers. You should use solder to join these wires to your original bed wires, and heat shrink tubing to secure the joint. Use solderless connectors at your own risk. We accept no liability for your assembly.	

1 ea	**LCD Cable**	
1 ea	**Power Supply Bracket** M4 Hex Cap Screw M5x8 button head screw M5 T-Slot Nut Ender 3 V2 KITS ONLY	
1 ea	Utility Drawer Bracket M5x8 button head screw M5 T-Slot Nut Ender 3 V2 KITS ONLY	
4 ea	M5x8 button head screw M5 t-slot nut For Y Axis Support	
1	Aluminum plate, .125” (3mm) thick Note: there will be a slight overhang when using glass plate. We recommend using black office clips, thermal pads, or double- sided tape to secure glass to the aluminum plate.	
4	M4x35 screws, nylon washers and M4 nylon lock nuts and flat washers (for securing the large plate to stock plate).	
1 ea	Y Motor/End Stop wire extensions. These extension wires connect at the control board end of the wires. The reason for this arrangement is to avoid excessive movement of the interconnects. There may be hot glue holding the connectors to the control board. You will need to remove the spots of glue, unplug the existing cables and plug in the extensions. It is suggested that you re-glue the connections.	

1 ea	500mm Bowden Tube (400/400XL Kits only)	
1 set	Hot end wire extensions (Does not include BLTouch wire extension) *(XL Kits only)* Included in this package: • Fan wire extension with white connectors • Fan wire extension without connectors. ○ You can twist old/new wire ends together and use the included shrink wrap tubing and a hair dryer, lighter, soldering iron, whatever, to heat the tubing and seal the connection. You can also solder the wires if you have that ability. • Hot end wire extension • Thermistor extension • Zip ties *Note* we are no longer including crimp or solderless wire connectors for heated bed or hotend. You should solder these wires to the original wires and use heat shrink tubing to seal the joint.	
1 ea	X Motor/Extruder/Endstop Wire Kit (XL kits only) These extension wires connect at the control board end of the wires. The reason for this arrangement is to avoid excessive movement of the interconnects. There may be hot glue holding the connectors to the control board. You will need to remove the spots of glue, unplug the existing cables and plug in the extensions. It is suggested that you re-glue the connections.	
1 ea	Y Axis Support with screws/t-slot nuts Print one in your color of choice https://www.thingiverse.com/thing:4602353 https://www.thingiverse.com/thing:4715415	 

Additional 3D printed parts recommended but not included

Step 2: Disassemble the Ender 3 V2

In general, we will completely disassemble all the major frame components, power supply, X axis, LCD mount, utility drawer, control board and box, Y axis, print bed and carriage plate. So, get out those allen keys, grab your favorite beverage, and get to work!

Take copious amounts of pictures while you disassemble the printer so you have a good reference during re-assembly!

The Ender Extender V2 kit is 99% part for part compatible with the stock V2. Your re-assembly steps should match any online video guide. The few exceptions are noted in this guide.

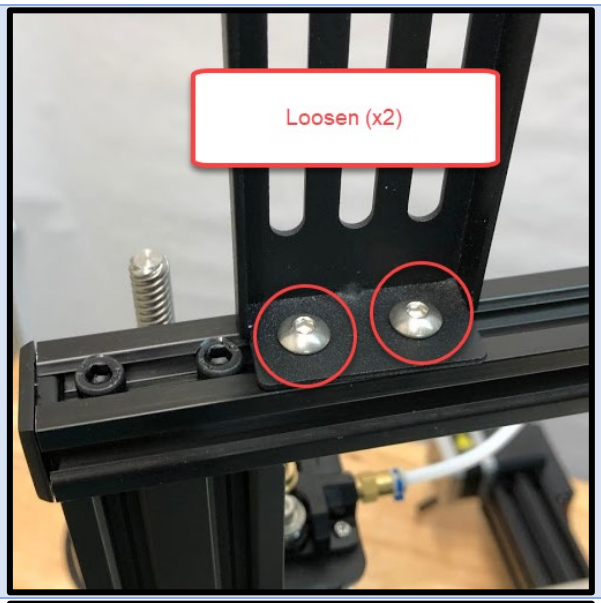
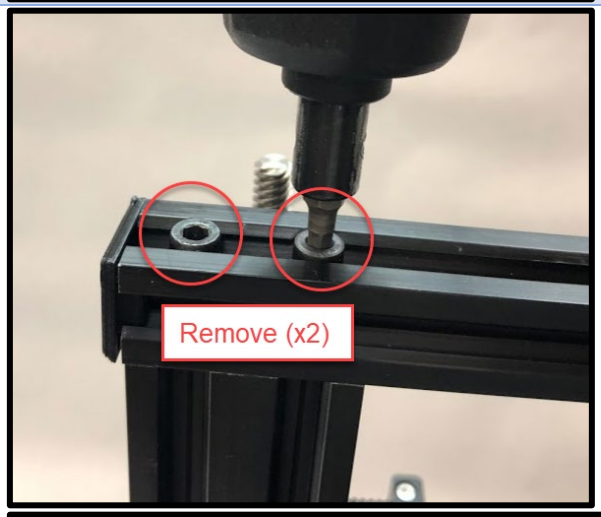
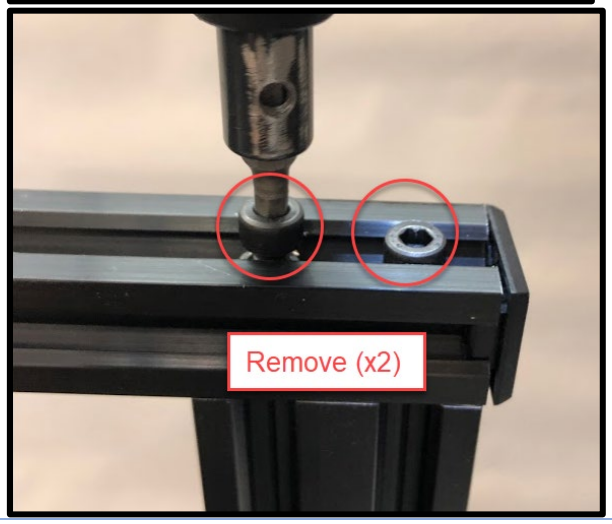
Note the exceptions below:

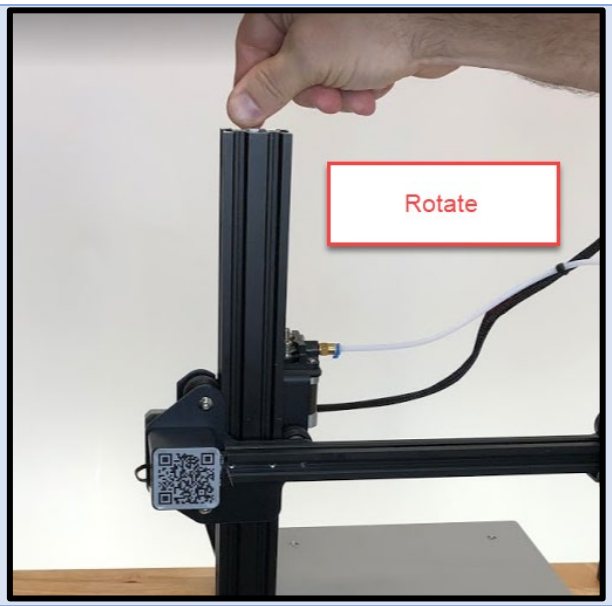
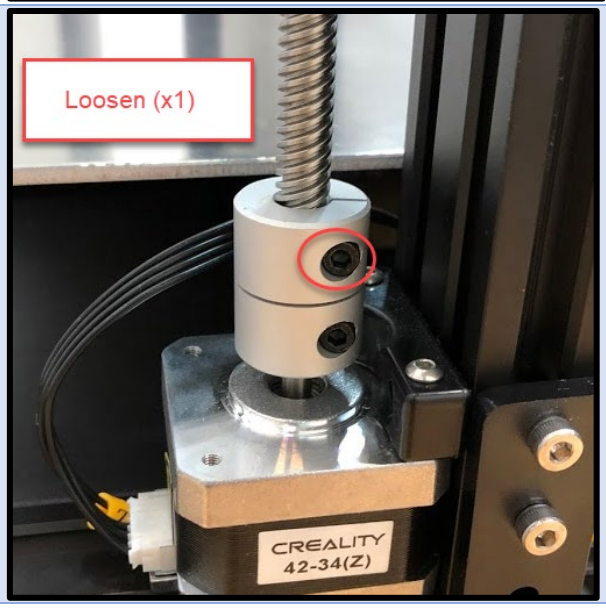
Ender 3: If you are upgrading an Ender 3 (Has a 2040 Y axis, narrow beam standing upright), you will be supplied with a 4040 Y axis, a plastic motor mount, and a Y belt tensioner. Your printer should look like the pictures in this guide upon completion.

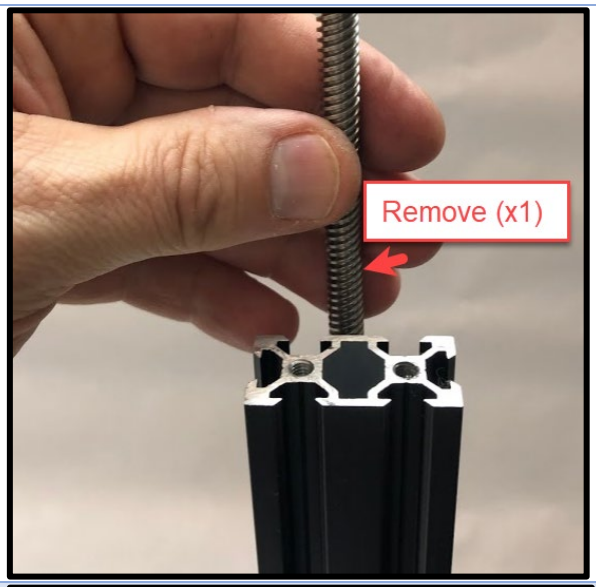
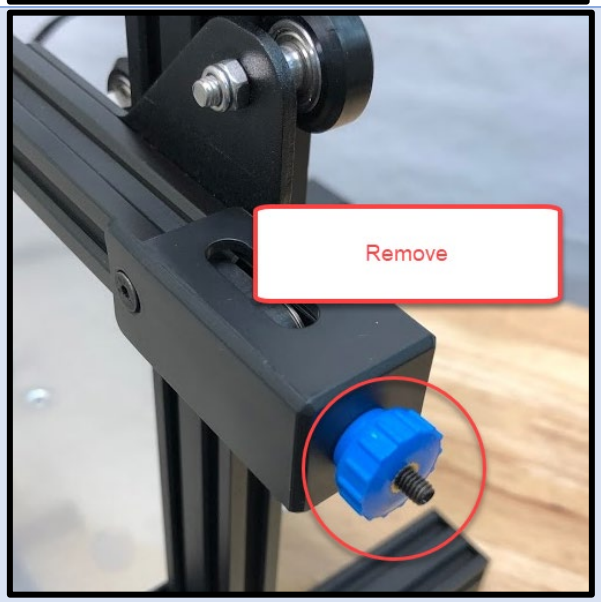
Ender 3 PRO: If you are upgrading an Ender 3 Pro, you will be supplied with a 4040 Y axis and a new Y belt tensioner. Your printer should look like the pictures in this guide upon completion.

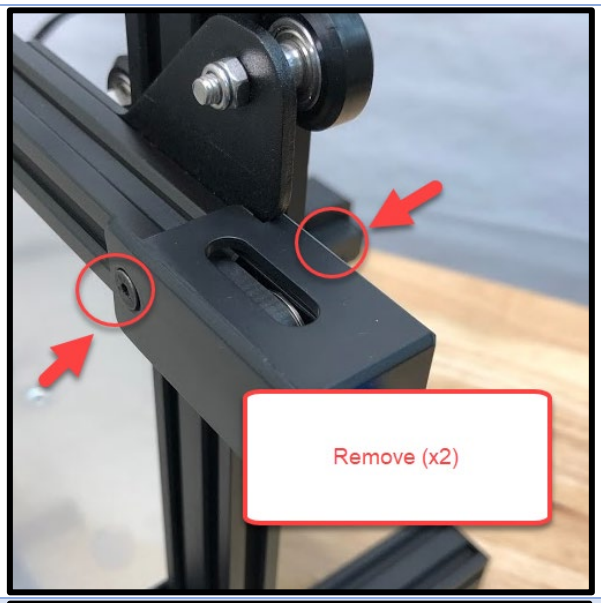
Work smart! Put those screws in a container so you do not lose them.

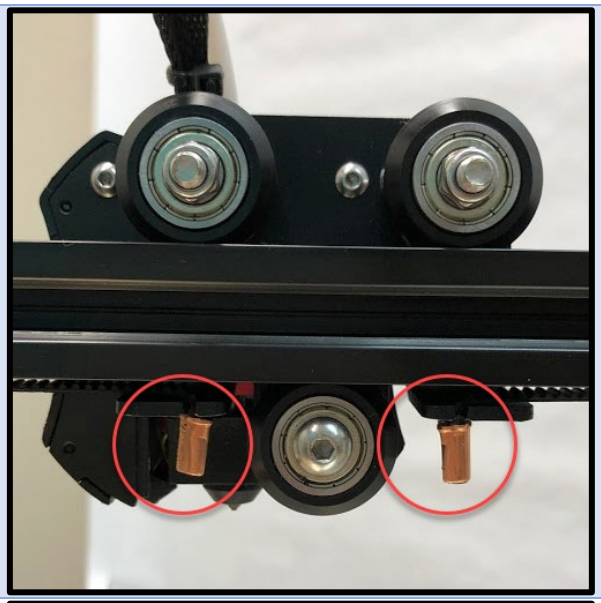
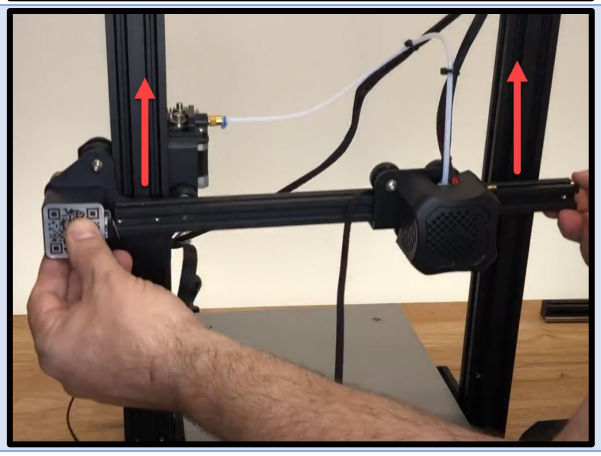
Description	
Remove filament from extruder and remove filament spool	
Disconnect power cable from power supply	

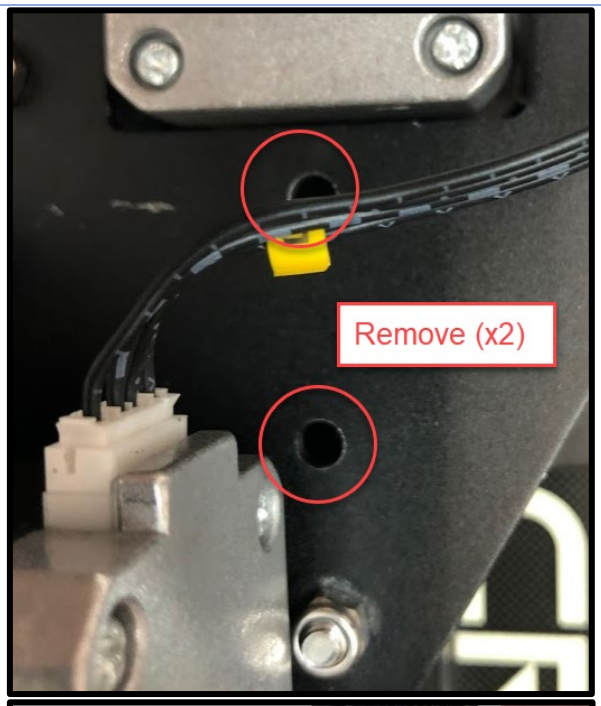
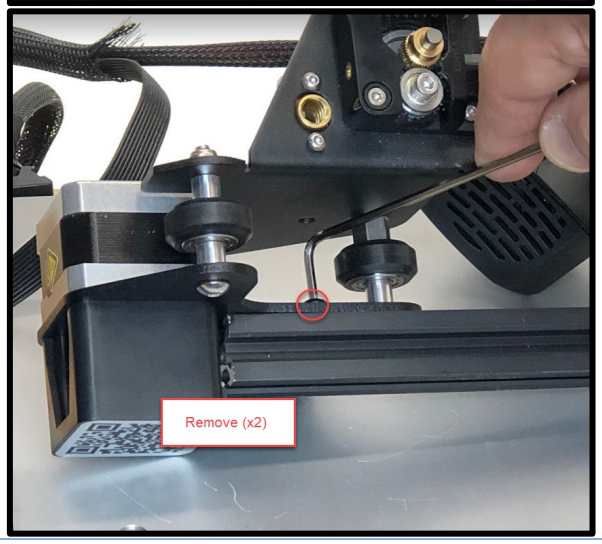
Remove filament holder	
Remove top fame member **Save screws and washers** **Set top frame member aside; will not be re-used.**	 

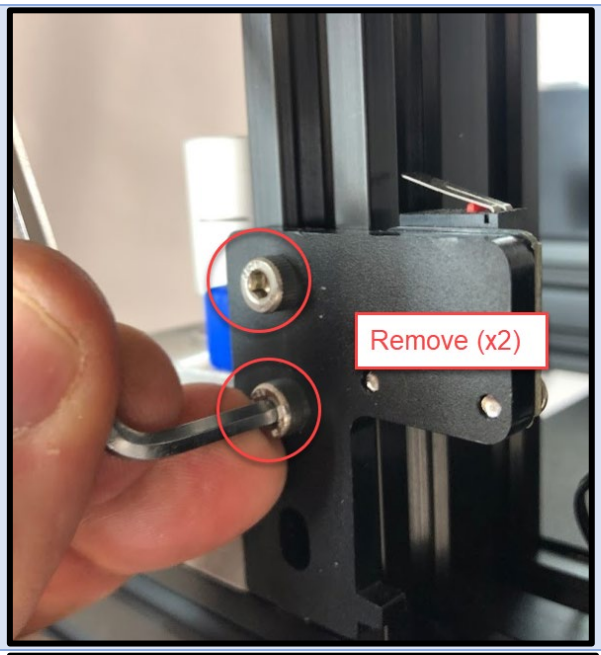
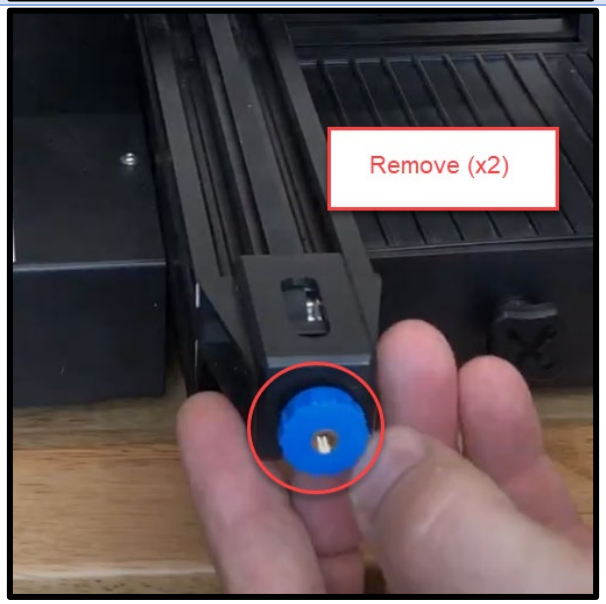
Rotate the lead screw so that the X Axis bar is about mid-point up its travel distance	
Place the filament spool holder under the x axis bar on the left side of the frame. **Rotate the lead screw so that X axis moves downwards and rests upon the top of the filament spool holder**	
Loosen the top grub screw in the Z motor coupler	

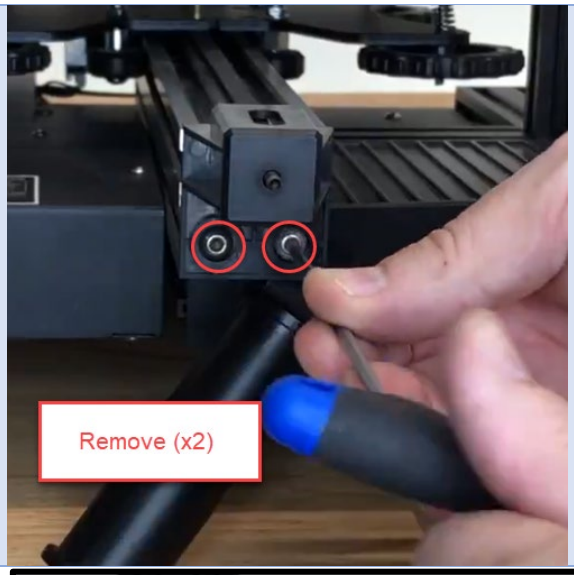
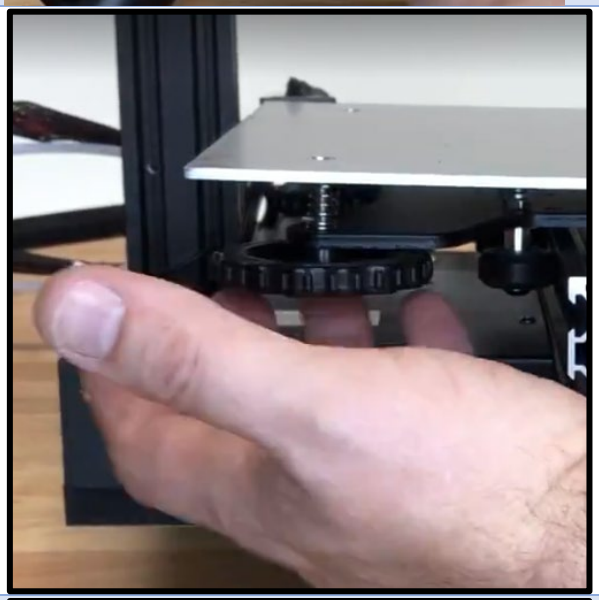
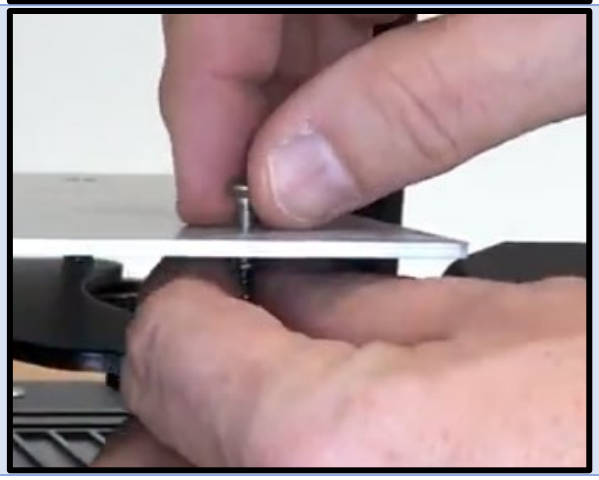
Carefully pull upwards until it disengages from the coupler. **After the lead screw is free of the coupler, turn it so that it unscrews out of the brass nut on the X axis bracket.** **Rest the X axis assembly upon the filament spool holder.**	
Remove the X Axis Belt Tensioner wheel	 (Ender 3 V2)

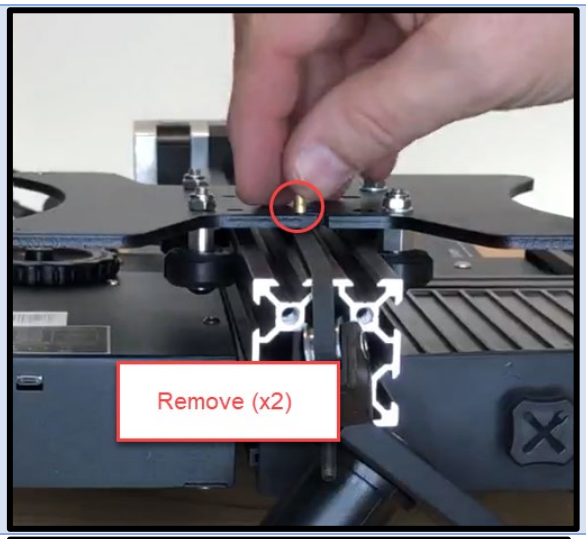
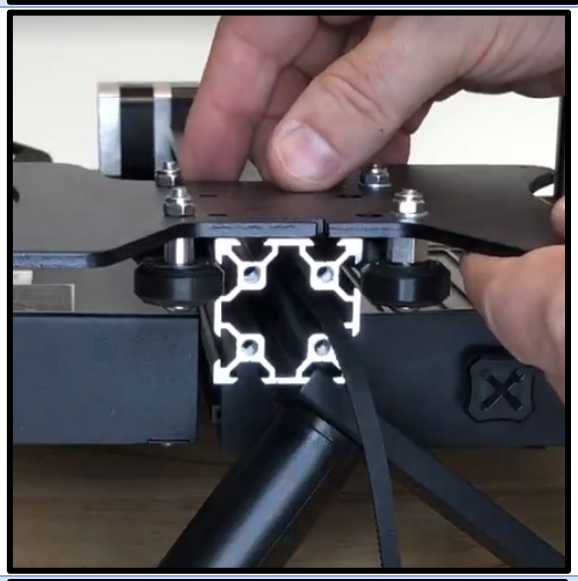
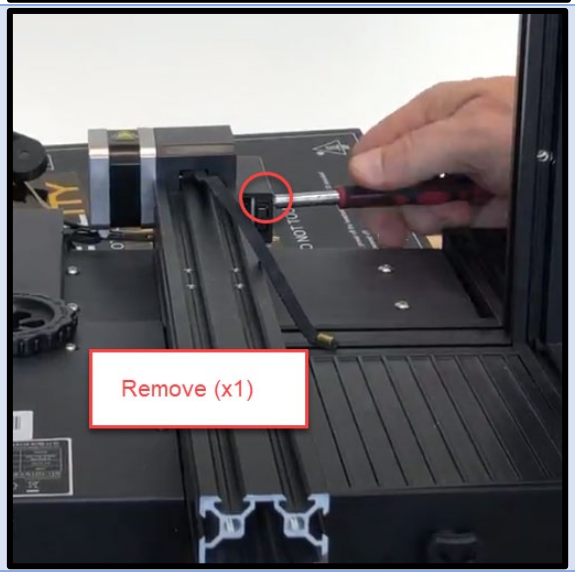
Remove the front and rear X Axis Belt Tensioner screws.	
Remove the single remaining screw on the right X carriage plate.	
Remove the X Axis Belt Tensioner cover and bearing holder.	

Disengage both ends of the X axis belt from the underside of the nozzle carriage plate.	
Carefully slide the carriage plate upwards and remove from the vertical extrusion.	
Slide the left side of the X axis assembly up to the top of the left vertical extrusion and carefully remove the X axis assembly from the Z vertical extrusion.	

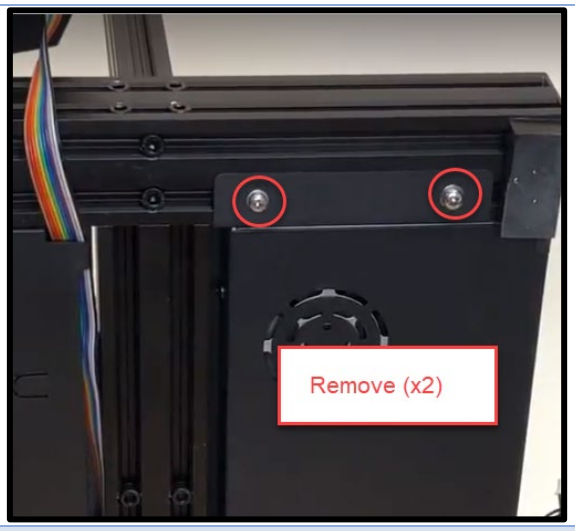
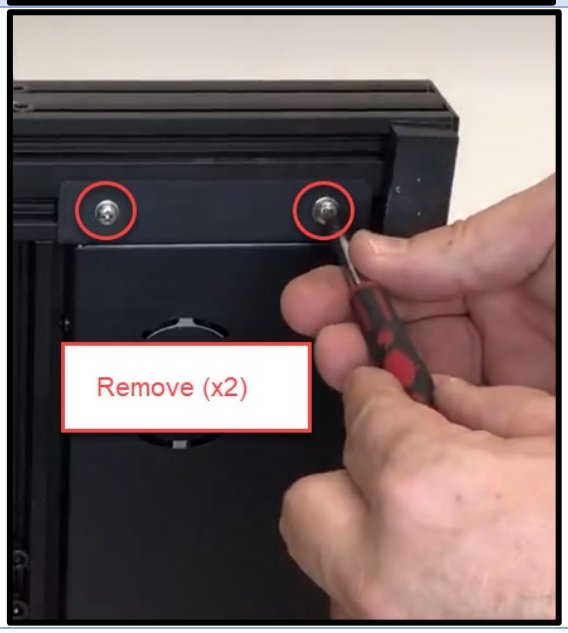
Place the X axis assembly on the printer bed and locate the two screws embedded under the extruder bracket. Use the short end of the hex key tool to loosen the screws, then use the long end through the holes in the extruder bracket to remove the screws. **Set the X axis aluminum extrusion aside; it will not be reused.**	 

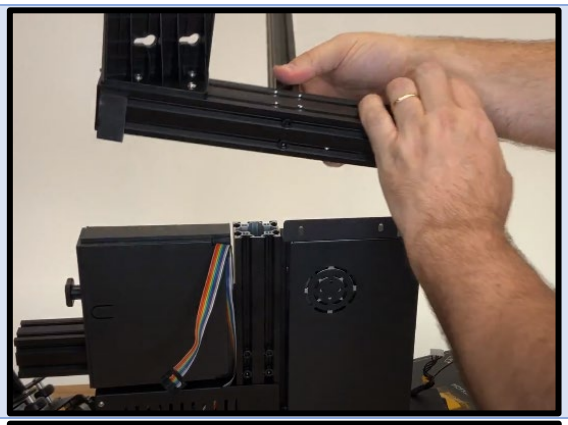
Remove Z end stop bracket **Disconnect the Z end stop wire connector from the end stop switch.**	
Remove the Y axis belt tensioner wheel	 Original V2 shown

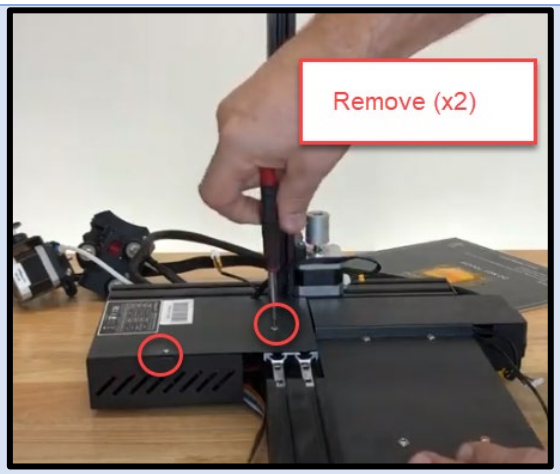
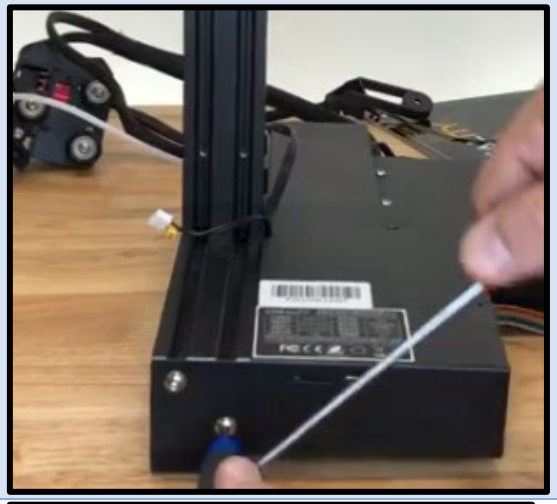
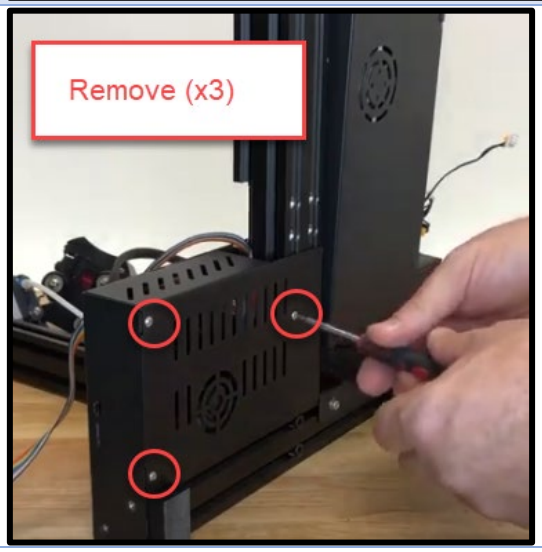
Remove Y belt tensioner and bearing block	
Remove the four bed levelling wheels	
Remove the bed levelling screws and springs	
Remove the heated build plate. Place the heated build plate onto the workbench and avoid twisting the wires.	

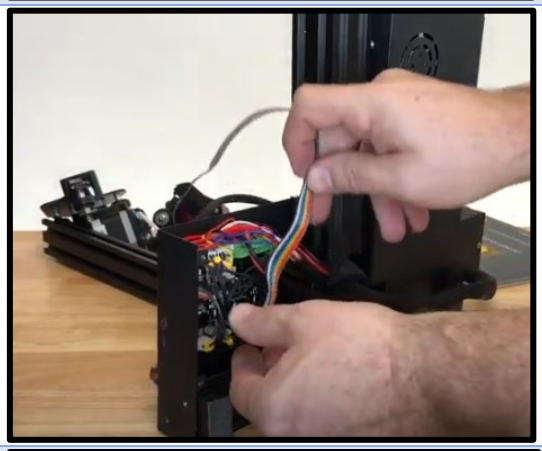
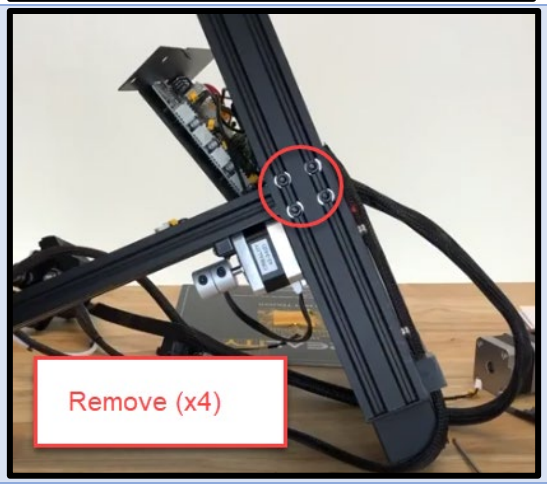
Do not remove the plastic wire retainer from the heat bed wires.	
Disengage the Y axis belt ends from the carriage plate	
Slide the Y carriage plate towards the front of the Y axis and remove the Y carriage plate assembly	
Remove Y axis end stop cover screw	

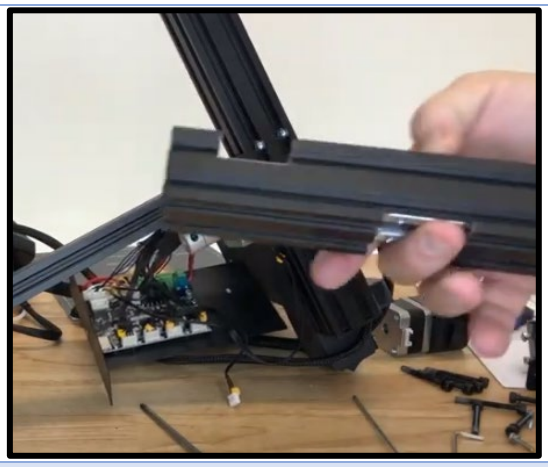
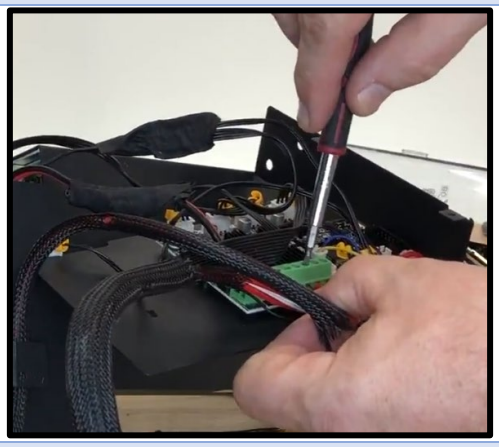
Remove Y axis end stop cover. It is a snap fit, so take care while removing.	
Disconnect the Y axis end stop wire connector from the inside of the cover	
Remove the Y axis motor mount	
Disconnect the Y axis motor wire	

Remove two power supply mounting screws on bottom right side	
Remove LCD cable	
Remove LCD from LCD bracket	
Remove right side four screws which connect bottom center brace from right bottom brace	
Remove power supply mounting screws from underside of right support beam.	

Set the right-side assembly aside	
Remove four center Y axis mounting screws	
Remove Y axis 4040 extrusion and set it aside	
Remove utility drawer	

Remove control board top cover screws; remove front two screws securing cover to right side support beam.	 
Remove control board bottom cover screws (3)	

Remove control board fan wire from control board. The wire may be secured with hot glue, so you may have to use a tool to loosen it.	
Remove LCD cable from control board	
Remove four left side screws	

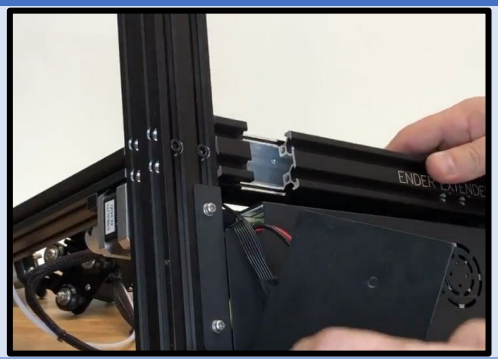
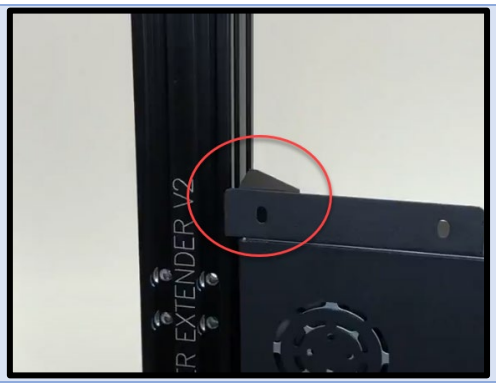
Remove center beam	
Locate the heated bed thermistor wire connector and unplug it from the control board.	
Unscrew the heated bed wire terminals and remove the heated bed wires from the terminals. Make a note of the connection of the red/black wires.	
Remove the Y motor and Y end stop connectors from the control board.	

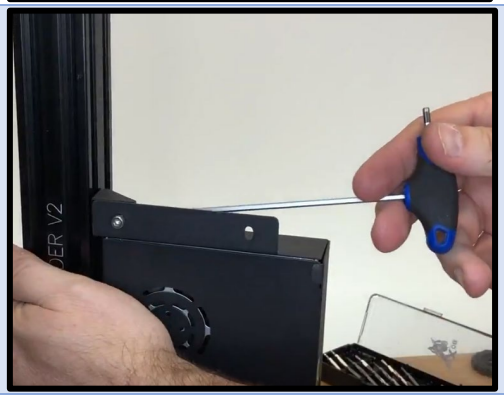
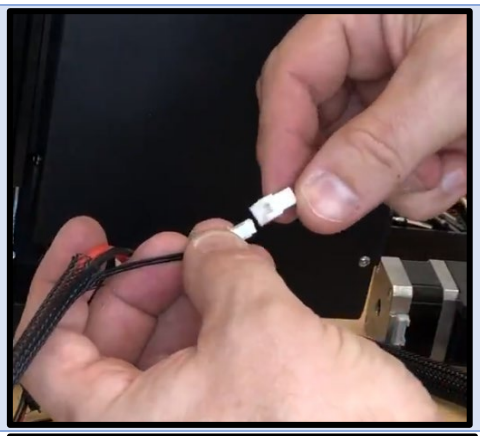
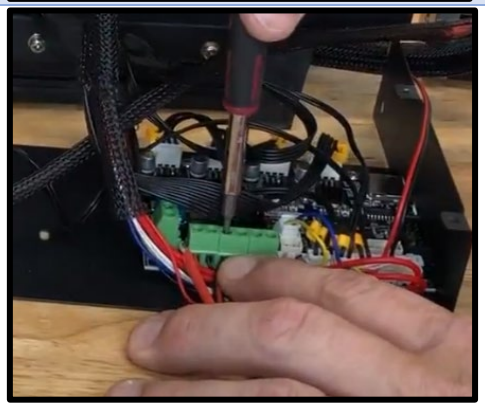
That was a lot of work! You should have the printer completely disassembled at this point.

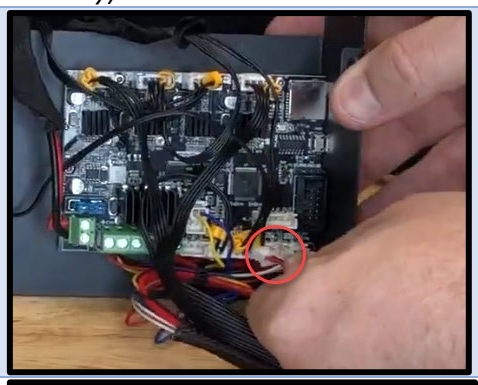
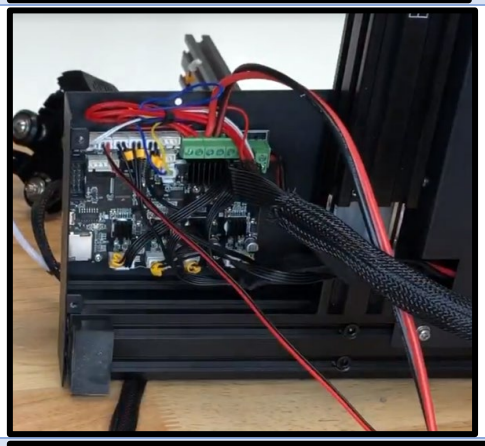
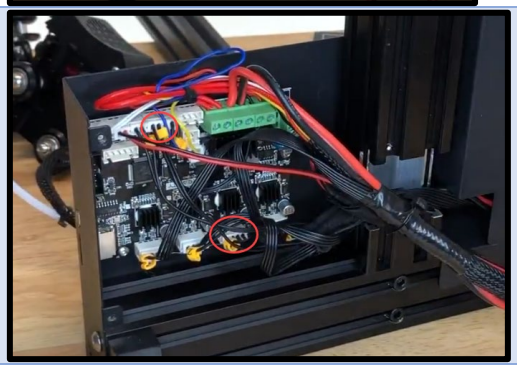
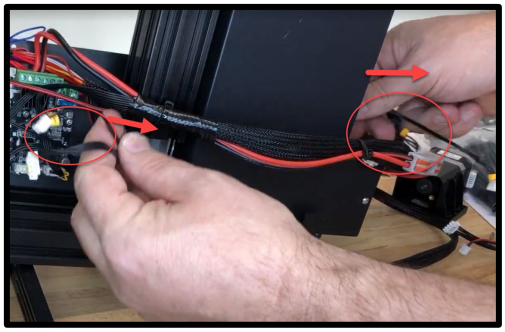
You will have a pile of parts that you will not use in the re-build:

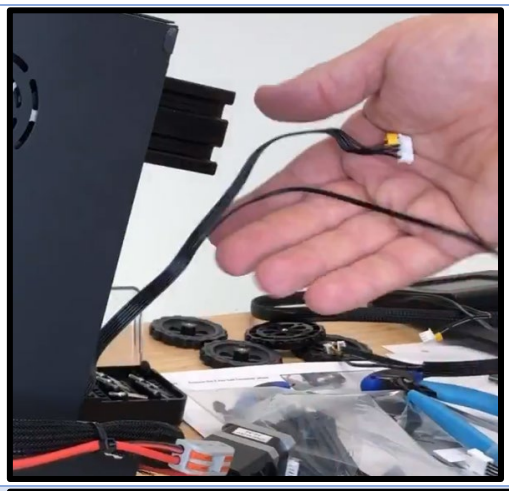
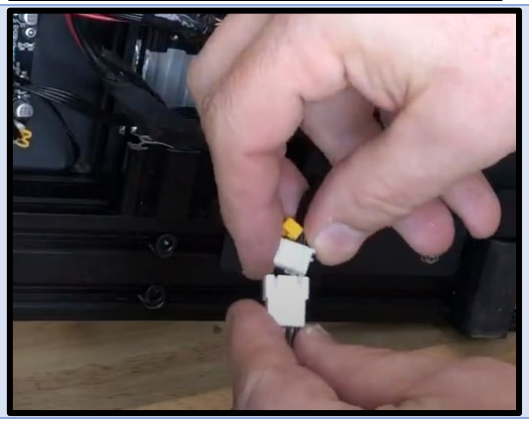
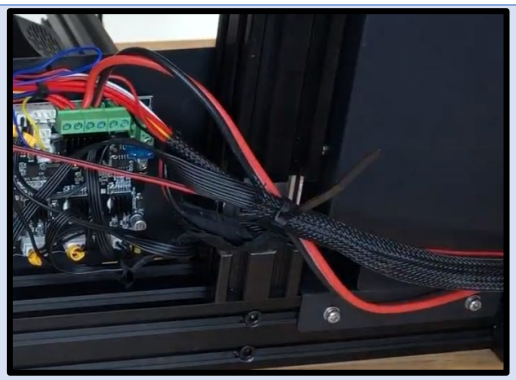
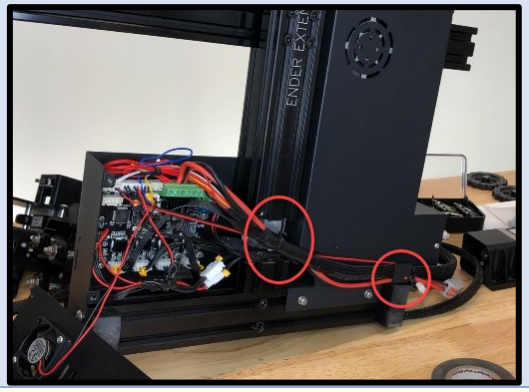
- Top frame cross member
- X Axis profile
- Center frame cross member
- Left / Right Z axis members (if you are building the 400XL kit)
- X and Y axis belts
- X/E motor and X end-stop wiring harness (if you are building the 400XL kit)

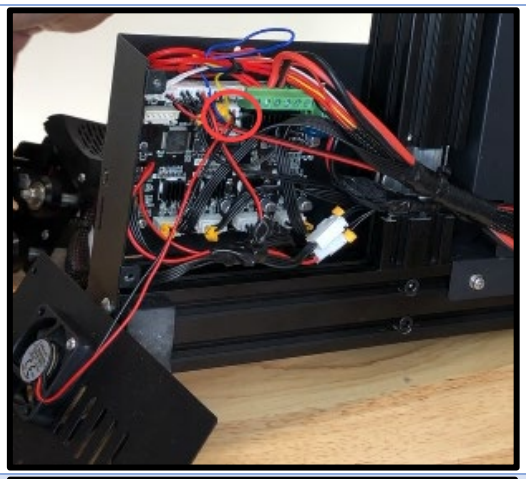
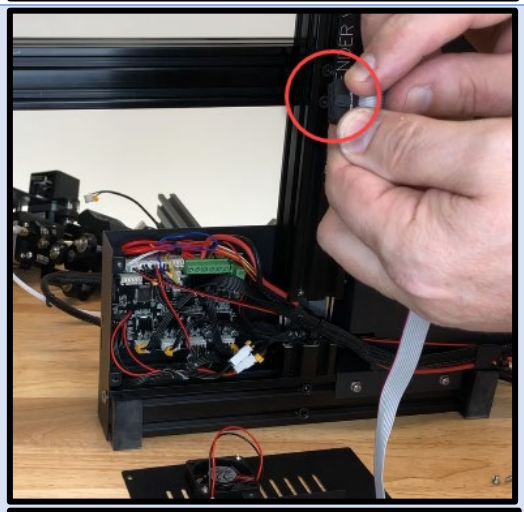
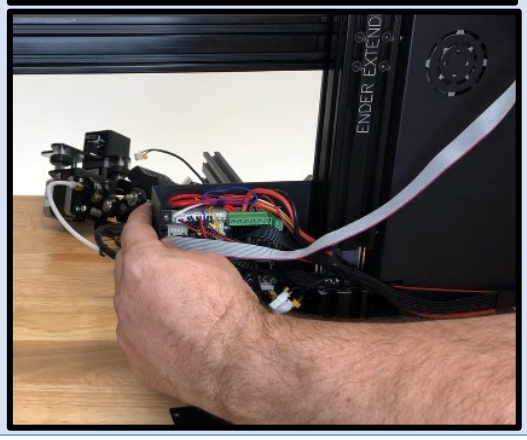
Step 3: Base frame re-assembly

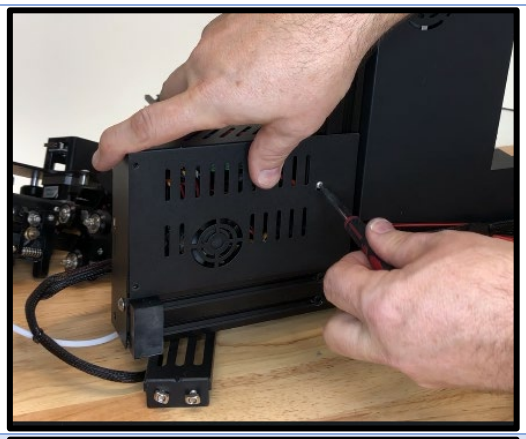
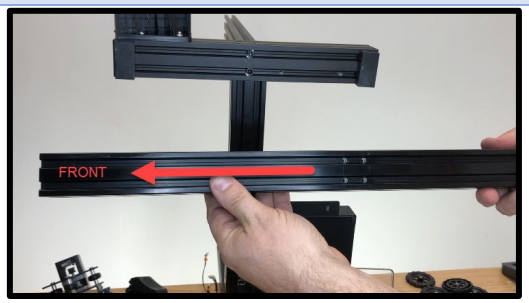
Description	
Attach the new center support beam in the same position as the original	
Re-attach the four side mounting screws	
Locate the power supply support bracket 3D printed. Included in the bag is an M5 screw, M5 t-slot nut, and an M4 screw. **Insert the M5 screw through the hole in the 3D printed bracket. Attach T-slot nut to M5 screw.** **Ender 3 V2 KITS ONLY**	
Position plastic bracket on the Y axis center support beam near the power supply flange. **Ender 3 V2 KITS ONLY**	

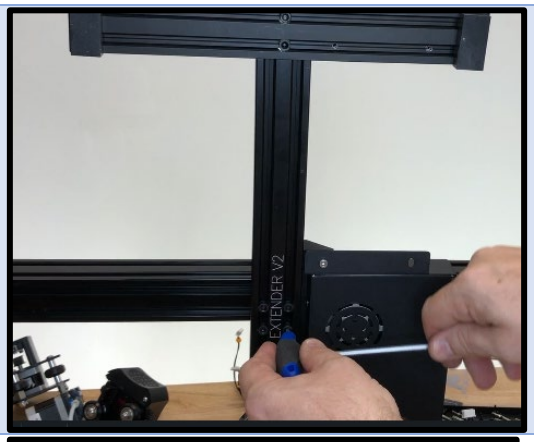
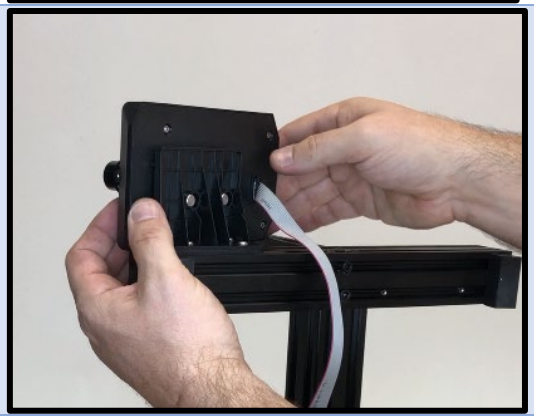
Use the M4 screw to attach the plastic bracket to the power supply flange	
Tighten the M5 Screw to secure the power supply.	
Attach the heated bed thermistor wire extension (white connector) to the end of the heated bed thermistor wire connector.	
Attach the end of the heated bed extension wire to the control board. The polarity of the stock heat bed connection is not important. However, the Creality wiring diagram suggests the positive wire (red) should connect to the left terminal.Ensure the black wire is close to the red wire of the power supply line.	 *(Stock bed heater only: I attached the black to the left terminal. It does not matter which terminal; however, you should attach it the same way it was before you detached it)* *(If you are installing an A/C heat pad powered by a Solid State*

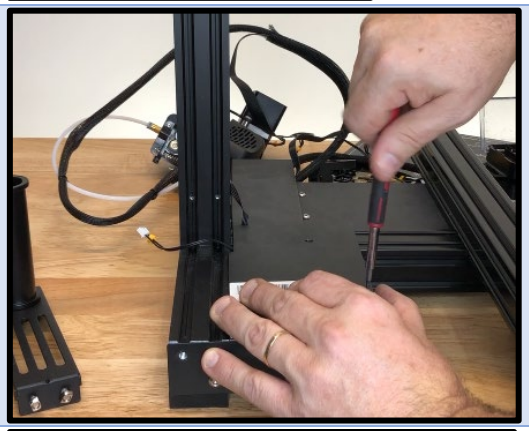
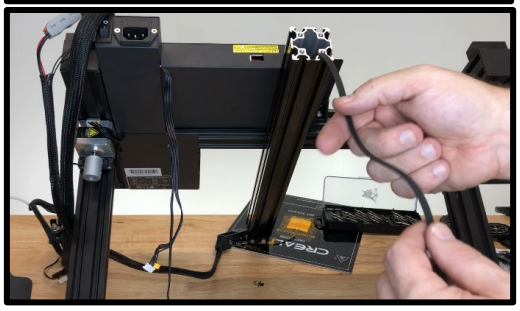
	Relay, play close attention to the +/- terminals here as the SSR will not function (no heat) if the wires are not connected correctly)
Attach the heated bed thermistor extension wire to the control board Bed Temp port.	
Attach the control board to the left / bottom frame member	
Remove the Y motor and end stop cable from the control board plugs. They may be secured with hot glue, therefore, use a tool (not a knife) to remove the glue.	
Pull the Y motor and end-stop wire towards the motor to lengthen it. **Note: If your kit included a replacement Y motor wire, you would simply replace the existing wire set. We started shipping extension wires in Mid-October. The new extension wires connect at the board end of the cables and the stock wires will connect to the opposite end of the extension wire connector socket.**	

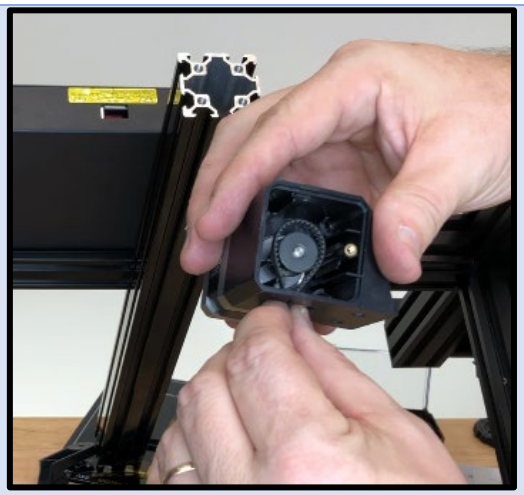
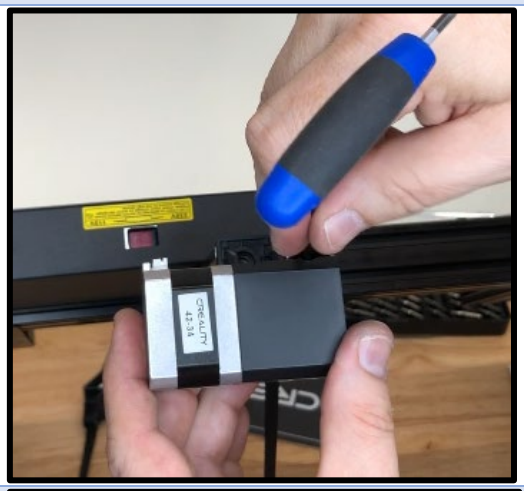
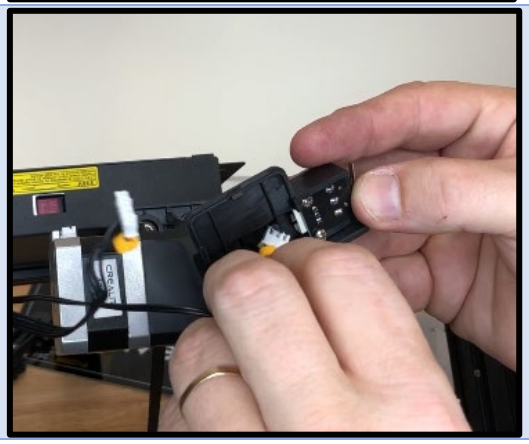
	
Using the included Y motor extension wire, connect the existing motor cable to the extension cable. Connect the Y motor extension wire to the control board. **Connect the Y motor end-stop wire to the new extension wire plug. Connect the extension wire to the control board.**	
Take care to route the wires through the cutout. Use zip ties and electrical tape to secure the wires and to protect them from the edges.	 

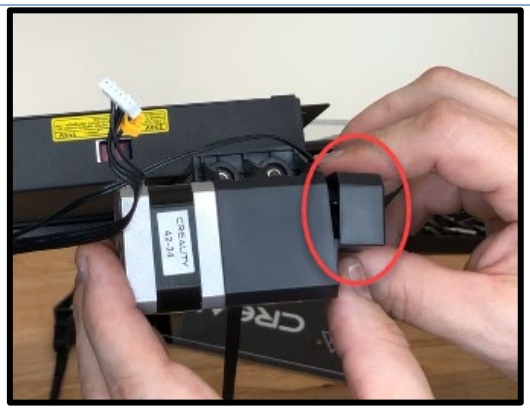
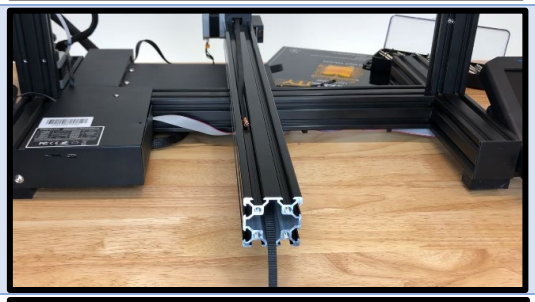
Reattach bottom control board cover fan wire to control board.	
Attach LCD cable to control board. The LCD cable has a proper orientation; on the control board side, the square key on the connector is on the inside facing the cable.	 

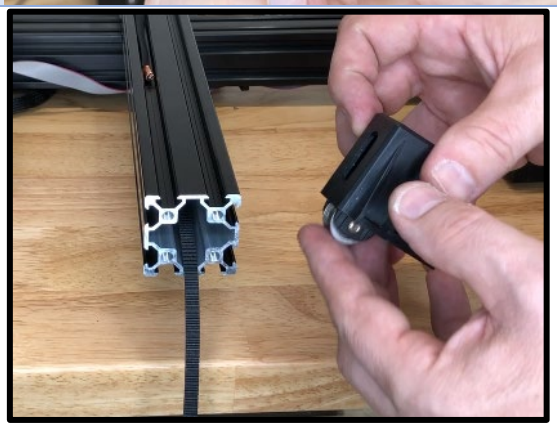
Reattach bottom control board cover	
Attach right side assembly to Y axis center beam	
Attach Y axis 4040 beam to center cross beam. The long end will face towards the front.	 

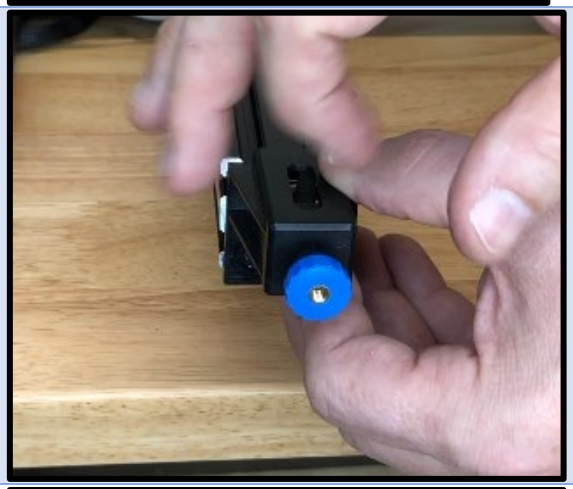
Always use short end of tool to tighten bolts	
Attach LCD cable to LCD	
Attach LCD to bracket	

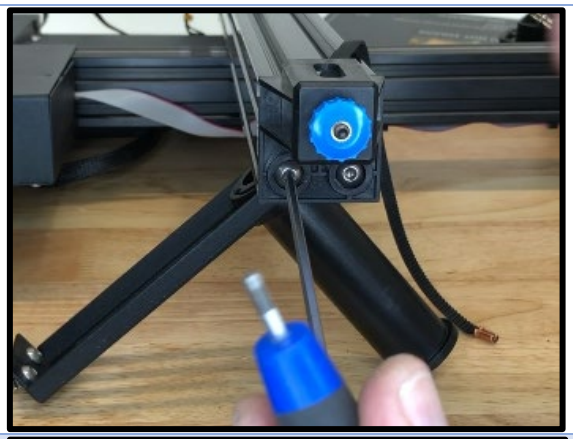
Use the included LCD wire clips to attach the LCD cable to the center beam. (optional). You can twist the clips into the slot, or slide them in before assembly (oops)	
Attach top control board cover screws (2) **(the back screw is the long one)**	
Feed Y belt through Y axis tube, ensure the belt does not become twisted. **This step can be tricky. You may have to set the printer at a weird angle so that you could see down the tube while feeding it in.**	 

Loop the Y belt over the Y motor pulley through the opening.	
Attach the Y motor to the end of the Y axis.	
Attach the Y end stop switch wire to the end stop switch.	

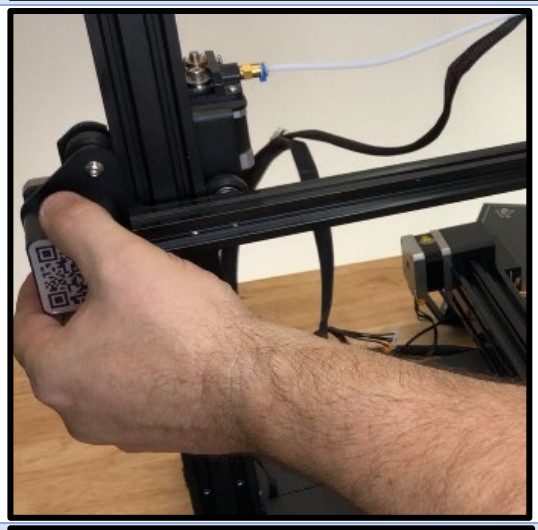
Attach the Y end stop switch cover. Take care the wires do not get pinched between the cover and the motor mount.	 
Position the printer facing you	
Locate the Y carriage plate, and fit it to the Y axis 4040 extrusion, taking care not to damage the wheels. Ensure the narrow corner faces the back/left of the printer. Slide the Y carriage towards the middle of the printer.	

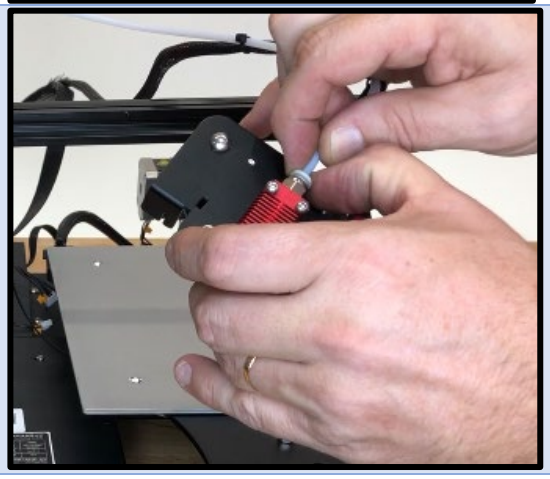
Note: The Y motor bearing is smaller than the X axis bearing.	
Locate the Y belt tensioner cover and bearing assembly. Determine the proper insertion and feed the belt around the bearing and insert the bearing block into the cover.	 

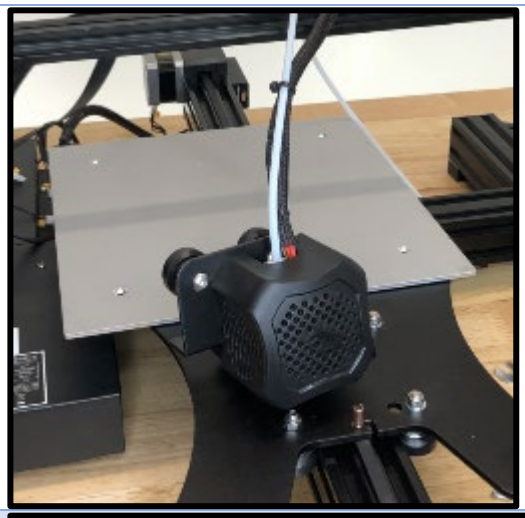
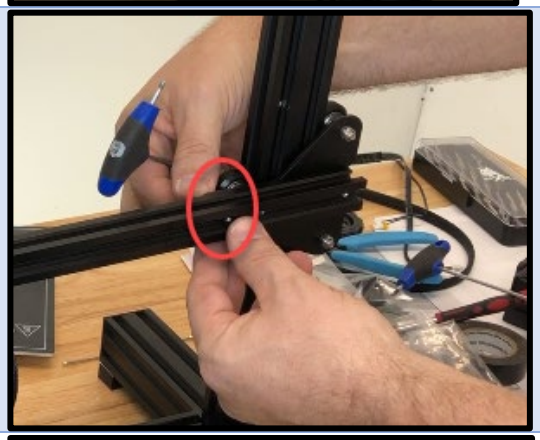
	
Attach the Y belt tensioner wheel	
Attach the belt tensioner to the end of the Y axis	

	
Attach the belt ends to the Y carriage plate	
Tighten the Y belt tensioner wheel until the belts are taught but not over tight.	

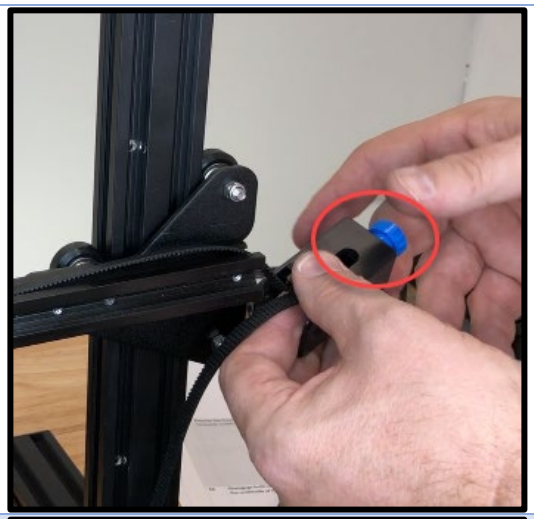
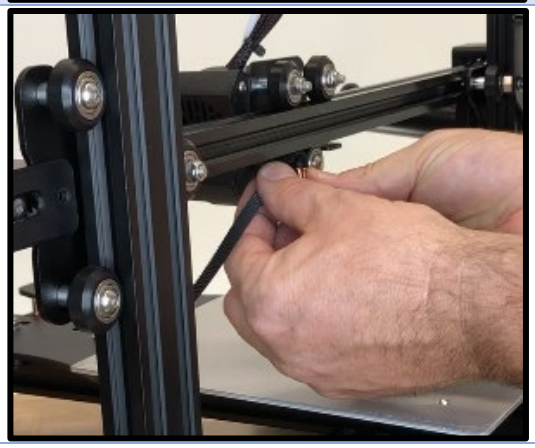
Step 4: X Gantry installation

Description	
Attach the right-side carriage bracket to the vertical beam, sliding down from the top, taking care not to damage the wheels. Let the carriage rest at the bottom.	
Attach the left side bracket and X axis beam to the left vertical beam	
Support the X axis assembly with the filament spool holder	

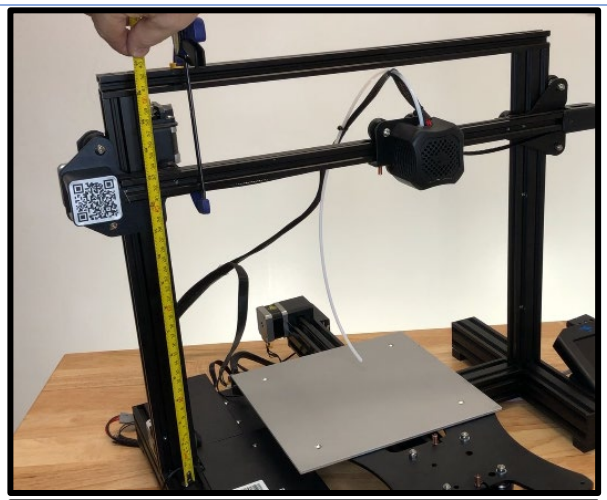
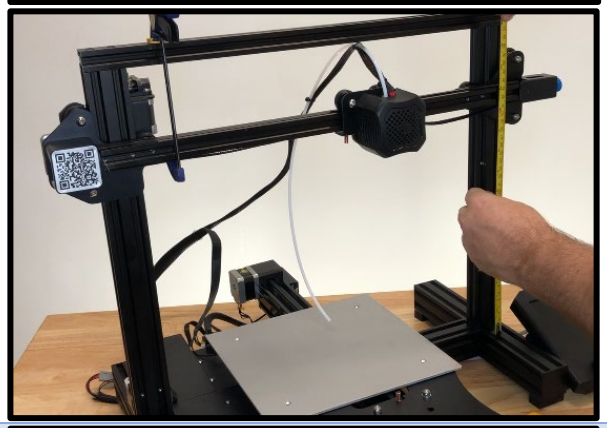
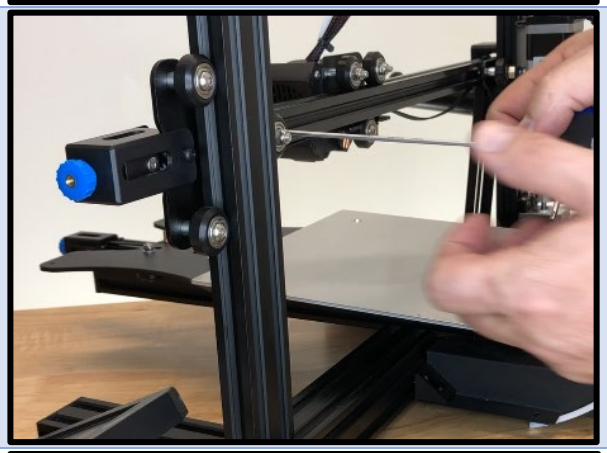
Remove the nozzle cover to gain access to the Bowden tube retention ring. The cover is held in place by two small screws, and two small plastic notches that act as a hinge. Take care not to break the plastic parts.	
Press on the plastic retention ring towards the hot-end and pull the Bowden tube out of the hot-end.	
Remove the other end of the Bowden tube from the extruder.	
Attach new Bowden tube to extruder and hot end.	

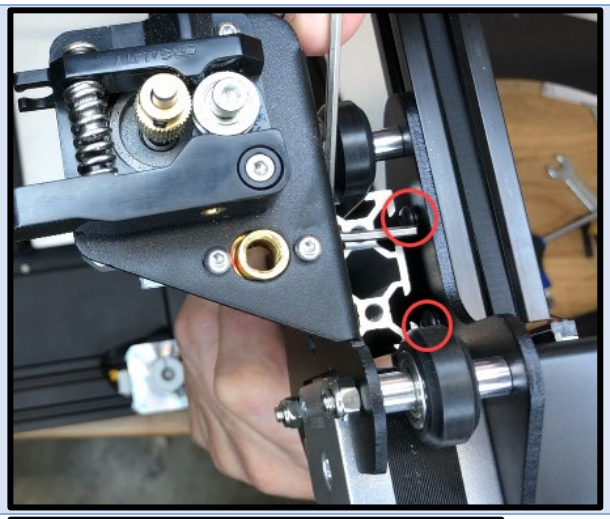
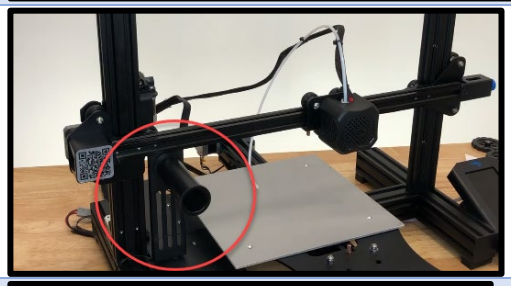
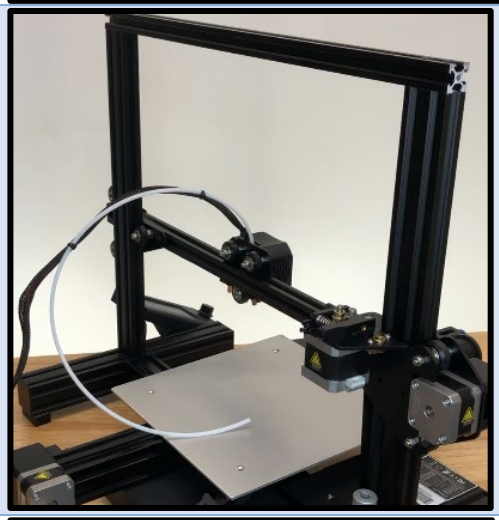
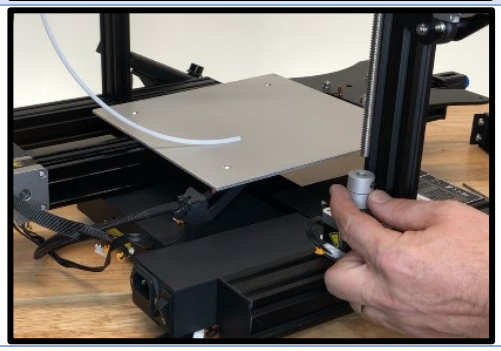
Reassemble hot end cover	
Loosely attach right side plate to X axis using one screw. Do not tighten the screw.	
Locate the X axis belt and feed the left end through the motor pulley cover, around the pulley, and back under the X axis bar. This part is tedious! We find it makes it a bit easier if you use a tool to guide the belt through the small gap at the end of the X axis bar.	

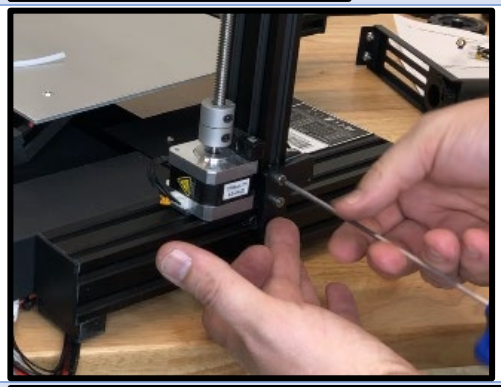
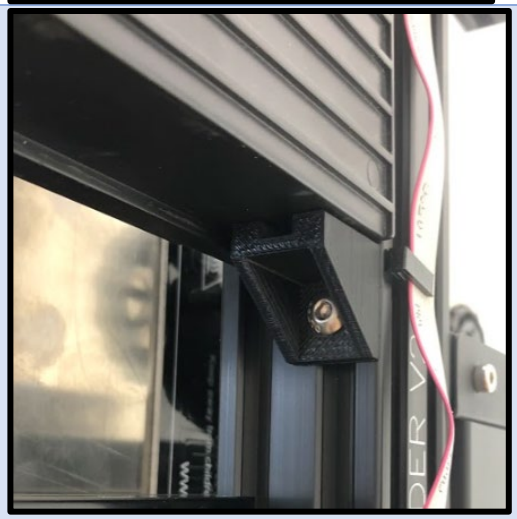
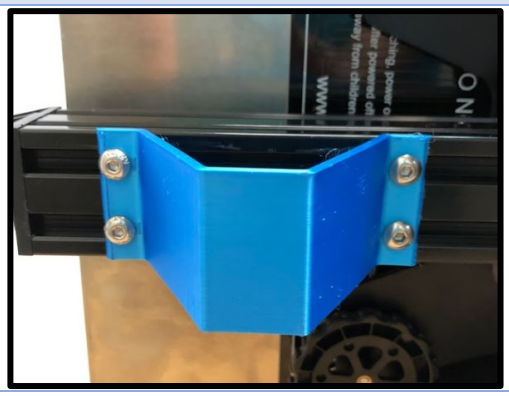
Slide nozzle assembly onto the X axis bar from the right side; ensure the belt is positioned below the wheels. If the assembly will not clear the right gantry carriage, loosen the gantry carriage screw on the back.	
Loop the X belt through the pulley assembly	
Attach the pulley into the X belt tensioner cover	

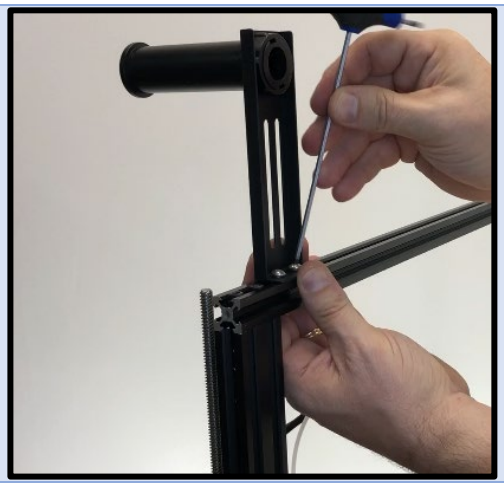
Attach the X belt tensioner wheel	
Attach the belt tensioner cover to the X axis. The front screw is a counter sink screw; the rear is a round head screw. ***Do not tighten the screws at this time.***	
Attach the belt ends to the nozzle carriage	

Tighten the X belt tensioner, ensure the belt is not over tightened.	
Attach the top cross bar with four M5x20 screws	
Attach a small clamp to the top cross bar and the X axis to hold them in position where the X axis is near the top. The clamp should be attached to the left side near the motor.	

Measure the distance between the X axis bar and the left and right bottom frame member; adjust the right side up or down, holding the motor side in place.	 
Once the left and right sides are equidistant from the bottom frame members, tighten the two screws on the back of the right-side X axis carriage.	
Remove the top frame member.	

Hold the X axis assembly and remove the clamp(s). Carefully slide the X axis up to the top of the vertical Z axis frame members. Use the M4 allen key tool to tighten the screws inside the extruder plate assembly.	
Slide the X axis assembly back down onto the vertical frame members; support the carriage with the filament spool holder.	
Re-attach the top cross member.	
Insert the lead screw into the brass nut and turn it until it reaches the Z motor coupling. Insert the lead screw into the Z motor coupling.	

Tighten the lead screw in the Z motor coupler. Use short side of allen key tool to tighten.	
Re-attach Z end-stop switch	
Locate the utility drawer support bracket. Use the included M5 screw and T-slot nut to attach to the center cross beam. Hold pressure on the bracket against the drawer side, tighten screw to hold drawer in place.	
Attach front support (3D printed part) to underside of Y axis. Adjust the location to suit your needs. Adjust the height to make contact with your table by squeezing or stretching the part length-wise.	

Re-attach filament spool holder	

Step 5: Assemble the Build Platform – Plate Stack

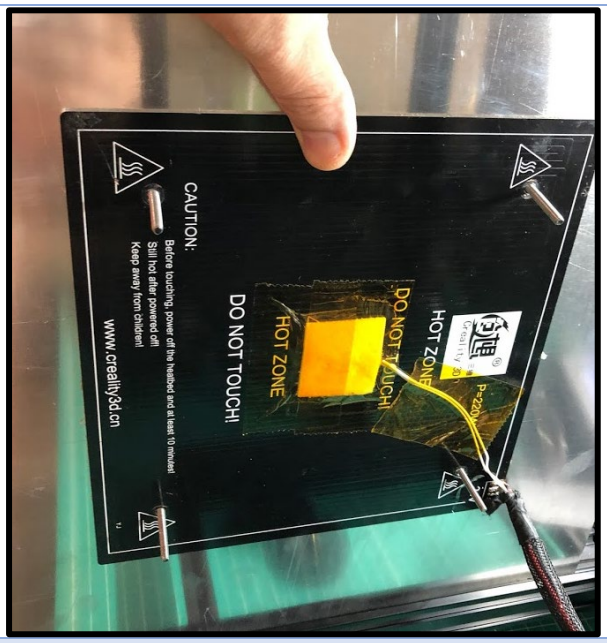
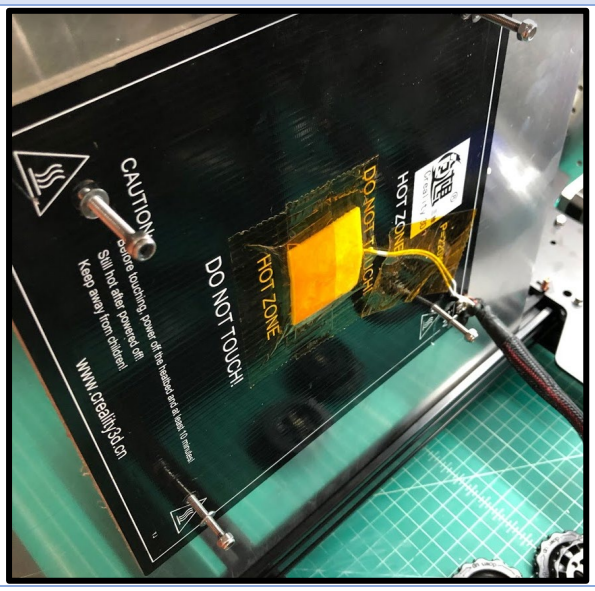
Note: If you are installing the AC heat pad (optional), follow the heat pad installation instructions in place of this step.

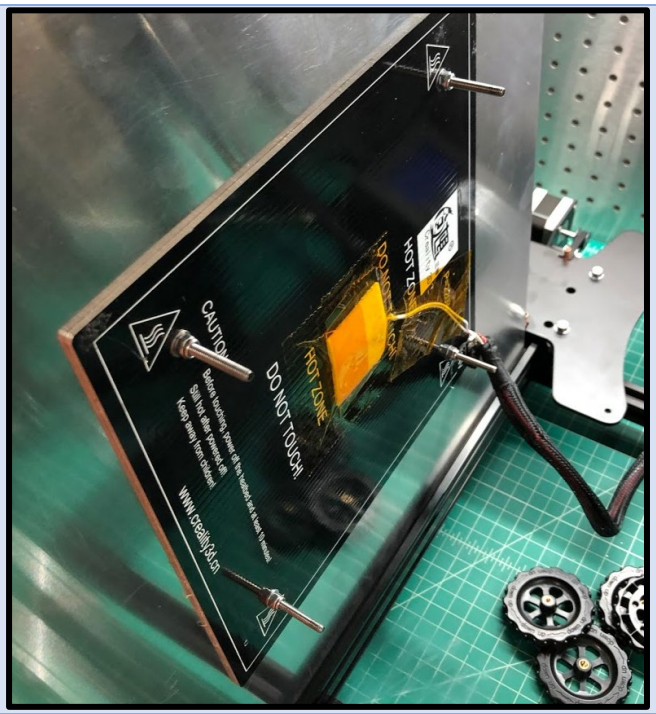
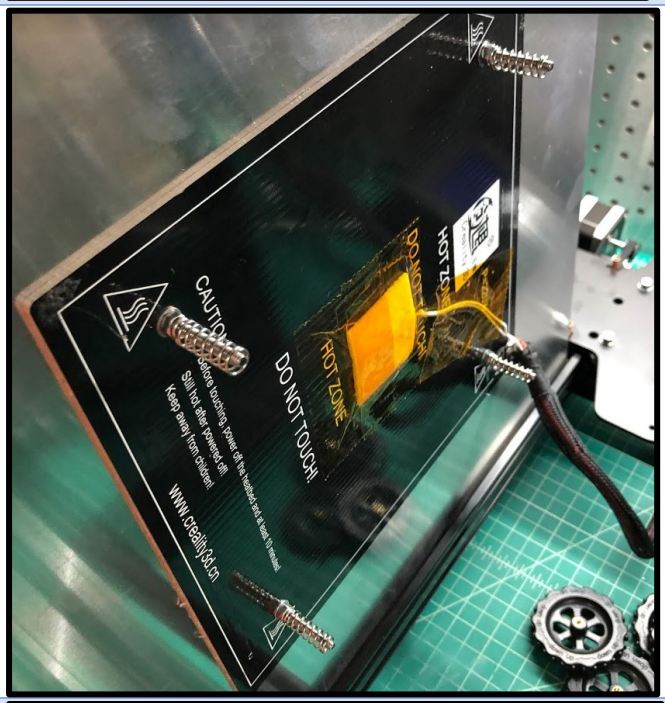
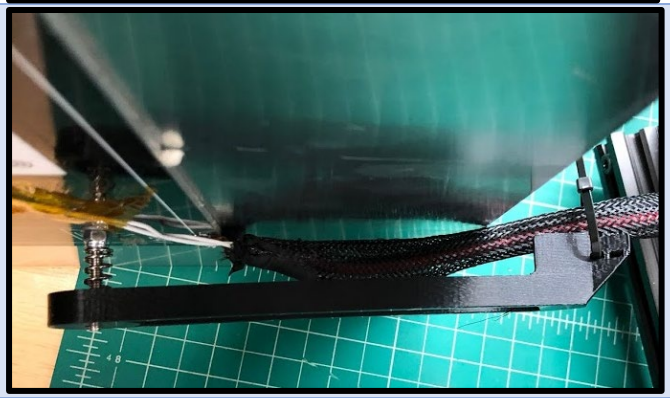
Items needed in this step:

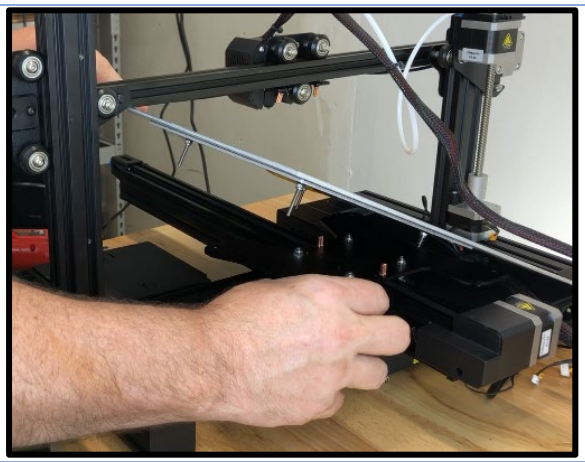
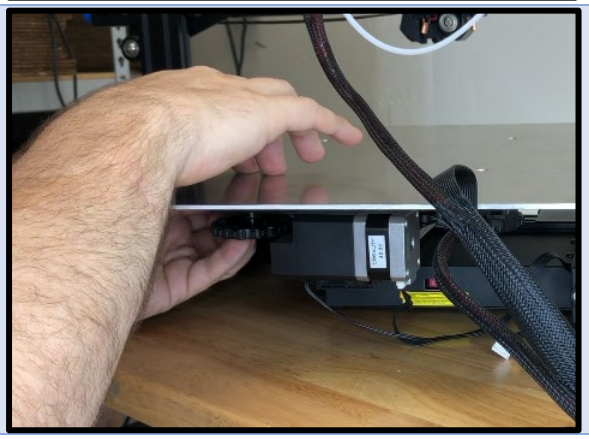
- Original heated build platform
- New 400mm build plate
- Four Phillips head M4 screws
- Four M4 Nylon lock nuts
- Four M4 flat washers
- Four levelling springs
- Four levelling wheels

The nylon lock nuts and washers are necessary to ensure positive mechanical connection between the two plates.

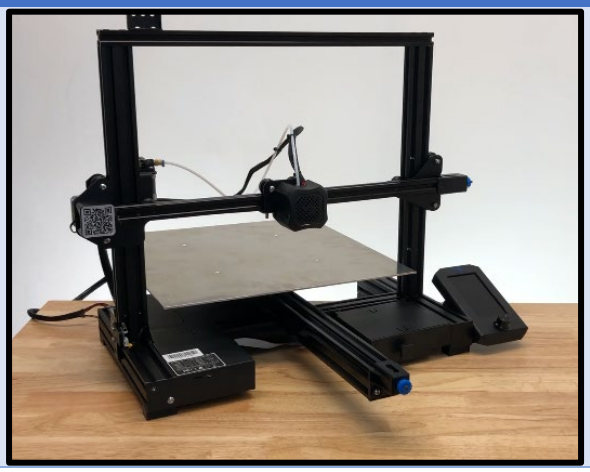
Description	
NOTE: DO NOT REMOVE THE PLASTIC WIRE RESTRAINT.	

Position the new larger plate atop the stock heated build plate.	
Insert the screws through the two plates.	
Attach the M4 washers and nylon lock nuts to the build plate screws and tighten. IMPORTANT NOTE: AS OF August, 2020, we are shipping nylon washers instead of metal for the bed assembly. Please avoid using metal washers.	

Tighten the M4 lock nuts against the washers and stock heater plate.	
Position the levelling springs on the levelling screws.	
Optionally, you may attach the longer plastic wire support bracket (if included; if not, you may print this part at your leisure). The stock piece works just as well, if you have not removed it already.	

Attach the aluminum plate stack and screws through the springs and carriage plate.	
Attach the levelling wheels.	

Finished!

Congratulations! A difficult build to say the least! There are so many steps, we probably missed a few! Consult the experts in the Ender XL Builder's Club Group on Facebook!	
This has been a basic build guide. The final product is up to you! Good performance requires precision assembly. There are many techniques not described in this manual that may improve your final assembly. Check the videos at the end of the guide for more information.	

Slicer Settings

Caveats

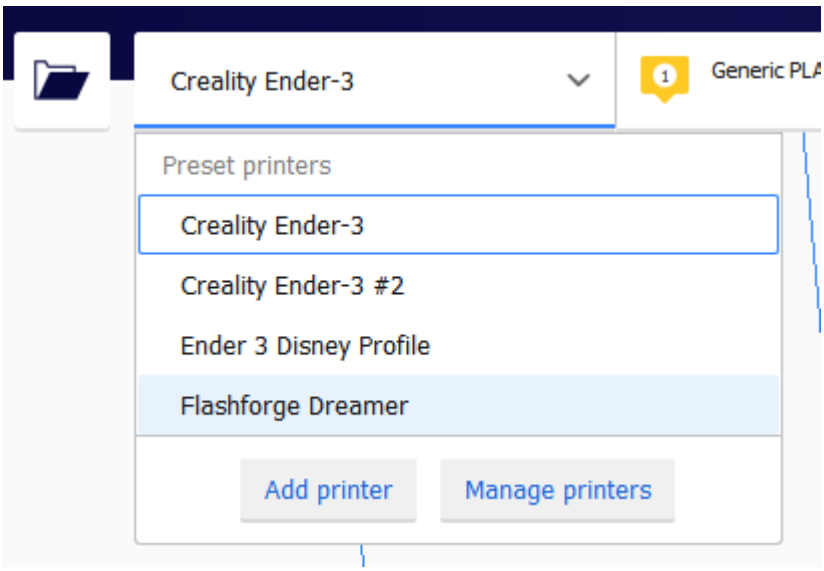
It's not really practical to document all possible slicers and how to print on a larger bed without updating firmware, so we're just going to go with Cura here and you should be able to adapt the concepts to any slicer.

We also can't document all the possible boards, firmwares, firmware versions, etc. Lastly, we do not provide precompiled firmware, and any firmware found in the Facebook group is contributed by individuals not associated with EnderExtender.com. We provide no support or warranty for installing firmware, or the failure of your printer by installing any firmware suggested, linked to, or provided by members of the Facebook Group Ender XL Builders Club.

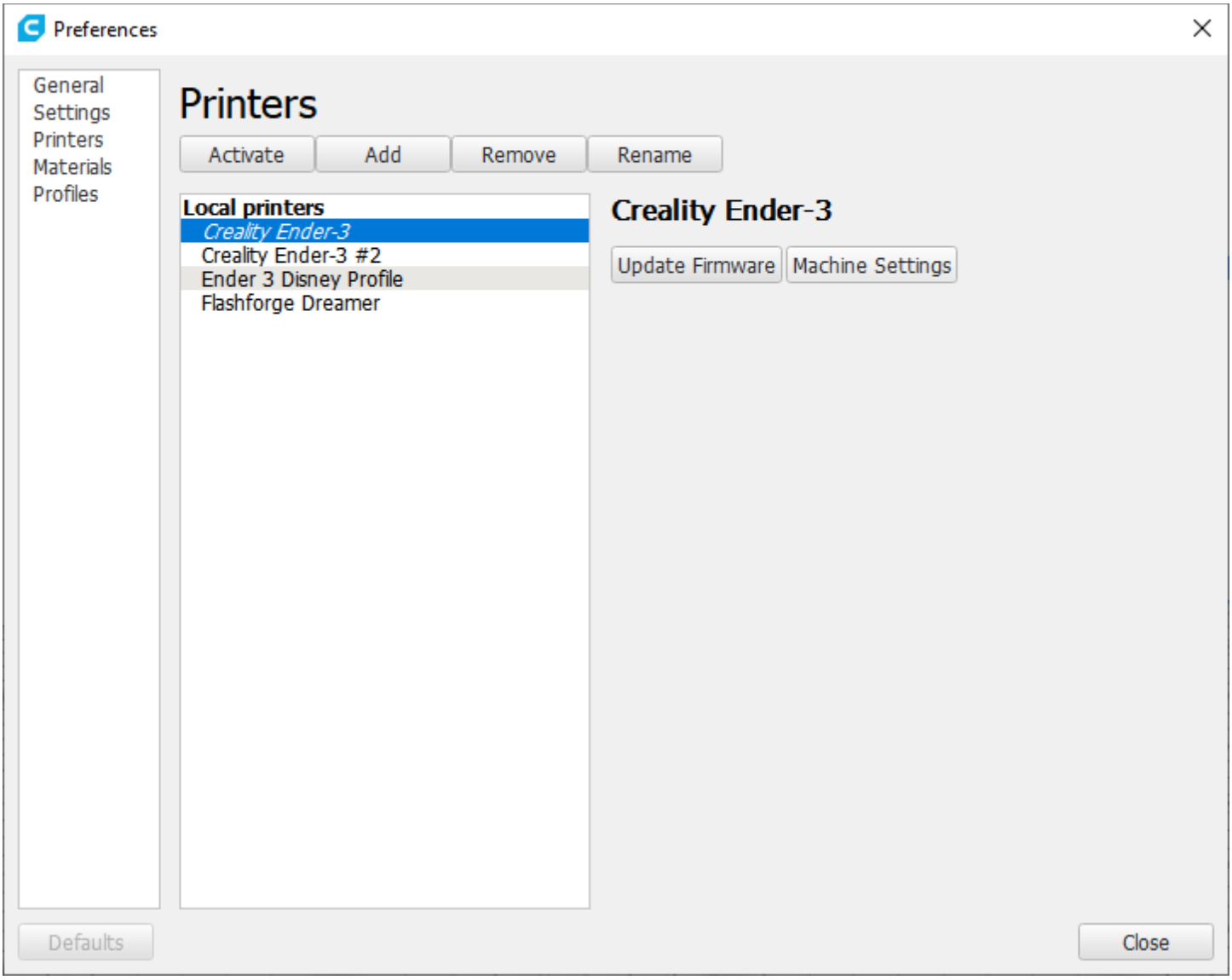
Most versions of Marlin firmware (the firmware installed on all Creality printers) support a special Gcode command called M211, which controls the firmware's internal "software endstops" which prevent the machine from exceeding the physical internal limits set by Creality. These limits are 235 (X), 235 (Y), and 250 (Z). This command accepts a parameter (S1 or S0, which means turn the feature on or off). By turning the feature off, we can print beyond the pre-set limits.

This feature is not available in all brands of Marlin, specifically TH3D firmware, and some older versions of marlin from the original Ender 3. However, it is available on all modern versions of Marlin found on Ender 3 Pro, and V2 boards.

Assuming you have already created a profile for your Ender 3 (Ender Extender) in Cura, you will access the profile/machine settings from the menu in the upper left corner under the printer's name:



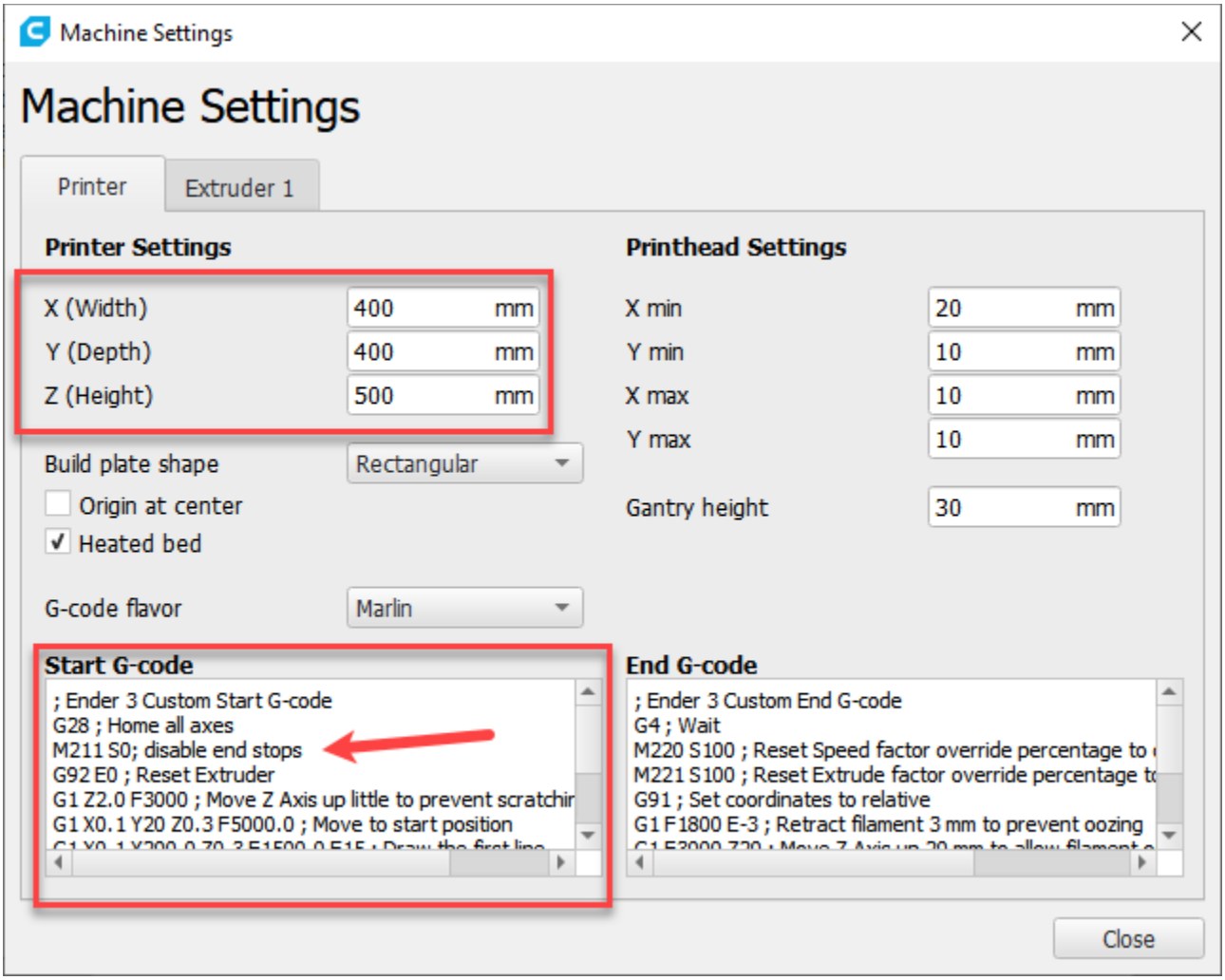
Click the button labelled Manage Printers.



Highlight the printer profile that you will use with your Ender Extender, and click the button labelled Machine Settings.

Note the G28 line in your Start G-Code. If you are using some form of BLTouch or other auto levelling system, we are going to assume you've already learned how to update the firmware, so you would be best suited by updating your machine's X, Y and Z size in the configuration.h file and reflashing. However, we will continue here with the custom g-code. First, we want to set our printer dimensions for X, Y, Z. Depending on the kit you purchased, fill in the values accordingly.

In most situations you do not need to update your firmware to print large items on your Ender Extender 400V2.



Note the line M211 S0; disable end stops

We need to ensure this line exists after G28 line.

These settings will allow the printer to print full size on the larger bed. However, depending on the Cura version, you may have another issue where Cura is forcing you to a small printable area defined by the Ender 3. This “feature” was introduced recently in 2020, and it is rather annoying. This is called the Keep Out area. See video below.

https://www.youtube.com/watch?v=Il1sierB4Yk

Where to go for more information/help

Congratulations! At this point, the Ender Extender specific portions of your kit have been assembled. The remainder of the assembly is the same as the original Ender 3, and I encourage you to refer to the following materials to complete your build:

Edge of Tech Help Guides for Ender 3

https://www.youtube.com/playlist?list=PLVctiritf4zQhJeXFqaimrCKjhH9DPza1

Edge of Tech Ender 3 Performance Assembly Build Section 1.1

https://www.youtube.com/watch?v=GLvpfpK5mo8

Edge of Tech X Gantry Rework

https://www.youtube.com/watch?v=4bFYH0X3qjk

Luke Hatfields 3D Printer Help Guide.pdf

Ender XL Builders Club Facebook Group