Ender Xtender XL Installation Guide
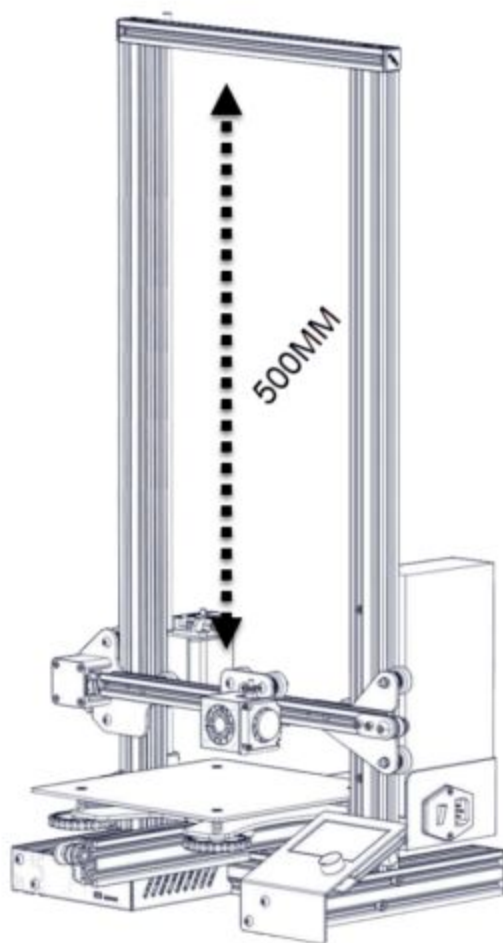

Facebook group: Ender XL Builders Club

https://www.facebook.com/groups/Ender3XLBuildersClub

Welcome 3D Printer Enthusiast and Hacker! This project is all about getting our Creality 3D Ender 3 or Ender 3 Pro 3D Printer to "reach" new heights! From the first unboxing and setup, to the first print, and through the end of our first spool of filament I wondered to myself, could I make the Ender 3 taller? What could I print with twice the vertical build volume? Here are some examples.

[Thingiverse Vase at 19" (480mm)](#)
(Original Ender 3 height on the left, Ender 3 XL on the right)
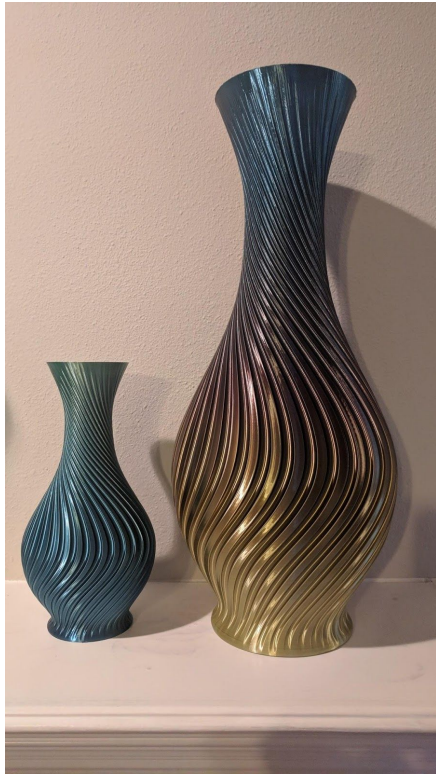
Others? What would you print?

Now that we're done dreaming, let's get to the nuts and bolts. First some disclaimers and caveats.

Printing tall things takes an enormous amount of time. Yes, even a single walled vase in spiral mode (basically one continuous print) takes an all nighter. The vase shown above took about 9 hours overnight. If you're used to lengthy prints then this shouldn't scare you. However if you have only printed small test cubes and widgets, keep these facts in mind.

SCUFF HAPPENS

The metal upright bars tend to take a bit of a beating during shipping. The company that manufactures them does not wrap them individually, so they tend to rub on each other during shipping and this causes light suffing or some scratches. Additionally, although I try to be as careful as possible, scuff happens in the workshop. After cutting, drilling, and threading, I give them a bath and then a clean rub down with degreaser. Even with all this care, there may be some residue from machine oil, or dust, scuffs, scratches; none of which will interfere with the installation and use of them rails. Scuff marks can usually be removed with a green scratch pad and some soapy water or window cleaner. I've attempted to clean them as much as possible.

CAVEATS

Increasing the height of a typical V-Slot structured 3D Printer is really not difficult, it just involves a few tools and some steady hands. It does however require some restraint. One might be tempted to over stretch things and end up with a mess. No, we have to pay attention to how the machine reacts to its new dimensions, and carefully work within its limits. Therefore, I've pointed out a couple of variations with this extension project that keep us within these limits but still meet our goals of a substantial gain in Z height.

PARTS LIST

Lead screw

That long shiny thing at the left side of your printer (back) that moves the horizontal bar up and down. Yeah, we're going to need a longer one. I elected to go with a 600MM Lead Screw for

this kit, which nets a build height of 500mm.

Aluminum Extrusions aka Vertical Rails

Two pieces of 2040 V-Slot extrusions, left side with threaded holes for motor mount; right side with M4 holes for mounting the power supply

Extruder/X Axis/Endstop wiring harness - 1 meter in length


Installation Instructions

I recommend that you follow the assembly instructions provided with your printer to get an idea of the proper steps to disassemble and then re-assemble the printer.

There are also numerous videos on YouTube which provide great instructions on the disassembly and re-assembly of the Ender 3 printer. This guide is an abbreviation of the standard build instructions.
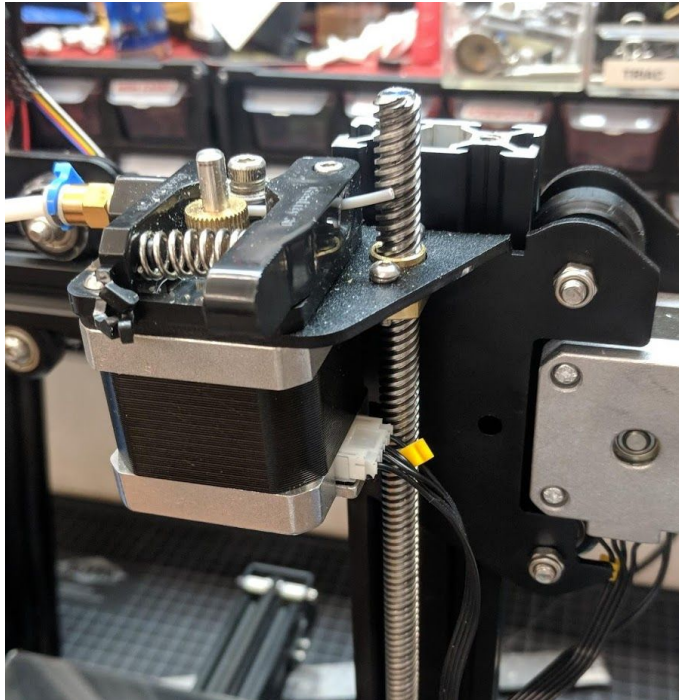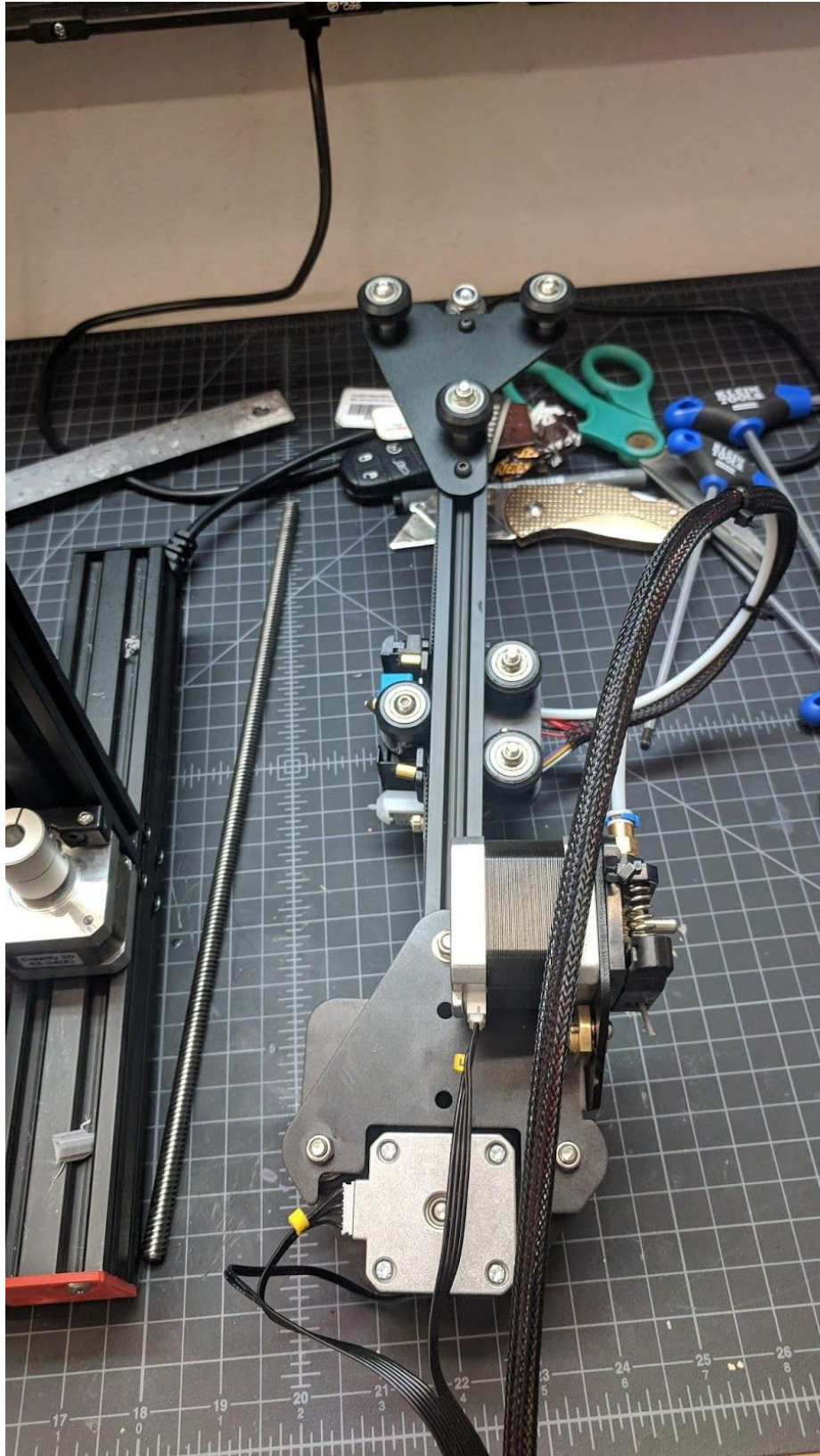
Disassembly Steps

Remove the filament spool from the top cross brace of your printer.
Remove the top cross brace.

Unplug the Extruder Motor, X Motor and X End Stop switch
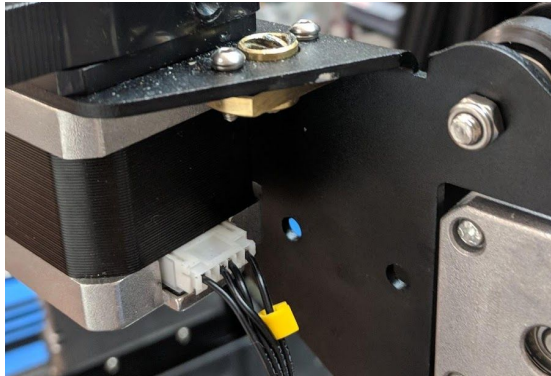
Twist the lead screw to move the X carriage rail up, all the way to the top, and detach it from the lead screw. Carefully remove the X carriage from the vertical rails. Set it aside.

Loosen the top grub screw securing the lead screw to the motor coupler.

Turn your printer onto its side so that you can access the two screws on each side beneath the vertical rails. Remove these screws and set the rails aside.

Attaching the wiring harness

Remove the bottom cover of the printer control box.

Locate the black ribbon cable for the X/E motor and end stop. You may have to cut some wire ties to free the cable. Carefully remove the black tape holding the wire bundle together, and extract the flat black cable which goes to the X/E motors and X Endstop.
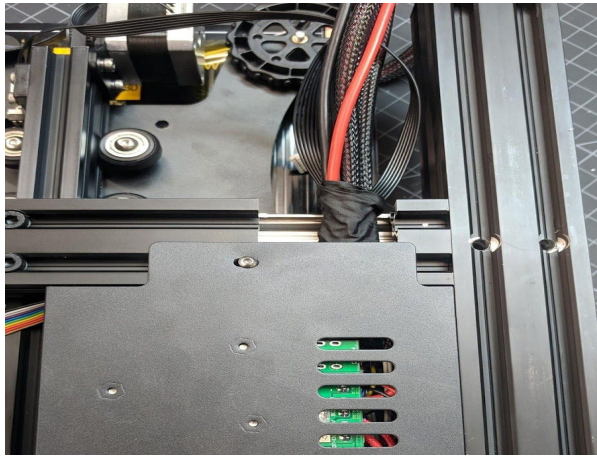
Remove the existing X/E motor wiring harness and connect the new one in its place. Route the wiring harness out the back with the rest of the cables.
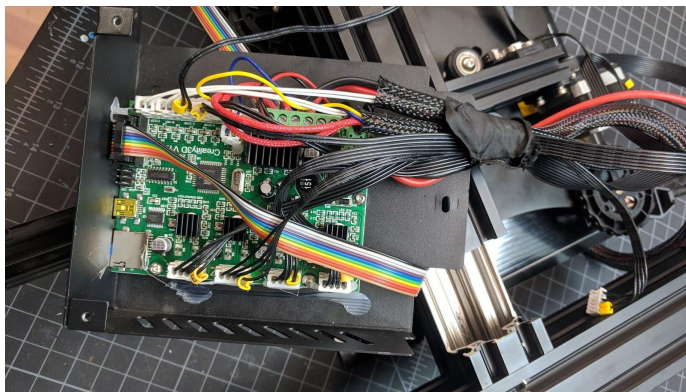
Re-wrap the wire bundle with the safety tape.

Re-install the control box and/or cover to the control box.

Assembly Steps

Generally, follow the dis-assembly steps in reverse.

Re-install the bottom printer control box cover.

Install the vertical rails, attach them to the bottom frame using the screws you removed in the previous step. Suggested to start with the rail closest to your work table. Do not tighten the screws completely yet.

Place one rail up to the bottom frame rail, align the holes in the bottom frame to the holes in the end of the rail. With an allen wrench, screw in one of the long screws you removed earlier. Tighten the screws until they are snug but not over-tight. Now repeat with the other screw. Don't tighten them all the way yet, just a little bit snug. This will help with an alignment step later. Repeat this step for the other side.

We are going to use one of our short linear rails that we removed to do some alignment of the two new rails. It's difficult to describe this in words so I will try a picture. In the drawing below,

imagine the two vertical rails were the black rectangles, and the green line is our spare rail, acting as an alignment tool. We want to twist the rails so that they are even with each other and no visible cap between the new rails and our alignment tool is showing. Hold it across the two verticals and look down from above, or from each side, eyeballing along the horizontal.

Once they are aligned, turn the machine on its side gently and tighten the screws for the vertical rails until they are snug but don't over tighten.

Bad
Alignment

Good
Alignment

Example alignment process:

Install the new lead screw into the motor coupling. Tighten the grub screw to secure the lead screw in the motor coupling.

Re-install the X rail assembly, taking care with the wires. You may need to cut some more wire ties that secure the harness to the bowden tube. Ensure the wires are all arranged on the back side of the vertical rails.

Twist the lead screw to lower the x carriage about mid-way down the vertical rails.

Re-install the top rail cross bar. Re-install the filament spool if you desire.

I'm not going to repeat all the details of properly assembling an Ender 3, for those, please consult the excellent guide written by Luke Hatfield, and the many youtube videos on the subject.

https://c3d.media/wp-content/uploads/2018/12/Help-guide-Creality-and-others-12-2018.pdf
https://www.youtube.com/playlist?list=PLVctiritf4zQhJeXFqaimrCKjhH9DPza1

https://s3-us-west-2.amazonaws.com/3dprintersbay/ender-3-deliverables/Ender+3+instructions+(1).pdf

You will now need to re-run the bed levelling process if you are not using an auto bed levelling system.

Software setup

This is where things get interesting. The Ender's firmware (the code that runs inside the machine) has hard limits set for the X, Y and Z axis. This guide assumes you are using stock Marlin that came with your Ender.

I am also going to choose the path that does not require uploading new code to the Ender. The upload process requires specialized tools and software to compile the firmware, so I am not going to cover that here. If you have the tools, you just need to find the line that sets the max Z height (usually 250) and set it to 500, then upload the firmware to the printer.

Not all versions of the Ender firmware allow this "hack"; if you set the custom g-code in your slicer, and during testing you discover you cannot move beyond 250mm high, then you will require a firmware update.

For users of TH3D you will have to compile and upload since it has been discovered that TH3D does not appear to recover the required command explained later.

We can temporarily disable min/max limits during a print. This has no effect on normal operation, but please be careful when moving the Z axis down when you are close to zero, as it may not stop at zero and plunge into the bed surface.

There are two things we need to set up in the slicer software.

First, you will need to adjust your printer's dimensions to reflect the new height. In Cura this is in the machine settings window, the field is usually labelled Z (Height).

Secondly, you will have to edit the custom start gcode to add a command after the G28 (and G29 if you use auto bed level).

Test Gcode file:

Copy and paste the following into a file named disableendstops.gcode and "print" the file. It will home the printer, disable end stops and move the X axis bar upwards to a height of 350mm. If it stops at 250mm, then you have an old or unsupported firmware and will need to update it.

```
; 500MM Extension Manual Test GCode
; This file simply homes the printer then disables the software (Marlin)
; endstops which will normally prevent the printer from exceeding the
; firmware's built in X/Y/Z limits.  For the 500mm vertical extension
; we need to override these settings, and there is only one way to do that
; from gcode, and that is with the M211 S0 (disable endstops) command
;
; This does not disable the physical end stops, only the "virtual" or software
; endstops for min/max
;
; It also means it is possible, during this configuration, to move the Z
; below 0, which could be a catastrophe, so we'll just have to not do that ok?
G28 ; home all axis
M211 S0 ; disable Marlin's software endstops
M117 Software Endstops Off..
G1 Z350; go to a height of 350
```

Cura

Click on the printer name at the upper left corner, then click Manage Printers, then Machine Settings.

In the Start G-Code box, you must add this G-Code AFTER the G28 or G29 (Auto Bed Levelling) commands:

M211 S0; Disable software endstops

I would suggest creating a special Cura slicing profile for Ender3XL Mode, so that software endstops are disabled only when you desire to print something very tall.
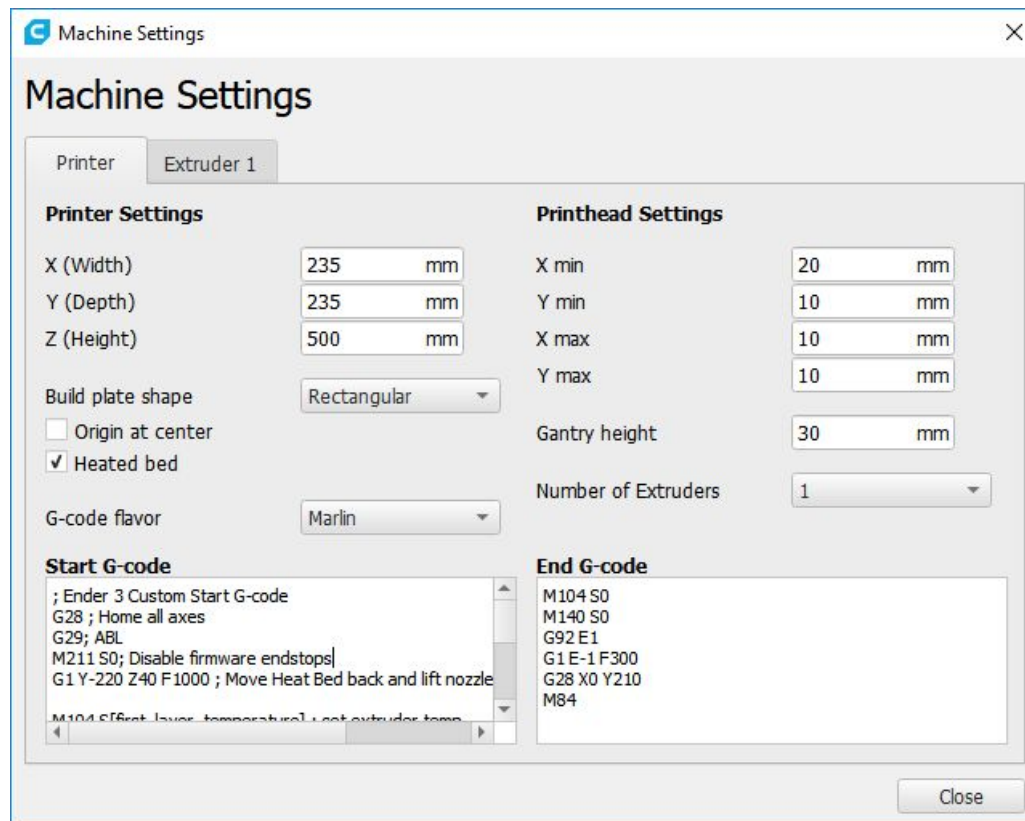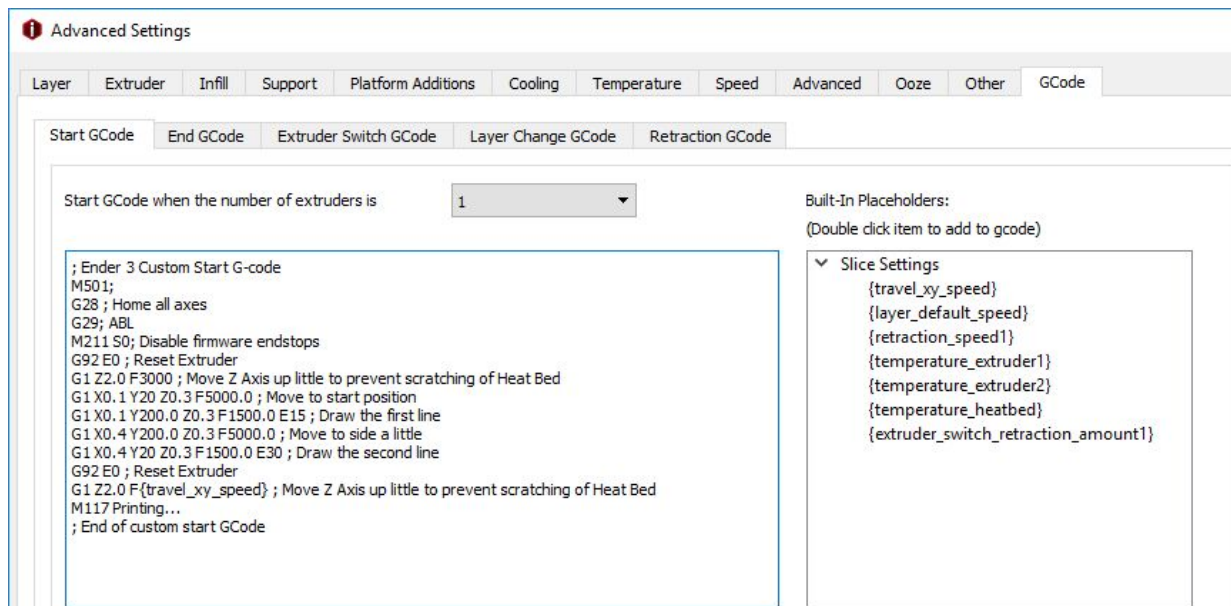
IdeaMaker

First, let's set our max build height under the Printer Type dialog box, General tab:
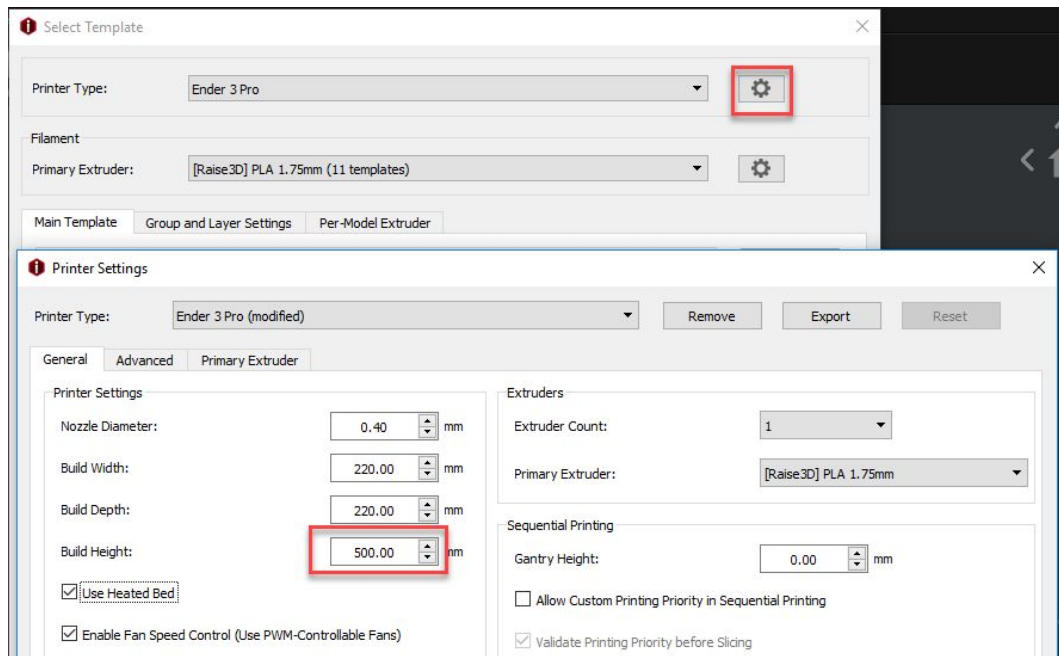
Next the custom Gcode setting is in the Slicer Template, under Advanced , GCode tab:

PrusaSlicer

First thing we need to change is the Max Build Height, under Printer Settings.
Next we need to add our custom G-Code