LibrePrint XL

User Guide and Manual
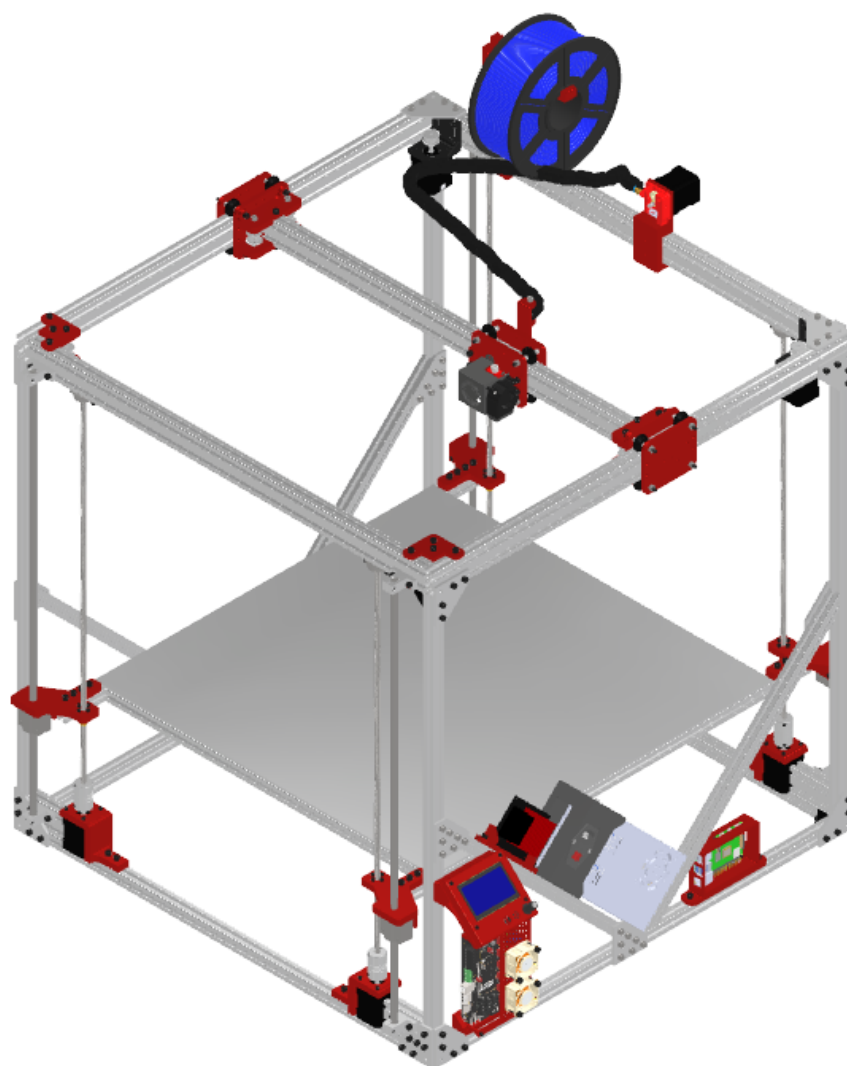
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Printing a Part

Setting up PrusaSlicer

- Download and install the [latest version of PrusaSlicer](). At the time of writing, this is 2.9.2. Any 2.X.X version of PrusaSlicer will be compatible with LibrePrint XL.
- Download "PrusaSlicer_LibrePrintXL.ini" from the Github (https://github.com/andrewschalk/LibrePrintXL). Be warned that using other profiles can lead to failed prints and even printer damage.
- Navigate to *File -> Import -> Import Config Bundle.* In the file browser that opens, select the profile you downloaded from Github.
- LibrePrint XL's profiles are now loaded and you are ready to slice a model!
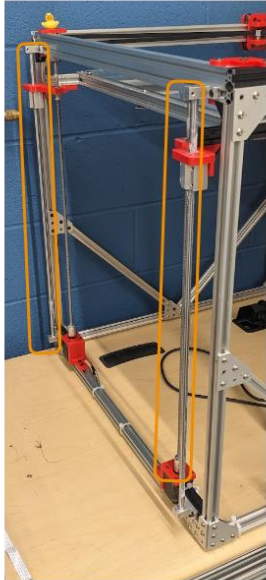
Slicing a Model

- The usage of PrusaSlicer is [documented extensively on their website]().
- Ensure that the proper profiles are selected
    - Under "Print Settings" select "LibrePrintXL"
    - Under "Filaments" select "LibrePrintXL_PLA"
    - Under "Printers" select "LibrePrintXL"
- No modifications to these profiles are needed
- Add a model to the print space, slice the model, and export the Gcode to an SD card.

Mechanical Calibration

- Visually inspect the bed, if it looks to be out of level by greater than 2° in any direction, manual leveling must be performed (see "manual bed leveling). Software bed leveling will account for small errors in bed levelness, but large errors can cause mechanical failure.
- Make sure that the printer has enough room for moving parts to not contact surrounding objects. Ensure that:
    - All four corners of the bed can move up and down
    - The wire carrier which holds the wires for the print head can protrude horizontally above the user interface
    - The y-gantry on both sides can move forwards and backwards.

o   The space beneath the printer is clear
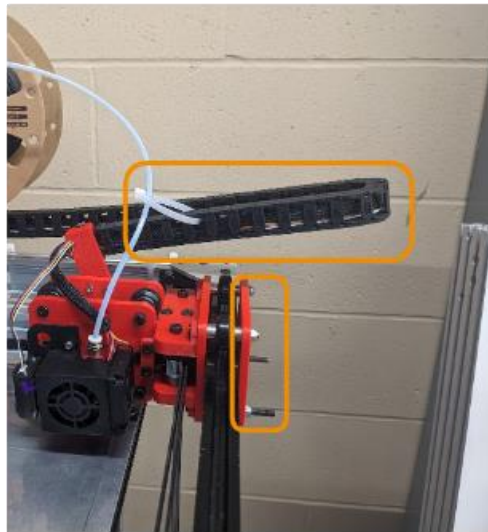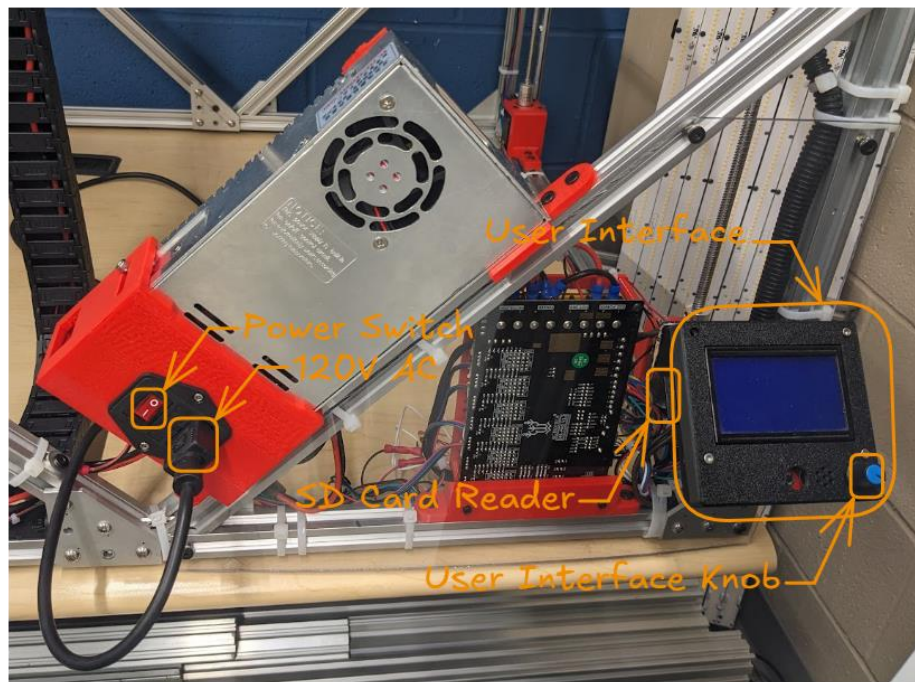

Beneath bed clearance

Bed corner clearance

Y gantry and print head wire carrier clearance

Printing a File

- See "Unloading Filament" and "Loading Filament" if filament needs to be replaced
- Put the SD card in the slot on the left side of the user interface.
- Turn on the printer with the power switch
- Wait for the info screen to appear
- Press the knob on the user interface to enter the menu. Turning the knob will navigate through the menu
- Select *Print from Media -> YourFileName.gcode -> Print*
- The info screen will appear saying "Bed Heating…" at the bottom, indicating that the print is starting.
- The bed and hot end will heat up, all three axes will move to home, and the print head will probe the bed. Once this is complete, the printing will begin.
- Verify that the first layer is printed properly and allow the print to complete
- The screen will indicate the percentage completed and how long the print has been running.

Unloading Filament (For PLA)

Extruder Motor Assembly

- Heat up the extruder nozzle to 260°C using the user interface.
  - Press the user knob to navigate to the main menu.
  - Select *Temperature -> Nozzle*
  - Turn the knob until the number reads 260°C
  - Press the knob. The nozzle will begin to heat up and you will be taken back to the temperature page.
  - Select *Main -> Info Screen* to monitor the temperature
- Once the nozzle has reached 260°C, you may begin unloading filament
- Press and hold the filament tension lever to free the filament
- Pull the filament gently until it comes completely out of the printer
  - If the filament is hard to pull, first push the filament farther into the extruder to melt built up plastic off of the end and then pull

Loading Filament (For PLA)

- From the "Unloading Filament" section, the nozzle should already be heated to 260°C. If not, the following steps describe the heating process
  - Press the user knob to navigate to the main menu.
  - Select *Temperature -> Nozzle*
  - Turn the knob until the number reads 260°C
  - Press the knob. The nozzle will begin to heat up and you will be taken back to the temperature page.
  - Select *Main -> Info Screen* to monitor the temperature
- Once the nozzle has reached 260°C, you may begin loading filament.

- Cut off any ragged bits at the end of the filament and straighten out the last 2 inches by hand
- Press and hold the filament tension lever
- Insert the filament into the filament insertion point and push the filament until it begins to extrude out of the nozzle
- Wait until the old color has been purged, the filament has been successfully loaded and you are ready to print
- Remove any stray plastic that may have been extruded during filament loading

Troubleshooting

LibrePrint XL is based on standard 3D printer design methods so the solutions to any issues not listed here can usually be found online.

First layer issues

- The nozzle is too close or too far from the bed
  - During a print, the z-offset may be set by *menu -> tune -> Z babystepping*
  - While the first layer is being laid by the printer, turn the knob to slowly move the nozzle away or towards the bed

CoreXY belt loose

- If the belt comes loose, pull belt taught and tighten screws on the extruder mount holding belt in place. The belt should be tight enough to be easy to move and vibrate like a guitar string when plucked but not loose enough to sag.
- Command the X axis and Y axis to move using the touch screen, observe their movements to ensure they move properly. *Info Screen -> Main Screen -> Move Axis -> Move X -> 1mm.*
- Move in the X-axis several times to ensure it moves correctly
- Repeat the process for the Y-Axis
- *Info Screen -> Main Screen -> Move Axis -> Move Y -> 1mm.*

Thermal Runaway

- The screen displays "THERMAL RUNAWAY PRINTER HALTED Please reset"
- This is the printer recognizing an issue with the commanded heating and the sensed temperature.
- Test the operation of the heating functions !!While it is not likely, it is possible that these systems could heat to a dangerous level if broken, keep an eye on the heat while troubleshooting
  - Heat the nozzle to 260°C

o Heat the bed to 60°C
- If both systems work well, the system is likely fine, this error may have been a false positive. If the error occurs again, check the thermal sensor and heating element for loose wiring.
- If one system fails, note the actual temperature and displayed temperature
  o If the system begins to heat but the temperature doesn't change, consider rewiring or replacing the temperature sensor
  o If the system does not heat, consider rewiring or replacing the heating element

Filament Slipping

- If there is an issue with any part of the extruder assembly, it may cause the filament to slip preventing it from printing properly
- Brass pinion gear on extruder motor shaft may not be contacting filament
  o If the brass pinion gear is not contacting the filament unscrew the set screw in the pinion, move the pinionup towards the filament and then tighten it back on
  o To test extrusion, begin by heating the extruder to 260°C this can be done by *menu ->temperature -> nozzle*
  o Once the nozzle is heated up, feed the filament into the extruder.
  o *Menu -> Motion -> Move Axis -> Move Extruder -> Move 1mm.*
  o Rotate the user knob until the filament extrudes from the nozzle.
  o Observe extruder motor and ensure gear is moving filament.

Under Extrusion

- Ensure that the filament roll is oriented on the stand such that the plastic is being fed into the extruder at the same height.
- Measure on the filament role from the entrance of the extruder motor to a pre-determined distance. 10-20mm should be sufficient. Mark the filament that distance
- Rotate the user knob that distance. The mark should reach the entrance of the extruder motor and stop.

Hot-End Loose

- !! This may be a symptom of other issues. If the hot end fan is not working, the hot end fasteners may get too hot causing the hot end to sag in the plastic.
  o The hot end fan will turn on if the hot end is above 60°C.
  o Verify that the fan turns on by setting the hot end temperature to 260°C and waiting for the fan to turn on. *menu -> temperature -> nozzle*
- This may be fixed by retightening the two bolts that hold the hot end to its mount. These are held tight with lock washers so there should be no need for thread locker. If they keep coming loose, add thread locker.
- The two screws may be reached by putting through

Z-axis Squeaking or Binding

- Review procedure for manual bed leveling
- Review procedure for lubricating z-axis
- Verify all z-axis fasteners are tight by attempting to wiggle the parts they fasten

Loose Parts/Fasteners

The fasteners are all held in place by either thread locker or nylon lock nuts. When tightening fasteners, be considerate of the materials being held together and the force used. Plastic and even aluminum can deform from tightening too much.

- If a nylon lock nut becomes loose, it may be sufficient to tighten it back into place. If it does not stay in place, replace the lock nut with a new one.
- If there is not a nylon lock nut, the fastener is held in place with thread locker. The fastener must be removed and thread locker(locktite blue is good, do not use red) applied before retightening.

Broken Part

- Any part may be found in the bill of materials for replacement
- 3D printed part files are in the LibrePrint XL GitHub
- When replacing fasteners, they need to be properly secured again. If this is not done, the part may become loose, causing print failures or printer damage.
    - Fasteners with nylon lock nuts should have the lock nut replaced, lock nuts lose some of their locking force after being used once.
    - Fasteners without nylon lock nuts should have thread locker (locktite blue is good, do not use red) applied before securing.

Stringy and Saggy print(or other print quality issues)

This can be caused by many issues so it may be best to search up the specific issue online. This kind of error can usually be fixed by tuning slicer settings.

- Different brands of filament may need different settings even if they're the same type of plastic.
- The temperature that we found worked best for the overture brand filament was 260°C. Another (no-name brand) was found to work best around 220°C and 260°C was far too hot. Research a "temperature tower" to tune the temperature for your filament.

Electrical Specifications

- The frame and bed are connected to earth through the power supply case.

Wiring Schematic

- Each wire is labeled with a white flag to identify what it is
  - Example: "XY1" means that this is the XY1 motor
  - Use the following schematic to find the ports that these devices plug into
- Wire pairs which consist of just a red and black wire will plug into the positive and negative pins respectively
- Most connectors can only be plugged in one way. The exception is the CR touch whose connection is described in the schematic
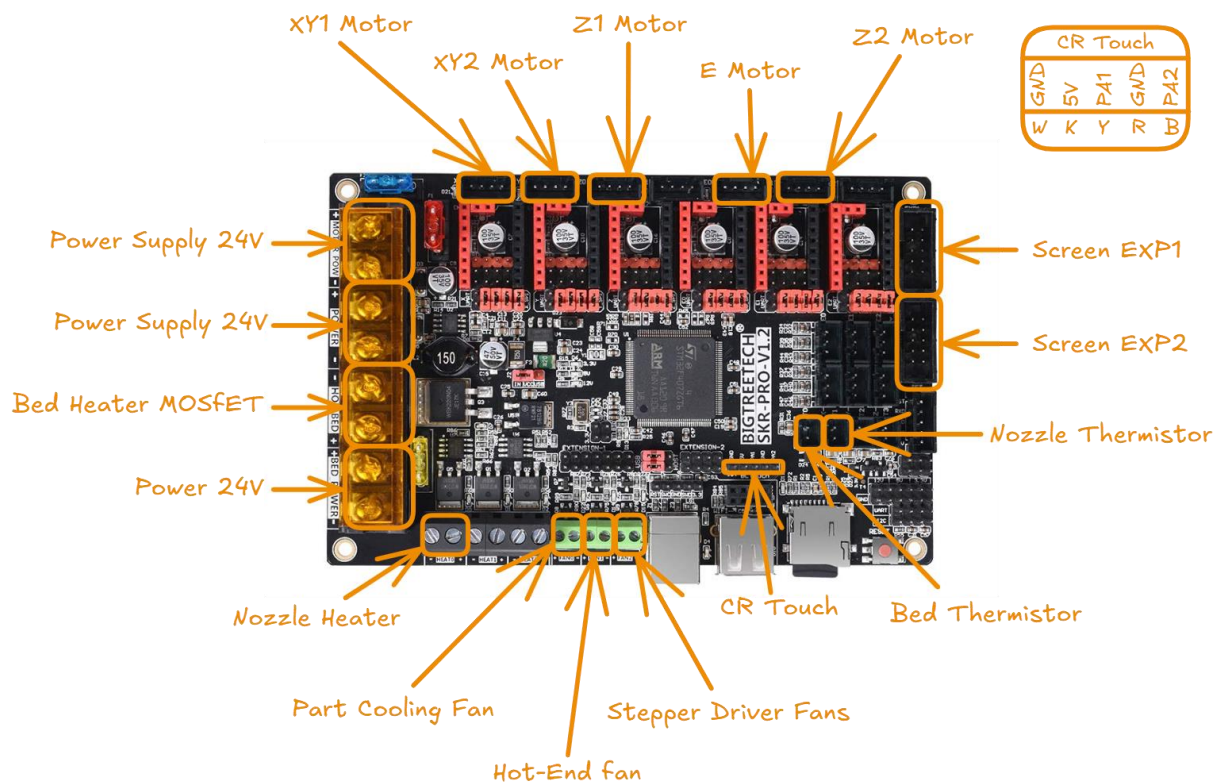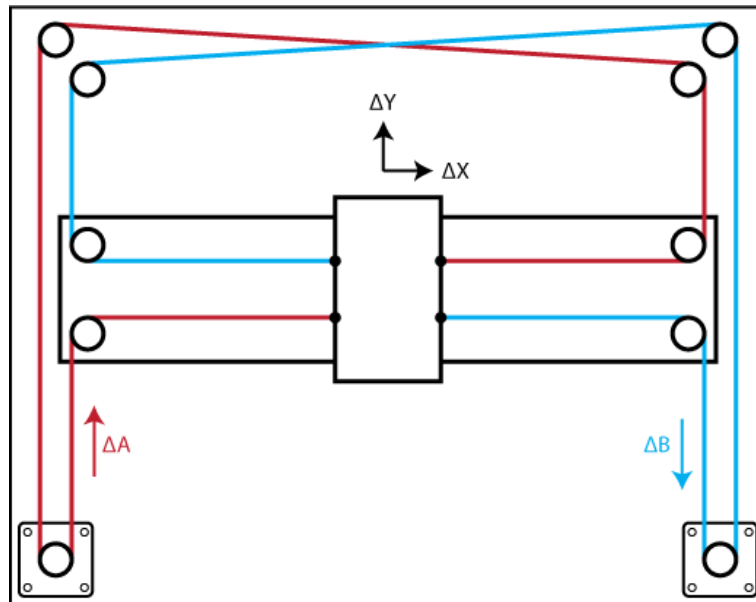
Bed Circuit Diagram

The 24V source is provided by the bed heater MOSFET
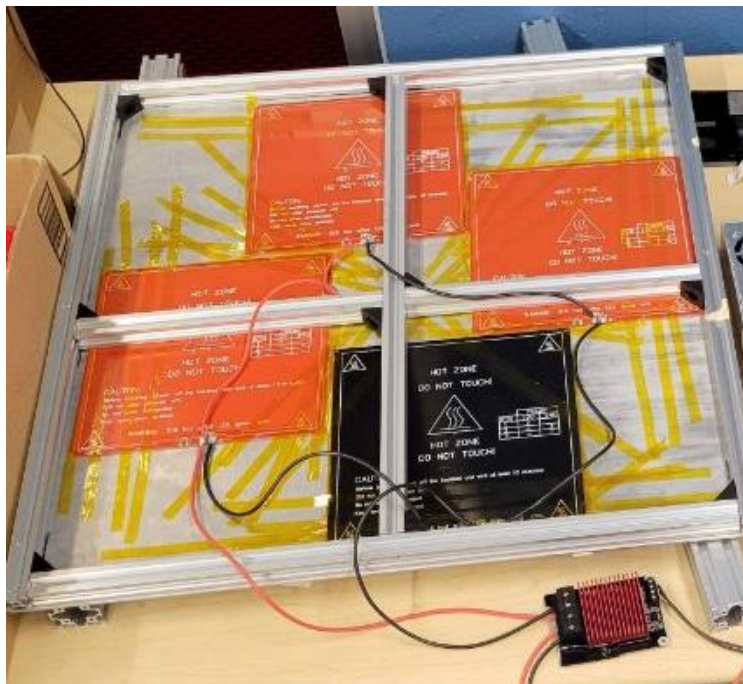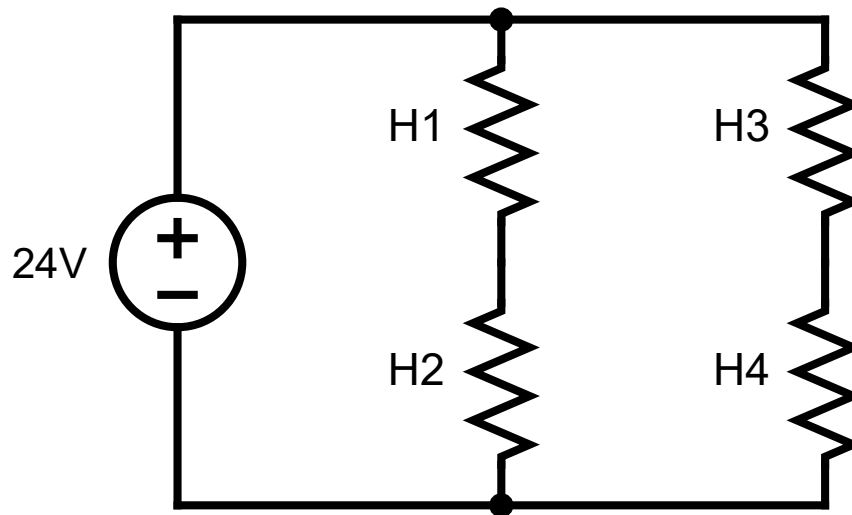
Mechanical Specifications

CoreXY

Belt routing

Firmware

- LibrePrint XL uses a custom version of Marlin 2.1.2.5. Anything not discussed here can be referenced in the Marlin documentation.
- The files needed to rebuild LibrePrint XL's firmware are on the GitHub. Marlin provides tutorials on how to develop and flash this firmware.

# Maintenance and Calibration

Manual Bed Leveling

This should be performed every 50 hours of printing or whenever the bed is out of level by greater than 2° in any direction. Software bed leveling will account for small errors in levelness, but large errors can cause mechanical failure.

- Needed
    - A small, flat, object about ½ inch in one dimension. This will be used as a ground truth for the distance between the nozzle and points on the bed.

- Turn on the printer, press the user button, and select *Motion -> Auto home*. This will cause the printer to move to the home position
- Once homing is complete, from the motion menu, select *Move Axis -> Move Z -> Move 1mm*.
- Turn the knob clockwise to move the z-axis by 1mm increments until your flat object fits between the bed and the nozzle. This does not need to be precise
- Turn off the printer. (This disables the motors for the next step)
- Each corner of the bed will be brought to the same height by moving the nozzle to each corner and adjusting the position of the motor at that corner
- With your flat object between the nozzle and bed, rotate the coupling at the base of the z-axis lead screw to move the bed up until the nozzle just barely contacts the top of your flat object. The best way to do this is to move your flat object back and forth slowly on the bed while moving the bed up. You'll know when the nozzle is touching when you feel a small amount of resistance to moving your flat object.
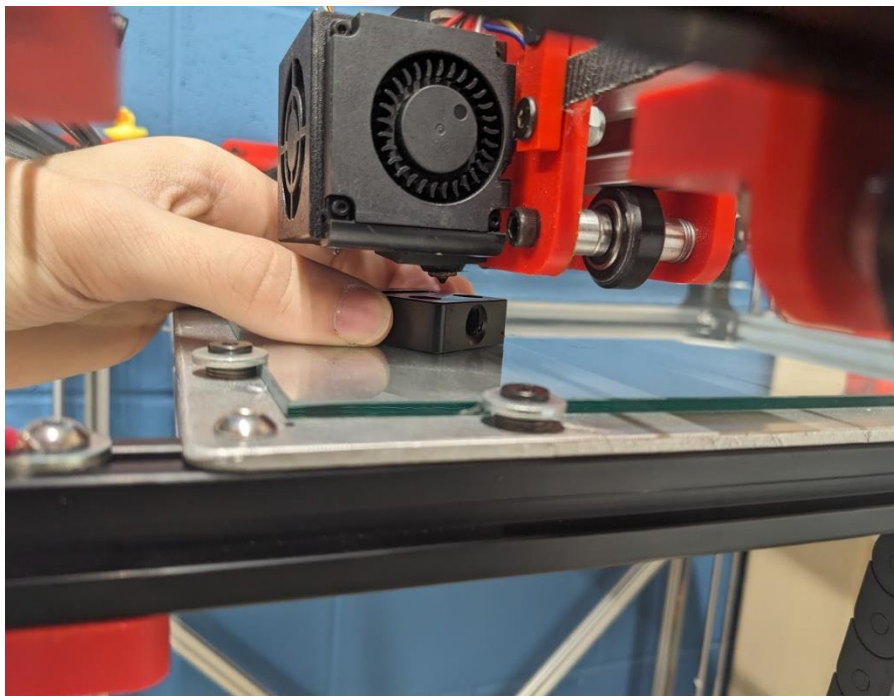
Leveling bed with flat object
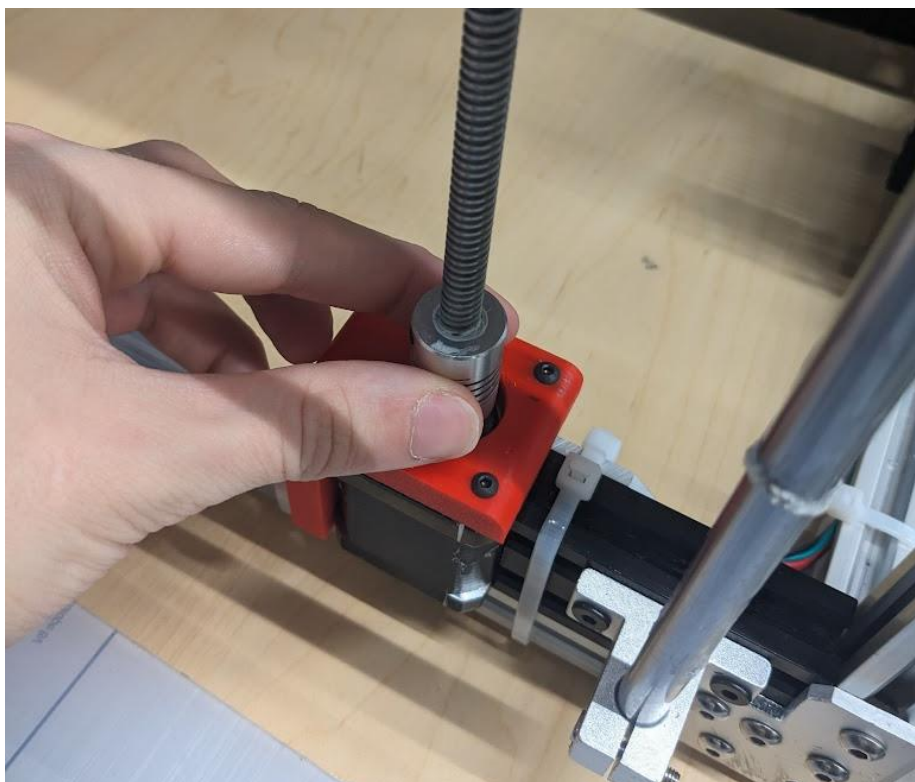
Manually moving z-axis

- By hand, slowly move the print head close to another corner on the bed and repeat the prior step for each corner. !! Moving too fast will generate a voltage which could damage the printer, if the screen lights up while the printer is off, you're moving too fast.
- After all corners have been set to the same height, bed leveling is complete.

Lubricating Z-axis

This should be performed every 100 hours of printing or whenever the z-axis starts to squeak.

- Needed
  - White lithium grease (Lucas Oil Products Inc. NLGI #2 is what we used)
- All four z-axis lead screws and all four z-axis linear rods should be greased
- Squeeze a thin layer of grease (about 1/16 of an inch thick) onto the lead screws and linear rods, all the way from the top to the bottom.
- Use nitrile gloves or a paper towel to spread the grease all around the linear rods. This does not need to be done on the lead screws, the lead screws will spread the grease when they rotate.
- Move the z-axis through its entire range of motion by pressing the knob and selecting *Motion -> Move Axis -> Move Z -> Move 10mm.* Turning the knob will move the bed in 10mm increments
- Wipe off any excess grease built up from movement