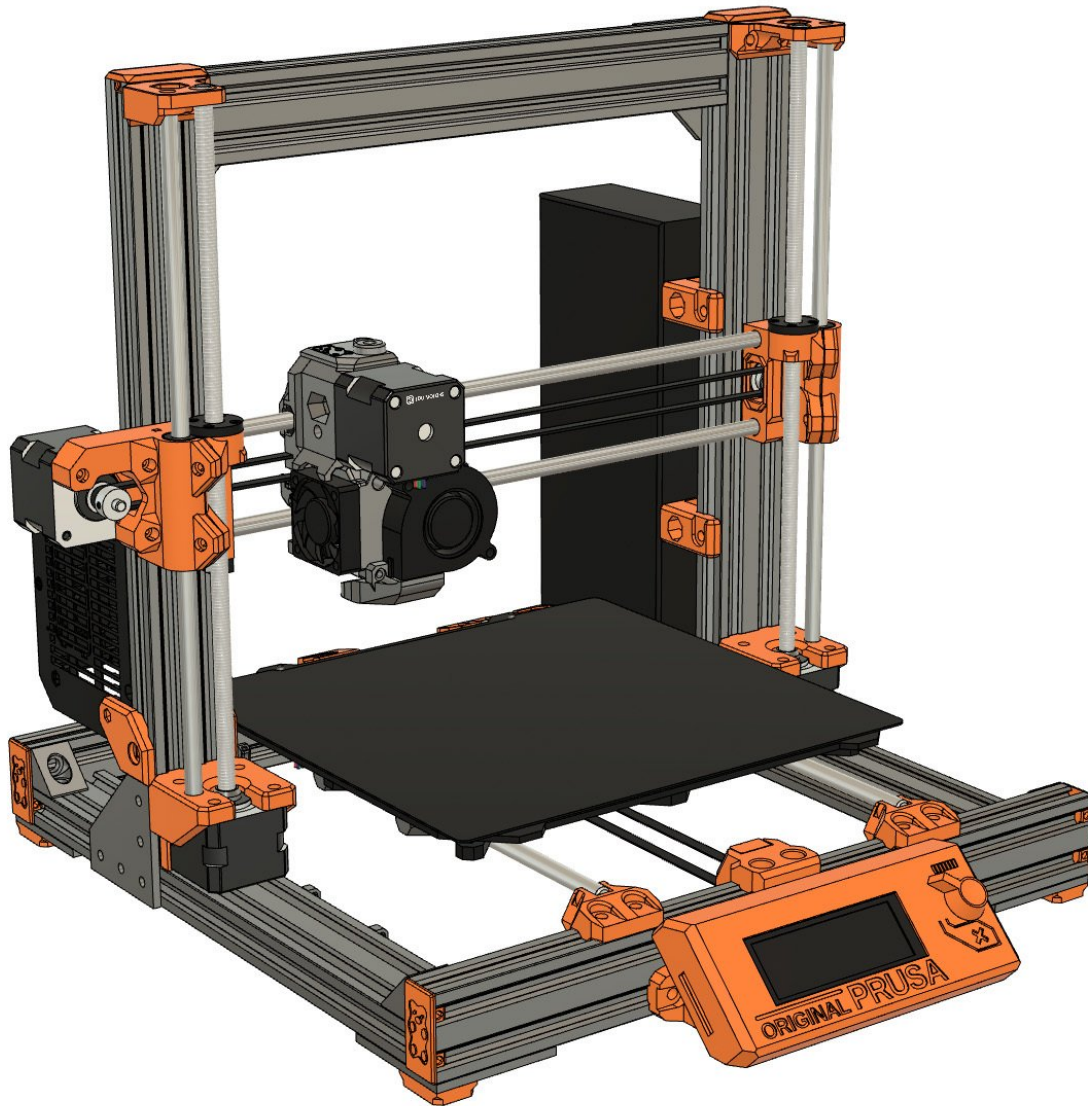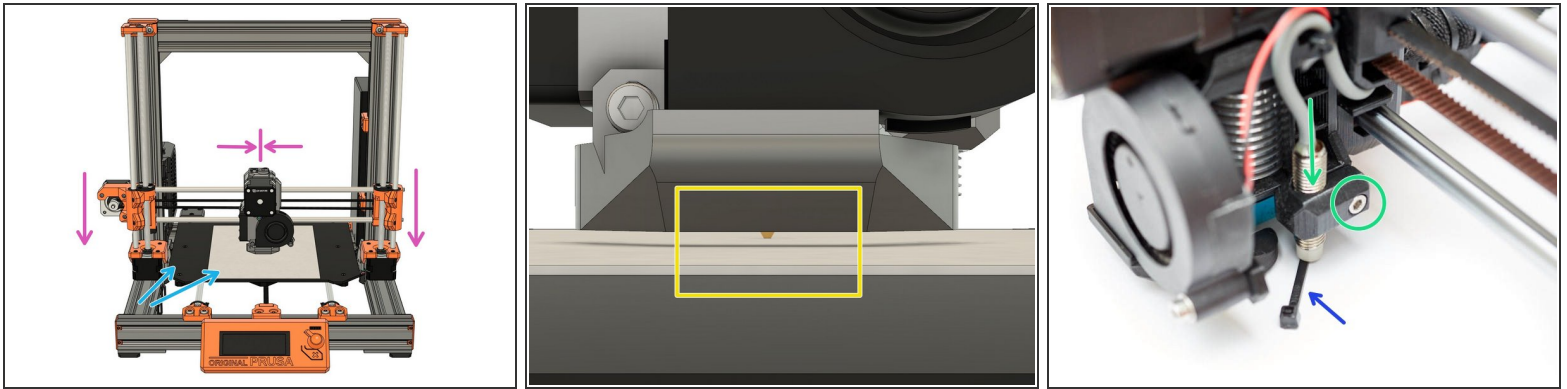# Bear Lab

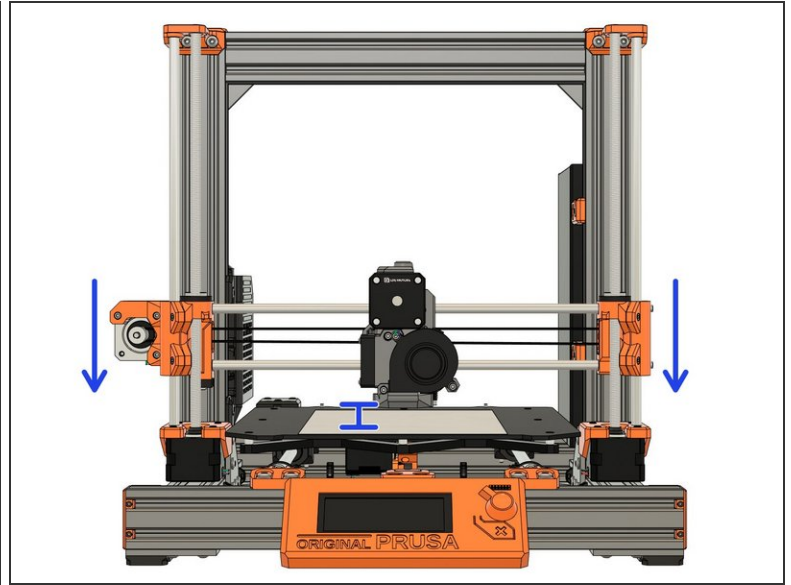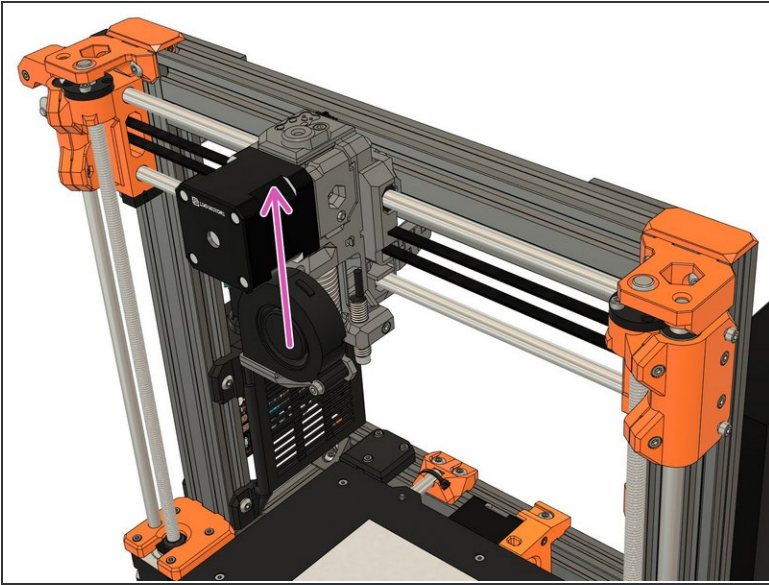# 5. Final adjustments and calibration

Written By: Grégoire Saunier

Step 1 — Pinda adjustment

⚠ Ensure the hotend has cooled down and turn off the printer.

- Remove the steel sheet and place a sheet of paper on your heated bed. Remove any residual filament from the nozzle.

- Center your extruder on the X axis. Move it down by rotating both the Z lead screws at the same time. Move the extruder down until the nozzle is just touching the paper.

  ⚠ Make sure the X axis is flat. You can move the extruder left and right and compare the distance with the heated bed.

- Stop when the nozzle is just touching the paper.

- Place the middle section of a zip tie under the Pinda.

- Loosen the M3x10 screw and gently move the PINDA down until it is touching the zip tie.

- Tighten the M3x10 screw to secure the PINDA in place.

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 2 of 16

Step 2 — Trapezoidal nuts adjustment

- Plugin and turn on the printer.

- Using the screen menu, move the X axis up until it crashes in to the Z tops. The stepper motors will skip, making a noise - this will not damage the motors.

  - ⓘ If your printer can't reach the Z tops, unplug the printer and plug it back. You can now reach Z tops.

- Using the screen menu, move the X axis down until the nozzle is approximately 10-15mm from the heated bed.

This document was generated on 2021-12-28 09:21:51 AM (MST).

Step 3 — Trapezoidal nuts adjustment
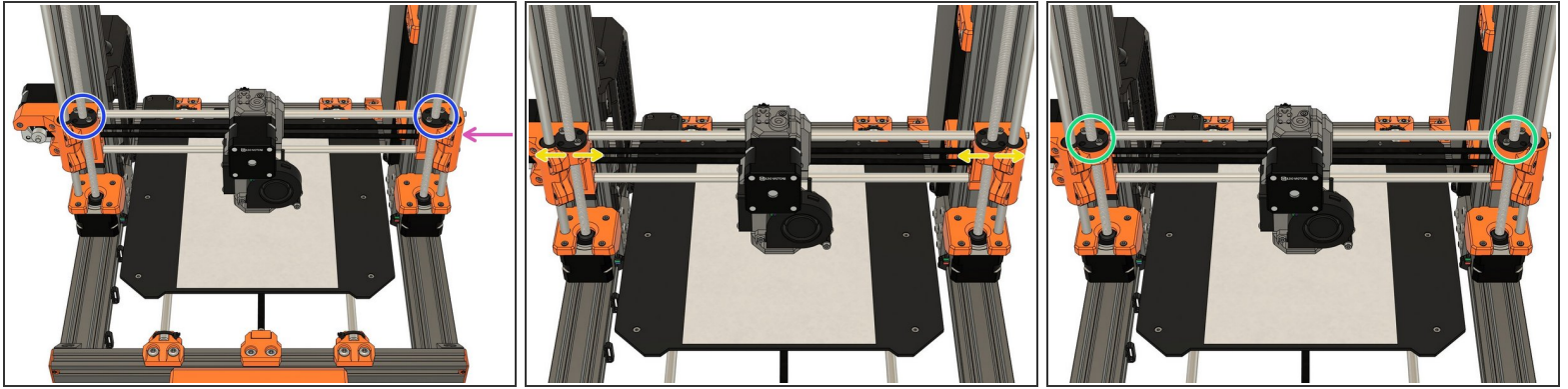

- Turn off the printer and center the extruder.

- If you have applied tension to the belt, unscrew the belt tensioner on *x_end_idler* until the belt is relaxed.

- Loosen the screws which secure the trapezoidal nuts. This is to ensure that the Trapezoidal nuts 'self-centre' on the lead screws.

- Make sure the trapezoidal nuts are moving freely.

- Alternate between all 4 screws evenly while tightening (alternate between both sides during the process). Don't apply any lateral force on the trapezoidal nuts.

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 4 of 16
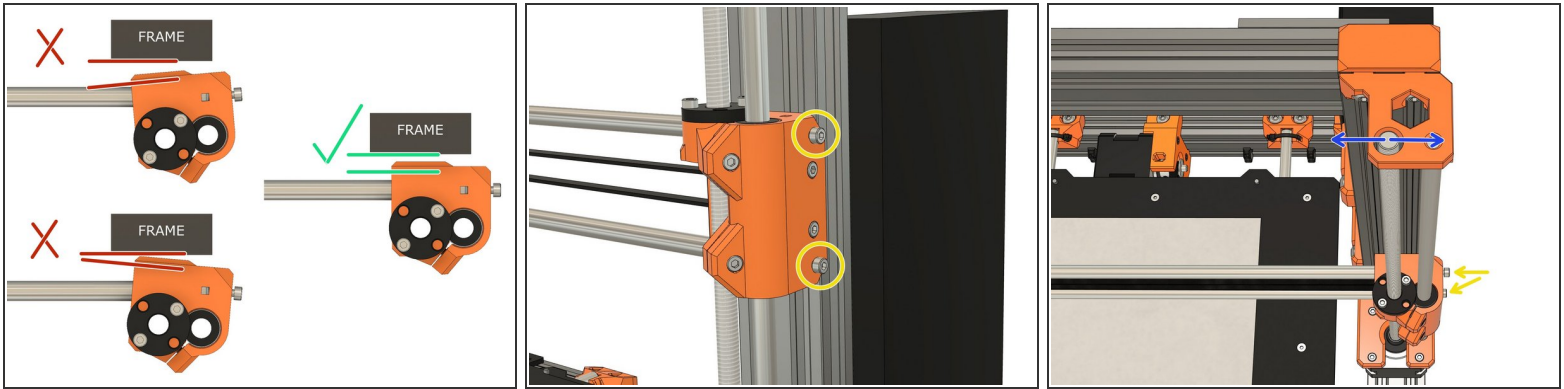
Step 4 — Pulley position
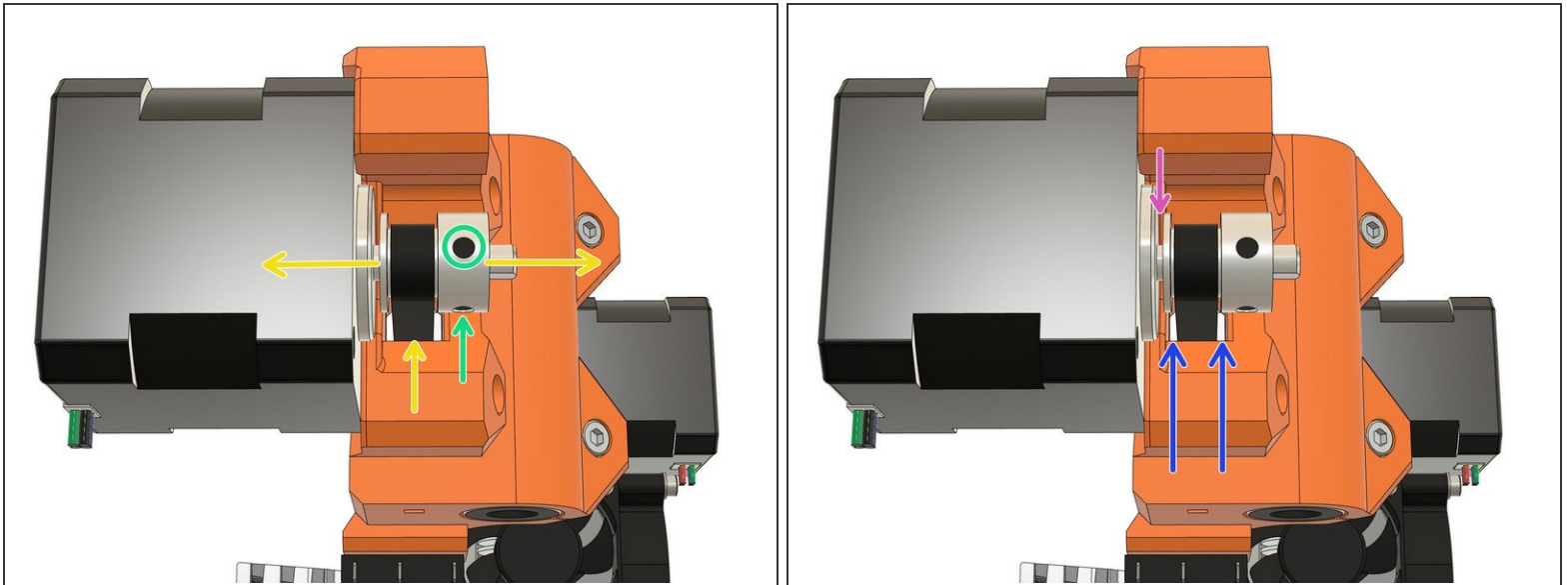
- Loosen both pulley set screws a little.

- Align the pulley with the belt hole of the *x_end_motor*.

- Tighten the set screws alternately.

- Verify that the belt is not touching the *x_end_motor*.

- Verify that the drive pulley is not touching the X motor.

This document was generated on 2021-12-28 09:21:51 AM (MST).

Step 5 — Belt pre-tension
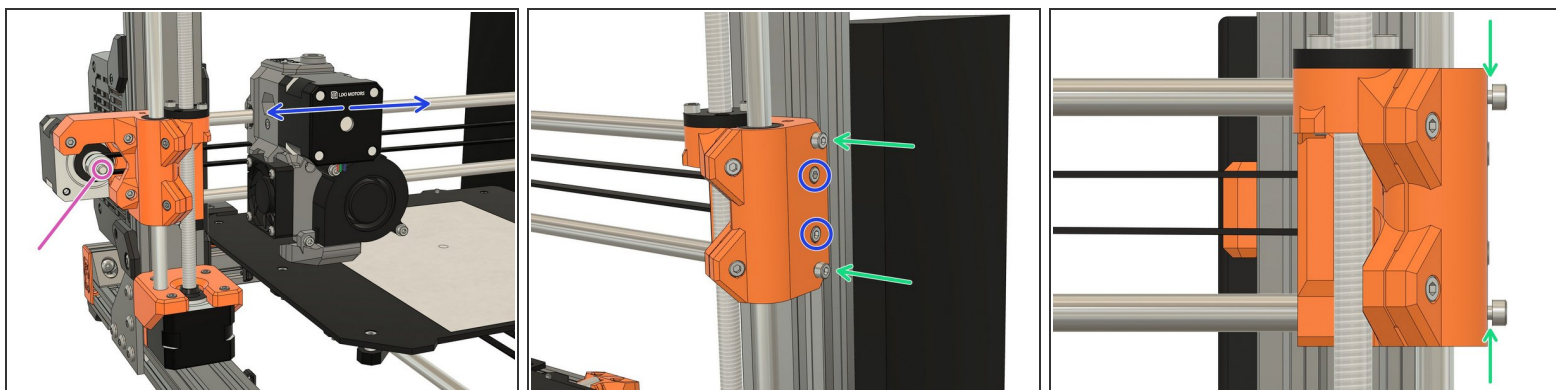
- Grip the X motor shaft with pliers to prevent it moving (grab the flat side of the shaft).

- Tension the belt, by tightening the screws in the *x_end_idler*. Do this while trying to move the extruder to the left or right. The belt should stay straight and should not bow up and skip over the drive pulley teeth.

  ⓘ No need to be very precise with the belt tension here as the final tension will be improved later.

- Thread two M3x10 screws inside the top and bottom holes of *x_end_idler*. Do not screw them fully, leave a gap of 1-2mm as shown on the third image.

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 6 of 16

Step 6 — X axis length

ⓘ Not all X axis have the exact same length because of tolerances (including on Original Prusa printers). This step will adjust your X axis length.

ⓘ The 1st image shows what happens to the X ends when you tension the X axis belt. We want to have the X ends as parallel as possible to the frame (or it will affect the X belt motion).

  ● 1st image, top left: when the X axis is too short.

  ● 1st image, bottom left: when X axis is too long.

  ● 1st image, right: when the X axis has the perfect length.

● To adjust the length of the X axis we need to use the two M3x10 screws of the *x_en_idler* and look at the Z tops.

● While you tighten the M3x10 screws keep an eye on the Z tops. The M3x10 screws will move the Z leadscrews laterally (left or right), adjust them to have the Z leadscrews as possible centered.

   ⓘ Note that the M3x10 screws will not move back and forth the Z lead screw position, only laterally.

Step 7
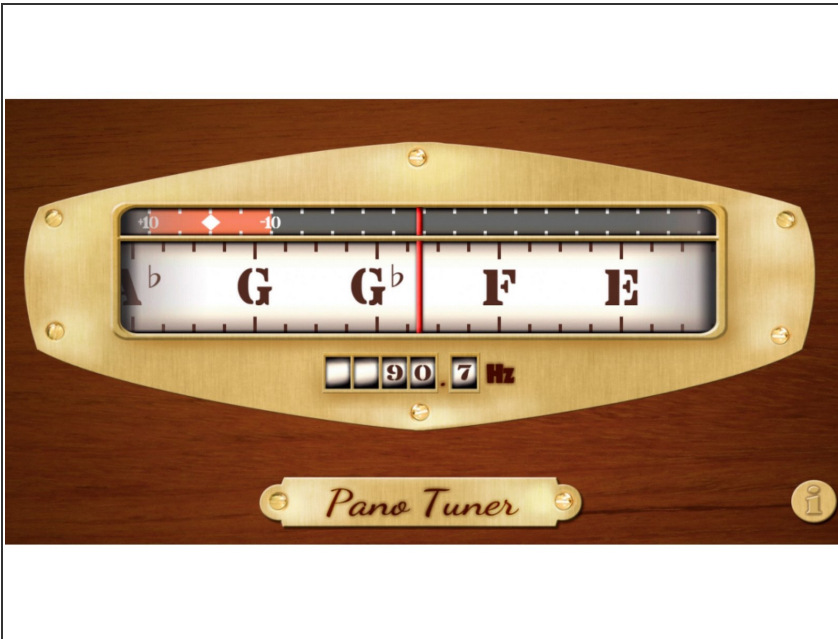
(i) To set perfect belt tension we will make it vibrate and tune it to a certain frequency, just like a guitar. To do that we will use a smartphone application.

- Download and install the **Pano Tuner** application (developed by Kaleloft LLC) on your smartphone.
  - [Android Google Play link](#).
  - [Apple Store link](#).

- Turn off the printer (if your hotend is **higher than 50°C**, let the hotend cool down first until the **hotend fan stops spinning**)

- Launch the Pano Tuner app and place your smartphone on the heated bed. Make sure there is no noise in the room that could disrupt the measurement (like a ceiling fan).

Step 8 — Belt tension
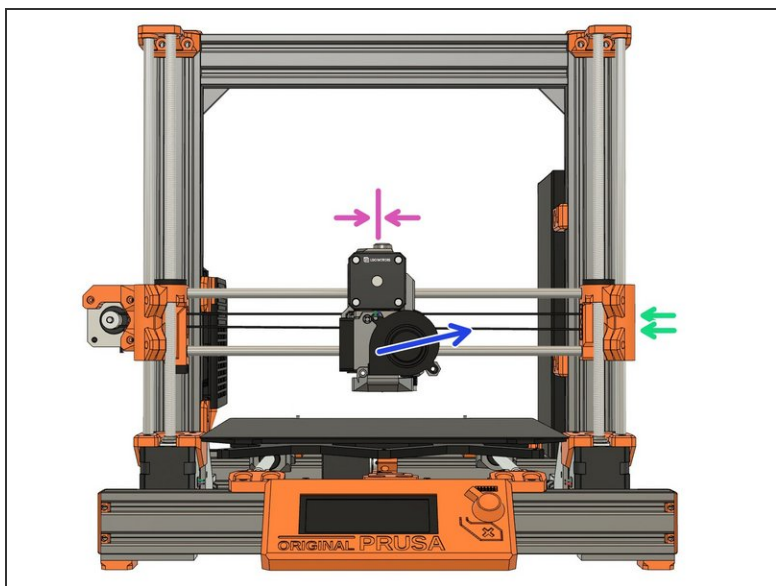
- Move the extruder to the middle of the X axis.

- Pluck the **lower** belt to make it vibrate. Don't pluck it too much as it might touch the carriage and produce a wrong frequency.

- Adjust the belt tension until you have a value around **90Hz**. Between each adjustment, **move the extruder** to all the way to the left and right and then center it again.

  ⚠ It is very important to move left and right the extruder between each measurement to relax some tension in the belt.

- ⓘ If your belt is new, you can repeat this procedure after a few prints. A new belt will loosen in the first hours of use.

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 9 of 16
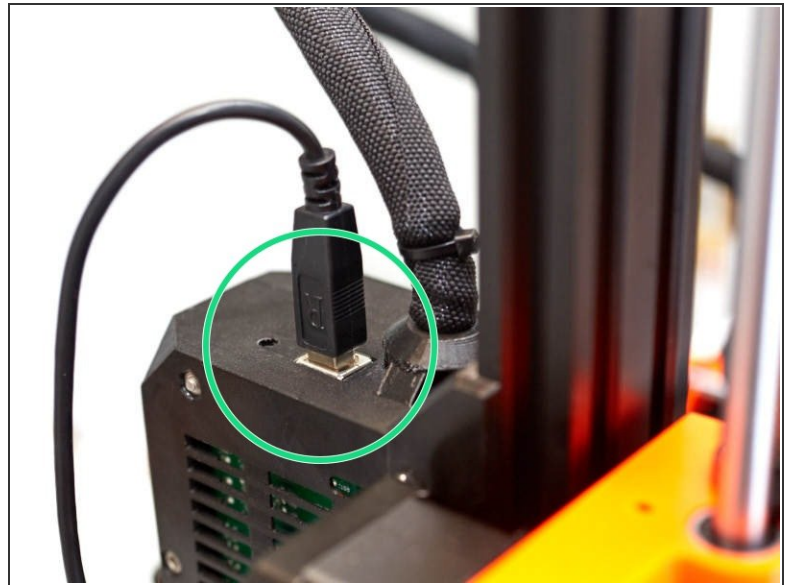
Step 9 — Download Bear firmware for calibration

⚠ For improved reliability and print quality, the Bear extruder is slightly taller than the original MK2.5S/MK3S extruder. We provide customized firmware to pass Selftest and (XY)Z Calibration for the taller size of the Bear extruder. Our firmware also provides a faster and safer rotation for hotend fan (if using something different than Noctua).
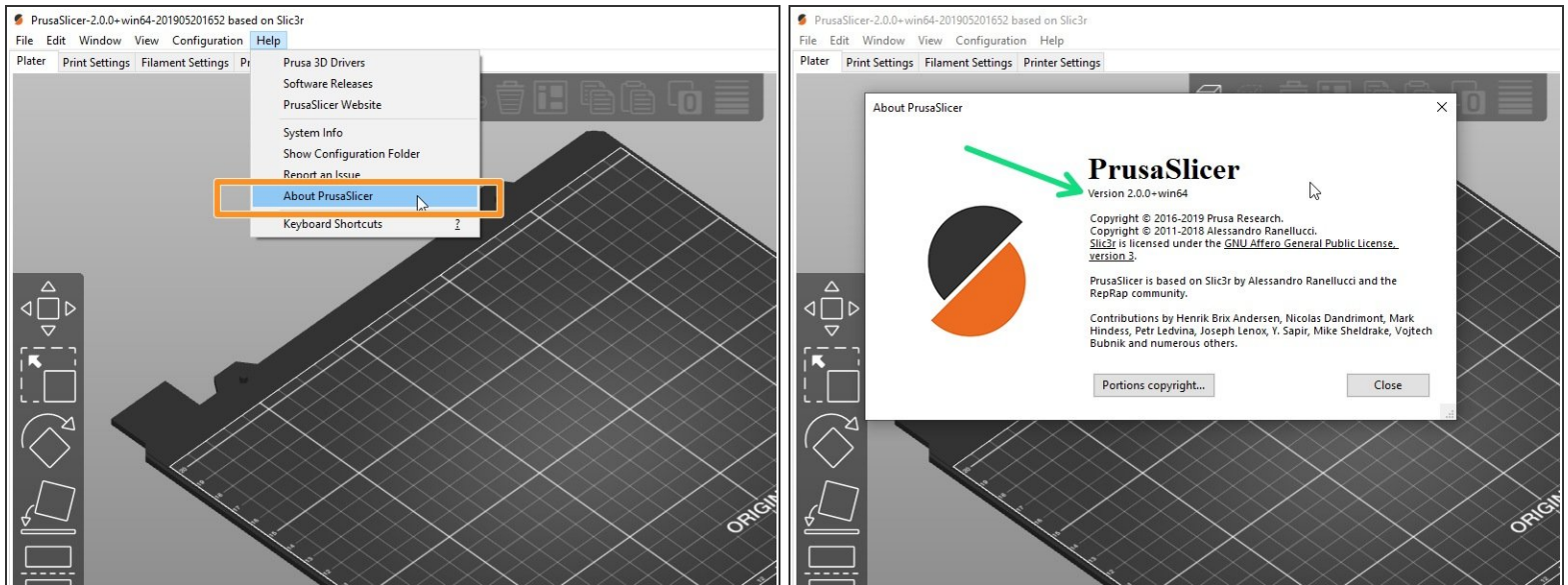
- After the self test, you can go back to Prusa firmware if you prefer. However, you will have to use the stock hotend fan (Noctua).

- Select and download the latest Bear calibration firmware here: github.com/bear-lab-3d/Prusa-Firmware/re...:

  - **MK3S Einsy-Rambo 10a** firmware name: *Bear_Cal_FW***_MK3S-EINSy10a.hex*

  - **MK2.5S Mini-Rambo 13a** firmware name: *Bear_Cal_FW***_MK25S-RAMBo13a.zip*

  - **MK2.5S Mini-Rambo 10a** firmware name: *Bear_Cal_FW***_MK25S-RAMBo10a.zip*

  ⓘ MK2.5S firmware comes as a ZIP file containing several languages of the firmware. They all contain English. Extract the ZIP file and choose the language you prefer to use (in addition to English).

  ⓘ If you don't know which Mini-Rambo board you have, please refer to this document

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021　　　　　　　　　　　　　　guides.bear-lab.com/　　　　　　　　　　　　　　Page 10 of 16
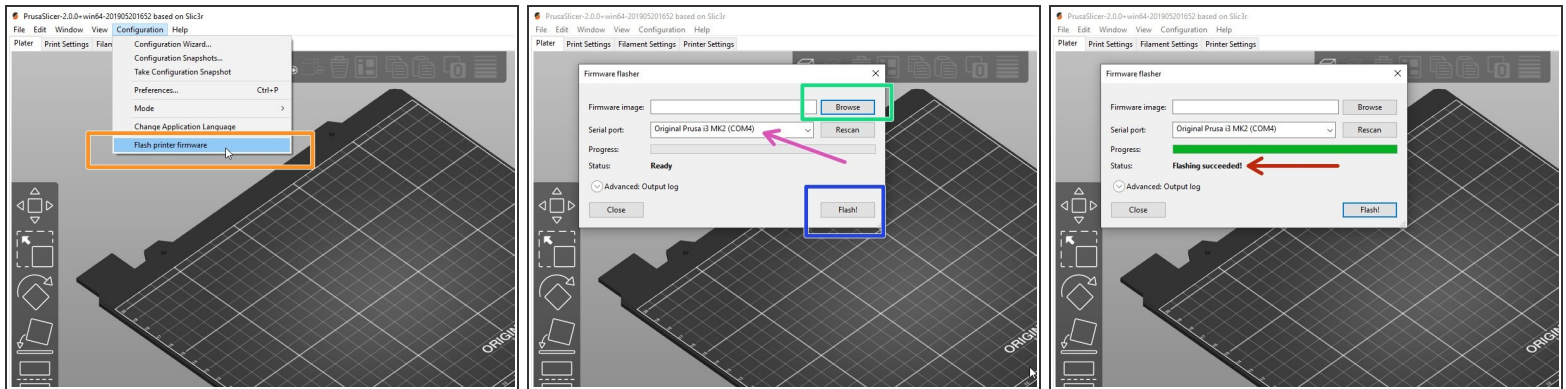
Step 10 — Connect your printer

- Get a USB A to B cable.

- Connect the USB cable to the Mini-Rambo / Einsy-Rambo.

- Connect the other side of the USB cable to a computer that is running PrusaSlicer.

- (i) We recommend to you use PrusaSlicer to flash the firmware.

- Turn on the printer.

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 11 of 16

Step 11 — Verify slicer version

- Start PrusaSlicer and go to the top menu *Help -> About ...*

- Verify that the slicer version is equal or greater than 2.0.0.
  - If the version is equal or greater: go to the next step

  - If your version is lower: download and install the version shown above from this page: prusa3d.com/prusaslicer.

  - (i) You can update to the most recent version, however, we may not have tested with that version.

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 12 of 16

Step 12 — Flash Bear firmware for calibration

- Verify that the printer is turned on.

- Start PrusaSlicer and navigate to the top menu *Configuration -> Flash printer firmware*

- Select the appropriate Bear calibration firmware *.hex file using the *Browse* button.

- Verify that the printer is detected in the "Serial port:" window. If not, check that the USB cable is firmly connected to both the printer and the computer. select "Rescan"

- Click the button *Flash!* to flash the Bear calibration firmware.

⚠ Never turn off the printer or disconnect the USB cable while flashing the firmware!

- Wait until you get a *Flashing succeeded!* message.

ⓘ In case of issues while flashing the firmware read the [Prusa troubleshooting article](#).
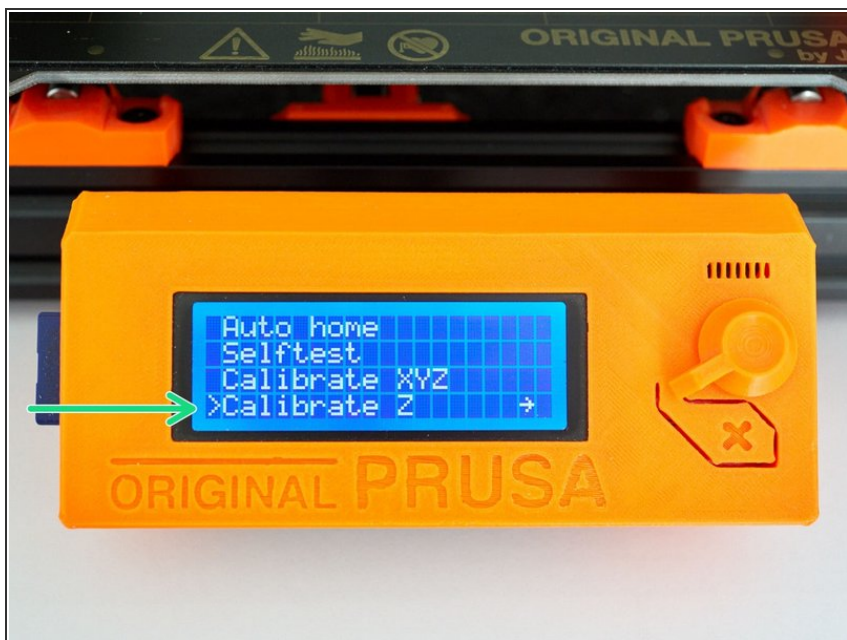
Step 13 — Selftest and PID calibration
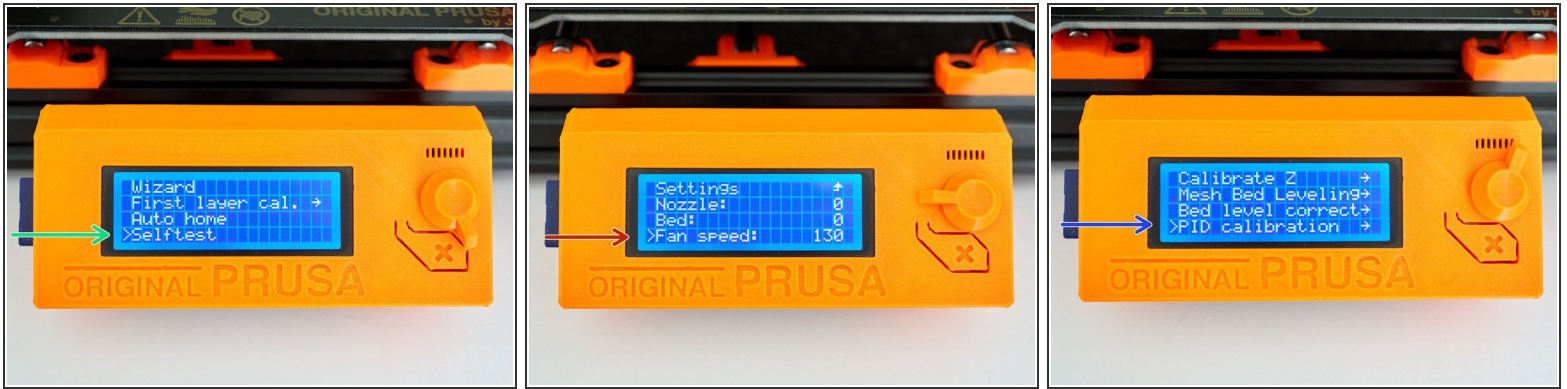
- Turn the printer off and and then on.

- Run the "Selftest" in calibration settings.

⚠ If errors occur during selftest, please fix them before going further.

- In Settings -> Temperature -> Fan speed set the value at 130 if you print lots of PETG and 255 if you print lots of PLA. For other materials select a value suitable for your most used filament.

- Run PID calibration in calibration settings.

- Choose a temperature that matches your most used printing temperature.

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 14 of 16

Step 14 — Z calibration preparation

- Heat up the nozzle by selecting Settings -> Temperature -> Nozzle: and insert PLA filament.

- Make sure you have the steel sheet on the printer.

- Run the Z Calibration.

- (i) Because the extrusion multiplier and filament diameter are not calibrated yet, it will only give a first approximation of the first layer height.

Step 15 — Extrusion mutliplier calibration
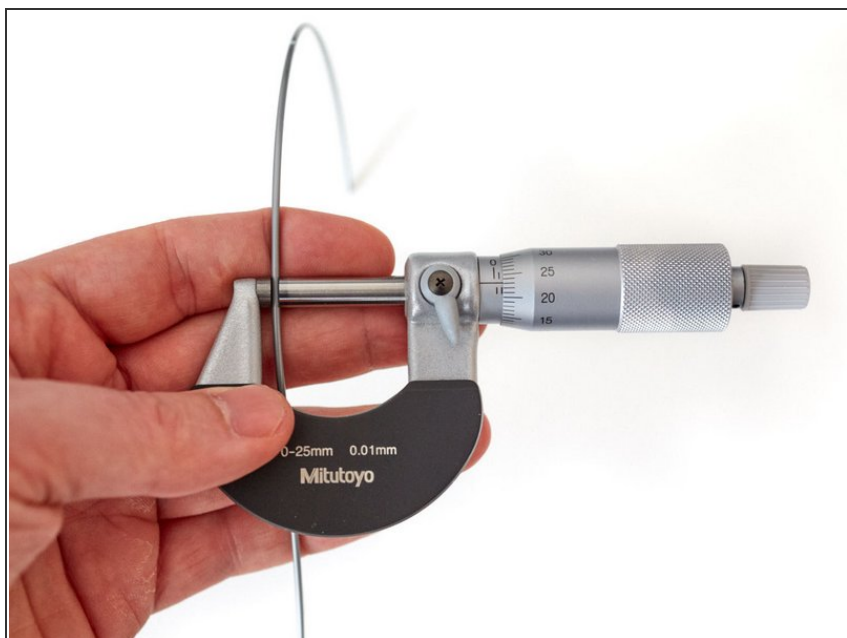
- Follow our "Extrusion multiplier" guide here: 8. Extrusion multiplier and filament diameter

This document was generated on 2021-12-28 09:21:51 AM (MST).

Step 16 — Finished!

- Congratulations, you have finished to install and calibrate your Bear extruder.

- Happy printing :)

This document was generated on 2021-12-28 09:21:51 AM (MST).

© 2021   guides.bear-lab.com/   Page 16 of 16