

**Fusion3**

# **EDGE 3D Printer**

## **BED LEVELING**

**Revision 7/25/2022**

# BED LEVELING

Information on how the bed leveling systems work on EDGE

## INTRODUCTION

The term "bed leveling" encompasses two related but distinct concepts:

- The relative distance from the tip of the nozzle to the print surface over its entire span (bed level).
- The gap between the tip of the nozzle and the print surface at  $z=0$  (first layer height)

Note that neither of these concepts have anything to do with how level the print surface is relative to the rest of the world. In other words, please do not use a bubble level to try to "level the bed". **The printer only cares that the print surface is the same height away from the tip of the print head at all points.**

There are 4 major components to the bed leveling and first layer height systems:

1. Auto bed leveling process
2. Nozzle / probe offset calibration process
3. Babystepping
4. Manual bed leveling

## AUTO BED LEVELING

The auto bed leveling process is run automatically at the beginning of every print. The printer will probe the bed in a 5x5 grid (25 points total).

The results of the bed level are shown on the *Menu > Utilities > Bed Leveling* screen.

During the first layer of a print, the printer uses the height data it collected to automatically adjust the height of the bed as the print head moves in X and Y.



If the printer detects a difference in bed height (max-min) of more than 2.0 mm, it will stop the print and prompt you to manually level the bed.

**IMPORTANT: The auto bed leveling system does not mechanically / physically adjust the level of the z axis. There is a limit to what you can expect this system to successfully compensate for. If your bed / Z axis is so out of level that it binds or doesn't move smoothly, you will need to manually level the bed (see below).**

If you need to run the auto bed level outside of a print, use the "Run Auto Level" button on the *Bed Leveling* screen.

**NOTE:** The "Run Auto Level" button will only probe a 3x3 (9 point) grid, to save time.



### Quick-Turn Mode & Auto Bed Level

If quick-turn mode is enabled, the printer will skip the 5x5 grid and instead do a single probe point in the center of the bed, and use the existing bed height map stored in memory.

This reduces the time needed to start a print. However, it means that if the bed level has changed since the height map was generated, your first layer may not print correctly. You may see areas that are too close to the bed, or too far away.

If you encounter issues with first layer height/adhesion after enabling quick-turn mode, we recommend disabling it again.

### NOZZLE / PROBE OFFSET CALIBRATION

The nozzle offset calibration process is run automatically at the start of every print.

1. **Heat:** The printer will heat up the print head.
2. **Clean:** The printer will clean the print head by pumping out the molten plastic and scrubbing it in the print head scrubber (back right corner of the bed).
3. **Touch nozzle:** The tip of the print head is touched against an electrically conductive surface to register its position.
4. **Touch probe:** The bed probe is deployed and checked on the same spot.
5. **Math:** The nozzle offset is calculated and used to make sure the first layer height is perfect on every print.

If you need to run the nozzle offset outside of a print, use the "Run Nozzle Offset" button on the *Bed Leveling* screen.

**IMPORTANT:** In order for the cleaning step to work correctly, you **MUST** run the nozzle offset process with filament **LOADED** into the printer.



## Quick-Turn Mode & Nozzle Offset

If quick-turn mode is enabled, the printer will skip the entire nozzle offset process, and instead use the last value stored in memory.

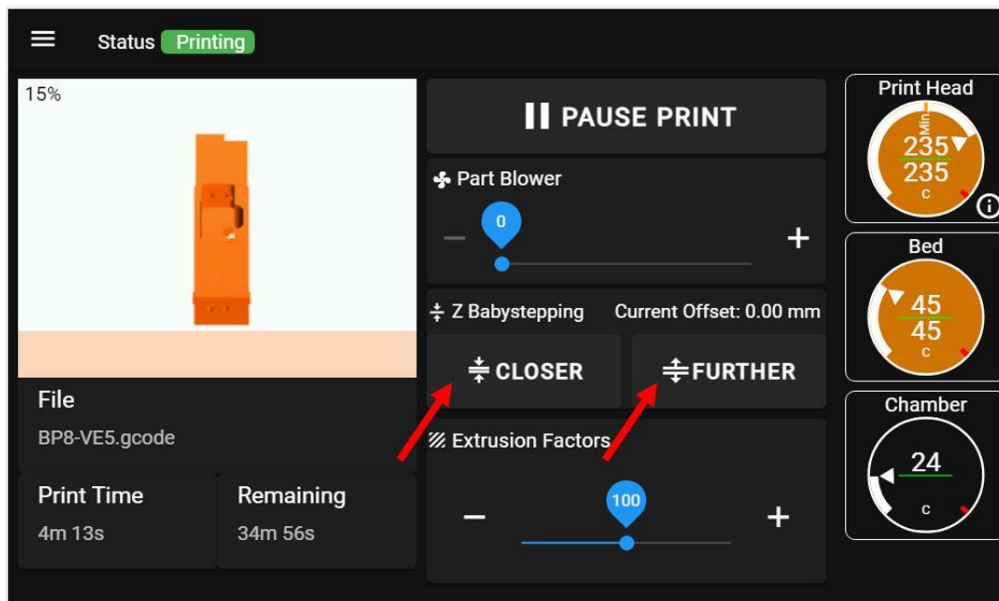
This reduces the time needed to start a print. However, it means that if the nozzle offset has changed since the value in memory was generated, your first layer may not print correctly (too close or too far away).

It is possible to correct the first layer height by using the Babystepping functionality (described below). However, if you don't want to do that, we recommend leaving quick-turn mode disabled.

## BABYSTEPPING

During a print, another function becomes available to you called babystepping. This is a function that allows you to make on-the-fly adjustments to the first layer height in very small increments. Its purpose is to allow you to fine-tune your first layer height without needing to cancel and restart a print.

On the main screen, you will see two buttons labeled "closer" and "further".



- Press "closer" to move the nozzle and bed closer together in 0.05mm increments
- Press "further" to move the nozzle and bed further away in 0.05mm increments

If you find that your first layer is consistently off in the same direction for multiple prints in a row:

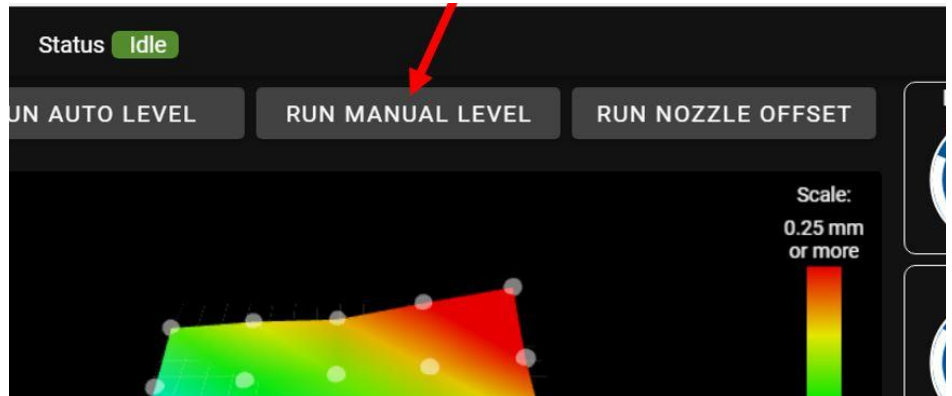
- If quick-turn mode is enabled, disable it OR run *Menu > Utilities > Bed Leveling > Run Nozzle Offset*.
- If quick-turn mode is disabled, inspect the nozzle offset system (scrubber, touch plate, bed probe) for mechanical issues. Contact Fusion3 Customer Support for more information & assistance.

**NOTE:** Babystepping can be used at any point during a print job. However, it is INTENDED to be used during the first and second layers only.

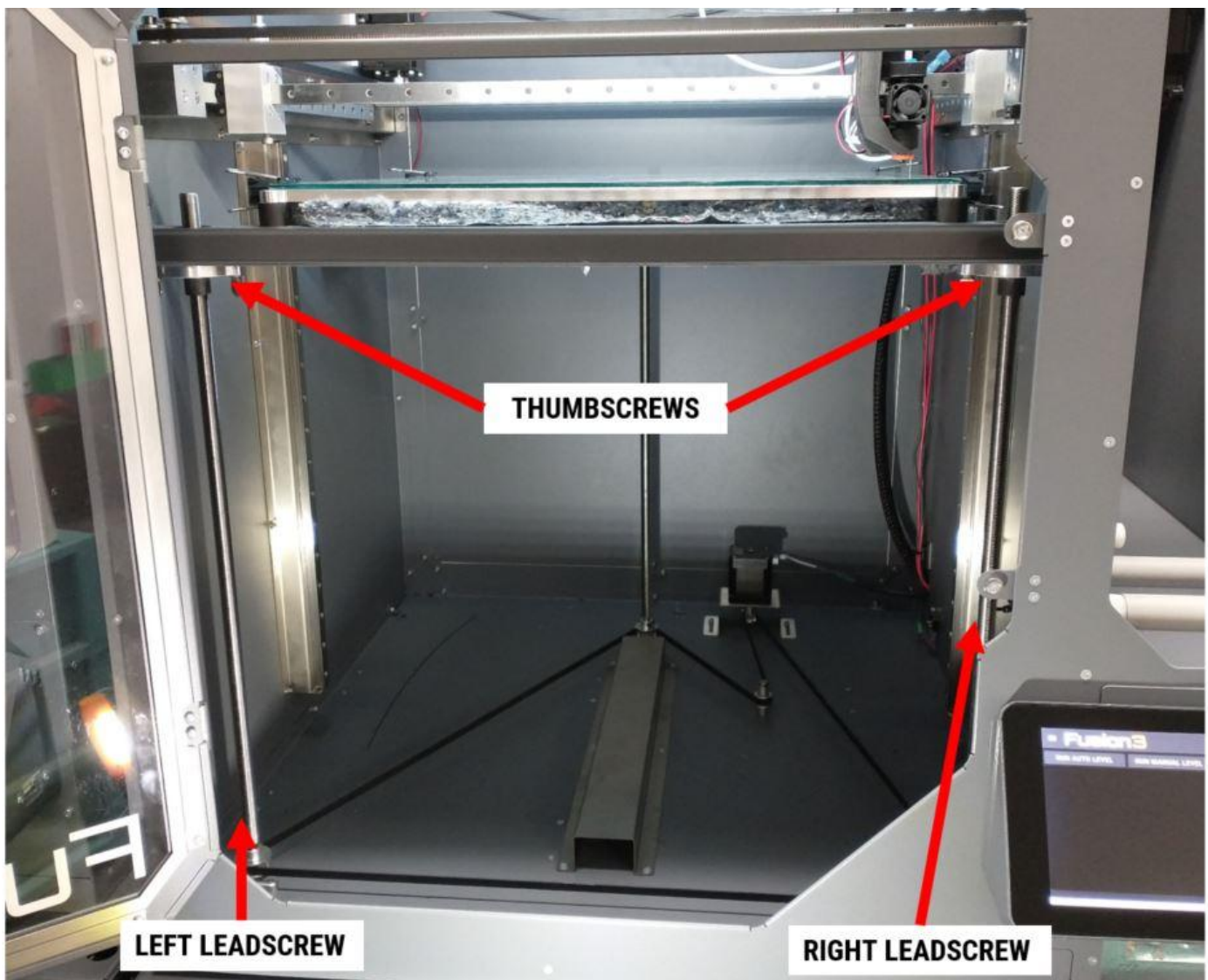
## MANUAL BED LEVELING

The manual bed leveling process is the only method that physically changes the level of the z axis and bed; everything else mentioned in this guide compensates for things being out of level. So this is an important process, even though you should not have to do it very often.

To start the manual bed leveling process, go to *Menu > Utilities > Bed Leveling > Run Manual Level*. The onscreen prompts will guide you through the process.



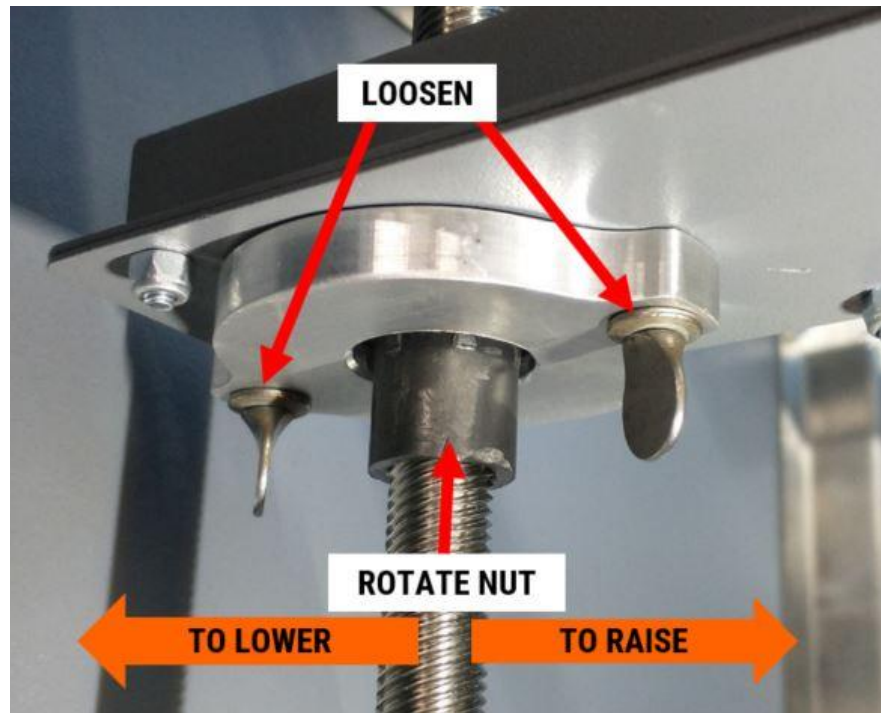
To level the bed, you will turn the front two leadscrew nuts to adjust the height of the front corners, relative to the back leadscrew nut (the back leadscrew is not adjustable).



When prompted by the wizard, you will need to loosen the two thumbscrews holding the leadscrew nut clamp in place. Only loosen them enough to rotate the nut by hand.

Once you adjust the height of that corner, finger tighten both thumbscrews again to prevent the nut from rotating when you don't want it to. Once you're happy with the bed level, double check that all 4 thumbscrews are as tight as you can get them by hand.

**NOTE:** If the Z axis was extremely out of level, you may need to run the wizard more than once in order to get the bed leveled completely. In other words, this can be an iterative process.



### When To Manually Level

- If the printer prompts you to manually level based on its Auto Bed Level measurements, at the beginning of a print.
- If you notice binding or sticking as the Z axis tries to raise the bed (usually accompanied by the noise of the motor stalling).
- If motion up or down is very stiff when moved by hand.
- If you have to perform maintenance or repairs on the z axis in a way that potentially may have affected the level of the bed (belt tension, leadscrews, etc).

**Related Articles / Resources:**

**Tags:** edge, bed leveling, manual bed level, auto bed level, bed probe