Precision Alignment guide

10. E step calculation

What is an E step? This is the description of how many times the stepper motor on the extruder must advance for 100mm of filament to be advanced. There is two methods that can be used. First method is to remove the Bowden tube from the extruder. We will call this the free air method. The second would be to do the test thru the heated extruder. The through the extruder is done by marking the filament at 100 and 120 mm from the inlet to the extruder. Then use the controller or gcode to advance 100mm of filament. Once done, you measure the distance from the extruder to the 20mm mark to determine actual length advanced. You then use the actual filament extruded in a formula, along with the current e step to calculate your new E step value. Example using 87 mm advanced (100 commanded measured 33mm from the 120mm mark, giving 87 actual distance traveled) and 98 current e step; Formula 100/87 = 1.1494 x 98 = 112.64 so rounded off that's a new e step of 113 steps.

Using the free air method, we will remove the Bowden tube and coupler from the extruder. Run the filament just out of the extruder by hand and use flush cuts to cut it at face of extruder. Now use the control panel or software to advance the filament 100mm. After extrusion stops, cut the filament in same location. Take the cut piece and measure its length. Use 100/measured length x the current e step to calculate your new e step. Example; we sent 100mm with an e step of 93mm the stock ender 3 value. Our cut length of material was 86mm. So 100 / 86 is 1.1628 x93 equals a new e step of 108.13 or 108.

Ideology of each method. Free air is giving a direct linear advance without the restriction of the hot end flow path. The slicer is designed to use linear value along with measured diameter to calculate extruded volume in a part tool path. This method does not require you to calculate e steps again if changing filament type. It is one and done, only to be re visited if changing extruder or extruder drive gear. With this method any filament used will then be tuned with the flow rate to optimal extrusion using a single wall test cube. Print the cube at .40 single wall, then measure and record 2 values from all 4 sides. Add them together and divide by eight. Divide .40 by the resultant, and multipy that by 100 to give your new flow rate or extrusion multiplier. Example test cube measurements avg to be .428 so we take .4/.428 which equals .934579 x 100 = 93.458 or 93% flow rate as your new value. Note: if you had already been using a flow rate modifier, you would be at that % of the rate you were using. Example was at 97% and the calculation comes to 92%. That's 92% of 97% or 89% 97 x.92 is 89

In summary, the author prefers this method, as I never have to chase my e step, I can mark a filament of any type with its flow % on the spools label, and just change it in slicer. Being able to move through many materials at will.

Ideology of threw the nozzle method. When done with a given filament, the flow rate may be left at 100% as you have tuned the e step to the current condition of the hot end and the specific filament that you are running. There is no need for a flow test to be done once the e step is set, unless conditions change.