Filament Extruder Manual

Prototype

Preparation

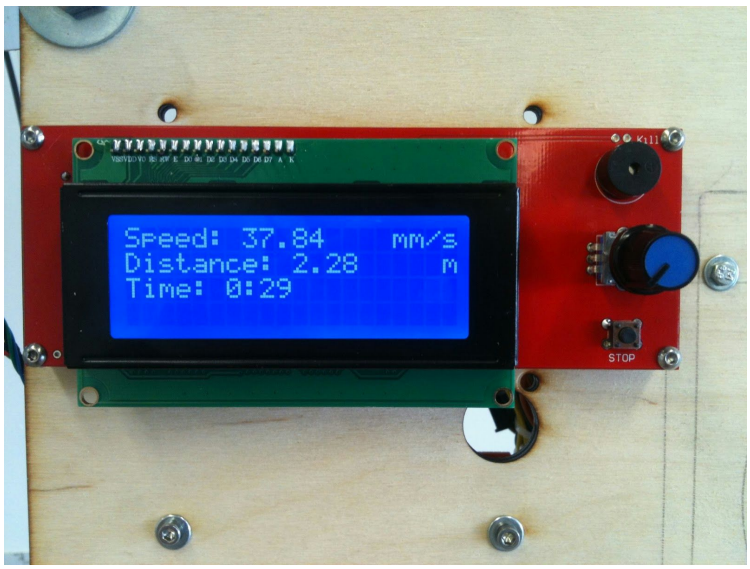
1. Pre-heat the extruder with these settings:
    a. PLA: first zone: 60 degrees - second zone: 225 degrees
    b. ABS: first zone: 100 degrees - second zone: 260 degrees
    * second zone is the zone that is closest to the nozzle
2. Make sure the extruder motor is turned off.
3. Now is a good time to make sure the hopper is filled.
4. Wait until the set temperature is reached and stable (around 15 minutes).
5. Turn on the extruder motor at a low rpm.
6. Place a wooden scrap board underneath the nozzle to catch the gooey plastic exiting the nozzle.
7. Wait until you observe a steady stream of extruded plastic.

example of a good steady stream of plastic:

Starting filament production

1. Turn on the caterpillar by clicking on the knob, if the caterpillar moves in the wrong direction reverse the stepper motor plug.
2. Now comes the tricky part; use a spatula to quickly cut off the stream of plastic.
3. Use a plier to grab the molten plastic and guide it into the aluminum guide rail.
4. Slowly drag the plastic filament in a constant motion along the aluminum rail towards the caterpillar. Don’t go to fast or you will stretch the wire too much, go to slow, and the plastic will pile up at the beginning.

5. Carefully feed the wire into the running caterpillar, it should be cooled down enough so the caterpillar can grip the plastic.
6. Now observe the machine, leave it running for some time to stabilize the process.



Fine tuning the process

1. You might have noticed that the filament you are making is the wrong diameter for your particular 3D printer (either 1.75mm or 2.85mm).
2. Measure the filament after it has passed the catterpillar with callipers.You now have two options:
    a. The filament is too thick - >
        i. (preferably) increase the caterpillar speed to stretch the filament thinner by turning the knob clockwise.
        ii. (alternatively) decrease the extruder RPM
    b. The filament is too thin - >
        i. (preferably) the caterpillar is moving too fast causing the filament to stretch too much, slow down the caterpillar by turning the knob counterclockwise.
        ii. (alternatively) decrease the extruder RPM
3. Leave the machine running a couple of minutes before measuring again. Repeat the process until you reach a desired filament diameter.
4. Use cutting-pliers to cut the filament after the caterpillar, then guide the wire onto the empty spool, usually there's a hole in the center.
5. To start and stop the caterpillar press the knob.
6. Double press the knob to reset the total measured distance and time.
7. Press and hold the knob to temporary get a speed boost (handy to reduce any slack in the filament).

Troubleshooting

- The filament diameter is inconsistent.
    - Check your extruder settings and observe the rotation of the screw to see if it’s constant.
    - Check if the filament is slipping in the caterpillar, not enough pressure on the roller wheels will cause slipping and inconsistent speed settings.
- The filament is flattened (or non-circular)
    - Not enough cooling causes the filament to be too soft where the caterpillar grips the material. Either add more cooling fans or lengthen the entire set-up so the material has more time to cooldown. Another option could be to produce at a slower rate.
    - The nozzle that you are using might be damaged and not completely circular.
- The stepper motor is turning in the wrong direction.
    - Simply reverse the stepper motor plug.

Tips & Tricks

- Making filament is all about consistency, make sure the material is clean and sorted so only one type of plastic is extruded.
- Drill a 1.75 mm or 3.00 mm hole in a scrap piece of board and run the produced filament through this board, if the filament jams in the hole the diameter exceeds the maximum allowable for your 3D printer, don't feed this in your printer, it will jam.
- Start producing ABS filament first, this will most likely be easier than PLA or any other material.
- Work in a well ventilated environment when you're producing filament.
- When your spool is full of filament during production cut the filament but don't stop the caterpillar. Making filament is a continuous process, never stop the caterpillar unless your want to quit.
- Store your filament in in a dry and dark place.
- Save your settings by writing them down! This will be helpful when you are troubleshooting and to improve the overall quality of the filament.
- If you have any issues or suggestions, visit the forums: http://davehakkens.nl/community/forums/forum/precious-plastic/