Backlash 101

Do you keep hearing the term **backlash** and have no idea what it is or what it does?

Well, we're here to help answer all of the questions you have ever had about backlash and why adjusting these settings are so important!

In short, backlash is the correction for the slack in the drive systems for the x and y axis.

When printing a 3D object, the print head moves in various directions along the x and y axis. This drive system is controlled by several belts and rods and is flexible in nature.

Imagine yourself standing still and taking one step backward and then taking one step forward. What is the likelihood that you would have stepped back into that exact same spot? Probably not very likely. This is exactly what happens with your printer! The print head will move backward and then will try to move forward again into the exact same spot, but may be off by just a bit because of the flexibility of the belts and the rods. The backlash settings adjusts and corrects for this flexibility.

Without proper backlash settings, you may end up with circles that aren't very circular and/or gaps within the print.
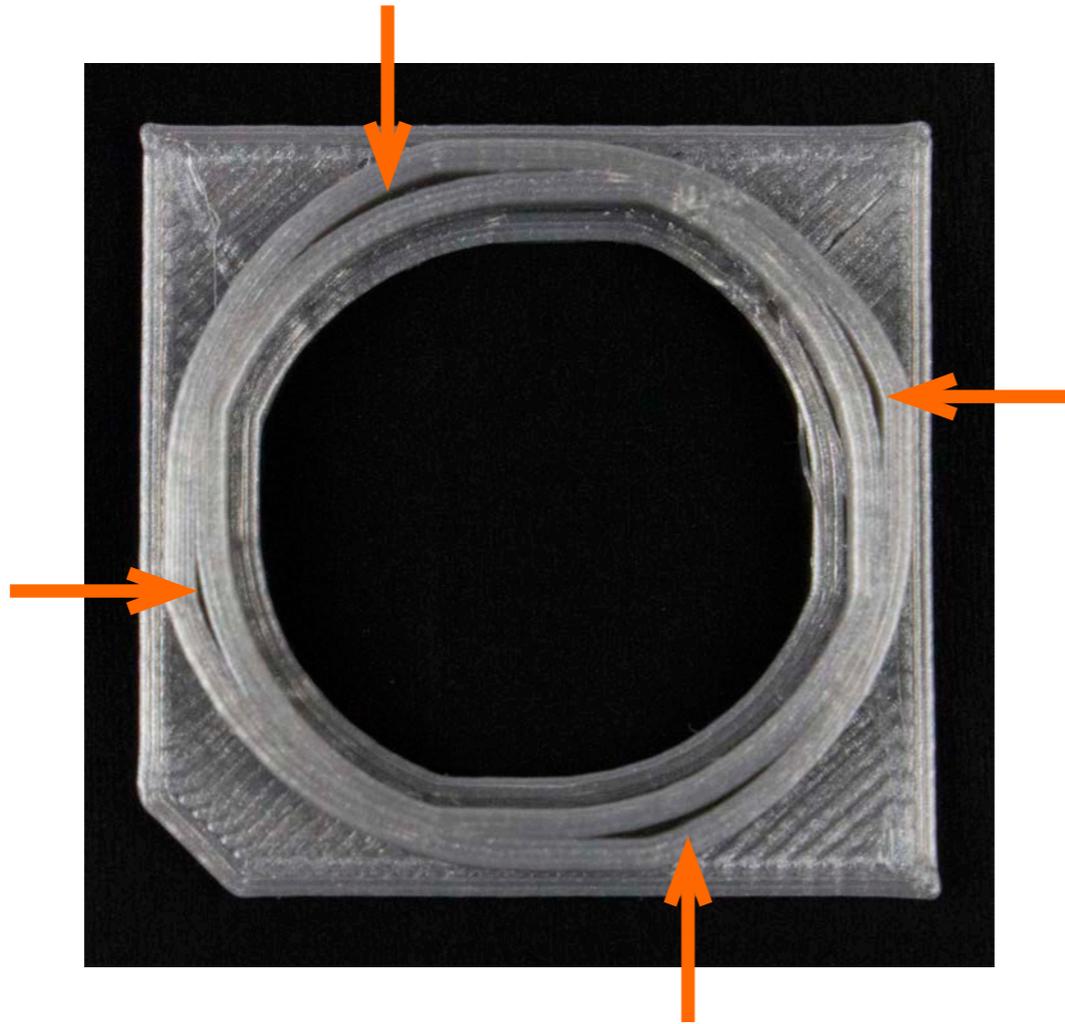
**These gaps were caused by bad backlash**
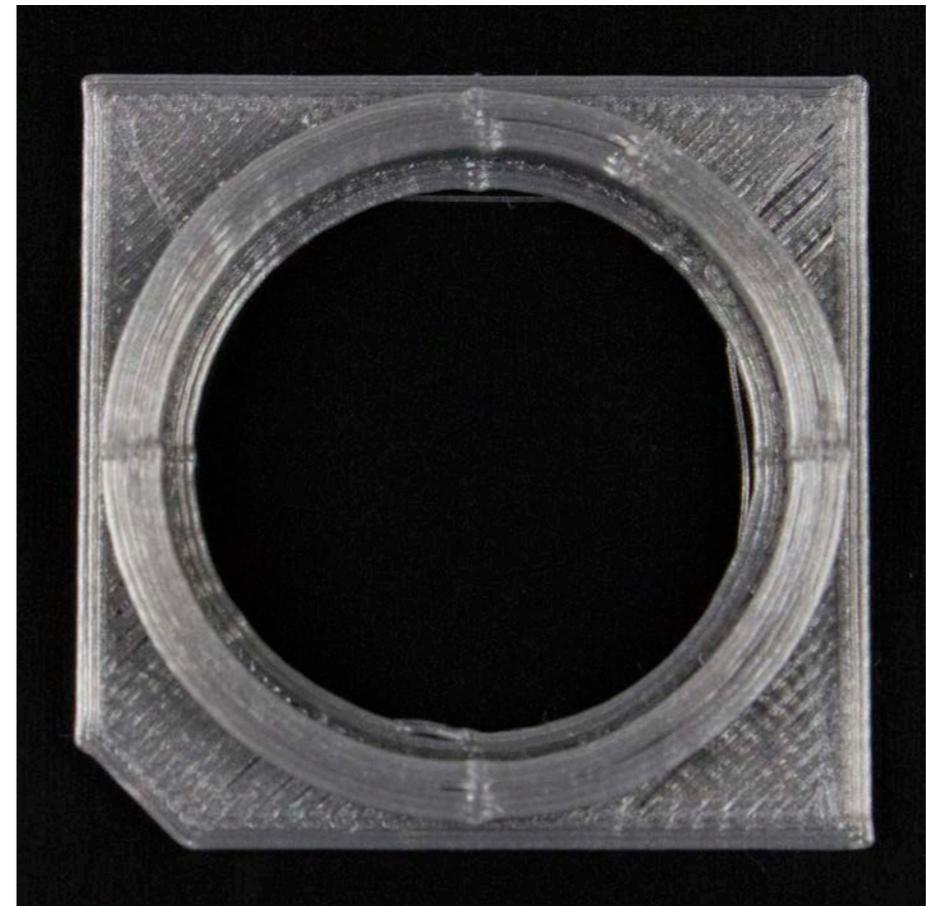
No gaps = great backlash!

If you are going to be printing anything that is remotely circular in nature, it is essential that your backlash is adjusted well to prevent these gaps from occurring.

There are two settings that you can manually control when it comes to adjusting the backlash. You can control the backlash along the x and y axis as well as the speed of the backlash. The speed adjusts how fast the backlash corrections are applied. If the speed is too fast, it can cause skipping to occur. The y axis can be especially difficult to adjust correctly because it is controlled by belts rather than rigid rods which controls the x axis. If the tension is not exactly the same on each y belt, the values may need to be played around with a bit to get the settings just right.

The backlash speed that we recommend is 1500mm.

This is where you will be making all of your backlash adjustments:

Backlash Settings

X Backlash   0.7   mm

Y Backlash   1.03   mm

Backlash Speed   1500   mm/ min

Apply
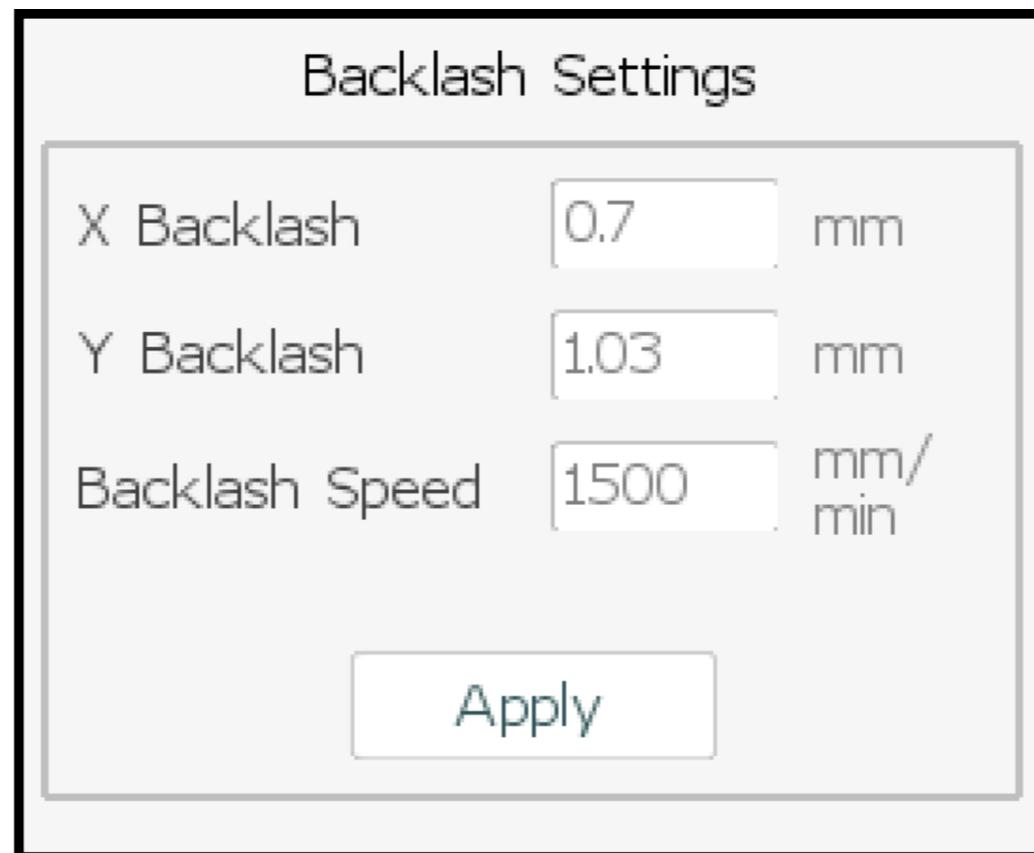
This is an example of a printer that has good backlash. Please note that good backlash settings for one printer may not be good for another printer as the amount of correction needed varies greatly based on the flexibility in the belts and rods.
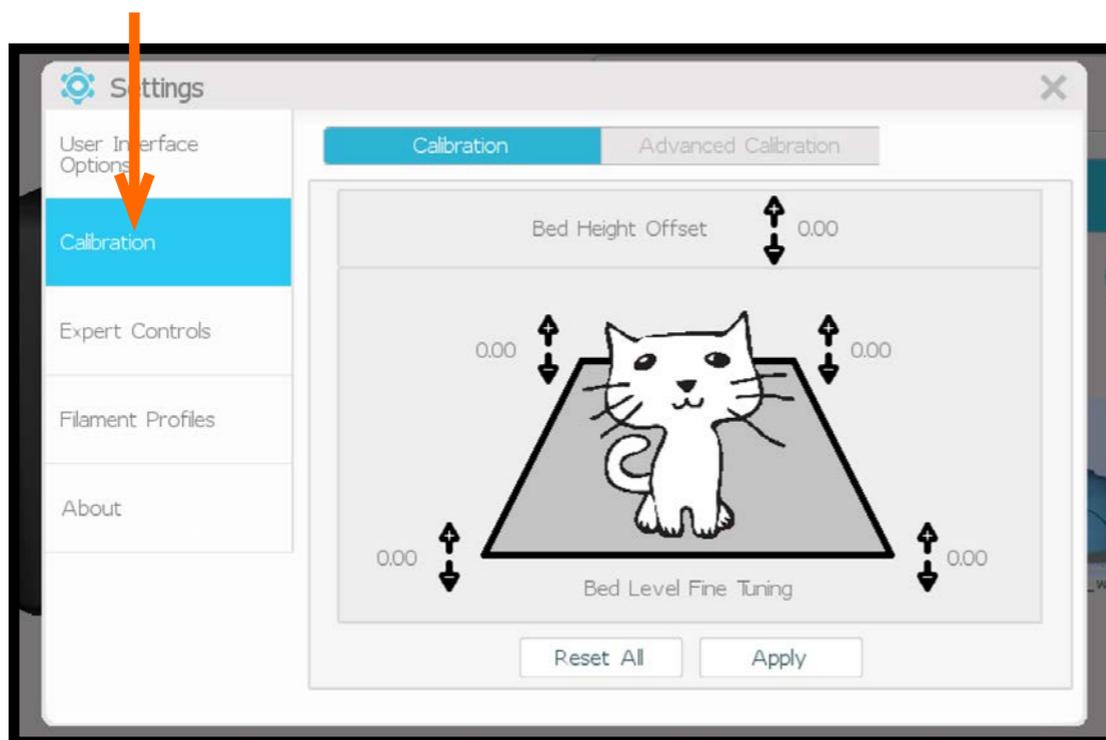
M3D

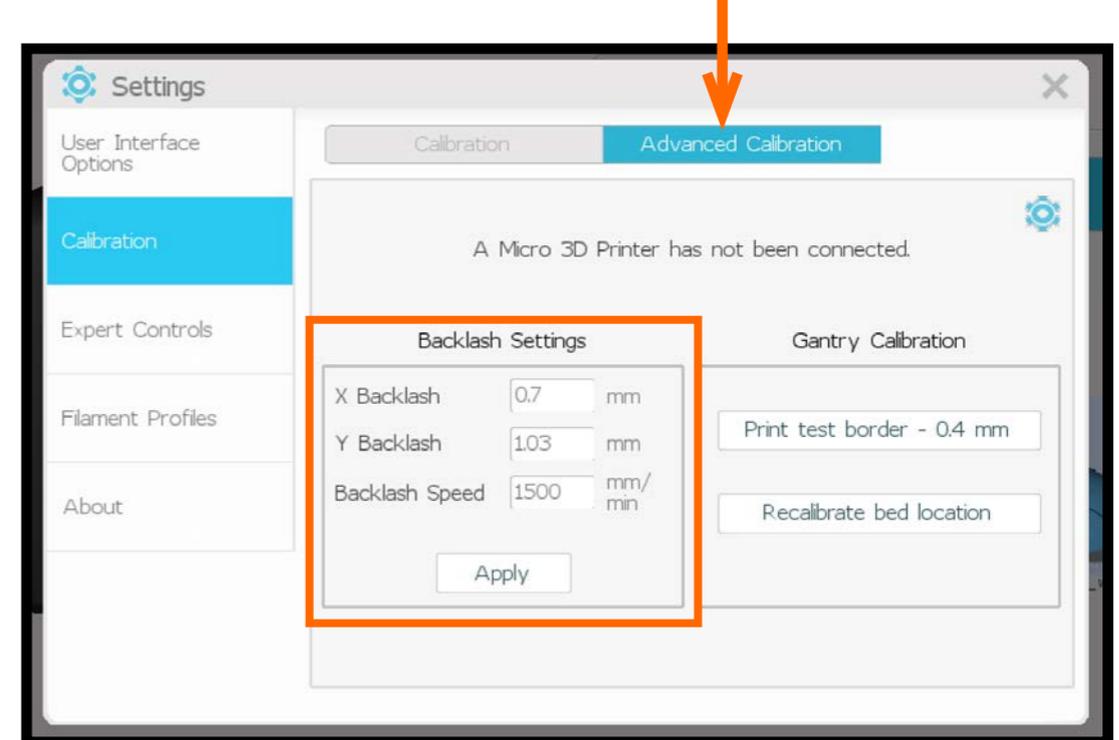# To access these settings you need to do the following:

1.

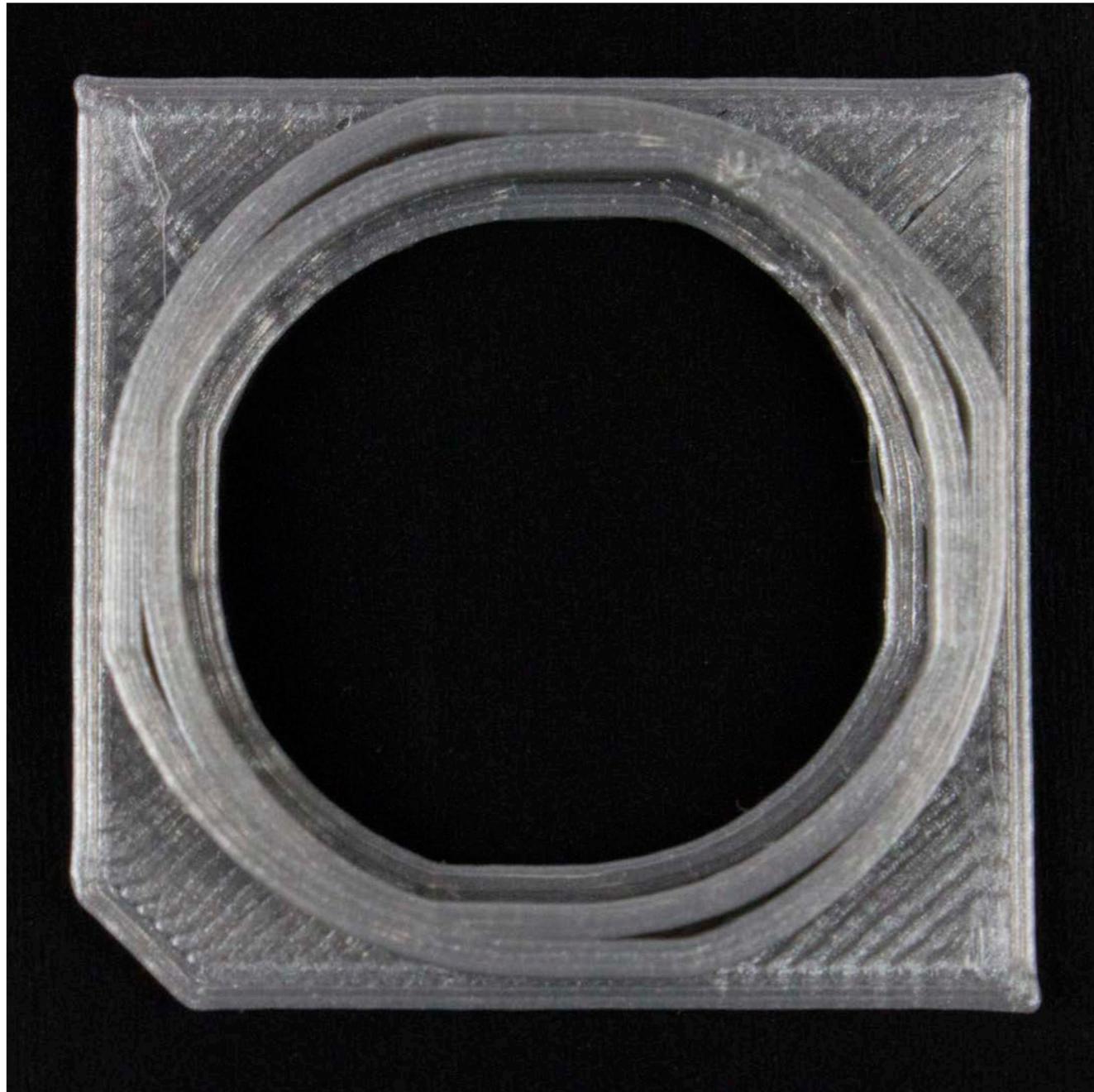**Click on the settings wheel**

2. **Click: "Calibration"**

3. **Click: "Advanced Calibration"**

This is what the backlash may look like when both the x and y axis are set to 0.00mm:

Backlash Settings

X Backlash	0.00	mm
Y Backlash	0.00	mm
Backlash Speed	1500	mm/min

Apply

The goal of adjusting backlash settings is to end up with a near perfect circle with very little to no gaps. Click here to download the Calibration.STL file.

Print settings: low quality, low infill, no raft, no wave bonding, no support.

When adjusting backlash values, it is very important to keep the calibration print in the same orientation.
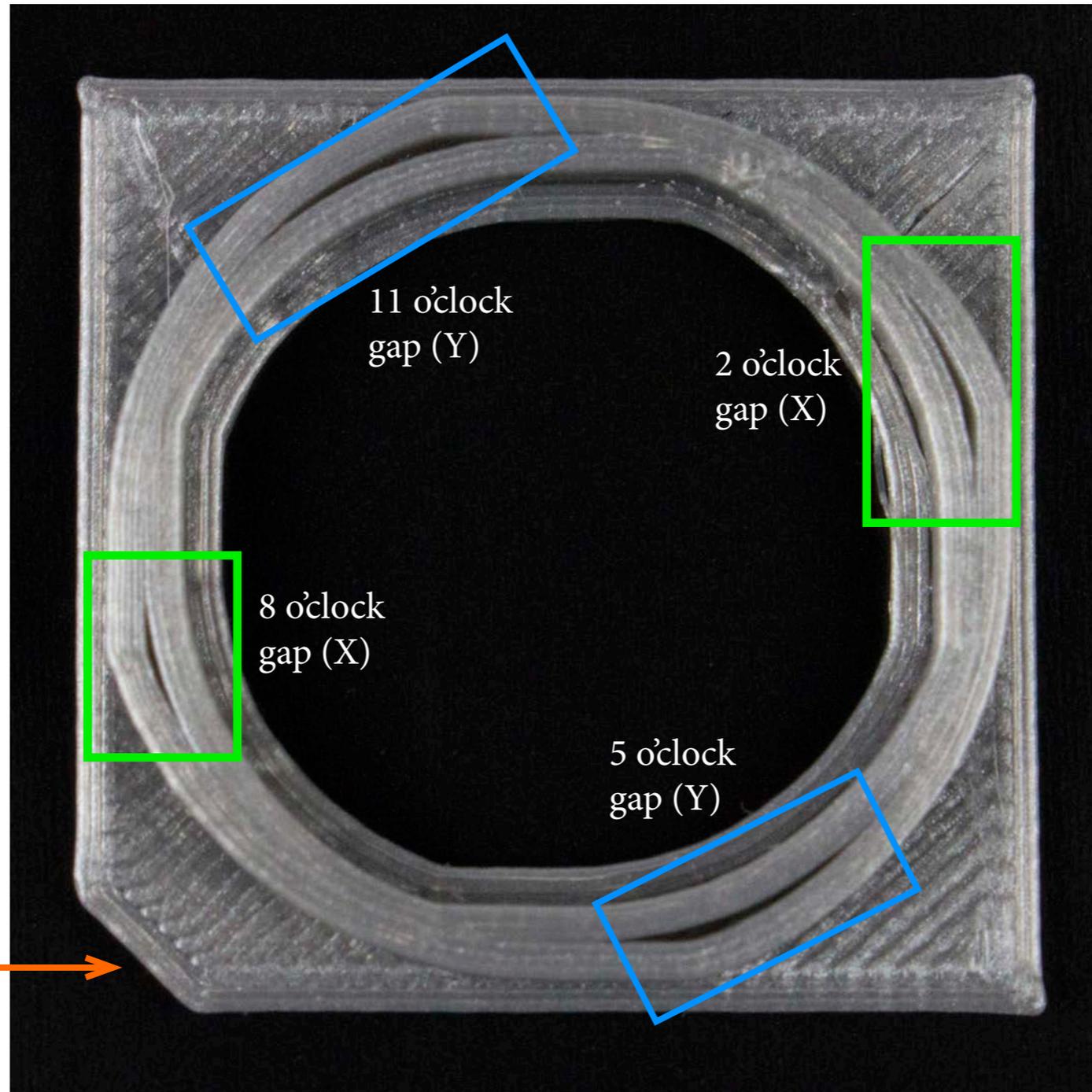
X axis backlash signature gaps are in **green**. They are located at 2 o'clock and 8 o'clock.

Typical range: 0.2 to 0.6mm

Y axis backlash signature gaps are in **blue**. They are located at 5 o'clock and 11 o'clock.
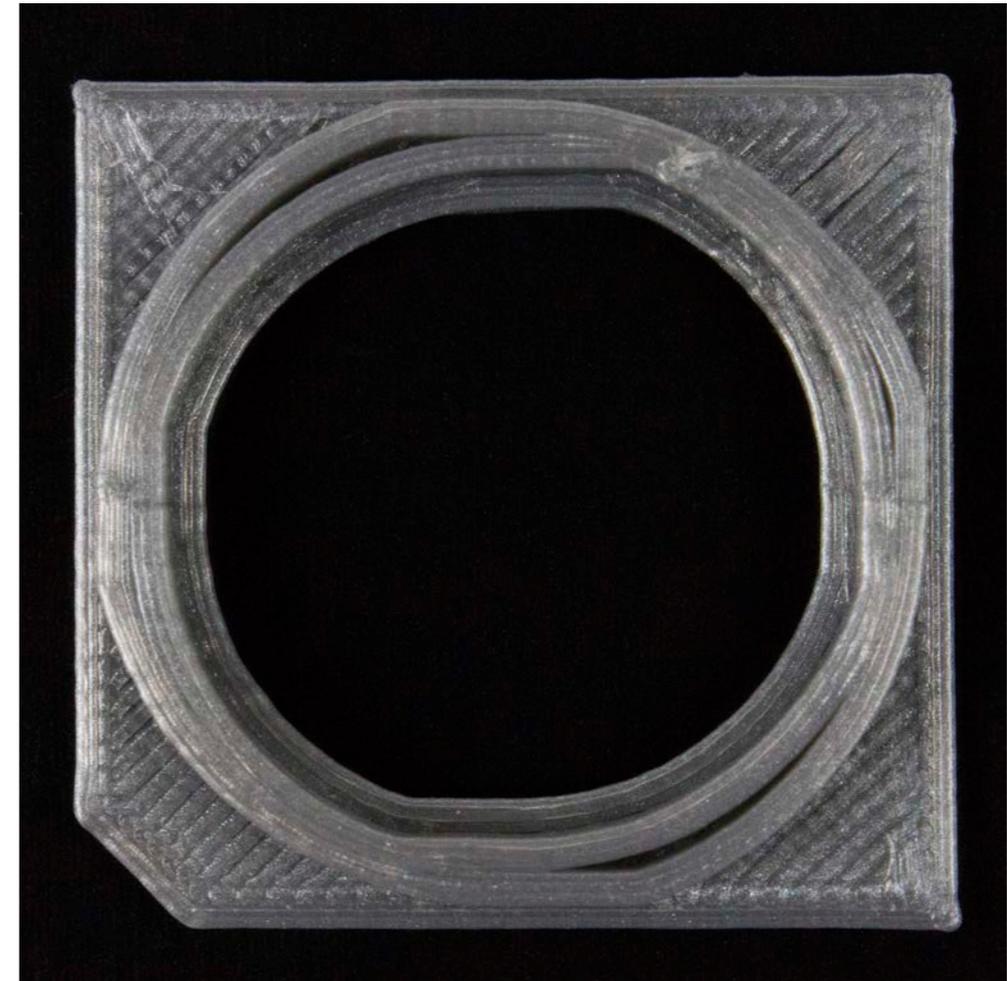
Typical range: 0.4 to 1.3mm

11 o'clock gap (Y)

2 o'clock gap (X)

8 o'clock gap (X)

5 o'clock gap (Y)

This corner must *always* be oriented in the bottom **left.**

The key to getting great backlash is to start from scratch, make minor changes, and keep testing until all of the gaps close.
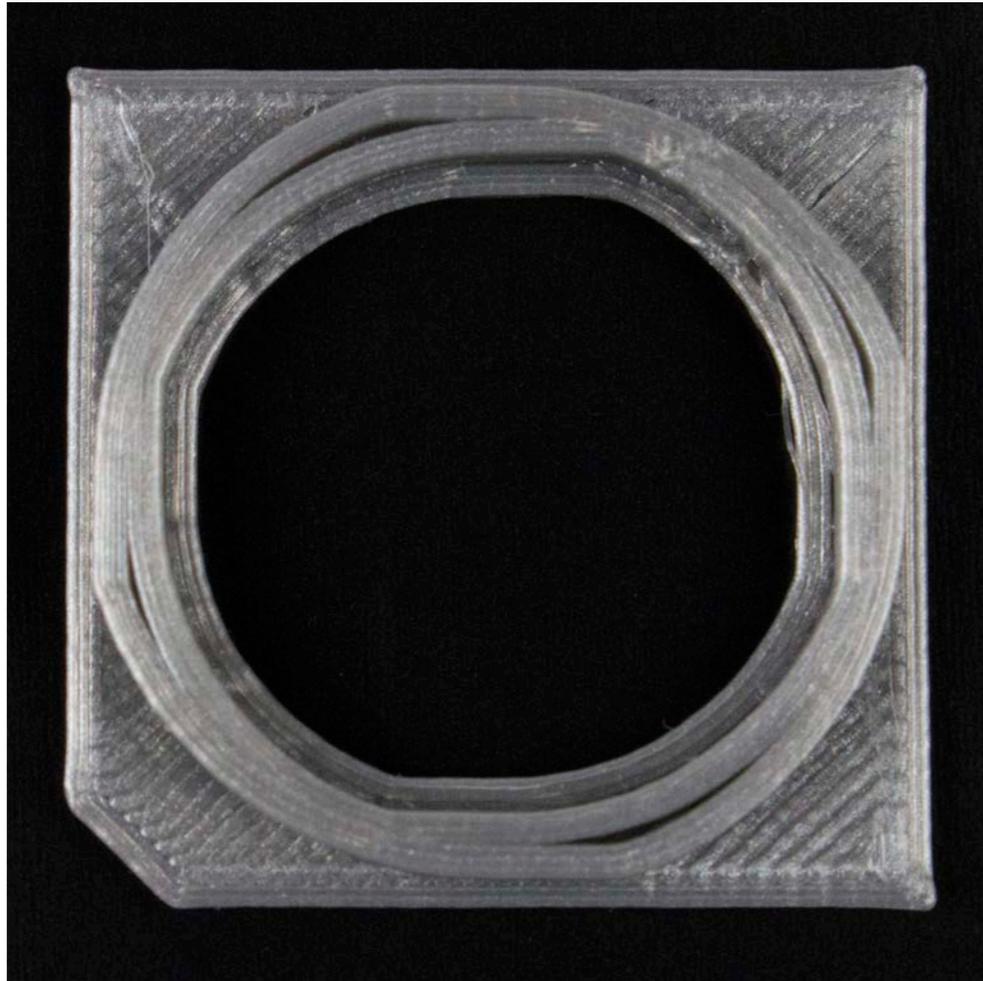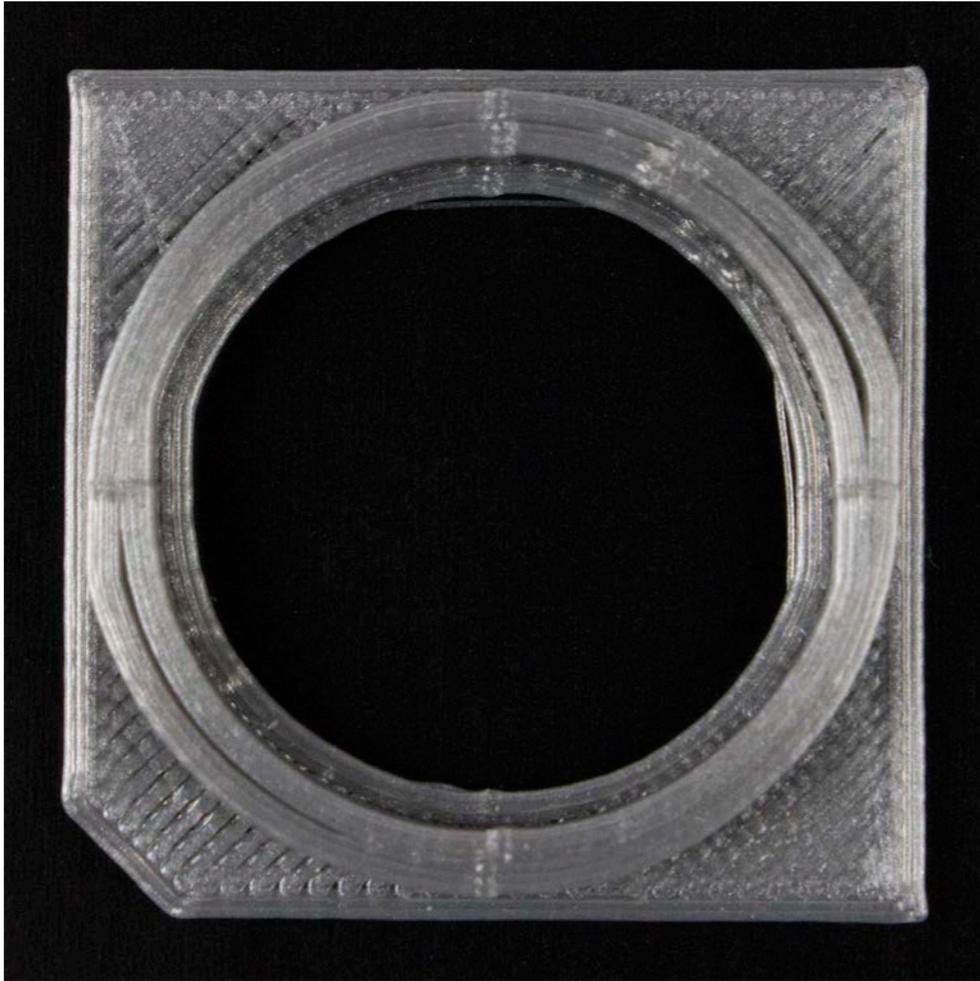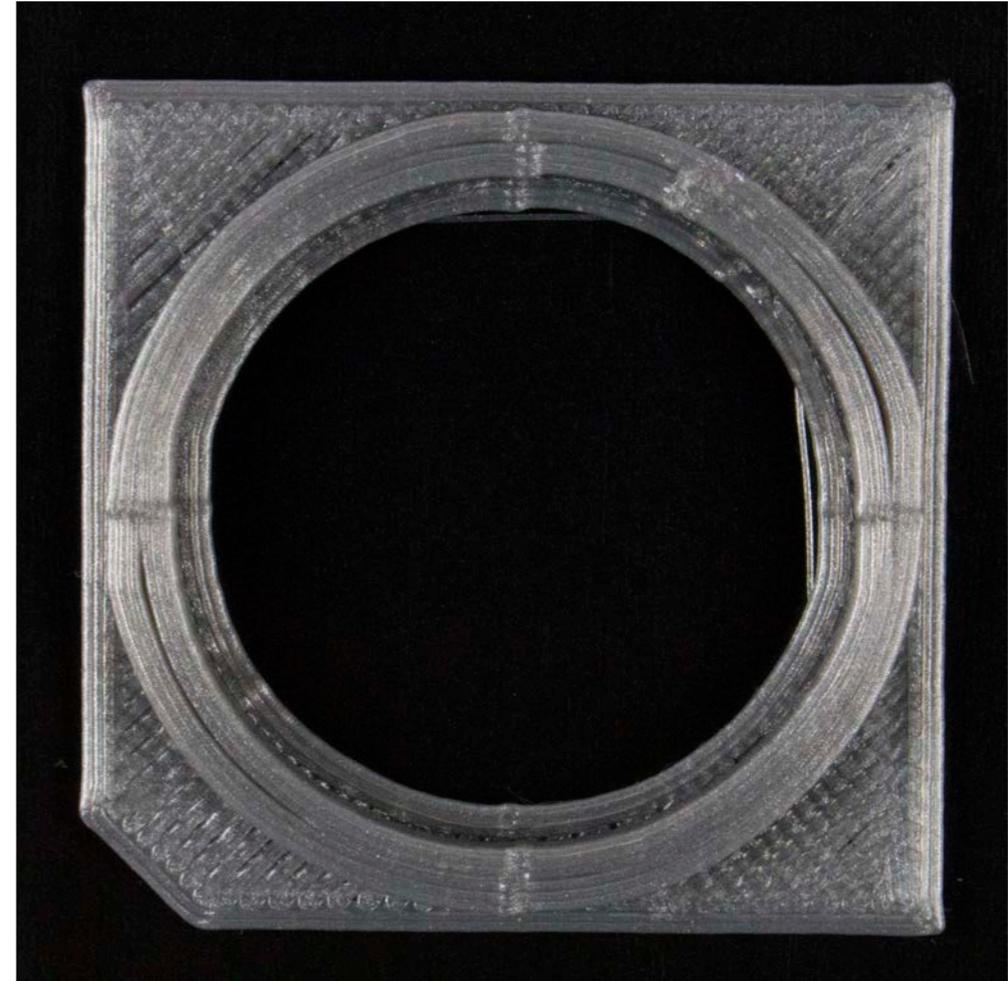

| X Backlash | 0.00 | mm |
| Y Backlash | 0.00 | mm |

| X Backlash | 0.24 | mm |
| Y Backlash | 0.00 | mm |

With each minor adjustment, you can see that the gaps are beginning to close:

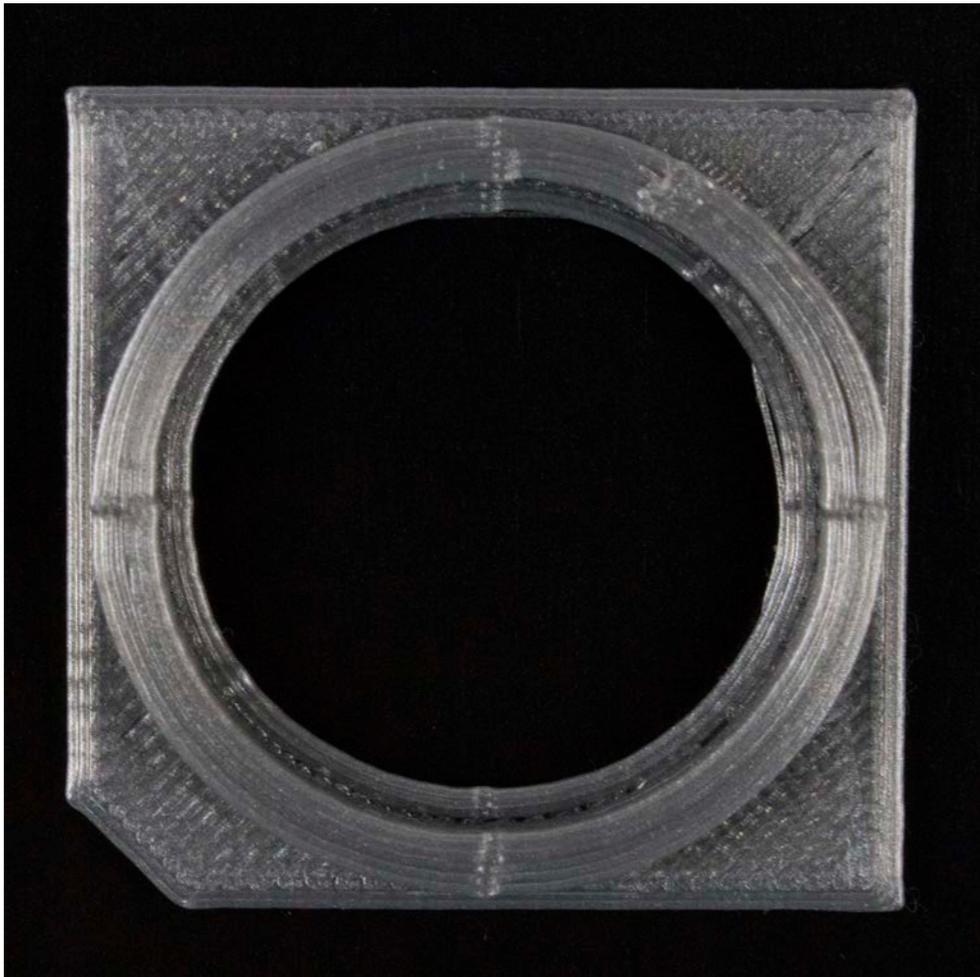| X Backlash | 0.24 | mm |
| Y Backlash | 0.65 | mm |

| X Backlash | 0.35 | mm |
| Y Backlash | 0.65 | mm |

When there are no more gaps, you have successfully adjusted your backlash settings!

X Backlash	0.46	mm
Y Backlash	0.65	mm

X Backlash	0.60	mm
Y Backlash	0.76	mm

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