



The ideal approach to pulling a Patch Pipette (1-3 μ Tip)

First install one of the following programs:

P-97 & Trough Filament:	Heat= Ramp+15	Pull= 0	Velocity= 50	Time= 150	Pressure= 500
P-97 & Box Filament:	Heat= Ramp+10	Pull= 0	Velocity= 30	Time= 250	Pressure= 500
P-87 & Trough Filament:	Heat= Ramp	Pull= 0	Velocity= 50	Time= 150	Pressure= 500
P-87 & Box Filament:	Heat= Ramp+5	Pull= 0	Velocity= 30	Time= 250	Pressure= 500

With the appropriate program, load the glass, press pull and this single line will loop, we hope, four times. If it loops five to six times, increase the velocity by five units at a time until it loops four times. If it loops two to three times, decrease the velocity by five units at a time. A one-line program that loops four times should produce a patch pipette with a 1.0 to 2.0 micron tip.

To create the **most stable** program, do the following:

- First find a velocity that loops four times, and then find the entire range of velocity settings that loop four times by reducing the setting 3-5 points at a time until it loops five times. Then increase the velocity setting to the point at which it loops three times. Using the absolute mid-point of the velocity range will create the most stable and reproducible program for 1mm OD glass. If you are using 1.5mm OD glass, it is best to use 2.5mm x 2.5mm or a 3mm x 3mm box filament and velocity setting that is 3 to 4 units above the mid-point.

How to adjust the program to make the tip **smaller**:

- To create a smaller tip with a slightly longer taper, find the range of velocities that loop three times (instead of four) by gradually increasing the velocity and choosing the middle value.
- If you would like to maintain the short taper length while reducing the tip size, you should write out a four line program based on the one line program you previously established.

If your program was:

Heat	Pull	Velocity	Time	Pressure
285	0	45	150	500

- Create a four line program like the one below, where the velocity on the third line is reduced by five units, and a slight amount of pull and is added to the fourth line. For even smaller tips, first decrease the time and then increasing the heat on the fourth line. Pull a pipette after each adjustment and make only one modification at a time.

	Heat	Pull	Velocity	Time	Pressure
Line 1)	285	0	45	150	500
Line 2)	285	0	45	150	500
Line 3)	285	0	40	150	500
Line 4)	285+	5-10	45	100	500

How to adjust the program to make the tip **larger**:

- Create a four line program like the one below, where the heat on the last line is gradually reduced. The final tip size will vary according the level of heat on the last line.

	Heat	Pull	Velocity	Time	Pressure
Line 1)	285	0	45	150	500
Line 2)	285	0	45	150	500
Line 3)	285	0	45	150	500
Line 4)	245	0	45	150	500

- You may also try creating a one line program that loops five times or a five line program when using 2.0mm to 1.5mm OD thick walled glass.

NOTE: Pulling patch type pipettes will cause the brass jaws to retain heat, and for this reason the brass jaws are mounted on a heat tolerant nylon block. During consecutive pulls this heat retention can cause some variability in the tip ID and you will sometimes see the tip becoming slightly smaller. A minor reduction in heat or velocity can offset this change.

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