



Mechanical Assembly Guide V1.1 (For Purchased Devices)

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Overview

In this document we summarise the minor mechanical assembly required for the Chi.Bio platform's pumps when purchased ready-built from Labmaker. This takes approximately 5 minutes per device, and requires a screwdriver and pair of scissors.

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1 Pump Board Assembly

1.1 Assembling Legs/Stack

To prevent damage the pump board is shipped with its legs detached. These are connected as illustrated in Fig. 1 using the PumpClamp PCBs (to hold the pumps in space) and nuts/spacers.

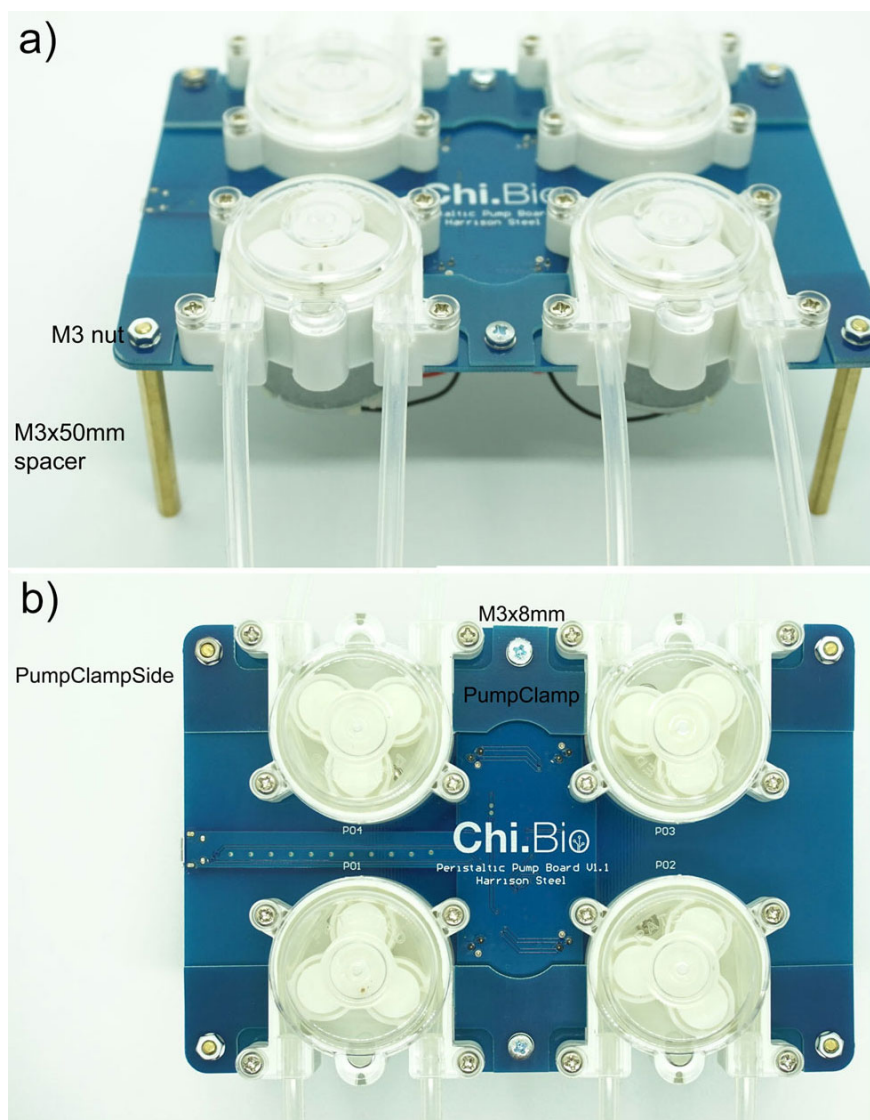


Figure 1: Assembly of the pump PCB, which uses four peristaltic pumps, M3x50mm PCB spacers, M3 nuts, and the PCBs PumpClamp (x2), PumpClampSide (x4), and Pumps (x1). Note that the pump board can be assembled with only two or three pumps, depending on the user's needs.

It is possible to modularly stack multiple pump PCBs together, as illustrated in Fig. 2. This is done by removing the nut at the top of each of the pump board's legs, and then screwing on the PCB spacer for the pump board above.

1.1 Assembling Legs/Stack

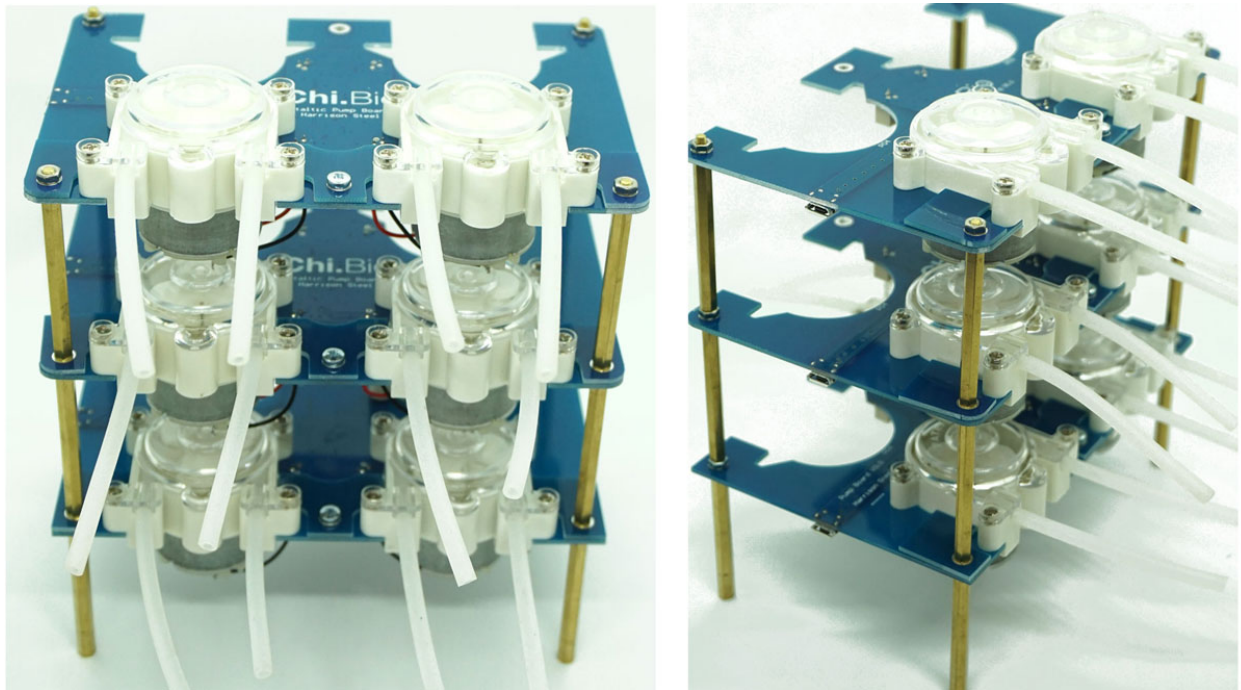


Figure 2: Multiple pump PCBs each with 2 pumps attached stacked together. In the place of the Pump-ClampSide PCBs on the rear side of the stack M3 nuts are used to ensure that each board remains level/equidistant.

1.2 Tubing

Generally it is easiest to secure each peristaltic pump to its PCB (i.e. following the steps in the previous section), prior to adding/changing their tubing. The pumps are designed for silicone tubing with 2.5mm interior diameter / 4.5mm exterior diameter, and replacement pumps can easily be found online (e.g. eBay, AliExpress).

To disassemble the pump head remove the four screws indicated in Fig. 3. The original tubing can then be lifted out, as can the three rollers of the pump head. To put a new tube in the easiest approach is to start from one side of the pump and push it down with your fingers whilst using the other hand to slowly rotate the pump head. Ensure the tubing is properly pushed down between the rollers and the side of the pump head prior to re-fastening the lid.

Once the lid is re-fastened test that each pump makes a good seal by pumping some water through it. If the seal is poor a good initial fix is to turn the pump on and then pull the tube through the head (by a few centimeters) slowly in the direction it is turning. If it still fails to make a good seal you may need to remove the head's cover and push the tube further into the pump head. I would recommend running pumps for \sim 20 minutes continuously when you are setting them up for the first time (pump some water with both ends in the same cup) to allow them to “settle” (I assume the silicone tubing inside the pump head takes some time to soften, and then they work much more reliably). Due to manufacturing variability in the pumps and silicone tubing, situations may arise in which their dimensions stack up to resulting in a poor seal and pumping performance. If, following the above steps, the pumping is still not consistent, then perform the easy modifications described in the “Pump Modification” section below.

It may be useful to cut a small “V” or nick into the input end of pump 1’s tube (i.e. the end of the tube that will go into the fresh media) to prevent the tube suctioning itself to the side of your fresh media vessel.

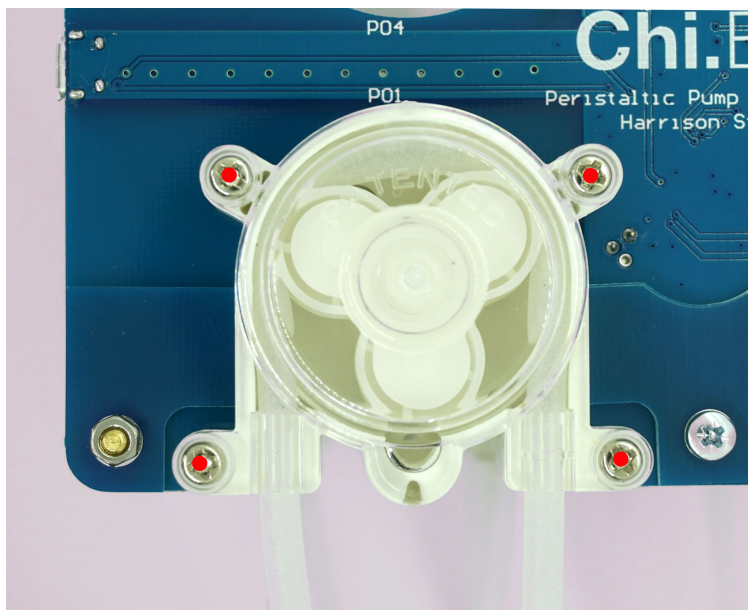


Figure 3: Pump head, disassembled by removing the four screws indicated in red.

1.2.1 Pump Modification

An easy method for increasing the contact force between the peristaltic pump rotor and the silicone tubing is lining the internal peristaltic pump surface with one or two layers of tape. In Fig. 4 I demonstrate this with normal Autoclave tape, though other types of tape (e.g. electrical) may work even better. This doesn't

1.2 Tubing

need to be an overly precise operation; you just need to slightly reduce the distance between the wall and the pump rotor to ensure the tube is completely pinched off inside the pump. Ensure that you don't have too much tape (in the vertical direction) preventing you from re-fastening the clear plastic lid of the pump properly.

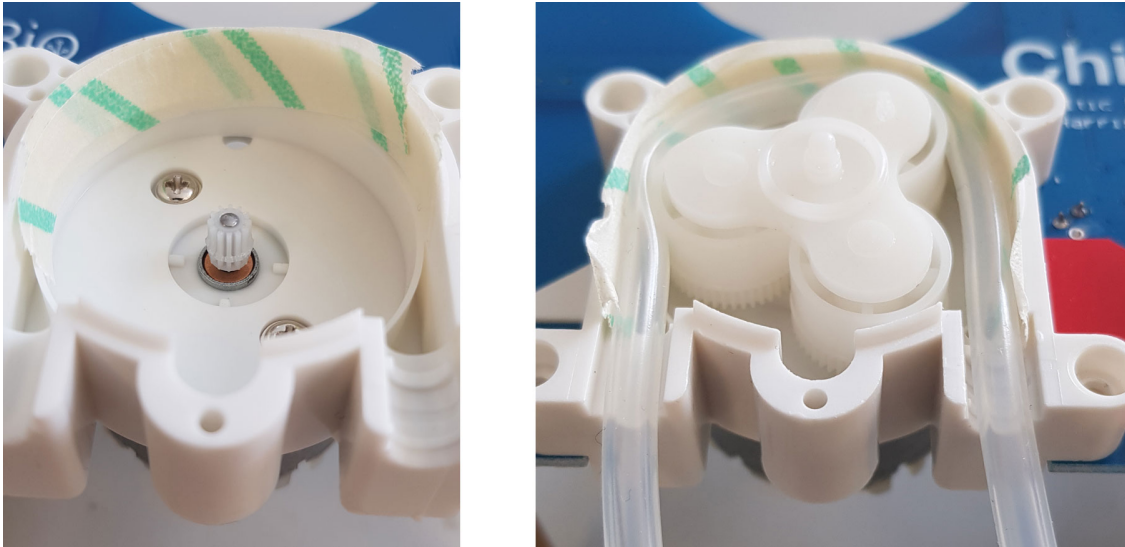


Figure 4: Pump head with tube in place with/without rotor and silicone tubing. This simple fix can salvage a faulty pump/tubing if encountered.