

ReadMe

Guide to mount our 3Dbioprinter

The drawings presented in this guide were made using the software FreeCAD version 0.20, which was complemented with the add-on named "parts library". This add-on contains many ready-made parts that may be used in many projects. In our project, some of these parts, like screws and Arduino Mega board were used.

In addition, the following parts available in the "Grabcad" library repository (grabcad.com) were used as it is or with some modifications and, all credits to the respective authors of the parts are given:

"Cannula G21 for Syringe"

Scarus, 2021

<https://grabcad.com/library/cannula-g21-1>

"Syringe 3 ml"

Kaloyan Georgiev, 2022

<https://grabcad.com/library/syringe-3-ml-2>

"Arduino Uno CNC Shield"

Anirudh Pednekar, 2021

<https://grabcad.com/library/arduino-uno-cnc-shield-1>

(only the CNC Shield3.0 model were used)

"Syringe pump model 2"

Eng. karim samhy, 2021

<https://grabcad.com/library/syringe-pump-model-2-1>

"Optical-endstop-for-3d-printers"

Sergiy Ozymok, 2017

<https://grabcad.com/library/optical-endstop-for-3d-printers-1>

A. Mounting the base and gantry

Two parts of structural base was joining with tin soldering, linked sides of gantry and the base. The plates was fixed with screws or epoxy glue for better adhesive.

B. Components within the optical head must be carefully removed.

Depending on manufacturer, CD/DVD Rom can be varied, as well as the position of hole in the base. The liner track vary a range of 35 to 40 mm. Drivers were linear linked.

C. First assembly and electronic modules

Printing table was made using a metallic table and acrylic baseplate with 90 x 90 mm of dimension. The printing table was attached with screws. The print head was made using a luer lock syringe and attached using a U bracket fixed with screws. And electronic modules such as Arduino Mega and CNC Shield board were attached on the gantry.

D. End-stop sensors

Optical end-stop sensors for X, Y and Z axis. These sensors have a LED infrared emitter and infrared separated by a gap and they were fixed in linear driver.

E. Final view of Bioprinter assembly

The infuser pump by step was connected directly to ARDUINO/CNC board. 3mm endotracheal catheter fitted in the 12GA needle and glued internally to the tip of the 3mL syringe with epoxy glue. The head printer was positioned over the print table and it is possible to replace the 23G needle of extrusion

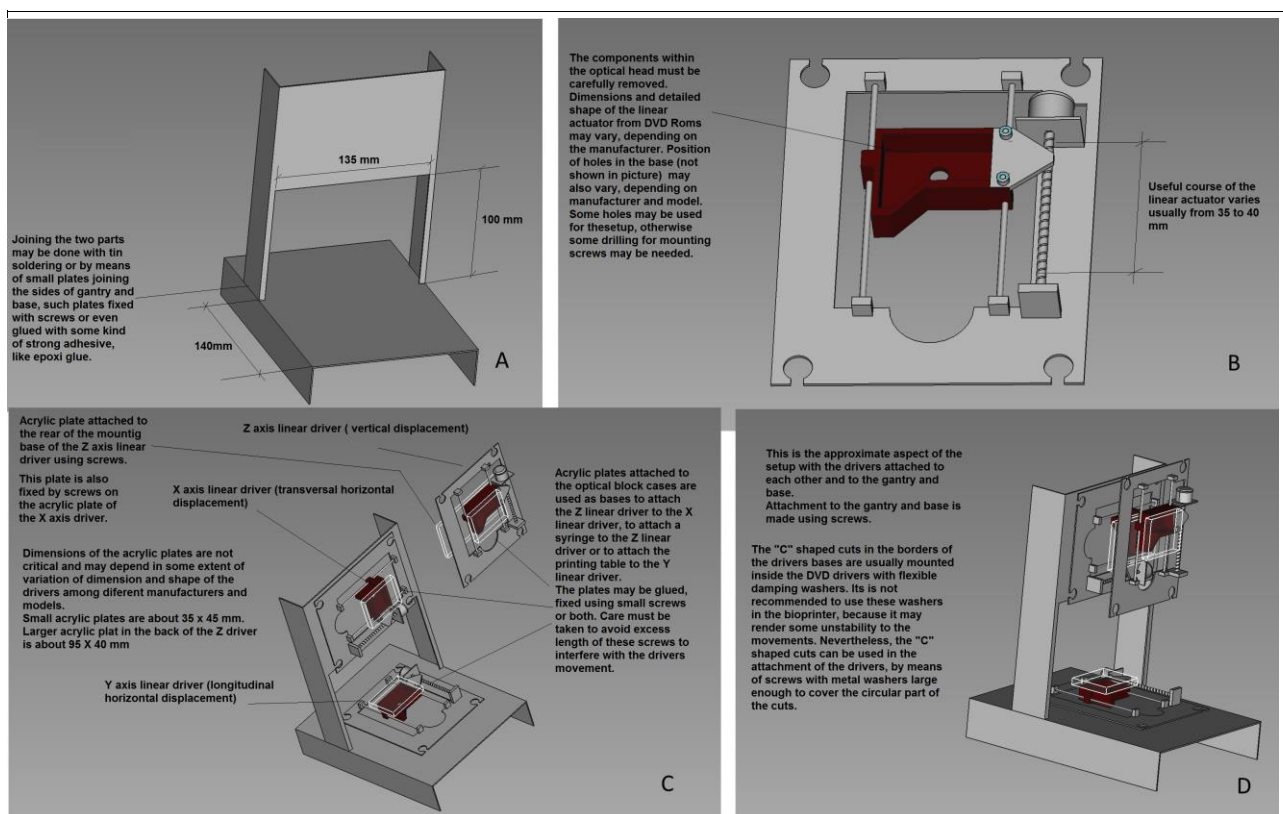


Figure 1 – First steps to the mounting of the bioprinter.

A – Mounting of the base and gantry; B – Detail of the linear actuator obtained from scrap DVD drivers; C – Positioning and attachment of the linear drivers; D – Aspect of the three drivers in these respective positions.

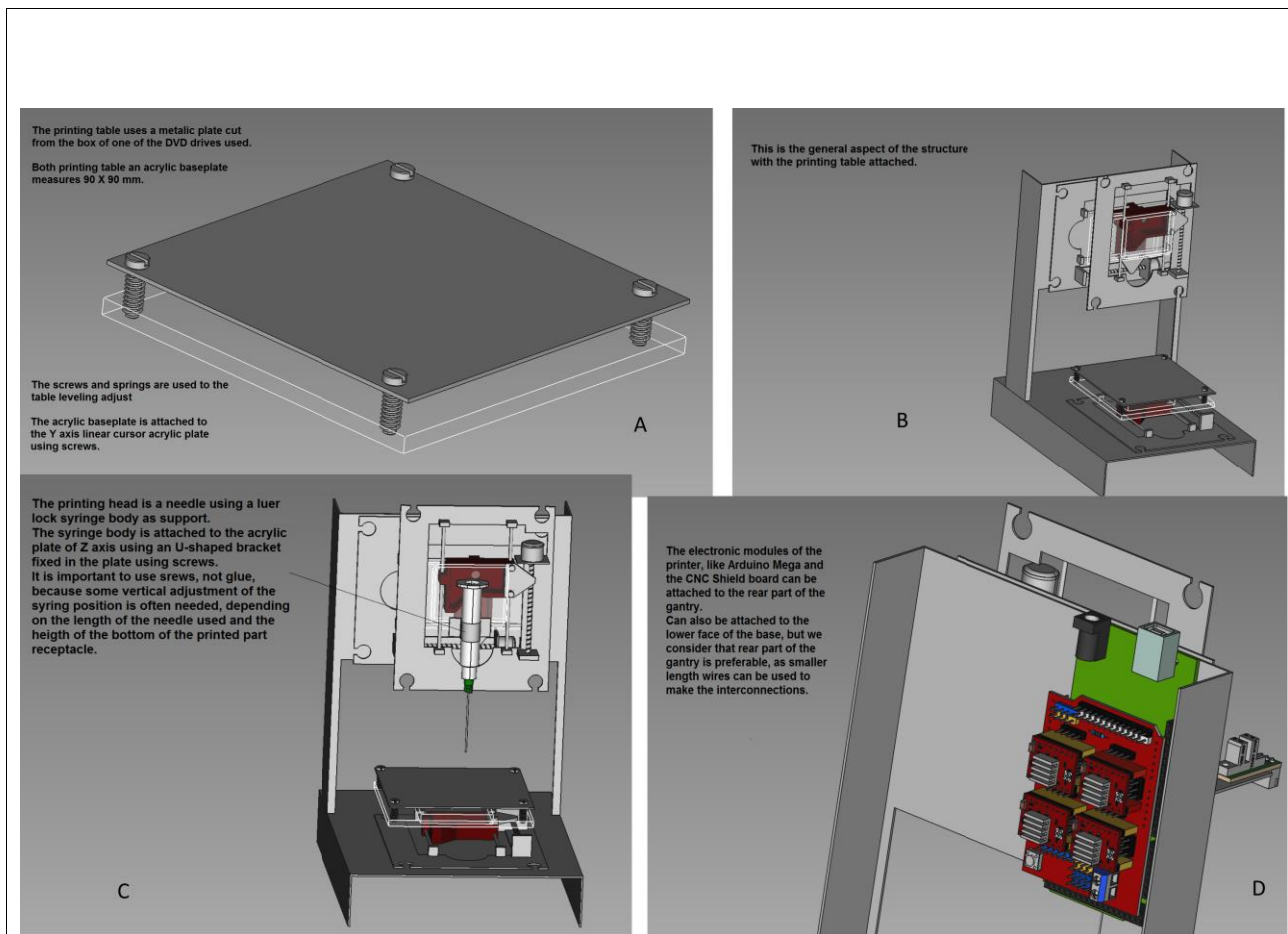


Figure 2 – Sequence of the mounting procedure

A – Detail of the printing table and its base plate; B – Aspect of the printing table attached to the Y axis linear cursor; C – Aspect of the printing head attachment; D – Attachment of the electronic parts;

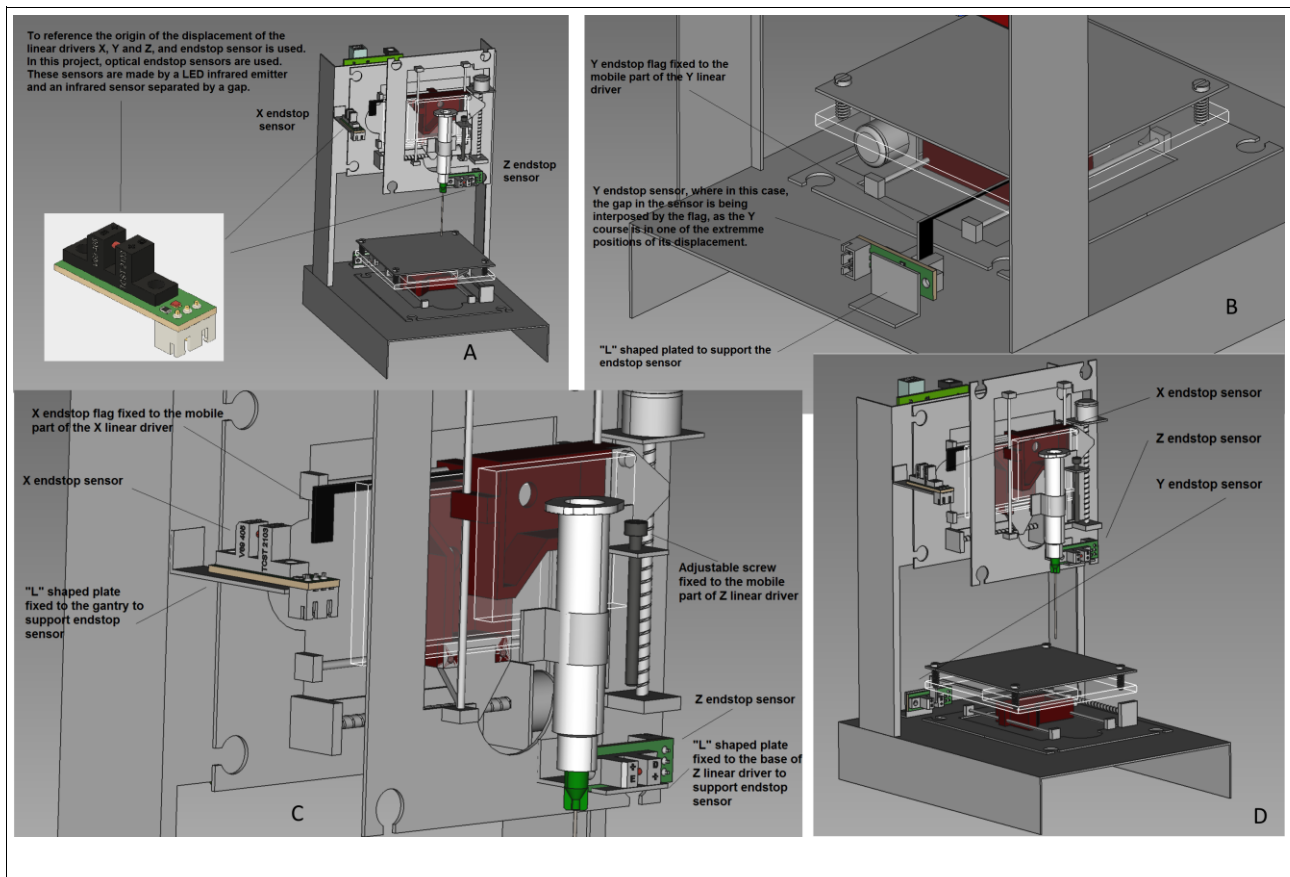


Figure 3 – Endstop sensors placement

A – Explanation about endstop sensors; B - Endstop sensor Y placement; C – Endstop sensors X and Z placement; D – General view of endstop sensors positioning;

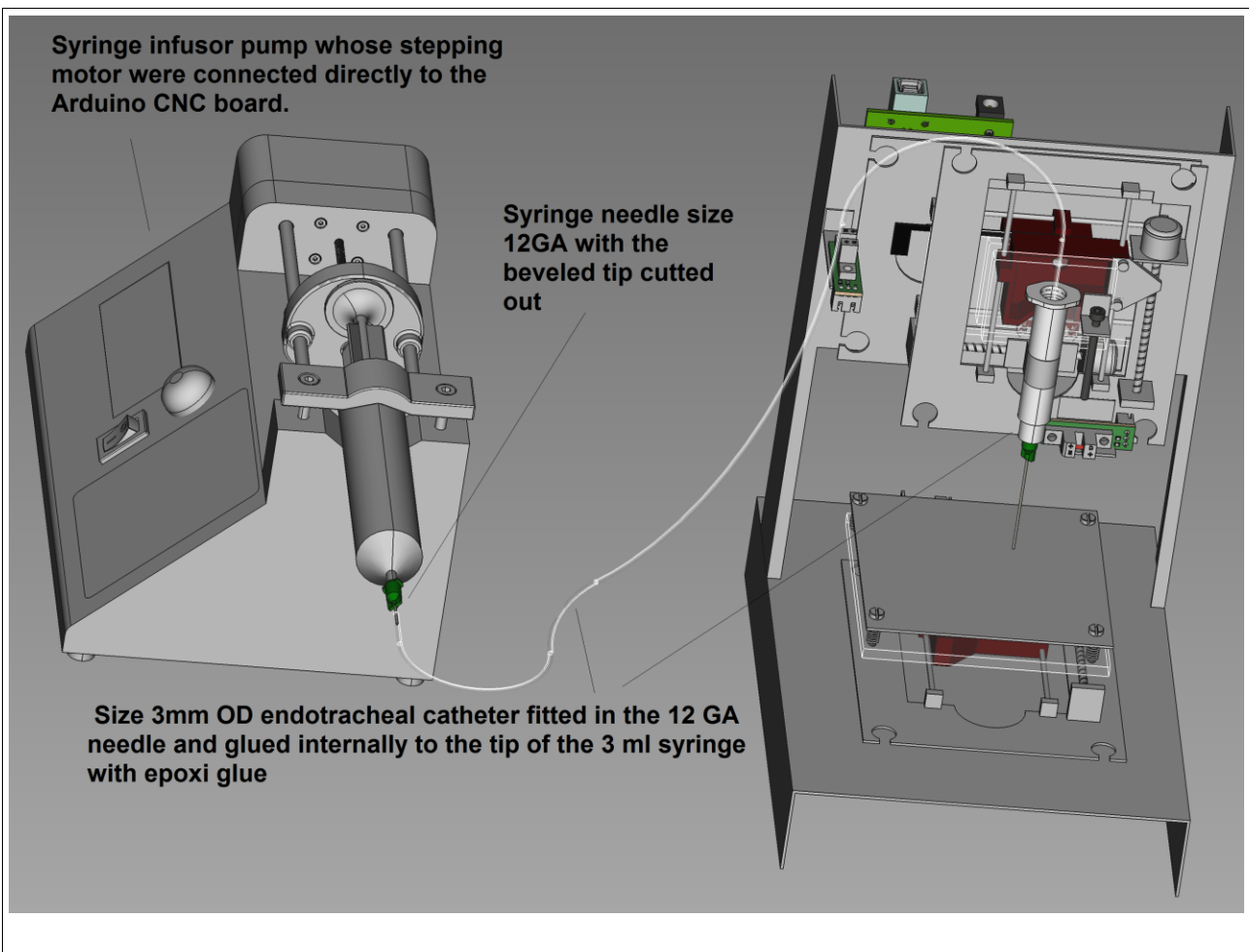


Figure 4 – Complete view of the bioprinter, including detail of the injection system. The infusion pump used was obtained from scrap and, though not exactly equal to the pump represented in this figure, have main similarities with it.