LULZBOT®
Bio

START HERE

YOUR
IMAGINATION
BUILT BY
LULZBOT®

LULZBOT Bio

Welcome to the LulzBot Community

Thank you for choosing the LulzBot® Bio Printer. This Quick Start Guide will familiarize you with the proper use and operation of your FRESH™ Certified LulzBot Bio. By the time you finish, you will have completed a calibration test on your new printer.

Your LulzBot Bio is a **FRESH™** (*F*reeform *R*eversible *E*mbedding of *S*uspended *H*ydrogels) **Certified** bioprinting platform that enables the fabrication of soft, biological scaffolds for applications in tissue engineering and regenerative medicine.

> **i**
> *Complete documentation is available online at **LulzBot.com/downloads**. If you have questions while setting up your LulzBot Bio, please contact our technical support team by emailing **Support@LulzBot.com** or by calling **1 (701) 809-0800 x 2**. Learn more at **LulzBot.com/Support**.*

> **!**
> *Read the included User Safety Sheet completely before beginning the Quick Start Guide.*

The FRESH™ acronym is a Trademark of FluidForm™ 3D Bioprinting.

LulzBot Bio Printer Key Components

SD Card Slot

Touch Screen LCD

Print Bed

Power Switch

USB Port

AC Power Port (back)

Bed
26°C

Feed motions   No

LULZBOT
BIO

ON
I
O
OFF

Syringe Pump

Syringe Thumbscrew

Plunger

Syringe Clamp Base

Syringe Clamp Block

Syringe

Needle
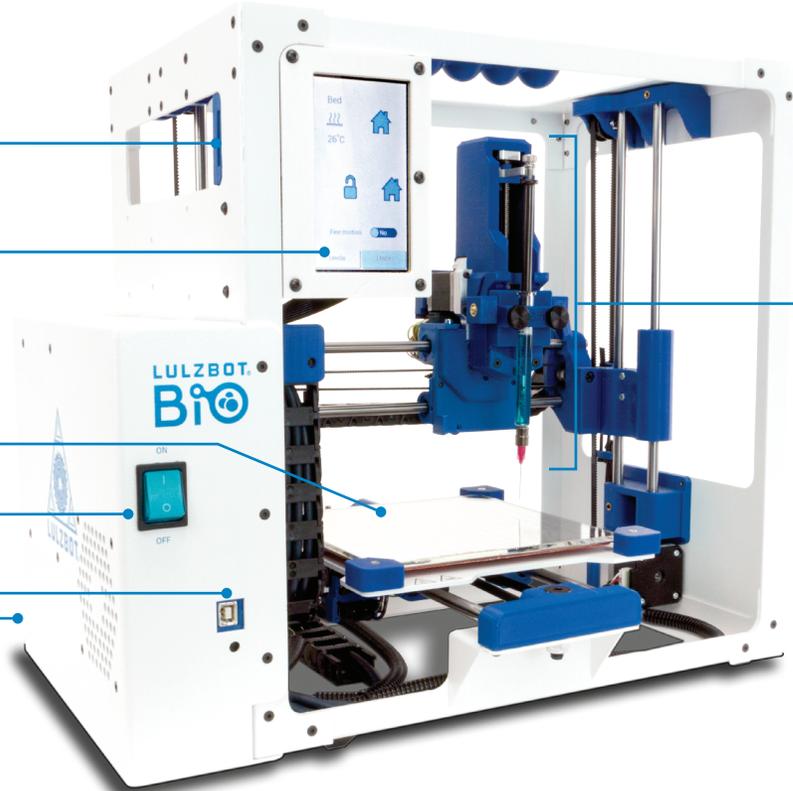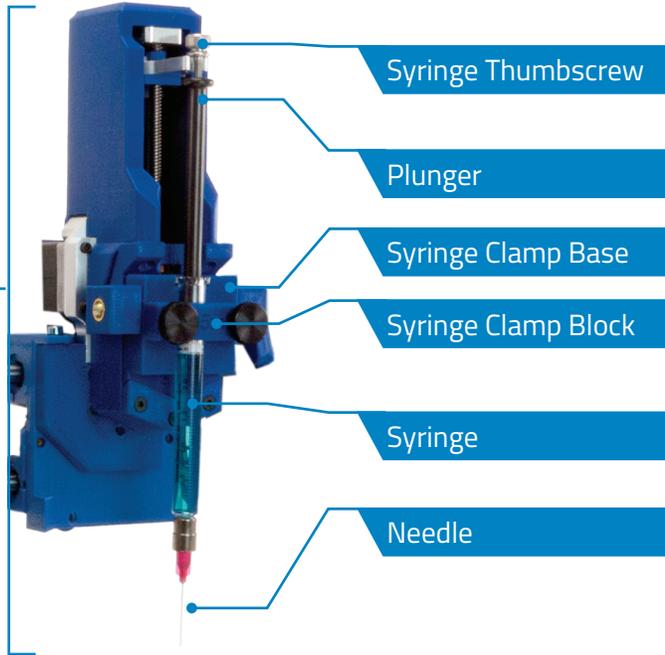
Cartesian Coordinate System
The LulzBot Bio can move on three linear axes: X, Y, *and* Z.

Z

Y

X
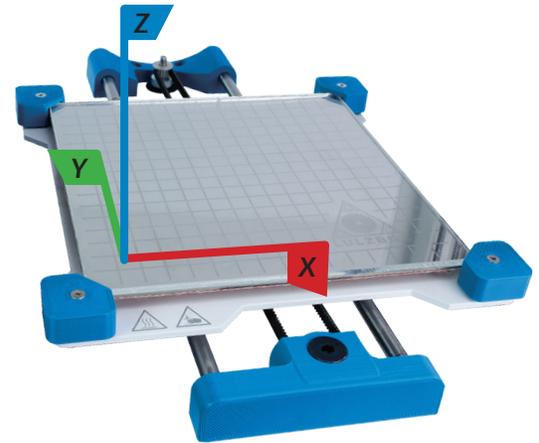
Unpack your LulzBot Bio Printer

2.1 Open the top of the box (labeled OPEN), then carefully remove the top piece of protective foam and other included materials. Grasp the handle located under the front left of the frame as shown and place your LulzBot Bio on a flat and level surface. Ensure there is 15cm (6 in.) of clearance in every direction.

> ⚠️ *Be sure the space above the printer is kept clear so that the syringe pump can move up freely during operation.*

2.2 Remove all remaining packaging foam and confirm all items on the included packing list have been removed from the box. Save all of the provided packaging materials in the event that the printer needs to be transported or shipped for warranty service in the future.

!
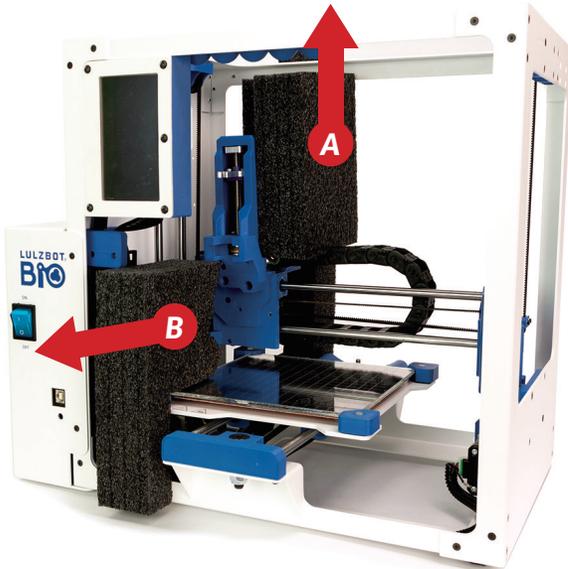
*Save the box and **all** provided packaging materials! In the event that warranty service is necessary, the Bio printer **must** be shipped in its original packaging.*
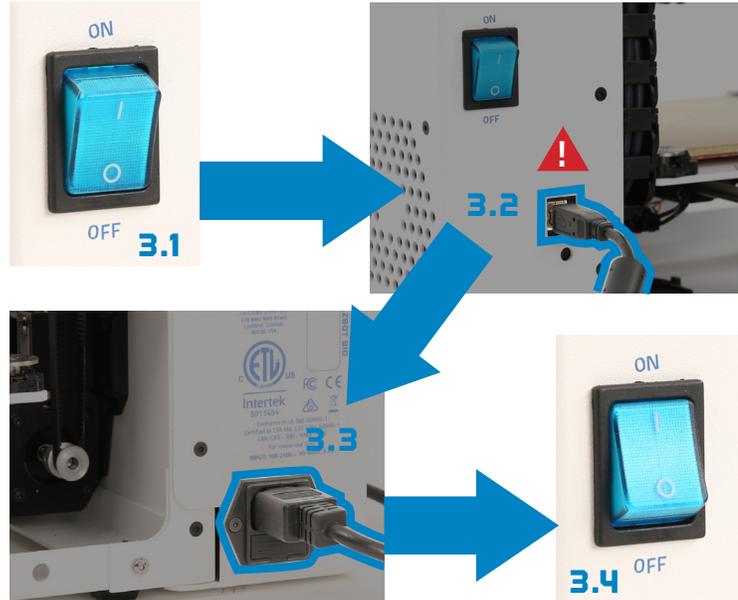
3 Connect and Power On Your LulzBot Bio Printer

3.1 Verify that the power switch on the front of the LulzBot Bio is in the **OFF** position.

3.2 Plug in the included USB cable, connecting the LulzBot Bio to a computer.

3.3 Plug in the AC power connection.

3.4 Flip the power switch to the **ON** position to turn on the LulzBot Bio.

⚠ *The included USB cable must be plugged in before the LulzBot Bio is powered on. Plugging in after the printer is powered on will restart the printer.*
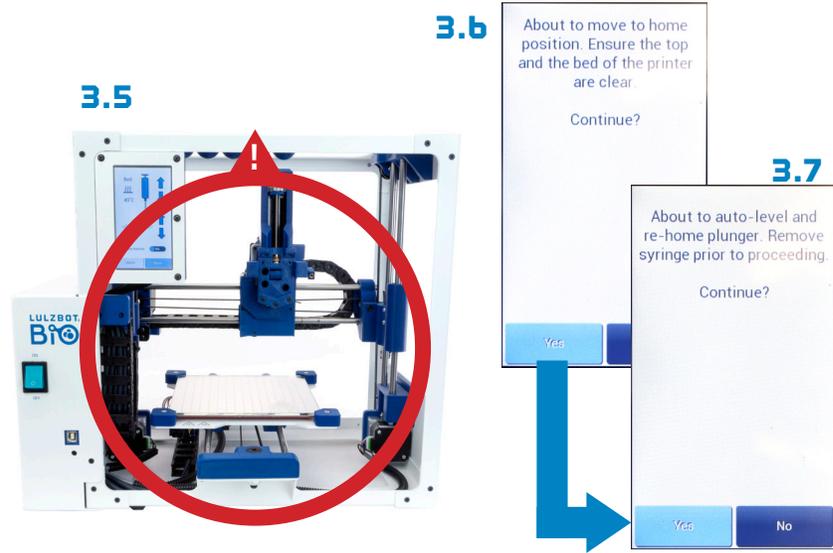
3.5 ⚠ Ensure that the top of the printer is unobstructed, the print bed is clear and there is no syringe installed on the tool head.

3.6 Every time the LulzBot Bio powers on, it will attempt to auto-home. Verify that the syringe plunger and print bed are clear then press **YES** when prompted on the LCD screen.

3.7 After auto-homing, your LulzBot Bio will re-home the syringe plunger and level the x-axis gantry. Verify that the syringe plunger and print bed are clear then press **YES** when prompted on the LCD screen.

3.5

3.6
About to move to home position. Ensure the top and the bed of the printer are clear.

Continue?

Yes

3.7
About to auto-level and re-home plunger. Remove syringe prior to proceeding.

Continue?

Yes   No

⚠ *Always remove the syringe from your LulzBot Bio before the auto-homing and auto-leveling processes. Failure to do so could result in damage to the printer or other equipment. It is recommended that unless printing, the syringe should always be removed after a print.*

4 Setting up Cura LulzBot Edition

4.1 Cura LulzBot Edition is the recommended software to control your LulzBot Bio. It includes built-in support for compatible materials that are optimized for use with the Bio. Find installation instructions, troubleshooting information, and more at **LulzBot.com/Cura**.

Already have Cura LulzBot Edition? Update now to get additional material support and new slicing profiles. Expert help and advice are available at **LulzBot.com/Support**.

> *There may be later versions of Cura LulzBot Edition available at **LulzBot.com/Cura**, with added features and functionality. We recommend checking for updates regularly.*

> *The LulzBot Bio is compatible with Cura LulzBot Edition version 3.6.22 and later. If you have an older version of Cura LulzBot Edition installed you will need to download the latest version in order to use your LulzBot Bio.*

4.2 Launch Cura LulzBot Edition. If this is your first time using Cura LulzBot Edition, the **Add Printer** menu will automatically appear. Select **LulzBot Bio**, then click **Add Printer**. Existing users should select the **Settings** drop-down menu, **Printer**, then **Add Printer**. On the next menu that appears, click **Finish** to complete the printer setup. Cura LulzBot Edition is now ready for use with your LulzBot Bio.
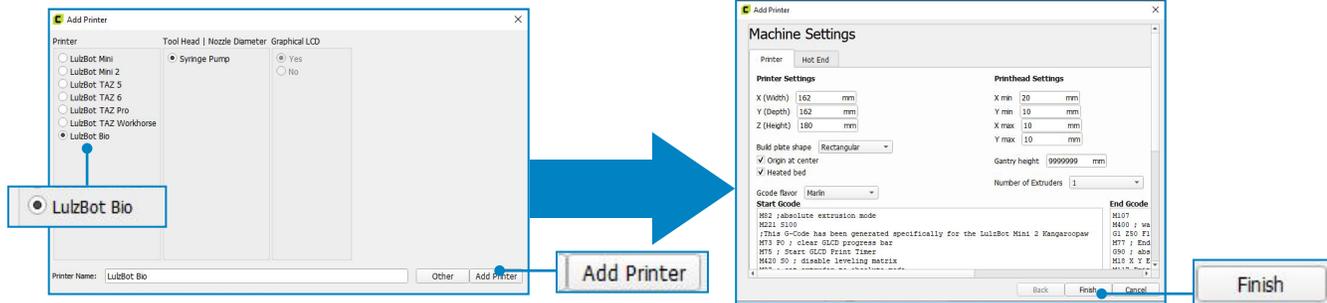

4.3 New firmware is consistently being developed to add new functionality and ensure your LulzBot Bio is creating the best quality prints. Update the printer firmware now by clicking the **Settings** drop-down menu and selecting **Printer,** then **Manage Printers**... With **LulzBot Bio** highlighted, click **Upgrade Firmware** and select **Automatically Upgrade Firmware**. Follow the prompts to install the latest firmware.
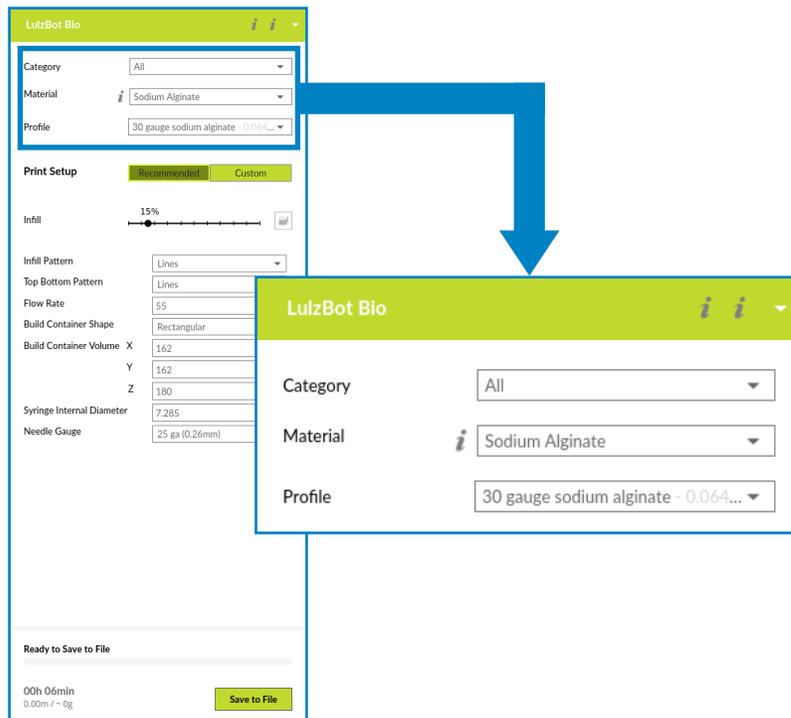
Ч.Ч The first print model, **Right_ Coronary_Artery_Tree.stl**, will automatically load into Cura LulzBot Edition's virtual print bed the first time you run Cura LulzBot Edition with your LulzBot Bio.

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*If the First Print model is not present in the virtual print bed, you can download it from download.LulzBot.com/Bio/1.0/ sample_prints/Right_Coronary_ Artery_Tree.stl or the included SD card, then load it into the virtual print bed using the **Open File** button in the main Cura interface.*
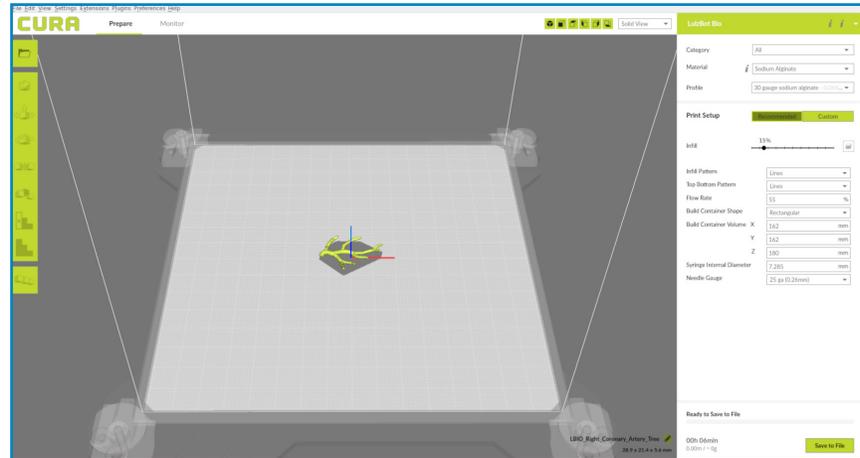
4.5 In the **Prepare** sidebar on the right side of the screen, confirm that **Sodium Alginate** is selected for material and **30 gauge sodium alginate** is selected for the profile.

LulzBot Bio

Category	All
Material	Sodium Alginate
Profile	30 gauge sodium alginate - 0.064...

Print Setup Recommended Custom

Infill 15%

Infill Pattern	Lines
Top Bottom Pattern	Lines
Flow Rate	55
Build Container Shape	Rectangular
Build Container Volume X	162
Y	162
Z	180
Syringe Internal Diameter	7.285
Needle Gauge	25 ga (0.26mm)

Ready to Save to File

00h 06min
0.00m / ~ 0g Save to File

LulzBot Bio

Category	All
Material	Sodium Alginate
Profile	30 gauge sodium alginate - 0.064...

5   Preparing Your LulzBot Bio to Print

5.1 Locate the included samples of Sodium Alginate and LifeSupport™. We strongly recommend using the included sample materials for your first Bio print.

5.2 Follow the visual guides at **LulzBot.com/lulzbot-bio-quick-start-guide** or use the QR codes below to prepare the included materials for printing.

LifeSupport™ Video
Scan the QR code to open the video link on your device.

Sodium Alginate Video
Scan the QR code to open the video link on your device.

> **i** *Your LulzBot Bio is developed and built to print a variety of materials. Each material may have different preparation and printing steps. Always consult manufacturer instructions before printing with a new material.*

> **!** *Some materials may take minutes or hours to mix and prepare. Fully prepare all materials before moving on to the next step.*

LifeSupport™ is a Trademark of FluidForm™ 3D Bioprinting.

5.2 To transfer the LifeSupport™ to the included petri dish, scoop with a spatula, or tap the container to dislodge and pour it in. Once the LifeSupport™ has been transferred, firmly tap the petri dish against a flat surface to settle the LifeSupport™ in place with no bubbles suspended in the material.

5.3 Apply three pea-sized amounts of vacuum grease to the bottom of the petri dish, then place the petri dish firmly at the center of the print bed. This holds the petri dish in place during the printing process.
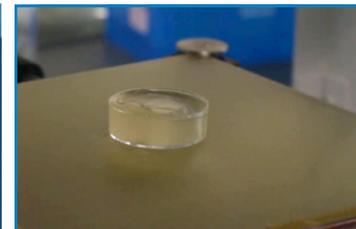
⚠️ *Be careful when tapping any glass containers to avoid cracking or breaking.*
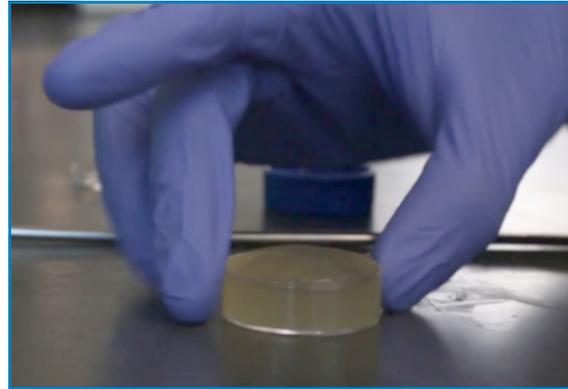
5.2 Tap firmly to settle LifeSupport™

5.3 Apply vacuum grease

Place petri dish

5.5 Before attaching a dispensing needle to the syringe, load it with sodium alginate. Push out any air bubbles that may appear while loading the syringe. Bubbles that appear in the Sodium Alginate while mixing can be removed with a centrifuge.

5.5 Load syringe with sodium alginate

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The syringe must be free of air bubbles in order to print successfully. If air bubbles are present, flip the needle upside down, put a finger over the tip, and pull back to create a vacuum. Then release your finger to move the bubble to the top of the syringe. Slowly compress the syringe until all of the air is pushed out, then proceed to fill the syringe normally.

5.6 Choose the correct size syringe clamp for your syringe. Each pair of clamps is marked 2.5ml, 5ml, and 10ml. Your Bio comes with a 2.5ml syringe, the 5ml and 10ml syringes are optional. All three Gastight syringe sizes are availble at **LulzBot.com**.
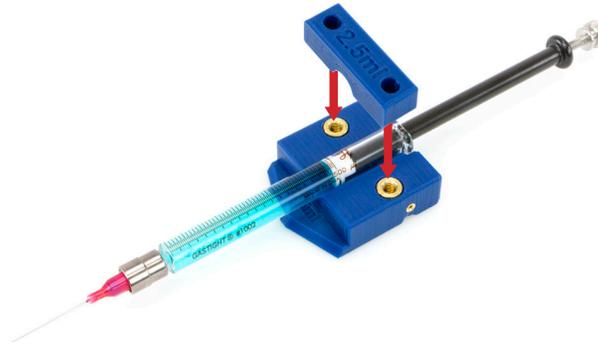
Clamping Block

Clamp Base

Thumbscrews

5.7 Set the clamp base on a flat surface. Place the loaded syringe on the clamp base. Line up the top flanges of the syringe barrel with the indents on the top of the clamp base.
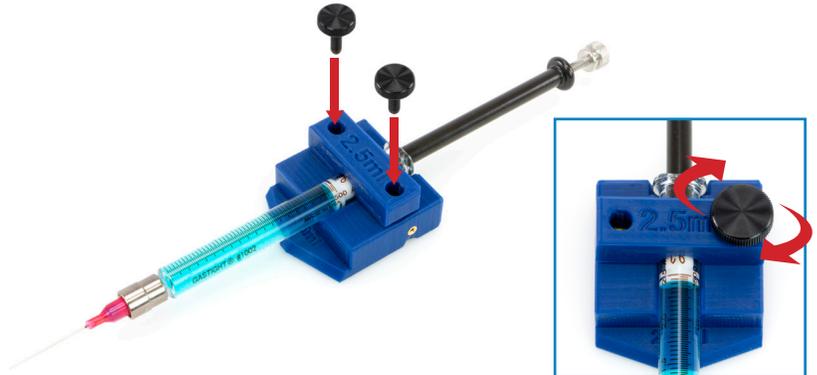
5.8 Put the clamp block over the top of the syringe, aligning the holes in the clamp block with the brass inserts on the clamp base.


5.9 The clamp thumbscrews should be threaded into the brass inserts of the clamp block. Tighten clamp thumbscrews clockwise to secure the clamp block evenly.

⚠️ *DO NOT OVERTIGHTEN the clamp block. You may damage the syringe or the clamp assembly!*

5.10 Place the assembled syringe and clamp into the syringe pump cradle by sliding the "V" shaped bottom in (A), then push the syringe clamp toward the syringe pump cradle until it "pops" into place (B).
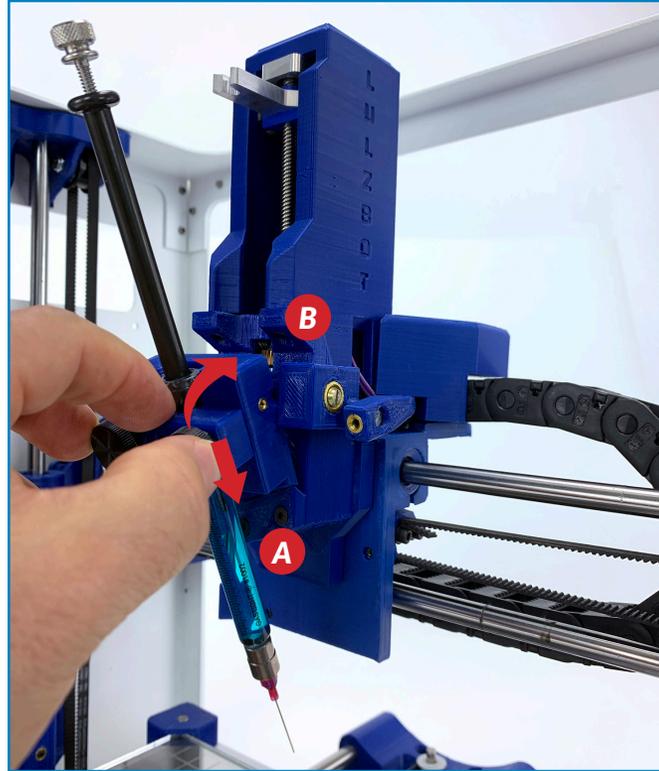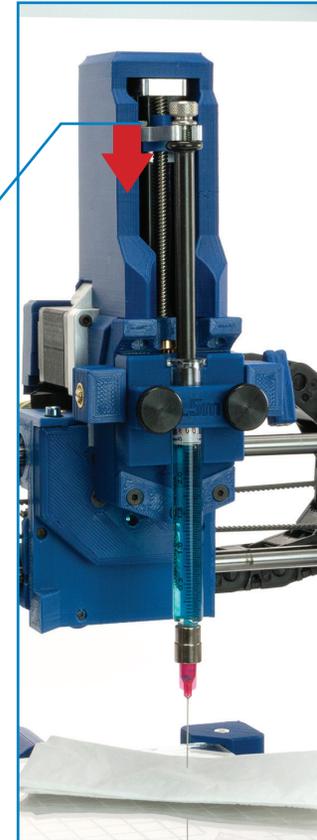
5.11 Using the touchscreen LCD, move the plunger connection on the syringe pump down until it is in contact with the plunger **A**. Use the syringe thumbscrew to securely fasten them **B**.
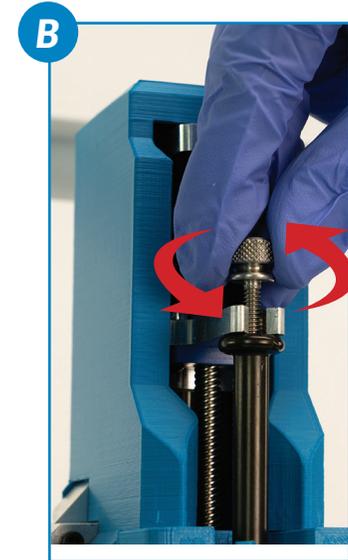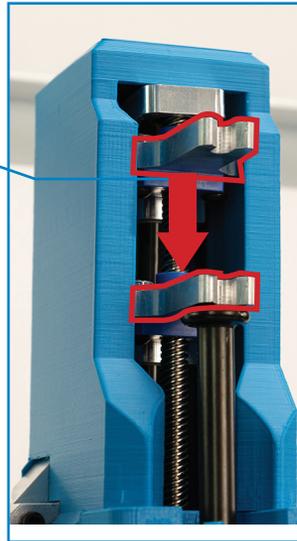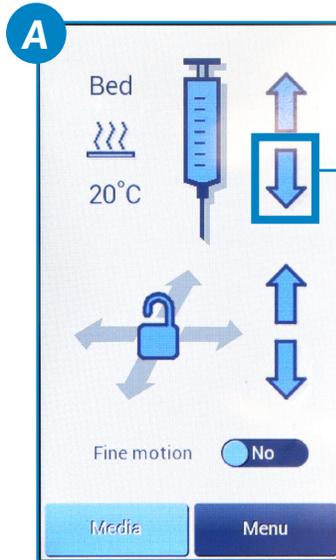
i *If needed, turn fine motion on by using the button on the LCD screen to show the speed of the syringe pump.*

5.12 Hold a paper towel under the syringe, then continue moving the plunger down in order to prime the syringe for printing. This will release a few drops of material and clear the needle of possible air bubbles.

> ⚠️ *Always use caution when handling the syringe and needle. Though it is blunted, it may still cause injury. Always dispose used needles safely in a sharps container.*
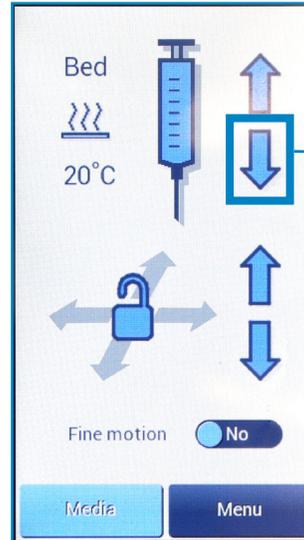
5.13 Manually center the needle above the petri dish by moving the syringe pump and print bed carefully into place by hand **A**. Using the touchscreen LCD controls, move the syringe pump down until the needle is just inside the LifeSupport™ material in the petri dish **B**.
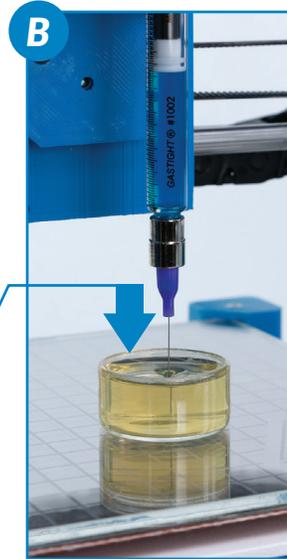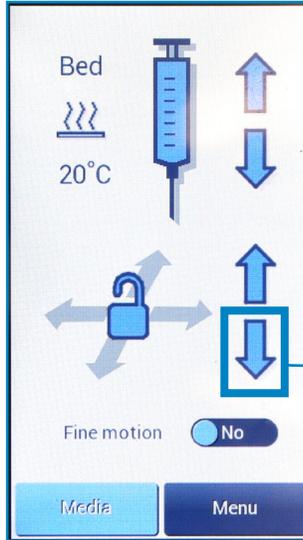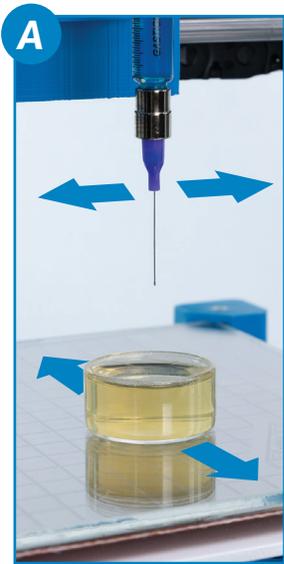
5.14 Move the print bed back until the needle tip is clearly visible when looking at the side of the petri dish Ⓐ. Switch to fine control using the button on the LCD screen, then continue to move the syringe pump down until the needle is roughly 1 mm above the bottom of the petri dish Ⓑ. Once the needle is in position, move the bed forward until the needle is in the center of the petri dish Ⓒ.

ⓘ *When a print is started, the printer uses its current position as the home position and bases the placement of the print on that position.*

Starting Your First Print
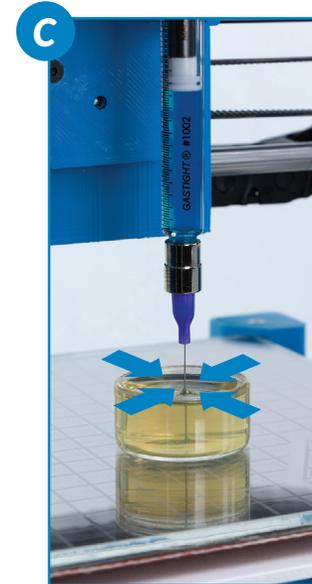
> ⓘ If you need to make changes to your model, use the **Prepare** sidebar in Cura. Once changes are made, Cura will automatically begin implementing the changes (also known as re-slicing).

> ⓘ Confirm that your model fits fully within the dimensions of the petri dish. If it is too large, the needle will make contact with the petri dish, causing it to move and the print to fail. Print dimensions can be found in Cura by selecting the print and clicking on the **Scale** button on the left side of the window while in **Prepare** mode. If a model is too large to fit in the current container, switch to a container of the appropriate size.

> ⓘ Your LulzBot Bio can be operated without a USB tether to a computer by using the touchscreen LCD and included SD card. Once models are sliced and a .gcode file is saved they may also be saved to the included SD card by clicking **Save to File**. Once saved, models may be printed directly from the SD card by plugging it into the slot located on the left side of the touchscreen LCD, pressing the **SD card** button, and selecting the model you would like to print.

6.1 Your LulzBot Bio is now ready to print! Click on the **Monitor** button at the top of the main Cura interface. This will change the sidebar on the right side of the screen to show printer information and controls.
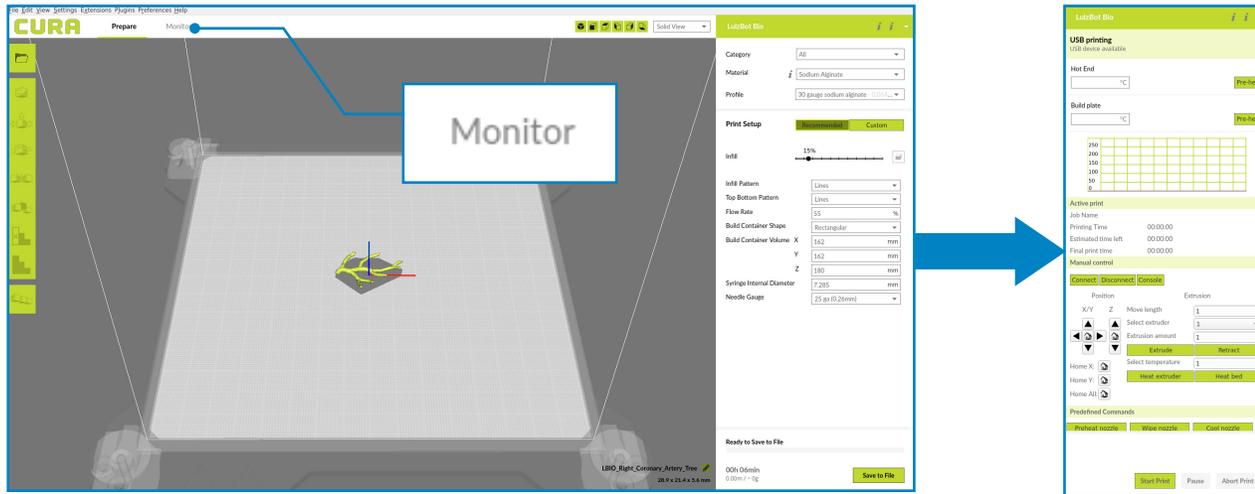
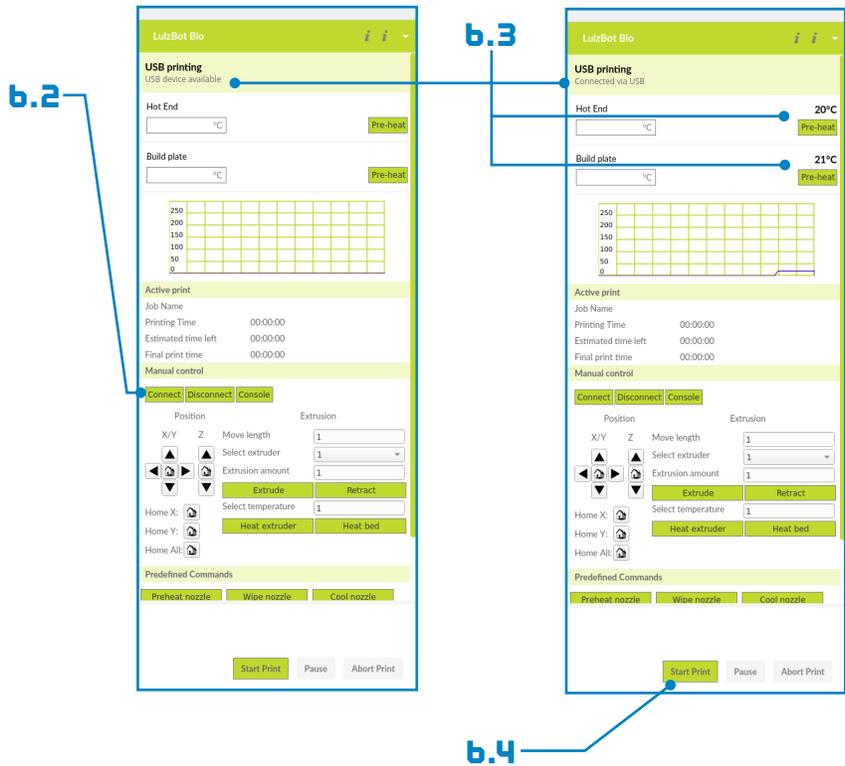⚠️ *Before starting a print, check that your printer is ready:*
- *Confirm that all packaging has been removed from your LulzBot Bio*
- *Verify that the printer is on a flat and level surface, and has at least 15 centimeters (6 inches) of clearance in all directions.*

6.2 Click the **Connect** button under **Manual Control** to connect to the LulzBot Bio.

6.3 Once connected, the top status bar will change from **USB device available** to **Connected via USB** and the current hot end and print bed temperatures will be displayed.

6.4 Click **Start Print** at the bottom of the **Monitor** sidebar to start your first 3D print.

⚠ *Always watch your LulzBot Bio start the printing process to visually ensure proper functionality.*

6.2

6.3

6.4

LulzBot Bio

USB printing
USB device available

Hot End
°C   Pre-heat

Build plate
°C   Pre-heat

250
200
150
100
50
0

Active print
Job Name
Printing Time   00:00:00
Estimated time left   00:00:00
Final print time   00:00:00
Manual control
Connect Disconnect Console

Position   Extrusion
X/Y   Z   Move length   1
▲   ▲   Select extruder   1
◀ ⌂ ▶ ⌂   Extrusion amount   1
▼   ▼   Extrude   Retract
Home X: ⌂   Select temperature 1
Home Y: ⌂   Heat extruder   Heat bed
Home All: ⌂
Predefined Commands
Preheat nozzle Wipe nozzle Cool nozzle

Start Print Pause Abort Print

LulzBot Bio

USB printing
Connected via USB

Hot End   20°C
°C   Pre-heat

Build plate   21°C
°C   Pre-heat

250
200
150
100
50
0

Active print
Job Name
Printing Time   00:00:00
Estimated time left   00:00:00
Final print time   00:00:00
Manual control
Connect Disconnect Console

Position   Extrusion
X/Y   Z   Move length   1
▲   ▲   Select extruder   1
◀ ⌂ ▶ ⌂   Extrusion amount   1
▼   ▼   Extrude   Retract
Home X: ⌂   Select temperature 1
Home Y: ⌂   Heat extruder   Heat bed
Home All: ⌂
Predefined Commands
Preheat nozzle Wipe nozzle Cool nozzle

Start Print Pause Abort Print

6.5 After your LulzBot Bio is finished printing, the syringe pump will lift out of the petri dish and the print bed will move into the finished position. Using the LCD menu, increase the bed temperature to 70°C and liquefy the LifeSupport™ material. This may take up to 45 minutes.

> **!** *Your print bed is now heating. Do not attempt to remove the petri dish before the LifeSupport™ material has fully melted. Attempting to do so could disrupt the melting process or damage the print.*

> **i** *Some materials may require special equipment or sterile environments for part removal and post-removal care. Always consult material instructions before part removal.*

6.6 Once the LifeSupport™ has been fully liquefied, the print can be slowly and carefully transferred to a suspension media. Sodium Alginate uses a suspension media composed of 1% wt/vol $CaCl_2$ in deionized water. Other materials may require different post-print care. Always consult the material instructions when printing with other materials.

6.7 If the LifeSupport™ material has not been completely melted away, it may solidify again once it cools down in the suspension media. Feel free to transfer and re-transfer the print to fresh suspension media if it is necessary.

6.8 Now that your first print is complete, your LulzBot Bio is ready for use! For more projects, ideas, and ready-to-print models, visit **http://download.LulzBot.com/bio/1.0/sample_prints/**.

> **i**
>
> *A small amount of material remains in your syringe after your first sample print. Remove the syringe by unscrewing the thumbscrew, then remove the clamp from the syringe pump. To remove the syringe clamp, hold the syringe clamp with your left hand and turn the clamp release lever clockwise (away from you). Remove the syringe from the syringe clamp by removing the two clamp thumbscrews. After removing and disposing of the needle, clean thoroughly the syringe, petri dish, and print bed. The needles are single-use, but the syringe and petri dish can be reused multiple times with regular cleaning.*

Make sure that the print bed is at room temperature before beginning any cleaning or maintenance unless otherwise noted.

Print Bed
Thoroughly clean the vacuum grease from the print surface after every print. To clean the print surface, wipe with diluted Isopropyl Alcohol (1:10 IPA to water ratio) and a clean, lint-free cloth.

WARNING -
Electric shock can kill.

ALWAYS disconnect the printer by unplugging the power cord before attempting to enter the electronics box enclosure.

Failure to follow warnings could result in personal injury, death, or property damage.
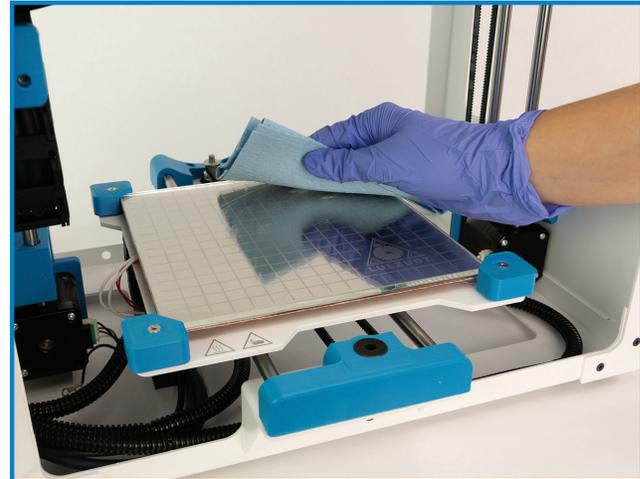
Print Area Cleaning

With regular use, dust and debris can collect underneath the printer and may cause interference with the Y-axis motion. Periodically clean and dust the area underneath and surrounding the printer to prevent this.

Smooth Rod Cleaning

The LulzBot Bio is equipped with hardened steel rods and linear ball bearings. Every 30 days, It is important to wipe down the rods on the X, Y, and Z axes using a clean, dry, lint-free cloth and lubricate them with 1 drop of SuperLube® Multi-Use Synthetic Oil with PTFE per rod to prevent rusting and marring due to friction.

Electronics Box Cleaning

⚠ *Unplug the power cord and USB cable before beginning any maintenance on the LulzBot Bio's control box.*
Unscrew the screws holding the control box in place and gently slide the control box away from the frame, being careful not to pull on wires traveling between the frame and control box. Using compressed air, clear the fans, power supply, and area around the control board of any dust or debris that may have collected inside.

⚠

Improper maintenance of rods and bearings can lead to rusting, marring, and damage to your printer. Follow the recommended maintenance guidelines for smooth rod maintenance.

NOTES:

NOTES:

Important Information About Your 3D Printer

Customer Feedback
Why keep a good thing secret? Share your LulzBot LOVE with the world! Tell coworkers, peers, friends, and family. Share your experience by writing a review or sharing your LulzBot Bio projects on social media. Tag your projects with LulzBot on Instagram, Facebook, Twitter, and LinkedIn.

Not happy? We're here to help. Contact our friendly customer support team, we'd love to solve your problem and get you printing again! Check out the Warranty and Support section for details.

Warranty and Support
Your machine comes with a limited one-year warranty and customer support period including USA-based technical support available via email at **Support@LulzBot.com** or by phone at **1 (701) 809-0800 x 2**. For more information, please visit **LulzBot.com/Support**.

Extended warranties of one, two, and three years may also be purchased to further protect your investment. Email **Sales@LulzBot.com** or call **1 (701) 809-0800 x 1** for more information.

Warranty and customer support cover electrical, mechanical, and motion systems on the printer. Material issues are not covered by LulzBot customer support. Material questions and concerns should be directed to the material manufacturer. For more information about the warranty on your LulzBot 3D Printer, visit **www.LulzBot.com/content/shipping-standard-warranty-and-return-policies**

Source Files
This product runs with free software because we support your right to see how it works, make modifications, and share your modifications with others. Find the source files online at **Download.LulzBot.com**.

Certification
Your LulzBot Bio is a **FRESH™** (**F**reeform **R**eversible **E**mbedding of **S**uspended **H**ydrogels) **Certified** bioprinting platform that enables the fabrication of soft, biological scaffolds for applications in tissue engineering and regenerative medicine.   **FRESH™ Certification** is a patented bioprinting process licensed to FluidForm™ 3D Bioprinting.