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Laser Cutter and Print Software Badging Guide

The Beginners Guide to Glowforge Pro and Print Software

As a patron of the Ascension Parish Library (APL) system, you have access to a variety of equipment and software! The Glowforge laser cutter provides makers with a host of possibilities for creating unique projects and maker-masterpieces. You can etch on glass, engrave or cut acrylics, MDF boards, and more! The Glowforge is a professional-level precision machine capable of cutting, scoring, and engraving on a wide variety of materials. Using the Glowforge Print software, makers can create custom designs, engravings, and intricate cuts for various projects. To have the option to reserve Makerspace equipment, patrons must take a badging class and pass the practical exam to earn a badge for each piece of equipment or software.

This guide will teach you how to:

- Operate the Glowforge Pro Laser cutting machine
- The basics of Glowforge Print software
- Compatible materials

Need to Know

Before you begin, let's review the badging "need-to-knows" so you can add that Laser Cutter Badge to your Makerspace repertoire. Materials you will want to review for the badging practical exam are available on the APL Makerspace webpage in detail and include:

- This badging manual's equipment and station specific content
- Makerspace equipment and station reservation, check-in, clean-up, close-down, and check-out procedures
- Materials Consumables Fees documents; procedures for acquiring and purchasing materials (not scrap)
- Location of branch-specific clean-up and safety equipment (e.g. broom, fire extinguisher, eye and hearing protection, first-aid kits).
- Makerspace User Agreement and Release of Liability
- APL & Makerspace Policies, Procedures and Safety Rules

Begin by reading through this badging manual, the library and Makerspace policies and procedures, and review the pathways to Badging. Next, sign up for a badging class with the equipment you are interested in. Search and register for classes on the Library Events Calendar.

Please note, completing the quiz or a class DOES NOT result in a badge. To complete the badging process, patrons must pass an in-person lab practical in the Makerspace. It is recommended that

patrons review the relevant online material in addition to attending a badging class prior to reserving a date and time to complete their lab practical to receive their badge. Reservations must be made 48 hours (about 2 days) in advance of the date and time being requested, whether patrons are reserving time to take their badging practical or reserve time on equipment or software after becoming badged. This ensures library staff have time to reference and approve requests.

Welcome to the Ascension Parish Library (APL) Makerspace. This guide will cover the steps to become badged with the glowforge pro laser cutter. A badge means that you know how to safely operate APL equipment without direct supervision. It lets you book time on the equipment first come, first served.

Safety

The Glowforge Pro 3D Laser Printer is a Class 4 laser product. The laser in your Glowforge emits enough infrared light to cause instant skin and eye injury or start a fire. This infrared laser light is invisible. The Glowforge unit has a case and glass lid which block harmful levels of infrared and ultraviolet light to allow you to operate the laser safely.

Electrical Safety

To reduce the risk of electric shock or fire:

- Do not try to service, repair, or modify the Glowforge unit.
- Never try to access the wiring of the Glowforge unit.
- Do not open the power supply or any other sealed portion of the Glowforge unit.
- If the Glowforge unit is damaged, unplug the power cord and contact us at glowforge.com/help immediately.
- In the event of any emergency or malfunction, unplug the power cord on the back of the unit.
- Use only a properly grounded outlet that meets local building codes and has at least 800 watts of power available.
- The power cord is intended to serve as the disconnect device. Make sure the outlet is near the equipment and easily accessible, so you can unplug the unit if needed.
- The minimum rating of the circuit breaker, also known as an over-current protective device, on this circuit feeding the outlet should be at least 15 amps.

Fire Safety

The Glowforge unit's laser cuts and engraves with a beam of high-intensity infrared light. The laser can generate extremely high temperatures in the material being cut or engraved. Under some circumstances, it is possible for the material inside the Glowforge unit to ignite and for the flame to spread outside of the area being cut or engraved. If ignited, the flame could destroy your unit and spread, potentially setting fire to the building.

Do not use it if glass or case are damaged or modified. Do not modify or service

Fire Risk

- Do not put anything inside the Glowforge printer that is not laser-compatible, even if you do not intend to cut or engrave it. Learn more about laser-compatible materials below.
- Do not stack materials; for example, attempting to cut two or more sheets of material at a time. Multiple sheets are more likely to burn.
- Clean out leftover bits inside the Glowforge unit when it builds up. (See "Cleaning")

- Do not place things on top of the Glowforge unit. Do not store things that can catch fire above it.
- Do not store sources of flammable vapors like oil-based paint, acetone, gasoline, or alcohol in the same room as your Glowforge unit. Flammable vapors could be ignited during operation.
- When a print is complete, certain materials, like plastics, can remain hot. Allow them to cool down before you touch them.

Keep watch during operation

- Never leave the Glowforge unit unattended while operating – either when it's paused and ready to print (with the button flashing) or while it's printing (with the button on). Always stay within sight and look inside frequently.
- A small, candle-like flame where the laser beam strikes the material is normal. This flame should move with the laser and should not remain lit when the laser has moved past.
- If there is a lasting flame inside the Glowforge unit that does not extinguish when the laser has moved past:
    - Pull the plug on the back of the unit.
    - If it is safe to do so, extinguish the fire with a wet towel. Note that water may damage your Glowforge.
    - If that is not an option, then if it is safe to do so, extinguish the fire with a fire extinguisher. Note that fire extinguishers may cause damage to your Glowforge.
    - If the fire cannot be safely extinguished or if it spreads outside the Glowforge unit, call your local emergency number (for example 911) and evacuate the building.
    - Do not operate the unit further until you have contacted Glowforge for service information at glowforge.com/help.

Fumes

When you use your Glowforge, the laser creates visible and invisible aerosols, gases, vapors, and particulates (referred to here as "smoke and fumes"). The smoke and fumes can include carbon monoxide and other chemicals which present health hazards, as well as being unpleasant and stinky. The chemical composition of the smoke and fumes depend on the material being lasered. Smoke and fumes from laser-compatible materials are controlled by exhaust or filtration.

Laser cutting can produce a large amount of hazardous fumes and particulates and requires ventilation during operation, known as Laser Generated Air Contaminants (LGACs). The ratio of harmful gases to particulates released is dependent on the material used during operation. For example, when using nylon, the fume composition is 20% gas and 80% particulate; when using acrylic, the composition is 90% gas and 10% particulate.

Materials Safety

Laser-Compatible Materials

"Laser-compatible" refers to materials that can be safely processed with the CO2 laser in the Glowforge unit. Materials that are not laser-compatible may catch fire, emit hazardous smoke and fumes that cannot be controlled by exhaust or filtration, and are a health hazard to you, your neighbors, and your Glowforge printer. For this reason, you must only put laser-compatible materials in the Glowforge unit.

Proofgrade® materials

Glowforge sells a line of Proofgrade materials that are laser-compatible and give top-quality results when used with the Glowforge printer. To learn more about Proofgrade materials, go to glowforge.com/materials.

Laser-compatible materials from other suppliers

Other suppliers like Inventables.com sell material that they indicate is laser-compatible. If you are uncertain, ask the supplier if the material may be processed safely with a CO 2 laser.

Food Safety

Many food products can be engraved, and some can even be cut. However, residue from prints on acrylic or other materials might be present in your Glowforge and could contaminate food that you put in your Glowforge. For that reason, if you use your Glowforge for materials other than food, then don't eat any food you put inside it.

Materials must fit

Materials that do not fit properly may obstruct operation and result in damage and increased risk of fire.

- Materials must be no more than 21 in (53.3 cm) wide and must not be so long as to touch the end of the Glowforge unit. Material must be less than ½ in (1.2 cm) tall if the crumb tray is in, or less than 2 in (5.0 cm) tall if it is removed.
- Materials must not extend past the side of the crumb tray (if it is being used) or the metal bottom of the print area (if not).
- Do not place rolled-up material in the Glowforge. It may be too tall, or unroll during printing, obstructing operation.

Materials must be flat

Materials must be flat so they rest on the crumb tray.

- While a bulge is acceptable, for example from warped wood, the highest point of the material may not extend more than ½ in (1.2 cm) above the crumb tray.
- Material must never double back on itself, for example curling up.
- Should material curl or bend so it reaches more than ½ in (1.2 cm) above the crumb tray during a print, turn off the power immediately.
- If the material has a protective paper or plastic coating, that coating must be firmly affixed to the material. If it begins to peel off, discard the material and do not print on it.

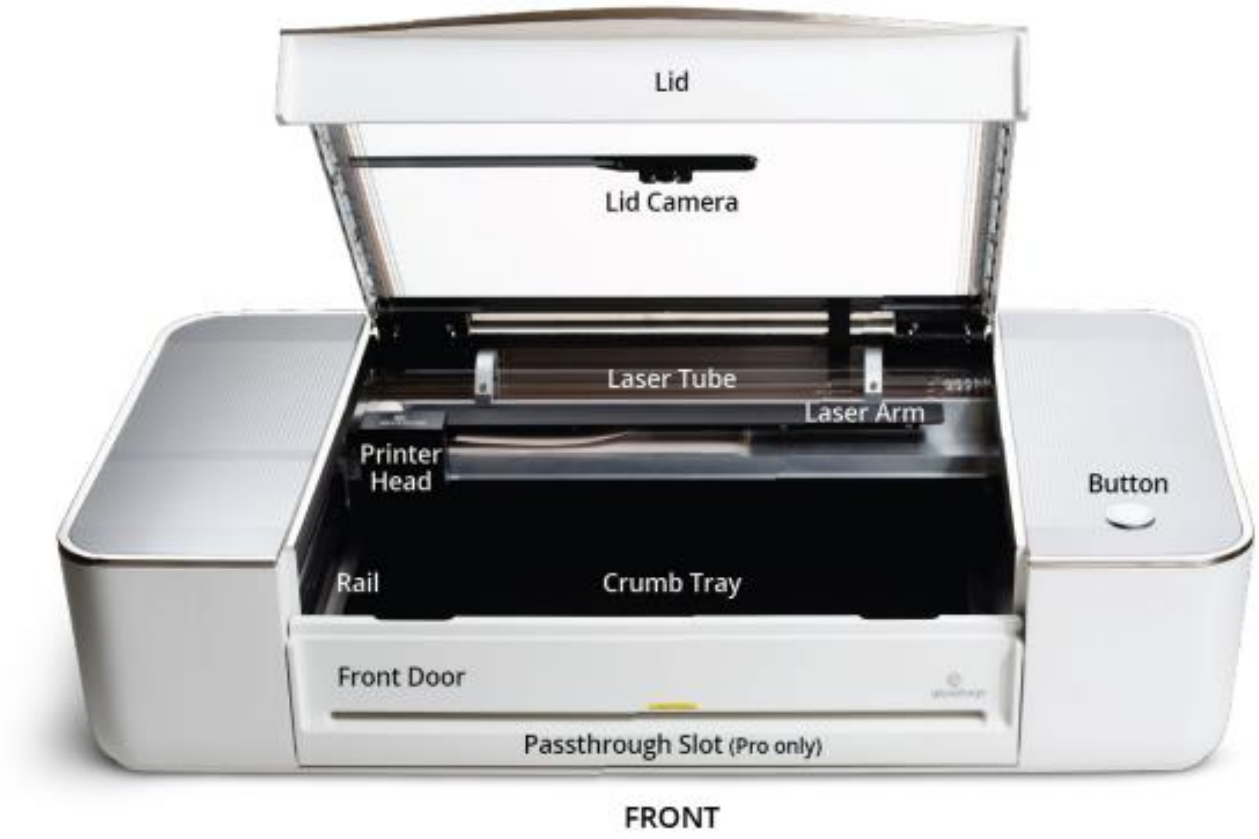
Stop Using Your Glowforge Unit If....

If any of the following occur, immediately turn off the power switch, unplug the unit, and contact us at glowforge.com/help. Do not use your Glowforge unit again until the issue has been addressed by support.

- The default settings for a piece of Proofgrade material do not cut through the material even after cleaning the lens and windows
- There is a fire in the unit which persists after the laser turns off
- The head stops moving but the laser is on
- The unit's button turns any color other than white, yellow, or teal
- You see any damage or discoloration to the case
- There are any cracks or chips in the glass tube or lid
- You see any moisture present inside the Glowforge unit
- You see any damage to the interior components of the Glowforge unit
- You notice unusual light coming from the unit that was not occurring previously.
- You notice an unusual sound coming from the unit that was not occurring previously

Glowforge Pro

Equipment



Pre-Startup

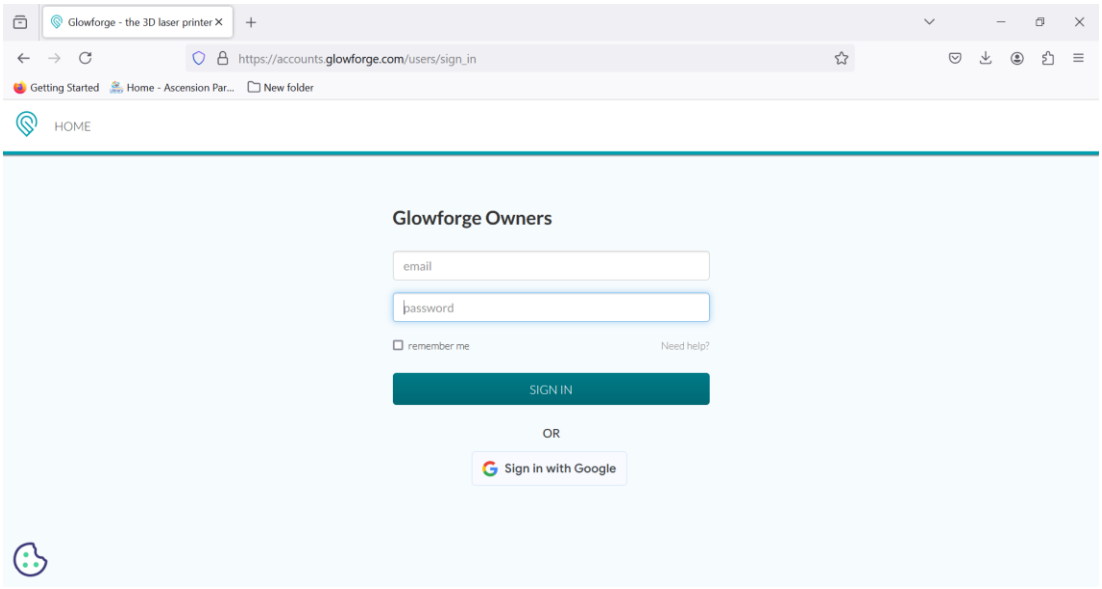
Before turning on the glowforge, check to make sure that the vent is attached both to the machine and to the exhaust. Also check to make sure the switch in the back is in the on position.

Once the machine is on, you should see lights turn on and you should see and hear the machine should start doing some calibrations. Once the glowforge is done with its checks and calibrations, open the lid and load your material onto the bed. Close the lid once your material is positioned how you want it. You may also use clips to hold down your material.

*Note there will be less camera distortion the closer to the center you load your materials.

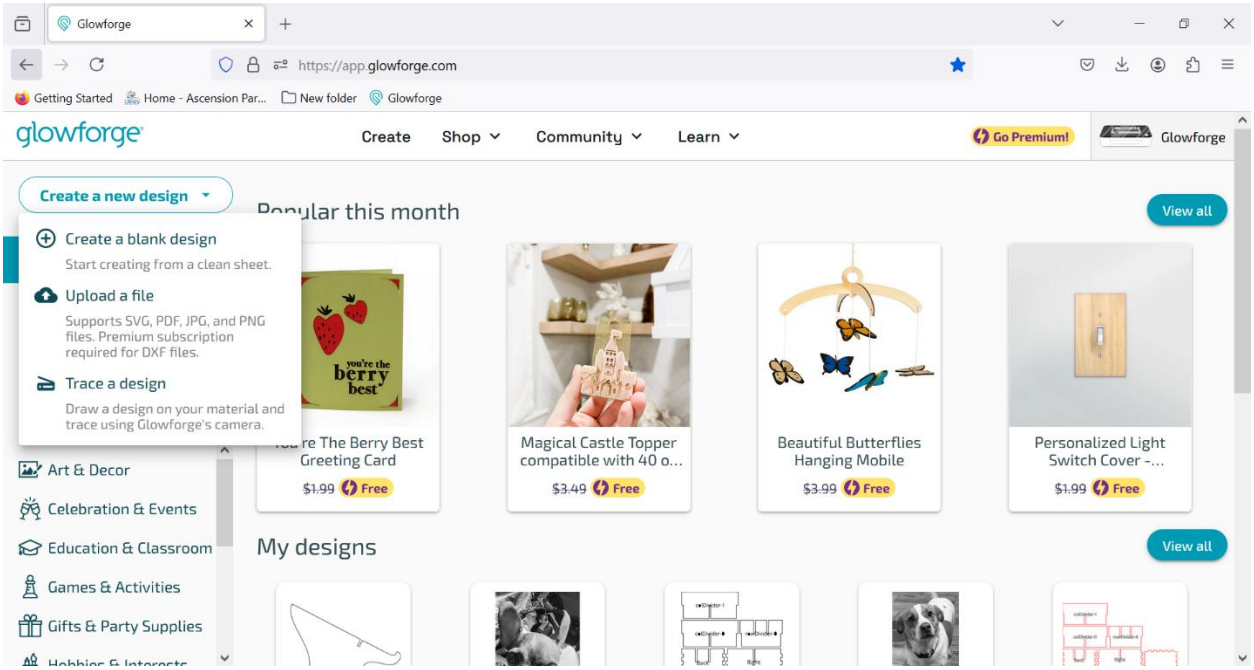
Glowforge basics

Once the material is loaded Login to accounts.glowforge.com. APL has an account already that features the premium subscription. This subscription allows patrons to utilize all of the glowforge features on the print software. Patrons are free to use their own account if they would prefer.

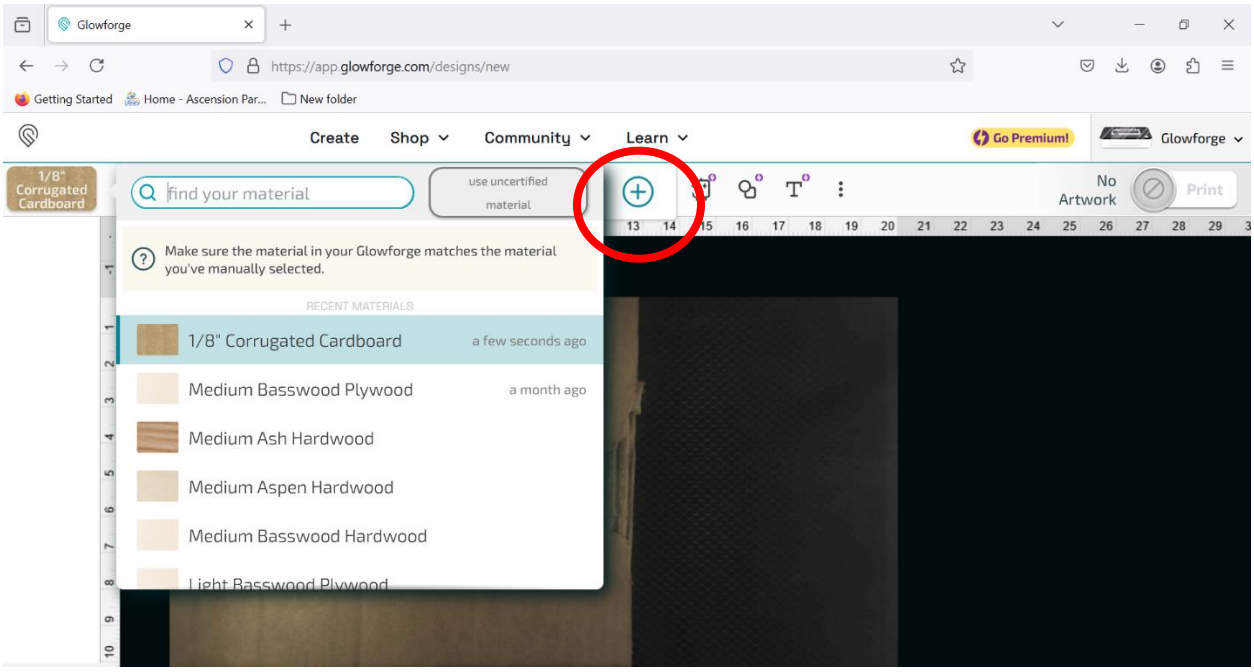


Make these four prints and you'll learn the basics of creating and printing with your Glowforge.

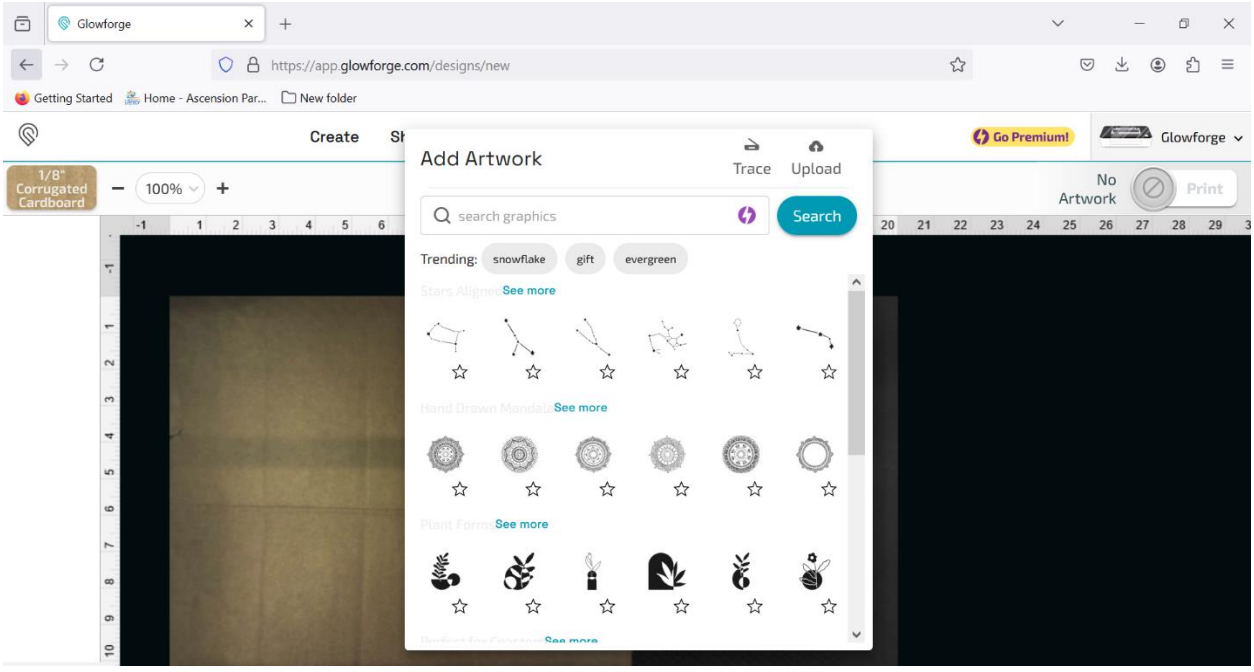
- Print a catalog design - When you sign in to app.glowforge.com, and go to the Dashboard, you'll see that we've started you off with a few of our favorite designs. You can find more at catalog.glowforge.com.
- Trace and print a sketch - Drawings or printed images can transform into digital designs that you can print on dozens of materials.
- Print a design from scratch - You can use shapes, text, and millions of graphics to create your own original designs. These creative tools are a part of the free 14-day Glowforge Premium trial included with the purchase of your Glowforge.
- Print a design you've uploaded - After your first three prints, you may want to create a design of your own using 3rd-party design software or purchase a design from other makers. This article shows you how to print those designs.



When you click “Create a new design” three options pop up. You can create a blank design, upload a file from the computer, or trace a design to cut using the Glowforge camera. We will select “Create a blank design.”



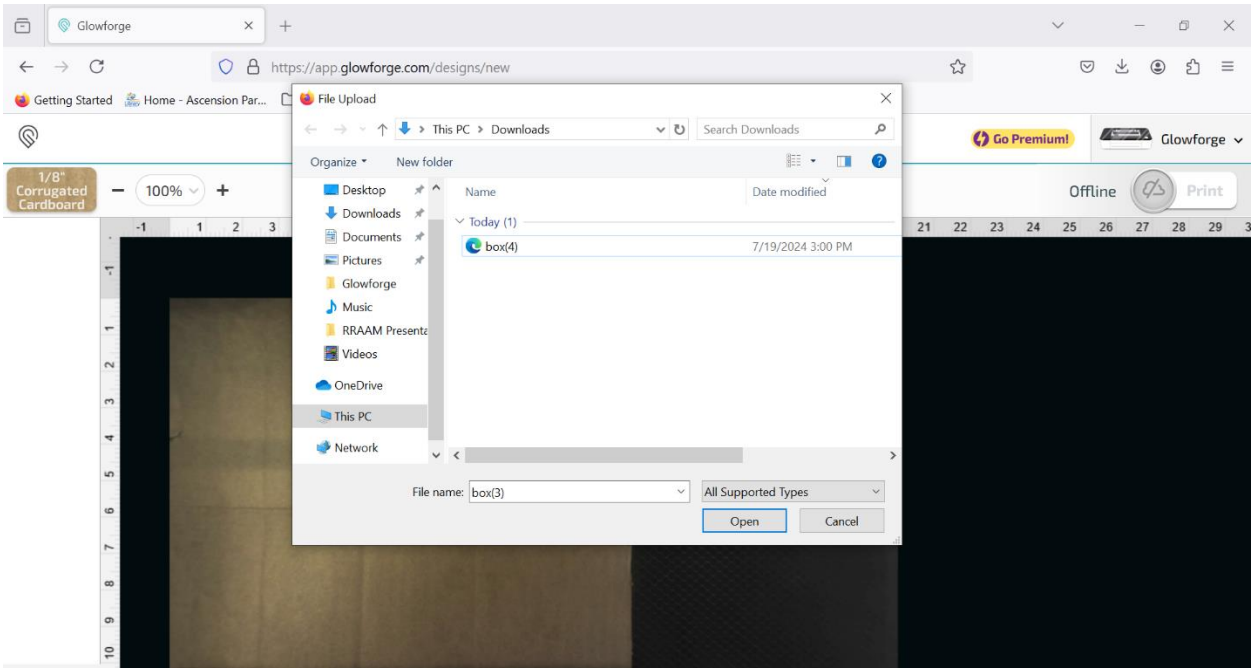
Click the blue plus sign for an additional menu



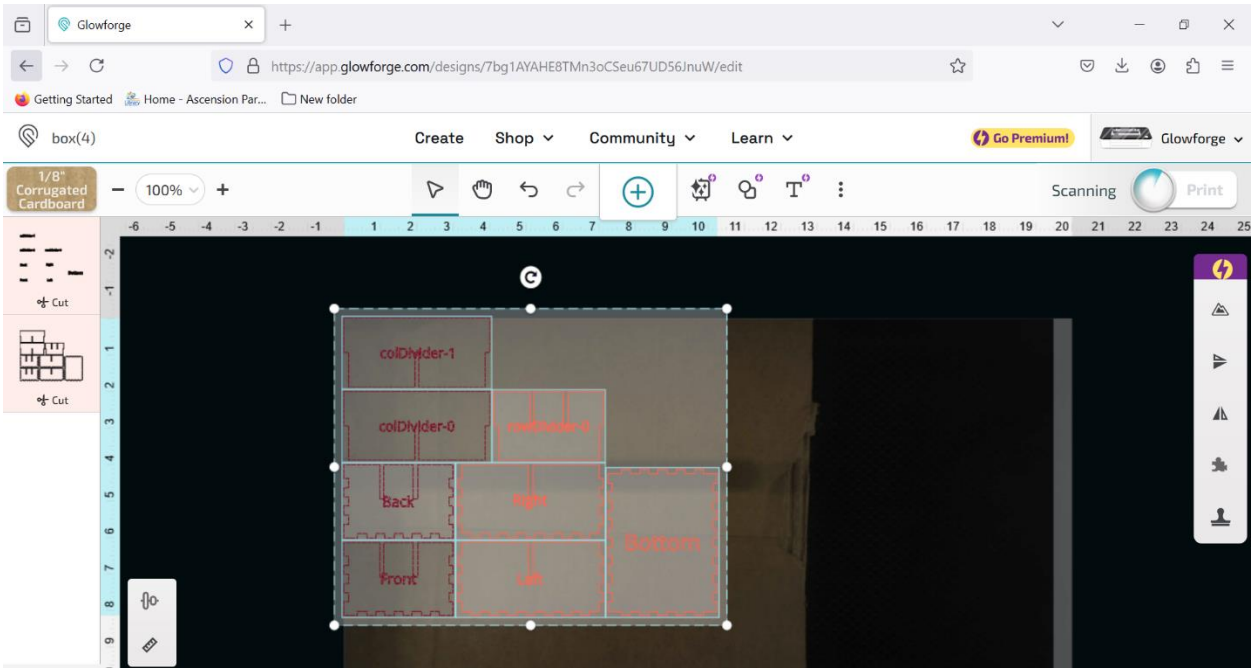
In this menu option you can also trace a design, upload a file, or search for a graphic to use. This allows you to use multiple types of form factors. We will select “Upload.”

Computer graphics can be thought of in two categories, bitmaps and vectors. Bitmaps are images composed of pixels. The Glowforge can engrave these pixels onto materials by varying the power setting on the laser to give a grayscale effect. Vectors on the other hand are lines that the laser can follow along to cut or score. Glowforge compatible file types for bitmaps include JPEG, PNG, GIF, BMP, TIFF, PDF, and SVG. Compatible file types for Vectors are PDF and SVG.

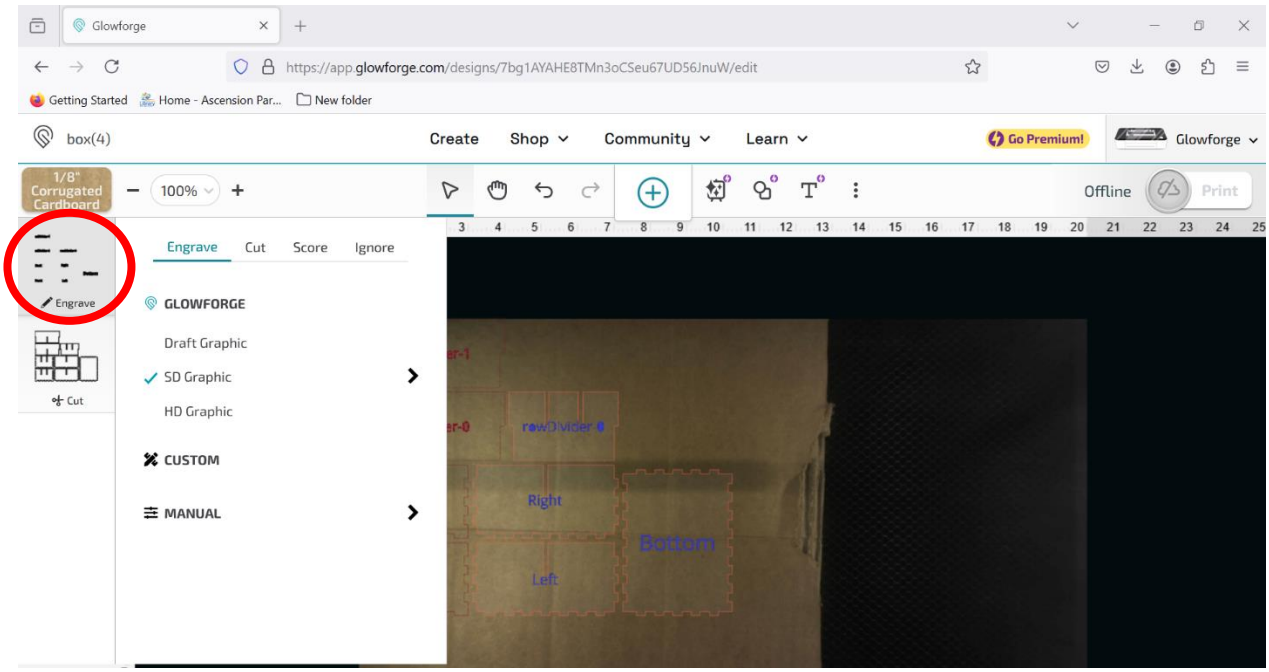
It is important to note that SVGs and PDFs may contain both bitmaps and vectors. However, saving a bitmap in one of these file formats is not the same as converting it to a vector. To properly convert the image, one would need to trace the bitmap in a vector editing program, e.g. Inkscape, Illustrator, Corel Draw, etc. Some programs do have an “auto trace” feature to assist in this process.



Select your design file, this file may be on a jump drive or in a different folder. Scroll up or down in the organizer on the left to find it. To open your file, double click it, or click it once and press open in the bottom right of the window.

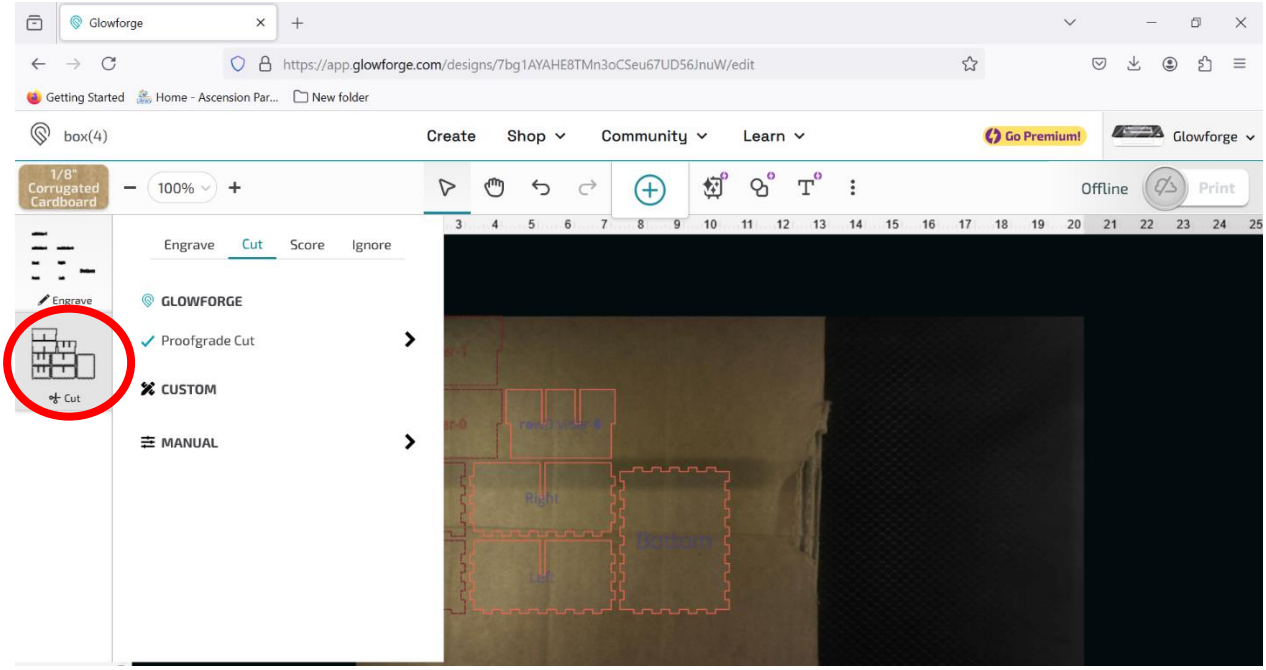


The Glowforge will automatically detects and place the pattern of your file onto the designated material, but you are able to adjust and resize the image manually

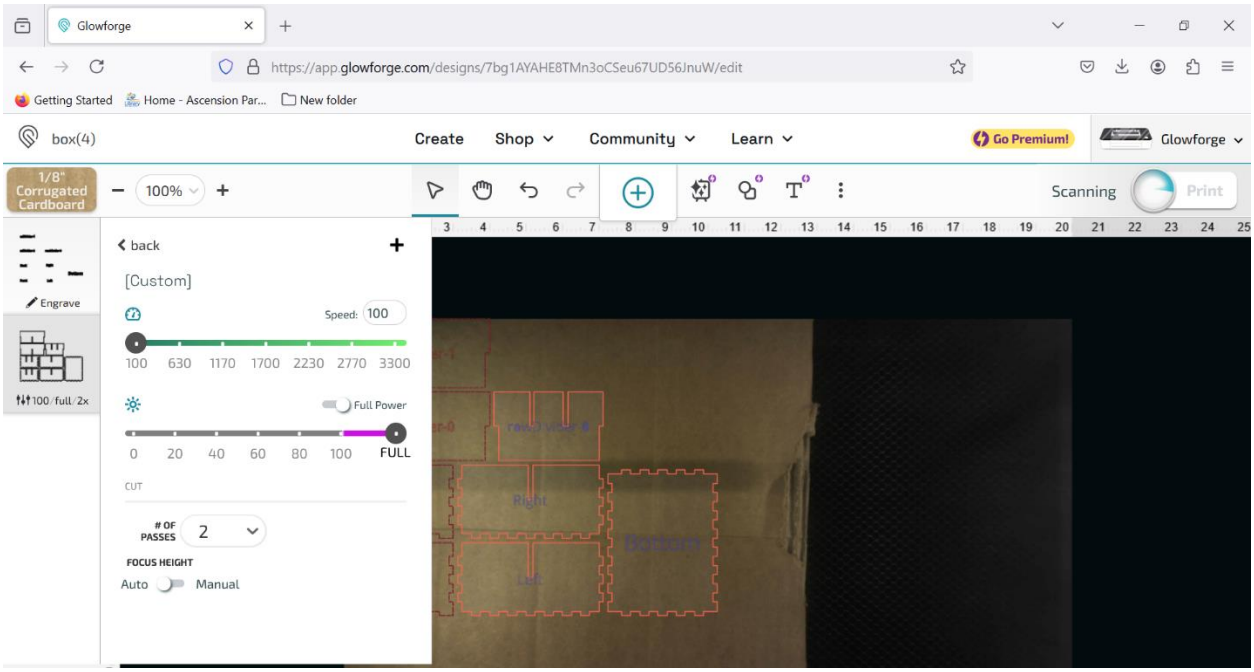


With this file there are 2 layers. You can choose what to do with each layer. Click the layer at the top left. A menu will pop up: Engrave, Cut, Score or Ignore.

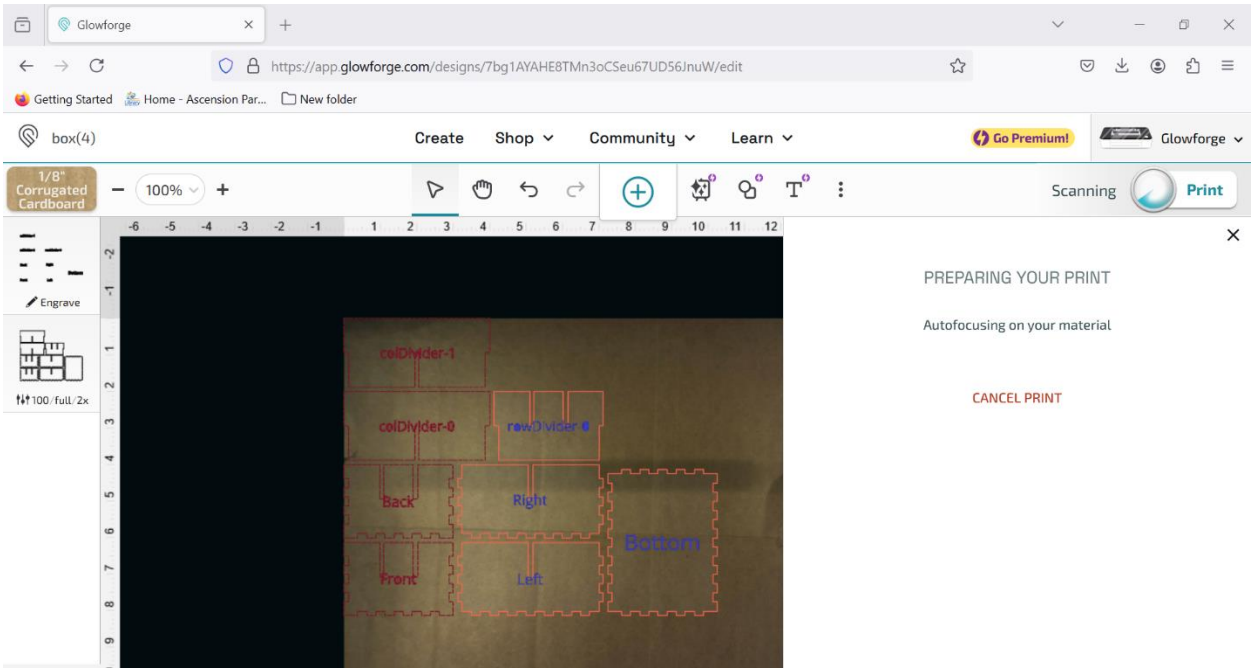
- Engraving will allow you to replicate an image onto your material
- Cutting will allow you to cut your material.
- Scoring is a lower power cut that is not intended to go all the way through the material
- Ignoring will allow the laser to ignore any layers you don't want to use.
- We will choose to engrave. Each tab allows you to customize the cut or leave at default settings.



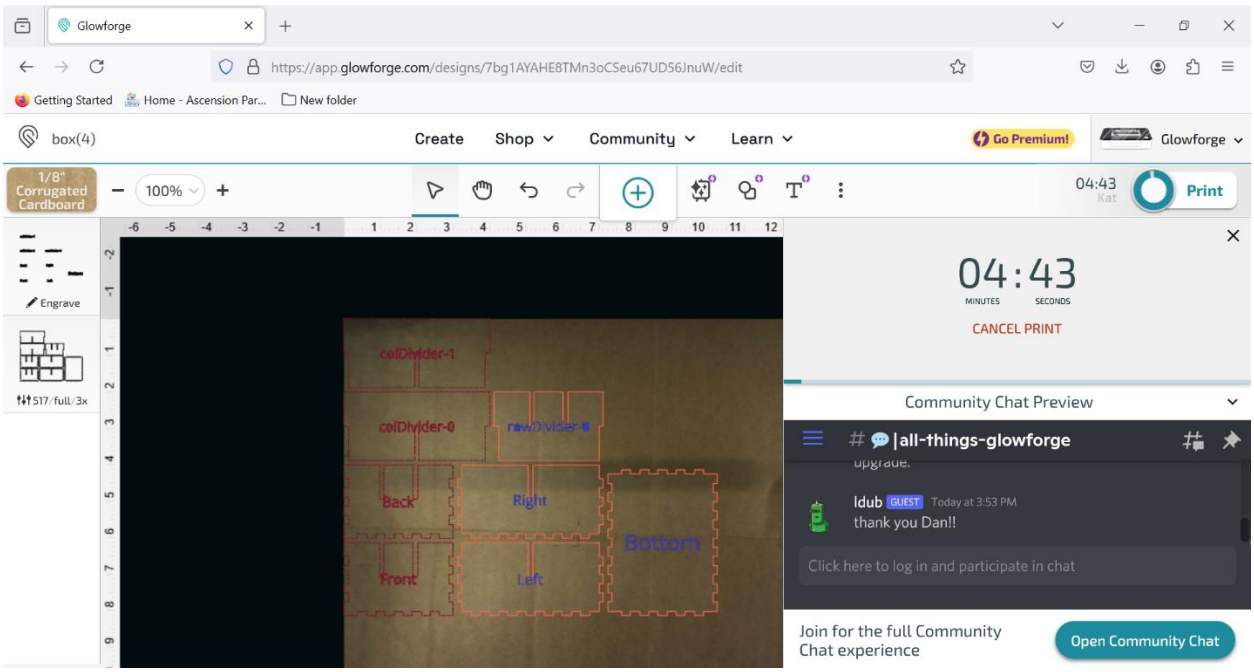
Select the second layer, this layer. We will choose cut.



This is the custom menu, you can adjust the speed of the cut, the amount of power, the number of passes, and the focus height. If you are using official Glowforge materials it would be best to use the automatic setting. If you are not, then you may want to do a test piece and customize the settings.

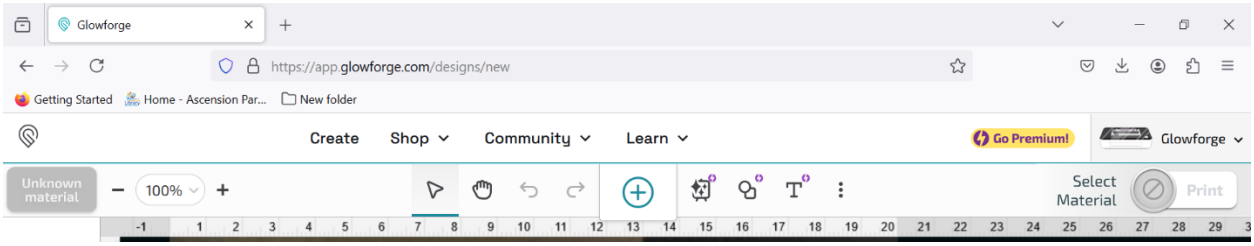


In the image half the project is not lit up, and it will not print/cut. You will have to select and move the shapes because they are too close to the edge. Afterwards select print.

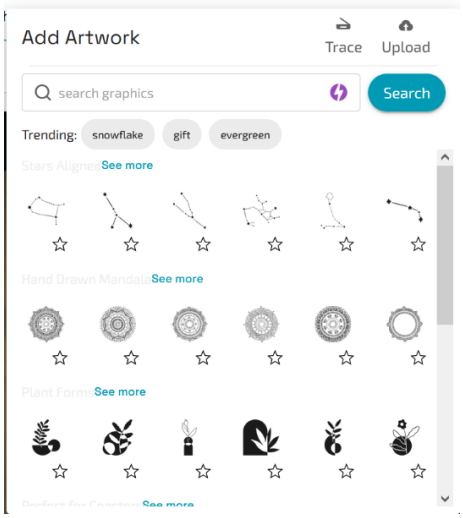


Press the flashing blue button on the actual Glowforge Pro, this should initiate the laser. Always watch the Glowforge while it's printing. When the button stops glowing and the fans stop, remove your print, peel off the protective layer, and get ready to assemble.

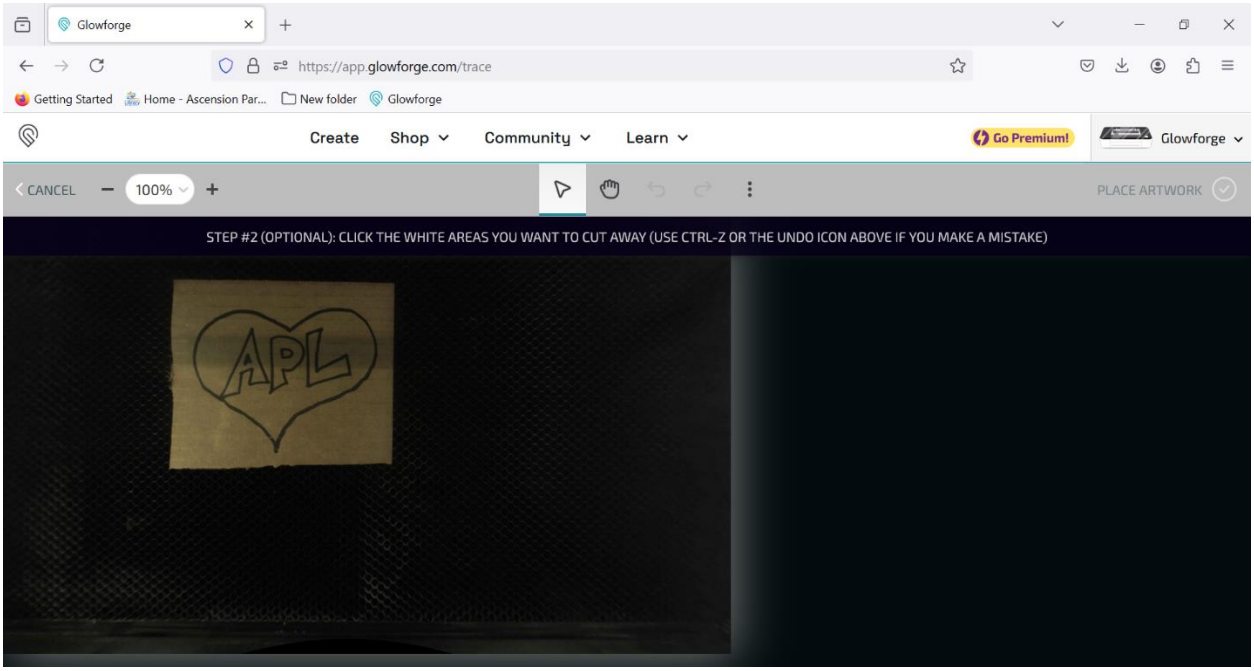
Trace



Now we will learn to trace. Select the blue plus sign.

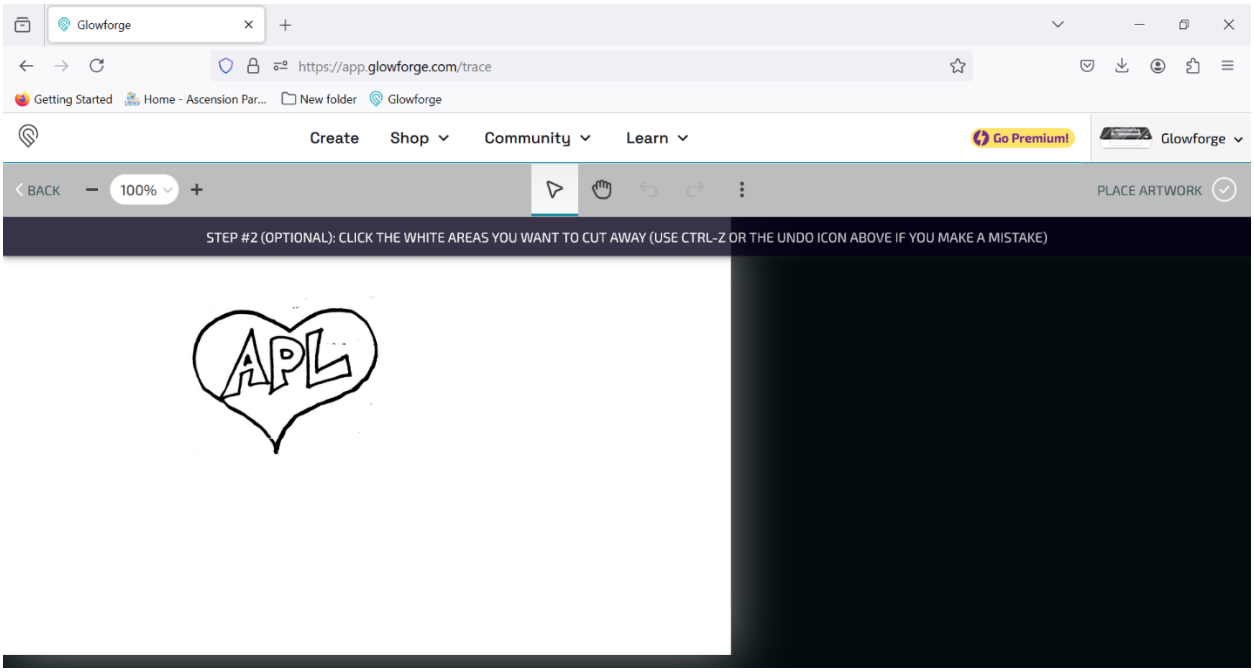


Select trace.

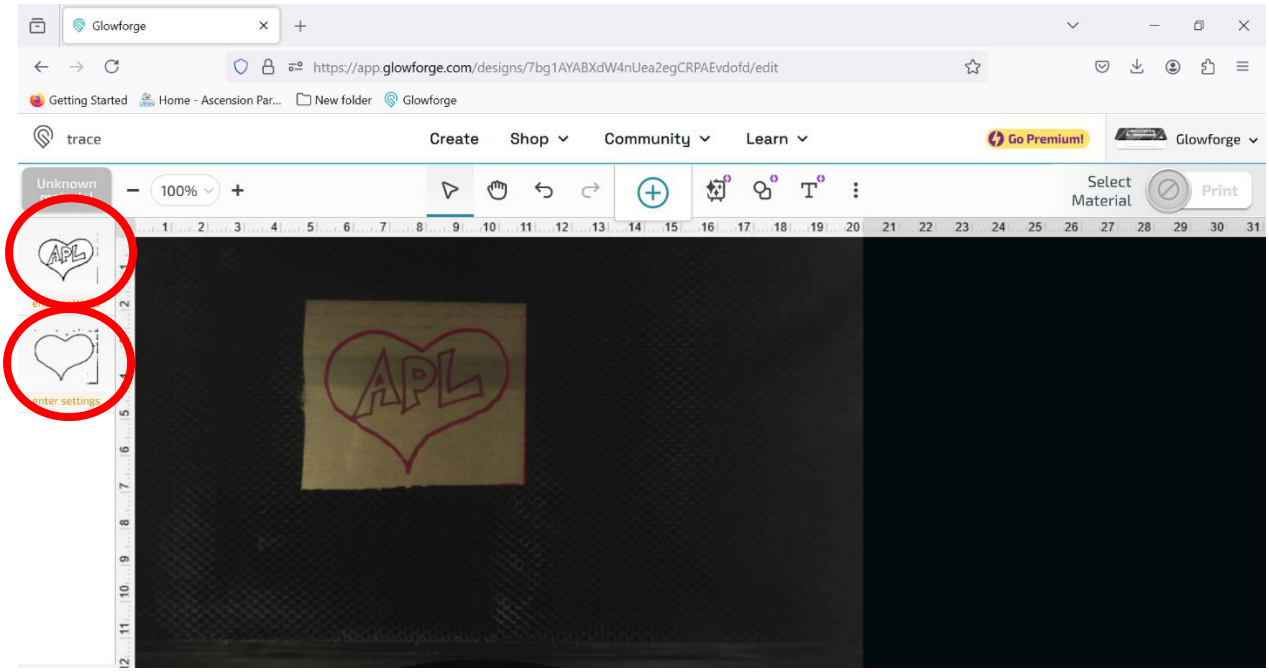


15.

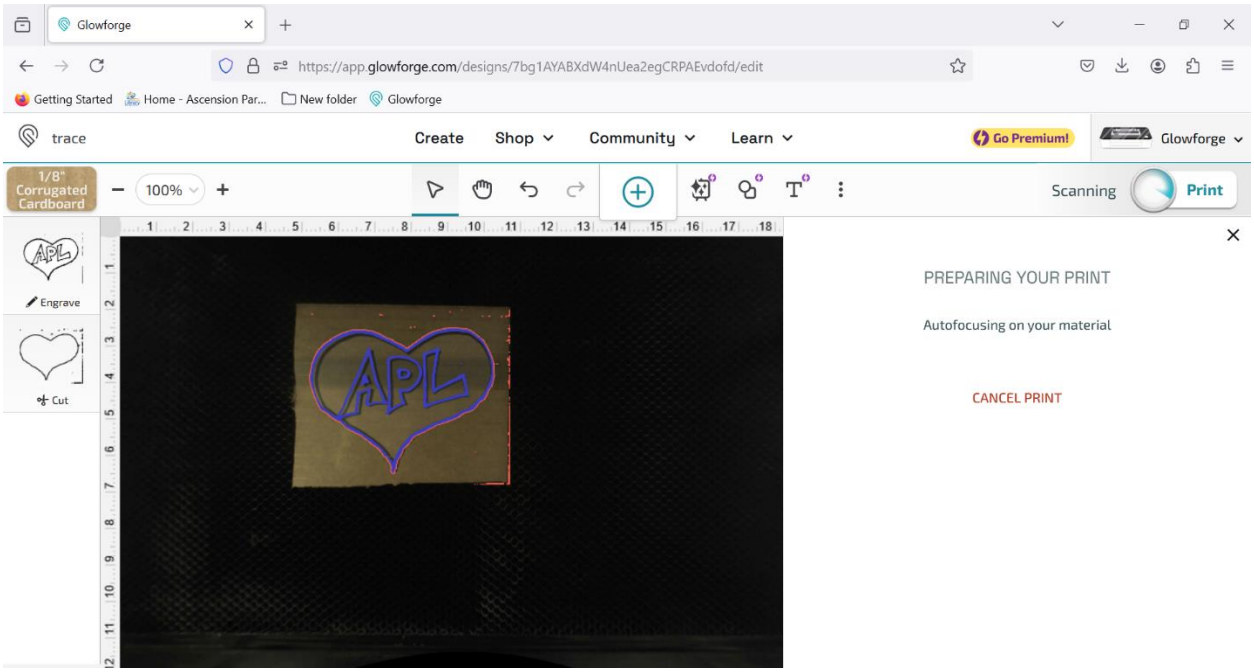
Load artwork into Glowforge



Select the white areas you want to cut away



Create custom settings for your layers. In our example, we will engrave the first layer and cut the second.



Select your material, and press print. Press the glowing blue button on the Glowforge. Always monitor your print while in progress. There is always a possibility that the Glowforge may catch fire.

Makerspace Workstation Closing Procedures

When your reservation time has ended, follow the closing procedures for ALL workstations. Maker culture and community rely on a shared value of leaving the Makerspace like you found it, or better.

Closing Checklist:

- Turn off the equipment.
- Place all salvageable materials in their appropriate bin (paper, cardboard, 3D filament (plastic), fabric, metal, wood, etc.)
- Recycle or throw away all the remaining non-salvageable scraps and materials. Be sure to place recyclable materials in their appropriate bin.
- Return all accessory tools used to their appropriate locations.
- Inspect all station equipment at the reserved workstation and ensure its functionality.
- Report any concerns to Makerspace staff immediately.
- If you used a Makerspace computer, log off your personal account only. DO NOT log off the workstation computers or shut them down.
- Clean the workstation. This may include: (1) using alcohol spray and a paper towel to wipe down the workstation table and chair(s), as well as equipment handles and buttons; and (2) sweeping the workstation area of visible debris.
- Push Makerspace chairs and stools back under the workstation tables and ensure all electrical cords are tucked away so others will not trip over them.

Once the checklist is completed, check out with the Makerspace staff on duty so they can review/inventory the workstation and charge the total of consumables used to your LS2 account. If you are leaving earlier than your reserved time, and reserved time during Open Hours of Innovation, please let the staff member know so they can allow others to use the workstation.