Laser Cutting With CSDTs

Last Updated: 9/22/2020

This guide will go over the three types of laser cutters that we use with CSDTs: the Bachin Desktop Laser the Wainlux Mini Desktop Laser., and the atomstack laser. These lasers come in various power levels for different purposes.

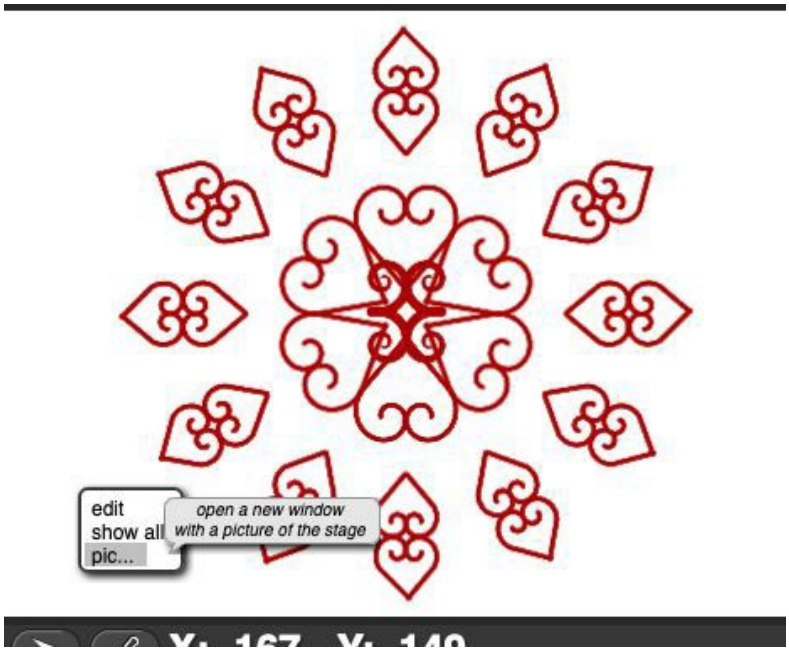
General Safety Tips

- It may be tempting to not wear goggles while laser cutting since it feels fine at first, but **please wear the goggles.** One time, I didn't wear goggles and was laser-cutting for an hour. I thought it was fine, but then I started getting weird blurry spots in my vision for a few hours. Long story short, **wear the goggles.**
- **Before connecting the laser to power, please always make sure that it's pointing to a safe surface.**
- When you'd like to disconnect any cables, please cut out the power supply first.
- **Please always be around when it's operating,** and stop the operation when necessary (e.g. weird odors, unintended shape/jams); In case of emergency, cut out the power immediately
- It'd be ideal to use it near a window for ventilation, on top of the stove where there're vents; please make sure there are no old paint thinner cans with flammable fumes nearby.

Getting Images from CSDT

First thing you want to do is to get images from the site. Pick a tool that you want to use. The team uses Adinkra mostly for laser etching, but you can use whatever suits you. Pick one and create your design!

Once you finish your design, you can right click the image, and select Pic…



This will save the stage to your Downloads folder.

From here, you can give it a transparent background by either using Photoshop (if you have access to it) or by using Photopea which is a free Photoshop alternative. Edit it how you see fit. Once you are done with that, we are ready to move on to laser cutting!

Bachin Assembly

Besides the included instructions, we also found a video that proved useful when assembling the laser: https://www.youtube.com/watch?v=jzn5mif5Ldo&t=1s
Some more assembly tips.

Bachin Operation

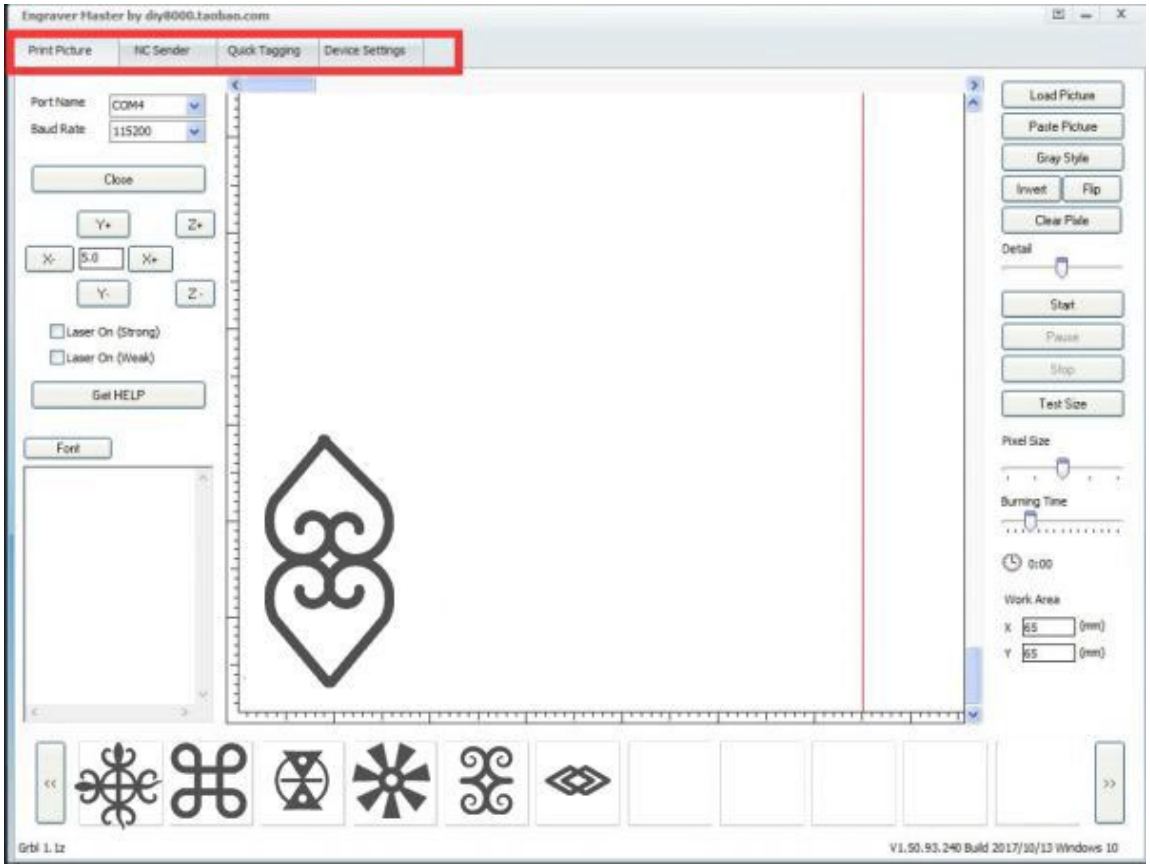
This laser uses the LiteFire engraving software, found here. Connect the laser to your computer and let's walk through the software. Images taken from the Bachin Wiki. We use the Bachin mostly in cloth cutting.

For this example, we are going through this process using a PC. Mac users might experience a different interface, but concepts should still be the same.

1) Launch the engraving software
2) Check the laser connection
3) Switch laser mode to NC
4) Import your image
5) Set the mode and size
6) Set the speed and start printing
7) Tips and Tricks for Bachin

Launch the Engraving Software

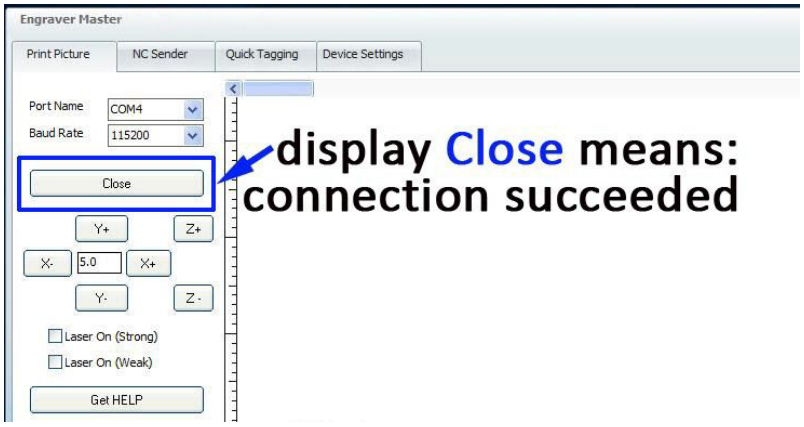
Once you downloaded the correct version of the engraving software, go ahead and launch it.



Take a minute and explore the software and see the types of settings you can alter.

Check the Laser Connection

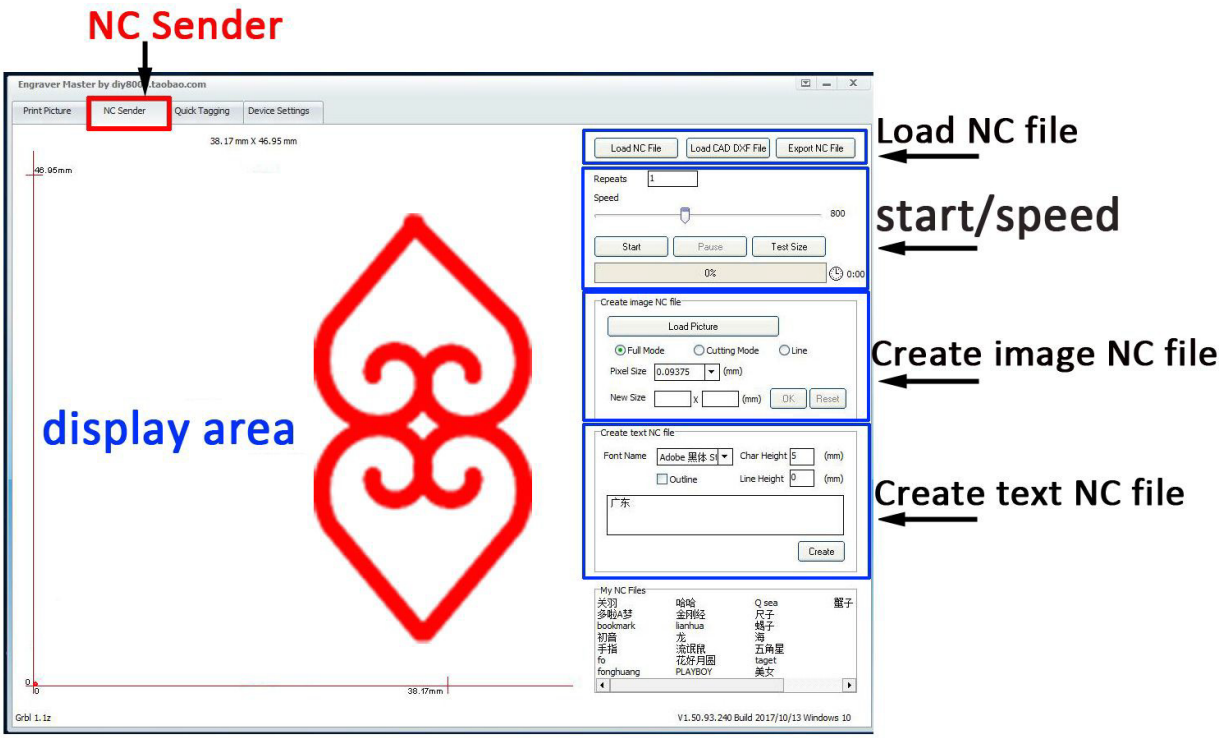
Next, you need to see if your laser is properly connected to your computer and the engraving software.



If this doesn't say 'Close', check your connection and try again.

Switch the Mode to NC Sender

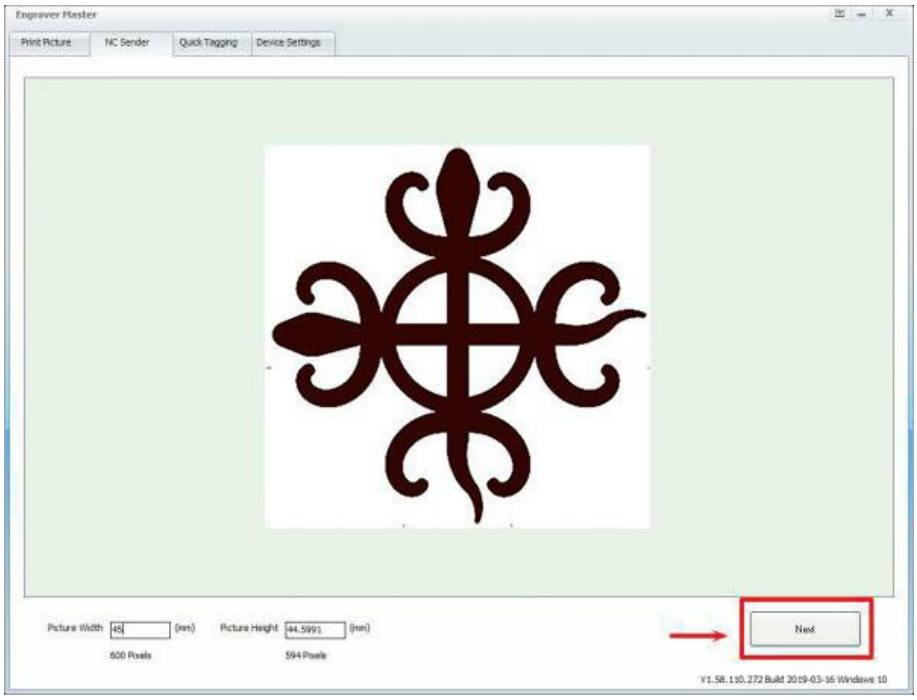
For the purposes of this example, we are using NC Sender. It is the most common mode of engraving and will satisfy most of our needs. However, we do encourage you to experiment with different settings and modes.



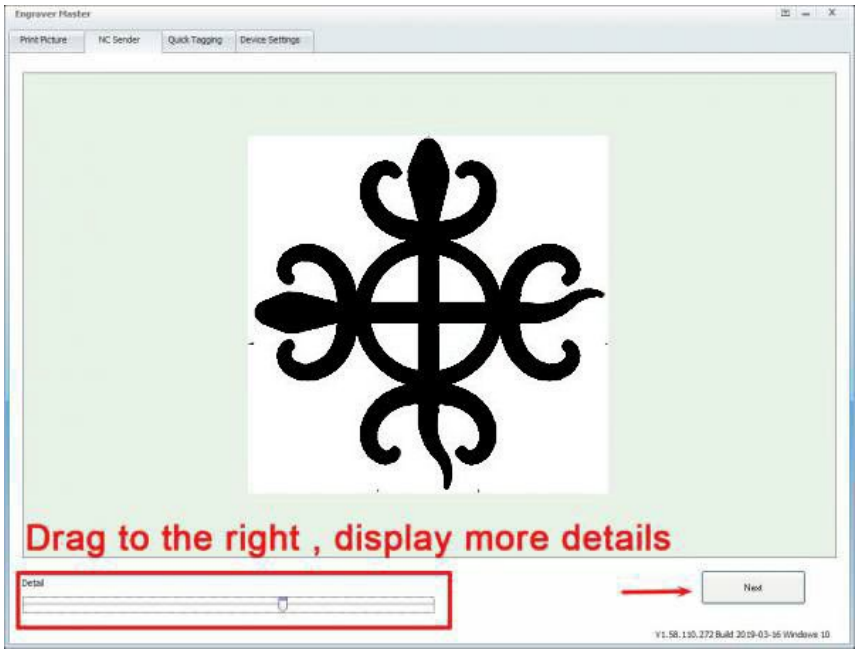
We are going to focus on two areas, the ‘Create image NC file’, and ‘Start/Speed’.

Load your Image

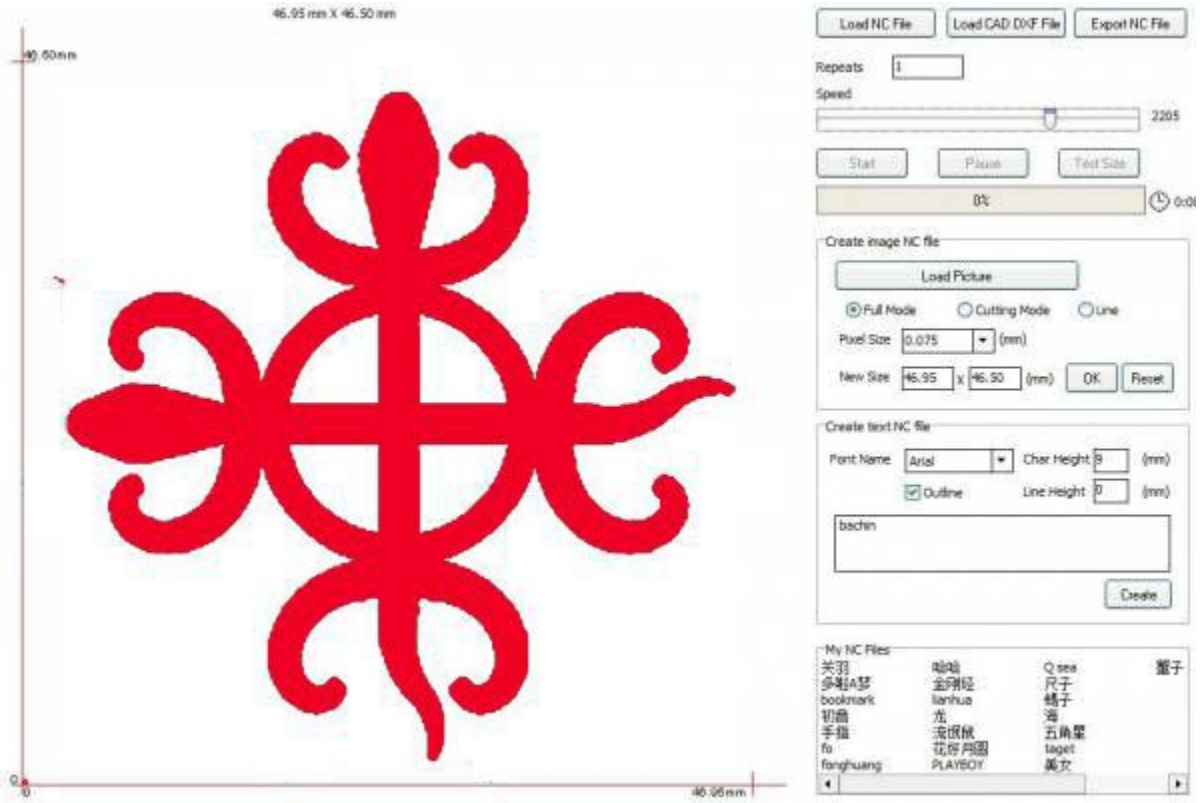
Click on **Load Picture,** pick an image, and import it. For testing, we suggest using images found on the Adinkra CSDT. Edit the picture width and height as desired.



Adjust the detail levels to your liking. This is most noticeable with complicated images like cornrows.

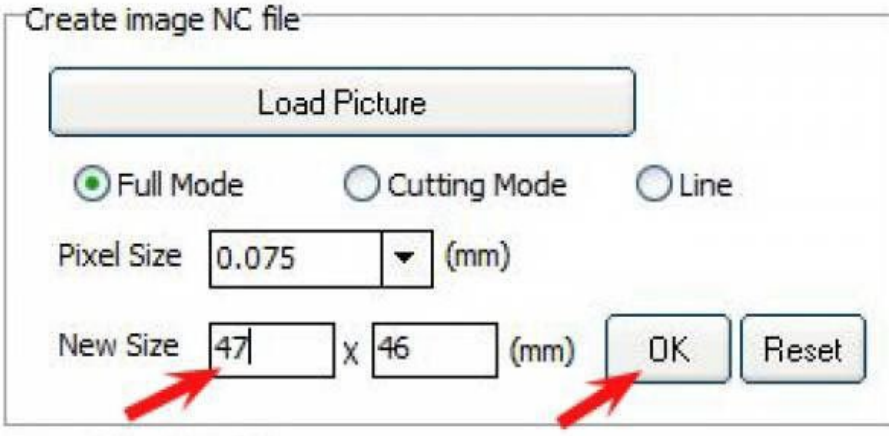


Click next and it will be imported into the software.

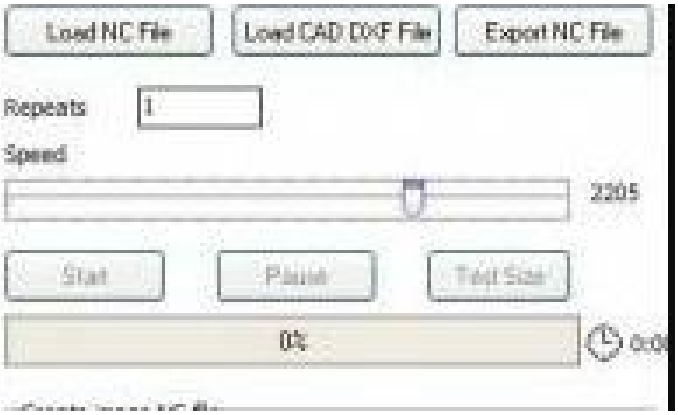


Set Mode and Size

Once you have your image, you can set the desired mode. Full mode will laser engrave the entire image (all that red will be burned into your cloth or wood). Cutting mode will laser engrave the outline of the image instead of the entire image. Those are the two main modes we will be dealing with. You can also set the size of the engraving. Once you have your settings, click OK.



Set Speed and Start
You can think of speed as how deep of an engraving you want. The quicker the laser cut, the lighter the engraving. The slower the laser cut, the darker the engraving. You can also set multiple passes to make that laser cut deep. When cutting, a high speed will cut faster, but may not cut all the way through if you have stronger materials. A low speed can cut through, but also create the potential to burn or melt the edges of the material as it moves too slowly.
With the size set, you can test the size. This allows the laser to show you the area in which the image will be cut. This will help you align your wood or cloth easier.

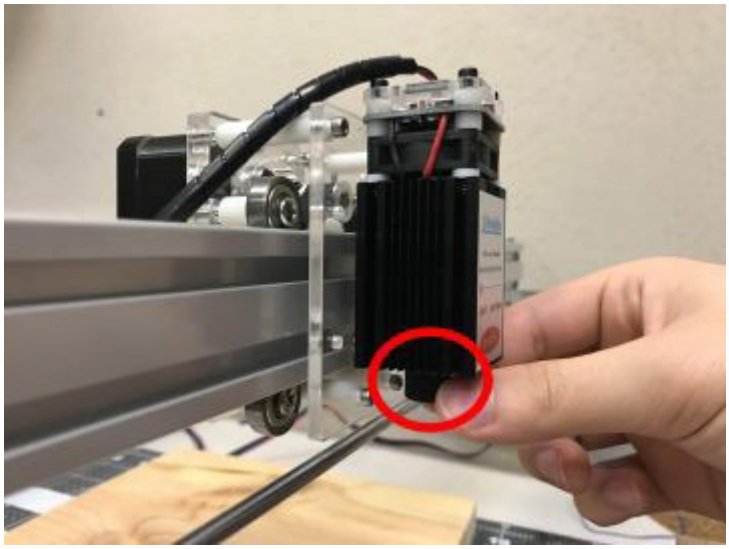


Once you are done testing the size, click it again to stop the laser moving. You are now ready to press start and print your pattern!

Bachin Tips and Tricks

Focusing the Laser
The most common pitfall for using the laser cutter is not having focused the laser. Whenever there's any discontinuities in cutting, large heat-affected zones, or if the laser cutting is simply taking too long, it's often an indication of an unfocused laser.

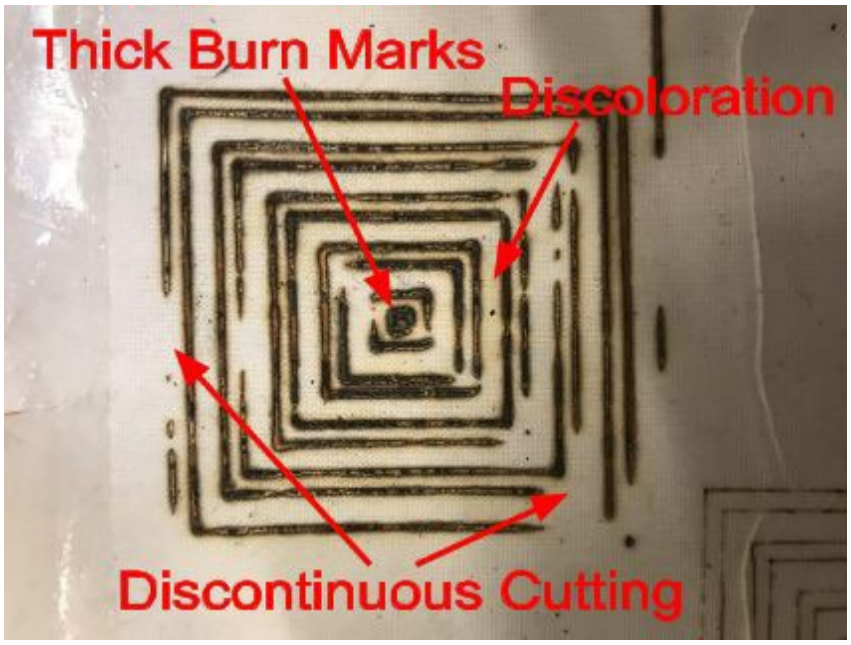
In order to focus the laser, turn on the "weak mode" in the software and rotate this knob:



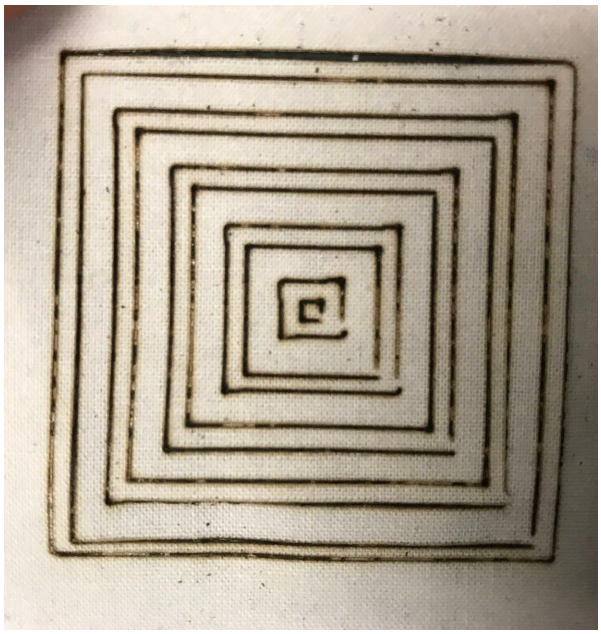
Place a slab of wood beneath the laser. Start to slowly twist the focus head left or right and adjust what you see to the minimum spot, instead of a blur. Twist slowly because you might go “past” the focus, and the spot will become larger. This video shows how to rotate the knob (3’25 - 3’40)

Side note: wearing protective glasses is still necessary, and please avoid letting your finger directly go under the beam to prevent burnt fingers.

Then, place the cloth on top of the wood and begin cutting. If the laser is not focused, then your cut will be discontinuous, thick (the burn mark is more than 1mm), and there may be discoloration around the cut area. For example:



Instead, a focused laser should create a sharp cut without excessive burn marks. The cut should easily fall out. For example:



Another way to focus the laser is to put on goggles and hit “Test Size” on the Engraver Master while the laser is over a **smooth** surface. Through the goggles you should turn the knob until you see a sharp dot (rather than a diffuse blur) on the surface.

It’d be useful to make a tool for spacing, so that next time you don’t need to repeat this process when switching the table surface that’s under the cutter.

Avoiding Unpleasant Odors

If there are any unpleasant odors during the laser cutting process, it usually means that whatever is being burnt very heavily. This can usually be attributed to an unfocused laser burning the surface underneath the cloth, since the laser burns unevenly and therefore burns the surface severely when it does manage to cut through the cloth. This can also be attributed to the material of the cloth.

However, if your laser is focused and there are still weird odors, you may want to use a wood block as your surface instead of the plastic mat provided (since burnt plastic is much more unpleasant than burnt wood). Attaching adhesive to the back of the cloth also creates a barrier between the cloth and the surface, which reduces unpleasant odors.

Finding the best speed and power combination

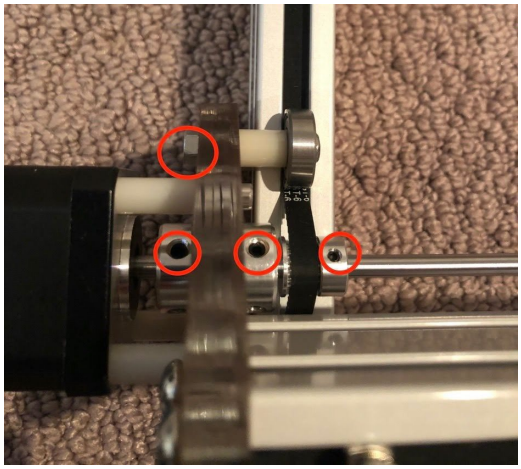
Bachin Motor Troubleshooting

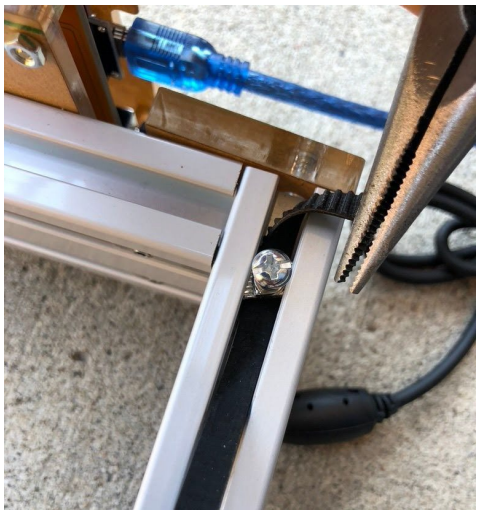
Before each cut, please check if the belt is tightened on each axis, and that the middle bar of the x-axis is synchronized.

If one of the motors is not moving, please check if all cables are connected to the board and the power supply is working.

If the laser is working, but x/y motors are not responding at all, it might be because a connector is broken, or that the motor was damaged.

If the shape is not turning out as complete: Check if there's a jam that could occur, or if there's any foreign object on the rail, as well as if the belt is tightened and that you can push both motors to move freely by hand. Please also check the screws on motors and for the wheels.


Example of the different screws that may be loose.


Example: a potentially loosened screw for the belt due to moving.

Bachin Maintenance

Lens Cleaning tips: Use a lens cloth/soft swab with water, apply to dust as necessary.

Operating temperature and environment: The relative humidity must not exceed 85%.[1] Best operating temperature is 20 - 40 °C

Attaching Adhesive

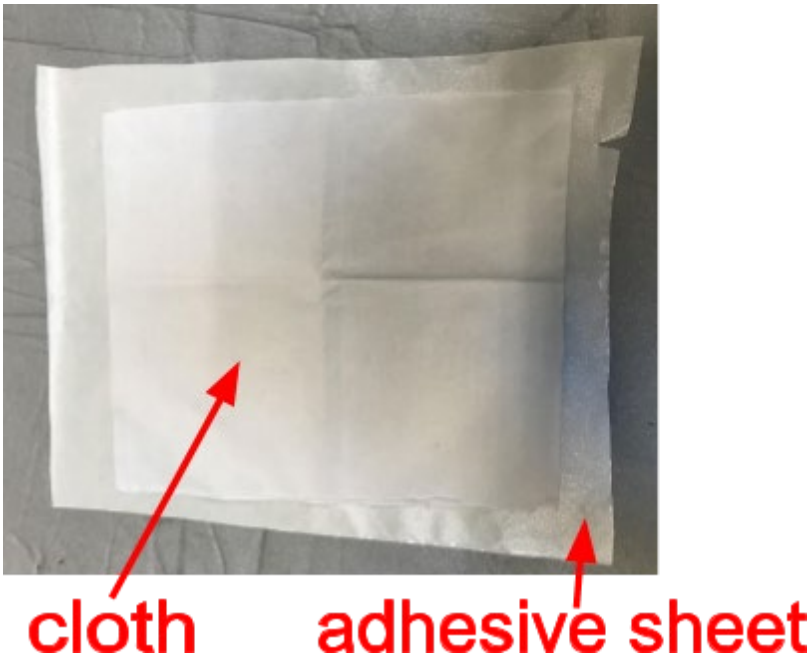
In this guide, “adhesive” refers to iron-on adhesive on a paper backing. Here’s what it looks like:

Note that the shiny side of the roll (which is the side that contains adhesive) is **NOT** sticky. This is because the adhesive is activated with heat, which requires an iron.

To attach this adhesive to this cloth, follow these steps:

1) Cut out a sheet of adhesive **larger** than the piece of cloth you are using.

[1] https://rpmclasers.com/wp-content/uploads/products/How%20to%20Improve%20Laser%20Diode%20Lifetime.pdf



2) First place the cloth onto the surface you'll be ironing on. Then, place the adhesive sheet on top of the cloth with the shiny side facing **downwards**. The adhesive sheet should **completely** cover the cloth.
3) If your iron has a steam feature, then turn it **OFF**. Otherwise, the cloth will get wet.
4) Iron the entire sheet, including the edges. Pressing the iron onto each area for three to five seconds should be sufficient.
5) Wait a few seconds to let the cloth cool off.
6) The cloth should be entirely attached to the adhesive now. You can begin laser-cutting!

If you're going to attach iron-on adhesive to the back of the cloth, here are two general tips to ensure that laser-cutting goes well:

1) The cloth side should be facing up, and the adhesive side should be facing down. This allows for the adhesive to be a barrier between cloth and surface.
2) Don't peel off any paper backing before laser-cutting. This paper backing serves as a second barrier between cloth and surface so that the surface is less likely to be burnt.

Now that you've cut out your pattern, it's ready to be attached onto another surface. Follow these steps **after** you've finished laser-cutting:

1) Peel off the paper backing
2) Place your pattern onto the surface you want to attach it to with the shiny side facing downwards.
3) Iron it for 3-5 seconds
4) The pattern should now be attached to your surface.

Here, we've laser-cut a Akoko Nan pattern out of white cloth with adhesive backing and then attached it to black cloth:

Links to CSDTs for Adinkra Patterns
Now that you know how to successfully laser cut and the common pitfalls, try laser-cutting these Adinkra patterns!

Akoko Nan: https://csdt.org/projects/15085/run
Gye Nyame: https://csdt.org/projects/16202/run

Wainlux Assembly

This laser comes already assembled! The only thing you have to manage is the screen guard in front, which takes only a few screws. Key thing to know is to get some compressed air and clean out the packaging debris that would still be stuck in there.

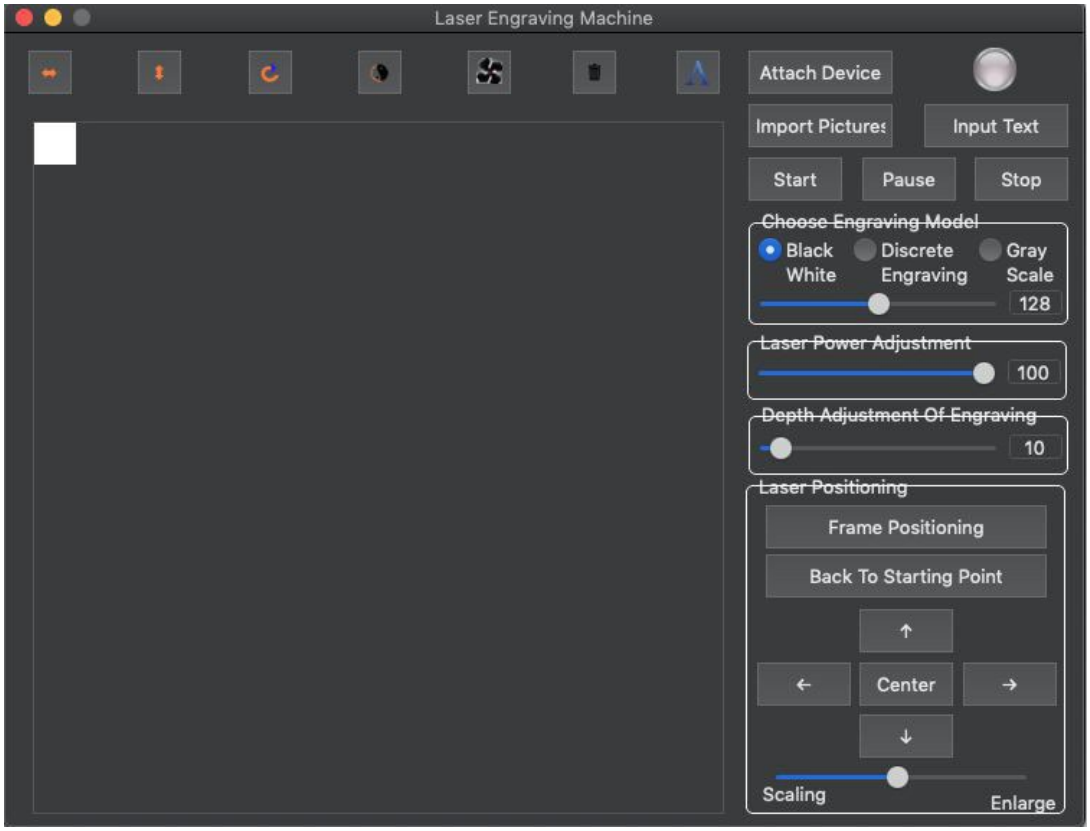
Wainlux Operation

This laser uses the Wainlux engraving software, found here. Connect the laser to your computer and let's walk through the software. We use the Wainlux mostly in laser etching wooden disks.

1) Launch the engraving software
2) Connect the laser
3) Import your image
4) Change the settings
5) Align your image
6) Print

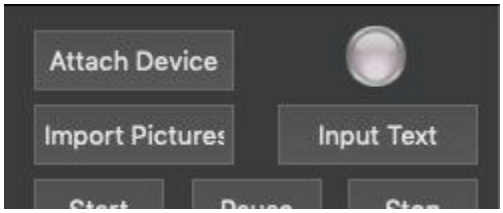
Launch the Engraving Software

For this example, we are using the Mac version of the software. There might be some differences between Mac and PC, but they should still function the same. Take a minute and look at the various options on the screen.



Connect the Laser

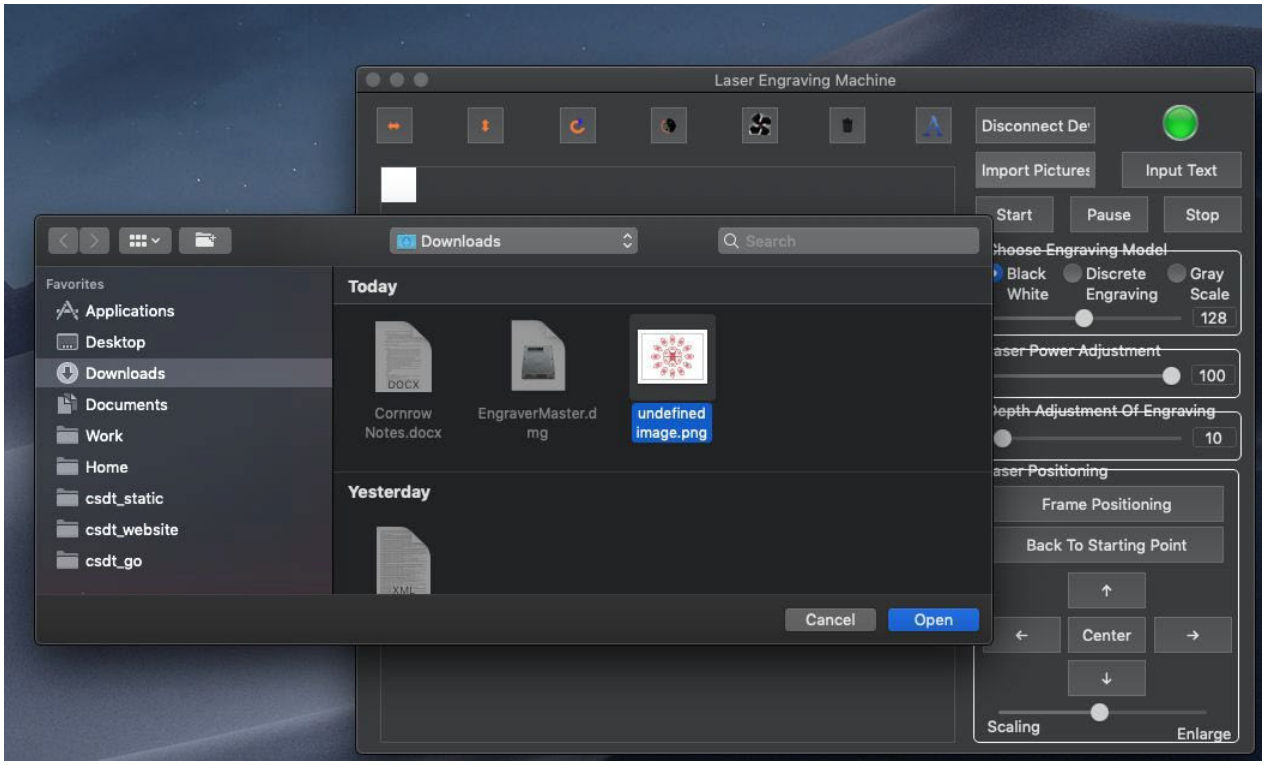
Unlike the Bachin, the Wainlux does not auto connect when you launch the software. You need to connect by clicking “Attach Device”.



You will know that your laser is properly connected when it says “Disconnect Device” and you get the green light.

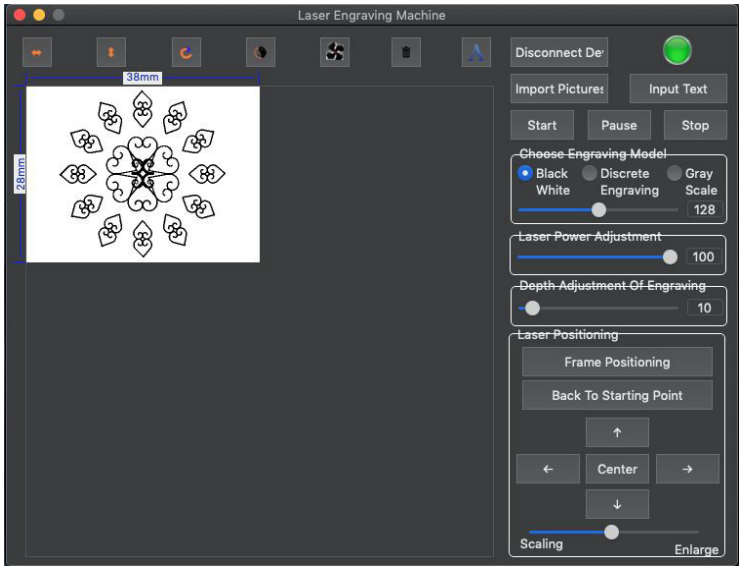
Load Your Image

Next step is to load your image. We suggest using the Adinkra Stamping software when creating your wood disks. Click “Import Pictures”, select your image, and click Open.

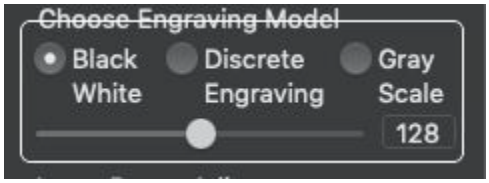


Changing Settings

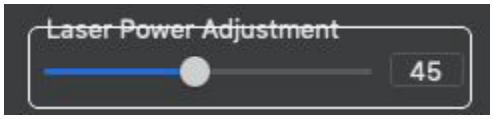
Now that you have your image in the software, it is time to make some adjustments.



The Engraving Model is how you adjust the level of detail you want the engraving to have. Keep it at Black White. Gray Scale is best for complex images like cornrows.



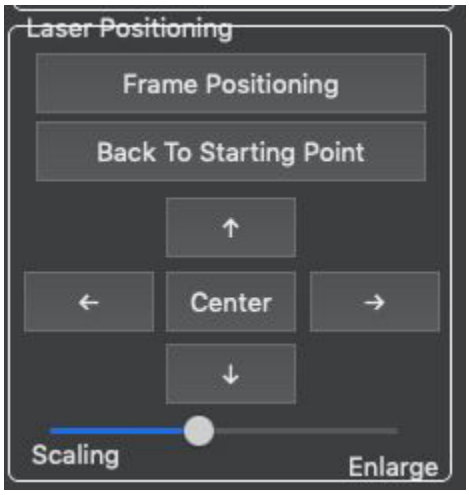
The Laser Power Adjustment controls the power levels of the laser. For the wood disks, it is best to keep it in the range of 40 to 60 to make sure it retains the detail of the image. Otherwise, fine details would merge together. Also, this is a matter of experimentation based on the level of detail you have in your image.



The Depth Adjustment controls how deep you want your engraving to go. Think of it as the speed setting. The deeper you go, the longer it is going to take, and vice versa. It is recommended to keep it in the range of 25 to 50 for the wood disks. Again, this is all about experimentation based on your designs.

Lastly, the laser positioning positions the laser. It also allows you to view the frame position, or where the laser is going to cut. You can control where this area is, but frame positioning must be disabled when it is time to start. The software will alert you of this. You can also control how

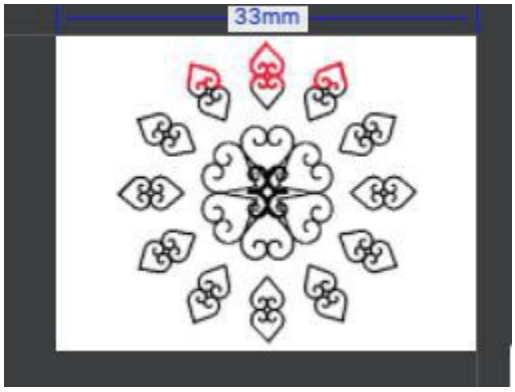
large the engraving should be with the slider below. For this example, we are using a wooden disk that is 36mm in diameter. Use your best judgement as to how to size your image.



You can also drag your image around to position it to your disk. Trial and error is needed because of various images and various disk sizes.

Print Your Image

You are now ready to print your image. Make sure you ‘Stop Frame Positioning’. Once you do that, you can now Start. The image will slowly fill in red with the areas that have been etched.



Congrats! You (hopefully) conquered the Wainlux!

Wainlux Tips and Tricks

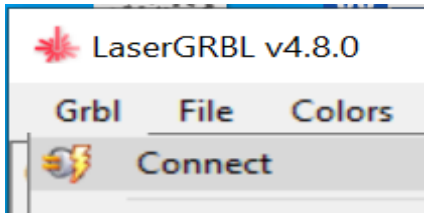
General Safety
Even though there is a screen in front of the wainlux that blocks out that laser light, you HAVE to wear safety glasses. Another workaround is to tape some cardboard around the sides to block out the laser light, but be careful not to block the fan. WEAR SAFETY GLASSES!!!

Loud Noises
If you hear loud, screeching noises when positioning the laser, that is normal. Since it is a small and cheap laser, the way it detects the farthest edge that it can laser etch is by seeing if the track can go that far. That makes the loud noise. It is unfortunately normal.

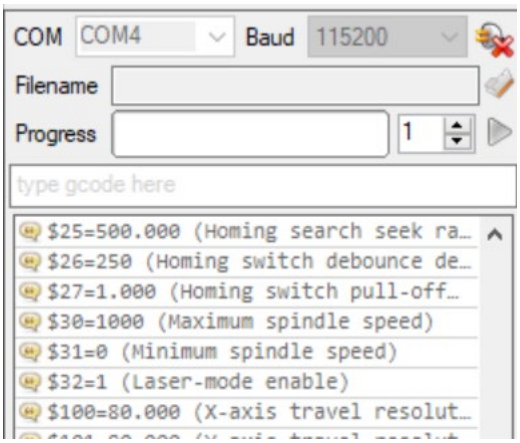
Creating Wooden Disks Fast
The best way to create these wooden disks fast is to get a wooden base and drill in a hole that is just a tad wider than your disk. Place the disk in the hole and align the laser so that the frame positioning is aligned with the edges of the hole you drilled. Once you got that figured out, make sure you create a PSD (photoshop file) that is the exact same size as your wood disk. Center your image and give it enough space around. Now you have a way to export an image to the perfect size for your wood disks. Then all you have to do is import the image, drop the disk into the hole you drilled, and press start. Easy as that!
(Note that sometimes when you disconnect and reconnect the laser, you may have to reposition it. This unfortunately isn't an exact science, just lots of trial and error.)

Atomstack laser

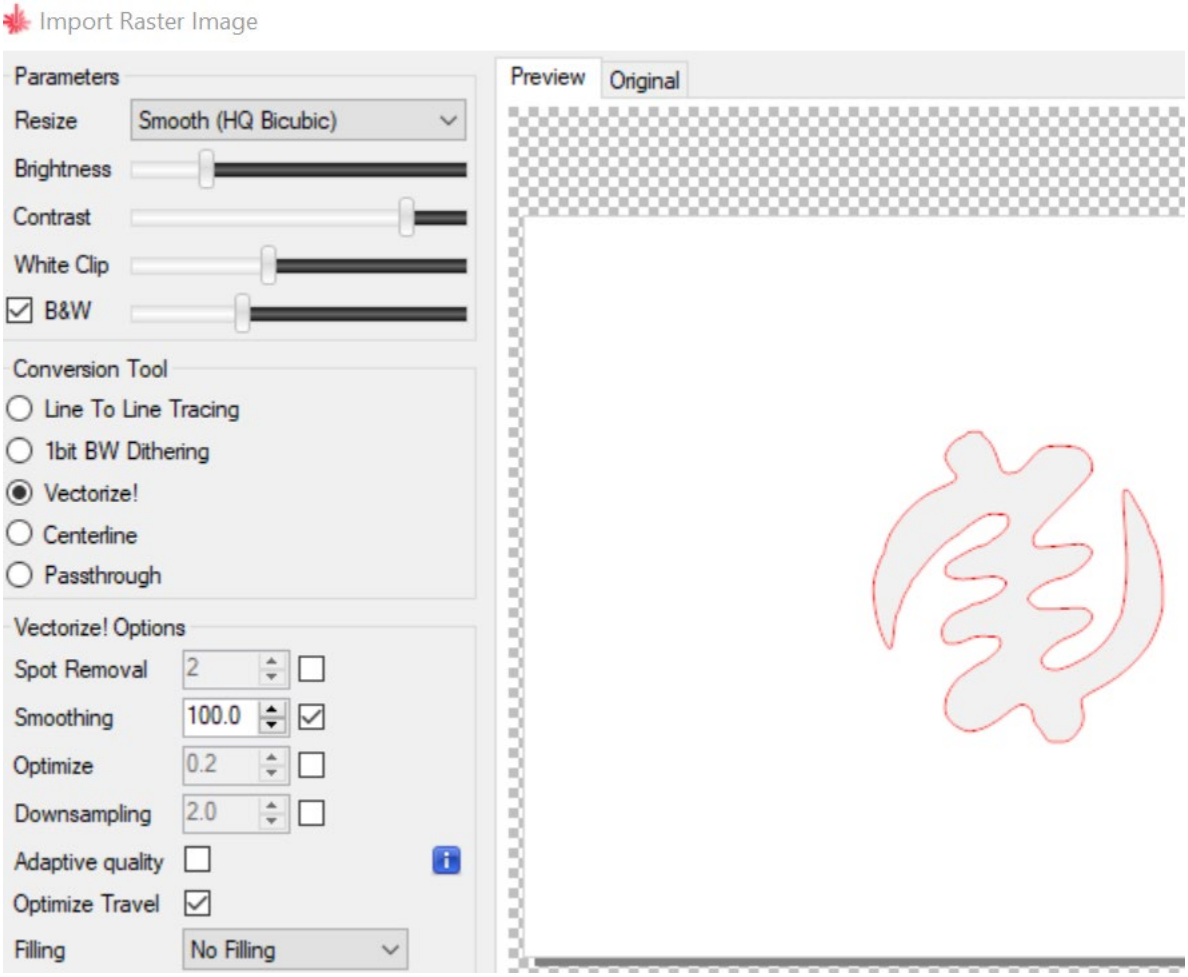
The free software for atomstack is GRBL laser. The first step is to connect the machine to your laptop: go to the upper left, click on the Grbl menu, and select “connect”



It should respond with a beep and some script (in the GRBL code) that you don’t need to read, but gives you confirmation that you successfully connected.

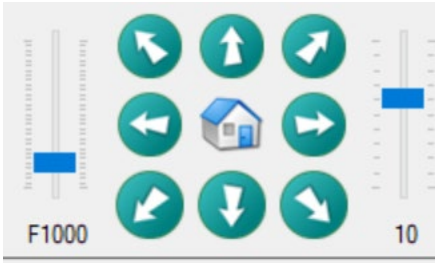


Then go to the File menu and select “open file”. Select your image. It should respond by showing you the image, now outlined:



You can play around with these parameters to see how it effects your image. For example, line to line and dithering fills in the shape, vector creates an outline (for cutting it out as a shape), centerline finds the central-most path, and passthrough scans it as a series of lines.

Click on “next” and you will see the panel for speed and other controls. Slower speed allows a deeper cut, but at the risk of burning. Click on “create” and now you can adjust where the laser starts from, using the positioning panel at lower left. Note that how you orient your laptop relative to the laser might make this move in the reverse of how you are expecting it to move.



Finally, you are ready to etch! Go to the File menu and select “send to machine”. If you need to pause or stop at some point, you can use the stop button at lower right.