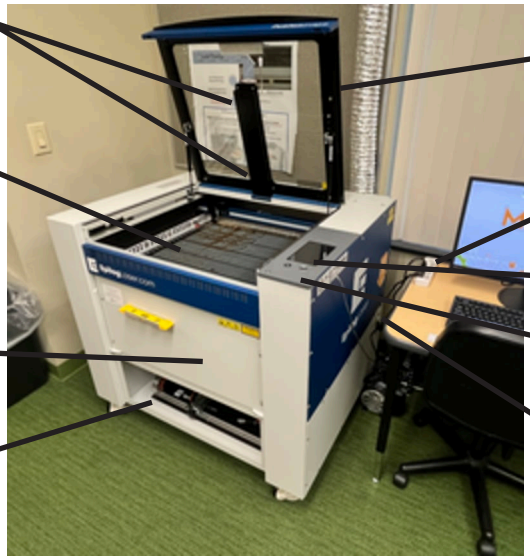
Epilog Fusion Edge
Laser Cutter

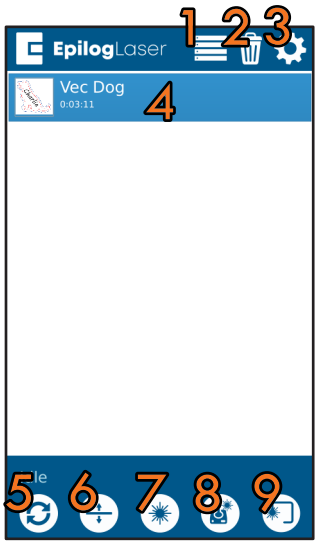
Introduction: The Epilog Fusion Edge is a laser cutter capable of engraving a wide variety of materials and is capable of cutting through certain materials up to 3/8" thick. It is also equipped with a rotary table to engrave on round objects with a maximum diameter of 7."

Overview of Laser Cutting

Parts of the Laser



Control Panel



Here's the various icons found on the touch screen.

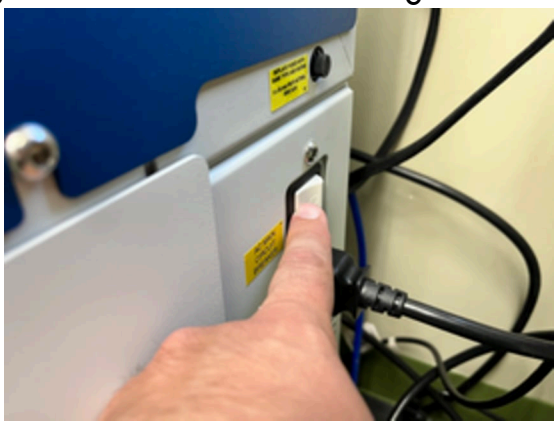
1. Job List - This returns you to the list of available jobs from whatever menu you are in at the time.
2. Delete Job - Removes a job from the job list.
3. Settings - Accesses the machine settings (For staff only)
4. Available Jobs - The full list of available jobs that have been sent to the laser. If there is more than a single screen worth of jobs, scroll with your finger to see those that were hidden. The most recently sent job will be typically at the top of the list.
5. Reset - If you have moved the laser head around any to test positioning for set up or if you want to cancel a job mid-project, this button will reset it to the machine home.
6. Focus - This allows you to set the depth of the laser bed for various reasons. Most typically used to adjust the height to match the material being used.
7. Red Dot Laser - Turns on a red dot so you can see where the laser is located. The red dot itself does not fire the laser.
8. Jogging - This allows you to move the laser left, right, up, and down around the bed. Typically used with center engraving.
9. Trace - This will trace a square outline around the borders of your overall design. This is used for visualizing where your project will sit on the material.

Operating the laser

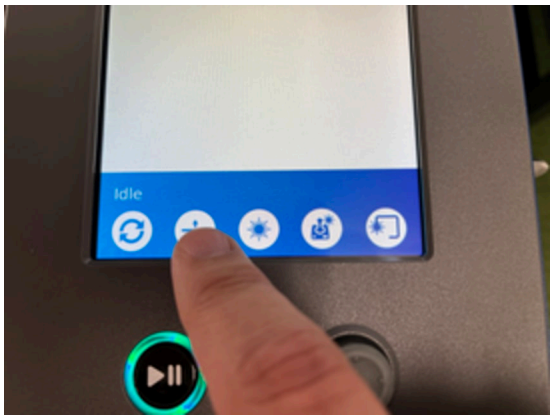
Setting up the machine

The following steps are to set up for a standard flat object engraving and cutting procedure. If you are engraving a cylindrical object, skip to Rotary Engraving later in the guide.

1. Turn on the laser using the switch on the bottom right side of the laser.



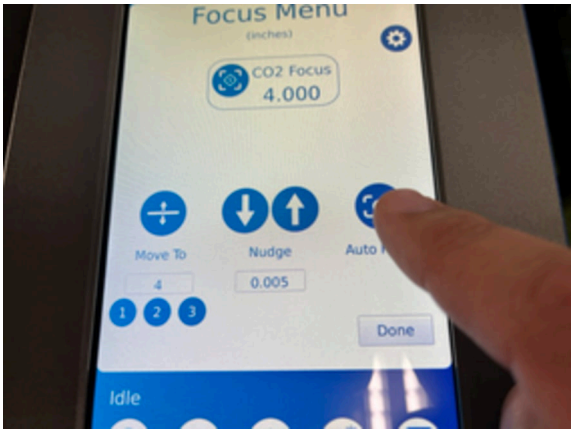
2. Once the machine boots up, tap the focus button on the touch screen.



3. If your object is too big to fit under the laser lower the bed by holding down on the joystick until there is sufficient clearance.

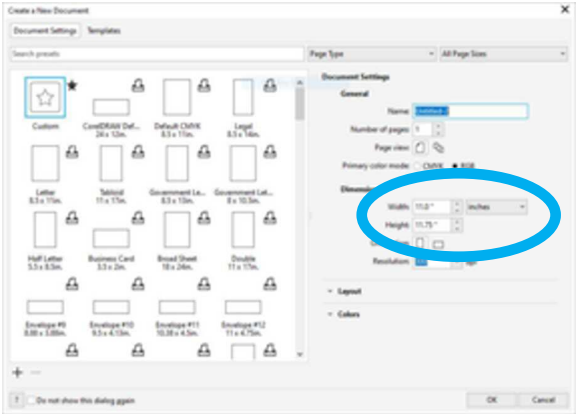
4. Once you have clearance for your object, place your object in the back left corner of the bed (or as back and left as you can if your object isn't square.) Take note of the size of your object using the built in rulers on the bed. If your object is not square, you may need to use a ruler to get a more accurate sizing.

5. Tap the Auto Focus button on the touch screen and the laser will now focus itself to your object.



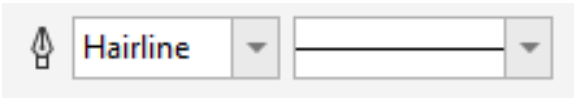
Engraving and cutting flat stock

1. In Corel Draw, set up your page to be the size of the object you're working with.

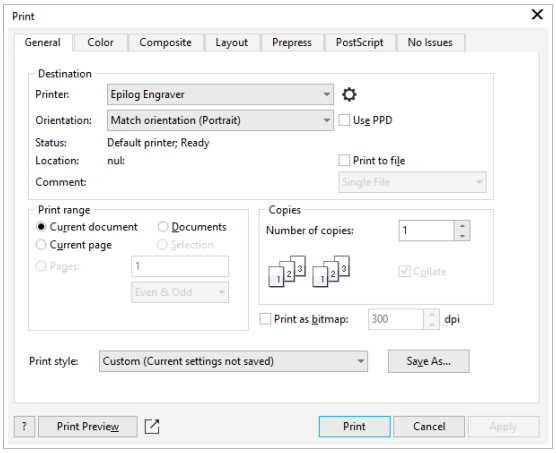


2. Place your design where you would like for it to appear on the object. (For example, if centered to the middle of your page, then it would be centered to the middle of your item as long as their dimensions were matched.)

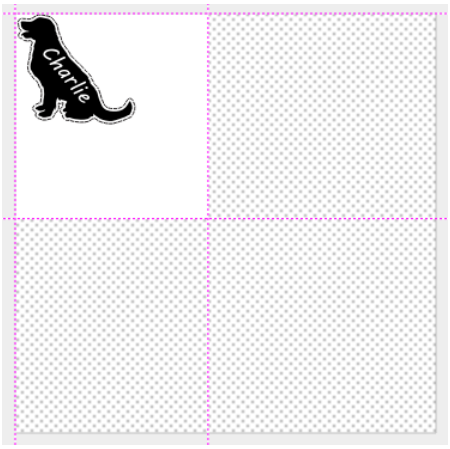
3. If you intend to cut through the material, set the vector path of your cut line to a hairline thickness.



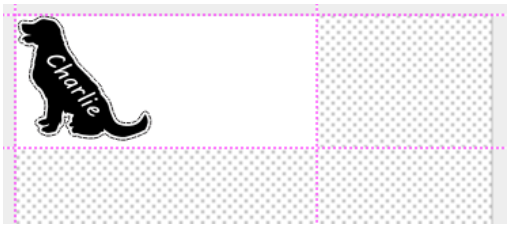
4. Print your object by clicking on the printer icon on the toolbar or going to File > Print. On the print dialog, press Print.



5. The Epilog Dashboard will now open with your object. By default it will block off a region of the bed that matches the document size you created in Corel and your design should be placed where it was.

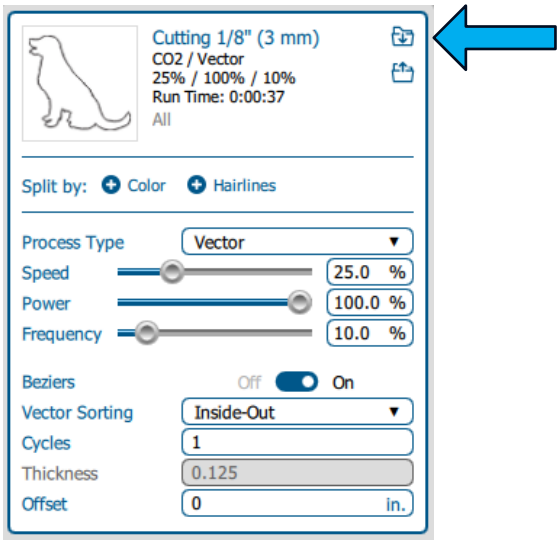


a. Note, nothing in the greyed out region will print even if something appears there. However this region can be expanded if you change your mind on the page size or you need to adjust the placement later on. To do this, drag the pink border lines in include more in the usable area.



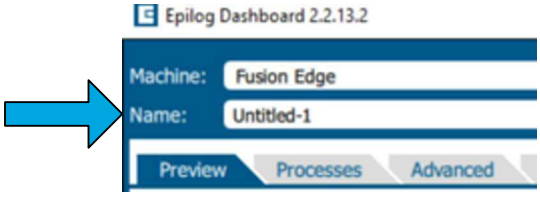
6. The design will enter in exactly as it was placed on the project in Corel Draw. If however you wish to make any adjustments to size, position, or rotation you can do that at this stage by clicking on the object and adjusting the points in the corners.

7. On the right side are your processes. This is where the software analyzes your design and separates out any engraving from cutting. There are two folder icons on each process, and the top one will pull up the material catalog.

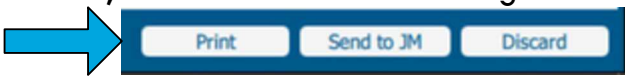


8. Select the material you're using and the type of engraving or cutting you wish to do. You will have to set this for both the engraving and vector settings.

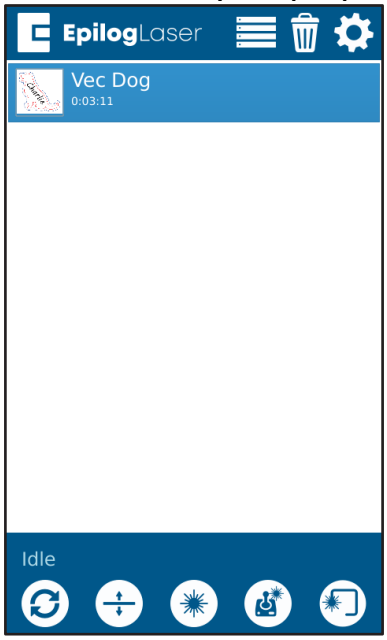
9. You can also rename your project in the top left which may be useful in later steps but is optional for the actual process.



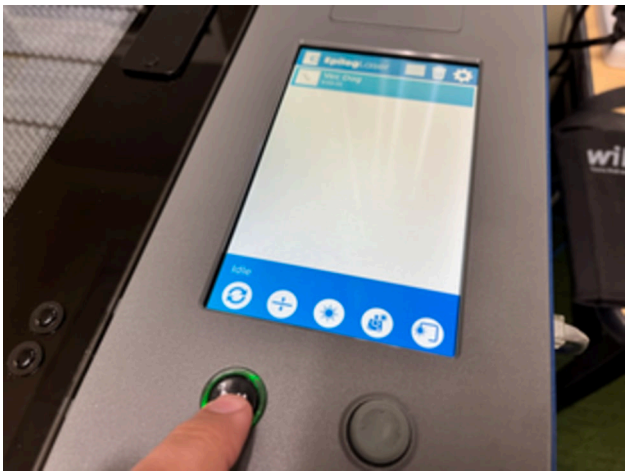
10. Once you are satisfied with the placement of your design, and you've applied the settings to your processes, click Print in the bottom right of the screen.



11. On the screen of the laser you should see your project appear at the top of the list.



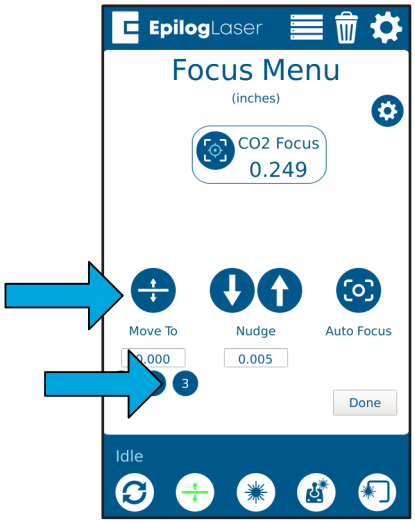
12. Close the lid of the laser and press the play button below the screen and your project will begin.



13. The project will move through the process list from start to finish. If it doesn't have one or the other, it simply skips that step in the process.
14. Once you are done with your project on the computer, click the Discard button in the bottom right of the screen to close out the project.

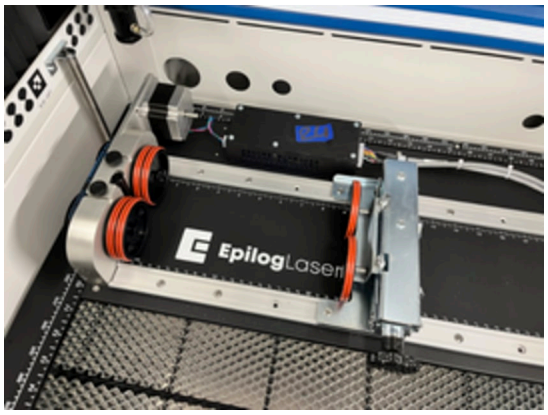
Rotary Engraving

1. Ensure there is adequate spacing under the laser. There should be several inches to start with. If there is not, tap the Focus button on the touch screen. Tap 3 and then the focus button. This will move the bed automatically to 6 inches down. You are also welcome to use the joy stick and lower the bed down manually.

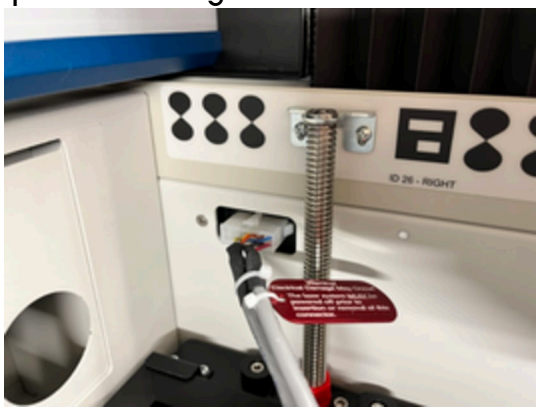


2. Once there is sufficient space, **turn off the laser.** This next step cannot be safely completed if the machine is on.

3. Take the rotary table from the opening at the bottom of the laser and place it into the back left corner of the laser bed.



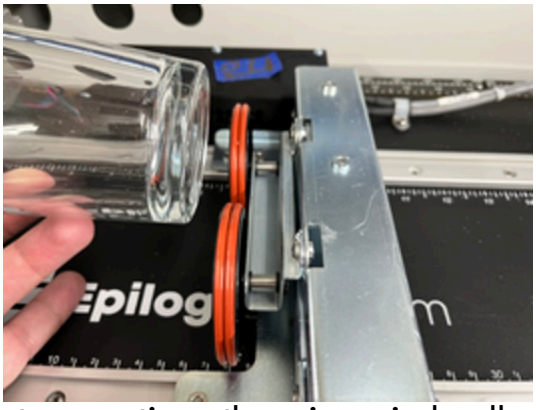
4. Plug the cable into the port on the right back corner of the laser.

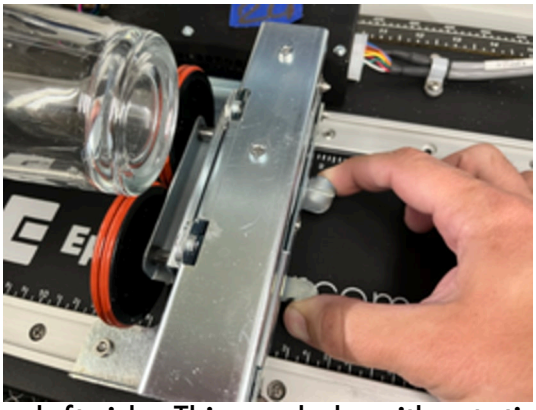


5. Turn on the laser.

6. Measure your object in terms of height and width. Note these for later.

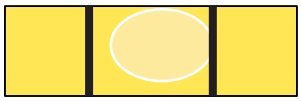
7. Place your object on the wheels of the rotary table. If the right most wheels don't touch or are too far in from the edge of your object, pinch the two arms on the right side and slide the wheels until your object is sitting with both ends on a set of wheels.

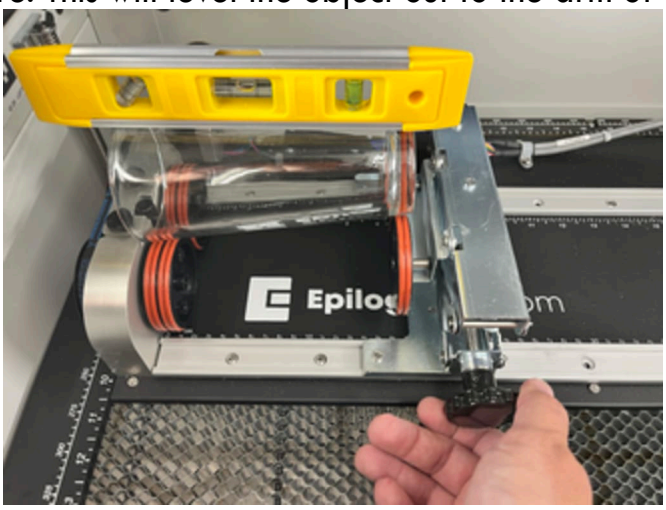




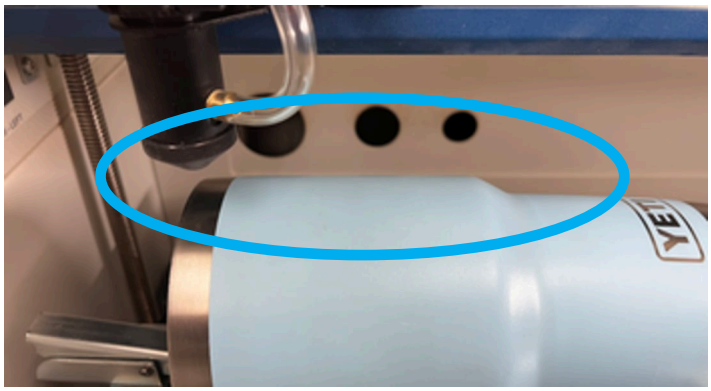
a. Note, sometimes there is a pinch roller on the left side. This can help with rotation sometimes, but can get in the way depending on the orientation of the glass. If it is present, press the left side to open it, and put the lip under the roller.

8. Set the level onto the object. Turn the knob on the right side left or right to raise or lower the one end of your object until the bubble on the level is just touching the right line as shown in the picture. This will level the object out to the arm of the laser itself.

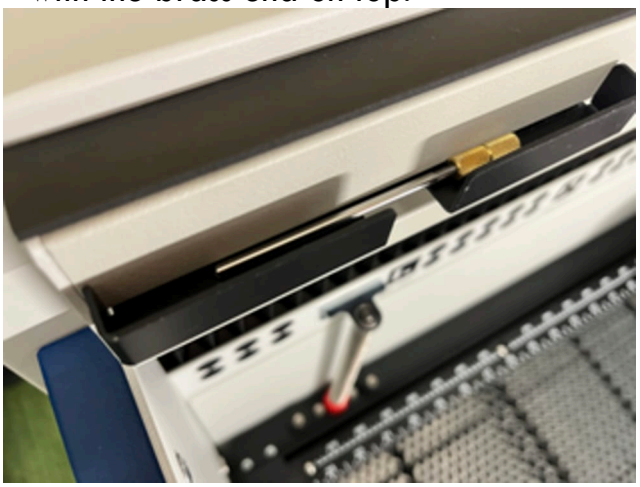


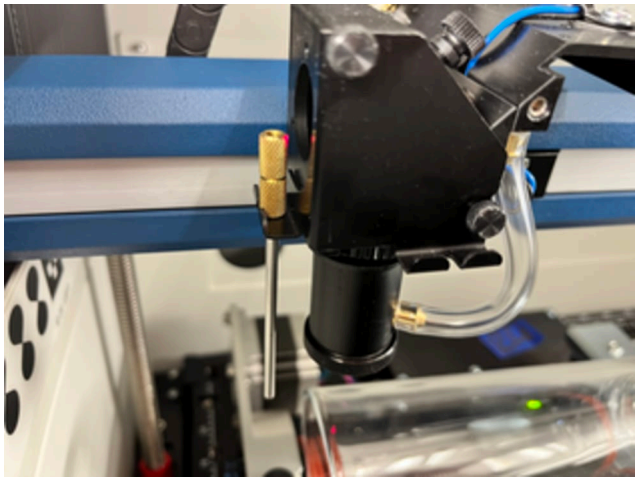


a. Alternatively you can visually align the edge of the object to the line on the back edge of the laser as a way to level it.

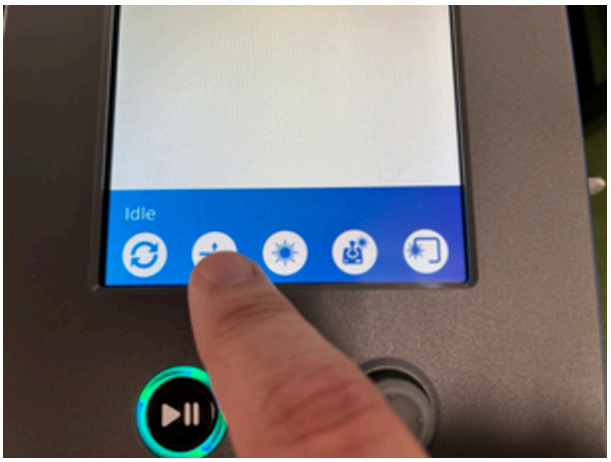


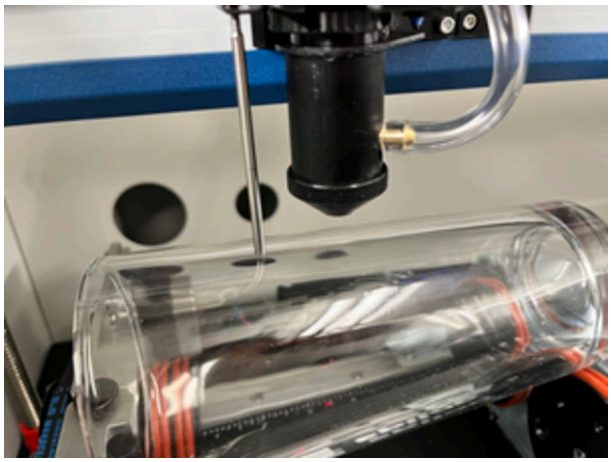
9. Take the sizing bar out of the storage tray and set it on the left side of the laser head with the brass end on top.





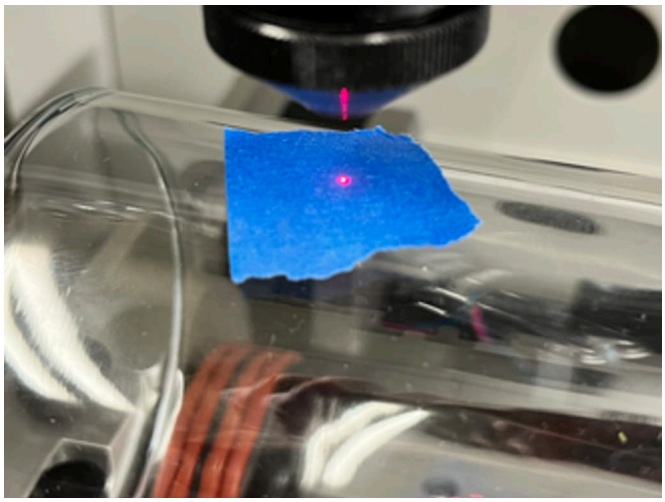
10. Press the focus button on the control panel. Use the joy stick to raise or lower the bed so that the tip of the sizing bar is just touching the surface of your object. DO NOT USE AUTO FOCUS. Remove the sizing bar and set it back in the tray for storage.



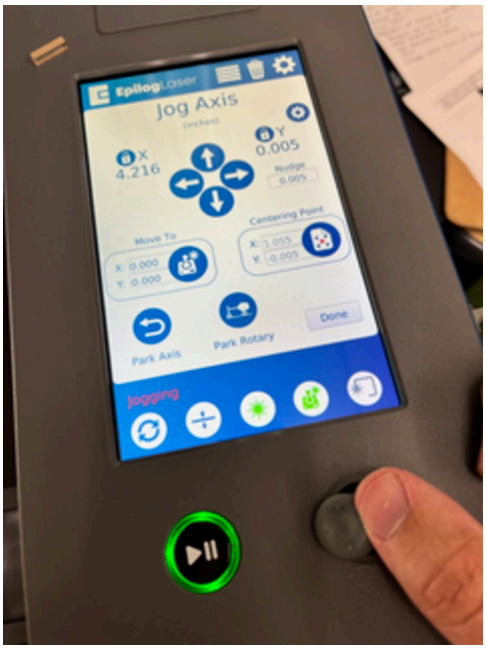


11. Press the red dot laser button on the touch screen to turn the laser pointer on.

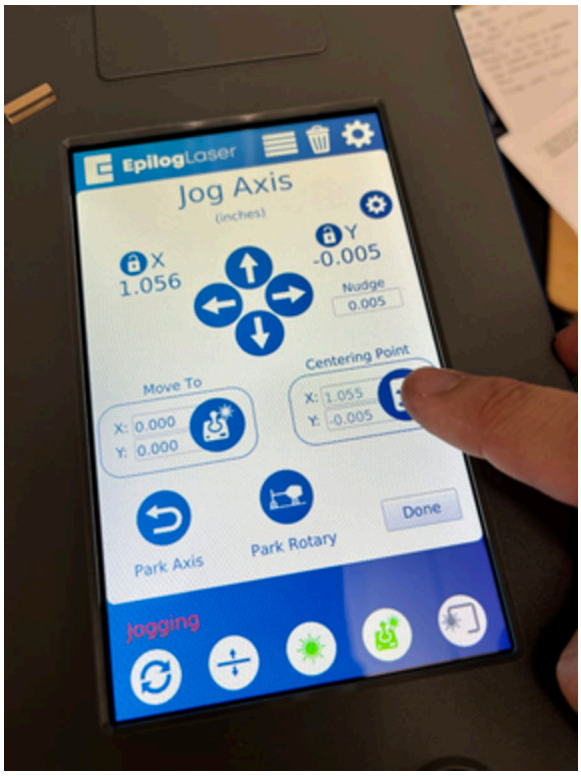
a. Note: If using glass as your material, it can be helpful to apply some blue tape to the surface of your object to help see the red dot. Be sure to remove this before running the project.



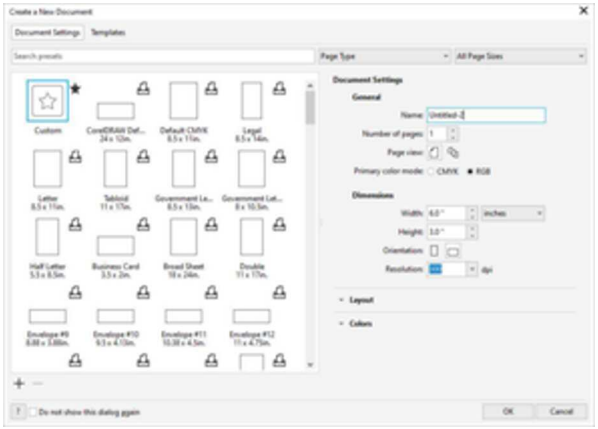
12. Use the jogging function on the touch screen to move the laser left and right to align your home position (the red dot) with where you wish to start your object from. There are two methods to this approach and they're listed in detail below under the section for Center Engraving.



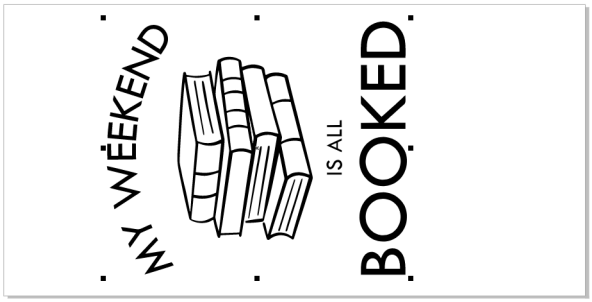
13. Once your location is set, press the Centering Point button to lock that position in.



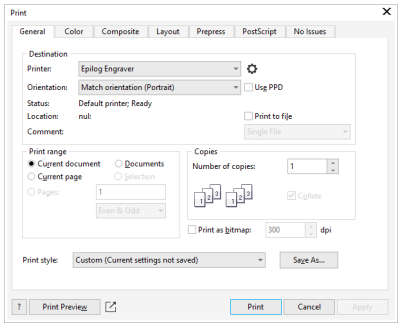
14. In Corel Draw, create a document where the width of the page is the height of your object and the height of the page is the width of your object. Then click OK.



15. Set up your page with whatever design you're doing. Then rotate the design 90 degrees left or right so your design matches the orientation of the object in the machine.



16. Print your file using the icon on the task bar or through File > Print. Press print on the dialog box that pops up.



17. You'll then be taken to the Epilog Dashboard where your design will appear.

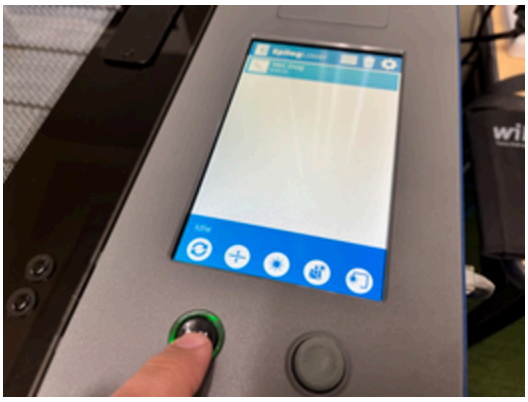
18. On the right hand side under Processes, click the upper folder icon to select the material you're going to engrave on and apply those settings. If you are engraving at 400 DPI or lower, choose a dithering option like Jarvis from the drop down.

19. Click on the advanced tab at the top side. In that section you'll toggle "Rotary Engraving" on. It should then show you your page size you listed in Corel Draw.

20. In the left column you'll choose your centering option. The specifics of these are listed in the section for Center Engraving.

21. Once these settings are applied you can press Print.

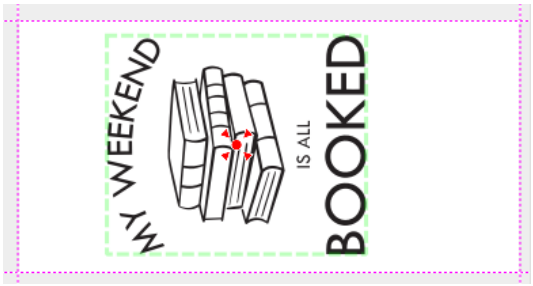
22. Your job should appear on the touch screen on the laser.
23. Close the lid of the laser, turn on the fans using the switches by the computer monitor, and press the play button below the touch screen.



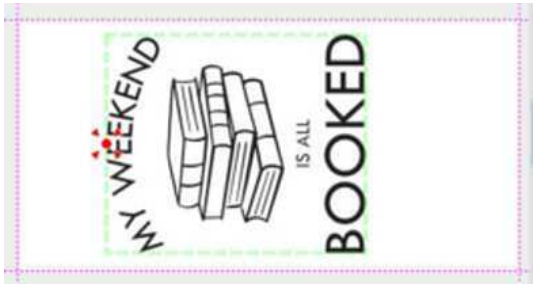
Center Engraving

Center engraving is a process by where you define a home position for the laser. There are a few different approaches to center engraving and their placement is dependent on the design you want to use.

Typically you'll be doing this in one of two ways. If you want to align your design to the center of your object, you'll use the "Center-Center" option. This looks at the center of your design and places it at the red dot you defined using the jog feature on the touch screen.



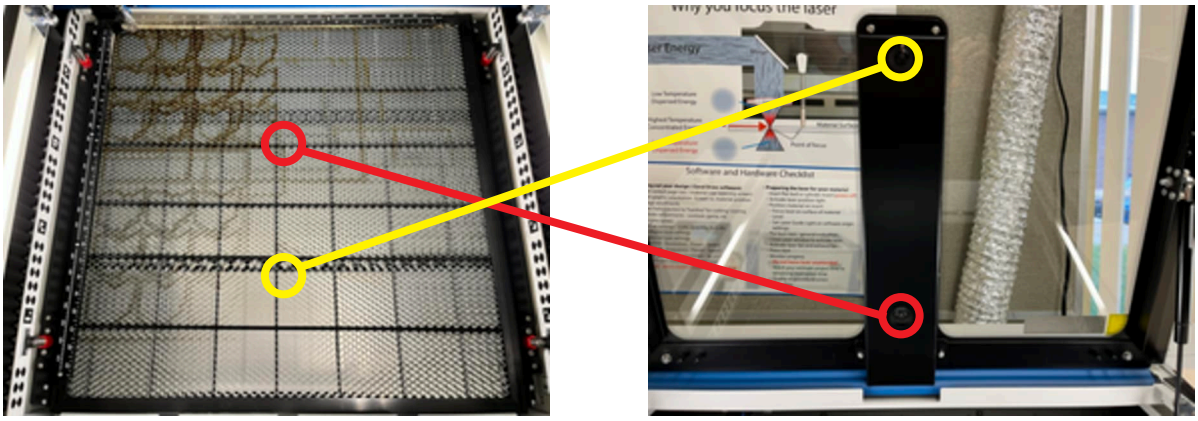
If you want to align the design a certain position away from an edge, say the rim of a cup, then you would use the "Left-Center" or "Right-Center" method depending on the orientation of your object. Here you would define your red dot at the top of the design and your design will engrave from that point outwards.



Neither option is more correct than the other inherently, but you can utilize one over the other based on your intended outcome of the object.

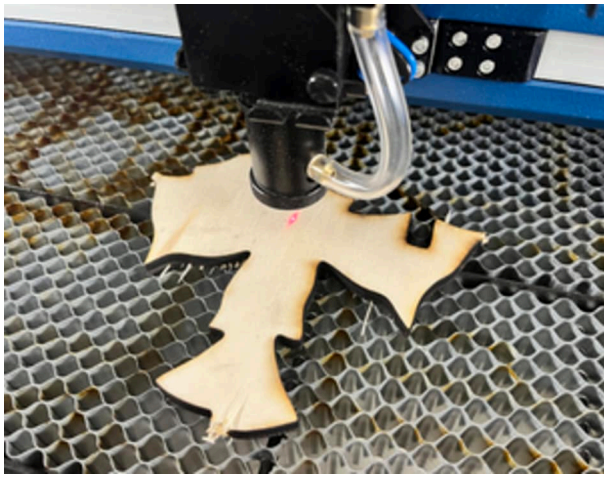
Using the Camera

The laser cutter is equipped with an overhead camera that can show you on the computer where objects are positioned and allow you to place your design onto easily misshapen or size restricted materials. The key thing to realize with this is the cameras are located at approximately 12" x 8" and 12" x 18" on the bed. The further from these points you get the less accurate the camera can be. In particular the far corners of the bed do not 100% line up with your design visually on the screen.

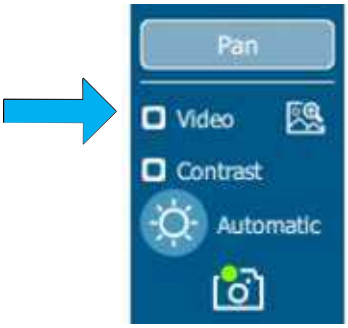


For this reason, it's best to use the camera only when required for an unusually shaped material and you should place the material directly under one of the two cameras to do so. This will ensure the most accurate representation of your object on the computer.

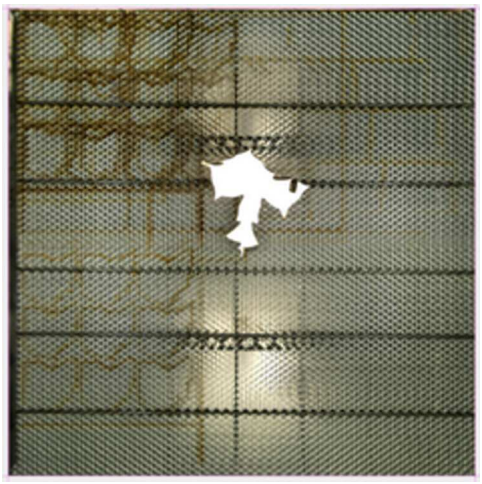
1. Place your object on the bed underneath the camera. Jog the laser to the object and then auto-focus the laser to your object.



2. On the Epilog Dashboard, find the option for "pan" on the left sidebar and select that.
3. There is a checkbox to turn on the video feed. Click this to turn on the camera.



4. A live feed of the bed will now appear on the screen.
   a. Note, if your object is rather deep (for example a box), then the top of your box will be in focus with the laser, but you may see more of the bed and interior of the laser than intended. For this instance, try to ignore everything that isn't showing directly on the top side of your object.



5. You can drag, rotate, and resize your design to fit onto this object.

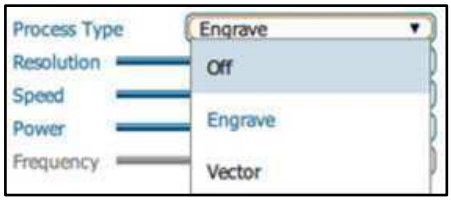
6. Apply any settings through the processes menu as usual and print your object.

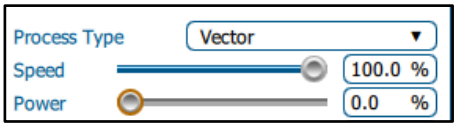
Performing a test cut

You can use a vector cut path to trace the outer bounds of your design around your object. This is a useful tool when checking whether your design will fit into an appropriate area on oddly shaped object. (You can use the camera for this as well in certain instances, but you can be more accurate with this approach. Though this method does take more effort, it will be more accurate on objects not placed directly under the camera.)

1. In Corel Draw, create a vector path using a shape or pen tool slightly outside the edges of your design. You want this to be bigger than your design, but not by much.

   a. Note if your design has a cut line already, you can skip creating a second cut path and just use this design as your vector.
2. Print your job and open it in the Epilog Dashboard.
3. From the dashboard, set your engraving process, if any, to off. Set your vector speed to 100 and power to 0, then print your job.

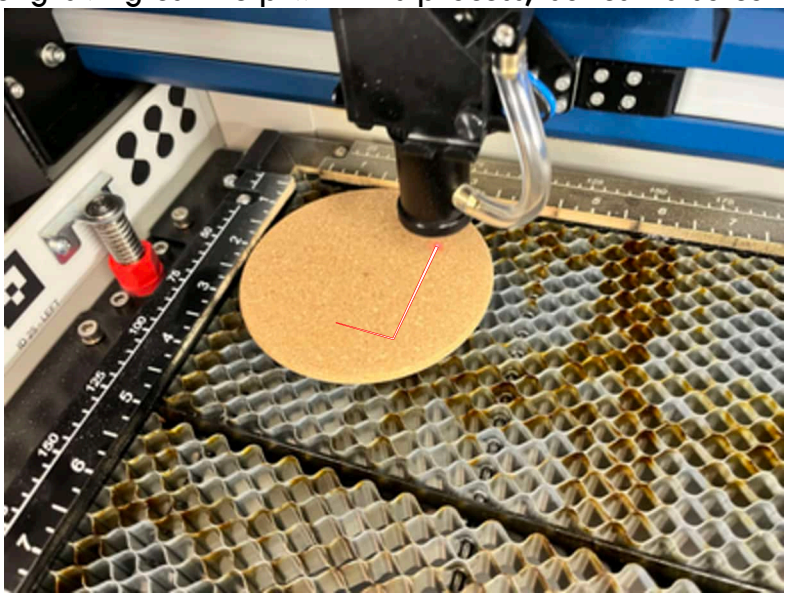




4. Leaving the lid to the laser open, turn on the red dot laser using the touch screen.

5. Press Start on the laser.

6. Watch the path the red dot follows. If this is not where you intended your design to be, either move the material to match, or adjust the placement on the screen and print again.
   a. Note: Center engraving can help with this process, but can also complicate the project some as well. See the section on Center Engraving for more information.



7. If you like the placement of your design, return to the Epilog Dashboard and remove the vector process (unless you were tracing with your actual cut line), turn your engraving process back on, and run your job as you normally would for the project.

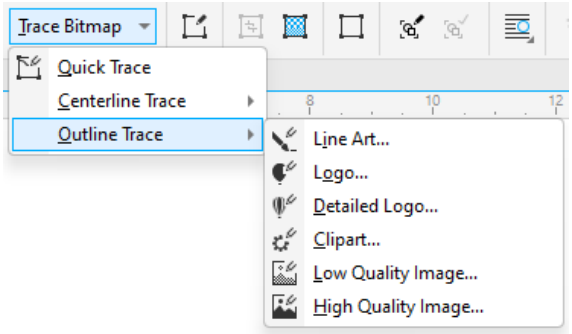
Advanced

Trace Bitmap

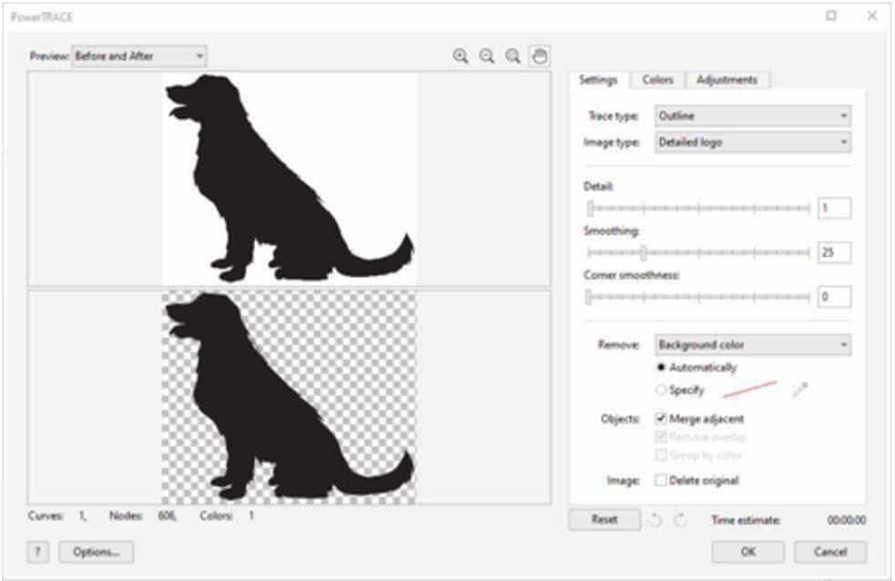
Objects that enter into CorelDraw may not be the best quality, or may have elements that are not ideal for the laser process. One solution to this can be the Trace Bitmap function. This process will scan the image and attempt to make a vector version of it. This can be useful to create unique cut lines from a piece of clipart in a JPG or PNG format, or to remove an unwanted background that would appear on the finished piece.

Note that the process can work very well, but the worse quality the image, or the more detail is in it, you may have less luck with the overall process. This will describe how to create an image using a simple piece of clip art. You may need to tweak and modify your design to get the best output.

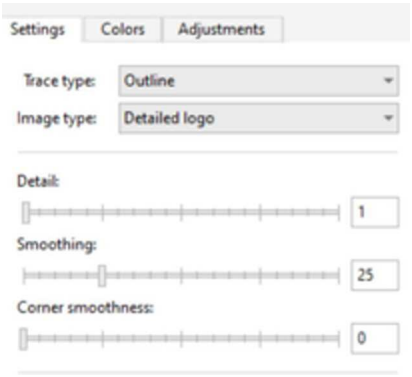
1. With your image selected, click on "Trace Bitmap" on the toolbar. Under this you'll look for Outline Trace and then select the most appropriate option. Detailed logo typically works when you're unsure which to use.



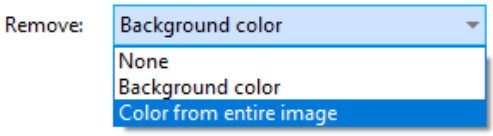
2. This will then display a preview with your original image and with the vectorized version, along with some adjustment sliders.



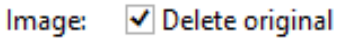
3. The sidebar gives you some sliders you can adjust. This allows for changes to detail, corner smoothing, and the overall smoothness of the design.



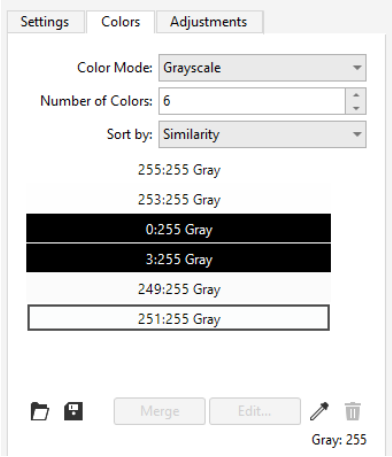
4. Under the Remove section, if you have any internal areas that haven't had the background removed, choose "Color from entire image" to remove those.



5. It is recommended you check the box for "Delete original", but it isn't required and may be best left unchecked if you plan to try this process multiple times with different results.



6. If your image has a lot of colors, or even just appears with a few patches of color, you can click the Colors tab. This will show all the colors in the design. It is recommended you get to as few colors as you can manage for the process to simplify the overall design.



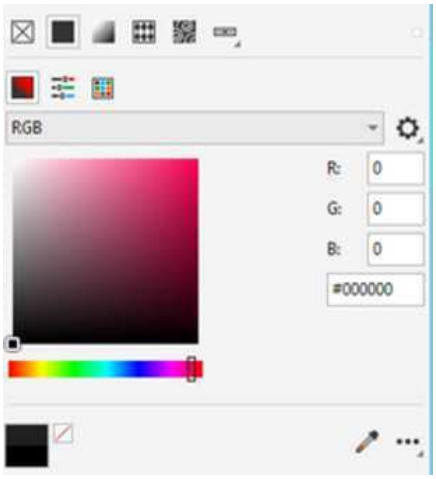
7. Once satisfied with the process, you can click OK to get your finished design.

Using Dockers

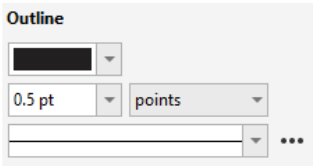
Dockers are the set of tools on the right sidebar of the screen in Corel. The library default includes five though there are many under Window > Dockers you can add for a variety of features. This section will cover the five we typically provide.

Properties

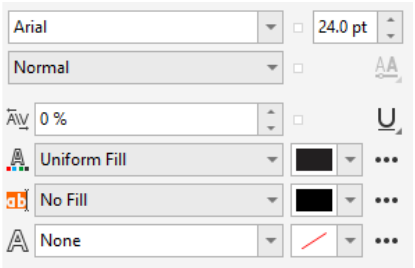
This docker will give you the ability to modify a particular item. There are too many variables to cover in here, but the main items are desribed below. Here you have the ability to change the fill of an object. You'll most likely want to work in RGB for this process. Note that anything that is listed as R0,G0,B0 will engrave at full power and anything that is R255,G255,B255 will be ignored in the final engraving.



You also get the ability to change the outline of an object. You can tweak the appearance of the outline by how thick it is, what the line looks like, and where along the vector path the outline sits. Hairline is the outline setting used to cut through an object fully.

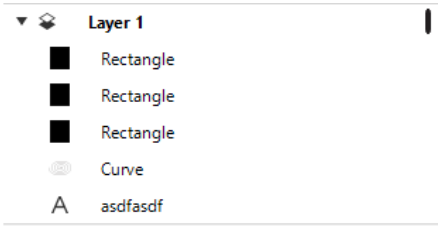


The other main area is the ability to modify the color and outline settings on text. While the font choices appear on the top toolbar, modifying the color and outline settings can be harder to manage and those settings are here under Properties.

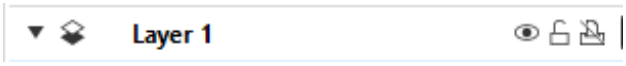


Objects

The objects docker lets you see every piece of text, shape, and line you have within your design. These are organized into layers. It will put everything into just one layer unless you create a second layer.



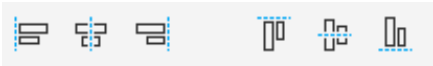
One of the most useful features within this is the ability to prevent a layer from printing. You can use this feature to create a layer filled with guides to help you better set up your design without using them in the finished printing. For instance, creating a circle to visualize where your design sits on a round coaster without engraving or cutting anything along the border of the coaster itself.



To do this, hover over an entire layer and click the printer so that it becomes crossed out.

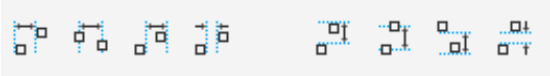
Align and Distribute

Align and Distribute are two very useful features that let you better arrange your objects. The top section shows the ability to arrange objects by the left, center, right, top, middle, or bottom of all the selected objects.

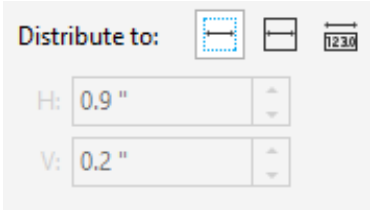


The next section down details how they will align to each other. These will align them to each other, to the edges of the page, to the center of the page, along a grid, or to a specific point you specify on the page.

Distribute lets you space your objects in relation to each other either along their edges, centers or the spacing between the objects themselves.

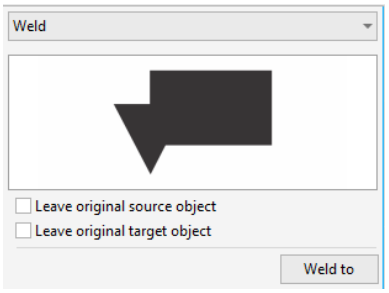


The second section allows you to distribute them either according to the bounding edges of the outer most selected area, across the entire page itself, or with a specified distance between the objects.



Shape

Shape is used to connect different pieces together to make one solid object. There is a docker for this giving you a drop down menu of features.

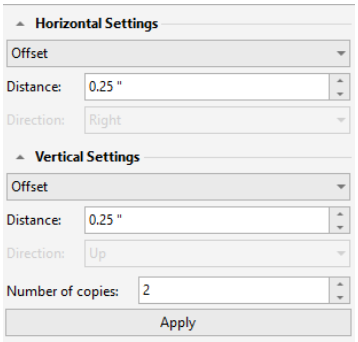


For a quick action, these tools are also on the toolbar when more than one object is selected.

These are most commonly used to merge shapes together into one object, but also are used to cut one object out of another to create a hole.

Step and Repeat

Step and repeat is similar to distribute except where distribute moves around already created objects, step and repeat creates the objects as well as distributes them in one action.



You can distribute either horizontally or vertically, or both together. The distance listed is the gap between each item and can usually be set as low as .125”. If you just want to go in one direction, set the direction you don't want to move to “No offset.”

Color Mapping

One useful feature of the laser system is called color mapping. This is where you can apply different settings to differently colored items in your design. Perhaps you want one part of the design to engrave deeper than another, or maybe you want to score one cut line and use another to also cut through the material.

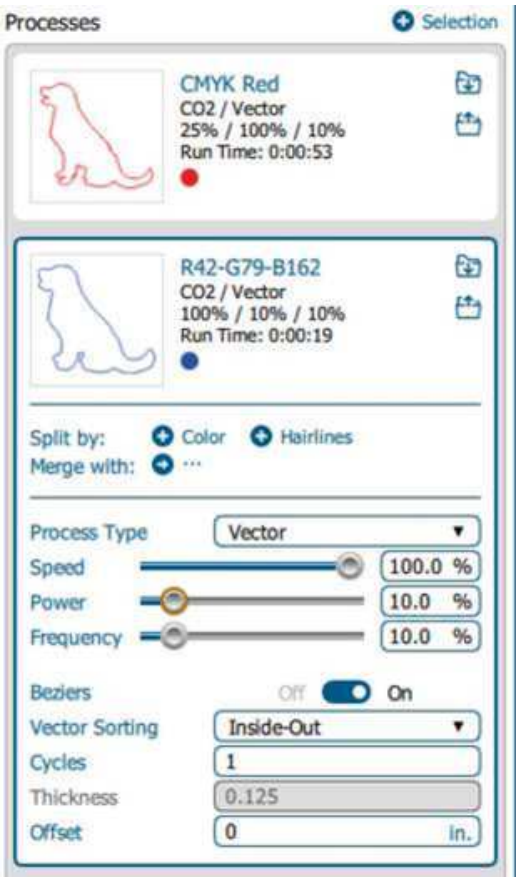
For this process in Corel Draw you'll need to apply different colors to the different parts you want to treat differently. For instance in this example, there are two hairlines.

Without color mapping these would both cut through the material. But with color mapping we can set the one line to score into the surface while the other cuts through it.

1. After sending your project to print, click on the process you wish to split up.
2. Click on the "Split by: Color" option and your project should split into parts for each color.

3. You can merge these back together should you need to by clicking "Merge with:" and selecting the appropriate option.

4. From here you can apply any amount of settings to your multiple processes either by importing a material type or by manually applying settings.



5. Print your job as normal.
6. Do note, that the laser will perform the job from the top down in the processes menu. It's advised that whatever process is going to cut through the material completely be reserved for the last position just in case any part of it were to shift after being cut out.

Dithering

When engraving with a lower DPI or with photos, it's best to use an image dithering option found under the raster settings. Dithering is the dot pattern produced by the laser. This can affect the overall look. For clip art and single color graphics, standard is fine. Standard produces a fairly uniform dot pattern over the image which may not be desired with a photo. However, when engraving a photo or an icon with a lot of variable grays, other options like Jarvis can be preferred. Jarvis is an all around good option for photo engraving.

These are the various options and what they do.

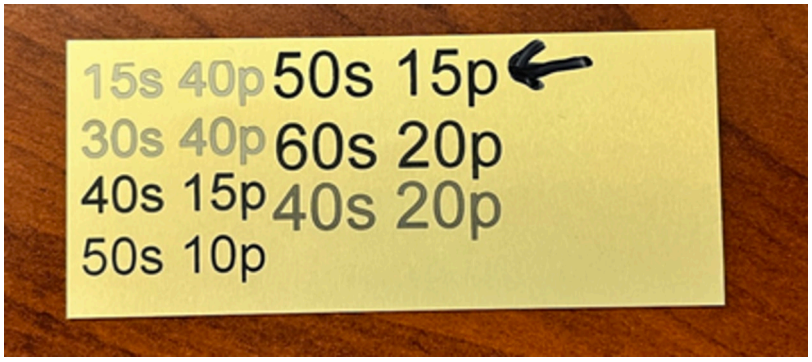

400 DPI Standard Mode


400 DPI Stucki Mode

- Standard - The default for most text and clip art applications at 500 DPI.
- Floyd-Steinberg - Has a wave like pattern to it that can be ideal for photos with a lot of detail.
- Jarvis - A good general use option for photographs.
- Stucki - A similar pattern to Jarvis that is nearly identical in outcome.
- Bayer - Produces a cross hatching pattern which is lower resolution but very stylized.

Testing new materials

When using a new material that is not found in the materials list, or if you want to modify an established setting for a different effect, first check with Maker Studio staff to see if they have experience with that material. If not, follow these steps to find the right settings. This guide can also be used to modify the settings of an existing known material for personal preferences.

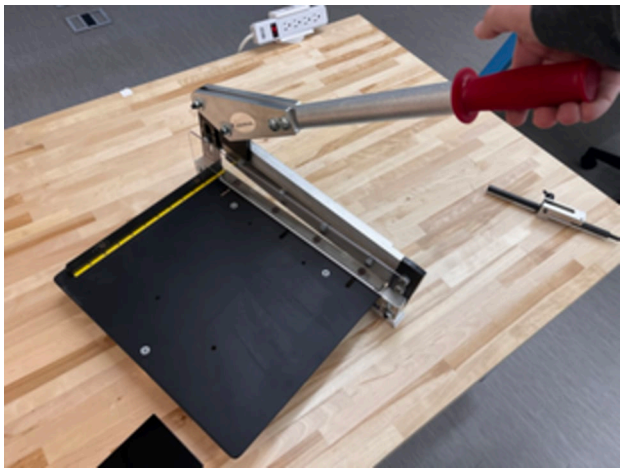


1. Choose a material from the chart that seems similar to your object, either in thickness, density, or stiffness. Use these settings as a baseline.
2. In CorelDraw, add a small bit of text to a design if you're finding engraving settings and a small rectangle if you're finding cutting settings. You will engrave or cut this design in multiple times while experimenting with settings. It can be helpful to engrave in the settings you used so you can reference and compare to past experiments.
3. Engrave this design in using the settings from your similar material. After the job is complete, examine your material and see if it had the desired effect. If not, adjust settings and try again. Even if it looks good the first time, try a couple variations to see if you can really get it looking great.
4. When adjusting settings, if you want the design to engrave more, increase the power and/or decrease speed. If you want to engrave less, increase speed and/or decrease power. Similarly, if your design didn't cut all the way through, increase the power and/or decrease speed. If your design cut through but perhaps burned too much of your edge away, increase speed and/or decrease power.
5. Repeat this process multiple times until you find a good balance between speed and power.
6. If this is a brand new material, write down the settings and provide them to the Maker Studio staff to update our materials catalog.

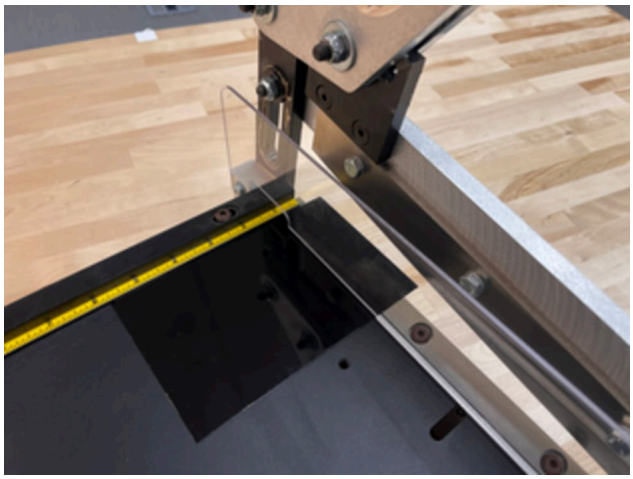
Metal shear/Corner rounder

The laser is incapable of cutting through metal. For that reason, we have a metal shear that can cut thin metals along straight lines. When cutting metal with the shear, do the best you can to maximize the size of the scrap cut off by cutting in a way that would save the largest sizes of metal before cutting small pieces off.

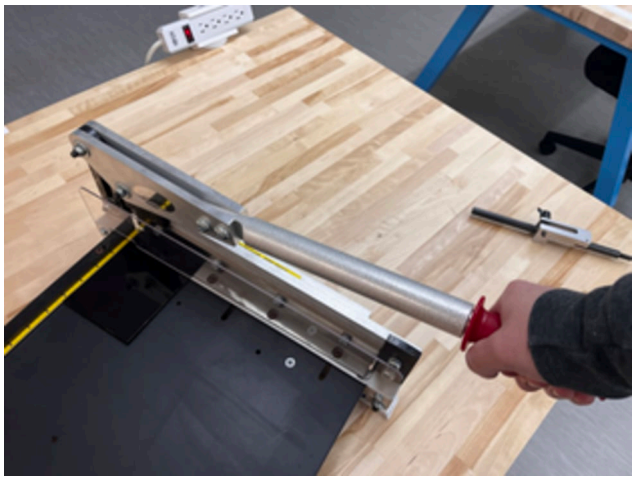
1. Raise the arm of the metal shear and place the sheet of metal on the bed against the ruler.



2. Slide the sheet under the blade and align the edge of your design with the edge of the bed.



3. Give consistent pressure as you push the arm of the metal shear down to cut through the metal.



4. Repeat on all four sides.
5. If desired, we can round the corners with a punch.

a. Place your cut metal into the corner punch. Ensure your design is pressed back as far as it will go on both sides of the die punch.

b. Press down on the handle.

c. Repeat until all corners have been rounded.

For Staff Use

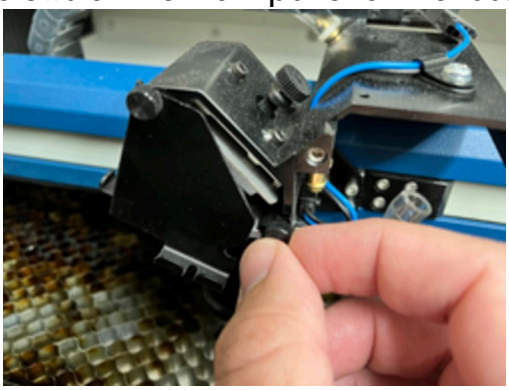
Adjusting the focus gauge

The focus gauge is very precisely set. In the event that the end loosens and it gets out of alignment, the total length of the rod should be 86.1mm. Alternatively you can auto focus to a flat object, loosen the end of the gauge and then manually adjust the gauge to match the gap created through autofocusing.

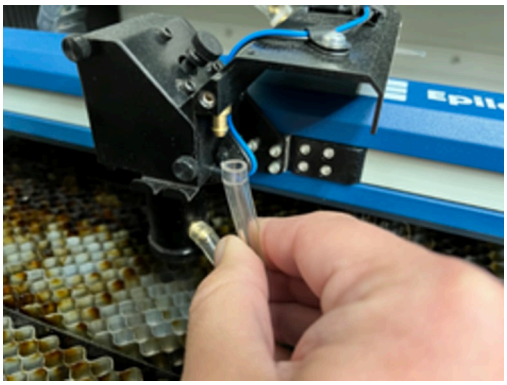
Cleaning

To clean the laser head follow these steps.

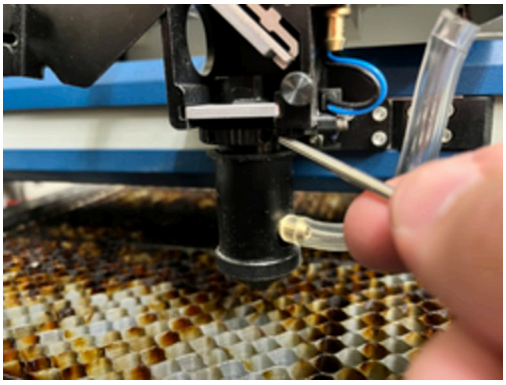
1. Loosen the two thumb screws on the front panel of the laser head.



2. Unplug the hose on the left side of the laser head.



3. Take the focus gauge out of the storage tray and locate one of the holes in the ring surrounding the laser.



4. Insert the focus gauge into one of these and turn it left to loosen.

5. Once loosened, swing the front panel out of the way and remove the laser head.

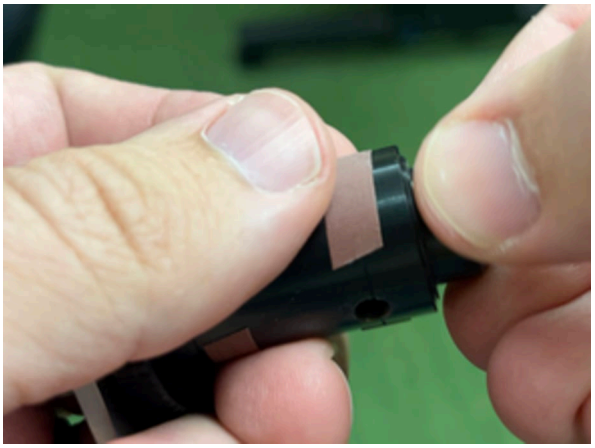
6. The back of the lens can be cleaned using a lens cleaning wipe by reaching down the tube from the top. It may be useful to use a cotton swab to help get the wipe all the way down the tube to the lens.

7. To clean the front of the lens, loosen the screw cap on the bottom of the head.

8. Unscrew the brass plug. If it is stuck, use the small screwdriver in the maintenance kit and insert it into the brass plug to loosen this and remove it.

9. Remove the outer tube and spring and set them aside.

10. Unscrew the inner shroud and set aside.



11. The front of the lens can now be reached for cleaning. It may be useful to use a cotton swab to help get the wipe all the way down the tube to the lens.

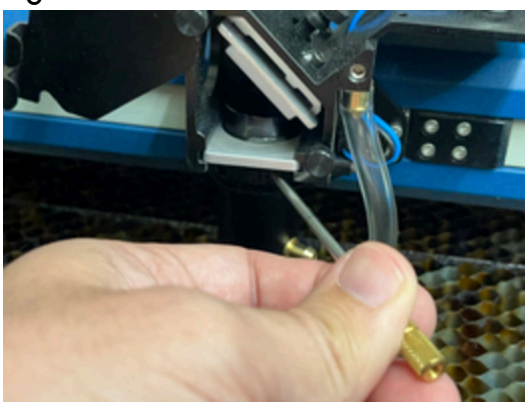
12. Reassemble by inserting the inner shroud and ensuring there is no overlap visible in the hole.

13. Put the spring inside the outer tube and then insert the laser head back into the outer tube.

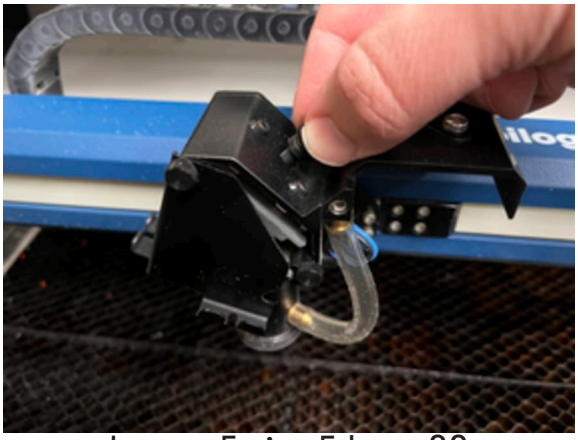
14. Align the holes up and insert the brass plug into the hole. Tighten the brass plug by hand. Ensure the outer tube can slide up and down once inserted.

15. Screw the outer shroud back onto the end of the laser. Reinsert it into the laser head.

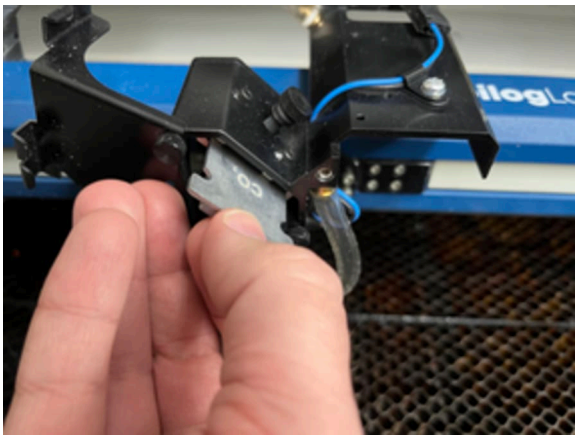
16. Using the focus gauge, tighten the nut to reattach the laser head.



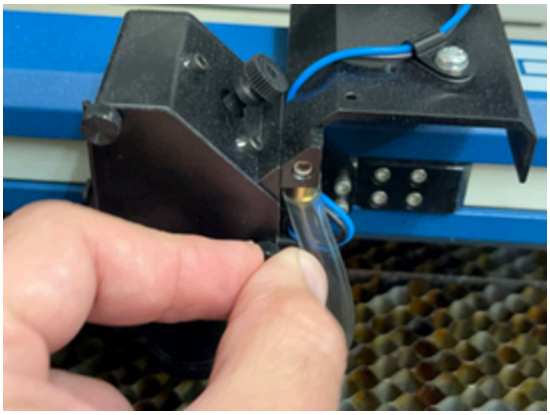
17. Reconnect the air tube to the brass plug.
18. Loosen to the top screw on the top of the laser head.



19. Remove the mirror from the laser head assembly. Clean the mirror with a lens wipe and reinsert it. Tighten the top screw.



20. Close the front panel and tighten the thumb screws.



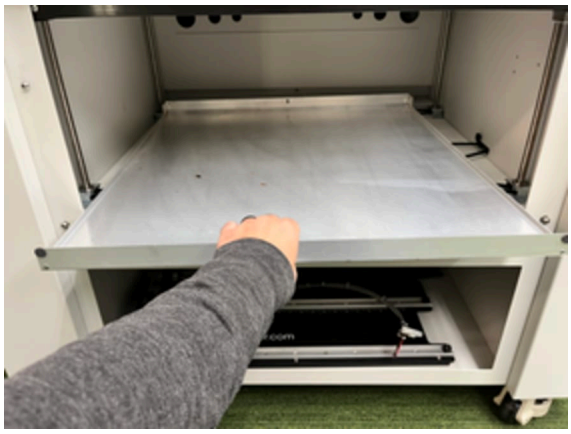
Emptying the tray

As small pieces of material are cut out and fall through the bed, you'll need to clean out the tray under the bed.

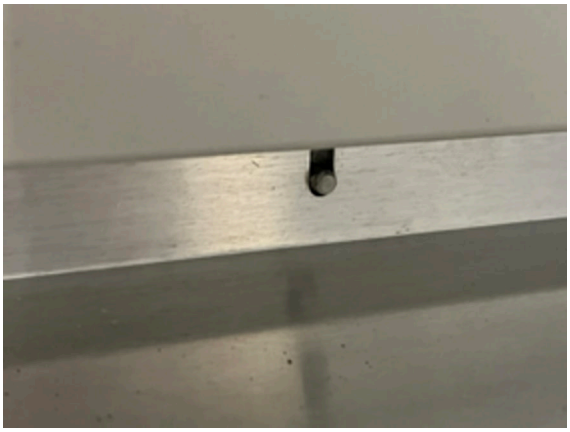
1. Taking the hex screwdriver, loosen the three screws on the front panel. (The top left screw was inserted incorrectly at the factory and should be left alone for this process.)

2. Pull down on the front panel to remove it.

3. Slide out the inner tray and empty it's contents into the trash. Try to sweep out any extra bits you can that fell out of the tray using a brush.



4. Insert the tray back in. A pin is located in the center of the back and should be aligned to allow the tray to properly sit.



5. Align the pin on the front panel with the hole at the top of the panel area, and then slide up to lock in place.

6. Tighten the three screws to secure it.