Laser Engraver/Cutter
Information and Procedures

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CE+D Laser Cutter/Engraver Policies and Procedures

Access to the laser cutter in the College of Environment & Design is a privilege, not a right. This privilege can be revoked at any time, without appeal.

The laser cutter is a powerful, dangerous, industrial machine. Misuse is very likely to result in a fire. They are a valuable resource to the community and must be used responsibly and respectfully by all. Please treat it as such and help to ensure it remains available by making sure your peers use it in a safe and responsible manner.

You are responsible and accountable for the use and care of the laser during your reservation. Any policy violations and penalties will be directed to you during this time.

You must be present for all cuts - leaving the room during a cut is unacceptable. This applies to individual work and group work.

You must use the lasers only during times that you have reserved. Reservations cannot be transferred or exchanged between students or reserved for other students.

The laser room computer is for operation of the laser only. Do not use these computers for working on your project.

Beverages and food are not permitted in the lab.

The laser cutter is available during pre-approved reserved hours ONLY

Penalties for improper usage:

Failure to operate the laser safely may result in (1) loss of access to the laser and (2) fines covering any damage to the machine.

The computer that is attached to the laser cutter has all the necessary software to perform the cuts and/or etch and should only be used for running the laser. Attempting to hook up a personal computer to the laser will result in immediate loss of access to the laser for the remainder of the academic year.

Access and Use of the Laser Cutter

Access

- Access to the laser cutter is available for limited times on Monday – Friday between 7:00 am and 5:00 pm as well as Sunday from 4:00 pm – 6:00 pm, when CED staff are present.
- The Tech Staff is authorized to revoke laser privileges or demote user levels immediately for safety reasons or policy violations
- The Tech Staff has final say on materials and operation of the laser cutter and can prohibit use at any time
- Users may only operate the machines during approved reserved times
- Users will need to pick-up a key to access the space from the Owens Library + Resource Center and return the key at the end of the appointed time.
    - Failure to return the key will result in loss of privileges for the remainder of the academic year.

Required Laser Cutter Training

- The laser cutter is used for educational, non-commercial purposes only. The laser cutter is for modeling, prototyping, and experimentation, not for mass production. All users must read and understand the training information and successfully complete a project-based training session, which covers how to operate the laser cutter. After completion of training, the expectation is that the user can independently operate the laser cutter safely.
- CED staff do not create items on the laser cutter for patrons and do not perform Vector/Graphics editing for patrons.
- Users supply their own materials. No other materials may be used.
    - Patrons must provide documented evidence that material is safe for use with laser cutter i.e., label on material, receipt.

Reservations

- Reservations can be made at https://calendar.ced.uga.edu/space/115835
- Reservation periods are for 60 minutes and each user is limited to a maximum of 2 hours per week of laser cutter reservations.

- Reservations that are not claimed within 15 minutes of the reservation start time are forfeit and the laser cutter may use on a first-come-first-served basis.

Usage

- All users agree to respect the health and safety of the University community and abide by all applicable laws, University policies and the Student Code of Conduct.
- No weapons, parts for weapons, weapon accessories, or weapon replicas may be produced with the equipment.
- No materials should be stored prior to, or left after completion of, the job. All scraps and debris need to be removed from the equipment and room when leaving.
- Constant physical presence of the user is required when the machine is running.
- The University of Georgia abides by the copyright laws of the United States (Title 17, U.S. Code). These laws govern photocopying or creating other reproductions of copyrighted materials. All users must abide by copyright and trademark laws. More information concerning copyright may be found at the University's Office of Legal Affairs.
- CED staff reserve the right to deny or cancel any laser cutter project that does not and restrict access to any user who does not comply with the above policies.
- The computer is setup to automatically log in with the correct user and setup. If you are presented with a Windows login screen either reboot the computer.

Responsibility of User

- Must have gone through basic laser file setup training before operating the laser cutter
- Must come to appointment with all materials and files prepared for use
- Will not be able to modify incorrect files on the management workstation during appointment time
- Will clean the surround area and take all unused materials and scraps from the laser cutting room

Cost

- There is no charge to use the laser cutter. CED **does not** provide materials.

Laser Cutter Information

Epilog Laser Fusion M2

- Laser type: Sealed CO2 laser tube
- Laser power: 75 Watts
- Engraving/Cutting area: 40" x 28"
- Max engraving height: 13”
- File type dictates laser process:
    - .DWG Vector Cut
    - .SVG Vector Cut
    - .JPEG Image: Engrave
    - .PNG Image: Engrave

Approved Materials

CED maintains a list of acceptable materials. To ensure the safety of the University Community, as well as to protect the equipment only materials from this list are allowed.

Acceptable Materials:

- Acrylic (engrave and cut)
- Birch and walnut plywood (engrave and cut)
- Cork (engrave only)
- Cardboard (engrave and cut)
- 100% Cotton fabric (engrave and cut)
- Denim fabric (engrave and cut)
- Felt, wool (cut only)
- Glass (engrave only)
- Leather, unstained (cut and engrave)
- Maple, solid (engrave and cut)
- Mat board (engrave and cut)
- Oak, solid (engrave and cut)
- Paper (engrave and cut)
- Rubber, laser grade (engrave and cut)
- Walnut, solid (engrave and cut)

All materials must contain identifying information

Cutting is limited to materials up to ¼" thick.

No material exposed to spray paint or spray adhesive will be allowed. Extremely flammable chemicals in the propellant are present even after the piece is dried.

Only materials listed under Acceptable Materials may be used in the laser cutter. If you have any doubt as to whether your material is on the Acceptable Materials list, or how your material will behave in the laser cutter ask the Tech Staff before bringing it to your appointment.

Unacceptable Materials

- FOAMCORE
- PVC or any materials containing PVC
- Pine boards
- Metals
- Anything NOT listed under Acceptable Materials

If you want to use a material that is not listed, please consult with the Tech Staff before bringing it to your appointment.

Materials Quality & Preparation

Use flat materials only. Surfaces that are not flat may block the movement of the laser head assembly or the airflow of the nose cone, both of which may damage the laser cutter.

Non-flat materials also will not cut/engrave properly due to the changing focal length across the material.

The operational tolerances of the laser cutter require very little change in the focus distance between the material and the lens. Your material needs to be flat with no bows, warping, or wrinkles to achieve a successful engraving or cutting.

Because laser is light, and light refracts as it passes through media of different densities, results using plywood will be different than using matboard or solid wood. The success of the job cannot be guaranteed when using materials that consist of various layers.

Woods can be stained or painted prior to cutting/engraving. In fact, you can often achieve a better finish on your engraving if the wood is sealed prior to engraving because the oils and soot will be easier to remove. All sealant and paint need at least 48 hours prior to cutting/engraving to dry fully.

Formats and File Types

Vector vs Raster

When you are vector cutting or engraving, the laser is following a continuous path that follows the outline, or profile, of an image. Vector cutting is used to cut completely through materials such as wood, acrylic, paper, etc. It can also be used for quick marking of characters and geometric patterns. You can vector cut with the laser by setting objects and text to be unfilled and drawn with a 0.001" (0.025 mm) outline. The thin outline will produce a vector cut.

Raster engraving can best be described as very high-resolution dot matrix "printing" with a laser. Raster engraving is used to create highly detailed graphic images. The laser head scans back and forth, left to right, engraving a series of dots one line at a time. As the laser head moves down line by line, the dot pattern forms the image that was printed from your computer. You can raster engrave scanned images, text, clipart, photographs, or line drawings.

- AutoCAD can be used for vector cutting and marking
- Illustrator can be used for a combination of raster engraving and vector cutting
- Photoshop can be used for raster engraving

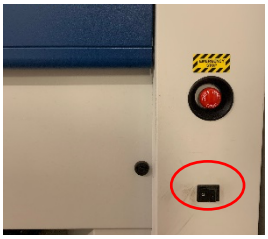
In Case of Fire

In the event your material catches fire, press the red emergency stop button on the front of the machine to stop the laser and turn off the exhaust system. DO NOT open the unit, the lack of oxygen within the unit should quickly smother the fire. If the fire does not go out there is a fire extinguisher outside of room 031. Immediately after the fire is out notify a staff member for assistance either by returning to the Owens Library + Resource Center or calling 706-542-4463.

Machine Operation

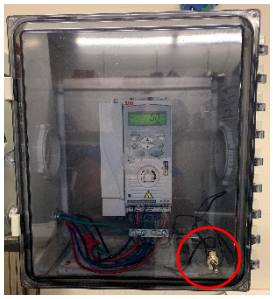
Power Switches

There are three switches that must be turned on prior to sending and starting a job.



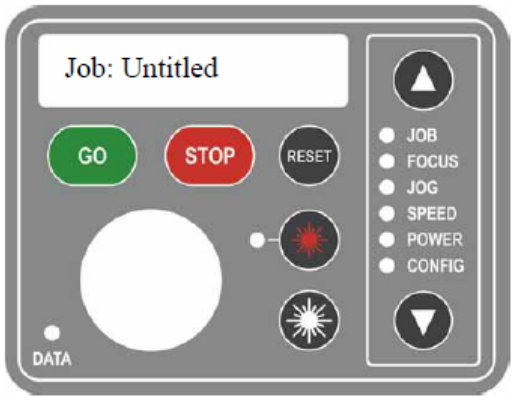
1) The first is the main system power located on the front right side of the Fusion and the front left side of the Legend laser cutter

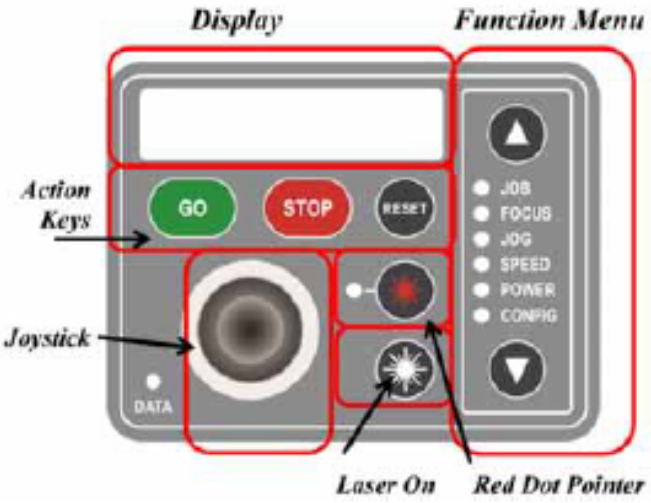
2) The second is the air assist pumps controlled by the power strip located next to the exhaust system panel.



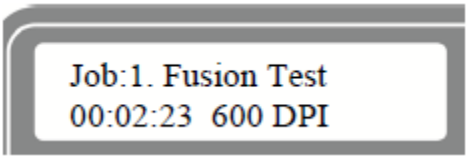
3) The third is the exhaust system located on the wall over the computer.

Fusion Control Panel





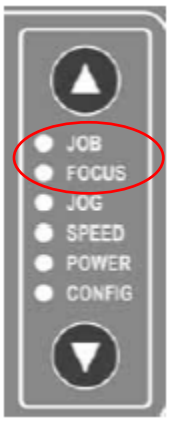
Display



The display shows valuable information associated with the highlighted Functional Menu items. Its main purpose is to show the job name and estimated time of completion for your project. Each new job is numbered, and the job name will be the same as your file name.

The image above shows an example screen. The job is the first to be cut, it is called Fusion Test, and the job time estimator indicates that the job will take 2 minutes and 23 seconds.

Function Menu



The function menu has many options but the only ones you will be using are the JOB and FOCUS menu. The up and down arrows will be used to go back and forth through the two menus.

When a job has been printed to the laser and the JOB menu is highlighted, you will be seeing the job in the first line of the display. If multiple jobs have been printed to the laser, the last job printed will be displayed. Use the Joystick to scroll through multiple jobs.

With FOCUS highlighted, move the Joystick up and down to move the table up or down in order to focus it to the new job. The display will show a digital readout of the table position.

Action Keys

Pressing the GO button on the keyboard will start this job. After pressing the GO button the job timer will be activated and the print resolution will be displayed on the second line of the display.

Pressing the STOP key will stop the lens carriage and the laser beam will be shut off. If the STOP key is pressed during raster engraving mode, the lens carriage will stop on either the far left or far right of the engraving line that is in process. If the STOP key is pressed while in vector cutting mode, the lens carriage will stop at the end of a line segment or at the next line node location. Once the lens carriage has stopped, you can open the door to examine the engraving. By closing the door and pressing the GO key, the engraving / cutting job will commence where it left off. If the item being engraved is not moved the engraving / cutting registration will not be affected.

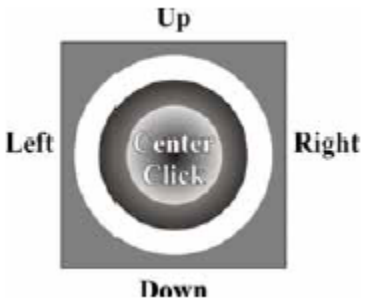
Note: Opening the door on the laser during engraving or cutting will stop the laser from firing; however, the lens carriage will continue to move. It is important to STOP the job before you open the door to ensure the engraving / cutting is completed.

If you press the STOP key while in vector mode it may take some time for the system to stop. The system needs to get to the next node in a vector before it can stop.

Pressing the RESET key will move the carriage back to its Home position. Press the RESET button after you have pressed the STOP button, or after you have moved the carriage when in the Jog position.

RESET does not erase the job from the laser systems memory; rather it will stop the engraving job in process and send the carriage back to the home position.

Joystick



The Joystick is used to control, move, or change all of the available features found in the Fusion keyboard.

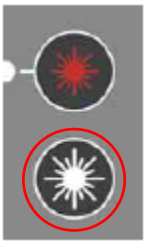
After you highlight a Function Menu item you will use the Joystick to control, move or change that function by tilting or depressing the Joystick.

Changes made while using the Joystick will be shown on the two-line LCD display.

Red Dot Pointer

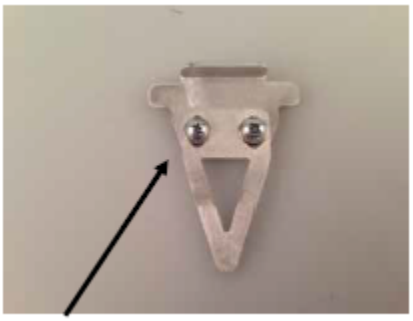
The Pointer key is a toggle switch that turns the laser systems Red Dot Pointer on and off. When the red dot pointer is on, the indicator light directly to the left of the pointer key will be illuminated.

Laser On

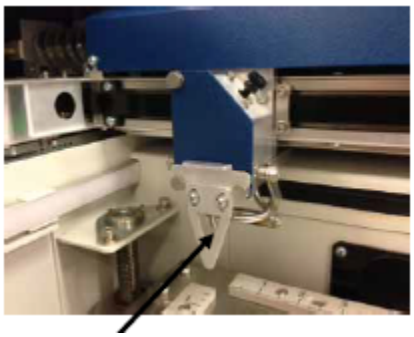


The laser on button allows you to move the carriage and fire the laser without having a job in the display. This is a very handy feature because it allows you to do simple tasks without printing a job to the laser system.

Focusing



Manual Focus Gauge



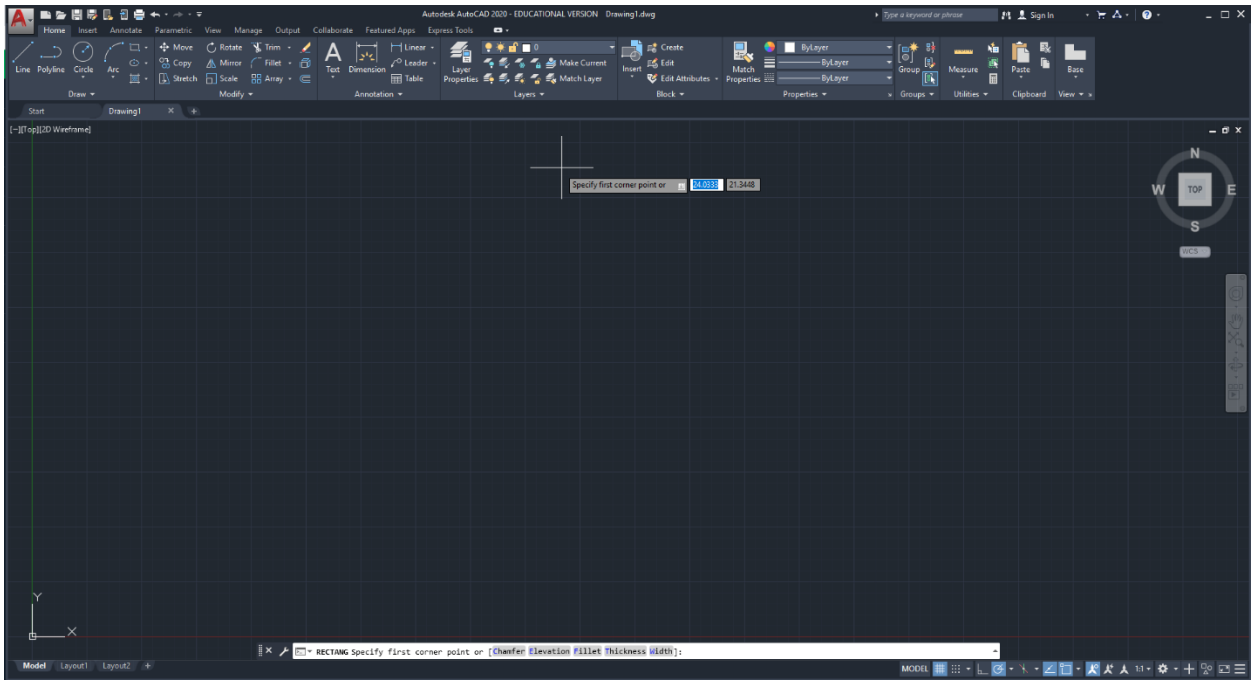
The laser cutter must be focused before any project cutting can be done.

To do this, first use the up and down arrows on the function menu to select the FOCUS menu, then use the manual focus gauge placed in the left-hand compartment of the laser cutter. Place the manual focus gauge on the front notches of the laser cutter (pictured to the left) be sure the screws on the gauge are facing forward.

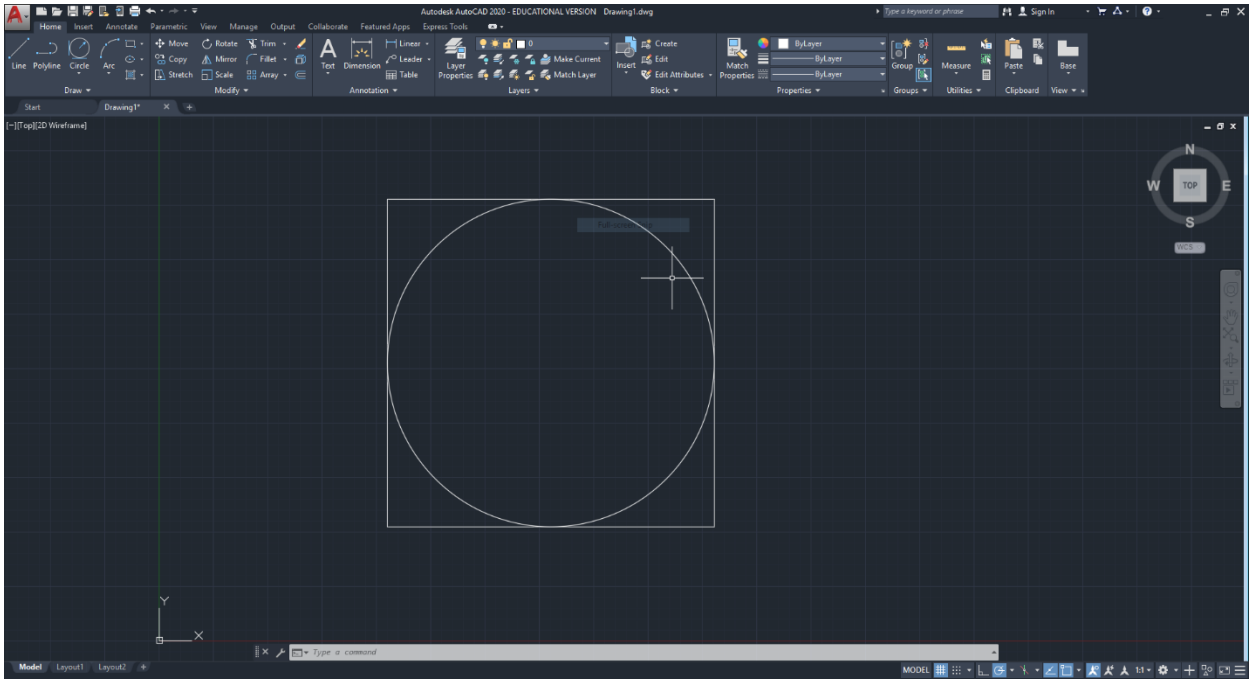
After placing the gauge on the laser, use the Front Control panel Joystick to adjust the height of the laser cutter to where the gauge barely touches the material you're planning to cut. Once the gauge is in place double click the center of the joystick, and then push the joystick all the way to the left to set the focus. Once complete, return to the JOB menu to continue.

Preparing your AutoCAD Laser Cutter Project

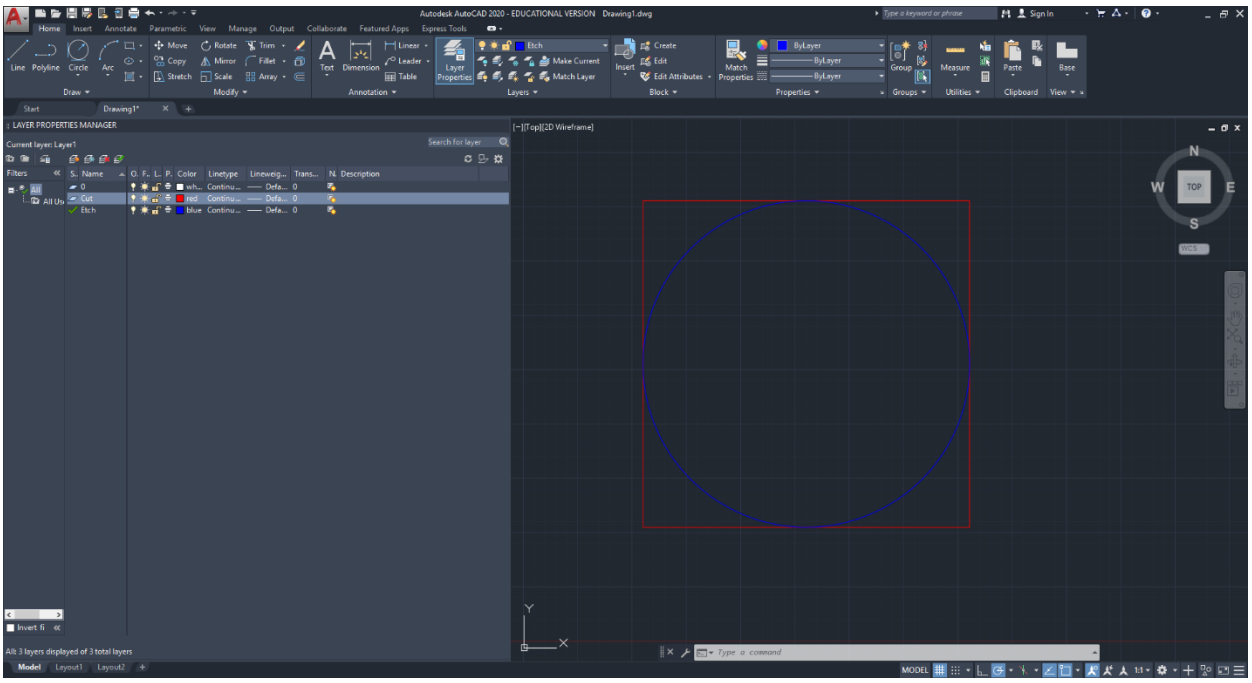
1) Open a blank AutoCAD file

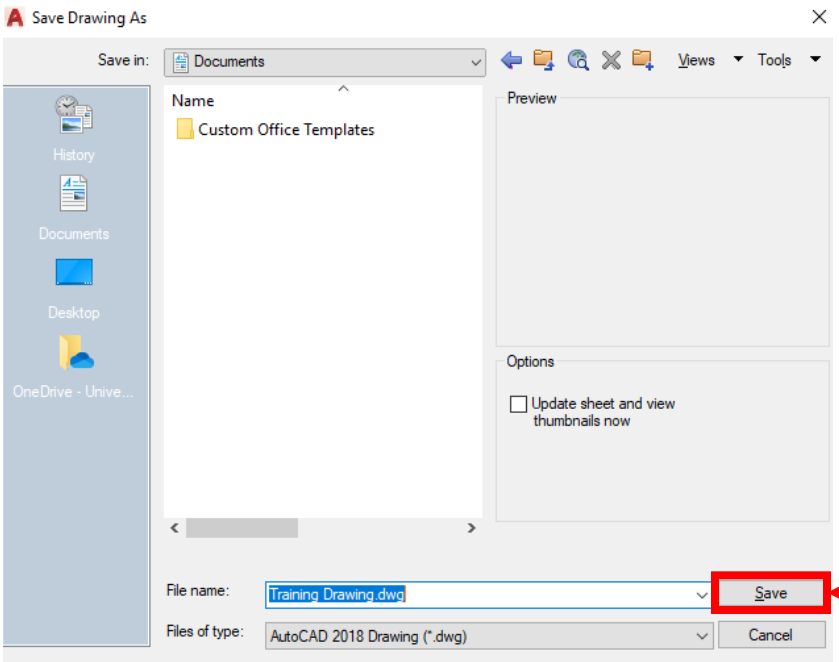


2) Using model space, draw your laser cutting project at actual size. (i.e. if your drawing a large-scale topography model, in model space your drawing should be drawn at the complete full-size model at 1:1)



3) Once your drawing is complete create 2 layers:
    a. Cut (Red #1)
    b. Etch (Blue #5)
4) Use these layers to assign each line in your drawing with the ability to cut or etch based on what project your completing
    a. Cut lines should not overlap unless the space is intended to not be a part of the final project.





5) Save your project to a flash drive or external hard drive and bring it to your laser cutting appointment.

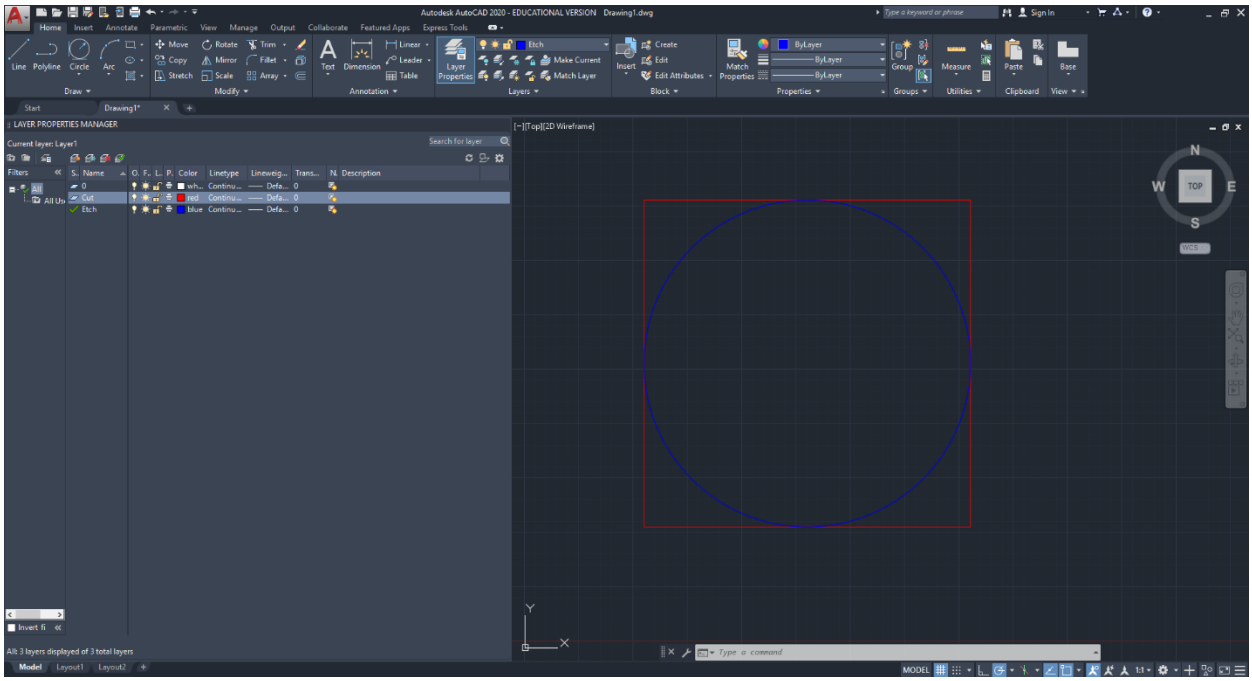
Cutting your AutoCAD Laser Cutter Project (Fusion)

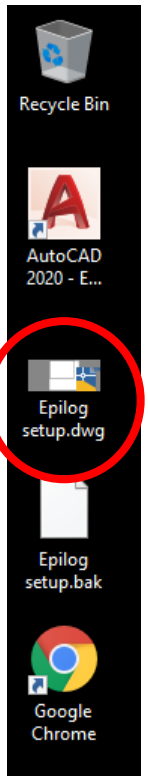
After you have saved your file to a flash drive proceed to your laser cutting appointment and complete the following steps:

1) Use the "Machine Operations" section of this manual to properly turn on the laser cutter and all its power switches.
   a. **ALL SWITCHES MUST BE TURNED ON FOR SAFE OPERATION**
2) Open the top cover of the laser cutter and place your material in the allotted space.
3) The edges of your material should line up with the Top left side of the laser cutter as shown here.
   a. The placement of the document is always the same no matter what you are cutting. If your drawing is in the middle of your page, it will need to be reformatted to fit the space allowed by the laser cutter.

4) Refer back to the "Machine Operation" section to properly focus the machine before continuing to the rest of the project.
   a. **If the machine is not properly focused, your project will not cut properly.** It is vital that this step is completed properly before cutting your project.

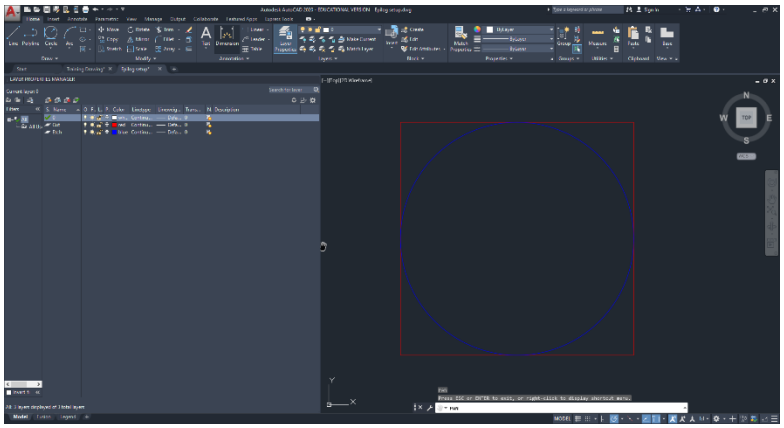
5) Open your original file on the laser cutter desktop.



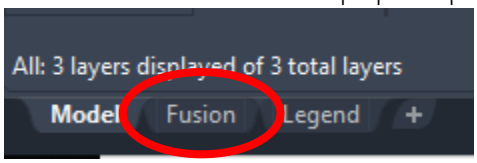


6) Open the epilog file located on the desktop in AutoCAD
   a. This file has all the presets necessary for you to complete your project with little changing
   b. Do not save your original file over this drawing or change any page set up

7) Copy your original file from your model space into the model space of the epilog file.

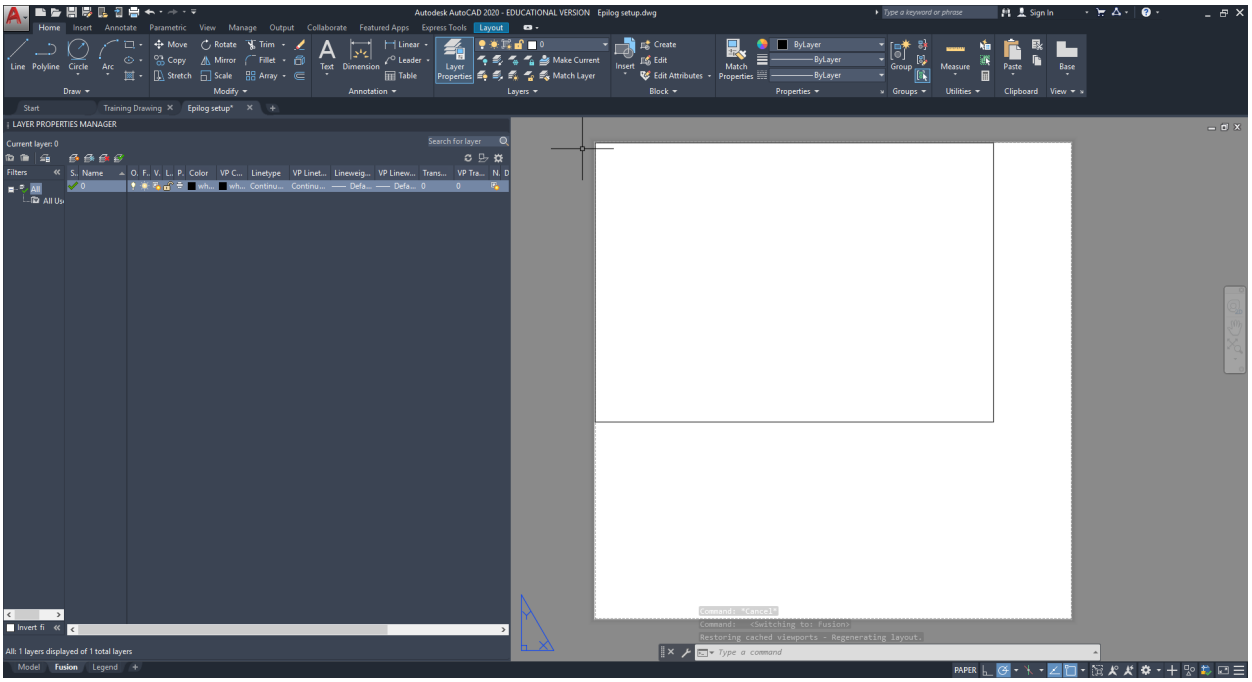


8) Once your file is copied over correctly, click the tab in the lower left to labeled fusion to enter paper space of the Fusion laser cutter.

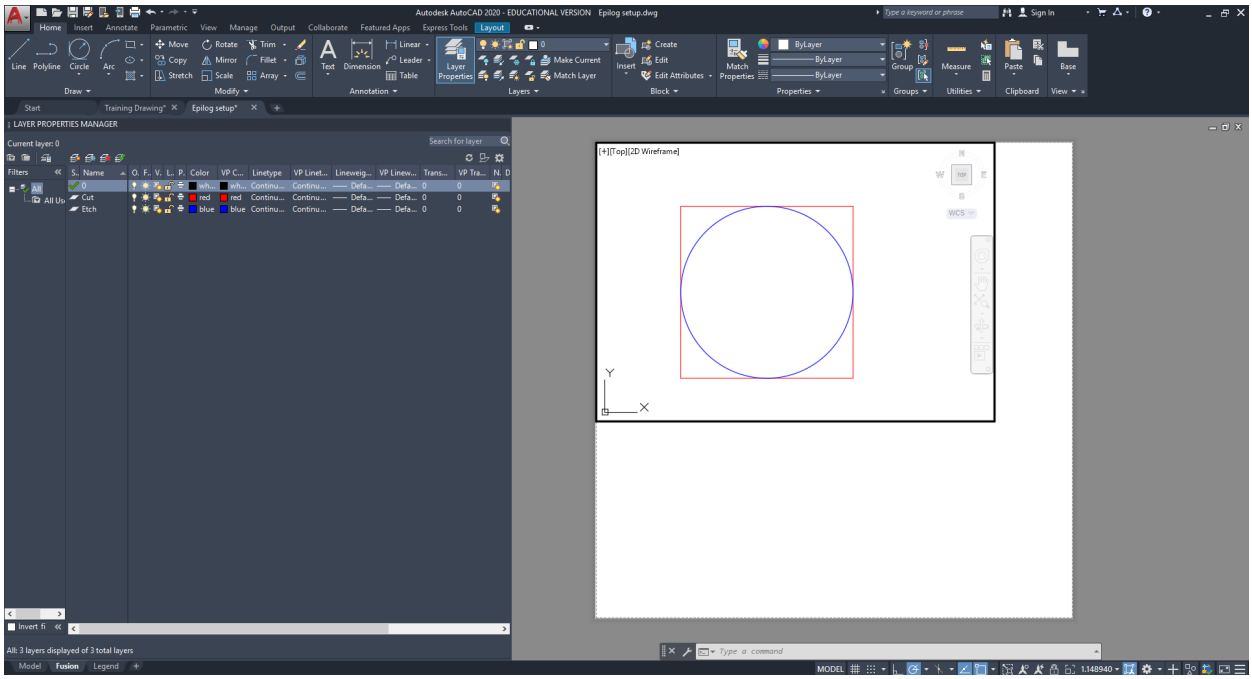


9) In paper space, you will see a document that is 48”x48” with a box sized at 28”x40”.

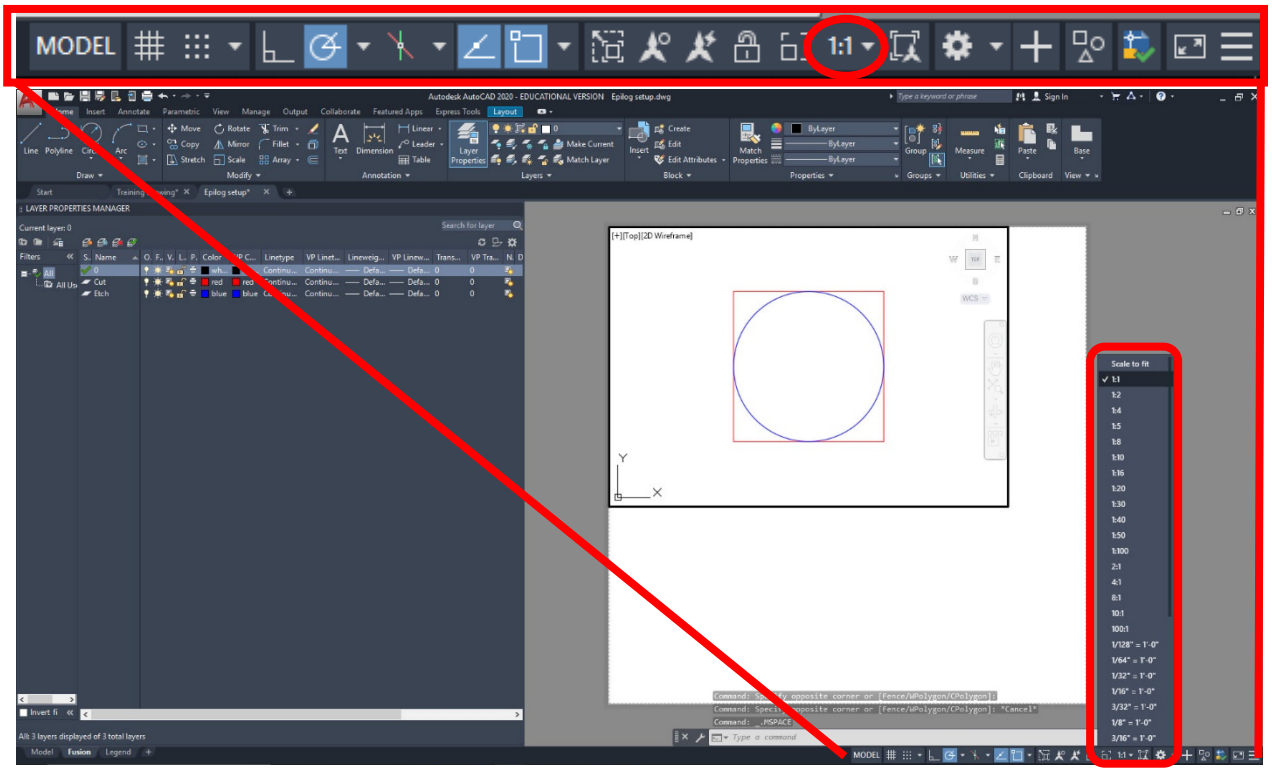
   a. Do Not Change these settings, move the box, or try to resize the box. This is the designated are that the laser cutter can do. If your project does not fit in the space, consider scaling it down or making multiple cuts to complete it.



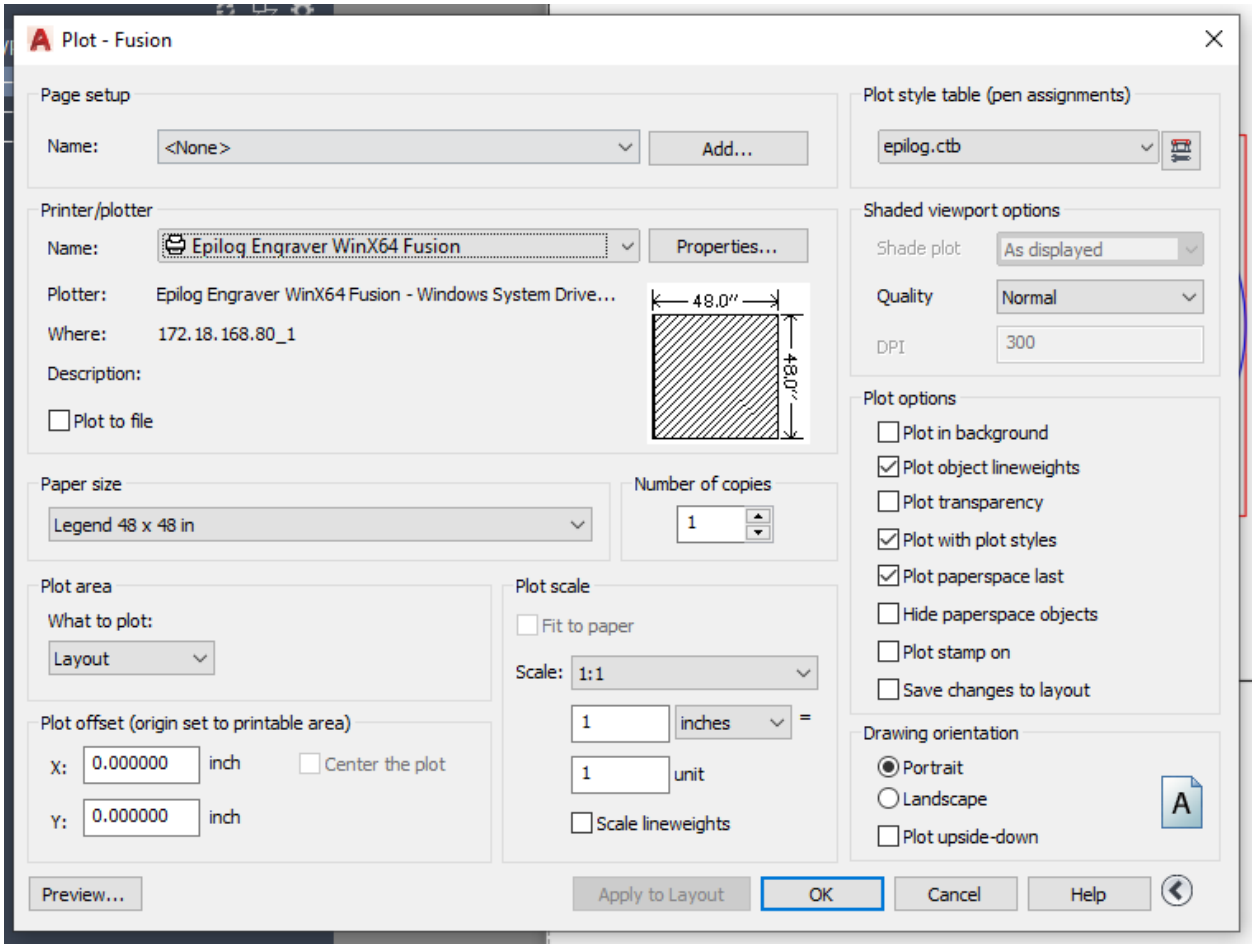
10) Double click into the box on paper space, once inside pan around the space to locate what you will be cutting.



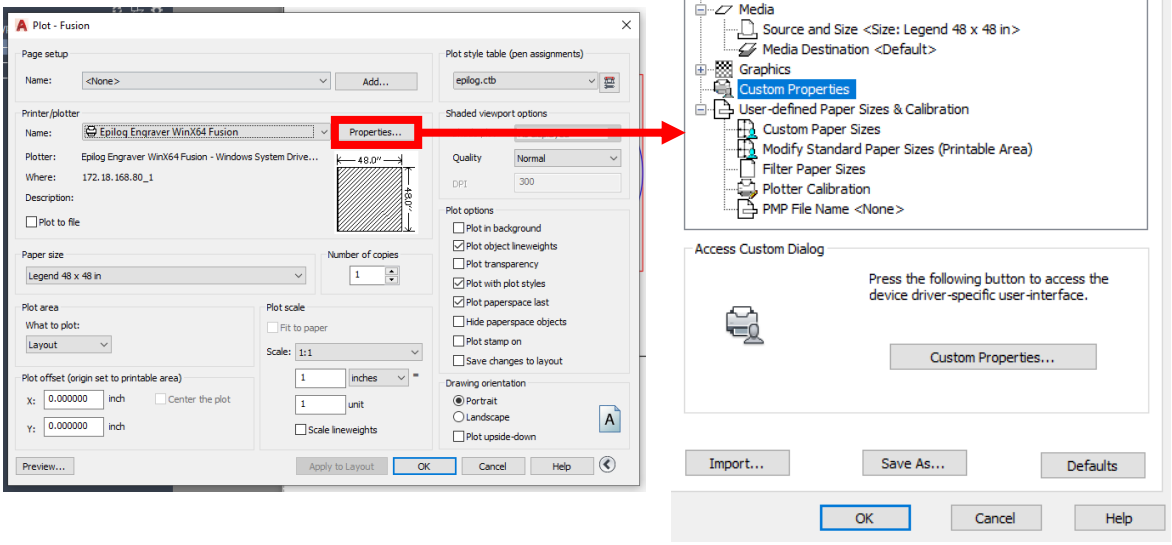
11) From there, use the bottom right tab to select the scale of your drawing.
   a. This should be the final project (i.e. 1": 300')



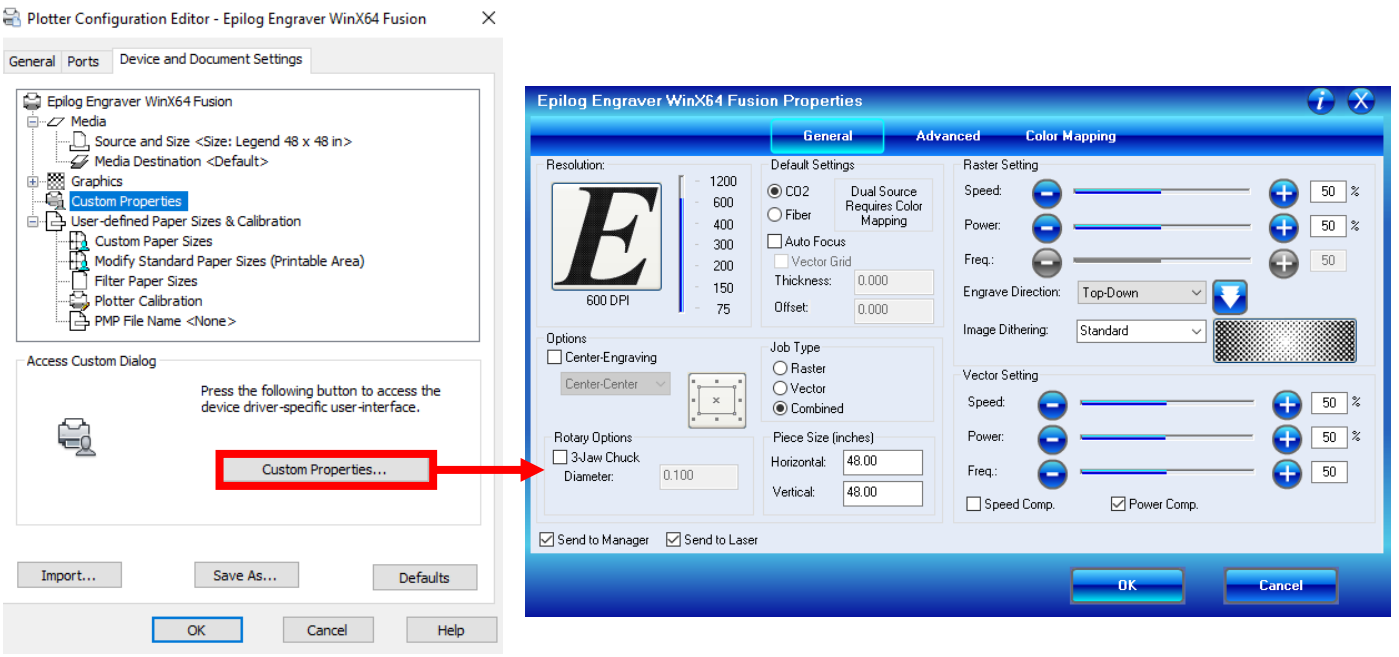
12) After the scale is properly set up and your drawing is in the correct space click anywhere outside of the box.
13) Select the print icon or use Control + P to open the print menu
14) All the settings regarding the printer should be already set up and shouldn't need any additional adjusting from you.



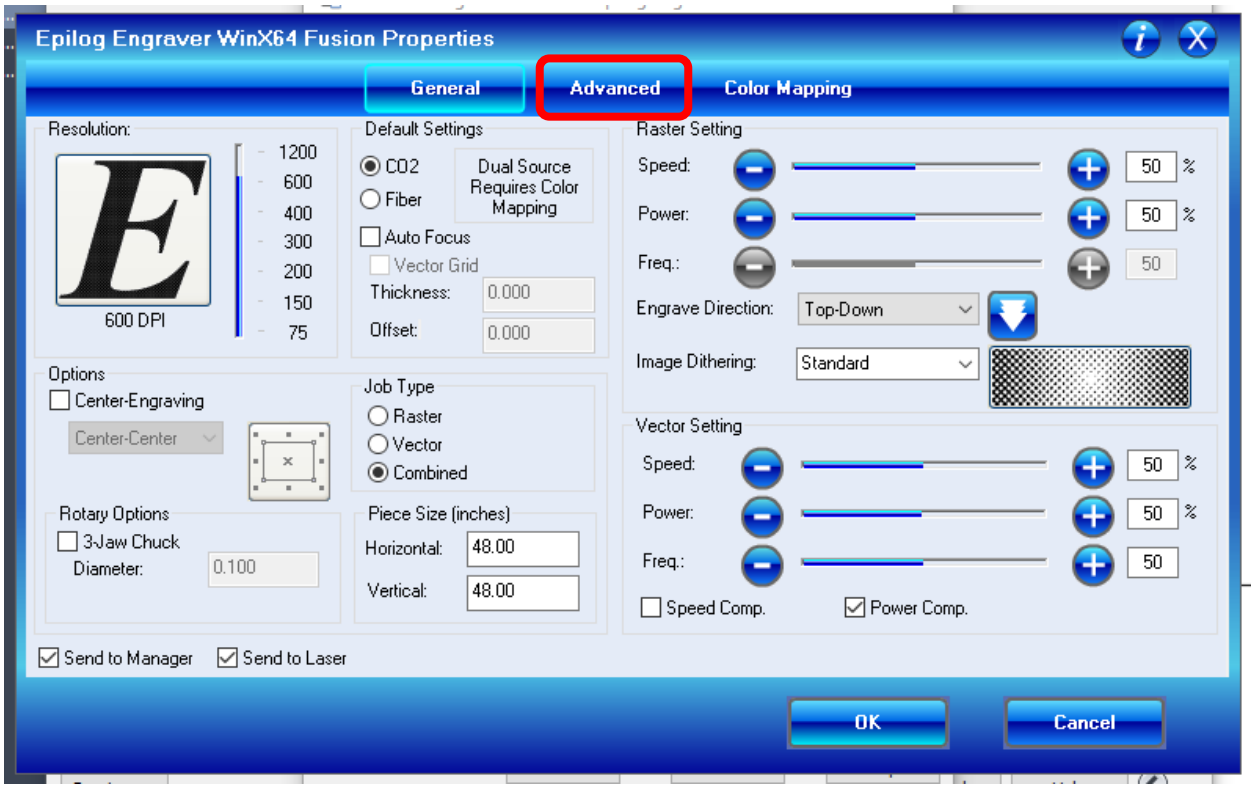
15) Select Printer properties.



16) Select Custom Properties



17) Once the Epilog Engraver menu is open, selected the tab called Advanced.



18) In this window, you should see a drop down with various materials listed.

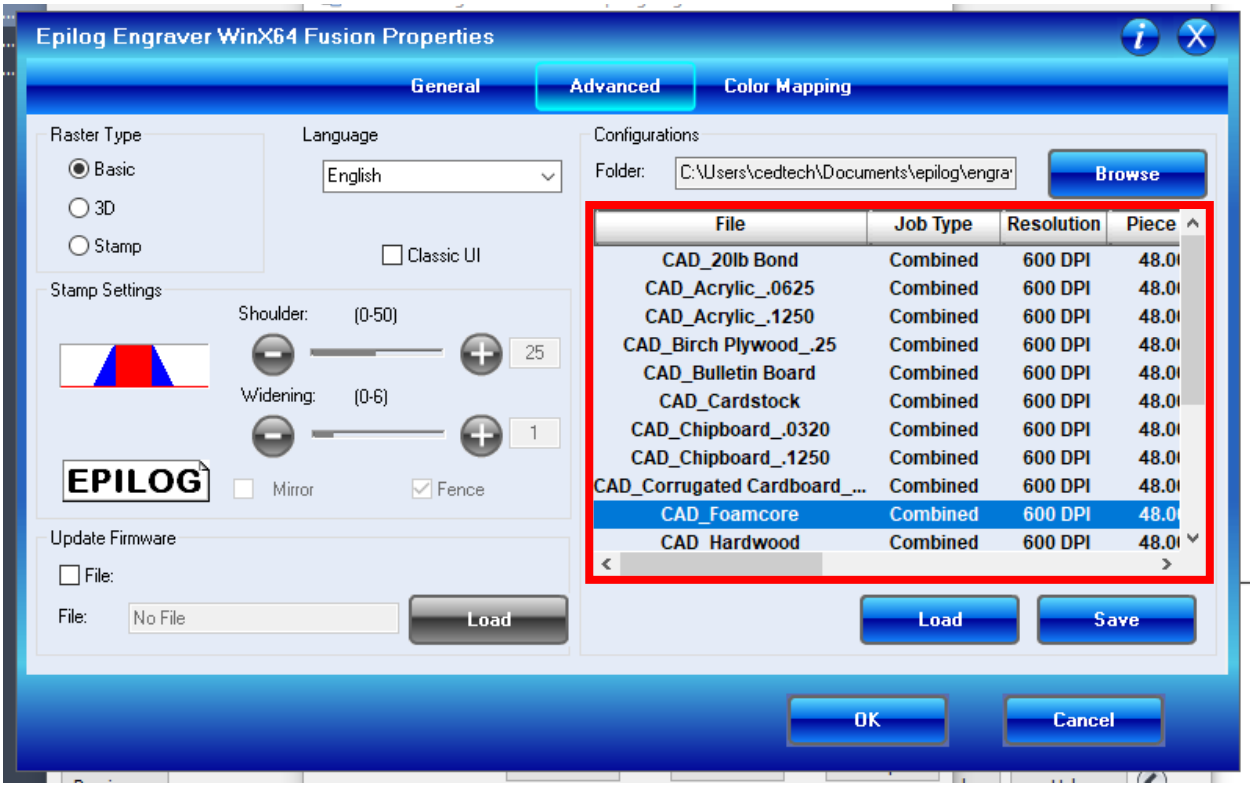
19) Scroll through the list to select the material you are trying to cut.

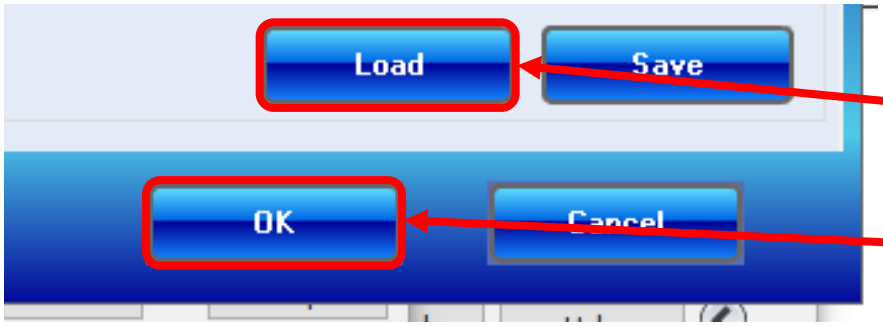
a. The Materials are organized by the following naming system

i. Document Type (CAD or AI (Illustrator))_Material_Thickness

ii. The Thickness is not required for all materials so look carefully before making your selection

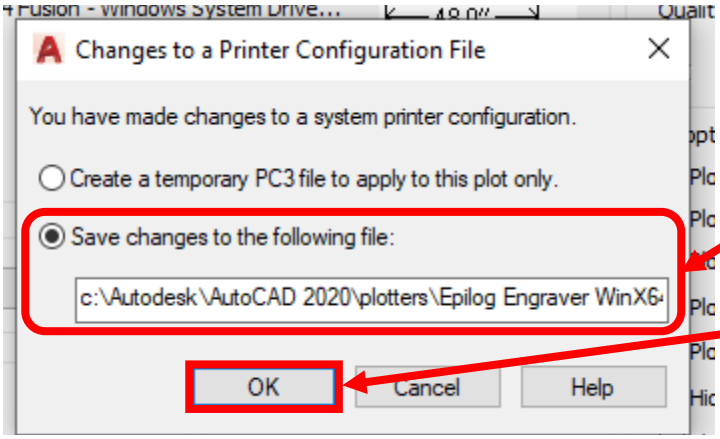
b. This will set up the rest of the configurations for you without the need to change individual settings





20) Select "Load" to add the configurations to the drawing

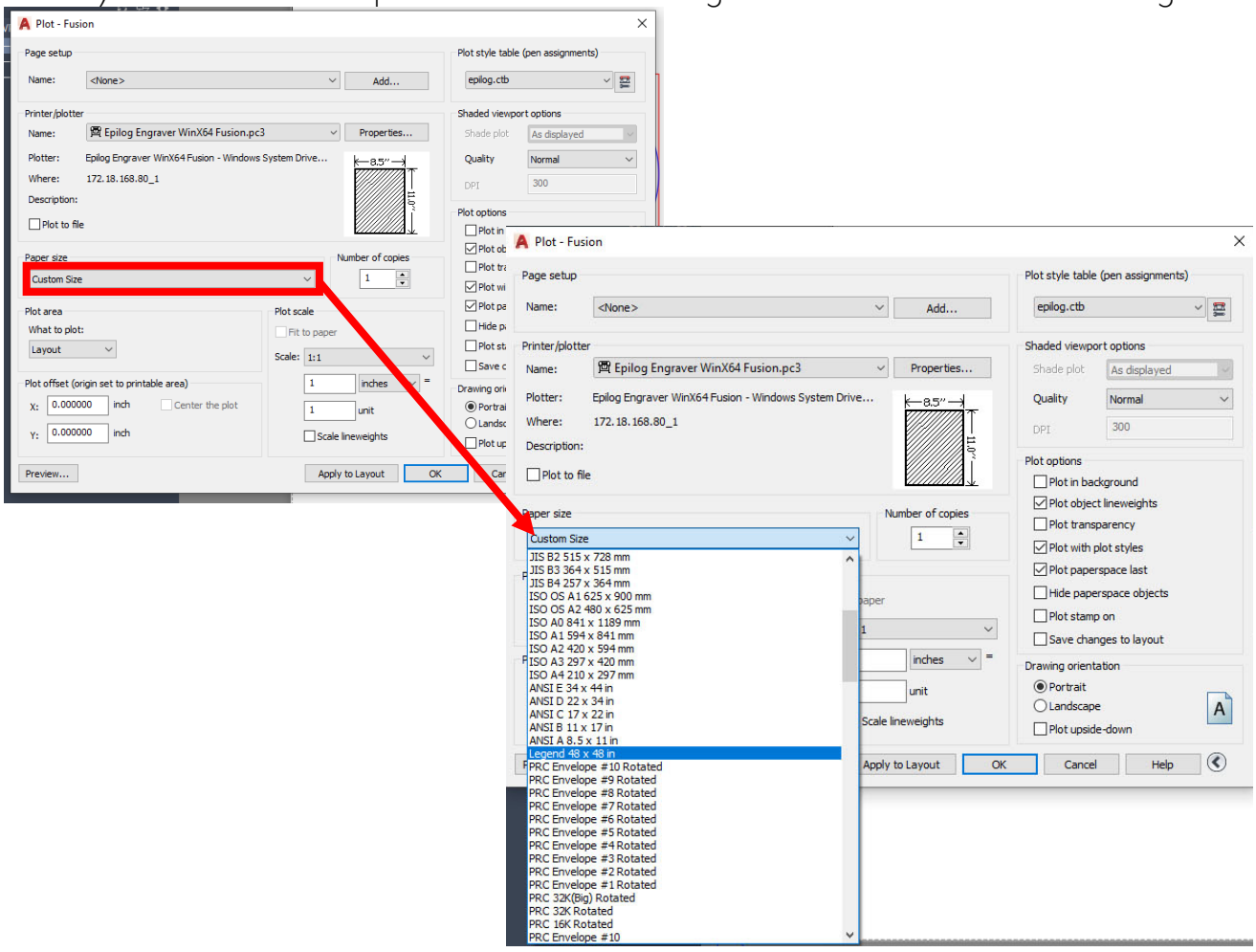
21) Select OK to exit the Custom Properties menu



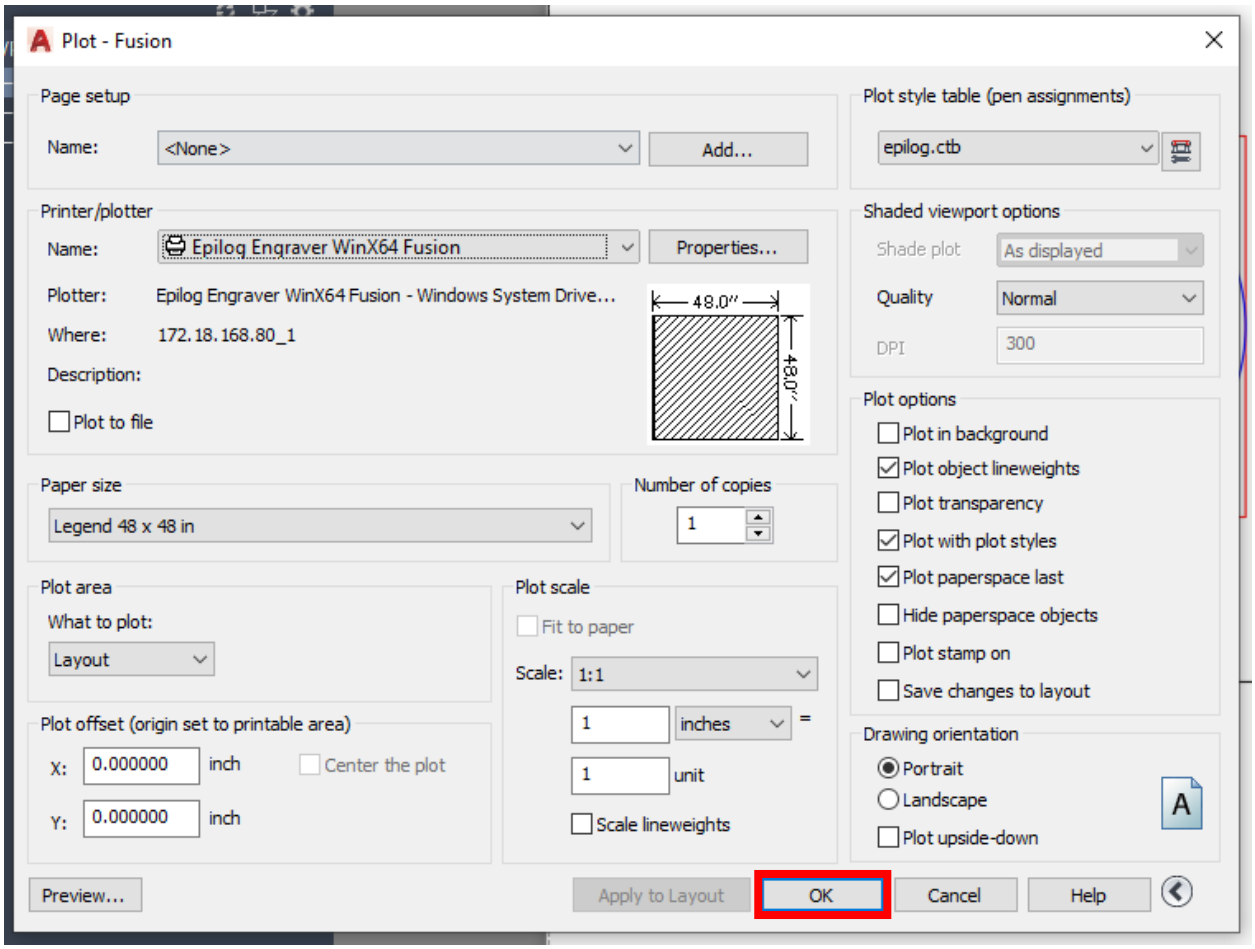
22) When you exit the menu, you will be presented with a new pop-up screen. Select the second Save option, do not change the file name in the box, and then select OK

23) Once you are back to the original print screen, you'll notice that the Paper Size of the Document has changed

24) Use the Size dropdown to select the "Legend 48" x 48" before continuing



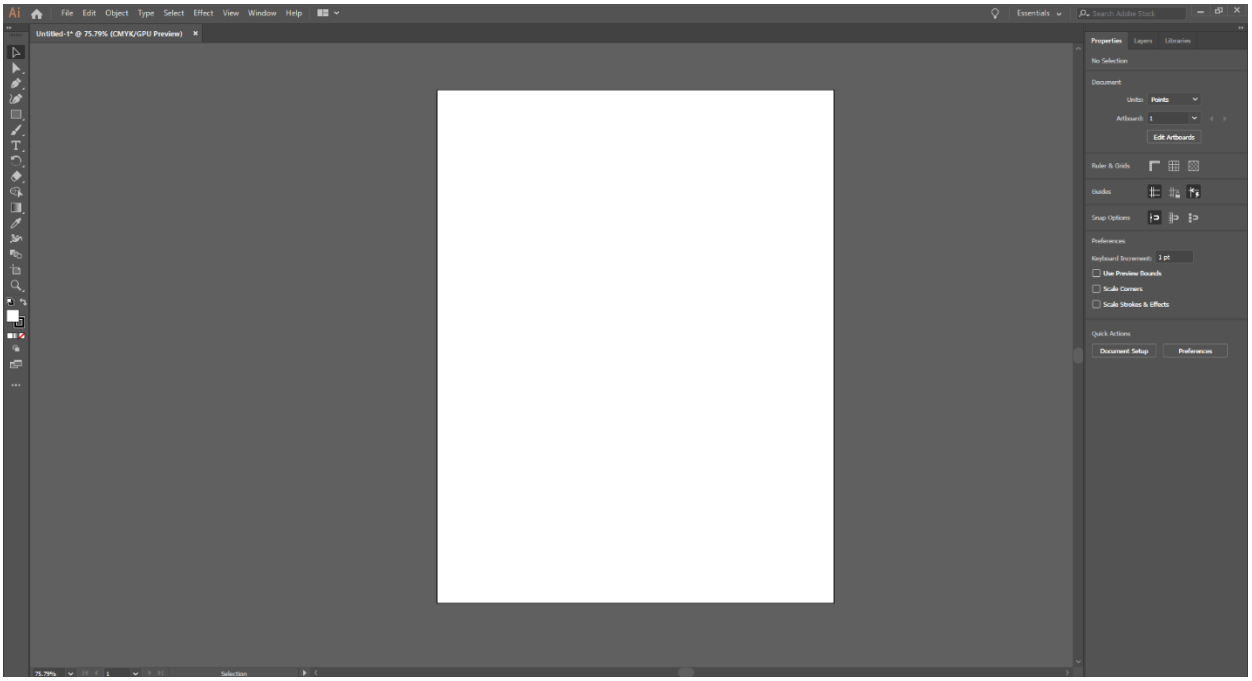
25) Once the print screen looks like this one, select OK to send your document to the laser cutter.



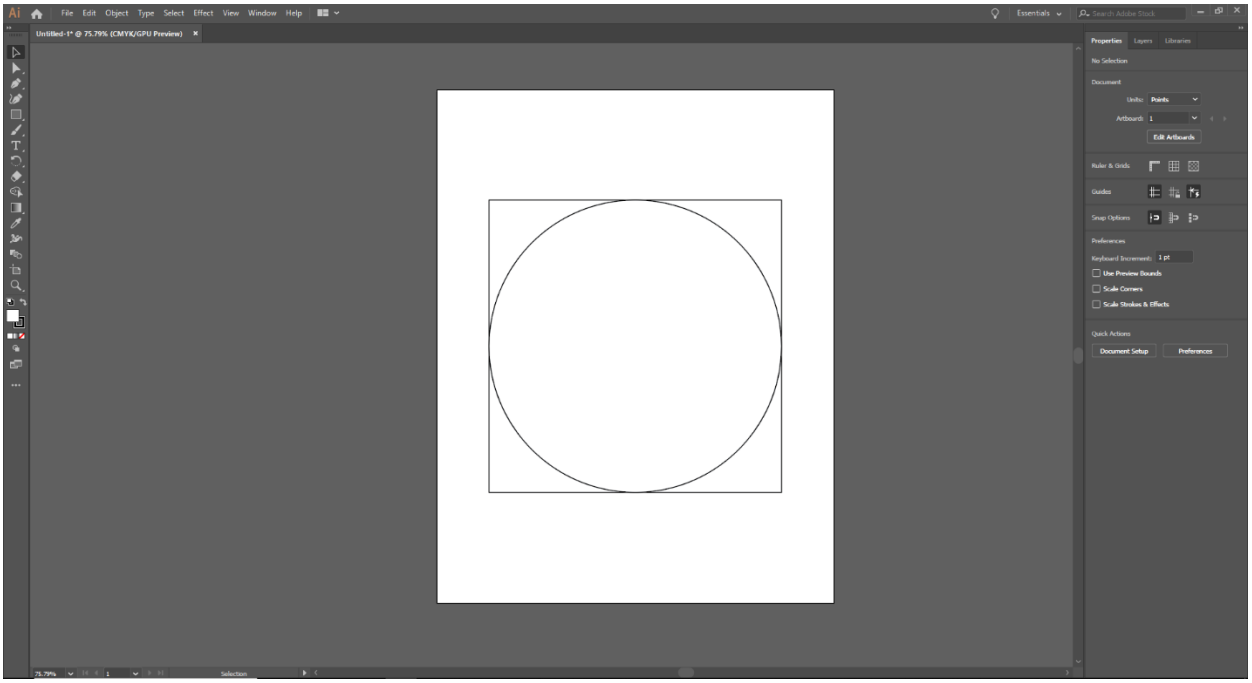
26) Once your project is successfully sent, check the display screen to make sure the time is a realistic time frame (this is a big indicator of if your project is correct. i.e. if the display says 1 sec. something is probably wrong)
27) If the display is correct, press GO on the cutter to cut your project
28) Wait until your project is complete.
29) When your project is complete, take it out of the laser cutter, clean up the area, and remove any leftover materials or scraps
30) Close all programs without saving your document over the Epilog file, and safely eject your flash drive or hard drive
31) Turn off all three switches for the laser cutter.
32) Enjoy your finished project!

Preparing your Illustrator Laser Cutter Project

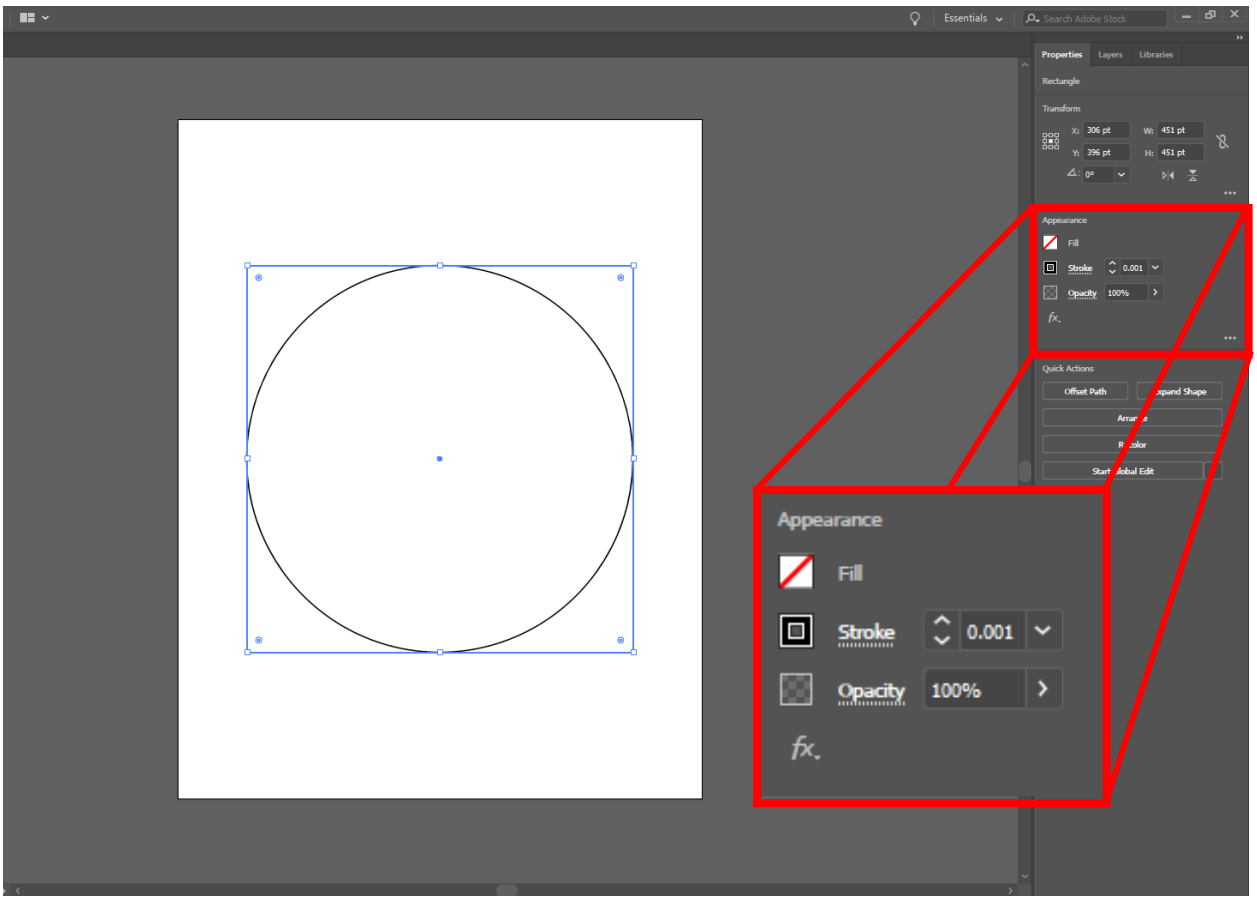
1) Open a blank illustrator file, any size will work for the laser cutter as long as it does not exceed 28” x 40”



2) Determine what you will be drawing

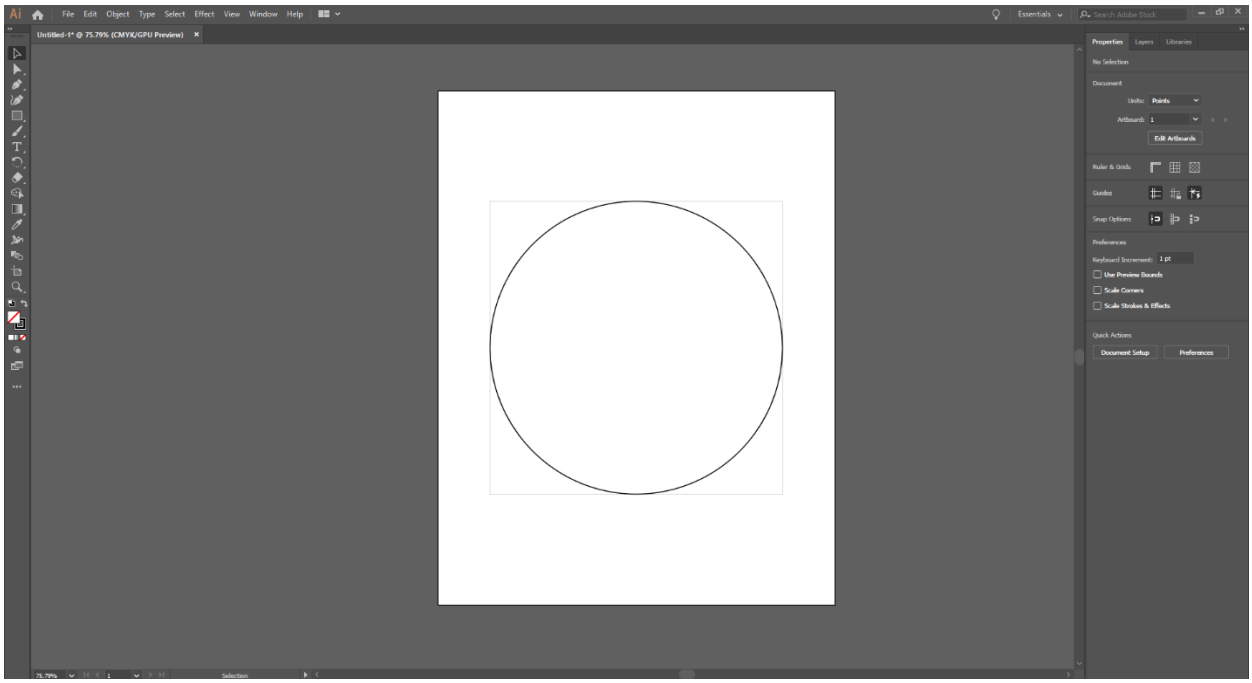


3) To cut you will need to draw your line segments and set your line weight to .001 in order for it to be read by the laser cutter



a. If you plan on engraving an image be sure that the image is pure black and white before it can be engraved. The thickness of your drawing will be engraved as it appears on screen.

4) Save your project to a flash drive or external hard drive and bring it to your laser cutting appointment



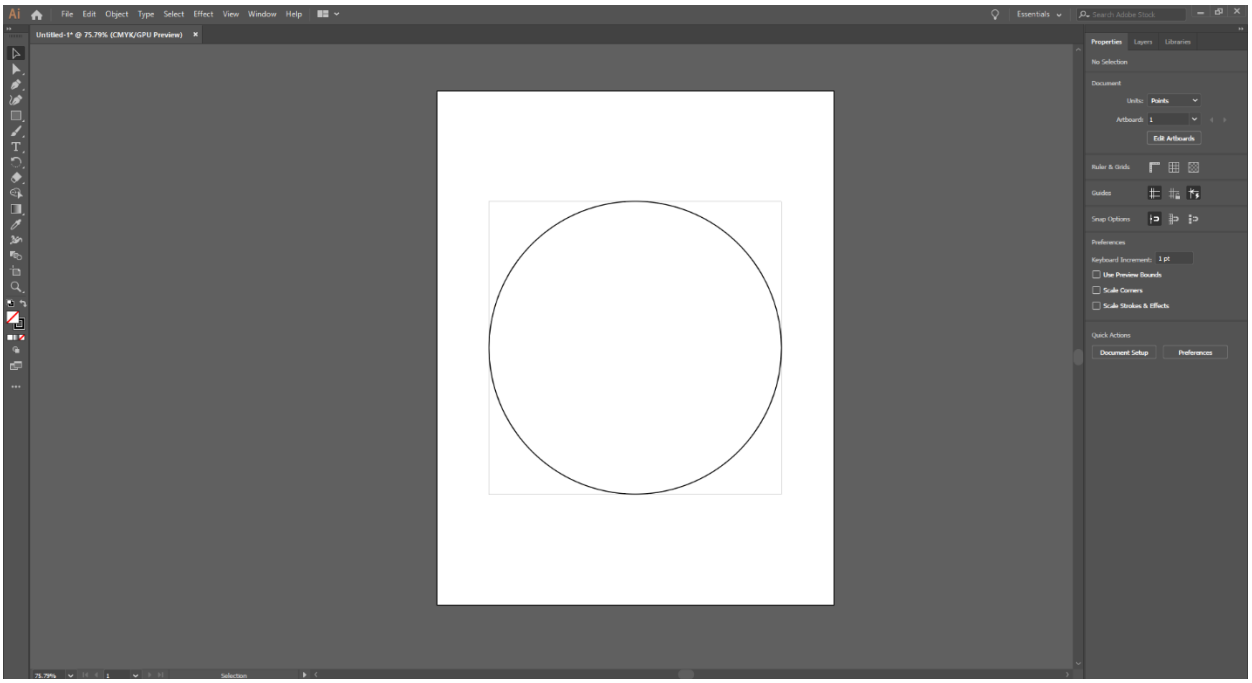
Cutting your Illustrator Laser Cutter Project (Fusion)

After you have saved your file to a flash drive proceed to your laser cutting appointment and complete the following steps:

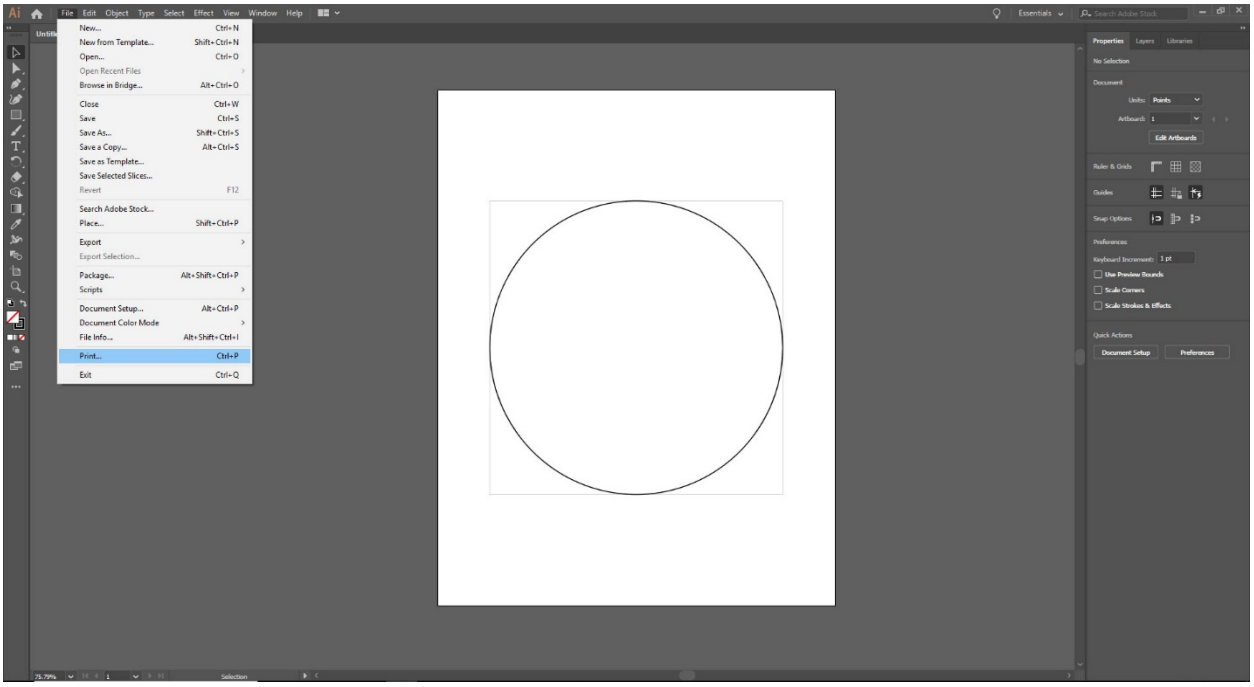
1) Use the "Machine Operations" section of this manual to properly turn on the laser cutter and all its power switches.
   a. **ALL SWITCHES MUST BE TURNED ON FOR SAFE OPERATION**
2) Open the top cover of the laser cutter and place your material in the allotted space.
3) The edges of your material should line up with the Top left side of the laser cutter as shown here.
   a. The placement of the document is always the same no matter what you are cutting. If your drawing is in the middle of your page, it will need to be reformatted to fit the space allowed by the laser cutter.

4) Refer back to the "Machine Operation" section to properly focus the machine before continuing to the rest of the project.
   a. **If the machine is not properly focused, your project will not cut properly.** It is vital that this step is completed properly before cutting your project.

5) Open your original file on the Laser Cutter Desktop



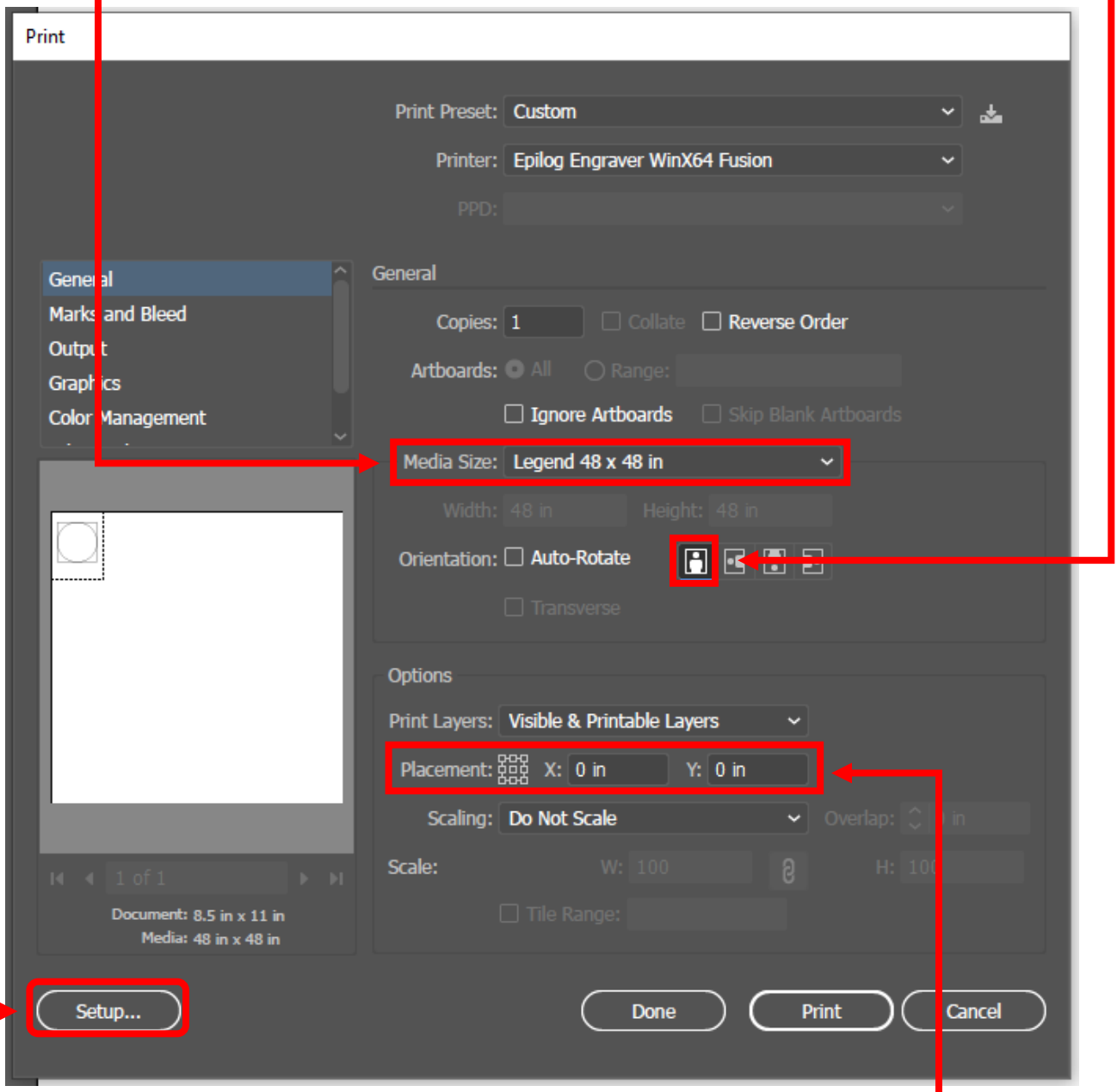
6) Ensure your file is properly set up before selecting the print icon or use Control + P to open the print menu



7) In the Print screen, ensure the Epilog Engraver WinX64 Fusion is selected as the printer,

8) Use the dropdown arrow next to “Media Size” to select “Legend 48 x 48 in” as your document size.

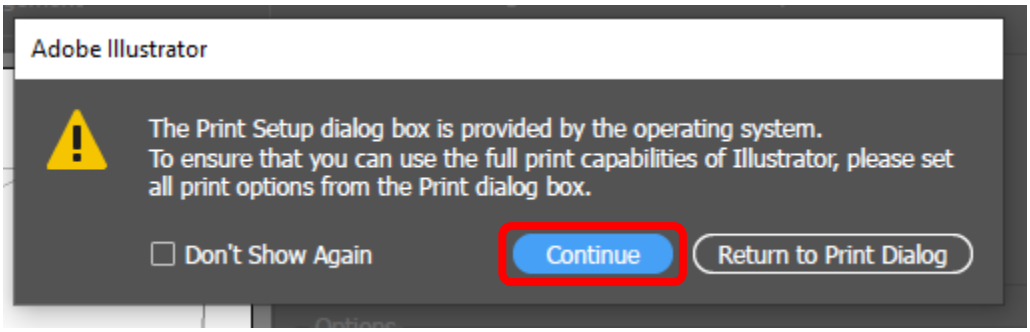
9) Next, set the document to portrait mode before printing.



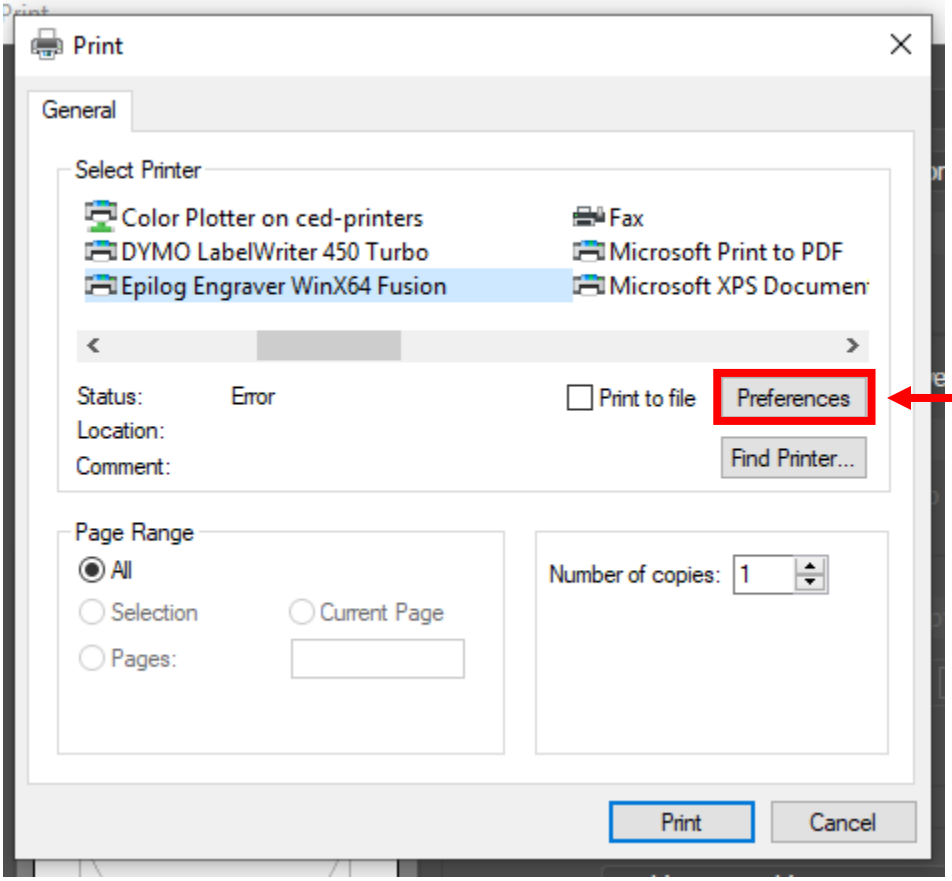
10) For Placement set the X and Y coordinates to be 0 in.

11) Once the layout is set, select Setup in the bottom left corner to enter the printer settings.

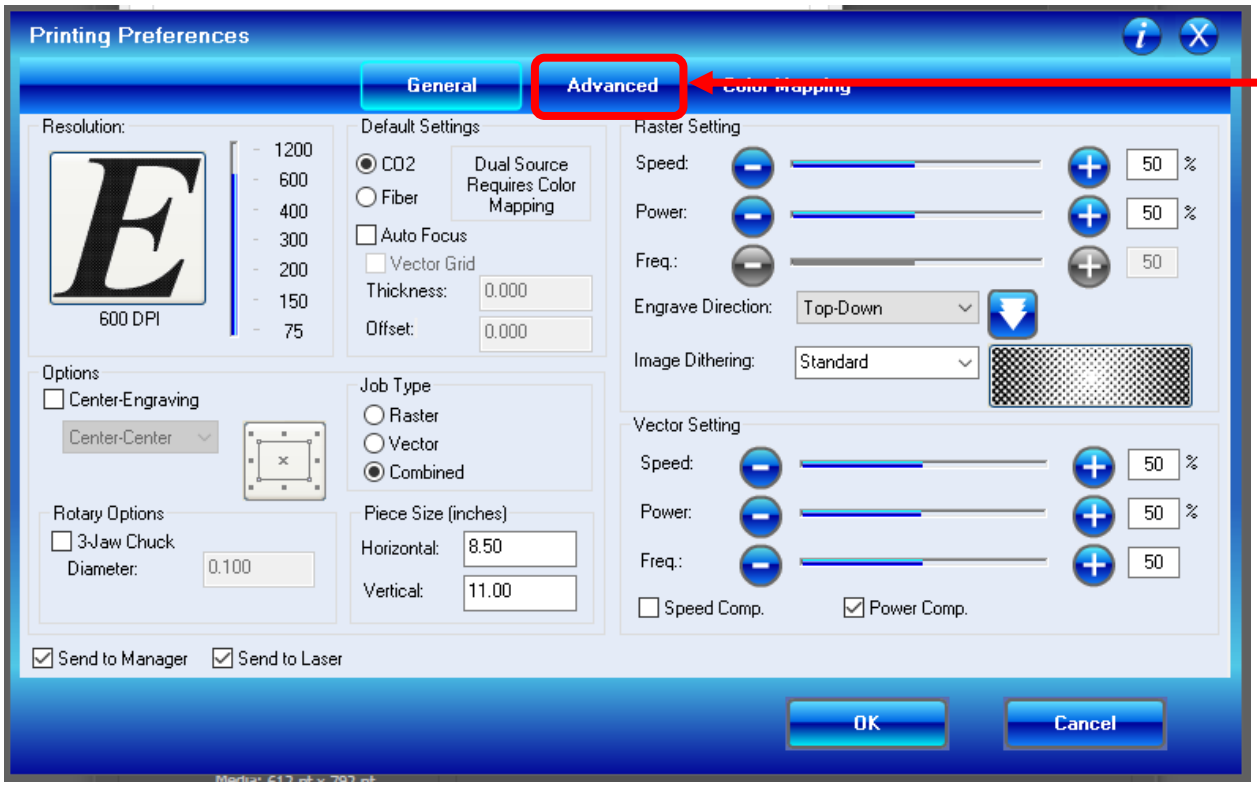
12) On occasion, this screen may appear always select Continue



13) Once continued, the print screen below will open, select Preferences



14) Preferences will take you to the engraver settings



15) Once your size is set, Select the Advanced Tab in the center

16) In this window, you should see a drop down with various materials listed.

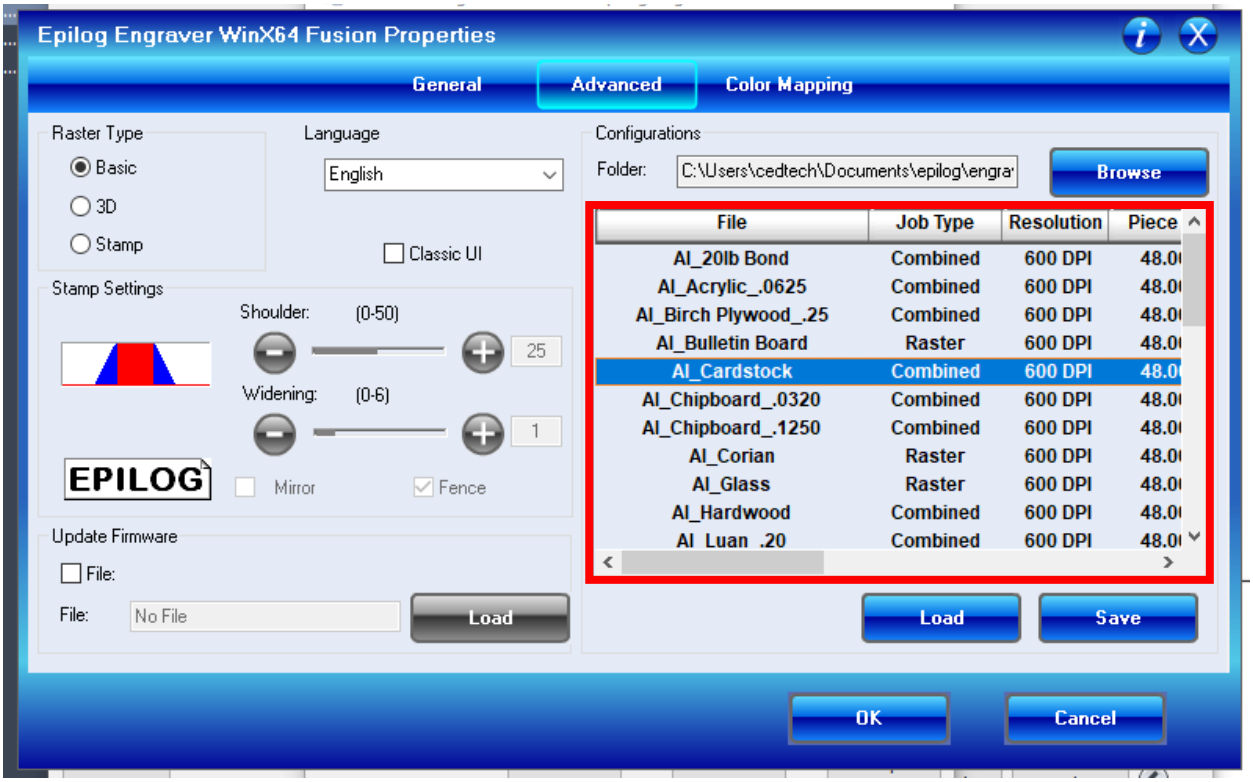
17) Scroll through the list to select the material you are trying to cut.

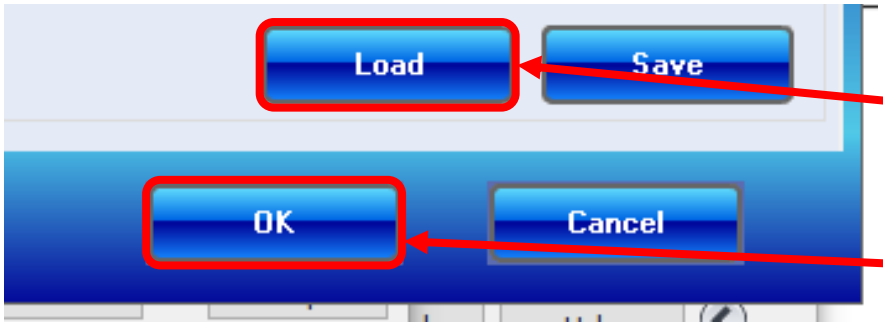
a. The Materials are organized by the following naming system

i. Document Type (CAD or AI (Illustrator))_Material_Thickness

ii. The Thickness is not required for all materials so look carefully before making your selection

b. This will set up the rest of the configurations for you without the need to change individual settings

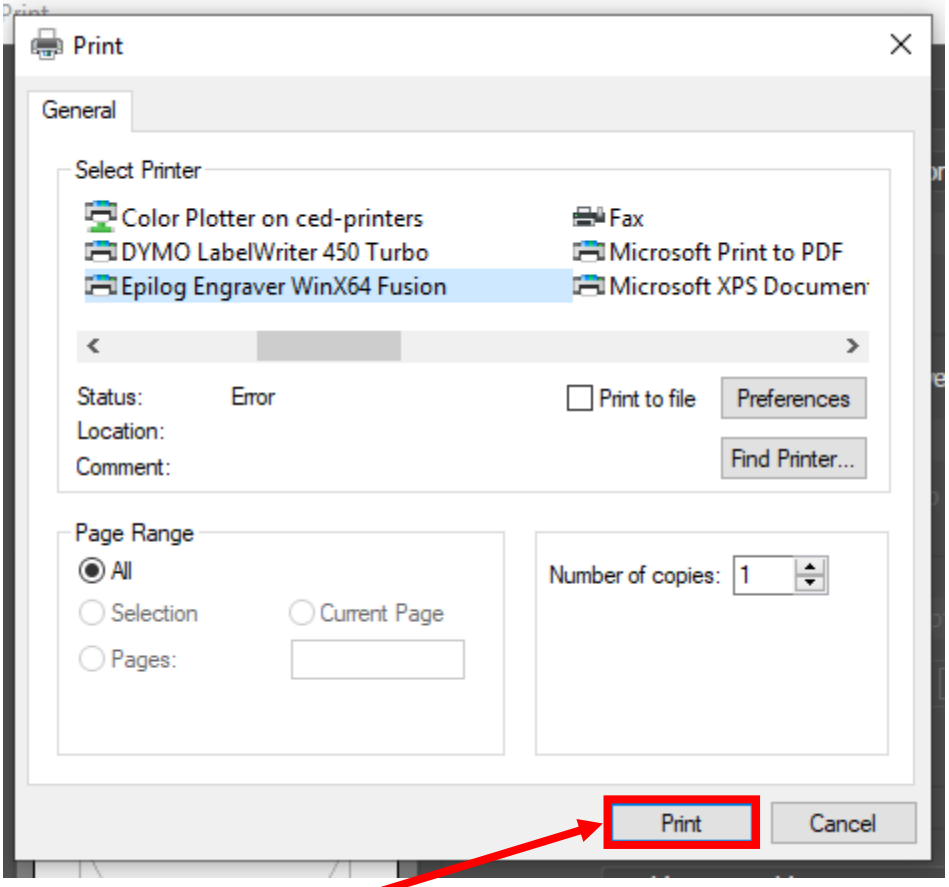




18) Select "Load" to add the configurations to the drawing

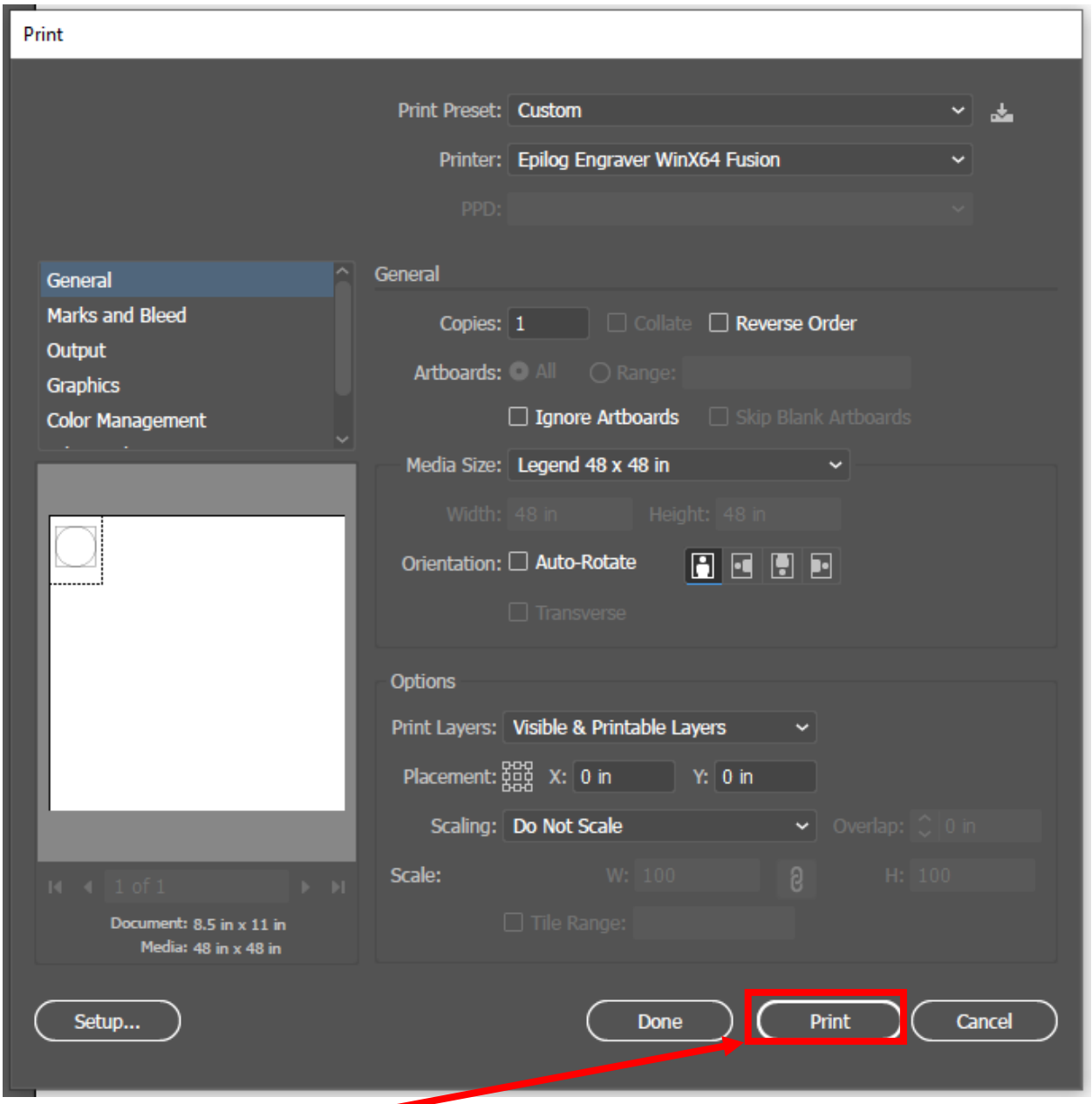
Select OK to exit the Printing Preferences

19) Selecting OK will take you to the previous Print Setup Screen



20) Select "Print" to continue

21) This will take you back to the Original print screen.



22) Select "Print" to send your project to the laser cutter.
23) Once your project is successfully sent, check the display screen to make sure the time is a realistic time frame (this is a big indicator of if you project is correct. i.e. if the display says 1 sec. something is probably wrong)
24) If the display is correct, press GO on the cutter to cut your project
25) Wait until your project is complete.
26) When your project is complete, take it out of the laser cutter, clean up the area, and remove any leftover materials or scraps

27) Close all programs without saving your document over the Epilog file, and safely eject your flash drive or hard drive
28) Turn off all three switches for the laser cutter.
29) Enjoy your finished project!