



MUSE ULTRA VIOLET GALVO USER MANUAL



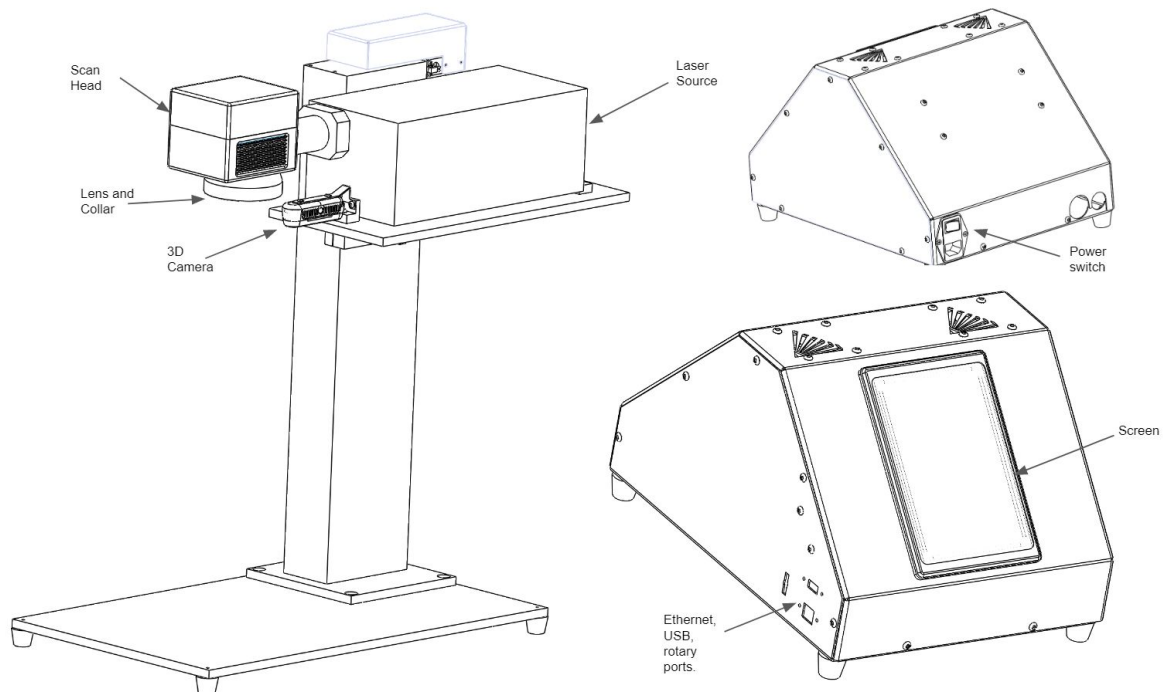
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The UV Galvo by Full Spectrum Laser


Thank you for purchasing your new Ultraviolet (UV) Galvo with Full Spectrum Laser. Our high quality products will provide years of service simply by following proper usage and upkeep. This user manual will guide you through the safety guidelines and operation of your machine. We recommend that you familiarize yourself with this manual before using your laser engraver. Remember to be safe and have fun!


For more information and product selection, please visit www.fslaser.com



Compliance Statement: The Full Spectrum Laser UV Galvo Laser System is a Class 4 laser product, as defined in International Standard IEC 608251. The Full Spectrum UV Galvo complies with 21 CFR 1040.10 and 1040.11, the Federal Performance Standards for Light Emitting Products, except for deviations pursuant to Laser Notice No. 50, dated July 16, 2001. The Center for Devices and Radiological Health of the US FDA issued Laser Notice No. 50 to permit manufacturers to classify and manufacture their products in accordance with the International Standard. 21 CFR 1040 and IEC 608251 require that certification, identification, and warning labels be placed on laser products.

DANGER


 CLASS IV LASER VISIBLE AND INVISIBLE LASER RADIATION AVOID EYE AND SKIN EXPOSURE.
 WEAR PROTECTIVE EYEWEAR.
 LASER RADIATION IS EMMITED FROM THIS APERTURE


THIS PRODUCT COMPLIES WITH THE 21 CFR 140.10 AND CFR 140.11 EXCEPT FOR THE DEVIATIONS PURSUANT TO LASER NOTICE NO. 50, DATED JULY 26, 2007

MAX OUTPUT	PULSE DURATION	WAVELENGTH
	<120 NS	1064 NM

MONTH **1 2 3 4 5 6 7 8 9 10 11 12**
 YEAR **20**

FULL SPECTRUM LASER LLC
 6216 S SANDHILL ROAD
 LAS VEGAS, NV 89120 USA

Eyewear needs to protect 1064 nm wavelength sources.

Symbols and Definition

Red icons indicate dangerous situations that could result in death or serious injury.



Indicates a hazardous situation.



Indicates a risk of fire.



Warns of potential risk to eye-safety.



Indicates a respiratory hazard.



Indicates an electrical hazard.



Indicates sharp edges that could cause injury via laceration.

Black icons indicate practices not related to personal injury.

NOTICE

Calls attention to important information.



Warns of fragile parts or materials.



Calls attention to important details.




Indicates issues regarding software or network.

Section I. Safety

Setup Precautions



Follow all safety protocols and procedures before operating any machinery. It is the responsibility of the operator to ensure all safety precautions are correctly followed and the machine is properly assembled and in working order.

	Always inspect the laser cutter for damage or breakage before each use. Do not operate machinery that is damaged or defective in any way.
	Always have a clean, level, and open work space to unbox and place your laser cutter.
	Never modify, disassemble, or in any way alter the construction of the laser and never start up a system that has been modified or disassembled.
	Keep your laser system clean and organized.
	Do not disassemble the machine or remove any of its protective covers.
	Always have on hand a first-aid kit designed for the initial treatment of burns and smoke inhalation. Be sure to store this kit in an area that is outside risk areas.
	Never operate the machine with any of the panels removed. Be aware that removal of any portion of the cabinet will expose the laser system and greatly increase the risk of injury and/or fire.


Eye and Lung Safety

The Muse Galvo Laser has an overall rating of Class 4. Class 4 lasers have the capability to damage eyes, burn skin, and start fires. Safety goggles must be worn when in operation.

Follow these Safety Guidelines at all times:

	Always use provided safety glasses. Unshielded laser light is harmful to the eyes.		Only operate Muse Galvo in a ventilated area larger than 10ft x 10ft. Excessive inhalation of fumes can be detrimental to health or fatal.
	It is recommended that when the laser is running, the user is at least 5 ft from the laser.		Never engrave or cut any material containing PVC or vinyl under any circumstance. These materials (along with other materials that contain chlorine / chloride) produce a highly toxic, corrosive vapor that is lethal to humans and will destroy your machine. Your warranty will be void if your machine is damaged by corrosion from engraving or cutting PVC or vinyl.
	Never aim any laser towards an aircraft or vehicle that is in motion. The bright light can flash, blind, cause glare, or distract the pilot or driver		Never engrave or cut any unknown material. The vaporization / melting of many materials, including but not limited to PVC and polycarbonates, can give off hazardous fumes. Please refer to the MSDS sheet from the material manufacturer to determine the response of any work material to extreme heat (burning/fire hazard).


Electronic Safety

	Do not open the machine while the unit is plugged in. Opening the machine may expose the operator to the unit's AC input power which is potentially lethal.
	Never make or break any electrical connections to the system while the unit is turned on.
	Never access the electronics area with hands or tools unless the unit is disconnected from power for at least fifteen minutes.

The standard reference for laser safety is the American Standard for the Safe Use of Lasers, Z136.12000, developed by the American National Standards Institute (ANSI). This reference is the basis for many of the federal regulations for laser and laser system manufacturers, and for the Occupational Safety and Health Administration (OSHA) laser safety guidelines. It contains detailed information concerning proper installation and use of laser systems. While the ANSI standard itself does not have the force of law, its recommendations, including warning signage, training, and the designation of a laser safety officer, may be compulsory under local workplace regulations when operating laser systems above Class I. It is the operator's responsibility to ensure that the installation and operation of the Full Spectrum Laser Hobby Laser System is performed in accordance with all applicable laws. Copies of ANSI Standard Z136.12000 are available from: LASER INSTITUTE OF AMERICA 12424 RESEARCH PARKWAY, SUITE 125 ORLANDO, FL 32826 (407) 3801553

Fire Safety

Laser cutting and engraving systems can present a significant fire hazard due to the extremely high temperatures generated by the laser beam. While the objective of most cutting and engraving operations is to vaporize material without burning, most materials capable of being cut or engraved are inherently combustible and can ignite. Usually this is a small flame of burning material issuing from the cut zone which self-extinguishes due to the air assist or depowering of the beam. However, it is possible for the flame to propagate and set fire to the machine and its surroundings.

	<p>Always keep a properly maintained and inspected 5lbs. or larger fire extinguisher on hand. Full Spectrum Laser recommends a Halogen fire extinguisher or a multipurpose dry chemical fire extinguisher. Halogen extinguishers are more expensive than a dry chemical, but offer certain advantages should you ever need to use an extinguisher. The Halogen extinguisher discharges a clean, easily removable substance that is not harmful to the mechanics or wiring of the laser system. The dry chemical extinguisher discharges a sticky, corrosive powder that is very difficult to clean up.</p>
	<p>Stacking materials (especially organic materials such as paper) can lead to increased risk of flame propagation or work piece ignition.</p>
	<p>Never operate your machine unattended. There is a significant risk of fire if the machine is set improperly, or if the machine should experience a mechanical or electrical failure while operating.</p>
	<p>Always keep the area around the machine clean and free of clutter, combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline.</p>
	<p>Be cautious when vector cutting. Many materials have the potential to burst suddenly into flames – even materials that may be very familiar to the user. Always monitor the machine when it is operating</p>
	<p>Vector cutting with the laser has the most potential to create an open flame. Acrylic in all its different forms has been shown to be especially flammable when vector cutting with a laser.</p>
	<p>Never cut PVC (polyvinyl chloride) under any circumstances: fumes are highly toxic and potentially lethal.</p>
	<p>Never store any flammable materials in the immediate vicinity of the device. Debris and left over produced materials within the machine must be removed to prevent fire hazard.</p>

Section II. Assembly & Connectivity

Assembling your UV Galvo

1. To assemble your new UV Galvo you will need these items.

Hardware:

M8x16 Button Head Screws:  x 4

M6x20 Button Head Screws:  x 3

M5x25 Socket Head Screws:  x 4

Sensor Flag:  x 1

Flag Spacer:  x 1

Spacers:  x 2

Tools:

2.5 mm Hex Key

4mm Hex Key

5mm Hex Key

Phillips Screwdriver

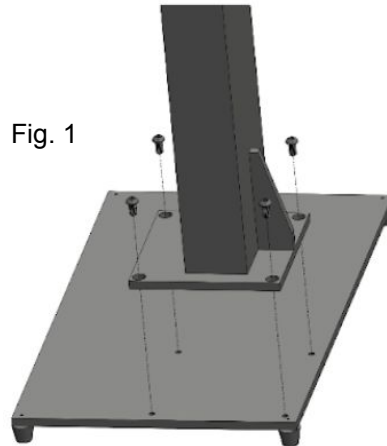



Fig. 1

Note: Tool Not Provided!

2. Use the 8 x 16 screws to fasten the base to the stage. (See Fig.1)
3. The next step will require these items.

Hardware: Flag Spacer  x 1

Sensor flag  x 1

Spacer  x 2

M5x25 screws  x 4

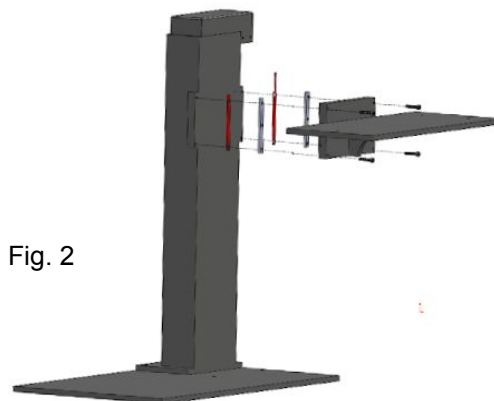


Fig. 2

4. The mounting plate will be attached to the side of the stage. The flag spacer and the sensor flag are attached with the flag pointing upward. (See Fig.2)
5. Place the source onto the mount and secure using the 6 x 20 screws.

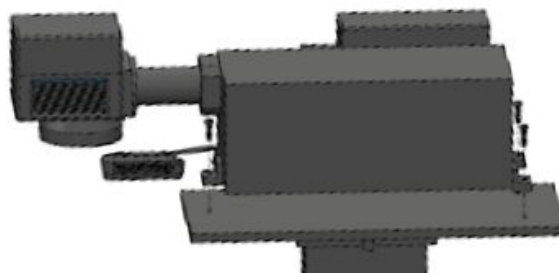


Fig. 3

6. The wire loom has 2 wires that will connect to the 2 ports found behind the source.(see Fig. 4)

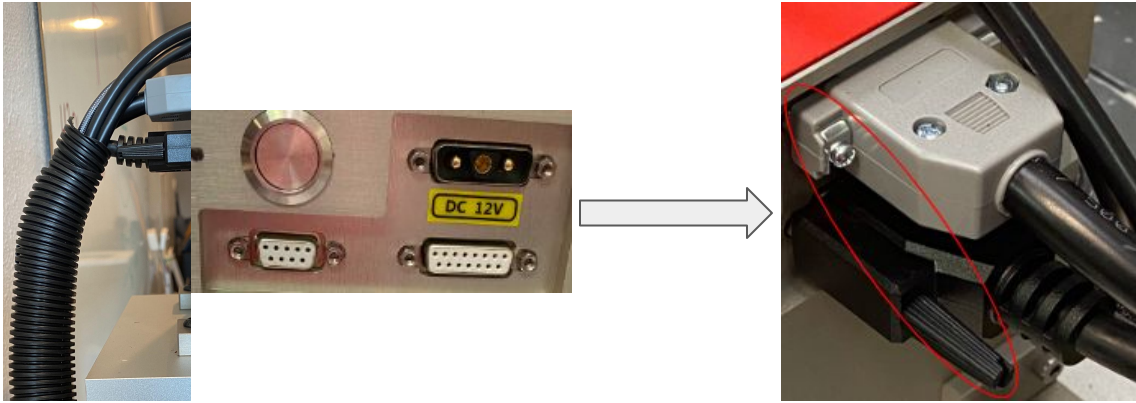


Fig. 4

7. Secure the connection using a phillips screwdriver.

8. The last wire on the loom will connect to the port under the scan head.

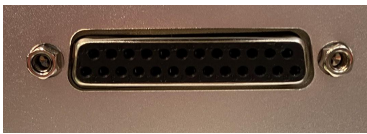


Fig. 5

9. Next, we will connect the camera using the Type-C cord provided.



Fig. 6

10. In order to connect some cable to the laser we need to remove the cover head use the 2.5mm hex key.(see Fig. 7)

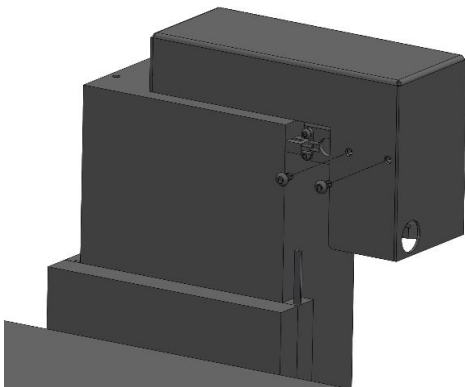


Fig. 7

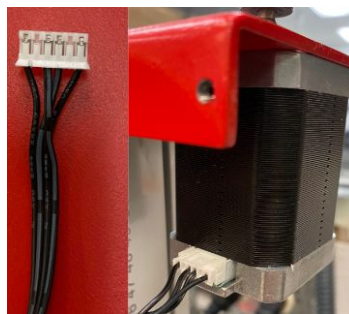


Fig.8

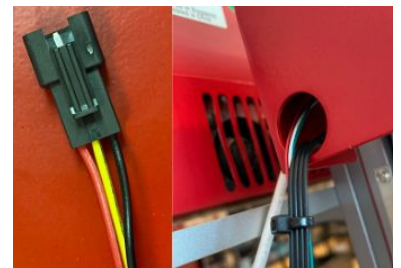


Fig. 9

11. Attach the motor wire to the motor.(see Fig. 8) & The sensory wire to the white wire(see Fig.9).

12. Replace the coverhead.

Machine Connection

The UV Galvo software is browser-based, meaning no download is required. RetinaEngrave v3.0 (RE3) is locally hosted on the machine's internal computer so it will function even without an internet connection. Using any computer, only an internet browser (such as Google Chrome) is needed to access RE3. The easiest method is to connect the Ethernet Cable that came with your Muse Galvo.

Connect Via Router (Recommended):

Connecting your Galvo to the router is the most reliable way to establish a link to RE3.

1. The Titan came with an ethernet cable.(See Fig. 10)

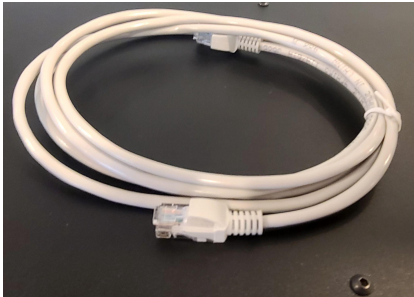


Fig. 10

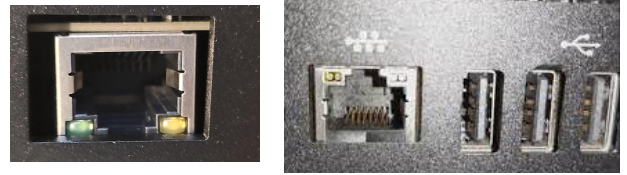


Fig. 11

2. Connect the cable to the ethernet ports on both devices(see Fig. 11).

Note: Ethernet port looks the same on all devices

Connect to Wi-Fi:

1. Your machine should come with a device attached to the usb port. This device enables your machine to connect to the wifi. Make sure that it is there and connected.

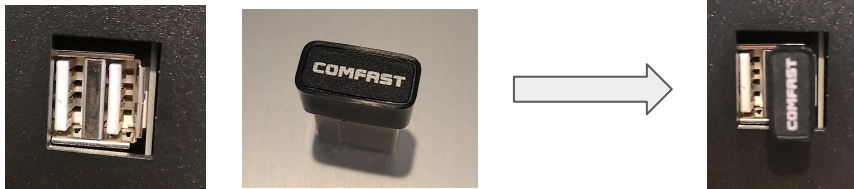


Fig. 12

2. Select the Network button on the top right of the touch screen.

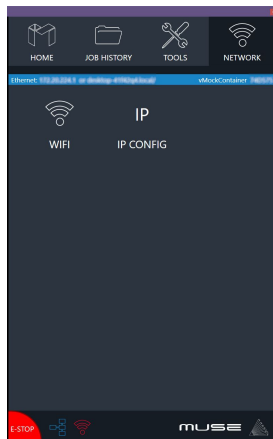


Fig. 13

3. Select wifi and look for your network. Select it and enter password.

Connect Directly to Computer:

Connecting the UV Galvo and the computer should only be done if the previous two options are not possible.

Note: The location of the ethernet port varies on computer modes.

Connect to the Software

RetinaEngrave v3.0 is a combination of a print driver and control software that communicates with, downloads jobs to, and controls the laser system. There is no download required for RetinaEngrave v3.0. With a local connection (achievable with Wi-Fi or the included Ethernet cable) your Galvo will link with the software's IP address

1. **Turn On UV Galvo:** Allow 30 seconds or so for the machine and touch screen to boot up.
2. **Locate the IP Address in the blue line under the Home icon.** Alternatively, you can find the IP Address of the machine by tapping Tools -> About. The address will be listed there. This IP Address is of the network you connected the machine to. Wireless and Wired connections will have different IP Addresses.

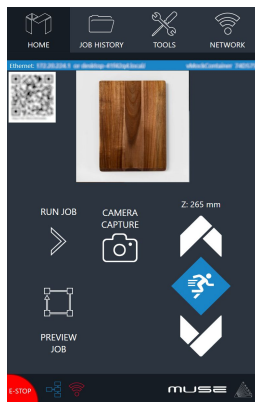


Fig. 14

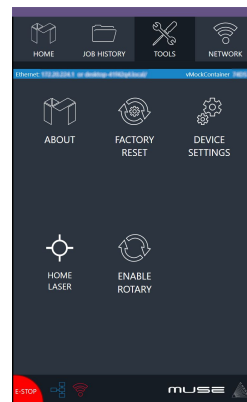


Fig. 15

3. **Type IP Into Browser**(Google Chrome is recommended). This will link you to the RetinaEngrave v3.0 (RE3) interface. You now have full access to the software. There is no need to install or download anything. You must, however, keep a local connection, either through Wi-Fi or the Ethernet cable.

Using QR Code:

Another method is to use the QR code which is visible in the Home and About sections.

1. Take a picture of the QR code with your camera or use a QR code reader.
2. A link will appear that can be selected.

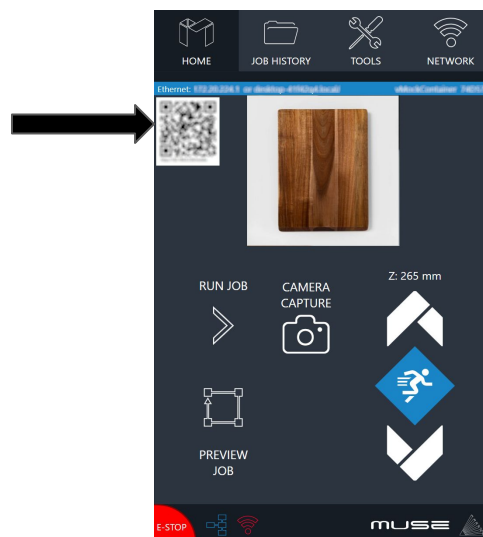



Fig. 16

Section III. Lens Calibration

NOTE: THE MACHINE IS SHIPPED PRE-CALIBRATED.
DO NOT CALIBRATE UNLESS INSTRUCTED TO DO SO.

NOTICE	Avoid glare, direct sunshine, and bright lighting while operating the machine. Bright light can impair the sensors.
WARNING 	Wear protective eyewear

Warning!! Calibration cannot be done in Rotary Mode.

Calibration should be performed if:

- The camera is changed or manipulated.
- The lenses are removed, replaced, or changed.
- Focusing accuracy has degraded and the laser is not marking.

Lens Removal and Replacement

If you wish to change the lens, the machine must be calibrated again. Ensure lenses are probably stored with appropriate lens caps and are not cross threaded when mounting.

1. Ensure laser head is in a reachable position to remove lens.
2. Remove any objects or work pieces from underneath the lens work area.
3. Turn off machine and unplug it from your powersource.
Warning!! Failure to do so may result in personal injury or damage to machine!
4. Install the lens cap onto your lens.

Lens Size(mm)	Working Area Approx. (mm)
163	110X110
210	140X140
254	175X175
330	220X220
420	300X300

Fig. 17

- a. Carefully twist counter clockwise to loosen the lens.
Note: Try to avoid damaging the camera or camera shutter located on the side of the scanhead.

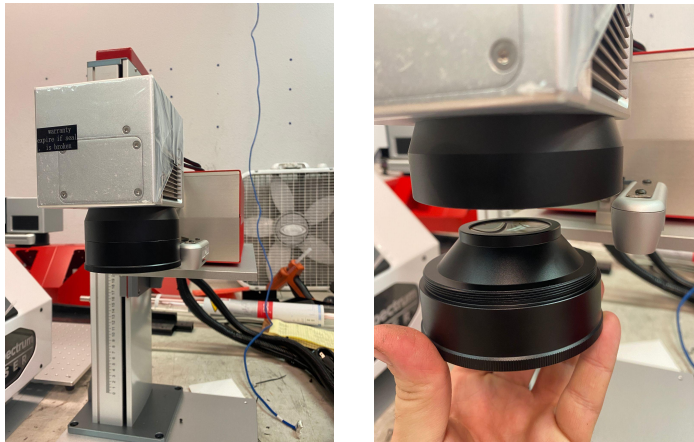


Fig. 18

Avoid touching the glass surface of the lens to prevent scratches.

- b. Lens collar may loosen with the lens, if that occurs remove both together and separate once off the machine
c. Replace the collar to the scanhead before inserting a new lens.

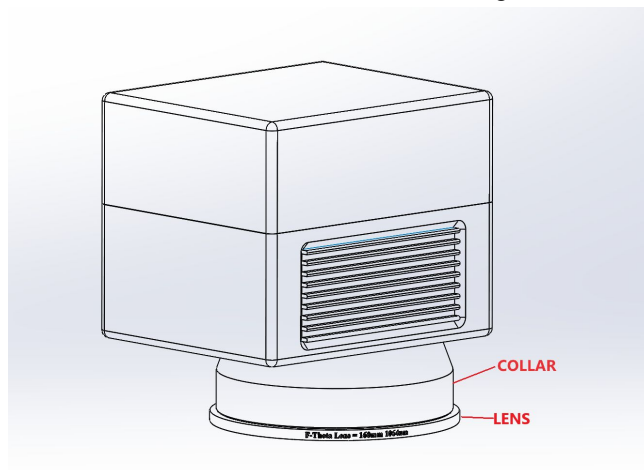


Fig. 19

- d. Remove top and bottom protective lens caps and screw new lens into collar on scan head
DO NOT OVERTIGHTEN LENSE!!
e. Wipe down the glass surfaces with alcohol based lens wipes if you notice smudges, fingerprints or other contaminants.

NOTE: Do not use microfiber cloths, shirts, rags or other materials as they can cause scratches.

Recalibration Process

1. Machine should be on and on the home screen.
2. Click the tools icon, then select home laser to return it to home position.
3. Enter the setup page for your machine via IP/setup

Ex. 192.168.12.34/setup

Then go to the "Laser Tools Tab"

Focusing

Focusing must be done each time a new material is selected or when restarting your machine.

1. Your Galvo came with a black anodized aluminum card that can be placed on to your desired material under the laser head (see Fig. 20).

Note: Make sure the QR code is visible on the camera during focusing.

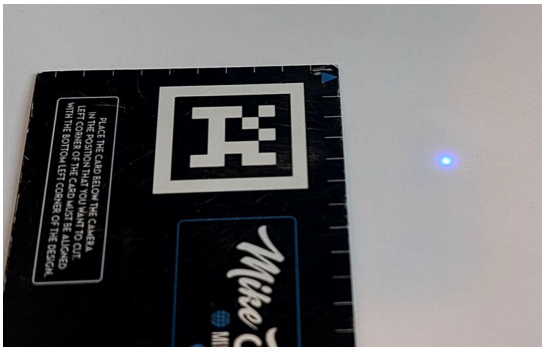


Fig. 20

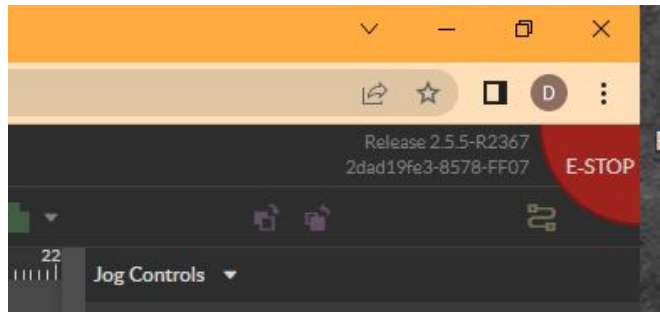


Fig. 21

2. On Retina go to the top right section of your browser and locate the jog Controls.(See Fig. 21)
3. Select the Jog Control arrow to open menu and select the **Z** autofocus button.(See Fig. 22)

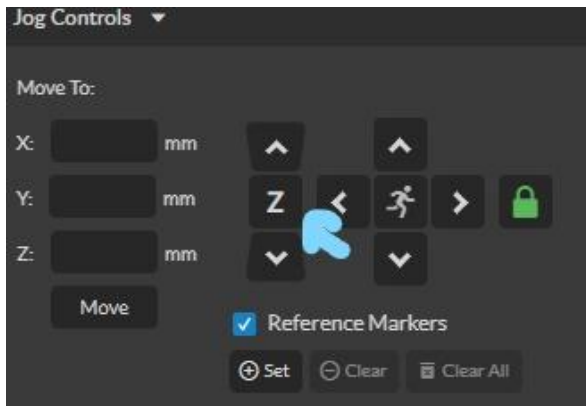


Fig. 22

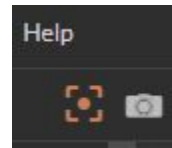


Fig. 23

4. The lens will move into ideal position for the selected material
5. Place a piece of paper or plastic above the selected material to run focus test.
6. Select the laser focus icon.(See Fig.23)

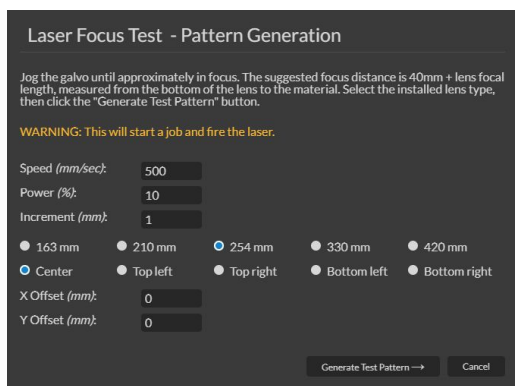


Fig. 24

7. Make sure the appropriate lens size is selected before hitting the generate test pattern option.

WARNING!! This will fire the laser!

8. The laser will produce a grid of marks from A through H vertically and numbers 1-6 horizontally.(See Fig.17)

Chose the 2 most visibly similar blocks and input them into the Pattern Selection then select "Focus Job Result", and then done.

Example: In this picture 3F and 4D are visibly similar so they can be chosen.

Note: If focus test does not produce the grid then it may need to be re-focused or needs a different material for the test.

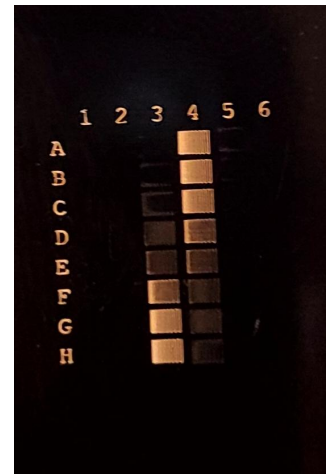


Fig. 25

3D Camera Calibration

1. Lay out about 1 to 2 sheets of letter sized paper centered under the red dot.
 - a. Ensure these sheets are flat and smooth to produce the best calibration.
2. Select "Run Lens Calibration"
WARNING!! LASER WILL START!WEAR SAFETY GOOGLES!!
Do not handle or turn off the laser during this process.The laser will produce a grid of dots .
3. Once calibrating, it will give a result of "Passed"
4. Next place your Capture tag underneath the red laser and select "Capture Tag Focus Offset"

After moving the galvo into focus, click the "Run Lens Calibration" button. Refresh all open browser sessions of RE3 after this step is complete.

Result:
After moving the galvo into focus, click the "Capture Tag Focus Offset" button.

Tag Focus Offset Result:

NOTICE	After calibration, the machine will auto-focus to the material before engraving. Keep in mind the height of the object being engraved . If the object is too tall then the laser cannot autofocus to the material and the cut quality will be worse. If you wish to engrave tall objects then try a different setup option to allow the laser to go to the proper focus height.
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Mark Adjustment

1. Run the mark adjustment to verify that the calibration process was successful,.
2. Set a speed of 100mm/sec and input the lens size you are using.
3. Place a piece of test material under the laser for marking.
Note: Preview the square before proceeding to ensure only test material is marked.
4. Select "Mark Square"
5. Measure the marked square and input the measurements into the boxes.
Note: that the top left corner of the square is cut off intentionally
6. Select "Save Mark Adjustment"

Mark Adjustment

Enter the size of the square to mark and click the "Mark Square" button.
Warning: this will start a job and fire the laser.

The recommended sizes are:
100 for 160mm lens, 110 for 163mm lens, 145 for 254mm lens, 225 for 330mm lens, and 288 for 420mm lens.

Speed (mm/sec):

Power (%):

Size (mm):

Measure the actual width and height of the marked square and enter the values below, then click the "Save Mark Adjustment" button.
Click the "Mark Square" button again to verify the size is correct. This mark will be used in preview adjustment.

Actual mark width (mm):

Actual mark height (mm):

Adjustment

1. Mark a new, properly adjusted square
2. Without moving the part you just engraved, press "Preview Square"
3. Use the adjustment buttons so that the red dot trace perfectly overlaps the marked square.
4. Select "Save Preview Adjustment."

Preview Adjustment

Click the "Preview Square" button then use the "X/Y Scale/Offset Up/Down" buttons to line up the red laser preview with the previous square mark.
Click the "Save Preview Adjustment" button to save the results.
Unsaved changes will persist until power cycle or the "Reset" button is clicked.

Section IV. Touch Screen Interface

The touch panel that comes preinstalled allows you to control the basic functions of your laser without needing to connect to a computer. Jobs are accessible and can be modified via the RE3 web interface discussed in the “Connect to Software” section. A rotary mode is pre-installed on your machine, the rotary should be connected to the UV Galvo before it is powered on. Rotary mode can be engaged from the touchscreen or from RE3. The “Directional Jog” button will change to a “Z-Axis” symbol. Tapping on the “Z-Axis” symbol will change to the “Rotary” symbol. The arrows will now control the rotation.

Home

The Home screen contains the devices IP address, the QR Code for RE3, the video feed from the camera, and controls for the laser head.

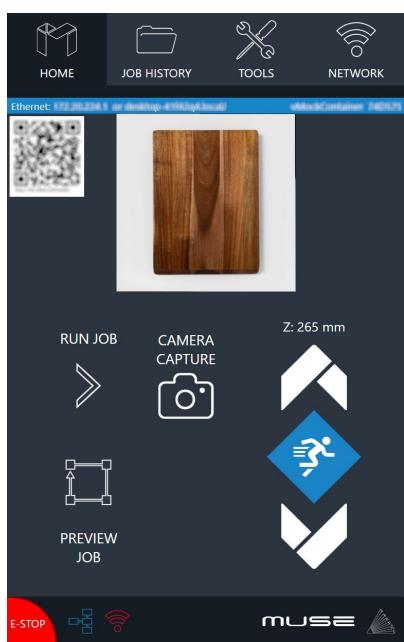


Fig.26

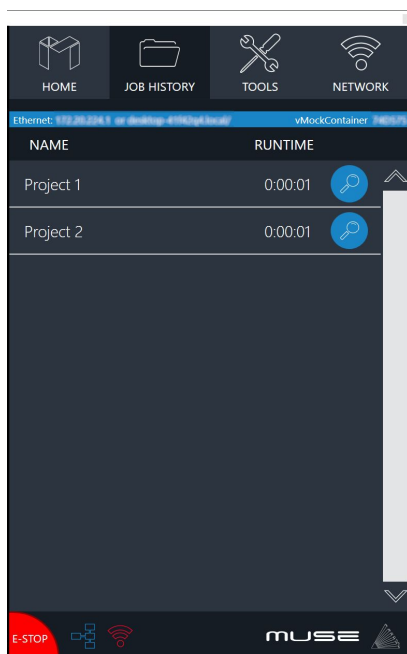


Fig. 27

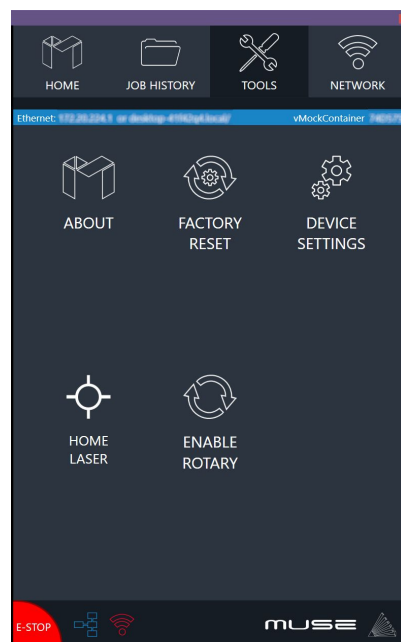


Fig. 28

Job History

The Job History icon allows the user to browse previous jobs. Clicking on the File allows the user to view and re-run previous job details. No Wi-Fi connection is needed to run jobs saved here.

Tools

The tools icon allows the user to check and adjust the machine settings. Here the user can enable rotary attachments, home the laser, and get information about the machine.

Tools ⇨ Update Status

The user can use the Update Status icon to check the Network Connection Status, Software updates, and connection history. (See Fig. 28)

Network ⇨ Wi-Fi

Allows the user to connect to the Wi-Fi.

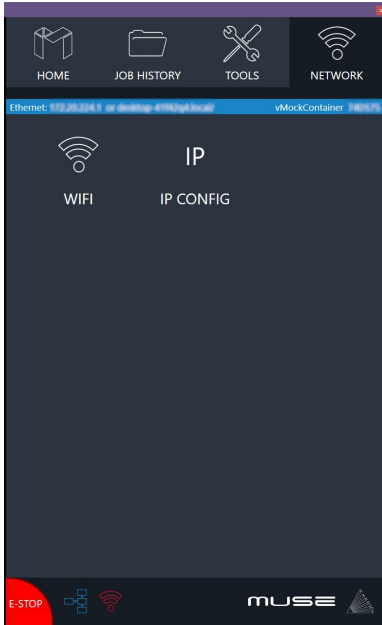


Fig. 29

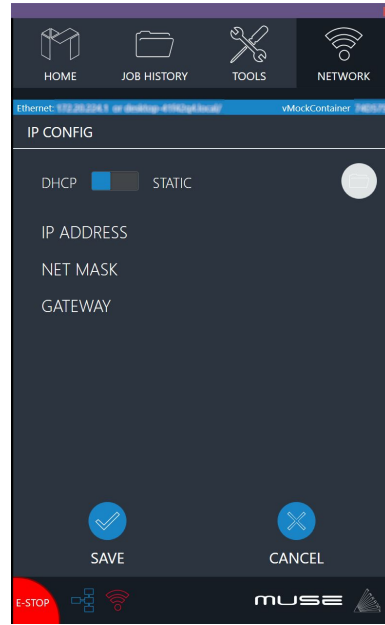


Fig. 30

Network ⇨ IP Configuration

Allows the user to set IP Address and DNS Server manually.

Most of the things mentioned in this section can also be done from your phone using the mobile or web browser version on RE3.

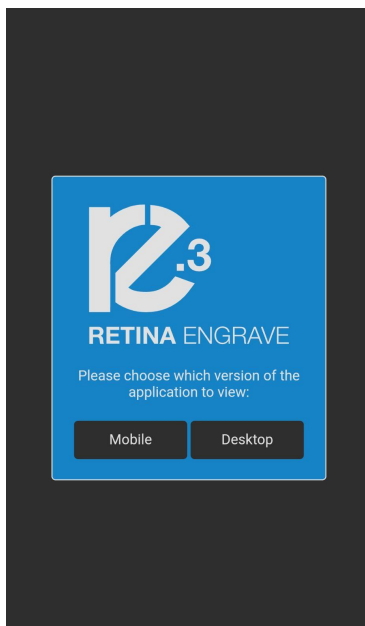



Fig. 31



Fig. 32

Section V. Operations and Using Your Galvo

This section will guide you through using your UV Galvo. To get started, it is important to understand the meanings of “Vector Cutting” and “Raster Engraving” and their associated file types.



VECTOR	RASTER
Project Examples	
Signs, Logos, Parts, Gears	Image Engraving, Surface Marking
File Types	
PDF, SVG, DXF, AI	JPEG, PNG, BMP, TIF
Preferred File Types	
PDF	JPEG
File Composition	
Geometrics Formulas	Pixels

General Functions

Vector Cutting

The most common feature when cutting with a laser engraver or cutter. When vector cutting, the laser follows the “vector lines” embedded in the vector image to cut out the design. The laser starts at a designated location and follows the vector lines until the shape is cut out. This process is highly accurate and requires no resolution adjustments because of the properties of a vector image. RE3 receives information from the print stream and interprets it as a series of paths for the laser head to follow. For the print stream to have that information, the file being printed must be a vector. These images are created using mathematical equations, making them more flexible than rastered images. PDF’s, company logos, and branded graphics work great as vector files and are easy to resize without losing resolution.

Engraving

Engraving is the process by which designs are etched into something. Engraving can range from a simple surface mark all the way through deep material removal. It is also known as “Raster Engraving” or “Rastering”. For engraving, a laser has two states: on and off. Every black pixel or “laser dot” is the result of the laser turning on and firing at that location, which is controlled by the input image. The laser fires individual pulses corresponding to pixels in an image. When the laser is operating in raster mode the head moves rapidly from left to right and slowly from top to bottom, engraving your image pixel by pixel and line by line.

Images and Engraving

Engravable images use multiple colored pixels to form an image, such as JPEGs and PNGs. Photos found on the Internet and photo prints are raster images, images created using colored pixels. The amount of colored pixels are fixed so they can't be resized without distorting their resolution. Pixels become visibly grainy and the image becomes distorted, that is why it is important that you save raster files at the dimensions needed to eliminate possible resolution issues.

Direct Printing PDF Files

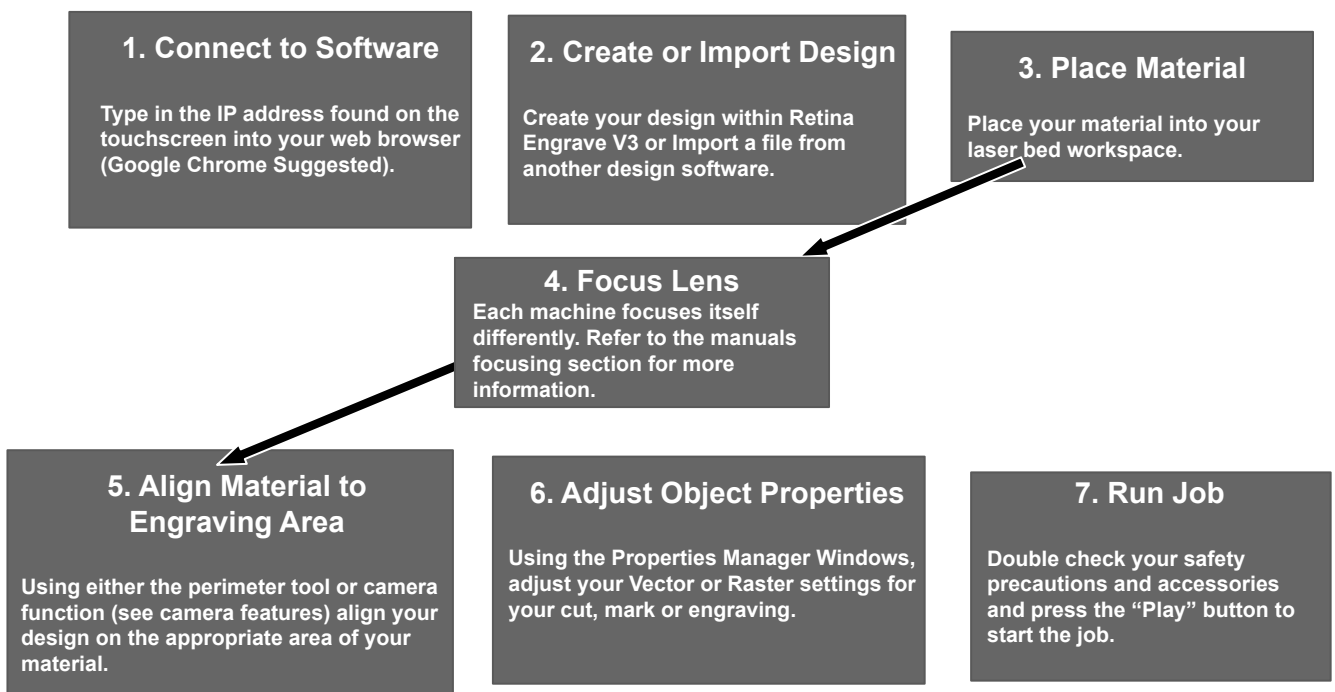
The easiest way to import any file type to RetinaEngrave v3.0 is to “drag ‘n drop” it directly into the workspace window or use the File> Import File. Another method would be to "Print" the PDF file which can send the data directly from your chosen design software into RetinaEngrave 3.0. A PDF file type is the preferred method as this can hold both vector and raster data.

Designing in RetinaEngrave v3.0

RE3 has a robust set of design tools, allowing users to design in the software without needing outside design software. Third party design software, however, is still an option for RetinaEngrave v3.0 users. Just about any design software will work (You can choose the software you are most comfortable with, as long as you can convert files to PDF (which most can). You can also “direct print” to the software. Each operating system does this in a slightly different way, so check the instructions for your particular program.

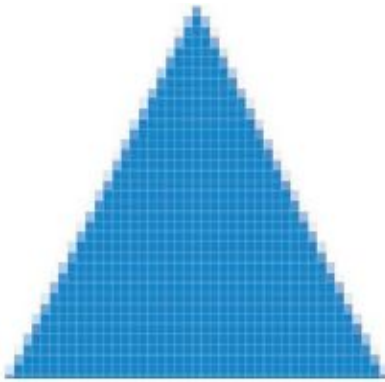
Project Workflow: From Concept to Design

RetinaEngrave v3.0 create a simple, easy to learn set of operations. Your UV Galvo will achieve amazing results using this Project Workflow List. For the “best practice” for any project, follow the step-by-step instructions from start to finish.



1. Create Design

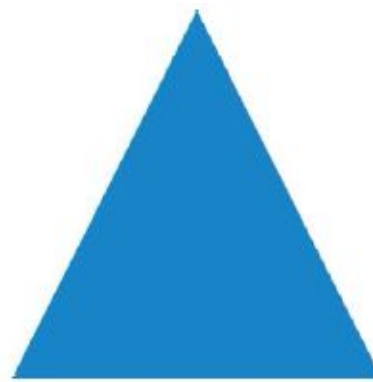
Projects are created in design software and then imported to RetinaEngrave 3.0. A PDF file is mainly used for both raster and vector data due to its ease of conversion. For engraving, a JPEG file is best due to its bitmap files. It is important to know if you intend to do a vector cut or an engraving and choose the most appropriate file type. This will greatly aid the user to design in RE3 without needing outside design software. If the user decides to use a third party software, choose one you are most comfortable with, as most can convert the image to PDF. You can also “direct print” to the software. Each operating system does this in a slightly different way, so check the instructions for your particular computer.



Raster Image (bitmap)

Pixel based image.

Examples: JPEG, PNG



Vector Image (bitmap)

Vector File Geometric based image.

Example: SVG, AI, PDF

2. Connect to Software RetinaEngrave v3.0

Refer to Section II: Assembly & Connectivity.

3. Import Design

Import your designs by selecting the “Open File” icon, or by dragging and dropping your file into the workspace. This software detects a wide variety of file types.

4. Place Material

Place your material into the laser bed workspace. The material can be placed anywhere in the work area. Once the material is placed, close the lid. Your material can range from wood, acrylic, cardboard, fabric, and steel. **Note: It is the user’s responsibility to know the components of material used and its limitations (thickness, chemical residues, etc.). Check with the material manufacturer, or MSDSonline.com, if there are any questions to its usage. We recommend using a Materials Log to keep track of the different materials you use.**

5. Focusing your Lense

Your Galvo should be re-focused after changing materials.

Refer to Manual

6. Align Material to Engraving Area

The material should be aligned to ensure the design is within the workspace and positioned straight. This can be done with a simple vision check while “jogging the perimeter”. By using the directional arrows on the touchscreen or the arrow keys on your computer, move the laser dot to the top left corner of your material. When placing an engraving image, leave at least ½” inch of space on the left and right side. Once the material looks aligned, click the “Run Perimeter” button. The laser head will automatically outline the material with the red beam diode, adjust as needed.

Note: Laser will continue to outline the material until manually stopped by re-selecting “Run Perimeter”. See Positioning below for more options.

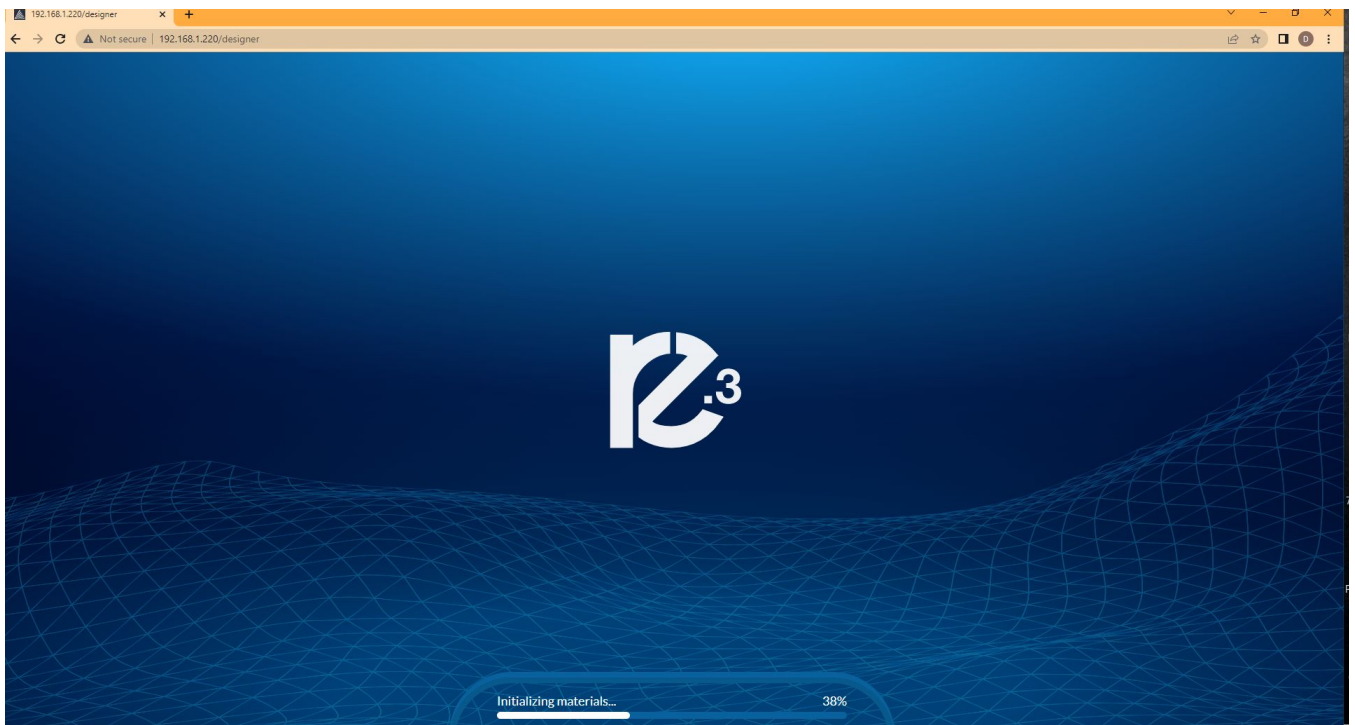
7. Adjust Object Properties

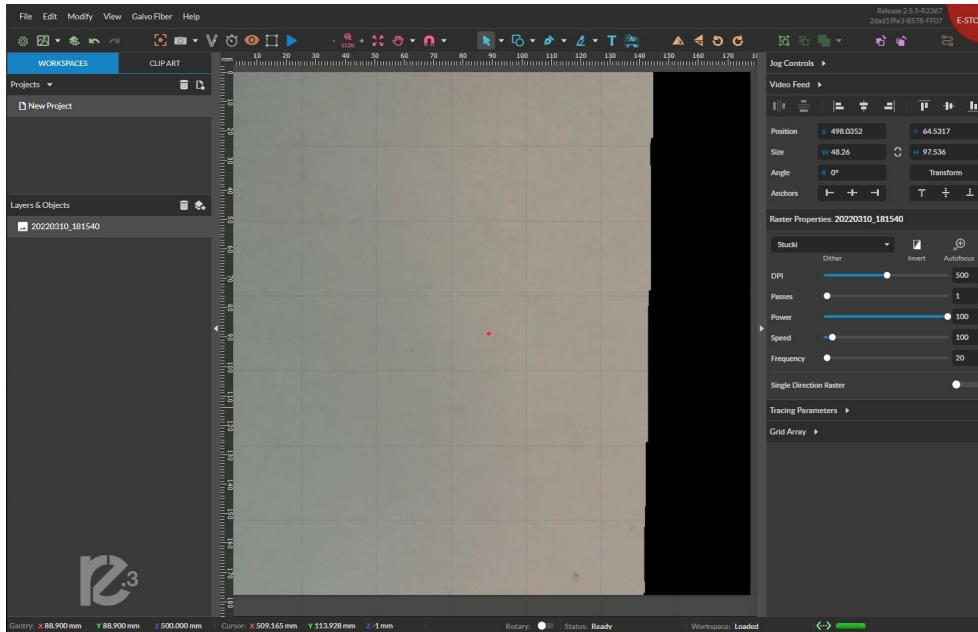
It is again important to know if you want to engrave, cut, or both. Once the file is imported, you will have access to the Properties Tab. Click this tab and select the parameters for your cuts and/or engravings. For details on setting these parameters, see the following section.

8. Run Job

Selecting the “Play” button begins the laser process. Therefore, double check your safety protocol and that your system accessories are connected properly. Be sure to monitor the job while the laser is firing. If a problem occurs during the process, stop the laser.

Starting on RE3



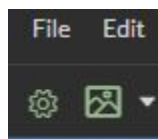


RetinaEngrave V.3 will look like this when fully loaded on the bowser.

Note: The device must be on and fully booted to access RE3. If the machine is off RE3 will inform you that the device has been disconnected.

What sets our machines apart from our competitors is that the settings for our machines are usable for all materials, at most the customer will only need to adjust the speed. Using your new machine for the first time may seem a little intimidating but we have been working on making this section of the manual the easiest part to understand so that your first experience is a possible one. In the previous section we talked about having an idea of what you would like to engraver and on what. The Muse Galvo can preform jobs on metals, rubber, stone, some plastic, and leather. Once you have a material and design ready you can start using RE3.

1. Select the file you wish to engrave via your editing software or an image saved on your computer.
 - a. It can be place into RE3 using two methods:
 - It can be “dragged” into your RE3 workspace using your mouse.
 - It can be place using the photo icon.



- b. Modify the image in RE3 to be the proper size, laser settings, and file type (raster or vector), as well as any other laser properties that are specific to that engraving
2. Prepare the material you wish to engrave. If the material you are working with is new to you or untested, make sure you have enough material to test with to ensure your settings are correct before marking the final part/design.
3. Focus the laser to the material if you have not done so.
 - a. Method 1: QR Tag (Preferred)
 - *Refer to Focusing Section***
 - b. Method 2: Use Depth map
 - i. When no autofocus mark or april tag is detected, the laser will focus based off the depth map from the 3D camera
 - ii. The location of your design in the workspace will determine the focus position.

NOTE: The focus distance number set in the RE3 interface is machine relative. It signifies a distance away relative to home, not a distance away from the part.

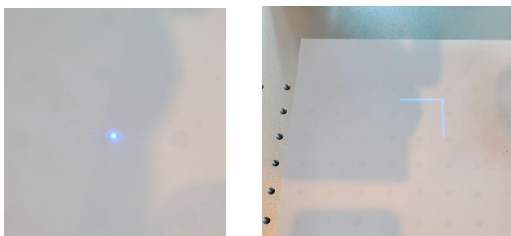
4. Align your design with your material

- a. This can be done by using the eye icon or the perimeter icon to preview the area where the laser will engrave.



Note: The Eye icon will procedure a line that will run up and down the work area, while the perimeter icon will form a square image of the work area.

- b. Adjust the design or material to ensure your design is engraved in desired area.



Note: The UV laser is very small and hard to see. We recommend placing a white paper under the laser head to see the border for the job preview.

- c. Ensure the material has enough weight so as to not move while engraving

Note: A jig, fixture, putty, or tape can be to use to set objects in the same position for repetition.

5. Once the picture is aligned with the material and checked via preview, you are ready to run your job.

- d. Run the laser using the play button.
WARNING!! PUT ON SAFETY GLASSES BEFORE STARTING! LASER CAN CAUSE EYE DAMAGE!
- e. Once the marking is complete, do not move the part until you are sure that it has the desired look, as realigning becomes significantly difficult.
- f. Wipe your part clean of any dust/residue resulting from the engraving process

Congratulations!! You have made your first engraving on RE3. It's an exciting process to engrave material to your liking. Sometimes a little trial and error is needed to see what designs go well in what ways. The following pages will provide more information on how to use RE3 for more detailed and precise engravings.

RE3(in depth)

File:

New Project (Alt+N): Start a new project.

- **Load Project from File (Ctrl+O):** Load a project from a saved file.
- **Import:** Import and place a file.
 - **Image/Drawing:** Import image or drawing.
 - **Add fonts:** Add fonts from outside sources.

Sync Workspace: Saves any changes to the workspace. Also done with **(Ctrl+S)**

- **Export Project to File (Shift+Ctrl+E):** Export the project to a file.

Edit:

Undo (Ctrl+Z) Cancel action	Redo (Shift+Ctrl+Z) Returns cancelled action	Cut (Ctrl+X) Removed and added to Clipboard	Delete (Del)
Copy (Ctrl+C) Copies highlighted object	Paste (Ctrl+V) Created the copied object	Paste in Place (Shift+Ctrl+V)	Style Paste(F4) Copy matches style
Duplicate (Ctrl+D) Creates copy of selected object	Select All (Ctrl+A)	De-Select All (Shift+Ctrl+A)	Invert Selection(Ctrl+I) Selected objects are unselected and unselected become selected

Modify:

Arranging Layers

Send to Front Layer (Shift+Ctrl+Up)	Forward (Ctrl+Up)	Starting Layer	Backward (Ctrl+Down)	Send to Back Layer (Shift+Ctrl+Down)
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Alignment

	Align Top	
Align Left	Align Center/ Align Middle	Align Right
	Align Bottom	

Same Width: All selected objects will have the same width.

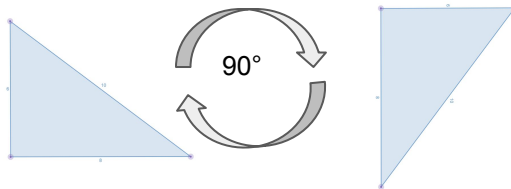
Same Height: All selected objects will have the same height.

Distribute Horizontally: Evenly arrange selected objects horizontally.

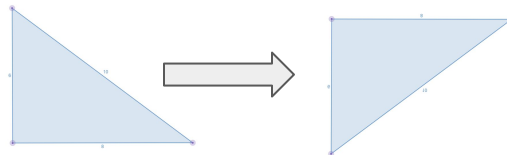
Distribute Vertically: Evenly arrange selected objects vertically.

Object Adjustment

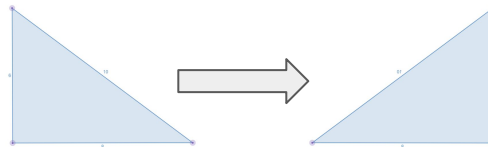
Rotation:



→ **Flip Vertical:**



→ **Flip Horizontal:** Reverse selected object's orientation along horizontal axis.



MASK WITH SHAPE:

Create a mask for a raster image with a vector shape

COMPOUND:

GROUP SELECTION (Ctrl+G): Select a group of objects.

CREATE COMPOUND (Ctrl+M): Merge a selected group of objects.

UNGROUP SELECTION (Shift+Ctrl+M): Split up a compound shape or object.

CREATE NESTED COMPOUND (Ctrl+Alt+M): Create Compound shape from two already created compound shapes

COMPOUND SHAPE:

- **Union:** Combine layers into one.
- **Subtract:** Remove and combine non-overlapping layers into a single compound layer.
- **Intersection:** Combine overlapping layers into a single compound layer.
- **Difference:** Combine non-overlapping layers into one layer.

PACK OBJECTS:

Create an equally spaced grid to pack objects from multiple selected shapes

PATH:

Join Paths (Ctrl+J): Combine multiple paths into one compound path.

Split Paths (Shift+Ctrl+J): Split a compound path into its original separate paths.

Convert to Path (Shift+Ctrl+P): Convert a non-path to a layer path or new path.

Simplify Path (Ctrl+Alt+S): Simplify (and smooth) a path.

What can be done with path?

You can:

Convert an object to an Outline path.	Pack Objects	Expand/Shrink an object	Text to Path attach/detach text and conform to path	Vectorize Border Create a border path
Rasterize Convert object to image	Break Curve Separate paths at specific mode	Vectorize Image Create vector path for	Connect Path Lines Connect the ends of 2 or more paths	Reverse Order

VIEW:

Original View (Ctrl+0): Return the workspace to the original view state

Outline View: Set to outline view mode.

- **Fit Selection:** Fit the selected object in to the viewable area.
- **Fit Layer:** Fit the currently selected layer to the viewable area.
- **Fit All (Alt+Ctrl+0):** Fit all layers, whether or not selected, to the viewable page area.

Magnification Increase or decrease magnification.

Zoom In/Out (Ctrl + +/-): Enlarges/Reduce workspace screen detail and size.

CANVAS:

Rulers: Toggle rulers on and off.

Guide Lines (Ctrl+,:): Toggle guidelines on and off.

Grid (Ctrl+Alt+G): Toggle grid on and off.

SNAP TO:

Use Snapping (Shift+F10): Enable or disable the snapping feature.

Snapping can be used to : **Snap Zones ,Snap to Grid, Snap to Guide Lines, Snap to Full Pixels, Snap to Anchor Points, Snap to Shapes, and Snap to Pages.**

CAMERA

Toggle fullscreen: Causes the window to occupy the entire screen.

Video Feed : Allows user to access video feed

Capture Workspace: Initiates camera functions.

Clear Last Workspace Capture: Remove camera image.

Trace Background: Used with camera functions to apply vectors to selected area of image.

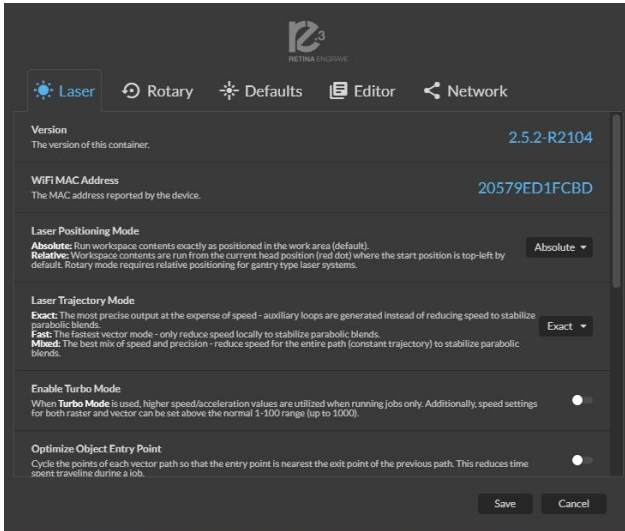
Estimate Job Time: Give approximate time for the job to complete.

Run Job: Run your project. When running, "Play" button is replaced with "Pause" and "Cancel".

Settings:

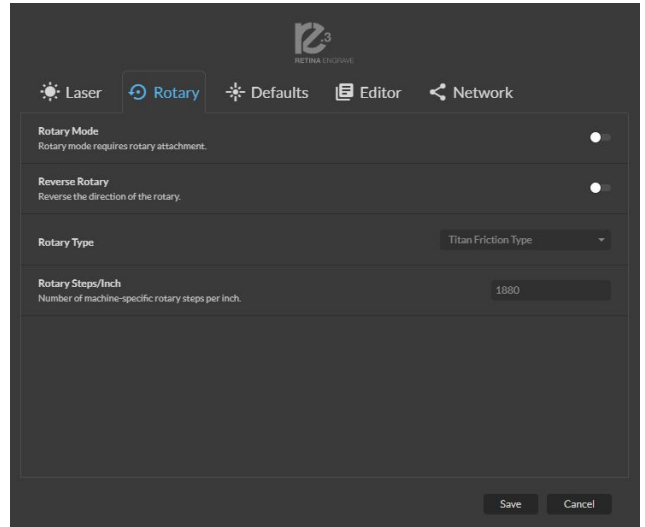
Laser:

Information regarding your machine.



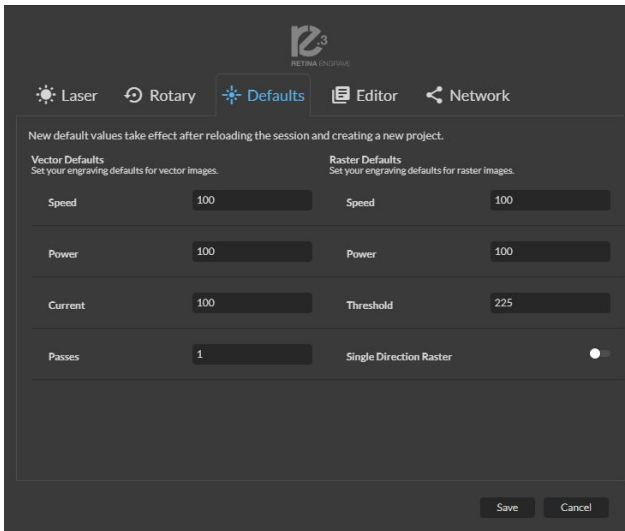
Rotary:

Settings for using Rotary Mode.



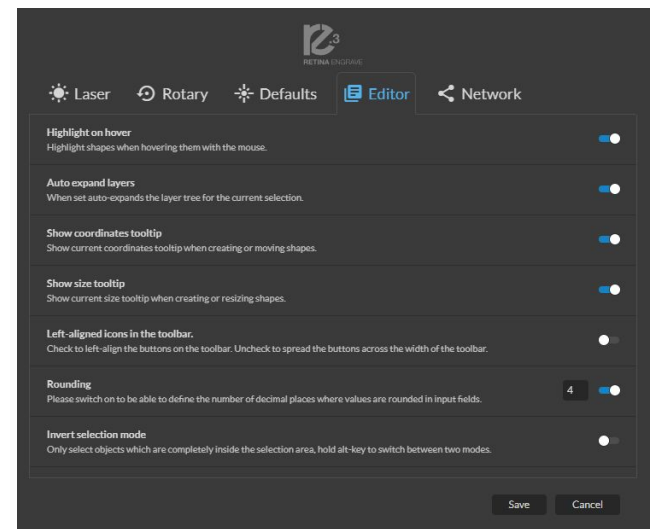
Defaults:

Shows information on Default values within RE3

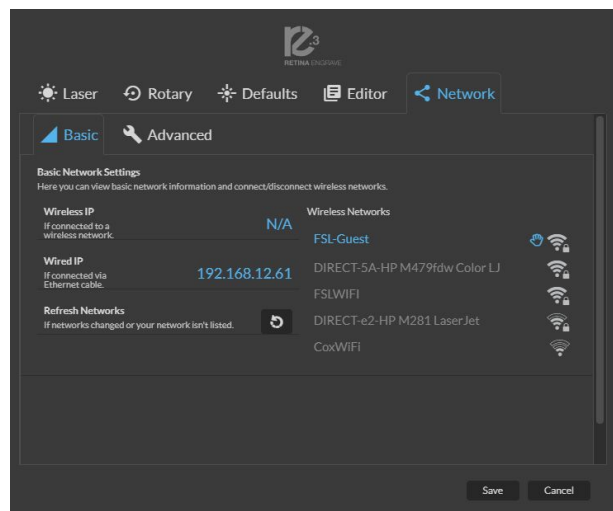


Editor:

Shows information on Editor preferences



Network: Network settings for RE3.

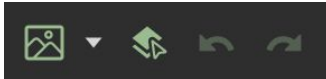


RE3 Interface:



Settings

Files:



1 2 3 4

1. **Import Image:** Import image or drawing JPEG, PNG, SVG, PDF.
2. **Save:** Save project.
3. **Undo:** Reverse your last action.
4. **Redo:** Reverse your last undo.

Workspace:



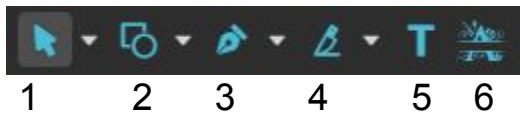
1 2 3 4 5

1. **Capture Workspace:** Takes images of workspace
 - ▼**Clear Last Workspace Capture:** Clears previous workspace image.
2. **Trace Background Image**
3. **Estimate Job Time:** Amount of time the job will take.
4. **Show Bounding Perimeter of all Objects:** Shows the space the job will occupy.
5. **Run Job:** Start Engraving



1 2 3 4

1. **Zoom (-/+):** Enlarges/Reduces workspace screen detail and size.
2. **Fit All:** Fits entire captured image on screen.
3. **View**
 - ▼**Pan (H):** Manually pan project window using mouse.
 - Zoom (Z):** Zoom project window using mouse.
4. **Snap**
 - ▼**Use Snapping (Shift+F10):** Enable or disable the snapping feature.
 - Use Snap Zones:** Enable or disable the snap zone feature.
 - Snap to Grid:** Enable or disable the Snap to Grid feature.
 - Snap to Guide Lines:** Enable or disable the Snap to Guide Lines feature.
 - Snap to Full Pixels:** Enable or disable the Snap to Full Pixels feature.
 - Snap to Anchor Points:** Enable or disable the Snap to Anchor Point feature.
 - Snap to Shapes:** Enable or disable the Snap to Shapes feature.
 - Snap to Pages:** Enable or disable the Snap to Pages feature.
 - Show Grid:** Toggle grid on and off.
 - Show Guidelines:** Toggle guidelines on and off.



Toolbar:

- 1. Select: **Pointer**
 - Subselect
 - Lasso
 - Layer

- 2. Shape: **Line.**
 - Rectangle
 - Ellipse
 - Polygon
 - Triangle
 - Star

- 3. Path:**Pen**
 - Bezigon
 - Freehand

- 4. **Knife:** Cuts out objects
Freehand Shaping: Initiates “freehand” mouse pointer for creating paths.

- 5. Text
- 6. Monogram



Orientation:

- Flip Horizontally:** Flip object along horizontal axis.
- Flip Vertically:** Flip object along vertical axis.
- Rotate CCW:** Rotates 90 degrees counterclockwise.
- Rotate CW:** Rotates 90 degrees clockwise.



Grouping:

- Group: Group objects**
- Merge: Union:** Combine layers into a single compound layer.
- Difference:** Combine non-overlapping layers into a single compound layer.
- Intersection:** Combine overlapping layers into a single compound layer.
- Subtract:** Remove and combine non-overlapping layers into a single compound layer.
- Split:** Split up a compound shape or object.



Arrange Menu

- Bring Forward:** Send an object one layer forward.
- Send Backward:** Send an object one layer backward.



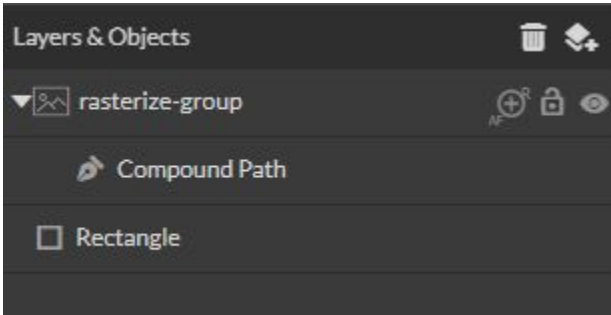
Convert to Path

Convert objects to paths.

Left Sidebar:

Projects Menu

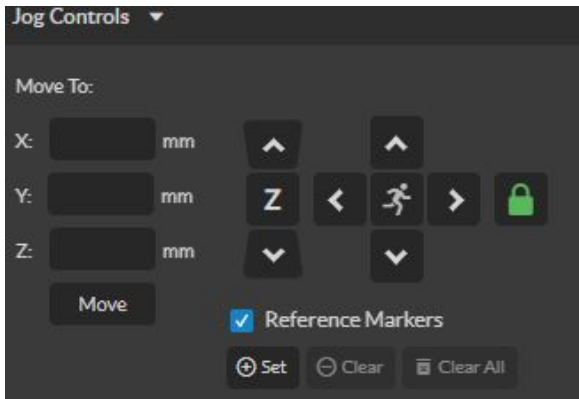
For storing, creating and deleting projects.



Layers & Objects Menu

Here layers can be created, deleted, locked in place or turned invisible.

Right Sidebar:

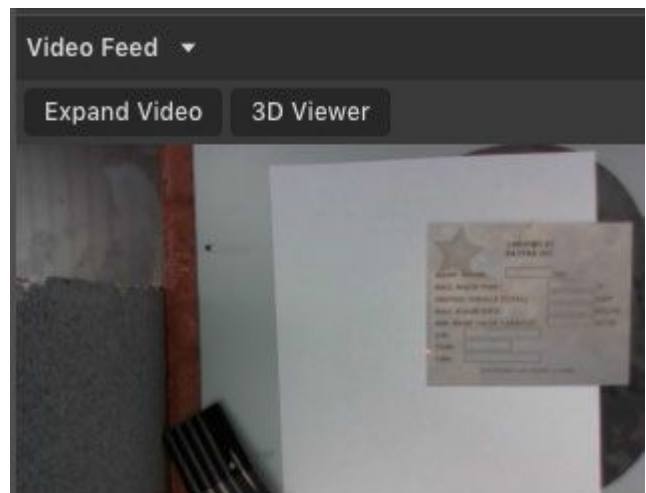


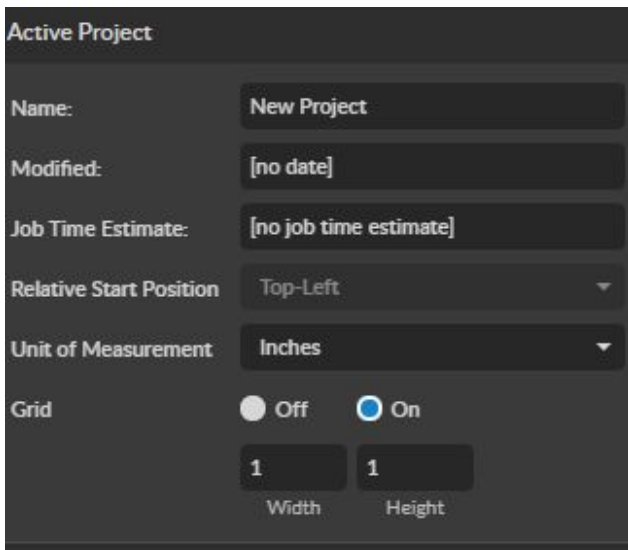
Jog Controls

The Camera, Gantry, and/or Rotary can be moved from here.

Video Feed

Camera shows live view of your work area.



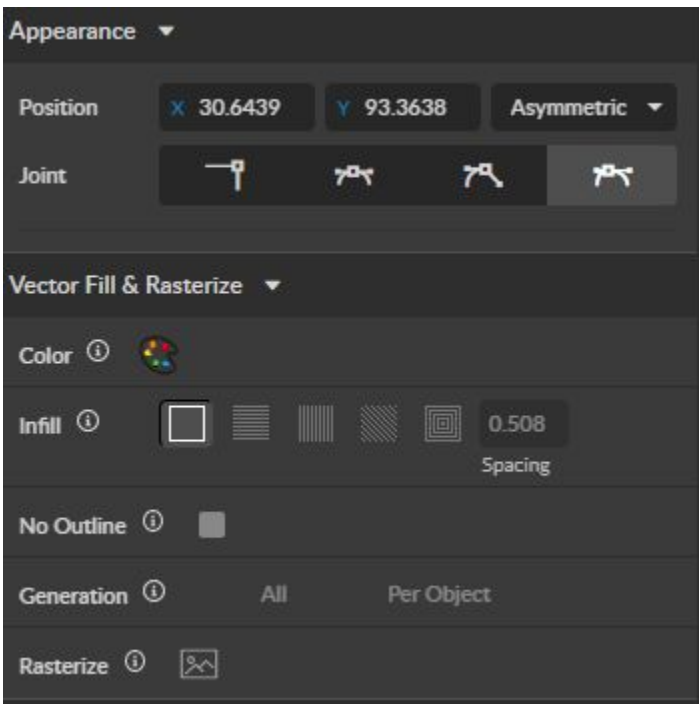
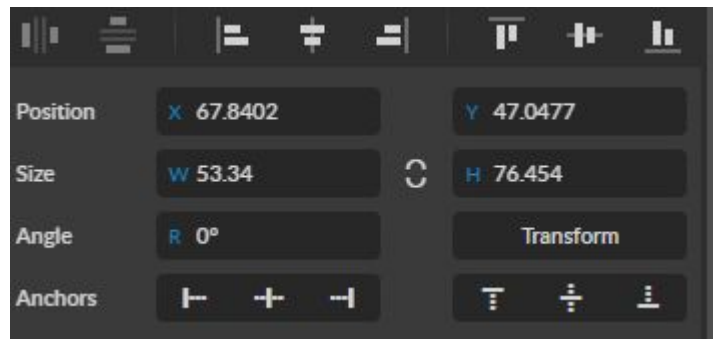


Project Info

This window displays information regarding the active project.

Image Properties

Appears when Image is selected. Allows user to adjust size and position of selected image.



Appearance/Vector Fill & Rasterize (G)

These tabs only appear when a vector object is placed in workspace.

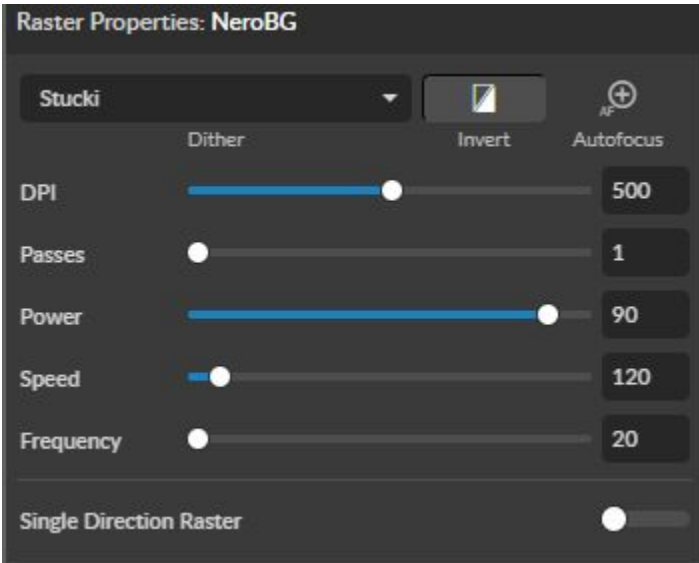
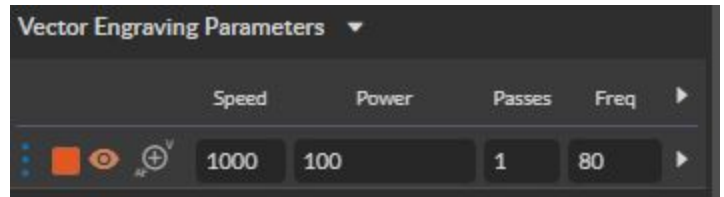
Appearance gives details on the vector image.

Vector Fill & Rasterize is for adjusting the properties of vector before changing it into a raster image for engraving.

Note: Cutting is done using vector lines!.

Vector Engraving Parameters

The parameters used for cutting lines.



Raster Properties

Properties that will be used for engraving.

Invert- Reverses images grayscale.

Black to white, White to black

DPI-Resolution

Passes- the amount of times the images is engraved

Power- Lasers power in percent

Speed- how fast the laser engraves in mm/sec

Frequency- the rate at which the power is distributed

Tracing Parameters

Tracing is used on rastered images to be made into vector lines for cutting.

Threshold- Pixels to include

Smoothing

Ignore Area- how much speckling will be removed

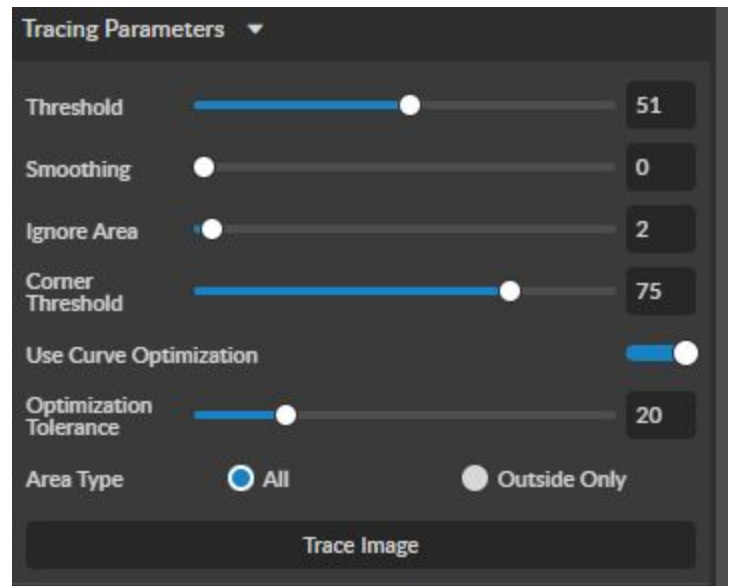
Corner Threshold- how sharp corners will look

Optimization Tolerance- determines how many lines are in each curve

Ex. The greater the tolerance, the fewer lines but it affects accuracy.

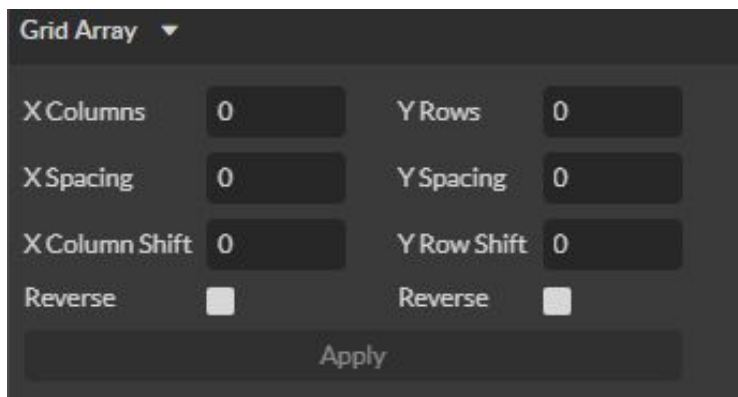
Area Type- All- The entire picture is trace.

Outside Only- The border of the picture is traced.



Grid Array

The Grid Array is for making multiple copies of the selected object. It is ideal for projects that require multiple copies.



Indicators (Bottom Tabs)



Gantry Indicator: Displays current position of the laser on the grid.

Cursor Indicator: Displays current position of the Cursor.



Time Indicator: Displays the time remaining to complete the current job.



Status Indicator: Displays whether laser is ready to initiate a job or is currently executing a job.



Sync Indicator: Notifies you of the last workspace update operation results. "Press Sync" to sync immediately.



Rotary Indicator: Displays whether rotary is enabled or disabled..



Machine Indicators displays information on connected devices.

Device Connection Available: Indicates connection to machine is successful.

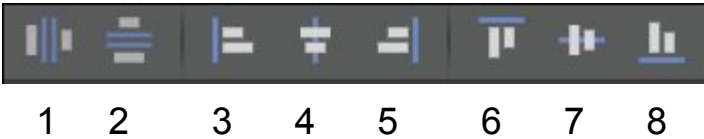
Creating and Manipulating Text



Select the “Text” icon and then select the location for the text. Write your text and customize it by selecting the text and adjusting the options for the positioning, size and font of your text.

Text Positioning

Text position can be quickly adjusted by clicking on one of the following options:



- 1. Distribute Horizontally:** Evenly arrange selected text horizontally.
- 2. Distribute Vertically:** Evenly arrange selected text vertically.
- 3. Align Left:** Align text to the left.
- 4. Align Center:** Align text to center.
- 5. Align Right:** Align text to right.
- 6. Align Top:** Align text to top.
- 7. Align Middle:** Align text to middle.
- 8. Align Bottom:** Align text to bottom

Text Positioning Coordinates

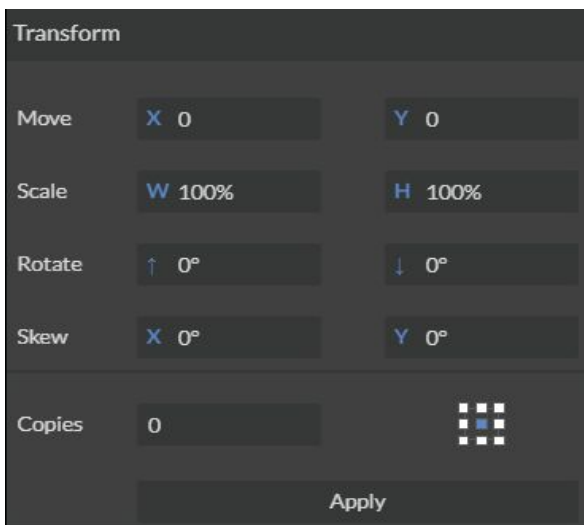
This window displays the coordinates and other specs of the selected text. Coordinates can be changed manually by entering the desired specifics directly into the software.



- Position:** Displays position of text X/Y coordinates in the workspace
- Size:** Displays size of text according to width and height.
- Angle:** Displays angle of text as a degree.
- Transform:** Transform brings up the Transform Window options.
- Anchors:** Allows the user to snap the layer to anchors.

Text Transform Options

Transform options allow the operator to alter the shape and skew of text.



- Move:** Set X/Y coordinates.
- Scale:** Manipulate the scale of text, separately, in width and height.
- Rotate:** Rotate text a set number of degrees, up or down.
- Skew:** Skew the angle of text by a set number of degrees on the X and Y axis.
- Copies:** Create duplicates of the selected text.
- Apply:** Click to apply all transform changes.

Text Appearance

Select Font: Choose or change the text font.

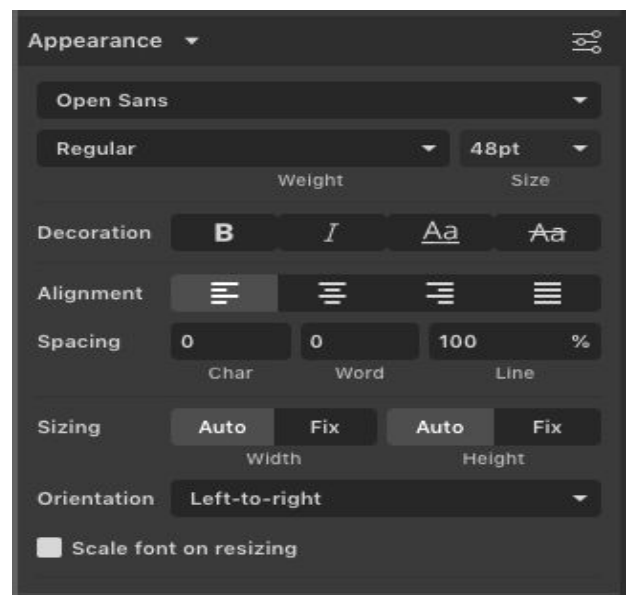
Weight: Choose bold and italic options.

Font Size:

Alignment: Align text left, right, or center.

Spacing: Set spacing for characters, word blocks, and lines.

Sizing: Lock all sizing options (Fixed) or allow custom alterations (Auto). When in auto select text and use the mouse to manipulate corner nodes to change size.



Text Path Options:

Attach Text to Path:

The user to attach and contour text to a shape or object.

For example, if the user creates an ellipse and a text element separately they can drag the mouse over both and select Attach Text to Path. The text will merged with the ellipse and conforms to the contour of the shape. The user can then drag the text element to the desired position, using the mouse.

Detach Text from Path:

Reverses the Attach Text to Path option. Select the object and text by dragging a square to highlight both, click Detach Text from Path and the shape and the text will be separated.

Convert to Path (Shift+Ctrl+P):

If a layer is composed of elements that are treated like paths, sometimes internally or because it is a Text object, then the existing paths that make up the object are simply extracted from the object as they are already defined. This results is a compound path containing all of the separate paths, with the transform information from the original layer not retained in its paths. For all other types of layers a new path is created, preserving any transforms. The user creates a text layer then converts to a path. Because the text was composed of more than one distinct element a compound path is created. The compound path can then be split into separate paths for each distinct element in the text.

Convert to Raw Path:

Similar to Convert to Path, except that with Convert to Raw Path new path objects are created regardless of the type of the original layer and transforms are preserved.

For example, the user creates a text layer, attaches it to an ellipse path so that it follows the curvature of the ellipse, then converts the text to a raw path. The text retains its curvature because the transforms of the separate text paths are preserved.

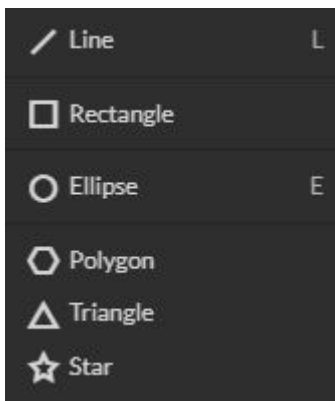
Creating and Manipulating Shapes and Objects

The easiest way to create an object is to select a shape from the tools menu. For example, you want to make a circle. Select the circle tool, then click and drag to create a circular shape. By holding shift while dragging, you can constrain the proportions so that the circle is perfectly round. Design view has hundreds of shapes that can be selected and manipulated to endless choices. The “Square” icon gives access the shape library



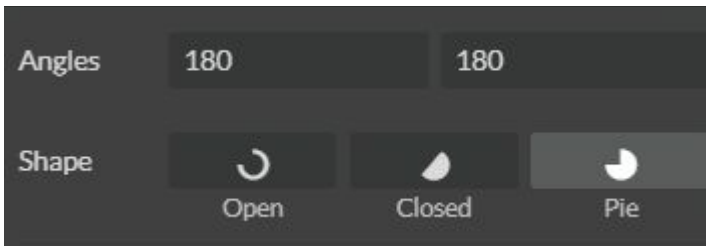
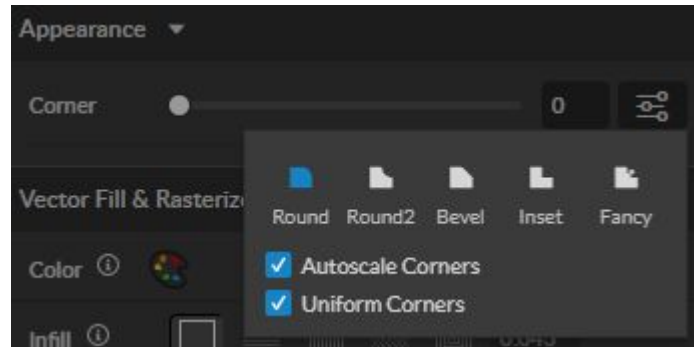
Creating Shapes

Select the Square Icon and then click and hold anywhere in the view window. By moving the mouse, you can expand and manipulate the square you want to create. By clicking the drop-down arrow next to the Square Icon, you can choose other base shapes and expand them just like with a square. The basic shape library includes line, rectangle, ellipse, polygon, triangle, and star. You can modify any shape by clicking on it and then adjusting the interface data appearing on the right side of the screen. Each shape will have slightly different options as follows:



Rectangle (R)

- Round:** Create rounded corners.
- Round2:** Create inverted rounded corners.
- Bevel:** Create beveled corners.
- Inset:** Create inset corners.
- Fancy:** Create fancy corners
- Autoscale Corners:** Toggle autoscale corners on and off.
- Uniform Corners:** Click to ensure all corners have the same parameters.

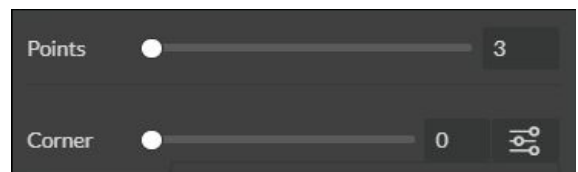


Ellipse (E)

- Angles:** Input custom angles.
- Shape:**
 - Open:** Click for open ellipse.
 - Closed:** Click for closed ellipse.
 - Pie:** Click for pie shaped ellipse.

Triangle & Polygon

- Points:** Slide bar to create polygons with multiple points (3 to 25).
- Corner:** Slide bar to curve corners.

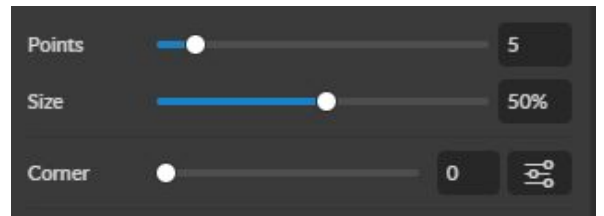


Star

Points: Slide bar to create polygons with multiple points (3 to 25).

Size: The size of the inside of the star.

Corner: Slide bar to curve corners.



Advanced Setting:

Round: Create rounded corners.

Round2: Create inverted rounded corners.

Bevel: Create beveled corners.

Inset: Create inset corners.

Fancy: Create fancy corners

Autoscale Corners: Toggle autoscale corners.

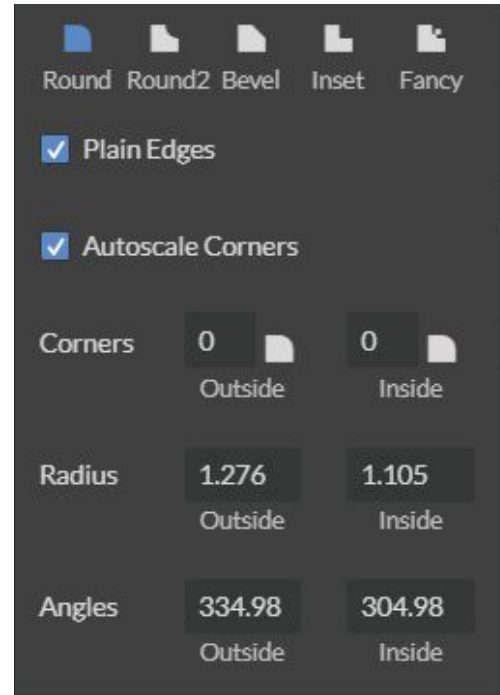
Uniform Corners: Set all corners to have the same parameters.

Plain Edges: Toggle plain edges on and off.

Corners: Input outside and inside corner curvature.

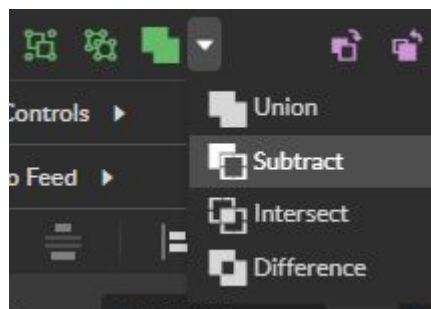
Radius: Input outside and inside corner radius.

Angles: Input outside and inside corner angles.



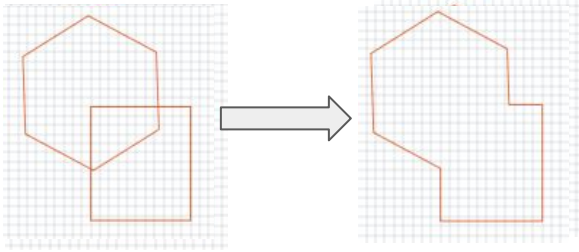
Creating and Manipulating Compound Shapes & Objects

Compound Shapes & Objects Operators can combine and modify shapes and objects to create unique compound shapes and objects with these functions (see also Modify):

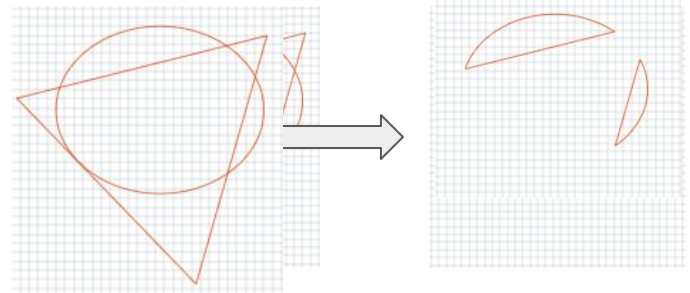


Split Selection (Shift+Ctrl+G): Split up a previously created compound shape or object that has been Unioned with other shapes. Select the compound shape and choose Split Selection. The different objects are split back up into individual layers that can be moved independently.

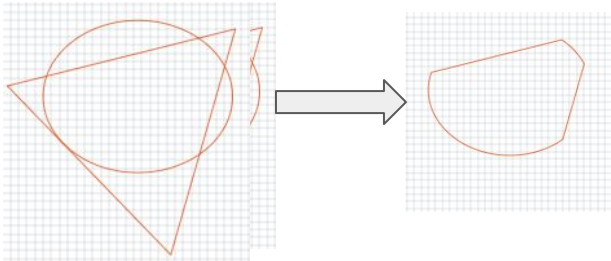
Union:



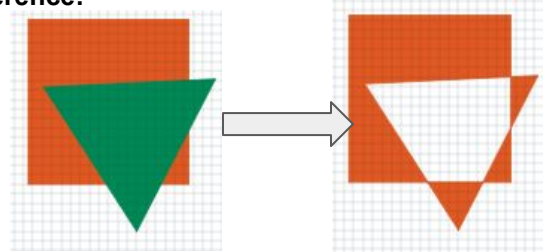
Subtract:



Intersection:



Difference:



Create Nested Compound: Combine compound shapes into a single compound shape. All of the selected compound shapes will be nested within the compound shape that was selected last. For example, if a user has created compound shapes and created the layout with the desired spacing but would like to move them all while retaining the existing layout.

Convert to Outline: Create an outline path of a specified size around an object. If the original object is not continuous, such as a line, an outline is created around the line and the original line is replaced. If the original object is continuous, such as a rectangle, an outline is created around the rectangle and the original rectangle is preserved, resulting in a compound path with two rectangles.

Creating & Converting Vector Paths

A vector path indicates the line the laser moves along while cutting. For a simple line, the path is a clear route from Point A to Point B. More complicated paths, and shapes, can be created using the following:

Vectorize Border: Use to create a vector path of the border of an object. For example, the user creates an object, such as a rectangle, and wants to have a vector path of just the border of the triangle.

Vectorize Image: Use to create vector paths of each separate element in an image. For example, the user first imports an image. User then wants certain parts of the image to be vectors so they can be cut. User vectorizes the image and then moves some of the resulting vectors out of the image object. The vectors can then be edited.

Join Paths (Ctrl+J): Combine 2 or more selected paths into one compound path. It does not connect them into one continuous path but rather a single object with breaks between the individual paths that were joined. The user joins together multiple path objects so that they can be transformed more easily and change their properties as a single object.

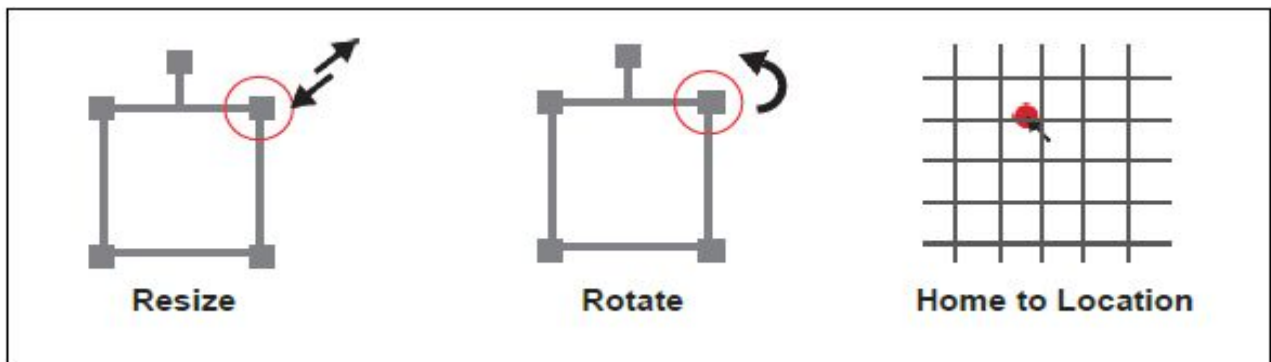
Split Paths (Shift+Ctrl+J): Split a compound path into its original separate paths. Simplify Path (Ctrl+Alt+S) Simplifies (and smooth) a path to varying degrees of tolerance. The user can create a freehand line or compound curve with the resulting curve has some sharp turns and jagged edges but by simplifying it with a tolerance (start with 20%). The resulting path has fewer vertices and smoother turns

Connect Path Lines: Connect the ends of 2 or more paths. The user vectorizes an image containing text but there are time when the low quality of the image causes some of the text characters to have breaks in their paths. The user can select the “Connect Paths Lines” feature to re-connect the paths.

Break Curve: Break apart a path at a specified node. The user creates a path but would like to separate it and add space at certain vertices to add another artistic element in between. Or maybe to specify different engraving parameters for different parts of the path. To do so, the user selects a node and chooses “Break Curve”. The path is separated into two separate paths.

Reverse Order: Reverse the order of nodes in a path. When the user creates several paths and uses the “Connect Paths Lines” feature, they are connected but not at the desired ends. This is because the paths are connected from the last node of one path to the first node of the next. Undo the previous action and choose “Reverse”.

Mouse Controls



1. **Drag ‘n Drop:** Click and hold a design file and then drag it into the workspace. You will be invited to “Drop anywhere!”. Once uploaded, click and hold the left mouse button and drag the mouse to move the object in the workspace.
2. **Resize / Rotate:** Clicking on the object with your mouse will highlight the adjusters for size and orientation. Use the mouse to manipulate the object’s size by expanding or constricting the square adjusters or turning the rotation node to rotate the object.
3. **Left Click to Rotate:** Hold the Alt button on your keyboard, then left click and hold your mouse over the rotation node. By moving the mouse, you can rotate the object from the opposing node.
4. **Left Click to Resize:** Hold the Alt button on your keyboard, then left click and hold your mouse over one of the four corner “resizing” nodes. By moving the mouse, you can resize the object from the center rather than the corner.
5. **Home to Location:** Instantly home the laser to any location in the work bed by simultaneously holding the Ctrl key and left-clicking the mouse.

Marking Applications

One should keep in mind that every material will react differently based on the settings used. Materials can have different grades or alloys will affect the engraving process. It is up to the user to determine their application and the best process for their needs. Many factors are involved when using the Galvo laser, such as speed, power, frequency, lens size, the power source (20W or 50W), focus and material grade. This is a very generic list to give you, the user, an idea of just some of the many marks possible with your machine.

<u>Type of Mark</u>	<u>Methodology/Process</u>
Deep engrave	High power, low speed, multiple passes
Surface Mark	Medium power/Medium Speed
Thin Cutting	Use wobble feature, high power, low speed
Plastic Marking/Discoloration	Very Low Power, High speed,
Anneal marking	Medium power, out of focus, low speed

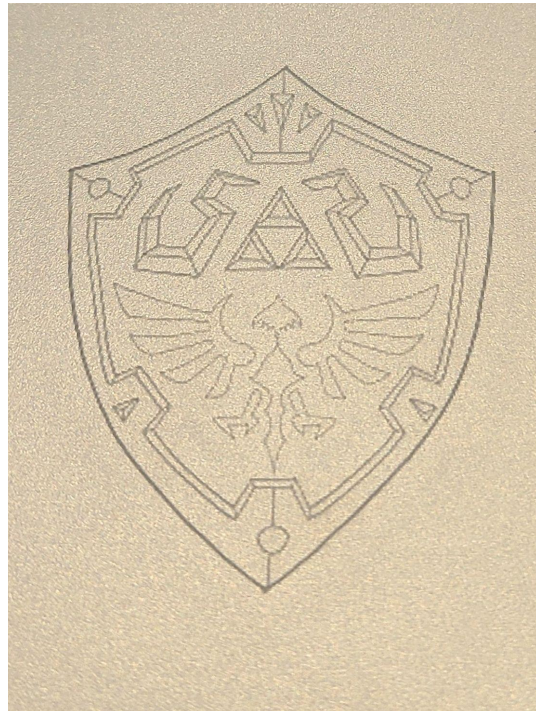
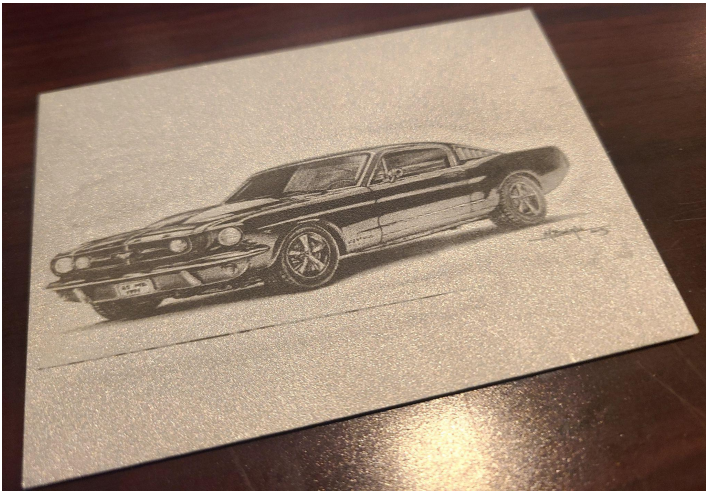
Troubleshooting

A large amount of problems customers face centers around laser focusing. These lasers must be within 2 millimeters focus to function properly. Being outside of focus will yield no mark at all. Before calling tech support, please verify that you are in focus using the black card provided. (Refer to Focusing section.)

<u>Problem</u>	<u>Potential solutions</u>
My laser won't mark my material	<ul style="list-style-type: none"> - Verify that your laser is in focus using a focus test and larger step size (2mm instead of 1mm) - Verify the material you are working with is receptive of 1064nm wavelength
I can't get the mark I want	<ul style="list-style-type: none"> - Try multiple settings, adjusting one setting at a time between tests - Determine if the mark is even possible for our material
I can't get depth on my engravings	<ul style="list-style-type: none"> - Maximize power: A 50W will always be faster and stronger when it comes to engraving compared to a 20W - Use a smaller lens (160>420) - Run max power, low speed, multiple passes - VERIFY FOCUS
I cant get my laser to focus	<ul style="list-style-type: none"> - Follow the focus guide in the "Work Flow" section of this manual
My mark adjustment square is wobbly	<ul style="list-style-type: none"> - Recalibrate your camera with a perfectly flat, level surface with smooth white sheets of paper. <ul style="list-style-type: none"> - Wrinkles, bumps and non-flat surfaces will yield improper galvo calibration
My mark fades on one or multiple sides	<ul style="list-style-type: none"> - Your work surface or material is not flat and level to the laser head. Level your material and laser head.

Samples

With your new laser engraver, the sky's the limit. All you need to worry about is your own imagination. In order to help spark it we picked some projects others made to help show you the potential of your Galvo.



Appendix A. Warranty

Full Spectrum Laser will replace or repair any defective parts free of charge within the first 30 days. Ground shipping is free with overnight shipping available at extra charge.

Full Spectrum Laser will replace or repair any defective part within the warranty period free of charge but shipping charges are the responsibility of the customer. Warranty includes parts and labor only. Shipping of defective and replacement components is excluded.

The customer may arrange their own shipping. Parts can be dropped off at our warehouse free of charge.

All defective parts must be returned to Full Spectrum Laser for evaluation before replacements are issued, unless otherwise authorized. The warranty is valid for normal use only and excludes uses not stated in manual. Parts damaged by fires are considered user error if the machine is left unattended. Always stand next to the machine with a fire extinguisher and be ready to turn it off in case of an emergency. Never operate the machine unattended.

Products sold before 8/7/2012, had a 60-day base warranty on all items excluding shipping unless an extended warranty was purchased.

Our lasers have a 60-day full warranty and include a 1-year extended warranty. The 1-year extended warranty excludes shipping and consumable items. All electronic items (control cards, power supplies, motors) and most mechanical items are covered under the extended warranty unless damaged by abuse/fires. Consumables not covered include, but are not limited to, rubber parts (such as tubing, belts, plastic wheels, lenses, mirrors, other optics, and laser tubes).

The original purchaser may transfer the balance of the warranty to anyone free of charge provided we are notified in writing within 30 days. After 30 days, we will only provide warranty and tech support services to the original purchaser unless a warranty transfer fee.

Warranty will remain valid if product is sold. However, the buyer must request RMAs and repairs from the original purchaser unless a warranty transfer fee is paid.

NOTE: Full Spectrum Laser DOES NOT offer warranties or customer support for 3rd Party parts, including replacement laser tubes, as it may not be compatible with Full Spectrum Laser machines and can cause damage to your laser system.

Visit <https://fslaser.com/terms> for most current warranty postings.

Customer Support

Full Spectrum Laser provides the best customer support in the industry. Contact us if you have any questions or issues with your Muse Galvo. We offer convenient accessory upgrades and replacement parts for a number of consumable items. Refer to this sheet for all your customer support and reordering needs

PLEASE CONTACT OUR TEAM:



SUPPORT

M-F 8am to 5pm (PMT)
support@fslaser.com
702.802.3103



MANUALS

For a PDF of the user manual, warranty & video tutorials:
fslaser.com/support



SALES

M-F 8am to 5pm (PMT)
sales@fslaser.com
702.802.3101



SOFTWARE

Access RetinaEngrave v3.0 by typing IP address displayed on the touch screen into your browser

ORDER ACCESSORIES & UPGRADES

LASER TUBES

45W Laser Tube

FOCUS LENSES

1.5" Lens, 2" Lens, 2.5" Lens, 5" Lens

EXTRACTORS & FILTERS

Large Fume Extractor
Large Filter Replacements

Small Fume Extractor
Small Filter Replacements

AIR ASSIST

Air Compressor, Exhaust Fan, Large Exhaust Fan

COOLBOX

Combines water assist, air assist & exhaust into one system

ROTARY ATTACHMENTS

Friction Rotary

WATER ASSIST

Water Chiller, Advanced Water Chiller

Join the Full Spectrum Laser Community

Full Spectrum Laser invites you to join our community of hobby makers and professional manufacturers through our social media channels (Facebook, Instagram, Twitter, YouTube). We love being part of the hobby maker culture and the industry we work in. You can follow us to see what is new at FSL, and learn about the latest updates, projects, and more. Best of all, we offer countless FREE projects for you to make on your new laser. Join our community and see what all the excitement is about.



www.facebook.com/fslaser
<https://www.instagram.com/fullspectrumlaser>
<https://twitter.com/FullSpecLaser>
<https://www.youtube.com/user/FullSpectrumLasers>

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LASER