RETINA ENGRAVE 4

RetinaEngrave4.0

QuickStart Guide

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Section I. Materials

Fiber / MOPA Lasers:

Safe Materials:

Material	Raster	Vector
Aluminum	√	√
Nickel	√	√
Copper	√	√
Titanum	√	√
Leather	√	√
Rubber	√	√
Stone	√	√

Ultra-Violet Lasers:

Safe Materials:

Material	Raster	Vector
Aluminum	√	√
Nickel	√	√
Copper	√	√
Titanum	√	√
Leather	√	√
Rubber	√	√
Stone	√	√
Wood	√	√

Section II. Operations

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

Vector Cutting	Raster Engraving
Vectors use mathematical formulas to create paths that form a shape.	Rasters are make of white and colored pixels. The colored pixels are what is engraved.
Used for creating signs & logos	Used for creating surface marking & engravings
Vectors are found in PDF, SVG,DXF, and AI files.	Rasters are found in JPEG, PNG, BMO, and TIF files
PDF is preferred.	JPEG is preferred.

Re4 is compatible with: AI, BMP, PNG, PDF, JPG, TIF, DXF, SVG, and Re4 files. When importing images the resolution for the preview image will be at 100 dpi but the resolution of the actual image will be 500 dpi.

The file type of an image can be viewed by opening it or by looking at the properties/details section.

Creating a Design

You may decide that instead of just importing a picture you want to make one. When creating a design in design software, we recommend using a software you are familiar with. Re4 can work with a variety of file types but we recommend saving your files as a pdf, svg , or jpeg. PDF and SVG files contain both raster and vector data, making them the most suitable for both engraving and cutting. Jped is the most suitable for rastering.

Beside the file types there are two things to keep in mind when designing:

1. Line thickness- When designing an image for Re4, the lines in the drawing should be a decent thickness. If the lines are too thin, then Re4 will have trouble reading them.

2. Coloring- When importing an image it is important to keep in mind the lasers function in two ways: on and off. The laser will fire when it reads a shaded image and stop when it doesn’t. For that reason, when an image is imported it is converted into a grayscale image. This also means that any colors chosen will vanish. To compensate, you can make the image monochrome or cut out their designs on aspect at a time to get the whole object.

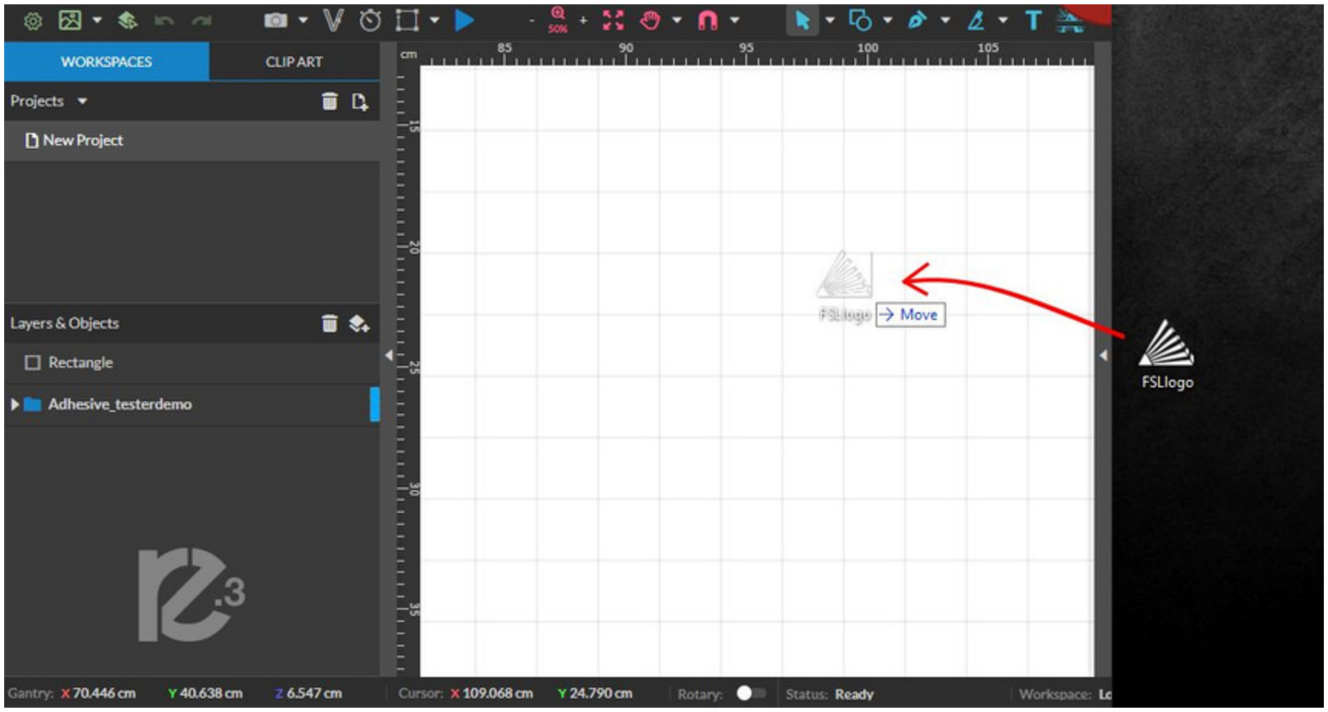
3. File Size- Files larger than 10MB may slow down the machine. Vector files are typically harder to run than rasters.

Section II. Operations

Mouse Controls:

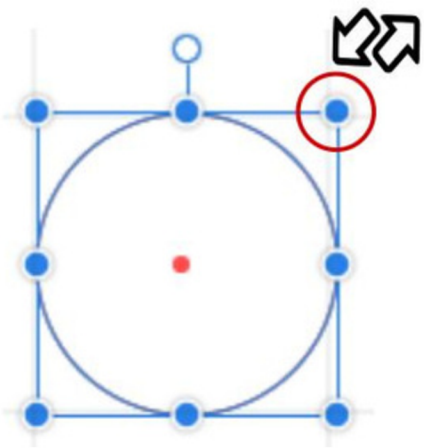
1. **Drag ‘n Drop:** Click and hold a design file, it will become highlighted letting you know it can then be dragged. Drag it into the workspace and a “move” prompt will appear below the object showing it can be dropped into the workspace. Release the file and it will be imported into Re4. Once uploaded, you can freely move the design within the workspace.

Importing Images:

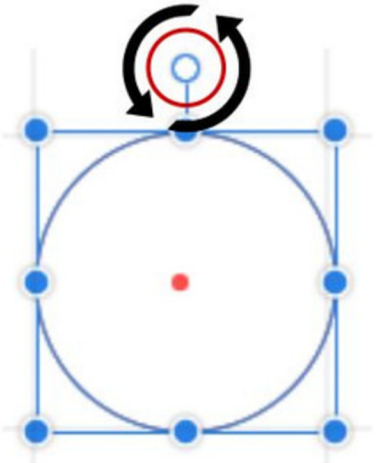


2. **Resize / Rotate:** Clicking on the object with your mouse will highlight the border in blue. The adjusters for size and orientation will become visible We can use the mouse to manipulate the object’s size by expanding or constricting the square adjusters on each edge (see Resize) or rotate the object using the rotation node usually located above the object (see Rotate).

Resize



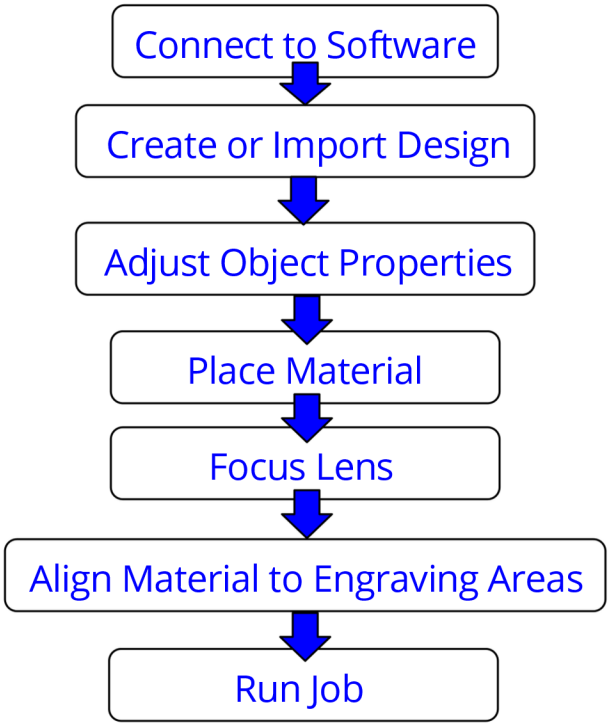
Rotate



Section III. Retina Engrave v4-Starting Off

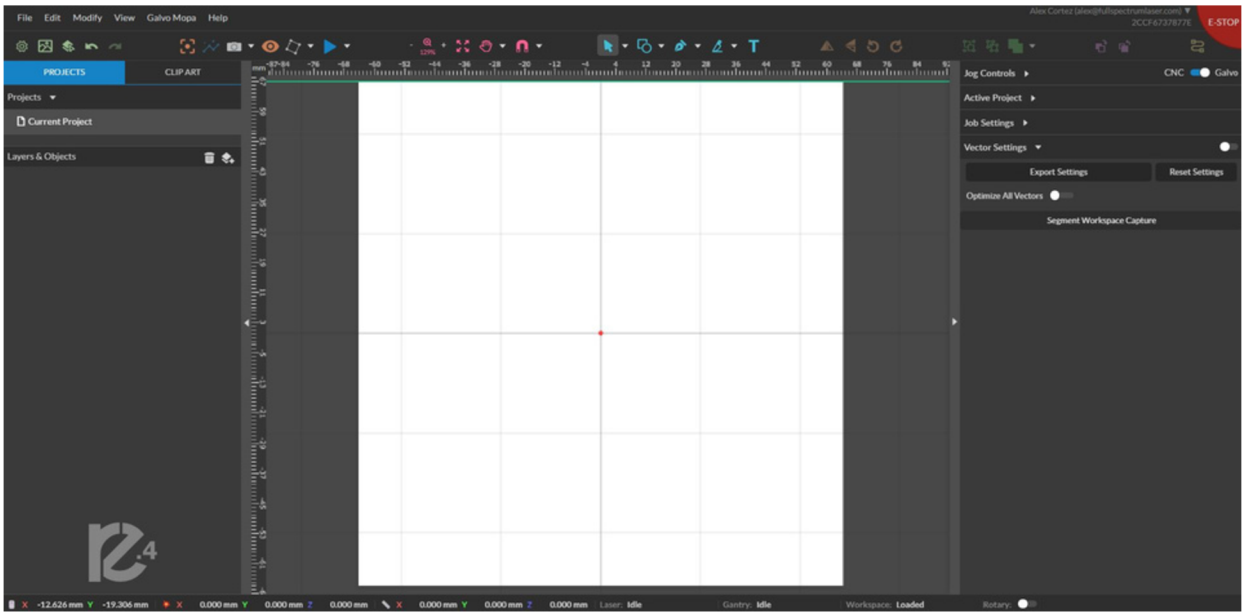
Starting on Re4

Using your new machine for the first time can seem intimidating but we've worked to make this guide as clear as possible regarding our software. We have broken down the entire process into 7 steps.



Before starting your project, make sure that the all your accessories are properly connected and functional.

1. **Entering Re4.**
   Enter Re4 if you have not already done so. Below is a picture of how Re4 should look once loaded. You can visit re4.fslaser.com and proceed to connect your to your machine.



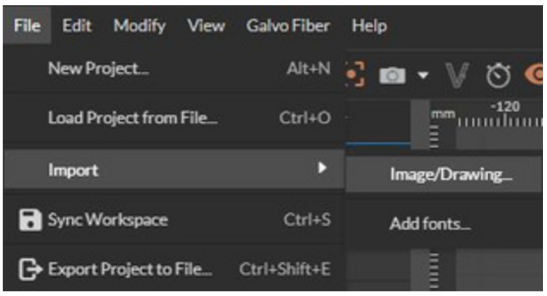
Section III. Retina Engrave v4-Starting Off

2. **Import Design**

Select the file you wish to engrave via your editing software or an image saved on your computer.

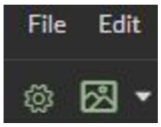
It can be place into Re4 using three methods:

-It can be imported by going to the File->Import->Image



-It can be "dragged" into your Re4 workspace using your mouse (Drag 'n Drop).

-It can be placed using the photo icon.



The Arrow next to the photo icon is for selecting the properties you wish to import. If you wish to be asked when importing the image, then do not save any setting.

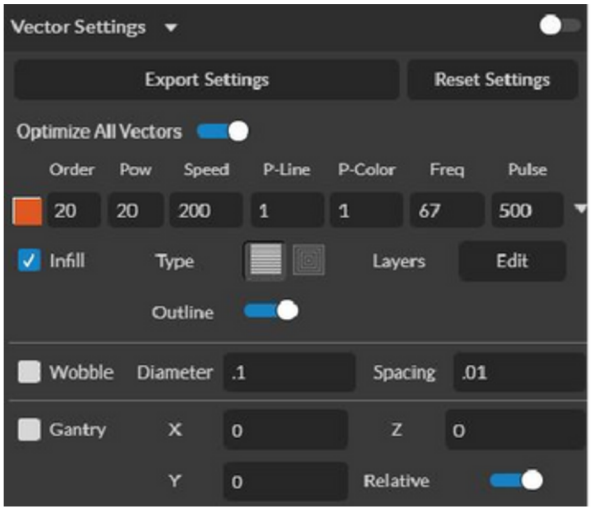
3. Adjust Object Properties

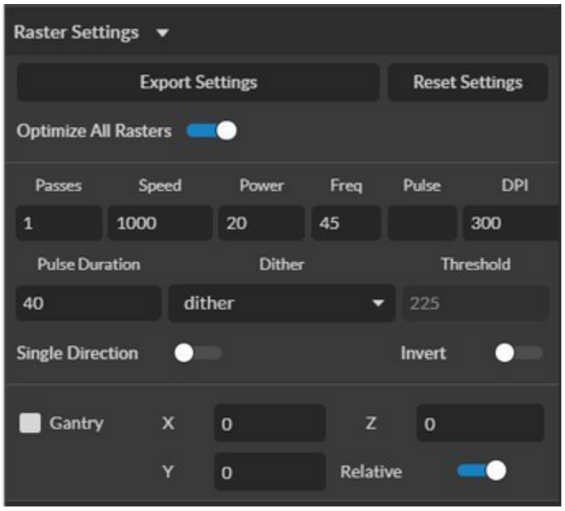
Modify the image in Re4 using the right toolbar. The main things you'll be adjusting are the size, power, and speed.

The size can be adjusted individually by using the Width/Height bars or together by selecting the white oval. When the white oval is on (see left), then the width and height will change proportional to each other.

Section III. Retina Engrave v4-Starting Off

Fiber and UV Settings:





The Power of the machine will depend on the wattage chosen. The power setting is set in terms of percentage with 100% being full power. If you purchases a laser of 50W (MOPA)/10W (UV) or higher we recommend performing your first engraving below 50% and then adjusting based on results.

Speed ranges from 10 to 1200 while passes range from 1 to 999. The machine can run multiple passes however it is important to keep in mind that adding more passes increases the project run time and may heat up the material.

The machine's frequency should be adjusted by minor increments as a result. Frequency is the rate at with the laser pulses. It essentially how much energy is let. Subsequently frequency will control how hot the material will get.

4. Place Material

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.

5. Focus Lens

Your machine will have its own focusing method. Some auto focus before each project. Other require focusing beforehand and some may comes with an autofocus feature in Re4 and on the touchscreen.

Refer to your manual for your focusing method.

NOTE: The focus distance number set in the Re4 interface is machine relative. It signifies the distance away from home needed to engrave.

Section III. Retina Engrave v4-Starting Off

6. Align your design with your material.

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

You can the camera capture option that can help for better alignment of your design. You should still make sure to check the engraving perimeter before running your project.

Once adjusted to ensure your design is engraved in the desired area, you should make sure the material does not move from the workspace. This can be done by weight down the material using an object that will not interfere with the engraving, such as jig, fixture, putty, or tape.

7. Once the picture is aligned, close the Lid

8. Run job.

You can start the job by selecting the play button.

While the job is running you should not look directly at the engraving process unless you have safety glasses. Instead, the project can be viewed from the Video Feed or Touchscreen.

Once the marking is complete, do not move the part until you are sure that it has the desired look, as re-aligning becomes significantly difficult.

Once completed, wipe your part clean of any dust or residue resulting from the engraving process

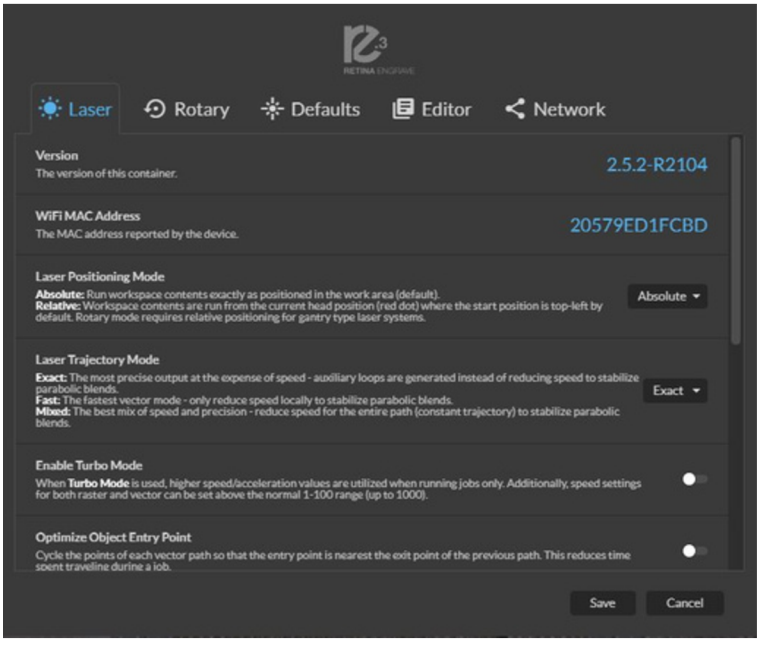
Congratulations!! You have made your first engraving on Re4. It's an exciting process to engrave material to your liking. Sometimes a little trial and error is needed to see what designs go well in what ways. The following pages will provide more information on how to use Re4 for more detailed and precise engravings.

Settings:

In this section, you will be introduced to the major interface features of RetinaEngrave v4.0.

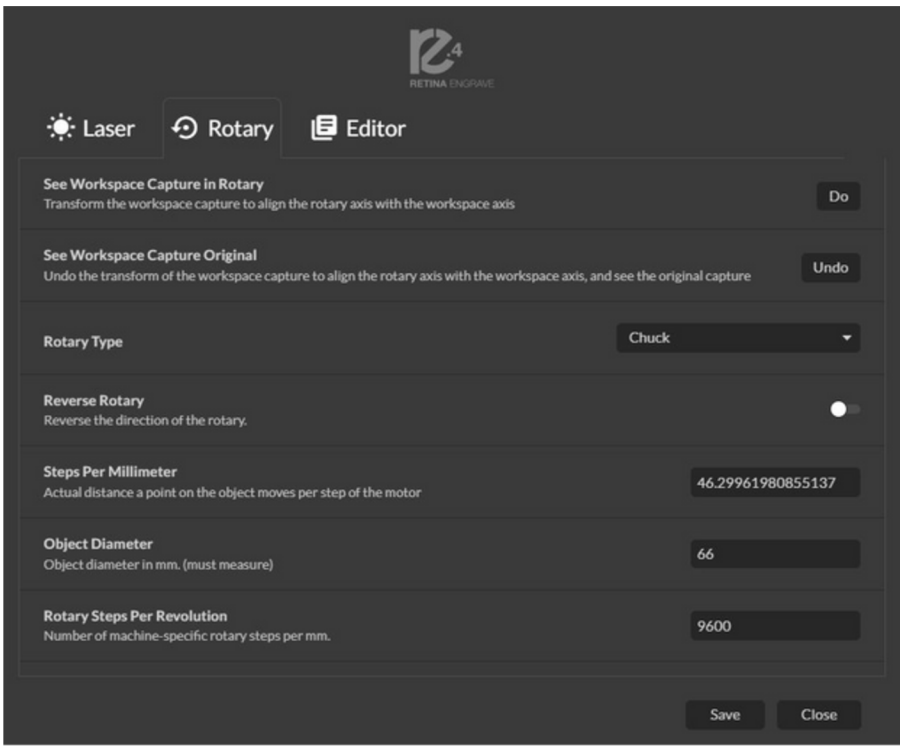
Laser:

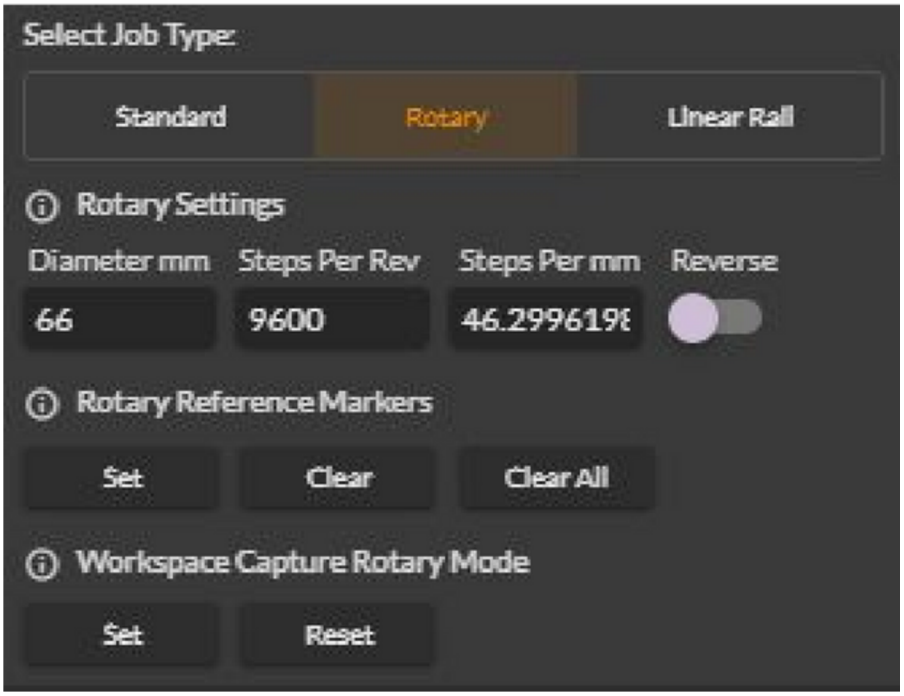
Information regarding your machine. Here you can set the laser positioning mode, change your lens type, set starting delays and factory reset your machine.



Section III. Retina Engrave v4-Settings

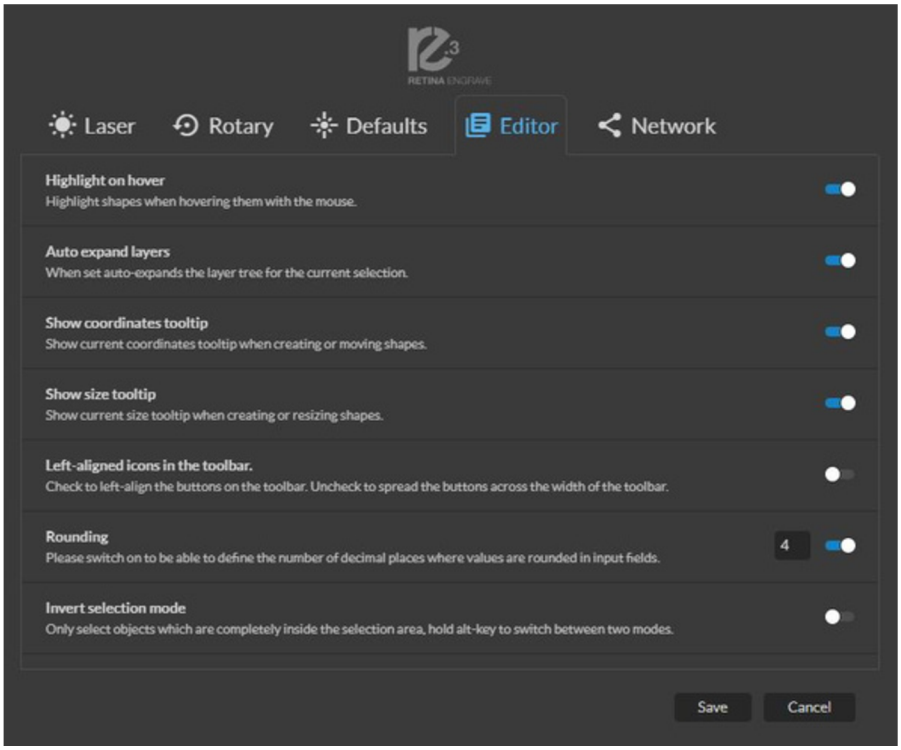
Rotary:
Usable only if a rotary accessory has been purchased. When using a rotary accessory rotary mode must be on and set to the appropriate rotary type.



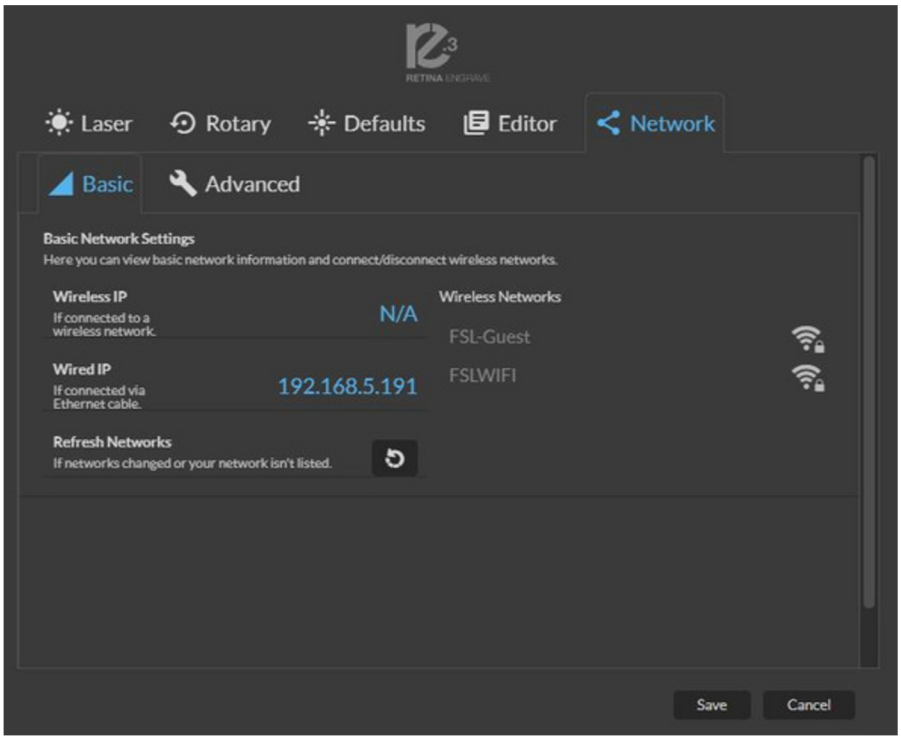


Section III. Retina Engrave v4-Settings

Editor:
Allows the user to adjust display settings.



Network:
Contains all Ethernet, Wi-Fi, and DNS setting.



Section III. Retina Engrave v4-Key Functions

Key Functions:

In this section, you will be introduced to the features available in RetinaEngrave v4.0. A majority of these functions can be accessed by keyboard inputs and by other means but can come in handy in certain situations.

Main Menu

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 (Ctrt+A)	Deselect 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)

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.

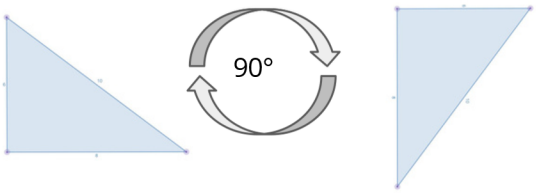
Distribute Horizontally: Evenly arrange selected objects horizontally.

Distribute Vertically: Evenly arrange selected objects vertically.

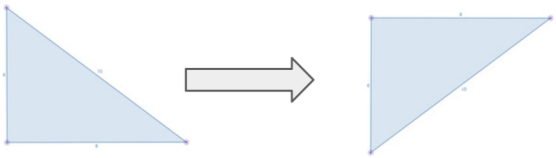
Section III. Retina Engrave v4-Key Functions

Object Adjustment

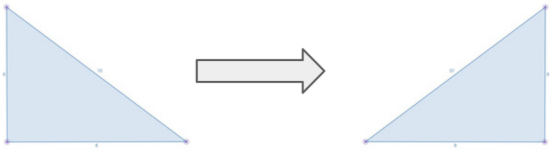
Rotation:



Flip Vertical:



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



Compounding:

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

Section III. Retina Engrave v4-Key Functions

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 confor to path	Vectorize Border Create a border path
Rasterize Convert object to image	Break Curve Separate paths at specific mode	Vectorize Image Create vector paths using an image	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:

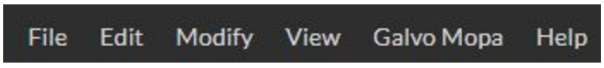
Use Snapping (Shift+F10): Enable or disable the snapping feature.
Snapping can be used to : **Snap Zones ,Snap to Grid**, **Snap to Guide Lines, Snap to Full Pixels,Snap to Anchor Points, Snap to Shapes, and Snap to Pages.**

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”.

Section III. Retina Engrave v4-Re4 Interface

Re4 Interface:

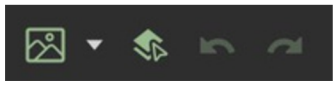


1 2 3 4 5 6

1. **File:** Create new projects,import and export existing projects, import image or drawing, and sync the workspace.
2. **Edit:** Select object, delete or duplicated objects, undo and redo changes, access setting and materials Library.
3. **Modify:** Arrange layers, move and modify images, generate barcodes, and create compound objects and paths
4. **View:** Adjust magnification, canvas settings, and view other display settings
5. **Machine Name:** Use the camera functions, run a job and access the laser calibration page from diagnostics.
6. **Help:** Access the user guide, support, tutorials, and the list of keyboard shortcuts mentioned in the previous section.

Settings

Files:



1 2 3 4

1. **Import Image:** Import image or drawing JPEG, PNG, SVG, PDF.
   ▼ Here you can chose to save the raster or vector properties of imported object. If neither is selected then Re4 will ask each time.
2. **Save:** Save project.
3. **Undo:** Reverse your last action.
4. **Redo:** Reverse your last undo.

Workspace:

1 2 3 4 5

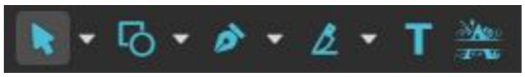
1. Capture Workspace: Takes images of workspace
▼ **Clear Last Workspace Capture:** Clears previous workspace image.
2. Trace Background Image
3. Estimate Job Time: Amount of time the job will take.
4. Show Bounding Perimeter of all Objects: Shows the space the job will occupy.
5. Run Job: Start Engraving

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 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.

Section III. Retina Engrave v4-Re4 Interface



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:

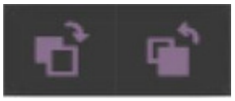
Flip Horizontally: Flip object along horizontal axis.
Flip Vertically: Flip object along vertical axis.
Rotate CCW: Rotates 90 degrees counterclockwise.
Rotate CW: Rotates 90 degrees clockwise.

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.

Section III. Retina Engrave v4- Shapes

Creating and Manipulating Shapes and Objects:

The easiest way to create an object is to select a shape from the tools menu.

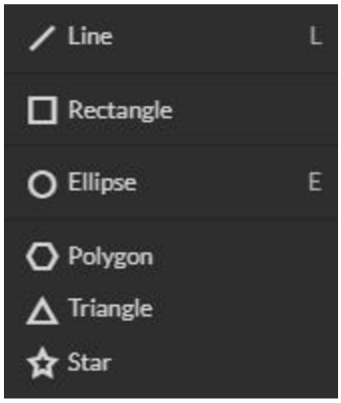
For example, you want to make a circle. Select the circle tool, then click and drag to create a circular shape. By holding shift while dragging, you can constrain the proportions so that the circle is perfectly round. The “Square” icon gives access the shape library.

Creating Shapes

1. Select the Square Icon.

2. 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.

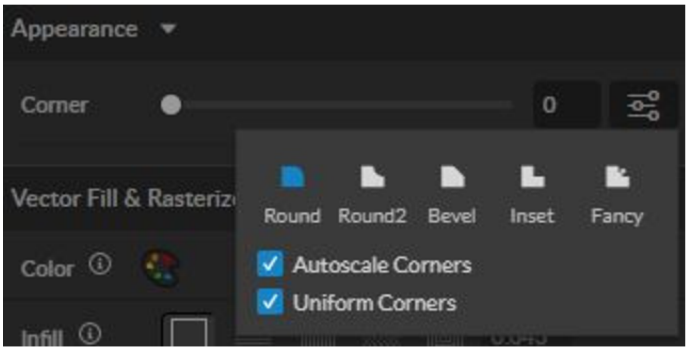
3. The basic shape library includes line, rectangle, ellipse, polygon, triangle, and star. You can modify any shape by clicking on it and then adjusting the interface data appearing on the right side of the screen. Each shape will have slightly different options as follows:



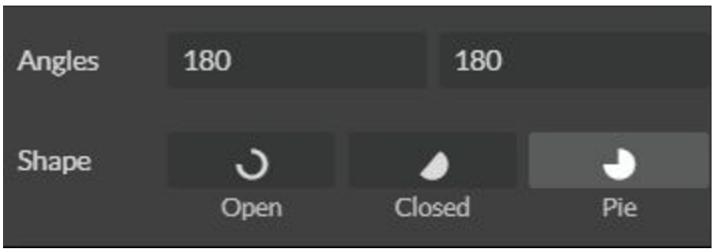
Shapes:

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.



Section III. Retina Engrave v4- Shapes



Ellipse (E)

Angles: Input custom angles.
Shape:

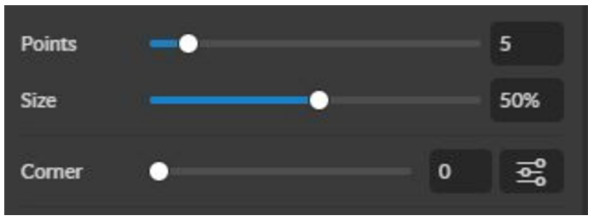
Open: Click for open ellipse.
Closed: Click for closed ellipse.
Pie: Click for pie shaped ellipse.

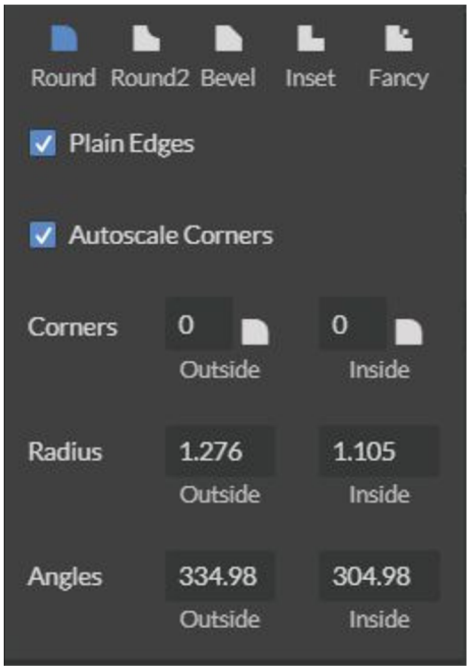
Triangle & Polygon

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:

Accessed by selecting the following icon from the shape options

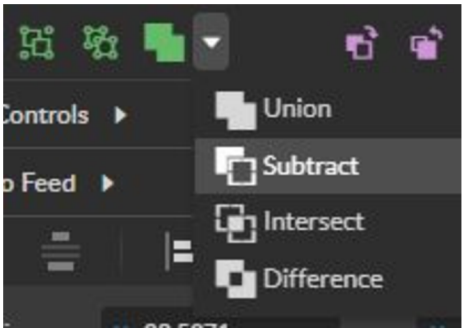
Round: Create rounded corners.
Round2: Create inverted rounded corners.
Bevel: Create beveled corners.
Inset: Create inset corners.
Fancy: Create fancy corners

Plain Edges: Toggle plain edges on and off.
Autoscale Corners: Toggle autoscale corners.
Uniform Corners: Set all corners to have the same parameters.

Corners: Input outside and inside corner curvature.
Radius: Input outside and inside corner radius.
Angles: Input outside and inside corner angles.

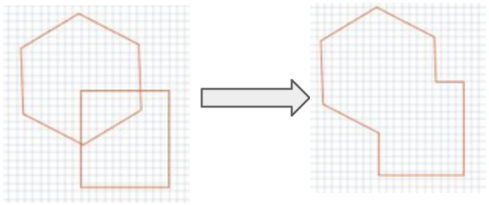
Section III. Retina Engrave v4- Compounds

Creating and Manipulating Compound Shapes & Objects

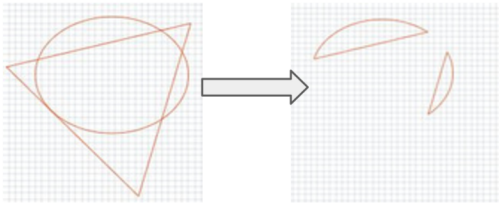


These function are available in the Grouping section of the toolbar (see above). Compound Shapes & Objects Operators can combine and modify shapes and objects to create unique compound shapes and objects with these functions:

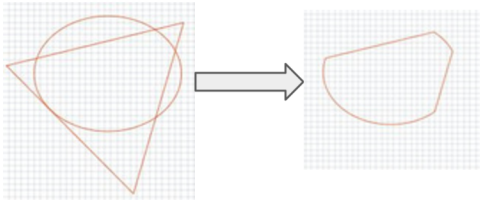
Union:



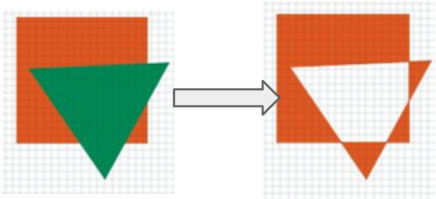
Subtract:



Intersection:



Difference:



Split Selection (Shift+Ctrl+G):

Split up a previously created compound shape or object that has been combined 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.

Create Nested Compound:

Here you can combine multiple compound shapes into a single compound shape. All of the selected compound shapes will be nested within the compound shape that was selected last.

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.

Section III. Retina Engrave v4- Paths

Creating & Converting Vector Paths

A vector path is the path the laser will move 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.

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. If the image is of low quality, then it will 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. To do so, the user selects a node and chooses “Break Curve”. The path is separated into two separate paths.
It’s used if 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 to specify different engraving parameters for different parts of the path.

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. The previous action can be undone and can choose “Reverse”.

Section III. Retina Engrave v4- Sidebars

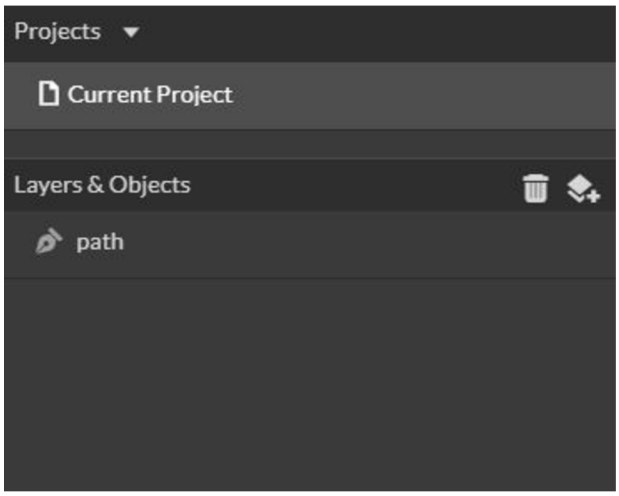
Left Sidebar:

Projects Menu

Your custom workspace that can be moved from machine to machine.

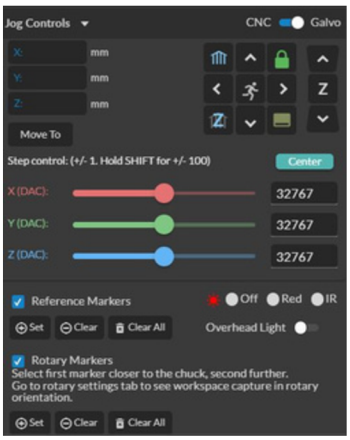
Layers & Objects Menu

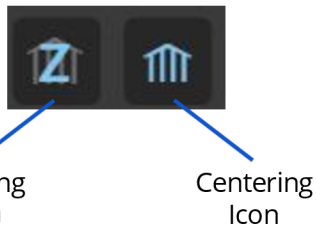
Here layers can be created, deleted,moved, locked in place or turned invisible. You can also see the type of object it is based on the icon shown.



Right Sidebar:

Fiber And UV Jog Controls





The coaxial camera(LiuVision), Laser Head, Z-Stage(Galvos), Linear rail, Open and close lid, and Rotary can be moved from here. Additionally the overhead light can be toggled here as well.

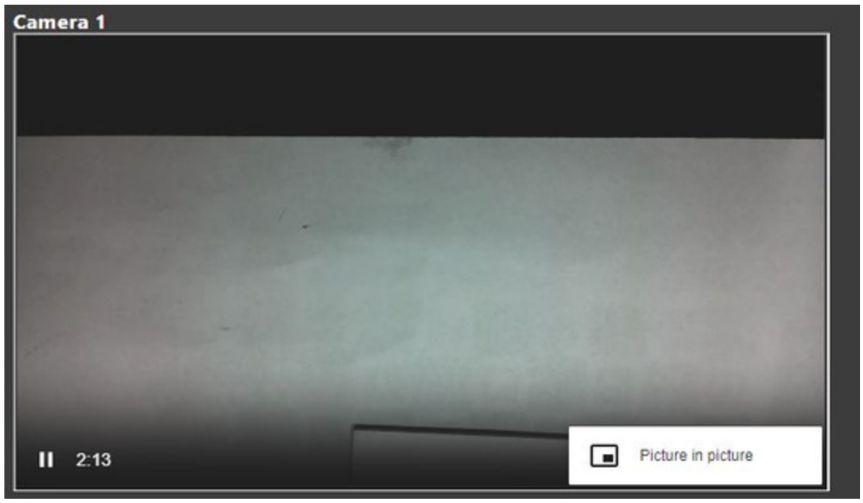
Reference markers can be used to mark the center of a cylindrical object during rotary mode while also centering your image in your workspace if your rotary is rotated. Once your reference markers are placed make sure to go to the 'rotary settings' page for an updated image.

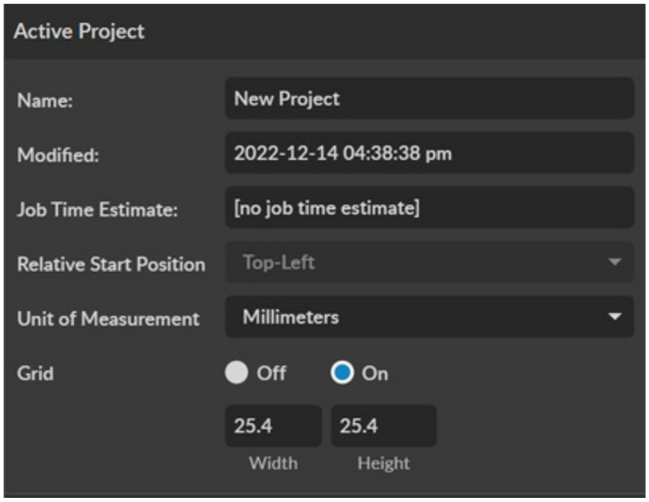
Section III. Retina Engrave v4- Sidebars

Video Feed

If your machine comes with a camera, then you can see a live view of your work area in the local page. The window can be set to window-to-window mode extending the video feed outside of the local page. (IP)

Galvo and MOPA lasers can read the April Tag on your focusing card when present in the workspace (as shown). These machines also come with the 3D Viewer.



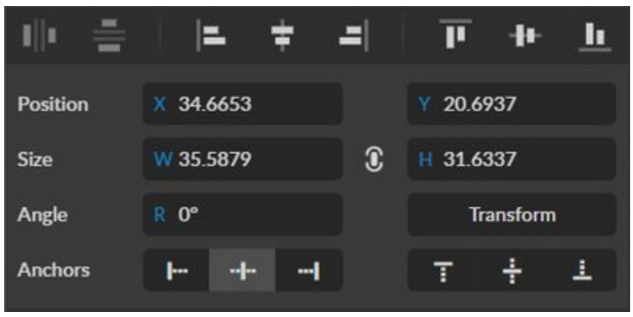


Project Info:

This window displays information regarding the active project. The projects information can be edited here.

Image Properties

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



Section III. Re4- Object Properties

Vector Properties

Appearance/Vector Fill & Rasterize (G)

These tab only appear when a vector object is place in workspace.

Appearance gives details on the vector image.

Vector Fill is for adjusting the layer angle, spacing, and toggles single direction

Wobble Diameter Reduction Decreases the Diameter of wobble line by a set distance based on your units

Settle delay sets the time the laser settles after a line segment

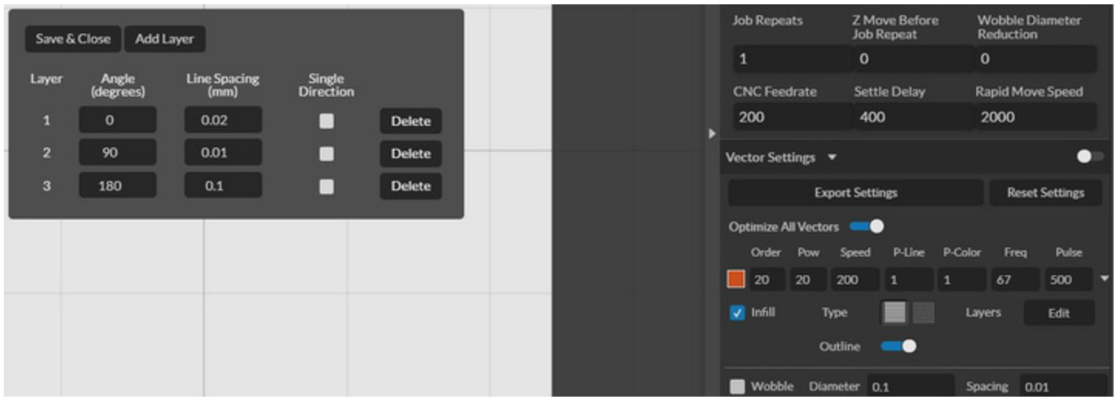
Job Repeats Will repeat every set of pass per line,pass per color passes, layer, and rasters that is visible in the workspace

P-Line allows for an increase of passes per vector line, a vector line is a segment from two nodes

P-Color allows for an increase of passes per color

Z Move Before Job Repeat will + increase or - Decrease your Z stage by a specific distance before a job sequence begins

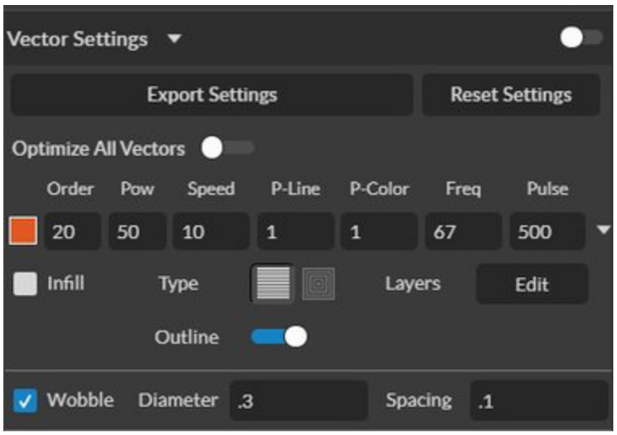
Wobble Diameter Reduction Decreases the Diameter of wobble line by a set distance based on your units



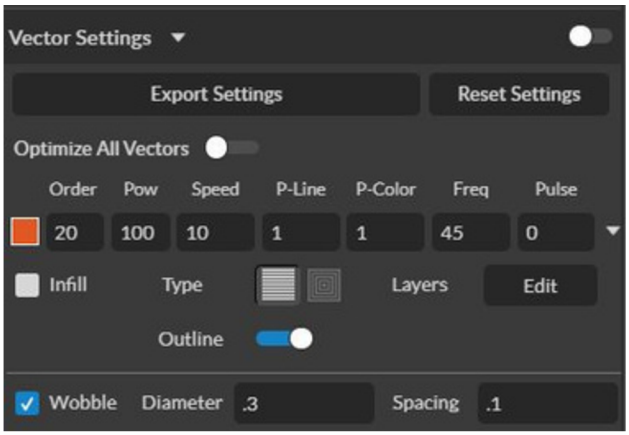
Vector Engraving Parameters

Note: Cutting is done using vector lines!.
The parameters used for cutting lines. For general MOPA and UV use

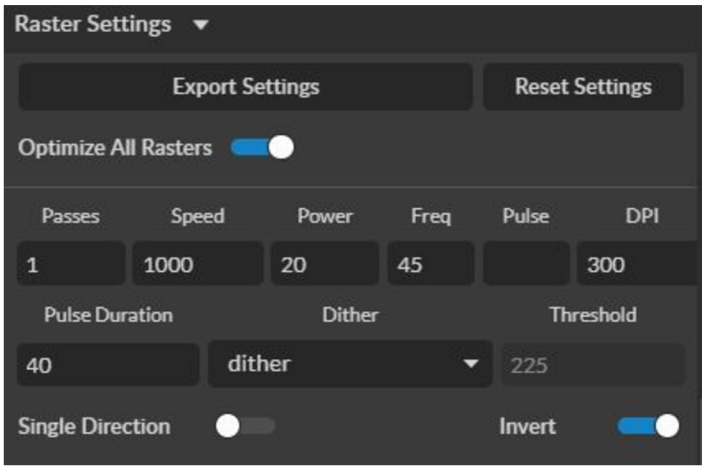
MOPA



UV



Section III. Re4- Object Properties



Raster Properties

Properties that will be used for engraving.
Invert- Reverses images grayscale.

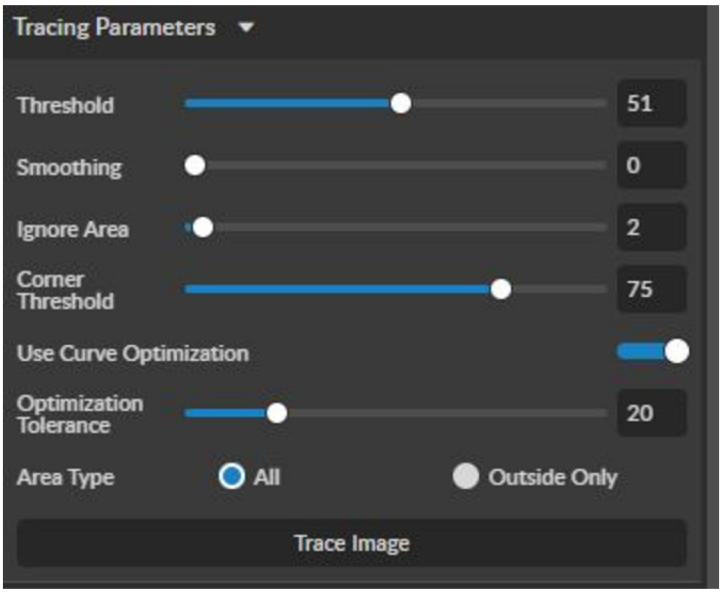
Black to white, White to black
DPI-Resolution
Passes- the amount of times the images is engraved
Power- Lasers power in percent
Speed- how fast the laser engraves in mm/sec
Frequency- the rate at which the power is distributed
Pulse Duration time(ms) that the pulse duration will last
BEST BETWEEN (40-120)

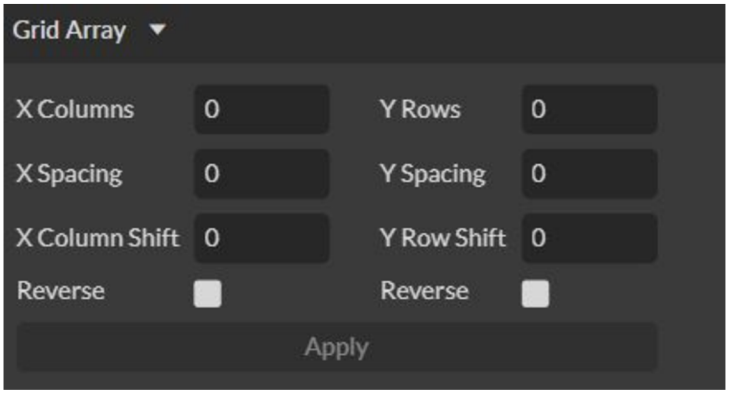
Tracing Parameters

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.

Section III. Re4- Object Properties

Passes

Passes are typically used for different things in rastered material, than in vectored.

Vector Passes

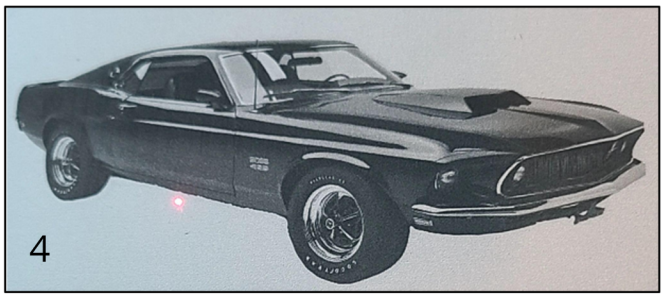
In vectors, multiple passes are done to cut through thicker material. Sometimes, such as when cutting wood, a single cut is not enough therefore we can program multiple passes to ensure we cut through our material.

Note: Certain material will need more passes than others and may result in some charring around the edges.

Raster Passes

In rastered images passes are done to add more depth into a picture. Multiple passes are mainly done to add more details to you design.

Below will be an image done on a Fiber Galvo to show the difference multiple passes will have on an image.



The Final Pass (pass 4) is far more detailed than the first pass. The final product looks much closer to the original than the other one. However, one should keep in mind that the more passes you add, then the longer it will take the job to be completed. This job has 4 passes programmed, therefore the time was 4 time longer than doing 1 pass .

Note: Different materials may not need to perform multiple passes. It depends on user preference if an image should be engraved multiple times or not.

Creating and Manipulating Text

Select the “Text” icon.
Chose a location for the text before selecting it on the workspace.

A text window, like the one below, will appear. The blue highlighting indicating that it can be edited.

Write your text. It can then be customized by selecting the text and adjusting the options for the positioning, size and font.

Section III. Retina Engrave v4- Text Functions

1 2 3 4 5 6 7 8

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

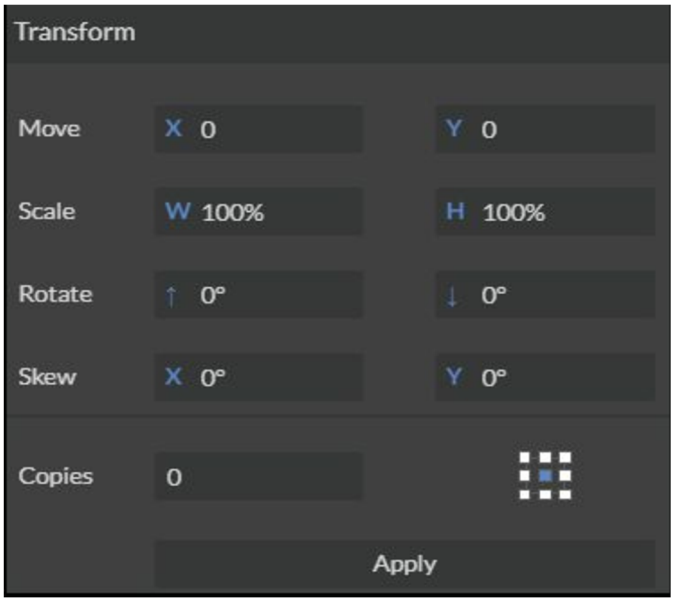
Text Positioning Coordinates

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.

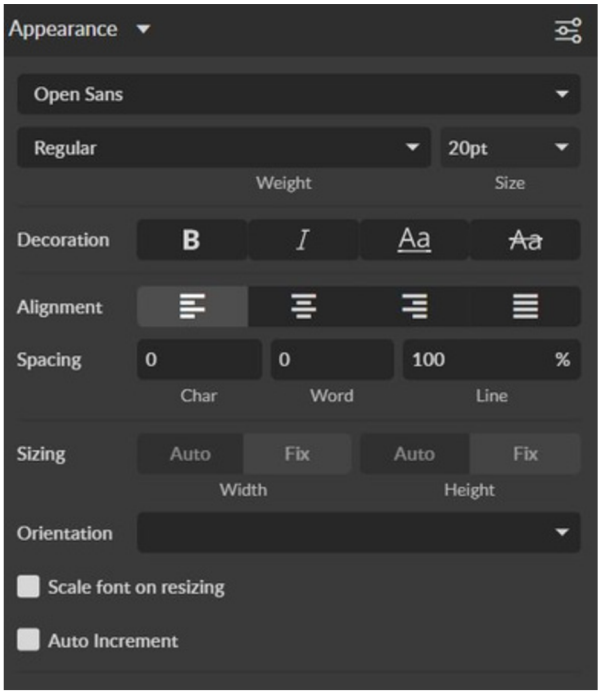


Move: Set X/Y coordinates.
Scale: Manipulate the scale of text, separately, in width and height.
Rotate: Rotate text a set number of degrees, up or down.
Skew: Skew the angle of text by a set number of degrees on the X and Y axis.
Copies: Create duplicates of the selected text.
Apply: Click to apply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

Section III. Retina Engrave v4- Text Functions

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 nods to change size.



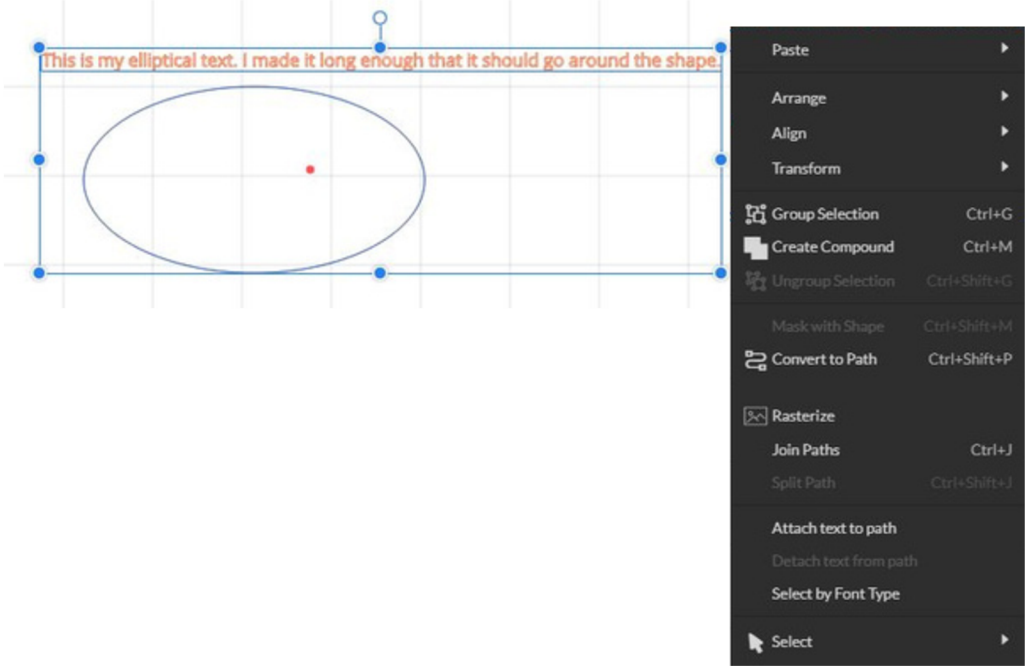
Text Path Options:

There are many different path options available to make your designs stand out from the others. Here we will go over the many different ways that paths can be made and changed.

Attach Text to Path:

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

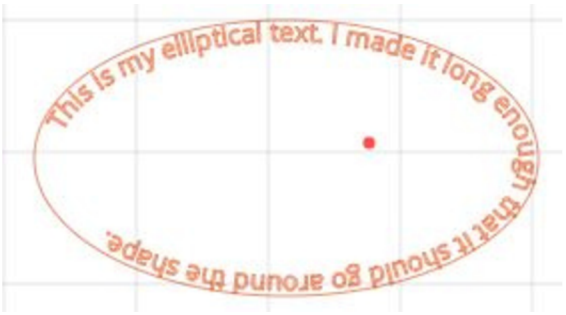
For example, if the user creates an ellipse and a text element separately they can select both objects, right click and select Attach Text to Path. The text will merged with the ellipse and conforms to the contour of the shape. The user can then drag the text element to the desired position, using the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

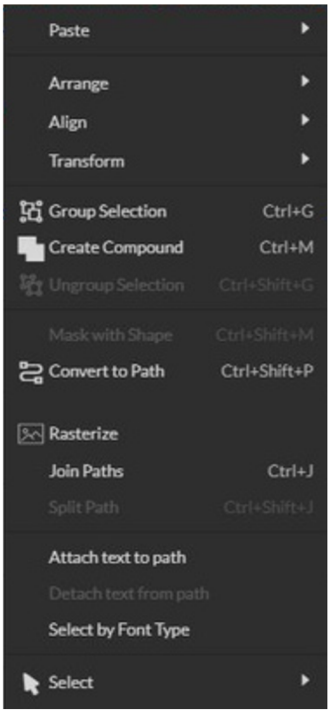


Section III. Retina Engrave v4- Text Functions

Detach Text from Path:

If you decide you don't want the text you can reverses it. Select the object and text again, right click and click Detach Text from Path option 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.

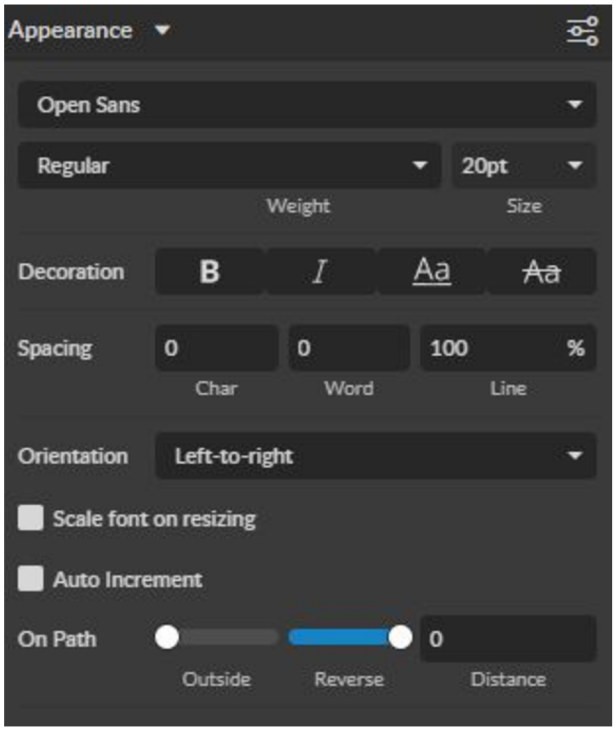
Convert to Raw Path:

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.

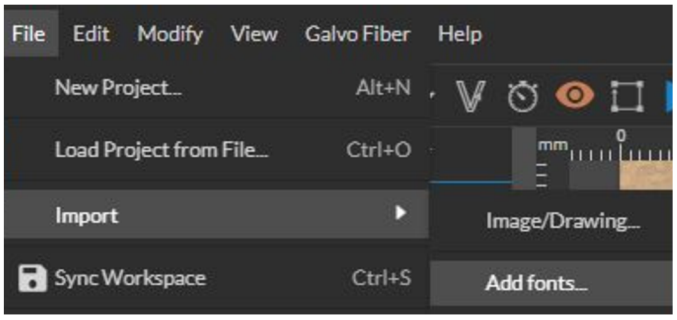
Section III. Retina Engrave v4- Text Functions

Path Orientation:
If you have text that within your image and want to make sure they are facing a certain way Select the text, go to the appearance tab and edit the orientation.



On Path:
If your text is attached to a path like on the ellipse from before, then the text can be adjusted using the On Path tabs. Outside will move the object to the inner or outer perimeter while reverse will have the object face up or face down.

Importing New Fonts:
New fonts can be imported to Re4 easily. Simply have the font style downloaded, then go to the file section and select Import -> Add fonts



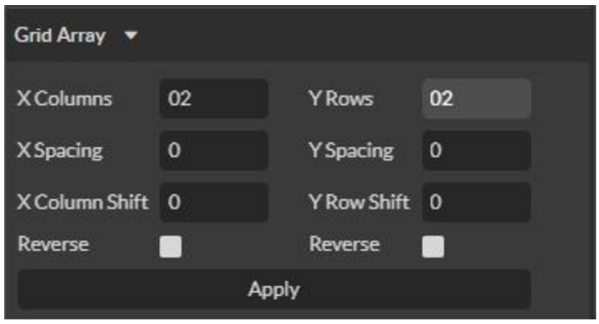
Section III. Retina Engrave v4- Grid Array

Grid Arrays are convenient for individuals that use their machines to make an item multiple times on a single material, such as for a business. This section will show how Re4's grid Array works.

Using Grid Array:

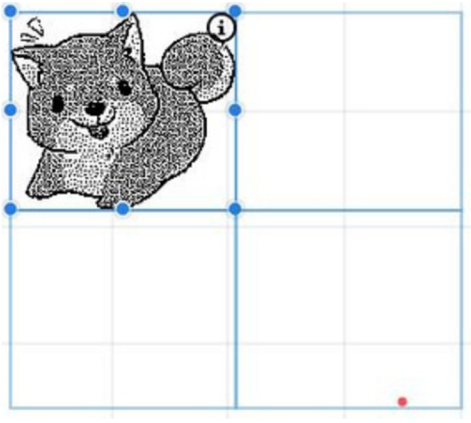
To use grid array first import the object you want to use.

Select the object and go to the Grid Array section.

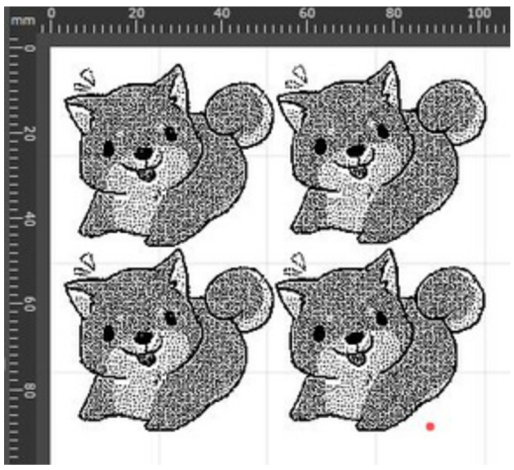


From there choose the grid settings.
The X columns controls how many copies are made in the x axis.
The Y rows controls how many copies are made in the y axis.
Spacing controls the distance between each copy.
Reverse reverses the direction in which the copies are made.

While making these selections a grid will start to form showing where the images should be placed.



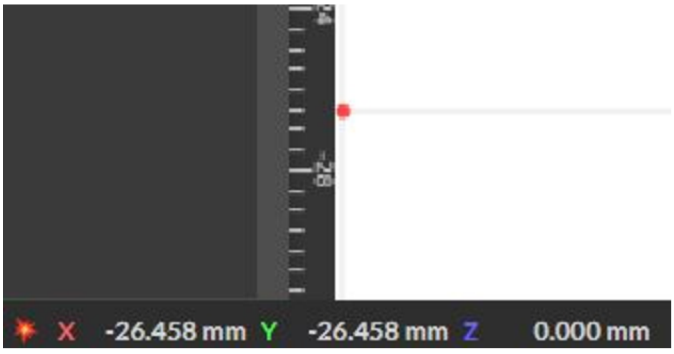
Once your grid is ready hit apply and your copies will be made.



Section III. Retina Engrave v4- Indicators

Gantry position:
Displays the current position of the Z stage, Rotary, or linear rail if applicable

Cursor Indicator:
Displays current position of the Cursor.



Laser position:
Displays current position of the laser on the grid.

Additional Indicators:

1 2 3

These indicators display information on connected devices.

1. Laser: Indicates whether or not your laser is idle, downloading_job, processing, running_job, or offline.

2. Gantry:Indicates whether gantry is idle or moving.

3. Workspace:Indicates whether your workspace is synced with the RE4 server, when working on big files ensure your syncing your workspace often (Ctrl + S)

Time Indicator: WIP

Section III. Re4- Vector & Raster Properties

Infill:

Before:

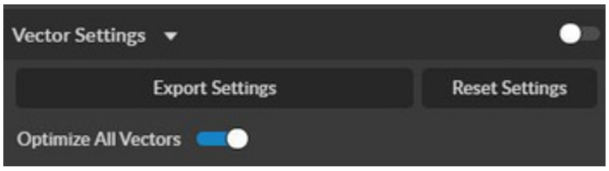
After:

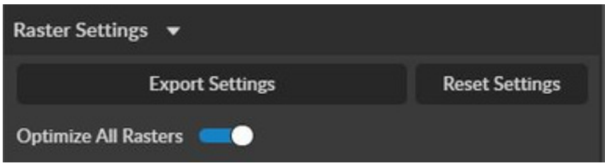
Infills are mainly used when one wants to engrave words or shapes into an object. Once the infill is placed it can be rasterized for engraving. If the shape is something you want to cut out, then the infill is not needed.

Optimize All Vectors and All Rasters

Enabling Optimize All Vectors will process the job until it finds the quickest possible path to follow

Enabling Optimize All Rasters will process the job until it finds the quickest group of pixels to engrave





Section III. Re4- Vector & Raster Properties

Tracing Types:

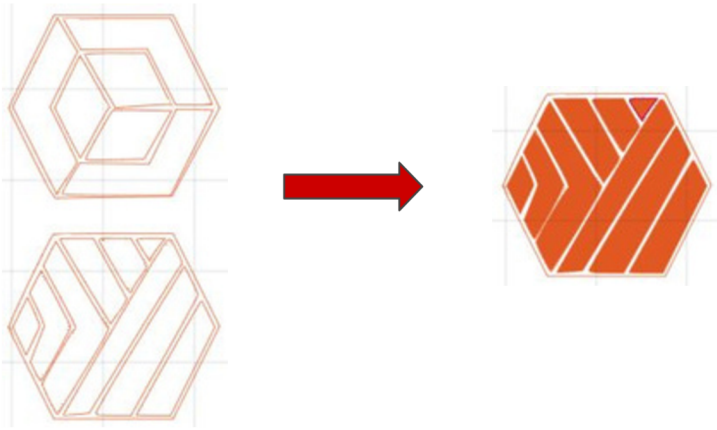
By using the tracing parameters the lines visible on the image will be converted into lines that can be used for cutting. Certain pictures will create different lines depending on the area type selected.

Original

Area Type: All

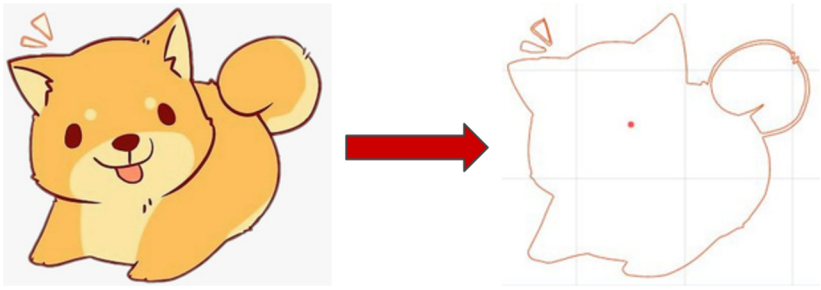
All the lines in the image are traced. This is perfect for when one wants certain parts to look sharper than the others.

The lines are all stored into compound groups which can be customized separately from each other. For a mixture of different designs.



Area Type: Outside

This area type captures the outside of the image. This makes it useful for creating silhouettes of a picture for cutting.



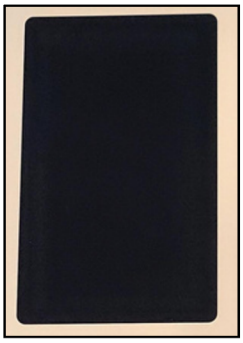
Original

Section III. Re4- Vector & Raster Properties

Inverting:

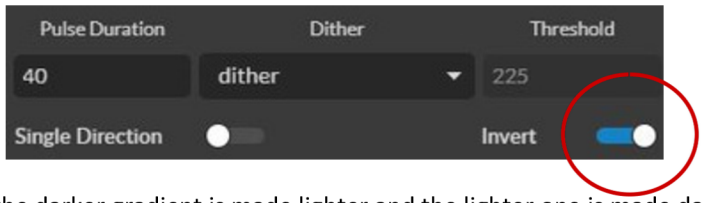
At the top of the Raster Properties you can chose to invert an image or not. Depending on the material you use inverting the image can result in a smoother look than if not. Here will will show you how to invert an image as well as the final results.

Images that focus on a darker object are ideal for inverting if one is using material that change colors as engraved,such as an anodized card(see below) or painted material. For this example we will be using the image on the left.



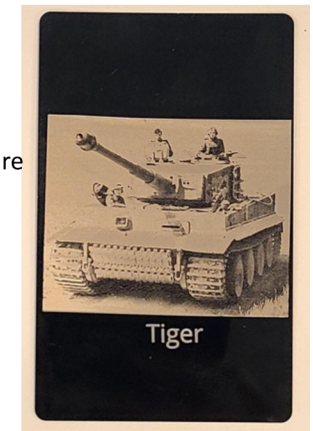
Here is how it image looks when uploaded into Re4. By looking at the image we can see that most of it will be engraved since it has many dark pixels.

However, on an anodized card the parts of the image with darker pixels will come out lighter ask it's engraved. Since we want the darker shapes to come out darker on the card we want to invert the image.By selecting the invert option in the Raster properties it will change the grayscale.



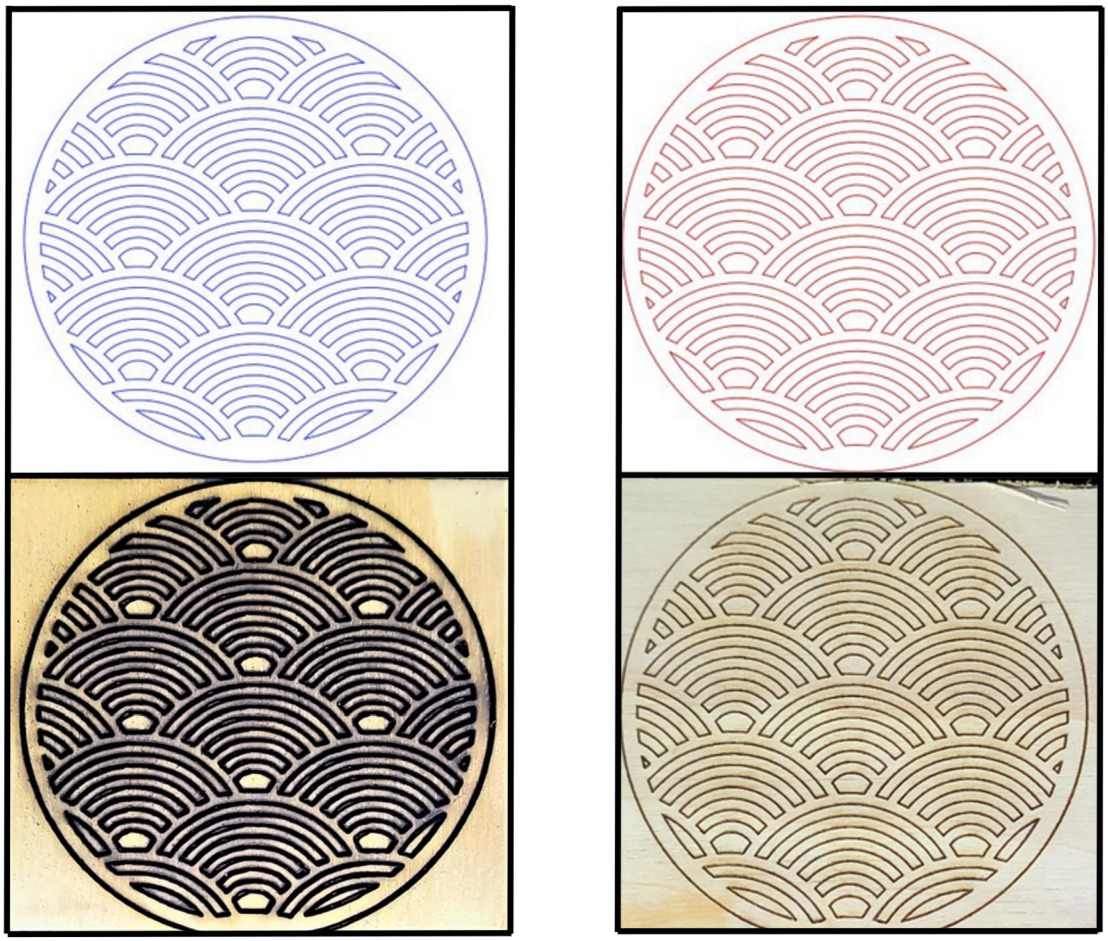
That meanings that the darker gradient is made lighter and the lighter one is made darker. Resulting in the image below.

The product of the inversion is a picture that made the men and their vehicle equally visible.



Section III. Re4- Vector & Raster Properties

Vector Cutting VS Raster Marking

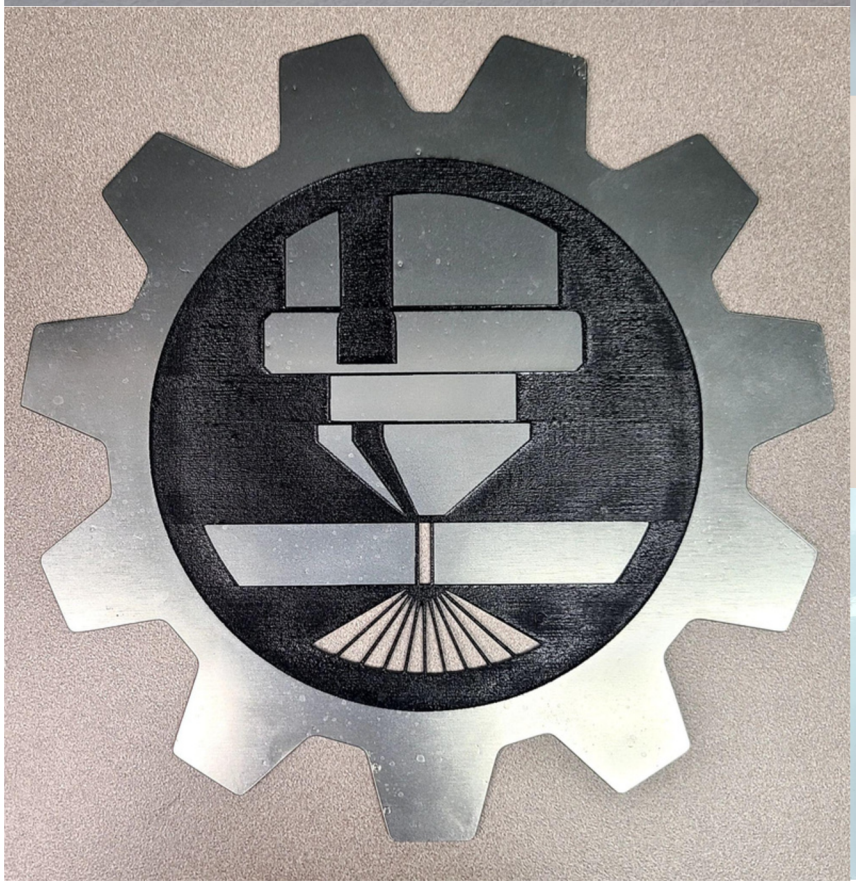


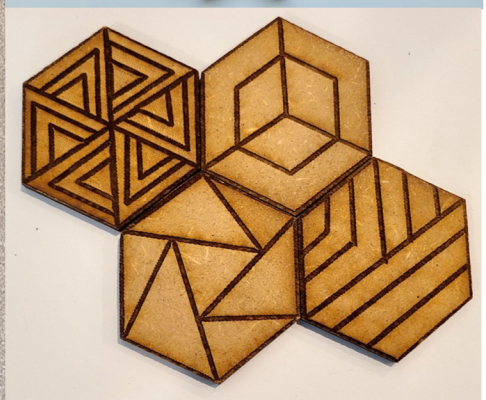
Knowing the different between vector and raster properties is the easiest way to change a design. The design is blue was a vector, meaning it was set to cut out the entire pattern, while the red design was set to rasterized or engrave the material. The blue design came out darker than the red one due to the fact that each line was cut out individually while the read design went along the wood left to right distributing the intensity of the laser beam.

By learning to use both vector and raster properties. You will be able to create a variety of different shapes and designs. In the next page we'll show some samples of objects made using vector and raster objects.

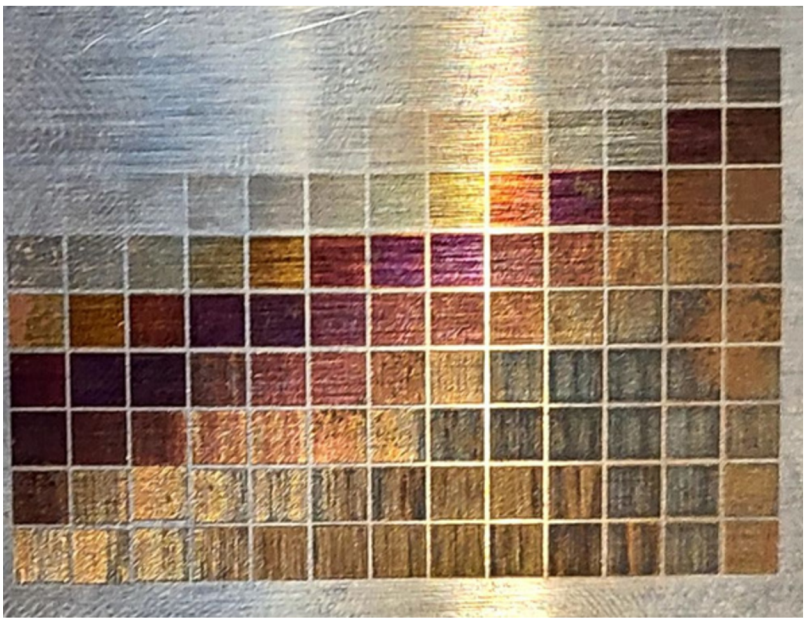
Section III. Re4- Vector & Raster Properties

Examples:





Section III. Re4- MOPA Color Engraving



MOPA machines are called that because they contain both a master oscillator to produce a beam and an optical amplifier to increase its power output. This cause Master Oscillator Power Amplifier or MOPA machines to have greater power and faster speed than a traditional fiber laser. This system also has the added feature of having an adjustable pulse width. The ability to adjust all of these setting is what gives MOPA lasers the means to engrave color. However, certain conditions must be fulfilled in order to engrave in color.

1. **Material**
   MOPA systems can only engrave color in stainless steel materials. This is because the process of marking the material will cause a chemical reaction that will anneal or alter the properties of the metal. The chemical reaction is what creates the color in the material.

2. **Machine Properties**
   The coloring process can be affected by many factors such as: the laser source, the lens used and the focus distance. This is important to keep in mind since even similar models can produce different shades of color.

3. **Engraving Parameters**
   The hatching type, the pulse width, the frequency, the line spacing and the power are adjusted according to the type of color ones trying to engrave.

4. **Only vector objects can be engraved in color.** That is because the infill will play an important part in engraving. Bi-directional or Optimization Two-Way hatching are mainly used for color engraving.
   If you wanted to use a rasterized image then the tracing parameters will need to be used.

5. **Do not engrave in high power.** The material will not engrave color properly or at all if the material gets too hot.

In the following pages we will explain in more detail how these properties can affect color engraving.

Section III. Re4- MOPA Color Engraving

Engraving Parameters:

Frequency:

Fiber lasers work by emitting light in fixed intervals. By increasing the frequency the interval are shortened. This causes the laser to be fired with greater power and subsequently makes darker engraving. However, if the frequency is too high certain material can potentially catch fire. However, for stainless steel we have to worry about a different effect.

By increasing the frequency of the laser machine the stainless steel will be heated up fairly quickly. This can affect the color engraving process. If the material is too hot it will not engrave in color. There is an on the off chance that it will engrave in color however the color will look different once the material cools down.

Hatching and Line Spacing:

Hatching types, or infills as we like to call them, is the pattern in which your engraving is done. As mentioned before Bi-directional or Optimization Two-Way hatching are used for color engraving. The way the pattern is engraved depends on the line spacing. The larger the spacing the lease the object is filled in. Since we're trying to engrave colors we want to have a small infill. The ideal spacing for colored engraving is .001-.005. It's important to keep in mind that simply by changing the line spacing the colors can be different.

Focus Distance:

Fiber and MOPA lasers work by emitting two beams of light that will burn the material when they converge. For that reason these laser systems must be in focus to engrave. The focus distance is within a few millimeters, meaning if you switched from a 1mm stainless steel sample to a 2mm sample your material will still engrave without having to refocus.

This become important in color engraving because it means you can raise and lower your laser head to help get different coloring. Let's say you get a blue marking but your aiming for purple, you can try lowering the stage to get a hotter etch and could end up with a shade closer to purple.

Levelness:

You should always make sure your object is level to ensure proper engraving. Engraving in color simply adds another reason as to why to do so. As stated above, raising and lowering the laser head can change the colors. The same can apply to an unleveled object. One end of the object will have a different shaping than the other.

Rainbow Engraving:

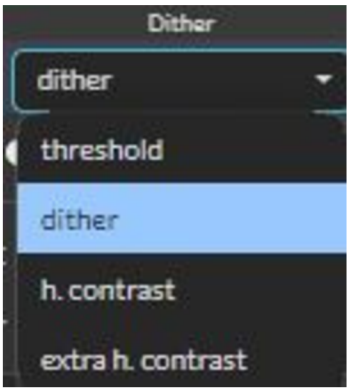
Rainbow Engravings are engraving that slowly change color as engraved. These types of engraving can be done in both Fiber and MOPA lasers. These engraving are done in a higher line spacing of .02, a medium-low to medium speed, and medium to medium-high power, such as 45 to 70%.

Remember that this is just a General Guideline for you to help better understand how complicated engraving in color is. It's up to you to find out what method works best for your needs.

Section III. Re4- Dithering Methods

Dithering Methods:

Last but certainly not least are the different dithering methods. What is dithering? Most files that are important into Re4 are colored pictures one owns or finds on the internet. When the file is brought into Re4 it is converted into a grayscale image for engraving. Dithering is how the grayscale of each pixel is determined. Usually files are automatically set to either threshold or dither but can be changed to another by going to the Dithering tab and selecting the desired type.



There are 4 different types of dithering methods.

1. Threshold
2. Dither
3. Contrast
4. Extra contrast

Below we will explain the difference between each type of dithering.

1. Threshold
As stated above dithering determines the grayscale. If there is no dithering then the software will run the image as black and white.This will work for two tone engravings such as text and logos.

2. Dither
This method will produce its depth from black to white by distributing its inaccuracies to the surrounding dots producing more of a “blend” between the lights and the darks.

3. Contrast
Similar to dither but adds a contrasting filter, this is best for portraits

4. Extra contrast
Similar to Contrast but filters it once more, best for glass.

Section IV. Troubleshooting & Applications

Troubleshooting (Fiber,MOPA & UV Lasers)

A large amount of problems customers face centers around laser focusing. These lasers must be with it's focus range to function properly. Being outside of focus will yield no mark at all. Before proceeding with any project, please verify that you are in focus using the black card provided. (Refer to your manuals Focusing section.)

Issue	Possible Solution
Laser Won't Mark	Make sure your machine is focused. If the machine is off in height by a few millimeters it will not engrave. Make sure to refocus your laser head after changing to a new material. Verify that the material used if receptive to your machines wavelengths (1064 and 1080 nanometers are the main wavelengths used in these laser engravers.)
I can't get the marks I want	Make sure the material is usable. Some material are not meant to be cut with the Galvo. Try some of the setting ideas mentioned in the marking applications (pg. 41). We have a raster and vector materials tests on our website to help you find the types of engraving you want. Visit https://fslaser.com/material-test/ for the files.
My engraving lacks depth	May need to increase the power and/or lower the speed. Multiple passes can add more depth. A smaller lens can be used to engrave in more detail. The laser may engrave even it it's not fully focused. Make sure to perform the laser focus test each time you change to a new material.
I'm having trouble focusing my laser.	If auto-focusing with the QR tag, then make sure that the QR tag is visible in the camera throughout the process. If the QR tag get cut off from the screen, then the machine will not focus. One can always try the manual focus. **Refer to your manuals Focusing section of the guide**
The Mark Adjustment square looks wobbly.	If the mark adjustment was done on a wrinkled, bumpy, or slanted surface, then the adjustment will be off. Make sure the machine is on a flat, smooth, and leveled surface at all time
The marking are not coming out even.	If the material your engraving on is not flat or leveled them the material will engrave unevenly. We suggest getting something to make the engraving surface leveled beforehand.

Section IV. Troubleshooting & Applications

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), focusing and material grade. This is a general list to give an idea of how one can go about getting the engraving desired.

Fiber Lasers:

Marking Types	Methods Used
Deeper Engraving on steel	High Power, Medium Speed, 25-50 passes Multiple passes can be programed Low khz
Surface Marking	20W- High power & Low Speed 50W- High power & Low Speed 4-8mm in/out of focus
Thin Cuts	High Power & Medium Speed Use wobble amplitude .1 and spacing .05 Low khz
Marking black acrylic (Bleaching the surface)	Low Power, Low Speed & Low DPI
Annealing	High Power, Low Speed & unfocused by 4-8mm Multiple passes Mid range khz

Section IV. Troubleshooting & Applications

UV Lasers:

Marking Types	Methods Used
Deeper Engraving	High power & low speed. Multiple passes can be programed.
Surface Marking	3W - Medium Power & Medium Speed 5W - Low Power & High Speed
Marking Plastic	3W - High Speed, Low-Medium Power & Medium Frequency 5W - High Speed, Low Power & Low Frequency
Marking Glass	High Speed & Medium-High Frequency Cross-hatching should be enabled Needs a 254mm lens
Marking Cloth	High Speed & Low Frequency
Wood	Needs a lens with a focal length above 210 (We have a 254mm and 420mm lens.) High Speed & Low Frequency

Customer Support

For a list of Frequently Asked Question and a series of help guides, visit us at our Help Center .

We offer a variety of free projects to help you get started, just check out our Free Projects page.

For more information on laser engraving, check out our Blog .

Financing:
We work to provide a perfect option for any budget.

For more information contact sales:

M-F 8AM-5PM PST
sales@fslaser.com
702-802-3101

Technical Support:
Are you having an issue not found in the Help Center?

Contact support:

M-F 8AM-5PM PST
support@fslaser.com
702-802-3103

Contact Information:

Phone: (702) 802 - 3100
Fax: (702) 987 - 0150
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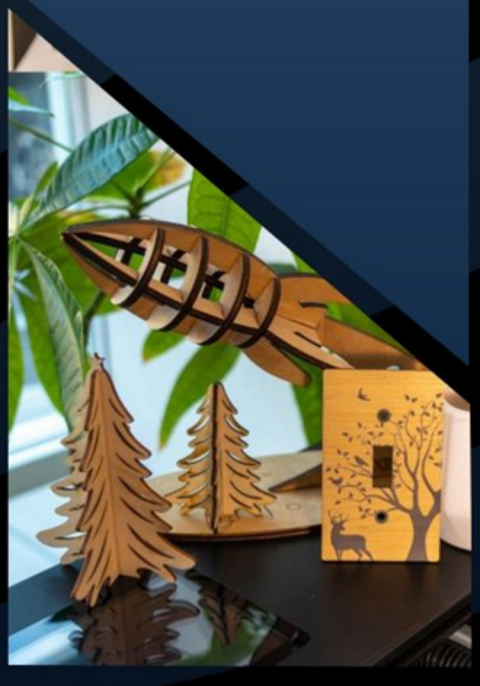

Full Spectrum LASER