MUSE
FIBER GALVO 2
USER MANUAL

Full Spectrum
LASER
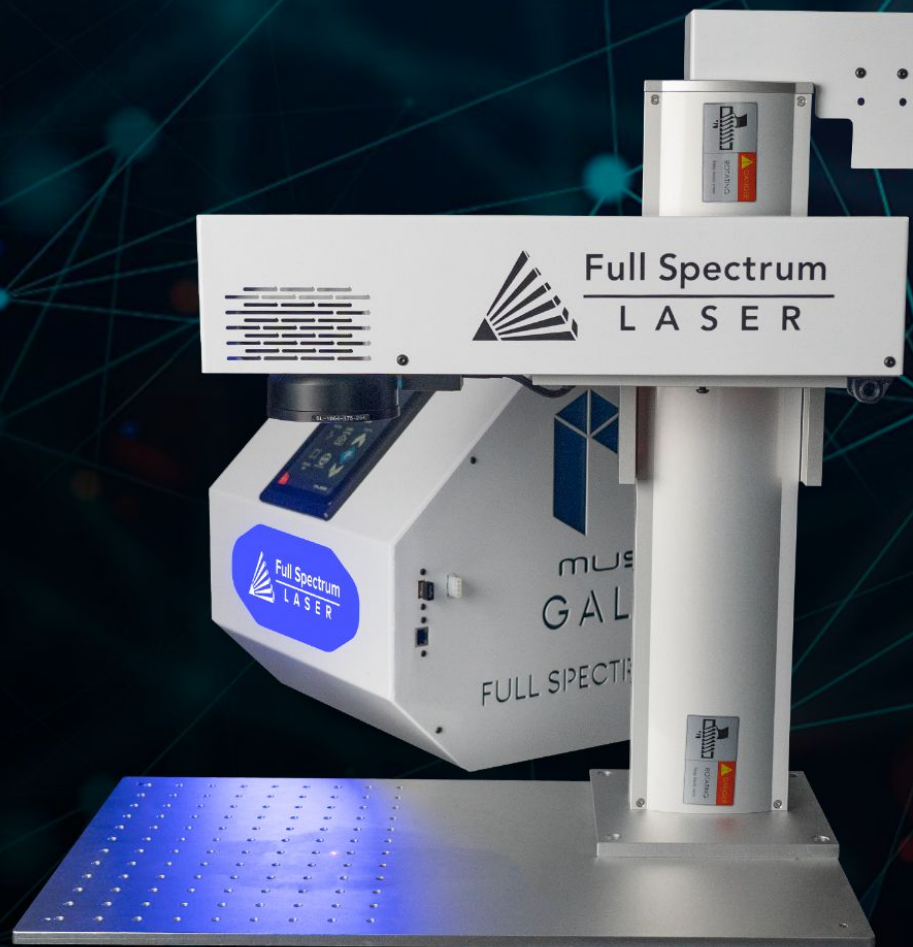
Safety Symbols:

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

Indicates a hazardous situation which, if not avoided, will 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.

Warns sharp edges that could cause injury via laceration.

Looking for financing or eager to buy, contact Sales:

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

Need help, visit us at our Help Center or contact Support:

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

Safety Warnings:

WARNING	• This product is rated as a Class 4 machine, however the presence of an enclosure will make the overall class of the machine Class 3R. • If purchased with an enclosure, keep the enclosure closed when operated to ensure proper ventilation.
(eye icon)	• Always wear the provided safety glasses when using your machine. • Never stare directly into the laser when the machine is running. We recommend staying at least 5 ft away from the machine when in use.
(respiratory icon)	• Avoid using materials made of or containing carbon components. • Make sure your exhaust in functioning properly before each use.
(fire icon)	• Do not leave your machine unattended. • Always keep a fire extinguisher and first aid kit nearby. • Regularly inspect your fire extinguisher to ensure functionality.
(electrical icon)	• Do not attempt to access any electrical areas while the machine is on. • Unplug the machine and wait for an hour before accessing panels.
(hazard icon)	• Always maintain a clean work area. • Inspect your machine before each use. Do not use if the machine or its accessories are damaged in any way.

Full Spectrum LASER

Safety Stickers:

Manufacturer: Full Spectrum Laser

Model: Fiber Galvo

Working Voltage: 110V

Laser Power: 20 or 50 W

Work Area: 4"x4"-12"x12"

Mass: 60 lbs

This product complies with the 21 CFR 1040.10 and 1040.11 except for the deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

This product complies with IEC 60825-1: 2001

Full Spectrum Laser LLC
6216 S. Sandhill Road
Las Vegas, NV 89120 USA

LASER RADIATION
This product is rated as a Class 4 machine. Keep the enclosure closed during operation to avoid eye & skin exposure. Do not operate the machine if the housing is damaged in any ways.

CAUTION
DO NOT STARE DIRECTLY INTO THE BEAM!
VISIBLE LASER RADIATION IS PRESENT.

LASER TYPE: CO2 MACHINE
WAVE LENGTH RANGE: 10604 nm
MAX POWER: 75 W
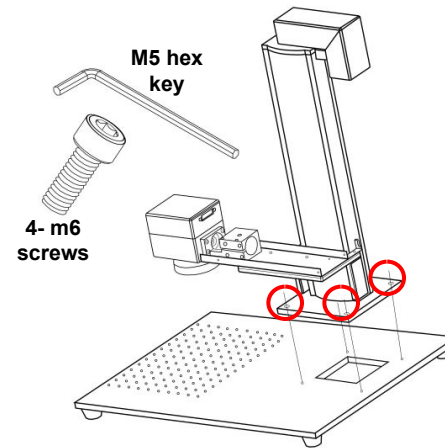CLASS: 4

DANGER!
ELECTRIC SHOCK HAZARD!

DO NOT OPEN ANY ACCESS PANELS WHEN THE MACHINE IS IN USE.

Unplug Your Machine and Let The Electricity Dissipate For An Hour Before Opening The Access Panels.
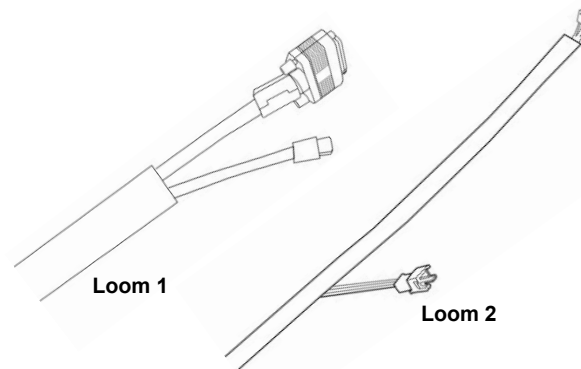
CAUTION
Safety Glasses Required. Keep Your Safety Glasses On When Operating The Machine.
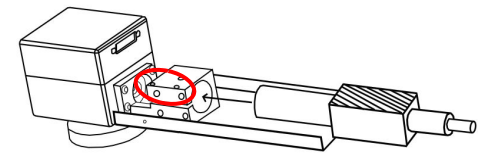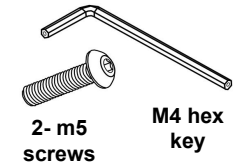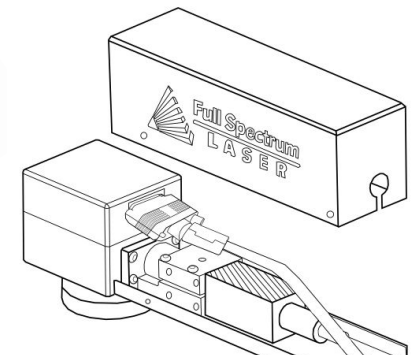
Assembly:

M5 hex key

4- m6 screws

1. Secure the stage to the base using the m6 screws.

2- m5 screws

M4 hex key

2. Slid the isolator into position and screw in place using the m5 screws.

Loom 1

Loom 2

3. Grab Loom 1 connect the VGA cable to the back of the scanhead and the Type C cable to the camerahead. Then grab Loom 2, connect the 3 pin cable to the cable hanging near the motor and the other into the motor.
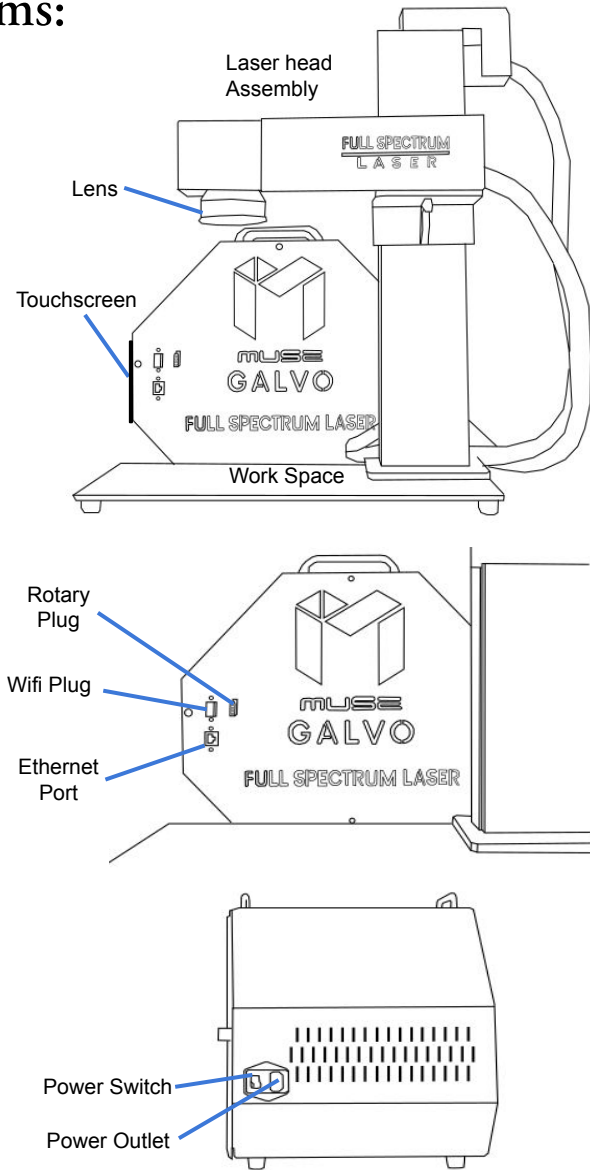
4. Place the machine cover over the laser head assembly and secure it in place.

Diagrams:

Laser head Assembly

Lens

Touchscreen

Work Space

Rotary Plug

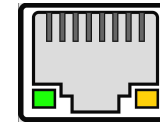Wifi Plug

Ethernet Port

Power Switch

Power Outlet

# Connecting to Internet:

Connect Via Router (Recommended):

To establish a reliable link to RE3, it is recommended to connect the Fiber Galvo to the router. The Fiber Galvo is equipped with an ethernet cable that should be plugged into the ethernet ports of both devices

Note: Ethernet port looks the same on all devices

Connect to Wi-Fi:

Make sure that the dongle, a device attached to the USB port of your machine, is present and connected as it enables your machine to connect to the WiFi network.
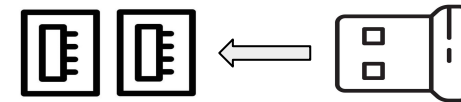
1. To connect to the WiFi network, select the Network button located on the top right of the Touchscreen.

2. Then, choose the WiFi option and search for your network. Once you have located your network, select it and enter your password.

Connecting Directly Using Computer:

This option is only advisable when the other two methods are not possible. The Fiber Galvo can connect to the computer through Ethernet, but an adapter might be required for your computer.

Touchscreen Interface:
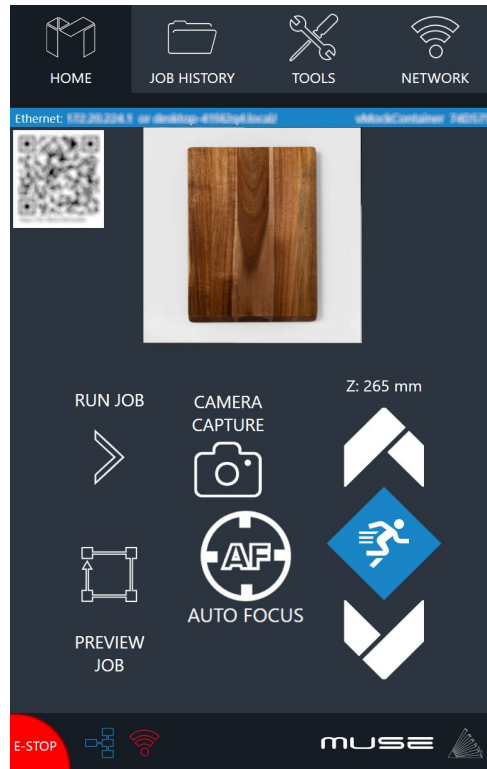

Movement Controls:
The movement icon allows the user to adjust the stage's vertical movement through three adjustable speed settings. The speed settings can be modified by selecting the prism icon.

Home
The Home screen displays important information such as the device's IP address, the QR Code for RE3, and controls for the laser head.

Job History
The Job History icon provides easy access to previous projects. Users can select the file and view its contents, or choose to re-run the job. Note that an internet connection is not required to use files saved in this section.
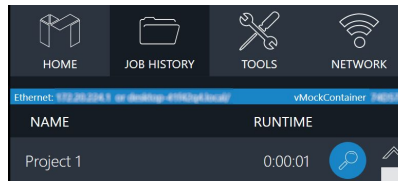
Machine Indicators:
Wired IP Indicator:
The IP indicator shows if the machine is connected to an ethernet cable.

Connected   Not Connected

Wi-Fi Indicator:
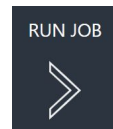The Wi-Fi indicator will indicate if the machine is connected to the Wi-Fi.

Connected   Not Connected

Run Job Icon:
Selecting the icon will run the job.

Network ⇨ Wi-Fi
Enables users to connect to a Wi-Fi network.

Mobile Version
A mobile version of the device is accessible by either scanning the QR Code or entering the device's IP address into the web browser of a mobile device.

Tools
The Tools icon enables the user to verify and modify the machine settings, activate rotary attachments, home the laser, and retrieve relevant information regarding the device.

AutoFocus Icon:
The Autofocus icon automatically moves your machines Z-stage to the height needed to perform an engraving. (Needs QR card to work.)

Camera Capture Icon:
The Camera Capture icon takes images of the workspace.
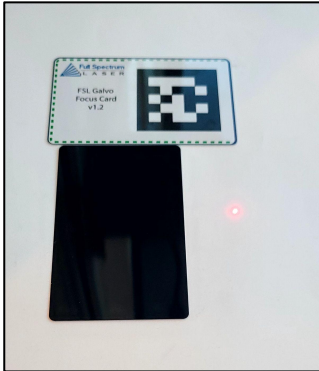

Preview Job Icon:
Selecting the icon will make the machine outline the area of your project on your workspace.


4

Focusing:

Autofocus

Retrieve your April tag card first. Ensure that the side of the card labeled "Focus Card V1.2" is facing upward. Position the card under the camera.

There are two methods to autofocus your machine.

- Navigate to the touch screen and selecting the Autofocus icon located on the Home page.
- Enter RE3 by typing the IP address in the web browser. Then, go to the Jog Controls, select the Autofocus Icon.
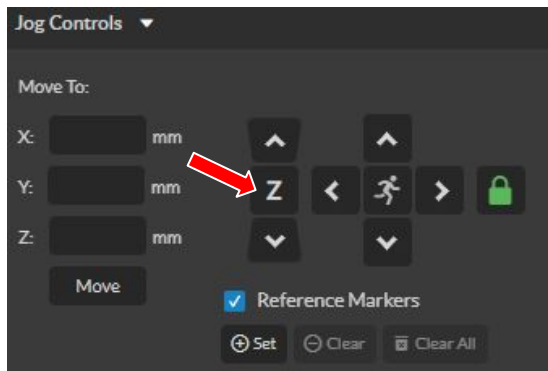
Note: If your machine does not move when the autofocus button is hit, then lower the gantry and try again.

Manual Focus

The focal length of the lens determines the amount of distance between it and the material. Refer to the chart below for the required distance for each of our lenses.

Lens Focal Length	Distance from Material
163mm	203mm
254mm	294mm
330mm	370mm
420mm	460mm

Note that the numbers in the chart refer to the distance from the lens to the object, not from the lens to the workspace. If you switch to a larger object, adjust the stage accordingly.

During manual adjustments, keep an eye on the red diode. When the laser turns on, the red diode will appear large and fuzzy. As the laser head moves down the stage, the red diode will become smaller and more focused. Stop adjustment when the diode appears clearest, run the focusing test to ensure that it falls within the desired range.
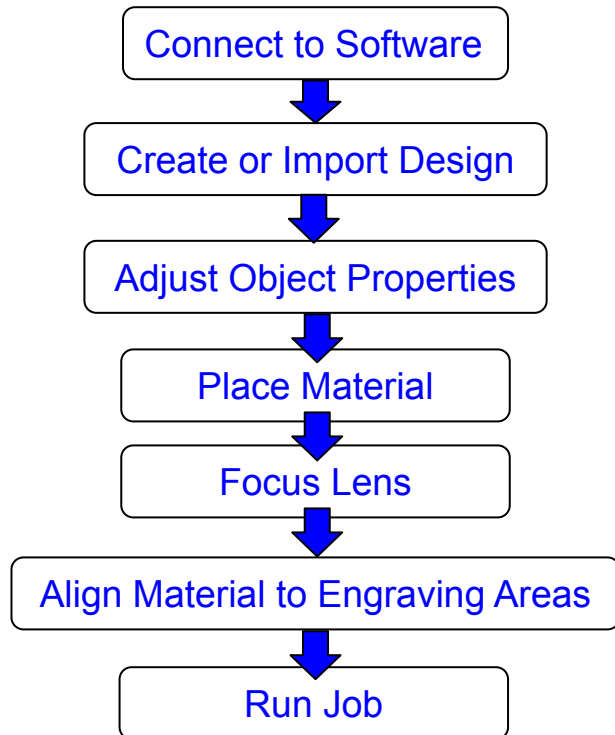
Focus Test

Once you're machine is in position, locate and select the Focus Test Icon.

The Focus Test window will open, ensure that you have selected the appropriate lens size then select the "Generate Test Pattern" button to produce a grid.

From the grid, choose the two markings that appear most similar to one another. Enter these markings into the pattern selection and save the results. For example, in this image we selected 3F and 4D as they appear to be most similar.

Project Procedure:

Connect to Software

↓

Create or Import Design

↓

Adjust Object Properties

↓

Place Material

↓

Focus Lens

↓

Align Material to Engraving Areas

↓

Run Job

For more information on your machine refer to your user manual. For information on RE3, refer to the RE3 Guide found in our website.

General Maintenance:

By following our maintenance instructions, you can ensure your machine will function at peak performance for a long time. Please keep in mind that the following maintenance schedule can vary depending on machine usage.

Before each daily use:

Clean your lens with optical grade wipes.
Cover the lens when not in use.
Make sure all your cables are connected properly.
Make sure your ventilation system is functioning properly.

After weekly use:

Clean your machines workspace with a vacuum to remove small debris.
Check your ventilation system's filters and clean if needed using a vacuum at low power.

Monthly:

Perform a simple engraving ,such as a square, to make sure the laser diode is aligned with the laser. Perform the Mark and Preview adjustment if needed.
Check your ventilation system's filters and replace if needed.

Focusing:

Dual Diode:
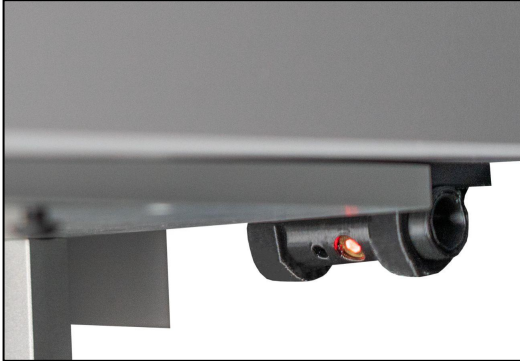
A red diode is mounted to the rear of the machine and is positioned to align with the laser diode when lowered to the lens' focus point.
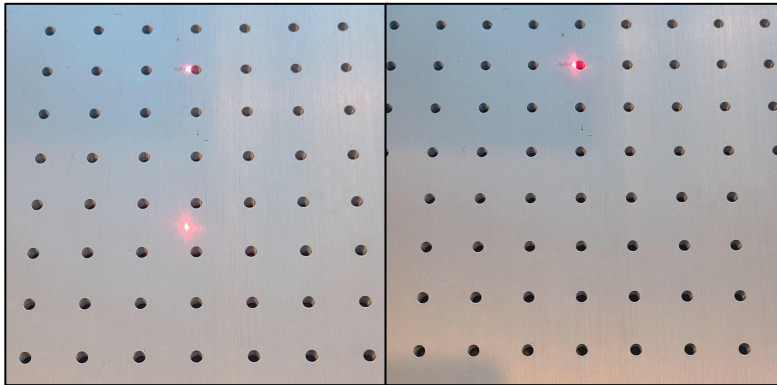

Note that when switching lenses, the rear diode will need to be readjusted for the new focal length. In order to adjust the red diode, focusing your machine to the new lens. Then adjust the position of the back diode until it aligns with the laser. Once the adjustment is made, perform a focus test to ensure optimal results.

# Lens Replacement:

Lens Collar

Camera
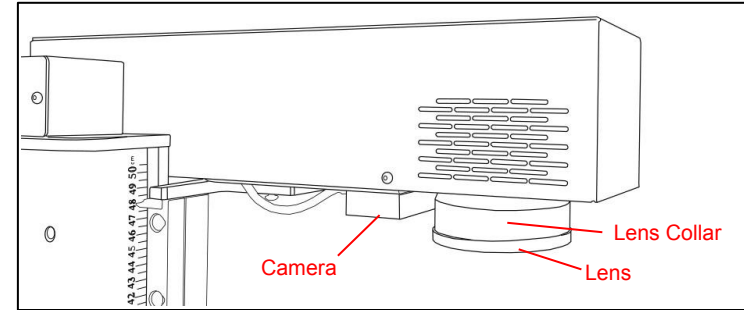
Lens

1. Remove any objects found in the work area. Ensure laser head is in a reachable position to remove lens.

2. Cover the removed lens with its lens cap.

3. Remove the lens by turning it counter-clockwise.
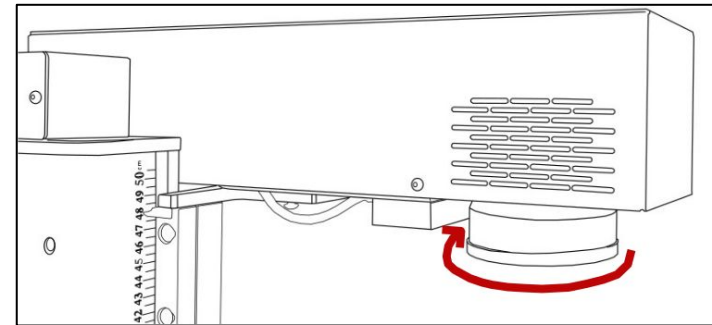
Avoid touching the glass surface of the lens to prevent scratches. The lens collar may come loose with the lens,if that occurs remove it with the lens and then reinstall.

4. Install the new lens into the machine.

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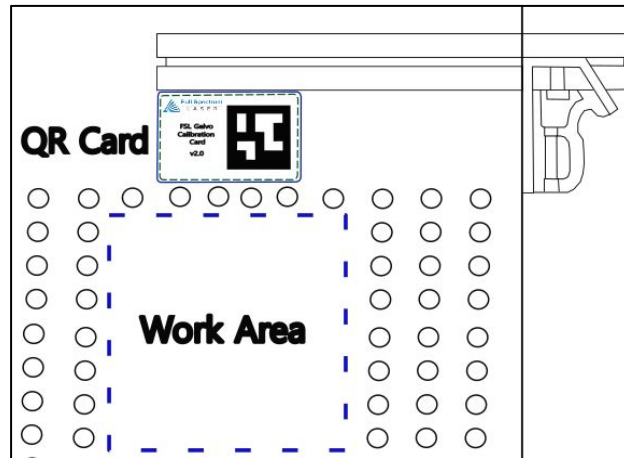
Lens Calibration:

Preparation:

Locate the QR card, have the side with the Calibration April Tag facing upwards.The card should be placed outside the work area and within the camera's view. It must be placed parallel for accurate calibration. The size of the work area is determined by the lens in use (refer to the chart below).

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

Access the "Laser Tools" page by navigating to the Machine name, locate Diagnostics, and then select Galvo Calibration. Alternatively, you can type the following into your web browser: **IP Address/setup**.

1. In the Laser Tools page, locate the Laser Focus and Lens Calibration section.

Ensure that the correct lens size is saved in the lens section.

2. Select Run Lens Calibration.

The laser diode will disappear, and the camera will slowly turn off. The diode will start scanning the work area. After the calibration is finished, you will be given a pass or fail result.

If your test fails, adjust the lighting in your work area. If the lightning is too bright or too dark, the camera will not be able to scan the workplace properly.

3. Once the test is passed, we recommend performing a camera capture to ensure the QR card was positioned correctly. If the QR card was not placed parallel to the work area, the camera may be calibrated improperly (as seen below).
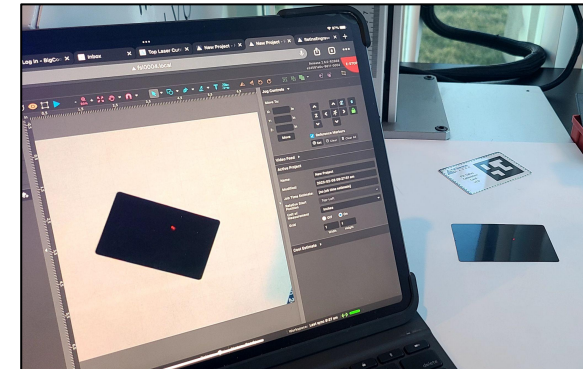
In this image the QR card was placed in an angle, therefore the calibrated camera was shifted by that angle. If this happens, you should re-run the calibration.

Once the machine is successfully calibrated, perform a mark and preview adjustment to ensure the laser properly engraves in its new work area.

Mark Adjustment:

Mark Adjustment is used to ensure your lens is calibrated properly. Keep the speed and power settings unchanged.

1. Adjust the size parameters to the dimensions of the square that corresponds to the lens used.

2. Place a flat piece of test material under the laser for marking. Preview the square before proceeding to ensure that only the test material will be marked.

3. Select "Mark Square".

Measure the marked square. It should match the size chosen earlier. If the lens calibration was not done correctly, the marked square may be off by approximately 2mm. Re-run the lens calibration and redo mark adjustment.

Please note that the top left corner of the square was intentionally cut..

4. Select "Save Mark Adjustment".

Preview Adjustment:

Without moving the previously engraved material, perform a preview adjustment.

1.Go to the Preview Adjustment window and select the "Preview Square" button.

2. Make use of the adjustment buttons to align the tracing made by the red dot precisely with the marked square.

3. Finally, select "Save Preview Adjustment" to save the adjustments made.

Parameter Test:
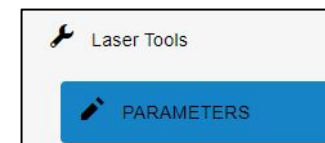
Unsure of what settings you want to use for your materials, then try using the **Laser Parameter Test**. Found directly under the Laser Tools tab on the Setup page. The Parameters Test will generate a graph to test two chosen parameters using the set minimum and maximum values. The size of the grid is determined by the intervals set, makes it easier to narrow down your selection.

The parameters you can test are: Power, Speed, Frequency, DPI, and Pulse Width. Pulse Width is a parameter only used in MOPA machines. To access the Setup page, go to the Machine name, then go to Diagnostics and select Galvo Calibration. Next, select the Parameters tab.

Focus Tag Calibration:

Your machine needs to be properly focused before starting the calibration process. Take note of the Z-stage coordinates displayed on the Main Unit screen to ensure accurate calibration.

In the Laser Tools page, locate the Galvo Autofocus Calibration section and select the Autofocus Mode.

Note: The mode that is not selected will be inaccessible.

AprilTag:

Choose the **AprilTag option** to calibrate the **QR card**.

Place the Focus tag in the center of the work space. Select the Take Snapshot icon to capture an image with the camera. The Focus Tag should appear on the screen with a red box above it. If the box does not appear, it may indicate a damaged Tag.

The tag size should be saved as **19.44**.

Settings Outset:

We recommended starting with a value of 120 and adjust from there. Saving the focus will cause the machine to move to the lower offset position. If the lower offset is set too low, it may hit zero and return to the previous location. Set the lower offset as close to the bottom as possible for optimal accuracy.

After saving the focus, move the stage from its position and test the autofocus. If done correctly, the stage will return to its previous focus location.
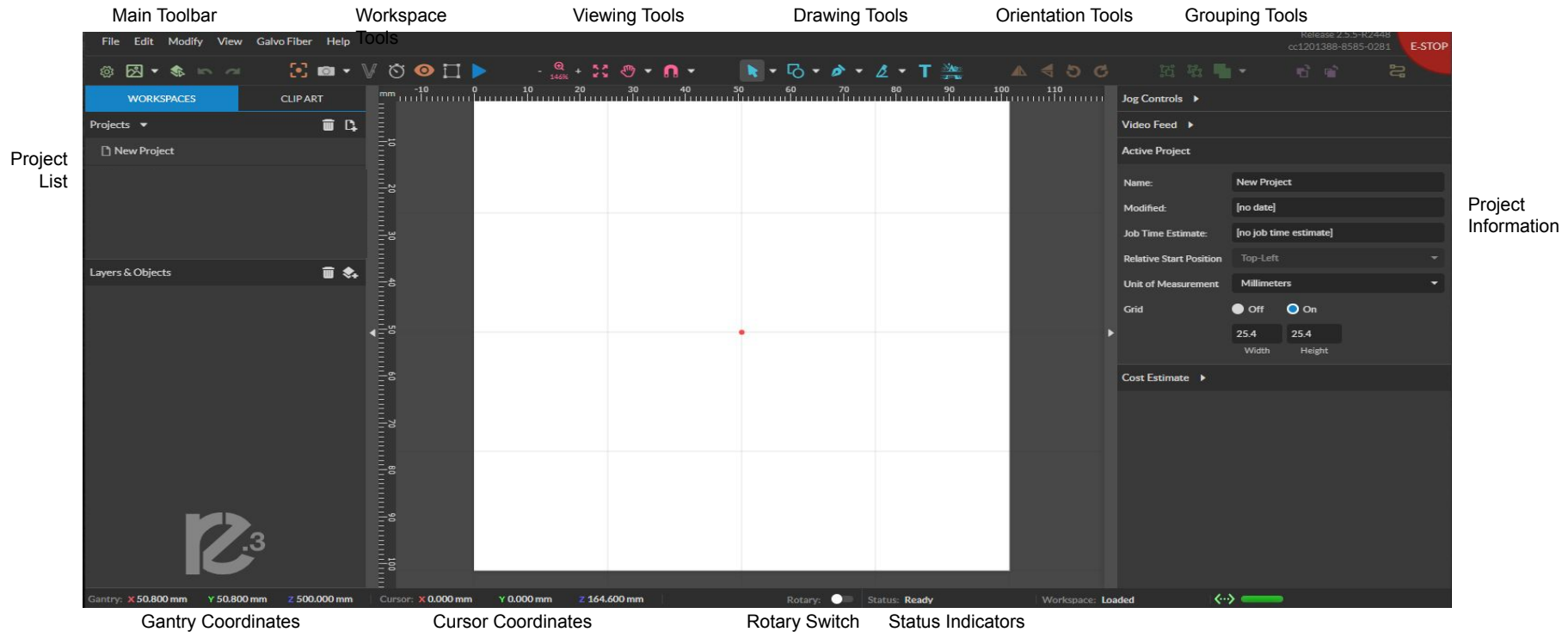
Red Diode:

To adjust the red diode, select the TwoDots option.

Position the back diode to the desired location.

Select **Update Ref. Position**.

RetinaEngraveV3 (RE3):

RE3 can be accessed by entering your machines IP address into your web browser. When loaded RE3 will appear like so.

Main Toolbar   Workspace   Viewing Tools   Drawing Tools   Orientation Tools   Grouping Tools
                    Tools

Project List   Project Information

Gantry Coordinates   Cursor Coordinates   Rotary Switch   Status Indicators

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

Workspace Tools
Focusing Test: Verify that your laser it in focus
Capture Workspace: Takes images of workspace
   Clear Last Workspace Capture: Clears previous workspace image.
Trace Background Image
Estimate Job Time: Amount of time the job will take.
Show Bounding Perimeter of all Objects: Shows the space the job will occupy.
Run Job: Start Engraving

Viewing Tools
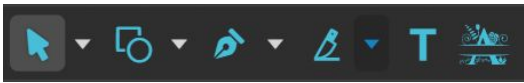**Zoom (-/+):** Enlarges/Reduces workspace screen detail and size.
Fit All: Fits entire captured image on screen.
View
   Pan (H): Manually pan project window using mouse.
   Zoom (Z): Zoom project window using mouse.
Snap
   Use Snapping (Shift+F10): Enable or disable the snapping feature.
   Use Snap Zones: Enable or disable the snap zone feature.

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Drawing Tools:
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

Grouping Tools:
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.

Orientation Tools:
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.

Tracing Parameters:
Tracing is used on rastered images to be made into vector lines for cutting.
Threshold- Pixels to include

Smoothing- smoothens the corners of the selected object

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.

Positioning Tools:

Position Coordinates

Object Size

Object Transformation

Scaling Button

Full Spectrum AI:

Entering RE3:

In order to use the AI, the machine must be connected to the internet.
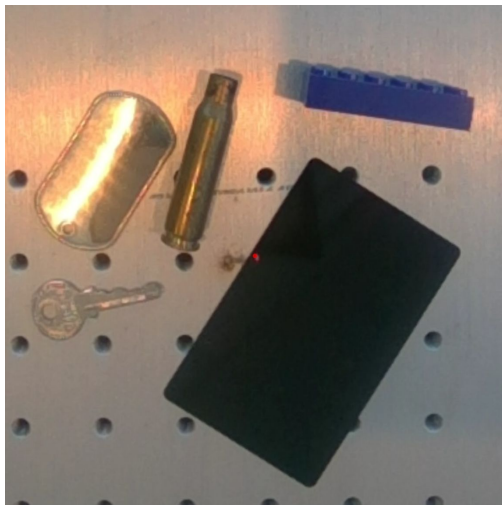
Go to the web browser and enter the following format: **IP Address/re3**.

The software will have and additional toolbar next to the Help icon.

AI Toolbar:

The **Find Objects** icon is used to detect multiple objects within the workspace. In order to use this function a screenshot of the workspace needs to be taken.

After taking the Screenshot, hold the **Shift** key and left click a few spots on the prepared materials. Hold the **Shift** and **Alt** keys instead to select background spots. After selecting your points, use the **Find Objects** icon.
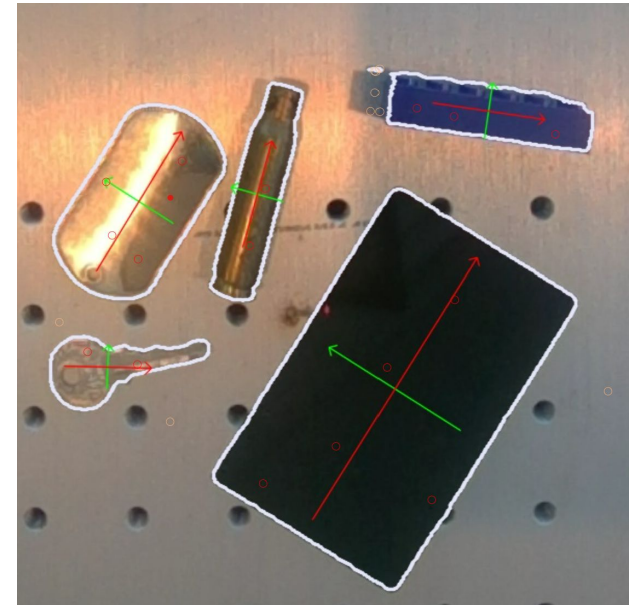
The AI will identify the objects, highlight their perimeter and calculate the center of each. The width is displayed in red, while the height will be displayed in green.

If a part of the background was added to the perimeter it can be removed by using the **Shift** and **Alt** keys to identify it as the background then select the **Find Object** icon again.

The screenshot can be cleared of any selects using the following icon.
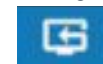
Full Spectrum AI:

Aligning objects:

Vector and Raster objects can be selected and placed onto the center of each object using the align option. Keep in mind that the AI will only place the object at the center, resizing must be done manually.
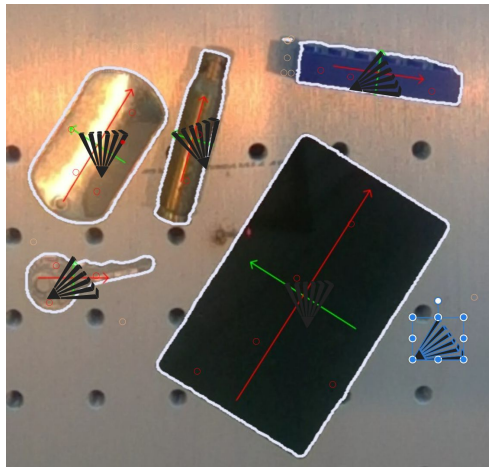

Aligning Text:

There are two methods to align text.

1. The Textbox Options:

Write your text in a textbox. Then select the **Align** option.
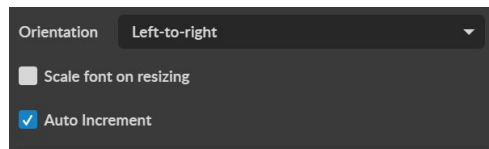
If the text needs to be numbered select the Auto Increment option from the Text window.

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2. The Advanced Settings:(Sidebar)
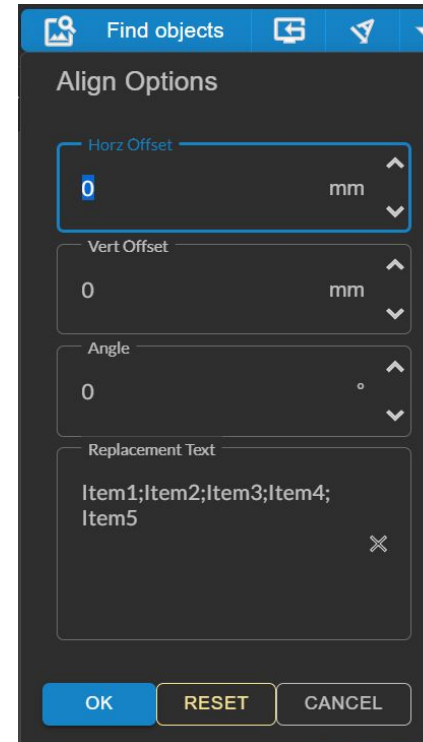
Select the down arrow to open the Advanced settings.

The horizontal and vertical offset can be adjusted here. As well as, the angle of the object.

The text for the objects can be placed under the **Replacement Text** window. The text for each object can be written down as long as the ; key is used to separate them from each other, as shown in the picture.

Use the ok button to save the settings. Then select the **Align** option.

Full Spectrum AI:

Text to Art Generation:

Our AI can generate raster images using a text prompt. Select the downward arrow to open the prompt window.

Write your prompt and then select the **OK** icon. The window will close automatically. Select the **Generate image from text** option. Your image will be generated.
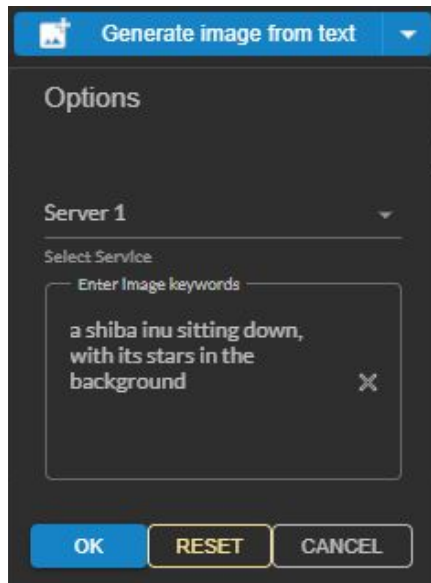
Background Removal:

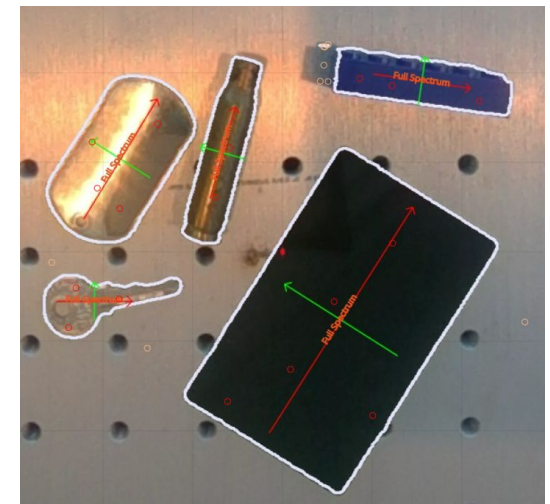Our AI can identify the subject of the image and remove any unwanted background.
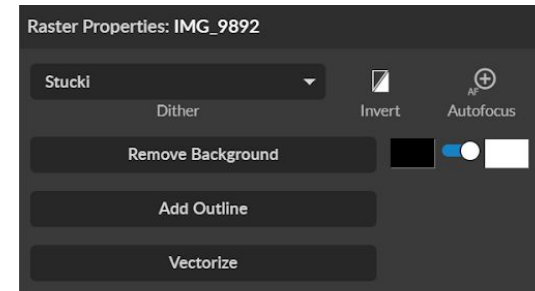
Removing the background can be done from the Raster Properties section. The background will be replaced with the background color of your choice. The white background is selected for normal engravings while the black background is used for images that are going to be inverted.

Starting Parameters:

The following parameters are for starting your engravings, these setting will have to be fine tuned for each machine.

Material	Model	Power %	Speed (mm/sec)	Frequency	Passes	Line Spacing	Notes	These are all approximate settings and may very from machine to machine depending on the current lens installed and laser source
Acrylic	20 Watt	60	1000	20			DPI-750	
Engrave Black Leather	20 Watt	45	2500	40	1	.03mm		
Painted Aluminum Business Card	20 Watt	80	1000	40	1	.03mm		
Steel Deep Engraving	20 Watt	100	600	25	1	.02mm		
Painted Aluminum Business Card	20 Watt	30	500	40	1	.03mm		
White On Annodized Aluminum	20 Watt	100	1000	50	1	.03mm		
White/Frost On Aluminum	20 Watt	100	1000	40	1	.03mm		
Dark Engraving Aluminum	20 Watt	100	150	30	1	.02mm		
Aluminum Deep Engrave	20 Watt	100	700	30	1	.02mm		
Acrylic	50 Watt	40	1000	20			DPI-750	
Steel Deep Engraving	50 Watt	100	1200	25	25-50	.02mm	Run clean up pass at the very end at 25%pwr	
Painted Aluminum Business Card	50 Watt	30	1000	45	1	.03mm		
White On Annodized Aluminum	50 Watt	100	2000	55	1	.03mm		
White/Frost On Aluminum	50 Watt	100	2000	45	2	.03mm		
Dark Engraving Aluminum	50 Watt	100	250	30	1	.02mm		
Aluminum Deep Engrave	50 Watt	100	1500	35	25	.02mm		
Gold Engraving 18K	50 Watt	50	1000	20	1-3	.02mm		
Engrave On Stone	50 Watt	75	700	20	5	.02mm		
Black Color Marking On Steel	50 Watt	100	300	20	1-5	.02mm	Unfocus 10mm	
Anneal Stainless Steel	50 Watt	100	300	20	1-3	.03mm	Unfocus 10mm	
Bleach Black Acrylic	50 Watt	30	300	55	1	Rasterize/300dpi		
PMAG	50 Watt	30	1500	50	1	.01mm		
Stippling Glock Frames	50 Watt	40	1500	60	...	.08mm	Many Passes, Let Material Cool Down Every Few Sets Of Passes	
Slate	50 Watt	60	1000	40	1	.02mm		
Carbon Fiber Engraving	50 Watt	80	1000	45	1-3	.05mm		
Natural Leather	50 Watt	40	1200	35	1	.05mm	STINKS	
ChalkBoard	50 Watt	40	1000	40	2	.02mm	grey/white look	
Brass (Cut)	50 Watt	100	1000	20	2000	.02mm	Metal will warp, Weight it down or put it in a vice	
Matte (removal)	50 Watt	25	1000	20	2	.02mm	2nd pass will be a clean up at 15-20pwr	
General Plastics	50 Watt	15	1000	40	1	.02mm		

Troubleshooting:

Q: What should I do if my laser isn't marking?

A: Adjust the laser is in its focal height. If the machine is off by even a few millimeters, it won't engrave. The laser head should be refocused after changing materials.

Still having difficulties? Make sure that your material is compatible with your laser engraver. Material containing carbon components should not be cut in this machine. For a list of material compatible with our laser machine, click on the link here.

Q: Why are my marks turning out incorrect?

A: Experiment with different settings to find the ones that work best for you. Here are some initial guidelines to get started:

- To get darker/lighter engravings, adjust the power or speed.
- To get deeper engravings, decrease the speed or increase passes.
- For clearer engravings, use a picture with a high resolution.

Q: What should I do if my engravings are too shallow?

A: You may need to increase the power and/or decrease the speed. Multiple passes can also add more depth. For precise engravings, ensure that the laser is fully focused. You can also use a smaller lens to engrave in more detail.

For a more detailed explanation on how to adjust the settings on your CO2 laser, please refer to the material settings article linked here.

Q: What should I do if my engravings look wobbly and uneven?

A: Ensure your material is flat while engraving, it may need to be flatten and/or weigh down your material before engraving to avoid this issue.

You're lens may have gotten out of focus. Make sure your lens is secure, then perform a Lens Calibration.

Q: How can I solve issues with focusing my laser?

A: The Galvo machines can be focused manually using the provided focusing billet.

If your machine's laser head assembly moves irregularly, check belts. The belt may be cracked or torn and need to be replaced.

Q: I changed my focus lens and now it's not engraving like I want.

A: When changing your focus lens you also have to perform a lens calibration. Perform a Camera capture to make sure the Lens was calibrated correctly. After confirming the lens is calibrated properly, start the Mark and Preview Adjustments.

If your having an issue not listed here, visit our Help Center. We provides comprehensive videos, guided, and useful resources for troubleshooting to helping you get the most out of your investment in our products.

Galvo Accessories (Sold Seperately):
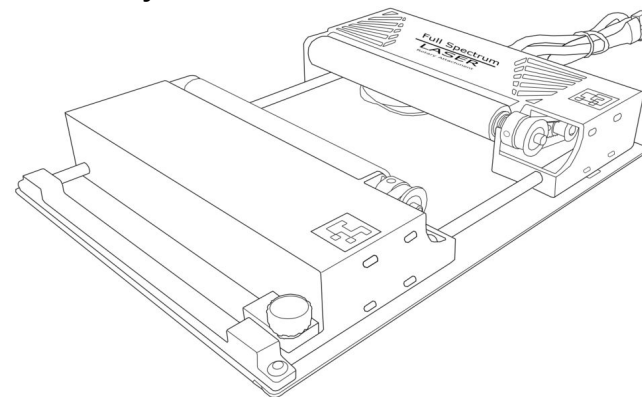
Chuck Rotary:
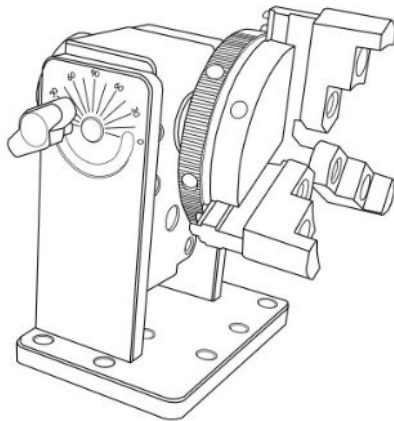
The Chuck Rotary is a compact rotary tool designed to accommodate object of any size with ease. The jaws can be easily changed to the rod attachment for engraving smaller objects such as rings.
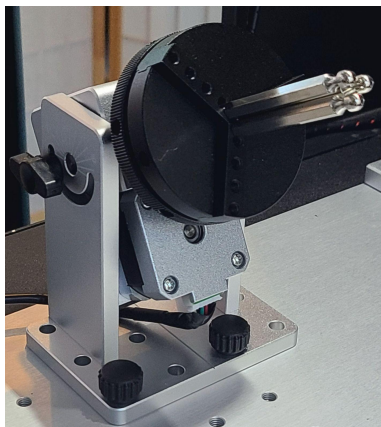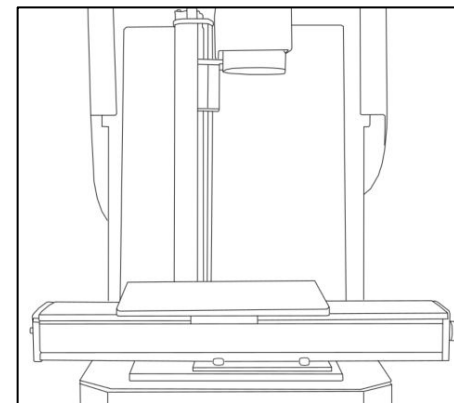

For more information visit the product page here or check out or Zendesk article here.

Low Profile Rotary:

The Low Profile Rotary is a compact rotary compatible with all of our Muse machine. Its adjustable mount makes the Low Profile rotary capable of engraving cylindrical objects ease.

Linear Rail:

The Linear Rail attachment uses a motorized rail to engrave long pieces of material with ease.

For more information visit the product page here or check out or contact us here.

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FULL SPECTRUM LASER INVITES YOU TO JOIN OUR COMMUNITY OF HOBBY MAKERS AND PROFESSIONAL THROUGH OUR SOCIAL MEDIA CHANNELS (FACEBOOK,INSTAGRAM,TWITTER AND YOUTUBE) WE ALWAYS HAVE SOMETHING NICE TO SAY ABOUT HOBBY MAKER CULTURE OR THE INDUSTRY WE WORK IN. YOU CAN FOLLOW US AS WE CROSS THE COUNTRY GOING TO CONVENTIONS AND MAKER EVENTS OR JUST CHECK OUT ALL THE AWESOME STUFF WE MAKE. BEST OF ALL, WE OFFER ALL THOSE DESIGNS FOR ALL THOSE PROJECTS WE MAKE WITH OUR LASER CUTTERS FOR FREE. JOIN OUR COMMUNITY AND SEE WHAT ALL THE EXCITEMENT IS ABOUT.

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