PS20/PS24

USER MANUAL

Safety Symbols:

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

DANGER **WARNING** **CAUTION**

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 enclosure makes the overall rating of the machine Class 3R.** **Keep the enclosure closed during operation to avoid eye & skin exposure.**
(eye icon)	**Never stare directly at the laser when the machine is running.**
(respiratory icon)	**Avoid using materials made of carbon or that contain 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)	**Inspect your machine before each use. Do not use if the machine or its accessories are damaged in any way.** **Always maintain a clean work area.**

Full Spectrum L A S E R

Safety Stickers:

Pro-Series

Manufacturer:
Full Spectrum Laser

Model:	Laser Power:
PS-20	40 or 75 W

Working Voltage:	Work Area:
110V	20" x 12"

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.

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

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

This product complies with IEC 60825-1: 2001

Mass: 350 lbs

Full Spectrum LASER

Pro-Series

Manufacturer:
Full Spectrum Laser

Model:	Laser Power:
PS-24	90 W

Working Voltage:	Work Area:
110V	24" x 16"

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.

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

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

This product complies with IEC 60825-1: 2001

Mass: 500 lbs

Full Spectrum LASER

CAUTION

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

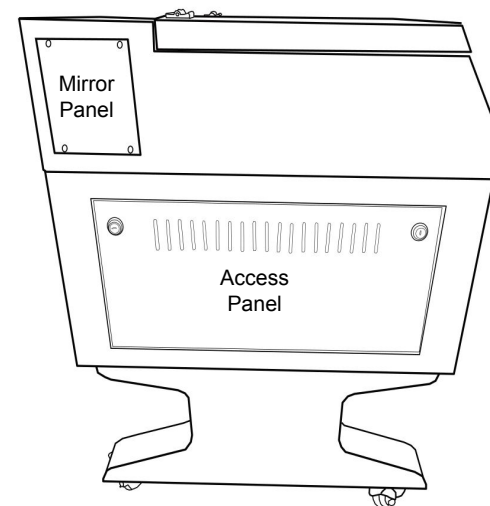| LASER TYPE:	CO2 MACHINE
WAVE LENGTH RANGE:	10604 nm
MAX POWER:	75 W
CLASS:	4

DANGER!
ELECTRIC SHOCK HAZARD!

DO NOT OPEN ANY ACCESS PANELS WHEN THE MACHINE IS IN USE.
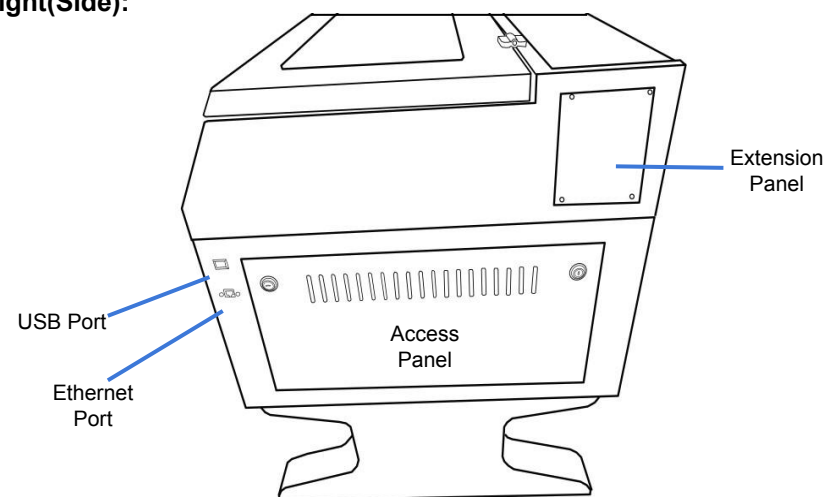
Unplug Your Machine and Let The Electricity Dissipate For An Hour Before Opening The Access Panels.
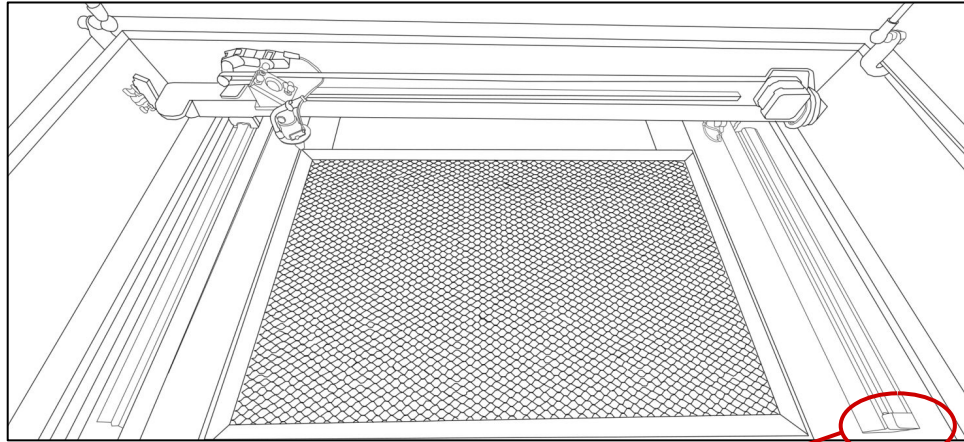
Diagrams:

Left(Side):

Mirror Panel

Access Panel

Right(Side):

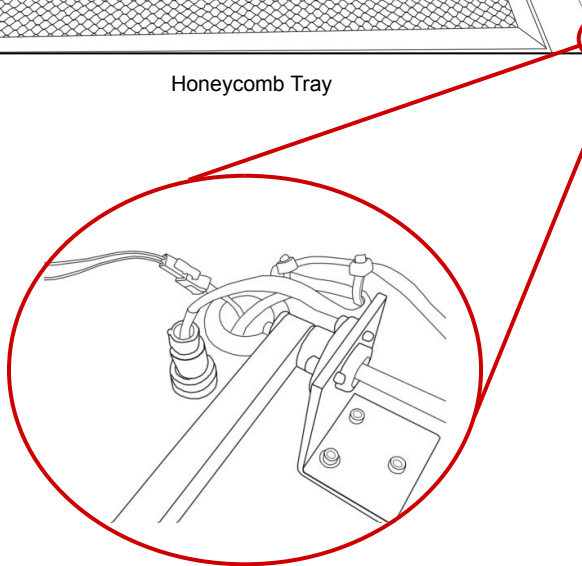Extension Panel

USB Port

Access Panel

Ethernet Port

Work Space:

Laser Head Assembly

Honeycomb Tray

Y-Gantry/
Rotary Port

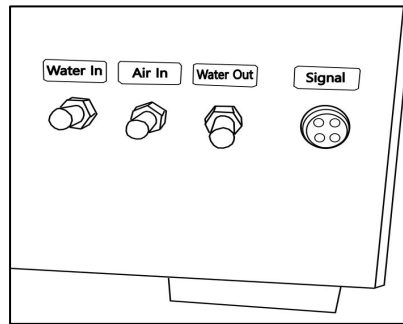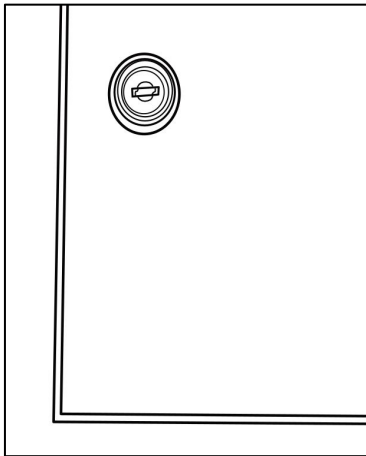
Back View:

Laser Tube
Access Door

Passthrough

Exhaust
Fan

Power
Outlet

Battery
Access Panel

Chiller
Connections

Back Panel (Left):

Exhaust
Fan

Power
Outlet

AC110V

Ground

Power
Switch

Back Panel (Right):

Water In Air In Water Out Signal
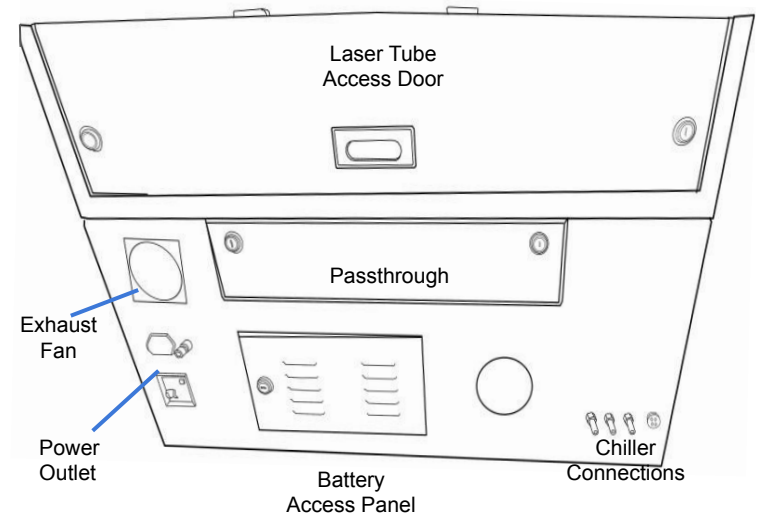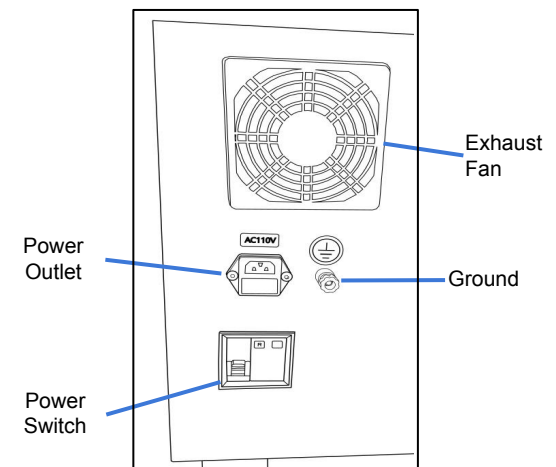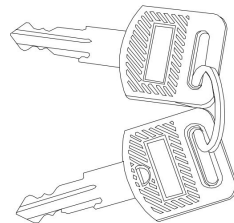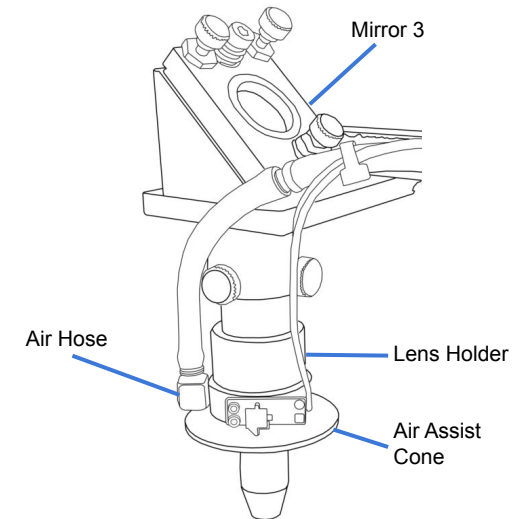
Accessing Panels:
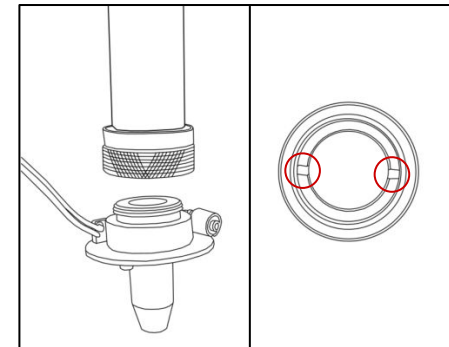

The access panels on the Pro machine can be opened and closed using one of the ignition keys.

Laser Head Assembly:

Mirror 3

Air Hose

Lens Holder

Air Assist Cone

Focus Lens:

In order to replace the focus lens, twist off the Air Assist Cone and disconnect it from the air hose. Turn the lens holder to its side. Your replacement lens should come with a tool that can be used to remove the lens retaining piece. Once the piece is removed take out the lens and insert the new lens. Reattach the retaining piece and connect the corresponding air assist cone to the air hose and secure in place.

Full Spectrum
L A S E R

Setting Up Your Pro:
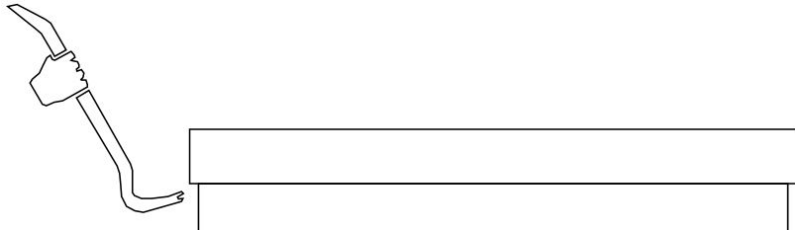
1. Open the Crate. Use a Pry Bar, a hammer, and a Boxcutter (or scissor) to open the crate.

2. Level Machine. Use a forklift to move the Pro-Series into the empty work area. Adjust the machine's legs so that the machine is level in both the front and back sides before removing the forklift.
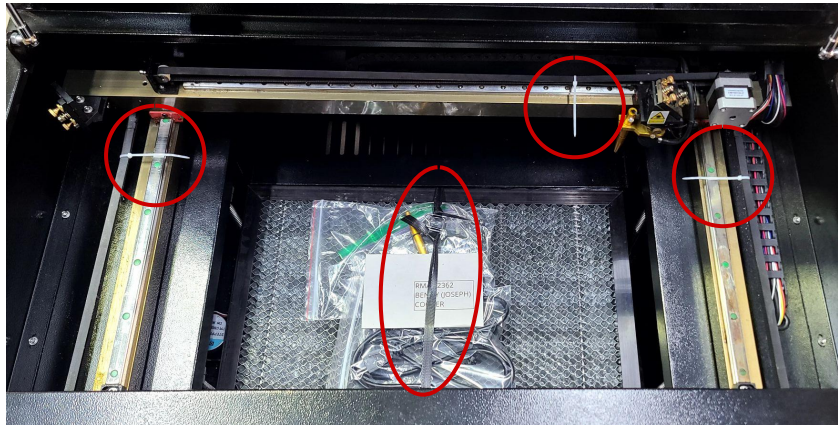
3. Remove the Zip Ties from the machine.
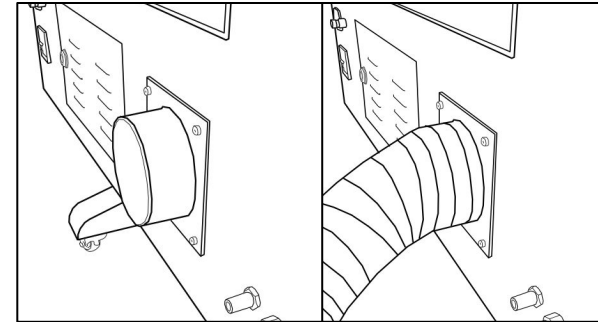
4. Install the exhaust flange. Connect the ducting to the flange.
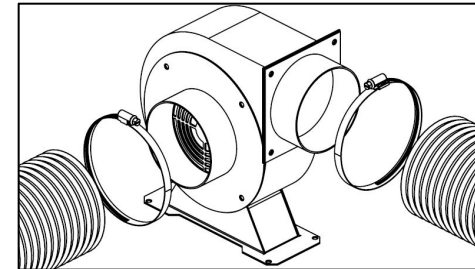
5. Connect the ducting to the Exhaust Fan.

6. Check the exhaust fans connections.

7. Connect the Power cables to the machine.

![Full Spectrum Laser logo]

Connecting to Internet:

Connect Via Router (Recommended):

To establish a reliable link to RE3, it is recommended to connect the PS 20 or 24 to the router. The Pro 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
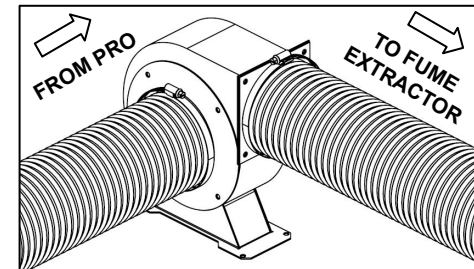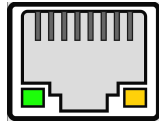

Connect to Wi-Fi:

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.
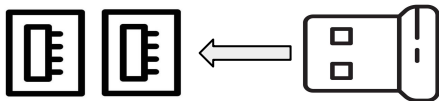
1. To connect to the WiFi network, select the Network button located on the top right of the Touchscreen.

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 Pro machine can connect to the computer through Ethernet, but an adapter might be required for your computer.

Focusing:
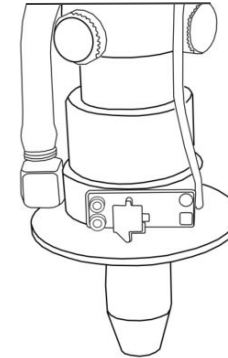
The Pro-Series autofocuses before running a project. The machine can also be auto-focused using the autofocus icon found in both the touchscreen or RE3.

Touchscreen Interface:

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.

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

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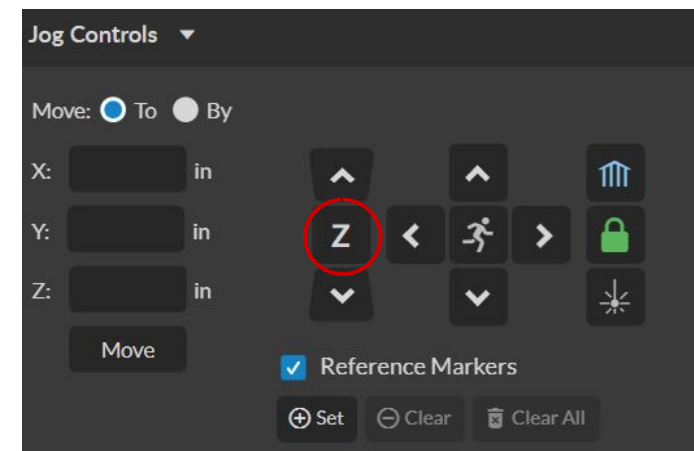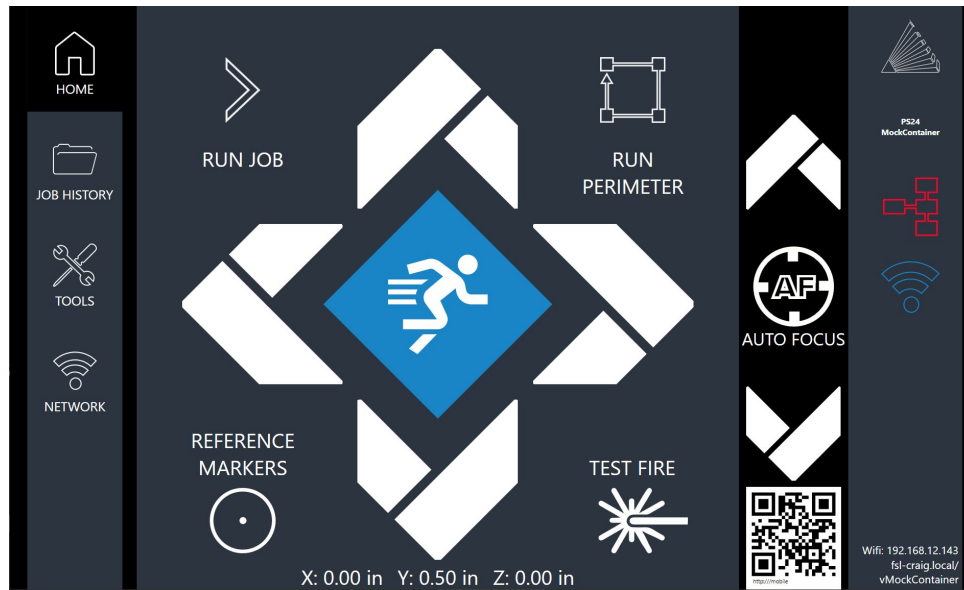A mobile version of the device is accessible by either scanning the QR Code or entering the device's IP address into the web browser of a mobile device.

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.

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

Movement Controls:
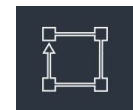The left icon governs the movement of the gantry along the X and Y axes. Three different speed settings can be chosen by selecting the prism icon. The right icon is used to control the height of the laser head.

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

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

RUN JOB

Full Spectrum LASER
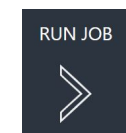
RetinaEngraveV3 (RE3):

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

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

Project List

Project Information

Cursor Coordinates　　　　　　　　　　　　　Rotary Switch　　　Status Indicators
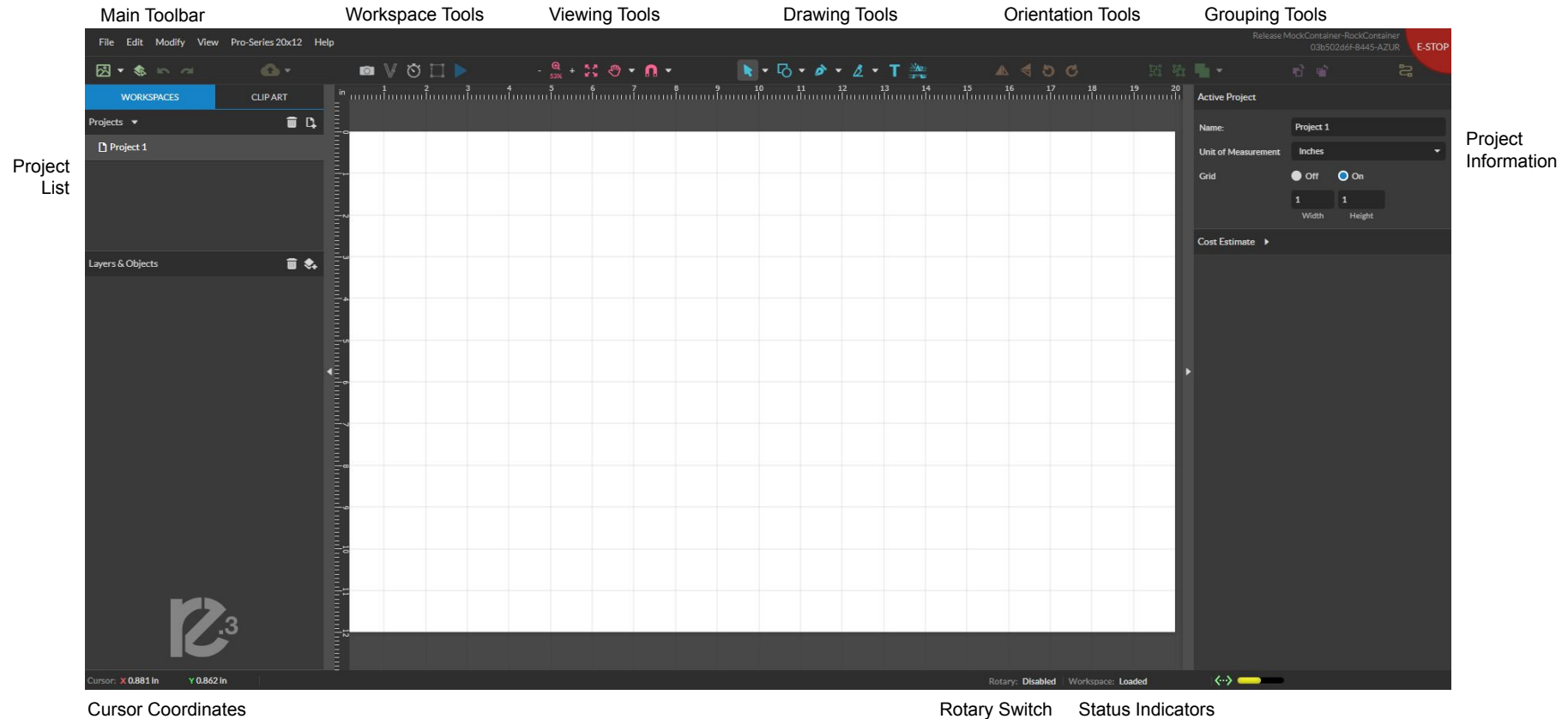
Main Toolbar

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.

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

Project List

Project Information

Cursor Coordinates   Rotary Switch   Status Indicators
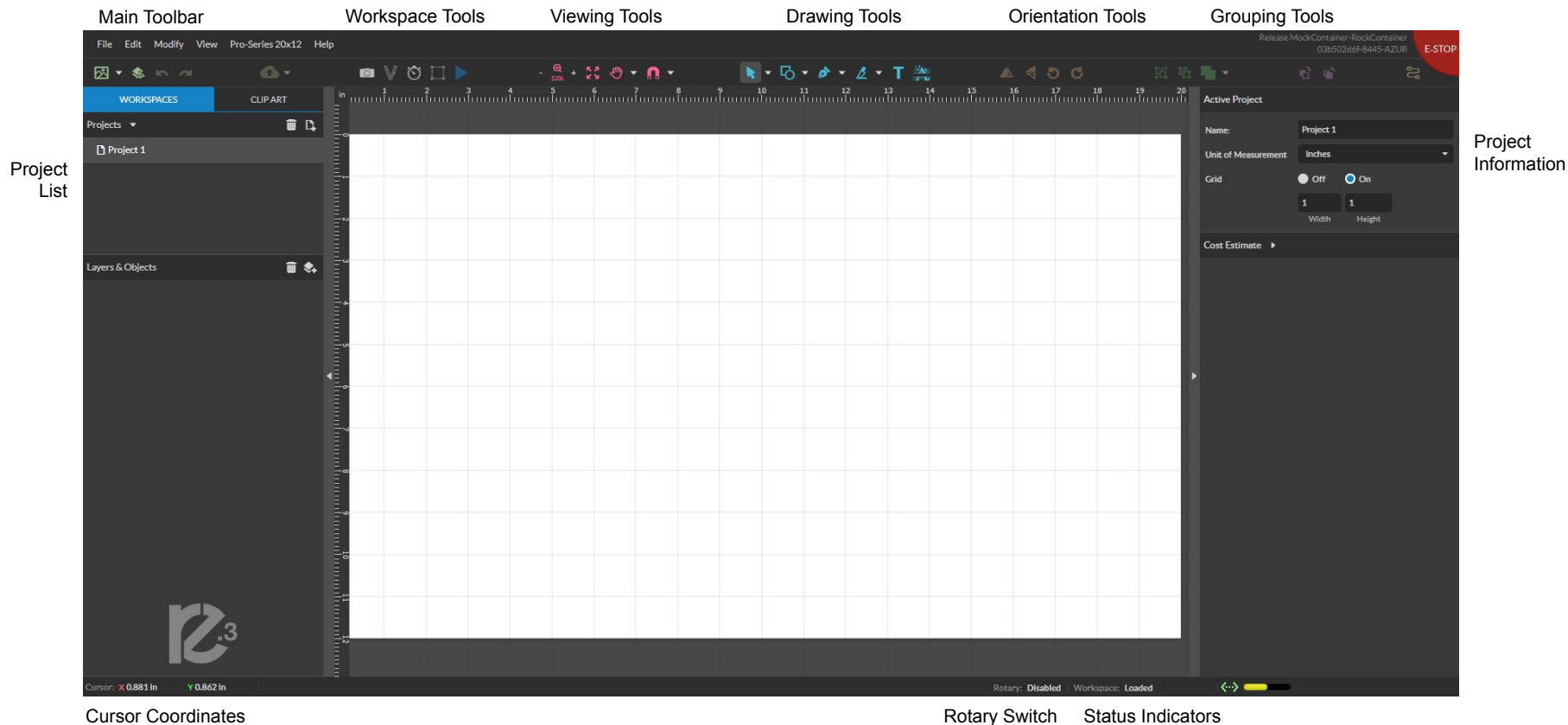
Workspace Tools

Focusing Test: Verify that your laser it in focus
Capture Workspace: Takes images of workspace
  Clear Last Workspace Capture: Clears previous workspace image.
Trace Image: Traces a captured image for engraving
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.

Drawing Tools:

1. Select: Pointer	**Subselect**	
Lasso	**Layer**	
2. Shape: Line	**Rectangle**	**Ellipse**
Polygon	**Triangle**	**Star**
3. Path: Pen	**Bezigon (Curve Tool)**	
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.
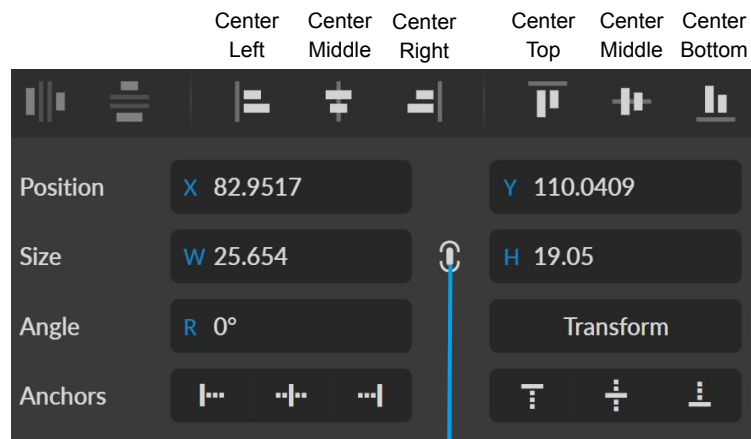

Orientation Tools:
Flip Horizontally: Flip object along horizontal axis.
Flip Vertically: Flip object along vertical axis.
Rotate CCW: Rotates 90 degrees counterclockwise.
Rotate CW: Rotates 90 degrees clockwise.

Positioning Tools:

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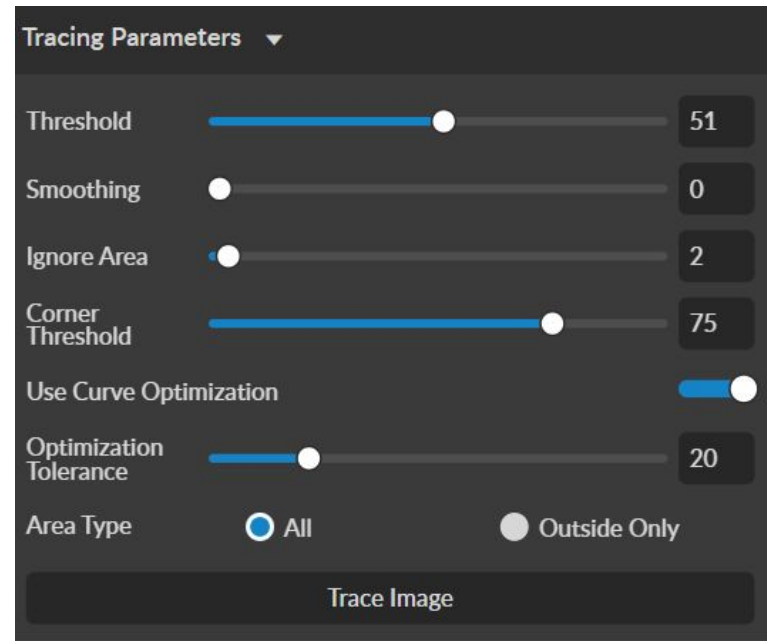
Tracing Parameters:
Tracing is used on rastered images to be made into vector lines for cutting.
Threshold- Pixels to include

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 traced.

        Outside Only- The border of the picture is traced.

Stopping your Laser:

Once a project has started, it will run continuously until it is completed. In case of an emergency, there are several options available to stop the laser immediately:

1. Open the Lid: This will immediately stop the laser from firing. If the laser doesn't stop, please contact support.
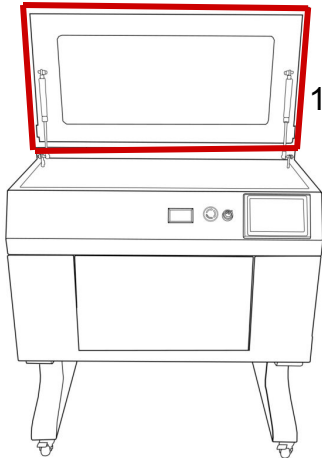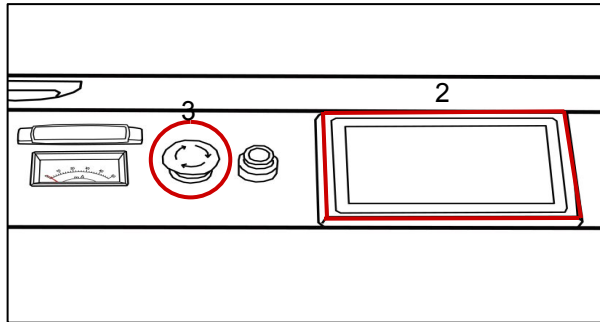

2. Touchscreen Stop/Pause Button. By stopping the job it will be be marked as finished, selecting Play again will start the project from the beginning.

3. Emergency Stop Button. This button will immediately stop the laser. The laser will not fire until the emergency stop button is returned to its previous position.
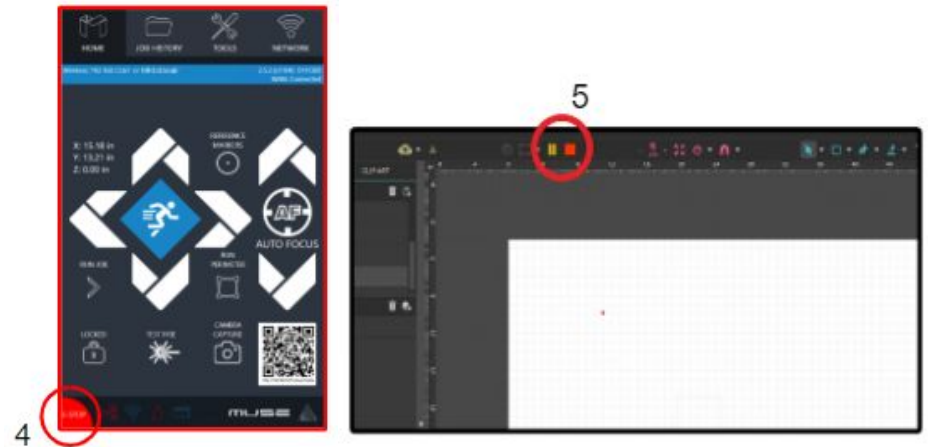
4. **E-Stop Button:** Located in the lower left corner of the touch screen, pressing this button will cut power to the laser instantly. Please handle this button with care as it is still part of the touch screen and can be fragile.

5. **RE3 Stop/Pause Button.**
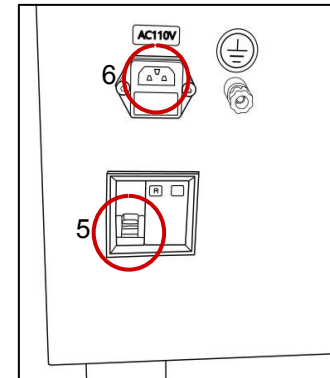
6. **Power Switch**. Turns the machine on and off.

7. **Power Outlet**. This should be considered a last resort, as unplugging the power cord of the Muse Titan from the electrical outlet may cause damage to your cables.

Project Procedure:

```
┌─────────────────────────────┐
│     Connect to Software     │
└─────────────────────────────┘
              ▼
┌─────────────────────────────┐
│    Create or Import Design   │
└─────────────────────────────┘
              ▼
┌─────────────────────────────┐
│   Adjust Object Properties   │
└─────────────────────────────┘
              ▼
┌─────────────────────────────┐
│        Place Material        │
└─────────────────────────────┘
              ▼
┌─────────────────────────────┐
│         Focus Lens           │
└─────────────────────────────┘
              ▼
┌─────────────────────────────────┐
│ Align Material to Engraving Areas │
└─────────────────────────────────┘
              ▼
┌─────────────────────────────┐
│          Run Job             │
└─────────────────────────────┘
```
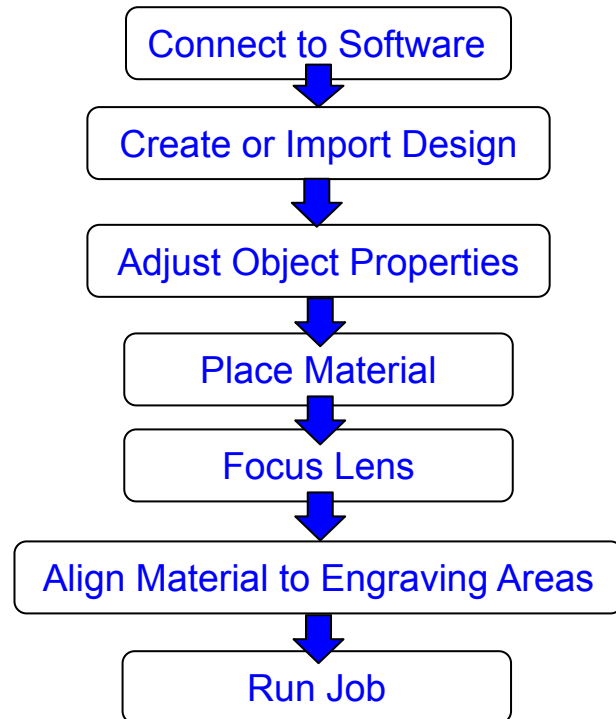
For more information on your machine refer to your user manual. For information on RE3, refer to the RE3 Guide found in our website.

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 and Mirrors with optical grade wipes.
    Check your water, and air tubes for any potential issues.
    Make sure your exhaust system is functioning properly.

After weekly use:

    Remove the honeycomb tray and clean the interior of any debris.
    Clean laser tube mirrors with optical grade wipes.
    If you have issues with smoke in the workspace look into cleaning your exhaust options.

Monthly:

    If cleaning is no longer effective, look into replacing your exhaust systems filters (if applicable).
    Check X and Y belts, tighten if needed.
    Clean your honeycomb trays with oven cleaner.

Bi-Yearly:

    Perform an Alignment test to ensure proper engraving.
    Check rails and clean if needed using white lithium grease.

Mirror Alignment:

Before running your first job, you should check and make sure the mirrors are properly aligned using the following procedure. The mirror is pre-installed and aligned for before shipment, however if your mirror is out of alignment, or if you have installed a new laser tube, you must align the laser.

Alignment Test:

Before you start your first job, it is important that your laser is tested in case it needs to be adjusted. Follow the following steps to test your laser:

For this alignment test, we will test-fire the laser both at the closest possible position and at the farthest possible position between Mirror 2 and Mirror 3.
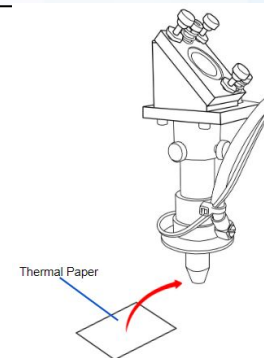

1. **Open the Safety Lid:**
   You will need to access the interior of the machine.

2. **Place Thermal Paper**:
   Take a small piece of thermal paper or craft tape and place it on the air assist cone <u>under</u> Mirror #3.

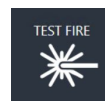3. Make sure to place the thermal paper firmly on, creating a reference ring on the paper.

4. **Position Laser Head to 1st Position:**
   Move the laser head into the left most position.

5. **Close The Safety Lid:**
   Safety measures are in place to ensure laser does no fire with the safety lid open. Regardless, never attempt to fire the laser with the safety lid open.

6. **Fire the Laser:**

    Press the Test Fire Laser Icon on the touch screen until a burn mark becomes visible on the thermal paper.

7. **Repeat Test Fire in Second Position:**
   Move the laser head to the rightmost position. Without removing the thermal tape, fire the laser again.

8. **Check Results:**
   With the test fires complete, open the lid and remove the thermal tape. The burn marks should overlap each other. If they do not overlap perfectly, you will need to align the mirrors.

   Please note that the burn mark will most likely resemble the shape of an oval.

Mirror Alignment:

Perform only if the initial test was unsuccessful.

The goal of the mirror alignment is to adjust the invisible CO_2 laser beam properly so that in can engrave anywhere on the works space. Once the CO_2 beam is consistent along the X-axis, the visible red beam will serve as the primary indicator for mirror alignment.
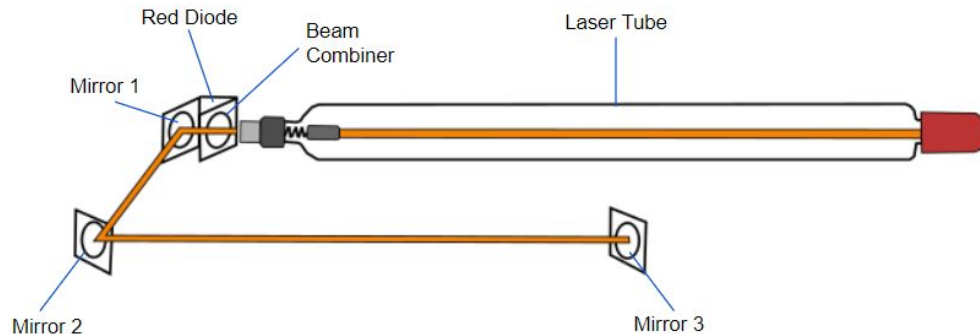

Preparation:

Tools:

Thermal Paper (included with accessories)
2.5mm Hex Wrench (included with accessories)

Make sure to prepare your tools and workspace.

1. **Turn on Titan:** Allow the machine time to fully boot up.

2. **Unlock Driver Motor:** On the touch screen, press the "Locked" icon. It will enter the "Unlocked" position signifying the gantry motor is disabled.

3. **Locate the Ignition Key.** The Pro-series comes with two copies of the ignition key. The ignition key can also be used to open the panels on the machine.

4. **Unlock the Laser Tube Back Panel.** Use one of the ignition keys to unlock the back panel.
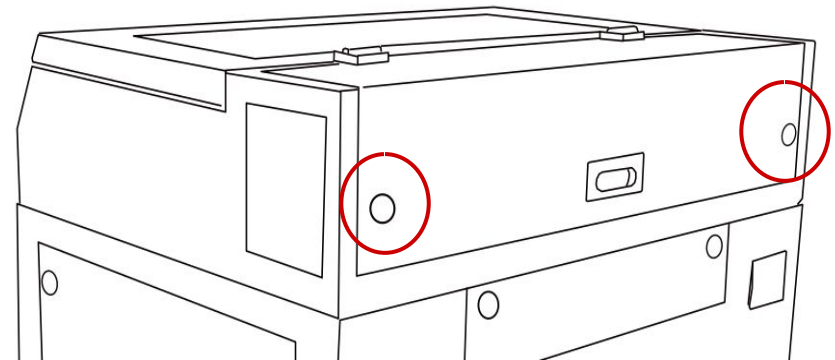
5. **Open the Back Panel.**

Diode to Mirror 1:

Mirror 1

Red Diode

Mirror 1 Assembly
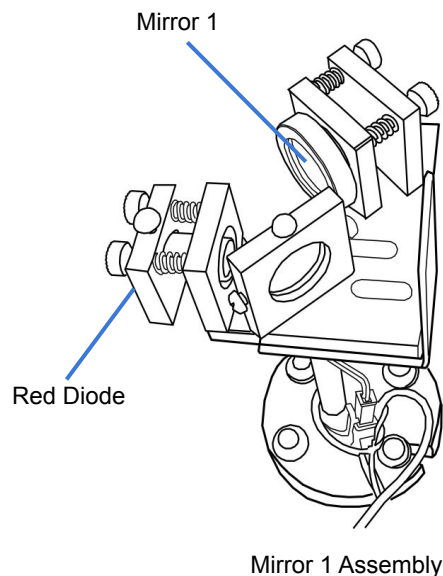
Align the laser output to Mirror #1 making sure that the beam hits close to the center of the mirror.

1. Open the Safety Lid.

2. Place Thermal Paper On Mirror 1. Make sure to place it firmly over **Mirror #1** to create a reference ring.

3. Close Safety Lid: Machine should be unable to fire the laser with the safety lid open.

4. Fire the Laser: Press the Test Fire icon on the touch screen. Open the lid and check the thermal paper for a burn mark.

5. Adjust The Mirror 1: Adjust Mirror 1 so that the burn mark will be at the center. Test again and adjust as needed.

6. Adjust Red Diode: Use your hex wrench, make incremental adjustments to the adjustment screws of the red beam diode, and position the red dot exactly over the center of the burn mark.

Mirror 1 to Mirror 2:

Mirror 1

Mirror 2
(Closest)

Mirror 2
(Farthest)

Mirror 1 is stationary but Mirrors 2 and 3 are located on the Y and X gantry respectively. Therefore both of those Mirrors need to be aligned in the nearest and farther position from the previous Mirror for proper alignment.
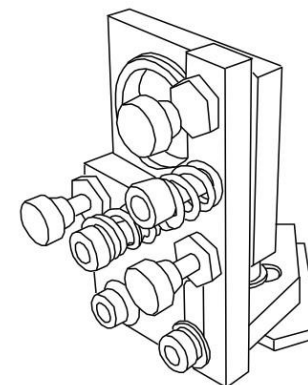
Mirror 2 is located at the left corner of the gantry (see picture above).

1. **Open the Safety Lid.**

2. **Place Thermal Paper:** Take a piece of thermal paper and place it firmly over **Mirror #2** to create a reference ring.
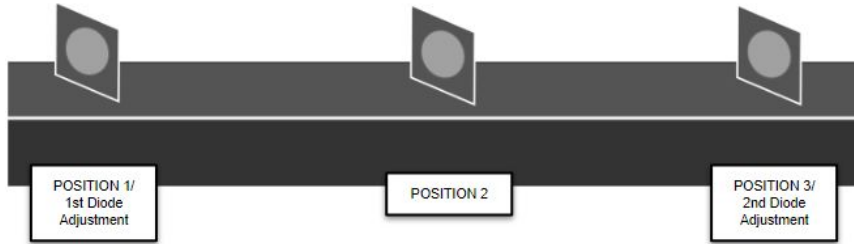
3. **Close Safety Lid.**

4. **Test Fire the Laser:** Press the Test Fire icon to create a burn mark on the thermal paper.

5. **Adjust Mirror #1:** Make incremental adjustments to the adjustment screws of **Mirror #1**.

Full Spectrum
L A S E R

Mirror 2 to Mirror 3:

Mirror 3 is located on the laser head assembly, we will have to check the alignment along the X-gantry. We recommend selecting three position to test the alignment and using two of those positions to adjust the red diode.

1. **Open the Safety Lid.**

2. **Place Thermal Paper.** Take a piece of thermal paper and place it firmly over **Mirror #2** to create a reference ring.

3. **Move the Laser Head Assembly to Position 1.**

4. **Close Safety Lid.**

5. **Fire the Laser.** Press the Test Fire icon to create a burn mark on the thermal paper.

6. **Check Results.** Adjust the Mirror if needed. Replace Thermal Paper as needed.

7. **Adjust Red Diode.** Make sure the diode is at the center of the burn mark.

8. **Move the Laser Head Assembly to Position 2.**

9. **Close Safety Lid.**

10. **Fire the Laser.** Press the Test Fire icon to create a burn mark on the thermal paper.

11. **Check Results.** Adjust the Mirror if needed. Replace Thermal Paper as needed.

12. **Repeat For Positions 3.**

Mirror 3 to Focus Lens:

The focus lens converges the laser beam to a single point. The focus lens does not require manual focusing, however it is important to ensure that the path from mirror #3 to the focal lens is straight throughout the Z-axis.
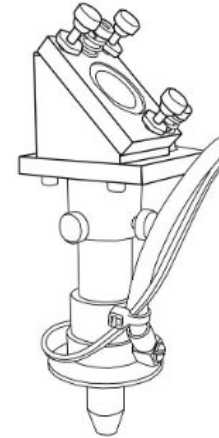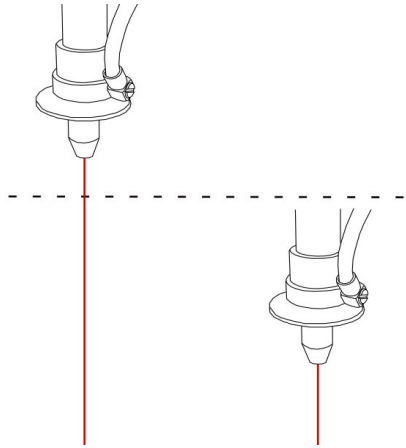

Please Note: The Focus Lens is taken off for this part as the coating can be damaged by the thermal paper.

1. **Open the Safety Lid.**
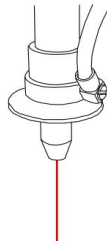
2. **Remove Focus Lens.** The Focus Lens is removed
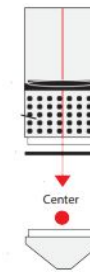
3. **Place Thermal Paper.** Take a piece of thermal paper and place it firmly over the **Focus Len Mount** to create a reference ring.

4. **Close Safety Lid.**

1st Position

2nd Position

5. **Position Laser Head to 1st Position.** Manually adjust the laser head assembly so that the z- belt is as high as it goes.
.

6. **Close Safety Lid.**

7. **Fire the Laser.** Press the Fire Laser icon to see a burn mark on the thermal paper.

8. **Adjust Mirror #3:** Make incremental adjustments to the adjustment screws of **Mirror #3** to move the burn mark over the center of the **Focus Len Mount.**

9. **Open the Safety Lid.**

10. **Position Laser Head to 2nd Position.** Manually adjust the laser head assembly so that the z- belt is as low as it goes.
.

11. **Close Safety Lid.**

12. **Fire the Laser.** Press the Fire Laser icon to see a burn mark on the thermal paper.

13. **Adjust Mirror #3:** Make incremental adjustments to the adjustment screws of **Mirror #3** to move the burn mark over the center of the **Focus Len Mount.**

Adjusting the Beam Attenuation:
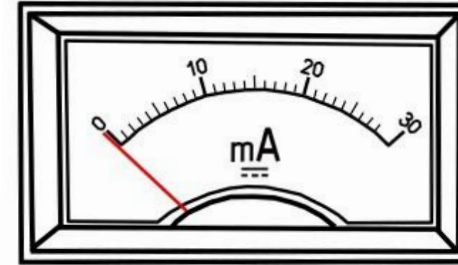
When a laser tube is installed the amps released by the machine needs to be adjusted. The laser machines comes with attenuator gauges for adjusting the amount of Amps released. A large number of Pro machines come with this beam attenuator dial and milliamp gauge to make the adjust easier. If your machine does not have the beam attenuator dial then the power supply needs to be replaced with one set to the appropriate voltage.

1. Turn on the machine. In order to adjust the milliAmps of the machine the machine must be on.

2. Check the milliamps. The Amps displayed will depend on the laser tube installed on the machine.

3. Adjust the Amps. The Amps your machine is set to correspond to the Laser Tube installed. The following chart list the Amps needed for each laser tube.

Amp Settings For Laser Tubes	
45 W	18 mA
90 W	24 mA
120 W	26 mA
150 W	28 mA

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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.

If the problem persists, it may be a belt or gantry issue.

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

A: The Pro will automatically focus to your material by touching the material and moving to the programmed focus height. If your machine does not move to the height try autofocusing manually using the autofocus button.

Is it still not focusing correctly, then the machine can still be focused manually using the provided focusing billet.

If your machine's laser head assembly moves irregularly, check belts. The belt may 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 change your air assist cone. Since different focus lenses have different focal heights, an air assist cone is made to work only with one lens.

Is your issue not listed here? Visit our Help Center and look at our comprehensive guides, videos, and other helpful resources.

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