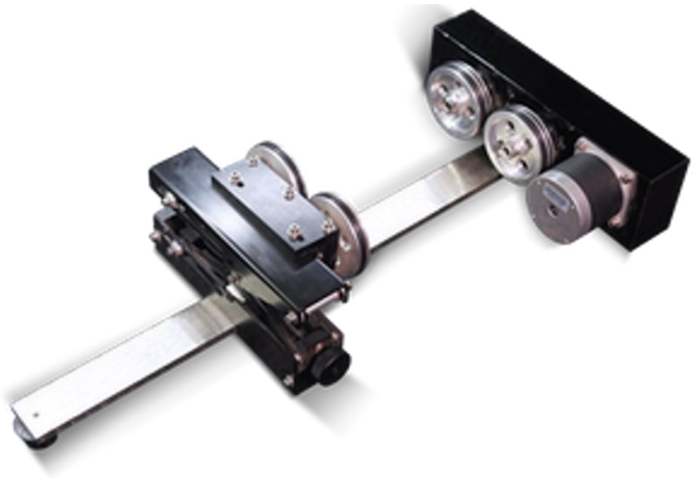
FEBRUARY 16, 2023

Full Spectrum LASER



OPERATING ROTARY ATTACHMENT

STEP BY STEP: HOW TO ENGRAVE ON CYLINDERS

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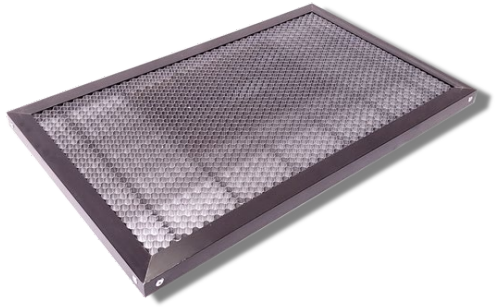
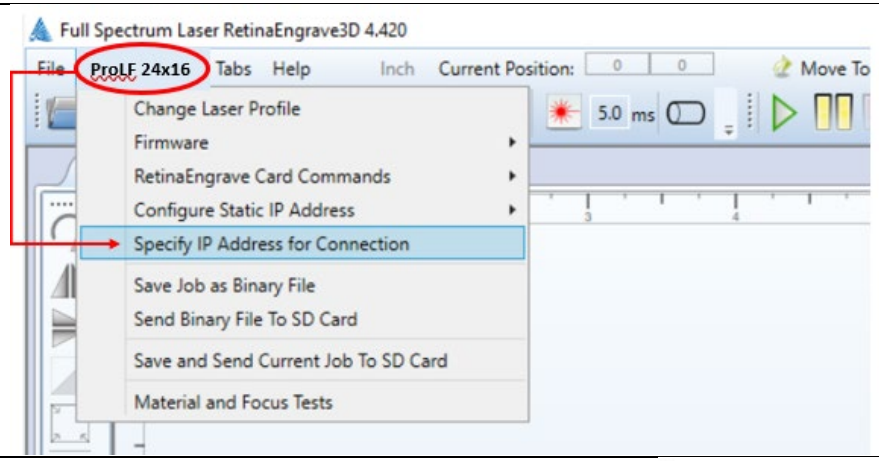
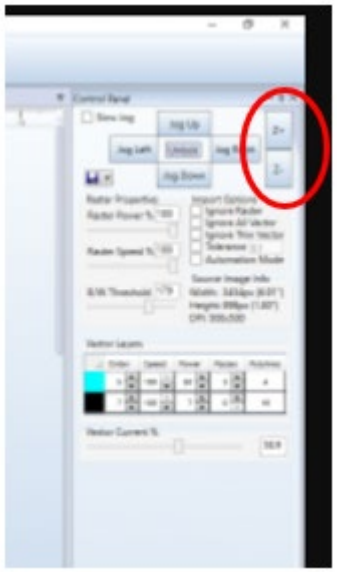
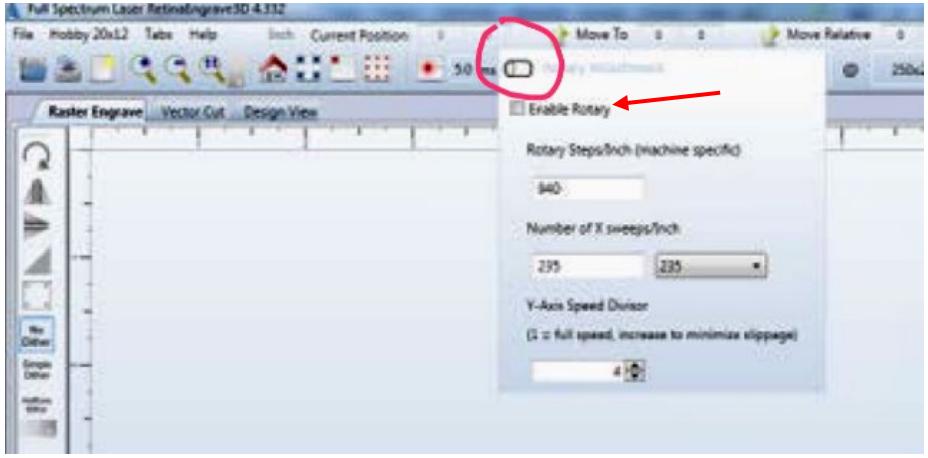
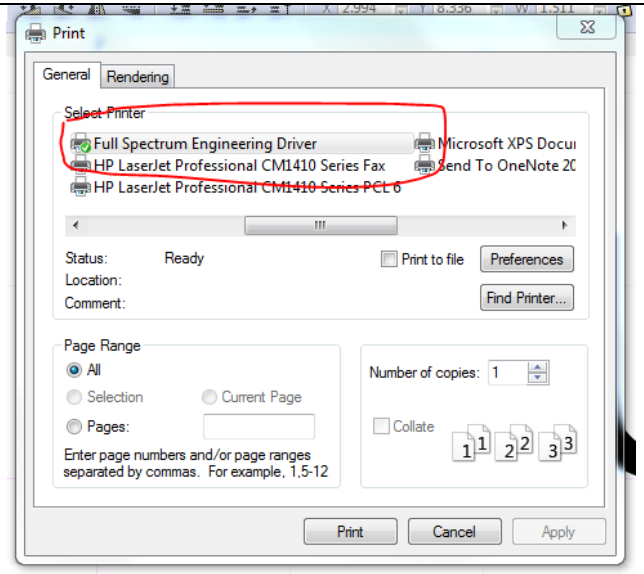
Date: 12/15/2022 -

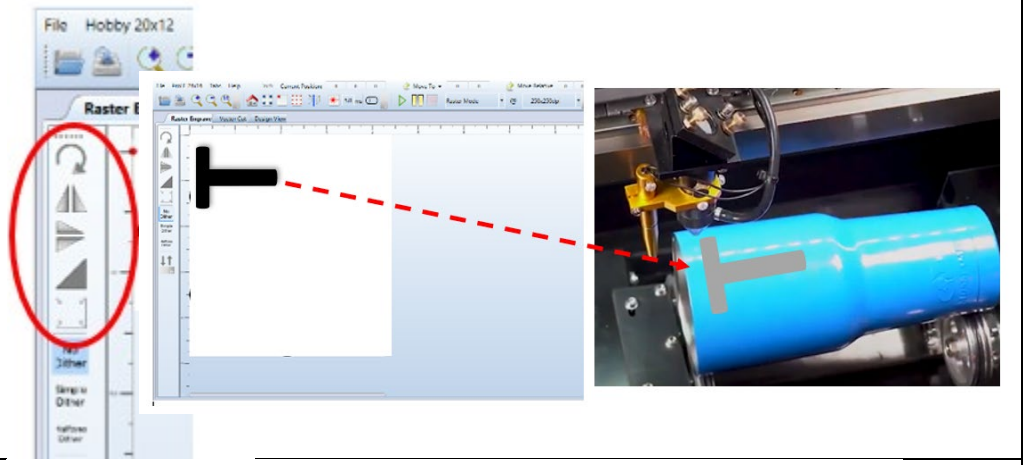
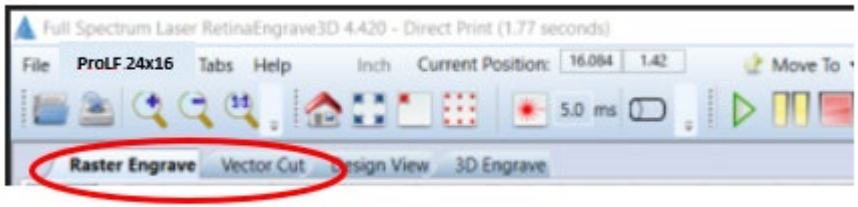
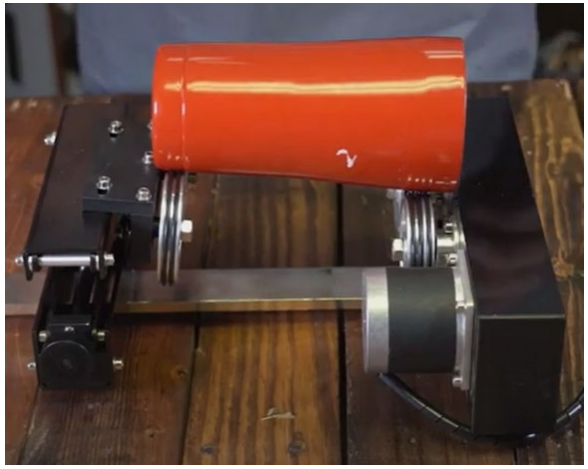
#	Step	Key Points	Why	Picture
1	Unhook laser connection	**-IMPORTANT: MAKE SURE POWER TO LASER IS OFF** **-Turn off power** **-Unscrew connection**	-This is necessary so you can plug in the rotary tool. Disconnecting or connecting while power is on can damage laser and injure operator.	
2	Remove hex plate from bottom of laser cutter	-You can place it next to the laser cutter while using the rotary. -The hex plate floats freely in the laser and can be lifted out -Be careful not to bump laser head or mirrors.	The rotary tool requires extra space and the hex plate is not needed.	

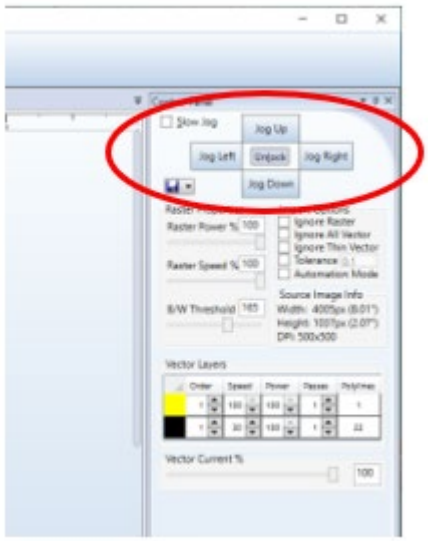
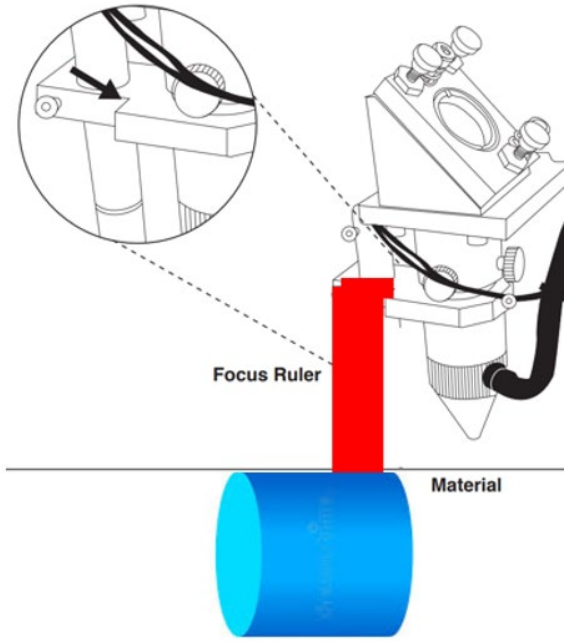
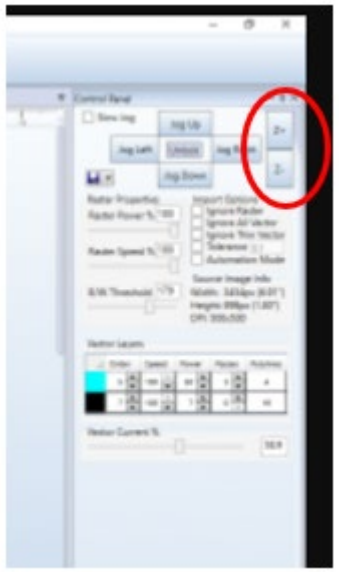
3	Place rotary on left hand side of laser cutter. Connect to laser cutter.	The heavy end with motors should go against the left hand side. The scissor jacks on the right. The unit should be aligned in the center of the black table. The collar of the connector can be loosely tightened.	Having the rotary on the left side in this laser produces more consistent results.	  
4	Turn Laser Cutter on	-There are three keys needed: • Toolbox key • Main Power key • Laser key (inside toolbox)	User the laser key in the laser machine to turn on. Check main power key is turned on. Check if emergency stop is engaged if the laser is not turning on.	 

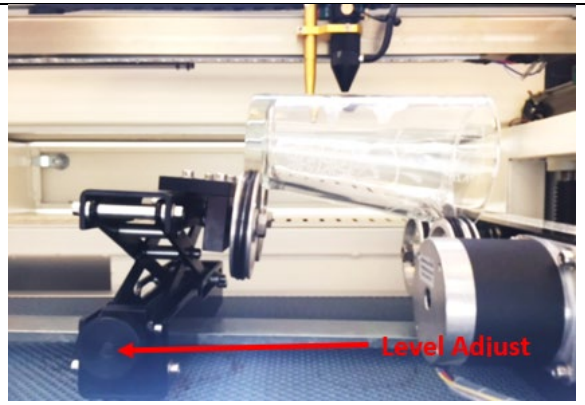
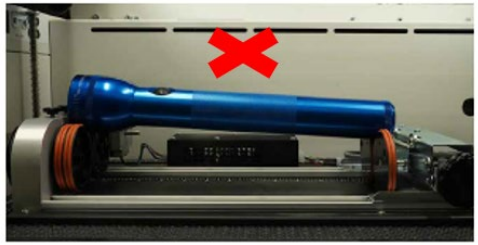
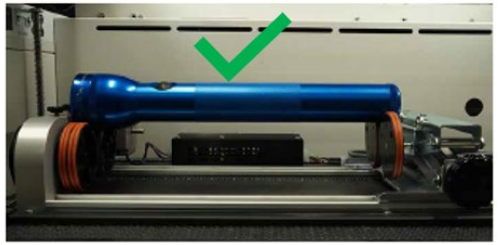
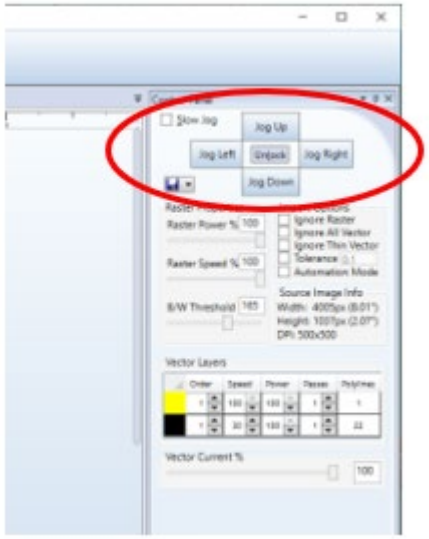
5	Turn on Air Filtration system	- Button is red when the system is off		
6	Check temperature on water chiller	If temperature at or above 26 C you will need to wait until it cools down.	Using the laser cutter when the temp is above 26 can damage the laser.	
7	Open your design file on the computer	-Double check file type (svg, pdf) -Artwork should be sized to fit on your material. -Make any edits/sizing in the software used to create the file.	You cannot edit files once they are sent to the laser software.	
8	Open RetinaEngrave	-Icon located on the desktop	This program is what controls the laser cutter.	

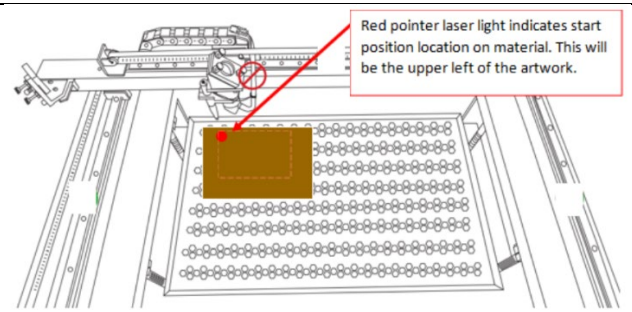
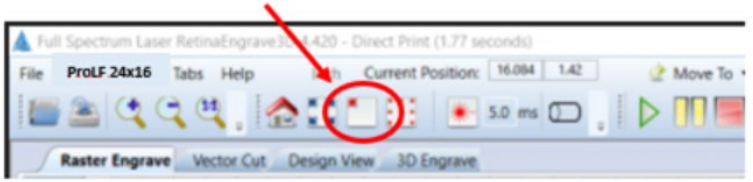
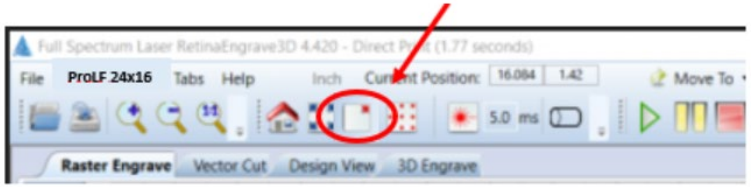
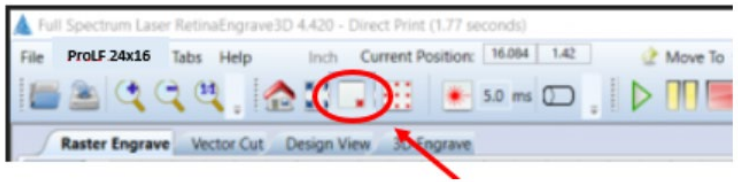
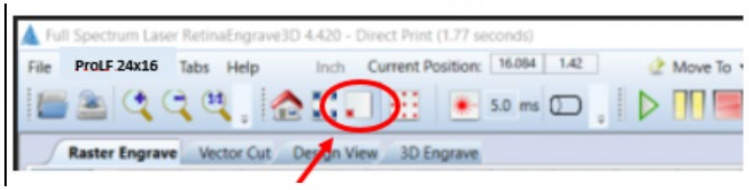
9	Connect laser cutter to RetinaEngrave	-ProLF 24x16 >Specify IP Address for Connection > Enter IP address shown -Once entered you should see 'Connected' in green in the bottom left corner of the program	-This allows you to control the laser cutter.	
10	Center laser head on rotary tool.	Rotary tool should be centered on the bed. Laser head centered on rotary tool. The cone of the laser head assembly should be over the highest point of the cylinder. Try aligning the red pointer laser in the center bolt heads of the rotary unit.	TIP: You may need to raise or lower the bed of the laser. Use the Z+ to raise the bed. Use Z- to lower bed.	 

11	Enable rotary in RetinaEngrave software.	-Press the Rotary cylinder icon at the top of the screen and check the box to enable rotary. -Change DPI in dropdown based on the material used. Due to a quirk in software, it is necessary to change the DPI setting. If you require the default setting of 500 DPI. Change it to 250 DPI, and then change it back to 500 DPI.	**Not making the DPI change will result in an engraved image that is distorted.**	
12	Send design to laser cutter	-In your image viewing software select '**Print'** and one of the printer options will be **'Full Spectrum Engineering Driver**' -Your image will import to the RetinaEngrave software Select 'Actual Size' on print screen under Paper Size and Handling		

13	Make changes to design in RetinaEngrave	Rotate your artwork so it will be applied correctly to your cylinder. You will want to mirror image your artwork. The rotary tool is turning in the reverse direction that is typical requiring the artwork to be mirror imaged.	Mirror Image Icons:  Rotate Icon: 	
14	Make sure Raster Engrave tab is selected at top of page.	-You cannot use the Vector cut option with the rotary; you can only engrave.		
15	Place material on rotary.	-Material is typically placed in top left of the bed for best results. -Avoid contact with the laser head.		

16	Move laser head over material.	-Use ‘Jog’ options on upper right part of RetinaEngrave software to move the laser head. Place a check in the “Slow Jog” box to make slower more exact moves. With rotary enabled only the jog left/right options will move the head. Jog up/down will rotate your object on rotary. *You can move the laser along the y-axis manually.		
17	Measure Focal Point (Z height)	Use the Z+ to raise the material higher. Use Z- to lower the material. When focus ruler touches top of material when hanging off the brass bracket on laser head, the laser will be in focus.		 

18	Make sure object is level	-Use small bubble level in tool kit to check if item is level. -Use knob on scissor jack to raise or lower the object.	If the top of the cylinder is not level, the result of the applied artwork will look distorted.	  
19	Make sure object is secure on rotary by jogging up and down.	-Use Jog **Up**/Down buttons to rotate material to test how secure it is on the rotary. Do a few full rotations to make sure the cylinder rotates smoothly without any issues.	If object shifts while you are engraving, it will negatively impact the results. If a portion of the cylinder extends beyond the rollers, it may drag on a bolt head or frame of the rotary tool. This will cause it to rotate inconsistently.	

20	Jog laser head to start position.	Use the jog buttons to move the laser head to where you would like the laser to start applying the artwork on the material.		
21	Perform Perimeter Check	Click the perimeter step button. Each time you click the button the laser head will move along one of the four sides of your artwork's perimeter. You will want step around all four sides and return the laser head to the left corner. Be sure to return to the top left corner before making any adjustments to the position of the material or artwork. Make any adjustments to either the position of the laser head, position of the material, or the artwork. Then do a second full perimeter check.	This is to double check the placement of the artwork on your material.	Start Position  1st Click  2nd Click  3rd Click  4th Click: Back to start position

<table>
<tr>
<td>22</td>
<td>Enter power/speed settings</td>
<td>-See manual for standard power/speed.

- You may need to experiment with settings on extra material to find the settings you prefer.

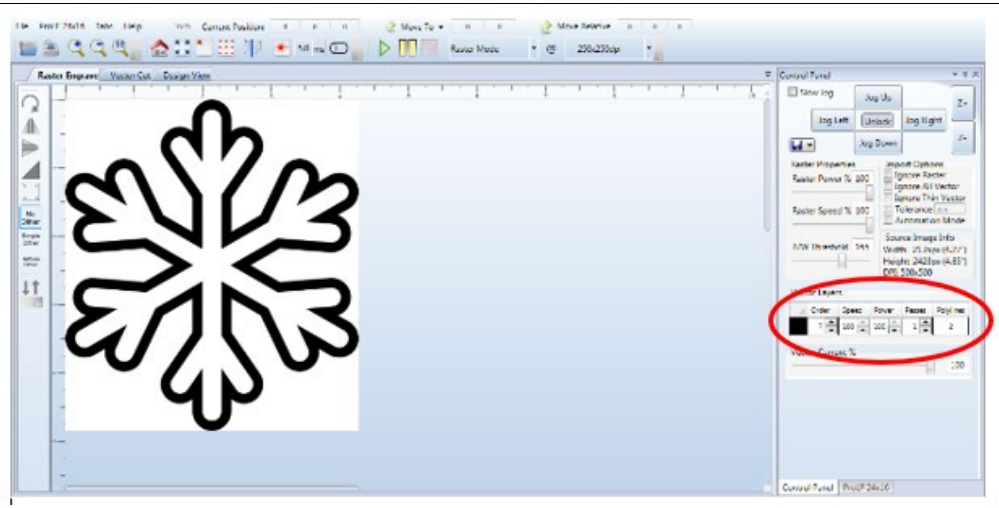
GLASS:
Speed: 100%
Power: 2%
DPI: 250

COATED METAL:
Speed: 20%
Power: 80%
DPI: 500

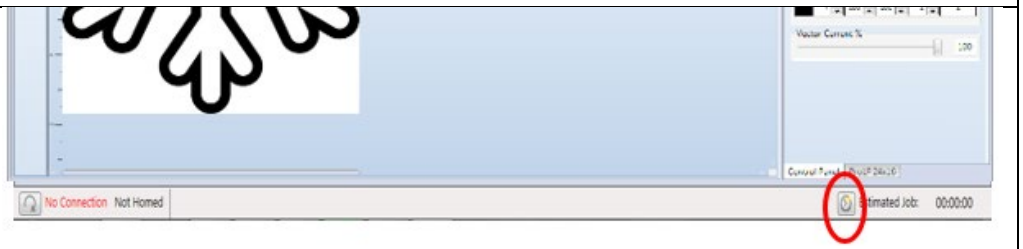
These are suggested starting settings. You may need to adjust for your project.</td>
<td>-These settings tell the laser how fast to move back and forth as well as how much power the laser uses.

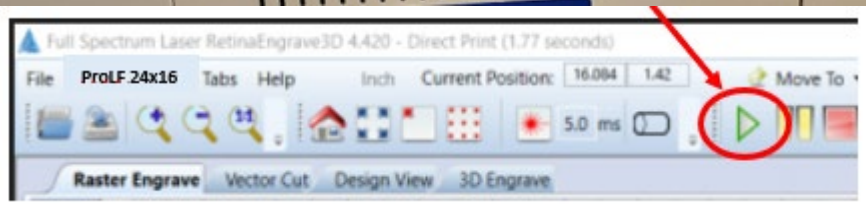
POWER: Higher percentage uses more power.

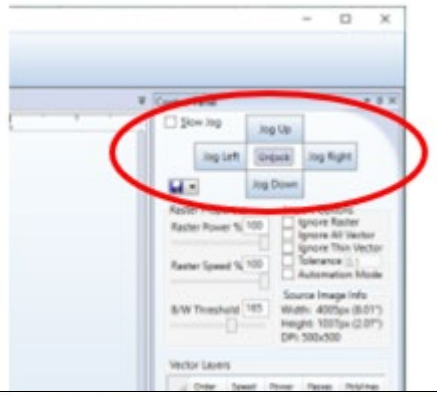
SPEED: Higher percentages moves the laser head faster. Slowing the laser speed intensifies the power.

PASSES: The number of times the laser will trace over the artwork.</td>
<td> 
<table>
<tr><th rowspan="2">Material</th><th colspan="4">Engrave</th></tr>
<tr><th>Speed</th><th>Power</th><th>Dither</th><th>DPI</th></tr>
<tr><td>Glass</td><td>100%</td><td>2%</td><td>No</td><td>250</td></tr>
<tr><td>Metal</td><td>20%</td><td>80%</td><td>No</td><td>500</td></tr>
</table></td>
</tr>
<tr>
<td>23</td>
<td>Time Check</td>
<td>Click clock icon to get a time estimate needed to complete the job.

Can you complete the job AND clean up before the end of your reservation?

You may need to book a new reservation.</td>
<td></td>
<td> 
</td>
</tr>
</table>

24	Close Lid before starting laser	-Be gentle when closing the lid! It is heavy. The lid is heavy and will fall fast Use handle on front to lower gently.	-Safety first!	
25	Click Start	-Do not open the lid while the laser is running! Observe job and watch for issues: • Excessive smoke • Fire • Unusual Performance	While glass and metal are not typical fire hazards, there is a chance missed debris from a previous job could ignite.	
26	Wait for job to finish	**Pause Button**: You can pause the job keeping the laser head in place in order to resume progress. **Stop**: Cancels the job and send the laser head back to the start position.		

27	Open Lid and Inspect	If you do not move the material, it is possible to run the job again over the top. You can adjust your settings and rerun the job.	The laser will be removing the coating on the metal to reveal the bare metal underneath. Laser will etch into surface of glass.	
28	Remove Material	Jog laser head out of the way if needed. IMPORTANT: Do not bump mirrors or laser head when removing materials.		
29	Turn Off Laser	Turn off power to laser. Use the keys to power off laser.	Laser must be off so that you can disconnect the laser.	
30	Disconnect Rotary Tool	Unscrew the collar of the connector of the rotary tool. Remove rotary tool and put away.		

31	Connect laser motor	Reconnect the laser motor to the connection point.		
32	Clean Up	Vacuum up soot and debris from laser bed. Wipe table and work surfaces as needed. Return tools to toolbox.		
33	Check Out	See staff. Return key.	Staff will verify area is clean and all tools are present.	 Keys that are not checked in from your account can result in additional fees.

TOOL INVENTORY

Drawer 1 – 7 items

- Focus Ruler (z-height guage)
- Caliper
- Level
- Scissors
- Knife
- Measuring tape
- Laser key

Drawer 2 – 3 items

- Instructions
- Rotary Instructions
- Suggested Power and Speed Settings

Drawer 3 – 1 item

- Cleaning Instructions

Drawer 4

- Staff Manuals

Drawer 5 – 1 item

- Rotary Tool
  (Used for engraving cylinders.)

Open Area Below Drawers

- Vacuum