



# Laser Cutter SOP



Stratasys Dimension Elite

Stratasys Fortus 250mc

## **Safety Information**

The information contained within this guide is limited and is not a total replacement for the standard operating manual. It is meant to educate new users operating within the GT Aero Maker Space about basic safety protocol and operation of the machine. For

applications deviating from the practices in this guide, please consult a Mentor staff member. We encourage creativity, community, and safety within the space.



This machine fires intense beams of light meant to cut or etch onto hard materials. Laser only fires when lid is closed. Avoid blocking the path of the laser other than the desired path.



Lasers have the potential to start fires on a variety of materials. Consult the Power/Speed settings tab. Laser can also release caustic gases from certain materials.

The Emergency Stop button is located on the front of each machine.



#### In Case Of FIRE:

1. Stop machine, turn off all ventilation, and *keep the lid closed*. Fire may suffocate
2. If it persists, open lid and smother with fire blanket
3. For out-of-control or large fires, use the fire extinguisher

#### Safe Operation:

1. All ventilation systems are on and in the correct position
2. Lid is closed and laser carriage's motion is uninhibited
3. Always watch jobs to completion. Use sunglasses for high power settings.
4. Know what you're cutting – don't cut materials that contain chlorine (Never cut PVC, vinyl, polycarbonate)

#### **Operation Guide**

1. Power on laser cutter and computer - open AutoCAD
2. Import file to be cut or laser etched

3. Prepare file (AutoCAD, PDF, etc.)
4. Use Epilog Job manager to set power and speed settings
5. Align material inside of laser bed
6. Focus laser
7. Run job with lid open to check correctness
8. Turn on all ventilation/Air assist
9. Close lid and run job. Remember to turn off ventilation, retrieve flash drive, and power down what is not in use after completion.

Power/Speed – consult to find the recommended settings

Maintenance – performed by the machine masters

Tips – check out the latest in tricks to running the laser cutters

**Power on laser cutter and computer - open AutoCAD**

Fusion 40

Description

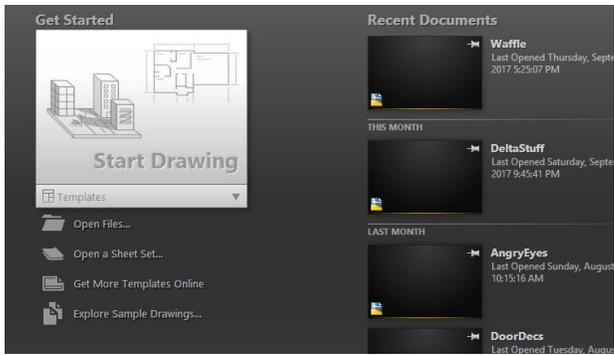
Legend 36EXT

	<p>Turn on switch located on front/side of machine. The machine will run through the initialization process. If already on, do nothing.</p>	
	<p>Log onto the computer. Switch users if it is not your account or ask permission. Open AutoCAD.</p>	
		

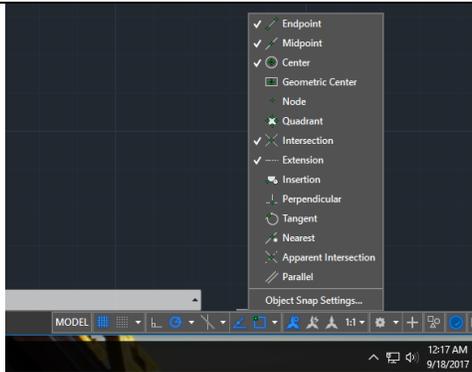
**Import file to be cut or laser etched (AutoCAD)**

Fusion 40/Legend 36EXT

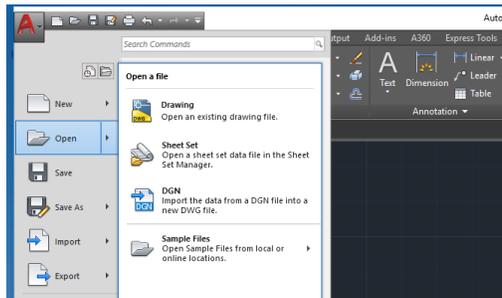
Description



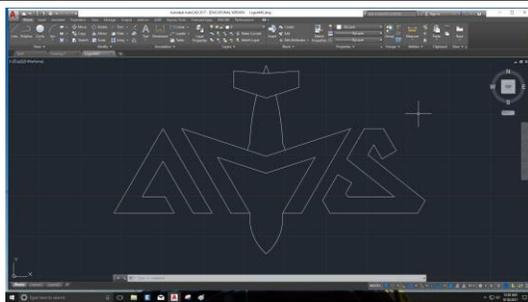
Open file into AutoCAD (supports .dwg, .dxf). For other file types, consult the mentor on duty.



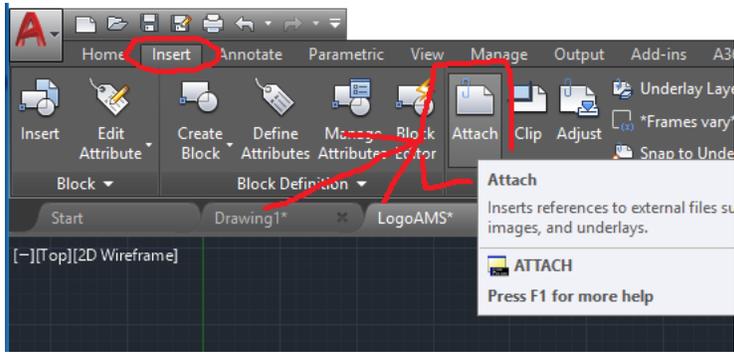
Make settings in bottom right corner match settings shown in image. "Perpendicular" and "Tangent" are also good to use in some applications.



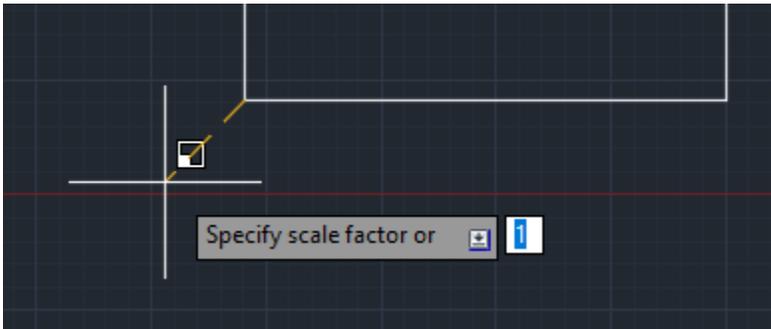
Open your file into AutoCAD. Now may be a good time to stick in your flash drive.



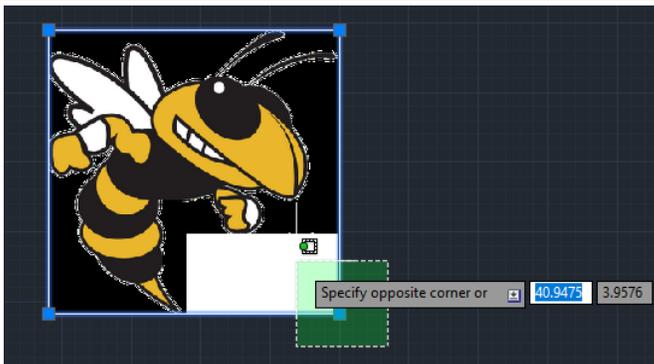
Your file appears.



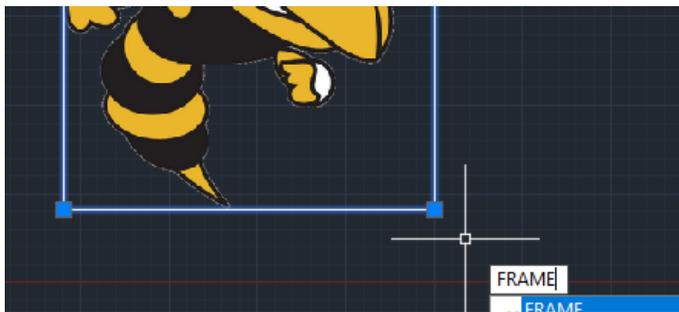
Use “Attach” under the Insert tab to import an image if required.



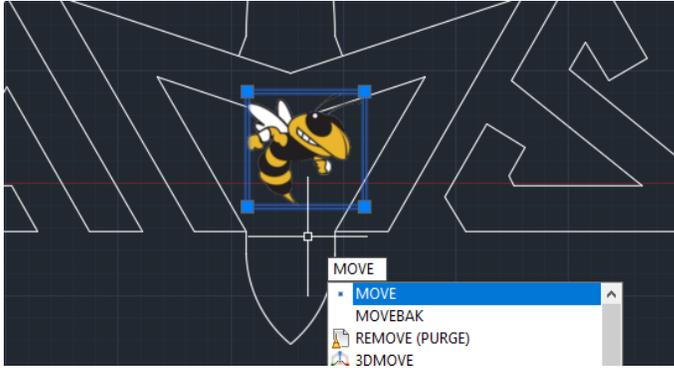
Click once and drag to initially size image. Then click again and the image will fill that space.



Select the image and in the upper corner select “Remove Background”.  
NOTE: white backgrounds will not engrave. White=no power, Black=100% of upper power bound, Color=scaled power

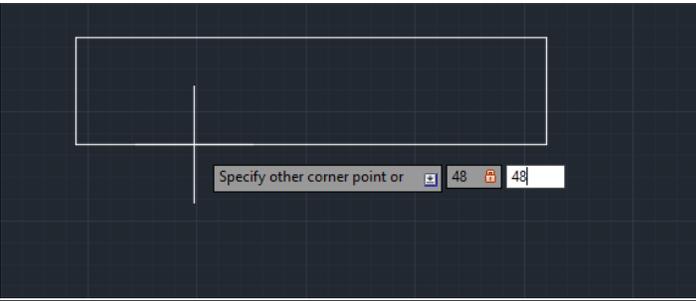
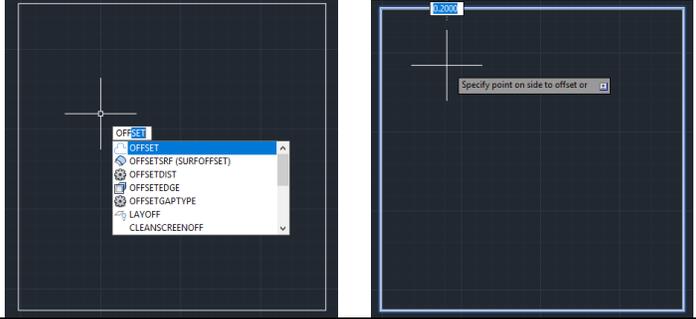
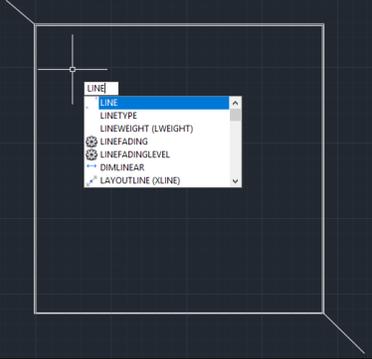
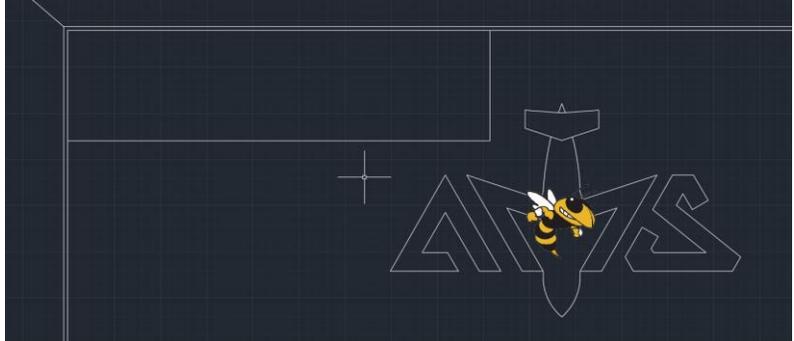


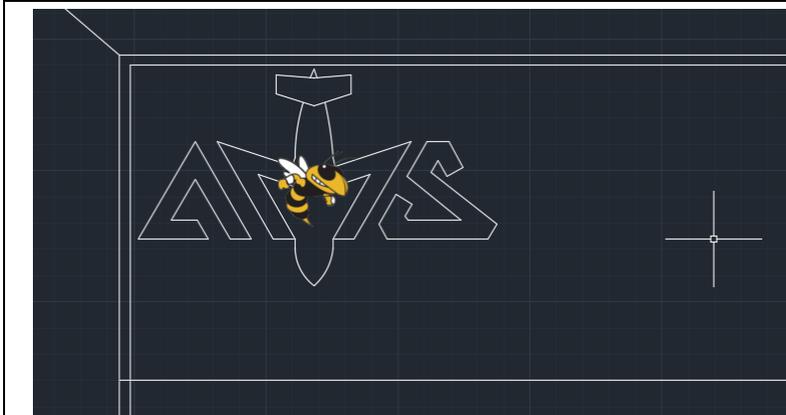
Highlight the image and type “frame”, then type “1” then enter. Repeat this process, only with “0” instead of 1 to remove the frame.



Use commands “Scale”, “Rotate”, and “Move” to put the image in its place.

## Prepare file (AutoCAD)

Fusion 40/Legend 36EXT	Description
	<p>Make a 48" x 48" box. Command "Rect", enter, then click, 48, tab, 48, enter.</p>
	<p>Command "offset", enter, 0.2, click box and move lines inside.</p>
	<p>Add tick marks to the upper left and bottom right corners. Use "line" command. NOTE: The lines are attached to the outermost box only.</p>
	<p>Create your material size and orientation. The upper left of the outside box represents the origin of the machine(upper left on laser bed). Use "line" to make material shape and "move" to place your cuts</p>



For best results, place as close to upper left without crossing inner box line. NOTE: Layout cuts close together to maximize usable material after cut.



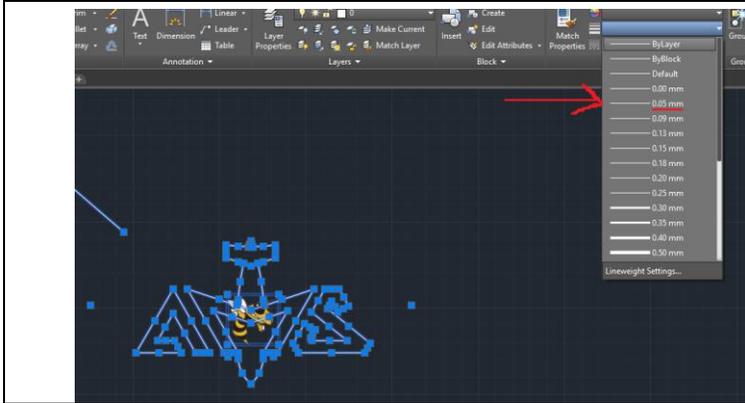
Delete box lines and material lines as well as anything within that area that should NOT be cut or rastered.



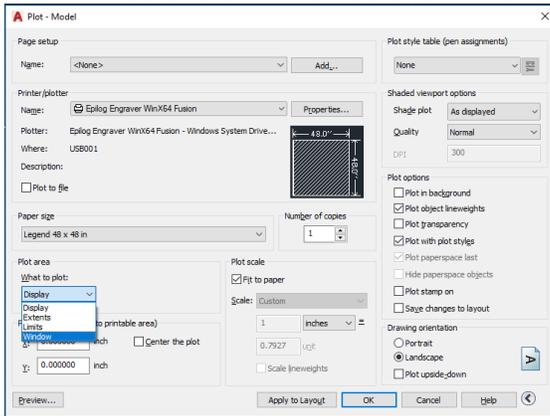
Use “explode” on all the *lines only*. It will destroy images but makes compound lines printable.



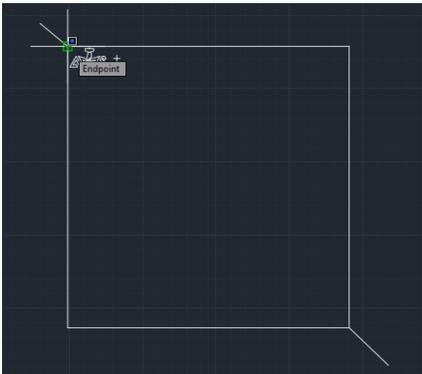
Use “overkill” on everything. Hit OK to the dialog box that pops up.



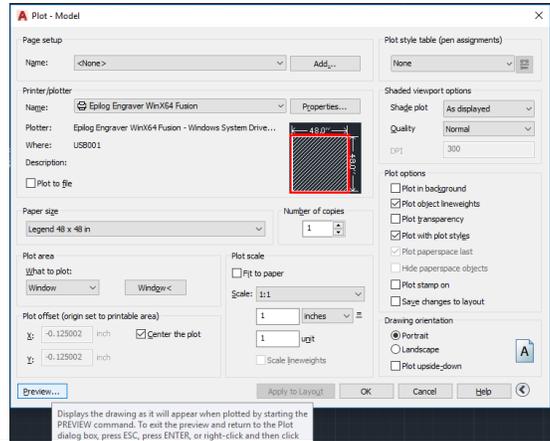
Select everything and set line thickness to .05mm in order to cut. Anything larger than this, including all images, will be a raster with that thickness. Hit ESC to deselect everything.



**CTRL + P**  
 Select Printer: WinX64 Fusion or Legend 36EXT  
 Paper Size: Legend 48x48  
 Plot Area: Window



Click the inside of bottom tick mark, then click the inside of the top tick mark to select the window print area

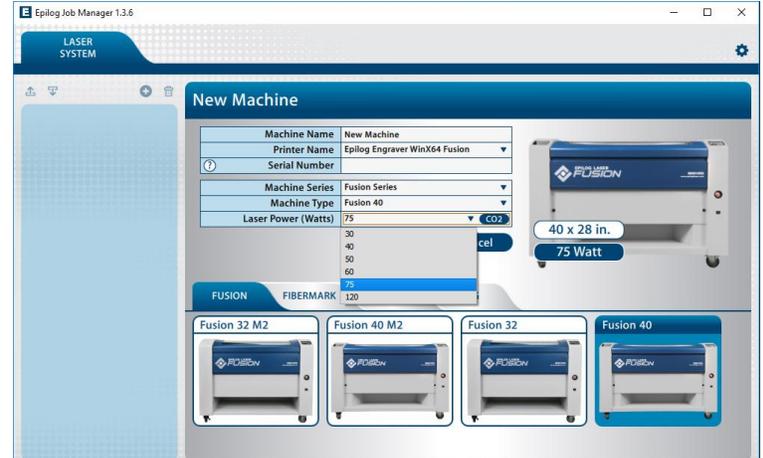


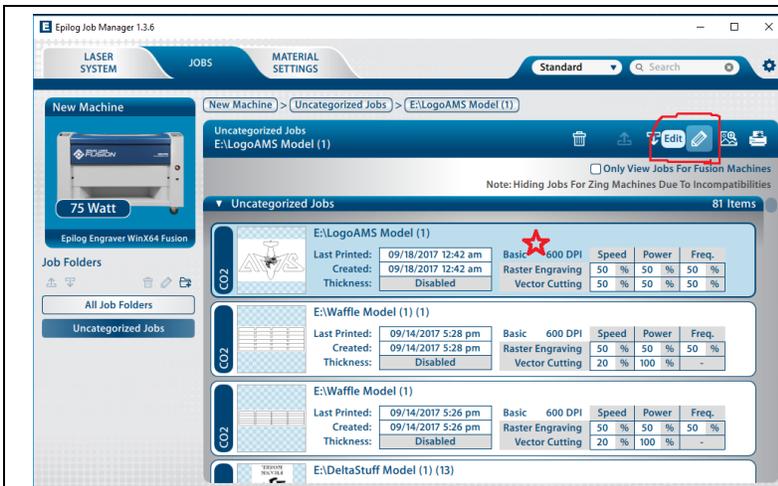
Check "Center the Plot", Uncheck "Fit to Paper", in scale chose "1:1", and select "Portrait". Make sure the dialog box looks like the image. Then click OK to send the job to the job manager.

# Use Epilog Job manager to set power and speed settings

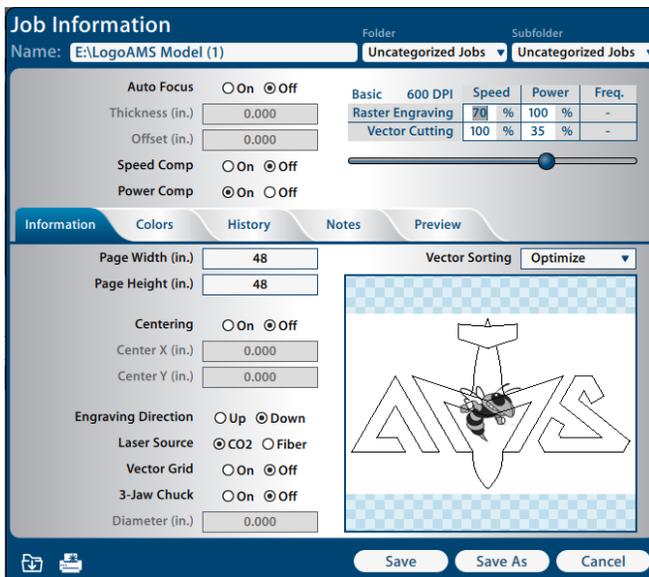
Fusion 40/ Legend 36EXT

Description

 <p>The splash screen for Epilog Job Manager features the title 'EPILOG LASER Job Manager' in large blue letters. Below the title are four icons representing 'Organize' (a folder with a plus sign), 'Preview' (a magnifying glass over a photo), 'Edit' (a pencil over a document), and 'Print' (a printer with a starburst). The bottom left corner says 'MADE IN USA www.epiloglaser.com'. The bottom right corner has the Epilog Laser logo and copyright information: '2016 © Epilog Laser. All Rights Reserved. Version 1.3.6'. A 'Finalizing...' status bar is at the very bottom.</p>	<p>Open Epilog Job Manager. Type in windows search bar for it if not already visible on the task bar.</p>
 <p>The 'New Machine' window in Epilog Job Manager 1.3.6 is shown for a Fusion 40 machine. The 'Machine Type' dropdown is set to 'Fusion 40'. The 'Laser Power (Watts)' dropdown is set to '75'. The 'Machine Series' is 'Fusion Series'. The 'Printer Name' is 'Epilog Engraver WinX64 Fusion'. The window shows a preview of the Fusion 40 machine with dimensions '40 x 28 in.' and '75 Watt'. Below the main form are four thumbnails for other machine models: Fusion 32 M2, Fusion 40 M2, Fusion 32, and Fusion 40.</p>	<p>Set machine settings dependent on machine you are using. Use left image if you are using the Fusion 40. Use below if you are using the 36EXT.</p>
 <p>The 'New Machine' window in Epilog Job Manager 1.3.6 is shown for a Legend 36EXT machine. The 'Machine Type' dropdown is set to 'Legend 36EXT'. The 'Laser Power (Watts)' dropdown is set to '50'. The 'Machine Series' is 'Legend'. The 'Printer Name' is 'Epilog Legend 36EXT'. The window shows a preview of the Legend 36EXT machine with dimensions '36 x 24 in.' and '50 Watt'. Below the main form are four thumbnails for other machine models: Mini 18, Mini 24, Helix 24, and Legend 36EXT.</p>	<p>36EXT machine settings are image to the left. Click Save when finished.</p>



Go to the Jobs Tab and click on your job. Then click the Edit icon when it pops up.



Set Raster (Engrave) and/or Vector cutting speed and power settings. Use the "Power/Speed" tab in this SOP



When finished, Select "Quick Print"

## Align material inside of laser bed

Fusion 40/Legend 36EXT

Description

	<p>Place material inside the laser on the bed. Push as far into the upper left corner as possible. DO NOT lean on the bed or machine.</p>
	<p>Use weights or tape on the material to make it as flat as possible. Be sure the laser carriage will at no time be impeded during the job.</p>

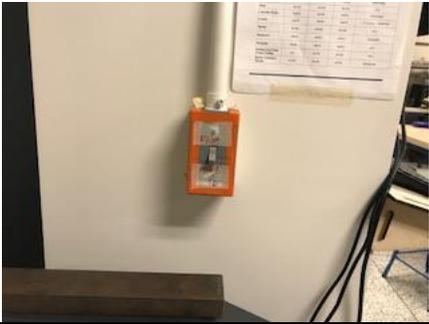
# Focus laser

Fusion 40	Description	Legend 36EXT
	<p>Go to the focus menu.</p>	
	<p>Press GO on the 36EXT, or place the focus triangle gauge on the laser carriage.</p>	
	<p>Use the joystick to move the bed up and down. Make the top of the material just touch the bottom of the triangle.</p>	
	<p>Remove the triangle and go back to the job menu.</p>	

**Run job with lid open to check correctness**

Fusion 40	Description	Legend 36EXT
	<p>With the lid open, hit the GO button. To see the laser, hit the red laser button. It will turn on the laser pointer.</p>	
	<p>When you are satisfied you are right or the test is complete, hit the red "stop" button and <i>wait for the carriage to stop</i>. Then hit "reset".</p>	

**Turn on all ventilation/Air assist**

Fusion 40	Description	Legend 36EXT
	<p>Flip the ventilation switch to the right of the machines on the wall.</p>	<p>(Same)</p>
	<p>Turn on the air compressor. 1 is the Fusion 40, 2 is the Legend 36EXT</p>	
	<p>Check that the lever is in the correct position.</p>	<p>(Same, but lever behind 36EXT)</p>
	<p>Close the lid of the machine and Press "GO". Remember to watch your job to completion. Use the E-stop if necessary.</p>	

**Power/Speed – FUSION 40**

	<b>Speed</b>	<b>Power</b>	<b>Frequency/DPI</b>
<b>Acrylic</b>			
Photo Engraving	90	40	300 DPI
Photo Engraving	90	55	600 DPI
Cutting 1/8" (3mm)	10	100	100 f
Cutting 1/4" (6mm)	3	100	100 f
Cutting 3/8" (9.5mm)	1	100	100 f
<b>Plywood</b>			
Photo Engraving	100	90	300 DPI
Photo Engraving	100	80	600 DPI
Deep Engraving	90	100	600 DPI
Cutting 1/8" (3mm)	20	100	10 f
Cutting 1/4" (6mm)	5	100	25 f
Cutting 3/8" (9.5mm)	1	100	25 f
<b>Balsa Wood/Bass Wood</b>			
Photo Engraving	100	20	600 DPI
Cutting 1/32" (0.75mm)	100	30	10 f
Cutting 1/16" (1.5mm)	100	70	10 f
Cutting 1/8" (3mm)	100	90	10 f
Cutting 1/4" (6mm)	100	100	10 f
<b>Plastic</b>			
Photo Engraving	90	20	300 DPI
P. Engraving (dense)	90	40	300 DPI
P. Engraving (dense)	90	25	600 DPI
Cutting 1/16" (1.5mm)	10	40	100 f
<b>Anodized Aluminum</b>			
Photo Engraving	90	35	400 DPI
Photo Engraving	90	40	600 DPI
<b>Glass</b>			
Photo Engraving	35	100	300 DPI
<b>Leather</b>			
Photo Engraving	90	20	300 DPI
Photo Engraving	90	25	600 DPI
Cutting 1/8" (3mm)	30	100	50 f

\*Interpolate between similar materials for material settings not listed here

## Power/Speed – LEGEND 36EXT

	Speed	Power	Frequency/DPI
<b>Acrylic</b>			
Photo Engraving	100	50	300 DPI
Photo Engraving	100	35	600 DPI
Cutting 1/8" (3mm)	15	100	5000 f
Cutting 1/4" (6mm)	8	100	5000 f
Cutting 3/8" (9.5mm)	3	100	5000 f
<b>Plywood</b>			
Photo Engraving	30	100	300 DPI
Photo Engraving	70	100	600 DPI
Deep Engraving	30	100	600 DPI
Cutting 1/8" (3mm)	30	80	500 f
Cutting 1/4" (6mm)	10	100	500 f
Cutting 3/8" (9.5mm)	6	100	500 f
<b>Balsa Wood/Bass Wood</b>			
Photo Engraving	80	100	600 DPI
Cutting 1/32" (0.75mm)	55	100	500 f
Cutting 1/16" (1.5mm)	45	100	500 f
Cutting 1/8" (3mm)	30	100	500 f
Cutting 1/4" (6mm)	15	100	500 f
<b>Plastic</b>			
Photo Engraving	100	55	300 DPI
P. Engraving (dense)	100	45	300 DPI
P. Engraving (dense)	100	30	600 DPI
Cutting 1/16" (1.5mm)	30	50	5000 f
<b>Anodized Aluminum</b>			
Photo Engraving	100	60	400 DPI
Photo Engraving	100	40	600 DPI
<b>Glass</b>			
Photo Engraving	30	100	300 DPI
<b>Leather</b>			
Photo Engraving	100	50	300 DPI
Photo Engraving	100	30	600 DPI
Cutting 1/8" (3mm)	50	80	500 f

\*Also consult mentor for material settings not listed here

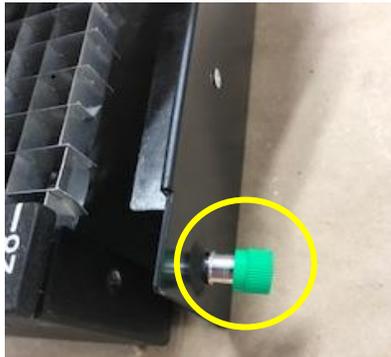
## Maintenance

Clean the lens with optical cleaning solution and Q-tip DAILY.

Empty laser bed grate bin WEEKLY. Vacuum out ventilation and other dirty areas.

Check laser alignment/origin MONTHLY.

Check laser machine level to the floor YEARLY.

Fusion 40	Description	Legend 36EXT
	Remove the laser carriage and lower the bed height	
	Have two people lift opposite sides of the bed out of the machine	
	Remove the back of the bed by unscrewing the green knob.	

	<p>Dump the contents of the bed into the trash</p>	
	<p>Put the 'back' back on the bed and make sure to align it properly.</p>	
	<p>Clean using a vacuum for larger chunks and a damp paper towel for wood dust.</p>	
	<p>Vacuum the dust around the ventilation holes.</p>	

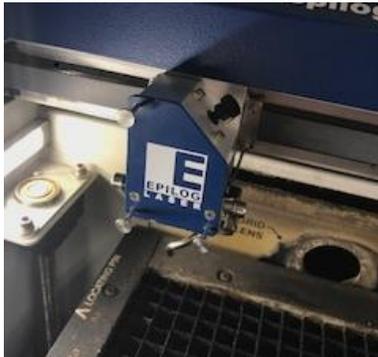


Now that everything is cleaned, carefully place the bed back into the laser machine and don't bang the carriage



Make sure the alignment pegs on the laser bed fit into the alignment holes underneath. The bed should not be able to slide and look like it's back in place

## Cleaning the Lens

	<p>Unscrew the 3 screws holding the carriage on. Note: they do not come all the way out</p>	
	<p>Find the Q-tips and optical solution underneath the laser.</p>	
	<p>Place 1 to 2 drops of solution on the Q-tip</p>	
	<p>Use the Q-tip to “pick-up” the dust and debris on the lens. Then wipe the lens clean. Do not touch or scratch the lens</p>	



Put the carriage back in the laser and tighten (finger tight) the 3 screws. Note: The side rails must slide on top of the side pegs.

### **Tips / Problem Diagnostics**

Turn the machine off and back on.

If the bed moves all the way down during initialization, that's ok, just move it back up under the focus menu

To set a different origin, jog the carriage to that point and push the joystick in (click once)

To set origin back to original home, go to configuration menu and click joystick (Restore XY home)