

How To Laser Cut With Rhino5



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COLLEGE of DESIGN UNIVERSITY OF MINNESOTA

General Rules:

NEVER LEAVE THE LASER RUNNING UNATTENDED! Fires happen unexpectedly. If you need to step out, ask someone to watch the laser for you.

IF A FIRE BREAKS OUT, USE THE CAN OF FIRE SUPPRESSANT LOCATED BY THE LASER! Do not put still-smoldering pieces in the garbage.

NEVER CUT A MATERIAL THAT IS NOT IN THE MATERIALS DATABASE! Damage to the laser and/or toxic emissions may occur. If you would like to cut a material that is not on the list, ask the lab attendant or shop personnel.

COMMERCIAL AND FREELANCE WORK ARE NOT PERMITTED! College of Design academic work has priority over other University academic work.

Laser usage costs \$.20/min, beginning when you log into the computer and ending when you log out. Logging out of the computer will terminate the laser job.

A minimum Gopher Gold balance of \$10 is required to use the laser.

Laser use is first-come, first-served.

Be courteous; avoid long projects when there are other students waiting.

Clean up after yourself. Use the vacuum to suck up small scraps.

Do not brush waste pieces into the cabinet. Damage to the laser may occur.

If ever in doubt, ask the lab attendant or shop personnel.

File Set-up Tips

Download and use the template from the shop's website (right click and save as).

If you choose to not use the template, do the following:

- Draw/place your parts in a box which is the same size as the stock you will be cutting. This box should have its print width set to *NO PRINT*.
- The laser cutter bed size is 18" x 32".
- Allow a 1/4" margin around the stock to ensure all parts will be cut.
- Lines to be vector cut **MUST** have their print width set to *HAIRLINE*.
- Lines to be vector cut **MUST ALSO** be set to the correct colors. See below for color specifications.

Avoid stacked lines. If there are multiple lines drawn on top of each other, the laser will cut them all!

Like any other cutting tool, you need to consider the width of the cut (kerf). The laser has a kerf of about .01", depending on the material cut. Thicker material generally has a wider kerf. If you need to cut parts that will fit together snugly, we suggest making a test cut.

The minimum width of pieces to cut is about 1/32". Anything smaller will burn! Again, this depends on the thickness of the material being cut.

Power and speed settings are assigned in the print driver according to line color. Except in rare situations, you will not change the power and speed settings. We have saved laser settings for commonly cut materials.

These are the default color assignments we are using. The laser will always process them in this order:

BLACK	(R255, G255, B255)	Raster engrave	lineweight > hairline or solid hatch
RED	(R255, G0, B0)	Vector engrave - shallow	lineweight = hairline
GREEN	(R0, G255, B0)	Vector engrave - deep	lineweight = hairline
YELLOW	(R255, G255, B0)	Vector cut - interior cuts	lineweight = hairline
BLUE	(R0, G0, B255)	Vector cut - exterior cuts	lineweight = hairline

Vector cutting/vector etching = fast/relatively cheap

Raster engraving = slow/expensive

Using the Laser Cutter

To send a file to the laser cutter, go to **File > Print** or press **Ctrl + P**.

Select **LASER CUTTER**

Click **Properties**

Select **Manual Control** tab

Click **Load**

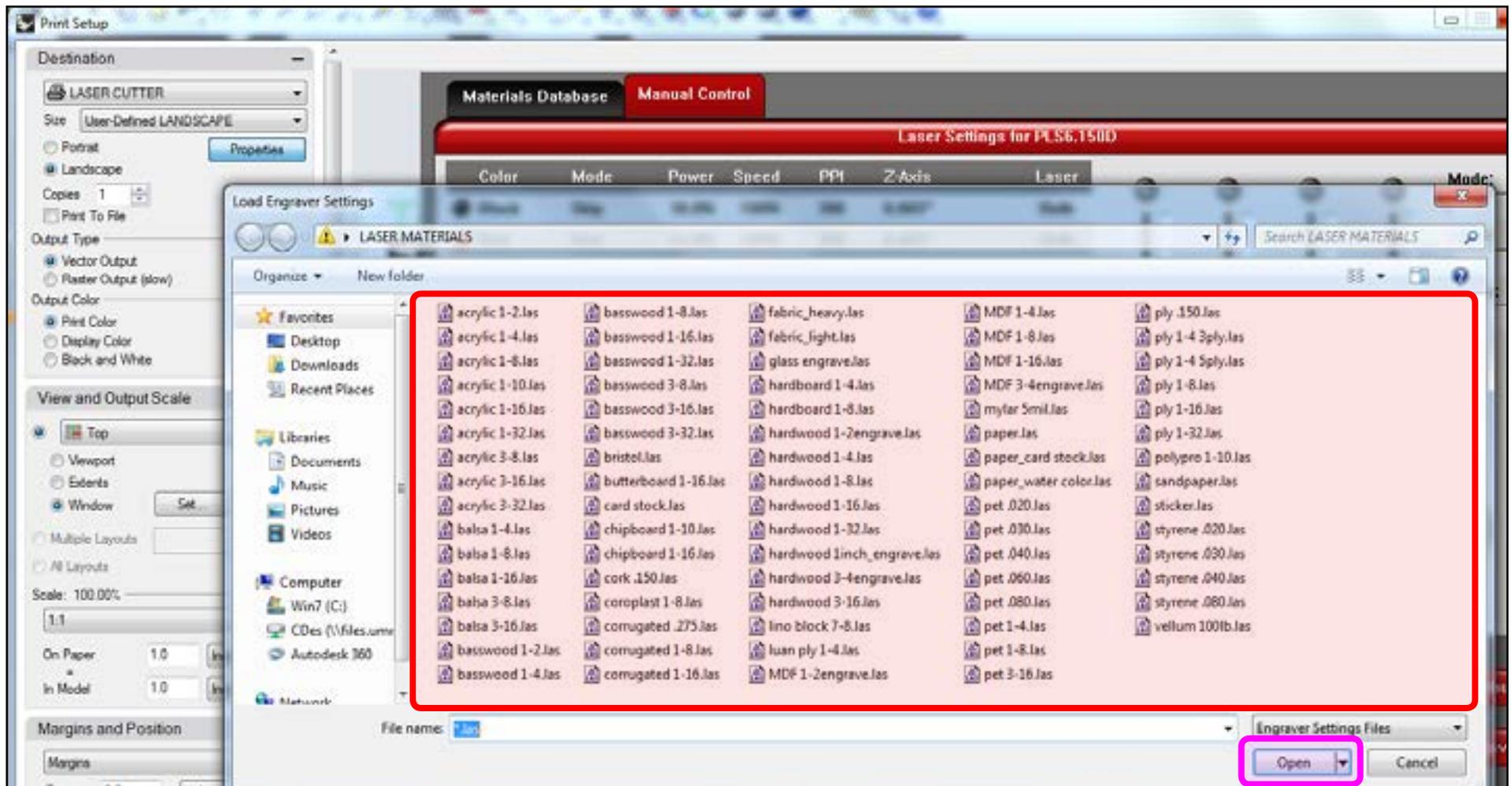
The screenshot shows the software interface for a laser cutter. On the left, the 'Destination' dropdown is set to 'LASER CUTTER' (highlighted with a red box), and the 'Properties' button is highlighted with a purple box. The main window has the 'Manual Control' tab selected (highlighted with a green box). The 'Laser Settings for PLS6.1500' section contains a table of material settings:

Color	Mode	Power	Speed	PPI	Z-Axis	Laser
Black	Rast	30.0%	100%	300	0.125"	Both
Red	Vect	15.0%	100%	300	0.125"	Both
Green	Vect	30.0%	100%	300	0.125"	Both
Yellow	Vect	100%	8.0%	200	0.125"	Both
Blue	Vect	100%	8.0%	200	0.125"	Both
Magenta	Skip	100%	0.0%	200	0.125"	Both
Cyan	Skip	100%	0.0%	200	0.125"	Both
Orange	Skip	100%	0.0%	200	0.125"	Both

Below the table are sliders for Power, Speed, PPI, and Z-Axis. The 'Raster' tab is active, showing 'Normal' print direction and 'Image Density' settings. The 'Load' button is highlighted with a cyan box. Other buttons like 'Apply', 'Defaults', 'Save', 'OK', and 'Cancel' are also visible.

Select the material you will be cutting from the list.

Click *Open*



By default we have the laser set up to skip the color black. If you require raster engraving black areas, do the following:

Select **Black**

Set **Mode** to **Rast** or **Rast/Vect**

Click **Set**

Click **OK**

The screenshot shows the 'Laser Settings for PLS6.1500' dialog box. The 'Materials Database' tab is active, displaying a table of settings for various colors. The 'Black' row is highlighted with a red box. The 'Mode' dropdown menu is highlighted with a pink box and set to 'Rast'. The 'Set' button is highlighted with a green box, and the 'OK' button is highlighted with a cyan box.

Color	Mode	Power	Speed	PPI	Z-Axis	Laser
Black	Rast	30.0%	100%	300	0.125"	Both
Red	Vect	15.0%	100%	300	0.125"	Both
Green	Vect	30.0%	100%	300	0.125"	Both
Yellow	Vect	100%	8.0%	200	0.125"	Both
Blue	Vect	100%	8.0%	200	0.125"	Both
Magenta	Skip	100%	0.0%	200	0.125"	Both
Cyan	Skip	100%	0.0%	200	0.125"	Both
Orange	Skip	100%	0.0%	200	0.125"	Both

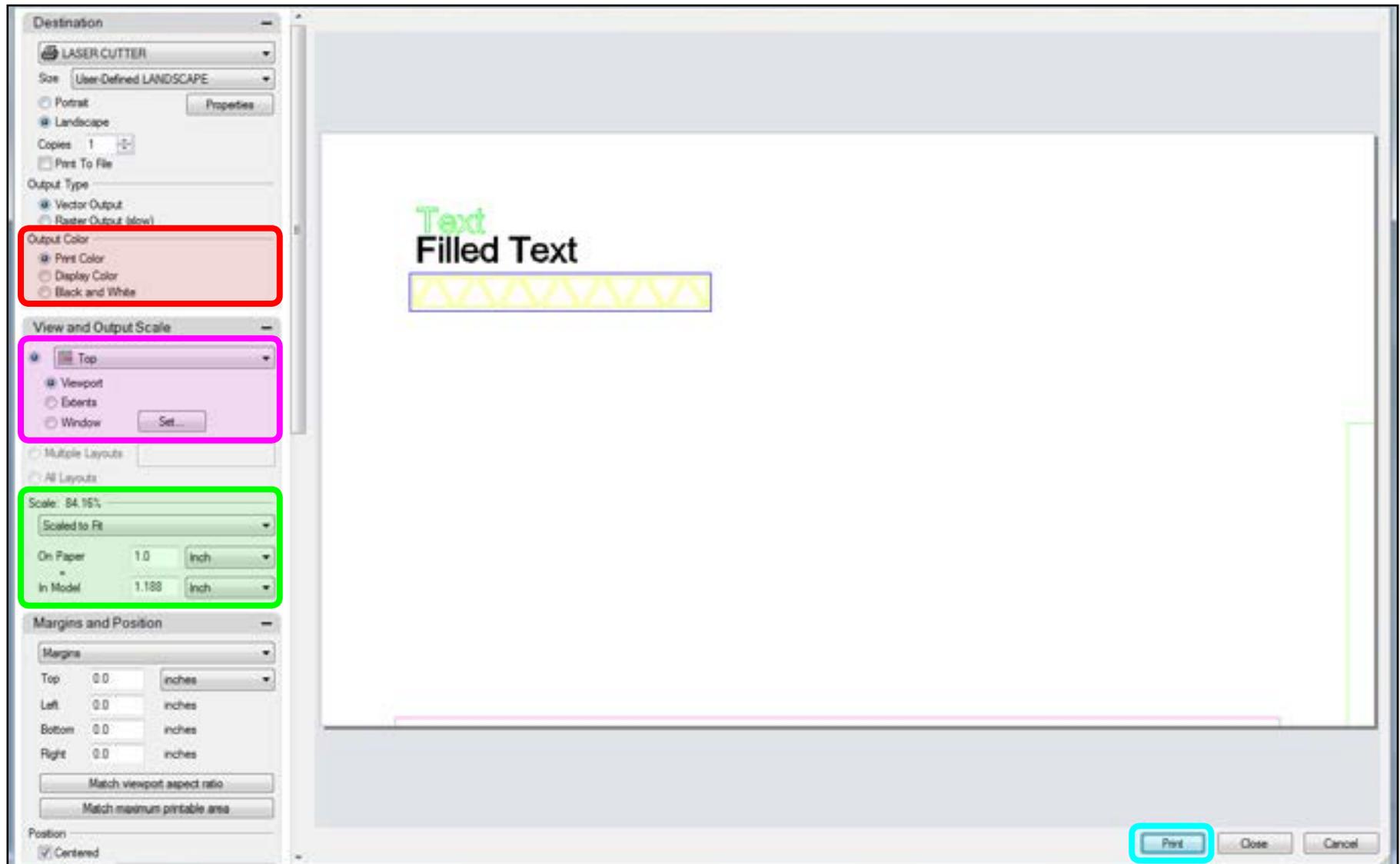
The 'Raster' tab is selected, showing 'Normal' for Print Direction and 'Image Density' settings. The 'Vector' tab shows 'Print Direction' and 'Image Enhancement' settings. The 'Engraving Field' tab shows 'Dithering' settings. The 'Set' button is highlighted with a green box, and the 'OK' button is highlighted with a cyan box.

Select **Print Color**

Select **Window**. You may have to set the window location by clicking **Set**. See [next page](#) for help setting the window.

Set required scale. If you're using the template, **1:1** should be the correct scale

Click **Print**



The area to be laser cut will appear as a light grey rectangle.

To resize the printing window:

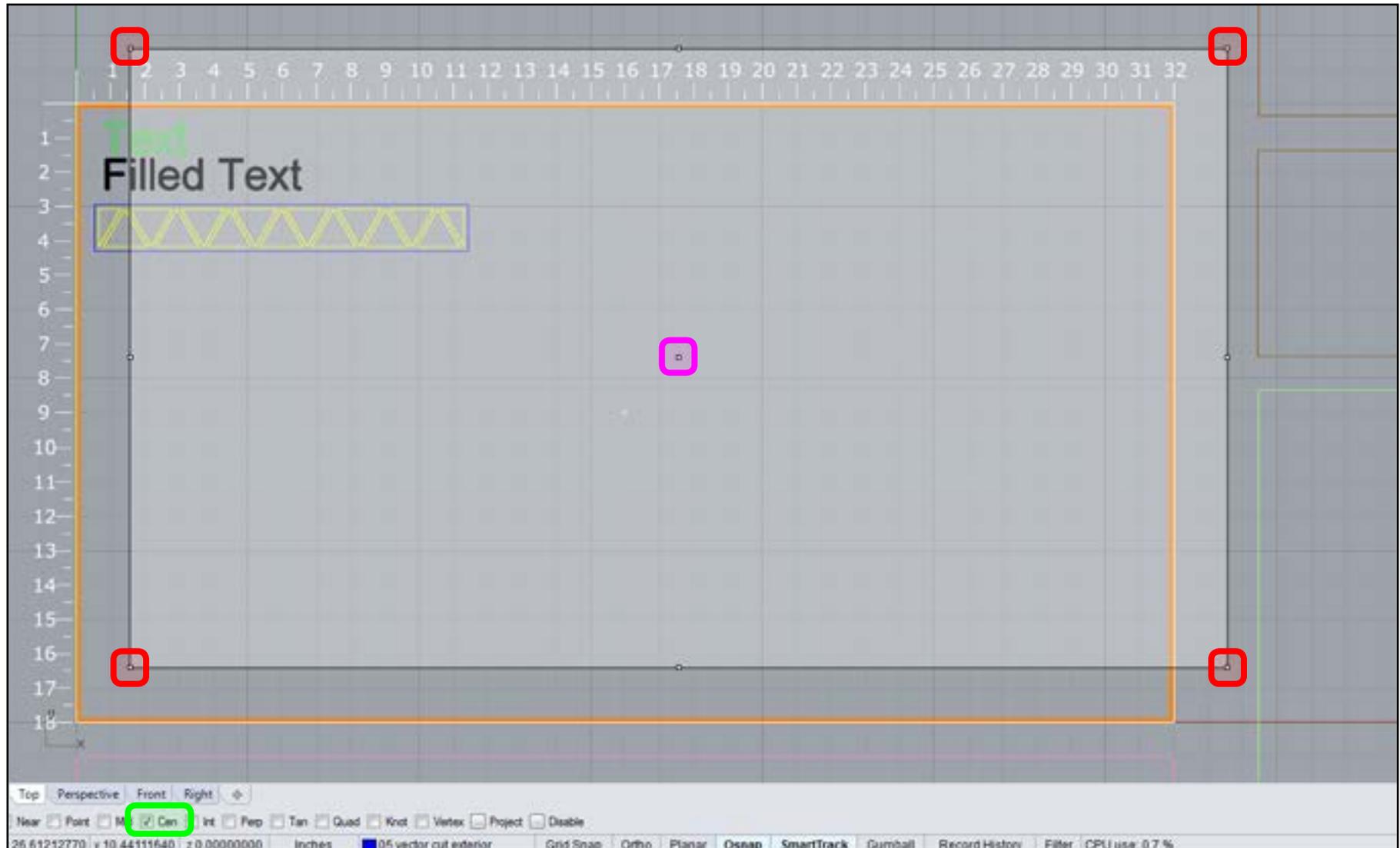
Resize the print rectangle by clicking and dragging one of the corner points

To move the printing window:

Move the print rectangle by clicking the center point and dragging.
Hit **Enter** to continue.

TIP:

Use the **Center** object snap to ensure the print rectangle snaps to the exact center of the cutting area.



Open **UCP (Universal Control Panel)** by clicking on the icon in the taskbar

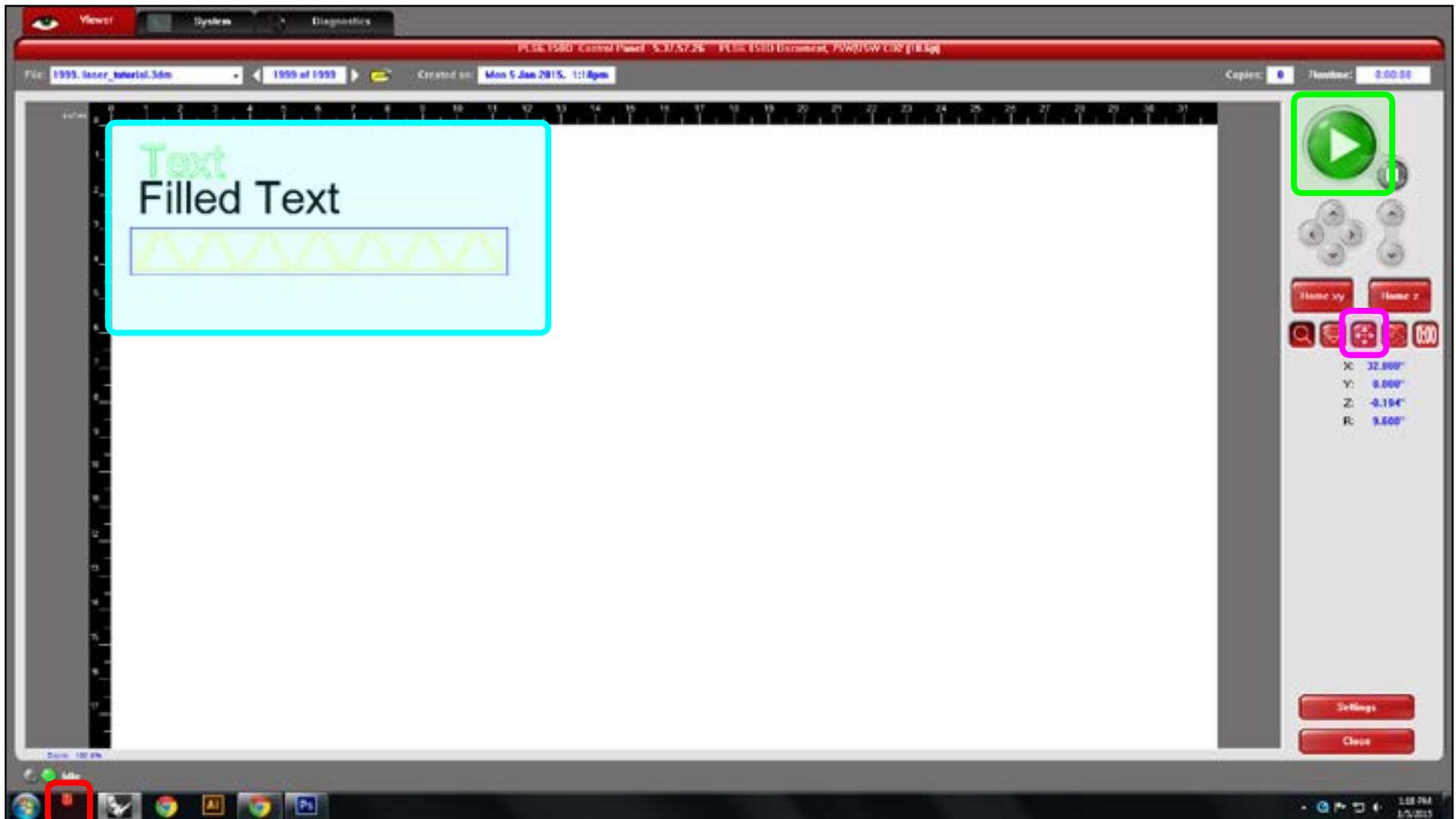
This gives you a preview of what the laser will cut/raster and where it will cut/raster.

If you don't see objects that you want cut/rastered, or they show up as the wrong color, go back into Rhino and double-check their properties.

If your object appears to be in the wrong place, [you can move it](#).

Does everything look good? If so, you are ready to cut...

Click the **Green Play Button**.



Advanced Laser Tips

Sometimes you need to change the settings of the laser to get it to cut through the material you're using. Begin by [opening UCP](#) and clicking **Settings** in the lower right hand corner.

Select the color you'd like to change; only change one color at a time.

Adjust the desired variable

Click **Set**

Color	Mode	Power	Speed	PPI	Z-Axis	Laser
Black	Rast	30.0%	100%	300	0.125"	Both
Red	Vect	15.0%	100%	300	0.125"	Both
Green	Vect	30.0%	100%	300	0.125"	Both
Yellow	Vect	100%	8.0%	200	0.125"	Both
Blue	Vect	100%	8.0%	200	0.125"	Both
Magenta	Skip	100%	8.0%	200	0.125"	Both
Cyan	Skip	100%	8.0%	200	0.125"	Both
Orange	Skip	100%	8.0%	200	0.125"	Both

The interface also features a 'Raster' section with a 'Normal' dropdown and 'Frame Rasters' checkbox. The 'Vector' section includes 'Print Direction' (down arrow), 'Dithering' (Haltone, Error Diffusion, Black and White), and 'Image Enhancement' (Disabled, Texturize). The 'Engraving Field' section has a circular dial. At the bottom, there are buttons for 'Apply', 'Defaults', 'Load', 'Save', 'OK', and 'Cancel'.

NOTES:

You generally don't want to change these settings by more than a few points.

It is usually better to move the power up than to slow the speed down.

Bonus tip: You can also adjust the **Z-Axis** height to make vector etching produce wider lines. **Always** move in the positive direction. Moving the Z-Axis by .1-.2 usually produces good results.

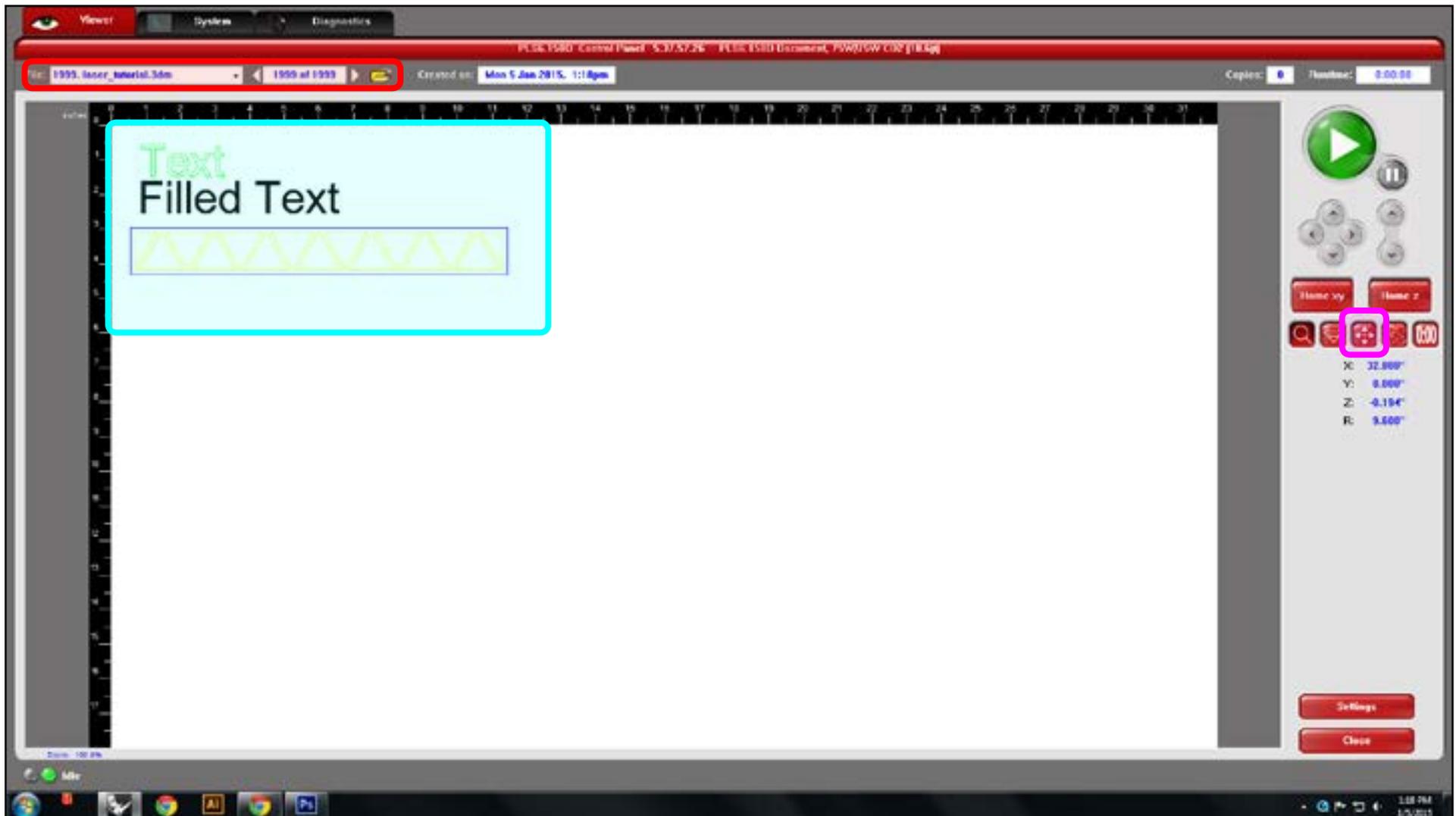
Sometimes you need to cut multiple copies of a file. You can easily do that through UCP without even having to open Rhino. It's even possible to recut a file you sent the day before.

Select the file here.

If you need to adjust where your object is placed in the laser bed:

Click the **Move Button**

Drag the object to desired location.



Troubleshooting:

The laser dialogue box says your document contains no data.

- Make sure your print width is set to *hairline*.
- Make sure your print colors are set to the [proper RGB values](#).

The laser isn't cutting, but there is a red dot.

- Make sure the lid is closed completely.

The laser didn't cut through your material completely.

- Make sure you selected the correct **material** **and** **thickness** in the print dialogue box.
- Sometimes the settings need to be tweaked a little. Either see a lab attendant for help or [adjust the settings yourself](#).

More Info:

[UCP Manual Controls](#) - Advanced information on using UCP

[User Manual](#) - Official manual for our ULS lasers

[Rotary Fixture Manual](#) - Did you know you can laser engrave cylindrical objects on our machines?

[10 Tips and Tricks for Laser Engraving and Cutting](#) - Instructable from Geordie at PDX Portland

[BoxMaker](#) - Free web app for making boxes

[Ponoko Laser Cutting Tutorials & Tips](#) - A plethora of tips from the Ponoko forums

[Using Photoshop to Enhance Photos for Laser Engraving](#) - In-depth Youtube video from ULS

[XYZ Lab Rastering Samples](#) - Visual guide of rastering different materials from the XYZ Lab at Regis