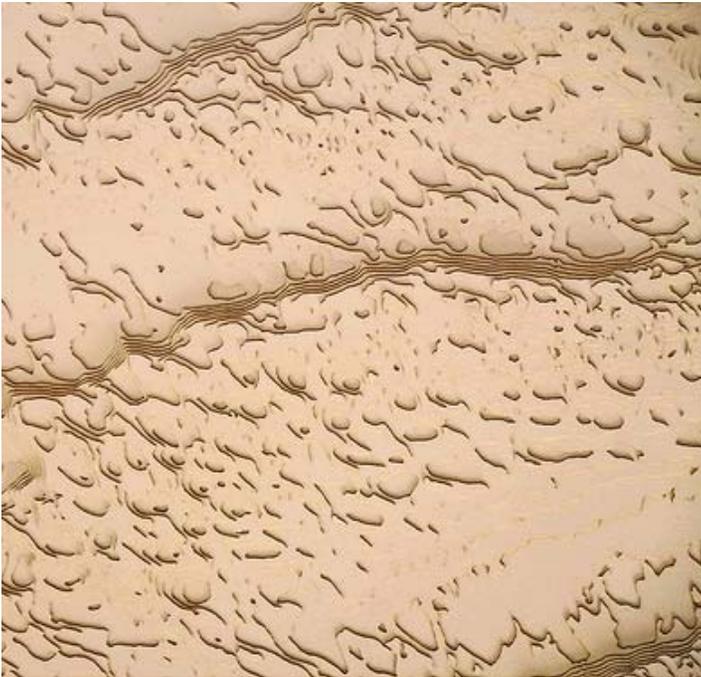




# Laser Cutter Tutorial

Universal X-660

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## Introduction

The laser cutter should be thought of as a plotter. Any application that prints can be cut on the laser cutter. It cuts two ways: Vector or Raster cutting. Vector cutting follows lines, curves, circles, etc. Raster based cutting is used with digital images such as photographs.

Plan files can be prepared using software such as Adobe Illustrator, Rhino, or AutoCAD. The designer simply draws vector lines or text with the standard tools, and uses colors to code which lines are intended as cuts and which are intended as etched lines. In addition, pixel-based or raster graphics such as JPEGs or Adobe Photoshop files can be burned into a surface as a duotone or grayscale image. The system uses a very thin laser beam and highly accurate X/Y plotter mechanism allowing, for example, the creation of interlocking pieces or inlay materials. The information below addresses plotting from AutoCAD.

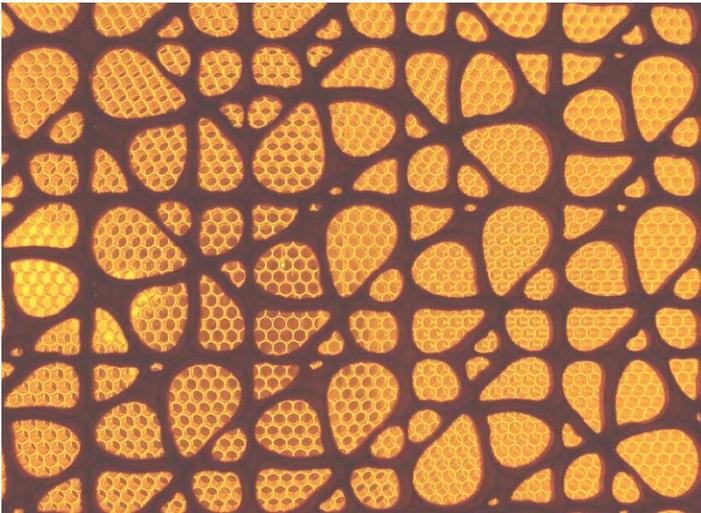
## Materials that **can** be used

**For cutting:** Wood, Plexiglas, acrylic, matte board, chip board, card board, cork, rubber, and particle board. The thickest material that may be cut is ½”.

**For etching only:** Stone, ceramic.

## Materials **not** for use with the machine:

Reflective surfaces (i.e. Mirrors), foam core, toxic or highly flammable materials, For specific thicknesses, please see the Universal Manual (in the S Drive Laser Cutter Folder)





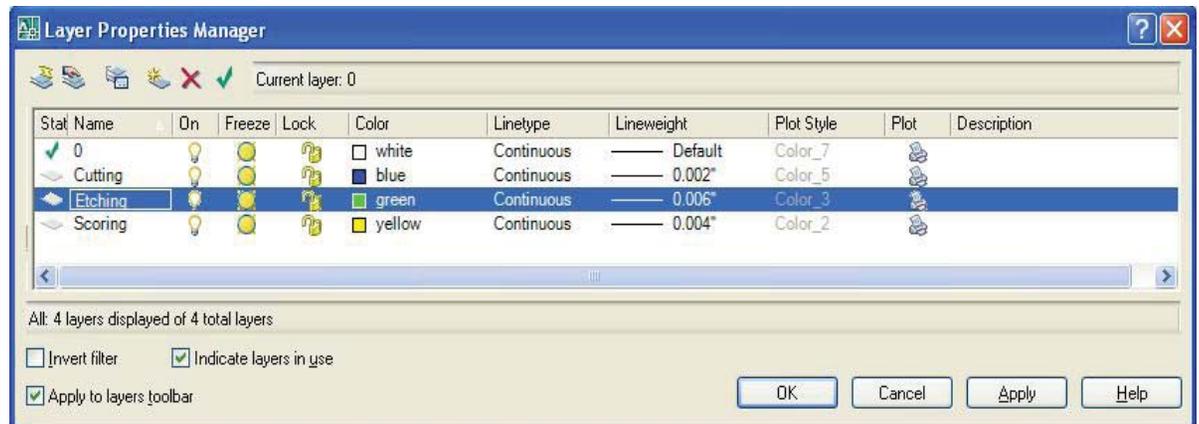
## PART 1: Prepare your Drawings in advance

**Step 1** Make sure that you use architectural units.

**Step 2.** Use only three main AutoCAD index colors for layers: Blue (index color 5) for cutting, Yellow (index color 2) for scoring, Green (index color 3) for Etching . The line weight for cutting should be 0.000", for scoring: 0.000", and for etching: 0.000". Custom colors will not work with the laser cutter.

Layers	Colors	Lineweight
Cutting	Blue	0.000
Scoring	Yellow	0.000
Etching	Green	0.000

**Step 3** Place cut profiles and engraved details in different layers so the laser cutter will operate differently in each layer. (Some cuts or engraving may be deeper depending on your needs).

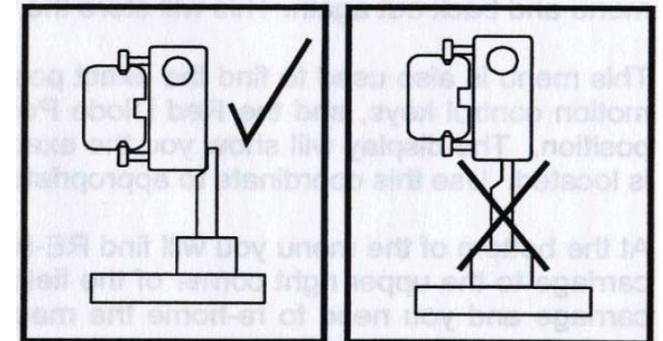
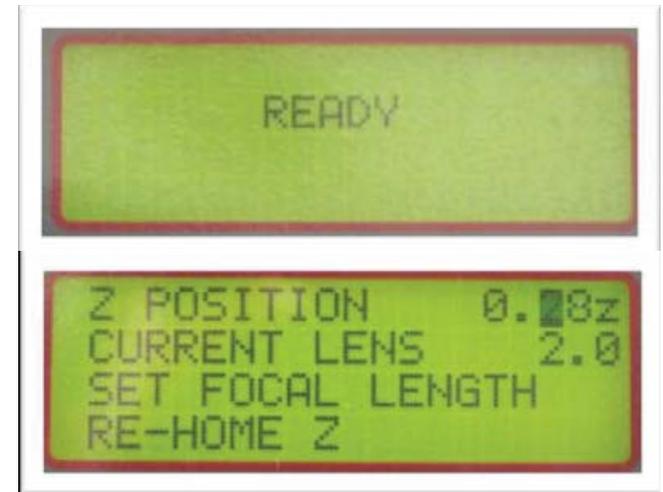




- Step 4** Clean up your file before “printing” it; make sure that extra lines or geometries aren’t in the layers that you are cutting.
- Step 5.** Please Use the “overkill” command.
- Step 6.** Place dimensions on a layer color that won’t print (but not Black, Red, Green, Yellow, Blue Magenta, Cyan, Orange.)
- Step 7** Parts can’t be larger than 32”x18”
- Step 8.** Leave a ½” margin on the edges of your drawing to ensure accuracy of cuts.
- Step 9.** The stability of laser cuts for vector lines drawn closer together than 1/8” depends on the material; 1/16” is the closest recommended distance, but should be tested.
- Step 10.** Keep in mind, the laser cutter will typically remove 0.004” to 0.005” of material with each cut (depending on material and thickness): you may want to adjust your model for this.
- Step 11** Please save your file in this particular format. – Professorname\_s11\_Studentlastname\_material (S11 is Spring 2011)
- Step 12.** Save your file to a CD or USB drive so it can be brought to the laser cutter computer.
- Step 13.** Please save your file on the laser cutter computer in the following manner - -Desktop / Spring11 / Professor name / Professorname\_s11\_Studentlastname\_material

## PART 2: Prepare the Laser Cutter

- Step 1** Turn the machine on and wait until the screen says **READY**.
- Step 2.** Open the hood and place your material on the bed on top of five rows of staples; make sure that it is straight. The near left corner represents the machine's point of reference.
- Step 3** Set the laser's focal length manually:
- Select → Z →Select.
  - Move the lens directly over the material, using the left-right arrow buttons.
  - Take out the focus tool from its storage place at the left hand side of the laser cutter under the hood, and place on the material below the lens holder. The focus tool is just a guide to place the lens correctly: do not press it. To make fine adjustments press select and you can change the distance in 0.01" increments. It should like this.
  - Put the focus tool back in its place
  - Press Z again and the lens will go back to this position
- Step 4.** Delete old files on the laser cutter:
- Hit ESCAPE until the main menu shows up
  - Select Memory control
  - Select Delete files and confirm.
  - Press escape until file display option appears, select it until it says "Ready"
- Step 5.** Turn on the air supply
- Step 6** Turn on the blower. This is **ESSENTIAL** to the proper functioning of the machine.
- Step 7.** Lower the hood of the laser cutter

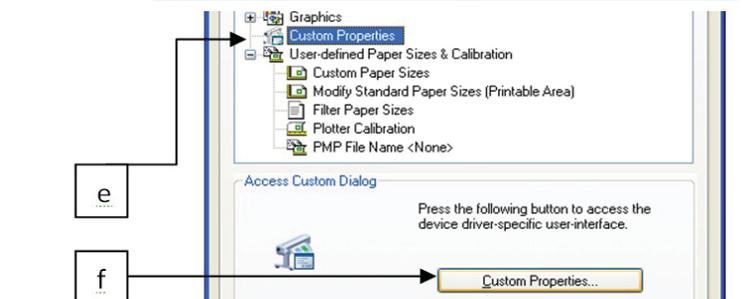
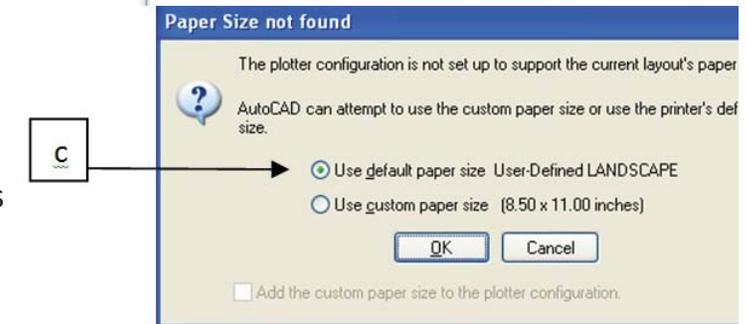
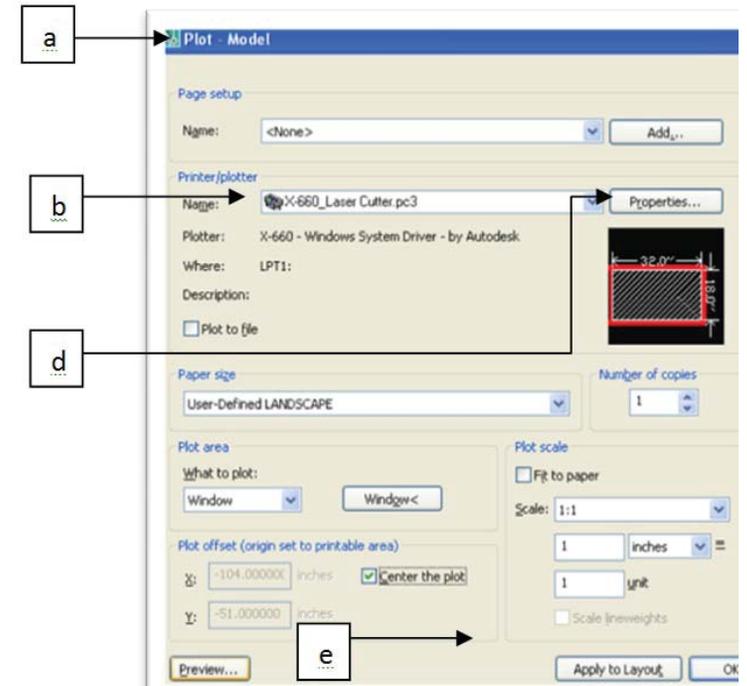


### PART 3: Prepare File for Cutting with AutoCAD

- Step 1** Open AutoCad.
- Step 2.** Open your file
- Step 3** Set plot parameters for cutting.
  - a. Open the Plot Window.
  - b. Select the Plotter : Laser Cutter X-660.
  - c. Select Use default paper size User-Defined LANDSCAPE.
  - d. Click on Properties.
  - e. Highlight Custom Properties under the Device and Document Settings tab.
  - f. Click on Custom Properties to open the speed and power settings window.
  - g. In the Pen Mode settings tab set SKIP for the black layer and the other layers leave it at RAST/VECT.
  - h. Set Power and Speed according to your needs and lock these settings by clicking on the set button. **Speed and power have an inverse relation.** Typically high power and low speed = deeper cuts and low power and high speed = lighter cuts.

**Remember!**

<b>High Power</b> + <b>Low Speed</b> = <b>Deeper Cuts</b>
<b>Low Power</b> + <b>High Speed</b> = <b>Lighter Cuts</b>

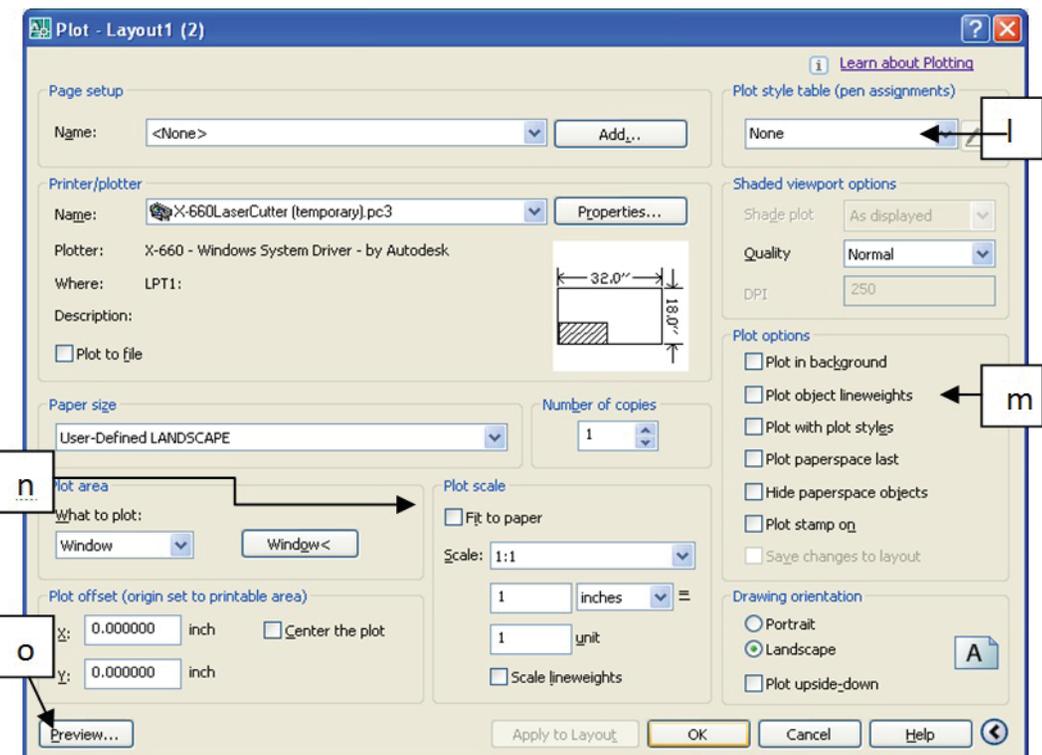


**Do not set speed above 20%** for cutting or you can damage the machine; speed can exceed 20% for raster etching/scoring. The following settings are to be used when cutting chipboard.

Layers	Power	Speed	PPI
Cutting (Blue)	70	15	500
Scoring (Yellow)	30	60	100
Etching (Green)	10	60	100



- i. "Set" the settings for each color individually, and hit OK.
- j. Select Apply changes for the current plot.
- k. Go back to the plot window.
- m. Uncheck all the Plot options on the right side of the window.
- n. Choose desired scale in the same way you do to print a drawing; typically you will want you drawing to be 1:1 scale
- o. Preview fully your drawing's plot to verify that everything is in place; if it does not look correct fix it before printing/cutting. Double check the orientation, scale, and lines.
- p. Generally, you will want to send a test plot of part of the whole file to the laser cutter to check if the settings are correct;



## PART 4: Cutting

- Step 1** Send your file to the laser cutter. After correcting any mistake in the drawing press OK on the plot window and wait until the laser cutter displays your file, it will take few seconds.
- Step 2.** Open the machine and press the Green Start Button of the laser cutter: the machine's red light will trace out the pattern it will follow. If this appears correct, close the lid and press start
- Step 3** Follow safety procedures. It is important that you know what to do if something goes wrong.
- Do not leave the room while cutting, stay near the laser cutter and watch the machine all the time until the job is completed.
  - If you see a fire starting press the pause button immediately. If the fire does not go out turn it off the laser cutter and then the air supply. Leave the blower on.
  - Put some water on the material.
  - If the fire does not stop call 911; and if necessary, use the fire extinguisher.
- Step 4** Remove all the parts from the bed of the laser cutter.
- Step 5** Clean up
- Delete your file from the computer.
  - Throw out all the small pieces, and donate any larger pieces to the lab.
  - Turn off the laser cutter; this allows the laser to re-ionize/re-charge.



## PART 3: Prepare File for Cutting with Rhino

**Step 1** Open Rhino.

**Step 2.** Open your file

**Step 3** Set plot parameters for cutting.

- a. Open the Plot Window.
- b. Select the Plotter : Laser Cutter X-660.
- c. Select Use default paper size User-Defined LANDSCAPE.
- d. Click on Properties.
- e. Highlight Custom Properties under the Device and Document Settings tab.
- f. Click on Custom Properties to open the speed and power settings window.
- g. In the Pen Mode settings tab set SKIP for the black layer and the other layers leave it at RAST/VECT.
- h. Set Power and Speed according to your needs and lock these settings by clicking on the set button. **Speed and power have an inverse relation.** Typically high power and low speed = deeper cuts and low power and high speed = lighter cuts.

