LASER CUTTING EBOOK

BEAM
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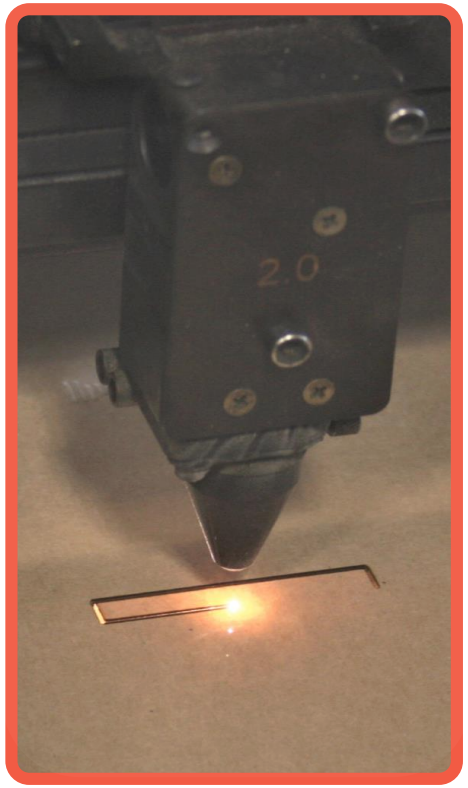
CLICK TO ENTER

LASER CUTTER MAIN MENU

Click on any of the topics below to jump to that page!

LASER CUTTER 101



DIGITAL DESIGN

BEAM
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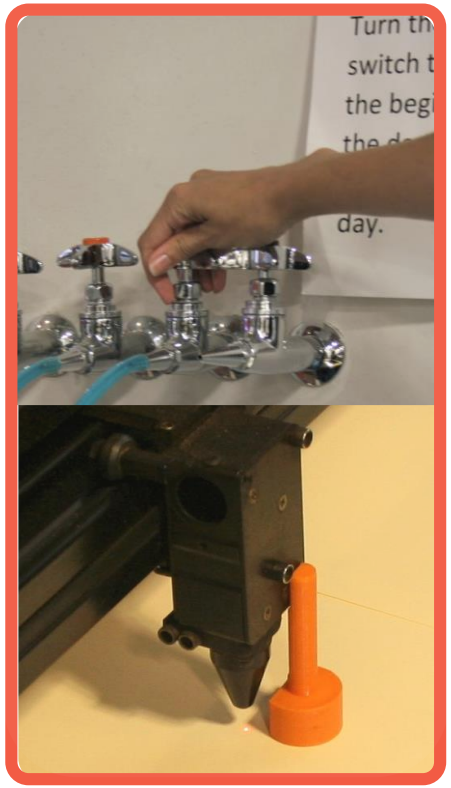
POWER & SPEED

Color	Mode
Black	Rast/V
Magenta	Rast/V
Yellow	Rast/V
Cyan	Rast/V
Green	Rast/V
Red	Rast/V
Blue	Rast/V
Orange	Rast/V

ULS SOFTWARE

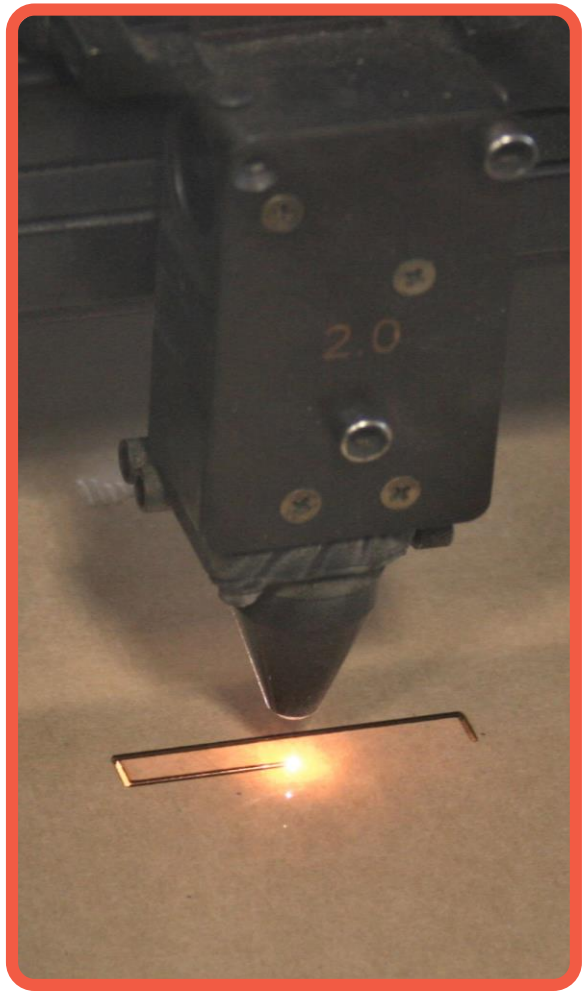
TOOL PREP & CUT



LAST

NEXT

LASER CUTTER 101



LASER CUTTER 101

PARTS OF LASER CUTTER

EXAMPLES OF STUDENT CREATIONS

SAFTEY CONCERNS

FIRE SAFETY

APPROVED MATERIALS

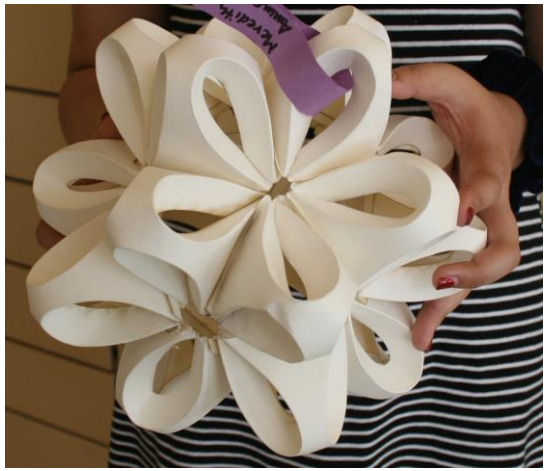
NON-APPROVED MATERIALS

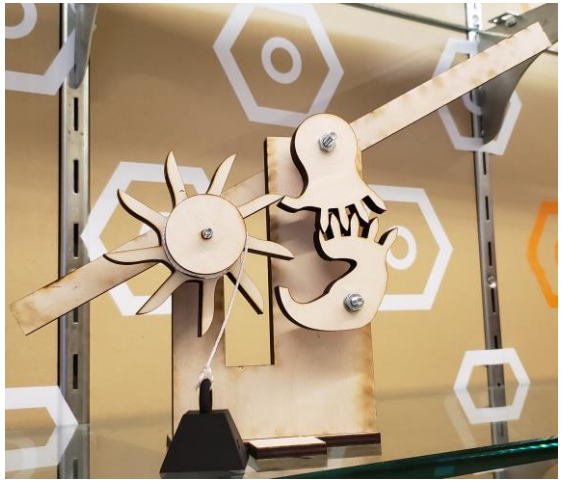
NEXT

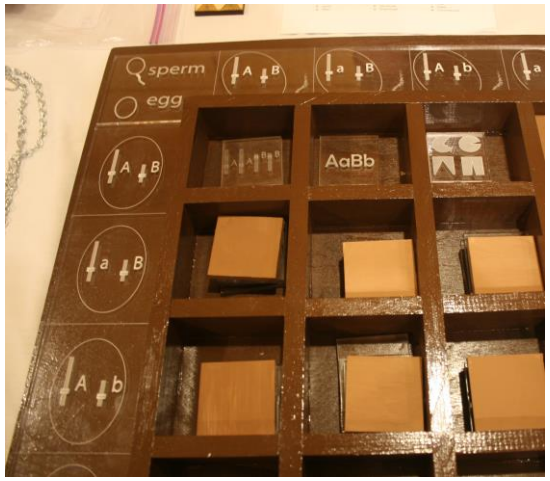
LASER CUTTER 101

Laser Cutter Parts

LASER CUTTER 101 Student Creations



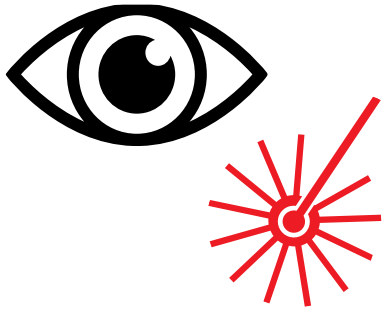




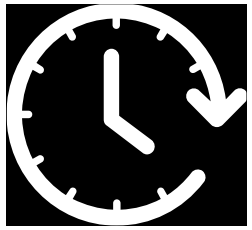
LASER CUTTER 101 Safety Concerns

BE SAFE

Don’t look at the laser for an extended period



Only use materials approved by BeAM



Stay for the ENTIRE TIME you use the cutter

90 MINUTES MAX

No PVC or Teflon – they release harmful gases!

Fire Safety

In case of fire:

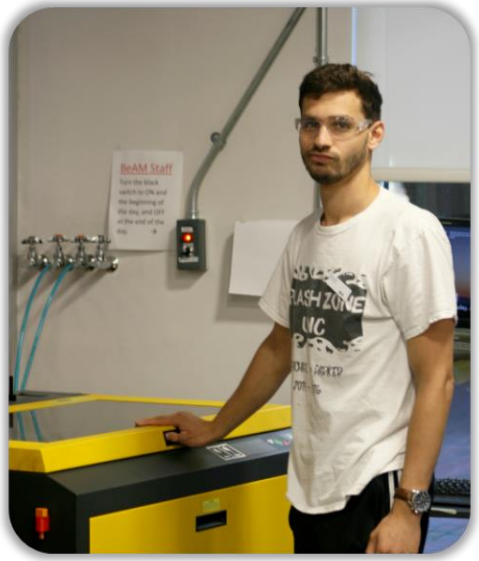
Grab fire blanket

Open the door

Lay blanket on bed

Close the door

Get a staff member



LASER CUTTER 101 Approved Materials

BeAM provides the following materials for free:

- Plywood (⅛" and ¼" thicknesses)
- Cardboard
- Clear acrylic (⅛ " and ¼" thicknesses)
- Bristol paper

You can bring in other materials (paper, natural rubber, felt) but you MUST get them approved by BeAM staff.

Materials to Avoid

No PVC or Teflon

Laser cutter will not cut metal

Cannot be bigger than bed of laser cutter:

Murray: 32" by 18"
Hanes: 48" by 24"

Consult with BeAM staff about any material not provided by BeAM

DIGITAL DESIGN

DIGITAL DESIGN

DOWNLOAD DESIGN SOFTWARE

SETTING UP ILLUSTRATOR

ILLUSTRATOR QUICK GUIDE

BEGINNER PROJECT GUIDES

3 MAIN FUNCTIONS OF LASER CUTTER

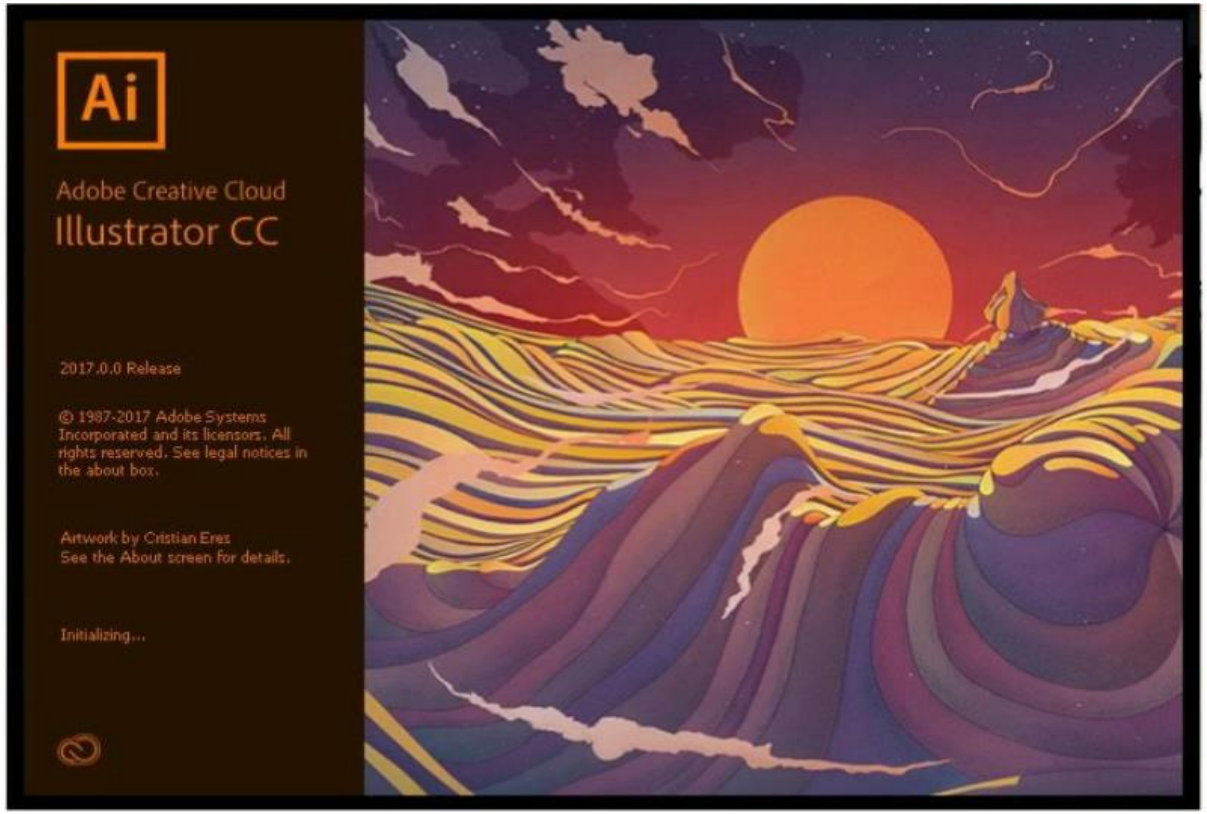
VECTOR VS RASTER

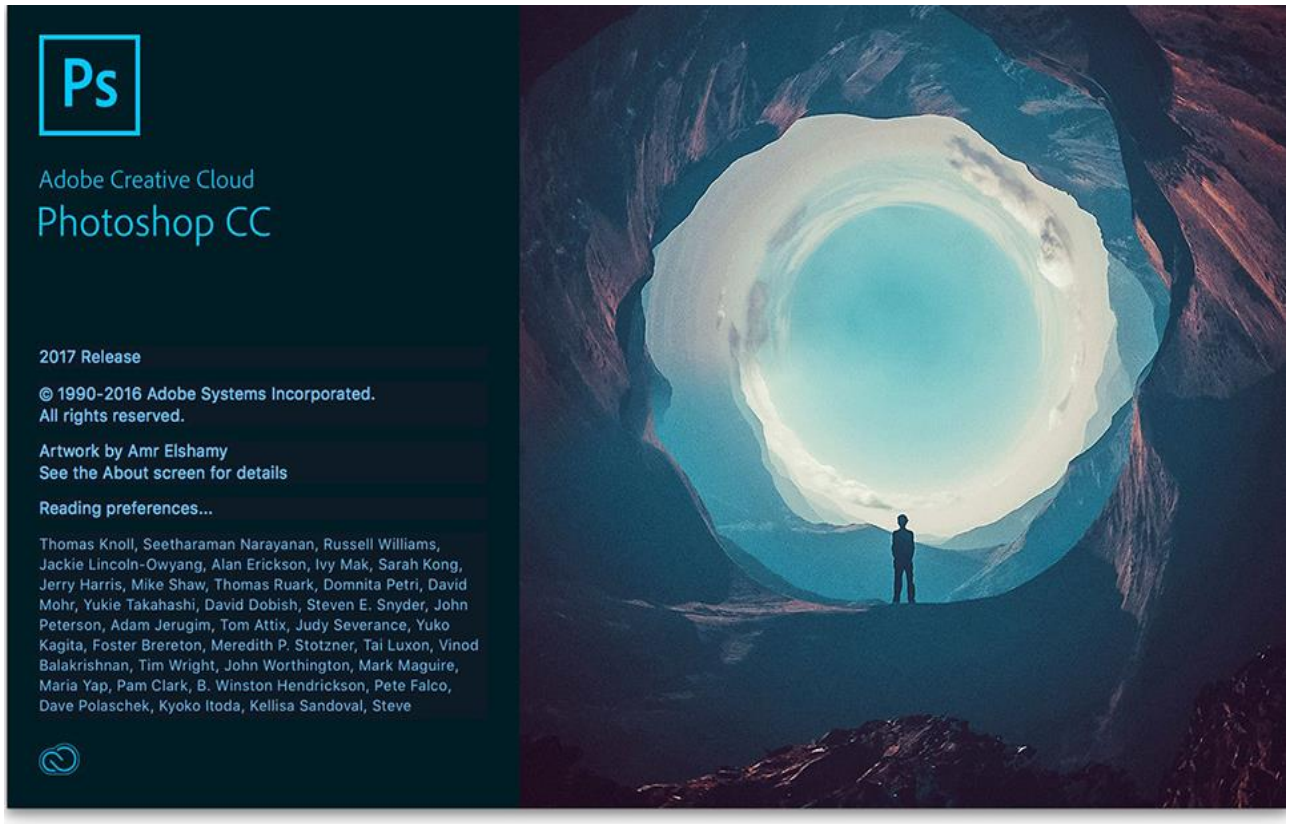
VECTOR GRAPHICS

RASTER GRAPHICS

NEXT

Digital Design Tools



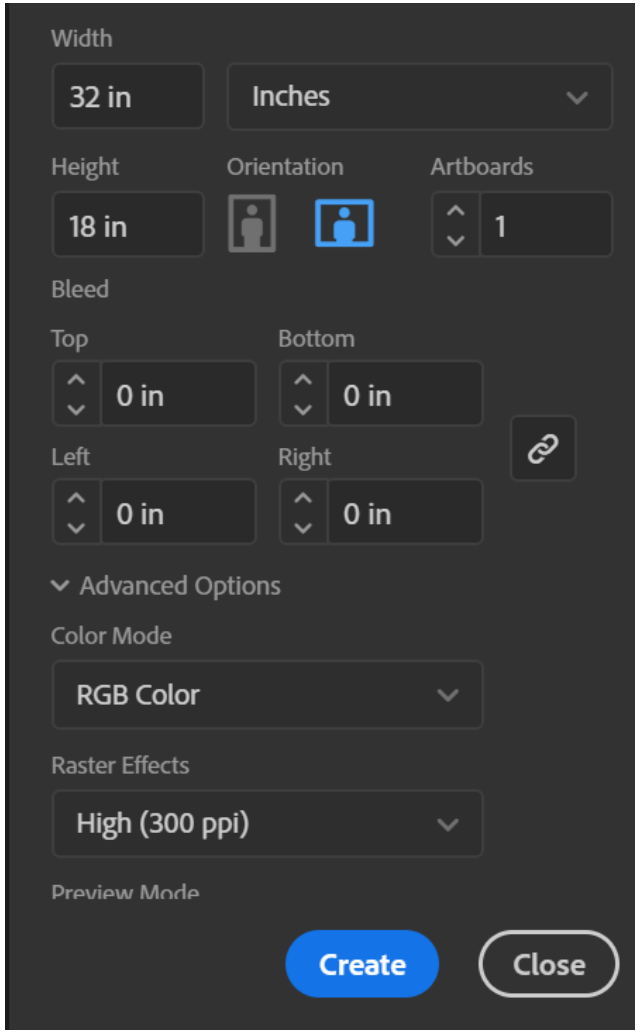


Illustrator and Photoshop are both part of the Adobe Creative Cloud Suite.
Don’t have the Adobe Creative Cloud Suite? Download it for free: adobe.unc.edu

DIGITAL DESIGN Set Up Illustrator

- Open Adobe Illustrator and start a new document
- Always choose ‘Art and Illustration’
- Set the unit of measure to INCHES
  - Murray: Set the size to 32in wide and 18 in tall.
  - Hanes: Set the size to 48in wide and 24 in tall.
- Under pre-sets, click ‘advanced options’
  - Color mode: RGB
  - Resolution: 300 pixels/inch

OR use the template provided at www.beam.unc.edu/resources !



Illustrator Quick Guide

WHAT IS ILLUSTRATOR?

Adobe Illustrator is a desktop graphic design program used to create both print and digital designs, including logos, posters, banners, flyers, and billboards. It is a standard program used by graphic designers to create professional designs and branding.

KEYBOARD SHORTCUTS

Use Ctrl on PCs and Cmnd on Macs

Ctrl z Undo	**Ctrl c** copy	**Ctrl r** shows ruler	**A** White arrow
Ctrl + Zoom in	**Ctrl v** paste	**Ctrl "** show grid	**V** Black arrow
Ctrl - Zoom out	**Ctrl f** paste in front	**Ctrl d** transform again	**T** Type tool

HOW TO

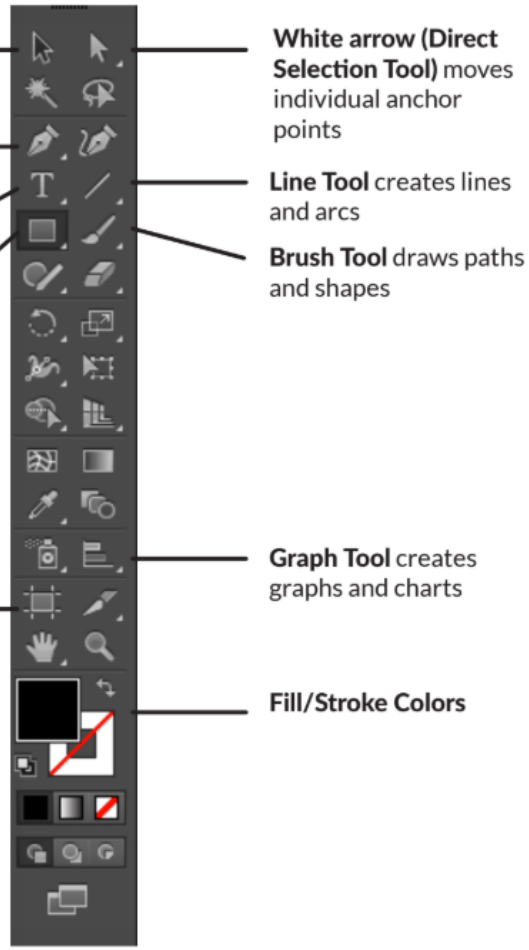
1. Create text go.unc.edu/Bp2c9
2. Draw basic lines and shapes go.unc.edu/o6TQf
3. Place images go.unc.edu/y2BKx
4. Use the graph tool go.unc.edu/i2SPt

@RBHouseUL
Chat us at *library.unc.edu/house*
Drop-in help available at the front desk of the UL.

UNC-Chapel Hill University Library
2018

UNC UNIVERSITY LIBRARIES
DESIGN LAB

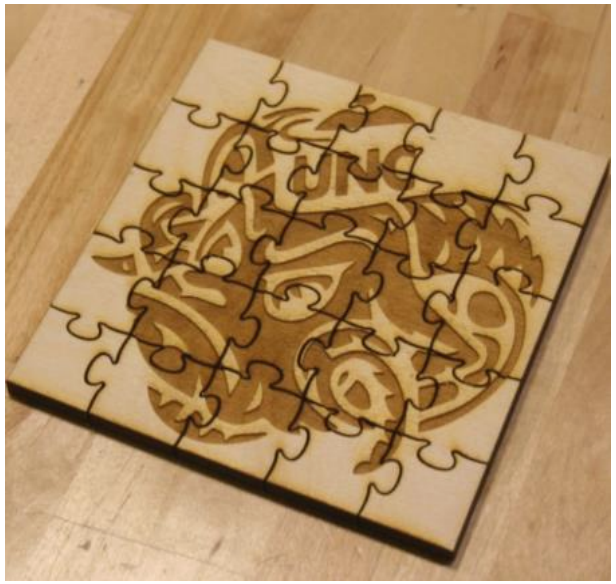
BASIC TOOLS



DIGITAL DESIGN

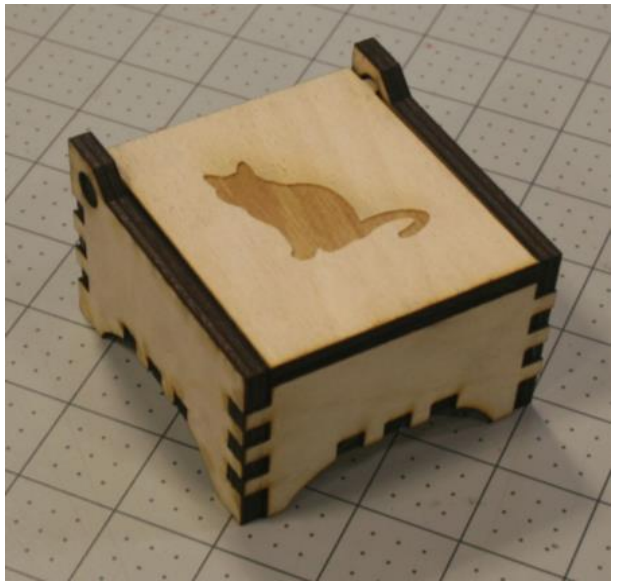
Beginner Projects

**Click any project below to access the guided instructions*



Jigsaw Puzzle

Keychain



Trinket Box

DIGITAL DESIGN: 3 Main Functions of Laser Cutter

Cuts all the way ***through*** the material

Thinly ***etches*** or ***"scores"*** the material

Etches graphics with ***gradients*** onto the material

DIGITAL DESIGN: Vector vs. Raster

Vector: things that will ***score*** or ***cut***

- Line thickness = .001 in
- Line colors = RGB red, blue, green, yellow, black, cyan, magenta, orange

Raster: things that will ***etch*** back and forth

- Line thickness ≠ .001in
- Line colors = anything other than those 8 RGB colors (e.g. CMYK, RGB purple, etc.)

DIGITAL DESIGN: Vector Graphics

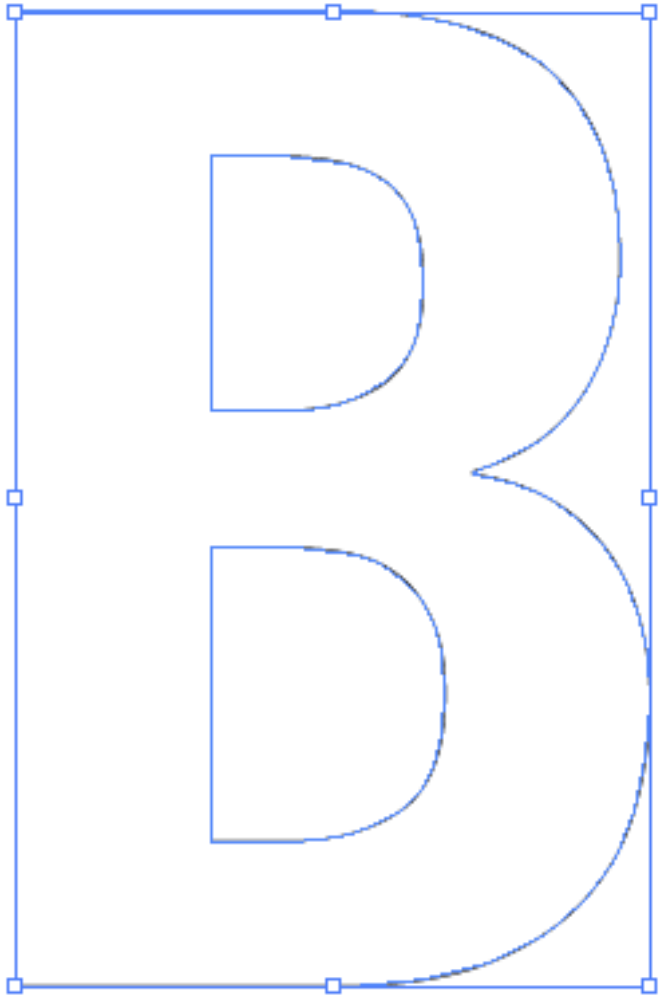
Digital image made of **paths** determined by mathematical statements

BOTH of these things must be true:

Its line thicknesses are equal to .001”

It uses only the following colors:

RGB red, **RGB blue**, **RGB green**, **RGB yellow**, **RGB black**, **RGB cyan**, **RGB magenta**, **RGB orange**



DIGITAL DESIGN: Raster Graphics

Made of squares of solid color called **pixels**

At least one of these things is true:

Its line thicknesses are not equal to .001”

It uses colors from outside the laser cutter’s list (e.g. CMYK colors, RGB brown or RGB purple, etc.)

POWER & SPEED

Color	Mode
Black	Rast/Ve
Magenta	Rast/Ve
Yellow	Rast/Ve
Cyan	Rast/Ve
Green	Rast/Ve
Red	Rast/Ve
Blue	Rast/Ve
Orange	Rast/Ve

POWER & SPEED

POWER AND SPEED DEFINED

POWER AND SPEED EFFECTS

READING THE POWER & SPEED BOARDS

BALTIC BIRCH PLYWOOD SETTINGS

ACRYLIC SETTINGS

CARDBOARD & BRISTOL BOARD SETTINGS

USING THE POWER & SPEED BOARDS

DETERMINING ORDER

SETTINGS IN ILLUSTRATOR

POWER & SPEED Defined for Laser Cutting

Power = a percentage of the laser's maximum output

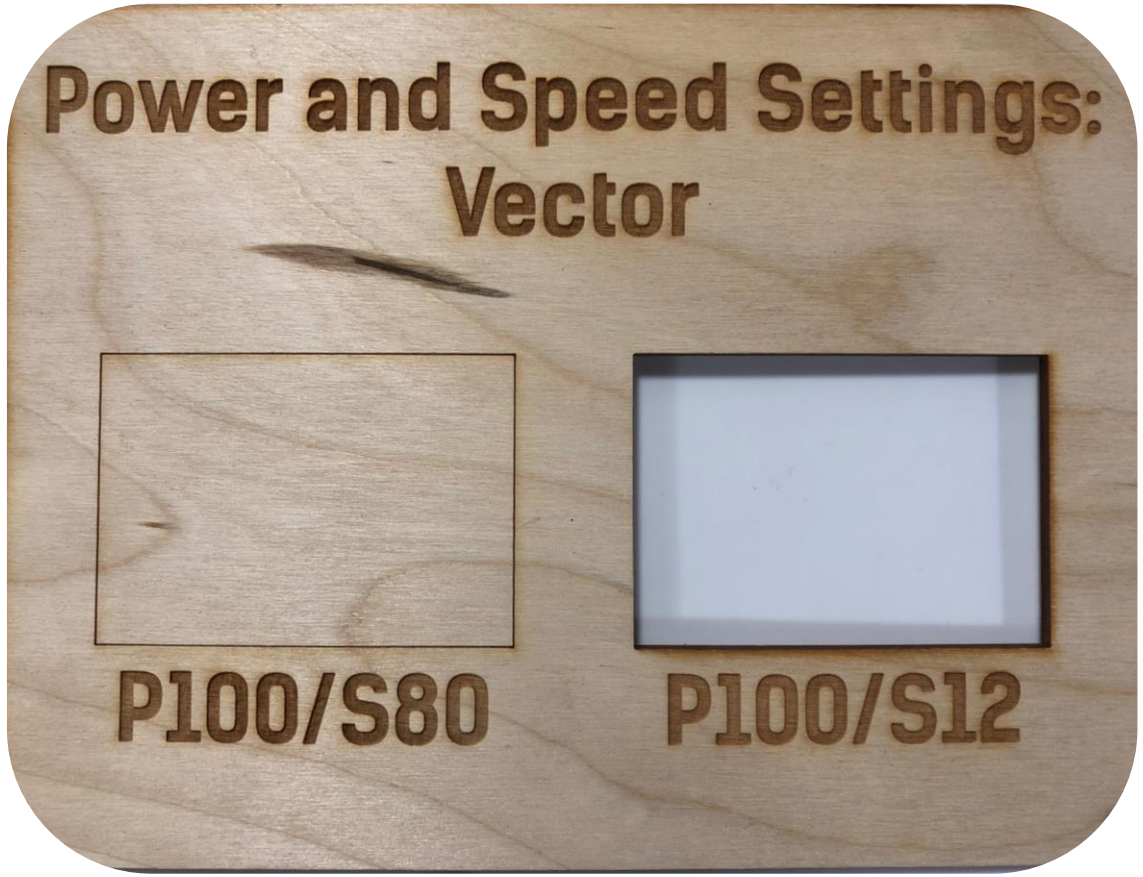
Speed = how fast the laser carriage is traveling

Color	Mode	Power	Speed	PPI	Z-Axis
Black	Rast/Vect	50.0%	100%	1000	Off
Magenta	Rast/Vect	100%	5.0%	1000	Off
Yellow	Rast/Vect	100%	50%	1000	Off
Cyan	Rast/Vect	100%	5.0%	1000	Off
Green	Rast/Vect	80.0%	100%	1000	Off
Red	Rast/Vect	100%	6.0%	1000	Off
Blue	Rast/Vect	100%	100%	1000	Off
Orange	Rast/Vect	100%	5.0%	1000	Off

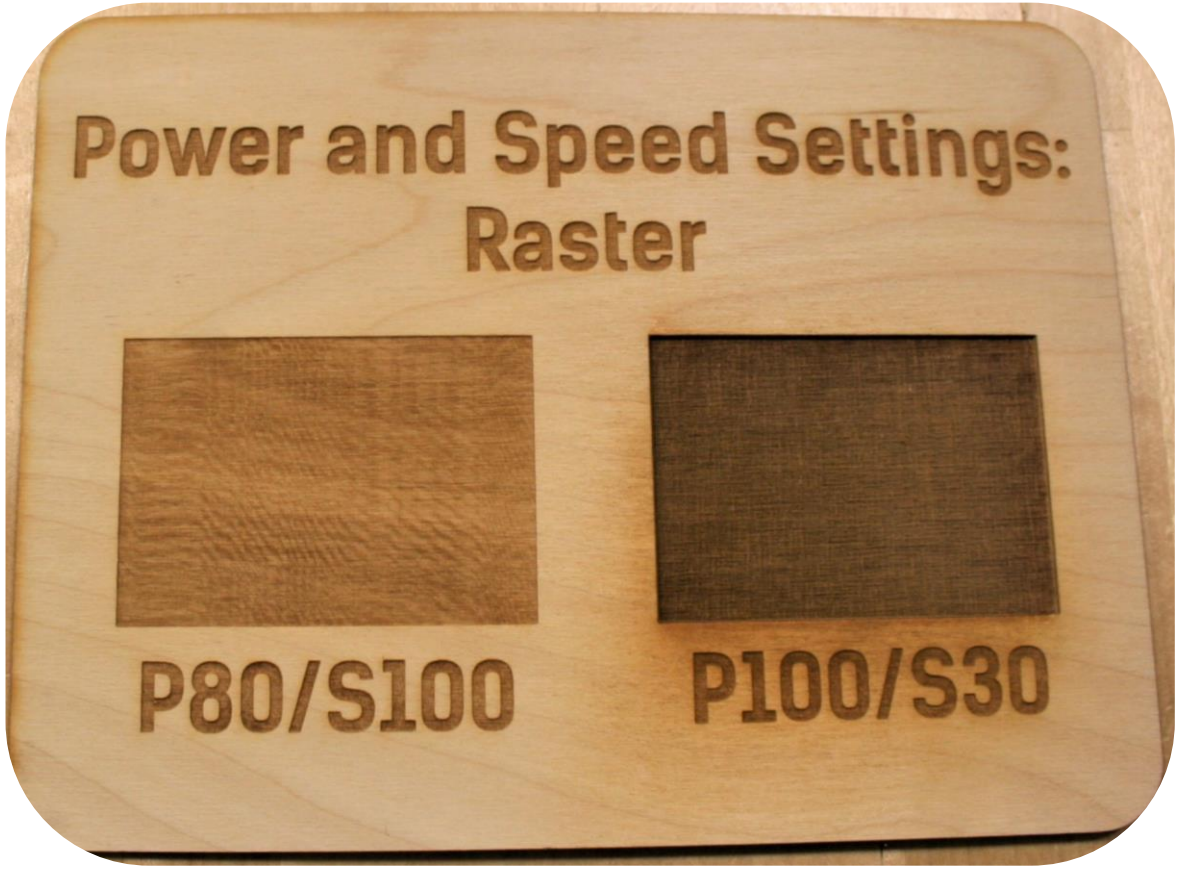
POWER & SPEED

Raster & Vector Power/Speed Effects

Vector images: **cutting** vs. **etching**



Raster images: **lighter** vs. **darker** etching



POWER & SPEED

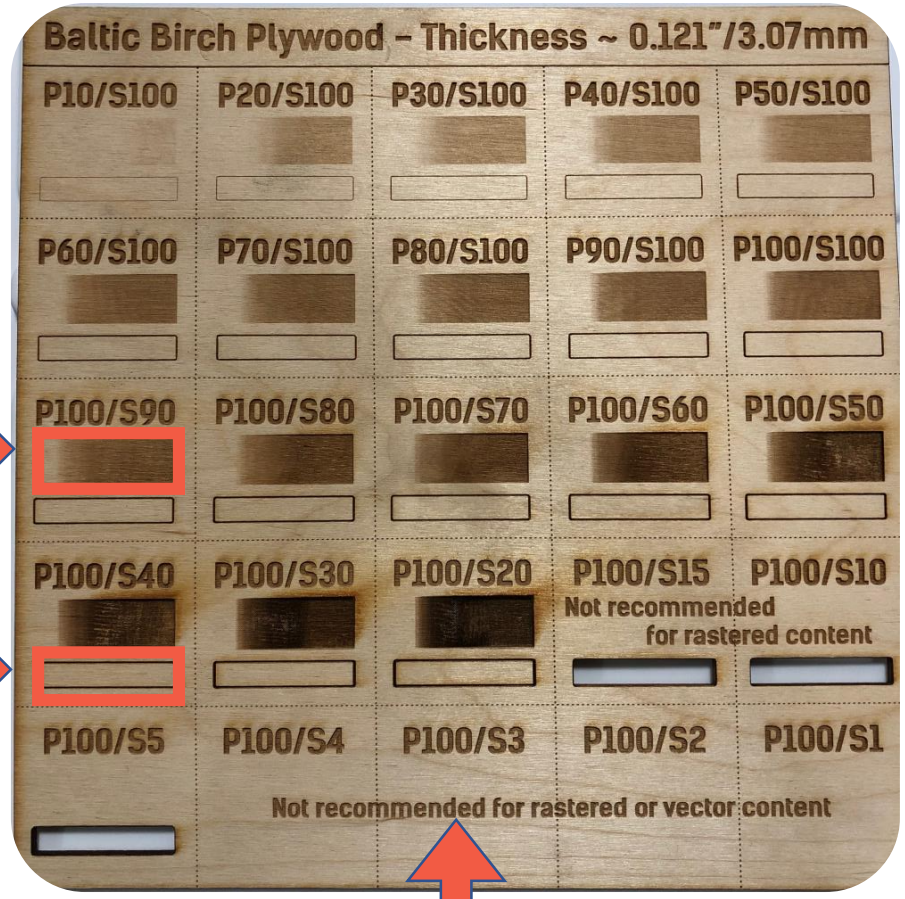
Reading the Power & Speed Boards

Power and Speed boards can be found on the wall next to the laser cutter in the Makerspace as well as on the following pages for you to access at home

Top output is for ***raster*** at that power/speed

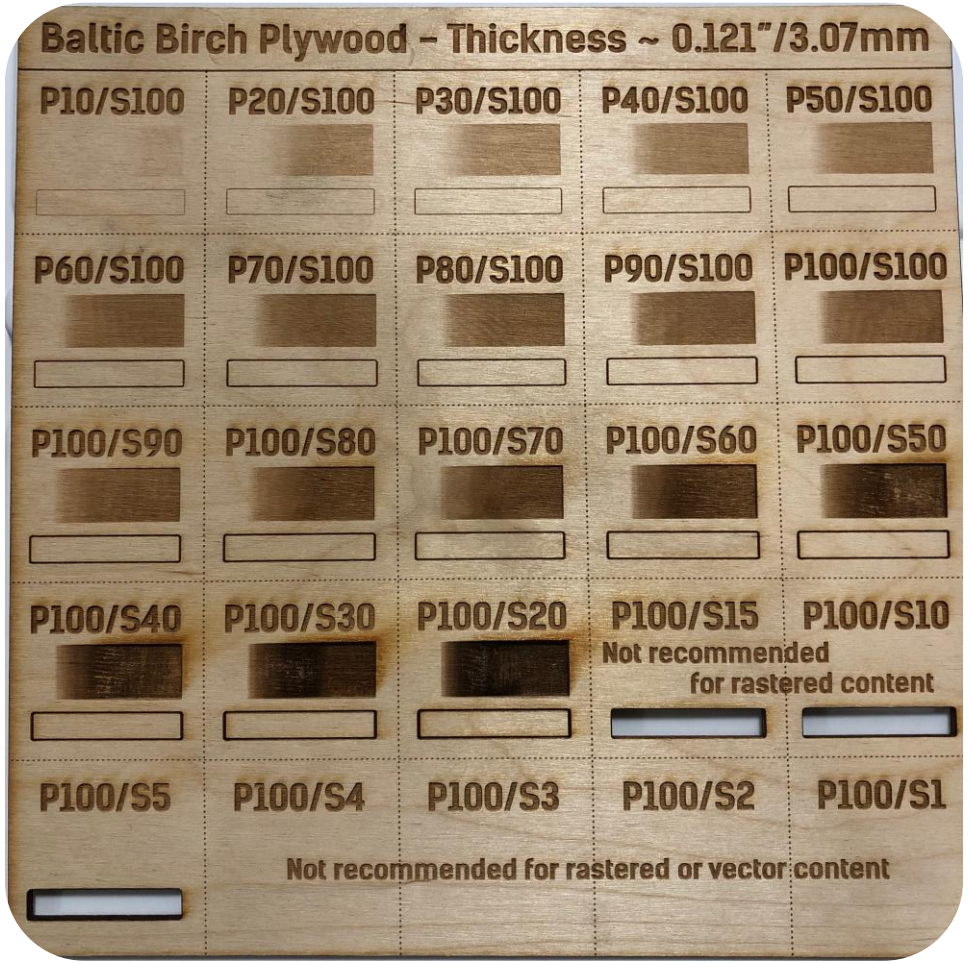
Bottom output is for ***vector*** at that power/speed

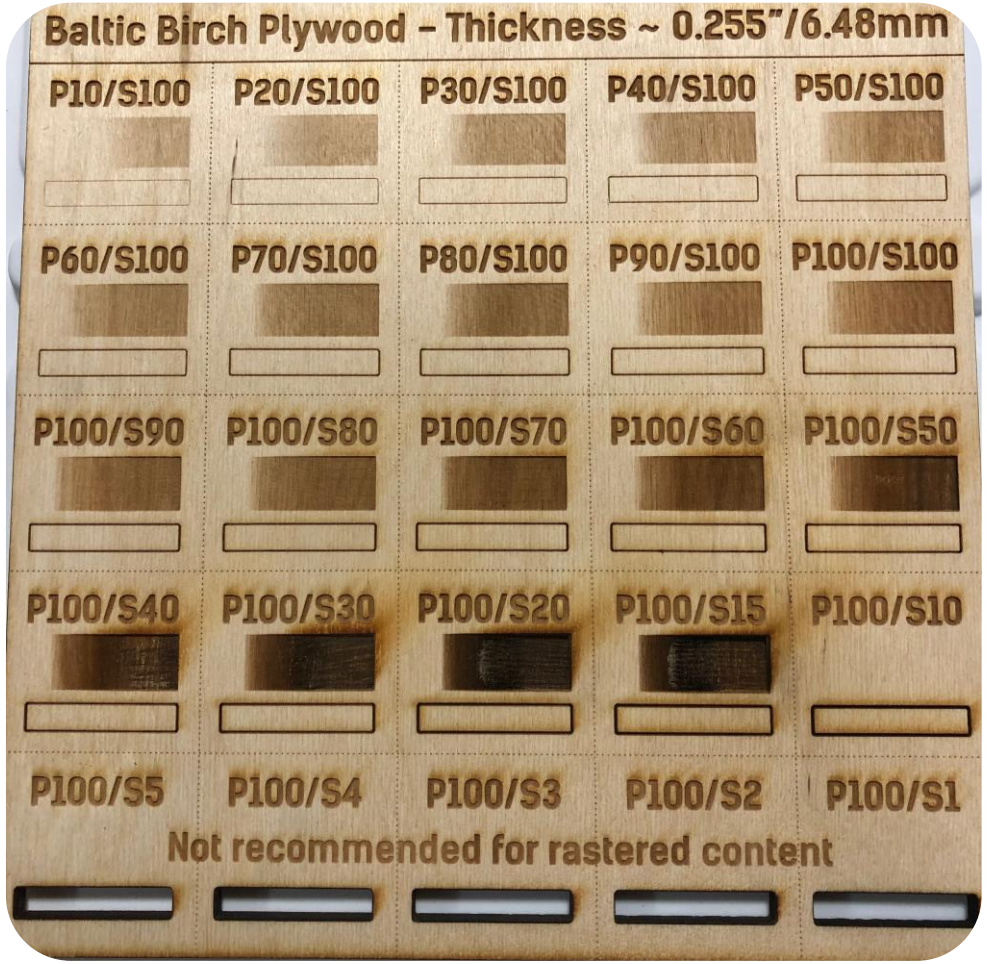
Some speeds are ***not*** recommended because of how long they will take.



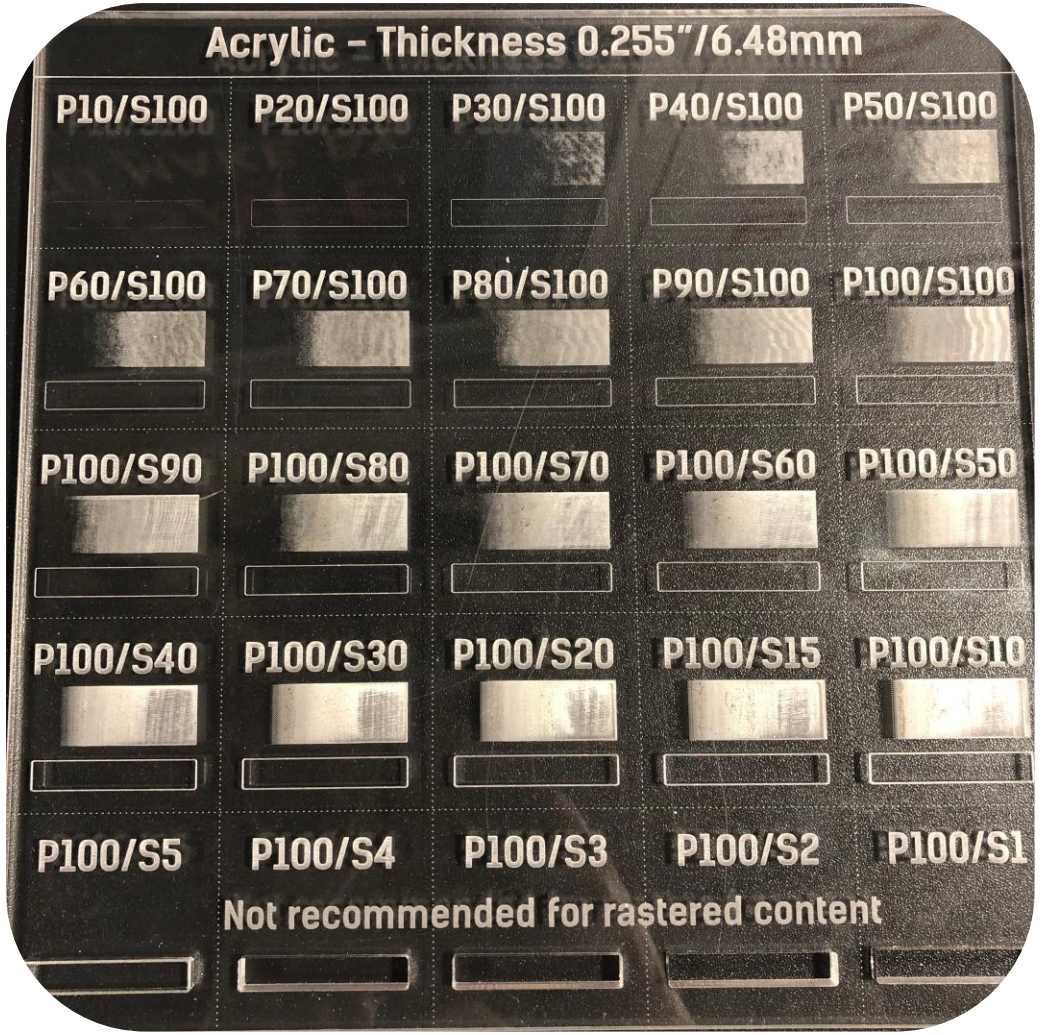
POWER & SPEED

Baltic Birch Plywood (0.121" or 0.255")

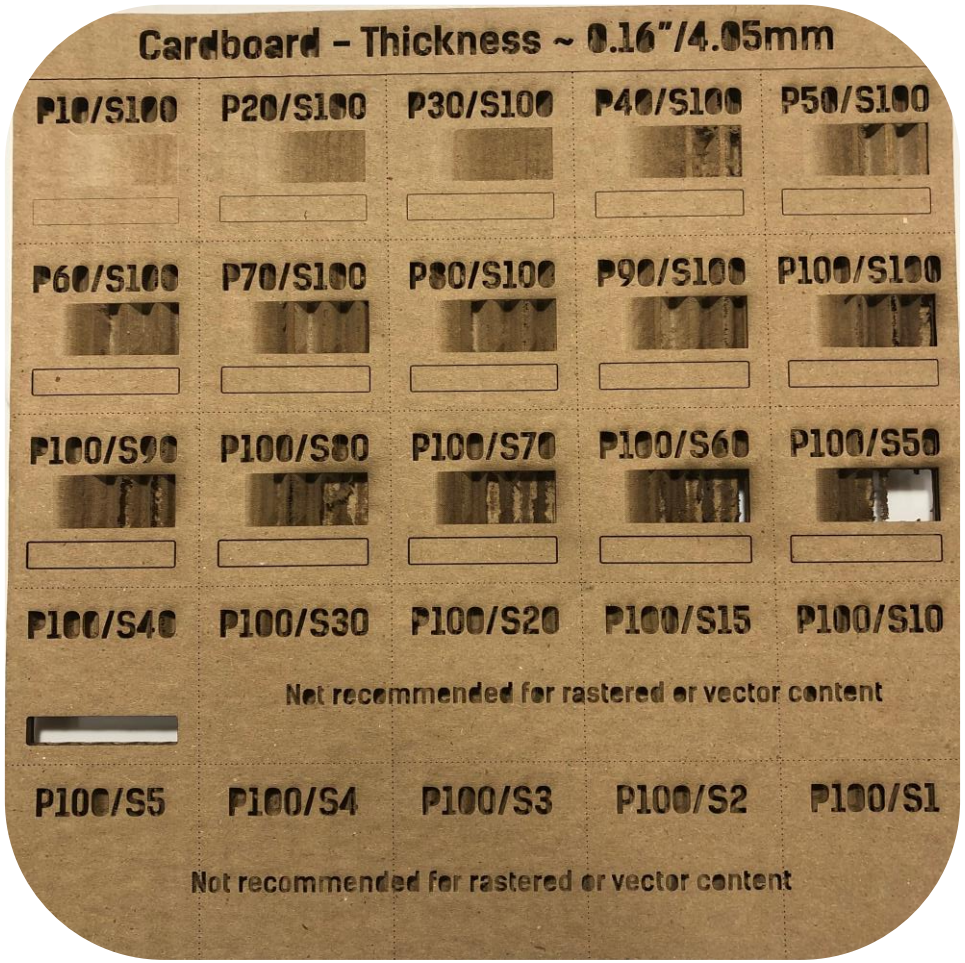




POWER & SPEED Acrylic (0.121" or 0.255")



POWER & SPEED Cardboard & Bristol Board



POWER & SPEED

Using Power & Speed Boards to Plan Ahead

In order to save time, determine your initial power and speed settings ***before*** you get on laser cutter.

You can do this using the Power/Speed Boards from previous pages or use the boards in the Makerspaces next to the Laser Cutters.

Color	Mode	Power	Speed
Black			
Magenta			
Yellow			
Cyan			
Green			
Red			
Blue			
Orange			

Color	Mode	Power	Speed
Black	Rast/Vect	50.0%	100%
Magenta	Rast/Vect	100%	5.0%
Yellow	Rast/Vect	100%	50%
Cyan	Rast/Vect	100%	5.0%
Green	Rast/Vect	80.0%	100%
Red	Rast/Vect	100%	6.0%
Blue	Rast/Vect	100%	100%
Orange	Rast/Vect	100%	5.0%

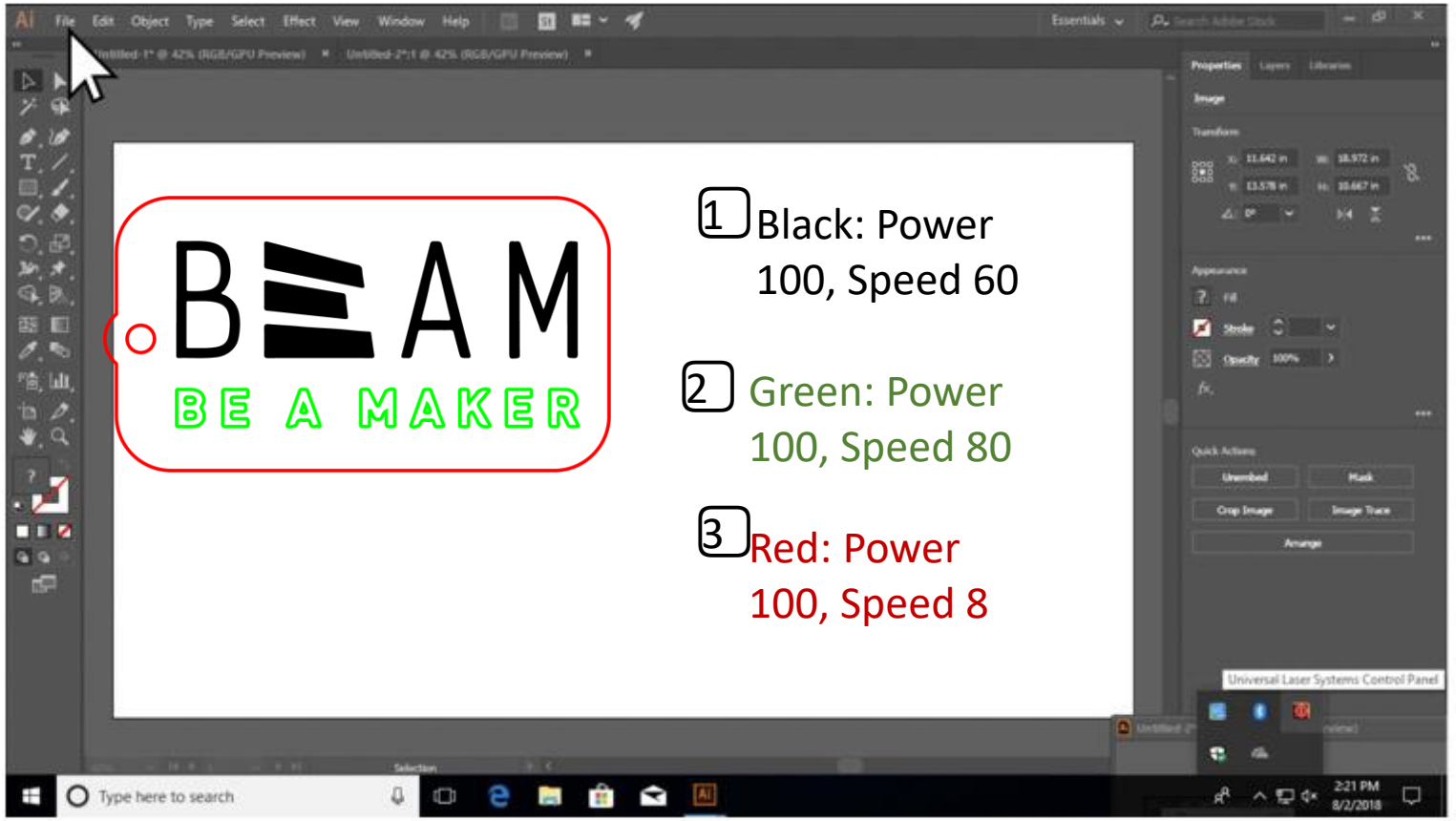
POWER AND SPEED Determine Order

You can decide what order to cut or etch things by choosing what order the colors go in.

It is better to raster or etch things before cutting. Cutting can cause pieces of material to move around, affecting later rasters.

For example: If you were to cut out the red part of the keychain on the right before you etched the BeAM logo and wording, the keychain would be separated from the larger piece of wood and can move around while the rest of the design is cut.

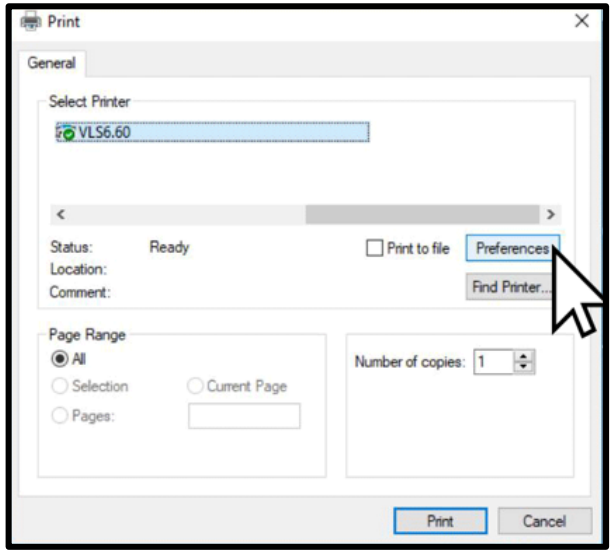
Record the order for yourself so you remember it!

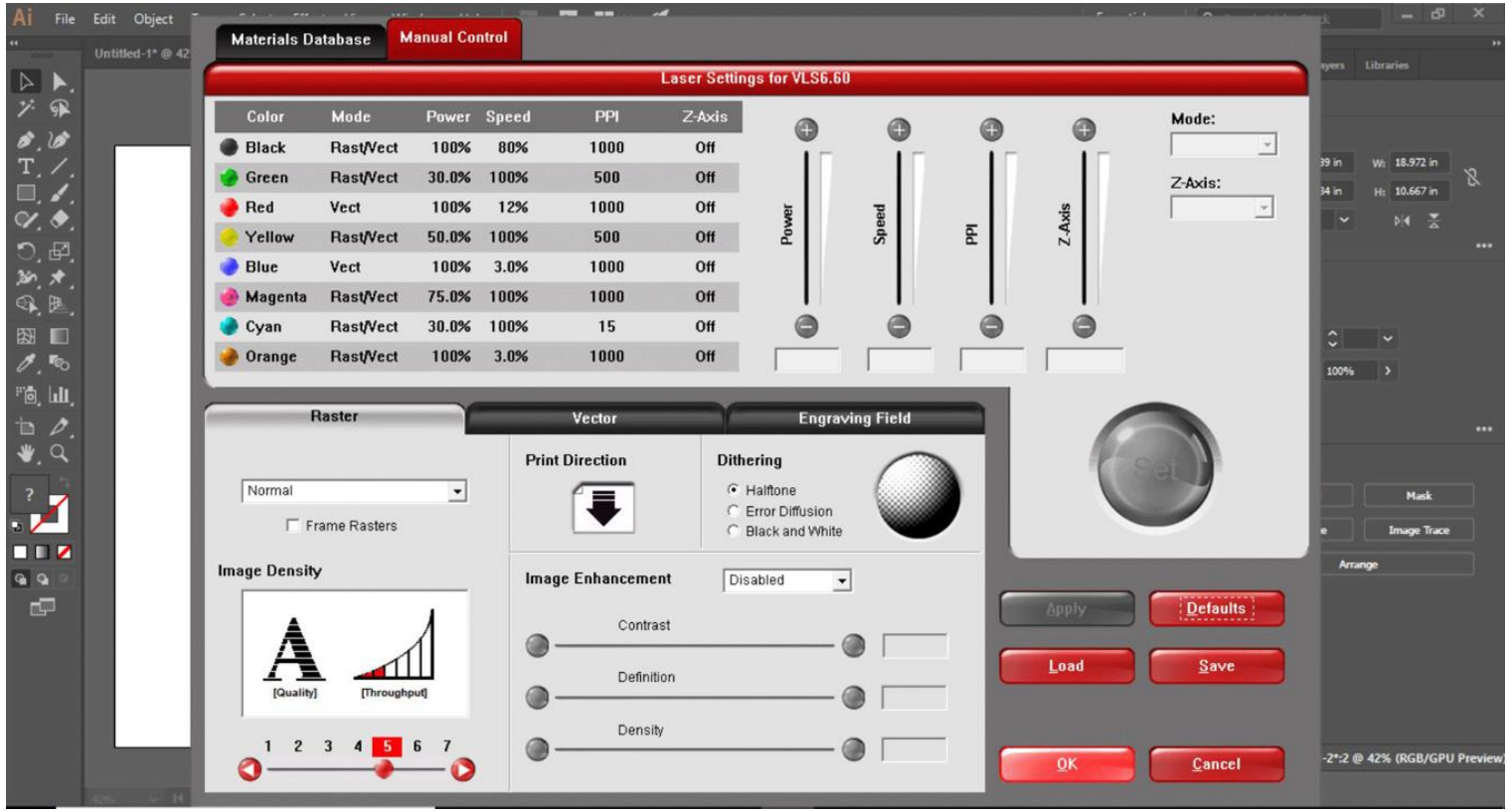


POWER & SPEED Settings in Illustrator

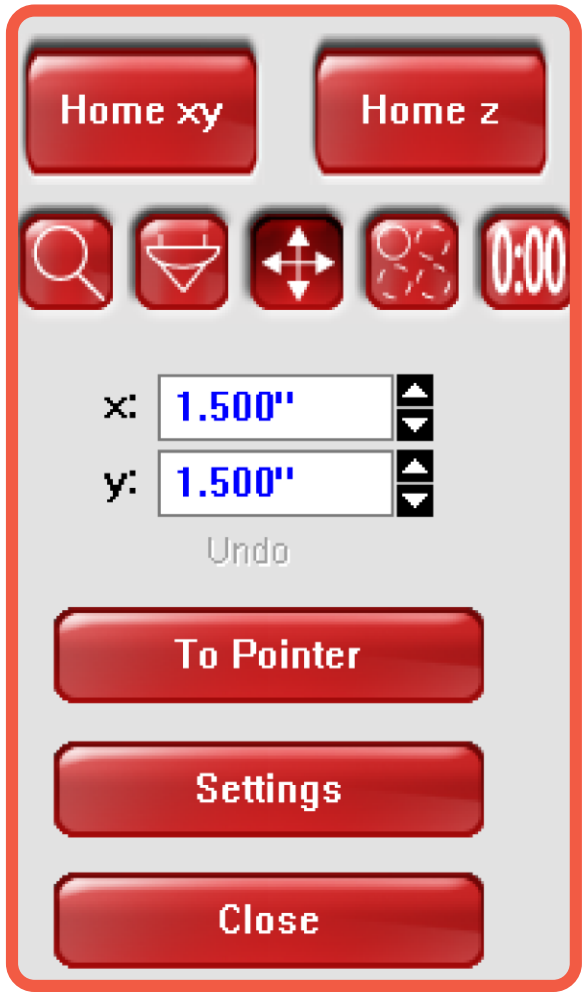
To get to Power and Speed settings:

- Open Illustrator file on laser cutter computer
- File → Print
- Click ‘Setup’
- Click ‘Preferences’





ULS SOFTWARE



ULS SOFTWARE

DOWNLOAD ULS SOFTWARE

ZOOM VIEW

FOCUS VIEW

RELOCATE VIEW

DUPLICATE VIEW

ESTIMATE VIEW

NEXT

ULS SOFTWARE Downloading the Software

ULS = Universal Laser System Software

Access step-by-step instructions on downloading the ULS Software from BeAM using the following link:

https://beam.unc.edu/files/2019/01/LaserCutter_SoftwareSOP_01012019.pdf

UNIVERSAL LASER SYSTEMS INC.

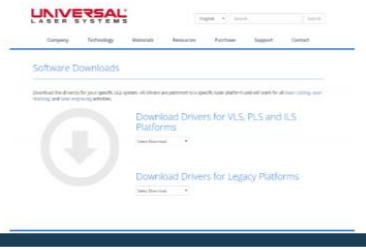
UNC BeAM
Hanes Art Center or Murray Hall
ULS UCP (Laser Cutter Control Software)
Standard Operating Procedures (SOP):

Introduction

Universal Laser Systems offers its Universal Control Panel software as a free download on its website. This software is used to position and duplicate your design, as well as determine power, speed and PPI settings in preparation for cutting. Downloading and using this software will allow one to determine the required settings and estimated time of a cut *before* actually getting on the laser cutter.

Download and Installation

Begin by downloading your software. Navigate to ULS's downloads page at https://www.ulsinc.com/support/software-downloads.

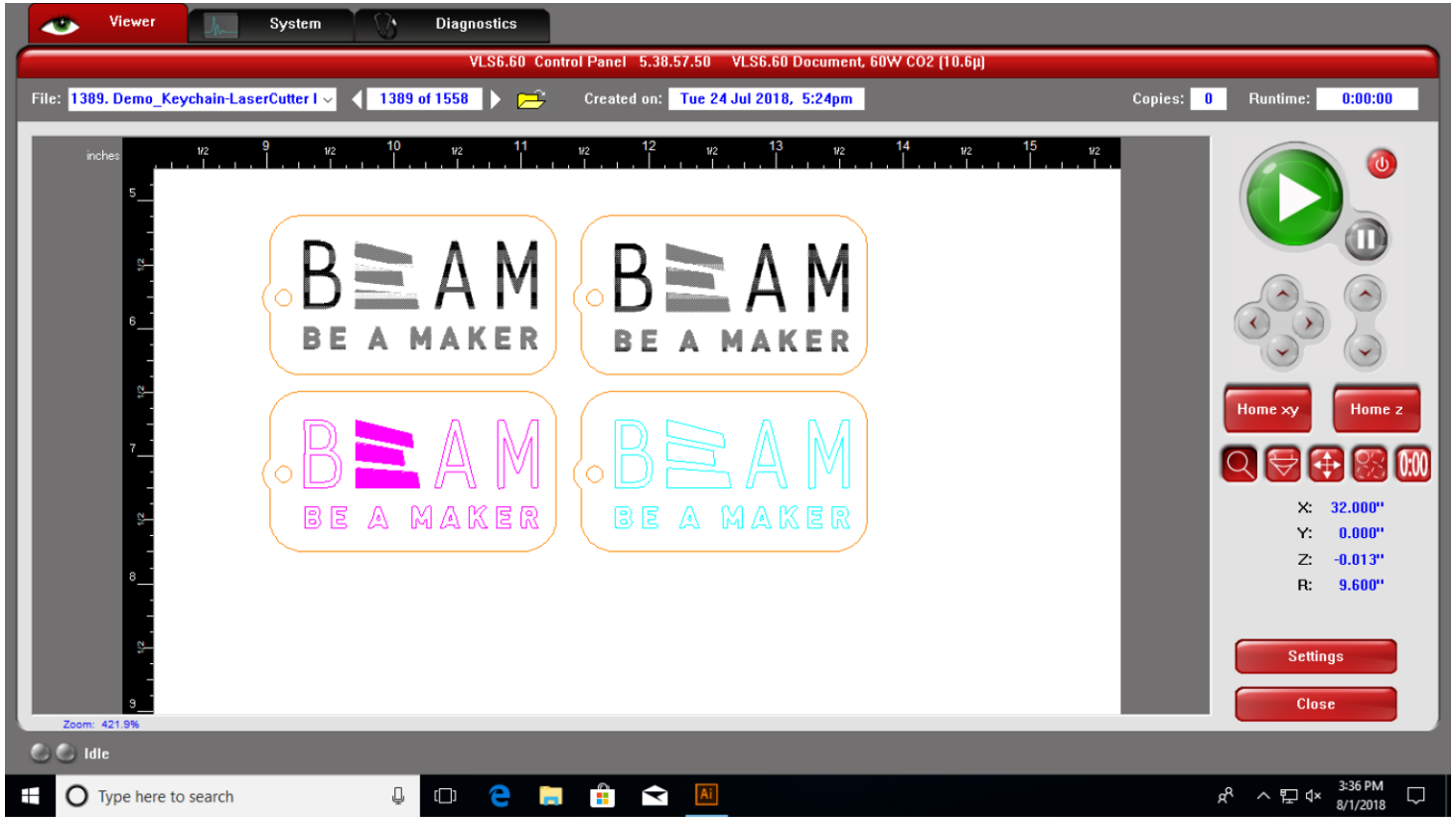


Zoom View

Zoom View:

-Can magnify specific part of design

-Can be helpful for small details



ULS SOFTWARE Focus View

Focus View:

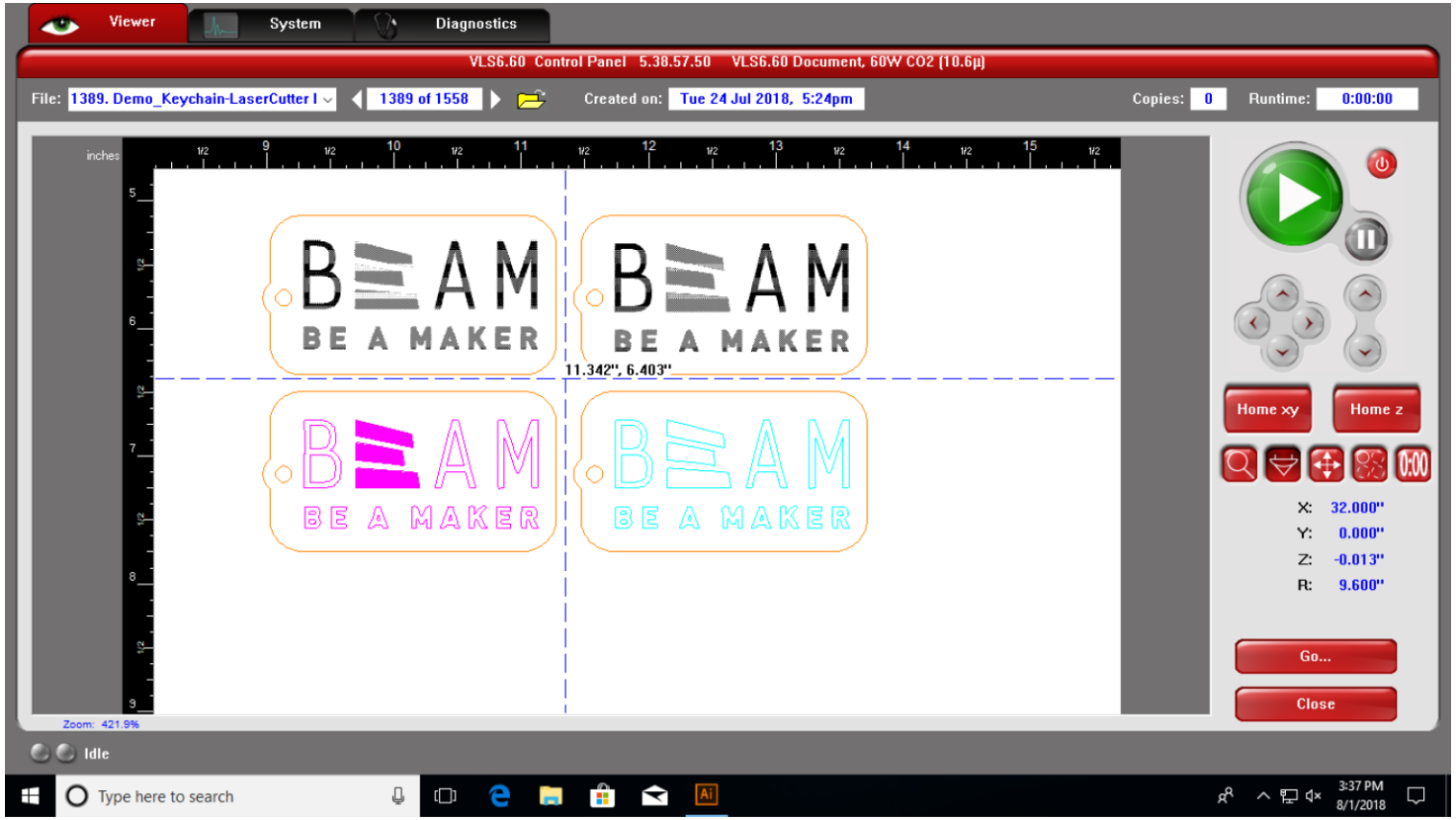
-Controls the x and y position of the laser carriage.

-Click on a point on the screen and the laser carriage moves to that point on bed.

-When laser cutter door is open, a red light will show where the laser is pointed

-Helpful for determining where your design will actually cut on the material.

-Click on all corners of your design to make sure your design fits on the material.



ULS SOFTWARE Relocate View

Relocate View:

-Allows you to adjust placement of your design.

-Helpful in conjunction with the nozzle tool – if you find your design doesn't line up on the material, click and drag it with the relocate view.

L-ook at rulers on both the screen and the laser cutter to make sure design is placed where you want it to be.

-Can choose 'To Pointer' button to snap design to location of the laser carriage.

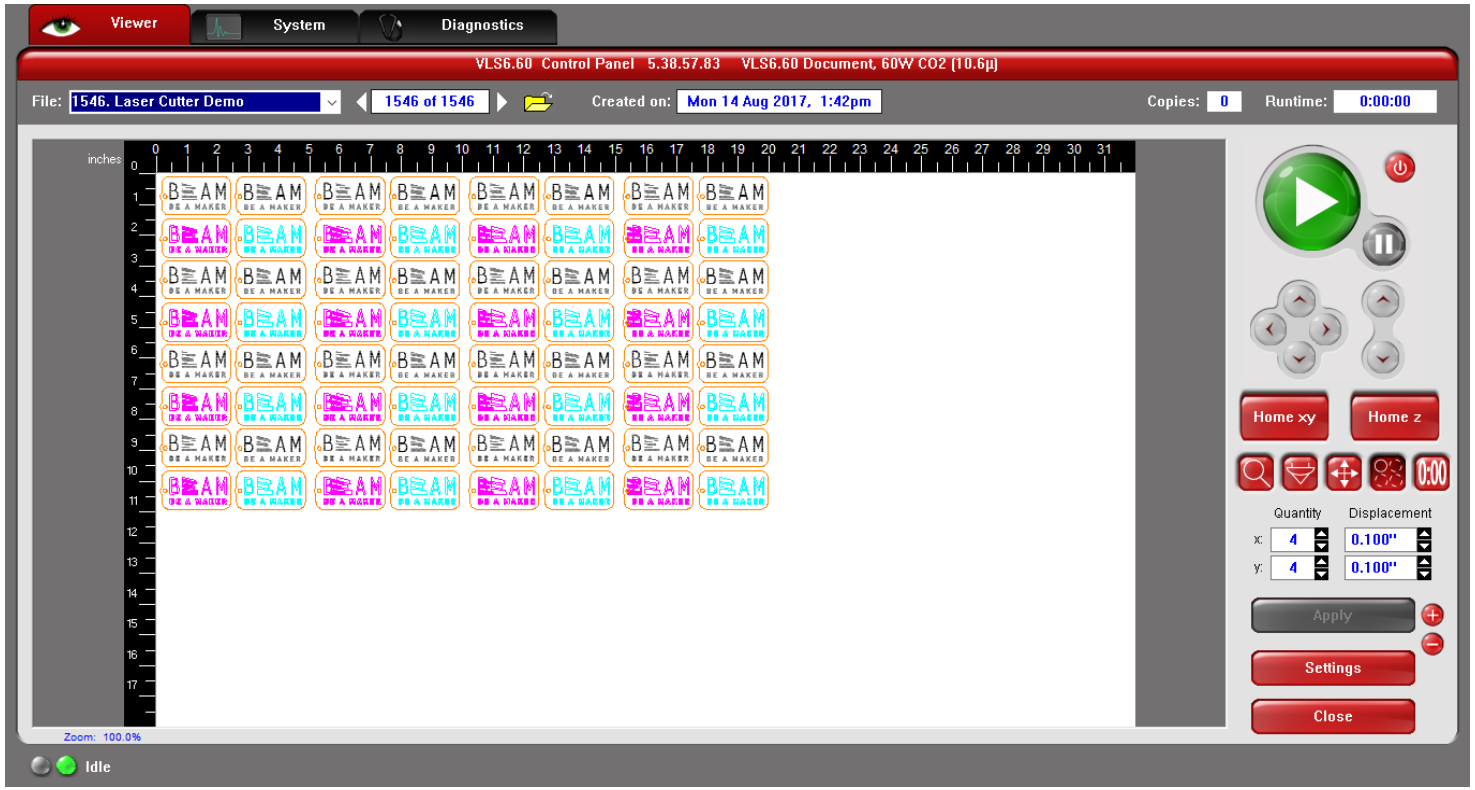
ULS SOFTWARE Duplicate View

Duplicate View:

-This tool allows you to duplicate your design.

-Put in how many times you want to duplicate along the x axis, and how many times along the y, and it will do so.

-For example: 3 along x and 3 along y means you will get 9 of your design arranged in a 3 by 3 square.



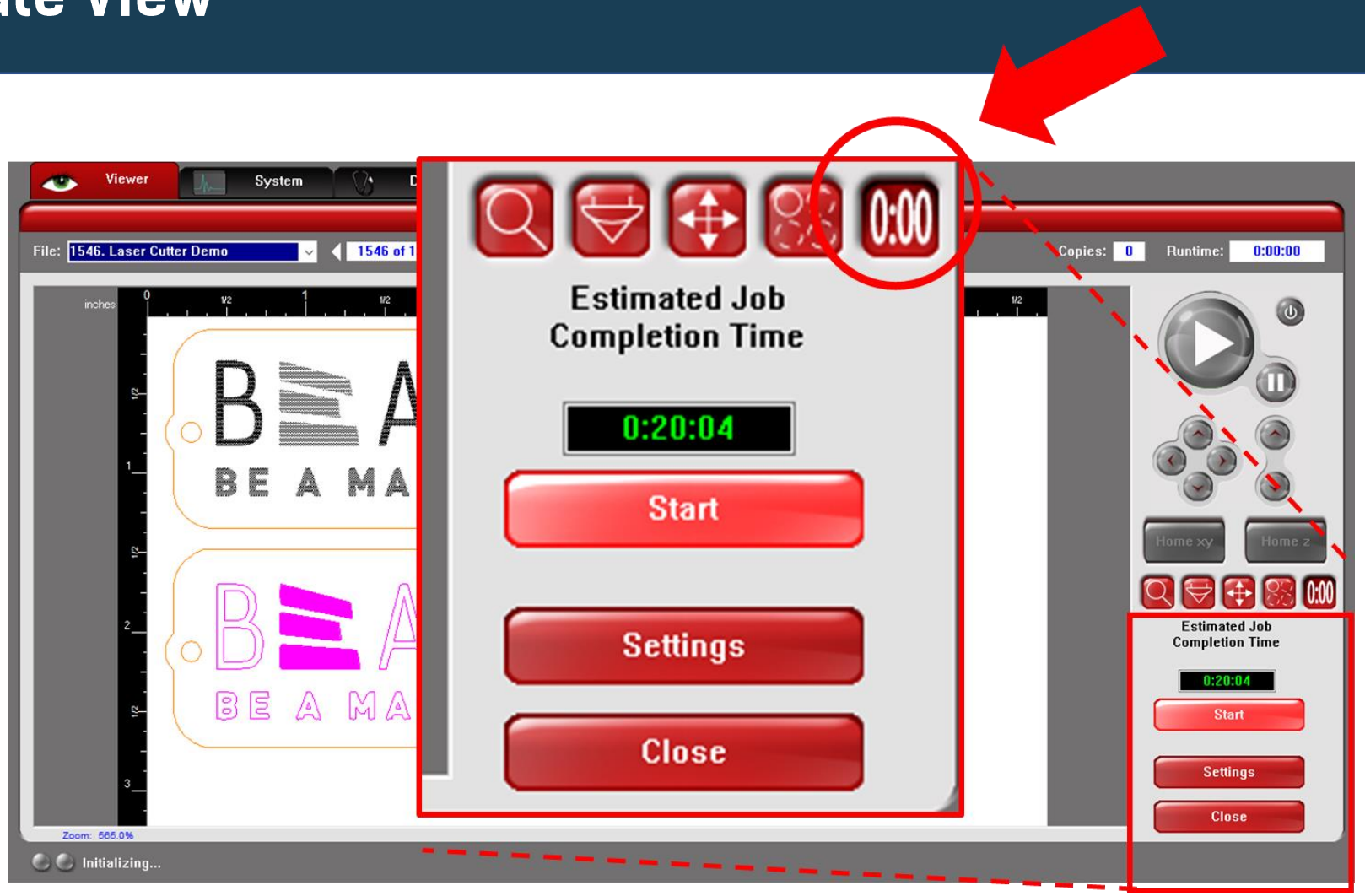
ULS SOFTWARE Estimate View

Estimate View:

-Predicts how long your job will take to run. Remember there is a 90 minute limit for all students using the laser cutter.

-Required that you click ‘Start’ on the timer before each job to check the time.

-If colors are greyed out at any point in any of these views, something’s wrong



TOOL PREP & CUT

TOOL PREP & CUT

VERIFY CUT WITH BEAM STAFF

TURNING ON AIR FLOW

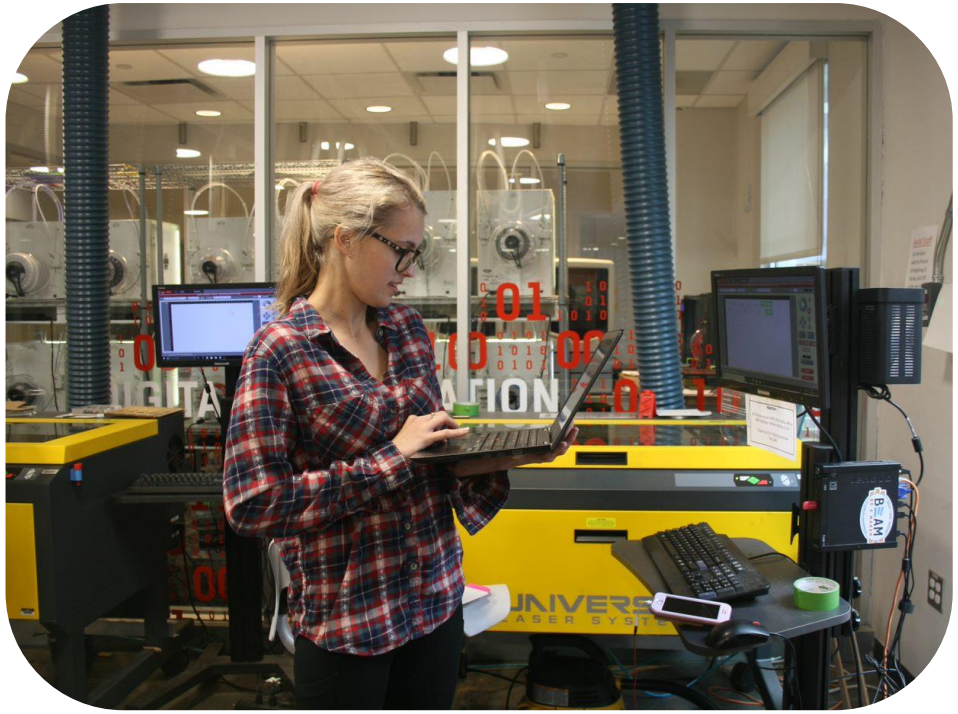
FOCUSING THE LASER

CLOSING THE GLASS DOOR

NEXT

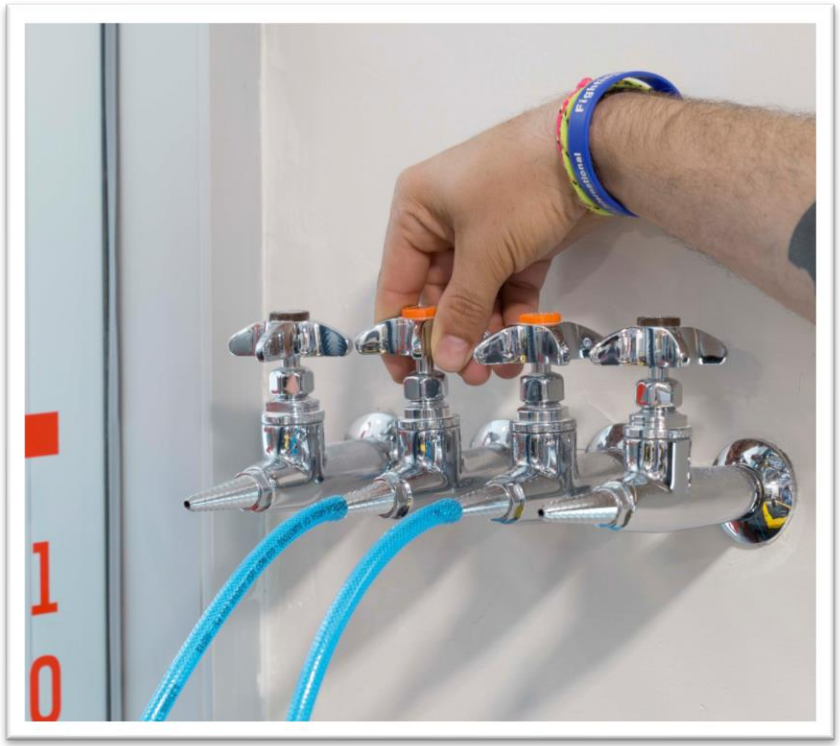
TOOL PREP & CUT Verifying your Cut with BeAM Staff

- Before you can use the laser cutter you must have your Illustrator file approved by a BeAM Staff member.
- Verifying the illustrator file will reduce common errors associated with laser cutting to save time using the laser cutter.
- Reminder once you are on the laser cutter there is a 90 minute time limit on the machine per person
- Make sure to check out our Laser Cutting FAQ page



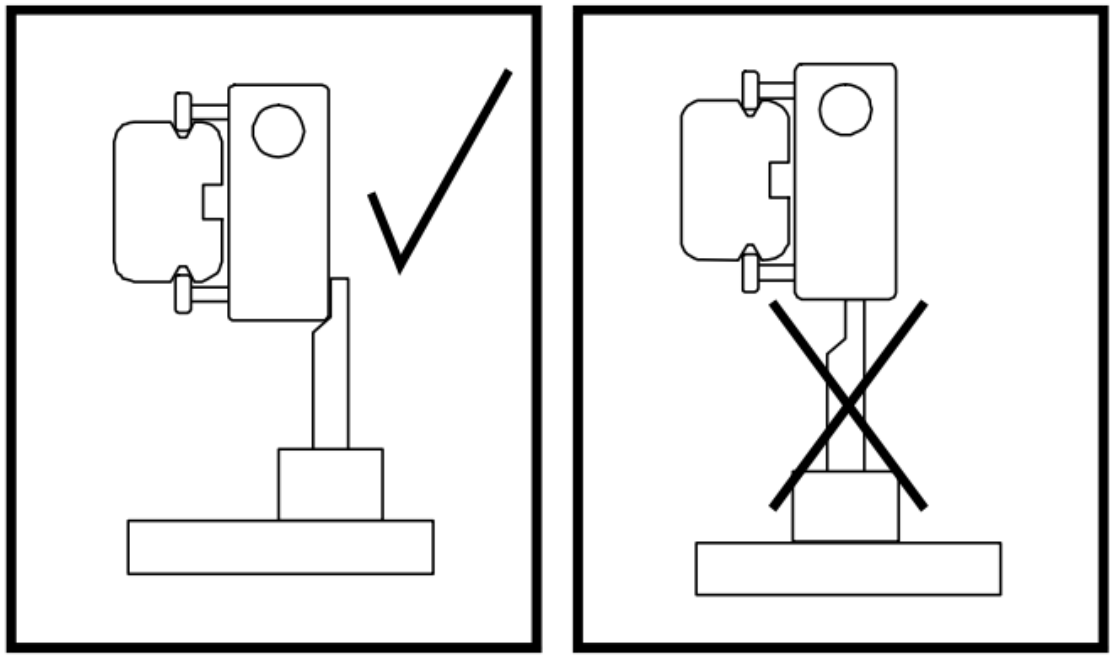
Turning on Air Flow

MURRAY



HANES

Focusing the Laser



Focusing the laser makes sure the laser is right height for working with your material the way you want it to.

Using the calibration tool, slide it under the front of the laser cutter carriage until notch rests just under carriage.

Closing the Glass Door

Make sure to close glass door properly before beginning your cut. If the door is not properly shut the laser will not cut, it will outline the path in safe-mode using the red laser as an outline.

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