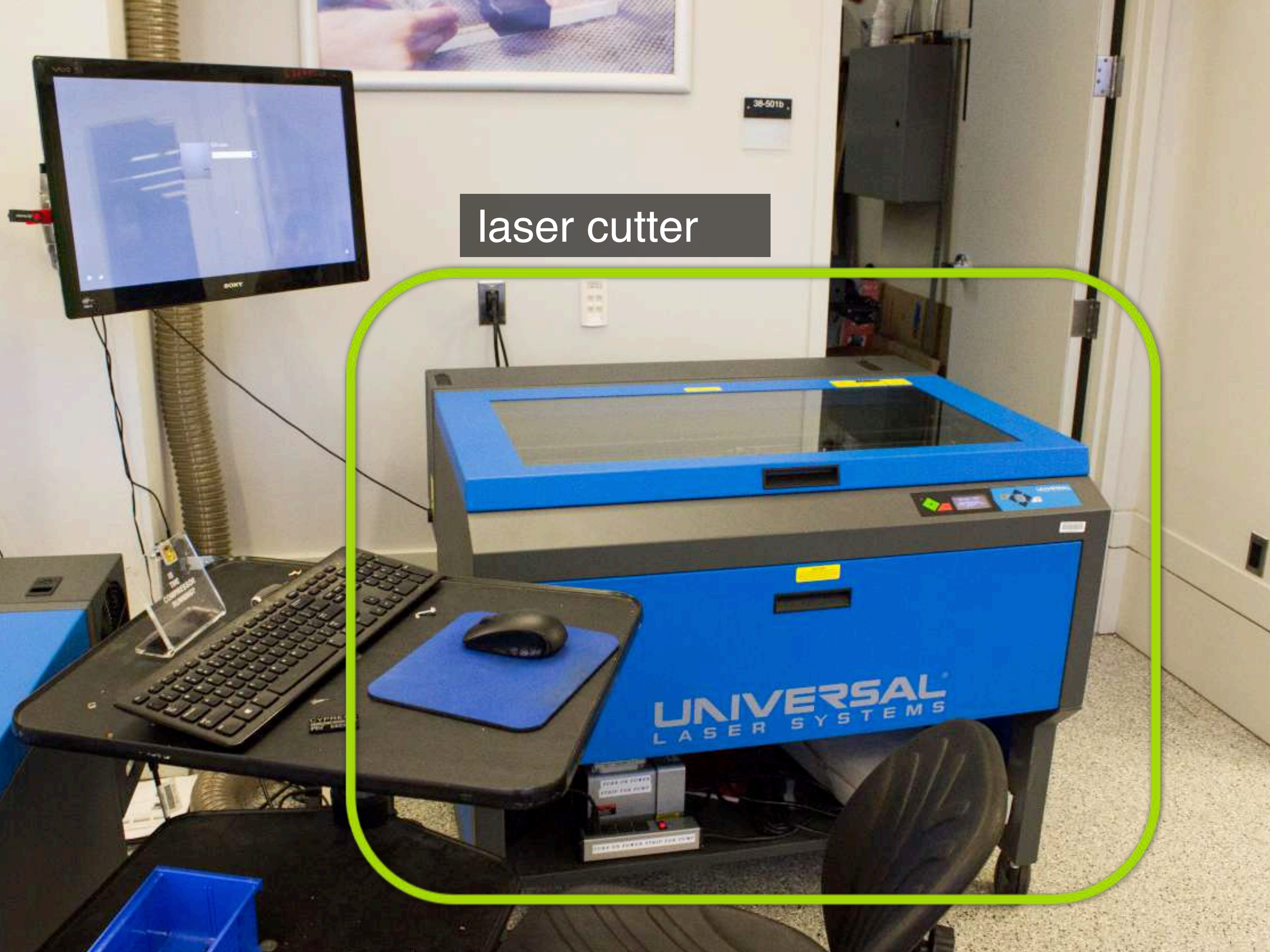


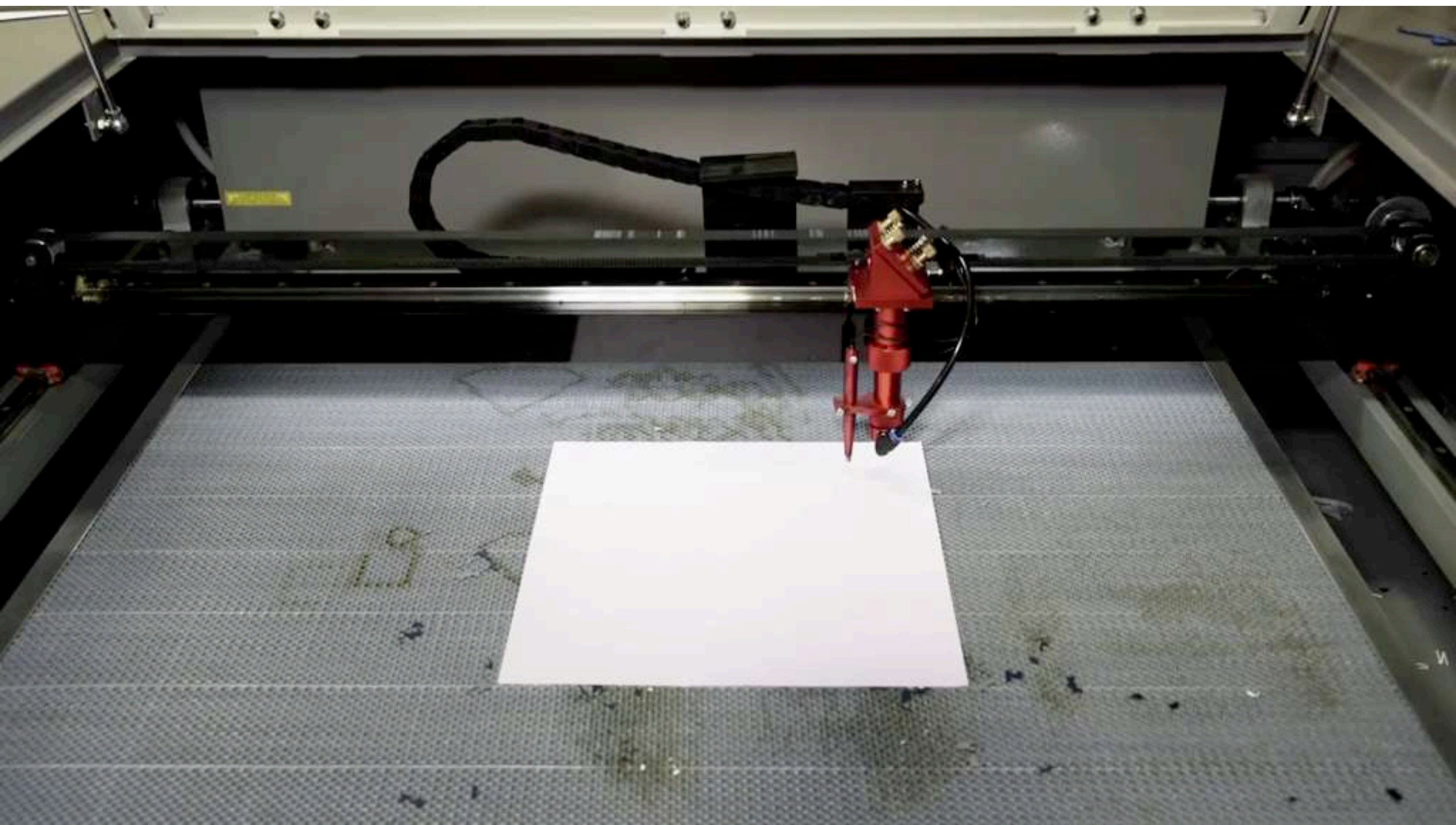
Laser Cutting for Starters

6.S063 Engineering Interaction Technologies

Prof. Stefanie Mueller | MIT CSAIL | HCI Engineering Group

laser cutter





benefits::

fast (good for design iteration)

easy to learn and get started!

how can

I laser cut something?

create a 2D vector drawing

File Edit View Window Help

Home Tools

final_template.pdf x

Sign In

Save Undo Print Email Find

Page 1 / 1

61%

Hand Mouse

Zoom In Zoom Out

Full Screen

Search

Comment

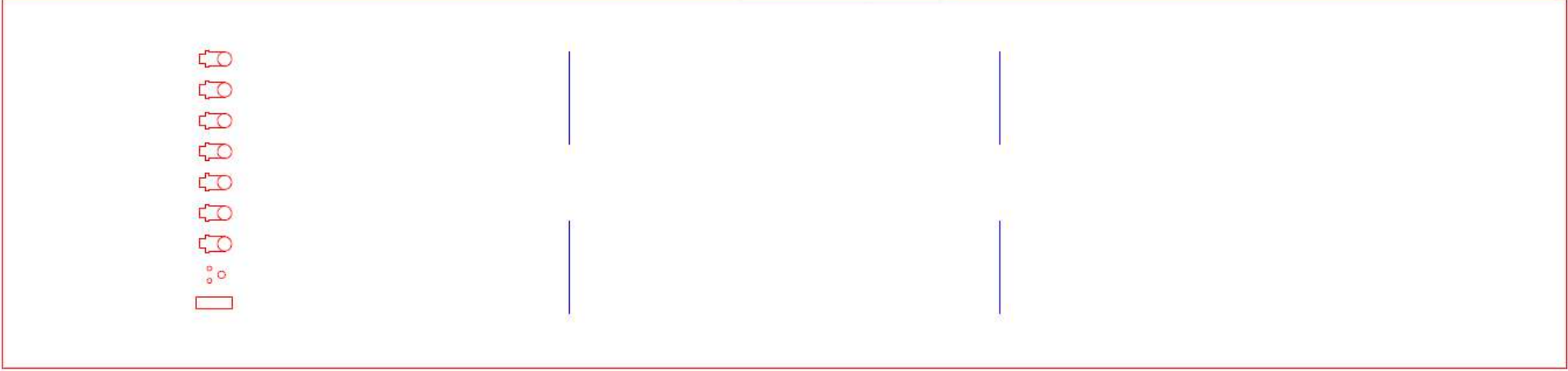
Draw

Copy

Bookmark

Link

Fullscreen Stop



Export PDF

Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File

final_template.pdf

Convert to

Microsoft Word (*.docx)

Document Language: English (U.S.) Change

Convert

Create PDF

Edit PDF

Comment

Combine Files

Organize Pages

Fill & Sign

Send for Signature

Send & Track

Store and share files in the Document Cloud

Learn More

Windows Taskbar

10:16 AM 1/18/2017

File Edit View Window Help

- Open... Ctrl+O
- Create PDF Online...
- Save Ctrl+S
- Save As... Shift+Ctrl+S
- Save as Other
- Send File
- Revert
- Close Ctrl+W
- Print... Ctrl+P
- 1 final_template.pdf
- 2 C:\Users\EDS\Downloads\laser test (1).pdf
- 3 E:\...laser cutter temp...multitouch pad.pdf
- 4 E:\...laser cutter temp...multitouch pad.pdf
- 5 E:\PT1pdf.pdf
- View All Recent Files...
- Exit Ctrl+Q

Navigation toolbar: Mouse, Hand, Zoom Out, Zoom In, 61%, Rotate, Crop, Content, Comments, Annotations

Document content: A large white area with two vertical blue lines and a horizontal red line, suggesting a template or a specific layout for a document.

Print

Printer: PLS6.75

Properties

Advanced

Help

Copies: 1

☐ Print in grayscale (black and white)

☐ Save ink/toner

Pages to Print

☒ All

☐ Current page

☐ Pages 1

More Options

Page Sizing & Handling

Size

Poster

Multiple

Booklet

☐ Fit

☐ Actual size

☒ Shrink oversized pages

☐ Custom Scale: 100 %

☐ Choose paper source by PDF page size

Orientation:

☒ Auto portrait/landscape

☐ Portrait

☐ Landscape

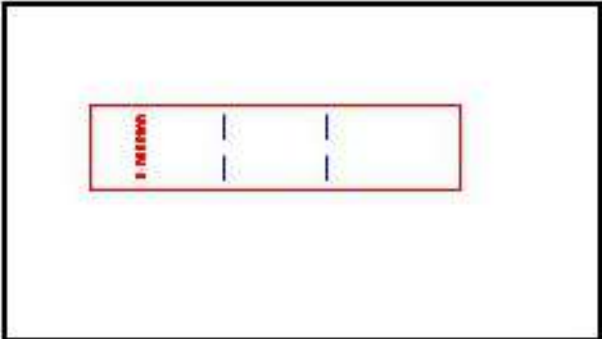
Comments & Forms

Document and Markups

Summarize Comments

Scale: 100%

32 x 18 Inches



<

>

Page 1 of 1

Print

Cancel

Page Setup...

define power, speed of laser (different for each material)

The screenshot displays a laser control software interface. At the top, there are tabs for 'Viewer', 'System', and 'Diagnostics'. Below these, there are tabs for 'Materials Database' and 'Manual Control'. The 'Manual Control' tab is active, showing a red header bar with the text '75W CO2 (10.6μ) Laser Settings for PLS6.75'.

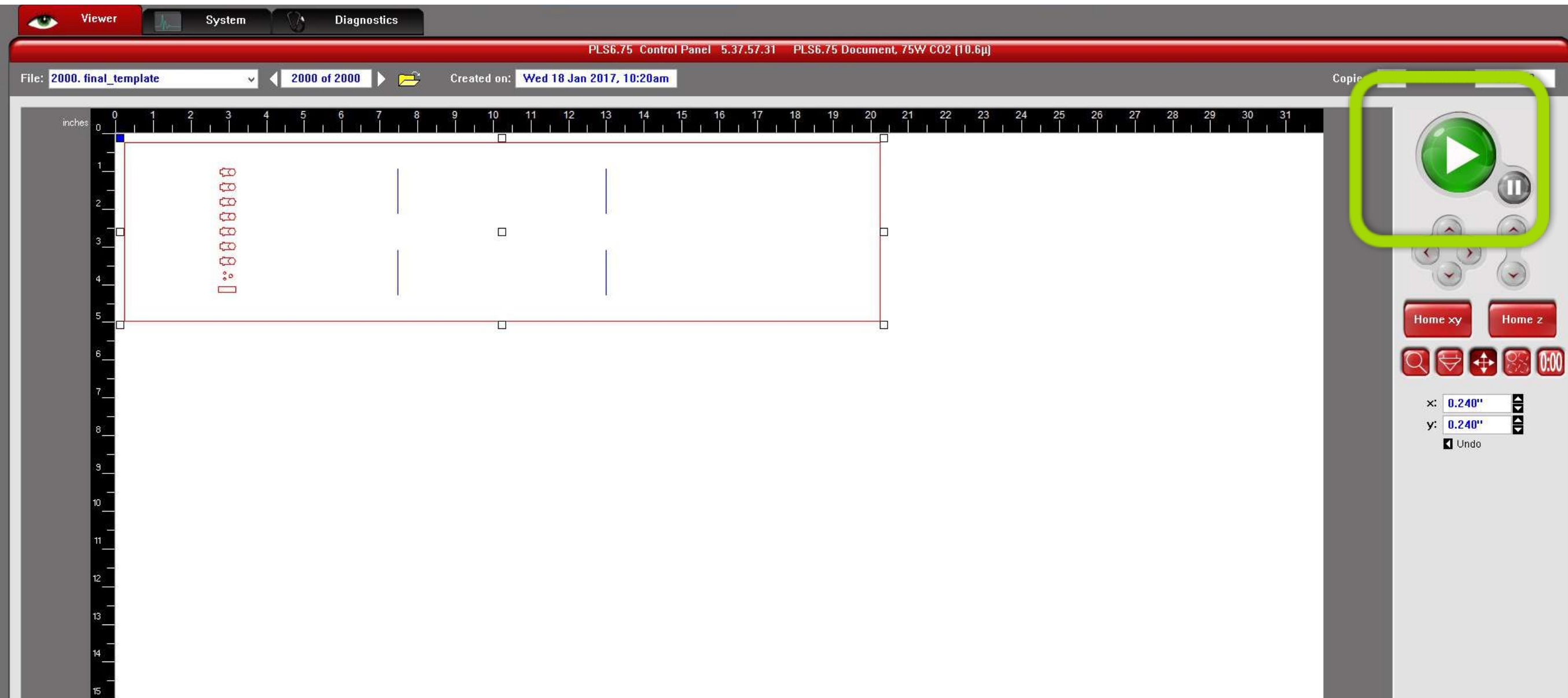
Below the header bar is a table with the following columns: Color, Mode, Power, Speed, PPI, and Z-Axis. The table lists settings for various colors:

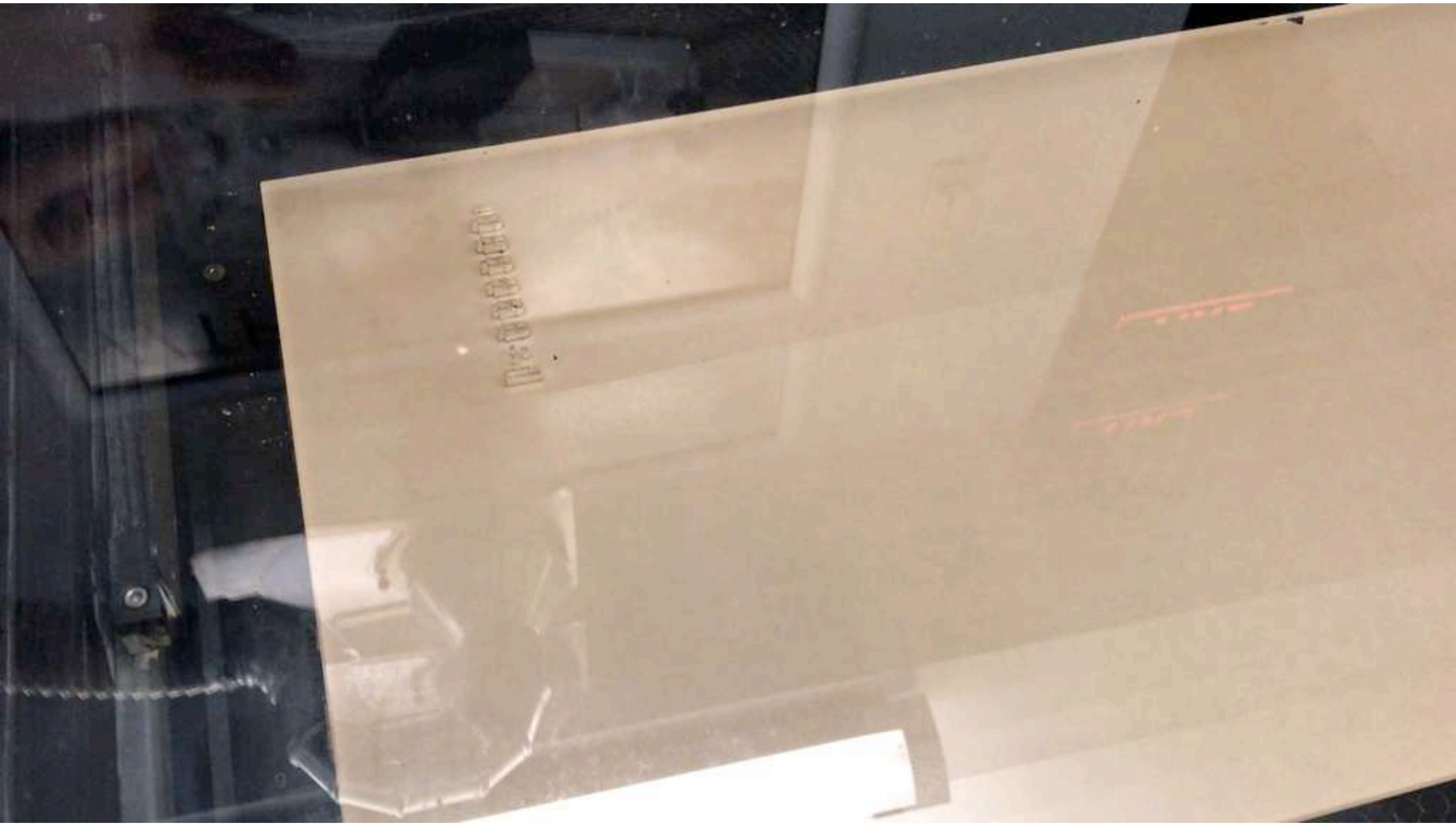
Color	Mode	Power	Speed	PPI	Z-Axis
Black	Rast	26.0%	100%	500	0.230"
Red	Vect	100%	1.9%	1000	0.230"
Green	Vect	100%	1.9%	1000	0.230"
Yellow	Vect	100%	1.9%	1000	0.230"
Blue	Vect	5.4%	12%	500	0.230"
Magenta	Vect	100%	1.9%	1000	0.230"
Cyan	Rast/Vect	50.0%	100%	500	0.230"
Orange	Rast/Vect	50.0%	100%	500	0.230"

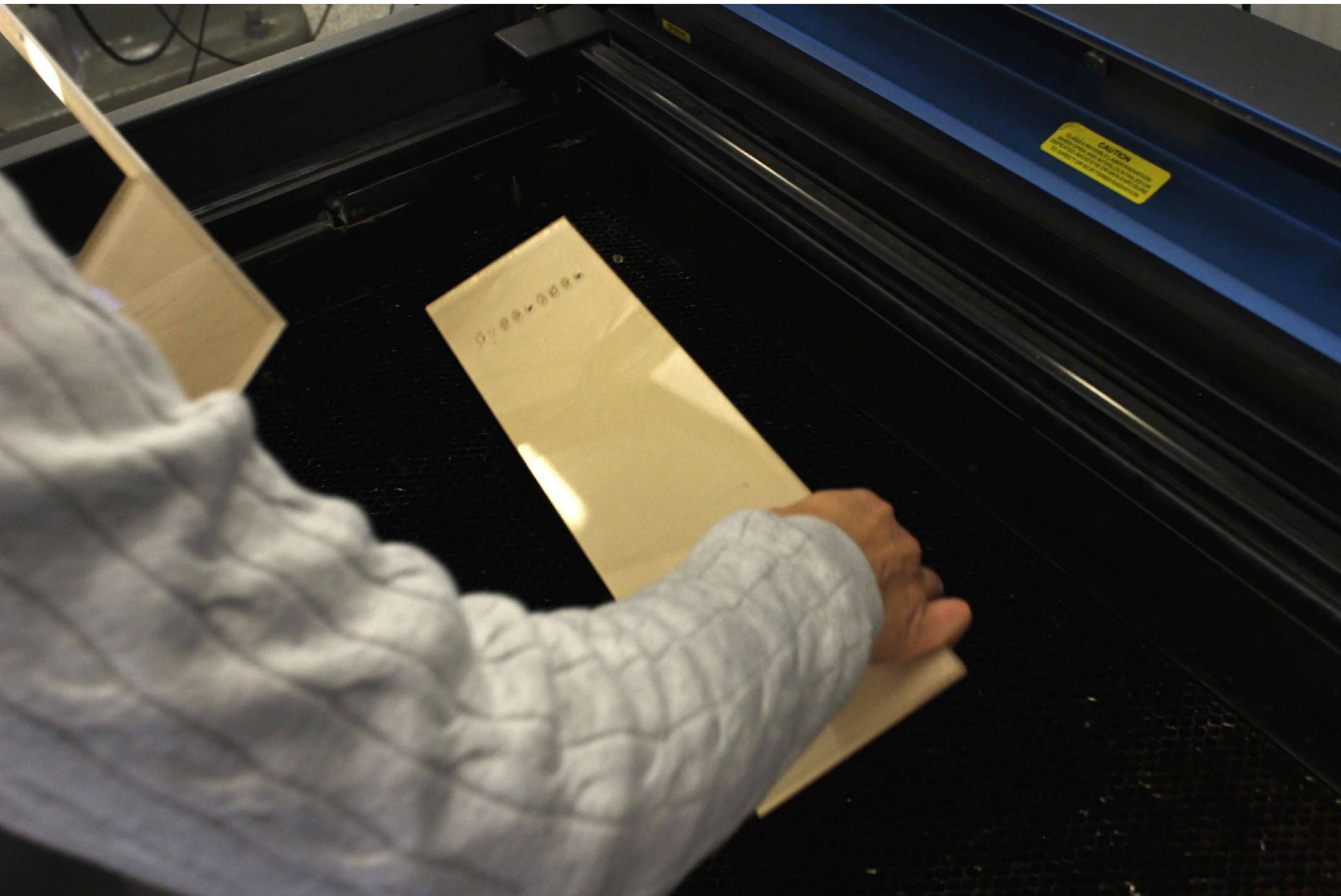
To the right of the table are four vertical sliders labeled 'Power', 'Speed', 'PPI', and 'Z-Axis'. Each slider has a '+' button at the top and a '-' button at the bottom. Below each slider is a numerical input field. To the right of these sliders are two more input fields labeled 'Mode:' and 'Z-Axis:'. At the bottom of the interface, there are three tabs: 'Raster', 'Vector', and 'Engraving Field'. The 'Vector' tab is active, showing a 'Print Direction' section with a button and a 'Dithering' section with a radio button labeled 'Halftone'.

laser cutter control panel: hit cut button

(looks different for each laser cutter model)







**homework
until next wednesday**

laser cut your own business card::


homework until next wednesday (Sept. 13)

pass / no pass (not graded)



deliverables::

- bring your card to class on wednesday (Sept. 13)
- upload a photo of your card to gradebook
- upload the laser cut file to gradebook


 6.S063 Engineering Interactive Techn...
Class Membership **Gradebook** Calendar Materials Forum Settings


Assignments Students

Assignments > Laser Cut Your Business Card Delete Edit Hide Details View Distribution

Due	September 13, 2017 01:00 pm
Weight	0
Max Points	100
Graders Can View	Yes
Options	<ul style="list-style-type: none">• Allow students to submit their work online• Allow late submissions (marked as "late")

Assignment post on September 05, 2017 01:00 pm

 photo of your business card

 laser cut file as pdf, svg or other vector format

what we do today to get you started:

- live demo laser cutting in small groups (5-10 people)
- getting your 2D drawing program to work
- which materials you can use and where to get them
- how to access laser cutters on campus



which materials to use

most common materials::

paper

cardboard

wood

acrylic

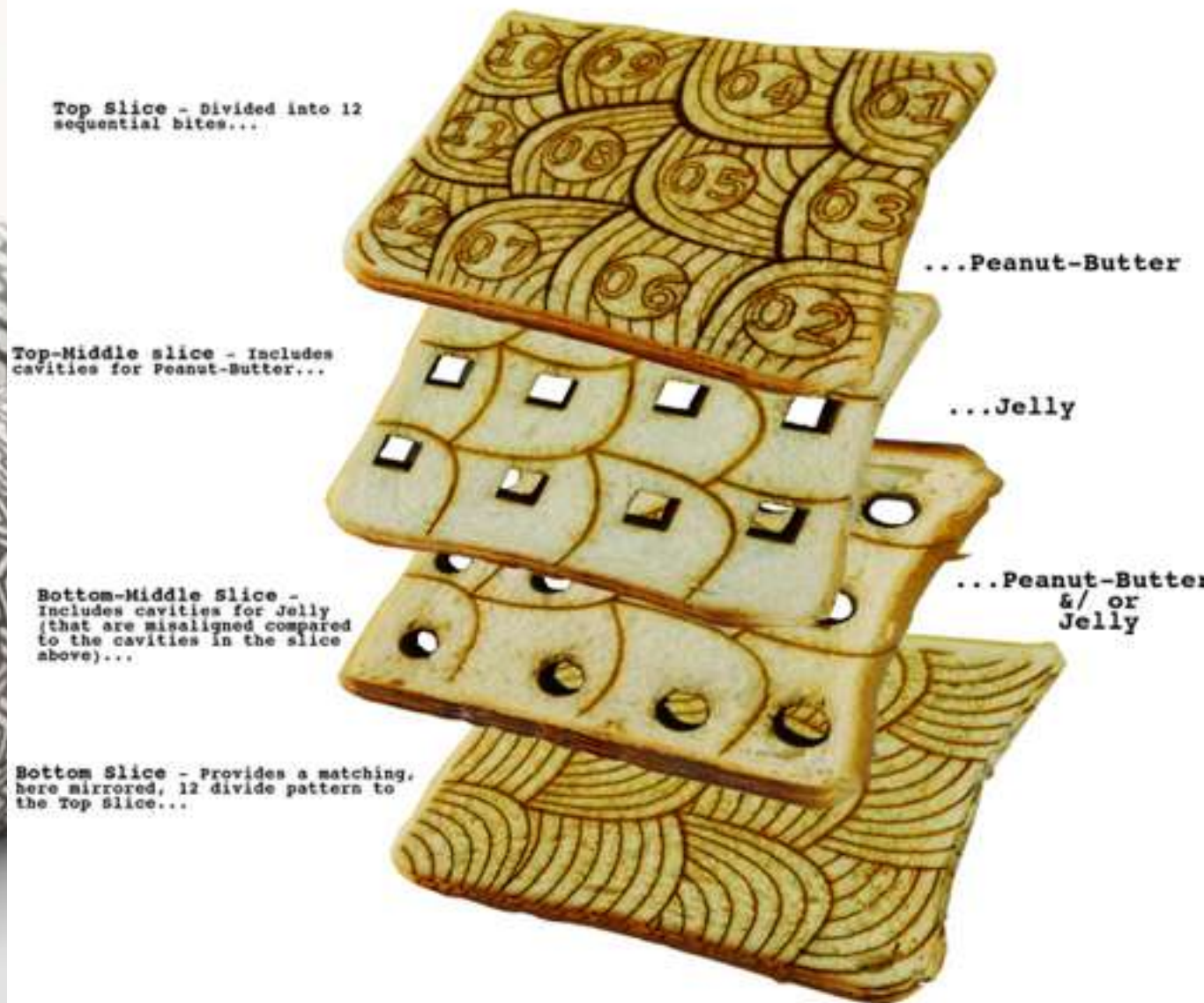
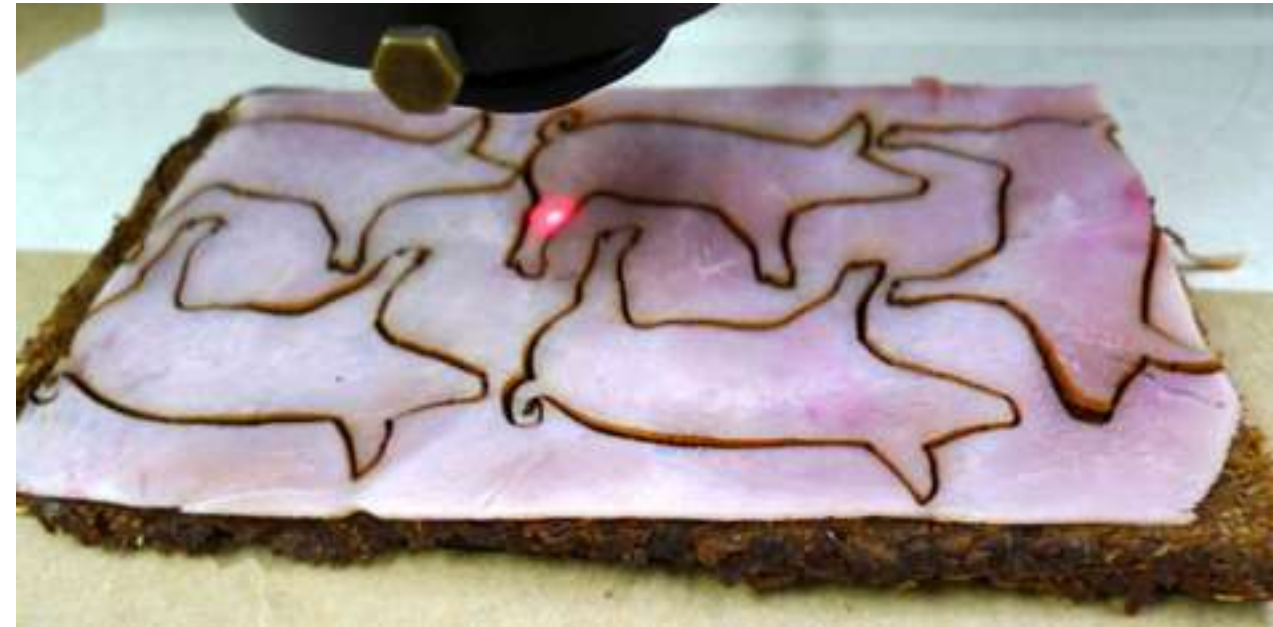


what other materials can we laser cut?

<google>

<30 second brainstorming>

unconventional materials... food...



never cut materials::

that are **flammable**

create **toxic fumes**

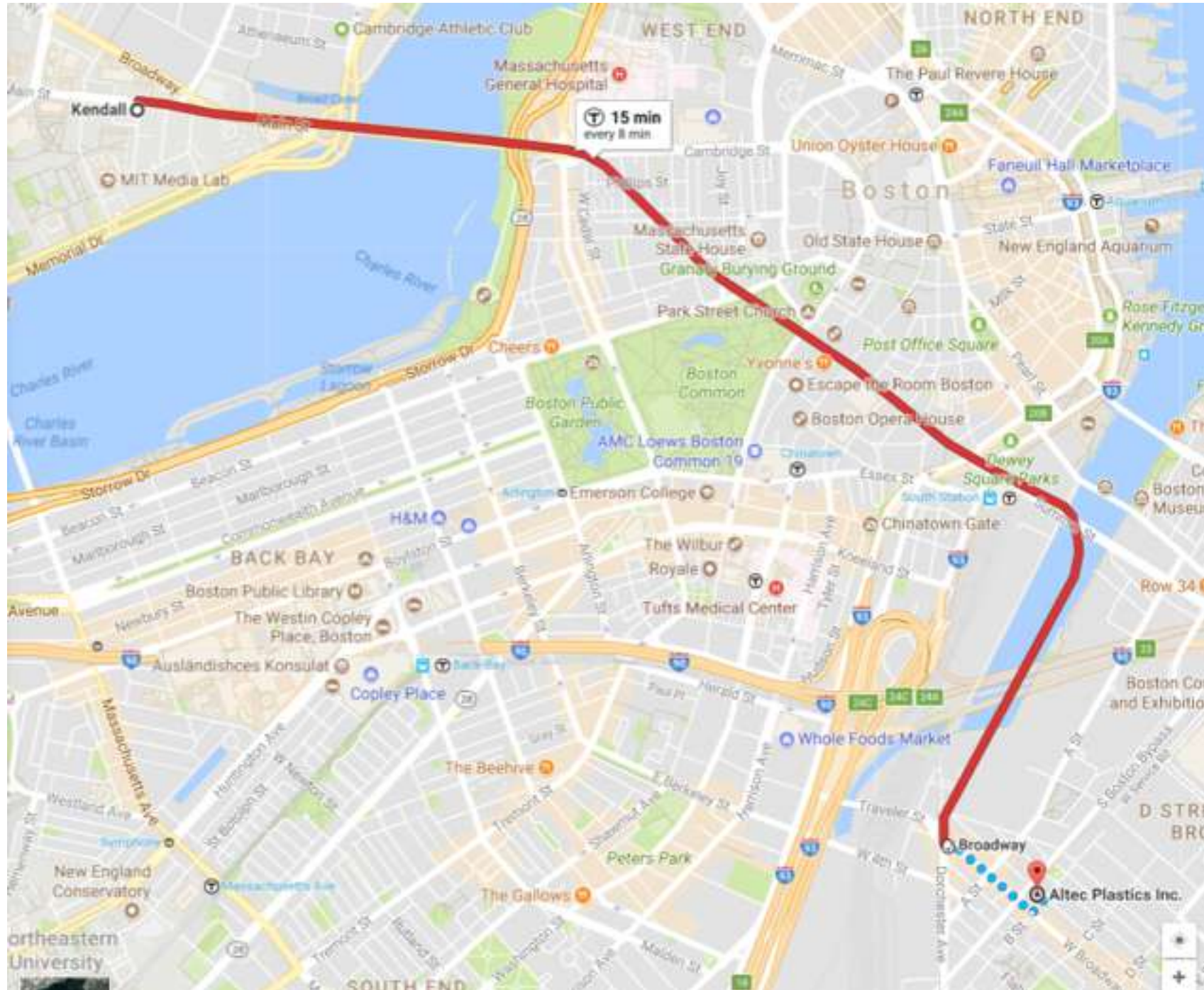
if you are not sure, **ask the shop manager!**

can we laser cut metal and glass?

no we can't, at least not on the machines we have,
but high-power industrial laser cutters can.

where to buy materials

buy materials here in Boston (15 min on redline):



Altec Plastics

116 B St

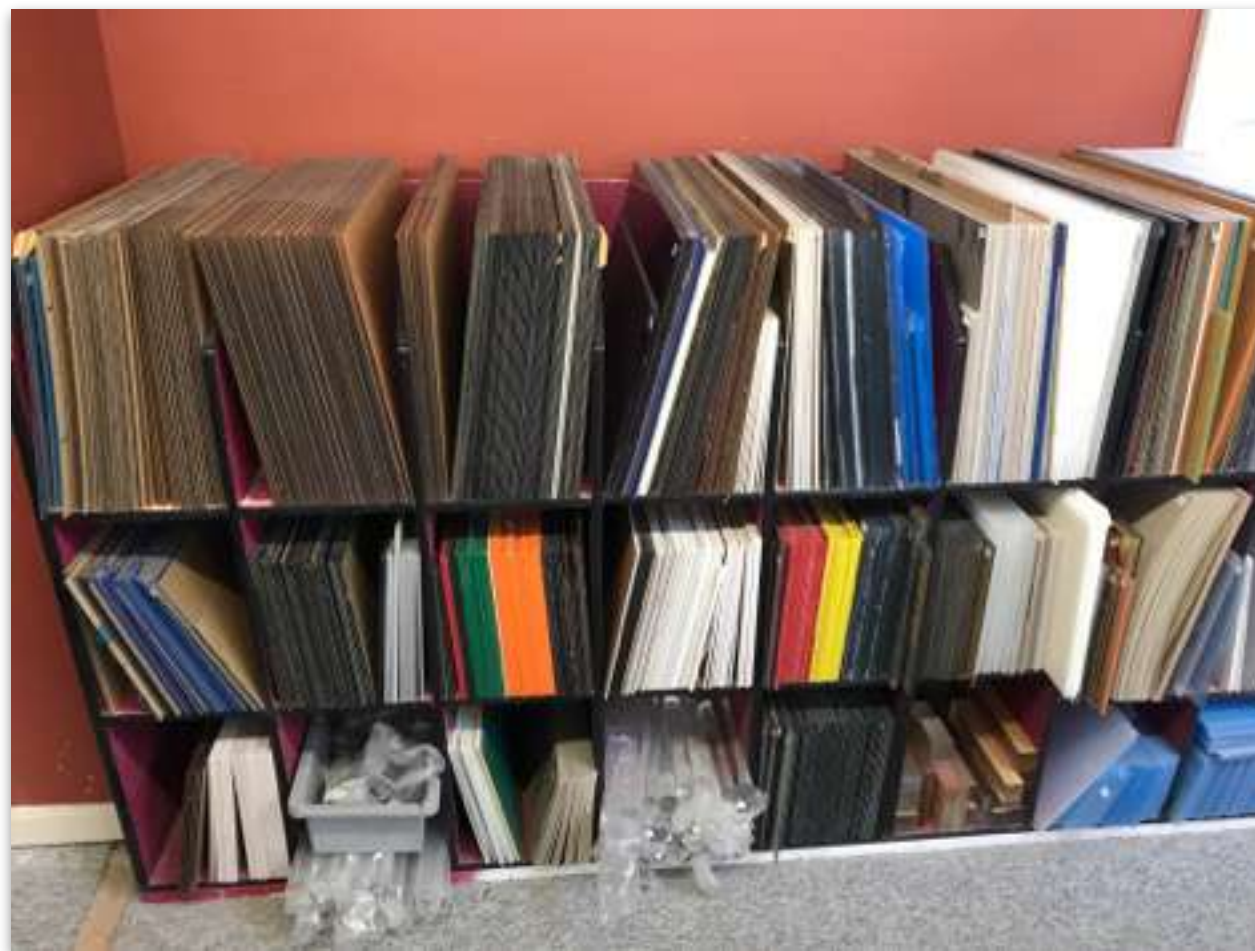
Boston, MA 02127

both **cast** and
extruded
acrylic are fine

Altec Plastics

116 B St

Boston, MA 02127



buy materials online:

The screenshot displays the Evonik Acrylite website interface. At the top, the Evonik logo is visible on the left, and a shopping cart icon on the right indicates an empty cart. The navigation bar includes links for HOME, CONTACT, PRODUCTS (highlighted), and APPLICATION GALLERY. A search bar and filters for Thickness and Color are present. A large banner features the text "Sheet, rod and tube - hundreds of products available from stock!" and "No Minimum Quantities! Cut to your exact measurements." Below the banner, a sidebar on the left lists various Acrylite products under the heading "Purchase ACRYLITE®". The main content area displays several product cards for ACRYLITE® extruded (FF) acrylic sheet in various colors (Yellow, Ruby Edge, Red/Orange, Bright Orange, Red, Blue). Each card includes a product image, a list of specifications (e.g., 91.0% Transmission, transparent, UV absorbent, high-gloss surface, 0.118 inch - 0.220 inch, Industry No. 4073-8, fluorescent, Made in USA), and a price/sqft starting from 6.62 USD. An "Order Now" button is provided for each product. An "Information Center" section on the right provides additional information about acrylic sheet, including a link to "Visit the Info Center".

Shopping cart
Your shopping cart is empty.

HOME CONTACT **PRODUCTS** APPLICATION GALLERY LOGIN UNITED STATES LANGUAGE: ENGLISH

Sheet, rod and tube - hundreds of products available from stock!

No Minimum Quantities!
Cut to your exact measurements.

You are here: [Start](#) > [Purchase ACRYLITE®](#) > [Sheet](#) > [ACRYLITE®](#) > [fluorescent](#)

Search Thickness: All Color: All

ACRYLITE®

Purchase ACRYLITE®

Sheet

- ACRYLITE®
- block
- cast
- digital print
- extruded
- fluorescent
- framing grade
- markerboard
- non-glare
- POP Touch
- UV filtering
- UV transmitting
- ACRYLITE® Heatstop
- ACRYLITE® Hi-Gloss
- ACRYLITE® LED
- ACRYLITE® Optical
- ACRYLITE® Reflections
- ACRYLITE® Resist
- ACRYLITE® SatinIce
- ACRYLITE® Solar
- ACRYLITE® Textures

Rod

Tube

Multi-skin

Wave Profile

Cements & Cleaners

Sample Boxes

Fabrication Tools

ACRYLITE® extruded (FF) acrylic sheet fluorescent colors

ACRYLITE® extruded sheet is available in seven attention-grabbing fluorescent colors. The sheet provides superior color uniformity throughout, with vivid edge colors and a long fluorescent life.

*Recommended for indoor use.

[Learn more about ACRYLITE® extruded \(FF\)](#)

ACRYLITE® extruded (FF) Yellow 1C020 GT

- 91.0% Transmission
- transparent
- UV absorbent
- high-gloss surface
- 0.118 inch - 0.220 inch
- Industry No. 4073-8
- fluorescent
- Made in USA

Price/sqft
From 6.62 USD
plus tax (where applicable), cutting & shipping cost

ACRYLITE® extruded (FF) Ruby Edge 3B020 GT

- 88.0% Transmission
- transparent
- UV absorbent
- high-gloss surface
- 0.118 inch - 0.220 inch
- Industry No. 2143-7
- fluorescent
- Made in USA

Price/sqft
From 6.62 USD
plus tax (where applicable), cutting & shipping cost

ACRYLITE® extruded (FF) Red / Orange 3C024 GT

- 51.0% Transmission
- transparent
- UV absorbent
- high-gloss surface
- 0.118 inch - 0.220 inch
- Industry No. 2149-4
- fluorescent
- Made in USA

Price/sqft
From 6.62 USD
plus tax (where applicable), cutting & shipping cost

ACRYLITE® extruded (FF) Bright Orange 3C025 GT

- 57.5% Transmission
- transparent

ACRYLITE® extruded (FF) Red 3C026 GT

- 41.0% Transmission
- transparent

ACRYLITE® extruded (FF) Blue 5B021 GT

- 90.0% Transmission
- transparent

Information Center

Did you know acrylic is also referred to as plexiglass and plastic?

For more information visit the Information Center for answers to your questions regarding ACRYLITE® acrylic sheet.

[Visit the Info Center](#)

<https://www.acrylite-shop.com/US/us/acrylite-/fluorescent-g3g0uco8gns.html>

buy materials online:

Cut: ACRYLITE® extruded (FF), sheet, Yellow 1C020 GT

Step 1: Select thickness from the drop-down menu (if applicable).

Step 2: Update dimensions (In inches) inside the length & width box.

The price will be calculated after the cut-to-size dimensions have been entered.

1 Thickness

0.118 inch 6.62 USD/sq ▾

plus tax (where applicable), cutting & shipping cost

2 Please enter your dimensions

length inch 12.000

width 12.000 inch

3 Would you like to polish the edges?

☐ Polish all edges (2.82 USD/ft Incl. 0.0% Tax)
The maximum polish length is 48.0" per edge

Product Overview

91.0% Transmission
transparent
UV absorbent
high-gloss surface
0.118 inch - 0.220 inch
Industry No. 4073-8
fluorescent
Made in USA

Weight per cut piece

LB 1.61 pound

Price per cut piece

11.62 USD
plus tax (where applicable), cutting & shipping cost

1 total pieces

Place in Shopping cart

No Minimum Quantities!

Cut to your exact measurements.

**expensive
shipping**
(group orders?)

<https://www.acrylite-shop.com/US/us/acrylite-/fluorescent-g3g0uco8gns.html>

costs::

paper
cardboard

cheap low-fi prototyping

wood
acrylic

\$10-\$20 per sheet

\$10-\$20 per sheet

depending on thickness

**accessing laser cutters
on campus
(and beyond)**

International Design Center (IDC)::

card access:

to the shop: 8am - 5pm, Mondays - Fridays

to the main space: 24h, including weekends

Engineering Design Studio (EDS, 38-501)::

typically 9-5pm, mondays-fridays, but their times vary
check their calendar for 'open hours'

(no card access required)

<http://eds.mit.edu/hours>

[illegible]

where else can we laser cut?

< any thoughts? >



Home page

Social Media



[About](#) [Students](#) [Alumni](#) [Mobius](#) [Courses](#) [Freshman Year](#) [Symposium](#) [Team](#)

MIT's Makerspaces

Makerspaces at MIT (and many universities) are usually one of three types. They all have similar maker tools, but their community elements differ, and they are purposed and managed in a different way:

- **Machine shops** - Spaces that specialize in training/mentoring/making on creation of complex systems and/or fine-detailed components. Interaction with staff (skilled machinist educators) is their key value, so they specialize in quality of maker education/work vs. quantity of students served.
- **Project makerspaces** - Spaces that primarily support class projects. These spaces usually contain more resources to facilitate collaboration, i.e. meeting space and open working space. The key value of these spaces is in their ability to integrate specific resources that enable programmed, curriculum-based learning.
- **Community makerspaces** - Prioritizes fostering unrestricted making via a community effort. The community serve as stewards of the space/resources and educate users in safe making practices. The key value of these spaces is the communities' ability to facilitate access to more users, particularly early/novice users.

Recent News

Project Manus Joins Social Media

Fri, 04/28/2017

Get Mobius and win a chance to go to the Diablo Glass School

Wed, 04/12/2017

ISAM 2016 Highlight Video

Wed, 04/12/2017

[more](#)

Contact Us

Project Manus Central Office

MIT Mobile Möbius

By Massachusetts Institute of Technology

Open iTunes to buy and download apps.



[View in iTunes](#)

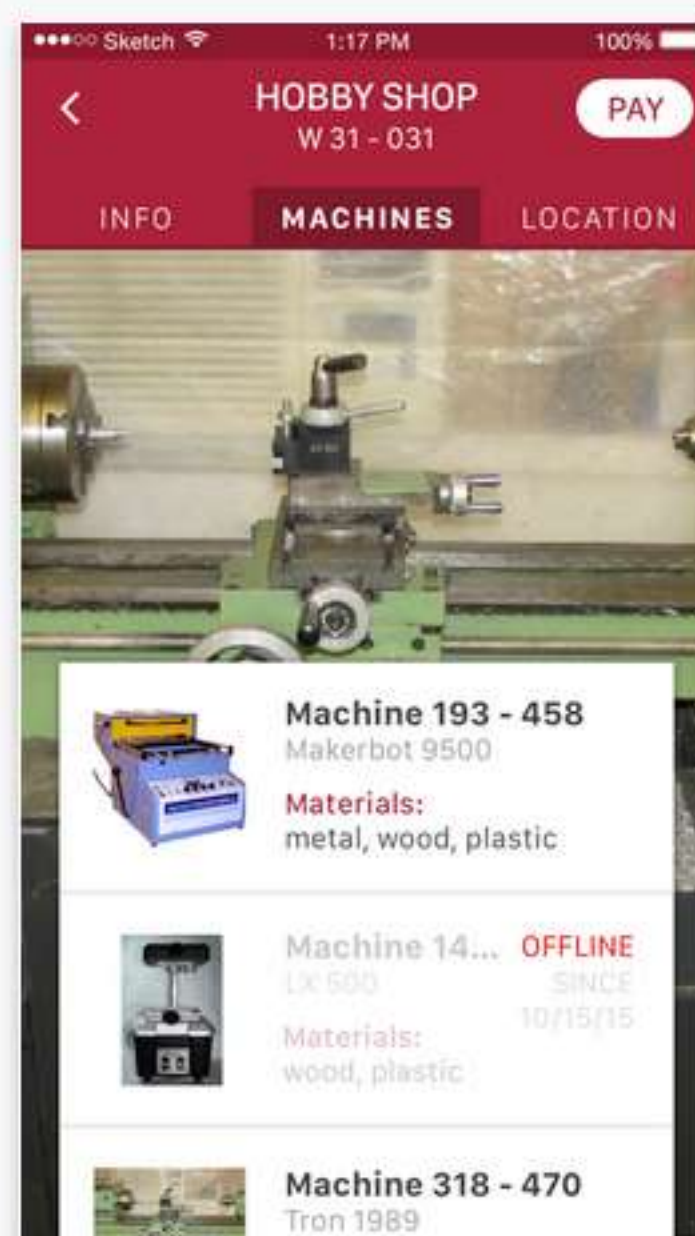
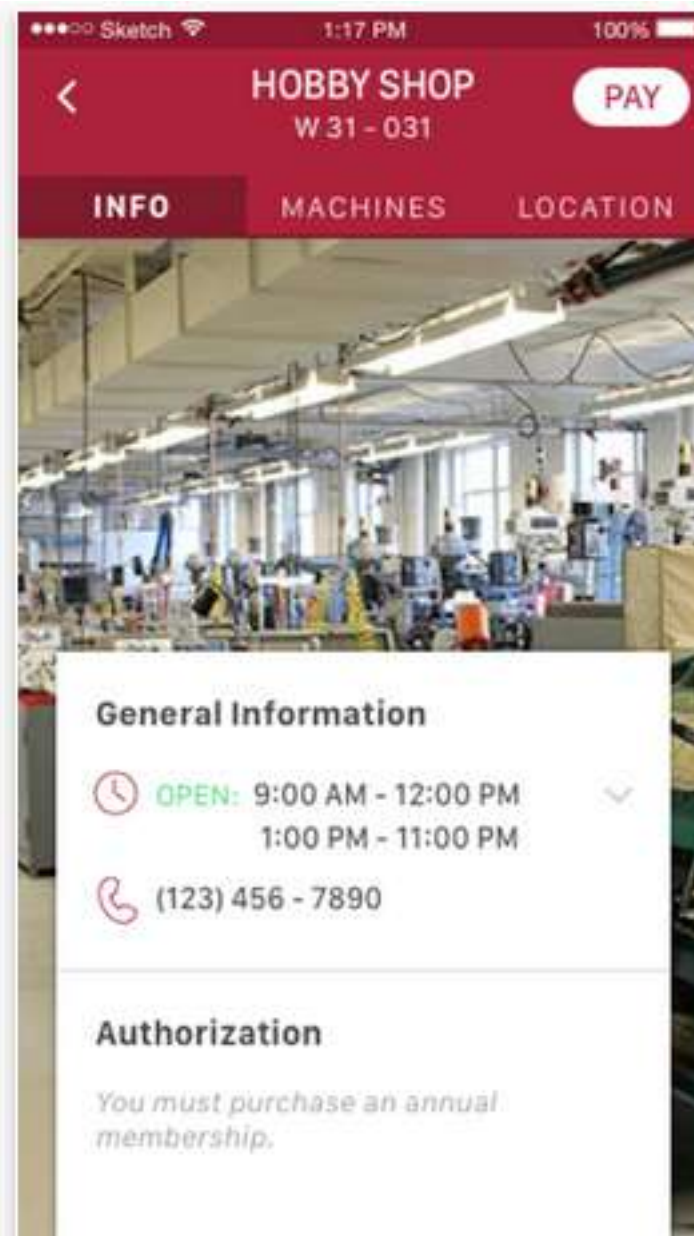
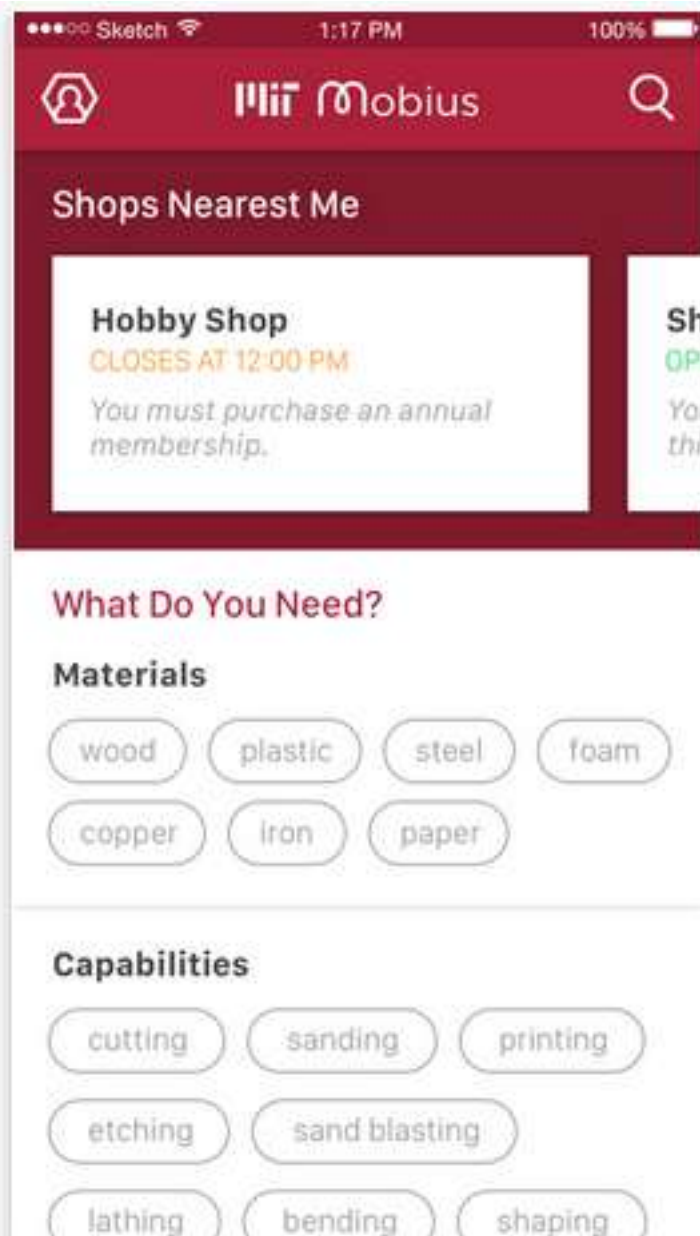
Description

MIT Möbius is an app that enables students and staff to access laboratory resources on the MIT campus. Users are required to provide training/authorization levels and requirements.

[MIT Mobile Möbius Support](#)

What's New in Version 2.0

- Added the ability to make purchases with Credit
- Bug fixes and improvements



Want to use our new Laser Cutter + CNCs and 3D Printers? [Checkout our memberships](#), and see what we have to offer!

Cambridge Hackspace



what

We are a growing maker space in the center of Somerville, MA. We have a 1200sqft space catering to enthusiastic makers, and hold weekly meetings where we get together and make things. We have a Laser cutter, CNCs, 3D printers, and a range of other tools for our members to use.



why

We've started the Cambridge Hackspace to provide a physical space where people can gather and work on their projects, have access to larger or expensive tools (like the 3D printers, and laser cutter), and provide a place where the community can share their knowledge.



who

Anyone and everyone is welcome. Whether your thing is software, electronics, woodwork, or knitting, we provide a space where you can meet fellow makers, to learn, and be inspired. We hold workshops every month so you can learn new skills.



where

We are located in Union Square, Somerville [\[address\]](#). We hold events every week, our next meeting is on Tuesday, 29 Aug @ 06:30pm - Check our events page for future events. You can also like our [Facebook page](#) and follow us on Twitter ([@HackCambridge](#))

Join Cambridge Hackspace

Become a Cambridge Hackspace member, join us and help support our efforts to get bigger and better.

[Become a Member](#)



if you try a new space,
please tell us about your experience :).

sign the safety hand out

sign the **safety** hand out first

Revision 2.4

Department of Electrical Engineering & Computer Science

Electrical Safety

for Staff and Students in EECS Department Teaching Laboratories (D

NEVER WORK ALONE

If you will be working with energized circuits or equipment **over 50 volts peak or 50 volts DC**, be sure that at least one other person can see you and hear you. In case of emergency, call the nearest any institute phone [617-253-1212 from cell phones]; and notify the stock clerk of your absence on duty.

VOLTAGE RULES

All EECS Department Teaching Laboratories lab kit voltages are **below 50 volts peak or 50 volts DC**. (OSHA permits "unqualified persons" to work on such circuits with "awareness training" which is what this document is.)

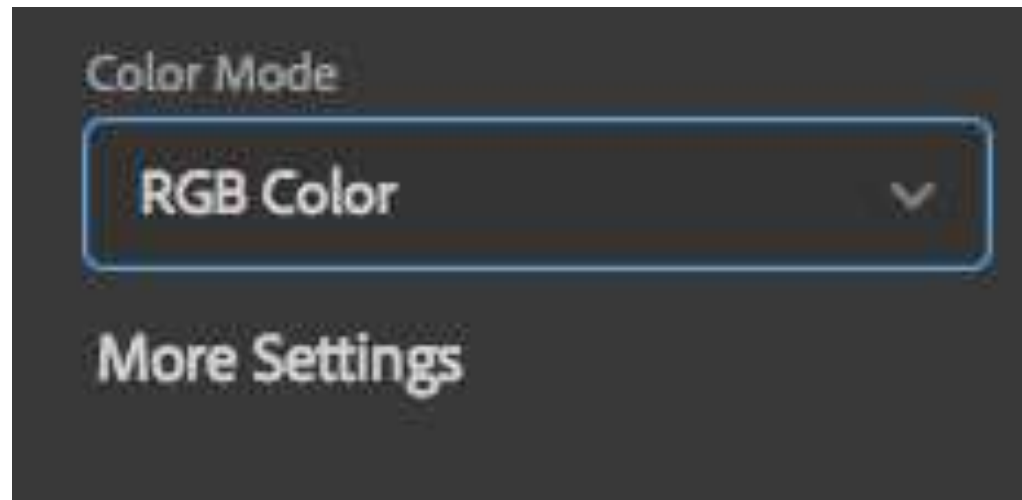
If you intend to work on a project using power sources **over 50 volts peak or 50 volts DC**, you must first **secure permission** from your Faculty or Staff Instructor; and take an **Familiarization class** from either David Lewis [38-501, 617-653-5629] or Karl Berggren [38-0272] **before** any work on the project begins.

No power tools or energized machine tools are to be used in the Teaching Laboratories without prior review by David Lewis and Karl Berggren and the Course Instructor.

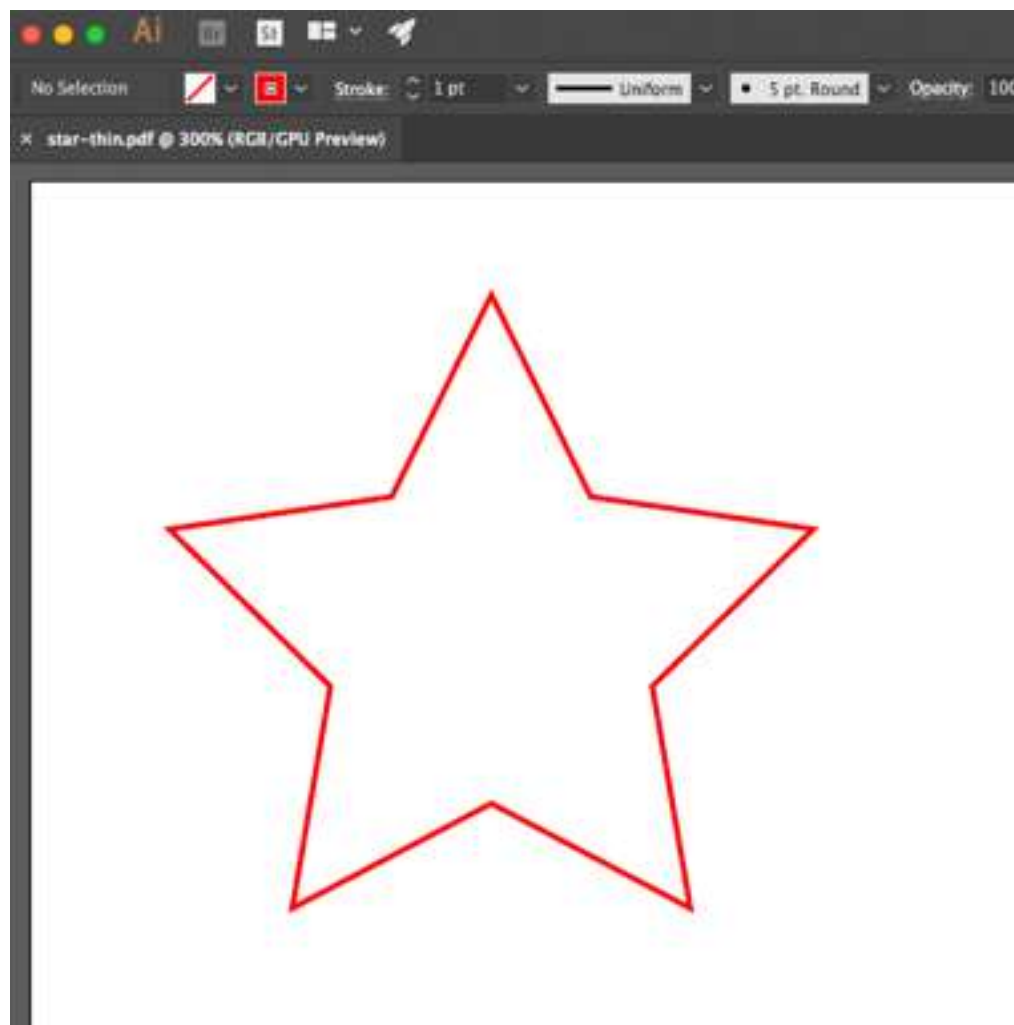
PREVENT ACCIDENTS: FOLLOW THIS ADVICE

- Never hurry. Work deliberately and carefully.
- Connect to the power source **LAST**.
- If you are working with a lab kit that has internal power supplies, **turn the main power switch OFF** before you begin work on the circuits. Wait a few seconds for power supply discharge. These steps will also help prevent damage to circuits.
- If you are working with a circuit that will be connected to an external power source, **turn the power switch of the external supply OFF** before you begin work on the circuit.
- Check circuit power supply voltages for proper value and for type (DC, AC, etc.) before energizing the circuit.
- Do not run wires over moving or rotating equipment, or on the floor, or across aisles or walkways from bench-to-bench.
- Remove conductive watchbands or chains, finger rings, wristwatches, etc., and conductive pencils, metal or metal edge rulers, etc. when working with exposed circuits.
- When breaking any high-voltage or high current inductive circuit open the switch with one hand and turn your face away to avoid danger from any arc which may occur at the terminals.

**setup your
2D drawing program**



document color mode::
RGB is correct, CMYK is wrong



line color::

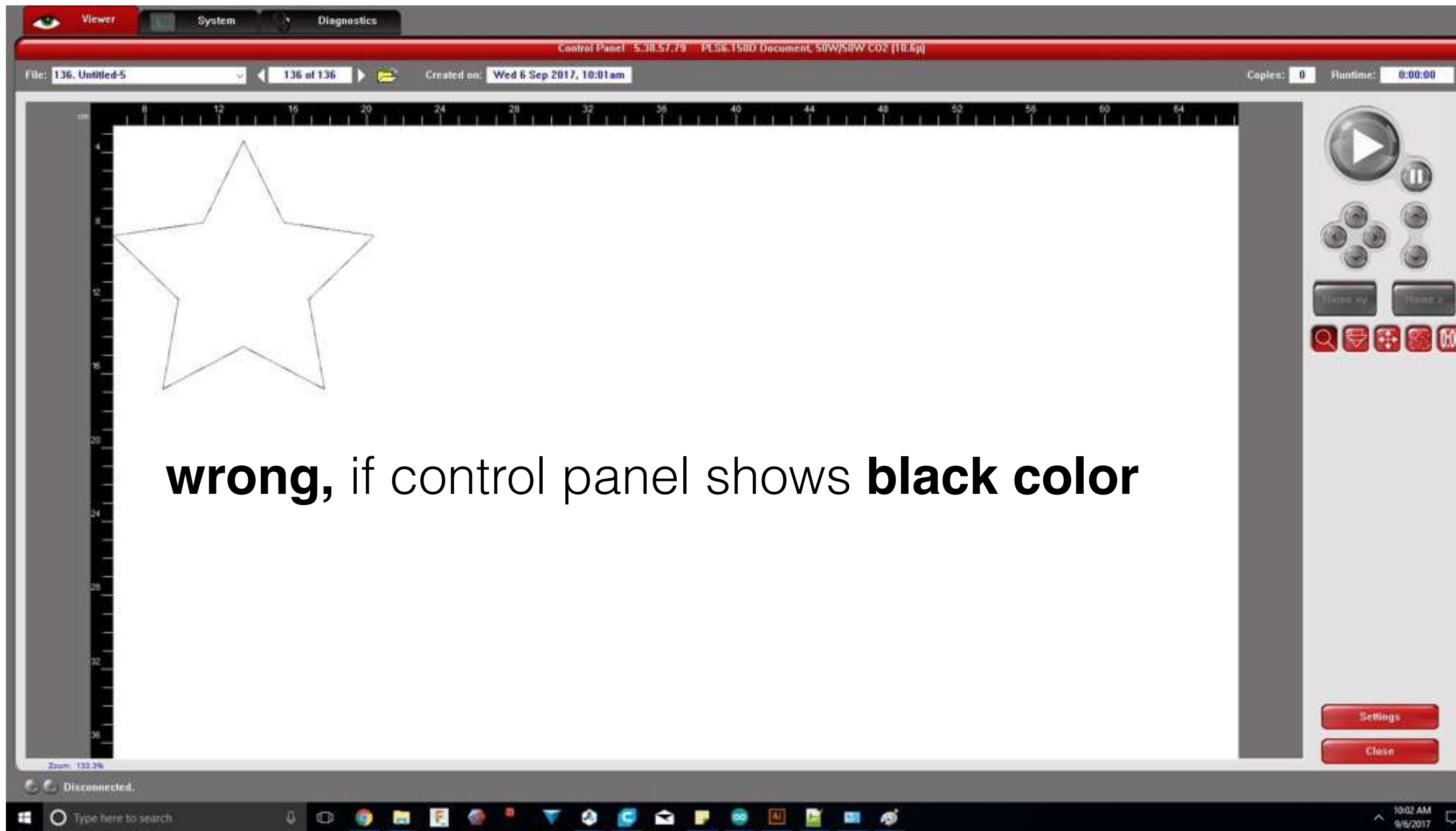
red

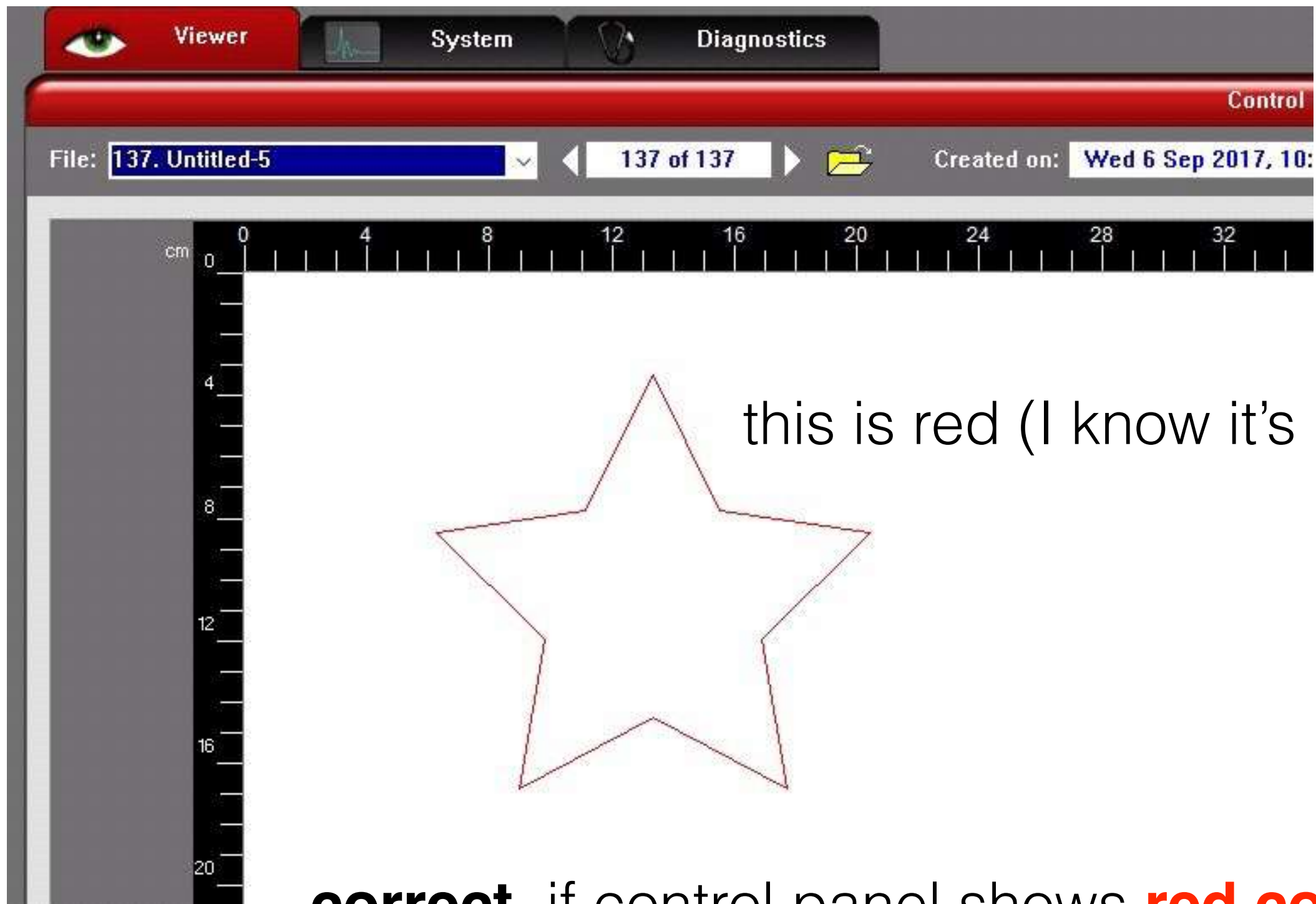
R = 255

G = 0

B = 0

#FF0000



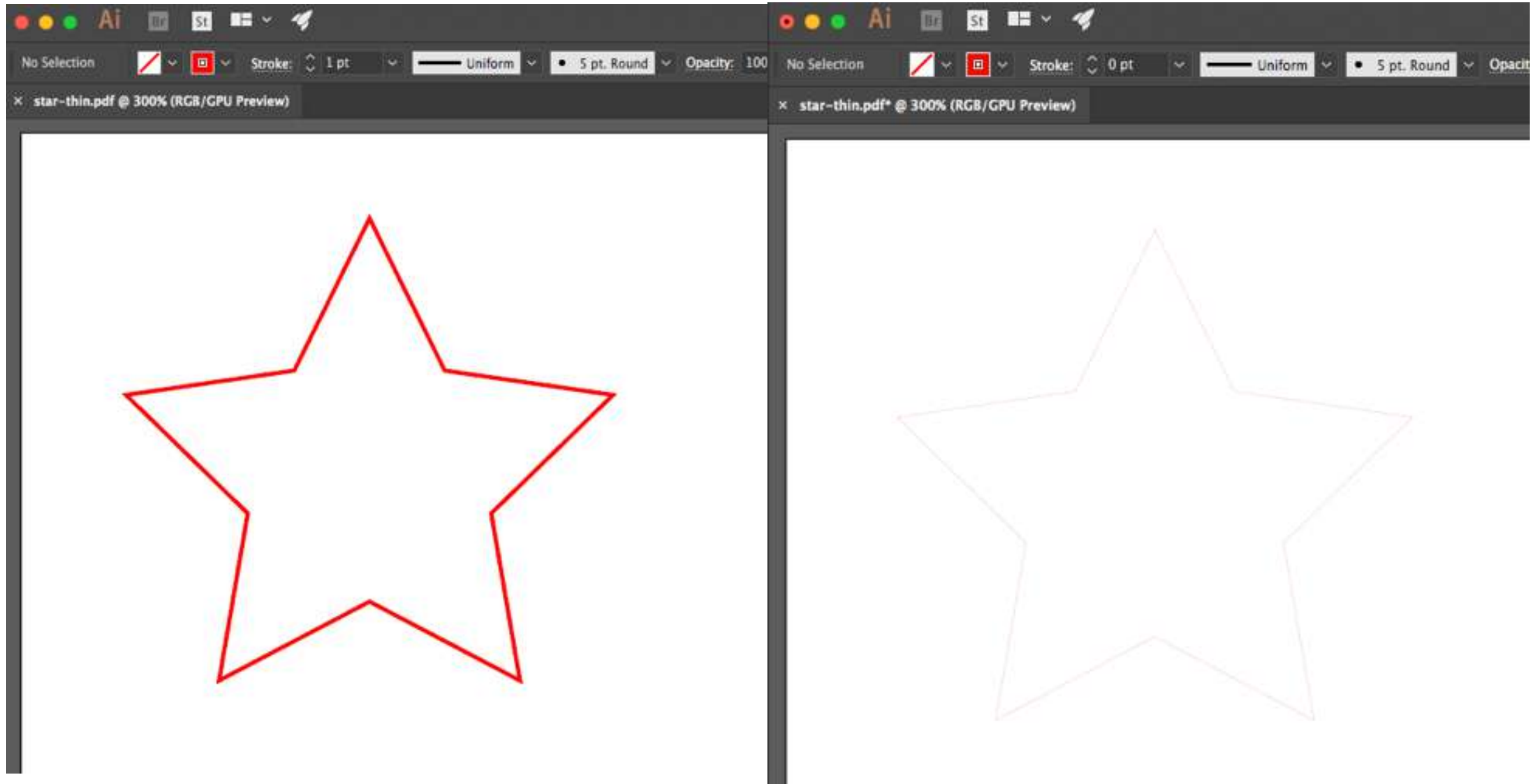


this is red (I know it's hard to see)

correct, if control panel shows **red color**

Adobe Illustrator::

stroke thickness = 0.0001



Inkscape::

everything correct, use as is

OpenDraw (Open Office)::

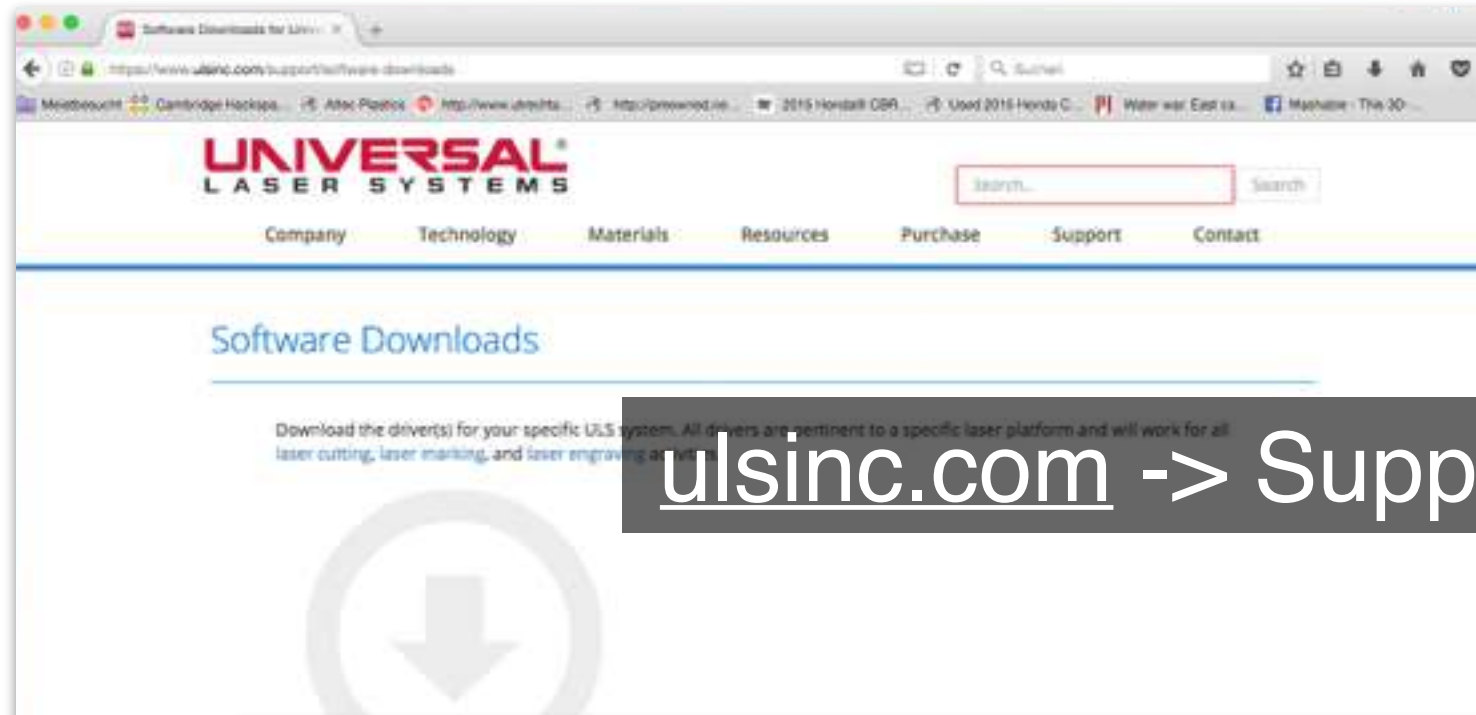
everything correct, use as is

if you want to use **text**
you need to **convert it to a path** first

how can I **test my settings?**

Windows only!

you can also test on Jared's machine



[ulsinc.com](https://www.ulsinc.com) -> Support -> Software Downloads

Download Drivers for VLS, PLS and ILS Platforms

UCP Installer

Items to Download

[Download UCP Installer](#)

File Edit View Window Help

 Open... Ctrl+O

Create PDF Online...

 Save Ctrl+S


Save As... Shift+Ctrl+S

Save as Other ▶

Send File ▶

Revert

Close Ctrl+W

 Print... Ctrl+P

1 final_template.pdf

2 C:\Users\EDS\Downloads\laser test (1).pdf

3 E:\...laser cutter temp...multitouch pad.pdf

4 E:\...laser cutter temp...multitouch pad.pdf

5 E:\PT1pdf.pdf

View All Recent Files... Exit Ctrl+Q



Print

Printer: PLS6.75

Properties

Advanced

Help

Copies: 1

☐ Print in grayscale (black and white)

☐ Save ink/toner

Pages to Print

☒ All

☐ Current page

☐ Pages 1

More Options

Page Sizing & Handling

Size

Poster

Multiple

Booklet

☐ Fit

☐ Actual size

☒ Shrink oversized pages

☐ Custom Scale: 100 %

☐ Choose paper source by PDF page size

Orientation:

☒ Auto portrait/landscape

☐ Portrait

☐ Landscape

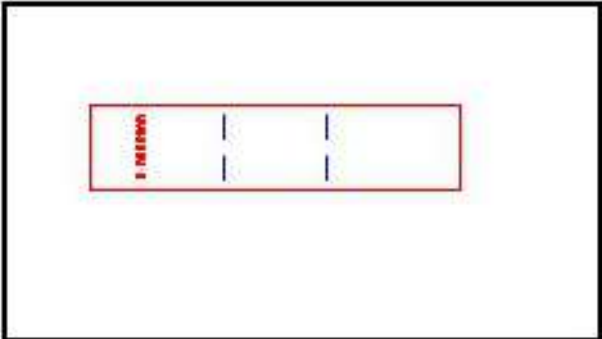
Comments & Forms

Document and Markups

Summarize Comments

Scale: 100%

32 x 18 Inches



<

>

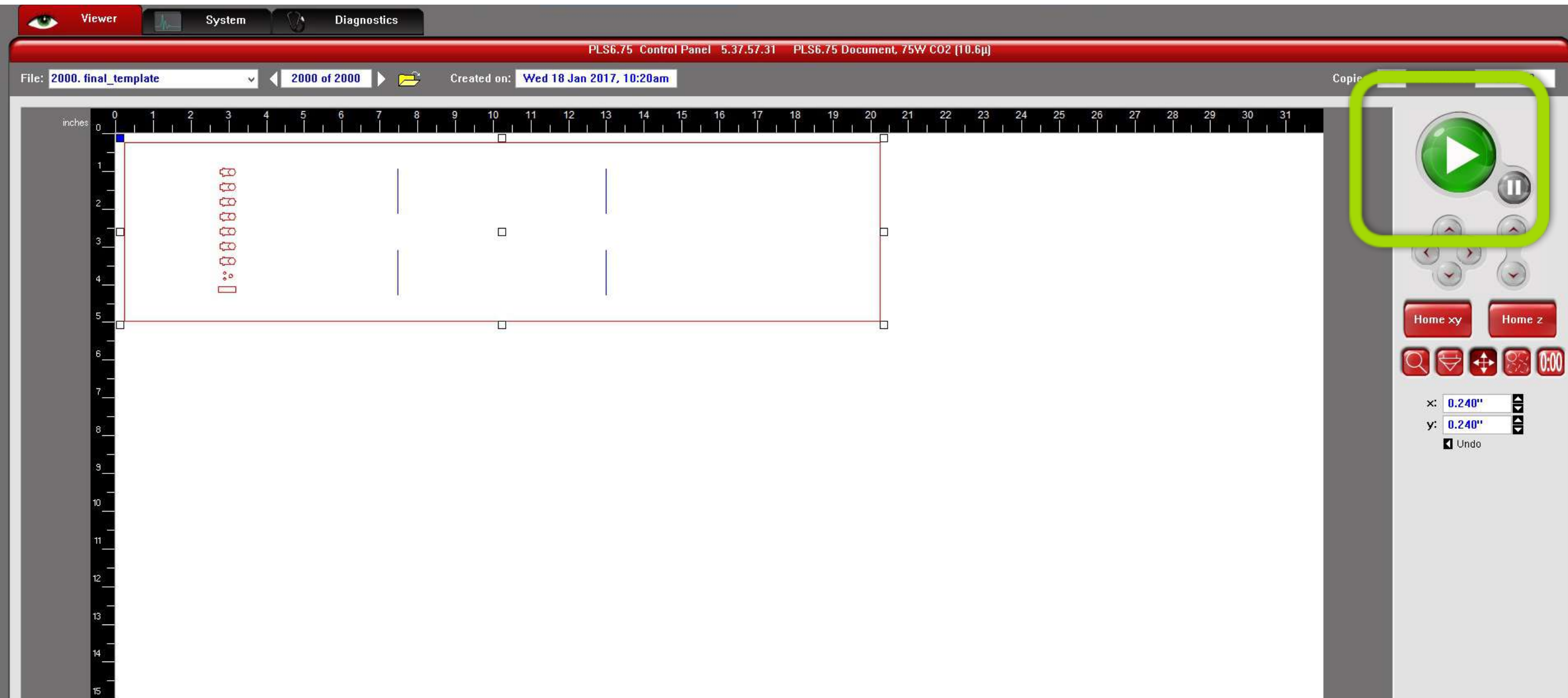
Page 1 of 1

Page Setup...

Print

Cancel

line is red? you are ready to laser cut!
line black? your drawing settings need adjustment



**in groups of 5,
let's laser cut**

friday::

we will be at EDS (38-501)

- augmented reality
- some laser cutting tips & tricks for your home work

end.