Turn off the ventilation

Turn off the ventilation.

Laser cutter guide

Figure 1: Our laser cutter

Theory

Figure 2: Uppsala Makerspace

Contents

Turn off computer

Turn off the computer.

Figure 35: Buttons inside the laser cutter

Foreword

This is a book about using the laser cutter at the Uppsala Makerspace.

About this book

This book has a CC-BY-NC-SA licence.

Figure 1: Licence for this book

(C) Lars van der Nat and Richèl Bilderbeek

You can do whatever you like with this book, as long as you give proper credit to us and/or mention the website https://github.com/uppsala-makerspace/laser_cutter_guide.

This guide will always be free (as in beer) and free (as in freedom). # Warning

The laser can blind you if used improperly.

1. The coloured plastic does not prevent harm from the laser.
2. The laser cutter can (and will) operate in unsafe ways, there are no automatic safety systems in place.
3. Make sure you understand how to operate the laser cutter safely before doing so.

Get material

Get a material that is safe to cut.

Safe materials

- Cork
- Leather
- MDF
- Natural fiber cloth, e.g. cotton
- Paper
- Paper for oil and acryl painting, 290 g/m2
- Plywood
- Stone
- Unpainted wood

Unusable

These materials are safe, but do not engrave or cut well.

- Glass
- Metal

Unsafe materials

- ABS plastic
- Carbon fiber
- Fiberglass
- HDPE plastic
- Painted wood
- Polypropylene foam
- Polystyrene foam
- PVC plastic

Tips

- K-Rauta sells cheap wood

Figure 34: The power of the laser cutter is on

Turn off laser

Make sure the laser is not in use.

Open the laser cutter.

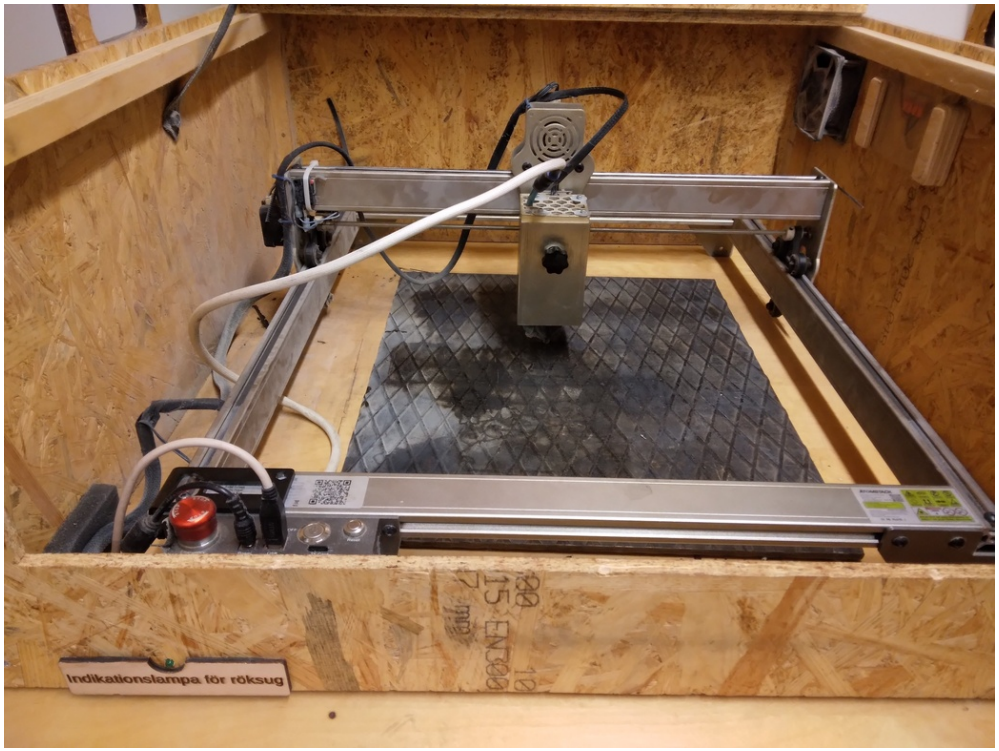


Figure 33: The opened laser cutter

The opened laser cutter

The power button is on: it gives off a red light.

The power of the laser cutter is on

Press the power button.

Now to power button is off.

Close the lid

Start ventilation

Starting the ventiation has two steps:

- Turn on the ventilation
- Block the fume food

Turn on the ventilation

In the woodshop, press the button to turn on the ventilation.

Find the door to the woodshop.

Figure 2: Door to the woodshop

Go through the door of the woodshop. You are now in the woodshop.

Figure 3: Woodshop

At the backside of the woodshop, find the timer.

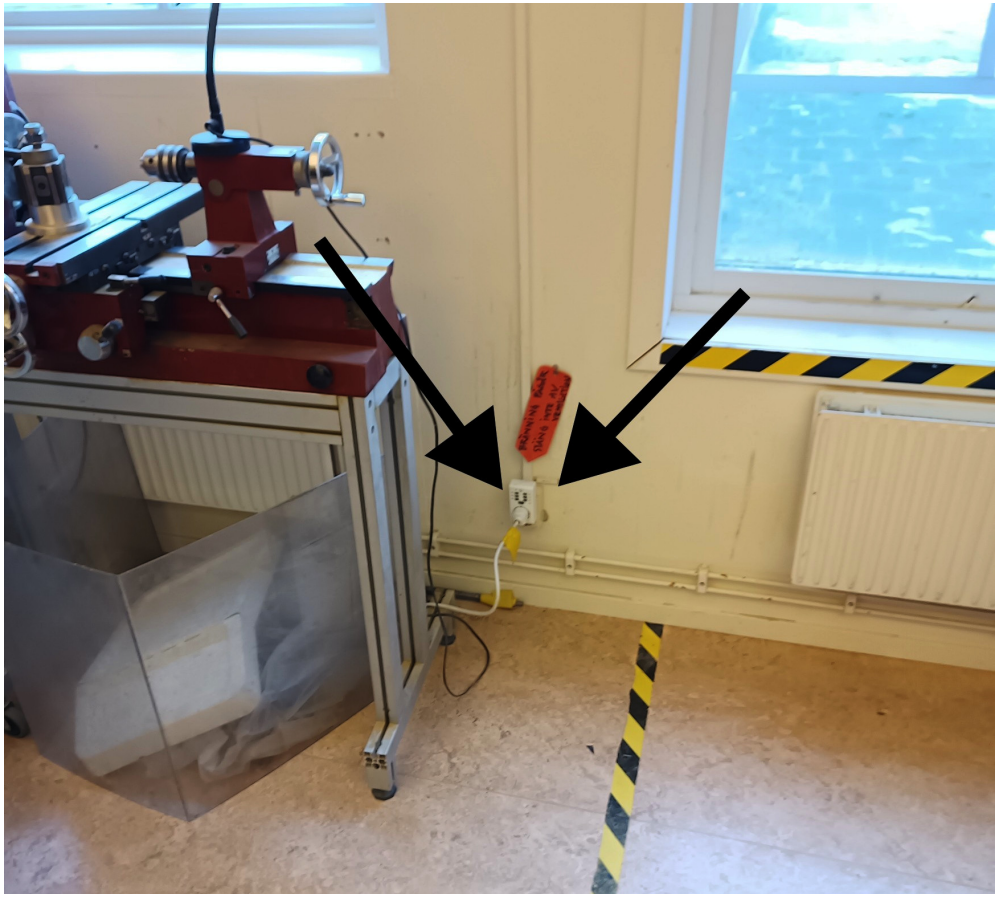


Figure 4: The backside of the woodshop

Go?	Check
Yes	No people behind you
Yes	All people behind you wear goggles
No	Not all people behind you wear goggles

Step 5: Countdown

The goal of this step is to allow the procedure to stop.

If somebody says ‘stop’, you stop.

Step 6: Press start

In LightBurn, press ‘Start’ to start the laser.

Step 7: Say ‘Laser is on’ and put hand on casing

Say ‘Laser is on’ and put your hand on the casing as long as the laser is on.

Use your other hand to move the mouse cursor to ‘Stop’.

Step 8: Say ‘All is well’

Repeatedly say ‘All is well’ when all is well.

If a fire starts or someone says ‘Stop’, click on stop. Laser is safe after stop

Step 9: Say ‘Laser is off’

Say ‘Laser is off’. You can remove your hand from the casing

Go?	Check	Image
No	Air flow is off	

Step 2: Check goggles of yourself

The goal of this step is to check if you yourself have your goggles on

Go?	Check
Yes	You have your goggles on
No	You do not have your goggles on

Step 3: Check goggles of the other

The goal of this step is to check if the other has his/her goggles on

Go?	Check
Yes	Other person has his/her goggles on
No	Other person does not have his/her goggles on

Step 4: Check behind

The goal of this step is to check if all people behind you have their goggles on

Go to the ventilation timer. Here is how it looks:

Figure 5: The ventilation timer

Press the button of the right duration on the ventilation timer:

- 15M: 15 minutes
- 2H: 2 hours

Now the ventilation timer is on and you will a blue LED light up.

You should hear a noise start. This is a fan that will suck out the air from the laser cutter's enclosure.

Block the fume food

In the same room as the laser, there is a fume hood, that uses the same ventilation. This is how the fume hood looks:

At the top of the fume hood, there is a slider.

Figure 6: The button on the ventilation timer

Start laser

Operator procedure

Here is the operator procedure, which is described in detail below.

Step	Do	Check
1	Say ‘Air is on’	The green light is on
2	Say ‘I am wearing my goggles’	You have your goggles on
3	Say ‘You are wearing your goggles’	You assistant has his/her goggles on
4	Say ‘Those behind us are wearing their goggles’	All those behind you (if any) have goggles on
5	Say ‘3, 2, 1’	Nobody says ‘stop’
6	Press start	Nobody says ‘stop’
7	Say ‘Laser is on’	Laser is on, hand is on laser casing
8	Say ‘All is well’	No fire
9	Say ‘Laser is off’	Laser is off

Step 1: Check air flow

The goal of this step is to check if the air flow is on.

Go?	Check	Image
Yes	Air flow is on	

Close enclosure

Close the enclosure.

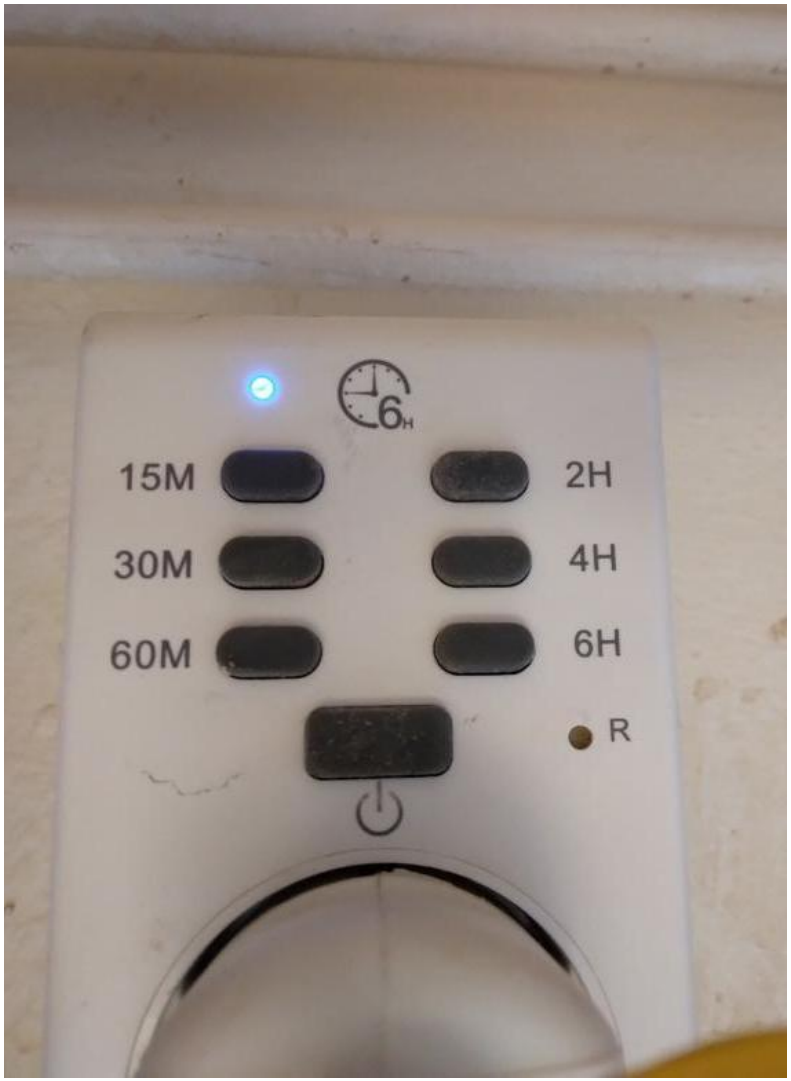


Figure 7: The ventilation timer is on

Figure 8: The fume hood

You will have to find out your values by trail and error. Please contribute the values for your favorite material.

Where the laser cuts

The laser can show where it will cut.

:warning: This laser light is safe! It is at very low power.

In the 'Laser' menu, click 'Frame' (either the square or the oval one) to see the contour of where the laser will cut:

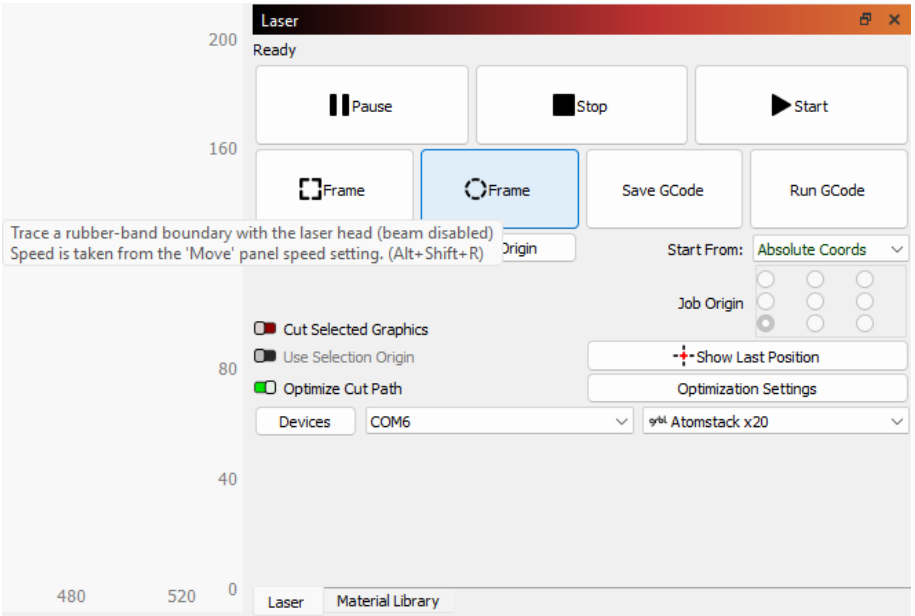


Figure 32: Trace frame

Align the material with where the laser cuts, either by moving the material or by moving the image in LightBurn or both.

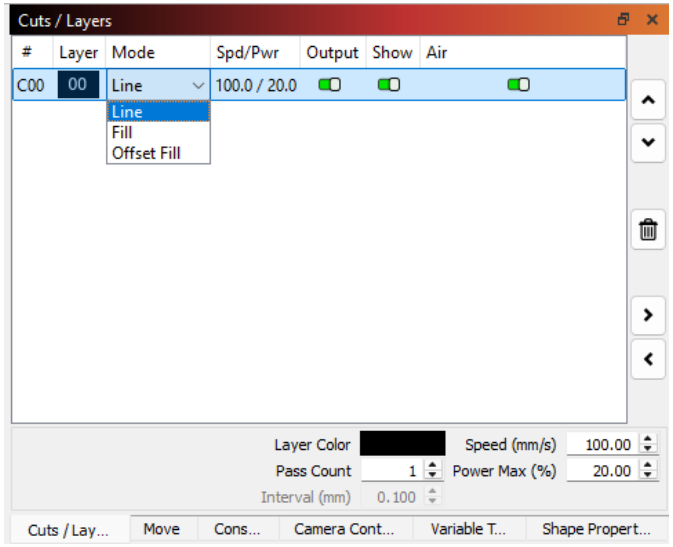


Figure 31: Select ‘Line’ to cut

Selet mode ‘Line’ to cut

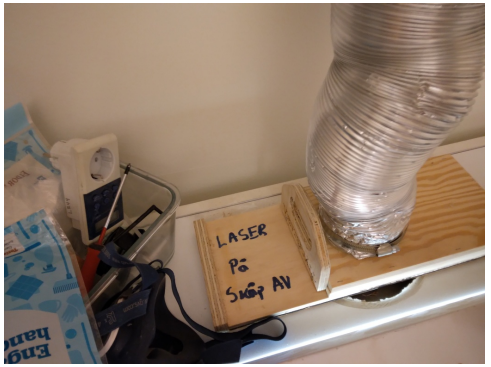
Here are the modes:

Mode	Description
Line	Cut through
Fill	Will etch the surface
Offset fill	Hard to describe :-)

The pass count, speed and power differ per material.

Here is a list of know values:

Material	Cut	Pass count	Speed (mm/sec)	Power (%)
Paper for oil and acryl painting, 290 g/m2	Complete	1	10	75
Paper for oil and acryl painting, 290 g/m2	Half	1	10	20
Paper from printer	Complete	1	10	20
Paper from printer	Half	1	30	25

How it looks	Description
	Air goes to the fume hood
	Air goes to the laser

Change the slider on the fumehood so that the air goes to the laser cutter.

Power on laser cutter

Open the laser cutter.

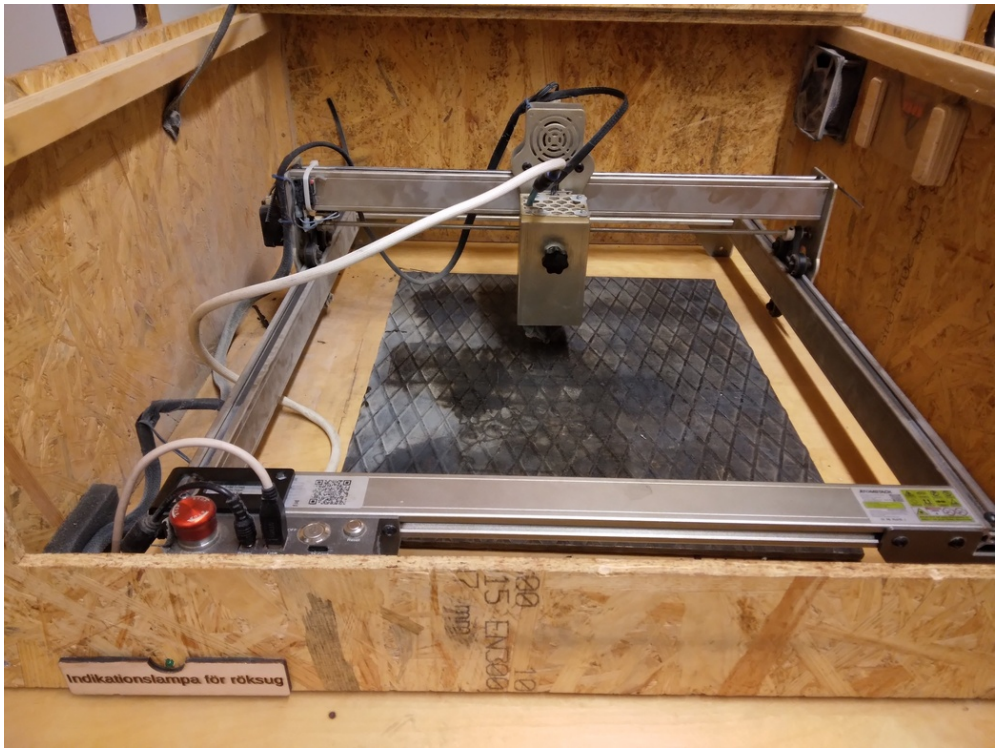


Figure 9: The opened laser cutter

The opened laser cutter

You can see the buttons inside the laser cutter. Press the power button.

The buttons inside the laser cutter

The power of the laser cutter is on.

The power of the laser cutter is on

The air indicator should turn on too.

The air indicator should turn on too

Setup LightBurn

Here you set up:

- How the laser cuts
- Where the laser cuts

How the laser cuts

The 'Cuts/Layers' tab determines how the laser cuts. It is located at the top-right of the screen.

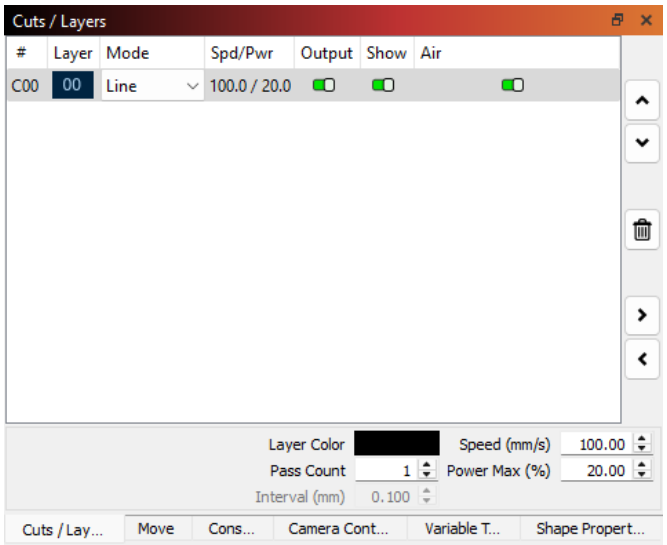


Figure 30: The LightBurn 'Cuts/Layers' menu

In the 'Cuts/Layers' tab, you can set the most important parameters per layer:

Parameter	Description
Mode	The mode of cutting, see below
Output	Run the laser here yes/no
Show	Show this color on the drawing
Air	Have air on yes/no. Have this on for cuts
Speed (mm/s)	The speed of the laser
Power Max (%)	The power of the laser
Pass count	How often the laser cuts each line

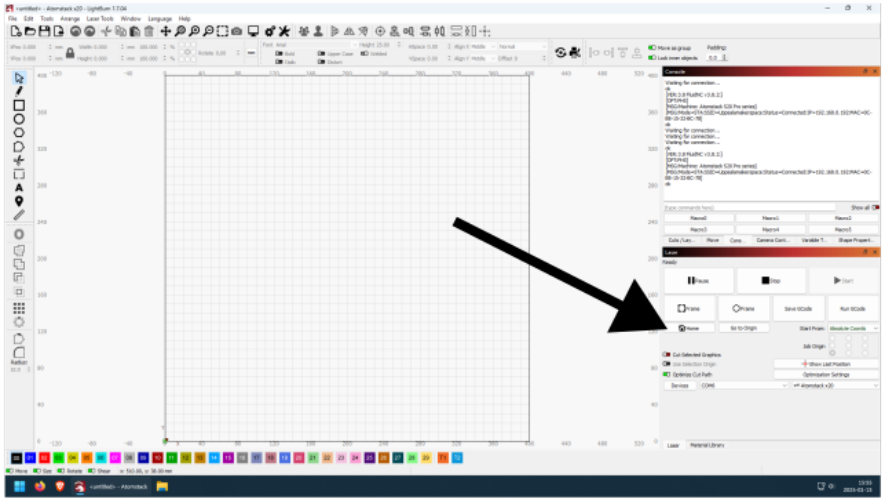


Figure 29: Press the home button

Load image

In LightBurn, to load an image, do ‘File | Load’.

Figure 10: Buttons inside the laser cutter

Figure 11: The power of the laser cutter is on

Select `COM4`

Observe the message ‘Waiting for connection’ at the top-right (in the ‘Console’ tab). If you need to wait for this connection longer than 3 seconds, The Dance continues.

If The Dance needs to be continued, click `COM6`

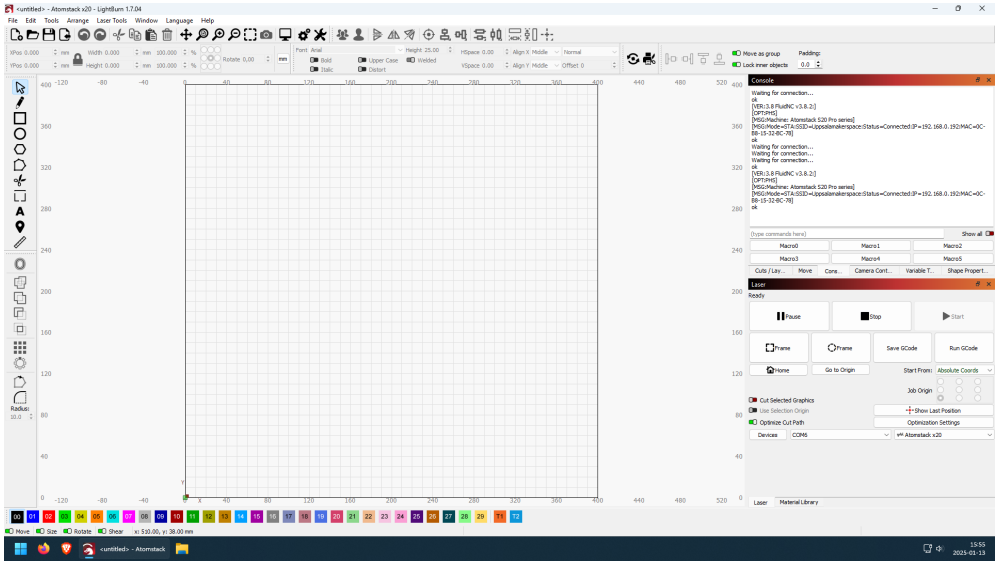


Figure 28: Select `COM6`

Select `COM6`

In this case, the message ‘ok’ is shown (in the ‘Console’ tab). The Dance is over!

Home the laser

Check that the laser can movement to the front-left side of the enclosure: that is where its home is.

Press the Home button to make the laser orient itself.

Press home

The laser will move into the front left corner.

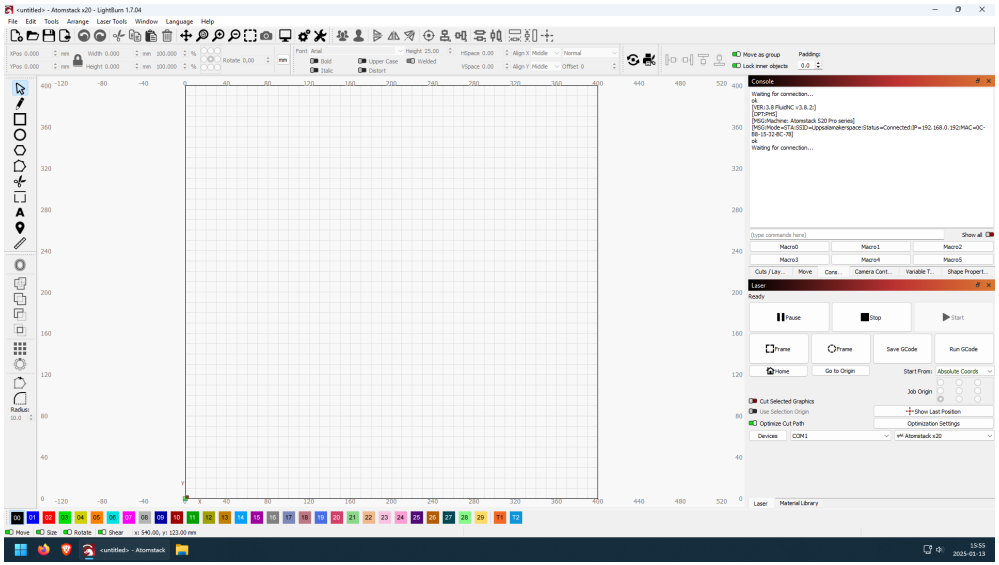


Figure 26: Select `COM1`

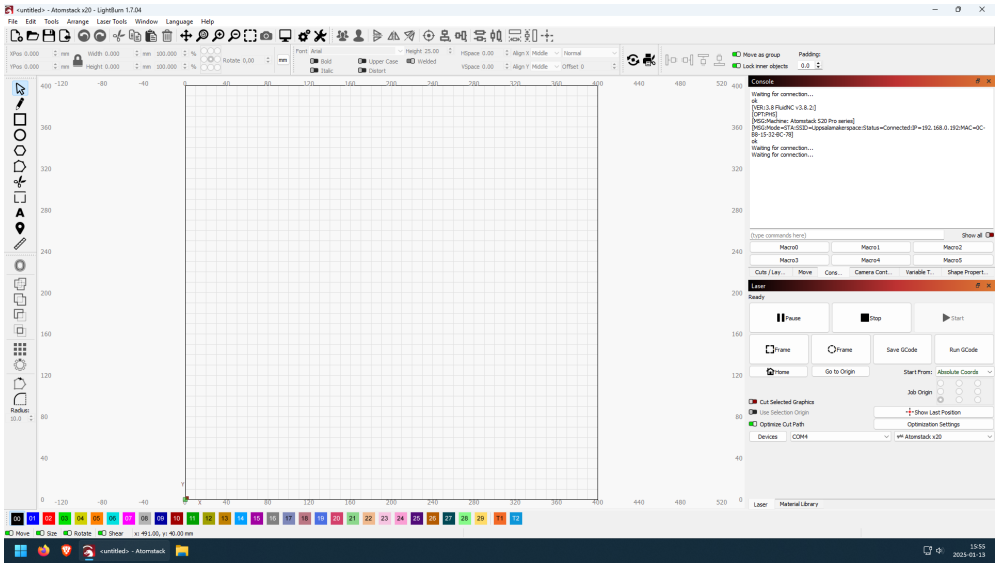


Figure 27: Select `COM4`

Figure 12: The air indicator should turn on too

Start computer

Press the computer's power button, at the top right.

Figure 13: The computer's power button is at the top right

The computer will power up and show a login screen.

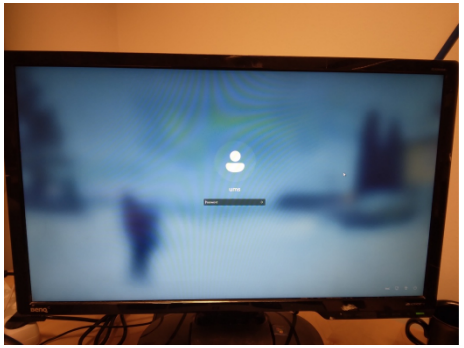


Figure 14: The login screen

Write the password in the rectangle and press enter.

You have now started the computer!

Setup laser in LightBurn

To setup the laser in LightBurn:

- Connect the the laser cutter
- Home the laser

Connect to the laser cutter

In LightBurn, click at the combo box right of 'Devices'. It will probably say `COM1` or `COM4` or `COM6`.

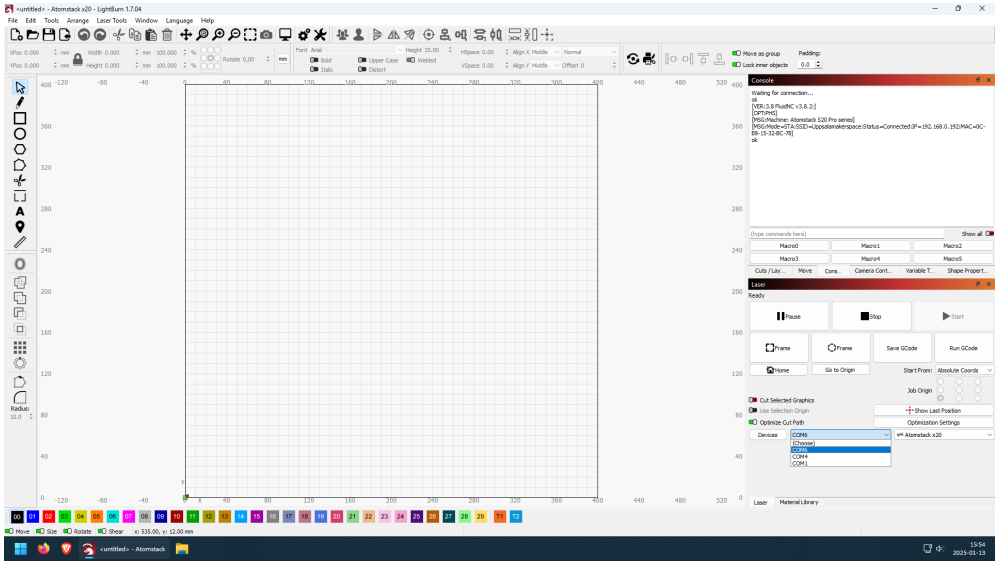


Figure 25: Pick a COM port here

Pick a COM port here

Now The Dance starts. The Dance is picking different COM ports, until a connection is established.

Select `COM1`.

Select `COM1`

Observe the message 'Waiting for connection' at the top-right (in the 'Console' tab). If you need to wait for this connection longer than 3 seconds, The Dance continues.

If The Dance needs to be continued, click `COM4`

Remove the spacer

Place the spacer back in its original spot

Figure 24: Place the spacer back in its proper place

Place the spacer back in its proper place

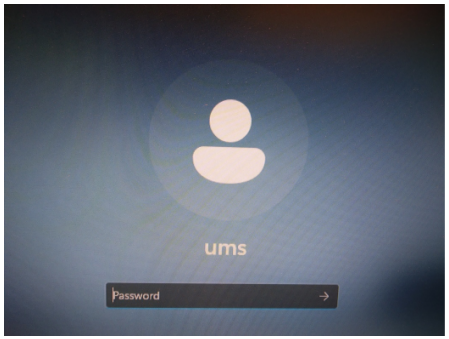


Figure 15: Write the password here and press enter

Start LightBurn

At the desktop of the computer next to the laser, there is a LightBurn icon at the left side of the desktop.

Double-click the LightBurn icon.

Now LightBurn starts.

This is how the first screen of LightBurn looks like:

Well done!

Figure 16: Desktop of the computer next to the laser

Position material

Put the material on the black metal plate in the enclosure.

Put the material in the enclosure

Figure 23: removing_the_spacer_from_the_laser.jpg

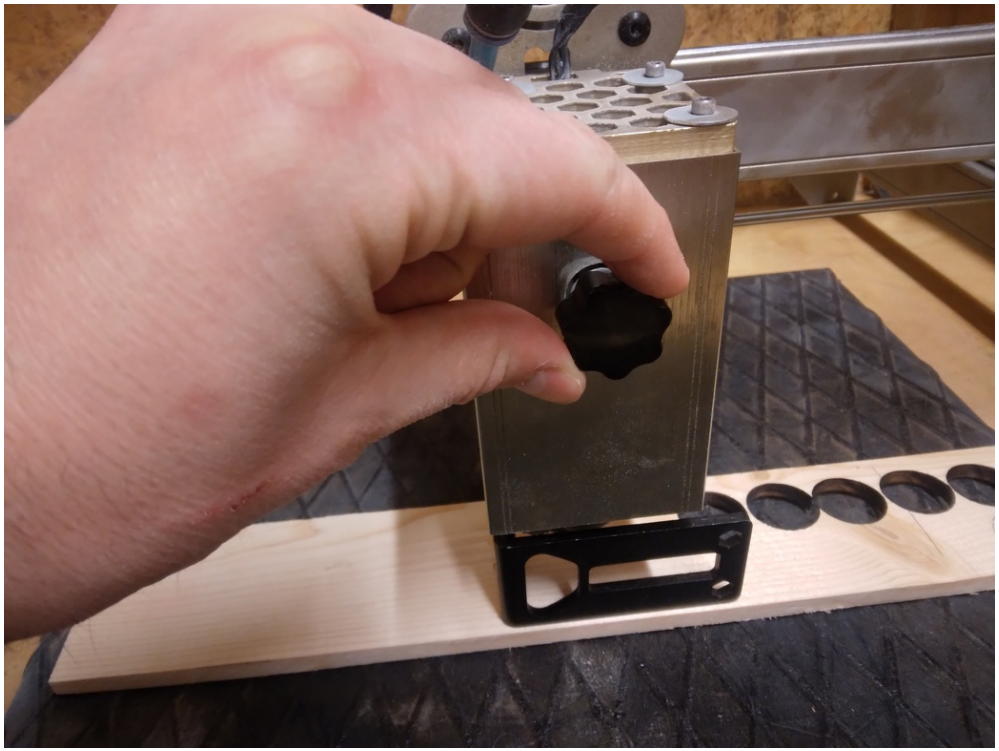


Figure 22: Tighten up the laser again by turning its screw

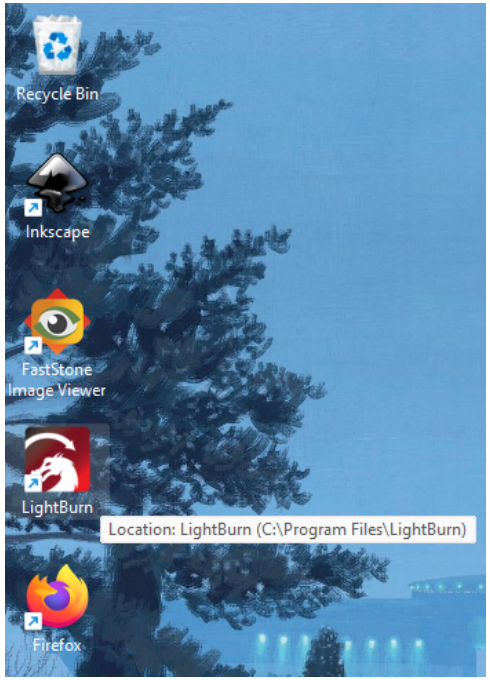


Figure 17: Double-click the LightBurn icon

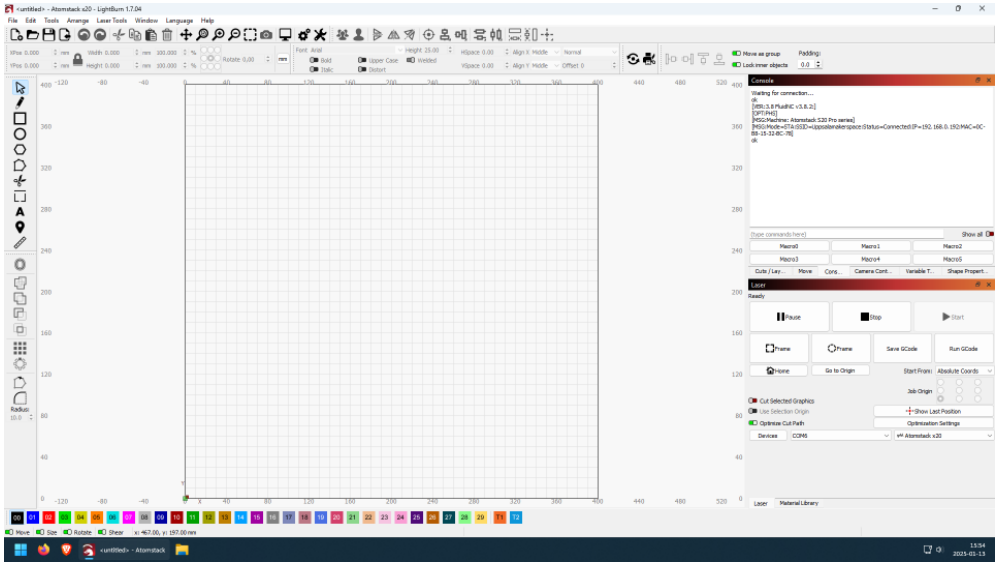


Figure 18: First screen of LightBurn

Setup laser physically

Take the spacer from the bottom-left of the enclosure.

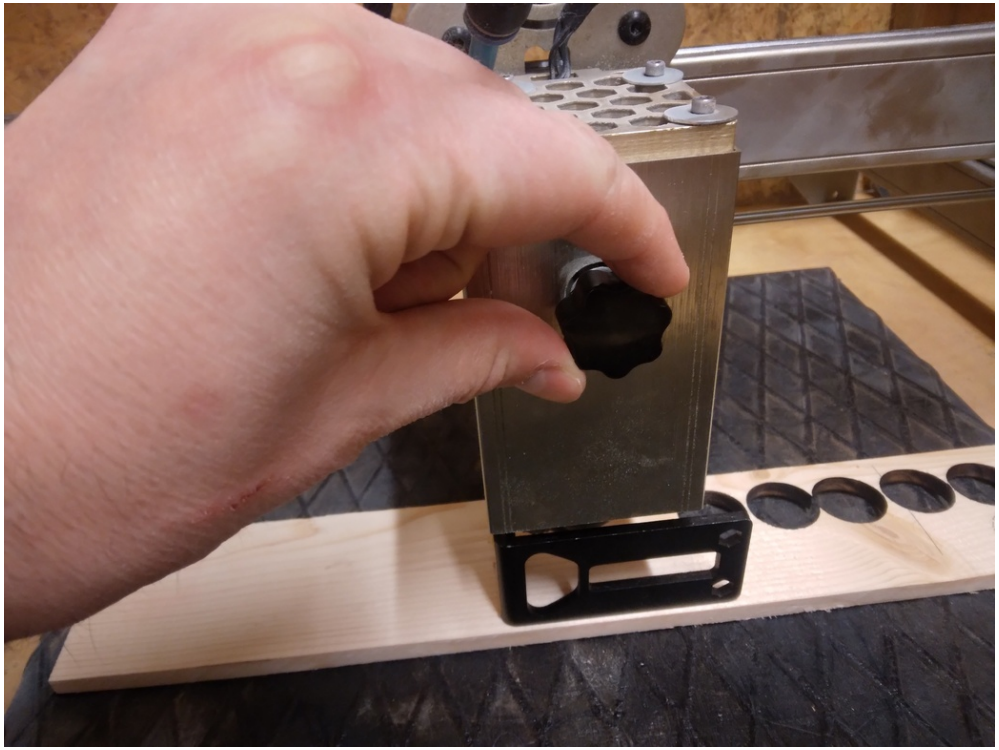
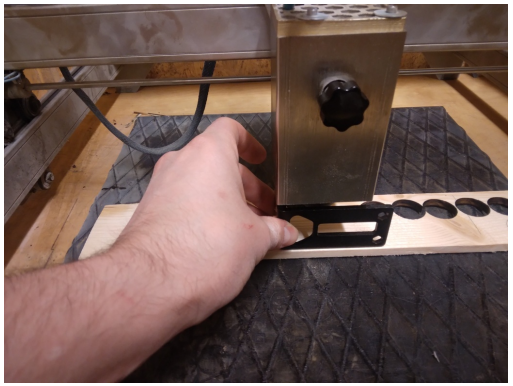
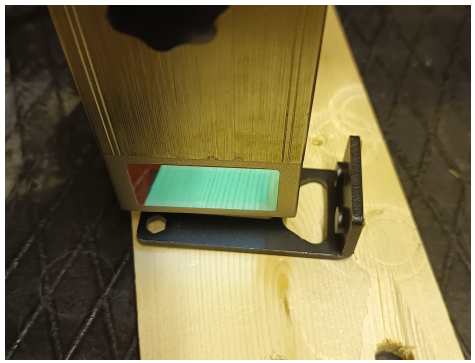


Figure 21: Loosen up the laser by unscrewing it a bit

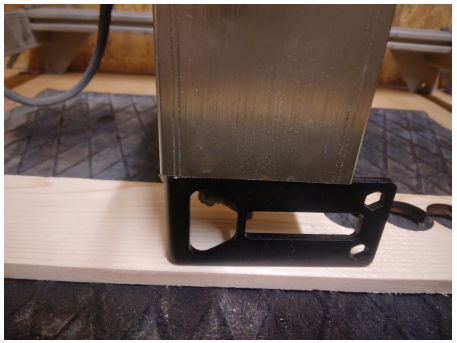
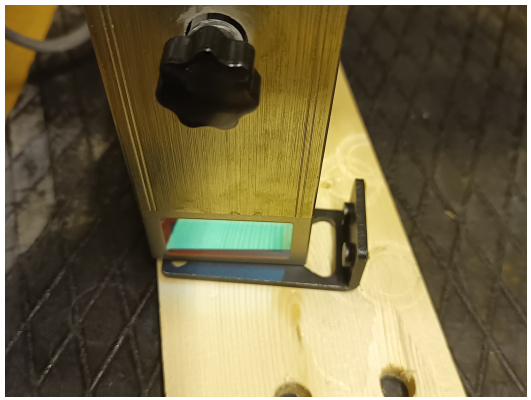
It might look like this	Or like this
	

Place the spacer between laser and material

Loosen up the laser so it can slide up and down, by unscrewing it a bit.

Loosen up the laser by unscrewing it a bit

Slide the laser down, so it rests on the spacer.

It might look like this	Or like this
	

Slide the laser down, so it rests on the spacer.

Tighten up the laser again by turning its screw.

Tighten up the laser again by turning its screw

Remove the spacer

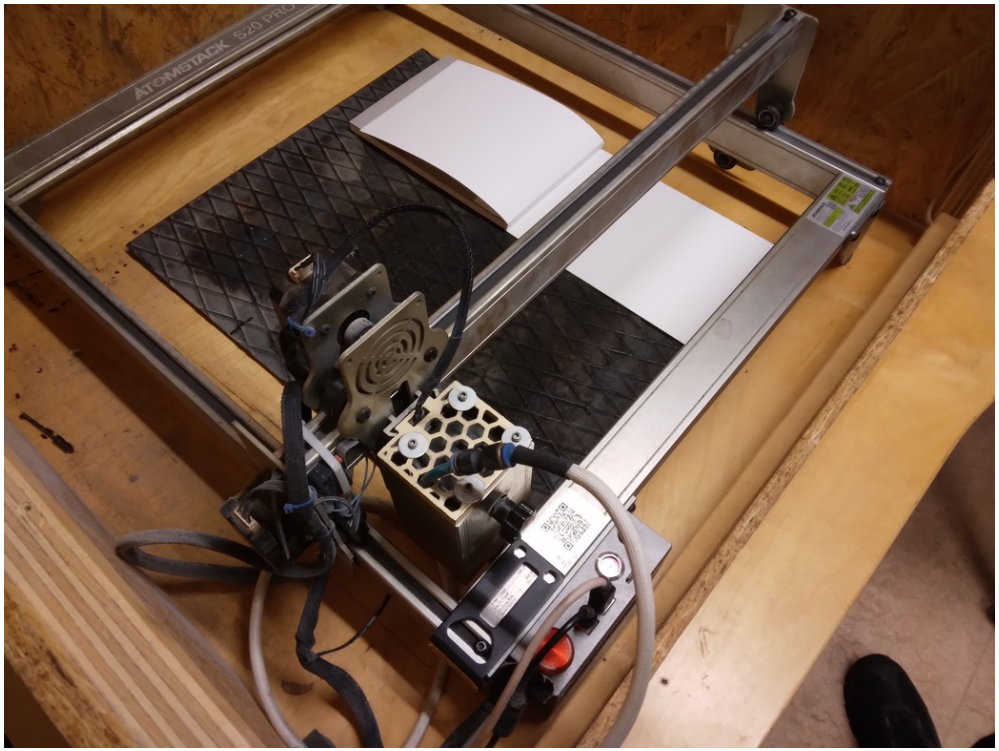


Figure 19: Put the material in the enclosure

The spacer's proper place is at the front-left of the enclosure.

The spacer in its proper place

Take the spacer from its proper place.

Take the spacer from its proper place.

Place the spacer between laser and material

Figure 20: Take the spacer from its proper place.