Laser cutter guide

Figure 1: Our laser cutter

Exercises

Figure 2: Uppsala Makerspace

Contents

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).

9. Certification

To get your certification:

- Turn off everything
- Find a verified operator
- He/she:
  - Is not allowed to help
  - Will decide on a material (that is present) to cut
  - Is allowed to make mistakes you should detect
- Safely make a simple cut in the material as an operator
- Turn off everything

If you can safely do the full procedure, you will get your certificate :-)

1. Turn everything on and off

To use the laser, one needs to turn on these things:

- The laser
- The ventilation
- The computer

After usage, one needs to turn these all off.

You can read those steps in the procedure.

Exercise 1: practice

Read the steps in the procedure to:

- turn on everything
- log in to the computer
- turn on everything

Do so.

Exam

Preparation:

Within 5 minutes:

- turn on all that is needed
- log in to the computer
- turn off all that is needed

2. Be a good controller

To use the laser, two people are needed:

- Operator: the person that starts the laser
- Controller: the person that double-checks the operator

Both roles are needed to work with a laser safely.

In this lesson, we practice being a good controller.

- Find an operator to use the laser
- Read the procedure for the operator

In this session, we never start the laser. All the operator says is 'Laser is on'.

Exercise 1: test the operator

- Let the operator start the procedure
- During countdown, say 'stop'
- You and the operator pass if the laser is not started

Exercise 2: test the operator

- Take off your glasses
- Let the operator start the procedure
- During countdown, say 'stop'
- However, in step 3, the operator must stop the procedure. You and the operator pass if the laser is not started

Exercise 3: test the controller

- The operator takes off his/her glasses
- Let the operator start the procedure
- During countdown, say 'stop'
- However, in step 2, you or the operator must say 'stop' to stop the procedure. You and the operator pass if the laser is not started

Exercise 4: test the controller

- Turn off the air flow
- Let the operator start the procedure
- During countdown, say 'stop'
- However, in step 1, you or the operator must say 'stop' to stop the procedure. You and the operator pass if the laser is not started

8. Your first cut as an operator

Finally, we make our first cut!

Exercise

On your own, do all the steps until (i.e. without) 'Start laser':

- For material, use a match
- For the design, use a very small circle
- The laser is set up to cut the head of the match, using the settings in this guide
- Test that the head of the match will indeed be hit by the laser, using the 'Frame' functionality

Find a controller.

Find a controller to be responsible for starting the laser.

Exercise 1: dry run

The first exercise is a dry run of what needs to be done:

- Do the safety procedure as usual
- You say: 'laser started'
- You say: 'all is well'
- You say: 'laser done'

Exercise 2: for real

In the second exercise, you make your first cut!

- Do the safety procedure as usual
- You say: 'laser started', 'all is well' and 'laser done'
- You turn off the laser and opens the enclosure
- You take out the material, see if it worked

Exam

Do exercise 2 without errors.

7. Extinguish fire as an operator

Before we make our first cut as an operator, we need to be able to extinguish a fire when it occurs.

Exercise

On your own, do all the steps until (i.e. without) 'Start laser':

- For material, use a match
- For the design, use a very small circle
- The laser is set up to cut the head of the match, using the settings in this guide
- Test that the head of the match will indeed be hit by the laser, using the 'Frame' functionality

Find a controller. You will be responsible for extinguishing the fire!

Exercise 1: dry run

The first exercise is a dry run of what needs to be done:

- Do the regular safety procedure
- You say: 'laser started'
- You say: 'fire'
- You pretend to click 'Stop' in LightBurn
- You open the enclosure
- You pretend to extinguish the fire

Exercise 2: for real

In the second exercise, you will extinguish the fire

- Do the regular safety procedure
- Start the laser and say: 'laser started'
- When the first starts, you say: 'fire'
- In LightBurn, you click on 'Stop'
- You open the procedure
- You extinguish the fire

Exam

Do exercise 2 without errors.

Exam

Do the following 5 times:

- A certified operator tells the controller secretly to:
  - Do the right thing
  - Put off glasses
- A certified operator tells the operator secretly to:
  - Do the right thing
  - Put off glasses
  - Turn off the air flow
- Do the procedure
- If the laser is turned on when it should not, the exam is failed

3. Prepare for cutting

There are multiple things that need to be done before the laser cutter can start.

Exercise

Do all the steps until (i.e. without) 'Start laser'.

- For material, use regular paper
- For the design, use any drawing you like: just a circle is perfectly fine
- The laser is set up to cut through the paper, using the settings in this guide
- Test that the design will indeed be correctly cut out off the paper, using the 'Frame' functionality

Exam

Do the exercise in 10 minutes, without any help.

- The ventilation must be on
- The laser is at the correct physical height
- The laser must be set up to cut through the paper
- The paper is place there where the laser is cut

You pass if indeed you've prepared correctly for laser cutting.

  - Do the right thing
  - Put off glasses
- A certified operator tells the operator secretly to:
  - Do the right thing
  - Put off glasses
  - Turn off the air flow
- Do the procedure
- If the laser is turned on when it should not, the exam is failed

6. Be a good operator

To use the laser, two people are needed:

- Operator: the person that starts the laser
- Controller: the person that double-checks the operator

Both roles are needed to work with a laser safely.

In this lesson, we practice being a good operator.

- Find a controller to work with you
- Read the procedure for the operator

In this session, we never start the laser. All you will say is 'Laser is on'.

Exercise 1: test the controller

- Take off your glasses
- Let the operator start the procedure
- During countdown, say 'stop'
- However, in step 3, the operator must stop the procedure.
- The controller (not you!) fails if the laser would have been started

Exercise 2: test the operator

- The controller takes off his/her glasses
- Let the operator start the procedure
- In step 3, stop the procedure
- You pass if you stopped the procedure in step 3
- The controller (not you!) fails if the laser would have been started

Exercise 3: test the controller again

- Turn off the air flow
- Start the procedure
- During countdown, say 'stop'
- However, in step 1, the operator must say 'stop' to stop the procedure
- The operator (not you!) fails if the laser would have been started

Exam

Do the following 5 times:

- A certified operator tells the controller secretly to:

4. Extinguish fire as a controller

Before we make our first cut, we need to be able to extinguish a fire when it occurs.

Exercise

On your own, do all the steps until (i.e. without) 'Start laser':

- For material, use a match
- For the design, use a very small circle
- The laser is set up to cut the head of the match, using the settings in this guide
- Test that the head of the match will indeed be hit by the laser, using the 'Frame' functionality

Find an operator to be responsible for starting the laser. You will be responsible for extinguishing the fire!

Exercise 1: dry run

The first exercise is a dry run of what needs to be done:

- Do the regular safety procedure
- The operator says: 'laser started'
- The operator says: 'fire'
- The operator presses Stop
- The operator opens the enclosure
- You pretend to extinguish the fire

Exercise 2: demonstration by operator

In the second exercise, the operator shows how this must be done:

- The operator follows the regular safety procedure for starting the laser and starts the laser
- When the fire starts, the operator says: 'fire'
- The operator turns off the laser, opens the enclosure and extinguishes the fire

Exercise 3: for real

In the third exercise, you will extinguish the fire

- The operator follows the regular procedure for starting the laser and starts the laser
- When the first starts, the operator says: 'fire'
- The operator turns off the laser and opens the enclosure
- You extinguish the fire

Exam

Do exercise 3 without errors.

5. Your first cut as a controller

Finally, we make our first cut!

Exercise

On your own, do all the steps until (i.e. without) 'Start laser':

- For material, use any material that is fast to cut
- For the design, use a very small circle
- The laser is set up to cut the material, using the settings in this guide
- Test that the material will indeed be hit by the laser, using the 'Frame' functionality

Find a controller to be responsible for starting the laser.

Exercise 1: dry run

The first exercise is a dry run of what needs to be done:

- Do the safety procedure as usual
- The operator says: 'laser started'
- The operator says: 'all is well'
- The operator says: 'laser done'

Exercise 2: demonstration by operator

In the second exercise, the operator shows how this must be done:

- The operator follows the regular procedure for starting the laser and starts the laser
- The operator will say: 'laser started', 'all is well' and 'laser done'
- The operator turns off the laser and opens the enclosure
- Take out the material, see if it worked

Exam

Do exercise 2 without errors.