Week2

Last week we learned about the hardware of lasers, both diode and CO2. We got introduced to Lightburn - a combination layout and gcode sender program. We did our first cut and etch, and in doing so learned the basics of positioning the laser head and planning our operations.

This week, we will go further still and learn how to create a template for cutting multiple variations. We'll use that to create a series of tests for a variety of materials. We will run an assortment of speed/power tests on a variety of materials, and we'll learn how to capture our findings into the cut library we started creating last week.

By the end of this lesson, we'll have a comprehensive cut library, and a visual reference we can look to for any of the designs we want to create.

To get started:

1. Do your visual inspection of your laser
2. Connect to your machine, send gcode to confirm connection
3. Import the settings and cut library you created last week

You may want to do a quick test burn to ensure that everything is set up and working, and to remind yourself of the process from last week.

We'll have two exercises this week. We will be creating a speed/power grid, and we'll be learning how to create a template.

Lastly, we will combine our grid and template to perform tests on multiple types of materials, and save our best settings into our growing cut library.

Exercise: **Create a Speed/Power Grid**

A speed/power grid is a tool you will use constantly when you are working with a laser, as it is the only way to test the effect of a combination in the real-world conditions of your laser. A wide variety of factors that are outside of your control can affect the quality of your work, including:

- Variations in manufacturing quality in your materials
- Room temperature
- Relative humidity

The beautiful designs you do on plywood can look quite differently the next time you run the laser. The way to build up a nice set of cut settings is to run the laser at a predetermined set of speed and power settings - a grid allows you to do this.

With this exercise, you will learn about:

- Using arrays
- Relative positioning
- Speed/power combinations
- Power scale

And you'll finish with one of the handiest tools you can have in your tool kit.

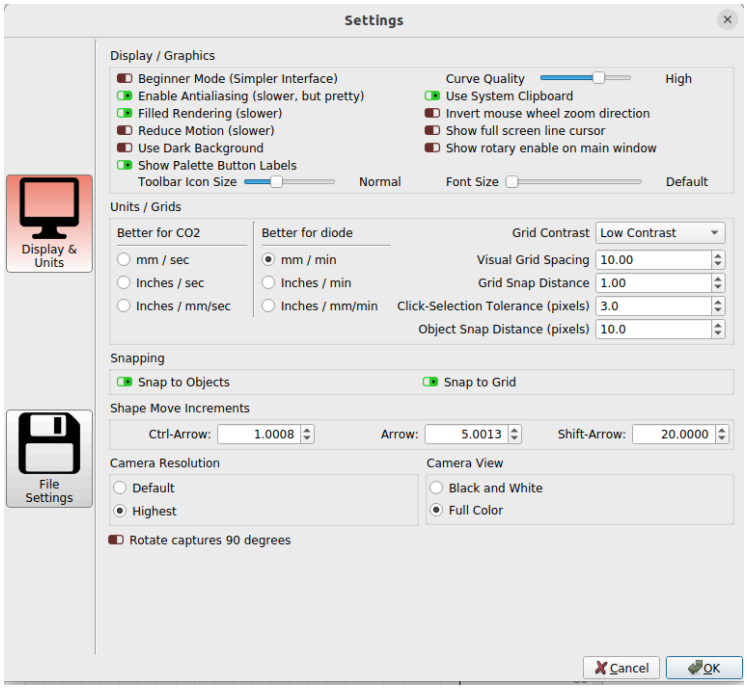
Have students prepare a piece of cardboard.
Draw a box and introduce the array tool to duplicate it out into 9 columns and 9 rows.
Set a color for each row, and set the power scale for each column to 20,30,40,50,60,70,80,90,100. Set power to 100%.
Select each column, and use the advanced property to set shape-properties to 20% power scale.

Live Time - Creating A Laser Vector Test Grid

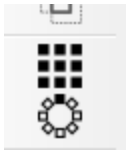
Creating A Grid - Ortur Laser Master

Start by creating a single box, 20mm x 20mm. Set that box to "Fill". This box will be used to create the entire speed/power grid.

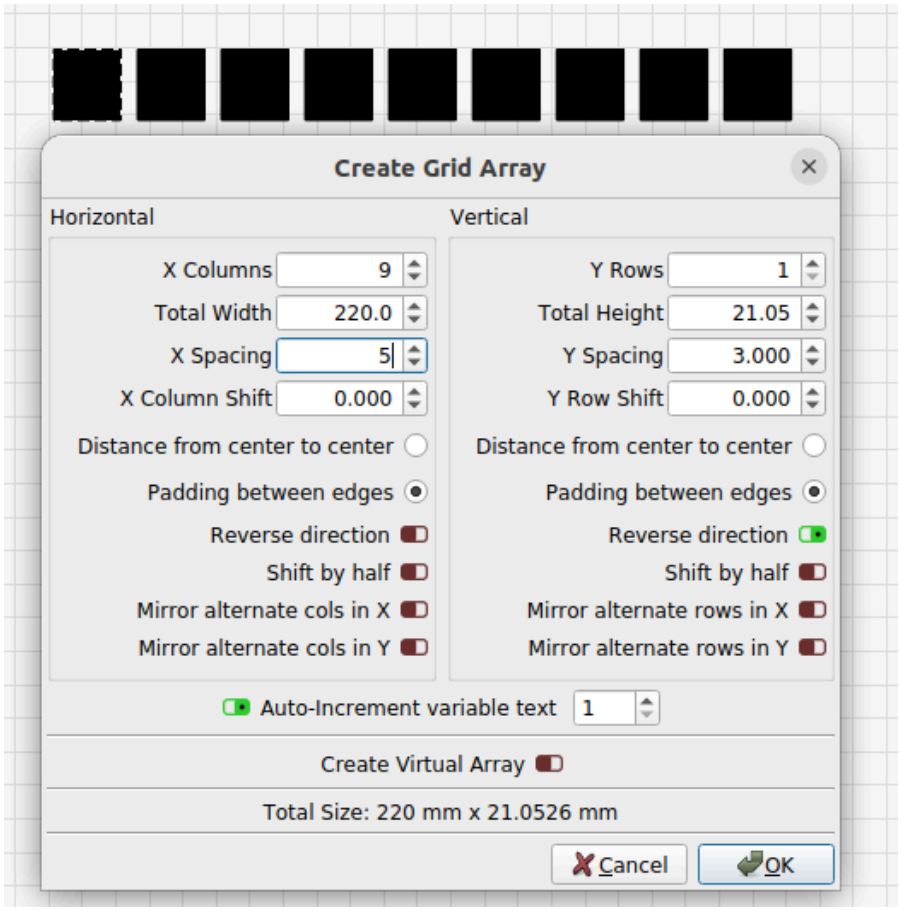
In "settings" ensure that your speeds are set to mm/min:



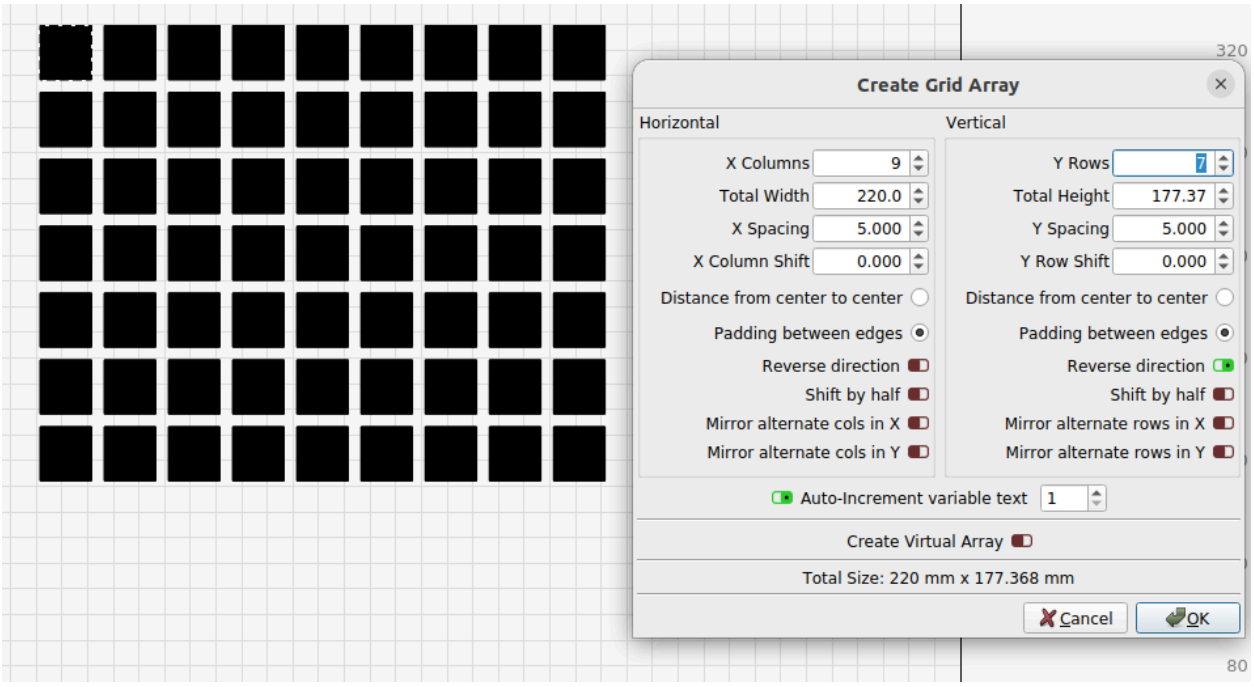
Now look for the "grid" icon:



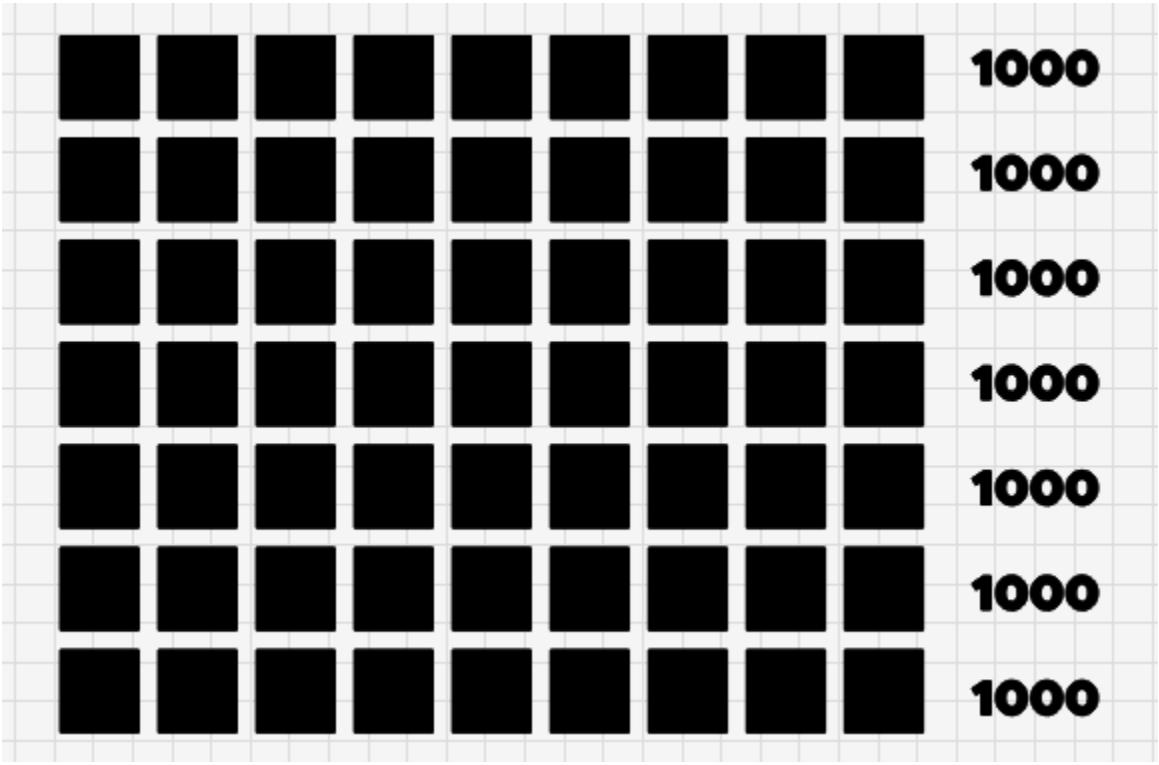
1. Creating the Grid:



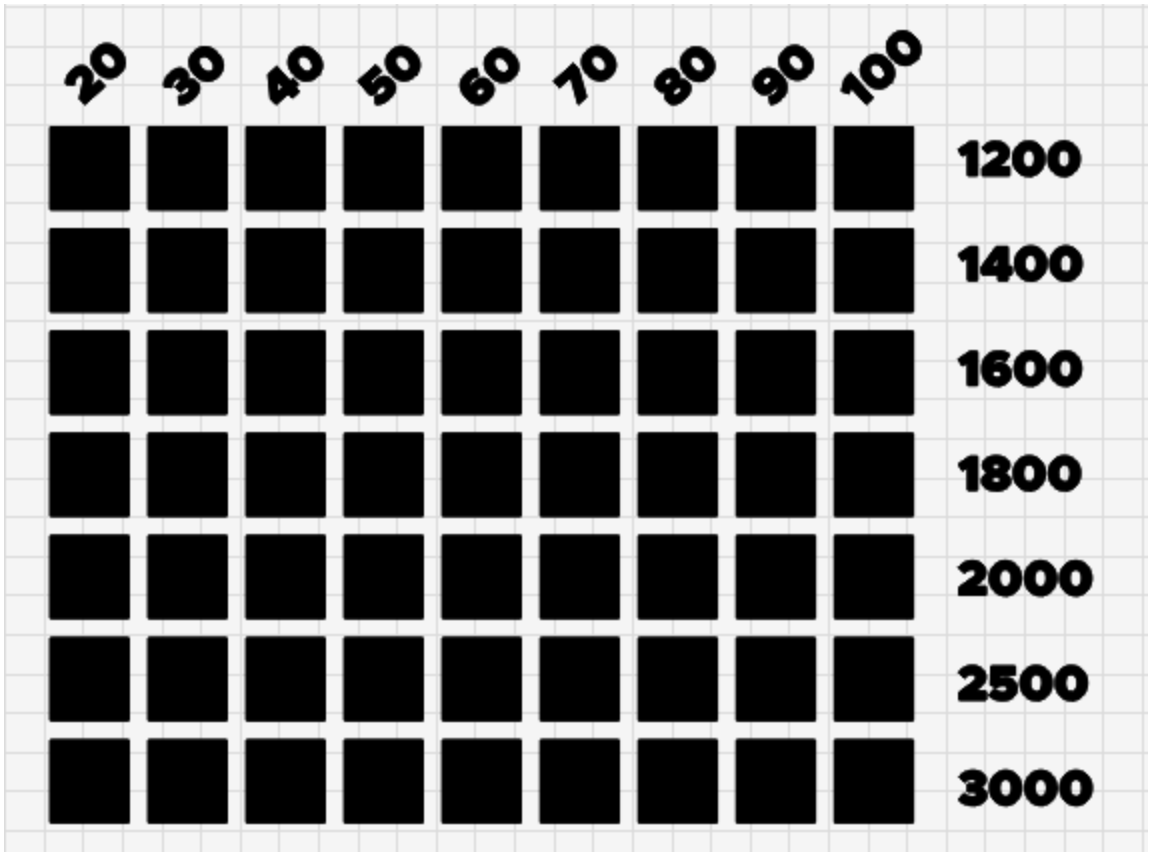
Create 9 columns and 7 rows.



Make text for each of the speeds. Learn to “duplicate” (ctrl+D). Use your align and distribute tools to position the text fields.

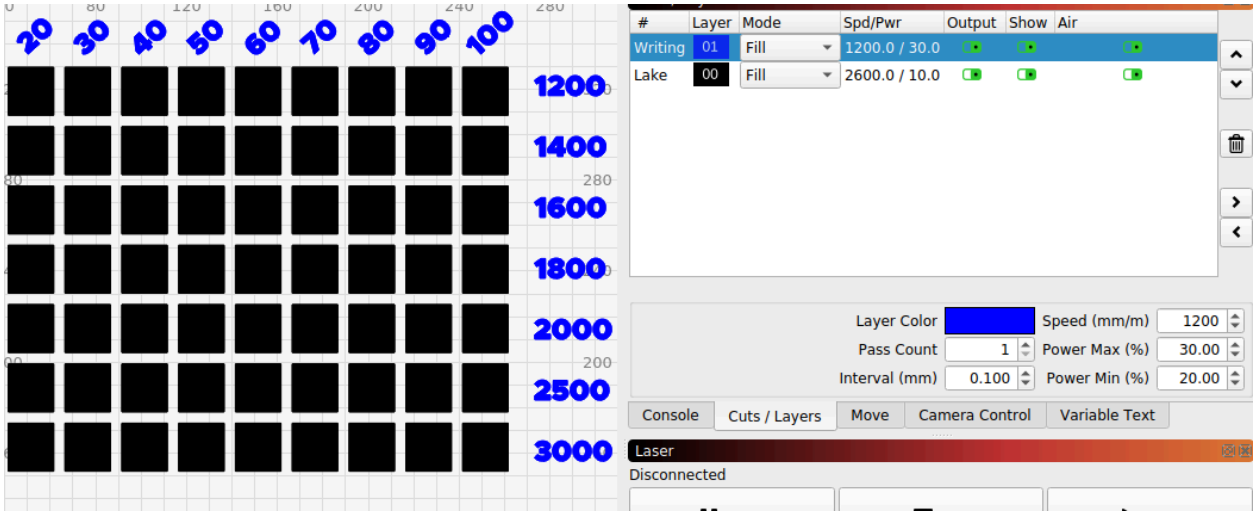


Use the Array tool to create text fields for the power numbers on the top.

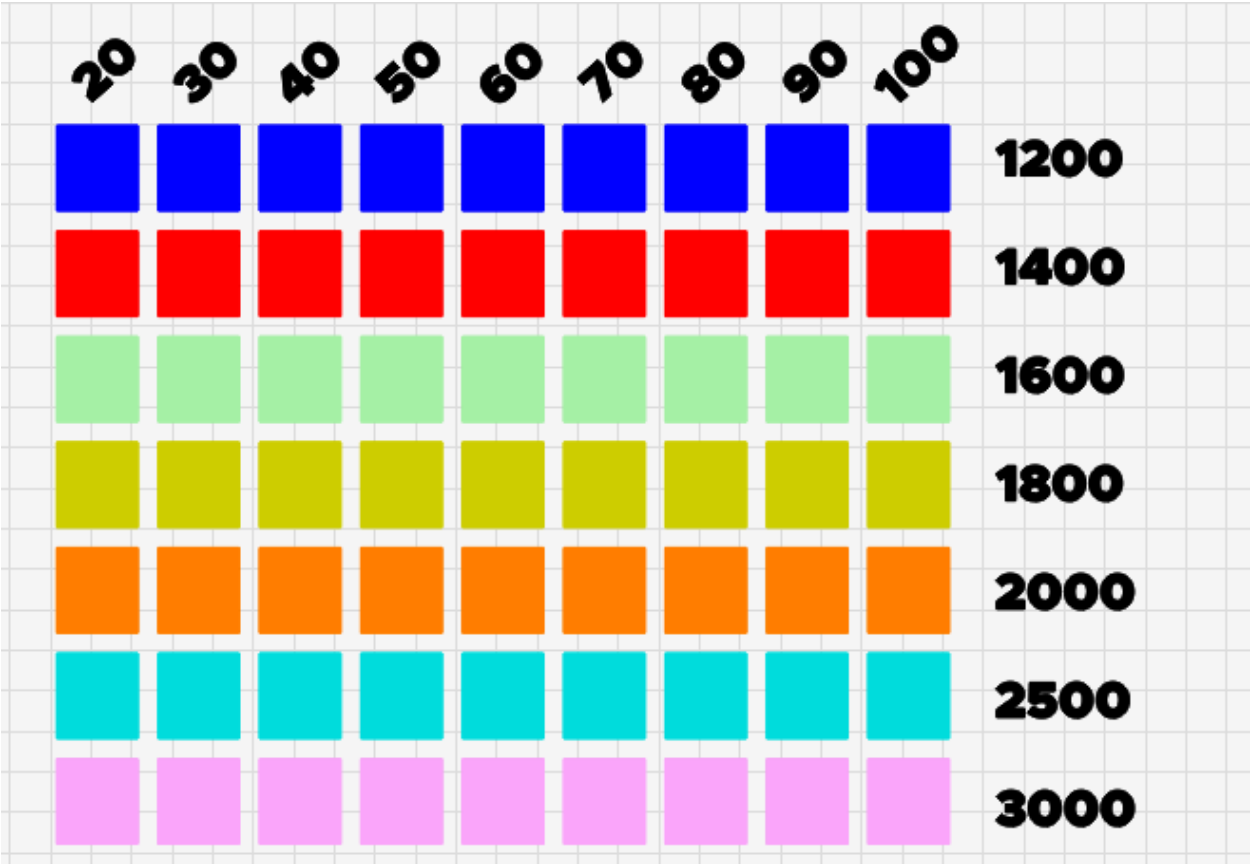


Fill in the values for the grid: 1200, 1400, 1600, 1800, 2000, 2500, 3000 speed, 20-100 power

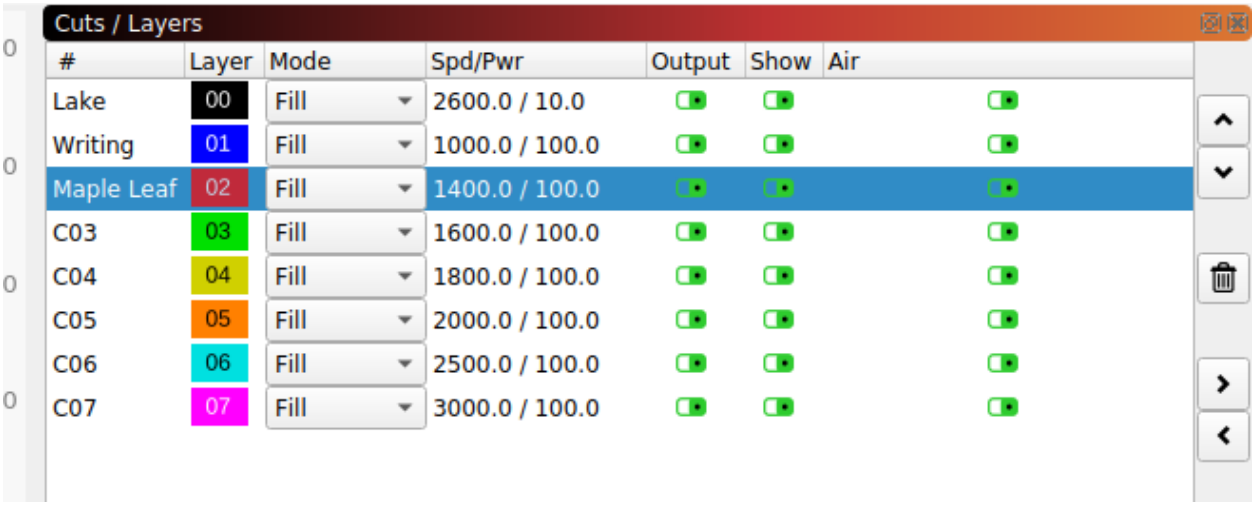
Move the labels onto their own layer by selecting a color for them. Speed 1200, power 30.



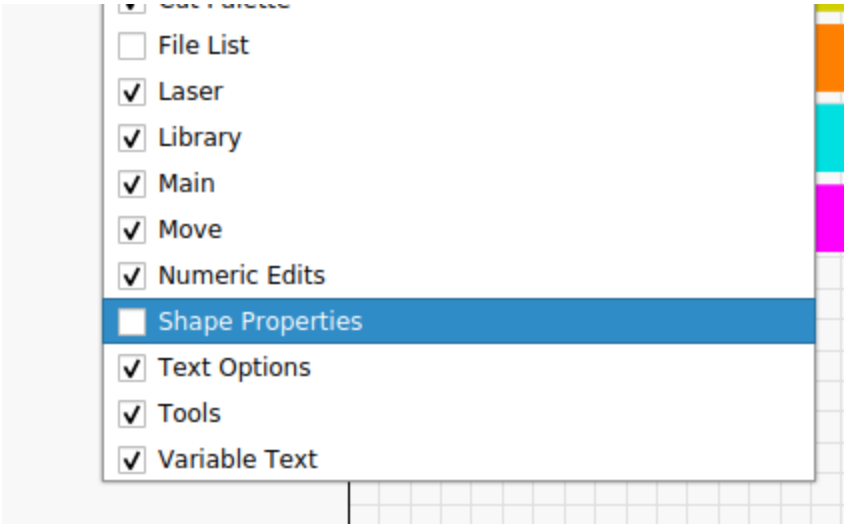
Assign a new layer to each row, each of them set to “fill”. For each row, assign a new layer, and set the speed of that layer to the speed indicated. But set the power for each layer to 100.



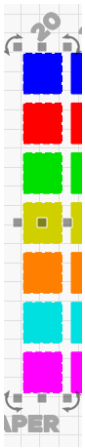
Set the speed settings for each layer:



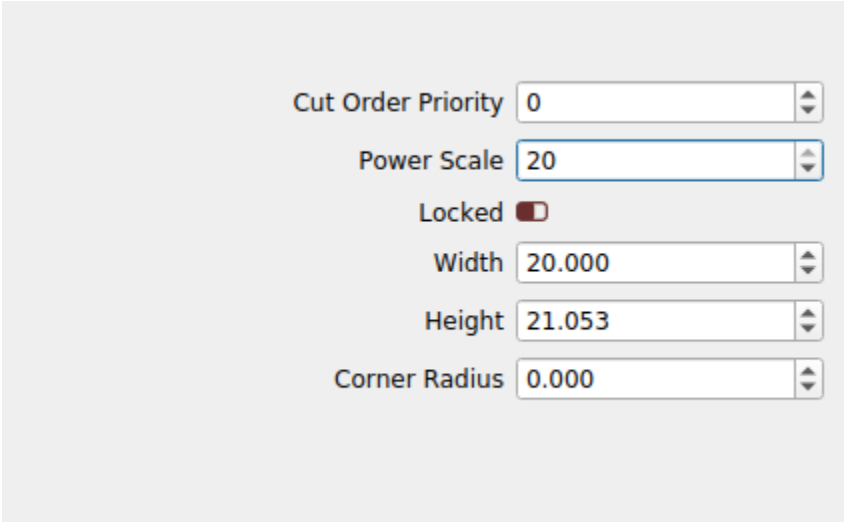
Next we will set the power settings. Turn on “shape properties” under “window”



Select the first column of shapes to set the power scale:

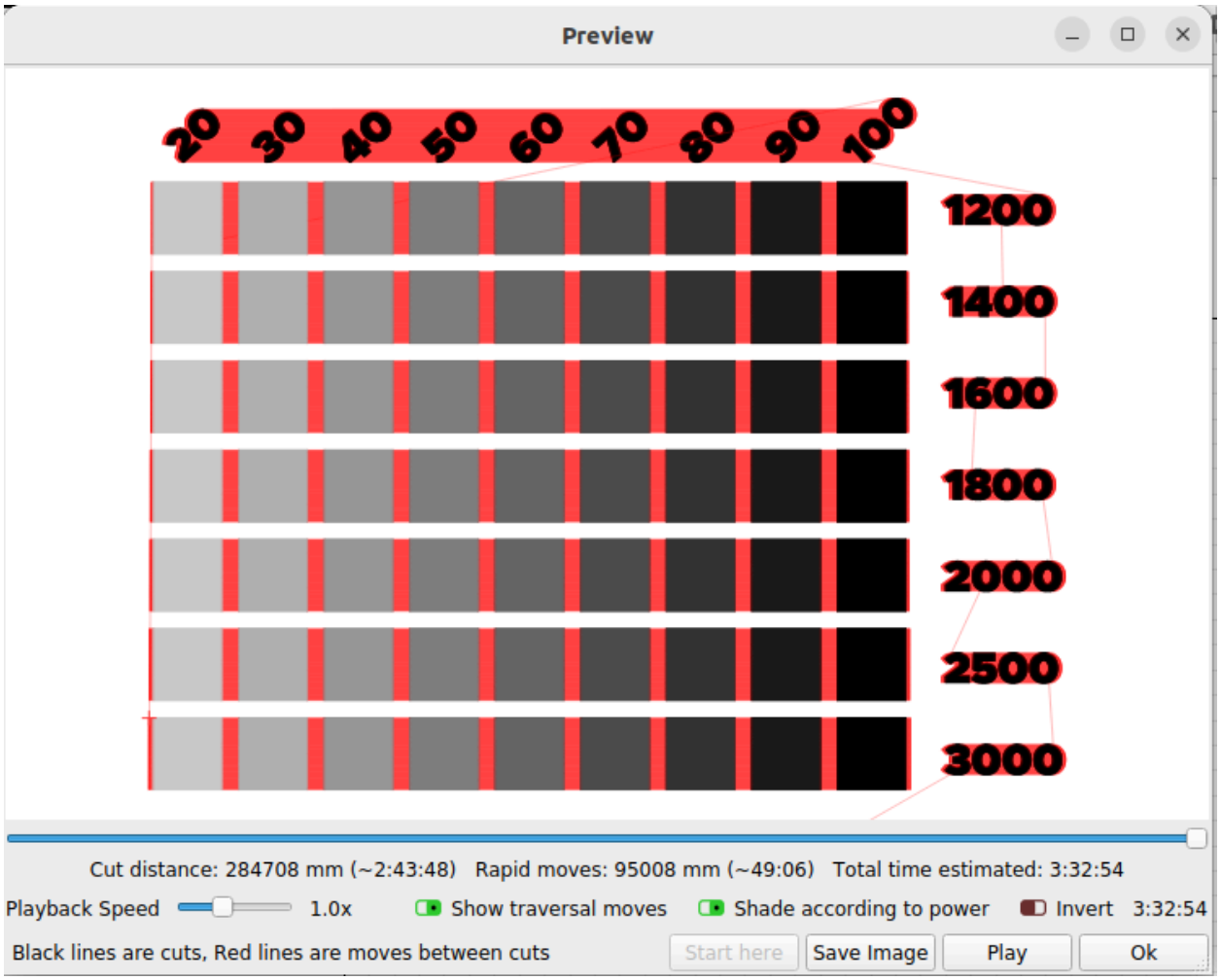


For the column, set the power scale to 20, which will basically scale the power to 20% of whatever it would be based on the layer.



Set the power scale of each column, going up by 10 each time.

Now we can do a preview, checking the box “shade according to power”



It is important to optimize the grid for the material that we will be cutting. For materials that are easily burned, chances are the low speeds are going to burn far too hot. For more robust materials like plywood, there is a good chance the slower speeds will work well.

Create groups out of each row so that you can turn them on or off easily, or move them around to make smaller test grids for the materials you want to test. Note: you’ll want to do your grouping last, or you will not be able to set the power scale on the squares of each row!

Run the first grid on cardboard - watch out for burning!

Now that we have a functional grid, we can start to use it to determine settings for a variety of materials. In this lesson, we’ll be using the grid on some common materials used in artwork.

Materials to test:

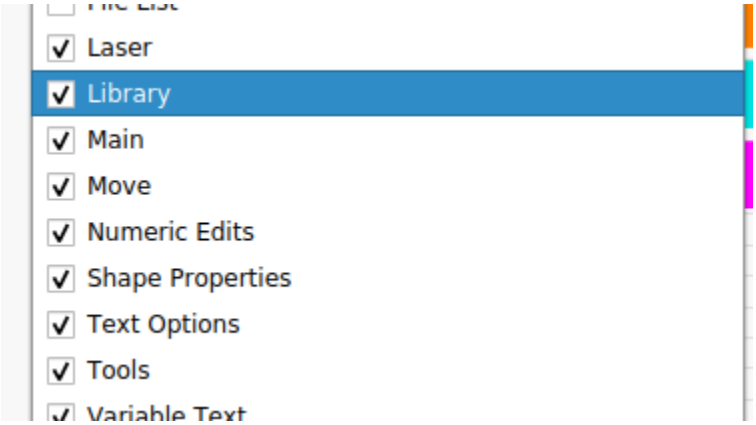
- Plywood
- Cardstock
- Veneer
- Papers
- Colored Acrylic
- Transparent Acrylic
- Mirrored Acrylic
- Ceramic
- Slate
- Canvas
- Veggietan

Since we want to run our tests on multiple materials, it is a good time to learn about a time-saving technique - creating a template.

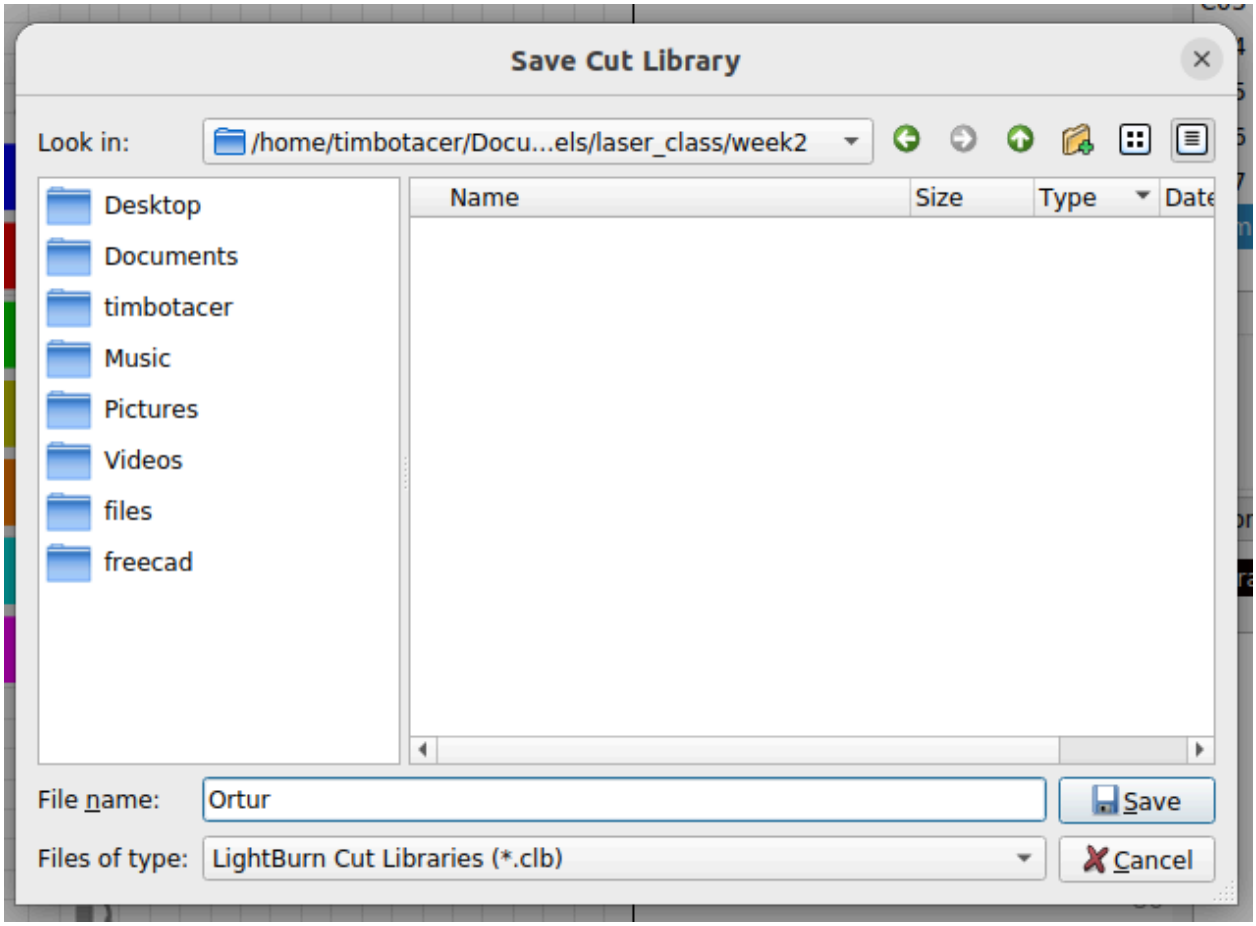
Exercise 2: **Create A Material Library**

With your handy grid, you will soon want a way to store settings you have found are good for specific materials. Thankfully there is a way to do this, and even to save and load your library of materials.

Make sure the “library” window is turned on.



Create a new library, and save it to a location you will remember. It is a good idea to make a library per machine that you typically use, so we will call this one “Ortur” for the Ortur Laser Master 2.

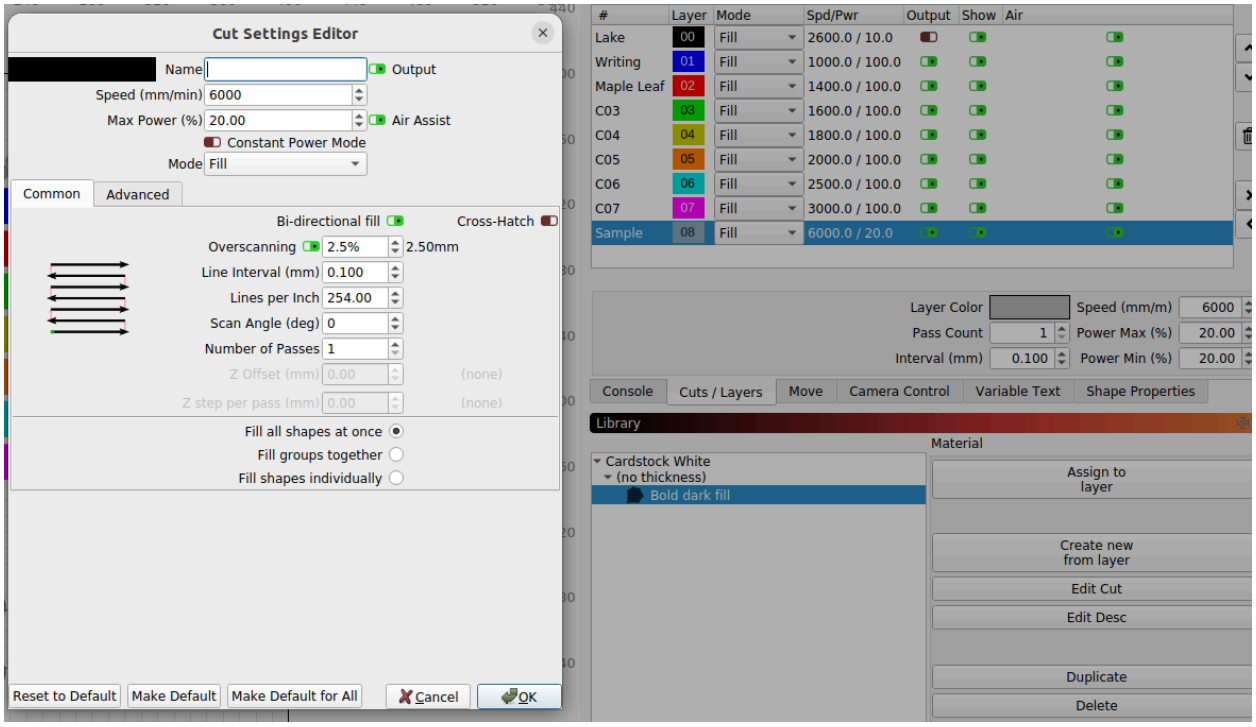


Select your sample square, and click on “New from Layer” to create your first library entry.

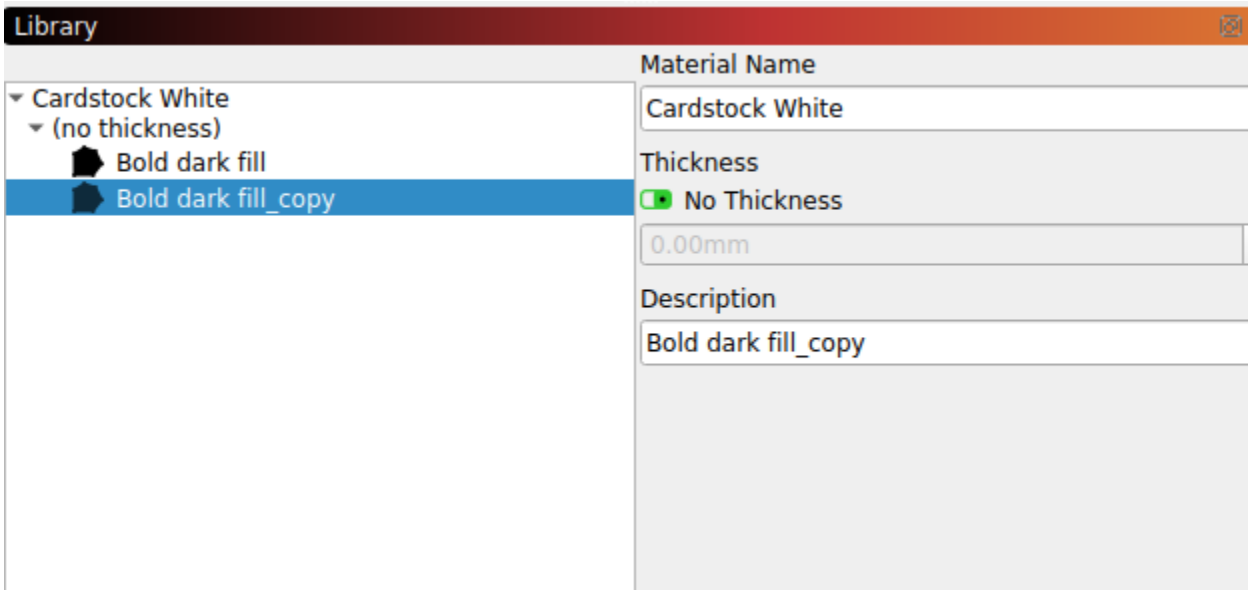
Enter a material name - you’ll want to be descriptive here. Instead of just saying “paper”, you might say “white cardstock” since you’ll use this a lot. In a professional setting you might use the product number of the stock.

In the description, enter what kind of burn is created on this material at this setting. Be specific “bold dark” is better than just saying “fill”.

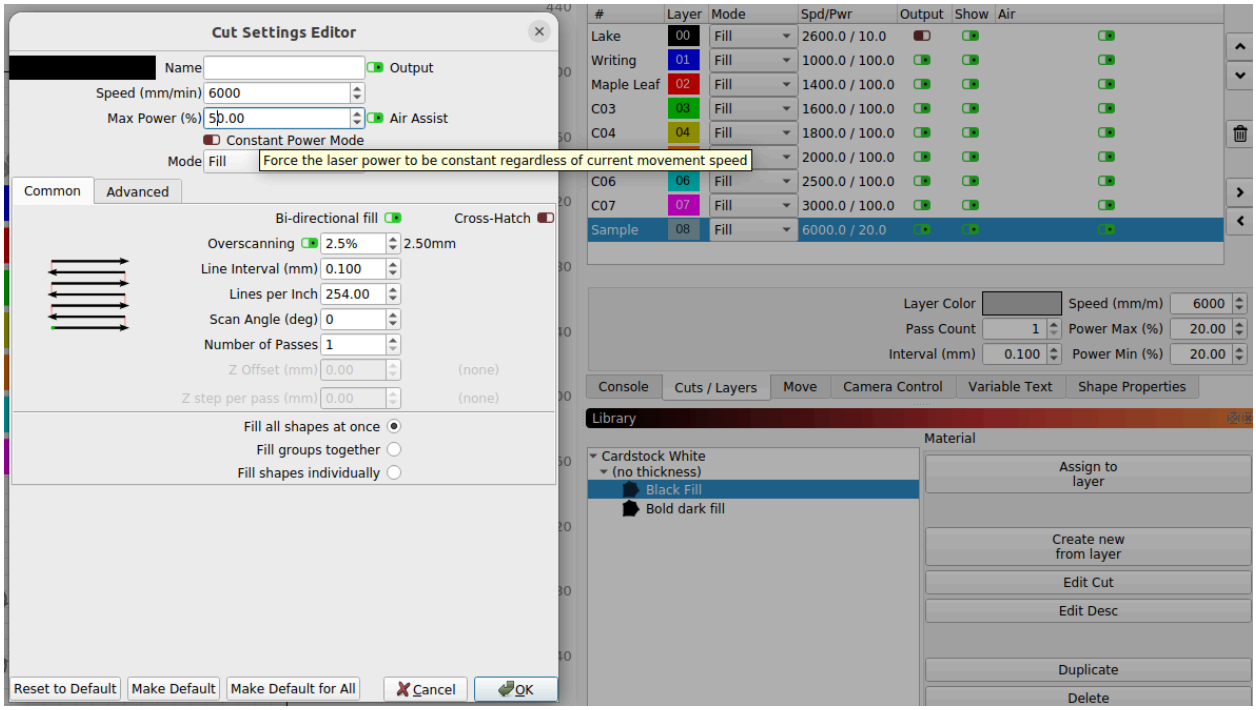
The “edit cut” button will allow you to change settings in your library, without actually changing the settings for the layer in your work area.



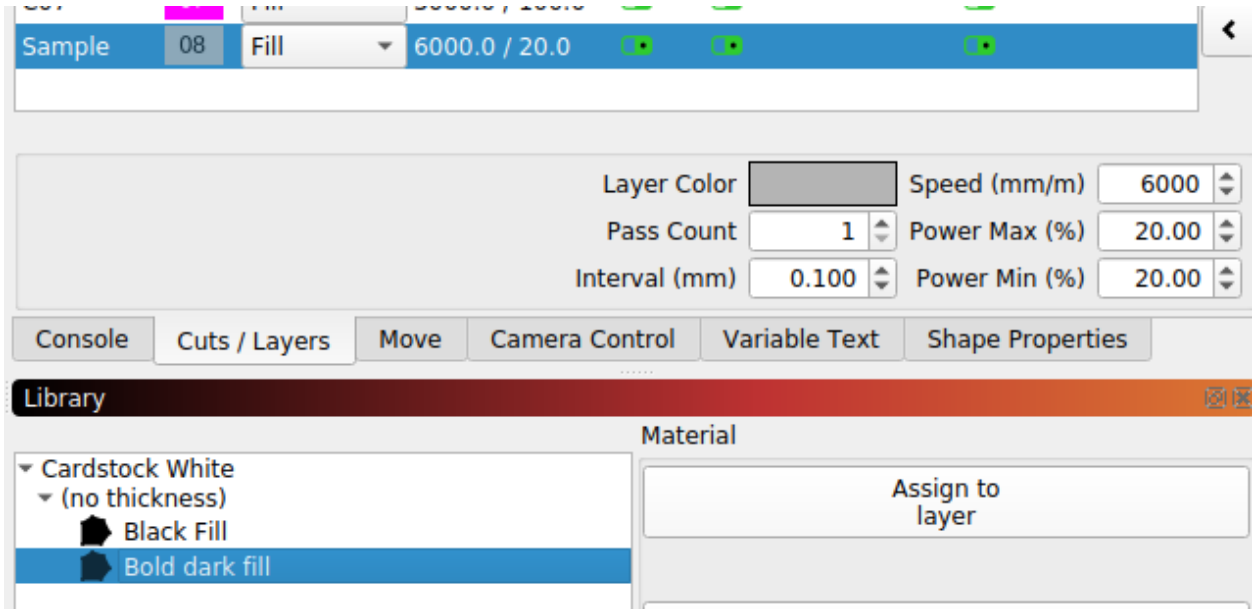
You can also duplicate an entry, which has the effect of storing the new entry under the currently selected material.



As above, you can now alter the settings to make them specific to the material. In the example below, the power has been raised up for the “Black” setting to make it darker than the original setting.



Finally, you can use the “assign to layer” button to copy the settings to the currently selected layer.



Spend a bit of time using your grid pattern to test a variety of materials and build up your library file.

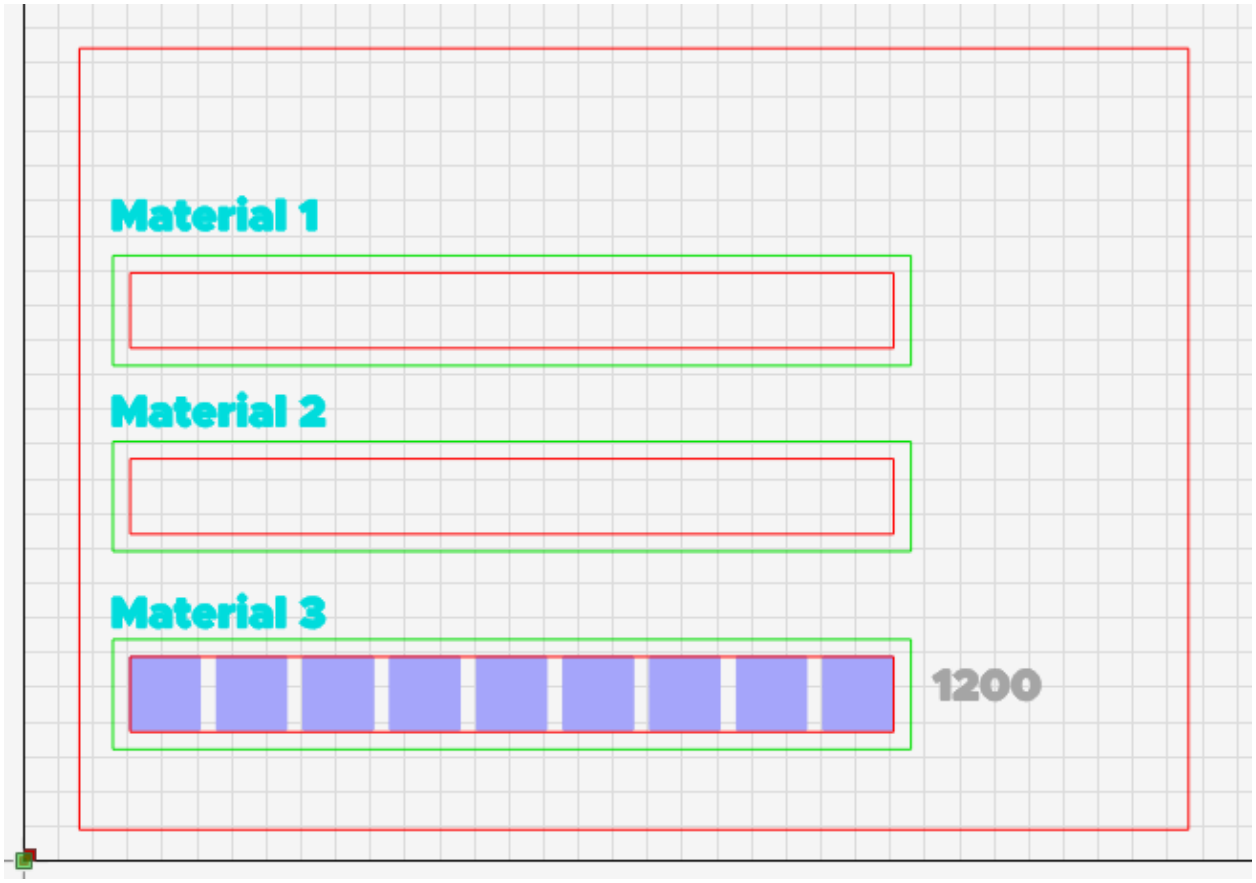
Don’t forget to store a copy of your materials library on a USB drive so that you can load it in the next time you are on the laser!

Note: the exercise below was changed to showing the Variable Text feature on Nov. 14 2023.

Exercise: **Create a Template of Grids**

Templates are often used when you want to be able to run multiple copies of something with the same shape. Think of coasters, name tags, badges, etc.

In this case, create a cardboard template you can use to insert swatches of material based on your findings in the previous two exercises.



With this template, you'll be able to copy/paste your grid rows into place

With this exercise, you will learn about:

- Optimizing your production
- Power modes
- Factory edges
- Tool paths
- Saving templates

- Expanding your cut library

And you'll end up with a handy reference you can use. This will also be your first chance to move between the Ortur and Dremel lasers and see how to divide jobs between them.

Have students create a template for applying test grids to a variety of materials. Have material stock ready for them in acrylic, plywood, and ceramic.
Their template should be cut from corrugated cardboard. They will design it on the Ortur but cut it out on the CO2.

Stock can be inserted into the cardboard. They should position it in the Ortur and perform tests to figure out good settings for each of the materials. If they wish they can label each of the materials using the text tool.

Making A Spoilboard
Create an outer border 380x410 (set to line)
Use alignment tools to position the box
Speed 800, power 90% constant power mode, burn spoilboard
Make The Template
Turn line into a toolpath layer
Create box for inserting material card
Array - 3 columns, 3 rows, xspacing 10mm, yspacing 10mm (optionally use distribute tools)
Set to cardboard cut settings from previous week (look in your cut library)
Cut em!

Use offset tool to create inner box inside the material boxes
Set template lines to toolpath
Save your template.

Use The Template
Have the students select materials and insert them into the template. The tricky part is that the materials all need to be the same distance from the laser, so thinner materials may need backing material to raise them up to the same height as thicker materials.

Run the etch, carefully watching for cases where the cut is too strong and burns the material. Learn to stop the cut and restart it.

For this lesson it is important that the prepared stock be of uniform thickness so that the materials will all be at the same z-depth.

Creating A Laser Bed Template for Production Runs