

Anchorage Makerspace

Laser Cutter Instructions

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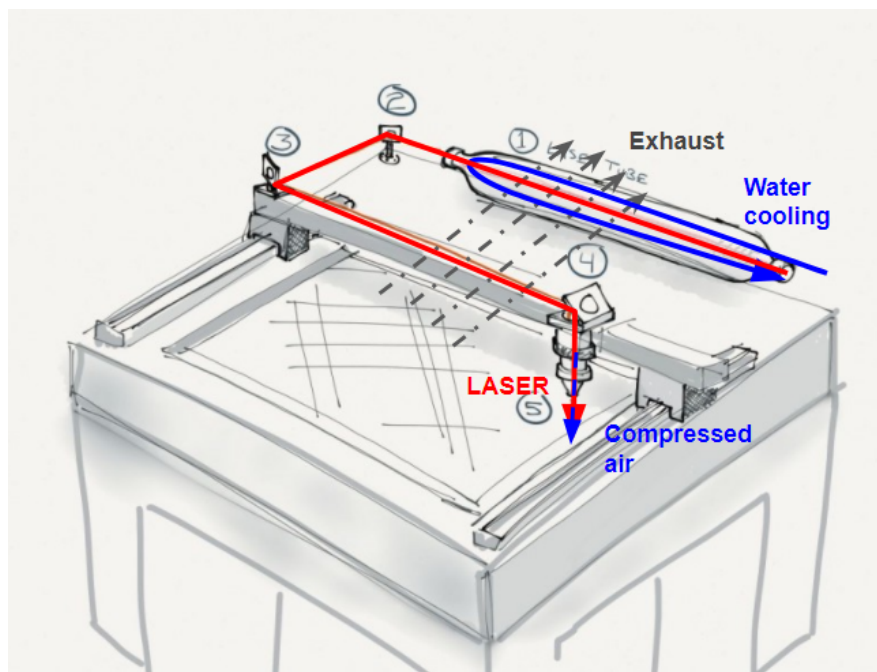
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Starting the machine

Components



There are four components to the laser cutter:

- The laser cutter machine
- The water pump, which runs water through the laser tube to cool it
- The air compressor, which blows air on the cut to clear debris
- The exhaust, which pulls air through the machine and vents outside

It is very important that the water pump is ALWAYS running whenever the laser machine is on. If you run the machine without the water cooling, the bulb could overheat and crack. This piece costs \$700 and could take weeks to ship and install.

Check the machine and components

1. Check the water bucket behind the machine. The bucket should be full, the water should be cool (less than 100 degrees), and the water should be clean. If it is dirty, empty the water and fill the bucket with distilled water (there are usually a couple of gallons lying around)
2. Make sure there's no debris or equipment in the bed

3. Check that the laser head and autofocus are clean and in good condition

Start the machine

1. Turn on the water pump
2. Turn on the laser cutter

The air compressor and exhaust are very loud, and not necessary until you actually start cutting, so you can leave them off for now.

The machine will take about 30 seconds to boot, and show its IP address once it's done booting.

If you turn on the power switch but the machine does nothing, **twist the e-stop button until it pops up**. Some people turn off the machine by pressing the e-stop, so that it doesn't get used by untrained members.



How things should look when the machine is booted up

Running the machine

Laser Cutter Display

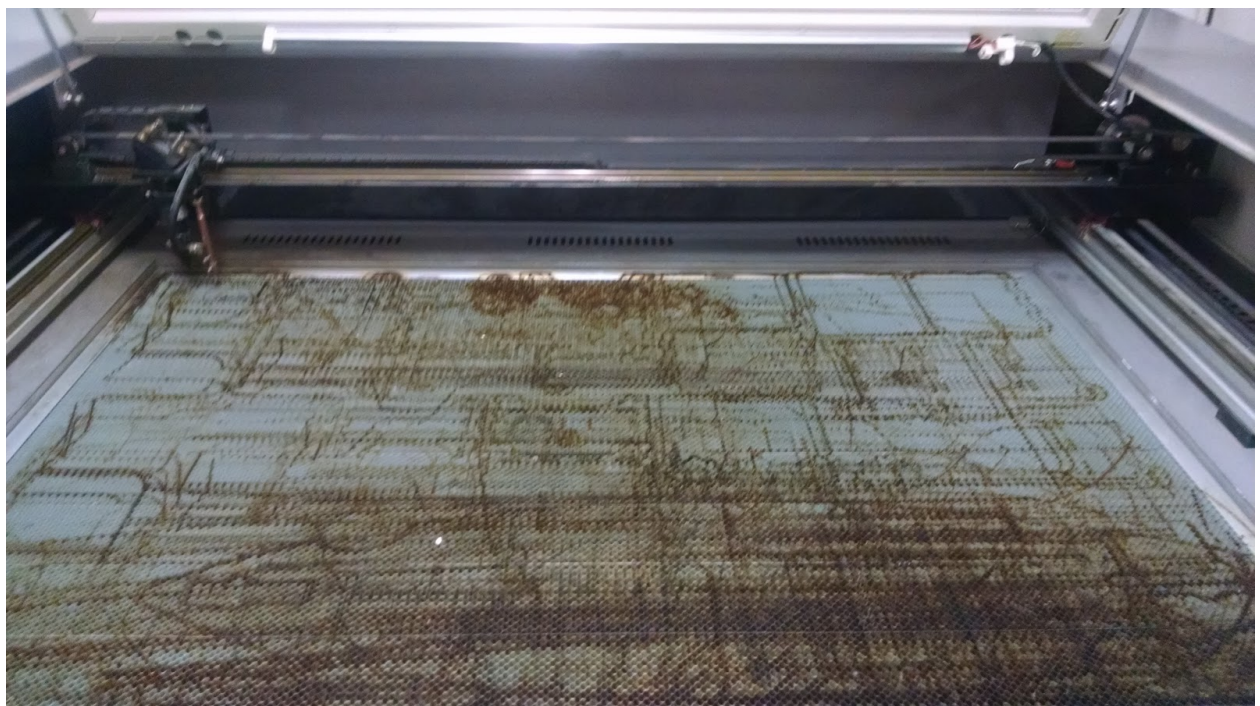


The display is not the most user-friendly, but luckily there's only a few things you need to know how to do:

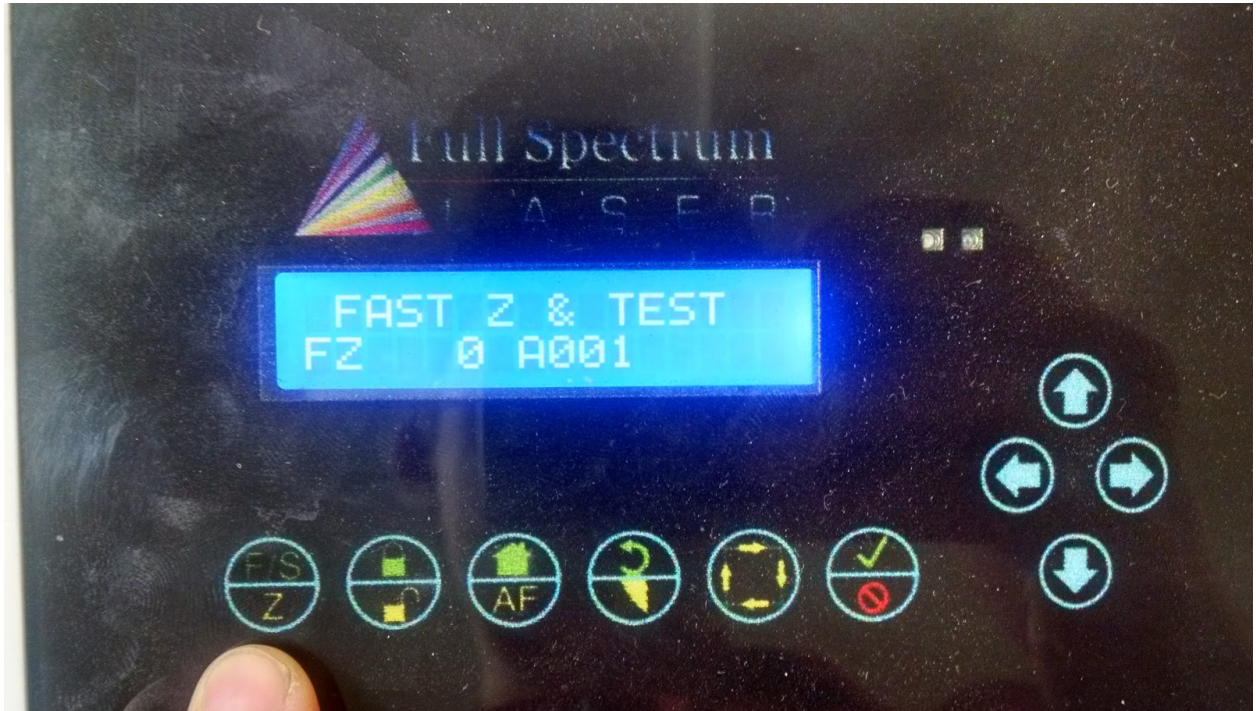
- The function button (**F/S**) changes what mode you're in, like FX (fast X/Y direction), SX (slow X/Y direction), etc.
- The Home/Autofocus button does two things: when you're in FX or SX, it will move the laser to the home position (upper-right corner). When you're in FZ (fast Z direction) mode, it will move the bed up and down in the Z direction until the laser is focused on the material surface.
- The arrow keys move in the X, Y, Z directions.

Setting up for your cut

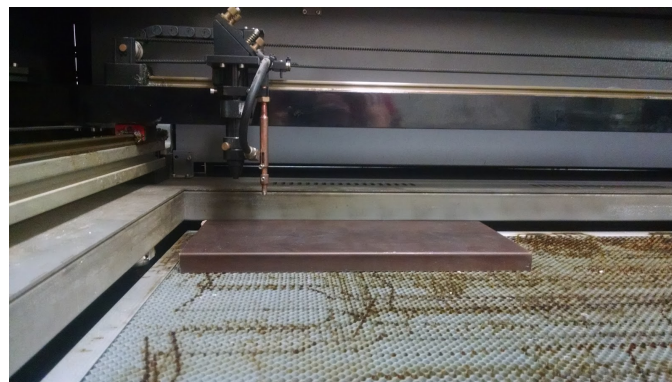
Press the Function key until you get into FX (Fast-XY) mode. Use the arrow keys to move the head around until you get it into vaguely the area where you'll put your material.



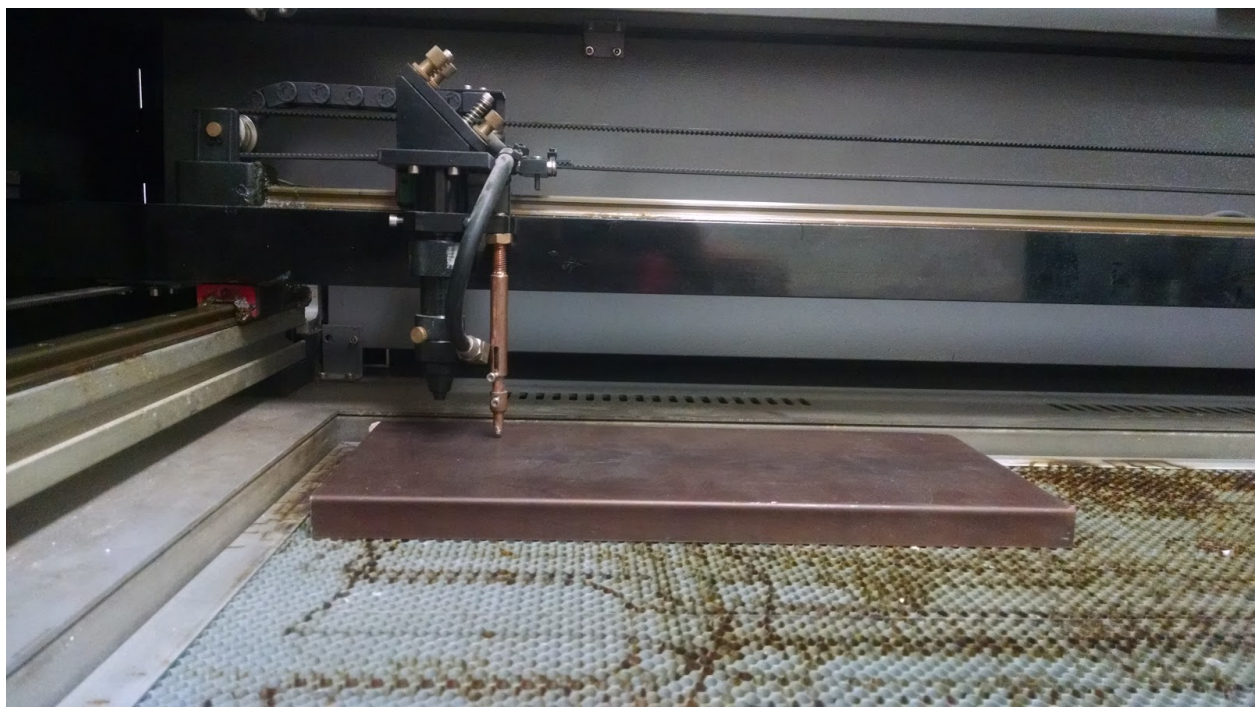
Then, Press the Function key until you get to FZ or SZ (fast-Z or slow-Z). In this mode, you can move the bed up and down. BE VERY CAREFUL ABOUT MOVING AROUND IN FAST-Z MODE, AS YOU CAN EASILY JAM THE HEAD INTO THE BED AND DAMAGE IT!



Lower the bed until it's low enough that the material that you're cutting will be below the laser head. Place your material below the the head, taking care that the thickest part is underneath the laser -- you'll want to calibrate against the highest point.



Make sure you're still in FZ mode and hit the Autofocus button (aka the Home button). This will raise the bed until the material touches the copper head, and then it will lower it so that the material surface is at the focal length of the laser.



At this point, you have the correct depth/focus for your material. If you continue to use the same material for multiple cuts, you don't need to follow this process again -- just place your material and go to your desired start position using the FX and SX modes.

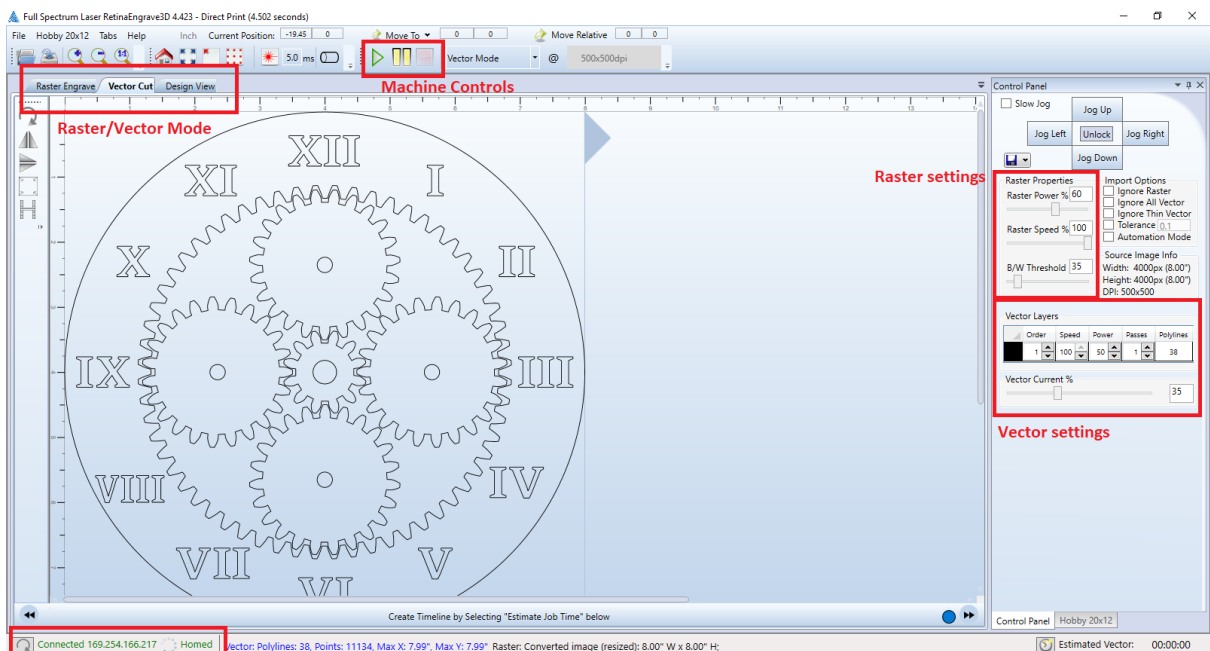
Laser Cutter Software

Now that your material is in place, it's time to head over to the computer.

The software that runs the laser cutter is called RetinaEngrave. There should be a quick link in the toolbar.

Once you've opened up Retina Engrave, look at the lower left hand corner. There should be green text that says something like **Connected 169.254.166.217**. It doesn't matter what the numbers are, just that it's connected. If instead it shows **No Connection**, then click the refresh button and it should connect to the laser.

Just like the panel on the machine, the software user interface is not great, but luckily there's only a few things you need to care about.



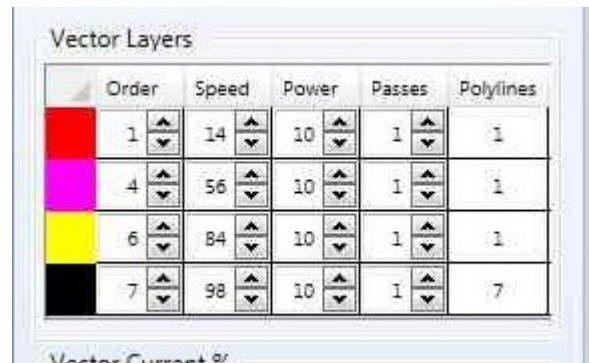
The tabs on the upper left switch between raster and vector mode. On the right, there are settings for both raster and vector cuts.

In the top middle, there are the machine controls:

- Play button -- start the cut
- Pause -- pause the cut
 - If you pause, the laser head stays in the same place, so you can do something like tape a piece down or make a small adjustment, close the lid, and hit play and it'll continue as before
- Stop -- stop the cut and return the head to the start
 - If you do this, you'll lose your place in the cut

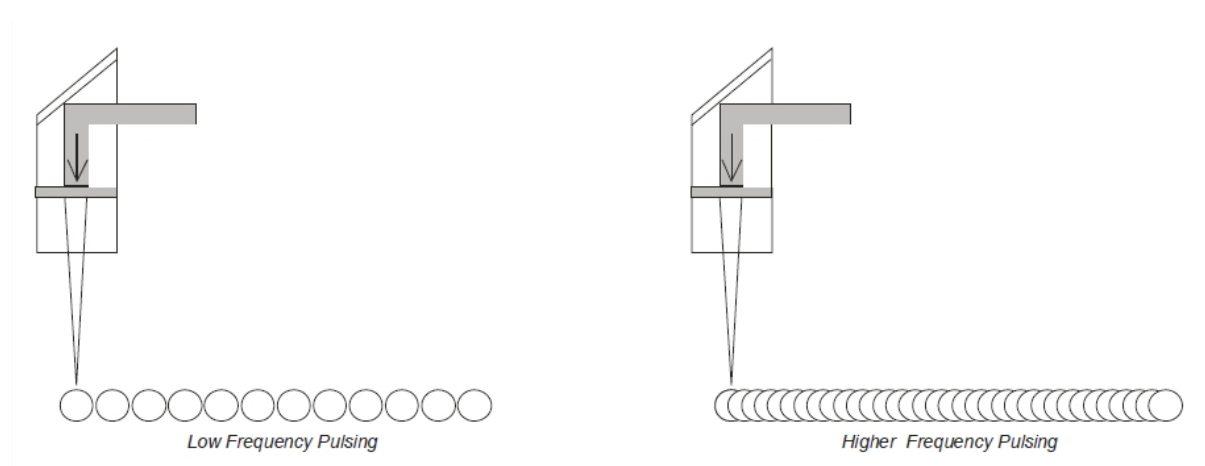
You'll notice that the vector has multiple layers. These layers have a few properties associated with them:

- Cut order
- Number of passes -- set to zero to "disable" the layer
- Power
- Speed



	Order	Speed	Power	Passes	Polylines
Red	1	14	10	1	1
Magenta	4	56	10	1	1
Yellow	6	84	10	1	1
Black	7	98	10	1	7

Speed and Power combined will determine how thick of a cut you will make. Lower speed and higher power will give you greater depth, and exactly how deep of a cut depends on the material. There's also Vector Current, which is essentially the "pulses per inch" -- 100% current means the points are touching and form a line, lower current means the points will be more spread out. This is a more advanced setting, but you can essentially use this as an additional power control.

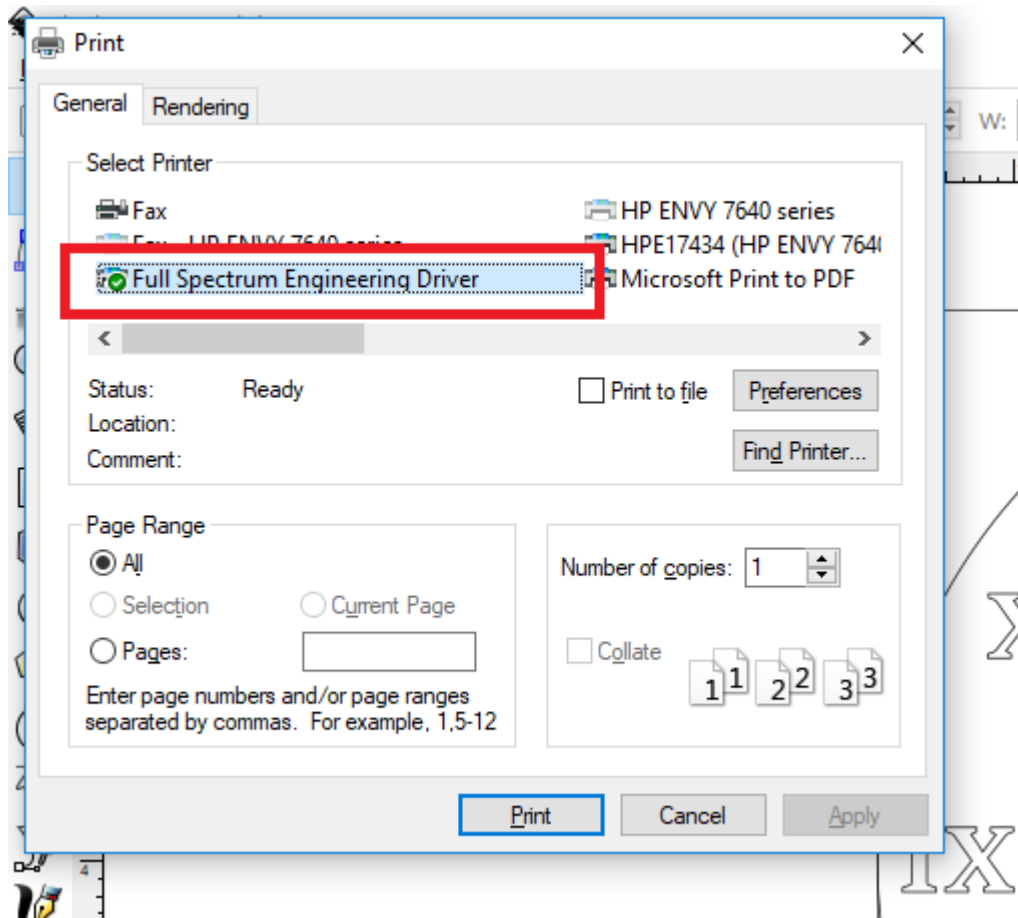


Low Vector Current on the left, and high on the right

To determine what speed/power to use for a cut, it's a good idea to play around with a sample piece of your material, trying different options until you get a good idea of how things will go.

Loading your design

You can import your design from software like Inkscape by "printing" to the machine.



In Inkscape (or whatever software you're using), choose Print and then select "Full Spectrum Engineering Driver" as your printer. Hit Print, then switch over to the RetinaEngrave software. After a few seconds, it should load up your design.

Starting the cut!

The laser cutter will start at the upper left hand corner of your design, so make sure your piece is set up and aligned properly.

Turn on the air compressor and exhaust. Double-check that the water pump is on and running.

Close the lid on the machine.

In RetinaEngrave, hit Play.

If something doesn't look right, you can hit Stop in the software.

IF SOMETHING IS ON FIRE, HIT THE E-STOP BUTTON!