

## Requesting 3D Print, Laser Cutter and PCB Mill Jobs at the Shop

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### Introduction

The BYU ECEn Shop has a 3D printer, Laser Cutter/Engraver, and a PCB mill available for student projects. While we only charge for the materials used, it is important that your projects be formatted properly so we can accommodate all student requests in a timely manner. Please read and comply with the following guidelines before submitting a project to the Shop.

### General Shop Procedures

We receive all our project requests through [ecenshop@gmail.com](mailto:ecenshop@gmail.com). This constitutes our queue and projects will be completed on a first come, first serve basis. However, projects for the Electrical Engineering Department and Student projects will take precedence over personal projects.

**Please note:** Due to federal regulations, we cannot complete projects for third parties. Only University projects and personal projects will be accepted.

While we would love to accommodate rush orders, **there is no guarantee that a project will be finished within a specified amount of time.** Depending on queue length and staff availability, projects may take up to a week to complete. Please plan in advance. Generally, projects can be finished within a couple of days.

That being said, please be aware that near the end of semester, our work load goes up. Don't wait till the last minute to finish projects for classes, because your project completion **will be delayed!**

When your project is finished, we will send you an e-mail notifying you of its completion. You can pay for and pick up all completed projects at our window. **Remember,** we only accept signature card as payment. If your project is for a research group, let us know and we will charge it to that group.

### Laser Cutter Projects

The laser cutter we have at the shop is the 40W Full Spectrum Hobby Laser. It is not high precision, but is very useful for engraving images or vector cutting parts from acrylic or wood.

#### **Materials**

There are certain materials that will damage the laser cutter. We therefore ask that if you do not

know what your material is made out of that you not provide it to be cut. If we cannot verify the safety of the material, we will not cut it.

Materials we can cut include acrylic and wood, which you can purchase at the shop. Any other materials must be adequately researched to verify their safety before we will cut them.

We will not cut any material containing pvc or vinyl, as these release a gas that quickly corrodes the laser lens. This includes any polycarbonate material.

### ***Procedures***

The laser cutter will engrave an image using any bitmap image. These include .png, .jpeg, etc. Assure that the dimensions are correct in your document.

If you want a part cut out, we need a vector file. .svg files work best. We typically use either CorelDraw or Inkscape to create our files. These are free and tutorials are readily available on the web. Again, make sure that your dimensions are correct.

Send us your files with their dimensions, along with any other specifications you may have (material, color, etc) to [ecenshop@gmail.com](mailto:ecenshop@gmail.com) and we will get them done as soon as possible!

## **3D Printer Projects**

We have both a flashforge and a zortrax printer. Both work well. The Zortrax prints ABS, while the flashforge prints in PLA plastic. When 3D printing interlocking parts, almost always, some sanding will need to be done due to imperfections. We can add supports if needed, but we cannot choose where. There are limitations to how detailed the printer can be. Also, there are some objects that simply will not print well. When you want to print an object, try to make sure that it makes sense for you object to be printed layer by layer from the ground up. Simplify your part where possible.

3D printing generally takes about a day. The risk of something going wrong while we are away is also high, in which case printing will be delayed. Make sure you plan well in advance to have your parts ready on time.

### ***Procedures***

3D parts can be created in a number of CAD programs. Export your files into either a .stl or .obj format. The printers will not accept any other format. We can scale your objects to size as long as your object is scaled properly and we have your dimensions.

Email your files and specifications to [ecenshop@gmail.com](mailto:ecenshop@gmail.com). We will then put them on the printer when one becomes available. Department and student projects will take precedence over personal projects. Let us know if your project is University related.

## **PCB Mill Projects**

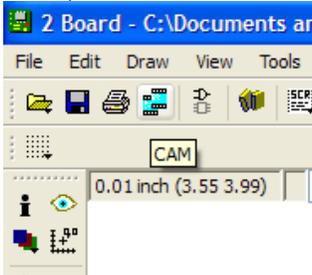
We can provide either single or double sided copper PCB. We cannot do vias, multiple layers, solder masking, or other more complicated PCB manufacturing procedures.

## ***Procedures***

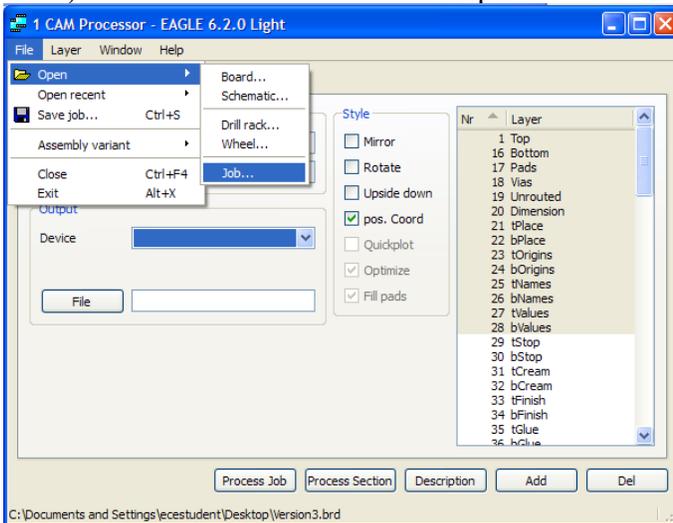
Generally, Eagle is the best program to design your board in. Make sure you use large pads, as the drilling procedure will rip them off if they're not thick enough. After you create your circuit board, export the files we will use to mill them out. The rest of this Document explains how to do that.

## How to make Gerber files from Eagle to get your PCB Fabricated

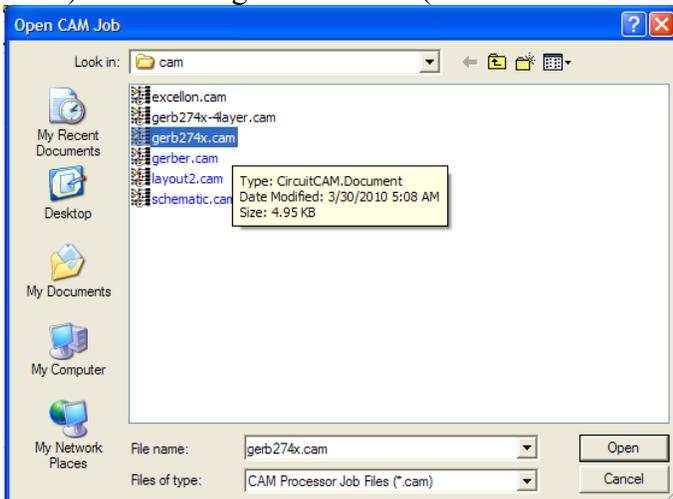
1) Click on the CAM button.



2) Select Job... under the File/Open/Job...

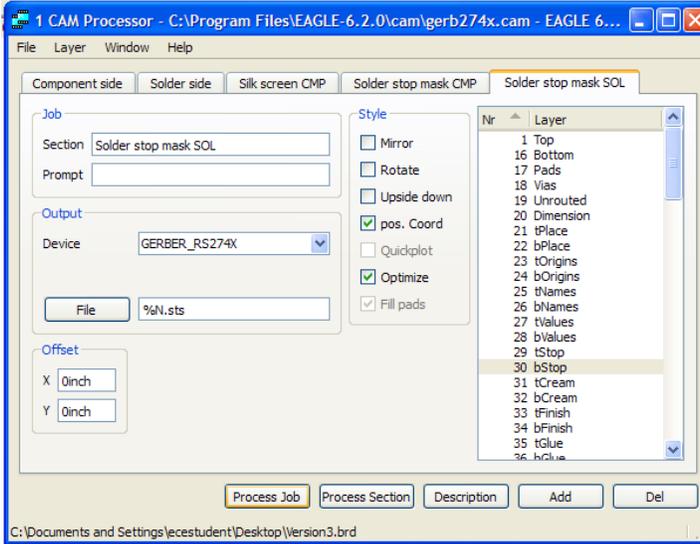


3) Select the gerb274x.cam (This will create the top and bottom layer files needed)

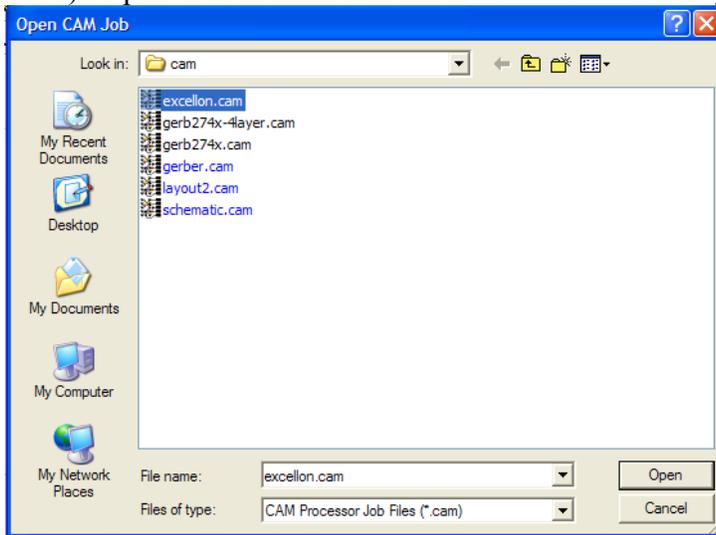


5

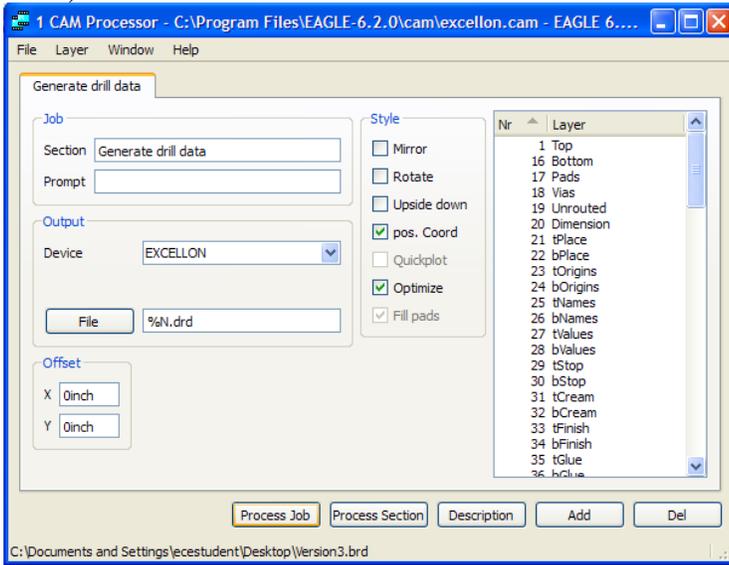
4) Click the “Process Job” button at the bottom of the CAM Processor window.



5) Open the excellon.cam file in the same window you opened in step 2.



6) Click the “Process Job” button.



7) Where you saved your board file you now have the .cmp (top layer), .sol (bottom layer), and .drd (drill file) that you can send to [ecenshop@gmail.com](mailto:ecenshop@gmail.com) to get it fabricated.

