

Submitting Jobs to the Machine Shop

It's a fun and rewarding process to see a part that you designed come to life. Working in an environment such as here at the Polarized Target Lab, a lot of the core systems consist of one-off, custom made components. As such, there isn't the option to run to the hardware store and buy a replacement, instead we must either commission the machine shop to make the part or make the part ourselves. In either case, producing clear, concise, and accurate models and drawings make the process smooth and gives yourself and others something to refer back to if the need ever arises. Some tips and tricks to help you get started are given in the itemized lists below.

Golden Rules for submitting jobs to the shop.

- Time is money for the shop, so the less work they have to do, the better. Thus, simple is almost always better.
- Design your part to be made from a generic piece of stock material. This will lessen the total amount of machining required to make the part. Look around at supplier websites such as McMaster.com to see what is available. If you are unsure, ask the shop.
- Although you are a scientist and have unconditional love for the metric system, American Machinists use the Imperial system. You should design your part in inches from the beginning as opposed to designing in metric and converting at the end to minimize potential errors/oversights (think about what happened with the Hubble telescope). Also, designing in inches will also make it easier to find generic stock pieces close to the dimensions you want.

Pro-Tips

- If you are a grad student or staff member, ask to sign up and take the Machine Shop class. Although it is more of a crash course, it will allow you to be hands on and see how simple parts are made. This will give you some perspective and show you things to keep in mind while designing so your part doesn't end up looking beautiful on the computer but impossible to bring to life.
- It is a good idea to ask the machinists if you can watch them work, or to describe how they would make something. It is very important to keep the way in which the part will be machined in mind during the design process so to not engineer yourself into a corner, or for the machining process to take unreasonable time/effort. Remember, CAD software will allow you to design just about anything on any scale. If the part is impossible to make, it just becomes a pretty picture.
- 9 times out of 10, simple is better.
- When designing your part, it is a great idea to also draw the parts that interact with your part and put it all together in an assembly. This will allow you to see any conflicts or design oversights before the part is made. This is a little more work up front, but will save time/resources in the long run.
- If you have any questions at all, ask. The machinists are very nice, knowledgeable, and talented. **Do not** bother them during their lunch hour between 12:00pm - 1:00pm. Seriously.
- Include some pictures of where the part will go to help give them context. The machinists have been working here for years and have a good idea about what we are working on, thus if you give them a good idea of what you plan to make, they often will make suggestions on ways to simplify the design, change things that could be a potential issue, or just tell you that your part is not going to work as you hoped. This part is very constructive for you and will help you design better parts over time.
- On your drawings, be sure to give the dimensions in inches with a precision to the thousandth place. eg. if the dimension is 2-1/8", provide it as 2.125"