Universal Laser Tech Manual

Before training, all TA's must read and understand this information provided and in the guidelines provided to students. Please review this material on a regular basis as it is subject to change.

WARNING: The laser cutter is a potentially hazardous machine that is capable of damage to the eyes, body, building, and the machine itself. If ever in doubt, do **NOT** proceed. Contact someone more knowledgeable and ask questions.

When a trained TA is on duty they have the final say when it comes to who and what can be laser cut. **UNDER NO CIRCUMSTANCES WILL PVC OR POLYCARBONATE BE ALLOWED.**
Files that are not properly formatted or jobs that will require more time than allowable in the reserved time may be declined at the discretion of the TA. If you are aware of any problems or situations that may be of use please leave a note or message for the Student Shop Manager.

General information:

This information is typically disregarded by students and should be repeated as often as possible.

- The laser cutter can hold a piece of material 34" x 20". However, the actual cutting area is only 31.7" x 17.7".
- ¼" is the **maximum thickness** we will cut. The laser cutter has the capability to cut thicker, but the results tend to be less reliable and very time consuming.
- The student shop has regular hours 9am to 5pm. **NO EXCEPTIONS** without prior approval from the Student Shop Manager.

Basic machine information:

The laser cutter operates from the Windows platform using a printer driver much like an old pen plotter. Any Windows program can access the laser cutter. However, the results may vary depending on which program is used and how that particular program handles page sizes. For example, Photoshop creates an image in the center of the page. To compensate, resize the engraving size to .125" larger in every direction than the item you wish to plot.

The machine operates on a ratio of speed to power. Higher speeds coupled with lower powers will not produce a greater deal of surface etching. On the other hand, slow speeds and higher power ratios are used to cut through materials up to ¼" thick. These ratios have been predetermined for most of the materials that will commonly be used.

Cleaning the machine should be a daily process that includes removal of excess trash and debris from the inside of the machine. Typically, the laser cutter's lenses will not need to be cleaned on a daily basis. Over-cleaning will produce minute scratches that eventually build up to create a permanent haze. Proper cleaning techniques will insure that the lenses remain intact and optically clear for a lifetime.

The laser cutter is a CO_2 based machine that should require little or no service on a daily basis. Any irregularities that arise should be pointed out immediately to the TA and Steven Earp. Steve will evaluate the problem and determine a solution based on his prior experiences. TA's should be aware that this machine is a very expensive piece of equipment and will not be replaced should it be damaged beyond a repairable degree.

Basic Machine Operation:

The power switch is on the lower right hand side of the machine. On the opposite side are the gauges and controls for the air assist mechanism. On the wall adjacent to the machine are the switchbox for the exhaust system. Please take some time to familiarize yourself with the operation and location of these items in case of an emergency. Remember: Without oxygen, fire will not burn. Turn off the machine, and the exhaust in the case of a fire.

- Turn the laser cutter on by toggling the power switch. Allow the machine to recalibrate itself and reset.
- Before any material is loaded into the laser machine, press the **Z** button located on the user control panel on the top right hand corner of the machine. The focus head moves from its home position and stops a few inches from 0,0. Using the larger of the two sets of arrows, move the bed up and down until the bottom of the lens case is directly in line with the notch on the focus tool. Do not allow the tool to become trapped beneath the lens case. Note that to change the increments that the bed moves press <select> to toggle between tenths and hundredths. Once the machine is focused to the honeycomb bed, lower the bed by approximately ½ the thickness of the material. This will guarantee a straighter edge and a more precise cut that focusing to the bed or top of the material. Press **Z** again to return the carriage to the home position.
- Load the material onto the bed paying special attention not to damage the honeycomb table. If the material is excessively warped or bowed, do not hesitate the student should prepare another flatter piece of stock for cutting. If the material is too warped, the cone attached to the lens case may drag the material across the bed. This will result in a ruined job and perhaps damage to the machine.
- After loading the material, close the lid and return to the computer to prepare the plot.

Software:

The student should present the shop manager with either a thumb drive, or a cd-rom file. If the student does not have them, feel free to send the student back to prepare the file appropriately. The laser machine is loaded with Windows XP, CorelDraw, and AutoCAD Inventor and Mechanical. There are other programs available as well, but typically AutoCAD will be the most often used. Basic knowledge of AutoCAD is assumed.

- Be sure that the computer is switched on and Windows has finished loading. If prompted for a password, put in password, click **OK** and the machine will finish booting.
- Insert the thumb drive in an appropriate USB slot and click on the AutoCAD icon. Once AutoCAD has finished loading, you may open the file by pressing CTRL+O and browsing the appropriate folders and disks.
- Create a new drawing using the template LASERCUTTER1 that can be found in the TODAY box.
- Paste the items into the existing box. If the items do not fit, transfer to PAPER SPACE. Double click the black window to work in model space. Set the scale for the view port at the appropriate scale for the model (1:30 is not equal to 1" = 30'). Draw a new rectangle inside the view port using the CONSTRUCTION LINES LAYER. Items on this layer will not cut.
- Click on the MODEL tab. Rearrange the pieces to fit inside the new rectangle that you just drew. Items outside of this box will not be seen nor plotted.
- Select all the objects and choose COLOR BY LAYER from the object properties toolbar. Open the layers property box and set all cut layers to **white** and all etch layers to **red**. Typically you will not need to adjust more than one or two layers at this stage.
- Switch back to PAPER SPACE and verify that your parts are in the correct arrangement and alignment. Pay close attention to the size of the material versus the actual cutting area of the plot. Anything within the view port will be 'seen' by the laser cutter and etched or scored appropriately.
- Choose **plot** from the FILE menu. Press PROPERTIES > CUSTOM PROPERTIES > LOAD. Select the C: Drive and find the folder for named 01Laser Settings. Find the file that corresponds to your material and double click. Press OK to return to the first plot screen. Press PLOT PREVIEW. If all checks out, right click and choose PLOT. The file has been sent.

NOTE: The plotting process is the same regardless of which layers are turned on or off. For best results, plot all etches and internal cut layers first. This can be disregarded if the student

has attached 'tabs' to the pieces. Plotting etch lines and interior cut lines first minimizes the chance of a piece falling out of square as the outer edges are cut.

Laser Cutting:

- Once the plot has been sent and the material is loaded, the operator must manually press the **START** button for cutting to begin. Be sure that the exhaust fan has been turned on. The plot will begin and the machine will stop automatically when all the lines have been plotted.
- **DO NOT LEAVE THE LASER CUTTER UNATTENDED WHILE IN OPERATION.** The laser cutter will stop if the lid is lifted or the power is turned off. Do not attempt to run the machine by defeating the safety features. This allows the reflected laser beams to escape the enclosure and could cause permanent damage to the eyes of people around it. If you knowingly do this you will lose all future privileges in the student shop.
  No Exceptions!
- Remove the cut parts and any excess material or scrap. Return to the computer to complete the next part.
- Pressing start again will create an exact duplicate of the previous plot. To advance the list of plots stored in the machine, press **NEXT FILE.**

While every effort has been made to cover the basics of laser cutting, there will be ample opportunity for you to attempt problem solving with materials, how-to's, and software conflicts. Do not dismiss any unusual activities, odors, or sounds as normal operation. The laser cutter is your responsibility while you are inside the student shop.

Any questions or concerns may be directed to the Student Shop Manager.

END OF TECH MANUAL