

This instruction covers the set-up and use of ULS PLS6MW systems etching and cutting various material.

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1. Introduction

ULS PLS6MW is a laser etching system that can be used on various metals, acrylics, and other materials. Please refer to the main pamphlet on what materials can be cut inside the system. This system is capable of a CO2 and Multi-Wave laser platforms. Each platform is designed for specific material use.

Designs can be made using AutoCAD, CorelDraw, or Illustrator. The exported/saved file must be in **DXF** or **PDF** format. Login to the computer located in room 2081 to load the design. Refer to the AutoCAD guide attached at the end of the document for instructions on loading a design and printing it.

2. Safety Requirements

- 2.1. Safety glasses must be worn whenever in the laboratory, except when using a microscope or when wearing protective goggles.
- 2.2. Information regarding the hazardous materials used in the laboratory can be found through MSDS documentation located in the gowning room.
- 2.3. When handling hazardous liquids and chemicals, Personal Protective Equipment must be worn.
- 2.4. Please contact the Process & Equipment Engineer for any maintenance, repairs, or problems of the system.
- 2.5. When handling/cleaning laser lens proper gloves must be worn.

3. Equipment

- 3.1. Universal Laser Systems PLS6MW
- 3.2. Lens Cleaner
- 3.3. Lens Tissues
- 3.4. Lens Swabs

4. Facility Requirements

- 4.1. Universal Laser Systems PLS6MW
- 4.2. Electrical: 110AC / 10amp or 240AC / 5amp
- 4.3. Electrical: 110VAC for computer power
- 4.4. Electrical: 110VAC for computer monitor
- 4.5. Exhaust: Two 4-inch ports
- 4.6. Weight: 325 lbs. (147 kg)

5. Cycle of Operations

This procedure details how to operate the ULS PLS6MW system. Please note that exhaust must be on to remove any potentially hazardous fumes generated by the system.

- 5.1. Enable the ULS PLS6MW system through iLabs to ensure proper billing and operation.
- 5.2. Open the system's top cover and remove the lens from the print head by unscrewing the 3 thumb screws (Figure 5-1).
- 5.3. Inspect the lens for any cracks, scratches, dust, or other contaminants. Clean the lens if necessary: place a drop of the cleaning solution on a cotton tip applicator and gently wipe the lens with it; blow-dry with nitrogen.
- 5.4. Replace lens or insert a different lens if necessary (see table 5-1 later in this guide). Ensure that the 3 screws are securely fastened to prevent the lens from vibrating during operation.
- 5.5. Check the laser tube to ensure the correct laser is loaded (CO₂ for polymers; fiber for metals).
- 5.6. Press the two hinges and flip back cover (Figure 5-2).
- 5.7. Select the correct laser tube.

5.7.1.CO2 Laser

Lens	Spot Size	Tolerance	Comments
4	300 μm	+/- 5 mm	More working distance
2	130 μm	+/- 2.5 mm	General-purpose
HPDFO	30 μm	+/- 0.8 mm	High resolution

5.7.2. Fiber Laser

Lens	Spot Size	Tolerance	Comments
4	63 μm	+/- 1.02 mm	More working distance
2	25 μm	+/- 0.50 mm	General-purpose
HPDFO	6 μm	+/- 0.15 mm	High resolution



Figure 5-1



Figure 5-2

- 5.8. If the desired laser is installed, close the cover. Otherwise, swap out the laser.
 - 5.8.1. FIND A SECOND PERSON TO HELP WITH THIS.
 - 5.8.2. Disconnect the cable from the laser tube (Figure 5-3)
 - 5.8.3. WITH TWO PEOPLE carefully lift the laser tube out of the system and place it in a safe location.
 - 5.8.4. WITH TWO PEOPLE remove the other laser tube from its case (Figure 5-4).
 - 5.8.5. WITH TWO PEOPLE carefully lower the laser tube into the system; ensure the tube rests on the back prongs.
 - 5.8.6. Verify that the tab in (Figure 5-5) is positioned as shown.
 - 5.8.7. Connect the cable to the laser tube as shown in (Figure 5-3).
 - 5.8.8. Close the back cover until the hinges lock in place.



Figure 5-3



Figure 5-4

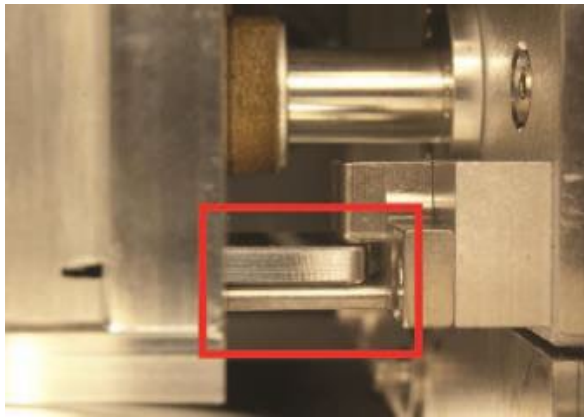


Figure 5-5

5.9. If using the rotary platform (Figure 5-6):

5.9.1. Open the front cover of the laser system.

5.9.2. Remove the cutting table and place it in a safe location.

5.9.3. Place rotary platform on the system table. Make sure the deadbolts are properly aligned (Figure 5-7).

5.9.4. Connect the rotary platform cable to the system.

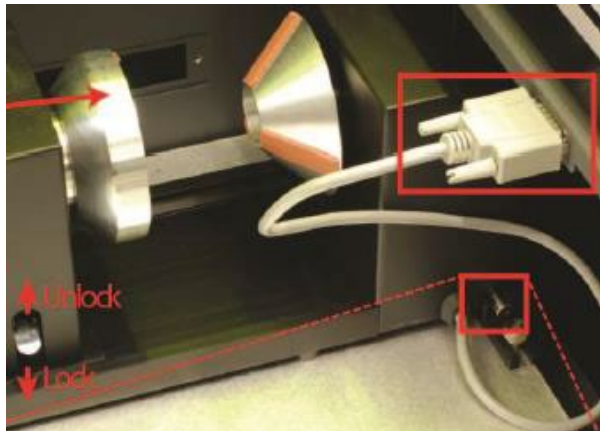


Figure 5-6



Figure 5-7

6. Engraving

- 6.1. Turn on the laser system, located on the right side of the machine, and wait for it to initialize.
- 6.2. Send a design to the printer named PLS6MW. This process varies depending on which design software is used. Consult the attached supplemental guides for doing this with AutoCAD or CorelDraw.
- 6.3. Double click the Laser Control Panel icon in the taskbar (Figure 6-1) to display the control panel interface (Figure 6-2).
- 6.4. Click the System tab to adjust optics settings.
 - 6.4.1. Select the lens that is loaded on the system (Figure 6-3).
 - 6.4.2. Click the General tab when done.
- 6.5. Adjust the engraving settings for each color used in the design. See the Universal Laser System User Guide for detailed description of each parameter (Figure 6-4).
- 6.6. Click Settings.
- 6.7. Click the desired color to activate its parameters.
- 6.8. Select from the materials panel or use the manual controls to set the power, speed, and ppi.
 - 6.8.1. For materials panel: Select material, enter material thickness, and enter substrate thickness (if any). Click Set to apply these settings. This will load appropriate settings, but they can be fine-tuned in the manual control panel.
 - 6.8.2. For manual controls: Ensure Z-positioning is ON. Set the power, speed, PPI, and Z-axis (thickness of material + substrate). Select the type of engraving to be used (rast/vect/skip). Click Set to apply settings for each material.
 - 6.8.3. Adjust any other parameters as required. (See Universal Laser System User Guide for details)
 - 6.8.4. Click OK.



Figure 5-1



Figure 5-2

- 6.9. Position the material to be processed in the laser system.
 - 6.9.1. Place material sheet on the engraving table. Use a metal plate under the sheet when using the fiber laser (prevents laser marking the engraving table).
 - 6.9.1.1. If using the rotary platform, place part between the two cones, raise the locking lever to adjust cone position, and lower the lever to lock in place.

6.9.2. Click the Focus icon on the software.



6.9.3. Click in the active white area to move the print head to that position (close to the desired engraving location).

6.9.4. Align the material sheet to the red laser spot. This will be the upper left-hand corner of the design.

6.9.5. Click the Relocate icon.



6.9.6. Select the upper left-hand corner of the design and click To Pointer. The design aligns the design with the pointer on the sheet.

6.9.7. Click the Zoom icon when done.



6.10. Engrave

6.10.1. Close the system lid.

6.10.2. Turn on the exhaust.

6.10.3. Press Start to engrave the part.

6.10.4. Repeat for multiple passes (deep cuts) or other designs.

6.10.5. When finished, turn off the exhaust, open the lid, and remove the part.



Figure 5-3



Figure 5-4

7. Post - Engraving

7.1. Remove all processed samples and leftover debris.

7.2. Remove the lens from the print head.

7.3. Inspect the lens for any cracks, scratches, dust, or other contaminants. Clean the lens if necessary: place a drop of the cleaning solution on a cotton tip applicator and gently wipe the lens with it; blow-dry with nitrogen.

7.4. Replace lens. Ensure that the 3 screws are securely fastened to prevent the lens from vibrating during operation.

7.5. Close the driver panel on the computer (Click close).

7.6. Save work and exit AutoCAD/ CorelDraw.

7.7. Disable the system on iLabs and log off.

8. Designing with CorelDraw

- 8.1. create a design:
 - 8.1.1. Use geometric shapes or the pen tool to create a design.
 - 8.1.2. Left click on a color in the palette to set fill color.
 - 8.1.3. Open the Stroke panel (double-click 'Stroke') and make sure the line width is set to **Hairline**.
- 8.2. If printing directly from CorelDRAW:
 - 8.2.1. Select the parts to be printed.
 - 8.2.2. Select Print from the File menu.
 - 8.2.3. Set PLS6MW as the printer and click Preferences. This will open the laser system control panel; set the appropriate laser parameters and click OK.
 - 8.2.4. Click OK on the print dialog to send the design to the laser driver.
 - 8.2.5. Open the laser system control panel from its icon in the taskbar and print the part (see attached documentation).

9. Designing with AutoCAD

- 9.1. Working in AutoCAD: Importing a File from a Graphics Program
 - 9.1.1. AutoCAD can be installed on any student's computer, by going to the Autodesk website <http://www.autodesk.com/education/student-software> . However, if you wish to create laser patterns in other programs and then use AutoCAD to print them, this can be done with some limitations.
 - 9.1.2. To preserve vector cut lines (zero width lines), the file must be saved as one of the following common formats: DWG, DWF, or DXF and then opened with AutoCAD. Other formats (igs, dgn, etc) can be imported into an AutoCAD file using the "IMPORT" command, but the results are not guaranteed.
 - 9.1.3. Open a file saved as .DXF in AutoCAD using the Open-> Drawing command.
 - 9.1.4. The drawing should open and have the same objects as the original file, though they may be broken up or have modified geometric settings.
 - 9.1.5. If the objects do not appear after opening the file, try using the command "REGENALL" to regenerate the viewports.
- 9.2. Working in AutoCAD: Starting from Scratch
 - 9.2.1. Download the AutoCAD template file (BRK2081_lasercutting_AutoCADtemplate_rev1.dwt) and save it to a place on the computer where you can find it. Saving the file to Templates will allow you to find it from any computer, simply by clicking the "New Drawing" command.
 - 9.2.2. Open the template file in AutoCAD using the "New Drawing" command, if necessary, pointing to the path where you saved the file. Begin creating your design in AutoCAD.
 - 9.2.3. Note that only the drawing objects that are within the green dashed square boundary will be printed to the laser by default. This can be easily changed, however, by defining a new boundary and then executing the "LIMITS" command.
 - 9.2.4. Also note that various layers have already been defined in the template with the colors that correspond to various laser functions (cutting, rastering). Simply choose one of these layers in the drop-down to create an object for that function. White objects correspond to the black color in the laser dialog (Figure 9-5 and 9-6)

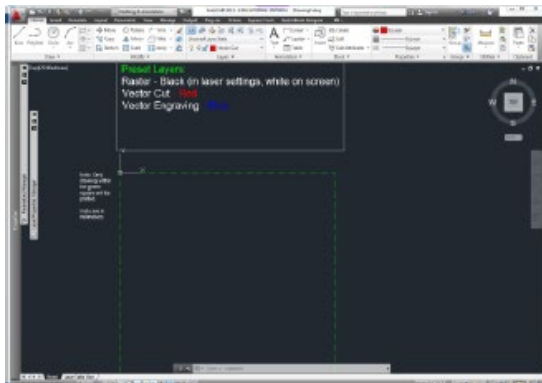


Figure 9-5

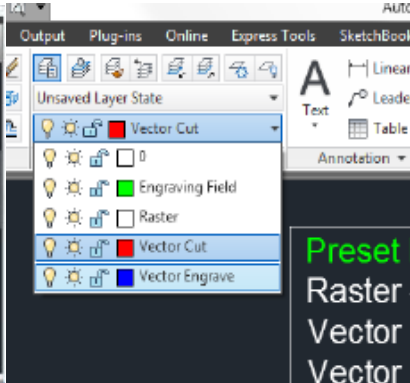


Figure 9-6

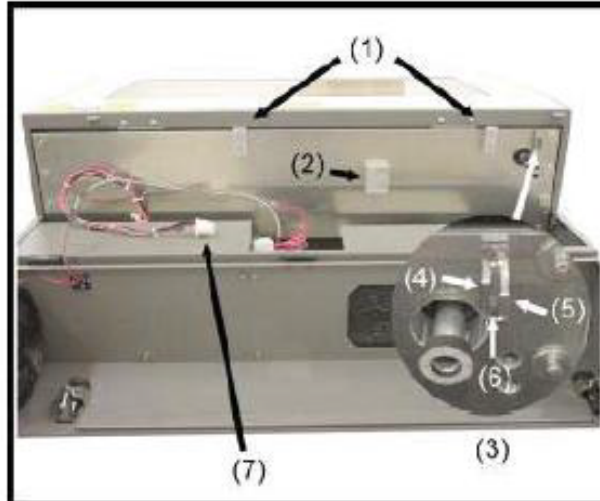
9.3. To learn AutoCAD itself, see these helpful resources at <http://knowledge.autodesk.com/support/autocad/getting-started>

10. Changing the laser

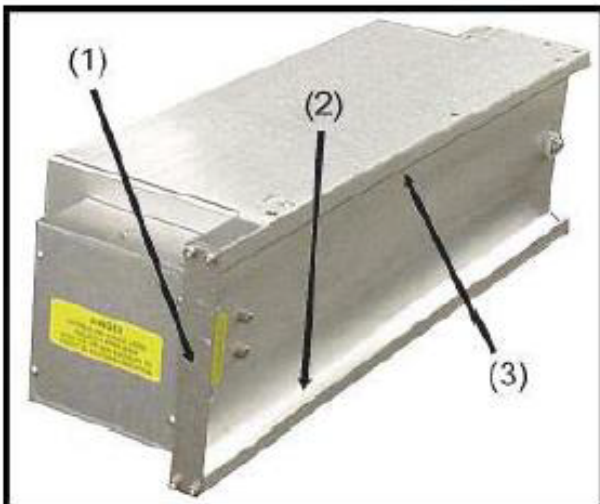
Laser Cartridge Installation



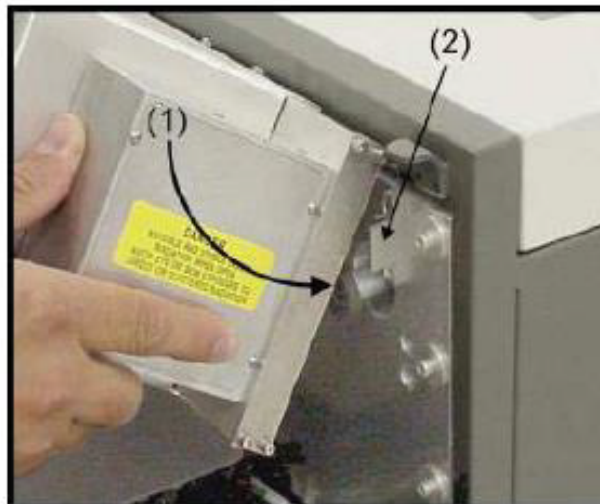
1) Make sure that your power cord **IS NOT** plugged in at this time. Press on the backside of the two hinges to release the latch. Gently fold back the rear cover.



2) Visually locate the two mounting blocks (1), the laser latch (2), alignment fork (3), and power connector (7). Notice that the alignment fork has two plates, one small (4) and one large (5). Locate the gap between the two plates (6).



3) Observe the "V" groove along the upper (3) and lower (2) part of the laser cartridge and the alignment plate (1) at the end.



4) Pick up the laser cartridge by the sides and tilt it downward on a 30-degree angle. Mount the cartridge onto the mounting blocks by placing the upper "V" groove on top of the mounting blocks. Slide the cartridge to the right until the **OUTER EDGE** of the alignment plate contacts the **INSIDE EDGE** of the large plate of the alignment fork.