

M Class
Operation Manual

M Class

Laser Engraving and Cutting System Operations Manual

**Manufactured by:
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March 1999

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Introduction

Thank you for purchasing the M Class Laser System. Years of testing and refinements have made this unit the ultimate laser engraving and cutting system. With its small footprint design and large engraving area, the M Class combines flexibility and full featured performance without sacrificing simplicity, ease of use, and ease of maintenance. Using advanced engineering and design features, the M Class is truly one-of-a-kind. Actually, the M Class is such a breakthrough in technology that it is more than just a laser system, it is a precision engraving and cutting device used as a tool for the imagination.

To begin with, we highly recommend that this entire manual be read before attempting to use the laser system. The manual includes important information about safety, assembly, use, and maintenance. **We cannot overemphasize the importance of reading the Operation Manual completely.**

How To Get Help

Step 1:

Determine exactly what the problem is. Try to recreate the problem and write down the circumstances in which the problem occurred. Be prepared to describe all pertinent information about the computer being used with the laser cutting and engraving system such as software, operating system and computer type. Have the serial number of the laser system available. The serial number tag is located on the back of the machine in the lower right corner. There is a second serial tag located behind the front door on the right side when you open it.

Step 2:

Contact your local Sales Representative first to assist you in diagnosing the problem. If possible, call from a phone that is close to the laser engraving system so that the system can be operated while talking to our representative.

Step 3:

If your local Sales Representative is unavailable, contact our Customer Service Department at:

Universal Laser Systems, Inc.
Service/Parts Department
7707 East Acoma Drive, Suite 108
Scottsdale, AZ 85260
Phone: 480-609-0297
Fax: 480-609-1203
Email: service@ulsinc.com
M-F 8am – 5pm Arizona Time

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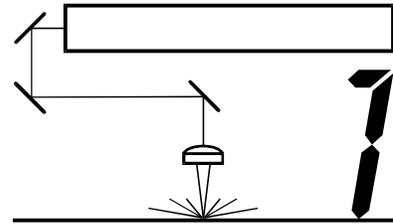
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SECTION 1

Safety



This section describes hazards that may occur if the laser system is installed or used improperly. Failure to follow these guidelines can result in injury to yourself, others, or may cause severe damage to the equipment. Use, misuse, or abuse of the equipment in a manner other than what is described in this manual may increase this risk. Operation and care of the laser system must be followed in strict accordance to this manual.

Description of Appropriate Use

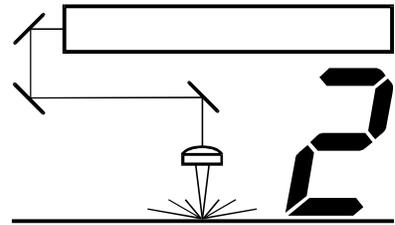
ULS laser systems are designed for cutting and engraving of the materials listed in this manual in laboratory, workshop or light duty manufacturing environments. Laser systems must be properly installed and connected to an appropriate exhaust system meeting the specifications outlined in this manual. Materials to be processed must fit completely inside the system for proper operation.

General Safety

- **Exposure to the laser beam may cause physical burns and can cause severe eye damage.** Proper use and care of this system are essential to safe operation.
- **Never operate the laser system without constant supervision of the cutting and engraving process.** Exposure to the laser beam may cause ignition of combustible materials and start a fire. A properly maintained fire extinguisher should be kept on hand at all times.
- **A properly configured, installed, maintained, and operating fume/smoke exhaust system is mandatory when operating the laser system.** Fumes and smoke from the engraving process must be extracted from the laser system and exhausted outside.
- **Some materials, when engraved or cut with a laser, can produce toxic and caustic fumes.** We suggest that you obtain the Material Safety Data Sheet (MSDS) from the materials manufacturer. The MSDS discloses all of the hazards when handling or processing that material. The law requires all manufacturers to provide this information to anyone who requests it. **DISCONTINUE** processing any material that shows signs of chemical deterioration of the laser system. Systems damaged from this abuse will **NOT** be covered under warranty.
- **Dangerous voltages are present within the electronics and laser enclosures of this system.** Although access to these areas is not necessary during normal use, if it becomes necessary to open one of these enclosures for service reasons please remember to unplug the machine first.

SECTION 2

Installation



Proper operating conditions are vital to a safe and productive environment. This section describes the ideal environment and setup of the laser system.

Unpacking and Assembling the System

Since packaging can change from time to time, please refer to any unpacking or assembly instructions that may be found inside of the shipping container when you first opened it.

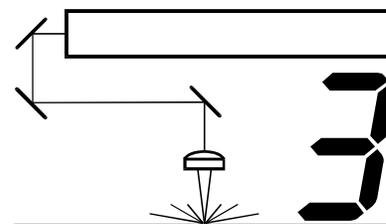
Operating Environment

Follow these guidelines to ensure a proper operating environment for the laser system. Operating the laser system outside of these guidelines can seriously damage the laser system and damages from this type of abuse **WILL NOT** be covered under warranty. Although conforming to these guidelines will greatly reduce the chance of a problem occurring, it does not guarantee it. **It is your responsibility to provide a proper operating environment.**

- Ambient room temperature **MUST** be between 58 and 85 degrees F (15 and 30 degrees C). If transporting the laser system from a very cold or very hot environment to the proper operating environment, the laser system must be allowed time to adjust to the ambient temperature. To do this, turn ON the laser system (and chiller if applicable), and let the system idle for 15 minutes before processing materials. This will allow the ambient temperature to circulate through the laser system to either warm it up or cool it off.
- Ambient room dewpoint temperatures **MUST** be less than 50 degrees F (10 degrees C).
- The laser system **MUST** be installed in an office type environment. Dusty or dirty air environments can damage the laser system. Keep the laser system isolated from any type of sandblasting, sanding, or any other machinery that produces airborne particles.
- Avoid small, enclosed, non-ventilated areas. Some materials, after laser engraving or cutting, continue emitting fumes for several minutes after processing. Having these materials present in a confined, unventilated room can contaminate the room.
- Choose a place, which provides the shortest and most direct path to the exhaust ductwork (not provided). Refer to exhaust requirements later on in this section.
- Have a work table or storage area next to or nearby the laser system. This prevents the operator from using the system as a table or storage facility.
- Do not move, push, lean on, or jar the laser system while it is engraving. The material you are engraving can shift and produce unsatisfactory results.

SECTION 3

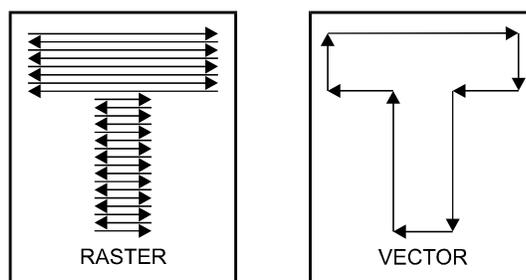
The Printer Driver



This section describes how the computer controls the laser system through the printer driver. It defines some very important terms that you need to know in order to operate the system correctly so please read it thoroughly.

How the Computer Controls the Laser System

The laser system is a unique type of output device. Let's call it a very sophisticated printer/plotter. A regular laser printer is a "raster" based output device and so is a bubble jet, ink jet, and a dot matrix printer. A plotter is a "vector" based output device. The difference is how characters and other graphics are formed. To explain what "raster" and "vector" are, let us use the example of trying to print the letter "T". A raster printer will make a back-and-forth motion to create the character whereas a vector plotter will follow the path of the outline of the character.

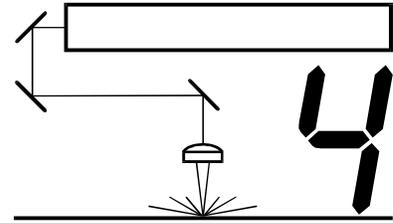


The laser system can actually raster the image, vector the image, or do both raster and vector motions. The laser systems printer driver works directly with your software program to send the correct image to the laser system. We will explain later on in this section about how this works but for right now, we want you to understand this simple concept behind how the computer controls the laser system:

The laser system is an output device just like a printer or plotter is. After the graphic is created on your computer system, you print the graphic the same way you would print to a laser printer or plot to a plotter. This information then gets sent down to the laser system through the parallel cable and is stored in the laser systems RAM memory. Once the file is in memory, press the "Start" button on the control panel to begin processing. The only real difference between how a laser printer or a plotter works compared to the laser system is that the laser systems printer driver also has controls on how much laser power as well as motion system speed is applied. Obviously, there are many more differences between the laser system and other output devices, but as long as the basics are clear, we can continue to learn about how the system works.

SECTION 4

Graphics Software



Choosing the right graphics software program to run the laser system is essential for maximum usage and control of the laser system. Not all software can be used to run the laser system because many have limitations. Because you may be using a word processing software to output to your laser printer does not mean you should use it to output to your laser engraving system. Setting up you software correctly is essential to running the laser system properly.

Software Setup

There are many software programs that you can purchase off-the-shelf that will work with the laser system. Some of them can access more features of the laser system than others. Whichever program you choose, it must be set up to work with the laser system otherwise unexpected results may occur. Use the following guidelines when configuring your software program.

Page Setup

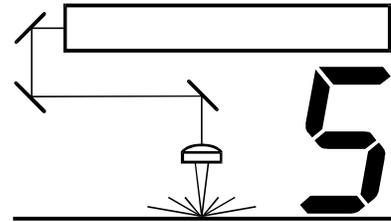
To properly generate and position artwork, most graphics software will permit the customization of the page size and orientation. Set the page orientation, in the graphics software to Landscape, and the page size to a horizontal length of 24 inches (609.6 mm) and vertical height of 12 inches (304.8 mm). The driver's orientation and page size **MUST** then be set to match these specifications **EXACTLY**, otherwise the artwork may not print correctly. When setting page orientation and driver orientation to Landscape mode, the laser system will operate in the horizontal direction, left to right. If page orientation and driver orientation is set to Portrait mode, the laser system will operate in the vertical direction, front to back. The laser system is designed to operate best in the Landscape mode and this orientation is highly recommended. The page size may also be reduced to match the size of the engraving material, but remember to adjust the page size in the driver's to correspond to the graphics software's page size. Note that in production situations it is often more efficient to leave the page size at its maximum page size and engrave or cut more than one object at a time. This is accomplished by duplicating the image on screen as many times as necessary to fill up the entire page.

Ruler Setup

Usually the graphics software will provide on-screen rulers, which can be configured to match the rulers in the laser system. Using rulers in the software and matching them with the ones provided in the laser system gives the ability to correctly align the graphic on the screen with the material in the laser system. For now, consider that the laser system's origin is fixed in the upper left corner of the engraving area and cannot be altered. Later on you will learn how to relocate the origin. But for right now, change the ruler position on screen to match the laser system with the origin (0,0) in the upper left corner.

SECTION 5

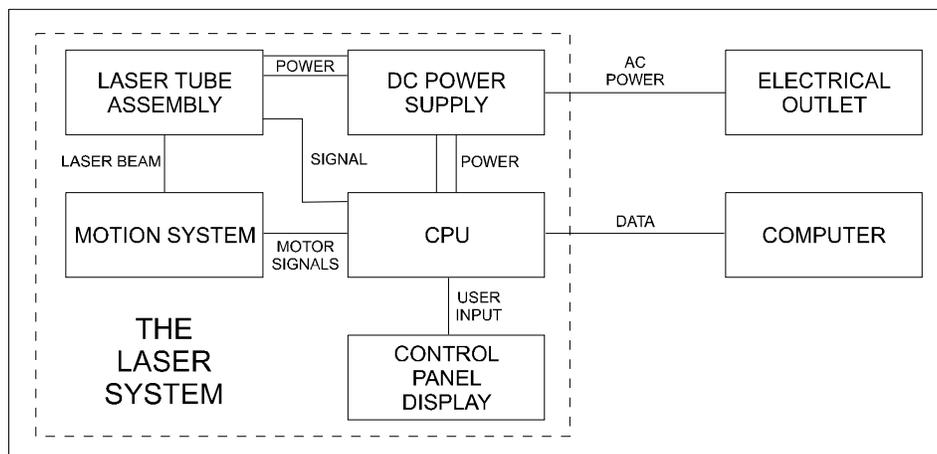
System Operation



In this section you will learn how the laser system actually works and will familiarize you with laser system terminology. We will then start working with the control panel and learn how to get around in the menu system. Since there are many features in this laser system, the menu system may seem complicated at first, but once you start using it, you will find out that it is a very simple system to operate.

How it Works

There are five (5) basic components that make up the laser system, the control panel, the CPU, the DC power supply, the laser tube assembly, and the motion system.



DC Power Supply

The DC power supply converts the incoming AC electricity to 48 volts DC. This is used to power both the laser tube assembly and the CPU.

CPU

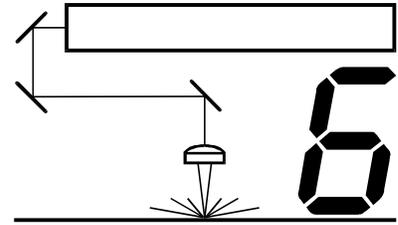
The CPU is the “brains” of the system and controls everything. Located on the CPU are standard computer memory SIMMS. This is where incoming files, from the computer, are stored while the power is on. The CPU gets input from the computer and the control panel. It outputs precisely timed signals to fire the laser beam and to move the motion system simultaneously.

Control Panel

This is where the operator controls the laser system. It is composed of tactile feel push buttons and a LCD display. From this panel, the operator can position the motion system, move around through the menu system in the LCD display, and run the laser system.

SECTION 6

Running the System Step by Step



In this section we will cover how to completely use the laser system to create a product from start to finish. From powering on everything to removing the finished product from the system, we will cover the entire process step by step. As an example, let's engrave and cut out a key chain from a 2 by 4 inch, 1/8 inch thick piece of hardwood.



Before continuing, please ensure that you have completely read and understood the entire manual up to this point. It is essential that you know how to safely operate the laser system before you actually engrave or cut any material.

Powering Up

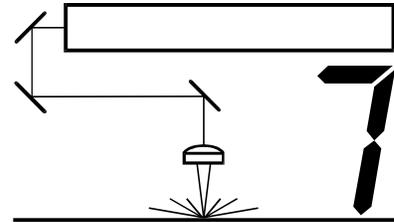
We recommend that you turn on your computer first and let it boot up completely before powering up the laser system. This will prevent any garbage information that might have traveled out the printer port from entering the laser system during power up. This common practice should be utilized for all output devices whether it is a laser printer or a laser engraver. If you happen to power up the laser system first and then power up your computer afterwards, there is a possibility that some garbage information gets transmitted to the laser system. If you then send down a file to print, that garbage may confuse the laser system and cause it to engrave erroneously which could damage your material. This is why we recommend turning on your computer first before the laser system as a safe practice.

Loading and Positioning the Material

The next step is to load and position the wood on top of the engraving table inside the laser system. Open the top door and position the piece of wood into the upper left hand corner of the table against the rulers as the diagram below indicates.

SECTION 7

Options & Accessories



There are several options and accessories available for this laser system. The new 3D Effects option is now available as a standard feature. The Rotary Fixture, Cutting Table, Air Assist System, Air Assist Compressor, various Focus Lens Kits, and the Dual Head option are available at additional cost.

3D Effects

The 3D Effects option can be used to create rubber stamps or produce a three-dimensional engraving appearance on other materials. As an example of how this option works, we will describe how to make rubber stamps with the laser system.

Rubber Stamps

There are two methods used to create a rubber stamp, the single stamp method and the full sheet method. In the following examples will show you the step by step method of creating both a single rubber stamp and a full sheet of stamps.

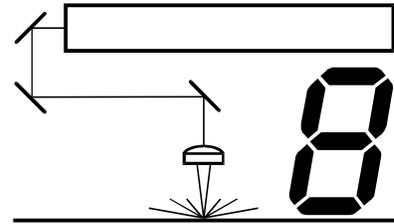
Single Stamp Method

To create the artwork and engrave only one or a few stamps, set the page size in the graphics program to something smaller than the full field. Just as an example, we will use a page size that is 8.5 x 11 inches (215.9 x 292.1 mm) in the Landscape mode. In this way we can output to a paper printer, before engraving, for proofreading. Make sure that this page size is set up the same in the printer driver. Create a negative style stamp by drawing a black box slightly larger than the size of the stamp desired. Type in or add graphics within that area and color them with a fill of white. If you want the laser to cut out your stamp, draw a red outline box that is the smallest possible line thickness as your program allows. **Make sure that the red outline is inside the black box by at least .050 inches, otherwise there will be a little rubber strip of rubber sticking up around the border that will unintentionally appear when using the stamp.**



SECTION 8

Sample Materials



This section provides sample driver settings and helpful hints to get started engraving and/or cutting the materials listed.

Safety



NEVER LEAVE THE LASER SYSTEM RUNNING UNATTENDED FOR ANY REASON. Exposure to the laser beam can cause ignition of combustible materials. All laser cutting and engraving should be constantly supervised.

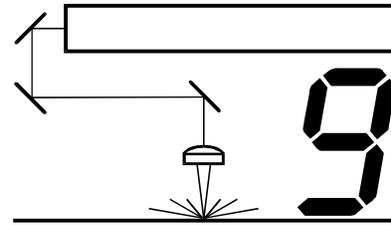
NEVER OPERATE THE LASER SYSTEM WITHOUT A PROPERLY INSTALLED AND OPERATING EXHAUST SYSTEM. Some materials when cut or engraved can produce fumes that are hazardous in concentrated amounts. Also make sure that your room is adequately ventilated as some materials will continue to produce fumes for several minutes to possibly hours after the cutting or engraving process has been completed. Since many materials can produce toxic and possibly caustic fumes or residue, it is advisable to obtain the Material Safety Data Sheet (MSDS) from the materials manufacturer. The MSDS discloses all of the hazards when handling or processing that material. The law requires all manufacturers to provide this information to anyone who requests it.

DO NOT ENGRAVE OR CUT PVC (Polyvinylchloride) BASED MATERIALS. The fumes are extremely toxic if you inhale them. The fumes are so caustic that it can chemically destroy the metal parts of the laser system. Damage to the laser system from this type of abuse **WILL NOT** be covered under warranty.

DO NOT ENGRAVE OR CUT UNCOATED METALS OR REFLECTIVE SURFACES. The laser beam can reflect off of these materials causing damage to the laser system as well as being a safety hazard. Damage to the laser system from this type of abuse **WILL NOT** be covered under warranty.

SECTION 9

Maintenance



Keeping the laser system clean will ensure the highest quality engraving. The frequency of cleaning will depend entirely on the type of material being engraved, the performance of your exhaust blower, the operating environment, and the amount of laser system usage over a given period of time. Dirt or debris that is allowed to build up on the motion system components will cause uneven or rough engraving, or loss of engraving position as well as premature component failure. Smoke or dirt buildup on the optics can cause damage to them, loss of laser power, or premature failure of these components. Use good judgment and keep in mind that a clean machine is the best performing machine.



Always turn the laser engraving system OFF and unplug it before performing any cleaning procedures.

Suggested Cleaning and Maintenance Supplies

- Soap solution mixture of 1 tablespoon (2 cl) liquid soap and 1 quart (liter) of water in a spray bottle
- Paper towels
- Cotton cloth
- Denatured alcohol (**NOT** to be used on any painted surface, plastic, or the Top Window)
- Acetone (can be used on the engraving table but nowhere else)

- Cotton swabs (supplied)
- Lens cleaner (supplied)
- Lens tissue (supplied)

- Vacuum cleaner
- Set of Allen wrenches sized from .050 to 3/16 inch

***NOTE:** When using acetone or denatured alcohol, please follow the instructions on the printed label of these materials for safe handling procedures.

Please familiarize yourself with the motion system components in the following diagram. It will help you understand which components need periodic cleaning.

APPENDIX

Appendix A - Limited Warranty

Please refer to the Warranty Registration Form
included with your shipment.

Appendix B - Specifications

Model Number	M Class
Resolution	1000 x 1000 DPI, 500 x 500 DPI, 333 x 333 DPI, 250 x 250 DPI 200 x 200 DPI, Draft
Computer Interface	Windows 95, 98, and HPGL
Table Size	29" x 17" (736.6 mm x 431.8mm)
Work Area	24" x 12" (609.6 x 304.8 mm)
Maximum Part Size	29" (736.6mm) wide x 17" (431.8mm) deep x 9" (228.6mm) tall
Laser Source	15 watt air cooled CO2 laser quick change cartridge 20 watt air cooled CO2 laser quick change cartridge 25 watt air cooled CO2 laser quick change cartridge 30 watt air cooled CO2 laser quick change cartridge
Lenses Available	Focal Length / Spot Size / (Standard or Optional) 1.5" (38.1mm) / 0.003 inches (.08 mm) / Optional 2.0" (50.8mm) / 0.005 inches (.13mm) / Standard 2.5" (63.5mm) / 0.007 inches (.18 mm) / Optional 4.0" (101.6mm) / 0.013 inches (.33 mm) / Optional
Interfaces	Centronics parallel, RS232C Serial
Memory Buffer compression	Multiple file / Single file / Auto Start modes, automatic data
Dimensions	36" wide x 30" deep x 38.5" tall
Weight	200 lbs. (91 kg)
Safety	Class IIIa interlocked safety enclosure
Available Options	Rotary Fixture, Air Assist, Honeycomb Cutting Table

Facility Requirements

Power	Single Phase 100/220V AC, 10/5 Amp, 50/60 Hz
Exhaust	Outside exhausting required, one 4" connection, 250 CFM minimum at 6 inches of static pressure (water)
Cooling	Air cooled (ambient temperature 58°F (15°C) to 85°F (30° C)

Specifications are subject to change without notice.

Appendix C - Using DOS Based Programs

DOS software is not standardized and each application will work differently. When using DOS applications, it is not possible to print through the Windows Printer Driver and for this situation, the system has been designed to automatically emulate a Hewlett Packard plotter. Plotters use a special language called HPGL that the laser system has been designed to accept. When configuring the DOS based program, select the HP7475 plotter (or larger) as the printing device. Set the maximum paper size to 24 inches (609.6 mm) wide by 12 inches (304.8 mm) tall (refer to the DOS software manual for how to configure the printing device). Once configured properly, the laser system should interface with the program and act just like a plotter. Keep these points in mind:

1. Some DOS programs will not allow the page size to be set at 24 inches (609.6 mm) x 12 inches (304.8 mm) in the Landscape mode. If this is not possible, the full engraving field cannot be utilized. If a smaller page size is used, determine where the program will place the graphic on the engraving table by running a few tests.
2. Some DOS programs use the lower left corner of the engraving field as the origin so remember this when setting up the graphic drawing.
3. When assigning power settings to the graphic, it will be necessary to assign an HPGL plotter pen to the different colors in which the graphic was drawn. In most cases the pen numbers should match the power setting numbers in the laser systems "DOS Power Settings" display.
4. Some DOS programs may allow the setting of pen speed for the plotter pens. The laser will ignore these speeds. The laser system only recognizes the settings in the "DOS Power Settings" section of the laser systems control panel.
5. Set all of your line widths to .001 inch otherwise the laser system may go into raster mode instead of the desired vector mode.
6. If your laser system is configured to run in the multiple file memory mode, after every file download an "End of File" marker must be inserted at the laser systems control panel so that the memory control will work properly. To do this, print the file to the laser system and wait for the file to completely download. While in either the "MEMORY CONTROL" or the "FILE DISPLAY" menu, press and hold down the "NEXT FILE" button while you press the "SELECT" button once. Let go of both buttons and the word "NONAME" will appear in the display. You can now run the file. If you are in the "ONE FILE MEMORY" mode, it is unnecessary to do this because the file will run automatically as soon as the first part of the file enters into the laser systems memory.
7. Power setting for plotter pens can only be done at the laser system itself through the main control panel display. If having trouble with using DOS based programs, please contact our technical support.

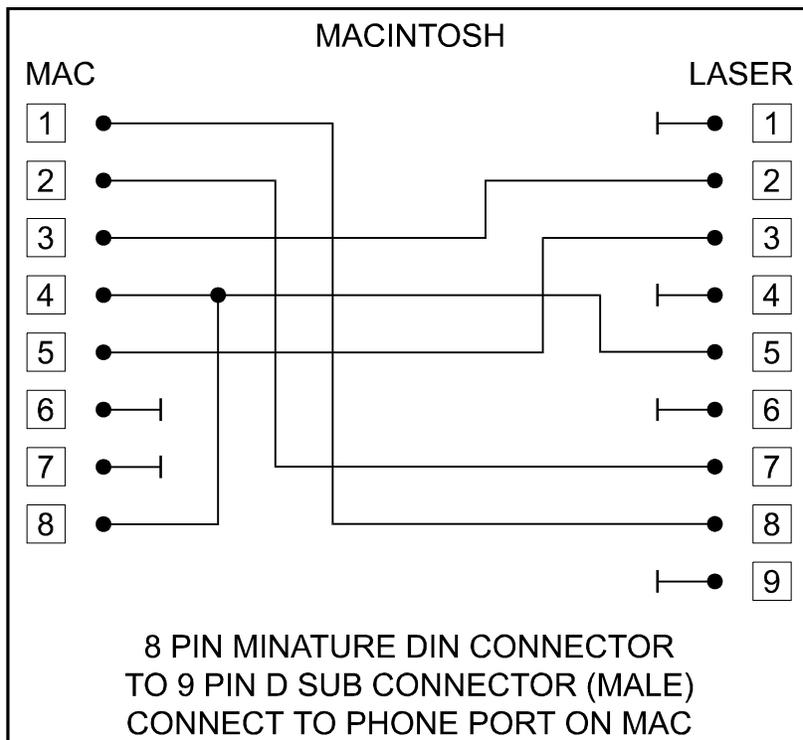
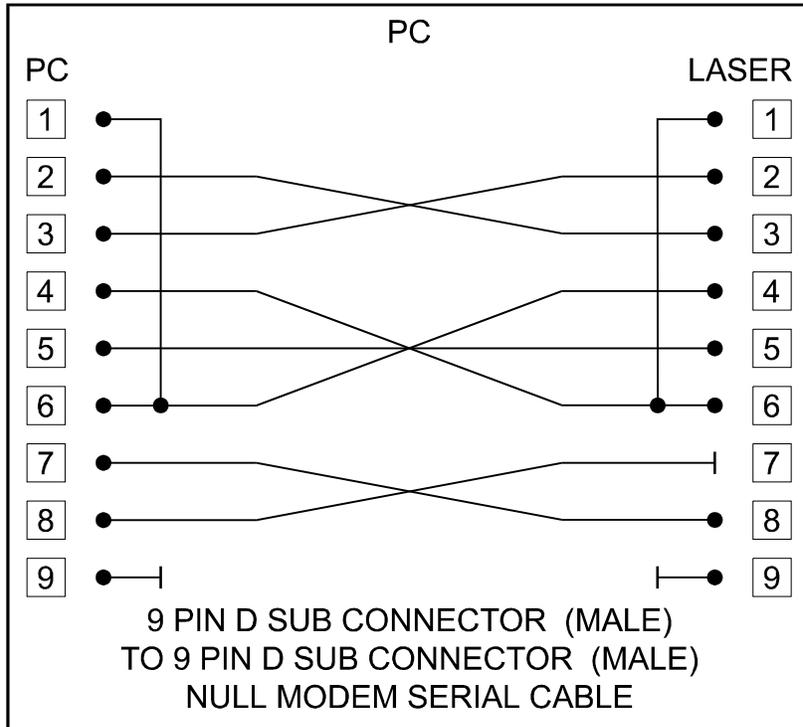
Appendix D - Using Macintosh Computers

The laser system has primarily been designed to run under the Windows 95 or Windows 98 operating system.

We have created the Macintosh printer driver to be used as a secondary computer operating system. This driver has limited features and capabilities compared with the PC driver.

If you ordered the Macintosh printer driver and the special printer cable required, please refer to the installation and operation instructions included with your order.

Appendix E - Serial Port Cable Requirements



Appendix F - Software Anomalies

In order for certain software to work properly with your laser system, some modifications might have to be made. If using the following software, be sure to follow these instructions. If having any difficulty making these adjustments, please contact our technical support.

CorelDraw

- **Change a setting in one of CorelDraw's ini files.** If you are using any version of CorelDraw, you need to change the Fontrasterizer setting to "0" (zero). Corel's interpretation of fonts can sometimes be different than what Windows had intended the font to be. This is why we must turn off Corel's internal rasterizer and allow Windows to rasterize the fonts. A symptom would be fonts that print like black blocks. Another symptom would be that the font engraves scrambled when it is "Fitted to Path" and mirrored even though it looks good on screen. To learn how to change this setting go to Corel's help menu on screen and search for "Fontrasterizer" (without the quotes). It will tell you how to disable this setting.
- **If using Corel 8.0, you must change a setting in its default configuration.** Corel 8.0 uses, as its default, the Pantone color, display palette. This causes a problem with our driver's power setting, color mapping ability. A symptom of this would be an incorrect power setting being downloaded to the laser. For example, if you draw an object using what you think is the color "Red", Corel 8.0 actually tells our printer driver that it is the color "Orange" and uses the laser power settings that you defined in the driver for the color "Orange". Obviously, this will not produce the results that you desire. To fix this problem, you must first start Corel 8.0. Start a new graphic then click on the "Tools" menu. Then click on "Options", double click on "Global", click on "Color Management". Now deselect "Calibrate Colors for Display" so that there is NO check mark in the box. Click on "OK" and watch your screen colors change immediately.
- **Use the CorelDraw color palette that is found on your laser system's printer driver disk.** If you do not know how to set up your color palette to match the printer driver's color mapping feature, you can load the file called ULS.CPL into your CorelDraw's configuration. This palette can be used in versions 4,5,6,7, and 8. Color palette setup is described in more detail in Section 3 of this manual.
- **Set your line widths to the smallest possible size (in inches) to enable the laser system to vector.** In versions like Corel 4, you need to set the line width to .001 inches to enable the laser system to vector that line. In Corel 8, you need to set it to .0005 inches for it to vector. Both of these settings are the smallest line widths that those versions can display.

Appendix G - How To Get Help

Step 1:

Determine exactly what the problem is. Try to recreate the problem and write down the circumstances in which the problem occurred. Be prepared to describe all pertinent information about the computer being used with the laser cutting and engraving system such as software, operating system and computer type. Have the serial number of the laser system available. The serial number tag is located on the back of the machine in the lower right corner. There is a second serial tag located behind the front door on the right side when you open it.

Step 2:

Contact your local Sales Representative first to assist you in diagnosing the problem. If possible, call from a phone that is close to the laser engraving system so that the system can be operated while talking to our representative.

Step 3:

If your local Sales Representative is unavailable, contact our Customer Service Department at:

Universal Laser Systems, Inc.
Service/Parts Department
7707 East Acoma Drive, Suite 108
Scottsdale, AZ 85260
Phone: 480-609-0297
Fax: 480-609-1203
Email: service@ulsinc.com
M-F 8am – 5pm Arizona Time