

VersaLASER® (VLS) User Guide
VLS2.30, VLS3.50

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Universal's laser systems are protected under one or more of U.S. Patents: 5,051,558; 5,661,746; 5,754,575; 5,867,517; 5,881,087; 5,894,493; 5,901,167; 5,982,803; 6,181,719; 6,313,433; 6,342,687; 6,423,925; 6,424,670; 6,983,001; 7,060,934; 7,415,051; 7,469,000; 7,715,454; 7,723,638. Other U.S. and international patents pending.

Thank you for choosing Universal Laser Systems®. We appreciate innovative customers like you who have made Universal Laser Systems an integral part of their business.

Universal Laser Systems is committed to providing the highest level of customer satisfaction and support. To ensure your satisfaction, we urge you to read the documentation provided with your equipment.

Since 1988, Universal Laser Systems has been committed to continually improving our technology and customer-driven laser solutions. Your satisfaction is very important to us and we welcome your feedback. Tell us about your experience with Universal Laser Systems and our systems at info@ulsindustrial.com.

Should you have any questions, please contact Universal Laser Systems' Customer Service Team at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com.

Again, thank you for choosing Universal Laser Systems.

Your Universal Laser Systems Team

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USER GUIDE CD

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Software

Your Reference Guide contains the Software Installation CD. Please follow the instructions for proper installation.

Warranty

Your Reference Guide contains Warranty documents pertaining to your purchase. Should you require a copy of the warranty, please contact ULS at 480-609-0297 or email support@ulsinc.com.

Parts

To order parts for your Universal laser system, contact ULS at 480-609-0297 or support@ulsinc.com.

Chapter 1 - Specifications

	VLS2.30	VLS3.50
Operating Environment	Well-ventilated office (recommended) or clean, light-duty manufacturing	
Operating Temperature	50°F (10°C) to 95°F (35° C) capable 73°F (22°C) to 77°F (25° C) for best performance	
Storage Temperature	50°F (10°C) to 95°F (35° C)	
Operating Humidity	Non-condensing	
Electrical Power	Single Phase 110/240V AC, 10/5 Amp, 50/60 Hz Grounded (earthed) and stable (surge and spike protected)	
Particulate/Odor Outside Ventilated Exhaust System	High-pressure vacuum blower capable of:	
	150 CFM (cubic feet per minute) @ 6 inches static pressure (255m3/hr at 1.5kPa)	250 CFM (cubic feet per minute) @ 6 inches static pressure (425m3/hr at 1.5kPa)
Computer Requirements (See the Installation & Set-up Guide for more information)	Windows XP or Windows Vista (32-bit versions only) 2.0 GHz Processor (minimum) 1 GB of RAM (minimum) 40 GB Hard Drive (minimum)	
Software Requirement	Graphics or CAD based	

	VLS2.30	VLS3.50
Laser Safety	CO ₂ Laser, Interlocked Safety Enclosure = Class 1 Red Diode Pointer = Class 3R	
Work Area*	16 x 12 in (406 x 305 mm)	24 x 12 in (610 x 305 mm)
Table	18.75 x 14.5 in (476 x 368 mm)	26.75 x 14.60 in (679 x 368 mm)
Maximum Part (WxHxD) with 1.5" lens	18.75 x 14.5 x 4 in (476 x 368 x 102 mm)	26.75 x 14.5 x 4 in (679 x 368 x 102 mm)
Maximum Part Weight	20 lbs (9 kg)	
Resolutions	1000, 500, 333, 250, 200, 83 dpi/lpi	
Control	Requires a dedicated PC to operate; requires Windows XP, Windows Vista, or Windows 7 (32-bit and 64-bit)	
Interconnection	USB 2.0 High Speed port only	
Laser Options	10, 25 and 30 watts	10, 25, 30, 35, 40, 45 and 50 watts
Power Consumption up to:	110V/10A 240V/5A	
Overall Dimentions (WxHxD)	With Cart: 26 x 44 x 25 in (661 x 1118 x 635 mm) Without Cart: 26 x 14 x 25 in (661 x 356 x 635 mm)	With Cart: 34 x 44 x 25 in (864 x 1118 x 635 mm) Without Cart: 34 x 14 x 25 in (864 x 356 x 635 mm)
Weight (uncrated) Does not include Cart	System = 85 lbs. (38 kg)	System = 100–106 lbs. (45-48 kg)
Exhaust Hookup	One 3-inch (10.16 cm) port	
Laser Cartridge Weight	10 Watt = 13 lbs (6kg) 25/30 Watt = 20 lbs (9 kg) 35/40 Watt = 23 lbs (10 kg) 45/50 Watt = 26 lbs (12 kg)	
Available Options	Cart, Integrated Air Cleaner, Rotary Fixture, Air Assist, Compressed Air, Cutting Table, Lens Kits	

Chapter 2 - Safety

Description of Appropriate Use

This device is designed for laser cutting and engraving in an office, laboratory, workshop or light duty manufacturing environment. Materials to be processed must fit completely inside the system for proper operation.

CAUTION: This device is not designed, tested, intended or authorized for use in any medical applications, surgical applications, medical device manufacturing or any similar procedure or process requiring approval, testing or certification by the United States Food and Drug Administration or other similar governmental entities.

General Safety

Use of the equipment in a manner other than described in this manual or failure to follow the operational requirements and safety guidelines listed in this manual can result in injury to yourself and others and may cause damage to the equipment and your facility.

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. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



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 which can lead to a fire. A properly maintained fire extinguisher should be kept on hand at all times.

NEVER LEAVE MATERIALS IN THE LASER SYSTEM AFTER LASER PROCESSING HAS FINISHED. Always remove all material including scrap material from the machine after use. Scrap material left in the laser system including materials that collect in the removable cutting table device can be a fire hazard. It is also recommended you allow scrap materials to cool prior to leaving the work area. A properly maintained fire extinguisher should be kept on hand at all times.



A PROPERLY CONFIGURED, INSTALLED, MAINTAINED AND OPERATIONAL PARTICULATE AND FUME EXHAUST SYSTEM IS MANDATORY WHEN OPERATING THE LASER SYSTEM. Fumes and smoke from the engraving process must be extracted from the laser system and filtered or exhausted outside.



SOME MATERIALS, WHEN ENGRAVED OR CUT WITH A LASER, CAN PRODUCE TOXIC AND CORROSIVE FUMES. We recommend that you obtain the Material Safety Data Sheet (MSDS) from the manufacturer of every material you intent to process in the laser system. The MSDS discloses all of the hazards when handling or processing a particular material. **DISCONTINUE** processing any material that causes chemical deterioration of the laser system such as rust, metal etching or pitting, peeling paint, etc. Damage to the laser system from corrosive fumes is **NOT** covered under warranty.

DO NOT ATTEMPT TO MOVE OR LIFT THIS SYSTEM ALONE. Obtain the assistance of additional people when lifting or carrying (secure motion system and doors before lifting). Injury may occur if improper lifting techniques are used or the system is dropped.



DANGEROUS VOLTAGES ARE PRESENT WITHIN THE ELECTRONIC ENCLOSURES OF THIS SYSTEM. Access to these areas is not necessary during normal operation. If it becomes necessary to open one of these enclosures for service reasons, please remember to disconnect the power cord from your electrical supply.



NEVER REMOVE THE GROUND LEAD TO THE ELECTRICAL CORD AND PLUG THE SYSTEM INTO A NON-GROUNDED OUTLET. A laser system that is not properly grounded is hazardous and has the potential to cause severe or fatal electrical shock. Without proper grounding, the laser system may exhibit sporadic or unpredictable behavior. Always plug the system into a properly grounded (earthed) outlet.

THE POWER SUPPLY CORD IS THE MAINS DISCONNECT DEVICE; THE EQUIPMENT SHOULD BE LOCATED CLOSE TO AN EASILY ACCESSIBLE POWER OUTLET. To disconnect the equipment from the supply mains, the power cord should be unplugged from the power outlet or main power inlet (appliance coupler) of the unit.

THE LASER SYSTEM IS DESIGNED AS A CLASS I, GROUP A, PLUGGABLE DEVICE. It is also designed for connection to IT power systems which provide the most flexibility to the user.

THIS DEVICE IS SPECIFICALLY DESIGNED TO COMPLY WITH CDRH PERFORMANCE REQUIREMENTS UNDER 21 CFR 1040.10 AND 1040.11 AND TO COMPLY WITH EUROPEAN LASER SAFETY REGULATIONS UNDER EN60825-1. CDRH is the Center for the Devices of Radiological Health division of the Food and Drug Administration (FDA) in the USA. No guarantees of suitability or safety are provided for any use other than those specified by Universal Laser Systems, Inc.

Laser Safety

This device contains a sealed carbon dioxide (CO₂) laser that produces intense invisible laser radiation at a wavelength of 10.6 microns in the infrared spectrum. For your protection, the laser is contained within a Class 1* enclosure designed to completely contain the CO₂ laser beam. CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous levels of invisible laser radiation.

- The intense light that appears during the engraving or cutting process is the product of material combustion or vaporization. **DO NOT STARE AT THIS INTENSE LIGHT FOR LONG PERIODS OF TIME OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS SUCH AS BINOCULARS OR MICROSCOPES.**
- This device contains a visible Red Diode Pointer (Class 3R) to aid in positioning material to be cut or engraved. **DO NOT LOOK DIRECTLY INTO THE RED LASER BEAM OR USE A REFLECTIVE SURFACE TO REDIRECT OR VIEW THE RED LASER BEAM. NEVER ATTEMPT TO VIEW THE RED LASER BEAM USING OPTICAL INSTRUMENTS SUCH AS BINOCULARS OR MICROSCOPES.**
- The user door(s) are safety interlocked which will prevent the CO₂ laser beam from firing when the user door(s) are opened. The Red Diode Pointer is **NOT** safety interlocked and can be automatically activated with the door(s) either open or closed.
- **DO NOT OPERATE THE LASER SYSTEM IF ANY SAFETY FEATURES HAVE BEEN MODIFIED, DISABLED OR REMOVED.** This may lead to accidental exposure to invisible CO₂ laser radiation which may cause severe eye damage and/or severe burns to your skin.
- Always use caution when operating a laser system.

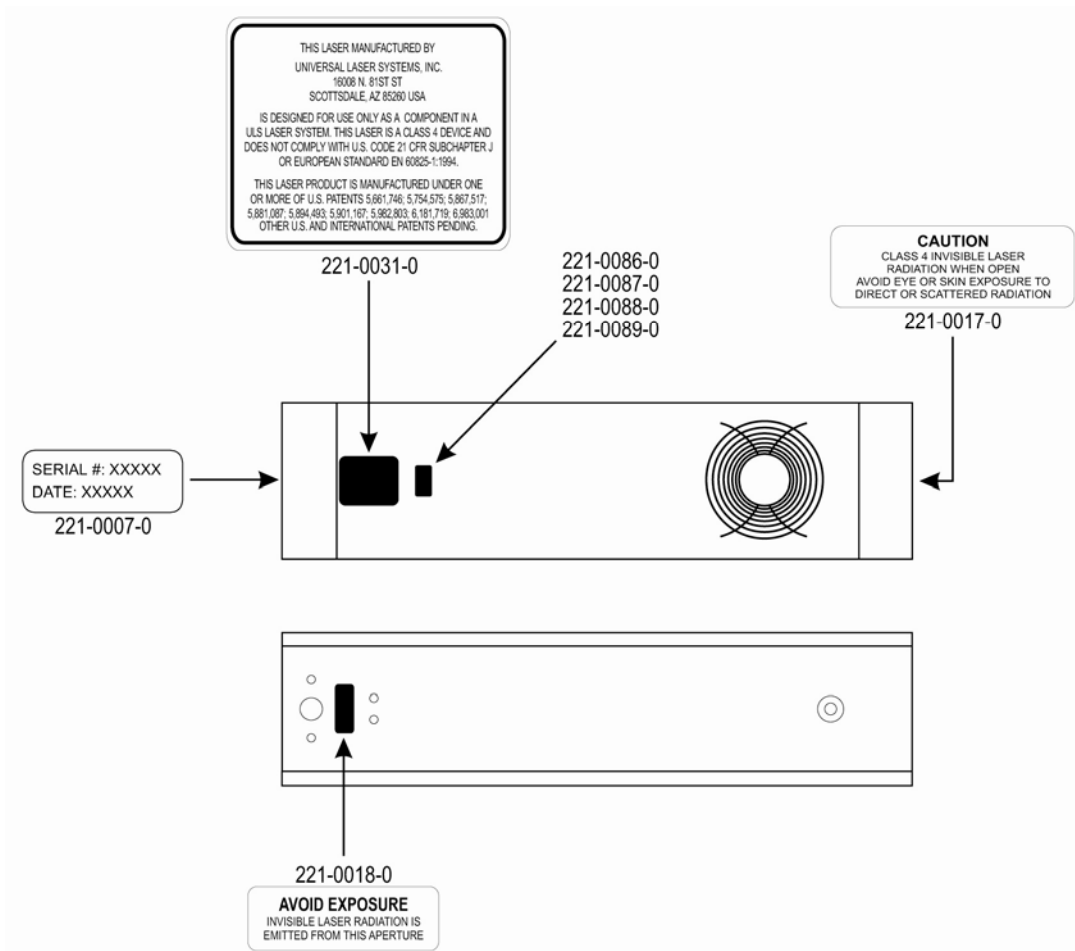
*An enclosure which does not permit human access to laser radiation in excess of the accessible emission limits of Class 1 for the applicable wavelength and emission duration.

Tamper Proof Labels

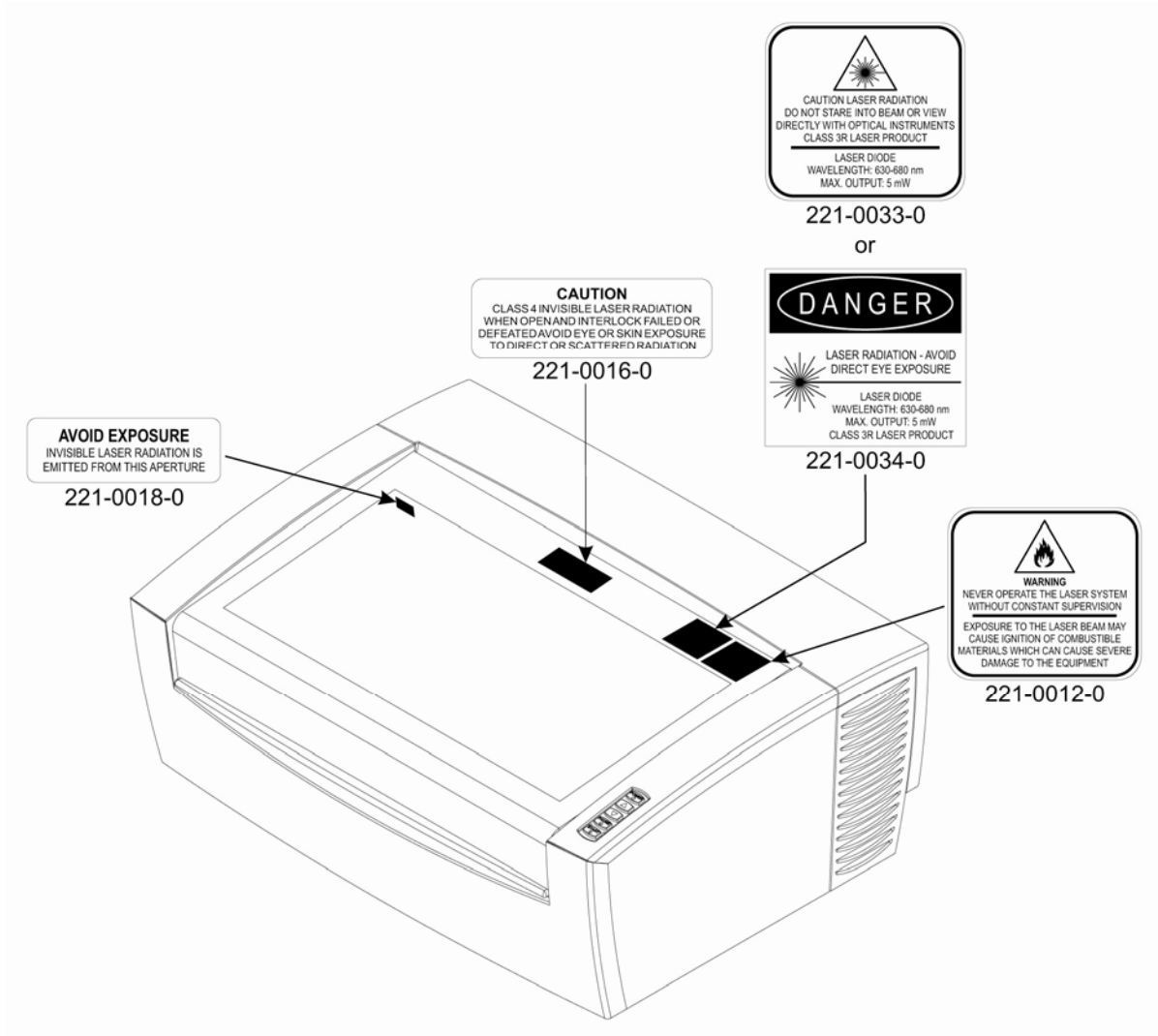
All laser cartridges are equipped with tamper proof labels. There are NO field serviceable parts inside a Universal Laser System, Inc. (ULS) laser cartridge. If your laser cartridge needs service, please contact the ULS Customer Service Team at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com.

Safety Labels

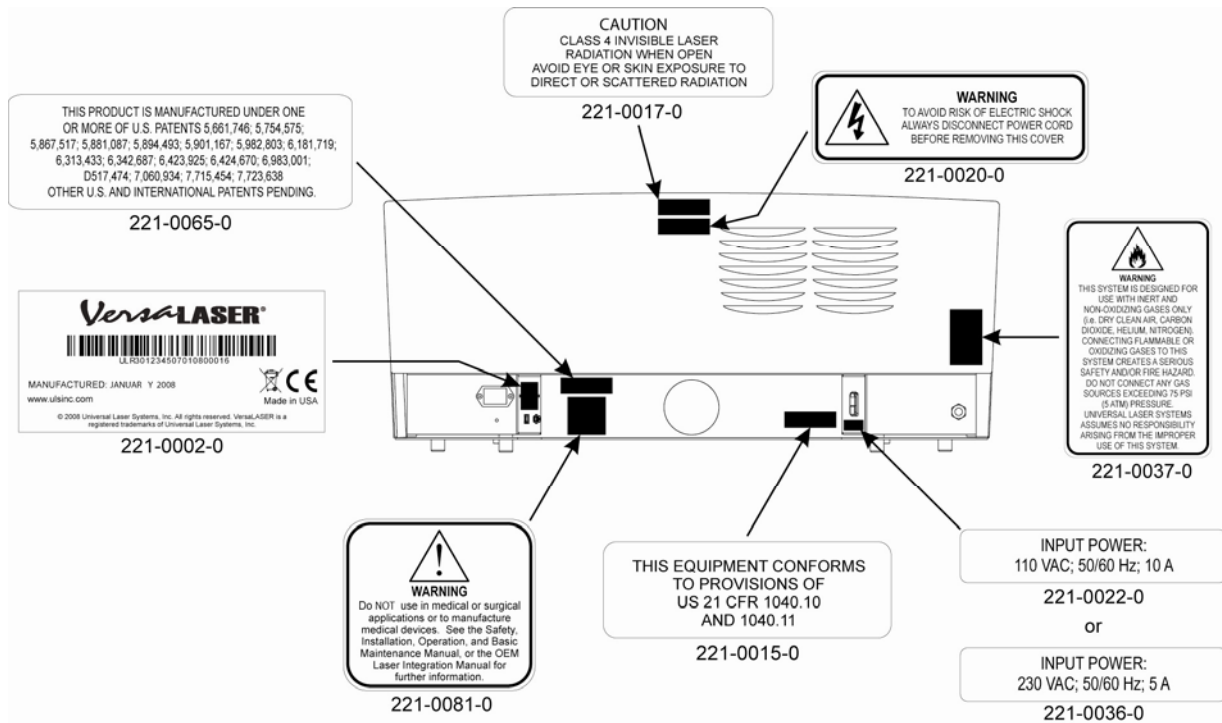
CDRH and CE regulations require that all laser manufacturers affix warning labels in specific locations throughout the equipment. The following warning labels are placed on the laser system for your safety. Do not remove these labels for any reason. If the labels become damaged or have been removed for any reason, do not operate the laser system and immediately contact Universal Laser Systems, Inc. at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com for a free replacement.



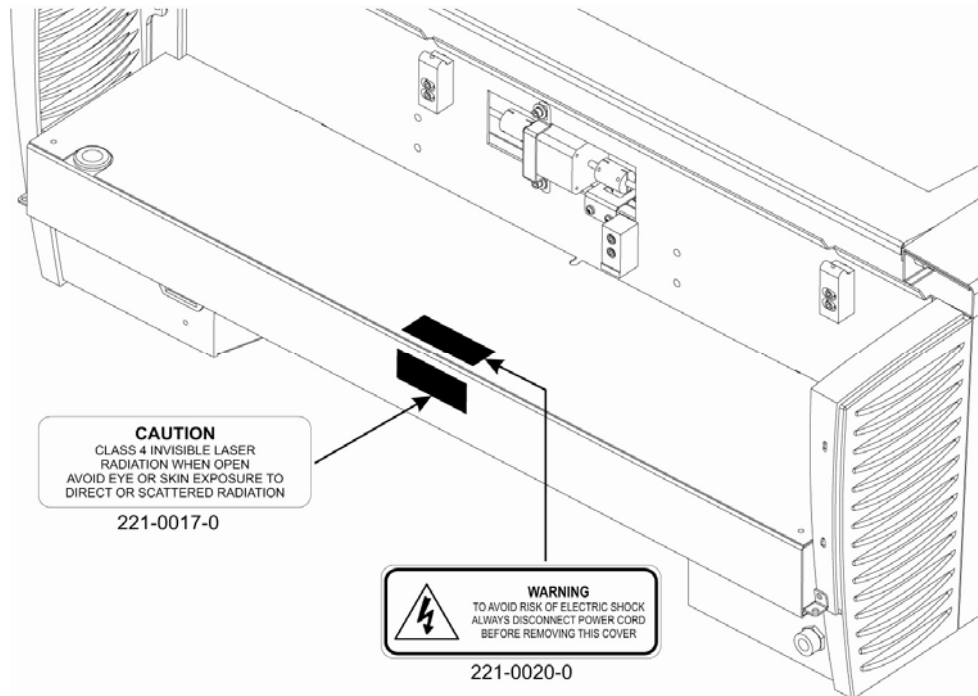
ULS Laser Cartridge Labels



Front View



Back View



Back view with laser cover removed

EU Declaration of Conformity

UNIVERSAL[®]
LASER SYSTEMS

Product Identification: VersaLASER System

Manufacturer:

Universal Laser Systems, Inc.
16008 N. 81st St.
Scottsdale, AZ 85260
USA

European Office:

Universal Laser Systems GmbH
Lerchenfelder Guertel 43
A-1160 Vienna/Austria

The manufacturer hereby declares that the equipment specified below is in conformity with the following directives:

2004/108/EEC (EMC Directive)
2006/95/EEC (Low Voltage Directive)
2006/42/EEC (Machinery Directive)
2002/95/EEC (ROHS Directive)
2002/96/ECC (WEEE Directive)

based on the standards listed.

Standards Used:

Safety:

EN 60950: 2002
EN 60825-1: 2007 (Class 3R)

EMC:

EN 55024 1998 (Class A)
EN 55022: 2003 (Class A)
EN 61000-3-2: 2001 (class A)
EN 61000-3-3: 2002
EN 61000-4-2: 2001 (4kV CD, 8kV AD)
EN 61000-4-3: 2003 (3 or 10 V/m)
EN 61000-4-4: 2002 (1 or 2 kV power line)
EN 61000-4-5: 2001 (class 3)
EN 61000-4-6: (3 or 10Vrms)
EN 61000-4-8
EN 61000-4-11

Note: This is not a declaration of conformity. The importer of this equipment supplies the declaration of conformity.

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Compliance

This ULS laser system has been tested and found to comply with Federal Communication Commission (FCC) directives regarding Electromagnetic Compatibility (EMC). In accordance with these directives, ULS is required to provide the following information to its customers.

FCC Compliance Statement and Warnings

This device complied with FCC Rules Part 15. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device as set forth in Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

Users should be aware that changes or modifications to this equipment not expressly approved by the manufacturer could void the user's authority to operate the equipment.

This equipment has been type tested and found to comply within the limits for a Computing Device per FCC part 15, using shielded cables. Shielded cables must be used in order to insure compliance with FCC regulations.

Recycling



By placing the above symbol on our products and accessories, Universal Laser Systems is indicating that we are committed to helping reduce the amount of waste electronics ending up in municipal landfills. Therefore, Universal Laser Systems urges consumers to recycle this product and its accessories. Universal Laser Systems is equipped to recycle any of its electronic products and accessories and will assist our customers with their recycling options. To arrange for recycling of your ULS product or accessory, please contact Universal Laser Systems for more information at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com.

Chapter 3 - Installation

This section provides step-by-step instructions for site preparation, computer/software setup and laser system assembly and connection. Follow the instructions in the order shown.

1. Site Preparation
2. Operating System Requirements and Software Installation
3. Assembling and Connecting Your Laser System

Note: Make sure to complete step 2 (software installation) prior to plugging the laser system into a USB port on your PC.

CAUTION: Damage to the laser system due to inadequate or improper installation or operation is not covered under the Universal Laser Systems (ULS) Warranty. See the ULS Warranty for additional information. A ULS Warranty document is supplied with your laser system. Should you require a copy of the Warranty, please contact the ULS Customer Service Team at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com.



Please refer to the Safety section before operating your laser system.

Step 1: Site Preparation

Operating Environment (User Supplied)

1. The laser system must be installed in an office, laboratory, workshop or light duty manufacturing environment.
2. Dusty or dirty environments can damage the laser system. Keep the laser system isolated from any processes that produce airborne particles such as sandblasting, sanding, machining, etc. Also, keep the laser system isolated from any equipment requiring mists of oil or water for lubrication. Airborne dust and liquids can coat and damage optics and motion system components.
3. 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 create a health hazard.
4. For best results, since the laser cartridges are air-cooled, we recommend operating the laser system between the ambient temperatures of 70°F (21°C) and 78°F (25°C).
5. Avoid storing the laser system outside the temperatures of 50°F (10°C) and 95°F (35°C) as excessively cold or hot temperatures can damage the laser cartridge or reduce its lifetime.
6. Ambient humidity levels must be non-condensing to protect optics.
7. The laser system should be at least 1 foot (300 mm) away from any wall or obstruction to allow for access and proper ventilation.

Electrical Power Source (User Supplied)

1. For your system's electrical requirements, please refer to the "INPUT POWER" label near the power inlet.
2. **CAUTION:** Never remove the ground lead to the electrical cord and plug the laser system into a non-grounded outlet. A laser system that is not properly grounded is hazardous and has the potential to cause severe or fatal electrical shock. Without proper grounding, the laser system may exhibit sporadic or unpredictable behavior. Always plug the system into a properly grounded (earthed) outlet.
3. Noisy or unstable electricity and voltage spikes may cause interference and possible damage to the electronics of the laser system. If electrical power fluctuations, brown outs or constant power outages are a problem in your area, please contact your local Electrician to supply a power isolation and regulation module. Electrically noisy equipment, such as equipment with large motors, can also cause interference if plugged into the same outlet. It may be necessary to attach the laser system to a dedicated electrical line to resolve the problem.

4. The laser system is designed as a Class I, Group A, pluggable device. It is also designed for connection to IT Power systems which provide the most flexibility to the user.

Step 2: Computer Requirements and Software Installation

Your computer is a critical component in the operation of your laser system. In fact, you cannot operate the laser system if your computer is not connected, powered on, running Windows and running the Universal Control Panel (UCP) software.

You can only run one laser system per computer. You will need to purchase a separate computer for each laser system you own. You must operate the laser system using the computer that is directly attached to it via the provided 6 ft (2 meters) USB cable. USB cables longer than 6 feet (2 meters) may cause the laser system to malfunction.

Computer and Operating System Requirements

- Minimum Computer Requirements (User Supplied)
- GHz processor (minimum)
- 32 bit or 64 bit version of Windows XP, Windows Vista or Windows 7
- 2 GB of RAM (minimum)
- 40 GB hard drive (15 GB free space) (minimum)
- VGA monitor (minimum 1024 x 768 resolution)
- CD/DVD Drive
- Mouse and keyboard
- Available USB 2.0 Hi-Speed compliant port only
- Computer speakers (optional)
- Internet connection and e-mail address (optional)

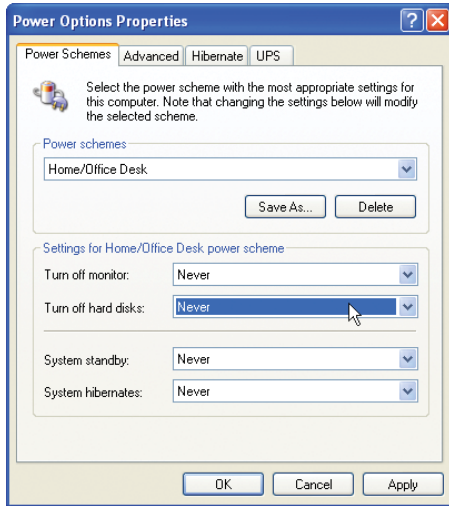
Note: Some computer manufacturers' USB ports do not comply with USB 2.0 Hi-Speed standards. This may cause the laser system to exhibit erratic behavior. Confirm that your computer is USB 2.0 Hi-Speed compliant by checking your computer manual. For more information on USB 2.0 Hi-Speed compatibility, please visit www.usb.org.

Other USB peripheral devices that demand a large amount of computer processing power may slow down the operation and productivity of the laser system. If you experience problems with operation of the laser system while using another USB device, we recommend you discontinue use of that device while the laser system is in use. Do not connect or disconnect USB devices while the laser system is running a job.

Computer Power Management

Power management settings on your computer can interfere with proper operation of the laser system by putting the PC in standby or sleep mode while the laser system is processing material. The settings can be controlled through the power options in the Windows control panel on your PC. The illustrations below show you how to disable power management.

XP

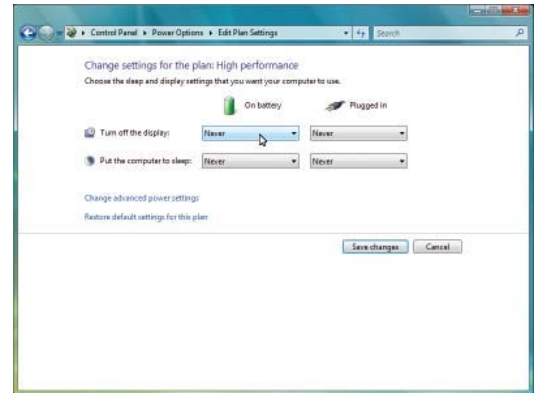


and system hibernates.

For the Power Scheme in use, select "Never" for all the options: Turn off display and Put the computer to sleep.

For the Power Scheme in use, select "Never" for all the options: Turn off monitor, turn off hard disks, system standby

Vista and 7



Software Installation

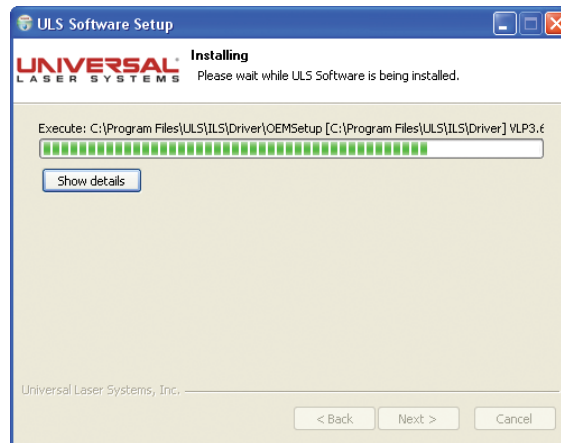
At this point you need to install the Universal Control Panel (UCP) and printer driver. In order to install the software, you need to have administrative privileges on the computer before starting installation. Use the Software Installation CD-ROM included with your laser system.

1. Insert the Software Installation CD-ROM into your PC's CD/DVD drive. It should automatically launch the "Universal Control Panel Installation" window. Select the laser system for which you are installing software.

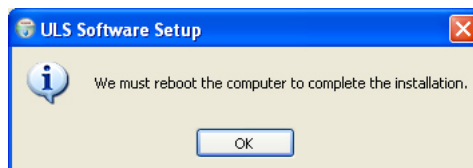
Note: If the setup window does not automatically launch, you can launch it manually. Locate your CD or DVD drive using Windows Explorer and launch the Setup.exe application to start installation.



2. The installation process will proceed as indicated by a progress bar.



3. When the installation process is finished, the "Completing the ULS Software Setup Wizard" window will prompt you to reboot the PC to complete the installation. If you have any other applications running in windows make sure you save your work prior to rebooting. After the PC finishes rebooting, the software installation is complete and you are ready to connect your laser system to the PC.



Step 3: Assembling and Connecting Your Laser System



Familiarize yourself with the instructions before getting started.

The final step in installation is to assemble your laser system, install the laser cartridge(s), make final connections and perform a beam alignment check. Do not power up your laser system until the final step, "Checking Beam Alignment."

Laser System Assembly

1. Unpack the air filtration unit and place it on a level surface.
2. Push down on the tabs of the locking casters so that the cart does not roll.



3. Unpack the laser system.



4. With the assistance of another person, lift the laser system and place it on top of the air filtration unit so that the feet of the laser system rest within the four depressions on top of the air filtration unit.

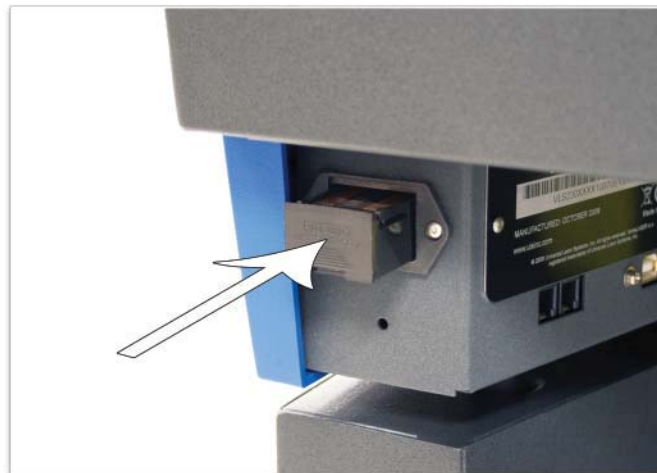


5. Open the top door and remove any packaging from inside the machine.
6. Gently move the X-Axis arm (1) back and forth. It should slide freely.



7. Bend and connect the short exhaust hose provided with the air filtration unit to the exhaust port on the back of the laser system and secure it with the provided hose clamps. Once the hose is attached, install the provided sheet metal cover over the exhaust hose.
8. Using a flat blade screw driver gently open the Thermal Sensor battery holder drawer on the back of the laser system as indicated and install the provided 9-volt battery into the battery holder.

Note: A properly installed 9-volt battery is necessary to operate the laser system. The laser system will not function without a charged battery installed. Keep a spare 9-volt battery on hand at all times.



9. In some instances the laser must be installed in the laser system. If the laser is not already installed in the laser system, locate the laser and follow these instructions to install it, otherwise skip to step 10.

a. Remove the back cover from the laser system by removing the two screws on the left and right side of the cover.



b. Locate the two mounting blocks shown with arrows below and the laser connector on the left side of the laser compartment.



c. Locate the “V” groove along the upper (3) and lower (2) part of the laser cartridge base plate and the alignment plate (1) at the end of the base plate.



- d. Pick up the laser cartridge by the ends and mount the cartridge onto the mounting blocks shown in step b by placing the upper “V” groove on top of the mounting blocks. Slide the cartridge to the right or left as necessary until the mounting holes in the top of the laser line up with the mounting holes in the top of the laser mounting block.



- e. Attach the two supplied mounting screws marked 1 above, the supplied securing bracket marked 2 and the laser connector marked 3.
- f. Replace the back cover.

10. Attach a power cord to the air filtration unit's power inlet (5).
11. Connect the provided 3 ft. communications cable between one of the two Serial ports (2) of the laser system and the Serial port connector on the air filtration unit (3). Secure the Serial cable using the retainer clips (4).
12. Attach a power cord to the laser system's power inlet (6).



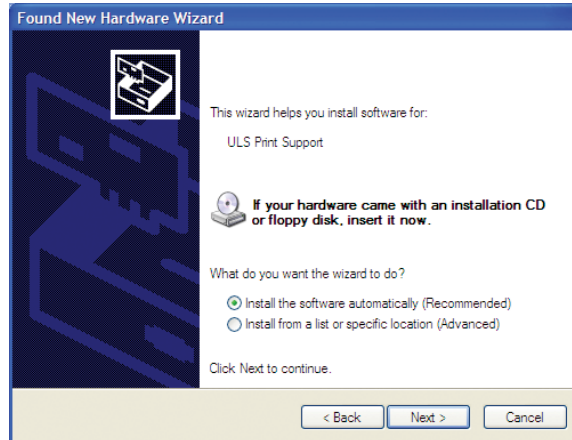
13. Connect both air filtration and laser system power cords into a grounded outlet.
14. Connect the USB cable provided with the laser system between the USB port of the computer and the USB port on the back of the laser system.

CAUTION: The laser system is USB 2.0 Hi-Speed (only). The laser system comes equipped with a high quality, 6-ft (2.0 meter) USB 2.0 certified cable. We recommend you use this provided cable. Do not use any adapters, extension cables, USB cables longer than 6 ft (2.0 meters) or other devices between the computer's USB port and the port on the laser system; sporadic or unpredictable behavior may result.

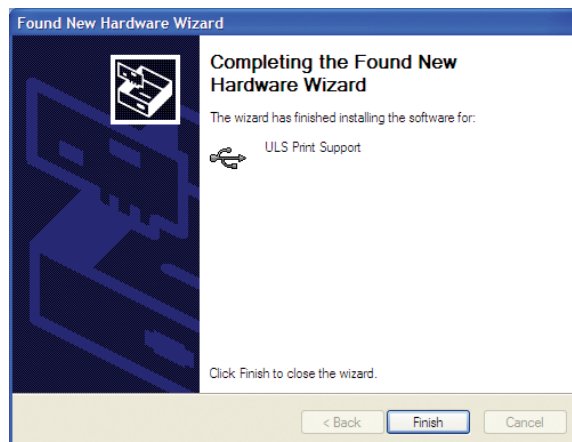


15. After connecting the USB cord, the “Found New Hardware Wizard” will open to install the drivers for the USB connection. If the wizard offers to connect to “Windows Update” to search for software, select “No, not at this time.” Then select “Next” to continue.

- a. Select “Install the software automatically.” Then Select “Next” to continue. You do not need to insert the Software Installation CD-ROM.



- b. Select “Finish” to close the Wizard.

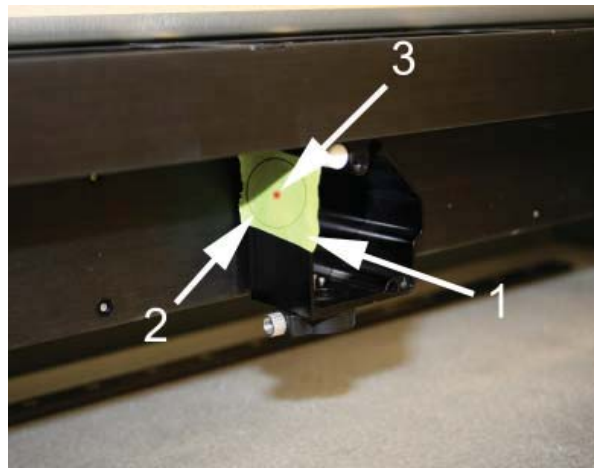


Note: Another set of New Hardware Wizard windows may appear after the initial USB connection. Follow the same instructions as mentioned previously. Once completed your USB connection is established.

Checking Beam Alignment

As a final step in the installation process you need to check your beam alignment. You do this using the red pointer beam.

1. Open the top door and rotate the x axis arm cover up and out of the way.
2. Place a small piece of masking tape across the 3/4" (19 mm) hole in the focus carriage (1). Gently rub the tape around the edge of the hole so that you can see the outline of the hole through the tape (2).
3. Power on your computer and verify that the Universal Control Panel (UCP) icon is present on the taskbar. If not, activate it by selecting on the "Universal Control Panel" icon on your desktop.
4. Power on the laser system by pressing the Power button on the laser system keypad.
5. With the top door open, a red target pointer will appear on the masking tape (3). The red target pointer should appear centered, within 1/8 inch (3 mm). If not, turn off the laser system, remove and re-install the laser cartridge and try again. If the red dot still does not appear centered, please contact the ULS Customer Service Team at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com.
6. Once you have completed laser beam alignment verification, remove the masking tape.



Focus Carriage Beam Alignment

Accessories

Your laser system includes various accessories such as an cutting table for cutting applications and ULS Computer Controlled Compressed Air Unit, along with cone and backsweep for air assisted material processing. The accessories section of the manual details how to install and use these accessories.

Chapter 4 – Operation

Important Overview

CAUTION: Please refer to the Safety section before operating the laser system.

All ULS laser systems are designed to operate like a computer printer. The laser systems are provided with two software components designed for Microsoft Windows based operating systems. The first component is a printer driver that allows you to print from any Windows based graphic software capable of printing through the Windows print system. This component shows up as a printer in the printer section of the Windows control panel. The second component is a task bar application called the Universal Control Panel (UCP) which controls and operates the laser system through the USB port. Laser systems cannot function unless this component is running on the PC connected to the laser system. This component shows up as a red diamond shaped icon in the task bar.

Printing through the printer driver creates a job for the laser system which is then transferred to and stored in the job queue in the UCP from which the job can be selected and run on the laser system as needed. The printer driver has a printing preferences interface which can be accessed at the time of printing to set the laser system job settings for the particular job being printed. Most of these settings can also be changed after the job is printed through the UCP.

ULS laser systems operate in one of two modes. A raster mode in which images are marked or engraved into a material by etching a pattern of dots into the material at high resolutions up to 1000 dpi and a vector mode in which the laser follows a two dimensional path to cut or mark a shape into a material. The printer driver determines whether an element in the graphic data being printed is a vector or raster object by its width. Only lines and curves with a thickness of .001" (.0254 mm) or less will be interpreted as vector objects. All other elements of the graphic being printed will be interpreted as raster objects. In order to print vector elements, the software you are printing from must support creation of lines with a thickness of .001" (.0254 mm) or less.

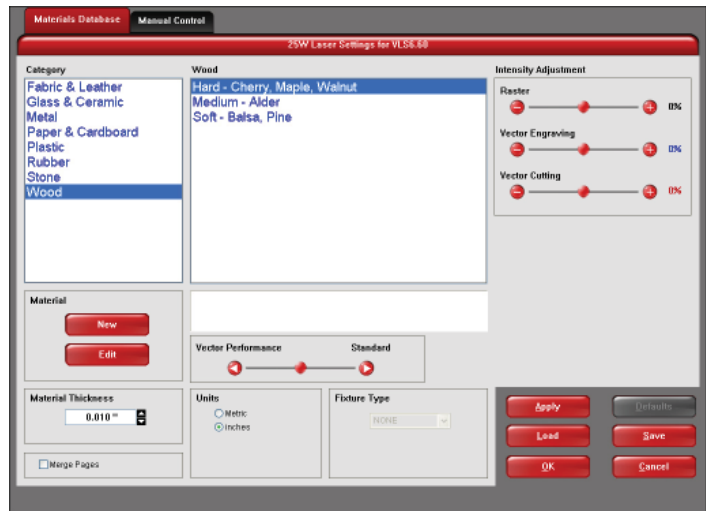
Vector cutting depth and raster engraving depth (or marking intensity if you are surface marking only) are controlled by specifying the speed of processing and the laser power level for raster engraving and by specifying the speed of processing, laser power level and number of pulses per inch (PPI) for vector cutting and marking. These parameters are specified in the printer driver printing preferences interface.

The Printer Driver Interface

The printer driver is a piece of software that allows you to create jobs for the laser system using the Windows print system. The printer driver has a preferences dialog with two tabs which allow you to set various parameters for a print job.

Materials Database Printer Driver Tab

This tab of the printer driver automatically calculates the appropriate laser job settings for a nominal effect based on the material selected and the maximum output power of the laser installed. Please note that all raster data is printed using one set of job settings, all vector cut data using another set and all vector marking data using a third set. There are only three sets of job settings available, one for each type of graphic element in your print job: raster objects, vector cut objects and vector mark objects. All elements of the graphic interpreted as raster objects will be converted to grayscale and printed using the raster job settings with a grayscale dither pattern applied. A dither pattern is a method of mimicking shades of gray using patterns of dots with varying spacing. Dots further apart will appear lighter gray and dots closer together will appear darker gray. This is how the laser system is able to print shaded images and photographs. If you desire a solid background removal for certain elements of your graphic instead of a dither pattern, you must make those elements solid black in color. Objects to be vector cut must be in red and must have a thickness of .001" (.0254 mm) or less. Objects to be vector marked must be in blue and must have a thickness of .001" (.0254 mm) or less. Any vector elements in your graphic that are not blue or red in color will be converted to grayscale and printed as raster objects. Order of execution when using the materials database tab proceeds with raster objects first, then vector marking objects and finally vector cutting objects.



The various controls in the materials database printer driver tab are explained below:

Category List

This section allows you to choose a material category.

Material List

Once you select a category, a variety of material types will appear to the right of the category section from which to choose.

Intensity Adjustments

Intensity Adjustments allows you to adjust the nominal material settings for raster, vector mark and vector cut operations up to +/-50%. Increasing the intensity gives you deeper results. Decreasing the intensity gives you shallower results. Always start at 0 on a scrap piece of material and make any necessary changes after a trial run.

Material Thickness

You must enter the thickness of the material to be processed. This value is used by the materials database to calculate the vector cutting job settings to ensure that the laser cuts all the way through the material. This value is also used to by the laser system to move the Z axis to the proper focus height when using the auto Z mode. Using a caliper or similar measuring device, measure the thickness of your material and enter it into the Material Thickness box.

Units

This section allows you to switch between Metric and English units.

Fixture Type

None

If you are not using any type of fixture, set the drop down menu to NONE.

Rotary

If you have purchased this accessory, read how to install and operate this fixture in the Accessories section of the User Guide.

Custom (Cutting Table)

This setting is used to set the height offset from the engraving table of any fixtures such as the cutting table or any custom fixtures you might use to support the material to be processed. This value is used along with the material thickness to move the Z axis to the proper focus height when using the auto Z mode.

Vector performance

This setting allows you to adjust vector performance from Standard to Throughput or Quality. This effects how small geometry and curves in your graphic are processed. The Quality mode will increase job completion time, but improve vector quality. Throughput mode will decrease job completion time, but may have an adverse effect on vector quality.

Merge Pages

This setting allows you to treat multipage documents in different ways. By default, multipage documents are treated as separate jobs with each page having to be selected in the UCP and run individually. This setting allows you to change that behavior. Selecting this setting once will merge the pages with auto-start, meaning the pages will all be printed one after another as one job. This is useful if you want all the graphic images to print on one piece of material, but you want to control the order in which they are applied. Selecting this setting again will merge the pages with manual start, meaning the pages will all be printed one after another as one job, but with the laser system pausing in between each page. This is useful if you need to load new material in between each page.

Save Button

The save button brings up a dialog box which allows you to save a snapshot of the laser job settings which you can then reload at a later date. All settings will be stored in a file with “.LAS” extension.

Load Button

To recall a snapshot of the printer driver settings that have been previously saved to a .LAS file using the save button, select the “Load” button and choose the desired .LAS settings file from the dialog box. The settings that are currently on screen will be replaced by the settings from the .LAS file. You may abort these changes by selecting Cancel; selecting OK or APPLY will approve the changes.

Default Button

The Default button will reset the driver settings to factory default values. You may abort these changes by selecting Cancel; selecting OK or APPLY will approve the changes.

Cancel Button

The Cancel button closes the printer driver settings interface window and takes you back to the previous window without saving changes made to the settings.

Apply Button

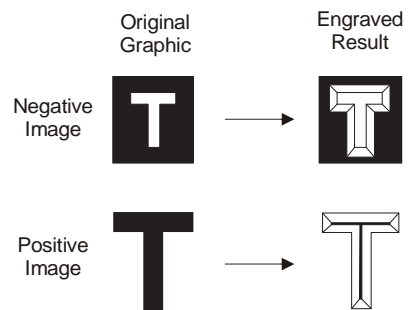
The APPLY button saves all changes made to the printer driver settings.

OK Button

The OK button saves all changes made to the printer driver settings and closes the printer driver settings interface window and takes you back to the previous window.

Rubber Stamp Processing

The rubber stamp material in the materials database activates a special shouldering mode. This mode is specifically for rubber stamp creation and is used for creating shoulders on characters and graphics when processing rubber stamps. The shoulder is created by gradually ramping the laser power up or down near the edges of each element in the graphic being printed creating a tapered edge around each graphic element that produces a pyramid-like effect in the material being processed. Most rubber stamp applications will require the graphic to be a negative image with black representing the material to be removed by the laser.



Shoulder applied to negative and positive images

The Universal Control Panel (UCP)

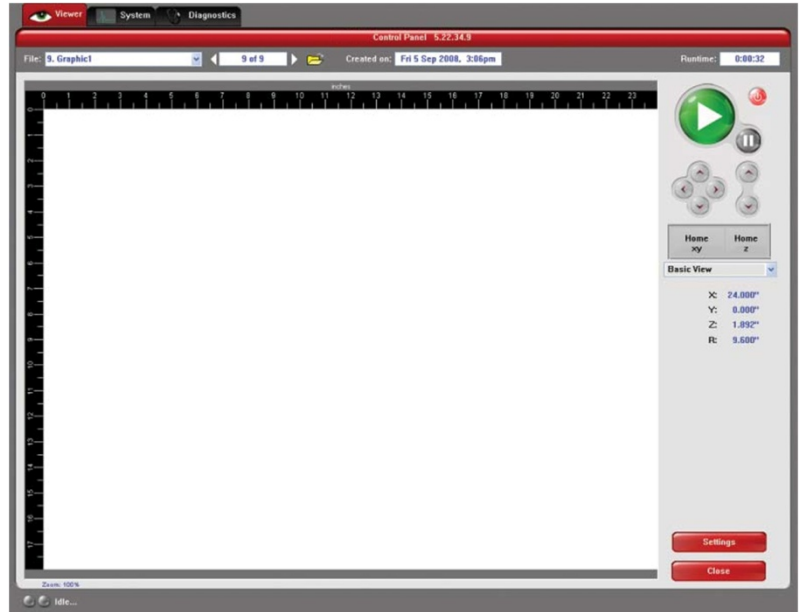
When a graphic has been printed through the printer driver a laser job is created and passed to the queue in a piece of software called the Universal Control Panel (UCP). The UCP software provides a convenient interface for interacting with and controlling your laser system. Once you have installed the UCP, a red diamond-shaped icon will appear in the lower right corner of your Windows taskbar. If for any reason the UCP is deactivated, you can reactivate it by using the ULS Engraver shortcut found on your computer's desktop. The UCP is organized into three convenient tabs: Viewer, System and Diagnostics. The following describes the features of each tab of the UCP.

Viewer Tab

You send jobs to your laser system by printing to it. Anytime you print to the laser system, a job is created and inserted into the laser systems job queue. Selecting the viewer tab allows you to navigate through and manage the jobs in the laser system job queue. The viewer tab also allows you to operate your laser system right from your computer. The viewer tab has the following functions:

Laser System Controls

- The same controls found on the control panel on your laser system are duplicated here.
- The green START button begins processing the selected job.
- The PAUSE button stops the engraving process. Pressing the PAUSE button again resumes the engraving process where it was last stopped.
- The four navigation buttons move the focus carriage manually in X and Y.
- The two up and down buttons move the Z-Axis table up or down.
- The Home XY button re-homes the focus carriage to the upper right hand corner of the field.
- The Home Z button re-homes the Z-Axis table to the bottom of the laser system.



View Tab Modes

A drop down list allows you to select from various modes of operation for the preview screen.

Basic View (default mode in the drop down list)

- The Basic View shows a preview window of the job currently selected.
- The cursor becomes a magnifying glass (Zoom Tool) if you pass it over the preview window. Left-clicking the mouse zooms in and right-clicking zooms out.
- Selecting the Settings button takes you back to the printer driver interface to allow you to change most of the settings for the job selected. Keep in mind that some settings cannot be changed after printing from your graphics program such as print density and vector quality. If a setting is not adjustable after printing from your graphics program, it will be grayed out or not appear at all when you press the settings button in the UCP.

Focus View (drop down list)

The Focus View allows you to quickly manually move the focus carriage to a desired position in the material processing field.

- To have full range of motion, verify that you are zoomed out in the preview window by right-clicking on the mouse before entering the manual focus window.
- In the focus view the cursor changes to a blue target symbol with trailing X-Y coordinates. Clicking the mouse in the preview window moves the focus carriage to the selected position. Selecting another feature from the drop down list terminates the focus feature and moves the focus carriage back to the home position.
- To move the focus carriage to a specific location, select the GO button. Type in the X and Y coordinates and press the GO TO button and the focus carriage will move to the specified location. You can also move the engraving table to a specific Z-height using the GO feature.

Estimate View (drop down list)

The estimate feature approximately calculates the amount of time it will take the laser system to process the selected job. For more complex jobs, the estimate feature can take a while to estimate the job completion time.

Relocate View (drop down list)

The Relocate feature gives you the ability to move the image in the selected job to another area of the engraving field. This feature does not permanently modify the original image location.

When this feature is activated, the image is surrounded by nine small squares (anchor points) representing the center and extents of the graphic. Using these anchors you can relocate the image in one of three ways:

1. You can select and hold an anchor point and drag that anchor to move the image around in the field.
2. You can select an anchor point and type a new X-Y coordinate for that anchor point in the X-Y fields to the right of the preview screen.
3. Using the X-Y manual motion buttons, you can move the focus carriage to a location on the processing table in the laser system using the red pointer diode as reference, then select an anchor point in your image and press the TO POINTER button to move that anchor point to the current focus carriage location. This feature is useful for aligning an image with a piece of material you plan to process with the laser system.

Note: If you print with a page size smaller than the maximum field size of the laser system, the anchors will display at the edges of the page on the image.

Duplicate View (drop down list)

The Duplicate feature gives you the ability duplicate an image in a grid pattern. You can select how many rows and columns of the image as well as the spacing between the rows and columns. After you create a grid of duplicate images you can also remove any one of the copies or the original from the group by selecting that instance in the preview window. If you need to restore a copy that you removed, click in the general area of that instance and it will return.

Settings

The settings button gives you access to the printer driver settings for the selected job. Most of the settings can be changed after printing if necessary. Any changes made will be permanently saved with the job.

File Management

As jobs are printed, they are added to the print queue until the queue reaches the print queue limit set in the system tab. Once the Print queue reaches the maximum number of jobs, the printer driver deletes the oldest job each time a new job enters the queue (a FIFO system). Information listed above the preview screen includes the name of the currently selected job, the number of jobs stored, the date and time the selected job was stored on your hard drive and the job processing time (after the job has been run once). Just under the name of the job the Copies feature tells you how many times the selected job has been run on the laser system. Navigation Arrows on either side of the currently selected print job number allow you to navigate through the print jobs stored on your hard drive. The “folder” button displays a pop up window that allows you to further manage the jobs in the print queue by performing such functions as: importing print jobs exported from other computers, exporting print jobs, deleting print jobs, marking jobs as permanent so they will not be deleted by the FIFO systems and purging the entire queue (except for jobs marked permanent).

Multi-page Job Controls

If you print a job from a graphics program that supports creation and printing of multi-page documents, a second set of file navigation controls will appear below the preview windows allowing you to navigate through the pages in the multi-page job. Multi-page jobs can be processed with each page manually selected in the preview screen one at a time or they can be merged and processed as a single job with or without a forced pause between pages. Use the multi-page control in the printer driver (setup button in the UCP) to control this.

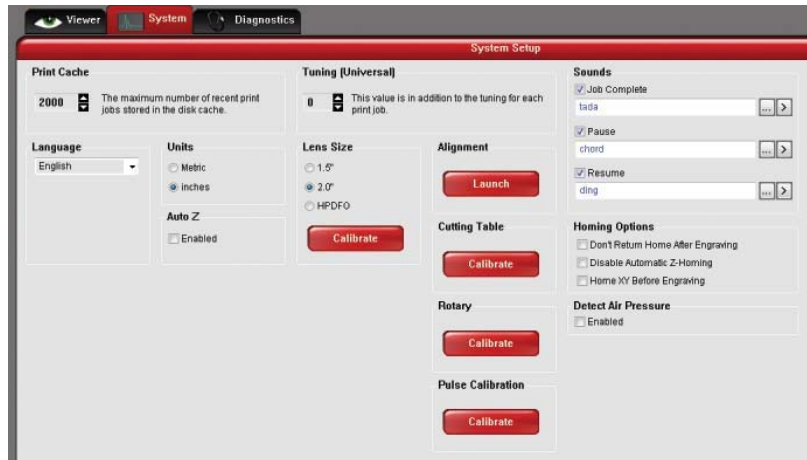
Laser System Status Indicators

At the bottom left of the preview window two lights and some text are provided to indicate status of the laser system connected to the UCP. Blinking of the lights indicate when the UCP is talking to the laser system and the status text indicates the current state of the laser system.

System Tab

The System Tab allows you to configure certain features of the laser system. If your laser system needs to be calibrated, you will need to do so from this tab. The System tab contains the following controls:

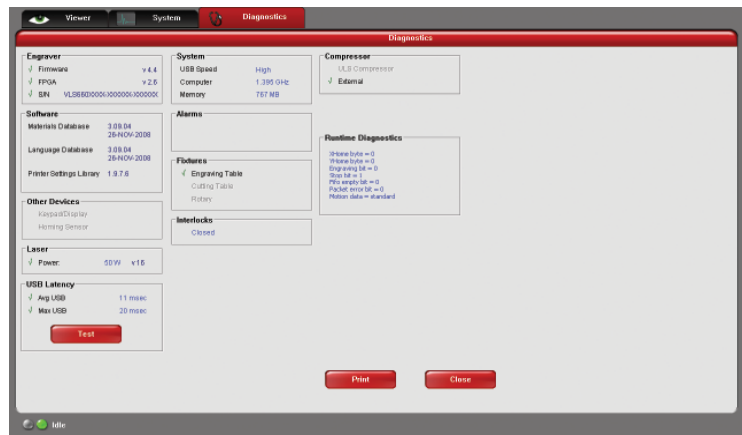
- The PRINT CACHE number indicates the maximum number of print jobs that will be stored on your hard drive. If you exceed the number shown, the software will automatically begin deleting the oldest jobs as newer jobs enter the queue, unless “Permanent” is checked in the File Management window.
- LANGUAGE allows you to switch between available languages according to your preference.
- UNITS allows you to choose between Metric or English units of measure.
- AUTO Z enables a feature that automatically moves the Z axis to the material thickness value entered into the printer driver properties window. If it is disabled, the Z values entered in the printer driver properties window will be ignored and you will need to set focus manually by using the Focus Tool. If you use this feature make sure the Z axis has been properly homed.
- The TUNING value is used compensate for mechanical lag when raster engraving by shifting the left to right and right to left raster lines with respect to each other by the amount entered.
- The LENS SIZE selection lets the laser system know which lens you have installed. This is important for proper function of the auto Z mode in the laser system and auto-focus feature in those laser systems with autofocus. Lenses are calibrated to the laser system at the factory, but if you replace a lens you will need to recalibrate the lens. Select the Calibrate feature and follow the instructions given.
- The ALIGNMENT Mode Launch button opens the Alignment Mode window for checking and adjusting alignment of the laser to the motion system. The Alignment feature should only be used if instructed by the Customer Service Team at ULS.
- CUTTING TABLE allows you to calibrate the Z axis to the top surface of a removable cutting table. You need to have the cutting table installed in the system to activate the CALIBRATE button. To calibrate, press the button and follow the instructions.
- ROTARY allows you to calibrate the Z axis to a rotary fixture. You need to have the rotary fixture installed in the system to activate the CALIBRATE button. To calibrate, press the button and follow the instructions.
- PULSE CALIBRATION is set at the factory to calibrate laser pulsing for the installed laser. It should not be adjusted unless you are instructed to do so by the Customer Service Team at ULS.
- If the SOUNDS box is checked, the computer will play the sound file selected every time the selected event occurs. You can attach sounds to the JOB COMPLETE, PAUSE and RESUME events.
- HOMING OPTIONS allows you to change behavior of the homing features in the laser system. By default after a job is complete the motion system will return home. To prevent this, select the ‘Don’t Return Home After Engraving’ switch.
- If the laser loses its Z location, the materials processing table will home at start-up. To have this feature turned off, check the ‘Disable Automatic Z-Homing’ switch. Disabling this feature can also be helpful when troubleshooting Z-Axis problems.
- If you would like the laser system to re-home the X and Y axes before it processes each job, select the ‘Home XY Before Engraving’ switch.



Diagnostics Tab

The Diagnostics Tab gives you important information about your laser system for troubleshooting purposes. The diagnostics tab contains the following:

- ENGRAVER shows the current Firmware and FPGA version being loaded in the laser system. It also displays the Serial Number of your laser system. The Serial Number is needed when calling the Customer Service Team at ULS.
- SOFTWARE displays the current Materials Database, Language Database and Printer driver versions being used.
- OTHER DEVICES displays the current firmware version for various devices installed in the laser system as well as status information about those devices.
- LASER displays information about the current laser cartridge(s) installed in the laser system. If a red 'x' appears, this indicates that the laser cartridge is either not functioning properly or is disabled because one of the safety interlocked doors to the laser system is open (causing the interlock system to disable the laser).
- The Test button, under USB LATENCY, displays information about the speed of the USB connection. Typical USB 2.0 performance should be below 10 msec and worst case USB 2.0 performance should be below 100 msec.
- SYSTEM displays information about your personal computer.
- ALARMS shows the status of the over-temperature circuit in the material processing area and indicates if the Thermal Sensor circuit battery is low in power. If the Thermal Sensor inside the laser system is triggered, an alarm will sound and the laser will be shut down.
- FIXTURES indicates if a cutting table is installed on the engraving table and properly detected.
- INTERLOCKS displays the status of the Top, Front or Rear Doors of the laser system.
- COMPRESSOR shows the status of the ULS Computer Controlled Compressed Air Unit which supplies compressed air for the air assist feature.
- The RUNTIME DIAGNOSTICS box for use when troubleshooting.
- The PRINT button gathers the information displayed on the Diagnostics Tab into a PDF file. This PDF file can be emailed to the ULS Customer Service Team for aid in troubleshooting.



Control Panel

The control panel on your laser system provides the functions necessary to setup and run jobs on your laser system.

Safety Interlock Status

A Red LED on the control panel provides an indication of the status of the interlock system.

Indication	Condition
On	The top door to the laser system is closed. If a laser job is initiated in this state, the CO ₂ laser will fire.
Flashing	The top door to the laser system is open and the safety interlock system has disabled the CO ₂ laser. If a laser job is initiated in this state, the CO ₂ laser will not fire and the red target pointer will be on instead.

A Green LED indicates whether the machine is powered on or not.

Keys



Power: This button turns the Laser system ON and OFF, but only if the Laser system is connected to a computer and the UCP is running in the task bar of the computer. The Laser system cannot power ON and function independently of the computer and UCP. To power the Laser system OFF, the power switch must be held down for about five seconds.



START: Initiates processing of the laser job currently selected and visible in the preview screen of the Universal Control Panel on your PC.



PAUSE: If a laser job is in process, the Pause button stops job execution and moves the focus carriage to its home position in the upper right corner of the engraving area. If the Pause button is pressed again, it will resume job execution at the point where the motion system was paused. If the Start button is pressed while the machine is in a paused state, it will restart processing at the beginning of the laser job.



UP/DOWN: These buttons moves the engraving table up and down for loading material into the machine and focusing. Pressing a button once will move the table .010" (.254mm) in the indicated direction. Holding a button down will move the table continuously in the indicated direction until the button is released.

Loading and Processing Materials

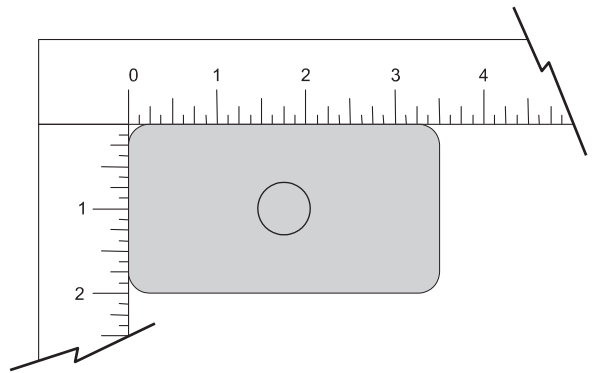
Before laser processing material, you will need to load material into the laser system and then focus the laser system onto the top surface of the material.

Loading Material

Open the top door to the laser system and place material to be laser processed onto the engraving table. You may need to manually move the support table down to allow clearance to fit thicker materials into the machine. If you are cutting, you can also use the cutting table (use of this accessory is described in the accessories section of the manual).

CAUTION: Material to be laser processed must fit completely within the machine so that the top door to the laser system can be closed. The access door is safety interlocked and will not allow the laser to operate if the access door is not fully closed.

Position the material so that it is aligned with the graphics to be engraved, cut or marked. There are a few methods that can be used to accomplish this. One method is to use the rulers on the laser system processing table and the corresponding rulers in the preview window of the UCP to align your material with the graphics in your laser job file. It is often useful to push the material up against the rulers and position your graphics accordingly before printing. A second method is to use the relocation feature in the UCP to move your graphics to your material. A third method is to use fixturing to position your material. This is especially useful for odd shaped materials. The laser system can even be used to create the fixturing. For example, fixturing can be made out of acrylic by placing a piece of acrylic against the rulers in the laser system and cutting the shape of the material to be laser processed out of the acrylic. You can then place the material in the cut out to position it accurately.



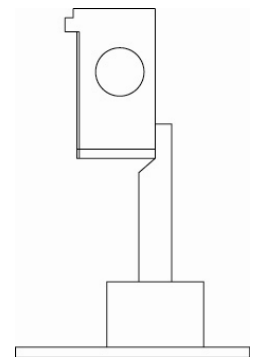
Focusing

Once you have positioned the material, you will need to focus the laser system by adjusting the Z axis up or down until the top surface of the material to be laser processed is at the focal plane of the lens installed in the laser system. This can be done in one of three ways.

The first focusing method is to use the calibrated focus tool provided with the lens kit. Every lens kit is provided with a calibrated focus tool so make sure to use the one provided with the lens being used.

Manual focusing steps:

1. Manually move the focus carriage out over the material to be laser processed.
2. Move the engraving table manually up or down in the Z axis as necessary until base of the focus tool can be placed on the top surface of the material to be laser processed and the wedge shaped notch at the top of the focus tool can be placed as shown with the edge of the carriage fitting in the corner of the notch. ***Laser processing results are very sensitive to focus so pay close attention to the fit of the focus tool.***
3. Remove the focus tool from the material processing area.



A second focusing method is to measure the thickness of the material (use a calipers for accuracy) to be laser processed and manually move the Z axis up or down until the Z axis position equals the measured thickness.

Important Note: Make sure the lens specified in the system tab of the UCP matches the lens installed in the laser system when using this method.

CAUTION: In order for this method to work correctly, the Z axis must be properly homed and calibrated to the lens being used. To verify this, move the Z axis manually until the Z axis position reads zero and use the manual focus tool as described in the manual focus section above to verify that the surface of the engraving table is at the focus plane. If necessary, re-home the Z axis using the home Z command in the UCP viewer tab and re-check. If you are still having trouble, recalibrate the lens using the lens calibrate function in the system tab of the UCP.

A third focusing method is to measure the thickness of the material (use a calipers for accuracy) to be laser processed and enter the material thickness into the printer driver settings when printing. In materials database printer driver, you will enter the thickness in the material thickness field. With this method, the Z axis will move up or down to the appropriate height when you press the start button to initiate laser processing of the selected job.

Important Note: Make sure the lens specified in the system tab of the UCP matches the lens installed in the laser system when using this feature and that the Auto-Z function is enabled.

CAUTION: In order for this method to work correctly, the Z axis must be properly homed and calibrated to the lens being used. To verify this, move the Z axis manually until the Z axis position reads zero and use the manual focus tool as described in the manual focus section above to verify that the surface of the engraving table is at the focus plane. If necessary, re-home the Z axis using the home Z command in the UCP viewer tab and re-check. If you are still having trouble, recalibrate the lens using the lens calibrate function in the system tab of the UCP.

Initiating laser processing

Once the material is placed and focused, you are ready to initiate laser processing of the selected laser job file. If you need to use air assist for the material to be processed, make sure you have an air assist cone or backsweep installed on the carriage and the ULS Computer Controlled Compressed Air Unit is properly connected (see the accessories section for details). Also ensure that your air filtration unit is plugged in to a power outlet and properly connected to the laser system. Then start the laser job by pressing the start button on the control panel or in the UCP.

CAUTION: Make sure the air filtration unit activates and proper exhaust flow is present in the laser system during laser processing. If proper exhaust flow is not present, damage to optics and other laser system components can occur very quickly.

Third-Party Graphic Software Configuration

ULS Windows Printer Driver will work with a wide variety of Windows based graphic software to create laser jobs through the Windows Print System. Every effort has been made to make the printing process as seamless as possible, however, to get the best results when printing through the ULS Windows Printer Driver, you should be aware of a few general guidelines for all software as well as some specific notes regarding some of the more popular Windows software for printing to the laser system.

Note: ULS provides no warranties or guarantees regarding compatibility with any third party software packages not supplied by ULS.

Note: ULS laser systems are not postscript devices and therefore are not compatible with PostScript fonts. Use True type fonts only.

General Software Guidelines

Use the following GENERAL guidelines when configuring Windows software applications to print to the ULS Windows Printer Driver.

Page Setup

To properly position graphics in the laser system processing field, most graphics software will permit the customization of the page size and orientation. As a rule of thumb try to set the page orientation in your software of choice to Landscape and the page size to match the engraving area of your laser system. This should result in the upper left corner of the page aligning with the upper left corner or zero-zero of the laser system processing field.

Some graphics software will provide on-screen rulers. If this is the case, it is often possible to configure the rulers so they match those in the laser system. This can also help with positioning of graphics in the processing field of the laser system.

Power Control through Color Selection

As mentioned earlier your laser system uses colors to assign laser settings to different elements of the graphics you are printing. The materials database driver tab uses three colors: BLACK (raster objects), RED (vector cut objects) and BLUE (vector mark objects). These colors are defined in the RGB (Red-green-blue) color system using the following RGB values. In order to ensure that the colors you are using in your graphics will map appropriately to the printer driver colors, you should learn how your graphic software defines colors and if possible use or set up an RGB pallet with the RGB values listed below.

		RED (R)	GREEN (G)	BLUE (B)
COLORS	BLACK	0	0	0
	RED	255	0	0
	BLUE	0	0	255

Vector Output for Vector Cutting and Marking

The printer driver distinguishes between raster objects (raster engraving) and vector objects (vector cutting and marking) by the types of elements contained in the graphic being printed. All graphics, other than outlines of very thin line widths will be interpreted as raster objects and the raster mode will be used for laser processing. Not all software is capable of printing vector output. If you want to create jobs for vector cutting, make sure your graphic software of choice allows creation of vector lines and that the line width can be 0.001" (0.0254 mm) or less. The printer driver will interpret these objects as vectors.

Overlapping Raster Objects

If the artwork created has raster objects that overlap, the driver will automatically filter out the portion of the object that is not visible so that only the visible part of the underlying filled area will be engraved to prevent the overlapped area from being engraved twice. This allows the color white to be used as an effective drawing tool. Since the laser system will not engrave the color white (this is the background color), it can be used to block out the undesired engraving areas of raster objects. However, you cannot use a white fill to cover a vector outline, the outline will vector cut even though you cannot see it on screen.

Overlapping Vector Objects

The driver does not filter vector objects that overlap each other. If you place one thin vector outline on top of another, both outlines will be cut by the laser system. This can be useful for making multiple cutting passes in one laser job for thicker materials.

Bitmapped Scanned Images

When printing raster objects such as photographs which are grayscale or color bitmaps, keep in mind that the printer driver uses a dither pattern filter screen to reduce the images to black and white (monochrome images) for laser processing using variable spacing between the dots to create the illusion of shades of gray. These dither patterns are relatively coarse so it is not necessary to use high resolution bitmaps. Grayscale or color photos should be reduced to 300 to 600 dpi for purposes of laser processing and scanned images should be scanned into the computer at 300 to 600 dpi.

Postscript Images and Fonts

The laser system is not a postscript device. This means that Postscript fills, Postscript textures and especially Postscript fonts are not compatible with the laser system and should be avoided.

Font Troubles

Occasionally you may have trouble printing certain fonts at certain sizes in some Windows applications. In these cases it is helpful to export the graphic to a bitmap format, such as jpeg, and re-import it into your software. This process forces the fonts to be converted to bitmap images.

Adobe Illustrator CS or CS2

Illustrator versions CS and CS2 do not properly support non square landscape pages. For this reason, in order to print effectively from these programs you must set up your page size as landscape and make the width and height both equal to the largest dimension of your laser system's processing field. For example, if your processing field is 24" wide x 12" tall, make the page in Illustrator 24" x 24" landscape. You can then treat the upper left corner of the illustrator page as the zero-zero point in the laser system processing field and only use the upper half of the page in illustrator. Anything in the lower half of the page will not be printed. Also make sure you are using an RGB color palette and the vector line stroke width is set to .001" (.0254 mm) or less.

Adobe Illustrator CS3 and higher

Illustrator versions CS3 and higher treat landscape page sizes correctly, but make sure you select user defined page size at time of printing and make sure the page size in Illustrator matches the page size in the printer driver. Also make sure you are using an RGB color palette and the vector line stroke width is set to .001" (.0254 mm) or less.

AutoCAD and AutoCAD LT

Note: AutoCAD version 2000 is not compatible with ULS laser systems. You must upgrade to version 2000i or higher.

Vector output

Line widths for printing from AutoCAD products are controlled by plot styles. Make sure you set the first eight pens in the plot style you use to .001" (.0254 mm) or less in order to ensure vector objects are output.

Placement of Graphics

The easiest way to control placement of graphics in the processing field when using AutoCAD is to create a non-printing rectangle with a width and height equal to the processing field in your laser system. Then print using the Print Window feature and use the Pick Tool to pick the upper left and lower right corners of the rectangle as the print window. You can then treat the upper left corner of the rectangle as the zero-zero point in the processing field and lay out your graphics inside the rectangle as desired.

Make sure you print with a 1:1 scale and make the plotter margins zero in the print setup screen. Also make sure plotter offsets are set to zero.

CorelDRAW (All versions)

CorelDRAW products have a color matching feature which interferes with the proper mapping of colors in graphics being printed with colors in the printer driver. Make sure to turn color matching feature off when using CorelDraw.

Solidworks

When using 3D solid modeling software such as Solidworks, you must keep in mind that the laser system is a 2D device, so you must create a 2D drawing view of the object you want to laser process. You cannot print 3D parts and assemblies directly to the laser system.

To control placement of your job on the processing table in the laser system, use a custom page size and make it the same size as your laser system's material processing area. Make sure to remove any drawing templates and borders from the page or they will print also and be part of your laser job. Once your page size is set, match the material processing area in the laser system. Treat the upper left corner of the page as equivalent to the zero-zero point in the processing field of the laser system. Solidworks does not give you the ability to precisely position sketch elements on the page, so you can use the relocate feature in the UCP to more precisely position your job once you have printed them.

Set the thickness for the thin line font in document properties to .001" (.0254 mm) or less to force thin lines to be output as vector objects. Then assign all line segments in the drawing view the thin line font and change colors as necessary to map to colors in the printer driver. If you are using the materials database driver tab, remember that all vector cut objects must be red and all vector mark objects blue.

SPECIAL NOTE: If printing at image density 6, Solidworks will not print sketch entities assigned the color black as vector objects regardless of line thickness. Avoid the color black if you want a sketch element to print as a vector object at image density 6. At lower image densities this is not a problem.

Chapter 5 – Accessories

Air Assist System

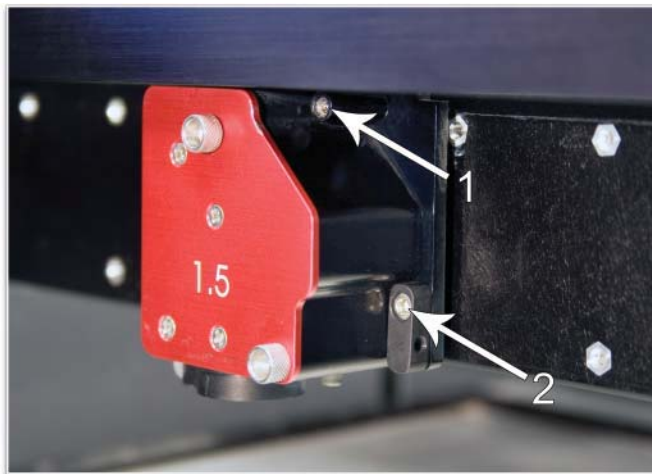
Air Assist is employed with a backsweep or cone to direct air flow onto the material being processed during laser material processing. This feature also provides compressed air to the optics (mirrors and lenses) in the system, reducing contamination. Air assist aids in removing smoke and debris from the laser processing area and directing it to the exhaust. It also helps reduce the heat affected zone in the material being processed and helps to prevent flame up when processing certain materials. Use of this system requires a supply of 60 PSI, clean, dry oil free compressed air or gas. Air can be provided by the ULS Computer Controlled Compressed Air Unit. The Air Assist System consists of a backsweep or a cone fitting and an ULS Computer Controlled Compressed Air Unit. The backsweep fitting is geared more toward engraving applications and the cone is geared more toward cutting applications.

Air Assist Back Sweep

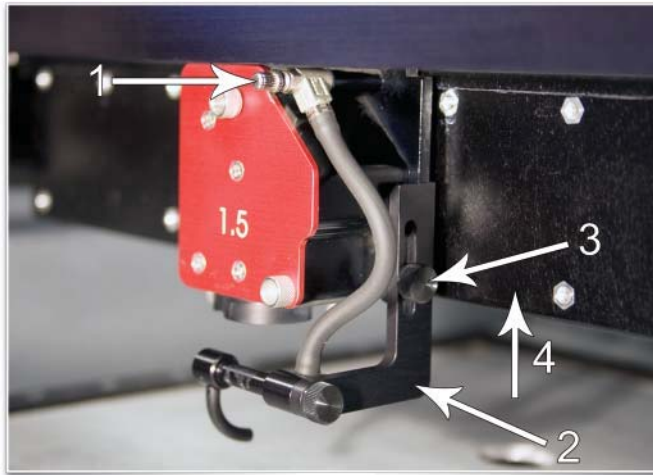
The Air Assist Back Sweep directs debris and smoke away from cutting or engraving process toward the exhaust at the back of the laser system. When using the air assist back sweep, you can adjust the angle of the air jet coming from the back sweep as necessary to optimize the effect of the air assist.

Installation

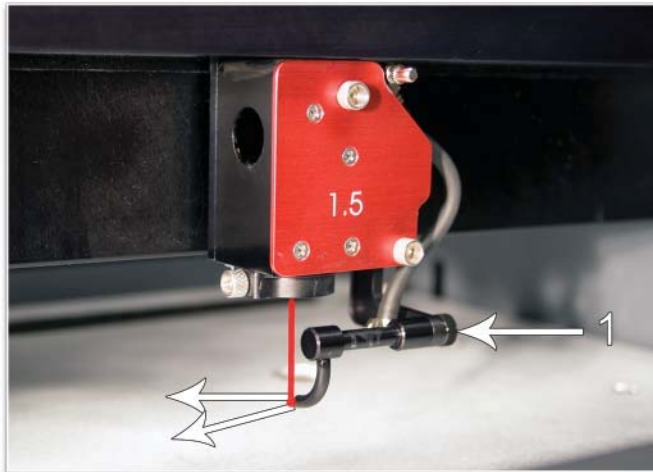
1. Remove (if present) the plug screw (1) with a flat bladed screwdriver. Attach the mounting block (2), if not already attached, with the provided mounting screw using a 3/32 Allen wrench (once the mounting block is installed, it can be left in place).



2. Using the provided 3/16 nut driver, attach the needle valve (1) to the port from which you removed the plug. Be careful not to cross-thread the small fitting when installing and do not over tighten it (the needle valve will be left permanently installed on the carriage from this point forward). Attach the air assist back sweep (2) to the mounting block using the thumbscrew (3) and adjust it up or down (4) as necessary. Tighten the thumbscrew once it is at the desired height.



- Adjust the angle of the nozzle as necessary by loosening the thumbscrew (1), rotating the bracket and re-tightening the thumbscrew. A convenient way to align the air flow is to focus on the material to be processed and then align the nozzle using the angle and height adjustments toward the red target laser which is on when the laser system is powered on and the top door is open.



Air Flow adjustment

The needle valve can be used to adjust air flow for different applications. It is best to start with the needle valve at maximum flow (turn the needle valve counterclockwise until it seats), then adjust as necessary.

Removal

Remove the height adjustment thumbscrew and detach the air assist back sweep from the mount. You can re-attach the thumbscrew to the mount so as not to lose it. Detach the hose from the needle valve by using a small wrench or needle nose pliers to loosen the nut that attaches the hose to the needle valve and unthreading the nut from the needle valve. The needle valve will stay with the carriage.

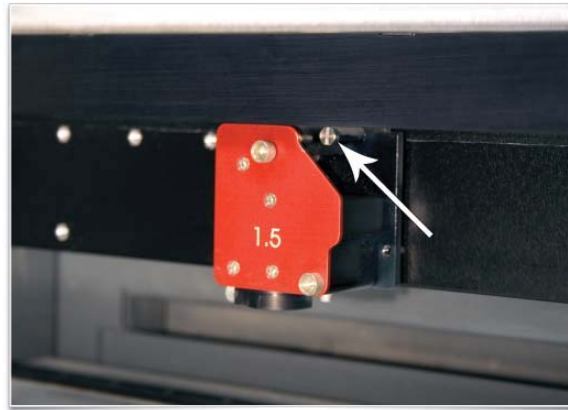
Air Assist Cone

The cone attaches to the base of the Focus Carriage and will force air directly onto the surface of your material. It also helps to protect the lens from contamination.

CAUTION: Do not install the cone unless you plan on using Air Assist and never use the Air Assist Cone without proper airflow. Leaving the cone attached to the cone base and running the laser system without airflow will cause smoke from laser processing to be drawn up into the cone and rapidly damage the focus lens.

Installation

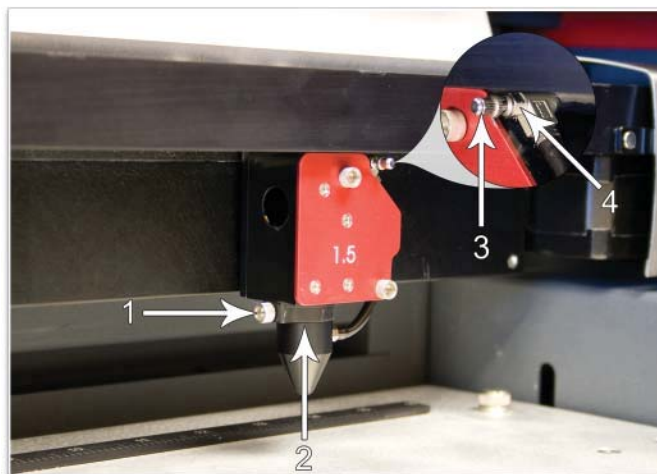
1. Remove (if present) the plug screw with a flat bladed screwdriver.



2. Using the provided 3/16 nut driver, attach the needle valve to the port from which you removed the plug. Be careful not to cross-thread the small fitting when installing and do not over tighten it (the needle valve will be left permanently installed on the carriage from this point forward).



3. Loosen the thumbscrew (1) on the side of the Focus Carriage (if already attached). Insert the cone (2) into the cone base on the bottom of the Focus Carriage until it bottoms out and gently tighten the thumbscrew.



Air Flow adjustment

The needle valve can be used to adjust air flow for different applications. It is best to start with the needle valve at maximum flow (turn the needle valve counterclockwise until it seats), then adjust as necessary.

Removal

Loosen the thumbscrew and pull the Cone downwards. Leave the thumbscrew attached to the Focus Carriage by re-tightening. Detach the hose from the needle valve by using a small wrench or needle nose pliers to loosen the nut that attaches the hose to the needle valve and unthreading the nut from the needle valve. The needle valve will stay with the carriage.

ULS Computer Controlled Compressed Air Unit

The ULS Computer Controlled Compressed Air Unit provides a 60 PSI @ 2.5 cfm (4.1 bar @ 4.25 cubic meters/hour) source of clean, dry, oil free compressed air for air assisted laser material processing. It must be used in conjunction with either the Air Assist Cone or Air Assist Back Sweep accessory.

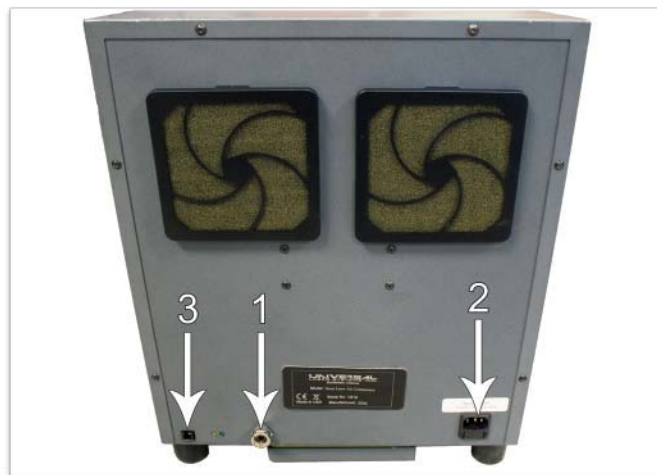
CAUTION: Air Assist can decrease frequency of cleaning for the optics, but will not decrease the need for maintenance as a whole.

Installation

1. Insert one end of the provided blue coil hose into the air supply fitting on the back of the laser system.



2. Then connect the other end of the blue coil hose to the ULS Computer Controlled Compressed Air Unit (1).
3. Connect a power cord to the power inlet (2) and then connect the power cord to a grounded electrical outlet.



4. Connect the provided communications cable between one of the laser system Serial ports and the Serial port (3).

Operation

Operation of the compressor is automatic if all of the connections are properly made and the unit has power. The ULS Computer Controlled Compressed Air Unit will automatically power on when the laser system starts a job, and then power off automatically when the job is complete.

Maintenance

At least once per month, check the condition of the two filters on the back of the device. If they are dirty, simply remove them by snapping off the covers, removing the filter media, washing them out with mild soap and water, drying the filters and re-installing.



Exhaust Air Filtration Unit

The exhaust air filtration unit provides exhaust flow to remove the smoke and fumes generated during laser processing of materials. It also contains a three stage filtration system to clean the exhaust air removed from the laser system. The three stage filtration system consists of a pre-filter to remove coarse particulates, a HEPA filter to remove fine particulate and an activated charcoal filter to remove fumes and odors. A high-pressure vacuum motor is employed to provide the air flow. The filtration unit also serves as a base for the laser system.

To reduce noise and prolong filter life, the filtration unit only operates while the laser system is running a job.

The filtration unit has sensors to monitor the pre and HEPA filters and a consumption meter to monitor consumption of the carbon filter. The UCP provides warnings when it is time to change each filter.



Note: Always keep a spare set of filters on hand to reduce downtime.

Filter replacement

The Carbon filter is housed in the bottom drawer of the filter unit and the Pre and HEPA filters are housed in the top drawer. To replace any of the filters, open the drawer and remove the drawer lid. Remove the filter and replace it with a new one. The HEPA filter is underneath the pre filter so you will have to remove the pre filter to gain access to it.

Maintenance

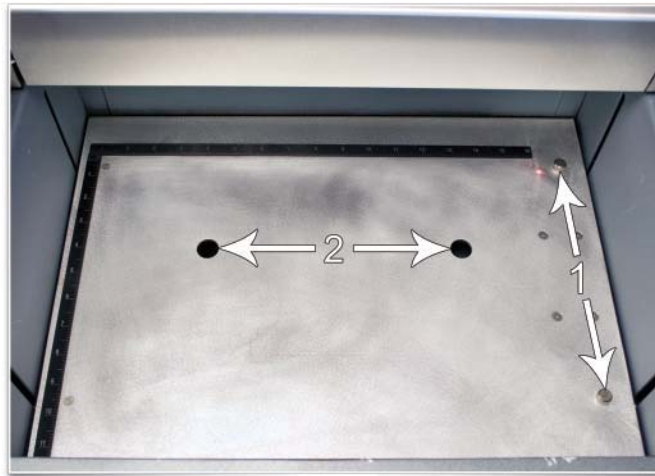
The area around the pre filter and the chamber above the HEPA filter may become dirty over time. It is a good idea to take an opportunity to clean these areas with a vacuum cleaner and/or a wipe down with a mild soap solution when replacing these filters.

Cutting Table

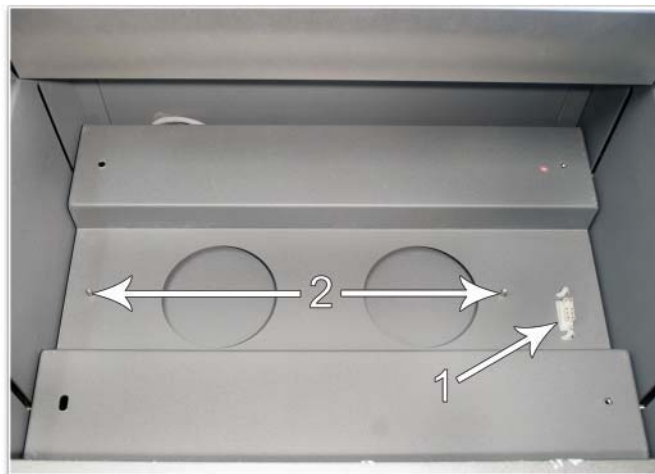
The cutting table is used to support material when cutting so that exhaust flow is redirected both above and below the material for clean cuts. Without it, smoke and debris can build up underneath the material causing the surface of the material to be damaged. The cutting table also helps to reduce damage to the surface of the material from laser back reflection which can occur when the laser reflects off of the table supporting the material if you attempt to cut without the cutting table.

Installation

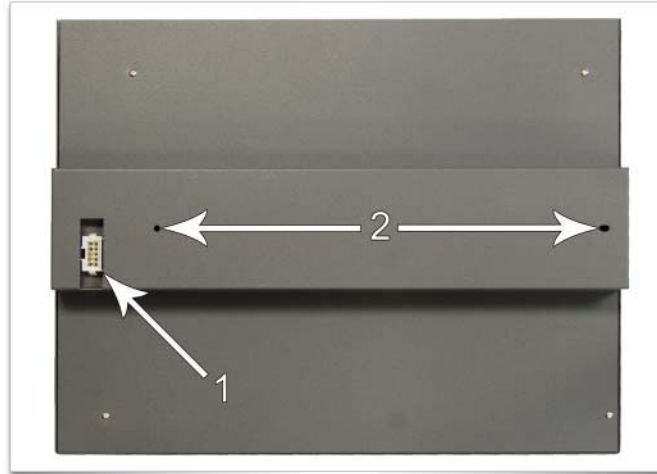
1. Turn on your laser system.
2. Lower the engraving table to the bottom of its travel.
3. Remove the engraving table by loosening the two captive thumbscrews (1). Then, using the finger holes (2), carefully lift the table out of the laser system.



4. The table support platform underneath contains a self-aligning electrical connector (1) and the two alignment pins (2).

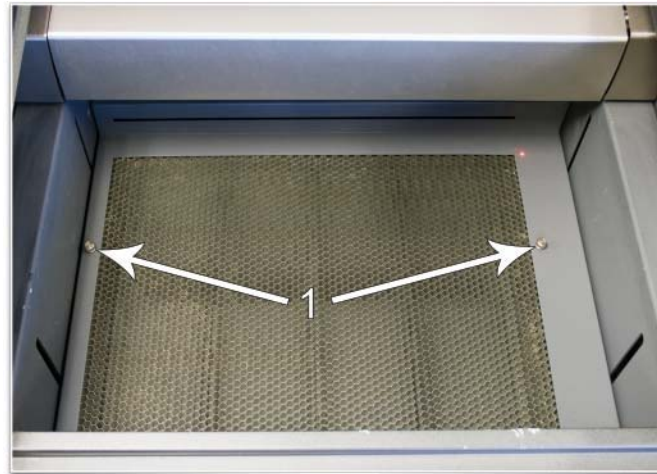


5. Locate the self-aligning electrical connector (1) and two alignment holes (2) on the underside of the cutting table.



6. Using the thumbscrews as handles (1), install the cutting table into the machine (the cutting table is hot swappable so it is not necessary to turn power off to switch between table and cutting table) and adjust it until it engages the connector and alignment pins. The cutting table will be detected automatically and Z axis zero position will be adjusted automatically to the top surface of the cutting table.

CAUTION: The cutting table must be calibrated to the laser system in order to function properly. Calibration is performed at the factory, however, if the zero position does not appear to be correct you may need to recalibrate the table. See the calibration instructions below.



Cutting Table Focus Lens Calibration

To properly use the cutting table with the Auto-Z feature in the printer driver, the cutting table must be calibrated to the lens you are using. This is done at the factory when the laser system ships. You can check calibration by using the manual focus tool to focus on the surface of the cutting table. Make sure to use the manual focus tool included with the lens installed in the laser system and that the lens selected in the system tab matches the lens installed in the laser system. Once focused, the Z position indicated in the UCP should be 0" +/- .020" (.508 mm). If not, recalibrate the table by selecting the cutting table Calibrate button in the system tab and following the instructions.

Maintenance

As you use the cutting table, material from the cutting process may fall through the honeycomb surface and collect in the bottom of the cutting table. Periodically check this area and remove any material that has collected there.

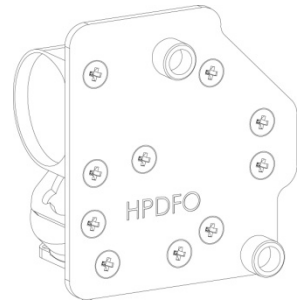
CAUTION: If left to build up in the bottom of the cutting table, this scrap material can be a fire hazard.

The honeycomb material that makes up the support surface for materials being cut will wear out over time and can easily be replaced. New honeycomb can be purchased from the Customer Service Team at ULS. To replace the material, remove back panel of the cutting table. Remove the old honeycomb and replace it with a new one. Reinstall the back panel.

HPDFO

High Power Density Focusing Optics (HPDFO) has a smaller focal spot size than a standard 2.0" inch lens. Depending on the type of material being processed, the effective spot size produced by the HPDFO can be as small as 1/4th the size of a standard 2.0" focusing lens.

With a smaller spot size (higher power density), depending on your material, you can engrave smaller text, produce sharper graphics and photographs and vector mark and cut thinner lines with the same laser power. With the HPDFO it is also possible to scribe and/or etch some uncoated metals, such as stainless steel, directly without the assistance of chemicals or coatings.



The HPDFO replaces the standard lens kit in the carriage and comes with its own calibrated focus tool which should always be used when focusing with the HPDFO.

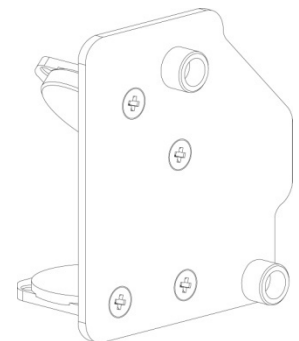
Installation

1. Turn off the laser system.
2. Rotate the X axis arm cover up and out of the way.
3. Remove the two thumbscrews that hold the lens kit in place and slide the lens kit out.
4. Replace the standard lens kit with the HPDFO lens kit.
5. Before running a file, select HPDFO from the lens size list on the UCP's System Tab.

Lens Kits

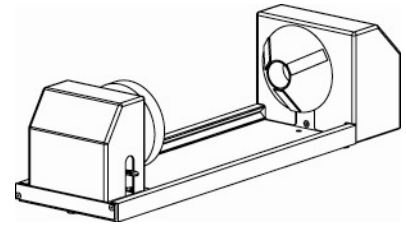
There are two Focus Lens Kits available for your laser system; 2.0 and 1.5, along with the High Power Density Focusing Optics (HPDFO). Included with each kit is its own calibrated focus tool.

Different lenses produce different spot sizes and have different focal ranges. For example, the 1.5 lens produces a spot size of 0.003" (0.076 mm) and has an effective focal range of +/- 0.075" (1.91 mm). This lens can engrave very fine detail, but can only be used on very flat materials. The 2.0 lens has a spot size of 0.007" (1.77 mm), but has an effective focal range of +/- 0.140" (3.5 mm) making it much less sensitive to flatness of material and accuracy of focus, but with the trade off of a larger spot size. Contact Universal Laser Systems customer support for help in choosing the right lens for your application.



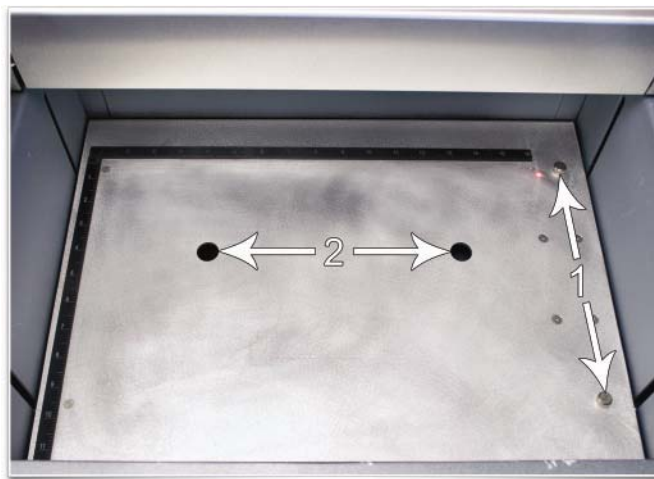
Rotary Fixture

The Rotary Fixture allows the laser system to engrave and mark on cylindrical objects. The Rotary fixture is equipped with an external cone shaped fixture mounted to the fixed, motorized end and an internal cone shaped fixture attached to the adjustable end allowing the fixture to hold a variety of objects such as wine glasses, mugs, cups, etc. Additional internal and external cone fixtures can be purchased by contacting the ULS Customer Service Team at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com.

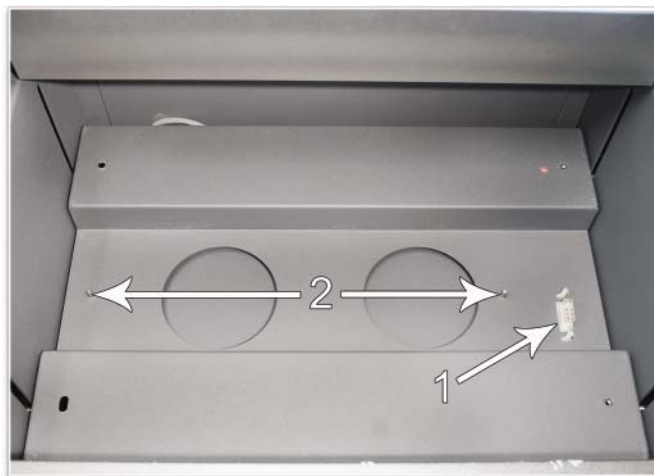


Installation

1. Remove the engraving table by loosening the two captive thumbscrews (1) and using finger holes (2) lift the table out of the laser system.

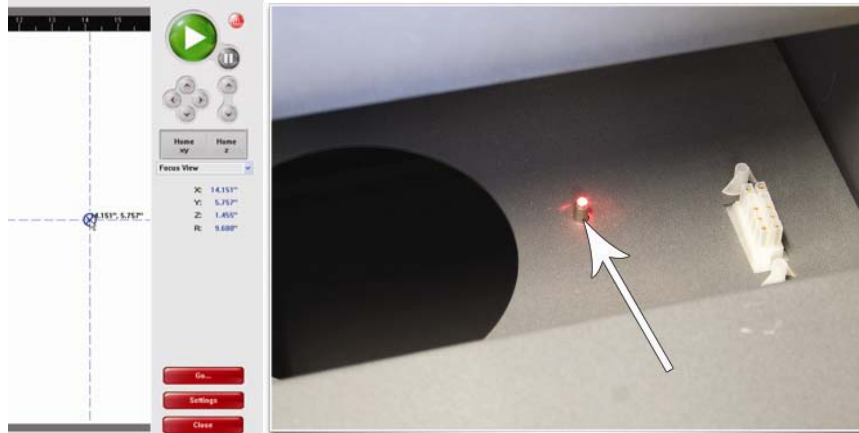


2. Underneath the engraving table you will find a large recessed slot with a self-aligning rotary connector to the right side (1) and the two alignment pins (2). If you are using the rotary for the first time or replaced the laser system's CPU, rotary position calibration may be needed, if so proceed to Rotary Position Calibration below. If rotary calibration is not needed proceed to step 3

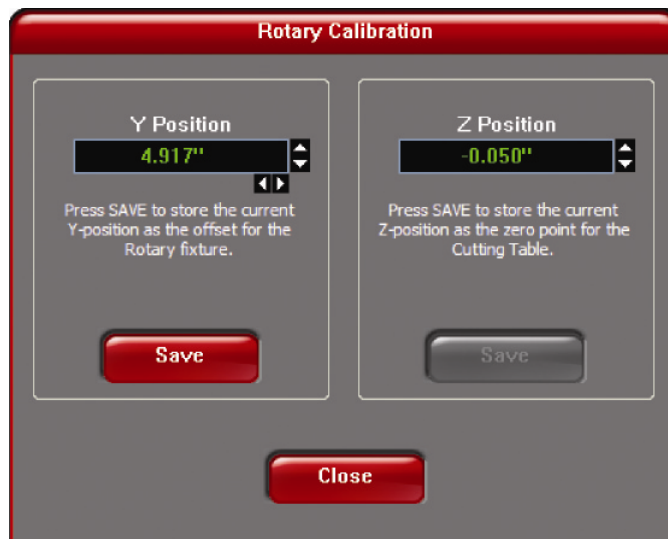


Rotary Position Calibration

- a. Raise the Z-Axis platform to the top of its travel (engraving table should be removed first).
- b. In the UCP Viewer Tab, select the Focus Feature on the Viewer Tab. Using the mouse pointer and the manual motion keys in the UCP move the carriage manually and center red alignment pointer on the right alignment pin.

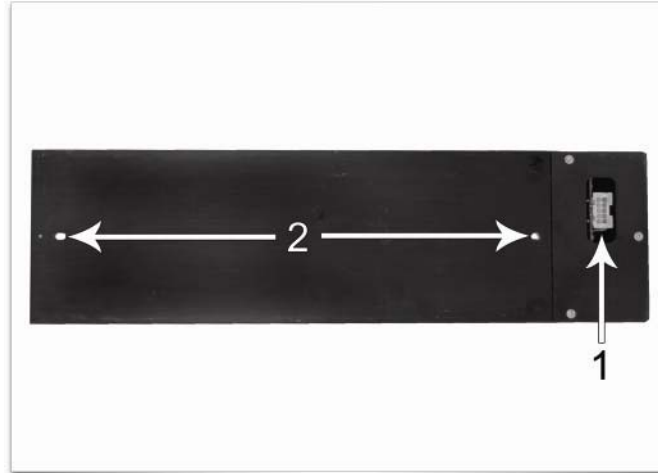


- c. Next, select the System Tab and press the Rotary CALIBRATE button to activate the Rotary Calibration Window. Press the Y position SAVE button while the red alignment laser is still located on the right alignment pin. If asked to override the current position, accept the new position. Once the Rotary Calibration window is closed the focus carriage will re-home.



- d. Go back to the Viewer Tab and exit the focus feature.

3. Lower the laser system engraving table enough to install the rotary fixture. Make sure the motion system will clear the top of the rotary fixture.
4. On the underside of the Rotary Fixture locate the self-aligning electrical connector (1) and two alignment holes (2).



5. Insert the Rotary Fixture into the recessed slot (It is OK to do so with the power on because the rotary fixture is hot swappable) and adjust until the connector engages, the alignment pins protrude through the alignment holes in the base of the rotary fixture and the rotary is sitting flat. The rotary will indicate that it is installed properly by automatically rotating its cone slightly. If you are using the rotary for the first time or replaced the laser system's CPU, rotary focus calibration may also be needed, if so proceed Rotary Focus Calibration below. If rotary focus calibration is not needed the rotary is ready for use.

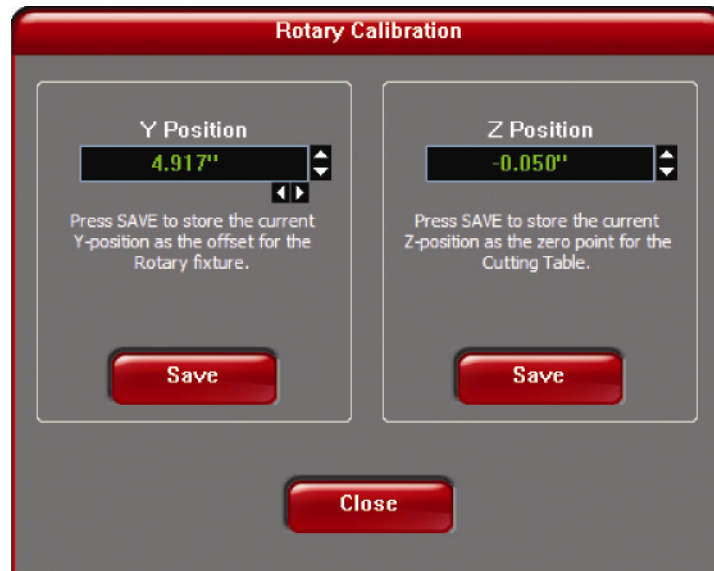


Rotary Focus Calibration

- a. In the UCP Viewer Tab, select the Focus Feature on the Viewer Tab. Using the mouse pointer and the manual motion keys in the UCP move the carriage manually and center red alignment pointer over the flat part of the internal cone fixture. Use the focus tool and manually focus on top of the flat part of the internal cone fixture.



- b. Next, select the System Tab and press the Rotary CALIBRATE button to activate the Rotary Calibration Window. Press the Z position SAVE button ONLY. If asked to override the current position, accept the new position. Once the Rotary Calibration window is closed the focus carriage will re-home.



- c. Go back to the Viewer Tab and exit the focus feature.

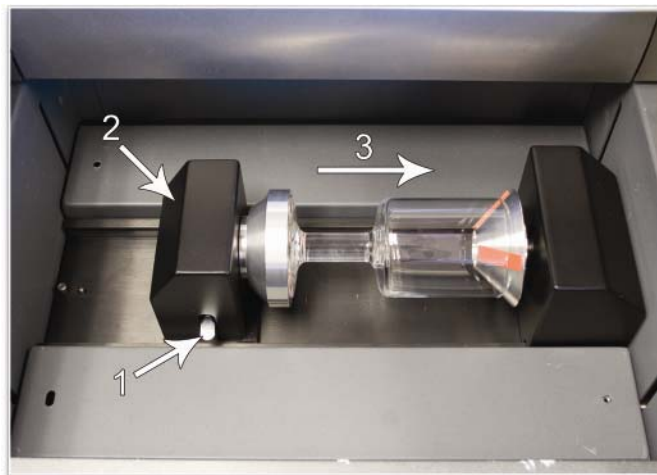
Loading Material

Before loading material into the fixture, measure the diameter (1) of the material in the area where the engraving or marking is to be located, by using a caliper or similar measuring device. A wine glass is used for illustrative purposes here.

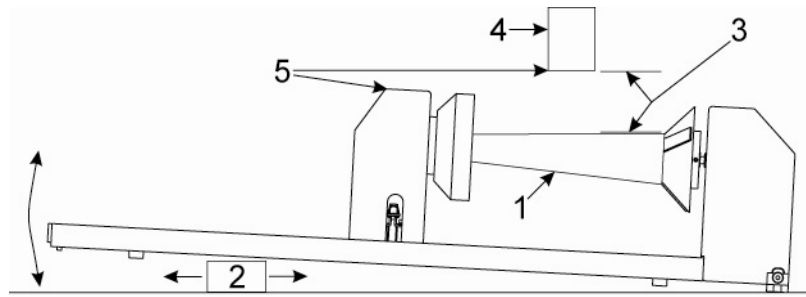


1. Place the open end of the material (4) on the fixed end of the rotary fixture. Lift the lever (2) on the adjustable end of the fixture and slide it up against the base of the material so the material rests firmly centered inside of the inverted cone. Push the adjustable end of the fixture (3) to the right firmly against the bottom of the material. Lower the lever on the end of the fixture to lock the material in place. The rubber pads should keep the material from slipping.

Note: If the material does not have an open end you can purchase an additional internal cone fixture to hold the material. If the material has two open ends you can purchase an additional external cone fixture to hold the material. To change out fixtures, loosen the setscrew that holds the fixture to the rotary shaft, remove the un-needed fixture and replace with the new fixture.



2. Note: If engraving a tapered object (1), the Rotary Fixture can be tilted to maintain proper focus on the tapered surface. To do this, lift the left end of the fixture and place a spacer (2) underneath. Slide the spacer left and right until the tapered surface of the object is parallel (3) to the material support table. Make sure all parts of the rotary fixture clear the motion system.

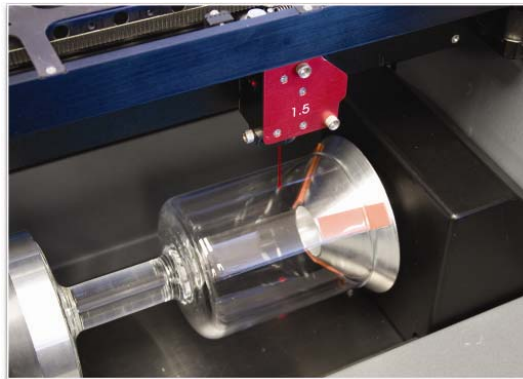


3. Power ON the laser system.

Determining Graphic Placement

The next step is to align the graphics to be printed with the material inserted in the rotary fixture. Again, a wine glass is used for illustration. You can use the X axis ruler or to be more precise use the Red alignment Laser and the X-Y coordinate display in the UCP to position the graphics in the X axis.

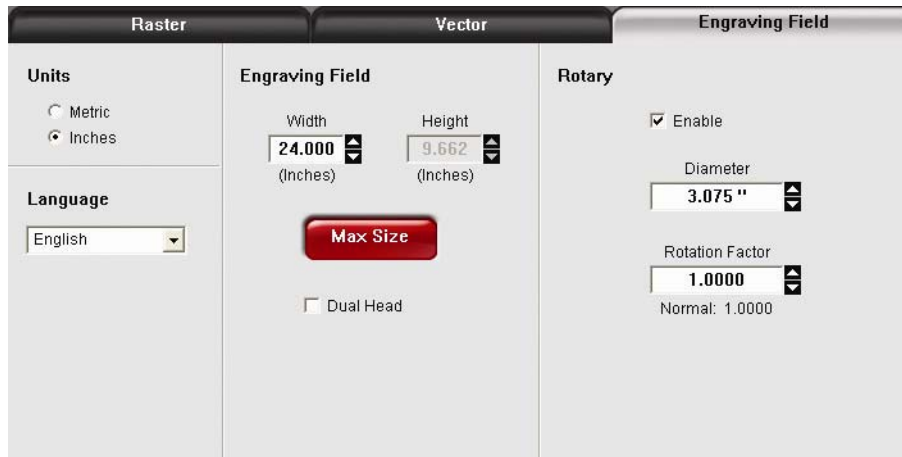
1. Using the Navigation buttons on the UPC, position the Focus Carriage above the material.
2. Move the carriage left or right until the center of the carriage or the red alignment laser is located where you would like the top of the graphic to start on the material as indicated by the right most line in the picture below. Make note of the X coordinate on the ruler or in the UCP.
3. Now, position the center of the carriage or the red alignment laser is located where you would like the graphic to end on the material as indicated by the left most line in the picture below. Make note of the X coordinate on the ruler or in the UCP.



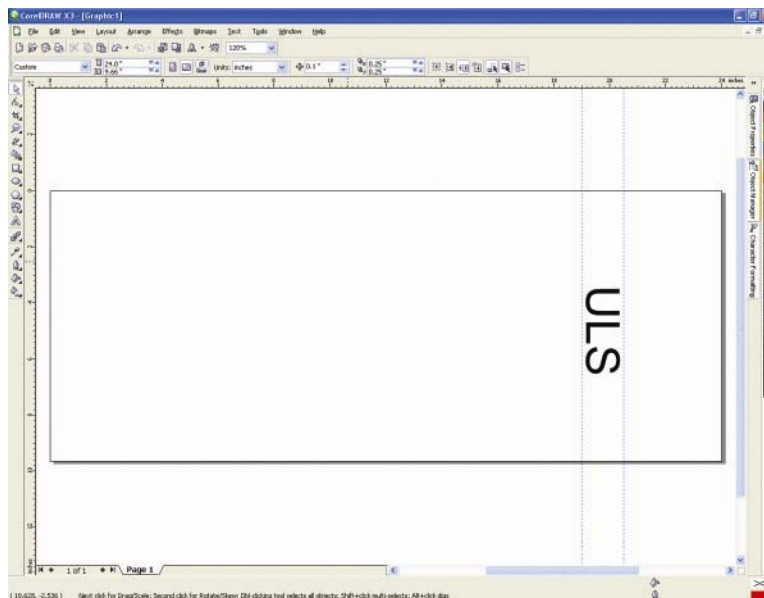
4. Finally rotate the material by hand until the position you want to be the center of your graphic is facing directly up. Keep in mind that the rotary fixture does not have a home location in the rotational axis so the top most part of the material (the part facing straight up) is always the center of the graphic when printing using the materials driver tab or the center of the page when printing using the manual driver tab.

Printer Driver Settings (manual driver tab)

1. Start the graphic software you plan to print the job from and open or create the artwork you plan to print to the laser system then open the print setup dialog in your graphic software, make sure your ULS laser system printer driver is selected and open printer properties dialog.
2. In the ULS printer driver properties dialog, press the Engraving Field sub-tab within the Manual Control Tab.
3. Press the "Max Size" button to make sure the field is maximized before continuing.
4. Then select the "Enable" selection box in the Rotary section to enable rotary mode.
5. Type in the diameter of the material measured earlier.
6. Notice that while typing in the diameter, the height dimension of the engraving field changes automatically. The new height value is equal to the circumference of the material. Make a note of this new engraving field size.



7. Once you have the new engraving field size, exit the printer driver properties dialog.
8. In your graphics software change the page size to equal the new engraving field size from the printer driver dialog.
9. This new vertical dimension of the page is now the circumference of the material to be engraved.
10. Position your graphic on page so that it is located horizontally within the upper and lower engraving limits that you determined earlier and center the graphic vertically as shown below.

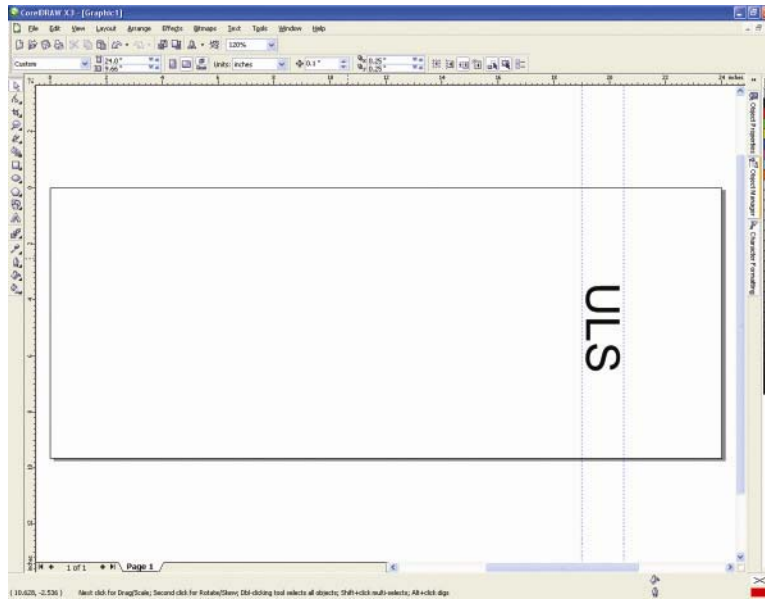


11. Once you are ready to print, select print in your graphics software and check to make sure rotary mode is still enabled and the correct diameter for your material is still entered in the printer driver dialog.
12. Then set the appropriate power and speed settings before printing the job.

Note: Remember, before running a rotary job, to rotate the material by hand until the position you want to be the center of your graphic is facing directly up. Keep in mind that the rotary fixture does not have a home location in the rotational axis so the top most part of the material (the part facing straight up) is always the center of the graphic when printing using the materials driver tab or the center of the page when printing using the manual driver tab.

Printer Driver Settings (materials driver tab)

1. Start the graphic software you plan to print the job from and open or create the artwork you plan to print to the laser system.
2. Position your graphic on page so that it is located horizontally within the upper and lower engraving limits that you determined earlier and center the graphic vertically as shown below.



3. Once you are ready to print, select print in your graphics software and open the printer driver preferences dialog. In the materials driver tab select the material you are going to laser process, select "Rotary" in their fixture section and enter the diameter of the material measured earlier.
4. Finally, printing the job.

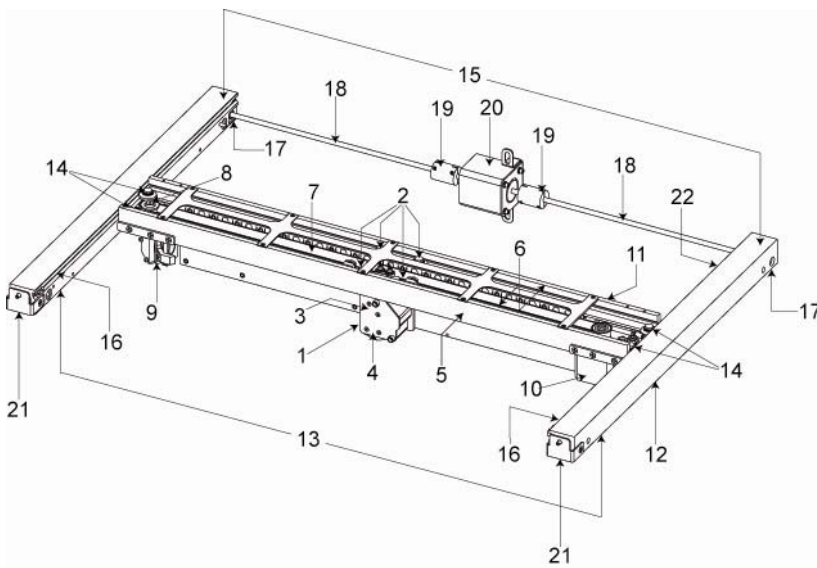
Note: Remember, before running a rotary job, to rotate the material by hand until the position you want to be the center of your graphic is facing directly up. Keep in mind that the rotary fixture does not have a home location in the rotational axis so the top most part of the material (the part facing straight up) is always the center of the graphic when printing using the materials driver tab or the center of the page when printing using the manual driver tab.

Chapter 6 - Maintenance

Overview

Accumulation of dirt and debris on the motion system components will cause uneven or rough engraving, loss of engraving position and premature failure. Accumulation of smoke or dirt on optics can result in loss of laser power and premature failure. It is important to keep your laser system as clean as possible to ensure trouble free operation and best results from laser processing. Always turn the laser engraving system OFF and unplug it before performing any cleaning procedures.

Motion System Components Diagram



1. Focus carriage
2. X-Axis bearing (4)
3. #3 mirror (inside cover plate)
4. Focus lens (inside cover plate)
5. X-Axis rail (arm)
6. X-Axis bearing track (2)
7. X-Axis belt
8. X-Axis idler pulley
9. #2 mirror and holder
10. X-Axis motor and drive gear
11. X-home sensor board
12. Y-home sensor board
13. Y-Axis belt (2)
14. Y-Axis bearing (4) (2 on right side Y-Axis rail, 2 on left side Y-Axis rail)
15. Y-Axis rail (2)(one right side and one left side)
16. Y-Axis rail bearing track (2) (one on right side, one on left side)
17. Y-Axis drive gear (2) (one on right side, one on left side)
18. Y-Axis shaft (2) (one on right side, one on left side)
19. Y-Axis shaft flex coupler (one on right side, one on left side)
20. Y-Axis motor
21. Y-Axis idler pulley (2) (one on right side, one on left side)
22. Y-Axis home sensor magnet

Note: #2 Mirror Cover and X-Axis rail cover have been removed for visibility

Cleaning and Maintenance Supplies

- Mild soap solution mixture of 1 tablespoon (14.78 ml) liquid soap and 1 quart (liter) of water in a spray bottle
- Window cleaner
- Paper towels
- Cotton cloth
- Denatured alcohol (do not use on any painted surface, plastic or the Top Window)
- Acetone (can be used on the engraving table, but nowhere else)

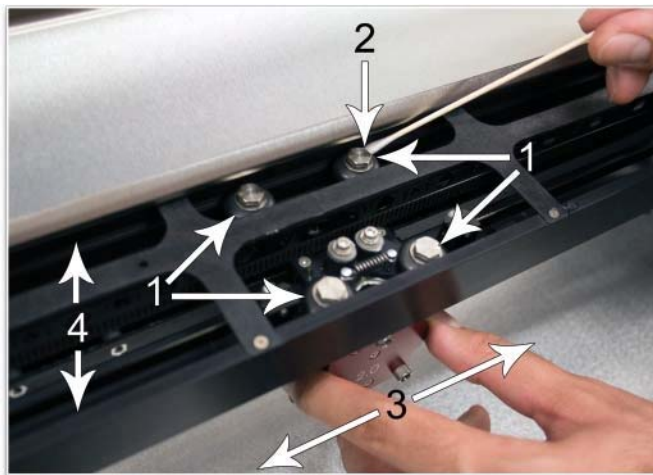
CAUTION: When using acetone or denatured alcohol, please follow the instructions on the printed label of these materials for safe handling procedures.

- Cotton swabs (supplied)
- Lens cleaner (supplied)
- Vacuum cleaner
- Set of Allen wrenches sized from 0.050 to 3/16 inch

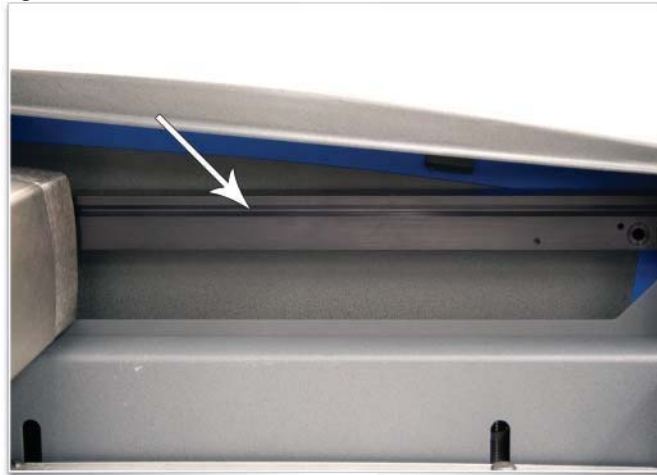
System Cleaning and Maintenance

Motion System

- Vacuum all loose dirt and debris from the inside of the device.
- Clean the processing table surface with either a soap solution, or alcohol, and a cloth or paper towels (acetone can be used in extreme cases to remove gummy deposits, but should be handled carefully as it will melt plastic components of the laser system). Never pour or spray any solution directly into the laser system. Always dampen your paper towel or cloth with the cleaning solution outside of the laser system and then wipe down the parts you are cleaning with the dampened cloth.
- Locate the four X-Axis Bearings (1). Dampen a cotton swab with a soap solution. Place and hold the dampened swab against each in turn bearing as shown (2), grasp the focus carriage (3), move the focus carriage left and right holding the swab on each bearing to roll the bearing against the swab. Also use a dampened swab to clean the length of the x-axis v-grooves (4).



- Dampen a cotton swab or cotton cloth with soap solution and clean the Y axis v-groove shown below. Slide the X-Axis Arm toward the front or rear of the device as necessary to gain access to the entire length of the Y-axis v-groove.



Main Enclosure

- Clean the glass Top/Front door with a non-abrasive cotton cloth, paper towel or facial tissue and window cleaner. The top window is made out of glass; therefore, do not use abrasive cleaning clothes because they will scratch the glass. Also, do not use abrasive chemicals that will damage the glass.
- Use a soft cloth dampened with the soap solution to clean the enclosure. Do not use alcohol, acetone or any other harsh chemical as these will damage the paint.

Optics

A visual inspection of the #2 and #3 mirrors, beam window and focus lens should be performed at least once a day.

CAUTION: Do not clean an optic that appears clean. Excessive cleaning can damage the optical coatings. To prevent contamination, wash your hands thoroughly before handling and cleaning any optic. Try not to touch the optical surfaces with your fingers, handle optics only by the edge or optical housing. Fingerprints can damage the optical coatings.

Never clean any optic right after engraving or cutting because the optic may be hot and the cool lens cleaning solution may thermally shock the optic and crack it.

#2 Mirror

To gain access to the #2 mirror rotate the X axis rail cover up and out of the way. Locate the #2 Mirror Holder handle on the left end of the rail (red) and gently slide it out of the holder. It is held in place by magnets so you may feel a slight resistance as you are sliding it out.

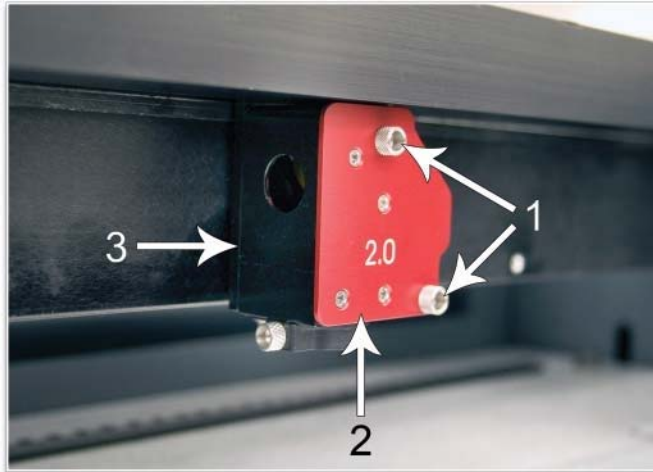


Inspect the #2 mirror and clean it only if there is debris present. To clean the #2 mirror with a cotton swab, moisten the cotton swab with the lens cleaning solution supplied with the laser system. Do not use other types of cleaners or solutions. Gently roll the cotton swab across the mirror once. Do not drag the swab or roll it back and forth as this can scratch the mirror. If the mirror did not come clean, use a fresh cotton swab and repeat the procedure. Reinstall the mirror by sliding it back into its holder until seated.

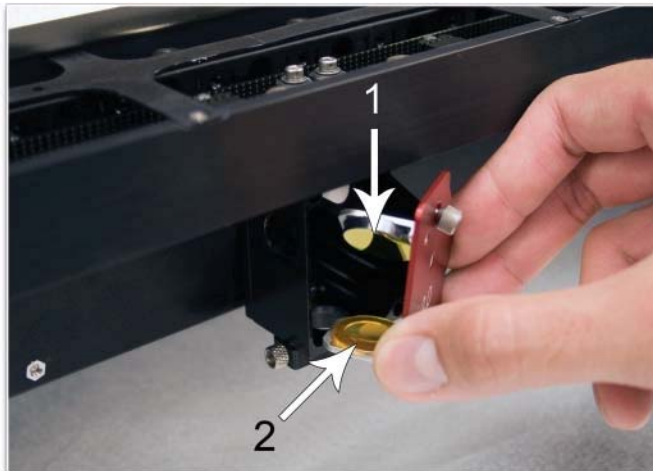
CAUTION: When reinstalling the mirror make sure not to install it backwards.

#3 Mirror and Focus Lens

Loosen the two thumbscrews (1). They are held captive by retaining clips so they should remain with the cover. Grasp the Front Cover Plate (2). Gently slide it forward and out of the Focus Carriage (3).

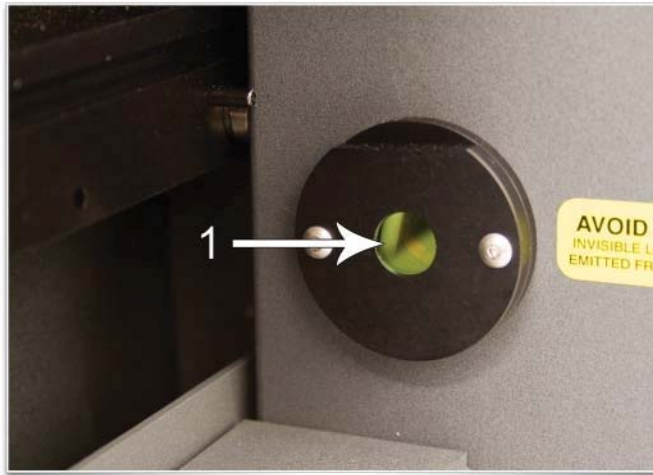


Inspect the #3 Mirror (1) and Focus Lens (2) and clean as necessary. Be sure to inspect both the top and bottom of the Focus Lens. Use the same cleaning method described for the #2 mirror to clean #3 mirror and lens. Make sure to use a fresh swab for each pass.



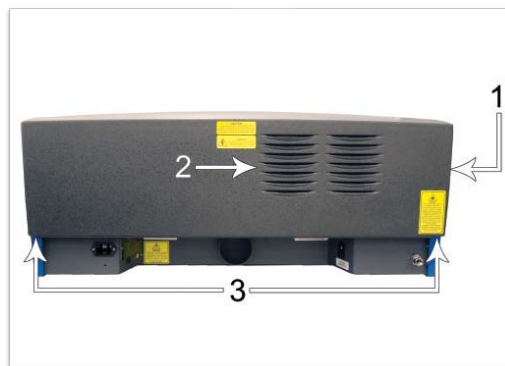
Beam Window

The Beam Window (1) is located where the laser beam enters into the processing area. It is located in the upper left hand corner of the engraving area against the back wall and is yellow in color. It is only necessary to clean the front side of the beam window. Do not remove the optic to clean it; simply clean it in the same manner as the #2 mirror.



Cooling Fan Filters

The side (1) and rear (2) cooling fan filters are located inside the Rear Cover. To access them, remove the two mounting screws (3) underneath the rear of the system. Lift the cover straight up and off. Locate the filters on the inside of the rear cover and on the inside of the side vent panel. Remove the plastic retainers and the filter media. Rinse the filter media with soap and water. Allow them dry before re-installing.



Exhaust Plenum

The exhaust plenum should be routinely inspected and cleaned to ensure good exhaust flow. To access the inside of the exhaust plenum, lower the engraving table to the bottom of its travel and remove then remove the table by loosening the thumbscrews on the right side and lifting the table out. You can then remove the exhaust plenum cover on the inside back wall of the machine by gently pulling on it. It is held in place by snap fasteners. Clean the inside of the plenum with a mild soap solution and then reinstall everything in the reverse order.

Adjustments and Lubrication

Periodic adjustments are not normally required. The bearings in the motion system will self-adjust to take up any clearances as they begin to wear. The belts are fiber-reinforced and will not stretch under normal use so periodic tension adjustment is not necessary. All bearings in the system are sealed and do not require lubrication. Do not lubricate the tracks that the bearings ride in.

Maintenance Schedule

We recommend the following schedule:

As necessary

- Clean engraving table
- Clean main enclosure
- Clean top door window

Every 8 hours of engraving

- Clean X-Axis and Y-Axis bearings
- Clean X-Axis and Y-Axis rails and bearing tracks
- Clean X-Axis belt
- Check beam window, #2 mirror, #3 mirror and Focus lens for debris. Clean ONLY if dirty.

Every month

- Clean cooling fan filters
- Clean Z-Axis lead screws with white lithium grease
- Check for X-Axis and Y-Axis belt wear. Replace as necessary.
- Check and/or clean X-Axis and Y-Axis drive gears
- Check for X-Axis and Y-Axis bearing wear. Replace as necessary.
- Inspect system for loose screws and mechanical parts. Tighten as necessary.

Every 6 months

- Clean exhaust plenum

Note: If you have any questions about maintaining the laser system, please contact the ULS Customer Service Team.

