XLS10 User Guide
XLS10.150 & XLS10MWH™

Version 1.0
August 18, 2016

www.ulsinc.com

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

Universal Laser Systems (ULS) 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, ULS 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 products at: *info@ulsinc.com*.

Should you have any questions, please contact ULS Factory Support Team at:

> +1 480 609-0297 (USA)
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> +43 1 402 22 50-28 (Austria)
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> +81 (45) 224-2270 (Japan)
>
> Email us at *support@ulsinc.com*

Again, thank you for choosing ULS.

Your Universal Laser Systems Customer Service Team

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About This Guide

This User Guide provides system specifications, instructions, and reference information for the XLS10.150D and the XLS10 MultiWave Hybrid™ (XLS10MWH) laser systems.

This guide contains the following chapters:

1	*System Specifications*	Lists the specifications of the XLS10.150D & XLS10MWH™ laser systems.
2	*Safety*	Contains important safety information about the XLS10 laser system.
3	*Getting to Know the System*	Provides a high-level overview of the system components, LCD Control Panel, and Laser System Manager™ (LSM) User Interface.
4	*Laser System Manager (LSM)*	Provides detailed descriptions of all options in the LSM and instructions on how to use each option.
5	*Laser Processing Settings*	Provides detailed descriptions of all options in the Laser Processing Settings component and instructions on how to use each option.
6	*LCD Control Panel*	Provides detailed descriptions of all options in the LCD Control Panel and instructions on how to use each option.
7	*Third-Party Graphics Software*	Describes how to set up the third-party graphics software to work with the XLS10.150D & XLS10MWH™ laser systems.
8	*Material and System Preparation*	Describes how to prepare material and the system for laser processing.
9	*Laser Processing Options*	Explains how to set up and configure options for the XLS10.150D & XLS10MWH™ laser systems.
10	*Maintaining the System*	Provides instructions for maintaining the XLS10.150D & XLS10MWH™ laser systems.

System Specifications 1

MEET THE XLS10.

Universal Laser Systems (ULS) XLS10 platform-based laser systems are designed and ideally suited for precision 2D cutting and surface modification in product research and development, academic research, prototyping, pre-production and production environments. Major features of the new platform include rapid, high-accuracy laser beam positioning and the flexibility to be configured with 9.3μm and 10.6μm CO_2 lasers and 1.06μm Fiber lasers. All lasers are air-cooled in a range of power from 10W to 150W for CO_2 and 40W to 50W for fiber lasers.

The variety of wavelengths and power ranges make the XLS10 highly-effective in the areas of organic material modification, including plastic films, industrial fabrics, engineering plastics, laminating adhesives, composite materials, and many others. Additionally, when equipped with high-power lasers, the XLS10 can be used for thin metal cutting, micro-machining and direct metal marking.

For optimal materials processing flexibility, an XLS10 system can be equipped with MultiWave Hybrid™ technology, offering the broadest range of compatibility with otherwise challenging-to-process materials, in industries from Aerospace and Electronics to Consumer Goods Manufacturing. This unique technology uses a combined beam of laser power containing up to three wavelengths – 9.3μm, 10.6μm and 1.06μm – in a single coaxial beam. Each spectral component of the beam is independently controlled and can be modulated in real time.

The XLS10 laser system is designed to operate primarily in a Class1 configuration however an optional Class 4 Conversion Module is available to enable the XLS10 to accommodate long parts or materials or automated processes.

ADVANCED FRICTIONLESS MOTION SYSTEM

The XLS10 frictionless motion system provides smooth, fast, and precise movements over the processing area, improving throughput and accuracy while virtually eliminating vibration.

Located in the X-axis arm, the hydrostatic bearings float on a cushion of air provided by the integrated Compressed Air Source. Compressed air is also directed at all of the optics to both clean and cool them.

OTHER ULS PLATFORM FEATURES

ULR Laser Sources

ULS's air-cooled, metal core CO_2 laser sources have a mode-replicating, free-space slab resonator and an integrated RF power supply. They produce an excellent quality beam with even power distribution, making them ideal for precise laser material processing. The lasers are tuned at the factory, so upon installation the system automatically knows what type, wattage, and wavelength laser source(s) is/are installed and communicates that information to the integrated Laser System Manager (LSM) software. The combination of technologies involved in this design not only allow ULS laser sources to be compact, but also permit both pulsed and true continuous wave (CW) operation.

Modular Architecture

The ULS "building block" architecture features easily reconfigurable, field upgradeable platforms, laser sources, feature options, and focusing optics. And as the number of materials suitable for laser cutting, marking and engraving grows, it is important to be able to adapt your laser system to achieve optimal results or to reconfigure your system with virtually zero downtime. In a multiple-system configuration, components can be shared between systems or new components can be added or removed as required by your applications.

Rapid Reconfiguration™

ULS offers a full range of factory-aligned laser sources designed to be field-interchangeable, with no special tools or training needed. This technology allows you to adapt your laser materials processing solution to match your business needs quickly and easily. At its core, Rapid Reconfiguration allows users to simply install and reinstall any ULS laser source(s) onto virtually any current ULS laser system.

Class 4 Conversion Module

This ULS option provides the hardware and safety features necessary to convert the laser system into an open Class 4 laser device, allowing you to process continuous rolls of material or objects that are too large to entirely fit on the work surface.

SuperSpeed™

Optional SuperSpeed produces two independently-controlled laser beams, increasing productivity by more than 50%. It is the definitive solution for high-throughput Raster marking applications. When using SuperSpeed, the Carriage is able to skip every other line and process two Raster lines in one stroke, reducing mechanical wear by half, decreasing scheduled maintenance, driving down service costs and increasing system uptime.

The XLS10.150D & XLS10MWH™ have the following specifications:

	XLS10.150D	XLS10MWH™
Laser Material Processing Area (W x H)	40 x 24 in. (1016 x 610 mm)	
Maximum Part Size (W x H x D)	Within laser platform enclosure: 61 x 33 x 12 in. (1550 x 838 x 304 mm) Class 4 Conversion Module installed: ∞ x 33 x 12 in. (∞ x 838 x 304 mm)	
Material Support	Up to 80 lb (36 kg) lift capacity	
Laser Configuration Supported	• Single CO_2 laser • Dual CO_2 lasers	• Single and dual CO_2 lasers • Single fiber laser
Laser Power Range Supported	• CO_2 (10.6μm) 10 to 150 watt • CO_2 (9.3μm) 30 to 100 watt	• CO_2 (10.6μm) 10 to 150 watt • CO_2 (9.3μm) 30 to 100 watt • Fiber (1.06μm) 40 to 50 watt
Laser Safety	• CO_2 & Fiber laser: Class 1 • Red Laser Pointer Class 2 • Class 4 Conversion Module (Optional)	
Standard Focusing Lenses	• 2.0 in. (51 mm) • 3.0 in. (76 mm)	
Overall Dimension (W x H x D)	69.2 x 61 x 55.5 in. (1758 x 1550 x 1410 mm)	
Laser Source Weight	• 10W = 13 lb (6 kg) • 25/30W = 20 lb (9 kg) • 40W= 23 lb (10 kg) • 50/60W = 26 lb (12 kg) • 75W = 29 lb (13 kg)	
Laser System Weight	Approximately 850 lb (386 kg) excluding lasers	
Power Requirements	Dual receptacle 208/230V AC/30A 50/60Hz Single-Phase	
Exhaust Requirements	External exhaust or air filtration unit required (consult factory for specifications)	
Computer Requirements	• Dedicated Windows 7 or higher PC (32-bit and 64-bit) • 2.0 GHz Quad-Core processor (minimum) • 8 GB of RAM (minimum) • 250 GB hard drive (minimum) • Monitor (minimum 1280 x 1024 resolution) • Mouse and keyboard (unless using a Touchscreen) • Available USB 2.0 hi-speed or USB 3.0 compliant port only • Internet connection and email address (optional)	

Operating Environment	Well-ventilated office (recommended) or clean, light-duty manufacturing facility
Operating Temperature	50⁰F to 95⁰F (10⁰C to 35⁰C) capable 73⁰F to 77⁰F (22⁰C to 25⁰C) for best performance
Storage Temperature	50⁰F to 95⁰F (10⁰C to 35⁰C)
Operating Humidity	Non-condensing
Power Consumption	Varies depending on laser power setting, up to 5000 watts
Exhaust System for Laser Material Processing	6" exhaust port requiring high-pressure vacuum blower capable of: 700 CFM (cubic feet per minute) @ 6 inches static pressure (1190 m3/hr at 1.5 kPa)
Laser Beam Positioning Resolution	+/- 0.0005 in. (12 microns) (2000 dpi)
Control	Requires a dedicated PC or Embedded PC to operate system control service; UI can run on same computer or across network. Requires Windows 7 or higher PC (32-bit and 64-bit)
Laser Processing Options	• Lateral Gas Assist Attachment • Automation Interface • Universal Camera Registration • Class 4 Conversion Module • Flow-Through Cutting Table • Embedded PC • Fire Suppression with Over-Temperature Sensors • HPDFO™ Lens Kit (10.6µm CO_2 Only) • Pin Table • Rotary Fixture • SuperSpeed™ (10.6µm CO_2 Only) • Traveling Exhaust

Safety 2

DESCRIPTION OF APPROPRIATE USE

This device is designed for laser material processing (cutting, marking, 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 (Class 1 laser safety), unless using the optional Class 4 Conversion Module (see *Laser Safety When Using the Optional Class 4 Conversion Module*).

> ⚠️ *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 (FDA) 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 instructions and safety guidelines listed in this manual can result in personal injury and may cause damage to the equipment and surrounding property. If you have any questions please contact the ULS Factory Support Team at: +1 480 609-0297 (USA), +43 1 402 22 50-28 (Austria), +81 (45) 224-2270 (Japan) or email us at: *support@ulsinc.com.*

> ⚠️ EXPOSURE TO THE LASER MATERIAL PROCESSING BEAM CAN RESULT IN BURNS TO THE SKIN 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 exposure to hazardous laser radiation.
>
> WHEN USING THE OPTIONAL CLASS 4 CONVERSION MODULE, PROPER EYEWEAR MUST BE USED AT ALL TIMES WHEN THE BEAM INDICATOR IS ILLUMINATED ON THE CLASS 4 CONTROL PANEL. Eyewear must be properly-certified for use with and protection from all material processing laser wavelengths in use (10.6 micron, 9.3 micron, and/or 1.06 micron) and be at least optical density 5+. If unsure of proper eyewear requirements, do not operate the laser system with Class 4 Conversion Module installed and consult your certified Laser Safety Officer or contact ULS Factory Support Team for more information.

> ⚠️ Never operate the laser system without constant supervision of all cutting, marking, and engraving processes. 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.
>
> A remote connection to the system across a network does not negate the need for constant supervision of all cutting, marking, and engraving processes.

> ⚠️ Never leave materials in the laser system after processing. 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 Flow-Through Cutting Table, can be a fire hazard. Materials can be hot after processing so caution should be used when handling material immediately after processing. A properly-maintained fire extinguisher should be kept on hand at all times.

Do not attempt to move or lift the laser system by hand. It is recommended to use a fork lift or other mechanical assistance when moving the laser system. If you are unsure about how to move the equipment please consult a professional rigging company or ULS Factory Support Team at: +1 480 609-0297 (USA), +43 1 402 22 50-28 (Austria), +81 (45) 224-2270 (Japan) or email us at: *support@ulsinc.com.*

A properly-configured, installed, maintained, and operational particulate and fume exhaust system is mandatory when operating the laser system. Fumes and smoke from laser material processing must be extracted from the laser system and filtered or exhausted outside.

SOME MATERIALS, WHEN ENGRAVED, MARKED OR CUT WITH A LASER, CAN PRODUCE TOXIC AND CORROSIVE FUMES. Obtain the Material Safety Data Sheet (MSDS) from the manufacturer of each material to be processed. The MSDS discloses all of the hazards when handling or processing a particular material. DISCONTINUE processing any materials that cause 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.

DANGEROUS VOLTAGES ARE PRESENT WITHIN THE ELECTRONICS ENCLOSURES OF THIS SYSTEM. Access to these areas (marked with warning labels) is not necessary during normal operation. If it becomes necessary to open one of these enclosures for any reason, the power cord must first be disconnected from the 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 can result in 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 main disconnect device; the equipment should be located close to an easily-accessible power outlet. To disconnect the equipment from the supply main, 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.

The equipment should be connected to an AC power supply with Zmax = 0.049 Ohms or lower impedance. The end user should consult with their power supply authority to ensure the AC line impedance requirement of EN 61000-3-11:2000 Annex B compliance is met.

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.

CO$_2$ Laser Safety

The XLS10 is designed to support sealed carbon dioxide (CO$_2$) laser sources that produce intense invisible laser radiation at wavelengths of 10.6 and 9.3 microns in the infrared spectrum. The laser source is contained within a Class 1* enclosure designed to completely contain the CO$_2$ 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.*

- Laminated safety glass is employed in the viewing window to block 10.6 and 9.3 micron laser radiation transmission from CO$_2$ lasers, allowing safe observation of laser material processing. The viewing window is optical density 5+ for 10.6 and 9.3 micron laser radiation. Do not operate the laser system if the view port is damaged, with any of the doors removed, or if any of the safety interlocks are defeated.

- The intense light that appears during the engraving, marking 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 Laser Pointer (Class 2) to aid in positioning material to be cut, marked 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 access door(s) are safety interlocked, which will prevent the CO$_2$ laser beam from firing when the access door(s) are opened. The Red Laser 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 CO$_2$ laser radiation, which may result in severe eye damage and/or burns to the skin.

- Always use caution when operating a laser system.

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* 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.

CO$_2$ AND FIBER LASER SAFETY (MULTI-WAVELENGTH LASER SYSTEM)

The XLS10MWH™ is designed to support both sealed carbon dioxide (CO$_2$) and fiber laser sources. CO$_2$ lasers produce intense invisible laser radiation at a wavelength of 10.6 and 9.3 microns in the infrared spectrum and fiber laser sources produce intense invisible laser radiation at a wavelength of 1.06 microns. For your protection, these laser sources are contained within a Class 1* enclosure designed to completely contain both the CO$_2$ laser beam and the fiber 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.*

- Fiber laser radiation is especially damaging to the eye if viewed directly. The XLS10MWH™ laser system employs a viewing window made with a green tinted layer and an optical density of 5+ for 1.06 microns laser radiation from fiber lasers and laminated safety glass to block 10.6 and 9.3 microns laser radiation from CO$_2$ lasers. This viewing window will block transmission of both CO$_2$ and fiber laser radiation, allowing safe observation of laser processing. Do not operate the laser system if the view port is damaged, with any of the doors removed or if any of the safety interlocks are defeated.

- The intense light that appears during the engraving, marking 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 Laser Pointer (Class 2) to aid in positioning material to be cut, marked 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 access door(s) are safety interlocked, which will prevent the CO$_2$ laser or fiber laser beam from firing when the access door(s) are opened. The Red Laser 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 CO$_2$ laser or fiber laser radiation, which may result in severe eye damage and/or burns to the skin.

- Always use caution when operating a laser system.

EXPOSURE TO THE LASER MATERIAL PROCESSING BEAM CAN RESULT IN BURNS TO THE SKIN 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 exposure to hazardous laser radiation.

WHEN USING THE OPTIONAL CLASS 4 CONVERSION MODULE, PROPER EYEWEAR MUST BE USED AT ALL TIMES WHEN THE BEAM INDICATOR IS ILLUMINATED ON THE CLASS 4 CONTROL PANEL. Eyewear must be properly-certified for use with and protection from all material processing laser wavelengths in use (10.6 microns, 9.3 microns and 1.06 microns) and must be at least optical density 5+. If unsure of proper eyewear requirements, do not operate the laser system with Class 4 Conversion Module installed and consult your certified Laser Safety Officer or contact ULS Factory Support Team at: +1 480 609-0297 (USA), +43 1 402 22 50-28 (Austria), +81 (45) 224-2270 (Japan)or email us at: *support@ulsinc.com.*

XLS10 laser systems are equipped with interlocked access panels on either side of the unit. An optional Class 4 Conversion Module is available to allow the user to operate the laser system with the side panels open. This device bypasses the safety interlocks on the side panels of the XLS10 laser system. With this optional device in place, the protective system housing will not fully contain the infrared laser radiation produced by the laser source(s), creating the potential for exposure. Use of this optional device redefines the safety classification of the XLS10 laser system from Class 1, which is considered safe for use under all conditions of normal use, to Class 4, which is considered potentially hazardous. Additionally, the system housing will not contain flames or by-products from potential ignition of materials within the system housing. It should also be noted that damage or ignition of flammable materials in the immediate or remote vicinity can be caused by infrared laser radiation escaping the housing of a system equipped with the Class 4 Conversion Module.

There are a number of mandatory safety measures set by national and international laws and standards that must be complied with when operating a Class 4 laser system. Certain safety measures are provided by the manufacturer through incorporation into the optional Class 4 Conversion Module, including the following:

• **Remote Interlock Connection** – A means of remotely connecting to the interlock circuit of the laser system allowing the connection of remote switches for deactivating the laser. This feature can be used to connect an interlock switch to the doors of the designated room in which the laser system will be operated so that the laser is automatically deactivated when the doors are open.

• **Key Control** – A removable key that prevents unauthorized operation of the laser.

• **Laser Radiation Emission Warning Device** – A visible warning light that indicates when the laser is capable of emitting laser radiation.

• **Attenuator** – A mechanical device to block emission of laser radiation. This device takes the form of a shutter which is manually operated.

• **Class 4 Warning Label** – A Class 4 warning label to indicate the laser system is classified as Class 4.

In addition to a properly-installed exterior exhaust connected to the laser system equipped with the Class 4 Conversion Module, the laser system must be operated only in a continuously well-ventilated area. Certain operational safety measures are the responsibility of the XLS10 laser system Owner when the optional Class 4 Conversion Module is installed. THESE SAFETY MEASURES ARE MANDATORY FOR OPERATION OF CLASS 4 LASER SYSTEMS UNDER FEDERAL AND STATE LAW IN THE UNITED STATES AS WELL AS UNDER THE LAWS OF MOST FOREIGN COUNTRIES.

Many of these safety measures are outlined in ANSI Standard Z136.1 American National Standard for the Safe Use of Lasers or in equivalent standards available in most foreign countries, such as the European Standard EN 60825-1. Other safety measures may be required by state and/or local authorities, for example, the Regulation BGV B2 on laser beams of the German Employer's Liability Insurance Association, and it is the responsibility of the Owner to understand and adhere to these laws. A brief synopsis of the most common safety requirements addressed to Owners of a Class 4 laser system is outlined below:

- In any facility in which a Class 4 laser system is to be operated, an individual must be designated as a Laser Safety Officer (LSO) who will assume the authority and responsibility to monitor and enforce the control of laser hazards. The LSO should be trained in laser safety and be aware of all safety measures set by law. There are many avenues available to acquire this training. Recognized sources of this training are the Laser Institute of America (www.laserinstitute.org), the Employer's Insurance Liability Associations in European countries, or laser safety associations within the Owner's country or territory.

- The Owner of a Class 4 laser system will be responsible for creation of a controlled area in which the Class 4 laser system will be operated. A controlled area is designed to fully contain the laser radiation that can potentially escape from a Class 4 laser system, with measures in place to prevent unauthorized personnel from entering the area, including lighted warning signs outside the designated and controlled area and interlocks on entryways.

- The LSO will be responsible for designating and training all personnel authorized to operate, maintain or service a Class 4 laser system. It will also be the responsibility of the LSO to take measures to inform and restrict all unauthorized personnel from access to a Class 4 laser system.

- The Owner of a Class 4 laser system will be responsible for identifying and providing to all authorized personnel any protective equipment such as specially-designed eyewear, protective equipment and clothing needed when operating, maintaining or servicing a Class 4 laser system. Furthermore, the Owner will ensure that no juveniles operate the laser. If the laser is in use, the user will also ensure that mirrors, lenses, and other reflecting materials are fixed and are only moved in a controlled manner.

- The LSO will be responsible for regularly auditing all safety measures. This includes regular retraining of authorized personnel, serialization and regular inspection (and replacement when necessary) of all special eyewear and clothing and regular inspection of all safety measures surrounding the controlled area in which a Class 4 laser system is operated. The LSO may be required to maintain records as necessary to prove compliance.

- The LSO will be responsible for regular medical surveillance of all authorized personnel operating a Class 4 laser system. For example, this includes but is not limited to, mandatory annual eye exams.

- Class 4 lasers systems must not be used at trade shows or exhibitions.

This list is not all-inclusive. Other mandatory safety measures may be applicable and will vary from state-to-state and country-to-country. IT IS THE RESPONSIBILITY OF THE CLASS 4 SYSTEM OWNER AND THE OWNER OF THE FACILITY IN WHICH IT WILL BE OPERATED TO IDENTIFY AND COMPLY WITH ALL PERTINENT REGULATIONS. In some states, for example, anyone wishing to operate a Class 4 laser system must register with the state radiation regulatory agency, pay annual fees and submit to annual inspections. There may be penalties involved for non-compliance. The United States Occupational Safety and Health Administration (OSHA) has also adopted rules for safe use of lasers in the workplace. The LSO must comply with all Rules and Regulations set by law.

To reiterate, the safety measures relating to operation of a Class 4 laser system are mandatory under Federal and State law in the United States as well as in most foreign countries. If an operator/owner is unable or unwilling to comply with all safety measures required for safe operation of a Class 4 laser system, the optional Class 4 laser conversion module must not be used.

TAMPER PROOF LABELS

All Universal Laser Systems laser sources are equipped with tamper proof labels. There are NO field-serviceable parts inside a ULS laser source. If a ULS laser source needs service, please contact the ULS Factory Support Team at: +1 480 609-0297 (USA), +43 1 402 22 50-28 (Austria), +81 (45) 224-2270 (Japan) or email us at *support@ulsinc.com*.

FIRE SUPPRESSION WITH OVER-TEMPERATURE SENSORS

Fire Suppression does not negate the need for constant supervision of all cutting, marking, and engraving processes.

Fire Suppression is not certified for life safety. It is intended to reduce or eliminate damage to the laser material processing system due to self-sustained combustion of materials during laser processing, resulting from improper setup and/or absence of constant supervision by the operator. It is not intended as a replacement for certified fire suppression equipment as required by local or national laws and regulations. Regardless of the addition of Fire Suppression to the laser system, an operator must be present and in visual range during material processing.

SAFETY LABELS

CDRH and CE regulations require that all laser manufacturers affix warning labels in specific locations throughout the equipment. Do not remove these labels for any reason. If the label(s) become damaged or have been removed for any reason, do not operate the laser system and immediately contact ULS Support Team at: 480-609-0297 (USA), +43 1 402 22 50-28 (Austria), +81 (45) 224-2270 (Japan) or email us at *support@ulsinc.com* for a free replacement.
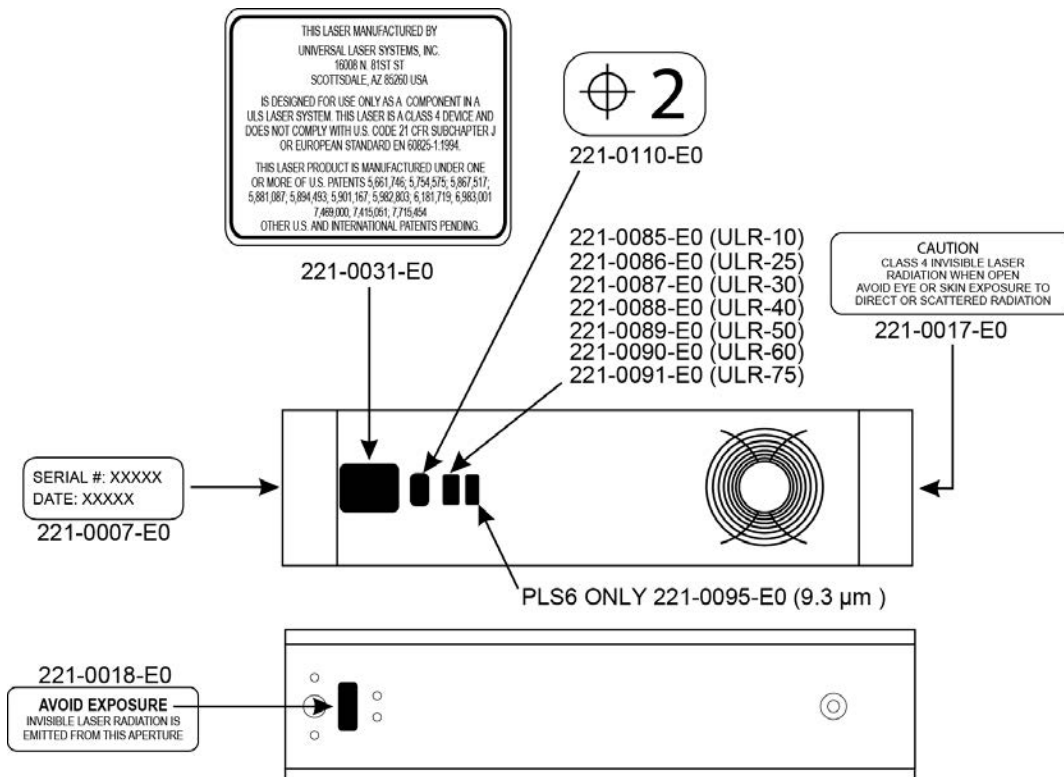
XLS10 CO$_2$ Laser Source Labels

INVISIBLE LASER RADIATION AVOID EYE OR SKIN
EXPLOSURE TO DIRECT OR SCATTERED RADIATION CLASS4
LASER PRODUCT

Wavelength: 1040-1200 nm
Pulsed output-Max average power <120W
Max pulse energy <2.0mJ
Repetition freq. 1-1000kHz
Pulsee duration 1ns-500ns

CW Output power < 120W   EIC/EN 60825-1: 2007

Wavelength: 630-670 nm
Output power < 5mW CW

**VISIBLE LASER RADIATION
AVOID DIRECT EYE EXPOSURE
CLASS 3R LASER PRODUCT**

EIC/EN 60825-1: 2007

COMPONENT FOR INCORPORATION

This product is intended as a component for
incorporation into a laser product, and as such
requires additional features for Laser Safety and to
comply with IEC/EN60825-1 and 21CFR 1040.10

SPI FiberLaser Label
(comes with laser sources from SPI)

XLS10MWH™ Fiber Laser Source Labels

221-0115-E0 (INTERNATIONAL)

CAUTION LASER RADIATION
DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT
EN 60825-1: 2007
LASER DIODE
WAVELENGTH: 630-680 nm
MAX. OUTPUT: 1 mW

221-0114-E0

WARNING
THIS LASER SYSTEM CONTAINS A
COLOR FIBER LASER IN A CLASS 1
ENCLOSURE. THE LASER SYSTEM HAS
BEEN CLASSIFIED AS CLASS 2
DUE TO THE PRESENCE OF A
VISIBLE LASER DIODE.

221-0116-E0 (DOMESTIC)

CAUTION
LASER RADIATION-DO
NOT STARE INTO BEAM
LASER DIODE
WAVELENGTH: 630-680 nm
MAX. OUTPUT: 1 mW
CLASS 2 LASER PRODUCT

221-0016-E0
(On both side doors)

CAUTION
CLASS 4 INVISIBLE LASER RADIATION
WHEN OPEN AND INTERLOCK FAILED OR
TED AVOID EYE OR SKIN EXPOSURE
DIRECT OR SCATTERED RADIATION

221-0012-E0

WARNING
NEVER OPERATE THE LASER SYSTEM
WITHOUT CONSTANT SUPERVISION
EXPOSURE TO THE LASER BEAM MAY
CAUSE IGNITION OF COMBUSTIBLE
TERIALS WHICH CAN CAUSE SEVERE
DAMAGE TO THE EQUIPMENT

221-0016-E0

CAUTION
CLASS 4 INVISIBLE LASER RADIATION
WHEN OPEN AND INTERLOCK FAILED OR
DEFEATED AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION

221-0018-E0

AVOID EXPOSURE
INVISIBLE LASER RADIATION IS
EMITTED FROM THIS APERTURE

221-0016-E0

CAUTION
CLASS 4 INVISIBLE LASER RADIATION
WHEN OPEN AND INTERLOCK FAILED OR
DEFEATED AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION

XLS10 Front View Labels

WARNING
Do **NOT** use in medical or surgical applications or to manufacture medical devices. See the Safety, Installation, Operation, and Basic Maintenance Manual, or the OEM Laser Integration Manual for further information.

221-0081-E0

UNIVERSAL
L A S E R   S Y S T E M S

CE
Made in USA

MANUFACTURED: JANUARY 2010
www.ulsinc.com

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221-0002-E0

WARNING
TO AVOID RISK OF ELECTRIC SHOCK ALWAYS DISCONNECT POWER CORD BEFORE REMOVING THIS COVER

221-0020-E0

INPUT POWER:
230 VAC; 50/60 Hz; 20 A

221-0129-E0

CAUTION
CLASS 4 INVISIBLE LASER RADIATION WHEN OPEN AND INTERLOCK FAILED OR DEFEATED AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

221-0016-E0

THIS EQUIPMENT CONFORMS TO PROVISIONS OF US 21 CFR 1040.10 AND 1040.11

221-0015-E0
(DOMESTIC ONLY)

THIS PRODUCT IS MANUFACTURED UNDER ONE OR MORE OF U.S. PATENTS 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; D517,474; 7,060,934; 7,715,454; 7,723,638; 7,947,919 OTHER U.S. AND INTERNATIONAL PATENTS PENDING.

221-0065-E0

WARNING
THIS SYSTEM IS DESIGNED FOR USE WITH INERT AND NON-OXIDIZING GASES ONLY (i.e. DRY CLEAN AIR, CARBON DIOXIDE, HELIUM, NITROGEN). CONNECTING FLAMMABLE OR OXIDIZING GASES TO THIS SYSTEM CREATES A SERIOUS SAFETY AND/OR FIRE HAZARD. DO NOT CONNECT ANY GAS SOURCES EXCEEDING 75 PSI (5 ATM) PRESSURE. UNIVERSAL LASER SYSTEMS ASSUMES NO RESPONSIBILITY ARISING FROM THE IMPROPER USE OF THIS SYSTEM.

221-0037-E0
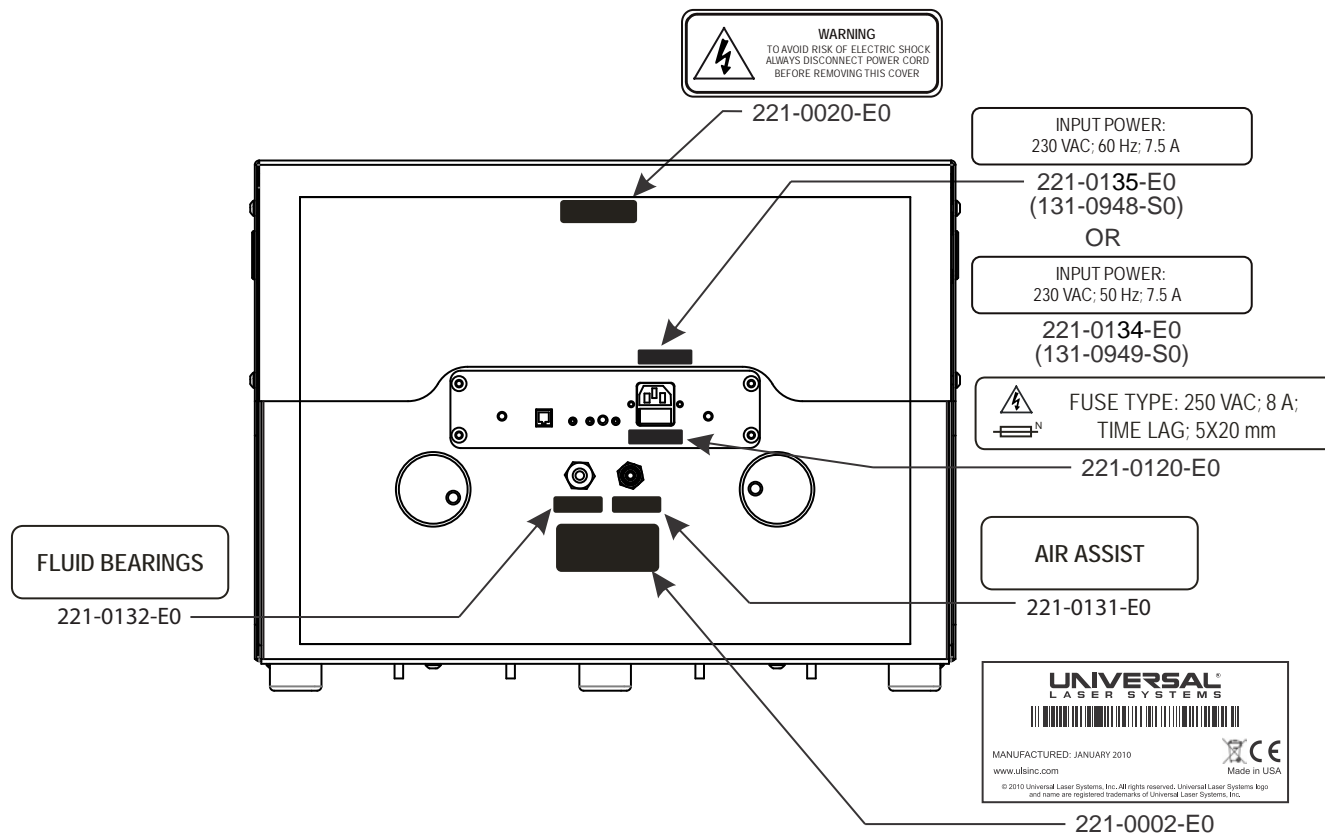
XLS10 Back View Labels

XLS10 Platform Electronics Enclosure (right-side)

221-0021-E0

WARNING
TO AVOID RISK OF ELECTRIC SHOCK
ALWAYS DISCONNECT POWER CORD
BEFORE REMOVING THIS COVER

221-0020-E0

INPUT POWER:
230 VAC; 60 Hz; 7.5 A

221-0135-E0
(131-0948-S0)

OR

INPUT POWER:
230 VAC; 50 Hz; 7.5 A

221-0134-E0
(131-0949-S0)

FUSE TYPE: 250 VAC; 8 A;
TIME LAG; 5X20 mm

221-0120-E0

FLUID BEARINGS

221-0132-E0

AIR ASSIST

221-0131-E0

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221-0002-E0

XLS10 Compressed Air Source

CAUTION VISIBLE AND INVISIBLE
LASER RADIATION
AVOID EYE CAN SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
CLASS 4 LASER PRODUCT
EN 60825-1:2007

CO_2 LASER:
WAVELENGTH: 9.3-10.6 μm / MAX OUTPUT: 500 W CW
LASER DIODE:
WAVELENGTH: 630-680 nm / MAX OUTPUT: 1 mW CW
FIBER LASER (if present):
WAVELENGTH: 1040-1200 nm
PULSED OUTPUT - MAX AVERAGE POWER 120 W
MAX PULSE ENERGY 2 mJ
REPETITION FREQ 1-1000kHz
PULSE DURATION 1-500 ns
CW OUTPUT - MAX OUTPUT 120 W

221-0136-E0
(International)

DANGER

INVISIBLE AND VISIBLE
LASER RADIATION - AVOID EYE
OR SKIN EXPOSURE TO DIRECT
OR SCATTERED RADIATION

CLASS IV LASER

CO_2 LASER:
WAVELENGTH: 9.3-10.6 μm / MAX OUTPUT: 500 W CW
LASER DIODE:
WAVELENGTH: 630-680 nm / MAX OUTPUT: 1 mW CW
FIBER LASER (if present):
WAVELENGTH: 1040-1200 nm
PULSED OUTPUT - MAX AVERAGE POWER 120 W
MAX PULSE ENERGY 2 mJ
REPETITION FREQ 1-1000kHz
PULSE DURATION 1-500 ns
CW OUTPUT - MAX OUTPUT 120 W

221-0137-E0
(Domestic)

Optional Class 4 Conversion Module Labels

EU Declaration of Conformity

Product Identification: All XLS10 Laser Systems

Manufacturer:	**Authorized Representative:**
Universal Laser Systems	Universal Laser Systems GmbH
16008 N. 81st St.	Lerchenfelder Guertel 43
Scottsdale, AZ 85260	A-1160 Vienna/Austria
USA	

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

2004/108/EC	(EMC Directive)
2006/95/EC	(Low Voltage Directive)
2006/42/EC	(Machinery Directive)
2011/65/EU	(RoHS2 Directive)
2012/19/EU	(WEEE Directive)

based on the standards listed.

Standards Used:

Safety:

EN 60950: 2002

EN 60825-1: 2014 (Class 2)

EMC:

EN 55024 2010 (Class A)

EN 55022: 2010 (Class A)

EN 61000-3-2: 2006 (class A)

EN 61000-3-3: 2008

EN 61000-4-2: 2008 (4kV CD, 8kV AD)

EN 61000-4-3: 2006 (3 or 10 V/m)

EN 61000-4-4: 2012 (1 or 2 kV power line)

EN 61000-4-5: 2014 (class 3)

EN 61000-4-6: 2013 (3 or 10Vrms)

EN 61000-4-8: 2009

EN 61000-4-11: 2004

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

CAUTION: *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 complies 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 ensure compliance with FCC regulations.

Recycling

Universal Laser Systems is committed to helping reduce the amount of waste electronics ending up in municipal landfills. Therefore, ULS urges consumers to recycle this product and its laser processing options. ULS is equipped to recycle any of its products and will assist customers with their recycling options.

To arrange for recycling of a ULS product or options, please contact the ULS Factory Support Team for more information at +1 480 609-0297 (USA), +43 1 402 22 50-28 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at *support@ulsinc.com*.

Getting to Know the System 3

SYSTEM OVERVIEW

XLS10 with Side Panels Removed - Front-View

A	Emergency Stop	Instantly disconnects all AC power to the system when depressed. This button should only be used in case of emergency. To reset the system after executing an E-Stop, twist the red button clockwise until it releases.

B	On/Off Switch	Serves as the main power switch for the laser system. Press to turn on the laser system and press again to turn off the laser system. Compressed gas for air bearings and optics protection is automatically powered on and off with the XLS10 laser system.
		
		 There are five states for the BLUE POWER LED:
		
		 • OFF – Laser system power is off.
		
		 • SOLID BLUE – Laser system power is on.
		
		 • 50% blink: (ON/OFF ON/OFF, ETC) – Laser system is busy changing power states. This occurs:
		
		   • When laser system is first plugged in, use to determine if AC is present.
		
		   • During Power-on sequence
		
		   • During Power-off sequence
		
		   • During Reboot sequence
		
		 • Single "ON" blink followed by long "OFF" – E-Stop is pressed and needs to be released to run the laser system.
		
		 • Two "ON" blinks followed by long "OFF" – CPU is not responding or not present.

C	Beam Delivery System	Positions Carriage anywhere in the laser processing field to deliver focused laser energy to the material being processed.
D	Carriage	Contains Final Focusing Lens, Autofocus Sensor, and Camera for UCR, if purchased.
E	Processing Table	Supports materials to be processed and provides rulers as a positioning aid for orienting materials within the laser processing field. Table moves up and down to position materials at the focal plane of the beam delivery system.
F	LCD Control Panel	Provides controls necessary to operate the XLS10 laser system.
G	Top Door	Allows for the safe viewing of the laser process and for the loading of materials.
H	Front Door	Grants access to easily-loaded large materials into the XLS10 laser system.
I	Storage Drawer	Provides a storage space for the Flow-Through Cutting Table and the Rotary Fixture underneath the processing table.
J	Storage Compartment	Stores additional Final Focusing Lens assemblies, Focusing Tools, Lateral and Coaxial Gas Assist Attachments.

XLS10MWH™ with Laser Cover Down - Back View

A	CO$_2$ Laser Sources	Introduces laser radiation into the XLS10 laser system.
B	Fiber Laser Source	Introduces laser radiation into the XLS10 laser system. (XLS10MWH™ only)
C	Laser Cover	Protects and allows access to the Laser Sources.
D	Side Access Panels	For use while operating in **Class 4** mode (Class 4 Conversion Module required)

XLS10 Connections - Back View

A	Compressed Air Source	Provides compressed air to the beam delivery system and Computer-Controlled Gas Assist with Optics Protection.
B	USB Connection	In conjunction with a USB cable, provides the communication connection between the laser system and the computer.
C	Power Connection	Provides power to the laser system.
D	Circuit Breakers	Protects the XLS10 laser system from current spikes.
E	Compressed Air Source Control Connection	When connected to the supplied Compressed Air Source, allows for the automatic activation and deactivation of air flow.
F	Fluid Bearing Compressed Air Connection	Quick coupling connector used to supply compressed air to the beam delivery and optics protection systems.
G	Air Assist Connection	Quick coupling connector used to supply compressed air during material processing.
H	Gas Assist Connection	¼ in. push connector used to supply compressed gas during material processing.

LASER SYSTEM MANAGER (LSM) OVERVIEW

The advanced Laser System Manager (LSM) software, included with the XLS10 laser system enables the user to control and operate the laser system. For the XLS10 laser system to operate, the LSM software must be loaded onto an appropriately configured computer connected to the XLS.

The LSM consists of two components, Control Service and the User Interface (UI):

• The Control Service component of the LSM manages the connection between the XLS10 and the computer.

• The UI component of the LSM can be installed and run on the same computer as the Control Service portion or it can be installed and run on a separate computer that is connected via a network to the tethered control computer.

After installation of the LSM UI, the LSM icon appears on the desktop. The status of the LSM Control Service component is displayed on the **Diagnostics** window of the LSM UI.

When printing a graphic from a compatible graphics software, the XLS10 printer driver, along with Laser Processing Settings, creates a design file and passes it to the queue in the Control Service component of the LSM.

NOTE: For complete instructions on using the Laser System Manager component, see the Laser System Manager section.

LSM Preview Window

Tap the **LSM** icon on the desktop to open the **Preview** window. The **Preview** window allows navigation through and management of the design files in the **Design File Storage Queue**.

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*NOTE: The **Preview** window is re-sizable. Only the viewing area changes size. If the window size is expanded beyond the field size of the machine, that area is grayed out.*
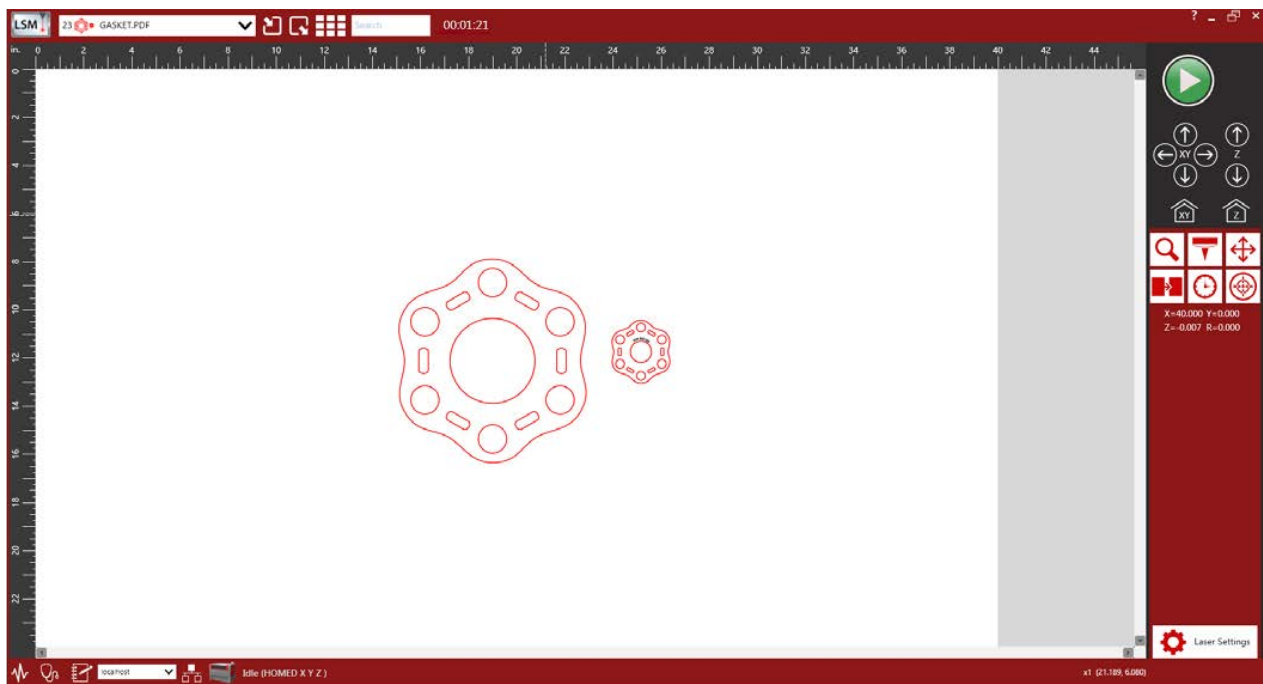
LSM Preview Window

Components of the LSM

The **Preview** window provides controls for interacting with and controlling the laser system. The available controls are organized as follows in the application window:

- **File Management Controls** – Upper left-hand corner of the window.

- **Main Control Panel** – Right pane of the window.

- **Laser Processing Settings and Current Zoom & Cursor Location** – Lower right-hand corner of the window.

- **System Information and Connection Controls** – Lower left-hand corner of the window.
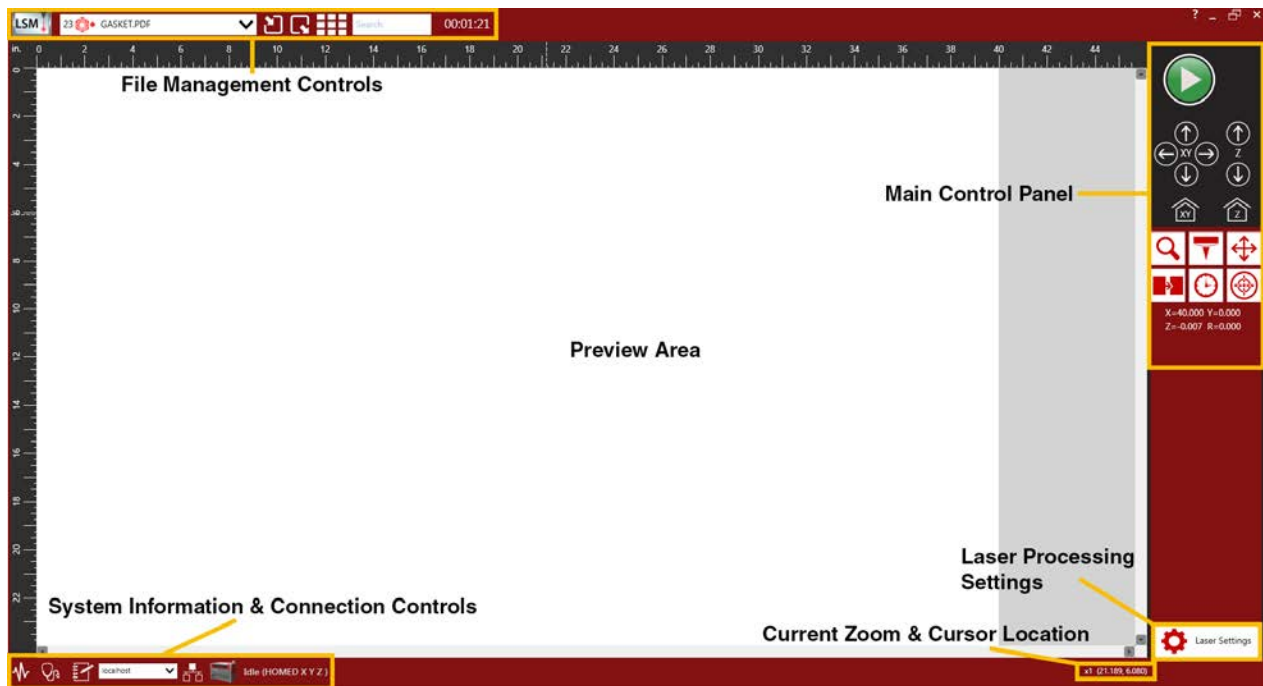
LSM Controls

File Management Controls

The **File Management** controls are located in the upper left-hand corner of the **Preview** window. These controls allow you to open, view and search for design files in the **Design File Storage Queue**.

The following File Management controls are available:

- **Currently Selected File** – Displays the currently active design file. If desired, you can select another file to open using the **drop-down** list.

- **Import/Export File** – Imports and exports design files.

- **Thumbnail File View** – Displays thumbnail images of the design files in the **Design File Storage Queue**. Pressing the **Thumbnail File View** button toggles between **Thumbnail File View** and **Preview** in the **Preview** window.

- **Search for File** – Search for a design file by typing its *name* into the **Search** box.

- **Processing Time** – The design file processing time for the job. The clock runs up when the job is first run, and then counts down on the second and subsequent jobs.

File Management Controls
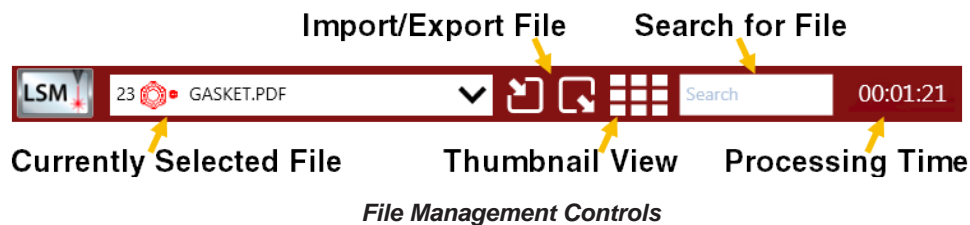
Main Control Panel

The **Main Control Panel** is located in the right pane of the **Preview** window. It contains many of the same controls and processing tools that are found on the **LCD Control Panel**. The figure below shows a close-up of the available controls and processing tools.
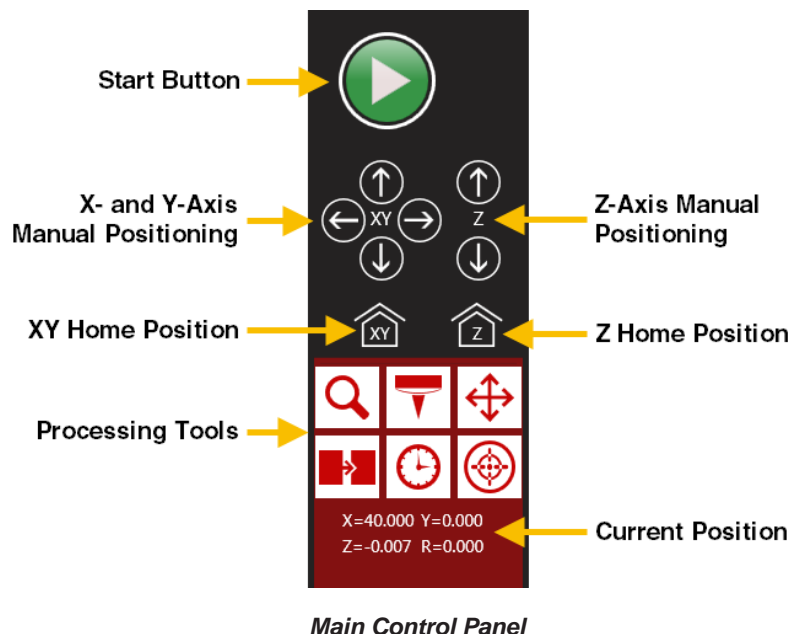
Main Control Panel

Laser Processing Settings

Tap the **Settings** button ⚙ to open the **Laser Processing Settings** window. This control is found in the lower right-hand corner of the **Preview** window.

Current Zoom & Cursor Location

The current level of magnification and the location of the cursor displays in the lower right-hand corner of the **Preview** window.

System Information and Connection Controls

The **System Information** and **Connection Controls** are located in the lower left-hand corner of the **Preview** window.

The following **System Information** and **Connection Controls** are available:

- **System Configuration Window**
- **Diagnostics Window**
- **Log Window**
- **ULS Control Service**
- **Network Connection Status**
- **System Type**
- **System Status**

LASER PROCESSING SETTINGS OVERVIEW

The **Laser Processing Settings** window is a component of the **LSM**. It allows for setup of the required parameters for a laser processing job.

*NOTE: For complete instructions on using the **Laser Processing Settings** component, see the Laser Processing Settings section.*

After using one of the supported third-party graphics software programs to prepare a graphic file using our standard color scheme, launch the **Laser Processing Settings** component from the **Preferences** or **Properties** button from the graphics program's **Print** function. See *Third-Party Graphics Software* for more information.

The Laser Processing Settings window consists of three main pages:

- **Material Settings** Page
- **System Settings** Page
- **Manual Settings** Page

*NOTE: The **Laser Processing Settings** window is re-sizable.*

Material Settings Page

The **Material Settings** page displays when the **Laser Processing Settings** component first opens. This page lets you select the type of material, thickness of the material, and units used for the thickness measurement for a new design file from an extensive database of materials that support laser processing.

The Materials Database is presented in a tree structure with additional controls allowing you to create a custom material or category, access parameter settings, or learn more about a material. You can make small modifications to the nominal laser intensity settings specified in the Materials Database by using the intensity controls in the right pane of the window. The **Gas Assist** settings can also be adjusted for each process.
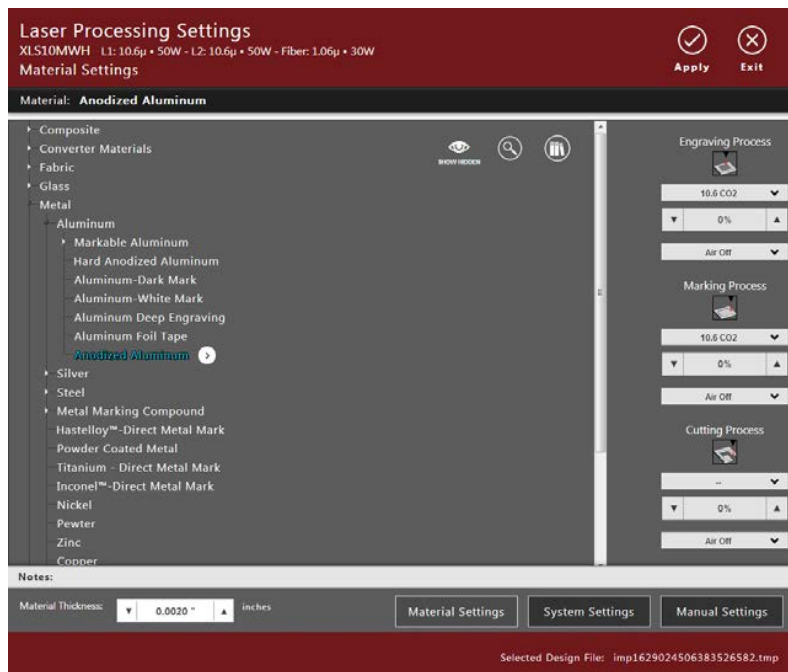
Material Settings Page

System Settings Page

The **System Settings** page provides additional selections for controlling the laser process. On this page, you can specify the methods for interpreting the design file, select **Laser Processing Options** and customize processing behavior.
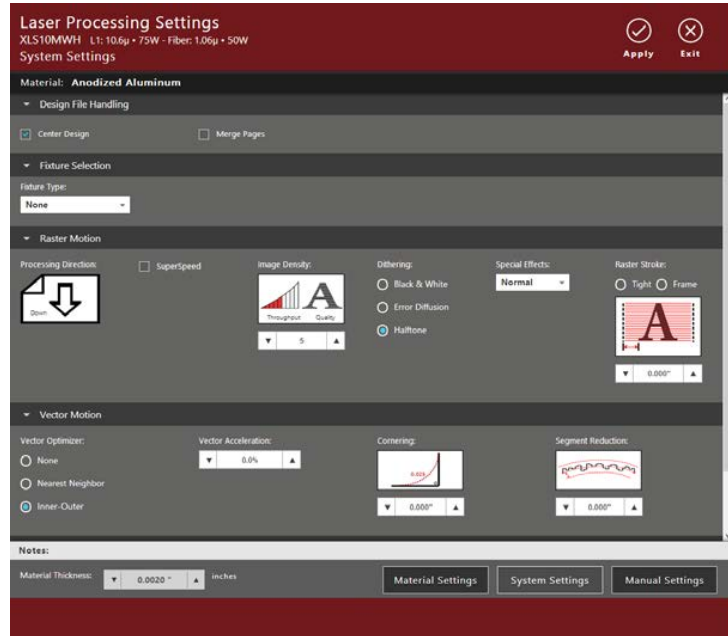
Manual Settings Page

The **Manual Settings** page provides direct control over the laser material processing settings and the option of specifying more than the three process colors defined in the **Materials Database**.

You can add colors to or remove colors from the process, depending on the design file you are processing. You can also override the database and manually adjust the Mode, Speed, Z-axis Height, Gas Assist, PPI and Laser Power for each color in your design file.
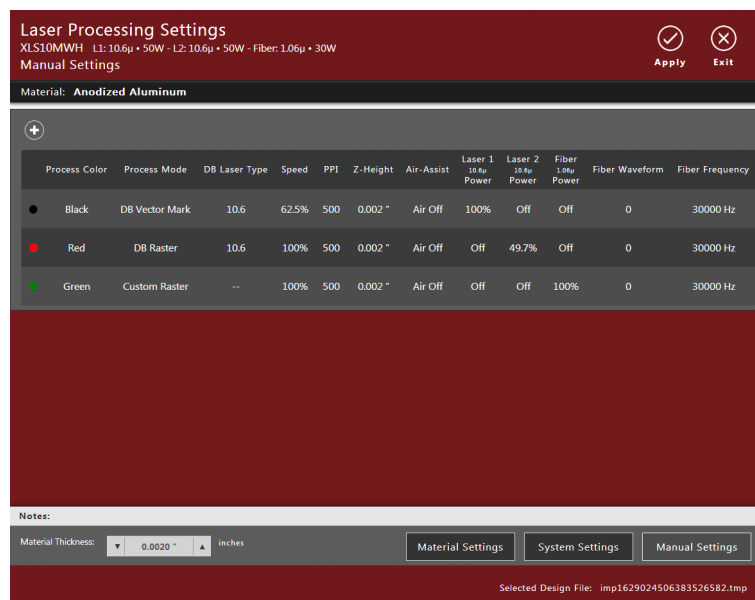
LCD Control Panel Overview

The **LCD Control Panel,** a touchscreen attached to the right frame of the XLS10, works in concert with the LSM to provide the functions necessary to operate the laser system.

The **Control Panel** Main Screen contains two panes:

- The upper pane is the Preview Area for displaying the current design file.
- The lower pane contains the controls.

NOTE: *For complete instructions on using the controls on the **Control Panel**, see the LCD Control Panel section.*

LCD Control Panel - Main Screen

Laser System Manager (LSM) 4

The **LSM** is required to control and operate the laser system. It runs on a computer with the correct specifications and connects to the XLS10 via a USB port. When you print a graphic in the graphics software, the **Laser Processing Settings** component creates a design file and passes it to the queue in the **LSM**.

After installation of the **LSM**, the **LSM** icon ![LSM icon] appears on the desktop.

LSM PREVIEW WINDOW

When you access the **LSM** through the icon on the desktop, the **Preview** window opens. The **Preview** window allows you to navigate through and manage the design files in the **Design File Storage Queue**.
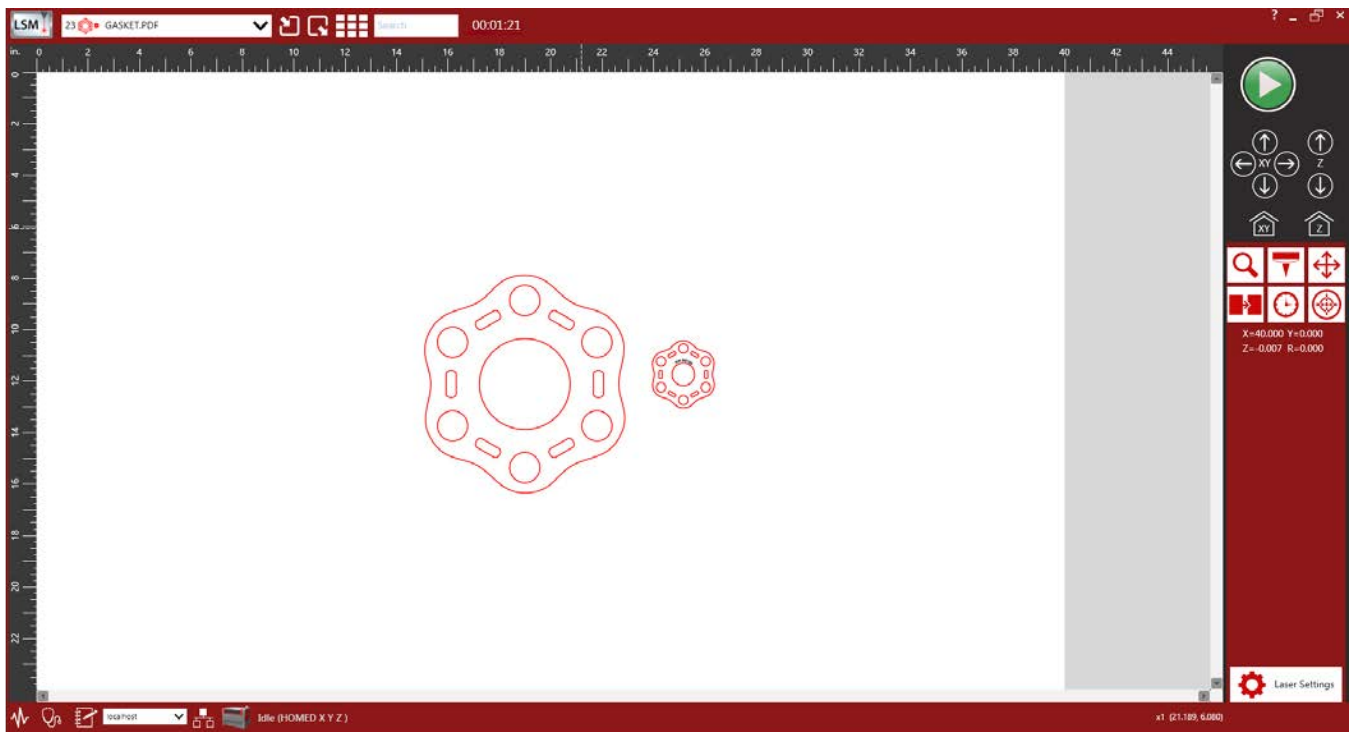
LSM Preview Window

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*NOTE: The **Preview** window is re-sizable. Only the viewing area changes size. If the window size is expanded beyond the field size of the machine, that area is grayed.*

WORKING WITH FILE MANAGEMENT CONTROLS

The **File Management** controls help you navigate through and manage the design files in the **Design File Storage Queue**. These controls are located above the Preview Area and include the currently-selected design file's name, place in the queue, and the file's processing time. The file's processing time will only be available after the job has been run once.

> **NOTE:** A design file's place in the queue may change as files are added or removed or moved around in the queue.
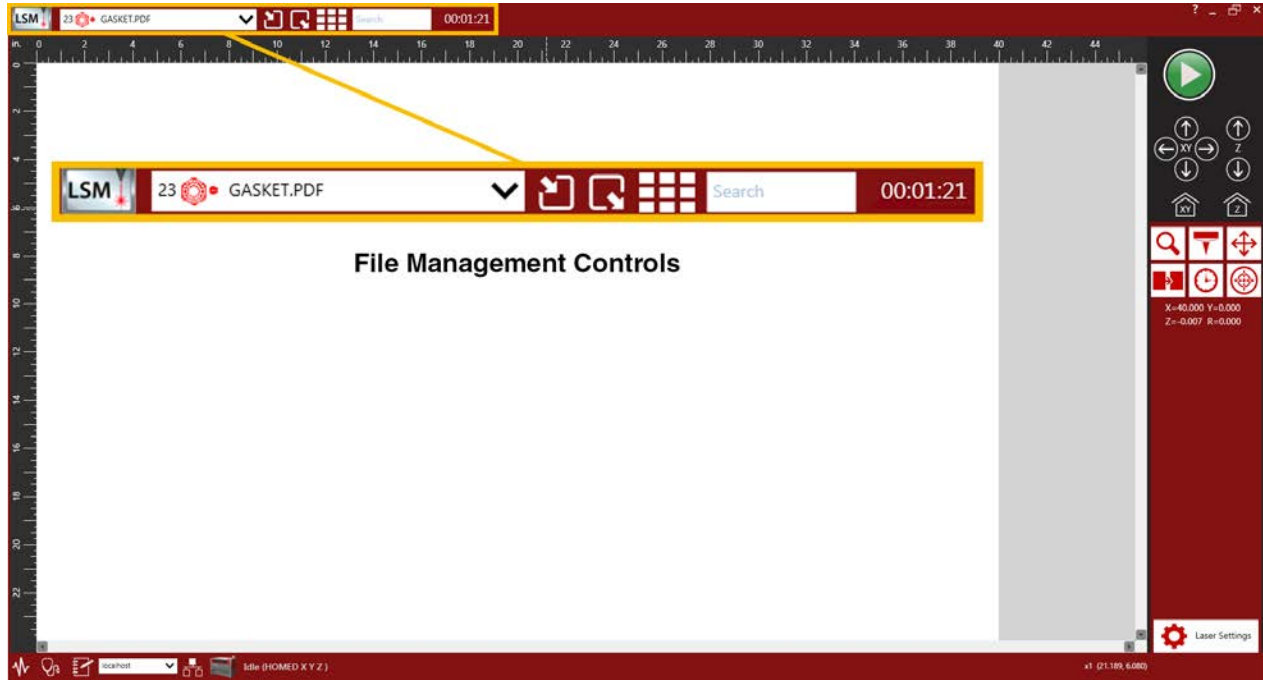
As design files are printed, they are added to the **Design File Storage Queue** until the queue reaches the limit set in the **System Configuration** window. Once the queue reaches the maximum number of jobs, the oldest job is deleted each time a new job enters the queue.

> **NOTE:** The **Design File Storage Queue** can be set up to hold a maximum of 2000 design files.

Other options that allow you to manage the design files in the queue include: importing or exporting design files, working with thumbnail design files and searching for a specific design file.

Open Design File

When the **LSM** is first opened, the most recently used design file in the **Design File Storage Queue** displays in the Preview Area. You can process this design file or open another design file from the queue. Tap the **down arrow** in the **Currently Opened Design File** box to select another design file. To open from the **drop- down** list or navigate through the Thumbnail View window, select a thumbnail to open that design file. For more information on using the Thumbnail View window, see *View Thumbnail Files*.

Import Design Files

The **Import Files** control allows you to import EMF, PDF, DXF, G-code and STL file types.

1. On the **File Management** controls in the upper left-hand corner of the window, tap the **Import Design File** icon .

The **Open** dialog box displays.
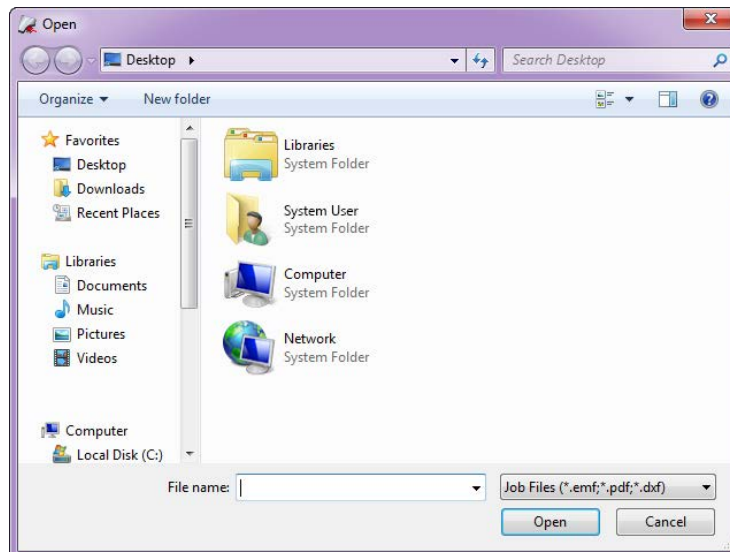
2. Select the design file type you want to work with from the **drop-down** list.

3. Navigate to and Select the design file you want to open, and tap **Open**.

The design file name is displayed in the **Currently Opened Design File** box and the file opens in the Preview Area.

Importing PDF Files

If a PDF file is selected when importing a design file you will be prompted with the **PDF Import** dialog box.
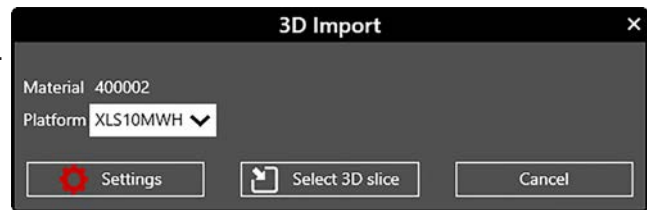
1. Select the settings and Platform you would like to use.

2. Tap **Settings** to open the **Laser Processing Settings** window.

3. Select/Enter the desired setting in the **Laser Processing Settings** window. Tap **Apply** and then **Exit**.

4. Tap **Import**.

The design file name is displayed in the **Currently Opened Design File** box and the file opens in the Preview Area.
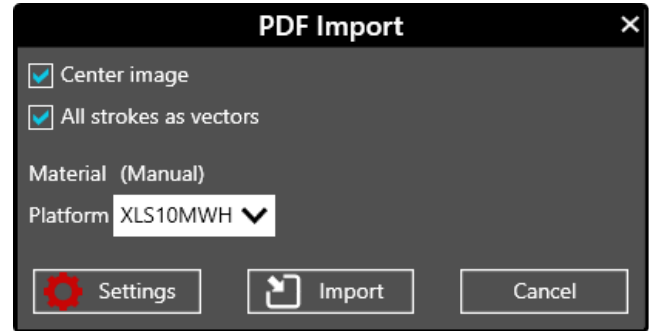
Importing DXF Files

If a DXF file is selected when importing a design file, you will be prompted with the **DXF Import** dialog box.

1. Select the settings and Platform you would like to use.

2. Tap **Settings** to open the **Laser Processing Settings window.**

3. Select/Enter the desired setting in the **Laser Processing Settings** window. Tap **Apply** and then **Exit**.

4. Tap **Import**.

The design file name is displayed in the **Currently Opened Design File** box and the file opens in the Preview Area.
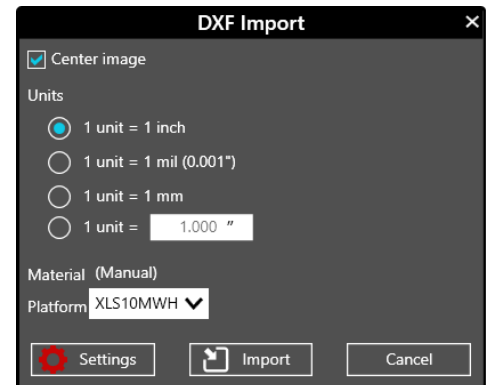
Importing G-code Files

If a G-code file is selected when importing a design file, you will be prompted with the **G-code Import** dialog box.

1. Select the settings and Platform you would like to use.

2. Tap **Settings** to open the **Laser Processing Settings** window.

3. Select/Enter the desired setting in the **Laser Processing Settings** window. Tap **Apply** and then **Exit**.

4. Tap **Import**.

The design file name is displayed in the **Currently Opened Design File** box and the file opens in the Preview Area.
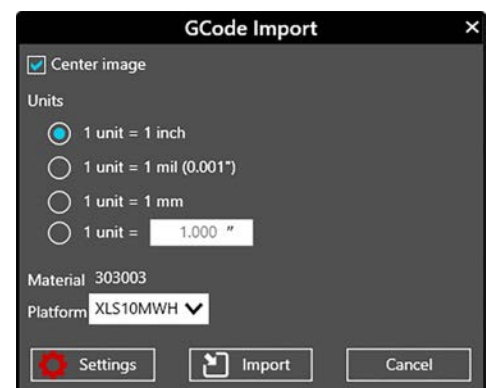
Importing 3D Slice

Importing a 3D object (STL) allows you to create a vector slice along the **X**, **Y**, or **Z** axis of a 3D object. If a 3D object is selected when importing a design file you will be prompted with the **3D Import** dialog box.

1. Select the Platform you would like to use.

2. Tap **Settings** to open the **Laser Processing Settings** window.

3. Select/Enter the desired setting in the **Laser Processing Settings** window. Tap **Apply** and then **Exit**.

4. Tap **Select 3D slice**.

5. A new window will appear displaying the file name of the selected 3D object.
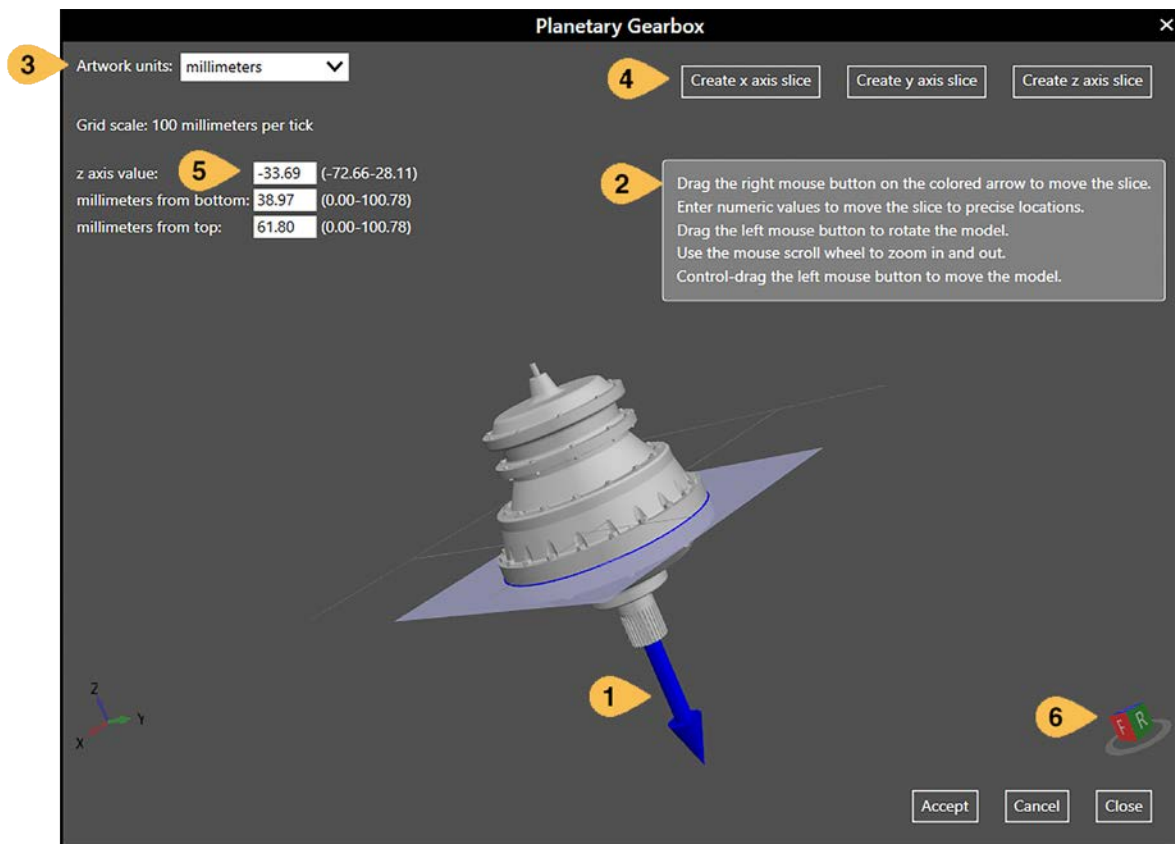
Controlling and Slicing a 3D Object

Mouse Controls

- Click and drag with the **left mouse button** to rotate the 3D object in space.

- Hold **Control** + click and drag with the **left mouse button** to reposition the 3D Object.

- Scroll the **mouse wheel** to zoom in and out on the 3D object.

- On the displayed colored arrow (1), click and drag with the **right mouse button** to position the slice. Only available when the **Create axis slice** button has been pressed.

Help/Instructions - Displayed when an axis slice option is selected. Provides you with information (2) on how to manipulate the 3D object.

Artwork Units - Select your preferred units of measurement (3) (inches, mils, millimeters or custom).

Create Axis Slice - Select (4) which axis you would like to slice by tapping the corresponding button.

Slice Position - Available when an axis slice is selected, these values (5) display the location of the slice. Values can be entered to specify a specific position. Press TAB on your keyboard or click to another box for the entered value to take effect.

Positioning Faces - Clicking on the face of the cube (6) will snap the 3D object to the corresponding face.

Accept - Applies the selected slice and closes the 3D slice window.

Cancel - Discards/Clears any slice selections. The 3D slice window will remain open.

Close - Closes the 3D slice and import windows.

6. Tap **Create Axis Slice** for the axis you want to create and by entering a value or by sliding the slice in the 3D model and select the section you wish to slice by tapping **Accept**.

The design file name is displayed in the **Currently Opened Design File** box and the file opens in the Preview Area.

Export Design Files

The **Export Design File** control allows you to export design files to other computers using the proprietary ULS Job Files format (file extension .emf).

1. Open the design file you want to export.

2. On the **File Management** controls in the upper left-hand corner of the window, tap **Export Design File** .

The **Save As** dialog box displays.
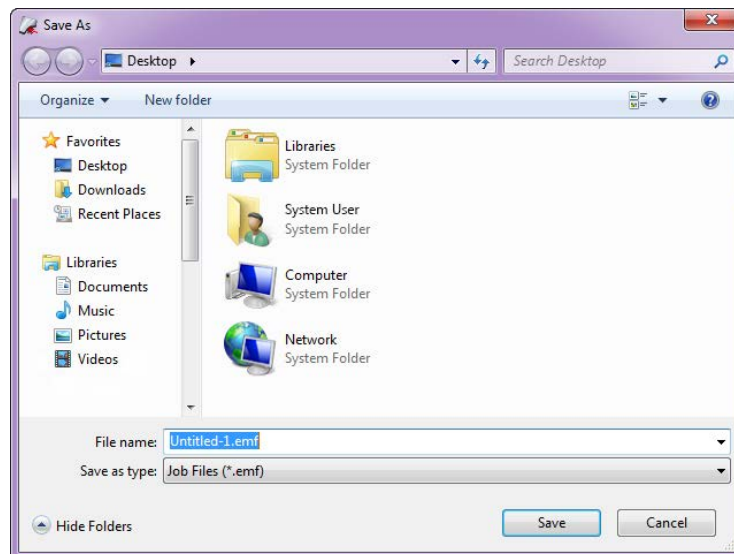
The currently-opened design file's name displays in the File name field.

The Job Files extension .emf is selected as the default file type.

3. **Navigate** to the location where you want to save the design file.

4. Tap **Save**.

View Thumbnail Files

In Thumbnail view, all of the stored design files are visible as small representations of the files. Thumbnail view makes it easy to navigate through the design files stored on your hard drive to locate the file you want to process.

1. On the **File Management** controls in the upper left-hand corner of the window, tap **Show Thumbnails**.

The **Thumbnail View** window displays.
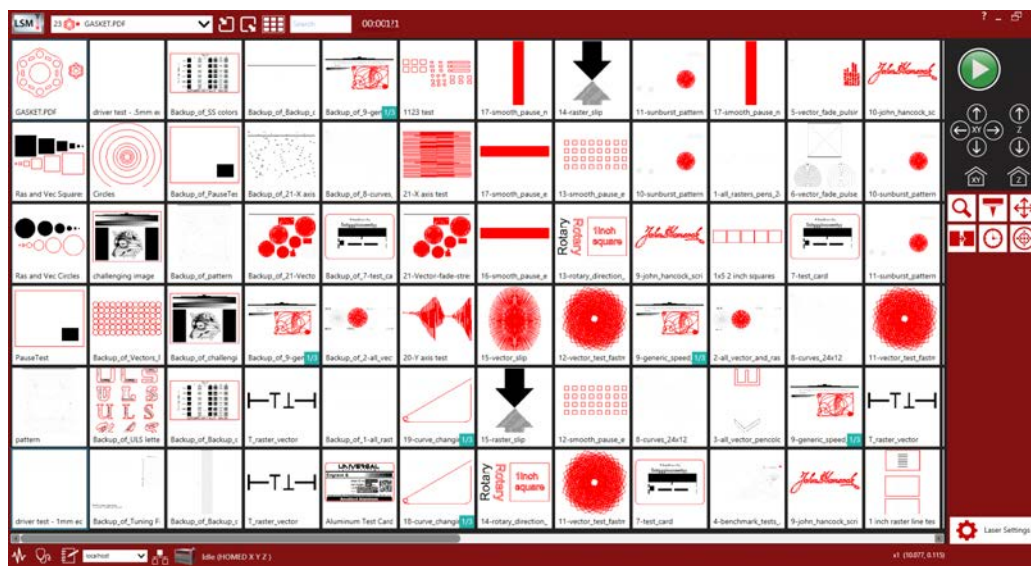
*NOTE: If there are more files than can be displayed on the window, swipe **left** or **right**.*

2. Do one of the following:

    *   **Swipe** to pan through the available design files until you locate the one you want to open; or

    *   Search for a thumbnail file, by typing its name in the **Search** box. The design files that match your search criteria display in the **Thumbnail View** window.

*NOTE: As you type, only the files that match the letters entered will display in the **Thumbnail View** window.*

3. Optionally, change the order of the design files in the queue by selecting a file and dragging it to a new location. The design files renumber to reflect the new queue order.

4. Double-tap a **thumbnail file** to select it.

The design file displays in the Preview Area of the **Preview** window.
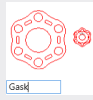
5. To return to the **Preview** window without selecting a new file, tap to toggle to **Preview**.

Use the Thumbnail File View Context Menu

1. Tap **Switch to Thumbnail File View** to open the **Thumbnail File View** Context Menu.

2. Tap and hold a **thumbnail file** to view the **context menu**.
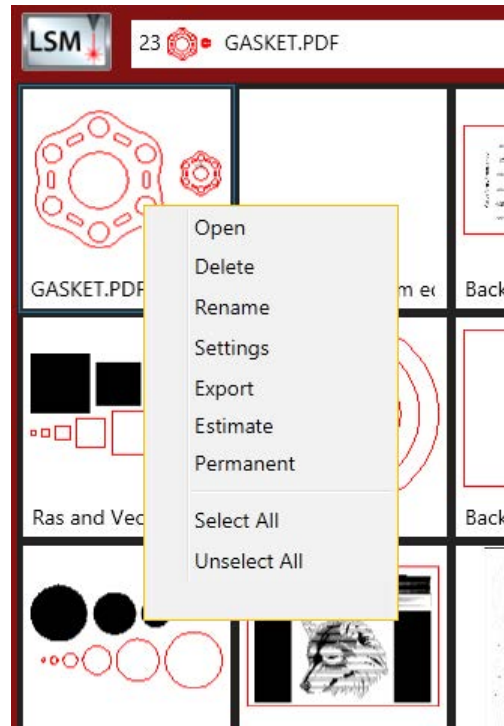
The following options are available on the **Context Menu**:

Open	Opens the currently-selected thumbnail file.
Delete	Deletes the currently-selected thumbnail file, upon confirmation. *NOTE: Files that are marked **Permanent** cannot be deleted until you first un-check the permanent flag.*
Rename	Allows you to rename the currently-selected thumbnail file. Enter the *new name* in the **text** box.
Settings	Opens **Laser Processing Settings** for the currently-selected file.
Export	Exports the currently-selected file as an .emf. See *Export Design Files* for more information.
Estimate	Provides the ability to estimate processing time in advance. This feature is beneficial in planning productivity.
Permanent	Marks the thumbnail file as permanent so it will not be deleted. A push-pin appears in the upper right-hand corner of the thumbnail. De-select the permanent flag to allow the file to be deleted.
Select All	Selects all thumbnail files.
De-select All	De-selects all thumbnail files.

Using the Main Control Panel

The **Main Control Panel** is located on the right side of the **Preview** window. Many of the same controls found on the **LCD Control Panel** are duplicated here in the **LSM**.
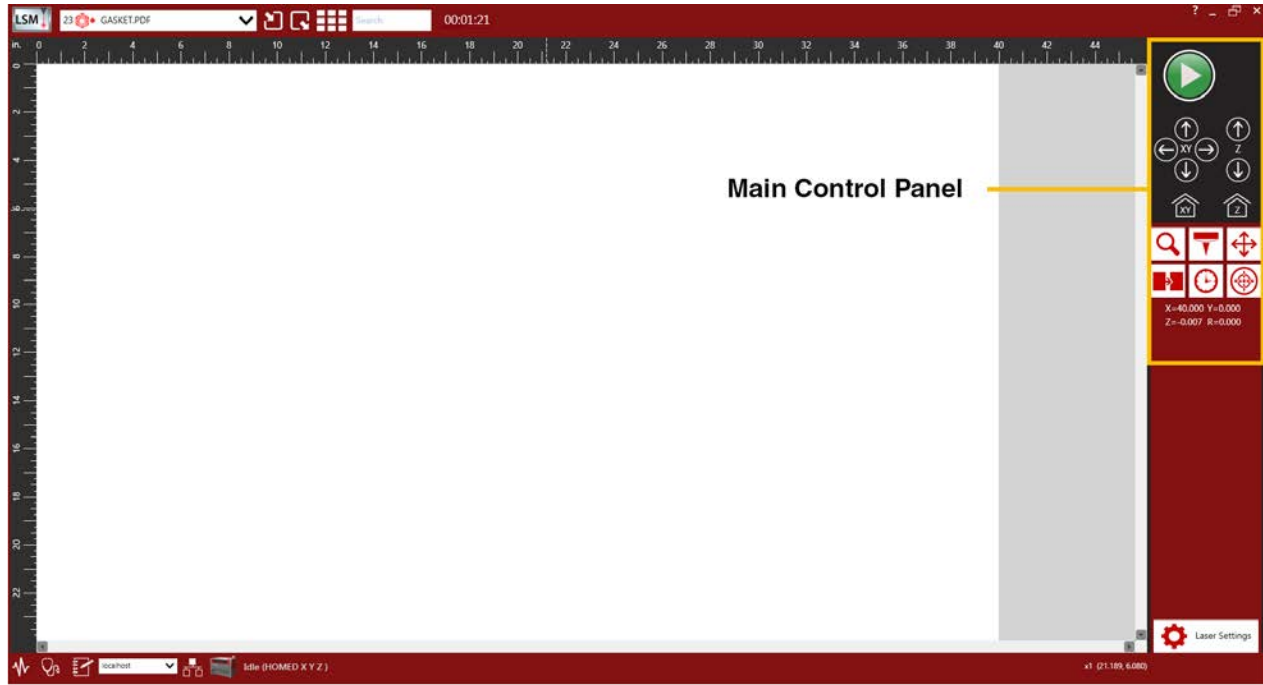
Start, Pause and Resume Controls

Tap the green **Start** button to begin processing the selected job. The **Pause** button appears to the right of the **Start** button.
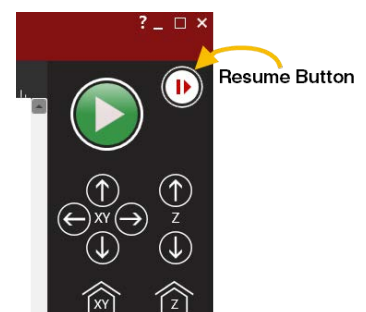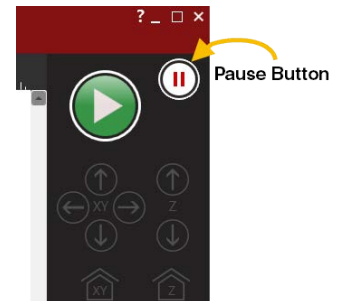

NOTE: The Main Control Panel tools are disabled when the laser processing job is running.

If needed, tap the **Pause** button to temporarily stop processing. The **Pause**

button changes to the **Resume** button .

Tap the **Resume** button to continue the process where it was last paused.

Tap the **Start** button to restart the process from the beginning.

Position X and Y Manually

	The **XY** navigation buttons move the Carriage manually in the X or Y direction. Tap and hold for longer moves, or tap and release to move in small increments, . As you move the Carriage, a green target symbol $\oplus$ indicates the location of the Carriage on the laser processing table.
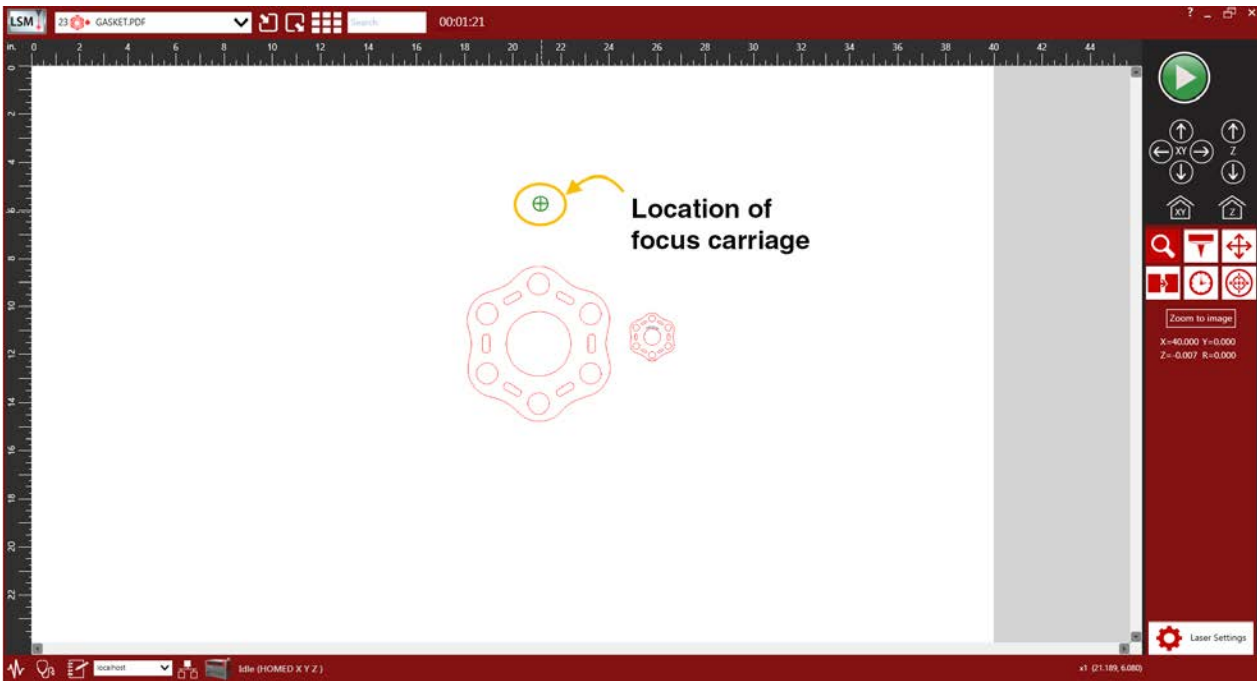
Position Z Manually

	Tap the up and down **Z** buttons to move the Processing Table up or down. Tap and hold for longer moves, or tap and release to move in small increments. *CAUTION: While a properly-calibrated system will prevent this, care should be taken when raising the table toward the Carriage to prevent potential damage.*

Move to Home Position

	Tap **Home XY** to move the Carriage to the home position in the upper right-hand corner of the laser processing table. *NOTE: When the Carriage is in the home position, the green target symbol $\oplus$ does not display in the Preview Area.*
	Tap **Home Z** to move the Z-axis to the home position at the bottom of the laser system.

USING THE PROCESSING TOOLS

Six window views are available using the processing tools on the **Main Control Panel**:

- **Zoom View**

- **Focus View**

- **Relocate View**

- **Duplicate View**

- **Estimate View**

- **Registration View**

Zoom View

Zoom View (default mode) shows a preview of the currently-selected job in the Preview Area.

Tap **Zoom** 🔍 to activate the magnifying glass in the Preview Area. The cursor becomes a magnifying glass (Zoom Tool) when passed over the image in the Preview Area.

Tap **Zoom to image** to fit the entire image into the Preview Area.
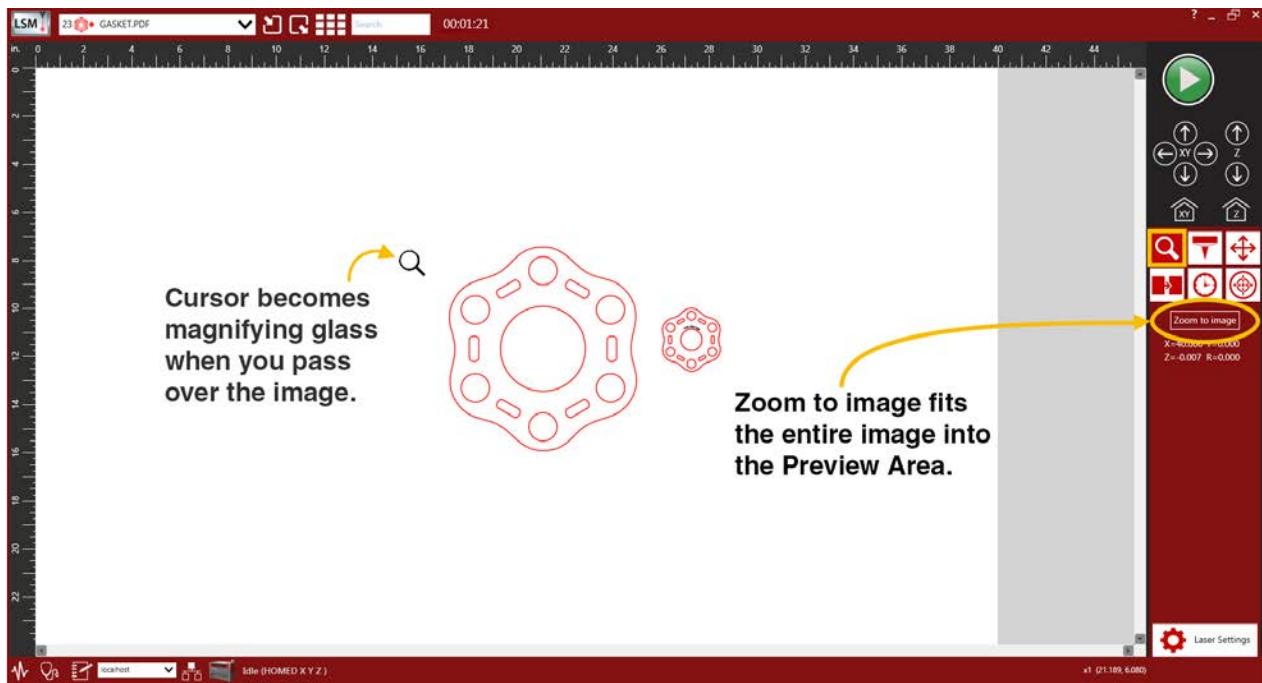
For touchscreens, **stretch to zoom in** or **pinch to zoom out** of the Preview Area. **Swipe** to pan across the Preview Area.

When using mouse control, **left-clicking** zooms in and **right-clicking** zooms out. You can also use the mouse scroll wheel in any mode to zoom in and out. You can pan by **clicking and holding** the mouse wheel down and dragging.

Focus View

Focus View quickly moves the Carriage to a desired position on the laser processing field.

Tap **Focus** ![icon] on the **Main Control Pane**l to activate **Focus View**.

NOTE: To have a full range of motion, verify that you are zoomed out in the Preview Area.

In **Focus View**, the cursor changes to a blue target symbol.
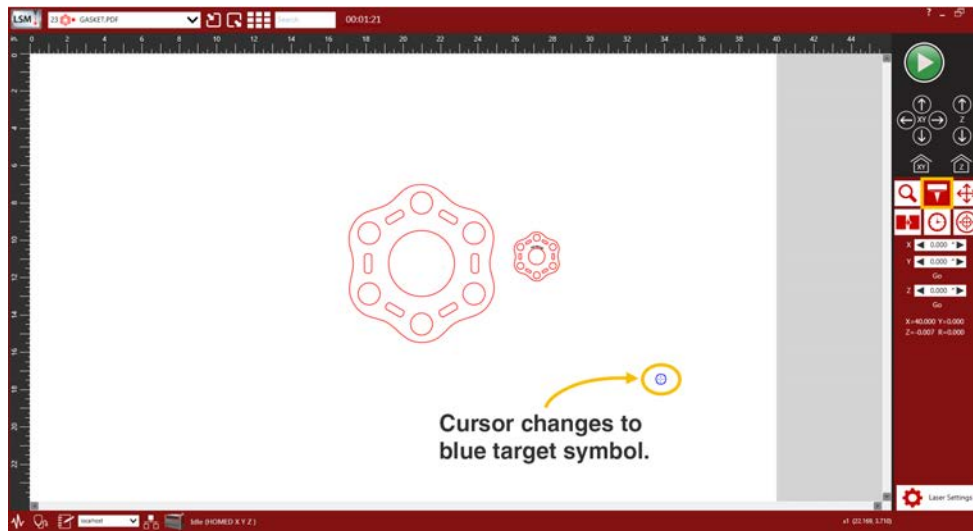
To move the Carriage, do one of the following:

- **Click** the mouse or **touch** a new location on the screen and the Carriage moves to the selected position.

- Enter the *X and Y coordinates* in the **Control Panel fields** and tap **Go**.

The Carriage moves to the specified location.

Move the laser processing table along the Z-axis by entering *a specific Z-height*, and then tapping **Go**.
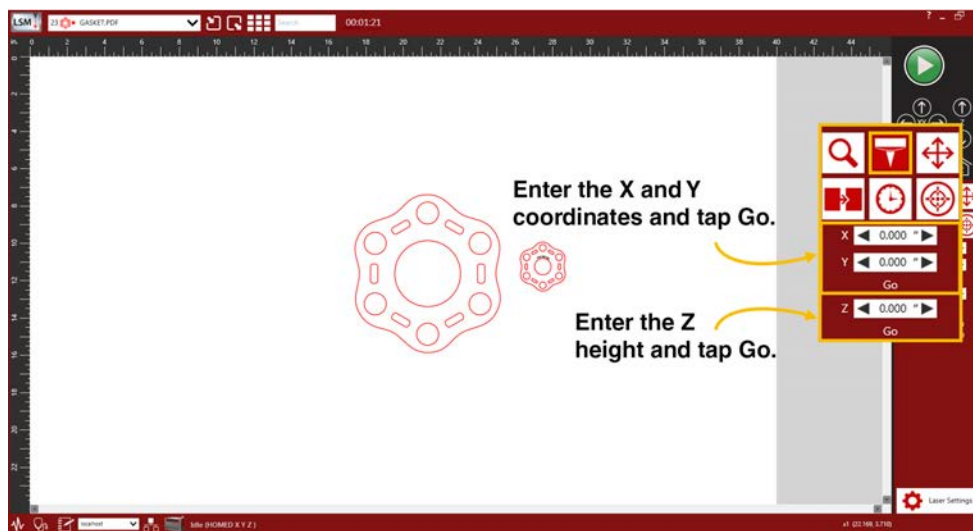
Relocate View

Relocate View provides the ability to move the image in the selected design file to another area of the laser processing field without having to reprint the design. This does not permanently modify the original image location.

When **Move** ⊕ is activated on the **Main Control Panel**, nine anchor points surround the image, representing the center and extents of the graphic.

NOTE: If your page size is larger than the maximum field size of the laser system, the anchor points will display at the edges of the page on the image.
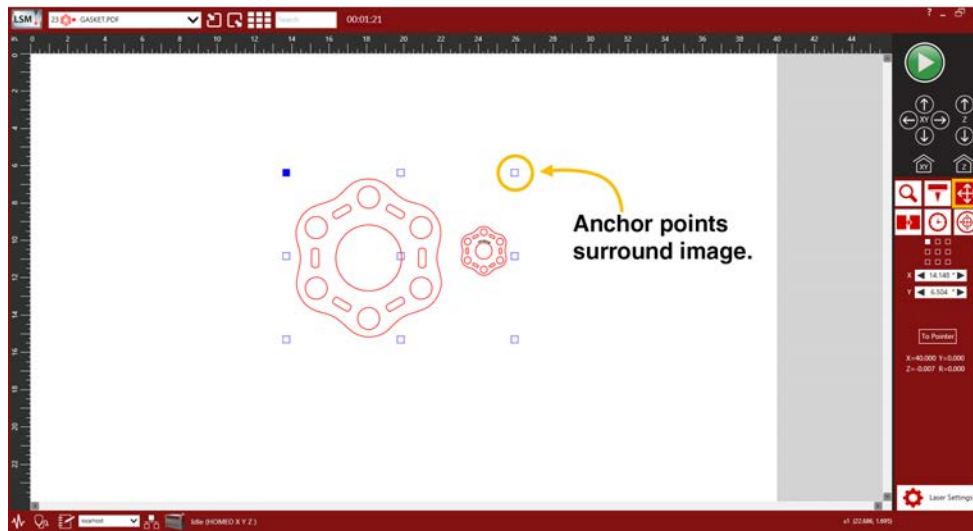

Use these anchor points to relocate the image in the one of the following ways:

- **Drag to new location** - Drag an anchor point to move the image around in the field.

- **Enter new location coordinates** - Select an **anchor point** from the image or the Control Panel (1) and then *enter new XY coordinates* for that anchor point in the **XY** fields below the processing tools (2).
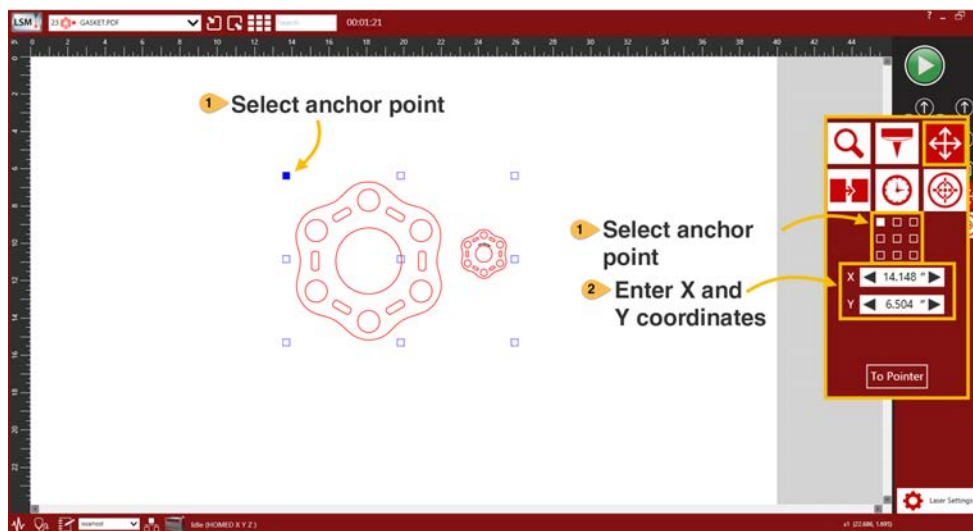
- **Snap to Carriage location** - Using the **XY** navigation buttons (1), move the Carriage to a location on the processing table using the Red Laser Pointer as a reference (2). **Select** an anchor point from the image or from the control panel (3), and tap the **To Pointer** button (4).
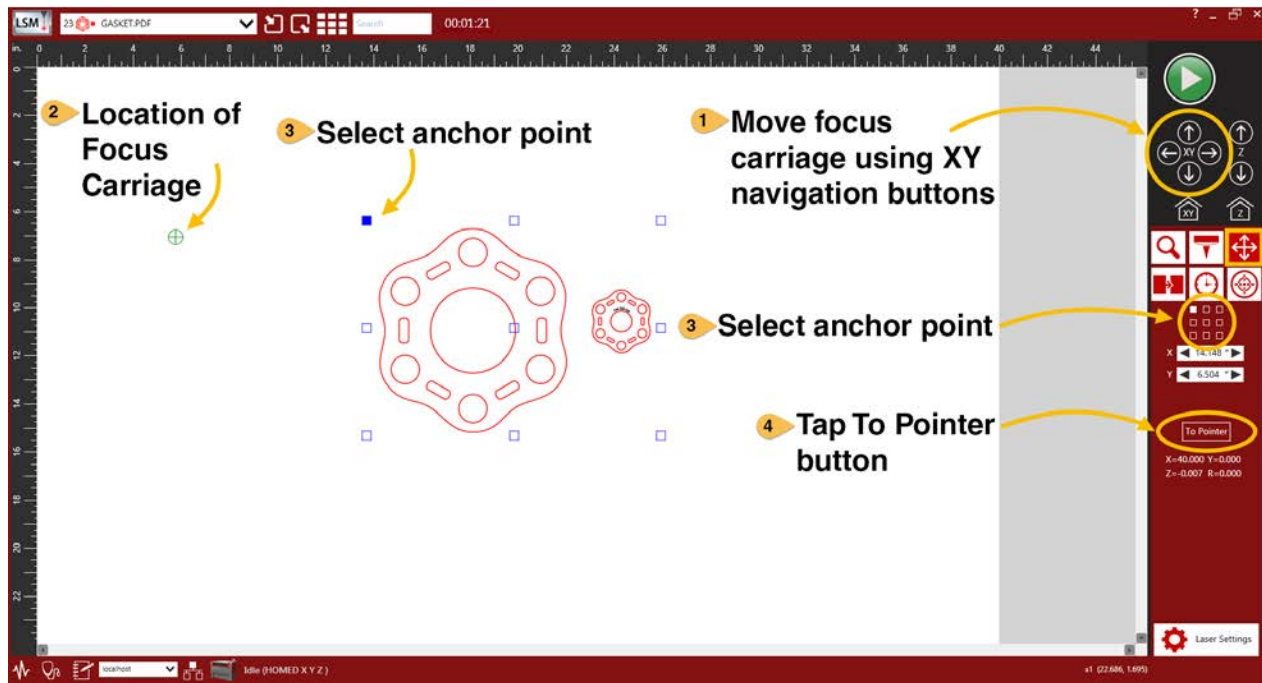
The anchor point moves to the current Carriage location. This feature is useful for aligning an image with the piece of material to be processed.
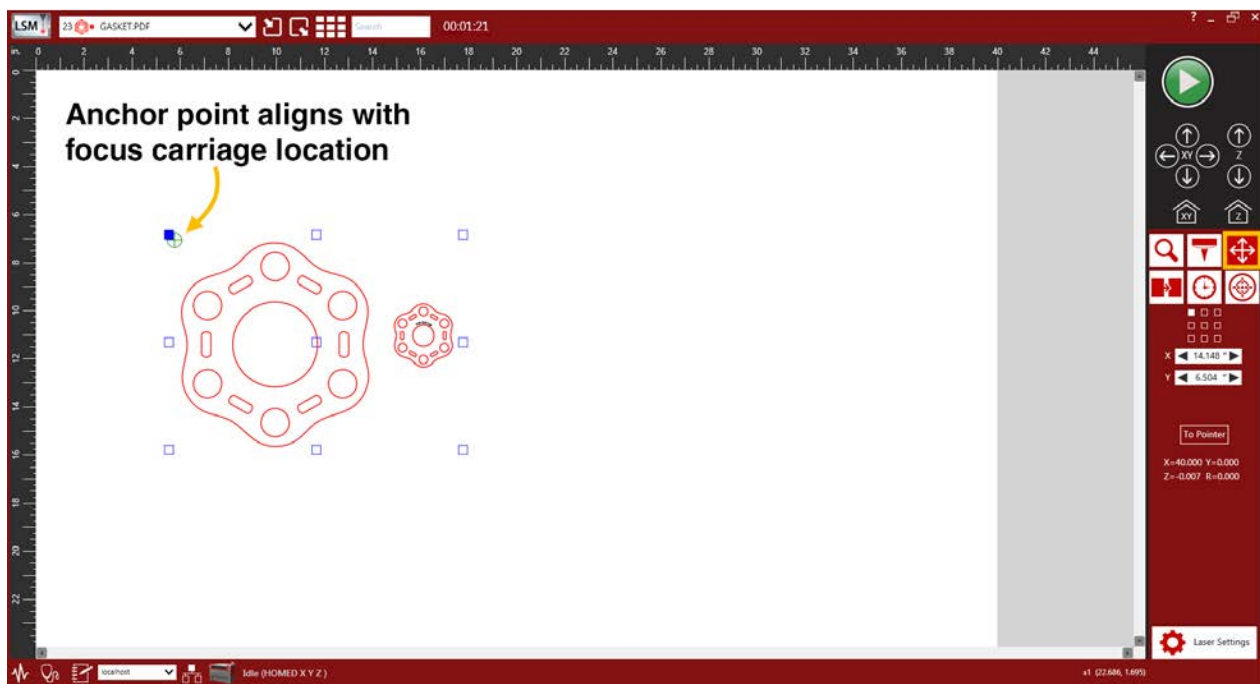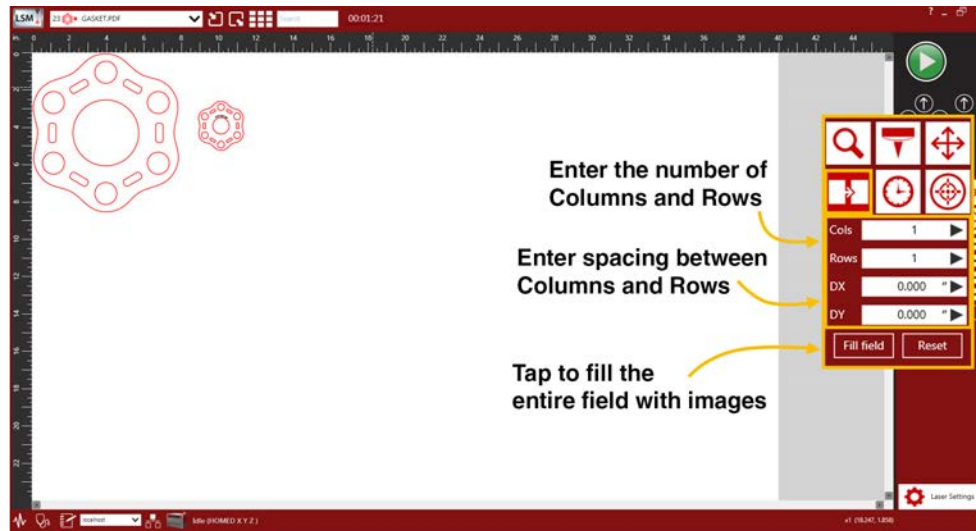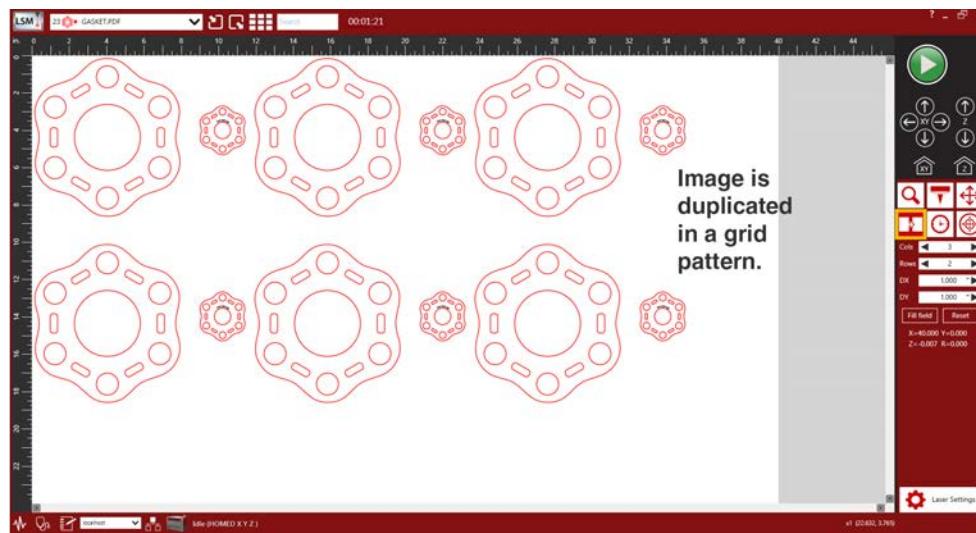
Duplicate View

Duplicate View provides the ability to duplicate an image in a grid pattern on the laser processing field. The horizontal and vertical spacing of the grid can be independently adjusted.

Tap **Duplicate** ▣ on the **Main Control Panel** to activate **Duplicate View.**

• **Enter** the *number of rows and columns* for the grid.

• **Enter** the *spacing between the rows and columns.*

• Tap **Fill Field** to fill the entire Preview Area with a duplicate of the image.

The image displays in a grid pattern.

After you create a grid of duplicate images, you can also remove any one of the copies or the original image from the group by selecting that instance in the Preview Area.

---

*NOTE: Tap **Reset** to remove all duplicate settings.*

To restore a copy that has been removed, tap in the general area of that instance and it will return.

Estimate View

Estimate View provides the ability to estimate processing time in advance. This feature is beneficial in planning productivity.

Tap **Time Estimator** 🕐 on the **Main Control Panel** to activate **Time Estimate View.**

- Select the *laser, or lasers,* from the **drop-down** lists you want to use to estimate processing time (1).
- Tap the **Estimate** button (2).
- The estimated time displays on the **Control Panel** (3).
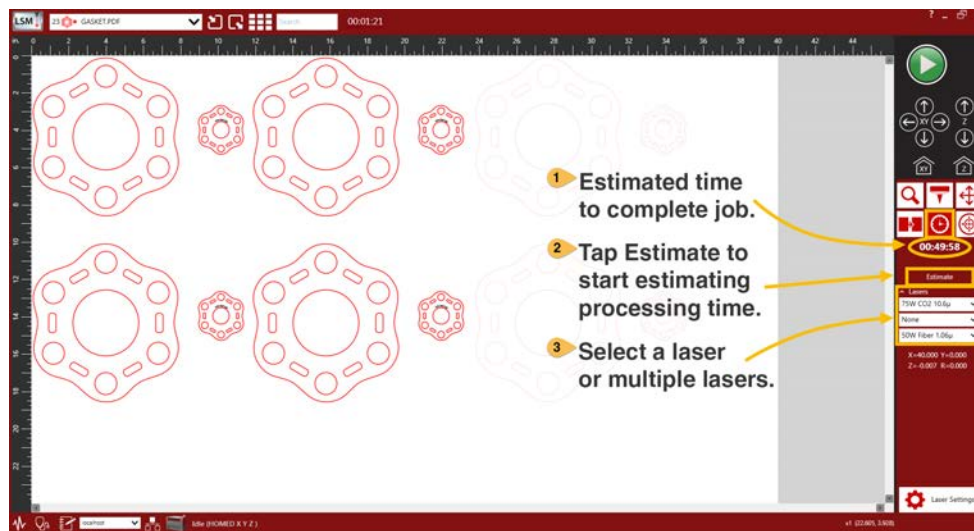
NOTE: A job can still be estimated when the machine is disconnected or turned off.


Registration View

In addition to providing you with unique camera-related tools, **Registration View** provides the ability to automate the alignment of a design file. The Universal Camera Registration option must be installed to activate **Registration View**. If you have purchased this option and would like additional information, please refer to the *Universal Camera Registration* section of *Laser Processing Options*.

Tap **Registration View** ⊕ on the **Main Control Panel** to activate **Registration View.**

- Select the **Registration** Mode you want to use to process your design file (1).

- Enter the *tolerance value* (2).

- Tap **Train Auto** or **Run Manual** to begin using **Camera Registration** to process a design file (3), or

- Tap **Camera View** to utilize the **Camera Interface** Controls without processing a design file.

---

*NOTE: **Auto** and **Manual** registration modes will only be present if the selected design file contains registration marks. If a design file without registration marks is selected only the **Camera View** button will be displayed.*
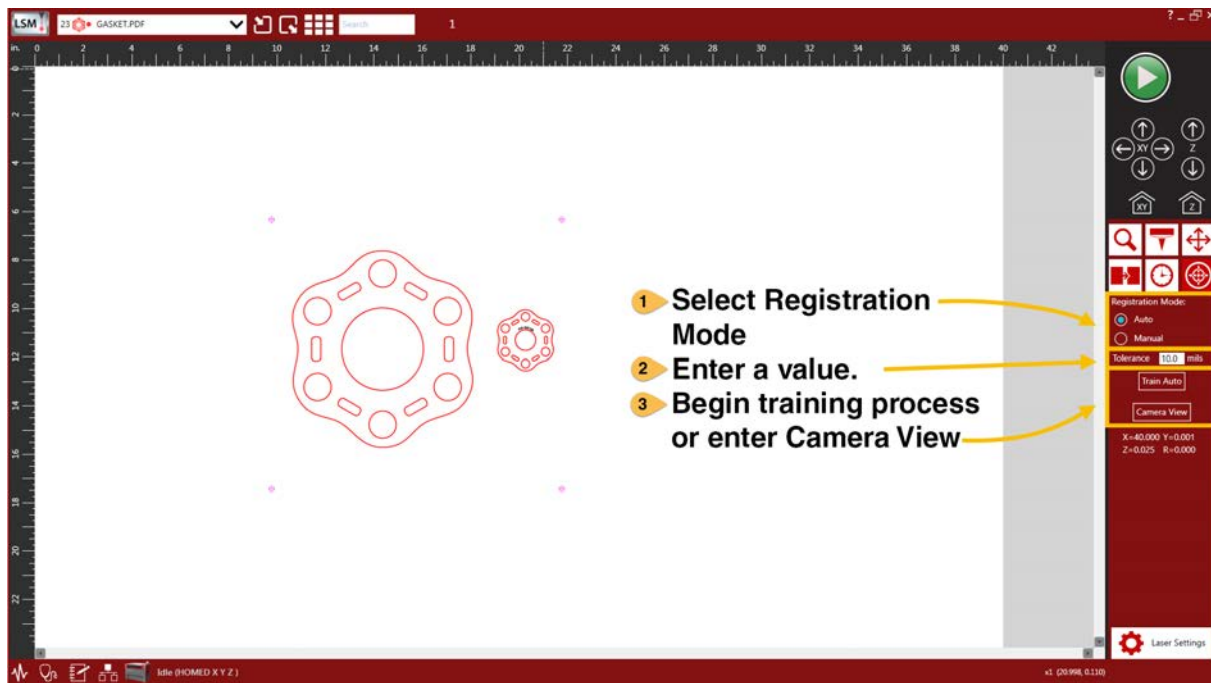
View Laser Processing Settings

Tap the **Settings** button ⚙ to open the **Laser Processing Settings** window. This control is found in the lower right-hand corner of the **Preview** window.

If necessary, most of the Laser Processing Settings can be changed after printing. A few of the settings such as Image Density and Print Special Effects are not reconfigurable after printing and are grayed out. Any changes made are permanently saved with the job.
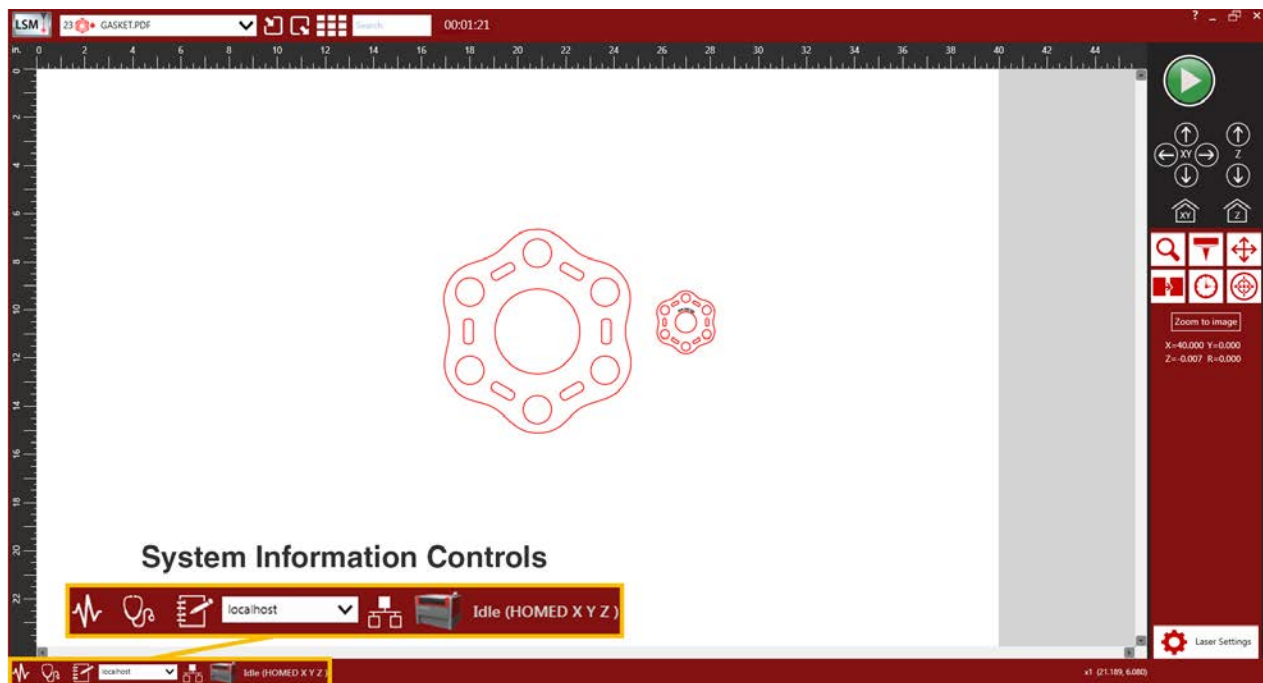

View Current Zoom & Cursor Location

The current level of magnification and the location of the cursor displays in the lower right-hand corner of the **Preview** window.
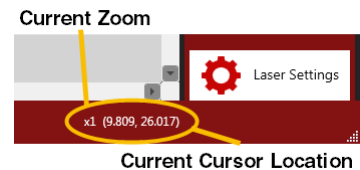
USING THE SYSTEM INFORMATION CONTROLS

The **System Information** controls are located in the lower left-hand corner of the **Preview** window.

System Configuration Window

The **System Configuration** window allows for configuration of certain features of the laser system. If needed, calibration of the laser system is performed from this window.

Access this window by tapping the **System Configuration** button.

Open System Configuration Window → [icons: localhost ▼] Idle (HOMED X Y Z)

The **System Configuration** window displays.

System Configuration	✕

General

Server [localhost] [Connect] [Connect local]

Print cache ◄ [2000]

Units ○ METRIC ● INCHES

Lens Size ● 2.0" ○ 3.0" ○ HPDFO

Z height 0.000

Z-Axis Speed % [0]

Job-Start Delay [0] seconds

☐ Enable Auto-Z ☐ Laser Diode Always On

[Applications]

Calibration

[Z Height] [Alignment] [Cutting Table] [Rotary] [Auto-focus]

[Camera] [Superspeed]

Sounds

☑ Use speech synthesis

Job Complete ☐ [_____] ⊙

Pause ☐ [_____] ⊙

Resume ☐ [_____] ⊙

Homing

☐ Remain in place after processing

☐ Home XY before processing

Users

[____] ?

✛

Misc

☐ Traveling Exhaust/Camera

☑ Show tooltips

The **System Configuration** window contains the following settings:

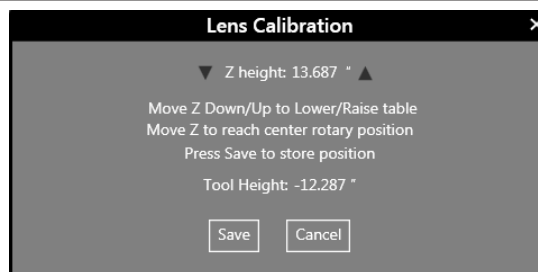| General	
Server	Displays the currently-selected laser system. Enter the name or IP address of another laser system and select **Connect** to connect to another laser system.
Print Cache	Enter the *maximum number of design files* that will be stored on the hard drive. If you exceed the number entered, the software automatically begins deleting the oldest design file as newer design files enter the queue, unless it's marked Permanent.
Units	Select **Metric** or **Inches** as the units of measure used.
Lens Size	Shows the currently-installed lens that is auto-detected by the laser system. This is important for proper function of the **Auto** mode and **Autofocus**, if installed. Lenses are calibrated to the laser system at the factory, but if a lens is replaced, it will need to be re-calibrated.
Z Height	Displays the current Z height position in relation to the lens size installed.
Z-Axis Speed %	Adjusts the speed by which the Z-Axis moves based on the percentage entered. Enter a value between *1% and 100%.*
Job-State Delay	Delay the start of all laser processes by the *entered value*.
Enable Auto Z	If activated, automatically moves the Z-axis to the *material thickness value* entered in the Laser Processing Settings component. If disabled, the Z-axis values in the color table are ignored and the focus will need to be set manually using the Focusing Tool. Make sure the Z-axis is properly-homed when using this function. *NOTE: If a Rotary Fixture is currently installed this feature will be disabled.*
Laser Diode Always On	**Tap** or **click** to place a **check mark** in the box to activate. If activated, the red laser pointer will remain on regardless of door status.

Calibration

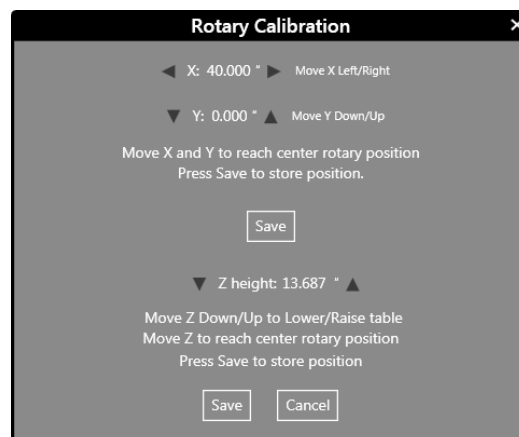|		
Z Height	Tap **Z Height** to adjust the Z-axis to the top surface of the stage. Follow the instructions provided. *NOTE: Use of the appropriate Focusing Tool is required when calibrating the Z Height.*	**Lens Calibration** ✕ ▼ Z height: 13.687 " ▲ Move Z Down/Up to Lower/Raise table Move Z to reach center rotary position Press Save to store position Tool Height: -12.287 " Save Cancel
Alignment	Tap **Alignment** to open the **Alignment Mode** window used for checking and adjusting alignment of the laser to the motion system. *NOTE: The Alignment feature should only be used if instructed by the ULS Factory Support Team.*	
Cutting Table	Tap **Cutting Table** to adjust the Z-axis to the top surface of a removable flow-through cutting table. Follow the instructions provided. *NOTE: The Flow-Through Cutting Table must be installed to activate the **Cutting Table** button.*	**Table Calibration** ✕ ▼ Z height: 13.687 " ▲ Move Z Down/Up to Lower/Raise table Move Z to reach center rotary position Press Save to store position Save Cancel
Rotary Fixture	Tap **Rotary** to adjust the Z-axis to a Rotary Fixture. Follow the instructions shown. *NOTE: The Rotary Fixture must be installed to activate the **Rotary** button.* *NOTE: For detailed instructions please refer to the Rotary Fixture section of Laser Processing Options.*	**Rotary Calibration** ✕ ◄ X: 40.000 " ► Move X Left/Right ▼ Y: 0.000 " ▲ Move Y Down/Up Move X and Y to reach center rotary position Press Save to store position. Save ▼ Z height: 13.687 " ▲ Move Z Down/Up to Lower/Raise table Move Z to reach center rotary position Press Save to store position Save Cancel
Autofocus	Tap **Autofocus** to adjust the Autofocus Sensor. Follow the instructions shown. *NOTE: All materials, options, and fixtures must be removed from the laser system prior to calibration.*	**Train Auto-Focus Sensor** ✕ Train AF Sensor Press Train AF to train auto focus sensor
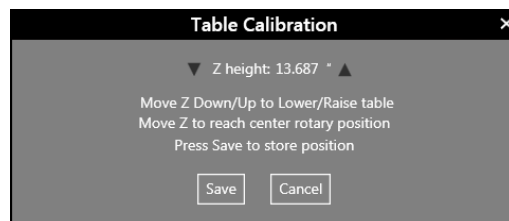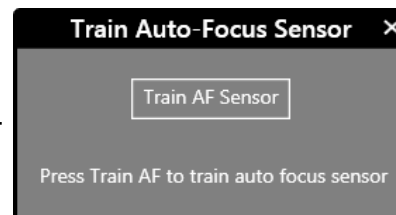
| Camera	Tap **Camera** to adjust the Universal Camera Registration option. Follow the instructions shown.

> *NOTE: The Camera must be installed to activate the **Camera** button.*

> *NOTE: For detailed instructions please refer to the Universal Camera Registration section of Laser Processing Options.*
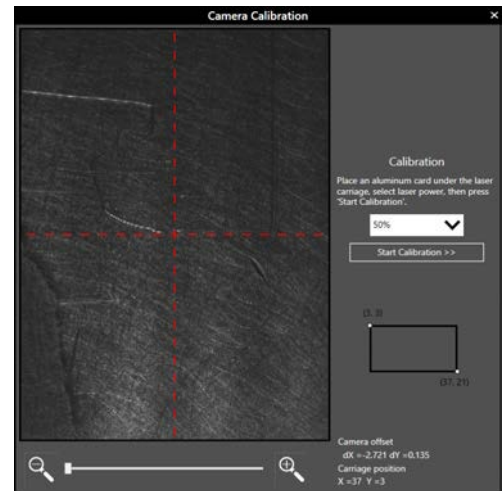
Superspeed	Tap **SuperSpeed** to adjust the SuperSpeed™ laser processing option.

> *NOTE: Adjusting any setting within the **Superspeed Deflections** window may negatively impact the performance of your Superspeed laser processing option. For detailed assistance in calibrating the option please contact the ULS Factory Support Team.*
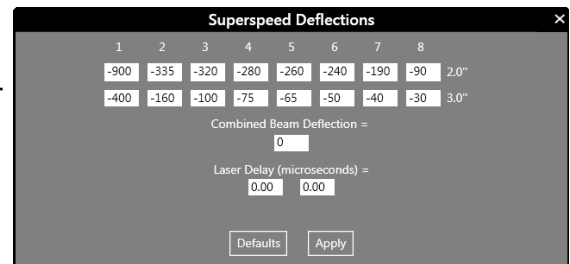
> *NOTE: SuperSpeed must be installed to activate the **SuperSpeed** button.*

Sounds

Use Sounds or Speech Synthesis	Select sound files or speech synthesis and attach to selected laser material processing events. If activated, the computer plays the selected sound or speech file every time the selected event occurs.

You can attach sound files or speech synthesis to the following events:

- JOB COMPLETE

- PAUSE

- RESUME

Homing

Remain in place after processing	If activated, prevents the motion system from returning home after a job is complete.
Home XY before processing	If activated, forces the laser system to re-home the X and Y axis before it processes each job.

Users

Controls access to the local laser system (connected by USB) by remote LSM clients. Remote clients cannot access the local system unless accounts and passwords are set up.

Enter the following information to allow remote users access to the local system:

- *Username*

- *Password*

- Select the *type of Access* for the user from the **drop-down** list.

> *NOTE: Each access level allows only certain actions to be performed and has all privileges of the access level above it.*
>
> - **Guest** - Initial state, version and login commands are available.
>
> - **Viewer** - Can view jobs in the queue and the current state of the laser system.
>
> - **Job Editor** - Can create and add design files to queue. Can modify existing design files.
>
> - **Operator** - Can operate the laser system.
>
> - **Admin** - Full access to the laser system. Can add and remove existing users.

- Tap the sign to add a new user to the table.

- Tap to delete a user from the table.

Misc.

Traveling Exhaust/ Camera	Informs the system that the Traveling Exhaust or Camera is installed.
	NOTE: It is important to select this switch when a Traveling Exhaust or Camera is installed so the motion system can compensate for the extra load.
Show tooltips	Display tooltips on windows and dialog boxes, if available.

Diagnostics Window

The **Diagnostics** window provides important information about the laser system for troubleshooting purposes. Access this window by tapping the **Diagnostics** button.

The **Diagnostics** window displays.

Diagnostics		
Laser Material Processing System		
Firmware version		1.36.44.1
FPGA version		2.23.1.1
Serial number		
Lasers		
Laser 1		50W CO2 10.6μ v16
Laser 2		50W CO2 10.6μ v32
Laser 3		30W Fiber 1.06μ v3
Computer		
CPU, MHz		1895
Memory, MB		8120
Software version		6.03.58 2015-04-28T13:18:52
USB speed		Full
Alarms		
Interlocks		
Peripheral devices		
Keypad/LCD	11.23.0.0	
Carriage	1.6.0.38	Lens: 2.0"MW, Autofocus: sensor unblocked
X-Servo	9.32.0.0	Motion Ready: 1, Motor Enabled: 1, Motor Fault: 0, Error Flag: 0, Index Pulse: 0, Near Home Limit: 0, Home Limit: 0, Pos Limit: 0, Neg Limit: 0, Trace Buffer Trigger: 0, Trace Buffer Full: 0, CPU LED: 1, Servo LED: 0, Error LED: 0, Calibrated: 1, Homed: 1
Y-Servo	9.32.0.0	Motion Ready: 0, Motor Enabled: 1, Motor Fault: 0, Error Flag: 0, Index Pulse: 0, Near Home Limit: 0, Home Limit: 0, Pos Limit: 0, Neg Limit: 0, Trace Buffer Trigger: 0, Trace Buffer Full: 0, CPU LED: 1, Servo LED: 1, Error LED: 0, Calibrated: 1, Homed: 1
Z-Servo	9.32.0.0	Motion Ready: 0, Motor Enabled: 0, Motor Fault: 0, Error Flag: 1, Index Pulse: 0, Near Home Limit: 0, Home Limit: 0, Pos Limit: 0, Neg Limit: 0, Trace Buffer Trigger: 0, Trace Buffer Full: 0, CPU LED: 0, Servo LED: 1, Error LED: 1, Calibrated: 1, Homed: 1
DC/AC power control	1.6.0.34	Air Bearing PSI: 62, degreesC: 1, CPU/servo/MW DC-Ok: 1, AC for CPU/servo/MW: 1, AC for lasers: 1, Laser1 Power: 1, Laser1 DC-Ok: 0, Laser2 Power: 1, Laser2 DC-Ok: 1, Shutdown: 0
Air assist	10.0.3.39	Pressure low, Cone PSI 0
Compressor	18.0.0.35	OFF
Registration Camera		
Fixture		Standard
R-Servo		Not present
Backplane I/O		Not present
CPU Voltage Monitor		Not present
Class4 switch		Not present
SuperSpeed™		Not present
Automation port		Not present
Air Cleaner		Not present
Positions		
Max	X=40.000 Y=24.000 Z=12.000 R=0.000	
Machine	X=40.000 Y=0.000 Z=-0.007 R=0.000	

The **Diagnostics** window displays the following information:

Laser Material Processing System	
Firmware version	Current Firmware version loaded into the laser system.
FPGA version	Current FPGA version loaded into the laser system.
Serial number	The Serial Number of the laser system. The Serial Number is needed when calling the ULS Factory Support Team.

Laser Sources
Information about the current laser source(s) installed in the laser system. A red 'x' indicates that the laser source 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).

Computer
Information about your personal computer. Use the UlsControl service section to Start, Stop, or Reset the UlsControl Service. Pressing the **Create Diagnostics** zip button will capture diagnostic information for your computer and laser system and place it in a zip file.

Alarms
The status of the over-temperature circuit in the material processing area. Also, 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 automatically shut down.
NOTE: An alarm status only displays if there is an over-temperature or low battery event.

Interlocks
The status of the top, front, side or rear doors of the laser system.
NOTE: An interlock status only displays if there is an event, such as an open door.

Peripheral Devices
The current firmware version for various devices installed in the laser system as well as status information about those devices.

Positions	
Max	The maximum field size.
Machine	The current location of the Carriage.

Log Window

The **Log** window is a useful troubleshooting tool that records system activity. This window allows you to filter system activity information to display selected message types and time frames. You can also search for messages containing specific strings.

Access this window by tapping the **Log** button.

The **Log** window displays.
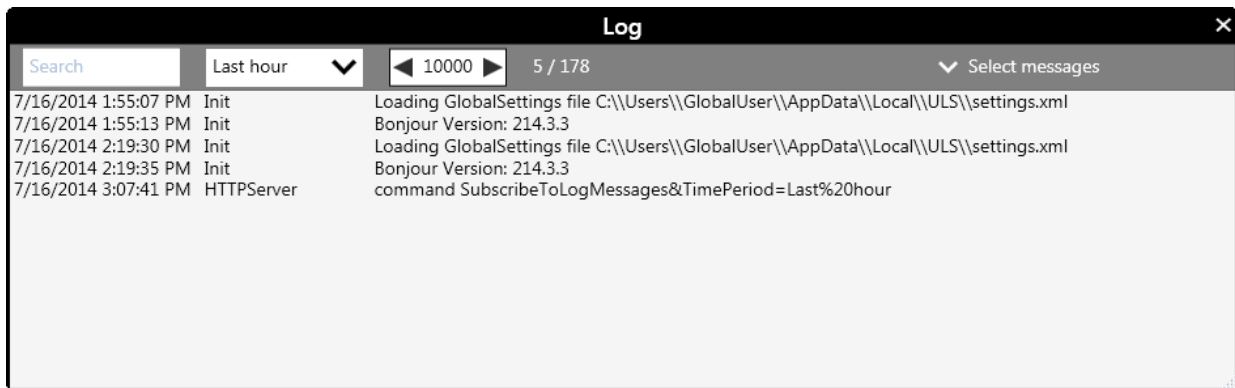
To search for a message in the log:

1. Enter the *message* or *part of the message* in the **text** box at the top of the **System Log** window.

2. Select a time period from the **drop-down** list in the second box.

3. Select the *number of the results* you want to view from the **third** box.

4. Select the *type of messages* you want to search from the **Select messages drop-down** list.

The results matching your criteria are shown in the window.

ULS Control Service

If a network connection is present, the **ULS Control Service** box displays the currently-available laser systems on the network. Use the **drop-down** list to connect to and control another laser system on the network. The default connection is the locally-connected (USB connected) laser system.

A client can only connect to one laser system at a time, but may choose between multiple available laser systems on the network.

A laser system may connect with multiple clients at the same time. Remote clients can observe what the laser system is doing, edit the job queue, etc.

A remote laser system cannot be accessed unless User Access Control has been set up. See the *Users* section under the **System Configuration Window**.

NOTE: This list does not appear if the laser system is not connected to a network.

Network Connection Status

Network Connection Status is activated if there is a current connection.

NOTE: If there is no connection, this button is grayed out.

System Type

System Type displays the type of system.

Hover over this button to view the system ID.

System Status

System Status displays the current status of the laser system:

- Idle
- Processing
- Paused

Laser Processing Settings 5

Laser Processing Settings is the component of the **LSM** that allows you to set the required processing parameters for a laser processing job.

After using a third-party graphics software program to prepare the graphics file (see *Third-Party Graphics Software* for more information), launch the graphics program's **Print** function. Use **Preferences** or **Properties** for the **Print** function to open the **Laser Processing Settings** component.

After selecting and applying the parameters for the graphics file using the **Laser Processing Settings** component, you are ready to create a design file. After printing, the design file is created and appended to the design file storage queue in the **LSM** control service for laser processing.

To Launch Laser Processing Settings:

1. When you are ready to process your graphics file, select **Print** in your graphics software's **Print** function.

2. Verify that the laser system appears as the *Printer name*. If the laser systems name does not appear, **click** the **drop-down** list and select your laser system.

3. Select **Preferences** or **Properties** from the graphics software's **Print** function.
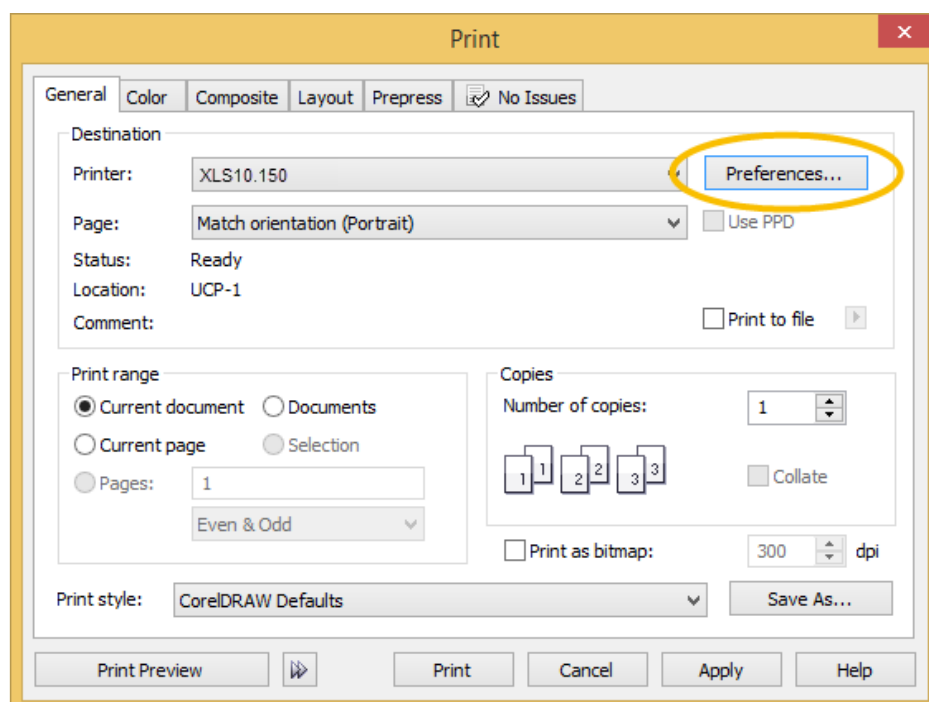
The **Laser Processing Settings** component launches with the **Material Settings** page displayed.

NOTE: The name of the design file to which you are applying settings displays in the lower right-hand corner.
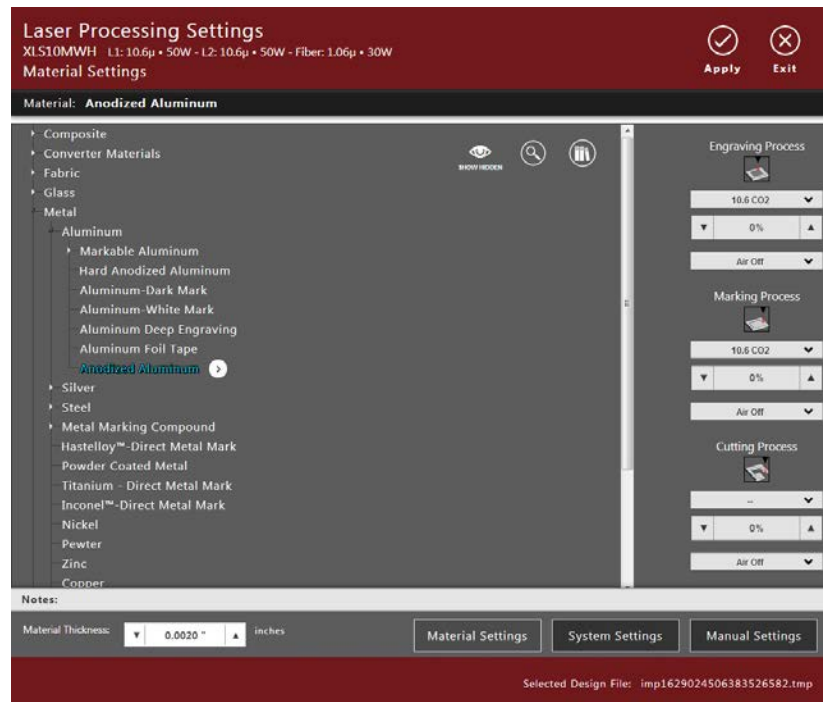
NOTE: The **Laser Processing Settings** *window is re-sizable.*

4. Complete the **Laser Processing Settings** selections on the following pages, as necessary:

• **Material Settings Page**

• **System Settings Page**

• **Manual Settings Page**

5. Tap ✓ to apply and **Save** the settings as they are defined. The **Laser Processing Settings** page remains open so that you can continue working.

6. When finished, tap ✓ to apply and **Save** all settings, and then tap ⊗ to **Exit** and return to the graphics program's Print function.

Laser Processing Settings - Common Controls

The following controls are common to all **Laser Processing Settings** pages.

⊘	**Apply**	Applies the changes made to the **Laser Processing Settings**. Tap **Apply** on the **Material Settings**, **System Settings**, or **Manual Settings** page to save changes made to the design file.
⊗	**Exit**	Closes the **Laser Processing Settings** application window. Tap **Exit** on the **Material Settings**, **System Settings**, or **Manual Settings** page to close the **Laser Processing Settings** application window. An **Exit** without a prior **Save** displays a confirmation message.
	Selected Design File	Displays the name of the currently-opened design file.

Material Settings Page

The **Material Settings** page displays when the **Laser Processing Settings** window first opens. This page lets you select the type of material, thickness of the material and units used for the thickness measurement for a new design file. Additional controls on the page allow you to customize the **Materials Database** view, access parameter settings or learn more about a material.

You can adjust laser intensity settings specified in the Materials Database by using the controls in the right pane of the page. **Gas Assist** settings can also be adjusted for each process.

NOTE: A material must be selected first before you can adjust any other settings. All settings stay with the design file.
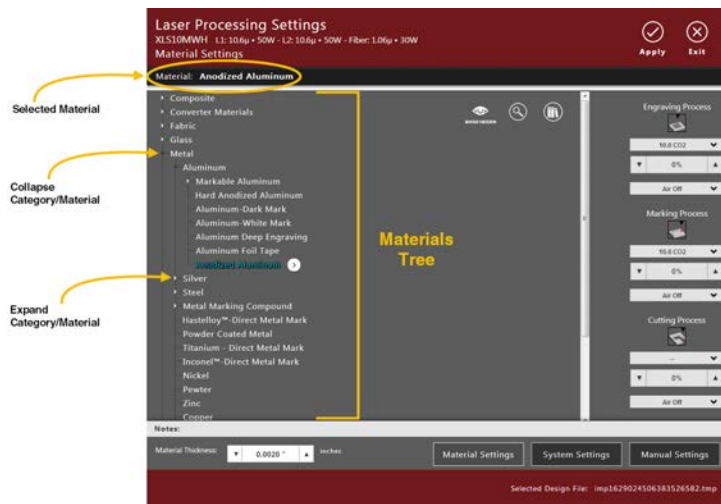
Materials Database

The Materials Database provides nominal settings for the most common materials used in laser processing. When you select a material from the materials database the system queries the database and uses the entered thickness to automatically calculate the settings that are required for laser processing that material.

Materials settings in the database are arranged in a multi-leveled tree structure. **Expand** or **collapse** the tree as needed to locate the material to be processed:

- Tap the expand symbol next to a material category to **expand** the category, and then tap to select a *material type*. The selected material displays at the top of the page.

- Tap the collapse symbol next to material category to **collapse** the category.
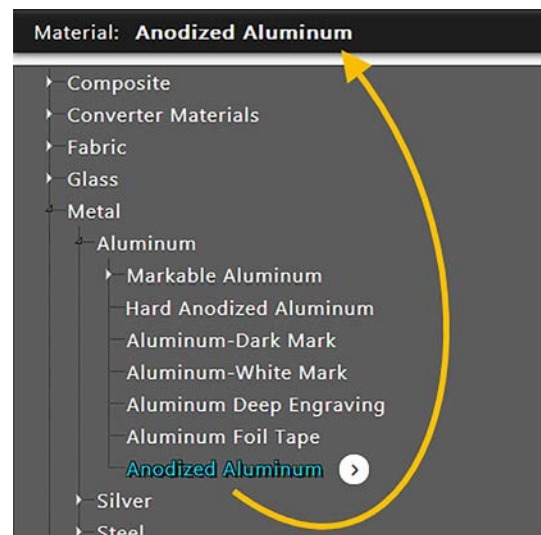
Working with Material Options

Material Options provide the ability to edit new or cloned custom materials, define a custom recipe and rename or delete custom materials.

Tap ⊙ next to a selected material.
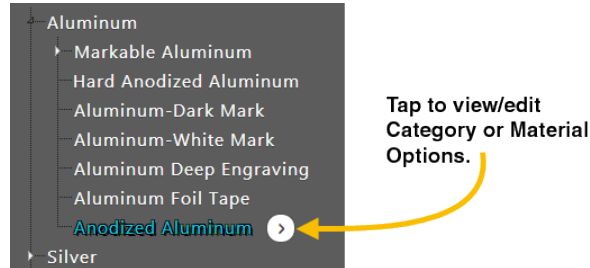
Tap to view/edit Category or Material Options.
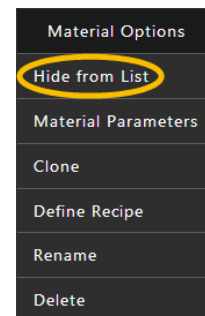
The **Material Options drop-down** list displays.

The following tasks can be performed using options on the **Material Options** drop-down list:

- **Hide a Material in the Materials Database**
- **Edit Parameters for a Custom Material**
- **Create a Custom Material from a Clone**
- **Define a New Recipe**
- **Rename a Custom Material**
- **Delete a Custom Material**

Hide a Material in the Materials Database

Tap **Hide** on the **Material Options drop-down** list.

When the **Hide** option is selected, the selected material is hidden and does not appear in the Materials Database. In this way you may hide materials that are not commonly used.
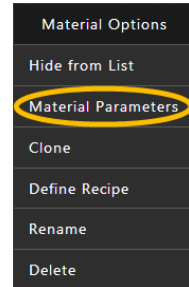
Edit Parameters for a Custom Material

Tap **Material Parameters** on the **Material Options drop-down** list.

The **Existing Material Parameters** window displays the parameters for the currently-selected material in the Materials Database. If the material selected is a custom material, edit the parameters as needed.


NOTE: *These parameters are read-only when a standard database material is selected.*

Material Options
- Hide from List
- Material Parameters
- Clone
- Define Recipe
- Rename
- Delete

Create a Custom Material from a Clone

Tap **Clone** on the **Material Options drop-down** list.

The **Existing Material Parameters** window displays a copy of the parameters for the material currently-selected in the Materials Database. You can then edit the parameters of this copy to create a new custom material record.

Material Options
- Hide from List
- Material Parameters
- Clone
- Define Recipe
- Rename
- Delete
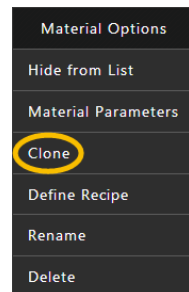
Existing Material Parameters

Material Code: 251998	Material(English):	Notes:
Date Stamp: 07/09/2015 17:27	Record Name:	
	Category: **Aluminum**	

Options:

- ☑ Visible
- ☑ 3D Support
- ☐ Fixed Thickness
- ☐ CO_2 9.3µ Support
- ☑ Fiber 1.06µ Support
- ☐ Can be Vector Cut
- ☑ CO_2 10.6µ Support
- ☐ Stamp Support

Laser Type: Fiber Parameters 1.06µ

Watts: 50

Fiber Simmer Power: ▼ 0% ▲

Default Thickness: ▼ 0.0000" ▲ | 3D Power |

Engraving Depth Settings:

Power:	Speed:	Image Density:
▼ 80% ▲	▼ 58% ▲	▼ 1 ▲

Fiber Engraving Waveform:	Fiber Engraving Frequency:
▼ 0 ▲	▼ 30000 Hz ▲

Marking Intensity Settings:

Power:	Speed:	PPI:
▼ 40% ▲	▼ 6% ▲	▼ 500 ▲

Fiber Marking Waveform:	Fiber Marking Frequency:
▼ 0 ▲	▼ 30000 Hz ▲

CO_2 Cutting Depth Settings:

For a description of each option available on the **Edit Parameters** and **Clone** windows, see *New Material* under the **Category Options Dialog Box** section.

1. Enter a new Material Name and modify each field, as needed, for the cloned material.

2. Tap ⊘ to save your changes.

3. The new/cloned material is available in the Materials Database under the category selected for the material.

4. Tap **Close** to **Exit** the window.

Define a New Recipe

A recipe is a variant setup for a particular material. Here are two examples:

- You are using a Rotary Fixture to mark designs on glass vases. The vases are 2 inches, 4 inches and 8 inches in diameter and are all the same material —glass— and in this case, every other parameter to laser process these vases is the same except for the circumference. Rather than having to set the circumference parameter every time a vase is laser processed, create a recipe for 2 inch vases, one for 4 inch vases, and one for 8 inch vases.

- You are processing silicone rubber. The material from supplier A processes slightly differently than the material from supplier B. You can optimize the process settings for supplier A material and save them in a recipe under silicone rubber and do the same for supplier B material. When the material is being run, select the recipe appropriate for the supplier rather than manually adjusting the settings each time the material is run.

To define a new recipe:

Tap **Define Recipe** on the **Material Options drop-down** list.

Use the **New Recipe** dialog box to create a new recipe from the current system settings. When a new recipe is created, the material selected in the Materials Database becomes the parent to the new recipe.

Enter a *Recipe Name* in the text box, and then tap [✓] to **Save** changes.
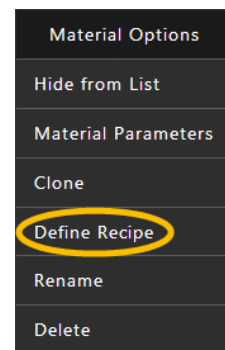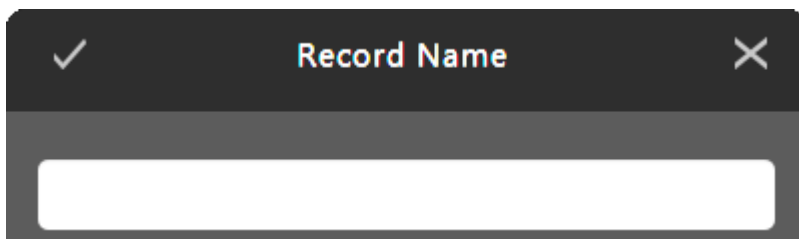
The new recipe displays on the Material Database.

Rename a Custom Material

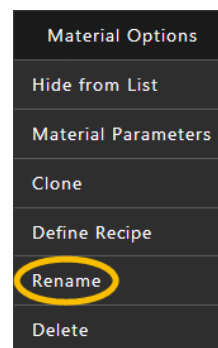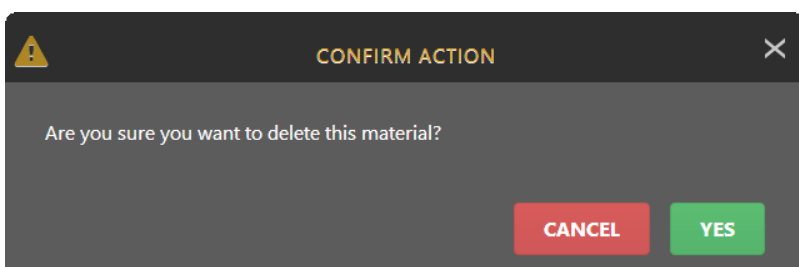Renames the currently-selected material in the Materials Database.

NOTE: *You can only rename custom materials.*

Tap **Rename** on the **Material Options drop-down** list.

Enter a *new name* for the material in the text box, and then tap [✓] to **Save** changes.

✓	Record Name	✕

Material Options
Hide from List
Material Parameters
Clone
Define Recipe
Rename
Delete

Delete a Custom Material

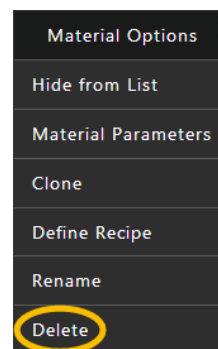Deletes the currently-selected material in the Materials Database.

NOTE: *You can only delete custom materials.*

Tap **Delete** on the **Material Options drop-down** list.

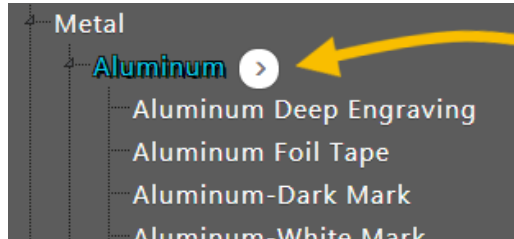When the confirmation message displays, tap **Yes** to delete the material.

⚠ **CONFIRM ACTION** ✕

Are you sure you want to delete this material?

CANCEL   YES

Material Options
Hide from List
Material Parameters
Clone
Define Recipe
Rename
Delete

Working with Category Options

Category Options provide the ability to edit or create custom categories, create a custom material and rename or delete custom categories.

Tap next to a category.


Tap to view/edit Category or Material Options.

The **Category Options drop-down** list displays.

You can perform the following tasks using options on the **Category Options drop-down** list:

- **Hide a Category in the Materials Database**
- **Edit Parameters for a Custom Category**
- **Create a Custom Category**
- **Create a Custom Material**
- **Rename a Custom Category**
- **Delete a Custom Category**

## *Hide a Category in the Materials Database*

When the **Hide from List** option is selected, the category is hidden and does not appear in the Materials Database. This allows you to hide categories that you do not commonly use.
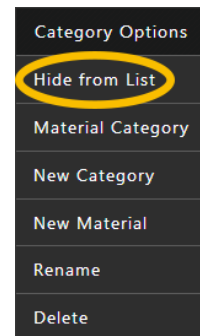
Edit Parameters for a Custom Category

Tap **Material Category** on the **Category Options drop-down** list.

The **Material Category** dialog box shows the parameters for the currently-selected category in the Materials Database. If the category selected is a custom category, edit the parameters as needed. (See *Create a Custom Category* for the field definitions.)

Category Options
Hide from List
Material Category
New Category
New Material
Rename
Delete
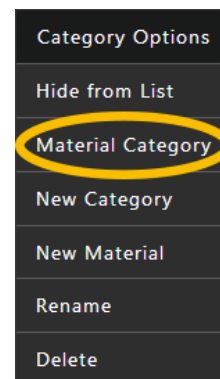
Material Category

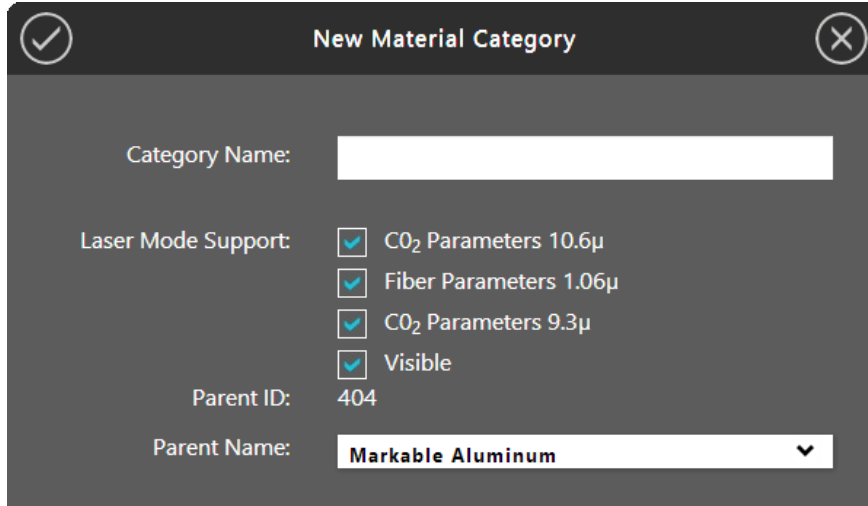|	
Category ID:	404
Category Name:	**Markable Aluminum**
Date Stamp:	07/09/2015 10:40
Laser Mode Support:	☑ CO_2 Parameters 10.6μ
	☑ Fiber Parameters 1.06μ
	☐ CO_2 Parameters 9.3μ
	☑ Record is Read Only
	☑ Visible
	☑ Custom DB Record
Parent ID:	5
Parent Name:	**Aluminum(parent)** ▾

NOTE: These parameters are read-only when a standard database material category is selected.

Create a Custom Category

1. Tap **New Category** on the **Category Options drop-down** list.

This option allows you to add a new category to the Materials Database using the **New Material Category** dialog box.
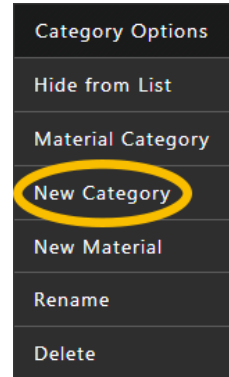
2. Complete the following editable fields in this dialog box:

   Category Name - Type the new category name in the text box.

   Laser Mode Support

   - CO_2 Parameters 10.6μm - Makes the material category available when this particular type of laser is installed in the laser system.

   - Fiber Parameters 1.06μm - Makes the material category available when this particular type of laser is installed in the laser system.

   - CO_2 Parameters 9.3μm - Makes the material category available when this particular type of laser is installed in the laser system.

   - Visible - Makes the category visible in the Materials Database.

   Parent ID - The system-assigned code for the parent category.

   Parent Name - Select the category from the **drop-down** list under which the new category will appear in the Materials Database.

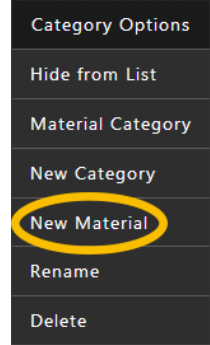*NOTE: The **Category ID** field displays the system-assigned code for the category.*

*NOTE: The **Date Stamp** field displays the date and time that the category was created or edited.*

---

3. Tap to save the changes.

The new category is available in the Materials Database.

Create a Custom Material

1. Tap **New Material** on the **Category Options drop-down** list.

    Use this option to create a new material using the **Add New Material** window.

2. Complete each field, as needed, for the new material.

Material Identification Information

1. Complete the following editable fields in this dialog box:

*   ***Material Name*** - Enter the name for your new material.

*   **Record Name** - Displays the Material Name.

*   **Category** - Select the category you want your new material to appear under from the **drop-down** list.

*   ***Notes*** - Enter notes that describe the material record. These notes display at the bottom of the Materials Database when the material is selected.

Options

- **Visible** - Controls whether the material is visible or not in the Materials Database. If you hide a material, this switch is affected. To restore materials that are hidden, first tap **Show All** on the **Materials Settings** page, select the hidden material you wish to restore, and then deselect **Hide** on the **Material Options drop-down** list.

- **Fiber 1.06µm Support** - Makes the material record available when a Fiber 1.06µm laser is installed in the laser system.

- **3D Support*** - If the material supports 3D mode, enables the ability to adjust the default 3D power levels for the new material using the **3D Support** button.

- **Can be Vector Cut** - Enables the ability to enter information into the Vector cut section.

- **Fixed Thickness** - Locks the available material thickness to one value.

- **CO_2 10.6µm Support** - Makes the material record available when a CO_2 10.6µm laser is installed in the laser system.

- **CO_2 9.3µm Support** - Makes the material record available when a CO_2 9.3µm laser is installed in the laser system.

- **Stamp Support*** - If the material supports **Rubber Stamp** mode, enables the ability to adjust Rubber Stamp settings levels for the new material.

Laser Type

- **Laser Type** - Select the type of laser for which you are entering processing parameters (CO_2 10.6µm, CO_2 9.3µm or Fiber 1.06µm).

- **Watts -** Wattage available for the selected laser type.

- **Default Thickness** - Value displayed by default when selected from the Materials Database.

- **Fiber Simmer Power (Fiber only) -** Sets the amount of additionally-stored energy the Fiber laser has prepared when processing the material.

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* Not available for use with the 1.06µm Fiber laser source.

3D Power

Tap **3D Power** to display the **3D Mode Power Calibration** dialog box.

Use the **sliders** to adjust the power profile for gray levels between white and black when in 3D mode. Values vary from *0 to 100%*.
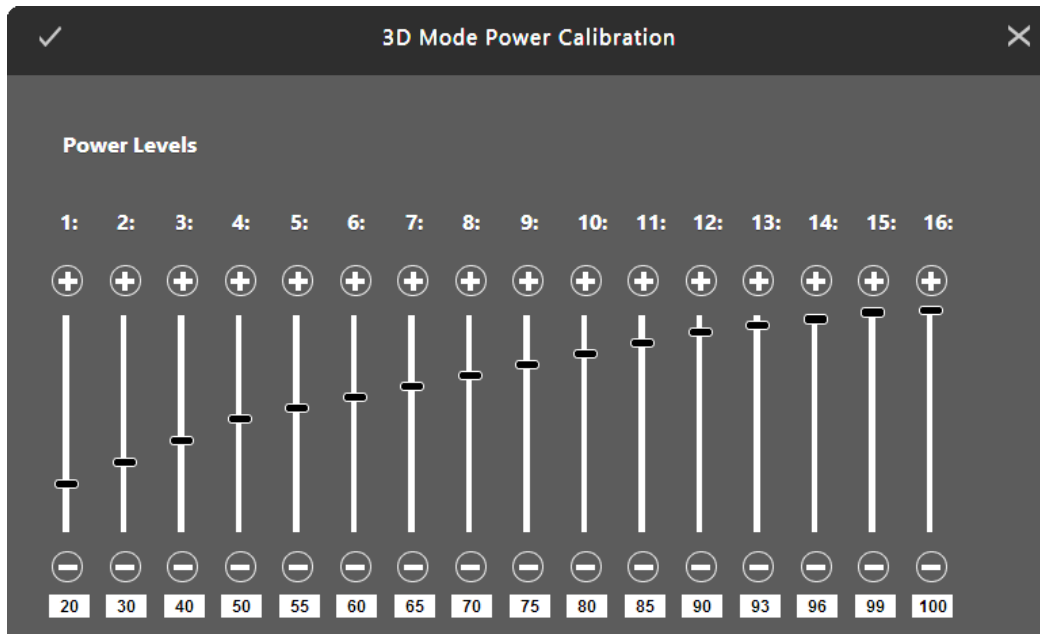
Engraving Depth Settings (Black)

Enter the *laser processing settings* to be used whenever **DB Raster** is selected for a processing color. The default color for this process is black. Test the material first to determine these settings.
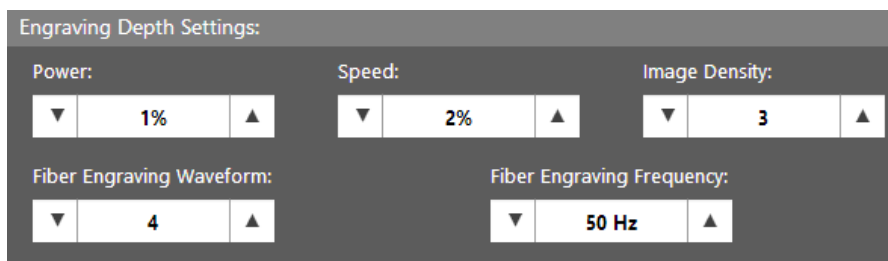
- **Power** - Select the laser power level for the laser wattage from *0 to 100%* by using the **up/down arrows** or by *typing in a value*.

- **Speed** - Select a processing speed from *0 to 100%* by using the **up/down arrows** or by *typing in a value*. This setting determines the motion system's maximum rate of travel.

- **Image Density** - Set from *1 to 7* by using the **up/down arrows** or by *typing in a value*. Select 1 for maximum throughput. Select 7 for maximum quality.

- **Fiber Engraving Waveform (Fiber only)** - Set from *0 to 5* by using the **up/down arrows** or by *typing in a value*.

- **Fiber Engraving Frequency (Fiber only)** - When choosing a waveform, the **LSM** will automatically fill in the recommended frequency value. You can manually select the frequency by using the **up/down arrows** or by *typing in a value*. Frequency can range from *1kHz to 500kHz.*

Marking Intensity Settings (Blue)

In this section, enter the laser processing settings to be used whenever **DB Vector Mark** is selected for a processing color. The default color for this process is blue. Test the material first to determine these settings.

Marking Intensity Settings:		
Power:	Speed:	PPI:
▼ 6% ▲	▼ 7% ▲	▼ 800 ▲
Fiber Marking Waveform:		Fiber Marking Frequency:
▼ 2 ▲		▼ 90 Hz ▲

- **Power** - Select the laser power level for the laser wattage from *0 to 100%* by using the **up/down arrows** or by *typing in a value.*
- **Speed** - Select a processing speed from *0 to 100%* by using the **up/down arrows** or by *typing in a value.* This setting determines the motion system's maximum rate of travel.
- **PPI** - When Vector cutting, select the pulsing frequency of the laser pulse stream being applied to the material, from 1 to 1000 Pulses Per Inch (PPI).
- **Fiber Marking Waveform (Fiber only)** - Set from *0 to 5* by using the **up/down arrows** or by *typing in a value.*
- **Fiber Mark Frequency (Fiber only)** - When choosing a waveform, the **LSM** will automatically fill in the recommended frequency value. You can manually select the frequency by using the **up/down arrows** or by *typing in a value.* Frequency can range from *1kHz to 500kHz.*

CO$_2$ Cutting Depth Settings (Red)

Using the values from your customer material testing, enter the processing settings. These settings are used whenever **DB Vector Cut** is selected for a processing color. The default color for this process is red.

CO₂ Cutting Depth Settings:				
Power: 10%	**Speed:** 11%	**PPI:** 500	**Max Depth:** 0.1000"	**Cut Entries:** 0 [Cut Data]
Fiber Cutting Waveform: 0		**Fiber Cutting Frequency:** 30000 Hz		

- **Power** - Select the laser power level for the laser wattage from *0 to 100%* by using the **up/down arrows** or by *typing in a value*.
- **Speed** - Select a processing speed from *0 to 100%* by using the **up/down arrows** or by *typing in a value*. This setting determines the motion system's maximum rate of travel.
- **Max Depth** - Enter the *maximum depth* the material can be cut.
- **Fiber Cutting Waveform (Fiber only)** - Set from *0 to 5* by using the **up/down arrows** or by *typing in a value.*
- **Fiber Cutting Frequency (Fiber only)** - When choosing a waveform, the **LSM** will automatically fill in the recommended frequency value. You can manually select the frequency by using the **up/down arrows** or by *typing in a value*. Frequency can range from *1kHz to 500kHz.*
- **Enter Cut Data** - Tap **Enter Cut Data** to display the **Cut Data Points** dialog box.

In order for the Materials Database to automatically calculate the job settings for any material thickness, you will need to enter values for at least two different thicknesses of the material into this dialog box. The more thicknesses entered, the more accurately the Materials Database can calculate the settings for other thicknesses.

The Materials Database will interpolate and extrapolate for other thicknesses as necessary, up to the thickness entered in the **Max Depth** field.

1. Tap **Save** [checkmark icon] to save the cut data. Then **Exit**.

2. Tap **Save** [circled checkmark icon] to save the new custom material. Tap **Exit** to close the **New/Clone Material** window.

The new material is available and listed in the Materials Database under the parent category selected for the material.

Cut Data Points			
Point	**Thickness**	**Power**	**Speed**
0	0.001"	100%	8.00%
1	0.0020"	100%	8.00%
2	0.0030"	100%	7.00%
3	0.0040"	100%	6.00%
4	0.0050"	100%	5.00%
5	0.006"	100%	4.00%
6	0.0070"	100%	3.00%
7	0.0080"	100%	2.00%
8	0.009"	100%	1.00%

Rename a Custom Category

Renames the currently-selected category in the Materials Database.

NOTE: You can only rename custom categories.

Tap **Rename** on the **Category Options drop-down** list.

Enter a new name for the currently-selected category in the text box.

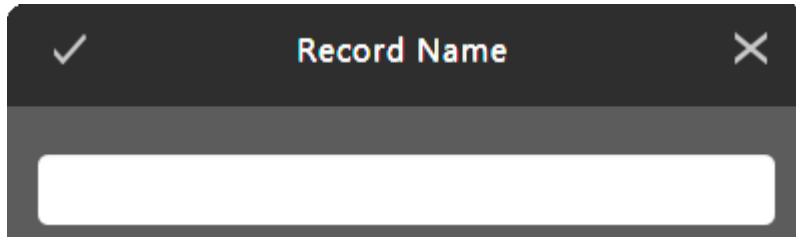| ✓	Record Name	✕
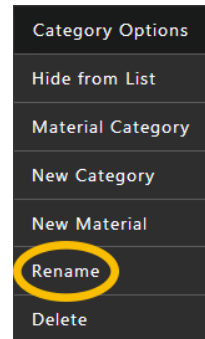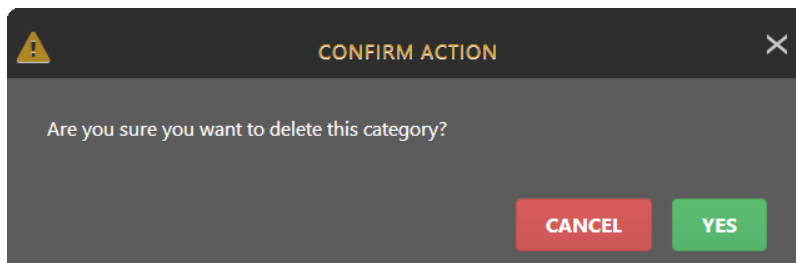
Delete a Custom Category

Deletes the currently-selected category in the Materials Database.

NOTE: You can only delete custom categories.

Tap **Delete** on the **Category Options drop-down** list.

When the confirmation message displays, tap **Yes** to delete the category.

⚠ CONFIRM ACTION ✕

Are you sure you want to delete this category?

CANCEL   YES
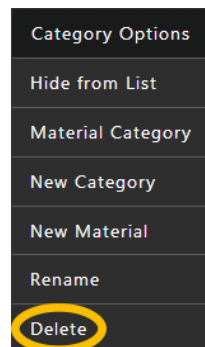
Viewing/Hiding Materials & Categories

Tap **View All** on the **Materials Settings** page to toggle between viewing all materials/categories in the Materials Database and hiding hidden materials/categories from the Materials Database.
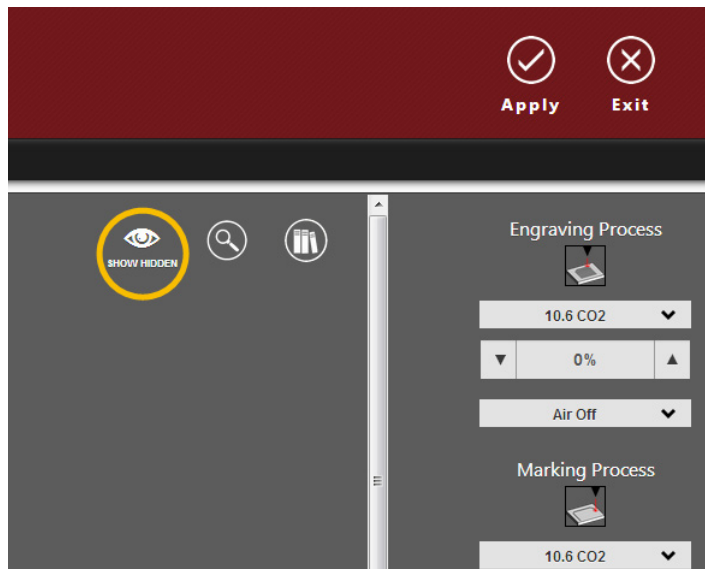
Hidden materials/categories are those with the **Hide From List** option selected on the **Material and Category Option drop-down** lists.
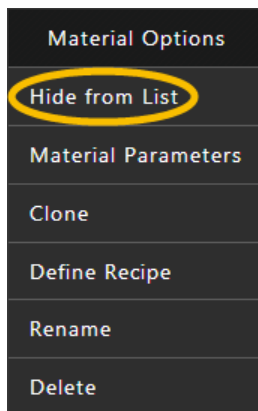
When the **Show All** button appears blue , all materials and categories that were hidden in the Materials Database will now display. When the **Show Hidden** button is white, all hidden materials and categories remain hidden in the Materials Database.

Searching for Materials

1. Tap the **magnifying glass** [🔍] on the **Materials Settings** page to search for a material.
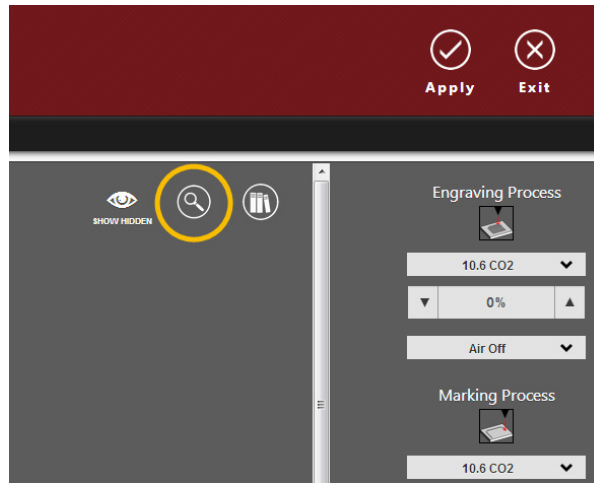
The **Find Material** dialog box displays. **Search** using the *material ID or material name.*
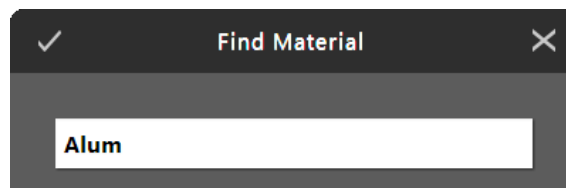
2. **Enter** the *material or category name or ID.* Records will narrow when more information is typed into the field.

3. Tap [✓] to close the **Find Material** dialog box.

4. Search results will appear highlighted in gold.

> **NOTE:** *When the* **Show All** *button appears blue,* **Find Material** *will return the results of hidden materials.*

Accessing the DLMP™ Library*

Tap **Online Library** to open the **Digital Laser Materials Processing™ (DLMP) Library** in a browser window. If a material or category is selected when you tap the button, the library opens to the relevant DLMP profile for that material or category. You must have Internet access available to view the **DLMP Library.**

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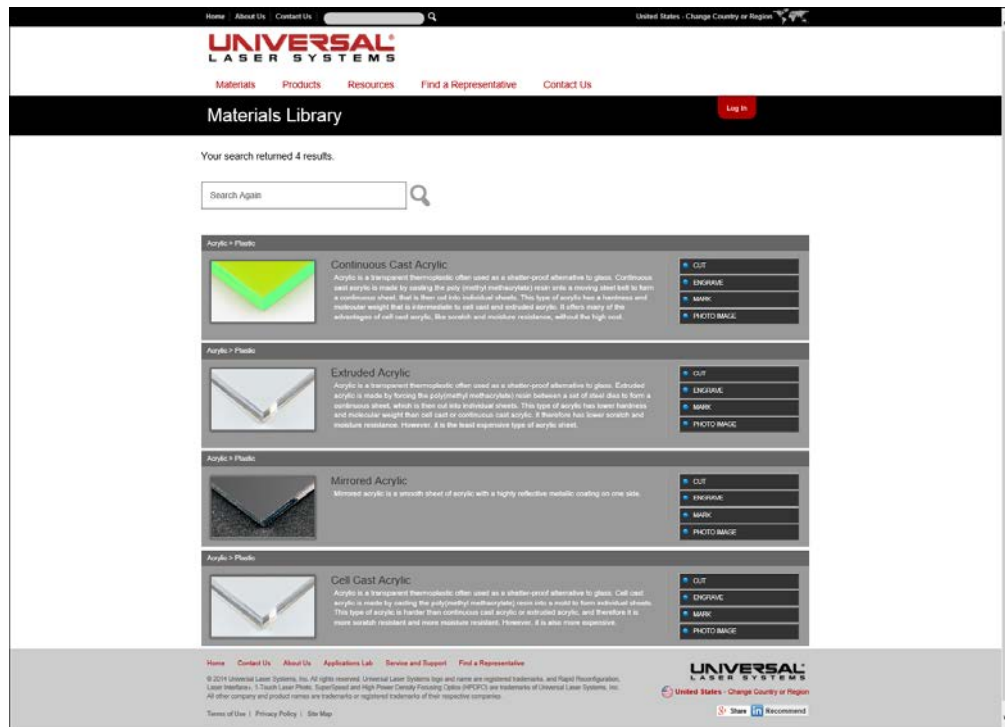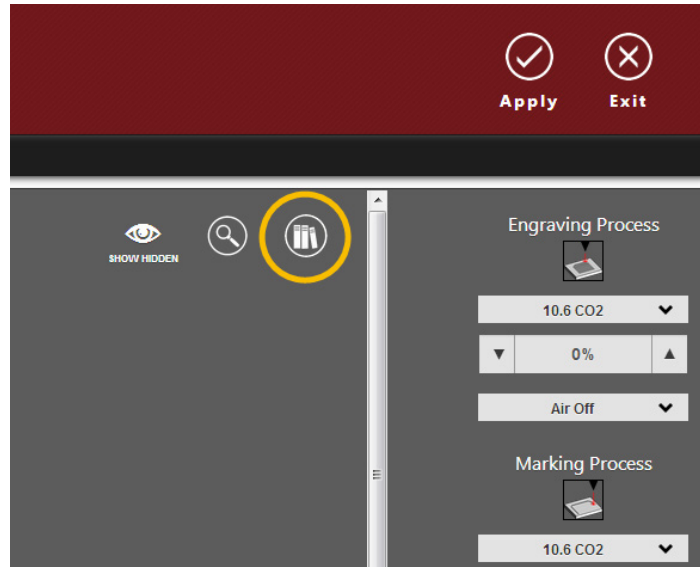
*   Currently under development.

Entering Material Thickness

The **Material Thickness** *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 by the laser system to move the Z-axis to the proper focus height when using **Auto Z** mode.

Enter the material thickness.
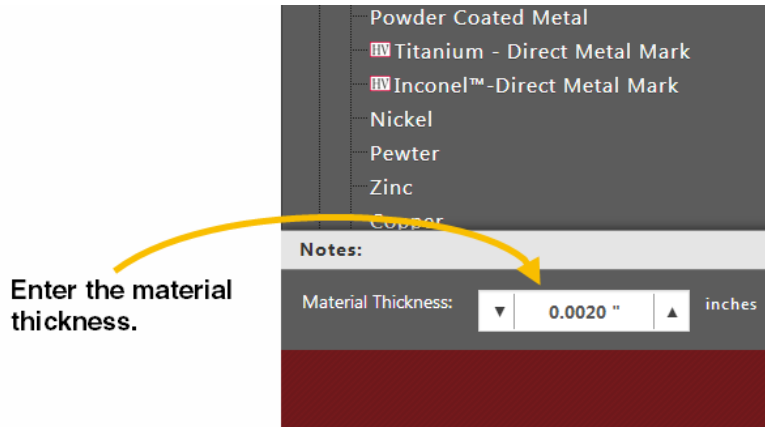
Using a caliper or similar measuring device, measure the thickness of the material and enter it into the **Material Thickness** box.

NOTE: If using a fixture, do not add the fixture height to the Material Thickness. Doing so may adversely affect laser speed and power settings for Vector cut lines.

Adjusting Process Settings

Based on the material selected from the Materials Database and the maximum output power of the installed laser, the system automatically calculates the appropriate settings for a nominal effect.

You can adjust the nominal material settings as well as the laser source for engraving, marking, and cutting:

Change the laser source by selecting a different source from the **drop-down** list.

Use the **up/down arrows** to increase or decrease intensity. Increasing intensity causes deeper engraving, marking, and cutting results and decreasing intensity causes shallower engraving, marking, and cutting results.

You can also adjust the Air or Gas Flow Rate by selecting a *percentage* from the **drop-down** list.
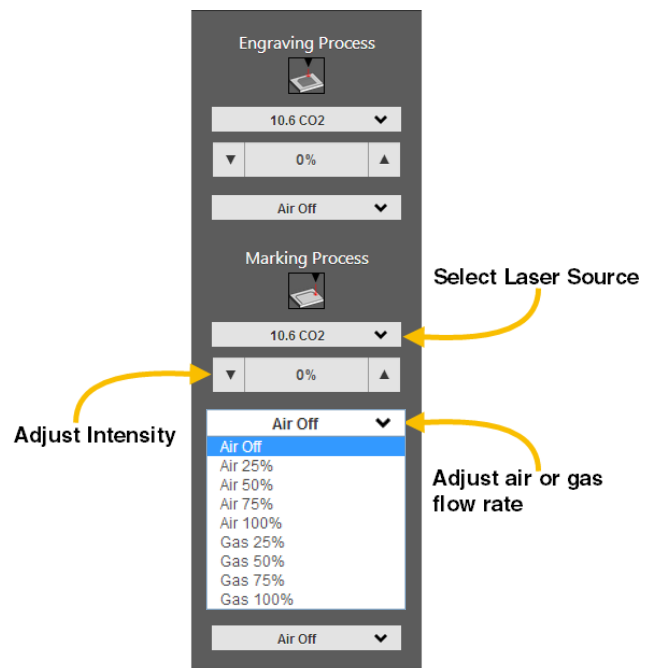
System Settings Page

The **System Settings** page provides additional options for controlling a process. Options to specify the methods to interpret the design file, select options, and customize processing behavior are offered on this page.
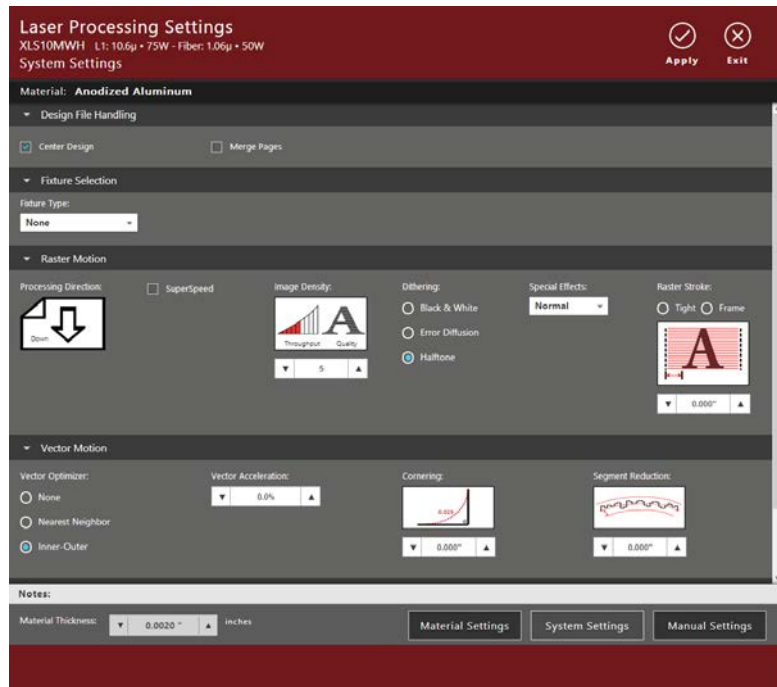
Design File Handling

Design File Handling allows you to set how the system will process the design file.

Place a **check mark** in each option as needed.

Merge Pages

Determines how a multi-page design file is handled:

- When unchecked, a single-page design file is assumed.
- When checked, a **drop-down** box displays.

Choose **Auto-Start** or **Manual Start**:

- **Auto-Start** - The system processes pages in a multi-page job consecutively with no pause between the pages.
- **Manual Start** - The system pauses processing after each page in a multi-page job. The user initiates the start of the next page.
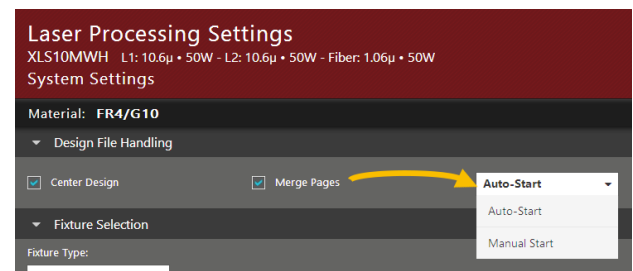
Center Design

Determines if the processing of the drawing/text element in the design file will be centered on the field:

- When **unchecked**, the drawing/text element in the design file is located where placed on the field.
- When **checked**, the drawing/text element in the design file is centered on the field.

Fixture Selection

Select the fixtures that are installed on the system.
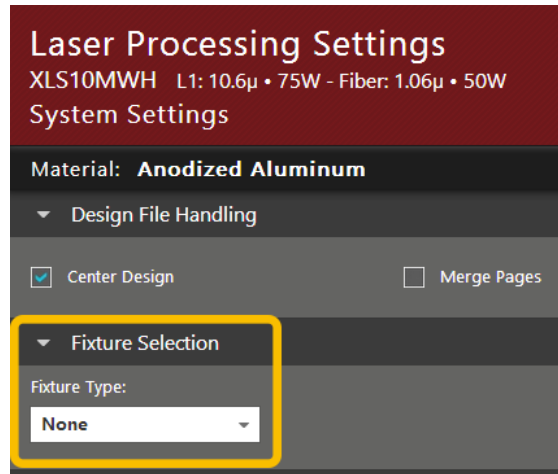
Fixtures

Select the type of fixture in use from the **drop-down** list, and then enter *parameter settings* for the selected fixture.

- **None** - Select **None** if no option is being used.

- **Rotary** - Enter the *Diameter*. If you have purchased this option, refer to the *Rotary Fixture* section of *Laser Processing Options* for additional information.

- **Pin Table** - If you have purchased this option, refer to the *Pin Table* section of *Laser Processing Options* for additional information.

Raster Motion Controls

These controls allow you to select Options that control **Raster Motion** behavior.
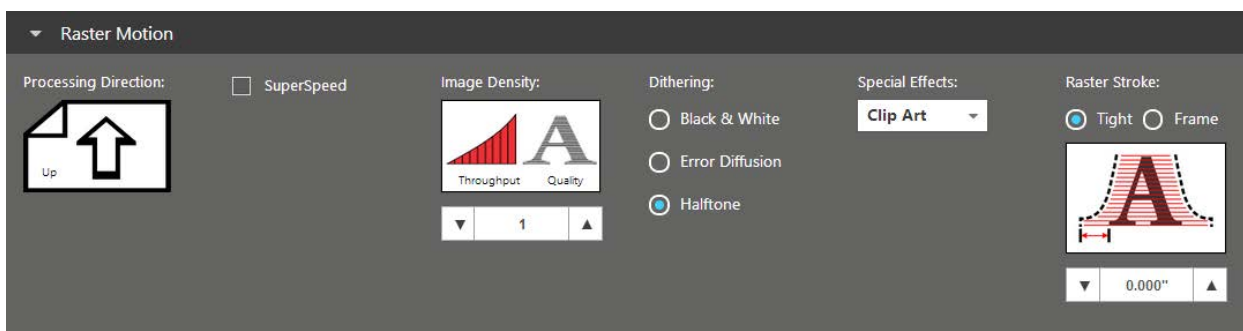
Processing Direction

Tap **Processing Direction** to toggle between the two Raster motion processing directions:

- Back-to-front (top to bottom)
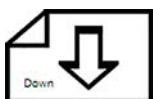
- Front-to-back (bottom to top)
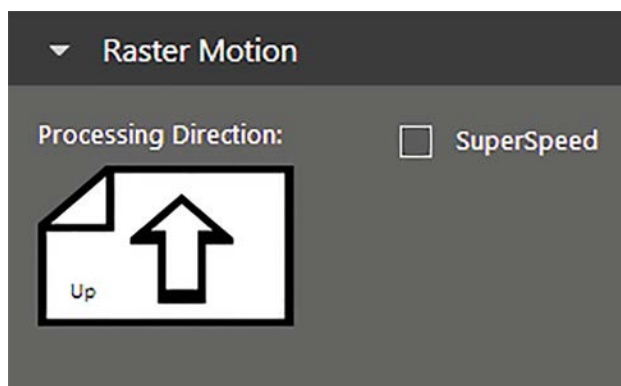
NOTE: On some materials it is advantageous to process Raster from front-to-back (bottom-to-top) to prevent smoke from marring the previously marked or engraved surfaces.

SuperSpeed™

Tap to **Enable** or **Disable** the SuperSpeed laser processing option. When enabled, SuperSpeed will be utilized while processing Raster data. If you have purchased this option please refer to the *SuperSpeed* section of *Laser Processing Options* for additional information.

Image Density

Image Density determines the number of lines of pixels or dots per (vertical) inch (DPI) used to render a Raster image on the material. It is also referred to as the vertical resolution or DPI. **Higher Image Density** settings produce better quality Raster images with finer detail, but reduce productivity by increasing Raster engraving time. **Lower Image Density** settings produce lower quality Raster images, but increase productivity by decreasing Raster engraving time.

Image Density settings will also have an effect on Vector quality and processing speeds when Vector objects contain many curves and small segments. Higher image densities will produce finer Vector detail, but may reduce productivity and vice versa for lower image densities. By running samples on scrap materials and trying different density settings, you can find an acceptable compromise between throughput and image quality.

Set **Image Density** from *1 to 9* by using the **up/down arrows** or by *typing in a value*. Select 1 for maximum throughput. Select 9 for maximum quality. An example of the approximate linear quality displays above the selected setting.
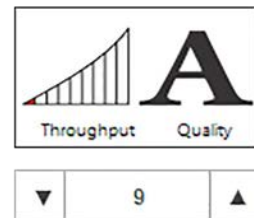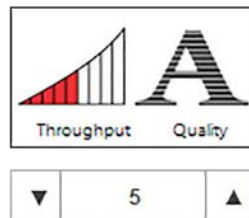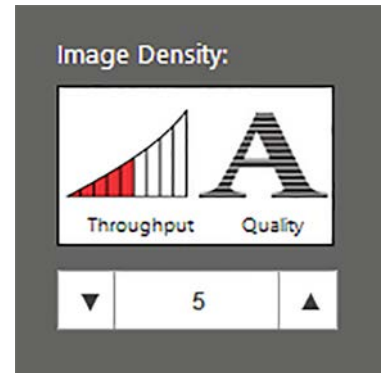
Dithering

Use **Dithering** settings when printing design files that contain grayscale or color bitmaps, such as photographs, for all printing modes except **3D** mode. A dither pattern is a special screen filter that is used to convert a grayscale or color image to monochrome (black and white). The screen filter reduces the image to black and white while preserving the illusion of shades of gray by varying the spacing of pixels (dots) in the image. Darker areas have more dots spaced closer together, and lighter areas have fewer dots spaced farther apart. Since the laser system is not capable of directly reproducing color or shades of gray, use this method to mimic shades of gray when engraving or marking onto your selected material.

Dithering:
- ○ Black & White
- ○ Error Diffusion
- ⦿ Halftone

Select one of the **Dithering** radio buttons for the dithering algorithm you want to use:

• **Black and White**

• **Halftone**

• **Error Diffusion**

Black and White

The **Black and White** mode is a thresholding dither pattern. This pattern thresholds at 50% black. Each pixel in a grayscale image that is greater than 50% black is converted into black and each pixel that is less than 50% black is converted into white. This dither pattern does not produce good results when reproducing photographs, but it is very useful when printing design files that should be black and white, yet may have some unintended grayscale pixels in them.

For example, you can use the **Black and White** mode for an image of a text document that was scanned into a computer using a grayscale scanner setting. Ideally the scanned image of text should be black text on a white background, but if a grayscale scanner setting was used, there may be very light gray pixels at the edges of the characters of text. This dither pattern will remove those gray pixels.

Error Diffusion

The **Error Diffusion** dither pattern uses a random scatter filter to place pixels in order to represent shades of gray, introducing a level of noise into the process. The pattern created will vary with the density chosen. Higher density settings, such as 5, will produce a more densely-packed, finer pattern and lower resolution settings, such as 2, will produce a loosely-packed, coarser pattern.

Halftone

The **Halftone** dither pattern is a line-type filter which applies a 45° line screen to a color or grayscale image to convert it to black and white. The line spacing of the line screen varies with the density chosen, so at lower densities, the line screen is coarser.

Image Density	Lines Per Inch	Image Density	Lines Per Inch
9	355	5	70
8	180	4	60
7	120	3	45
6	90	2	35

Special Effects

Select the **Special Effect** mode for your custom material from the **drop-down** list.

Normal Mode

Converts all Raster data to grayscale and then applies a dither pattern. Laser processing of the Raster data is done at a fixed laser job setting (laser power level and processing) calculated by the Materials Database.

NOTE: Normal mode is used for most materials and applications. This is the recommended default mode of operation.
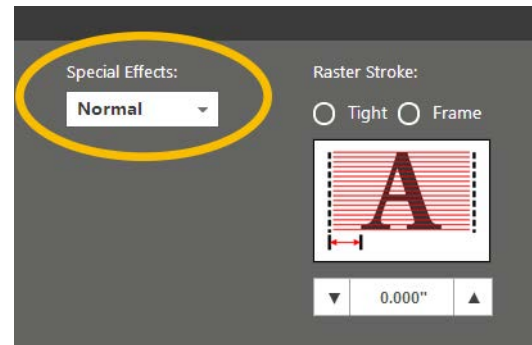
Clip Art Mode

Allows you to easily print many images from off-the-shelf clip art libraries. Many of these images are made by combining many overlapping shapes and only print correctly if converted to grayscale bitmaps. Be aware that this mode converts the entire graphic being printed into a grayscale image, including Vectors, and the black color settings are used for processing. Because of this, you will notice that the Color Table is reduced to one color (black) when this mode is selected. The dither pattern applied is the pattern currently selected in the **Dithering** field.

3D Mode

Varies the laser power level on the fly, in accordance with the grayscale levels of the Raster elements in the image (multicolor bitmaps are converted to grayscale first). Lighter parts of the image receive less laser power and darker parts more laser power. This mode is for very specific applications.

Use CONFIGURE to adjust how the grayscale levels are mapped to the laser power levels.

Move the **sliders** to adjust the power profile for gray levels between white and black. Values can vary from *0-100%.*
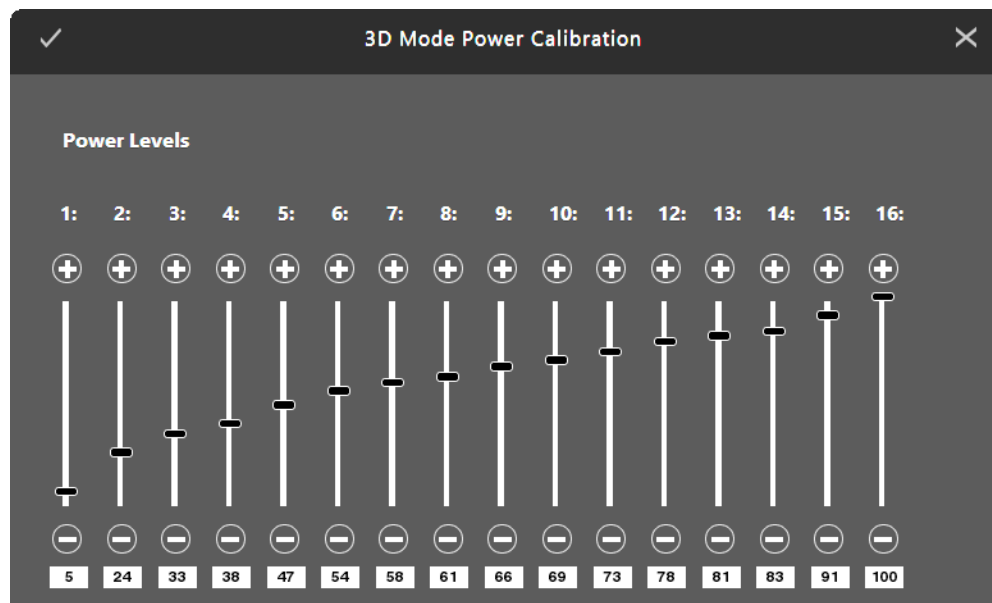
Rubber Stamp Mode

Creates shoulders on characters when processing rubber stamps.

Use [⚙ CONFIGURE] to adjust the shoulder settings in the **Rubber Stamp Profile** dialog box.
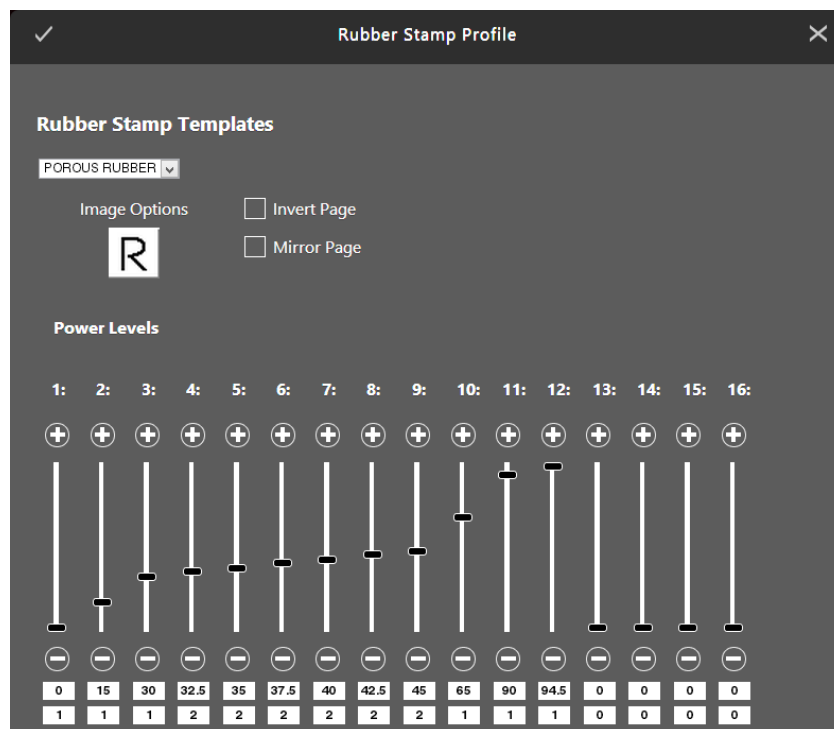
These controls allow you to view and adjust the settings for the selected template:

- On the **Taper Selection drop-down** list, select a ULS-defined taper.
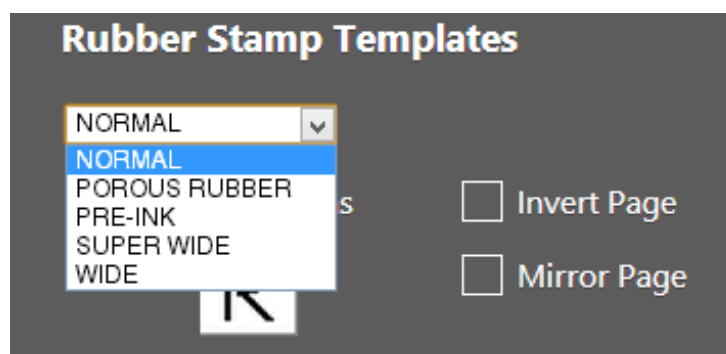
- **Invert** and/or **Mirror** the design

When the **Invert Page** and **Mirror Page** options are checked, the image changes to reflect the selections made. The four selection combinations are illustrated below.
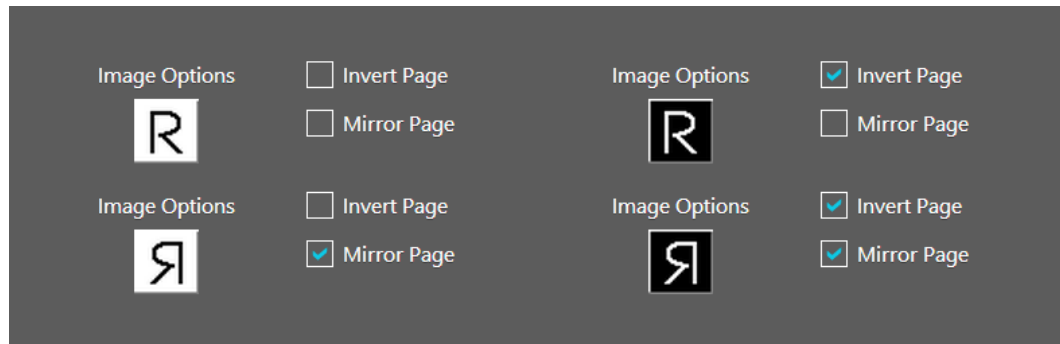
- Review the **Power Levels** and **Shoulder Taper Width** for the selected template.

Displays gray scale power levels for the selected template.

Shoulder taper width (mils).
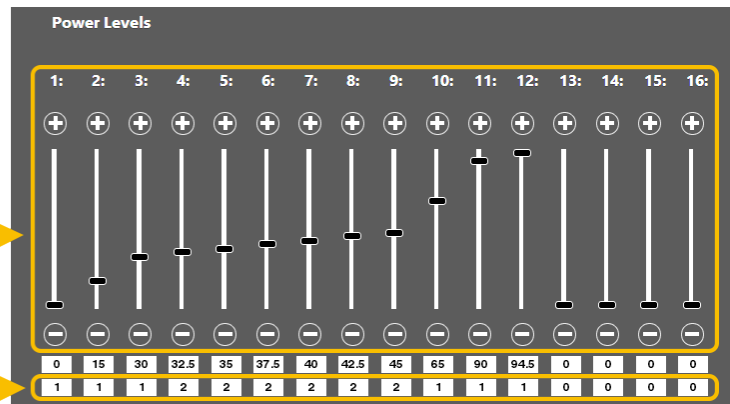
Reduction Mode

Adjusts the **Barcode Elements** for readability by removing pixels from the edges of each element of the Barcode. This is necessary because most barcodes are generated from barcode fonts so that the widths of the elements in the barcode are not adjustable. This mode allows you to adjust the widths of the elements at the time of printing to make the barcodes more readable with barcode scanners.

Use **⚙ CONFIGURE** to adjust the amount of reduction.
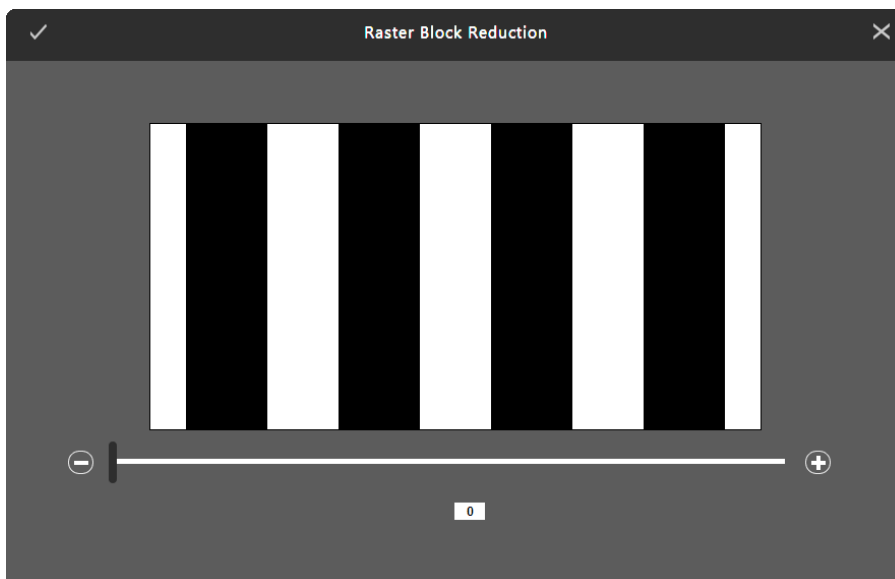
You can increase the reduction of black bars from *0 to 100*, proportionally increasing *the space between the bars*.
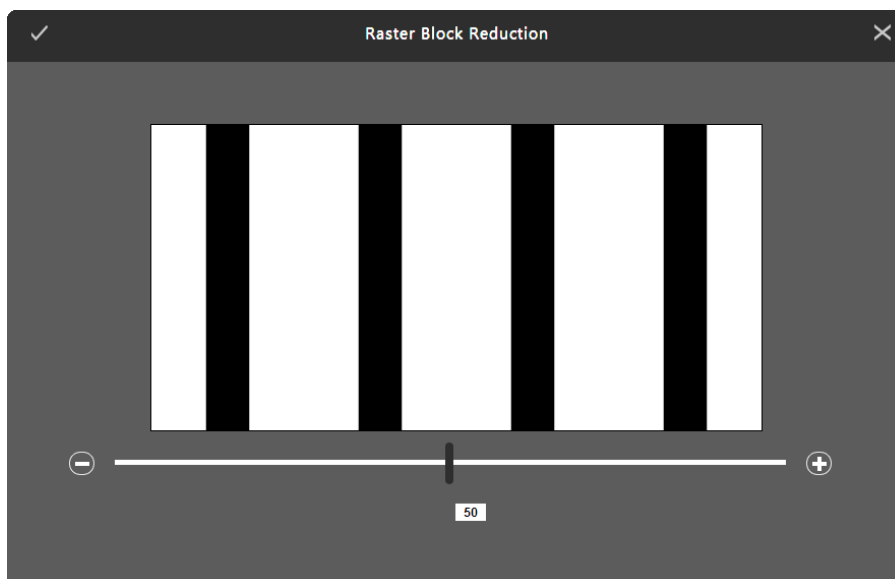
Texturize Mode

Adds texture to an engraved area.[*]

Use [⚙ CONFIGURE] to adjust the **Texture** settings.
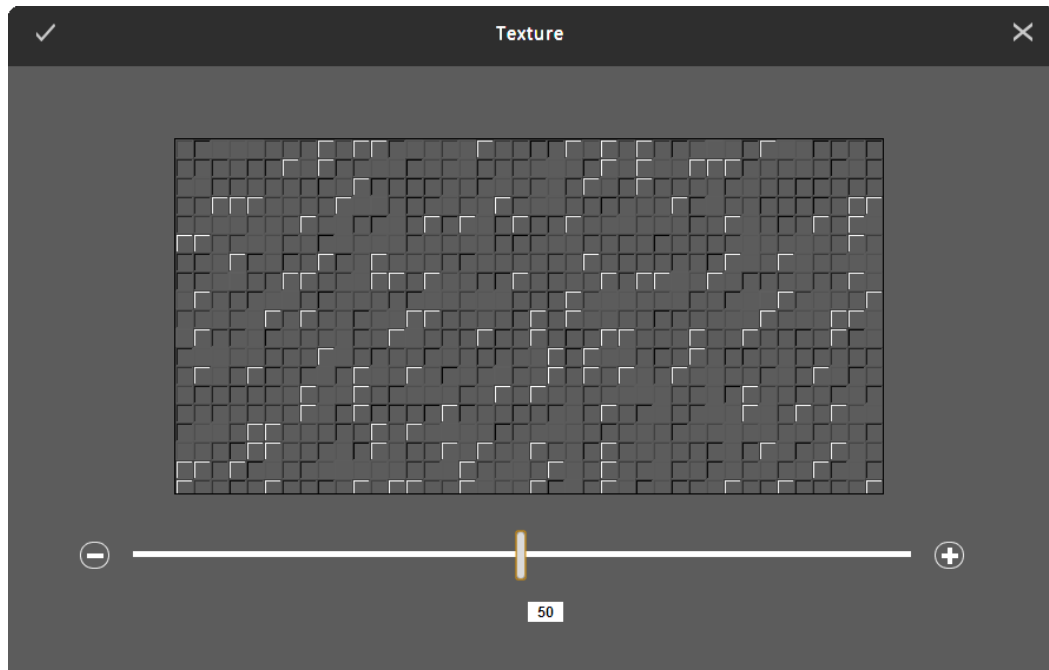
Use the **slider** to adjust the **Texture** settings from *0 to 100*. When set to 0, the engraved area will look/feel smooth. Increasing the texture will make the engraved area look/feel lumpier.

Same Pass

During normal laser processing, each individual color in a design file is processed separately. When **Same Pass** is selected, if two or more Raster objects of different colors share data on the same Raster stroke, the laser system will process them on the same pass. Laser Processing Settings created for each color are maintained with the laser system adjusting to the defined settings when passing over the individual color.

1-Touch Laser Photo™ Mode

Optimizes settings for best results with *1-Touch Laser Photo* images. This setting is automatically selected when printing photos from Universal Laser Systems 1-Touch Laser Photo printing software. You can also select this mode when printing a photo processed by 1-Touch Laser Photo that has been imported into other software prior to printing.

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[*] Not available for use with the 1.06μm Fiber laser source.

Raster Stroke

When you select **Normal** as a Special Effect, the **Raster Stroke** option is available for selection:

- If **Tight** is selected, the Raster strokes will vary with the image. For example, if you are engraving a triangular shape, the tip of the triangle will be engraved with short Raster strokes and the strokes get longer as the wider parts of the triangle are engraved.

- If **Frame** is checked, the longest Raster stroke is determined and all other Raster strokes are equal in length to the longest Raster stroke. This increases processing time, but edge quality can improve when engraving or marking at higher processing speeds. Use this mode only if necessary.

- Use the **up/down arrows** to add additional length to the calculated stroke. Adding length will increase total processing time but may improve engraving or marking at higher processing speeds. Use this setting only if necessary.
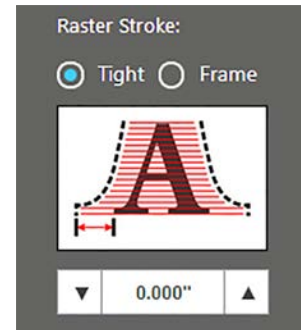
Vector Motion Controls

These controls allow you to select Options that manage **Vector Motion** behavior.
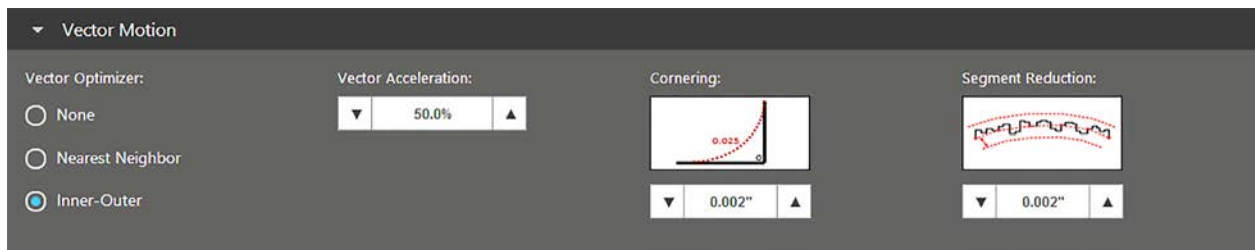
Vector Optimizer

Vector Optimizer settings affect how Vectors are grouped and in what order they are executed. Vectors are grouped by pen color first and always execute in the color order listed in the color table, but all Vectors of a given color are grouped and executed based on which of the following controls you select from the **Vector Optimizer drop-down** list:

- **None**

  Prints in the original order in which Vectors were passed to the **LSM** by the graphics program. This is usually a random order.

- **Nearest Neighbor**

  All open path Vectors are output first, beginning with the end point of the Vector path that is closest to the current position of the Carriage. All subsequent Vector paths are output using the same "nearest neighbor" starting point method.

- **Inner-Outer**

  When enabled, activates **Nearest Neighbor** while also performing the following:

  Once open paths are completed, closed paths will follow in a nested order, beginning with closed paths that are contained within other closed paths. The innermost closed path will be executed first then ends with the outermost closed path.

Vector Acceleration

The **Vector Acceleration slider** controls the acceleration and deceleration ramps in Vector processes. Decreasing this value creates a smoother acceleration and deceleration curve resulting in higher quality Vector strokes. Increasing this value results in faster Vector processing and potentially decreasing Vector quality.

Cornering

Adjusting the **Cornering** value will add a small curve to a corner allowing the laser system to continue processing without having to stop at each corner. Increasing this value will decrease processing time at the expense of corner accuracy. Decreasing this value will increase processing time while preserving corner quality.

Segment Reduction

Segment Reduction smooths out Vector curves consisting of multiple line segments and identifies a similar curve using fewer points. Any dissimilar points within the specified tolerance and along the Vector path will be ignored, resulting in the simplified curve. Points outside this value will still be processed. Increasing this value will decrease processing time at the expense of accuracy, whereas decreasing this value may increase processing time while preserving accuracy.

Special Settings

These controls allow you select Options that manage controls outside the motion system.

Fiber Simmer Power

This parameter is only available when working with a Fiber laser source. **Fiber Simmer Power** controls the amount of stored energy the fiber laser has prepared while processing. When using high frequency settings while processing at high speeds, increasing this value may provide additional responsiveness from the fiber laser source. In the **Special Settings Menu**, use the **up/down arrows** to add a *percentage of power.*

MANUAL SETTINGS PAGE

The **Manual Settings** page allows direct control over the laser material processing settings and the ability to specify additional processes.

Add colors to or remove colors from a process, depending on the design file being processed. You can also override the database and directly adjust the **Process Mode, Speed, PPI, Z-axis Height, Gas Assist, and Laser Power** for each process in the design file. In addition to this, if you are working with an XLS10MWH™ you will have the ability to adjust **Fiber Waveform** and **Fiber Frequency**.

Laser Processing Settings
XLS10MWH   L1: 10.6µ • 50W - L2: 10.6µ • 50W - Fiber: 1.06µ • 30W
Manual Settings

Apply   **Exit**

Material: **Anodized Aluminum**

Process Color	Process Mode	DB Laser Type	Speed	PPI	Z-Height	Air-Assist	Laser 1 10.6µ Power	Laser 2 10.6µ Power	Fiber 1.06µ Power	Fiber Waveform	Fiber Frequency
● Black	DB Vector Mark	10.6	62.5%	500	0.002 "	Air Off	100%	Off	Off	0	30000 Hz
● Red	DB Raster	10.6	100%	500	0.002 "	Air Off	Off	49.7%	Off	0	30000 Hz
● Green	Custom Raster	--	100%	500	0.002 "	Air Off	Off	Off	100%	0	30000 Hz

Notes:

Material Thickness: ▼ 0.0020 " ▲   inches

Material Settings   **System Settings**   **Manual Settings**

Selected Design File: imp1629024506383526582.tmp

Using the Color Table

The **Color Table** contains the settings for individual processes. There are sixteen colors available to which settings can be assigned. Any color in the design file that does not map directly into a color in the Color Table is matched to the nearest color. Any multi-color objects, such as grayscale or color bitmaps, will have a black and white dither pattern applied and will be mapped to the black color settings. Order of execution proceeds down the Color Table from top to bottom, with all Raster objects being completed first, then Vector objects. All materials in the database initially default to a specific arrangement of colors assigned to processes: black for all raster data, blue for all vector mark data, and red for all vector cut data. Each color/process will default to database settings but can be overridden if desired. This process order can be changed and the database will remember the laser used, arrangement of colors, and processes for each material in the database.

NOTE: *You can define up to 16 processes: 8 Raster settings and 8 Vector settings. See Third-Party Graphics Software for more information.*

Laser Processing Settings
XLS10MWH   L1: 10.6µ • 50W - L2: 10.6µ • 50W - Fiber: 1.06µ • 30W
Manual Settings

Apply   Exit

Material: **Anodized Aluminum**

Process Color	Process Mode	DB Laser Type	Speed	PPI	Z-Height	Air-Assist	Laser 1 10.6µ Power	Laser 2 10.6µ Power	Fiber 1.06µ Power	Fiber Waveform	Fiber Frequency
● Black	DB Vector Mark	10.6	62.5%	500	0.002 "	Air Off	100%	Off	Off	0	30000 Hz
● Red	DB Raster	10.6	100%	500	0.002 "	Air Off	Off	49.7%	Off	0	30000 Hz
● Green	Custom Raster	--	100%	500	0.002 "	Air Off	Off	Off	100%	0	30000 Hz

Color Table

Notes:

Material Thickness: ▼ 0.0020 " ▲ inches

Material Settings   System Settings   Manual Settings

Selected Design File: imp1629024506383526582.tmp

Define a Process

1. Tap a **Color** in the **Color Table** to open the **Process Settings** dialog box.

2. Complete the following settings:

- **Skip** - Toggle **on/off** by tapping on the **Power** button. Ignores all elements in the design file mapped to the selected color and does not print the elements.

- **Process Mode** - Select a mode from the **drop-down** list that will interpret the elements mapped to the selected color. The choices include:

  - **DB Raster** - Utilizes the recommended settings from the Materials Database to process Raster objects for the selected color.

  - **DB Vector Mark** - Utilizes the recommended settings from the Materials Database to process Vector marks for the selected color.

  - **DB Vector Cut** - Utilizes the recommended settings from the Materials Database to process Vector cuts for the selected color.

  - **Custom Raster** - Interprets all elements in the design file mapped to the selected color as Raster, including thin line widths.

  - **Custom Vector** - Interprets elements with a line width of .001" (.0245 mm) in the design file mapped to the selected color as Vector. Raster objects of the same color will be ignored.

  - **Registration** - Interprets elements with a line width of .001" (.0245 mm) in the design file mapped to the selected color as a registration mark utilized by the Universal Camera Registration laser processing option.

- **Drill** - Interprets individual Vector points with a thickness of .001 (.0245 mm) in a design file mapped to the selected color as Drill points. Vector and Raster objects of the same color will be ignored.

- **DB Laser Type** - Utilizes the recommended settings from the Materials Database for the selected laser type.

- **# of Pulses** - Available only when the **Drill** process mode is selected. Select the number of times the laser will fire by tapping on the **up/down arrows** or by typing in *a value*.

- **Duty Cycle** - Select the *%* of power for the enabled laser(s) when applying each pulse while using the **Drill Process** mode.

- **Repeat** - Enter the number of times the selected process will be run. Selecting **0** will complete the process once and not repeat.

- **Kerf Comp** - Available only when a **Vector Cut** process is selected. Select **ON** or **OFF** from the **drop-down** list. This option will only impact enclosed Vector paths. For individual lines, the laser system will follow the Vector path with no compensation.

- **Kerf Width** - Available when **Kerf Comp** is enabled. This option compensates for the *entered value* by adjusting the Vector path, followed by the laser, while completing the selected process.

- **Good Side** - Select the side on which to apply the kerf compensation. Select **Keep Outside** or **Keep Inside** from the **drop-down** list.

- **Pierce Mode** - Available only when a **Vector Cut** process is selected. Force the laser system to dwell at the start point of a Vector path prior to continuing. Select **ON** or **OFF** from the **drop-down** list.

- **Air Assist** - Select the **Flow Rate** for the **Air or Gas input** from the **drop-down** list.

- **Speed** - Select a processing speed from *0 to 100%* by using the **up/down arrows** or by *typing in a value.* This setting determines the motion system's maximum rate of travel.

Actual engraving time (throughput) is not only dependent on the **Speed** setting, but on the size, intricacy and placement of the graphic in the laser processing field. The motion system will accelerate/decelerate at a fixed rate up to the chosen speed. If the motion system cannot achieve the chosen speed based on the size and intricacy of the graphic or graphical placement in the field, it automatically adjusts its speed to the maximum speed it can achieve. This is evidenced when the motion system automatically slows down while cutting curves or circles. Automatic Proportional Pulsing (see PPI below) of the laser beam ensures that there is no difference in the depth of cut from straight lines to curves.

NOTE: 100% Raster speed is different than 100% Vector speed. Rastering is done with the X-axis Carriage which is lightweight and has a high acceleration and top speed. Due to the inertia of the X-axis arm, movements in the Y-direction have a slower acceleration and top speed making Vector speeds range from one-third to one-half the maximum Raster speed.

- **Z-axis** - Select the position of the Z-axis Table by using the **up/down arrows** or by *typing in a value.* When the Z-axis height is set and **Enable Auto Z** is selected in **System Settings**, the Table moves to the indicated position before processing elements in the design file. The Z-axis position is equivalent to material thickness unless using a fixture.

- **PPI** - Select the pulsing frequency of the laser pulse stream when Vector cutting. Select from *1 to 1000* pulses per inch (PPI) from the **drop-down** list.

The PPI setting indicates how many laser pulses per linear inch the laser source will emit. The pulsing of the laser beam is electronically linked to the motion. These pulses will always fire, equally spaced, from one to the next, regardless of changes in speed.

Higher PPI settings may cause melting, burning, or charring on the edges when cutting. Lower PPI settings may reduce this effect, but may result in a serrated-looking edge. Using less than 150 PPI may result in the pulses being spread so far apart that they may or may not touch one another, creating a perforated effect. A PPI setting from 300 to 500 PPI is a good nominal value for most applications, but some experimentation may be necessary.

NOTE: In Raster mode, PPI is controlled by the image density selected for Rasters (image densities 5 and below fix pulses at 500 PPI and image densities 6 and 7 fix pulses at 1000 PPI).

- **Laser 1** - Toggle **on/off** by tapping the **Power** button. Select the laser power level for Laser 1 from *0 to 100%* by using the **up/down arrows** or by *typing in a value.*

- **Laser 2** - Toggle **on/off** by tapping the **Power** button. Select the laser power level for Laser 2 from *0 to 100%* by using the **up/down arrows** or by *typing in a value.*

- **Fiber Laser (XLS10MWH™ Only)** - Toggle **on/off** by tapping on the **Power** button. Select the laser power level for the fiber laser from *0 to 100%* by using the **up/down arrows** or by *typing in a value.*

The **Power** settings are directly related to how deep the cutting or engraving will be. The higher the setting, the deeper the cutting or engraving, and vice-versa. Power essentially determines the duty cycle/pulse width of each laser pulse in the job. Laser pulse frequency is controlled by the PPI setting for Vector and by the Image Density setting for Raster (Image Density settings 5 and below fix pulses at 500 PPI and Image Density settings 6 and 7 fix pulses at 1000 PPI).

*NOTE: The **Power** and **Speed** settings work together in determining how deep the engraving or cutting will be. Higher power and slower speeds produce deeper results. Lower power and higher speeds produce shallower results.*

- **Waveform (XLS10MWH™ only)** - Set from *0 - 5* by using the **up/down arrows** or by *typing in a value.*

- **Frequency (XLS10MWH™ only)** - Select the frequency by using the **up/down arrows** or by *typing in a value.* Frequency can range from *1kHz to 500kHz.*

3. Do one of the following:

- Tap **Apply** to save changes and return to the **Manual Settings** page. The **Process Settings** dialog box remains open to allow you to edit another process.

- Tap **Exit** to close the dialog box. If changes were not previously saved, the dialog will close without saving changes.

Select Active Processes

1. Tap the **Plus** Symbol ⊕ above the **Color Table** to select active processes.

Open Active Processes dialog box to select active processes.

Laser Processing Settings
XLS10MWH   L1: 10.6μ • 50W - L2: 10.6μ • 50W - Fiber: 1.06μ • 30W
Manual Settings

Material: **Anodized Aluminum**

⊕

Process Color		Process Mode	DB Laser Type	Speed	PPI	Z-Height
●	Black	DB Vector Mark	10.6	62.5%	500	0.002 "
●	Red	DB Raster	10.6	100%	500	0.002 "
●	Green	Custom Raster	--	100%	500	0.002 "
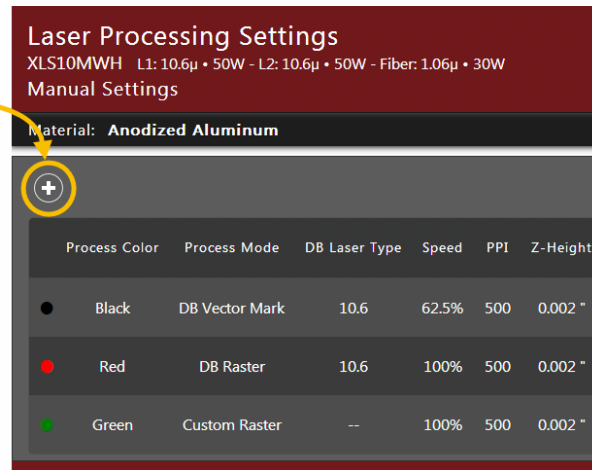
The **Active Processes** dialog box displays.

A check mark next to a process indicates it is active.

Active Process Selection   ✕

SELECT ALL

Tap to toggle between Select All (all boxes checked) and Unselect All (all boxes unchecked).

Touch box to toggle between checked and unchecked.

☑ ● Black	☐ ● Brown
☐ ● Blue	☐ ● Maroon
☑ ● Red	☐ ● Forest Green
☑ ● Green	☐ ● Olive
☐ ● Yellow	☐ ● Pink
☐ ● Magenta	☐ ● Purple
☐ ● Cyan	☐ ● Teal
☐ ● Orange	☐ ● Slate Blue
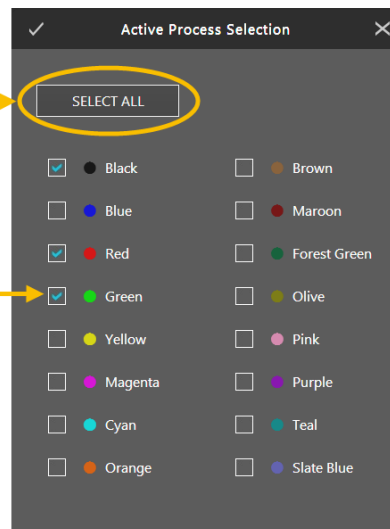
2. Select processes by doing one of the following:

• Touch a **box** to **check it** or **deselect it.**

• Tap to toggle between **Select All** and **Deselect All**.

   • **Select All** - checks all boxes in the list.

   • **Deselect All** - un-checks all boxes in the list.

*NOTE: At least one color must be selected on the **Active Processes** dialog box.*

3. Tap **Apply** ✓ to save changes to the design file. Tap **Exit** ✕ to close the dialog box. If changes were not previously saved, the dialog box closes without saving any changes.

Assign Process Order of Execution

The order of execution can only be changed before the first printing of a job. After printing the job, the color order becomes fixed for that job.

1. Change the order of execution for the processes by **dragging a color dot** into the position you want it to process. Processes are executed in the order they appear in the list from top to bottom. This changes the order of execution for all objects using those colors.

Laser Processing Settings
XLS10MWH   L1: 10.6μ • 50W - L2: 10.6μ • 50W - Fiber: 1.06μ • 30W
Manual Settings

Material: Anodized Aluminum

Process Color	Process Mode	DB Laser Type	Speed	PPI	Z-Height
● Black	DB Vector Mark	10.6	62.5%	500	0.002 "
● Red	DB Raster	10.6	100%	500	0.002 "
● Green	Custom Raster	--	100%	500	0.002 "

To define the order of execution, drag the colored dots into the desired position.
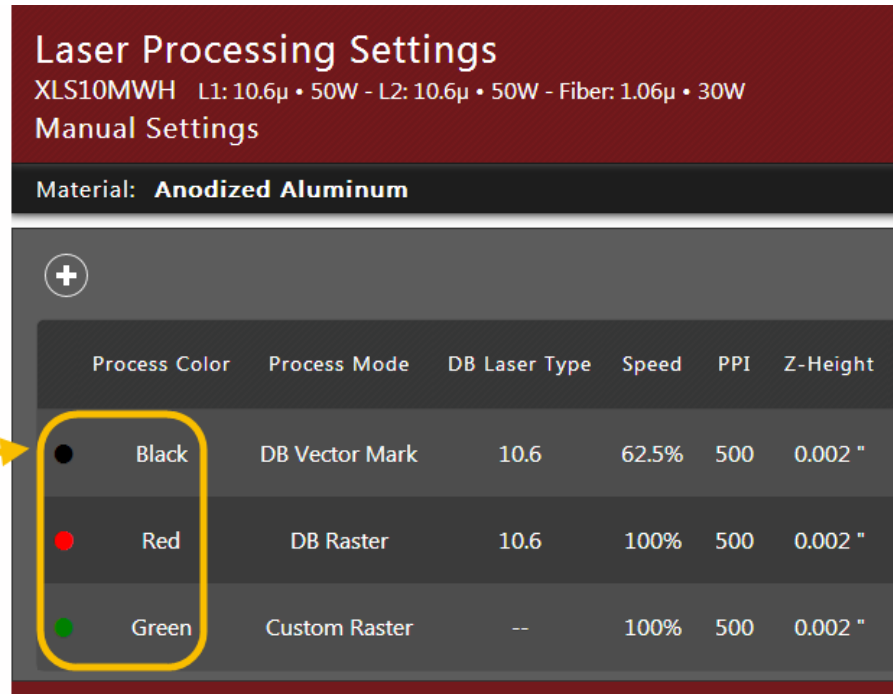
2. Tap **Apply** ✓ to save changes, or tap **Exit** ✕ to close the **Manual Laser Processing Settings** application without saving any changes.

LCD Control Panel 6

The **LCD Control Panel** on the XLS10 laser system provides the functions necessary to operate the laser system. The **Control Panel** is a touchscreen that is attached to the right frame of the XLS10.

The Control Panel's **Main Screen** contains two panes:

- The upper pane is the Preview Area for displaying the current design file.
- The lower pane contains the controls.

LCD Control Panel Main Screen

USING THE CONTROLS ON THE LCD MAIN SCREEN

A.	*Rulers*	Tap the **Rulers** to toggle between inches and centimeters. The rulers expand and contract when using the **Zoom** feature.
B.	*Preview Area*	Displays a preview of the current design file.
C.	*X, Y, Z Position*	Shows the current X, Y, and Z positions of the Carriage.
D.	*Previous/Next*	Tap **Previous/Next** to display the previous/next file in the queue in the Preview Area.
E.	*Design File Storage Queue Screen*	Displays the **Design File Storage Queue** screen. This screen is useful when your file queue is large and you need to navigate through it.
F.	*Interlock State*	Indicates if all the doors to the system are closed so that it is safe for the laser to fire.
G.	*Start*	Initiates processing of the laser job currently selected and visible in the Preview Area.
H.	*Pause/Resume*	Stops the execution of the job in process and moves the Carriage to its home position in the upper right-hand corner of the processing area. If the **Pause** button is tapped again, the job will **Resume** at the point where the motion system was paused. Tapping **Start** while the machine is in a paused state restarts processing from the beginning of the job.

I	*Pan/Zoom*	Tap [icon] to enter **Pan/Zoom** mode: • Swipe to **Pan** • Tap to **Zoom** Use **Pan** to view an area of the image that is outside the displayed ruler area. The **Zoom** level does not change when panning. If you are **Zoomed** all the way out so that the rulers show the entire field, you will not be able to **Pan**.
J	*Focus*	Tap [icon] to enter **Focus** mode. A crosshair identifies the location of the Carriage. Tap a *new location* on the screen to relocate the Carriage.
K	*Relocate Image*	Tap [icon] to change the location of the image on the field. Select one of the anchor points surrounding the image, then tap **Relocate Image to Carriage**. The selected image anchor point will snap to the Carriage location.
L	*Zoom In/Out*	Tap [icon] to toggle between **Zoom In** and **Zoom Out**.
M	*Autofocus*	While in **Focus** mode, tap [icon] to enter **Autofocus** mode.
N	*Relocate Image to Carriage*	Select an anchor point and tap [icon] to move that image's anchor point on the field to the same location as the Carriage.
O	*XY Motion Sensitivity*	Controls the tap sensitivity of *XY Motion Control*. **Toggle** between *0.01* and *0.100* inch per tap.
P	*Z Motion Sensitivity*	Controls the tap sensitivity of *Z Motion Control*. **Toggle** between *0.005, 0.025 and 0.100* inch per tap.
Q	*XY Motion Control*	Drag the Virtual Joystick Control away from center in the desired travel direction. Manual motion speed increases as the joystick control is moved farther from center. Incremental moves in X or Y can only be made by tapping directly on the **arrow keys** surrounding the **joystick** control.
R	*Z Motion Control*	Moves the Table up and down in the Z direction. Press and hold the **Motion Control** button for lengthy moves and tap it for short moves. *Z Motion Control* displays the following: • Single chevron: *0.005* inch per tap • Double chevron: *0.025* inch per tap • Triple chevron: *0.100* inch per tap

USING THE DESIGN FILE STORAGE QUEUE SCREEN

The **Design File Storage Queue Screen** helps you navigate through your design file queue. This is useful when your design file queue is large and you need to locate a specific file.

To use the Design File Storage Queue Screen:

1. On the LCD Control Panel, tap the **Job File Storage Queue Screen icon.**
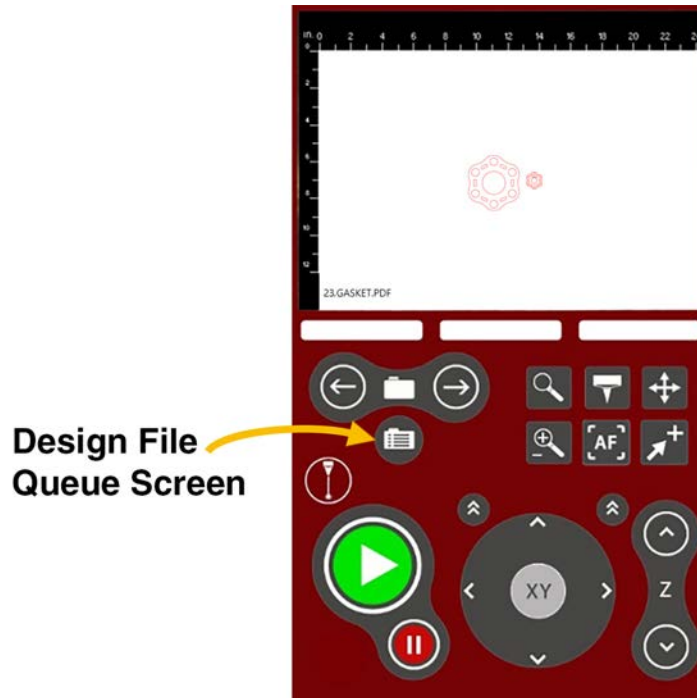
The **Design File Storage Queue Screen** button displays the **Design File Queue** list in the bottom pane. The currently-selected design file displays in the **Preview Area** on top.

2. Navigate through the **Design File Storage Queue** using the following buttons:

	Moves up approximately 100 lines from the current location in the list.
	Moves up 1 page from the current page in the list.
	Moves up 1 line from the current location in the list.
	Moves down 1 line from the current location in the list.
	Moves down 1 page from the current location in the list.
	Moves down approximately 100 lines from the current location in the list.
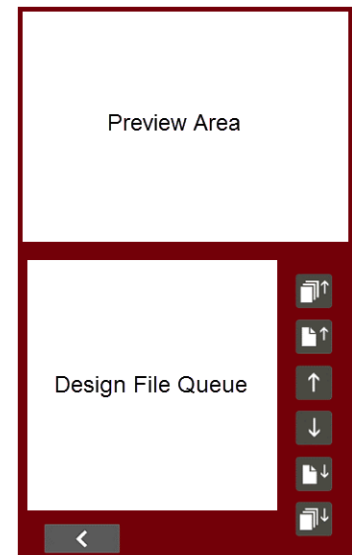
3. When you have located the file to be processed, tap to return to the **LCD Main Screen**.

Third-Party Graphics Software 7

OVERVIEW

The **Laser Processing Settings** component works with a wide variety of third-party graphics software packages to create design files through the Windows Print System including the following:

- Adobe Illustrator
- AutoCAD
- CorelDRAW
- SOLIDWORKS

Every effort has been made to make the printing process as seamless as possible, however, to get the best results when printing through the **Laser Processing Settings** component, you should be aware of a few general guidelines that apply to all software when printing to the laser system.

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

COLOR SELECTION

Processing Colors

The XLS10 laser system uses colors to assign material processing settings to different elements of the graphics being printed. The Materials Database defaults to a black, blue and red color scheme to signify three common types of processing. Additional colors/processes can be added manually.

- **Black** – used for engraving. Raster motion is used by default to process black data.
- **Blue** – used when marking, scribing or kiss cutting. Vector motion is used by default to process blue data.
- **Red** – used when a cutting process is desired. Vector motion is used by default to process red data.

RGB Colors

The **Manual Settings** window in the **Laser Processing Settings** component uses a color table of sixteen colors: Black, Red, Green, Yellow, Blue, Cyan, Magenta, Orange, Brown, Maroon, Forest Green, Olive, Pink, Purple, Teal and Slate Blue.

To ensure that the colors being used in the graphics file will map appropriately into the **Laser Processing Settings** component colors, be sure to understand how the graphic software being used defines colors, and set up an RGB pallet with the RGB values listed below.

These colors are defined in the RGB (red-green-blue) color system using the following RGB values.

COLOR	NAME	RED (R)	GREEN (G)	BLUE (B)
	Black	0	0	0
	Red	255	0	0
	Green	0	255	0
	Yellow	255	255	0
	Blue	0	0	255
	Magenta	255	0	255
	Cyan	0	255	255
	Orange	255	102	0
	Brown	153	102	51
	Maroon	128	0	0
	Forest Green	0	102	51
	Olive	136	136	0
	Pink	255	155	204
	Purple	153	0	204
	Teal	0	153	153
	Slate Blue	102	102	204

Page Setup

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

Some graphics software provides 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 laser processing field of the laser system.

Raster Objects vs. Vector Objects

The **Laser Processing Settings** component 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 design files for Vector cutting, make sure your graphic software of choice allows creation of Vector lines and that the line width can be set to *0.001" (0.0254 mm) or less.* The **Laser Processing Settings** component interprets these thin line width objects as Vectors.

Overlapping Objects

If the artwork created has Raster objects that overlap, the **LSM** automatically filters out the portion of the object that is not visible, so that only the visible part of the underlying filled area will be engraved. This prevents the overlapped area from being engraved twice. It also 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 because the Vector outline cuts even though you cannot see it on the screen.

The **Laser Processing Settings** component 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 that are grayscale or color bitmaps, keep in mind that the **Laser Processing Settings** component uses a **Dither Pattern Filter Screen** to reduce the images to black and white (monochrome images) for laser processing and uses 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 Issues

Occasionally, you may have trouble printing certain fonts at certain sizes in some Windows applications. In these cases, it is sometimes 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.

Material and System Preparation 8

LOADING MATERIAL

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

Follow these steps to load your material into the XLS10 laser system:

1. Open the top door of the XLS10.

2. Place material to be processed onto the laser processing table.

If you are cutting, you can also use the *Flow-Through Cutting Table* (see *Laser Processing Options*).

> ⚠️ **CAUTION:** *Material to be laser processed must fit completely within the machine so that all access doors to the laser system can be closed. The access doors are safety interlocked and will not allow the laser to operate if the access doors are not fully closed.*

3. Position the material so that it is aligned with the graphics to be engraved, cut or marked.

Use one of the following methods to align the material:

- Use the rulers on the processing table and the corresponding rulers in the Preview Area of the **Preview** window to align the material with the graphics in the design file. Push the material up against the rulers and position the graphic accordingly before printing.

- Use the **Relocate View** button ✥ , located on the **Main Control Panel** of the **Preview** window, to align the design file with the material. See *Relocate View* for additional information.

- Use fixturing to position the material. This is especially useful for odd-shaped materials. The laser system can even be used to create the fixture. For example, you can make a fixture out of acrylic by placing a piece of acrylic against the rulers on the processing table and cutting the shape of the material to be laser processed out of the acrylic. Then place the material in the cutout to position it accurately.

FOCUSING THE LASER SYSTEM

Once you have loaded and 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 is at the focal plane of the installed focus lens assembly.

Use one of the following four methods:

- **Use the Calibrated Focusing Tool**
- **Manually move the Z-axis to equal the material thickness**
- **Program a material thickness into the Laser Processing Settings of the Design File**
- **Use Auto-Focus Mode**

Use the Calibrated Focusing Tool

In this method, you will use the Calibrated Focusing Tool provided with the lens kit. Verify that you have the proper Focusing Tool for the lens being used.

1. Move the Carriage above the material to be laser processed using one of the following ways:

    - Using the **Focus** mode in the **LSM**.
    - Through the **LCD control panel** clicking or tapping on the desired location in the material processing field.
    - Manually using the **X-Y** Motion Controls in the **LSM**.
    - Employing the **LCD control panel** to move the Carriage manually to the desired location.

2. Move the Z-axis up or down using the **Z** Motion control buttons on the **LCD**.

3. Move the Z-axis until the top surface of the Focusing Tool is flush with the lower edge of the groove in the front cover of the Carriage, as shown.

4. Remove the Focusing Tool from the material processing area.
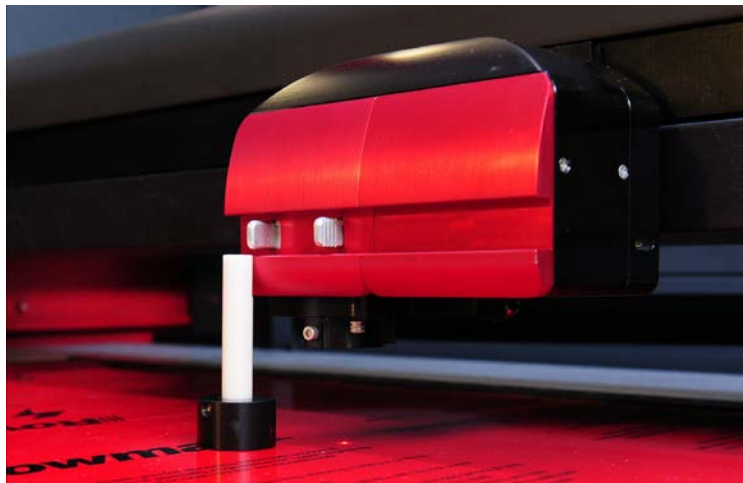
NOTE: *Laser processing results are very sensitive to focus, so pay close attention to the fit of the Focusing Tool.*

Manually move the Z-axis to equal the material thickness

1. Measure the thickness of the material (use calipers for accuracy).

2. Manually move the Z-axis up or down using the **Z** Motion control buttons on the **LSM** or **LCD** until the Z-axis position equals the measured thickness.

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*NOTE: Make sure the lens specified on the **LSM System Configuration** window matches the lens installed in the laser system when using this method.*

NOTE: In order for this method to work correctly, the Z-axis must be properly-homed and calibrated to the lens before being used. To verify this:

• *Move the Z-axis manually until the Z-axis position reads zero.*

• *Use the Focusing Tool as described above to verify that the surface of the laser processing table is at the focal plane.*

• *If necessary, re-home the Z-axis by tapping **Home Z** in the **LSM**.*

*If you are still having trouble, recalibrate the lens using the **Lens Calibrate** function in the **LSM System Configuration** window.*

Program a material thickness into Laser Processing Settings of the Design File

1. Measure the thickness of the material (use calipers for accuracy).

2. Enter the measurement into the **Material Thickness** box at the bottom of the **Laser Processing Settings** window.
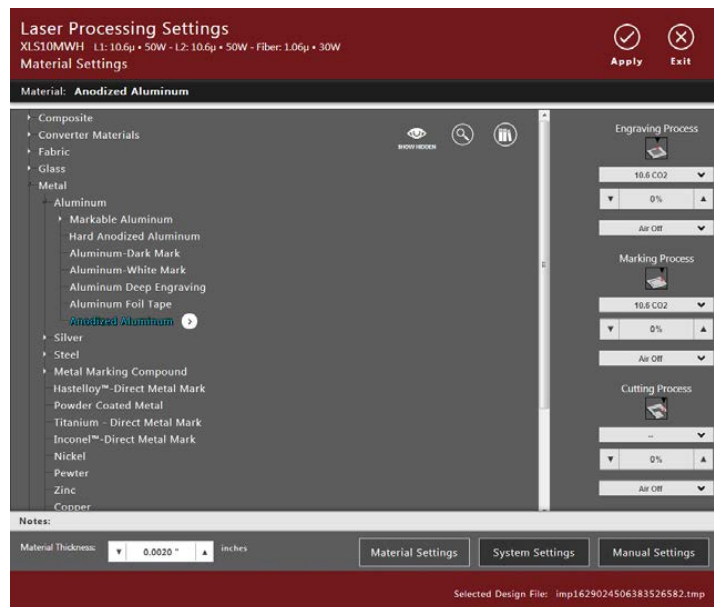
Tap **Start** on the **Control Panel** to initiate laser processing, which moves the Z-axis up or down to the appropriate height.

*NOTE: On the **LSM System Configuration** window, verify that the lens specified matches the lens installed and **Enable Auto Z** is selected.*

NOTE: In order for this method to work correctly, the Z-axis must be properly-homed and calibrated to the lens before being used. To verify this:

- *Move the Z-axis manually until the Z-axis position reads zero.*
- *Use the Focusing Tool as described above to verify that the surface of the laser processing table is at the focal plane.*

- *If necessary, re-home the Z-axis by tapping **Home Z** in the **LSM**.*

*If you are still having trouble, recalibrate the lens using the lens calibrate function in the **LSM System Configuration** window.*

NOTE: If a Rotary Fixture is currently installed this feature will be disabled.

Use Autofocus Mode

In this method, use Autofocus on the LCD Control Panel to focus on the material.

The **Autofocus** sensor is located in the Carriage of the Beam Positioning System. To use the **Autofocus** sensor the Carriage must be positioned above the material to be laser processed.

1. Tap on the Control Panel to enter **Focus** mode. A crosshair identifies the location of the Carriage.

2. Move the crosshair by **tapping** or **clicking** *on the screen* to relocate the Carriage over the material to be laser processed.

3. To enter **Autofocus** mode, press .

When the Z-axis stops moving, the material is in focus.

NOTE: For this method to work correctly, the Z-axis must be properly-homed and calibrated to the lens before being used. To verify this:

- *Move the Z-axis manually until the Z-axis position reads zero.*

- *Use the Focusing Tool as described above to verify that the surface of the laser processing table is at the focal plane.*

- *If necessary, re-home the Z-axis by tapping **Home Z** in the **LSM**.*

*If you are still having trouble, recalibrate the lens using the **Lens Calibrate** function in the **LSM System Configuration** window.*

NOTE: If a Flow-Through Cutting Table or Rotary Fixture is currently installed this feature will be disabled.

Focusing Optics

The XLS10 offers users the flexibility of focal distance and spot size when processing with the laser system. To accomplish this, the system can be configured with a 2.0 or 3.0 focal length lens in addition to an optional HPDFO optic that is available for the XLS10.150D laser system. When switching between these optics the XLS10 detects the installation of a new lens and automatically adjusts the calibrated Z-height to the new optic.

Switching Focusing Optics (XLS10.150D)

1. Remove the currently-installed focusing optic by grasping the two protruding spring-loaded tabs on the front of the Optics Plate. While pinching them together carefully pull out toward the front of the laser system, sliding the optics out of their housing.

2. Insert the new focusing optic by guiding the lens holder between the two lens guides. When correctly seated the spring-loaded tabs will snap into position.
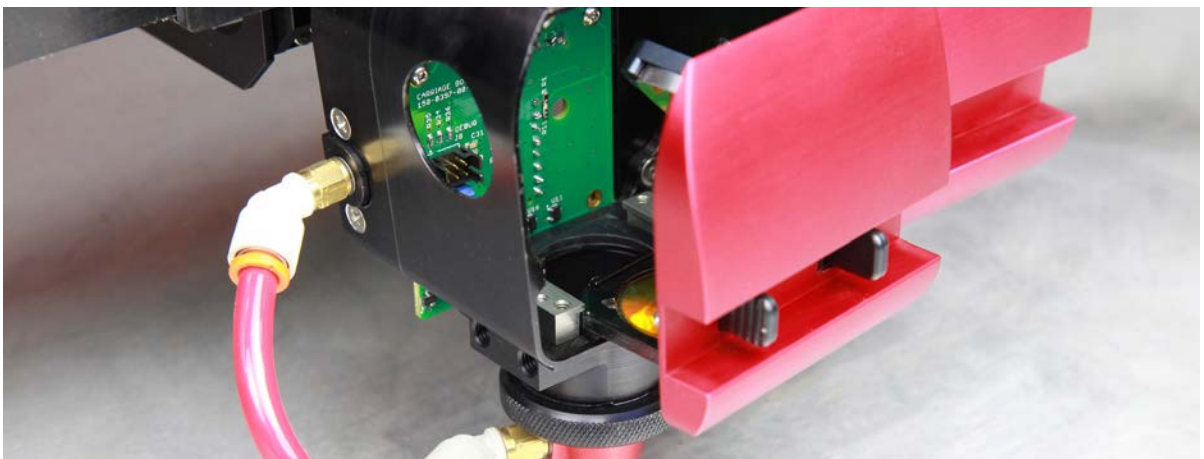
3. The laser system will automatically detect the installation of the new focusing optic.

Switching Focusing Optics (XLS10MWH™)

1. Remove the magnetic Optics Cover from the Carriage.
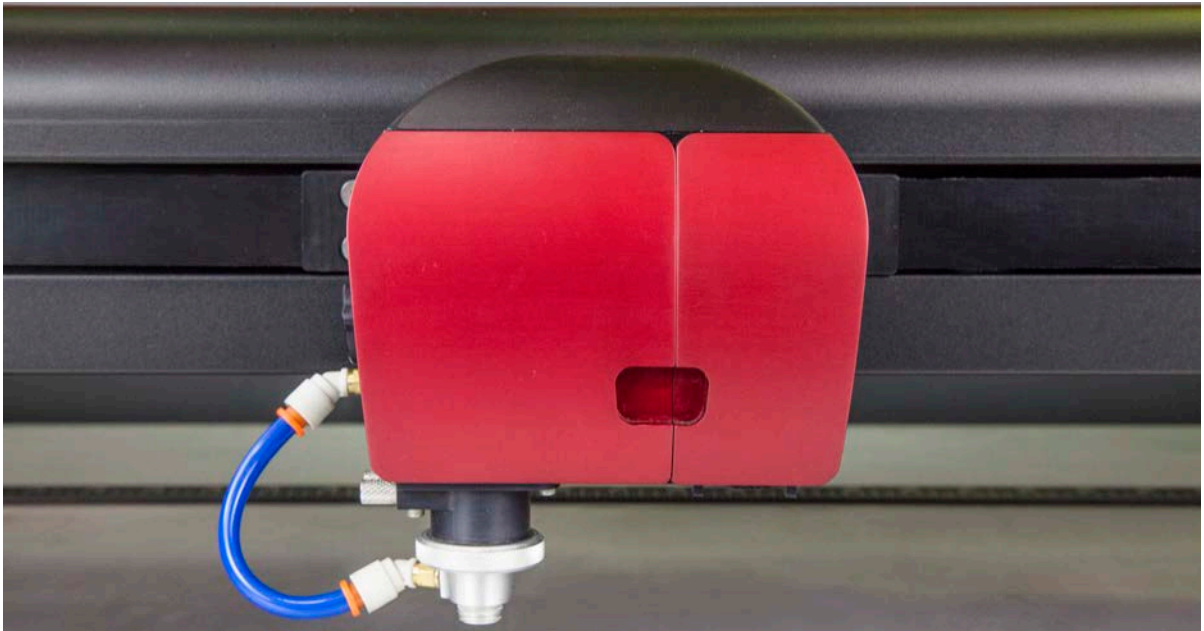
2. Remove the currently-installed focusing lens by grasping the tab protruding from the lens holder and pulling toward the front of the laser system.
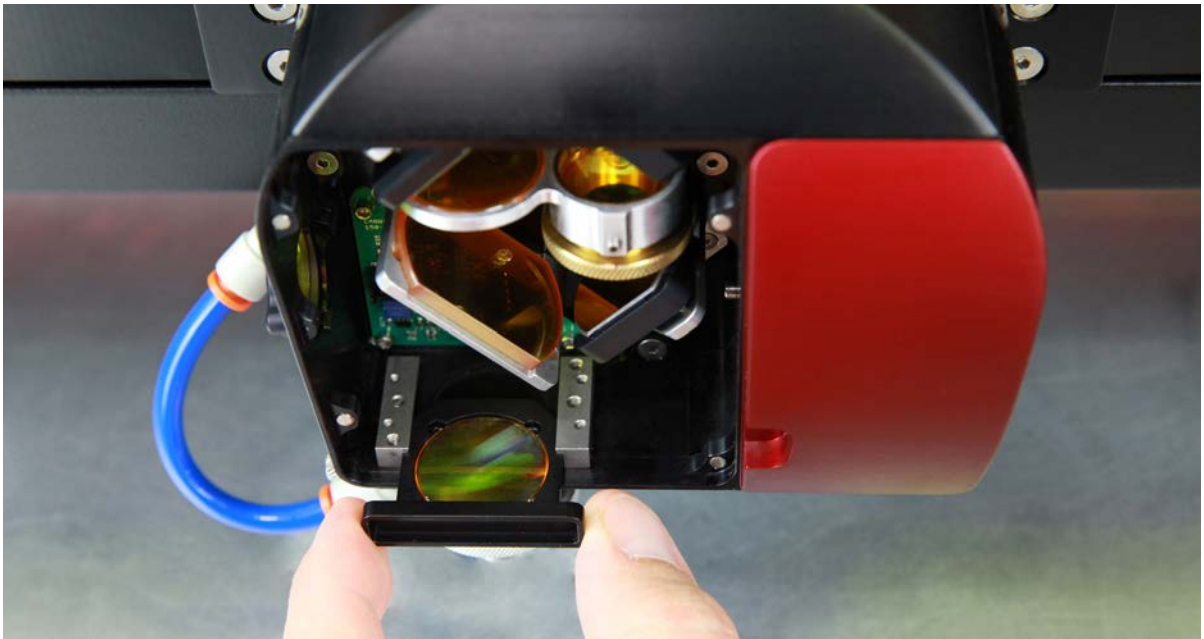
3. Insert the new focusing lens by guiding the lens holder between the two lens guides, ensuring that the protruding tab is aligned upward.

4. Replace the magnetic Optics Cover.

5. The laser system will automatically detect the installation of the new focusing lens.

MultiWave Hybrid™ Focal Plane Alignment

The XLS10MWH™ laser system utilizes a set of internal expansion optics that enable the ability to process a design file with the Fiber laser source and two CO_2 laser source(s) on the same focal plane. This reduces processing time by removing the need to run the two (or 3) laser sources independently at different focal heights. When switching focusing optics 2.0 > 3.0 and 3.0 > 2.0 the internal expansion optics will need to be adjusted slightly. This task is performed using the Gap Pins supplied with the laser system.

> **NOTE:** *If you intend to only process with the Fiber laser source after switching focusing optics, expansion optic adjustment will not be necessary.*

Adjusting the Internal Expansion Optics

1. Remove the magnetic Optics Cover from the Carriage.

2. Remove and replace the currently-installed focusing optic with the desired focusing optic.

3. Locate the Internal Expansion Optics (1) within the optics housing.

4. Loosen the small set screw (2) securing the current gap position.
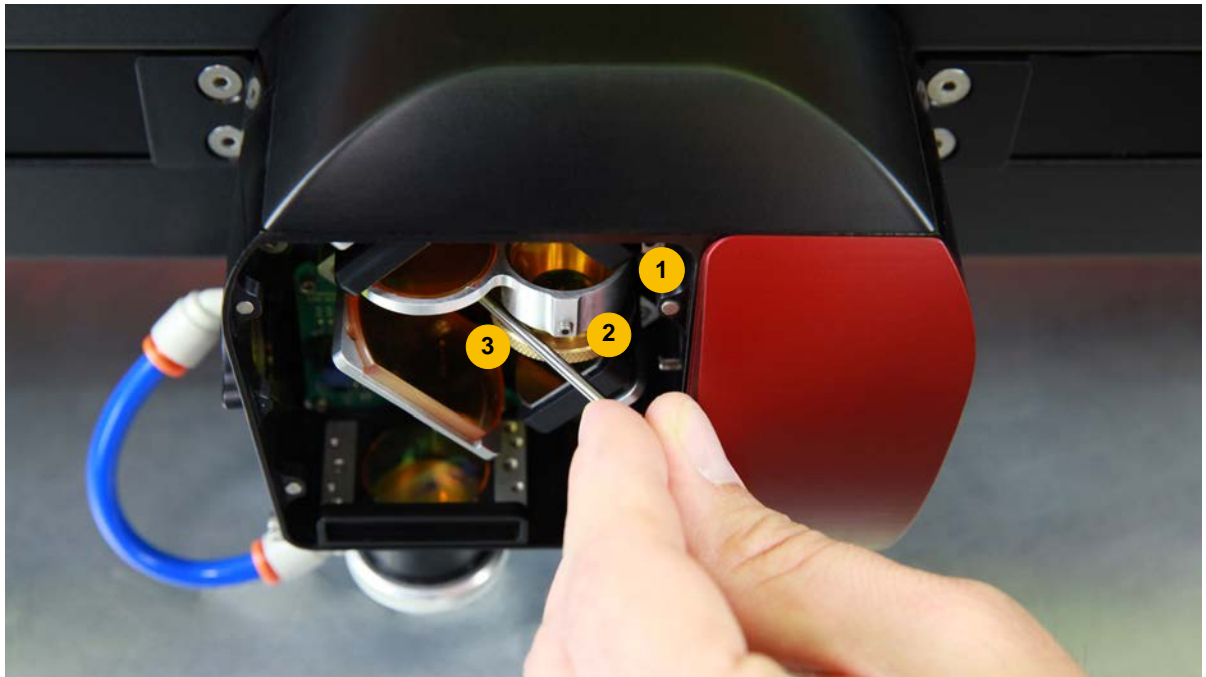
5. Using the pin labeled to match the focusing optic that is to be used, carefully place the Gap Pin (3) next to the threads of the expansion optics.

6. Turn the expansion optic, closing or expanding the gap until the pin is snug between the gnarled adjustment screw (4) and the optic housing.

7. Tighten the small set screw securing the measured gap in place.

8. Replace the magnetic Optics Cover.

INITIATING LASER PROCESSING

Once the material is loaded and focused, you are ready to initiate laser material processing with the selected design file:

1. If you need to use Gas Assist for the material that is being processed, verify you have an Coaxial or Lateral Gas Assist Attachment installed on the Carriage and that the Compressed Air Source is properly-connected (see *Computer Controlled Gas Assist with Optics Protection* for more details).

2. Ensure that your exhaust system is on and exhaust air is flowing through the machine.

3. Start the laser job by tapping **Start** ▶ on the **LCD Control Panel** or on the **LSM.**

⚠️ **CAUTION:** *Make sure proper exhaust flow is present in the laser system before initiating laser processing. If proper exhaust flow is not present, damage to optics and other laser system components can occur very quickly.*

CHANGING THE CO$_2$ LASER SOURCE

Depending on your laser processing needs, you may need to add an additional laser source or remove the current laser source and replace it with another laser source.

1. Make sure the laser system is turned **OFF** before changing laser sources.

2. Open the rear laser cover using the latch handles.

NOTE: *Access latches for the laser cover are lockable. To open the rear laser cover you may need to unlock them first. If you lose your keys, please contact the ULS Factory Support Team for a new set of keys.*

3. Locate the mounting blocks (1) the laser latches (2) and alignment forks (3) along the firewall of the system. Notice that the alignment fork has a groove located between two blocks, one short and one tall.
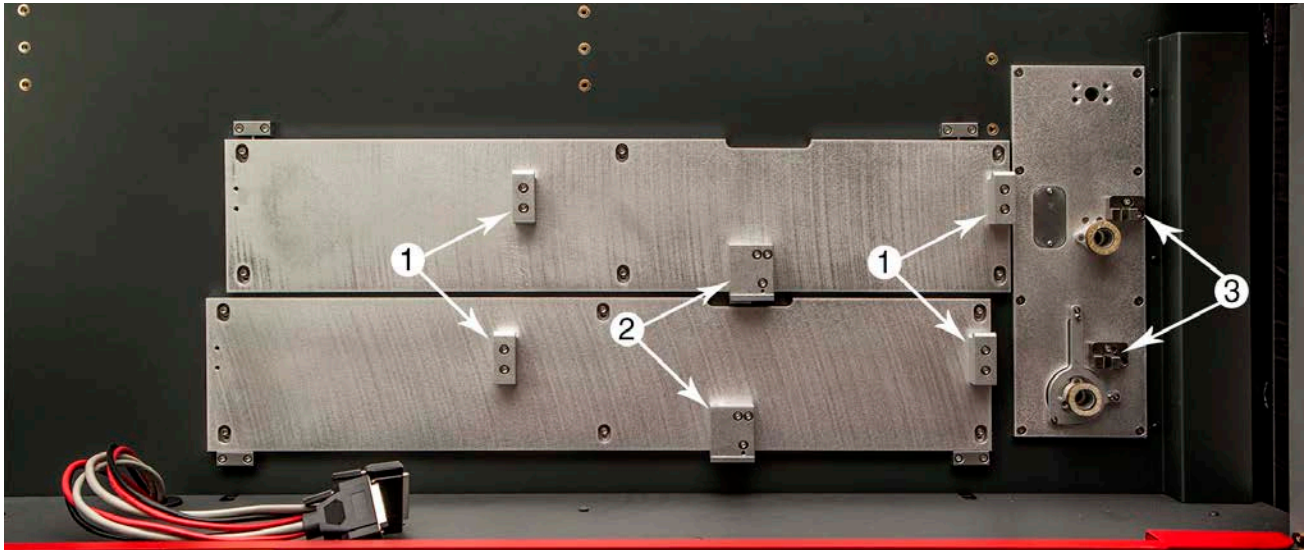
4. Locate the "V" groove (1) along the upper and lower part of the laser source base plate and the alignment plate (2) at the end of the base plate.
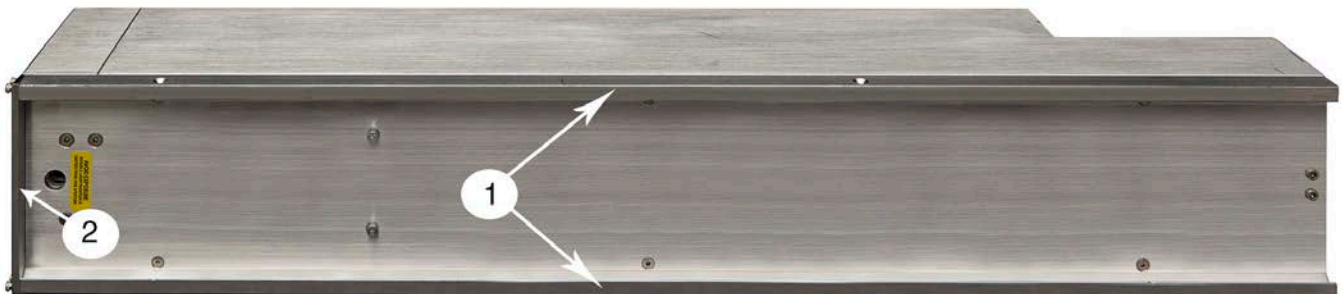
5. If you are using two laser sources, install a laser source in the lower position first.

NOTE: Single lasers should be mounted in the upper position.

6. Pick up the laser source by the ends and tilt it to a 30° angle as shown. Mount the source onto the mounting blocks by placing the upper "V" groove on top of the mounting blocks. Slide the source to the right until the outer edge of the alignment plate contacts the inside edge of the tall block of the alignment fork.

7. Slowly rotate the laser source, making sure that the alignment plate is centered with the gap in the alignment fork. As you slowly release the weight of the laser, you should feel it lock itself smoothly into place. Never force the laser into position. If the laser does not install smoothly, check for obstructions such as pinched wires or a binding laser latch. Once installed, verify that the alignment plate is centered within the alignment fork.

8. Plug in each power connector to the corresponding laser source. The power connectors are labeled Top or Bottom. Single laser source users will use the top laser connector only.

9. Close the rear laser cover, making sure not to pinch any wires.

VERIFYING BEAM ALIGNMENT

A properly-aligned beam is critical to the success of any engraving or cutting application. Failure to have a properly-aligned beam will result in poor engraving quality, inaccurate marks, and poorly cut edges. Prior to shipping the system, ULS completes a beam alignment check and calibration, however, there will be times that the beam alignment may be off. With this in mind, we recommend that you check the beam alignment prior to processing any material.

*NOTE: When adjusting the settings to complete the beam alignment procedure, do not adjust the **Frequency Field**.*

Top Laser (Laser 1)

1. Remove the lens kit from the Carriage.

2. Place a small piece of masking tape across the 3/4" (19 mm) hole on the left hand side of the Carriage. Gently rub the tape around the edge of the hole so that you can see the outline of the hole through the tape.

3. In the **LSM**, navigate to the **System Configuration** window. Tap the **Alignment** button located below the Calibration header.
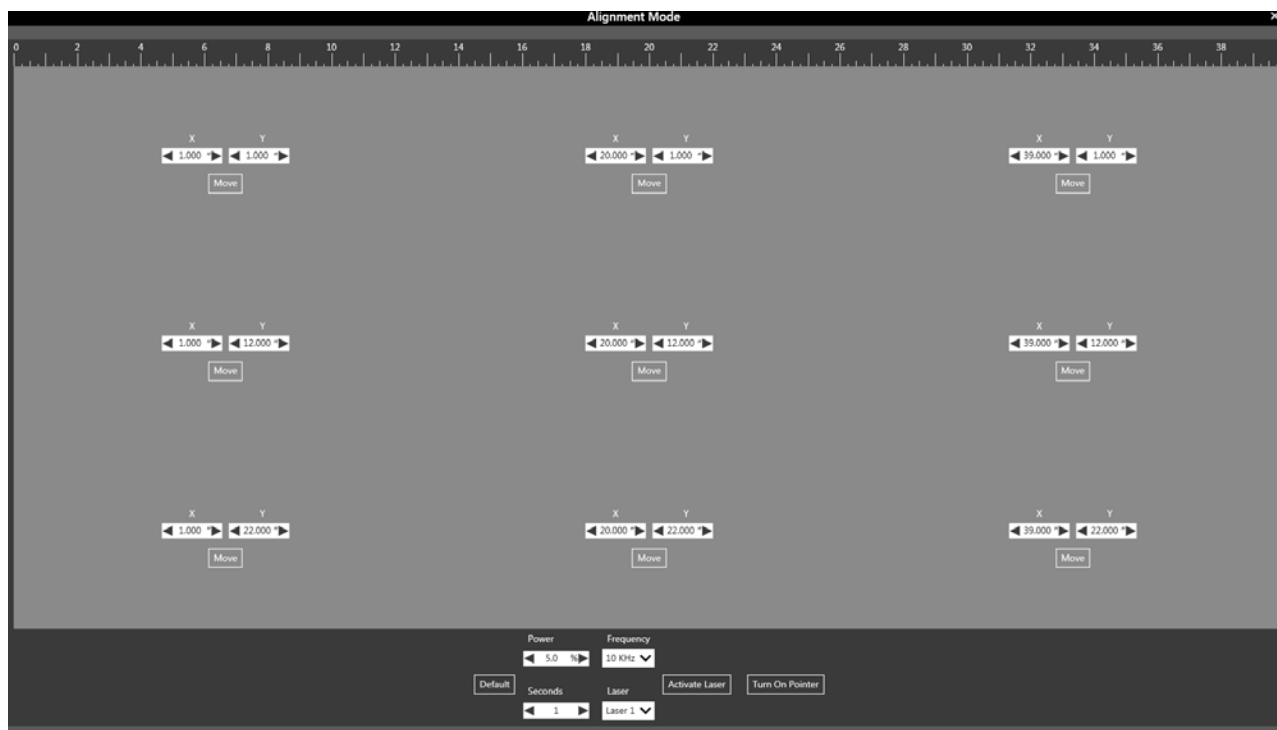
4. Move the Carriage to the 1,1 (upper left corner) position by tapping the **Move** button in the upper left-hand corner of the screen. The Red Laser Pointer should appear centered within 1/8 inch (3mm). Close the top door.

NOTE: The Red Laser Pointer and the laser beam itself originate from two different sources. If the Red Laser Pointer is off, continue to the next step as the laser beam itself may be correctly aligned.

5. Set an appropriate amount of power and time in relation to the wattage of the installed laser. (Often 5% Power for 1 Second).

6. Select **Laser 1** in the Laser Field.

7. Close the top door of the system and tap **Activate Laser**.

8. With the countdown complete, open the top door and inspect the burn mark on the masking tape. The burn mark should appear centered within 1/8 inch (3mm) within the circle.

9. Repeat this step in the 39,22 (lower right corner) position. Both burn marks should be on top of one another (50% overlap minimum).
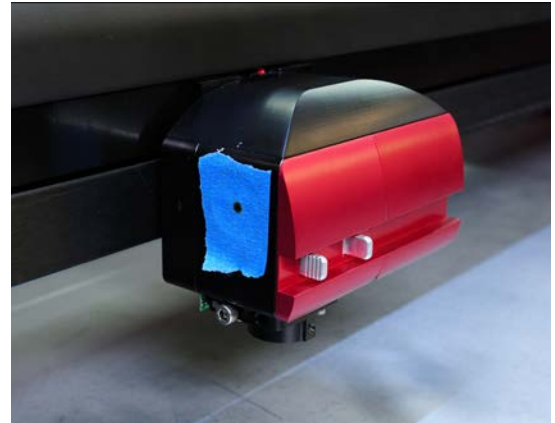
Bottom Laser (Laser 2)

1. Place a small piece of masking tape across the 3/4 inch (19 mm) hole on the left-hand side of the Carriage. Gently rub the tape around the edge of the hole so that you can see the outline of the hole through the tape.

2. Move the Carriage to the 1,1 (upper left corner) position by tapping the **Move** button in the upper left-hand corner of the screen.

3. Set an appropriate amount of power and time in relation to the wattage of the installed laser. (Often 5% Power for 1 Second)

4. Select **Laser 2** in the Laser Field.

5. Close the top door of the system and tap **Activate Laser**.

6. With the countdown complete, open the top door and inspect the burn mark on the masking tape. The burn mark should appear centered within 1/8 inch (3mm) within the circle.

7. Repeat this step in the 39,22 (lower right corner) position. Both burn marks should be on top of one another (50% overlap minimum).

8. With the tape still in place, in the lower right-hand corner, Select **Laser 1** in the Laser Field.

9. Close the top door of the system and tap **Activate Laser**.

10. With the countdown complete, open the top door and inspect the burn mark on the masking tape. The burn marks from Laser 1 and Laser 2 should be on top of one another (50% overlap minimum).

NOTE: If the laser beam is not properly-aligned, please contact the ULS Factory Support Team for assistance.

COMPUTER-CONTROLLED GAS ASSIST WITH OPTICS PROTECTION

Gas for laser material processing on the XLS10 is supplied by a built-in Compressed Air Source through a fitting on the back of the XLS10, marked AIR. User-supplied gas can also be introduced into the system via the fitting marked GAS. The Compressed Air Source, which sits behind the XLS10, supplies air to two separate gas systems: Gas Assist with Optics Protection and air flow for the beam delivery system.

- Gas Assist helps remove smoke and debris from the laser processing area by first directing a stream of gas or air through the Coaxial or Lateral Gas Assist Attachments onto the material being processed, then directs the air flow to the exhaust. During material processing Gas Assist also helps reduce the size of the material's heat-affected zone (HAZ) while preventing flame up. Both the Coaxial or Lateral Gas Assist Attachments also enable the introduction of user-supplied gas into a process for cooling or other desired results.

- A direct air flow through the Fluid Bearings of the beam positioning motion system provides Optics Protection by directing a constant stream of air that both cleans and cools the XLS10 Optics. Optics Protection is useful for materials like wood that can shed significant particulates during processing.

Be sure the included hose is connected between the Compressed Air Source and the air fittings on the XLS10 before switching the system **ON**.

Compressed Air Source

The Compressed Air Source contains two sound insulated air compressors and intake filters. One compressor provides compressed air to the air input of the Computer-Controlled Gas Assist unit for laser material processing. The other compressor provides compressed air to both the Fluid Bearings of the beam delivery system and to each of the optics in the beam path to protect them from contamination.

Connecting the Source

The Compressed Air Source is factory installed.

Located on the back of the laser system, within the CPU module area are two ports, the bottom inlet for air (from the compressed air source) and the top inlet for user-supplied gas (max 75 PSI).
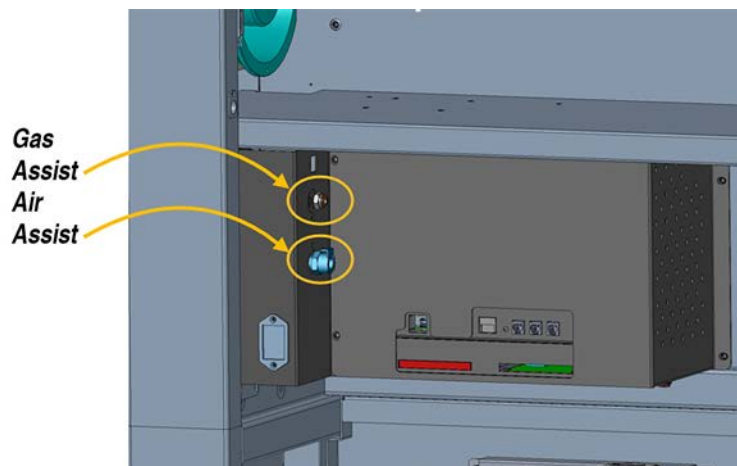
For Air Assist:

1. Make sure the laser system is turned **OFF**.

2. Using the supplied flex coil hose, **connect** the compressor's outlet port labeled **Air Assist** to the XLS10's inlet port labeled **Air Assist.**

For Gas Assist:

1. Make sure the laser system is turned **OFF**.

2. **Connect** a ¼" OD tube to the inlet port (push fitting) labeled **Gas Assist.**

Controls

The Compressed Air Source functions automatically when connected to the laser system and no operator intervention is necessary. Controls and indicators on the unit are for diagnostics purposes only and provide the following information:

- **Link light** - blinks to indicate a good communications link with the laser system.

- **ON and OFF lights** - indicate the state of the compressor. If the **ON** light is illuminated the compressor should be running and supplying compressed air. If the **OFF** light is illuminated the compressor should be off and no compressed air is being supplied.

- **Manual ON/OFF switch** - turns compressor on or off manually to verify operation. A long press (5 seconds) will toggle the fluid bearing compressor ON and OFF and a short press will toggle the Compressed Air Source ON and OFF.

NOTE: If needed, this mode may be used to move the motion system while the XLS10 is powered off.

Maintenance

Each particle filter should be inspected every 160 hours or one month of normal use. Twist the upper portion of the filter housing 1/8 turn and remove the foam filter found inside. If it needs cleaning, wash it in water, dry it thoroughly and reassemble.

Computer-Controlled Gas Assist with Optics Protection

Computer-Controlled Gas Assist controls the flow of gas or air to a Lateral or Coaxial Gas Assist Attachement, which in turn directs the flow onto the material during laser processing. Using the Lateral Gas Assist versus the Coaxial Gas Assist is application-dependent.

Lateral Gas Assist Attachment- An option used for engraving applications.

Coaxial Gas Assist Attachment - Use for cutting or engraving applications. The attachment helps direct air straight down in line with the beam path to help reduce the heat-affected zone during processing and reduce flame ups. The attachment is included with each Final Focusing Lens Kit.

Use of Gas Assist is programmed through **Laser Processing Settings** when a design file is created. Gas or Air can be selected independently for Raster, Vector Marking or Vector Cutting using the **Material Settings** page of the **Laser Processing Settings** window and can be selected independently, per color in the color table, using the **Manual Settings** page of the **Laser Processing Settings** window. **Flow Rate** can be selected in *25%* increments.

Gas Supply Requirements

Gas Assist requires a source of compressed gas, typically a bottle of compressed gas. Compressed gas sources must be regulated to between *50 and 80 PSI* and be oil-free, moisture-free and particulate-filtered.

NOTE: *Gas supply pressures higher than 80 PSI (4.1 bar) can rupture the internal hoses. Damage to the laser system from improper gas supply is not covered under warranty.*

WARNING: *Do not use flammable or corrosive gases as this can result in injury or fire.*

When you press the **Start** button on the laser system, the Computer-Controlled Gas Assist function turns the Compressed Air Source ON and keeps the air supply ON until the job completes.

NOTE: *If you are using gas, make sure your supply of gas is turned on.*

The Computer-Controlled Gas Assist function also has built-in pressure sensors that detect insufficient supply pressure and stop laser processing. An error message, "The air pressure is low or unstable" appears on the computer monitor, indicating that there is a problem with your supply of air or gas.

Air Flow Settings Guidelines

As a rule of thumb, the **Flow Rate** in the laser settings for a design file should be set as low as possible for the application, especially when using gas. Start with **Low Flow** and adjust upward until the desired result, such as suppression of flame up or removal of debris, is achieved.

CAUTION: *Never leave a Coaxial Gas Assist Attachment installed while processing a material without sufficient air flow. Doing so will result in damage to the Focusing Lens, rendering it unusable in a matter of seconds.*

NOTE: *The proper Coaxial Gas Assist Attachment comes with the associated Final Focusing Lens Kit. Please use extreme care to not use the 3.0" Coaxial Gas Assist Attachment with the 2.0" Final Focusing Lens. We do not distinguish between the attachment's length, so use visual inspection to select the longer attachment for the 3.0" Final Focusing Lens.*

NOTE: *The focal distance of a Final Focusing Lens, when used in conjunction with the Coaxial Gas Assist Attachment, is slightly different than without. Ensure that you are using the correct focusing tool when laser processing the material. If you would like to use the **Auto Z** feature with the Coaxial attachment you must calibrate the appropriate focal length lens with the corresponding Coaxial Gas Assist Attachment Focusing Tool. For additional information please refer to the Z Height Calibration section of this Users Guide.*

Coaxial Gas Assist Attachment Installation

1. Use the attachment's rear locating feature to orient it properly on the Carriage. This will ensure the Coaxial attachment is correctly identified as installed by the laser system.

2. Insert the Coaxial attachment vertically until the attachment's flanges are flush with the attachment holder (1).

Turn the threaded Coaxial attachment retaining collar clock-wise tightening it onto the upper Coaxial Gas Assist Attachment holder. A properly-installed Coaxial attachment should look like the image below (2).

3. Insert the attachment's air hose into the high pressure air line push fitting (3). Slightly pull the air hose to ensure it is securely attached.

NOTE: *We recommend cleaning the Coaxial Gas Assist Attachment every time you clean the Final Focusing Lens to help ensure a clear optical path.*

Laser Processing Options 9

AUTOMATION INTERFACE

This interface makes it possible to integrate a Universal laser system into an automated manufacturing cell. With six inputs and two outputs, all programmable, the system can be personalized to the end user's needs.

Automation Interface provides the following inputs/outputs:

- Six inputs to initiate various laser system functions in response to signals from external devices such as programmable logic controllers (PLC).

- Two low power relay outputs for external devices to poll laser system status.

Upon power up, the system automatically detects an Automation Board. Controls for the Board display in the **Systems Settings** window of the **LSM**. If the Automation Board is not present, the controls do not display.

Installation

There are two accessory card slots in the card cage containing the main CPU board on the back left side of the XLS10. These accessory card slots are just below the CPU. The Automation Board is installed into the lower left accessory card slot. Install the board using the following steps:

1. Remove the large L-shaped CPU cover.

2. Remove the lower accessory bracket of the CPU cage just below the CPU (the CPU bracket contains the USB connector) to expose the two accessory card slots.

3. Slide the automation card into the card guides of the left accessory card slot with the light gray connector facing back toward the machine and the black connector facing out.

4. Replace the accessory card bracket so the black connector protrudes from the slot in the bracket as shown.

5. Replace the main CPU cover.

6. Use the wiring diagrams and the provided mating connector to wire automation controls to the black connector as needed.

> ⚠ *CAUTION: ULS does not authorize or support the use of third-party safety devices via the Automation Board. Outputs are intended to be used for informational purposes such as to indicate error conditions; they are not intended to drive external devices.*

NOTE: The controls for setting up the Automation Port display only if the Automation Board is plugged in and working properly.

External Wiring

The Automation Board's **J4** connector is used to wire external signals to six programmable inputs that can initiate various laser functions.

The Automation Board Pin #1 is the RIGHTMOST pin on the removable connector.

Pin	Name	Limits
1	IN1	Optically Isolated Inputs, 5V DC - 24V DC
2	IN2	
3	IN3	
4	IN4	
5	IN5	
6	IN6	
7	Shared Isolated GND for IN1 - IN6	
8	(Unused)	
9		
10		
11	OUT1 (Normally Closed)	OUT1 relay, 24V DC @ 0.5A max
12	OUT1 (Common)	
13	OUT1 (Normally Open)	
14	OUT2 (Normally Closed)	OUT2 relay, 24V DC @ 0.5A max
15	OUT2 (Common)	
16	OUT2 (Normally Open)	

Input Events

To trigger a function:

1. Supply between **5V DC** to **24V DC** to one of the input pins (see the diagram below).

> **NOTE:** *It is not necessary to limit current with a resistor to the input pins. All of the input pins share the same isolated GND pin.*

2. Hold the pulse on the input pins at least **5ms** in order to register.

Automation Card   (Example External User Connections)

IN1	J4-1	
IN2	J4-2	
IN3	J4-3	5VDC to
IN4	J4-4	24VDC
IN5	J4-5	
IN6	J4-6	
SHARED GND	J4-7	
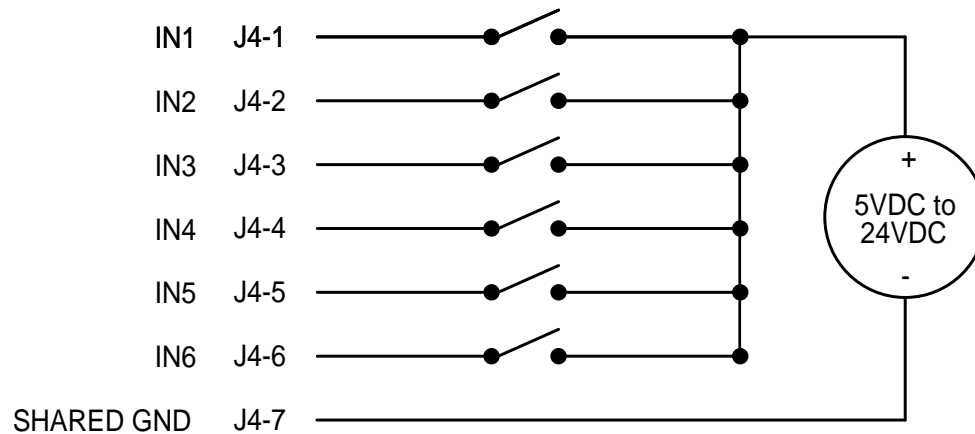
Output Events

The Automation Board's **J4** connector is used to connect to the two relay outputs. Both Normally Open and Normally Closed relay outputs are available. There is no "PNP" or "NPN" switch needed. Relay contacts should be limited to 24V at 0.5A. When choosing contacts, keep in mind that the "Normally Closed" contacts will remain closed when the machine's power is turned off. The relay outputs may be used in many different configurations; the two examples below do not cover all methods.

Automation Card   (Example External User Connections)

OUT1 NC	J4-11
OUT1 COM	J4-12
OUT1 NO	J4-13

OUT 1 CONTROL SIGNAL

+ 3.3V -

OUT2 NC	J4-14
OUT2 COM	J4-15
OUT2 NO	J4-16

OUT 2 CONTROL SIGNAL

+ 3.3V -
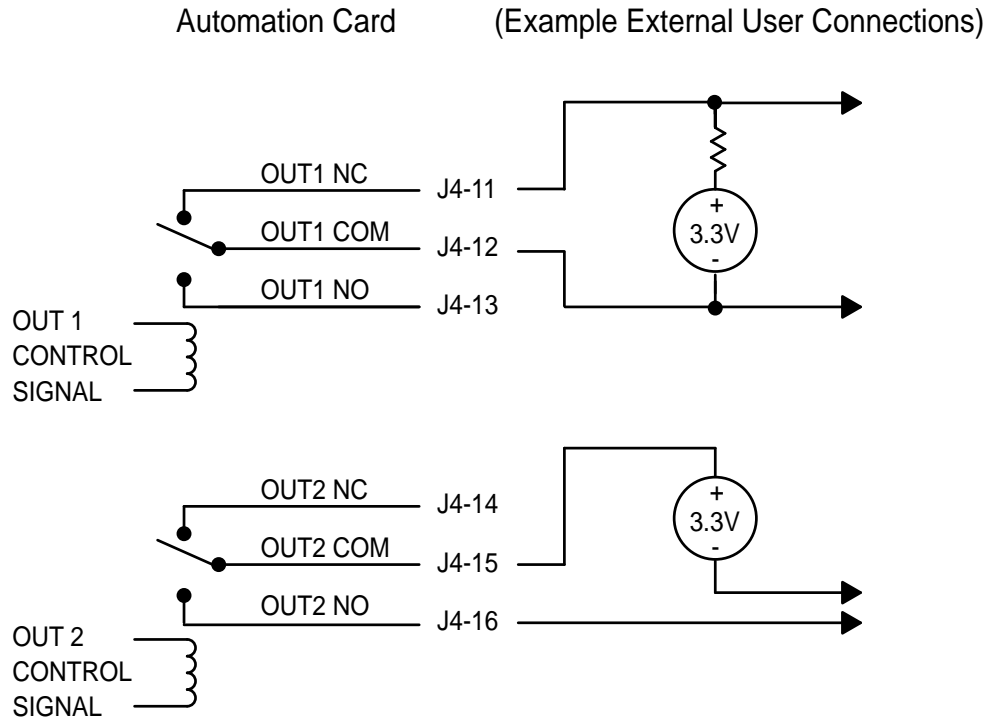
Automation Port Functions

Input functions and output events are configured under **Automation Port** on the **System Configuration** window of the **LSM**.

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*NOTE: The controls for **Automation Port** setup display only if the Automation Board is plugged in and working properly.*

Enter an Input Function:

1. In the **Input Function** field for the assigned port, **select** one of the following actions:

   • **Start Job**

   • **Pause Job**

   • **Resume Job**

   • **Previous Job**

   • **Next Job**

   • **Autofocus**

   • **Goto Z**

   • **Message**

2. In the **Delay** field select the Delay *in seconds* before each action occurs.

3. In the **Output Event** field for the assigned port, select one of the following actions:

   • **Job Complete**

   • **Job Aborted**

   • **Job Running**

   • **Processing Goto Z**

4. Complete the **Output Event** field to supply the Output Ports information about the completion and aborting of jobs. Jobs are aborted when any error or a pause occurs. The output ports will change state when the event assigned to them occurs.

5. Select the **Use Messages** checkbox to enable messages.

Set Up Custom Message for Input Function

You can create a custom pop-up message that displays on the **LSM** screen when an input function is initiated after a programmable delay.

For example, you can add the message: *"Is the material loaded in the laser system?"* to the **Start Job** command. You can set the message box to display the **OK** and **Cancel** buttons, which the user would have to click before the job would initiate.

To create a message:

1. On the **System Configuration** window in the **LSM**, Under the **Automation** heading **Select** the **Use Messages** checkbox to enable messages.

2. Identify which **Port** and **Input Function** you would like to assign a message to and select the type of message, that will display from the **drop-down** list.

3. Continue to add additional messages to the **Input Function**, as needed.

Automation Port Configuration Example

There are many ways to employ the **Automation Port** functions. In this example, we will use two functions, *Start Job* and *Pause Job*, to illustrate the Automation Interface:

1. Verify that the Automation Board is installed.

2. Wire signals from your control system to **J4-1** and **J4-2** and the return wires for each signal to **J4-7** as indicated in the schematics.

3. Start your **computer** and XLS10 laser system.

4. Send a **design file** to the XLS10 as you normally would.

5. Proceed to the **System Configuration** window in the **LSM**.

6. Set the **Input Function** for **Port 1** to **Start Job** and *add a 5 second Delay.*

7. Set the **Input Function** for **Port 2** to **Pause Job** and *add a 5 second Delay.*

8. Select **Disabled** for the remaining functions not being used.

9. Using your control system, activate the signal to **Port 1** to **Start loading** the design file. Laser processing will begin after a 5 second delay.

10. Using your control system, activate the signal to **Port 2** to **Pause** the design file. Laser processing pauses.

UNIVERSAL CAMERA REGISTRATION

Universal Camera Registration (UCR) automates the alignment of a Vector path or Raster stroke with the material, for the purpose of tightening process control and improving the quality of a cut, scribe, or engraving by the laser system.

Hardware for Camera Registration is incorporated into the XLS10 and the software is included with the **LSM**. No separate/third party software is needed.

Creating registration marks in artwork is easy and straight forward. No special plug-ins or toolbars need to be installed in your graphics software.

Artwork is precisely aligned to registration marks on the material by using the Camera and pattern recognition software to locate the center of the material's registration marks. The difference between the X,Y coordinates of the center of the registration marks on the material and the X,Y coordinates of the center of the registration marks in the artwork are used to translate, rotate, and stretch the design file to align the artwork with the material before the laser begins to cut, scribe, or engrave the material.

NOTE: The software is tied to the Camera hardware in the laser system; if the machine is not plugged in or if the Camera is not connected, the Camera Registration function will not be available in the LSM. The user will still be able to create and print camera-ready jobs with registration marks, but will not be able to access the registration process itself.

Creating Registration Marks

Registration marks are identified in the artwork by color. If a material from the **Materials Database** is selected, and the registration marks are Magenta, then recognition is automatic. If using the **Manual Settings** page, registration marks can be any color supported in the color table, however you must define the **Process Mode** as **Registration** in **Processing Settings** for that specific color. There are no standard registration marks, however, registration marks must be 0.25" (6mm) in size and identified as hairline Vectors in the drawing package.

NOTE: Regardless of whether the objects are Raster or Vector, it is recommended that no other objects in the design file are assigned the same color as the registration marks.

NOTE: Due to travel limitations in the Carriage on the XLS10, the Camera cannot see the leftmost 1.5" of the laser processing field. Registration marks cannot be placed in this area of the field, however, it is okay for the cut pattern itself to extend into this area.

Printing/Importing to the LSM

Artwork containing registration marks that follow the registration mark setup rules listed above can be printed to the **LSM**. The artwork can also be exported to DXF or PDF format and imported directly using the *Import Files* feature of the **LSM**.

Enter Registration View

This button allows the user to enter the **Camera Registration** process.

1. Tap the **Registration View** button to display the Camera options.

Camera View

Camera View allows you to utilize functions of the Camera without setting up an Automatic or Manual seek routine. When a design file without registration marks is selected, the Camera View button will be the only button visible in **Registration View**. Once a design file with registration marks is selected, **Registration** mode options become available in addition to the **Camera View.**

1. Tap **Camera View** to launch the **Camera Interface** window.

Using the Camera Interface Controls

Movement Controls

Click or **Tap** *within the Camera window* to manually move the Camera to the selected position.

- **XY Motion Controls** - tap an **arrow key** to move the Camera in the desired direction.

- **XY Motion Sensitivity** - controls the tap sensitivity of *XY Motion Controls.* Toggle between *0.001", 0.010" and 0.100" per tap.*
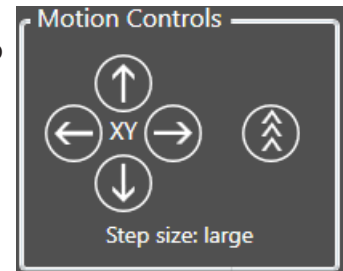
Measurement Tools

- **Alignment Circle** - tap to place an *Alignment Circle* around the center of the Camera crosshairs. Tap **Alignment Circle** again to remove it.

- **Radius** - controls the Radius of the *Alignment Circle* by entering or changing *the value.*

- **Ruler/Measure** - tapping **Ruler/Measure** allows you to measure the distance between two points. Tap once in the **Camera** window to create the **start point**, tap again to create an **end point**. The distance and coordinates of the start and end points will display below the **Rule/Measure** button. This measurement will remain until erased.

- **Eraser** - tap **Eraser** to remove a *measured distance*.
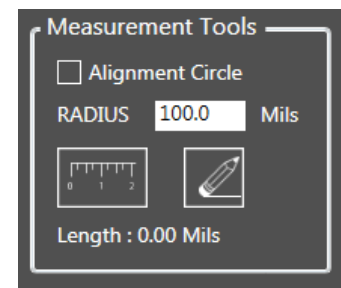
Auto-Zoom Level

Tap the **drop-down** list to select the *level of Zoom*. When a magnification level is selected, tapping within the Camera window will *relocate the Camera* to the selected position and *zoom into the area* with the selected **Zoom** setting.

NOTE: *You can manually* ***Zoom*** *by* ***sliding*** *the* ***magnification bar****, under the Camera window, to the* ***left*** *or* ***right***.

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*Brightness (Only available in **Auto** or **Manual Registration** Mode)*

Controlling the LED on the Camera, drag **slider** to the *right* to increase brightness or drag the **slider** to the *left* to decrease brightness.

Using the Automatic Seek Routine to Laser Process Material

After the laser system is trained, the **Automatic Seek** routine utilizes the positioning of the design file's registration marks to automatically locate the registration marks of the material you will be processing. The **Automatic Seek** routine is only visible when a design file with registration marks is selected,

1. Place the material containing pre-existing registration marks into the laser system. Ensure that the material is correctly focused with the Carriage.

2. Select **Auto** in **Registration** Mode and enter your desired *Tolerance value.*

   ---

   *NOTE: This **Tolerance** value is used when calculating the differences between your design file and the points you select when registering your material. If the measurements are outside of the **Tolerance** value, registration will fail.*

   ---

3. **Tap, Train Auto.**

4. Tap **Start Training** to begin. When pressed, the Camera will seek the first registration mark in the design file. If the material is not located in the same position as the artwork, use the **Motion Controls** to position the displayed crosshairs over the center of the registration mark.

5. Tap **Crop** and adjust the crop area to match the size and shape of the registration mark. Press **Save Image.** Repeat for each registration mark.
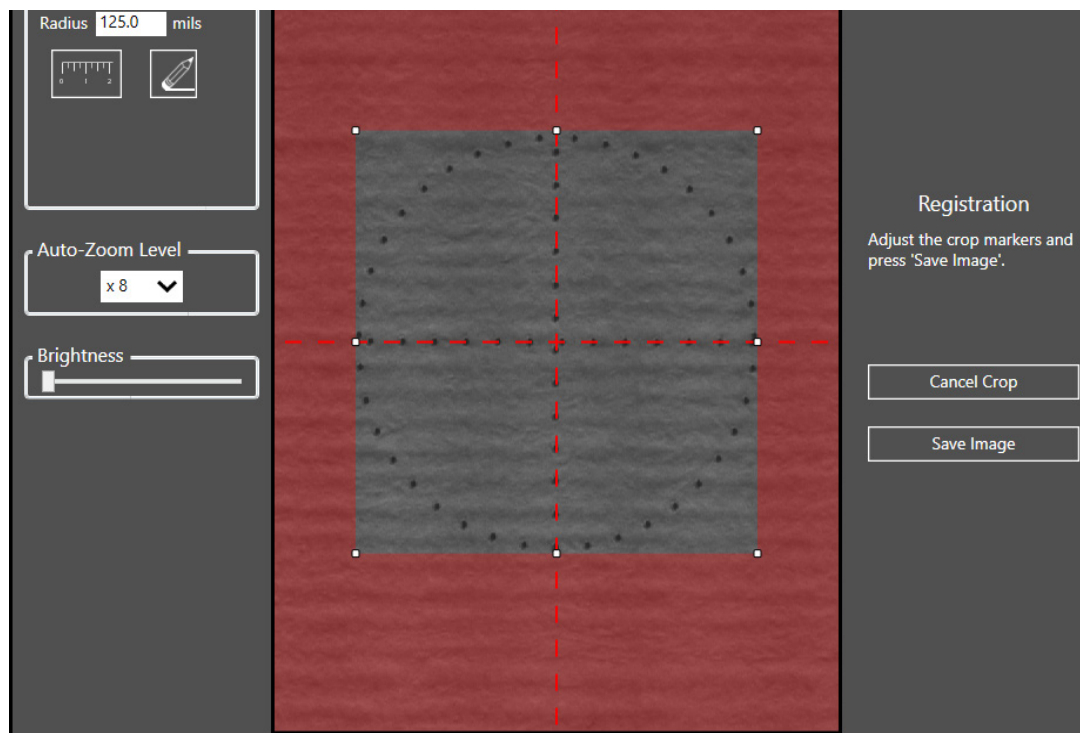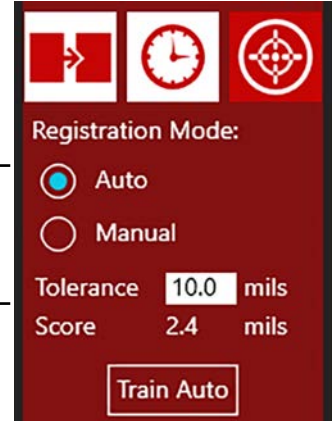
6. When complete, tap **Test Auto-Registration** to check your trained values. If the registration test is successful, tap the **X** in the upper right-hand corner of the window. If the registration test fails, attempt the test again or repeat the training process.

7. Once the registration mark training has been completed the system will use the stored information when processing.
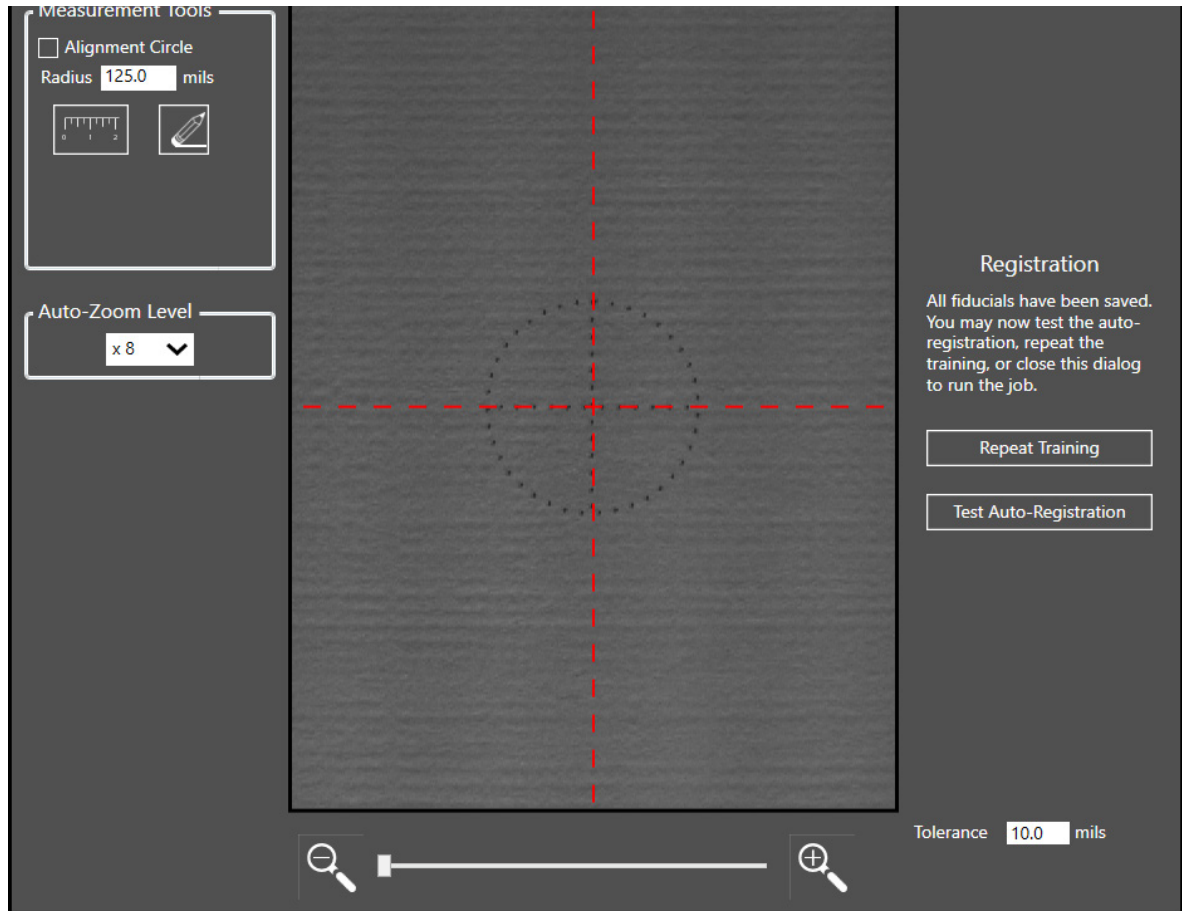
8. Press **Play** to begin the **Registration** and **Laser** process.

9. Repeat indefinitely by inserting new material containing pre-existing registration marks into the laser system.

10. For efficiency it is recommended that you use a rough alignment guide such as tape or a fixture to ensure that the registration marks are within +/-0.25" (6 mm) of the nominal positions in the artwork. This ensures that the registration mark on the material falls within the 0.5" (12 mm) window of the Camera's view at each seek location. If the registration marks do not fall within the Camera's view, the system begins to seek the registration mark by moving one Camera view width to the right and continuing around the nominal location counterclockwise until it finds the registration mark. This adds some time to the overall completion time.

> **NOTE:** If the **Automatic Seek** routine fails to find a registration mark in the nominal location and fails to find it after performing a one Camera width search around the nominal location, the **Automatic Seek** process will be aborted and an error will pop up requiring user intervention.

Using the Manual Seek Routine to Laser Process Material

Only visible when a design file with registration marks is selected, the **Manual Seek** routine allows you to further refine the registration process by foregoing the Automatic recognition of a registration mark, then giving you the ability to manually locate the center of a registration mark on your preprinted material.

1. Place the material containing pre-existing registration marks into the laser system. Ensure the material is correctly focused with the Carriage.

2. Tap **Registration Mode** in the **main** window of the **LSM**.

3. Select **Manual** Mode and enter a *tolerance value.*

   ---
   *NOTE: This **Tolerance Value** is used when calculating the differences between your design file and the points you select when registering your material. If the measurements are outside of the **Tolerance Value**, registration will fail.*

   ---
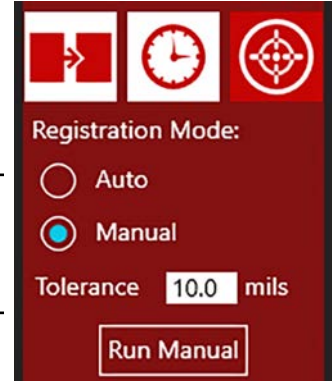
4. Tap **Run Manual** to enter the **Camera Interface.**

5. Tap **Start Registration** to begin the **Manual Registration** process.

6. Using the directional keys located within the **Camera Interface** window or on the **LCD** screen of the XLS10, center the crosshairs over the center of your registration mark.

   ---
   *NOTE: Use the **alignment tools** and **Zoom** feature in the **Camera interface** window to assist you in the **Registration** process.*

   ---

7. Once aligned, Tap **Accept Fiducial.**
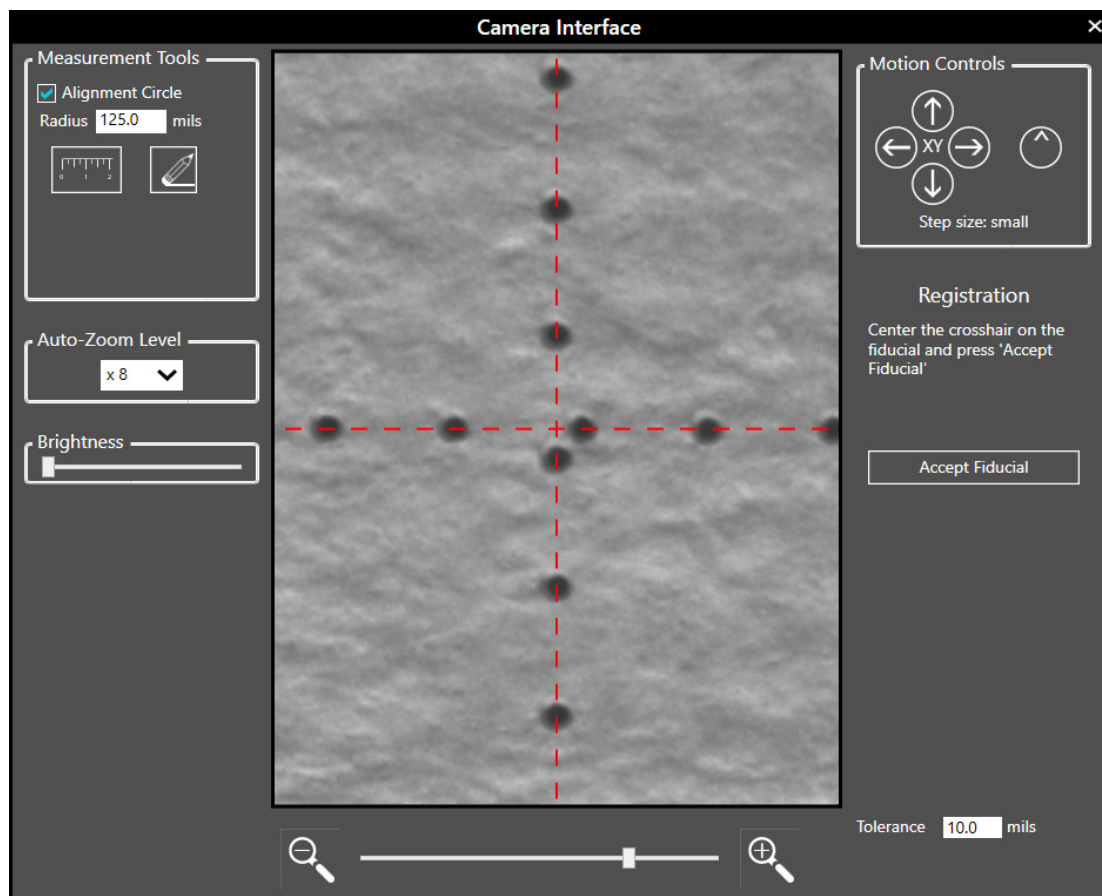
8. Repeat these steps for each remaining registration mark.

9. When complete, **Registration Mode** will check the measurements based off the entered *Tolerance Value.* If these tests are successful you may close the **Camera Interface** window by tapping the **X** in the upper right-hand corner of the window. If the test fails, you will be required to close the **Registration** window and either adjust your *Tolerance Values* or attempt the registration process again.
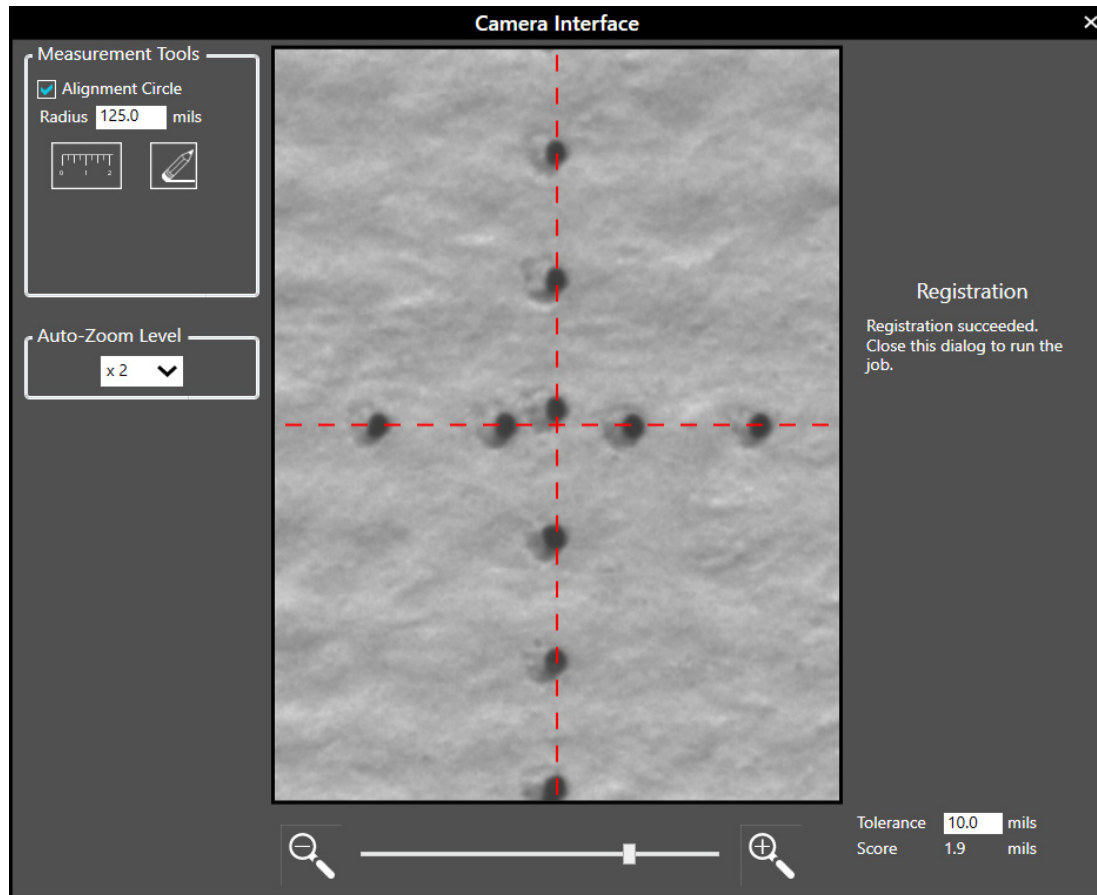
10. Once registration is complete press **Play** to start the **Registration** and **Laser Process.**

> *NOTE: Unlike **Auto-Registration** you must register each time you use the **Manual Registration** process. If you would like to repeat the same process, utilize **Auto-Registration** when registering your material.*

Calibrating the Camera

In order for the **Registration** process to work, the Camera must be calibrated to the Focusing Lens. During the **Camera Calibration** process, the system learns the distance between the laser focal spot and the center of the Camera View. **Camera Calibration** is normally performed at the factory, but may be necessary if service is performed on the machine or if a lens is replaced. The registration system is calibrated at four locations on the field and the calibration numbers are interpolated between these locations for increased accuracy.

1. On the **Systems Settings** window of the **LSM**, click or tap the **Camera** button.

2. The **Camera Calibration** window is displayed.

3. When calibrating the Camera you will be presented with three paths prior to beginning the **Calibration** process.
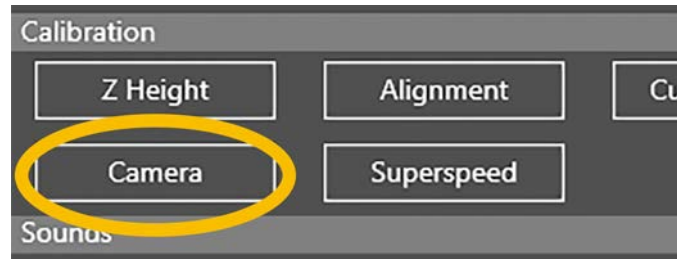
- **Use Current Calibration Positions:** Select **Yes** if you would like to use the defined positions. Select **No** to be presented with a choice of default or custom positions.

- **Use Default Calibration Positions:** Selecting the default positions will select (3,3) in the top left-hand corner and (37,21) in the bottom right-hand corner.

- **Use Custom Calibration Positions:** Use this selection if you would like to reduce the size of the calibrated area. If this option is selected, you will be asked to select a top left position and a bottom right position. These positions must be outside the registration marks of the artwork in addition to being limited to the area of *2.8 in. to 39.5 in.* on the X-Axis and *.5 in. to 23.5 in.* on the Y-Axis. Use the LCD **Motion Controls** to select these positions.

4. To begin the **Camera Calibration** process Tap the **Move to Top Left Fiducial** button.
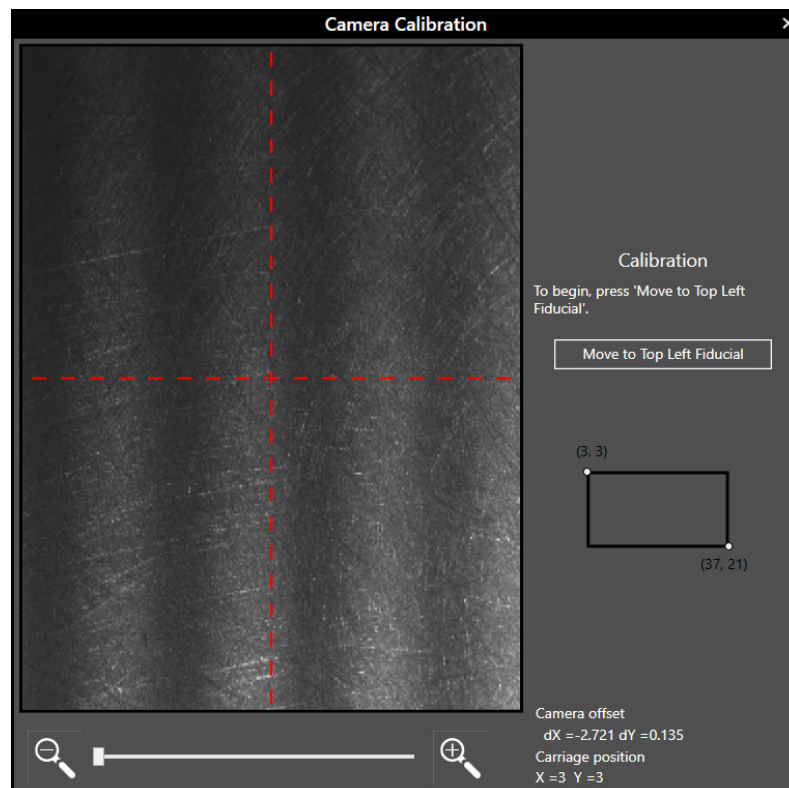
5. Place an anodized aluminum card under the Carriage. Tap the **Move to the Bottom Left Fiducial** button.

6. Repeat for the bottom left, bottom right, and top right positions.

7. Select the power the system will use during the **Camera Calibration** process.
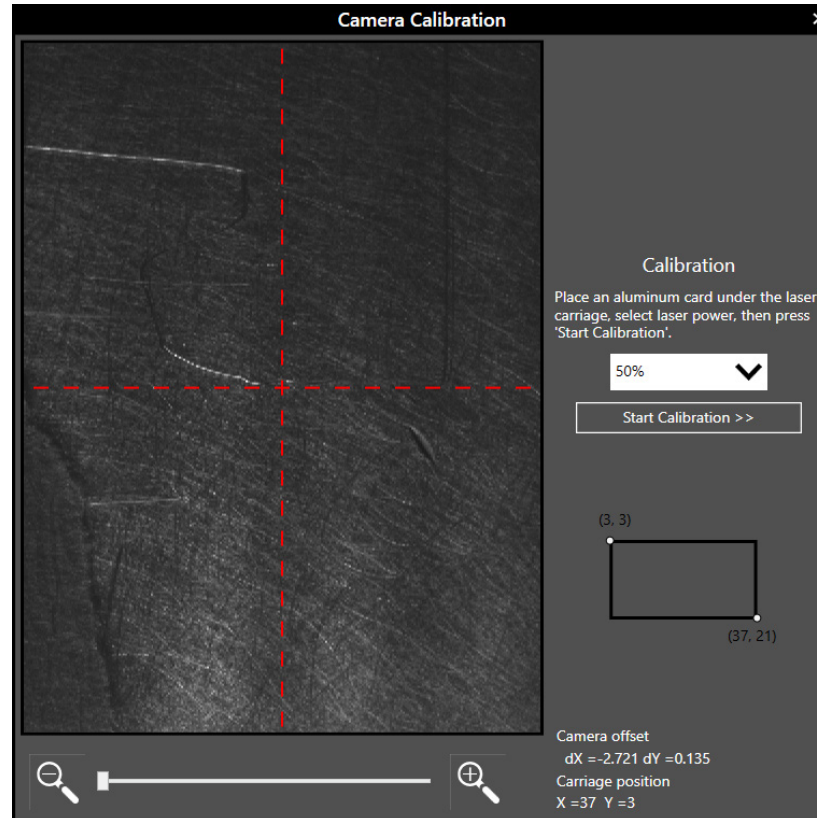
> **NOTE:** *Increased power may not be the best option. Use the power level that will best mark your material without overpowering it.*

8. Tap **Start Calibration**.

9. Using the Focusing Tool, ensure the laser system is in focus. Close the top door and tap **Yes** when the system is focused.

> **NOTE:** *The **LSM** disables **Auto Z** during the **Camera Calibration** process. Utilize the Focusing Tool to properly-focus the Carriage to the top surface of the material. For instructions on how to accomplish this please refer to the Use the Calibrated Focusing Tool section of the User Guide.*

10. The laser system will move to the top left position and scribe a calibration mark. Use the **XY directional buttons** or click with your **mouse** to manually adjust the center point.

> **NOTE:** *Tapping on* *will decrease the movement resolution by one unit per press. Doing this will reduce the total steps taken with a press of the **XY** directional buttons.*
>
> *You can adjust the level of magnification by **clicking** within the **slide bar** below the **Preview** window. **Zoom** ranges from 1X to 16X.*

11. Once centered, tap **Accept**. The Camera will perform a seek routine and travel to the next location.
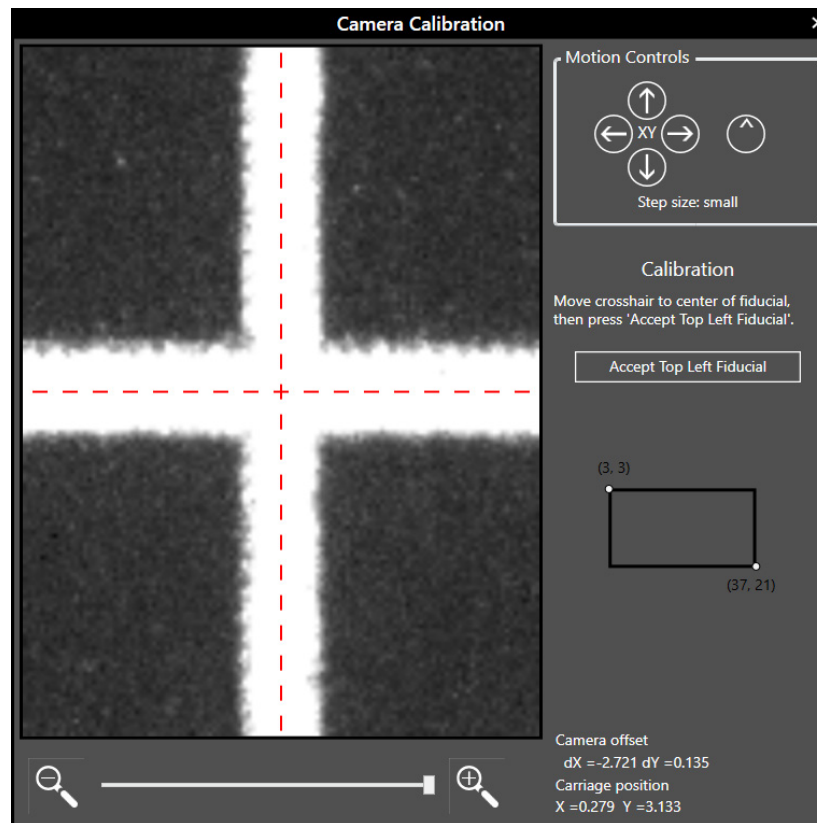
12. Repeat for each remaining position.

13. With the **Camera Calibration** complete, the system will store the XY offset for each position. Close the window by tapping the **X** in the top right-hand corner.

CLASS 4 CONVERSION MODULE

The Class 4 Conversion Module bypasses the safety interlocks on the side access panels of the XLS10 Laser System, allowing you to have both side access panels open give you the ability to engrave and/or cut lengthy materials. This option is useful for engraving or cutting large pieces of material that do not normally fit on the laser processing table.

Keep in mind that with this optional device in place, it is possible for the intense invisible laser radiation produced by the CO_2 laser, normally contained inside the enclosure, to be reflected out one of the open side access panels. This creates the potential to expose the operator and others to dangerous levels of laser radiation which can easily damage skin and eyes. Because of this potential for exposure, use of this device redefines the safety classification of the XLS10 laser system from Class 1, which is considered safe for use under all conditions set by law, to Class 4, which is considered potentially hazardous. Before installing this option, you must create a safe environment for operation of a Class 4 device by following the safety precautions outlined in the *Safety* section of this manual. Additionally you must make sure you have adequate ventilation so that fumes do not escape through the side access panels of the laser system.

CAUTION: *Use of the Class 4 Conversion Module makes the XLS10 a Class 4 laser system and creates laser safety hazards. Please refer to the Optional Class 4 Conversion Module section of this user guide for addition information.*

Pre-Installation

Before installing the Class 4 Conversion Module, you must create a safe environment in which to operate the XLS10 laser system in **Class 4** mode. In order to create a safe environment you must follow all local laws and regulations as well as OSHA guidelines for safe use of Class 4 laser systems in the workplace. It is recommended that you consult an expert on laser safety if you are not sure how to create a safe environment for using a Class 4 laser system, of consult the ULS Factory Team.

At minimum, you should block off an area or create a room with walls that will block any stray laser radiation and place the appropriate illuminated "Laser In Use" signs at the entrance to this area. When operating in **Class 4** mode, anyone inside this area should wear laser safety glasses certified for use with carbon dioxide lasers producing 10.6 and 9.3 micron laser radiation up to 200 watts and a 1.06 micron Fiber laser, if present, producing up to 120W CW and 20 kW @ 30 kHz PRF (2 microjoules max per pulse) pulsed.

Installation

Installation of External Interlocks

A connection is provided on the back of the XLS10 laser system, which plugs directly into the CPU for connecting external interlock switches. This connector allows you to interlock the entrance to the area in which the XLS10 will operate in **Class 4** mode. The external interlock circuit is a self-powered 12 volt circuit that can be attached to two or more switches (not provided) to attach one or more doors. Switches should be rated for at least 12 volts and 200 milliamps and should be installed as follows:

1. Ensure your laser system is powered **OFF**.

2. Wire external interlock switches (not provided) in series, routing wiring from all external switches to the back of the laser system.

3. Remove the screws holding the large L-shaped CPU cover in place.

4. Feed the wiring through one of the CPU cover ventilation holes.

5. Remove the jumper loop connecting pins 3 and 4 of the connector marked J6 (external interlock) on the main CPU board.

6. Attach external switches to pins 3 and 4 of the J6 connector (external interlock) on the main CPU board.

7. Reinstall the main CPU cover.

Installation of the Class 4 Conversion Module

1. Make sure the laser system is turned **OFF**.

2. Connect the Class 4 module cable into the back of the Touch Screen display.

3. Route cable through the wiring channel and attach the Class 4 module to the display using the two captive screws.

4. Remove the Rear Drive Shaft cover from the back of the engraving area by removing the three screws holding it in place.

5. Plug the wiring harness into the Class 4 module and carefully attach the grommet onto the bracket.

6. Install the Class 4 Shutter onto the back wall of the engraving area inside the laser system over the top of the Collimator where the laser beam enters the work area.

7. Re-attach the Drive Shaft cover.

8. Remove the Left Side Panel of the XLS10 laser system by locating the latches and removing the screws securing them in place.

9. Rotate the latch to disengage.

10. Lightly press the Left Side Panel toward the outside of the machine being careful to not push too hard, as the panel is still being held in place by two brackets.

11. Lift the Left Side Panel off the bracket to complete the removal.

12. Repeat steps 8 through 11 to remove the Right Side Panel.

Description of Controls

The Class 4 Conversion Module controls consist of a Key Switch, an Emission Indicator and a Shutter Switch. Operation of these controls is described below:

- **Key switch** - The Key Switch activates the lasers in the XLS10. It has three positions: **OFF, START** and **ON. OFF** deactivates the lasers and in this position the Key Switch can be removed to prevent unauthorized use of the laser system in **Class 4** mode. In order to activate the lasers, you must turn the Key Switch momentarily to the **START** position until the Emission Indicator lights up, then return the Key Switch to the **ON** position to maintain activation of the lasers.

- **Emission Indicator** - The Emission Indicator illuminates to indicate that the laser(s) are activated and capable of emitting laser radiation. If the Key Switch is turned to the **OFF** position or the External Interlocks Circuit is broken, such as when someone enters the area where the laser is being used in **Class 4** mode through an interlocked door, the Emission Indicator will turn **OFF**. You will need to re-activate the laser(s) by momentarily turning the Key Switch to the **START** position. There is a five-second delay when the Emission Indicator first lights up before the lasers are actually activated.

- **Shutter Switch** - The Shutter Switch closes and opens the Shutter that blocks the laser beams and prevents them from entering the processing area. Before starting a laser job, make sure the Shutter is in the open position. The Shutter can be closed when necessary to block the beam for safety.

Operation of the Class 4 Conversion Module

WARNING: *Always wear appropriate laser-safe eyewear when operating a laser system in **Class 4** mode.*

Make sure the **LSM** is running on the computer that is attached to the laser system. Turn the laser system **ON** and wait for the system to connect and home.

Once the laser system is homed and ready to process a design file, take the following steps to enable the laser in **Class 4** mode (side panels open):

1. Make sure the front door, top door and rear laser cover are closed.

2. If you have External Interlocks attached to the laser system for room doors or such, make sure those doors are closed.

3. Turn the Key Switch on the **Class 4 Module** to the **ON** position.

4. Momentarily turn the Key Switch to the **START** position until the Emission Indicator is on. If the Emission Indicator does not come on, check your external interlocked circuit. Keep in mind that there is a five-second delay after the Emission Indicator is illuminated before the laser is enabled.

5. Make sure the Shutter Switch is in the **OPEN** position.

6. If everything is working properly, the Interlock Indicator Light on the control panel of the laser system should be **OFF**. If this light is still blinking, then check that the Shutter Switch is **OPEN**, the Key Switch is **ON** and the Emission Indicator is illuminated.

EMBEDDED PC

The Embedded PC eliminates the need for a computer next to the laser system platform and utilizes the XLS10 touchscreen display. To remotely send design files, the laser system must be connected to the same network as the remote PC.

Connecting to the Embedded PC

1. Ensure that your PC is connected to the same network device as the Embedded PC.

2. Insert the ULS USB Flash Drive into your computer.

3. Navigate to the USB Flash Drive and double click on the **LSM** Installation Software**.**

4. Follow the instructions shown to install the software. Reboot your PC.

5. Launch the **Devices and Printers** window by holding the **Windows** key and **Q** to open the search box. With SEARCH open type in **Devices and Printers**. Press **Enter** on your keyboard.

6. Locate the newly-installed XLS10 printer and right click on the **icon**. Tap **Remove Device**.
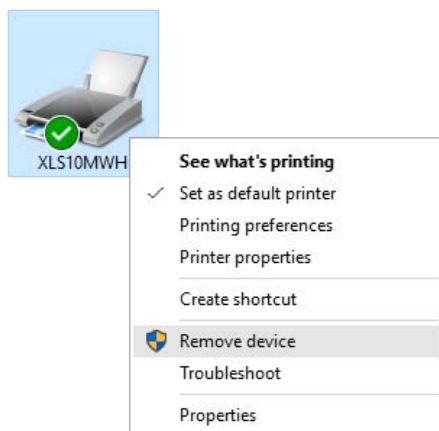
7. While still in **Devices and Printers** tap **Add a Printer.**
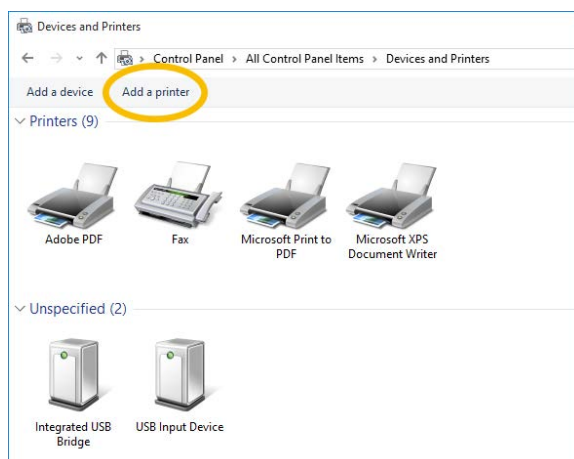
8. Tap **Add a network, wireless or Bluetooth printer**.

9. Tap **Select a shared printer by name** and enter the *network path,* provided by your network administrator, to the Embedded PC. *Example: \\192.168.1.205\XLS10MWH*
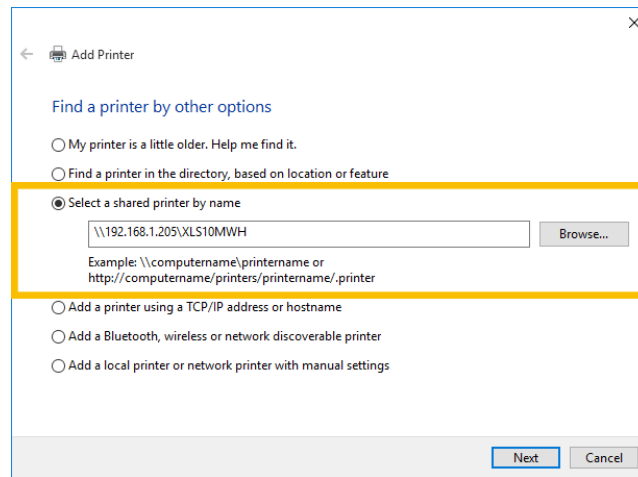
10. Click **Next** to finish.

11. Open the **LSM** and tap on **System Settings**. Under the General section locate **Server** and enter *the IP address* of the Embedded PC, provided by your network administrator, and press **Connect**.
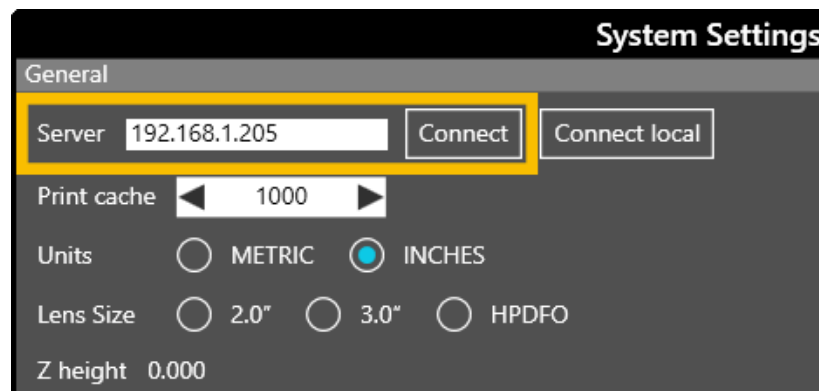
12. Enter the **Username** and **Password** provided to you by your administrator.

13. Exit the **System Configuration** window. You are now remotely connected to the **LSM** on the Embedded PC.
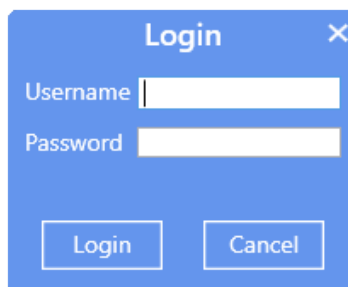
Adding Additional Users

1. Connect to the Embedded PC's **LSM** using the Admin account created for you during installation.

2. Navigate to the **System Configuration** window and scroll down to the Users section.

3. Click to add a new user.

    *   Type in the *username.*

    *   Enter a *password.*

    *   Select *access level.*

    > **NOTE:** *For additional information on access levels, please refer to the Users section of the User Guide.*

FIRE SUPPRESSION WITH OVER-TEMPERATURE SENSORS

The standard XLS10 comes plumbed for Fire Suppression.

Fire Suppression only deploys after the automatic thermal shut-off has taken place. If a fire persists after the automatic system shut-off, and the temperature reaches 133-147°F in either the processing area or in the exhaust plenum, a signal to open the tank valve will be sent to the fire suppression module, releasing the suppressant.

Installation

A total of four connections must be made to install the fire suppression system:

1. Connect the supplied 3/8" yellow tube to the output tube connector in the back of the Fire Suppression housing.
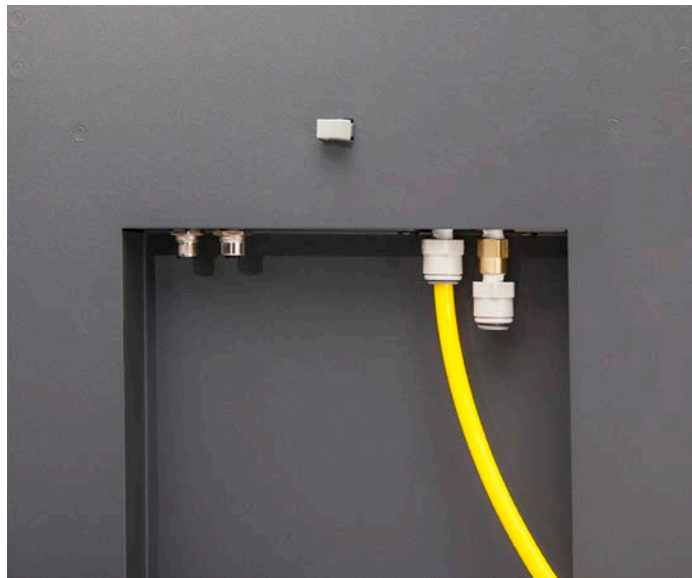
2. Connect the other end of the same 3/8" yellow tube to the inlet connector on the back of the system (back left on the bottom of the Power Supply module).

3. Connect the supplied coaxial communication cable to the back of the Fire Suppression housing.

4. Connect the other end of the coaxial communication cable to the mating panel mount connector in the same location as the suppressant tube (cable has both male and female connector ends, so this connection cannot be made incorrectly).

5. On the back of the Fire Suppression housing, there is a switch that toggles from left to right indicating which of two suppressant tanks is engaged. If the first tank is depleted, the user must toggle the switch toward the second tank. The laser system monitors the pressure in the tanks and will not allow the system to process materials if the switch is pointing to an empty tank.

FLOW-THROUGH CUTTING TABLE

The Flow-Through Cutting Table is used to support material so that when cutting, exhaust flow can be simultaneously redirected above and below the material allowing for a cleaner cut. Without it, smoke and debris can build up underneath the material, causing the surface of the material to become damaged. The Flow-Through Cutting Table is installed directly on top of the laser processing table to help reduce reflection damage. Back reflection is when the laser reflects off of the engraving table and back into the material during processing.

Installation

1. Turn the laser system **ON**.

2. Lower the table to the bottom of its travel.

3. Open the lower exhaust plenum slides.

4. Prior to installing the Flow-Through Cutting Table into the laser system, loosen the screws on the side of the Cutting Table that allow for the adjustment of the duct on the back of the Cutting Table, enough to allow the manifold to slide in and out.

5. Open the front door of the laser system and insert the Cutting Table so that the feet on the bottom of the Cutting Table are resting on the laser processing table. Slide the Cutting Table back and to the left until the two rear feet are up against the X-axis ruler. Then slide the Cutting Table left until the two left feet are up against the Y-axis ruler. The feet of the Cutting Table must be aligned properly with the X and Y rulers to ensure that the rulers on the cutting table line up with the rulers on the laser processing table.

6. Make sure the adjustable manifold is squarely up against the exhaust plenum in the back of the laser system to ensure proper exhaust flow below the material, then tighten the four screws on the side of the Cutting Table loosened in Step 4. Be careful not to move the Cutting Table while tightening the screws.

7. Use the Red Laser Pointer to ensure the Cutting Table is aligned to the processing field by moving the Red Laser Pointer around the edge of the field using the manual motion keys. If the Cutting Table is not aligned, check that the feet are properly-pressed against the X Y rulers in the machine. If the feet are properly-positioned and the rulers are still not aligned, adjust them by loosening their mounting screws slightly (you may have to remove the Cutting Table to do this). Adjust the rulers and then re-tighten the screws.

Cutting Table Focus Lens Calibration

To properly use the Flow-Through Cutting Table with the **Auto Z** feature in the **Laser Processing Settings**, the Cutting Table must be calibrated to the lens you are using. While this is done at the factory when the machine ships, you can check calibration by using the Manual Focusing Tool to focus on the surface of the Cutting Table. Make sure to use the Manual Focusing Tool included with the lens installed in the laser system and that the lens selected in the **System Configuration** window matches the lens installed in the laser system. Once focused, the Z position indicated in the **LSM** should be 0" +/-.020" (.508 mm). If you ever have to recalibrate the Flow-Through Cutting Table, there is a **Calibrate** feature in the **System Configuration** window of the **LSM**, which will guide you through the process.

*NOTE: **Autofocus** mode is disabled while the Flow-Through Cutting Table is in use.*

Maintenance

During use, material from the cutting process may fall through the honeycomb surface and collect in the drawers in the bottom of the Cutting Table. Periodically check the drawers and remove any material that has collected there.

⚠️ *CAUTION: Scrap material left to build up in the bottom of the Flow-Through Cutting Table, can become a fire hazard.*

The honeycomb material that makes up the support surface on the Cutting Table will wear out over time and can easily be replaced. New honeycomb can be purchased from the ULS Factory Support Team.

To replace the honeycomb, remove the rulers and flanges that hold the honeycomb in place around its edges. Remove the old honeycomb and replace it with the new one.

Reinstall the edge flanges and rulers. Rulers should be installed slightly loose and then adjusted to match the edges of the processing area by placing the Cutting Table back into the machine and using the Red Laser Pointer to position the rulers before tightening them down.
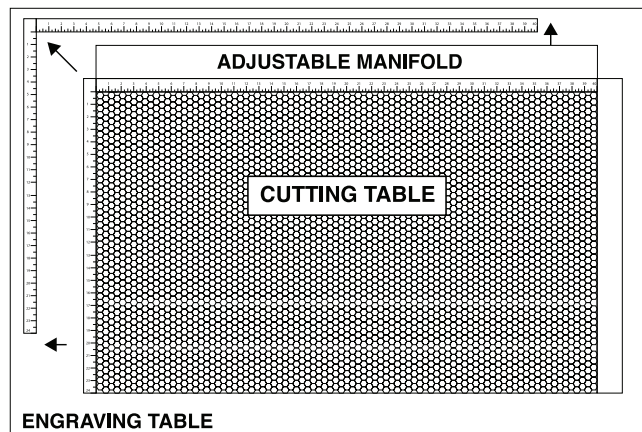
LATERAL GAS ASSIST ATTACHMENT

The Lateral Gas Assist Attachment works in conjunction with the Computer-Controlled Gas Assist, directing airflow across the material while pushing debris back towards the exhaust and away from the Final Focusing Lens and the material. This helps minimize the contamination of the Optic as well as direct debris away from the finished product.

If there are flame ups on the material while using the Lateral Gas Assist Attachment, there is a chance that heat could damage the hose. Applications with excessive flame ups are best processed using the Coaxial Gas Assist Attachment.

Installation

1. To install the attachment, remove the thumbscrew that seals the Gas Assist Feed Port.

2. Insert the attachment's brass tube into the Gas Assist Feed Port that was exposed when you removed the thumbscrew.

3. Use the thumbscrew removed earlier to hold the attachment in place using the forward of the two holes on the Carriage.

4. Adjust the Lateral Gas Assist Attachment's height by loosening the thumbscrew and adjusting it up or down.

5. Tighten the thumbscrew once it is at the correct height.

6. To adjust the angle of the gas flow, turn the screw in small increments, directing the gas jet to the desired position over the material.

Tighten the thumbscrew.

To adjust gas flow angle, turn the screw in small increments.
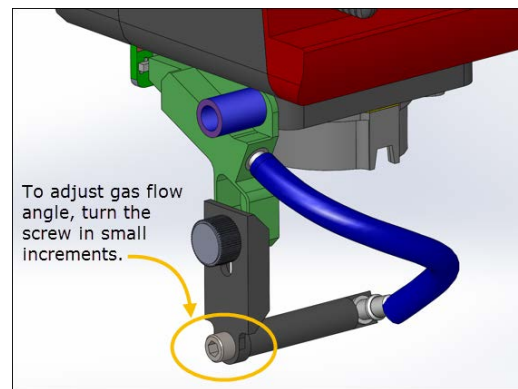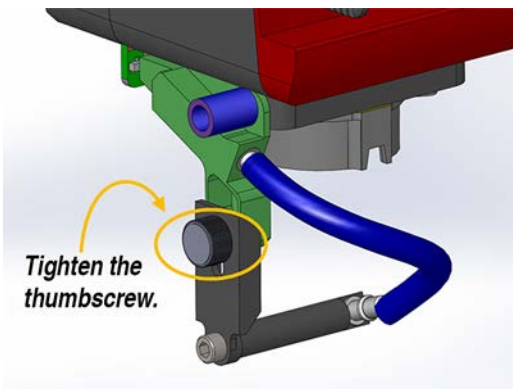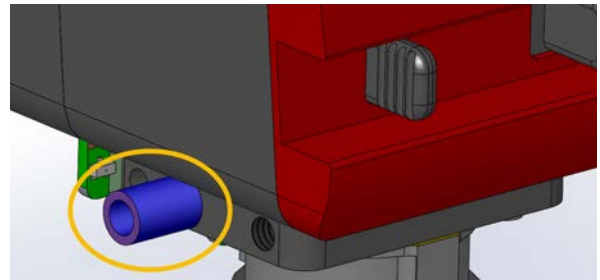
A convenient way to align the gas flow is to focus on the material to be processed and then align the nozzle using the angle and height adjustments toward the Red Laser Pointer which is on when the laser system is powered on and the top door is open.

> **NOTE:** *If you remove the* Lateral Gas Assist Attachment*, remember to reattach the mounting thumbscrew to seal the Gas Assist Feed Port.*

Final Focusing Lens Kits

There are three Final Focusing Lens Kits available for the laser system; 2.0" and 3.0", and the High Power Density Focusing Optics™ (HPDFO). The different lenses produce different spot sizes and have different focal ranges. Included with each kit is its own calibrated Focusing Tool and Coaxial Gas Assist Attachment.

HPDFO™

Available only for the XLS10.150D, HPDFO has a smaller focal spot size than a standard 2.0" focusing lens. Depending on the type of material being processed, the effective spot size produced by the HPDFO can be as small as 1/4 the size of a standard 2.0" Final Focusing Lens.

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

The HPDFO replaces the standard Final Focusing Lens Assembly in the Carriage and comes with its own calibrated Focusing Tool, which should always be used when focusing with the HPDFO.

Installation

1. Remove the currently-installed Final Focusing Lens Assembly by pinching the spring-loaded actuators together and **sliding** the Lens Assembly out of the Carriage.

2. Store the Final Focusing Lens Kit in the storage compartment located in the left interior panel of the XLS10.

3. Install the new Final Focusing Lens Kit by aligning the Focusing Optic to the lens guides and sliding it into the Carriage. The spring-loaded actuators will click into place, securing the Lens Kit within the Carriage.

PIN TABLE

The Pin Table is designed to eliminate certain scorch marks and other defects which may occur when cutting acrylic, wood or other sensitive materials using conventional laser cutting tables. By using specially-coated aluminum pins to elevate the material being processed, the Universal Pin Table greatly reduces the amount of laser energy reflected back into the material from the table surface.

The Universal Pin Table consists of a modular 12" x 12" base with an energy-absorbent coating, sixteen supporting pins to elevate the material and four fixture pins for material positioning. The base contains magnets which enable quick and accurate alignment with additional Universal Pin Tables. Pins slide snugly into the pin slots in the base (arranged in a grid with 1" intervals) and can then be locked in place with screws from below for high volume jobs.
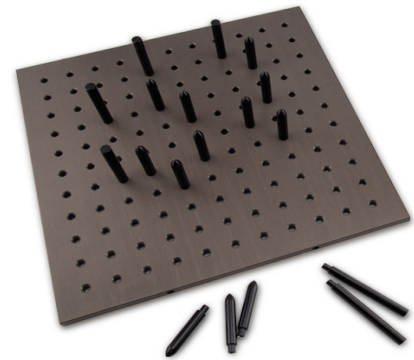
Installation

1. Place the base against the rulers on material processing table. Place additional Pin Table bases against first base and magnets will secure them to each other when oriented correctly.

2. Place rounded pins as needed to support the material to be cut.

3. If desired, place taller squared pins to form stops to locate the material. The Pin Table photo above illustrates an example setup with supporting and stop pins.

4. Place material to be processed on the pins.

5. Focus on top of the material surface.

NOTE: When utilizing the **Auto Z** feature in the **System Settings** page, make sure to select the Pin Table as the **Fixture Type.**

ROTARY FIXTURE

The Rotary Fixture allows the laser system to engrave and mark on cylindrical objects including open-ended objects such as wine glasses, mugs, cups, and vases. It is equipped with an external conical fixture and a chuck, which can be mounted to the fixed, motorized end and an internal conical fixture which can be attached to the adjustable end.

Installation

1. Lower the laser system material support table enough to install the Rotary Fixture. Make sure the motion system will clear the top of the Rotary Fixture.

2. Now turn the laser system **OFF**.

3. Place the Rotary Fixture support bracket (1) on the table positioned over the mounting holes (2) on the right side of the Table. Install the provided thumbscrews, but leave the thumbscrews loose enough to allow adjustment of the Rotary Fixture.

4. Place the Rotary Fixture on top of the bracket so that its pivot bolts sit in the forks on the mounting bracket. Adjust the Rotary Fixture so the front edge lines up with the 14" (355.6 mm) mark (5) on the Y ruler. Tighten the thumbscrews. (6)
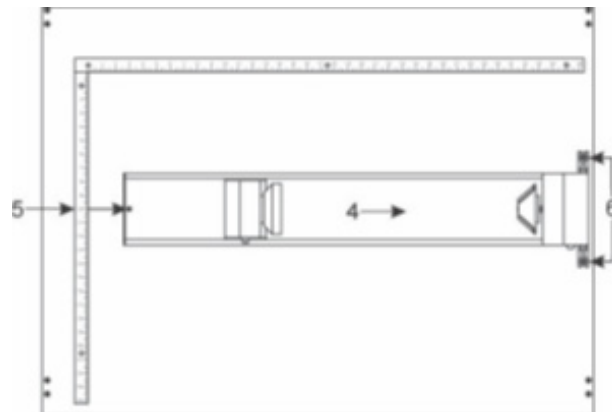
5. With the power to the system still **OFF**, connect the Rotary Fixture control cable to the receptacle on the laser system.
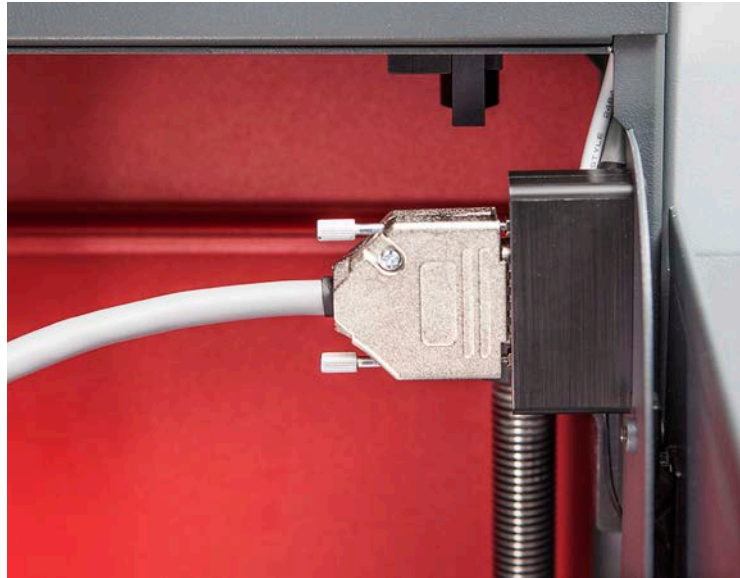
Loading Material

Before loading material into the Rotary Fixture, use a caliper or similar measuring device to measure the diameter of the material in the area where the engraving or marking is to be located. A wine glass is used as an example here.

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

> **NOTE:** *If the material you are using 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 fixtures to hold the material. To change out fixtures, loosen the setscrew that holds the fixture to the Rotary shaft, remove the unneeded fixture and replace with the new one.*

2. If engraving a tapered object, 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 underneath. Slide the spacer left and right until the tapered surface of the object is parallel to the material support table.

3. Power the laser system **ON**. If you are using the Rotary Fixture for the first time, Calibration may be needed, so proceed to the next step. If Calibration is not needed, proceed to **Determining Graphic Placement**.

Rotary Fixture Calibration

1. On the **System Configuration** window of the **LSM**, click or tap the **Rotary** button.
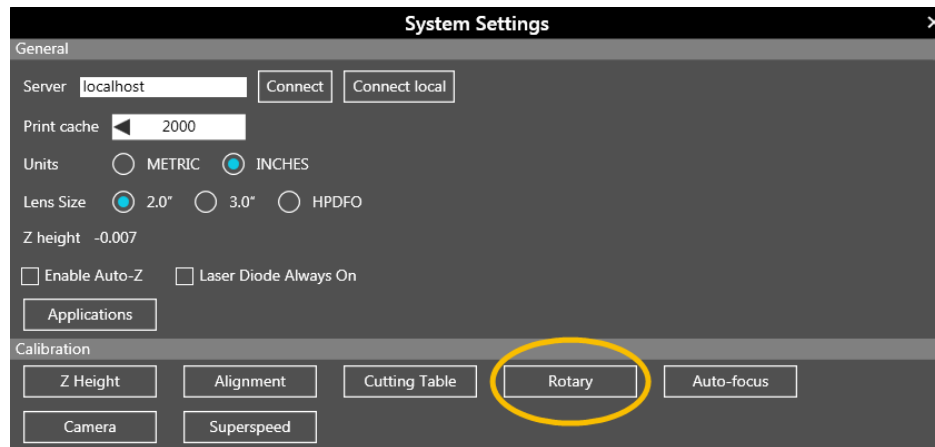
2. In the **Y Position** box, use the **Y-axis** arrows shown to move the Carriage so that the Y-axis position indicated is aligned with the rotational axis of the Rotary Fixture. In the installation section above it was recommended that you align the front edge of the Rotary Fixture with the 14" (355.6 mm) position on the Y rule. If you did this you can set the Y-axis position to 11.385" (289.179 mm).
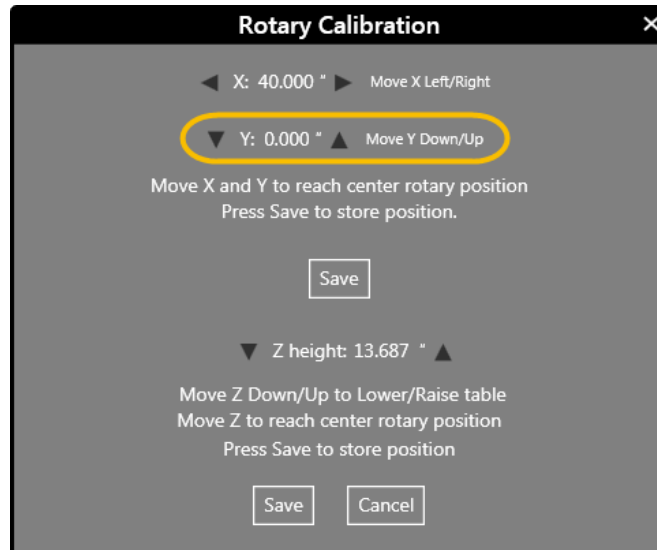
3. Next, use the **X-axis** arrows to move the Carriage left or right and place the Red Laser Pointer over the flat part of the internal conical fixture normally located on the left side of the Rotary Fixture.
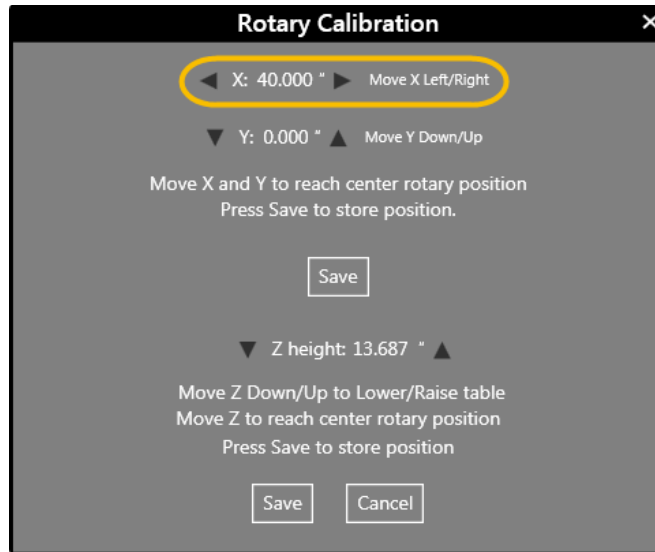
4. Now use the **Z-axis** buttons in the **Rotary Calibration** dialog box or the **Z-axis** buttons on the **Control Panel** to move the table up and down into focus using the Focusing Tool on top of the flat surface of the internal conical fixture.

NOTE: If you do not have an internal conical fixture, you will need to carefully bring the table into focus on the edge of the external conical fixture. Care is required when doing this step as an out-of-focus Lens will result in poor engraving and marking quality.

5. After focusing, tap both **SAVE** buttons on the **Rotary Calibration** dialog box. If asked to overwrite an existing position, accept the new value by tapping **YES**.

6. Once complete, tap **CLOSE** and the Carriage re-homes.

7. Calibration is now complete.

*NOTE: **Auto Z** and **Autofocus** mode are disabled while the Rotary Fixture is in use.*

Determining Graphic Placement

The next step is to align the graphics to be printed with the material inserted in the Rotary Fixture. Use the X-axis ruler or, to be more precise, use the Red Laser Pointer and the X-Y coordinate display in the **LSM** to position the graphics in the X-axis.

1. Using the **Navigation** buttons on the **LSM**, position the Carriage above the material.

2. Move the Carriage left or right until the center of the Carriage or the Red Laser Pointer is located where you would like the top of the graphic to start on the material, as indicated by the rightmost line in the picture below. Make note of the **X** Coordinate on the ruler or in the **LSM**.

3. Position the center of the Carriage so the Red Laser Pointer is located where you would like the graphic to end on the material, as indicated by the leftmost line in the picture below. Make note of the **X** Coordinate on the ruler or in the **LSM**.

4. Rotate the material by hand until the location for the center of the graphic is facing directly up.

NOTE: Keep in mind that the Rotary Fixture does not have a home location in the rotational axis, so the topmost part of the material, the part facing straight up, is always the center of the graphic.

Creating a Rotary Design File

1. In your graphics software, open or create the artwork to be printed to the laser system (this example uses CorelDRAW).

2. Position the graphic on the page so that it is located horizontally within the upper and lower engraving limits determined earlier, and center the graphic vertically as shown below.
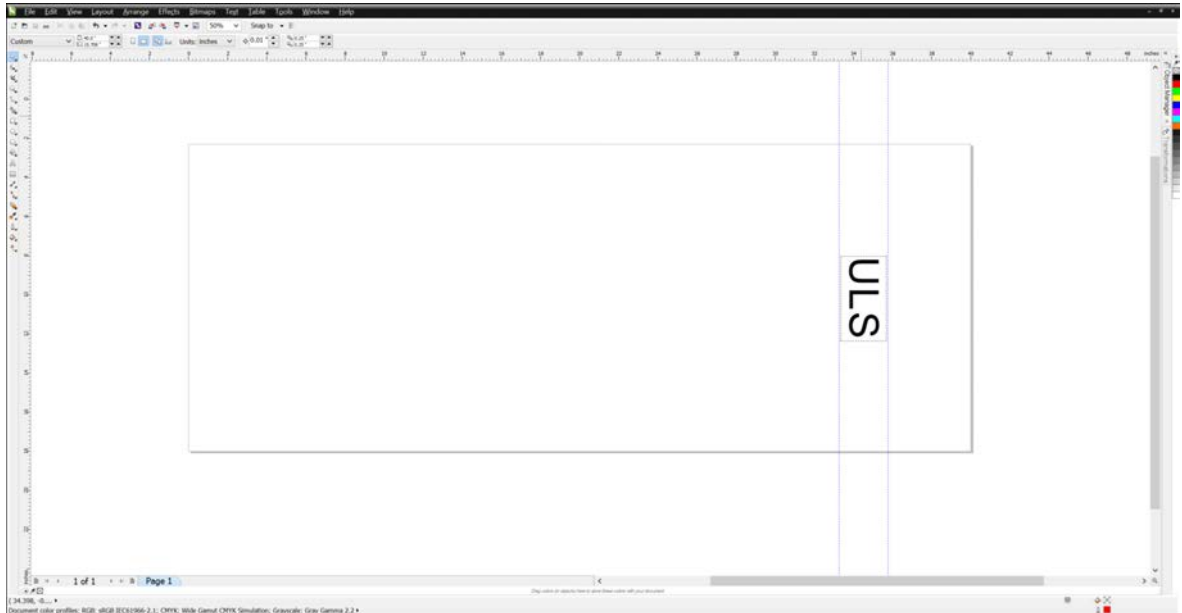
3. When the artwork is ready to print, open the **Print Setup** dialog box in your graphics software.

4. Select the XLS10 on the printer **drop-down** list, then open the **Printer Preferences** dialog box. This will launch the **Laser Processing Settings** module.
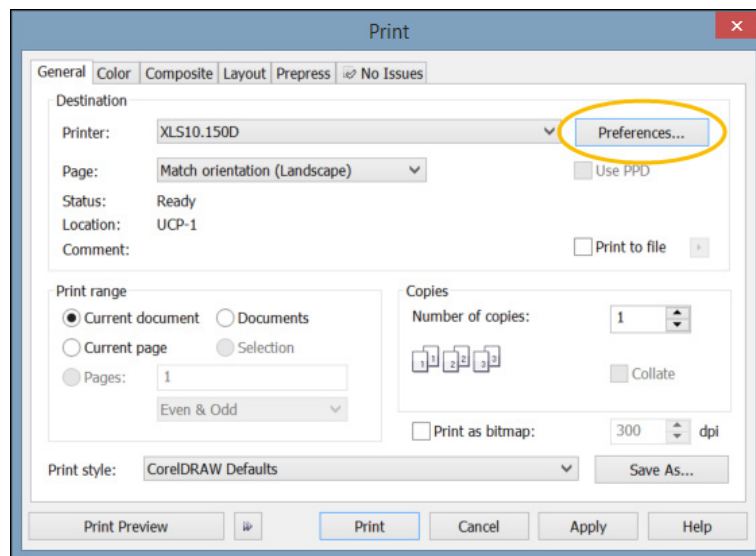
5. Select the *material* being processed from the Materials Database.
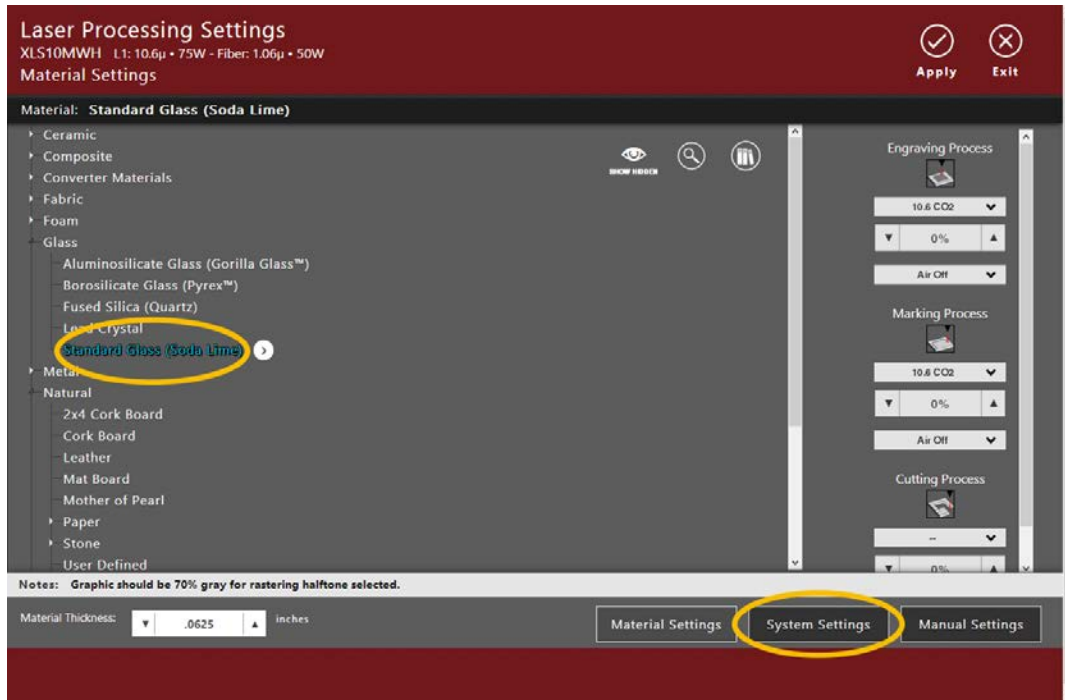
6. Switch to the **System Settings** page. Under **Fixture Type** in the **Fixture Selection** section, select **Rotary** from the **drop-down** list.

7. Enter the *Diameter* of the material being processed. If needed, adjust the *Rotation Factor.*

NOTE: *The Rotation Factor is used to make small adjustments so that 360 degrees is equal to one full rotation of the Rotary.*

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8. Tap **Apply** to save the changes, then tap **Exit** to close the **Laser Processing Settings** window and return to the **Print Setup** dialog box in your graphics software.

9. Select **Print** to create the design file and place it into the laser processing system queue.

**NOTE:** *Before running a Rotary job, rotate the material by hand until the center position of the graphic is facing directly up. Keep in mind that the Rotary Fixture does not have a home location in the rotational axis so the topmost portion of the material (the part facing straight up) is always the center of the graphic when printing.*
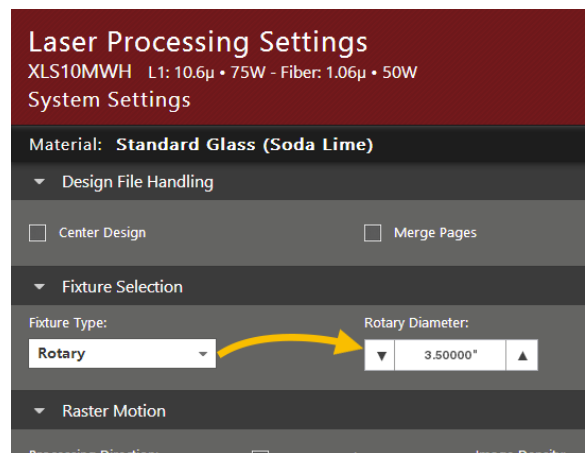
SuperSpeed™

SuperSpeed increases the productivity of the system by printing two lines of Raster information simultaneously with each pass of the X-axis over the material being laser processed, dramatically reducing Raster completion times.

SuperSpeed provides two extra densities to choose from, which can improve productivity even further. It works by using a motor to tilt a system of beam splitting optics to precisely split the laser beams from two laser sources at various angles to the Focus Lens. This causes the beams to focus at different locations with respect to each other in the Y-axis with a desired spacing between them. The pulsing information for two lines of Raster data (pixels) from the image being printed is sent simultaneously, one line to one laser and the second line to the other laser, with each pass of the X-axis across the material. Then the Y-axis steps a small amount and the process is repeated.
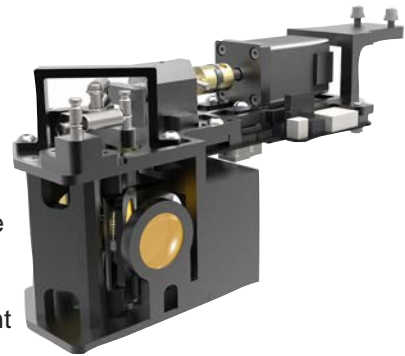
This approach works well to dramatically increase productivity of the laser system without speeding up the motion system. However, results from SuperSpeed are sensitive to the material and application, as well as setup and maintenance of the system.

SuperSpeed may not be an appropriate option for every application. Here are some guidelines for its use:

- The spacing between focus positions of the two lasers changes if the lens is out of focus. The system is calibrated so that the beams are correctly spaced for each image density at the focal distance of the lens. This beam spacing is very sensitive to the distance from the lens, so moving the Z-axis a small amount (as little as .010") away from the calibrated focus distance can have a visible effect on image quality, depending on the sensitivity of the material being used and the image being printed. For example, large text engraved on wood is much less sensitive to focal changes than small text engraved on anodized aluminum.

- The spacing of the laser beams for SuperSpeed is very sensitive to laser alignment. Both lasers must be very precisely aligned to each other and to the center of the optical path across the entire field of the laser system. Alignment of the lasers is sensitive to movement of the system. For very precise alignment, a system should be properly-leveled and stationary.

- For optimal results when laser engraving small precise features on sensitive materials (such as acrylic and anodized aluminum), the Laser Processing Table and the material must be flat and level with the Motion System Arm across the entire field and to a very high degree. Even if the system is kept level and flat, results can still vary if the material is not entirely flat or tends to bow when heat is applied. It is very important when using SuperSpeed to accurately focus on the material.

Enabling Superspeed™

The laser system automatically recognizes SuperSpeed when the laser system is turned **ON**. The SuperSpeed option will appear in the **Peripheral devices** section of the **Diagnostics** window in the **LSM** and a **SuperSpeed** check box will appear on the **System Settings** page. To enable Superspeed when preparing a design file. Place a **check mark** in the box to activate **SuperSpeed** mode when processing a design file.

![Universal Laser Systems logo]
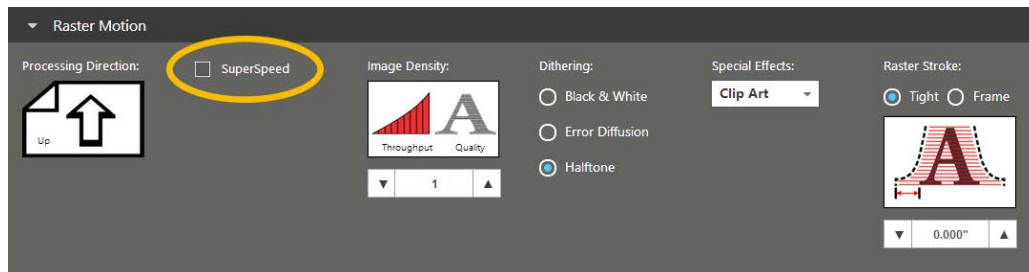
TRAVELING EXHAUST

The Traveling Exhaust option is an alternate method of exhausting smoke and debris from the laser system. It works by capturing smoke and debris directly at the site of laser processing. It consists of an Exhaust Plenum attached to the X-arm of the motion system which travels with the Arm, and connects through flexible hoses to separate exhaust ports on the interior back wall of the machine. It also includes a Traveling Exhaust Booster, attached to the Carriage, which helps to direct the smoke and debris into the exhaust slot on the Traveling Exhaust Plenum.

Installing the Traveling Exhaust Booster

1. To install the Traveling Exhaust Booster, remove the thumbscrew that seals the Air Assist Feed Port.

2. Insert the Traveling Exhaust Booster brass tube into the Air Assist Feed Port that was exposed when you removed the thumbscrew.

3. Use the thumbscrew removed earlier to hold the Gas Assist Back Sweep in place using the forward of the two holes on the Carriage.

4. Adjust the Traveling Exhaust Booster height by loosening the thumbscrew and adjusting it up or down.

5. Tighten the thumbscrew once it is at the correct height.
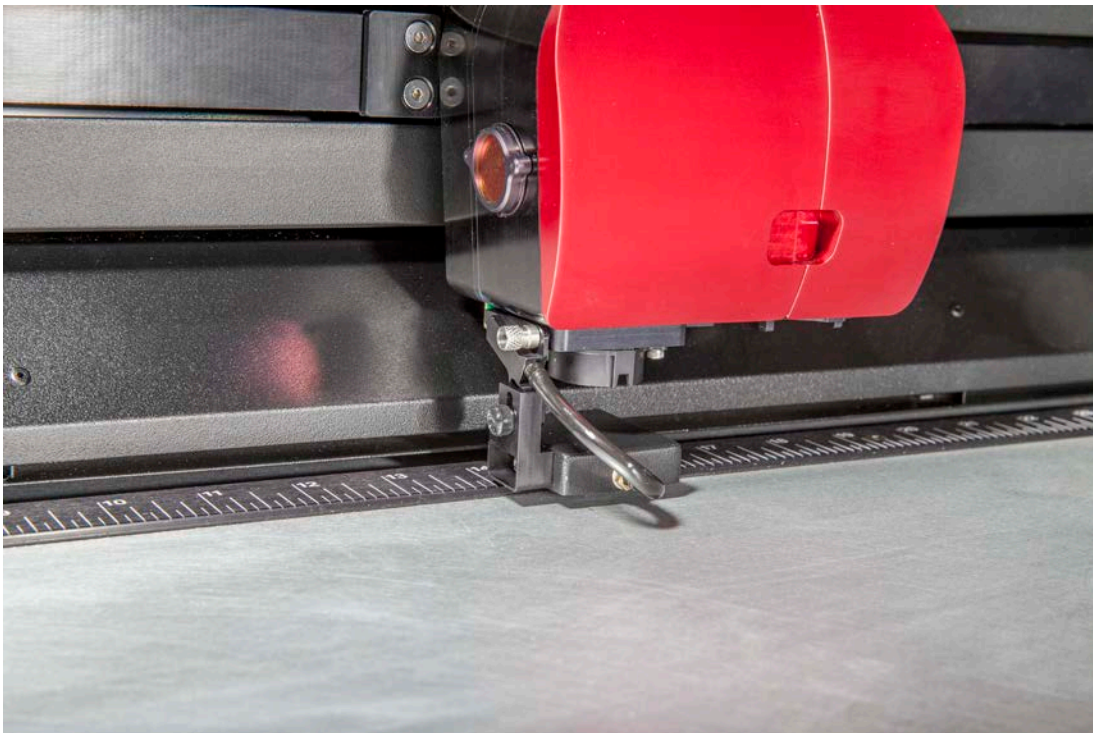
6. Prior to processing a design file with Traveling Exhaust installed, navigate to the **System Configuration** window of the **LSM,** locate the **Misc** section and place a **check mark** in the **Traveling Exhaust/Camera** box.

Adjusting the Traveling Exhaust Plenum

To maintain it's effectiveness, the Traveling Exhaust Plenum will need to be adjusted when switching between different focal length lenses.

1. Turn the laser system **ON** and move the laser processing table up, using the Focusing Tool to verify that the surface is at the focus position.

2. Adjust the Traveling Exhaust Plenum by loosening the screws that mount the straps to the X-arm and lower the Exhaust Plenum until it rests on the rulers, then raise it about .050" (1.25 mm) above the ruler and tighten the mounting screws.

3. Move the X-arm back and forth to ensure the Traveling Exhaust Plenum does not rub anywhere.

    NOTE: If the Traveling Exhaust Plenum has been adjusted, the Traveling Exhaust Booster attachment will also need to be adjusted accordingly.

Maintenance

Over time dirt and debris can collect in the Traveling Exhaust Plenum attached to the X-arm as well as in the hoses and ducts of the Traveling Exhaust. All components are removable and should be cleaned using a mild soap solution and a hose with a spray nozzle, when necessary.

Maintaining the System 10

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 the best results when laser processing. Always turn the XLS10 laser system **OFF** and unplug it before performing any cleaning procedures.

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 (use **only** on the laser processing table, but nowhere else)
- Cotton swabs (supplied)
- Lens cleaner (supplied)
- Vacuum cleaner with a soft bristle brush attachment
- Set of Allen wrenches sized from 0.050" to 3/16"

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

System Cleaning and Maintenance

Motion System and Laser Processing Table

To clean the motion system and laser processing table:

1. Turn the laser system **OFF** and unplug.

2. Open the top door and thoroughly remove all loose dirt and debris from inside the laser system using a vacuum cleaner with a soft bristle brush attachment.

3. Clean the laser processing table with either a mild soap solution or alcohol with a cloth or paper towels. Never pour or spray any solution directly into the laser system. Always dampen a paper towel or cloth with the cleaning solution outside of the laser system and then wipe down the parts with the dampened cloth.

> ⚠️ **CAUTION:** *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.*

The Main Enclosure

To clean the main enclosure:

1. Clean the top and front windows with window cleaner and a cotton cloth or paper towel. Since the top and front windows are glass; do not use abrasive cleaning cloths as they will scratch the glass. Also, do not use abrasive chemicals as these chemicals will damage the glass. Only use cleaners suitable for glass.

2. Use a soft cloth or paper towels and a mild soap solution to clean the enclosure. Do not use alcohol, acetone, or any other harsh chemical as these products will damage the paint.

Optics

A visual inspection of the #2 and #3 Mirrors, Collimator, and Final Focus Lens should be performed at least once a day. Additional visual inspections may be required if the material being processed produces excessive amounts of smoke and debris.

> **NOTE:** *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 of the 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 and crack it.*

#2 Mirror

To clean the #2 mirror:

1. Gain access to the #2 Mirror by grasping its protruding handle with your thumb and forefinger and sliding it out. It is held in place by magnets.

2. Inspect the #2 Mirror and clean it only if there is debris present.

3. To clean the #2 Mirror with a cotton swab, moisten the cotton swab with the supplied lens cleaning solution. Do not use other types of cleaners or solutions.

4. 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.

5. If the Mirror did not come clean, use a fresh cotton swab and repeat the procedure.

Final Focusing Lens Assembly

To clean the Optics on the Lens Assembly:

1. Gain access to the Optics by pinching the tabs protruding from the cover and pulling the front cover straight out.

2. Tilt the front cover enough to enable you to apply the lens cleaning solution directly to the #3 Mirror.

3. Flood the reflective surface of the #3 Mirror with the solution. If heavy debris is present, let the solution soak in for a minute.

4. Roll a fresh cotton swab across the Optic in one direction. Use a fresh swab for each pass. Be gentle when cleaning the Optic to avoid scratching the surface. Repeat this procedure for the Final Focusing Lens, ensuring you clean both sides of the Final Focus Lens if debris is present.

Collimator

The Collimator is located where the laser beam enters into the processing area in the upper left-hand corner of the processing area against the back wall. It is yellow in color. It is only necessary to clean the front side of the visible Optic. Do not remove the Optic to clean it, simply clean it in the same manner as the #2 Mirror.

Exhaust Plenum

To clean the Exhaust Plenum:

1. Lower the laser processing table.

2. Locate the 3 screws securing the drive shaft cover and remove them. Carefully remove the cover from the laser system.
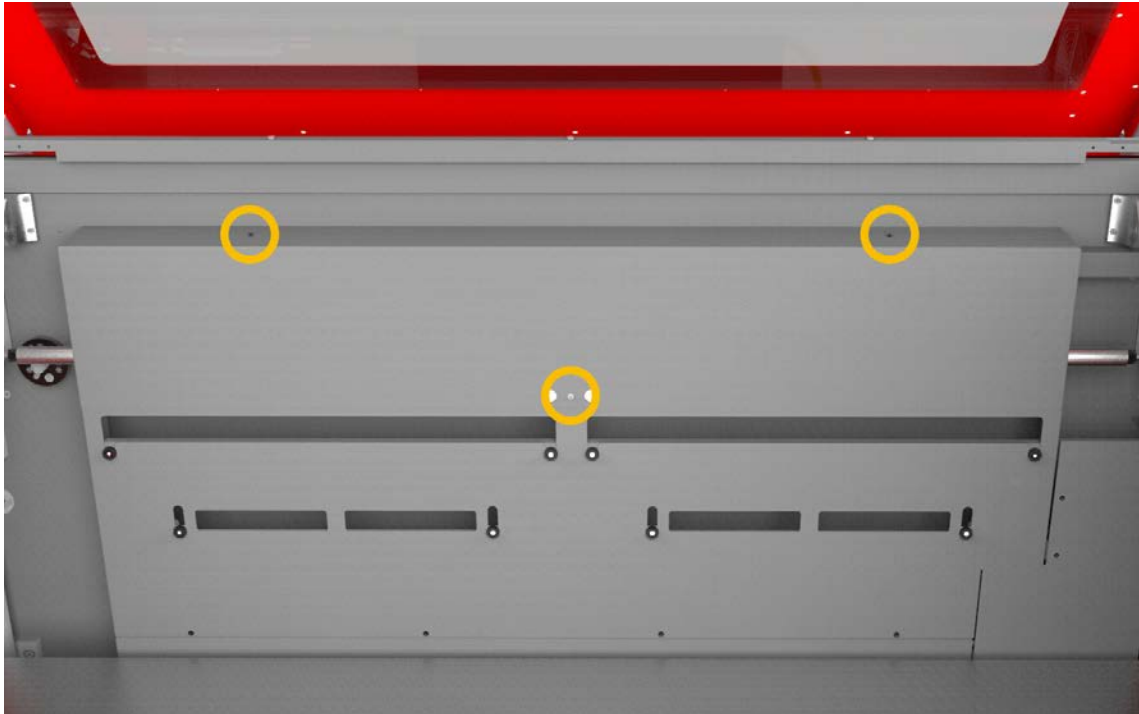
3. Remove the Z-axis component cover by removing the single screw securing it to the Rear Exhaust Plenum. Lift up and remove the cover from the laser system.

4. Take out the 2 screws holding the Thermal Sensor bracket to the Upper Exhaust Plenum. The thermal sensors will be connected by a pair of wires. Carefully set the Thermal Sensor Bracket aside.

5. Locate and remove the 14 screws that attach the Exhaust Plenum to the inside rear wall of the laser system.

6. Remove the Exhaust Plenum from the laser system.

7. Using a vacuum cleaner with a soft bristle brush, remove any loose dust and debris from the Exhaust Plenum and inside rear wall of the laser system.

8. Using a mild soap and water solution, clean the inside of the Exhaust Plenum as well as the inside rear wall of the laser system.

9. Reinstall the Exhaust Plenum using the screws removed in step 5.

10. Reinstall the Thermal Sensor bracket with the screws removed in step 4.

11. Reinstall the Z-axis component cover using the screw removed in step 3.

12. Reinstall the drive shaft cover using the 3 screws removed in step 2.

Cooling Fan Filters

This air-cooled laser system will require periodic cleaning of the Cooling Fan Filters. Since ambient air is used to cool the laser source, the air must be filtered before it passes through the laser. Dust contamination impeding airflow through the Intake Filter may reduce the cooling fan's ability to keep the laser source from overheating. An overheated laser source will lose laser power during processing and will eventually shut down completely.

To clean the Cooling Fan Filters:

1. Turn the laser system **OFF** and unplug.

2. Remove the 4 large square filters by snapping off the black cover and removing the foam element.

3. Wash the foam element in a soap and water solution, dry and re-install.

NOTE: Never operate the laser system with the Cooling Fan Filters removed as dust and debris can build up in the laser source cooling channels, leading to damage.

Adjustments and Lubrication

Due to the use of Fluid Bearings and Fiber Reinforced Belts, periodic adjustments are not normally required on the XLS10 laser system. During normal operation, the air pressure required to operate the Fluid Bearings results in a self-cleaning response and the Fiber Reinforced Belts do not stretch. All other bearings in the system are sealed and do not require lubrication. From time to time, lubrication may be required on the screw threads of the Z-axis lifting mechanism as contaminants build up in the lubricant; causing the laser processing table to bind. Periodically wipe off the contaminated grease with a soft cloth dampened with alcohol and apply fresh white lithium grease to the screw threads. Never spray any degreasing solutions directly onto the threads. Run the table up and down to work in the fresh grease.

Maintenance Schedule

We recommend the following routine maintenance schedule:

As necessary:

- Clean laser processing table
- Clean main enclosure
- Clean top door window

Every 8 hours of processing:

- Check beam window, #2 Mirror, and Lens Kit for debris. Clean ONLY if dirty.

Every month:

- Clean rear cover Cooling Fan Filters
- Check for X-axis and Y-axis belt wear. Replace as necessary.

Every 6 months:

- Clean Z-axis lead screws with white lithium grease
- Clean Exhaust Plenum

Every 12 months:

- Check Rear Coalescing Air Filter for debris and particulates. Replace as necessary.

NOTE: If you have any questions about maintaining the laser system, please contact the ULS Factory Support Team.