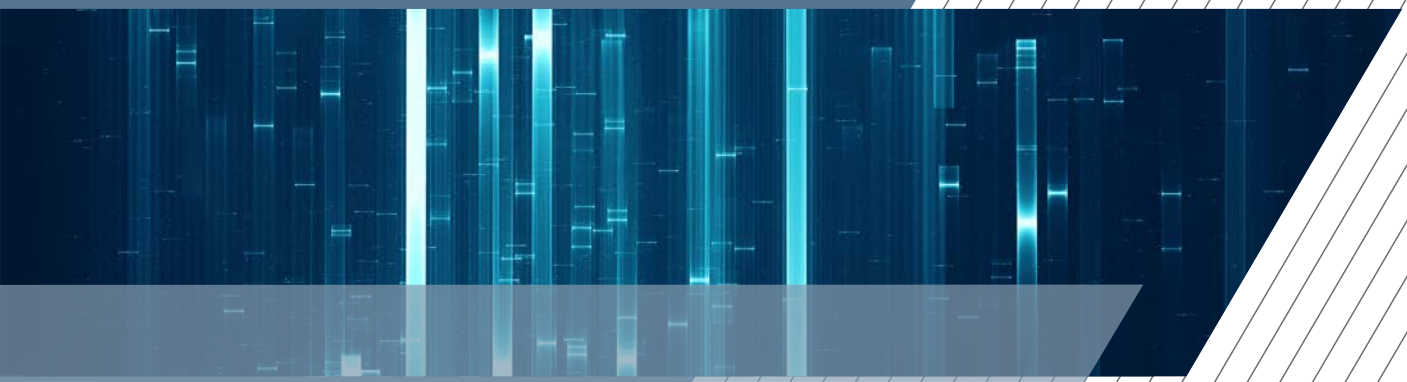
FIBERCUBE®
FIBER MARKING+ENGRAVING

FiberCube® Marker 3400 Series Operation & Maintenance Manual



LASERSTAR® TECHNOLOGIES

If you have additional questions about your device or would like to provide feedback, a testimonial or present your applications results, please reach out — we'd love to hear from you!

LaserStar Technologies: Important Contacts		
Sales & Training	**Service & Support**	**Corporate Office**
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TECHNOLOGIES
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Declaration of Conformity

Manufacturer's Name:	LaserStar Technologies Corporation®
Manufacturer's Address:	2461 Orlando Central Parkway Orlando, Florida 32809
Phone / Fax:	PH: (407) 248-1142 FX: (866) 708-5274
Designation:	FiberCube® 3400 Series Marking & Engraving System
Model Number(s):	5X8-3400
Year of Manufacture:	2024
EC Directive(s):	2014 / 35 / EU (Low Voltage Directive) 2014 / 30 / EU (EMC Directive)

Standard(s) to which Conformity is Declared:

IEC 60825-1:2014 Ed. 3.0

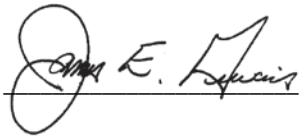
IEC 61010-1:2010 Ed. 3.0

IEC 61000-6:2 Ed. 2.0 (2005-03)

IEC 61000-6:4 Ed. 2.0 (with A1:2011)

This declaration is issued under the sole responsibility of LaserStar Technologies Corporation®. The object of this declaration is in conformity with relevant Union harmonization legislation.

I, the undersigned, hereby declare that the equipment specified above conforms to the above identified standards and fullfills the provisions of the EU directive(s).



James E. Gervais
President and Chief Operating Officer

January 04, 2024

Declaration of Compliance

United States and Canada

Manufacturer's Name:	LaserStar Technologies Corporation®
Manufacturer's Address:	2461 Orlando Central Parkway, Orlando, Florida 32809
Phone / Fax:	PH: (407) 248-1142 FX: (866) 708-5274
Designation:	FiberCube® 3400 Series Marking & Engraving System
Model Number(s):	5X8-3400
Year of Manufacture:	2024

Standard(s) to which Compliance is Declared:

UL 61010-1:2012 Ed. 3+R:29 April 2016 "Safety Requirements for Electrical Equipment for Laboratory Use; Part 1:
General Requirements"

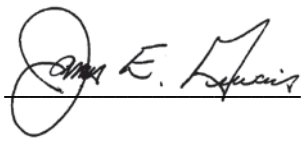
CSA C22.2 No. 61010-1-12:2012 Ed. 3+U2 "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use; Part 1:
General Requirements"

Code of Federal Regulations (CFR), Title 21; Part 1040.10, 1040.11 for Laser Products

FCC 47CFR; Part 15, Subpart B (2017): Unintentional Radiators, Class A Verification

Listing: ETL Mark; Control Number: 4006074

I, the undersigned, hereby declare that the equipment specified above conforms to the above identified standards, as described in the test record.



James E. Gervais
President and Chief Operating Officer

January 04, 2024

LaserStar Technologies Corporation®
Library Publication Data

FiberCube® 3400 Series Marker

Operation & Maintenance Manual

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Background

A laser is a device that emits a beam of coherent light through a process of optical amplification (based on the stimulated emission of electromagnetic radiation). The word *laser* is an acronym and stands for **light amplification by stimulated emission of radiation**.

Lasers exist and are made possible because of fundamental interactions between light and matter, or more specifically, electrons — negatively charged subatomic particles that orbit around the nucleus of an atom. These electrons and their associated photon energies exist at specific energy levels (energy levels uniquely dependent on an atom's structure).

Imagine these energy levels as orbits or rings around the sun — electrons within the outer rings produce more energy than those of inner rings. With the introduction of a new energy source (a flash of light), however, electrons can be stimulated or excited to a new energy state, transitioning from a lower-energy orbit to a higher-energy orbit. When they return to their normal or “ground” state, electrons emit particles of light called photons **(Figure 1)**.

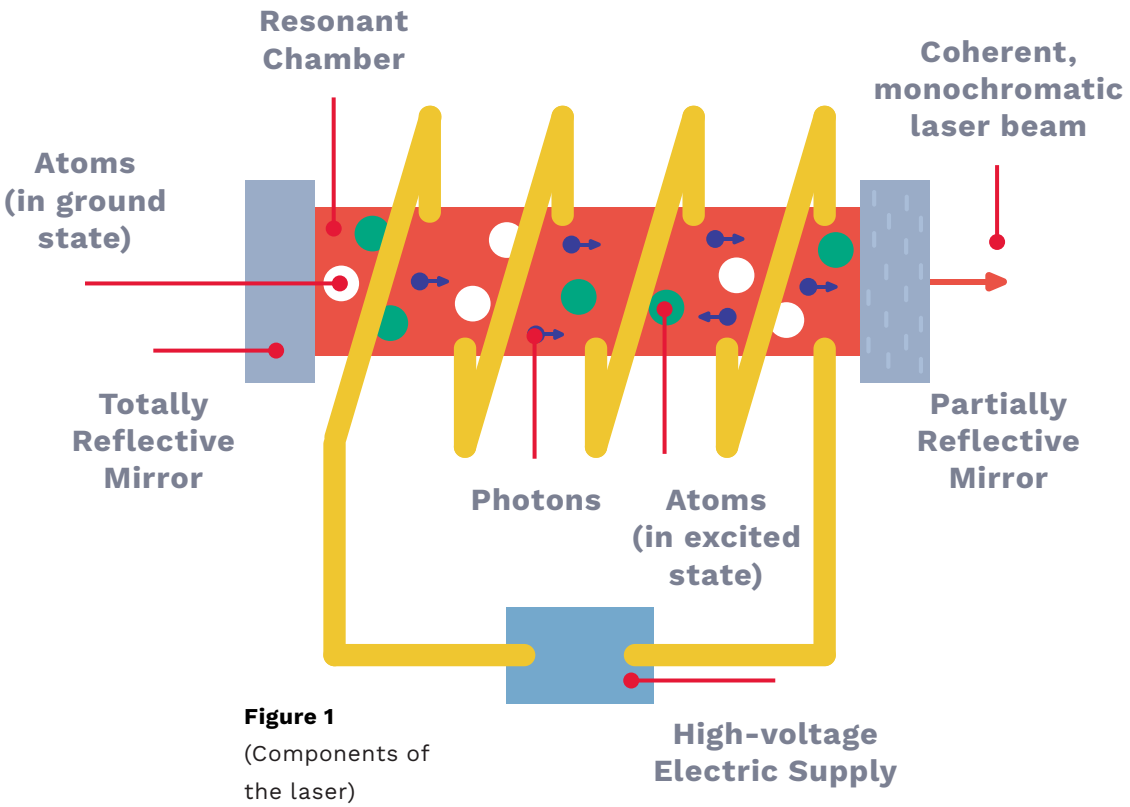


Figure 1
(Components of the laser)

The propagation of light through space can be described as a traveling wave motion — an electromagnetic wave. The wave consists of two fields, each fluctuating — one electric and the other magnetic. The fields remain in-phase and at right angles (orthogonal) to one another — both perpendicular to the direction of travel **(figure 2)**.

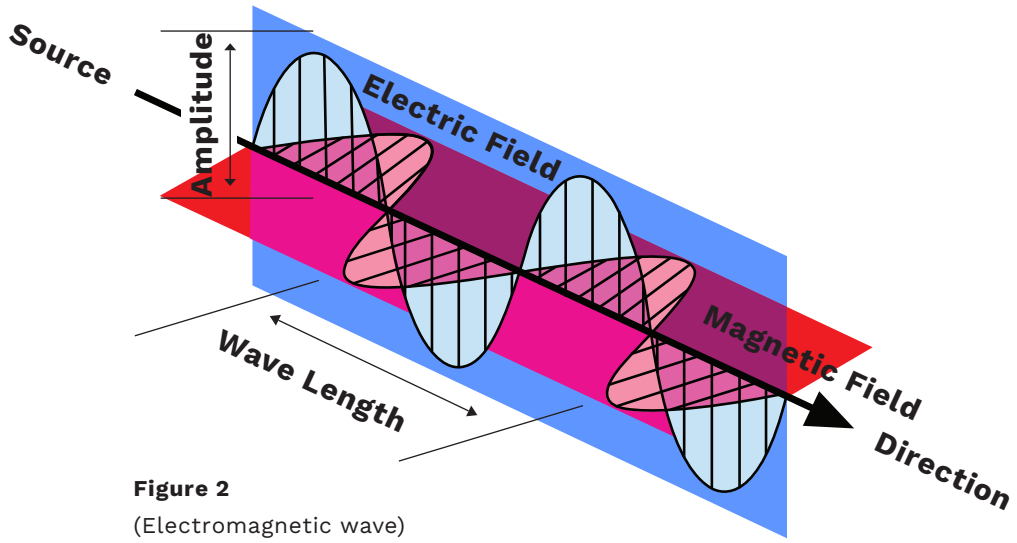


Figure 2
(Electromagnetic wave)

The concept of laser light is better understood by defining and examining its inherent properties. The light outputted from a laser differs from ordinary light and has three (3) defining characteristics that make it unique and help it to stand apart: coherence, monochromaticity, and direction. When all emitted photons bear a constant relationship with one another in both time and phase, the light is said to be coherent. In addition, due to the specificity and purity of the medium, laser light is also monochromatic (one color). Lastly, light emitted from the laser is highly directional, traveling as a relatively narrow beam, in a single direction, and down a specific and predetermined path **(figures 3 & 4).**

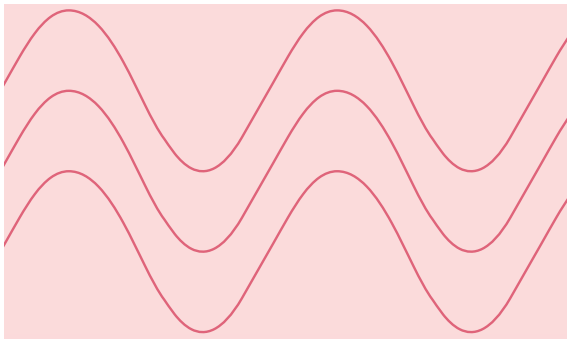


Figure 3
(Coherent, monochromatic directional light)

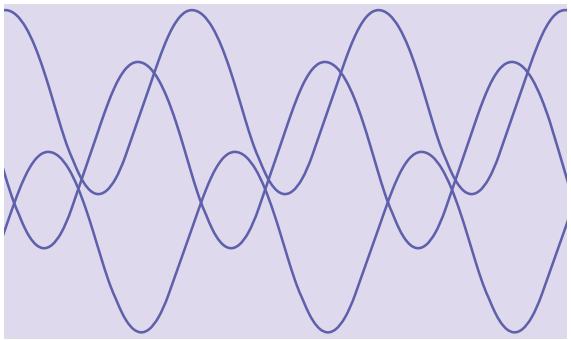


Figure 4
(Incoherent, monochromatic, directional light)

I. Introduction

Fiber Medium Laser: About, Standards, and Technical Data

The FiberCube® 3400 Series Marker is a compact, turnkey, single-user operated laser device designed for marking, engraving, and cutting. The workstation can be operated with or without an enclosure, providing unique versatility, while still offering all of the benefits of contact-free, abrasion resistant, permanent laser marking, transferrable to nearly any surface or material.

The FiberCube® marker is a **class 4** laser when installed and while the **setup key switch** remains in the "off" position, and the key (for the key switch) is removed and stored in a secure location. The FiberCube® marker has a class **3R laser** (when the **focus diodes** are in the "on" position) and the device is a **class 2** laser when the **red laser pointing** diode is "on."

Caution: A class 4 laser requires that all persons within the Nominal Ocular Hazard Area where appropriate laser protective eyewear.

A wide range of standard and customizable platforms are available for the FiberCube® marker, ranging from simple enclosures to more advanced integrated x–y–z motion (with step-and-repeat laser marking or coordinated rotary motion) to seamlessly mark around a circumference motion which is easily configured and controlled with the marking software. Selecting either a standard or customized platform offers the speed, reliability, and flexibility required to meet stringent quality control and process certification standards.

With marking, engraving, and cutting applications, in order to achieve optimal finalized results, the workpiece must be properly positioned within the focusing area of the laser beam positioning and work piece height are determining factors that directly affect the results and outcome.

Laser pulse energy is another factor that can have a direct influence on the quality of marking, engraving, and cutting this setting can be adjusted using the software.

With certain materials, the quality of the mark, engraving, or cutting can be improved by using good ventilation, such as vacuums and exhausts. The focusing rules for supporting endothermic reactions when cutting (not marking or engraving) require focusing the laser beam at (or just below) the bottom of the part surface.

Fiber Medium Laser: Advantages of Ownership

+ **Flexible Fiber**

  The inherent properties of light ensure that it can be easily delivered to a movable focusing element, which is important for laser marking + engraving for assorted metals.

+ **Sustained Output Power**

  Fiber lasers can have active regions several kilometers long, and so can provide extraordinarily high optical gain. They can support kilowatt levels of continuous output power because of the fiber's high surface area to volume ratio, which allows efficient cooling.

+ **Superior Optical Quality**

  The fiber's wave guiding properties reduce or eliminate thermal distortion of the optical path, typically producing a diffraction-limited, high-quality optical beam.

+ **Conveniently Compact**

  Fiber lasers are compact compared to rod or gas lasers of comparable power, because the fiber can be bent and coiled to save space.

+ **Unwavering Reliability**

  Fiber lasers exhibit high vibrational stability, extended lifetime, and maintenance-free, turnkey operation.

  - High peak power and small pulses enable effective marking and engraving.
  - Additional power and improved beam quality provide cleaner cut edges and faster cutting speeds.
  - Lower cost of ownership.

FiberCube® 3400 Series Workstation: External Components and Body Configuration

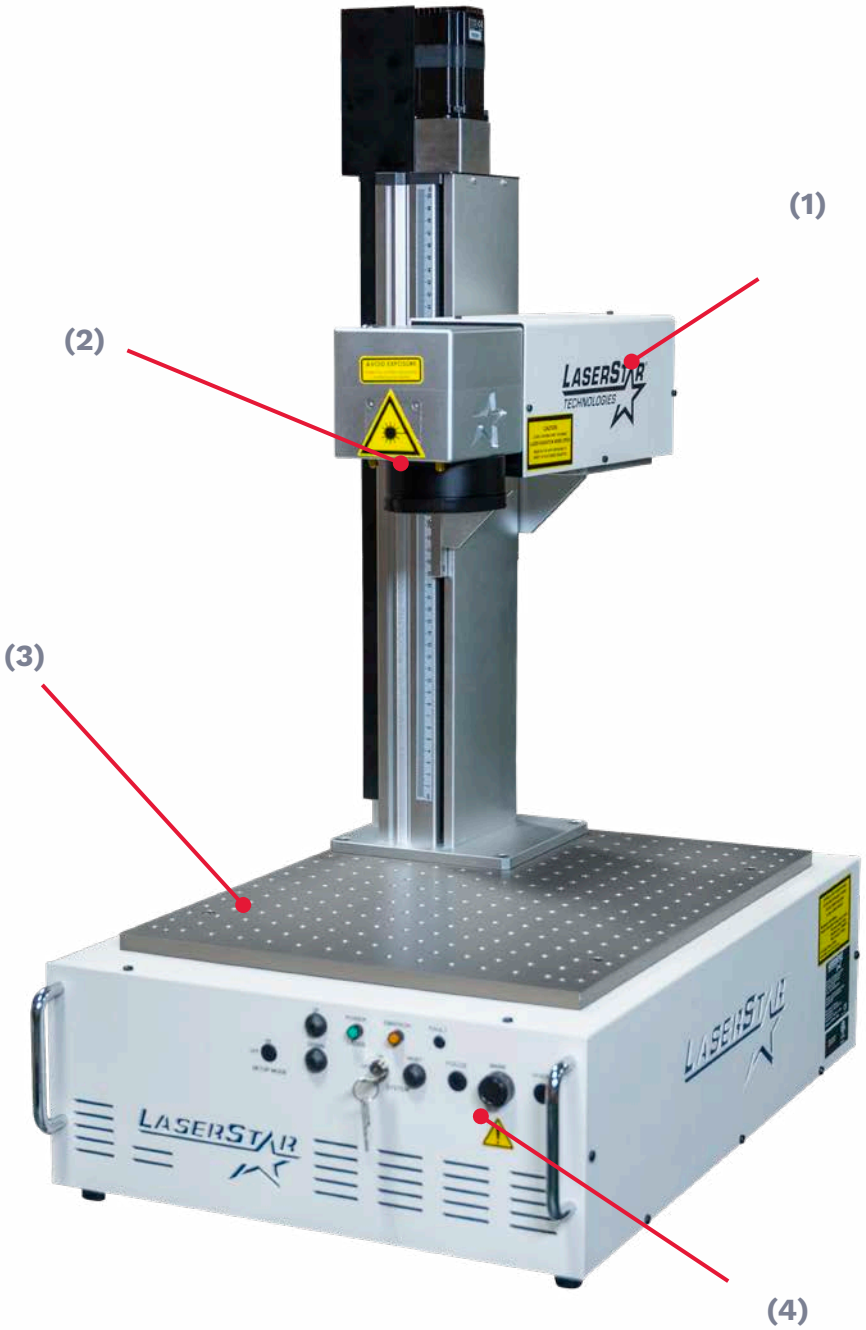


Figure 1
(FiberCube®
3400 Series Marker)

External Components and Body Configuration (continued)

(for a visual reference of the individual components noted below, see the diagram on the previous page page 21)

1. Optical Rail Assembly
2. Scanner Head (with focus diodes)
3. Workpiece Rest (holds or secures the workpiece while marking not shown)
4. Controls Panel
5. Laptop Computer (not shown)

Technical Specifications

The modular construction of the FiberCube® 3400 Series workstation facilitates efficient, time-saving repairs by allowing for replacement of individual failed modules (non-functional units), as opposed to more intricate repairs that can require extensive downtime and dismantling of the entire machine.

The marker, a turnkey-operated device, consists of the following components, which are configuration dependent:

- High-energy Fiber Medium Laser (**class 4**; adjustable from either continuous-wave or single-pulse modes; installed within a **class 1** enclosure)
- Single or Multi-axis Positioning Device (manual or motorized)
- Work Exhaust Connection (Vacuum Optional)
- Laptop Computer

FiberCube® 3400 Series Marker: Device Components and Build Specs			
A typical system includes a variety of standard and optional components			
Laser Medium	**Fiber (50W)**	**Fiber (60W)**	**Fiber (80W)**
Laser Wavelength	1064nm		
Laser Class	Class 4; openframe		
Repetition Frequency	1-2000 kHz	1–4000 kHz	
Pulse Energy (maximum)	.8 mJ	1.5 mJ	
Device Warm-up Period	< 15 minutes (application dependent; user should determine appropriate timeframe)		
Pulse Duration	10 – 500ns		
Beam Diameter	7.5mm	7 mm	
L × W × H	65 × 44 × 31 cm (26 × 17.5 × 31 in)		
Electrical Connections (single-phase)	10A, 120–240 VAC, 50 / 60Hz		

Technical Specifications (continued)

FiberCube® 3400 Series Marker: Device Components and Build Specs			
A typical system includes a variety of standard and optional components			
Laser Medium	**Fiber (50W)**	**Fiber (60W)**	**Fiber (80W)**
Red Guide Laser Pointer	≤ 1mW (660nm wavelength)		
Focus Diodes	≤ 5mW (650nm wavelength)		
Ambient Temperature (operating)	5°C–35°C (41°F–95°F)		
Ambient Temperature (storage)	-5°C–50°C (23°F–122°F)		
Humidity (operation & storage)	10%–95% (non-condensing)		
Elevation (above sea level)	0–2,000m (0–6,562ft)		
Noise Level	≤ 80 dBa		
Degree of Protection	IPX0		
Required Surge Suppression	> 1kV (on AC line)		

External Control Elements

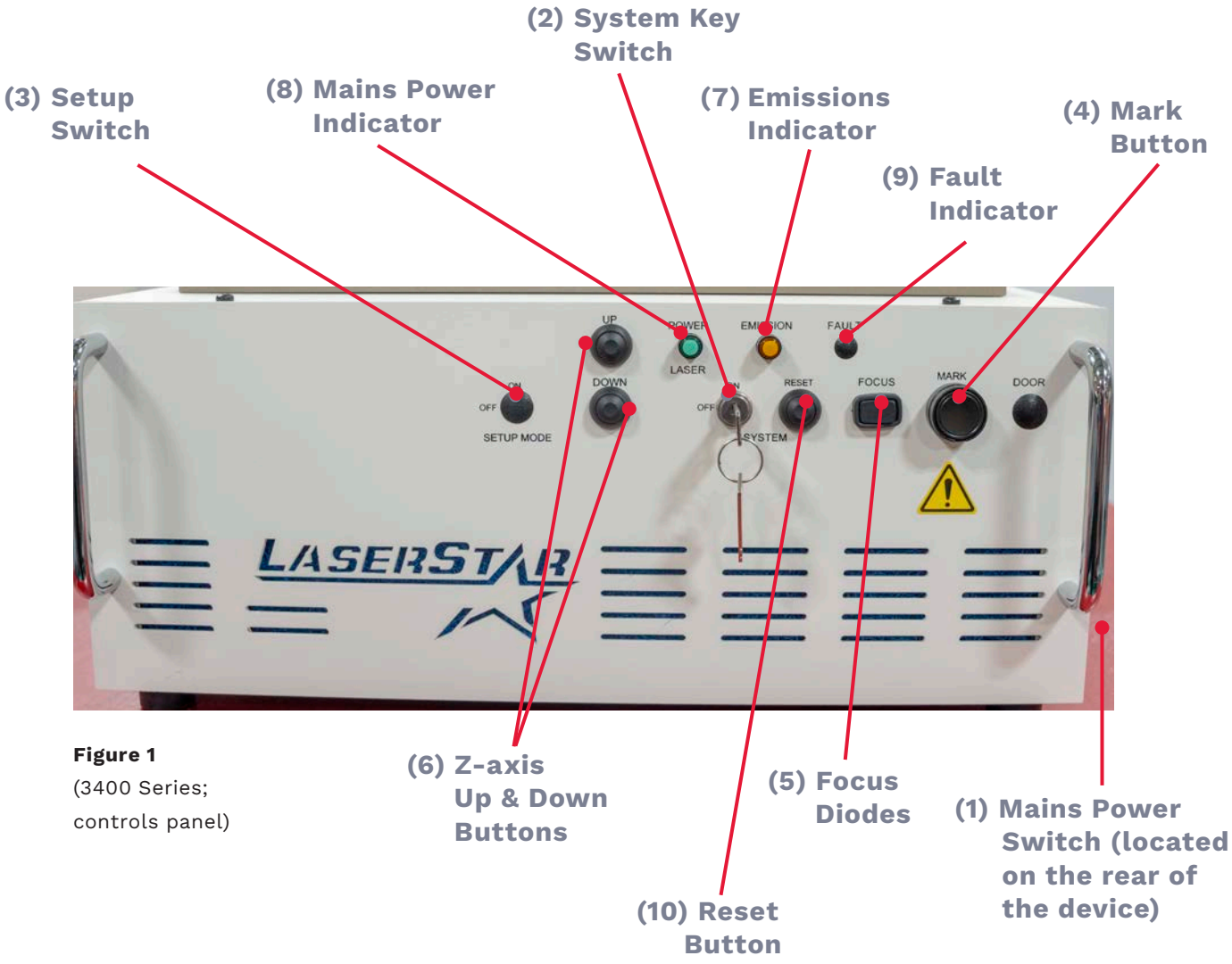


Figure 1
(3400 Series;
controls panel)

1. **<u>Mains Power Switch:</u>**

   The **mains power switch (1)**, which is located on the rear of the device) turns “on” or “off” the line voltage for the laser. In case of an emergency, the marker can be turned “off” (“O”) without turning “off” the device's **system key switch**. **<u>Attention</u>**: Disconnection from the AC power requires that the AC plug, located on the rear of the device, be fully disconnected.

2. **<u>System Key Switch:</u>**

   The **system key switch (2)** enables or disables the laser source and axes. Turn the **system key switch (2)** to the “on” position; the power indicator will turn “on” (green) when the laser source has been enabled. During normal operation, the **system key switch (2)** should remain “on.”

External Control Elements Continued on Next Page

External Control Elements

This device is a class 4 laser when the setup key switch is "on" and a class 3R laser when the front door is open and the setup key switch is "off." While operating the marker, be sure to avoid exposure of the skin or eyes to direct or scattered radiation. In addition, appropriate laser safety eyewear should always be worn.

3. **Setup Key Switch:**

   The **setup key switch (3)** is used to disable the **front door** safety interlocks when placing a workpiece inside the chamber enclosure. When the **front door** safety interlocks are disabled, the **power indicator** on the control panel will blink.

4. **Mark Button:**

   The **mark button (4)** is used to start the marking process or fire the laser.

5. **Focus Diodes:**

   The **focus diodes (5)** are used to position the surface of the workpiece for maximum energy. The **focus diodes (5)** can be turned "on" by pressing the **focus button** on the controls panel (the **setup key switch** can either be "on" or "off"). During a marking cycle, the **focus diodes (5)** will turn "off" automatically.

6. **Z-axis Up & Down Buttons:**

   The **z-axis up** and **down buttons (6)** are used to adjust the height and positioning of the z-axis. When the **z-axis up** and **down buttons (6)** are held continuously, the speed for adjusting the z-axis increases. When the **z-axis up** and **down buttons (6)** are released, z-axis motion will cease. The maximum speed is <25mm (less than 1") per second; the lowest speed is approximately 1/3 the maximum. Labels noting the pinch points are located on the front of the device's scanner head and at the bottom of the z-axis rail (motorized version only). **Attention: The mains power switch can be used at any point to stop the z-axis motion.**

The focus diodes emit class 3R laser radiation when "on" and the front door is open. The operator should avoid direct eye exposure to the beam and its specular reflection. It is recommended also that the operator wear appropriate laser protective eyewear.

External Control Elements Continued on Next Page

External Control Elements

7. **Emissions Indicator:**

   The **emissions indicator (7)** is turned “on” (amber) after the **system key switch** is turned “on” and the **Reset button (10)** is pressed. While the **emissions indicator (7)** remains “on,” the laser is enabled and ready to fire.

8. **Mains Power Indicator:**

   The **mains power indicator (8)** turns “on” (green) when the **mains power switch** is “on.” **Attention:** This indicator blinks “on” and “off” when the **setup key switch** is “on.”

9. **Fault Indicator:**

   The **fault indicator (9)** turns “on” (red) when a system fault is detected. When this occurs, the device should be powered down and restarted. If the fault cannot be cleared, be sure to contact LaserStar Technologies Corporation® Service Department for support. **Attention:** If the indicator blinks “on” and “off;” this is an indication that the remote interlock is not plugged in.

10. **Reset Button:**

    The **reset button (10)** is used to reset the laser system, which enables the laser source to fire, and power-up the drive axes. After turning the laser on the reset button should be pressed. This will turn "on" the **emissions indicator** (amber) when the laser source is enabled.

Remote Mark Input

The **remote mark input** is available through the optional interface connector on markers that are equipped with an automated **front door**. While the **setup key switch** is in the “on” position, the **remote mark** will not allow the laser to fire (marking cycle to begin).

Remote Interlock Connector

There is a **remote interlock connector** (located on the rear of the marker) which is available to readily connect this device to a **remote interlock circuit** (such as an entry door) into a specific laser room. The **remote interlock** can be bypassed by using the **remote interlock shorting connector**. For instructions on connecting or bypassing this feature, be sure to reference the section on installation; **Installation > Remote Interlock Connector; chapter III** within this manual.

Notes

II. Safety

Overview and Fundamentals

Radiation produced by laser light is capable of melting, burning, or vaporizing almost any material. The composition of the workpiece also dictates the vapor or gases that are generated; therefore, appropriate safety precautions are essential and critically important.

The FiberCube® 3400 Series Marker is designed exclusively for marking, engraving, and cutting applications, including both metals and metal alloys, as well as other non-metallic materials. This device is a **class 4** openframe series and incorporates a **class 3R laser** (used for pointing, as well as focusing on workpieces; some models use a **class 2 laser**).

To use the system for any purpose beyond what has been outlined in this operation manual is to use it improperly. **LaserStar Technologies Corporation® will not accept liability for damages resulting from improper use or negligence.**

Proper use of this system includes:

- Following all instructions and procedures and heeding all precautions, warnings, and important safety guidelines provided throughout this manual.
- Ensuring inspections and routine maintenance is scheduled and completed on-time to maintain the marker and preserve the equipment in its optimal condition.

In addition to general information and specified mandatory regulations that help to ensure safe operation of this device, this section also outlines information on potential risks and associated dangers when using the marker, which cannot be eliminated (either because of design or structural means). These advisories are marked with varying safety symbols (examples follow) and are a mandatory requirement set forth by OSHA and CDRH.

Indicates a potential threat or danger to health or life. Failure to heed this advisory can result in serious damage, critical injury, and death.

Indicates a potentially dangerous situation. Failure to heed this advisory can result in minor injury or property damage.

Indicates helpful tips or other important guidelines for correct use of the laser system. Failure to heed this advisory can result in malfunctions or problems with the device and additionally, can result in damage to areas or property in close proximity to the laser system.

Indicates safe operating guidelines, tips and recommendations, and particularly useful details that will help you to better utilize all of the functions of your laser system.

General Information

This laser system incorporates a **class 4 laser** (solid-state) with a high-powered optical output. **This device emits both visible and invisible radiation;** the invisible radiation generated during use produces **a wavelength of 1050–1090nm (near infrared range) and is not detectable by the human eye**. In addition, the visible secondary radiation that is emitted from this device can cause dazzle effects when viewed for any length of time.

When working with direct access to the laser beam (for general use, maintenance or repair) appropriate laser protective eyewear must always be worn. Intense radiation is capable of destroying the delicate tissues of the eye. When infrared light is transmitted from the cornea to the lens of the eye, it's multiplied (concentrated by up to 100,000 times). The light is then narrowly focused on the retina, causing burning and lesions. Because the tissue of the retina cannot be repaired, damage is permanent, resulting in a reduction or loss of eyesight (these effects may not be apparent for many years).

Always follow OSHA regulations, ANSI Z136.1-2014, Safe Use of Lasers or the equivalent national or international regulations (e.g. IEC/EN Standard 60825-1:2014) to ensure accident prevention and reduce the risk of exposure to radiation when working with laser equipment.

If modifications are made to this device that affect performance, software or intended function (as described in ANSI Z136.1-2014, Safe Use of Lasers and outlined in official documentation for laser standards classification), the individual or organization responsible assumes the status of manufacturer and must obtain a new classification and appropriate labeling for the device.

When operating laser equipment, appropriate protective eyewear—which protects against direct, reflected, and scattered radiation, is required; however, even while wearing protective eyewear, remain cautious, never looking directly into the laser beam, as intense laser light is capable of destroying the delicate tissues of the eye. (Note: With **class 4** operation, protective eyewear will normally shield against the hazards of collateral radiation [which includes ultraviolet, visible, and infrared radiation], however, if a concern exists that the accessible collateral radiation might be hazardous, the end-user is responsible for review and consideration of the MPE values required for the various materials being processed.)

While operating the equipment all persons in the Nominal Ocular Hazard Area (NOHA) are required to wear appropriate laser protective eyewear (OD >6.5). This protective eyewear must meet applicable safety requirements (based on the laser's output power). The maximum radiant exposure (10cm from the laser's focus) is 8mJ/cm^2. The maximum permissible exposure (MPE) @10s is 185nJ/cm^2. The Nominal Ocular Hazard Distance (NOHA) is 24m from the laser's focus (163mm focus lens @10s exposure).

Although the skin can withstand considerably higher radiation intensity than the tissue of the eye, burning destroys tissue. The severity and extent of damage depends on the period of exposure and the intensity of the irradiation. Appropriate protective clothing should be worn to protect the skin whenever necessary.

If a laser injury (or a suspected laser injury) occurs while using the laser marker, be sure to complete the following steps right away:

- Turn “off” the device’s **mains power switch**
- Notify your Safety Officer or safety specialist
- Consult a doctor or go to the hospital

Fire Hazard

The intense power output from this **Class 4** laser can pose a fire hazard; a wide range of materials are susceptible to catching fire and **precautions must be taken to prevent fires while the laser beam is active**. Paper items (including diagrams, leaflets or even posters on the wall), curtains lacking fire retardant, wooden panels or other similar materials can be easily set on fire by direct or reflected laser radiation.

Containers holding flammable or explosive chemical agents (e.g. used for cleaning and maintenance tasks) should be kept away from the areas that are exposed to the laser beam. When using solvents or cleaning agents, be sure to heed relevant warnings. Significant explosions, fires, and other dangers can result if such containers are inadvertently exposed to or destroyed by the intense invisible laser beam.

Fundamental Safety Information

The guidelines below ensure safe operation when using the laser system:

- Read this manual; it contains guidelines and important information for ensuring the safety of the operator and outlines procedures for proper use of the system.
- Anyone who works with or operates the laser system must be informed of pertinent safety information and applicable safety regulations; this is a prerequisite for safe, trouble-free operation of this system.
- Anyone who works with or operates the system is expected to follow (and be knowledgeable in) the outlined operational procedures; especially the guidelines for safety.
- Mandatory regulations and requirements for ensuring safety and accident prevention (that are relevant for the current place of installation) must be complied with. In addition, all regulations set forth by OHSA, ANSI Z136.1-2014, Safe Use of Lasers or equivalent national or international regulations (e.g. IEC/EN Standard 60825-1:2014) are especially critical and must be strictly adhered to. Lastly, be sure to stay informed on all required state, municipalities, and local regulations and requirements.

Organizational Measures

Specific guidelines and policies must be upheld to ensure the safety and wellbeing of personnel who work with and operate the system. Organizational responsibilities and expectations are as follows:

- The employer must provide necessary personal safety equipment (in this case, laser protective eyewear is required only for maintenance purposes) whenever there is direct access to the laser beam.
- Regulations and requirements outlined in accordance with OSHA regulations, ANSI Z136.1-2014, Safe Use of Lasers or equivalent national or international regulations (e.g. IEC/EN Standard 60825-1:2014) must also be fulfilled.
- The laser system must be serviced at regular intervals and maintained as instructed within this manual.

Employer Requirements

Only authorized personnel who have received adequate training are permitted to work with and operate the system. Employers are responsible for ensuring that all operating personnel:

- Have familiarity with important regulations regarding workplace safety and accident prevention; employees must also have received instruction on the use of the laser system;
- Have read and understood the chapter in this manual concerning safety and be familiar with relevant warnings; employees should sign and acknowledge that these requirements have been met
- Receive training and instruction on the dangerous effects of laser radiation in accordance with OSHA regulations, ANSI Z136.1-2014, Safe Use of Lasers or equivalent national or international regulations (e.g. IEC/EN Standard 60825-1:2014) to ensure accident prevention when working with laser equipment;
- Receive ongoing training at regular intervals on relevant topics, such as operation, safety, and best practices for using the laser system.

Personnel Requirements

Employees who are trained and authorized to work with the laser system are expected to:

- Comply with important regulations concerning workplace safety and accident prevention for laser radiation, OHSA regulations, ANSI Z136.1-2014, Safe Use of Lasers or the equivalent national or international regulations (e.g. IEC/EN Standard 60825-1:2014).
- Have read and understood the chapter within this manual regarding safety and be familiar with the warnings detailed throughout this manual; employees should sign and acknowledge that these requirements have been met.

Potential Equipment Dangers

This laser system is a state-of-the-art device, **meticulously designed and engineered to meet and exceed standards for safety and approved operation and safety regulations.** Nevertheless, use of this equipment can still endanger life and limb (both the operator and third parties) or damage products and other material assets.

The laser workstation must only be used for its intended purpose as outlined in this manual (see details on proper usage). In addition, the laser system must also remain functionally sound (and in optimal condition) from the standpoint of safety. If a malfunction occurs that creates an unsafe condition or negative consequence, it must be corrected right away.

Protective Devices

- Before each use, the safety mechanisms for the laser system must all be checked to ensure that they are functional and appropriately affixed to the device.
- Safety mechanisms may only be removed when the laser system has been switched “off” and appropriate measures have been taken to prevent the laser system from being restarted. **(Note: The interlock switches can be bypassed by our service technicians and authorized specialists, if needed, but only while making adjustments and carrying out maintenance and other service-related tasks.)**

Informal Safety Measures

The operating instructions for the workstation must remain at the installation site. In addition to the instructions, applicable regulations for ensuring safety when working with or operating laser equipment (including applicable local regulations for accident prevention and environmental protection) must be complied with. Regulations set forth by OSHA, ANSI Z136.1–2014, Safe Use of Lasers or the equivalent national or international regulations (e.g. IEC/EN Standard 60825–1:2014) are also critically important.

All safety information and warning labels that are attached to the laser system must remain intact, legible, and accessible (see the section entitled “Labeling”).

Personnel Training

Only qualified personnel who receive adequate training and instruction on accident prevention and associated dangers when working with laser radiation (as required by OSHA, ANSI Z136.1–2014, Safe Use of Lasers or the equivalent national or international regulations [e.g. IEC/EN Standard 60825–1:2014]) are permitted to operate the laser system.

Trainees are only permitted to use the laser system while under the supervision of an experienced user.

Safety Measures for Normal Use

- Before using the laser system, verify that all of the safety mechanisms (remote interlock, chamber enclosure, front door safety interlock, laser protective eyewear, etc.) are in proper order and functional.
- Be sure to check the laser system at least once a week for external damage and to ensure soundness of all safety mechanisms and other components are properly functioning (e.g. splash-protective observation window, laser protective window, interlock circuits, chamber enclosure, chamber access door). **The laser system must only be used after routine safety checks are performed and the laser system is deemed to be in safe and operable condition.**

Electric Shock Danger

- **Only authorized personnel are permitted to carry out maintenance on the power supply.**
- **The housing for the internal components must remain closed at all times. Only authorized personnel who are specially trained (and possess the appropriate tools) are permitted to open the housing and perform maintenance on the internal components.**

- **If work is to be carried out on voltage-carrying parts, a second person must be present who can switch the device "off" using the power switch, if necessary (see section entitled "Maintenance").**

Particularly Dangerous Points

- **Particularly dangerous points must be labeled as such; various warning labels and their location on the laser system are described in the section entitled, "Labeling."**
- **The marker integrates a class 4 laser; therefore, appropriate safety eyewear is required and must be worn at all times.**

- **Above all, never operate the laser while your hands, fingers, or other body parts are positioned directly inside or beneath the cross-hair or path of the laser beam.**

Emission of Noxious Gases and Vapors

- **Avoid inhalation of vapors produced during the applications process with correct use of the argon (inert) gas.**
- **Radiation produced by laser light is capable of melting, burning, or vaporizing almost any material. The composition of the workpiece also dictates the vapor or gases that are generated; therefore, appropriate safety precautions are essential and critically important. The operator should filter the air exhausted as required by OSHA regulations (for further details, reference the section on installation).**

- **Never use this device on non-metallic materials, especially plastics, without the use of an approved external fume and heavy particle exhaust filtration system.**

Equipment Modifications

+ **Never attempt to make additions or modifications to this equipment (structural or otherwise); any alteration requires mandatory written approval from LaserStar Technologies Corporation®.**

+ **It's important that this laser system be maintained as intended and kept in safe and operable condition. Be sure to immediately replace all parts that are not in optimal working condition. Never purchase or install components from other manufacturers; use only LaserStar Technologies Corporation® replacement and consumable parts.**

Important Advisory

Parts ordered from LaserStar Technologies Corporation® meet stipulated requirements for safety and performance; **there is no guarantee for parts purchased from companies other than LaserStar Technologies Corporation® will meet stipulated requirements.**

Safety Officer

When class 4 laser equipment is installed, the employer must appoint a competent Laser Safety Officer; this action must be recorded in writing. In the case of **class 1** laser devices, the Laser Safety Officer need only be present while the service technician is carrying out service or maintenance on the equipment (and only when there's direct access to the laser beam). This assumes that the service technician bypasses the interlock switches or removes the protective covers from the laser system.

With ongoing training and experience in the field of laser radiation, the Laser Safety Officer should be fully competent in operating the workstation. In addition, this person should **be knowledgeable and informed on all important safety protocols for the laser system, as the Laser Safety Officer bears full responsibility for the safe operation of the laser equipment and correct implementation of mandatory safety measures.**

When completing training for proper use of the laser system, the Laser Safety Officer may elect to receive instruction from an approved body (e.g. an institution providing insurance against occupational accidents) or alternatively, can purchase and enroll in training provided by LaserStar Technologies Corporation®.

Authorized personnel with responsibilities for the operation, maintenance, or repair of this device must read and understand both the safety protocols and operating instructions for the equipment. Be sure to use this device only for its intended purpose; never aim the laser's beam in the direction of or directly at humans or animals.

What To Do If You Receive A Burn

If a laser pulse has burned your fingers or hand, you must be sure to have the wound treated. Depending on the severity of the burn, medical treatment may be necessary. Although a small burn is not particularly critical, it must still be monitored to be sure there is no resulting infection.

Scattered Radiation!

Scattered radiation can also cause minor burns on the skin of your hand. Depending on the material, its reflective properties, and the selected pulse energy, scattered radiation can also be dangerous. Only under very unfavorable circumstances will the scattered radiation reach intensities that can cause slight burns; this is because individual laser pulses are very short.

Normal exposure of the skin to low levels of scattered radiation (at a wavelength of 1070nm) is regarded as physiologically safe; in this instance, infrared light is comparable with radiation from the sun.

Notes

Important Safety & Informational Labels

[810-00-019]

[01-40026]

[48-40028]

[48-40010]

Device Certificate or Identification (Model Dependent)

Figure 1
(3400 Series)

[810-8001-10] Operator Must Read the Manual Prior to Use.

Important Safety & Informational Labels (continued)

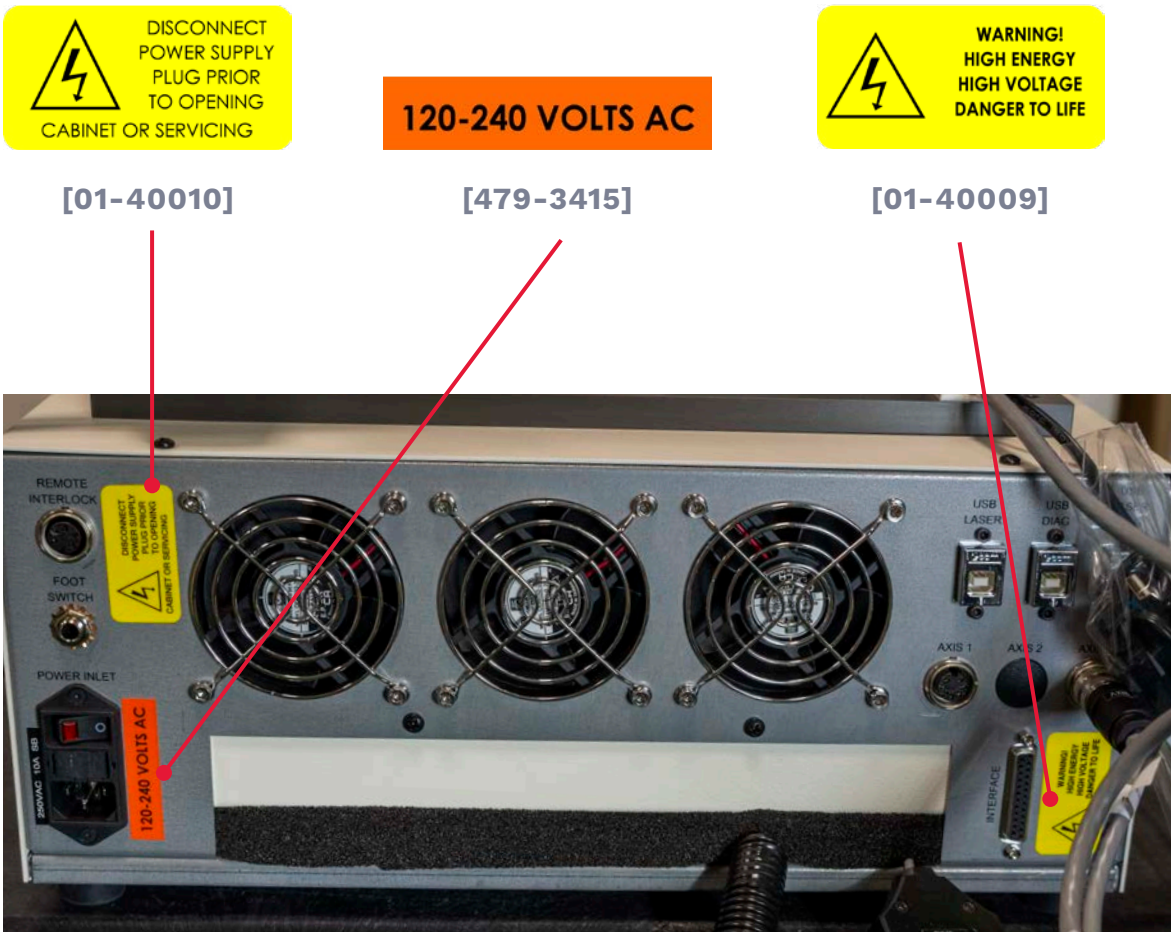


Figure 2
(3400 Series
rear view)

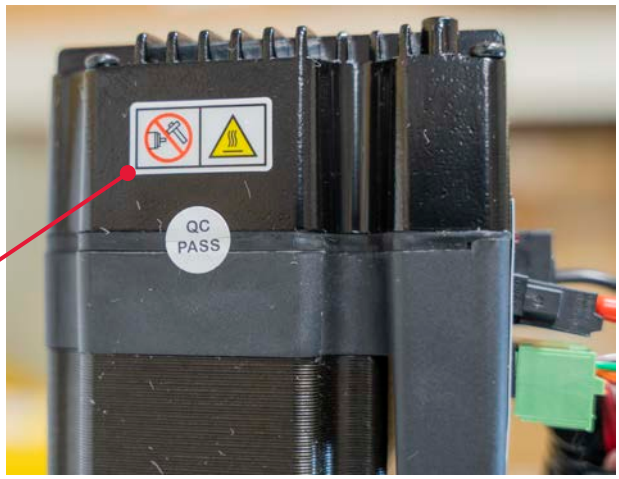


Figure 3
(3400 Series
top of rail)

Important Safety &
Informational Labels (continued)

Figure 4
(3400 Series;
Left view)

III. Installation

Overview & Requirements

This section describes the requirements that must be fulfilled to ensure faultless operation of the laser system. Details for installation, setup, and transport are detailed in this chapter.

Safety Guidelines

When choosing an installation site, be sure to take into account for maintenance, the ability to limit laser area is required (see regulations set forth by OSHA regarding accident prevention for laser radiation, ANSI Z136. 1–2014, Safe Use of Lasers or equivalent national or international regulations [e.g. IEC/EN Standard 60825–1:2014]).

To ensure faultless operation of this system, specific measures must be implemented to promote safety and encourage sound operational practices. In an effort to safeguard against accidents, an installation site must meet and abide by the following rules and requirements:

- The system should be installed and remain in a location that is as dust-free as possible.
- Never expose this system to direct sunlight.
- To ensure proper ventilation, a **required clearance between this device and any wall surface must be a minimum of at least 12" (300mm) from the back and sides.**
- Never position the marker in a way that makes it difficult to access or operate the laser system's disconnecting device.
- **This device is required to be connected to an approved external filtration and fume exhaust system** (either purchased separately or sold through LaserStar Technologies Corporation®). For additional details about this requirement, be sure to reach out to your sales representative.

Ambient Conditions

Operating Temperature: (reference **Introduction > Technical Specifications; section I**)

Storage Temperature: (reference **Introduction > Technical Specifications; section I**)

Environmental Conditions

Elevation: (reference **Introduction > Technical Specifications; section I**)

Relative Humidity: (reference **Introduction > Technical Specifications; section I**)

Unpacking

Before shipping, this system underwent a thorough inspection process and rigorous software testing. This system has been delivered to the shipping carrier in faultless condition. Before opening the shipping container, be sure to thoroughly inspect the outside of the crate for indications of damage that may have occurred in transit.

- If possible, use the supplied skid to transport the device to its final destination (the intended installation site).
- When unpacking the equipment and removing components from the shipping container, packaging, and skid base, be sure to use exceptional care.
- For helpful tips and step-by-step instructions on setup, be sure to reference the quick setup guide, which you can access by scanning the QR Code provided with the laser system.

Standard Shipping Container Contents

- FiberCube® 3400 Series Fiber Medium Laser (stand-alone; with or without enclosure)
- Laptop Computer (optional)
- Basic Device Components and Hardware
- Motion Devices (optional)
- Operation Manual (digitized version; included on flash drive)

(Note: Orders can include additional accessories [add-ons that were purchased separately] Following delivery, be sure to reference the included packing slip and compare with parts received.)

Lifting and Carrying the Equipment

- A minimum of two (2) people capable of lifting and carrying the equipment is required.
- The door handle and other parts and components of the unit must not be used for lifting.
- Follow OSHA guidelines for lifting methods; based on the weight and size of the unit and the user's facility requirements.

Notes

Initial Power Connections

The activities described in this section should only be performed by trained service technicians who are affiliated with LaserStar Technologies Corporation® or other authorized personnel who are trained and qualified. Warranty claims for damage to persons or property that are the result of an improperly connected device will not be honored.

Check the VAC label and device's certificate or ID label (located on the rear of the laser system) and compare with the power requirements at the installation site.

AC Voltage Input (AC disconnect)

The AC voltage input is used to supply AC power to the workstation; removing this plug will disconnect the AC power from the equipment. Each of the laser system's switches (**mains power switch**, **system key switch**, and **setup key switch**) should be in the “off” position before applying AC voltage.

The laser system’s model determines the AC requirements; check that the AC supply agrees with the specifications on the identification label (located on the rear of the system). This label includes important information for your laser system, including the device’s model number, serial number, and AC requirements. **Attention: Make sure the laser system is grounded; the ground wire must be connected for safe and reliable operation. When power requirements exceed 1kV on the AC line, surge suppression is required.**

When replacing the detachable mains supply cord, it’s important that the new cord be appropriately rated and suitable for the required or anticipated electrical load. Be sure to check the rating for the replacement cord before purchase; **never use or purchase cords that lack an appropriate rating**.

Notes

Remote Interlock Connector

The laser marker is equipped with a remote interlock connector for connecting to a secondary interlock system or remote interlock circuit (such as an entry door into a specific laser room). **The marker will not generate a laser pulse unless the remote interlock connector is closed**. For the location of the remote interlock connector, reference the section for **External Fuse Replacement, Rear System Overview & External Connections.**

When connecting the remote interlock to a secondary interlock circuit, the following requirements must be met:

- Before wiring, the shorting jumper (under the plastic cover of the connector) must be removed.
- The wiring should be routed away from all power cords and should not exceed thirty (30) feet or nine (9) meters in length.
- The interlock must be a voltage-free, form-a contact (normally open) that is held closed to enable operation of the laser.
- The shorting connection in the connector must be removed and wired to the secondary interlock circuit.
- A licensed professional in compliance with and knowledgeable of applicable electrical codes must perform the wiring procedure.

If you are not connecting the remote interlock to a secondary interlock system; the shorting connector must be installed on the device to enable operation of the laser.

The shorting connector and keys for the **system key switch** and **setup key switch** are included inside the bag within the work chamber.

1. To enable operation of the laser, insert the shorting connector into the remote interlock connector (located on the controls panel; rear of the laser system).
2. Manually tighten the connector locking ring, turning clockwise, until finger tight.

External Exhaust System

All **laser marking + engraving** devices are equipped with an exhaust connection (2” or 50.8mm) at the rear of the enclosure. We recommend the use of an external exhaust system with the appropriate air filtration (dependent on the type of material being used) and a fume extractor or vacuum (when determining the required “CFM” [200 to 400CFM is the typical range; application dependent], the device's power output and enclosure size should be taken into account).

Processing vapors with particulates can be an explosive or fire hazard (depending on the particulate material and concentration). Consult your organization’s internal safety department for details on regulations and concentration levels of fumes with particulates (for your specific material processing) and for requirements set by your local authority for permissibility and safety limits to ensure the lasing equipment is adequate for your application.

Electromagnetic Compatibility

This device meets EMC standards listed in the **Declaration of Conformity** and **Declaration of Compliance** in the beginning of this manual.

The limiting values for the generation of electromagnetic disturbance will be exceeded at both ends of the frequency spectrum whenever this device is operated within locations for residential, office, or trade and commerce districts.

Disassembly and Transport

To prepare the equipment for transport over short distances, simply unplug the power supply and other relevant cables. Then, with at least two people, the laser can be carried to its desired location.

Preparing for Storage

The equipment must be stored in a clean environment that meets specified storage temperature and humidity requirements. These details can be found in **Introduction > Technical Specifications; section I**.

IV. Operation

Overview & Fundamentals

This section describes systems operations. The (>) symbol notes actions that must be carried out by the operator. In most cases, these actions (in any form) will result in responses or reactions from the device; these responses are noted with a (⊗) symbol.

Whenever adjustments are made to this device that alter performance or use of the controls (adjustments which affect safety or interfere with standard operating protocols), this can result in hazardous radiation exposure. If this device is operated in a manner that has not been approved by the manufacturer, the equipment protections could fail, compromising the safety of the operator and others who are nearby. Before operating this device, all users must be sure to read the section within this manual on safety.

Before turning "on" the laser marker, be sure to read the section detailing steps for Power Up–Restart-Power Down. Failure to follow this procedure can result in unreliable operation. (Note: A copy of this quick reference guide can be found in the Appendix; section X within this manual.)

Be sure to verify that the fault indicator (located on the front of the controls panel) is "off" before enabling the system to fire.

When adjusting the laser's focus for highly reflective materials (silver, copper, gold, brass, etc.), the operator must follow the steps for focusing and defocusing (for further details, see the Appendix). Failure to follow the laser focusing and defocusing guidelines increases potential risk for damaging the device. This damage is considered a process and applications induced failure and is not covered under warranty.

This device emits class 4 radiation. Be sure to avoid direct exposure of the skin and eyes to direct or scattered radiation. All persons in the Nominal Ocular Hazard Area (NOHA) must also be sure to wear appropriate laser protective eyewear.

When operating the marker with the front door open, setup key switch "off," and focus diodes and/or red laser pointing diode "on," the laser is operating as a class 3R laser. Notice the caution label on the front door, which reads: "CLASS 3R LASER RADIATION WHEN OPEN AVOID DIRECT EYE EXPOSURE." The user should avoid directly looking at the laser beam or its specular reflection. It is recommended also that all persons in the Nominal Ocular Hazard Area (NOHA) wear appropriate laser protective eyewear for class 3R radiation. (Note: The focus diodes should remain "off" when the device is not in use.)

When enabling power to the device (and before launching the LaserStar StarFX® Premier Design Studio software), check that both ends of the USB cable are plugged in, and that the mains power switch is in the "on" position. An incorrect start-up sequence can corrupt the configuration file (markcfg7), resulting in device malfunction. Reference Troubleshooting Basics > System Marks Parts Incorrectly for instructions on installing a duplicate configuration file, if needed.

If a system fault is displayed on the laptop computer, be sure to turn "off" the system key switch, exit from the LaserStar StarFX® Premier Design Studio software, and turn "off" the mains power switch. Next, restart the marker following the standard start-up procedure. (Note: A list of fault messages and additional system recovery procedures can be found under Troubleshooting Basics; section VI: within this manual.)

The operator should not have any part of their body in the marking area during z-axis motion. The z-axis is moved up or down using buttons on the controls panel. The z-axis has three (3) rates of speed (model dependent). This maximum speed is <25mm per second (<1" per second). The lowest speed is approximately 1/3 the maximum speed. Pinch Point labels are located on the front of the scanner head and at the bottom of the motorized z-axis rail. The mains power switch can be used at any time to stop z-axis motion.

Notes

Visible Warning with Class 4 Operation (setup key switch “on”)

The laser marker utilizes the control panel and laptop computer screen, which operate independently, to communicate warnings and provide updates or alerts pertaining to the laser system’s status.

Manual Operation

Control Panel:

1. The **power indicator** will blink.

Laptop Computer and LaserStar StarFX® Premier Design Studio Software:

2. The **LaserStar StarFX® Premier software (screen 6)** indicates that the laser is running when “marking” is displayed on the laptop computer screen.
3. To stop the marking process at any time, press the **stop button**; this button displays on the icon ribbon for the **LaserStar StarFX® Premier software**.

Automated Operation (optional)

Control Panel:

1. The **power indicator** will blink.

Laptop Computer LaserStar StarFX® Premier Design Studio Software:

2. The **LaserStar StarFX® Premier software (screen 6)** indicates that the laser is running when “marking” is displayed on the laptop computer screen.
3. To stop the marking process at any time, press the **stop button**; this button displays on the icon ribbon for the **LaserStar StarFX® Premier software**.

Initial Operation

After having properly connected the equipment, the laser marker is ready for use. For detailed instructions on enabling power to this device, restarting, or shutting down, reference the instructions for **Power Up-Restart-Power Down** in the **Appendix.**

When making adjustments to the **final focus lens** for a different work distance or field of view, **recalibrate the lens using the LaserStar StarFX® Premier Design Studio software.** The software will also display a prompt requesting that the operator verify their lens selection. When this message appears, simply select the lens that's currently installed on the device.

Switching the Marking System "On":

Failure to follow the steps for the Power Up-Restart-Power Down procedure may corrupt the configuration file, resulting in faulty or unreliable device operation. For help with troubleshooting, be sure to refer to the Troubleshooting Guidelines.

1. Check to be sure that the **mains power switch**, and **system key switch** are in the "off" position.
2. Make sure the laptop computer is "off."
3. Verify that the USB cable (connecting the computer and marker) is plugged in and correctly seated.
4. Verify that the **remote interlock connector** is installed (if available/if using an enclosed system).
5. Plug-in and connect the AC power to both the marker and laptop computer.
6. Turn the **mains power switch** and **system key switch** "on."
7. Press the **reset button**.
8. Turn "on" the laptop computer.

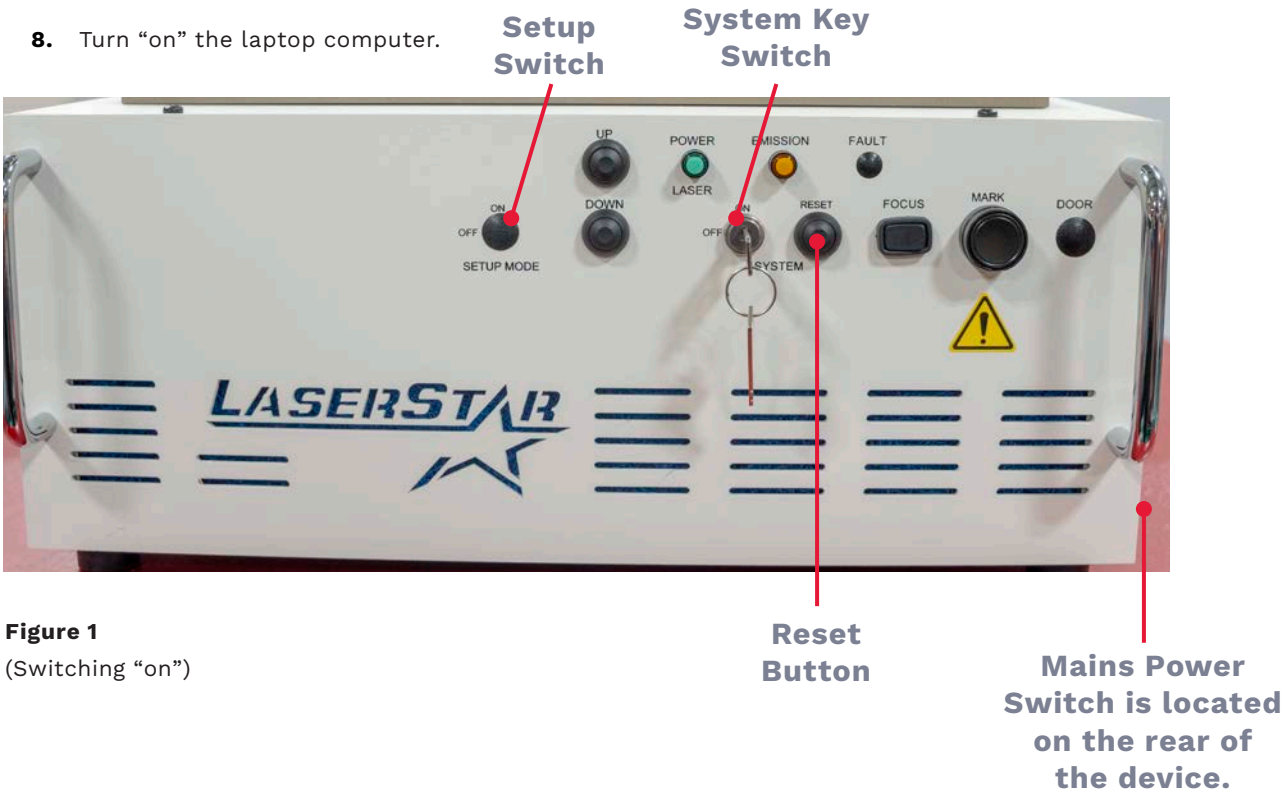


Figure 1
(Switching "on")

Switching “On” the Workstation

Operator Action >	System Response ⊗
Make sure the **mains power switch** is in the “off” or “O” position (see **figure 1** on the previous page).	Verify.
Check that the **system key switch** and **setup key switch** are in the “off” or “O” position.	Verify.
Check to be sure the USB cable is plugged in and correctly seated.	This cable connects the laptop computer to the marker; it must be properly seated and plugged in for the device to operate. **Caution: Launching the StarFX® Premier Design Studio software before having plugged in the USB cable at both ends may corrupt the device’s software configuration file: markcfg7.**
Turn the **mains power switch** “on” or to the “I” position (see **figure 1** on the previous page).	The **power indicator** will be green.
Turn the **system key switch** to the “on” or “I” position. **(Note: The setup key switch should be in the “off” or “O” position.)**	The marker is ready for use; the computer can be powered “on.”
Turn “on” the laptop computer.	On the desktop, the icons for both the **LaserStar StarFX® Premier Design Studio software** and its user manual.
Double-click on the icon for the **LaserStar StarFX® Premier Design Studio software**. **(Note: Refer to the Premier software user manual for helpful tips and instructions on programming, setup, and usage.)**	LaserStar Technologies Corporation® logo displays briefly, followed by the main interface screen for the **StarFX® Premier software**.

Switching “On” the Workstation

Operator Action >	System Response ⊗
The **emissions indicator** on the controls panel should still be “off.”	The **emissions indicator** will switch to amber when the laser source has been enabled. **Attention: The system key switch and mains power switch can be used to disable the laser source and power down or turn “off” the device at any time.**
Press the **reset button**.	The **emissions indicator** will turn “on” and change to amber; the device is ready for use.
Proceed to **Programs, Parts & Setup**.	Follow these instructions to proceed with using the workstation.

LaserStar StarFX® Premier Design Studio Software:

9. Select the **StarFX® Premier Design Studio software icon** on the computer desktop; this will launch the device’s software.
10. Select the appropriate file or part program (located on the **Premier Design Studio software** main interface screen).
11. Select “**trace contour**” from the **trace menu** (dropdown selection).
12. Verify that the part to be marked is positioned properly within the (red Class 3R Laser) profile box.
13. Turn “off” the profile diode by selecting the **stop button** (located on the **Premier Design Studio software** menu ribbon).
14. Turn “on” the **focus diodes** by pressing the **focus button** on the controls panel.

Caution: The focus diodes are **class 3R lasers**. Never look directly into the **focus diodes** or their emitted specular reflection. When using the device, it is recommended that the operator wear appropriate laser protective eyewear suitable for **class 3R lasers**. Check **Safety: Section II** for additional details on these precautions.

15. Verify that the workpiece to be marked remains in focus. **(Note: The focus diodes will turn "off" auto matically when the marking cycle begins. While not in use, the focus diodes should remain "off."**
16. Enable the laser source by turning "on" the system key switch and pressing the reset button.
17. To begin the marking cycle, select **"mark"** or press the **mark button** (located on the **LaserStar StarFX® Premier Design Studio software** main interface screen).
18. The marking process can be stopped at any time by pressing the **stop button** (located on the **StarFX® Premier Design Studio** software main interface screen) or by turning "off" the **system key switch** or **mains power switch**.

Caution: This is a **class 4 laser**. When using the device, be sure to avoid eye or skin exposure to direct or scattered radiation. In addition, all persons in the Nominal Ocular Hazard Area (NOHA) must wear the appropriate laser protective eye wear for the **class 4 laser** emissions and collateral radiation. Check Safety: Section II for additional details on these precautions.

Restart:

1. If the **remote interlock switch** circuit is opened or the **system key switch** is turned "off" during marking, the marking cycle will stop.
2. Close the **remote interlock switch** circuit.
3. Turn "on" the **system key switch**.
4. Press the **reset button**; the **emissions indicator** will turn "on".
5. Select **"mark"** or press the **mark button** to begin the marking cycle.

Switching the Marking System "Off":

1. Close the **LaserStar StarFX® Premier Design Studio software**; exit to the computer desktop.
2. The laptop computer can be turned "off" or remain "on," either option is suitable.
3. Turn the **system key switch** "off" or to the "O" position.
4. Turn "off" the **mains power switch**.
5. Remove the system key for the device and store it in a secure location only authorized personnel should have access.

When removing the keys, store the keys in a secure location; only authorized personnel should have access.

Attention:

- Reference **External Control Elements** within this manual for additional front panel switch functionality and operations.

Programs, Parts & Setup

The tasks listed below are typically performed by an individual who is trained and qualified process for determining optimal position and targeting for marking, engraving or cutting.

Operator Action >	System Response ⊗
Place the workpiece or part on or in the fixture. **(Note: The surface to be marked, cut, or engraved should be within the laser's focal plane.)**	
Press the **focus button** on the controls panel; this will turn the **focus diodes** "on" or "off." The **focus diodes** are used to accurately position and distance (z-axis) the laser's **final focus lens** with relation to the workpiece (some models are equipped with optional automatic focusing). **Caution**: When the **focus diodes** are "on," the marker is a **class 3R laser**. Never look directly into the diodes or their specular reflection. It is also recommended that the operator wear the appropriate laser protective eyewear.	The point at which the two (2) Focus Diodes converge is the starting position for the z-axis. Place the part surface to be marked perpendicular to the laser beam's axis; should also be parallel with the plane formed by the face (or end) of the **final focus lens.** **(Note: Reference the Focusing and Defocusing Guidelines in the Appendix of this manual. When adjusting the focus diodes, be sure to refer to Appendix B, as well as the StarFX® Premier software manual.)**
Choose the appropriate part program by clicking "file" and selecting "open." Next, locate the directory for the required part program; click on the program.	The laptop monitor will display an image of the feature to be marked, engraved, or cut.
Select the appropriate trace option from the **trace icon** in the drop down menu. Next, press the **mark icon** or **mark button** on the controls panel **(screen 3)**.	The (red Class 3R Laser) profile box will be displayed on the workpiece. If required, adjust the part position in relation to the profile box and make sure the **focus diodes** are in focus. **(Note: When adjusting the focus diodes, be sure to refer to Appendix B, as well as the StarFX® Premier software manual.)**

Operator Action >	System Response ⊗
Select the **stop icon** on the **StarFX® Premier software** icon ribbon **(screen 4)**.	The red class 3R laser pointing diode will turn “off."
The individual in charge of setup can initiate the marking process using any of the following methods: Select the **mark icon** on the **StarFX® Premier Design Studio software** or; Press the **mark button** located on the controls panel or;	The **mark icon** on the right-hand side of the display will change from red to green. The part program will start marking, engraving, or cutting. The word “mark” will be greyed out on the **LaserStar StarFX® Premier Design Studio software**. To stop marking at any time during the cycle, click on the **stop button** (displayed on the **StarFX® Premier Design Studio software** icon ribbon).
The technician in charge of device setup can optimize the position of the part in Z (laser beam focus) for optimal marking, engraving, and cutting.	Optimization complete. **(Note: For additional details, be sure to reference the Focusing and Defocusing Guidelines noted in the Appendix section within this manual.)**

Parts Marking, Cutting & Engraving

Steps below are done with or without having completed the procedure for programs, parts & setup.)

Operator Action >	System Response ⊗
Double-click on the icon for the **LaserStar StarFX® Premier Design Studio software.** **(Note: Refer to the LaserStar StarFX® Premier software user manual for helpful tips and instructions for programming, setup, and usage.)**	LaserStar Technologies Corporation® logo displays briefly, followed by the main interface screen for the **StarFX® Premier software**.
Choose the appropriate part program by clicking “file” and selecting “open.” Next, locate the directory for the required part program; click on the program.	The laptop monitor will display an image of the workpiece to be marked, engraved, or cut.
Place the workpiece within the workspace. **(Note: The surface to be marked + engraved, or cut must remain within the area of the laser’s focal plane.)**	The part is loaded on the fixture.
Select the appropriate trace option from the trace icon drop down. Then, press the **mark icon** or press the **mark button** on the device’s controls panel.	The (red Class 3R Laser) profile box will display on the part or workpiece. If necessary, adjust the position of the part relative to the profile box, ensuring that the **focus diodes** are precisely focused. **(Note: When making adjustments to the focus diodes, be sure to refer to Appendix B and the StarFX® Premier software manual.)**

Parts Marking, Cutting & Engraving (continued)

Operator Action >	System Response ⊗
The technician in charge of device setup can initiate the marking process using any of the following methods: Select the **mark icon** on the screen for the **StarFX® Premier Design Studio software** or; Press the **mark button** located on the controls panel or;	The **mark icon** on the right-hand side of the display will change from red to green. The part program will start marking, engraving, or cutting with its class 4 laser. The word “mark” will be greyed out on the **LaserStar StarFX® Premier Design Studio software**. To stop marking at any time during the cycle, click the **stop button** (displayed on the **StarFX® Premier Design Studio software** icon ribbon).
To restart the part program after an abort, close the front door and select mark using one of the methods outlined above.	The part program will start class 4 laser marking from the beginning.
Part Program complete	System will stop.

LaserStar StarFX® Premier Design Studio Icons and Software Screens

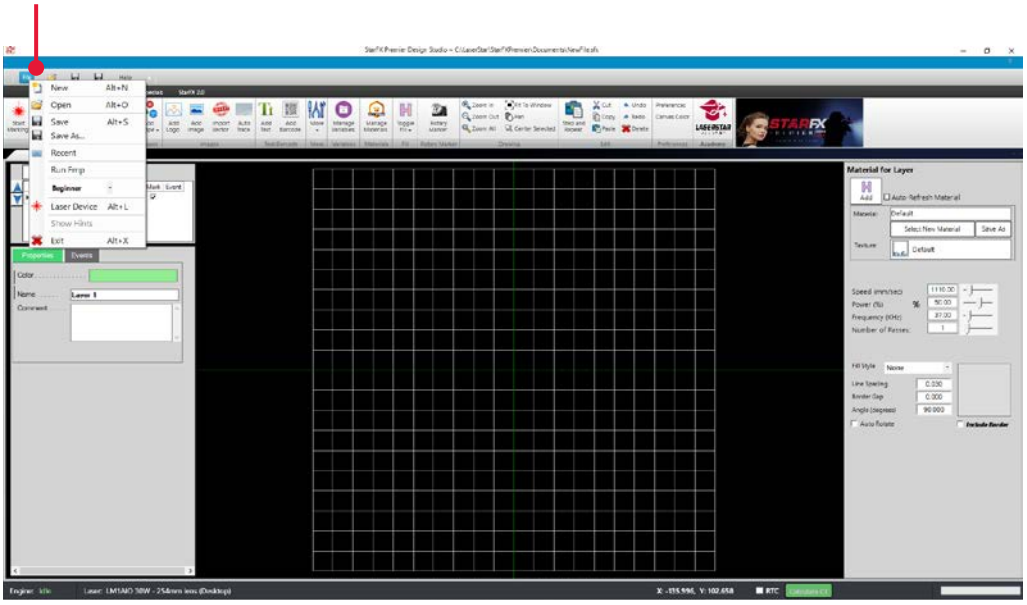
StarFX® Premier Design Studio Software Program

LaserStar StarFX® Premier Design Studio Software Manual

Screen 1
(LaserStar StarFX® Premier Design Studio software; laptop computer [desktop])

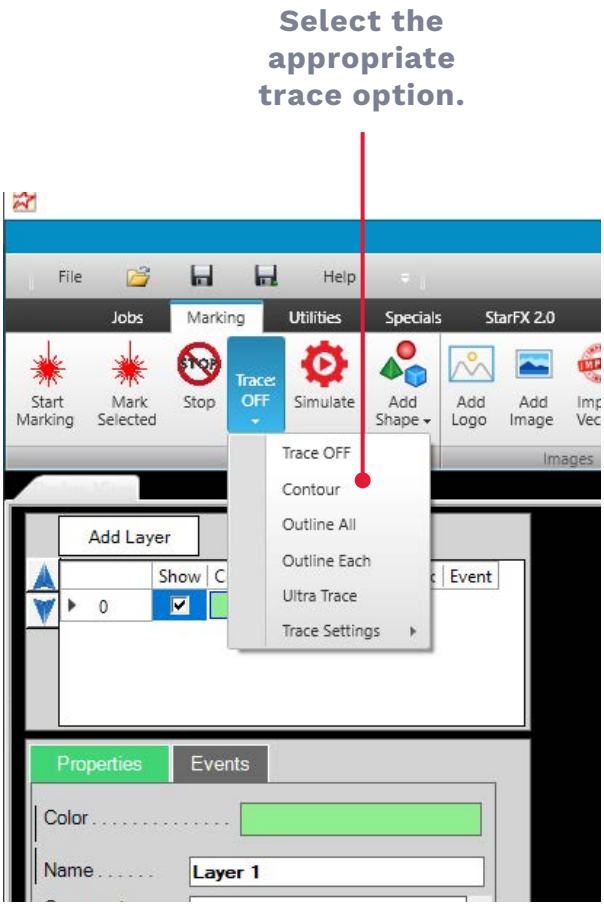
LaserStar StarFX® Premier Design Studio Icons and Software Screens (continued)

Select “file” to open an existing part program or generate a new one using the Premier Design Studio drawing tools.



Screen 2
(Open existing part program or generate a new one)

LaserStar StarFX® Premier Design Studio Icons and Software Screens (continued)

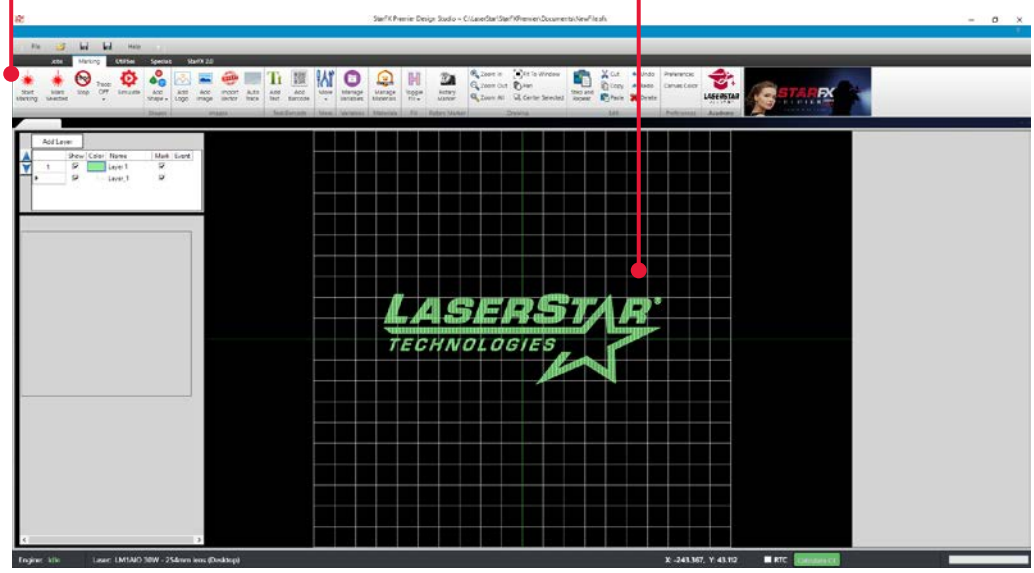


Screen 3
(Trace options)

LaserStar StarFX® Premier Design Studio Icons and Software Screens (continued)

To mark or trace, select the mark icon.

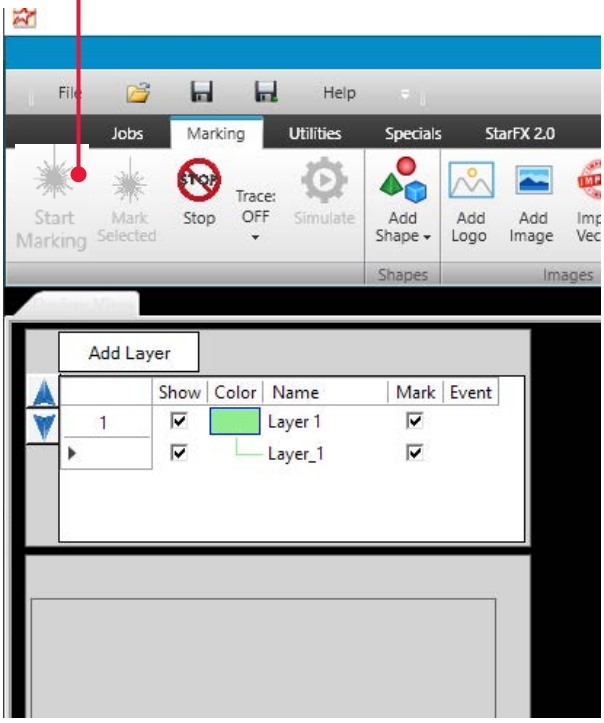
File opened for marking a logo, as shown.



Screen 4
(Select the mark icon to mark or trace)

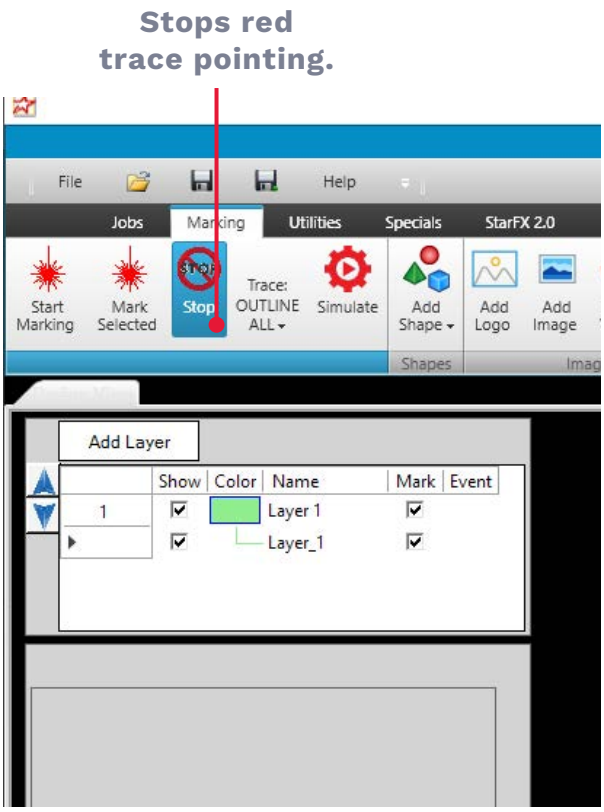
LaserStar StarFX® Premier Design Studio Icons and Software Screens (continued)

Grayed out icon indicates that the laser is currently marking.



Screen 5
(Stop button appears while the marking process completes)

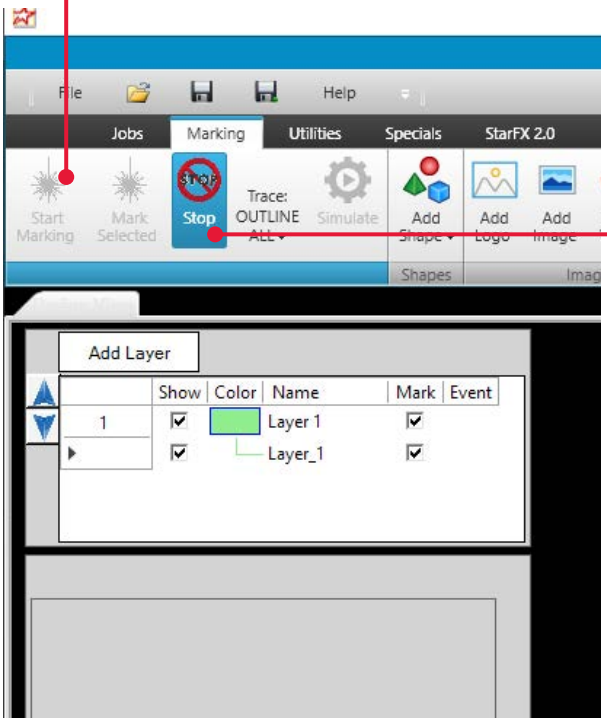
LaserStar StarFX® Premier Design Studio Icons and Software Screens (continued)



Screen 6
(Laser pointing diode active; select "stop" when setup is complete)

LaserStar StarFX® Premier Design Studio Icons and Software Screens (continued)

Indicates the part program is enabled and marking.

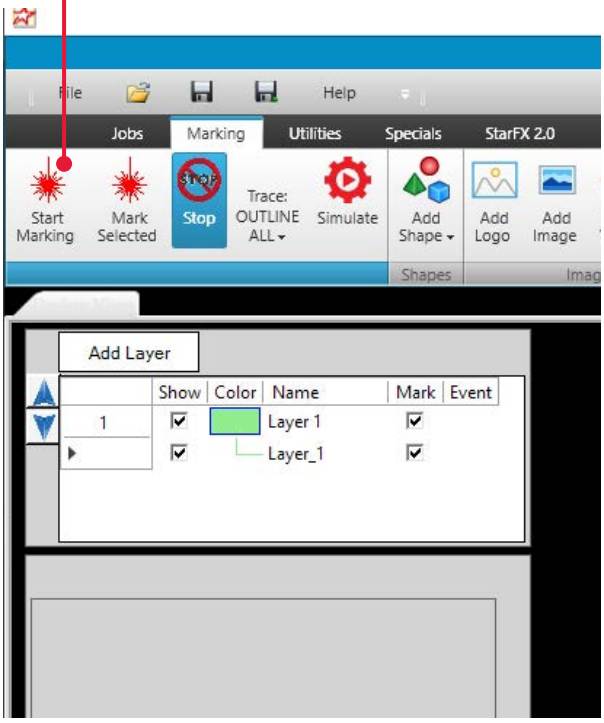


Select "stop" to halt the part program.

Screen 7
(Part program has been stopped or aborted)

LaserStar StarFX® Premier Design Studio Icons and Software Screens (continued)

Click “mark” to restart the part program from the beginning.



Screen 8
(Restart the part program from the beginning)

V. Maintenance

Overview & Requirements

Routine maintenance is a requirement for ensuring the safe and optimal operation of the laser system. Regular maintenance intervals must be scheduled in accordance with the manufacturer's recommendations and requirements. **(Note: When working with an open device, be sure always to wear appropriate laser protective eyewear.)**

Before maintenance can be carried out, the following safety measures must be observed and followed:

- Disable all systems, subsystems, and auxiliary equipment by turning "OFF" and disconnecting from power sources or live components.
- Verify that all disconnected equipment has been secured against being switched "ON" again (whether automatically [e.g. vibration] or inadvertently [e.g. operator error]). Secure the **Mains Power Switch** with a padlock (you may use the mechanical locking device provided) or alternatively, remove the fuses. Check all warning indicators to be sure they're functional and remain alert while maintenance is being carried out.
- Using a voltage meter or voltage tester, check whether the equipment is "live." Measure the conductors against one another and also against the protective ground conductor.
- When reconnecting the equipment, **remember, you should always ground first**. With low-voltage devices, short-circuit the capacitors, and for high-voltage devices, short circuit both the capacitors and high-voltage lines. When service has been concluded, be sure to remove the grounding and shorting jumpers.

While working with an opened device, regulations set forth by OSHA regarding laser safety (or equivalent national or international regulations [e.g. EC Directive 608 or IEC Publication 825]) must be adhered to. Also remember to wear protective eyewear.

- If there's a risk of touching "live" components while at the worksite, and it's not possible to disconnect these components from their voltage source, they must be covered with a reliable and sufficiently strong insulating material. If the components cannot be covered, another method must be used to prevent direct contact. Once precautions are in place, be sure also to cover the workspace with plastic sheeting, paneling, or a rubber mat.
- After maintenance has been concluded, the service personnel must verify that the equipment is safe to operate.
- When replacing components, use only Laser Star Technologies Corporation® approved parts and accessories.

While performing maintenance tasks, be sure never to work alone. A second person familiar with the risks posed by high-voltage electricity and laser radiation should be present. In the event of an emergency, this person will provide support, disabling power sources, and administering first aid, if necessary.

This device complies with all generally recognized technical standards and regulations, including those set forth by OSHA, EC, EN, DIN, and VDE. The laser is ignited and operated using dangerous high voltage (>1 kV) and special care must be taken when working inside the control box. When recording measurements for electrical or electronic components (and while the laser system is "on,") it is critical to maintain required clearances (for details, see Installation; section III). When working with electrical equipment of this kind, you must comply with relevant safety regulations (OSHA, or the equivalent national or international standards).

Maintenance Intervals

The maintenance schedule is dependent on both the environment and general usage. The operator should determine the appropriate maintenance intervals.

Weekly: (a)

1. The outside surface of the enclosure, the work chamber, and safety material (surrounds the outside of the splash-protective observation window) should be cleaned using a cloth that's been dampened with water or another non-abrasive cleaner. **If 70% isopropyl alcohol, a flammable liquid, is used: be sure there's no contact with the stand-alone laptop computer; this will damage the display. Additionally, never use strong cleaning agents, such as powders or solvents to clean the equipment.**

2. The **protective disk**, which is located at the end of the **final focus lens**, should be unscrewed and cleaned with a lens cleaning solution. We recommend LaserStar Technologies Corporation® cleaning solution (part number: 810-2353), which can be conveniently purchased from our e-store. If it is preferred to use cleaning wipes (part number: 810-2356 [quantity: 1]) or 810-2354 [quantity:90]), these are also available to purchase from our e-store. **(Note: If opting for 70% isopropyl alcohol, be sure to use with a lint-free cleaning cloth. After cleaning, polish with a clean, lint-free wipe to remove any hazy residue.)**

Over time, and with continued use, metal splashes will adhere to the surface of the **protective disk**; there is a danger of local heating at these splash points that can result in cracking or possible destruction of the focus lens. Eventually, the **protective disk** will need to be replaced. **Caution: When replacing the protective disk, always replace with a new component; never reinstall the protective disk with the side that has metal splashes facing upward.**

Quarterly: (b)

1. Turn “off” the mains power switch and system key switch

2. Use a vacuum to clean the vents for the air filter (located on the front of the device's control panel).

3. If a splash-protective observation window is used it should be visually checked for cracks, voids, or other damage. **If damage is discovered, be sure to replace the splash-protective observation window before using the device.**

Protective Disk

The **protective disk**, which is constructed from glass, prevents the lens from being damaged by mechanical influences, such as metal splashes or dust. An anti-reflective coating is present on both sides of the **protective disk** and helps to minimize the chance of loss as a result of absorption.

Protective Disk Replacement

1. Turn the **mains power switch** “off” or to the “O” position.
2. Unscrew the knurled ring from the underside of the lens; turning counterclockwise, remove the component from the laser - ensuring that it remains horizontal, if possible.
3. Replace the previous **protective disk** with a new one.
4. Turning clockwise, secure the knurled ring together with the new **protective disk**; reaffix to the underside of the lens.

Cleaning the Air Filter

1. Turn “off” the **mains power switch** and **system key switch**.
2. Using a shop vacuum with the flexible hose and brush tool attached, clean the air filter and remove excess dust from the device by running the vacuum across the vents (located on the front of the device's control panel).

Figure 1
(Air filter)

Air filter (located behind the controls panel cover)

Never use compressed air to clean the filter beating or blowing out the air filter with compressed air will destroy the filter medium. In addition, this can cause pollutants that have adhered to the filter to cycle back into the air and within the operator’s workspace.

VI. Troubleshooting

Before troubleshooting is carried out on the laser system, be sure to reference the important safety protocols outlined in **Maintenance; section V** within this manual.

While working with an opened device, regulations set forth by OSHA regarding laser safety (or equivalent national or international regulations [e.g. EC Directive 608 or IEC Publication 825]) must be adhered to. Be sure also to safeguard your eyes and wear appropriate laser protective eyewear.

Equipment Malfunction

If you experience a malfunction with your laser system that cannot be eliminated through one of the actions outlined in the previous sections for maintenance or troubleshooting, be sure to document your results and immediately contact LaserStar Technologies Corporation® Service Department for support, by calling 1-888-578-7782.

Service and maintenance tasks should only be performed by technicians who are affiliated with LaserStar Technologies Corporation® and who are appropriately trained; other properly trained personnel; personnel who are supervised by trained personnel (in-person or by phone); or by those who have read and understand the service-related protocols within the sections for maintenance and operation within this manual.

LaserStar Technologies: Important Contacts		
Sales & Training	**Service & Support**	**Corporate Office**
(407) 248-1142 sales@laserstar.net	1-888-578-7782 service@laserstar.net	2461 Orlando Central Pkwy. Orlando, Florida 32809, USA

Diagnosing & Troubleshooting Basics

Error or Issue	Possible Cause	Corrective Action
The laser system does not turn “on.”	AC is not plugged in.	Plug-in the AC.
The laser system does not turn “on.”	The wall switch is not turned “on.”	Turn “on” the wall switch.
The laser system does not turn “on.”	Fuse(s) is blown.	Reference instructions for **Fuse Replacement.**
The laser turns “on,” but will not mark or fire.	**Front door** of the **work chamber** is open.	Close the chamber door.
The laser turns “on,” but will not mark or fire.	**Remote Interlock** plug has either become loose, is unplugged, or missing.	Install the **remote Interlock** plug. Turn the **system key switch** “on” or to the “I” position. Turn “on” the laser by pressing the **reset button** (the emissions indicator will turn “on” and change to an amber color).
The laser turns “on,” but will not mark or fire.	The **system key switch** was not enabled or turned “on” or it was disabled or turned “off” during the marking cycle, or the **reset button** was not pressed following activation of the **system key switch**.	Turn the **system key switch** to the “on” or “I” position. Press the **reset button** (the emissions indicator will turn “on” and change to an amber color). Press the **mark button**.

Diagnosing & Troubleshooting Basics

Error or Issue	Possible Cause	Corrective Action
The **final focus lens** is not powering "on."	**Protective disk** has either become contaminated or it is defective.	Examine the **protective disk**, checking for visible damage or smudging; clean or replace, if necessary.
The power outputted from the **final focus lens** is low.	Review the settings for the power, frequency, speed, and velocity; make sure they're all appropriate.	Make adjustments to the settings, as required.
The power outputted from the **final focus lens** is low.	Check that the workpiece is inside the focal plan for the lens.	The surface of the workpiece should remain parallel with the face of the final focus lens.
The power outputted from the **final focus lens** is low.	Check to be sure the **focus diodes** have not been inadvertently moved or adjusted.	Refer to instructions for **Focus Diodes Alignment, Adjustment & Replacement.**
Message: "Cannot find dongle! Software will not work in demo state." OR **Message:** "Current LMC Board is not for SPI G3.0 Laser!"	USB cable is not plugged in or it became unplugged while the device was operating.	Turn "off" the laptop computer, **system key switch**, and **mains power switch**. Reconnect the USB cable. If it appears that the USB cable is still connected, check the connections by unplugging and reinserting the cable once again. Restart the device.

Diagnosing & Troubleshooting Basics

Error or Issue	Possible Cause	Corrective Action
Message: "Invalid Device Handle"	USB cable is not plugged in or it became unplugged while the device was operating.	Turn "off" the laptop computer, **system key switch**, and **mains power switch**. Reconnect the USB cable. If it appears that the USB cable is still connected, check the connections by unplugging and reinserting the cable again. Restart the device.
Message: "No data available. Check whether the file was loaded."	USB cable is not plugged in or it became unplugged while the device was operating.	Turn "off" the laptop computer, **system key switch**, and **mains power switch**. Reconnect the USB cable. If it appears that the USB cable is still connected, check the connections by unplugging and reinserting the cable again. Restart the device.
The device marks the part incorrectly.	USB cable became unplugged while the device was in operation and/or the configuration file has become corrupted.	Turn "off" the laptop computer, **system key switch**, and **mains power switch**. Contact LaserStar Technologies® Service Department for additional support and troubleshooting; either by calling 1-888-578-7782 or emailing service@laserstar.net.

Fault Diagnostics Software

For support with troubleshooting and to obtain the fault diagnostics software, please contact LaserStar Technologies® Service Department in one of the following ways **with your laser's ID Number and Service Number**:

1. **Recommended**: Fill out a Service Request Form on the LaserStar Technologies Website: **https://laserstar.net/en/about/service-center/**
2. Call Service & Support with the following number: 1-888-578-7782
3. Email Service & Support with the following email: service@laserstar.net

Important Advisory:

The fault diagnostics software must only be used under guidance from support technicians affiliated with LaserStar Technologies Corporation®. If you are in need of support and require the use of the diagnostics software, please be sure to reach out to our service department for assistance.

FiberCube Software Installation & Upgrades

For support with FiberCube® software installation or upgrades for a customer-supplied computer, please contact LaserStar Technologies Corporation® Service Department.

LaserStar Technologies: Important Contacts		
Sales & Training	**Service & Support**	**Corporate Office**
(407) 248-1142 sales@laserstar.net	1-888-578-7782 service@laserstar.net	2461 Orlando Central Pkwy. Orlando, Florida 32809, USA

VII. Parts & Accessories

LaserStar Technologies Corporation® Approved Components	
Description	**Catalog Number**
Operation and Maintenance Manual (hardcopy)	58-99990-3400
Operation and Maintenance Manual (digital; USB flash drive)	58-99991-3400
Fuse (10A, 250V AC, SB 5 × 20mm)	405-4320-100
Fiber Wipe (quantity ×1)	810-2356
Fiber Wipes (quantity ×90)	810-2354
Power Cord (without connector [flying leads] on input ends) CSA LL110850 & UL E84516 3×18 AWG (3×0.824mm) 60°C 300V	405-6199-254
Power Cord (with connector on both ends) Power Cord (without connector [flying leads] on input ends) CSA LL112007 & UL E159216 3×18 AWG (3×0.824mm) 60°C 300V	PWC-001
Power Cord (AC power cord; ROJ [remove outer jacket] to IEC60320 C13 connector [8 feet] 10A, 250V H05VV-F3G1.0, VDE-UL-CSA-CE)	405-6199-255

VII. Parts & Accessories (continued)

LaserStar Technologies Corporation® Approved Components	
Description	**Catalog Number**
USB Cable (6’ with ferrites on each end)	405-6199-911
Protective Disk (used with 408-2473-100, 408-2473-160, or 408-2473-254)	408-2470-300
Fan Filter	61-64001
Remote Interlock Shorting Connector	148-36-0114
LaserStar StarFX® Premier Design Studio Software Manual	A .pdf file has been preloaded on supplied laptop computer.

Notes

VIII. Original Equipment Warranty - FiberCube Marking+Engraving Products

LaserStar Technologies Corporation® ("LaserStar") warrants for a period of one (1) year, or two (2) years (depending on your purchase) from the date of invoice that this equipment will be free from defects in materials and workmanship as determined at the date of shipment. For details on your warranty period, please reference your purchase invoice.

(a). Limited Warranty:

After reaching out and notifying the LaserStar Technologies Corporation® Service Department about a problem with your laser system, we will, at our option, elect to:

1. Immediately send a replacement part; or
2. Request defective part(s) or alternatively, the entire laser system be returned to LaserStar Technologies Corporation® Service Department for inspection and repair or replacement; or
3. Schedule a service technician to travel to the buyer's facility to inspect, troubleshoot, repair, or replace defective components.

(b). Warranty Exclusions:

1. This warranty does not provide coverage or protection against damage, misuse or abuse of the optical components (damage to the optical output fiber, lenses, mirrors, glass, crystal, etc.) associated with the device;
2. This warranty does not provide coverage or protection against damage, misuse or abuse of the computer hardware;
3. It is required to connect an exhaust device to ensure ablated materials and/or harmful gases are removed from the system which can potentially cause damage to the laser system. Failure to connect an exhaust system can result in voiding the warranty.
4. This warranty does not provide coverage or protection for consumable parts (protective disks, air filters, fuses, halogen lights, LED lamps, F-Theta lens, etc.).

This warranty is applicable for all equipment, when operated under normal conditions, and in an industrial environment. Any unauthorized use, misuse, neglect, or modification, including use of accessories that have not been previously approved or authorized by LaserStar Technologies Corporation® will void this warranty. Under no circumstance will LaserStar Technologies Corporation® accept liability for loss of use or for any indirect or consequential damage that is the result of customer negligence.

Satisfaction of this warranty, consistent with other provisions herein, is limited to replacement or repair, modification, at the sole discretion of LaserStar Technologies Corporation® and with LaserStar Technologies Corporation® to determine the availability of service personnel, and any absorption of associated service-related expenses.

The warranty terms previously outlined are valid and will remain in effect only if and when the following obligations are met:

(a). Prompt written notification is provided to LaserStar Technologies Corporation® upon discovery of an alleged defect;

(b). LaserStar Technologies Corporation® examines the equipment, and to its satisfaction, finds that any defect is not the result of misuse, neglect, improper installation, improper operation or improper maintenance, unauthorized repair, alteration or unusual deterioration or degradation of the equipment or parts thereof, due to the physical environment or an electrical or electromagnetic noise environment.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND THEREFORE, EXCLUDES CERTIFICATIONS OR THE LIKE FOR EQUIPMENT PERFORMANCE, USE OR DESIGN WITH RESPECT TO ANY STANDARD, REGULATION OR THE LIKE (UNLESS, AND TO THE EXTENT, THIS HAS BEEN APPROVED INDEPENDENTLY, AND IN WRITING BY LASERSTAR TECHNOLOGIES CORPORATION®) AND EXTENDS ONLY TO THE BUYER OR CUSTOMER PURCHASING DIRECTLY FROM LASERSTAR TECHNOLOGIES CORPORATION® OR FROM ANOTHER AUTHORIZED RESELLER.

Return Authorization:

Whether your equipment is under warranty and in need of repair or otherwise, you must first contact LaserStar Technologies Corporation® to communicate your issue, schedule service, and obtain prior authorization; such authorization shall be granted for each reasonable request. Unless such authority has been granted, the shipment will be refused. Any and all transportation-related expenses associated with evaluation or repair of your equipment, including any refusal of delivery, are the sole expense of the buyer. When sending equipment to our facility, an RMA or CRA number will be assigned to accompany your laser system; this number should remain clearly marked and visible on the exterior of the shipping container.

Governing Law:

The sale and purchase of this equipment, including all terms and conditions thereof, shall be governed in accordance with the Uniform Commercial Code and the **laws of the State of Florida.**

Limited Liability:

LASERSTAR TECHNOLOGIES CORPORATION® DOES NOT ASSUME RESPONSIBILITY FOR, NOR WILL IT BE HELD LIABLE FOR (A) FINES OR PENALTIES RELATING TO PENALTY CLAUSES OF ANY VARIETY, OR (B) CERTIFICATIONS NOT OTHERWISE SPECIFICALLY PROVIDED HEREIN, (C) INDEMNIFICATION FROM THE BUYER OR OTHERS (RELATED OR NOT) FOR LIABILITY, CLAIMS, ACTION, DAMAGES, LOSS, FINES, COSTS OR EXPENSES, INCLUDING, WITHOUT LIMITATION, REASONABLE ATTORNEY'S FEES, OF EVERY KIND OR NATURE ASSERTED BY ANY PARTY, AND ARISING DIRECTLY OR INDIRECTLY FROM OR IN CONNECTION WITH EQUIPMENT OR REPAIRS RELATING TO THIS PURCHASE ORDER, OR (D) FOR INDIRECT OR CONSEQUENTIAL DAMAGE UNDER ANY CIRCUMSTANCE.

This warranty does provide coverage or protection against damage or defects resulting from accidents that occur while in transit, unauthorized repairs, alteration, misuse, neglect or failure to follow proper safety and operating instructions, fire, flood, freezing temperatures or acts of God.

Authorized Equipment Repairs

Corporate Office	Rhode Island Office	California Office
Sales, Training, Repairs & Manufacturing	**Sales, Training & Repairs**	**Sales, Training, Repairs & Manufacturing**
2461 Orlando Central Pkwy. Orlando, Florida 32809 (407) 248-1142	100 Jefferson Blvd., Ste. 315 Warwick, Rhode Island 02888 (407) 248-1142	20 East Foothill Blvd. Ste. 128 Arcadia, California 91006 (213) 612-0622

IX. Service

Before service is carried out on the laser system, be sure to reference the important safety protocols outlined in **Maintenance; section V** within this manual.

Service and maintenance tasks should only be performed by technicians who are affiliated with LaserStar Technologies Corporation® and who are appropriately trained; other properly trained personnel; personnel who are supervised by trained personnel (in-person or by phone); or by those who have read and understood the service-related protocols within the sections for Operation and Maintenance within this manual.

While carrying out service-related activities with an open device, you must comply with regulations set forth by OSHA for accident prevention with regard to laser radiation or the equivalent national or international regulations (e.g. EC Directive 608 or IEC Publication 825). Be sure also to safeguard your eyes and wear appropriate laser protective eyewear.

Equipment Malfunction

If you experience a malfunction with your laser system that cannot be eliminated through one of the actions outlined in the previous sections for maintenance or troubleshooting, please document your results and immediately contact LaserStar Technologies® Service Department for support; either by calling 1-888-578-7782 or emailing service@laserstar.net. When reaching out, be sure to include your laser system's model number and serial number with all correspondence. After emailing, plan to follow-up with a phone call to our service department; this will ensure that we have received all of the details necessary to assist you.

LaserStar Technologies: Important Contacts		
Sales & Training	**Service & Support**	**Corporate Office**
(407) 248-1142 sales@laserstar.net	1-888-578-7782 service@laserstar.net	2461 Orlando Central Pkwy. Orlando, Florida 32809, USA

Service Section A: Rear System Overview, Internal & External Connections

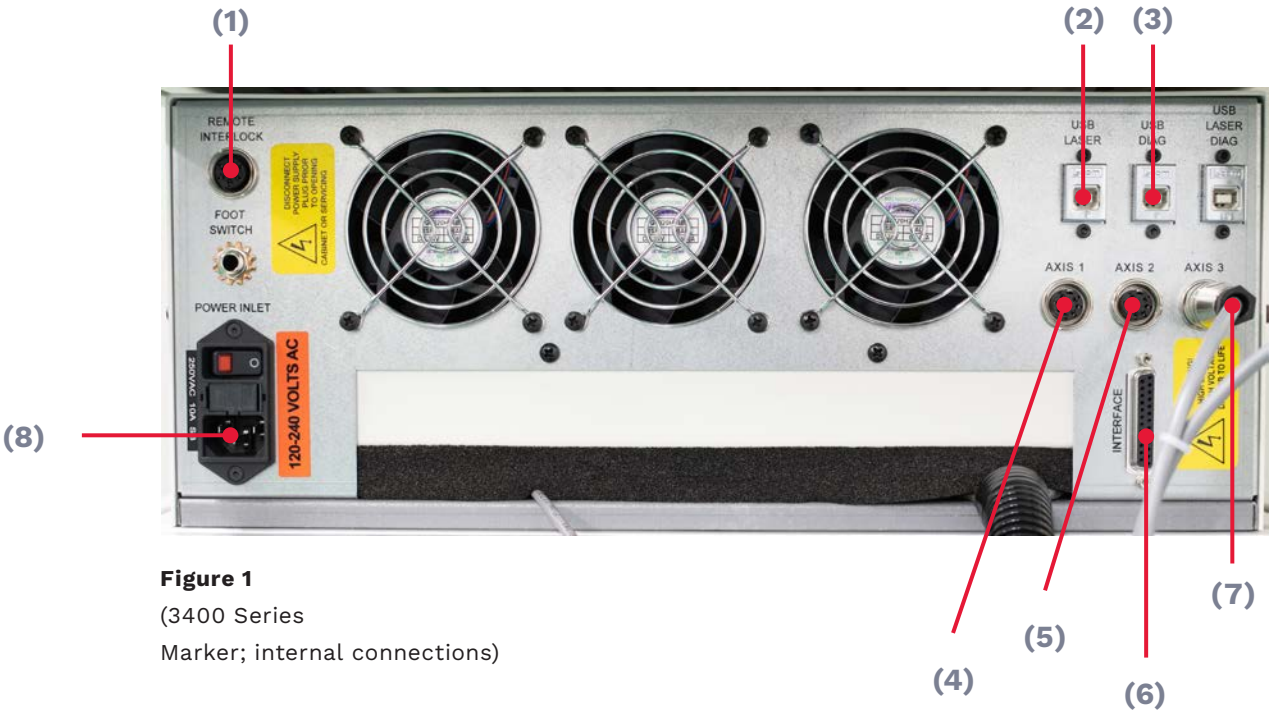


Figure 1
(3400 Series
Marker; internal connections)

1. **Remote Interlock:**
   Reference **remote interlock connector** in **sections I & III**.

2. **USB 1 - Laser:**

   The **USB 1: laser (2)** facilitates communication between the laptop computer, the marker, and the device's laser control electronics.

3. **USB 2 - USB Diag:**

   The **USB 2: diag (3)** is used for system fault diagnostics and device troubleshooting.

4. **Axis 1:**

   Axis 1 (4) is used to supply power to a linear or rotary axis.

5. **Axis 2:**

   Axis 2 (5) is used to supply power to a linear or rotary axis.

6. **IO Rack Interface:**

   The **IO rack interface (6)** is used for specific specialized internal and external functions.

7. **Axis 3:**

   Axis 3 (8) is used to supply power to a linear or rotary axis.

8. **Power Input (main “on” “off”):**

   The **power input (9)** is the main port and source of power for the device.

9. **Chamber Exhaust:**

   The **chamber exhaust (not shown)** is used to connect an external chamber exhaust system.

Service Section B: Focus Diodes Alignment, Adjustment & Replacement

This device is a class 4 and class 3R laser. Avoid eye or skin exposure to direct or scattered radiation. All persons in the Nominal Ocular Hazard Area must wear appropriate laser protective eyewear.

Focus Diodes Alignment

This procedure assumes that the operator has completed the steps for adjusting the **focus diodes** to a minimum "dot" size within the laser's marking plane. If this is not the case, please proceed to **Appendix B: Focusing and Defocusing Guidelines**; follow all steps until completed.

Tools Needed (supplied or required):

- Slotted Screwdriver (3/16" – 1/4")
- Hex Key Wrench (2mm)

1. Select the **LaserStar StarFX® Premier Design Studio icon** on the computer desktop; this will launch the software for the laser system.
2. Draw a 0.5mm circle on the page and center this shape to the 0.0 location by clicking the **Center Selected button.**

Figure 1
(StarFX menu ribbon)

3. Configure the settings for power and speed to achieve the results shown in **figure 3**.
4. Using the default material, set the loop count to a minimum of ten (10) or enable the repeat function (navigate to utilities; select the repeat icon).

Focus Diodes Alignment, Adjustment & Replacement (continued)

5. Place a flat piece of scrap material on a lab stand, positioning the workpiece underneath the lasers' scan head.

6. Select the **mark icon** located on the LaserStar **StarFX® Premier Design Studio software** menu ribbon.

7. Move the lab stand up and down to find an ideal position; this is the location where the laser marks most accurately (reference **figure 2** and **figure 3**).

8. When the surface of the workpiece is in focus, select the **stop button**; be sure not to make any additional movements or adjustments.

9. Turn "on" the **focus diodes** by pressing the **focus button**.

10. Using the 2mm hex key wrench, loosen the hex set screws to adjust the positioning of the pivot and angle of the **focus diodes** (reference **figure 4**) until they reach the center of the 0.5mm circle. When this step is finalized, the **focus diodes** will be overlapping one another to form a single "dot" within the center of the circle. The marker is now ready for use.

Figure 2
(Laser; out of focus)

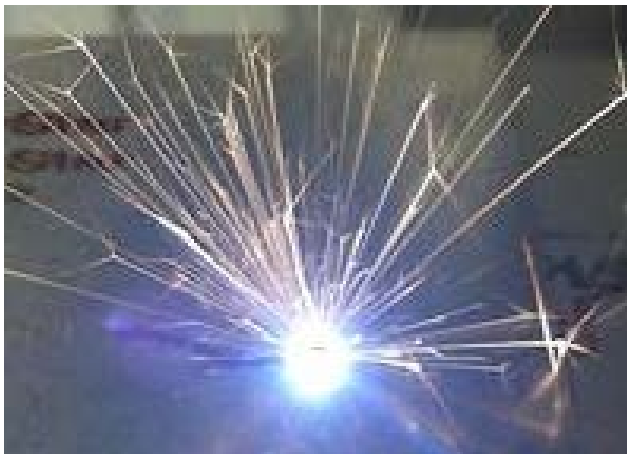


Figure 3
(Laser; in focus)

Service Section B: Focus Diodes Alignment, Adjustment & Replacement (continued)

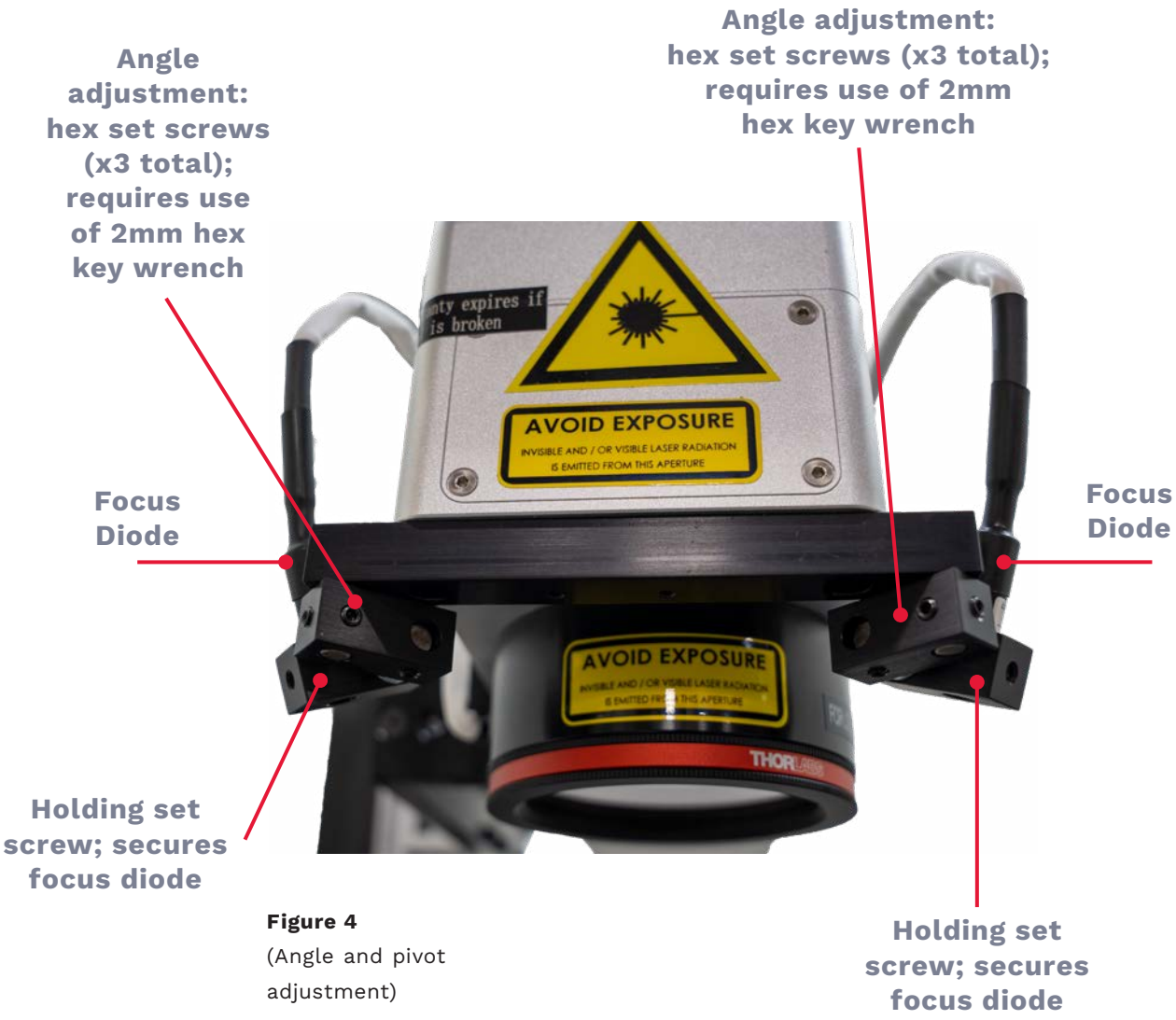


Figure 4
(Angle and pivot adjustment)

Replacing the Focus Diodes

1. Turn “off” the **system key switch** and **mains power switch**.
2. Unplug or disconnect the wires for each of the **focus diodes** (be sure to take note of the wire color and locations for each of the connection sites.)
3. Loosen the holding set screws that secure the **focus diodes**.
4. Install the new **focus diodes** into their chambers, ensuring that the output ends for each are positioned downward toward the bottom of the cavity; tighten the holding set screws **(be sure not to overtighten these screws)**.
5. Reconnect the **focus diodes**, ensuring that all wires are correctly connected. **Caution**: If the wires are not properly connected, there is a risk of damaging the **focus diodes**.
6. Turn “on” the **system key switch** and **mains power switch**.
7. Check to make sure the laser beam is in focus (see **Figure 3**).
8. Turn “on” the **focus diodes**. **Caution**: When using this device, and while the laser beam is active, never stare into the beam that's emitted.

Safety glasses are recommended for the steps that follow:

9. Turn “on” the **red laser pointing diode**.
10. The **focus diodes** are focused by inserting a slotted screwdriver (3/16” to 1/4” blade width) into the output ends of the component. (Note: The tip of the screwdriver must be wide enough to ensure that it does not contact the face of the diode, which will cause damage to the lens; reference **figure 5**)

- To determine the minimum spot size for each of the focus diodes, rotate the diodes slotted screw clockwise or counterclockwise. If needed, be sure to revisit **Service B: Focus Diodes Alignment** for additional tips and helpful information.

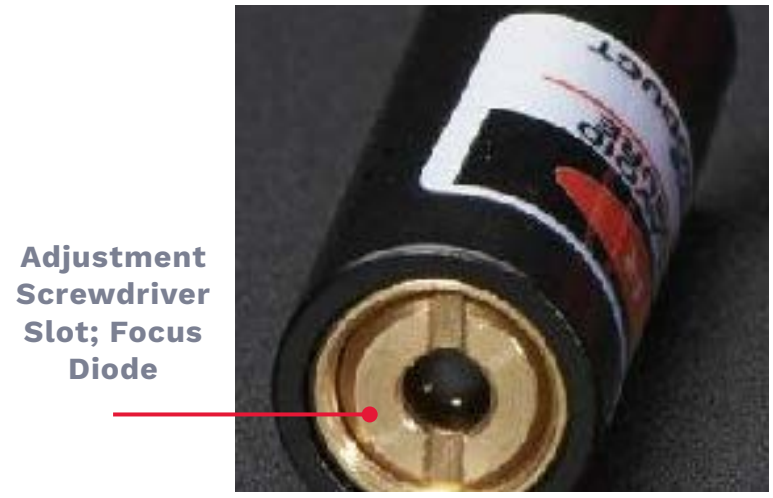


Figure 4
(Focus diode;
adjustment slot)

Service, Section C: External Fuse Replacement

Fuse Replacement

When completing the steps below, be sure to reference **Data Table: Fuses** below.

1. When replacing any fuse or checking the status of the laser system, first turn “off” the system using the **system key switch** and **mains power switch**.
2. Disconnect the AC power cord from the wall and from the equipment.
3. Verify that the AC power has been disconnected; this step is **critically important**.
4. Move the laser system to allow for access to its rear.
5. Remove all external fuses; be sure to check periodically and replace, as needed.
6. Reconnect the AC power; proceed with testing the system to ensure it’s functioning properly.

(Note: If there is any trouble and the laser needs support, be sure to reach out to LaserStar Technologies Corporation® Service Department for assistance.)

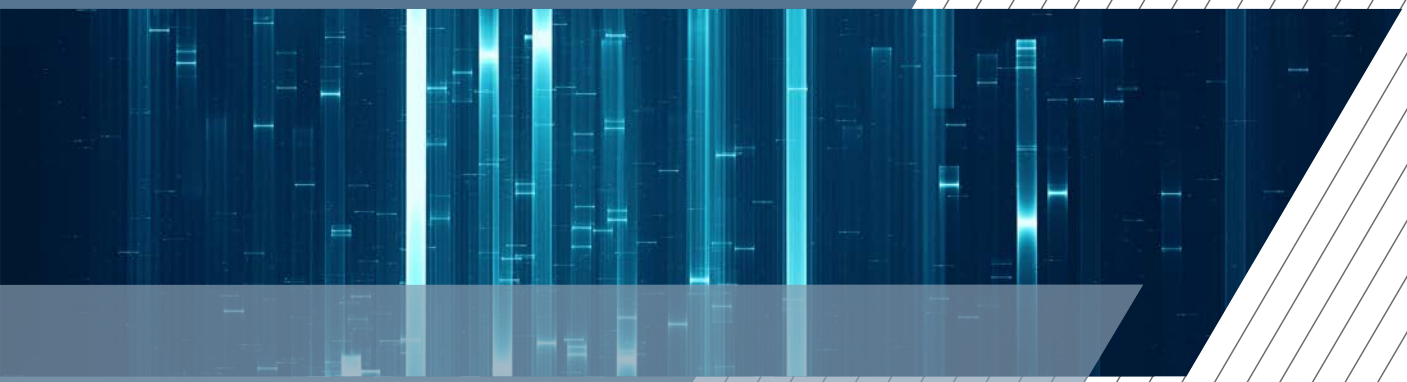
Data Table: Fuses

Fuse(s)	Part Number (be sure to purchase only LaserStar Technologies Corporation® manufactured parts)	Amperage or Voltage Type: 120–230VAC	Usage
1 and 2	405–4320–100	10A, 250V AC, SB 5 × 20mm	Mains Power

Attention: SB is the abbreviation for a Slo-Blo fuse. Slo-Blo (SB) and Time-Delay fuses are equivalent to TL fuses.

If you have additional questions about your device or would like to provide feedback, a testimonial or present your applications results, please reach out — we'd love to hear from you!

LaserStar Technologies: Important Contacts		
Sales & Training	**Service & Support**	**Corporate Office**
(407) 248-1142 sales@laserstar.net	1-888-578-7782 service@laserstar.net	2461 Orlando Central Pkwy. Orlando, Florida 32809, USA



For additional resources, learning, and support, including our library of latest video how-tos, be sure to visit us online:

LaserStarAcademy.com, LaserStar.net, and LaserStar.TV