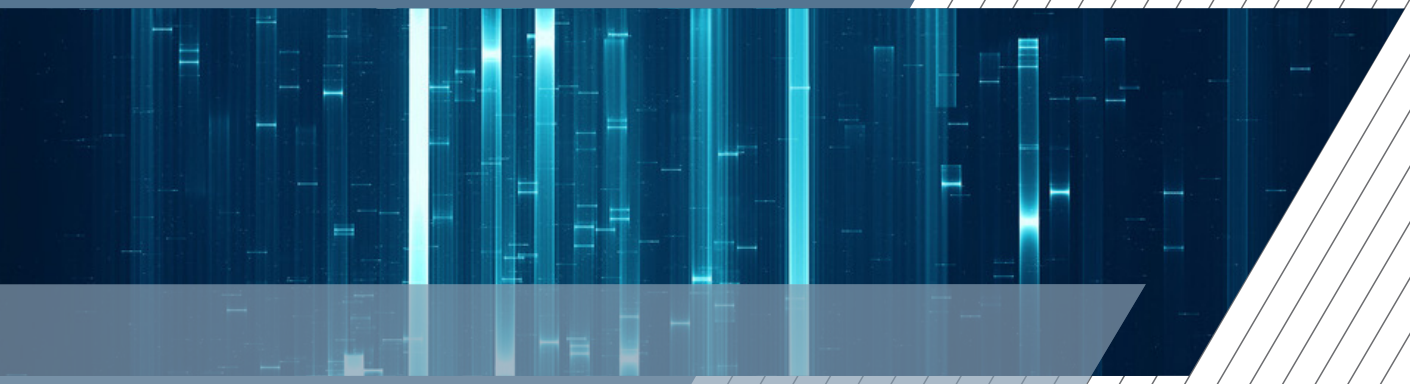
FIBERCUBE®
LASER ENGRAVING SYSTEM

FiberCube® Marker 3803 Series

Setup Guide, Operation & Maintenance Manual



LASERSTAR® TECHNOLOGIES

HARNESSING THE POWER OF HOT LIGHT™

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STUDIO
INDUSTRIAL EDITION

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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® Laser Workstation
Model Number(s):	5xx-3803-XL
Year of Manufacture:	2023
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

Date: January 04, 2023

Declaration of Compliance

United States and Canada

Manufacturer's Name:	LaserStar Technologies Corporation®
Manufacturer's Address:	2461 Orlando Central Parkway, Orlando, Florida 32809
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Designation:	FiberCube® Laser Workstation
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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"

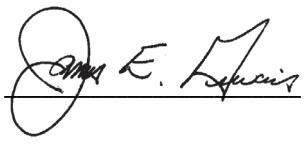
CSA C22.2 No. 61010-1-12:2012 Ed. 3+U2 "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use; Part 1:
General Requirements"

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: 5009261

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

Date: January 04, 2023

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LaserStar Technologies Corporation®
Library Publication Data

FiberCube® 3803 Series Workstation

Setup Guide, 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)**.

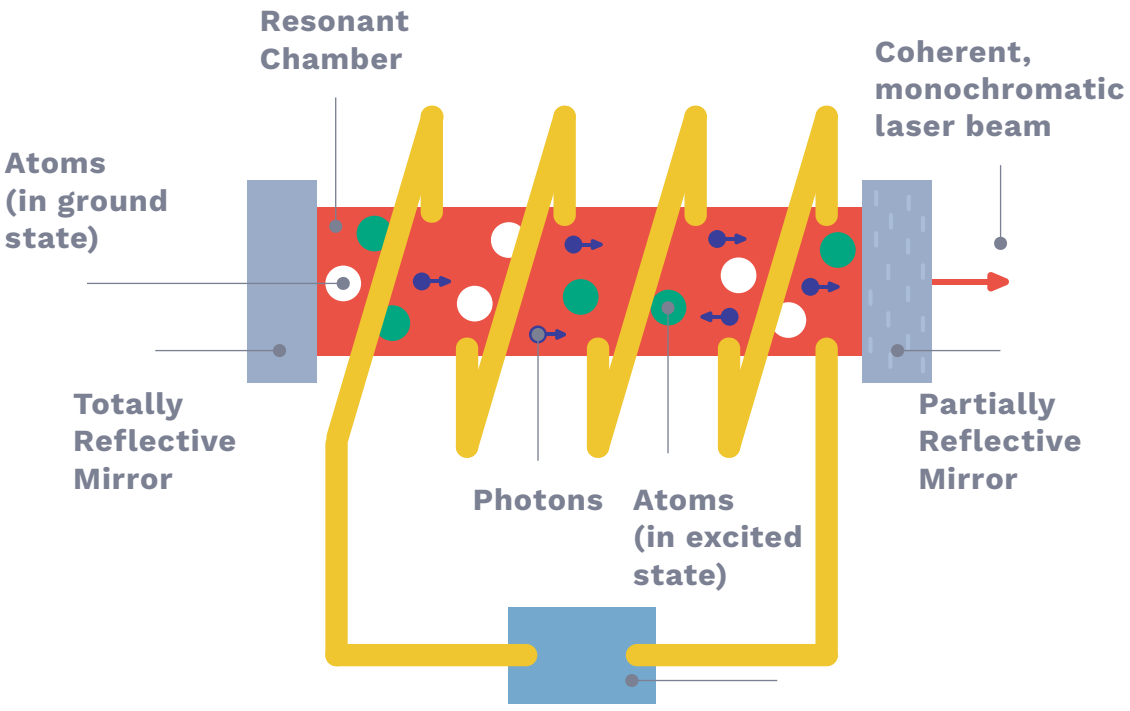


Figure 1
(Components of the laser)

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)**.

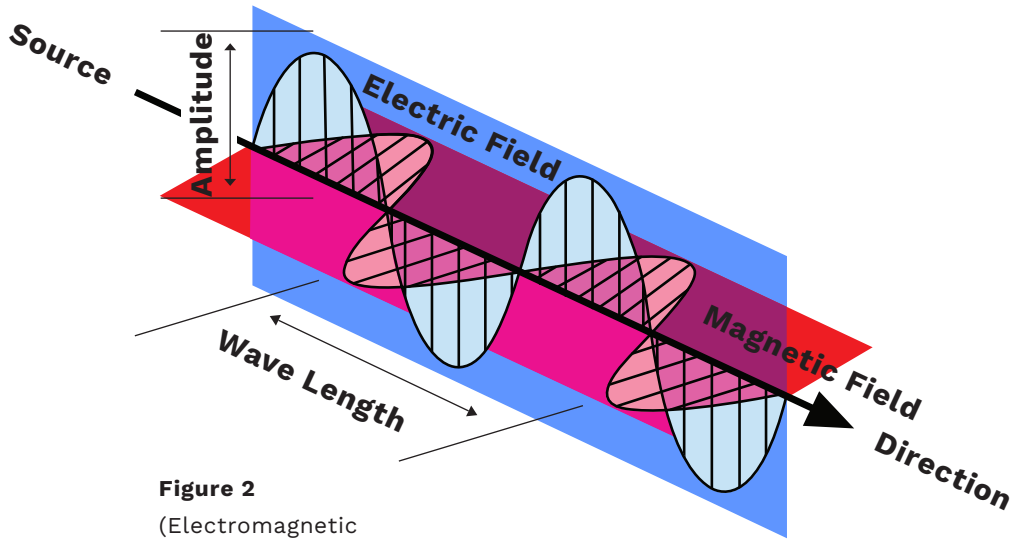


Figure 2
(Electromagnetic wave)

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)**.

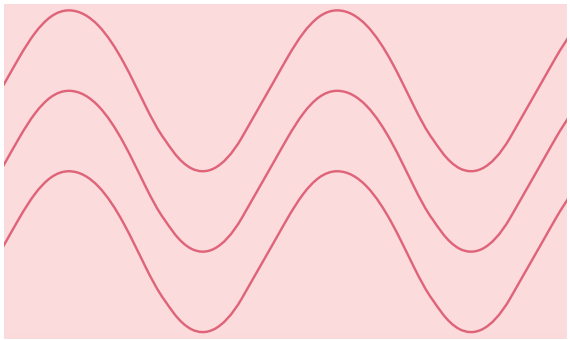


Figure 3
(Coherent, monochromatic, directional light)

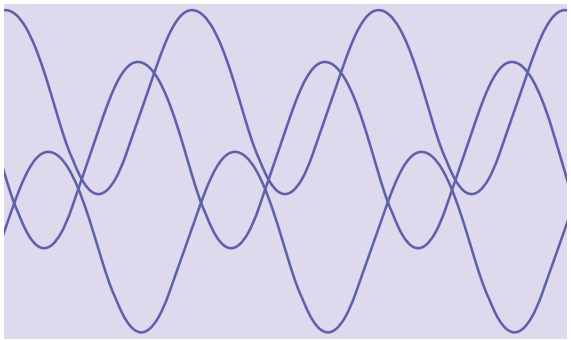


Figure 4
(Incoherent, monochromatic directional light)

I. Introduction

Fiber Medium Laser: About, Standards, and Technical Data

A fiber laser is a device in which the active gain medium is an optical fiber doped with rare-earth elements, elements such as erbium, ytterbium, and neodymium. They are related to doped fiber amplifiers, which provide light amplification without lasing. Solid-state lasers or laser amplifiers where the light is guided due to the total internal reflection in a single mode optical fiber are instead called fiber lasers. The guiding of light allows extremely long gain regions providing good cooling conditions; fibers have high surface area to volume ration, which allows for efficient cooling. In addition, the fiber's wave guiding properties tend to reduce thermal distortion of the beam.

Fiber lasers are designed using a double-clad fiber, which consists of a fiber core, as well as an inner and outer cladding. The index of these three concentric layers is chosen so that the fiber core acts as a single-mode fiber for laser emissions, while the outer cladding acts as an efficient multi-mode core for the pump laser. This allows the pump to propagate a large amount of power into and through the active inner core region, while still having a high numerical aperture (NA) permitting conditions that ensure effortless launching.

The fiber laser produces a very high energy density light beam at the focal point of a lens; this light energy is many times more concentrated than is possible with normal light. The energy "hot light" created at the focal point in a relatively short time (0.5 to 20 ms) heats the workpiece beyond its melting point and thus enables a weld.

The affected area has a limited range — approximately 0.20 to 2mm, depending on the type of material. The laser light welds two metals together, and thus, permits safe, durable, precise, and non-warped joining of metal materials in the form of a spot or seam. Because of the very short time of the laser pulse, the zone of heat influence is limited to the immediate vicinity of the welded spot or seam.

The characteristics of a laser pulse, and thus the effect on the material, can be influenced by the operating parameters joules (energy) and pulse length (width). The joules effects the amplitude while the pulse length influences the width of the laser pulse.

In practice, the effect of both parameters while welding metals is as follows:

- The joules first influences the weld depth.
- Pulse length predominantly influences the diameter of the welding point.
- Focus influences weld depth, as well as the diameter of the weld spot. When the diameter of the weld spot is increased, weld depth is simultaneously reduced.

Fiber Medium Laser: About, Standards, and Technical Data Continued on Next Page

Fiber Medium Laser: Advantages of Ownership

+ Focused Efficiency

The inherent properties of light ensure that it can be easily delivered to a movable focusing element, which is important for laser cutting, welding, and folding of metals and polymers.

+ Sustained Output Power

Fiber lasers can have active regions several kilometers long, providing **extraordinarily high optical gain**. In addition, because of fiber's high surface area to volume ratio, these devices are capable of highly-efficient cooling, which allow the laser to support kilowatt levels of continuous power output.

+ Superior Optical Quality

The wave-guiding properties of fiber reduce or eliminate thermal distortion along the optical path, typically resulting in a **diffraction-limited, high-quality optical beam**.

+ Conveniently Compact

Because the fiber material can be bent and coiled to save space, fiber lasers are much more compact when compared with rod or gas lasers of a comparable power.

+ Unwavering Reliability

Fiber lasers exhibit high vibrational stability, extended lifetime, and allow for **50,000+ hours of maintenance-free operation**.

- High-peak power coupled with smaller, more controlled pulses resulting in more precise marking, engraving, and cutting results.
- Supplimental power and improved beam quality ensure cleaner cuts and edges, in addition to faster working speeds.
- Intelligent design and a modular build allow for convenient turnkey operation, resulting in less down-time and maintenance, as well as lower cost of ownership.

FiberCube® 3803 Series Marker

Equipment Overview

The FiberCube® 3803 Series marker is a compact, turnkey, single-user operated laser device designed for marking, engraving, and cutting applications. This device can be operated with or without an enclosure, allowing for unique versatility, while still offering all the benefits of contact-free, abrasion-resistant, permanent laser marking, that's transferrable to nearly any surface or material.

The FiberCube® marker is a **class 1** laser when installed in a **class 1** enclosure and while the front door is closed, the **setup key switch** remains in the "off" position, and the key (for the key switch) is removed and remains stored in a secure location. When the **setup key switch** is in the "off" position and the front door is open, the FiberCube® marker is a **class 3R** laser (when the **focus diodes** are in the "on" position); 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 wear the appropriate laser protective eyewear.

Both standard and customizable platforms are available for the marker, ranging from simple enclosures to more advanced variations with integrated x, y, and z motion (and step-and-repeat laser marking with coordinated programmable rotary motion) for seamlessly marking around a circumference; motion which is easily configured and controlled with the marking software.

Whether choosing from either a standard or customized platform, each device is sure to offer the speed, reliability, and flexibility required to meet stringent quality control and process certifications 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; position and height are determining factors that directly affect these results and outcome. Workpiece height is correct when the surface of the part remains in-focus while underneath the microscope.

In addition to the positioning, 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 argon (inert) gas or other similar non-reactive gases. With the use of an accompanying non-reactive gas while the laser beam is active, an endothermic reaction occurs as material is removed. The focusing rules for supporting endothermic reactions when cutting (not marking or engraving) requires focusing the laser beam at (or just below) the bottom area of the part surface. **(Note: This device may be equipped with a separate, and optional argon [inert] gas valve.)**

Another material removal process, called an exothermic reaction, uses gas with accelerant properties; such as oxygen under high pressure. With exothermic reactions, intense energy from the laser beam vaporizes — or literally boils — cut material as oxygen reacts vigorously with the liquid molten material.

The focusing rules for supporting exothermic reactions when cutting (not marking or engraving) require the focus position to be above the surface (for thick materials) and just into the top surface (for thinner materials).

Many of the vapors produced during marking, engraving, or cutting are known to be harmful when enhaled or breathed for any length of time. With prolonged or continued exposure, these toxic fume can result in serious health risks and poor health. To ensure safety and preserve the health of the operator and others who work in nearby areas, hazardous fumes should be extracted from the workspace with the use of an external exhaust system.

FiberCube® 3803 Series Workstation: External Components and Body Configuration

Figure 5
(FiberCube® 3803 Series Marker)

External Components and Body Configuration
Continued on Next Page

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. Chamber Enclosure (optional removable automation chamber available)
2. Optical Rail Assembly
3. Scanner Head (with focus diodes)
4. Workpiece Rest (holds or secures the workpiece while marking; not shown)
5. Splash-protective Observation Window
6. Controls Panel
7. Laptop Computer
8. Wheel Locks (×2)

Workpieces or parts within the **chamber enclosure (1)** can be observed through the **splash-protective observation window (5)**. The observation window is made from a specialized material and allows for absorption of harmful laser radiation, as well as the ultraviolet (UV) component of plasma light.

Notes

Technical Specifications

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)
- Foot Pedal Switch (for triggering laser pulses or beginning an automated marking cycle)
- Work Chamber Exhaust System (with accompanying filter)
- Side Table (for resting the laptop while in use with the workstation)

FiberCube® 3803 Series Workstation: Device Components and Build Specs				
A typical system includes a variety of standard and optional components				
Laser Medium	**Fiber (20W)**	**Fiber (30W)**	**Fiber (50W)**	**Fiber (60W)**
Pulse Energy (maximum)	1 mJ	0.85 mJ	1 mJ	2 mJ
Repetition Frequency	20 – 80 kHz	20 – 600 kHz	20 – 600 kHz	5 – 2000 kHz
Pulse Duration	90 – 120 ns	80 – 120 ns	140 – 200 ns	200 ns
Beam Diameter	7.5 mm	7.5 mm	7.5 mm	7.5 mm

Technical Specifications Continued on Next Page

Technical Specifications (continued)

FiberCube® 3803 Series Workstation: Device Components and Build Specs

A typical system includes a variety of standard and optional components

	Fiber (20W)	Fiber (30W)	Fiber (50W)	Fiber (60W)
Eye Safety Filters (view window; 1030 – < 2200 nm)	OD 8+	OD 8+	OD 8+	OD 8+
L × W × H (door closed)	99 × 59 × 81 cm (34 × 23 × 32 in)	99 × 59 × 81 cm (34 × 23 × 32 in)	99 × 59 × 81 cm (34 × 23 × 32 in)	99 × 59 × 81 cm (34 × 23 × 32 in)
L × W × H (door open)	99 × 59 × 130 cm (34 × 23 × 51 in)	99 × 59 × 130 cm (34 × 23 × 51 in)	99 × 59 × 130 cm (34 × 23 × 51 in)	99 × 59 × 130 cm (34 × 23 × 51 in)
Weight (varies; can range based on selected components)	82kg (180lbs)	84kg (185lbs)	86kg (190lbs)	89kg (195lbs)
Electrical Connections (single-phase)	10A, 120 – 240VAC, 50 / 60Hz	10A, 120 – 240VAC, 50 / 60Hz	10A, 120 – 240VAC, 50 / 60Hz	10A, 120 – 240VAC, 50 / 60Hz

Notes

Notes

External Control Elements

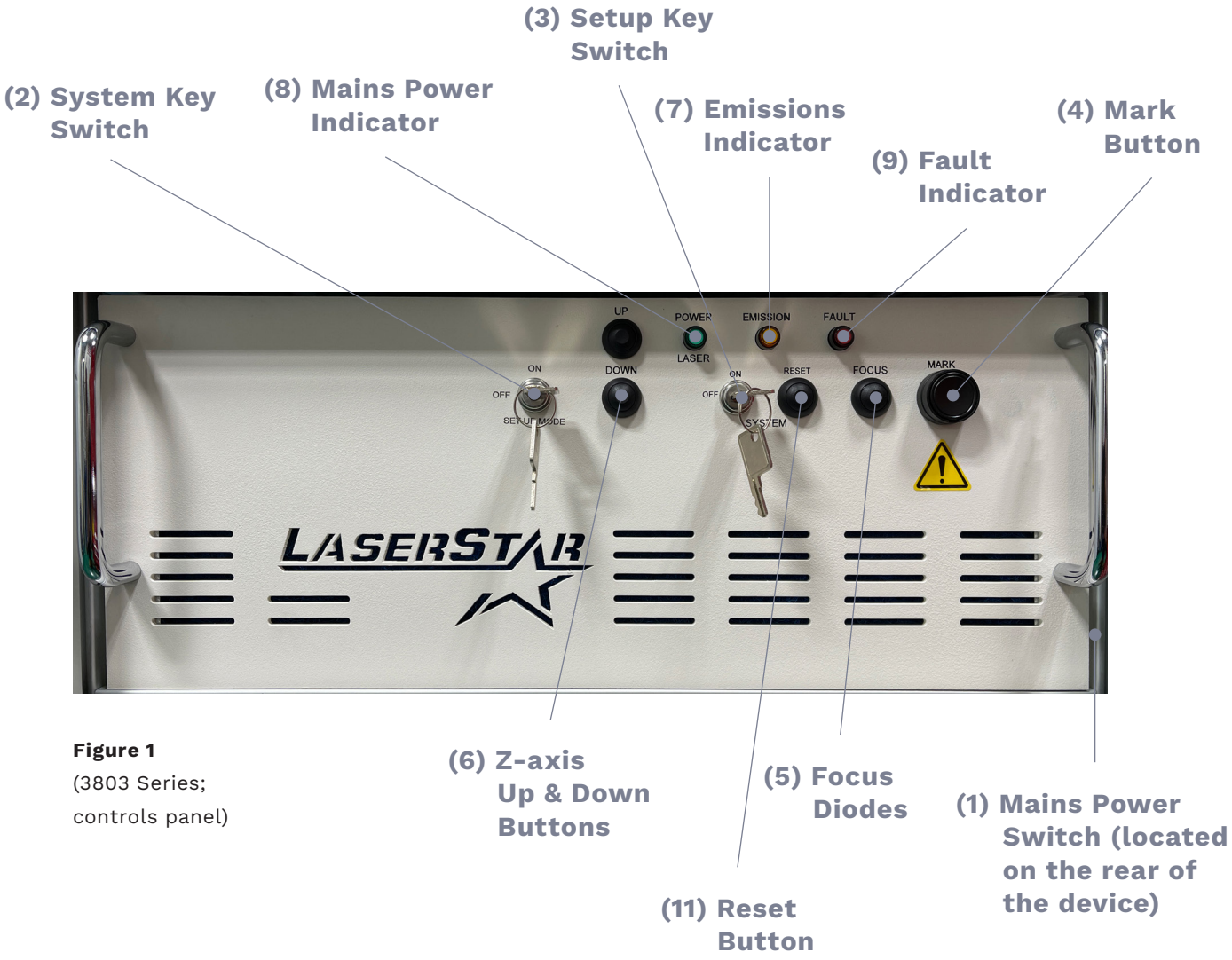


Figure 1
(3803 Series;
controls panel)

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 front door is open and the setup key switch is "on" (safety interlocks disabled) 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. **(Note: With the automated front door model, this button will start the automated cycle: close the front door > mark > open the front door)**.

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.

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 when using this device.

External Control Elements Continued on Next Page

External Control Elements

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

   The **z-axis up** and **down buttons (5)** are used to adjust the height and positioning of the z-axis. When the **z-axis up** and **down buttons (5)** are held continuously, the speed for adjusting the z-axis increases. When the **z-axis up** and **down buttons (5)** 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.**

6. **Emissions Indicator:**

   The **emissions indicator (6)** is turned "on" (amber) after the **system key switch** is turned "on" and the **Reset button** is pressed. While the **emissions indicator (6)** remains "on," the laser is enabled and ready to fire.

7. **Mains Power Indicator:**

   The **mains power indicator (7)** turns "on" (green) when the **mains power switch** is "on." **Attention:** This indicator blinks "on" and "off" when the **setup key switch** is "on."

8. **Fault Indicator:**

   The **fault indicator (8)** 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 you notice the indicator blinks "on" and "off;" this is an indication that the remote interlock is not plugged in.

9. **Power Door Up & Down Buttons (optional; not shown):**

   The **power door up** and **down buttons (9)** are used to open or close the **front door** of the enclosure.

External Control Elements Continued on Next Page

External Control Elements

11. <u>Reset Button</u>:

The **reset button (11)** is used to turn “on” the computer, enable the laser source to fire, and power-up the drive axes. The **emissions indicator** will turn “on” (amber) when the laser source is enabled.

Foot Pedal Switch Connector

The **foot pedal switch connector** (located on the rear panel) is used for marking, to fire the laser or begin an automatic cycle.

Remote Mark (optional)

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

In addition to the foot pedal switch 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

Foot Pedal Switch

The workstation is equipped with a foot pedal switch for triggering laser pulses or to begin an automatic cycle. The foot pedal is connected to the marker via several flexible cables; these can be moved and re-positioned by the operator, as needed.

The foot pedal switch has two (2) operating positions with the following functions:

stage 1:

- Depress the foot pedal partially (you'll feel initial resistance); this will trigger the inert (argon) gas supply to switch “on.”

stage 2:

- Depress the foot pedal fully (until it reaches the floor); this will trigger a laser pulse. If the inert gas supply is connected to the welder, it will remain “on” until the foot pedal switch has been fully released.

When releasing laser pulses consecutively, the following options are available:

- The foot pedal switch can be partially released after each laser pulse, and then pressed down again, right away.

- If the pulse frequency is set for continuous pulse mode (Hz), while depressing and holding down the foot pedal, a series of laser pulses will fire consecutively.

- If **Burst Mode (B)** is set (and while depressing and continuing to hold the foot pedal), a number of pulses (chosen by the operator) are released in quick succession.

Remote Interlock Connector

In addition to the foot pedal switch connector, there is a remote interlock connector available to readily connect the device to a secondary interlock circuit (such as an entry door) into a specific laser room. The remote interlock can be bypassed by using the remote interlock shorting cap, p/n 101-36-0036. For information on connecting or bypassing this feature, be sure to reference the installation instructions (see **Remote Interlock** on **page 60**). For the location of the remote interlock connector, refer to **Service > External Fuses & Rear Connections**.

Locking Brake

The front wheels of the workstation are equipped with a locking brake to help secure the machine and prevent unintentional movement. Pressing the brake lever down will activate the brake.

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® 3803 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 incorporates a **class 3R laser** (used for pointing, as well as focusing on workpieces; some models use a **class 2 laser**). In addition, a **class 4 laser** can be supplied in a **class 1** enclosure (these models operate with the **front door** closed) or a **class 4** openframe series.

To use the marker 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 the marker 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 welding workstation. 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 machine.

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 marker.

General Information

The FiberCube® 3803 Series Marker incorporates a **class 4 laser** (solid-state) with a high-powered optical output. **This device emits both visible and invisible radiation; the invisible radiation 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 your 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, you should 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 without the workspace protective housing or front door in place, 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 output power and intensity generated by this **class 4** laser can pose significant dangers, including fire hazards; a wide range of materials are susceptible and **specific 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.

Essential Safety Information

The guidelines below ensure safe operation of the laser marker:

- Read this manual; it contains guidelines and important information for ensuring the safety of the operator and outlines procedures for proper use of the marker.
- Anyone who works with or operates the laser marker must be informed of pertinent safety information and applicable safety regulations; this is a prerequisite for safe, trouble-free operation of this machine.
- Anyone who works with or operates the laser marker 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 personel who work with and operate the marker. 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 marker 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 marker. Employers are responsible for ensuring that all operating personel:

- 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 in acknowledgment;
- 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 marker.

Personnel Requirements

Employees who are trained and authorized to work with the marker 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 in acknowledgment.

Potential Equipment Dangers

The FiberCube® 3803 Series Marker 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 machine 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 marker 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 marker has been switched “off” and appropriate measures have been taken to prevent the machine 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 service-related tasks.)**

Informal Safety Measures

The operating instructions for the workstation must remain at the installation site. In addition, all applicable regulations for ensuring safety while working with or operating laser equipment (including 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) must also be strictly adhered to. **All safety and warning labels attached to this device must remain intact, legible, and accessible; see the section on 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 marker. In addition, trainees are only permitted to use the machine while under the supervision of an experienced operator.

Safety Measures for Normal Use

- Before using the machine, you must 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 machine at least once a week for external damage and to ensure soundness of all safety mechanisms and other components (splash-protective observation window, laser protective win dow, interlock circuits, chamber enclosure, chamber access door). **The marker must only be used after routine safety checks are performed and the machine 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 “Notes on Maintenance”).**

Particularly Dangerous Points

- **Particularly dangerous points must be labeled as such; various warning labels and their location on the machine are described in the section entitled, “Labeling.”**

- **This workstation 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 welding 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 device 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®.**

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 machine.

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 knowledgable and informed on all important safety protocols for the machine, 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 marker, 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 (figures 1 – 7; continued)

(7b)
[48-40006]

Figure 1
(3803 Series;
front view)

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

Important Safety & Informational Labels
Continued on Next Page

Important Safety & Informational Labels (figures 1 – 7; continued)

Device Make Label [250V AC 10A SB]

(8) [403-013]

(11) [01-40009]

(13) [479-3415]

(12) [403-451]

(9a) [01-40010]

Figure 2
(3803 Series Marker; rear view)

Important Safety & Informational Labels
Continued on Next Page

Important Safety & Informational Labels (figures 1 – 7)

(3)
[48-40002]

Figure 3
(3803 Series Marker; right-side view)

(4b)
[48-40007]

Figure 4
(3803 Series; left-side view)

(4a)
[48-40004]

Important Safety & Informational Labels
Continued on Next Page

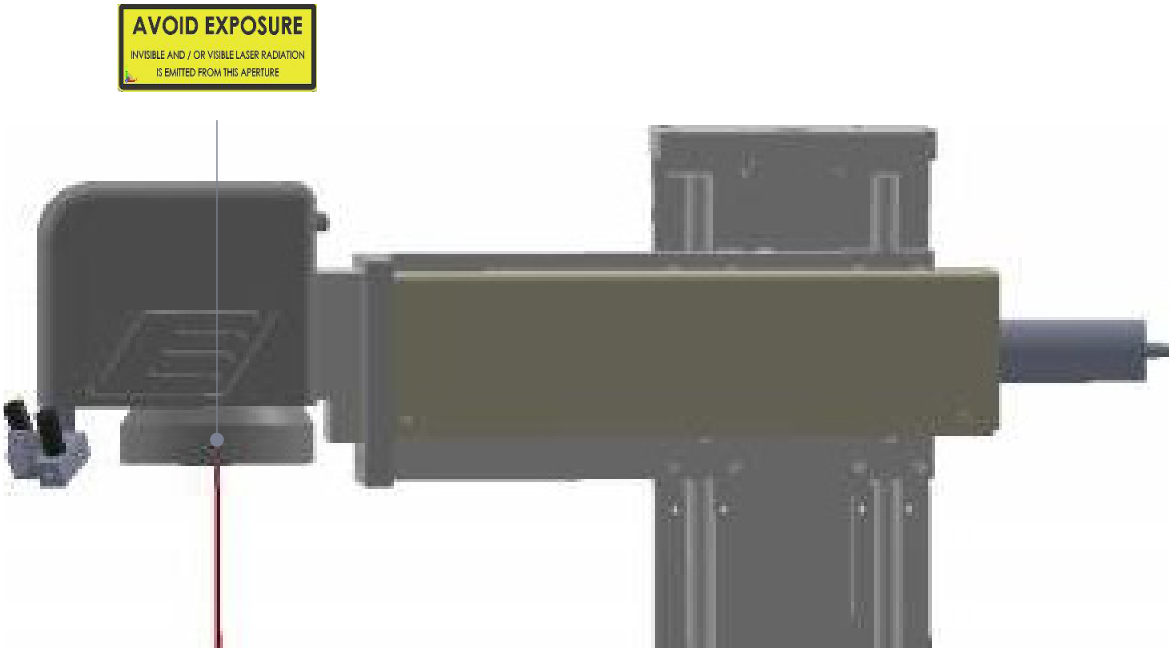


Figure 5
(Collimator
and collimator
housing)

Important Safety & Informational Labels
Continued on Next Page

Important Safety & Informational Labels (figures 1 – 7; continued)

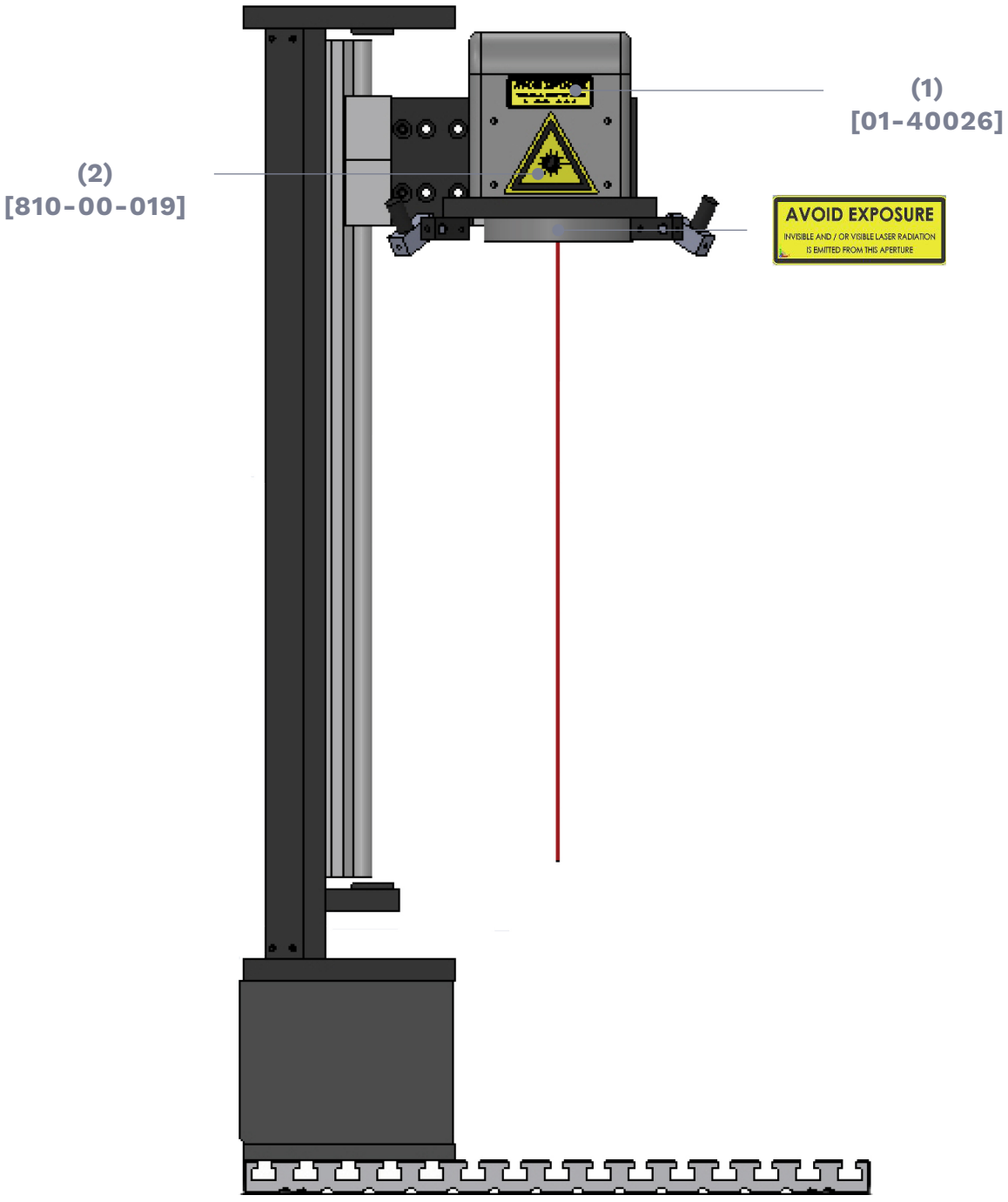


Figure 6
(Optical rail assembly and scanner head)

Important Safety & Informational Labels (figures 1 – 7; continued)

(1)
[01-40026]

(2)
[810-00-019]

(14)
[810-8001-21]
Applicable
for Motorized
Z-axis Only

Figure 7
(Collimator
and collimator
housing)

Important Safety & Informational Labels
Continued on Next Page

Notes

Label Reproductions

Complies with **21 CFR 1040.10** and **1040.11**, except for deviations pursuant to **Laser Notice No. 50**; dated July 26th, 2001.

Aperture (1a or 1b; model dependent)

(1a)
[71-40026]

(1b)
[01-40026]

General Warning

(2)
[810-00-019]

Visible and / or Invisible Radiation (3a or 3b; model dependent)

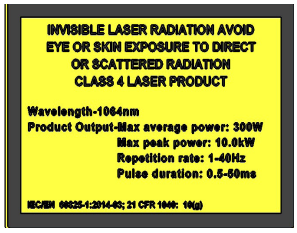
(3a)
[71-40025]

(3b)
[01-40025]

Label Reproductions Continued on Next Page

Label Reproductions (continued)

Invisible Radiation Output & Standards (model dependent)



(4)
[13-40011]

Visible Radiation Output & Standards (5a or 5b; model dependent)

(5a)
[48-40004]

(5b)
[48-40007]

Non-interlocked Protective Housing (6a or 6b; model dependent)

(6a)
[71-40028]

(6b)
[01-40028]

Label Reproductions Continued on Next Page

Label Reproductions (continued)

Device Certificate or Identification (model dependent)

(7)
[403-003]

Danger: High Voltage (be sure to disable power source <u>before</u> servicing)

(8a)
[01-40010]

(8b)
[810-00-016]

Operator Must Read Manual <u>Prior</u> to Use

(9)
[810-8001-10]

Label Reproductions Continued on Next Page

Label Reproductions (continued)

High Energy, High Voltage, Danger to Life

(10)
[01-40009]

ETL Certification (model dependent)

(11)
[403-450]

Wait 5 Minutes <u>Before</u> Discharging

(12)
[01-40012]

208-240 Volts AC (model dependent)

(13)
[479-3414]

Label Reproductions Continued on Next Page

Label Reproductions (continued)

Device Certificate or Identification (model dependent)

(14)
[48-40001]

Caution: Pinch Point Hazard; Keep Hands Clear (15a or 15b; model dependent)

(15a)
[810-8001-21]

(15b)
[810-8001-22]

Notes

Notes

III. Installation

Overview and Requirements

This section describes the requirements that must be fulfilled to ensure faultless operation of the laser marker. Details for installation, setup, and transport are also provided 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 regultions (e.g. IEC/EN Standard 60825–1:2014).

To ensure faultless operation of this device, 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 marker should be installed and remain in a location that is as dust-free as possible.
- Never expose this machine 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 machine'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, the marker underwent a thorough inspections process and rigorous software testing. This device was was delivered to the shipping carrier in faultless condition. If you suspect mishandling, before opening the shipping container, be sure to check the outside for indications of damage that may have occured in transit.

- If possible, use the supplied skid to transport the device to its final destination (the intended installation site).
- When unpacking the device 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 included quick setup guide: FiberCube 3803 Series Laser Marker – Quick Setup Guide (located in the back of this manual).

Standard Shipping Container Contents

- FiberCube® 3803 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 supplied 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

Removing the Shipping Stabilizer Bolts (counterweight securing bolts)

<u>Two (2) persons are recommended for the steps that follow</u>:

1. Remove the rear panel, which is secured by Phillips #2 M4 screws (see **figure 3**; **page 58**). **<u>Attention</u>:** Before removing the panel, it may first be necessary to loosen the cable-retaining nut to allow the cable to slide out, before proceeding.

Figure 1
(3803 Series; rear panel)

Counterweight Securing Bolts (requires 4mm hex key wrench; x2 total)

Removing the Shipping Stabilizer Bolts (counterweight securing bolts) Continued on Next Page

Removing the Shipping Stabilizer Bolts (counterweight securing bolts; continued)

2. Using a 4mm hex key wrench, remove the two (2) shipping stabilizer bolts (counterweight securing bolts) positioned along each side at the rear of the laser system (reference **figure 1**; **previous page & figure 2**; **below**).

3. Reinstall the rear panel and tighten the cable-retaining nut.

Figure 2
(Removing the counterweight securing bolts)

Rear Panel Removal (location of M4 screws)

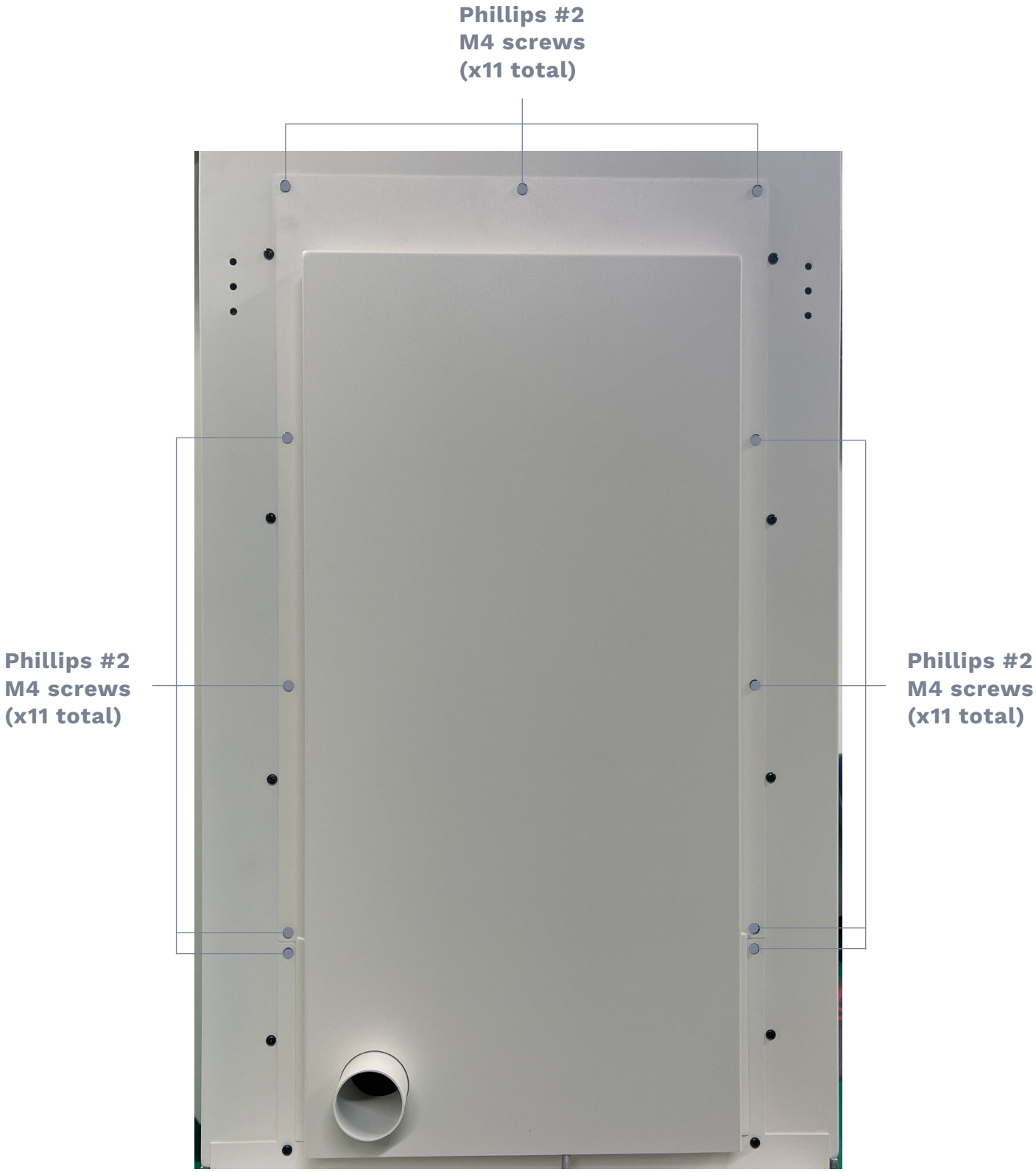


Figure 3
(Rear panel removal)

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 machine) 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. Before applying AC voltage, each of the device's switches (**mains power switch**, **system key switch**, and **setup key switch**) should be “off.”

The machine’s model is the determining factor for AC requirements; check that the AC supply agrees with the specifications on the device's certificate or ID label (located on the rear of the marker). This label includes important information for your machine, including the device's model number, serial number, and AC requirements. **Attention: Make sure the workstation 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; within Maintenance**.

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 machine).

2. Manually tighten the connector locking ring, turning clockwise, until finger tight.

External Exhaust System

All **class 1** 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 marked, engraved, or cut) 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 the **Declaration of Compliance** for heavy industrial equipment.

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.

Notes

Disassembly and Transport

To prepare the equipment for transport over short distances, you will only need to unplug the power supply and inert gas supply and loosen the locking brake(s) on the front wheels.

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**.

Notes

Notes

IV. Operation

Overview and 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.)

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

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; page 122). 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.

When firing the laser with the front door open and setup key switch "on," the marker will emit class 4 laser radiation. Be sure to avoid eye or skin exposure 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.)

Overview & Fundamentals Continued on Next Page

When enabling power to the device (and before launching the LaserStar® Premier 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, shut-down the LaserStar® Premier software, and turn "off" the mains power switch. Restart the marker following the standard start-up procedure. (Note: A list of fault messages and additional system recovery procedures can be found in Troubleshooting Basics; section VI: within this manual.)

The operator should not have any part of their body in the chamber or 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 machines’ status.

Manual Operation

Control Panel:

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

Laptop Computer & LaserStar® Premier Software:

2. The LaserStar® 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® Premier software.

Automated Operation (optional)

Control Panel:

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

Laptop Computer and LaserStar® Premier Software:

2. The LaserStar® 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® Premier software.

Initial Operation (manual front door or openframe)

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**; **page 118**.

When making adjustments to the **final focus lens** for a different work distance or field of view, you must **recalibrate the lens using the LaserStar® Premier 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.

Figure 1
(Switching "on")

Notes

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. **<u>Attention</u>: Starting the Premier program without the USB cable plugged in at both ends may corrupt the 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, you will notice icons for the **LaserStar StarFX® Premier Design Studio software** and the accompanying software user manual.

Switching “On” the Workstation Continued on Next Page

Switching “On” the Workstation

Operator Action >	System Response ⊗
Double-click the **LaserStar StarFX® Premier Design Studio software icon**. **(Note: Refer to the Premier software user manual for helpful tips and instructions on programming, setup, and usage.)**	The LaserStar Technologies Corporation® logo displays briefly, followed by the main interface screen for the **StarFX® Premier Design Studio software**.
The **emissions indicator** on the controls panel should still be “off.”	The emissions indicator will become 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 now ready for use.
Proceed to **Programs, Parts & Setup.**	Follow these instructions to proceed with using the workstation.

Notes

Switching “Off” the Marking System:

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. Close the front door of the work chamber.

4. Turn the **setup key switch** “off” or to the “O” position.

5. Turn the **system key switch** “off” or to the “O” position.

6. Turn “off” the **mains power switch**.

7. Remove the **system key** for the device and store it in a secure location; only authorized personnel should have access.

Figure 1
(Switching “off”)

Notes

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 ⊗
Open the **front door** of the enclosure and 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.)**	If the **setup key switch** is "on," the **power indicator** will blink when the door is open or closed.
Press the **focus button** on the controls panel to turn "on" or "off" the **focus diodes**. The **focus diodes** are used to accurately position and distance (z-axis) the laser's **final focus lens** in 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 **focus diodes** or their specular reflection. It is recommended also that the operator wear 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 beam 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 section of this manual. If adjusting the focus diodes, refer to Appendix C and 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.
Turn the **setup key switch** (applicable for enclosed systems only) to the "on" or "I" position.	The laser can now fire with the **front door** of the enclosure open. The **power indicator** will blink continuously to indicate that the safety interlocks have been disabled. Avoid exposure of the skin or eyes to direct or scattered radiation. All persons within the Nominal Ocular Hazard Area (NOHA) are required to wear the appropriate laser protective eyewear.

Programs, Parts & Setup Continued on Next Page

Operator Action >	System Response ⊗
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) 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 C, as well as the Premier software manual.)**
Select the **stop icon** on the **StarFX® Premier software** icon ribbon **(screen 4)**.	The red 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 software** or; Press the **mark button** located on the controls panel or; Depress the **foot pedal** (optional accessory; plugs into the rear of the device).	The **mark icon** (located on the right-hand side of PC monitor) will change from red to green. The part program will begin marking, engraving, or cutting (during this process, the user will notice “marking” displays on the screen). During the cycle, if you need to stop marking, click the **stop button**. **(Note: For single cycle operation, make sure that continue is not selected.)**
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: Reference Focusing and Defocusing Guidelines in the Appendix of this manual.)**
Turn the **setup key switch** to the “off” or “O” position.	The **power indicator** will stop blinking and switch to green. **(Note: Once setup is completed, be sure to remove the setup key and place it in a secure location (should remain accessible only to personel who are authorized to perform device setup).**

Programs, Parts & Setup Continued on Next Page

Operator Action >	System Response ⊗
Close the front door of the enclosure.	The device is ready for use.

Notes

Parts Marking, Cutting & Engraving

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

Operator Action >	System Response ⊗
On the computer desktop, double-click on the **LaserStar StarFX® Premier Design Studio software icon**. **(Note: A manual for the StarFX® Premier software [in PDF format] is already saved on the computer.)**	The LaserStar® logo displays briefly, followed by the main interface screen for the **StarFX® Premier software.** **(Note: Refer to the StarFX® Premier Design Studio software manual for instructions on programming and usage.)**
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.
Open the **front door** of the enclosure and place the workpiece or part on or in the fixture. **(Note: The surface to be marked, engraved, or cut should be within the laser’s focal plane.)**	The part is loaded on the fixture.
Select the appropriate trace option from the trace menu. Then, select the **mark icon** or press the **mark button** on the controls panel.	The (red) 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: If making adjustments to the focus diodes, be sure to refer to Appendix C and the StarFX® Premier software manual.)**
Close the **front door** of the work chamber or enclosure (enclosed systems only).	The **emissions indicator** on the controls panel must be “on” to mark.

Parts Marking, Cutting & Engraving Continued on Next Page

Parts Marking, Cutting & Engraving (continued)

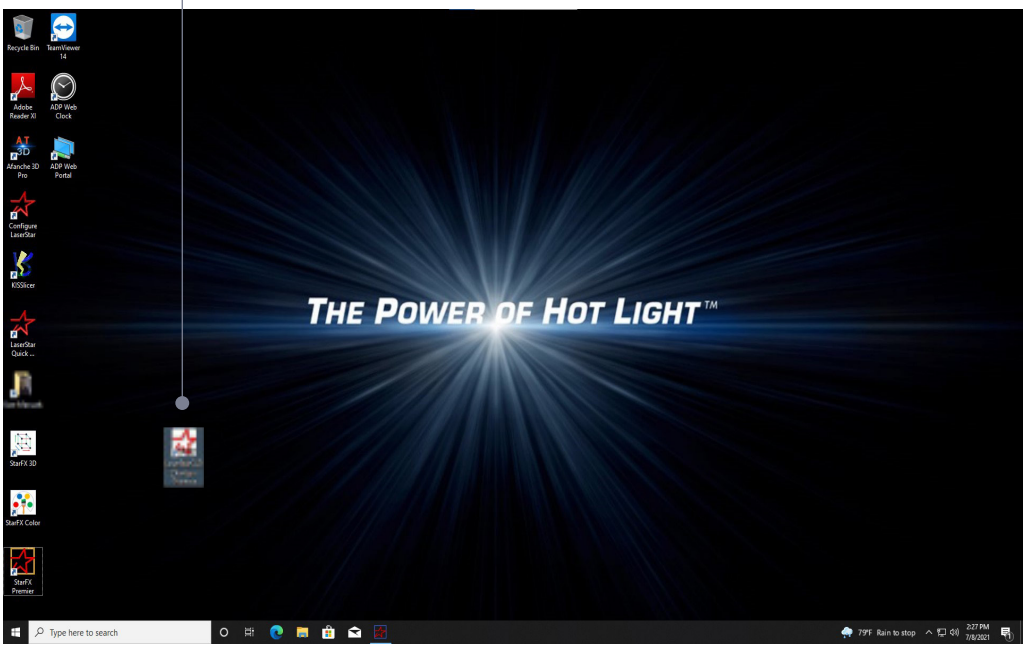
Operator Action >	System Response ⊗
The operator may begin the marking process using any of the following methods: Select the **mark icon** on the screen for the **StarFX® Premier Design Studio software** or; Press the **mark button** (located on the controls panel) or; Depress the **foot pedal** (optional component); plugs into the rear of the device.	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 **Premier software** icon ribbon).
The **front door** of the enclosure is opened during the part program cycle.	The laser will stop lasing, but the part program will continue.
To restart the part program after an abort, close the **front door** and select **mark**.	The part program will start marking from the beginning.
With the power door option, if the **mark button** on the controls panel is used to start the program, the **front door** will automatically open at the end of a cycle.	The **front door** will open at the end of the program.
The part program is complete.	The system will stop.

Notes

Notes

LaserStar StarFX® Premier Design Studio Icons and Software Screens

StarFX® Premier Design Studio Software Program



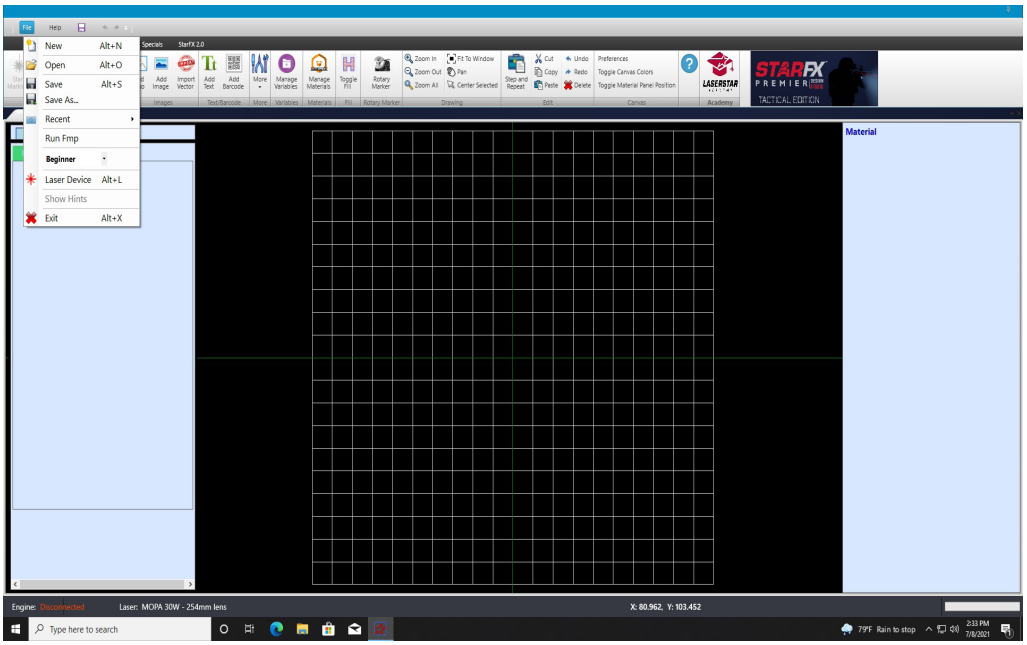
LaserStar StarFX® Premier Design Studio Software Manual

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

LaserStar StarFX® Premier Design Studio Icons and Software Screens Continued on Next Page

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.

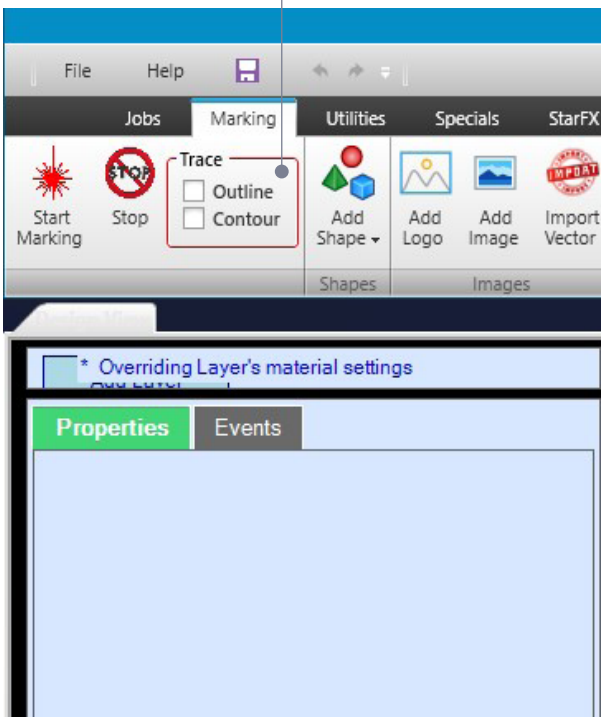


Screen 2
(Open an existing part program or generate a new one)

LaserStar StarFX® Premier Design Studio Icons and Software Screens Continued on Next Page

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

Select the appropriate trace option.



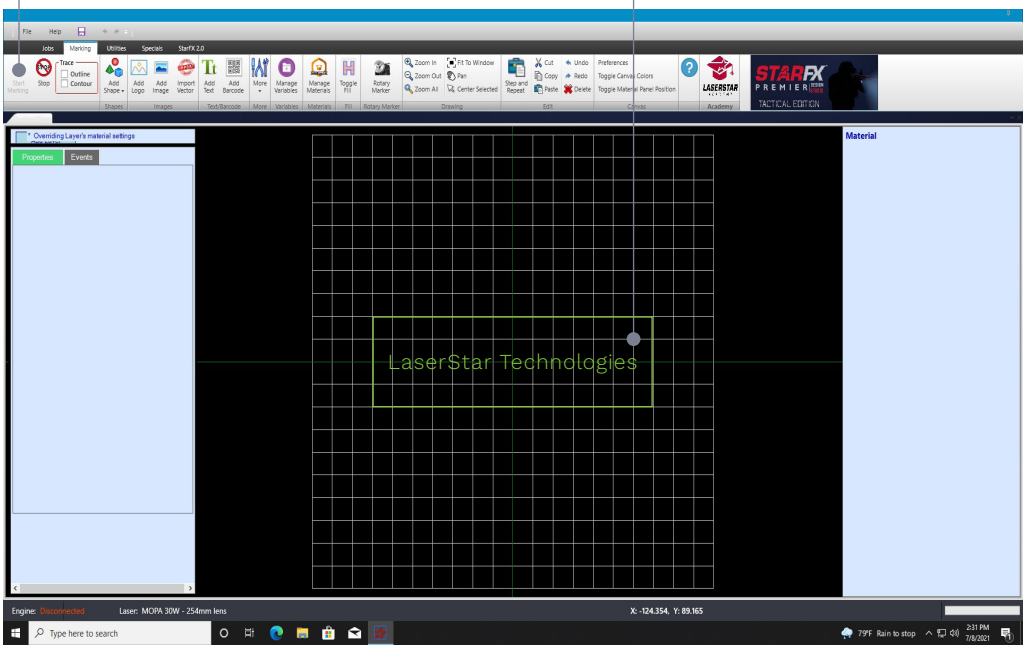
Screen 3
(Trace options)

LaserStar StarFX® Premier Design Studio Icons and Software Screens Continued on Next Page

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

To mark or trace, select the mark icon.

File opened for marking a rectangle, as shown.

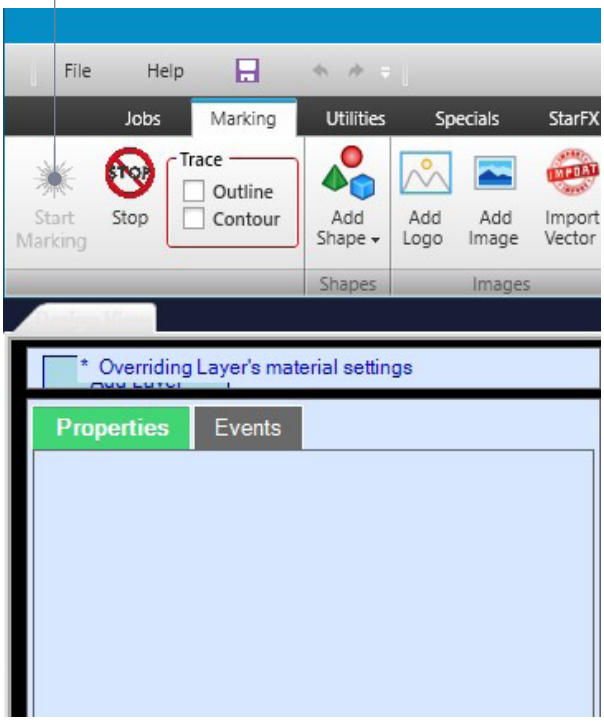


Screen 4
(Select the mark icon to mark or trace)

LaserStar StarFX® Premier Design Studio Icons and Software Screens Continued on Next Page

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

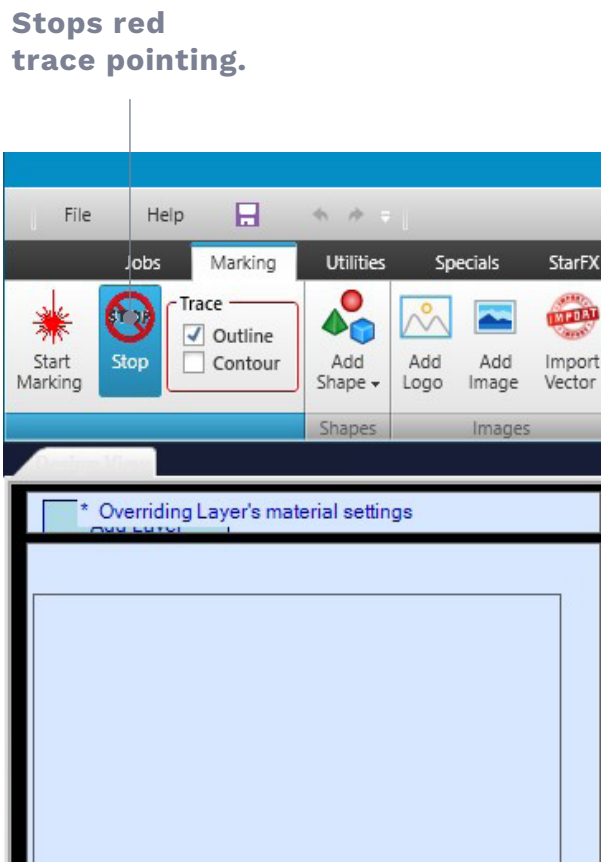
Grayed out icon indicates that the laser is currently marking.



Screen 5
(Stop button appears while marking process completes)

LaserStar StarFX® Premier Design Studio Icons and Software Screens Continued on Next Page

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

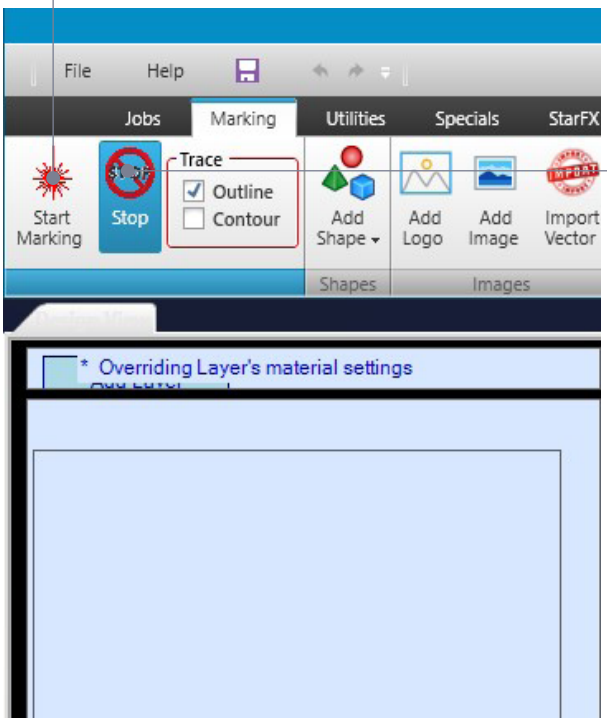


Screen 6
(Laser pointing diode active; select "stop" when setup is complete)

LaserStar StarFX® Premier Design Studio Icons and Software Screens Continued on Next Page

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

Indicates the part program is enabled and marking.



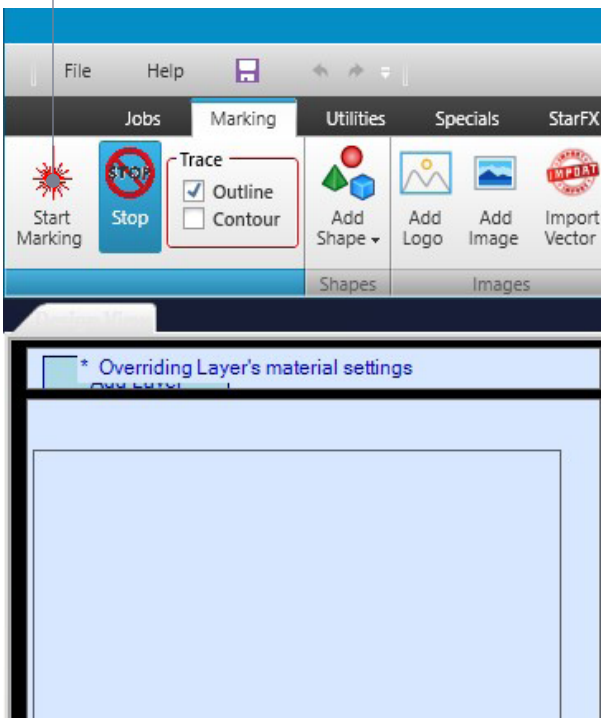
Select "stop" to halt the part program.

Screen 7
(Part program has been stopped or aborted)

LaserStar StarFX® Premier Design Studio Icons and Software Screens Continued on Next Page

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

Click “mark” to re-start the part program from the beginning.



Screen 8
(Restart the part program from the beginning)

LaserStar StarFX® Design Studio Icons and Software Screens Continued on Next Page

V. Maintenance

Overview and Requirements

Routine maintenance is a requirement for ensuring the safe and optimal operation of the marker. Regular maintenance intervals must be scheduled in accordance with the manufacturer's recommendations and requirements. **(Note: When working with an opened 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 or inadvertently). 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.

- If there's a risk of touching "live" components while at the worksite, and it's not possible to disconnect these components from their volt age 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 machine 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 you choose to use 70% isopropyl alcohol, a flammable liquid, be sure there's no contact with the stand-alone laptop computer; this will damage the display. Additionally, you should never use strong cleaning agents, such as powders or solvents to clean the equipment.**

2. The protective disk, which is located inside the work chamber, should be unscrewed from the focus lens 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 you prefer 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, you will notice metal splashes will adhering 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. Use a vacuum to clean the vents for the air filter (located on the front of the device's control panel).

2. The splash-protective observation window should be visually checked for cracks, voids, or other damage. **If you discover damage, be sure to replace the splash-protective observation window before using the device.**

Maintenance Intervals Continued on Next Page

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. Wait **five (5) minutes** for the chamber lights to cool.

2. Unscrew the knurled ring from the underside of the lens; turning counterclockwise, remove the component from the welding chamber — 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 the component to the underside of the lens.

Notes

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)

Notes

VI. Troubleshooting

Before troubleshooting is carried out on the machine, 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.

Equipment Malfunction

If you experience a malfunction with your machine 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	2461 Orlando Central Pkwy. Orlando, Florida 32809

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.”	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**; see **page 125**.
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
Continued on Next Page

Diagnosing & Troubleshooting Basics

Error or Issue	Possible Cause	Corrective Action
The laser turns "on," but will not mark or fire.	The interlock opened and closed while the part program was active and/or running.	Check to be sure the **Front door** of the **work chamber** is closed. Press the **Mark button**.
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; page 110**.
Message: "Cannot find dongle! Software will not work in demo state."	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
Continued on Next Page

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 once 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 once 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.

Diagnosing & Troubleshooting Basics
Continued on Next Page

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Notes

Fault Diagnostics Software

For support with troubleshooting and to obtain the fault diagnostics software, please contact LaserStar Technologies® Service Department.

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.

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

Notes

VII. Parts & Accessories

LaserStar Technologies Corporation® Approved Components	
Description	**Catalog Number**
Operation and Maintenance Manual (hardcopy)	58-99990-3803
Operation and Maintenance Manual (digital; USB flash drive)	58-99991-3803
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

Parts & Accessories Continued on Next Page

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 included on the supplied laptop computer.

Notes

Parts & Accessories Continued on Next Page

Notes

Notes

VIII. Original Equipment Warranty

LaserStar Technologies Corporation® ("LaserStar") warrants for a period of one (1) year, two (2) years, or three (3) 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 LaserStar Technologies Corporation® Service Department about a problem with your machine, we will, at our option, elect to:

1. Immediately send a replacement part; or

2. Request defective part(s) or alternatively, the entire machine 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 (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. This warranty does not provide coverage or protection for consumable parts (flashlamp [or flashlamp connectors], protective disk, air filter, water filter, deionized water, cuffs, fuses, halogen lights, LED lamps, final focus [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, or issuance of a credit for applicable equipment, 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 machine; 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 Rhode Island.

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 2461 Orlando Central Pkwy. Orlando, Florida 32809 (407) 248-1142	**Sales, Training & Repairs** One Industrial Court Riverside, Rhode Island 02915 (401) 438-1500	**Sales, Training, Repairs & Manufacturing** 20 East Foothill Blvd. Ste. 128 Arcadia, California 91006 (213) 612-0622

Notes

Notes

IX. Service

Before service is carried out on the machine, 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 machine 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 machine'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	2461 Orlando Central Pkwy. Orlando, Florida 32809

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

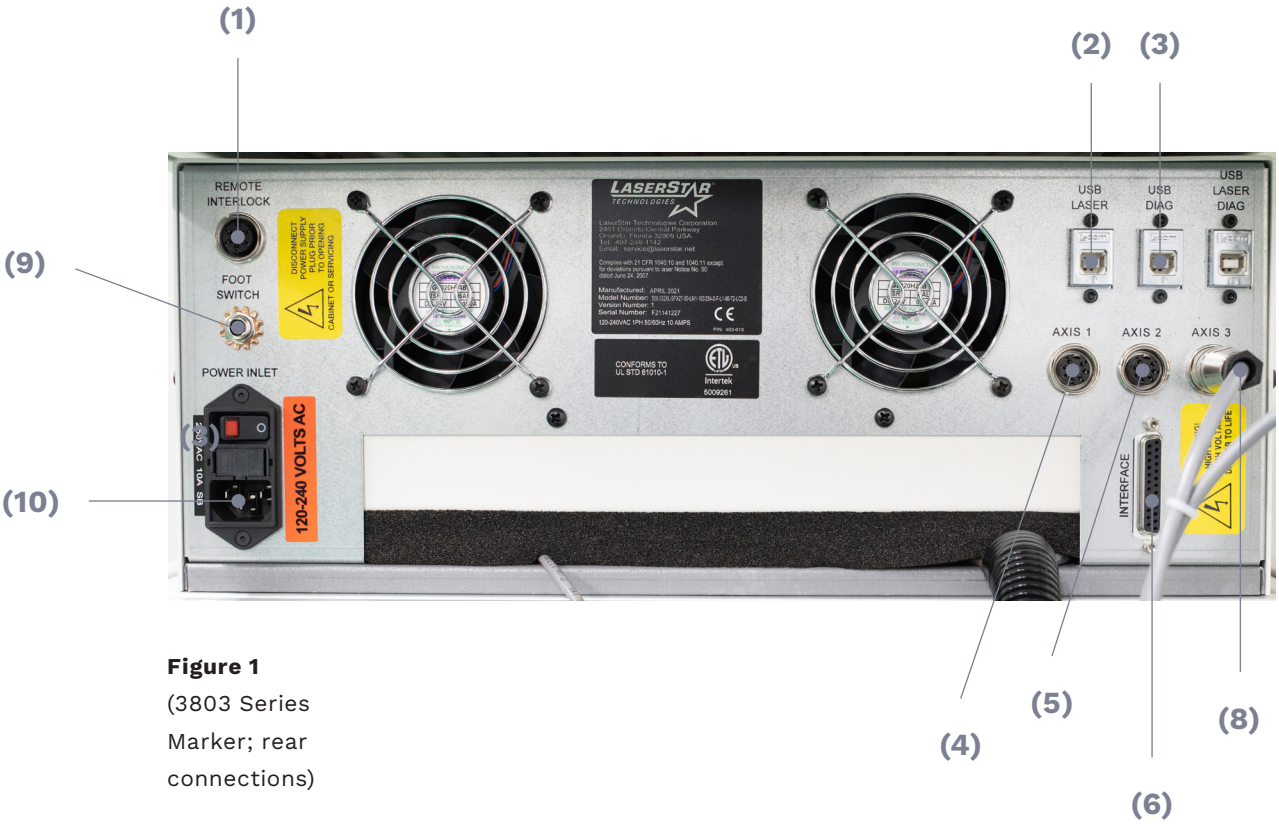


Figure 1
(3803 Series Marker; rear connections)

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.

Rear System Overview, Internal & External Connections Continued on Next Page

Rear System Overview, Internal & External Connections (continued)

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. **Chamber Exhaust:**

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

8. **Axis 3:**

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

9. **Foot Pedal Switch:**

   The **foot pedal switch (9)** is an external switch that can be used as a trigger source to fire the laser or begin a marking cycle.

10. **Power Input (main “on” “off”):**

    The **power input (10)** is the main port and source of power for the device.

Notes

IX. Service, Section B: Major Internal System Components

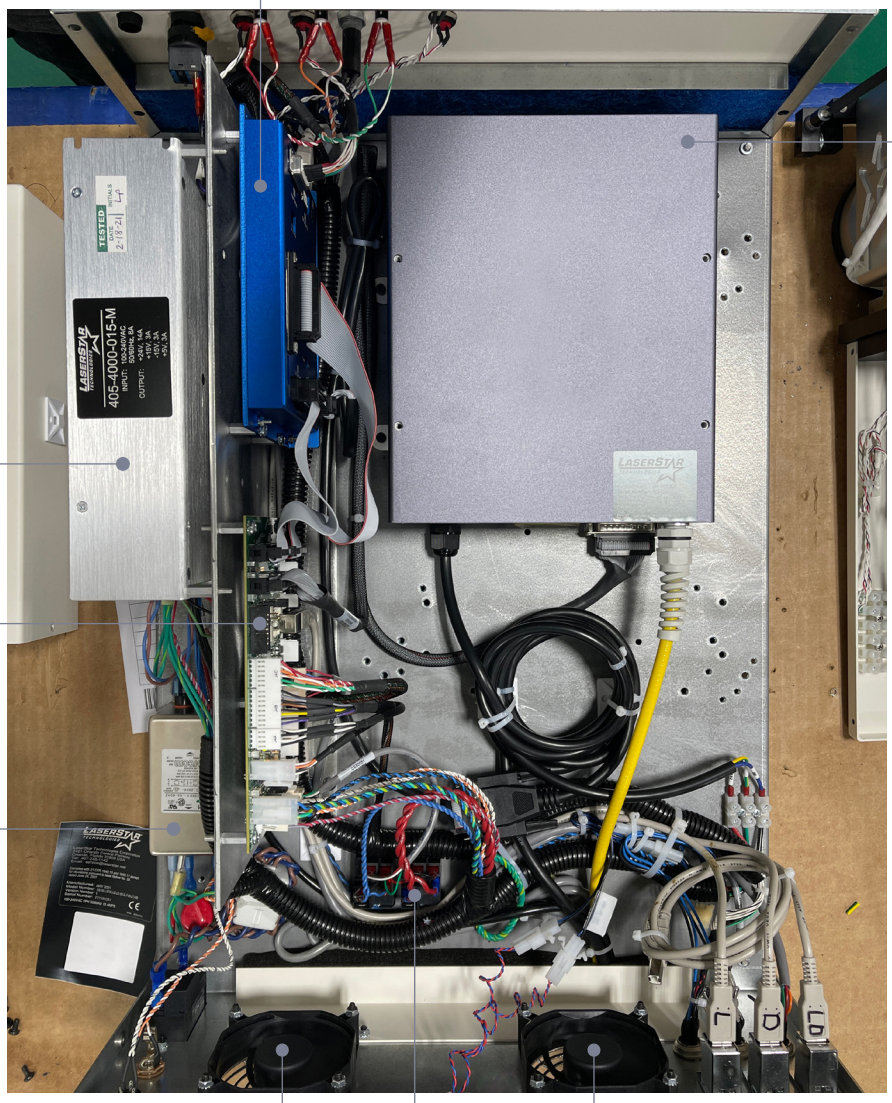


Figure 2
(Internal electronic components)

IX. Service, Section C: Focus Diodes Alignment, Adjustment & Replacement Procedures

This 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 eye wear.

Tools Needed (supplied or required):

+ Slotted Screwdriver (3/16” – 1/4”)
+ Hex Key Wrench (2mm)

(Note: This procedure assumes that the operator has completed the steps for adjusting the **focus diodes** to a minimum “dot” size within the device’s marking plane. If this is not the case, please proceed to **Service C: Adjusting the Focus Diodes**; **section II**; follow all steps until completed.

This procedure assumes that the operator has completed the steps for aligning the **red laser pointing diode** with the path of the laser beam. If this is not the case, please proceed to **Appendix D**, **section I**; follow all steps until completed.)

1. Select the **LaserStar StarFX® Premier Design Studio software** on the computer desktop; this will launch the software.

2. Draw a 0.5mm circle on the page and center this shape to the 0.0 location by clicking the **Put to Origin button**.

Focus Diodes Alignment, Adjustment & Replacement Procedures Continued on Next Page

Focus Diodes Alignment, Adjustment & Replacement Procedures (continued)

3. Configure the settings for power and speed to achieve the results shown in **figure 2**; see next page.

4. Check to be sure the pass count is set to **a minimum of ten (10)** or enable the repeat function (navigate to utilities; select the repeat icon).

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

6. Select the **mark button** (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 **figures 1 & 2**; see next page).

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 3**; **page 111**) 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.

Notes

Focus Diodes Alignment, Adjustment & Replacement Procedures Continued on Next Page

IX. Service, Section C: Focus Diodes Alignment, Adjustment & Replacement Procedures (continued)

Figure 1
(Laser;
out of focus)

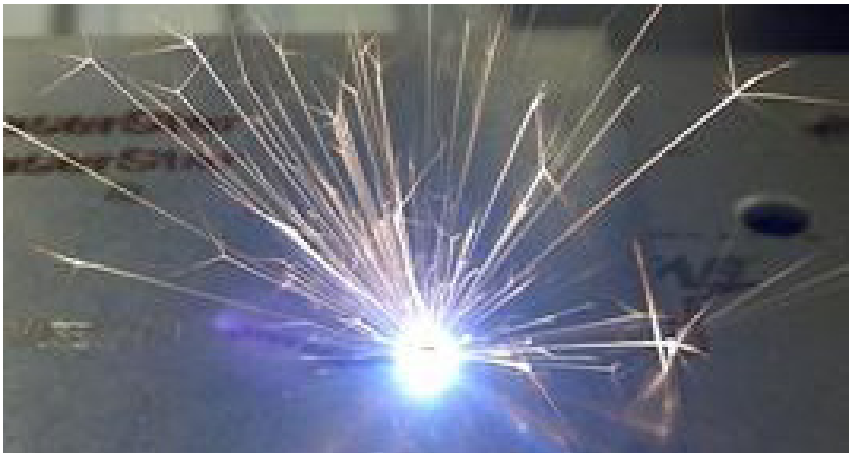


Figure 2
(Laser;
in focus)

Focus Diodes Alignment, Adjustment & Replacement Procedures Continued on Next Page

Focus Diodes Alignment, Adjustment & Replacement Procedures (continued)

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 3**; below) 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 ready for use.

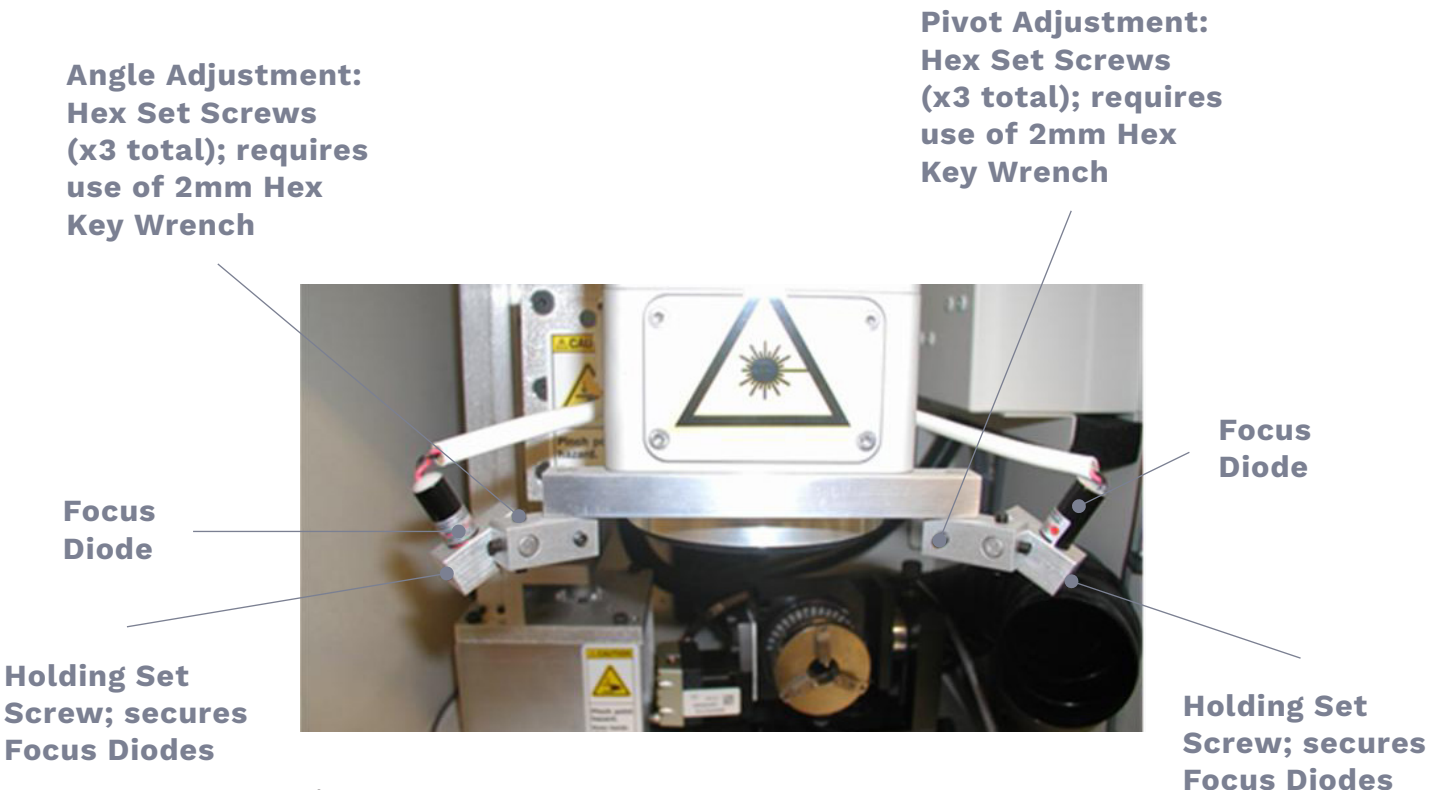


Figure 3
(Angle and pivot adjustment)

Focus Diodes Alignment, Adjustment & Replacement Procedures Continued on Next Page

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 note on **page 98**).

8. Turn “on” the **focus diodes**. **Caution**: When using this device, and while the laser beam is active, you should never stare into the beam that's emitted.

Notes

Replacing the Focus Diodes Continued on Next Page

Replacing the Focus Diodes (continued)

<u>Safety glasses are recommended for the steps that follow</u>:

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 4**; **below**.)

11. 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, section C: Focus Diodes Alignment.**

Figure 4
(Focus diode;
adjustment slot)

Fault Diagnostics Software

For support with troubleshooting and to obtain the fault diagnostics software, please contact LaserStar Technologies® Service Department.

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.

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

Notes

X. Appendix

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** on **page 93**.)

Power Up–Restart–Power Down

Power Up:

1. Check to be sure that the **mains power switch**, **system key switch**, and **setup 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.

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. Verify that the **setup key switch** is “off” and press the **reset button**.

8. Turn “on” the laptop computer.

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).

Power Up–Restart–Power Down Continued on Next Page

Power Up–Restart–Power Down (continued)

LaserStar StarFX® Premier Design Studio Software:

12. Verify that the part to be marked is positioned properly within the (red) profile box.

13. Press the **focus button** on the control panel to turn “on” the **focus diodes**.

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 the appropriate laser protective eyewear for **class 3R lasers**. For additional details, be sure to review the section on **Safety**; **page 32**.

Notes

Power Up–Restart–Power Down Continued on Next Page

Power Up–Restart–Power Down (continued)

LaserStar StarFX® Premier Design Studio Software:

14. Close the **front door** of the enclosure.

15. To begin the marking cycle, select "**mark**" or press the **mark button** located on the **StarFX® Premier Design Studio** main interface screen).

16. The marking process can be stopped at any time by pressing the **stop button** (located on the **Premier Design Studio** main interface screen) or by turning "off" the **system key switch** or **mains power switch**.

Caution: This is a **class 4 laser** when the **front door** is open, and the **setup key switch** is "on". 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. For additional details, be sure to review the section within this manual for safety; **page 32**.

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. Verify that the **front door** of the work chamber is closed.

6. Begin the marking cycle by selecting "**mark**" or pressing the **mark button**.

Power Up–Restart–Power Down Continued on Next Page

Power Up–Restart–Power Down (continued)

Power Down:

1. Close the **StarFX® Premier Design Studio software**; exit to the computer desktop.

2. The laptop computer can be turned “off” or left “on;” either option is suitable.

3. Close the **front door** of the enclosure.

4. Check to be sure that the **setup key switch** is “off.”

5. Turn the **system key switch** “off.”

6. Turn the **mains power switch** “off.”

Notes

Focusing and Defocusing Guidelines

Overview and Requirements

When operating G4 pulsed fiber lasers on highly-reflective materials, there is a risk of potential damage to the ILLK beam delivery optic. This section highlights the associated dangers and offers suggestions for minimizing risk while working with these materials. **Damage to the ILLK beam delivery optic is considered a process and application-induced failure and is not covered under warranty.**

- ILLK beam delivery provides extremely robust protection for the laser, ensuring that back-reflected light is isolated and removed before it can enter and adversely affect the lasers' cavity; however, great care must be excercised when processing highly-reflective materials that are heavily defocused (silver, copper, gold, brass, etc.).

- In extreme cases, when processing highly-reflective materials (while in a defocused state), back-reflected light can be focused onto optical surfaces within the ILLK, resulting in energy densities that exceed the rated Laser Induced Damage Threshold (LIDT) for the optical surface. This circumstance can result in an initial etching of the optics in the ILLK (see **figure 1**; next page). With continued operation (and due to enhanced absorption) a catastrophic failure can result. The potential for absorption is low, however, due to the scattered nature of back-reflected light and its sensitivity to angular deviation from normal incidence, nevertheless, the operator should never use this device when the circumstances present a high risk.

- The highest risk optical setup can arise when long focal length Beam Expanding Collimators (BECs) are used in conjunction with short focal length **f-theta lenses**. When processing highly-reflective materials, an F100 [BEC] and FL100 [f-theta] combination is not recommended.

With general applications usage, pulsed fiber lasers are typically operated while in a focused state, however, it is often in attempting to find or set the focus point on a material that the highest risk of optic damage can occur.

Using the methods below for focus-finding, ensure the safety of the operator and avoid damaging the ILLK beam delivery optic:

- When completing the steps for initial setup and focus-finding, use less reflective materials like stainless steel (never use metals like silver, gold, copper, or brass).

- With initial setup and focus-finding, the marker should be operated at reduced power. Later, during processing, power can be increasd.

- When beginning the process for focus-finding, locate the end of the workpiece that is postioned toward the **f-theta lens** (this can be de termined using the "flange focal length" dimension provided by the f-theta manufacturer; see **figure 1** [next page]); this is the safe zone.

- Taking small steps (<0.5mm), move the work piece toward the focus spot until focus is achieved. The highest risk of optical damage is beyond focus at a distance that is dependent on both the BEC's and **f-theta lens** combination. Once focus is found, be sure not to move beyond the values listed in the **data table** (next page); this is the "danger zone."

- Once focus has been found, fine-tuning can be carried out using the operators' preferred power and materials. If the focus needs addtional adjustments in the future, be sure to use the same process as before — move the workpiece toward the **f-theta lens** and away from focus, in small steps; (<0.5mm).

Focusing and Defocusing Guidelines Continued on Next Page

Figure 1
(ILLK optic; Etch damage from back-reflected light)

Data Table: F-Theta Lens Focal Length (units in millimeters)

BEC Focal Length (units in millimeters)	100	163	254	300	410
F30	15	40	97	135	252
F50	5	14	35	49	91
F75	2	6	16	22	40
F100		4	9	12	22

Positive defocusing limits [millimeters represent the extent of the safe zone below optimal focus]. The reflected out-of-focus state that can damage the optic is shown in the data table above [in grey], while the other fields show normal back-reflection resulting from in-focus processing.

Focusing and Defocusing Guidelines Continued on Next Page

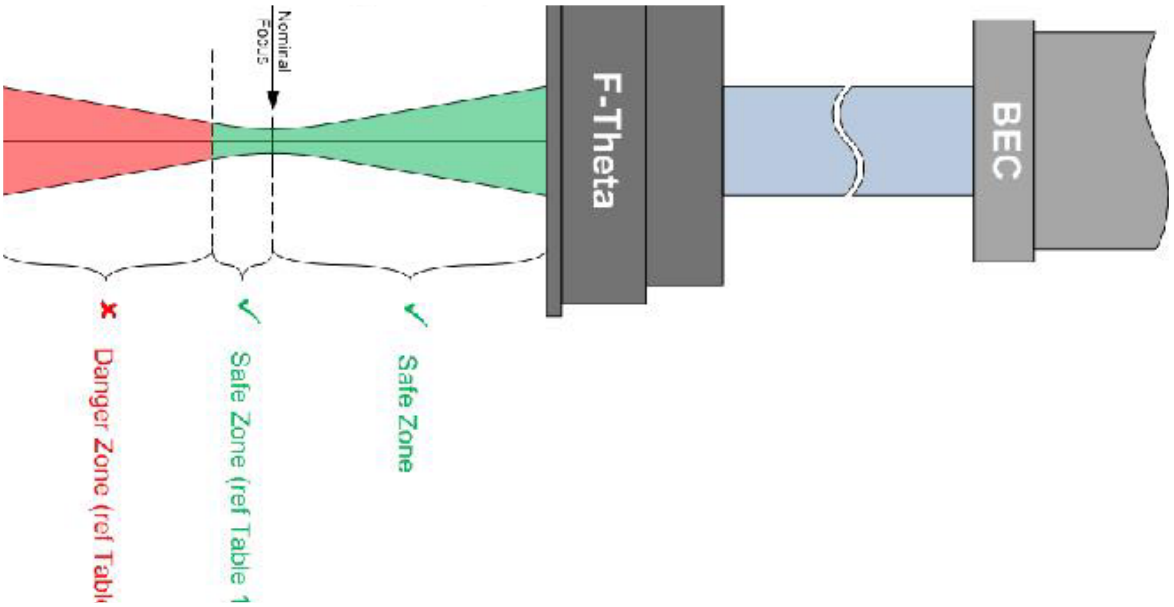


Figure 2
(Processing reflective materials; danger zone)

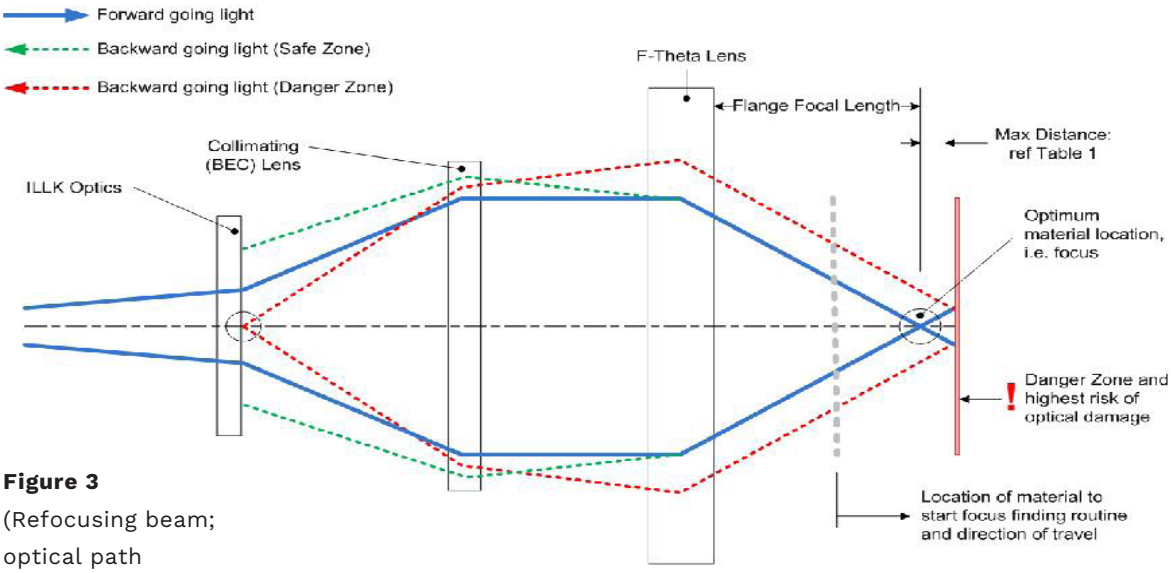


Figure 3
(Refocusing beam; optical path

Notes

Appendix C: 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 service@laserstar.net	1-888-578-7782	2461 Orlando Central Pkwy. Orlando, Florida 32809

Notes

LASERSTAR®
LEARNING CENTER

FiberCube® 3803 Series Marking System
Quick Setup Guide

LaserStar Technologies Corporation
2461 Orlando Central Parkway, Orlando, Florida 32809
Phone: 407-248-1142 • Email: Service@LaserStar.net

FIBERCUBE® 3803 SERIES MARKING SYSTEM
QUICK SETUP GUIDE INSTRUCTIONS

ITEMS NEEDED: Phillips Head Screwdriver or Power Drill with Phillips Head Drill Bit, 6mm Allen Bit & 7/16" Socket Bit, 5mm & 6mm Allen Wrench, Scissors or Snips, Box Cutter or Knife, Step Ladder, Ramp

INSPECTION

1. Before opening the shipping container, be sure to inspect the outside of the crate for apparent damage that may have occurred in transit. If you discover damage, immediately contact LaserStar's Service Department.

2. Identify the TIP-N-TELL indicator (located on the outside of the shipping crate). Check to see whether blue beads are present in the top portion of the arrow on the TIP-N-TELL. If you notice blue beads in this area, immediately contact LaserStar's Service Department.

No blue beads present:
(no tipping of crate)

Blue beads present:
(crate has been tipped)

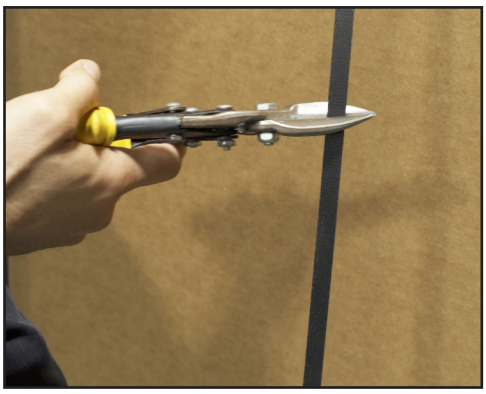
3. Identify the SHOCKWATCH warning sticker (located on the outside of the shipping crate). Check to see whether the tube in the center of the SHOCKWATCH warning is red. If you find the center of this tube is red, immediately contact LaserStar's Service Department.

Tube is not red:
(no shock warning)

Tube is red:
(shock warning)

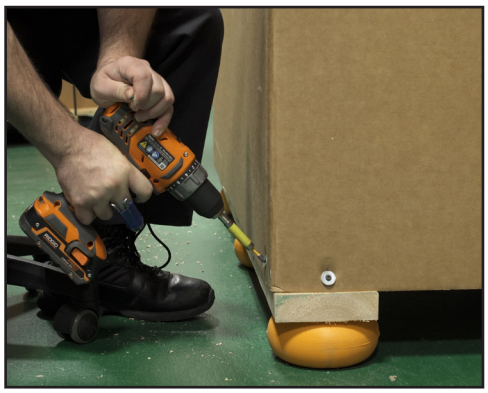
UNPACKING

4. With scissors, snips, or a knife, cut the banding straps on the outside of the shipping container.



5. Using a step ladder, carefully remove the top cover from the crate.

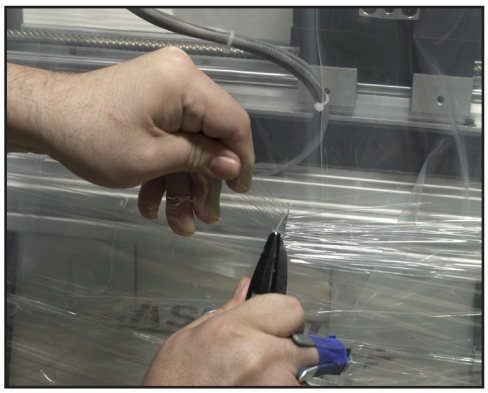
6. Remove the screws from the bottom of the skid. **(Note: A power drill with a Phillips head drill bit is helpful.)**



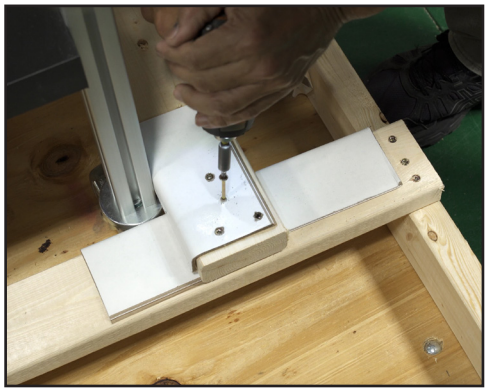
7. Using a knife, carefully cut the corrugated cover, slicing downward at the overlapping corner.

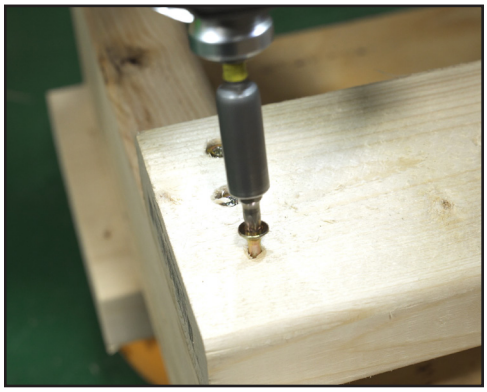
8. Remove the ratcheting straps that secure the laser to the skid base.

9. With scissors or a knife, gently cut any shrink wrap that is affixed to the plastic cover; remove the cover from the machine. **(Note: Be sure to save the plastic cover to protect the equipment from dust when it's not in use.)** Gently remove any remaining shrink wrap. **(Note: Be careful not to cut or damage the laser.)**



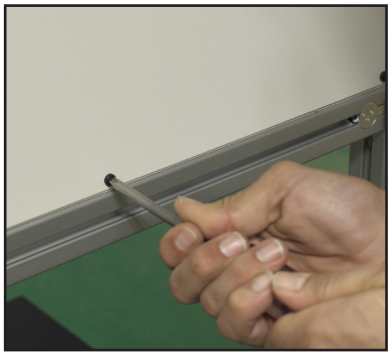
10. There are two (2) 2x4 braces that secure the laser to the skid base. Using a Phillips head drill bit, remove the bracket screws from the skid. **(Note: A power drill is recommended.)**





11. Remove each of the boxes located beneath the laser system. With two people, you can now move the laser off the skid base, gently lowering the wheels onto the floor (we recommend the use of a ramp to roll the laser off the skid). Wheel the laser to the desired location and reset the breaks.

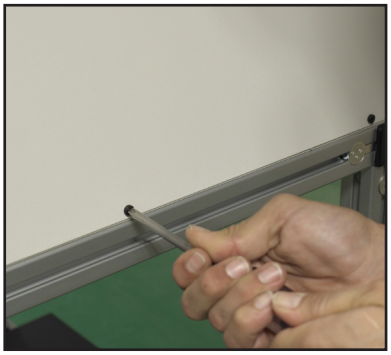
12. Moving to the back of the laser, remove the rear panel. You will need a Phillips head screwdriver for this step. **(Note: You may need two (2) people to complete this step.)**

13. Before opening the front door of the laser, you will need to remove the two (2) counterweight stabilizer M-5 screws (located in the top corners on the rear of the laser).


14. Once the counterweight screws have been removed, reinstall the rear panel. **(Note: Take note of the exhaust clearance and cable covers, located inside the chamber.)**





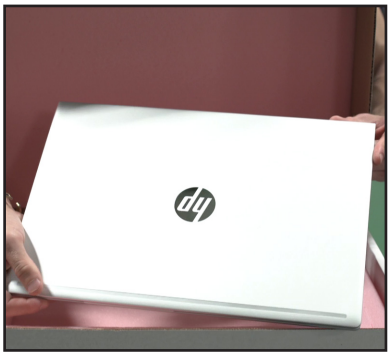
15. Locate the swing arm table on the side of the laser stand; loosen the tension knob and adjust to the desired position.



SETUP

16. Locate and open the box labeled “accessory kit” and retrieve the following items: keys, remote interlock, power cord, USB hub, and USB cables.


17. Locate the box for the laptop and remove the computer and power cable provided. Place the laptop on the swing platform (located on the side of the laser).


18. Retrieve the USB hub and plug in the power cable and mini USB. Plug the other end of the power cable into a 110V outlet. Also plug the free end of the USB cable into the laptop.



19. Locate the two (2) USB cables provided. Connect one to the "USB LASER" port and the other to the "USB AXIS" port. Plug the two free ends into the laptop.

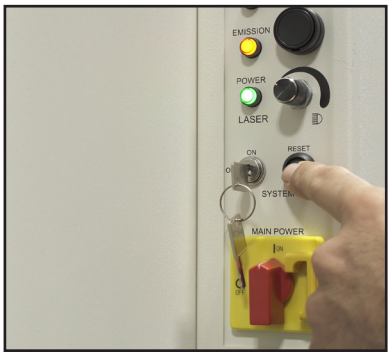
20. Retrieve the remote interlock component and power cable; insert each into the rear of the laser.

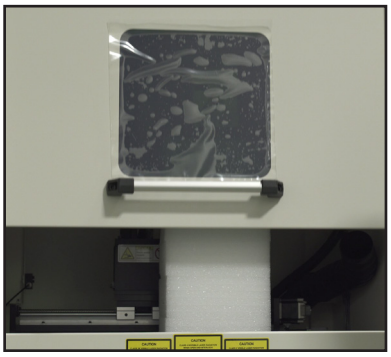
21. Take both the laser and laptop power cables and plug them into a 110V wall outlet.

22. Retrieve the keys from the accessory kit; there is a smaller and larger key. Insert the small key into the "Setup" Key Switch and the large key into the "System" Key Switch.

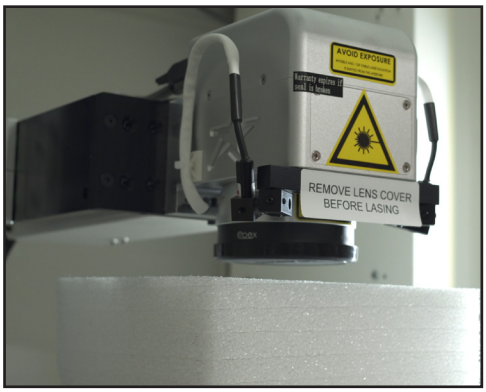
23. Power up the laser by turning the Main Power Switch (red and yellow switch) to the "ON" position. Turn the "System" Key Switch to the "ON" position. Turn the "Setup" Key Switch to the "ON" position.

24. Push the "Reset" button to activate the laser. Open the door of the laser using the "Door" controls.

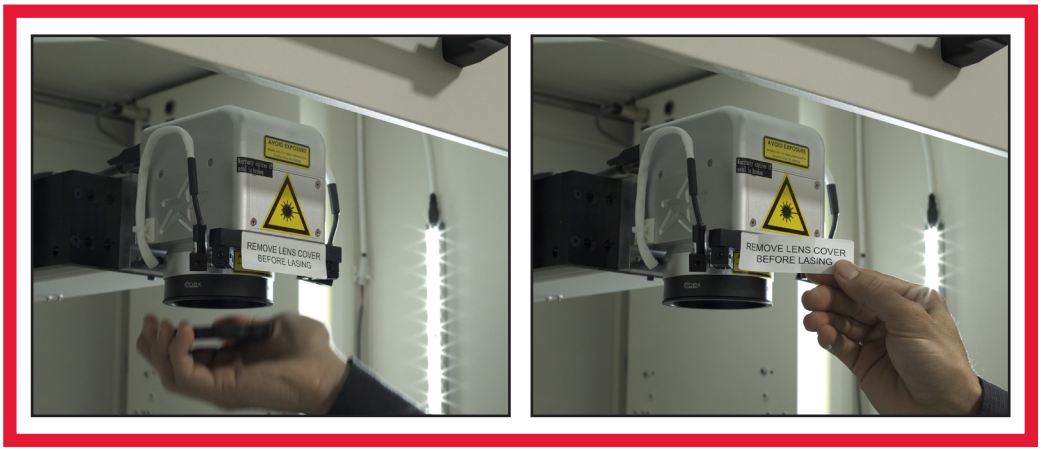




25. Once the door is fully open, press the "Focus" button and the "Up" button until the focus head has been raised 2" to 3". Now, remove the foam block.



26. Note the instructions on the front of the laser's scan head; remove the lens cover from the focus lens. Once the lens cover has been removed, you may remove this label.



(Note: The vapor produced when marking, engraving or cutting can be extracted from the lasing chamber and operator's work station using an external filtration and fume exhaust system.)

This open laser engraving system must be connected to an approved external filtration and fume exhaust system (either purchased separately or through LaserStar Technologies®). Never use this machine on non-metallic materials, especially plastics, without the proper air exhaust filter system in place, as required by OSHA regulations.

27. Unpack your purchased (or previously owned, approved) fume exhaust system and place it next to the machine (if a cyclone adapter option was purchased, setup appropriately).

28. Connect the exhaust hose and then connect to the exhaust unit and rear of the lasing chamber, as shown.

29. Be sure to properly position the interior chamber adjustable exhaust tube to the required marking area to ensure maximum suction.

Congratulations, you are now ready to begin using your laser marking system! Please proceed to LaserStar Academy to begin your online training.

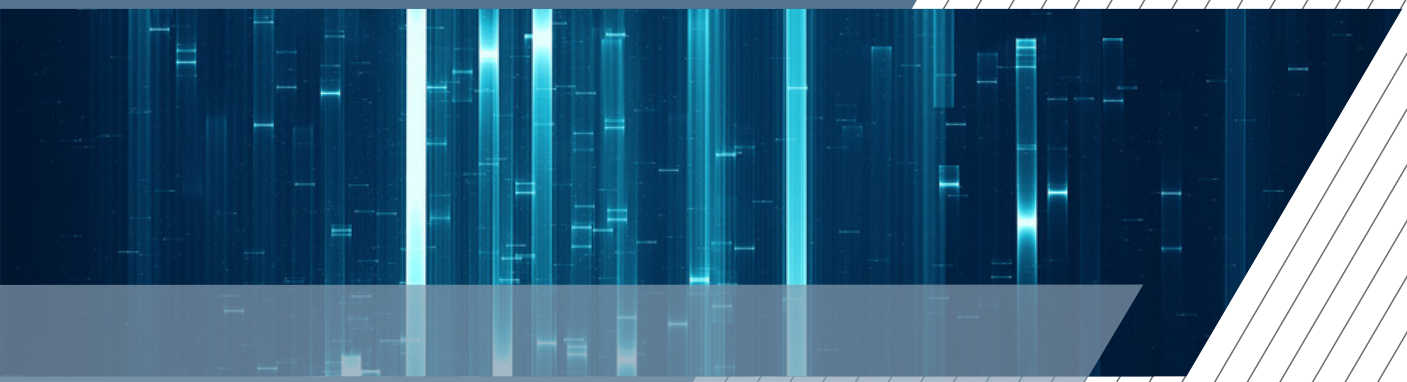
Notes

Notes

Notes

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-to's, be sure to visit us online:

LaserStarAcademy.com, LaserStar.net & LaserStar.TV