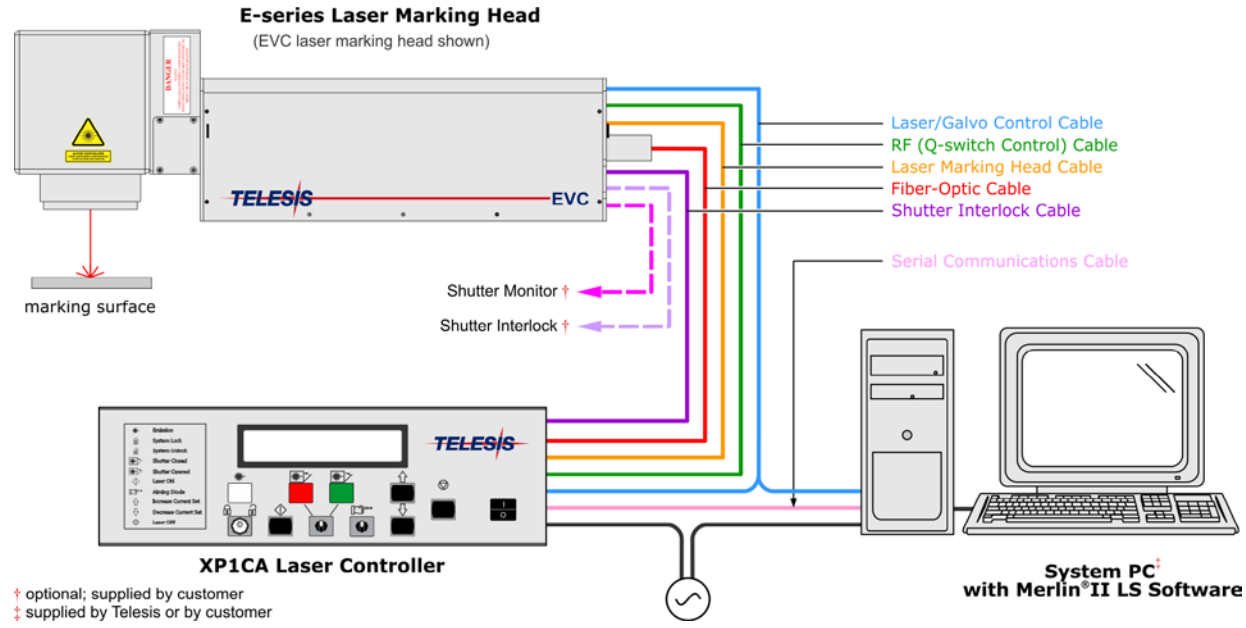


E-series/XP1CA Laser Marking System General Arrangement

SYSTEM OVERVIEW

The Telesis® E-series lasers are advanced diode-pumped solid state (DPSS) laser marking systems. The laser beam and Q-switched pulse characteristics are optimized for applications that require high beam quality and stability.

The E-series lasers offer extra power and speed for precision marking and material processing applications. Their short pulse width and extremely small spot size provide high resolution marking with minimal heat impact to surrounding areas.

These characteristics make them an ideal choice for laser marking, scribing, trimming, and other material processing applications. The robust mechanical and optical design allows the Telesis E-series marking heads to operate in an industrial environment where shock, vibration, and dust are a concern.

The laser marking system offers these advantages:

- Reliable, long, maintenance-free performance
- Compact size and modular construction
- Remote, fiber-coupled pump diode
- Exceptional beam quality and stable output power
- Visible red beam aiming diode (optional for EV4GDS)
- Air cooling
- Thermo-electrical temperature control of the laser crystal and pump diode
- Active AO Q-switching
- Large digital display for marker status, settings, and error condition monitoring
- Standard 115/230VAC operation
- Key switch, Laser Off button, interlocked safety shutter, and emission indicators
- DoD-compliant Unique Identification (UID) marking

SYSTEM CONFIGURATION

The basic laser system consists of the following components.

- **Laser Marking Head** – contains sealed resonator, beam expander, galvanometer assembly, and visible red beam aiming diode.
- **Laser Controller** – contains pump diode, RF driver, and other electrical components
- **Fiber Optic Cable Assembly**
- **Cable Assemblies** – power, control, and data cables
- **System Computer, Monitor, Keyboard, and Mouse** – supplied by Telesis or by customer
- **Software** – Merlin® II LS Laser Marking Software

The modular design allows for major components to be easily replaced and returned to Telesis if required.

SYSTEM SPECIFICATIONS

E-series/XP1CA System Specifications

Compliance	CDRH, CE
Laser Type	Class 4, fiber-coupled, diode-pumped, Q-switched, Nd:YVO4
Wavelength	1064 nanometers (nm)
Mode	TEM_{00}
Long Term Output Power Drift	< ± 2%
Laser Diode MTTF	500,000 hours
Power Requirements	95 to 250 VAC, single-phase, 6A, 50/60 Hz
System Power (total)	< 400 watts
Maximum Supply Voltage	264 VAC
Supply Voltage Fluctuation	< ±10% with clean ground line
Operational Temperature	15° to 35°C (59° to 95°F)
Recommended Temperature	20° to 25°C (68° to 77°F)
Ambient Relative Humidity	10% to 85% non-condensing
Fiber Optic Cable Length	1.75 m (5.74 ft.)
Cooling	air cooled, active thermo-electric

E-series Laser Marking HeadSpecifications

Dimensions (L x W x H)	611.33 x 153.80 x 188.34 mm (24.068 x 6.055 x 7.415 in.)
Surrounding Envelope	see *E-series Laser Marking Head Dimensions* drawing
Electrical Power	210 watts (approximate)
Mounting Weight	approximately 14.5 Kg (32 lbs.)
Mounting	three M5-0.80 mounting bolts; three 0.2362P6 locating pins
Positioning	Class 1 visible (red) aiming diode
Field Resolution	16 bit (65535 data points)
Galvanometer Repeatability	< 22 micro radian
Marking Field Size	lens-dependent, see chart

Lens	Image Field (mm)	Image Field (in.)	Working Clearance (mm)	Working Clearance (in.)
100mm	65 x 65	2.56 x 2.56	97	3.82
160mm	110 x 110	4.33 x 4.33	176	6.93
254mm	175 x 175	6.89 x 6.89	296	11.65

XP1CA Laser Controller Specifications

Dimensions (W x H x D)	419.1 x 139.7 x 495.3 mm (16.5 x 5.5 x 19.5 in.)
Surrounding Envelope	see *XP1CA Laser Controller Dimensions* drawing
Weight	approximately 10 Kg (22 lbs.)
Cooling	air cooled, active thermo-electric

System Computer Specifications

If supplied by anyone other than Telesis, the system computer must, at a minimum, meet the following specifications:

Operating System	Windows® 2000, XP, Vista® (Business), 7 (professional) or 8 (Professional)
Operator Interface	Telesis Merlin II LS Laser Marking Software
Processor	Pentium® III with RAM as recommended per operating system
Hard Drive	2 GB Hard Disk Drive
External Drives	CD-ROM Drive
Comm Ports	One available RS-232 Serial Port, Two available USB Ports, Two available Ethernet Ports, Three available full-height PCIe Slots (1)
Circuit Cards	Laser/Galvo Controller Board, Video Board
Peripherals	SVGA Color Monitor, Mouse (2), Keyboard (2)

(1) *One additional PCIe slot required if system is configured for mark-on-the-fly operation. If the system computer is a notebook, expansion must be used to provide the PCIe slots.*

(2) *Telesis recommends a USB mouse and a USB keyboard for system computers that are embedded in the laser controller.*

SYSTEM OPTIONS

- Desktop computer or notebook computer with powered cardbus-to-PCIe expansion enclosure to run the Merlin II LS Laser Marking Software
- Remote pushbutton station (start/abort)
- Externally-mounted focus-finder diode
- I/O options (see *Remote Communications* for details)
- Manually operated tool post for vertical (z-axis) adjustment
- Programmable tool post for vertical (z-axis) adjustment (requires two-axis controller)
- Rotary drive fixture for rotational (theta-axis) adjustment (requires two-axis controller)
- Workstation / work area enclosure
- Fume extraction systems

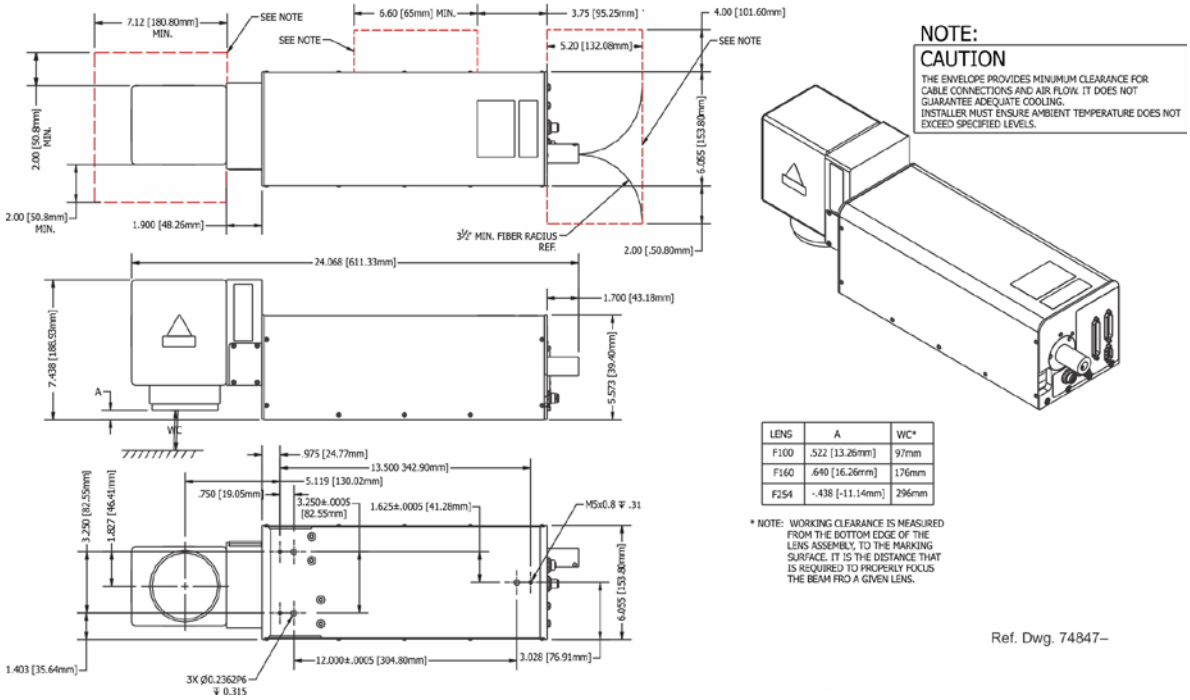
SYSTEM SETUP

The following procedures are listed for reference only to provide a general overview of the installation process. Refer to the *E-series/XP1CA Installation & Maintenance Manual* for complete installation details.

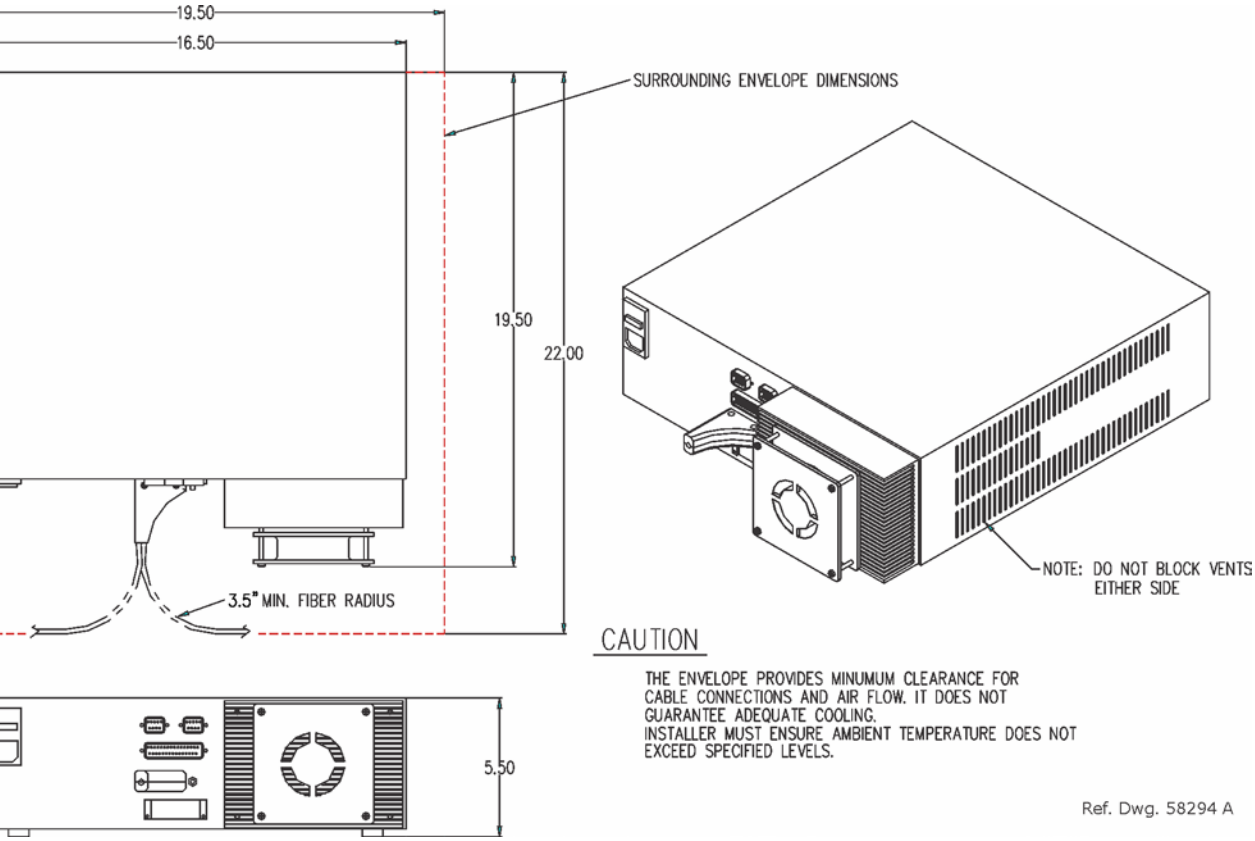
CAUTION

Never connect any power cable to power source until all system connections are made.

1. Ensure sufficient clearance exists on all sides of the laser marking head to allow for proper air circulation and to permit proper installation of applicable cables. See *E-series Laser Marking Head Dimensions* drawings for details.
2. Place the laser marking head on a suitable mounting surface. Secure laser marking head to mounting surface using the factory-tapped mounting holes provided in the marking head base plate.
3. Ensure sufficient clearance exists on all sides of the laser controller to allow for proper air circulation and to permit proper installation of applicable cables. See *XP1CA Laser Controller Dimensions* drawing for details.
4. Place the laser controller in the desired location. Locate controller as close as practical to laser marking head.
5. Place the system computer, monitor, keyboard, and mouse in the desired location. Locate the system computer as close as practical to laser controller.
6. Optionally, connect the laser marking head to a customer-supplied shutter monitor.
7. Optionally, connect the laser marking head to a customer-supplied shutter interlock.
8. Connect all remaining system cables.



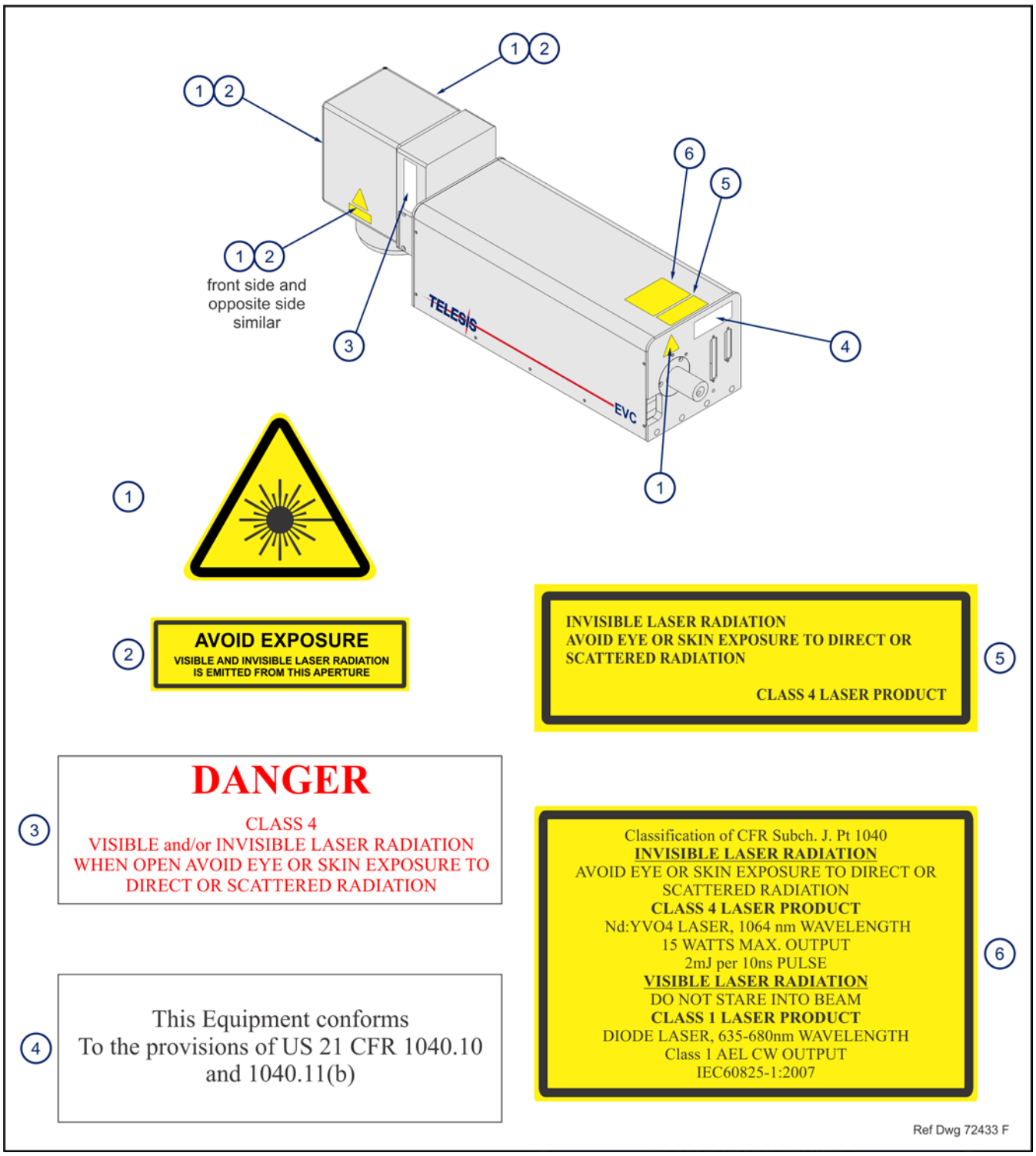
EVC Laser Marking Head Dimensions



XP1CA Laser Controller Dimensions

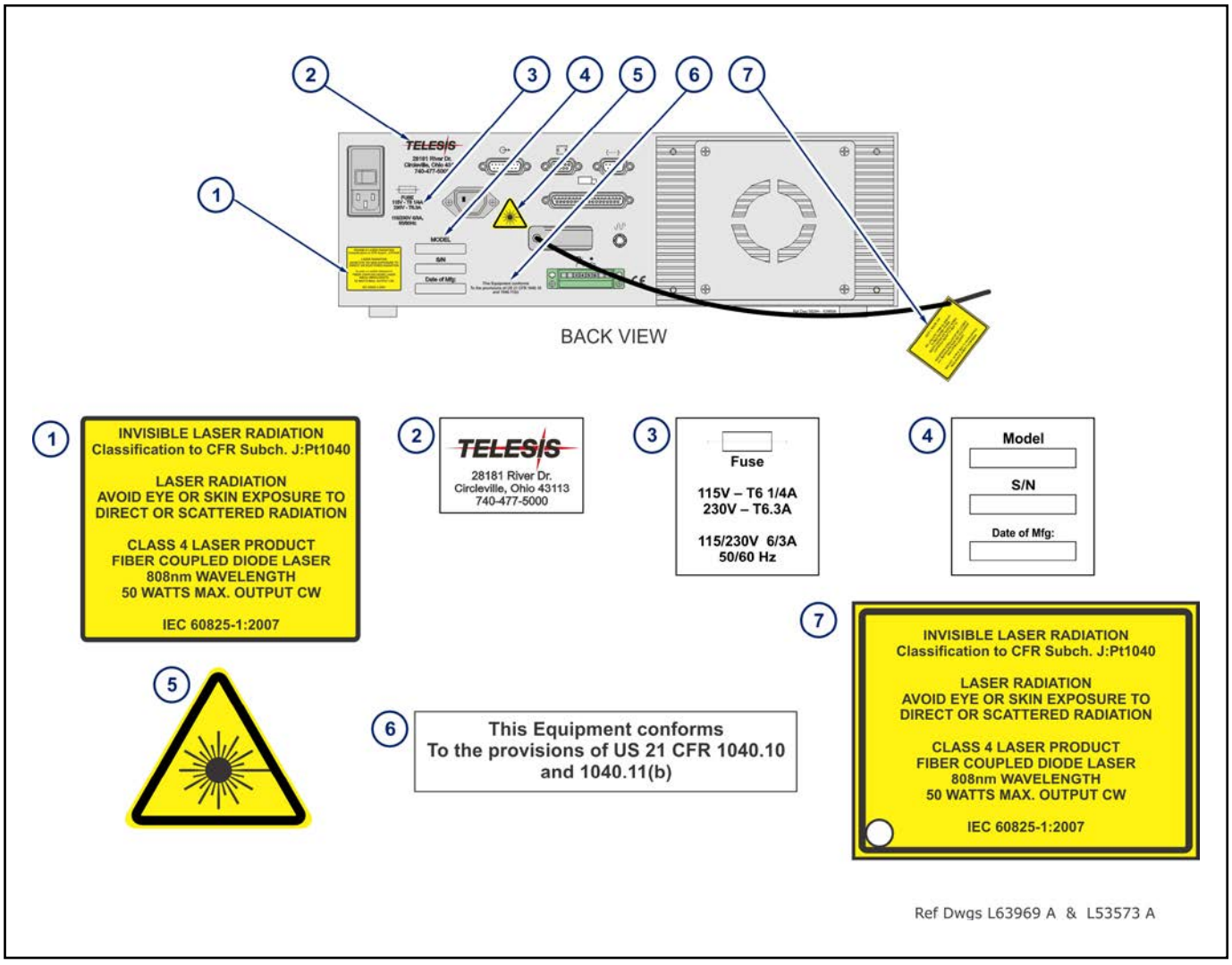
E-SERIES LASER MARKING HEAD SAFETY LABELS

The following illustration shows the labels and their locations on the E-series laser marking heads. Please familiarize yourself with the laser labels and their locations prior to operating the laser marking system.



XP1CA LASER CONTROLLER SAFETY LABELS

The following illustration shows the labels and their locations on the XP1CA laser controller. Please familiarize yourself with the laser labels and their locations prior to operating the laser marking system.



E-SERIES LASER MARKING HEAD

E-series lasers are designed for easy maintenance. The laser marking head encloses the sealed laser resonator, the beam expander, the visible red beam aiming diode, and the galvanometer assembly. A heat exhaust fan is located on the right side of the unit.

Sealed Laser Resonator

The laser resonator is assembled and sealed in the clean room environment to prevent contamination. The laser marking head contains an electro-mechanical safety shutter. Under power, the safety shutter allows the laser beam to pass through the galvanometer steering mirrors. If the shutter is closed during normal operation (or power is removed from the system via a power off/stop condition) it will block the laser beam.

Visible Red Aiming Diode

The laser marking head produces a visible red diode that may be viewed on the work surface without the need for protective safety goggles. This provides a safe and convenient aid for laser setup and part programming. Since the aiming diode is located *after* the shutter, the visible red beam may be used with the shutter opened or closed. Additionally, the visible red beam may be used with the lasing beam during the marking cycle. **Note that protective eyewear must always be worn when the laser is in operation.**

Shutter Monitor

The E-series laser marking head employs a self-monitoring safety circuit using two separate sensors to detect the closed-state of the laser shutter mechanism. The sensor signals can be monitored at the DB9P Dual Sensor connector on the back panel of the laser marking head. When the shutter is open, the sensor feedback signals are OFF. When the shutter is closed, the sensor feedback signals are ON.

Shutter Interlock

The E-series laser marking head employs a Shutter Interlock Input connector and a Shutter Interlock Output connector. An optional, customer-supplied shutter interlock can be connected to the Input connector. The Shutter Interlock cable (provided) connects the Output connector to the laser controller.

Marking Field Size

The size of the marking field is dependent on the lens installed on the laser marking head. See *E-series Laser Marking Head Specifications*.

Marking Depth

Simple laser parameters can be operator programmed to create depths ranging from simple surface discoloration, shallow laser etching, or deep laser engraving. Marking depth is dependent on several factors including material, lens selected, and laser marking parameters. Please contact Telesis for the proper setting for your specific application.

Flat-Field Lens

The flat-field lens is key to the marking performance of the system. This is the final coated optical lens that the beam will pass through before it strikes the marking target. This lens is called a flat field lens because when the beam is focused, the focus lies in a plane perpendicular to the optical axis of the lens. To protect the final objective lens from dust and debris, a clear protective cover is inserted between the work area and the lens.

XP1CA LASER CONTROLLER

The pump diode is enclosed in the laser controller, while the laser resonator with the crystal is located in the laser marking head. The pump beam from the diode (approx. 808nm) is delivered through a fiber optic cable directly into the laser resonator. This compact laser controller can be fitted to any standard-rack mount or it can be placed directly upon a desktop.

The laser controller also contains the active thermo-electrical cooling system for the pump diode, the RF driver, galvanometer power supply, driver control circuits, appropriate fusing, and a 115/230VAC IEC320 connector, and a front panel control module.

Engineered for the greatest reliability and for ease of maintenance, the pump diode within the laser controller is an easily replaceable sealed module with a long MTTF providing many maintenance-free operating hours.

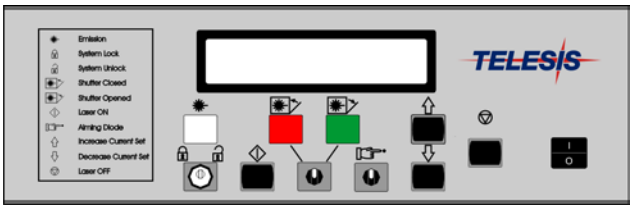
Fiber Optic Cable Assembly

The fiber optic cable is permanently attached to the pump diode within the laser controller and cannot be removed. The standard optical fiber cable is 1.75 meters (5.74 feet) long.

The fiber optic cable assembly contains an interlock switch assembly. The fiber optic cable must be connected to the laser marking head to close the laser interlock circuit. If the cable is disconnected, the laser interlock circuit will open.

Operator (Front) Panel

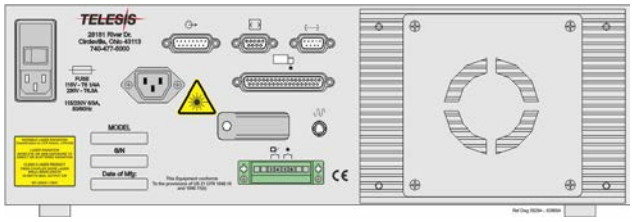
The front panel includes the system key switch, laser off push button, manual safety shutter control, function indicators, and LCD display. The display allows monitoring of the diode current, the crystal and diode temperatures, system status, and error conditions.



XP1CA Laser Controller – Front Panel

Connector (Back) Panel

The back panel of the laser controller provides a power entry module and connectors for the fiber optic cable, laser marking head cable, galvo control cable, and RF cable. It also provides a remote outputs connector. The outputs connector allows you monitor output signals reporting the status of the shutter, laser emission, and fault conditions.



XP1CA Laser Controller – Back Panel

SYSTEM COMPUTER

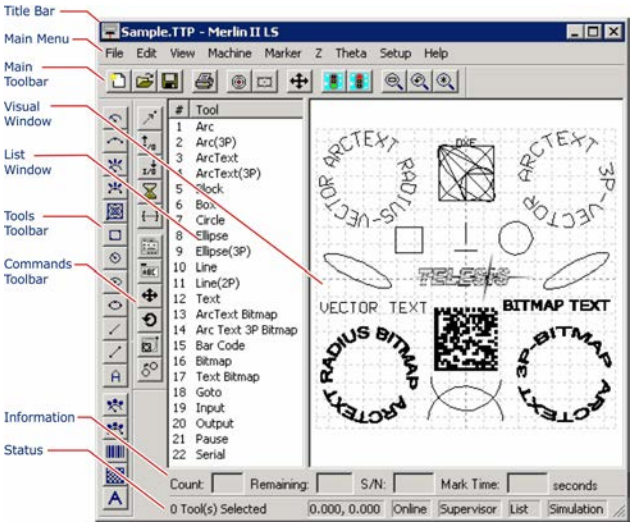
The laser system requires an IBM-compatible computer for running the Merlin II LS Laser Marking Software.

All system computers supplied by Telesis have the laser/galvo controller board and the Merlin II LS software installed prior to shipment so the entire assembly is tested as a laser marking system. Warranties for the computer, keyboard, monitor, and peripherals default to the original equipment manufacturer.

SYSTEM SOFTWARE

The powerful Telesis Merlin II LS Laser Marking Software is a Windows® based software package that comes standard with the laser marking system. It is a graphical user interface that makes marking pattern design quick and easy. The WYSIWYG (what-you-see-is-what-you-get) interface provides a to-scale image of the pattern as it is created. Just “click and drag” for immediate adjustment to field size, location, or orientation.

The Merlin II LS software includes tools to create and edit text at any angle, arc text, rectangles, circles, ellipses, and lines. Multiple fields may be grouped and saved as a block to form a logo. Existing DXF files can also be imported for marking. Non-printable fields can be created to clearly display a graphical representation of the part being marked.



REMOTE COMMUNICATIONS

The communication capability of the laser marking software allows you to control the laser from a remote source. Remote communications can be performed by connecting to a Host computer, an optional two-axis Auxiliary Controller, or to remote I/O devices.

Host Communications. Remote communications may be executed from a host computer using RS-232 or Ethernet (TCP/IP) connections to the system computer running the Telesis laser marking software. The software provides parameters to define the data transmitted to and from the host.

Two-axis Controller. Telesis offers an optional two-axis controller for all laser systems that use the Merlin II LS Laser Marking Software. The auxiliary controller provides an interface for connecting a Z-axis tool post and/or a Theta-axis rotary drive unit.

I/O Kits. Telesis offers optional I/O kits that provide up to 12 additional, programmable I/O signals (6 inputs and 6 outputs). All kits provide an I/O card, pre-installed SIPs resistor packs, and software driver CD.

Communications Protocol

Two types of host interface are supported (RS-232 or TCP/IP) and two communication protocols are provided through the Merlin II LS laser marking software: Extended and Programmable.

Extended Protocol

Extended protocol provides two-way communication with error checking and transmission acknowledgment. It is designed to provide secure communications with an intelligent host device using pre-defined message formats and response formats where serial communication is a vital part of the marking operation.

All communications are carried out in a parent/child relationship with the host being the parent. Only the host has the ability to initiate communications. The Extended Protocol message is transmitted using the following format.

SOH TYPE [##] STX [DATA] ETX BCC CR

The message type is defined by a single, printable ASCII character. The Extend Protocol message types are:

Message Type 1 provides data to a text string in the pattern or polls the pattern for data.

Message Type A provides data to the system Offset Angle parameter for the marking window or polls the system for data.

Message Type E allows the host to take the machine offline. It also provides the option of displaying an error message box with the provided data string.

Message Type G initiates a print cycle.

Message Type H provides data to the system X/Y Offset parameters or polls the system for data.

Message Type I polls the system for the I/O status.

Message Type O places the marker online. This allows a host computer to reset. This may be used to recover from a power outage when the marker is unattended.

Message Type P loads a pattern or polls the system for the current pattern name.

Message Type Q provides data to the system query text buffer or polls the system for data.

Message Type S polls the system for the machine status. The machine status is returned to the host in an eight-character hexadecimal mask.

Message Type V provides data to a variable text string in the pattern or polls the pattern for data.

Programmable Protocol

Programmable protocol provides one-way (receive only) communication with no error checking or acknowledgment of the transmitted data. You may use Programmable protocol to extract a continuous portion of a message string to print. This can be used with a host computer or a bar code scanner. Note that XON/XOFF Protocol applies even when Programmable Protocol is selected.

The Programmable Protocol Message Type identifies the type of message sent from the host. It determines how the marker uses the data it extracts from the host message string when Programmable Protocol is used. The Programmable Protocol message types are:

Message Type 49 (ASCII 1) overwrites the content of the first text-based field in the pattern with the data extracted from the host message.

Message Type 65 (ASCII A) updates the Offset Angle parameter for the marking window using data extracted from the host message.

Message Type 72 (ASCII H) updates the Offset X/Y parameters for the marking window using data extracted from the host message.

Message Type 80 (ASCII P) indicates the data extracted from the host message is the name of the pattern to be loaded.

Message Type 81 (ASCII Q) updates the text in the first query text buffer (buffer 0) with the data extracted from the host message.

Message Type 86 (ASCII uppercase V) updates the text in the first variable text field in the pattern with the data extracted from the host message.

Message Type 118 (ASCII lowercase v) updates the first text field encountered in the pattern that contains a variable text flag that matches the specified string length.

Message Type 0 (zero) indicates that host will provide message type, field number (if applicable), and data. This delegates message type selection to the host on message-by-message basis.

TRADEMARKS