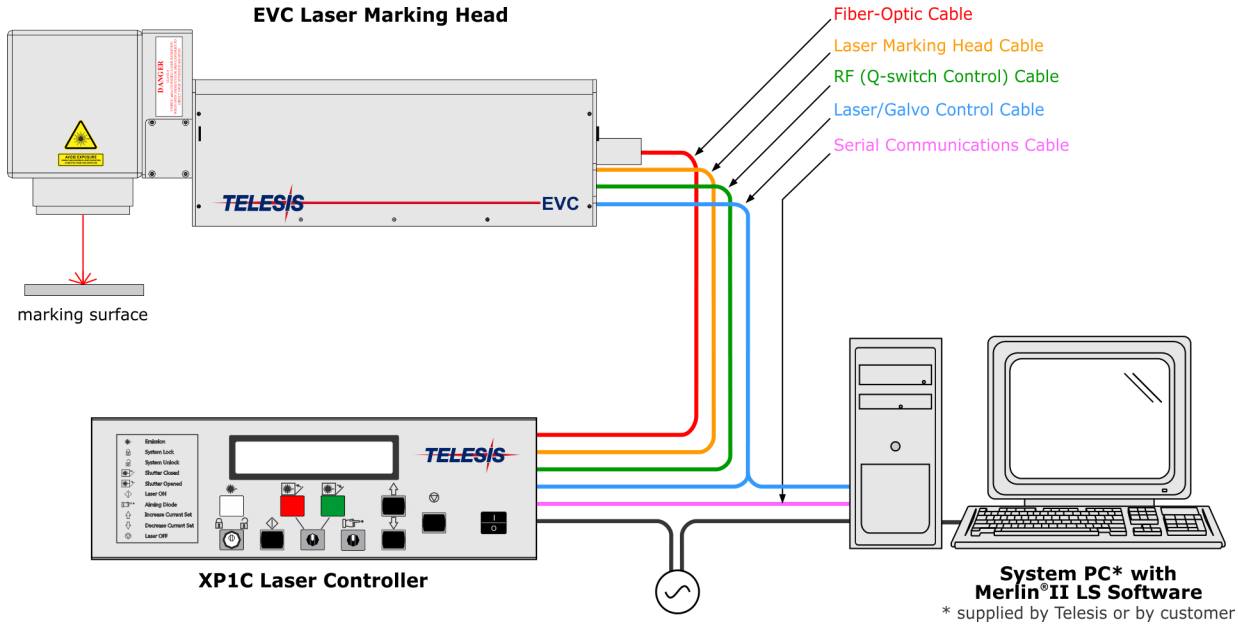


EVC Laser Marking System General Arrangement

SYSTEM OVERVIEW

The Telesis® EVC is an advanced, fiber-coupled diode-pumped solid state (DPSS) laser marking system. The laser beam and Q-switched pulse characteristics are optimized for applications that require high beam quality and stability. The EVC does an exceptional job of high speed marking on delicate and sensitive electronics components and medical instruments. These characteristics make it an ideal choice for general-purpose laser marking, scribing, trimming, and other material processing applications.

The EVC design features a Q-switched Nd:YVO_4 end-pumped laser with a remote fiber-coupled diode pump source. With average diode life of greater than 200,000 working hours the EVC offers the user "best-in class" reliability.

The robust mechanical and optical design allows the Telesis EVC marking head 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
- 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
- DoD-compliant Unique Identification (UID) marking

SYSTEM CONFIGURATION

The basic EVC laser marking system consists of the following components:

Laser Controller – contains pump diode, RF driver, and other electrical components

Fiber Optic Cable Assembly

Laser Marking Head – contains sealed resonator, beam expander, turning mirror, galvanometer assembly, visible red aiming diode

Software – Merlin® II LS Laser Marking Software

System Computer – supplied by Telesis or by customer

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

SYSTEM SPECIFICATIONS

Compliance	CDRH
Laser Type	fiber-coupled, diode-pumped, Q-switched, Nd:YVO4
Wavelength	1064 nanometers (nm)
Mode	TEM00
Long Term Output Power Drift	< ± 2%
Expected Diode Lifetime	> 200,000 hours
System Power (total)	< 400 watts
Power Requirements	95 to 250 VAC, single-phase, 6A, 50/60 Hz
Maximum Supply Voltage	264 VAC
Supply Voltage Fluctuation	< ±10% with clean ground line
Operational Temperature	18° to 35°C (65° to 95°F)
Recommended Temperature	20° to 25°C (68° to 77°F)
Ambient Relative Humidity	10% to 85% non-condensing

SYSTEM OPTIONS

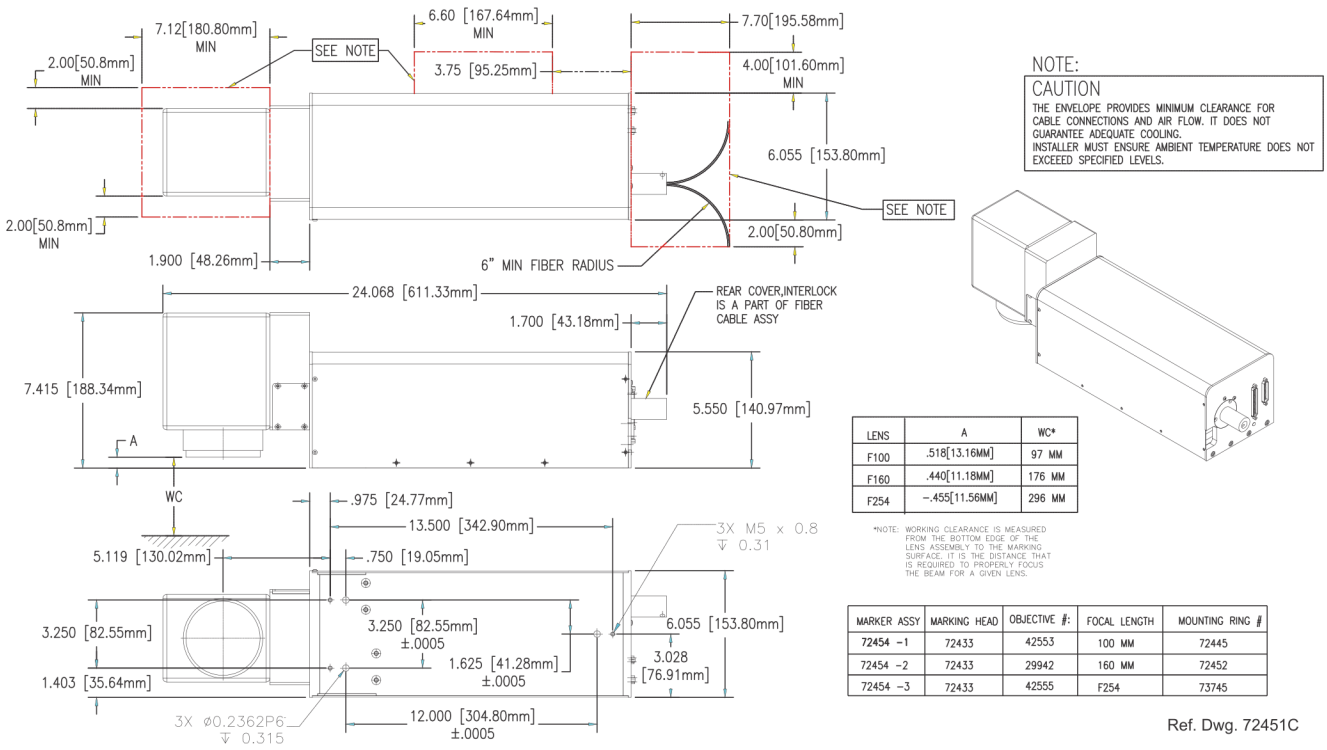
- Desktop computer or notebook computer with powered cardbus-to-PCI expansion enclosure
- Remote pushbutton station (start/abort)
- Externally-mounted focus-finder diode
- I/O options (see *Remote Communications* for details):
  TTL via PCI-DIO24 Board
  Opto-isolated via Merlin DCIO Module
  Two-axis Controller
- 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 *EVC Installation & Maintenance Manual* for complete installation details.

Do not connect any power cable to power source until <u>all</u> system connections are made.

1. All equipment must remain powered down and in OFF position until mounting is complete.
2. Place the laser controller, system computer, monitor, keyboard, and mouse in the desired locations. Locate the laser controller as close as practical to the laser marking head.
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. Refer to the *XP1C Laser Controller Dimensions* drawing for details.
4. Place the laser marking head on a suitable mounting surface.
5. 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. Refer to the *EVC Laser Marking Head Dimensions* drawing for details.
6. Mount the laser marking head with three M5-0.80 bolts and lock washers using the factory-tapped mounting holes provided. Refer to the *EVC Laser Marking Head Dimensions* drawing for details.
   Note: Optionally, three M6 locating pins may be used at the 0.2362 P6 hole locations for more precise marking head alignment.
7. Select proper fuse arrangement for the laser controller. Refer to the *EVC Installation & Maintenance Manual*.
8. Connect all cables as applicable (fiber optic cable, laser marking head cable, RF cable, galvo control cable, computer monitor, keyboard, mouse, and power cables).
9. Connect any optional or customer-supplied devices or interface circuits as applicable.
10. Refer to the *EVC Operation Supplement* for proper startup procedure. Refer to the *Merlin II LS Operating Instructions* for complete information on using the system software.



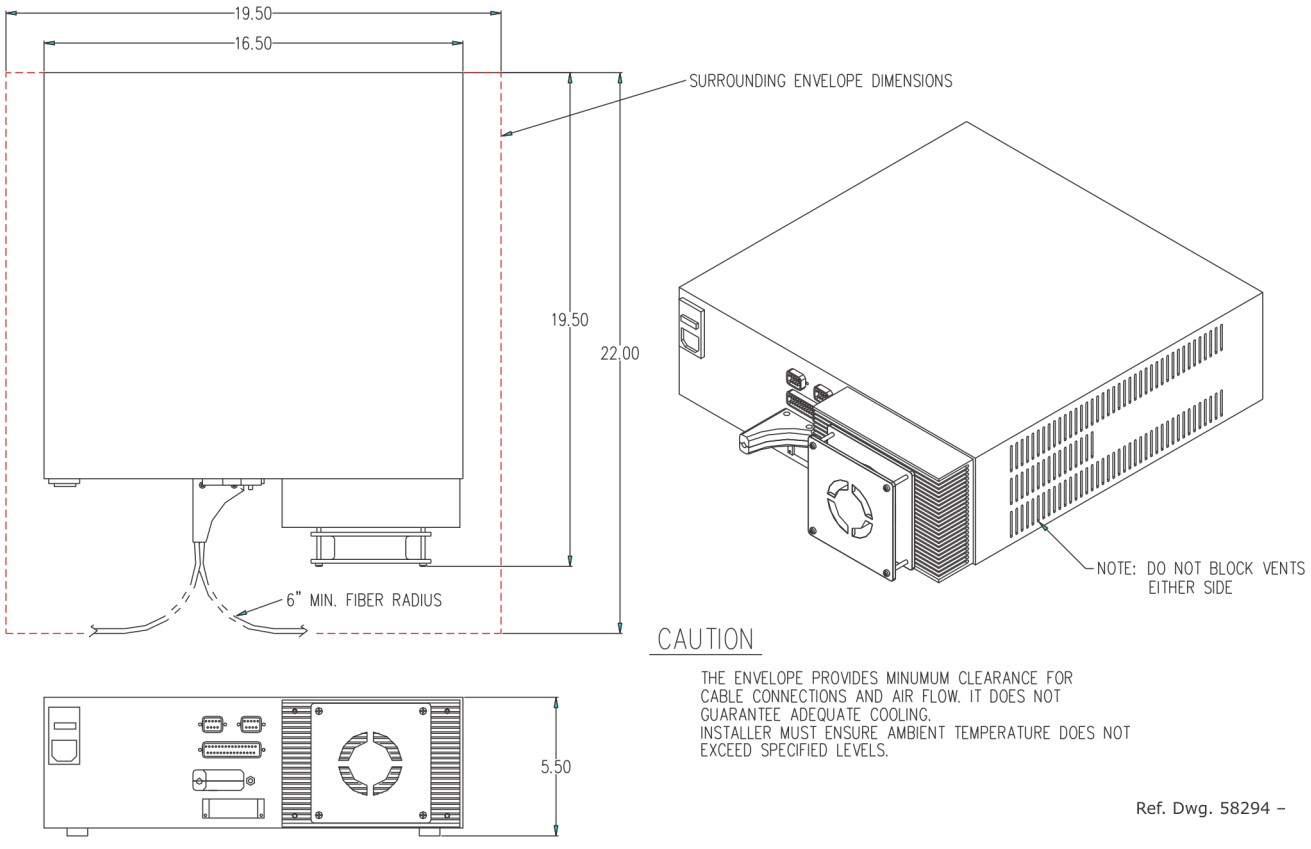
LENS	A	WC*
F100	.518[13.16MM]	97 MM
F160	.440[11.18MM]	176 MM
F254	–.455[11.56MM]	296 MM

*NOTE: WORKING CLEARANCE IS MEASURED FROM THE BOTTOM EDGE OF THE LENS ASSEMBLY TO THE MARKING SURFACE. IT IS THE DISTANCE THAT IS REQUIRED TO PROPERLY FOCUS THE BEAM FOR A GIVEN LENS.

MARKER ASSY	MARKING HEAD	OBJECTIVE #:	FOCAL LENGTH	MOUNTING RING #
72454 –1	72433	42553	100 MM	72445
72454 –2	72433	29942	160 MM	72452
72454 –3	72433	42555	F254	73745

Ref. Dwg. 72451C

EVC Laser Marking Head Dimensions

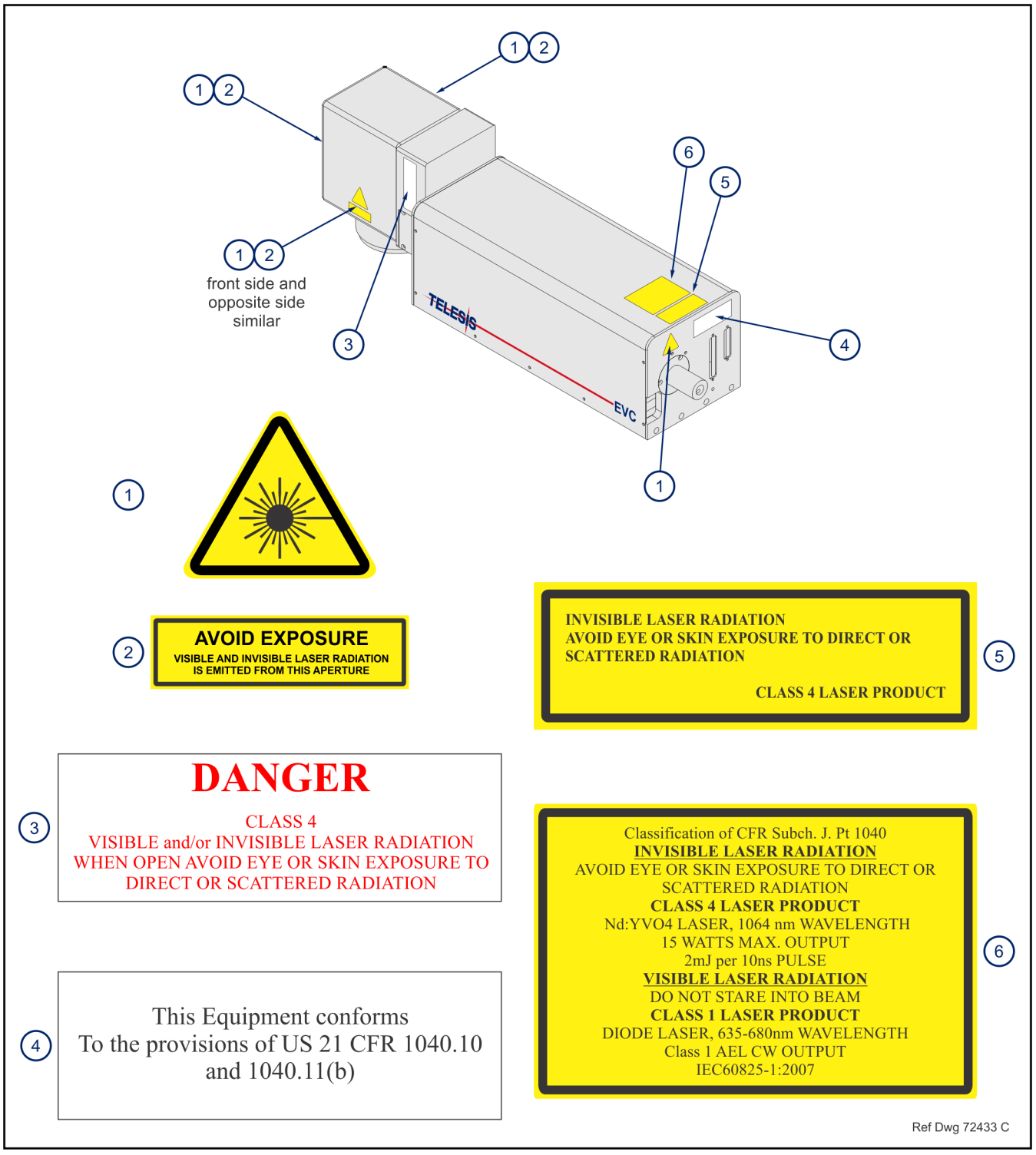


Ref. Dwg. 58294 –

XP1C Laser Controller Dimensions

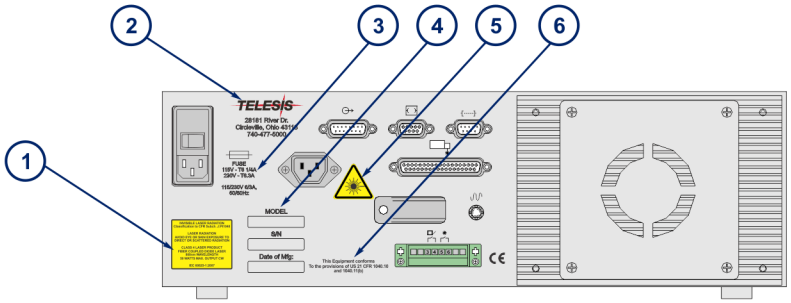
EVC LASER MARKING HEAD SAFETY LABELS

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



XP1C LASER CONTROLLER SAFETY LABELS

The following illustration shows the labels and their locations on the XP1C laser controller. Please familiarize yourself with the laser labels and their locations prior to operating the laser marking system.



BACK VIEW

1

INVISIBLE LASER RADIATION
Classification to CFR Subch. J:Pt1040

LASER RADIATION
AVOID EYE OR SKIN EXPOSURE TO
DIRECT OR SCATTERED RADIATION

CLASS 4 LASER PRODUCT
FIBER COUPLED DIODE LASER
808nm WAVELENGTH
50 WATTS MAX. OUTPUT CW

IEC 60825-1:2007

2

TELESIS
28181 River Dr.
Circleville, Ohio 43113
740-477-5000

3

Fuse

115V – T6 1/4A
230V – T6.3A

115/230V 6/3A
50/60 Hz

4

Model

S/N

Date of Mfg:

5

6

This Equipment conforms
To the provisions of US 21 CFR 1040.10
and 1040.11(b)

Ref Dwg 58294–, 63969A

EVC LASER MARKING HEAD

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

EVC Laser Marking Head Specifications

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 *EVC 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 or three 0.2362P6 locating pins

Positioning ..... visible (red) aiming diode

Field Resolution ..... 16 bit (65535 data points)

Galvanometer Repeatability .... < 22 micro radian

Marking Field Size ..... lens-dependent, see chart

Fiber Optic Cable Length ..... 1.75 m (5.74 ft.)

Cooling ..... air cooled, active thermo-electric

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 1064nm 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 1064nm 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 red beam is located *after* the shutter, the aiming diode 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.**

Marking Field Size

The size of the marking field is dependent on type of lens installed on the laser marking head. See *Flat-Field Lens*.

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 type 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.

The following chart outlines the available lenses, the resulting image field (marking window) provided by the lens, and the working clearance (in millimeters and inches) to properly focus the laser for marking.

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

XP1C 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.

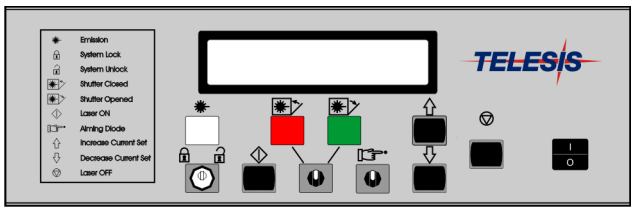
Engineered for the greatest reliability and for ease of maintenance, the pump diode within the laser controller is an easily replaceable sealed module with expected lifetime of greater than 200,000 operating hours.

XP1C 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 *XP1C Laser Controller Dimensions* drawing
Weight.....	approximately 10 Kg (22 lbs.)
Cooling.....	air cooled, active thermo-electric

Operator Control 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.



XP1C Laser Controller

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 for the EVC is 1.75 meters (5.74 feet) long.

SYSTEM COMPUTER

The laser system requires an IBM-compatible computer for running the Merlin II LS Laser Marking Software. The system computer may be a desktop or a notebook computer and may be supplied by Telesis or by the customer.

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.

If the system computer is supplied by anyone other than Telesis it must use the following software:

Operating System	Windows® 2000, XP, 7 (32-bit Edition), or Vista® (Business Edition)
Operator Interface....	Telesis Merlin II LS Laser Marking Software

Additionally the system computer must, at a minimum, meet the following specifications:

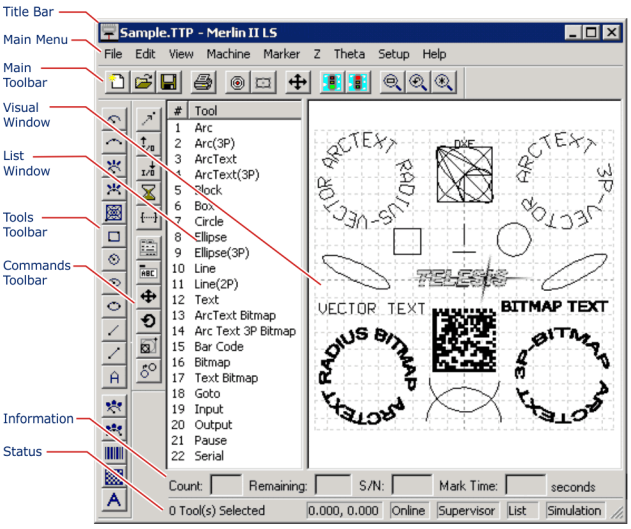
Processor	Pentium® III with RAM as recommended per operating system
Hard Drive.....	2 GB Hard Disk Drive
External Drives.....	CD-ROM Drive
Comm Ports.....	One available RS-232 Serial Port, Two available USB Ports, Two available Ethernet Ports, Two available full-height PCI Slots *
Circuit Cards.....	Laser/Galvo Controller Board, Video Board
Peripherals.....	SVGA Color Monitor, Mouse, Keyboard

* *If the system computer is a notebook, expansion must be used to provide the PCI slots.*

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.



Merlin II LS User Interface

Merlin II LS Laser Marking Software Specifications

Font Generation	True Type Fonts
Barcodes and Matrix.....	2D Data Matrix, PDF417, BC 39, Interleaved 2 of 5, UPCA/UPCE BC 128, Maxi Code, Code 93, QR Code and others
Graphic Formats.....	Raster and Vector: BMP, GIF, JPG, WMF, EMF, DXF, CUR, ICO
Serialization	Automatic and Manual Input Host Interface Capable
Linear Marking	Scalable w/ Letter Spacing Control
Arc Text Marking.....	Scalable and Adjustable
Drawing Tools	Line, Rectangle, Circle, Ellipse

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. For more information on using and configuring these parameters, refer to the *Merlin II LS Operating Instructions*.

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. An optional board allows connection of two additional linear axes. For installation details, refer to the *Auxiliary Controller Installation & Maintenance Manual* supplied with the two-axis controller.

I/O Kits. Telesis offers optional kits that provide programmable I/O signals in addition to the standard input signals (Go, Abort, Input 1 through Input 4) and standard output signals (Done, Ready, Paused, Output 1 through Output 3). For more information on connecting and using the additional I/O signals, refer to the *I/O Installation Supplement* provided in each of the kits.

- **Kit #53920** provides an additional 6 inputs and 6 outputs. It includes the I/O board, pre-installed SIPs resistor packs, software driver CD, and installation documentation. **This kit does not provide opto-isolated signals. Telesis does not endorse direct connection of I/O signals to the I/O board. Direct connections to high current/high voltage devices will damage the board.** The installer/integrator must provide opto-isolation between remote I/O devices and the I/O board.
- **Kit #53928** provides an additional 6 inputs and 6 outputs. It includes the I/O board, pre-installed SIPs resistor packs, software driver CD, Telesis Interface Module (#53423), two cable assemblies, and installation documentation. This kit provides opto-isolated signals between remote I/O devices and the I/O board using a Telesis interface module so additional I/O racks or opto-isolated board assemblies are not required.

Communications Protocol

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

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.

49 **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. Note that if the field contains message flags, they will be overwritten, not updated.

65 **Message type 65** (ASCII A) updates the Offset Angle parameter with the data extracted from the host message. Syntax for the transmitted string is ±n where ± is a positive or negative sign and n is an integer that represents the offset angle for the marking window.

72 **Message type 72** (ASCII H) updates the Offset X/Y parameters with the data extracted from the host message. Syntax for the transmitted string is ±X.X, ±Y.Y where ± is a positive or negative sign, X.X represents the X-axis offset distance, and Y.Y represents the Y-axis offset distance.

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

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

86 **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.

118 **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.

0 **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. The host message must use the format:

Tnn<string>

where:

T = the message type (1, A, H, P, Q, V, or v)

nn = the two-digit field number or query text buffer where data will be placed.
Note: Not used with Message Types A, H, P.

<string> = the pattern name to load (Message Type P).
or
the data to be inserted into the field or the query text buffer, as applicable (Message Types 1, Q, V, or v).

Communications Protocol ***(continued)***

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 following describes the Extended Protocol message format as sent from the host to the Merlin II LS software.

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

where:

SOH ASCII Start of Header character (001H). The system ignores all characters received prior to the SOH.

TYPE A single, printable ASCII character that defines the meaning (type) and content of the message downloaded from the host, where:

- **1** **Message Type 1** provides data to a text string in the pattern or polls the pattern for data. See [DATA] for details.
- **A** **Message Type A** provides data to the system Offset Angle parameter for the marking window or polls the system for data. See [DATA] for details.
- **E** **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. See [DATA] for details.
- **G** **Message Type G** initiates a print cycle.
- **H** **Message Type H** provides data to the system X/Y Offset parameters or polls the system for data. See [DATA] for details.
- **I** **Message Type I** polls the system for the I/O status.
- **O** **Message Type O** places the marker online. This allows a host computer to reset. For example, this may be used to recover from a power outage when the marker is unattended.
- **P** **Message Type P** loads a pattern or polls the system for the current pattern name. See [DATA] for details.
- **Q** **Message Type Q** provides data to the system query text buffer or polls the system for data. See [DATA] for details.
- **S** **Message Type S** polls the system for the machine status. The machine status is returned to the host in an eight-character hexadecimal mask.
- **V** **Message Type V** provides data to a variable text string in the pattern or polls the pattern for data. See [DATA] for details.

[##] Optional two-digit ASCII number that specifies the Station ID of the system in multi-drop network applications. The ID may range from 00-31. Note that "00" is reserved for applications where only one controller is used. In such applications, this field may be eliminated and "00" will be assumed.

STX ASCII Start of Text Character (002H).

[DATA] Character string that may be required for certain message types (e.g., Type 1, A, E, H, P, Q, or V).

Typically, data is sent in the format:

nn<string>

where:

nn = the two-digit field number or query text buffer where data will be placed. (Message Types 1, Q, or V).

<string> = the data to be inserted into the field or the query text buffer, as applicable (Message Types 1, Q, or V).
or
the pattern name to load (Message Type P).
or
the value of the X/Y Offset (Message Type H).
or
the value of the Offset Angle (Message Type A).

ETX ASCII end of text character (003H).

BCC Optional Block Check Code that is generated and sent to improve link reliability by providing fault detection. The BCC is calculated by taking an eight bit addition of the TYPE and DATA TEXT characters and transmitting them as a three digit ASCII decimal number in the range from 000 to 255. If the sum is greater than 255, the most significant bit overflows and is discarded.

CR ASCII Carriage Return Character (00DH)