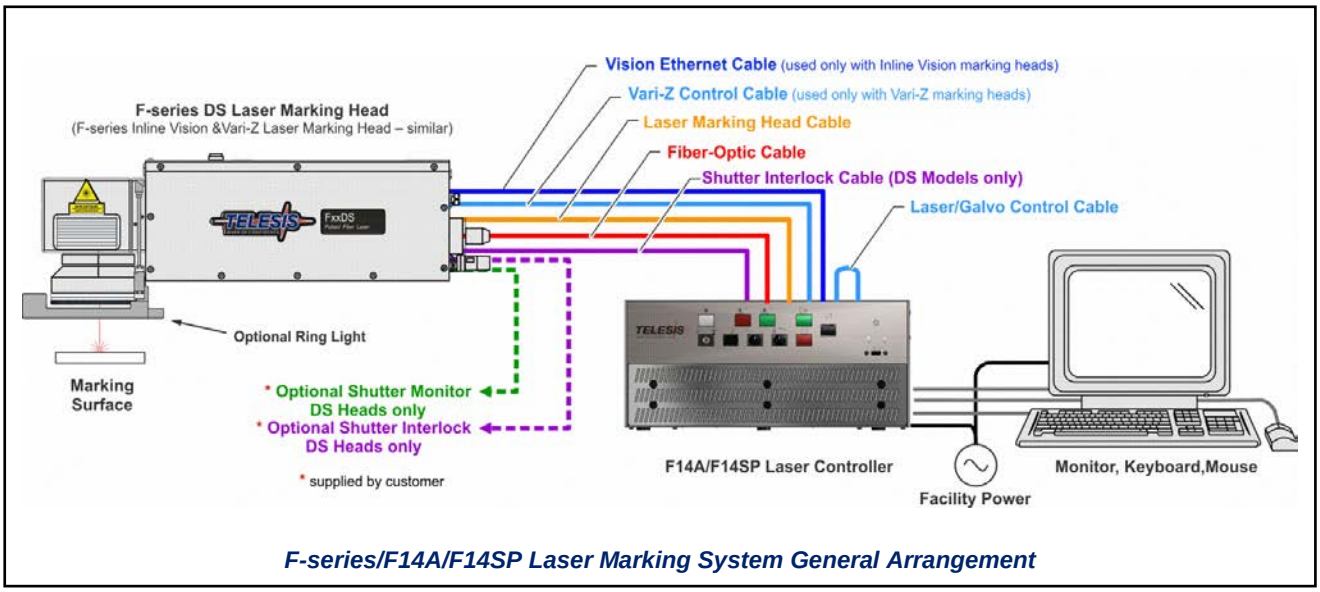

F-series/F14A/F14SP Laser Marking System General Arrangement

SYSTEM OVERVIEW

The Telesis® F-series lasers are a family of maintenance-free, Q-switched, Ytterbium fiber lasers designed for marking applications. These lasers deliver a high power laser beam directly to the marking head via a flexible, metal-sheathed fiber cable. The fiber-based optical design and rugged mechanical design allows the Telesis F-series marking heads to operate in an industrial environment where shock, vibration, and dust are a concern.

The unique design of the F-series lasers allows for a remote beam delivery system. The galvanometer package is attached to a fiber-optic delivery system from a remote laser engine. This allows the overall package to be very small and modular.

The F-series lasers offer these advantages:

- Standard 115/230 VAC operation
- Over 100,000 hours of reliable, maintenance-free performance
- Compact size and modular construction
- Output laser beam delivery via a fiber optic cable
- Exceptional beam quality and stable output power
- Active AO Q-switching
- Sealed head to prevent dust contamination in optical chamber
- Visible red diode for aiming and dry run operations
- Air cooled
- DoD-compliant Unique Identification (UID) marking
- Dual-sensor shutter circuit

SYSTEM CONFIGURATION

The F-series lasers are available in several models and wattages (30W), (50W), and (75W). Each model is available with or without the Vari-Z (variable Z-axis) feature, Inline Vision, and Dual Channel Shutter Status. The V models have the integrated Inline Vision system called Telesis TeleView. It is a through the lens camera system that allows on-screen viewing of the mark during setups (supervisor mode), as well as quick setup of the laser beam using the Marker Focus procedure. With the optional Read Tool added, the system can read and grade data matrix 2D bar codes.

- **Fxx Markers (Base)** are the base models, and provide dual-sensor shutter circuits.
- **FxxDS Markers** provide dual-sensor shutter circuits, plus dual channel shutter monitor, and shutter interlock
- **FxxV and FxxDSV Markers with Inline Vision** provide dual-sensor shutter circuits, plus shutter monitor, shutter interlock with Inline Vision options (2).
- **FxxZ and FxxDSZ Vari-Z Markers** provide the same capabilities as the DS markers, but include the Vari-Z features. The Vari-Z laser marking heads are equipped with a dynamic focusing unit. Dynamic focusing allows you to define various focal distances for the lens on your marker.
- **FxxZV and FxxDSZV Vari-Z Markers with Inline Vision** provide the same capabilities as the Vari-Z with the added option of the Inline Vision.

The basic laser system consists of the following components. The modular design allows for major components to be easily serviced if required.

Laser Marking Head – includes the shutter assembly, visible red aiming diode, galvanometer assembly, camera and flat-field lens.

F14A Laser Controller – contains the laser source unit, fiber optic cable assembly, circuit boards, the galvo controller board, and other electrical components. Controllers for the Vari-Z markers contain an additional 3D galvo controller board.

F14SP Laser Controller is the same as the F14A, except it is used only for the SP fiber laser heads.

The front panel of the controllers provide controls for the operator. The back of the controller provides an interface panel for connecting the laser marking head and other external devices.

System Computer – The system computer is embedded in the laser controller. The Merlin®II LS Laser Marking Software is pre-installed on the embedded computer.

Monitor, Keyboard, and Mouse – supplied by Telesis for connection to the laser controller.

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SPECIFICATIONS

F-series/F14A/F14SP System Specifications

Compliance	CDRH, CE
Laser Type	Class 4 Q-switched Ytterbium fiber
Wavelength:	
F-30DS, F-50DS, F-75DS	1060 nanometers (±20 nm)
Long Term Output Power Drift	< ± 5%
Laser Diode MTBF	100,000 hours
Power Requirements	95 to 250 VAC, 50/60 Hz
System Power (total):	
F-30DS	< 280W
F-50DS	< 400W
F-75DS	< 400W
Maximum Supply Voltage	264 VAC
Supply Voltage Fluctuation	< ± 10% with clean ground
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: un-detachable	
F30DS, F50DS	2.74 m (8.989 ft.) 5m(16.4ft) optional
F75DS	3m (9.8 ft.),
Laser Marking Head Cable	5 m (16.4 ft.), detachable
Vari-Z Control Cable	5 m (16.4 ft.), detachable
Peripherals	Monitor, Keyboard, Mouse

F14A/F14SP Laser Controller Specifications

Dimensions (W x H x D)	438.2 x 212.9 x 511.1 mm (17.25 x 8.38 x 20.12 in.)
Surrounding Envelope	see *F14A or F14SP Laser Controller Dimensions* drawing
Weight	approx. 18.64 Kg (41 lbs.)
Cooling	air cooled, fan

System Computer Specifications

Operating System	Windows® 7
Operator Interface	Telesis Merlin II LS Software
Processor	3 GHz Intel® Core™ I5
RAM	8 GB
Comm Ports	Two TCP/IP Ethernet Ports, Four USB Ports (back panel) One USB Port (front panel)
Circuit Cards	Laser/Galvo Controller Board, 3D Laser Galvo Controller Board (for Vari-Z markers only)

F-series *Laser Marking Head Specifications*

Dimensions (Length x Width)

Base ,V , DS and DSV heads.... 573.0 x 133.4 mm (22.60 x 5.25 in)

Z, DSZ and DSZV heads..... 733.7x 164.9 mm (28.88 x 6.49 in)

Dimensions (Height)	Dependent on laser marking head model and lens selection:
Base, V, DS, and DSV heads.	F100 lens: 154.57 mm (6.084 in.) F160 lens: 152.65 mm (6.009 in.) F163 lens: 168.98 mm (6.650in.) F254 lens: 182.38 mm (7.178 in.) F330 lens: 186.76 mm (7.350 in.) F350 lens: 172.01 mm (6.771 in.) F420 lens: 186.49 mm (6.734 in.)
Z, DSZ and DSZV heads	F100 lens: 143.59 mm (5.654in.) F160 lens: 141.63 mm (5.577 in.) F163 lens: 157.86 mm (6.216 in.) F254 lens: 171.39 mm (6.749 in.) F420 lens: 175.35 mm (6.905 in.)
Surrounding Envelope	see *Laser Marking Head Dimensions* drawings
Electrical Power	Fxx/ FxxDS 45W (approximate) FxxV/ FxxDSV 68W (approximate) FxxZ/ FxxDSZ 73W (approximate) FxxZV/ FxxDSZV 97W (approximate) FxxV(TeleView) FxxDSV(TeleView) 47W (approximate) FxxZV(TeleView)/ FxxDSZV(TeleView) 76W (approximate)
Mounting Weight	approx. 6.82 Kg (15 lbs.)
Mounting	factory-tapped M6-1.00 holes
Positioning	visible (red) aiming diode
Field Resolution	16 bit (65535 data points)
Galvanometer Repeatability	< 22 micro radian
Marking Field Size	lens-dependent, see *Laser Marking Head Dimensions* drawings, pgs. 4 and 5

SYSTEM OPTIONS

- Vari-Z (Dynamic Laser Focus)
- Auxiliary 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)
- Remote pushbutton station (start/abort)
- Externally-mounted focus-finder diode
- Workstation/Work area enclosure
- Fume extraction systems
- TeleView Inline Vision (when applicable)
- Ring Light
- Read Tool Command (must have TeleView)

SYSTEM SETUP

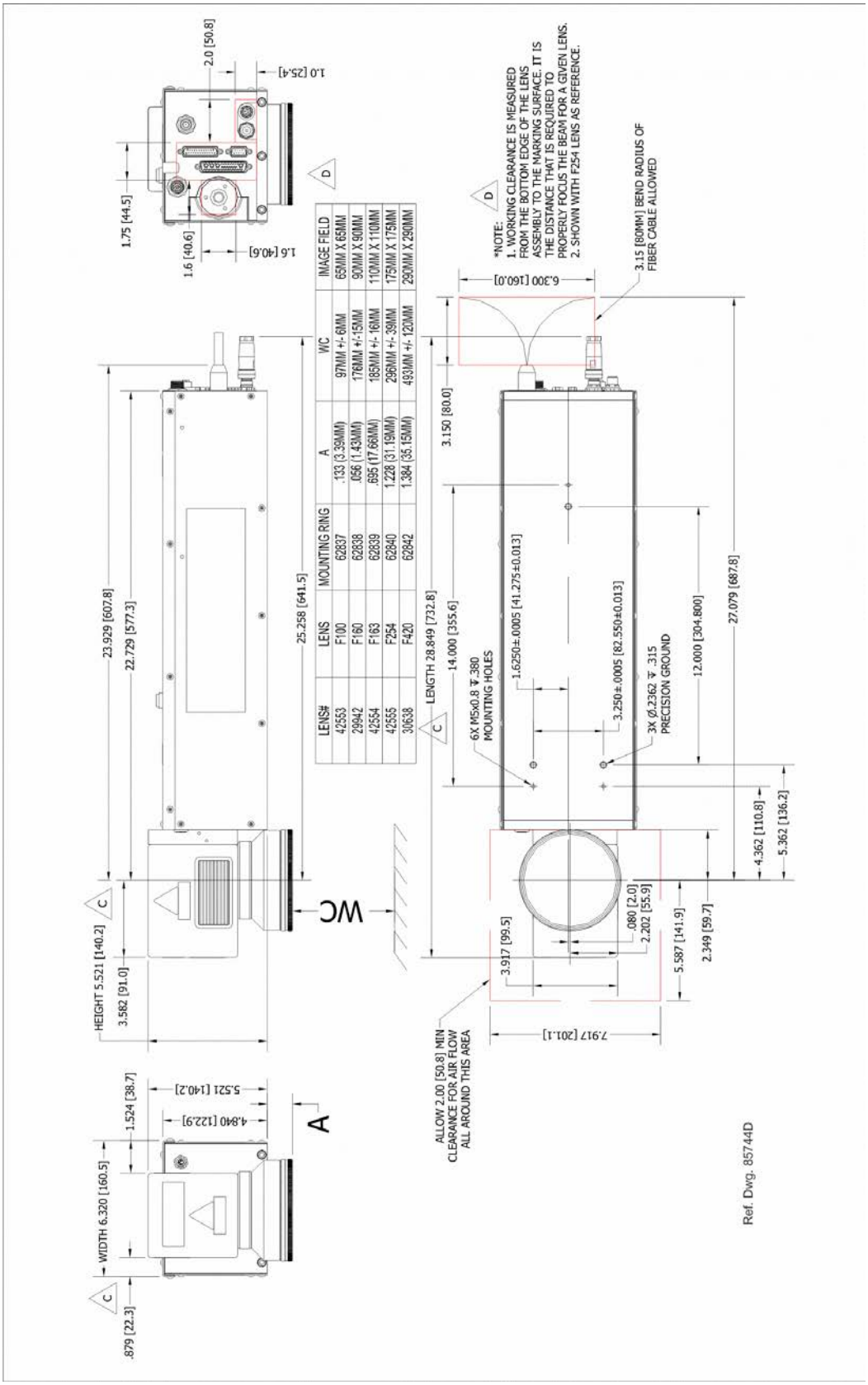
The following procedures are listed for reference only to provide a general overview of the installation process. Refer to the *F-series/F14A/F14SP Installation & Maintenance Manual* for complete installation details.

CAUTION

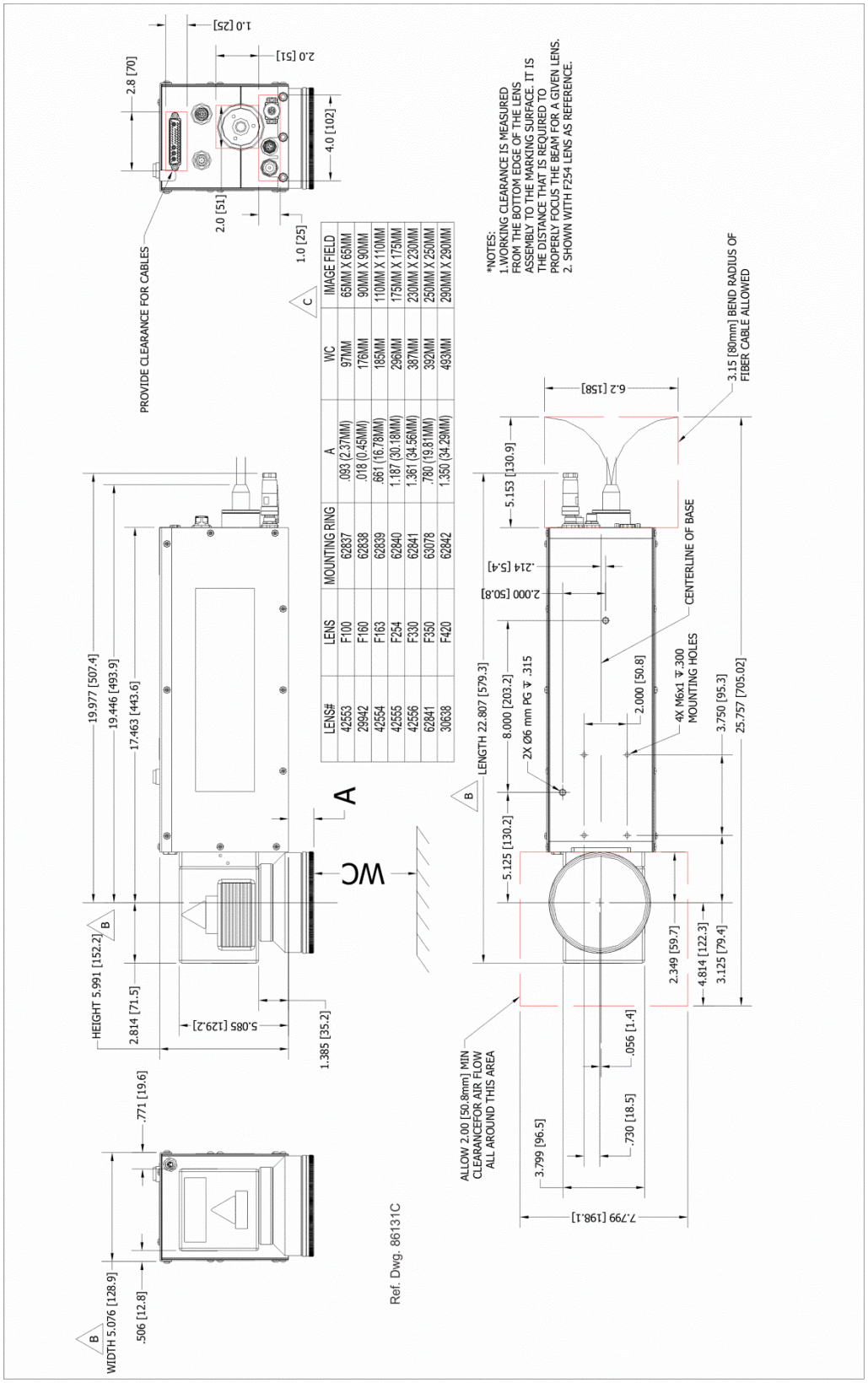
Never connect any power cable to power source until all system connections are made.

Avoid electromagnetic fields and static electricity in or around the Vari-Z marking head and its controller board.

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 *Laser Marking Head Dimensions* drawings for details.
2. Place the laser marking head on a suitable mounting surface. Secure the laser marking head to the 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 *F14A/F14SP Laser Controller Dimensions* drawing for details.
4. Place the laser controller, monitor, and keyboard in the desired location. Locate controller as close as practical to laser marking head.
5. Optionally, connect the laser marking head to a customer-supplied shutter monitor, DS Models only.
6. Optionally, connect the laser marking head to a customer-supplied shutter interlock, DS Models only.
7. Connect all remaining system cables.



F-series FxxZ, FxxDSZ, and FxxDSZV Laser Marking Head Dimensions



F-series Fxx, FxxDS, and FxxDSV Laser Marking Head Dimensions

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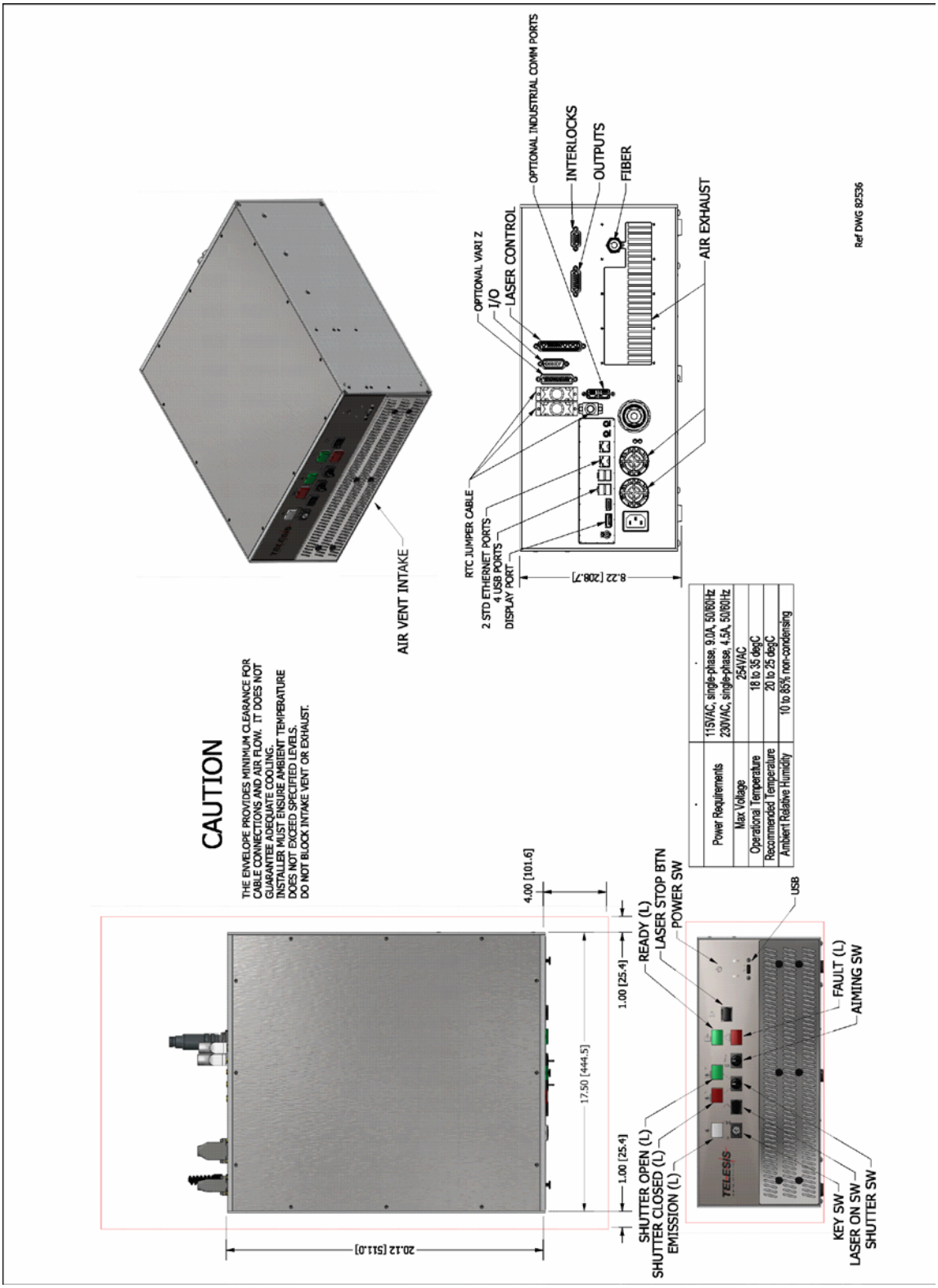
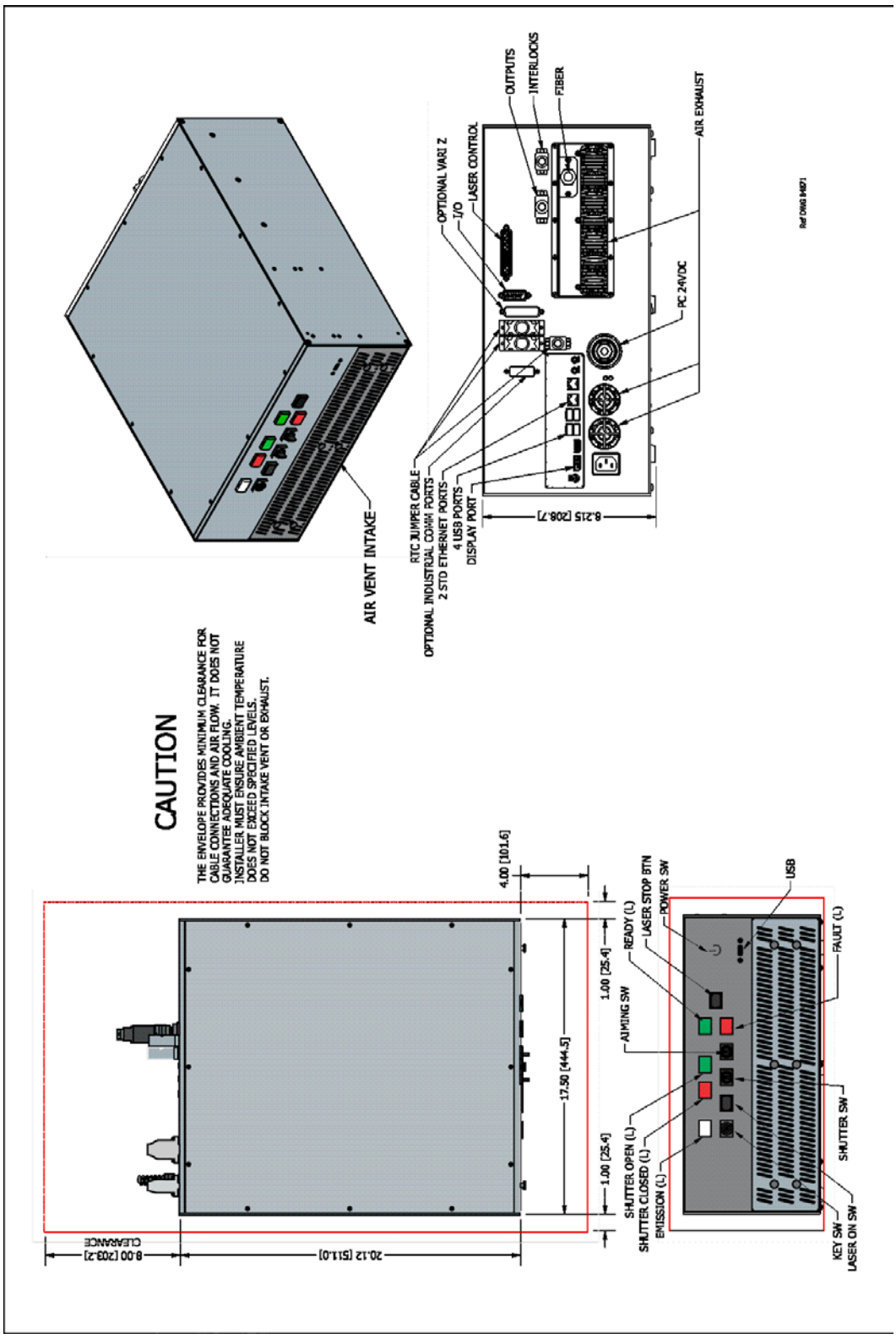


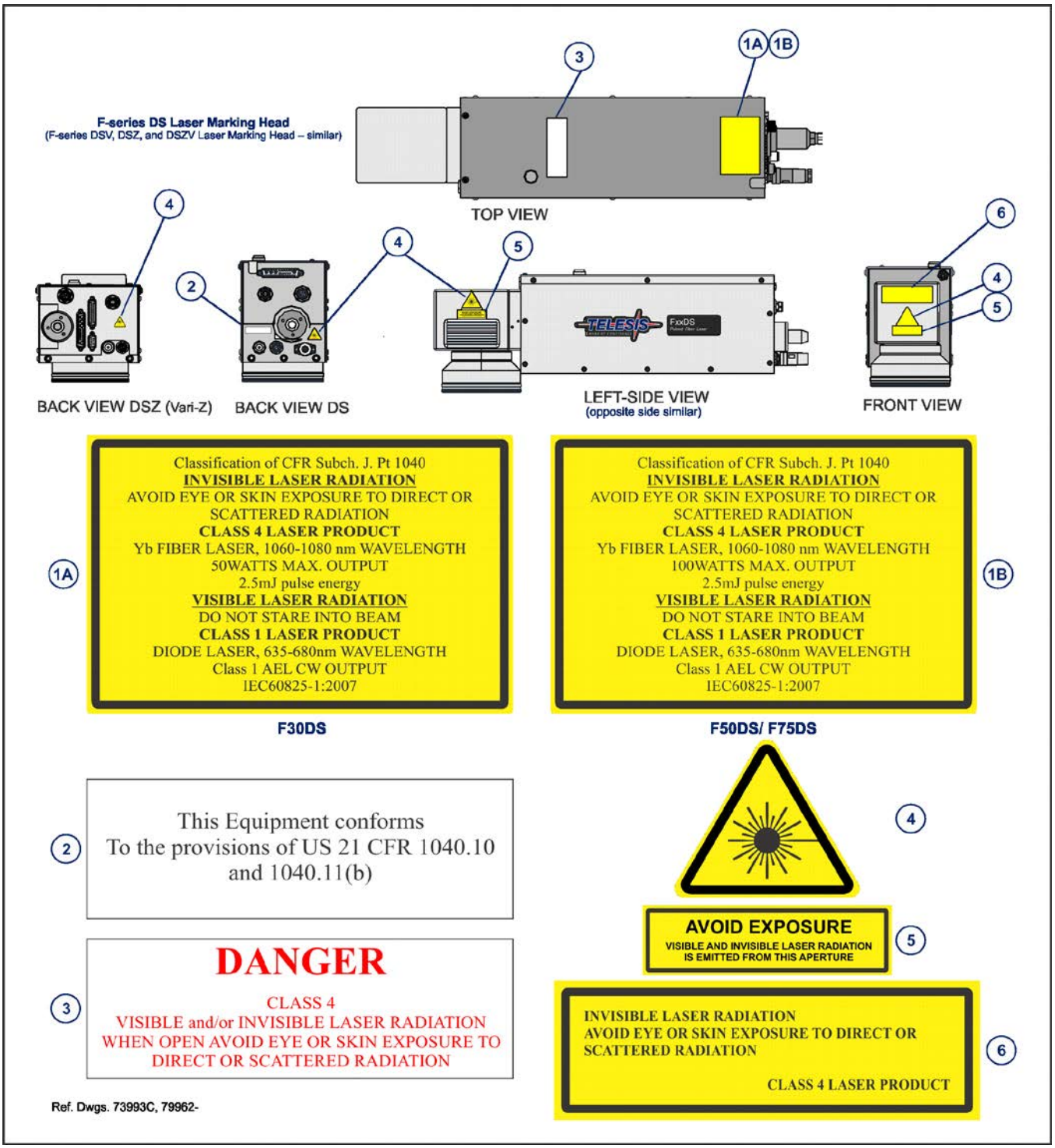
F14A Laser Controller Dimensions



F14SP Laser Controller Dimensions

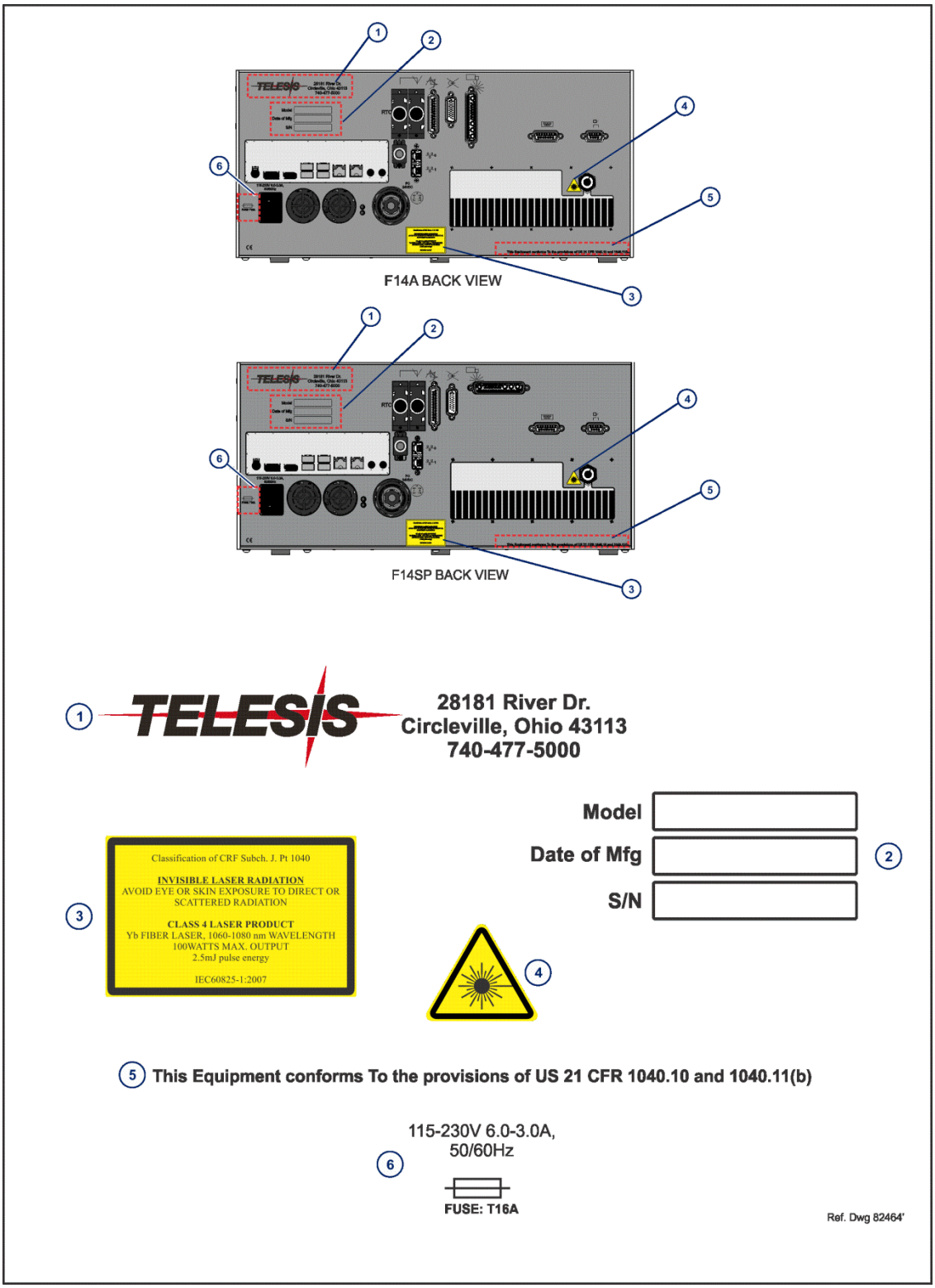
F-SERIES LASER MARKING HEAD LABELS

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



F14A LASER CONTROLLER SAFETY LABELS

The following illustration shows the labels and their locations on the F14A laser controller. Please familiarize yourself with the laser labels and their locations prior to operating the laser marking system.



F-SERIES LASER MARKING HEAD

The laser marking head includes the shutter assembly, visible red aiming diode, circuit board, galvanometer assembly, and the flat-field lens. The beam collimator and isolator (at the end of the fiber optic cable) are enclosed within the laser marking head and cannot be removed.

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 *F-series Laser Marking Head Specifications*.

Marking Depth

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.

Shutter Monitor (DS models only)

The F-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 by a additional safety circuit 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 (DS models only)

The FxxDS 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.

F14A/F14SP LASER CONTROLLER

The laser controller houses the laser source unit, system circuit boards, galvo controller board, programmable logic controller, control relay, cooling fan, and 115/230VAC IEC320 connector.

The laser controller also contains an embedded computer that runs the Merlin II LS Laser Marking Software. Controllers used with Vari-Z markers contain an additional 3D galvo controller board to provide variable Z-axis features.

The front panel provides controls for the operator. See *Operator Control Panel* for details. The back of the controller provides an interface panel for connecting the laser marking head and other external devices. See *Interface (Back) Panel* for details.

For Non-DS Heads the controller contains a single channel shutter interlock.

Fiber Optic Cable Assembly

The lasing beam is delivered to the laser marking head from the laser controller through a fiber optic cable. One end of the fiber optic cable is permanently attached to the laser source unit inside the laser controller. The opposite end of the cable includes a beam collimator and isolator that is enclosed within and pre-attached permanently to the laser marking head assembly.

The standard fiber optic cable for the F30DS, and F50DS lasers is 2.74 m (8.989 ft.) long with a 5m (16.4 ft.) option. The F75DS is 3.0m(9.8 ft.)

To prevent back reflections an ***optical isolator*** is used in all F-series Laser Marking Systems. Installed on the laser marking head end of the fiber optic cable, the isolator functions as a one way check valve allowing laser light to exit the laser but not return to the laser's most sensitive optical components.

Operator Control Panel

The front panel control module includes the system key switch, power on switch, laser off push button, manual safety shutter control, aiming diode on/off control, air filter and indicators lights (open/closed status, emission, ready, and fault).
For convenience, the front panel provides a USB port for usage with optional Telesis software.

F14A/F14SP Laser Controller – Front Panel

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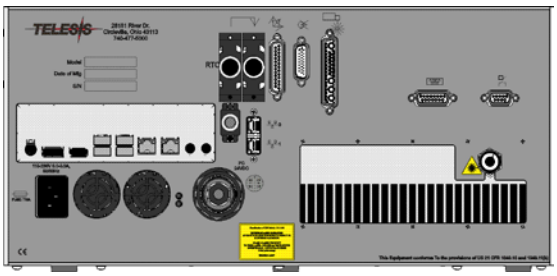
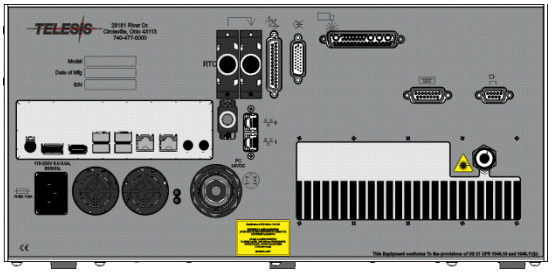
Interface (Back) Panel

The back panel of the controller provides a power entry module and a permanent pre-connected fiber optic cable. Connections are also available for the laser marking head cable, galvo control cable, and, if implemented, a Vari-Z control cable.



F14A Laser Controller – Back Panel



F14SP Laser Controller – Back Panel

The panel also provides a remote interlock connector and a remote pendant connector. An opto-isolated I/O connector is provided for connection to the remote I/O devices. Additionally, Ethernet, and USB ports are provide for other optional connections and usage with Telesis software. See *Remote Communications* for more information.

Connections for the embedded system computer are mounted on a sub-panel of the back panel. The separate panel allows you to connect a monitor, keyboard and mouse directly to the laser controller.

System Computer

The laser controller contains an embedded, IBM-compatible computer for running the Merlin II LS Laser Marking Software.

NOTICE

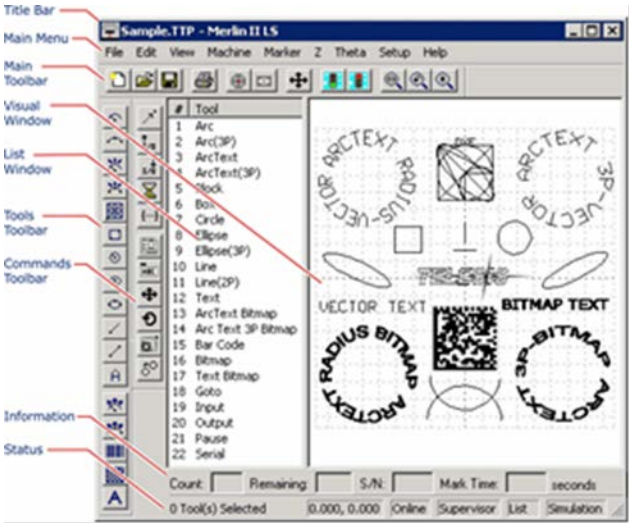
Merlin II LS software and associated applications are pre-installed on the embedded computer. The embedded system supports Telesis-installed software only and does not support user-installed programs.

All F14A/F14SP laser controllers have the Merlin II LS software installed and the entire system tested prior to shipment. Warranties for the computer, keyboard, monitor, and peripherals default to the original equipment manufacturer. Peripheral equipment provided with the embedded controller include a color monitor, mouse, and keyboard.

SYSTEM SOFTWARE

The powerful Telesis Merlin II LS Laser Marking Software is a Windows® based software package that comes with the standard 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, arc text, data matrix symbols, bar codes, rectangles, circles, ellipses, and lines. 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

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 Merlin II LS laser marking software. The software provides parameters to define the data transmitted to and from the host.

Four-axis Controller. Telesis offers an optional four-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.

I/O Connector. The laser controller provides an opto-isolated DB26P I/O connector. Separate I/O racks or opto-isolated board assemblies are not required. In addition to the standard input and Output signals, this connector provides two programmable inputs and two programmable outputs.

Communications Protocol

The host interface supports 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 Message type one is not recommended for use. Please use message type V when possible. If message type 1 is needed please contact your Telesis representative.

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 M Sets the current Omni Serial Number to the integer value in the message data.

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 R Allows a rotation angle to be specified via the host to rotate all pattern objects about the window origin

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.

Message Type X Sets the current Pattern Serial Number to the integer value in the message 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.

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