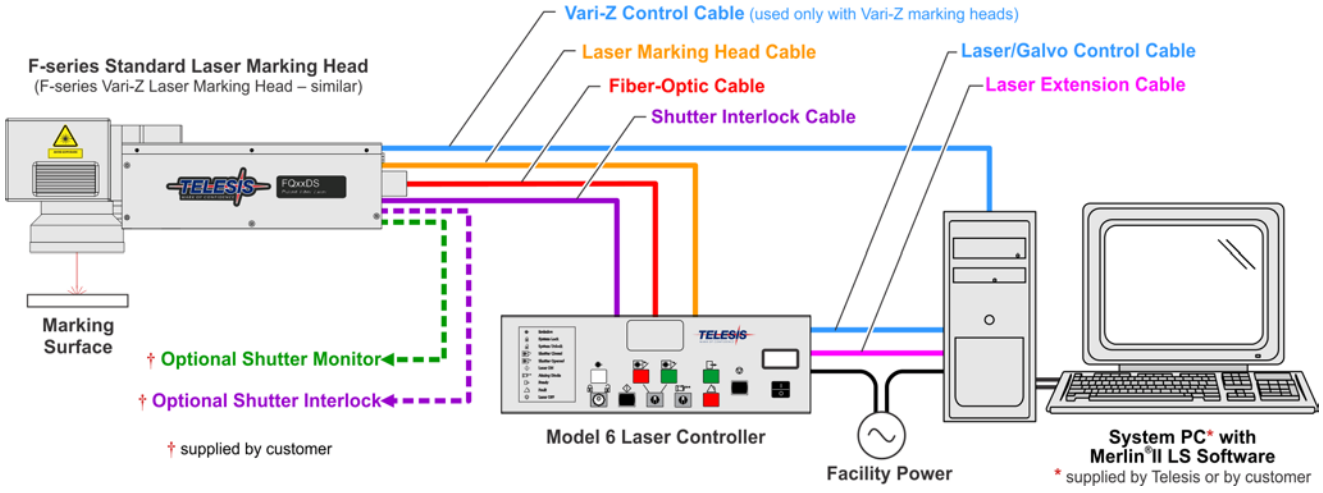


F-series/Model 6 Laser Marking System General Arrangement

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 lasers 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: FQ10DS (10W), FQ20DS (20W), FQ30DS (30W), and FQ50DS (50W). Each model is available with or without the Vari-Z (variable Z-axis) feature.

- **Standard Markers** provide dual-sensor shutter circuits, plus shutter monitor, shutter interlock, Theta (rotational) axis, and Z (vertical) axis capabilities.
- **Vari-Z Markers** provide the same capabilities as the standard 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.

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, and flat-field lens.

Laser Controller – contains the laser source unit, fiber optic cable assembly, circuit boards, and other electrical components. The front panel provides 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, Monitor, Keyboard, and Mouse – The system computer runs the Merlin®II LS Laser Marking Software and contains the laser/galvo controller board. System computers for Vari-Z markers contain an additional 3D galvo controller board.

SPECIFICATIONS

F-series/Model 6 System Specifications

Compliance ..... CDRH, CE

Laser Type ..... Q-switched Ytterbium fiber

Wavelength:
- FQ10DS, FQ20DS ..... 1060 nanometers (±10 nm)
- FQ30DS, FQ50DS ..... 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):
- FQ10DS ..... < 200W
- FQ20DS ..... < 250W
- FQ30DS ..... < 280W
- FQ50DS ..... < 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:
- FQ10DS ..... 5 m (16.4 ft.)
- FQ20DS,FQ30DS, & FQ50DS ..... 2.74 m (8.989 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

Model 6 Laser Controller Specifications

Dimensions (W x H x D) ..... 425.5 x 144.3 x 508.0 mm
16.75 x 5.68 x 20.00 in.

Surrounding Envelope ..... see *Model 6 Laser Controller Dimensions* drawing

Weight ..... approx. 15 Kg (33 lbs.)

Cooling ..... air cooled, fan

System Computer Specifications

Operating System ..... Windows® 2000, XP, Vista® (Business), 7 (professional) or 8 (Professional)

Operator Interface ..... 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,
Two available full-height PCI Slots

Peripherals ..... SVGA Color Monitor, Mouse, Keyboard

Circuit Cards ..... Laser/Galvo Controller Board, Video Board
3D Laser Galvo Controller Board (for Vari-Z markers only)

F-series *Laser Marking Head Specifications*

Dimensions (Length x Width)
- Standard Markers ..... 574.15 x 127.00 mm (22.604 x 5.000 in.)
- Vari-Z Markers ..... 618.80 x 160.5 mm (24.359 x 6.320 in.)

Dimensions (Height) ..... Dependent on laser marking head model and lens selection:
- Standard Markers ..... F100 lens: 142.20 mm (5.598 in.)
  F160 lens: 140.41 mm (5.528 in.)
  F163 lens: 156.62 mm (6.166 in.)
  F254 lens: 170.20 mm (6.701 in.)
  F330 lens: 174.39 mm (6.866 in.)
  F350 lens: 158.49 mm (6.240 in.)
  F420 lens: 173.99 mm (6.850 in.)
- Vari-Z Markers ..... F160 lens: 140.82 mm (5.544 in.)
  F254 lens: 170.77 mm (6.725 in.)

Surrounding Envelope ..... see *Laser Marking Head Dimensions* drawings

Electrical Power ..... 60W (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 chart

Lens	Image Field (mm)	Image Field (in.)	Working Clearance (mm)	Working Clearance (in.)
100 mm*	65 x 65	2.56 x 2.56	98	3.86
160 mm	90 x 90	3.54 x 3.54	176† 160 ±15‡	6.93† 6.3 ±.59‡
163 mm*	110 x 110	4.33 x 4.33	185	7.28
254 mm	175 x 175	6.89 x 6.89	296† 254 ±39‡	11.65† 10 ±1.54‡
330 mm*	230 x 230	9.06 x 9.06	388	15.28
350 mm*	250 x 250	9.84 x 9.84	395	15.55
420 mm*	290 x 290	11.42 x 11.42	494	19.45

* *These lenses are not available for Vari-Z markers.*

† *Working clearance for standard markers*

‡ *Working clearance for Vari-Z markers*

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

SYSTEM SETUP

The following procedures are listed for reference only to provide a general overview of the installation process. Refer to the *F-series/Model 6 Installation & Maintenance Manual* for complete installation details.

CAUTION

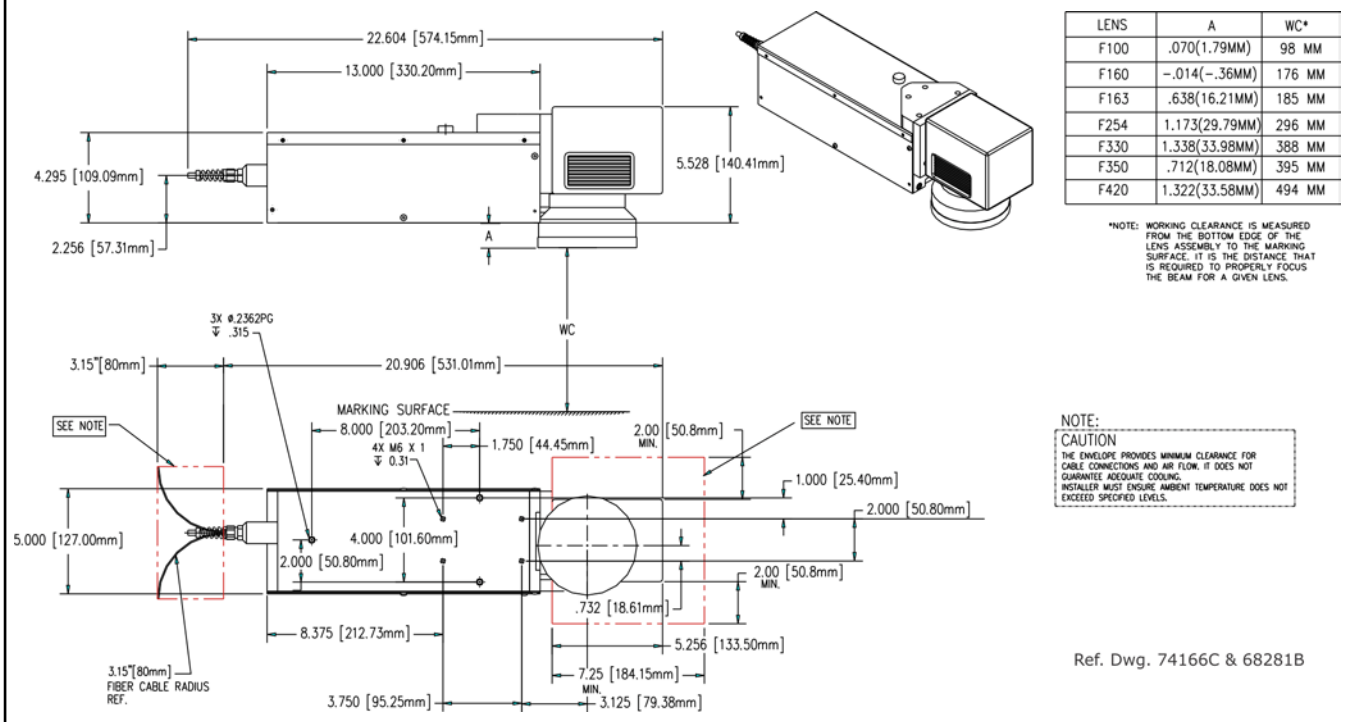
Never connect any power cable to power source until all system connections are made.

Marking heads with the Vari-Z option are position sensitive. When installing these markers, ensure the base of the marking head is horizontal. Do not mount with the base toward the side and never mount the base facing upward.

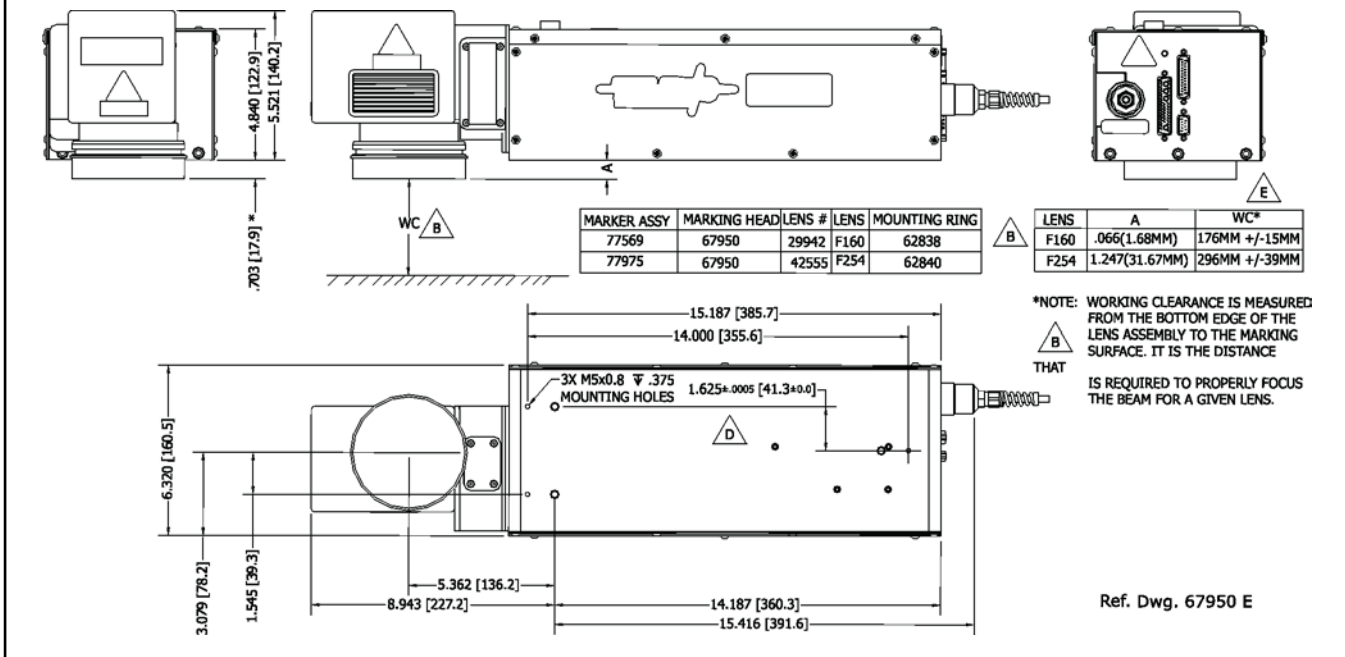
Avoid electromagnetic fields and static electricity in or around the Vari-Z marking head and its controller board.

The Vari-Z amplifier board and scan head are a matched set. Their serial numbers must match. Never intermix them with other serial numbers.

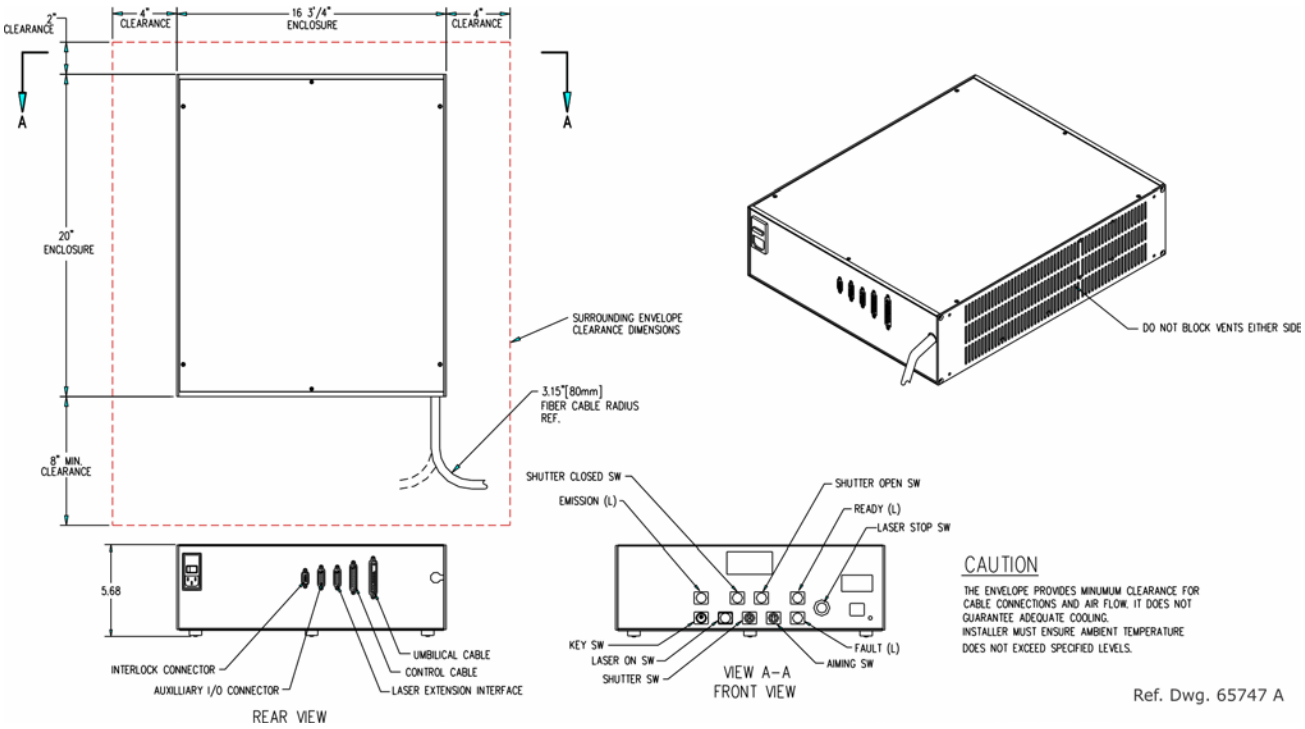
1. Ensure sufficient clearance exists on all sides of the laser marking head to allow for proper air circulation and to permit proper installation of applicable cables. See *Laser Marking Head Dimensions* drawings for details.
2. Place the laser marking head on a suitable mounting surface. Secure laser 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 *Model 6 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. Select proper fuse arrangement (115 or 230VAC) for the laser controller.
6. Place the system computer, monitor, and keyboard in the desired location. Locate the computer as close as practical to laser controller.
7. Optionally, connect the laser marking head to a customer-supplied shutter monitor.
8. Optionally, connect the laser marking head to a customer-supplied shutter interlock.
9. Connect all remaining system cables.



Standard F-series Laser Marking Head Dimensions



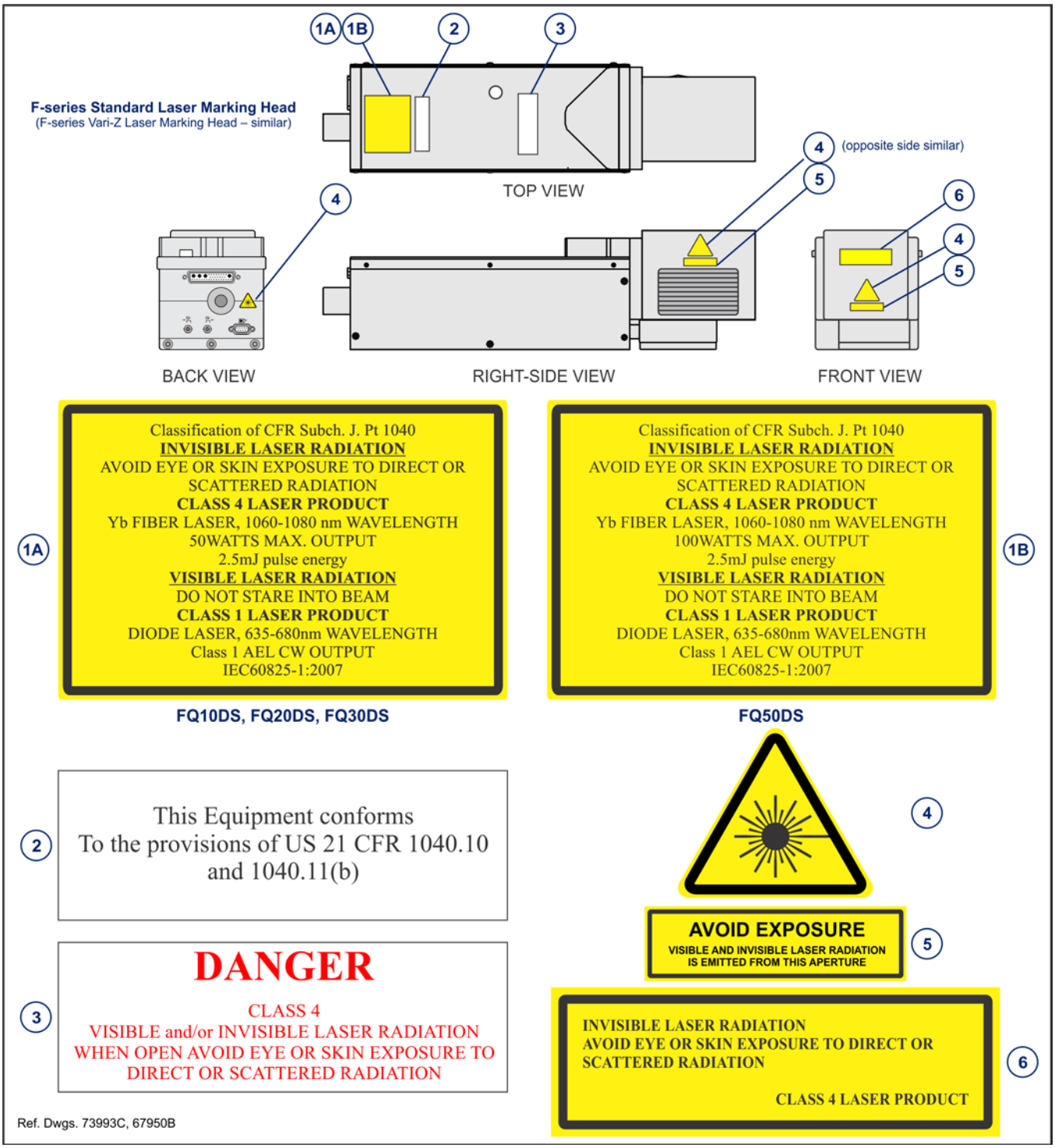
Vari-Z F-series Laser Marking Head Dimensions



Model 6 Laser Controller Dimensions

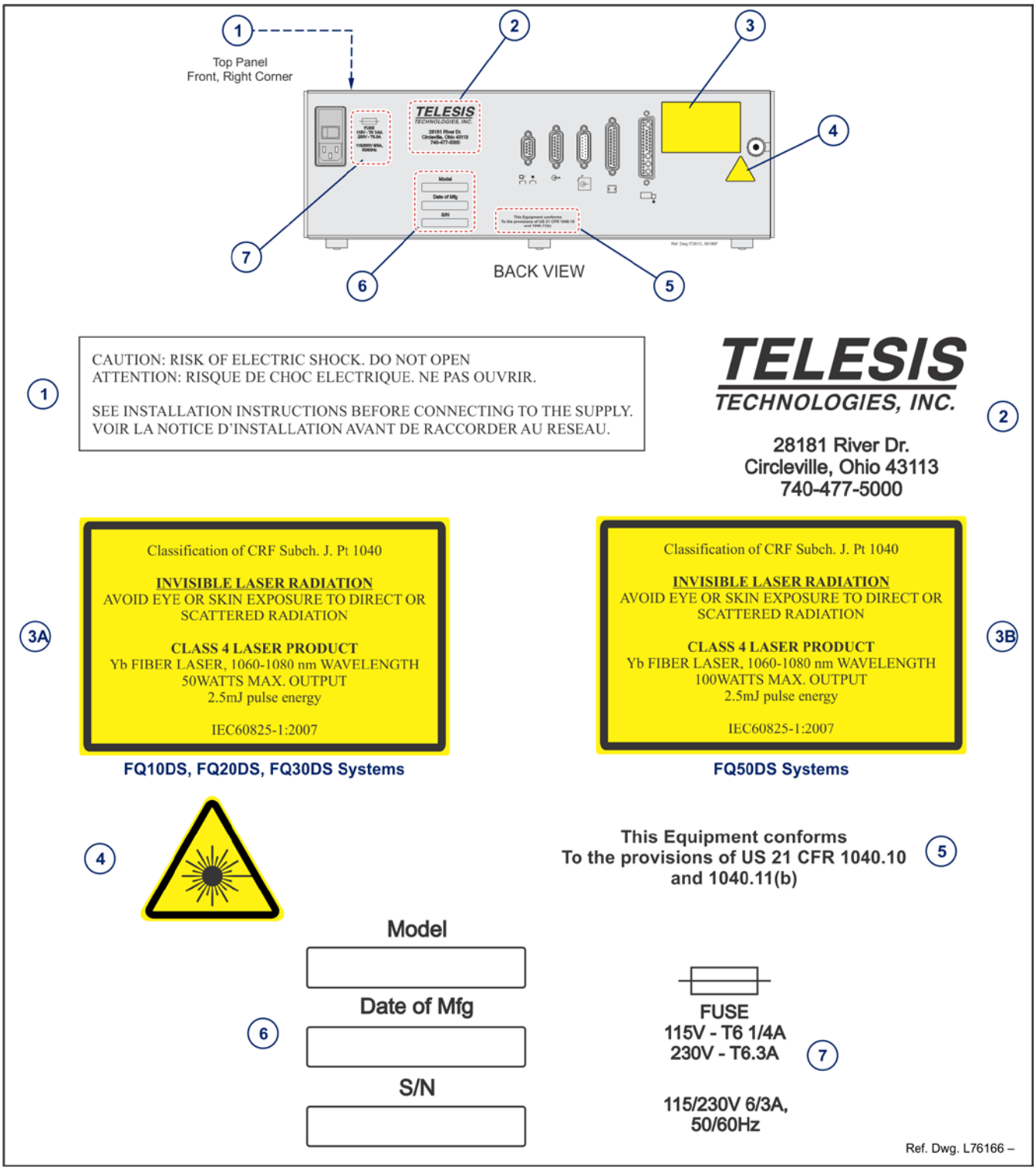
F-SERIES LASER MARKING HEAD LABELS

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.



MODEL 6 LASER CONTROLLER SAFETY LABELS

The following illustration shows the labels and their locations on the Model 6 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.

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

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.

Shutter Monitor

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 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 F-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.

MODEL 6 LASER CONTROLLER

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

The laser source unit generates the lasing beam. Engineered for the greatest reliability and for ease of maintenance, the laser source is an easily replaceable sealed module with an expected MTBF of 100,000 operating hours.

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.

Fiber Optic Cable Assembly

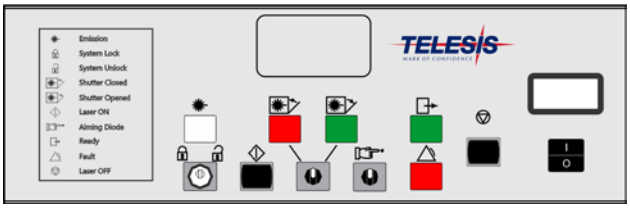
The lasing beam is delivered to the laser marking head from the laser controller through a fiber optic cable. One end of the fiber optic cable is permanently attached to the laser source unit inside the laser controller. The opposite end of the cable includes a beam collimator and isolator that is enclosed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

The standard fiber optic cable for the FQ10DS is 5 m (16.4 ft.) long. For the FQ20DS, FQ30DS, and FQ50DS lasers, the standard fiber optic cable is 2.74 m (8.989 ft.) long

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

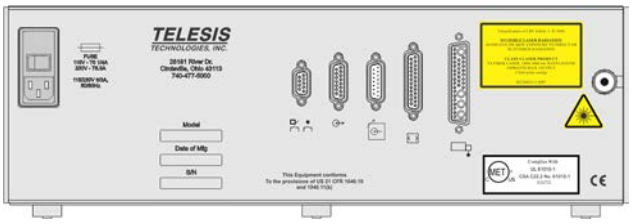
The front panel control module includes the system key switch, laser off push button, manual safety shutter control, function indicators, and an LCD panel to monitor elapsed emission time.



Model 6 Laser Controller – Front Panel

Interface (Back) Panel

The back panel of the controller provides a power entry module, a pre-connected fiber optic cable and connections for the laser marking head cable. The panel also provides a shutter interlock connector, a remote pendant connector, and a connector to monitor output signals that report the status of the shutter, laser emission, and fault conditions.



Model 6 Laser Controller – Back Panel

SYSTEM COMPUTER

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

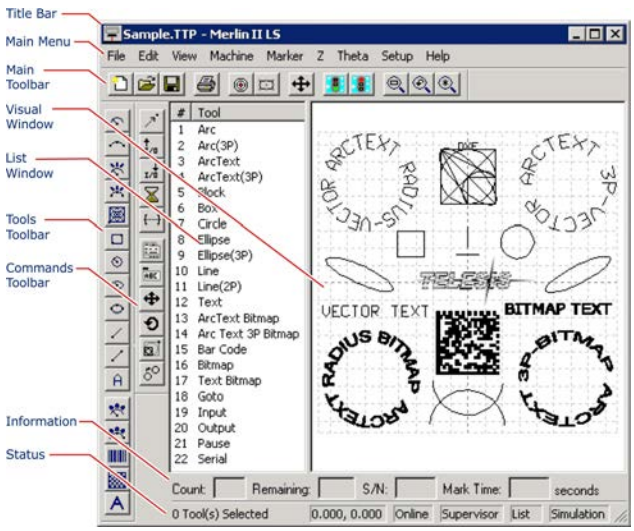
The system computer must contain the Merlin II LS software and the laser/galvo controller board. Additionally, systems using a Vari-Z markers must contain an additional 3D galvo controller board to provide variable Z-axis features. All system computers provided by Telesis have these components installed 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 system computer 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 remote I/O devices. Remote communications can be performed by connecting to a Host computer, an optional I/O kit, or an optional two-axis Auxiliary Controller.

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.

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 a PCI-DIO24 or PCIe-DIO24 card 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