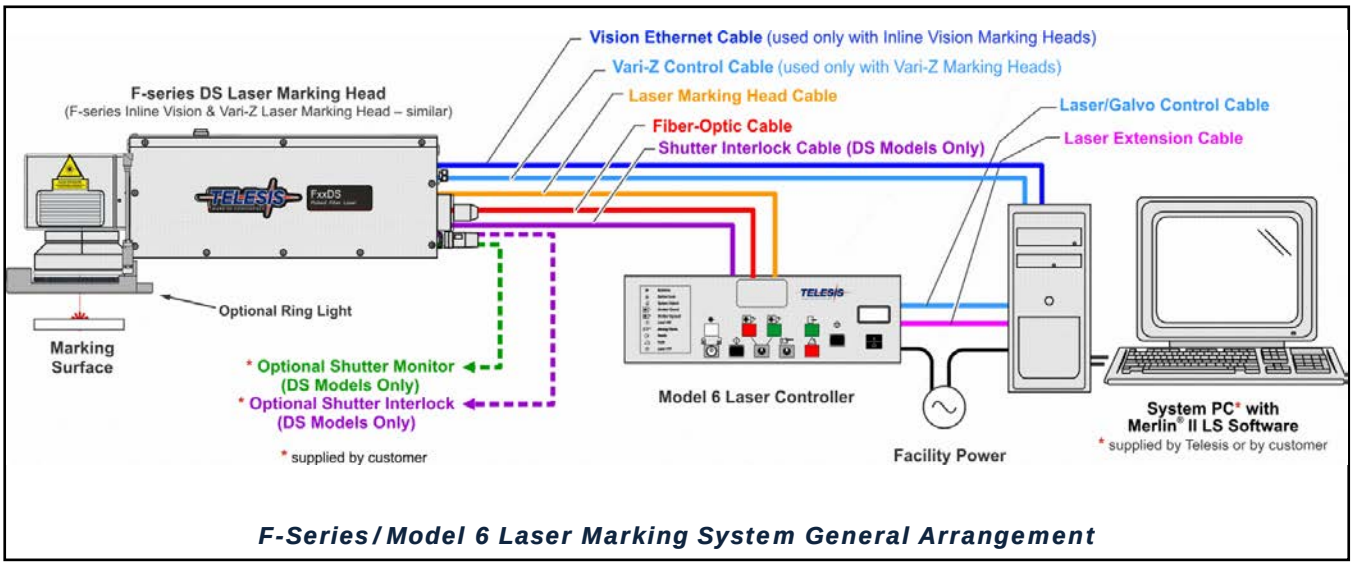


F-Series/Model 6 Laser Marking System General Arrangement

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 to the marking head via a flexible, metal-sheathed fiber cable. The fiber-based optical design and rugged mechanical design allow 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 design allows the overall package to be very small and modular.

The F-series lasers offer the following advantages:

- Standard 115/230 VAC operation
- 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 the 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, as well as 30- and 50-watt varieties. 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 in Supervisor mode, as well as quick setup of the laser beam using the Marker Focus procedure. With the optional Read Tool, the system can read and grade data matrix 2D barcodes.

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

© 2020 Telesis Technologies, Inc. – All Rights Reserved

Disclaimer: Printed or downloaded copies of this document are considered to be uncontrolled. Documentation is subject to change without notice.

The modular design of the laser system allows major components to be easily serviced if required. The basic laser system components are listed below.

Laser Marking Head. The laser marking head includes the shutter assembly, visible red aiming diode, galvanometer assembly, and flat-field lens.

Model 6 Laser Controller. The Model 6 controller contains the laser source unit, fiber-optic cable assembly, circuit boards, and other electrical components.

Controller Panels. The front panel provides controls for the operator. The back panel 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.

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 push button 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 provide a general overview of the installation process. Refer to the *F-Series Installation & Maintenance Manual* for complete installation details.

CAUTION

Never connect any power cable to a 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* 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 *Model 6 Laser Controller Dimensions* drawing for details.
4. Place the laser controller, monitor, and keyboard in the selected location. Locate the controller as close as practical to the laser marking head.
5. Select the proper fuse arrangement (115 or 230 VAC) for the laser controller.
6. Place the system computer, monitor, and keyboard in the desired location. Locate the computer as close as practical to the laser controller.
7. Connect the laser marking head to a customer-supplied shutter monitor. **This step is optional and applies only to DS models.**
8. Connect the laser marking head to a customer-supplied shutter interlock. **This step is optional and applies only to DS models.**
9. Connect all remaining system cables.

SPECIFICATIONS

F-Series/Model 6 System Specifications

Compliance	CDRH, CE, CSA (Model 6 only)
Laser Type	Q-switched Ytterbium fiber
Wavelength	
F30DS and F50DS	1060 nanometers (±20 nm)
Long-Term Output Power Drift	< ± 5%
Power Requirements	95 to 250 VAC, 50/60 Hz
System Power (total):	
F30DS	< 280 W
F50DS	< 400 W
Maximum Supply Voltage	264 VAC
Supply Voltage Fluctuation	< ± 10% with clean ground
Operational Temperature	18° 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	
F30DS, F50DS	2.74 m (8.989 feet) 5 m (16.4 feet) optional
Laser Marking Head Cable	5 m (16.4 feet), detachable
Vari-Z Control Cable	5 m (16.4 feet), detachable
Peripherals	Monitor, Keyboard, Mouse

F-Series Laser Marking Head Specifications

Head Dimensions (Length x Width)

Base, DS, and DSV	578.9 x 128.9 mm (22.791 x 5.076 inches)
DSZ and DSZV	668.3 x 160.5 mm (26.311 x 6.320 inches)
Dimensions (Height)	Height dimensions are determined by the head height + the A column value in the Laser Marking Head Dimensions drawings
Base, V, DS, and DSV heads	
F100 lens	154.57 mm (6.084 inches)
F160 lens	152.65 mm (6.009 inches)
F163 lens	168.98 mm (6.650 inches)
F254 lens	182.38 mm (7.178 inches)
F330 lens	186.76 mm (7.350 inches)
F350 lens	172.01 mm (6.771 inches)
F420 lens	186.49 mm (7.342 inches)
DSZ and DSZV heads	
F100 lens	143.59 mm (5.654 inches)
F160 lens	141.63 mm (5.577 inches)
F163 lens	157.86 mm (6.216 inches)
F254 lens	171.39 mm (6.749 inches)
F330 lens	174.81 mm (6.884 inches)
F350 lens	160.05 mm (6.303 inches)
F420 lens	175.35 mm (6.905 inches)
Surrounding Envelope	see the *Laser Marking Head Dimensions* drawings
Electrical Power (approximate)	
Fxx/FxxDS	45 W
FxxV/FxxDSV	68 W
FxxZ/FxxDSZ	73 W
FxxZV/FxxDSZV	97 W
FxxV/FxxDSV (Teleview)	47 W
FxxZV/FxxDSZV (TeleView)	76 W

Head Mounting Weight (approximate)

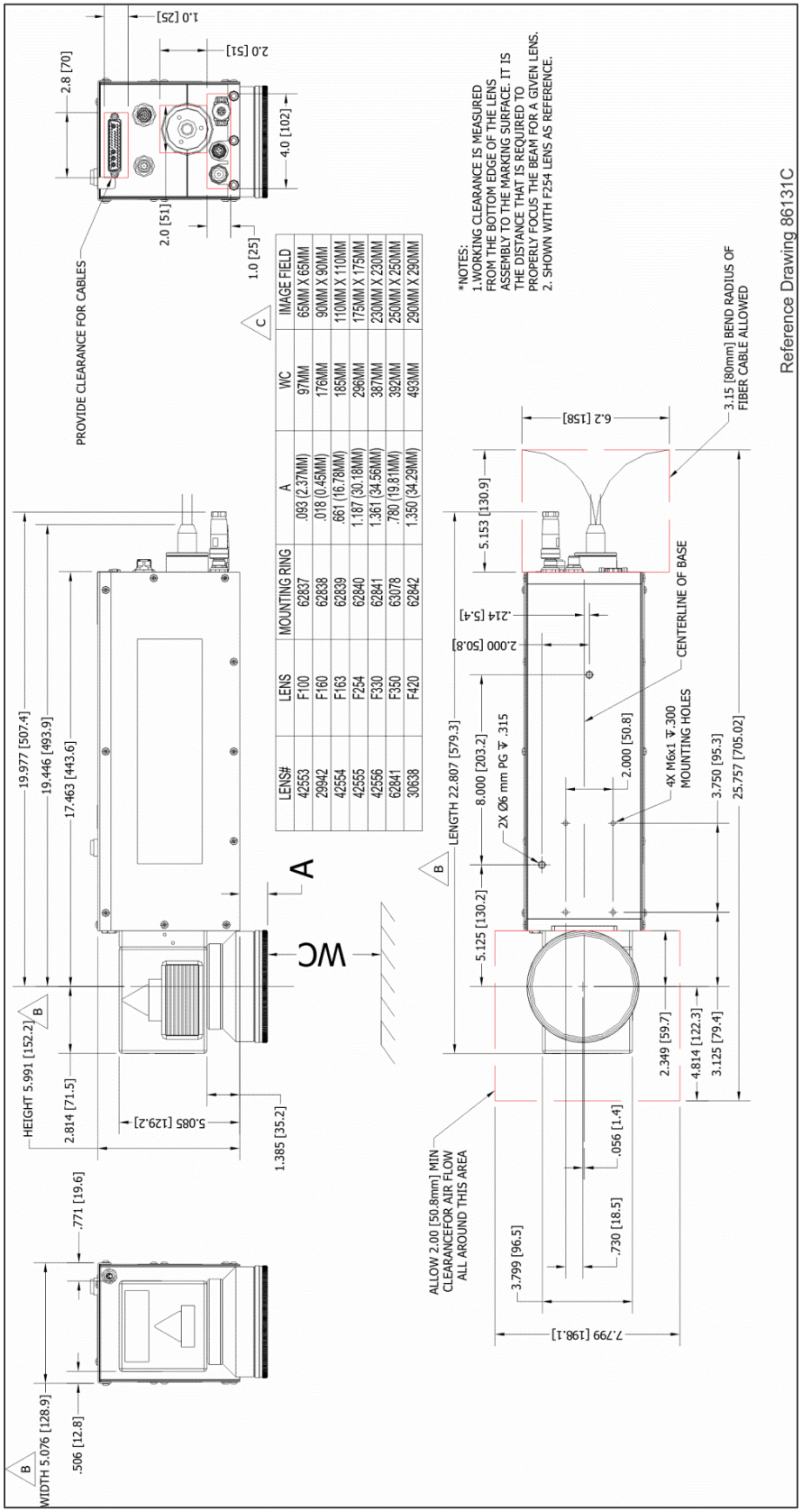
Base, V, DS, and DSV	7.64 kg (16.84 lb)
Z, DSZ, and DSZV	11.46 kg (25.26 lb)
Mounting	Factory-tapped M6-1.00 holes
Positioning	Visible (red) aiming diode
Field Resolution	16 bit (65535 data points)
Galvanometer Repeatability	< 22 micro radian
Marking Field Size	Lens-dependent see the *Laser Marking Head Dimensions* drawings

Model 6 Laser Controller Specifications

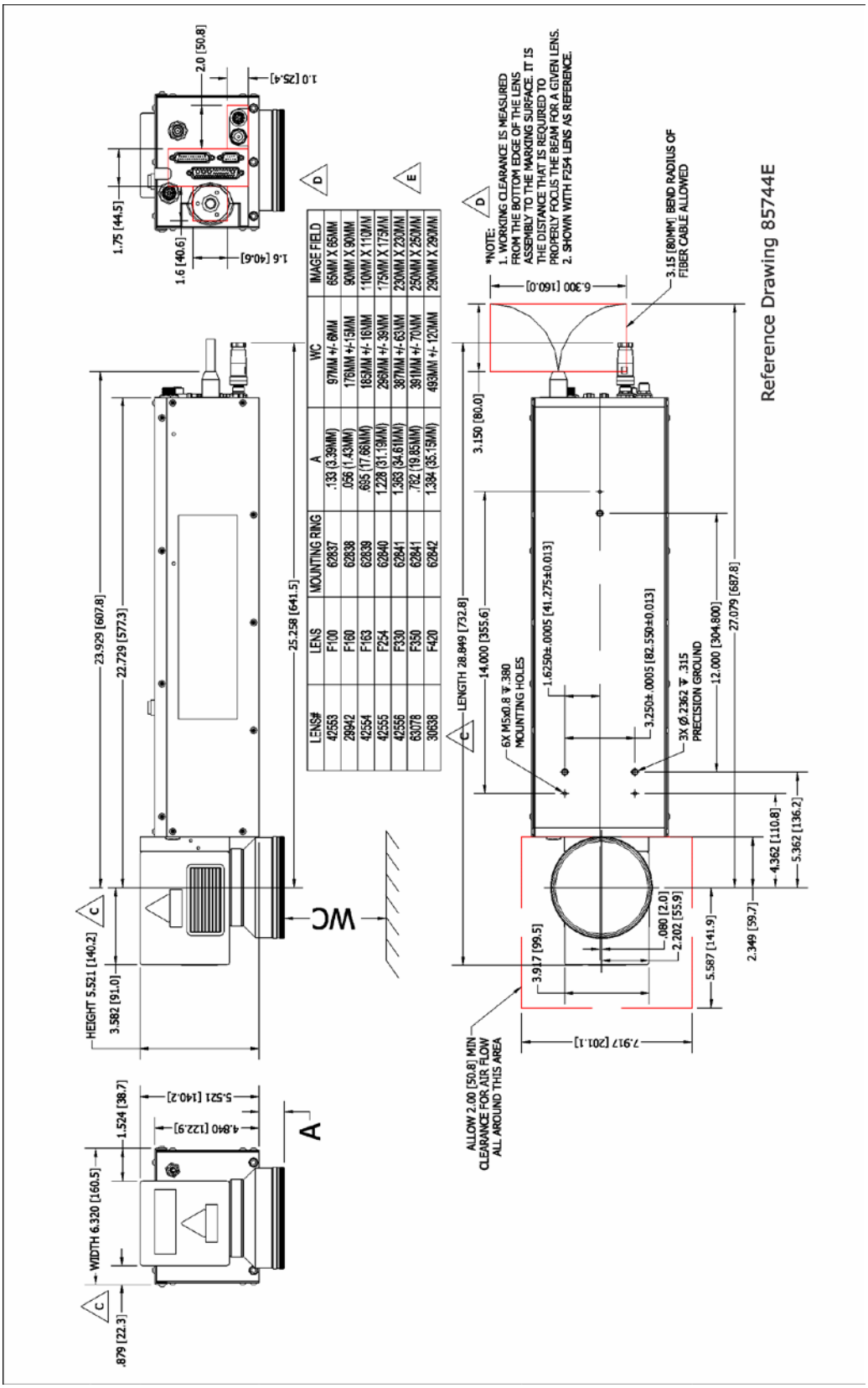
Dimensions (W x H x D)	425.5 x 144.3 x 508.0 mm 16.75 x 5.68 x 20.00 inches
Surrounding Envelope	see the *Model 6 Laser Controller Dimensions* drawing
Weight	Approximately 15 kg (33 lb)
Cooling	Air cooled, fan

System Computer Specifications

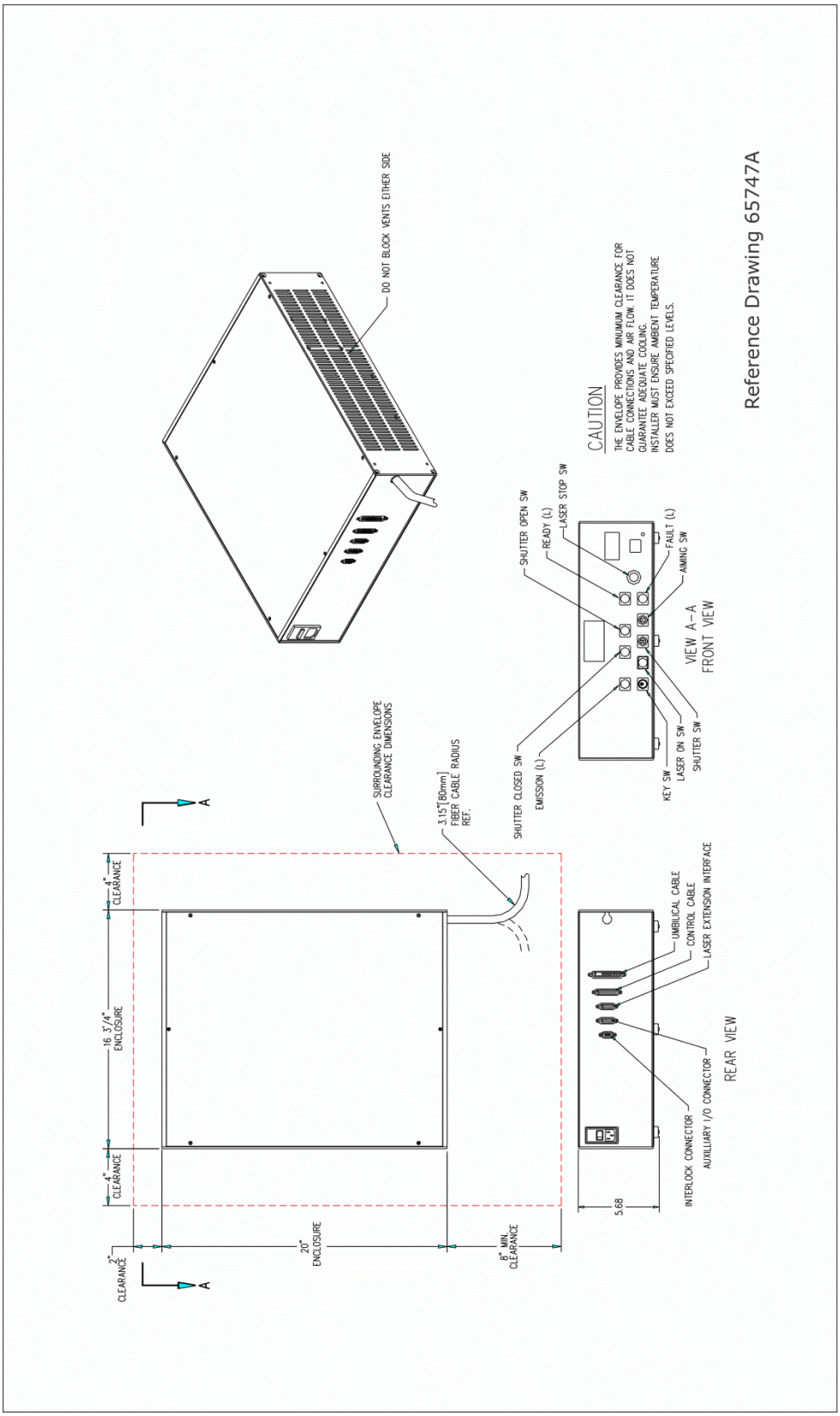
Operating System	Windows® XP-SP3, 7, 8, or 10; 32 or 64 bit
Operator Interface	Merlin II LS Laser Marking Software
Processor	3 GHz Intel® Core™ I5
Hard Drive	2 GB Hard Disk Drive
Comm Ports	One available RS-232 serial port (optional for host) Two available USB ports Two available Ethernet ports Three available full-height PCIe 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 Fxx, FxxDS, and FxxDSV Laser Marking Head Installation Drawing



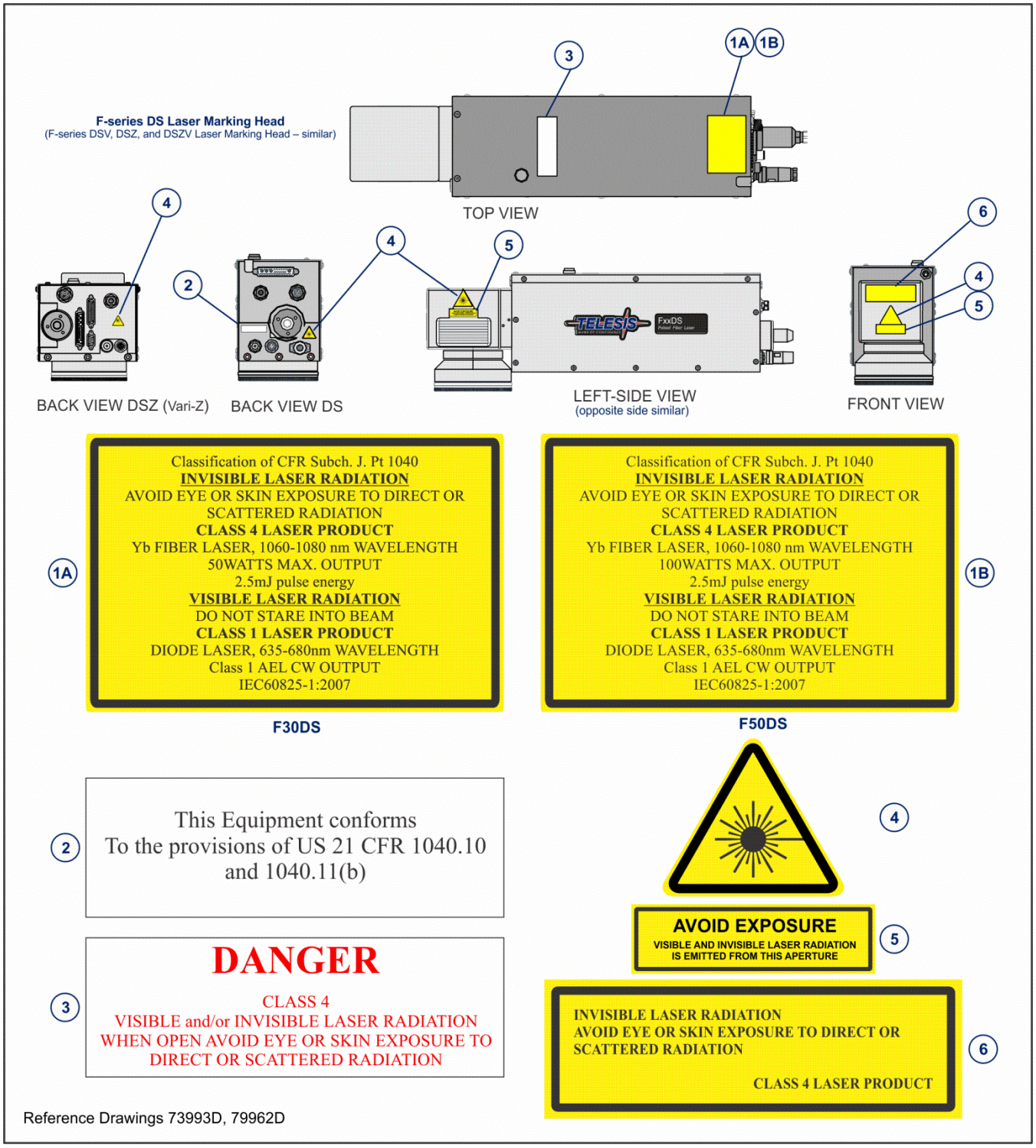
F-Series FxxZ, FxxDSZ, and FxxDSZV Laser Marking Head Installation Drawing



Model 6 Laser Controller Dimensions

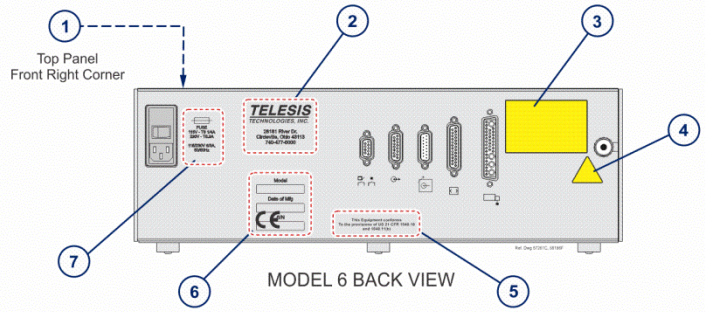
F-Series Laser Marking Head Labels

Familiarize yourself with the laser labels and their locations before operating the laser marking system. The labels and their locations on the F-series laser marking heads are shown in the following illustration.



MODEL 6 LASER CONTROLLER SAFETY LABELS

Familiarize yourself with the labels and their locations before operating the laser marking system. The labels and their locations on the Model 6 laser controller are shown in the following illustration.



1

CAUTION: RISK OF ELECTRIC SHOCK. DO NOT OPEN
ATTENTION: RISQUE DE CHOC ELECTRIQUE. NE PAS OUVRIR.

SEE INSTALLATION INSTRUCTIONS BEFORE CONNECTING TO THE SUPPLY.
VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RESEAU.

TELESIS
TECHNOLOGIES, INC.

2

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

3A

Classification of CRF Subch. J. Pt 1040

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

CLASS 4 LASER PRODUCT
Yb FIBER LASER, 1060-1080 nm WAVELENGTH
50WATTS MAX. OUTPUT
2.5mJ pulse energy

IEC60825-1:2007

F30DS Systems

3B

Classification of CRF Subch. J. Pt 1040

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

CLASS 4 LASER PRODUCT
Yb FIBER LASER, 1060-1080 nm WAVELENGTH
100WATTS MAX. OUTPUT
2.5mJ pulse energy

IEC60825-1:2007

F50DS Systems

4

5

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

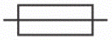
6

Model

Date of Mfg

S/N

7



FUSE
115V - T6 1/4A
230V - T6.3A

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

Reference Drawing 76166-

F-SERIES LASER MARKING HEAD

The laser marking head includes the shutter assembly, visible red aiming diode, circuit board, galvanometer assembly, and 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. Because the red beam is located *after* the shutter, the aiming diode can be used with the shutter opened or closed. Additionally, the visible red beam can be used with the lasing beam **during** the marking cycle. **Note protective eyewear must always be worn when the laser is in operation.**

Marking Field Size

The size of the marking field depends on the type of lens installed on the laser marking head. See *F-Series Laser Marking Head Specifications*.

Marking Depth

The operator can program laser parameters to create depths ranging from simple surface discoloration, shallow laser etching, or deep laser engraving. Marking depth depends on several factors, including material, lens type selected, and laser marking parameters. Contact Telesis for the proper setting for your specific application.

Flat-Field Lens

The flat-field lens is vital to marking system performance. The flat-field lens is the final coated optical lens the beam passes 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 an 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 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 provided shutter interlock cable 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 115/230 VAC 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.

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

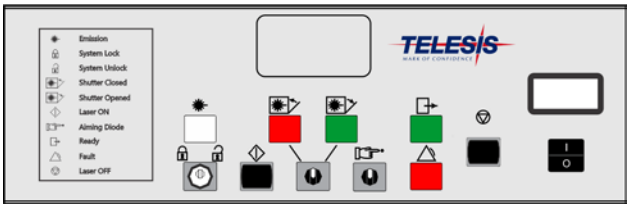
The lasing beam is delivered to the laser marking head from the laser controller through a fiber-optic cable. One end of the fiber-optic cable is permanently attached to the laser source unit inside the laser controller. The opposite end of the cable includes a beam collimator and isolator that is enclosed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

The standard fiber-optic cable for the F30DS and F50DS lasers is 2.74 m (8.989 feet) long with a 5 m (16.4-foot) option.

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

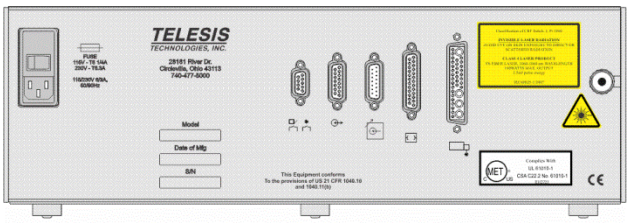
The front panel control module includes the system key switch, laser off push button, manual safety shutter control, function indicators, and an LCD panel to monitor elapsed emission time.



Model 6 Laser Controller–Front Panel

Interface (Back) Panel

The back panel of the controller provides a power entry module, a permanently pre-connected fiber-optic cable and connections for the laser marking head cable. The panel also provides a shutter interlock connector for non-DS models, 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 BACK VIEW

Model 6 Laser Controller–Back Panel

SYSTEM COMPUTER

The system computer is an IBM-compatible computer for running the Merlin II LS software.

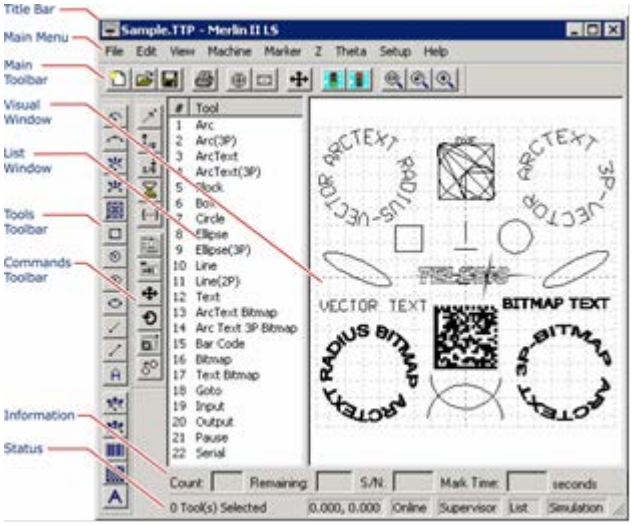
The system computer must contain the Merlin II LS software and the laser/galvo controller board. Additionally, systems using a Vari-Z marker must contain an additional 3D galvo controller board to provide variable Z-axis features. All system computers provided by Telesis have these components installed, and the entire system is 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 includes 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. Click and drag to adjust field size, location, or orientation.

The Merlin II LS software includes tools to create and edit text, arc text, data matrix symbols, barcodes, rectangles, circles, ellipses, and lines. Existing DXF files can also be imported for marking. Non-printable fields can be created to 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.

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 or a Theta-axis rotary drive unit. An optional board allows connection of two additional linear axes.

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 medium.

Communications Protocols

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

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 is not recommended for use. Use message type V when possible. If message type 1 is needed, 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 and can 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 barcode scanner. Note 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 the host will provide the message type, field number (if applicable), and data. This delegates message type selection to the host on a message-by-message basis.

TRADEMARKS

Telesis and **Merlin** are registered trademarks of Telesis Technologies, Inc. in the United States and/or other countries.

Pentium is a registered trademark of Intel Corporation in the United States and other countries.

Windows and **Vista** are registered trademarks of Microsoft Corporation in the United States and other countries.