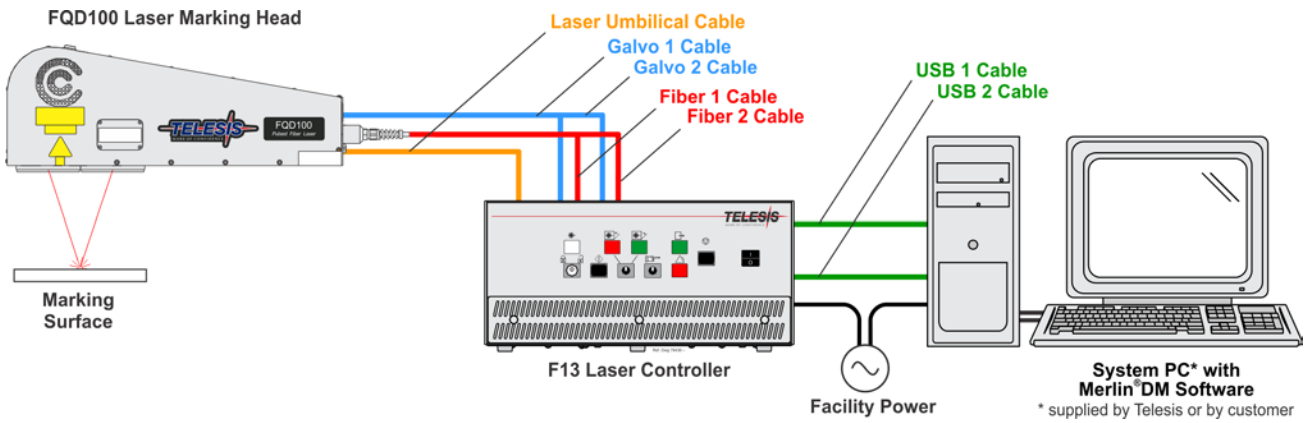


FQD100/F13 Laser Marking System General Arrangement

SYSTEM OVERVIEW

The Telesis® FQD100 is one laser in 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 twin, flexible, metal-sheathed fiber cables. The fiber-based optical design and rugged mechanical design allows the Telesis FQD100 to operate in an industrial environment where shock, vibration, and dust are a concern.

The FQD100 unique design allows for a remote beam delivery system. Two galvanometer packages are attached to a fiber-optic delivery system from remote laser engines. This allows the overall package to be very small and modular.

The FQD100 fiber laser offers 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 twin fiber optic cables
- Exceptional beam quality and stable output power
- Active AO Q-switching
- Sealed head to prevent dust contamination in optical chamber
- Visible red diodes for aiming and dry run operations
- Air cooled
- DoD-compliant Unique Identification (UID) marking
- Dual-sensor shutter safety circuit

SYSTEM CONFIGURATION

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

Laser Controller – contains the laser source unit, circuit boards, electrical components, and the operator console

Twin Fiber Optic Cable Assemblies with optical isolators

Laser Marking Head – includes the shutter assembly, visible red aiming diode, galvanometer assemblies, and flat-field lenses

Software – Merlin®DM Laser Marking Software

System Computer – supplied by Telesis or by customer

SYSTEM SPECIFICATIONS

Compliance	CDRH
Laser Type	Q-switched Ytterbium fiber
Wavelength	1060 nanometers (±20 nm)
Long Term Output Power Drift	< ± 5%
Laser Diodes MTBF	100,000 hours
Power Requirements	95 to 250 VAC, 50/60 Hz
System Power (total)	< 600W
Maximum Supply Voltage	264 VAC
Supply Voltage Fluctuation	< ± 10% with clean ground
Operational Temp.	18° to 35°C (65° to 95°F)
Recommended Temp	20° to 25°C (68° to 77°F)
Ambient Relative Humidity	10% to 85% non-condensing

SYSTEM OPTIONS

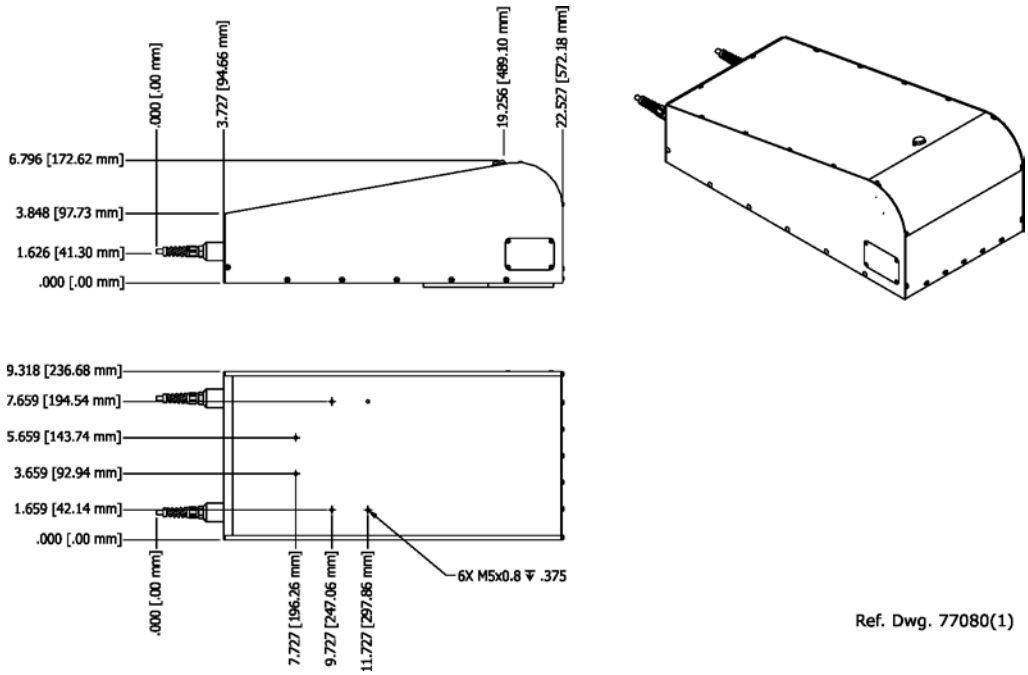
- Desktop computer or notebook computer with two available USB ports
- Remote pushbutton station (start/abort)
- Workstation / work area enclosure
- Fume extraction systems

SYSTEM SETUP

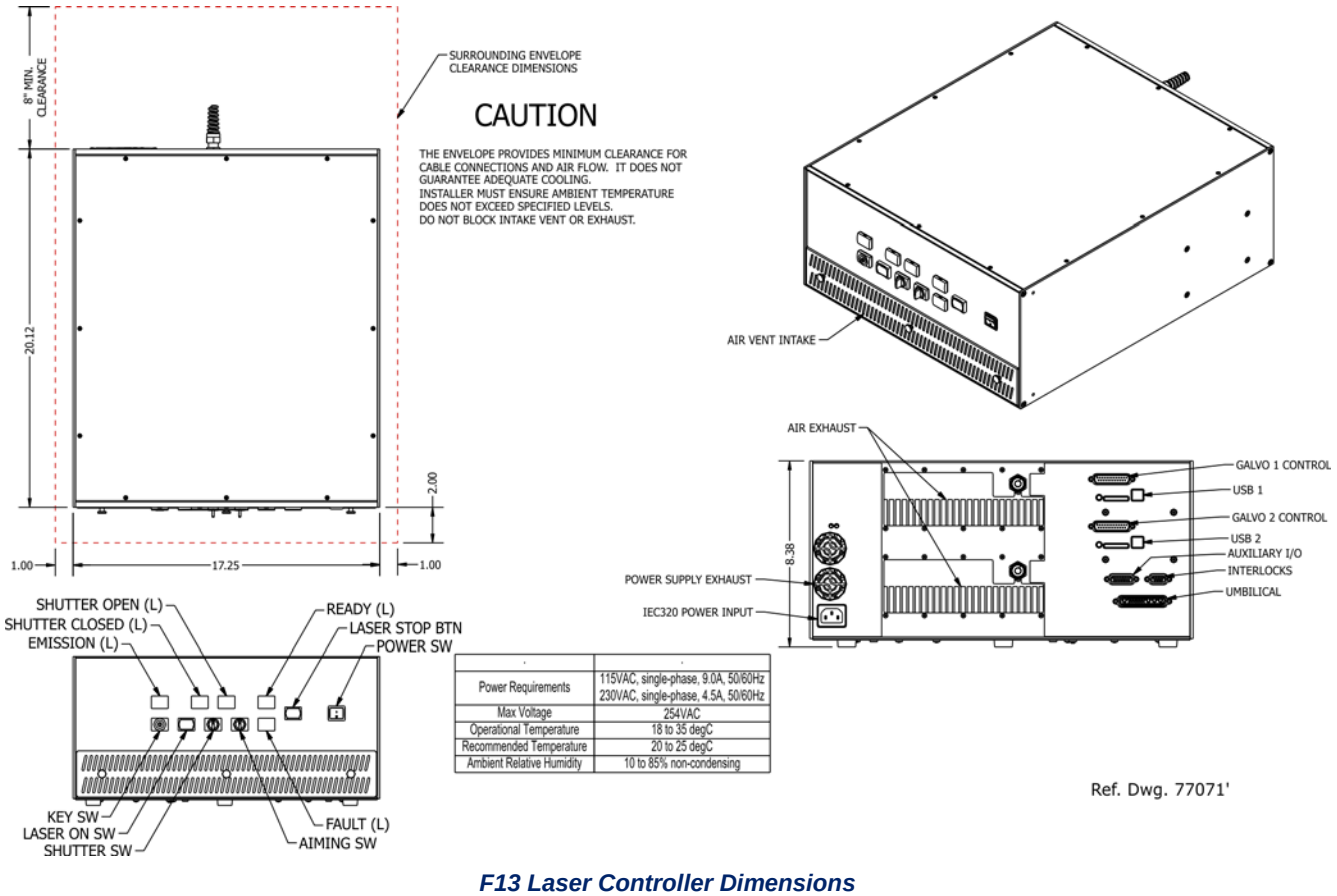
The following procedures are listed for reference only to provide a general overview of the installation process. Refer to the *FQD100/F13 Installation & Maintenance Manual* for complete installation details.

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

1. Equipment should remain powered down and in OFF position until mounting is complete.
2. Place the laser controller, system computer, monitor, and keyboard in the desired location. Locate controller as close as practical to 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 *F13 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.
6. Secure laser marking head to mounting fixture with six M5-0.80 bolts and M5 lock washers using the factory-tapped mounting holes provided in the marking head base plate.
7. Connect power cable to controller.
8. Connect remaining cables, as applicable.
9. Refer to *FQD100/F13 Operation Supplement* for proper startup procedure. Refer to the *Merlin DM Operating Instructions* for complete information on using the system software.



FQD100 Laser Marking Head Dimensions

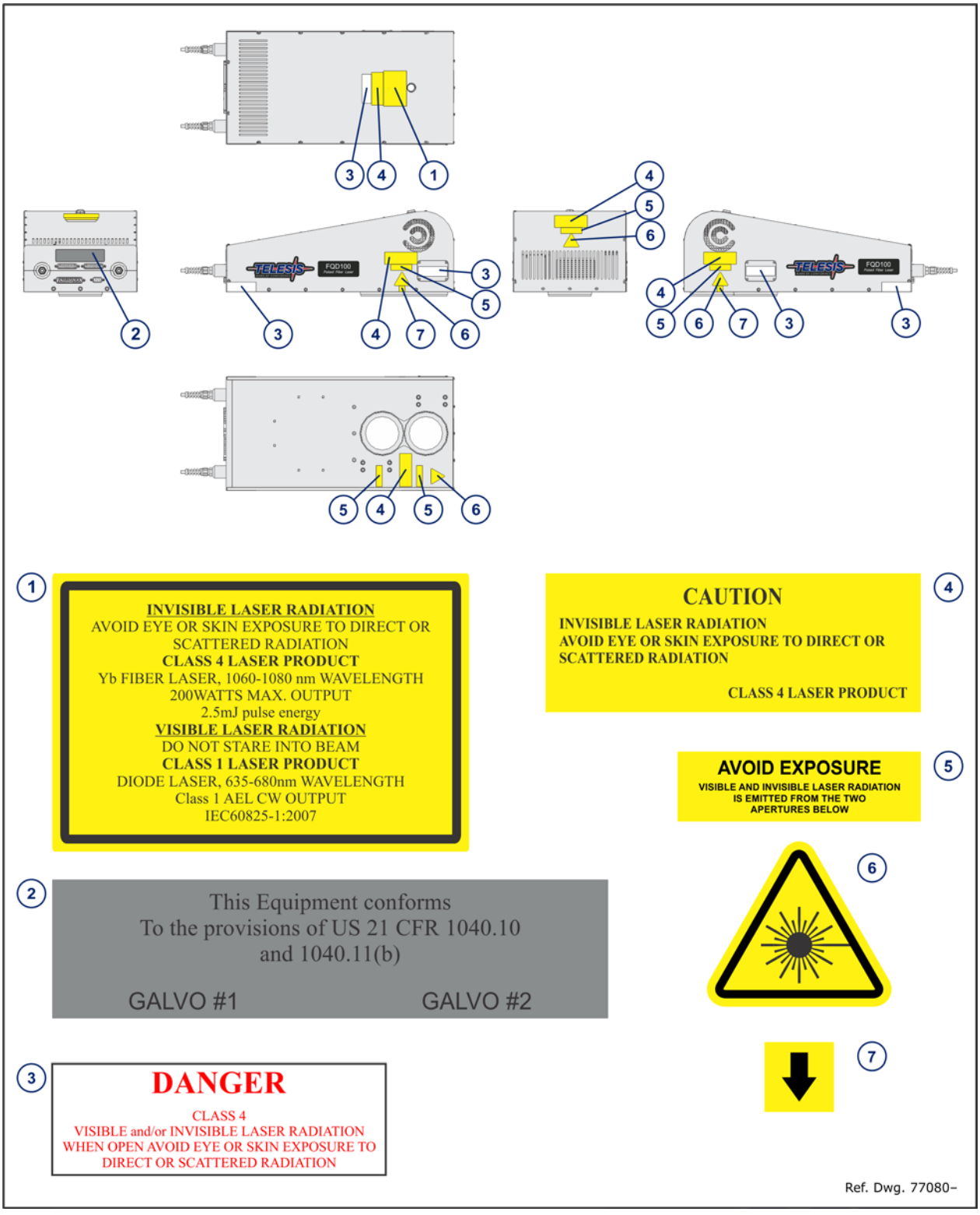


Power Requirements	115VAC, single-phase, 9.0A, 50/60Hz 230VAC, single-phase, 4.5A, 50/60Hz
Max Voltage	254VAC
Operational Temperature	18 to 35 degC
Recommended Temperature	20 to 25 degC
Ambient Relative Humidity	10 to 85% non-condensing

F13 Laser Controller Dimensions

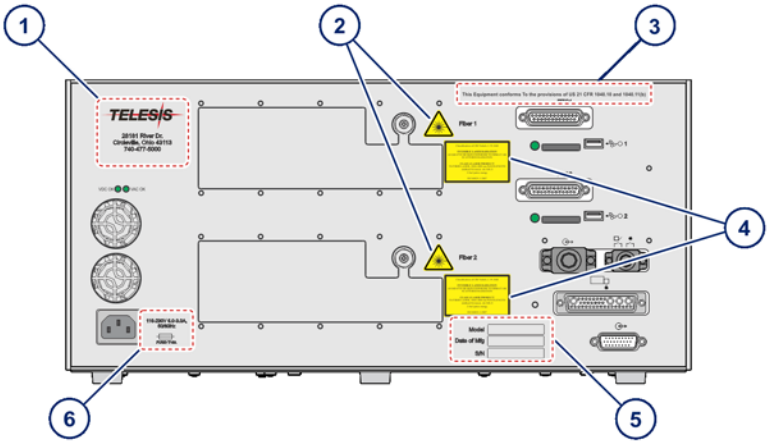
FQD100 LASER MARKING HEAD LABELS

The following illustration shows the labels and their locations on the FQD100 laser marking head. Please familiarize yourself with the laser labels and their locations prior to operating the laser marking system.



F13 LASER CONTROLLER SAFETY LABELS

The following illustration shows the labels and their locations on the F13 laser controller. Please familiarize yourself with the laser labels and their locations prior to operating the laser marking system.



1

TELESIS

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

2

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

4

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

5

Model
Date of Mfg
S/N

6

115-230V 6.0-3.0A,
50/60Hz

FUSE: T16A

Ref. Dwg. L76437 –
Ref. Dwg. L76438 A

FQD100 LASER MARKING HEAD

The laser marking head includes the shutter assembly, visible red aiming diodes, circuit boards, galvanometer assemblies, and flat-field lenses. The beam collimators and isolators (at the end of the fiber optic cables) are enclosed within the laser marking head.

FQD100 Laser Marking Head Specifications

Dimensions (L x W x H)	572.18 x 236.68 x 172.62 mm (22.527 x 9.318 x 6.796 in.)
Surrounding Envelope	see *FQD100 Laser Marking Head Dimensions* drawing
Electrical Power	160W (approximate)
Mounting Weight	approx. 15.91Kg (35 lbs.)
Mounting	six M5-0.80 bolts
Positioning	visible (red) aiming diodes
Field Resolution	16 bit (65535 data points)
Galvanometer Repeatability	< 22 micro radian
USB Cables	1.83m (6.0 ft.)
Galvo Control Cables	2.13m (7.0 ft.), detachable
Fiber Optic Cables	2.74 m (8.989 ft.), fixed
Laser Umbilical Cable	4.57 m (15.0 ft.), detachable

Dual-Sensor Shutter Circuit

The FQD100 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.

Visible Red Aiming Diodes

The laser marking head produces two visible red diodes 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 beams are located *after* the shutter, the aiming diodes may be used with the shutter opened or closed. Additionally, the visible red beams may be used with the lasing beams during the marking cycle. **Note that protective eyewear must always be worn when the laser is in operation.**

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 Lenses

The flat-field lenses are key to the marking performance of the system. These are the final coated optical lenses that the beams will pass through before they strike the marking target. These lenses are called a flat field lenses 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 lenses from dust and debris, clear protective covers are inserted between the work area and the lenses.

F13 LASER CONTROLLER

The laser controller houses the laser source units, galvo controller boards, power supplies, circuit boards, programmable logic controller, control relay, cooling fan, a 115/230VAC IEC320 connector, and a front panel control module.

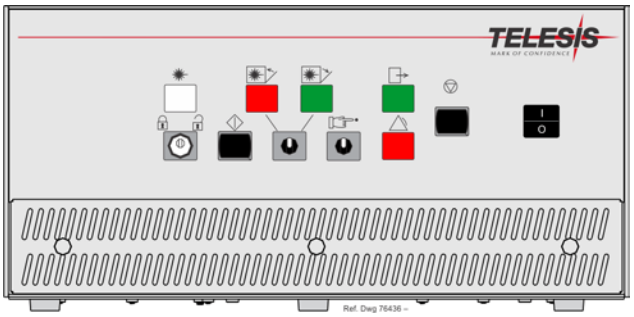
The laser source units generate the lasing beams. Engineered for the greatest reliability and for ease of maintenance, the laser sources are easily replaceable sealed modules with an expected MTBF of 100,000 operating hours.

F13 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 *F13 Laser Controller Dimensions* drawing
Weight.....	approx. 27.27Kg (60 lbs.)
Cooling.....	air cooled, fan

Operator Control Panel

The front panel control module includes the system key switch, laser off push button, manual safety shutter control, and function indicators.



F13 Laser Controller

Fiber Optic Cable Assemblies

The lasing beams are delivered to the laser marking head from the laser controller through twin fiber optic cables. One end of each fiber optic cable is permanently attached to its laser source unit inside the laser controller. The opposite end of each cable includes a beam collimator and isolator that is enclosed within the laser marking head assembly. The standard fiber optic cables for the FQD100 are 2.74 m (8.989 ft.) long.

Optical Isolator

To prevent back reflections ***optical isolators*** are used in all standard FQD100/F13 Laser Marking Systems. Installed on the laser marking head end of the fiber optic cables, the isolators function as a one way check valve allowing laser light to exit the laser but not return to the laser's most sensitive optical components.

SYSTEM COMPUTER

The laser system requires an IBM-compatible computer for running the Merlin DM 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 Merlin DM 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, Vista® (Business Edition), 7 (Professional) or 8 (Professional)
Operator Interface.....	Telesis Merlin DM Laser Marking Software

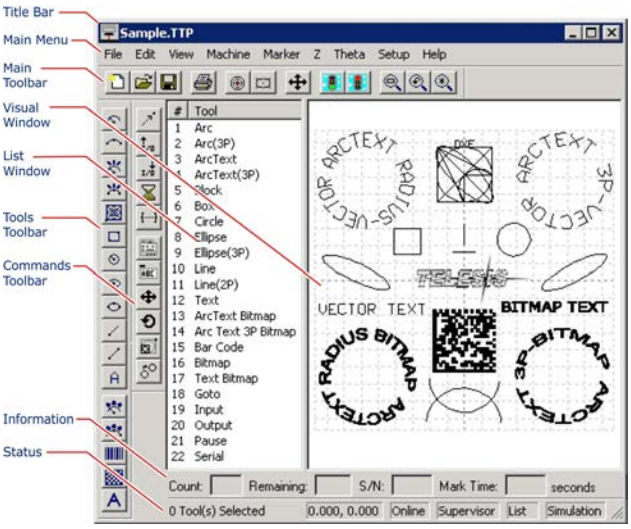
Additionally the system computer must, at a minimum, meet the following specifications:

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, Four available USB Ports, Two available Ethernet Ports,
Circuit Cards.....	Two Galvo Controller Boards, Video Board
Peripherals	SVGA Color Monitor, Mouse, Keyboard

SYSTEM SOFTWARE

The powerful Telesis Merlin DM 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 DM 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 DM User Interface

Merlin DM 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 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.

The rear panel of the controller also provides a connector to monitor output signals that report the status of the shutter, laser emission, and fault conditions.

Host Communications. Remote communications may be executed from a host computer using RS-232 or Ethernet (TCP/IP) connections to the system computer (i.e., the PC 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 DM Operating Instructions*.

I/O Connector. The controller provides an opto-isolated DB26P I/O connector. Separate I/O racks or opto-isolated board assemblies are not required when this connector is used for remote I/O. For more information on connecting and using the opto-isolated I/O connector, refer to the *FQD100/F13 Installation & Maintenance Manual.*

Communications Protocol

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

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 DM 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).

TRADEMARKS