

System Overview

The Telesis® FQ20DH is an advanced, dual scan head, Q-switched, ytterbium-doped fiber laser marker. Inside the laser marking head, the beam is divided into two equal halves. Each half is directed to a corresponding, high speed scan head. The FQ20DH is capable of exceptional high marking speed, thus cutting the marking time in half compared to single head markers. This laser is a very good choice for laser marking, scribing, trimming, and other material processing applications.

The robust mechanical and fiber-based optical design allows the FQ20DH to operate in an industrial environment where shock, vibration, and dust are a concern.

The FQ20DH fiber laser offers these advantages:

- Standard 115/230 VAC operation
- Over 50,000 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
- Display for monitoring actual laser power
- Display for monitoring hours of operation
- Seal head to prevent dust contamination in optical chamber
- Dual scan head configuration to double marking throughput
- Two visible red aiming diodes (one per scan head) for positioning and dry run operations
- Air cooling
- DoD-compliant Unique Identification (UID) marking

System Configuration

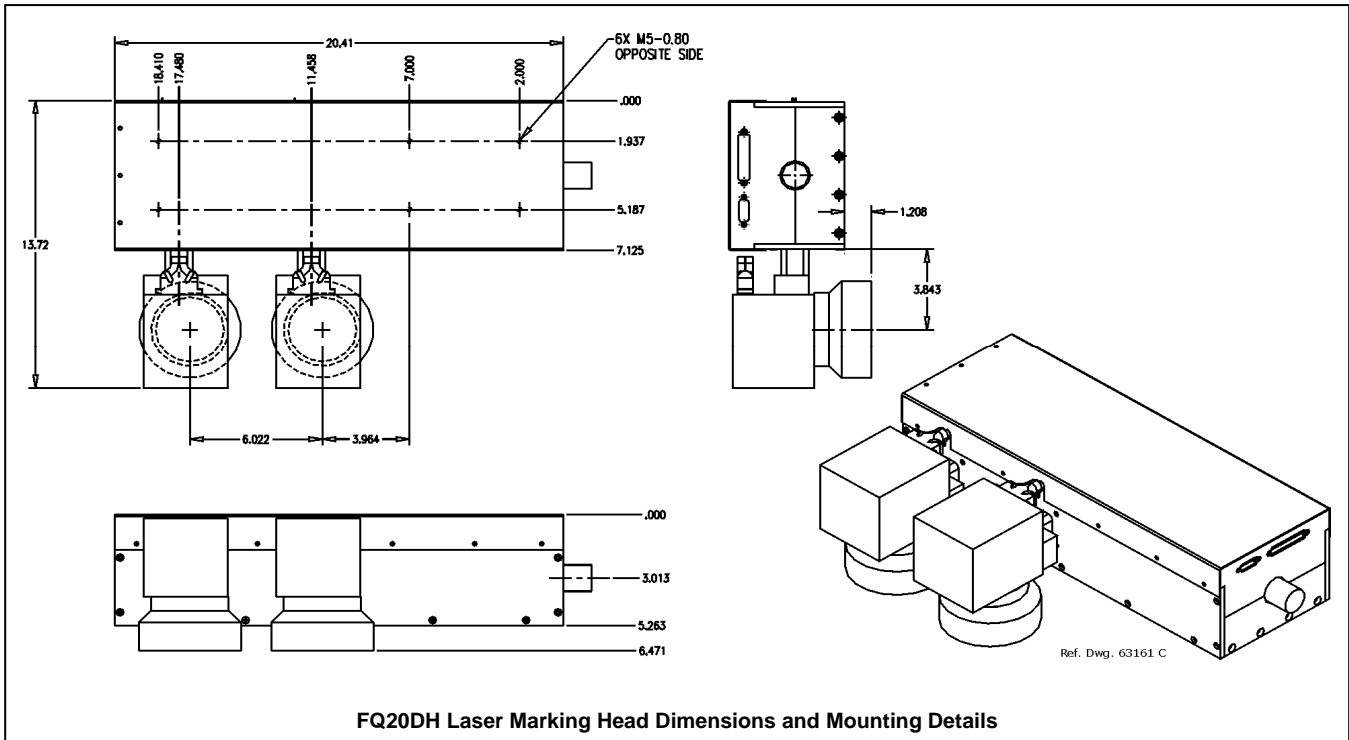
The basic laser system consists of the following components.

- **Laser Controller** – contains the laser source unit, circuit boards, electrical components, and the operator console
- **Fiber Optic Cable Assembly** – with optical isolator
- **Laser Marking Head** – includes the electromechanical shutter assembly, two visible red aiming diodes, two high speed scan heads, and two flat-field lenses.
- **Software** – Merlin®II LS Laser Marking Software
- **System Computer** – supplied by Telesis or by customer

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

Laser System Options

- Desktop computer or Notebook computer with powered cardbus-to-PCI expansion enclosure
- Externally-mounted focus-finder diode
- Tool post w/ manual hand crank for z-axis adjustment
- Pushbutton station (start/abort)
- I/O Options:
 - TTL via PCI-DIO24 Card (Kit #53920)
 - Opto-isolated via Merlin DCIO Module (Kit #53928)
 - Two-axis Controller (for auxiliary axes; additional I/O)
- Programmable X-, Y, or Z-axis (requires two-axis controller)
- Rotary drive fixture (requires two-axis controller)
- Vacuum System
- Workstation / Work area enclosures
- Remote operation via optional pendant



System Setup

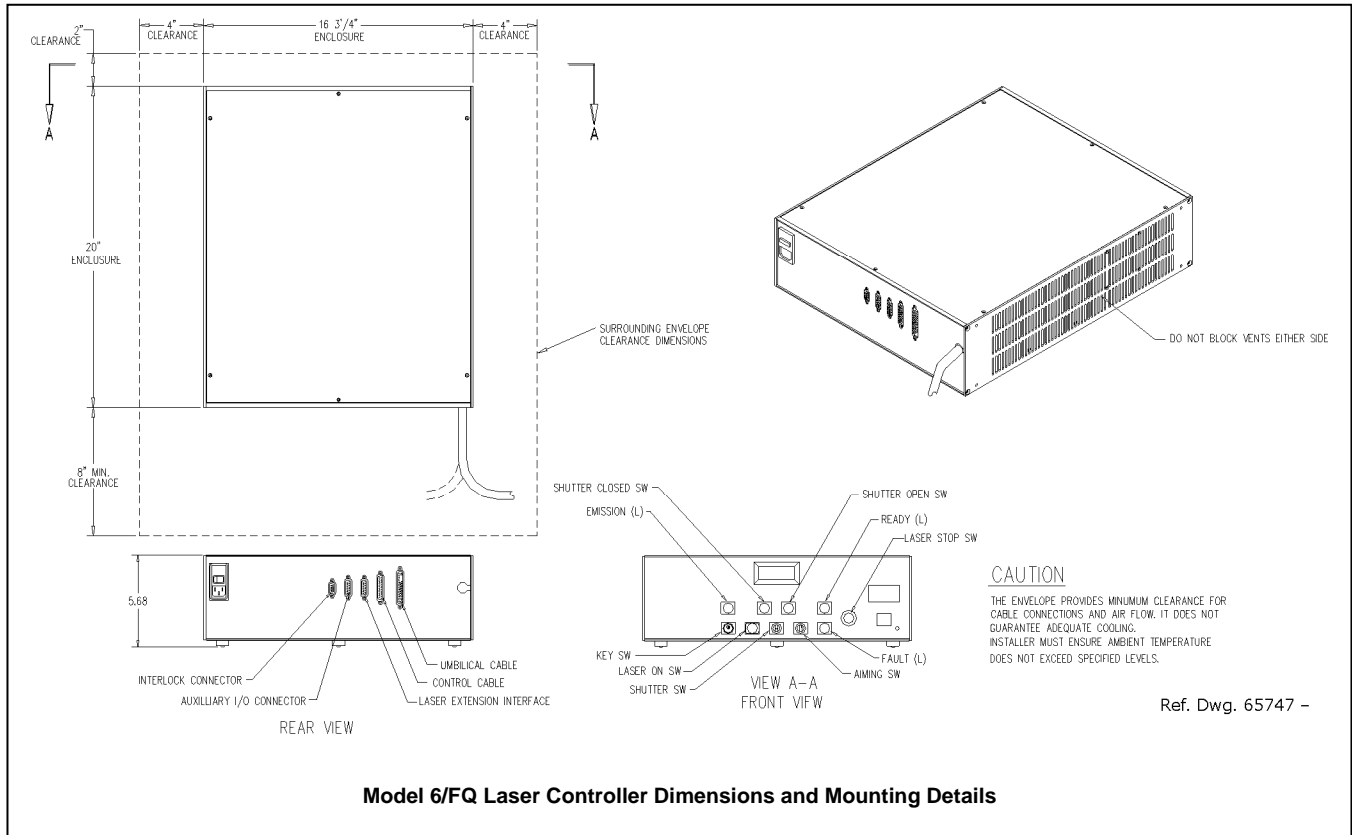
Complete installation procedures are provided in the *FQ20DH Installation/Maintenance Manual*. The following procedures are listed for reference only to provide a general overview of the installation process.

Note: A minimum distance of 8 in. (204 mm) should be allowed at the rear of the laser controller to allow for a proper bend radius of the fiber optic cable. A minimum of 4 in. (102 mm) should be allowed on each side of the controller to permit proper air flow.

Do not block the vented openings on the laser controller.

Note: A minimum distance of 8 in. (204 mm) should be allowed around the laser marking head. This permits proper air circulation and allows room for a proper bend radius of the fiber optic cable.

1. Equipment should remain powered down and in the OFF position until the mounting is complete.
2. Place the computer, monitor keyboard and laser controller in the desired location. Locate the controller as close as practical to the laser marking head. The standard cable length is 3 meters (9.8 feet).
3. Place the laser marking head onto the mounting position taking care not to bend or kink the fiber optic cable. The fiber optic cable will take an approximately 305 mm (12 in.) diameter bend without damage.
4. Locate the six factory-tapped M5-0.80 holes located in the base plate. Refer to the FQ20DH Dimensions and Mounting Details drawing (above).
 - a. As viewed from the cable-end of the laser marking head, the left edge of the mounting plate should be no greater than 1.937 in. (49.20 mm) from the left set of mounting holes to allow clearance for the beam output lenses.
 - b. As viewed from the cable-end of the laser marking head, the centers of the output beams are 3.843 in. (97.61 mm) from the left edge of the enclosure.
 - c. As viewed from the cable-end of the laser marking head, the first beam (forward-most beam) is 16.986 in. (431.44 mm) from the back edge of the enclosure.
 - d. As viewed from the cable-end of the laser marking head, the second beam (inward-most beam) is 10.964 in. (278.49 mm) from the back edge of the enclosure.
 - e. Use any four of the six mounting holes.
 - f. Mounting bolts **must not** penetrate laser marking head by more than 7.6 mm (0.30 in.) to avoid damage to, or obstruction of the internal components.
 - g. Secure the laser marking head using M5-0.80 bolts and M5 lock washers. **Torque to 47 in-lb (5.3 N-m).**
5. Ensure laser controller power switch (on front panel) is OFF.
6. Select proper fuse arrangement, then connect power cable.
7. Connect the remaining cables.
8. Refer to the *FQ20DH Operation Supplement* for proper startup procedure of the complete system.
9. Refer to the laser marking system *Operation Manual* for complete information on using the system software.



Laser Controller

The laser controller houses the laser source unit, 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 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 expected lifetime of greater than 50,000 operating hours.

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 Envelope628.7 x 152.5 x 762.0 mm
 24.75 x 6.00 x 30.00 in.

Weightapprox. 15 Kg (33 lbs.)

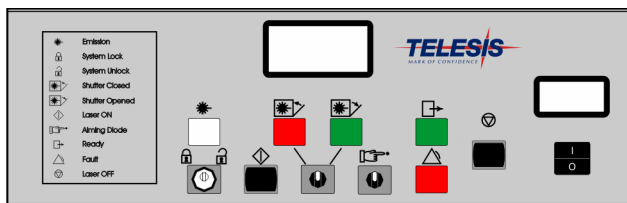
Coolingair cooled, fan

Operator Control Panel

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

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 the laser marking head. The standard fiber optic cable for the FQ20DH is 3 m (9.8 ft.) long.



Model 6/FQ Laser Controller

Optical Isolator

To prevent back reflections an *optical isolator* is used in all standard FQ20DH 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.

System PC

The laser system requires an IBM-compatible computer for running the Merlin II LS Laser Marking Software. The PC may be a desktop or a notebook computer and may be supplied by Telesis or by the customer. If the PC is supplied by Telesis, warranty for the computer, computer keyboard, monitor, and peripherals default to the original equipment manufacturer.

Galvo control cards are included, along with interconnect cabling. The laser software is installed and the entire unit is tested as a laser marking system.

The minimum computer requirements are as follows:

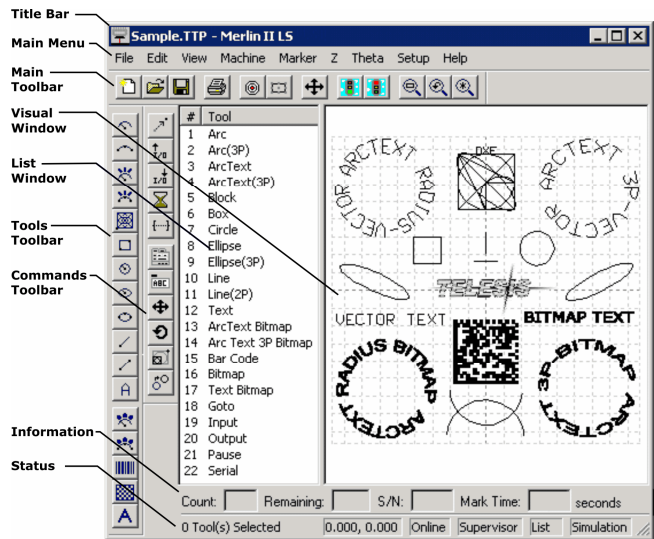
- Windows® 2000, Windows® XP or Windows® Vista Business
- Telesis Merlin II LS Laser Marking Software
- Pentium® III with recommended RAM as per operating system
- Multi-gigabyte, HDD
- CD-ROM and 3.5 in. External Disk Drives
- SVGA Color Monitor, Mouse, and Keyboard
- Laser/Galvo Controller Board
- Video Card
- One available RS-232 Serial Port
- Two available USB Ports
- Three (minimum) full-height PCI Slots *

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

System Software

The powerful Telesis Merlin II LS Laser Marking Software is a Windows® based operating software package that comes standard with the laser marking system. It is a graphical user interface that makes marking pattern design quick and easy. The WYSIWYG (what-you-see-is-what-you-get) interface provides a to-scale image of the pattern as it is created. Just “click and drag” for immediate adjustment to field size, location, or orientation.

The Merlin II LS 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 CAD files can also be imported for marking. Non-printable fields can be created to clearly display a graphical representation of the part being marked.



Overview of Merlin II LS User Interface

Merlin II LS Laser Marking Software Specifications

Operating System	Windows® 2000, Windows® XP, or Windows® Vista Business with Desktop PC or Notebook PC
Font Generation.....	True Type Fonts
Barcodes and Matrix	2D 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 with Letter Spacing Control
Arc Text Marking.....	Scalable and Adjustable
Drawing Tools.....	Line, Rectangle, Circle, Ellipse

Remote Communications

The communication capability of the marking system 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 card, 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 *Operation Manual* supplied with the laser marking software.

I/O Card. Telesis offers an optional I/O card that provides six input signals (Start Print, Abort, and four programmable inputs) and six output signals (Ready, Done, Paused, and three programmable outputs). The I/O card is available in the following kits. For more information on using the optional I/O card, refer to the Telesis *Optional I/O Card Installation Supplement* supplied in each of these kits.

Kit #53920 This kit is available for all Telesis laser systems. It includes the I/O Card, SIPs resistor packs (pre-installed), the software driver CD, and installation documentation.

This kit does not provide opto-isolated signals. If this kit is used, it is the responsibility of the installer/integrator to provide opto-isolation between remote I/O devices and the I/O card. Refer to the *OEM User's Guide* for signal limitations.

Note: Telesis does not endorse direct connection of I/O signals to the I/O card. Direct connections to high current/high voltage devices will damage the card.

Kit #53928 This kit is available for all laser systems that use the Merlin II LS Laser Marking Software. It includes Kit #53920 (above), plus the Telesis I/O Interface Module and two cable assemblies.

This kit provides opto-isolated signals between remote I/O devices and the I/O card through the Telesis I/O Interface Module. Additional opto-isolator board assemblies or opto-isolated I/O rack assemblies are not required when the interface module is used.

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 six input and six output signals to and from the laser marking system, and for connecting the optional auxiliary axes: vertical (Z) axis, rotational (Theta) axis, and linear (L1 and L2) axes.

Environmental considerations must be taken into account when installing the auxiliary controller concerning contaminants and EMI susceptibility. For details, refer to the *Installation/Maintenance Manual* supplied with the controller.

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 marking system 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 ("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 ("A") updates the Offset Angle parameter for the *primary* marking head with the data extracted from the host message. Syntax for the transmitted string is $\pm n$ where \pm is a positive or negative sign and n is an integer that represents the offset angle for the marking window.
- 72 Message type 72 ("H") updates the Offset X/Y parameters for the *primary* marking head with the data extracted from the host message. Syntax for the transmitted string is $\pm X.X, \pm Y.Y$ where \pm 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 ("P") indicates the data extracted from the host message is the name of the pattern to be loaded.
- 81 Message type 81 ("Q") updates the text in the first query text buffer (buffer 0) with the data extracted from the host message.
- 86 Message type 86 ("V") updates the text in the first variable text field in the pattern with the data extracted from the host message.
- 97 Message type 97 ("a") updates the Offset Angle parameter for the *secondary* marking head with the data extracted from the host message. Syntax for the transmitted string is $\pm n$ where \pm is a positive or negative sign and n is an integer that represents the offset angle for the marking window.
- 104 Message type 104 ("h") updates the Offset X/Y parameters for the *secondary* marking head with the data extracted from the host message. Syntax for the transmitted string is $\pm X.X, \pm Y.Y$ where \pm is a positive or negative sign, $X.X$ represents the X-axis offset distance, and $Y.Y$ represents the Y-axis offset distance.
- 118 Message type 118 ("v") updates the first text field encountered in the pattern that contains a variable text flag that matches the specified string length.

Programmable Protocol continued on next page

Programmable Protocol (continued)

If the host is providing the Message Type within the transmitted text string, enter "0" in the Message Type parameter text box displayed on the Programmable tab of the Host/Setup window.

- 0 Message type 0 (zero) indicates that the host will provide the message type, field number (if applicable), and data (if applicable). This option allows more flexibility by delegating the message type selection to the host on a message-by-message basis. It also allows you to direct data to specific fields and/or query text buffers.

The host can use Message Type 0 to provide data to the marking system. The marking system will insert data transmitted with the message into the appropriate location.

Extended Protocol. Extended protocol provides two-way communication with error checking. It is designed to provide secure communications with an intelligent host device using pre-defined message formats and response formats. It also provides error checking using a block check code to detect faults in the transmitted messages and to verify the data is properly received.

The Extended Protocol Message Type determines how the marker uses the data it extracts from the host message string or from the marking system software, as applicable.

- 1 Message Type "1" can provide data to a text string in the pattern or poll the pattern for data.
- A Message Type "A" can provide data to the system Offset Angle parameter for the *primary* marking window or poll the system for data.
- a Message Type "a" can provide data to the system Offset Angle parameter for the *secondary* marking window or poll the system for data.
- 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.
- V Message Type "V" can provide data to a variable text string in the pattern or poll the pattern for data.

- P Message Type "P" can load a pattern or poll the system for the current pattern name.
- 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.
- G Message Type "G" initiates a print cycle.
- Q Message Type "Q" can provide data to the system query text buffer or poll the system for data.
- H Message Type "H" can provide data to the system X/Y Offset parameters for the *primary* marking head or poll the system for data.
- h Message Type "h" can provide data to the system X/Y Offset parameters for the *secondary* marking head or poll the system for data.
- S Message Type "S" is used to poll the system for the machine status. The machine status is returned to the host in an eight-character hexadecimal mask.
- I Message Type "I" is used to poll the system for the I/O status.

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