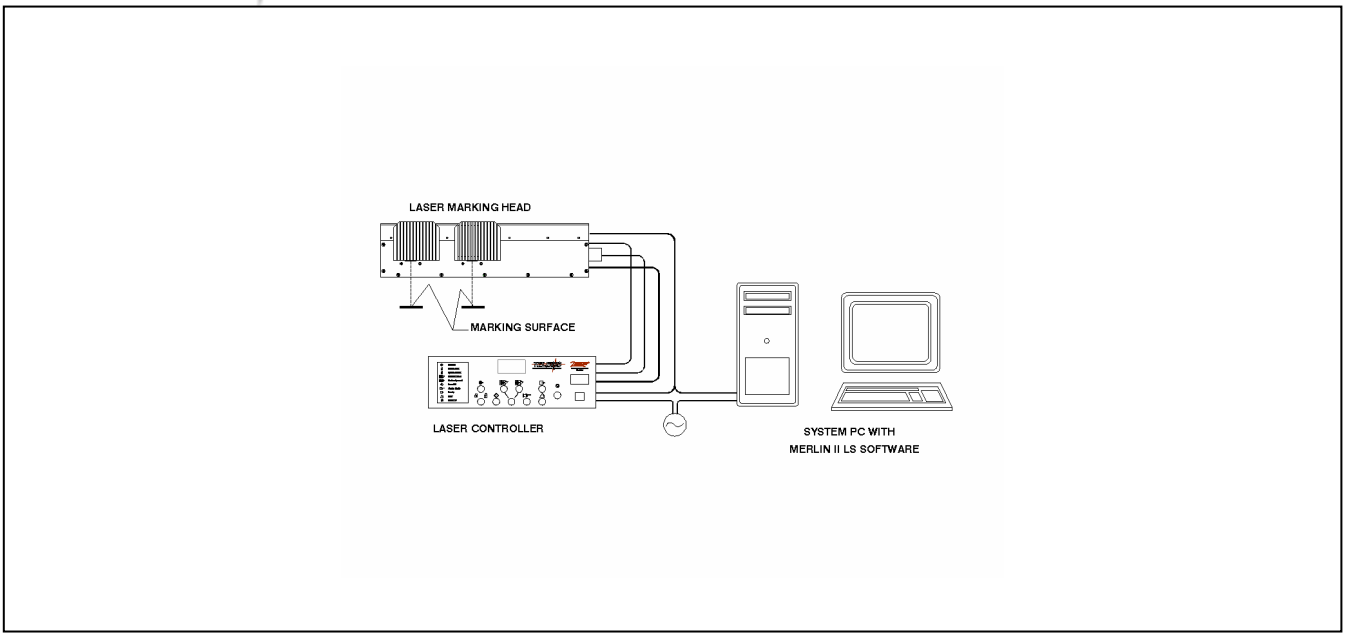


System Overview

The GEMINI is an advanced dual scan head, Q-Switched, ytterbium doped fiber laser marker. Inside the marking head the laser beam is divided into two equal halves. Each half is directed to a corresponding high-speed scan head. GEMINI is capable of doing an exceptional high-speed marking reducing the marking time twice in compression to single head markers. This laser marker 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 Telesis GEMINI to operate in industrial conditions with respect to shock, vibration, and dust, at non-condensing humidity from 10% to 85% within a temperature range of 10° to 35°C (50° to 95°F).

The GEMINI laser marking system offers these advantages:

- Reliable, over 50,000 hours maintenance free performance
- Compact size and modular construction
- Exceptional beam quality and stable output power
- Active AO Q-Switching
- Output laser beam delivery via an fiber optic cable
- Sealed marking head for preventing dust penetration into the optical compartment
- Two scan head configuration for doubling the marking throughput
- Two visible “red light” diodes for dry run / positioning for each scan head
- Air cooling
- Display for monitoring the actual laser power
- Display for monitoring the worked hours
- Standard 115/230VAC wall plug operation
- DoD-compliant Unique Identification (UID) marking

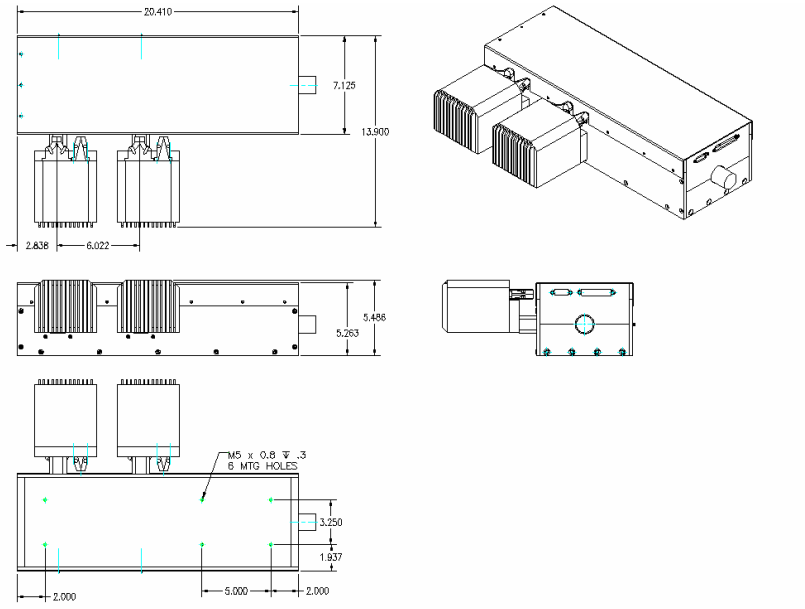
System Configuration

The GEMINI basic package consists of the following major components.

- Laser Controller (contains the fiber laser, the control electronics and other electrical components)
- Fiber Optic/ Umbilical Assembly
- Laser Marking Head (two high speed scan heads, two visible red light positioning laser diodes, the electro-mechanical shutter and some optical components)
- System PC and software

Laser Assembly System Options

- Desktop or Notebook computer (in lieu of desktop 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)
  TMC090 Controller (for auxiliary axes and additional I/O)
- Programmable X-, Y, or Z-axis (TMC090 required)
- Rotary drive fixture (TMC090 required)



MARKING HEAD ASSEMBLY AND MOUNTING DETAILS

GEMINI General Specifications

Compliance.....CDRH and CUL
Wavelength.....1,060 nm (+/-10nm)
Laser Type.....ytterbium doped Q-Switched fiber laser
Q-Switch Frequency.....20KHZ to 80KHz
Average power per scan head (for Gemini 20FQ)…10 Watts (combined 20Watss)
Average power per scan head (for Gemini 10FQ)…5 Watts (combined 10Watss)

Beam quality …….$M^2 < 2$
Long term power stability.....less than ± 5%
Positioning.....two red diodes
Fiber optic cable length (for Gemini 20FQ)…3 meters (9.8 feet)
Fiber optic cable length (for Gemini 10FQ)…5 meters (16.4 feet)
Cooling:.....Air cooled
Max. Power Consumption(for Gemini 20FQ)….. less than 550W
Max. Power Consumption(for Gemini 20FQ)….. less than 450W
Operating Range.....10° to 35°C (50° to 95°F)
Humidity.....10% to 85% non-condensing
Expected MTBF .....50,000 hours maintenance-free diode pumping source
Shipping weight (for 160mm lenses) ……..approx. 35 kg (77 lbs)

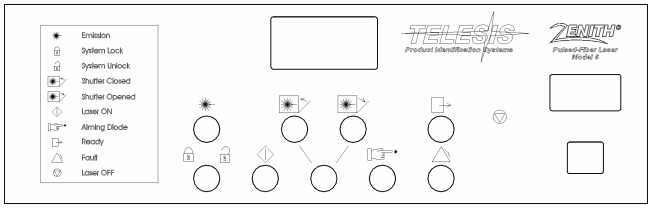
Laser Controller

The fiber laser is enclosed in the laser controller. The 3 meter (9.8 feet) long fiber optic cable delivers the laser beam into the marking head.

The laser controller also contains the laser and scan heads power supplies, driver control circuits, appropriate fusing, and a selectable 115/230VAC, 50/60Hz power jack.

The controller's front panel includes the system key switch, Laser Off push button, manual safety shutter control, function indicators, and two displays. The displays allow monitoring the actual laser power and the working hours.

This compact laser controller can be fitted to any standard-rack mount or it can be placed directly upon a desktop.



GEMINI Laser Controller Console

Laser Controller Specifications

Dimensions (W x H x L) .....16.74" x 5.25" x 20.0"
Weight.....approx. 15.5 kg (34 lbs)
Input Power (selectable).....115/230VAC 50/60 Hz

Fiber Optic Beam Delivery Assembly

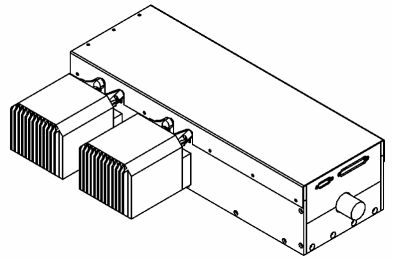
The beam is delivered from the fiber laser source (in the laser controller) through a fiber optic cable to the marking head. One end of the fiber optic cable is permanently attached to the fiber laser source and cannot be removed. The standard fiber optic cable length is 3 meters (9.8 feet).

Do not bend or kink the fiber optic cable during installation or maintenance. The fiber optic cable is stainless steel armored and will tolerate approximately 305 mm (12 in.) diameter long-term bend without damage.

Under no circumstances should the fiber optic cable be disconnected or removed from the marking head. Disconnection or removal may in extreme cases, expose personnel to active laser energy and the optical components to outside contamination. (There is no an interlock which will prevent the laser source to deliver the laser beam via the fiber optic cable when the fiber optic cable is disconnected).

Laser Marking Head Assembly

The laser marking head includes two high speed scan heads, the sealed laser collimator, beam splitting and turning optical components, red positioning laser diodes, the electro-mechanical shutter .



Laser Marking Head Specifications

Dimensions (L x W x H) ..... 20.0” x 13.9” x 5.486”

Mounting Weight (with 160mm lenses)

..... approx. 16 kg (35lbs)

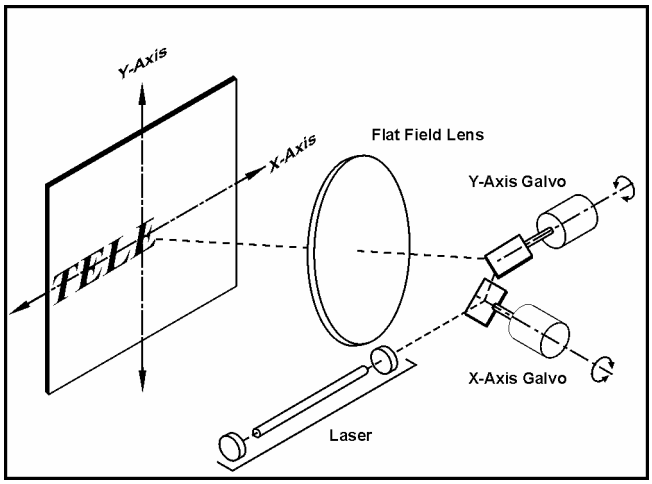
Mounting Holes..... six M5-0.8

Visible Red Light Positioning Laser diodes

The function of the red light positioning laser diodes is to provide a co-focal, visible red beams through the same optics that the main 1,060 nm lasing beam travels. This provides a safe and convenient aid to the user for “one-off” part program setup. This visible red light maybe viewed on the work surface without the need for protective safety goggles. The visible red light positioning laser diodes are mounted within the laser marking head, positioned after the shutter. They can be viewed on the marking surface even if the shutter is in Closed position. Power to the red positioning lasers diodes are provided by a power supply in the laser controller via the umbilical cable assembly.

Galvanometer Optical Scanners

Each scan head has two optic scanning galvanometers, one each for controlling X-axis beam positioning and Y-axis beam positioning. Galvanometer scanners are computer-controlled, high-performance, closed-loop, precision rotary motors. They consist of a motor section based on moving magnet technology and a high precision, closed-loop position detector. Attached to each motor shaft is an optically coated mirror assembly to deflect the beam. Each optically coated mirror assembly is factory balanced and bonded, then each combination of mirror and motor assembly are electronically equalized in the control circuitry.



Galvanometer Optical Scanners

Galvanometer (Scan Head) Specifications

Repeatability……..<22 micro radian

Field Resolution .....……16 bit (65535 data points)

Marking Speed (with 160mm lens)……2,500 mm/sec (in./sec)

Positioning speed (with 160mm lens)……12,000mm/sec(in/sec)

Writing speed (with160mm lens)…… up to 600 single stroke characters of 1mm height/sec

Flat Field Lens, Final Objective Lens, (F-Theta Lens)

The final object 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. The final objective lens is sometimes called the F-Theta Lens because the lens is optically corrected to provide an image height that is proportional to the scan angle (Theta), not the tangent of that angle, as is usually the case with traditional optical lenses. This lens is also 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.

The lens and protective cover is held in place by an adapter ring called a bezel (mounting kit). The bezel fits directly into the machined galvo block. The lens and protective cover can be replaced in less than five minutes. A properly maintained lens will remain functional indefinitely. Periodically, as a standard practice, the lens should be cleaned using an approved optical lens cleaner and soft optical tissue.

The following chart outlines the available lenses, their part numbers, the mounting kit (bezel) part numbers, and the resulting image field provided by the lens (in millimeters and inches).

Lens	Lens Part No.	Mount. Kit Part No.	Marking Field Size (mm)	Marking Field Size (in)
100 mm	42553		45 x 45	1.77 x 1.77
160 mm	29942		90 x 90	3.54 x 3.54
163 nm	42554		110 x 110	4.33 x 4.33
254 mm	42555		155 x 155	6.10 x 6.10

Marking Characteristics

Spot Size (line width). The laser marked spot size can be thought of as the line width of the image being marked. For all practical purposes, the laser-created text or machine-readable code can be programmed to mark or engrave smaller than can be seen without magnification. In the opposite extreme, it can be marked so large as to cover the entire marking field.

In all cases, laser marked spot size is dependent on a variety of factors including lens selection, focus, laser power and the material being marked. The following chart is provided for reference only.

Lens	Spot Size (line width)
100 mm	25 microns (.0010 in.)
160 mm	40 microns (.0015 in.)
163 mm	40 microns (.0015 in.)
254 mm	60 microns (.0025 in.)

Working clearance.

Lens	Working Clearance (mm)	(in.)
100 mm	97.0	3.82
160 mm	176.0	6.93
163 mm	185	7.28
254 mm	296	11.65

System PC

Gemini uses an off-the-shelf, IBM-compatible, desktop computer for running the Merlin®II LS Laser Marking Software.
The minimum computer requirements are as follows:

- Pentium III with 128 Mb RAM
- 17-in. SVGA Color Monitor
- Multi-Gigabyte HDD
- CD ROM Drive
- 3.5-in. Floppy Disk Drive
- Windows®2000 or Windows®XP
- Keyboard and Mouse
- One RS-232 Port, Two USB Ports Serial Two PCI Slots

Communications Protocol

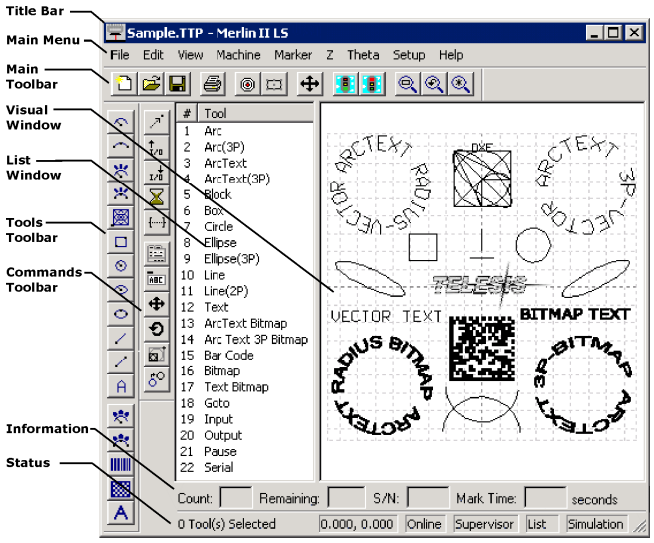
Two types of host interface are available (RS-232 or TCP/IP). Two protocols are available as well.
Programmable Protocol is used where very simple one-way communications are required (such as with bar code scanners). Programmable Protocol provides no error checking or acknowledgment of transmitted data. Note that XON/XOFF Protocol applies even when Programmable Protocol is selected.

The other type of interface is Extended Protocol. This protocol includes error checking and transmission acknowledgment. It should be used in applications where serial communication is a vital part of the marking operation.

System Software

Telesis' powerful WIN32 Merlin®II LS Laser Marking Software is a PC-based operating software package that comes standard with the ZENITH®10F 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.
For the second scan head in the Machine Properties, an extra Marker Setup tab is available to specify the X/Y offset, scan head orientation (Swap X/Y, Invert X, Invert Y) and calibration for the second head which is independent of the first scan head. This allows a marking part to be oriented differently under the second scan head. The individual calibration is necessary to calibrate the beam and aiming diode for the first and second scan heads.



Overview of Merlin-II LS User Interface

Merlin®II LS Laser Marking Software Specifications

Operating System	Windows®2000 or Windows®XP Desktop PC (Standard) Laptop (Optional)
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, PLT, DXF
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

System Setup

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

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. The standard fiber optic cable length is 3 meters (9.8 feet) long between the laser marking head assembly and the controller.
3. Locate the laser marking head assembly on the selected mounting.
    a. **Do not to bend or kink the fiber optic cable.** The fiber optic cable will tolerate approximately 305 mm (12 in.) diameter bend without damage.
    b. **Allow a minimum distance of 150 mm (6 in.) at the rear of the laser.** This will provide sufficient room for a proper bend radius of the fiber optic cable.
4. Mount the laser marking head assembly using any four of the six factory-tapped M5-0.8 mounting holes provided.
    a. Locate the six pre-drilled M5-0.8 mounting holes. Refer to the *Mounting and Dimension Details* drawing more information.
    b. Telesis recommends using a minimum of three (3) attach points for mounting the GEMINI laser.
    c. Mounting bolts must not extend into the marking head more than 7.6 mm (.3 in) to avoid interference with the internal components.
5. Secure the laser to the mounting fixture using M5-0.8 bolts and lock washers. **Do not over tighten bolts.**
6. Ensure the laser control console power switch (on the front panel) is OFF.
7. Select the proper voltage setting (either 115V or 230V), and then connect the power cable.
8. Refer to the *GEMINI 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.

General Mounting Procedures

If you chose to integrate the laser into a workstation that has not been designed by Telesis, you should keep in mind the following engineering considerations when integrating your system.

- **Design simple X-, Y-, and Z-axis adjustments.**

When designing a mounting fixture for the laser marking head, allow for simple three-axis adjustment to aid in horizontal, vertical, and lateral alignment of the laser marking head. Experience has shown that a minimum adjustment value of 12.7 mm (0.50 in.) is a prudent design consideration if the intent is to integrate the laser into workstation not designed by Telesis.

- **Ensure the part and the part holding fixture are perpendicular to the final objective lenses.**

When designing a work piece holding fixture, ensure the fixture is flat relative to the final objective lens of the galvo block assembly and square to the centerline of the laser marking field.

- **Ensure the part is stable and will not move during marking.**

Laser marking is a non-contact marking method. Typically all that is needed is simple fixturing pockets or X-axis, Y-axis datum rails.

- **Ensure the part width and length will fit in the marking area.**

Double check that all the parts to be marked will fit within the laser marking field. Ensure the marking area is not obstructed and can be targeted by the laser beam.

- **Ensure the combined total height of the part and fixturing does not exceed the working clearance of the final objective lens selected.**

Care should be taken to ensure that the laser beam can be focused on the part. The total combination of the part and fixturing height must not exceed the adjustment capability of the customer-supplied Z-axis. The working clearance is the distance between the bottom of the lens and the top of the part to be marked. See *Marking Characteristics (Marking Field Size*) for details on working clearances for the available lenses.