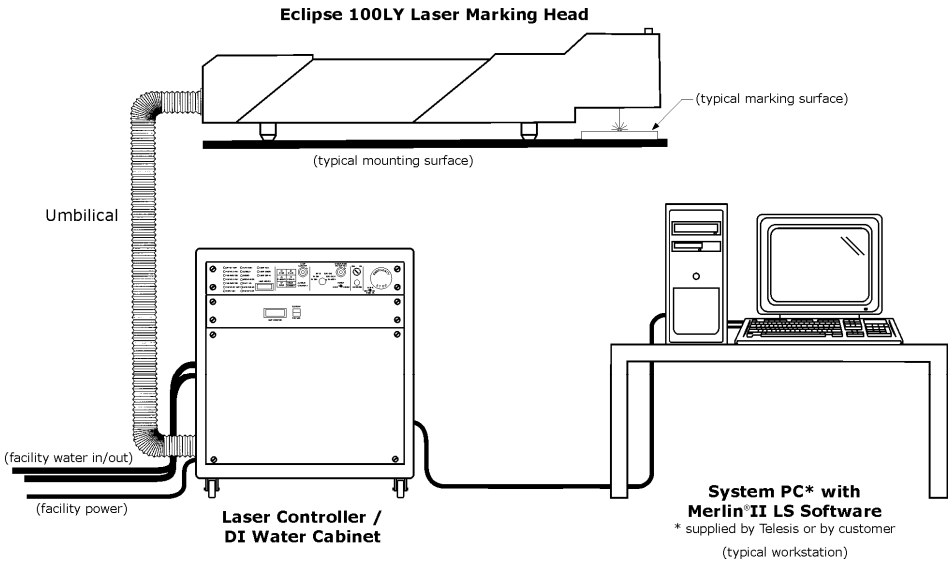


Eclipse 100LY Laser Marking System General Arrangement

System Overview

The Telesis Eclipse 100LY Nd:YAG laser is a high-powered, lamp-pumped, Q-switched, galvo-steered laser designed for marking applications. The Eclipse 100LY delivers a 1,064 nm laser beam which is excellent for deep engraving into metals and for high speed marking of plastics with a high carbon content.

The Eclipse 100LY laser offers these advantages:

- Rugged industrial design with field-proven lamp-pumped technology
- 100W average power; greater than 200KW peak power
- Broadest beam width and greatest depth of focus allow easy setup and fast material processing
- Exceptional beam quality works with the broadest range of material applications
- Off-the-shelf consumable components available from several after market sources
- Three-point rugged INVAR® bar-based rail construction for precise optical alignment
- Ceramic pumping chamber for performance and long life
- Umbilical can be detached from rear of controller for easy integration of laser rail assembly
- Long-life lamps; changes do not require cavity re-alignment

Simple and easy to maintain in a factory environment Nd:YAG laser is a high-powered, lamp-pumped, Q-switched, galvo-steered laser designed for marking applications.

System Configuration

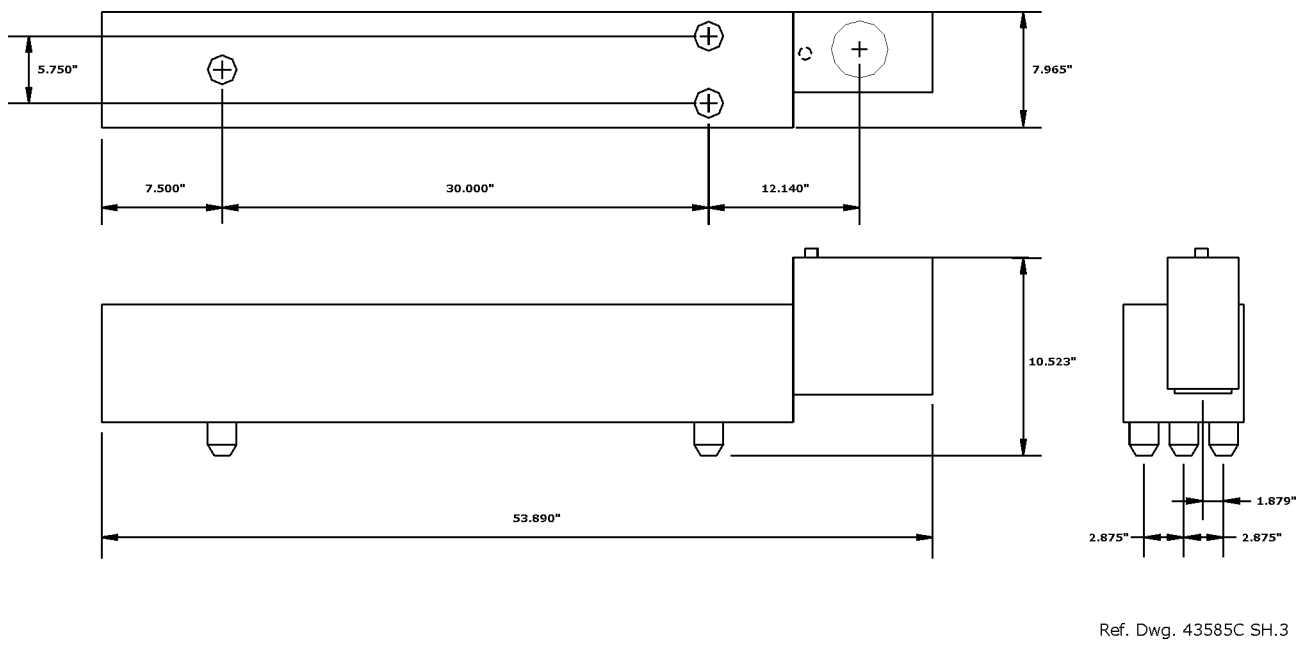
The basic laser marking system consists of the following:

- **Laser Rail** (laser cavity and optics)
- **Galvanometer Assembly and Flat-field Lens**
- **Laser Controller and DI Water Cabinet**
- **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 in need of repair.

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)
  TMC090 Controller (for auxiliary axes; additional I/O)
- Programmable X-, Y, or Z-axis (TMC090 required)
- Rotary drive fixture (TMC090 required)
- Vacuum System
- Workstation / Work area enclosures
- Remote operation via optional pendant



Eclipse 100LY Laser Marking Head Dimensions and Mounting Details

System Setup

Complete installation procedures are provided in the *Eclipse 100LY 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/DI water cabinet in the desired location. Locate the laser controller as close as practical to the laser marking head. The standard cable length is 3 meters (9.8 feet).

3. If you choose to mount the laser into a workstation that has not been designed by Telesis, consider these factors:
   - Mount the laser rail in a horizontal plane. If you intend to mount the laser in any other orientation, please consult with Telesis Customer Service before proceeding.
   - Mount the laser such that the laser rail cover can be easily removed for routine lamp changes.
   - Ensure the installation location provides adequate clearance and ventilation. The umbilical cable requires a minimum bend radius of 18cm (7 in.) to avoid damage.

4. Place the laser rail assembly in the mounting position taking care not to bend or kink the umbilical.

5. Mount the laser rail assembly by using three M6-1.0 bolts. **Mounting bolts must not extend into the galvo block as to interfere with the internal components.**
   a. Mounting holes are tapped for metric threads. Refer to the Dimensions and Mounting Details drawing for mounting bolt locations. Standard clearance holes (0.26 in.) for M6-1.00 bolts should be used.
   b. The leading edge of the mounting plate should be no greater than .875 in. (22.23 mm) from the first set of holes to allow clearance for the beam output lens.
   c. As viewed from front of laser in upright position, the center of the output beam is 12.14 in. (308.36mm) forward of the first set of mounting holes and is 1.879 in. (47.727mm) from the right mounting hole.
   d. A minimum distance of 14 in. (36 cm) should be allowed from the rear of the laser to allow for proper installation of the umbilical.

6. Ensure the Laser Controller power switch is OFF.

7. Connect the remaining cables.

8. Refer to the *Eclipse 100LY 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.

System Specifications

Compliance.....CDRH
Laser Type.....Solid State, Nd: YAG, Lamp-pumped
Wavelength.....1,064 nanometers (nm)
Average Power .....100 Watts
Total Power Consumption .....7.5 KVA
Input Power .....230 VAC, 3-phase, 32A per phase, 60 Hz
Supply Voltage Fluctuation ...± 10%, maximum; clean ground line
Oper. Environment .....Indoor only; Installation Category II, Pollution Degree 2 Environment
Oper. Temperature.....59 to 86ºF (15 to 30ºC)
Oper. Relative Humidity.....10% to 90% non-condensing

Laser Marking Head / Laser Rail Assembly

The laser rail assembly consists of a laser pumping chamber (laser engine/laser resonator/laser head assembly) attached to the beam steering galvanometer package. The laser rail cover serves as a sealed, lightweight dust cover and encloses the straight optical rail. This configuration provides easy maintenance, long term optical alignment and performance in the most demanding industrial environments. All mechanical and optic components are mounted on a three point INVAR rail that precludes the need for routine adjustment of optical components, and ensures increased power and thermal stability.

Inside the sealed laser resonator pumping chamber is an Nd:YAG rod shaped crystal mounted in close proximity to a bright white krypton arc lamp. Other devices mounted on the INVAR rail include the front and rear optics, an acoustical/optical modulator (Q-switch), the electro-mechanical safety shutter, the beam expander (collimator), and a red light positioning diode.

Laser Marking Head Specifications

Dimensions (L x W x H) .....53.89 x 7.97 x 10.52 in. (136.88 x 20.24 x 26.72 cm)
Surrounding Envelope .....62 x 16 x 19 in. (157 x 41 x 48 cm) [for air circulation]
Positioning.....visible red diode beam
Field Resolution.....16 bit (65535 data points)
Galvanometer Repeatability ..less than 22 micro radian
Umbilical Cable Length.....10 ft (3.05 m), detachable
Cooling.....Sealed loop, de-ionized water heat exchanger

Marking Field Size

The size of the marking field is dependent on lens type. See *Flat-Field Lens*.

Visible Red Positioning Beam

The laser marking head produces a visible red diode that may be viewed on the work surface without the need for protective safety goggles. The visible red beam that passes through the same optics that the 1,064 nm marking beam travels. This provides a safe and convenient aid for laser setup and part programming. Note that protective eyewear should always be worn when the laser is in operation.

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 lens from dust and debris, a clear protective cover is inserted between the work area and the lens.

The following chart outlines the available lenses, the resulting image field provided by the lens, and the working clearance (in millimeters and inches).

Lens	Image Field (mm)	Image Field (in.)	Working Clearance (mm)	Working Clearance (in.)
100 mm	45 x 45	1.77 x 1.77	97	3.82
160 mm	90 x 90	3.54 x 3.54	176	6.93
163 mm	110 x 110	4.33 x 4.33	185	7.28
254 mm	155 x 155	6.10 x 6.10	296	11.65
254 mm	155 x 155	6.10 x 6.10	296	11.65
330 mm	215 x 215	8.40 x 8.40	387	15.23
420 mm	275 x 275	10.8 x 10.8	493	19.40

Spot Size (line width)

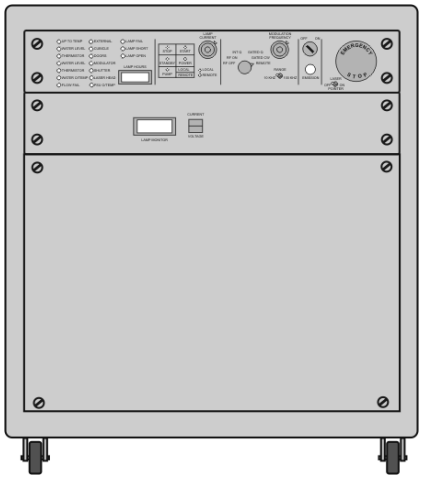
In all cases, laser marked spot size is dependent on a variety of factors including lens selection, focus, laser power, and the material being marked. The following chart is provided for reference only.

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.)
330 mm	100 microns (.0040 in.)
420 mm	150 microns (.0060 in.)

Laser Controller/DI Water Cabinet

Designed to meet CDRH, CE standards, the Laser Controller/DI Water Cabinet contains the galvo power supplies, computer interface card, driver control circuits, fusing, and the closed-loop de-ionized water cooling system. The small profile cabinet is designed to slide into a workstation opening or placed directly under a workbench.

The Laser Controller/DI Water Cabinet is remotely connected to the rail enclosure by a 3-meter (10-foot) umbilical. The umbilical is a combined multi-cable and hose assembly that carries power to the lamp, control voltages to the laser, and cooling, de-ionized water to the rail assembly.



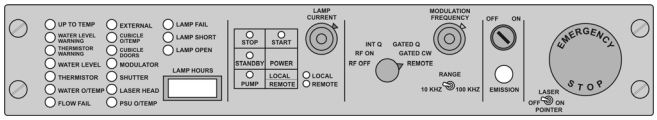
Eclipse 100LY Laser Controller/DI Water Cabinet

DI Water Cabinet. The internal de-ionized water system is a closed loop water to water heat exchanger system that transfers cooling water by way of a electric water pump from the DI Water Cabinet to the laser rail enclosure. Inside the laser rail the water is flows through the laser cavity cooling the laser rod and arc lamp assembly and through the modular AOM (Q-switch) to provide cooling to that optical device during lasing. The de-ionized cooling water is then returned through the umbilical to the DI Water Cabinet holding tank. The tank contains temperature sensors, di-restivity sensors, a de-ionizer filter cartridge, and particle filter water level sensors.

It is important to note that the laser system should be shipped or stored "dry" with no water in the laser cavity or umbilical. This is to prevent water spots from forming on the reflective surfaces of the laser cavity and to ensure that water will not freeze in the lines or on the optics during cold weather. It is also important to note that the pump size on the DI Water Cabinet is designed with enough pressure to pump only to and from the laser rail enclosure.

Laser Controller. The Laser Controller provides the energy to drive the krypton arc lamp (in the laser cavity of the laser rail enclosure) and to control the lasing process.

The Laser Control Panel includes the system key switch, Laser Power Off, a manual safety shutter control, function indicators, and digital displays.



Eclipse 100LY Laser Control Panel

Laser Controller/DI Water Cabinet Specifications

Dimensions (W x H x D).....23.75 x 23.63 x 31.75 in. (60.33 x 660.02 x 80.65 cm)

Surrounding Envelope (W x H x D) 32 x 32 x 40 in. (82 x 82 x 102 cm) [for air circulation]

Internal Heat Exchanger.....De-ionized (DI) Water, approximately 3.7 gallons (14 liters), distilled

External Cooling Water.....Facility water or dedicated water chiller (e.g., AEC PS2A) 5 gallons/min. (19 liters/min.); 50 to 65ºF (10 to 18ºC)

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:

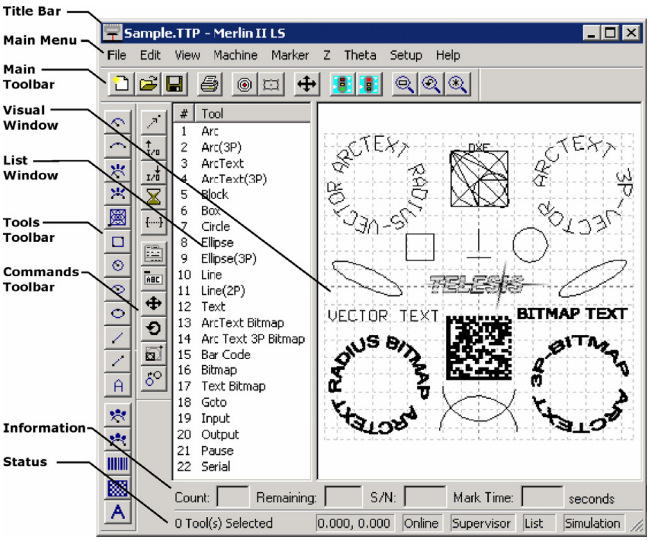
- Windows® 2000 or Windows® XP
- Telesis Merlin® II LS Laser Marking Software
- Pentium® III, 128 MB RAM (minimum)
- Multi-gigabyte, HDD
- CD-ROM and 3.5 in. External Disk Drives
- SVGA Color Monitor, Mouse, and Keyboard
- Laser/Galvo Controller Board
- Video Card
- One available RS-232 Serial Port
- Two available USB Ports
- Two available full-height PCI Slots *

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

System Software

Telesis' powerful WIN32 Merlin®II LS Laser Marking Software is a PC-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 or Windows®XP Desktop PC or Notebook PC

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

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 TMC090 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.

TMC090 Controller. Telesis offers an optional TMC090 Controller for all laser systems that use the Merlin-II LS Laser Marking Software. The TMC090 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. For details, refer to the *TMC090 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.
- **72** Message type 72 ("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 ("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.
- **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.

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.

Communications Protocol (continued)

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.

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 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.