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Contents of this manual are subject to change without notice.
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1. Introduction

Thank you for purchasing a Lanmark Controls Inc. Maestro Integrated Controller. The following guide will assist you in using the Maestro.

1.1 About this Manual

This manual provides the following information for the Lanmark Controls Inc Maestro integrated controller:
- product description
- operation
- installation
- troubleshooting

1.2 Scope

This manual covers the Lanmark Controls Inc. Maestro Integrated Controller.

1.3 Technical Support

If you are experiencing problems and you need help, you should:
1. Retry the action, carefully following the instructions given for that task in this guide.
2. Try to determine the nature of the problem. By eliminating variables, the problem can be narrowed down. If it appears to be hardware problems, check the documentation that came with your hardware for maintenance or hardware-related issues. Contact your hardware representative if necessary.
3. Contact Lanmark Controls Inc. Customer Service department for additional technical support.

1.4 Manufacturer

Lanmark Controls Inc.
1740 Massachusetts Avenue
Boxborough, MA 01719 USA

www.lanmarkcontrols.com
## 1.5 Revision History

<table>
<thead>
<tr>
<th>REVISION</th>
<th>DATE</th>
<th>CHANGES FROM PREVIOUS REVISION</th>
</tr>
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<tbody>
<tr>
<td>1.0 Preliminary</td>
<td>April 22, 2009</td>
<td>Beta Release</td>
</tr>
<tr>
<td>1.1</td>
<td>May 27, 2009</td>
<td>Initial Release</td>
</tr>
<tr>
<td>1.2</td>
<td>June 5, 2009</td>
<td>Typo corrections throughout</td>
</tr>
<tr>
<td>1.3</td>
<td>June 25, 2009</td>
<td>Added IPG DIP switch settings</td>
</tr>
<tr>
<td>1.4</td>
<td>June 26, 2009</td>
<td>Corrected Interlock connector drawing</td>
</tr>
<tr>
<td>1.5</td>
<td>August 17, 2009</td>
<td>Corrected SW1 Table descriptions for IPG laser type</td>
</tr>
<tr>
<td>1.6</td>
<td>December 3, 2009</td>
<td>Added details of IPG Fiber Laser Extension board, General Purpose Laser Extension board</td>
</tr>
<tr>
<td>1.7</td>
<td>December 7, 2009</td>
<td>Added Fiber Extension photos, Mains fuse photos</td>
</tr>
<tr>
<td>1.8</td>
<td>January 5, 2010</td>
<td>Added details about mounting requirement and cooling requirements.</td>
</tr>
</tbody>
</table>
2. Safety

Please read all operating instructions completely before installing and using the Maestro controller.

2.1 Safety labels and symbols

The following safety labels and symbols are used throughout the documentation:

<table>
<thead>
<tr>
<th>LABEL</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>DANGER</td>
<td>Serious bodily injury or death.</td>
</tr>
<tr>
<td>WARNING</td>
<td>Potential for serious bodily injury.</td>
</tr>
<tr>
<td>CAUTION</td>
<td>Potential for property damage and/or bodily injury.</td>
</tr>
<tr>
<td>SHOCK HAZARD</td>
<td>SHOCK HAZARD - Electrical voltage present. Take appropriate measures to protect yourself from electrical shock.</td>
</tr>
<tr>
<td>LASER HAZARD</td>
<td></td>
</tr>
<tr>
<td>ESD HAZARD</td>
<td></td>
</tr>
</tbody>
</table>
2.2 General safety guidelines

LASER RADIATION - Do not stare directly into a laser beam. Follow all system laser safety requirements during installation and operation.

LASER RADIATION - Lanmark Controls Inc. recommends the use of a shutter to prevent unwarranted emission of laser radiation, where practical.

2.3 Safety Cautions

Use of controls, adjustments, or procedures other than those specified in this manual without consulting a competent safety professional may result in component damage, and/or exposure to potential hazards. Always follow established industrial safety practices when operating equipment.

ESD HAZARD! Use appropriate anti-static wrist straps and/or work area equipment to prevent damage to the board electronic components.

Always check your application program BEFORE running it. Errors can cause system damage.

Electronic boards are fragile! Handle and store with care. Protect electronic components from dust, humidity, electromagnetic fields, static electricity, chemicals, and mechanical stress.
3. Product Introduction

3.1 System Description

The Maestro is a self-contained integrated controller incorporating Lanmark Control’s industry leading LEC-1 embedded controller with the appropriate I/O modules and a power supply. The Maestro is specifically designed for remote embedding and control of a scan head or laser system, and also provides integrated synchronization I/O for connection to factory automation equipment.

Specific laser extension boards are available to make connection to the laser as simple as plugging in a cable. Connection to a PC for job download and administrative control is made via Ethernet® network using industry standard TCP/IP protocols. In addition to Ethernet connectivity, the Maestro provides external USB connections to support job file distribution via industry standard USB Flash disks. RS232 Serial I/O is also provided for a pendant style user interface, to control the Maestro from an external PLC, and diagnostic access.

In a typical installation, the Maestro is an “embedded” controller, installed remotely in a laser scanning system. Positioning vectors are streamed from a networked PC to the remote Maestro which processes these vectors in real-time and sends them to the laser steering galvo servos as digital signals. Alternatively, the vector stream can originate from a locally stored file on-board or external USB based Flash memory.

There is no requirement to dedicate a full-time host PC to a laser scanning system, as the Maestro can process vectors while the PC is used for other purposes. In fact, one PC can support multiple Maestro based scanning systems with no loss in performance. This is due in part to the large amount of buffer memory available on the controller, the use of a separate supervisory processor on the controller to handle network communication processing, and the complete offloading of time critical tasks to a second real-time processor on the included LEC-1.

An optional Video Interface board provides the capability for a locally installed display screen, which can be used for machine control interaction. Both VGA video, and OEM LCD touch panel configurations are available.
3.2 Maestro Features

3.2.1 Hardware

► Industry leading LEC-1 embedded controller
► OEM Interface module, providing access to I/O and communications signals
► Specific laser extension board, providing easy integration to specific laser types
► +/ - 15 VDC, + 5 VDC power supply

3.2.2 Software

Preloaded on the LEC-1:
► WinLase Embedded Basic, Standard or Advanced
3.2.3 System Architecture Diagram

Figure 1 illustrates the functional concept of the Maestro when integrated with other components in a laser processing system.

*Figure 1  Maestro System Architecture Diagram*
3.3 Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of axes</td>
<td>2 (X, Y)</td>
</tr>
<tr>
<td>Command resolution</td>
<td>16-bit (-32768 to +32767)</td>
</tr>
<tr>
<td>Scanhead control</td>
<td>Digital: XY2-100 compatible protocol for X, Y and Z axes including status read back. Signal values represented at the analog outputs are reflected on the XY2-100 data channels.</td>
</tr>
<tr>
<td>Laser control</td>
<td>Specific laser extension boards available. Please consult factory</td>
</tr>
<tr>
<td>Electrical output</td>
<td>Signal levels 5 volt TTL compatible</td>
</tr>
<tr>
<td>Electrical output</td>
<td>Scan head connector + / - 15 VDC 2.5 A max</td>
</tr>
<tr>
<td>User inputs</td>
<td>4, optically isolated, programmable polarity</td>
</tr>
<tr>
<td>User outputs</td>
<td>4, optically isolated, programmable polarity</td>
</tr>
<tr>
<td>Automation Interfaces System Status</td>
<td>3 signals, optically isolated: BUSY: asserted when a Job is currently executing READY TO MARK: asserted when the system is actively waiting for a STARTMARK signal MARKINPRG: asserted when a marking object is executing ERROR: asserted if an error is detected</td>
</tr>
<tr>
<td>Automation Interfaces Synchronization</td>
<td>1 signal, optically isolated: STARTMARK: a marking job may contain an instruction that pauses execution until this signal is asserted by external equipment</td>
</tr>
<tr>
<td>Tracking</td>
<td>RS422 digital quadrature inputs (A &amp; B phases + Index), used for tracking objects in motion and automatically compensating for that motion while marking. Also known as “Marking-on-the-fly” Compensation can be software configured to be applied to either the X or Y axis</td>
</tr>
<tr>
<td>Safety</td>
<td>1, dry contact relay</td>
</tr>
<tr>
<td>Communication Ethernet</td>
<td>10/100 BaseT compatible</td>
</tr>
<tr>
<td>Communication Serial RS232</td>
<td>1 full modem interface capable on COM1 COM2 or COM3 with cable configuration</td>
</tr>
<tr>
<td>Peripherals USB</td>
<td>2 USB host ports for access to external Flash memory disks or other peripherals</td>
</tr>
<tr>
<td>Electrical AC Power</td>
<td>85 – 240 VAC, 50 – 60 Hz, 150 W</td>
</tr>
</tbody>
</table>
4. Principle of Operation

The Maestro controls a laser system’s galvanometer motors, accurately positioning deflection mirrors affixed to these motors in synchronization with laser control signals. The motion sequence, the operation speed/s, the laser power used, and any synchronization with external ancillary equipment is determined by scanning jobs created and formatted by WinLase® LAN. These jobs consist of sequences of instructions to the marking engine located on the LEC-1 module. Some instructions configure the module, such as setting up to emit laser control signals with the appropriate timing relative to the commanded motion of the laser beam steering galvos. Most instructions however, are sequences of mark and jump instructions, which describe when and where to move the galvos and when to switch the laser control signals in direct relationship to those motions.

4.1 Software

The Maestro contains a fully integrated processor and operating system capable of high-level communications with WinLase LAN using TCP/IP protocols, or operating in a fully independent Stand-Alone mode. The control software of the Maestro is stored in Flash memory. In a networked application, the Maestro boots upon system power-up and periodically broadcasts identification information on the network. The WinLase LAN software detects and processes these broadcast messages. The broadcast messages contain data that identifies the serial number, friendly name, and IP address of the Maestro, in addition to other information. This data, in turn, is used to establish session communication channels to the controller.

A communications session (WinLase LAN connection) permits the transmission of job data to the Maestro and the reception of job-generated messages. Jobs are streamed to the Maestro with multiple levels of buffering to guarantee full marking performance without CPU load-dependent timing anomalies. Two additional channels of communications are provided to permit asynchronous job aborts, job pausing and resuming, and exception message propagation back to WinLase LAN.

WinLase LAN and the Maestro also support the concept of fixed configuration data, i.e. data that defines the configuration of the scan-head and surrounding electronics. Examples of such data are lens correction tables, laser interface signal polarities, lens field-size, focal length and calibration values, etc. This data can be set by WinLase LAN and stored in Flash memory on the Maestro. On the next power-up, the Maestro will load these configuration files from Flash.

When running the board locally, WinLase Embedded provides the services to connect and interact with the Maestro. In addition, a local user interface is available for a richer user interface experience.
## 4.1.1 Streaming Mode

The Maestro is capable of receiving job instructions sent as a stream of data in real time from WinLase LAN. This data is meant to be executed by the vector engine as it arrives, and once consumed, is no longer available. Figure 2 illustrates the software architecture configuration in Streaming Mode.

![Maestro User Manual](image)

### Key Technology:
- **PC** – Computer running Windows XP Professional or Windows Vista Business
- **WinLase LAN GUI** – Off the shelf user interface solution for job creation, editing and streaming.
- **Custom GUI** – Optional custom user interface software solution developed by the integrator using the COMServer interface.
- **PLC or PC Host** – Optional host controller, using the Remote Interface API provided by WinLase LAN
- **Local I/O** – Local control over the marking process with Start Mark, Busy/Ready and Mark in Progress using optional 24-bit I/O card installed in PCI slot.
- **Marker Library** – Software libraries providing job editing and marking functionality
- **TCP/IP** – Streaming information is passed between PC and Maestro over TCP/IP
- **LEC-1** – The LEC-1 card internal to the Maestro
- **Marking Engine** – Software libraries providing marking services for Maestro

![Maestro User Manual](image)
4.1.2 Stand-Alone Mode

In addition to streaming jobs in real time to the Maestro, a user can create and edit job content with WinLase LAN and save the job on the Maestro for execution at a later time. The number of jobs that can be saved is limited only by the available storage on either the built in Flash memory, or an installed USB Flash drive. Individual jobs to be processed are accessed and selected either on the local pendant interface, through discreet I/O in I/O Job Selection Mode, or through commands sent to the Remote Command API. The Remote Command API is available via Ethernet, or one of the RS-232 serial ports.

Figure 3 illustrates the software and control architecture configurations that are possible in Stand-Alone Mode.

**Figure 3** Stand-Alone Mode Block Diagram

Key Technology:
- *Windows CE Embedded* – LEC-1 running WinCE
- *WinLase Embedded* – Software libraries for job storage and execution services.
- *WinLase Embedded GUI* – Optional MMI (user interface) displayed on a local VGA monitor or OEM LCD touch screen.
- *PLC or PC Host* – Optional host controller, using the Remote Interface API provided by WinLase Embedded.
- *Pendant* – Optional user interface pendant for local control of job editing and execution.
- *Local I/O* – Local control over the marking process with Start Mark, Busy/Ready and Mark in Progress using hardware I/O ports of the Maestro.
- *External job storage* – Externally connected compatible USB drive for job storage.
- *Internal job storage* – Embedded Flash memory for job storage.
- *Vector Engine* – Real time vector engine for direct control of scan head and laser equipment.
4.2 System I/O Timing

The Maestro provides very flexible System I/O control capability for applications that require the Maestro to interact with other process control equipment. Not all signals may be required for a given process control scenario. There are four fixed purpose system outputs and 5 fixed purpose system inputs. An integrator need only select an appropriate subset of these signals.

System Outputs:
- **Error / System Enabled** – From a cold start, or a reset, this output will stay low until the Maestro has completed it’s initialization routines and is ready for operation. After start-up, this output will go low if the following occurs: software exception, interlock trigger, or opcode command exception.
- **Job Busy** – This output indicates when a job is busy marking. Job Busy goes HIGH when the first object starts marking, and stays HIGH until the last object is finished marking. Job Busy then goes LOW.
- **Ready** – This output indicates when the Maestro is waiting for a Start Mark signal. Normally in the LOW state, Ready will only switch HIGH when the Maestro is waiting for a Start Mark signal. When the Start Mark signal is received, Ready switches to LOW. The Ready output will not change state if a job is executed from the software with the External Start feature disabled.
- **Mark In Progress** – This output indicates when an individual object within a job is executing. Mark In Progress will switch HIGH when an object starts marking, and then switch to LOW when the object completes it's marking.

System Inputs:
- **Start Mark** – This input is used to start the job marking sequence. The marking job must be configured to use the External Start feature. To start the marking sequence, switch the Start Mark input to HIGH.
- **Interlock 1-4** – Four individual Interlock inputs are provided as a means to immediately abort the current process and set all outputs to the Idle (LOW) state. To signal an Interlock input, switch the input to HIGH.

![System I/O timing diagram](image-url)

*Figure 4  System I/O timing diagram*
4.3 I/O Job Selection Mode

It is possible to select and execute an available locally saved job by using I/O bit combinations. In order for the Maestro to respond to I/O in this manner, the Maestro must be in I/O Job Selection Mode. When in this mode, User In 1-8 are used to select the preconfigured job. These same signals are also available for other uses once the job is loaded.

4.3.1 Configuring and using I/O Job Selection Mode

In order to enable I/O Job Selection, please note the following:
- The Maestro must be in I/O Job Selection Mode
- Jobs stored locally on the Maestro must be assigned to input bit combinations
- The Job Select input must be used to trigger the loading/enabling of a job
- The User In 1-8 inputs must be set to indicate which job to load/enable
- The Ready input is used to detect that the job is loaded/enabled
- The Start Mark input is used to start the marking process

4.3.1.1 Configuring settings in WinLase LAN

WinLase LAN is used to configure the Maestro for I/O Job Selection. WinLase LAN must have an active connection to the Maestro to be configured. In operating mode, WinLase LAN is not required, as the Maestro is running in stand-alone mode.

To connect to Maestro controller:
1. In the Laser System Viewer, right-click on an available Maestro controller and click Connect.
2. The Maestro controller turns blue to indicate it is actively connected.
To control the Maestro I/O Job Selection mode:

1. In the Laser System Viewer, right-click on an available Maestro controller and click Settings. The Laser System Settings window appears.

2. WARNING – If the Maestro is already in I/O Job Selection mode, opening the Settings dialog will abort any job that is currently active. The following message is displayed to warn the user:

3. Click the Job Selection tab. The Job Selection page appears.

The property values listed in the Job Selection page consist of the following:

- **Select job files with User Inputs (I/O Job Selection)** – Use this checkbox to enable or disable I/O Job Selection. When checked and the OK button is pressed, the Maestro will be immediately put into I/O Job Selection mode.

- **Cache jobs in memory when Laser System powers up** – Loading of jobs can be accomplished in one of two ways. (1) In cache mode, all the jobs in the Job assignment list are loaded either at boot time, or when the board is first placed in I/O Job Selection mode. Later, the Job Select bit is used to quickly switch between the previously loaded jobs. Caching the jobs in memory is preferable if fast switching times between jobs is desired. (2) If jobs are not cached, each job is loaded when the Job Select bit is set HIGH and the appropriate selection bits are set. This mode is desirable when the job files are very large, and would consume the local RAM if they were all loaded in memory at the same time. Because the job is loaded when the Job Select bit is set, the programmer must wait for the job to load before executing the job.

- **Available jobs** – The jobs currently saved on the Maestro, or on the (optional) USB stick.

- **Job assignment list** – Use this list to assign available jobs to a specific I/O input bit combination. For example, to select the job *circle.dat*, User In 2 must be HIGH, and User In 1, 3, 4, 5, 6, 7, 8 must be LOW when the Job Select bit is set HIGH.

4. Click the **Select job files with User Inputs** check box to enable I/O Job Selection.

5. To disable I/O Job Selection, uncheck **Select job files with User Inputs**.
To assign jobs to input bit combinations:

1. From the Available jobs list, select an available job.
2. Either drag the job into the Job assignment list, or click the Insert at top button to add the job to the list.
3. Jobs can be moved up or down in the Job assignment list by dragging the job, or using the up/down arrow buttons.
4. Delete a job from the Job assignment list by selecting the job and clicking the Remove button.

4.3.1.2 I/O Job Selection timing

Once the Maestro is in I/O Job Selection mode, the Maestro periodically scans (every 400 ms) the status of the Job Select input. When the Maestro detects that the Job Select input has transitioned (level detection) from GND (LOW) to +5 VDC (HIGH), for at least 400 ms, it then scans User In 1-8.

- If the User In 1-8 inputs are all at GND (LOW), this state is interpreted as an Abort. If there is a job actively executing, it will be aborted, and the system will return to scanning the Job Select input.
- If the User In 1-8 inputs represent a specific bit combination, this state is interpreted as an Enable Job (in cached job mode) or Load Job. The Job Assignment list is used to determine which job to activate.
- If the LEC-1 successfully loaded/enabled a job, the LEC-1 immediately starts waiting for a Start Mark signal. The Ready output is switched to +5 VDC (HIGH), indicating that the job was successfully loaded/enabled and the LEC-1 waits for Start Mark signal.
- If there was an error in loading the job, the system returns to scanning the Job Select input. The Ready output stays at GND (LOW).
- The Job Select bit must be brought to GND (LOW) to allow the LEC-1 to detect the next input transition.

4.3.1.3 Visual indications of I/O Job Selection modes

WinLase LAN provides feedback to the user through the Laser System Viewer as to the current state of the Maestro.

The Maestro is currently loading jobs into memory (cache mode)

The Maestro is in I/O Job Selection mode
5. Using the Maestro Integrated Controller

Because of the flexibility of the Maestro and the WinLase LAN software package, there are a number of different system integration possibilities that are available. All possible solutions rely on a combination of the following interfaces to control the Maestro in a marking application:

- **WinLase LAN** Graphical User Interface
- **COM Automation Server**, for creating a custom GUI
- **Pendant controller**, for local interaction with the Maestro
- **Remote Command API**, for automated interaction with the Maestro from PC or PLC

5.1 WinLase LAN Graphical User Interface

The WinLase LAN Software includes the following:

- WinLase LAN Graphical User Interface.
- Lanmark Controls Inc. COM Automation server object interface.
- Full documentation on the features of the included software tools.

WinLase LAN contains all of the elements of a multi-element Job Editor, automation sequencing tool (simplified ladder logic), and password-protected Operator’s Interface. Most procedures can be efficiently served entirely from within the program. Please refer to the document 20.007 - WinLase Professional Manual for complete details on using the WinLase LAN software package.

5.2 COM Automation Server API

WinLase LAN exposes a COM Automation server, which offers external programs the ability to communicate with and control WinLase LAN. For detailed information on the COM Automation server interface, please refer to the document 20.008 - COM Automation Interface Manual.

5.3 Pendant Controller

5.3.1 Pendant Error Codes

The following error codes may be displayed when the pendant is executing jobs locally.

- LoadFail = 100
- NoObjects = 101
- NoProperties = 102
- WriteFail = 103
- FileFormat = 104
- FileException = 105
- UnknownObject = 106
- UnknownType = 107
- NotSupported = 108
5.4 Remote Command API

The Maestro was designed to be a powerful Stand-Alone controller, with the ability to accept commands and return responses. The Remote Command API provides extended functionality to load jobs, rename jobs, change administration settings, and many other functions.

There are two methods available for interfacing with the Remote Command API while in Local mode:
- Message based TCP/IP socket connection
- Message based RS-232 connection

All interfaces are active simultaneously for interacting with the Remote Command API. All interfaces support making calls to get parameters. Some commands, however require the client to “Take Control” of the Maestro Host device. When a client has control, the client can send execution commands as well as commands to set parameters. For detailed information on the Remote Command API, please refer to the document \textit{20.020 – LEC-1 Reference Manual}.

5.5 Installing new Firmware

From time to time, Lanmark Controls Inc. will release an updated version of the firmware resident on the LEC-1 board internal to the Maestro. This update may be in the form of a single file, or a web link.

\textbf{WARNING:} When updating the Maestro firmware, all files stored locally on the Maestro will be lost. It is highly recommended to back up any job files that have been stored in the flash memory of the Maestro.

\textbf{NOTE:} After updating the firmware, the Maestro must be automatically (or manually) restarted for changes to take effect.

\textbf{To install an update from a provided update file:}

1. From the Main menu of WinLase, click Tools -> Laser System device software update. The backup warning appears.

2. Click Yes, and the Browse for Laser System software updates dialog box appears.
3. Browse to the provided Update file, select it, and click Open. The Laser System Software Updater appears.

The settings listed in the Laser System Software Updater consist of the following:

- **Refresh button** – Click this button to rescan the network for Maestro controllers.
- **Laser System name** – The name of an Maestro that has been detected on the network. The icon representing the Maestro will also indicate its status.
- **Current** – The version of the firmware currently on the Maestro.
- **Status** – Indicates whether the update file you have selected is newer, older, or the same version as the version currently on the Maestro.
- **Automatically restart Laser System(s) after update** – On current firmware versions after 1.4.2, the Maestro can automatically restart when the firmware update is complete. In order for changes to take affect, the Maestro must be restarted after an update session. On Maestro controllers with current firmware previous to 1.4.2, this checkbox has no effect, and the Maestro must be restarted manually.
- **Update button** – After selecting the Maestro to update, click the Update button to start the process.

4. Select the Maestro to update, and click the Update button. The windows shows the update status.
6. Maestro Installation and Use

![The Maestro Controller]

Figure 5 The Maestro Controller

6.1 Storage and Installation Environment

ESD HAZARD! Use appropriate anti-static wrist straps and/or work area equipment to prevent damage to the board and the electronic components.

Protect the Maestro from mechanical stress, humidity, dust, and thermal damage. Storage temperature is -20° C to +60° C. Operating temperature is 15 to 35° C.

6.2 Mounting Requirements

When mounting the Maestro in a 19’ rack, at least 25.4mm (1 inch) of clearance must be provided on the top and bottom of the Maestro to allow proper cooling. When using the Maestro in a tabletop application, do not place anything on top of the Maestro.
6.3 Front Panel Controls

6.3.1 Power Keyswitch

The Power Keyswitch turns power on and off to the device. The key can only be removed in the O (OFF) position.
6.3.2 LED Status Indicators

**Figure 7** LED Status Indicators

6.3.2.1 POWER Indicator
Indicates when the system has power applied. The indicator will blink once per second during initial power up, or if there is an internal error.

6.3.2.2 SYSTEM READY Indicator
Indicates that the LEC-1 has booted, initialized all outputs, and is ready for operation. If the LEC-1 enters an error state, this indicator will switch off, signaling that the Maestro needs to be restarted. This signal is also available on the User I/O connector as Error / System Enabled.

6.3.2.3 READY TO MARK Indicator
If the Maestro is actively waiting for a START MARK signal, this indicator will turn on. Note that this indicator will ONLY turn on while waiting for a START MARK signal. This signal is also available on the User I/O connector as Ready.

6.3.2.4 BUSY Indicator
When a job is actively executing, this indicator will turn on. This signal is also available on the User I/O connector as Job Busy.

6.3.2.5 INTERLOCK Indicator
All Laser Extension Kits include an INTERLOCK connector. When the external interlock loop on this connector is open, the INTERLOCK indicator will turn on.

6.3.2.6 LASER Indicator
All Laser Extension Kits report the state of the laser. Some lasers do not support this feature. If the connected laser supports error reporting, and there is an active laser error being reported by the laser, the LASER indicator will turn on.
6.4 Rear Panel Connector Locations

NOTE: Connectors and jumpers not listed are reserved for Lanmark Controls Inc. use.

![Rear view, Maestro connector locations](image)

Figure 8 Rear view, Maestro connector locations

6.5 Rear Panel Connector Pin-outs

The following sections describe each user accessible connector on the Maestro.

6.5.1 Laser Extension Option

The Laser Extension section of the rear panel is dependant on the Laser Extension kit that was specified with the Maestro. Please refer to the specific Laser Extension Options section of this manual for more details.

6.5.2 VGA Connector, D-Sub

The VGA connector was not available at the time of this printing.

6.5.3 SCAN HEAD POWER Connector, D-Sub female

Connector “SCAN HEAD POWER” on the Maestro rear panel is used for powering scanheads.

![D-Sub female SCAN HEAD POWER connector](image)

Figure 9 D-Sub female SCAN HEAD POWER connector
6.5.4 User I/O Connector, D-Sub male

Connector “I/O” on the Maestro rear panel provides access to user programmable I/O and the Mark-On-the-Fly encoder signals. The figure below details pin-outs and relevant signal names for the User I/O connector.

![D-Sub male I/O connector pin-out](image)

*Figure 10*  D-Sub male I/O connector pin-out
6.5.5 XY/2-100 (Scan head) Connector, D-Sub female

Connector “SCANHEAD (XY/2-100)” on the Maestro real panel provides access to the XY/2-100 signals. The figure below details pin-outs and relevant signal names for the XY/2-100 connector.

![D-Sub female SCANHEAD (XY/2-100) connector](image)

Figure 11  D-Sub female SCANHEAD (XY/2-100) connector
6.5.6 COM1 Connector, D-Sub male
Connector “COM1” on the Maestro rear panel provides access to the COM1 port. The figure below details pin-outs and relevant signal names for the COM1 connector.

![Diagram of COM1 connector pin-out]

*Figure 12  D-Sub male COM1 connector pin-out*

6.5.7 COM2 Connector, D-Sub male
Connector “COM2” on the OEM Interface Module provides access to the COM2 port. The figure below details pin-outs and relevant signal names for the COM2 connector.

![Diagram of COM2 connector pin-out]

*Figure 13  D-Sub male COM2 connector pin-out*
6.5.8 Ethernet Connector, RJ-45
Connector “ETHERNET” on the Maestro rear panel provides access to the Ethernet signals.

6.5.9 USB Connector
Connector “USB” on the Maestro rear panel provides access to the USB0 and USB1 host ports.

6.5.10 Input Power Connector
AC power is applied to the Input Power Connector. The input voltage specification is 90 – 240 VAC, 50 – 60 Hz, with a maximum power consumption of 150 watts.

6.6 Internal Component Locations

![Top view, Maestro internal component locations](image)

*Figure 14  Top view, Maestro internal component locations*
6.7 Signal Conditioning

On the Maestro, most control connections optically-isolated directly on the LEC-1 board are converted to single ended outputs and inputs. The following figures illustrate the Maestro input and output optical isolation used with the various signal groups.

**Figure 15** Maestro Laser Control Signal conditioning

**Figure 16** Maestro Laser Digital Outputs optical isolation
Figure 17  Maestro Inputs Optical Isolation

Figure 18  Maestro Outputs optical isolation
6.8 Replacing Fuses

6.8.1 Mains Power
The Mains Entry module includes an integrated fuse of type: 250V Slo-Blo 3AG 5Amp.

To replace the Mains fuse:
1. Disconnect the Maestro from the Mains power supply.
2. Using a screwdriver, or other sharp device, carefully pry open the fuseholder cover window (see illustration).
3. Pull out the integrated fuse holder. Remove and replace the fuse. Assemble in reverse order.

![Figure 19 Replacing the Mains fuse](image)

6.8.2 Internal Fuses
The Maestro also has three internal fuses to protect the +/-15 VDC and +5VDC power supplies.

To replace the internal fuses:
1. Disconnect the Maestro from the Mains power supply.
2. Remove the twelve screws on the left and right side panels.
3. Remove the six bracket screws from the left and right side panels.
4. Carefully remove the top cover. There is a ground wire which is attached to the top and bottom halves of the Maestro.
5. Locate the three fuses along the side of the OEM Interface module.

![Figure 20 Internal fuse location](image)
6.9 Physical Dimensions

Figure 21  Maestro Controller Physical Dimensions
7. Laser Extension Options

7.1 SPI Laser Extension Option

7.1.1 Connector Locations
NOTE: Connectors and jumpers not listed are reserved for Lanmark Controls Inc. use.

![SPI G3 Laser Extension Option connector locations](image)

*Figure 22* SPI G3 Laser Extension Option connector locations

7.1.2 SPI G3 Laser Extension Option User Accessible Connector Pin-outs
The following sections describe each user accessible connector on the SPI G3 Laser Extension Board.
7.1.2.1 LASER STATUS Connector, D-Sub female

Connector “STATUS” on the SPI G3 Laser Extension Option provides access to the Laser Status signals. The figure below details pin-outs and relevant signal names for the STATUS connector.

![Figure 23 D-Sub female STATUS connector pin-out](image)

7.1.2.2 INTERLOCK Connector, D-sub female

Connector “INTERLOCK” on the SPI G3 Laser Extension Option provides access to the INTERLOCK interface. The figure below details pin-outs and relevant signal names for the Interlock connector.

![Figure 24 D-Sub female INTERLOCK connector pin-out](image)
7.1.2.3 COM PORT Connector, D-Sub male

Connector “COM PORT” on the SPI G3 Laser Extension Option provides access to the COM port on the G3 controller. The figure below details pin-outs and relevant signal names for the COM PORT connector.

Figure 25 D-Sub male COM PORT connector pin-out
7.1.2.4 LASER Connector, SCSI II female

Connector “LASER” on the SPI G3 Laser Extension Option provides the interface to the SPI G3 controller. A standard SCSI cable can be used to make this connection.

Figure 26  SCSI II female LASER connector pin-out
7.1.3 Jumper and Switch Locations
Please refer to the LEC-1 User Manual for details about jumper settings, switch positions, and connector pin-outs for the SPI G3 Laser Extension Board.
7.2 IPG Fiber Laser Extension Option

7.2.1 Connector Locations

NOTE: Connectors and jumpers not listed are reserved for Lanmark Controls Inc. use.

Figure 27  Fiber Laser Extension Option connector locations
7.2.2 IPG Fiber Laser Extension Option User Accessible Connector Pin-outs

The following sections describe each user accessible connector on the IPG Laser Extension Option.

7.2.2.1 LASER STATUS Connector, D-Sub female

Connector “STATUS” on IPG Fiber Laser Extension Option provides access to the Laser Status signals. The figure below details pin-outs and relevant signal names for the STATUS connector.

![D-Sub female STATUS connector pin-out](image)

*Figure 28* D-Sub female STATUS connector pin-out
7.2.2.2 LASER Connector, D-Sub female

Connector “LASER” on the IPG Fiber Laser Extension Option provides the interface to the laser. A standard straight through d-sub cable can be used to make this connection.

![Figure 29 D-Sub female LASER connector pin-out](image)

7.2.2.3 INTERLOCK Connector, D-sub female

Connector “INTERLOCK” on the IPG Fiber Laser Extension Option provides access to the INTERLOCK interface. The figure below details pin-outs and relevant signal names for the Interlock connector.

![Figure 30 D-Sub female INTERLOCK connector pin-out](image)
7.2.3 Jumper and Switch Locations

Please refer to the LEC-1 User Manual for details about jumper settings, switch positions, and connector pin-outs for the IPG Fiber Laser Extension Board.
7.3 General Purpose Laser Extension Option

7.3.1 Connector Locations
NOTE: Connectors and jumpers not listed are reserved for Lanmark Controls Inc. use.

*Figure 31* General Purpose Laser Extension Option connector locations
7.3.2 General Purpose Laser Extension Option User Accessible Connector Pin-outs

The following sections describe each user accessible connector on the General Purpose Laser Extension Option.

7.3.2.1 LASER STATUS Connector, D-Sub female

Connector “STATUS” on the General Purpose Laser Extension Option provides access to the Laser Status signals. The figure below details pin-outs and relevant signal names for the STATUS connector.

Figure 32  D-Sub female STATUS connector pin-out
7.3.2.2 LASER Connector, D-Sub female

Connector “LASER” on the General Purpose Laser Extension Option provides the interface to the laser. Control signals. This connector also provides two inputs that can be used to report laser error status to the Maestro. These error signals are buffered and then provided on the Status connector.

(*') - Laser driver setting

Figure 33  D-Sub female LASER connector pin-out
7.3.2.3 INTERLOCK Connector, D-sub female

Connector “INTERLOCK” on the General Purpose Laser Extension Option provides access to the INTERLOCK interface. The figure below details pin-outs and relevant signal names for the Interlock connector.

![D-Sub female INTERLOCK connector pin-out](image)

*Figure 34* D-Sub female INTERLOCK connector pin-out

7.3.3 Jumper and Switch Locations

Please refer to the LEC-1 User Manual for details about jumper settings, switch positions, and connector pin-outs for the General Purpose Laser Extension Board.
7.3.3.1 Warranty

Lanmark Controls Inc. warrants to the Customer that the product is free from defects in workmanship and materials for a period of 12 months from the delivery date.

Lanmark Controls Inc. obligation under this warranty is limited to repair, replacement or service, at its option, any part of the product which, within the warranty period and upon Lanmark Controls Inc. examination shall disclose to its satisfaction not to have conformed to this Agreement or to have been defective. Defective parts or products are to be returned to Lanmark Controls Inc. place of shipment.

The above warranties do not apply (i) to defects or failure of product or parts caused by accident, alteration, abuse, misuse, corrosion or improper installation or operation, or (ii) to alterations or modifications made by Customer in any way so as in Lanmark Controls Inc. judgment to affect the products reliability, or (iii) to installation not performed pursuant to Lanmark Controls Inc. factory authorized protocol, or (iv) in the case of custom software designed to interact with other Customer-supplied software, in the event of any change, upgrade or reprogramming of such Customer-supplied software so as to create an incompatibility with Lanmark Controls Inc. software.

Authorization to return products purchased from Lanmark Controls Inc. must be obtained by Customer. Returns should always be carefully packed and sent freight prepaid. Unless otherwise agreed, return shipment freight and duty charges shall be borne by Customer. Customer shall bear all charges for freight and handling of products returned which are not defective.

THIS WARRANTY IS EXPRESSLY MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, EXPRESSED OR IMPLIED.
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