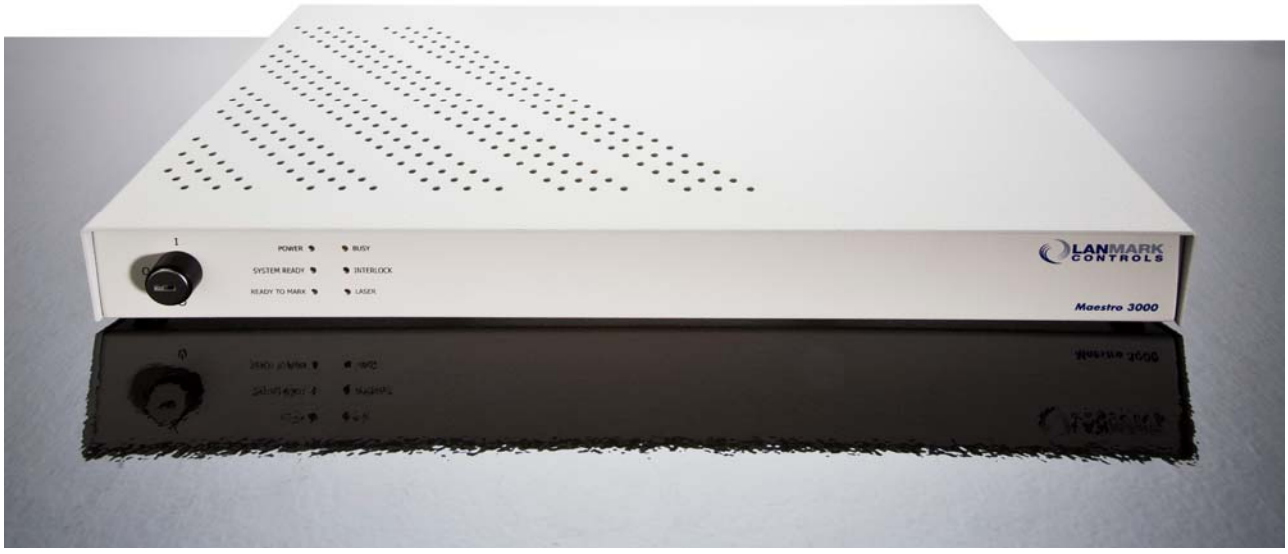
Maestro Integrated Controller
User Manual



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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.

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Boxborough, MA 01719 USA

www.lanmarkcontrols.com

1.5 Revision History

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

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:

LABEL	MEANING
	Serious bodily injury or death.
	Potential for serious bodily injury.
	Potential for property damage and/or bodily injury.
	**SHOCK HAZARD** - Electrical voltage present. Take appropriate measures to protect yourself from electrical shock.
	**LASER HAZARD**
	**ESD HAZARD**

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 intergrated 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 off-loading 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.

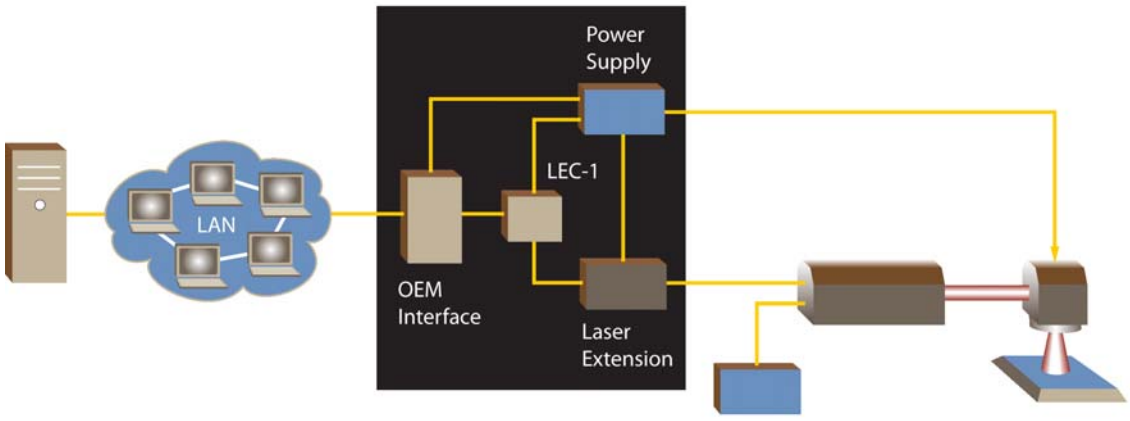


Figure 1 Maestro System Architecture Diagram

3.3 Technical Specifications

Number of axes		2 (X, Y)
Command resolution		16-bit (-32768 to +32767)
Scanhead control		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.
Laser control		Specific laser extension boards available. Please consult factory
Electrical output	Signal levels	5 volt TTL compatible
Electrical output	Scan head connector	+ / - 15 VDC 2.5 A max
User inputs		4, optically isolated, programmable polarity
User outputs		4, optically isolated, programmable polarity
Automation Interfaces	System Status	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
Automation Interfaces	Synchronization	1 signal, optically isolated: ▶ STARTMARK: a marking job may contain an instruction that pauses execution until this signal is asserted by external equipment
Tracking		RS422 digital quadrature inputs (A & 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
Safety	Interlock protection	1, dry contact relay
Communication	Ethernet	10/100 BaseT compatible
Communication	Serial RS232	1 full modem interface capable on COM1 COM2 or COM3 with cable configuration
Peripherals	USB	2 USB host ports for access to external Flash memory disks or other peripherals
Electrical	AC Power	▶ 85 – 240 VAC, 50 – 60 Hz, 150 W

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.

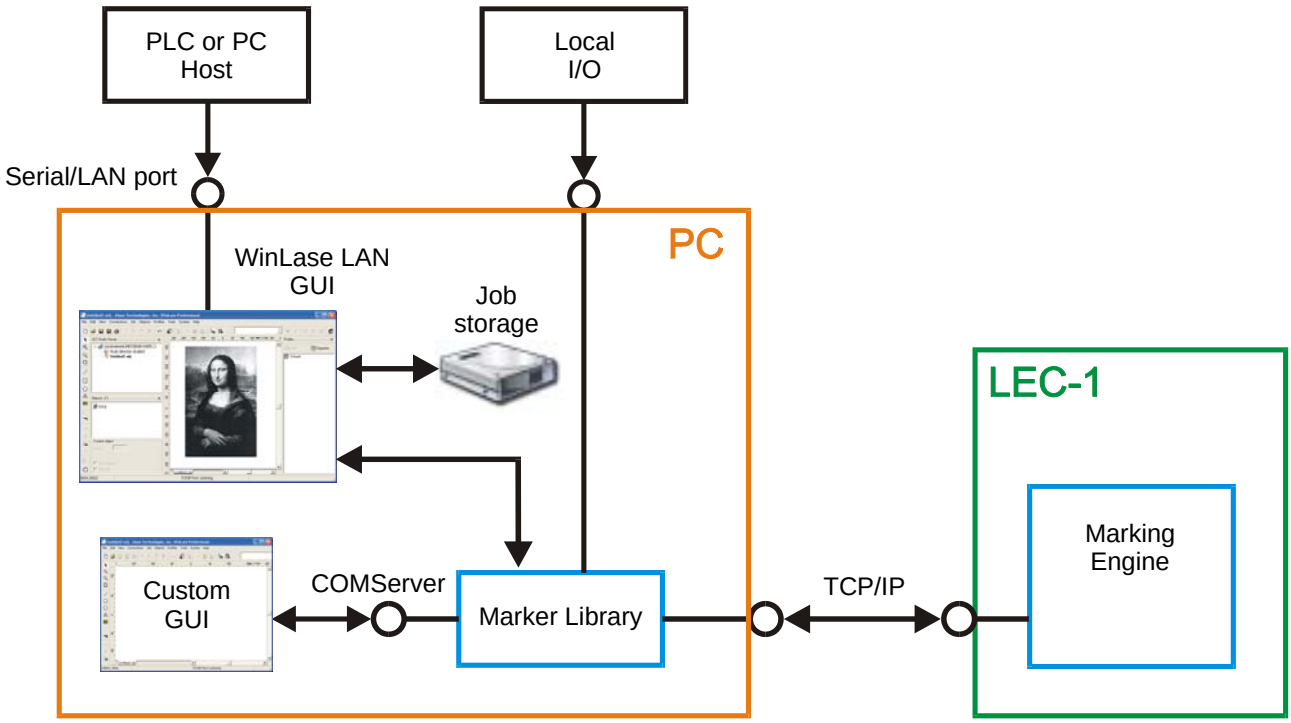


Figure 2 Streaming Mode Block Diagram

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

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.

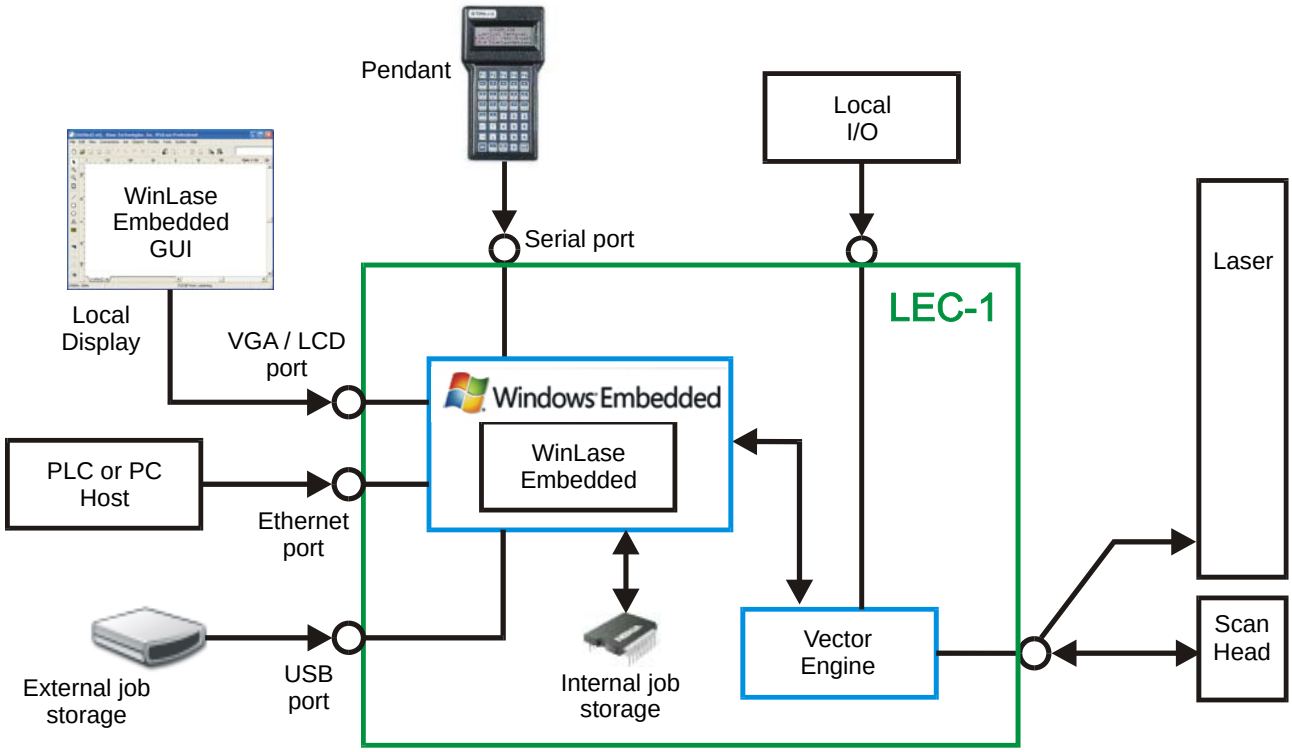


Figure 3 Stand-Alone Mode Block Diagram

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.

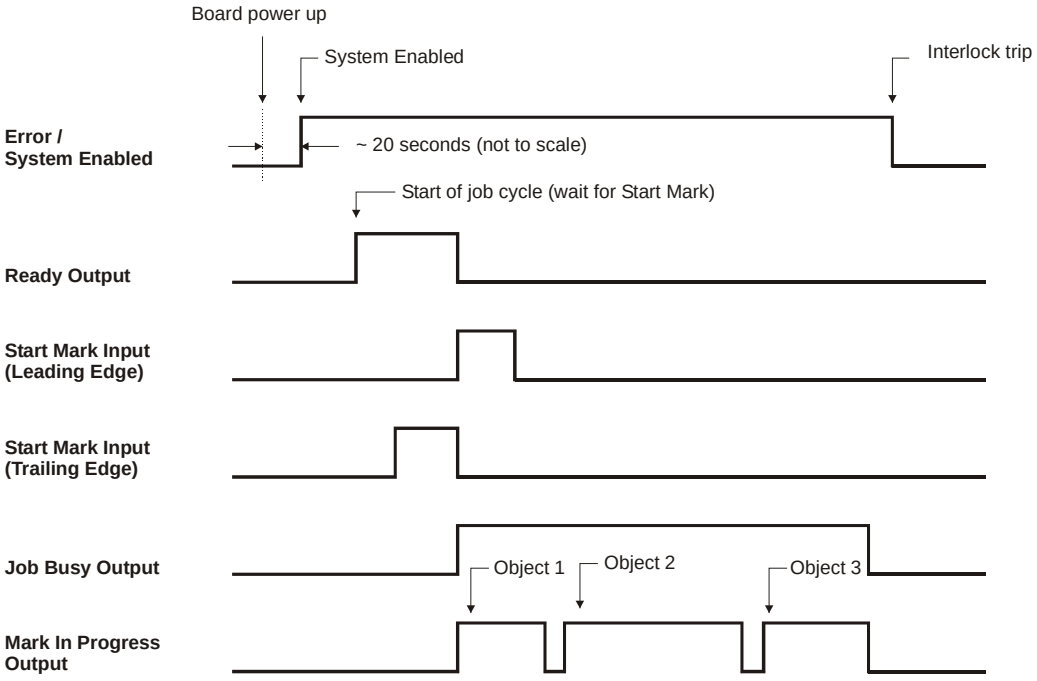


Figure 4 System I/O timing diagram

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:

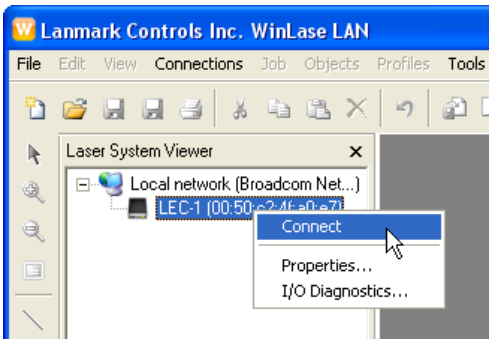
- The Maestro must be in I/O Job Selection Mode
- Jobs stored locally on the Maestro must be assigned to input bit combinations
- The Job Select input must be used to trigger the loading/enabling of a job
- The User In 1-8 inputs must be set to indicate which job to load/enable
- The Ready input is used 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

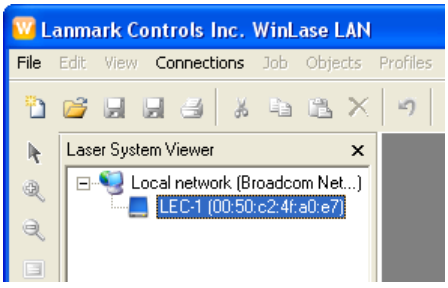
WinLase LAN is used to configure the Maestro for I/O Job Selection. WinLase LAN must have an active connection to the Maestro to be configured. In operating mode, WinLase LAN is not required, as the Maestro is running in stand-alone mode.

To connect to Maestro controller:

1. In the Laser System Viewer, right-click on an available Maestro controller and click Connect.

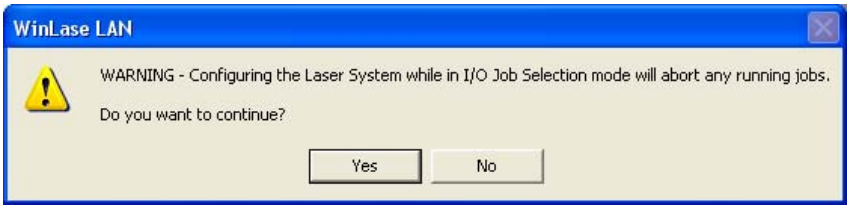


2. The Maestro controller turns blue to indicate it is actively connected.

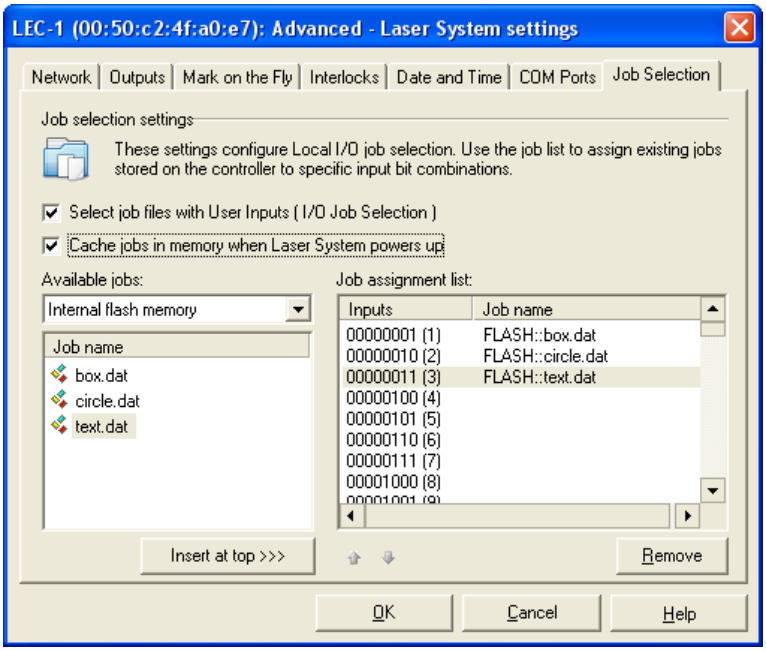


To control the Maestro I/O Job Selection mode:

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 approprite 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.

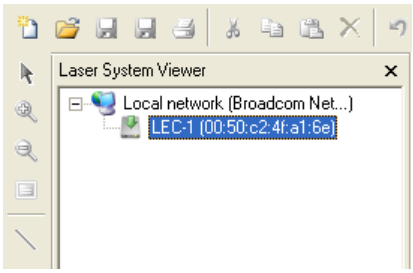
4.3.1.2 I/O Job Selection timing

Once the Maestro is in I/O JobSelection 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.

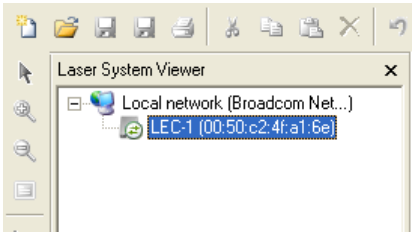
- If the User In 1-8 inputs are all at GND (LOW), this state is interpreted as an Abort. If there is a job actively executing, it will be aborted, and the system will return to scanning the Job Select input.
- If the User In 1-8 inputs represent a specific bit combination, this state is interpreted as 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 *20.020 – LEC-1 Reference Manual*.

5.5 Installing new Firmware

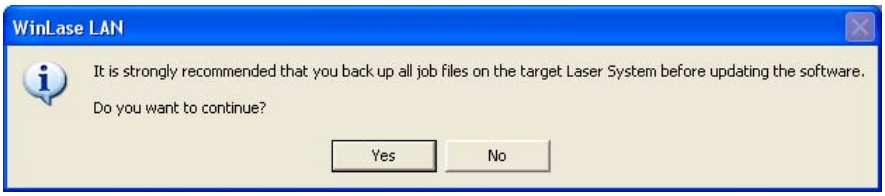
From time to time, Lanmark Controls Inc. will release an updated version of the firmware resident on the LEC-1 board internal to the Maestro. This update may be in the form of a single file, or a web link.

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.

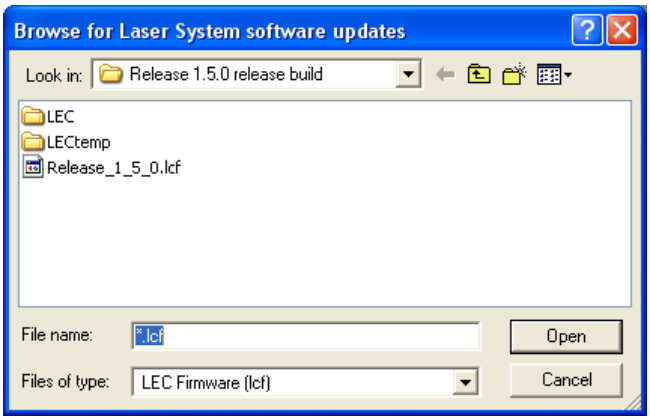
NOTE: After updating the firmware, the Maestro must be automatically (or manually) restarted for changes to take effect.

To install an update from a provided update file:

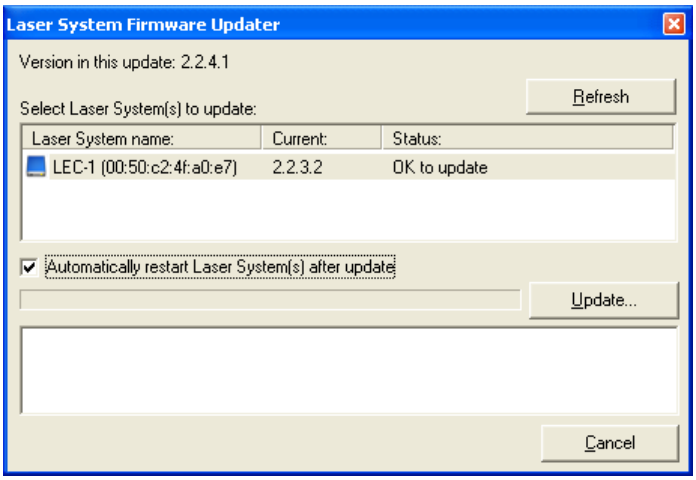
1. From the Main menu of WinLase, click Tools -> Laser System device software update. The backup warning appears.



2. Click Yes, and the Browse for Laser System software updates dialog box appears.



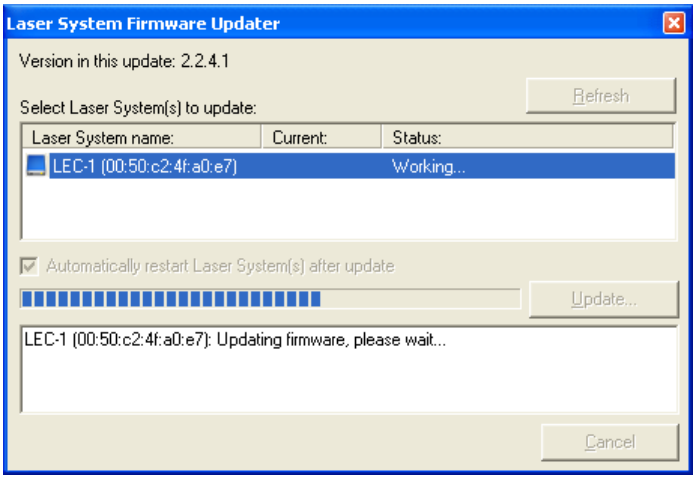
3. Browse to the provided Update file, select it, and click Open. The Laser System Software Updater appears.



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 it's 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

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

Figure 6 Front view, Maestro

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.

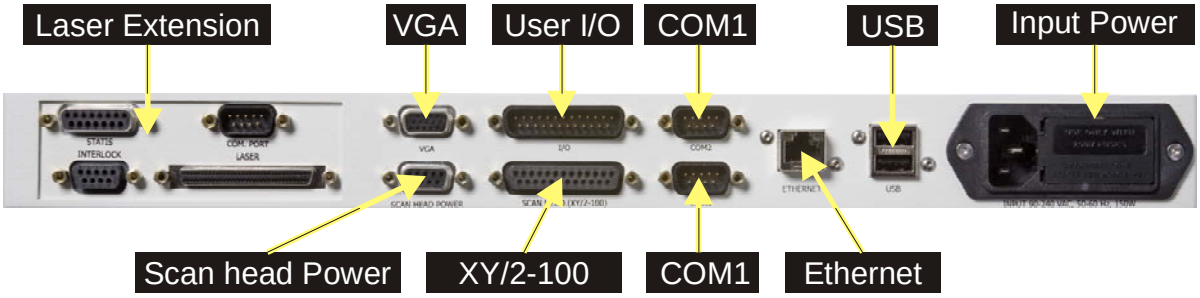


Figure 8 Rear view, Maestro connector locations

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.

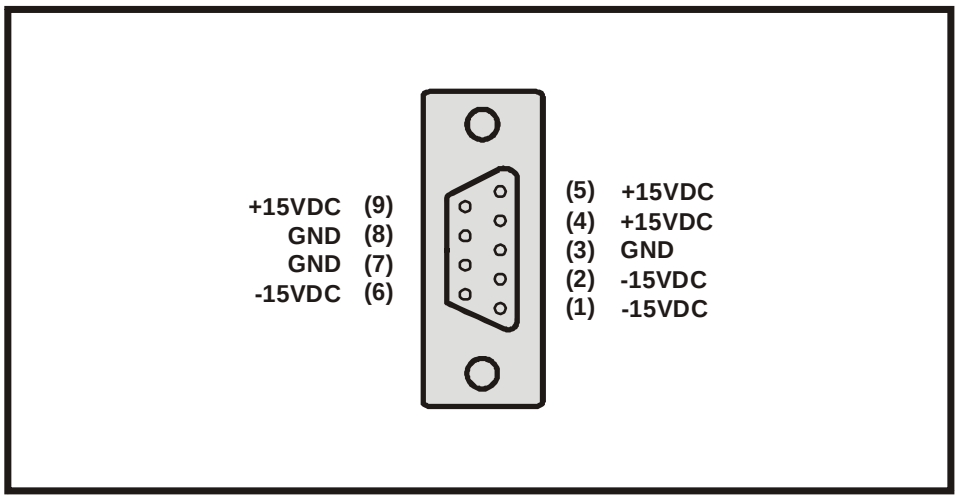


Figure 9 D-Sub female SCAN HEAD POWER connector

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.

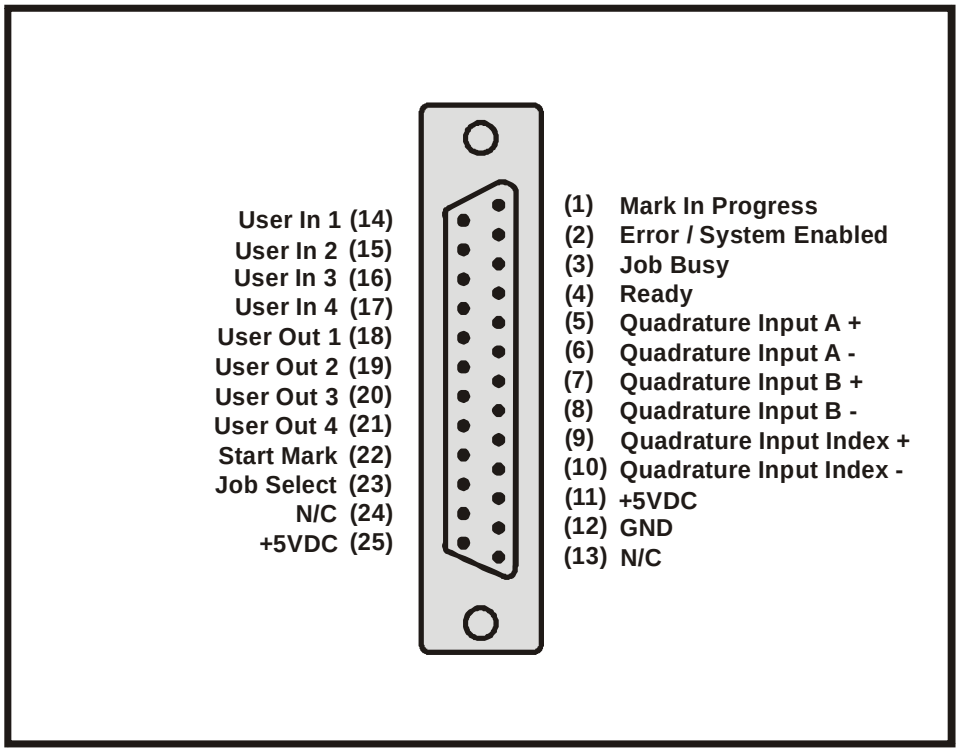


Figure 10 D-Sub male I/O connector pin-out

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.

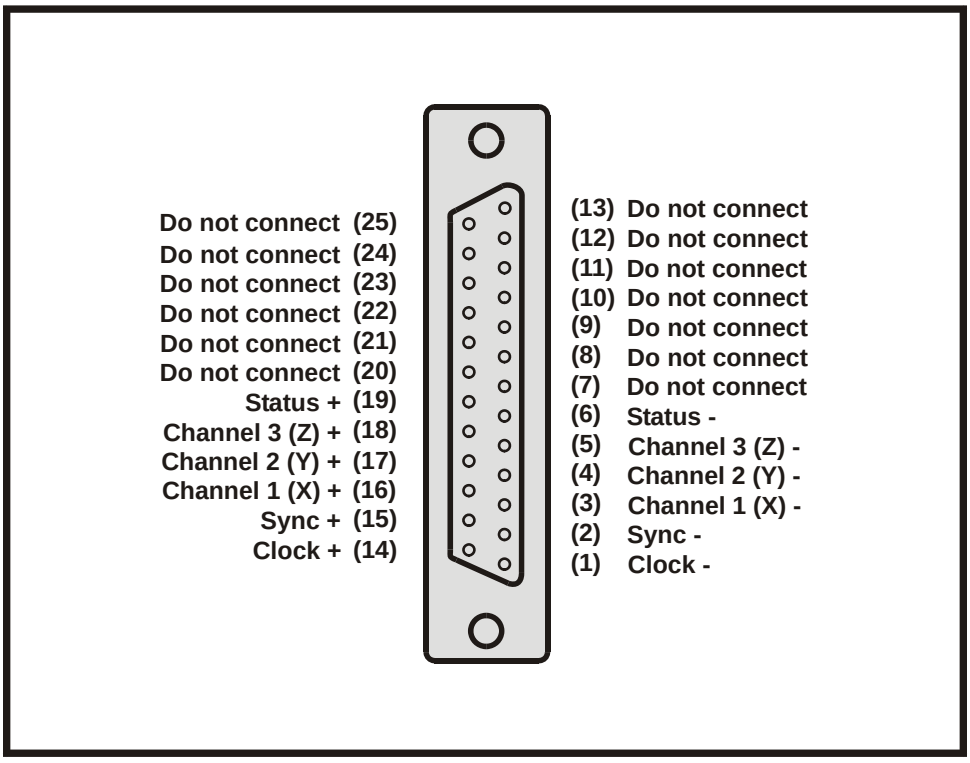


Figure 11 D-Sub female SCANHEAD (XY/2-100) connector

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.

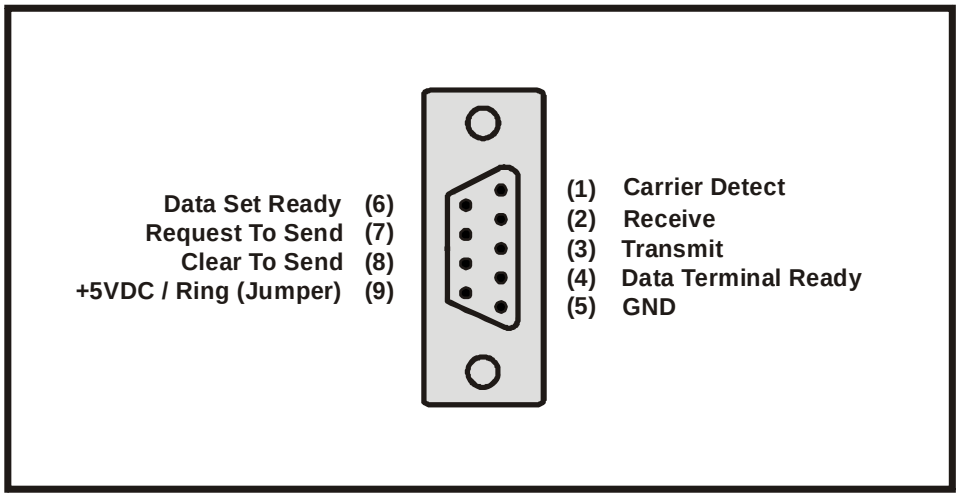


Figure 12 D-Sub male COM1 connector pin-out

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.

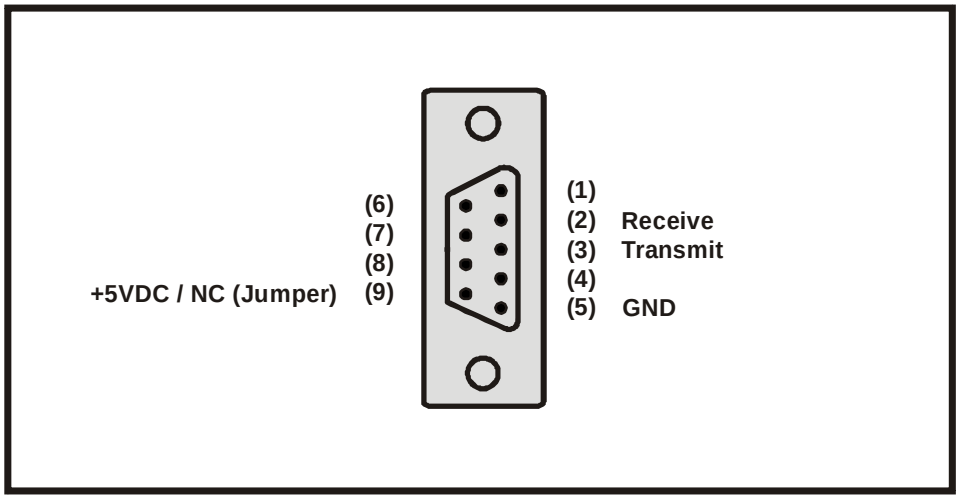


Figure 13 D-Sub male COM2 connector pin-out

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

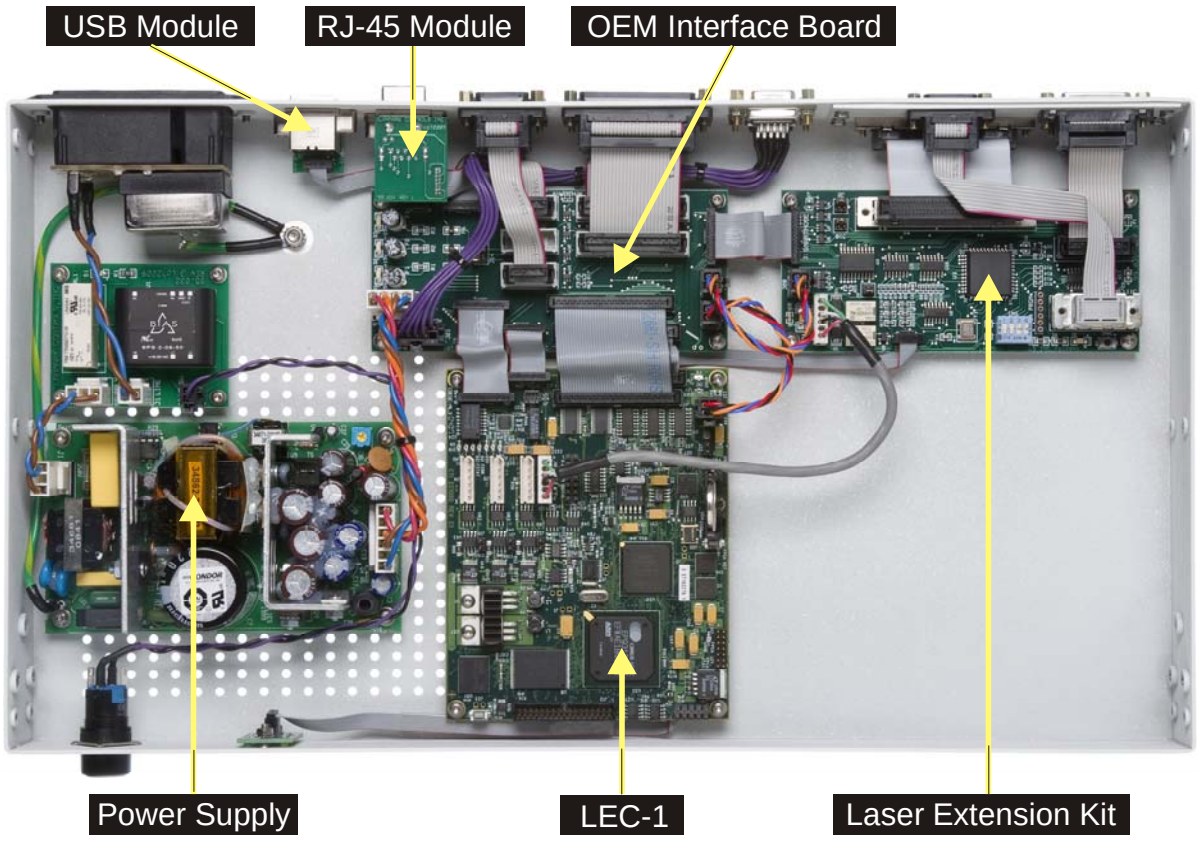


Figure 14 Top view, Maestro internal component locations

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.

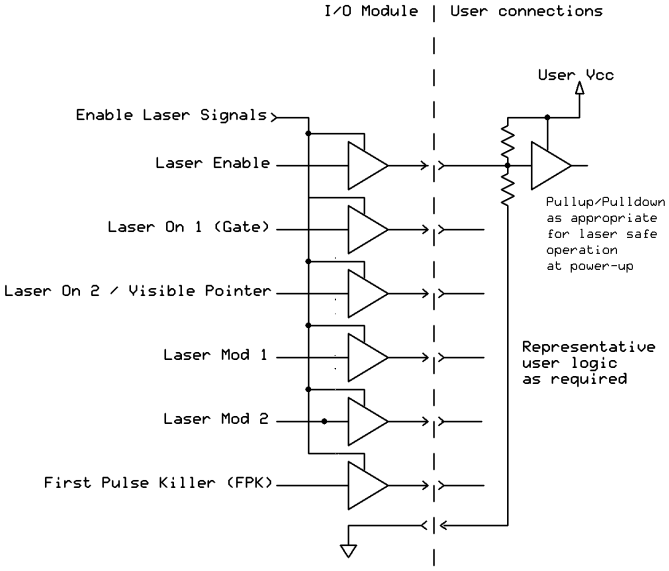


Figure 15 Maestro Laser Control Signal conditioning

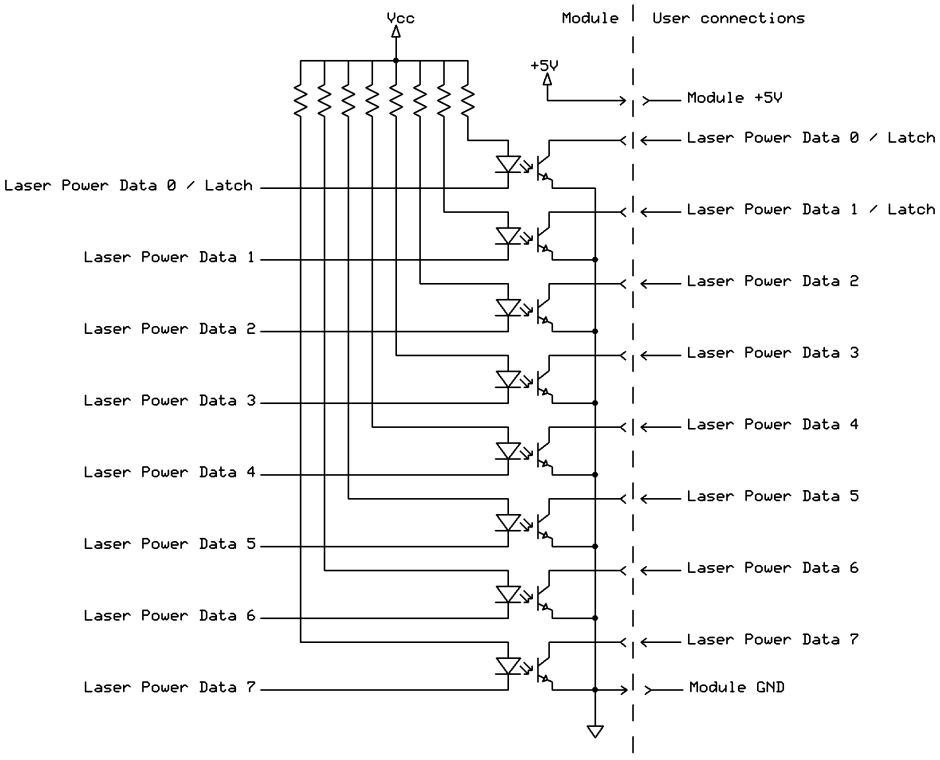


Figure 16 Maestro Laser Digital Outputs optical isolation

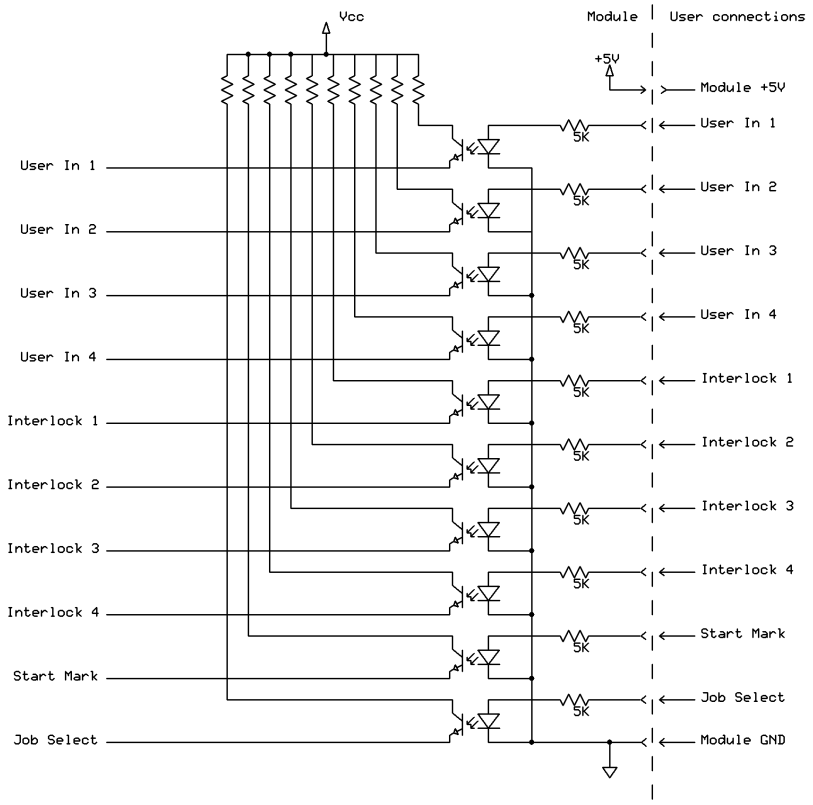


Figure 17 Maestro Inputs Optical Isolation

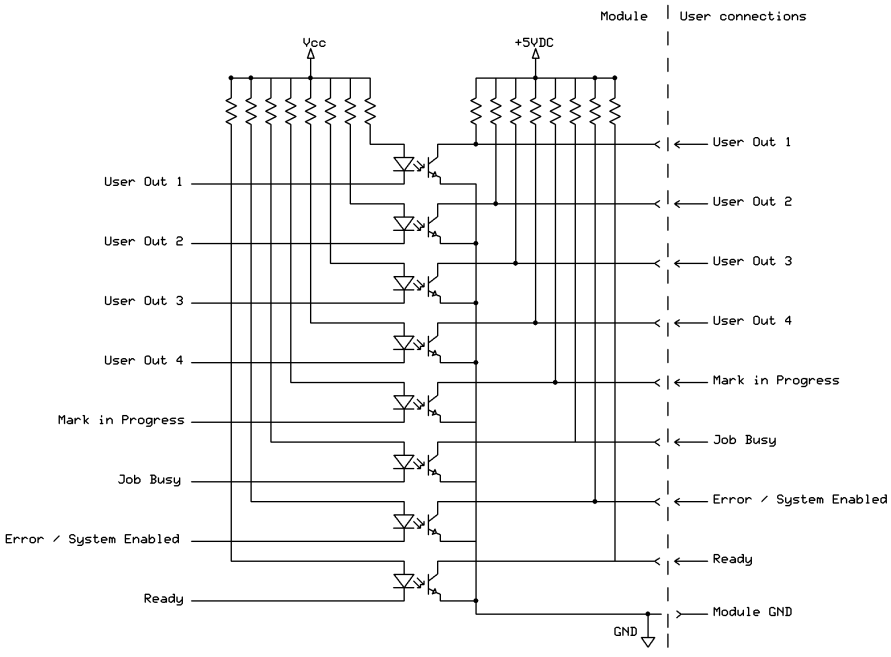


Figure 18 Maestro Outputs optical isolation

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

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.

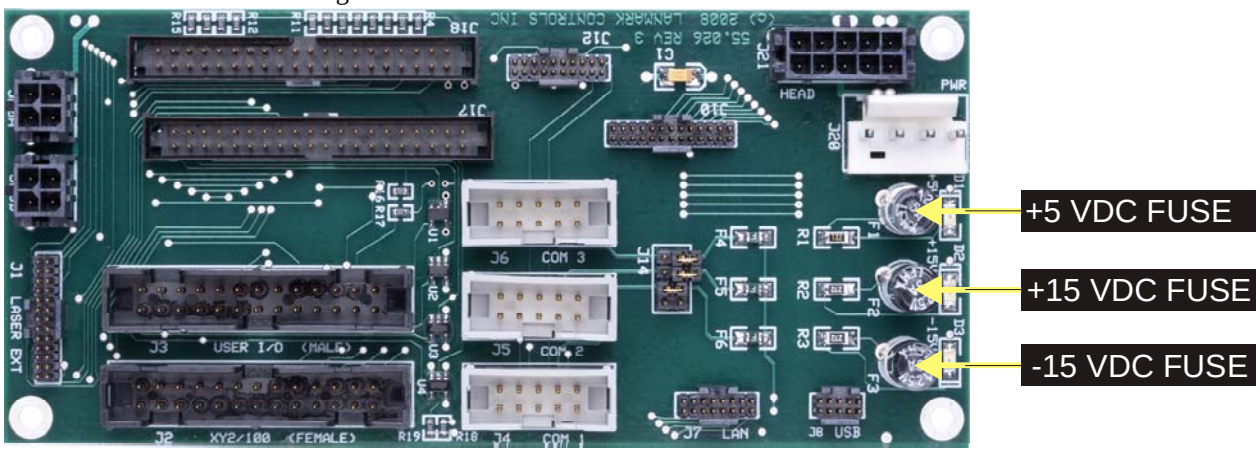


Figure 20 Internal fuse location

6.9 Physical Dimensions

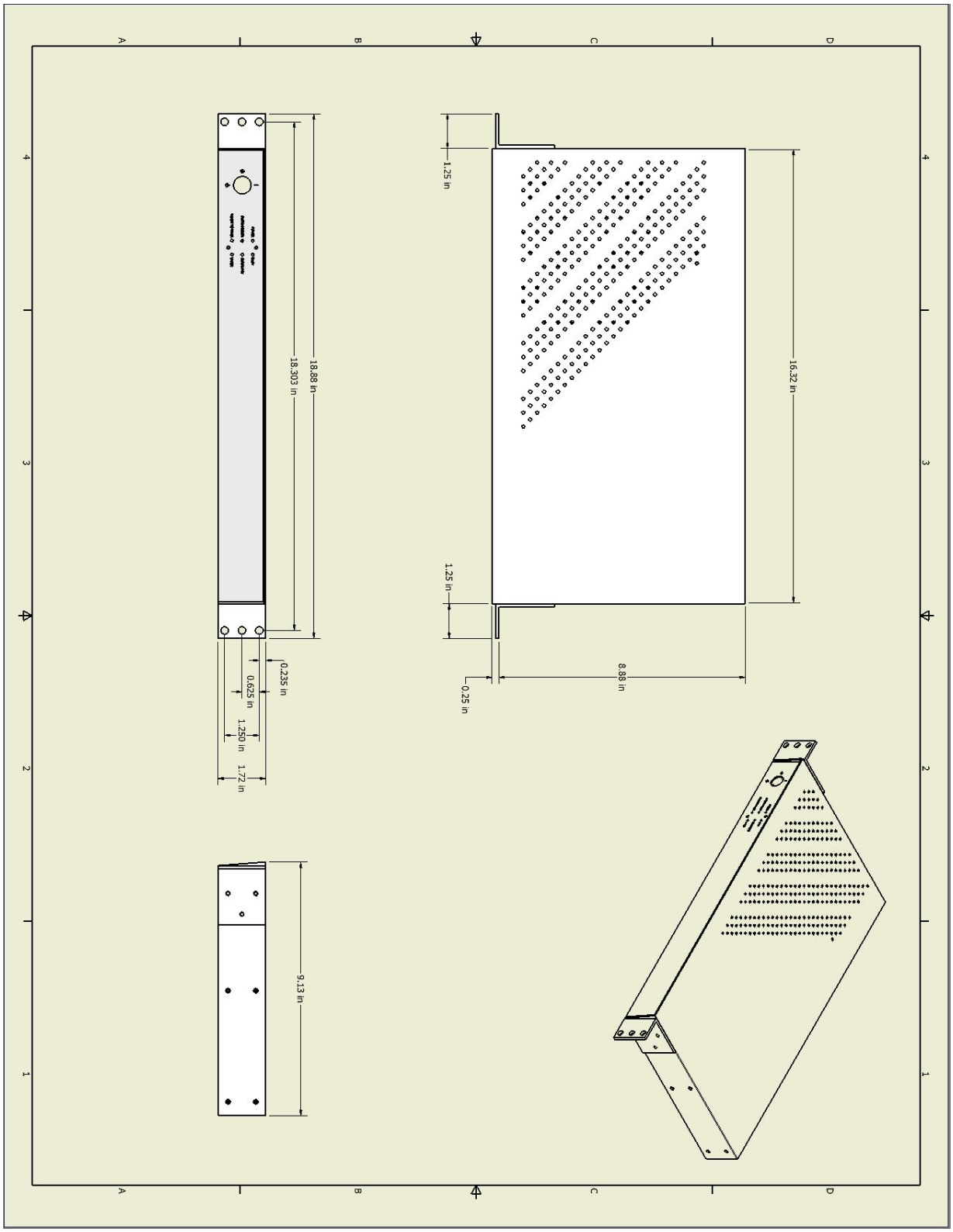


Figure 21 Maestro Controller Physical Dimensions

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.

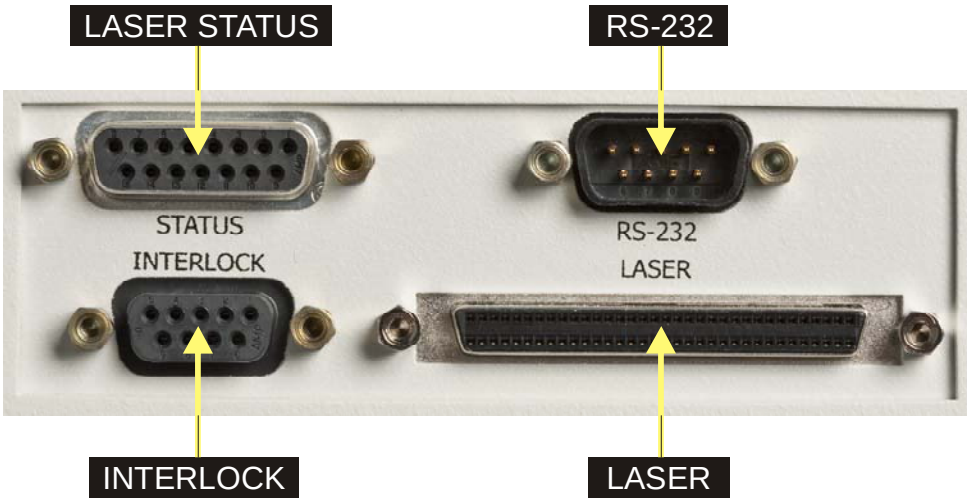


Figure 22 SPI G3 Laser Extension Option connector locations

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.

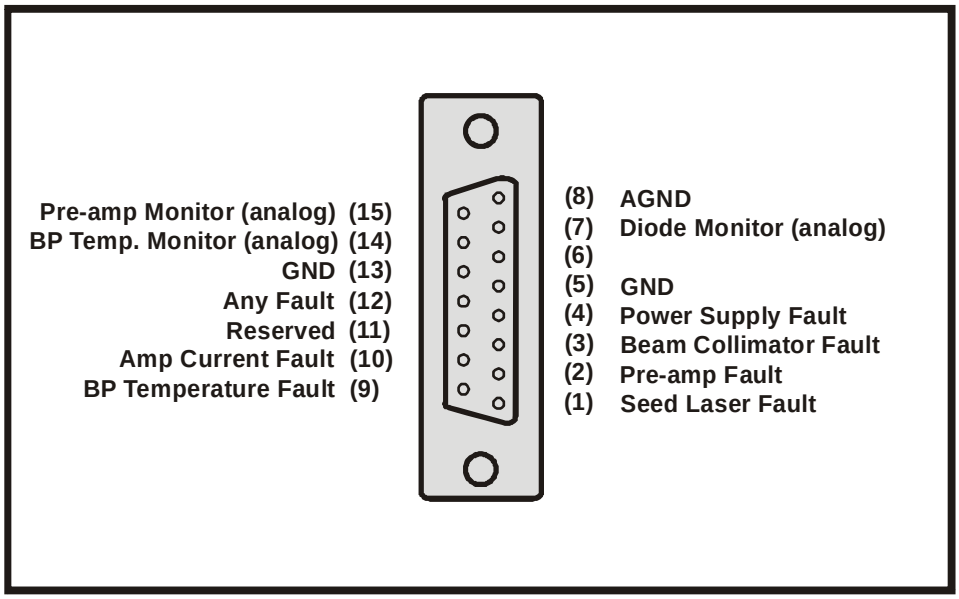


Figure 23 D-Sub female STATUS connector pin-out

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.

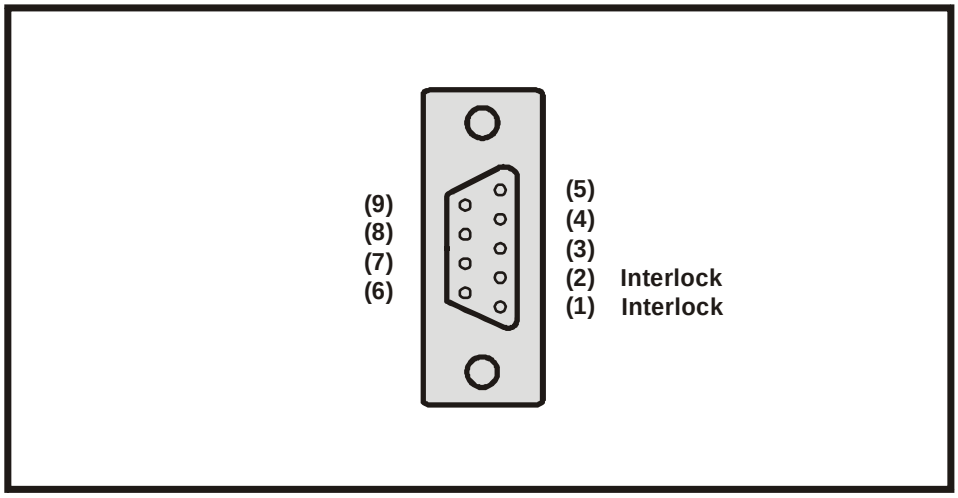


Figure 24 D-Sub female INTERLOCK connector pin-out

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.

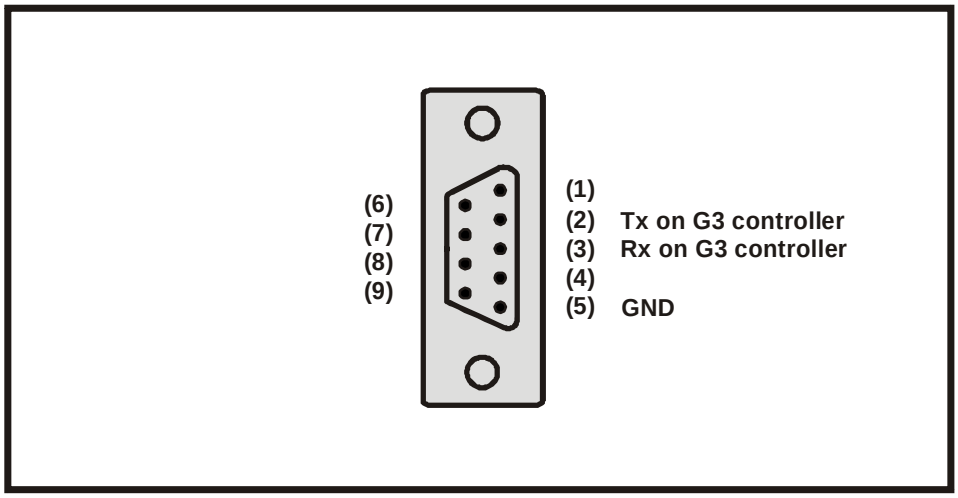


Figure 25 D-Sub male COM PORT connector pin-out

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.

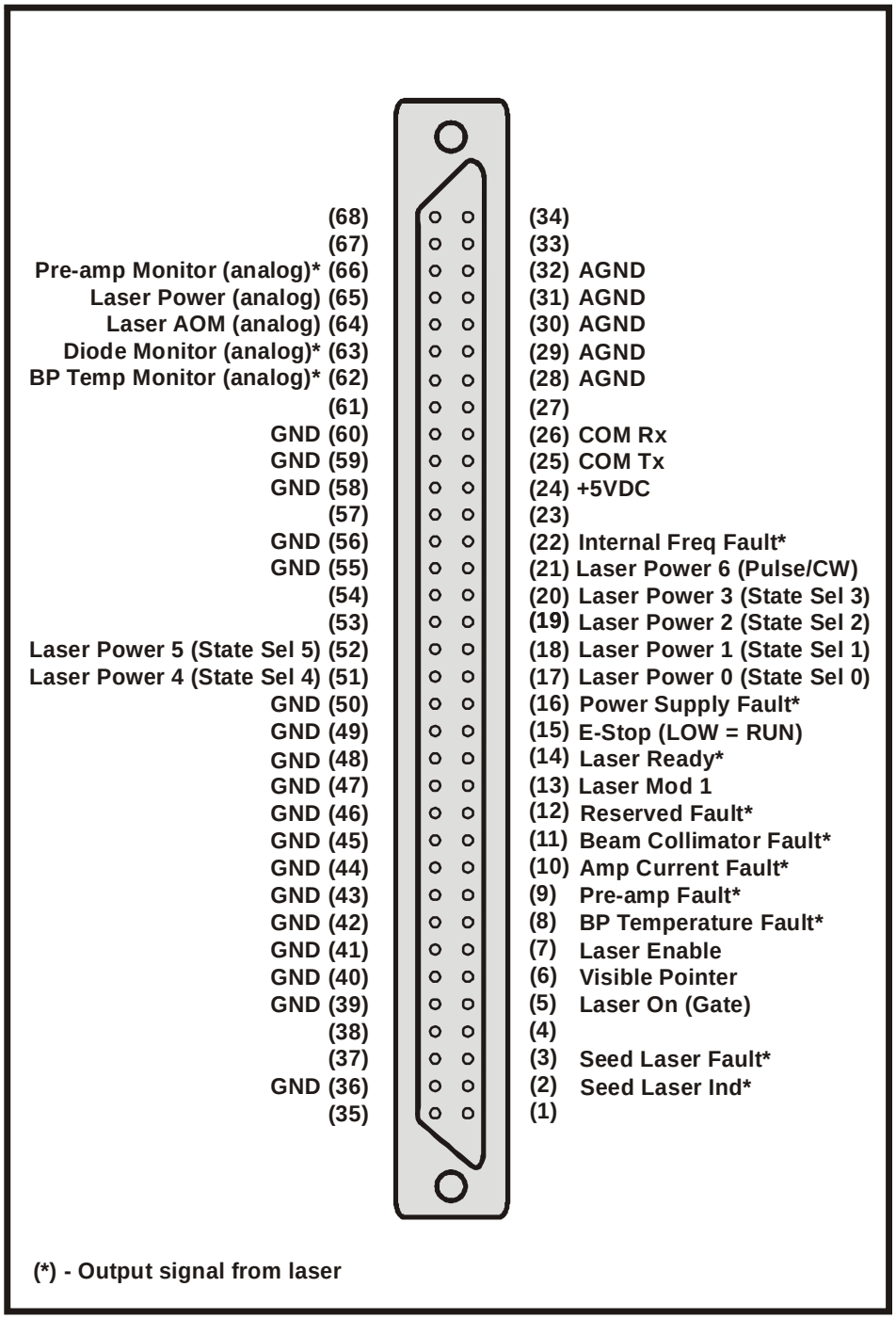


Figure 26 SCSI II female LASER connector pin-out

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.

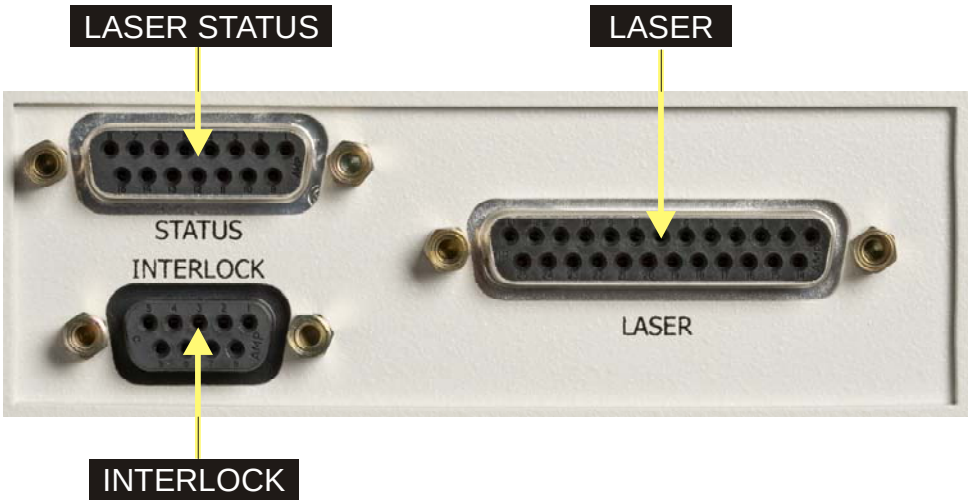


Figure 27 Fiber Laser Extension Option connector locations

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.

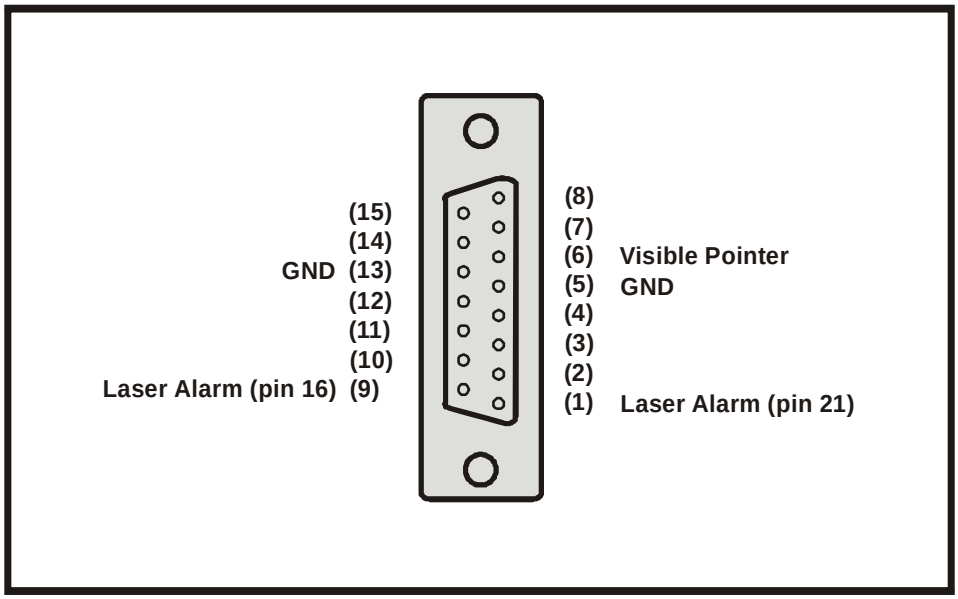


Figure 28 D-Sub female STATUS connector pin-out

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.

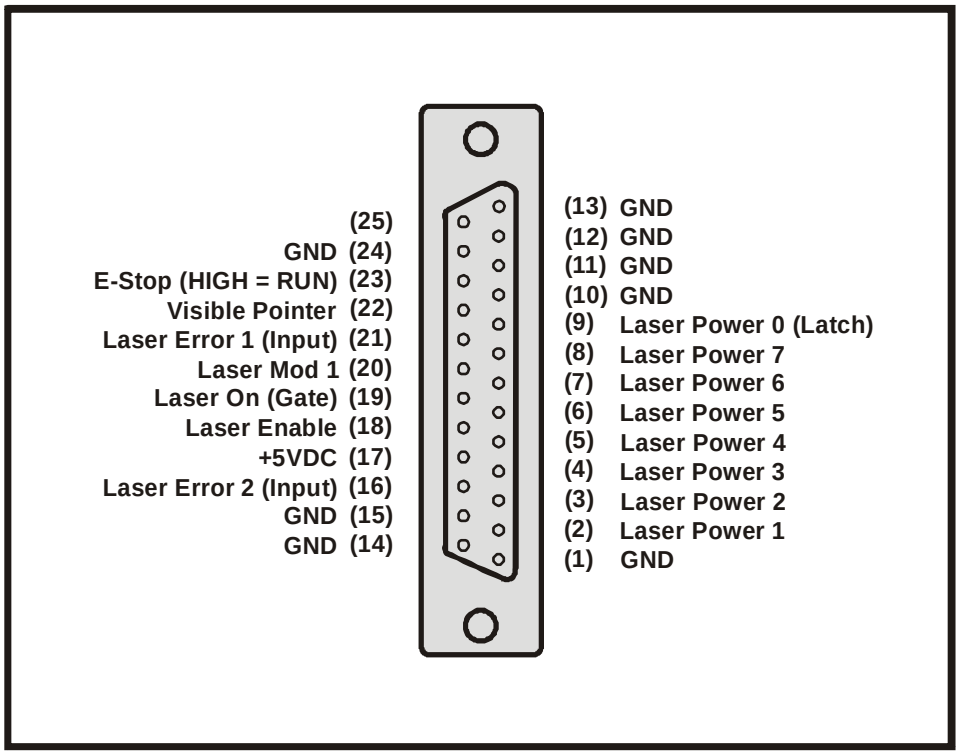


Figure 29 D-Sub female LASER connector pin-out

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.

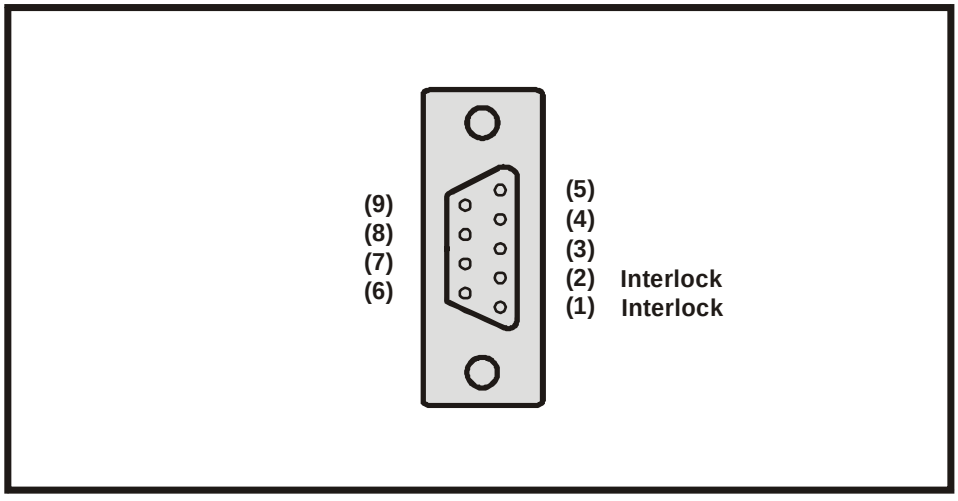


Figure 30 D-Sub female INTERLOCK connector pin-out

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.

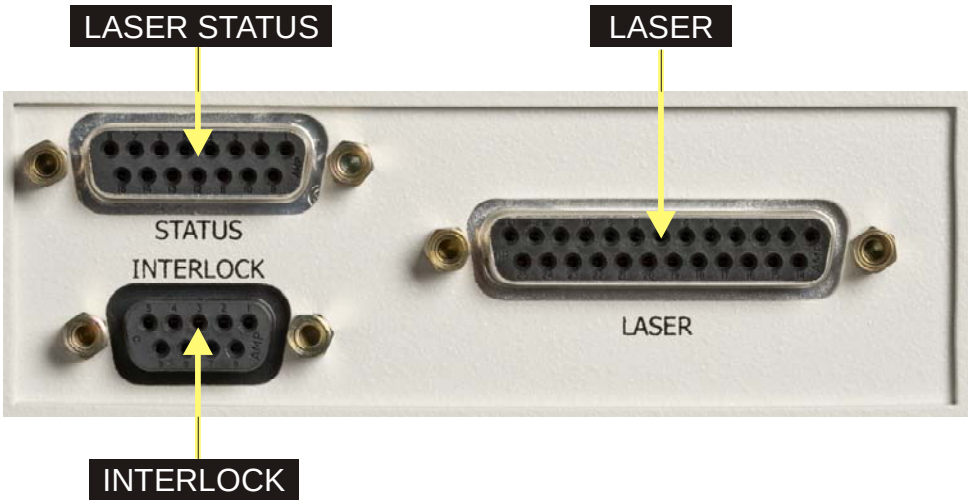


Figure 31 General Purpose Laser Extension Option connector locations

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.

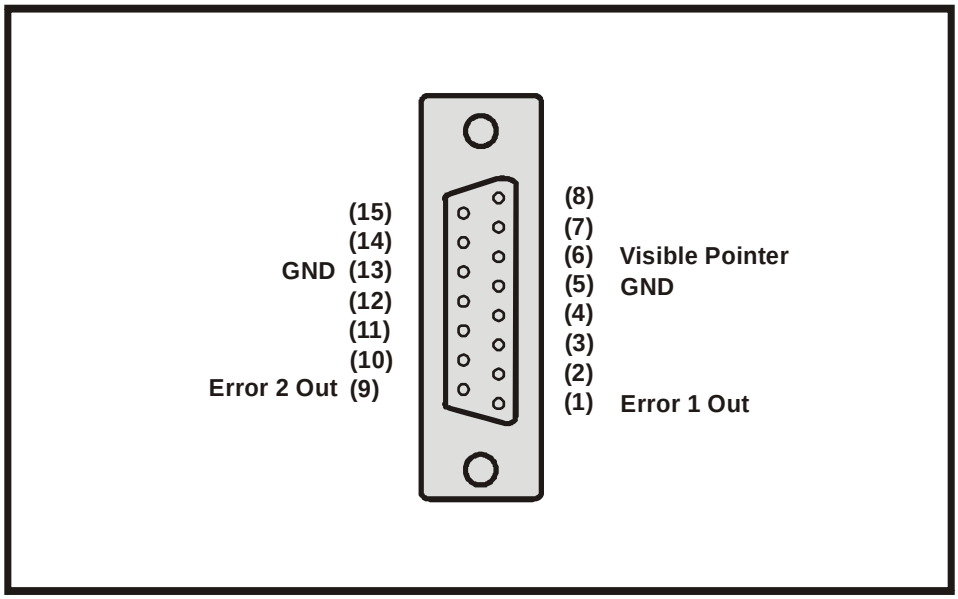


Figure 32 D-Sub female STATUS connector pin-out

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.

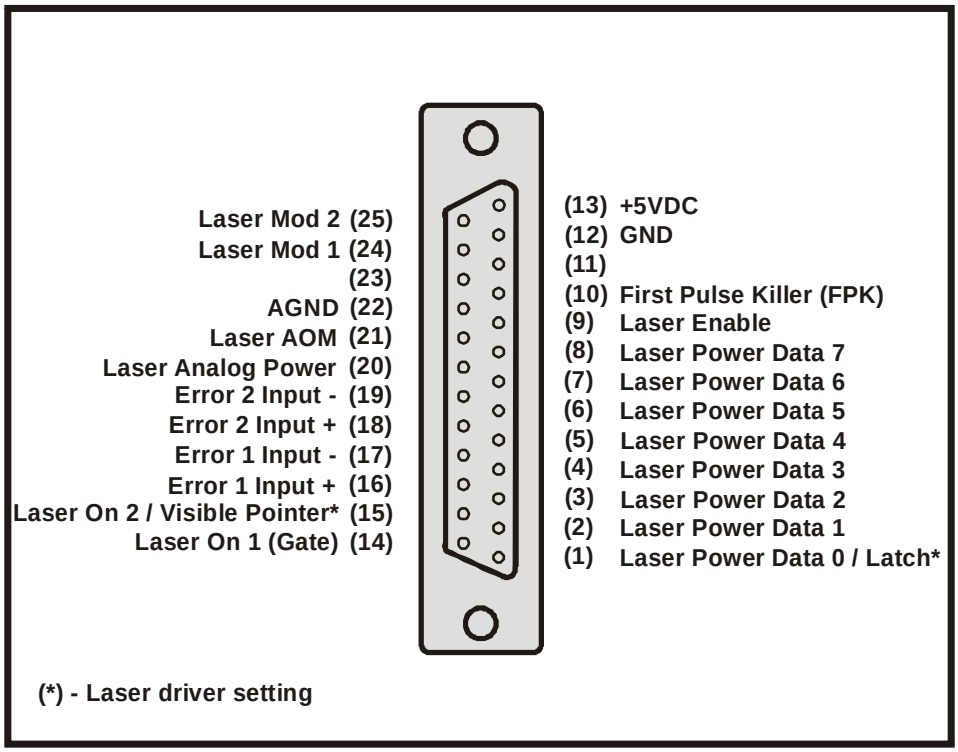


Figure 33 D-Sub female LASER connector pin-out

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.

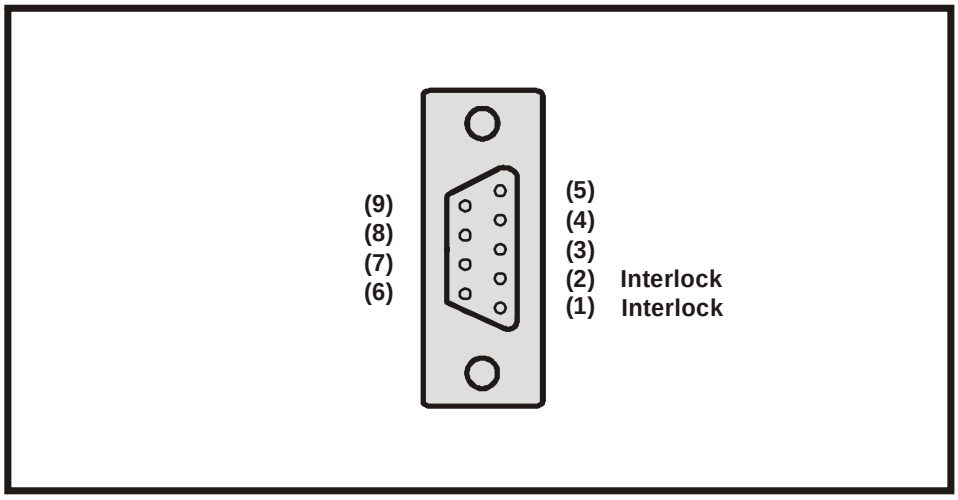


Figure 34 D-Sub female INTERLOCK connector pin-out

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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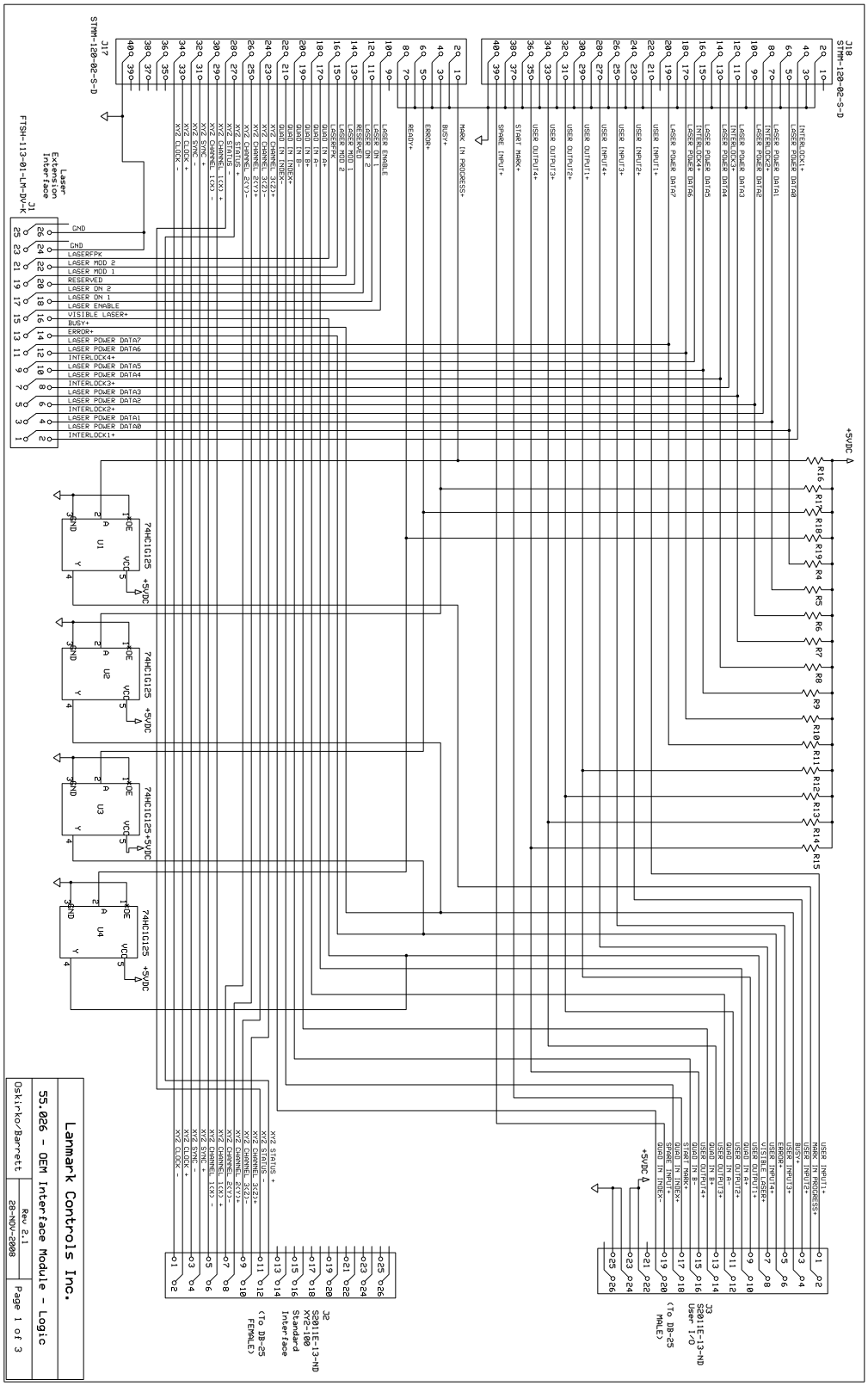
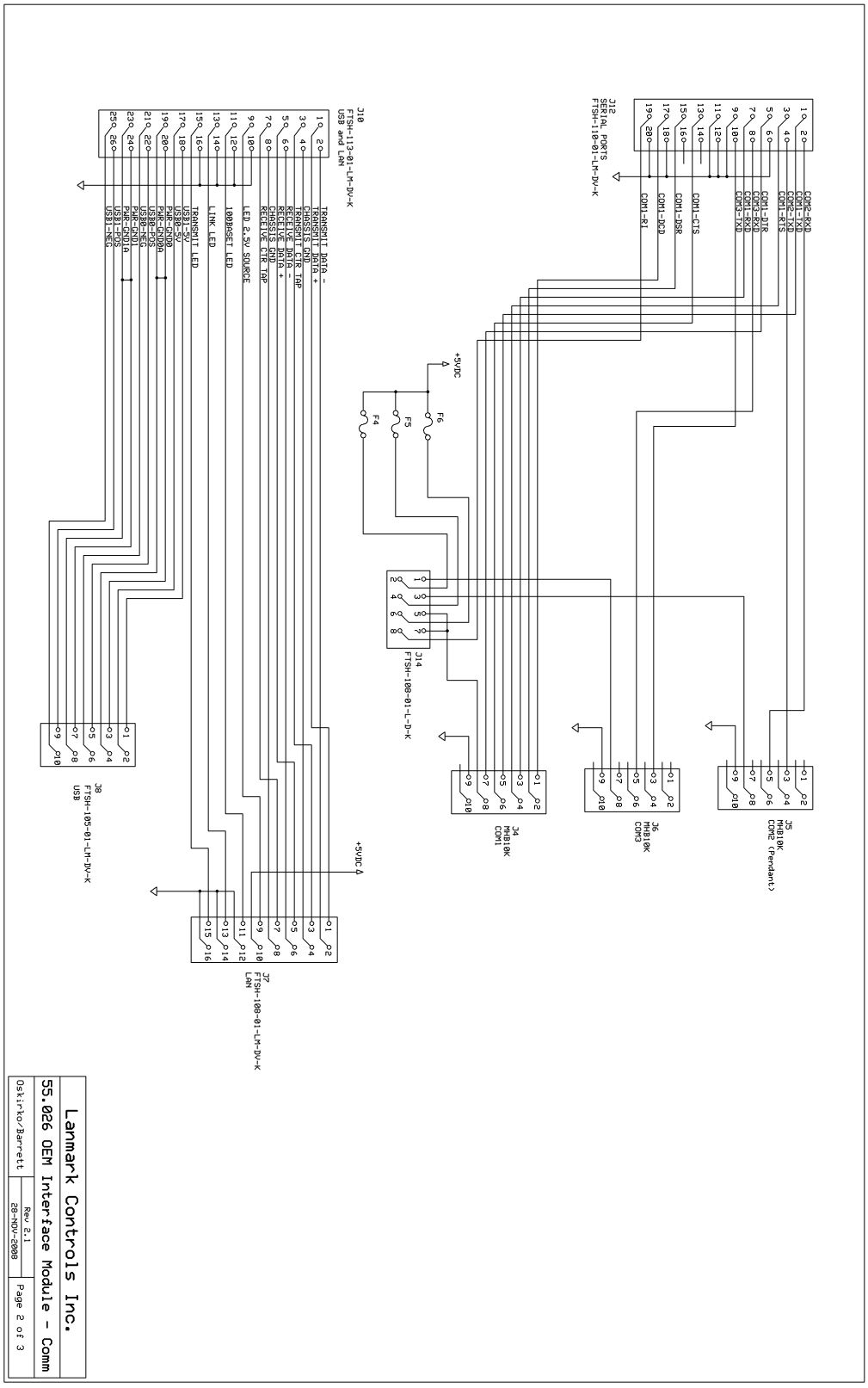
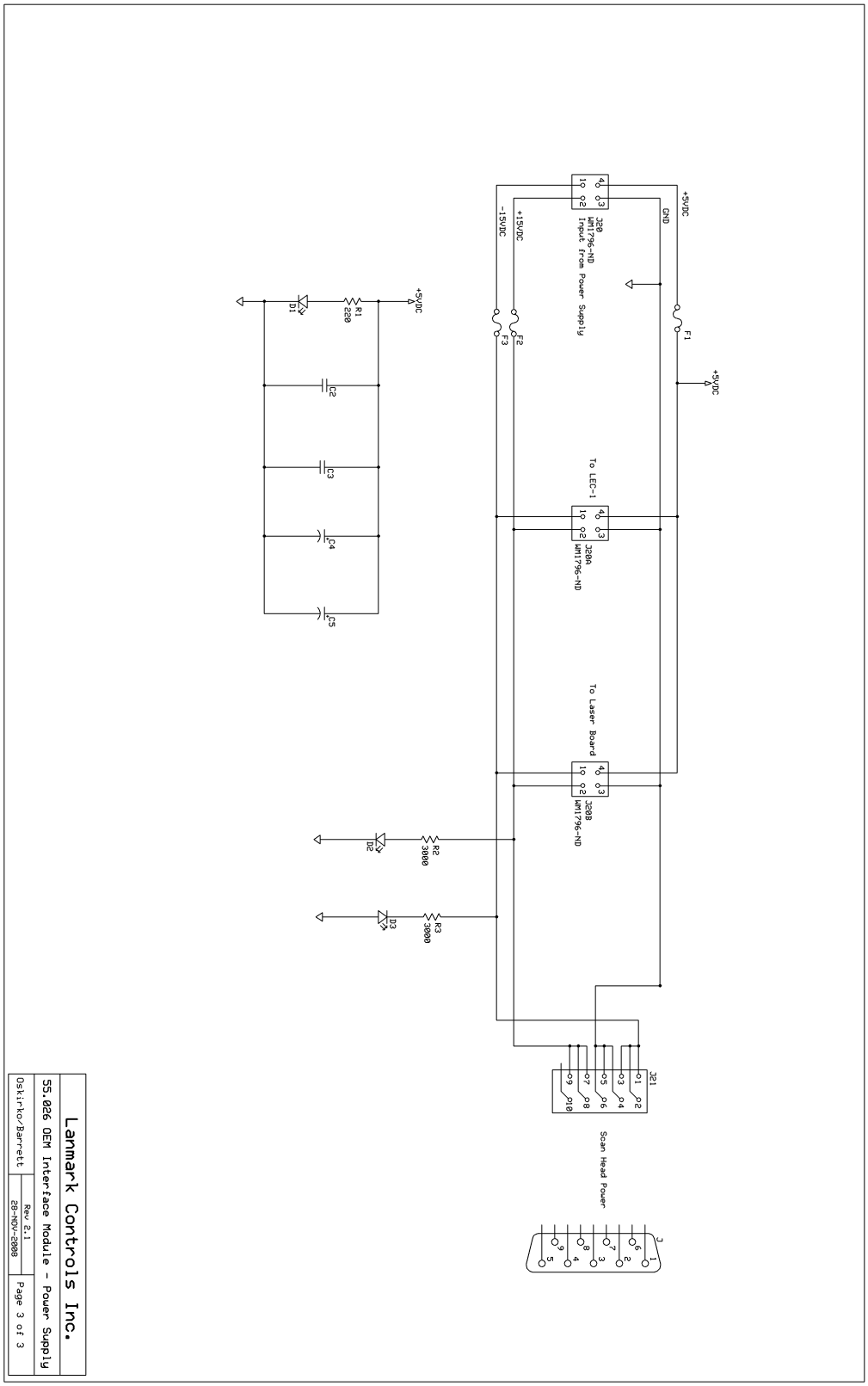
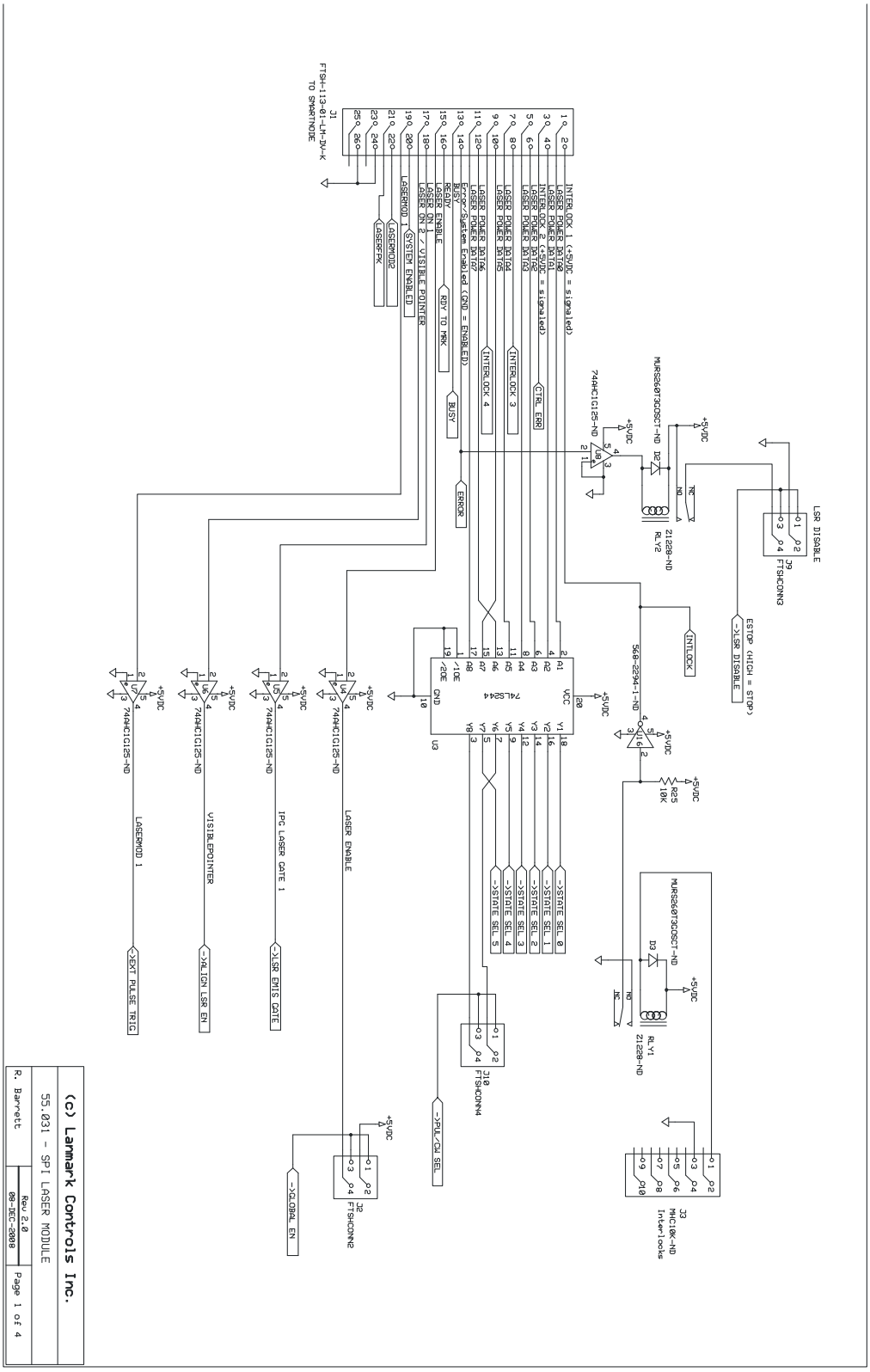
Appendix A – OEM Interface Module Schematics (55.026)

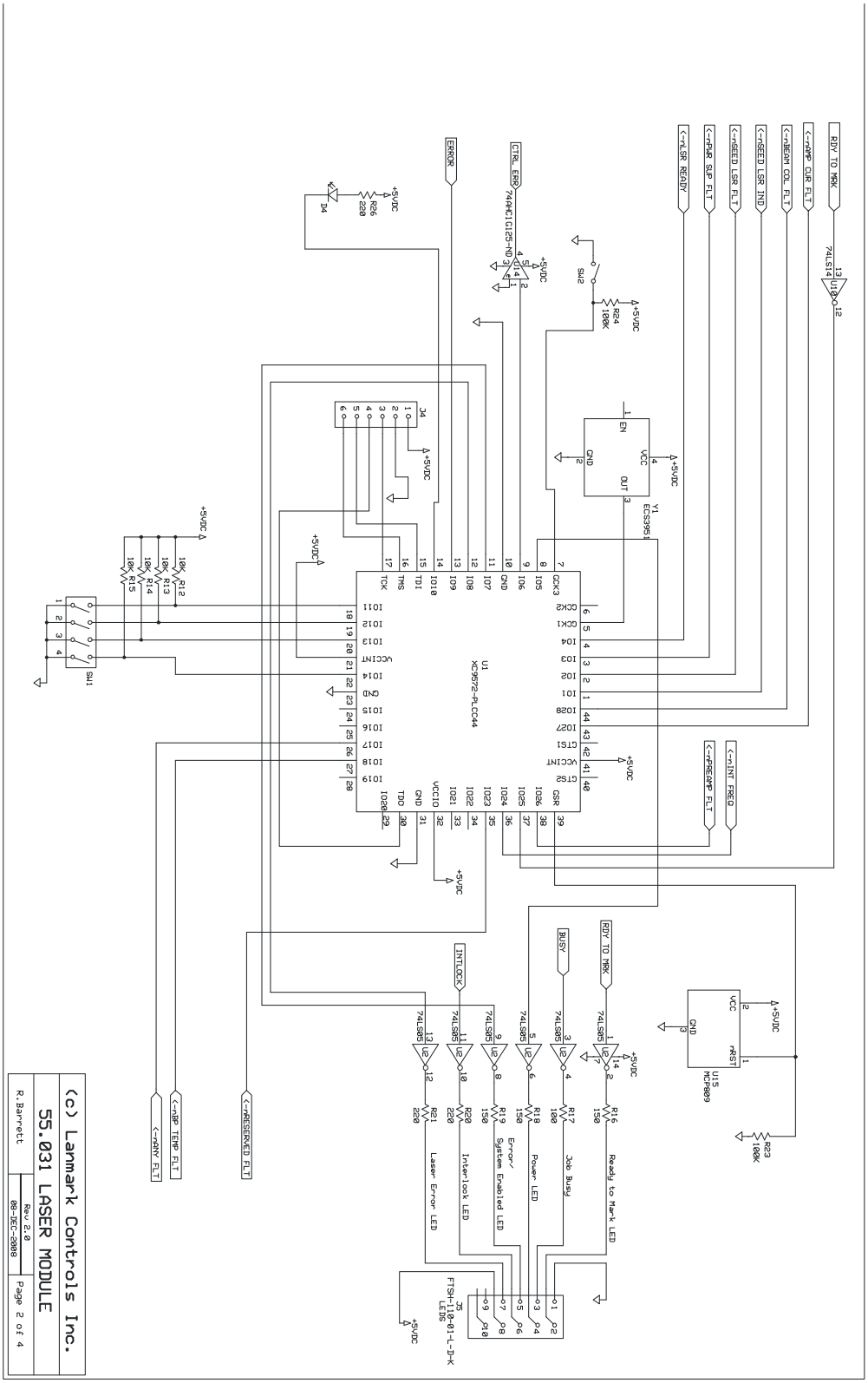


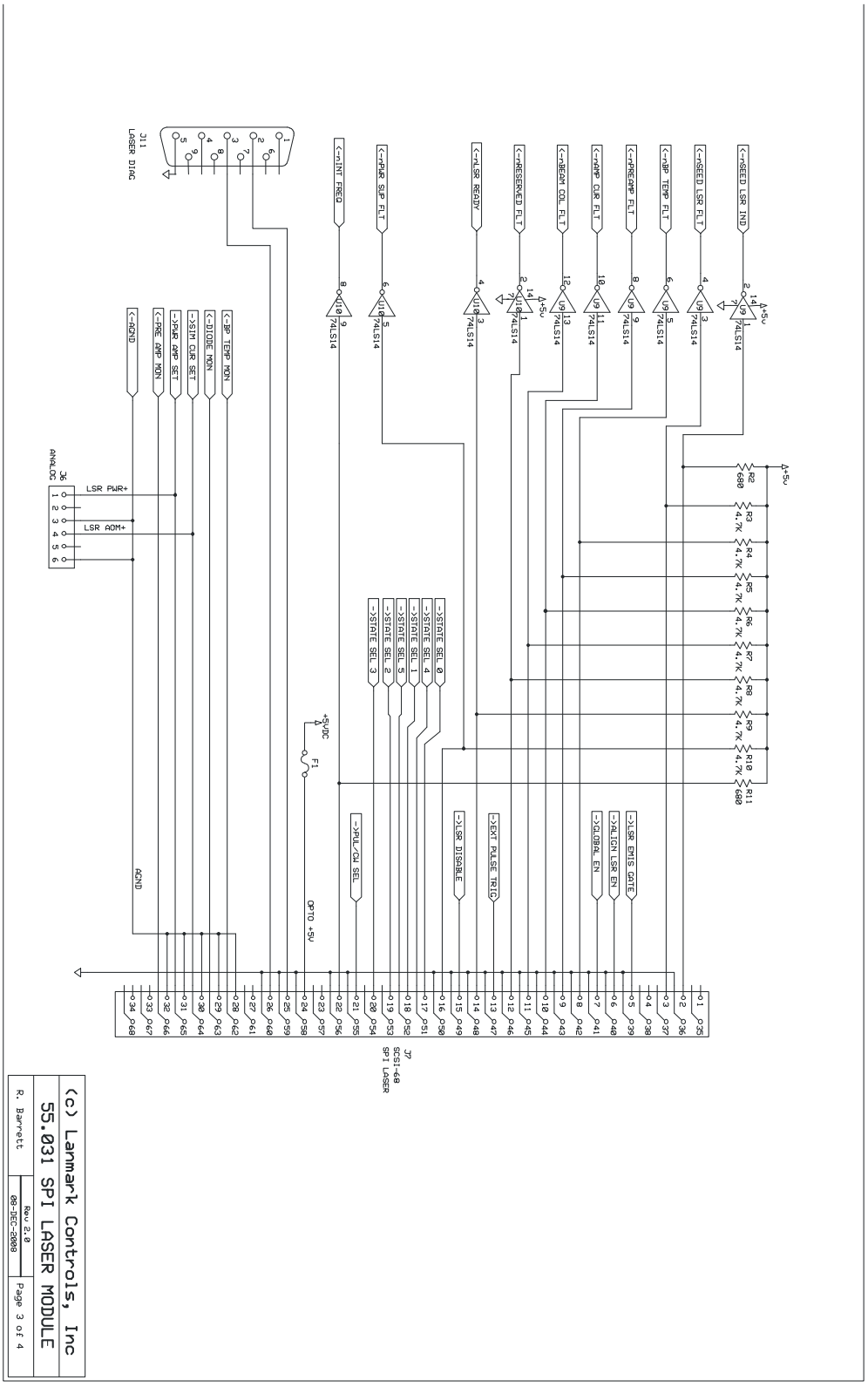

Lanmark Controls Inc.
55.026 OEM Interface Module - Comm
Ostirko/Barrett
Rev 2.1
28-NOV-2008
Page 2 of 3
J10
FTSH-113-01-LM-DV-K
USB and LAN
J12
SERIAL PORTS
FTSH-110-01-LM-DV-K
J14
FTSH-108-01-L-D-K
J4
MHB10K
COM1
J6
MHB10K
COM3
J5
MHB10K
COM2 (Pendant)
J8
FTSH-105-01-LM-DV-K
USB
J7
FTSH-108-01-LM-DV-K
LAN
+5VDC
F4
F5
F6
TRANSMIT DATA -
TRANSMIT DATA +
CHASSIS GND
TRANSMIT CTR TAP
RECEIVE DATA -
RECEIVE DATA +
CHASSIS GND
RECEIVE CTR TAP
LED 2.5V SOURCE
100BSET LED
LINK LED
TRANSMIT LED
USB1-5V
PWR-GND1
PWR-GND2
USB2-POS
USB2-NEG
PWR-GND3
PWR-GND4
USB1-POS
USB1-NEG
COM2-RXD
COM2-TXD
COM2-RTS
COM1-DTR
COM3-RXD
COM1-RXD
COM3-TXD
COM1-CTS
COM1-DSR
COM1-DCD
COM1-RI

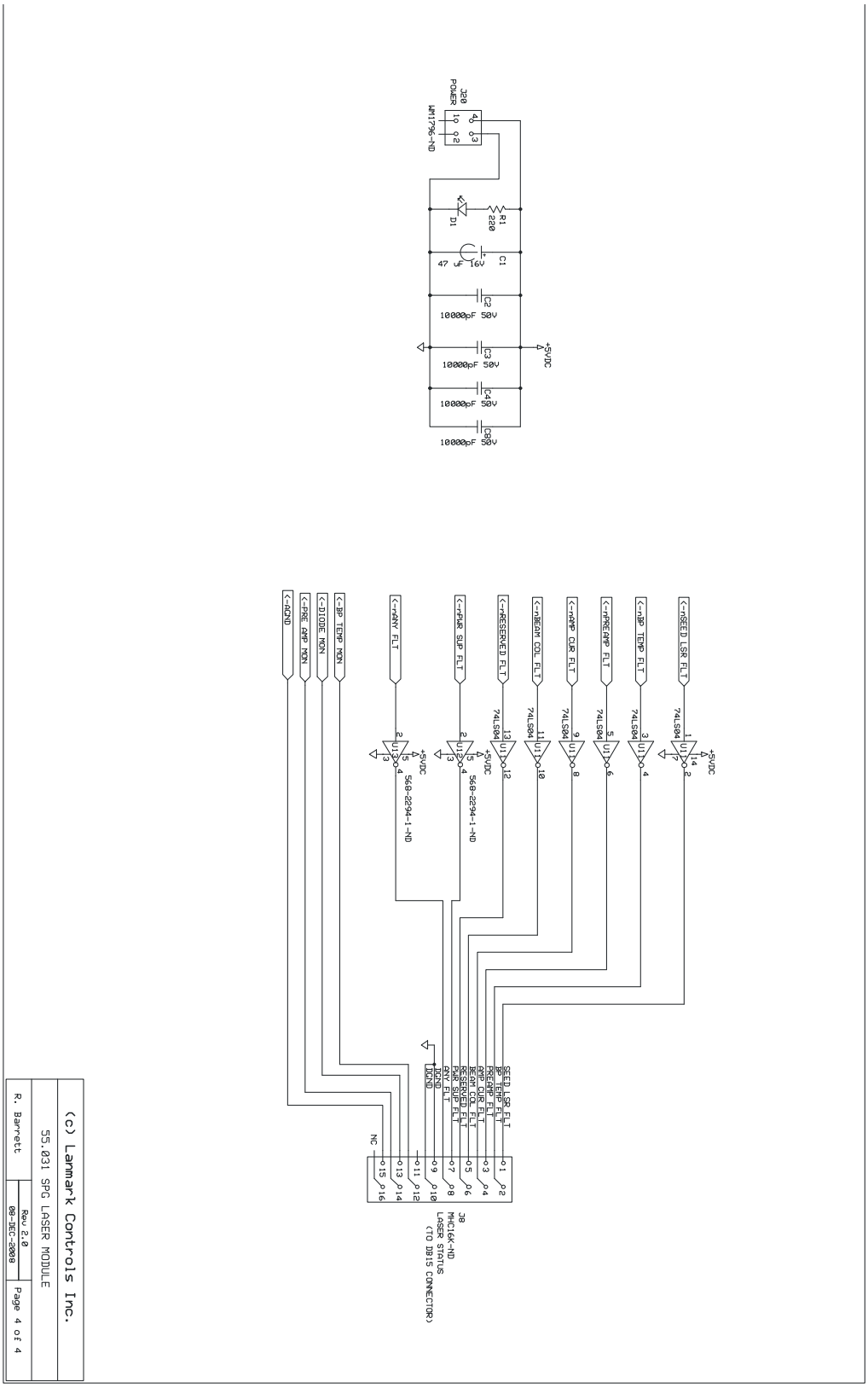

Lanmark Controls Inc.
SS.026 OEM Interface Module - Power Supply
Oskirko/Barrett
Rev 2.1
28-NOV-2008
Page 3 of 3
Input from Power Supply
J20
WM1796-ND
+5VDC
GND
+15VDC
-15VDC
F1
F2
F3
To LEC-1
J20A
WM1796-ND
To Laser Board
J20B
WM1796-ND
D1
R1
220
C2
C3
C4
C5
D2
R2
3000
D3
R3
3000
J21
Scan Head Power
J1

Appendix B – SPI G3 Laser Extension Board Schematics (55.031)

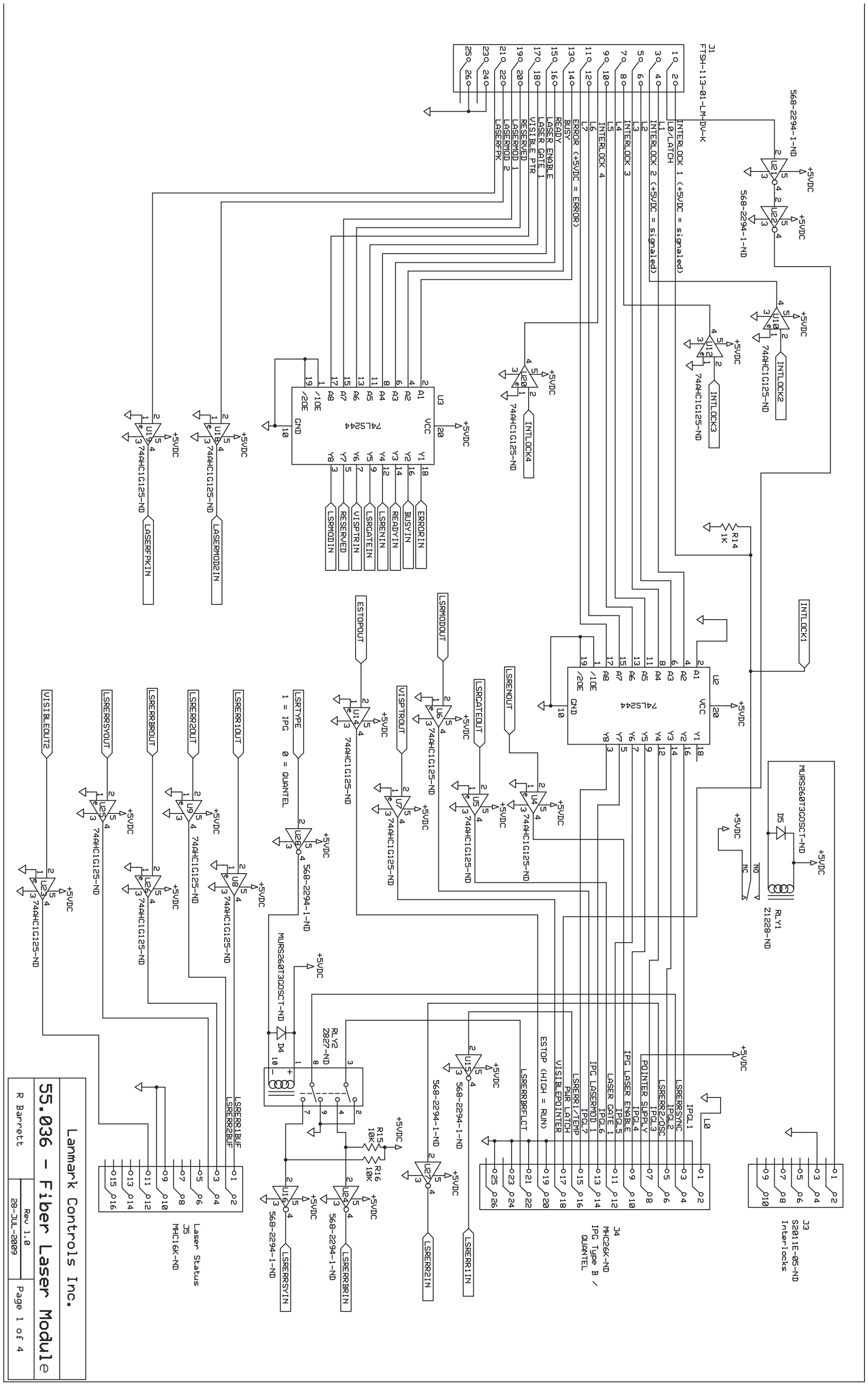


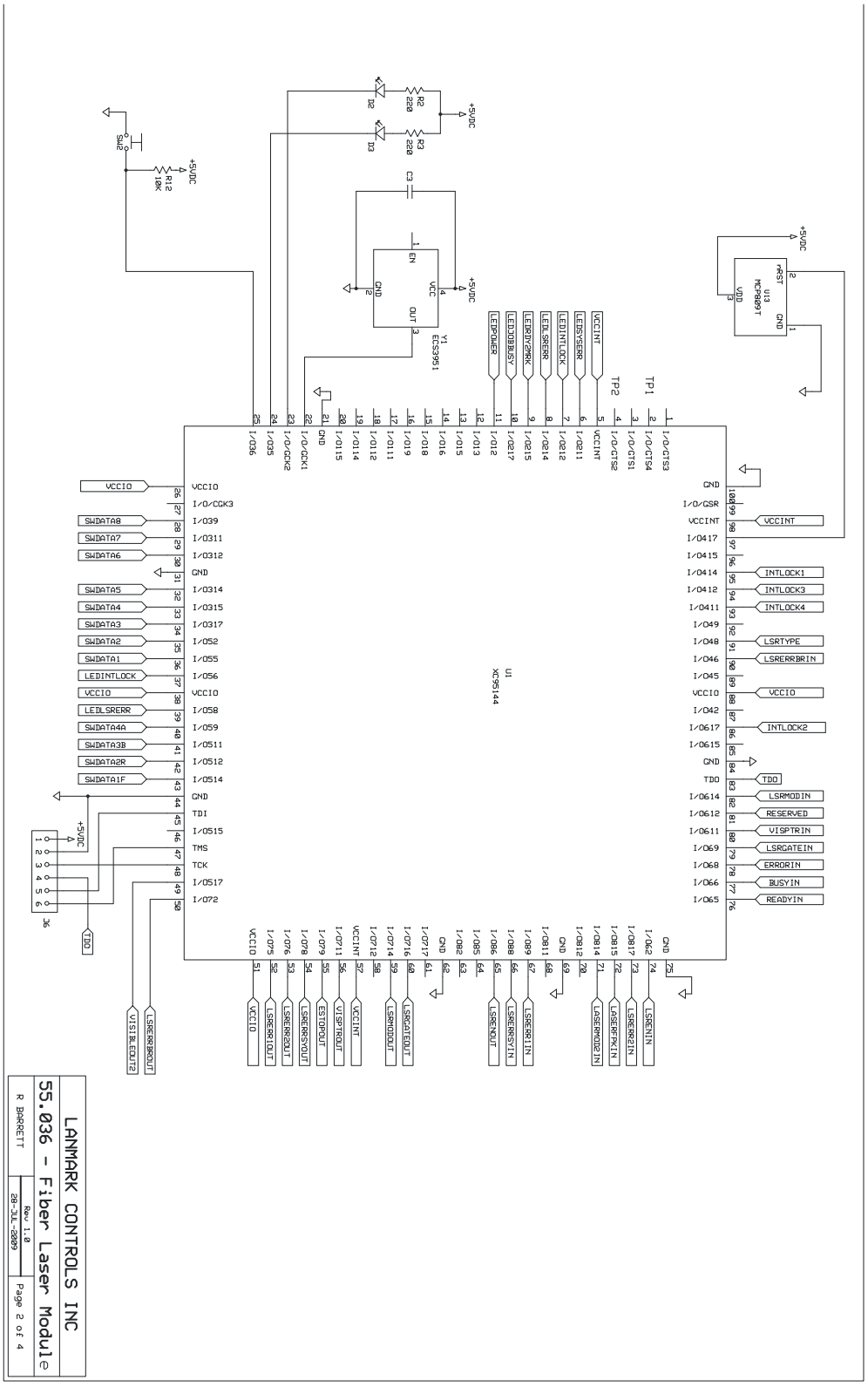

(c) Lanmark Controls Inc.
55.031 LASER MODULE
R.Barratt
Rev 2.0
08-DEC-2008
Page 2 of 4
RDY TO MRK
<-nLSR READY
<-nPWR SUP FLT
<-nSEED LSR FLT
<-nSEED LSR IND
<-nBEAM COL FLT
<-nAMP CUR FLT
<-nPREAMP FLT
<-nINT FREQ
ERROR
CTRL ERR
SW1
SW2
Y1
ECS995
U1
XC9572-PLCC44
U15
MCP809
J4
D4
R23
100K
INTLOCK
BUSY
Error/
System Enabled LED
Power LED
Job Busy
Ready to Mark LED
Interlock LED
Laser Error LED
FTSH-110-01-L-D-K
LEDS
<-nRESERVED FLT
<-nBP TEMP FLT
<-nHV FLT

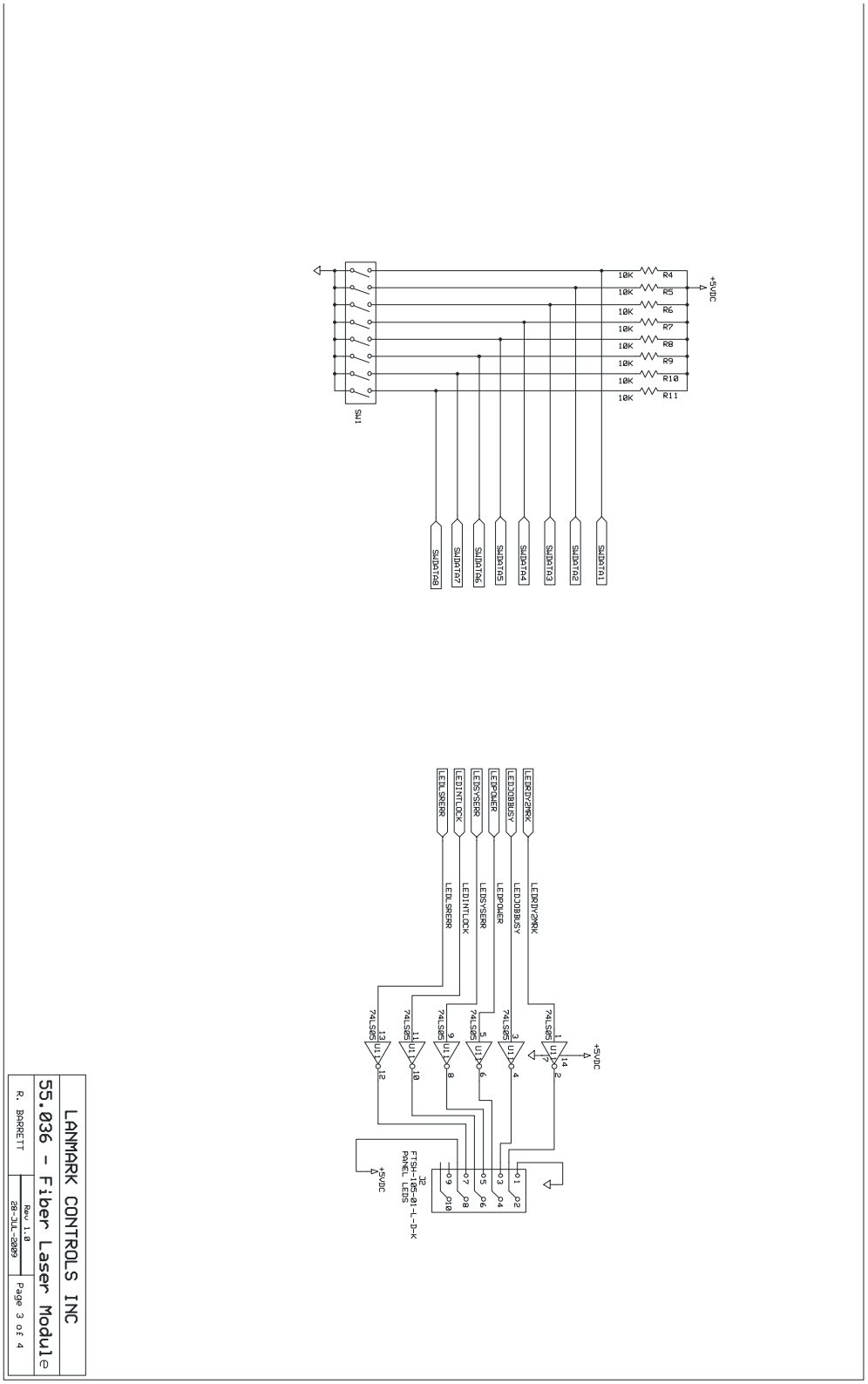

(c) Lanmark Controls, Inc
55.031 SPI LASER MODULE
R. Barrett
08-DEC-2008
Rev 2.0
Page 3 of 4
J7
SCSI-68
SPI LASER
AGND
OPTO +5V
+5VDC
F1
J6
ANALOG
LSR PWR+
LSR AOM+
311
LASER DIAG
<--SEED LSR IND
<--SEED LSR FLT
<--BP TEMP FLT
<--PREAMP FLT
<--AMP CUR FLT
<--BEAM COL FLT
<--RESERVED FLT
<--LSR READY
<--PWR SUP FLT
<--INT FREQ
<--AGND
<--PRE AMP MON
->PWR AMP SET
->STIM CUR SET
<--DIODE MON
<--BP TEMP MON
->PUL/CW SEL
->LSR DISABLE
->EXT PULSE TRIG
->GLOBAL EN
->ALIGN LSR EN
->LSR EMIS GATE
->STATE SEL 0
->STATE SEL 4
->STATE SEL 1
->STATE SEL 5
->STATE SEL 2
->STATE SEL 3
+5V
R2 680
R3 4.7K
R4 4.7K
R5 4.7K
R6 4.7K
R7 4.7K
R8 4.7K
R9 4.7K
R10 4.7K
R11 680

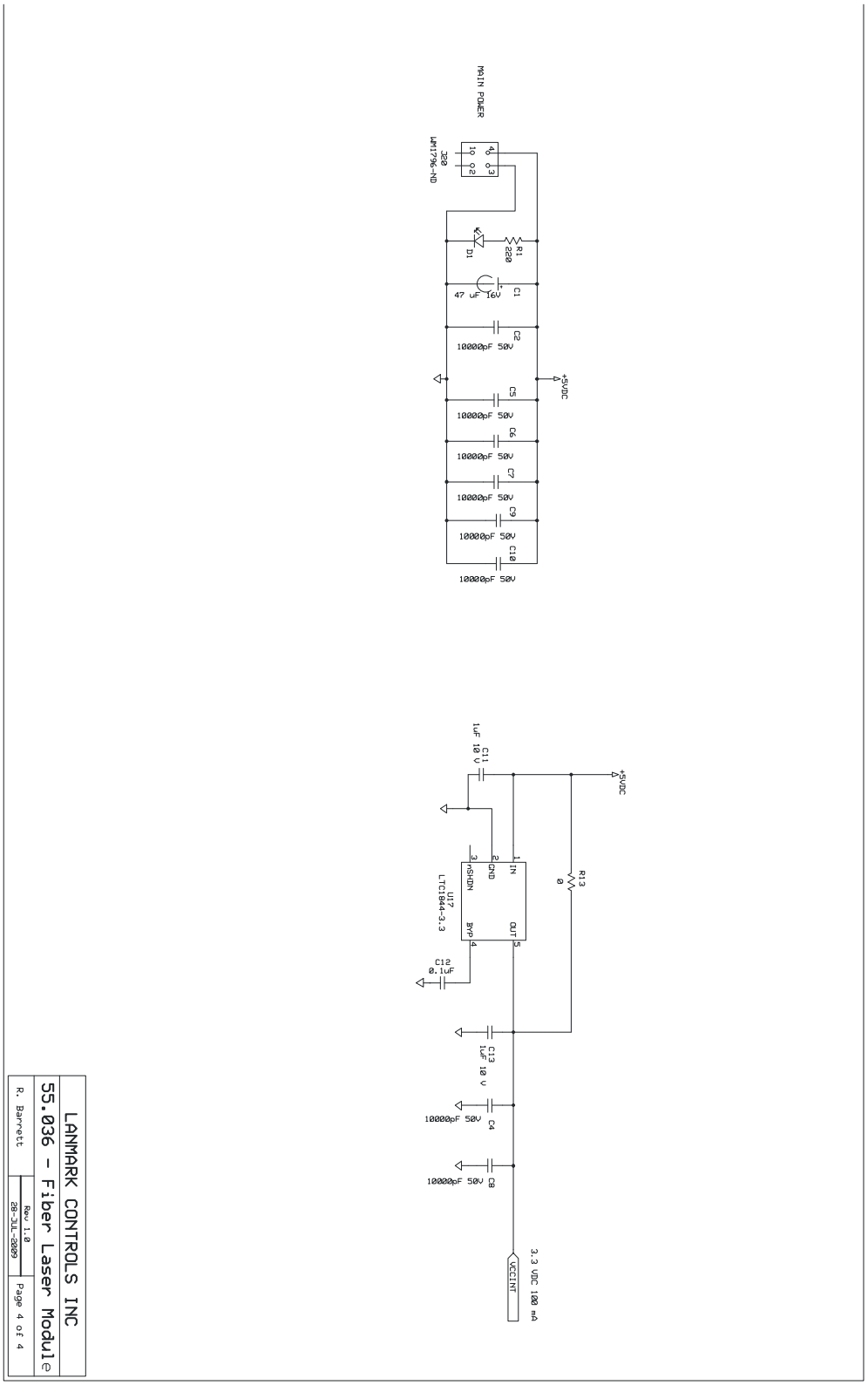

(c) Lanmark Controls Inc.
55.031 SPG LASER MODULE
R. Barrett
Rev 2.0
08-DEC-2008
Page 4 of 4
<-ACND
<-PRE AMP MON
<-DIODE MON
<-BP TEMP MON
<>ANY FLT
<>PWR SUP FLT
<>RESERVED FLT
<>BEAM COL FLT
<>AMP CUR FLT
<>PREAMP FLT
<>BP TEMP FLT
<>SEED LSR FLT
74LS04
+5VDC
560-2294-1-ND
NC
DGND
SEED LSR FLT
BP TEMP FLT
PREAMP FLT
AMP CUR FLT
BEAM COL FLT
RESERVED FLT
PWR SUP FLT
ANY FLT
DGND
3M
MMC16K-ND
LASER STATUS
(TO DB15 CONNECTOR)
POWER
WM1796-ND
D1
R1
220
C1
47 uF 16V
C2
10000pF 50V
C3
10000pF 50V
C4
10000pF 50V
C8
10000pF 50V

Appendix C – Fiber Laser Extension Board Schematics

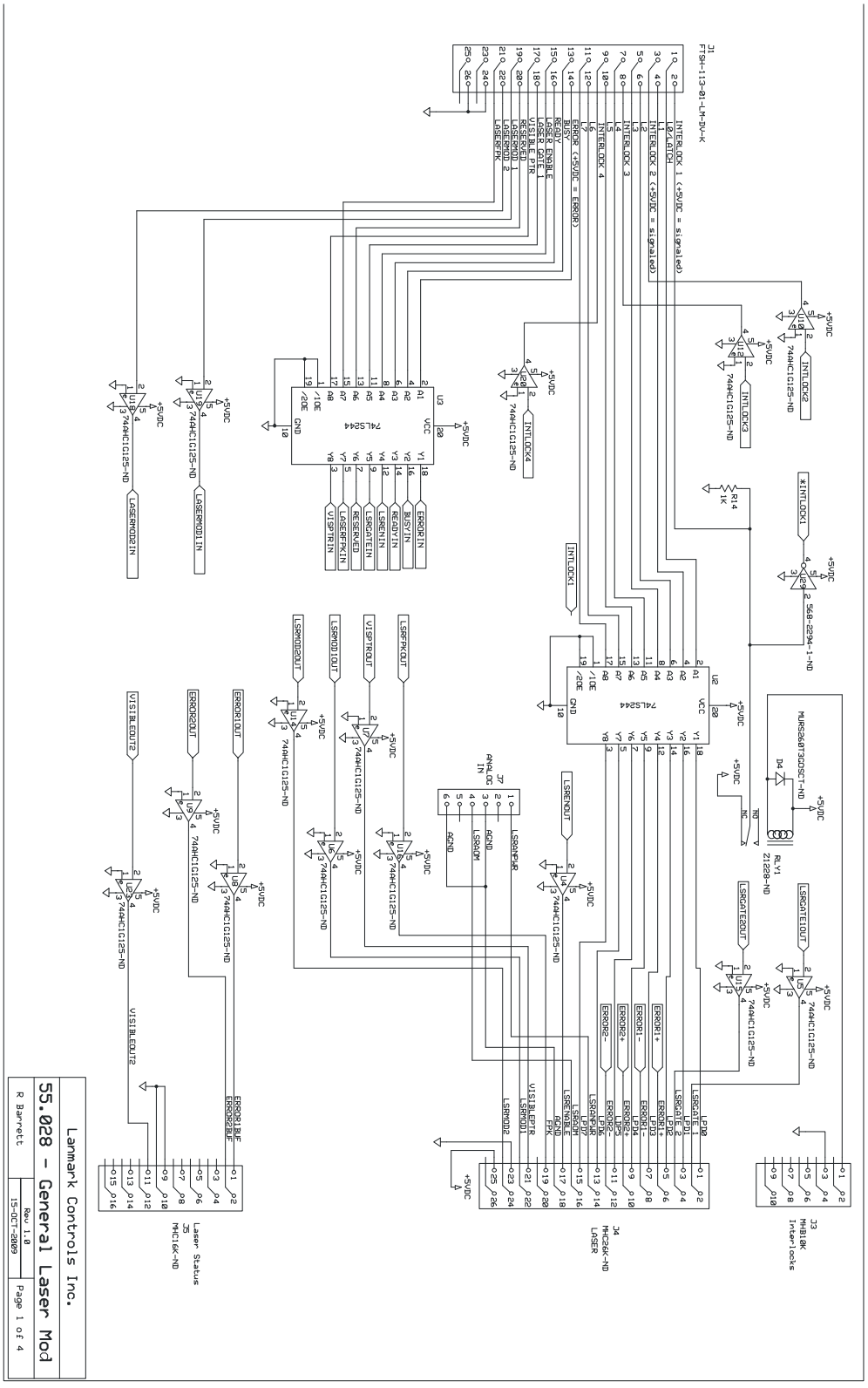


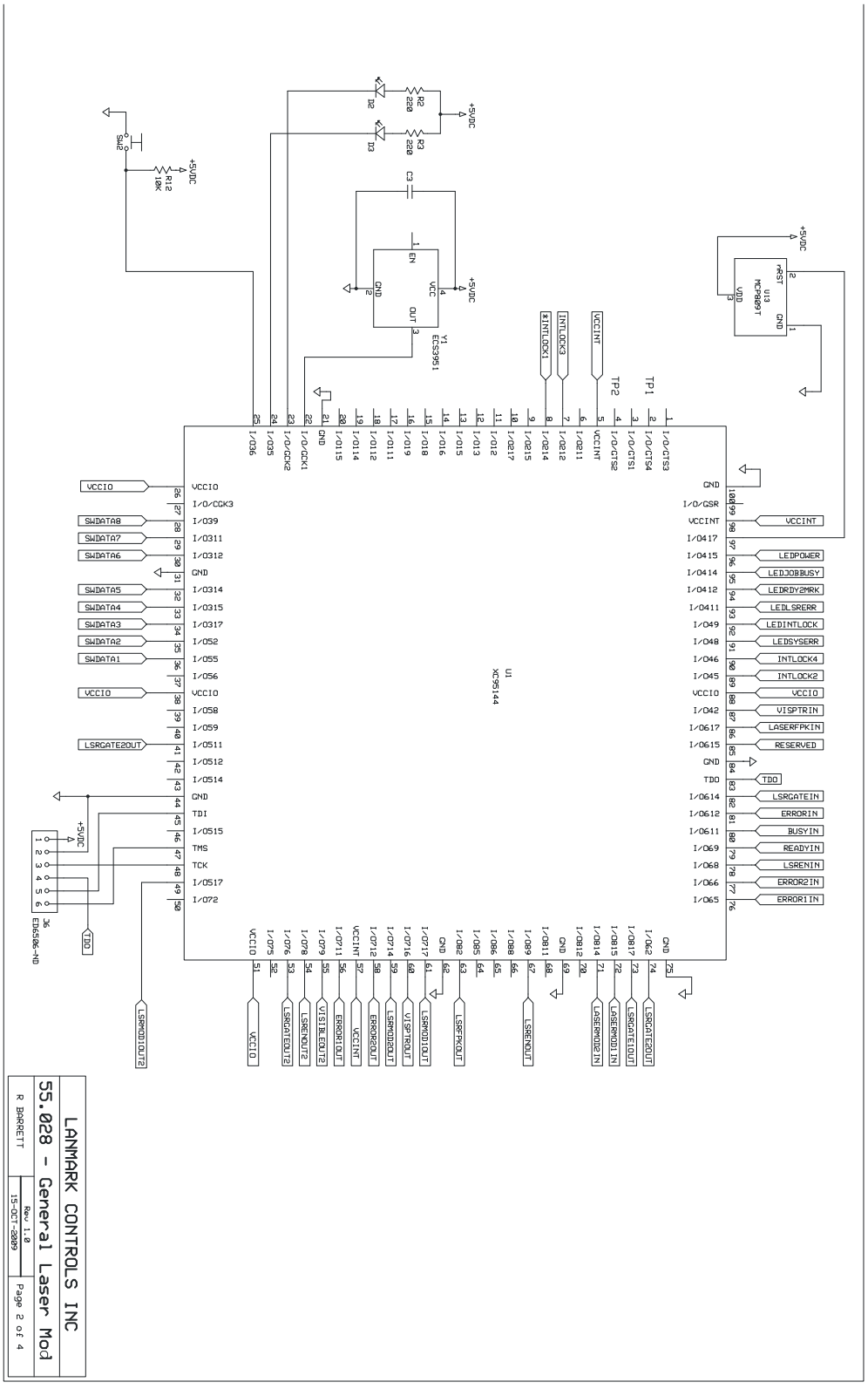

LANMARK CONTROLS INC
55.036 - Fiber Laser Module
R BARRETT
28-JUL-2009
Rev 1.0
Page 2 of 4
U1
XC95144
TP1
TP2
U13
MCP809T
Y1
ECS3951
SW2
R2
220
R3
220
R12
10K
C3
D2
D3
+5VDC
GND
VCC
RST
VDD
EN
OUT
TDO
TDI
TMS
TCK
SWDATA8
SWDATA7
SWDATA6
SWDATA5
SWDATA4
SWDATA3
SWDATA2
SWDATA1
SWDATA4A
SWDATA3B
SWDATA2R
SWDATA1F
LEDINTLOCK
LEDLSRERR
INTLOCK1
INTLOCK3
INTLOCK4
INTLOCK2
LSRTYPE
LSRERRBRIN
VCCIO
VCCINT
RESERVED
VISPTRIN
LSRGATEIN
ERRORIN
BUSYIN
READYIN
LSRMODIN
LSRENIN
LSRERR2IN
LASERPRDIN
LASERMODIN
LSRENOUT
LSRERRSYIN
LSRERRIIN
LSRGATEOUT
LSRMODOUT
VISPTROUT
ESTOPOUT
LSRERRSYOUT
LSRERR2OUT
LSRERRIOUT
VISIBLEOUT2
LSRERRBROUT
LEDPOWER
LEDLOOPBUSY
LEDRDY2MRK
LEDLSRERR
LEDINTLOCK
LEDSYSERR
VCCINT
I/O/GTS3
I/O/GTS4
I/O/GTS1
I/O/GTS2
I/O/CCK1
I/O/CCK2
I/O/CCK3
I/O/GSR
I/O/TDI
I/O/TMS
I/O/TCK
I/O/TDO

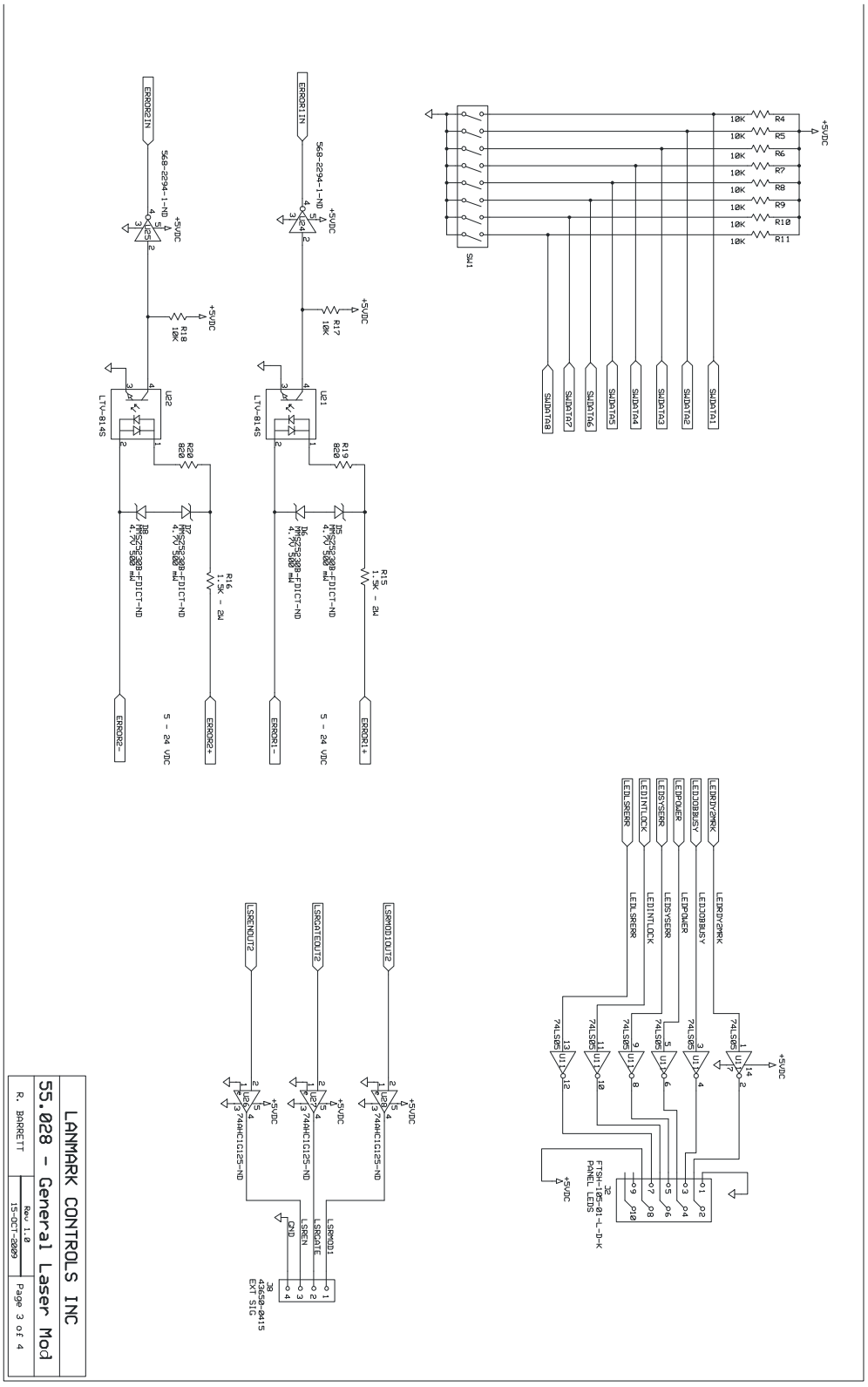

LANMARK CONTROLS INC
55.036 - Fiber Laser Module
R. BARRETT
Rev 1.0
28-JUL-2009
Page 3 of 4
SW1
10K
R4
R5
R6
R7
R8
R9
R10
R11
+5VDC
SWDATA8
SWDATA7
SWDATA6
SWDATA5
SWDATA4
SWDATA3
SWDATA2
SWDATA1
LEDLSRERR
LEDINTLOCK
LEDSYSERR
LEDPOWER
LEDJOBBUSY
LEDRDY2MRK
74LS05
U1
J2
FTSH-105-01-L-D-K
PANEL LEDS

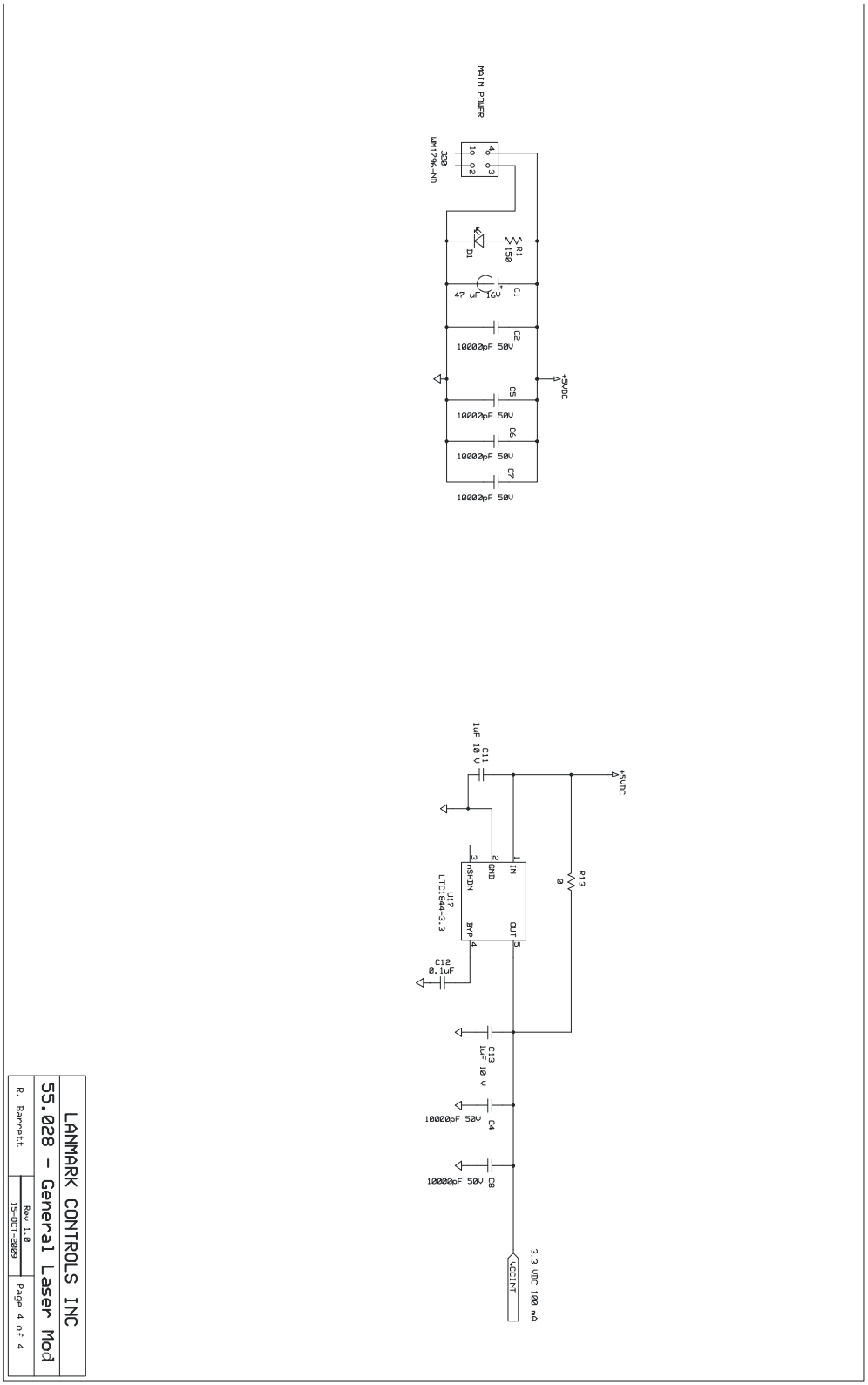

MAIN POWER
320
WM1796-ND
D1
R1
220
47 uF 16V
C1
C2
10000pF 50V
+5VDC
C5
10000pF 50V
C6
10000pF 50V
C7
10000pF 50V
C9
10000pF 50V
C10
10000pF 50V
1uF 10 V
C11
+5VDC
U17
LTC1844-3.3
SHDN
GND
IN
BYP
OUT
R13
0
C12
0.1uF
C13
1uF 10 V
10000pF 50V
C4
10000pF 50V
C8
3.3 VDC 100 mA
VCCINT
LANMARK CONTROLS INC
55.036 - Fiber Laser Module
R. Barrett
Rev 1.0
28-JUL-2009
Page 4 of 4

Appendix D – General Purpose Laser Extension Board Schematics




LANMARK CONTROLS INC
55.028 - General Laser Mod
R BARRETT
15-OCT-2009
Rev 1.0
Page 2 of 4
U1
XC95144
U13
MCP809T
Y1
ECS3951
TP1
TP2
+5VDC
TDO
TDI
TMS
TCK
VCCIO
VCCINT
GND
INTLOCK1
INTLOCK3
INTLOCK2
INTLOCK4
LEDPOWER
LEDJOBBUSY
LEDRDY2MRK
LEDLSRERR
LEDINTLOCK
LEDSYSERR
VISPTRIN
LASERFPKIN
RESERVED
ERROR1IN
ERROR2IN
LSRENIN
READYIN
BUSYIN
ERRORIN
LSRGATEIN
SWDATA1
SWDATA2
SWDATA3
SWDATA4
SWDATA5
SWDATA6
SWDATA7
SWDATA8
LSRGATE2OUT
LSRMOD1OUT2
LSRGATE1OUT2
LSRENOUT2
VISTRIGOUT2
ERROR1OUT
ERROR2OUT
VISTROUT
LSRMOD2OUT
LSRMOD1OUT
LSRFPKOUT
LSRENOUT
LASERMOD2IN
LASERMOD1IN
LSRGATE1OUT
LSRGATE2OUT
R2
220
R3
220
R12
10K
C3
D2
D3
SW2
EN
OUT
VCC
GND
RST
VDD


LANMARK CONTROLS INC
55.028 - General Laser Mod
R. BARRETT
Rev 1.0
15-OCT-2009
Page 3 of 4
SW1
SWDATA1
SWDATA2
SWDATA3
SWDATA4
SWDATA5
SWDATA6
SWDATA7
SWDATA8
R4
R5
R6
R7
R8
R9
R10
R11
10K
+5VDC
ERROR1IN
ERROR2IN
U21
U22
LTV-814S
R17
R18
R19
R20
820
R15
1.5K - 2W
R16
5 - 24 VDC
ERROR1-
ERROR1+
ERROR2-
ERROR2+
LEDRDY2PRK
LEDDOORBUSY
LEDPOWER
LEDSYSERR
LEDINTLOCK
LEDLSRERR
74LS05
FTSH-105-01-L-D-K
PANEL LEDS
LSRMODOUT2
LSRGATEOUT2
LSRENOUT2
74AHC1G125-ND
LSRMOD1
LSRGATE
LSREN
GND
36
43650-0415
EXT SIG


MAIN POWER
320
WM1796-ND
1o
2
3
D1
R1
150
47 uF
16V
C1
C2
10000pF 50V
+5VDC
C5
10000pF 50V
C6
10000pF 50V
C7
10000pF 50V
C11
1uF 10 V
+5VDC
U17
LTC1844-3.3
SHDN
GND
IN
BYP
OUT
R13
0
C12
0.1uF
C13
1uF 10 V
10000pF 50V
C4
10000pF 50V
C8
3.3 VDC 100 mA
VCCINT
LANMARK CONTROLS INC
55.028 - General Laser Mod
R. Barrett
Rev 1.0
15-OCT-2009
Page 4 of 4