



## eI/O USER MANUAL



PART# eI/O

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# Before You Get Started

## WHAT'S INCLUDED

All eI/O modules are shipped with the following items. If any of these items is missing or damaged please contact Sealevel for a replacement.

- eI/O Data Acquisition Module
- Sealevel Software CD



Do not connect the I/O module to the host until the software is installed.

## ADVISORY CONVENTIONS



**Warning** - The highest level of importance used to stress a condition where damage could result to the product or the user could suffer serious injury.



**Important** - The middle level of importance used to highlight information that might not seem obvious or a situation that could cause the product to fail.



**Note** - The lowest level of importance used to provide background information, additional tips, or other non-critical facts that will not affect the use of the product.

# Introduction

Sealevel el/O™ modules offer powerful data acquisition solutions that are perfect for a wide range of applications and environments with easy interfacing to computers, controllers, and PLCs. el/O modules are available in various digital and analog I/O configurations. Each el/O model is designed for maximum flexibility and easy field wiring.

For easy software integration, application programs or 3<sup>rd</sup> party software can use the Sealevel SeaMAX™ library or industry standard Modbus TCP (Ethernet) protocol.

## INDUSTRY SEGMENTS



el/O modules are perfect for a wide variety of applications and environments including:

- Process Control
- Data Acquisition
- Broadcast Automation
- Security
- Facility Management

## FEATURES

- Supports Industry Standard Modbus TCP Protocol
- Models Offering Choice of:
  - Optically Isolated Inputs
  - Form A Reed Relay Outputs
  - High Current Form C Relay Outputs
  - Solid State Relay Outputs
  - Single Ended and Differential Analog Inputs
  - Status Indicator LEDs for Communication and power
- Field Removable Terminal Block Connectors
- Power Input via Terminal Block or Power over Ethernet
- Compact Size – 4.5" (L) x 3.5" (W) x 1.3" (H)
- Din Rail or Table Mount

## eI/O PRODUCTS IN THIS MANUAL

Ethernet 10/100 BaseT	
	eI/O 110E - 4 Optically Isolated Inputs/4 Form A Reed Relay Outputs eI/O 120E - 4 Optically Isolated Inputs/4 Form C Relay Outputs eI/O 130E - 4 Optically Isolated Inputs eI/O 140E - 4 Form A Reed Relay Outputs eI/O 150E - 4 Form C Relay Outputs eI/O 160E - 32 Channel TTL Interface eI/O 170E - 8 Analog Inputs/2 Optically Isolated Inputs/2 Solid State Relay Outputs
Power Over Ethernet	
	eI/O 110PoE - 4 Optically Isolated Inputs/4 Form A Reed Relay Outputs eI/O 120PoE - 4 Optically Isolated Inputs/4 Form C Outputs eI/O 130PoE - 4 Optically Isolated Inputs eI/O 140PoE - 4 Form A Reed Relay Outputs eI/O 150PoE - 4 Form C Relay Outputs eI/O 160PoE - 32 Channel TTL Interface eI/O 170PoE - 8 Analog Inputs/2 Optically Isolated Inputs/2 Solid State Relay Outputs

## OPTIONAL ITEMS

Depending on the interface type, your el/O module may include additional accessories. Included accessories are listed below. All items can be purchased from our website ([www.sealevel.com](http://www.sealevel.com)) by calling our sales team at (864) 843-4343.

### POWER OVER ETHERNET SERIES

#### Power Over Ethernet Switch

Connect up to four el/O modules without power cables with the Sealevel unmanaged five port Ethernet switch.



### POWER SUPPLIES

#### US Options

#### el/O 120VAC to 12VDC @ 500mA Wall Mount Power Supply (Part# TR104)

The TR104 is a wall wart style power supply capable of powering a single el/O module at 120VAC input and 12VDC output at 500mA. Other power supply options are available for driving multiple el/O modules on a DIN rail.



#### 100-240VAC to 24VDC @ 300mA DIN Rail Power Supply (Part# PS101)

The PS101 is an AC/DC DIN rail mount power supply that accepts 100-240VAC input and outputs 24VDC at up to 300mA (7.5W).



#### 100-240VAC to 24VDC @ 2.1A DIN Rail Power Supply (Part# PS103)

The PS103 is an AC/DC DIN rail mount power supply that accepts 100-240VAC input and outputs 24VDC at up to 2.1A (50W).



## International Options

### eI/O 230VAC to 12VDC @ 500mA Wall Mount Power Supply (Part# TR105)

The TR105 is a wall wart style power supply for European countries and is rated for 230VAC input and 12VDC output at 500mA.



### eI/O 240VAC to 12VDC @ 500mA Wall Mount Power Supply (Part# TR106)

The TR106 is a wall wart style power supply for the United Kingdom, Hong Kong, Singapore, and Malaysia. The TR106 is rated for 240VAC input and 12VDC output at 500mA.





## CABLES

### CAT5 Patch Cable (Part# CA246)

Standard 7' CAT5 UTP Patch Cable (RJ45).



### CAT5 Patch Cable, 10' in Length (Part# CA247)

10' Blue Ethernet Patch Cable. Can be used to connect el/O Ethernet modules to a hub or switch.



# el/O Hardware Description

## eI/O STANDARD AND POWER OVER ETHERNET MODULES

eI/O modules are powered in one of two ways

- 9-30 VDC  $\approx$  5W MAX power input  
(600mA MAX @ 9V; 420mA MAX @ 12V; 210mA MAX @ 24V)



- 802.3af-2003 Power over Ethernet

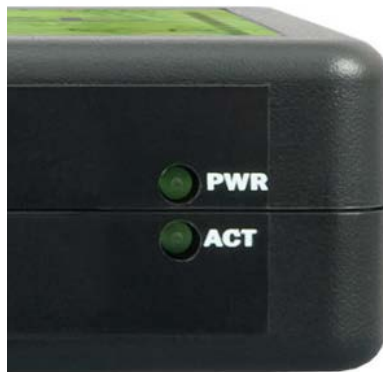


## eI/O MODULE COMMON FEATURES

All eI/O modules include the same power connector on the side of the unit. All models use the same style of 3.5mm pitch screw terminals on front for connection to field devices.

Status LEDs are also included on the front of all eI/O modules to indicate the following information:

- **Power (Green)** - Lights when power is applied to the module.
- **Act (Green)** - Light blinks when Modbus/TCP activity is present or when new firmware is being downloaded.



# eI/O CONFIGURATIONS & SPECIFICATIONS

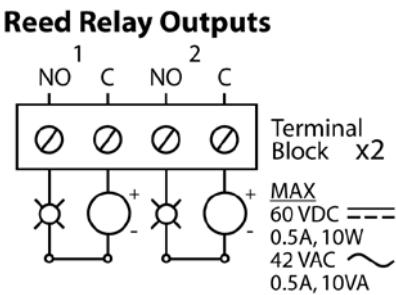
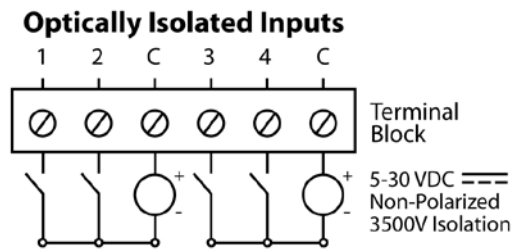
## 110 SERIES - 4 OPTICALLY ISOLATED INPUTS/4 FORM A REED RELAY OUTPUTS

eI/O-110 modules provide 4 optically isolated inputs and 4 Form A Reed Relay outputs. Inputs can range from 5-30VDC, while the Form A Reed Relays provide long life switch closures that are well suited for low current applications. Each pair of inputs shares a common and field wiring is simplified via 3.5mm field removable terminal blocks.



5-30VDC Power Input Version Shown

Inputs	
Type	4 non-polarized optically isolated inputs
Voltage Range	5-30VDC non-polarized
Isolation	2500VAC RMS / 3500VDC
Input Resistance	6.2K Ohms in series
Outputs	
Type	4 SPST Form A Reed Relays
Contact Max Power	10W
Switching Voltage Max DC / Peak AC Resistive	60VDC / 42VAC
Switching Current Max DC / Peak AC Resistive	500mA
Life Expectancy - Typical (Signal Level 1V, 10mA)	100 million ops.
Relay Max Operate Time, including Bounce*	1 ms
Relay Max Release Time*	0.2ms



Do not connect protective earthing or protective bonding conductor wiring of any equipment to relay contact outputs.

\*Minimum hardware requirements

## 120 SERIES - 4 OPTICALLY ISOLATED INPUTS/4 FORM C OUTPUTS

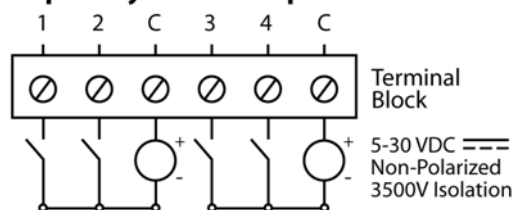
The eI/O-120 provides 4 optically isolated inputs and 4 SPDT Form C relay outputs. Inputs can range from 5-30VDC, while the high current Form C relays switch up to 60VDC, 200VAC or 6A. Each Form C relay has a discrete common and includes normally-open and normally-closed contact connections. Each pair of inputs shares a common and field wiring is simplified via 3.5mm field removable terminal blocks.



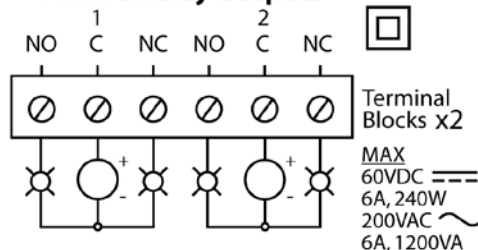
Power over Ethernet Option Shown

Inputs	
Type	4 non-polarized optically isolated inputs
Voltage Range	5-30VDC non-polarized
Isolation	2500VAC RMS / 3500VDC
Input Resistance	6.2K Ohms in series
Outputs	
Type	4 SPDT Form C relays
Power	DC 240W / AC 1200 VA
Contact Voltage	60VDC / 200VAC max. (5VDC min.)
Contact Current (DC)	<30 VDC @ 6A max. >30 VDC @ 700mA max. (100mA min.)
Contact Current (AC)	6A max.

### Optically Isolated Inputs



### Form C Relay Outputs



Do not connect protective earthing or protective bonding conductor wiring of any equipment to relay contact outputs.

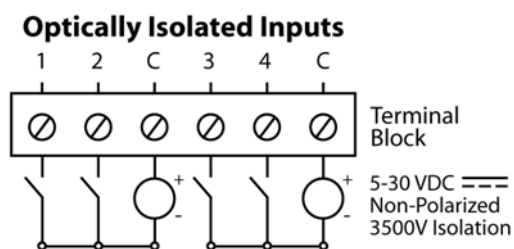
## 130 SERIES - 4 OPTICALLY ISOLATED INPUTS

el/O-130 modules provide 4 optically isolated inputs with 2500VAC RMS / 3500VDC external isolation and high channel-to-channel isolation. Each pair of inputs shares a common and field wiring is simplified via 3.5mm field removable terminal blocks.



5-30VDC Power Input Version Shown

Inputs	
Type	4 non-polarized optically isolated inputs
Voltage Range	5-30VDC non-polarized
Isolation	2500VAC RMS / 3500VDC
Input Resistance	6.2K Ohms in series



## 140 SERIES – 4 FORM A REED RELAY OUTPUTS

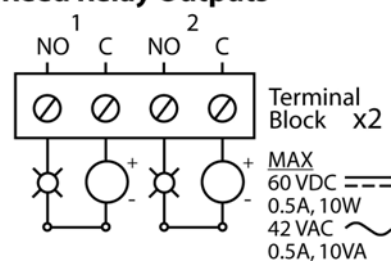
The eI/O-140 provides 4 SPST Form A dry-contact Form A Reed Relays. Form A Reed Relays offer long life performance and fast response time. Field wiring is simplified via 3.5mm field removable terminal blocks.



Power over Ethernet Option Shown

Outputs	
Type	4 SPST Form A Reed Relays
Contact Max Power	10W
Switching Voltage Max DC / Peak AC Resistive	60VDC / 42VAC
Switching Current Max DC / Peak AC Resistive	500mA
Life Expectancy - Typical (Signal Level 1V, 10mA)	100 million ops.
Relay Max Operate Time, including Bounce*	1ms
Relay Max Release Time*	0.2ms

### Reed Relay Outputs



Do not connect protective earthing or protective bonding conductor wiring of any equipment to relay contact outputs.

\*Minimum hardware requirements

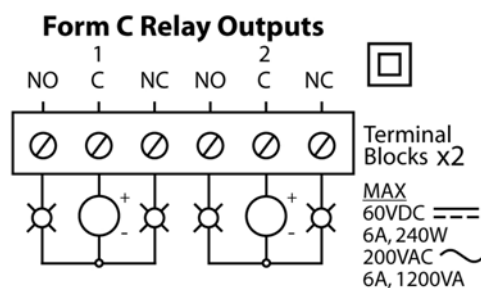
## 150 SERIES – 4 FORM C RELAY OUTPUTS

The eI/O-150 provides 4 SPDT Form C relay outputs. The high current Form C relays switch up to 60VDC, 200VAC or 6A. Each Form C relay has a discrete common and includes normally-open and normally-closed contact connections. Field wiring is simplified via 3.5mm field removable terminal blocks.



5-30VDC Power Input Version Shown

Outputs	
Type	4 SPDT Form C relays
Power	DC 240W / AC 1200 VA
Contact Voltage	60VDC / 200VAC max. (5VDC min.)
Contact Current (DC)	<30 VDC @ 6A max. >30 VDC @ 700mA max. (100mA min.)
Contact Current (AC)	6A max.



Do not connect protective earthing or protective bonding conductor wiring of any equipment to relay contact outputs.



## 160 SERIES – 32 CHANNEL TTL DIGITAL INTERFACE

Control and monitor up to 32 channels of buffered drive digital I/O with the el/O-160. The module addresses the 32 channels of I/O as four eight-bit ports, each programmable as input or output. Use a standard 50-pin IDC ribbon cable to connect an industry standard relay rack for PC based control and automation of equipment including sensors, switches, security control systems, and other industrial automation systems. The el/O-160 50 pin digital interface is pin compatible with the Sealevel SeaDAC Lite 8126 and will accept 8126 accessories.



Power Requirements	
Max Output Power	+5VDC @ 350mA
Inputs	
Logic High	Min 2VDC
Logic Low	Max 0.8VDC
Outputs *	
Logic High	Max 0.5VDC @ 64mA
Logic Low	Min 2VDC @ 32mA



The el/O-160 is designed to work with industry standard solid-state relay racks that expect negative logic to operate. The el/O-160 itself uses positive logic for inputs and outputs.

The el/O-160 addresses the 32 channels of buffered drive digital I/O as four eight-bit ports. Each port is programmable as input or output. The I/O channels are accessed via an industry standard 50-pin header connector. Use a standard 50-pin 0.100" pitch IDC ribbon cable to connect to an industry standard relay rack, terminal block (Item# TB07), or relay rack simulation module (Item# TA01). Each channel can sink up to 64mA or source up to 32mA. All channels combined cannot exceed a total output of 350mA.



Relay racks with less than 32 channels and the TA01 simulation module expect all even pins to be commons. When using the TA01 or relay racks with less than 32 channels, set Port D as an input to avoid shorting the outputs to ground through the relay rack.



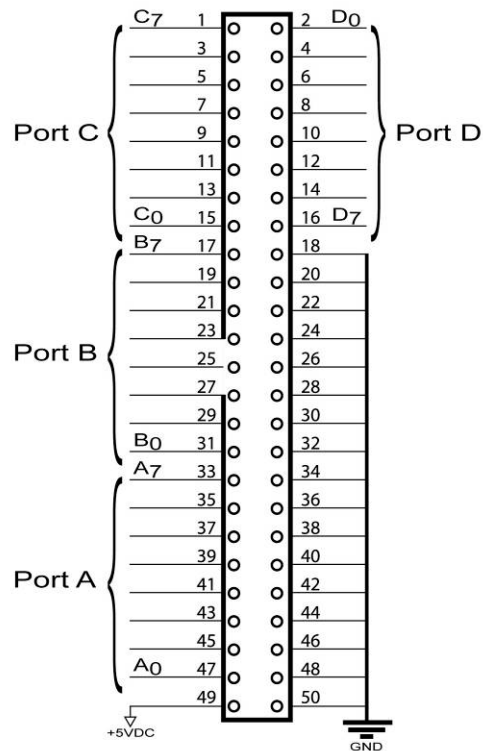
Relay modules vary in their performance and characteristics. Discrete output modules available from typically draw 10mA each but may draw 27mA in a worst case scenario. This actual current draw and the number of modules used will determine how many can be powered by the +5V on pin 49 of the 160E/POE. Contact your relay vendor to determine the actual current requirements.



Many relay racks allow the modules to be powered by an external power supply. This can allow more, higher powered devices to be used. In this case, a jumper on the relay rack must be disconnected so the external power supply does not back power the 160E/POE via pin 49. Contact the manufacturer of the relay rack to determine how this jumper can be disconnected.

#### 50-Pin Header Connector

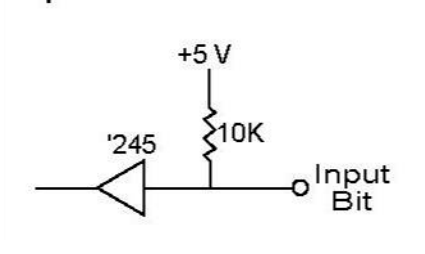
The eI/O-160 has the following pin out which is compatible with a wide variety of industry standard solid-state relay racks.



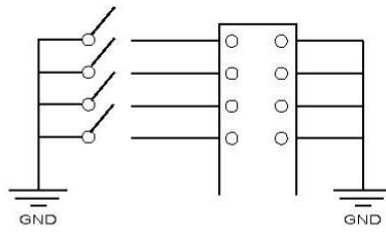
#### TTL Logic & Example Circuits

The eI/O-160 uses 74ABT245B octal bidirectional transceivers to provide TTL input/output capabilities. Each bit is pulled to +5V through a 10K  $\Omega$  pull-up resistor to insure each bit is at a known state when not driven. If an input is not connected to ground, it will read as a one (1) due to the 10K  $\Omega$  pull-up resistors on each port.

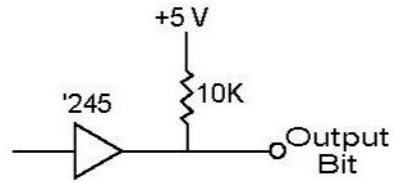
#### Input Circuit Schematic



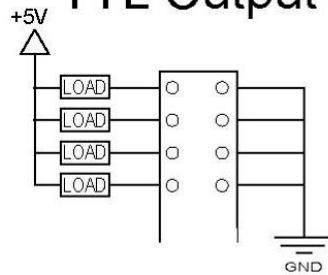
## TTL Input



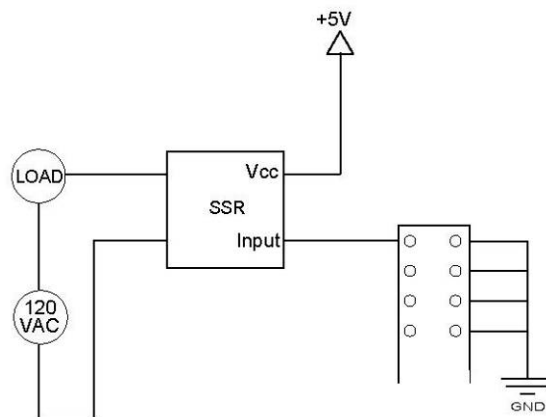
## Output Circuit Schematic



## TTL Output



## Solid State Relay Output



## 170 SERIES - 8 ANALOG INPUTS /2 OPTICALLY ISOLATED DIGITAL INPUTS/2 SOLID STATE RELAY OUTPUTS

The eI/O-170 provides 8 analog inputs 2 optically isolated digital inputs and 2 SPST Form A solid state relay outputs. Analog inputs can be configured via software as 8 single ended inputs or 4 differential inputs. Voltage ranges are software configurable as 0-5V, 0-10V, -5V to 5V and -10V to 10V to provide optimal accuracy depending on application. Digital inputs are pre-biased internally and current limited so a connection to ground is all that is necessary to activate the input. The inputs also provide 1000V isolation to digital ground. Solid state relays can switch up to 60VDC at 2.5A.

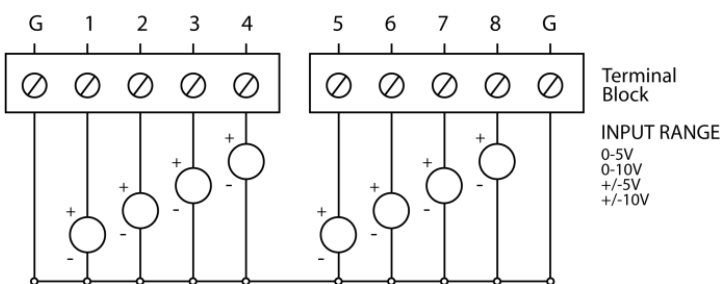


Power over Ethernet Option Shown

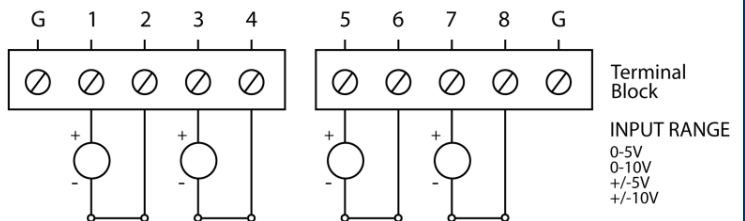
Analog Inputs	
Type	8 single ended or 4 differential
Voltage Range	0V-5V, 0V-10V, -5V-5V, -10V-10V
Resolution	12bit
Input Impedance	100k $\Omega$

The analog inputs can operate as 8 single ended inputs or 4 differential inputs. See wiring diagrams below for terminal numbering and channel pairing.

**Eight 12-Bit Single-Ended A/D Inputs**



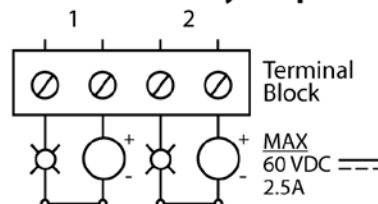
**Four 12-Bit Differential A/D Inputs**



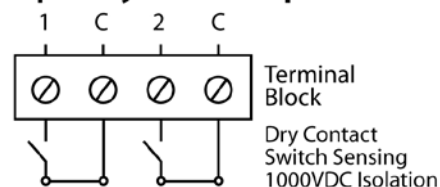
## 170 DESCRIPTION (CONT)

Relay Outputs	
Type	2 SPST solid state relays
Power	DC 150W
Contact Voltage	60VDC max
Contact Current (DC)	2.5A max.
Digital Inputs	
Type	2 Dry Contact Sensing
Isolation	1000VDC
Source Current	12mA max

### Solid-State Relay Outputs



### Optically Isolated Inputs



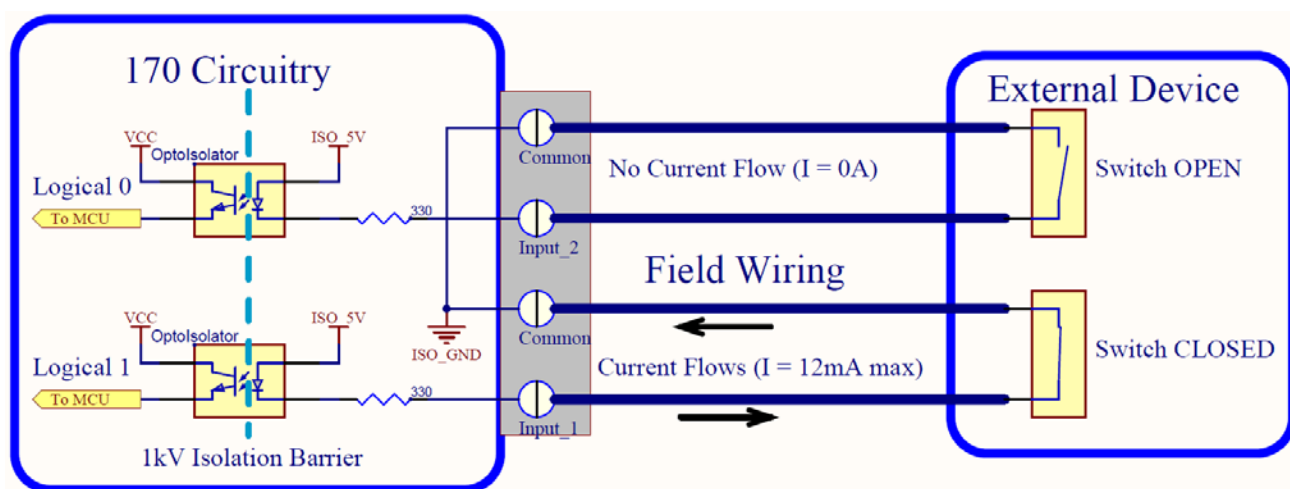
The optically isolated digital inputs featured on the 170 are designed unlike the opto-inputs found on many other Sealevel products. The 170 provides a voltage to the opto input, which is current limited with a 330 ohm resistor. Connecting either of the inputs to a common pin will cause current to flow through the opto-isolator, activating the input.

The inputs were designed this way so the end-user does not need to provide a voltage source. A simple external contact closure is all that is required to trigger the input.




Two common pins are provided with the optically isolated inputs for convenience; however, both common pins of the inputs are electrically equivalent on the board.

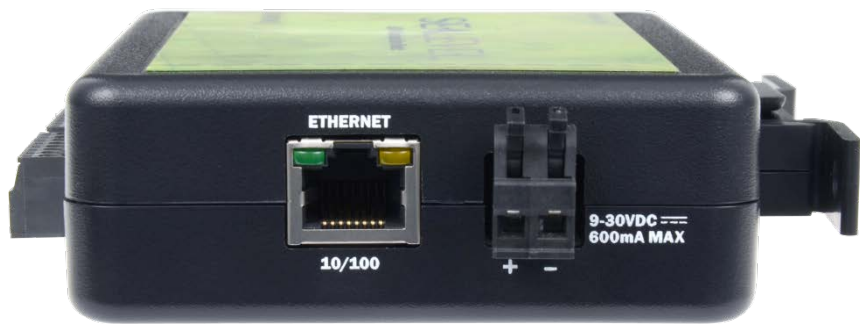
The diagram below shows how the inputs are intended to be used.




# Power Options

## eI/O POWER CONNECTION

eI/O standard units are powered from a 9-30VDC  source using the screw terminals on the side of the unit. Sealevel offers several power supply choices to make connection easy (see the Optional Items section in the beginning of this document).



 DC supply wiring must be made in accordance to all local and national electrical codes. In particular, DC supply wiring must include overcurrent protection which limits the maximum fault current to 8A.

The eI/O PoE units are Class 0 (IEEE 802.3af-2003) Power over Ethernet devices. This allows power and data to be transferred over a single CAT5 cable and eliminates the need for an external power supply. With PoE, power can be supplied by power sourcing equipment including PoE switches (midspans) and injectors.

## eI/O MAX POWER REQUIREMENTS

	Standard Series	Power Over Ethernet Series
eI/O-110	2.5W	2.5W
eI/O-120	5W	5W
eI/O-130	2W	2W
eI/O-140	2.2W	2.2W
eI/O-150	5W	5W
eI/O-160	7.2W	8W
eI/O-170	3W	3.5W

# SeaMAX Application Suite

## SEAMAX OVERVIEW

The SeaMAX Suite is a collection of configuration/diagnostic utilities and software libraries that enable rapid application development. The SeaMAX API, included in the SeaMAX Suite, provides a common API for Sealevel el/O, Seal/O and SeaDAC data acquisition modules. SeaMAX is designed to simplify application development by requiring little knowledge of the underlying communication protocols of these devices and replacing low-level programming. SeaMAX is available in an unmanaged library and a wrapper library that provides an interface to the API from managed code.

The following libraries and utilities are included in the SeaMAX Suite:

- MaxSSD Configuration & Diagnostics utility
- Ethernet Config utility
- SeaMAX API
- SeaMAX .NET API

The SeaMAX API documentation, installed with SeaMAX, explains the usage and API references, including function calls and enumerations. Sealevel digital and analog I/O modules supported by SeaMAX software are designed to work with third party applications via the SeaMAX API. To help simplify application development, the complete API documentation and code samples are automatically installed with the SeaMAX Suite and can be found in Windows by clicking Start → All Programs → Sealevel Systems → SeaMAX → Documentation. For convenience, Sealevel offers a PDF version of the [SeaMAX manual](#) on our website. Example code is also included for several popular languages and compilers.

Please contact Sealevel technical support with any questions regarding SeaMAX documentation:

Phone: (864) 843-4343

Email: [support@sealevel.com](mailto:support@sealevel.com)

## COMMUNICATING VIA MODBUS

Sealevel el/O modules are designed to integrate seamlessly into existing Modbus/TCP networks. The supported command set will vary depending on the el/O model number used. Specialized diagnostic commands and other RTU specific codes are not supported. An overview of the Modbus specification for TCP connections is covered in detail in the interactive documentation located on the Sealevel website at <http://www.sealevel.com/software/SeaMAX>.

The official Modbus specification can be found at <http://www.modbus.org>.



## SEAMAX SOFTWARE INSTALLATION

Proceed with installing the SeaMAX Software Suite using the software disk that was included with your Sealevel eI/O module. Software drivers are also available on the product webpage on the Sealevel website at [www.sealevel.com](http://www.sealevel.com).

### WINDOWS 2000/XP/VISTA/7™ OPERATING SYSTEMS



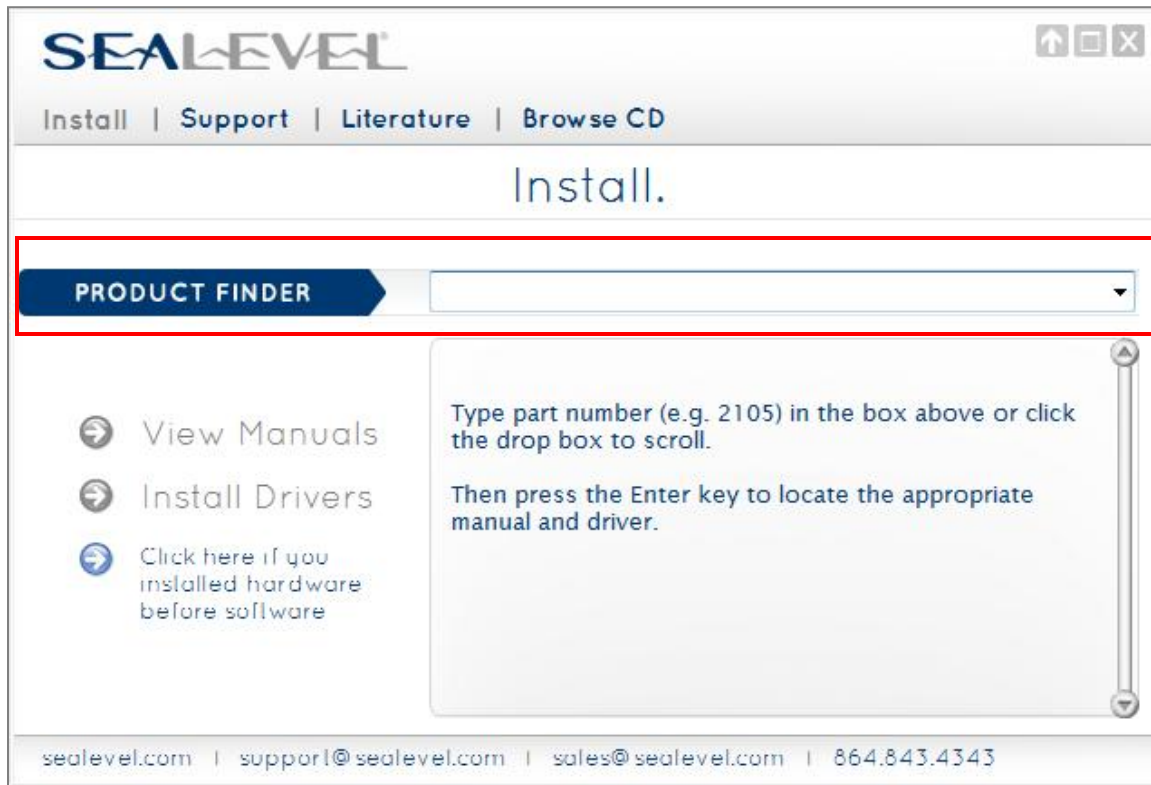
To install Sealevel Systems software, you must log in as an administrator or have administrator privileges in Windows.

### DRIVER INSTALLATION FROM THE SEALEVEL DISK USING 'AUTORUN'

1. Insert the Sealevel Systems disk in to your optical drive.
2. If 'AutoRun' is enabled for this drive the software will automatically launch.
3. Otherwise, navigate to the root directory of your optical drive and double-click the 'autorun.exe' application to launch the installation window.
4. Select 'Install'.



5. Type the part number for your adapter in the text box and click 'Enter', or click on the drop box to scroll from the listing to select your product.



If you installed your hardware prior to loading/installing the drivers, please click on the 'Click here if you installed hardware before software' button and follow the listed instructions.

6. Click the 'Install Drivers' button to launch the Installation Wizard.
7. When the 'InstallShield Wizard' window appears, click the 'Next' button to initiate the software installation.
8. When the 'License Agreement' window appears, accept the terms and click 'Next' to continue. You can click the 'Print' button to print out a copy of the agreement for your records. If you do not accept the terms of the agreement, the installation will stop.
9. When the 'Ready to Install the Program' window appears, click the 'Install' button to install the software onto the hard drive of your computer. The files will be automatically installed into the 'C:\Program Files' folder on your computer.
10. The setup file will automatically detect the operating environment and install the proper components. Next follow the information presented on the screens that follow. Once the installation is complete, close the disk installation window.

11. Refer to the Physical Installation section to connect and install your adapter.

#### DIRECT DRIVER INSTALLATION FROM THE SEALEVEL DISK

1. To install the driver executable from the Sealevel disk, browse the Sealevel Systems disk for: Software\SeaMAX\Windows\SeaMAX Installer.exe
2. If you are using Windows Vista or newer operating systems, *right* click on the installer executable and choose 'Run as Administrator'. If you are using an operating system prior to Windows Vista, double click on the executable to launch the InstallShield and initiate the driver installation.
3. Please refer to step six above in the *Disk Installation* section and follow the remaining installation steps.

#### INSTRUCTIONS FOR DOWNLOADED SOFTWARE INSTALLATION

1. To obtain the most current software driver package from Sealevel's website, download from here:
  - [SeaMAX for Windows](#)
  - [SeaMAX for Linux](#)
2. Choose the link for the target operating system and click on the 'Download File' link to download the current driver.
3. Once downloaded, if you are using Windows Vista or newer operating systems, *right* click on the installer executable and choose 'Run as Administrator'. If you are using an operating system prior to Windows Vista, double click on the executable to launch the InstallShield and initiate the driver installation.
4. Please refer to step six above in the *Disk Installation* section and follow the remaining installation steps.

#### UPGRADING TO THE CURRENT EIO SOFTWARE (SEAMAX)

Before upgrading your SeaMAX software, you first need to uninstall the previous version. Follow these steps to uninstall the software.

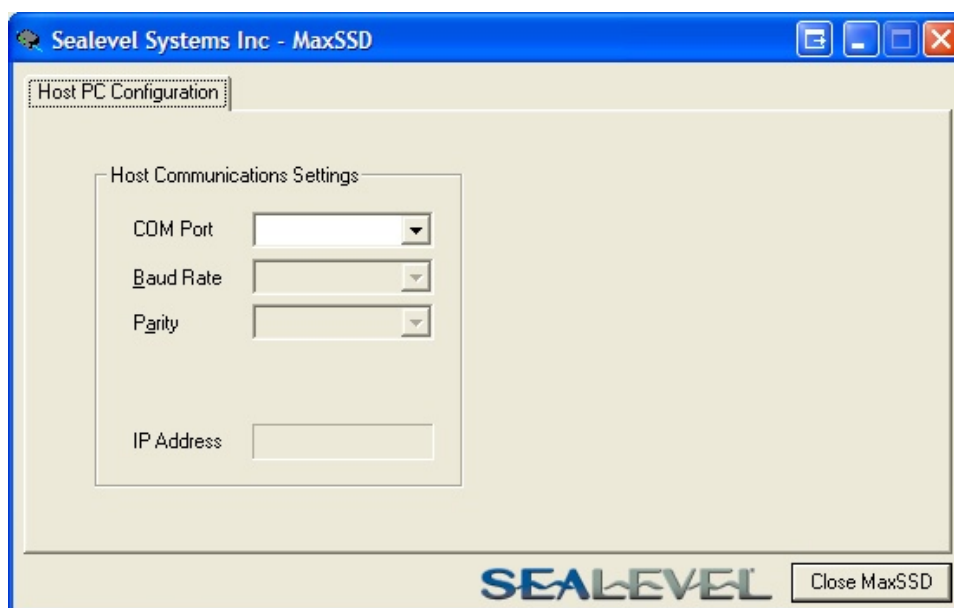
1. Download the current SeaMAX software using the instructions from the 'Downloaded Software Installation' section above. Please take note of the destination directory to which it will save.
2. Uninstall the currently loaded driver SeaMAX software found in the Control Panel. Prior to Windows Vista, SeaMAX will be populated in the 'Add/Remove Programs' list. In Windows Vista and newer operating systems, it will be found in the 'Programs and Features' list.

## MAXSSD CONFIGURATION & DIAGNOSTICS UTILITY

The Sealevel Systems configuration utility, MaxSSD, is designed to simplify the installation, configuration, and diagnostics of Sealevel eI/O and Sea I/O modules. MaxSSD is a Microsoft Windows application and has been tested with Windows 2000, XP, Vista and Windows 7.

### HOST PC CONFIGURATION TAB

When you run the MaxSSD utility (Start → All Programs → Sealevel Systems → SeaMAX → MaxSSD Configuration Utility) it will default to the “Host PC Configuration” tab. This tab allows the user to choose the initial communication settings for the connected I/O device. The “COM Port” dropdown box allows the selection of a serial COM port (from COM1 to COM256), and Ethernet (for Ethernet and Wireless Sealevel I/O modules).



To communicate with an eI/O module, select “ETHERNET” from the “COM Port” dropdown box. When Ethernet is selected, MaxSSD searches for any Seal/O Ethernet or Wireless modules on the network and displays their IP addresses in the “Available Ethernet Devices” list box (not shown). When an IP address is selected from the list box, a socket is opened to the Seal/O module and it is ready for communication.

If your eI/O module is set to a different subnet, you will need to type in the IP address into the IP Address field displayed in MaxSSD and press Enter. MaxSSD will try to open port 502 on that address. When the connection succeeds, it will display the “SeaIO Configuration” tab.

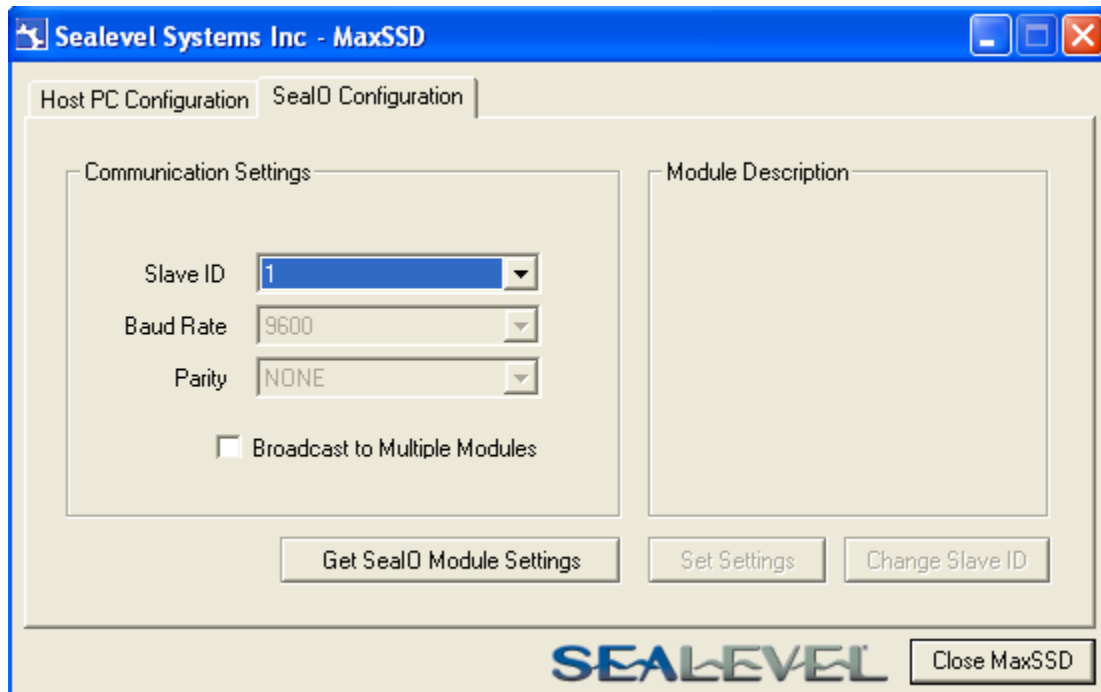


If no IP address is shown and your eI/O module is on the same subnet as the MaxSSD computer, review the previous Hardware Configuration section or proceed to the Troubleshooting section at the end of this manual.

## SEAI/O CONFIGURATION TAB

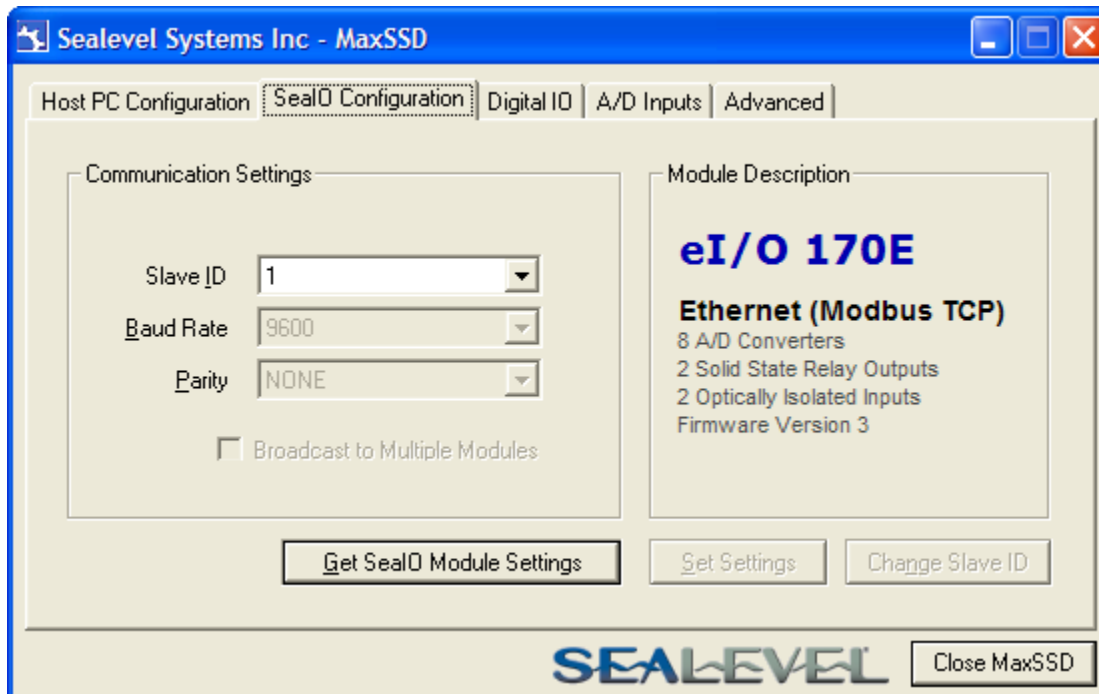
Once the host computer is configured correctly, the “Seal/O Configuration” tab becomes available. Before communicating with an el/O module, the configuration utility must determine if there is an I/O module, and if so, what type of module it is. This is the purpose of the Get operation.

- N** The el/O modules will respond to any Slave ID, so just use the default.



Click the “Get Seal/O Module Settings” button. After a short delay, the information for that I/O module should be displayed. If no information appears, verify that the host settings are correct and make changes if necessary.

After the Get command is executed, the “Module Description” frame will display the model type, description, firmware version number, interface, and I/O type. In the example shown, the module found at slave ID 1 is an eI/O 170 module with a PoE (Modbus TCP) interface.



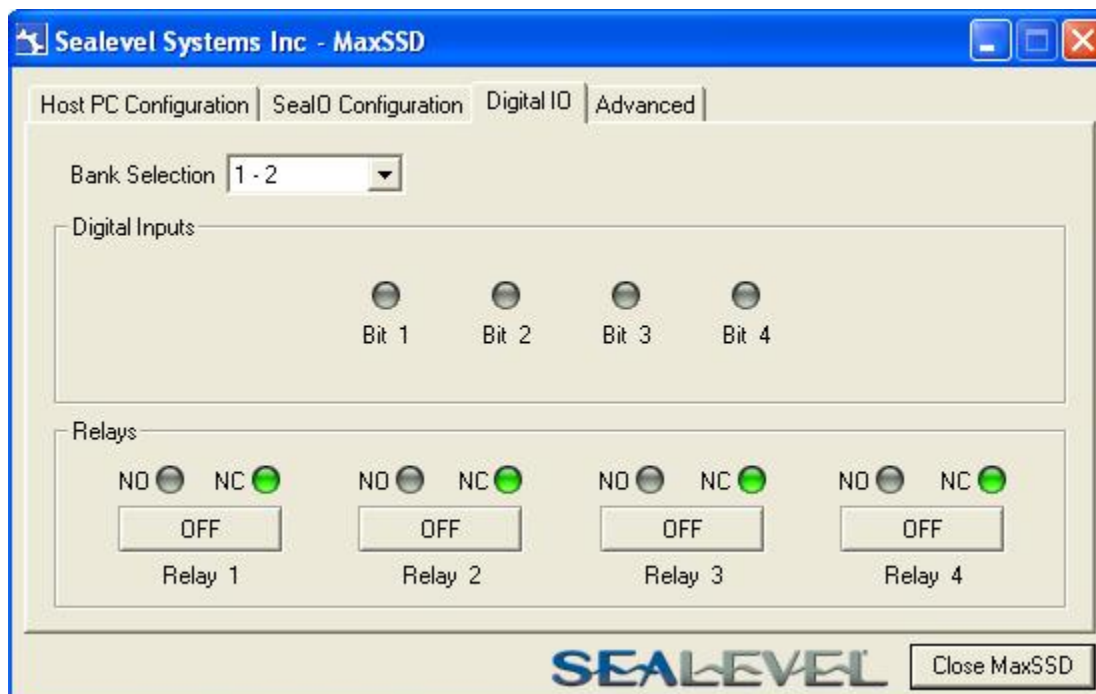
After a successful Get operation, additional tabs may be displayed in MaxSSD, depending on the device model found. These tabs display device I/O and allow easy configuration for all SeaMAX supported devices.

## DIGITAL I/O TAB

The 'Digital IO' tab of MaxSSD is displayed when using Sealevel I/O devices featuring discrete inputs and outputs. It displays the device's current input and/or output status in an intuitive and usable manner.

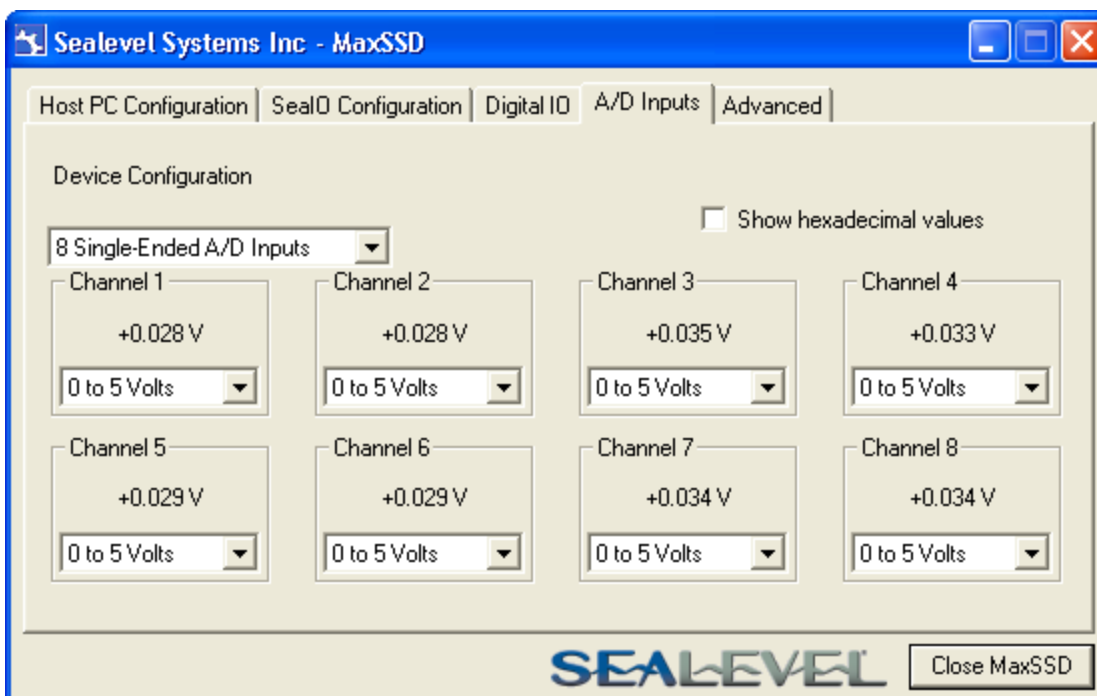
When banks of inputs are displayed, the status LEDs update on each of the banks automatically. This allows you to actively monitor external signals.

With a bank of outputs, the output coils can be set using the buttons below each output LED. As each coil is set, the I/O module is read. The corresponding status LED in the 'Digital IO' tab indicates the state of the coil. In the example below, an ei/O module with 4 optically isolated inputs and 4 Form C relays is shown.



## A/D INPUTS TAB

The “A/D Inputs” tab displays the current state of the analog-to-digital channels for Sealevel I/O devices that feature A/D inputs. Settings are provided for both device wide and per-channel configuration.



The “Device Configuration” selection drop-box adjusts the arrangement and function of the A/D input channels. Input channels are displayed as banks (groups of up to eight). Each channel is range configurable via the voltage range dropdown list. Both the channel voltage range and device-wide configuration are set on a dropdown list. There is no need to save your settings – they are automatically saved to the device as you select the various configuration options.

“Show Hexadecimal Values” checkbox – Displays the values returned by the A/D converter as a hexadecimal value without converting the values to engineering units (i.e., Amps or Volts).

## CONVERTING A/D VALUES

To properly use the values returned from the el/O-170 module’s A/D channels, the application program must convert the returned values to engineering units (voltage).

The conversion formulas will vary depending on how the I/O module is configured. The formulas and their uses are covered in detail in the interactive documentation located on the Sealevel website at <http://www.sealevel.com/software/SeaMAX/>. For ease of use, SeaMAX functions to convert A/D values have been provided. Use of these functions is also detailed in the SeaMAX Software Manual.



## TROUBLESHOOTING SEAMAX

Following these simple steps can eliminate most common problems.

1. Read this manual thoroughly before attempting to install the device in your system.
2. Uninstall any previous versions of the SeaMAX software before installing any new versions.
3. Confirm that all screw terminal connections are correct and secure and that the correct cables are being used, including network cables (crossover vs. patch cables).
4. Use the MaxSSD utility, included on the software CD, to verify proper installation. MaxSSD is designed to simplify the installation, configuration, and diagnostics of Sealevel Seal/O modules.
5. Refer to the Troubleshooting Ethernet eI/O Modules section on the following page for additional steps regarding eI/O modules.
6. If these steps do not solve your problem, please contact Sealevel Technical Support. Our technical support is free and available from 8:00am – 5:00 pm EST, Monday through Friday. You can contact Technical Support via email at [support@sealevel.com](mailto:support@sealevel.com) or by phone at +1 (864) 843-4343.

## TROUBLESHOOTING ETHERNET eI/O MODULES

**Problem: The eI/O module starts up with a strange IP address (i.e., 192.168.42.253).**

All eI/O modules are shipped with DHCP enabled. In case when the device is set to DHCP and no DHCP server is available or the DHCP server cannot be reached, eI/O modules default to an IP address of 192.168.42.253 and a subnet mask of 255.255.255.0. Change the PC's network settings to place both the eI/O module and PC on the same subnet. Adjust the eI/O module's IP address and subnet mask using the Ethernet Config utility (Start → All Programs → Sealevel Systems → SeaMAX → Ethernet Configuration Tool) installed with SeaMAX. Then restore the PC's network settings.

**Problem: The eI/O module is visible in Ethernet Config, but the network settings cannot be changed.**

The eI/O module is most likely on a different subnet than the PC. The PC's IP address and Netmask must be altered to place both the eI/O module and the PC within the same subnet. Contact your network administrator for assistance.

**Problem: The eI/O module doesn't show up in Ethernet Config.**

eI/O modules are discovered via a UDP broadcast. Verify that any firewall software, such as Windows Firewall, ZoneAlarm, etc., or router settings that would hinder UDP transmissions are disabled.

It is also possible that the eI/O module may not be discovered if the PC and module are on separate subnets. This may occur if the module's IP address is configured outside the range of the PC's subnet. It can also occur during a failed DHCP discovery. In either case, the "Recover Module" button in Ethernet Config utility may be used to recover the device. Refer to the Hardware Configuration section of this manual for more information.

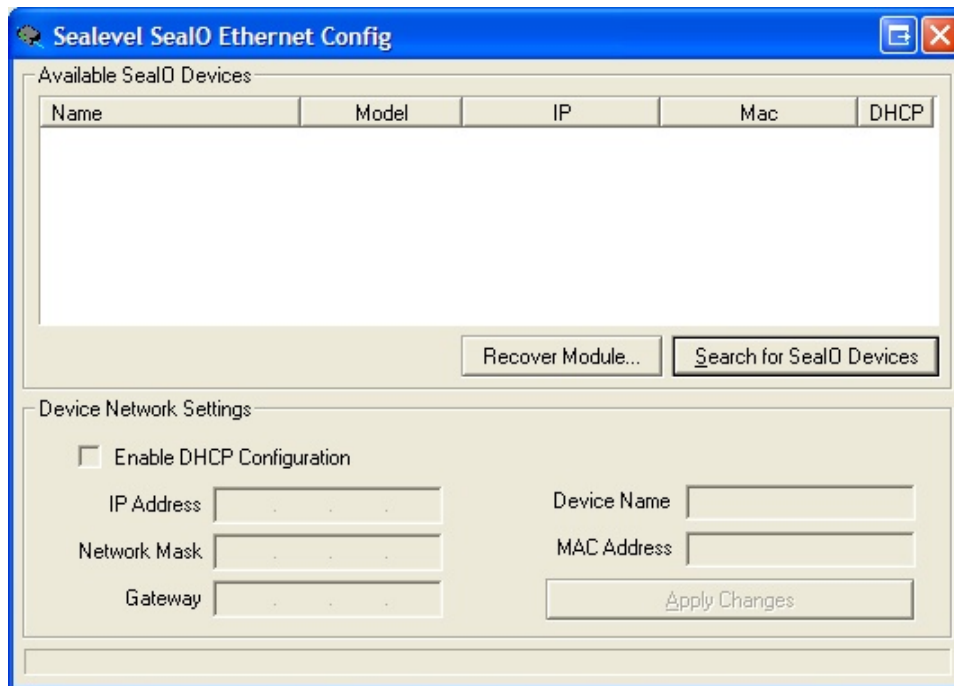
# Hardware Configuration

## CONFIGURING ETHERNET

Verify that SeaMAX software has been installed successfully and that an el/O module is connected directly to your computer using the yellow crossover cable supplied with your module.

All el/O modules are shipped with DHCP enabled. When you first connect an el/O module to the network, the status LEDs on the front of the module will blink while it searches for a DHCP server. Once it receives an IP address, the status LEDs will remain on.

If no DHCP server is available, the el/O module will default to an IP address of 192.168.42.253. To discover the el/O module's IP address, start the Ethernet Config utility (Start → All Programs → Sealevel Systems → SeaMAX → Ethernet Configuration Tool) installed with SeaMAX.



Click on the “Search for Seal/O Devices” button and the ‘Available Seal/O Devices’ pane should refresh with any Ethernet or Wireless Seal/O and any el/O modules that are found on the network. Select one of the modules in the list by clicking on it. You can update the settings in the Device Network Settings pane and then confirm these changes by clicking the “Apply Changes” button. The module list should refresh, indicating that your changes were successful.

Start MaxSSD (Start → All Programs → Sealevel Systems → SeaMAX → MaxSSD Configuration Utility) and choose the correct IP address to communicate with the el/O module. Ensure a successful Get operation (refer to the MaxSSD section of this manual for more information).

## RESETTING AN ETHERNET eI/O MODULE

An eI/O module may become no longer visible in the module list in the Ethernet Config utility if the eI/O module has been configured to use a different subnet than the host computer.

In other cases, the eI/O module doesn't appear in the module list due to a DHCP discovery failure. In either case, clicking on the "Recover Module" button (see image on previous page) in the Ethernet Config utility will bring up the "Module Reset" window shown below.

**Module Reset**

Before recovery, please ensure that the module is connected to the PC via a cross-over Ethernet cable or hub. Then use the drop down box to select the network interface the device is connected to.

Enter the module's MAC address (found on the bottom box label) below with dashed-octet format: XX:XX:XX:XX:XX:XX.

Network Interface  
Network 192.168.66.10

MAC Address  
[Text Field] [Indicator Light]

Network Settings  
☒ Enable DHCP Configuration  
IP Address [Text Field]  
Network Mask [Text Field]  
Gateway [Text Field]

Cancel Recover Module...

Before recovery begins, make certain that the PC and eI/O module are on the same network segment – they should be connected with an Ethernet crossover cable, through a hub, or through a non-routing switch. eI/O modules are shipped with an Ethernet patch cable (blue).

Next, select the IP Address of the network card your device is connected to from the dropdown labeled "Network Interface."

Enter the MAC address found on the label on the bottom of the eI/O enclosure. A MAC address is made up of six pairs of hexadecimal digits separated by dashes (i.e., xx-xx-xx-xx-xx-xx). The label on your device may or may not include the dashes. While entering the MAC address, the indicator to the right of the field will turn red if the MAC address entered is invalid. Once a MAC address is successfully entered, the indicator light will turn green and the "Network Settings" options will be enabled.

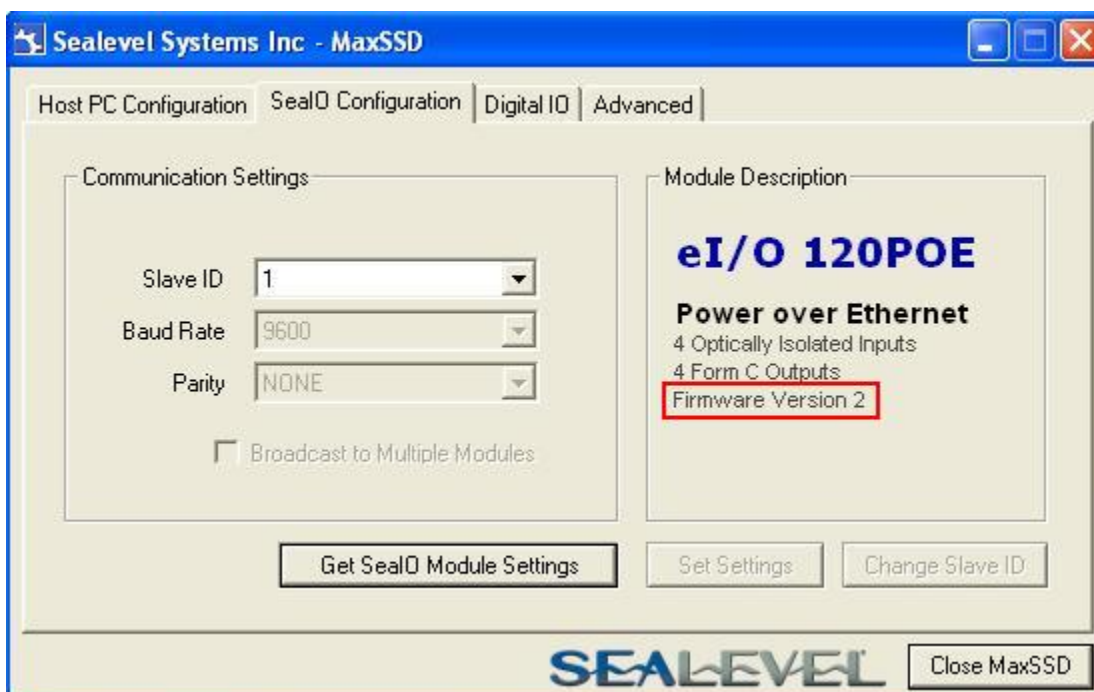
Contact your network administrator if you are unsure of the proper network settings to choose. If a DHCP server is available, select the "Enable DHCP Configuration" checkbox. Otherwise,

complete the network settings and click the “Recover Module” button to complete the configuration changes.

## ADVANCED FEATURES

### ADVANCED FEATURE CAPABILITY

Modules with version “2” or higher support several Advanced Features. You may determine the version of your SealO device using the MODBUS command FUNC\_SEAMAX\_GET\_EXTENDED\_INFO (0x66), using the SeaMAX method SM\_GetDeviceConfig(), or by viewing the Module Description in MaxSSD, shown below.



### FIRMWARE UPGRADING

In the event that a newer version of the firmware is available, it is possible to upgrade the firmware in the unit. This can be done through the same port that is used to do normal communications with the unit. The unit must be directly connected to the programming computer.



The following should only be performed if you (1) really feel the update is required and (2) you feel confident in your ability to perform the update. Once the firmware has been erased, you must either be able to re-program it locally or send it back to Sealevel Systems, Inc. for reprogramming.

Exercise caution when performing a firmware upgrade to ensure that the process does not get interrupted until it is completed. Once the firmware has been erased, you must either be able to re-program it locally or send it back to Sealevel Systems, Inc. for reprogramming.

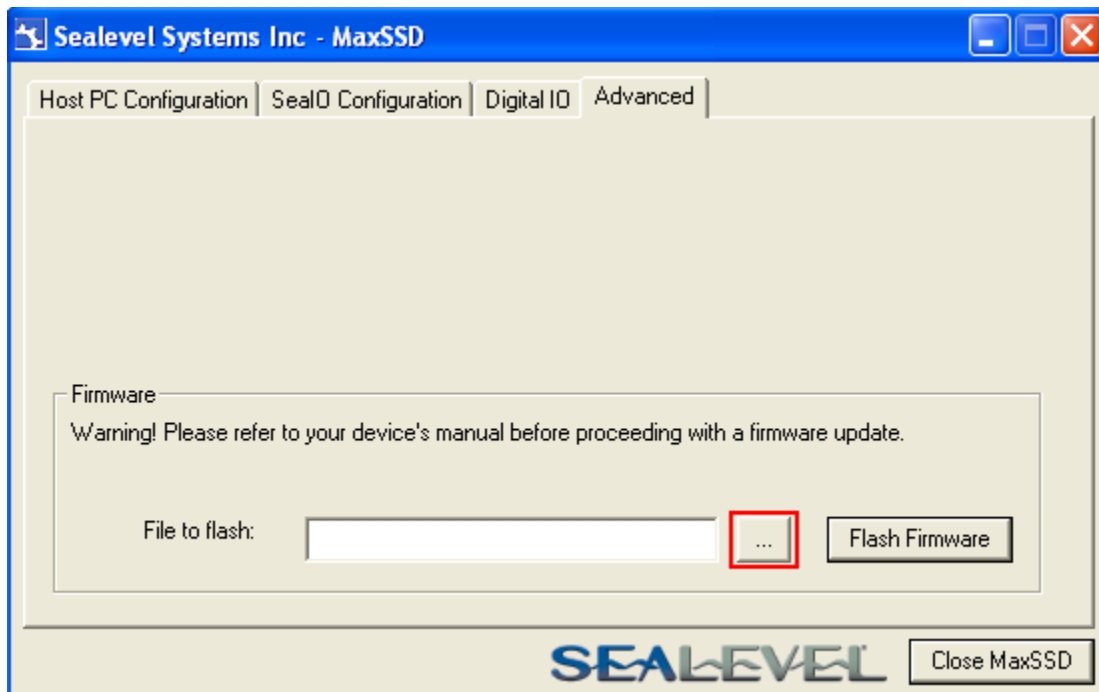
This firmware upgrade will be a file with a name similar to your eI/O model number with an extension of “.hex”. As an example, if you have an eI/O 120 style module, the programming

file name would be "120.hex". Please contact Tech Support to receive the latest version of the firmware.

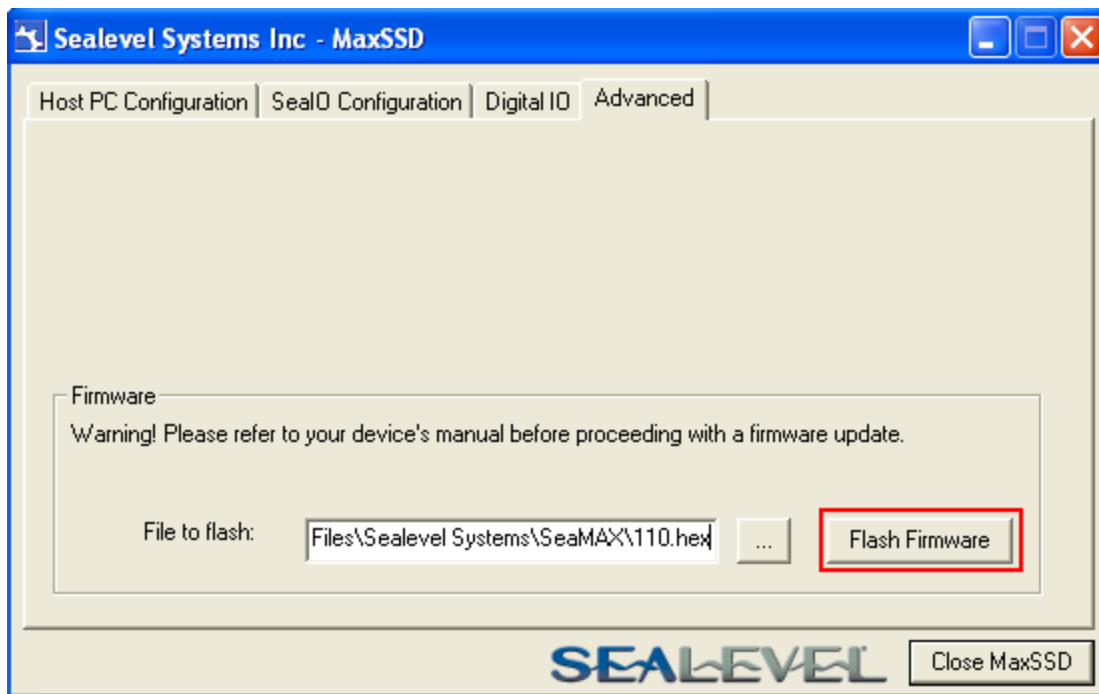
The device's firmware can be upgraded in one of two ways. The preferred method is through the MaxSSD Configuration Utility the command prompt. The second is using a command prompt procedure.

#### Upgrading Firmware via the MaxSSD Configuration Utility

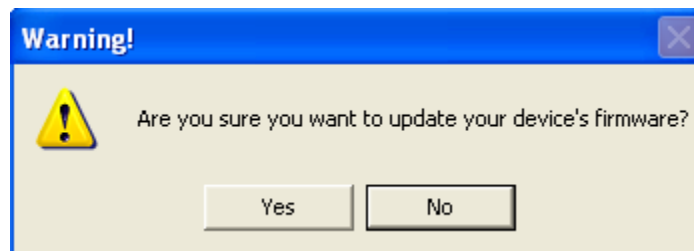
To upgrade your firmware through MaxSSD, connect to your device normally, and then go to the "Advanced" tab. At this point, you can use the "..." button to browse for the \*.hex file you wish to update your device with.



Once the proper file has been selected, click on the "Flash Firmware" button.



At this point, SeaMAX will give you a warning dialog. If you click “OK” then MaxSSD will attempt to flash your device with new firmware. If you click on the “Cancel” button, no changes will be made.



Clicking “OK” will result in IOCU.exe being run in a terminal window. Once the unit has received the download request it will turn on the ACT light. Once the download starts, the ACT light will flash rapidly as data is downloaded. Once the download is complete, the ACT light will remain on while the device is reprogramming itself. The unit will then reboot itself to reload the new firmware. At this point, the ACT light will turn off, and the terminal window will close. MaxSSD will return you to the Host PC Configuration tab.

## Upgrading Firmware via command prompt Procedure

To execute IOCU.exe from a command prompt, Click on Start, then click Run and type “cmd” (without the quotation marks) and hit ENTER. You will then see a command prompt (i.e. c:\documents and settings\name>). Once you are at the command prompt, browse to your SeaMAX folder. The default location is “C:\Program Files\Sealevel Systems\SeaMAX\” (or “C:\Program Files (x86)\Sealevel Systems\SeaMAX” on 64-bit systems). Your \*.hex file should be saved to this folder as well. If your operating system requires administrator permissions for this action and you cannot provide them, another folder outside the Program Files folder can be used, but a full path to the file will be required in the following step.

Type

Cd “C:\Program Files\Sealevel Systems\SeaMAX\” and then press Enter

When the command calls for iii.iii.iii.iii you substitute the unit’s IP address. Please do not enter the numbers with a leading zero. Therefore, if your IP address is 192.168.42.11, you will enter 192.168.42.11 and not 192.168.042.011. The command for this is therefore:

```
iocu /i=192.168.42.11 /a=247 120.hex
```

Once the unit has received the download request it will turn on the ACT light. Once the download starts, the ACT light will flash rapidly as data is downloaded. Once the download is complete, the ACT light will remain on while the device is reprogramming itself. The unit will then reboot itself to reload the new firmware. At this point, the ACT light will turn off.

## CONNECTOR PIN OUTS

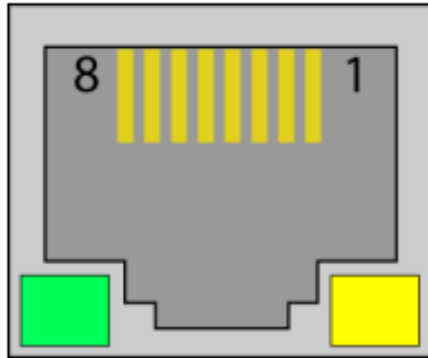
### eI/O ETHERNET PINOUT

eI/O Ethernet connector is used for both data and power in the PoE series of modules. Both DC on spares (Mode B) and mixed DC and data (Mode A) Power over Ethernet 802.3af-2003 configurations are acceptable for the eI/O. The eI/O PoE series modules are class 0 power over Ethernet devices.

#### Ethernet / PoE (Connector – RJ-45)

Pin	Signal	PoE Mode A	PoE Mode B
1	TX+	TX+/DC+	TX+
2	TX-	TX-/DC+	TX-
3	RX+	RX+/DC-	RX+
4	N/A	N/A	DC+
5	N/A	N/A	DC+
6	RX-	RX-/DC-	RX-
7	N/A	N/A	DC-
8	N/A	N/A	DC-





This module is not intended to be directly connected to wiring outside a building.

# Mounting Options

## DIN RAIL MOUNTING

eI/O modules ship ready for mounting on DIN rail. A small, rugged plastic (shown below) is included that naps onto 35mm DIN rail. This offers a clean installation by locating the I/O modules near the industrial control equipment on the DIN rail. Additionally, 3.5mm removable screw terminals allow for an easy and reliable connection method.



## WALL/PANEL MOUNTING

As an alternative to DIN rail, the versatile plastic clip includes mounting holes that allow eI/O modules to be mounted to walls, under counters, or inside panels. The plastic clip can be permanently mounted to a surface while still allowing the eI/O module to be easily removed for service or configuration changes.



## TABLE/DESKTOP MOUNTING

eI/O modules are perfect for table or desktop use. The units ship with four rubber feet that help prevent the devices from sliding due to vibration and help protect surfaces from scratches. The small enclosures take up very little space.



# Appendix A – Handling Instructions



## SAFETY INSTRUCTIONS

- Read these instructions completely. Keep these instructions.
- Do not use or install this apparatus near water. Clean only with a dry cloth.
- This apparatus is not intended for outdoor use. It is intended for indoor use only.
- This apparatus is not intended for use in hazardous (classified) locations.
- This apparatus has no user serviceable parts inside.
- Install this apparatus in accordance to all local and national electrical wiring codes.

## ESD WARNINGS

### ELECTROSTATIC DISCHARGES (ESD)

A sudden electrostatic discharge can destroy sensitive components. Proper packaging and grounding rules must therefore be observed. Always take the following precautions:

- Transport boards and cards in electrostatically secure containers or bags.
- Keep electrostatically sensitive components in their containers, until they arrive at an electrostatically protected workplace.
- Only touch electrostatically sensitive components when you are properly grounded.
- Store electrostatically sensitive components in protective packaging or on anti-static mats.

### GROUNDING METHODS

The following measures help to avoid electrostatic damages to the device:

- Cover workstations with approved antistatic material. Always wear a wrist strap connected to workplace as well as properly grounded tools and equipment.
- Use antistatic mats, heel straps, or air ionizers for more protection.
- Always handle electrostatically sensitive components by their edge or by their casing.
- Avoid contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting and removing connectors or connecting test equipment.
- Keep work area free of non-conductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools such as cutters, screwdrivers, and vacuum cleaners which are conductive.
- Always place drives and boards PCB-assembly-side down on the foam.

# Appendix B – How to Get Assistance

When calling for technical assistance, please have the device installed and ready to run diagnostics. If possible, have your user manual and current settings ready.

The Sealevel website is an excellent resource located at [www.sealevel.com](http://www.sealevel.com). The most current software updates and user manuals are available via our homepage by clicking on the 'Drivers' or 'Manuals' links located under 'Technical Support.' Manuals and software can also be downloaded from the product page for your device.

The FAQ section of our website answers many common questions. Refer to this helpful resource by visiting [www.sealevel.com/faq.asp](http://www.sealevel.com/faq.asp).

## TECHNICAL SUPPORT

Monday – Friday  
8:00 am to 5:00 pm EST  
Phone: +1 (864) 843-4343  
Email: [support@sealevel.com](mailto:support@sealevel.com)

**RETURN AUTHORIZATION MUST BE OBTAINED FROM SEALEVEL SYSTEMS BEFORE RETURNED MERCHANDISE WILL BE ACCEPTED. AUTHORIZATION CAN BE OBTAINED BY CALLING SEALEVEL SYSTEMS AND REQUESTING A RETURN MERCHANDISE AUTHORIZATION (RMA) NUMBER.**

# Regulatory

## FCC STATEMENT



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## EUROPEAN COMMUNITY



This equipment has been evaluated or tested and found in compliance with the requirements of the following directives issued by the European Commission:

- Low Voltage Directive **2006/95/EC**
- EMC Directive **2004/108/EC**
- RoHS Directive **2011/65/EU**

# Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured I/O products. Relio™ industrial computers are warranted for a period of two years and the R9 family is warranted for a five year period from date of purchase. We are able to offer this warranty due to our control of manufacturing quality and the historically high reliability of our products in the field. Sealevel products are designed and manufactured at its Liberty, South Carolina facility, allowing direct control over product development, production, burn-in and testing. Sealevel achieved ISO-9001:2000 certification in 2011.

## WARRANTY POLICY

Sealevel Systems, Inc. (hereafter "Sealevel") warrants that the Product shall conform to and perform in accordance with published technical specifications and shall be free of defects in materials and workmanship for the warranty period. In the event of failure, Sealevel will repair or replace the product at Sealevel's sole discretion. Failures resulting from misapplication or misuse of the Product, failure to adhere to any specifications or instructions, or failure resulting from neglect, abuse, accidents, or acts of nature are not covered under this warranty.

Warranty service may be obtained by delivering the Product to Sealevel and providing proof of purchase. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to Sealevel, and to use the original shipping container or equivalent. Warranty is valid only for original purchaser and is not transferable.

This warranty applies to Sealevel manufactured Product. Product purchased through Sealevel but manufactured by a third party will retain the original manufacturer's warranty.

## NON-WARRANTY REPAIR/RETEST

Products returned due to damage or misuse and Products retested with no problem found are subject to repair/retest charges. A purchase order or credit card number and authorization must be provided in order to obtain an RMA (Return Merchandise Authorization) number prior to returning Product.

## HOW TO OBTAIN AN RMA (RETURN MERCHANDISE AUTHORIZATION)

If you need to return a product for warranty or non-warranty repair, you must first obtain an RMA number. Please contact Sealevel Systems, Inc. Technical Support for assistance:

Available	Monday – Friday, 8:00AM to 5:00PM EST
Phone	864-843-4343
Email	<a href="mailto:support@sealevel.com">support@sealevel.com</a>

## TRADEMARKS

Sealevel Systems, Incorporated acknowledges that all trademarks referenced in this manual are the service mark, trademark, or registered trademark of the respective company.