SeaI/O User Manual

SeaI/O
Data Acquisition Solutions

SEALEVEL
SYSTEMS INCORPORATED

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Introduction

Sealevel SeaI/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. SeaI/O modules are available in various digital, analog, and serial I/O configurations. Each SeaI/O model is designed for maximum flexibility and easy field wiring.

Ordering options allow connection to the host device via Wireless 802.11b/g, Ethernet, USB, RS-485, or RS-232. Up to 246 expansion modules can be daisy chained together via RS-485 using convenient pass-through connectors.

For easy software integration, application programs or 3rd party software can use the Sealevel SeaMAX™ library or industry standard Modbus TCP (Ethernet & Wireless) and Modbus RTU (RS-232, RS-485, and USB) protocols.

Industry Segments

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

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

Features

- Choice of Connectivity:
    - Wireless (802.11b/g)
    - Ethernet
    - USB
    - RS-485
    - RS-232
- Supports Industry Standard Modbus TCP & RTU Protocols
- Models Offering Choice of:
    - Optically Isolated Inputs
    - Reed Relay Outputs
    - Form C Relay Outputs
    - TTL Interfaces
    - Analog A/D & D/A
- Status Indicator LEDs for Communication, Fault, and Status
- Field Removable Terminal Block Connectors (most models)
- 9-30VDC Power Input
- Power Input via Terminal Block or DC Jack
- Daisy Chain up to 247 Modules
- Extended Temperature Range Available (-40°C to +85°C)
- Rugged Metal Enclosure
- Compact Size – 7.5"(L) x 5.1"(W) x 1.3"(H)
- Din Rail or Table Mount

This manual covers the installation and operation of these SeaI/O products:

Wireless 802.11b & 802.11g
SeaI/O-410W – 16 Optically Isolated Inputs/16 Reed Relay Outputs
SeaI/O-420W – 16 Optically Isolated Inputs/8 Form C Outputs
SeaI/O-430W – 32 Optically Isolated Inputs
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SeaI/O-450W – 16 Form C Relay Outputs
SeaI/O-462W – 96 Bit TTL I/O (DB-78)
SeaI/O-463W – 96 Bit TTL I/O (50-Pin IDC)
SeaI/O-470W – 8 Inputs/8 Outputs/2 D/A & 16 A/D
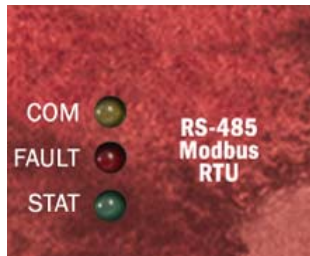SeaI/O-520W – 8 Optically Isolated Inputs/8 High-Current Form C Outputs

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SeaI/O-463N – 96 Bit TTL I/O (50-Pin IDC)
SeaI/O-470N – 8 Inputs/8 Outputs/2 D/A & 16 A/D
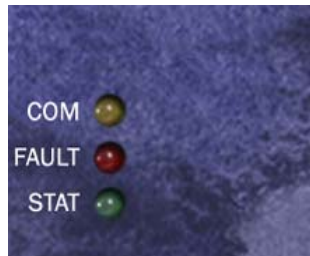SeaI/O-520N – 8 Optically Isolated Inputs/8 High-Current Form C Outputs

Before You Get Started

What's Included

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

- SeaI/O Data Acquisition Module
- Sealevel SeaMAX Software CD
- Accessories (Model Dependent)

NOTE:	Depending on the interface type, your SeaI/O module may include additional accessories. Included accessories are listed below.
	Additional useful items can be found in the **Accessories** section of this manual.

Included Communications and Expansion Accessories

SeaI/O modules are shipped with the following accessories:

W-Series (Wireless)	Item# **930-033-R** – Wireless antenna
E-Series (Ethernet)	Item# **CA246** – 1 x 7' straight through Ethernet cable, for connection to a network hub or switch (BLUE).
	Item# **CA251** – 1 x 7' crossover cable, for direct connection to a host computer's Ethernet port (YELLOW).
	DO NOT connect the yellow crossover cable to the RJ45 RS-485 pass-through connectors on the left side of the SeaI/O module!
U-Series (USB)	Item# **CA356** – 6' Type A to SeaLATCH Type B USB cable.
M-Series (RS-485)	No cable is included. Use twisted-pair wiring connected to RS-485 signals via screw terminals on left side of SeaI/O module.
S-Series (RS-232)	Item# **KT119** – RS-232 DB9/RJ45 Kit, includes a DB9F to RJ45 adapter with RS-232 pinout (Item# **DB109**) and a 7' CAT5 patch cable (Item# **CA246**) for connecting SeaI/O modules to both Sealevel and standard RS-232 serial ports.
N-Series (Expansion)	**KT122** – Expansion & Strap Kit, includes 5" CAT5 RS-485 interconnect cable, four metal straps, and four #4-40 metal screws, for connecting two or more SeaI/O modules together in a "stack".
All Models	Each SeaI/O unit is shipped with 4 adhesive rubber feet that can be attached to the bottom of the enclosure to enhance stability in table mount applications.

SeaI/O Hardware Description

SeaI/O Base and Expansion Modules

Base Modules connect to the host via one of the following interfaces:

■ W-Series – Wireless Modbus TCP
■ E-Series - Ethernet Modbus TCP
■ U-Series - USB Modbus RTU
■ M-Series - RS-485 Modbus RTU
■ S-Series - RS-232 Modbus RTU

After the Base unit is installed, up to 246 additional SeaI/O **N-Series Expansion Units** can be added to create an I/O network. These expansion modules interface via RS-485 and can be located local to the Base SeaI/O device or remotely located up to 4000 feet away. Local installations should use the 5" CAT5 RS-485 pass-through cable (Item number CA239) shipped with each N-series module to connect. Remote expansion modules should use RS-485 twisted pair wiring from the Base unit connected via the removable screw terminal connector.

For local installations power to the expansion modules is supplied from the Base unit via the pass-through connectors. For remote devices, separate power is required at each expansion unit. Refer to the **Power Options** section of this manual for more information on SeaI/O power requirements and power supply sizing.

Seal/O Module Common Features

All SeaI/O modules include the same connectors and configuration options on the side of the unit:
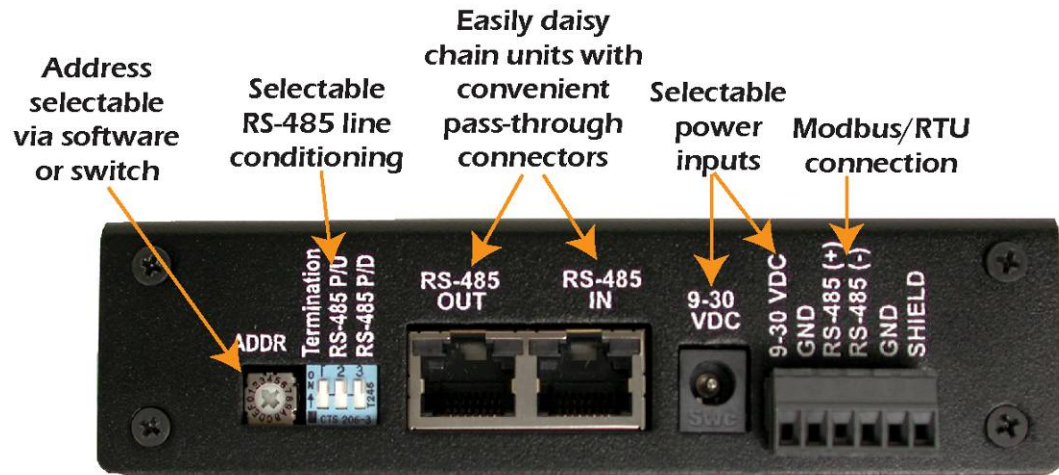
NOTE: ⚠️	**RS-485** networks should have termination enabled on each end of the network. Pull-up and pull-down resistors should also be enabled on the last device on the network.	
	The 9-30VDC input barrel connector is center positive.	

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

- Communication (Yellow) – Blinks when data is transmitted

- Fault (Red) – Lights when there is a problem with the device

- Status (Green) – See **Device Address Configuration** section of this manual

  o Blinks when the rotary "ADDR" switch is set to "0" and the default Slave ID is set to 247

  o Lights steady when module is properly configured from the factory defaults
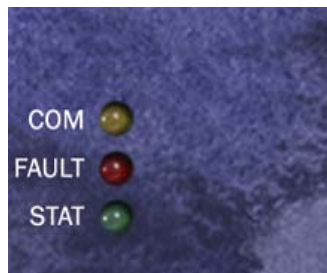
Seal/O Configurations & Specifications

410 Series – 16 Optically Isolated Inputs/16 Reed Relay Outputs

SeaI/O-410 modules provide 16 optically isolated inputs and 16 Reed relay outputs. Inputs can range from 5-30VDC, while the Reed relays provide long life switch closures that are well suited for low current applications. Inputs and outputs are grouped into four-bit segments. Each group shares a common for easy wiring via removable 3.5mm terminal blocks.

Ethernet Interface Shown

Inputs

Type:	16 non-polarized optically isolated inputs
Voltage Range:	5-30VDC
Isolation:	300V
Input Resistance:	6.2K Ohms in series
Response Time:	4 microseconds

Outputs

Type:	16 SPST Form A Reed relays
Power:	10VA max.
Contact Voltage:	60VDC max.
Contact Current:	500mA max.
Operate Time:	0.5ms max.
Bounce Time:	0.5ms max.
Release Time:	0.2ms max.

420 Series – 16 Optically Isolated Inputs/8 Form C Outputs

The SeaI/O-420 provides 16 optically isolated inputs and 8 SPDT Form C relay outputs. Inputs can range from 5-30VDC and provide 300V isolation to ground. Each output offers normally open and normally closed contact connections via 3.5mm field removable terminal blocks.

USB Interface Shown

Inputs

Type:	16 non-polarized optically isolated inputs
Voltage Range:	5-30VDC
Isolation:	300V
Input Resistance:	6.2K Ohms in series
Response Time:	4 microseconds

Outputs

Type:	8 SPDT Form C relays
Power:	DC 30W/ AC 60 VA
Contact Voltage:	60VDC max.
Contact Current:	2A max.
Operate Time:	2ms max.
Bounce Time:	7ms max.
Release Time:	1ms max.

430 Series – 32 Optically Isolated Inputs

SeaI/O-430 modules provide 32 optically isolated inputs with 300V external isolation and high channel-to-channel isolation. Ideal for low voltage monitoring applications, connection to real world signals is made via convenient 3.5mm field removable screw terminal connectors.

RS-232 Interface Shown

Inputs

Type:	32 non-polarized optically isolated inputs
Voltage Range:	5-30VDC
Isolation:	300V
Input Resistance:	6.2K Ohms in series
Response Time:	4 microseconds

440 Series – 32 Reed Relay Outputs

The SeaI/O-440 provides 32 SPST Form A dry-contact Reed relays. Reed relays offer long life performance and fast response time. Convenient removable 3.5mm screw terminal blocks compatible with 14-22 AWG wiring allow reliable connection to real world I/O.

RS-485 Interface Shown

Outputs

Type:	32 SPST Form A Reed relays
Power:	10VA max.
Contact Voltage:	60VDC max.
Contact Current:	500mA max.
Operate Time:	0.5ms max.
Bounce Time:	0.5ms max.
Release Time:	0.2ms max.

450 Series – 16 Form C Relay Outputs

Control a variety of low voltage, low current devices with the SeaI/O-450. The module's 16 channels of highly reliable SPDT Form C relay outputs are rated for up to 60VDC @ 2A. Each output offers normally-open and normally-closed contact connections via 3.5mm field removable terminal blocks.

Ethernet Interface Shown

Outputs

Type:	16 SPDT Form C relays
Power:	DC 30W/ AC 60 VA
Contact Voltage:	60VDC max.
Contact Current:	2A max.
Operate Time:	2ms max.
Bounce Time:	7ms max.
Release Time:	1ms max.

462 Series – 96 Channel TTL DB-78

Perfect for driving industry-standard solid-state relay (SSR) racks, the SeaI/O-462 provides 96 bits of buffered drive TTL I/O. Each DB-78 connector brings out 48 I/O bits addressable as six, eight-bit ports. For easy connection to relay racks, Sealevel offers a six-foot cable (Item# CA237) that terminates each DB-78 connector to two industry standard 50-pin IDC connectors. Order part number 462x-KT and receive two CA237 cables with each unit.

The SeaI/O-462 uses 74ABT245 octal bi-directional transceivers to provide TTL input/output capabilities and can sink 64mA and source 32mA. Each bit is pulled to +5V through a 10K ohm pull-up resistor to insure each bit is at a known state when not driven.

Expansion Interface Shown

Power Requirements

Max Output Power: +5VDC @ 1A (5W)

Inputs

Logic High: Max 0.8VDC
Logic Low: Min 2VDC

Outputs *

Logic High: Max 0.5VDC @ 64mA
Logic Low: Min 2VDC @ 32mA

NOTE: The SeaI/O-462 modules are designed to work with industry standard solid-state relay racks that expect negative logic to operate. The SeaI/O-462 modules expect negative logic on the inputs.


Seal/O-462 Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing the SeaI/O-462 to real-world signals. All items can be purchased from our website (http://www.sealevel.com) or by calling 864-843-4343.

For high-current, high-voltage applications:

■ DB-78 to Dual IDC 50 Pin Ribbon Cable (Item Number **CA237**)
   – 60" cable connects each SeaI/O-462's DB-78 connectors to solid-state relay racks equipped with 50-pin header interface.

■ Solid-State Relay Racks:
   • Quad six position relay rack (Part Number **PB24HQ**)
      – Relay rack can accept up to six QSSRs for a total of 24 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.

   • Quad four position relay rack (Part Number **PB16HQ**)
      – Relay rack can accept up to four QSSRs for a total of 16 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.

■ Quad Solid-State Relay Modules:
   • AC Input (Part Number **IA5Q**) – Provides 4 channels of discrete I/O interface to monitor AC inputs up to 140V @ 10mA.
   • DC Input (Part Number **IB5Q**) – Provides 4 channels of discrete I/O interface to monitor DC inputs from 3.3V to 32V.
   • AC Output (Part Number **OA5Q**) – Provides 4 channels of discrete I/O interface to control AC outputs up to 140V @ 3A.
   • DC Output (Part Number **OB5Q**) – Provides 4 channels of discrete I/O interface to control DC outputs up to 60V @ 3A.

■ Simulation/debug module (Part Number TA01)
   – Module simulates the operation and load characteristics of a standard 24-channel relay rack. An LED corresponding to each port bit illuminates to indicate state. Eight position DIP-switches are used to generate input status changes.

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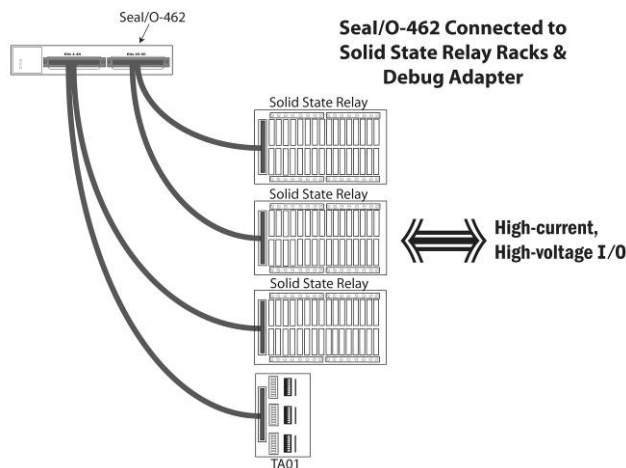
463 Series – 96 Channel TTL 50-Pin

The SeaI/O-463 offers 96 bits of buffered drive TTL I/O via four internal industry-standard 50-pin header connectors. The interface module addresses the 96 channels of I/O as 12 eight-bit ports, each programmable as input or output. Using standard 50-pin IDC ribbon cables, connect up to four industry standard relay racks for PC based control and automation of equipment including sensors, switches, security control systems, and other industrial automation systems. A metal strain relief bracket is included to secure the cables after installation.

The SeaI/O-463 uses 74ABT245 octal bi-directional transceivers to provide TTL input/output capabilities and can sink 64mA and source 32mA. Each bit is pulled to +5V through a 10K ohm pull-up resistor to insure each bit is at a known state when not driven.

Expansion Interface Shown

Power Requirements
Max Output Power: +5VDC @ 1A (5W)

Inputs
Logic High: Max 0.8VDC
Logic Low: Min 2VDC

Outputs *
Logic High: Max 0.5VDC @ 64mA
Logic Low: Min 2VDC @ 32mA

| NOTE:	The SeaI/O-463 modules are designed to work with industry standard solid-state relay racks that expect negative logic to operate. The SeaI/O-463 modules expect negative logic on the inputs.

Seal/O-463 Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing the SeaI/O-463 to real-world signals. All items can be purchased from our website (http://www.sealevel.com) or by calling 864-843-4343.

For TTL applications:

■ Terminal Block Kit - (Item# **KT107**)
  – Kit includes the TB07 screw terminal block and CA167 ribbon cable for connecting one of the SeaI/O-463's 50-pin header connectors to your I/O. 6" Snap track and DIN rail clips are included for DIN rail mounting.

■ IDC 50 to IDC 50 Pin 40" Ribbon Cable (Item# **CA167**)
  – Interfaces each of the SeaI/O-463's 50-pin header connectors.

■ Simulation/debug module (Item# **TA01**)
  – Module allows monitoring status of output pins and controlling state of input pins. An LED corresponding to each port bit illuminates to indicate state. Eight position DIP-switches are used to generate input status changes.
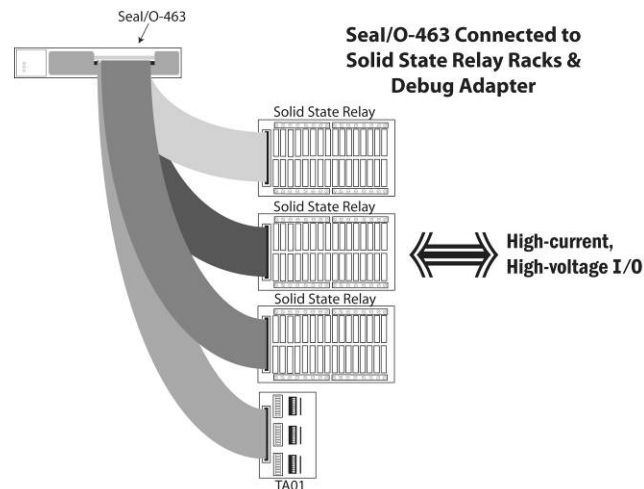
For high-current, high-voltage applications:

- IDC 50 to IDC 50 Pin Ribbon Cable (Item# **CA167**)
  - 40" cable connects the SeaI/O-463 to solid-state relay racks equipped with 50-pin header interface.

- IDC 50 to IDC 50 Pin Ribbon Cable (Item# **CA135**)
  - 40" cable connects the SeaI/O-463 to solid-state relay racks equipped with 50-pin edge connector.

- Solid-State Relay Racks:
  - Quad six position relay rack (Item# **PB24HQ**)
    - Relay rack can accept up to six QSSRs for a total of 24 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.
  - Quad four position relay rack (Item# **PB16HQ**)
    - Relay rack can accept up to four QSSRs for a total of 16 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.

- Quad Solid-State Relay Modules:
  - AC Input (Item# **IA5Q**) – Provides 4 channels of discrete I/O interface to monitor AC inputs up to 140V @ 10mA.
  - DC Input (Item# **IB5Q**) – Provides 4 channels of discrete I/O interface to monitor DC inputs from 3.3V to 32V.
  - AC Output (Item# **OA5Q**) – Provides 4 channels of discrete I/O interface to control AC outputs up to 140V @ 3A.
  - DC Output (Item# **OB5Q**) – Provides 4 channels of discrete I/O interface to control DC outputs up to 60V @ 3A.

- Simulation/debug module (Item# **TA01**)
  - Module simulates the operation and load characteristics of a standard 24-channel relay rack. An LED corresponding to each port bit illuminates to indicate state. Eight position DIP-switches are used to generate input status changes.

Seal/O-463

**Seal/O-463 Connected to
Terminal Blocks & Debug Adapter**

TB07

TB07

⟸⟹ TTL I/O

TB07

TA01
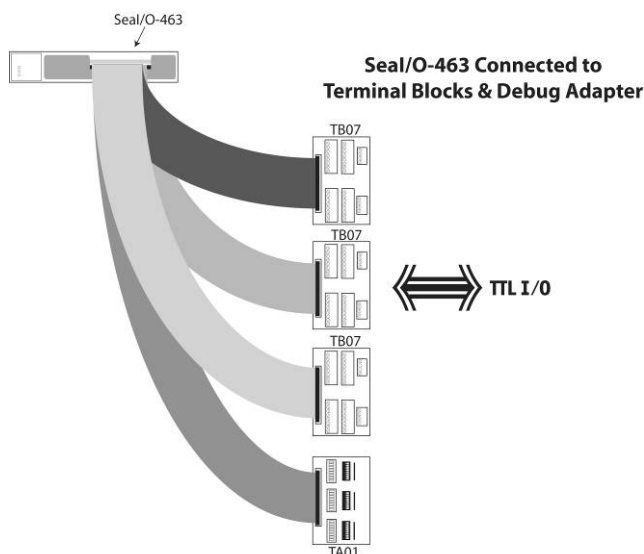
470 Series – 16 A/D, 2 D/A, 8 24V Outputs, 8 Isolated Inputs

Designed using the Maxim MAX197 successive approximation-type A/D chip, the SeaI/O-470 provides eight differential or 16 single-ended 12-bit inputs. The A/D inputs can be individually configured for sensing 4-20mA current loop signals. Additionally, the module provides two 12-bit D/A output channels, eight optically isolated inputs, and eight open collector outputs, ideal for driving 24V devices commonly found in industrial environments. Perfect for a variety of data acquisition/control and test & measurement applications, the SeaI/O-470 includes removable screw terminals, which simplify field-wiring connections.

RS-232 Interface Shown

Optically Isolated Inputs
Input Range: 5-30VDC

Open Collector Outputs
Output Voltage: Max. 30VDC
Output Current: Max. 500mA (single output)
Output Current: Max. 580mA (all outputs)

A/D Inputs
Number of Channels: 8 differential or 16 single-ended
Resolution: 12-bits
Sampling Rate: 100K/s

A/D Input Range
Software Selectable: 0-5V, 0-10V, +/-5V, +/-10V
Hardware Selectable: 0-20mA current loop (for 4-20mA devices)

D/A Outputs
Number of Channels: 2 single-ended
Resolution: 12-bits
Output Range: 0-5V, 0-10V
Load Resistance: Min. 2K

520 Series – 8 Optically Isolated Inputs/8 High-Current Form C Outputs

The SeaI/O-520 provides 8 optically isolated inputs and 8 SPDT high-current Form C relay outputs. Inputs can range from 5-30VDC and provide 300V isolation to ground. Each output offers normally open and normally closed contact connections via 3.5mm field removable terminal blocks.

Wireless Interface Shown

Inputs

Type:	8 non-polarized optically isolated inputs
Voltage Range:	5-30VDC
Isolation:	300V
Input Resistance:	6.2K Ohms in series
Response Time:	4 microseconds

Outputs

Type:	8 SPDT High-Current Form C relays
Contact Voltage:	250VAC/60VDC max.
Contact Current (AC):	6A max.
Contact Current (DC):	<30 VDC @5A max. / >30 VDC @500mA max.
Switching Capacity:	5 VDC @ 100mA min.
Operate Time:	10ms max.
Release Time:	10ms max.

Power Options

Base Module Power Connection

Base modules are powered from a 9-30VDC source using either the DC jack or screw terminals on the side of the unit. Sealevel offers several power supply choices to make connection easy (see the **Accessories** chapter at the end of this document).

Seal/O Expansion Power Connection

Each SeaI/O product, including the expansion modules, contains an onboard switching regulator power supply rated for 9-30VDC. For local installations (less than 10' apart), expansion unit power is usually supplied from the Base unit via the pass-through connectors. The number of expansion modules that can be driven from the Base unit depends on the power source and number/type of expansion units. Refer to the chart below for power requirements. For expansion modules mounted remotely (greater than 10' apart), separate power is required at each expansion unit.

Seal/O Max Power Requirements

	W-Series	E-Series	U-Series	M-Series	S-Series	N-Series
SeaI/O-410	3.4W	2.9W	1.7W	1.4W	1.6W	1.4W
SeaI/O-420	4.0W	3.5W	2.3W	2.0W	2.2W	2.0W
SeaI/O-430	2.4W	1.9W	0.7W	0.4W	0.6W	0.4W
SeaI/O-440	4.5W	4.0W	2.8W	2.5W	2.7W	2.5W
SeaI/O-450	5.8W	5.3W	4.1W	3.8W	4.0W	3.8W
SeaI/O-470	3.5W	3.0W	1.8W	1.5W	1.7W	1.5W
SeaI/O-520	5.5W	5.0W	3.8W	3.5W	3.7W	3.5W

TTL Power Requirements

	W-Series	E-Series	U-Series	M-Series	S-Series	N-Series
SeaI/O-462	2.5W	2.0W	0.8W	0.5W	0.7W	0.5W
SeaI/O-463	2.5W	2.0W	0.8W	0.5W	0.7W	0.5W

Sample Power Calculation

A typical application for SeaI/O products would use one Base module and several N-series units in a local expansion configuration. In this arrangement, with power applied to the Base module through either the DC jack or screw terminal connector and passed-through to the expansion units, attention should be given to ensure the input power to the Base module is adequate.

Example:

		Power (W)
Base Unit:	SeaI/O-430U	0.7
Expansion 1:	SeaI/O-410N	1.4
Expansion 2:	SeaI/O-440N	2.5
		4.6W Power Required

In this application, the Sealevel Item# **TR112** "wall wart" power supply is a good choice since it is low-cost and supplies 24VDC @ 250mA (6W).

NOTE:	A complete listing of recommended power supplies is provided in the **Accessories** section of this manual.

SeaMAX Application Suite

SeaMAX Overview

The SeaMAX Suite is a collection of software libraries, and configuration and diagnostic utilities that facilitates rapid application development. The following libraries and utilities are included in the SeaMAX Suite and are covered in this chapter:

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

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 SeaMAX → Documentation.

Additional SeaMAX documentation is available online that completely details the functions of the SeaMAX API. Example code is included for several popular languages and compilers. The interactive online documentation is located on the Sealevel website at:

http://www.sealevel.com/software/SeaMAX/

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

Phone: (864) 843-4343

Email: support@sealevel.com.

NOTE:	This chapter covers all SeaMAX supported devices. Not all features are applicable to all devices.

Communicating Via Modbus

Sealevel SeaI/O and SeaDAC modules are designed to integrate seamlessly into existing Modbus networks. The supported command set will vary depending on the SeaI/O model number used. Specialized diagnostic commands and other RTU specific codes are not supported. An overview of the Modbus specification for both RTU and 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

NOTE:	
⚠️	SeaDAC Lite modules do not currently support Modbus commands.

SeaMAX Software Installation

Proceed with installing the **SeaMAX Software Suite** using the software CD that was included with your Sealevel I/O module. Software drivers are also available on the product webpage on the Sealevel website at www.sealevel.com.

Windows 2000/XP/Vista™ Operating Systems

NOTE:	**Important!** Do not connect the I/O module to the host until the software is installed.

1. Start Windows.

2. Insert the Sealevel Software CD in to your CD drive.

3. If 'Auto-Start' is enabled the installation window will automatically appear. Otherwise, navigate to the root directory of your CD drive and double-click the 'autorun.exe' application to launch the installation window.

4. Select 'Install Software'.

5. Select the Part Number for your device from the listing.

6. The setup file will automatically detect the operating environment and install the proper components. Follow the information presented on the installation screens that follow.

7. A screen may appear with the declaration: "The publisher cannot be determined due to the problems below: Authenticode signature not found." Please select the 'Yes' button and proceed with the installation. This declaration simply means that the Operating System is not aware of the driver being loaded. It will not cause any harm to your system.

8. During setup, you may specify installation directories and other preferred configurations. This program also adds entries to the system registry that are necessary for specifying the operating parameters for each driver. An uninstall option is included to remove the driver and all registry/INI file entries from your system.

9. Proceed with configuring your Sealevel I/O module using the MaxSSD utility detailed on the following pages.

| NOTE:	If you are using a Wireless (W-series) or Ethernet (E-series) SeaI/O module, skip ahead to either the **Configuring a Wireless Module** or **Configuring an Ethernet Module** sections of this manual, before using MaxSSD.

MaxSSD Configuration & Diagnostics Utility

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

Host PC Configuration Tab

The first time you run the MaxSSD utility (Start → All Programs → Sealevel SeaMAX → MaxSSD) 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), Ethernet (for Ethernet SeaI/O modules), or SeaDAC Lite (USB).

USB connected SeaI/O and SeaDAC modules are installed as virtual COM ports. Using device manager, expand "Ports (COM & LPT)" by clicking on the '+' next to the category, and locate the COM port for your device and use it in the dropdown box in MaxSSD.
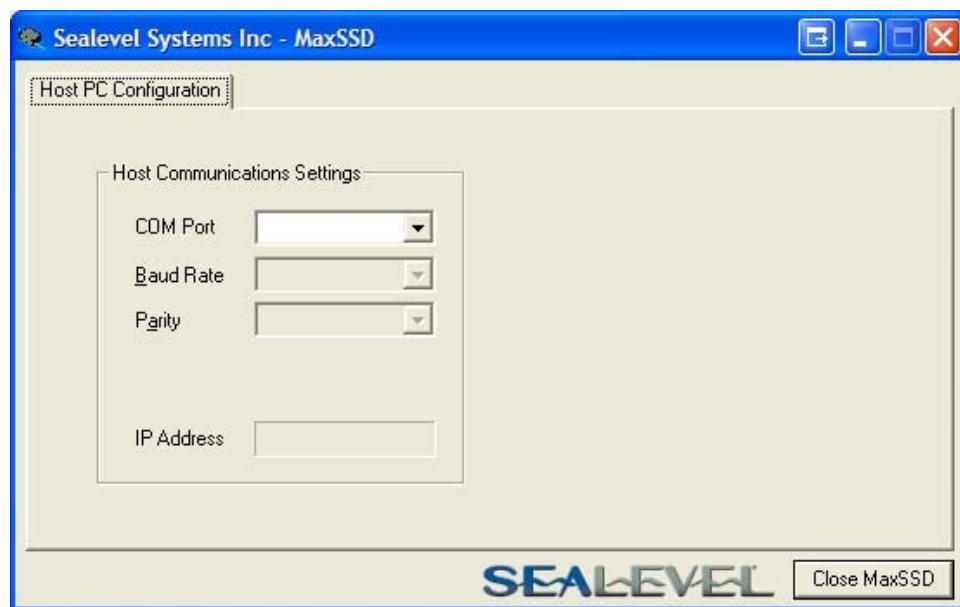

Once a COM port is selected, the baud rate and parity can be selected.

NOTE:	The baud rate and parity of the PC **must** match the settings of the Sealevel I/O module to be configured. The factory default settings for all Sealevel I/O modules are 9600 baud and no parity.

Host PC Configuration Tab (continued)

To communicate with a SeaDAC Lite module, select "SeaDAC Lite" from the "COM Port" dropdown box. MAXSSD will search for any SeaDAC Lite modules connected to a USB port and display them in a frame (as shown below). A new "Digital I/O" tab will appear. If more than one SeaDAC Lite module is connected, select the one you want to test from the list and click the "Digital I/O tab". You can use this new tab to test the functionality of inputs and relay outputs. The "Digital I/O" tab is covered in detail on subsequent pages.
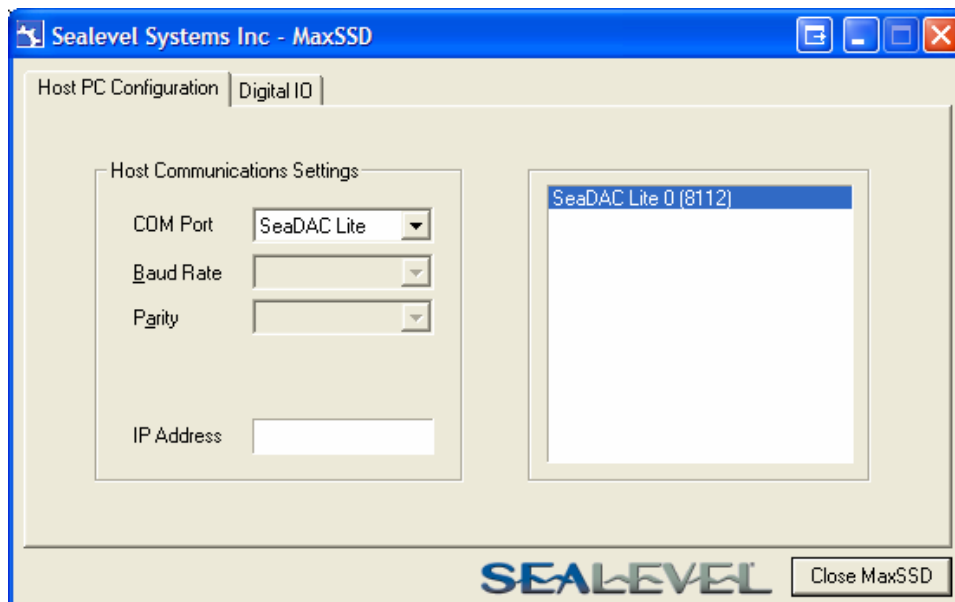
To communicate with a SeaI/O Ethernet or Wireless 802.11b/g module, select "ETHERNET" from the "COM Port" dropdown box. When Ethernet is selected, MaxSSD searches for any SeaI/O Ethernet or Wireless modules on the network and displays their IP addresses in the "Available Ethernet Devices" list box (not shown). When an IP address is selected from the list box, a socket is opened to the SeaI/O module and it is ready for communication.

> **NOTE:** If no IP address is shown when using Ethernet modules, 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 "SeaI/O Configuration" tab becomes available. This tab only appears for SeaI/O and SeaDAC modules and will not appear when using SeaDAC Lite modules.

Before communicating with a SeaI/O or SeaDAC module, the configuration utility must determine if there is an I/O module at that slave ID address, and if so, what type of module it is. This is the purpose of the **Get** operation.

To perform a **Get** operation, first select the slave ID to which the module is configured. SeaI/O modules are shipped at hardware setting **0** (labeled "ADDR" on the left side of the module) and slave ID **247** by default. All other slave ID addresses (from 1 to 246) are available. However, each daisy chained SeaI/O module must have a unique slave ID address - no duplicates are allowed.

SeaDAC modules are only available on slave ID **247**, and this number cannot be changed. To communicate with a different SeaDAC module, select a different COM port. Use device manager, if necessary, to locate the proper COM port.
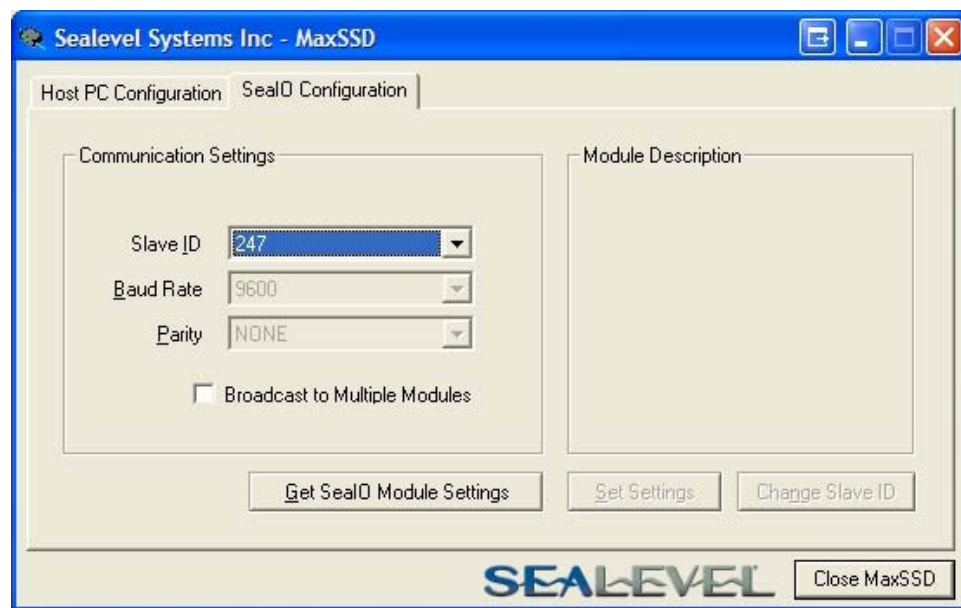
Once a slave ID is selected, click the "Get SeaIO Module Settings" button. After a short delay, the information for that I/O module should be displayed. If no information appears, verify the host settings and baud rates are correct and make changes, if necessary. For SeaDAC modules, make sure the baud rate is set to 9600bps. For SeaI/O modules, check the hardware settings (on the left side of the module) and try again.

Seal/O Configuration Tab (continued)

After the **Get** command is executed, the "Module Description" frame will display the model type, description, interface, and I/O type. In the example shown, the module found at slave ID 247 is a SeaI/O-410 module with an Ethernet (Modbus TCP) interface. The "Set Settings" and "Change Slave ID" buttons will also be enabled for this module.


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

SeaI/O Configuration Tab (continued)

The "Broadcast to Multiple Modules" checkbox, along with the "Set Settings" button can be used to change the baud rate and parity on multiple SeaI/O modules at once. This function only works with SeaI/O modules connected together via the pass-through connectors. This function is disabled with SeaDAC and SeaDAC Lite modules since these devices do not have pass-through connectors.

MaxSSD broadcasts a set data rate and set parity command to all devices on the RS-485 bus, but only those modules listening at the current baud rate will be able to receive and respond. For example, if you have five SeaI/O modules chained together and two are set to 9600 bps and no parity and three are set to 115.2k bps and the PC is set to 9600 bps, only the two modules set to 9600 bps will receive the broadcast set data rate and parity message.
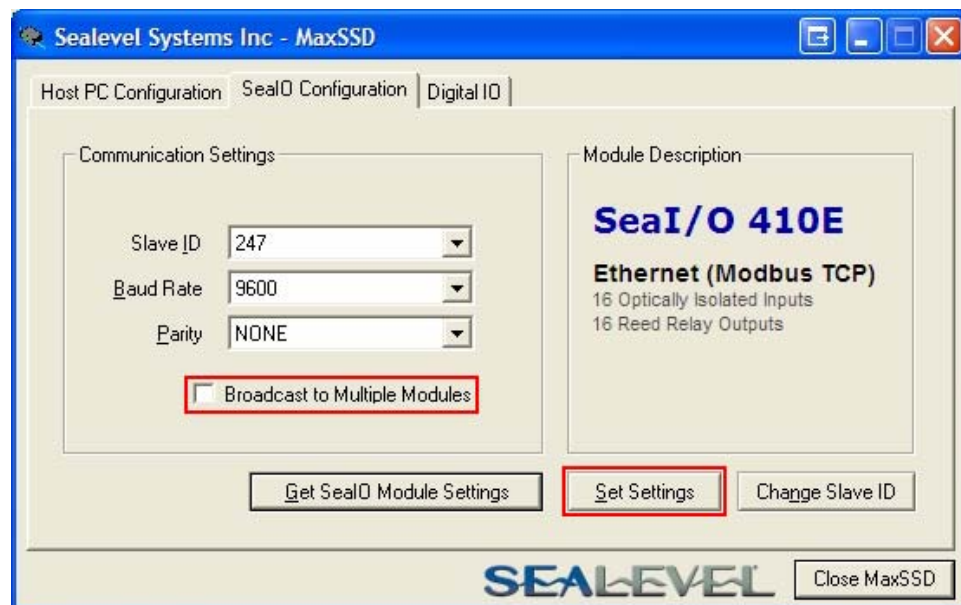
| NOTE:	Important! Ethernet (E-series) and Wireless (W-series) modules
⚠️	The broadcast feature sets the Ethernet SeaI/O (E-series) module's TCP/IP to RS-485 translation data rate independently of the SeaI/O module itself. If you set the data rate to 115.2K bps via a MaxSSD broadcast command, both the RS-485 port and the Ethernet port will respond thereafter to 115.2K bps, as expected. However, if you reset the SeaI/O module, by rotating the rotary switch clockwise one complete revolution, the RS-485 port will reset to 9600 bps and no parity, but the Ethernet port will remain unaffected. To restore communications, broadcast another set data rate and parity command (9600 and no parity) via MaxSSD.

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 displaying SeaI/O or SeaDAC modules (excluding SeaDAC Lite), the "Digital IO" tab displays inputs and outputs in groupings (or banks) of eight. Therefore, a Sealevel I/O device with 16 inputs and 8 outputs would show two banks of inputs and one bank of outputs.

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" window indicates the state of the coil. In the example below, a SeaI/O module with 16 Reed relays is shown.
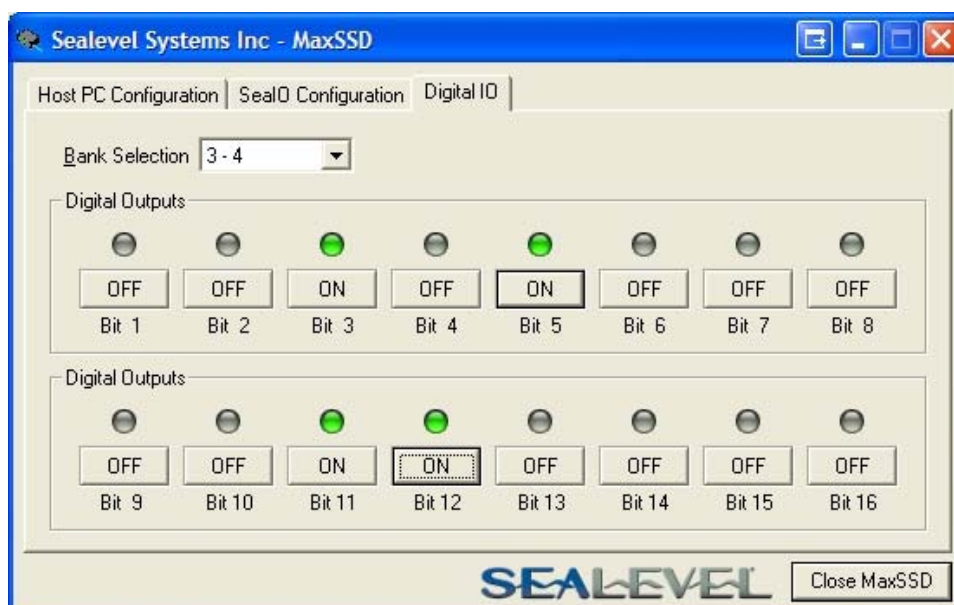
Digital I/O Tab (continued)

When displaying SeaDAC Lite modules, the "Digital IO" tab displays inputs and outputs in groupings (or banks) of four. Therefore, a SeaDAC Lite module with four inputs and four outputs would show only one bank of inputs and one bank of outputs.

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 SeaDAC Lite module is read. The corresponding status LED in the "Digital IO" window indicates the state of the coil. In the example below, a SeaDAC Lite module with four inputs and four Form C relays is shown, with the state of the relays showing either normally-open (NO) or normally-closed (NC).
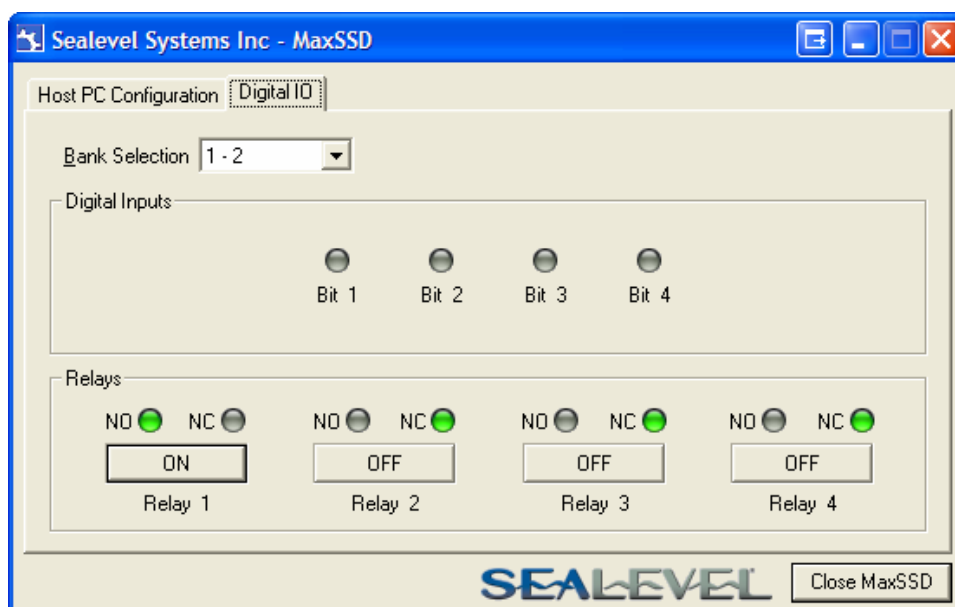

NOTE:	The "SeaI/O Configuration" tab does not appear in MaxSSD when using SeaDAC Lite modules since they have no configurable communication settings.

Programmable I/O Tab

The "Programmable IO" tab of MaxSSD is displayed when using Sealevel I/O devices featuring programmable inputs or outputs. This tab allows for bank configuration, input/output configuration, as well as bit-level presets.
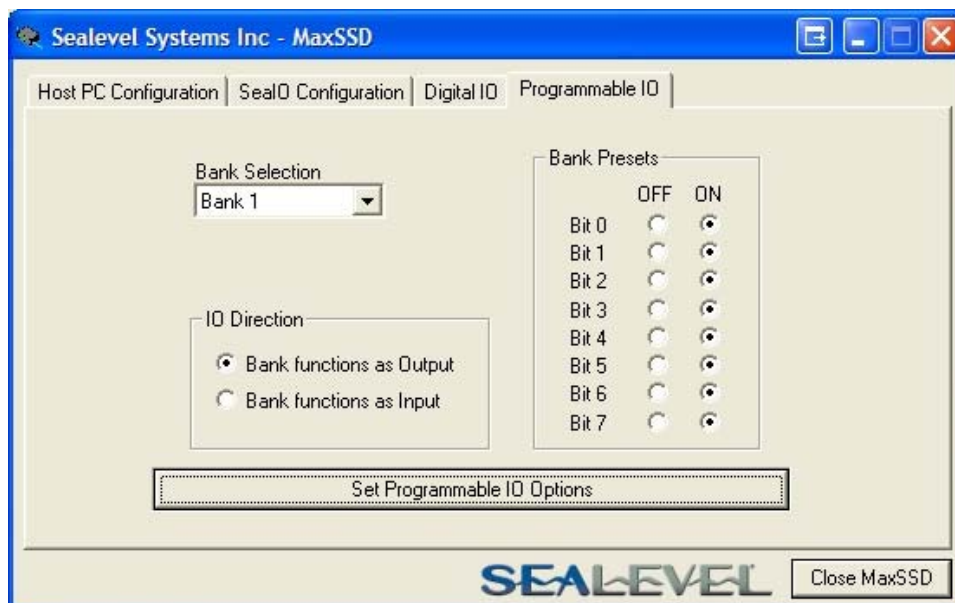
Each bank of programmable I/O can be set as either an 8-bit group of inputs or outputs. By selecting "Bank 1" from the drop-box, clicking the "Bank functions as Input" radio button, and then clicking the "Set Programmable IO Options" button, the first 8 PIO bits on the device will now function as inputs. For ease of configuration, an "All Banks of IO" option is available to configure all of the I/O at one time.

Inputs have no preset mode; therefore, the preset options are disabled for any bank of inputs. Outputs; however, have bit-addressable presets. These presets are used whenever the device is powered up or the bank direction changes from input to output.

NOTE:	The output presets, will not lock the outputs into a specified on or off state. They only set the state of the outputs on a power on or bank direction change.

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.
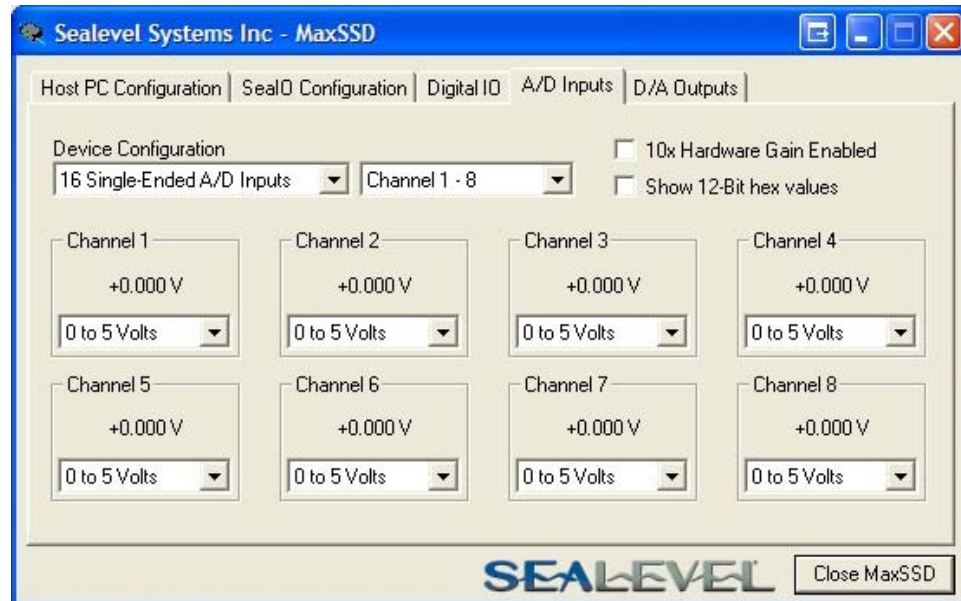
The "Device Configuration" selection drop-box adjusts the arrangement and function of the A/D input channels. Input channels are displayed as banks (groups of eight). Each channel is range configurable via the voltage range dropdown list. Both the channel voltage range and device-wide configuration are 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.

"10x Hardware Gain Enabled" checkbox – Indicates whether or not the onboard hardware gain jumper is currently set. This option is **not** user configurable – it only reflects the status of the onboard hardware jumper settings. Set the hardware jumper to enable this functionality, which allows smaller voltages to be measured more accurately (e.g., a 0-1V input signal can be measured more accurately by enabling the 10x hardware gain jumper and setting the SeaI/O-470 A/D input channel for 0-10V range).

"Show 12-Bit Hex 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)

D/A Outputs Tab

The "D/A Outputs" tab is useful for manually setting the digital to analog output voltages on applicable Sealevel I/O devices with D/A channels. A preliminary diagnostics utility (see following page) has been provided to verify proper hardware functionality.

The D/A outputs of the SeaI/O-470 and SeaDAC 8227 are factory set for 0-10V. To configure the D/A outputs for 0-5V, you will need to open the enclosure and set the correct jumpers. Refer to the **Hardware Configuration** section of this manual for instructions on opening the enclosure and accessing the correct jumpers.

To adjust a particular channel's output voltage, drag the slider until the desired voltage is displayed in the window on the right side. Also, you may type the desired voltage directly into the voltage display and then confirm your entry by pressing the 'Enter' key on your keyboard.
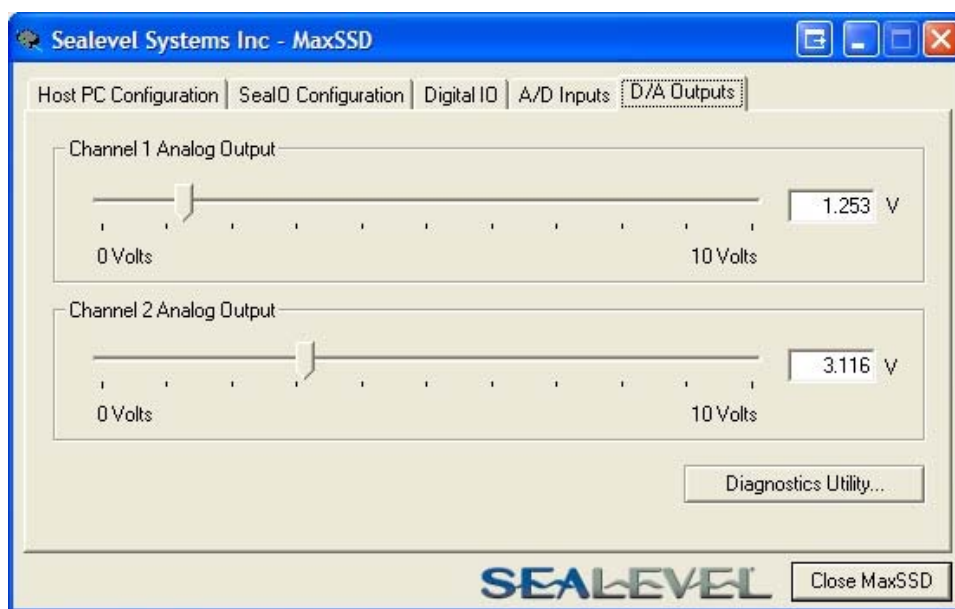

NOTE:	The output voltage will not change until the 'Enter' key is pressed or you have clicked on the window anywhere outside of the text entry field.

A/D & D/A Diagnostics

To check basic functionality of both the A/D and D/A converters, press the "Diagnostics Utility" button on the "D/A Outputs" tab (shown on the previous page) and then press the "Start" button, as shown below. Any errors will be shown in the "Results" pane. If any errors occur, please contact technical support for further help.
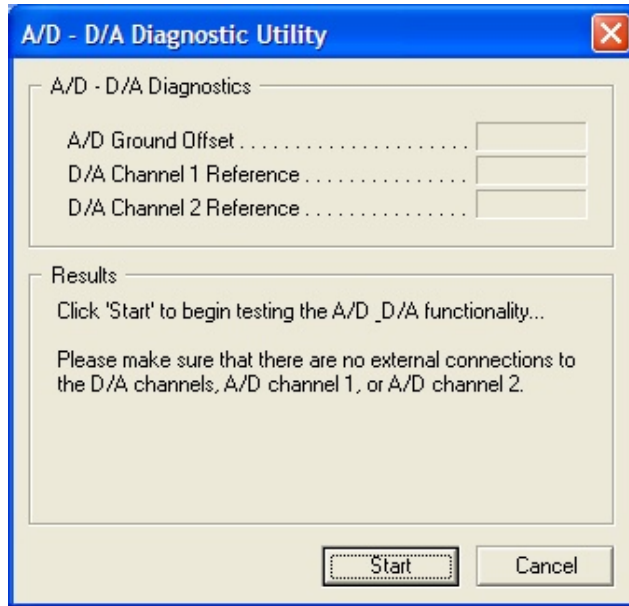
Converting A/D & D/A Values

To properly use the values returned from the SeaI/O-470 and SeaDAC 8227 module's A/D channels, the application program must convert the returned values to engineering units (voltage). Likewise, the application program must output the correct value to the I/O module's D/A outputs to generate the desired 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/

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. **Install SeaMAX software first, before connecting any Sealevel I/O devices**. Installing the software places the necessary files in the proper locations on your system. After installing the software, proceed with adding the hardware.

4. When installing SeaI/O modules, connect them <u>one at a time</u>. The "base" module must be properly configured and communicating successfully with the host before you can add additional expansion modules. Verify that each expansion module can communicate before connecting additional expansion modules.

5. 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).

6. You can use standard network patch cables (straight-through cables) to connect SeaI/O modules together via the pass-through connectors on the left side of the module. Crossover cables should never be used to connect two or more SeaI/O modules together. Crossover cables should **only** be used to connect an Ethernet SeaI/O module to a host without going through an Ethernet hub or switch.

7. On SeaI/O modules, verify that the device address (slave ID) is properly set. Refer to the **Hardware Configuration** section of this manual for instructions on setting the device slave ID.

8. 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 SeaI/O modules.

9. If the SeaI/O modules only sometimes respond to a **Get** operation or return invalid data, you may have termination improperly set. Refer to the **Hardware Configuration** section of this manual for instructions on properly setting line termination and pull-up/pull-down resistors.

10. Refer to the **Troubleshooting Ethernet & Wireless Modules** section on the following page for additional steps regarding Ethernet (E-series) SeaI/O modules.

11. If these steps do not solve your problem, please contact Sealevel Technical Support. Our technical support is free and available from 8:00AM-5PM Eastern Time, Monday through Friday. You can contact Technical Support via:

Phone: (864) 843-4343

Email: support@sealevel.com

Troubleshooting Ethernet & Wireless SeaI/O Modules

Problem: The SeaI/O module starts up with a strange IP address (i.e., 169.254.x.x)

All Ethernet (E-series) and Wireless (W-series) SeaI/O modules are shipped with DHCP enabled. If no DHCP server is available or the DHCP server cannot be reached, Ethernet SeaI/O modules default to a random IP address in the range 169.254.x.x. Wireless SeaI/O modules default to a random IP address in the range 192.168.0.x. Change the PC's network settings to place both the SeaI/O module and PC on the same subnet. Adjust the SeaI/O module's IP address and Netmask using the **Ethernet Config** utility (Start → All Programs → Sealevel SeaMAX → Ethernet Config) installed with SeaMAX. Then restore the PC's network settings.

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

The SeaI/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 SeaI/O module and the PC within the same subnet. Contact your network administrator for assistance.

Problem: The SeaI/O module doesn't show up in Ethernet Config

Ethernet and Wireless SeaI/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 SeaI/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.

Problem: The rotary switch (ADDR) was used to reset an Ethernet (or Wireless) SeaI/O module, but it no longer responds to a 'Get' operation.

If you reset the SeaI/O module by rotating the rotary switch clockwise one full revolution, the RS-485 port will reset to 9600 bps and no parity, but the Ethernet port will remain unaffected.

The broadcast feature in MaxSSD sets the SeaI/O module's TCP/IP to RS-485 translation data rate independently of the SeaI/O module itself. Therefore, if you have an Ethernet or Wireless SeaI/O module and you set the data rate to 115.2K bps via a MaxSSD broadcast command, both the RS-485 port and the Ethernet port will respond thereafter to 115.2K bps, as expected. Using the rotary switch will reset the RS-485 port, but the Ethernet port will still try to communicate at 115.2k bps. To restore communications, broadcast a set data rate and parity command (9600 and no parity) via MaxSSD.

Hardware Configuration

Setting Device Address (Slave ID)

Before configuring SeaI/O modules using MaxSSD, you must first select a device addressing method. Next, you must properly set termination and pull-up/pull-down resistors. Finally, you must configure the SeaI/O modules one at a time before MaxSSD and any subsequent applications (using the SeaMAX API) will be able to successfully communicate.
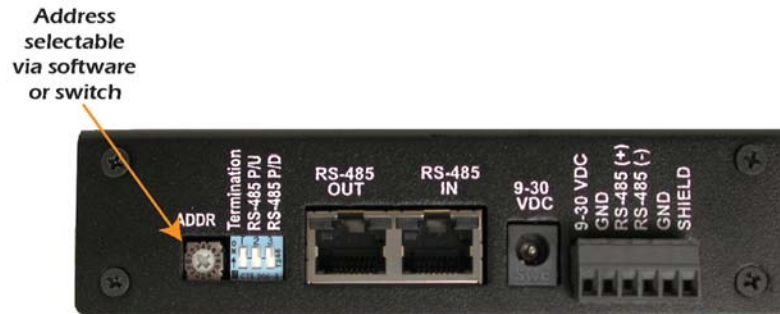
SeaI/O modules have a rotary switch, labeled "ADDR", located on the left side of the device that is used to set the device address (slave ID). The default position for all SeaI/O modules is position "0" (zero). Each SeaI/O module must be set to a unique slave ID in order to properly communicate with the host device, which can be a computer or Modbus device. The slave ID can be set by hardware using the rotary switch, which is recommended for most users. The slave ID can also be set in software by leaving the rotary switch at position "0" and using MaxSSD to set the slave ID. The rotary switch has three functions:

- **Set Address (slave ID) via Hardware** – If the rotary switch is set to a position between "1" and "15" (F). The SeaI/O module will then always respond to commands issued at that slave ID. This is useful when there are fewer than 16 SeaI/O modules in a chain and the slave ID is not required to change. This method is recommended for most users.
- **Set Address (slave ID) via Software** – If the rotary switch is left in the "0" (zero) position, the SeaI/O module uses a default slave ID of 247 for communications. By using MaxSSD (or the SeaMAX libraries), it is possible to set the slave ID to a software address between 1 and 247. This is useful when there are more than 16 SeaI/O modules in a chain, or when the slave ID of a module needs to be frequently changed.
- **Hardware Reset** – If you have an existing SeaI/O module set to an unknown slave ID or baud rate, you may wish to reset the device. If the rotary switch is rotated clockwise one full revolution, the SeaI/O module will be reset to factory defaults (slave ID 247, 9600 bps, and no parity).

NOTE: ⚠️	A Hardware Reset will not reset the communication rate of Ethernet (E-series) and Wireless (E-series) modules. Rotate the rotary switch clockwise one full revolution, and then use the MaxSSD utility to broadcast a set baud rate command to 9600 bps and no parity.

Setting Termination & Pull-Up/Pull-Down Resistors

A "stack" or "chain" of SeaI/O modules, connected via the pass-through connectors or screw terminals on the left side of the enclosure, communicates via an RS-485 bus, which must be properly terminated to work correctly. A set of three dipswitches is located on the left side of enclosure, next to the "ADDR" rotary switch. These switches control line termination and the RS-485 pull-up and pull-down resistors.

The pull-up and pull-down resistors ensure that the input ports are at a known state when not being driven by the RS-485 line. In most cases, all three of the dipswitches on each SeaI/O module should be in the down position, except the two end modules. The first and last SeaI/O modules in the chain should have all three dipswitches in the up (enabled) position.

NOTE: ⚠️	Make sure that only the first and last SeaI/O modules have line termination enabled (up position). Improper termination settings can result in invalid data or communication failures.

Configuring the "Base" SeaI/O Module

Once the **SeaMAX Software Suite** has been installed successfully and you have decided which address (slave ID) method you intend to use, start by connecting the first SeaI/O module to your computer. This will be referred to as the "base" module.

If you are chaining multiple SeaI/O modules together, only one SeaI/O module in the chain can be the "base". All other SeaI/O modules connected to the "base" module are referred to as expansion modules. Multiple "base" modules can be directly connected to a host computer, but expansion modules must be connected (daisy chained) to a "base" module.

NOTE:	If you are configuring an Ethernet (E-series) or Wireless (W-series) SeaI/O module, skip ahead to the **Configuring an Ethernet Module** or **Configuring a Wireless Module** sections for specific information on installing those modules.

For all other SeaI/O modules (U-series, S-series, or M-series), locate the COM port by expanding the 'Ports' list in Windows Device Manager.

Start MaxSSD (Start → All Programs → Sealevel SeaMAX → MaxSSD) and choose the correct port (IP address or COM port) to communicate with the "base" module. Ensure a successful **Get** operation (refer to the **MaxSSD** section on the following pages for more information).

Set the slave ID of the "base" module using the rotary switch or software selection method discussed in the **Setting Device Address** section on the previous pages. This guarantees that any expansion modules connected next will not conflict with the "base" module. Perform another **Get** operation to verify that you can communicate with the "base" module at the new slave ID.

NOTE:	Configure SeaI/O modules one at a time. Set the address to a hardware slave ID other than "0" or a software slave ID other than 247, which avoids device conflicts during setup.

After the "base" module is successfully communicating via MaxSSD, you can proceed with adding SeaI/O expansion modules (N-series) <u>one at a time</u>, as required.

NOTE:	If the "base" module doesn't respond as expected, turn the rotary switch (ADDR) clockwise one full revolution to reset. Configure the PC to communicate at 9600 bps and no parity and then try again.

Configuring N-Series Expansion Modules

Once you have successfully connected and communicated with a "base" module, you can begin adding expansion modules (N-series). Connect a single expansion module to the "base" module via the RJ45 pass-through connectors or screw terminals on the left side of the enclosure. Expansion modules include a convenient 5" interconnect cable (item# CA239) to simplify daisy-chaining SeaI/O modules together. Alternately, you can use standard network patch cables to chain expansion modules to a "base" module.

NOTE:	**CAUTION!** The RJ45 pass-through connectors on the left side of SeaI/O modules are **NOT** Ethernet connectors. **Do not** connect the ports to Ethernet enabled devices else damage to Ethernet devices **WILL** result.

Ensure a successful **Get** operation (refer to the MaxSSD section on the following pages for more information). Set the slave ID of the expansion module using the rotary switch or software selection method discussed in the Setting Device Address section on the preceding pages. Perform another **Get** operation to verify that you can communicate with the expansion module at the new slave ID.

Continue adding expansion modules (N-series) one at a time, until all modules have been successfully daisy-chained together and respond to a **Get** operation in MaxSSD. Once all SeaI/O modules are configured and communicating successfully, they are ready to communicate with your application.

Configuring a Wireless (W-Series) Module

NOTE: ⚠️	This section applies only to Wireless (W-series) SeaI/O modules. For all other SeaI/O modules, refer to the **Configuring a "Base" SeaI/O Module** and **Configuring Expansion Modules** sections on the previous pages.

Start by connecting power to the wireless SeaI/O module. The LEDs will blink to confirm that the unit is powered up and is ready to be configured to work with your wireless network.

The first time you power up the wireless SeaI/O module (and every time it is reset), it will take 20 seconds to "boot up" before it appears on the wireless network.

The wireless SeaI/O module ships in Ad Hoc mode by default and should be immediately visible with SSID of "SL_Recovery" to any computer equipped with a wireless adapter.

Most wireless adapters include a utility that allows you to see the wireless devices on your network. Please refer to the instructions included with your wireless adapter for details on how to locate wireless devices on your network. If the wireless SeaI/O module is not visible, you may need to adjust your security settings until you have successfully configured the wireless SeaI/O module.

Once you have confirmed that the wireless SeaI/O module is visible to your network, you can proceed with configuring the module. Instructions for configuring a SeaI/O module using Windows XP are detailed on the following pages.

SeaI/O Wireless Default Configuration
SSID: SL_Recovery
Topology: Ad Hoc
Security: No Encryption
Channel: [Varies] *

NOTE: ⚠️	* The channel number will increment each time a reset occurs. If you reset the module and can't see it on your wireless network, reset it again to increment the channel number up by one.

To reset the unit to factory defaults and increment the channel, locate the Reset button on the front of the module just above the antenna. Using a small rigid wire (e.g., paperclip), depress and hold the reset button. Power cycle the module by removing the barrel connector or terminal block supplying power to the unit, and then reconnecting the barrel connector or terminal block. Release the reset button and the SeaI/O module will be reset to the factory defaults and the channel number will increment up by one. The LEDs will blink to confirm that the SeaI/O module has been reset and is ready to be configured.

Configuring a Wireless Module (Continued)

Verify that SeaMAX software has been installed successfully and that a wireless SeaI/O module is connected to power and ready to be configured to communicate with your wireless network. This module will become the "base" module.

NOTE: ⚠	To configure a wireless SeaI/O module, you must be using a laptop or desktop computer with a wireless 802.11b/g compatible adapter. The security settings on many wireless access points (WAP) prevent you from seeing Ad Hoc devices by default. Therefore, configuring a wireless SeaI/O module through a Wireless Access Point (WAP) is not supported.

Wireless Configuration Overview

1. Using a wireless enabled computer, connect to the Ad Hoc network "SL_Recovery".

2. Move your wireless adapter to subnet 192.168.0.x.

3. Use the **Ethernet Config** utility to configure the wireless SeaI/O module to work with your wireless network (SSID, topology, channel, and security) settings.

4. Using the same wireless enabled computer, connect to your wireless network.

5. Use the **Ethernet Config** utility to configure the wireless SeaI/O module to use the same subnet as your wireless network.

6. Move your wireless adapter back to your wireless network subnet.

7. Use **MaxSSD** to configure the Slave ID of the wireless SeaI/O module and test settings.

The detailed configuration instructions that follow are for Windows XP. The basic instructions for Windows 2000 are the same. If you have any questions, please contact Sealevel technical support at support@sealevel.com.

Configuring a Wireless Module (Continued)

Start by opening the Windows **Wireless Network Connection** utility, which can be found by clicking the Start button and hovering over My Network Places. Right-click on My Network Places and then select Properties from the menu. You should see a Wireless Network Connection listed in the new window that opens up.

Right-click on your wireless network connection and select 'View Available Wireless Networks' from the menu.

The Wireless Network Connection window opens, as shown below, and you should see the SeaI/O module listed with the SSID "SL_Recovery." If not, reset the module using the instructions on the previous page. Other nearby wireless networks will also be listed here. Select the SSID "SL_Recovery" and click the Connect button.
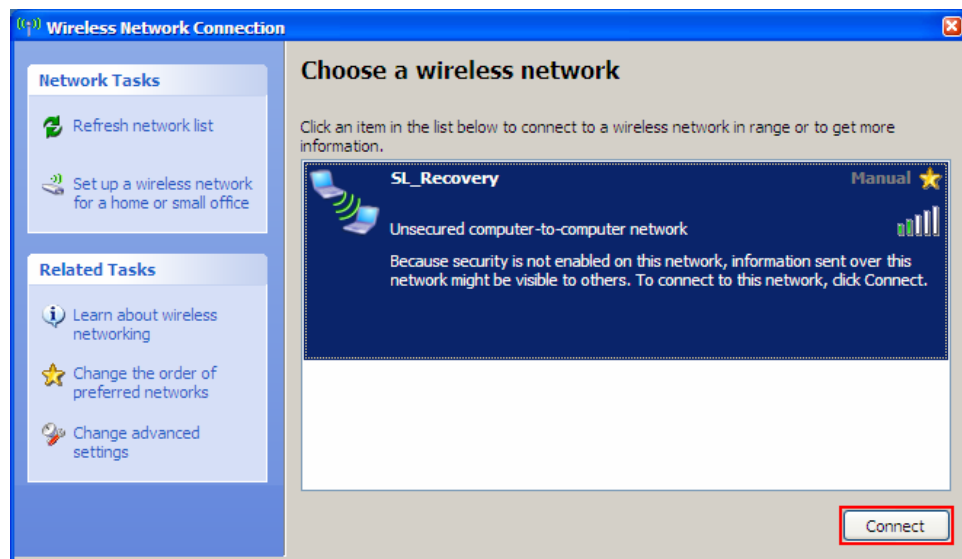
Configuring a Wireless Module (Continued)

The **Wireless Network Connection** window will now display "Limited or no connectivity" next to the "SL_Recovery" network connection. All wireless SeaI/O modules are shipped with DHCP enabled. When you first connect a wireless SeaI/O module to the network, the status LEDs on the front of the module will blink while it searches for a DHCP server.

Since "SL_Recovery" is an Ad hoc point-to-point network and not on the same network as any available DHCP servers, the SeaI/O module will not be able to complete the connection.

Close the **Wireless Network Connection** utility (you will still be directly connected to "SL_Recovery").
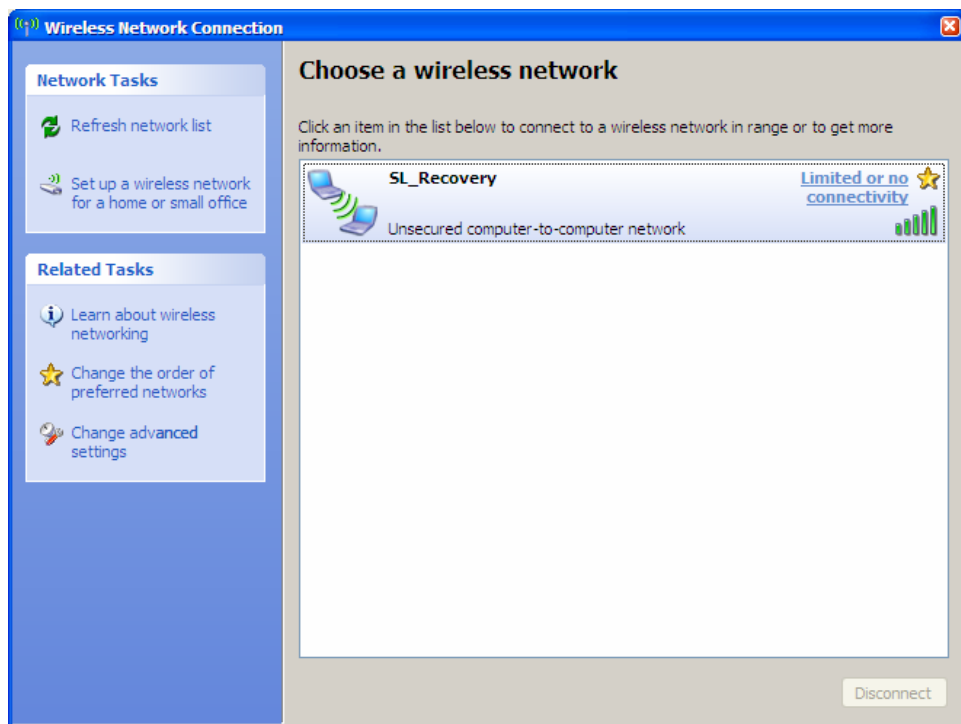
Configuring a Wireless Module (Continued)

Start the **Ethernet Config** utility (Start ➔ All Programs ➔ Sealevel SeaMAX ➔ Ethernet Config) installed with SeaMAX. In the 'Available SeaI/O Devices' pane, you should see a "SeaIO Wireless" module listed under Model, as shown below.

If the module doesn't show up, click the "Search for SeaI/O Devices" button. The 'Available SeaI/O Devices' pane should refresh with any Ethernet or Wireless SeaI/O modules that are found on the network.

At this point, since no DHCP server is available, the wireless SeaI/O module will default to a random IP address in the range 192.168.0.x.
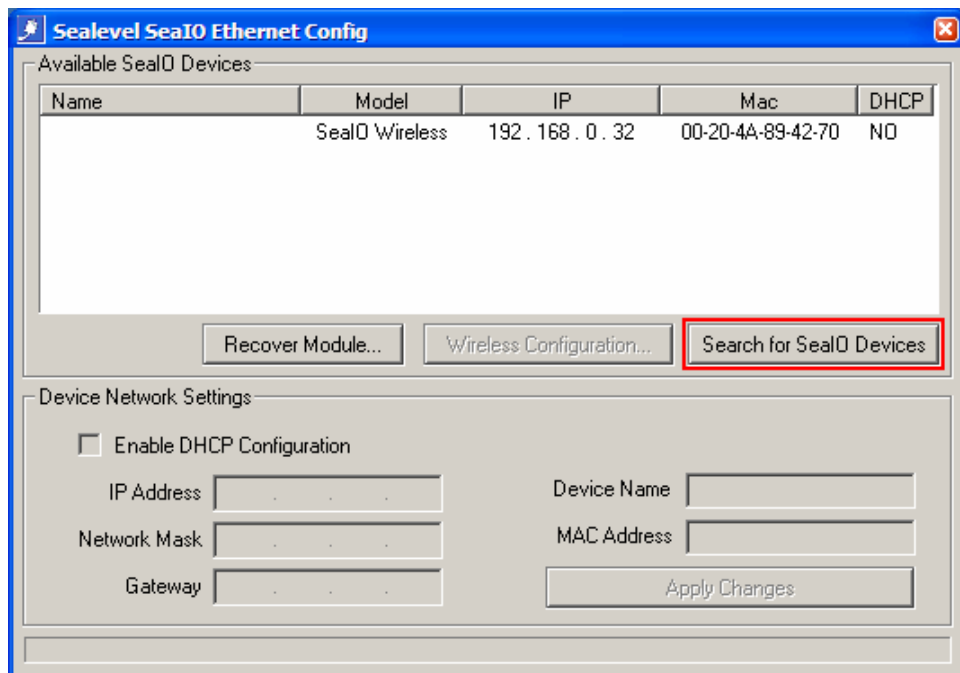
Notice that the 'Name' is not displayed due to the wireless SeaI/O module residing on a different subnet than your wireless adapter. **Ethernet Config** will mask the 'Name' of SeaI/O modules operating on a different subnet than the subnet you are currently using.

Take note of the IP Address of the wireless SeaI/O module listed in the 'Available SeaI/O Devices' pane. You will need this number in order to continue.

Also, make sure that the MAC Address shown matches the MAC Address on the label on the bottom of the wireless SeaI/O module. If the MAC address doesn't match, contact technical support for further assistance.

Close **Ethernet Config** before continuing.

Configuring a Wireless Module (Continued)

You must now change the IP Address of your wireless adapter to match the subnet (first 3 octets) of the wireless SeaI/O module listed in **Ethernet Config**.

You can change your wireless adapter's IP Address by going to the Properties dialog for your wireless adapter (Start → Settings → Network Connections). Right-click on your network adapter and then select Properties from the menu. This opens the **Wireless Network Connection Properties** window.

On the General tab, select 'Internet Protocol (TCP/IP)', leaving the box checked, and then click the Properties button.
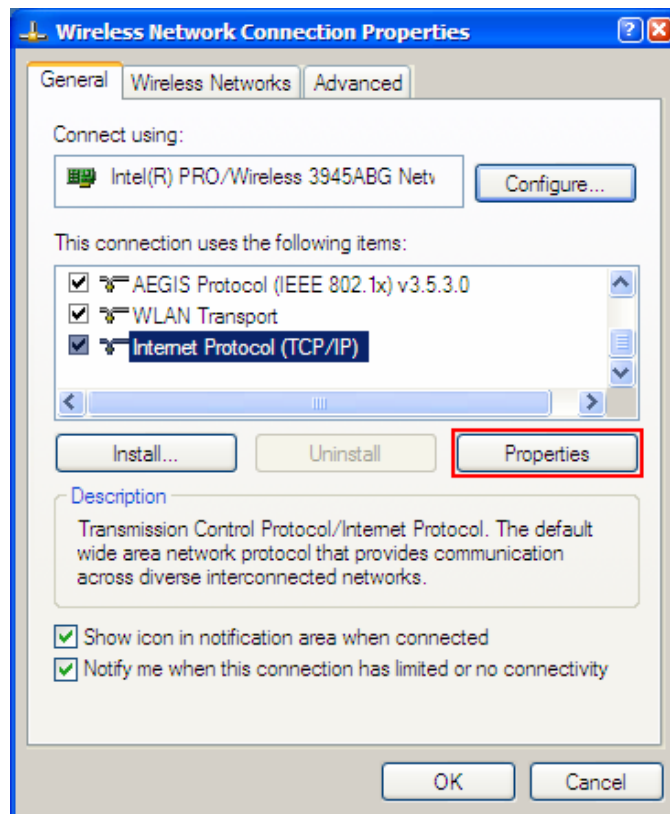
Configuring a Wireless Module (Continued)

NOTE:	Before you change any settings in the following window, make a note of your original settings. You will need to revert back to your original wireless adapter settings once you have successfully configured the wireless SeaI/O module to work with your network.

In the **Internet Protocol (TCP/IP) Properties** window, click the radio button for 'Use the following IP Address'. The first 3 octets of the IP address must match the IP address displayed for the wireless SeaI/O module. The last octet must be different

In this example, the last octet for the wireless SeaI/O module is 32 and we configured the last octet for the wireless adapter to 55. Click the OK button in this window. Click the OK button on the **Wireless Network Connection Properties** window.
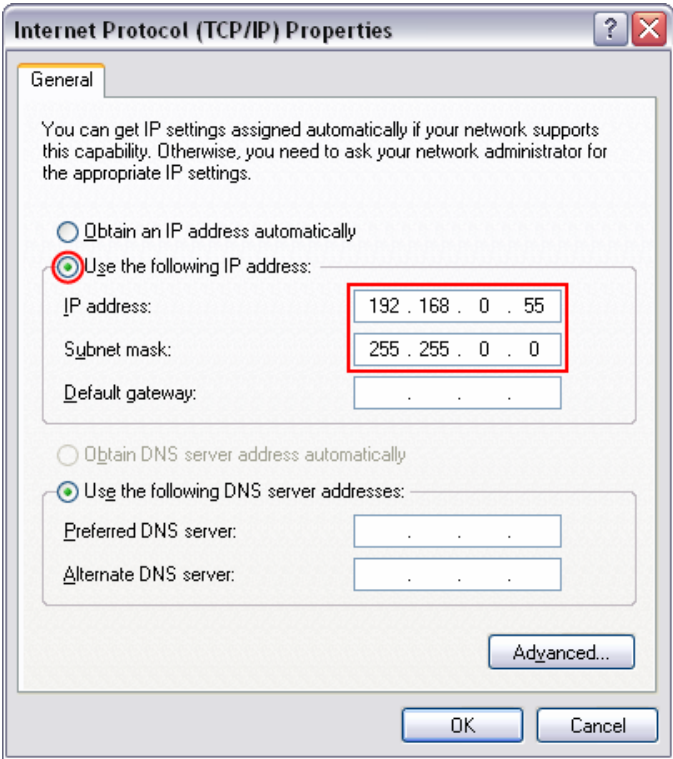
Configuring a Wireless Module (Continued)

To confirm that the IP Address for your wireless adapter was changed successfully, reopen **Ethernet Config** (Start → All Programs → Sealevel SeaMAX → Ethernet Config).

You should now see the wireless SeaI/O module's 'Name' listed ("DemoUnit" in this example). This indicates that your wireless adapter and the wireless SeaI/O module are on the same subnet and you are now able to communicate with the wireless SeaI/O module.

NOTE:	IMPORTANT!
⚠️	Do not make any changes to the 'Device Network Settings' at this point. You must complete the Wireless Configuration first.

Verify that you can communicate with the wireless SeaI/O module by clicking the "Wireless Configuration" button.
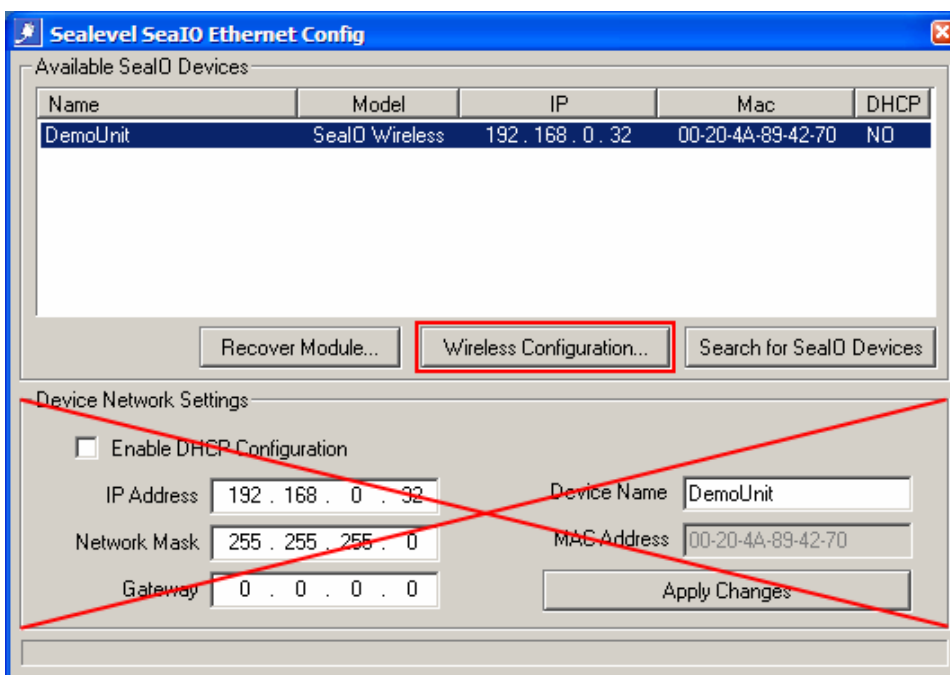
Configuring a Wireless Module (Continued)

Now that you can communicate with the wireless SeaI/O module, the Wireless Configuration settings window will open, as shown.
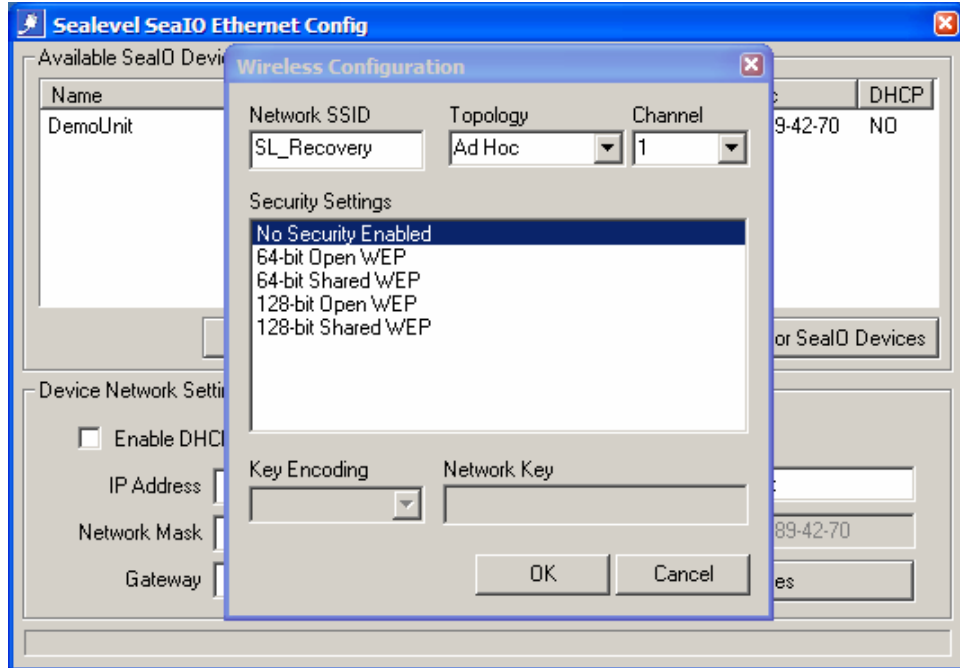
You can now change the Network SSID, Topology, Channel, and Security Settings to match your wireless network. After making your changes and clicking OK, the device will reboot and take 20 seconds to appear on the network using your new settings. If you change the SSID and/or network Topology and/or Channel, you'll have to reconnect to the SeaI/O module. Close **Ethernet Config** for now.

The supported wireless configuration settings are detailed on the following page.

NOTE:	The Network SSID, wireless network channel, and security settings are specific to your wireless network. Consult your IT department if you are unsure of your wireless network settings.

NOTE:	**IMPORTANT!** Once you change the wireless configuration and click the OK button, the wireless SeaI/O module will disappear from the **Ethernet Config** window. The SeaI/O module will now be configured to work with your wireless network, but will likely be on a different subnet. You still need to configure the Device Network Settings before the module will work with your wireless network.

Configuring a Wireless Module (Continued)

The following options are available in the **Wireless Configuration** window:

Wireless Configuration	Default Settings	Available Options
Network SSID	SL_Recovery	Alphanumeric Case Sensitive 32 Characters
Topology	Ad Hoc	Ad Hoc Infrastructure
Channel	[Varies]	1 – 11 (US) 1 – 14 (Europe, Japan)
Security Settings (Ad Hoc Mode)	No Security Enabled	No Security Enabled 64-bit Open WEP 64-bit Shared WEP 128-bit Open WEP 128-bit Shared WEP
Security Settings (Infrastructure Mode)	No Security Enabled	No Security Enabled 64-bit Open WEP 64-bit Shared WEP 128-bit Open WEP 128-bit Shared WEP WPA Encryption w/ TKIP WPA2 Encryption w/ AES
Key Encoding	Passphrase	Passphrase Hexadecimal Key
Network Key	[None]	[See Next Page]

Configuring a Wireless Module (Continued)

This information explains the various configuration options available. Continue with the wireless SeaI/O configuration on the following page.

The Network **SSID** (Service Set Identifier) is the name of the wireless network. The SSID can be up to 32 alphanumeric characters and is case-sensitive. If you are using the wireless SeaI/O module with a wireless access point (WAP), then the SSID names must match.

The network **Topology** defaults to Ad Hoc mode and supports Infrastructure mode. Ad Hoc mode is a point-to-point method used to communicate with other wireless network clients, including laptop computers and desktop computers using a wireless adapter. If you are using a WAP, select Infrastructure mode.

The network **Channel** will vary depending on the number of times the wireless SeaI/O module is reset. Every time the wireless SeaI/O module is reset, the channel will increment up by one. Since the wireless SeaI/O module supports channels 1-14, there is a chance that a reset can put the wireless SeaI/O module on a channel not compatible with your wireless adapter or access point. If you cannot see the wireless SeaI/O module on your network, try resetting the module using the steps described at the beginning of this section. Depending on the country used, it may take several reset cycles to get the unit back to a channel valid for your region. Use the **Wireless Configuration** window to change channels, if possible.

The **Key Encoding** method can be either a Passphrase or a Hexadecimal Key, if using a WEP variant. If you are using a WPA variant, then the Key Encoding method is Passphrase.

Different security encryption methods require different Network Key types and lengths. The different key types and lengths are displayed below:

|	
WEP 64-bit	10 character hexadecimal key or up to 32 character passphrase
WEP 128-bit	26 character hexadecimal key or up to 32 character passphrase
WPA	up to 64 character passphrase
WPA2	up to 64 character passphrase

Configuring a Wireless Module (Continued)

Open the **Wireless Network Connection** utility again (Start → right-click on My Network Places → select Properties from the menu. In the next window, right-click on your wireless network connection → select 'View Available Wireless Networks' from the menu).

Select the SSID for your wireless network and click the "Connect" button. The wireless SeaI/O module will no longer be visible since you configured it to work with your wireless network in the previous step. You still need to configure the 'Device Network Settings' in **Ethernet Config** to complete the configuration of the wireless SeaI/O module.

Open **Ethernet Config** (Start → All Programs → Sealevel SeaMAX → Ethernet Config). The wireless SeaI/O module should appear in the 'Available SeaI/O Devices' pane. Click on the wireless SeaI/O module to select the device. The current settings now appear in the 'Device Network Settings' area.

If your wireless network is set up to use DHCP, click the 'enable DHCP configuration' checkbox and then click the 'Apply Changes' button.

Otherwise, set the IP Address, Network Mask, and Gateway to match the settings for your wireless network. You can change the 'Device Name' to something appropriate for your application. Click the 'Apply Changes' button. The wireless SeaI/O module will again disappear, but is now fully configured to work with your wireless network. Close the **Ethernet Config** utility.
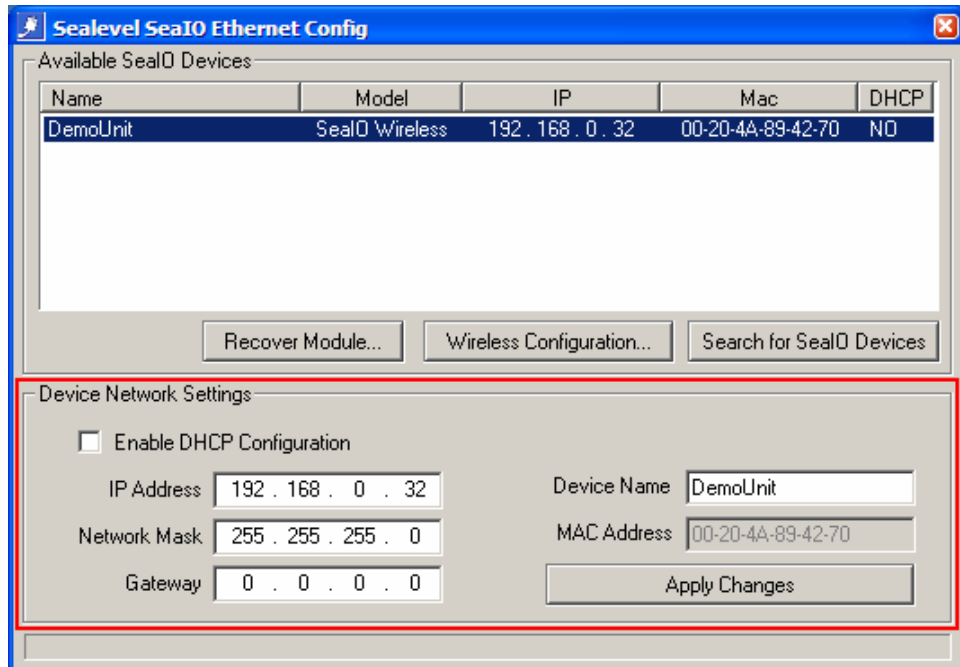
Configuring a Wireless Module (Continued)

To complete the configuration, you need to change the IP Address of your wireless adapter back to its original settings. Open the **Network Connections** utility (Start → Settings → Network Connections). Right-click on your network adapter and select Properties.

On the General tab, select 'Internet Protocol (TCP/IP)', leaving the box checked, and then click the Properties button.
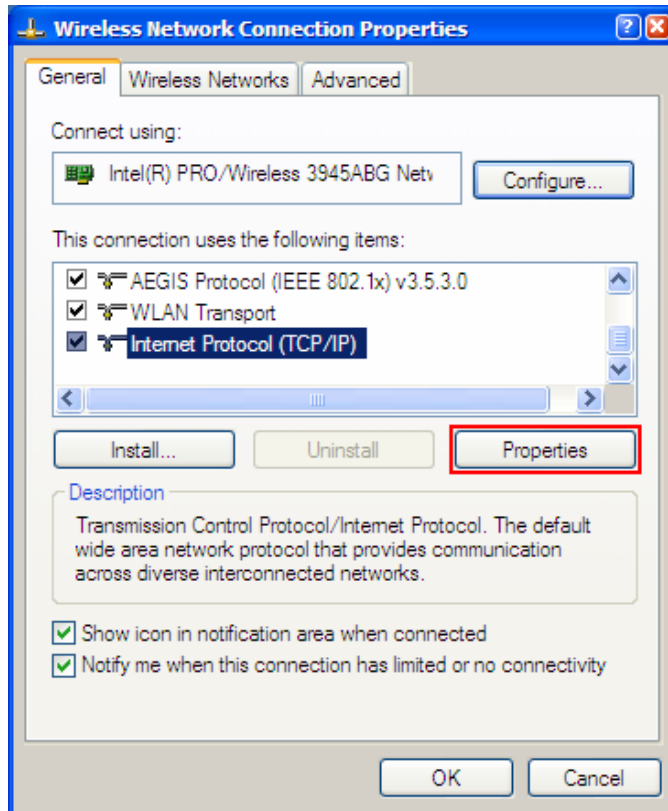

In the **Internet Protocol (TCP/IP) Properties** window, change the settings for your wireless adapter back to the original settings you noted at the beginning on this section. Click the OK button in this window. Click the OK button on the **Wireless Network Connection Properties** window.

Your wireless adapter should now be configured for your wireless network and the wireless SeaI/O module should now be properly configured to work with your wireless network. You can open **Ethernet Config** to verify. If you have any problems, please contact Sealevel technical support at support@sealevel.com.

Configuring a Wireless Module (Continued)

Start **MaxSSD** (Start → All Programs → Sealevel SeaMAX → MaxSSD) and select Ethernet in the drop down box. Verify that the IP Address for the wireless SeaI/O module appears in the right hand pane.
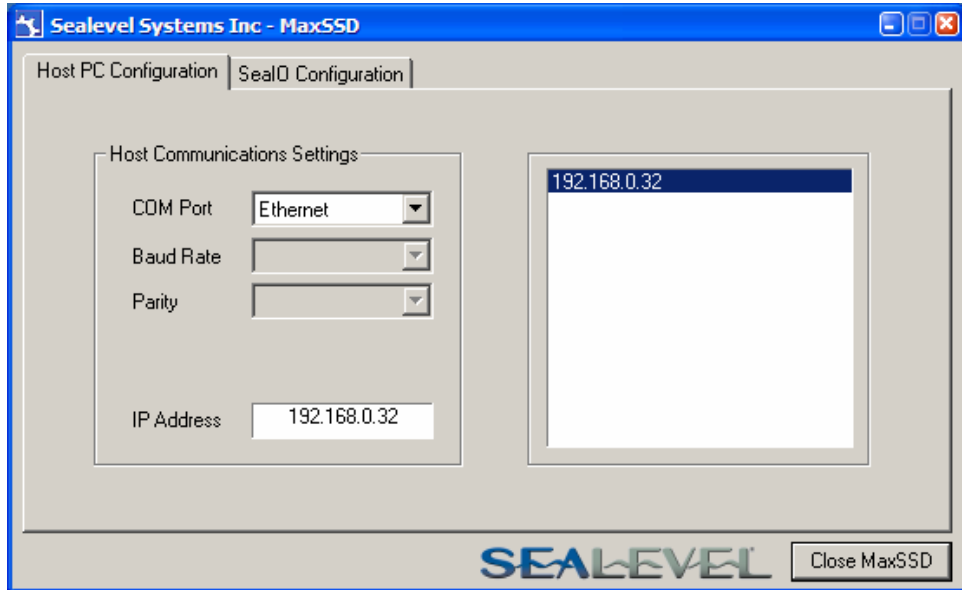
Choose the correct IP Address (if more than one is listed) and click the "SeaI/O Configuration" tab. Use the drop down box to select the appropriate Slave ID (default is 247) and the click the "Get SeaI/O Module Settings" button. You will see the description for the wireless SeaI/O module appear in the right hand frame.
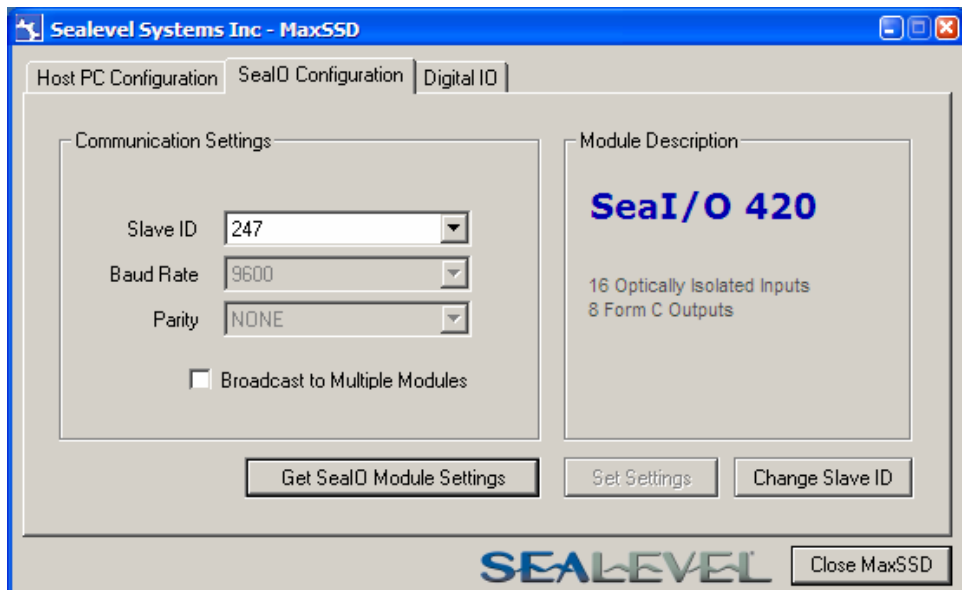
Configuring a Wireless Module (Continued)

Set the slave ID of the "base" wireless SeaI/O module using the rotary switch or software selection method discussed in the **Setting Device Address** section (MaxSSD chapter) of this manual. This guarantees that any expansion modules connected next will not conflict with the "base" module. Perform another **Get** operation to verify that you can communicate with the "base" wireless SeaI/O module at the new slave ID.

NOTE:	Configure the SeaI/O modules one at a time. Set the address to a hardware slave ID other than "0" or a software slave ID other than 247, to avoid device conflicts during setup.

After the "base" wireless SeaI/O module is successfully communicating via MaxSSD, you can proceed with adding SeaI/O expansion modules (N-series). Refer to the **Configuring Expansion Modules** section of this manual.

Configuring an Ethernet (E-Series) Module

NOTE: ⚠️	This section applies only to Ethernet (E-series) SeaI/O modules. For all other SeaI/O modules, refer to the **Configuring a "Base" SeaI/O Module** and **Configuring Expansion Modules** sections on the previous pages.

Verify that SeaMAX software has been installed successfully and that an Ethernet SeaI/O module is connected directly to your computer using the yellow crossover cable supplied with your module. This module will become the "base" module.

All Ethernet SeaI/O modules are shipped with DHCP enabled. When you first connect an Ethernet SeaI/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 Ethernet SeaI/O module will default to a random IP address in the range 169.254.x.x. To discover the SeaI/O module's IP address, start the **Ethernet Config** utility (Start → All Programs → Sealevel SeaMAX → Ethernet Config) installed with SeaMAX.
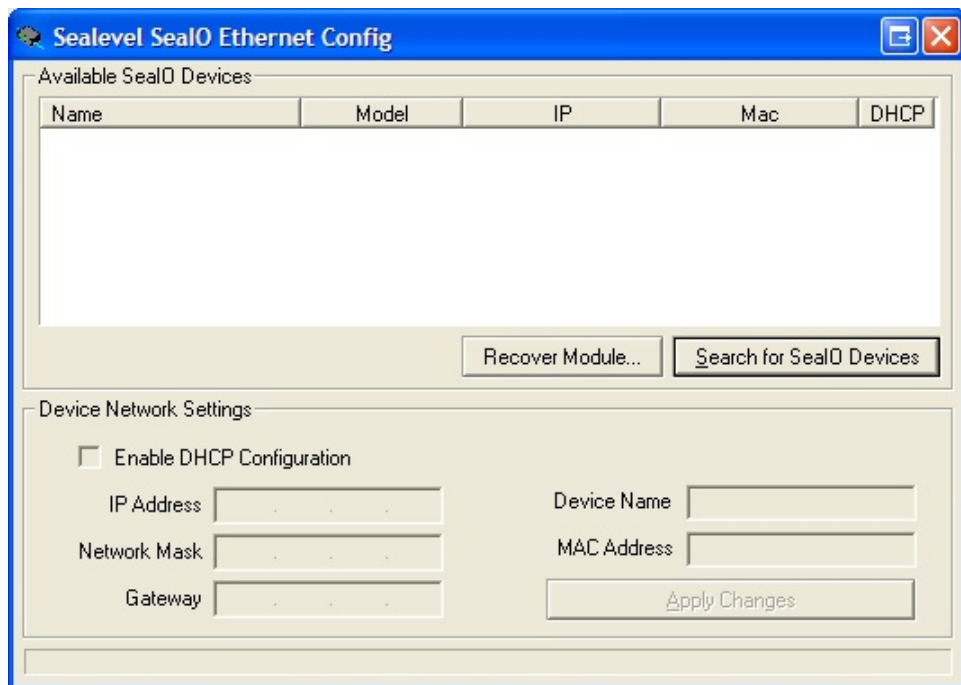
Click on the "Search for SeaI/O Devices" button and the 'Available SeaI/O Devices' pane should refresh with any Ethernet or Wireless SeaI/O modules that are found on the network. Select one of the modules in the list by clicking on it. You can update the settings in the Device Network Settings pane and then confirm these changes by clicking the "Apply Changes" button. The module list should refresh, indicating that your changes were successful.

Configuring an Ethernet Module (Continued)

> **NOTE:** If the module does not change or respond, the PC and the module may be on different subnets. Proceed to the Recover Module section on the following page.

Start MaxSSD (Start → All Programs → Sealevel SeaMAX → MaxSSD) and choose the correct IP address to communicate with the "base" Ethernet SeaI/O module. Ensure a successful **Get** operation (refer to the **MaxSSD** section of this manual for more information).

Set the slave ID of the "base" Ethernet SeaI/O module using the rotary switch or software selection method discussed in the **Setting Device Address** section on the previous pages. This guarantees that any expansion modules connected next will not conflict with the "base" module. Perform another **Get** operation to verify that you can communicate with the "base" Ethernet SeaI/O module at the new slave ID.

> **NOTE:** Configure the SeaI/O modules one at a time. Set the address to a hardware slave ID other than "0" or a software slave ID other than 247, which avoids device conflicts during setup.

After the "base" Ethernet SeaI/O module is successfully communicating via MaxSSD, you can proceed with adding SeaI/O expansion modules (N-series). Refer to the **Configuring Expansion Modules** section on the previous pages.

Resetting an Ethernet SeaI/O Module

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

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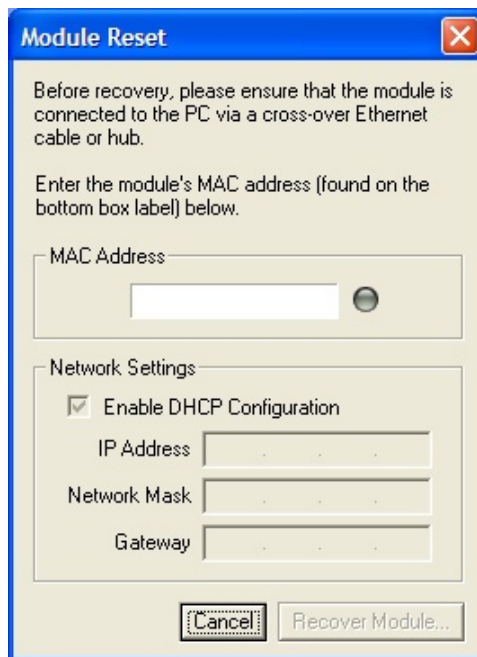
Before recovery begins, make certain that the PC and Ethernet SeaI/O module are on the same network segment – they should be connected with an Ethernet crossover cable, through a hub, or through a non-routing switch. Ethernet SeaI/O modules are shipped with both an Ethernet patch cable (blue) and an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

Enter the MAC address found on the label on the bottom of the SeaI/O enclosure. A MAC address is made up of six pairs of hex digits separated by dashes (i.e., xx-xx-xx-xx-xx-xx). 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.

Proceed with configuring expansion modules, explained in the previous section.

Seal/O-463 Ribbon Cable Installation

A copy of these instructions is included with the SeaI/O-463 module and can also be downloaded from the SeaI/O-463 product page on the Sealevel website.

NOTE: ⚠️	Do not perform these instructions with the power connected. Be sure to follow proper ESD procedures by grounding yourself and the SeaI/O module.

What you will need:

- SeaI/O-463 module
- Phillips head screwdriver
- Slotted screwdriver
- 50-pin IDC ribbon cable* (up to four)

*Ribbon cable accessories available:

- CA167 – 40" IDC 50-pin to IDC 50-pin ribbon cable
- CA197 – 18" IDC 50-pin to IDC 50-pin ribbon cable
- CA135 – 40" IDC 50-pin to 50-pin edge connector ribbon cable

Step 1

Remove the terminal block from the left side and then remove the two black screws from each side of the module as shown in the image.

Step 2

On the front right side of the module, wedge a slotted screwdriver between the top and bottom halves as shown. Pry upwards – a pem in the top half must clear the metal lip in the bottom half of the enclosure.
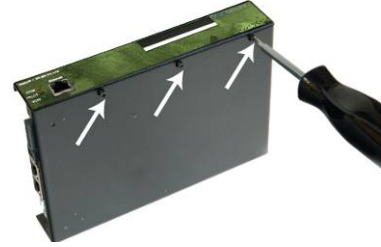

Step 3

Remove the two screws from the metal strain relief, as shown.

Step 4

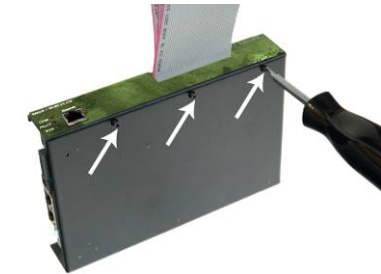Remove the three screws from the bottom of the module and remove the front plate.

Step 5

Install up to four industry standard ribbon cables in the 50-pin header connectors. A list of optional cable part numbers is listed on the previous page.
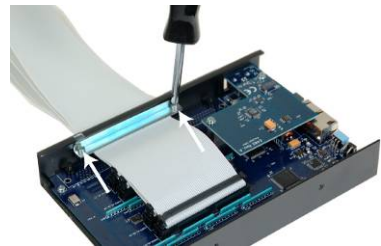
Step 6

Replace the front plate and install the three screws in the bottom of the module as shown.

Step 7

Replace the metal strain relief. Start both screws and tighten only until snug. Do not over-tighten.

Step 8

Replace the top half by starting it on the left side over the connectors and then snapping the right side down into place. Be careful not to pinch fingers. Replace both screws on each side and then replace the terminal block on the left side.

Step 9

Continue with the installation of the SeaI/O-463 module. The **SeaI/O Hardware Description** section of this manual contains information on TTL applications and optional accessories. The **SeaMAX Application Suite** section walks you through setting up the hardware address (Slave ID) and software installation.

Seal/O-470 Jumper and Dipswitch Settings

The SeaI/O-470 module ships factory configured with the D/A outputs set for 0-10V and current loop mode on the A/D inputs disabled. If you need to enable current loop mode or set the D/A outputs to 0-5V, you will need to open the enclosure and access the jumpers (shown on the next page).

NOTE: ⚠️	Do not perform these instructions with the power connected. Be sure to follow proper ESD procedures by grounding yourself and the SeaI/O module.

What you will need:

■ SeaI/O-470 module
■ Phillips head screwdriver
■ Slotted screwdriver

Step 1

Remove the terminal block from the left side and then remove the two black screws from each side of the module as shown in the image.

Step 2

On the front right side of the module, wedge a slotted screwdriver between the top and bottom halves as shown. Pry upwards – a pem in the top half must clear the metal lip in the bottom half of the enclosure.

Jumpers and dipswitch locations are shown on the following page.

Seal/O-470 Jumper Locations

This detail image of the right side of the SeaI/O-470 circuit board shows the locations of the user configurable jumpers and dipswitches. Refer to the following pages for instructions on properly configuring the jumpers and switches. The colored boxes are shown here for clarity and are not visible on the actual circuit board.
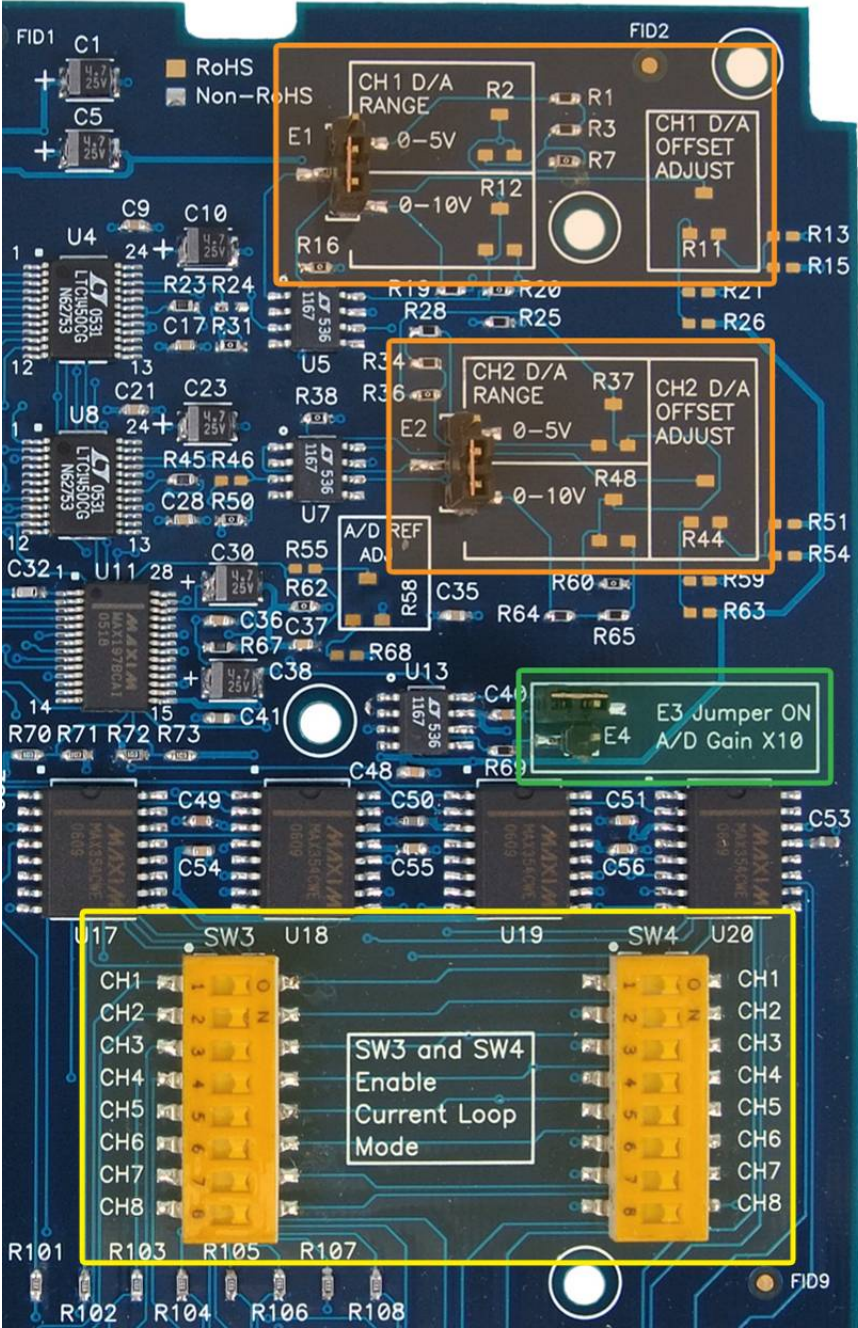
D/A Settings

The (E1) and (E2) jumpers (shown in the orange boxes on the previous page) configure the D/A outputs for 0-5V or 0-10V. Both channels can be configured independently. The D/A outputs do not support negative voltages. You must also set the correct output voltage in your application or MaxSSD. Refer to the **SeaMAX Application Suite** section of this manual for help configuring software to work with the SeaI/O-470.

A/D 10X Gain

The A/D 10X gain (E3) jumper (shown in the green box on the previous page) is disabled at the factory. Position the hardware jumper on both pins to enable this functionality, which allows smaller voltages to be measured more accurately (e.g., a 0-1V input signal can be measured more accurately by enabling the 10x hardware gain jumper and setting the SeaI/O-470 A/D input channel for 0-10V range). You can also set the A/D input channel for 0-5V to sense voltages smaller than 0.5V.

When the jumper is enabled, the "10X Hardware Gain" checkbox will also be enabled on the A/D Inputs tab in MaxSSD. Refer to the **SeaMAX Application Suite** section of this manual for information on using MaxSSD.

A/D and Current Loop Dipswitches

The (SW3) and (SW4) dipswitches (shown in the yellow box on the previous page) configure the A/D inputs for current loop mode and are disabled at the factory. Since current loop mode is differential, the corresponding dipswitch on both (SW3) and (SW4) should be properly set (e.g., 'CH1' on both dipswitches needs to be set to 'ON' to enable current loop mode).

SW3 – enables the current-loop sensing resistor

SW4 – ties the other half of connection to ground

Wiring Options

Seal/O Pass-Through Connector

All SeaI/O modules include two RS-485 pass-through connectors on the left side of the unit that are internally connected to the same pins on the screw terminals. This offers two convenient options for adding additional expansion modules.

For connecting several SeaI/O modules together in a "stack", all N-series expansion modules ship with an expansion and strap kit (item# KT122) that includes four metal straps, four #4-40 screws, and a 5" RJ45 RS-485 interconnect cable (item# CA239). The metal straps allow you to securely connect multiple SeaI/O modules together. The interconnect cable can be used to connect SeaI/O modules together via the RJ45 pass-through connectors, providing an easy method to cascade RS-485 signals and power from one module to the next.

For expansion modules that are less than ten feet from a base unit, a standard RJ45 CAT5 patch cable ("straight-through") may be used. For SeaI/O modules greater than ten feet apart, use twisted-pair cable connecting the data lines to the screw terminals instead. If RJ45 connectors are preferred, be sure to connect only the data lines (pins 4 & 5).

| NOTE:	When using standard CAT5 patch cables to connect modules less than ten feet apart, ensure the cables are wired "straight-through."
⚠	**DO NOT** connect network crossover cables to the pass-through connectors, else damage to equipment may result.

| NOTE:	Modules greater than ten feet apart must have separate power supplies. Refer to the **Power Options** section of this manual for recommendations.
⚠	

**RJ45 (RS-485 IN/OUT) Pass-Thru Connector**
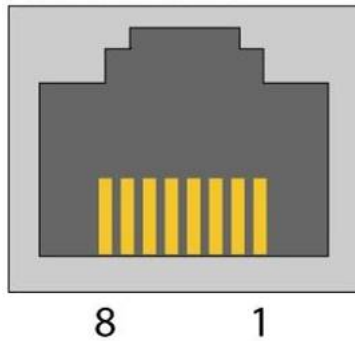
Pin Out

Pin #	Signal
1	9-30 VDC Source
2	9-30 VDC Source
3	Not connected
4	485+
5	485-
6	Common (GND)
7	Common (GND)
8	Common (GND)

8   1

I/O Wiring – Seal/O–410, 420, 430, 440, and 450 Modules

Optically isolated inputs are arranged such that each group of four shares a single common. The four I/O points and shared common are connected via a five-position removable screw terminal. Input voltage range is 5-30VDC. Like the inputs, each group of four Reed relays also shares a single common and connects via a five-position removable screw terminal. Form C Relay outputs are arranged such that each group of two relays shares a common. The NC and NO contacts of each relay along with the common are brought out via a five-position removable screw terminal.
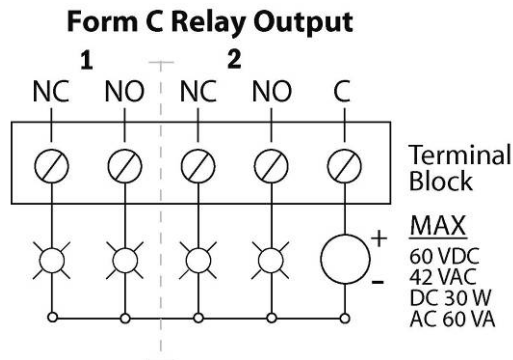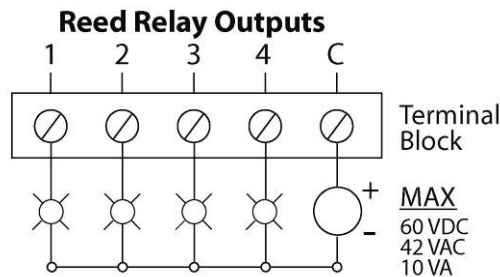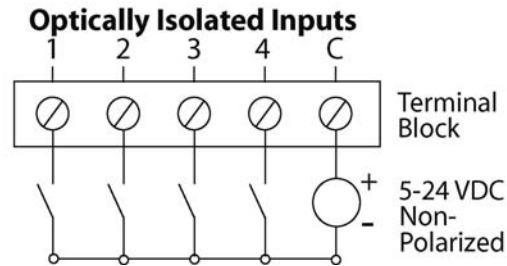
I/O Wiring – SeaI/O–462 and 463 Modules

The SeaI/O-462 and SeaI/O-463 use 74ABT245 octal bi-directional transceivers to provide TTL input/output capabilities and can sink 64mA and source 32mA. Each bit is pulled to +5V through a 10K ohm pull-up resistor to insure each bit is at a known state when not driven. The maximum output power is +5V @ 1A (5W).

SeaI/O–462 DB–78F Connectors

The SeaI/O-462's 96 digital I/O channels are brought out to two DB-78 Female connectors on the front of the enclosure (pinout shown below). Each connector provides 48 bits of digital I/O divided into six eight-bit ports. Each port may be individually configured via software command as an input or an output.

Bits	Bits 1-48					
	A1	B1	C1	A2	B2	C2
D0	75	38	18	10	30	2
D1	76	37	17	9	29	1
D2	77	36	16	8	28	22
D3	78	35	15	7	27	21
D4	59	34	14	6	26	40
D5	39	33	13	5	25	60
D6	20	32	12	4	24	61
D7	19	31	11	3	23	62

Bits	Bits 49-96					
	A3	B3	C3	A4	B4	C4
D0	75	38	18	10	30	2
D1	76	37	17	9	29	1
D2	77	36	16	8	28	22
D3	78	35	15	7	27	21
D4	59	34	14	6	26	40
D5	39	33	13	5	25	60
D6	20	32	12	4	24	61
D7	19	31	11	3	23	62

| Power & Commons	
+5V	63, 74
Commons	41 – 58, 64 – 73

Seal/O-462 Optional Cable (Item# CA237) Pinout

For easy connection to industry-standard solid-state relay racks, Sealevel manufactures a 6' cable, Item# CA237, that terminates the DB-78 to two industry standard 50-pin header connectors. Two cables and a SeaI/O unit can be order together as a kit using Item# 462x-KT. The pinout for the two 50-pin headers is shown below.
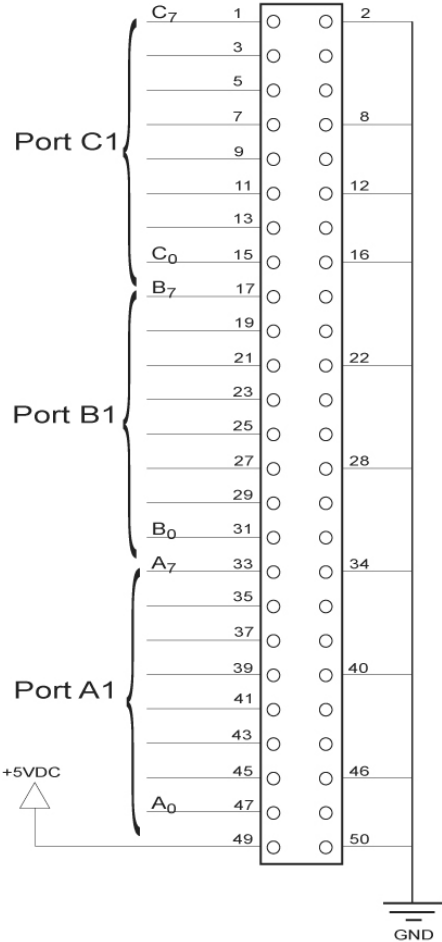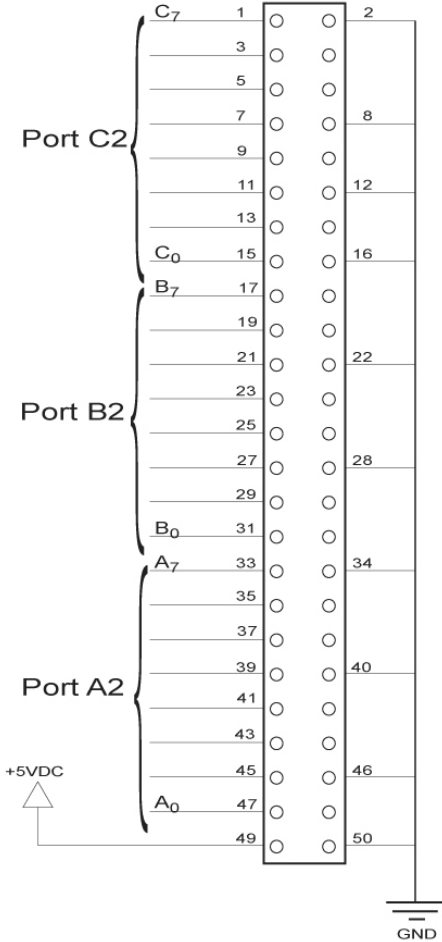
Seal/O-463 50-Pin Header Connectors

The SeaI/O-463's 96 digital I/O channels are accessed via four industry-standard 50-pin header connectors. Each header provides 24 bits of digital I/O divided into three eight-bit ports. Each port may be individually configured via software command as an input or an output.

You will need to open the SeaI/O-463's enclosure to access the four header connectors: P2, P3, P4, and P5. The connector designators are silk-screened onto the PCB for easy identification. Once cables are connected to the headers, route them through the opening in the front of the enclosure, attach the included strain-relief bracket to secure the cables and reassemble the enclosure. Refer to the ribbon cable installation instructions included with the SeaI/O-463.

Each of the four 50-pin connectors has the following pinout, which is compatible with a wide variety of industry-standard solid-state relay racks:
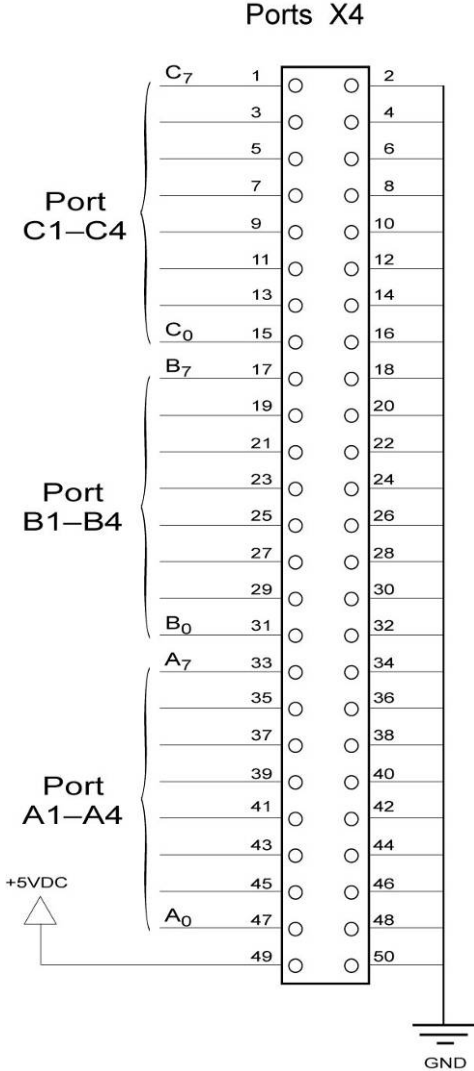
I/O Wiring – Seal/O-470 Modules

A/D Wiring Connections

The SeaI/O-470 supports single-ended, differential, and current loop A/D inputs. Single-ended and differential modes can be configured in software. Current loop mode requires configuring dipswitches inside the enclosure. Refer to the **Hardware Configuration** section of this manual for instructions on configuring the current loop dipswitches.

The SeaI/O-470 can be configured for up to sixteen 12-bit single-ended A/D inputs. Each input is referenced to a common ground. The user selectable voltage ranges are 0-5V, 0-10V, +/-5V, and +/-10V.

Sixteen 12-Bit Single-Ended A/D Inputs
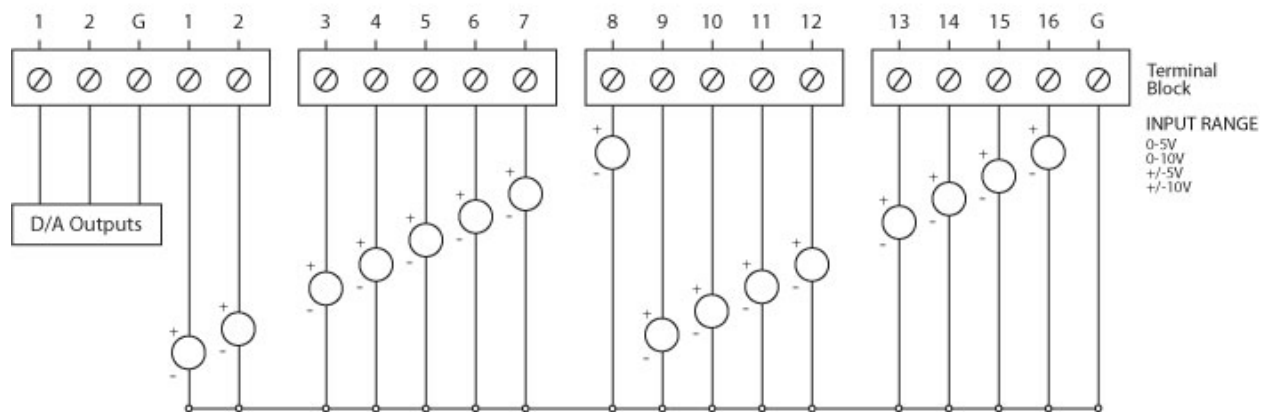
The SeaI/O-470 can be configured for up to eight 12-bit differential A/D inputs. The inputs are not referenced to ground. The user selectable voltage ranges are 0-5V, 0-10V, +/-5V, and +/-10V.

Eight 12-Bit Differential A/D Inputs
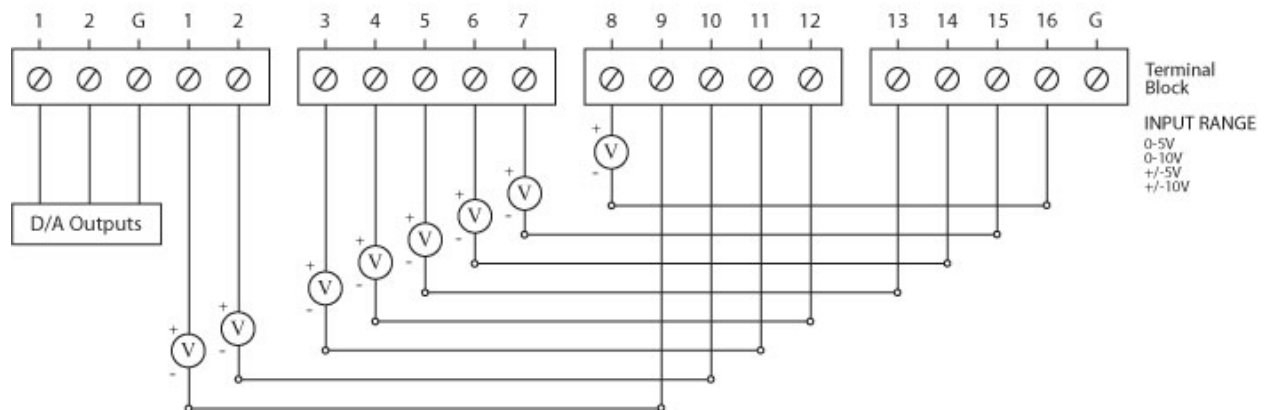
The SeaI/O-470's A/D channels can also be configured to provide up to eight 12-bit current loop inputs. Each input has two terminals – one positive and one negative. The input current range is 0-20mA for interfacing commonly used 4-20mA devices. The dipswitches inside the enclosure must be properly configured for each current loop input.

Eight 12-Bit Current Loop A/D Inputs
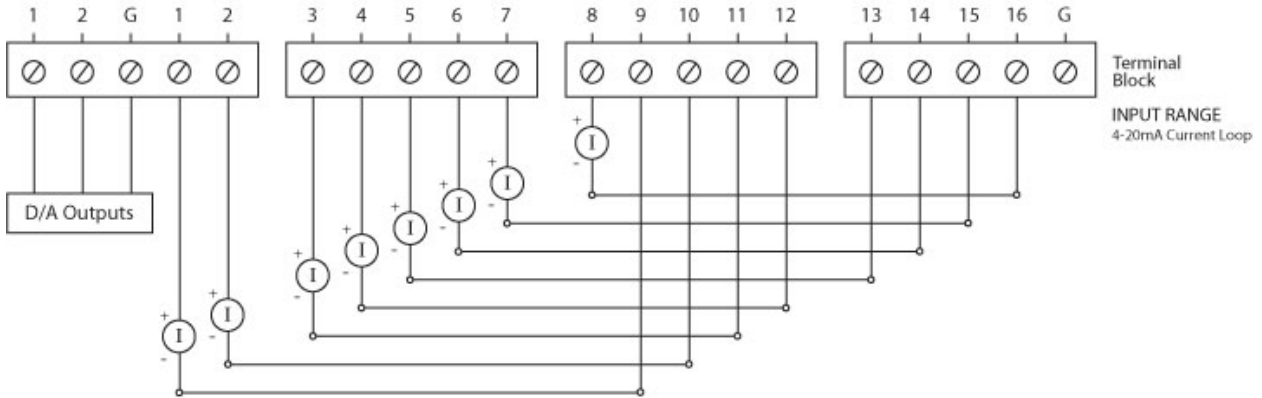
D/A Wiring Connections

The SeaI/O-470 provides two 12-bit D/A output channels, configured for 0-10V. 0-5V mode requires different jumper settings inside the enclosure. Refer to the **Hardware Configuration** section of this manual for instructions on configuring the D/A jumpers.

The SeaI/O-470 module's D/A output channels can be independently configured for 0-5V or 0-10V. The D/A outputs do not support negative voltages.

Two 12-Bit Single-Ended D/A Outputs
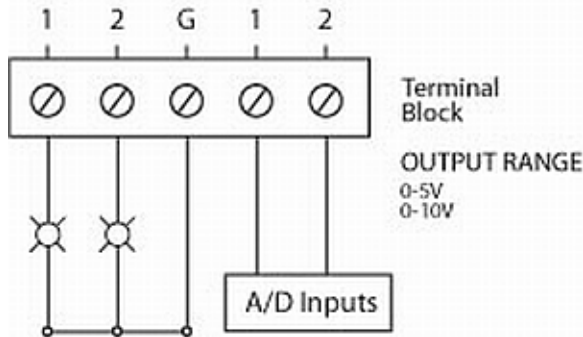
Digital I/O Wiring Connections

The SeaI/O-470 modules include eight optically isolated inputs that are arranged such that each group of four inputs shares a single common. The four I/O points and shared common are connected via a five-position removable screw terminal.
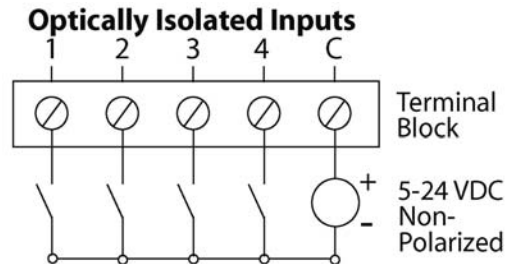
The SeaI/O-470 modules provide eight open-collector digital outputs. The outputs do not source any current and must be connected to an external power source, max 30VDC. The outputs act as a switch and the circuit is open until energized. When the output circuit is energized in software, the output sinks the current to ground, closing the circuit.
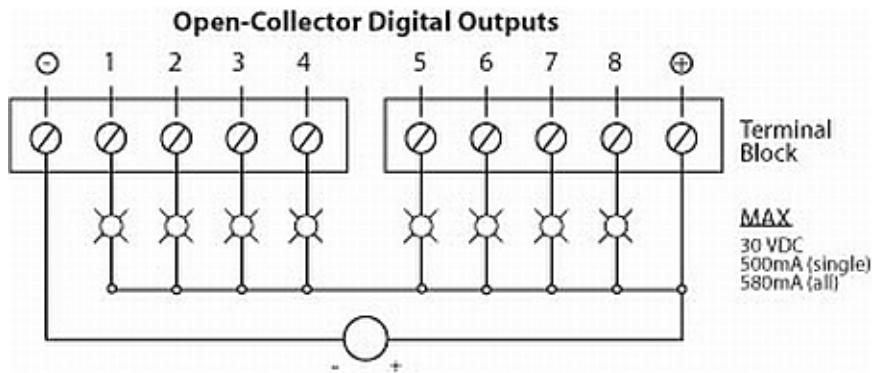
I/O Wiring – Seal/O-520 Modules

Optically isolated inputs are arranged such that each group of two shares a single common. The four I/O points and shared common are connected via a six-position removable screw terminal. Input vo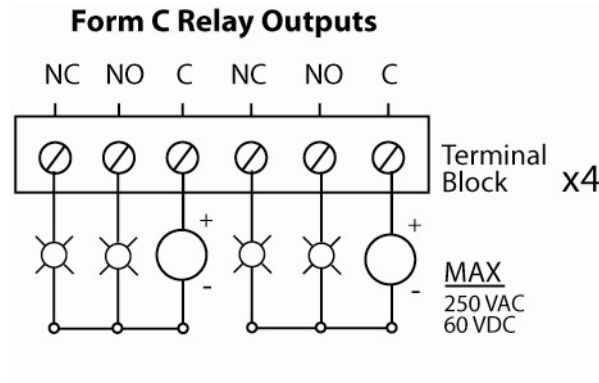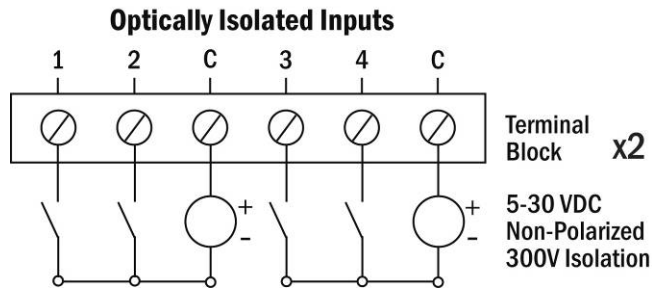ltage range is 5-30VDC. Like the inputs, each group of two Form C relays also shares a single common. The NC and NO contacts of each relay along with the commons are brought out via a six-position removable screw terminal.

Connector Pin Outs

SeaI/O (RS-232) S-Series Modules

SeaI/O S-Series (RS-232) modules have an RJ45 connector on the face of the enclosure. Each S-series module includes a kit (item# KT119) to convert the RJ45 RS-232 pin out to a standard DB9 RS-232 pin out. The kit ships with a DB-9F to RJ45 modular adapter (item# DB109) with RS-232 pin out and a standard 7' CAT5 patch cable (item# CA246). This kit allows SeaI/O S-series modules to be easily connected to a standard DB9 RS-232 serial port. For other interfacing options, the RJ45 serial pin out is shown below.

**RJ45 RS-232 (DCE)
Serial Connector**
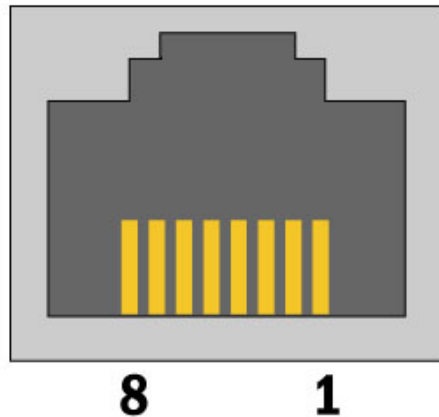
Pin Out

Pin #	Signal
1	TD
2	RD
3	CTS
4	5VDC Output
5	N/C
6	RTS
7	N/C
8	GND

NOTE: ⚠️	For SeaI/O S-series modules, pin 4 of the RJ45 connector outputs 5VDC @300mA. This is useful for powering the wireless Bluetooth adapter (Sealevel Item# BT-SD100). This allows any Bluetooth capable host to access a SeaI/O module as easily as communicating with a standard RS-232 serial port.

Mounting Options

Seal/O Mounting Kit

Expanding your I/O count is as simple as adding N-Series expansion units to the Base SeaI/O module (or other N-series modules). Each N-Series module includes an expansion and strap kit (Item# **KT122**), which includes a 5" CAT5 interconnect cable, four metal straps, and four #4-40 metal screws. The image shows a SeaI/O stack configuration using the expansion kit.

DIN Rail Mounting

All SeaI/O modules are available with a factory-installed DIN-rail mounting clip. Alternatively DIN-rail mounting clips can be ordered as a field upgrade kit (Item# **DR104**). The bracket with clip is easily attached using two included #4-40 Phillips head machine screws.

Table/Wall Mounting

The flush mount bracket kit (Item# **KT123)** is extremely versatile and can be used to mount SeaI/O modules from the top, bottom, or back edge. Individual modules or a stack of SeaI/O modules can be mounted flat to a tabletop, underneath a counter, or inside an enclosure. The kit can be used to mount SeaI/O modules flat to a wall, or along the back edge, similar to DIN-rail mounting options.

Universal Mounting Bracket

The universal mounting bracket (Item# **KT125**) can be used as a "backpack" to mount power supplies and other devices to SeaI/O modules. The bracket has holes for both 75mm and 100mm VESA mounting options. The universal arrangement of slots and holes accept bolt sizes to M4 and can be used for virtually any mounting configuration.

SeaLATCH™ USB

SeaI/O USB modules integrate a patent-pending SeaLATCH USB port, which is fully compatible with standard USB cables. When used with the included USB cable (Item# CA356) with a SeaLATCH USB type B connector, the metal thumbscrew provides a secure metal-to-metal connection to the module and prevents accidental cable disconnection.

Sealevel incorporates SeaLATCH locking USB ports on many USB hubs and I/O devices. Accidental cable disconnection is the most common point of failure with USB industrial I/O devices and SeaLATCH cables and connectors prevents that while being fully compatible with standard USB cables.

Examples of the isolated 7-port USB hub (Item# SeaI/O-270U) with SeaLATCH equipped Sealevel I/O devices are shown below.
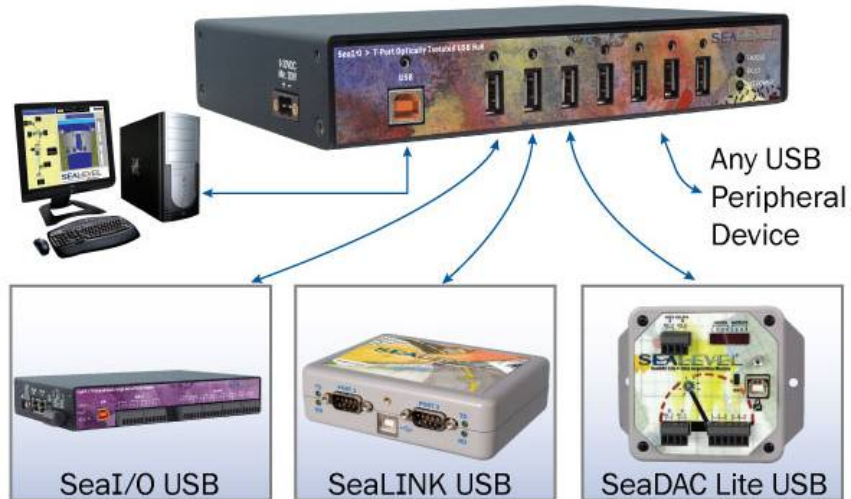
SeaLATCH Locking USB Cables

SeaLATCH USB Connectors

SeaLATCH locking USB cables integrate a small thumbscrew into each USB connector. SeaLATCH USB cables are fully interchangeable with standard USB cables. The thumbscrew provides a secure metal-to-metal connection preventing accidental disconnection. SeaLATCH USB cables are available in three configurations.
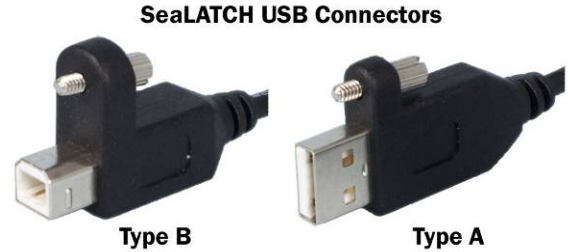

Item# CA356

The CA356 is a 72" USB cable with a SeaLATCH type B connector and a standard USB type A connector. This cable provides a secure connection between Sealevel products with a SeaLATCH type B port and legacy USB type A ports. The CA356 is included with Sealevel devices with a SeaLATCH type B port.

Item# CA332

The CA332 is a 72" cable with both SeaLATCH type A and B connectors. This cable secures both ends of the cable to devices with SeaLATCH USB ports and offers complete protection against accidental cable disconnection.

Item# CA355

The CA355 is a 72" cable with a standard USB type B and a SeaLATCH type A connector. This cable provides a secure connection between legacy USB devices and Sealevel products with a SeaLATCH type A port, such as the isolated USB hub (Item# 270U).

Accessories

Power Supplies

US Options

TR112 – 120VAC to 24VDC 250mA "Wall Wart" Power Supply with 1.3mm Plug (for single SeaI/O module)

TR109 – 120VAC to 24VDC 500mA "Wall Wart" Power Supply with 1.3mm Plug (for multiple SeaI/O modules)

TR108-US – 100-250VAC to 24VDC 36W 1.5A "Desktop" Power Supply with 1.3mm Plug, includes (CA248) Nema 5-15P 6' US Power Cord

PS101 – 100-240VAC to 24VDC 7.5W 300mA DIN Rail Mount Power Supply (connects via screw terminals, no wire included)

PS103 – 100-240VAC to 24VDC 50W 2.1A DIN Rail Mount Power Supply (connects via screw terminals, no wire included)

International Options

TR108-AU - 100-250VAC to 24VDC 36W 1.5A "Desktop" Power Supply with 1.3mm Plug, includes (CA187) "AS 3112" 6' Australian Power Cord

TR108-EC - 100-250VAC to 24VDC 36W 1.5A "Desktop" Power Supply with 1.3mm Plug, includes (CA188) "Schuko" 6' Continental European Power Cord

TR108-UK - 100-250VAC to 24VDC 36W 1.5A "Desktop" Power Supply with 1.3mm Plug, includes (CA189) "BS 1363" 6' UK Power Cord

TR108 – 100-250VAC to 24VDC 36W 1.5A "Desktop" Power Supply with 1.3mm Plug, requires IEC country-specific Power Cord

Mounting Options

KT122 – Expansion & Strap Kit. Includes 5" RS-485 Interconnect Cable (item# CA239), four metal straps, and four #4-40 metal screws, for connecting two SeaI/O modules together in a "stack"

KT123 – Flush Mount Bracket Kit. Includes two metal brackets and four #4-40 metal screws, for mounting SeaI/O modules or stacks in a variety of positions and locations

KT125 – Universal Mounting Bracket. Includes metal mounting bracket and four #4-40 metal screws, for mounting devices to SeaI/O modules or mounting SeaI/O modules to VESA mounts and other devices.

DR104 – DIN Rail Mounting Assembly. Connects to the back edge of SeaI/O modules to facilitate an easy DIN rail mounting option and a cleaner installation

RK1U – 1U 19" Rack Tray

RK2U – 2U 19" Rack Tray

RK-CLAMP – Securely holds SeaI/O modules to rack trays

Cabling Options

CA239 – 5" CAT5 RS-485 Interconnect Cable, used to connect SeaI/O modules together in a stack (included in 4xxN SeaI/O expansion modules)

CA246 – 7' Blue Ethernet Patch Cable. Can be used to connect SeaI/O Ethernet modules to a hub (included with 4xxE SeaI/O Ethernet modules). Can be used to connect SeaI/O RS-232 modules to both Sealevel and standard RS-232 serial ports (included with 4xxS SeaI/O RS-232 modules as part of p/n: KT119). Optionally, it can be used as an RS-485 interconnect cable to cascade additional SeaI/O modules via the RS-485 In/Out ports on the side of SeaI/O modules

CA251 – 7' Yellow Crossover Cable. Used to connect SeaI/O Ethernet modules directly to a computer's Ethernet port without having to go through a hub or switch

CA247 – 10' Blue Ethernet Patch Cable. Can be used to connect SeaI/O Ethernet modules to a hub, or can be used as an RS-485 interconnect cable to cascade SeaI/O modules via the RS-485 In/Out ports

CA179 – Standard USB type A to USB type B Device Cable, 6' in length

CA332 – SeaLATCH locking USB type A to SeaLATCH locking USB type B Device Cable, 6' in length

CA356 – USB type A to SeaLATCH locking USB type B Device Cable, 6' in length (included with SeaI/O USB modules)

CA355 – SeaLATCH locking USB type A to USB type B Device Cable, 6' in length

KT119 – RS-232 DB9/RJ45 Kit, includes (DB109) DB9F to RJ45 adapter with RS-232 pinout, and (CA246) 7' CAT5 patch cable. For connecting SeaI/O modules to both Sealevel and standard RS-232 serial ports (included with 4xxS SeaI/O RS-232 modules)

KT120 – RS-422 DB9/RJ45 Kit, includes (DB110) DB9F to RJ45 adapter with RS-422 pinout, and (CA246) 7' CAT5 patch cable. Optional accessory for connecting SeaI/O modules to Sealevel RS-422 serial port products

KT121 – RS-485 DB9/RJ45 Kit, includes (DB111) DB9F to RJ45 adapter with RS-485 pinout, and (CA246) 7' CAT5 patch cable. Optional accessory for connecting SeaI/O modules to Sealevel RS-485 serial port products

Appendix A – How to Get Assistance

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

Sealevel Systems maintains a website on the Internet. Our homepage address is http://www.sealevel.com. The latest software updates and newest manuals are available via our FTP site that can be accessed from our home page. Manuals and software can also be downloaded from the product page for your device.

Sealevel Systems provides an FAQ section on our website. Please refer to this to answer many common questions. This section can be found at http://www.sealevel.com/faq.asp

Technical support is available Monday to Friday from 8:00 a.m. to 5:00 p.m. Eastern Standard Time. You can contact Technical Support via:

Phone: (864) 843-4343

Email: support@sealevel.com

Appendix B – Wireless Module Information

SeaI/O wireless (W-series) modules are compatible with 802.11b and 802.11g wireless networking equipment operating in the 2.4GHz frequency spectrum. The wireless modules can operate over any of the 14 available channels, defined by the IEEE 802.11 specification, listed by country below. These regulations are subject to change at any time. Please consult your local regulatory authority for current information.

Wireless Specifications

Standards: 802.11b, 802.11g, 802.11i
Channels: 1-14
Frequency Range: 2.412 – 2.484 GHz
Wireless Output Power: 14 dBm +1.5/-1.0 dBm
Data Rates: 54Mbps Max, 1Mbps Min
Range: 328' (Indoors)

Channel	Frequency (GHz)	North America	Europe	Japan	France	Spain
1	2.412	OK	OK	OK	No	No
2	2.417	OK	OK	OK	No	No
3	2.422	OK	OK	OK	No	No
4	2.427	OK	OK	OK	No	No
5	2.432	OK	OK	OK	No	No
6	2.437	OK	OK	OK	No	No
7	2.442	OK	OK	OK	No	No
8	2.447	OK	OK	OK	No	No
9	2.452	OK	OK	OK	No	No
10	2.457	OK	OK	OK	OK	OK
11	2.462	OK	OK	OK	OK	OK
12	2.467	No	OK	OK	OK	No
13	2.472	No	OK	OK	OK	No
14	2.484	No	No	802.11b	No	No

This device contains an FCC approved RF module.
The transmitter carries FCC ID: R68WIPORTG.

RSS-GEN Sections 7.1.4 and 7.1.5 Statement for Devices with Detachable Antennas

This device has been designed to operate with the antennas listed in the Certificate, and having a maximum gain of 5 dB. Antennas not included in this list or having a gain greater than 5 dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Note:

a) This module is authorized under limited module approval specified to mobile host equipment. So, the antenna must be installed such that 20cm is maintained between the antenna and users.

b) The transmitter module may not be co-located with any other transmitter or antenna.

Appendix C – Compliance Notices

Federal Communications Commission Statement

FCC - This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in such case the user will be required to correct the interference at the user's expense.

EMC Directive Statement

Products bearing the CE Label fulfill the requirements of the EMC directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission.

To obey these directives, the following European standards must be met:

EN55022 Class A - "Limits and methods of measurement of radio interference characteristics of information technology equipment"

EN55024 – "Information technology equipment Immunity characteristics Limits and methods of measurement".

EN60950 (IEC950) - "Safety of information technology equipment, including electrical business equipment"

Warning
This is a Class A Product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures to prevent or correct the interference.

Always use cabling provided with this product if possible. If no cable is provided or if an alternate cable is required, use high quality shielded cabling to maintain compliance with FCC/EMC directives.

Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured products. 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 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 life. 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 or abuse are not covered under this warranty. Warranty service is obtained by delivering the Product to Sealevel and providing proof of purchase.

> **NOTE:** **Return authorization must be obtained from Sealevel Systems before returned merchandise will be accepted. Authorization is obtained by calling Sealevel Systems and requesting a Return Merchandise Authorization (RMA) number.**

The 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.

Sealevel Systems assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Sealevel Systems will not be liable for any claim made by any other related party.

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

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www.sealevel.com
email: support@sealevel.com

Technical Support is available Monday - Friday from 8 a.m. to 5 p.m. Eastern time.

Trademarks

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