SeaDAC Modules

User Manual | SeaDAC
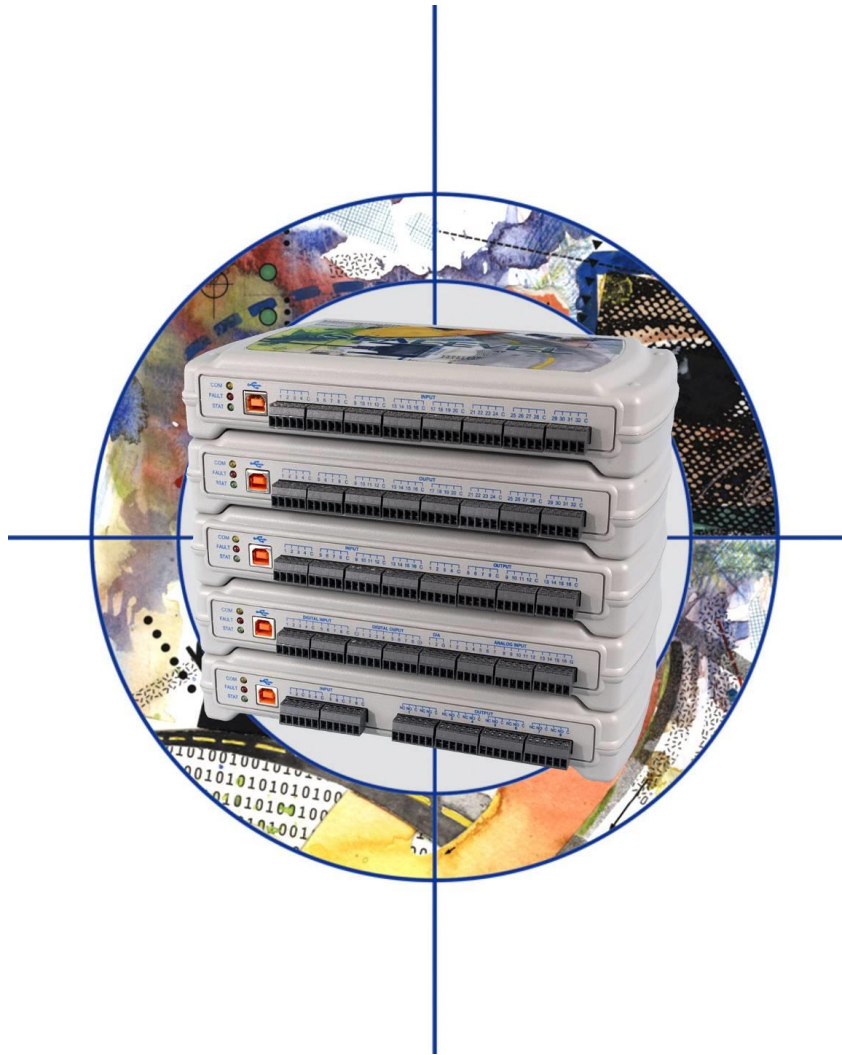
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Introduction

SeaDAC™ modules provide a powerful way to add digital and analog I/O to a variety of computers, controllers, and PLCs. Each SeaDAC model connects to an available USB port and provides easy field wiring via removable terminal blocks. SeaDAC modules are housed in a rugged, attractive plastic enclosure and include a high-retention USB type B connector to prevent accidental disconnection. SeaDAC modules are USB 1.1 compliant and USB 2.0 compatible.

SeaDAC modules are supported under many versions of Windows. For easy software integration, application programs or 3rd party software can use the Sealevel SeaMAX™ library or industry standard Modbus protocol.

This manual covers the installation and operation of these SeaDAC products:

Model No.	Part No.	Description
SeaDAC DIO-32	(P/N 8221)	- 16 Isolated Inputs/16 Reed Relay Outputs
SeaDAC PLC-24	(P/N 8222)	- 16 Optically Isolated Inputs/8 Form C Outputs
SeaDAC ISO-32	(P/N 8223)	- 32 Optically Isolated Inputs
SeaDAC REL-32	(P/N 8224)	- 32 Reed Relay Outputs
SeaDAC REL-16C	(P/N 8225)	- 16 Form C Relay Outputs
SeaDAC MIO-26	(P/N 8227)	- 8 Inputs/8 Outputs/2 D/A & 16 A/D
SeaDAC PLC-16H	(P/N 8232)	- 8 Iso. Inputs/8 High-Current Form C Outputs

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Overview

Sealevel SeaDAC modules are available in various I/O configurations, each designed for maximum flexibility and easy field wiring. SeaDAC modules can be used with industry standard Modbus RTU protocol or easily controlled from application programs using the supplied **SeaMAX** software libraries, which includes the diagnostic and configuration tool **MaxSSD**. Sealevel SeaDAC 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.

Industry Segments

SeaDAC modules are perfect for a wide variety of applications and environments including:

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

Features

- Models Offering Choice of:
    - Optically Isolated Inputs
    - Reed Relay Outputs
    - Form C Relay Outputs
    - Analog I/O − A/D & D/A
- Status Indicator LEDs for Communication, Fault, and Status
- High-Retention USB Type B Connector
- Field Removable Terminal Block Connectors
- Supports Industry Standard Modbus RTU Protocol
- Wide Operating Temperature (0°C to +70°C)
- Extended Temperature Range Available (-40°C to +85°C)
- Attractive & Rugged Plastic Tabletop Enclosure
- Compact Size − 9.2"(L) x 5.3"(W) x 1.7"(H)

Before You Get Started

What's Included

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

- **SeaDAC Digital Interface Adapter**
- **Item# CA179 – 6' A to B USB Device Cable**

The SeaDAC REL-16C (Item# 8225) included a wall-mount AC power supply (5VDC @ 2.4A) with a locking DC connector (Item# TR127). External power is required with this module due to the power requirements of the sixteen Form C relays.

Advisory Conventions

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

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

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

Optional Items

Mounting Options

RK1U – 1U 19" Rack Tray
RK2U – 2U 19" Rack Tray
RK-CLAMP – Securely holds SeaDAC modules to rack trays

Cabling Options

CA179 – 6' A to B USB Device Cable (included with SeaDAC modules)
CA214 – 3Meter Type A to Type A USB Extension Cable

USB Hubs

HUB7i – Optically Isolated 7-Port USB Hub – AC powered 7-port USB hub, AC adapter, and USB cable. Provides up to 5500VAC isolation and protects the host computer from voltage spikes, power surges, and ground loops commonly found in industrial environments.
HUB7 – High Speed USB 2.0 7-Port Hub – AC powered 7-port USB hub, AC adapter, and USB cable.
HUB4 – High Speed USB 2.0 4-Port Hub – AC powered 4-port USB hub, AC adapter, and USB cable.

SeaDAC Hardware Description

SeaDAC Module Common Features

SeaDAC models include a high-retention Type B USB connector that prevents accidental disconnection of the USB cable. The orange, ruggedized connector provides up to two times the removal resistance to the cable than standard USB connectors.

Status LEDs are also included on the front of all SeaDAC devices 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) – Blinks when the device is enumerated by the USB port

SeaDAC Power Requirements

Sealevel SeaDAC modules are powered by the USB host interface and require 5VDC @ 500mA to be available on the USB port. Most computers and powered USB hubs are capable of meeting this requirement, while passive USB hubs and some laptops running on batteries may not. Check the product manual that shipped with your system or hub if you are uncertain. You can also contact Sealevel technical support for assistance.

The maximum power requirements for each SeaDAC device are shown below.

Item#	Description	mA
8221	16 Isolated Inputs / 16 Reed Relay Outputs	340
8222	16 Isolated Inputs / 8 Form C Relay Outputs	460
8223	32 Optically Isolated Inputs	140
8224	32 Reed Relay Outputs	480
8225	16 Form C Relay Outputs	**820***
8227	8 Isolated Inputs, 8 Outputs, 2 D/A, 16 A/D	360
8232	8 Isolated Inputs, 8 High-Current Form C Outputs	480

The SeaDAC REL-16C (Item# 8225) includes a wall-mount AC power supply (5VDC @ 2.4A) with a locking DC connector (Item# TR127). External power is required with this module due to the power requirements of the sixteen Form C relays.

SeaDAC Configurations & Specifications

8221 – 16 Optically Isolated Inputs/16 Reed Relay Outputs

SeaDAC 8221 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.

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.

SeaDAC Configurations & Specifications, Continued

8222 – 16 Optically Isolated Inputs/8 Form C Outputs

The SeaDAC 8221 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.

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.

SeaDAC Configurations & Specifications, Continued

8223 – 32 Optically Isolated Inputs

SeaDAC 8223 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.

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

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SeaDAC Configurations & Specifications, Continued

8224 – 32 Reed Relay Outputs

The SeaDAC 8224 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.

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.

SeaDAC Configurations & Specifications, Continued

8225 – 16 Form C Relay Outputs

Control a variety of low voltage, low current devices with the SeaDAC 8225. 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.

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.

SeaDAC Configurations & Specifications, Continued

8227 – 16 A/D, 2 D/A, 8 24V Outputs, 8 Isolated Inputs

Designed using the Maxim MAX197 successive approximation-type A/D chip, the SeaDAC 8227 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 SeaDAC 8227 includes removable screw terminals, which simplify field-wiring connections.

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

SeaDAC Configurations & Specifications, Continued

8232 – 8 Optically Isolated Inputs/8 High-Current Form C Outputs

The SeaDAC 8232 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.

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/30VDC max.
Contact Current (AC):	6A max.
Contact Current (DC):	5A max.
Switching Capacity	5 VDC @10mA min.
Operate Time:	10ms max.
Release Time:	10ms max.

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SeaMAX Application Suite

SeaMAX Overview

The SeaMAX Suite is a collection of software libraries, and configuration and diagnostic utilities that facilitates rapid application development for SeaI/O, SeaDAC, and SeaDAC Lite modules. The following libraries and utilities are included in the SeaMAX Suite software (Click the link to download the software) and are covered in this manual:

- **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.

The 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

N   SeaDAC Lite modules do not currently support Modbus commands.

SeaMAX Software Installation

Windows Software Installation

W Only users running Windows 7 or newer should utilize these instructions for accessing and installing the appropriate driver via Sealevel's website. If you are utilizing an operating system prior to Windows 7, please contact Sealevel by calling (864) 843-4343 or emailing support@sealevel.com to receive access to the proper driver download and installation instructions.

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

1. Begin by downloading and installing the SeaMAX software from the Sealevel website at https://www.sealevel.com/support/software-seamax-windows/. Software drivers are also available on the product webpage or at the Sealevel software driver database. The user can search for the Part No. for the SeaDAC product the user is installing. Download the proper software for the specific product, launch the install and follow the directions on the screen.

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

3. 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.

4. 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.

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

Other Operating Systems

Refer to the appropriate section of the Serial Utilities Software.

LINUX INSTALLATION

Refer to [Linux Archives - Sealevel](). This link contains valuable information on installing your serial adapter in the various Linux releases. Also included is a series of files explaining proper Linux syntax and typical Linux serial implementations.

For additional software support, please call Sealevel Systems' Technical Support, (864) 843-4343. Our technical support is free and available from 8:00AM-5PM Eastern Time, Monday through Friday. For email support contact: [support@sealevel.com]().

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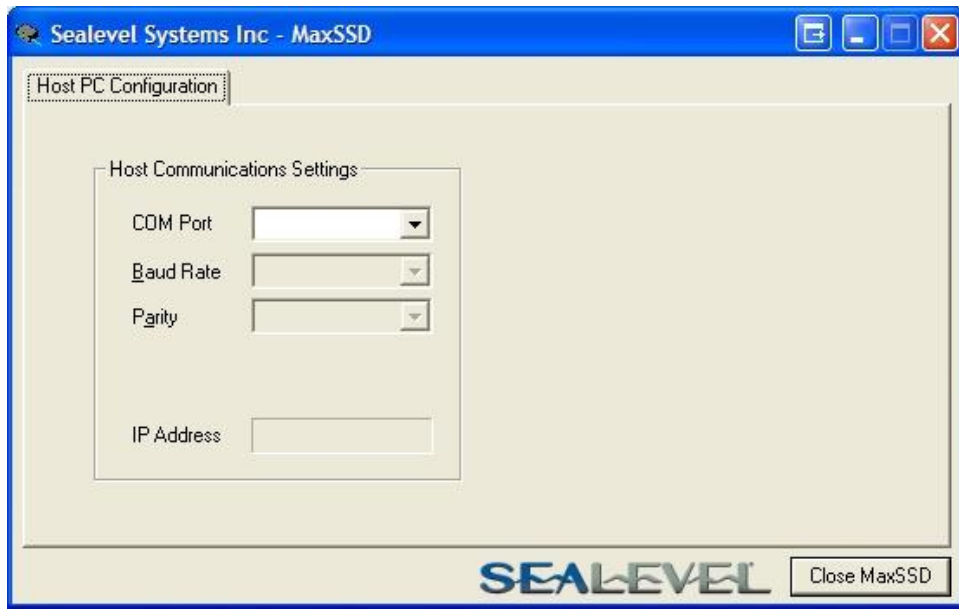
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Once a COM port is selected, the baud rate and parity can be selected.

N 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.

SeaMAX Software Installation, Continued

Host PC Configuration Tab (cont.)

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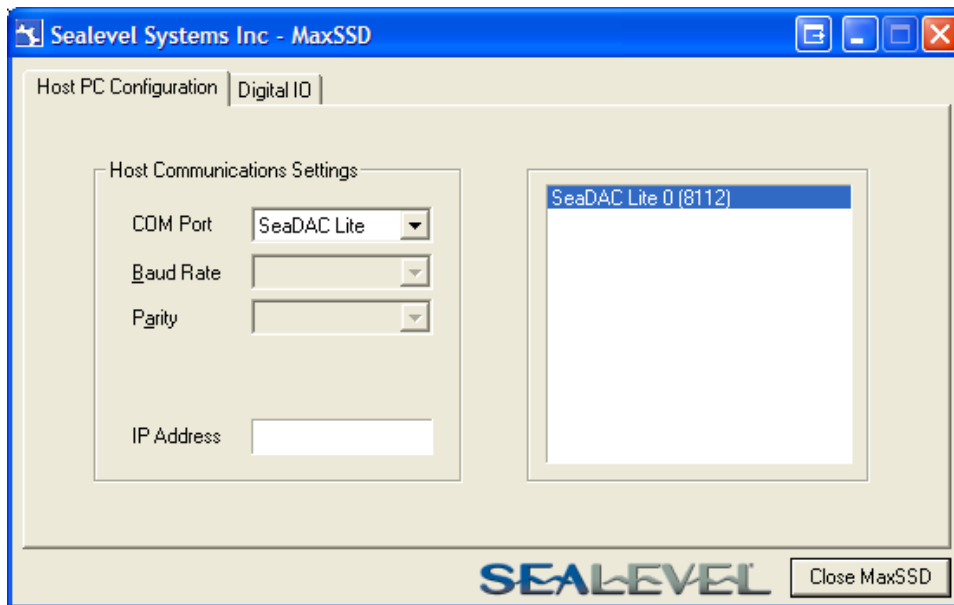
To communicate with a SeaI/O Ethernet module, select "ETHERNET" from the "COM Port" dropdown box. When Ethernet is selected, MaxSSD searches for any SeaI/O Ethernet modules on the network and displays their IP addresses in the "Available Ethernet Devices" list box (not shown). When an IP address is selected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

N 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 the is manual.

# SeaMAX Software Installation, Continued

Seal/O Configuration Tab

Once the host computer is configured correctly, the "Seal/O Configuration" tab becomes available. This tab only appears for Seal/O and SeaDAC modules and will not appear when using SeaDAC Lite modules.

Before communicating with a Seal/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. Seal/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 Seal/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.
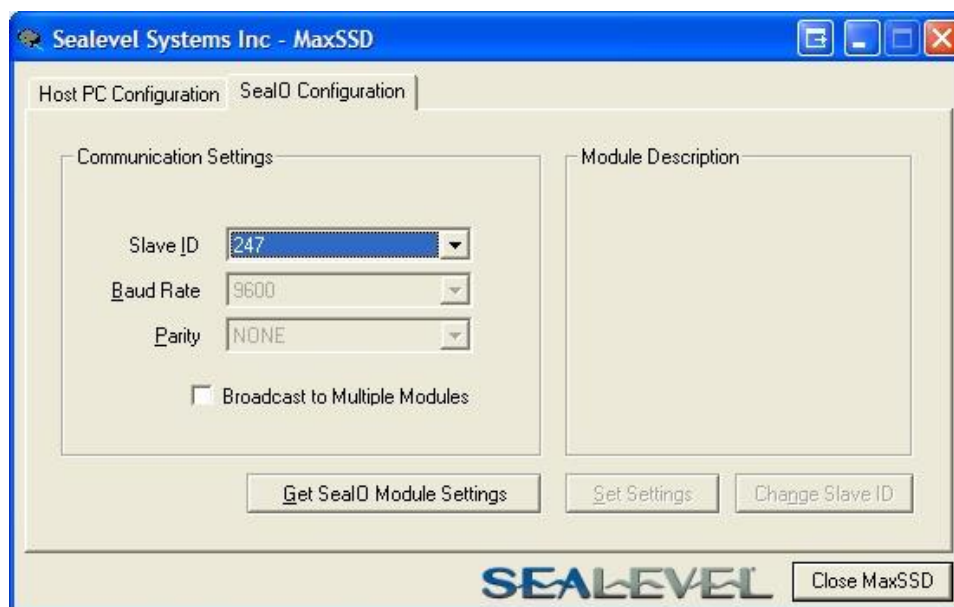
Once a slave ID is selected, click the "Get SeaIO Module Settings" button. After a short delay, the information for that I/O module should be displayed. If no information appears, verify the host settings and baud rates are correct and make changes, if necessary. For SeaDAC modules, make sure the baud rate is set to 9600bps. For Seal/O modules, check the hardware settings (on the left side of the module) and try again.

SeaMAX Software Installation, Continued

SeaI/O Configuration Tab (cont.)

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 configurations for all SeaMAX supported devices.

SeaMAX Software Installation, Continued

Seal/O Configuration Tab (cont.)

The "Broadcast to Multiple Modules" checkbox, along with the "Set Settings" button can be used to change the baud rate and parity on multiple Seal/O modules at once. This function only works with Seal/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 Seal/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.
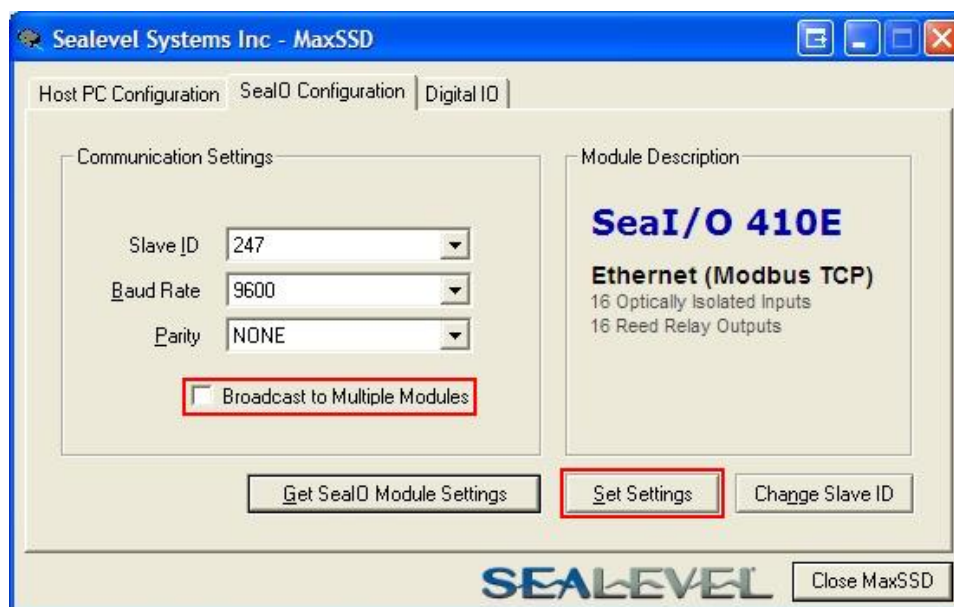
Important note regarding Seal/O Ethernet (E-series) modules
The broadcast feature sets the Ethernet Seal/O (E-series) module's TCP/IP to RS-485 translation data rate independently of the Seal/O module itself. Therefore, if you have an Ethernet Seal/O module and you set the data rate to 115.2K bps via a MaxSSD broadcast command, both the RS-485 port and the Ethernet port will respond thereafter to 115.2K bps, as expected. However, if you reset the Seal/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.

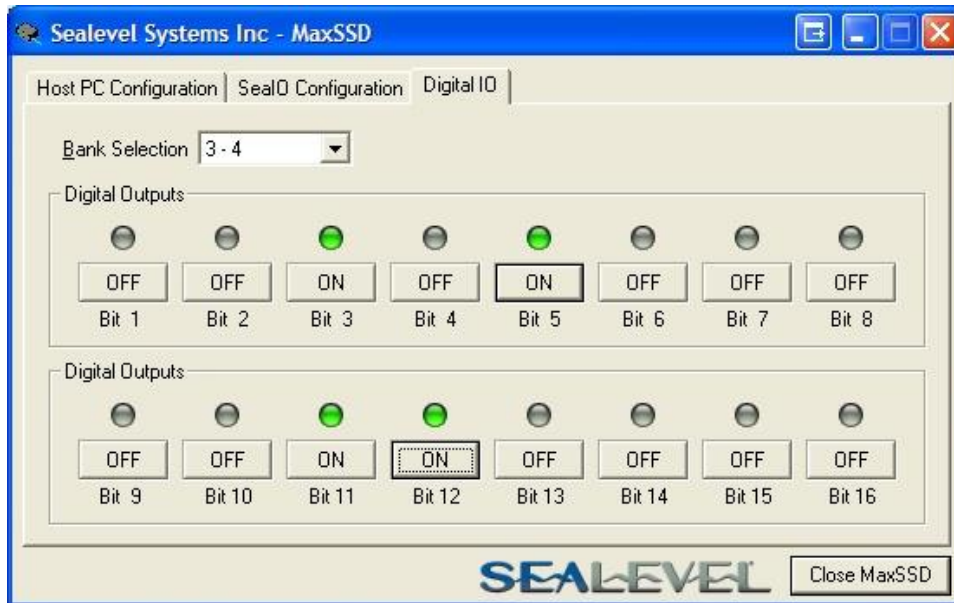# SeaMAX Software Installation, Continued

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.
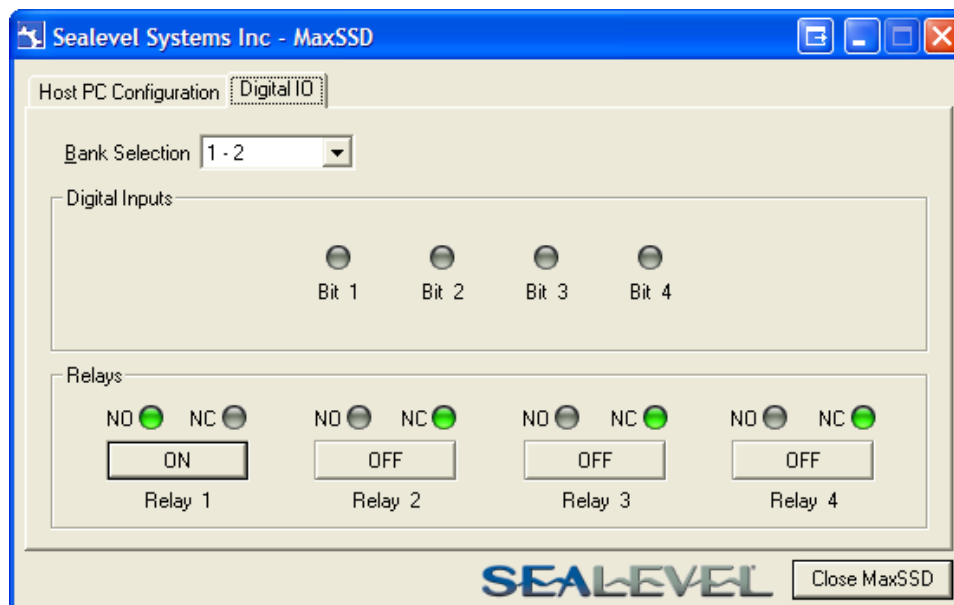
SeaMAX Software Installation, Continued

Digital I/O Tab (cont.)

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).


The "SeaIO Configuration" tab does not appear in MaxSSD when using SeaDAC Lite modules since they have no configurable communication settings.

SeaMAX Software Installation, Continued

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.
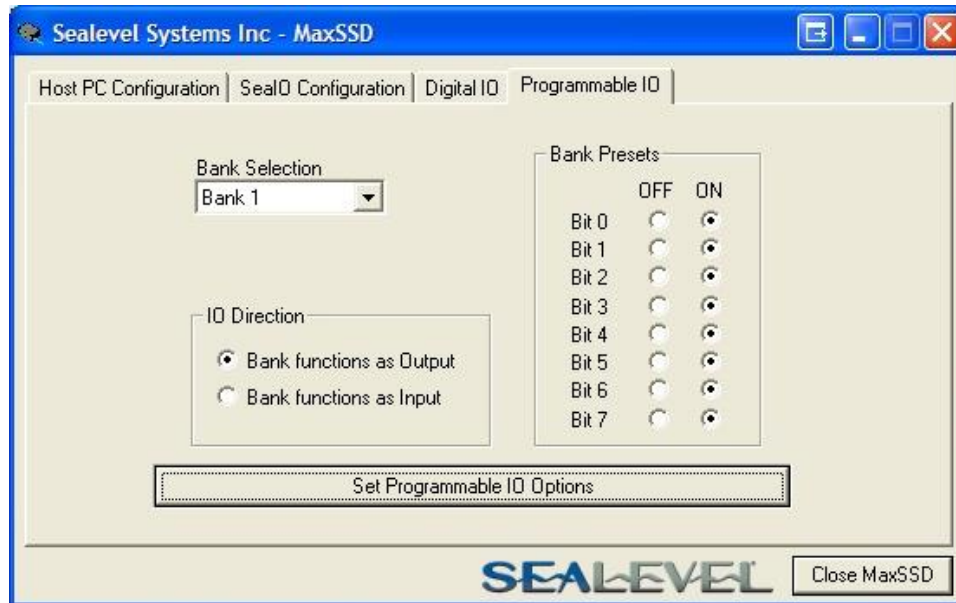
Each bank of programmable I/O can be set as either an 8-bit group of inputs or outputs. By selecting "Bank 1" from the drop-box, clicking the "Bank functions as Input" radio button, and then clicking the "Set Programmable IO Options" button, the first 8 PIO bits on the device will now function as inputs.   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.

N 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.

SeaMAX Software Installation, Continued

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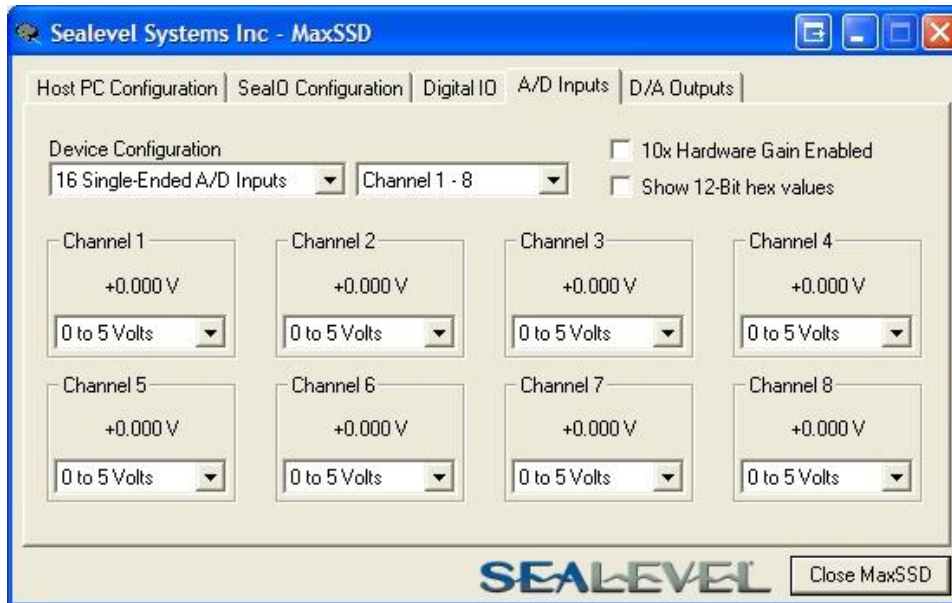
The "Device Configuration" selection drop-box adjusts the arrangement and function of the A/D input channels. Input channels are displayed as banks (groups of eight). Each channel is range configurable via the voltage range dropdown list. Both the channel voltage range and device-wide configuration are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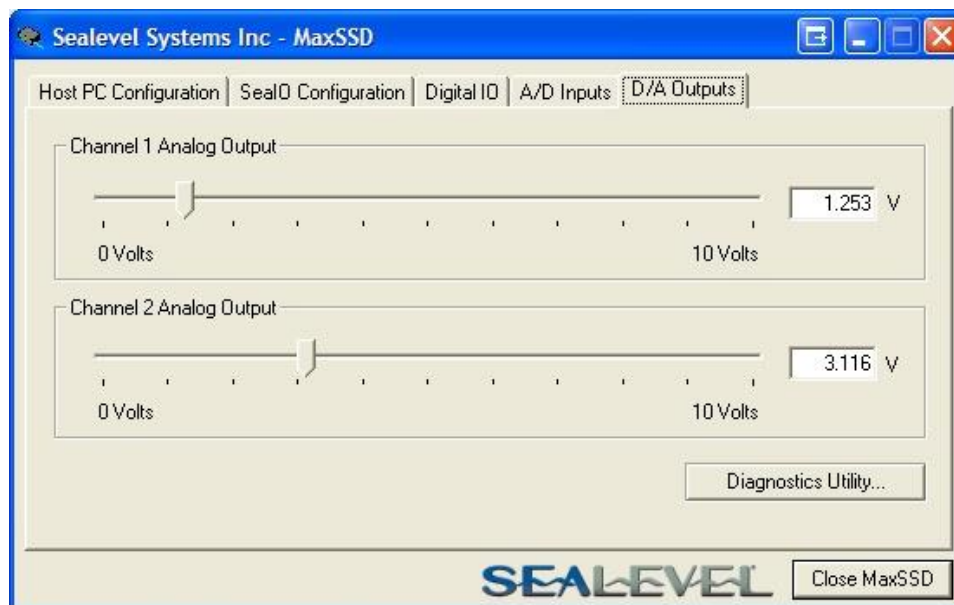
SeaMAX Software Installation, Continued

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.


> **N** 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.

SeaMAX Software Installation, Continued

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.
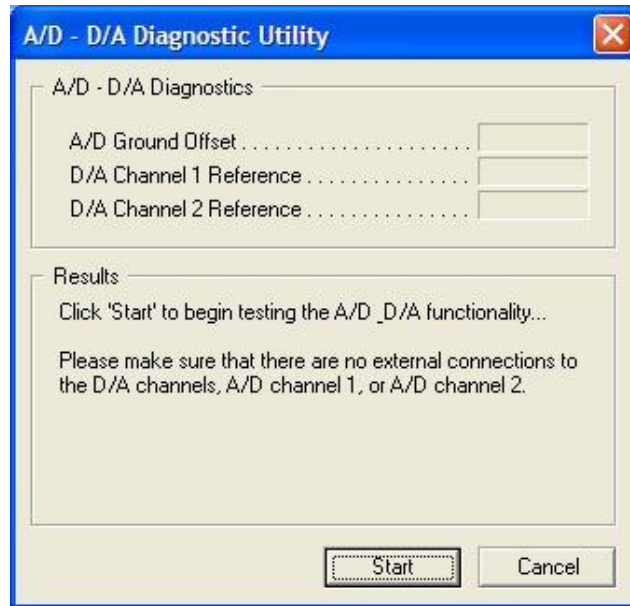
Converting A/D & D/A Values

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/

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Troubleshooting - SeaMAX

By using this software and following these simple steps, most common problems can be eliminated without the need to call Technical Support.

1. Read this manual thoroughly before attempting to install the adapter in your system.
2. Uninstall any previous versions of the SeaMAX software before installing any new versions.
3. **Install SeaMAX Software Suite first, before connecting any Sealevel I/O devices**. After installing the software then proceed to adding the hardware. This places the required installation files in the correct locations. After installing the software, proceed with adding the hardware.
4. 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).
5. 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.
6. 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.
7. Use the MaxSSD utility to verify proper installation. MaxSSD is designed to simplify the installation, configuration, and diagnostics of Sealevel SeaI/O modules.
8. 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.
9. Refer to the **Troubleshooting Ethernet Modules** section on the following page for additional steps regarding Ethernet (E-series) SeaI/O modules.

If these steps do not solve your problem, please call Sealevel Systems' Technical Support, (864) 843-4343. Our technical support is free and available from 8:00 AM - 5:00 PM Eastern Time, Monday through Friday. For email support contact: support@sealevel.com.

Troubleshooting Ethernet (E-series) SeaI/O Modules

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

All Ethernet SeaI/O (E-series) modules are shipped with DHCP enabled. If no DHCP server is available or the DHCP server cannot be reached, the Ethernet SeaI/O module will default to a random IP address in the range 169.254.0.1 to 169.254.255.254. 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

The Ethernet 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 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 Ethernet SeaI/O (E-series) module's TCP/IP to RS-485 translation data rate independently of the SeaI/O module itself. Therefore, if you have an Ethernet 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.

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Hardware Configuration

8227 – Jumper and Dipswitch Settings

The SeaDAC 8227 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).

N Do not perform these instructions with USB or field wires connected. Be sure to follow proper ESD procedures by grounding yourself and the SeaDAC module.

What you will need:

- SeaDAC 8227 module
- Phillips head screwdriver

Step 1

Turn the SeaDAC 8227 module upside down and remove the four black screws from the locations shown in the image.

Step 2

Holding the top and bottom halves of the SeaDAC module together, flip the module back over. Remove the top half of the enclosure and set to the side.

Jumpers and dipswitch locations are outlined in the image to the right and are shown in detail on the following page.

SeaDAC 8227 Jumper Locations

This detail image of the right side of the SeaDAC 8227 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.
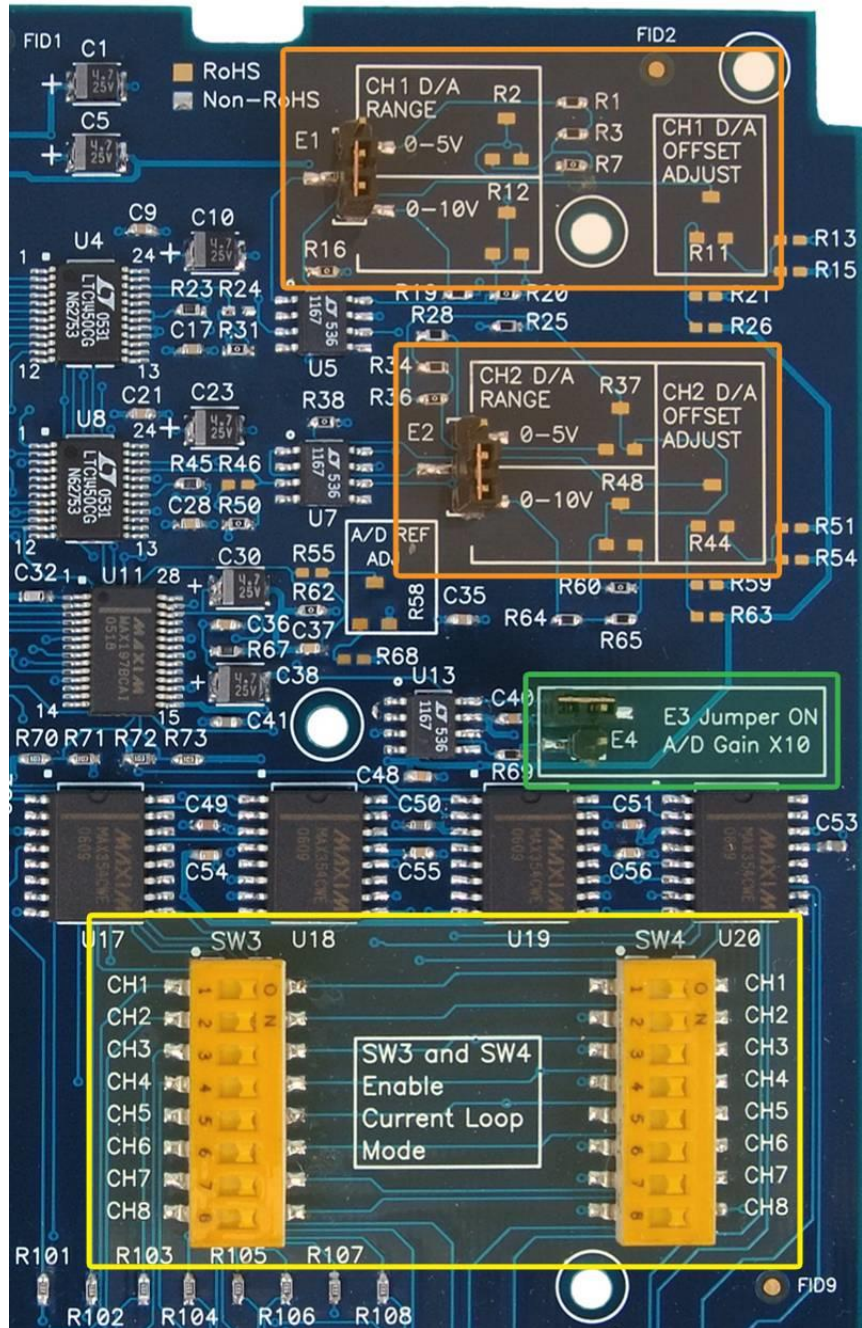
Hardware Configuration, Continued

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 SeaDAC 8227.

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 SeaDAC 8227 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

I/O Wiring – SeaDAC 8221, 8222, 8223, 8224, and 8225 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.
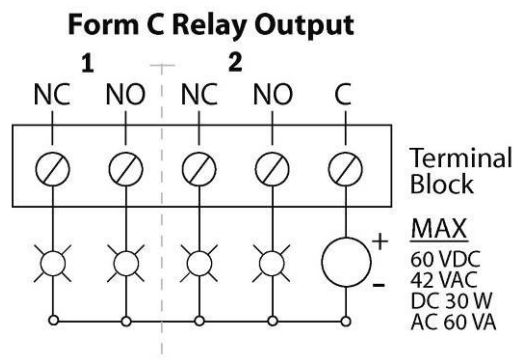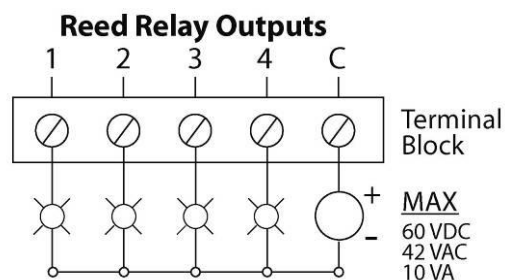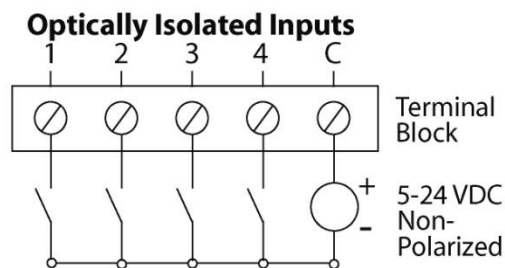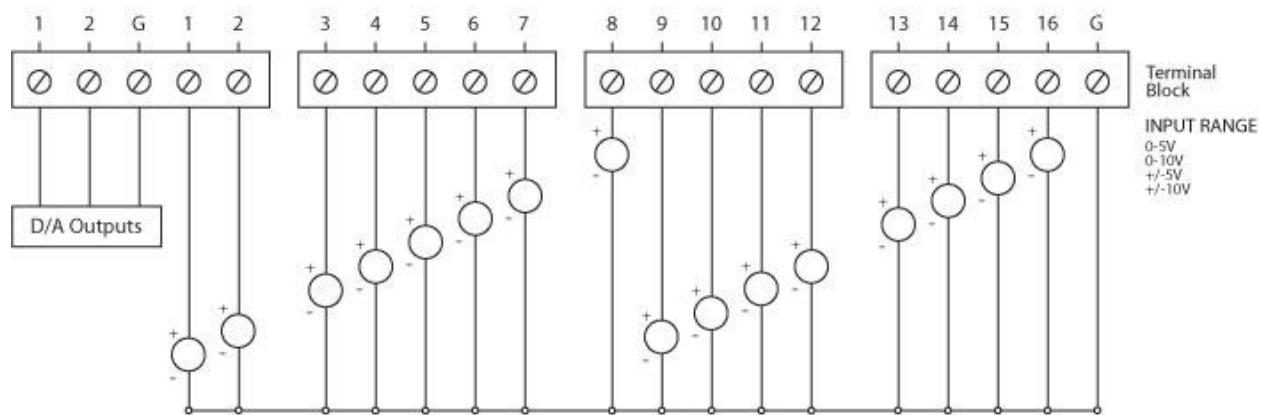
I/O Wiring – SeaDAC 8227 Modules

A/D Wiring Connections

The SeaDAC 8227 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 SeaDAC 8227 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 SeaDAC 8227 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
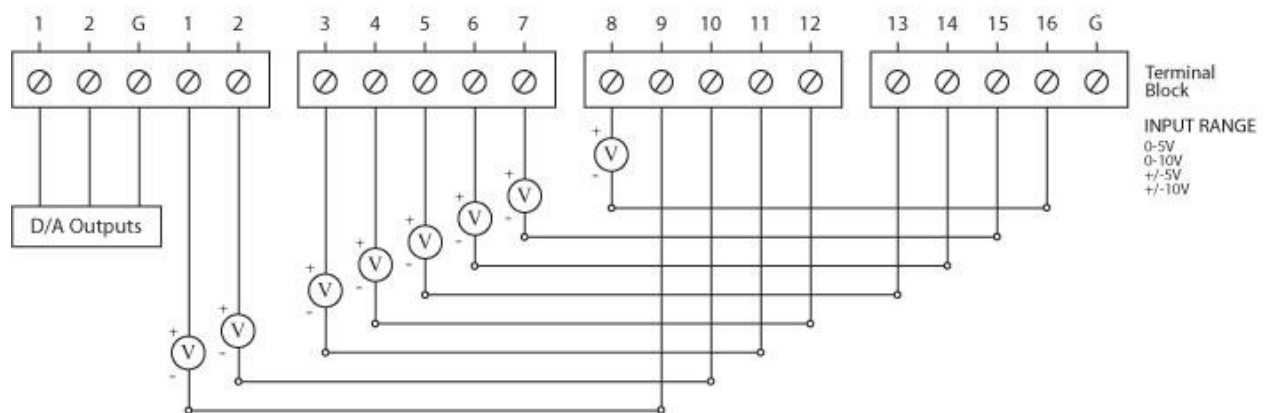
I/O Wiring – SeaDAC 8227 Modules
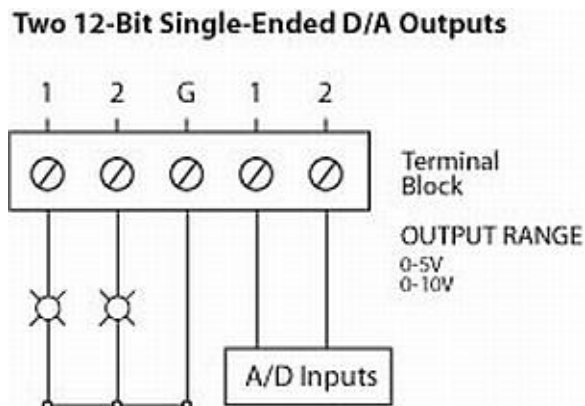
A/D Wiring Connections, Continuing

The SeaDAC 8227'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
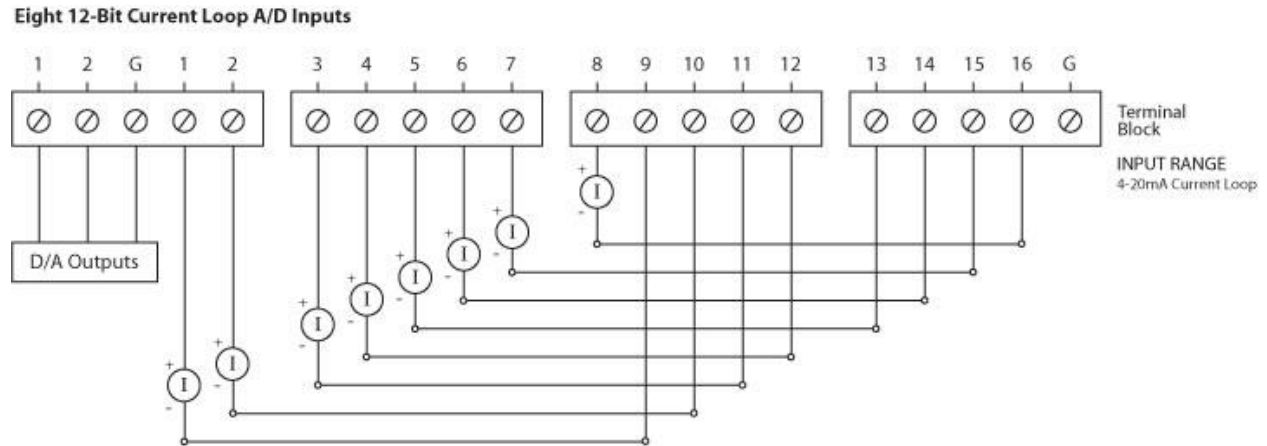
D/A Wiring Connections

The SeaDAC 8227 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 SeaDAC 8227 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

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I/O Wiring – SeaDAC 8227 Modules

A/D Wiring Connections, Continuing

Digital I/O Wiring Connections

The SeaDAC 8227 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.
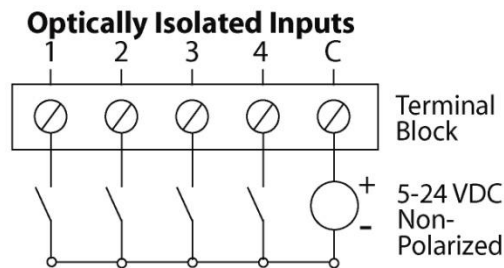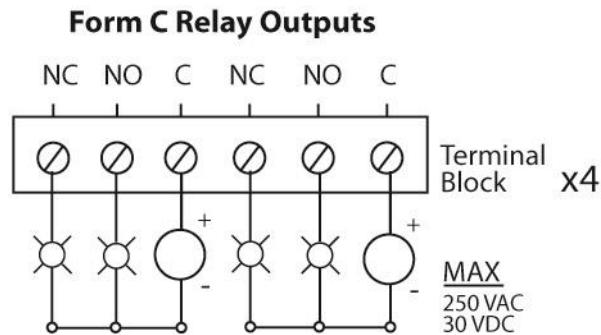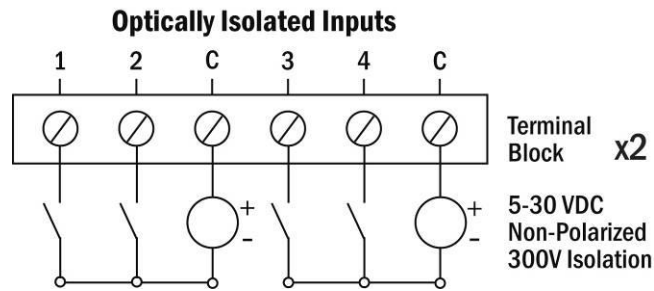

The SeaDAC 8227 modules provide eight open-collector digital outputs. The outputs do not source any current and must be connected to an external power source, max 30VDC. The outputs act as a switch and the circuit is open until energized. When the output circuit is energized in software, the output sinks the current to ground, closing the circuit.

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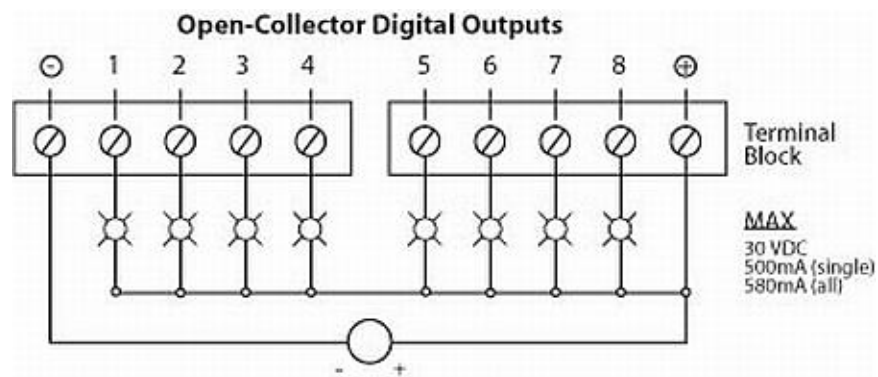
I/O Wiring – SeaDAC 8232 Modules

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 voltage 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.

Optically Isolated Inputs

| 1 | 2 | C | 3 | 4 | C |

Terminal Block **x2**

5-30 VDC
Non-Polarized
300V Isolation

Form C Relay Outputs

| NC | NO | C | NC | NO | C |

Terminal Block **x4**

MAX
250 VAC
30 VDC

Appendix A – How To Get Assistance

Begin by reading through the Trouble Shooting Guide. If assistance is still needed, please see below.

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

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

Sealevel Systems maintains a web page on the Internet. Our home page address is www.sealevel.com. The latest software updates, and newest manuals are available via our web site.

Technical support is available Monday to Friday from 8:00 AM - 5:00 PM Eastern Time. Technical support can be reached at (864) 843-4343. For email support: support@sealevel.com.

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

Appendix B – Compliance Notices

Federal Communications Commission (FCC) Statement

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".

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 I/O 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 achieved ISO-9001:2015 certification in 2018.

Warranty Policy

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

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

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

Non-Warranty Repair/Retest

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

How to obtain an RMA (Return Merchandise Authorization)

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

Available	Monday – Friday, 8:00AM to 5:00PM EST
Phone	864-843-4343
Email	support@sealevel.com

Trademarks

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