SEALEVEL®
SeaConnect 370

User Manual

PARTS# 370W AND 370C

Contents

Before You Get Started

WHAT'S INCLUDED

- **370W-A SeaConnect Wi-Fi Data Acquisition Module**
  - ✓ SeaConnect 370W Wi-Fi multifunction I/O edge module
  - ✓ Includes optional 1-month trial SeaCloud subscription plan (Must order Item# SC00W)
  - ✓ 100-240 VAC to 5 VDC @ 4 A desktop power supply with US power cord (TR151-US)
  - ✓ 10 Insulated Jumper Wires (CA603)

- **370C-AV00 SeaConnect Wi-Fi and Cellular Data Acquisition Module**
  - ✓ SeaConnect 370C LTE CAT 1 Cellular & Wi-Fi multifunction I/O edge module
  - ✓ LTE Ultra-Wideband 3 dBi+ dipole sail antenna (104264)
  - ✓ Includes optional 1-month trial SeaCloud subscription plan with 25MB cellular data (Must order Item# SC00C)
  - ✓ 100-240 VAC to 5 VDC @ 4 A desktop power supply with US power cord (TR151-US)
  - ✓ 10 Insulated Jumper Wires (CA603)

- **QSM100-KT SeaConnect QuickStart Module**
  - ✓ SeaConnect QuickStart Demonstration Module (QSM100)
  - ✓ 12V/5V 3000 mAh Dual-Output Battery Pack & 12 V AC/DC Charger (104752)
  - ✓ Spider Cable with 4 Cable Groups and 14 Color Insulated Wires (CA595)
  - ✓ USB Power Cable with Type A Connector to Tinned Leads (CA606)

All items can be purchased from our website (http://www.sealevel.com) by calling our sales team at +1 (864) 843-4343.

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.

REGULATORY

FCC STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. 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 which case the user will be required to correct the interference at his own expense.

RF EXPOSURE

This equipment complies with radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and human body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

UNAUTHORIZED MODIFICATIONS

Any changes or modifications to this device not expressly approved by Sealevel Systems, Inc. could void the user's authority to operate the equipment.

Introduction

The SeaConnect 370 has a small form-factor I/O board featuring a TI CC3200 Cortex ARM-M4 MCU with integrated Wi-Fi capability. The SeaConnect 370 can also be configured with a cellular modem. It includes 2 Form C relays, 4 discrete inputs, and 2 12-bit A/D converters, each configurable independently for either 0–10 VDC voltage measurement or 0–24 mA current measurement mode. There is also provision for connecting 1-Wire temperature probes.

The SeaConnect 370 features a powerful built-in event engine that can easily be configured using an intuitive web-based interface to trigger actions when pre-defined conditions are met. For example, if a tank level is too high or valve pressure out of range, the SeaConnect event engine can log data to SeaCloud to alert that action should be taken. This helps automation engineers, technicians, production managers, and network operators make critical decisions.

INDUSTRY SEGMENTS

SeaConnect 370 modules are perfect for a wide variety of applications and environments including:

- Data Acquisition
- Broadcast Automation
- Security
- Facility Management

SPECIFICATIONS

- ARM Cortex-M4 Core at 80 MHz

- Embedded Memory Options

  - Integrated Serial
  - RAM (up to 256KB)
  - Peripheral Drivers in ROM

- 1 I^{2}C interface on header (for OEM use)

- 2 12-Bit Differential Analog-to-Digital Converters (ADCs)

- 2 Form C Relay Outputs

- 4 Digital Inputs (dry or wet)

- 1 1-Wire bus interface

- Wireless (802.11b/g)

  - Supported Protocols: Modbus TCP, TCP/IP, UDP, DHCP, and HTTP
  - WPA2 Personal Security
  - Crypto Engine for Secured WLAN Connections with 256-Bit Encryption
  - Infrastructure and Access Point modes

- Cellular options:

  - 4G Cat 1 LTE modem
  - 4G Cat 3 LTE modem with GPS (Call)

- Supports Industry Standard Modbus TCP Protocol

- Status and Activity Indicator LEDs

- Field-Removable Terminal Block Connectors

- 5 VDC Power Input

- −20°C to 70°C (-4°F to 158°F) Operating Temperature

- Compact Size – 4.00"(L) x 2.03"(W) x 1.13"(H) (excluding mounting flanges and antenna connector)

OPERATIONS

The SeaConnect 370 is designed with features and connectivity compatible with the Sealevel eI/O and SeaI/O modules. Tools available for either will work with the SeaConnect 370. In addition to being able to be used on a LAN, the SeaConnect 370 supports WAN connectivity to the cloud service DWEET.IO and the Sealevel SeaCloud.

The SeaConnect 370 can be used on a LAN without connectivity to any cloud service as with traditional SeaI/O devices using the SeaConnect 370 web interface, SeaMAX software, our mobile app Mod+ Connect, or native Modbus protocol. See *SeaMAX Application Suite* and *MOD+ CONNECT* sections below for details. Simply configure the 370 to use the Modbus protocol then connect to your local LAN infrastructure. The 370 will then respond to traditional Modbus commands that allow you to read and write the I/O on the device.

The SeaConnect 370 is equipped with additional features that facilitate WAN data collection to the cloud via Wi-Fi or Cellular network connectivity. This is the default configuration of the 370. In this mode, the 370 can be configured to send data to the cloud via some triggering event, like when a digital input changes state or an analog value crosses a predefined threshold.

The SeaConnect 370 supports both DWEET.IO and the Sealevel SeaCloud service. DWEET.IO is a free cloud service that will let you get started sharing data to the cloud. See https://dweet.io for more information on using the DWEET.IO service.

SEACLOUD

The SeaConnect 370 is natively supported by the Sealevel SeaCloud cloud service. The Sealevel SeaCloud service is a secure, robust, scalable, Industrial IoT (IIoT) platform designed to track, monitor, control and analyze data from Sealevel I/O devices. With SeaCloud you can:

- Manage devices
- Monitor connectivity status over time
- Control available relay and digital outputs
- e-Mail and SMS alarms whenever something need attention
- Diagnose issues remotely
- Provision fielded units
- Brand your Instance

At its heart, SeaCloud was designed as an application platform (PaaS) for many different applications and companies. The SeaConnect 370 interacts with the SeaCloud SeaConnect Instance, but many application-specific Instances can be supported from the base platform. SeaCloud has all the features needed to support most IIoT applications with more features being developed daily.

Do you have an IoT idea? Do you need an application-specific device and cloud solution? Sealevel can provide a number of services from design, application-specific cloud instance, cellular data plans, and even billing services for a turn-key solution. Sealevel would love to work with you to realize your IoT vision.

SeaConnect 370 Hardware Description

SEACONNECT CONFIGURATIONS & SPECIFICATIONS

The SeaConnect-370 includes removable screw terminals, which simplify field-wiring connections. The specifications below based on the underlying hardware of the 370. Actual values may vary depending on your application.

Discrete Inputs	
Number of Channels	4
Voltage Range	3-30VDC
Response Time	4 microseconds
Form C Relay Outputs	
Number of Outputs	2
Contact Rating	2A
Maximum Switching Power	30W, 30VA
Maximum Switching Voltage	60VDC, 30VAC
Maximum Carrying Current	2A
Operate Time	5ms max.
Release Time	5ms max.
Differential A/D Inputs	
Number of Channels	2
Resolution	12-bit (10-bit effective)
Sampling Rate (ADC)	Fixed sampling rate of 16 µs per channel (Equivalent to 62.5 k Samples/sec per channel) Fixed round-robin sampling across all channels
Input Range	0–10VDC or 0–24mA (software-configurable)
Input Impedance	900kΩ
1-Wire	
Maximum simultaneous devices	10
Configurations	Parasite power and dedicated power
Chips supported	DS18B20

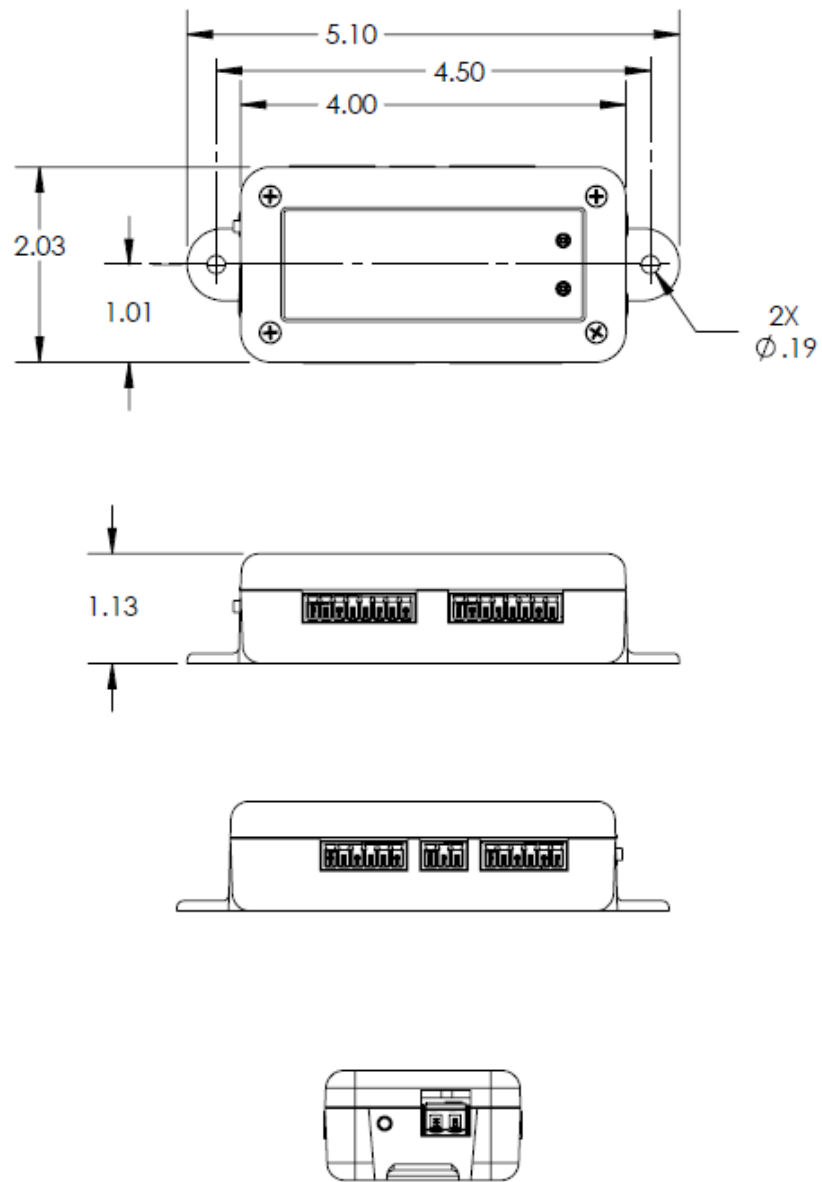|	DS18S20
Power	
Power Input	5 VDC @ 3A max via terminal block
Environmental	
Operating Temperature	-20°C to +70°C (-4°F to 160°F)
Humidity	10% to 90% RH (non-condensing)
Mechanical	
Dimensions	5.10" W X 2.03" H X 1.13" D (enclosure)

DIMENSIONAL DRAWING
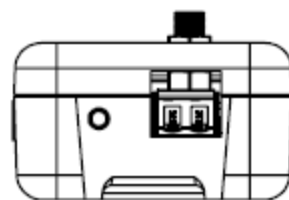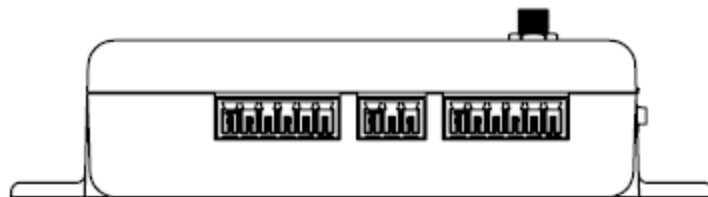
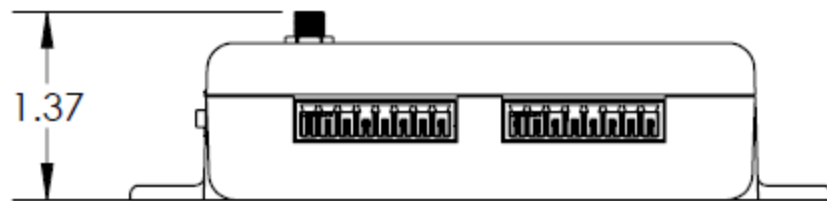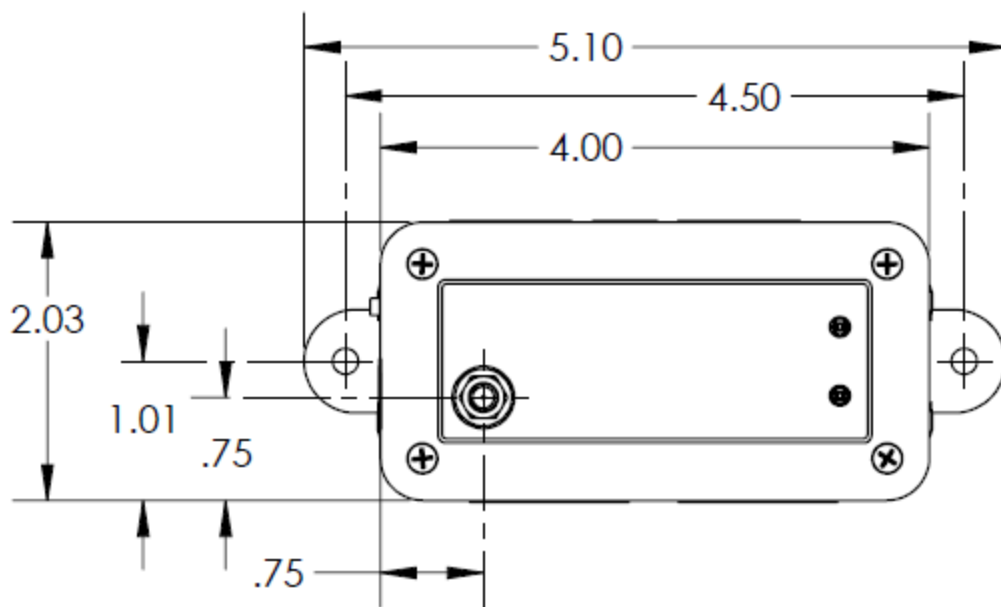**Figure 1: 370W Enclosure Dimensions (inches)**

Figure 2: 370C (inches)

WIRELESS MODULE INFORMATION

SeaConnect wireless modules have an internal antenna and are compatible with 802.11b, 802.11g, and 802.11n wireless networking equipment operating in the 2.4GHz frequency spectrum. The specifications below based on the underlying hardware of the 370. Actual values may vary depending on your application.

WIRELESS SPECIFICATIONS

Standards	2.4 GHz IEEE 802.11b/g/n WLAN
Channels	1–11
Frequency Range	2.412 – 2.484 GHz
TX Power	17 dBm at 1 DSSS 17.25 dBm at 11 CCK 13.5 dBm at 54 OFDM
RX	–94.7 dBm at 1 DSSS –87 dBm at 11 CCK –73 dBm at 54 OFDM
Application Throughput	UDP: 16 Mbps max TCP: 13 Mbps max
Range	[1]150' (on-board antenna) Outdoors with no obstructions or interference
WLAN	2.4 GHz IEEE 802.11b/g/n WLAN Supported Protocols: Modbus/TCP, TCP/IP, UDP, DHCP, HTTP, HTTPS, TCP/IP Stack, TLS 1.2
Antenna	Internal

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[1]Outdoor line of sight. Actual range may vary.

1-WIRE TECHNOLOGY

OVERVIEW

1-Wire is a serial protocol technology designed by Dallas Semiconductor Corp. (now Maxim Integrated) that provides low-speed data, signaling, and power over a single contact plus ground interface. The major features of the 1-Wire bus are:

- Single Contact Sufficient for Control and Operation
- Unique 64-bit ID Factory-Lasered into Each Device
- Power Derived from Signal Bus ("parasite power")
- Multidrop Capable: Supports Multiple Devices on Single Line
- Exceptional ESD Performance

For an overview of 1-Wire technology, visit: https://www.maximintegrated.com/en/app-notes/index.mvp/id/1796, "Overview of 1-Wire Technology and Its Use" or https://www.maximintegrated.com/en/products/1-wire/flash/overview/ for a tutorial.

The 1-Wire bus system uses a single primary controller to control one or more secondary devices. The SeaConnect 370 is the primary controller for up to 10 secondary devices. When there is only one secondary device on the bus, the system is referred to as a "single-drop" system; the system is called "multidrop" if there are multiple secondary devices on the bus.

1-Wire devices are available in one of two modes: parasite power and dedicated power. Parasite power mode devices use two wires, which provide (1) data with parasite power and (2) ground. Dedicated power devices use three wires, where the third wire is dedicated to power. In the case of a dedicated power device, it is required to use the dedicated power line, since the device will not operate in parasite power mode.

The SeaConnect 370 supports temperature probes built with the Maxim Integrated DS18S20 and DS18B20 1-Wire devices, which are described below. Such devices are available in various form factors.

The DS1820, a 9-bit device (now obsolete), was replaced by the DS18S20 as a drop-in replacement from a hardware and software perspective, with the exception that the DS18S20 requires 750ms for conversion compared with only 500ms for the DS1820.

The DS18B20 improves upon the DS18S20 by providing additional resolution. Maxim recommends the DS18B20 for new designs.

DS18S20

The Maxim Integrated DS18S20 is a digital thermometer providing 9-bit Celsius temperature measurements. It measures temperatures from −55°C to +125°C with ±0.5°C accuracy from −10°C to +85°C.

The DS18S20 is offered in parasite power and dedicated power modes. For this device, the use of parasite power is not recommended for temperatures above 100°C. In applications in which such temperatures are likely, it is strongly recommended to use a dedicated power mode DS18S20.

DS18B20

The DS18B20 and DS18S20 devices are very similar. The difference is that the DS18B20 gives 12 bits of precision as compared to the DS18S20, which gives 9 bits of precision. The DS18B20 measures temperatures from −55°C to +125°C with ±0.0625°C accuracy from −10°C to +85°C. Both devices have a conversion time of 750ms.

Hardware Configuration

WIRELESS CONNECTION MODES

WI-FI ACCESS POINT MODE

In this mode, the SeaConnect 370 functions as an access point and broadcasts its own private network with its own SSID, to which up to one client can connect. This mode is typically used for first-time setup and configuration. The SeaConnect 370 will not have access to any other Wi-Fi networks while in this mode.

WI-FI INFRASTRUCTURE MODE

In this mode, the device functions as a network client. It will attempt to connect to an access point defined by another SSID. The list of SSIDs are defined as wireless network profiles via the local Web configuration page. This mode is the normal use case for the Wi-Fi modules, as it allows the device to connect to SeaCloud and for connections with other clients on the local network.

If no profiles are defined (see section Profiles), the SeaConnect 370 will automatically enter AP Mode upon boot. If at least one wireless profile is defined, the SeaConnect 370 will boot into Infrastructure Mode by default.

See Entering Access Point Mode Manually for instructions on overriding boot mode.

CELLULAR CONNECTION

The 370C ships from the factory with an approved antenna and a cellular modem activated and configured to communicate with the Sealevel SeaCloud service.

CELLULAR ANTENNA CONSIDERATIONS

Primary Antenna Requirements	
Frequency	700MHz, 1700MHz
Bandwidth	LTE B4 (1700): 445MHz LTE B13 (700c): 41MHz
Impedance	50 ohm
Input Power	>24dB

For applications not using the supplied antenna, you must ensure that the selected antenna(s) meet the following gain requirements:

Frequency	Max Gain
700 MHz Band	10.41 dBi
1700 MHz Band	6.5 dBi

STATUS INDICATOR LEDS

STATUS LED

The Status LED (labeled STAT on the enclosure) indicates device status. The following LED legend applies to both the Wi-Fi and Cellular versions of the SeaConnect 370.

Table 1: Status LED Legend

Behavior	Condition
Flash once at boot	Infrastructure Mode
Flash twice at boot	AP Mode
Fast flashing	Network unavailable
Slow flashing	Network connectivity without SeaCloud connection
Solid on	Connected to SeaCloud

ACTIVITY LED

The Activity LED (labeled ACT on the enclosure) flashes to indicate data transfer between the device and the Sealevel SeaCloud service.

SETUP

The SeaConnect 370 runs an on-board HTTP server at port 80. Connect to the same network as the 370, and point your web browser to the device's web page. Depending on the platform you are using, the address is in one of the following formats:

- The IPv4 address, e.g., http://192.168.1.1/ (all platforms)
- The NetBIOS name, e.g., http://SL370-21XXXX/ (Windows only)[2]
- The mDNS name, e.g., http://SL370-21XXXX.local/ (iOS only)

Your browser will ask for a username and password (Figure 3). The default HTTP Authentication username is "admin", and the default password is unique to your device and is printed on the bottom of the device.

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[2] Here and elsewhere in this manual, "21XXXX" is a placeholder for the last 6 digits of the device's unique MAC address, which is printed on the bottom of the device.

Figure 3: Web server authentication prompt

FIRST BOOT

Power the SeaConnect 370 using the provided 5V DC power supply.

The SeaConnect 370 will boot up in AP mode when shipped from the factory and/or configured to default settings, or when there are no wireless profiles defined. The Status LED will blink twice briefly to indicate it is booted in AP mode. The Status LED will then blink rapidly. At this point, use a Wi-Fi connected computer or mobile device to connect to the SSID "SL370-21XXXX" (Figure 4).
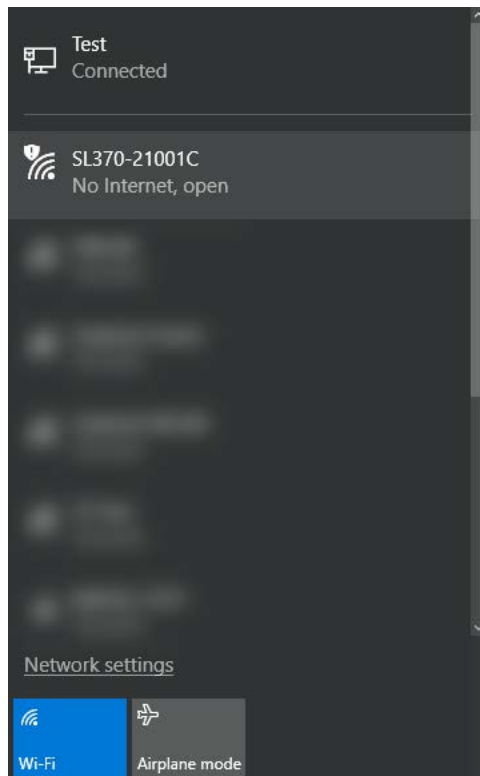

Figure 4: Connecting to the wireless access point

PROFILE CONFIGURATION

Once you have connected to the device AP, open a web browser, and navigate to the URL http://192.168.1.1. Enter the default HTTP Basic Authentication credentials. The username is "admin," and the password is printed on the bottom of the device. The I/O page will load (Figure 5, Figure 6).
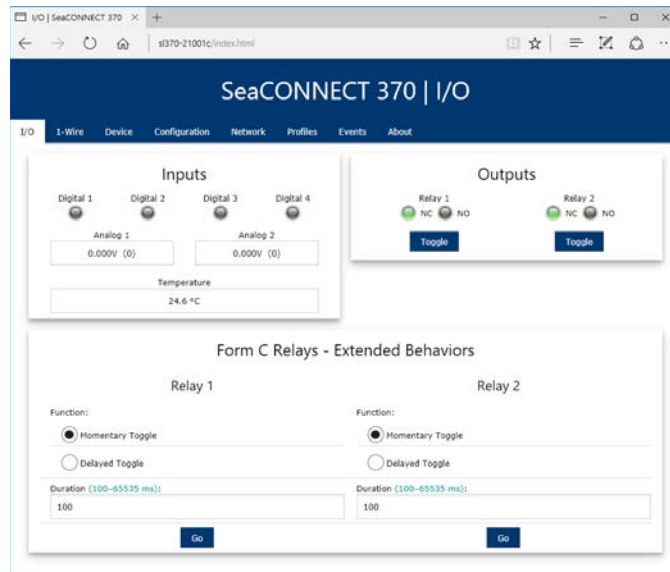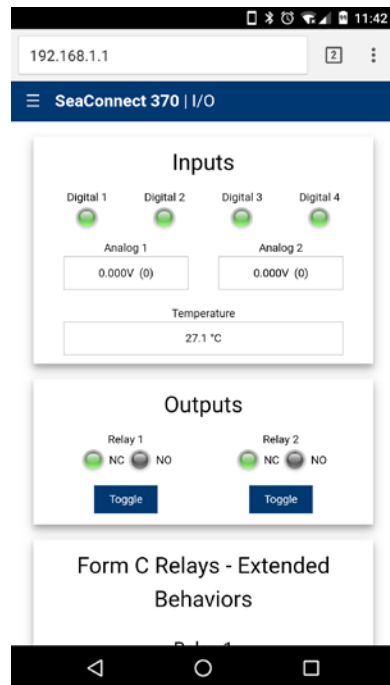

Figure 5: I/O Page (desktop view)

Figure 6: I/O page (Android phone view)

On the navigation bar at the top of the page or in the hamburger menu, click "Profiles." Click the circular Add button to begin adding a new profile. Enter the SSID of the existing wireless infrastructure network, the security type, and the security key, and the priority, then click the Save button (Figure 7).
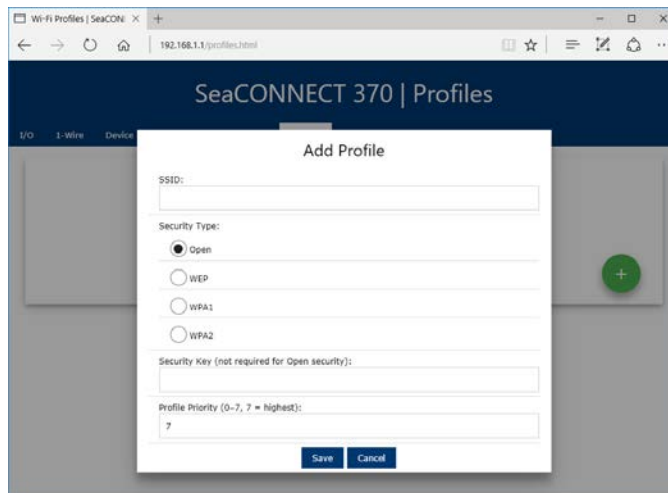
Figure 7: Add Profile dialog

The page will refresh, and you will be presented with an alert instructing you to restart the device for your changes to take effect. The "Profiles List" table on the same page will update with an entry for the profile that was just added (Figure 8).
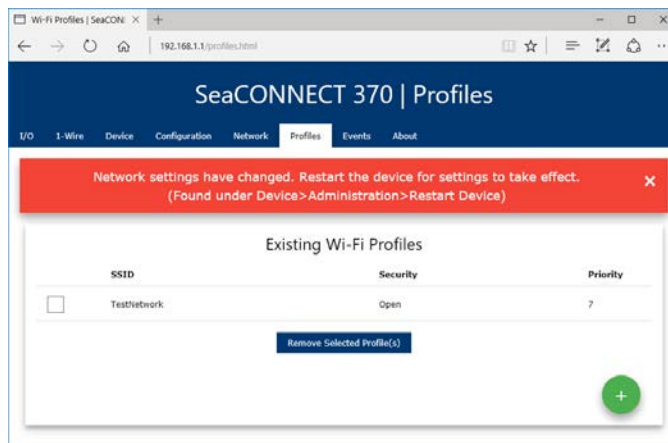

Figure 8: Profiles list showing the new profile and alert

Skip to the next step if your infrastructure network is configured for DHCP.

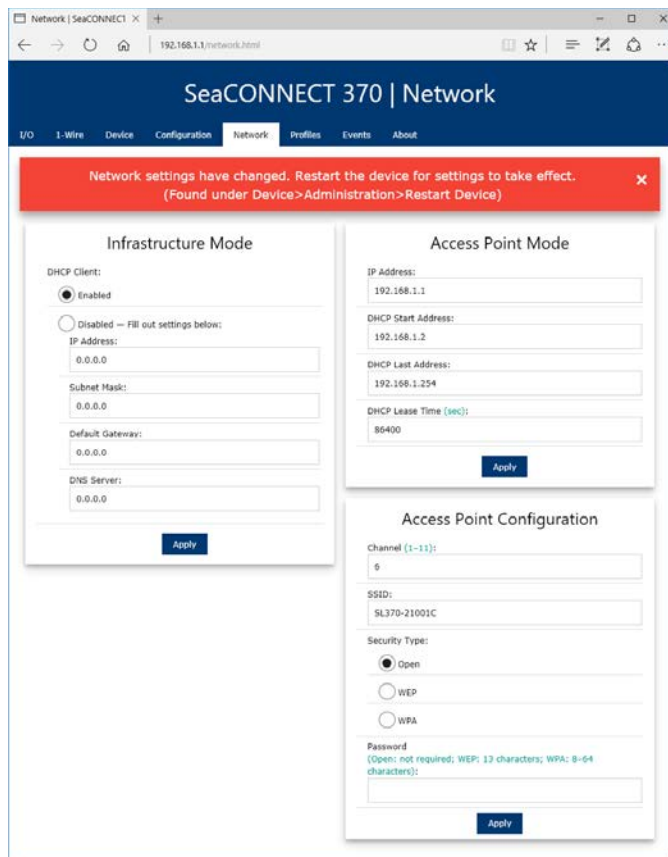Otherwise, visit the Network page to configure your Infrastructure Mode IP settings (Figure 9).

Figure 9: Network page showing alert

Restart the SeaConnect 370 by one of three methods:
- Unplug power to the device, wait 5 seconds, and plug it in again.
- Momentarily press the red configuration button on the device, located near the power input connector.
- Visit the Device page and click the "Restart Device" button.

The Status LED will blink once to indicate it is in Infrastructure Mode. After a pause, the Status LED will then begin to blink rapidly while it waits to connect to a Wi-Fi network. If the SeaConnect 370 has connected to SeaCloud, the Status LED will turn on and remain on.

SEACONNECT 370 WEB INTERFACE

This section describes the various web pages that make up the SeaConnect 370 web interface. The SeaConnect 370 defaults to the I/O page on login to the device. This page allows you review the current state of the device'

I/O

The I/O page displays status for the all device I/O. There are sections for Inputs, Outputs, and Form C Relay Extended Behaviors.
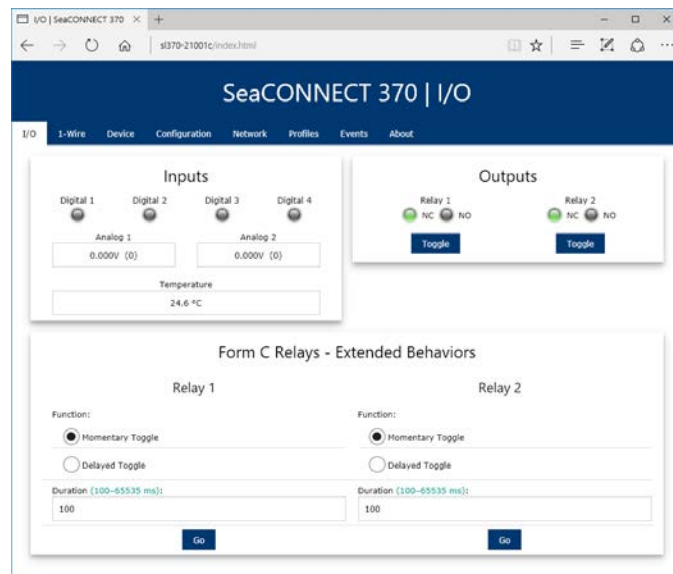
Figure 10: I/O Page

Inputs
The LEDs show the current status of the digital inputs, and the text boxes show the current analog input measurements in engineering units and in raw counts.

Outputs
The LEDs show the status of the Form C relay outputs. The Toggle buttons allow you to toggle the state of each relay.

Form C Relays - Extended Behaviors
This feature provides a basic level of timing on the relay. For each relay, you may perform a Momentary Toggle (toggle immediately, wait a specified time, and toggle again) or a Delay Toggle (wait a specified time, then toggle). The duration gives the period in milliseconds (with an allowable range of 100–65535 ms). The Go button initiates the special function for the corresponding relay.

1-WIRE

This page shows all connected 1-Wire devices (Figure 11). The SeaConnect 370 currently supports 1-Wire temperature sensors that use the Maxim Integrated DS18B20 or DS18S20 chip.

Press the "Scan for Devices" button to perform a search of the 1-Wire bus for connected sensors. After a brief period, the page will reload with an updated list showing the sensors' unique ROM number, name, SeaCloud ID, temperature, and an online status. New devices will be automatically given a name and a SeaCloud with a sequential numbering scheme.
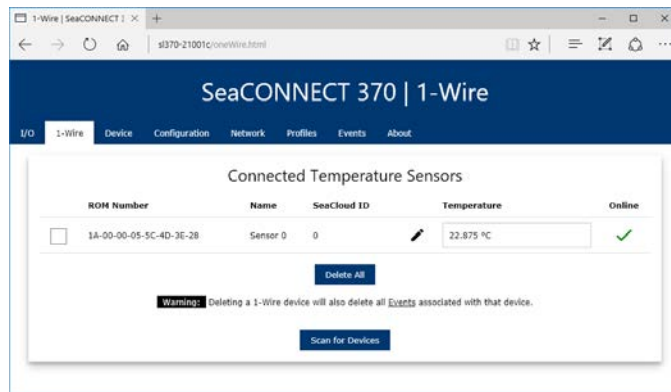
Figure 11: 1-Wire page

You may use the edit button next to a device (shown as a pencil icon) to change the device's name or SeaCloud ID.
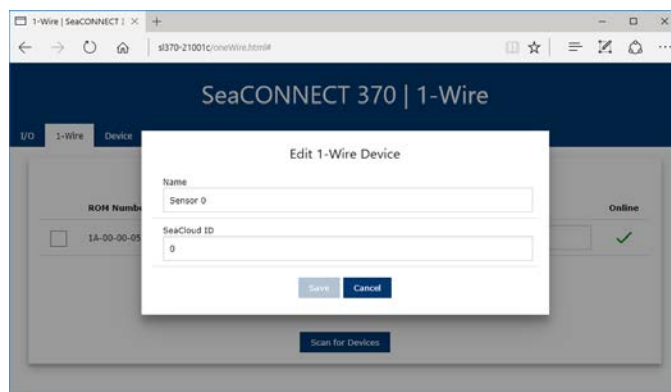

Figure 12: 1-Wire device edit dialog

While you are on this page, the temperature and Online status will update live at a rate of about once every 2 seconds. If a device has been disconnected, the Online status will change from a green check mark to a red 'X'. If a device goes offline unexpectedly, ensure that the electrical connections between the device and the SeaConnect 370 are secure.

To delete one or more devices, select them using the checkboxes next to the list entries and press the "Delete Selected" button. To delete all devices, leave all boxes unchecked and press the "Delete All" button (the button changes names when at least one device is selected).

> 1-Wire devices are represented in SeaCloud as sub-device or Node, not as part of the SeaConnect 370. In the case of 1-Wire devices, the SeaConnect 370 acts as a gateway for the device to SeaCloud. To view your 1-Wire devices in SeaCloud you must use the "Search For New Units" function in SeaCloud to discover your 1-Wire additions.

DEVICE

This page allows you to view network and system parameters and to issue a system restart or factory settings reset. Note that the system time is in UTC.
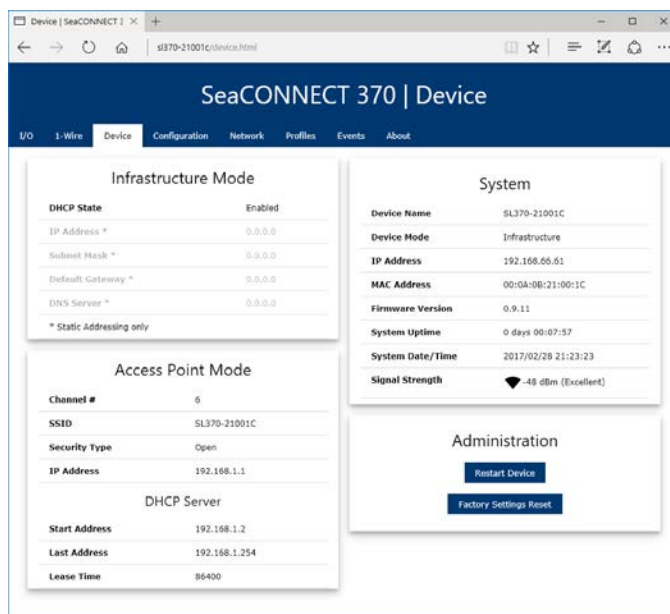

Figure 13: Device page

Infrastructure Mode
This section lists the settings for static IP allocation in Infrastructure Mode. If DHCP is disabled, the IP address, subnet mask, default gateway, and DNS server settings displayed take effect. Otherwise, those settings are automatically overridden by DHCP.

Access Point
These settings apply when the device is in Access Point mode. This section lists the Wi-Fi channel, SSID, security type, IP address, and DHCP server address range and lease time.

System
This section lists the device name, device mode (Access Point or Infrastructure), MAC address, firmware version, system uptime, system date and time, and signal strength. The System uptime, system date/time, and signal strength update each time you refresh the page.

The system date and time may not be accurate if the device does not have a connection to the Internet (e.g., while in Access Point mode). The firmware attempts to synchronize its internal date and time on boot-up and once per day.

CONFIGURATION

This page allows you to configure the analog inputs, the startup settings for the I/O, the device name, the connection policy (available on Cellular devices only), and optional features.
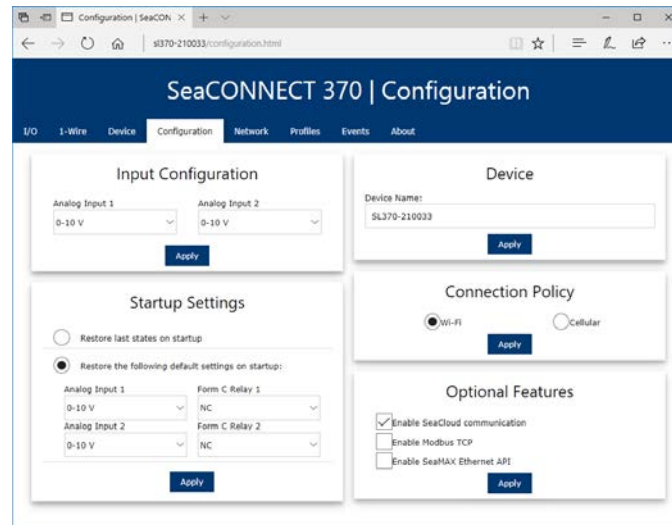

Figure 14: Configuration page

Input Configuration
This section allows you to configure the analog inputs. Each input can be individually set to 0–10 VDC or 0–24 mA. Settings take effect immediately upon clicking the Apply button.

Startup Settings
This section allows you to specify the I/O startup behavior.

- "Restore last states on startup" configures states to persist across power cycles, as if the device had not rebooted.

- "Restore the following default settings on startup" reverts the output states and analog input modes to a known state (which you specify here) each time the device boots up.

Changes to these settings take effect upon next boot after clicking Apply.

Device
This section allows you to change the device name. This name is used as the device's network name.

Connection Policy
This section allows you to change the device connection policy. Options are Wi-Fi and cellular. This setting is available on cellular devices only.

Optional Features
This section includes toggles for SeaCloud configuration, Modbus TCP, and SeaMAX Ethernet API. Modbus TCP and SeaMAX Ethernet API are disabled by default.
- If Modbus TCP is disabled, SeaMAX API functionality (including I/O and getting model information) will not work.
- If SeaMAX Ethernet API is disabled, the SeaMAX Ethernet API (including the SeaMAX Ethernet Configuration tool) will not be able to change Ethernet settings on the device.

NETWORK

This page gives options on setting the IP address settings for Infrastructure and Access Point modes, as well as Wi-Fi settings for Access Point mode (Figure 15).

Figure 15: Network page

Infrastructure Mode
In this section, you may enable or disable DHCP. If DHCP is disabled, you must assign the IP address, subnet mask, default gateway, and DNS server to match your Infrastructure network settings.

Access Point Mode
In Access Point mode, the device runs a DHCP server. In this section, you may set the IP address of the module, the DHCP IP address allocation range for clients, and the lease time.

Access Point Configuration
This section allows you to configure the Wi-Fi settings in Access Point mode. Choose the channel, the SSID, the security type, and the security password (if applicable).
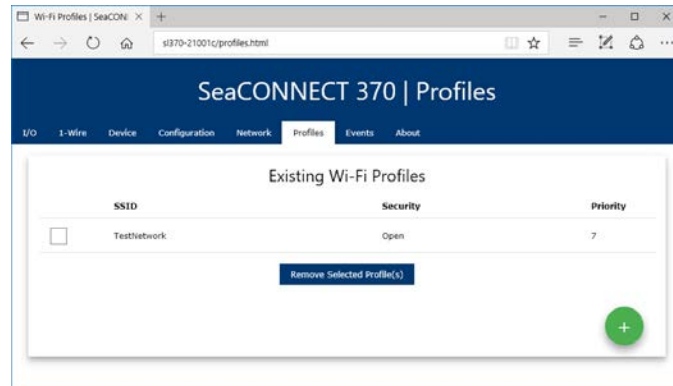
Figure 16: Profiles page

This page lists all defined profiles and allows you to select one or more profiles to remove. If no profiles are defined (or all profiles are removed), the device will automatically boot in AP mode. Otherwise, the device will boot into Infrastructure Mode unless overridden by the user. (See section Entering Access Point Mode Manually)

Add Profile Button (Green +)
This button opens a modal dialog which allows you to add a Wi-Fi profile for use in Infrastructure Mode. Enter the SSID, security type, security key (if applicable), and profile priority of the profile you which to add. Click Save to add it to the list (Figure 17).
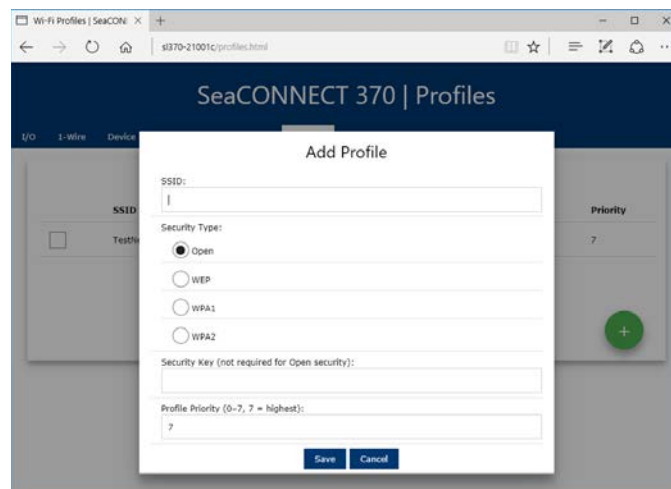

Figure 17: Add Profile dialog

After adding or removing a profile, you must power cycle the SeaConnect 370 for your changes to take effect.

EVENTS

The SeaConnect 370 supports up to ten events which perform an action when a trigger condition is met. Click the circular Add button to add a new event. See Figure 18 for an example of the Add Event dialog.
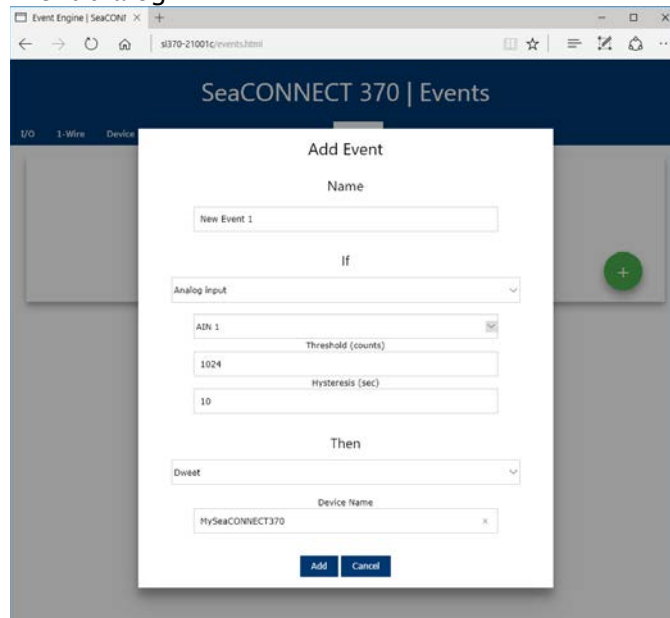

Figure 18: Add Event dialog (sample)

Triggers

A trigger is an event that causes a publish action. There are 6 available trigger types: Digital input, Analog input, Periodic interval, Power-on, On-board temperature, and 1-Wire temperature. The dialog updates to show additional parameters once you select a trigger type.

- The Digital input type triggers when the specified digital input changes.

- The Analog input, On-board temperature, and 1-Wire temperature types trigger when the specified input crosses the specified threshold in either direction. The value must remain above or below the threshold for the configured time span in order for the trigger to fire.

- The Periodic interval type triggers once every certain amount of time and reports value of the selected input. This can be very useful for data logging.

- The Power-on type triggers once each time the device powers on.

Actions

An action fires whenever a specified trigger occurs. There are two available action types: Dweet and Send to SeaCloud. The dialog updates to show additional parameters once you select an action type.

- Dweet publishes to the Dweet.io IoT cloud service (see http://dweet.io) using the device name you specify.

- Send to SeaCloud sends the data to SeaCloud.
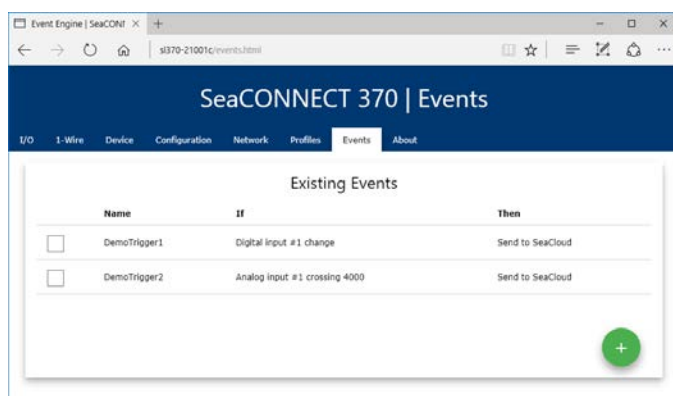
Figure 19: Events page

The SeaConnect 370 does not have any events programmed by default. In order to send the value of an input to SeaCloud, you must create an event to send that input.

Event Deletion
To delete events, select the checkbox to the left of the desired event(s) and click the "Delete Selected Event(s)" button.

ABOUT

The About page shows information related to copyright and technical support (Figure 20).

Figure 20: About page

ENTERING ACCESS POINT MODE MANUALLY

To enter Access Point (AP) mode manually, hold down the configuration button while applying power to the SeaConnect 370. The Status LED will blink twice to confirm this setting. Release the configuration button immediately once you see the Status LED blink twice.

If any Wi-Fi profiles have been defined, the SeaConnect 370 will default to Infrastructure Mode upon each subsequent boot. To default to AP mode, remove all Wi-Fi profiles or reset the settings to factory defaults.

RESETTING TO FACTORY DEFAULTS

To reset all settings to their factory-programmed defaults, hold the configuration button for 10 seconds while the device is powered. The Status LED will blink 5 times to confirm your input. The device will then restart with all of its factory-programmed settings restored. Please do not disconnect power during this process.

Wiring Options

RELAY OUTPUTS

The SeaConnect 370 has a flexible I/O set allowing it to interface with a variety of devices. This section details the connector pinout and example wiring for several device types. The circuitry shown within the dotted box in the diagrams is internal to the SeaConnect 370. The circuitry beneath the terminal block illustrates the example connection.

FORM C RELAY WIRING CONNECTIONS

The SeaConnect-370 modules include two Form C relays that may be connected as Normally Open (NO) or Normally Closed (NC). The two relay channels are connected via a six-position removable screw terminal.

Table 2: Form C Relay Connector Pinout

Pin	Purpose
1	Relay1-NC
2	Relay1-Common
3	Relay1-NO
4	Relay2-NC
5	Relay2-Common
6	Relay2-NO
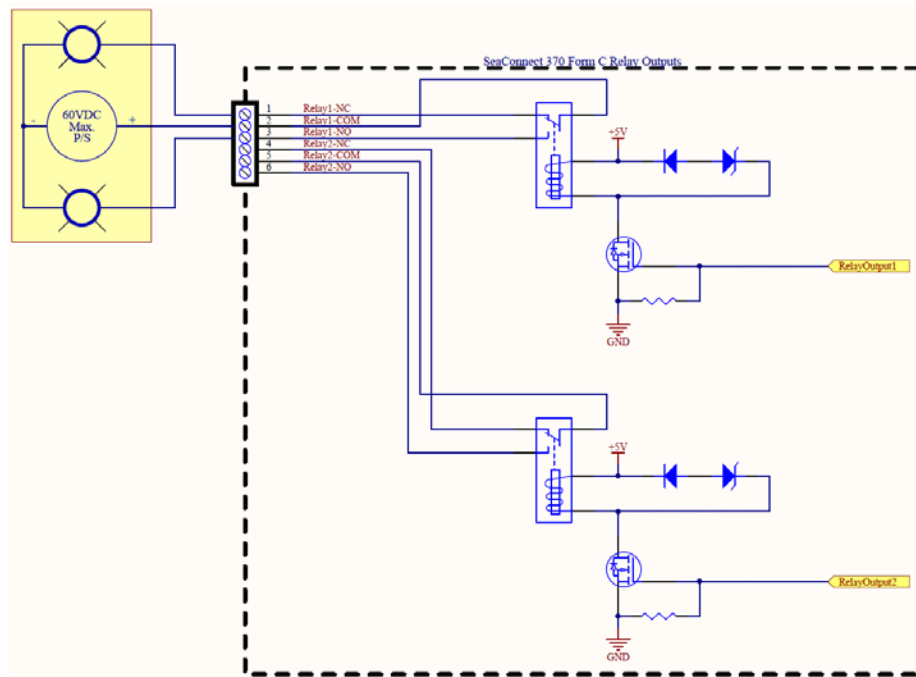
Figure 21: Voltage sources connected to relays

DISCRETE INPUTS

DIGITAL I/O WIRING CONNECTIONS

The SeaConnect-370 modules include four inputs that have separate common for each channel. The two I/O points and commons are connected via an eight-position removable screw terminal.

Table 3: Discrete Digital Input Connectors Pinout

Pin	1st Connector	2nd Connector
1	5VDC	5VDC
2	DIN-1A	DIN-3A
3	DIN-1B	DIN-3B
4	Common	Common
5	5VDC	5VDC
6	DIN-2A	DIN-4A
7	DIN-2B	DIN-4B
8	Common	Common

The I/O points can be wired to support various input schemes including Dry Contact closures and Open-Collector outputs. Various wiring schemes are illustrated below.

Figure 22: Dry Contact Closure
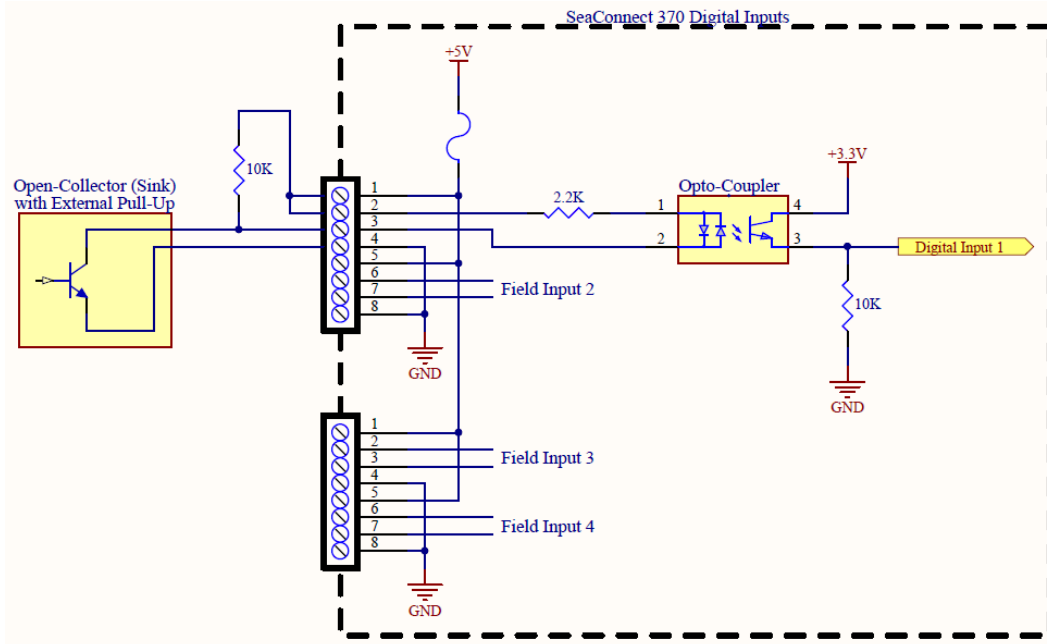
Figure 23: Open-Collector (Sink) with External Pull-Up

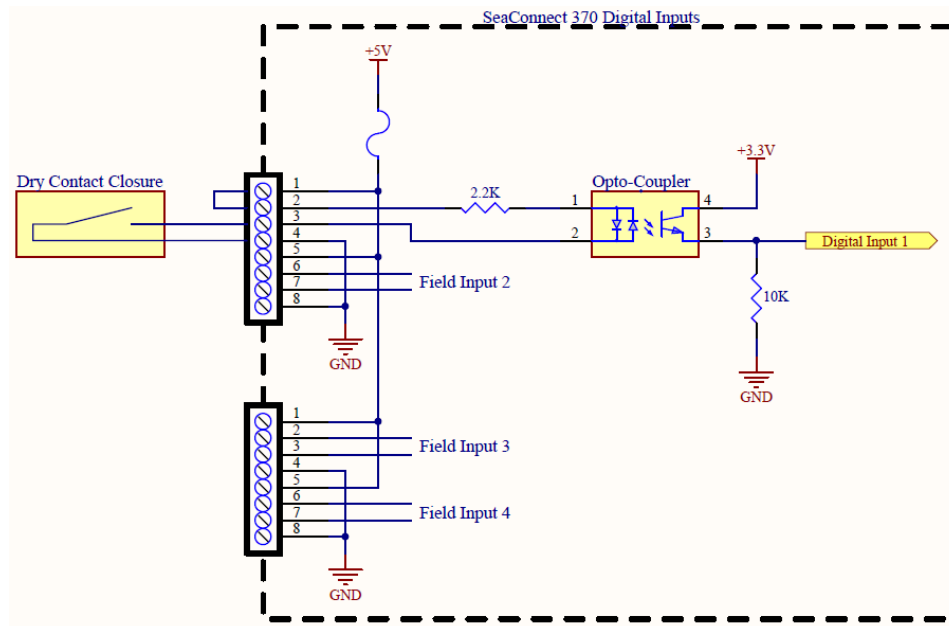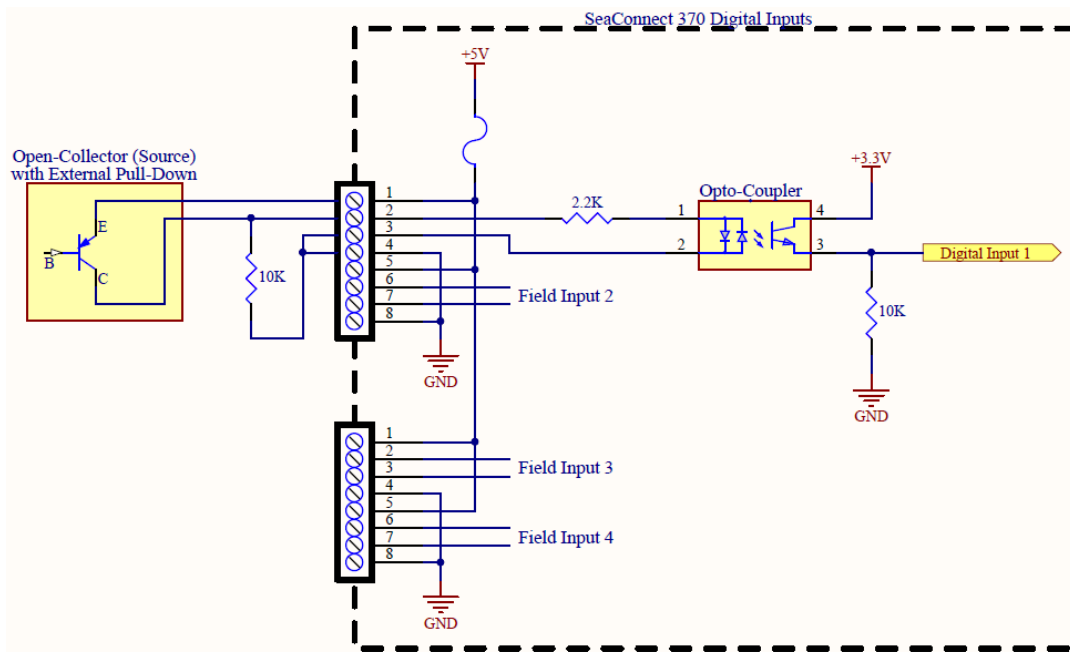**Figure 24: Open-Collector (Source) with External Pull-Down**
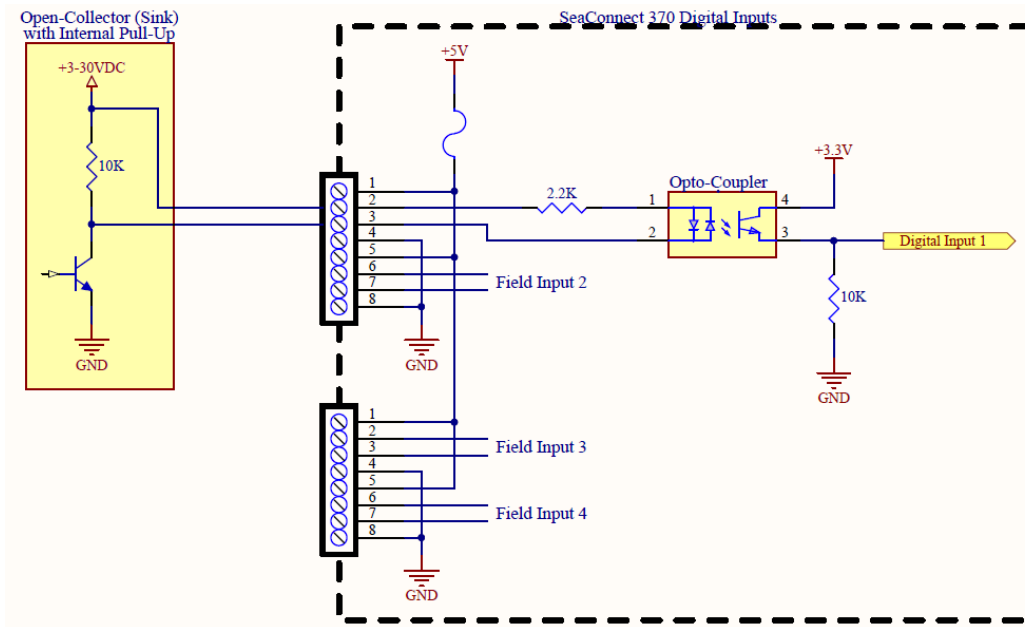
Figure 25: Open-Collector (Sink) with Internal Pull-Up
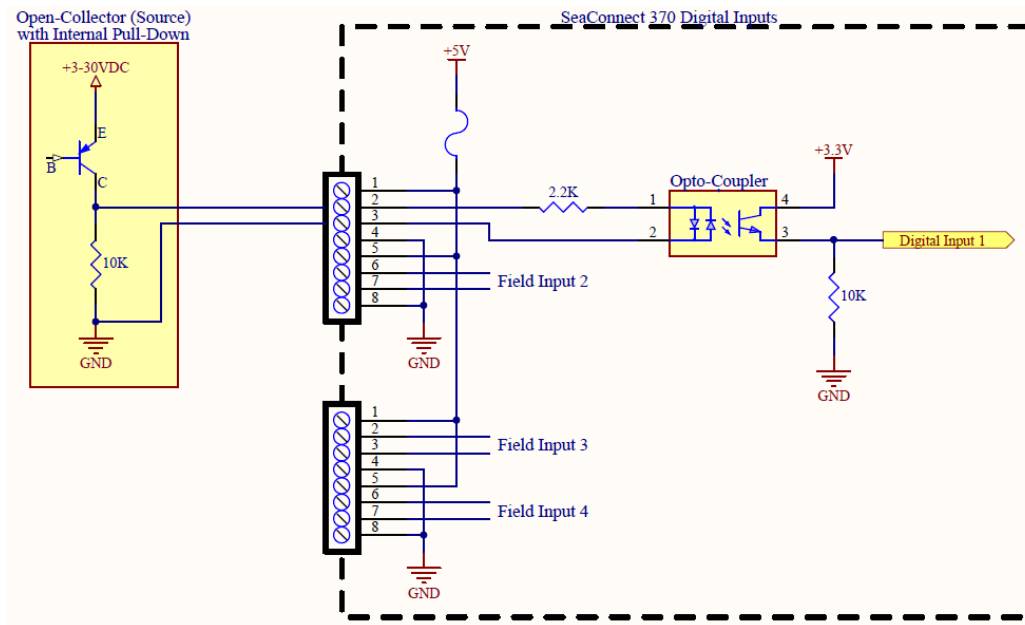
Figure 26: Open-Collector (Source) with Internal Pull-Down

A/D WIRING CONNECTIONS

The SeaConnect 370 has two 12-bit differential A/D inputs with polarity. The software-selectable measurement ranges are 0-10V and 0-24 mA. For proper operation when current loop mode is selected, a precision 200Ω resistor is placed in the circuit between positive and negative inputs via a software controlled switch.

Table 4: Analog Input Connector Pinout

Pin	Purpose
1	AIN-1+
2	AIN-1-
3	Ground
4	AIN-2+
5	AIN-2-
6	Ground

The following wiring example shows 0-24 mA 2- and 3-wire transmitter connection to AIN-1 and a 0-10VDC Sensor connection to AIN-2.
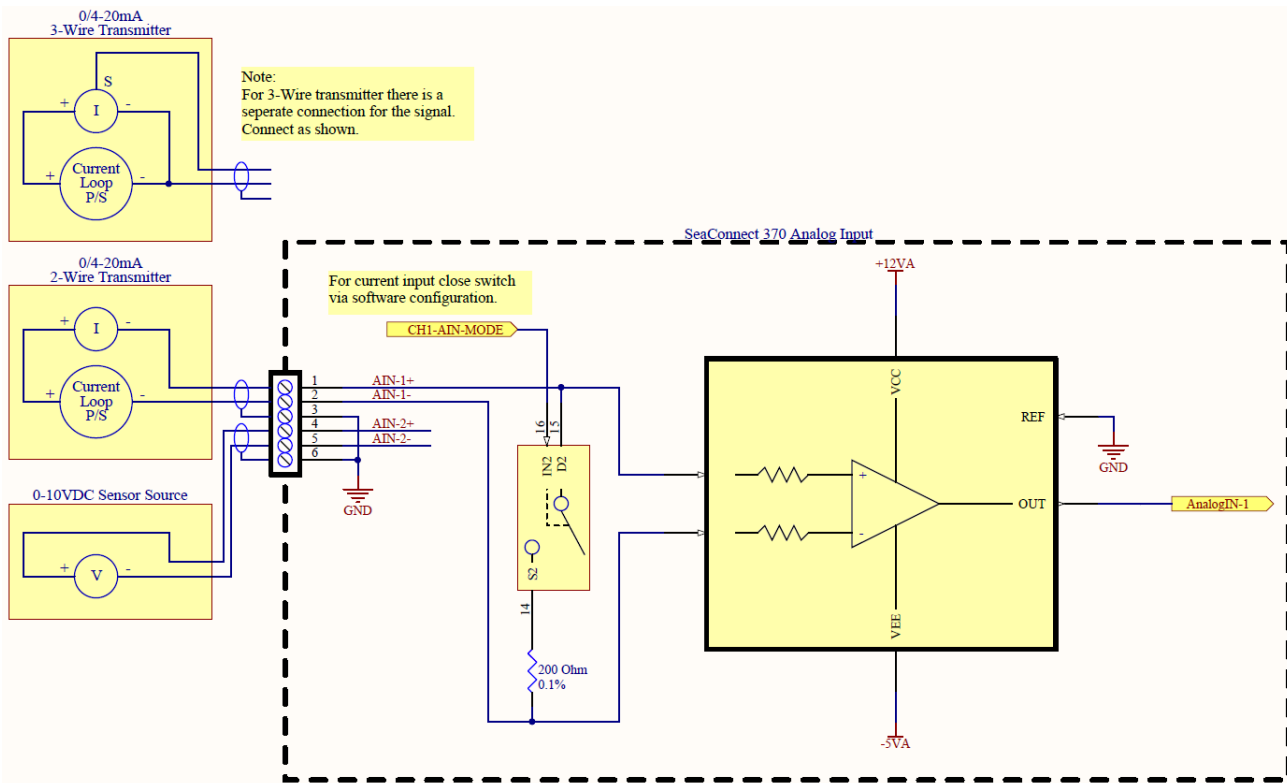
1-WIRE CONNECTION

Most 1-Wire devices operate on parasite power provided over the data line, but some 1-Wire devices require dedicated power. The SeaConnect 370 supports devices with either configuration.

The SeaConnect 370 can support up to 10 1-Wire devices at a time. The pinout is as follows:

Table 5: 1-Wire Connector Pinout

Pin	Purpose
1	3.3V Power
2	1-Wire Data
3	Ground

MOD+ CONNECT iOS App

The Sealevel Systems iOS app, MOD+ Connect, is designed to quickly connect, configure, and debug Sealevel I/O modules. MOD+ Connect is compatible with the iPhone 6/6 Plus or greater and iOS 8.0 and greater.

SETTINGS TAB

When you open the Sealevel MOD+ Connect app it will default to the "Settings" tab (Figure 27: MOD+ Connect – Settings Tab). This tab allows the user to choose the initial communication settings for the connected I/O module. The "Search" button is used to search for any SeaConnect Wireless modules on the network. The "IP Address" text box allows the entering of the IP address of the module and will also remember previously used IP addresses. The "Unit ID" text box allows the entering of the slave ID of a module. When connecting to a SeaConnect 370 over wireless you will just leave the "Unit ID" at its default value of 247. The "Ping" button is used to ping the IP that was entered to make sure the app can communicate with the module. The "Connect Timeout (sec)" selection allows changing how long the program waits for a response from the module.

Figure 27: MOD+ Connect – Settings Tab
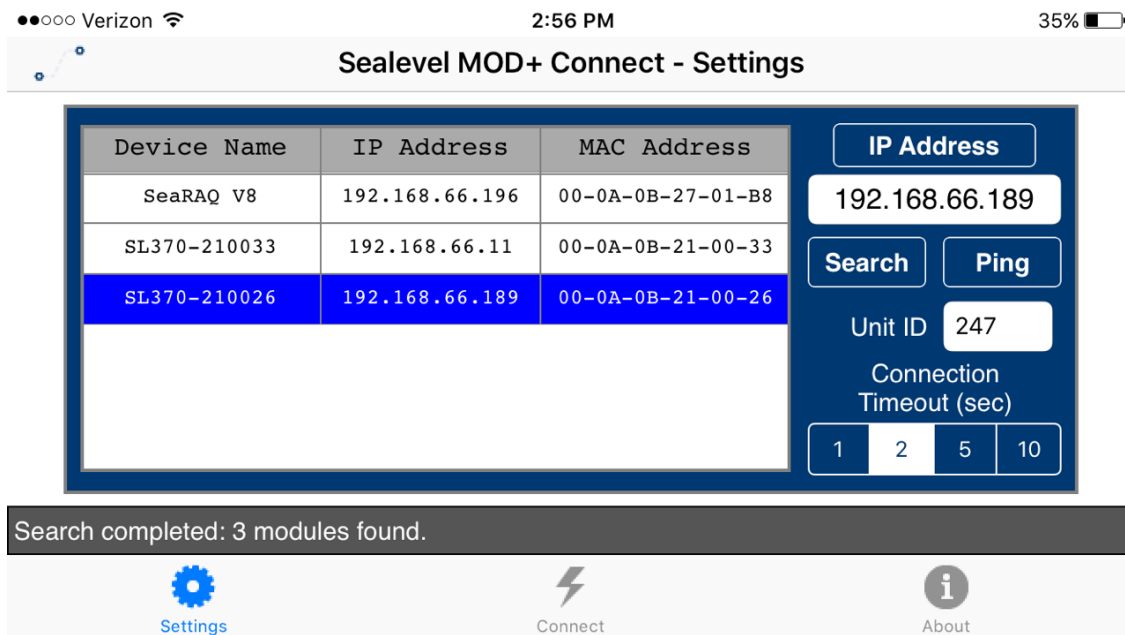
To communicate with a SeaConnect 370 module, select the device in the list and the IP will populate in the "IP Address" field and then click the "Ping" button. You can also enter the IP of the module or select a previously entered IP and then click the "Ping" button. If the app successfully pings the module, then it will display a message at the bottom stating it succeeded.

CONNECT TAB

Once the app successfully pings the module, swipe left or select the "Connect" tab to connect to the module. The "Connect" tab displays the device's current input and/or output status in an intuitive and usable manner.

The status LEDs update on the bank of digital inputs automatically. This allows you to actively monitor external signals.

With a bank of digital 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 graphic indicates the state of the coil.

With a bank of analog inputs, the tab displays the current state of the analog-to-digital channels. Settings are provided for channel configurations. The "Data Format" selection allows displaying of the values returned by the A/D converter as a hexadecimal value without converting the values to engineering units (i.e., Milliamps or Volts)

In the example below (Figure 28), a SeaConnect 370 module with 2 Form C Relays, 4 Digital Inputs, and 2 Analog inputs is shown.
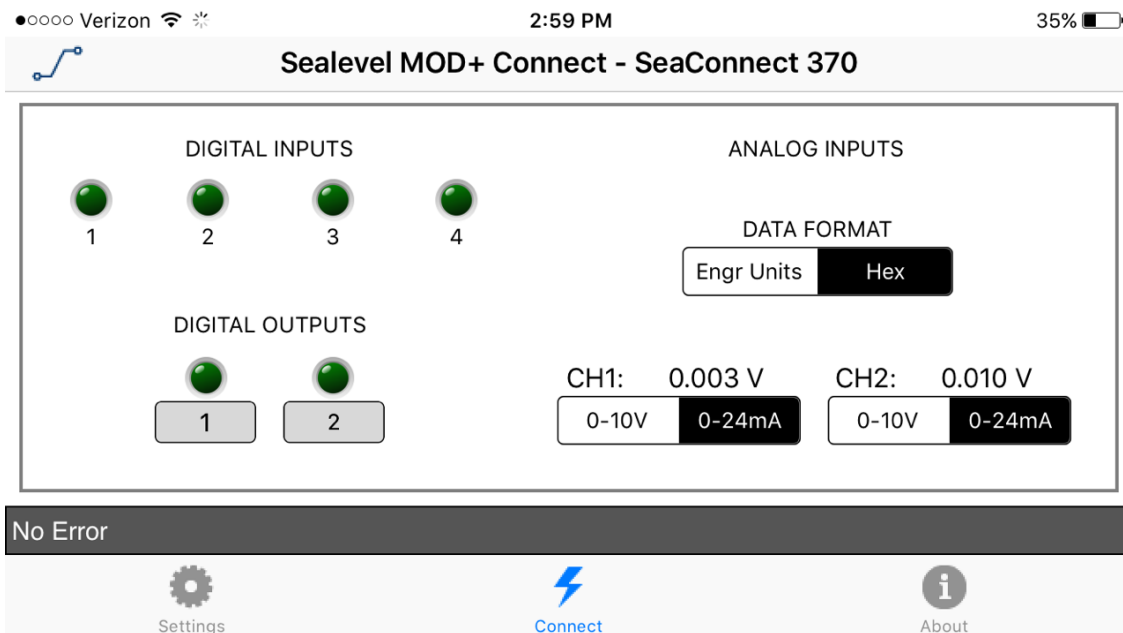

Figure 28: MOD+ Connect - Connect Tab

ABOUT TAB

The "About" tab displays the current version of the app, a link to our website for support and documentation, and a list of the supported Sealevel I/O modules for the app (Figure 29).
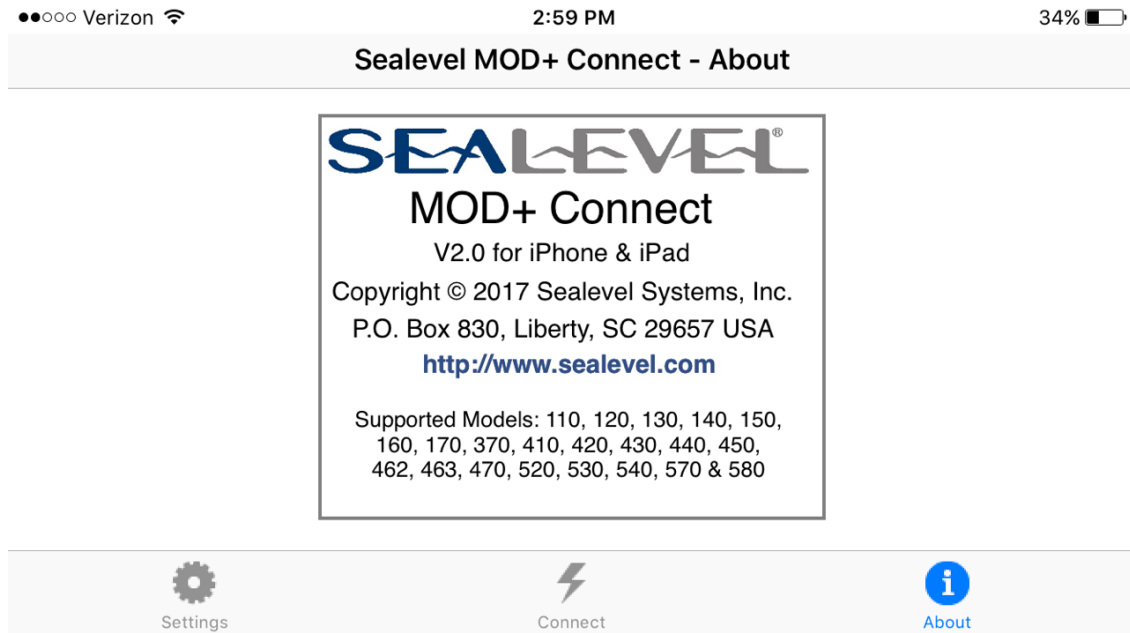

Figure 29: MOD+ Connect - About Tab

SeaMAX Application Suite

SEAMAX OVERVIEW

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

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

- MaxSSD Configuration & Diagnostics utility

- Ethernet Configuration utility

- SeaMAX API

- SeaMAX .NET API

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

Please contact Sealevel technical support with any questions regarding SeaMAX documentation:
Phone: (864) 843-4343
Email: support@sealevel.com

COMMUNICATING VIA MODBUS

When enabled, Sealevel SeaConnect modules are designed to integrate seamlessly into existing Modbus networks (See Configuration -> Optional Features). The supported command set will vary depending on the SeaConnect model number used. An overview of the Modbus specification is covered in detail in the interactive documentation included in the SeaMAX installation.

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

SEAMAX SOFTWARE INSTALLATION

1. To obtain the most current software driver package from Sealevel's website, download from here:

   - SeaMAX for Windows

2. Click on the link to download the current version.

3. Once downloaded, double click on the executable to launch the InstallShield software and driver installation.

MAXSSD CONFIGURATION & DIAGNOSTICS UTILITY

MaxSSD, the Sealevel Systems SeaMAX test utility, 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 7, 8.1, and 10.

ENABLE MODBUS TCP

You must first enable Modbus TCP on the device for MaxSSD functionality to work with the device. See the section "Configuration" under "SeaConnect 370 Web Interface" for instructions on enabling Modbus TCP.

HOST PC CONFIGURATION TAB

When you run the MaxSSD utility (Start → All Programs → Sealevel Systems → SeaMAX → MaxSSD Configuration Utility) it will default to the "Host PC Configuration" tab (Figure 30). 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, and Ethernet (for Wireless SeaConnect modules).
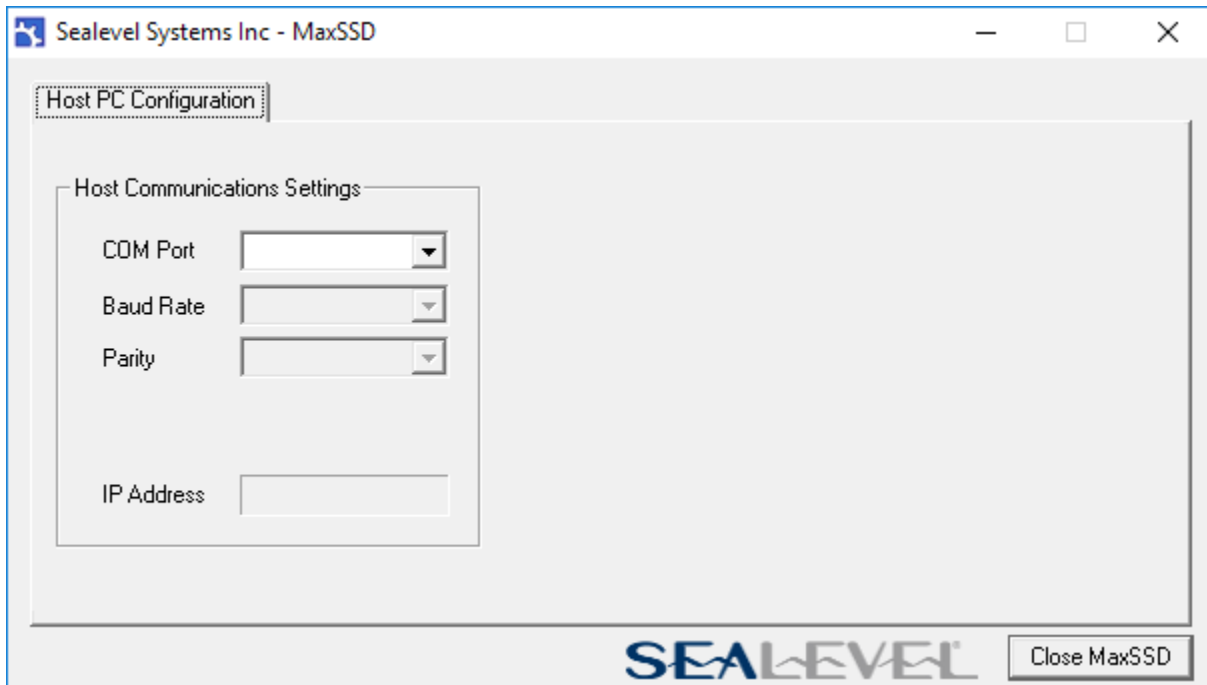
Figure 30: MaxSSD Host PC Configuration Tab

To communicate with a SeaConnect 370, select "Ethernet" from the "COM Port" dropdown box. When Ethernet is selected, MaxSSD performs a search for any SeaConnect Wireless modules on the network and populates the list box with the name, IP address, and MAC address of all discovered modules (Figure 31).
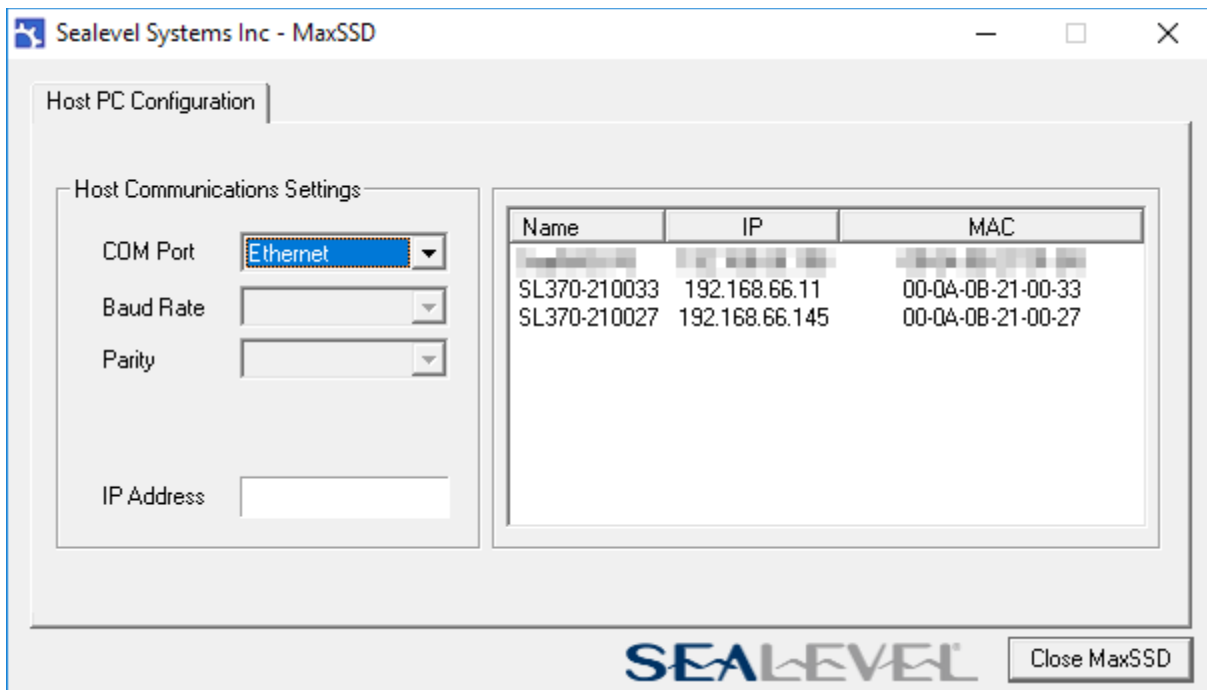
Figure 31: MaxSSD list of discovered Ethernet devices

When an IP address is selected from the list box, a socket is opened to the SeaConnect module, and it is ready for communication.

If no IP addresses are shown when using Ethernet modules, review the previous Hardware Configuration section, or proceed to the Troubleshooting section at the end of this manual.

MODULE CONFIGURATION TAB

Once the host computer is configured correctly, the "Module Configuration" tab becomes available (Figure 32).
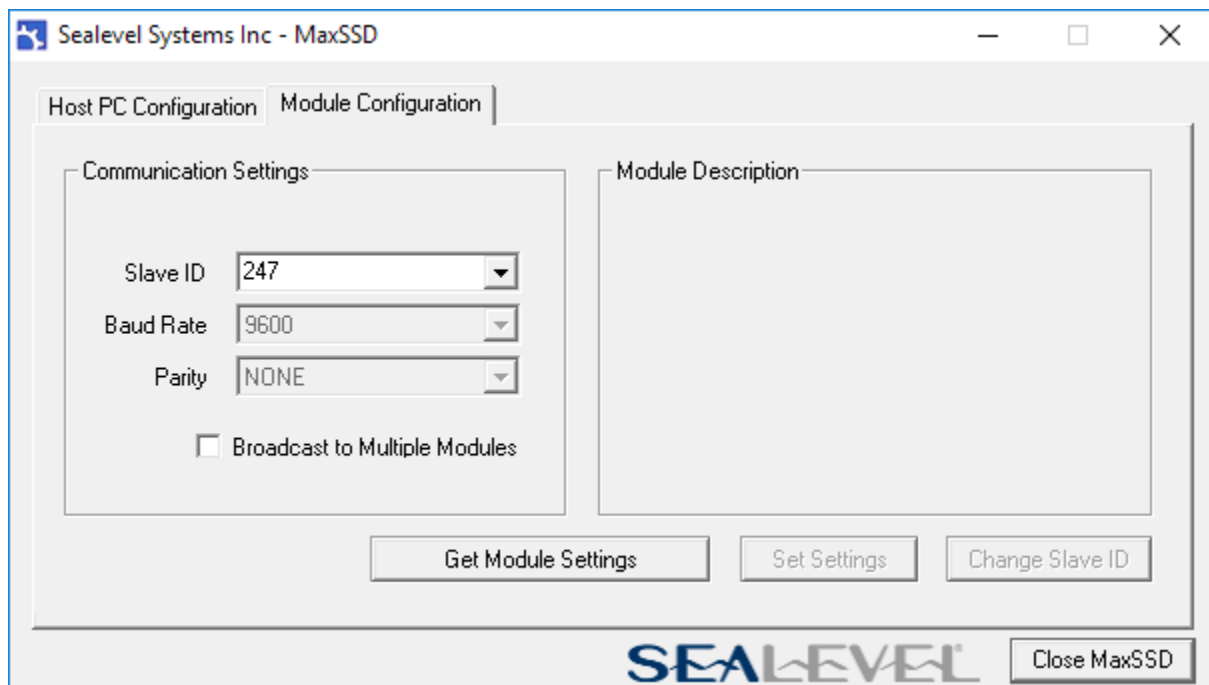
Figure 32: MaxSSD Module Configuration Tab

To enable control of the module, click the "Get 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 are correct and make changes, if necessary.

After Get Module Settings is clicked, the "Module Description" frame will display the model type, description, interface, and I/O type. In the example shown, the module is a SeaConnect 370 module with a Wireless (Modbus TCP) interface. *The "Set Settings" and "Change Slave ID" buttons are unsupported for the SeaConnect 370 and are therefore disabled.*


Figure 33: MaxSSD window showing Module Configuration and I/O Tabs

After a successful Get operation, additional tabs will 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.

The "Broadcast to Multiple Modules" checkbox is not supported for the SeaConnect 370 and is therefore disabled.

DIGITAL I/O TAB

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

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

With a bank of outputs, the output coils can be set using the buttons below each output LED. As each coil is set, the I/O module is read. The corresponding status LED graphic indicates the state of the coil. In the example below, a SeaConnect 370 module with 2 Form C Relays and 4 Digital Inputs is shown.
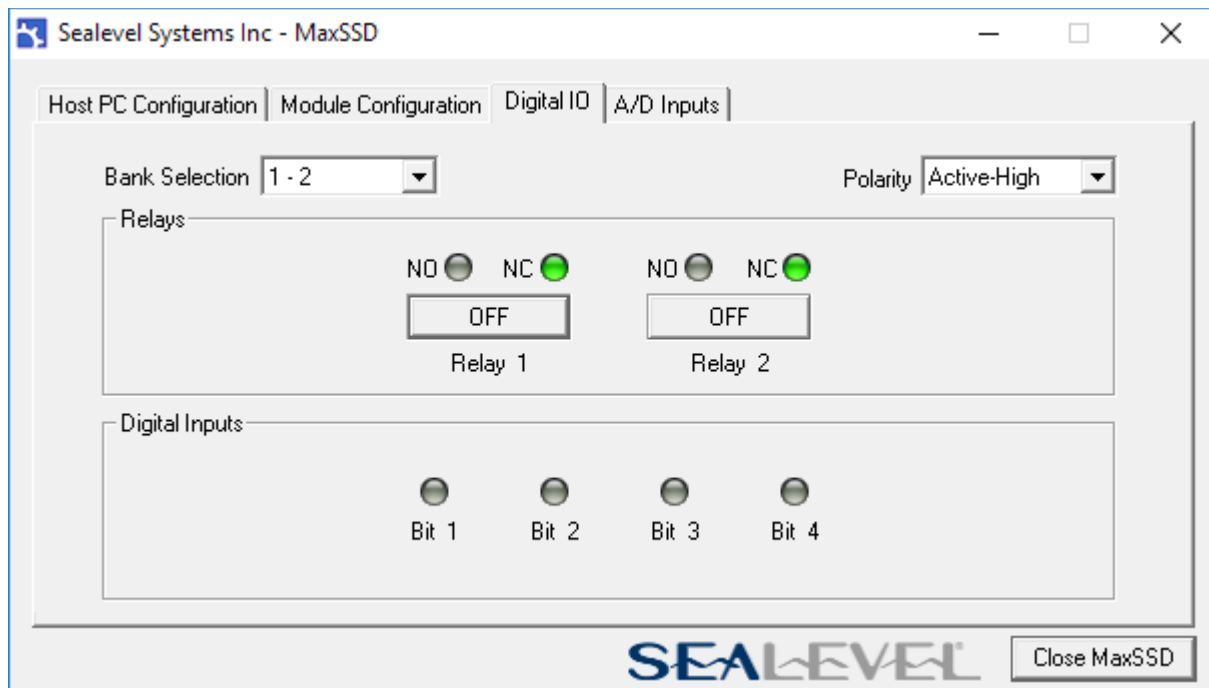
A/D INPUTS TAB

The "A/D Inputs" tab displays the current state of the analog-to-digital channels for Sealevel I/O devices that feature A/D inputs. Settings are provided for both device-wide and per-channel configurations.
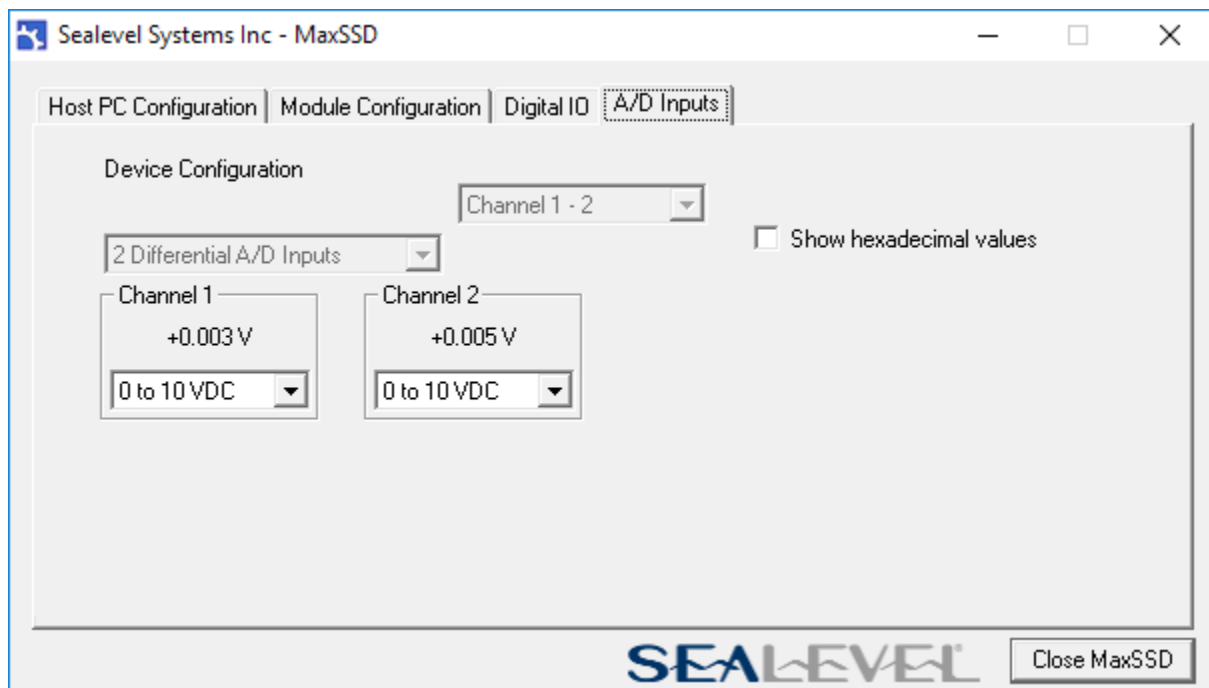
Figure 34: MaxSSD A/D Inputs Tab

The "Device Configuration" selection drop-box is not supported for the SeaConnect 370 and is therefore disabled.

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

CONVERTING A/D VALUES

To properly use the values returned from the SeaConnect 370 module's A/D channels, the application program must convert the returned values to engineering units.

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

TROUBLESHOOTING SEAMAX

Following these simple steps can eliminate most common problems.

1. Read this manual thoroughly before attempting to install the device in your system.
2. Uninstall any previous versions of the SeaMAX software before installing any new versions.
3. Use the MaxSSD utility, to verify proper installation. MaxSSD is designed to simplify the installation, configuration, and diagnostics of Sealevel SeaConnect modules.
4. 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 email at support@sealevel.com or by phone at +1 (864) 843-4343.

TROUBLESHOOTING SEACONNECT MODULES

Problem: The SeaConnect module is visible in Ethernet Config, but the settings cannot be changed.

You must first enable the SeaMAX Ethernet API optional setting. Refer to the "Configuration" section under "SeaConnect 370 Web Interface".

Problem: The SeaConnect module doesn't appear in Ethernet Config.

The SeaConnect module may not have been able to join your Wi-Fi network. Enter Access Point mode to recover the device by following the instructions in the "Entering Access Point Mode Manually" section. Add a wireless profile by following the instructions in the "Profiles" section under "SeaConnect 370 Web Interface". Double-check that the security type and password are correct.

The Wi-Fi signal strength may be too low for the device to connect. Try moving the device closer to the access point.

Ethernet and Wireless SeaConnect 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 SeaConnect 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.

Problem: The SeaConnect is discoverable in Ethernet Config, but the Wireless Configuration button is disabled.

The wireless configuration method used in Ethernet Config has been obsoleted in the SeaConnect 370. To configure the wireless settings, use the web interface instead.

Problem: The SeaConnect is discoverable, but I cannot connect to it using SeaMAX API, MaxSSD, or MOD+ Connect.

You must first enable Modbus TCP via the device's onboard web interface before the Modbus TCP and Ethernet Discovery APIs will work. Refer to the "Configuration" section under "SeaConnect 370 Web Interface".

Problem: My SeaConnect is configured for Infrastructure Mode. How do I find its IP address on my local network?

Not unlike other network connected devices, if your SeaConnect 370 was configured to operate in Infrastructure Mode, with a DHCP assigned IP address, it can be difficult to locate on your network. You will need to know either the MAC address of the device or the device's ID; e.g., SL370-210027. The simplest way to get the IP address is to use the ping network utility and ping the device name:

> ping SL370-210027

Ping will respond with the IP address of the device.

If you do not know the device name or your network does not support mDNS or NetBIOS, you will need to locate it with the MAC address using a utility like MaxSSD, MOD+ Connect, or a network discovery tool such as Fing (http://fing.io/), which is currently available for Linux, Windows, OSX, Android, and iOS. Some routers keep a list of connected devices from which you may be able to identify your SeaConnect device.

Accessories

POWER SUPPLY

TR 151 - AC to DC 5V Power Supply	
AC/DC USB power supply that accepts 220VAC input and outputs 5VDC via a 2-pin 5mm pitch terminal block connector at up to 4.0 A (20 W)	

Appendix A – Handling Instructions

ESD WARNINGS

ELECTROSTATIC DISCHARGES (ESD)

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

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

GROUNDING METHODS

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

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

Appendix B – How to Get Assistance

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

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

TECHNICAL SUPPORT

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

Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured I/O products. Relio™ industrial computers are warranted for a period of two years and the R9 family is warranted for a five-year period from date of purchase. SeaConnect devices carry a lifetime warranty with a one-year warranty on cellular modems. We can offer this warranty due to our control of manufacturing quality and the historically high reliability of our products in the field. Sealevel products are designed and manufactured at its Liberty, South Carolina facility, allowing direct control over product development, production, burn-in and testing. Sealevel achieved ISO-9001:2000 certification in 2002.

WARRANTY POLICY

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

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

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

NON-WARRANTY REPAIR/RETEST

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

HOW TO OBTAIN AN RMA (RETURN MERCHANDISE AUTHORIZATION)

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

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

TRADEMARKS

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