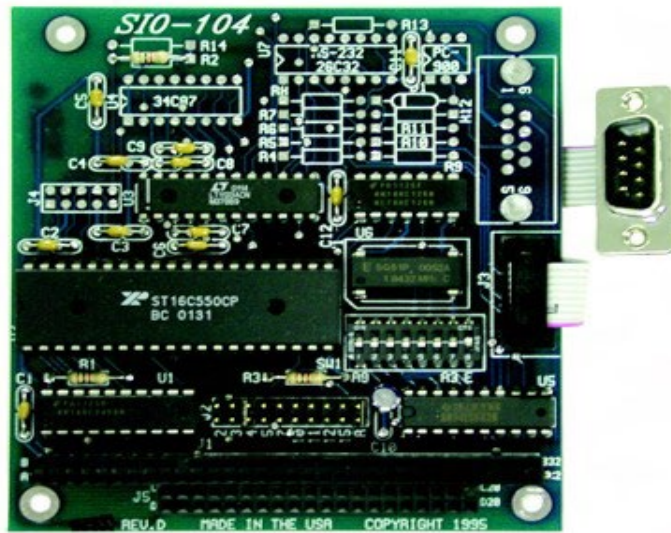


SIO-104

User Manual | 3501, 3500



SEALEVEL®

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Introduction

Overview

The **SIO-104** series provides the ultimate serial connection for your PC/104 application. The **SIO-104** is available in three different interfaces, RS-422/485, RS-232, and MIDI.

The RS-422/485 model (P/N 3500) provides an interface capable of long length, high speed communications.

The RS-232 model (P/N 3501) provides a standard RS-232C interface that is fully compatible all popular modem software, network operating systems software, and mouse drivers.

The MIDI model (P/N 3502) provides an interface suitable for control of musical instruments, MIDI sequencers and other compatible equipment.

Factory Default Settings

The **SIO-104** factory default settings are as follows:

	Base Address	IRQ
Port 1	280	5

Before You Get Started

What's Included

The **SIO-I04** is shipped with the following items. If any of these items are missing or damaged, contact the supplier.

- **SIO-104 Serial Interface Adapter**
- **(1) DB-9 cable assembly (P/N 3500, 3501), or (1) MIDI cable assembly (P/N 3502)**
- **(1) Nylon Mounting Hardware Kit**

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.

Software Installation

Windows Installation



Do not install the Adapter in the machine until the software has been fully installed.



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.

1. Begin by locating, selecting, and installing the [SeaCOM Asynchronous Serial Software Suite](#).
2. Select "Download Now" for SeaCOM for Windows.
3. The setup files will automatically detect the operating environment and install the proper components. Follow the information presented on the screens that follow.
4. A screen may appear with text similar to: "The publisher cannot be determined due to the problems below: Authenticode signature not found." Please click 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.
5. During setup, the user 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 also included to remove all registry/INI file entries from the system.
6. The software is now installed, and you can proceed with the hardware installation.

Other Operating Systems

Refer to the appropriate section of the Serial Utilities Software.

For your reference, record installed **SIO-104** settings below:

	Base Address	IRQ
Port 1		

For additional software support, 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.

Card Setup

The **SIO-104** contains several jumper straps for each port which must be set for proper operation.

Address Selection

The **SIO-104** occupies eight consecutive I/O locations. A DIP-switch is used to set the base address for these locations. Be careful when selecting the base address as some selections conflict with existing ports. The following table shows several examples that typically do not cause a conflict. SW1 sets the I/O address for the **SIO-104**.

Address	Binary		Switch Position Setting						
	Hex	A9 A0	1	2	3	4	5	6	7
280-287	1010000XXX		Off	On	Off	On	On	On	On
2A0-2A7	1010100XXX		Off	On	Off	On	Off	On	On
2E8-2EF	1011101XXX		Off	On	Off	Off	Off	On	Off
2F8-2FF	1011111XXX		Off	On	Off	Off	Off	Off	Off
3E8-3EF	1111101XXX		Off	Off	Off	Off	Off	On	Off
300-307	1100000XXX		Off	Off	On	On	On	On	On
328-32F	1100101XXX		Off	Off	On	On	Off	On	Off
3F8-3FF	1111111XXX		Off	Off	Off	Off	Off	Off	Off

Figure 1 - Address Selection Table

The following illustration shows the correlation between the DIP-switch setting and the address bits used to determine the base address. In the example below, address 300 is selected as a base. Address 300 in binary is XX11 0000 0XXX where X = a non-selectable address bit.

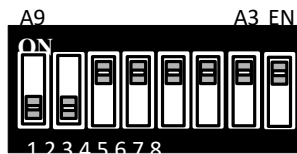


Figure 2 - DIP-Switch Illustration



Setting the switch “On” or “Closed” corresponds to a “0” in the address, while leaving it “Off” or “Open” corresponds to a “1”.

Port Enable / Disable

The port on the **SIO-104** can be enabled or disabled with switch position 8 on the DIP-switch. The port is enabled with the switch “On” or “Closed” and disabled when “Off” or “Open” (refer to Figure 2). If the port is disabled, be sure to also disable the interrupt request for that port by removing the IRQ jumper at header J2.

IRQ Selection

The **SIO-104** has an interrupt selection jumper which should be set prior to use if an interrupt is required by your application software. Consult the user manual for the application software being used to determine the proper setting. Position “R” is provided so that a jumper can be installed that connects a 1K Ohm pull-down resistor to the output of a high-impedance tri-state driver which carries the IRQ signal. Because the IRQ line is driven low only by the pull-down resistor, it is possible for two or more boards to share the same IRQ signal. Position “R” installed is the default setting and should be left as is unless multiple cards are sharing a single IRQ. If multiple adapters are sharing a single IRQ, then only one adapter should have the pull-down resistor (position “R” selected) in the circuit.

The IRQ can be set at jumper J2 for IRQ 2/9, 3-5, 7, 10, 11, 12, or 15. In the following example, the IRQ is set as IRQ4.



Figure 3 - Header J2, IRQ Selection (Factory Default)

RS-485 Mode (RTS Enable)

J4 selects whether the RS-485 driver is enabled by the UART signal **Request To Send** (RTS) or always enabled. With the jumper installed, RTS enables the RS-485 driver. Removing the jumper enables the driver regardless of RTS. The jumper should be installed for a 2/4 wire RS-485 application where the **SIO-104** is acting as a polled node on a multi-drop network. Remove the jumper if you are using a point to point RS-422 application such as programmable logic controllers (PLCs), etc.

Physical Installation



Do not install the Adapter in the machine until the software has been fully installed.

Extreme care should be taken when installing the SIO-104 to avoid causing damage to the connectors. After the adapter is installed, connect your I/O cables to J1-J4. Please note these headers are keyed so that pin 1 of the cable matches pin 1 of the connector. Refer to Card Setup for information on setting the address and jumper options before inserting the **SIO-104** onto the stack.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover (if applicable).
3. Gently insert the **SIO-104** connector P1 noting proper key orientation of the expansion connector on a PC/104 compatible card. The **SIO-104** adapter is keyed per the PC/104 Revision 2.1 Specification. This will aid in preventing the adapter from being inserted incorrectly.
4. Mounting hardware (nylon stand-offs and screws) is provided to insure a good mechanical connection. Retain any mounting hardware not used to allow for future expansion.
5. The cables provided are keyed and can be installed before or after the adapter is inserted in the stack.
6. Replace the cover.
7. Connect the power cord.

Installation is complete

Technical Description

The **SIO-104** series provides the ultimate serial connection for your PC/104 application. The **SIO-104** utilizes the 16550 UART. This chip features programmable baud rate, data format, interrupt control and a 16 Byte input and output FIFO.

The **SIO-104-422** (P/N 3500) is equipped with the RS-422/485 interface allowing long length, high speed communications suitable for data collection and shop floor control.

The **SIO-104-232** (P/N 3501) provides a standard RS-232C interface that is fully compatible with the DOS operating system, all popular modem software, network operating systems software, and mouse drivers.

The **SIO-104-MIDI** (P/N 3502) allows the controlling of Keyboards, sound modules, and drum machines which all can be interconnected and driven by sequencing software. The MIDI specification has been updated recently to include tape deck control for automated recording and stage & light show control for real-time theatrical production.

Features

- Selectable interrupts (IRQs) 2/9, 3, 4, 5, 7, 10, 11, 12, 15
- Multiple adapters can share the same IRQ
- 16550 UART standard, 16C650 UART optional
- Uses PC/104 compatible stack through connector for universal mounting
- 5 volt DC operation

Modem Control Signal Considerations

Some software packages require the use of the modem handshake signals such as CTS or DCD. Refer to your application software manual to determine the requirements for modem control signals. If no requirements are mentioned, a safe configuration is to tie DTR to DSR and DCD, and tie RTS to CTS. This configuration will typically satisfy the modem control signal requirements for most communications software.

Connector Pin Assignments

RS-232

Signal	Name	DB-9	Mode
GND	Ground	5	
TD	Transmit Data	3	Output
RTS	Request To Send	7	Output
DTR	Data Terminal Ready	4	Output
RD	Receive Data	2	Input
CTS	Clear To Send	8	Input
DSR	Data Set Ready	6	Input
CD	Carrier Detect	1	Input
RI	Ring Indicator	9	Input



These assignments meet EIA/TIA/ANSI-574 DTE for DB-9 type connectors.

RS-422/485

Signal	Name	Pin #	Mode
GND	Ground	5	
TX +	Transmit Data Positive	4	Output
TX-	Transmit Data Negative	3	Output
RTS+	Request to Send Positive	6	Output
RTS-	Request to Send Negative	7	Output
RX+	Receive Data Positive	1	Input
RX-	Receive Data Negative	2	Input
CTS+	Clear to Send Positive	9	Input
CTS-	Clear to Send Negative	8	Input



Please terminate any control signals that are not going to be used. The most common way to do this is connect RTS to CTS and RI. Also, connect DCD to DTR and DSR. Terminating these pins, if not used, will help insure you get the best performance from your adapter.

MIDI

Signal	Name	Pin #	Mode
MTX +	Transmit Data +	5	Output
MTX-	Transmit Data -	9	Output
GND	Ground	2,6	
MRX+	Receive Data +	4	Input
MRX-	Receive Data -	8	Input
MIDI Thru +		3	Output
MIDI Thru -		7	Output

Specifications

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0° to 50° C (32° to 122° F)	-20° to 70° C (-4° to 158° F)
Humidity Range	10 to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

Power Consumption

Product	3500	3501	3502
Supply line	+5 VDC	+5 VDC	+5 VDC
Rating	60 mA	125 mA	125 mA

Mean Time Between Failures (MTBF)

Greater than 150,000 hours (Calculated)

Physical Dimensions

The SI0-104 is PC/104 “Compliant” meaning that it conforms to all non-optional aspects of the PC/104 Specification, including both the mechanical and the electrical specifications.

Board length	3.775 inches (9.588 cm)
Board Width	3.550 inches (9.017 cm)

Appendix A – Troubleshooting

The adapter should provide years of trouble-free service. However, in the event that device appears to not be functioning incorrectly, the following tips can eliminate most common problems without the need to call Technical Support.

1. Identify all I/O adapters currently installed in your system. This includes your on-board serial ports, controller cards, sound cards etc. The I/O addresses used by these adapters, as well as the IRQ (if any) should be identified.
2. Configure your Sealevel Systems adapter so that there is no conflict with currently installed adapters. No two adapters can occupy the same I/O address.
3. Make sure the Sealevel Systems adapter is using a unique IRQ The IRQ is typically selected via an on-board header block. Refer to the section on Card Setup for help in choosing an I/O address and IRQ.
4. Make sure the Sealevel Systems adapter is securely installed in a motherboard slot.
5. If you are utilizing an operating system prior to Windows 7, please contact Sealevel's Technical support as directed below to receive more information regarding the utility software which will determine if your product is functioning properly.
6. Only users running Windows 7 or newer should utilize the diagnostic tool '[WinSSD](#)' installed in the SeaCOM folder on the Start Menu during the setup process. First find the ports using the Device Manager, then use 'WinSSD' to verify that the ports are functional.
7. Always use the Sealevel Systems diagnostic software when troubleshooting a problem. This will help eliminate any software issues and identify any hardware conflicts.

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 A.M.- 5:00 P.M. Eastern Time Monday through Friday. For email support contact support@sealevel.com.

Appendix B – How To Get Assistance

Please refer to Troubleshooting Guide prior to calling Technical Support.

1. Begin by reading through the Trouble Shooting Guide in [Appendix A](#). If assistance is still needed, please see below.
2. 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.
3. 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>.
4. Sealevel Systems maintains a web page on the Internet. Our home page address is <https://www.sealevel.com/>. The latest software updates, and newest manuals are available via our web site.
5. Technical support is available Monday to Friday from 8:00 A.M. to 5:00 P.M. Eastern Time. Technical support can be reached at (864) 843-4343.

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 C – Electrical Interface

RS-232

Quite possibly the most widely used communication standard is RS-232. This implementation has been defined and revised several times and is often referred to as RS-232 or EIA/TIA-232. The IBM PC computer defined the RS-232 port on a 9 pin D sub connector and subsequently the EIA/TIA approved this implementation as the EIA/TIA-574 standard. This standard is defined as the *9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*. Both implementations are in widespread use and will be referred to as RS-232 in this document. RS-232 is capable of operating at data rates up to 20 Kbps at distances less than 50 ft. The absolute maximum data rate may vary due to line conditions and cable lengths. RS-232 often operates at 38.4 Kbps over very short distances. The voltage levels defined by RS-232 range from -12 to +12 volts. RS-232 is a single ended or unbalanced interface, meaning that a single electrical signal is compared to a common signal (ground) to determine binary logic states. A voltage of +12 volts (usually +3 to +10 volts) represents a binary 0 (space) and -12 volts (-3 to -10 volts) denotes a binary 1 (mark). The RS-232 and the EIA/TIA-574 specification defines two type of interface circuits, Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The Sealevel Systems adapter is a DTE interface.

RS-422

The RS-422 specification defines the electrical characteristics of balanced voltage digital interface circuits. RS-422 is a differential interface that defines voltage levels and driver/receiver electrical specifications. On a differential interface, logic levels are defined by the difference in voltage between a pair of outputs or inputs. In contrast, a single ended interface, for example RS-232, defines the logic levels as the difference in voltage between a single signal and a common ground connection. Differential interfaces are typically more immune to noise or voltage spikes that may occur on the communication lines. Differential interfaces also have greater drive capabilities that allow for longer cable lengths. RS-422 is rated up to 10 Megabits per second and can have cabling 4000 feet long. RS-422 also defines driver and receiver electrical characteristics that will allow 1 driver and up to 32 receivers on the line at once. RS-422 signal levels range from 0 to +5 volts. RS-422 does not define a physical connector.

RS-485

RS-485 is backwardly compatible with RS-422; however, it is optimized for party line or multi-drop applications. The output of the RS-422/485 driver is capable of being **Active** (enabled) or **Tri-State** (disabled). This capability allows multiple ports to be connected in a multi-drop bus and selectively polled. RS-485 allows cable lengths up to 4000 feet and data rates up to 10 Megabits per second. The signal levels for RS-485 are the same as those defined by RS-422. RS-485 has electrical characteristics that allow for 32 drivers and 32 receivers to be connected to one line. This interface is ideal for multi-drop or network environments. RS-485 tri-state driver (not dual-state) will allow the electrical presence of the driver to be removed from the line. Only one driver may be active at a time and the other driver(s) must be tri-stated. The output modem control signal RTS controls the state of the driver. Some communication software packages refer to RS-485 as RTS enable or RTS block mode transfer. RS-485 can be cabled in two ways,

two wire and four wire mode. Two wire mode does not allow for full duplex communication and requires that data be transferred in only one direction at a time. For half-duplex operation, the two transmit pins should be connected to the two receive pins (Tx+ to Rx+ and Tx- to Rx-). Four wire mode allows full duplex data transfers. RS-485 does not define a connector pin-out or a set of modem control signals. RS-485 does not define a physical connector.

MIDI

The MIDI (Musical Instrument Digital Interface) specification grew out of the need for electronic musicians to link together synthesizers, drum machines, and all manner of other electronic instruments. Until the implementation of MIDI, each manufacturer of electronic musical equipment had its own proprietary method of passing data. With MIDI, a universal language for synthesizer control could be adopted by all manufacturers. MIDI was introduced in 1983 and very quickly was considered the standard for passing data between musical instruments. The MIDI specification has been continually updated and in 1987 was edited to include MIDI Time Code and in 1992 MIDI Machine Control. The MIDI specification is administered by the MIDI Manufacturers Association. From a hardware standpoint, MIDI is a simple current loop data signal traveling serially at 31.25K bits per second. MIDI defines the mechanical connector as a 5 pin DIN connector. There are only two ways to connect the instruments with cables: MIDI-IN on one instrument to MIDI-OUT on another or connect the MIDI-THRU to the MIDI-IN. The MIDI-THRU cable “echoes” or re-transmits the data from the MIDI-IN port, thus providing a means of “daisy chaining” MIDI instruments.

Appendix D – PC/104

What is PC/104?

The PC has become extremely popular in both general purpose (desktop) and dedicated (embedded) applications. Unfortunately, the PC has been hampered by the large size required to maintain PC compatibility. PC/104 addresses this by optimizing the PC bus in a form factor designed for embedded applications.

Briefly, the key differences between PC/104 and the standard “AT” or ISA bus computer are as follows:

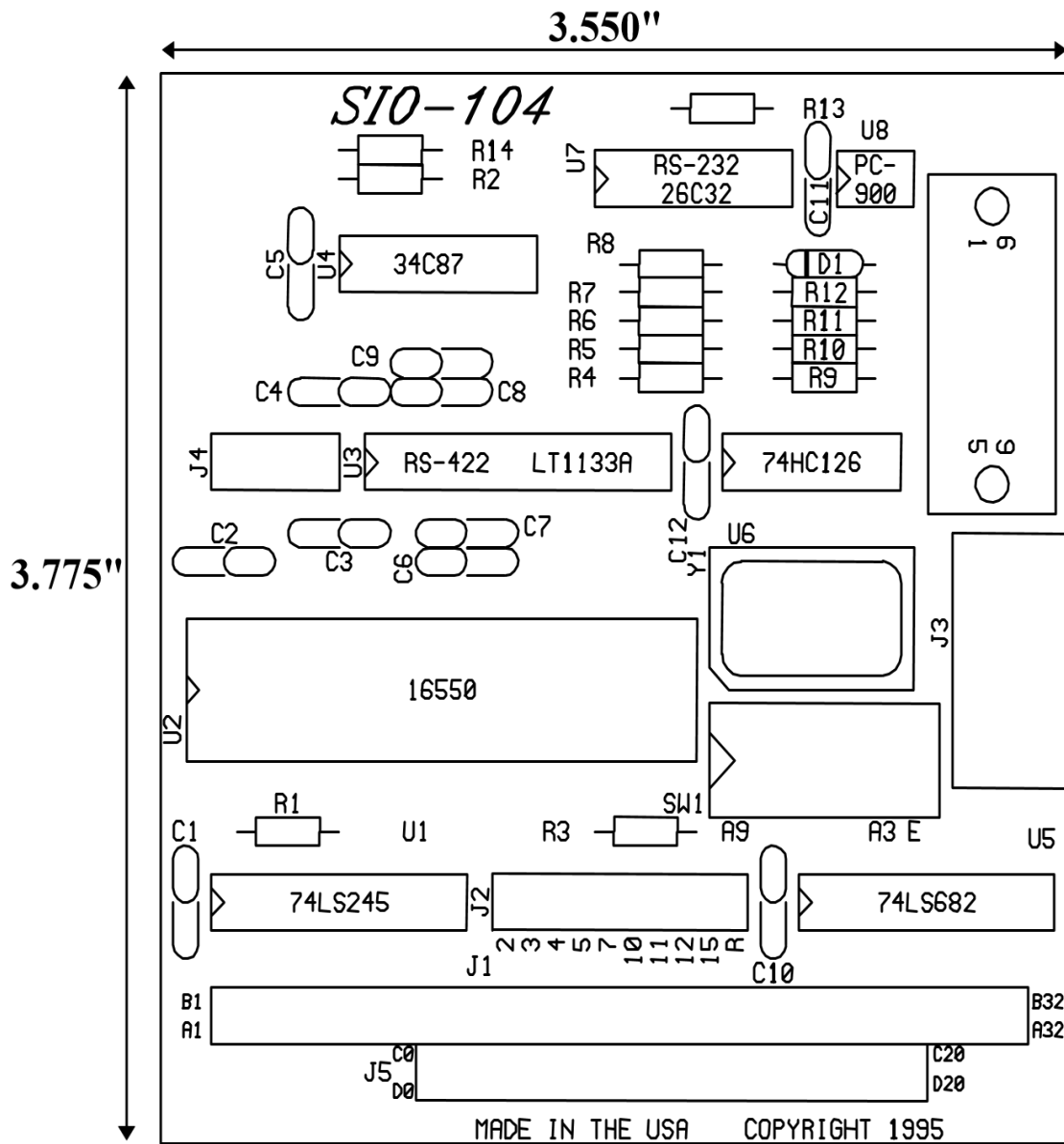
- Reducing the form factor, to 3.550 by 3.775 inches
- Eliminating the need for backplanes or card cages, through its self-stacking bus
- Minimizing component count and power consumption (typically 12 Watts per module) by reducing required bus drive on most signals to 4 mA.

Sealevel Systems has been a member of the PC/104 Consortium since its inception. Also Sealevel Systems has two members on the working group that is currently having the PC/104 bus approved by the IEEE as P996.1.

Questions about the PC/104 Consortium can be sent to:

PC/104 Consortium
P. O. Box 4303
Mountain View, CA 94040
(415) 903-8304 Ph. (415) 967-0995 Fax
www.controlled.com/pc104

Appendix E – Silk Screen



Appendix F – 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 users 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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