ACB-ULTRA.LPCIe Synchronous Serial Interface

User Manual | 5104e and 5104eS

SEALEVEL®

SEALEVEL®

Contents

Introduction

The Sealevel ACB-ULTRA.LPCIe (Item# 5104e) is a PCI Express 1.0a compliant interface adapter with a single channel high-speed multi-protocol serial interface suitable for the most popular communication protocols. This sync/async card provides an ideal solution for high-speed applications including LAN/WAN connectivity. Utilizing the Zilog Z16C32 (IUSC™) on chip DMA controller eliminates bus bandwidth constraints that are placed on typical interface adapters, allowing data rates to reach 10Mbps in burst mode. By utilizing the Z16C32's 32 byte FIFO buffer coupled with 256KB of on board memory, higher data rates are achieved.

The ACB-ULTRA.LPCIe ships with a Low Profile PCIe bracket that will only work in a Low Profile PCIe slot. If you need a standard size PCIe bracket, please order Item# 5104eS.

Features

- Single channel high speed sync/async wide area network (WAN) interface
- RS-232, RS-422/449, EIA-530, V.35 and RS-485 serial interface capability with versatile cabling options
- Multi-protocol capable including: PPP (point-to-point protocol), Frame Relay, X.25, high-speed Async, Bi-Sync, Mono-Sync, HDLC, SDLC, etc.
- Ideal for T1, Fractional T1, E1, and ISDN and other WAN applications
- On-board Z16C32 (IUSC™) with built in DMA controller and 32 byte FIFO buffer
- Up to 10 Mbps burst mode
- 256KB of on-board RAM
- Link list DMA supported
- OEM Security feature available as an option
- Compliant with RoHS and WEEE directives

Before You Get Started

What's Included

The ACB-ULTRA.LPCIe is shipped with the following items. If any of these items are missing or damaged, please contact Sealevel for replacement.

- **ACB-ULTRA.LPCIe Adapter (Item# 5104e)**
  - **5104e includes low profile PCIe bracket**
  - **5104eS includes standard size PCIe bracket**

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.

Installation & Configuration

Software Installation

Windows Installation

This section contains helpful information pertaining to the installation of supported Sealevel Systems, Inc. software packages. First, the process of acquiring the software is discussed. Next, the installation is detailed in a step-by-step guide for Windows operating systems.

Where to Get Sealevel Software

The current versions of Sealevel software packages can be obtained from the Sealevel website (see following instructions). If you already have the Sealevel software, proceed to the installation section.

Do not connect the hardware until the software has been successfully installed.

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

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 correct software from the Sealevel software driver database.
2. Type in or select the part number (#**5104e**) for the adapter from the listing.
3. Select 'Download file' link for SeaMAC for Windows.
4. The setup files will automatically detect the operating environment and install the proper components. Follow the information presented on the screens that follow.
5. 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.

6. 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.
7. The software is now installed, and you can proceed with the hardware installation.

Upgrading to the current SeaMAC driver

1. Download the current driver using the instructions from the Where to Get Sealevel Software section above. Please take note of the destination directory for download.
2. Follow the instructions in the subsequent section named Remove Hardware Using Device Manager.
3. Launch the SeaMAC installer executable from the directory where it was downloaded.
4. When the InstallShield Wizard' window appears, click the 'Next' button to initiate the software installation.
5. When the 'License Agreement' window appears, accept the terms, and click 'Next' to continue. You can click the 'Print' button to print out a copy of the agreement for your records. If you do not accept the terms of the agreement, the wizard will stop.
6. When the 'Ready to Install the Program' window appears, click the 'Install' button to install the software onto the hard drive of your computer. Some versions of Windows will halt the installation and provide you with a dialog box which will ask you for permission for the installer to make changes to your computer. Click on the button to continue installation of your Sealevel software.
7. If prompted, reboot your computer for changes to take effect.

Hardware Installation

Do not install the PCI Express board until the software has been successfully installed.

Once you have installed the software, install the 5104e into an available PCI Express slot and boot the computer. The drivers that were installed during the software installation process will automatically be used to configure the adapter

Once the hardware installation completes, you may need to restart the computer to finalize the installation process.

Technical Description

The Sealevel ACB-ULTRA.LPCIe (Item# 5104e) is a PCI Express 1.0a compliant interface adapter with a single channel high-speed multi-protocol serial interface suitable for the most popular communication protocols. This sync/async card provides an ideal solution for high-speed applications including LAN/WAN connectivity. Utilizing the Zilog Z16C32 (IUSC™) on chip DMA controller eliminates bus bandwidth constraints that are placed on typical interface adapters, allowing data rates to reach 10Mbps in burst mode. By utilizing the Z16C32's 32 byte FIFO buffer coupled with 256KB of onboard memory, higher data rates are achieved.

Z16C32 IUSC™

The ACB-ULTRA.LPCIe is based on a single Zilog Z16C32 IUSC (**I**ntegrated **U**niversal **S**erial **C**ontroller). The IUSC has a built-in DMA controller that allows high-speed data transfers directly to and from the 256KB block of on-board memory. The IUSC's built-in DMA controller supports 4 different modes of DMA transfer: Single Buffer, Pipelined, Array, and Link List.

RAM

The ACB-ULTRA.LPCIe provides 256KB of onboard memory.

Interface Selection

The ACB-ULTRA.LPCIe supports a variety of electrical interfaces: RS-232, RS-422/449, EIA-530, V.35 and RS-485. There is line termination on RXD, RXC, and TXC in the following modes: RS-530, RS-530A, RS-485T, and V.35.

Clocking

The ACB-ULTRA.LPCIe has an on-board 20MHz oscillator that clocks the IUSC. Other oscillator frequencies may be specified, via factory configuration: contact Sealevel for more information on this option.

OEM Security Feature (Option)

The ACB-ULTRA.LPCIe supports an OEM Security Feature, via factory configuration: contact Sealevel for more information on this option.

25 Pin Connector Signal Layouts (DB-25 Male)

In all modes, Pin 1 has a 1K ohm resistor to GND and pin 25 has a 1K ohm resistor to +5V connection. This is useful for RS-485 biasing. If this presents a problem in your implementation, please contact Sealevel for aid in removing these or to inquire about an alternate factory configuration.

RS-232 Signals

Pin #	Signal	Name	Mode
2	TD	Transmit Data	Output
3	RD	Receive Data	Input
4	RTS	Request To Send	Output
5	CTS	Clear To Send	Input
6	DSR	Data Set Ready	Input
7	GND	Ground	
8	DCD	Data Carrier Detect *	Input
15	TXC	Transmit Clock	Input
17	RXC	Receive Clock	Input
18	LL	Local Loopback	Output
20	DTR	Data Terminal Ready	Output
21	RL	Remote Loopback	Output
22	RI	Ring Indicator	Input
24	TSET	Transmit Signal Element Timing	Output
25	TM	Test Mode	Input

When in External Sync mode, the external sync signal is fed into DCD.

RS-485 or RS-485T

Pin #	Signal	Name	Mode
2	TDA TX–	Transmit Negative	Output
3	RDA RX–	Receive Negative	Input
7	GND	Ground	
9	RXCB RXC+	Receive Clock Positive	Input
11	TSETB TSET+	Transmit Signal Element Timing +	Output
12	TXCB TXC+	Transmit Clock Positive	Input
14	TDB TX+	Transmit Positive	Output
15	TXCA TXC–	Transmit Clock Negative	Input
16	RDB RX+	Receive Positive	Input
17	RXCA RXC–	Receive Clock Negative	Input
18	LL	Local Loopback	Output
20	DTRA DTR–	Data Terminal Ready Negative	Output
21	RL	Remote Loopback	Output
23	DTRB DTR+	Data Terminal Ready Positive	Output
24	TSETA TSET–	Transmit Signal Element Timing –	Output

The RX+/- lines do not have pull up or pull down biasing. For high baud rates or long distances, you may need to implement bias for the RX+/- lines. To do this, add connections of the RX+ pin to pin 25, and the RX- pin to pin 1. Alternatively, add a 1K Ω resistor from the RX- pin to the GND pin, and a 820 Ω resistor from the RX+ pin to the +5V pin of DTR. Do not toggle DTR or the bias will be lost.

RS-530 (RS-422)

Pin #	Signal	Name	Mode
2	TDA TX–	Transmit Negative	Output
3	RDA RX–	Receive Negative	Input
4	RTSA RTS–	Request To Send Negative	Output
5	CTSA CTS–	Clear To Send Negative	Input
6	DSRA DSR–	Data Set Ready Negative	Input
7	GND	Ground	
8	DCDA DCD–	Data Carrier Detect Negative *	Input
9	RXCB RXC+	Receive Clock Positive	Input
10	DCDB DCD+	Data Carrier Detect Positive *	Input
11	TSETB TSET+	Transmit Signal Element Timing +	Output
12	TXCB TXC+	Transmit Clock Positive	Input
13	CTSB CTS+	Clear To Send Positive	Input
14	TDB TX+	Transmit Positive	Output
15	TXCA TXC–	Transmit Clock Negative	Input
16	RDB RX+	Receive Positive	Input
17	RXCA RXC–	Receive Clock Negative	Input
19	RTSB RTS+	Request To Send Positive	Output
20	DTRA DTR–	Data Terminal Ready Negative	Output
22	DSRB DSR+	Data Set Ready Positive	Input
23	DTRB DTR+	Data Terminal Ready Positive	Output
24	TSETA TSET–	Transmit Signal Element Timing –	Output

When in External Sync mode, the external sync signal is fed into DCD.

RS-530A

Pin #	Signal	Name	Mode
2	TDA TX–	Transmit Negative	Output
3	RDA RX–	Receive Negative	Input
4	RTSA RTS–	Request To Send Negative	Output
5	CTSA CTS–	Clear To Send Negative	Input
6	DSRA DSR–	Data Set Ready Negative	Input
7	GND	Ground	
8	DCDA DCD–	Data Carrier Detect Negative *	Input
9	RXCB RXC+	Receive Clock Positive	Input
10	DCDB DCD+	Data Carrier Detect Positive *	Input
11	TSETB TSET+	Transmit Signal Element Timing +	Output
12	TXCB TXC+	Transmit Clock Positive	Input
13	CTSB CTS+	Clear To Send Positive	Input
14	TDB TX+	Transmit Positive	Output
15	TXCA TXC–	Transmit Clock Negative	Input
16	RDB RX+	Receive Positive	Input
17	RXCA RXC–	Receive Clock Negative	Input
18	LL	Local Loopback	Output
19	RTSB RTS+	Request To Send Positive	Output
20	DTRA DTR–	Data Terminal Ready Negative	Output
21	RL	Remote Loopback	Output
24	TSETA TSET–	Transmit Signal Element Timing –	Output

When in External Sync mode, the external sync signal is fed into DCD.

V.35 Signals

Pin #	Signal	Name	V.35	Mode
2	TDA TX–	Transmit Negative	P	Output
3	RDA RX–	Receive Negative	R	Input
4	RTS	Request To Send	C	Output *
5	CTS	Clear To Send	D	Input *
6	DSR	Data Set Ready	E	Input *
7	GND	Ground	B	
8	DCD	Data Carrier Detect *	F	Input *
9	RXCB RXC+	Receive Clock Positive	X	Input
11	TSETB TSET+	Transmit Signal Element Timing +	W	Output
12	TXCB TXC+	Transmit Clock Positive	AA	Input
14	TDB TX+	Transmit Positive	S	Output
15	TXCA TXC–	Transmit Clock Negative	Y	Input
16	RDB RX+	Receive Positive	T	Input
17	RXCA RXC–	Receive Clock Negative	V	Input
18	LL	Local Loopback		Output *
20	DTR	Data Terminal Ready	H	Output *
21	RL	Remote Loopback		Output *
22	RI	Ring Indicator	J	Input *
24	TSETA TSET–	Transmit Signal Element Timing –	U	Output

All modem control signals are single ended (un-balanced) with RS-232 signal levels.

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. When in External Sync mode, the external sync signal is fed into DCD. Terminating these pins, if not used, will help insure you get the best performance from your adapter.

Technical Specifications

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0° to 70°C (32° to 158°F)	-50° to 105°C (-58° to 221°F)
Humidity Range	10 to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

Dimensions

Board Length	5.18 inches (13.16 cm)
Board Height	2.54 inches (6.45 cm)

Manufacturing

All Sealevel Systems Printed Circuit boards are built to UL 94V0 rating and are 100% electrically tested. These printed circuit boards are solder mask over bare copper or solder mask over tin nickel.

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 damage to the device:

- Cover workstations with approved antistatic material. Always wear a wrist strap connected to workstation as well as properly grounded tools and equipment.
- Use antistatic mats, heel straps, or air ionizers for more protection.
- Always handle electrostatically sensitive components by their edge or by their casing.
- Avoid contact with pins, leads, or circuitry.
- Keep work area free of non-conductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools such as cutters, screwdrivers, and vacuum cleaners, which are conductive.

Appendix B – Troubleshooting

Following these simple steps can eliminate most common problems.

1. Read this manual thoroughly before attempting to install the adapter in your system.

2. Install software first. This places the required installation files in the correct locations. After installing the software, proceed to the physical installation section of this manual.

3. 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.

4. 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.

5. Make sure the Sealevel Systems adapter is securely installed.

6. For Windows 2000/XP/Vista, and Windows 7, the diagnostic tool 'WinSSD' is installed the SeaMAC 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. The Loopback tab is primarily designed for asynchronous cards and should not be used in synchronous modes – use the BERT tab instead.

7. Always use Sealevel Systems diagnostic software when troubleshooting a problem. This will eliminate any software issues from the equation.

If these steps do not solve your problem, please call Sealevel Technical Support at +1864-843-4343. Our technical support is free and available Monday through Friday from 8:00 AM – 5:00 PM EST. For email support, contact support@sealevel.com.

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. It is defined by the EIA as the Interface between Data Terminal Equipment and Data Circuit- Terminating Equipment Employing Serial Binary Data Interchange. The mechanical implementation of RS 232 is on a 25 pin D sub connector. 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. 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.

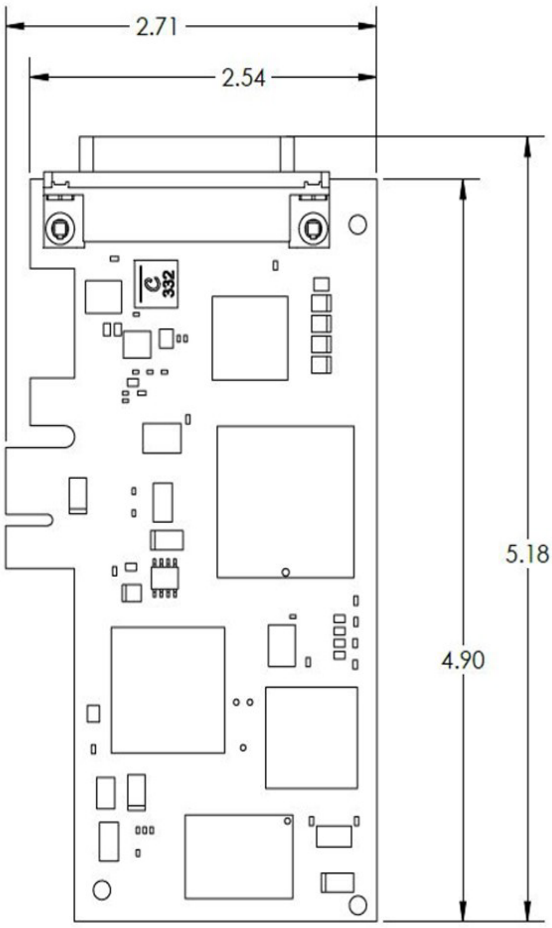
RS-530/530A

RS 530 (a.k.a. EIA 530) compatibility means that RS 422 signal levels are met, and the pin out for the DB 25 connector is specified. The EIA (Electronic Industry Association) created the RS 530 specification to detail the pin out and define a full set of modem control signals that can be used for regulating flow control and line status. The major difference between RS-530 and RS-530A lies in some of the modem control interface signals. In RS-530 the signals all of the modem control signals are differential, in RS-530A some of these signals are single ended. The RS 530 specification defines two types of interface circuits, Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The Sealevel Systems adapter is a DTE interface.

V.35

V.35 is a standard defined by ITU (formerly CCITT) that specifies an electrical, mechanical, and physical interface that is used extensively by high-speed digital carriers such as AT&T Dataphone Digital Service (DDS). ITU V.35 is an international standard that is often referred to as Data Transmission at 48 Kbps using 60 - 108 KHz Group-Band Circuits. ITU V.35 electrical characteristics are a combination of unbalanced voltage and balanced current mode signals. Data and clock signals are balanced current mode circuits. These circuits typically have voltage levels from 0.5 Volts to -0.5 Volts (1 Volt differential). The modem control signals are unbalanced signals and are compatible with RS-232. The physical connector is a 34 pin connector that supports 24 data, clock, and control signals. The physical connector is defined in the ISO-2593 standard. ITU V.35 specification defines two types of interface circuits, Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The Sealevel Systems adapter is a DTE interface.

Appendix D – Mechanical Drawing



Accessories

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

DB25 Female to DB25 Male Extension Cable, 72-inch Length (Item# CA104)	
The CA104 is a standard DB25F to DB25M serial extension cable. Extend a DB25 cable or locate a piece of hardware where it is needed with this six foot (72 inch) cable. The connectors are pinned one-to-one, so the cable is compatible with any device or cable with DB25 connectors. The cable is fully shielded against interference and the connectors are molded to provide strain relief. Dual metal thumbscrews secure the cable connections and prevent accidental disconnection. Recommended for applications with data rates less than 1Mbps.	
DB25 Female (RS-530) to DB37 Male (RS-449 DTE) Cable, 10-inch Length (Item# CA107)	
DB25 Female (RS-530) to DB37 Male (RS-449 DTE) Cable, 10-inch Length. RS-530 was designed to replace the bulky DB37 RS-449 connector. The CA107 cable allows any Sealevel RS-530 adapter to be used in an RS-449 application.	
DB25 Female (RS-530) to DB15 Male (X.21) Cable, 72-inch Length (Item# CA159)	
DB25 Female (RS-530) to DB15 Male (X.21) Cable, 72-inch Length. Converts the Standard DB25 implementation of RS-530 or RS-422 to the ITU-T X.21 standard pinout.	
DB25 Female to DB25 Male (RS-530) Twisted Pair Serial Cable, 72 inch Length (Item# CA174)	
DB25 Female to DB25 Male Twisted Pair Serial Cable, 72-inch Length. Twisted Pairs provide increased data integrity in high-speed serial applications. Recommended for RS-530 applications with data rates greater than 1M bps.	
DB25 Female (V.35) to ITU-T ISO-2593 Style Connector (V.35) Cable, 72 inch Length (Item# CA178)	
DB25 Female (V.35) to ITU-T ISO-2593 Style Connector (V.35) Cable, 72-inch Length. The CA178 converts the Sealevel DB25 implementation of V.35 to the ITU-T V.35 mechanical standard.	

Appendix E – 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

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