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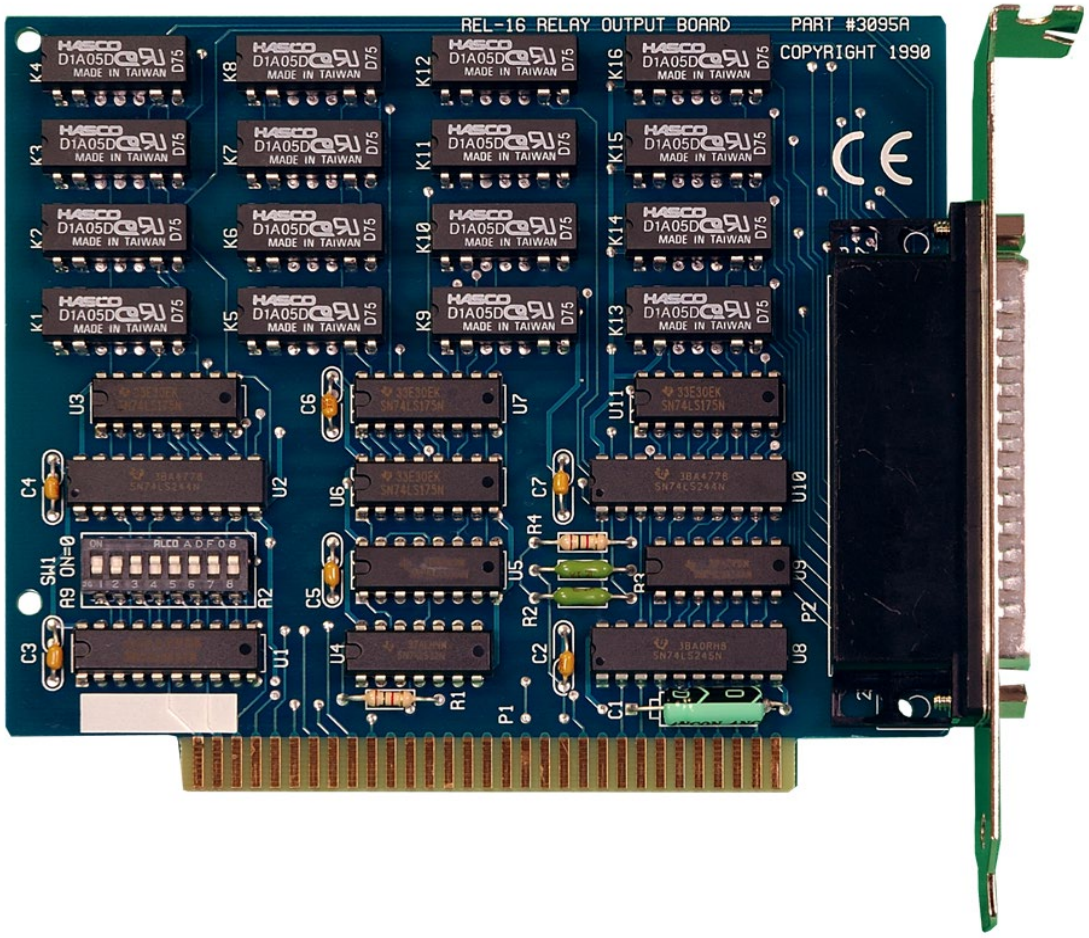
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REL-16

User Manual | 3095



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Introduction

The REL-16 provides 16 reed relay outputs. The outputs offer high quality, long life, low current (10 Watt maximum), dry contact switch closures. Reed relays are well suited for low current applications. The relays are normally open and will close when energized.

The REL-16 is designed to be used with a variety of Operating Systems including Windows 98/NT/ME/2000/XP, Linux, and DOS. The SeaI/O API (Application Programmer Interface) included on CD with the REL-16 provides a variety of useful high-level function calls implemented as a Windows dynamic link library (DLL) and as a Linux kernel module and library. In addition to the API, SeaI/O includes sample code and utilities to simplify software development.

Other Sealevel ISA Digital I/O Products

Model No.	Part No.	Description
DIO-16	(P/N 3096)	-8 Reed Relay Outputs / 8 Opto-Isolated Inputs
ISO-16	(P/N 3094)	- 16 Optically Isolated Inputs
DIO-32B	(P/N 3093)	- 16 Reed Relay Outputs / 16 Opto-Isolated Inputs
REL-16	(P/N 3098)	- 32 Switched Relay Outputs
PIO-48	(P/N: 4030)	-- 48 TTL Inputs/Outputs

Before You Get Started

What's Included

The REL-16 is shipped with the following items. If any of these items is missing or damaged, please contact Sealevel for replacement.

- **REL-16 Adapter**

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.

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Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing the REL-16 to real-world signals. All items can be purchased from our website (www.sealevel.com) or by calling (864) 843-4343.

- **DB-37 Male to DB-37 Female 6' Extension Cable (Item# CA112)**
  This cable extends the DB-37 connector on the CA172 cable an additional six feet and is pinned one-to-one.
- **DB-37 Male/Female Terminal Block (Item# TB02-KT)**
  Break out serial and digital connectors to 37 screw terminals for easy field connection. The TB02 terminal block is designed with both DB37 male and female connectors, therefore; it can be used with any DB37 board regardless of the board's port gender.
- **Cable and Terminal Block Kit (Item# KT101)**
  For convenient and easier ordering, the KT101 includes the TB02-KT terminal block and CA112 cable in a single kit.

Card Setup

The REL-16 contains several jumper straps for each port that must be set for proper operation.

Address Selection

The REL-16 occupies at total of 2 I/O locations. The DIP-switch (SW1) is used to set the base address for these locations. Be careful when selecting the base address as some selections conflict with existing PC ports. The following table shows several examples that usually do not cause a conflict.

Address	Binary	Switch Settings							
		1	2	3	4	5	6	7	8
100-104	01 0000 00xx	Off	On	On	On	On	On	On	On
104-108	01 0000 01xx	Off	On	On	On	On	On	On	Off
200-204	10 0000 00xx	On	Off	On	On	On	On	On	On
280-283	10 1000 00xx	Off	On	Off	On	On	On	On	On
284-287	10 1000 01xx	Off	On	Off	On	Off	On	On	Off
2EC-2EF	10 1110 11xx	Off	On	Off	Off	Off	On	Off	Off
300-303	11 0000 00xx	Off	Off	On	On	On	On	On	On
320-323	11 0010 00xx	Off	Off	On	On	Off	On	On	On
388-38B	11 1000 10xx	Off	Off	Off	On	On	On	Off	On
3A0-3A3	11 1010 00xx	Off	Off	Off	On	Off	On	On	On
3A4-3A7	11 1010 01xx	Off	Off	Off	On	Off	On	On	Off

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 the base address. Address 300 in binary is XX 11 0000 00XX where X = a non-selectable address bit and address bit A9 is always a 1.



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'.

Installation

Software Installation

Windows Installation

Do not install the Adapter in the machine until the software had 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 correct software from the Sealevel software driver database.
2. Select the Part Number (**3095**) for your device from the listing.
3. Click the 'Install Drivers' button.
4. The setup file will automatically detect the operating environment and install the proper components.
5. A screen may appear with the declaration: "The publisher cannot be determined due to the problems below: Authenticode signature not found." Please select the 'Yes' button and proceed with the installation. This declaration simply means that the Operating System is not aware of the driver being loaded. It will not cause any harm to your system.
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.

To confirm that the SeaCOM driver has been successfully installed, click on the 'Start' button, and then select 'All Programs'. You should see the 'SeaCOM' program folder listed.

You are now ready to proceed with connecting the 3098 to your system. Refer to the Hardware Installation section for details.

Windows NT Card Installation: After accomplishing the above steps, bring up the Control Panel and double-click on the SeaIO Devices icon. To install a new card, click "Add Port". Repeat this procedure for as many SeaIO cards as you wish to install.

Linux Installation



You MUST have "root" privileges to install the software and drivers.



The syntax is case sensitive.

SeaCOM for Linux can be downloaded here: https://www.sealevel.com/support/software-seacom-linux/. It includes the **README** and the **Serial-HOWTO** help files (located at seacom/dox/howto). This series of files both explains typical Linux serial implementations and informs the user about Linux syntax and preferred practices.



User can use a program such as 7-Zip to extract the tar.gz file.

In addition, the software selectable interface settings can be accessed by referencing **seacom/utilities/3095mode.**

To set up Linux to automatically load the driver; refer to a Linux manual concerning your specific distribution for help.

For additional software support, including QNX, 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.

Physical Installation

The adapter can be installed in any ISA PC expansion slot.



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

1. **Turn off PC power. Disconnect the power cord.**
2. Remove the PC case cover.
3. Locate an available 5V PCI slot and remove the blank metal slot cover.
4. Gently insert the REL-16 adapter into the slot. Make sure that the adapter is seated properly.
5. After the adapter has been installed, the cables should be routed thru the opening in the bracket. This bracket also features a strain relief function that should be used to prevent un-expected cable removal.
6. Replace the screw you removed for the blank and use it to secure the adapter into the slot. (This is required to ensure FCC Part 15 compliance.)
7. Replace the cover.
8. Connect the power cord

The REL-16 is now ready for use.

Programming the REL-16

Sealevel's SeaI/O software is provided to assist in the development of reliable applications for the Sealevel Systems family of digital I/O adapters. The software also includes driver functions for use in accessing the I/O as well as helpful samples and utilities.

Programming for Windows

The SeaI/O API (Application Programmer Interface) provides a variety of useful high-level function calls implemented in a Windows dynamic link library (DLL). The API is defined in the help file (Start/Programs/SeaIO/SeaIO Help) under "Application Programmers Interface". This help file also includes detailed information dealing with installation / removal of the software and information about latency, logic states, and device configuration.

For C language programmers we recommend using the API to access the ReL-16. If you are programming in Visual Basic, using the ActiveX control included with SeaI/O is advised.

Samples and Utilities

A variety of sample programs and utilities (both executable and source code) are included with SeaI/O. Further documentation on these samples can be found by selecting "Start/Programs/SeaI/O/Sample Application Description". Information about where the files are physically stored on your disk is also included in this same file.

Programming for Linux

SeaI/O for Linux consists of two major parts: a kernel module and a library. The kernel module is a simple IO pass-through device, allowing the library to handle the more sophisticated functions provided to SeaI/O users. It is provided in a 'tarball' format and can easily be compiled and included in the kernel build.

Application Programmers Interface (API)

Most modern operating systems do not allow direct hardware access. The SeaIO driver and API have been included to provide control over the hardware in Windows and Linux environments. The purpose of this section of the manual is to help the customer with the mapping of the API to the actual inputs and relays for the 3095 specifically. Complete documentation of the API can be found in its accompanying help file.

Digital I/O Interface

The REL-16 provides two output ports. The ports, which are reed relay output ports, are organized as ports A and B. Assuming an I/O address of 302 Hex the following table shows the Port Addresses.

Base Address	Hex	Decimal	Mode
	300	768	Unused
	301	769	
Port A Address	302	770	Reed Relay Output Port
Port B Address	303	771	

Output Ports (Reed Relay)

Reed relays provide very high quality, long life, low current (10 Watt maximum), dry contact switch closures. Reed relays are not suited for high current applications, and can be destroyed by inductive load switching, where a spark occurs across the contacts internally. The relays are normally open, and close when energized.

Output Ports (Reed Relay) Pin Assignments (P2)

Port C Bit	Relay	P2 Pin	Port D Bit	Relay	P2 Pin
0	K16	2,20	0	K8	10,28
1	K15	3,21	1	K7	11,29
2	K14	4,22	2	K6	12,30
3	K13	5,23	3	K5	13,31
4	K12	6,24	4	K4	14,32
5	K11	7,25	5	K3	15,33
6	K10	8,26	6	K2	16,34
7	K9	9,27	7	K1	17,35
Ground	18,36,37				
+ 5 Volts	19				
+ 12 Volts	1				

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Direct Hardware Control

In systems where the user's program has direct access to the hardware (i.e. DOS) the table below gives the mapping and functions that the REL-16 provides.

Function Available	Port	Port Address	Port Type
		Base + 0	Unused
		Base + 1	Unused
R/W	A	Base + 2	Output Port
R/W	B	Base + 3	Output Port

R/W = Read or Write

Relative Addressing vs. Absolute Addressing

The SealO API makes a distinction between "absolute" and "relative" addressing modes. In absolute addressing mode, the Port argument to the API function acts as a simple byte offset from the base I/O address of the device. For instance, Port #0 refers to the I/O address base + 0; Port #1 refers to the I/O address base + 1.

Relative addressing mode, on the other hand, refers to input and output ports in a logical fashion. With a Port argument of 0 and an API function meant to output data, the first (0th) output port on the device will be utilized. Likewise, with a Port argument of 0 and an API function designed to input data, the first (0^{th}) input port of the device will be utilized.

In all addressing modes, port numbers are zero-indexed; that is, the first port is port #0, the second port is #1, the third #2, and so on.

Reading the Outputs

The relay ports return the ones complement of the value that is currently being used to drive the relays. When using the API the actual value is returned not the complement of the value.

Writing the Outputs:

The output ports are the only ports that can be written. The relays on a standard REL-16 are normally open. To close a relay a one must be written to the appropriate bit.

Register Description

Address	Mode	D7	D6	D5	D4	D3	D2	D1	D0
Base+0	R	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+1		{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+2	R/W	PCD7	PCD6	PCD5	PCD4	PCD3	PCD2	PCD1	PCD0
Base+3	R/W	PDD7	PDD6	PDD5	PDD4	PDD3	PDD2	PDD1	PDD0
Base+4	R	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+5	R	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+6	R	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+7	R	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}

Electrical Characteristics

Features

- Selectable I/O port addressing from 100H – 3FFH
- 2 sets of SPST relays with each having 8 Relays
- Highly reliable 10 VA DIP reed relays utilized
- Multiple adapters can reside in same computer
- All address, data and control signals are TTL compatible

Specifications

Output Relays

Contact Max Power Rating	10W		
Contact Voltage Maximum	100 VDC/VAC		
Contact Current Maximum	.5A AC/DC RMS		
Contact Resistance, Initial	.15 Ω		
Rated Life	200 Million Closures (Low Load)	100 Million Closures (Maximum Load)	
Contact Speed:	Operate - .5mS	Release - .5mS	Bounce - .5 mS
Maximum Operating Speed	600 Hz		

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0° to 70° C	-50° to 105° C

Power Requirements

Supply Line	+5 VDC	+12VDC
Rating	200 mA	(Optional Use)

Physical Dimensions

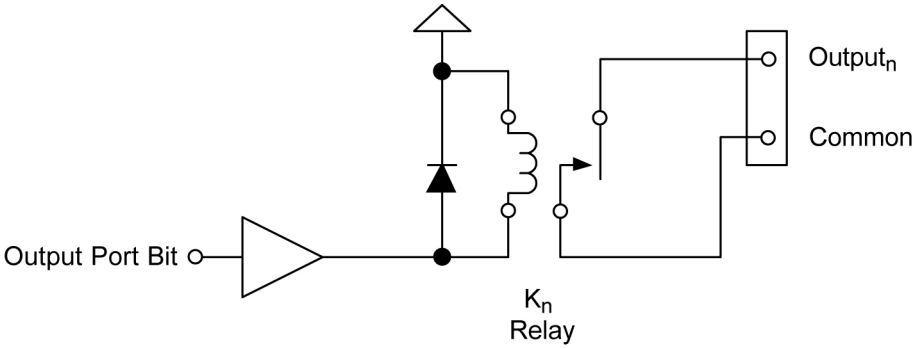
Board length	4.9 inches (12.5 cm)
Board Height including Goldfingers	4.2 inches (10.7 cm)

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.

Example Circuits

Output Circuit



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Appendix A – Troubleshooting

Sealevel Software is supplied with the Sealevel Systems adapter and will be used in the troubleshooting procedures. By using this software and following these simple steps, most common problems can be eliminated without the need to call Technical Support.

1. **Install software first**. After installing the software then proceed to adding the hardware. This place the required installation files in the correct locations.
2. Read this manual thoroughly before attempting to install the adapter in your system.
3. Use Device Manager under Windows to verify proper installation.
4. Use the SeaIO Control Panel applet or the Device Manager's property page for card identification and configuration.
5. The following are known I/O conflicts:
    a. The 278 and 378 settings may conflict with your printer I/O adapter.
    b. 3B0 cannot be used if a Monochrome adapter is installed.
    c. 3F8-3FF is typically reserved for COM1:
    d. 2F8-2FF is typically reserved for COM2:
    e. 3E8-3EF is typically reserved for COM3:
    f. 2E8-2EF is typically reserved for COM4:

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

Appendix B – How To Get Assistance

The adapter should provide years of trouble-free service. However, in the event that it appears to be functioning incorrectly, the following tips can eliminate most common problems without the need to call Technical Support.

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

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

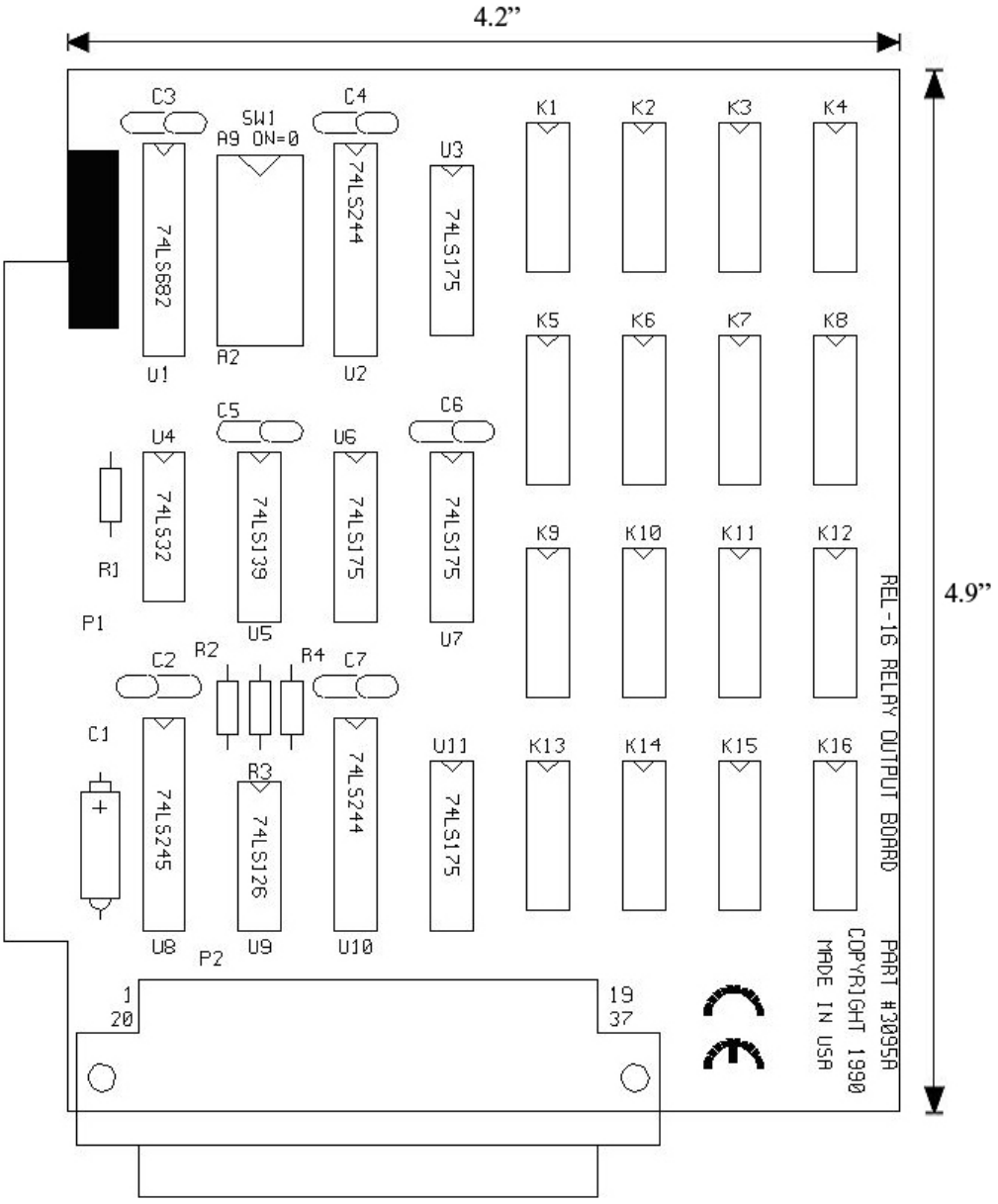
Sealevel Systems provides an FAQ section on its web site. Please refer to this to answer many common questions. This section can be found at http://www.sealevel.com/faq.asp.

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

Technical support is available Monday to Friday from 8:00 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 – Silk Screen – 3095 PCB



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Appendix D – Compliance Notices

Federal Communications Commission (FCC) Statement

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

EMC Directive Statement

Products bearing the CE Label fulfill the requirements of the EMC directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission. To obey these directives, the following European standards must be met:

- **EN55022 Class A** - "Limits and methods of measurement of radio interference characteristics of information technology equipment"
- **EN55024** – "Information technology equipment Immunity characteristics Limits and methods of measurement".

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

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

Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured I/O products. We are able to offer this warranty due to our control of manufacturing quality and the historically high reliability of our products in the field. Sealevel products are designed and manufactured at its Liberty, South Carolina facility, allowing direct control over product development, production, burn-in and testing. Sealevel achieved ISO-9001:2015 certification in 2018.

Warranty Policy

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

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

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

Non-Warranty Repair/Retest

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

How to obtain an RMA (Return Merchandise Authorization)

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

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

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Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

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