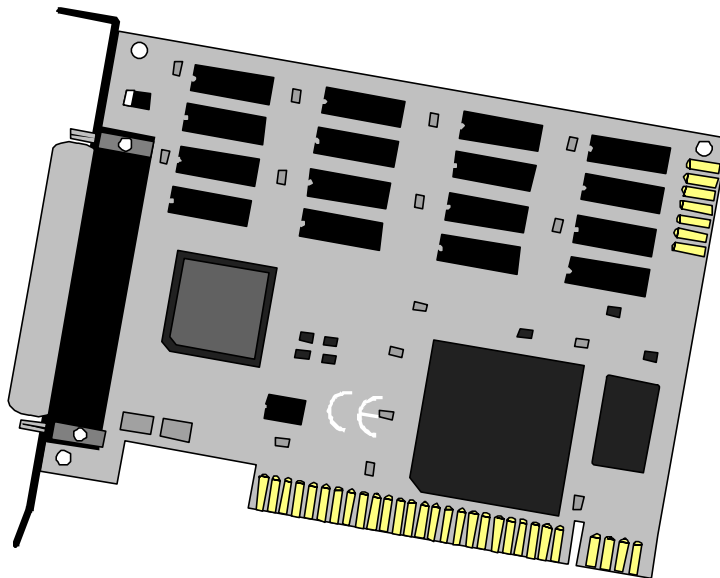


SEALEVEL

SYSTEMS INCORPORATED

REL-32.PCI[™] *USER MANUAL*



Part # 8007

Sealevel Systems, Inc
155 Technology Place
P.O. Box 830
Liberty, SC 29657 USA

Phone: (864) 843-4343
FAX: (864) 843-3067
www.sealevel.com

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Introduction

Overview

The **REL-32.PCI** provides 32 reed relays that can switch power, data or other electronic signals for control applications. The **REL-32.PCI** is PCI 2.1 bus compliant.

What's Included

The **REL-32.PCI** is shipped with the following items. If any item is missing or damaged, contact the supplier.

- **REL-32.PCI** Adapter
- Sealevel Software CD
- Cable (CA – 172)

Installation

Card Setup

The **REL-32.PCI** is a fully compliant PCI 'Plug and Play' adapter. The I/O address is auto-assigned by either your system BIOS or your 'Plug and Play' operating system.

Software Installation

For Windows Users

Choose **Install Software** at the beginning of the CD and select the **Digital I/O** software drivers and install **SeaIO**.

System Installation

The **REL-32.PCI** can be installed in any of the PCI expansion slots.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover.
3. Locate an available PCI slot and remove the blank metal slot cover.
4. Gently insert the **REL-32.PCI** into the slot. Make sure that the adapter is seated properly.
5. Replace the retaining screw.
6. Replace the cover.
7. Connect the power cord. Installation is complete.

Technical Description

The **REL-32.PCI** provides four parallel Reed Relay output ports. The ports are organized as ports 1, 2, 3, and 4.

Features

- 32 SPST relays
- DB-37 connectors
- Highly reliable 10 VA DIP reed relays utilized
- Multiple adapters can reside in same computer
- PCI 2.1 Bus compliant

Reed Relays

Reed relays provide very high quality, long life, low power, dry contact switch closures. Reed relays are not suited for high current applications, and can be destroyed by capacitive or inductive load switching. The relays are normally open, and close when energized.

Relay Specifications

- Contact Power Ratings: 10-Watts Maximum
- Contact Voltage Maximum: 100 Volts DC or AC Maximum
- Contact Current Maximum: 0.5 Amps DC or AC RMS
- Contact Resistance, Initial: 0.15 Ohms
- Rated Life:
 - Low Load: 200 Million Closures
 - Maximum Load: 100 Million Closures
- Contact Speed:
 - Operate: 0.5 mS
 - Release: 0.5 mS
 - Bounce: 0.5 mS
- Maximum Operating Speed: 600 Hertz

Software

The **REL-32.PCI** ships with Sealevel Systems' Seal/O suite of Windows drivers. Seal/O provides the user with a consistent and straightforward API, allowing the developer to concentrate on the details of the application as opposed to low level driver development. Popular development environments, including Visual C++, Visual Basic, and Delphi, are supported for application development. Seal/O includes a utility for configuring the driver parameters under Windows, further simplifying installation.

For DOS, QNX, Linux and other operating systems, please refer to the software included with your card.

Connector and Jumper Pin Out

Each relay has two sides, an A-side and B-side. Each side is connected to two places: the cable, and the jumpers on the top of the board. The tables on the next two pages provide the pin outs for the two DB37 cable ends and the onboard jumpers.

For ease in wiring, the card's DB-37 connector can be interfaced directly to Sealevel's terminal block kit, Part# KT-101. The KT-101 kit, consisting of a 6 ft. M/F cable and screw terminal block provides a simple means to connect field wiring to Sealevel 37-pin I/O cards. The Sealevel Terminal Block provides both male and female DB-37 connectors eliminating the need for gender benders and other adapters while simplifying cable connections.

Cable With Two Male Ends (Ports 1,2 Ports 3,4)

DB-37 – Labeled Ports 1, 2

| Relay | Relay A Side | | Relay B Side | |
|-------|--------------|-------------|--------------|-------------|
| | Port 1 - A | DB 37 - Pin | Port 1 - B | DB 37 - Pin |
| K1 | 1 | 2 | 1 | 20 |
| K2 | 2 | 3 | 2 | 21 |
| K3 | 3 | 4 | 3 | 22 |
| K4 | 4 | 5 | 4 | 23 |
| K5 | 5 | 6 | 5 | 24 |
| K6 | 6 | 7 | 6 | 25 |
| K7 | 7 | 8 | 7 | 26 |
| K8 | 8 | 9 | 8 | 27 |

| Relay | Relay A Side | | Relay B Side | |
|-------|--------------|-------------|--------------|-------------|
| | Port 2 - A | DB 37 - Pin | Port 2 - B | DB 37 - Pin |
| K9 | 1 | 10 | 1 | 28 |
| K10 | 2 | 11 | 2 | 29 |
| K11 | 3 | 12 | 3 | 30 |
| K12 | 4 | 13 | 4 | 31 |
| K13 | 5 | 14 | 5 | 32 |
| K14 | 6 | 15 | 6 | 33 |
| K15 | 7 | 16 | 7 | 34 |
| K16 | 8 | 17 | 8 | 35 |

Power and Ground Pin Assignments

| | |
|------------|----------|
| Ground | 18,36,37 |
| + 5 Volts | 19 |
| + 12 Volts | 1 |

DB-37 – Labeled Ports 3, 4

| Relay | Relay A Side | | Relay B Side | |
|-------|--------------|-------------|--------------|-------------|
| | Port 3 - A | DB 37 - Pin | Port 3 - B | DB 37 - Pin |
| K17 | 1 | 2 | 1 | 20 |
| K18 | 2 | 3 | 2 | 21 |
| K19 | 3 | 4 | 3 | 22 |
| K20 | 4 | 5 | 4 | 23 |
| K21 | 5 | 6 | 5 | 24 |
| K22 | 6 | 7 | 6 | 25 |
| K23 | 7 | 8 | 7 | 26 |
| K24 | 8 | 9 | 8 | 27 |

| Relay | Relay A Side | | Relay B Side | |
|-------|--------------|-------------|--------------|-------------|
| | Port 4 - A | DB 37 - Pin | Port 4 - B | DB 37 - Pin |
| K25 | 1 | 10 | 1 | 28 |
| K26 | 2 | 11 | 2 | 29 |
| K27 | 3 | 12 | 3 | 30 |
| K28 | 4 | 13 | 4 | 31 |
| K29 | 5 | 14 | 5 | 32 |
| K30 | 6 | 15 | 6 | 33 |
| K31 | 7 | 16 | 7 | 34 |
| K32 | 8 | 17 | 8 | 35 |

Power and Ground Pin Assignments

| | |
|------------|----------|
| Ground | 18,36,37 |
| + 5 Volts | 19 |
| + 12 Volts | 1 |

Jumper Setup Options

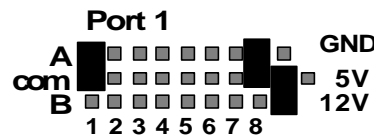
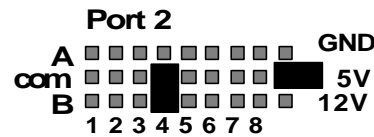
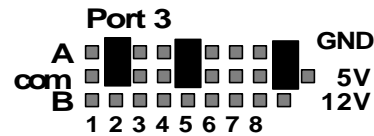
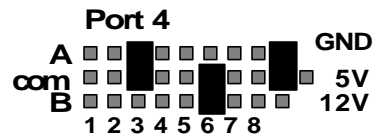
The common on each port may be tied to ground, 5, or 12 volts. Either side of each relay then may be tied to the common. The figure below is an example setup. The 8007 is shipped with all of the jumpers

- Port 4 : The common is tied to ground (GND).
 The A-side of port-4 relay 3 (K27) is tied to the common.
 The B-side of port-4 relay 6 (K30) is tied to the common.

- Port 3 : The common is tied to ground (GND).
 The A-side of port-3 relay 2 (K18) is tied to the common.
 The A-side of port-3 relay 5 (K21) is tied to the common.

- Port 2 : The common is tied to 5 volts.
 The B-side of port-2 relay 4 (K12) is tied to the common.

- Port 1 : The common is tied to 12 volts.
 The A-side of port-1 relay 1 (K1) is tied to the common.
 The A-side of port-1 relay 8 (K8) is tied to the common.



Cable With Two Female Ends (Side A, Side B)

| DB-37 | | | DB-37 | | |
|---------------|-----------------|---------------|---------------|---------------|---------------|
| Labled | | Jumper | Labled | Jumper | |
| Side A | Function | Pin | Side B | Pin | Common |
| 1 | Ground | N/A | 1 | Ground | N/A |
| 2 | Relay 2A | PORT 1-A2 | 2 | Relay 2B | PORT 1-B2 |
| 3 | Relay 4A | PORT 1-A4 | 3 | Relay 4B | PORT 1-B4 |
| 4 | Relay 6A | PORT 1-A6 | 4 | Relay 6B | PORT 1-B6 |
| 5 | Relay 8A | PORT 1-A8 | 5 | Relay 8B | PORT 1-B8 |
| 6 | Relay 10A | PORT 2-A2 | 6 | Relay 10B | PORT 2-B2 |
| 7 | Relay 12A | PORT 2-A4 | 7 | Relay 12B | PORT 2-B4 |
| 8 | Relay 14A | PORT 2-A6 | 8 | Relay 14B | PORT 2-B6 |
| 9 | Relay 16A | PORT 2-A8 | 9 | Relay 16B | PORT 2-B8 |
| 10 | Relay 18A | PORT 3-A2 | 10 | Relay 18B | PORT 3-B2 |
| 11 | Relay 20A | PORT 3-A4 | 11 | Relay 20B | PORT 3-B4 |
| 12 | Relay 22A | PORT 3-A6 | 12 | Relay 22B | PORT 3-B6 |
| 13 | Relay 24A | PORT 3-A8 | 13 | Relay 24B | PORT 3-B8 |
| 14 | Relay 26A | PORT 4-A2 | 14 | Relay 26B | PORT 4-B2 |
| 15 | Relay 28A | PORT 4-A4 | 15 | Relay 28B | PORT 4-B4 |
| 16 | Relay 30A | PORT 4-A6 | 16 | Relay 30B | PORT 4-B6 |
| 17 | Relay 32A | PORT 4-A8 | 17 | Relay 32B | PORT 4-B8 |
| 18 | 12 V | N/A | 18 | 12 V | N/A |
| 19 | 5 V | N/A | 19 | 5 V | N/A |
| 20 | Relay 1A | PORT 1-A1 | 20 | Relay 1B | PORT 1-B1 |
| 21 | Relay 3A | PORT 1-A3 | 21 | Relay 3B | PORT 1-B3 |
| 22 | Relay 5A | PORT 1-A5 | 22 | Relay 5B | PORT 1-B5 |
| 23 | Relay 7A | PORT 1-A7 | 23 | Relay 7B | PORT 1-B7 |
| 24 | Relay 9A | PORT 2-A1 | 24 | Relay 9B | PORT 2-B1 |
| 25 | Relay 11A | PORT 2-A3 | 25 | Relay 11B | PORT 2-B3 |
| 26 | Relay 13A | PORT 2-A5 | 26 | Relay 13B | PORT 2-B5 |
| 27 | Relay 15A | PORT 2-A7 | 27 | Relay 15B | PORT 2-B7 |

Specifications

| | | | | | | |
|----|-----------|-----------|--|----|-----------|-----------|
| 28 | Relay 17A | PORT 3-A1 | | 28 | Relay 17B | PORT 3-B1 |
| 29 | Relay 19A | PORT 3-A3 | | 29 | Relay 19B | PORT 3-B3 |
| 30 | Relay 21A | PORT 3-A5 | | 30 | Relay 21B | PORT 3-B5 |
| 31 | Relay 23A | PORT 3-A7 | | 31 | Relay 23B | PORT 3-B7 |
| 32 | Relay 25A | PORT 4-A1 | | 32 | Relay 25B | PORT 4-B1 |
| 33 | Relay 27A | PORT 4-A3 | | 33 | Relay 27B | PORT 4-B3 |
| 34 | Relay 29A | PORT 4-A5 | | 34 | Relay 29B | PORT 4-B5 |
| 35 | Relay 31A | PORT 4-A7 | | 35 | Relay 31B | PORT 4-B7 |
| 36 | Ground | N/A | | 36 | Ground | N/A |
| 37 | Ground | N/A | | 37 | Ground | N/A |

Programming

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 relays for the 8007 specifically. Complete documentation of the API can be found in its accompanying help file.

Relative Addressing vs. Absolute Addressing

The SeaIO 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 (0th) 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.

Due to the fact that the 8007 has no inputs the relative and absolute address for each relay are the same.

Specifications

Tables : API Port/bit reference numbers for Absolute and Relative Addressing

R = Read W = Write R/W = Read or Write

| Port | API Port # Absolute Address (function) | API Port # Relative Address (function) | Port Type |
|------|--|--|---------------------|
| 1 | 0 (R/W) | 0 (W) | Relay 1 - Relay 8 |
| 2 | 1 (R/W) | 1 (W) | Relay 9 - Relay 16 |
| 3 | 2 (R/W) | 2 (W) | Relay 17 - Relay 24 |
| 4 | 3 (R/W) | 3 (W) | Relay 25 - Relay 32 |

| API Bit # Absolute Address (function) | API Bit # Relative Address (function) | Relay |
|--|--|-------|
| 0 (R/w) | 0 (W) | K1 |
| 1 (R/w) | 1 (W) | K2 |
| 2 (R/w) | 2 (W) | K3 |
| 3 (R/w) | 3 (W) | K4 |
| 4 (R/w) | 4 (W) | K5 |
| 5 (R/w) | 5 (W) | K6 |
| 6 (R/w) | 6 (W) | K7 |
| 7 (R/w) | 7 (W) | K8 |
| 8 (R/w) | 8 (W) | K9 |
| 9 (R/w) | 9 (W) | K10 |
| 10 (R/w) | 10 (W) | K11 |
| 11 (R/w) | 11 (W) | K12 |
| 12 (R/w) | 12 (W) | K13 |
| 13 (R/w) | 13 (W) | K14 |
| 14 (R/w) | 14 (W) | K15 |
| 15 (R/w) | 15 (W) | K16 |
| 16 (R/W) | 16 (W) | K17 |
| 17 (R/W) | 17 (W) | K18 |
| 18 (R/W) | 18 (W) | K19 |
| 19 (R/W) | 19 (W) | K20 |
| 20 (R/W) | 20 (W) | K21 |
| 21 (R/W) | 21 (W) | K22 |
| 22 (R/W) | 22 (W) | K23 |
| 23 (R/W) | 23 (W) | K24 |
| 24 (R/W) | 24 (W) | K25 |
| 25 (R/W) | 25 (W) | K26 |
| 26 (R/W) | 26 (W) | K27 |
| 27 (R/W) | 27 (W) | K28 |
| 28 (R/W) | 28 (W) | K29 |
| 29 (R/W) | 29 (W) | K30 |
| 30 (R/W) | 30 (W) | K31 |
| 31 (R/W) | 31 (W) | K32 |

Direct Hardware Control

In systems where the users program has direct access to the hardware (DOS) the table below gives the mapping and functions that the 8007 provide. The address of each eight-bit port is calculated as shown in the table on the following page, the cards base address plus an offset.

Reading the Outputs (relays) (direct) :

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

Writing the Outputs (relays) (direct) :

The relays on a standard 8007 are normally open. To close a relay a one must be written to the appropriate bit.

R = Read
 W = Write
 R/W = Read or Write

| Function Available | Port | Address Hex | Port Type |
|--------------------|------|-------------|---------------------|
| R/W | 1 | Base + 0 | Relay 1 - Relay 8 |
| R/W | 2 | Base + 1 | Relay 9 - Relay 16 |
| R/W | 3 | Base + 2 | Relay 17 - Relay 24 |
| R/W | 4 | Base + 3 | Relay 25 - Relay 32 |

Register Description

| Address | Mode | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------|------|------|------|------|------|------|------|------|------|
| Base+0 | R/W | P1D7 | P1D6 | P1D5 | P1D4 | P1D3 | P1D2 | P1D1 | P1D0 |
| Base+1 | R/W | P2D7 | P2D6 | P2D5 | P2D4 | P2D3 | P2D2 | P2D1 | P2D0 |
| Base+2 | R/W | P3D7 | P3D6 | P3D5 | P3D4 | P3D3 | P3D2 | P3D1 | P3D0 |
| Base+3 | R/W | P4D7 | P4D6 | P4D5 | P4D4 | P4D3 | P4D2 | P4D1 | P4D0 |

Specifications

Environmental Specifications

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

| | |
|--------------------|--------|
| Supply line | +5 VDC |
| Rating | 560mA |

Mean Time Between Failures (MTBF)

MTBF is calculated as greater than 150,000 hours, **excluding relays**.
Relay Life expectancy is dependent on actual application usage.

Physical Dimensions

| | | |
|------------------------------------|--------------|--------------|
| Board Length | 6.600 inches | (16.764 cm.) |
| Board Height including Goldfingers | 4.200 inches | (10.668 cm.) |
| Board Height excluding Goldfingers | 3.875 inches | (9.8425 cm.) |
| Board Weight | 7.200 ounces | (204.117 g) |

Appendix A - Troubleshooting

Following these simple steps can eliminate most common problems without the need to call Technical Support.

1. Install software **first**. After installing the software then proceed to adding the hardware. This places the required installation files in the correct locations.
2. 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.
3. Ensure that there is no conflict with currently installed adapters. No two adapters can occupy the same I/O address and may not be allowed to share IRQs.
4. Make sure the Sealevel Systems adapter is securely installed in a motherboard slot.

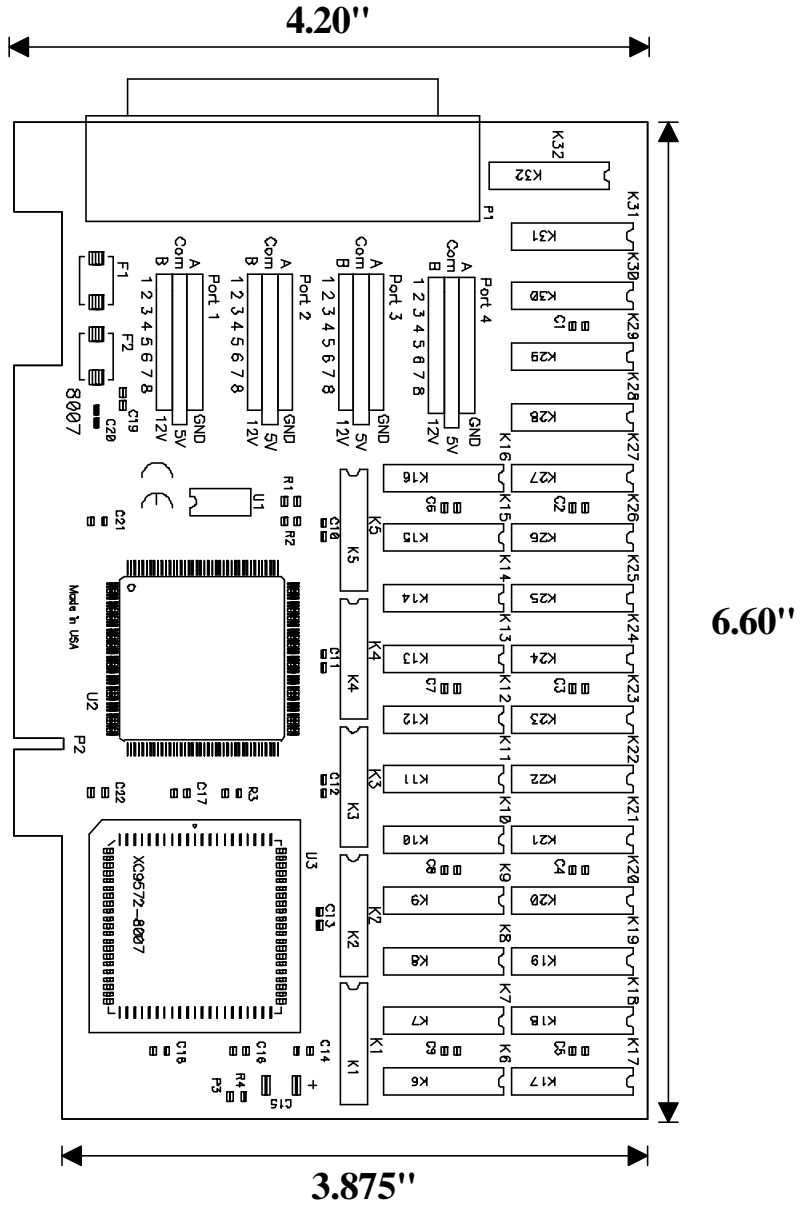
Appendix B - How To Get Assistance

Please refer to Troubleshooting Guide prior to calling Technical Support.

1. Read this manual thoroughly before attempting to install the adapter in your system.
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 maintains a Home page on the Internet. Our home page address is www.sealevel.com. The latest software updates, and newest manuals are available via our FTP site that can be accessed from our home page.
4. 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



Appendix D - Compliance Notices

Federal Communications Commission Statement

FCC - 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 his own 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 conform to 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'
- **EN60950 (IEC950)** - "Safety of information technology equipment, including electrical business equipment"

Warning

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.

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 Systems, Inc. provides a lifetime warranty for this product. Should this product fail to be in good working order at any time during this period, Sealevel Systems will, at its option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Sealevel Systems assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Sealevel Systems will not be liable for any claim made by any other related party.

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Sealevel Systems, Incorporated
155 Technology Place
P.O. Box 830
Liberty, SC 29657 USA
(864) 843-4343 FAX: (864) 843-3067
www.sealevel.com
email: support@sealevel.com

Technical Support is available from 8 a.m. to 5 p.m. Eastern time.
Monday - Friday

Trademarks

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