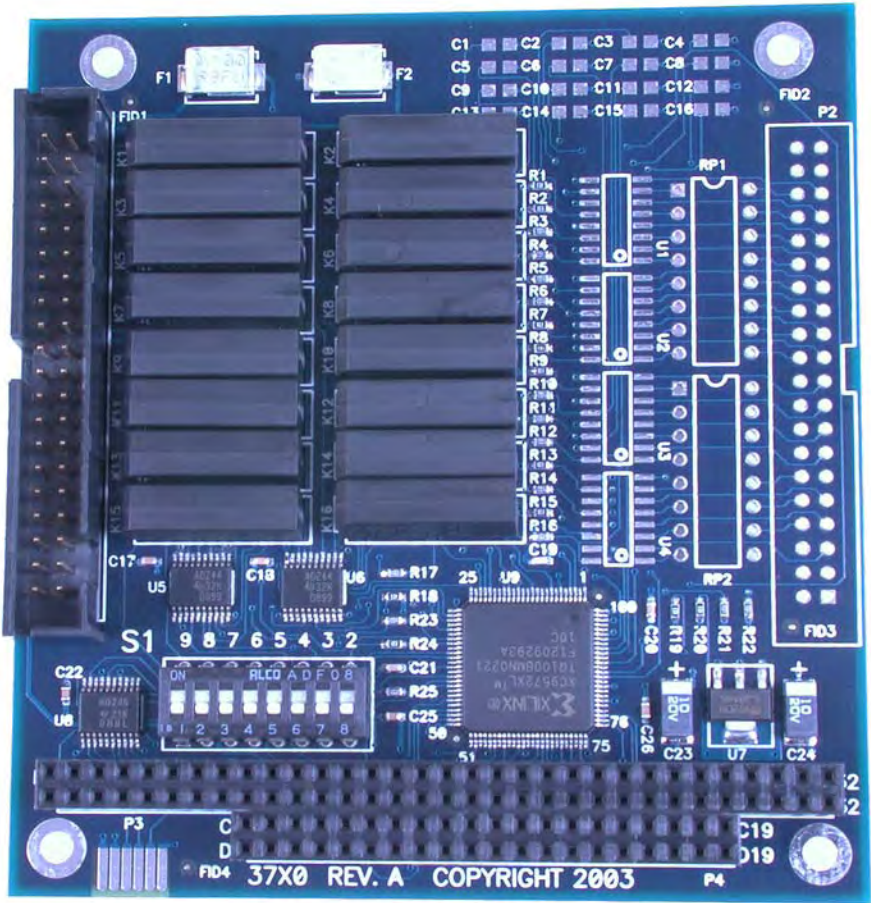


# DIO-104.REL User Manual



Part Number 3710



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# Introduction

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The DIO-104.REL is a PC/104 form factor adapter that provides 16 reed relays that can switch power, data or other electronic signals for control applications.

The DIO-104.REL is designed to be used with a variety of Operating Systems including Windows 98/NT/ME/2000/XP and DOS. The SeaI/O API (Application Programmer Interface) included on CD with the DIO-104.REL provides a variety of useful high-level function calls implemented as a Windows dynamic link library (DLL). In addition to the API, SeaI/O includes sample code and utilities to simplify software development.

## Other Sealevel PC104 Digital I/O Products

PIO-48.PC104	(P/N 3701)	- 48 Channel TTL
DIO-104.OPTO	(P/N 3720)	- 16 Optically Isolated Inputs
DIO-32.104	(P/N 3730)	- 16 Optically Isolated Inputs/16 Reed Relays

# Before You Get Started

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## What's Included

The DIO-104.REL is shipped with the following items. If any of these items is missing or damaged please contact Sealevel for replacement.

- **DIO-104.REL Adapter**
- **Sealevel SeaI/O Software CD**

## Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing the DIO-104.REL to real-world signals. All items can be purchased from our website (<http://www.sealevel.com>) or by calling (864) 843-4343.

- **40-Pin IDC to DB-37 Male 6' Ribbon Cable (Part Number CA110)**
  - For compatibility with other Sealevel digital I/O devices, the CA110 connects to the 40-pin header connector on the DIO-104.REL and provides a DB-37 Male connector.
- **DB-37 Male to DB-37 Female 6' Cable - (Part Number CA112)**
  - This cable extends the DB-37 connector on the 6' ribbon cable, part number CA110, to six feet and is pinned one-to-one.
- **DB-37 Male/Female Terminal Block (Part Number TB02-KT)**
  - Break out serial and digital connectors to 37 screw terminals for easy field connection. The TB02 terminal block is designed with both DB-37 male and female connectors, therefore; it can be used with any DB-37 board regardless of the board's port gender.
- **Cable and Terminal Block Kit (Part Number KT101)**
  - For convenient and easier ordering, the KT101 includes the TB02-KT terminal block and CA112 cable in a single kit.

# Card Setup

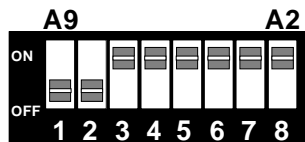
## Address Selection

The DIO-104.REL contains several jumper straps for each port that must be set for proper operation.

The DIO-104.REL occupies 4 consecutive I/O locations. The DIP-switch (S1) 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. To maintain compatibility with other Sealevel Systems I/O adapters, the actual port addresses are found at BaseAddress+2 (Relays K1-K8) and BaseAddress+3 (Relays K9-K16).

Address	Binary	Switch Settings							
		A9	A8	A7	A6	A5	A4	A3	A2
		1	2	3	4	5	6	7	8
100-103	01 0000 00xx	On	Off	On	On	On	On	On	On
104-107	01 0000 01xx	On	Off	On	On	On	On	On	Off
200-204	10 0000 00xx	Off	On	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	On	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

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.



**Note:** Setting the switch 'On' or 'Closed' corresponds to a '0' in the address, while leaving it 'Off' or 'Open' corresponds to a '1'.

# Software Installation

---

## Windows 98/ME/NT/2000/XP Installation

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

1. Start Windows.
2. Insert the Sealevel Systems CD in to your CD drive.
3. If 'Auto-Start' is enabled for this drive the software will automatically launch. Otherwise, point your browser to the 'Index.htm' on the root directory of the CD
4. Select 'Install Software'.
5. Select the Part Number for your adapter from the listing.
6. Select 'Windows 98/NT/ME/2000/XP'. The setup file will automatically detect the operating environment and install the proper components. Next (depending on your browser) select the 'Run this program from its current location' or 'Open' option. Follow the information presented on the screens that follow. 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 available to remove SeaIO files and registry/INI file entries from the system.
7. If installing in NT, skip to 'Windows NT Card Installation' step 16.
8. Go to the "Add New Hardware Wizard" in the Control Panel.
9. When the Wizard asks if you want Windows to search for the new hardware, choose "No, I want to select the hardware from a list."
10. Scroll through the list of categorized hardware and select 'SeaIO Devices'. If this is the first SeaIO device you may need to select 'Other Devices' and 'Sealevel Systems, Inc.' instead of 'SeaIO Devices'.
11. Click "Next".
12. Select the card model and press "Next".
13. The Wizard will guide you through a few more informational prompts; continue to click "Next" until it is completed.
14. Your card's resource assignments may be adjusted through the Device Manager (if, for instance, you need to change the I/O port address Windows assigned when you installed the card).
15. Windows software installation is complete
16. Windows NT Card Installation: After accomplishing steps 1 – 6, 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

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

1. Login as "root".

2. Mount the CDROM by typing:

```
mount -t iso9660 /dev/hdc /cdrom
```

**Note** Your cdrom may not be /dev/hdc it could be /dev/hda, /dev/hdb, /dev/hdd, or if you have a SCSI drive /dev/sda, /dev/sdb, /dev/sdc, etc. You may mount the CDROM to any location, the /cdrom is just a common example.

3. Next change to the directory where you mounted the CDROM:

```
Ex. cd /cdrom/software/SeaIO/Other/linux
```

**Note:** The syntax is case sensitive.

4. Copy seaio.tar.gz to your home directory by typing:

```
cp seaio.tar.gz ~
```

5. Change to your home directory by typing:

```
cd
```

6. Unmount the drive and then Unzip and Untar the drivers and software by typing:

```
umount /cdrom
```

```
tar -xvzf seaio.tar.gz
```

7. Change to the seaio directory by typing:

```
cd seaio
```

8. Now compile and prepare the drivers for use:

```
make install
```

9. Using your favorite text editor, edit the /etc/seaio.conf

10. Within the quote marks, insert

```
cardtype=0xYourSeaIOcardType io=0xCardBaseAddress
```

**Note:** YourSeaIOcardType = Model Number of your SeaIO Card.

CardBaseAddress = What base address you have your SeaIO card addressed at.

11. Save the file and exit your editor.

12. Load the driver by typing:

```
seaio-load
```

13. The driver has enabled the card and is ready to use.

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

# Physical Installation

---

Extreme care should be taken when installing the DIO-104.REL to avoid causing damage to the connectors. After the adapter is installed, connect your I/O cable to P1. 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 before inserting the DIO-104.REL onto the stack.

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

1. **Turn off power. Disconnect the power cord.**
2. Remove the case cover (if applicable).
3. Gently insert the **DIO-104.REL** connector noting proper key orientation of the expansion connector on a PC/104 compatible card. The **DIO-104.REL** adapter is keyed per the current PC/104 Specification. This will aid in preventing the adapter from being inserted incorrectly.
4. Mounting hardware (nylon stand-offs and screws) is provided to ensure 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 and power up the machine.

The DIO-104.REL is now ready for use.

## 3<sup>rd</sup> Party Software Support

Third party software support for many HMI/MMI and other process control software is included on the product installation CD. For the most up to date information on third party software support, please visit:

<http://www.sealevel.com/thirdpartysoftware.asp>



# Programming the DIO-104.REL

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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. Included on the SeaI/O CD are 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 DIO-104.REL. 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/SeaIO/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.

## Digital I/O Interface

The DIO-104.REL provides four parallel input/output (I/O) ports. The ports are organized as ports A, B, C, and D. Ports A and B are not used, but are decoded to provide compatibility with other Sealevel Systems I/O adapters. Ports C and D are the reed relay output ports. Assuming an I/O address of 300 Hex the following table shows the Port Addresses.

Base Address	Hex	Decimal	Mode
Port A Address	300	768	Not Used
Port B Address	301	769	
Port C Address	302	770	Reed Relay Output Port
Port D 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 Pin Assignments (P1)

Port C Bit	Relay	P1	DB-37 Pin		Port D Bit	Relay	P1	DB-37 Pin
0	K1	2	20		0	K9	18	28
		3	2				19	10
1	K2	4	21		1	K10	20	29
		5	3				21	11
2	K3	6	22		2	K11	22	30
		7	4				23	12
3	K4	8	23		3	K12	24	31
		9	5				25	13
4	K5	10	24		4	K13	26	32
		11	6				27	14
5	K6	12	25		5	K14	28	33
		13	7				29	15
6	K7	14	26		6	K15	30	34
		15	8				31	16
7	K8	16	27		7	K16	32	35
		17	9				33	17
Ground		34	36					
		35	18					
		36	37					
+ 5 Volts		37	19					
+ 12 Volts		1	1					

## Reading the Outputs

The relay ports return the ones complement of the value that is currently being used to drive the relays.

## Writing the Outputs:

The output ports are the only ports that can be written. The relays on a standard DIO-104.REL are normally open. To close a relay a one must be written to the appropriate bit.

# Electrical Characteristics

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## Features

- Selectable I/O port addressing from 100H - 3FFH
- 2 sets SPST relays with each set having 8 relays
- Highly reliable 10 VA SIP 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: 10 W
- Contact Voltage Maximum: 100 VDC/VAC
- Contact Current Maximum: .5A AC/DC RMS
- Contact Resistance, Initial: .15  $\Omega$
- Rated Life:
  - Low Load: 200 Million Closures
  - Maximum Load: 100 Million Closures
- Contact Speed:
  - Operate: .5 mS
  - Release: .5 mS
  - Bounce: .5 mS
- Maximum Operating Speed: 600 Hz

### Temperature Range

- Operating: 0°C – 70°C
- Storage: -50°C – 105°C

### Power Requirements

- +5VDC @ 125 mA

### Physical Dimensions

- PCB Length: 3.550" (9.017 cm)
- PCB Height: 3.775" (9.589 cm)

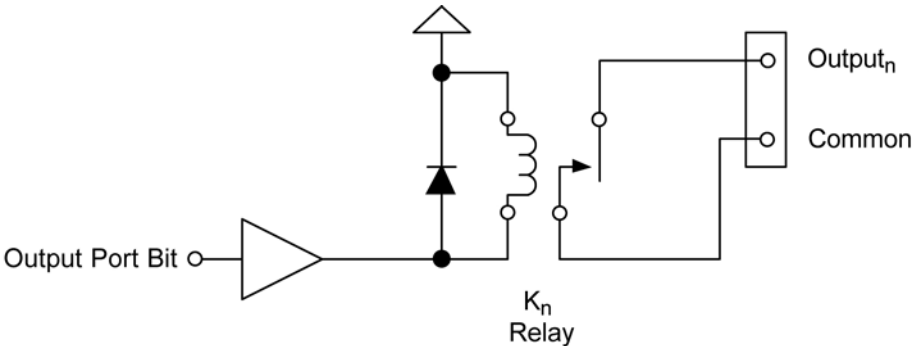
### Manufacturing

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

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## Output Circuit



## Appendix A - Troubleshooting

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Following these simple steps can eliminate most common problems.

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. 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:
6. 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 8:00AM-5PM Eastern Time Monday through Friday. For email support contact <mailto:support@sealevel.com>.

## Appendix B - How To Get Assistance

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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.

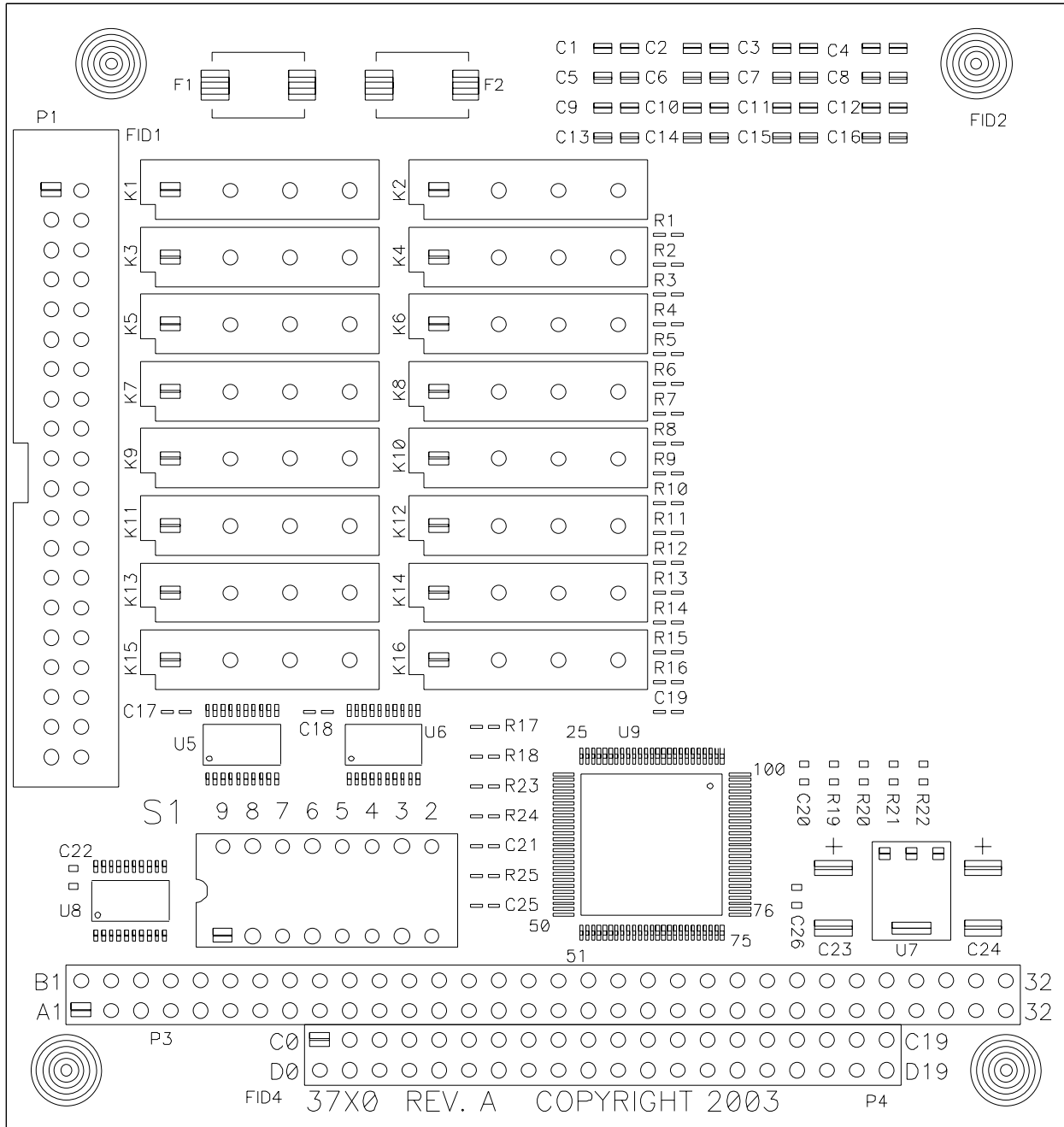
Sealevel Systems provides an FAQ section on its web site. Please refer to this to answer many common questions. This section can be found at <http://www.sealevel.com/faq.asp>

Sealevel Systems maintains a Home page on the Internet. Our home page address is <http://www.sealevel.com>. The latest software updates, and newest manuals are available via our FTP site that can be accessed from our home page.

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 – 3710 PCB



## Appendix D - Compliance Notices

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### 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 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”.

**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 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

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Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured 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 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 life. 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 or abuse are not covered under this warranty.

Warranty service is obtained by delivering the Product to Sealevel and providing proof of purchase. **Return authorization must be obtained from Sealevel Systems before returned merchandise will be accepted. Authorization is obtained by calling Sealevel Systems and requesting a Return Merchandise Authorization (RMA) number.** The Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to Sealevel, and to use the original shipping container or equivalent. Warranty is valid only for original purchaser and is not transferable.

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.

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

**Sealevel Systems, Incorporated  
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email: support@sealevel.com**

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

## Trademarks

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