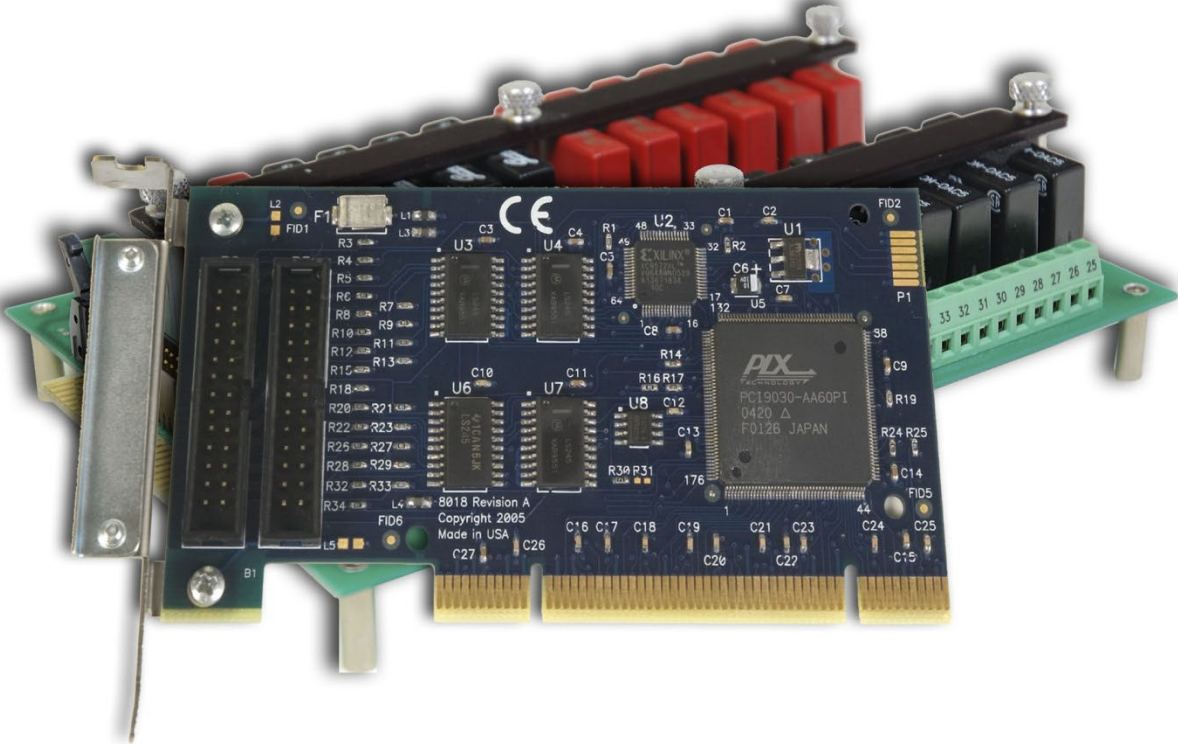


PIO-24.LPCI

User Manual | 8018



SEALEVEL®

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Introduction

The PIO-24.LPCI, part number 8018, digital I/O interface provides 24 channels of buffered drive digital I/O emulating 8255 mode zero. The PIO-24.LPCI can be utilized for a variety of control and automation applications including control and monitoring of TTL devices (e.g., sensors, switches, security control systems, industrial automations systems, LEDs, small solenoids, and small relays) and interfacing to solid-state relay racks (SSRs) for high-power AC or DC loads.

The PIO-24.LPCI's 24 digital I/O channels are accessed via two 26-pin header connectors that are brought out to a single 50-pin IDC connector with the included CA315 ribbon cable. The headers provide 24 bits of digital I/O divided into three eight-bit groups. Each eight-bit group may be individually configured via software command as input or output to best match your particular application requirements.

The PIO-24.LPCI is designed to be used with a variety of Operating Systems including Windows 98/NT/ME/2000/XP, Vista, 7, Linux and DOS. The Seal/O API (Application Programmer Interface) software 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, Seal/O includes sample code and utilities to simplify software development.

The RoHS compliant version of the PIO-24.LPCI, part number 8018-RoHS, meets the RoHS (2002/95/EC) and WEEE (2002/96/EC) directives.

Other Sealevel PCI Digital I/O Products

| Model No. | Part No. | Description |
|-------------|------------|---|
| PIO-32.PCI | (P/N 8010) | - 32 TTL Inputs/Outputs |
| PIO-48.PCI | (P/N 8005) | -48 TTL Inputs/Outputs |
| PIO-96.PCI | (P/N 8009) | - 96 TTL Inputs/Outputs |
| DIO-16.PCI | (P/N 8002) | - 8 Reed Relay Outputs/8 Opto-isolated Inputs |
| REL-16.PCI | (P/N 8003) | - 16 Reed Relay Outputs |
| DIO-32.PCI | (P/N 8004) | -16 Reed Relay Outputs/16 Opto-isolated Inputs |
| ISO-16.PCI | (P/N 8006) | - 16 Opto-isolated Inputs |
| REL-32.PCI | (P/N 8007) | - 32 Reed Relay Outputs |
| PLC-16.PCI | (P/N 8011) | - 8 Form C Relay Outputs/8 Opto-isolated Inputs |
| DIO-16.LPCI | (P/N 8012) | -8 Reed Relay Output/8 Opto-isolated Inputs |

Before You Get Started

What's Included

The PIO-24.LPCI is shipped with the following items. If any of these items are missing or damaged, please contact Sealevel for replacement.

- **PIO-24.LPCI Adapter**
- **IDC 50 to (2) IDC 26 Pin 40" Ribbon Cable (Part Number CA315)**

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.

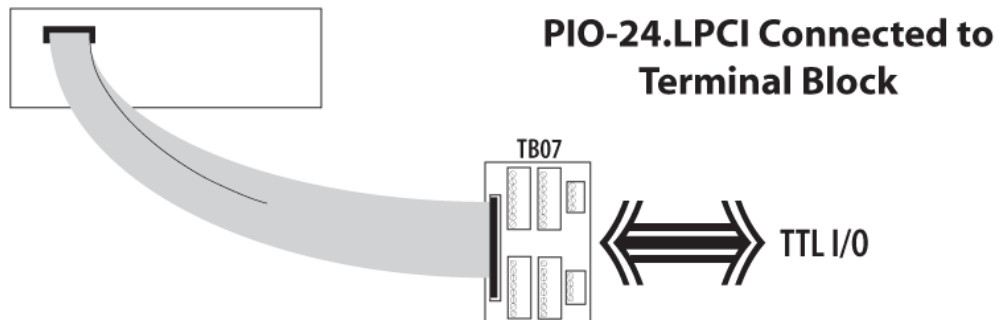
Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing the PIO-24.LPCI to real-world signals. All items can be purchased from our website (<http://www.sealevel.com>) or by calling (864) 843-4343.

*****CA315 Included*****

For TTL applications:

- **IDC 50 to (2) IDC 26 Pin 40" Ribbon Cable (Part Number CA315)**
Connects to the two 26-pin header connectors on the 8018 and brings them out to a single 50-pin IDC connector, which is compatible with industry-standard relay racks.
- **Terminal Block – (Part Number TB07) TB07-KT**
The TB07 allows you to break out 24 digital signals, +5 volts, and ground to screw terminals for easy field connection of switches, discrete solid-state relays, sensors, etc.
- **Simulation/debug module (Part Number TA01)**
Module allows monitoring status of output pins and controlling state of input pins. An LED corresponding to each port bit illuminates to indicate state. Eight position DIP-switches are used to generate input status changes.



OPTIONAL ITEMS, CONTINUED

For high-current, high-voltage applications: **See attached .doc for inclusions**

- **IDC 50 to IDC 26 Pin Ribbon Cable (Part Number CA315)**

Connects to the two 26-pin header connectors on the 8018 and brings them out to a single 50-pin IDC connector, which is compatible with industry-standard relay racks.

- **Solid-State Relay Racks:**

- **Quad six position relay rack (Part Number PB24HQ)**

Relay rack can accept up to six QSSRs for a total of 24 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.

- **Quad four position relay rack (Part Number PB16HQ)**

Relay rack can accept up to four QSSRs for a total of 16 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.

- **Quad Solid-State Relay Modules:**

- **AC Input (Part Number IA5Q)** - Provides 4 channels of discrete I/O interface to monitor AC inputs up to 140V @ 10mA.

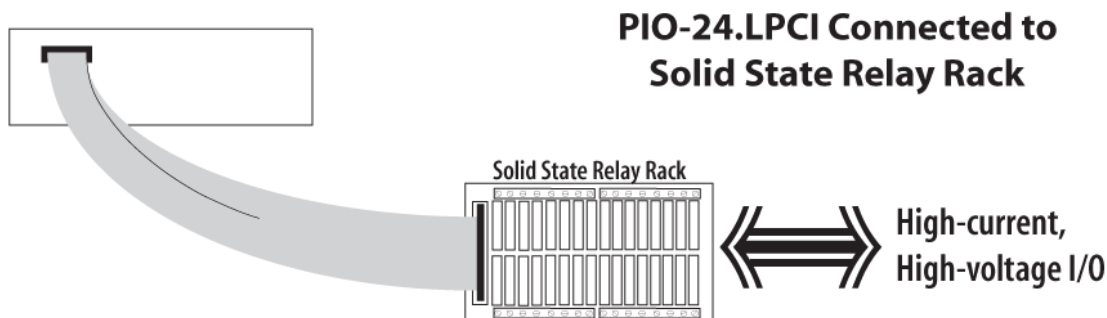
- **DC Input (Part Number IB5Q)** - Provides 4 channels of discrete I/O interface to monitor DC inputs from 3.3V to 32V.

- **AC Output (Part Number OA5Q)** - Provides 4 channels of discrete I/O interface to control AC outputs up to 140V @ 3A.

- **DC Output (Part Number OB5Q)** - Provides 4 channels of discrete I/O interface to control DC outputs up to 60V @ 3A.

- **Simulation/debug module (Part Number TA01)**

Module simulates the operation and load characteristics of a standard 24-channel relay rack. An LED corresponding to each port bit illuminates to indicate state. Eight position DIP-switches are used to generate input status changes.



Software Installation

Operating System Installation

For Windows and Linux Users

Begin by locating, selecting, and installing the SealO software from the Sealevel website. The [SealO Software Overview page](#) provides information that will allow you to easily download the [SealO Software for Windows](#) or the [SealO Software for Linux](#).

Seal/O software can also be downloaded from the 8018-product webpage: [PIO-24-LPCI Product](#)

Other Operating Systems

Refer to the appropriate section of the Serial Utilities Software.

For additional software support, 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>.

Hardware Installation

The adapter can be installed in any 5V PCI 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 PCI 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

Installation is finished.

Digital I/O Interface

The PIO-24.LPCI's 24 digital I/O channels are accessed via two (2) 26-pin header connectors. The included CA315 connects to the two 26-pin header connectors on the PIO-24.LPCI and brings them out to a single 50-pin IDC connector, which is compatible with industry-standard relay racks. The headers provide 24 bits of digital I/O divided into three eight-bit ports. Each port may be individually configured via software command as input or output.

26-pin Header Connectors

You will need to install the bracket assembly and cable to the PIO-24.LPCI prior to installing it in the PC. The PIO-24.LPCI's bracket features a unique cable clamp that provides a solid strain relief to prevent inadvertent cable removal.



Refer to page 12 for the 26-pin connectors pin out.

Sealevel's Seal/O software is provided on Sealevel's website in order to assist in the development of reliable applications for the Sealevel Systems family of digital I/O adapters.

Programming for Windows

The Seal/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/SealO/SealO 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 PIO-24.LPCI. If you are programming in Visual Basic, using the ActiveX control included with Seal/O is advised.

Samples and Utilities

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

Programming for Linux

Seal/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 Seal/O users. It is provided in a 'tarball' format and can easily be compiled and included in the kernel build.

DIGITAL I/O INTERFACE, CONTINUED

Direct Hardware Control

In systems where the user's program has direct access to the hardware (DOS) the tables that follow give the mapping and functions that the PIO-24.LPCI provides.

Register Description

| Address | Mode | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
| Base+0 | RD/WR | PA1D7 | PA1D6 | PA1D5 | PA1D4 | PA1D3 | PA1D2 | PA1D1 | PA1D0 |
| Base+1 | RD/WR | PB1D7 | PB1D6 | PB1D5 | PB1D4 | PB1D3 | PB1D2 | PB1D1 | PB1D0 |
| Base+2 | RD/WR | PC1D7 | PC1D6 | PC1D5 | PC1D4 | PC1D3 | PC1D2 | PC1D1 | PC1D0 |
| Base+3 | WR | CW1D7 | 0 | 0 | CW1D4 | CW1D3 | CW1D2 | CW1D1 | CW1D0 |
| Base+4 | RD/WR | 0 | 0 | 0 | 0 | 0 | IRQEN1 | IRQC11 | IRQC10 |
| Base+5 | RD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | IRQST1 |

0 = Not Used

Programming The PIO-24.LPCI

Presetting an Output Port

Each port has an output register associated with it. This register may be written and retains its value whether the port is configured as an input or an output. To preset the value of an output port the program should write to the port when it is configured as an input then configure it as an output.

Writing the Outputs

The outputs are active true. Writing a one (1) corresponds to 5V while writing a zero (0) corresponds to 0V, at the output.

I/O Control Word

Each port may be configured as either Input or Output. This is accomplished by writing the correct Control Word (CW) to the proper register.

| Control Word (X = 0) | | | | | | | | Hex Value | Port Setup | | | |
|----------------------|---|---|---|---|---|---|---|-----------|------------|-----|---------|---------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | A | B | C Upper | C Lower |
| 1 | X | X | 0 | 0 | X | 0 | 0 | 80 | Out | Out | Out | Out |
| 1 | X | X | 0 | 0 | X | 0 | 1 | 81 | Out | Out | Out | In |
| 1 | X | X | 0 | 0 | X | 1 | 0 | 82 | Out | In | Out | Out |
| 1 | X | X | 0 | 0 | X | 1 | 1 | 83 | Out | In | Out | In |
| 1 | X | X | 0 | 1 | X | 0 | 0 | 88 | Out | Out | In | Out |
| 1 | X | X | 0 | 1 | X | 0 | 1 | 89 | Out | Out | In | In |
| 1 | X | X | 0 | 1 | X | 1 | 0 | 8A | Out | In | In | Out |
| 1 | X | X | 0 | 1 | X | 1 | 1 | 8B | Out | In | In | In |
| 1 | X | X | 1 | 0 | X | 0 | 0 | 90 | In | Out | Out | Out |
| 1 | X | X | 1 | 0 | X | 0 | 1 | 91 | In | Out | Out | In |
| 1 | X | X | 1 | 0 | X | 1 | 0 | 92 | In | In | Out | Out |
| 1 | X | X | 1 | 0 | X | 1 | 1 | 93 | In | In | Out | In |
| 1 | X | X | 1 | 1 | X | 0 | 0 | 98 | In | Out | In | Out |
| 1 | X | X | 1 | 1 | X | 0 | 1 | 99 | In | Out | In | In |
| 1 | X | X | 1 | 1 | X | 1 | 0 | 9A | In | In | In | Out |
| 1 | X | X | 1 | 1 | X | 1 | 1 | 9B | In | In | In | In |

PROGRAMMING THE PIO 24.LPCI, CONTINUED

Interrupt Control

When enabled interrupts are generated on port bit D0 of each A port.
n = port number

| | | | |
|--------|--|-------------|--------------------------------|
| IRQENn | interrupt enable | 1 = enabled | 0 = disabled (0 on power up) |
| IRQn0 | Interrupt mode select, see table below | | |
| IRQn1 | Interrupt mode select, see table below | | |

Interrupt mode select table

| IRQn1 | IRQn0 | INT Type |
|-------|-------|--------------|
| 0 | 0 | Low level |
| 0 | 1 | High level |
| 1 | 0 | Falling edge |
| 1 | 1 | Rising edge |

Interrupt Read

Reading the INTSTAT port (Base+5) clears any interrupt pending.

| | | |
|--------|-----------------------|---------------------------------|
| IRQST1 | (D0) Interrupt status | 1 = interrupt pending, 0 = none |
|--------|-----------------------|---------------------------------|

Reading the Inputs

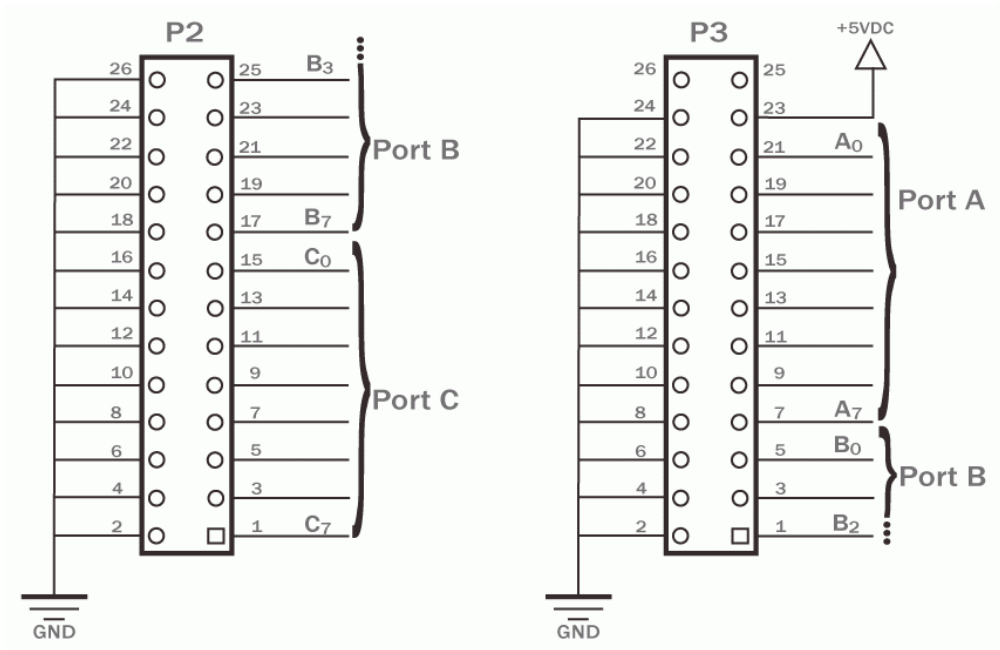
The inputs are active true. If an input is driven high (2V to 5.25 V) it will read as a logical one, if driven low (0V to 0.8V) it will read as a logical zero. If an input is not driven it will read as a one due to the 10K ohm pull up resistors on each port.

PROGRAMMING THE PIO 24.LPCI, CONTINUED

Reading the Outputs

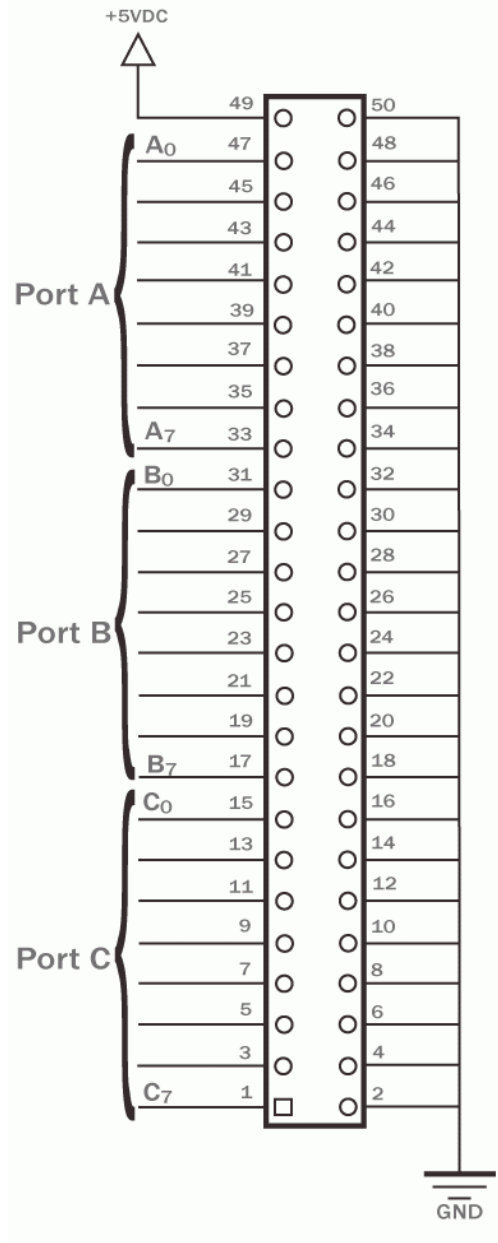
The value that is currently being used to drive the outputs will be returned.

Figure 1- 8018 board level 26 pin box header connector pin out



PROGRAMMING THE PIO 24.LPCI, CONTINUED

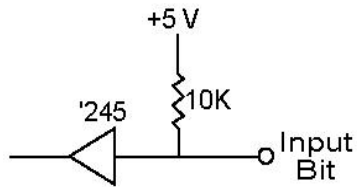
Figure 2 - CA315 50-Pin IDC Connector - Pin Out



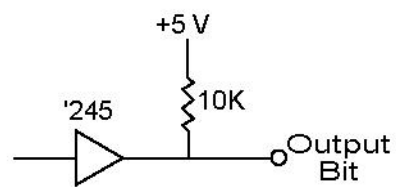
Electrical Characteristics

The PIO-24.LPCI uses 74LS245 octal bi-directional transceivers to provide TTL input/output capabilities. Each bit is pulled to +5V through a 10K ohm pull-up resistor to ensure each bit is at a known state when not driven.

Input Circuit Schematic



Output Circuit Schematic



Specifications

Inputs

| | |
|------------|------------|
| Logic High | Min 2VDC |
| Logic Low | Max 0.8VDC |

Outputs

| | |
|------------|-------------------|
| Logic High | Min 2VDC @15 mA |
| Logic Low | Max 0.5VDC @24 mA |

Temperature Range

| Specification | Operating | Storage |
|---------------|-------------|----------------|
| Operating | 0° to 70° C | -50° to 105° C |

Manufacturing

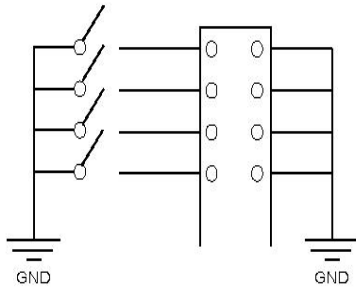
All Sealevel Systems Printed Circuit boards are built to UL 94V0 rating and are 100% electrically tested. These printed circuit boards are solder mask over bare copper or solder mask over tin nickel.

Power Requirements

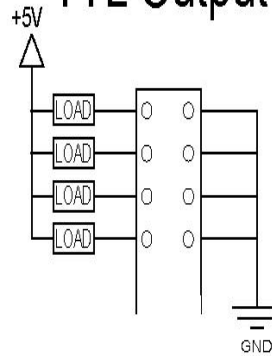
| | |
|-------------|--------|
| Supply Line | +5 VDC |
| Rating | 1A |

Example of Circuits

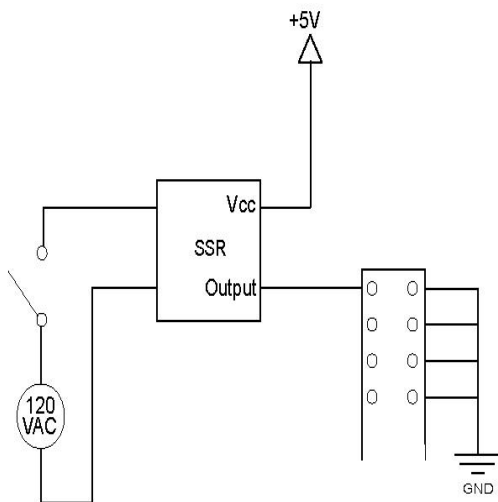
TTL Input



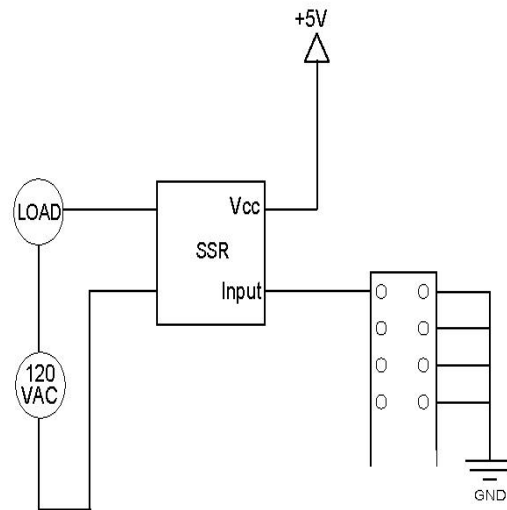
TTL Output



Solid State Relay Input



Solid State Relay Output



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 places the required installation files in the correct locations.
2. Read this manual thoroughly before attempting to install the adapter in your system.
3. Locate your SealO adapter in the Device Manager (under Windows) to identify and verify proper installation.
4. Use the SealO in the Device Manager for card configuration.
5. Always use the 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 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 support@sealevel.com.

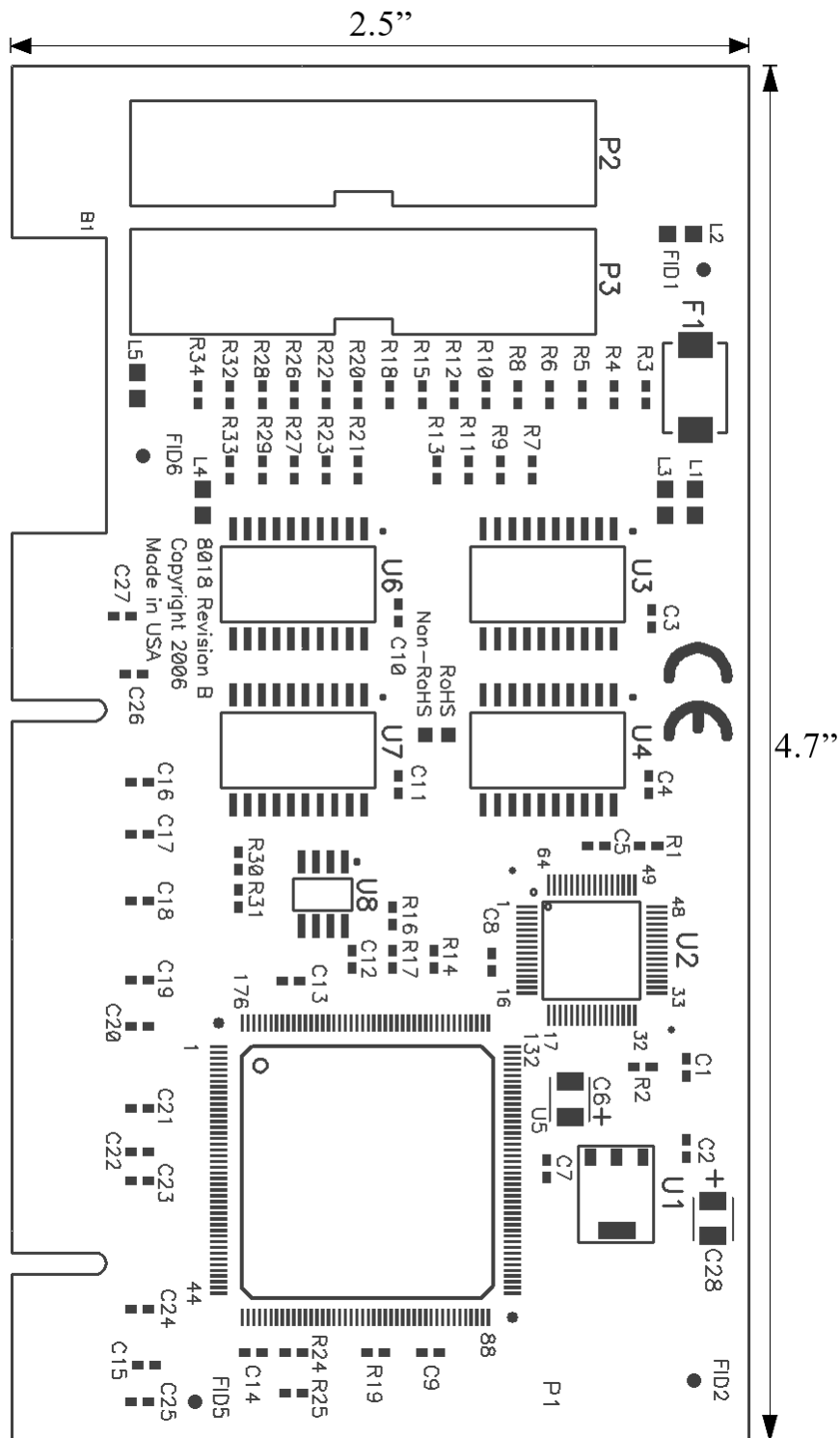
Appendix B – How To Get Assistance

Please refer to Troubleshooting Guide prior to calling Technical Support.

1. Begin by reading through the Trouble Shooting Guide in Appendix A. If assistance is still needed, please see below.
2. When calling for technical assistance, please have your user manual and current adapter settings. If possible, please have the adapter installed in a computer ready to run diagnostics.
3. Sealevel Systems provides an FAQ section on its web site. Please refer to this to answer many common questions. This section can be found at <http://www.sealevel.com/faq.asp>.
4. Sealevel Systems maintains a web page on the Internet. Our home page address is www.sealevel.com. The latest software updates, and newest manuals are available via our web site.
5. Technical support is available Monday to Friday from 8:00 a.m. to 5:00 p.m. eastern time. Technical support can be reached at (864) 843-4343.

RETURN AUTHORIZATION MUST BE OBTAINED FROM SEALEVEL SYSTEMS BEFORE RETURNED MERCHANDISE WILL BE ACCEPTED. AUTHORIZATION CAN BE OBTAINED BY CALLING SEALEVEL SYSTEMS AND REQUESTING A RETURN MERCHANDISE AUTHORIZATION (RMA) NUMBER.

Appendix C – Silk Screen – 8018 PCB



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".

United Kingdom Conformity Assessed Statement



Products with UKCA marking are in conformity with the essential requirements of the UK Electromagnetic Compatibility Regulations 2016:

- *Equipment must be designed and manufactured to ensure that the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment cannot operate as intended.*
- *The equipment has a level of immunity to the electromagnetic disturbance to be expected in its intended use which allows it to operate without unacceptable degradation of its intended use.*



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



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

Warranty

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

Warranty Policy

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

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

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

Non-Warranty Repair/Retest

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

How to obtain an RMA (Return Merchandise Authorization)

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

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

Trademarks

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