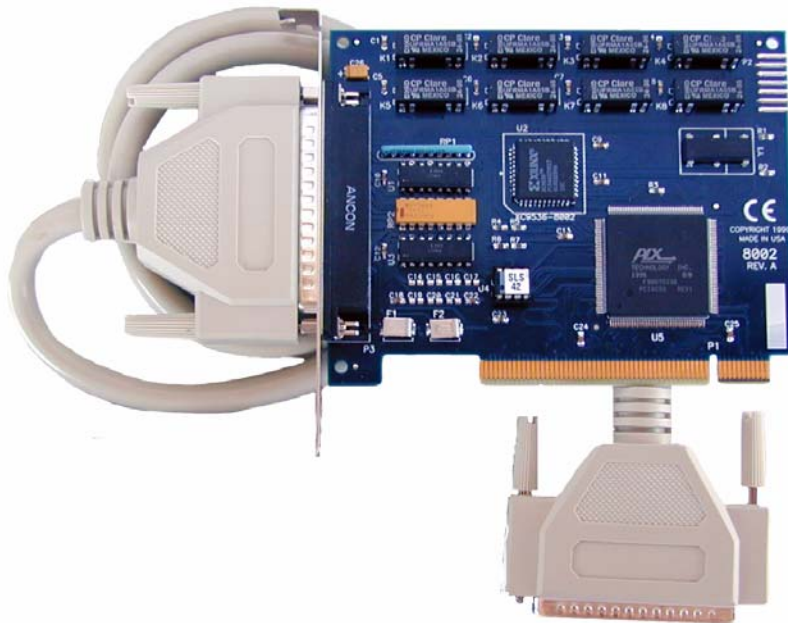


SEALEVEL[®]

SYSTEMS INCORPORATED

DIO-16.PCI *Users Manual*



Part # 8002

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Introduction

Overview

The **DIO-16.PCI** provides 8 reed relays that can switch power, data or other electronic signals for control applications and 8 optically isolated inputs to allow monitoring of off board switch closures, relays or for any other general purpose monitoring needs.

What's Included

The **DIO-16.PCI** is shipped with the following items. If any of these items is missing or damaged, contact the supplier.

- **DIO-16.PCI** Adapter
- Sealevel SeaIO Software CD

Optional Accessories

- CA112 – This cable has one DB37 Male connector and one DB37 Female connector and is 6 feet in length.
- TB02 - Break out serial and digital connectors to 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.
- KT101 - Terminal Block KT101 includes the TB02 and CA112 (DB37 M/F cable).

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 of the CD
4. Select 'Install Software'.
5. Select the part number for your adapter from the listing.
6. Select 'Windows 98/ME/NT/2000/XP' the setup file will automatically detect the operating environment and install the proper components. Next (depending on the OS version) select the 'Run from 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.

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

Note: You need to 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. With the system off and unplugged, install your SeaIO PCI card.

10. Plug system back in and boot Linux.

```
Login as "root".
```

11. Load the driver by typing:

```
SeaIO -load
```

The driver has enabled the card and is ready to use, and you now have the option to run a test utility on it. Skip to section "Using the test software" if you wish to do so at this time.

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

Physical 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 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. Replace the screw. (This is required to ensure FCC Part 15 compliance.)
6. Replace the cover.
7. Connect the power cord.

Installation is finished.

Technical Description

The **DIO-16.PCI** provides two parallel input/output (I/O) ports. The ports are organized as ports A, B, C, and D. Port A is an input port interfaced to optically-isolated inputs, while port C is the reed relay output port.

Features

- 8 SPST relays
- 1 eight bit optically isolated input port
- DB-37 Male connector
- Highly reliable 10 VA DIP reed relays utilized
- Multiple adapters can reside in same computer
- PCI 2.1 Bus compatible

Input Port

Port A is 8 bit input port connected to optically isolated input sensors. Each sensor can be used to interface a voltage input and then sense whether the voltage is on or off. Each sensor is isolated (with respect to a common ground) from every other sensor, and also isolated with respect to the host PC ground. This means that signals such as low-level AC line voltage, motor servo voltage, and control relay signals can be 'sensed', or read by the PC, without the risk of damage due to ground loops or ground faults.

Each sensor input pair has a current limiting resistor that is used to limit the input current to the opto-isolator. The opto-isolator has two 'back-to-back' diodes internally. This allows AC or DC signals to be sensed, regardless of polarity. When the applied voltage is high enough to cause the LED in the opto-isolator to turn-on, the output of the opto-isolator goes low (0 volts) and the signal is read as a low logic level (binary 0) by the PC. When the input signal is too low to turn on the opto-isolator, the output goes high and the port bit is read by the PC as a high logic level (binary 1).

The input impedance of each isolated input is approximately 560 ohms (factory default). The opto-isolator requires approximately 3 mA to turn on. The maximum input current is 60 mA. Two things to consider when selecting the input resistor:

1. The first is turn on voltage for the circuit to sense.
2. The maximum input voltage. Maximum input voltage must not provide too much power to the input resistor, and must also not overdrive the opto-isolator input current specification. The following formulas apply:

Turn on current: 3 mA

Isolator diode drop: 1.1 V

Resistor power Max: .25 W

Turn on Voltage = diode drop + (turn on current) x (resistance)

Or:

$$1.1 + (.003) \times R$$

Maximum voltage = square root of (.25 (resistor value))

The following table shows four common input resistors and the ranges associated with each.

Input Resistor (Ohms)	Min Turn-On (Volts)	Max Input (Volts)	Max Current (mA)
220	1.76	7	27
560*	2.8	12	20
1K	4.1	16	15
2.2K	7.7	24	10

*Factory default

Increasing the input resistor accordingly can increase the maximum input voltage. Because socketed DIP resistor networks are utilized, they can easily be replaced with a different value. This can be done at the factory, if necessary. **The input circuits are not intended for monitoring 120-volt AC circuits.**

Input Port Pin Assignments

Port A Bit	P1
0	2,20
1	3,21
2	4,22
3	5,23
4	6,24
5	7,25
6	8,26
7	9,27

Output Port

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. Writing a '1' to the proper port bit can individually energize each relay.

Relay Specifications

- Contact Power Ratings: 10 Watts Maximum
- Contact Voltage Maximum: 100 Volts DC or AC Maximum
- Contact Current Maximum: .5 Amps DC or AC RMS
- Contact Resistance, Initial: .15 Ohms
- Rated Life:
 - Low Load: 200 Million Closures
 - Maximum Load: 100 Million Closures
- Contact Speed:
 - Operate: .5 m Sec
 - Release: .5 m Sec
 - Bounce: .5 m Sec
- Maximum Operating Speed: 600 Hertz

Output Port Pin Assignments

Port C Bit	Relay	P2 Pin
0	K1	10,28
1	K2	11,29
2	K3	12,30
3	K4	13,31
4	K5	14,32
5	K6	15,33
6	K7	16,34
7	K8	17,35

Power and Ground Pin Assignments

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

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 **DIO-16.PCI** provides.

R = Read

R/W = Read or Write

Function Available	Port	Address Hex	Port Type
R	A	Base+0	Input Port (Opto Input)
	B	Base+1	Not Assigned
R/W	C	Base+2	Output Port (Reed Relays)
	D	Base+3	Not Assigned

FINDPCI.EXE is a utility used in the DOS environment to identify resources that have been assigned to the adapter by the BIOS. It is found on the supplied Sealevel Software CD in the \software\seai0\Other\DOS directory. It will display resources for each detected Sealevel Systems card in the system. These settings are also stored in the file **PCI.INI**, located in the same directory as **FINDPCI.EXE**.

Each system motherboard organizes its physical PCI slots according to the current PCI specification. There is not a fixed order or number of slots for each motherboard.

To determine which resources correspond to which PCI card, you may want to add the cards one at a time and run **FINDPCI.EXE** after each card is added. Each PCI slot will have a corresponding BUS, DEVICE, and FUNCTION number. These numbers uniquely identify that slot when running these DOS utilities. Note the slot data for each card that you install.

Reading the Inputs

The inputs are active Low. If no voltage is applied across one of the differential inputs it returns a one on that bit. If an AC or DC voltage is applied it returns a zero on that bit.

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-32.PCI** are normally open. To close a relay a one must be written to the appropriate bit.

Address	Mode	D7	D6	D5	D4	D3	D2	D1	D0
Base+0	RD	PAD7	PAD6	PAD5	PAD4	PAD3	PAD2	PAD1	PAD0
Base+1	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+2	RD/WR	PCD7	PCD6	PCD5	PCD4	PCD3	PCD2	PCD1	PCD0
Base+3	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+4	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+5	RD/WR	IRQEN	IRQST	{0}	{0}	{0}	{0}	IRC1	IRC0
Base+6	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}
Base+7	RD	{0}	{0}	{0}	{0}	{0}	{0}	{0}	{0}

Table : Hardware register map.

RD = read

WR = write

RD/WR = read or write

Note: When selecting the Interrupt Mode, always disable interrupts prior to changing or setting states. This will help prevent inadvertent or un-expected interrupts from occurring. When using the high and low level interrupts, a change in state of the input must occur before the interrupt can be cleared. The device providing the input to Base +0, bit D0 must do this.

PAD0-7 = Port A (Base+0) Input port.

PCD0-7 = Port C (Base+2) Output port.

IRC0-1= Interrupt Mode select (Base+5)

IRC1	IRC0	Interrupt Type
0	0	Low Level
0	1	High Level
1	0	Falling Edge
1	1	Rising Edge

IRQEN = enable interrupts (Base+5)

0 = disabled

1 = enabled (disabled after reset or power up).

IRQST = interrupt status (Base+5)

1 = interrupt pending (reading the bit clears interrupt). Bit can not be written.

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

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 Consumption

Supply line	+5 VDC
Rating	280mA

Physical Dimensions

Board Length	5.00 inches	(12.700 cm.)
Board Height including Goldfingers	3.900 inches	(9.906 cm.)
Board Height excluding Goldfingers	3.575 inches	(9.080 cm.)
Board Weight	3.2 ounces	(90.71 g)

Appendix A - Troubleshooting

Sealevel Software is supplied with the Sealevel Systems adapter and may be used in the troubleshooting procedures. Using this software and following these simple steps can eliminate most common problems without the need to call Technical Support.

1. 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.
2. 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.
3. Make sure the Sealevel Systems adapter is using a unique IRQ. While the Sealevel Systems adapter does allow the sharing of IRQs, many other adapters (i.e. SCSI adapters & on-board serial ports) do not. The IRQ is typically selected by the BIOS or Operating system. Some BIOS setup software will allow changing the IRQ, but others do not. Another method of changing assigned resources is to try changing PCI slots. This will typically cause the BIOS or OS to reassign the resources.
4. Make sure the Sealevel Systems adapter is securely installed in a motherboard slot.

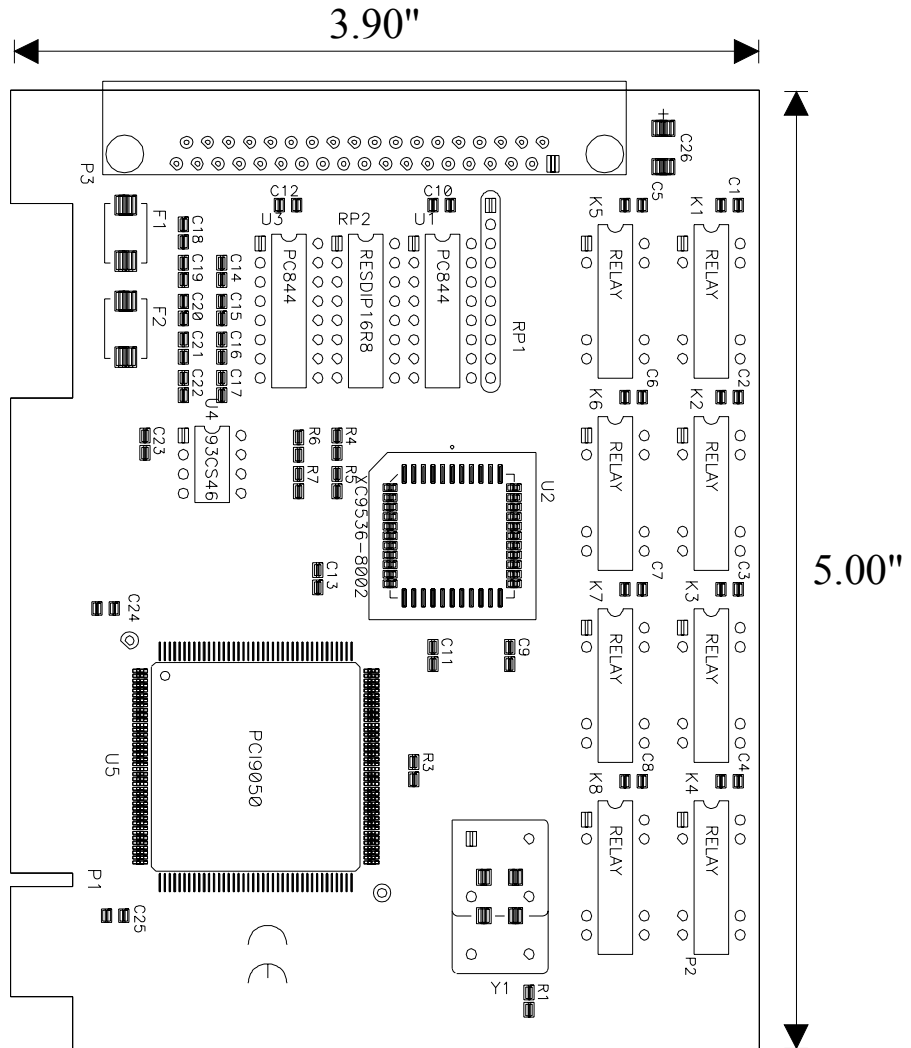
Appendix B - How To Get Assistance

Please refer to Troubleshooting Guide prior to calling Technical Support.

1. 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 <http://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



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 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



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.

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

Monday - Friday

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