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SeaLINK DIO-16 User Manual



Part Number 8209

SEALEVEL SYSTEMS INCORPORATED

www.sealevel.com PO Box 830 Liberty, SC 29657 864.843.4343

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Introduction

The SeaLINK DIO-16 provides 8 Reed relays that can latch 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. The adapter is USB 1.1 compliant.

The SEALINK DIO-16 is designed to be used under Windows 98/ME/2000/XP. The SeaI/O API (Application Programmer Interface) included on CD with the SEALINK DIO-16 provides a variety of useful high-level function calls implemented in a Windows dynamic link library (DLL). This API gives access to the SeaLINK DIO-16 I/O from Windows-based platforms such as Visual C++. In addition to the API, SeaI/O includes an ActiveX control along with sample code and utilities to simplify software development.

Other Sealevel USB Digital I/O Products

SeaLINK PLC-16	(P/N 8206)	- 8 Form C Relays/8 Opto-isolated Inputs
SeaLINK ISO-16	(P/N 8207)	- 16 Opto-isolated Inputs
SeaLINK REL-16	(P/N 8208)	- 16 Reed Relay Outputs
SeaLINK PIO-48	(P/N 8203)	- 48 TTL Inputs/Outputs
SeaLINK PIO-96	(P/N 8205)	- 96 TTL Inputs/Outputs

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Before You Get Started

What's Included

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

- **SEALINK DIO-16 Adapter**
- **USB A to B Cable, Part number CA179**
- **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 SEALINK DIO-16 to real-world signals. All items can be purchased from our website (http://www.sealevel.com) or by calling (864) 843-4343.

- **DIN Rail Clips (Part Number DR102)**
  - A pair of brackets, clips, and hardware necessary for DIN rail mounting the SeaLINK DIO-16.
- **2U 19" Rack Tray (Part Number RK2U)**
  - Standard 2U rack tray for supporting SeaLINK and other devices.
- **Clamp for Rack Tray (Part Number RK-CLAMP)**
  - Metal clamp and necessary hardware to secure SeaLINK or other devices to the RK2U rack tray.
- **High Speed USB 2.0 4-Port Hub (Part Number HUB4)**
  - AC powered 4-port USB hub, AC adapter, and USB cable.
- **High Speed USB 2.0 7-Port Hub (Part Number HUB7)**
  - AC powered 7-port USB hub, AC adapter, and USB cable.

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Software Installation

Windows 98/ME/2000/XP Installation

Important: Do not connect the SeaLINK DIO-16 adapter to the host USB device 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/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.
7. 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.
8. 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.

Windows NT Note: Windows NT is not USB aware and thus cannot support the SeaLINK DIO-16.

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Physical Installation

The SeaLINK DIO-16 can be installed in any open USB port.

Do not plug the unit into a USB port until the software has been fully installed.

1. Simply connect the SeaLINK DIO-16 to your USB port with the supplied cable.
2. The software drivers installed during setup will automatically recognize and configure the device.
3. You should see one or more “New Hardware Found” windows, indicating the actual device being created.
4. Next, view your system’s Device Manager.
5. You should have a new ‘SeaIO 8209’ in the SeaI/O Device heading indicating the installation was successful.

The SEALINK DIO-16 is now ready for use.

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Programming the SEALINK DIO-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. 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 SEALINK DIO-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/SeaIO/Sample Application Description". Information about where the files are physically stored on your disk is also included in this same file.

Digital I/O Interface

The SeaLINK DIO-16 provides one parallel input port and one parallel reed relay output port. The ports are organized as ports A, and B. Port A is an input port interfaced to optically isolated inputs, while port B is the relay output port. The SeaLINK DIO-16 is a line-powered device requiring a USB port capable of sourcing 500 mA.

Serial String

Each device has an eight digit alphanumeric serial string stored in non-volatile memory. On the Windows platforms, this number is used to give each unit a separate identity. This identity allows the device to be moved to any USB port or hub port on your computer while retaining its device number. If a device becomes damaged and is replaced the new device should be given the same serial string as the device it is replacing. This string is stored in an EEPROM along with other critical information. This EEPROM is read during enumeration. The device should not be unplugged during its enumeration due to remote possibility that the data in the EEPROM could be corrupted if power is removed during a read/write cycle to the EEPROM. Enumeration is complete when the LED is lit.

The control panel utility provides the capability to read or modify this string. However, setting the same string for two units connected to the same computer will cause the second unit to fail enumeration, and make it invisible to the operating system. Should this occur, unplug one unit and set the serial string for the other unit to a different string.

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Input Port

Port A is an eight 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 (2.7K ohm) 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 opto-isolator requires approximately 1mA to turn on. The maximum input current is 50mA. There are two things to consider when selecting the input resistor. The first is turn on voltage for the circuit to sense, and second is 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 Voltage = diode drop + (turn on current) x (resistance) [Ex: 1.1 + (.003) x R]

Input Current = ((input voltage)-1.1V) / (resistor value)

Maximum voltage = 1.1 + square root of (.25(resistor value))

The following table shows the ranges associated with the resistor.

Input Resistor	Turn-On	Input Range	Max Input	Max Current
2.7KΩ	3.0V	5 – 30V	37V	13mA

Note: The turn-off voltage for all resistors is less than 1V.

Because through hole resistors are utilized, they cannot be easily replaced. If modification is necessary, Sealevel can do this for an additional charge.

Important: The input circuits are not intended for monitoring 120-volt AC circuits. In addition to being too high a voltage for the circuits, it is dangerous to have that high a voltage on the card.

Output Ports (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, or inductive loads. The relays are normally open, and close when energized. Writing a logic value of one or zero will change the state. Refer to the Application Programmers Interface for more information.

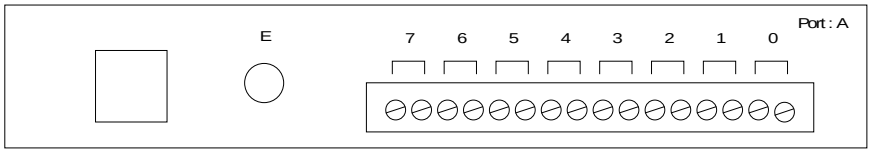
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Pin Assignments (Removable Terminal Block)

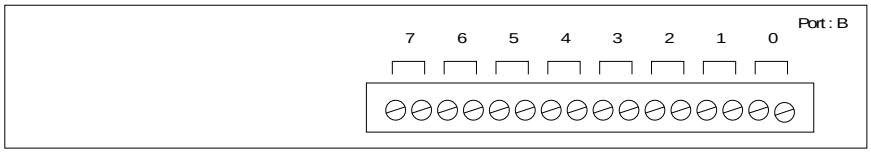
Port A (Input) Bit	Port A Terminals
0	0,1
1	2,3
2	4,5
3	6,7
4	8,9
5	10,11
6	12,13
7	14,15

Port B (Output) Bit	Port B Terminals
0	0,1
1	2,3
2	4,5
3	6,7
4	8,9
5	10,11
6	12,13
7	14,15

Side Panel View Port A



Side Panel View Port B



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Electrical Characteristics

Features

- 8 SPST Reed relays
- Eight optically isolated inputs
- Removable screw terminals
- Powered by USB port

Specifications

Input Ports

- Turn On Current: 1mA
- Isolator Diode Drop: 1.1 VDC
- Resistor Power Max: .5 W
- Maximum Input Range: 5 – 30 VDC/VAC

Output Relays

- Contact Max Power Rating: 10 W
- Contact Voltage Maximum: 100 VDC/VAC
- Contact Current Maximum: .5 A AC/DC RMS
- Contact Resistance, Initial: .15 Ω
- 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 @ 500mA

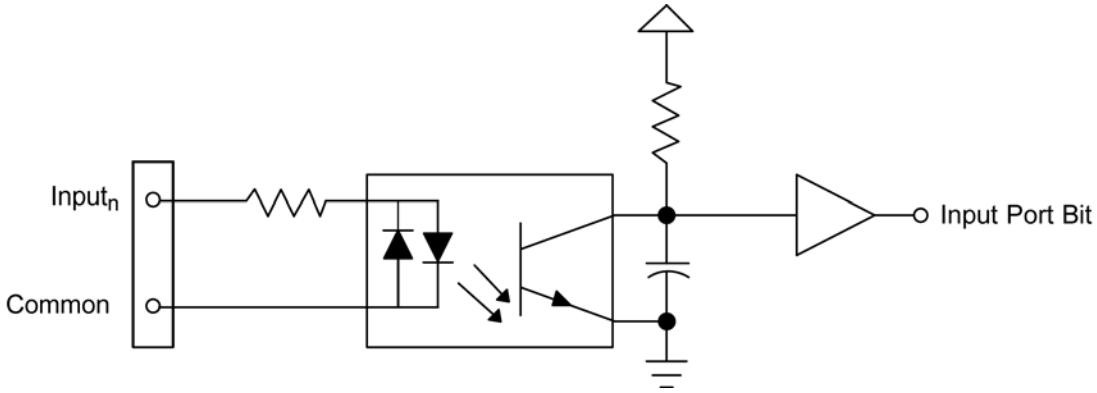
Manufacturing

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.

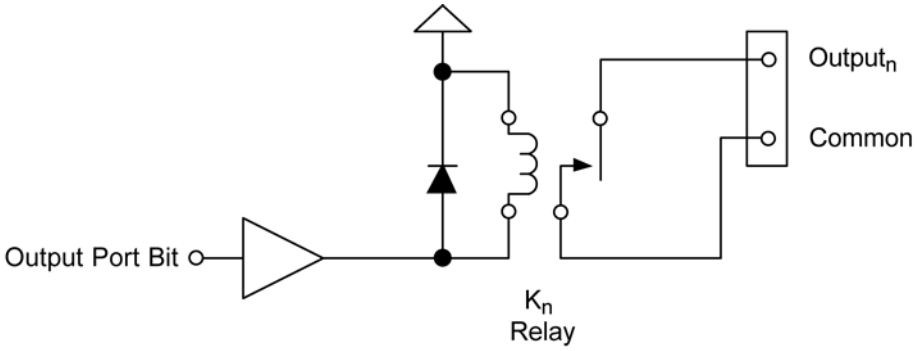
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Example Circuits

Input Circuit



Output Circuit



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Appendix A - Troubleshooting

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. 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-5:00PM Eastern Time Monday through Friday. For email support contact support@sealevel.com.

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Appendix B - How To Get Assistance

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

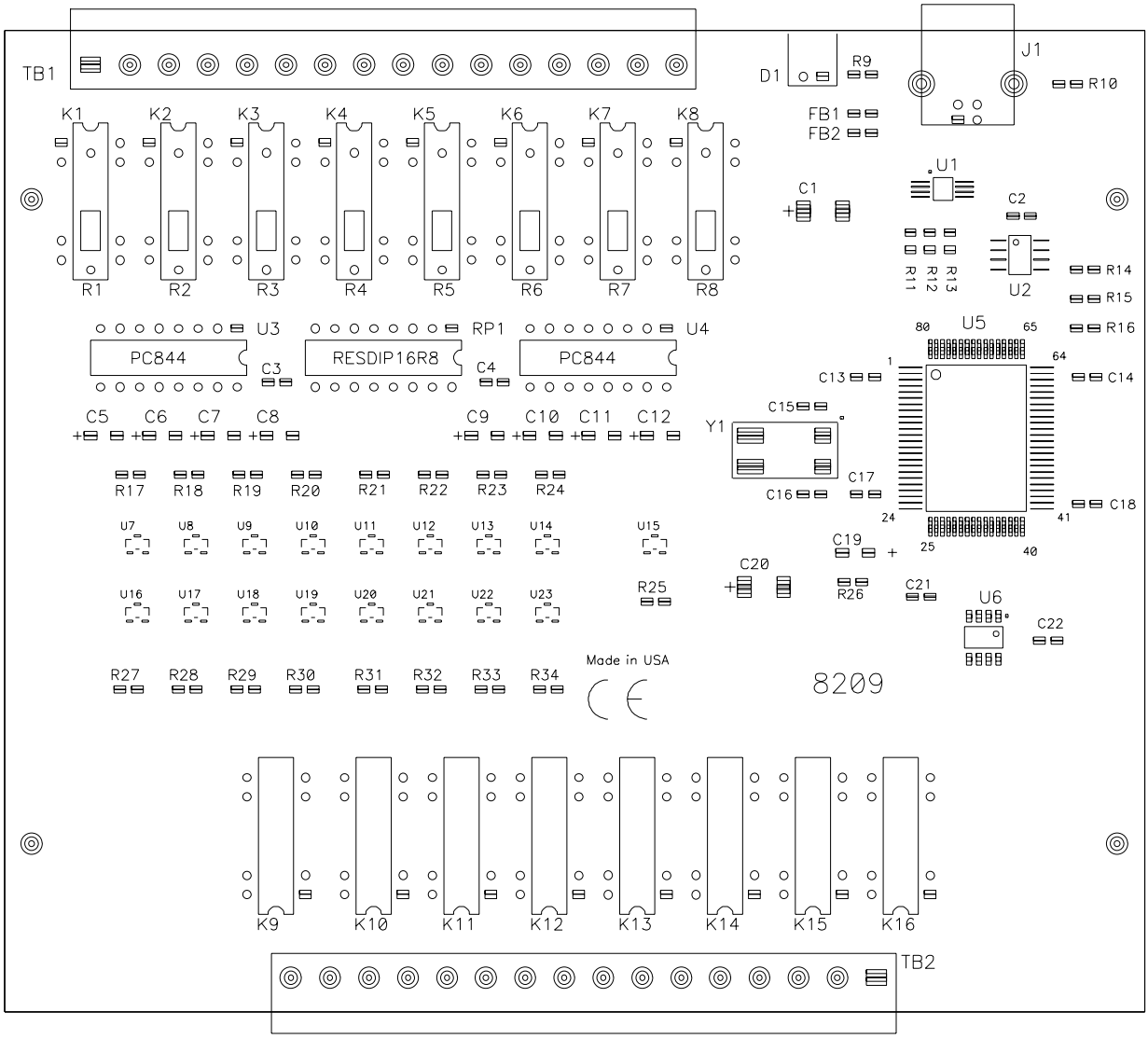
Sealevel Systems maintains a Home page on the Internet. Our home page address is http://www.sealevel.com. The latest software updates, and newest manuals are available via our FTP site that can be accessed from our home page.

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.

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Appendix C – Silk Screen – 8209 PCB



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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

CE

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.

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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.

Sealevel Systems, Incorporated
2779 Greenville Highway
P.O. Box 830
Liberty, SC 24857 USA
(864) 843-4343 FAX: (864) 843-3067
www.sealevel.com
email: support@sealevel.com

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

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