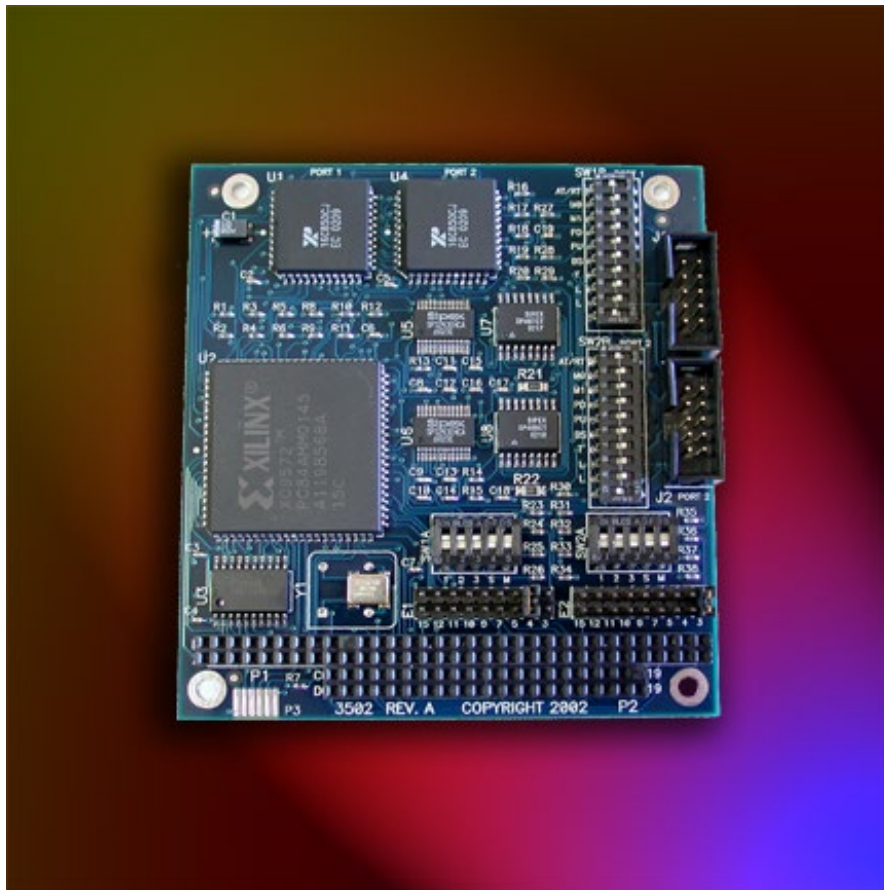


# SIO-104+2

User Manual | 3502



SEALEVEL®

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# Introduction

## Overview

The SIO-104+2 series provides the ultimate serial connection for your PC/104 application. The SIO-104+2 when configured in the RS-422/485 mode provides an interface capable of long length, high-speed communications, or when configured in the RS-232 mode provides a standard RS-232C interface that is fully compatible all popular modem software, network operating systems software, and mouse drivers.

# Before You Get Started

## What's Included

The SIO-104+2 is shipped with the following items. If any of these items are missing or damaged, contact the supplier.

- SIO-104+2 Serial Interface Adapter
- Nylon Mounting Hardware Kit (PC304-NK)

## 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 Accessories

- CA152 - Terminates the **SIO-104+2** 10 pin header to a DB9M connector. This cable provides the standard DB9 pin out for RS-232 (aka EIA/TIA574) and also provides the Sealevel Systems' DB9 standard for RS-422/485.
- DB103 - The DB103 is designed to convert a Sealevel DB9 Male connector to a pinout compatible with AC24AT and AC422AT Opto-22 ISA bus cards. When used with the optional CA152 cable assembly it allows Optomux devices to be controlled with the **SIO-104+2**.
- CA190 - When used with the optional CA152 cable assembly it allows connection directly to a Sony (or compatible) 207M "9 Pin" connector.

# Card Setup

The **SIO-104+2** contains two DIP-Switches and a jumper strap for each port, which must be set for proper operation.

## Switches SW1A and SW2A

### Address Selection

Each port on the **SIO-104+2** occupies eight consecutive I/O locations. A DIP-switch is used to set the base address for these locations. SW1A sets the I/O address for port 1 and SW2A sets port 2. The following table shows the addressing options available. If different address options are required, please contact Sealevel Systems Technical Support about a custom PAL option.

	1	2	3
3F8	On	On	On
2F8	On	On	Off
3E8	On	Off	On
2E8	On	Off	Off
2A0	Off	On	On
300	Off	On	Off
328	Off	Off	On
Disabled	Off	Off	Off

Figure 1 - Address Selection Table



Each COM: port in the system should have a unique address. Typically COM1: - COM4: addresses are 3F8, 2F8, 3E8 and 2E8 Hex.

Refer to Appendix A for common address contentions.

## Port Enable / Disable

Each port on the **SIO-104+2** can be enabled or disabled by setting the three switches in the 'Off' position. The port is enabled when a valid I/O selection is made. If any port is disabled, be sure to disable the interrupt request for that port by removing the IRQ jumper.

## Switches SW1B and SW2B

### RS-485 Enable Modes (SW1B and SW2B position 1)

RS-485 is ideal for multi-drop or network environments. RS-485 requires a tri-state driver that will allow the electrical presence of the driver to be removed from the line. The driver is in a tri-state or high impedance condition when this occurs. Only one driver may be active at a time and the other driver(s) must be tri-stated. The output modem control signal **Request To Send (RTS)** is typically used to control the state of the driver. Some communication software packages refer to RS-485 as RTS enable or RTS block mode transfer.

One of the unique features of the **SIO-104+2** is the ability to be RS-485 compatible without the need for special software or drivers. This ability is especially useful in Windows, Windows NT, and OS/2 environments where the lower level I/O control is abstracted from the application program. This ability means that the user can effectively use the **SIO-104+2** in an RS-485 application with existing (i.e. standard RS-232) software drivers.

DIP-Switch SW2A and SW2B are used to control the RS-485 mode functions for the driver circuit. The selections are:

'Auto' enable (Switch position 1 'Off'). The 'Auto' enable feature automatically enables/disables the RS-485 interface via on board circuitry.

'RTS' enable (Switch position 1 'On') The 'RTS' mode uses the 'RTS' modem control signal to enable the RS-485 interface and provides backward compatibility with existing software products.

### Electrical Interface Selection (Positions 2 and 3)

Positions 2 and 3 select the Electrical Interface for the **SIO-104+2**, the following table represents the only valid options:

Mode	M0	M1
RS232	OFF	OFF
RS422	OFF	ON
RS485 with echo	ON	OFF
RS485 no echo	ON	ON

## Line Termination (Position 4-9)

Typically, each end of the RS-485 bus must have line-terminating resistors (RS-422 terminates at the receive end only). A 120-ohm resistor is across each RS-422/485 input in addition to a 1K-ohm pull-up/pull-down combination that biases the receiver inputs. Switches SW1B and SW2B allows customization of this interface to specific requirements. Each jumper position corresponds to a specific portion of the interface. If multiple **SIO-104+2** adapters are configured in a RS-485 network, only the boards on each end should have jumpers T, P & P **ON**. Refer to the following table for each position's operation:

Name	Function
PD	Adds or removes the 1K ohm pull-down resistor in the RS-422/RS-485 receiver circuit (Receive data only).
PU	Adds or removes the 1K ohm pull-up resistor in the RS-422/RS-485 receiver circuit (Receive data only).
BS	Use only for RS-422/485
T	Adds or removes the 120-ohm termination.
L	Connects the TX+ to RX+ for RS-485 two-wire operation.
L	Connects the TX- to RX- for RS-485 two-wire operation.

## Typical settings for SW1B and SW2B

Mode (Switch position)	M0 (2)	M1 (3)	PD (4)	PU (5)	BS (6)	T (7)	L (8)	L (9)
RS232	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
RS422	OFF	ON	ON	ON	ON	ON	OFF	OFF
RS485 with echo	ON	OFF	ON	ON	ON	ON*	OFF	OFF
RS485 no echo	ON	ON	ON	ON	ON	ON*	ON	ON

\* If at end of RS485 bus turn termination ON  
If in middle leave OFF

## Clock Modes

The **SIO-104+2** employs a 7.3728 MHz clock. This provides for data rates up to 460.8Kbps.

# Installation

## Software Installation

### Windows Installation



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



Only users running Windows 7 or newer should utilize these instructions for accessing and installing the appropriate driver via Sealevel's website. If you are utilizing an operating system prior to Windows 7, please contact Sealevel by calling 864.843.4343 or emailing [support@sealevel.com](mailto:support@sealevel.com) to receive access to the proper driver download and installation instructions.

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1. Begin by locating, selecting, and installing the correct software from the [Sealevel software driver database](#).
2. Select the Part Number (3502) for your device from the listing.
3. Click the 'Download Now' button for SeaCOM for Windows.
4. The setup file will automatically detect the operating environment and install the proper components.

To confirm that the SeaCOM driver has been successfully installed, click on the 'Start' button, and then select 'All Programs'. You should see the 'SeaCOM' program folder listed.

You are now ready to proceed with connecting the 3502 to your system. Refer to the Hardware Installation section for details.

### Other Operating Systems

Refer to the appropriate section of the Serial Utilities Software.



## Linux Installation



You MUST have “root” privileges to install the software and drivers.



The syntax is case sensitive.

SeaCOM for Linux can be downloaded here: <https://www.sealevel.com/support/software-seacom-linux/>. It includes the **README** and the **Serial-HOWTO** help files (located at seacom/dox/howto). This series of files both explains typical Linux serial implementations and informs the user about Linux syntax and preferred practices.



User can use a program such as 7-Zip to extract the tar.gz file.

In addition, the software selectable interface settings can be accessed by referencing **seacom/utilities/3502mode**.

For additional software support, including QNX, please call Sealevel Systems’ Technical Support, (864) 843-4343. Our technical support is free and available from 8:00 AM - 5:00 PM Eastern Time, Monday through Friday. For email support contact: [support@sealevel.com](mailto:support@sealevel.com).

## Physical Installation

Extreme care should be taken when installing the adapter to avoid causing damage to the connectors. After the adapter is installed, connect your I/O cables. 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 and IRQ before inserting the adapter onto the stack.

1. Turn off PC power. Disconnect the power cord.
2. Remove the case cover (if applicable).
3. Gently insert the adapter noting proper key orientation of the expansion connector on a PC/104 compatible card. The 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.

Installation is complete.

# Technical Description

The SIO-104+2 series provides the ultimate serial connection for your PC/104 application. SIO-104+2 utilizes the 16850 UART. These chip features programmable baud rates, data format, interrupt control and 128-Byte input and output FIFOs.

The SIO-104+2 when configured with the RS-422/485 interface will allow long length, high-speed communications suitable for data collection and shop floor control.

The SIO-104+2 when configured with the RS-232C interface, is fully compatible with the DOS operating system, all popular modem software, network operating systems software, and mouse drivers.

## Features

- Selectable interrupts (IRQs) 3, 4, 5, 7, 9, 10, 11, 12, 15
- Multiple adapters can share the same IRQ
- Uses PC/104 compatible stack through connector for universal mounting
- 5 volts only DC operation

## Connector Pin Assignments

### RS-232

Signal	Name	J1/J2	DB-9	Mode
GND	Ground	9	5	
TD	Transmit Data	5	3	Output
RTS	Request To Send	4	7	Output
DTR	Data Terminal Ready	7	4	Output
RD	Receive Data	3	2	Input
CTS	Clear To Send	6	8	Input
DSR	Data Set Ready	2	6	Input
CD	Carrier Detect	1	1	Input
RI	Ring Indicator	8	9	Input



These assignments meet EIA/TIA/ANSI-574 DTE for DB-9 type connectors

Signal	Name		Pin #	Mode
GND	Ground	9	5	
TX +	Transmit Data Positive	7	4	Output
TX-	Transmit Data Negative	5	3	Output
RTS+	Request to Send Positive	2	6	Output
RTS-	Request to Send Negative	4	7	Output
RX+	Receive Data Positive	1	1	Input
RX-	Receive Data Negative	3	2	Input
CTS+	Clear to Send Positive	8	9	Input
CTS-	Clear to Send Negative	6	8	Input



Please terminate any control signals that are not going to be used. The most common way to do this is connect RTS to CTS and RI. Also, connect DCD to DTR and DSR. Terminating these pins, if not used, will help insure you get the best performance from your adapter.

# 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

## Power Consumption

Supply line	+5 VDC
Rating	220 mA

## Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

## Physical Dimensions

Board length	3.550 inches (9.017 cm)
Board height	3.775 inches (9.589 cm)

# Appendix A – Troubleshooting

The adapter should provide years of trouble-free service. However, in the event that device appears to not be functioning incorrectly, the following tips 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 The IRQ is typically selected via an on-board header block. Refer to the section on [Card Setup](#) for help in choosing an I/O address and IRQ.
4. Make sure the Sealevel Systems adapter is securely installed.
5. If you are utilizing an operating system prior to Windows 7, please contact Sealevel by calling (864) 843-4343 or emailing [support@sealevel.com](mailto:support@sealevel.com) to receive more information in regard to the utility software which will determine if your product is functioning properly.
6. Only users running Windows 7 or newer should utilize the diagnostic tool 'WinSSD' installed in the SeaCOM folder on the Start Menu during the setup process. First find the ports using the Device Manager, then use 'WinSSD' to verify that the ports are functional.
7. Remember if a "No Echo" mode is selected, a data loopback cannot be accomplished.
8. Always use the Sealevel Systems diagnostic software when troubleshooting a problem. This will help eliminate any software issues and identify any hardware conflicts.

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 8:00 A.M.- 5:00 P.M., Eastern Time Monday through Friday. For email support contact [support@sealevel.com](mailto: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](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. For email support contact [support@sealevel.com](mailto:support@sealevel.com).

**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 – Electrical Interface

## RS-232

Quite possibly the most widely used communication standard is RS-232. This implementation has been defined and revised several times and is often referred to as RS-232-C/D/E or EIA/TIA-232-C/D/E. It is defined as *“Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange”*. The mechanical implementation of RS-232 is on a 25 pin D sub connector. The IBM PC computer defined the RS-232 port on a 9 pin D sub connector and subsequently the EIA/TIA approved this implementation as the EIA/TIA-574 standard. This standard has defined as the *“9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange”*. Both implementations are in widespread use and will be referred to as RS-232 in this document. RS-232 is capable of operating at data rates up to 20 Kbps / 50 ft. The absolute maximum data rate may vary due to line conditions and cable lengths. RS-232 often operates at 38.4 Kbps over very short distances. The voltage levels defined by RS-232 range from -12 to +12 volts. RS-232 is a single ended or unbalanced interface, meaning that a single electrical signal is compared to a common signal (ground) to determine binary logic states. A voltage of +12 volts (usually +3 to +10 volts) represents a binary 0 (space) and -12 volts (-3 to -10 volts) denotes a binary 1 (mark). The RS-232 and the EIA/TIA-574 specification define two types of interface circuits **Data Terminal Equipment (DTE)** and **Data Circuit-Terminating Equipment (DCE)**. The Sealevel Systems Adapter is a DTE interface.

## RS-422

The RS-422 specification defines the electrical characteristics of balanced voltage digital interface circuits. RS-422 is a differential interface that defines voltage levels and driver/receiver electrical specifications. On a differential interface, logic levels are defined by the difference in voltage between a pair of outputs or inputs. In contrast, a single ended interface, for example RS-232, defines the logic levels as the difference in voltage between a single signal and a common ground connection. Differential interfaces are typically more immune to noise or voltage spikes that may occur on the communication lines. Differential interfaces also have greater drive capabilities that allow for longer cable lengths. RS-422 is rated up to 10 Megabits per second and can have cabling 4000 feet long. RS-422 also defines driver and receiver electrical characteristics that will allow 1 driver and up to 32 receivers on the line at once. RS-422 signal levels range from 0 to +5 volts. RS-422 does not define a physical connector.

## RS-485

RS-485 is backwardly compatible with RS-422; however, it is optimized for party line or multi-drop applications. The output of the RS-422/485 driver is capable of being Active (enabled) or Tri-State (disabled). This capability allows multiple ports to be connected in a multi-drop bus and selectively polled. RS-485 allows cable lengths up to 4000 feet and data rates up to 10 Megabits per second. The signal levels for RS-485 are the same as those defined by RS-422. RS-485 has electrical characteristics that allow for 32 drivers and 32 receivers to be connected to one line. This interface is ideal for multi-drop or network environments. RS-485 tri-state driver (not dual-state) will allow the electrical presence of the driver to be removed from the line. Only one driver may be active at a time and the other driver(s) must be tri-stated. RS-485 can be cabled in two ways, two wire and four wire mode. Two-wire mode does not allow for full duplex communication and requires that data be transferred in only one direction at a time. For half-duplex operation, the two transmit pins should be connected to the two receive pins (Tx+ to Rx+ and Tx- to Rx-). Four wire mode allows full duplex data transfers. RS-485 does not define a connector pin-out or a set of modem control signals. RS-485 does not define a physical connector.

# Appendix D – Asynchronous Communications

Serial data communications implies that individual bits of a character are transmitted consecutively to a receiver that assembles the bits back into a character. Data rate, error checking, handshaking, and character framing (start/stop bits) are pre-defined and must correspond at both the transmitting and receiving ends.

Asynchronous communications is the standard means of serial data communication for PC compatibles and PS/2 computers. The original PC was equipped with a communication or COM: port that was designed around an 8250 Universal Asynchronous Receiver Transmitter (UART). This device allows asynchronous serial data to be transferred through a simple and straightforward programming interface. A start bit, followed by a pre-defined number of data bits (5, 6, 7, or 8) defines character boundaries for asynchronous communications. The end of the character is defined by the transmission of a pre-defined number of stop bits (usually 1, 1.5 or 2). An extra bit used for error detection is often appended before the stop bits.

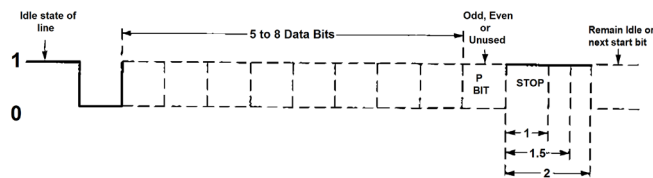


Figure 3 - Asynchronous Communications Bit Diagram

This special bit is called the parity bit. Parity is a simple method of determining if a data bit has been lost or corrupted during transmission. There are several methods for implementing a parity check to guard against data corruption. Common methods are called (E)ven Parity or (O)dd Parity. Sometimes parity is not used to detect errors on the data stream. This is referred to as (N)o parity. Because each bit in asynchronous communications is sent consecutively, it is easy to generalize asynchronous communications by stating that each character is wrapped (framed) by pre-defined bits to mark the beginning and end of the serial transmission of the character. The data rate and communication parameters for asynchronous communications have to be the same at both the transmitting and receiving ends. The communication parameters are baud rate, parity, number of data bits per character, and stop bits (i.e., 9600,N,8,1).



# Appendix E – PC/104

## What is PC/104?

The PC has become extremely popular in both general purpose (desktop) and dedicated (embedded) applications. Unfortunately the PC has been hampered by the large size required to maintain PC compatibility. PC/104 addresses this by optimizing the PC bus in a form factor designed for embedded applications.

Briefly, the key differences between PC/104 and the standard “AT” or ISA bus computer are as follows:

- Reducing the form factor, to 3.550 by 3.775 inches
- Eliminating the need for backplanes or card cages, through its self-stacking bus
- Minimizing component count and power consumption (typically 1-2 Watts per module) by reducing required bus drive on most signals to 4 mA.

Sealevel Systems has been a member of the PC/104 Consortium since its inception. Also Sealevel Systems has two members on the working group that is currently having the PC/104 bus approved by the IEEE as P996.1.

Questions about the PC/104 Consortium can be sent to:

PC/104 Consortium

P. O. Box 4303

Mountain View, CA 94040

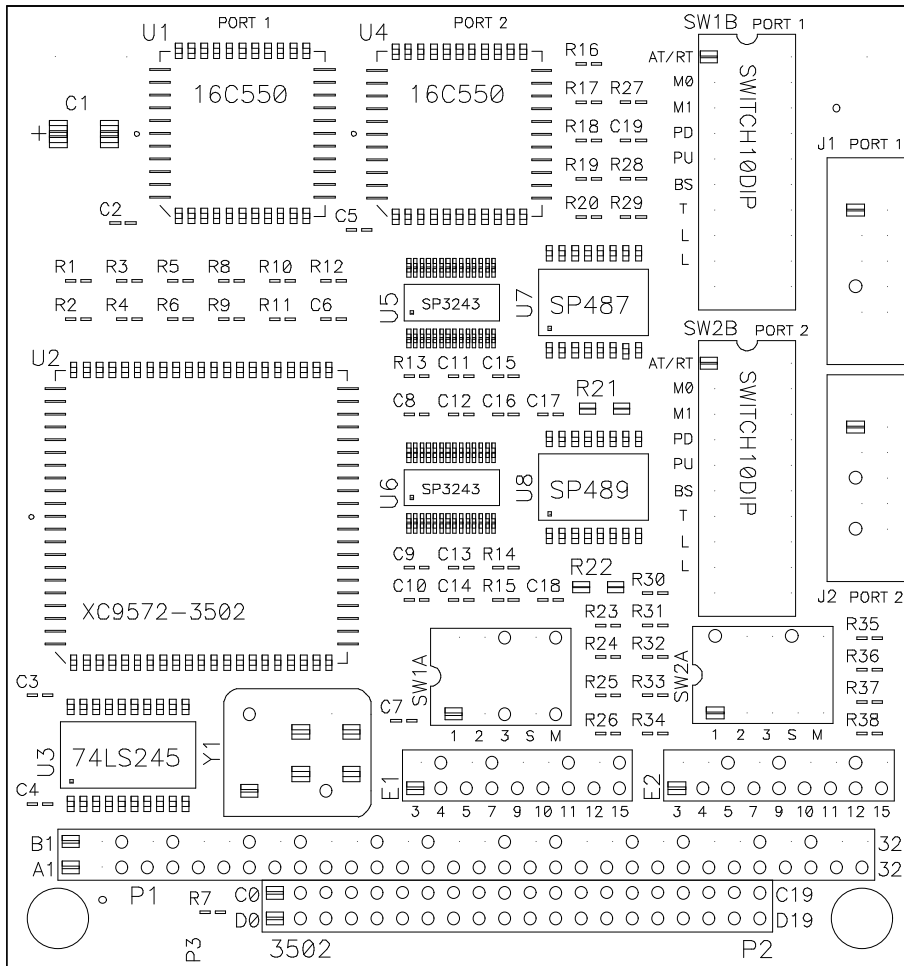
(415) 903-8304 Ph.

(415) 967-0995 Fax

[PC104 Consortium - PC/104 ConsortiumPC/104 Consortium](#)

Email: [info@pc104.org](mailto:info@pc104.org)

# Appendix F – Silk Screen



# 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, 8:00 AM to 5:00 PM EST
Phone	864-843-4343
Email	<a href="mailto:support@sealevel.com">support@sealevel.com</a>

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