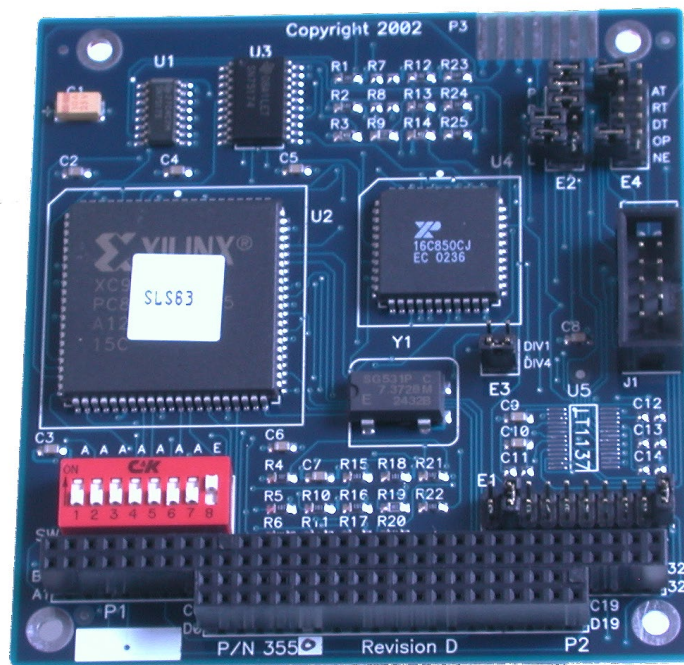


# ULTRA SIO-104

User Manual | 3550



SEALEVEL®

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# Introduction

The **ULTRA SIO-104** is the ultimate single port RS-422/485 serial connection for your PC/104 application. The **ULTRA SIO-104** provides a single field selectable port configurable as RS-422/485 supporting asynchronous data rates up to 460.8K bps. The **ULTRA SIO-104** utilizes the Exar 16C850, which provides 128-byte, transmit and receive FIFOs. These larger buffers allow error free operation even in high-speed applications. In RS-485 mode the **ULTRA SIO-104** offers automatic control of the RS-485 driver enable for trouble free network master arbitration.

Choose the RS-422 mode for long distance device connections up to 4000ft. where noise immunity and high data integrity are essential. Select RS-485 and capture data from multiple peripherals in a RS-485 multi-drop network. Up to 31 RS-485 devices can be connected to each port to automate your data collection.

In RS-485 mode, our special auto-enable feature allows the RS-485 ports to be viewed by the operating system as a COM: port. This allows the standard COM: driver to be utilized for RS-485 communications. Our on-board hardware automatically handles the RS-485 driver enable.

# Before You Get Started

## What's Included

The **ULTRA SIO-104** is shipped with the following items. If any of these items is missing or damaged, please contact Sealevel for replacement.

- **ULTRA SIO-104** 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

Depending upon your application, you are likely to find one or more of the following items useful with the **ULTRA SIO-104**. All items can be purchased from our website ([www.sealevel.com](http://www.sealevel.com)) or by calling our sales team at 864-843-4343.

- CA152 - Terminates the **ULTRA SIO-104** 10 pin header to a DB9M connector. This termination 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 **ULTRA SIO-104**.
- 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 **ULTRA SIO-104** contains several jumper straps for each port, which must be set for proper operation.

### Address Selection

The **ULTRA SIO-104** occupies eight consecutive I/O locations. A DIP-switch is used to set the base address for these locations. Be careful when selecting the base address as some selections conflict with existing ports. The following table shows several examples that typically do not cause a conflict. SW1 sets the I/O address for the **ULTRA SIO-104**.

Address	Binary		Switch Position Setting						
	Hex	A9 A0	1	2	3	4	5	6	7
280-287		1010000XXX	Off	On	Off	On	On	On	On
2A0-2A7		1010100XXX	Off	On	Off	On	Off	On	On
2E8-2EF		1011101XXX	Off	On	Off	Off	Off	On	Off
2F8-2FF		1011111XXX	Off	On	Off	Off	Off	Off	Off
3E8-3EF		1111101XXX	Off	Off	Off	Off	Off	On	Off
300-307		1100000XXX	Off	Off	On	On	On	On	On
328-32F		1100101XXX	Off	Off	On	On	Off	On	Off
3F8-3FF		1111111XXX	Off	Off	Off	Off	Off	Off	Off

Figure 1 - Address Selection Table

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 a base. Address 300 in binary is XX11 0000 0XXX where X = a non-selectable address bit.

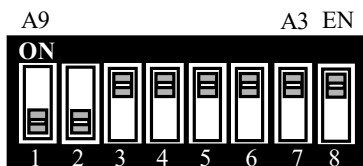


Figure 2 - DIP-Switch Illustration



Setting the switch “On” or “Closed” corresponds to a “0” in the address, while leaving it “Off” or “Open” corresponds to a “1”.

## Port Enable / Disable

The port on the **ULTRA SIO-104** can be enabled or disabled with switch position 8 on the DIP-switch. The port is enabled with the switch “On” or “Closed” and disabled when “Off” or “Open” (refer to Figure 2). If the port is disabled, be sure to also disable the interrupt request for that port by removing the IRQ jumper at header J2.

## IRQ Selection

The **ULTRA SIO-104** has an interrupt selection jumper, which should be set prior to use, if an interrupt is required by your application software. Consult the user manual for the application software being used to determine the proper setting. Position “R” is provided so that a jumper can be installed that connects a 1K-Ohm pull-down resistor to the output of a high-impedance tri-state driver which carries the IRQ signal. Because the IRQ line is driven low only by the pull-down resistor, it is possible for two or more boards to share the same IRQ signal. Position “R” installed is the default setting and should be left as is unless multiple cards are sharing a single IRQ. If multiple adapters are sharing a single IRQ, then only one adapter should have the pull-down resistor (position “R” selected) in the circuit.

The IRQ can be set at jumper J2 for IRQ 2/9, 3-5, 7, 10, 11, 12, or 15. In the following example, the IRQ is set as IRQ4.



Figure 3 - Header J2, IRQ Selection (Factory Default)

## RS-485 Enable Modes

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 **ULTRA SIO-104** 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 **ULTRA SIO-104** in an RS-485 application with existing (i.e. standard RS-232) software drivers.

Header E4 is used to control the RS-485 mode functions for the driver circuit. The selections are:

'Auto' enable (silk-screen 'AT'). The 'Auto' enable feature automatically enables/disables the RS-485 interface via on board circuitry.

'RTS' enable (silk-screen 'RT') The 'RTS' mode uses the 'RTS' modem control signal to enable the RS-485 interface and provides backward compatibility with existing software products.

'DTR' enable (silk-screen 'DT') The 'DTR' mode uses the 'DTR' modem control signal to enable the RS-485 interface, provides backward compatibility with existing software products and with the Oxford Semiconductor 16C950 RS-485 enable feature.

'Output One' enable (silk-screen 'OP') This mode uses the 'OP1' control signal to enable the RS-485 interface and provides backward compatibility with existing software products and with the Exar 16C850 RS-485 enable feature.

No Echo' (silk-screen 'NE') of E4 is used to control the RS-485 enable/disable functions for the receiver circuit and determine the state of the RS-422/485 driver. The RS-485 'Echo' is the result of connecting the receiver inputs to the transmitter outputs. Every time a character is transmitted; it is also received. This can be beneficial if the software can handle echoing (i.e. using received characters to throttle the transmitter) or it can confuse the system if the software does not. To select the 'No Echo' mode select silk-screen position 'NE'.

# RS-485 Mode Examples (Header E4)

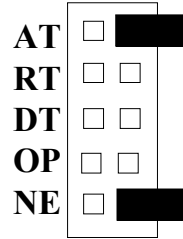


Figure 4 - Header E4, RS-422

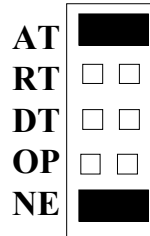


Figure 5 - Header E4, RS-485 'Auto' Enabled, with 'No Echo'

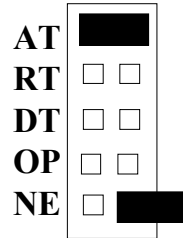


Figure 6 - Header E4, RS-485 'Auto' Enabled, with 'Echo'

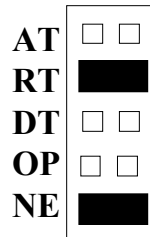


Figure 7 - Header E4, RS-485 'RTS' Enabled, with 'No Echo'

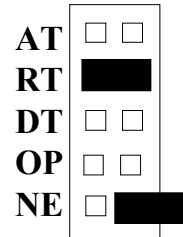


Figure 8 - Header E4, RS-485 'RTS' Enabled, with 'Echo'



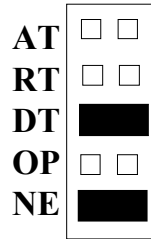


Figure 9 - Header E4, RS-485 'DTR' Enabled, with No-Echo

## Line Termination

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. Header E4 allows customization of this interface to specific requirements. Each jumper position corresponds to a specific portion of the interface. If multiple **ULTRA SIO-104** 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
P	Adds or removes the 1K ohm pull-down resistor in the RS-422/RS-485 receiver circuit (Receive data only).
P	Adds or removes the 1K ohm pull-up resistor in the RS-422/RS-485 receiver circuit (Receive data only).
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.



Figure 10 - Headers E3, Line Termination

## Clock Modes

The **ULTRA 530.PCI** employs a unique clocking option that allows the end user to select from divide by 4 and divide by 1 clocking modes. These modes are selected at Header E8.

To select the Baud rates commonly associated with COM: ports (i.e. 2400, 4800, 9600, 19.2, ... 115.2K Bps) place the jumper in the divide by 4 mode (silk-screen DIV4).

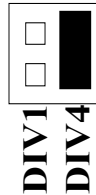


Figure 11 - Clocking Mode 'Divide By 4'

To select the maximum data rate (460.8K bps) place the jumper in the divide by 1 (silk-screen DIV1) position.

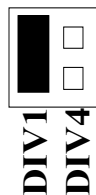


Figure 12 - Clocking Mode 'Divide By 1'

## Baud Rates and Divisors for the 'Div1' mode

The following table shows some common data rates and the rates you should choose to match them if using the adapter in the 'Div1' mode.

For this Data Rate	Choose this Data Rate
1200 bps	300 bps
2400 bps	600 bps
4800 bps	1200 bps
9600 bps	2400 bps
19.2K bps	4800 bps
57.6 K bps	14.4K bps
115.2 K bps	28.8K bps
230.4K bps	57.6 K bps
460.8K bps	115.2 K bps

If your communications package allows the use of Baud rate divisors, choose the appropriate divisor from the following table:

For this Data Rate	Choose this Divisor
1200 bps	384
2400 bps	192
4800 bps	96
9600 bps	48
19.2K bps	24
38.4K bps	12
57.6K bps	8
115.2K bps	4
230.4K bps	2
460.8K bps	1

# 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.

---

1. Begin by locating, selecting, and installing the correct software from the website - [SeaCOM software](#).
2. Select the "SeaCOM for Windows" download link.
3. 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 3550 to your system. Refer to the Hardware Installation section for details.

## 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/3550mode](http://seacom/utilities/3550mode).

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 **ULTRA SIO-104** to avoid causing damage to the connectors. After the adapter is installed, connect your I/O cable to J1. 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 jumper options before inserting the **ULTRA SIO-104** onto the stack.



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 case cover (if applicable).
3. Gently insert the **ULTRA SIO-104** into the connector noting proper key orientation of the expansion connector on a PC/104 compatible card. The **ULTRA SIO-104** 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 **ULTRA SIO-104** provides the ultimate RS-422/485 serial connection for your PC/104 application. The **ULTRA SIO-104** utilizes the 16850 UART. These chip features programmable baud rates, data format, interrupt control and 128-Byte input and output FIFOs.

## 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-volt DC operation

## Connector Pin-Outs

Signal	Name	Header J1	DB9 (CA152) 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  $RTS_{\pm}$  to  $CTS_{\pm}$ . 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

## 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 (mA)	60 mA

## Physical Dimensions

The **ULTRA SIO-104** is PC/104 "Compliant" meaning that it conforms to all non-optional aspects of the PC/104 Specification, including both the mechanical and the electrical specifications.

Board length	3.775 inches (9.588 cm)
Board Width	3.550 inches (9.017 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. While the Sealevel Systems adapter does allow the sharing of IRQs, many other adapters (i.e., SCSI adapters & on-board serial ports) do not.
4. For Windows operating systems, the diagnostic tool 'WinSSD' is 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.
5. Remember that a loopback test is not possible with the 'NE' jumper in place.
6. 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-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 – 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:

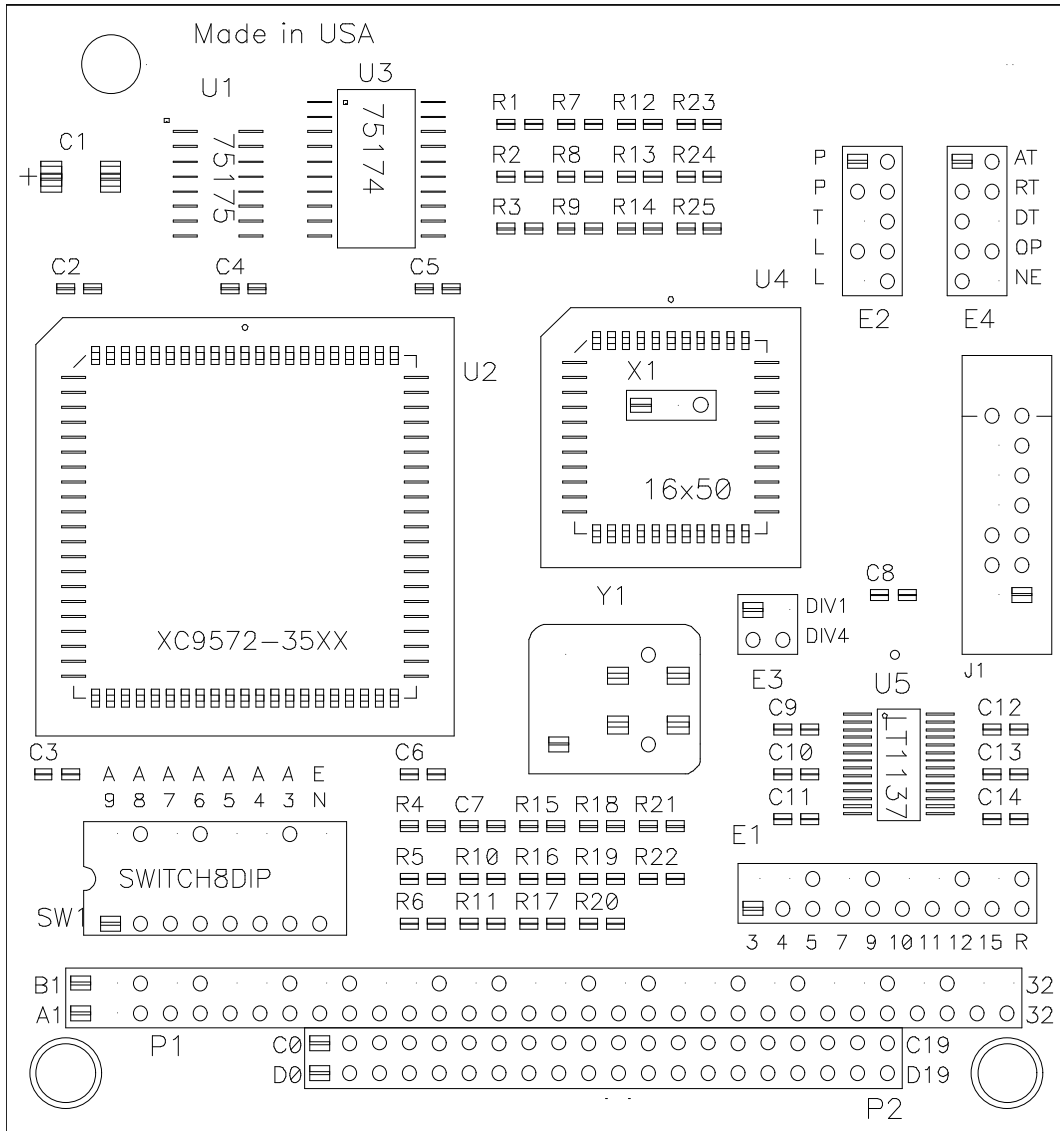
- Reducing the form factor, to 3.550 by 3.775 inches
- Eliminating the need for backplanes or card cages, through its self-stacking bus
- Minimizing component count and power consumption (typically 1-2 Watts per module) by reducing required bus drive on most signals to 4 mA.

Sealevel Systems has been a member of the PC/104 Consortium since its inception.

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](#)

# Appendix E – 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 in 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>

## Trademarks

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