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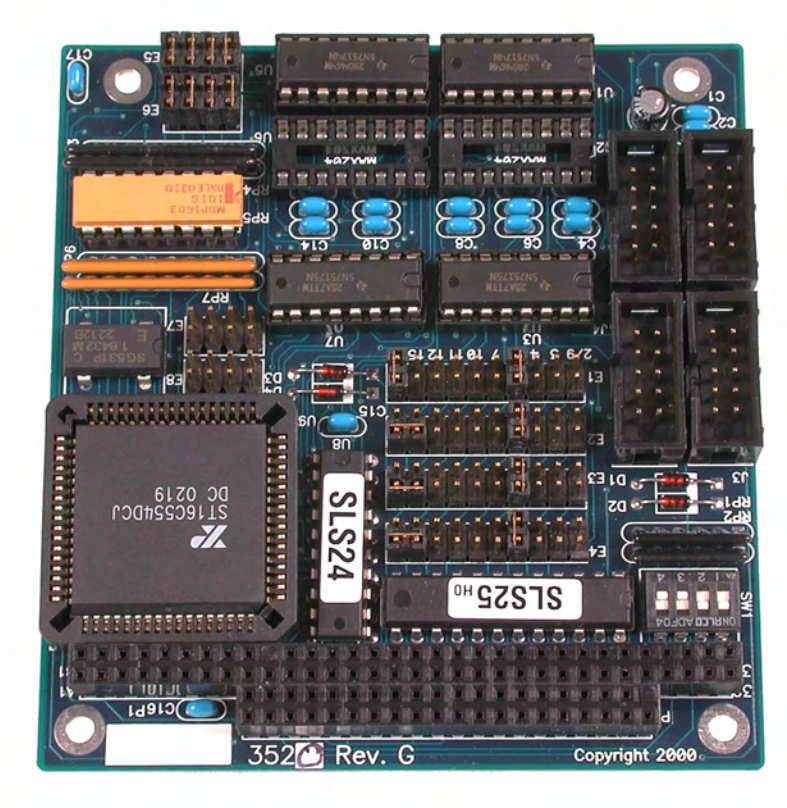
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SEALEVEL
SYSTEMS INCORPORATED

C4-104
Users Manual



Part # 3520, 3521, 3522

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Contents

INTRODUCTION 1

OVERVIEW 1
WHAT'S INCLUDED 1
FACTORY DEFAULT SETTINGS 1

CARD SETUP 2

ADDRESS SELECTION 2
IRQ SELECTION 3
RS-485 MODE (RTS ENABLE) 4
INTERFACE SELECTION 5
RS-232 5
RS-422/485 5
COMBINED RS-232 & RS-422/485 5

INSTALLATION 6

OPERATING SYSTEM INSTALLATION 6
Windows 95/98/ME/NT/2000/XP 6
LINUX 7
QNX 7
PHYSICAL INSTALLATION 7

TECHNICAL DESCRIPTION 8

FEATURES 8
CONNECTOR PIN ASSIGNMENTS 8
RS-232 (Male DB9) 8
RS-422/485 8
STATUS PORT 9

SPECIFICATIONS 10

ENVIRONMENTAL SPECIFICATIONS 10
MANUFACTURING 10
POWER CONSUMPTION 10
PHYSICAL DIMENSIONS 10

APPENDIX A - TROUBLESHOOTING 11

APPENDIX B - HOW TO GET ASSISTANCE 12

APPENDIX C - ELECTRICAL INTERFACE 13

RS-232 13
RS-422 13
RS-485 13

APPENDIX D - PC/104 14

WHAT IS PC/104? 14

APPENDIX E - SILK-SCREEN 15

WARRANTY 16

Figures

Figure 1 - Address Selection Table **2**
Figure 2 - Port to Connector Table **2**
Figure 3 - Headers E1, E2, E3, & E4 - IRQ Selection **3**
Figure 4 - Headers E7 and E8 - RS-485 Enable and Echo Selection **4**
Figure 5 - RS-232 Connector Pin Assignments **8**
Figure 6 - RS-422/485 Connector Assignments **8**

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Introduction

Overview

The Sealevel Systems **C4-104** series provides four selectable RS-232 or RS-422/485 serial I/O ports for your PC/104 application.

What's Included

The **C4-104** is shipped with the following items. If any of these items is missing or damaged, contact the supplier.

- (1) **C4-104** Serial Interface Adapter
- (4) DB-9 Cable Assemblies
- (1) Nylon Hardware Kit
- Sealevel Systems Software

Factory Default Settings

The **C4-104** factory default settings are as follows:

	Base Address	IRQ
Port 1	280	5
Port 2	288	5
Port 3	290	5
Port 4	298	5

For your reference, record installed **C4-104** settings below:

	Base Address	IRQ
Port 1		
Port 2		
Port 3		
Port 4		

Card Setup

The **C4-104** contains several jumper straps for each port that must be set for proper operation.

Address Selection

The **C4-104** occupies four port addresses with each port occupying 8 consecutive I/O locations. A DIP switch (SW1) is used to set the port address options for the **C4-104**. Be careful when selecting the port addresses as some selections may conflict with existing ports. The following table shows the addressing options available with the standard PAL. If you do not see an address option that suits your needs, please contact Sealevel Systems Technical Support about a custom PAL option.

Port1 J1	Port2 J2	Port3 J3	Port4 J4	SW1 1	SW1 2	SW1 3	SW1 4
3F8	2F8	3E8	2E8	On	On	On	On
2F8	3E8	2E8	2E0	On	On	On	Off
3E8	2E8	280	288	On	On	Off	On
280	288	290	298	On	On	Off	Off
2A0	2A8	2B0	2B8	On	Off	On	On
500	508	510	518	On	Off	On	Off
580	588	590	598	On	Off	Off	On

Figure 1 - Address Selection Table

DOS Note: Typically COM1: through COM4: addresses are 3F8, 2F8, 3E8 & 2E8 Hex (this is the first addressing option in the above table). If a COM1: is already present use the second addressing option, this will provide the typical addresses for COM2: through COM4: and a fourth port address at 2E0 Hex

Port #	Connector Location
1	J2
2	J3
3	J4
4	J5

Figure 2 - Port to Connector Table

IRQ Selection

Headers E1-E4 select the Interrupt Request (IRQ) for each serial port. E1 selects the IRQ selection for Port 1, E2 for Port 2, E3 for Port 3, and E4 for Port 4. If COM1: is selected, this jumper must be on the IRQ4 setting. If COM2: is selected, this jumper must be on IRQ3. Consult your particular software for IRQ selection. If no interrupt is desired, remove the jumper.

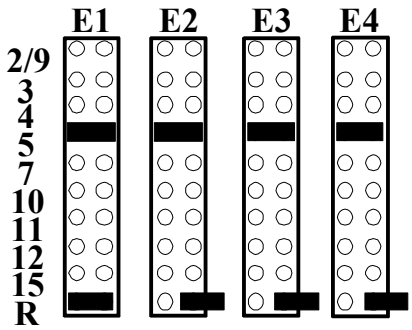


Figure 3 - Headers E1, E2, E3, & E4 - IRQ Selection

Position "**R**" is provided so that you can install a jumper that connects a 1K ohm pull-down resistor to the output of a high-impedance tri-state driver that carries the IRQ signal. Because the IRQ line is driven low only by the pull-down resistor you can have two or more boards which share the same IRQ signal. Position "**R**" installed is the default setting and should be left on unless multiple ports or cards are sharing a single IRQ. If multiple ports or cards are sharing a single IRQ then only one pull-down resistor is needed in the circuit.

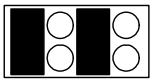
RS-485 Mode (RTS Enable)

E7 & E8 select whether the RS-485 driver is enabled by the UART signal **R**equest **T**o **S**end (RTS) or always enabled. With the jumper installed, RTS enables the RS-485 driver. Removing the jumper enables the driver regardless of RTS. The jumper should be installed for a 2/4 wire RS-485 application where the **C4-104** is acting as a polled node on a multi-drop network. Remove the jumper if you are using a point to point RS-422 application such as **P**rogrammable **L**ogic **C**ontrollers (PLC's), etc. Half-duplex two-wire operation is also possible by connecting TX+ to RX+ and TX- to RX- in your cable hood.

To enable the driver with RTS install jumpers at E7-1 for Port 1, E7-3 for Port 2, E8-1 for Port 3 and E8-3 for Port 4. Failure to correctly set this jumper can cause transmitter contention problems preventing operation by any nodes on the network.

Note: By connecting the TX+ to the RX+ and TX- to RX- you will experience a condition termed RS-485 "Echo". This means that when you transmit a data character it will be "Echoed" back through the receiver circuit, presenting itself as a received data character. This can be useful in RS-485 communications by providing a benchmark for the end of transmission (i.e. when the amount of received data available equals the transmit data count). The RS-485 "Echo" can be disabled at E7 and E8. To disable the echo install a jumper at E7-2 for Port 1, E7-4 for Port 2, E8-2 for Port 3 and E8-4 for Port 4.

The following example shows the drivers in the RS-485 mode and the echo enabled.



E7-1	Port 1 RS-485 Enable
E7-2	Port 1 RS-485 Echo Disable
E7-3	Port 2 RS-485 Enable
E7-4	Port 2 RS-485 Echo Disable
E8-1	Port 3 RS-485 Enable
E8-2	Port 3 RS-485 Echo Disable
E8-3	Port 4 RS-485 Enable
E8-4	Port 4 RS-485 Echo Disable

Figure 4 - Headers E7 and E8 - RS-485 Enable and Echo Selection

Interface Selection

Due to the versatility of the **C4-104**, a wide range of interface configuration options is available to the end user. Please use this section as a guide in configuring your board to provide the interface you require.

RS-232

1. Remove the 75174 drivers at U1 & U5.
2. Install MAX204 drivers at U2 & U6.
3. **Remove** all jumpers at E5 and E6.

RS-422/485

1. Install the 75174 drivers at U1 & U5.
2. Remove MAX204 drivers at U2 & U6.
3. **Install** all jumpers at E5 and E6.

Combined RS-232 & RS-422/485

Please use the following table as a guide in configuring the **C4-104** in this manner.

Configuration	Drivers	Headers E5 and E6
Ports 1 & 2 RS-232 Ports 3 & 4 RS-422	U2 & U5 Installed U1 & U6 Removed	E6 jumpers **Removed** E5 jumpers **Installed**
Ports 1 & 2 RS-422 Ports 3 & 4 RS-232	U1 & U6 Installed U2 & U5 Removed	E6 jumpers **Installed** E5 jumpers **Removed**

Installation

Operating System Installation

Windows 95/98/ME/NT/2000/XP

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.
4. Otherwise, point your browser to the 'Index.htm' on the root of the CD
5. The next step is to select 'Install Software'.
6. Select the part number for your adapter from the listing.
7. Select 'Windows 95/98/ME/NT/2000/XP' then (depending on the OS version) select the 'Run from current Location' or 'Open' option. Follow the information presented on the screens that follow.
8. Run the Add/Remove Hardware utility located in Control Panel. Double click the icon to launch the Wizard. When the Choose Hardware Task appears choose Add/Troubleshoot a device. At that point Windows will search for Plug and Play devices. Since the ISA board is not Plug and Play it will not be found. If Windows finds something you were not expecting, cancel that install and click Next. When Choose a Hardware Device appears select Add a new device. Windows will then ask if you want it to search and you select No, I want to select the hardware from a list. Then click Next. After choosing Next you will see Hardware Type. If you are installing a single port serial card select Ports (COM & LPT). If you are installing a multiport serial card, (two or more ports), choose Multi-port serial adapters. Click Next. The Select a Device Driver window will appear. On the left side find Sealevel Systems, Inc. and on the right side of the window select the card type you are installing.
9. Windows will now show a warning message that it could not detect the settings of the device and that you must enter the settings manually. Click OK. The Add New Hardware Wizard Properties window will appear. This window will show the default settings for the I/O address and one IRQ. The one IRQ will mean that you will be sharing one IRQ for all ports on the board for a multi port card. You will only need one IRQ if installing a single port card. Since Windows cannot detect the settings there my be a conflict with another device or the settings shown may be not the settings you wish to use. To change the settings choose Basic configuration 0001 next to the heading Setting based on:. When this configuration is chosen the Resources window will appear with all question marks. Simply choose each Input/Output Range and IRQ and change the settings to match the board settings. Make sure there are no conflicts with other devices that would appear at the bottom of the window under Conflicting device list. After you have either accepted the default settings or changed the settings, the Start Hardware Installation window will appear. Click Next.
10. The next window that may appear will be the Digital Signature Not Found. Do not search for digitally signed software and continue with the installation. The Completing the Add/Remove Hardware Wizard window will appear. You will be given a chance to change the resource settings again at this point if necessary. Choose Finish. At this point you will need to restart your computer. After restarting the Found New Hardware window will appear for each port that you are installing. To confirm that the drivers installed you can now look in Device Manager under Ports (COM &LPT) and each of the ports should show with their corresponding COM number.

Linux

Refer to D:\software\seacom\Other\Linux**Linux.serial.readme** (where D: = your CDROM driver letter) found on the Sealevel Systems CD. This file contains valuable information on installing your adapter in the various Linux releases. Also in this sub-directory is the **Linux SerialHOWTO.** This series of files explains typical Linux serial implementations, as well as informing the user to Linux syntax and preferred practices.

QNX

Refer to D:\software\seacom\Other\QNX6**Install.readme** (where D: = your CDROM driver letter) found on the Sealevel Systems CD. This file contains valuable information on installing your adapter in the QNX6 Neutrino OS, as well as the files required to ensure a flawless implementation. Also provided on the Sealevel Systems CD are implementation instructions for QNX4. These are found in D:\software\seacom\Other\QNX4**QNX_COM.txt.**

Physical Installation

Extreme care should be taken when installing the **C4-104** to avoid causing damage to the connectors. After the adapter is installed, connect your I/O cables to J1-J4. 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 **C4-104** onto the stack.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover (if applicable).
3. Gently insert the **C4-104** connector P1 noting proper key orientation of the expansion connector on a PC/104 compatible card. The **C4-104** adapter is keyed per the PC/104 Revision 2.1 Specification. This will aid in preventing the adapter from being inserted incorrectly.
4. Mounting hardware (nylon stand-offs and screws) is provided to insure 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.

Installation is complete.

Technical Description

The **C4-104** provides four RS-232 or RS-422/485 serial ports, utilizing a 16554 UART. This chip features programmable baud rates, data format, interrupt control and a 16-byte input and output FIFO. This UART is essentially four 16550 compatible UARTs in a 68 pin PLCC package.

Features

- PC/104 compatible "*Stack Through"* connector for universal mounting.
- 5 volt DC operation.
- DB-9P interface cables provided for ease in connecting.
- All mounting hardware provided.
- Supports TD, RD, RTS, CTS signals.
- Compatible with 16550 specific software.
- RS-422 version Part Number: 3520
- RS-232 version Part Number: 3521
- RS-422/232 version Part number: 3522

Connector Pin assignments

RS-232 (Male DB9)

Signal	Name	DB9	J1-J4	Mode
GND	Ground	5	9	
TD	Transmit Data	3	5	Output
RTS	Request To Send	7	4	Output
RD	Receive Data	2	3	Input
CTS	Clear To Send	8	6	Input

Figure 5 - RS-232 Connector Pin Assignments

Note: These pin assignments meet the EIA/TIA/ANSI-574 DTE for DB-9 type connectors. These are the only pins that can be connected in your cable for RS-232. If any other connections are made your data may become corrupted. If RTS and CTS are not being used terminate them by connecting the pins together. This will help insure the best performance.

RS-422/485

Signal	DB9	DB9	J1-J4	Mode
TX +	Transmit Data Positive	4	7	Output RS-422
TX-	Transmit Data Negative	3	5	Output RS-422
RTS+	Request To Send Positive	6	2	Output RS-422
RTS-	Request To Send Negative	7	4	Output RS-422
GND	Ground	5	9	
RX+	Receive Data Positive	1	1	Input RS-422
RX-	Receive Data Negative	2	3	Input RS-422
CTS+	Clear To Send Positive	9	8	Input RS-422
CTS-	Clear To Send Negative	8	6	Input RS-422

Figure 6 - RS-422/485 Connector Assignments

Status Port

The Sealevel **C4-104** also provides the user with an interrupt status port for greater throughput when servicing multiple ports on a single interrupt line. The interrupt status port is a read only 8-bit port that sets a corresponding bit when an interrupt is pending. Port 1 interrupt line corresponds with bit D0 of the status port, Port 2 with bit D1, Port 3 with bit D2, and Port 4 with bit D3. The status port allows your system to reduce the amount of polling required to service up to four ports. Bits D4 through D7 are not driven by the interrupt status port and can be either a 1 or 0.

The Status Port is located at Base+7 on each port (example: Base=280 Hex, status port=287, 28F, 297, and 29F Hex. All four status ports on the **C4-104** are identical, so any one of the four can be read.

Example: This indicates that Port 2 has an interrupt pending.

	Bit Position:	7	6	5	4	3	2	1	0
	Value Read:	0	0	0	0	0	0	**1**	0

Specifications

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0º to 70º C (32º to 158º F)	-50º to 105º C (-58º to 221º 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	130 mA

Physical Dimensions

The **C4-104** is PC/104 "Compliant" meaning that it conforms to all non-optional aspects of the PC/104 Specification including both mechanical and electrical specifications.

Board Length	3.775 inches	(9.588 cm)
Board Width	3.550 inches	(9.017 cm)

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.

4. Make sure the Sealevel Systems adapter is securely installed.

5. When running DOS or Windows 3.x refer to the supplied Sealevel Software and this User Manual to verify that the Sealevel Systems adapter is configured correctly. This software contains a diagnostic program 'SSD' (D:\software\seacom\Other\DOS\DIAG, where D: = the driver letter of your CDROM drive) will verify if an adapter is configured properly. This diagnostic program is written with the user in mind and is easy to use

6. For Windows95/98/ME/NT/2000/XP, 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.

7. Remember that a loopback test is not possible with the 'No-Echo' selection enabled.

8. Always use the Sealevel Systems diagnostic software when troubleshooting a problem. This will eliminate any software issues from the equation.

-

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 - 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 or EIA/TIA-232. 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 is 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 wide spread 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 at distances less than 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 defines two type 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 partyline 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. The output modem control signal Request to Send (RTS) controls the state of the driver. Some communication software packages refer to RS-485 as RTS enable or RTS block mode transfer. 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 embedding.

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

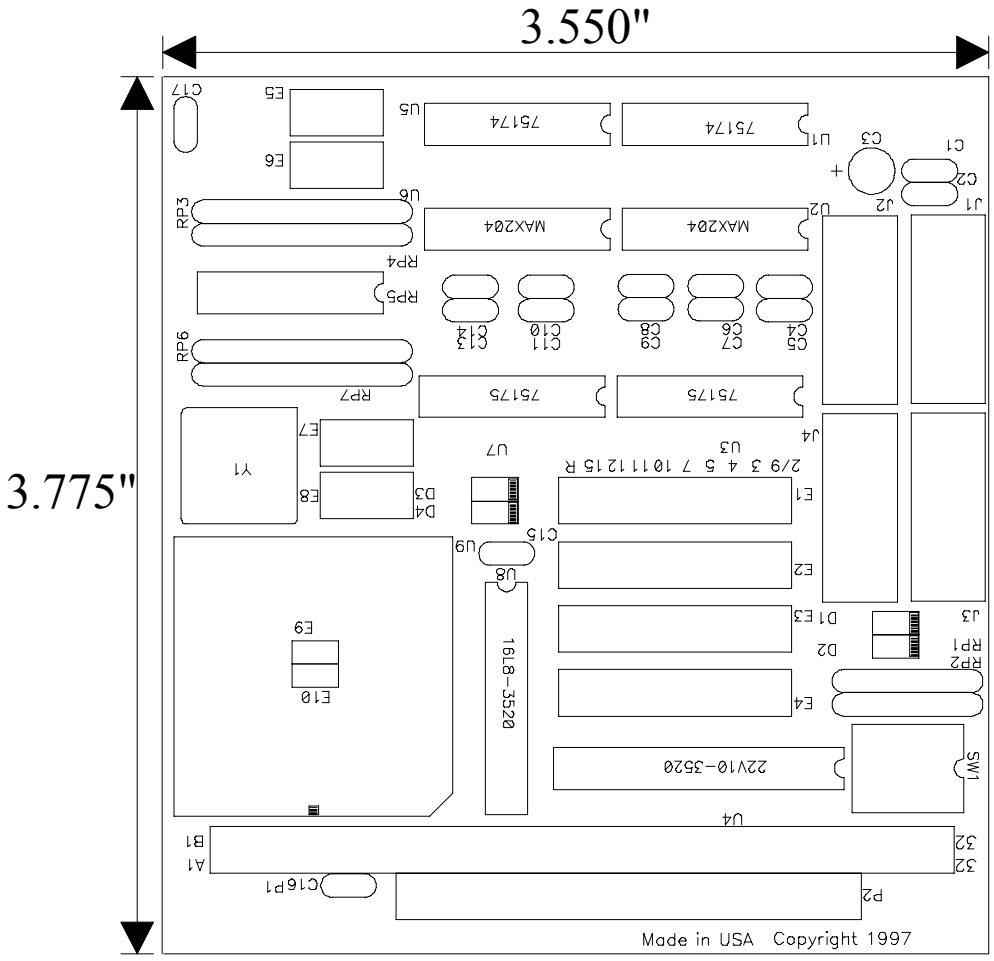
- Reducing the form factor, to 3.550 by 3.775 inches
- Eliminating the need for backplanes or card cages, through its self-stacking bus
- Minimizing component count and power consumption (typically 1-2 Watts per module) by reducing required bus drive on most signals to 4 mA.

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
849 Independence Ave., Suite B
Mountain View, CA 94043
(650) 903-8304 Ph. (650) 967-0995 Fax
http://www.pc104.org
email: pc104@multimanagement.com

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 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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