# SEALEVEL
SYSTEMS INCORPORATED

COMM+232.PCI™
USER MANUAL

Part # 7202

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Introduction

Overview

The Sealevel **COMM+232.PCI** is a two channel PCI Bus serial I/O adapter for the PC and compatibles. It provides two RS-232 serial ports supporting data rates up to 460.8K bps.

The **COMM+232.PCI** works seamlessly with the standard operating system serial driver. UART upgrades are available providing 32. 64 and 128 byte FIFOs.

What's Included

The **COMM+232.PCI** is shipped with the following items. If any of these items are missing or damaged, contact the supplier.

- **COMM+232.PCI** Serial I/O Adapter
- Sealevel Software

Factory Default Settings

The **COMM+232.PCI** factory default settings are as follows:

Port #	Clock Mode
Port 1	DIV4
Port 2	DIV4

To install the **COMM+232.PCI** using factory default settings, refer to Installation on page 4.

For your reference, record installed **COMM+232.PCI** settings below:

Port #	Clock Mode
Port 1	
Port 2	

Card Setup

Address and IRQ selection

The **COMM+232.PCI** is automatically assigned I/O addresses and IRQs by your motherboard BIOS. Only the I/O address may be modified by the user.

Adding or removing other hardware may change the assignment of I/O addresses and IRQs.

Clock Modes

The **COMM+232.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 Headers E1 and E2.

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) position.

E1   **E2**

DIV1 DIV4   DIV4 DIV1
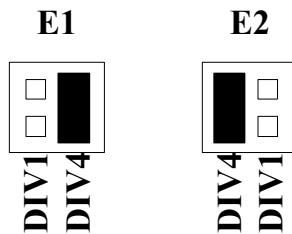
Figure 1 - Clocking Mode 'Divide By 4'

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

E1   **E2**
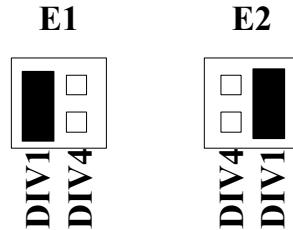
Figure 2 - Clocking Mode 'Divide By 1'

Baud Rates and Divisors for the 'DIV1' mode

The following table shows some common data rates and the rates you should choose 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

Installation

Operating System Installation

For Windows Users

Start by choosing **Install Software at the beginning of the CD. Choose Asynchronous COM: Port Software, SeaCOM.**

Other Operating Systems

Refer to the appropriate section of the Serial Utilities Software.

System Installation

The **COMM+232.PCI** can be installed in any of the PCI expansion slots and contains several jumper straps for each port that must be set for proper operation.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover.
3. Locate an available PCI slot and remove the blank metal slot cover.
4. Gently insert the **COMM+232.PCI** into the slot. Make sure that the adapter is seated properly.
5. Replace the screw.
6. Replace the cover.
7. Connect the power cord.

Installation is complete.

Technical Description

The Sealevel Systems **COMM+232.PCI** provides a PCI interface adapter with 2 asynchronous serial ports providing a versatile interface for modems, printers and plotters.

The **COMM+232.PCI** utilizes the 16550 UART. This chip features programmable baud rates, data format, interrupt control and a 16-byte input and output FIFO. A full array of advanced UARTS is also available for this card. Contact Sealevel Systems for more information.

Interrupts

A good description of an interrupt and its importance to the PC can be found in the book 'Peter Norton's Inside the PC, Premier Edition':

A good analogy of a PC interrupt would be the phone ringing. The phone 'bell' is a request for us to stop what we are currently doing and take up another task (speak to the person on the other end of the line). This is the same process the PC uses to alert the CPU that a task must be preformed. The CPU upon receiving an interrupt makes a record of what the processor was doing at the time and stores this information on the 'stack'; this allows the processor to resume its predefined duties after the interrupt is handled, exactly where it left off. Every main sub-system in the PC has it's own interrupt, frequently called an IRQ (short for **I**nterrupt **ReQ**uest).

In these early days of PC's Sealevel Systems decided that the ability to share IRQs was an important feature for any add-in I/O card. Consider that in the IBM XT the available IRQs were IRQ0 through IRQ7. Of these interrupts only IRQ2-5 and IRQ7 were actually available for use. This made the IRQ a very valuable system resource. To make the maximum use of these system resources Sealevel Systems devised an IRQ sharing circuit that allowed more than one port to use a selected IRQ. This worked fine as a hardware solution but presented the software designer with a challenge to identify the source of the interrupt. The software designer frequently used a technique referred to as 'round robin polling'. This method required the interrupt service routine to 'poll' or interrogate each UART as to its interrupt pending status. This method of polling was sufficient for use with slower speed communications, but as modems increased their throughput abilities this method of servicing shared IRQs became inefficient.

Why use an ISP?

The answer to the polling inefficiency is the **I**nterrupt **S**tatus **P**ort (ISP). The ISP is a read only 8-bit register 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 D1 etc. The use of this port means that the software designer now only has to poll a single port to determine if an interrupt is pending.

The ISP is at Base+7 on each port (Example: Base = 280 Hex, Status Port = 287, 28F… etc.). The **COMM+232.PCI** will allow any one of the available locations to be read to obtain the value in the status register. Both status ports on the **COMM+232.PCI** are identical, so any one can be read.

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

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

Note: Bit positions D7-D2 are not biased in anyway and may report back as either a 1 or a 0. When checking the ISP, these bits should be masked.

Connector Pin Assignments

RS-232 (DB-9 Male)

Name		Pin #	Mode
TD	Transmit Data	3	Output
RTS	Request To Send	7	Output
DTR	Data Term Ready	4	Output
GND	Ground	5	
RD	Receive Data	2	Input
DCD	Data Carrier Detect	1	Input
DSR	Data Set Ready	6	Input
CTS	Clear To Send	8	Input
RI	Ring Indicator	9	Input

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

Specifications

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0º to 50º C (32º to 122º F)	-20º to 70º C (-4º to 158º 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 U. L. 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	+12VDC	-12VDC	+5 VDC
Rating	50 mA	50 mA	480 mA

Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

Physical Dimensions

Board length	5.0 inches	(12.7 cm)
Board Height including Goldfingers	3.5 inches	(8.89 cm)
Board Height excluding Goldfingers	3.175 inches	(8.07 cm)

Appendix A - Troubleshooting

Serial Utility test software is supplied with the Sealevel Systems adapter and will be used in the troubleshooting procedures. By using this software and following these simple steps, most common problems can be eliminated 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 securely installed in a motherboard slot.

4. When running DOS, Windows 3.x or other operating systems refer to the Serial Utilities software for that operating system and the User Manual to verify that the Sealevel Systems adapter is configured correctly. The supplied software contains a diagnostic program 'SSD' that runs under DOS and will verify if an adapter is configured properly. This diagnostic program is written with the user in mind and is easy to use. Refer to the DIAG.txt file in the dos\diag directory for detailed instructions on using 'SSD'.

5. For Windows 95/98 and Windows NT, the diagnostic tool 'WinSSD' is installed in the Sealevel 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.

6. Always use the Sealevel Systems diagnostic software when troubleshooting a problem. This will help eliminate any software issues and identify any hardware conflicts.

PCI COM: Number Selection in Windows 95/98

When installing a multi-port PCI card in Windows 95 the default starting COM: number assigned to the first port will be COM:5 if no COM:5 exists. If there is a COM: 5, 6, etc., the next available COM: number will be assigned to the first port with all additional ports following in ascending order.

To change the first two ports so that Windows assigns them COM: 3 and COM: 4 port enumeration double click the Systems icon in control panel or right click on My Computer and choose properties which will bring you to System Properties. Choose the Device Manager tab and double click on the Multi-Function Adapter heading. This will show all the information concerning the Sealevel adapter. Choose the Resources tab, which will show all resources assigned to the multi-function adapter. Uncheck the Use Automatic Settings box. Notice that with a two port card there will be three input/output, (I/O), ranges listed. With a four port card there will be five input/output, (I/O), ranges listed. The first I/O range is for the PCI bus and should not be changed. The second and third I/O ranges are the ones that need to be changed in order to have those ports enumerated as COM: 3 and COM: 4. Double click on the second I/O range which will allow you to change the address. Highlight the entire I/O range and type: **03e8–03ef** for COM: 3**.** Click OK. Windows will inform you that you have made modifications that may affect other devices. Click OK. Next double click on the third I/O range. Highlight the entire I/O range and type: **02e8–02ef** for COM: 4. Again Windows will inform you that you have made modifications that may affect other devices. Click OK.

Following these steps will change the COM: number assignments on the first two ports to
COM: 3 and 4.

Appendix B - How To Get Assistance

Please refer to Appendix A – Troubleshooting prior to calling Technical Support.

1. Read this manual thoroughly before attempting to install the adapter in your system.

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

4. 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 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. 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 **COMM+232.PCI** is a DTE device.

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.
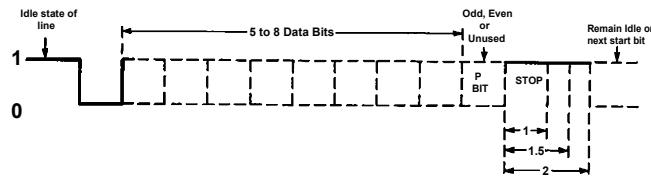

Figure 3 - Asynchronous Communications Bit Diagram

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 refereed 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 - Silk-Screen

3.5"

PORT 2 J2

PORT 1 J1

5.0"

3.175"

C4
C2
C1
C3
C5
GD75232 U2
GD75232 U1

U5 93CS46
C6
R1 R2

16550 SMT U4
16550 SMT U3

C11
C10
R8
R7
C9
C8
R6
R5
R4
R3
C7
R9

MADE IN USA

U6
16L8-7202

U7
PCI9050

DIV1 DIV4 E1
C12

DIV4 DIV1 E2

* E1 & E2 – CLOCK DIV *
DIV1= DIVIDE BY 1
DIV4= DIVIDE BY 4

CE 7202

P1
C16
C15
Y1
C14
R10 74LS74 U8
C13
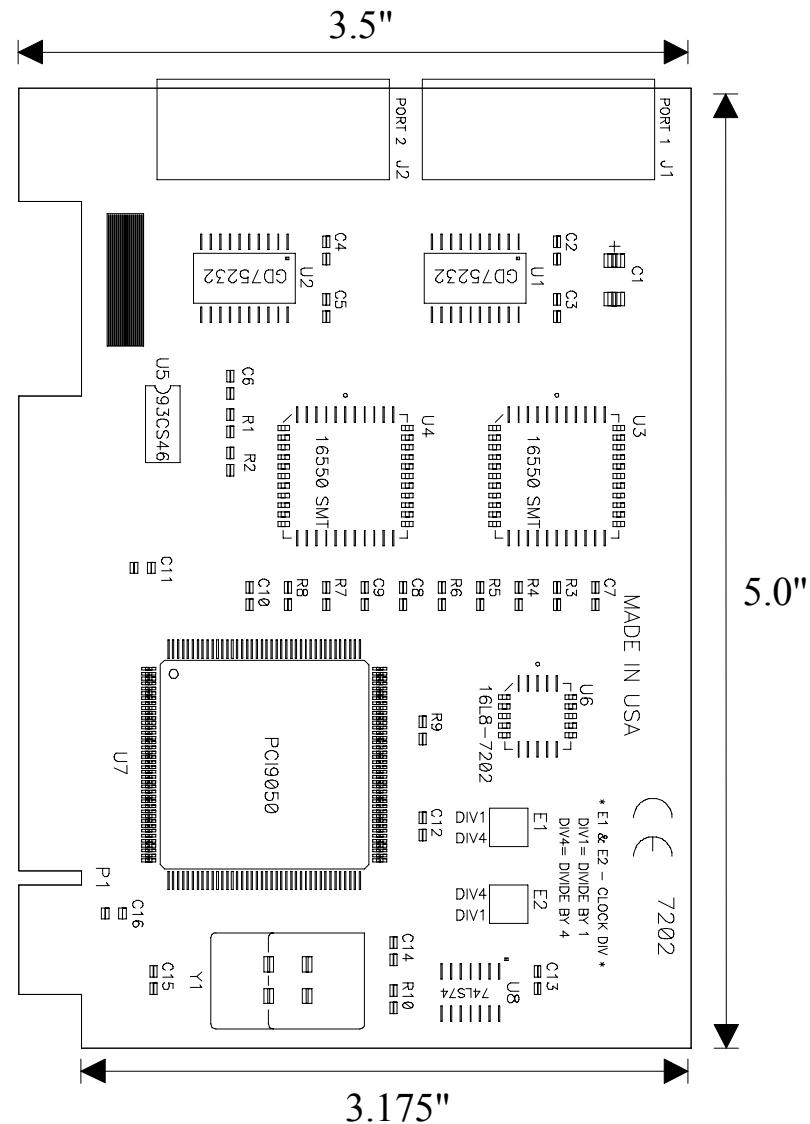
Appendix F - Compliance Notices

Federal Communications Commission Statement

This equipment has been tested and found to comply with the limits for Class B 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 residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

Caution

Sealevel Systems, Inc. is not responsible for any radio or television interference caused by unauthorized modifications of this equipment or the substitution of attachment of connecting cables and equipment other than those specified by Sealevel Systems. Such unauthorized modifications, substitutions, or attachments may void the user's authority to operate the equipment. The correction of interference caused by such unauthorized modifications, substitutions, or attachments will be the responsibility of the user.

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 directives.

Canadian Radio Interference Regulations

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet Appareil numérique de la classe B respecte toutes les exigences de Règlement sur le matériel du Canada

EMC Directive Statement

Products bearing the CE Label fulfill the requirements of the EMC directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission.

To obey these directives, the following European standards must be met:

EN55022 Class B - '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'

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 EMC directives.

Warranty

Sealevel Systems, Inc. provides a lifetime warranty for this product. Should this product fail to be in good working order at any time during this period, Sealevel Systems will, at it's option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

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.

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

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