C3-104™
PART # 3515
USER MANUAL

SECTIONS:

FIGURES:

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SECTION 1. Introduction

The Sealevel Systems ***C3-104*** provides the PC/104 with 2 independent Sync/Async communications ports with data rates up to 500K bps. The ***C3-104*** board provides jumper selectable RS-232, RS-423 or RS-530/422 communications, and has selectable base I/O addressing. The ***C3-104*** allows for software controlled setup of the IRQ, DMA and baud rate.

SECTION 2. Technical Description

The ***C3-104*** provides 2 independent Sync/Async communications ports utilizing the 8530 serial communications controller.

Features include:

- Two channels of Sync / Async communications using 8530
- Data rates up to 500 Kbps
- RS-232C / RS-232D / RS-530/422 / RS-423
- Tx, Rx, RTS, CTS, DSR, DTR, DCD, RI, TXC, RXC, GND, Send Common, Receive Common (RI is always single ended, the rest are both single and differential)
- EIA-530 DTE pin-out using DB-25 connectors
- Switch selectable I/O address
- Jumper selectable electrical interface
- Software controlled set-up of IRQ, baud rate and DMA
- Both ports are DTE
- Uses DMA and Interrupts
- IRQs 3, 4, 7, 9, 10, 11, 12 and 15 supported
- Uses PC/104 compatible stack through connector for universal mounting

SECTION 2.1 Communication Standards Technical Reference

The DB-25 male connectors meet the RS-232 and the RS-530/422 specification for DTE devices. The following sections contain a brief summary of RS-232, RS-423 and RS-530/422.

SECTION 2.1.1 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. It is defined by the EIA as the *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. 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, **D**ata **T**erminal **E**quipment (DTE) and **D**ata **C**ircuit-terminating **E**quipment (DCE). The Sealevel Systems adapter is a DTE interface.

Signal	Name	Pin #	Mode
GND	Ground	7	
RD	Receive Data	3	Input RS-232
CTS	Clear To Send	5	Input RS-232
DSR	Data Set Ready	6	Input RS-232
DCD	Data Carrier Detect	8	Input RS-232
RI	Ring Indicator	22	Input RS-232
RXC	Receive Clock	17	Input RS-232
TXC	Transmit Clock	15	Input / Output RS-232
DTR	Data Terminal Ready	20	Output RS-232
TD	Transmit Data	2	Output RS-232
RTS	Request To Send	4	Output RS-232

Figure 1 - RS-232 Connector Pin-Outs

Technical Note: 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.

SECTION 2.1.2 RS-423

The RS-423 specification defines the electrical characteristics of unbalanced voltage digital interface circuits. The voltage levels defined by RS-423 range from -5 to +5 volts. RS-423 is a single ended interface, meaning that a single electrical signal is compared to a common signal (ground) to determine binary logic states. A voltage of +5 volts represents a binary 0 and -5 volts denotes a binary 1. RS-423 is rated up to 100K bits per second. RS-423 also defines driver and receiver electrical characteristics. RS-423 does not define a physical connector.

Signal	Name	Pin #	Mode
GND	Ground	7	
RD	Receive	16	Input RS-423
CTS	Clear To Send	13	Input RS-423
DSR	Data Set Ready	18	Input RS-423
DCD	Data Carrier Detect	10	Input RS-423
RXC	Receive Clock	12	Input RS-423
TXC	Transmit Clock	9	Input / Output RS-423
TD	Transmit	14	Output RS-423
RTS	Request To Send	19	Output RS-423
DTR	Data Terminal. Ready	21	Output RS-423
Return	Digital RS-423 Return	23	

Figure 2- RS-423 Connector Pin Outs

SECTION 2.1.3 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.

SECTION 2.1.4 RS-530

RS-530 (a.k.a. EIA-530) compatibility means that RS-422 signal levels are met, and the pin-out for the DB-25 connector is specified. The EIA (Electronic Industry Association) created the RS-530 specification to detail the pin-out. The RS-530 is broken into two interfaces: DTE and DCE. In addition to the asynchronous modem control signals on a standard PC serial port.

Signal		Name	Pin #	Mode
GND		Ground	7	
RDB	RX+	Receive Positive	16	Input RS-422
RDA	RX-	Receive Negative	3	Input RS-422
CTSB	CTS+	Clear To Send Positive	13	Input RS-422
CTSA	CTS-	Clear To Send Negative	5	Input RS-422
DSRB	DSR+	Data Set Ready Positive	18	Input RS-422
DSRA	DSR-	Data Set Ready Negative	6	Input RS-422
DCDB	DCD+	Data Carrier Detect Positive	10	Input RS-422
DCDA	DCD	Data Carrier Detect Negative	8	Input RS-422
TDB	TX+	Transmit Positive	14	Output RS-422
TDA	TX-	Transmit Negative	2	Output RS-422
RTSB	RTS+	Request To Send Positive	19	Output RS-422
RTSA	RTS-	Request To Send Negative	4	Output RS-422
DTRB	DTR+	Data Terminal. Ready Positive	21	Output RS-422
DTRA	DTR-	Data Terminal Ready Negative	20	Output RS-422
RXCB	RXC+	Receive Clock Positive	12	Input RS-42
RXCA	RXC-	Receive Clock Negative	15	Input RS-422
TXCB	TXC+	Transmit Clock Positive	9	Input / Output RS-422
TXCB	TXC-	Transmit Clock Negative	17	Input / Output RS-422

Figure 3 - RS-530 / 422 Connector Pin Outs

SECTION 2.2 RS-530 / 422 Line Termination

Typically, each end of the RS-530/422 bus must have line terminating resistors. A 100 ohm resistor is across each RS-530/422 input in addition to a 1K ohm pull-up/pull-down combination that bias the receiver inputs.

The RS-530 specification calls for a 100 ohm 1/2 watt resistor between the signal ground and the chassis ground. On the IBM PC, these two grounds are already connected together, therefore this resistor is omitted.

SECTION 3. Installation

The ***C3-104*** board is installed by carefully inserting Bus connector J1 so that it lines up pin 1 to pin 1(pin 1 is labeled on the Silk-Screen as **B1**) of the expansion connector on a PC/104 compatible card. Mounting hardware (nylon stand-off and screws) is provided to insure a good mechanical connection. Extreme care should be taken when installing this board so as not to cause damage to the connectors. After the board is installed, connect the I/O cables to J3 and J4. Refer to Section 4 and 5 for information on setting the address and jumper options before connecting J1.

SECTION 4. Address Selection

The ***C3-104*** occupies 8 consecutive I/O locations. A dip-switch (SW-1) 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 valid I/O address settings for the ***C3-104*** board. SW-1 sets the I/O address for the ***C3-104*** board.

Address	**Switch Position Setting**		
Hex	1	2	3
300-307	Off	On	On
310-317	On	Off	On
280-287	Off	Off	On
290-297	On	On	Off
238-23F	Off	On	Off
308-30F	On	Off	Off
288-28F	Off	Off	Off

Figure 2 - Address Selection Table

Note: Switch position 4 on SW-1 is ignored.

The following illustration shows the dip-switch setting used to determine the base address. In the example below, the base address 310 Hex is selected.

Figure 4 - Dip switch SW-1

The relative I/O address of the 8530 SCC registers is as follows:

- Base+0 Channel A Data Port
- Base+1 Channel A Control Port
- Base+2 Channel B Data Port
- Base+3 Channel B Control Port
- Base+4 Board Control / Status Port

Where "Base" is the selected board base address.

SECTION 5. Option Selection

The ***C3-104*** contains several jumper straps for the port which must be set for proper operation.

SECTION 5.1 RS-232 Operation

Set Header **E2** to -5V for the selected port. Add the supplied sip resistor (10K ohm pin one common, 8 pin) with pin 1 installed in pin 8 of RP1 (for port 1) or RP2 (for port 2). RS-232 signals include: TD, RD, RTS, CTS, RI, DTR, DCD, TXC, and RXC.

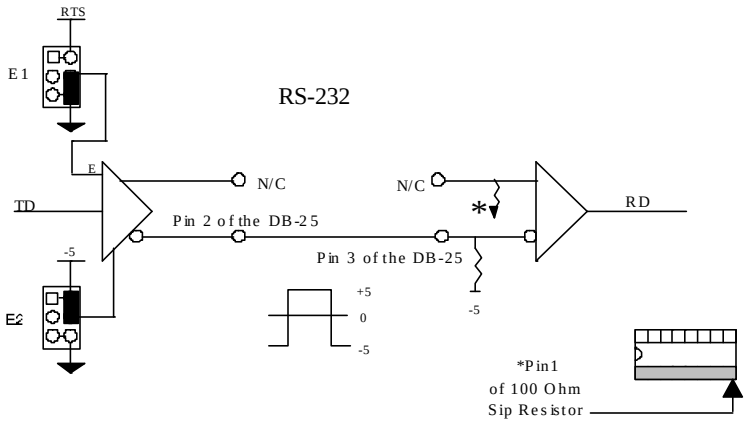

Figure 5 - RS-232 Operation

SECTION 5.2 RS-423 Operation

Set Header **E2** to -5V for the selected port. Add the supplied sip resistor (10K ohm pin one common, 8 pin) with pin 1 installed in pin 9 of RP2 (for port 2) or RP3 (for port 1). RS-423 signals include: TD, RD, RTS, CTS, RI, DTR, DCD, TXC, and RXC.

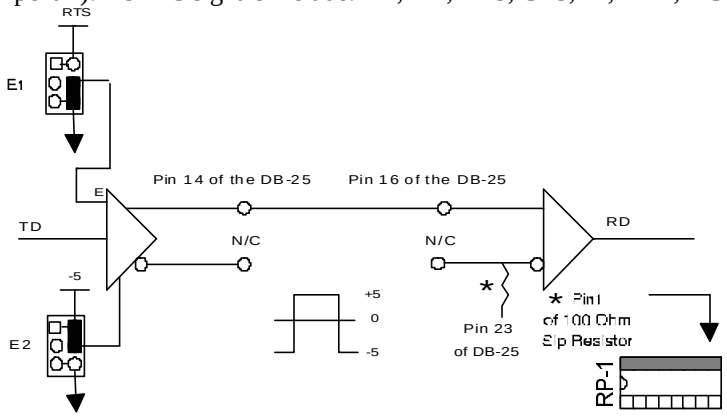

Figure 6- RS-423 Operation

Set Header **E2** to GND for the selected port. Install 100 Ohm 16 pin DIP-resistor into RP1 (for port 1) or RP2 (for port 2), remove it. RS-530/422 signals include: TD±, RD±, RTS±, CTS±, DTR±, DCD±, DSR±, TXC±, TSET± and RXC±.

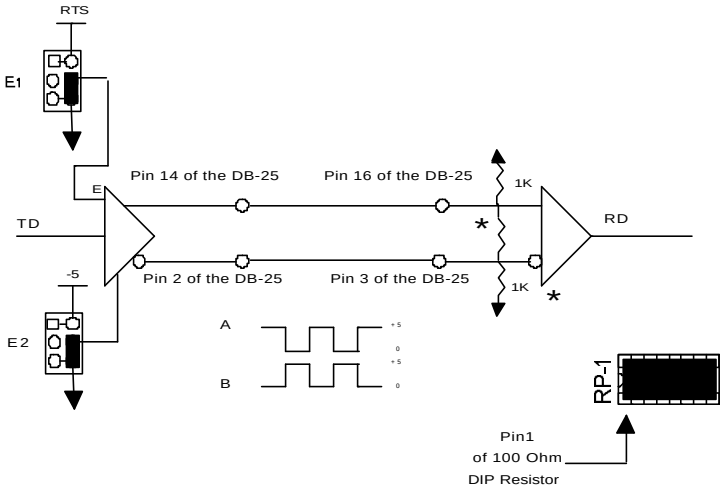

Figure 7 - RS-530/422 Operation

Header E3 Clocking Options

Header E3 selects whether the TXC is to be an input, with the default being output. The following table list the possible options. Signal RXC is always an input.

Pins 1 and 2 covered: TXC for channel B is selected as an input
Pins 3 and 4 covered: TXC for channel A is selected as an input

SECTION 5.4 Programmable Options

The ***C3-104*** occupies eight **i**nput / output (I/O) addresses. The first four are used by the SCC chip, while the fifth address (Base+4) is the address of the on-board ***Control/Status Port.*** This port is used to set the **D**ata **T**erminal **R**eady (DTR) signal, to enable or disable DMA under program control, and to monitor the **D**ata **S**et **R**eady (DSR) input signals from the modem. The following table lists bit positions of the Control/Status port.

Bit:	Output Port Bits	Input Port Bits
0	DTR A 0=On, 1=Off	DSR A 1=On, 0=Off
1	DTR B 0=On, 1=Off	DSR B 1=On, 0=Off
2	IRQ Selection, see table	RI A 1=On, 0=Off
3	IRQ Selection, see table	RI A 1=On, 0=Off
4	IRQ Selection, see table	SCC Interrupt Status, 0=Int Pending
5	DMA Selection , see table	DMA Selection
6	DMA Selection, see table	DMA Selection
7	DMA Selection, see table	DMA Selection

Figure 8 -Control / Status Register Bit Definitions

Software Examples

Bits	**Selection**
xxx000xx	No Interrupt Selected
xxx001xx	IRQ3 Selected
xxx010xx	IRQ7 Selected
xxx011xx	IRQ9 Selected
xxx100xx	IRQ10 Selected
xxx101xx	IRQ11 Selected
xxx110xx	IRQ12 Selected
xxx111xx	IRQ15 Selected
000xxxxx	No DMA Selected
001xxxxx	SCC Wait/REQ ChA DMA1 - DTR/REQ ChA DMA3
010xxxxx	SCC Wait/REQ ChA DMA1 - Wait/REQ ChB DMA3
011xxxxx	SCC Wait/REQ ChB DMA1 - DTR/REQ ChB DMA3

Figure 3 - Status Register Programmable Option Bits

SECTION 5.5 IRQ Selection

The IRQ of the SCC is programmed under software control. Interrupt request level is selected by writing to bits 2, 3 and 4 of the SCC Control/Status Port (Base+4). The Sealevel Systems **C3-104** board supports interrupt levels 3, 7, 9, 10, 11, 12 and 15. Both ports of the **C3-104** share the IRQ.

SECTION 5.6 Direct Memory Access

Direct **M**emory **A**ccess (DMA) can be used to transfer data at very high rates. DMA allows the transfer of data directly to or from system memory bypassing the CPU. The software examples provided on the ACB Developer Toolkit diskette demonstrate the setup and use of DMA.

SECTION 5.7 SECTION 6. Specifications

SECTION 6.1 Environmental Specifications

Specification	Operating	Storage
Temperature Range	0 - 50 º C (32 - 122 º F)	-20 -70 º C (-4 - 158 º F)
Humidity Range	10 - 90% R.H. Non Condensing.	10 - 90% R.H. Non Condensing

Environmental Specifications

SECTION 6.2 Performance Specifications

MTBF	> 150,000 Hours
MTTR	< .25 Hours
Turnaround For Repair	5 Working Days

Performance Specifications

SECTION 6.3 Manufacturing Specifications

IPC 610-A Class-III standards adhered to with a 0.1 visual A.Q.L. and 100% Functional Testing.

SECTION 7. 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.

RETURN AUTHORIZATION MUST BE OBTAINED FROM SEALEVEL SYSTEMS BEFORE RETURNED MERCHANDISE WILL BE ACCEPTED. AUTHORIZATION CAN BE OBTAINED BY CALLING SEALEVEL SYSTEMS AND REQUESTING A RETURN MERCHANDISE AUTHORIZATION (RMA) NUMBER.

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Please refer to your included diskette for any post production manual updates and application specific information.

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

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