C4-104.ULTRA

User Manual | 3541

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Contents

Introduction

Overview

The **C4-104.ULTRA** provides a PC/104 serial interface module with four software-selectable RS-232/422/485 ports. RS-232, RS-422, or RS-485 mode may be selected independently via software command for each of the four ports, eliminating the need for setting jumpers or DIP-switches. The board is designed using the XR16C864 UART, which provides a 128-byte FIFO, 8 times larger than boards designed with 16C550 compatible parts. The larger buffers allow error free operation even in high-speed applications. In RS-485 mode the **C4-104.ULTRA** offers automatic control of the RS-485 driver enable for trouble free network master arbitration. Additionally, the **C4-104.ULTRA** allows RS-485 network termination, critical to robust multi-drop communication, to be selectively added to the circuit via a simple software command.

The RS-232 compatibility allows for connection to devices utilizing the RS-232 electrical interface, such as modems, data-entry terminals, and plotters.

RS-422 provides excellent communications for long distance device connections up to 4000ft., where noise immunity and high data integrity are essential.

RS-485 is optimized for 'Multi-Drop' or 'Party-line' operations selecting data from multiple peripherals (as many as 31 devices can be connected on an RS-485 bus). The **C4-104.ULTRA** is optimized for RS-485 with automatic driver enable, and automatic suppression of RS-485 'Echo' as options, further simplifying integration.

Factory Default Settings

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

	Base Address	IRQ
Port 1	280	5

Before You Get Started

What's Included

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

C4-104.ULTRA Serial I/O Adapter

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.

Card Setup

The **C4-104.ULTRA** contains two DIP-Switches and a jumper strap for each port, which must be set for proper operation.

Address Selection

Each port on the **C4-104.ULTRA** occupies sixteen consecutive I/O locations. A DIP-switch is used to set the base address for these locations. 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.

SW1-1	SW1-2	SW1-3	Port 1	Port 2	Port 3	Port 4
OFF	OFF	ON	300	310	320	330
OFF	ON	OFF	400	410	420	430
OFF	ON	ON	500	510	520	530
ON	OFF	OFF	600	610	620	630
ON	OFF	ON	1500	1510	1520	1530
ON	ON	OFF	3220	3230	3240	3250
ON	ON	ON	4220	4230	4240	4250

Figure 1 - Address Selection Table

Refer to Appendix A for common address contentions.

Port Enable / Disable

All four ports on the 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 the adapter is disabled, be sure to disable the interrupt request by removing the IRQ jumper.

Interrupt Modes

DIP-Switch positions 'S' and 'M' on switch SW1 selects the interrupt mode for the adapter.

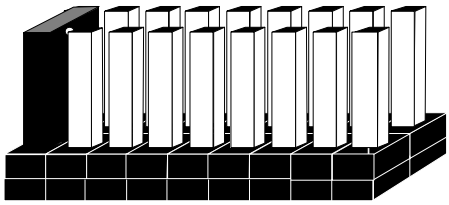
With the '**S**' selected, the adapter is in a (**S**)hared interrupt mode, which allows more than one adapter to access a single IRQ. Any two or more PC-104 adapters can share a common IRQ by placing the jumpers on the same IRQ setting and setting the appropriate selections for interrupt mode.

'**M**' indicates the inclusion of a 1K-ohm pull-down resistor required on one adapter when sharing interrupts.

Set the switch to '**S**' for shared interrupt mode on all adapters sharing an IRQ. On one of the adapters sharing an interrupt set the switches for both '**S**' and for '**M**'. This provides the pull-down resistor circuit that makes sharing IRQs possible. If you are using more than one compatible adapter in a bus, you should only have one port set to '**M**'.

Header E1 (IRQ Selection)

The **C4-104.ULTRA** has a single interrupt selection jumper for all four of the ports, 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.



3457910111215

Figure 2 - Header E1, IRQ Selection (IRQ 3 shown selected)

Clock Modes

The **C4-104.ULTRA** utilizes a 14.7456 MHz oscillator. This is eight times faster than the standard COM: port oscillator, which typically is 1.8432 MHz. This allows the adapter to achieve a maximum data rate of 921.6Kbps. The following sections outline the baud rate calculations and instructions for achieving your desired baud rate.

Baud Rates and Oscillator value

The following table shows some common data rates and the rates you should choose to achieve them when using the **C4-104.ULTRA**. If the O/S of choice is Windows 95/98/ME/2000/NT/XP, the oscillator value (14.7456 MHz) should be entered into the 'Advanced Tab' on 95/98/Me/2000/XP Device Manager applet. Typically this is done automatically when the Sealevel Software driver is loaded.

When using Windows NT, the 'Advanced Ports' applet in the Control Panel should be launched and the oscillator value entered manually in the 'Advanced' tab, or all data rates will be eight (8) times the selected rate. For example if a data rate of 19.2Kbps is selected, the actual data rate will be 153.6Kbps.

When using any other OS (i.e. Linux, or QNX) the following tables should be used.

For this Data Rate	Choose this Data Rate
1200 bps	150 bps
2400 bps	300 bps
4800 bps	600 bps
9600 bps	1200 bps
19.2K bps	2400 bps
57.6 K bps	4800 bps
115.2 K bps	14.4K bps
230.4K bps	28.8K bps
460.8K bps	57.6 K bps
921.6K 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	768
2400 bps	384
4800 bps	192
9600 bps	96
19.2K bps	48
38.4K bps	24
57.6K bps	12
115.2K bps	8
230.4K bps	4
460.8K bps	2
921.6K bps	1

Programmable Features

Each of the ports on the **C4-104.ULTRA** can be individually configured as an RS-232, RS-422, or RS-485 interface. This is a software selectable feature. Electrical Interface selection (RS-232/422/485), RS-422/485 termination, and RS-485 'Echo' control are selected via the 'Control' port (Base + 8). If the Sealevel Software Windows drivers are used, this is accomplished as a function of the Device Manager.

Power up default (D3-D0 = 0) = RS-485 (tri-stated) without termination.

	D3	D2	D1	D0	Control Word Written to Base +8
	Echo	422/485	Termination	Mode	Hex
RS-232	X	X	X	1	1
RS-422 no termination	X	1	0	0	4
RS-422 with termination	X	1	1	0	6
RS-485 no termination no echo	0	0	0	0	0
RS-485 no termination with echo	1	0	0	0	8
RS-485 with termination no echo	0	0	1	0	2
RS-485 with termination with echo	1	0	1	0	A

Line Termination

Typically, each end of the RS-485 bus must have line-terminating resistors (RS-422 terminates at the receive end only). One of the unique features of the **C4-104.ULTRA** is its ability to select this termination via a control word in the control port. It is completely software selectable, thus reducing the complexity of cabling typically found in RS-485 implementations. Typically 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. The **C4-104.ULTRA** mimics this typical termination electrically. If multiple **C4-104.ULTRA** adapters are configured in an RS-485 network, only the boards on each end should have the termination in place**.**

RS-485 'Echo'

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. An RS-485 'No Echo' option is selected by writing the correct control word to the control port.

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 to receive access to the proper driver download and installation instructions.

1. Begin by locating, selecting, and installing the correct software from the Sealevel software driver database.
2. Type in or select the part number (**#3541**) for the adapter from the listing.
3. Select "Download Now" for SeaCOM for Windows.
4. The setup files will automatically detect the operating environment and install the proper components. Follow the information presented on the screens that follow.
5. A screen may appear with text similar to: "The publisher cannot be determined due to the problems below: Authenticode signature not found." Please click the 'Yes' button and proceed with the installation. This declaration simply means that the operating system is not aware of the driver being loaded. It will not cause any harm to your system.
6. During setup, the user may specify installation directories and other preferred configurations. This program also adds entries to the system registry that are necessary for specifying the operating parameters for each driver. An uninstall option is also included to remove all registry/INI file entries from the system.
7. The software is now installed, and you can proceed with the hardware installation.

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/3541mode.**

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.

Physical Installation

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

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 cable to P1. 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 **C4-104.ULTRA** provides 4 RS-232/422/485 software programmable ports from a single PC-104 adapter. The **C4-104.ULTRA** utilizes the 16C864 UART. This chip features programmable baud rates, data format, interrupt control and industry leading 128-byte transmit and receive FIFOs.

Connector Pin-outs

Port 1				Port 2			
P1 Pin #	DB-9	RS-232	RS-422/485	P1 Pin #	DB-9	RS-232	RS-422/485
28	5	GND1	GND1	27	5	GND2	GND2
32	3	TD1	TX1-	23	3	TD2	TX2-
33	7	RTS1	TX1+	22	7	RTS2	TX2+
34	2	RD1	RX1-	21	2	RD2	RX2-
31	8	CTS1	RX1+	24	8	CTS2	RX2+
29	9	RI1		26	9	RI2	
30	4	DTR1		25	4	DTR2	
35	6	DSR1		20	6	DSR2	
36	1	DCD1		19	1	DCD2	

Port 3				Port 4			
P1 Pin #	DB-9	RS-232	RS-422/485	P1 Pin #	DB-9	RS-232	RS-422/485
10	5	GND3	GND3	9	5	GND4	GND4
14	3	TD3	TX3-	5	3	TD4	TX4-
15	7	RTS3	TX3+	4	7	RTS4	TX4+
16	2	RD3	RX3-	3	2	RD4	RX4-
11	9	RI3		6	8	CTS4	RX4+
12	4	DTR3		8	9	RI4	
17	6	DSR3		7	4	DTR4	
18	1	DCD3		1	1	DCD4	
				2	6	DSR4	

Pins 37, 38, 39, 40 on the Box Header (P1) are no connects.

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 ensure 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 Consumption

Supply line	+5 VDC
Rating	400 mA

Physical Dimensions

The SI0-104 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	3.550 inches (9.017 cm)
Board Width	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. Try the Sealevel Systems adapter with 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 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.

5. Make sure the Sealevel Systems adapter is securely installed in a motherboard slot.

6. If you are utilizing an operating system prior to Windows 7, please contact Sealevel's Technical support as directed below to receive more information regarding the utility software which will determine if your product is functioning properly.

7. 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.

8. Remember if a "No Echo" mode is selected, a data loopback cannot be accomplished.

9. 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.

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 https://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 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 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 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. The output modem control signal 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 – 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 starting 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.

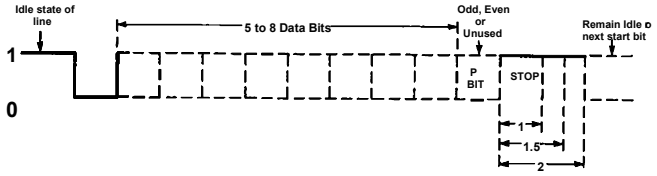
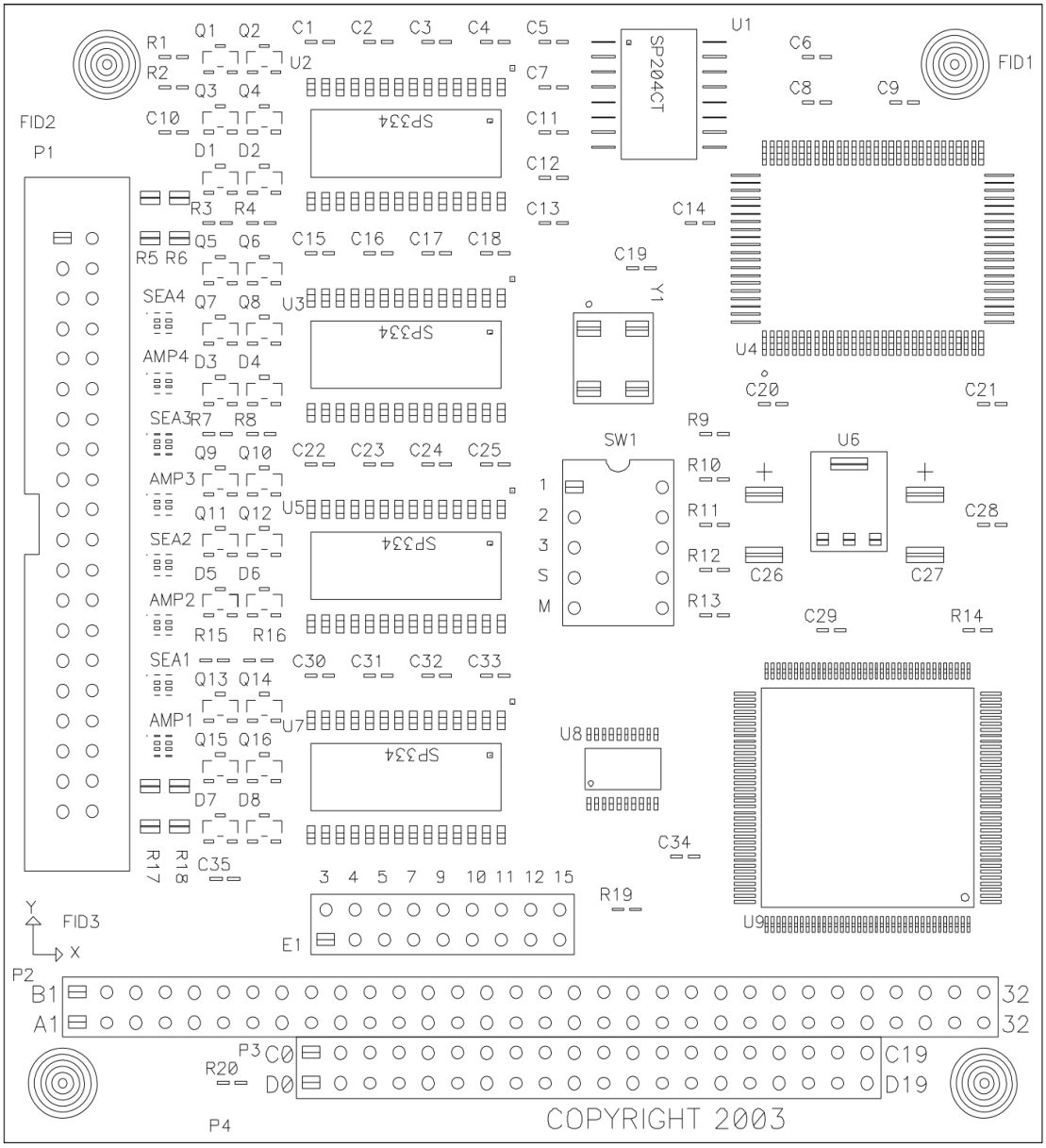


Figure 3 - Asynchronous Communications Bit Diagram

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 – Silk Screen



Appendix F – Compliance Notices

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for Class A 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 commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference in such case the user will be required to correct the interference at the users expense.

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 A** - "Limits and methods of measurement of radio interference characteristics of information technology equipment"
- **EN55024** – "Information technology equipment Immunity characteristics Limits and methods of measurement".

This is a Class A Product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures to prevent or correct the interference.

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/EMC directives.

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, 8:00AM to 5:00PM EST
Phone	864-843-4343
Email	support@sealevel.com

Trademarks

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