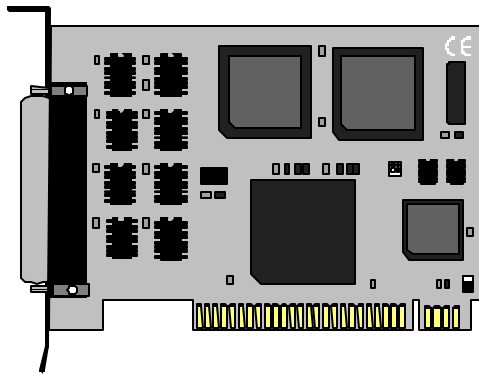


SIO-530TM
USER'S MANUAL
Part Number 3063



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Introduction

Overview

The **SIO-530** provides the PC with one asynchronous serial port which can interface to RS-232, RS-422, RS-485, and 20 mA Current Loop devices.

What's Included

The **SIO-530** is shipped with the following items. If any of these items are missing or damaged, contact the supplier.

- **SIO-530** Serial I/O Adapter
- 3.5" Serial Utility Diskette
- User Manual

Factory Default Settings

The **SIO-530** factory default settings are as follows:

Base Address	IRQ	Electrical Specification
3F8	4	RS-232

To install the **SIO-530** using factory default settings, refer to Installation on page 9.

For your reference, record installed **SIO-530** settings below:

Base Address	IRQ	Electrical Specification

Card Setup

The **SIO-530** contains several jumper straps which must be set for proper operation.

The **SIO-530** occupies 8 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 **SIO-530**.

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.

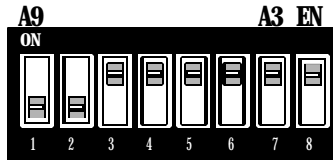


Figure 2 - DIP-Switch Illustration

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

Refer to Appendix A for common address contentions.

Port Enable / Disable

Each port on the **SIO-530** 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”. If any port is disabled, be sure to disable the interrupt request for that port by removing the IRQ jumper.

IRQ Selection

Header E3 selects the interrupt request for the serial port. 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.

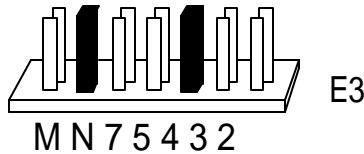


Figure 3 - Header E2 and E3, IRQ Selection

Position “M” & “N” allow the user to select a single interrupt per port mode or a shared interrupt mode. The “N” selects the single interrupt per port mode, which is the typical DOS, OS/2 and Windows 3.1 mode of operation. The “M” selects the shared interrupt mode, which allows more than one port to access a single IRQ, and indicates the inclusion of a 1K ohm pull-down resistor required on one port when sharing interrupts. This mode is used by software that requires COM3: and COM4: to share interrupts with COM1: and COM2: or in an OEM configuration to support a specific software application.

Note: Most communications software applications default COM3: to IRQ4 and COM4: to IRQ3. This requires the sharing of interrupts between COM1: and COM3:, and between COM2: and COM4:. While this is the default, it is not always the preferred setting. Check your software configuration instructions to determine the most appropriate IRQ selection.

Note: The actual Silk-Screen for the **SIO-530** may have a “2” in place of the IRQ “2/9” selection.

Interface Selection

Headers E1 and E2 connect the DB-25 connector (P1) to either RS-232 interface drivers / receivers, RS-422/485 interface drivers / receivers or to the Current Loop receiver interface.

Note: On E2 you must move all eight push-on jumpers. This is required to completely isolate RS-232 signals from RS-422/485 and vice-versa. On E1, however, there are several jumper options.

E2 jumper settings

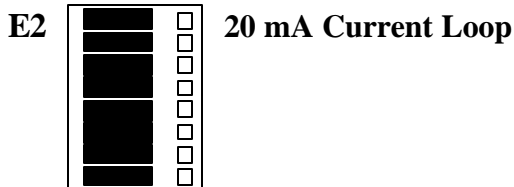
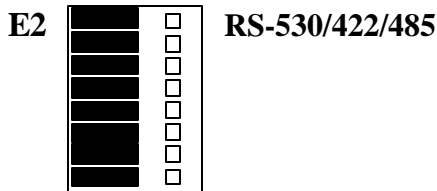
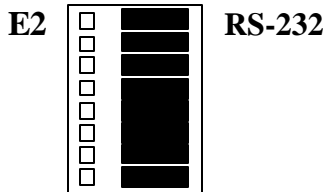


Figure 4 - Header E2 options

E1 Jumper setting for RS-232

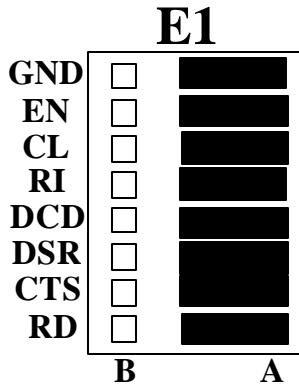


Figure 5 - Header E1 RS-232 Interface Selected

GND	Ground “A” selects normal ground for RS-232.
EN	Enable “A” (Not Applicable to RS-232).
CL	Current Loop “A” selects RS-232 Receive Data.
RI	Ring Indicator “A” enables RI, “B” sets it true.
DCD	Data Carrier Detect “A” selects RS-232.
DSR	Data Set Ready “A” selects RS-232.
CTS	Clear To Send “A” selects RS-232.
RD	Receive Data “A” selects RS-232.

E1 Jumper setting for RS-530 and RS-422

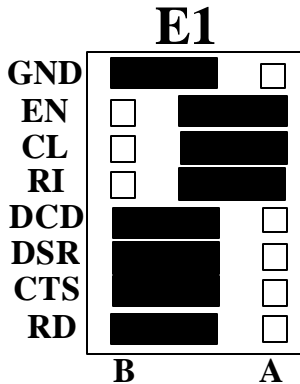


Figure 6 - Header E1 RS-530/422 Interface Selected

GND	Ground “ B ” selects 100 Ohm ground for RS-530/422.
EN	Enable “ A ” position for RS-530.
CL	Current Loop “ A ” selects RS-530 Receive Data.
RI	Ring Indicator (not used on RS-530) “ B ” sets it true.
DCD	Data Carrier Detect “ B ” selects RS-530.
DSR	Data Set Ready “ B ” selects RS-530.
CTS	Clear To Send “ B ” selects RS-530.
RD	Receive Data “ B ” selects RS-530.

E1 Jumper setting for RS-485

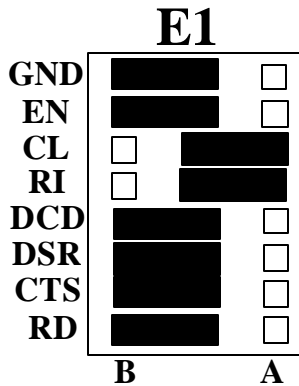


Figure 7 - Header E1 RS-485 Interface Selected

GND	Ground “ B ” selects 100 Ohm ground for RS-485.
EN	Enable driver with RTS “ B ” .” A ” is always enabled.
CL	Current Loop “ A ” selects RS-485 Receive Data.
RI	Ring Indicator not used on RS-485 “ B ” sets it true.
DCD	Data Carrier Detect “ B ” selects RS-485.
DSR	Data Set Ready “ B ” selects RS-485.
CTS	Clear To Send “ B ” selects RS-485.
RD	Receive Data “ B ” selects RS-485.

E1 position “**EN**” is used to enable the driver with RTS. To permanently enable the driver (normal RS-422 point to point mode) remove jumper “**EN**” at E1. ***Failure to correctly set this jumper can cause transmitter contention problems, preventing operation by any nodes on the network.***

E1 position “**GND**” determines whether the board provides a direct ground connection (as in RS-232 and most RS-422), or a 100 Ohm high impedance ground. The 100 Ohm high impedance ground is normally used in RS-485 (and some RS-422) to avoid ground loop currents with long cables.

E1 Jumper setting for 20 mA Current Loop

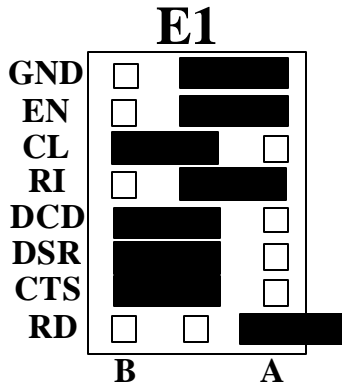


Figure 8 - Header E1 20 mA Current Loop Interface Selected

GND	Ground “A” selects normal ground for Current Loop.
EN	N/A
CL	Current Loop “B” selects Current Loop receive data.
RI	Ring Indicator not used, “B” sets it true.
CD	N/A
DSR	N/A
CTS	N/A
RD	Receive Data - Remove or “Float” on one pin for Current Loop.

Installation

The **SIO-530** can be installed in any of the PC expansion slots, but to access the “AT” or (E)ISA IRQ’s (10, 11, 12, 15) it must be installed in one of the 16 bit slots. The **SIO-530** contains several jumper straps for each port which must be set for proper operation prior to installing the adapter into the computer.

1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover.
3. Locate an available slot and remove the blank metal slot cover.
4. Gently insert the **SIO-530** 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 **SIO-530** provides one async serial port which can interface to RS-232, RS-530, RS-422, RS-485, and 20 mA Current Loop.

Features include:

- DB-25 male connector mounted on board bracket. Port can be addressed as COM1:- 4, or any other I/O address up to 3FF Hex.
- Interrupt Request (IRQ) lines are jumper selected for IRQ 3,4,5 and 2/9.
- RS-232C Interface with all standard PC signals (TD, RD, RTS, CTS, DSR, DCD, DTR, RI) or RS-530/422 interface .
- Serial port interface (RS-232, RS-530/422/485, 20 mA Current Loop) is determined by jumper selection.

The **SIO-530** is designed for asynchronous only operation and therefore implements only those signals associated with async operation. The DTE mode for RS-530 is assumed.

The **SIO-530** utilizes the 16550 UART chip. This chip features programmable baud rate, data format, interrupt control and has a 16 byte transmit and receive FIFO. The **SIO-530** can be addressed as COM1:, COM2:, or any other I/O address up to 3FF Hex, providing total compatibility with most communications software and languages. RS-232, RS-530/422/485, and 20 mA Current Loop compatible drivers and receivers are provided on the serial port.

Connector Pin Assignments

RS-232

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

RS-530/422/485

Signal		Name	Pin #	Mode
GND		Ground	7	
RDB	RX+	Receive Positive	16	Input
RDA	RX-	Receive Negative	3	Input
CTSB	CTS+	Clear To Send Positive	13	Input
CTSA	CTS-	Clear To Send Negative	5	Input
DSRB	DSR+	Data Set Ready Positive	22	Input
DSRA	DSR-	Data Set Ready Negative	6	Input
DCDB	DCD+	Data Carrier Detect Positive	10	Input
DCDA	DCD	Data Carrier Detect Negative	8	Input
TDB	TX+	Transmit Positive	14	Output
TDA	TX-	Transmit Negative	2	Output
RTSB	RTS+	Request To Send Positive	19	Output
RTSA	RTS-	Request To Send Negative	4	Output
DTRB	DTR+	Data Terminal. Ready Positive	23	Output
DTRA	DTR-	Data Terminal Ready Negative	20	Output

RS-530/422/485 Line Termination

Typically, each end of the RS-530/422/485 bus must have line terminating resistors. A 100 ohm resistor is across each RS-530/422/485 input in addition to a 1K ohm pull-up/pull-down combination that bias the receiver inputs.

20 mA Current Loop

Signal	Name	Pin #
	Current Source #1	21
TD+	Transmit Data Positive	25
RD+	Receive Data Positive	12
	Current Source #2	9
TD-	Transmit Data Negative	24
RD-	Receive Data Negative	11
	Ground	7

To perform a loop-back test, connect pins 21 to 25, 24 to 12, and 11 to 7.

Current Loop Connections

Passive Connection

Loop Input: Pin 12 (RD+) to Customer Current Source

Pin 11 (RD-) to Customer TD+ output

Loop Output: Pin 25 (TD+) to Customer Current Source

Pin 24 (TD-) to Customer RD+ Input

Active Connection

Loop Input: Pin 21 (Current Source 1) to Pin 12 (RD+)

Pin 11 (RD-) to Customer TD+

From Customer TD- to Pin 7 (Ground)

Loop Output: Pin 9 (Current Source 2) to Pin 25 (TD+)

Pin 24 (TD-) to Customer RD+

From Customer RD- to Pin 7 (Ground)

Specifications

Environmental Specifications

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

Manufacturing

- IPC 610-A Class-III standards are adhered to with a 0.1 visual A.Q.L. and 100% Functional Testing.
- 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	+12 VDC	-12 VDC	+5 VDC
Rating	50 mA	50 mA	195 mA

Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

Physical Dimensions

Board length	4.9 inches	(12.446 cm)
Board Height including Goldfingers	4.2 inches	(10.66 cm)
Board Height excluding Goldfingers	3.9 inches	(9.91 cm)

Appendix A - Troubleshooting

A Serial Utility Diskette is supplied with the Sealevel Systems adapter and will be used in the troubleshooting procedures. By using this diskette 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 using a unique IRQ. While the Sealevel Systems adapter does allow the sharing of IRQ's, many other adapters (i.e. SCSI adapters & on-board serial ports) do not. 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.
4. Make sure the Sealevel Systems adapter is securely installed in a motherboard slot.
5. Use the supplied diskette and User Manual to verify that the Sealevel Systems adapter is configured correctly. The supplied diskette contains a diagnostic program "SSD" that 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 "README" file on the supplied diskette for detailed instructions on using "SSD".

6. The following are known I/O conflicts:
 - The 278 and 378 settings may conflict with your printer I/O adapter.
 - 3B0 cannot be used if a Monochrome adapter is installed.
 - 3F8-3FF is typically reserved for COM1:
 - 2F8-2FF is typically reserved for COM2:
 - 3E8-3EF is typically reserved for COM3:
 - 2E8-2EF is typically reserved for COM4:
7. Please refer to your included diskette for any post production manual updates and application specific information.
8. Always use the Sealevel Systems diagnostic software when Troubleshooting a problem. This will eliminate the software issue from the equation.

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 forum on CompuServe providing utilities and new product information. This forum is accessed by typing "GO Sealevel" at the command prompt.
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. 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, **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-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, and define a full set of modem control signals that can be used for regulating flow control and line status. The RS-530 specification defines two types of interface circuits, Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The Sealevel Systems adapter is a DTE interface.

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. 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)** 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.

20 mA Current Loop

This communication specification is based on the presence or absence of current, not voltage levels, over the communication lines. The logic of a Current Loop communications circuit is determined by the presence or absence of current (typically + or - 20 mA). When referring to the specification, the current value is usually stated (i.e. 20 mA Current Loop). Current Loop is used for point to point communication and there are typically two current sources, one for transmit and one for receive. These two current sources may be located at either end of the communication line. To ensure a proper current path to ground, or loop, the cabling of two current loop communication ports will depend on the location of the current sources. Current Loop is normally good for data rates up to 19.2 Kbps. This limitation is due to the fact that the drivers and receivers are usually optically isolated circuits that are inherently slower than non-isolated equivalent circuits.

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. Character boundaries for asynchronous communications are defined by a starting bit followed by a pre-defined number of data bits (5, 6, 7, or 8). The end of the character is defined by the transmission of a pre-defined number of stop bits (usual 1, 1.5 or 2). An extra bit used for error detection is often appended before the stop bits.

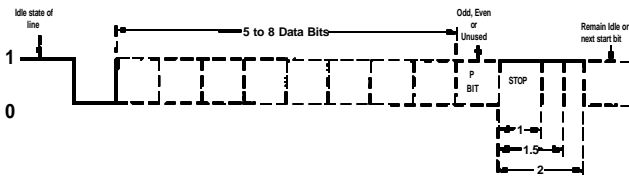
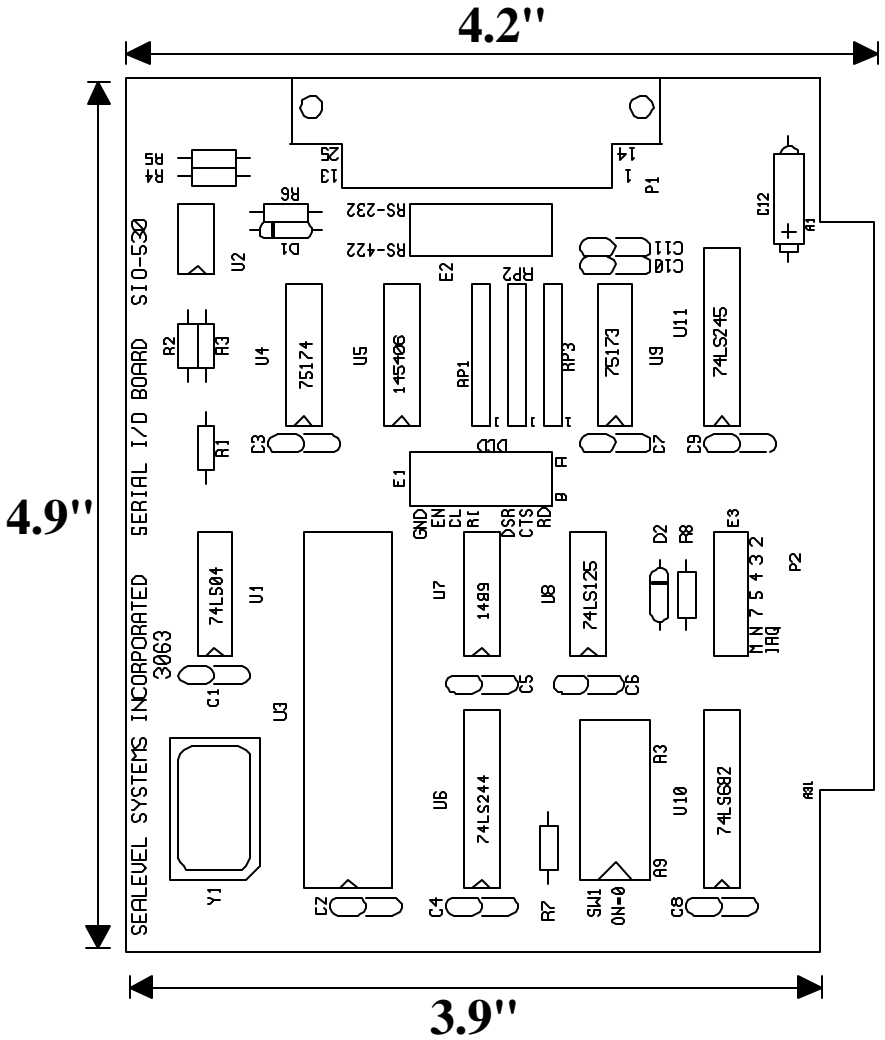


Figure 9 - Asynchronous Communications Bit Diagram

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 - Schematic

Appendix G - Compliance Notices

Federal Communications Commission Statement

FCC - 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 his own expense.

EMC Directive Statement



Products bearing the CE Label fulfill the requirements of the EMC directive (89/336/EWG) and of the low-voltage directive (73/23/EWG) 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"
- **EN50082-1** - "Electromagnetic compatibility - Generic immunity standard"
- Part 1 : Residential, commercial and light industry
- **EN60950 (IEC950)** - "Safety of information technology equipment, including electrical business equipment"

Warning

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.

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 Systems, Inc. warrants this product to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, Sealevel Systems will, at its 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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Technical Support is available from 8 a.m. to 5 p.m. Eastern time.
Monday - Friday

Trademarks

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