SEALEVEL
SYSTEMS INCORPORATED

SIO-II™

USER'S MANUAL

Part Number 3062

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Introduction

Overview

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

What's Included

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

- **SIO-II** Serial I/O Adapter
- RS-232 Interface Chips (1488 & 1489)
- RS-422/485 Interface Chips (Installed on Card)
- Serial Utility Software
- User Manual

Factory Default Settings

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

Base Address	IRQ	Electrical Specification
3F8	4	RS-422

To install the **SIO-II** using factory default settings, refer to Installation on page 5.

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

Base Address	IRQ	Electrical Specification

Card Setup

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

Address Selection

The **SIO-II** occupies 8 consecutive I/O locations. The 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 PC ports. The **SIO-II** has a total of 8 I/O address selections, if more than one switch is closed the board will be non-functional. Leaving all eight switches open will disable the port.

3F8-3FF Hex
(COM1:)
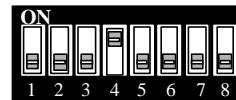
3B8-3BF Hex
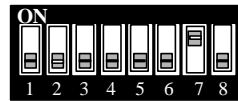
378-37F Hex
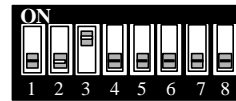
338-33F Hex
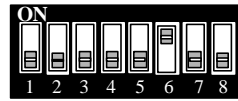
2F8-2FF Hex
(COM2:)
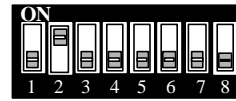
2B8-2BF Hex
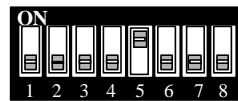
278-27F Hex
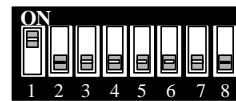
238-23F Hex

Figure 1 - DIP-Switch Illustration

Refer to Appendix A for common address contentions.

Interface Selection

Note: Only one interface can be selected at a time.

RS-232

The RS-232 option is selected when the RS-232 driver/receiver pair are installed at locations U17 (**1488**) and U11 (**1489**) and Header E5 is set to **"B"**. If the **SIO-II** is in it's default configuration, U6 (**75173**) and U7 (**75174**) must be removed.

RS-422

The RS-422 option is selected when the RS-422/485 driver/receiver pair are installed at U6 (**75173**) and U7 (**75174**) and Header E5 is set to **"B"**.

RS-485

The RS-485 option is installed when the RS-422/485 chips are installed at U6 (**75173**) and U7 (**75174**). The output of the RS-422/485 driver is capable of being **Active** (enabled) or **Tri-State** (disabled) for RS-485 compatibility. Header E2 selects whether the RS-485 driver is enabled by the UART signal **R**equest **T**o **S**end (RTS) or always enabled. With the jumper installed at Header E2, RTS enables the driver (RS-485). Removing the jumper from Header E2 enables the driver regardless of RTS (RS-422). Header E5 should be set to **"B"** for RS-485.

20 mA Current Loop

The 20 mA Current Loop option is installed when the RS-422/485 chips are installed at U6 (**75173**) and U7 (**75174**) and Header E5 is set to **"A"**.

IRQ Selection

The **SIO-II** has an interrupt selection jumper that should be set prior to use. Consult the user manual for the application software being used to determine the proper setting. E1 and E9 select the interrupt request for the port. A jumper at position 3 of E1 selects IRQ3, at position 4, IRQ4 is selected, and if the jumper is placed on E9, IRQ5 is selected. If no IRQ is required, remove the jumper completely.
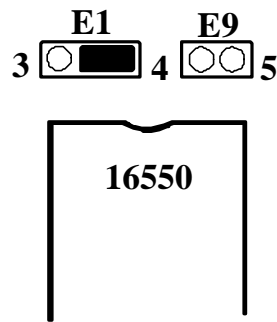
Figure 2 - Header E1 & E9, IRQ Selection (Shown in Factory Default)

Installation

System Installation

The **SIO-II** can be installed in any available PC ISA expansion slot. The **SIO-II** contains several jumper straps for each port which must be set for proper operation.

1. Determine the interface required (RS-232, RS-422, RS-455, or 20 mA Current Loop) and configure the **SIO-II** accordingly. (Refer to the section on Card Setup)
2. Turn off PC power. Disconnect the power cord.
3. Remove the PC case cover.
4. Locate an available slot and remove the blank metal slot cover.
5. Gently insert the **SIO-II** into the slot. Make sure the adapter is seated properly.
6. Replace the screw.
7. Replace the cover.
8. Connect the power cord.

Installation is complete.

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.

Technical Description

The **SIO-II** board utilizes the 16550 UART chip. This chip features programmable baud rate, data format, interrupt control and has a 16 byte transmit and receive FIFO.

Features

- Port can be addressed as COM1:, COM2:, or 6 other pre-defined addresses

- Interrupt Request (IRQ) lines are jumper selected for IRQ 3,4, and 5

- Interrupt can be shared with other sharable interrupts

- Versatile serial port interface (RS-232, RS-422, RS-485, or 20 mA Current Loop)

Connector Pin Assignments

RS-422/485

Signal	Name	Pin #	Mode
GND	Ground	7	
RX+	Receive Positive	12	Input
RX-	Receive Negative	13	Input
CTS+	Clear To Send Positive	10	Input
CTS-	Clear To Send Negative	11	Input
DSR+	Data Set Ready Positive	8	Input
DSR-	Data Set Ready Negative	9	Input
TX+	Transmit Positive	24	Output
TX-	Transmit Negative	25	Output
RTS+	Request To Send Positive	22	Output
RTS-	Request To Send Negative	23	Output
DTR+	Data Terminal Ready Positive	20	Output
DTR-	Data Terminal Ready Negative	21	Output

Figure 3 - RS-422/485 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
TD	Transmit Data	2	Output
RTS	Request To Send	4	Output
DTR	Data Term Ready	20	Output

Figure 4 - RS-232 Connector Pin Assignments

20 mA Current Loop

Signal	Name	Pin #	Mode
TX+	Transmit Positive	14	Output
TX-	Transmit Negative	16	Output
RX+	Receive Positive	15	Input
RX-	Receive Negative	17	Input
20 mA Source	12V 20 mA Current Source	18	

Figure 5 - 20mA Current Loop Connector Pin Assignments

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

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	(12.45 cm)
Board Height including Goldfingers	4.2 inches	(10.66 cm)
Board Height excluding Goldfingers	3.9 inches	(9.91 cm)

Please see Appendix E for board layout and dimensions.

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 and 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.txt" file on the supplied diskette for detailed instructions on using "SSD". For Windows 95 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. The following are known I/O conflicts:

    - The 278 and 378 settings may conflict with your printer I/O adapter.
    - 3B8-3BF cannot be used if a Monochrome adapter is installed.
    - 3F8-3FF is typically reserved for COM1:
    - 2F8-2FF is typically reserved for COM2:
    - 238-23F may conflict with a Bus Mouse

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 Troubleshooting Guide 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. 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.

RS-422

The RS-422 specification defines the electrical characteristics of balanced voltage digital interface circuits. RS-422 is a differential interface that defines voltage levels and driver/receiver electrical specifications. On a differential interface, logic levels are defined by the difference in voltage between a pair of outputs or inputs. In contrast, a single ended interface, for example RS-232, defines the logic levels as the difference in voltage between a single signal and a common ground connection. Differential interfaces are typically more immune to noise or voltage spikes that may occur on the communication lines. Differential interfaces also have greater drive capabilities that allow for longer cable lengths. RS-422 is rated up to 10 Megabits per second and can have cabling 4000 feet long. RS-422 also defines driver and receiver electrical characteristics that will allow 1 driver and up to 32 receivers on the line at once. RS-422 signal levels range from 0 to +5 volts. RS-422 does not define a physical connector.

RS-485

RS-485 is backwardly compatible with RS-422; however, it is optimized for partyline or multi-drop applications. The output of the RS-422/485 driver is capable of being **Active** (enabled) or **Tri-State** (disabled). This capability allows multiple ports to be connected in a multi-drop bus and selectively polled. RS-485 allows cable lengths up to 4000 feet and data rates up to 10 Megabits per second. The signal levels for RS-485 are the same as those defined by RS-422. RS-485 has electrical characteristics that allow for 32 drivers and 32 receivers to be connected to one line. This interface is ideal for multi-drop or network environments. RS-485 tri-state driver (not dual-state) will allow the electrical presence of the driver to be removed from the line. 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 **R**equest **T**o **S**end (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 states (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 **U**niversal **A**synchronous **R**eceiver **T**ransmitter (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.
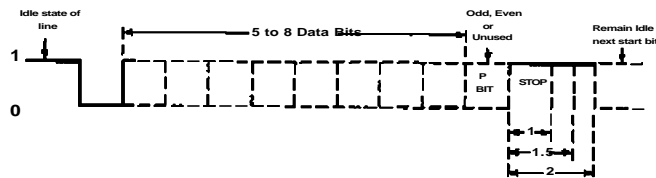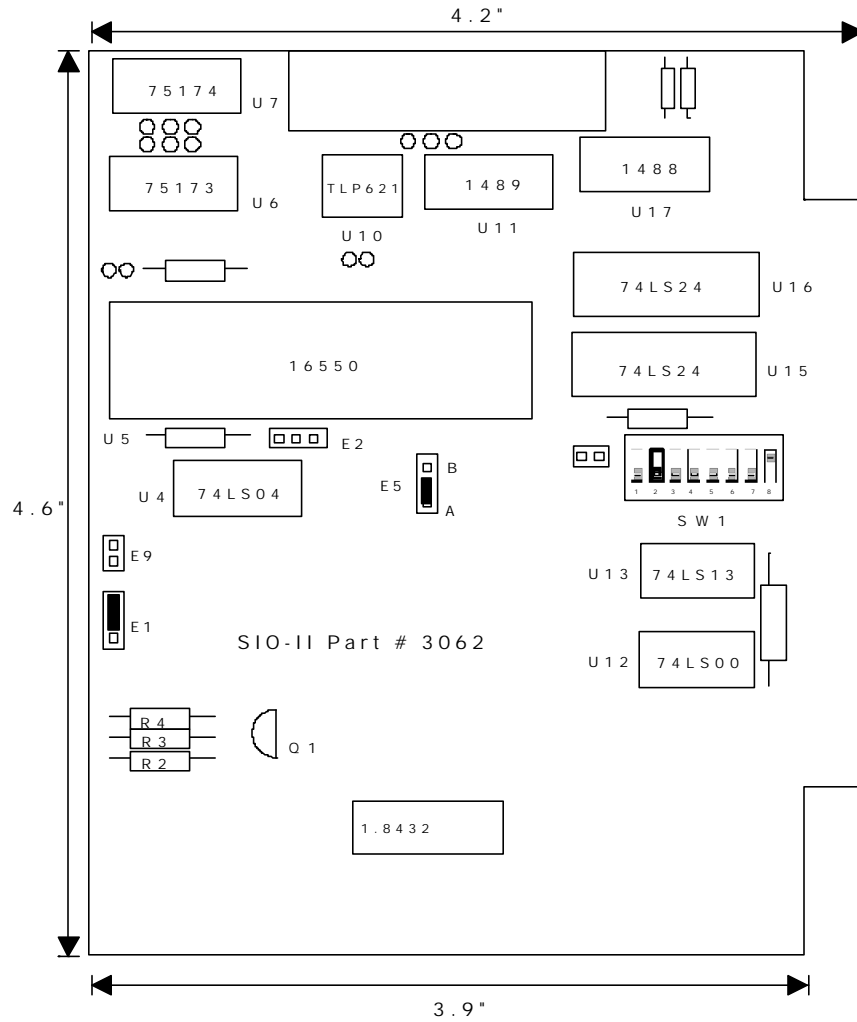

Figure 6 - Asynchronous Communications Bit Diagram

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

4.2"

75174	U 7
75173	U 6
TLP621 U10	1489 U11	1488 U17

74LS24 U 16

74LS24 U 15

16550

U 5   E 2

U 4   74LS04

E 5   B / A

SW 1

E 9

E 1

U 13   74LS13

SIO-II Part # 3062

U 12   74LS00

R 4
R 3
R 2

Q 1

1.8432

4.6"

3.9"

Appendix F - Schematic

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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