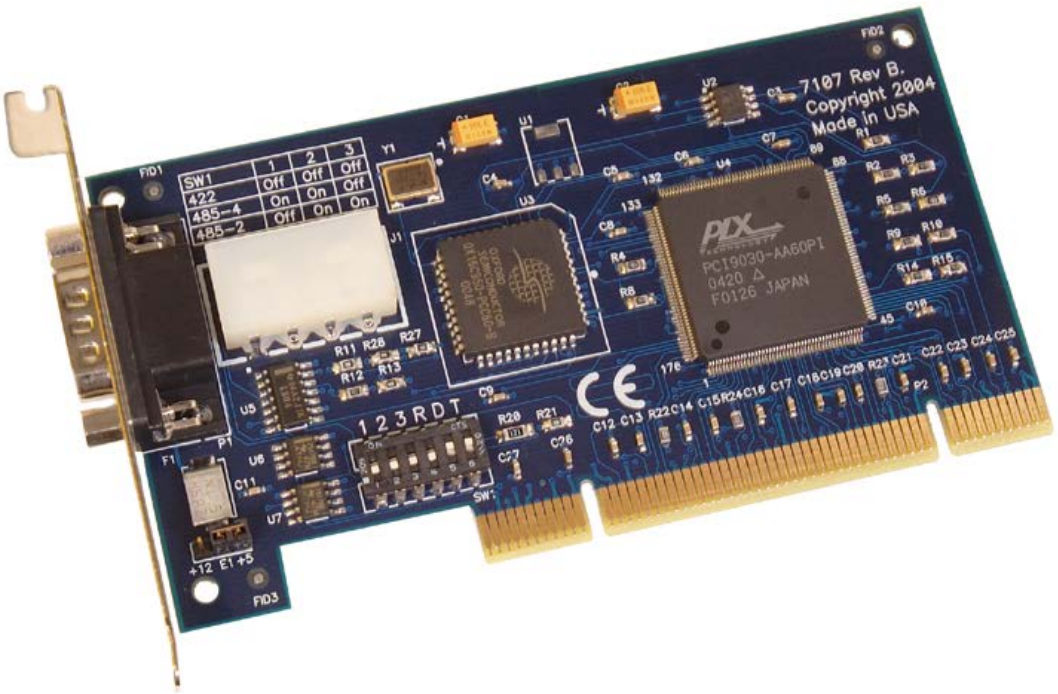
SIO-485.LPCI User Manual



Part Number 7107

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Table of Contents

INTRODUCTION **1**

Other Sealevel Low Profile PCI Serial I/O Products 1

BEFORE YOU GET STARTED **2**

What's Included 2

Optional Items 2

SOFTWARE INSTALLATION **3**

Windows 95/98/ME/NT/2000/XP 3

Linux 3

3rd Party Software Support 3

PHYSICAL INSTALLATION **4**

Physical Connection 4

CARD SETUP **5**

Address and IRQ selection 5

Electrical Interface Selection 5

Line Termination 5

RS-485 'Echo' 5

Clock Modes 5

RS-485 Enable Modes 7

ELECTRICAL CHARACTERISTICS **8**

Specifications 8

APPENDIX A - TROUBLESHOOTING **9**

APPENDIX B - HOW TO GET ASSISTANCE **10**

APPENDIX C – ELECTRICAL INTERFACE **11**

RS-422 11

RS-485 11

APPENDIX D - ASYNCHRONOUS COMMUNICATIONS **12**

APPENDIX E – SILK SCREEN – 7107 PCB **13**

APPENDIX F - COMPLIANCE NOTICES **14**

Federal Communications Commission Statement 14

WARRANTY **15**

Introduction

The SIO-485.LPCI, Item Number 7107, is a low profile PCI module that provides a single RS-422/485 serial interface port. The board is designed using the OX16C950 UART, which features a 128-byte FIFO and flexible clock prescalar (from 1 to 31.875), with support for 9-bit protocol and isochronous mode.

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 SIO-485.LPCI is designed to be used with a variety of Operating Systems including Windows 98/NT/ME/2000/XP, Linux and DOS. The SeaCOM API (Application Programmer Interface) included on CD with the SIO-485.LPCI provides a variety of useful high-level function calls implemented as a Windows dynamic link library (DLL) and as a Linux kernel module and library. In addition to the API, SeaCOM includes sample code and utilities to simplify software development.

Other Sealevel Low Profile PCI Serial I/O Products

COMM+850.LPCI	(P/N 7104)	- 1-Port RS-232
Ultra 530.LPCI	(P/N 7106)	- 1-Port RS-232/422/485
Ultra COMM+I.LPCI	(P/N 7108)	- 1-Port Isolated RS-232/422/485
Ultra COMM+2.LPCI	(P/N 7205)	- 2-Port RS-232/422/485
COMM+4.LPCI	(P/N 7406)	- 4-Port RS-232
COMM+8.LPCI	(P/N 7803)	- 8-Port RS-232

Before You Get Started

What's Included

The SIO-485.LPCI is shipped with the following items. If any of these items is missing or damaged please contact Sealevel for replacement.

- **SIO-485.LPCI Adapter**
  - **7107 includes low profile PCI bracket**
  - **7107S includes standard size PCI bracket**
- **Sealevel SeaCOM Software CD**

Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing the SIO4-104.485. All items can be purchased from our website (http://www.sealevel.com/) or by calling 864-843-4343.

- **DB9 Female to RJ45 modular adapter (Item Number DB112)**
  The DB112 is pinned out for RS-485 signals and converts the 7107 DB9 Male connector to an RJ45 connection. Designed for use with SeaI/O M-series modules, it takes power from pin 9 on the 7107 and sends it out over any standard RJ45 patch cable. This eliminates the need for an external power supply when communicating with SeaI/O RS-485 devices.
- **DB9 Male to DB9 Female Optomux adapter (Item Number DB103)**
  The DB103 is designed to convert a Sealevel DB9 Male connector to a pinout compatible with AC24AT and AC422AT Opto-22 ISA bus cards. This allows Optomux devices to be controlled from any Sealevel RS-422 board with a DB9 Male connector.
- **DB9 Male to DB9 Male Sony SMPTE 207M cable (Item Number CA190)**
  This cable allows any Sealevel RS-422 adapter with a DB-9 to connect directly to a Sony (or compatible) 207M 9-Pin connector.

Software Installation

Windows 95/98/ME/NT/2000/XP

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

1. Start Windows.
2. Insert the Sealevel Systems CD in to your CD drive.
3. If 'Auto-Start' is enabled for this drive the software will automatically launch. Otherwise, point your browser to the 'Index.htm' on the root directory of the CD
4. Select 'Install Software'.
5. Select the Part Number for your adapter from the listing.
6. Select 'Windows 98/ME/2000/XP'. The setup file will automatically detect the operating environment and install the proper components. Next (depending on the OS version) select the 'Run this program from its current location' or 'Open' option. Follow the information presented on the screens that follow.
7. A screen may appear with the declaration: "The publisher cannot be determined due to the problems below: Authenticode signature not found." Please select 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.
8. 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.

Linux

Refer to D:\software\seacom\Other\Linux**Linux.serial.readme** (where D: = your CDROM driver letter) found on the Sealevel Systems CD. This file contains valuable information on installing your adapter in the various Linux releases. Also in this sub-directory is the **Linux SerialHOWTO.** This series of files explains typical Linux serial implementations, as well as informing the user to Linux syntax and preferred practices.

3rd Party Software Support

Third party software support for many HMI/MMI and other process control software is included on the product installation CD. For the most up to date information on third party software support, please visit http://www.sealevel.com/thirdpartysoftware.asp.

Physical Installation

The adapter can be installed in any PCI expansion slot.

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

1. **Turn off PC power. Disconnect the power cord.**
2. Remove the PC case cover.
3. Locate an available PCI slot and remove the blank metal slot cover.
4. Gently insert the PCI adapter into the slot. Make sure that the adapter is seated properly.
5. Replace the screw. (This is required to ensure FCC Part 15 compliance.)
6. Replace the cover.
7. Connect the power cord
8. Installation is finished.

The SIO-485.LPCI is now ready for use.

Physical Connection

RS-422

Signal	Name	Pin #	Mode
GND	Ground	5	
TX +	Transmit Data Positive	4	Output
TX-	Transmit Data Negative	3	Output
RX+	Receive Data Positive	1	Input
RX-	Receive Data Negative	2	Input
5V/12V	Power selected by E1	9	Output

RS-485

Signal	Name	Pin #	Mode
GND	Ground	5	
DATA+	Data Positive	1	I/O
DATA-	Data Negative	2	I/O
5V/12V	Power selected by E1	9	Output

Card Setup

Address and IRQ selection

The SIO4-104.485 is automatically assigned I/O addresses and IRQs by your motherboard BIOS. Only the I/O address may be modified by the user. Adding or removing other hardware may change the assignment of I/O addresses and IRQs.

Electrical Interface Selection

The SIO-485.LPCI can be individually configured via SW1 as RS-422, or as a two/four wire RS-485 interface. The following table illustrates the electrical modes for SW1:

Electrical Mode	Switch Position 1	Switch Position 2	Switch Position 3
RS-422	Off	Off	Off
RS-485 4 Wire	On	On	Off
RS-485 2 Wire	Off	On	On

Line Termination

Typically, each end of the RS-485 bus must have line-terminating resistors (RS-422 terminates at the receive end only). A 120-ohm resistor is across the RS-422/485 data input in addition to a 1K-ohm pull-up/pull-down combination that biases the receiver inputs. The 120-Ohm termination is 'switched' in or out by SW1 (silk screen position 'T'). With the switch in the 'On' position, termination is present. With it in the 'Off' position termination is removed.

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. The SIO-485.LPCI automatically suppresses this 'Echo'.

Clock Modes

The SIO-485.LPCI 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 SIO-485.LPCI. 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) the following table 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
38.4K bps	4800 bps
57.6K bps	7200 bps
76.8K bps	9600 bps
115.2K bps	14.4K bps
153.6K bps	19.2K bps
230.4K bps	28.8K bps
460.8K bps	57.6K bps
921.6K bps	115.2K 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	16
115.2K bps	8
230.4K bps	4
460.8K bps	2
921.6K bps	1

RS-485 Enable Modes

RS-485 is ideal for multi-drop or network environments. RS-485 requires a tri-state driver that 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.

This capability allows multiple PCs to be connected in a multi-drop bus and selectively polled. Failure to correctly utilize the enable can cause transmitter contention problems preventing operation by any node on the network. The SIO4-104.485 utilizes the automatic RS-485 capabilities of the OX16C950 to control the RS-485 tri-state enable. This is a highly efficient method of enable and allows for minimum 'turn-around' times. If the Sealevel Systems Windows Software driver is used, a 'Radio' style button on the 'Advanced' property page under the Device manager can be selected that will configure the OX16C950 automatic RS-485 enable.

Another way of controlling the tri-state enable is with the output modem control signal **R**equest **T**o **S**end (RTS). Some communication software packages refer to RS-485 as RTS enable or RTS block mode transfer. The SIO4-104.485 is compatible with this RS-485 mode as well. If the Sealevel Systems Windows Software driver is used, a 'Radio' style button on the 'Advanced' property page under the Device manager can be selected that will automatically toggle RTS for use as an enable.

Switch SW1 is used to control the RS-485 mode functions for the driver circuit. The selections are:

'RTS' enable (silk-screen 'R') The 'RTS' mode uses the 'RTS' modem control signal to enable the RS-485 interface and provides backward compatibility with existing software products.

'DTR' enable (silk-screen 'D') The 'DTR' mode uses the 'DTR' modem control signal to enable the RS-485 interface, provides backward compatibility with existing software products and with the Oxford Semiconductor 16C950 RS-485 enable feature.

Power Supply

The SIO-485.LPCI has the ability to provide DC power on pin 9 of the DB-9 connector to be used by the integrator in low power implementations. This power is fused at 1A and is selectable as +5, +12 VDC or no power required.

Electrical Characteristics

Specifications

RS-422/485 Transceiver

- Bidirectional Transceiver
- Meet or Exceed the Requirements of ANSI Standards TIA/EIA-422-B and TIA/EIA-485-A and ITU Recommendations V.11 and X.27
- Designed for Multipoint Transmission on Long Bus Lines in Noisy Environments
- 3-State Driver and Receiver Outputs
- Individual Driver and Receiver Enables
- Wide Positive and Negative Input/Output Bus Voltage Ranges
- Driver Output Capability . . . ±60 mA Max
- Thermal Shutdown Protection
- Driver Positive and Negative Current Limiting
- Receiver Input Impedance . . . 12 kΩ Min
- Receiver Input Sensitivity . . . ±200 mV
- Receiver Input Hysteresis . . . 50 mV Typ
- Operate From Single 5-V Supply

Temperature Range

- Operating: -0°C – 70°C
- Storage: -50°C – 105°C

Power Requirements

- +5VDC @ 400 mA

Physical Dimensions

- Length: **4.721 inches (11.99 cm)**
- Height: **2.536 inches (6.44 cm)**

Appendix A - Troubleshooting

Sealevel Software is supplied with the Sealevel Systems adapter and may be used in the troubleshooting procedures. Using this software and following these simple steps 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. Make sure the Sealevel Systems adapter is using 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. The IRQ is typically selected by the BIOS or Operating system. Some BIOS setup software will allow changing the IRQ, but others do not. Another method of changing assigned resources is to try changing PCI slots. This will typically cause the BIOS or OS to reassign the resources.

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

5. For Windows95/98/ME/NT/2000/XP, the diagnostic tool 'WinSSD' is 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.

6. Remember that a loopback test is not possible in the RS-485 2-wire mode.

7. Always use the Sealevel Systems diagnostic software when troubleshooting a problem. This will eliminate any software issues from the equation.

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 8:00AM-5PM Eastern Time Monday through Friday. For email support contact mailto:support@sealevel.com.

Appendix B - How To Get Assistance

Begin by reading through the Trouble Shooting Guide in Appendix A. If assistance is still needed please see below.

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.

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

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

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-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.

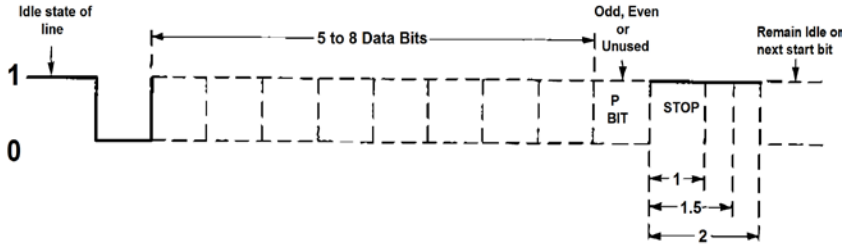
RS-485

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. 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

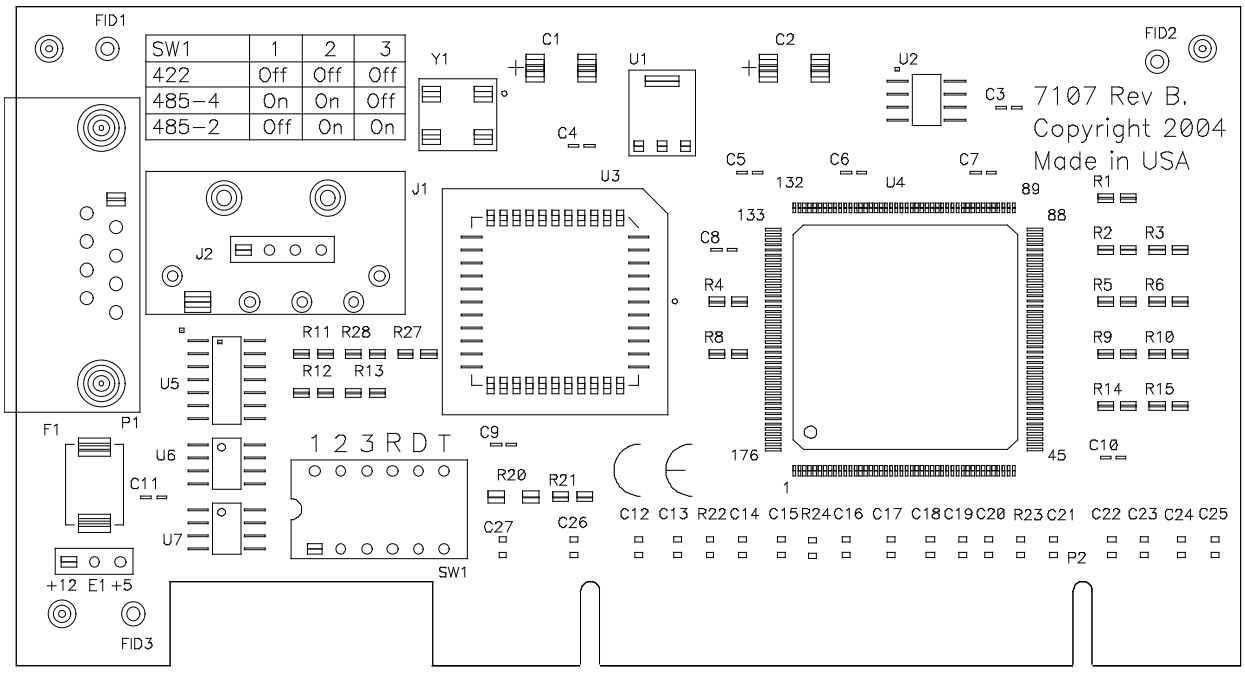
Serial data communications implies that individual bits of a character are transmitted consecutively to a receiver that assembles the bits back into a character. Data rate, error checking, handshaking, and character framing (start/stop bits) are pre-defined and must correspond at both the transmitting 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.



This special bit is called the parity bit. Parity is a simple method of determining if a data bit has been lost or corrupted during transmission. There are several methods for implementing a parity check to guard against data corruption. Common methods are called (E)ven Parity or (O)dd Parity. Sometimes parity is not used to detect errors on the data stream. This is refereed to as (N)o parity. Because each bit in asynchronous communications is sent consecutively, it is easy to generalize asynchronous communications by stating that each character is wrapped (framed) by pre-defined bits to mark the beginning and end of the serial transmission of the character. The data rate and communication parameters for asynchronous communications have to be the same at both the transmitting and receiving ends. The communication parameters are baud rate, parity, number of data bits per character, and stop bits (i.e. 9600, N, 8, 1).

Appendix E – Silk Screen – 7107 PCB



Appendix F - 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 the users expense.

CE

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".

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 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 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 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 life. 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 or abuse are not covered under this warranty.

Warranty service is obtained by delivering the Product to Sealevel and providing proof of purchase. **Return authorization must be obtained from Sealevel Systems before returned merchandise will be accepted. Authorization is obtained by calling Sealevel Systems and requesting a Return Merchandise Authorization (RMA) number.** The Customer agrees to insure 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.

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.

This warranty applies to Sealevel manufactured Product. Product purchased through Sealevel but manufactured by a third party will retain the original manufacturer's warranty.

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