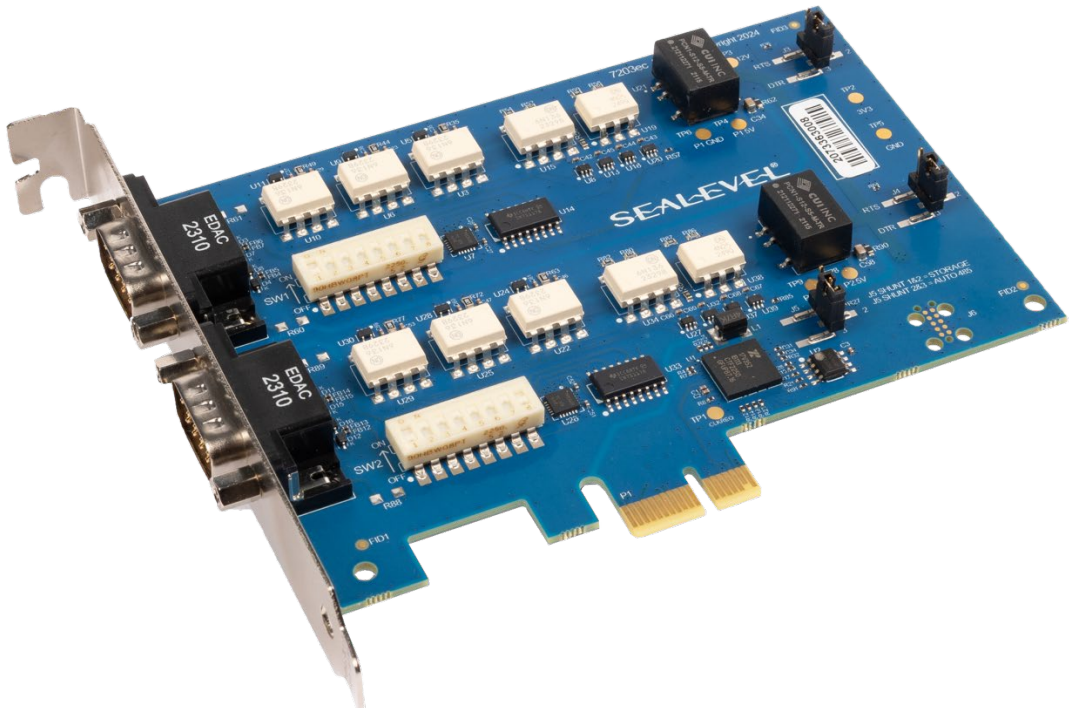


ULTRA COMM+2i.PC1e

User Manual | 7203ec



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Introduction

Overview

The Sealevel Systems, Inc. **Ultra COMM+2i.PCie** (product number 7203ec) is a two-channel isolated PCIe Bus serial I/O adapter for PCs. Utilizing an ultra high-speed UART with its enhanced register set and industry leading 256-byte FIFOs, Ultra COMM+2i.PCie provides two field selectable RS-232/422/485 serial ports supporting data rates up to 921.6Kbps.

Configure both ports as RS-232 for standard PC serial port requirements. Choose the RS-422 mode for long distance device connections up to 4000ft where noise immunity and high data integrity are essential. Select RS-485 and capture data from multiple peripherals in a RS-485 multidrop network. Up to 31 standard RS-485 devices can be connected to each port to automate your data collection. The option to independently configure each port for RS-232, RS-422, or RS-485 provides maximum flexibility to your application. Optional Terminal Block adapters are available to simplify field-wiring connections.

Regardless of which mode the ports are used in, the Ultra COMM+2i.PCie serial ports work seamlessly as standard COM ports (Windows) or serial device files (Linux).

The **Ultra COMM+2i.PCie** will operate in x1, x4, x8 or x16 PCIe bus slots.

The **Ultra COMM+2i.PCie** will be referred to by product number **7203ec** throughout the manual.

Features

- Two serial ports individually configurable for RS-232, RS-422, or RS-485
- Optical isolation provides protection against transients and ground loops
 - Optically isolated serial ports
 - Galvanically isolated power to the transceiver.
- Ultra High-speed UART with 256-byte TX and RX FIFOs
- Data rates to 921.6Kbps
- Automatic RS-485 enable/disable that is transparent to Windows applications and configurable to Linux applications

Factory Default Settings

The 7203ec factory default settings are as follows:

Port #	Electrical Specification
Port 1	RS-422
Port 2	RS-422

To install the 7203ec using factory default settings, refer to Installation section of this manual.

Before You Get Started

What's Included

The **7203ec** is shipped with the following item. If any of these items are missing or damaged, please contact Sealevel for replacement.

- **7203ec Isolated Serial Interface**

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.

Optional Items

Depending upon your application, you are likely to find one or more of the following items useful with the 7203ec. All items can be purchased from our website (www.sealevel.com) or by calling our sales team at (864) 843-4343.

Cables

DB9 Female to DB9 Male Extension Cable, 72 inch Length (Item# CA127)	
<p>The CA127 is a standard DB9F to DB9M serial extension cable. Extend a DB9 cable or locate a piece of hardware where it is needed with this six foot (72) cable. The connectors are pinned one-to-one, so the cable is compatible with any device or cable with DB9 connectors. The cable is fully shielded against interference, and the connectors are molded to provide strain relief. Dual metal thumbscrews secure cable connections and prevent accidental disconnection.</p>	
9 Female to DB25 Male Standard RS-232 Modem Cable, 72 inch Length (Item# CA177)	
<p>The CA177 is a standard AT-style RS-232 modem cable with a DB9 female connector on one end and a DB25 male connector on the other end. Simply connect the DB-9F connector to the DB9 serial port on your computer or host and then connect the DB-25M connector to your RS-232 serial modem or other compatible RS-232 serial device. The six foot cable is fully shielded with dual thumbscrews at each connector. All DB9 modem control signals are implemented, and the cable is pinned to EIA-232 standards.</p>	
DB9 Female (RS-422) to DB25 Male (RS-530) Cable, 10 inch Length (Item# CA176)	
<p>DB9 Female (RS-422) to DB25 Male (RS-530) Cable, 10 inch Length. Convert any Sealevel RS-422 DB9 Male Async Adapter to an RS-530 DB25 Male pinout. Useful in situations where RS-530 cabling exists and a multiport Sealevel RS-422 adapter is to be used.</p>	

Kits

TB05 Terminal Block & CA127 9-Pin Cable (Item# KT105-ROHS)

The KT105 terminal block kit breaks out a DB9 connector to 9 screw terminals to simplify field wiring of serial connections. It is ideal for RS-422 and RS-485 networks, yet it will work with any DB9 serial connection, including RS-232. The KT105 includes one DB9 terminal block (Item# [TB05](#)) and one DB9M to DB9F 72 inch extension cable (Item# [CA127](#)).



TB06 Terminal Block & (2) CA127 9-Pin Cables (Item# KT106-ROHS)

The TB06 terminal block has been designed to connect directly to any Sealevel dual DB9 serial board or to serial boards with DB9 cables. If you need to extend the length of your dual DB9 connection, the KT106 includes the TB06 terminal block and two CA127 DB9 extension cables.



Terminal Blocks

DB9 Female to 9 Screw Terminal Block (Item# TB05)

The TB05 terminal block breaks out a DB9 connector to 9 screw terminals to simplify field wiring of serial connections. It is ideal for RS-422 and RS-485 networks, yet it will work with any DB9 serial connection, including RS-232. The TB05 includes holes for board or panel mounting. The TB05 is designed to connect directly to Sealevel DB9 serial cards or any cable with a DB9M connector.



DB9 Female to 18 Screw Terminal Block (Item# TB06)

The TB06 terminal block breaks out a DB9 connector to 9 screw terminals to simplify field wiring of serial connections. It is ideal for RS-422 and RS-485 networks, yet it will work with any DB9 serial connection, including RS-232. The TB06 includes holes for board or panel mounting. The TB06 is designed to connect directly to Sealevel DB9 serial cards or any cable with a DB9M connector.



DB9 Female to 5 Screw Terminal Block (RS-422/485) (Item# TB34)

The TB34 terminal block adapter offers a simple solution for connecting RS-422 and RS-485 field wiring to a serial port. The terminal block is compatible with 2-wire and 4-wire RS-485 networks and matches the RS-422/485 pin-out on Sealevel serial devices with DB9 male connectors. A pair of thumbscrews secures the adapter to the serial port and prevents accidental disconnection. The TB34 is compact and allows multiple adapters to be used on multi-port serial devices, such as Sealevel USB serial adapters, Ethernet serial servers and other Sealevel serial devices with two or more ports.



Card Setup

Clock and Baud Rates

The 7203ec derives a 125 MHz clock for the Baud Rate Generator (BRG) from the PCI Express bus. The internal BRG offers a wide range of baud rates that are configurable by software. The best choice of clock divisor for a given baud rate is made automatically by the device driver which configures it to the card. A difference in baud rate configuration between serial ports of +/-2% is generally adequate for successful communication if the signal is free of noise and other artifacts.

Electrical Interface Selection

Each port of the 7203ec can operate either as an RS-232, RS-422, or RS-485 port. This selection is made for port 1 and port 2 via the following three switches of SW1 and SW2 respectively.

Switches SW1 / SW2

Switch 1	Switch 2	Switch 8	Electrical Interface
ON	OFF	OFF	RS-232
OFF	OFF	OFF	RS-422 (Default)
OFF	ON	OFF	RS-485 with Echo
OFF	ON	ON	RS-485 without Echo

Port Options

Switches 3 through 8 of SW1 and SW2 allow a user to customize port 1 and port 2 to specific requirements. Typically, each end of a RS-485 bus must have a line-terminating resistor and the receive end of a RS-422 bus should also be terminated with a resistor. In RS 485 and RS-422 modes switch 3 adds a 120-ohm resistor across the port's data receive pins which can satisfy the requirement for termination if the port is connected to the end of a bus. Switches 4 and 5 enable a 1K-ohm pull-up/pull-down combination that biases the data receive pins to prevent the reception of unwanted signals while the bus is not being driven. In RS-485 mode, switches 6 and 7 internally connect the TX to RX pins of the port together to create a 2-wire interface without the need for external wiring.






Please refer to the following table:

Switches SW1 / SW2

SW1 & SW2 Switch Position	Function
1	Protocol Mode
2	Protocol Mode
3	Adds or removes the 120 ohm termination across RX+ and RX-.
4	Adds or removes the 1K ohm pull-up resistor in the RS-422/RS-485 receiver circuit (Receive data only).
5	Adds or removes the 1K ohm pull-down resistor in the RS-422/RS-485 receiver circuit (Receive data only).
6	Connects the TX+ to RX+ for RS-485 two wire operation.
7	Connects the TX- to RX- for RS-485 two wire operation.
8	Echo or No Echo

Please see the following example configurations of SW1 / SW2.

SW1 & SW2		
MODE	1	2
RS232	ON	OFF
RS422	OFF	OFF
RS485	OFF	ON
3 = 120 OHM TERMINATION		
4 = 1K PULL DOWN RESISTOR		
5 = 1K PULL UP RESISTOR		
6 = RX- TO TX-		
7 = RX+ TO TX+		
8 = CLOSED = NO ECHO; OPEN = ECHO		

SW1 & SW2	
RS-232	
RS-422	
4-Wire RS-485 W/Echo	
2-Wire RS-485 W/Echo	
2-Wire RS-485 NO Echo	

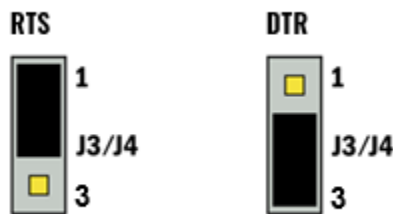
RS-485 Enable Modes

RS-485 is ideal for multi-drop or network environments. RS-485 requires a tristate transmitter that will allow the electrical presence of the transmitter to be removed from the line (high impedance) whenever one of the other transmitters in the network is transmitting. The output modem control signal Request To Send (RTS) is historically used by application software to enable and disable the transmitter high impedance state of the port, a function often referred to as RS-485 Enable. The 7203ec offers automatic control of RS-485 Enable, which relieves application software of the need to set and clear modem control signals to manage the RS-485 Enable state.

WINDOWS

Under Windows, Auto RS-485 Enable is always active when the port's electrical interface is set to RS-485 and the corresponding either J3 (port 1) or J4 (port 2) is set to the DTR position.

RS-485 Enable is under manual control of application software when the port's electrical interface is set to RS-485 and the corresponding either J3 (port 1) or J4 (port 2) is set to the RTS position. In this case when an application has the RTS signal set the transmitter is in high impedance state. When the application has the RTS signal cleared the transmitter can transmit data.



LINUX

Under Linux, Auto RS-485 Enable is not active in RS-485 until it is enabled by an application using the `SER_RS485_ENABLED` IOCTL specified by the kernel's serial driver. See the Linux serial driver documentation for more information about `SER_RS485_ENABLED`.



Kernel version 5.15.149 or newer is required to use `SER_RS485_ENABLED` with the 7203ec.

The signal to select at J3/J4 for an application that activates RS-485 Auto Enable via `SER_RS485_ENABLED` depends on your Linux kernel version. Please refer to the table below.

Kernel Version	Auto RS-485 Enable Application (uses <code>SER_RS485_ENABLED</code>)	J3/J4 Signal
6.7+	Yes	DTR
5.15.49 – 6.6.x	Yes	RTS
Below 5.15.149	<code>SER_RS485_ENABLED</code> is not supported	DTR or RTS as required by application software

If the `SER_RS485_ENABLED` IOCTL is not used by an application or it is not supported by the kernel version, the application must manually control RS-485 Enable by raising and lowering DTR or RTS according to the rule in the next paragraph. The application determines which of those two signals it uses and that signal should be configured at J3/J4.

If the application's control is by RTS, it must clear RTS to transmit data and set RTS to put the transmitter in high impedance state. If the control is by DTR, the application must set DTR to transmit data and clear DTR to put the transmitter in high impedance state.

Software Installation



Do not connect the hardware until the software has been successfully 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.

This section contains helpful information pertaining to the installation of supported Sealevel Systems, Inc. software packages. First, the process of acquiring the software is discussed. Next, the installation is detailed in a step-by-step guide for Windows and Linux operating systems.

Where to Get Software

Current versions of Sealevel software packages can be obtained from the Sealevel website. If you already have all the required software, proceed to the installation section for your operating system.

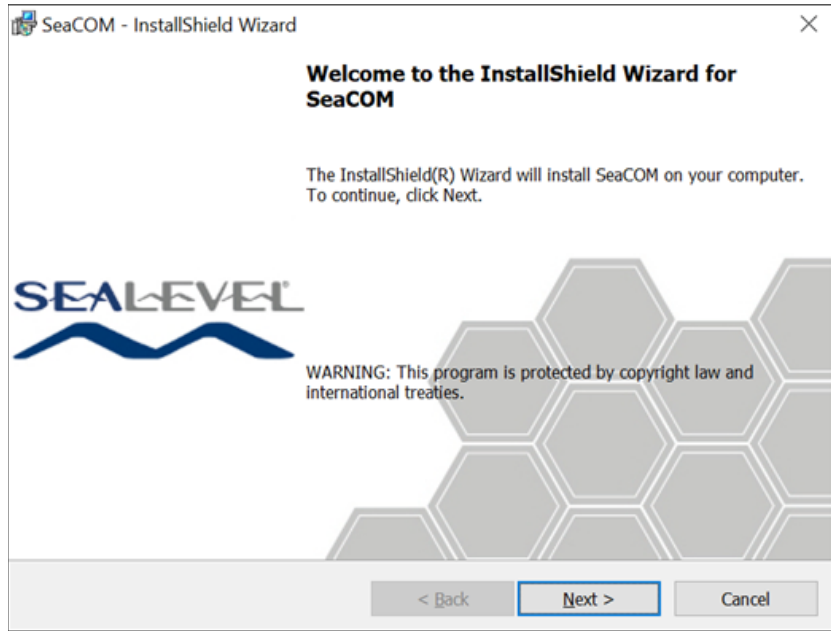
- For Windows:
 - [Software for Windows](#)
 - Click on the 'Download File' link to download the current version.
 - Proceed to the Windows Installation section.
- For Linux:
 - No Sealevel software required. Proceed to Linux Installation section.

Windows Installation

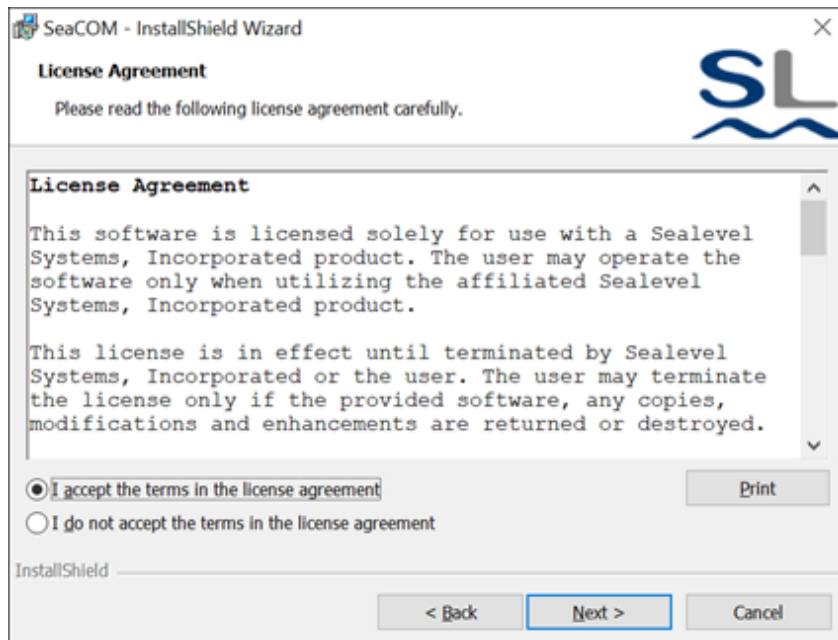


To install Sealevel software, you must log in as an administrator or have administrator privileges.

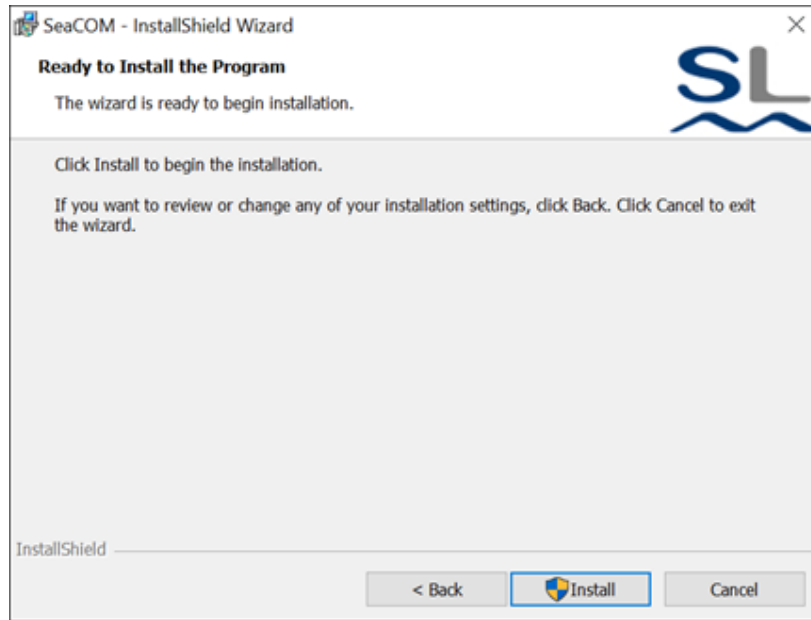
1. Open Windows Explorer and navigate to the downloaded Sealevel software. For example: C:\Downloads\SS030705.exe
2. Right click on the installer executable and choose 'Run as Administrator'.
3. Once opened Select 'Next' as demonstrated in the image below.



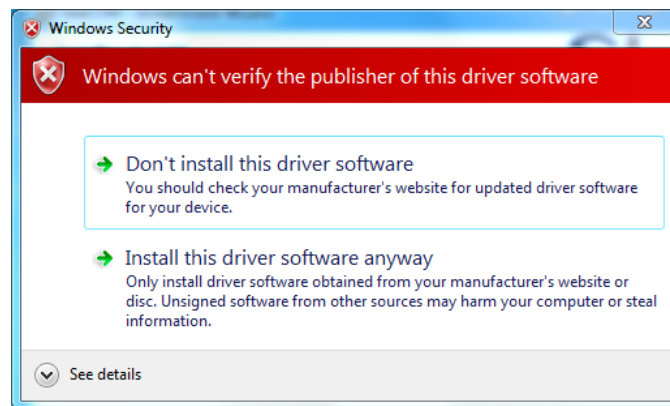
3. When the 'License Agreement' window appears, accept the terms, and click 'Next' to continue. If you do not accept the terms of the agreement, the wizard will stop.



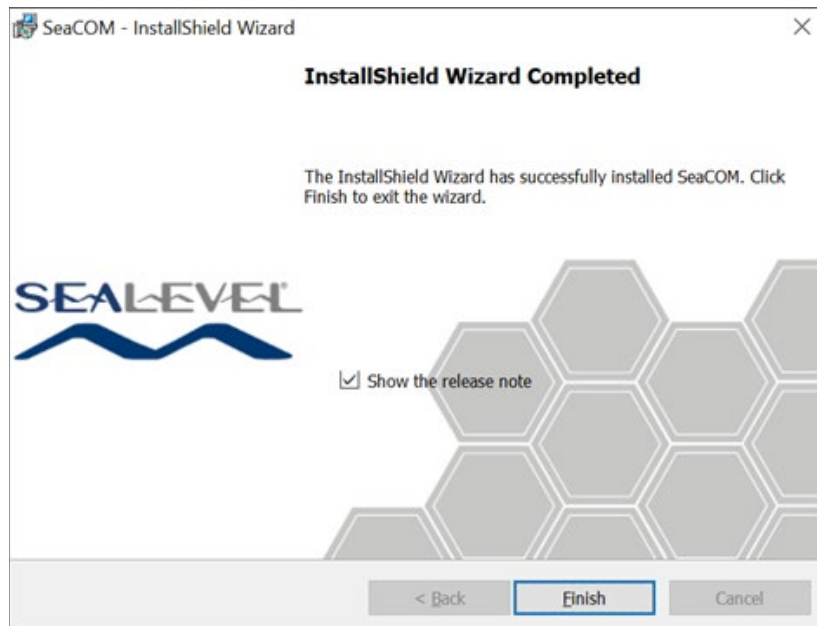
- When the 'Ready to Install the Program' window appears, click the 'Install' button to install the software onto the hard drive of your computer. Some versions of Windows will halt the installation and provide you with a dialog box which will ask you for permission for the installer to make changes to your computer. Click on the button to continue installation of your Sealevel software.



The below warning will appear when installing the driver on Windows 7. Select "Install this driver anyway" on the warning.



5. Click 'Finish' to complete the installation of SeaCOM onto your PC.



6. If prompted, reboot your computer for changes to take effect.

Windows Uninstall Instructions

The SeaCOM software program adds entries to the system registry that are necessary for specifying the operating parameters for your device. To completely remove the hardware and associated software, follow the steps in the order they appear.



Start with the hardware installed in a PCI Express slot. Do not remove until instructed to do so.

Remove-Hardware Using Device Manager

To access Device Manager, follow the steps below:

1. Open Windows Explorer.
2. Right click on the 'Computer' or 'This PC' icon.
3. Click 'Manage' in the fly out menu to launch the 'Computer Management' console window. Under Windows 11 you may have to click 'Show more options' to see 'Manage'.
4. In the left pane under 'System Tools', click 'Device Manager'.
5. In the right pane, expand the 'Multi-port serial adapters' section by double clicking it.
6. Locate the ISO COMM2 device in the listing.
7. Right click on the entry for the 'ISO COMM2' device and click 'Uninstall'.
8. Confirm that you want to uninstall the device by clicking the 'OK' button. This will remove the hardware, COM ports and all registry entries from your computer.
9. The window will refresh and the entry for the device will no longer appear. Proceed with removing the SeaCOM software via Windows Control Panel.

Power down your computer, remove the device from the PCI Express slot, and then reboot your computer to complete the uninstallation.

Linux Installation

No software installation is required if your system meets the following requirements:

- Linux Kernel Version 3.8.0 or higher
- 8250_exar kernel module installed



Auto RS-485 requires kernel 5.15.149 or newer. Refer to patch [59c221f](#).

Check Kernel Version

You may determine your kernel version by running the command below:

```
$ uname -a
```

If *uname* is not present on your system, you can try:

```
$ cat /proc/version
```

Check presence of 8250_exar driver

The 8250_exar driver is included by default many distributions, but you can use the following commands to verify it is present on your system.

If 8250_exar is installed, the command below will output detailed information about the driver.

```
$ modinfo 8250_exar
```

If *modinfo* is not present on your system, you can try the alternative below. If 8250_exar is installed, the command below will output the file path of the driver.

```
$ find /lib/modules/$(uname -r)/kernel/drivers/ -iname 8250_exar.ko
```

Refer to the [Sealevel support website](#). This link contains valuable information on installing your serial adapter in the various Linux releases. Also included is a series of files explaining proper Linux syntax and typical Linux serial implementations.

For additional software support or if you have any questions about using the 7803c in your system, 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.

Hardware Installation

Install the 7203ec into available PCI Express Slot and boot the computer. If you are using Windows, the drivers that were installed during the software installation process will automatically be used to configure the adapter. On most Linux systems, the 7203ec will be installed by the built-in 8250_exar serial driver.



Once the hardware installation is complete, you may need to restart the computer to finalize the installation process.



Under Windows your system will assign the next available COM numbers to the serial ports, which will vary by computer.

Technical Description

The **7203ec** provides a PCIe interface adapter with two optically isolated asynchronous serial ports which provide a versatile interface, field selectable RS-232 interfaces for modems, printers and plotters, as well as RS-422/485 interfaces for industrial automation and control applications. Isolation is important in installations where the equipment being connected to the PC is either far from the PC, or on a different power transformer circuit. Ground loop current is a commonly neglected and misunderstood phenomenon that leads to data loss and the destruction of communications interfaces.

The **7203ec** utilizes the EXAR XR17V352 featuring 16550 compatibility in combination with an enhanced register set and industry leading 256-byte FIFOs. This chip features programmable baud rates, data format, and interrupt control.

Connector Pin Assignments

RS-232

Name	Pin #	Mode
TD Transmit Data	3	Output
RTS Request To Send	7	Output
GND Ground	5	
RD Receive Data	2	Input
CTS Clear To Send	8	Input



These pins conform to EIA/TIA/ANSI-574 DTE for DB-9 type connectors.

RS-422/485

Signal	Name	Pin #	Mode
GND	Ground	5	
TX +	Transmit Data Positive	4	Output
TX-	Transmit Data Negative	3	Output
RTS+	Request To Send Positive	6	Output
RTS-	Request To Send Negative	7	Output
RX+	Receive Data Positive	1	Input
RX-	Receive Data Negative	2	Input
CTS+	Clear To Send Positive	9	Input
CTS-	Clear To Send Negative	8	Input

Technical Specifications

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0° to 50° C (32° to 122° F)	-40° to 105° C (-40° to 221° F)
Humidity Range	10 to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

MTBF (Telcordia SR-332 prediction method)

Mean Time Between Failure	503,203 hours	At 25° C ambient
---------------------------	---------------	------------------

Manufacturing

All Sealevel 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 - Maximum

Supply voltage	+3.3 VDC	+12 VDC
Rating	130mA	170mA

Physical Dimensions

Board Length	4.875 inches	(12.38 cm)
Board Height including Goldfingers	3.677 inches	(9.34 cm)
Board Height excluding Goldfingers	3.178 inches	(8.06 cm)

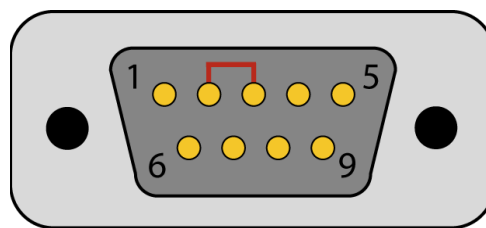
Appendix A – Troubleshooting

Under Windows once you have confirmed that the serial adapter COM ports are listed in Device Manager, use the Sealevel WinSSD utility to verify communications. Detailed help is included in the WinSSD utility.

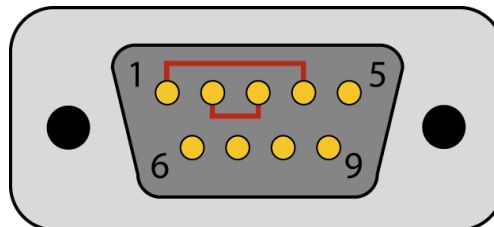
Please set the adapters Electrical Interface for either RS-232 or RS-422.

If you have a loopback plug, put it on the adapter connector. If you do not have a loopback plug, you can use female jumper wires to make the connection to verify the functionality.

RS-232 requires pins 2 (Receive) & 3 (Transmit) to be jumpered as shown in this graphic:



RS-422 requires pins 1 & 4 (Receive + and Transmit +) and also pins 2 & 3 (Receive - and Transmit -) to be jumpered as shown in this graphic:

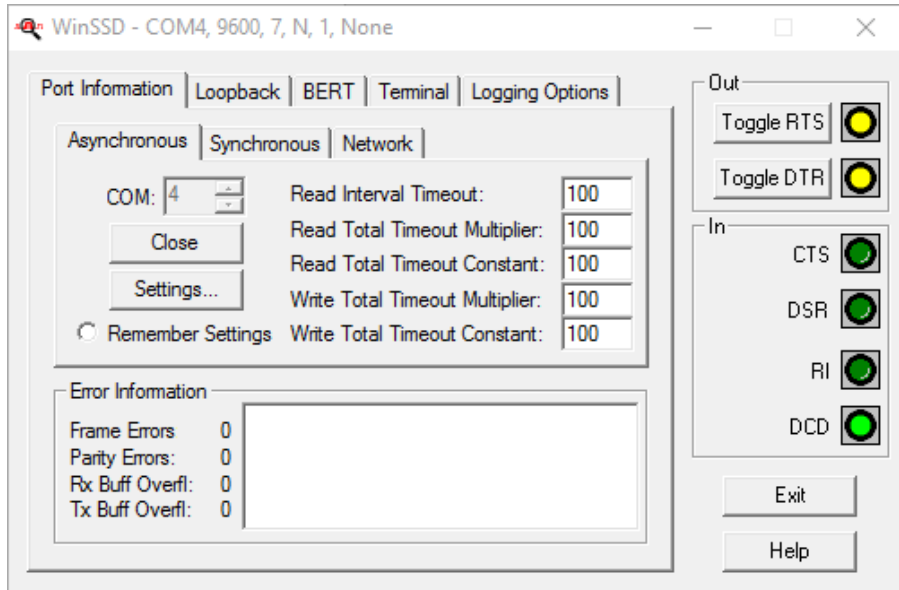


If you do not have a loopback plug or jumper wires handy, you can use a metal device such as a knife, screwdriver, key, or paperclip to short pins two and three.

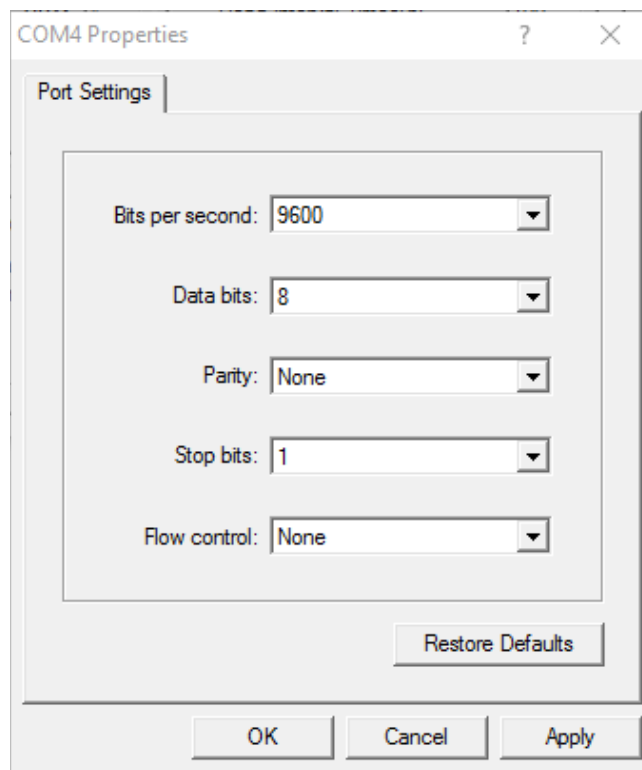
To test communications, launch the WinSSD utility in the SeaCOM folder in the 'Start' menu.

On the 'Port Information' tab, select the associated COM port and click the 'Open' button.

This will first open the COM port. From this tab the port can also be closed (See image below). Click the 'Settings' button to open the COM Port Properties dialog box. This will allow the Port Settings to be altered.



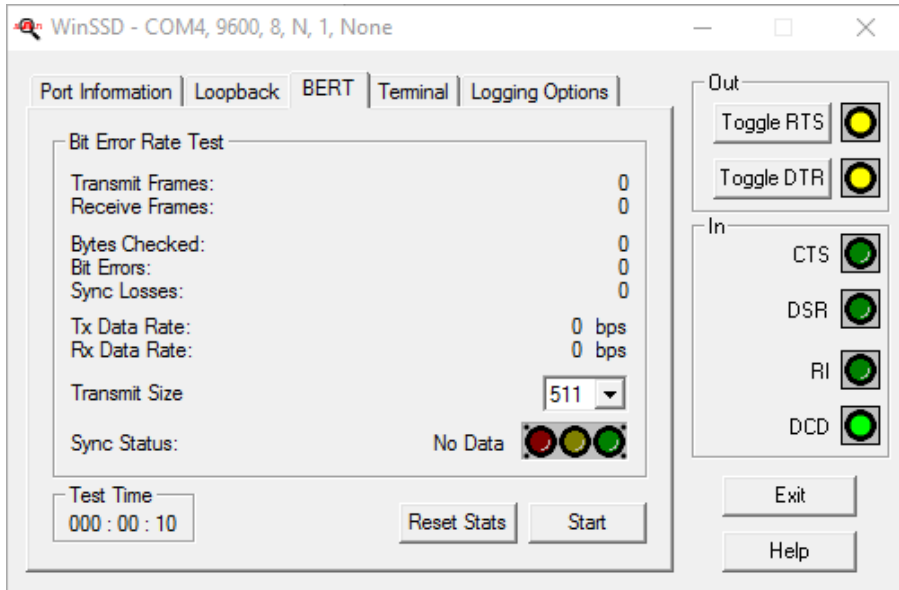
Change your parameters to 9600 bits per second, 8 data bits, no parity, 1 stop bit, and no flow control, as pictured below.



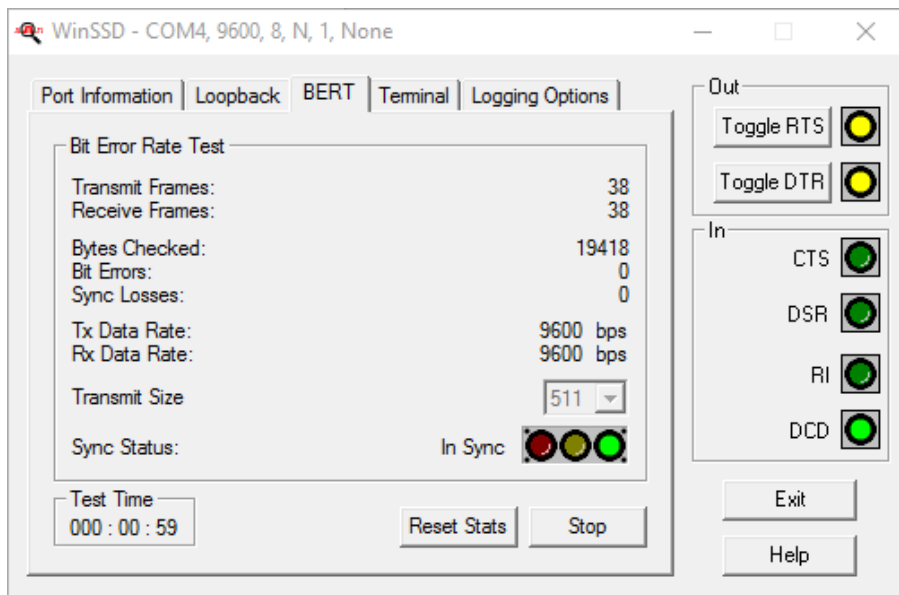
Click 'Apply' and 'OK'.

In the main WinSSD window, click on the 'BERT' tab (Bit Error Rate test).

Click on the 'Start' button.



If the COM port is working properly, the Sync Status green light will glow, and the Transmit Frames and Receive Frames will increase. The Tx and Rx Data Rates will show the calculated data rate.



This verifies that the adapter is working properly. You can continue testing this port with different configurations or proceed with testing other ports, if necessary.

If these steps do not solve your problem, please call Sealevel 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 – Handling Instructions

ESD Warnings

Electrostatic Discharges (ESD)

A sudden electrostatic discharge can destroy sensitive components. Proper packaging and grounding rules must therefore be observed. Always take the following precautions:

- Transport boards and cards in electrostatically secure containers or bags.
- Keep electrostatically sensitive components in their containers until they arrive at an electrostatically protected workplace.
- Only touch electrostatically sensitive components when you are properly grounded.
- Store electrostatically sensitive components in protective packaging or on anti-static mats.

Grounding Methods

The following measures help to avoid electrostatic damages to the device:

- Cover workstations with approved antistatic material. Always wear a wrist strap connected to a properly grounded workplace.
- Use antistatic mats, heel straps, and/or air ionizers for more protection.
- Always handle electrostatically sensitive components by their edge or by their casing.
- Avoid contact with pins, leads, or circuitry.
- Turn off power and input signals before inserting and removing connectors or connecting test equipment.
- Keep the work area free of non-conductive materials such as ordinary plastic assembly aids and Styrofoam.
- Use field service tools such as cutters, screwdrivers, and vacuum cleaners that are conductive.

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-C/D/E or EIA/TIA-232-C/D/E. It is defined as “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. 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 has 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 20K bps / 50 ft. The absolute maximum data rate may vary due to line conditions and cable lengths. RS-232 often operates at 38.4K bps 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) denote a binary 1 (mark). The RS-232 and the EIA/TIA-574 specification define two types of interface circuits Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE). The Ultra COMM+2i.PCie 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.

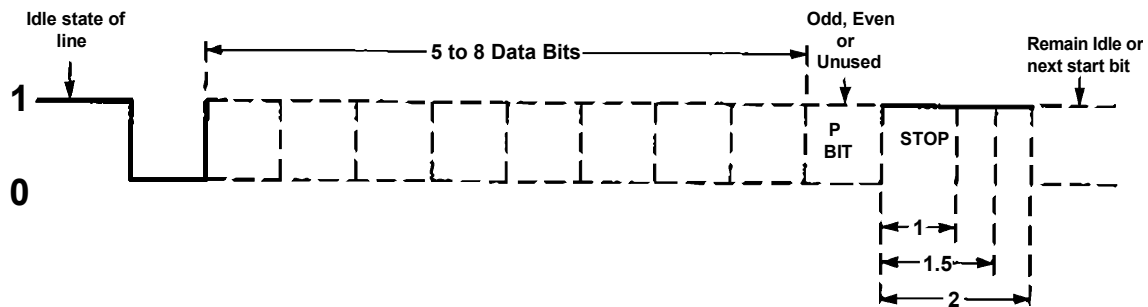
RS-485

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. 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.



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).

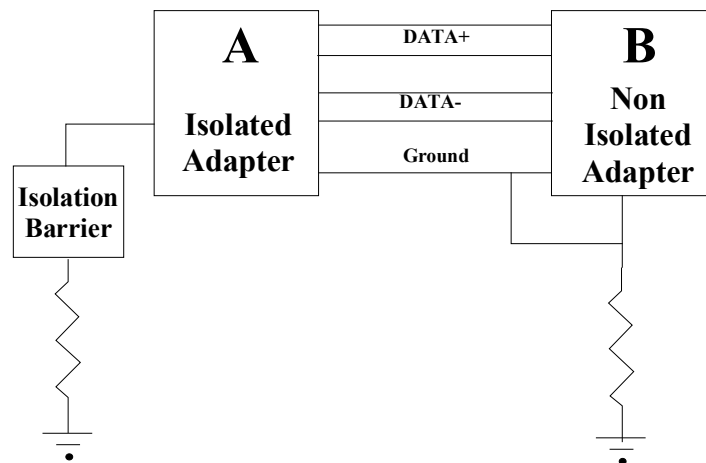
Appendix E – Ground loop Phenomenon

What is Ground Loop?

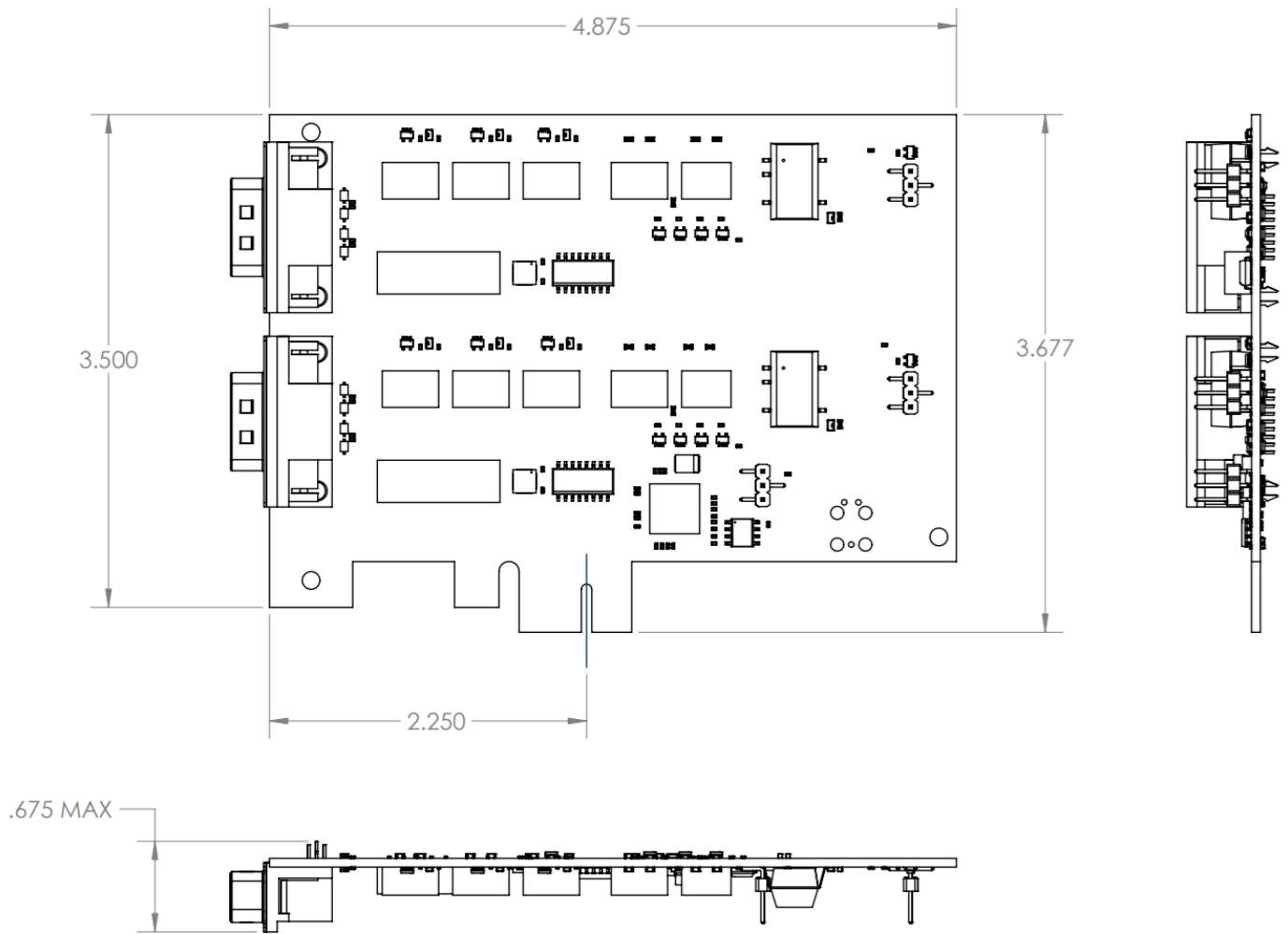
Ground loop Phenomenon occurs when two (or more) pieces of equipment are connected together with a common ground and a different ground potential exists at each location. This current can cause the connected equipment to experience noise that in turn causes data transmission errors. In the extreme this ground current can cause equipment malfunction or even destruction.

Cabling Recommendations

When connecting the 7203ec in a RS-485 network, care should be taken that both ends of the network are not isolated from ground (see Figure 8). This “floating” ground condition could cause the capacitive or inductive coupling of voltages that will cause a break down in the DC to DC converter circuit or in the opto-isolator circuit. This condition will cause data errors and possibly destruction of the receiver circuit.



Appendix F – Mechanical Drawing



Appendix G – Compliance Notices

Federal Communications Commission (FCC) Statement



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

ISED Canada

- **CAN ICES-003(A) / NMB-003(A)**

EMC Directive Statement



This equipment has been evaluated or tested and found in compliance with the requirements of the following directives issued by the European Commission:

- EMC Directive **2014/30/EU**
- RoHS Directive **2011/65/EU + (EU) 2015/863**



CE marking is recognized in the UK as an acceptable method of demonstrating compliance for certain categories of products, including the one described in this manual.



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 the 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 Systems, Inc. (hereafter "Sealevel") 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 and AS9100D certification in 2025.

Warranty Policy

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 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.

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, 8:00 A.M. to 5:00 P.M. EST
Phone	864-843-4343
Email	support@sealevel.com

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