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OMG-USB-232-8 and OMG-USB-SER-8 Eight Port Serial to USB Adaptors



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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

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Introduction

Overview

The models OMG-USB-232-8 and OMG-USB-SER-8 USB to Serial Converters equip the PC with 8 USB to Asynchronous serial ports. Two different model numbers are available that offer a variety of port options. Model OMG-USB-232-8 equips the PC with 8 additional RS-232 ports that support a full RS-232 interface and data rates up to 460.8K baud. Model OMG-USB-SER-8 equips the PC with 8 user configurable RS-232/422/485 ports. Each port is individually configurable and the interface is selected by configuring two dipswitch positions. The advantage of this product over more traditional approaches is that it does not require opening the computer case, nor does it require resources such as I/O ports or IRQs. It does require a system that supports USB both in terms of hardware and operating system.

What's Included

The USB to serial converter is shipped with the following items. If any of these items is missing or damaged, contact the supplier.

- USB to Asynchronous Serial Converter
- USB Cable Part Number OMG-CA-179 for Connecting to Upstream Host/Hub
- Software

Installation Instructions

Windows 98/ME/2000/XP/Vista™ Operating Systems

Do not connect the device to a USB port until the software is installed.

1. Start Windows.
2. Insert the software CD in to your CD drive.
3. If 'Auto-Start' is enabled the installation window will automatically appear. Otherwise, navigate to the root directory of your CD drive and double-click the 'autorun.exe' application to launch the installation window.
4. Select 'Install Software'.
5. Select the Part Number for your device from the listing.
6. The setup file will automatically detect the operating environment and install the proper components. Follow the information presented on the installation 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, you 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 included to remove the driver and all registry/INI file entries from your system.
9. Proceed with the physical installation of your USB serial adapter.

NOTE:



Windows NT is not USB aware and thus cannot support this device.

Physical Installation

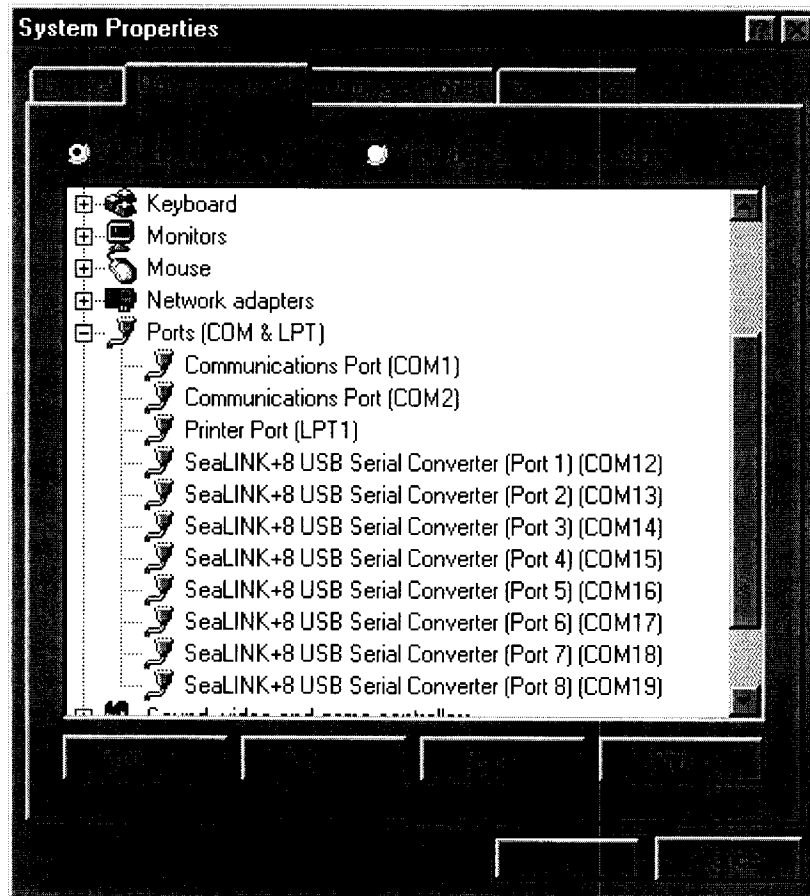
The screen captures below are taken from a Windows 98 installation. Your particular operating system may differ slightly from what is shown based on your version of Windows.

The USB to serial converter can be connected to any upstream type “A” port, either at the PC host or an upstream hub. The USB to serial converter is hot pluggable, meaning there is no need to power down your computer prior to installation.

Connect the USB to serial converter to an upstream host or hub.

The **New Hardware Found** wizard will now proceed to locate the appropriate drivers. These drivers were installed during the SeaCOM software setup procedure. Once the drivers are found a new window will pop up indicating the installation of each of the eight new ports.

If you view the system’s Device Manager, you should have new “COM” ports in the Ports (COM & LPT) Device Class. This is shown on the following page.



You can access your new COM: ports by using the assigned COM: identifiers as shown above. In this case, it is COM's 12 thru 19. However, this assignment will vary from system to system. At this point, the hardware is recognized and ready to use.

Configuration

Factory configuration

Each device ships with the following configuration.

Model OMG-USB-232-8 – USB to serial converter/232 USB to RS-232 Converter

Contains no user configurable components.

Model OMG-USB-SER-8 – USB to serial converter USB to RS-232/422/485 Converter

RS-422 4-wire full duplex mode selected.

Transmitter always enabled.

Receiver always enabled and terminated and biased as follows:

120ohm terminator between RX+ and RX-

1Kohm pull-up on RX+

1Kohm pull-down on RX-

In order to change the configuration the box must be opened. Do this by removing the four screws that attach the two halves of the box.

Electrical Interface Selection

Each port of the model OMG-USB-SER-8 USB to serial converter can be individually configured for the specific electrical interface. Model OMG-USB-SER-8 supports RS-232/422/485. This is selectable via the dipswitch associated with each port. Each of the switch positions is described on the following page.

Configuration

Below is a figure of dipswitches SW1, SW2, SW3, and SW4. Each switch has a total of twelve positions and serves to configure two ports. Six positions are used for each port. The default mode of RS-422 4-wire full duplex is shown.

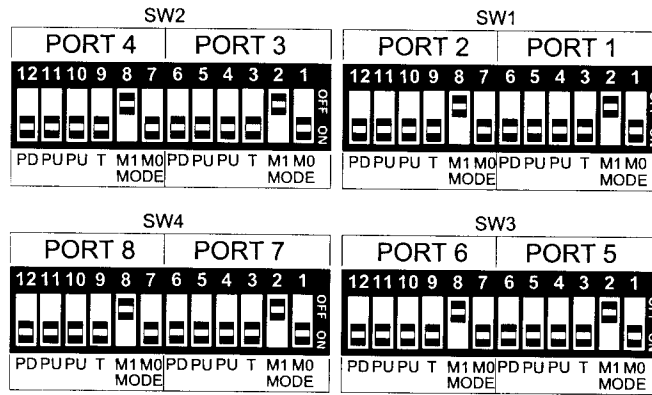


Figure 1- Dip Switches SW1 - SW4 RS-422 Default Mode

Mode Select Configuration

The first two positions for each port are used to select the electrical interface mode. In RS-422 mode the transmitter and receiver are always enabled. "485 WE" refers to RS-485 mode with receiver echo. In this mode the receiver is always enabled. If the card is in 2-wire mode, all transmitted data will be "echoed" back. "485 NE" refers to RS-485 mode with no receiver echo. In this mode the receiver is enabled only when no data is being transmitted. In either RS-485 mode the transmitter is only enabled during data transmission. Refer to the chart below for specific switch settings. Note that this chart appears in the silk screen on the board as well.

MODE SELECT		
SWITCH	M1	M0
232	OFF	OFF
422	OFF	ON
485 WE	ON	OFF
485 NE	ON	ON

Figure 2- Electrical Interface Mode Selection

Interface Biasing Configuration

The last four positions for each port are used to select the line termination and bias settings. Refer to the chart below for specific switch settings of the three supported electrical interface modes. Note that this chart appears in the silk screen on the board as well.

PD = 1Kohm pull-down resistor connected to RX-
 RS-232 mode = always OFF
 RS-422 mode = always ON
 RS-485 mode = ON if not provided by another device on the bus

PU = 5.1Kohm pull-up resistor connected to CTS+
 RS-232 mode = always OFF
 RS-422 mode = always ON
 RS-485 mode = always ON

PU = 1Kohm pull-down resistor connected to RX+
 RS-232 mode = always OFF
 RS-422 mode = always ON
 RS-485 mode = ON if not provided by another device on the bus

T = 120ohm terminating resistor connected between RX+ and RX-
 RS-232 mode = always OFF
 RS-422 mode = always ON
 RS-485 mode = ON if physically located at one end of bus

INTERFACE BIASING				
SWITCH	PD	PU	PU	T
232	OFF	OFF	OFF	OFF
422	ON	ON	ON	ON
485	ON	ON	ON	ON*

* = IF END OF 485 BUS

Figure 3 - Electrical Interface Termination and Biasing Selection

Technical Note

Contrary to some of our other products, there are no provisions on board for looping TX+ to RX+ and TX- to RX- for 2-wire RS-485 mode. These connections must be made externally inside the mating DB-9 connector. Refer to the RS-422 pinout diagram for the appropriate pin numbers.

Technical Description

The USB to serial converter utilizes eight USB UARTs. These chips feature programmable baud rate, data format, 128 byte Dual Port TX Buffer, and 384 byte Dual Port RX Buffer. The RS-232/422/485 transceiver supports data rates up to 921.6K baud for RS-422/485 and 460.8K baud for RS-232.

Features

- Hot pluggable device that does not require opening the case
- No system resources are required (i.e. I/O ports or IRQs)
- LED status indicators for power and port activity

Connector Pin Assignments

RS-422/485 (DB-9 Male)

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

RS-232 (DB-9 Male)

Signal	Name	Pin #	Mode
GND	Ground	5	
TX	Transmit Data	3	Output
RTS	Request To Send	7	Output
DTR	Data Terminal Ready	4	Output
RX	Receive Data	2	Input
CTS	Clear To Send	8	Input
DSR	Data Set Ready	6	Input
DCD	Data Carrier Detect	1	Input
RI	Ring Indicator	9	Input

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

- All 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

This device is a high power USB device. It must be plugged into the USB root hub or a self-powered hub capable of supplying 500 mA per port.

Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

Physical Dimensions

Package Length	8.68 inches	(22.04 cm)
Package Width	5.985 inches	(15.20 cm)
Package Height	2.062 inches	(5.24 cm)

Appendix A - Troubleshooting

Serial Utility test software is supplied with the USB to serial converter and will be used in the troubleshooting procedures. Using this software and following these simple steps, most common problems can be eliminated without the need to call Technical Support.

1. If your adapter isn't working, first check to make sure that USB support is enabled in the System BIOS and it is functioning properly in the operating system. This can be done by using either the Windows 98/ME or Windows 2000 Device Manager.
2. Ensure that the software has been installed on the machine so that the necessary files are in place to complete the installation.
3. When the USB to serial converter is configured properly, the Power LED will be lit. This should allow you to use the WinSSD utility and the supplied loopback plug to check communications. The supplied loopback plug connects TD to RD. If you decide to test the Modem Control Signals, a full pin loopback plug will be required. Details on loopback plugs are included on WinSSD. Contact technical support if you need further assistance
4. When testing the USB to serial converter in loopback mode, you should see the port LED's flashing as well as seeing echoed data on the screen. The loopback test first transmits a HEX pattern, 55AA, and then an ASCII string of data. If this test passes, then the USB to serial converter is ready for use in your application.
5. Please note that if the adapter is configured for 2-wire RS-485 with no echo a loopback test is not possible. The receiver in this case will be turned off and the test will fail. If you plan on using this device in 2-wire mode, test the adapter in RS-422 mode first. Then configure the adapter for your application.

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. Omega Engineering maintains a web site on the Internet. The address is www.omega.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 thru Friday from 8:30 a.m. to 6:00 p.m. eastern time. Technical support can be reached at (800) TC-OMEGA.

RETURN AUTHORIZATION MUST BE OBTAINED FROM OMEGA ENGINEERING BEFORE RETURNED MERCHANDISE WILL BE ACCEPTED. AUTHORIZATION CAN BE OBTAINED BY CALLING OMEGA ENGINEERING CUSTOMER SERVICE AND REQUESTING AN AUTHORIZED RETURN (AR) NUMBER.

Appendix C - Electrical Interface

RS-232

Quite possibly the most widely used communication standard is RS-232. This implementation has been defined and revised several times and is often referred to as RS-232 or EIA/TIA-232. The IBM PC computer defined the RS-232 port on a 9 pin D sub connector and subsequently the EIA/TIA approved this implementation as the EIA/TIA-574 standard. This standard is defined as the *9-Position Non-Synchronous Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*. Both implementations are in wide spread use and will be referred to as RS-232 in this document. RS-232 is capable of operating at data rates up to 20 Kbps at distances less than 50 ft. The absolute maximum data rate may vary due to line conditions and cable lengths. RS-232 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. 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).

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. 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 (usually 1, 1.5 or 2). An extra bit used for error detection is often appended before the stop bits.

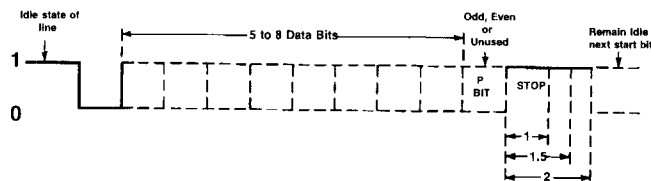


Figure 4 - Asynchronous Communications Bit Diagram

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 - 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/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.

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/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. **BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS).** The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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