

User's Guide

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OMG-USB-DIO96

96 Channel Digital I/O Interface Board



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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. 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, patient-connected applications.

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Introduction

Overview

The **OMG-USB-DIO96** provides twelve eight-bit ports that may be individually configured as inputs or outputs.

What's Included

The **OMG-USB-DIO96** is shipped with the following items. If any of these items is missing or damaged, contact the supplier.

- **OMG-USB-DIO96** Adapter
- Software CD
- 5V Power Supply
- USB A to B Cable, Part number CA179

Industry Standard Relay Rack Cables and Options

- Part number CA135 for Edge Connection
- Part number CA167 for IDC Connection
- Part number TB07-50 pin terminal block

Installation

For proper operation install software first. To install the software place the CD in your CD-ROM tray and the auto-run program will start. If auto-run is not available browse the CD and choose "index.htm". Choose **Install Software** at the beginning of the CD. Select the **Digital I/O** software drivers and install **SeaIO** prior to installing hardware. After installing the software, connect the power adapter and USB cable to the **OMG-USB-DIO96**. In the event that the hardware is installed first, the "Found new hardware wizard" will request a driver disk. Insert the CD and browse the SeaIO directory for the "SeaIO.inf" file. A complete installation of the SeaIO suite is recommended by running setup. When plugged in the device will light its enable LED once enumerated properly. Be sure to follow these steps to insure that the **OMG-USB-DIO96** opens and enumerates properly.

Technical Description

The **OMG-USB-DIO96** provides 96 channels of digital I/O configurable as inputs or outputs. Applications include PC based control and automation of sensors, switches, satellite antenna control systems, video and audio studio automation, security control systems, and other industrial automation.

Software

The **OMG-USB-DIO96** ships with the SeaI/O suite of Windows 98/NT/ME/2000 drivers. SeaI/O provides the user with a consistent and straightforward API, allowing the developer to concentrate on the details of the application as opposed to low level driver development. Popular development environments are supported for application development. SeaI/O includes sample applications and a utility for configuring the driver parameters under Windows, further simplifying installation.

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.omega.com>.

Electrical Characteristics

Figure 1, below provides the electrical characteristics of each Input/Output. Each port is buffered with a 74ABT245 octal bi-directional transceiver. Each input is capable of sinking up to 64 mA, while each output can source up to 32 mA. The **OMG-USB-DIO96** requires a 5V power source and is shipped with a 5V power supply rated at 2.4 A. The device uses 500mA leaving 1900 mA for outputs. $1900/32 = 59.375$; at most 59 outputs can drive 32 mA with the provided 5V power supply. If the provided adapter is not sufficient for your application, then an alternate 5V power supply rated higher than 2.4 A will be required.

Recommended Operating Conditions		
	Min	Max
Input	0 V	5.25 V
Source		32 mA
Sink		64 mA

Electrical Characteristics	
High Level Input Voltage	Min 2 V
Low Level Input Voltage	Max 0.8 V
High Level Output Voltage	Min 2 V at 32 mA
	Typically 3.4 V at 3 mA
Low Level Output Voltage	Max 0.55 V at 64 mA

Figure 1-Operating Conditions

Pull Ups

Ten pin bussed resistor packs are installed to provide pull-ups to the input ports. These are installed on all ports. The pull-up resistor packs are rated at 10K ohms. Figure 2 below provides the bussed resistor and corresponding port. The resistors insure that no line is floating which is not connected. This provides consistent biasing on all un-terminated lines.

Bussed Resistor	Corresponding Port	Bussed Resistor	Corresponding Port
RP3	Port A1	RP9	Port A3
RP2	Port B1	RP8	Port B3
RP1	Port C1	RP7	Port C3
RP6	Port A2	RP12	Port A4
RP5	Port B2	RP11	Port B4
RP4	Port C2	RP10	Port C4

Figure 2-Pull Up Resistors

Banks and Ports

The **OMG-USB-DIO96** has four 50-pin headers. Each 50-pin header is a bank of three ports, comprising a total of twelve eight bit ports. Each port is eight bits wide and may be configured as an input or output port. Figure 3 below gives the bank and port organization.

Bank 1 – P2	Bank 2 – P3	Bank 3 – P4	Bank 4 – P5
Port A1	Port A2	Port A3	Port A4
Port B1	Port B2	Port B3	Port B4
Port C1	Port C2	Port C3	Port C4

Figure 3-Bank and Ports

Serial String

Each device has an eight digit alphanumeric serial string stored in non-volatile memory. On the Windows platforms, this number is used to give each unit a separate identity. This identity allows the device to be moved to any USB port or hub port on your computer while retaining its device number. If a device becomes damaged and is replaced the new device should be given the same serial string as the device it is replacing.

This string is stored in an EEPROM along with other critical information. This EEPROM is read during enumeration. The device should not be unplugged during its enumeration due to a remote possibility that the data in the EEPROM could be corrupted if power is removed during a read/write cycle.

The control panel utility provides the capability to read or modify this string. However, **setting the same string for two units will cause the second unit to fail enumeration, and make it invisible to the operating system.** Should this occur, unplug one unit and set the serial string for the other unit to a different string.

50 pin ribbon cable pin out

Each of the four 50 pin ribbon cable headers has the following pin out as shown in Figure 4.

Description	Pin #
Port A	
A0	47
A1	45
A2	43
A3	41
A4	39
A5	37
A6	35
A7	33
Port B	
B0	31
B1	29
B2	27
B3	25
B4	23
B5	21
B6	19
B7	17
Port C	
C0	15
C1	13
C2	11
C3	9
C4	7
C5	5
C6	3
C7	1
GND	All Even pins
+5V	49

Figure 4-50 Pin Header/Ribbon Cable Pin out

Programming

Application Programmers Interface (API)

The SeaIO driver, API, and utilities have been included to provide control over the hardware in Windows environments. The following section is designed to help the customer understand the API connection to the actual I/O for the **OMG-USB-DIO96**. Complete documentation of the API can be found in the SeaI/O help file.

Presetting an Output Port:

Each port has an output register associated with it. This register may be written and retains its value whether the port is configured as an input or an output. To preset the value of an output port the program should write to the port when it is configured as an input then configure it as an output. Inputs cannot be written to with relative addressing, absolute addressing must be used. Refer to **Relative Addressing vs. Absolute Addressing** for more information.

Interrupts:

Interrupt sampling can be set up in the API. **Port A1 bit zero (0) is the interrupt source (pin 47 of P2)**. Refer to the API section in the SeaI/O help file for more information.

Port Configuration:

Each eight-bit port can be configured as inputs or outputs. The API provides a set adapter state call to access the control words.

Note: The control panel also allows you to configure the device. Your program can over ride the control panel configuration when executed, but the control panel configuration will be the default on power up. The default settings are based on the settings in the control panel application when last changed and saved after re-booting.

Relative Addressing vs. Absolute Addressing

The SeaIO API makes a distinction between “absolute” and “relative” addressing modes. In absolute addressing mode, the Port argument to the API function acts as a simple byte offset from the base I/O address of the device. For instance, Port #0 refers to the I/O address 0; Port #1 refers to the I/O address 1.

Relative addressing mode refers to input and output ports in a logical fashion. With a Port argument of 0 and an API function meant to output data, the first (0th) output port on the device will be utilized. Likewise, with a Port argument of 0 and an API function designed to input data, the first (0th) input port of the device will be utilized.

In all addressing modes, port numbers are zero-indexed; that is, the first port is port #0, the second port is #1, the third #2, and so on. The mapping of absolute addressing will always be the same, but due to the fact that this device is configurable, mapping for relative addressing will be dependent on the configuration.

Given Bank 1, Port B2, Port A3 and Port C3 are all inputs and the rest of the ports are outputs, Figure 5 gives the Absolute address, and Figure 6 gives the relative address.

Bank 1 – P2		Bank 2 – P3		Bank 3 – P4		Bank 4 – P5	
Address	Port	Address	Port	Address	Port	Address	Port
0	A1	3	A2	6	A3	9	A4
1	B1	4	B2	7	B3	10	B4
2	C1	5	C2	8	C3	11	C4

Figure 5-Absolute Byte Address (Same for any configuration)

Bank 1 – P2		Bank 2 – P3		Bank 3 – P4		Bank 4 – P5	
Address	Port	Address	Port	Address	Port	Address	Port
0 (input)	A1	0 (output)	A2	4 (input)	A3	3 (output)	A4
1 (input)	B1	3 (input)	B2	2 (output)	B3	4 (output)	B4
2 (input)	C1	1 (output)	C2	5 (input)	C3	5 (output)	C4

Figure 6-Relative Byte Address (Only applies to the given configuration)

Figure 7 below gives the absolute address for each bit on this device.

Bank 1 – P2		Bank 2 – P3		Bank 3 – P4		Bank 4 – P5	
Address	Port-Bit	Address	Port-Bit	Address	Port-Bit	Address	Port-Bit
0	A1-0	24	A2-0	48	A3-0	72	A4-0
1	A1-1	25	A2-1	49	A3-1	73	A4-1
2	A1-2	26	A2-2	50	A3-2	74	A4-2
3	A1-3	27	A2-3	51	A3-3	75	A4-3
4	A1-4	28	A2-4	52	A3-4	76	A4-4
5	A1-5	29	A2-5	53	A3-5	77	A4-5
6	A1-6	30	A2-6	54	A3-6	78	A4-6
7	A1-7	31	A2-7	55	A3-7	79	A4-7
8	B1-0	32	B2-0	56	B3-0	80	B4-0
9	B1-1	33	B2-1	57	B3-1	81	B4-1
10	B1-2	34	B2-2	58	B3-2	82	B4-2
11	B1-3	35	B2-3	59	B3-3	83	B4-3
12	B1-4	36	B2-4	60	B3-4	84	B4-4
13	B1-5	37	B2-5	61	B3-5	85	B4-5
14	B1-6	38	B2-6	62	B3-6	86	B4-6
15	B1-7	39	B2-7	63	B3-7	87	B4-7
16	C1-0	40	C2-0	64	C3-0	88	C4-0
17	C1-1	41	C2-1	65	C3-1	89	C4-1
18	C1-2	42	C2-2	66	C3-2	90	C4-2
19	C1-3	43	C2-3	67	C3-3	91	C4-3
20	C1-4	44	C2-4	68	C3-4	92	C4-4
21	C1-5	45	C2-5	69	C3-5	93	C4-5
22	C1-6	46	C2-6	70	C3-6	94	C4-6
23	C1-7	47	C2-7	71	C3-7	95	C4-7

Figure 7-Absolute Bit Address (Same for any configuration)

Figures 8 and 9 are provided for the user in the event that he/she wishes to record their particular relative addressing setup, provided its constant. Print this page and fill in the tables starting in the top left corner of each and work from top to bottom, left to right. Start with zero on the first input and increment by one on each additional input. Next move to outputs and again start with zero and increment by one on each additional output.

Bank 1 – P2		Bank 2 – P3		Bank 3 – P4		Bank 4 – P5	
Address	Port	Address	Port	Address	Port	Address	Port
	A1		A2		A3		A4
	B1		B2		B3		B4
	C1		C2		C3		C4

Figure 8-Relative Byte Address (Print and fill in for your configuration)

Bank 1 – P2		Bank 2 – P3		Bank 3 – P4		Bank 4 – P5	
Address	Port-Bit	Address	Port-Bit	Address	Port-Bit	Address	Port-Bit
	A1-0		A2-0		A3-0		A4-0
	A1-1		A2-1		A3-1		A4-1
	A1-2		A2-2		A3-2		A4-2
	A1-3		A2-3		A3-3		A4-3
	A1-4		A2-4		A3-4		A4-4
	A1-5		A2-5		A3-5		A4-5
	A1-6		A2-6		A3-6		A4-6
	A1-7		A2-7		A3-7		A4-7
	B1-0		B2-0		B3-0		B4-0
	B1-1		B2-1		B3-1		B4-1
	B1-2		B2-2		B3-2		B4-2
	B1-3		B2-3		B3-3		B4-3
	B1-4		B2-4		B3-4		B4-4
	B1-5		B2-5		B3-5		B4-5
	B1-6		B2-6		B3-6		B4-6
	B1-7		B2-7		B3-7		B4-7
	C1-0		C2-0		C3-0		C4-0
	C1-1		C2-1		C3-1		C4-1
	C1-2		C2-2		C3-2		C4-2
	C1-3		C2-3		C3-3		C4-3
	C1-4		C2-4		C3-4		C4-4
	C1-5		C2-5		C3-5		C4-5
	C1-6		C2-6		C3-6		C4-6
	C1-7		C2-7		C3-7		C4-7

Figure 9-Bit Relative Address (Print and fill in for your configuration)

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

Power Consumption

Supply line	+5 VDC
Rating	500 mA

Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

Appendix A - Troubleshooting

Following these simple steps can eliminate most common problems.

Install software **first**. After installing the software then proceed to adding the hardware. This places the required installation files in the correct locations.

1. Read this manual thoroughly before attempting to install the adapter in your system.
2. Use Device Manager under Windows to verify proper installation.
3. Use the SeaIO control panel applet for card identification and configuration.

If these steps do not solve your problem, please call Omega Technical Support, 1-800-DAS-IEEE. Our technical support is free and available from 8:30AM-6PM Eastern Time Monday through Friday.

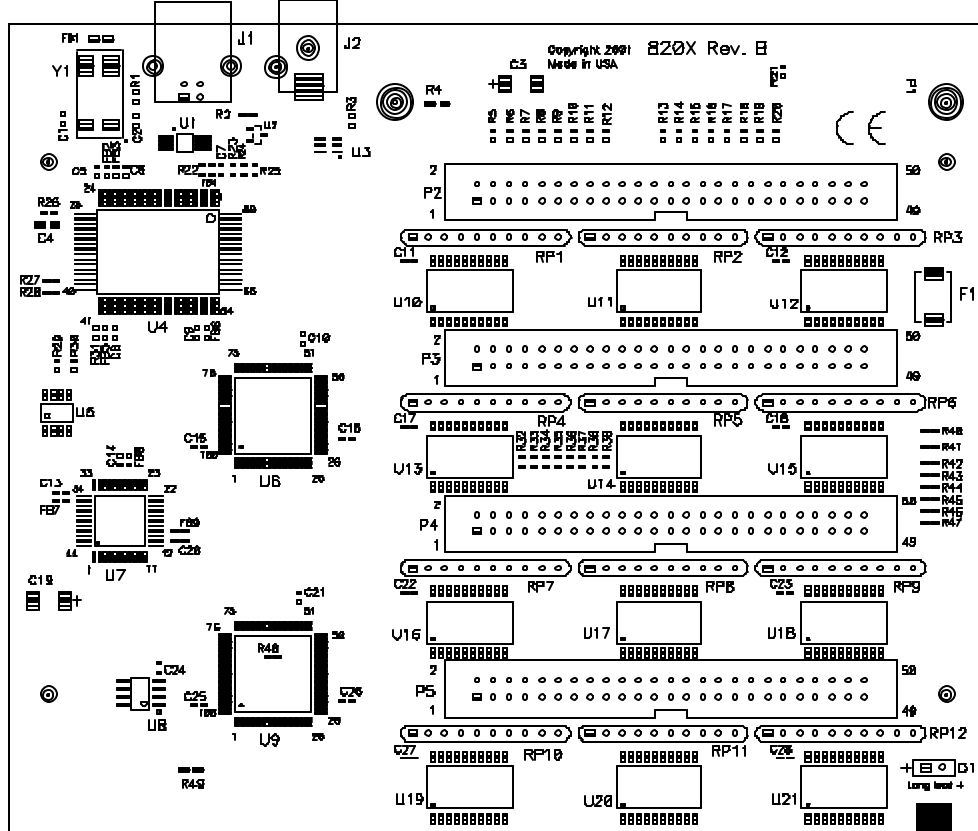
Appendix B - How To Get Assistance

Please refer to Troubleshooting Guide prior to calling Technical Support.

1. Begin by reading through the Trouble Shooting Guide in Appendix A. If assistance is still needed please see below.
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 Home page on the Internet. Our home page 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 to Friday from 8:30 a.m. to 6:00 p.m. Eastern time. Technical support can be reached at 1-800-DAS-IEEE.

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

Appendix C - Silk-Screen



Appendix D - 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 which wear are not warranted, including but 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 it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS 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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- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments