User's Guide

OMG-PCI-DIO96

96 Channel Digital I/O Board

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Introduction

Overview

The **OMG-PCI-DIO96** provides twelve eight-bit ports compatible with 8255 mode 0. Each port may be individually configured as inputs or outputs.

What's Included

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

- **OMG-PCI-DIO96** Adapter
- Software CD

Industry Standard Relay Rack Cables and options are available:

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

Installation

Card Setup

The **OMG-PCI-DIO96** is a fully compliant PCI 'Plug and Play' adapter. All card resources (i.e. I/O address, IRQ selection) are auto-assigned by either your system BIOS or your 'Plug and Play' operating system.

Software 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.

Linux Users

Refer to the installation instructions at the beginning of the CD for details on installing digital I/O cards in Linux.

System Installation

The **OMG-PCI-DIO96** can be installed in any of the PCI expansion slots.

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. Remove the clamping portion of the bracket from the card.
5. Gently insert the **OMG-PCI-DIO96** into the slot. Make sure that the adapter is seated properly.
6. Feed the four 50-pin ribbon cables through the cutout bracket and connect them to the card.
7. Replace the bracket retaining screw.
8. Install the clamping portion of the bracket
9. Replace the computer cover.
10. Connect the power cord. Installation is complete.

Technical Description

The **OMG-PCI-DIO96** provides 96 channels of digital I/O configurable as inputs or outputs, which can be utilized for PC based control and automation including sensors, switches, satellite antenna control systems, video and audio studio automation, security control systems, and other industrial automation systems.

Software

The **OMG-PCI-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, including Visual C++, Visual Basic, and Delphi, are supported for application development. SeaI/O includes sample applications and a utility for configuring the driver parameters under Windows, further simplifying installation.

Linux Users

The OMG-PCI-DIO96 ships with software for Linux, including a kernel-mode driver, API, and the SeaIOTst diagnostic tool. The kernel-mode driver is provided as a module, so future driver upgrades may be performed with minimal (usually zero) downtime. The Linux API is identical to its Windows counterpart, facilitating quick and easy ports of existing SeaI/O-aware applications to the Linux operating system. All source code for the Linux software suite is provided under the GNU Public License (GPL v2.0), to assist in "roll-your-own"-type applications.

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

The Table , below provides the electrical characteristics of each Input/Output. Each port is buffered with a 74LS245 octal bi-directional transceiver. Each input is capable of sinking up to 24 mA, while each output can source up to 15 mA.

Recommended Operating Conditions		
	Min	Max
Input	0 V	5.25 V
Source		15 mA
Sink		24 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 15 mA
	Typically 3.4 V at 3 mA
Low Level Output Voltage	Max 0.55 V at 24 mA

Figure 1-Electrical Characteristics

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

Figure 2-Pull Up Resistors

50 pin ribbon cable pin out

Figure 3-50 Pin Ribbon Cable Pin Out

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

Programming

Application Programmers Interface (API)

Most modern operating systems do not allow direct hardware access. The SeaIO driver and API have been included to provide control over the hardware in Windows and Linux environments.
The purpose of this section of the manual is to help the customer with the mapping of the API to the actual inputs for the **OMG-PCI-DIO96** specifically. Complete documentation of the API can be found in its accompanying 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. See **Relative Addressing vs. Absolute Addressing** below.

Interrupts:

Interrupt sampling can be set up in the API. **Port A1 bit zero is the interrupt source (pin 47)**. Refer to the API section in the SeaI/O help file for more detailed 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. For this device, four control word is used. Refer to the following table.

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.

Control Word 0: Bank 1 (A1, B1, C1)
Control Word 1: Bank 2 (A2, B2, C2)
Control Word 2: Bank 3 (A3, B3, C3)
Control Word 3: Bank 4 (A4, B4, C4)

Control Words
I/O Configuration

CWnD0	Port C1	see below		1 on power up
CWnD1	Port B1	1 = input	0 = output	1 on power up
CWnD2	0 or 1 (no effect)			
CWnD3	Port C1	see below		1 on power up
CWnD4	Port A1	1 = input		1 on power up
CWnD5	0 or 1 (no effect)			
CWnD6	0 or 1 (no effect)			
CWnD7	Always a 1			

n = port number

CWnD3	CWnD0	Port C direction
0	0	output
0	1	input
1	0	input
1	1	input

Figure 4-Control Words/Port Direction

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 base + 0; Port #1 refers to the I/O address base + 1.

Relative addressing mode, on the other hand, 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 (0^{th}) 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 (0^{th}) 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.

Tables : API Port/bit reference numbers for Absolute and Relative Addressing
R = Read
W = Write
R/W = Read or Write

Port	API Port # Absolute Address (function)
A1	0 (R/W)
B1	1 (R/W)
C1	2 (R/W)
A2	8 (R/W)
B2	9 (R/W)
C2	10 (R/W)
A3	16 (R/W)
B3	17 (R/W)
C3	18 (R/W)
A4	24 (R/W)
B4	25 (R/W)
C4	26 (R/W)

Figure 5-Absolute byte Address (any configuration)

Port	API Port # Relative Address (function)	Port Type
A1	0 (R)	Input
B1	1 (R)	Input
C1	2 (R)	Input
A2	0 (W)	Output
B2	1 (W)	Output
C2	2 (W)	Output
A3	3 (W)	Output
B3	4 (W)	Output
C3	5 (W)	Output
A4	3 (R)	Input
B4	6 (W)	Output
C4	7 (W)	Output

Figure 6-Relative byte Address

Given: Inputs A1, B1, C1, A4

Outputs A2, B2, C2, A3, B3, C3, B4, C4

Addressing Continued

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	64	A2-0	128	A3-0	192	A4-0
1	A1-1	65	A2-1	129	A3-1	193	A4-1
2	A1-2	66	A2-2	130	A3-2	194	A4-2
3	A1-3	67	A2-3	131	A3-3	195	A4-3
4	A1-4	68	A2-4	132	A3-4	196	A4-4
5	A1-5	69	A2-5	133	A3-5	197	A4-5
6	A1-6	70	A2-6	134	A3-6	198	A4-6
7	A1-7	71	A2-7	135	A3-7	199	A4-7
8	B1-0	72	B2-0	136	B3-0	200	B4-0
9	B1-1	73	B2-1	137	B3-1	201	B4-1
10	B1-2	74	B2-2	138	B3-2	202	B4-2
11	B1-3	75	B2-3	139	B3-3	203	B4-3
12	B1-4	76	B2-4	140	B3-4	204	B4-4
13	B1-5	77	B2-5	141	B3-5	205	B4-5
14	B1-6	78	B2-6	142	B3-6	206	B4-6
15	B1-7	79	B2-7	143	B3-7	207	B4-7
16	C1-0	80	C2-0	144	C3-0	208	C4-0
17	C1-1	81	C2-1	145	C3-1	209	C4-1
18	C1-2	82	C2-2	146	C3-2	210	C4-2
19	C1-3	83	C2-3	147	C3-3	211	C4-3
20	C1-4	84	C2-4	148	C3-4	212	C4-4
21	C1-5	85	C2-5	149	C3-5	213	C4-5
22	C1-6	86	C2-6	150	C3-6	214	C4-6
23	C1-7	87	C2-7	151	C3-7	215	C4-7

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

The following two tables 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)

Direct Hardware Control

In systems where the users program has direct access to the hardware (DOS) the tables below gives the mapping and functions that the **OMG-PCI-DIO96** provide. The address of each eight-bit port is calculated as shown in the table on the following page, the cards base address plus an offset.

Reading the Inputs:

The inputs are active high. If an input is driven high (2V to 5.25 V) it will read as a logical one, if driven low (0V to 0.8V) it will read as a logical zero. If an input is not driven it will read as a one due to the 10K ohm pull up resistors on each port.

Reading the Outputs:

The value that is currently being used to drive the outputs will be returned.

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.

Writing the Outputs:

The outputs are active high. Writing a one (1) corresponds to 5V while writing a zero (0) corresponds to 0V, at the output.

Port Configuration:

Each port can be configured as an input or an output by writing to its direction control bit, refer to the tables below.

Interrupts

Interrupts can be set up as shown in the tables below.

Register Description (for direct hardware control)

Address Hex		Mode	D7	D6	D5	D4	D3	D2	D1	D0
Base+0	Port A1	RD/WR	PA1D7	PA1D6	PA1D5	PA1D4	PA1D3	PA1D2	PA1D1	PA1D0
Base+1	Port B1	RD/WR	PB1D7	PB1D6	PB1D5	PB1D4	PB1D3	PB1D2	PB1D1	PB1D0
Base+2	Port C1	RD/WR	PC1D7	PC1D6	PC1D5	PC1D4	PC1D3	PC1D2	PC1D1	PC1D0
Base+3	Control Word Port 1	WR	CW1D7	0	0	CW1D4	CW1D3	CW1D2	CW1D1	CW1D0
Base+4	Interrupt configuration Port 1	RD/WR	0	0	0	0	0	IRQEN1	IRQC11	IRQC10
Base+5	Interrupt status for Port 1 -- 4	RD	0	0	0	0	IRQST4	IRQST3	IRQST2	IRQST1
Base+8	Port A2	RD/WR	PA2D7	PA2D6	PA2D5	PA2D4	PA2D3	PA2D2	PA2D1	PA2D0
Base+9	Port B2	RD/WR	PB2D7	PB2D6	PB2D5	PB2D4	PB2D3	PB2D2	PB2D1	PB2D0
Base+A	Port C2	RD/WR	PC2D7	PC2D6	PC2D5	PC2D4	PC2D3	PC2D2	PC2D1	PC2D0
Base+B	Control Word Port 2	WR	CW2D7	0	0	CW2D4	CW2D3	CW2D2	CW2D1	CW2D0
Base+C	Interrupt configuration Port 2	RD/WR	0	0	0	0	0	IRQEN2	IRQC21	IRQC20
Base+10	Port A3	RD/WR	PA3D7	PA3D6	PA3D5	PA3D4	PA3D3	PA3D2	PA3D1	PA3D0
Base+11	Port B3	RD/WR	PB3D7	PB3D6	PB3D5	PB3D4	PB3D3	PB3D2	PB3D1	PB3D0
Base+12	Port C3	RD/WR	PC3D7	PC3D6	PC3D5	PC3D4	PC3D3	PC3D2	PC3D1	PC3D0
Base+13	Control Word Port 3	WR	CW3D7	0	0	CW3D4	CW3D3	CW3D2	CW3D1	CW3D0
Base+14	Interrupt configuration Port 3	RD/WR	0	0	0	0	0	IRQEN3	IRQC31	IRQC30
Base+18	Port A4	RD/WR	PA4D7	PA4D6	PA4D5	PA4D4	PA4D3	PA4D2	PA4D1	PA4D0
Base+19	Port B4	RD/WR	PB4D7	PB4D6	PB4D5	PB4D4	PB4D3	PB4D2	PB4D1	PB4D0
Base+1A	Port C4	RD/WR	PC4D7	PC4D6	PC4D5	PC4D4	PC4D3	PC4D2	PC4D1	PC4D0
Base+1B	Control Word Port 4	WR	CW4D7	0	0	CW4D4	CW4D3	CW4D2	CW4D1	CW4D0
Base+1C	Interrupt configuration Port 4	RD/WR	0	0	0	0	0	IRQEN4	IRQC41	IRQC40

Control Words

I/O Configuration

Figure 10-I/O Configuration

CWnD0	Port C1	see below		1 on power up
CWnD1	Port B1	1 = input	0 = output	1 on power up
CWnD2	0 or 1 (no effect)			
CWnD3	Port C1	see below		1 on power up
CWnD4	Port A1	1 = input		1 on power up
CWnD5	0 or 1 (no effect)			
CWnD6	0 or 1 (no effect)			
CWnD7	Always a 1			

n = port number

CWnD3	CWnD0	Port C direction
0	0	output
0	1	input
1	0	input
1	1	input

Control Word (X = 0)								Hex Value	Port Setup			
7	**6**	**5**	**4**	**3**	**2**	**1**	**0**		A	B	C Upper	C Lower
1	X	X	0	0	X	0	0	80	Out	Out	Out	Out
1	X	X	0	0	X	0	1	81	Out	Out	In	In
1	X	X	0	0	X	1	0	82	Out	In	Out	Out
1	X	X	0	0	X	1	1	83	Out	In	In	In
1	X	X	0	1	X	0	0	88	Out	Out	In	In
1	X	X	0	1	X	0	1	89	Out	Out	In	In
1	X	X	0	1	X	1	0	8A	Out	In	In	In
1	X	X	0	1	X	1	1	8B	Out	In	In	In
1	X	X	1	0	X	0	0	90	In	Out	Out	Out
1	X	X	1	0	X	0	1	91	In	Out	In	In
1	X	X	1	0	X	1	0	92	In	In	Out	Out
1	X	X	1	0	X	1	1	93	In	In	In	In
1	X	X	1	1	X	0	0	98	In	Out	In	In
1	X	X	1	1	X	0	1	99	In	Out	In	In
1	X	X	1	1	X	1	0	9A	In	In	In	In
1	X	X	1	1	X	1	1	9B	In	In	In	In

Interrupt Control

When enabled interrupts are generated on port bit D0 of each A port.

n = port number

IRQENn	interrupt enable	1 = enabled	0 = disabled (0 on power up)
IRQCn0	Interrupt mode select see table		
IRQCn1	Interrupt mode select see table		

Figure 11-Interrupt Control

Interrupt mode select table

IRQCn1	IRQCn0	INT Type
0	0	Low level
0	1	High level
1	0	Falling edge
1	1	Rising edge

Figure 12-Interrupt Mode Select

Interrupt Read

(reading this port clears the interrupt)

IRQST1	(D0) Interrupt status	1 = interrupt pending, 0 = none
IRQST2	(D1) Interrupt status	1 = interrupt pending, 0 = none
IRQST3	(D2) Interrupt status	1 = interrupt pending, 0 = none
IRQST4	(D3) Interrupt status	1 = interrupt pending, 0 = none

Figure 13-Interrupt Read

Specifications

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0º to 50º C (32º to 122º F)	-20º to 70º C (-4º to 158º F)
Humidity Range	10 to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

Power Consumption

Supply line	+5 VDC
Rating	1000 mA

Mean Time Between Failures (MTBF)

Greater than 150,000 hours. (Calculated)

Physical Dimensions

Board Length	6.800 inches	(15.494 cm.)
Board Height including Goldfingers	4.200 inches	(10.414 cm.)
Board Height excluding Goldfingers	3.875 inches	(11.494 cm.)

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.
4. 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.

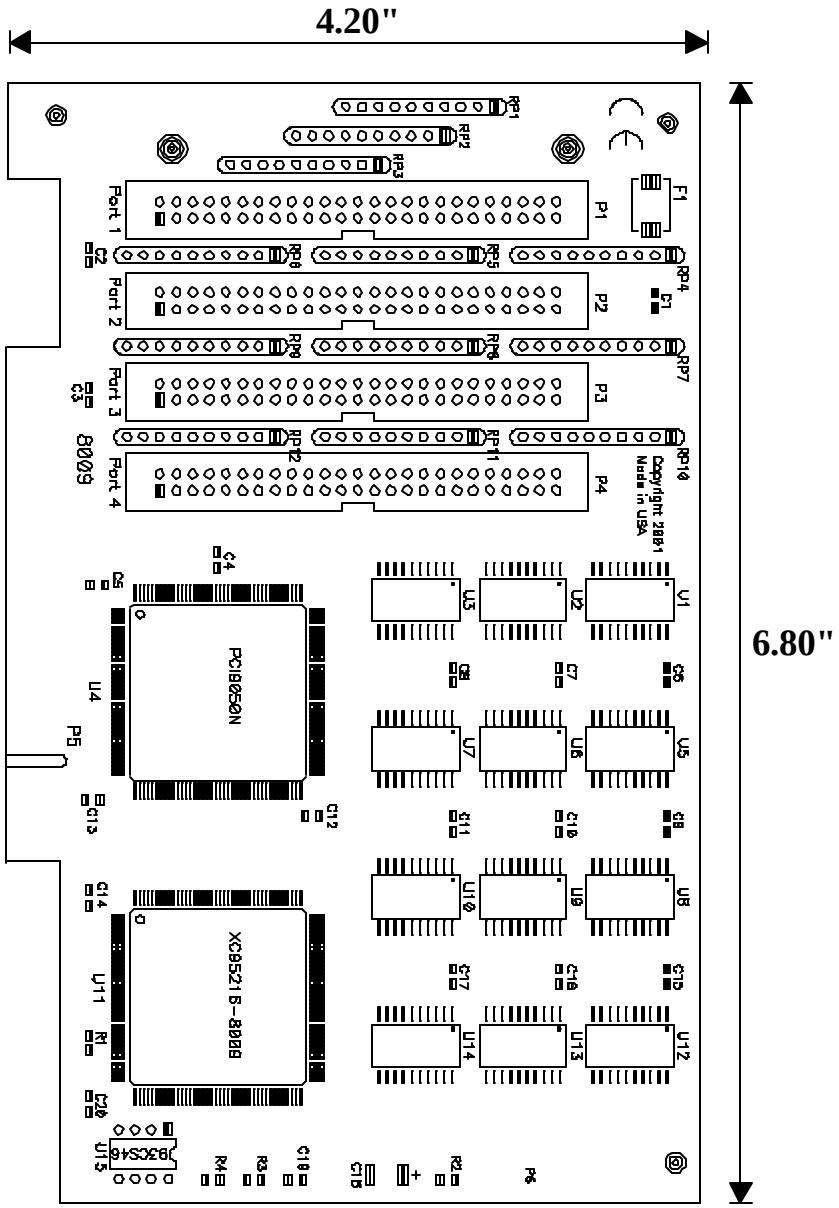
Appendix B - How To Get Assistance

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.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

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

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