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CIO-DO48H, CIO-DO96H and CIO-DO192H

USER'S MANUAL



MEASUREMENT COMPUTING™

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1 INTRODUCTION

The CIO-DO48H, 96H and 192H are designed to have the best quality and lowest cost of any digital output board. Throughout this manual the notation CIO-DOxxH is used when the information applies to the CIO-DO48H, CIO-DO96H and CIO-DO192H inclusive. Exclusive information for a particular version will be identified.

The 'H' designation indicates that these boards are capable of 'High Drive'. High Drive TTL is capable of higher currents than standard TTL. Rather than a few milliamps or even microamps, High Drive outputs are capable of tens of milliamps. See the electrical specification in this manual for details.

In addition to high drive the CIO-DOxxH boards have another advantage over 82C55 based boards in that there is no control register to set the port direction from input to output. The CIO-DOxxH boards are output only. In applications where the digital output is being used to control a relay that is switching an inductive load, the 82C55 is subject to resets and "glitching", while the CIO-DOxxH is not.

The connector pin specification of all the CIO-DO and CIO-DI family of digital boards may be used in place of one another without changing cabling or connectors.

All these products are supported by Universal Library programming library.

2 SOFTWARE INSTALLATION

In order to easily test your installation, it is recommended that you install InstaCal, the installation, calibration and test utility that was supplied with your board. Refer to the Software Installation Manual for information on the initial setup, loading, and installation of InstaCal and optional Universal Library software.

InstaCal will guide you through hardware settings and allow you to easily test for conflicts. If you decide not to use InstaCal to assist board configuration, details are provided in the following section.

3 HARDWARE SETUP

Open your PC (after turning off the power) and install the board. Leave the switches as they were set at the factory or refer to the information below to change the settings. After the board is installed and the computer is closed up, turn the power back on.

3.1 BASE ADDRESS

The CIO-DO48 employs the PC bus for power, communications and data transfer. As such it draws power from the PC, monitors the address lines and control signals and responds to it's I/O address, and it receives and places data on the eight data lines.

The BASE address is the most important user-selectable feature of the CIO-DO##H series. The base address is the starting location that software writes to when communicating with the CIO-DO##H.

A set of DIP switches is used for setting the base address. By placing the switch down, the CIO-DO##H address decode logic is instructed to respond to that address bit.

A complete address is constructed by calculating the HEX or decimal number which corresponds to all the address bits the board has been instructed to respond to. For example, in Figure 3-1, for address 300h, switches 9 and 8 are DOWN, all others UP.

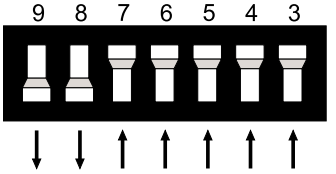
Address 9 = 200h (512D) and address 8 = 100h (256D), when added together they equal 300h (768D).

NOTE

DISREGARD THE NUMBERS PRINTED ON THE SWITCH. REFER TO THE NUMBERS PRINTED IN WHITE ON THE BOARD.

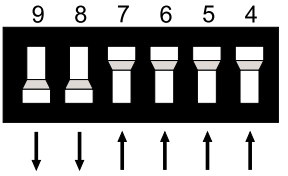
In Figure 3-1, note that the number of switches varies with the board version.

Certain addresses are used by the PC, others are free and may be used by the CIO-DO48 and other expansion boards. We recommend the factory default address, BASE = 300h (768D), be tried first.



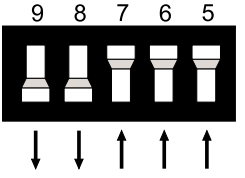
SW	HEX
A9	200
A8	100
A7	80
A6	40
A5	20
A4	10
A3	08

CIO-DO48H
BASE ADDRESS SWITCH - Address 300h shown



SW	HEX
A9	200
A8	100
A7	80
A6	40
A5	20
A4	10

CIO-DO96H
BASE ADDRESS SWITCH - Address 300h shown



SW	HEX
A9	200
A8	100
A7	80
A6	40
A5	20

CIO-DO192H
BASE ADDRESS SWITCH - Address 300h shown

Figure 3-1. Base Address Switches - All Versions

Table 3-1. PC I/O Address Summary

HEX RANGE	FUNCTION	HEX RANGE	FUNCTION
000-00F	8237 DMA #1	2C0-2CF	EGA
020-021	8259 PIC #1	2D0-2DF	EGA
040-043	8253 TIMER	2E0-2E7	GPIB (AT)
060-063	8255 PPI (XT)	2E8-2EF	SERIAL PORT
060-064	8742 CONTROLLER (AT)	2F8-2FF	SERIAL PORT
070-071	CMOS RAM & NMI MASK (AT)	300-30F	PROTOTYPE CARD
080-08F	DMA PAGE REGISTERS	310-31F	PROTOTYPE CARD
0A0-0A1	8259 PIC #2 (AT)	320-32F	HARD DISK (XT)
0A0-0AF	NMI MASK (XT)	378-37F	PARALLEL PRINTER
0C0-0DF	8237 #2 (AT)	380-38F	SDLC
0F0-0FF	80287 NUMERIC CO-P (AT)	3A0-3AF	SDLC
1F0-1FF	HARD DISK (AT)	3B0-3BB	MDA
200-20F	GAME CONTROL	3BC-3BF	PARALLEL PRINTER
210-21F	EXPANSION UNIT (XT)	3C0-3CF	EGA
238-23B	BUS MOUSE	3D0-3DF	CGA
23C-23F	ALT BUS MOUSE	3E8-3EF	SERIAL PORT
270-27F	PARALLEL PRINTER	3F0-3F7	FLOPPY DISK
2B0-2BF	EGA	3F8-3FF	SERIAL PORT

The CIO-DO48 BASE switch may be set for address in the range of 000-3F8 so it should not be hard to find a free address area for your CIO-DO48. Once again, if you are not using IBM prototyping cards or some other board which occupies these addresses, then 300-31Fh are free to use.

Addresses not specifically listed, such as 390-39Fh, are not reserved and may be available. Check your computer for other boards which may use I/O addresses.

4 HARDWARE INSTALLATION

4.1 INSTALL BOARD

1. Turn the power off.

2. Remove the cover of your computer. Be careful not to dislodge any of the cables installed on the boards in your computer as you slide the cover off.

3. Locate an empty expansion slot in your computer.

4. Push the board firmly down into the expansion bus connector. If it is not seated fully it may fail to work and could short circuit the PC bus power onto a PC bus signal. This could damage the motherboard in your PC as well as the CIO-DOxxH.

4.2 CABLING TO THE CONNECTOR

The connector(s) are accessible through the PC/AT expansion bracket. The connector is a standard 50 pin header connector. A cable with mating connectors (C50FF-#) can be purchased from Mesurement Computing Corp.

Those familiar with the CIO-DIO##H boards will find the signal levels and pin assignments are identical with those on the CIO-DOxxH.

4.3 SIGNAL CONNECTION

The CIO-DOxxH signals are buffered (high output drive) STTL. STTL is an electronics industry term, short for Schotky Transistor Transistor Logic, which describes a standard for digital signals which are either at 0V or 5V.

Under normal operating conditions, the voltages on the output pins range from near 0 volts for the low state to near 5.0 volts for the high state.

CAUTION

Voltages and currents associated with external devices can range from less than a hundred mA at a few volts for a small flash light bulb to 50 Amps at 220 volts for a large electric range. Attempting to connect either of these devices directly to the CIO-DO48 would destroy the output buffer chip.

4.4 CONNECTOR DIAGRAM AND REGISTER ASSIGNMENTS

The CIO-DOxxH user connector is one to four 50-pin header-type connectors accessible from the rear of the PC through the expansion backplate. The signals available are direct connections to a digital buffer chip.

The connector accepts female 50-pin header type connectors, such as those on the C50FF-2, a 2-foot cable with female connectors.

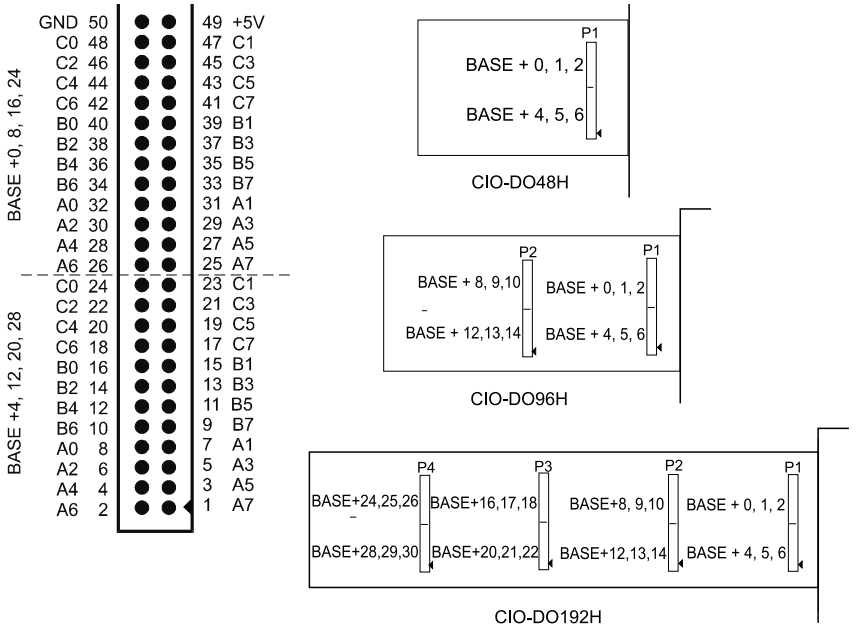


Figure 4-1. User Connector Pinout and Register Assignments

Figure 4-1 shows the register assignments for the outputs of all three board versions.

If frequent changes to signal connections or signal conditioning is required, please refer to the information on the CIO-TERM100, CIO-SPADE50 and CIO-MINI50 screw terminal boards.

5 DATA REGISTERS

Each CIO-DOxxH is composed of parallel output chips. Each address contains one latch and one buffer controlling eight output pins. The ports are arranged in sets of 3, with an intervening NA (not used) address area. This scheme allows compatibility with software written to control 82C55 based boards when the 82C55 is used as all outputs. On those boards every fourth address contains a control register.

The first address, or BASE ADDRESS 0 , is determined by setting a bank of switches on the board.

The data registers and their output function are listed on Table 5-1. Each register has eight output bits. Thus:

CIO-DO48H uses registers 0 to 6 (six registers x 8 bits = 48; skip registers 3 &7)

CIO-DO96H uses registers 0 to 14 (12 registers x 8 bits = 96; skip four registers.)

CIO-DO192H uses registers 0 to 30 (24 registers x 8 bits = 192; skip eight registers.)

To write a control data to an output register, the individual bits must be set to 0 or 1 then combined to form a Byte.

Table 5-1. Data Register Address Summary - All Board Versions

ADDRESSES	READ	WRITE FUNCTION
BASE +0, 4, 8, 12, 16, 20, 24, 28	None	Port A Output
BASE +1, 5, 9, 13, 17, 21, 25, 29	None	Port B Output
BASE +2, 6, 10, 14, 18, 22, 26, 30	None	Port C Output
BASE +3, 7, 11, 15, 19, 23, 27, 31	None	None (skip)

The port identities (A, B, and C) repeat for each set of 24 digital output lines, so the CIO-DO48 has two sets of ports, the DO96 has four and the DO192 has eight.

PORT A DATA

BASE ADDRESS + 0 (See Table 5-1 for remaining addresses.)

7	6	5	4	3	2	1	0
A7	A6	A5	A4	A3	A2	A1	A0

PORT B DATA

BASE ADDRESS + 1 (See Table 5-1 for remaining addresses.)

7	6	5	4	3	2	1	0

B7	B6	B5	B4	B3	B2	B1	B0

PORT C DATA

BASE ADDRESS + 2 (See Table 5-1 for remaining addresses.)

7	6	5	4	3	2	1	0
C7	C6	C5	C4	C3	C2	C1	C0

6 SPECIFICATIONS

Power consumption

+5V quiescent	
CIO-DO48H	0.75A typ, 1.0A max
CIO-DO96H	1.3A typ, 1.7A max
CIO-DO192H	2A typ, 2.6A max

Digital Input / Output

Digital Type	74S244
Configuration	Output only
CIO-DO48H	6 banks of 8 bits, 48 total outputs
CIO-DO96H	12 banks of 8 bits , 96 total outputs
CIO-DO192H	24 banks of 8 bits , 192 total outputs
Output High	2.4 volts min @ -15mA
Output Low	0.5 volts max @ 64 mA
Power-up / reset state	Logic low

Environmental

Operating temperature range	0 to 70°C
Storage temperature range	-40 to 100°C
Humidity	0 to 90% non-condensing

7 TTL TO SOLID STATE RELAYS

High AC and high DC voltage devices cannot be controlled directly by the outputs of a CIO-DOxxH.

Solid State Relays are used control and monitoring of AC and high DC voltages. They can provide up to 4000V of isolation. Solid State Relays (SSRs) are the recommended method of interfacing to AC and high DC signals.

The most convenient way to use solid state relays and a CIO-DO##H board is to use a Solid State Relay Rack. An SSR Rack is a circuit board that has sockets to accept SSRs.

A variety of SSR modules and racks are available from Measurement Computing Corp.

EC Declaration of Conformity

We, Measurement Computing Corp., declare under sole responsibility that the product:

Part Number	Description
CIO-DO48H	Digital output board
CIO-DO96H	Digital output board
CIO-DO192H	Digital output board

to which this declaration relates, meets the essential requirements, is in conformity with, and CE marking has been applied according to the relevant EC Directives listed below using the relevant section of the following EC standards and other normative documents:

EU EMC Directive 89/336/EEC: Essential requirements relating to electromagnetic compatibility.

EU 55022 Class B: Limits and methods of measurements of radio interference characteristics of information technology equipment.

EN 50082-1: EC generic immunity requirements.

IEC 801-2: Electrostatic discharge requirements for industrial process measurement and control equipment.

IEC 801-3: Radiated electromagnetic field requirements for industrial process measurements and control equipment.

IEC 801-4: Electrically fast transients for industrial process measurement and control equipment.

Carl Haapaoja, Director of Quality Assurance

Measurement Computing Corporation
16 Commerce Boulevard,
Middleboro, MA 02346
(508) 946-5100
Fax: (508) 946-9500
E-mail: info@measurementcomputing.com
www. measurementcomputing.com

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