

# User's Guide

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**CIO-PDISO8**

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# INTRODUCTION

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## DESCRIPTION

The CIO-PDISO8 is an 8 channel isolated input, 8 channel relay output interface board for the IBM PC and compatibles. The CIO-PDISO8 is designed for control and sensing applications where a few points of high voltage need to be sensed or controlled.

### **WARNING!**

*High voltages will be present on the CIO-PDISO8 board when you have connected high voltage inputs or outputs to the CIO-PDISO8 connector.*

*Use extreme caution! Never handle the CIO-PDISO8 when signals are connected to the board through the connector.*

*DO NOT REMOVE THE PROTECTIVE PLATES FROM THE CIO-PDISO8.*

The outputs are 8 electromechanical relays. Five provide FORM C connection and three provide normally open FORM A connection. The contacts are rated at 6A @ 120V A.C. or 28V D.C., resistive load. The relays are controlled by writing to one 8 bit port. The state of the relay control register may be read back from the same port.

The inputs are 8 individual, optically isolated (500V) inputs that may be read back as a single byte. The inputs are not polarity sensitive and may be driven by either A.C. (50 - 1000 Hz) or D.C. in the range 5V - 24V R.M.S. Each input has a switchable low-pass filter with a time constant of 5mS (200Hz).

Although requiring only two 8 bit ports, the CIO-PDISO8 occupies 4 ports and will appear at both locations. There is no need for this but that is how the original was designed and the CIO-PDISO8 is a true clone.

Programming is accomplished by writes and reads to two 8 bit ports. Each bit indicates the state of an input or controls an output. Because the board is simple to program, requiring only that the language you choose support direct register I/O, there is no CALL routine or driver software supplied with the board. There are a few BASIC examples.

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## ACCESSORIES

The CIO-PDISO8 is a combination digital I/O board with signal conditioning installed. Most accessory boards are intended to provide signal conditioning or easy to access signal termination. In general, the CIO-PDISO8 with not require additional signal conditioning.

We recommend that under no circumstance should a screw terminal board be used with the CIO-PDISO8. The CIO-PDISO8 is intended to sense and control high volt-ages. If you use a screw terminal board you will expose yourself and others to those high voltage signals.

We recommend that you construct a safe cable to carry you signals directly from your equipment to the CIO-PDISO8 connector.

# INSTALLATION

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## SOFTWARE

### INSTALL PROGRAM

On the disk labeled InstaCal there is an installation program. Please run SETUP.EXE and accept the defaults. A new directory will be created on your hard disk and several lines will be added to AUTOEXEC and CONFIG files. If you have purchased the Universal Library for programming language InstaCAL will be installed as part of the library installation. Please run SETUP.EXE from the Universal Library disk or CD.

Once all the software is installed, change to the CB directory and run InstaCal. Choose the INSTALL menu and select your board by part number from the list. Supply the information required for base address and any other switch set or programmable features. Heed and act upon any warning messages displayed.

You may then run TEST and test the installation of the board. Follow the instructions for signal connection displayed on the screen.

You may also run CALIBRATE and check the calibration of the board, although that is not necessary since the board was calibrated at the factory.

If you need it, there is some on-line help in the InstaCal program.

Owners of the Universal Library should read the manual and examine the example programs prior to attempting any programming tasks.

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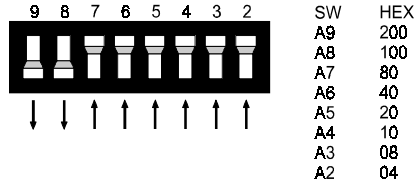
## BASE ADDRESS

The base address switch controls the I/O location where the CPU can access the registers of the CIO-PDISO8.

The factory default is 300H (768D).

If you have a board installed at address 300H, you will have to choose a new address from those available on your computer. You may use the list of PC I/O address assignments found elsewhere in this manual and add notes about the boards you have installed in your computer.

Choose a new base address from those available and set the switch using the guide to the right.



**BASE ADDRESS SWITCH** - Address 300H shown here.

If 300H is available on your computer, use it for the CIO-PDISO8. The software examples are written for base = 300H.

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## WAIT STATE

There is a wait state jumper on the CIO-PDISO8. The factory default is wait state disabled. You will probably never need the wait state because PC expansion slot busses are limited to 8 or 10 MHz.

If you were to get intermittent operation from your PDISO8, you may try enabling the wait state to see if that solves the problem.

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## AC INPUT FILTER

The inputs are 8 individual, optically isolated (500V) inputs that may be read back as a single byte. The inputs are not polarity sensitive and may be driven by either A.C. (50 - 1000 Hz) or D.C. in the range 5V - 24V R.M.S. Each input has a switchable low-pass filter with a time constant of 5mS (200Hz).

The switch which controls the input filter is shown here.

The filter must be used for A.C. inputs and should be used for D.C. inputs

Unless you have reason to turn off a filter, we recommend it be left on.

The diagram here shows an A.C. signal without the input filter. This is how the signal looks as it comes from the opto-isolator.

With the filter on, an A.C. voltage present on the input would produce a constant high signal.

Your CIO-PDISO8 is set up and may be installed in the computer.

**WARNING!**

*High voltages will be present on the CIO-PDISO8 board when you have connected high voltage inputs or outputs to the CIO-PDISO8 connector.*

*Use extreme caution! Never handle the CIO-PDISO8 when signals are connected to the board through the connector.*

*DO NOT REMOVE THE PROTECTIVE PLATES FROM THE CIO-PDISO8.*

# PROGRAMMING

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The CIO-PDISO8 is easy to program. Two eight bit registers located at the base address (relay output) and base+1 (isolated inputs) are written to or read to control relays, read back the state of relays or sense inputs.

BASE ADDRESS	Relay Output	Read/Write
BASE + 1	Isolated Inputs	Read Only
BASE + 2	Not Used	
BASE + 3	Not Used	

Although the CIO-PDISO8 decodes to four addresses, two of those are not used. This conforms to the design of the original PDISO-8, of which the CIO-PDISO8 is a true clone.

The registers are written to and read from as a single 8 bit byte. Each bit controls and output or represents the state of a device or input.

Both registers are read left to right. The leftmost bit being the most significant bit. Following this format bit 7 of BASE+0 corresponds to relay 7 and bit 0 to relay 0.

To construct a control word, use the following table:

<b>BIT No.</b>	7	6	5	4	3	2	1	0
<b>HEX Value</b>	80	40	20	10	8	4	2	1
<b>DECIMAL</b>	128	64	32	16	8	4	2	1

To assemble a control byte:

<u>RELAY</u>	<u>HEX</u>	<u>ON=1</u>	<u>WEIGHT</u>	<u>DECIMAL</u>	<u>ON=1</u>	<u>WEIGHT</u>
OP7	80	1	80	128	1	128
OP6	40	0	0	64	0	0
OP5	20	1	20	32	1	32
OP4	10	0	0	16	0	0
OP3	8	1	8	8	1	8
OP2	4	0	0	4	0	0
OP1	2	1	2	2	1	2
OP0	1	1	1	1	1	1
			AB			171

If the relay status byte is read back, it is in the same format.



The isolated inputs are read in this format as well. To disassemble the byte and determine the state of the isolated inputs or the relay read back register, perform the following operation in software:

<u>INPUT/RELAY</u>	<u>HEX</u>	<u>DECIMAL</u>
IP7/OP7	80	128
IP6/OP6	40	64
IP5/OP5	20	32
IP4/OP4	10	16
IP3/OP3	8	8
IP2/OP2	4	4
IP1/OP1	2	2
IP0/OP0	1	1

Perform an AND operation for each bit to see if it is on.. In this example the variable INPBYTE% is the isolated input byte read from BASE+1. This example is in Microsoft Basic.

```
INPBYTE% = INP(BADR+1)
INP7% = INPBYTE% AND &H80
IF INP7% = 1 THEN ISOINP$ = "ON" ELSE ISOINP$ = "OFF"
```

The code above shows how to set the variable INP7% to either 1 or 0. It may then be used in your program. The variable ISOINP\$ may be used as part of your on-screen display. Other programming example follow.

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## OUTPUT REGISTER

The output register is located at the CIO-PDISO8 base address.

**WRITE = CONTROL:** Write a byte to the register to control the relays. A one in the relay bit position turns the relay on.

**READ = STATUS:** Read the status of the relay control register. A one in the relay bit position indicates the relay is on.

**ON & OFF for FORM C RELAYS:**

On means that FORM C relay common is in contact with the Normally Open contact.

Off means that FORM C relay common is in contact with the normally closed contact.

**ON & OFF FOR FORM A RELAYS:**

On means that FORM A relay common is in contact with the normally open contact.

Off means that FORM A common is not in contact with anything.

<b>RELAY</b>	<b>OP7</b>	<b>OP6</b>	<b>OP5</b>	<b>OP4</b>	<b>OP3</b>	<b>OP2</b>	<b>OP1</b>	<b>OP0</b>
<b>BIT No.</b>	7	6	5	4	3	2	1	0
<b>HEX Value</b>	80	40	20	10	8	4	2	1
<b>DECIMAL</b>	128	64	32	16	8	4	2	1

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## INPUT REGISTER

The isolated input register is located at the CIO-PDISO8 base address + 1.

WRITE = NO FUNCTION

READ = STATUS: Read the status of the isolated inputs. A one in the input bit position indicates that a voltage is present at the input.

<b>INPUT #</b>	<b>IP7</b>	<b>IP6</b>	<b>IP5</b>	<b>IP4</b>	<b>IP3</b>	<b>IP2</b>	<b>IP1</b>	<b>IP0</b>
<b>BIT No.</b>	7	6	5	4	3	2	1	0
<b>HEX Value</b>	80	40	20	10	8	4	2	1
<b>DECIMAL</b>	128	64	32	16	8	4	2	1

# ELECTRONICS AND INTERFACING

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This short, simple introduction to the electronics most often needed by digital I/O board users covers a few key concepts. They are:

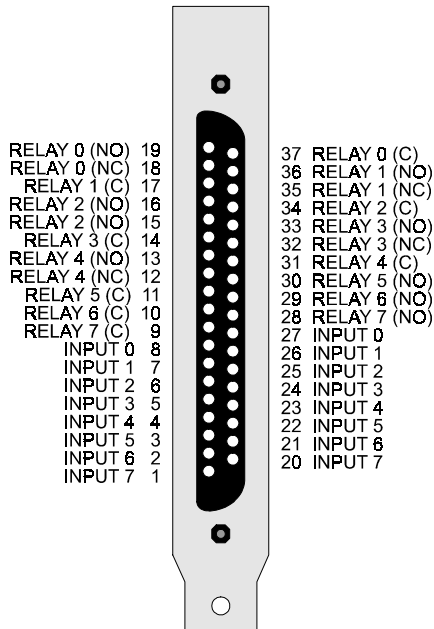
- Connector diagram.
- FORM C relay outputs.
- FORM A relay outputs.
- Isolated inputs.
- Adding a resistor to expand the range of the isolated inputs.
- Voltage dividers.
- Low pass filters for digital inputs.

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## CONNECTOR DIAGRAM

The CIO-PDISO8 use a single 37 pin connector for signal interfacing. The pin-outs of the connector are shown below.



**37 PIN CONNECTOR - (NO) = Normally Open, (C) = Common, (NC) = Normally Closed.**

### WARNING!

*High voltages will be present on the CIO-PDIS08 board when you have connected high voltage inputs or outputs to the CIO-PDIS08 connector. Use extreme caution! Never handle the CIO-PDIS08 when signals are connected to the board through the connector.*

**DO NOT REMOVE THE PROTECTIVE PLATES FROM THE CIO-PDIS08.**

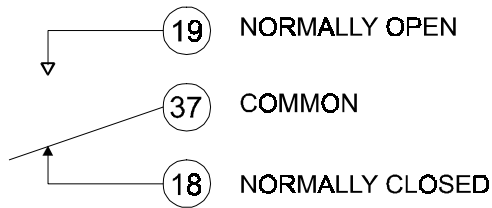
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## FORM C RELAY OUTPUTS

Shown here is the schematic for a form C relay, like those connected at OP0 through OP4.

The form C relay has a COMMON, normally open (NO) and normally closed (NC) contact.



### FORM C RELAY

When a 0 is written to the output, the common and NC are in contact.

When a 1 is written to the output the common and NO are in contact.

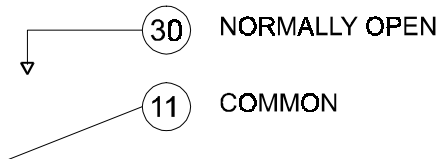
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## FORM A RELAY OUTPUTS

Shown here is the schematic for a form A relay, like those connected at OP5 through OP7.

The form A relay has a COMMON and a normally open (NO) contact.



### FORM A RELAY

When a 0 is written to the output, the common and NO are NOT in contact.

When a 1 is written to the output the common and NO are in contact.

The form A and form C relays on the CIO-PDIS08 are the same part. Only the connections to the relay poles differ.

The specifications for both types of relays are:

Contact rating	6A @ 120V A.C or 28V D.C. resistive
Contact type	Gold overlay silver

Contact resistance	100 miliohms max.
Operate time	20 miliseconds
Release time	10 miliseconds max.
Life expectancy	10 million mechanical operations min. 100,000 electrical at full load min.

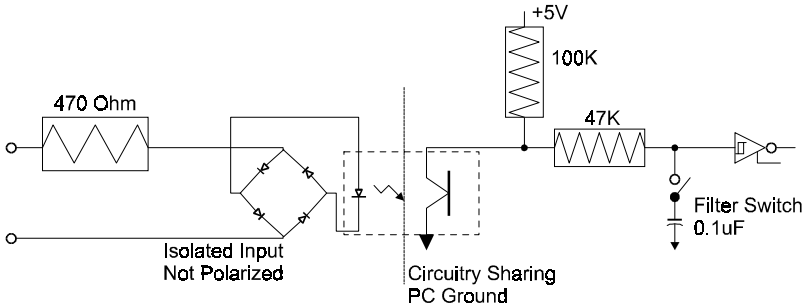
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## ISOLATED INPUTS

There are 8 isolated input channels. The schematic of a single channel is shown here.



The signals are routed through a bridge rectifier so that the inputs are not polarity sensitive.

The specifications for an input are:

Range	5-24V D.C. 5-24V A.C. (50-1000Hz) NOT TTL compatible.
Isolation	500V
Resistance	470 ohm min
Response	20 uSeconds w/o filter 5 miliseconds w/ filter

# SPECIFICATIONS

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## POWER CONSUMPTION

+5V supply	0.3A typical with all relays off. 1.0A typical with all relays on.
±12V Supply	Not used

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## RELAY SPECIFICATIONS

Number	8
Contact arrangement	5 form C, OP0 - OP4 3 form A, OP5 - OP7
Contact rating	6A @ 120V A.C or 28V D.C. resistive
Contact type	Gold overlay silver
Contact resistance	100 miliohms max.
Operate time	20 miliseconds
Release time	10 miliseconds max.
Life expectancy	10 million mechanical operations min.
Vibration	10 to 55 Hz (Dual amplitude 1.5mm)
Shock	10G (11 miliseconds)
Dielectric isolation	500V (1 minute)
Life Expectancy	1 Million Operations Electrical 100,000 Operations @ Full Load

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## ISOLATED INPUTS

Number	8
Range	5-24V D.C. or A.C. (50-1000Hz) NOT TTL compatible.
Isolation	500V
Resistance	470 ohm min
Response	20 uSeconds w/o filter 5 miliseconds w/ filter

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## ENVIRONMENTAL

Operating temperature	0 to 50 deg. C
Storage temperature	-20 to 70 deg. C
Humidity	0 to 90% non-condensing
Weight	8 oz.
Size	3 7/8" (99mm) tall excluding gold fingers
	6 1/2" (164mm) long

## EC Declaration of Conformity

<u>CIO-PDIS08</u>	<u>8 Channel relay/isolated input board</u>
Part Number	Description

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