

PC104-PDISO8

User's Manual



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1 INTRODUCTION

1.1 DESCRIPTION

The PC104-PDISO8 has 8-channels of isolated inputs and relay outputs. The board is designed for sensing and control applications having high voltages.

WARNING!

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

Use extreme caution! Never handle the board when live signals are connected to the board via the connector.

The eight outputs are electromechanical relays. Five provide FORM C connections and three provide normally-open FORM A connection. The relays are controlled by writing to one 8-bit port. The state of the relay control register may be read back.

The inputs are eight individual, optically-isolated inputs that may be read back as a single byte. The inputs are not polarity sensitive and may be driven by either AC (input range -24V to $+24\text{V}$ RMS, 50 to 1000 Hz) or DC (input range -24V to $+24\text{VDC}$). Each input has a switchable low-pass filter.

Although requiring only two, 8-bit ports, the board occupies four ports.

1.2 ACCESSORIES

The PC104-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, it does not require additional signal conditioning.

WARNING

We strongly recommend *against* using screw terminal boards with the PC104-PDISO8. The board is intended to sense and control high voltages. A screw terminal board would expose yourself and others to high voltage signals.

Rather, we recommend that you construct a safe cable to carry your signals directly from your equipment to the board's connector.

2 INSTALLATION

2.1 SOFTWARE

Before you open your computer and install the board, install and run *InstaCal*, the installation, calibration and test utility included with your board. *InstaCal* will guide you through switch and jumper settings for your board. Detailed information regarding these settings can be found below. Refer to the *Extended Software Installation Manual* for *InstaCal* installation instructions.

2.2 BASE ADDRESS

The base address switch controls the I/O location where the CPU can access the board's registers.

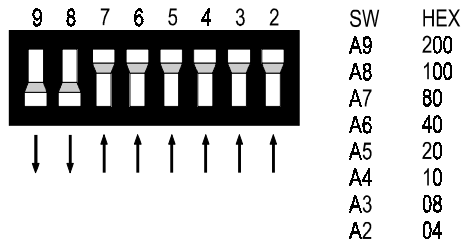
The factory default is 300 hex (768 decimal).

If you already have a board installed at address 300h, choose a new address from those available on your computer.

Use the list of PC I/O address assignments found in Table 2-1 to determine the appropriate address.

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

If 300 hex is available on your computer, there is no need to change this switch from the factory default setting.



BASE ADDRESS SWITCH - Address 300H shown here.

Figure 2-1. Base Address Switch

Table 1-1. PC I/O Addresses

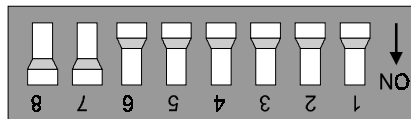
HEX RANGE	FUNCTION	HEX RANGE	FUNCTION
000-00F	8237 DMA #1	2C0-2CF	EGA
020-021	8259 PIC #1	2D0-2DF	EGA
040-043	8253 TIMER	2E0-2E7	GPIB (AT)
060-063	8255 PPI (XT)	2E8-2EF	SERIAL PORT
060-064	8742 CONTROLLER (AT)	2F8-2FF	SERIAL PORT
070-071	CMOS RAM & NMI MASK (AT)	300-30F	PROTOTYPE CARD
080-08F	DMA PAGE 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 BASE switches can be set for an address in the range of 000-3F8 so it should not be hard to find a free address. Addresses not specifically listed, such as 390-39F, are free.

2.3 AC INPUT FILTER

The inputs are eight individual, optically isolated (500V) inputs that may be read back as a single byte. The inputs are not polarity sensitive and can be driven by either AC (input range -24V to +24V RMS, 50 to 1000 Hz) or DC (input range -24V to +24VDC). Each input has a switchable low-pass filter.

The switch which controls the input filter is shown in Figure 2-2. From left to right, the switches apply to inputs 0 to 7. The diagram shows the low pass filter for inputs 0 and 1 enabled.



AC FILTER SWITCHES - On position is closed. Filter connected.

The filter must be used for AC inputs and should be used for DC inputs. Unless you have reason to turn off a filter, we recommend it be left on.

Figure 2-2. AC Filter Switches

WARNING

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

Use extreme caution! Never handle the board when high voltage signals are connected to the board.

3 REGISTER DESCRIPTIONS

3.1 INTRODUCTION

Two, eight-bit registers located at the base address (relay output) and base + 1 (isolated inputs) are read or written to for control of relays, read back the state of relays or sense inputs (Table 3-1).

Table 3-1. Board Registers

BASE ADDRESS	RELAY OUTPUT	READ/WRITE
BASE + 0	Relay Outputs	
BASE + 1	Isolated Inputs	Read Only
BASE + 2	Not Used	
BASE + 3	Not Used	

Although the PC104-PDISO8 decodes up to four addresses, two of those are not used. This conforms to the design of the original PDISO-8, of which the PC104-PDISO8 is a true clone.

Please use the Universal Library if you are programming from a high level language.

The registers are written to and read from as a single 8-bit byte. Each bit controls an output or represents the state of an 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, refer to Table 3-2 for bit weights.

Table 3-2. Bit Weights

BIT POSITION	DECIMAL VALUE	HEX VALUE
0	1	1
1	2	2
2	4	4
3	8	8
4	16	10
5	32	20
6	64	40
7	128	80

Example: To assemble a control byte with relays 0, 1, 3, 5, and 7 turned ON , refer to Table 3-3 for the coding.

Table 3-3. Control Byte Example

<u>RELAY</u>	<u>HEX</u>	<u>ON=1</u>	<u>WEIGHT</u>	<u>DECIMAL</u>	<u>ON=1</u>	<u>WEIGHT</u>
7	80	1	80	128	1	128
6	40	0	0	64	0	0
5	20	1	20	32	1	32
4	10	0	0	16	0	0
3	8	1	8	8	1	8
2	4	0	0	4	0	0
1	2	1	2	2	1	2
0	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:

Table 3-4. Register Read-Back

<u>INPUT/RELAY</u>	<u>HEX</u>	<u>DECIMAL</u>
INPUT 7/RELAY 7	80	128
INPUT 6/RELAY 6	40	64
INPUT 5/RELAY 5	20	32
INPUT 4/RELAY 4	10	16
INPUT 3/RELAY 3	8	8
INPUT 2/RELAY 2	4	4
INPUT 1/RELAY 1	2	2
INPUT 0/RELAY 0	1	1

3.2 OUTPUT REGISTER

The output register is located at the base address (BASE + 0).

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

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

3.2.1 ON & OFF for FORM C RELAYS

- On means that FORM C relay common is in contact with the Normally-Open (NO) contact.
- Off means that FORM C relay common is in contact with the Normally-Closed (NC) contact.

3.2.2 ON & OFF FOR FORM A RELAYS

- On means that FORM A relay common is in contact with the Normally-Open (NO) contact.
- Off means that FORM A relay common is open.

3.3 INPUT REGISTER

The isolated input register is located at **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.

INPUT #	7	6	5	4	3	2	1	0
BIT No.	7	6	5	4	3	2	1	0
HEX	80	40	20	10	8	4	2	1
DECIMAL	128	64	32	16	8	4	2	1

4 ELECTRONICS AND INTERFACING

This short introduction to the electronics most often needed by digital I/O board users covers the following:

- Connector diagram.
- FORM C relay outputs.
- FORM A relay outputs.
- Isolated inputs.
- Adding a resistor to expand the range of the isolated inputs.

4.1 I/O CONNECTOR

The PC104-PDISO8 use a single 40-pin connector. The pin-outs of the connector are shown in Figure 4-1. This connector can be converted to a 37 pin connector that is compatible with the CIO-PDISO8 through the use of an adapter such as the BP40-37 (Figure 4-2).

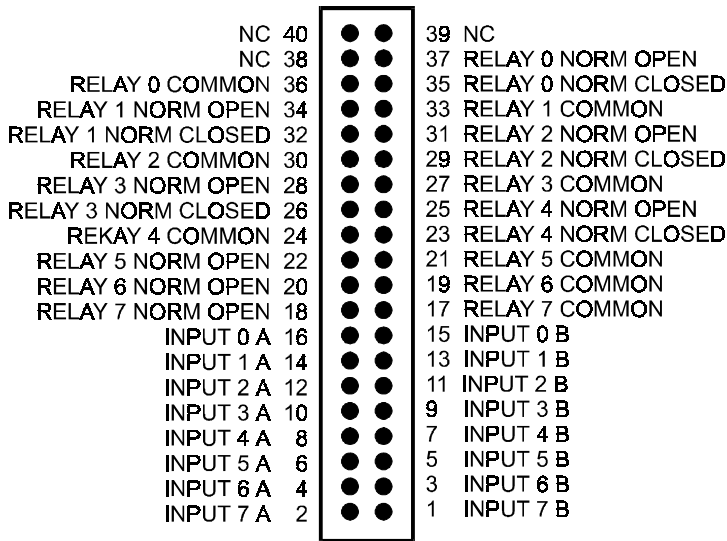
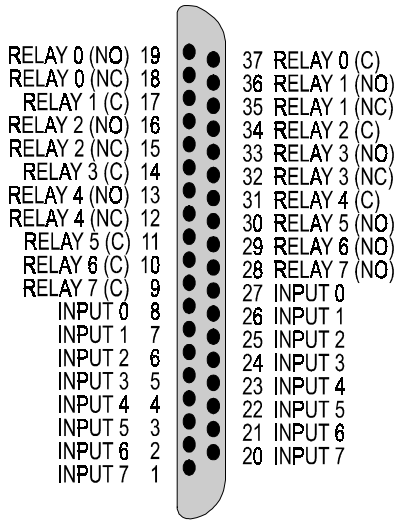


Figure 4-1. I/O Connector Pin Out

WARNING

High voltages will be present on the board when connected to high voltage inputs or outputs. Use extreme caution! Never handle the board when live signals are connected to the board.



(NO) = Normally Open, (C) = Common, (NC) = Normally Closed.

Figure 4-2. BP40-37 Pinouts

4.1 FORM C RELAY OUTPUTS

Figure 4-3 is the schematic for a form C relay, used at OP0 through OP4.

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

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.

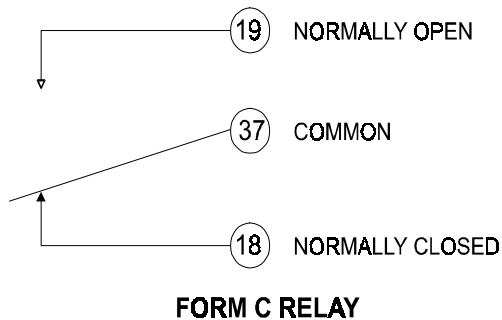


Figure 4-3. Form C Relay

The pin numbers shown in Figure 4-2 correspond to the 37 pin connector when using an adapter such as the BP40-37 or the C40-37F-2 cable for relay #0.

4.2 FORM A RELAY OUTPUTS

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

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

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.

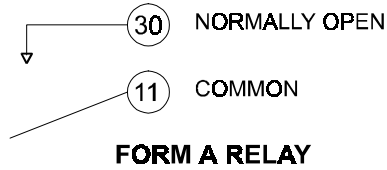


Figure 4-4 Form A Relay

The form A and form C relays are actually the same part number. Only the connections to the relay poles differ.

The Pin numbers shown in Figure 4-4 correspond to the 37 pin connector when using an adapter such as the BP40-37 or the C40-37F-2 cable for relay #5.

4.3 ISOLATED INPUTS

There are eight optically-isolated input channels. The schematic of a single channel is shown in Figure 4-4.

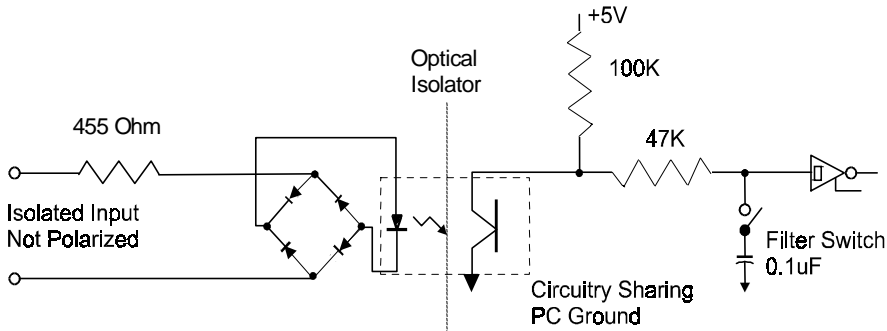


Figure 4-4. Input Circuit - Simplified

Input signals are fed to a bridge rectifier so that the inputs are not polarity-sensitive.

4.4 EXTENDING THE INPUT RANGE

You can extend the input range beyond the $\pm 24\text{V}$ specified by adding an external resistor to the input. Use the following formulas:

$$R_{\text{ext}} = 100 * (V_{\text{in}} - 24)$$

$$\text{Resistor power rating} = P_{\text{watts}} = R_{\text{ext}} / 10,000$$

5 SPECIFICATIONS

POWER CONSUMPTION

+5V supply

0.11 A typical with all relays off.
0.4 A typical with all relays on.

OUTPUT RELAY SPECIFICATIONS

Number	8
Contact arrangement	5 form C, Relay 0 to Relay 4 3 form A, Relay 5 to Relay 7
Contact rating (resistive load)	0.4 A @ 120VAC or 2 A @ 30VDC
Contact resistance	0.050 Ohms max.
Coil resistance	125 Ohms
Operate time	5 ms
Release time	5 ms max.
Isolation	
Between open contacts	1000VAC, 50/60HZ, 1 min.
Between coil and contacts	1500VAC, 50/60HZ, 1 min.
Life Expectancy	
Mechanical	100,000,000 Operations
Electrical	500,000 Operations @ Full Load

ISOLATED INPUTS

Number	8
Type	Non-polarized, optically isolated (NOT TTL compatible)
Range	
DC	±24V
AC (50 to 1 kHz)	±24V
Input 'High' level	>5V min. (positive or negative input voltage)
Input 'Low' level	<2.5V max. (positive or negative input voltage)
Isolation	500V
Resistance	455 Ohms min
Response	20 μs w/o filter 5 ms w/ filter
Filters	
Time constant	5 ms (200 Hz)
Filter control	Each input individually switch-selectable

CONNECTOR

Connector type	40 pin male header (optional cable available to translate 40 pin connector to 37 pin connector compatible with CIO-PDISO8)
Dielectric Strength	1000Vrms
Current Rating	1 A

ENVIRONMENTAL

Operating temperature	0 to 50 deg. C
Storage temperature	-20 to 70 deg. C
Humidity	0 to 90% non-condensing

For your notes.

EC Declaration of Conformity

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

PC104-PDIS08

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.

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