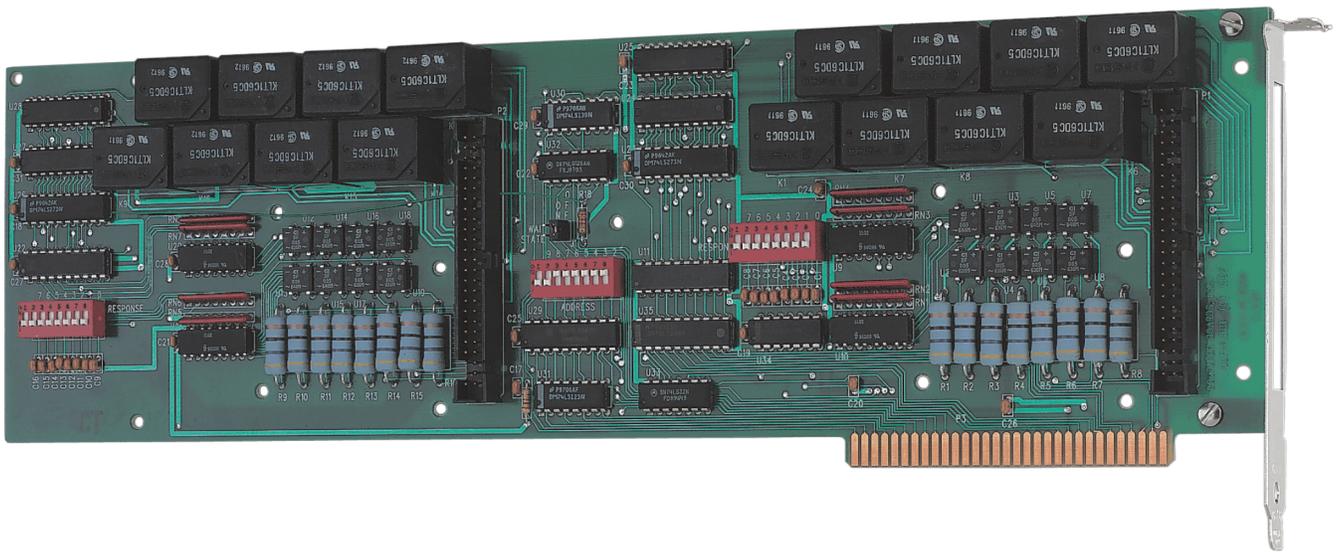


CIO-PDISO16

Isolated input and relay output interface board

User's Guide



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**MEASUREMENT
COMPUTING™**

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About this User's Guide

What you will learn from this user's guide

This user's guide explains how to install, configure, and use the CIO-PDISO16 so that you get the most out of its digital input and relay output features.

This user's guide also refers you to related documents available on our web site, and to technical support resources.

Conventions in this user's guide

For more information on ...

Text presented in a box signifies additional information and helpful hints related to the subject matter you are reading.

Caution! Shaded caution statements present information to help you avoid injuring yourself and others, damaging your hardware, or losing your data.

<#:#> Angle brackets that enclose numbers separated by a colon signify a range of numbers, such as those assigned to registers, bit settings, etc.

bold text **Bold** text is used for the names of objects on the screen, such as buttons, text boxes, and check boxes. For example:

1. Insert the disk or CD and click the **OK** button.

italic text *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase. For example:

The *InstaCal* installation procedure is explained in the *Quick Start Guide*.
Never touch the exposed pins or circuit connections on the board.

Where to find more information

For additional information relevant to the operation of your hardware, refer to the *Documents* subdirectory where you installed the MCC DAQ software (C:\Program Files\Measurement Computing\DAQ by default), or search for your device on our website at www.mccdaq.com.

If you need to program at the register level in your application, refer to the *Register Map for the CIO-PDISO16*. This document is available at on our web site at <http://www.mccdaq.com/registermaps/RegMapCIO-PDISO16.pdf>.

Introducing the CIO-PDISO16

Overview: CIO-PDISO16 features

The CIO-PDISO16 is a sixteen channel-isolated high voltage digital input and sixteen relay output interface board. You can use the CIO-PDISO16 for control and sensing applications where high voltages need to be sensed or controlled.

Caution! High voltages are present on the CIO-PDISO16 when you have connected high voltage inputs or outputs to the CIO-PDISO16 connector. Use extreme caution! Never handle the CIO-PDISO16 when signals are connected to the board through the connector. Never remove the protective plates from the CIO-PDISO16.

The sixteen inputs are optically-isolated (500 V) inputs that can be read back as a single byte. The inputs are not polarity sensitive, and may be driven by either AC (50 - 1000 Hz) or DC. Each input has a switchable low-pass filter with a time constant of 5 ms (200 Hz).

Outputs are from sixteen electromechanical relays. All relays have FORM C connections. The relays are controlled by writing to two 8-bit ports. The relay control register can be read back from the same ports.

Signal conditioning installed

The CIO-PDISO16 is a combination digital I/O board with signal conditioning installed. Most accessory boards provide signal conditioning or easy-to-access signal termination. The CIO-PDISO16 does not require additional signal conditioning.

Caution! We recommend NOT using screw terminal boards with the CIO-PDISO16. The CIO-PDISO16 is intended to sense and control high voltages. 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 your signals directly from your equipment to the CIO-PDISO16 connector.

Software features

For information on the features of *InstaCal* and the other software included with your CIO-PDISO16, refer to the *Quick Start Guide* that shipped with your device. The *Quick Start Guide* is also available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Check www.mccdaq.com/download.htm for the latest software version.

Installing the CIO-PDISO16

What comes with your CIO-PDISO16 shipment?

The following items are shipped with the CIO-PDISO16.

Hardware

- CIO-PDISO16 board. The CIO-PDISO16 is shipped with a protective plate covering some components. The board is shown here without the protective plate.



Additional documentation

For information on the features of *InstaCal* and the other software included with your CIO-PDISO16, refer to the *Quick Start Guide* that shipped with your device. The *Quick Start Guide* is also available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Check www.mccdaq.com/download.htm for the latest software version.

Optional components

- Cables



C50FF-x cable



C50-37F-x

- Signal termination and conditioning accessories
MCC provides signal termination products for use with the CIO-PDISO16. Refer to [Field wiring, signal termination and conditioning](#) on page 11 for a complete list of compatible accessory products.

Unpacking the board

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the CIO-PDISO16 from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

If any components are missing or damaged, notify Measurement Computing Corporation immediately by phone, fax, or e-mail:

- Phone: 508-946-5100 and follow the instructions for reaching Tech Support.
- Fax: 508-946-9500 to the attention of Tech Support
- Email: techsupport@mccdaq.com

Installing the software

Refer to the *Quick Start Guide* for instructions on installing the software on the *Measurement Computing Data Acquisition Software CD*. This booklet is available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.

Configuring the CIO-PDISO16

The CIO-PDISO16 has one base address switch, two sets of input filter switches, and one wait state jumper which you must set before installing the board in your computer. The *InstaCal* calibration and test program included with the CIO-PDISO16 will show you how to set the switches. Run *InstaCal* before you open your computer and install the board. The CIO-PDISO16 is shipped with the factory-default settings listed below.

Factory-configured default settings

Switch/jumper	Default setting
Base address switch	300h (768 decimal)
Input filter select switches	On position
Wait state jumper	OFF position

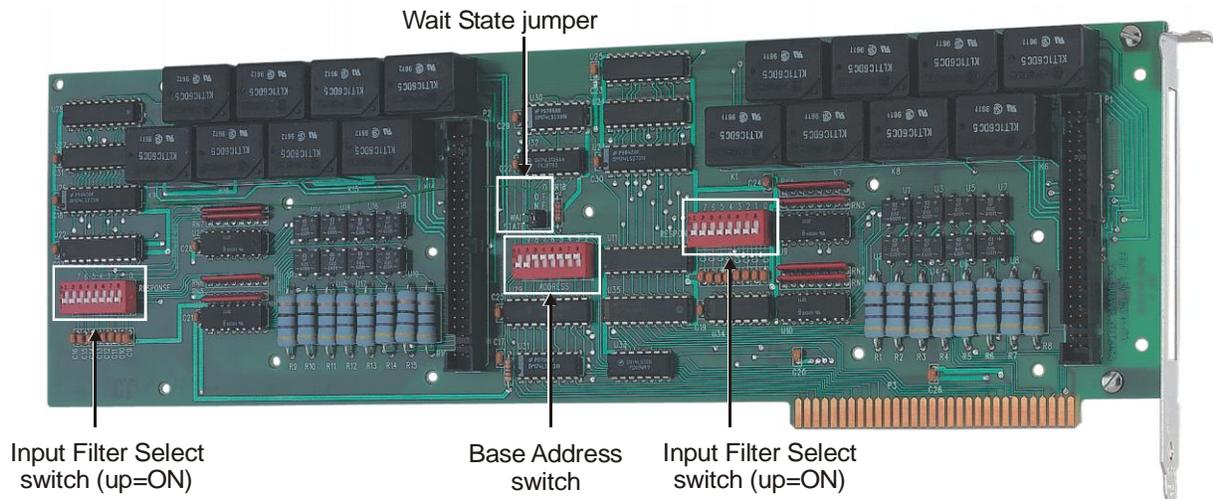


Figure 1. Switch and jumper locations

Base address switch

The base address switch sets the starting I/O location where the CPU can access the registers of the CIO-PDISO16. The factory default is 300h (768 decimal).

Before you install the CIO-PDISO16 in your computer, set the base address by using the dip switch labeled **ADDRESS** located on the board. The easiest way to set the base address switch is to let *InstaCal* show you the correct settings. However, if are already familiar with setting ISA base addresses, you may use the base address switch description below to guide your base address selection.

Unless there is already another board in your system using address 300 hex (768 decimal), leave the switches as they are set at the factory. The example shown in Figure 2 shows the settings for the factory-default base address of 300 hex.

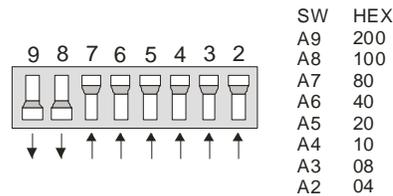


Figure 2. CIO-PDISO16 base address switches

In the default configuration shown in Figure 2, addresses 9 and 8 are DOWN, and all others are UP. Address 9 = 200 hex (512 decimal) and address 8 = 100 hex (256 decimal); when added together they equal 300 hex (768 decimal).

Disregard the numbers printed on the switch

When setting the base address, refer to the numbers printed in white on the printed circuit board.

Wait state jumper

The CIO-PDISO16 board has a wait state jumper which you can set to enable an on-board wait state generator. A wait state is an extra delay injected into the processor's clock via the bus. This delay slows down the processor when the processor addresses the CIO-PDISO16 board so that signals from slow devices (chips) will be valid.

The factory default is wait state disabled (Off). You will probably never need the wait state because PC expansion slot busses are limited to 8 or 10 MHz. If you get intermittent operation, try enabling the wait state to see if that solves the problem.

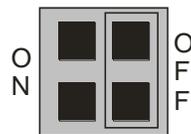


Figure 3. Wait State jumper

AC input filter switches

The CIO-PDISO16 board has two sets of eight individual, optically isolated (500 V) inputs that can be read back as a single byte. The inputs are not polarity sensitive, and may be driven by either AC (50 - 1000 Hz) or DC.

Each input has a switchable low-pass R-C filter having a time constant of 5 ms (200 Hz). The filters must be used for AC inputs, and should be used for DC inputs. A typical switch is shown in Figure 4.

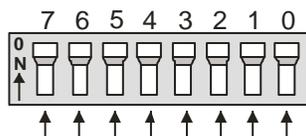


Figure 4. AC input filter switches (typical)

Unless you have reason to turn off a filter, you should leave it on (switch up). With the filter on, an AC voltage on the input will produce a constant high signal.

Caution! High voltages are present on the CIO-PDISO16 when you have connected high voltage inputs or outputs to the CIO-PDISO16 connector. Use extreme caution! Never handle the CIO-PDISO16 when signals are connected to the board through the connector. Never remove the protective plates from the CIO-PDISO16.

Installing the CIO-PDISO16

After you configure the board's switches and jumper, you can install the CIO-PDISO16 into your computer. To install your board, follow the steps below.

Install the MCC DAQ software before you install your board

The driver needed to run your board is installed with the MCC DAQ software. Therefore, you need to install the MCC DAQ software before you install your board. Refer to the *Quick Start Guide* for instructions on installing the software.

1. Turn your computer off, open it up, and insert your board into an available ISA slot.
2. Close your computer and turn it on.
3. To test your installation and configure your board, run the *InstaCal* utility you installed in the previous section. Refer to the *Quick Start Guide* that came with your board www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf for information on how to initially set up and load *InstaCal*.

Connecting the board for I/O operations

Connectors, cables – main I/O connector

The table below lists the board connectors, applicable cables and compatible accessory boards.

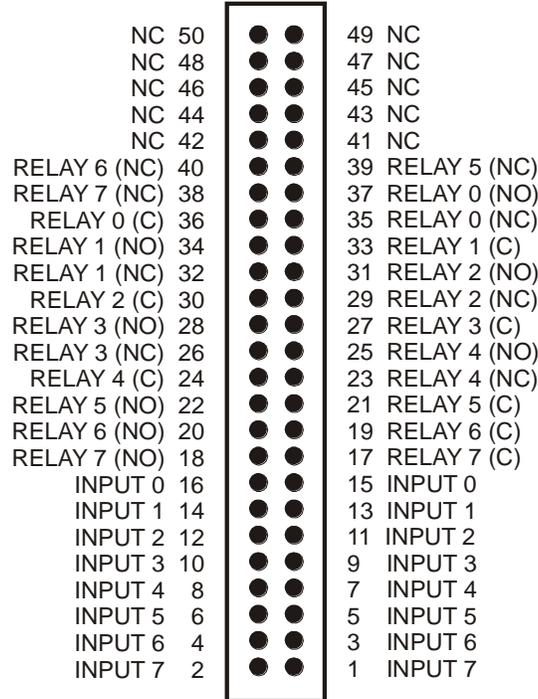
Board connectors, cables, accessory equipment

Connector type	50-pin male header x2 (optional cable available to translate 50-pin connector to 37 pin connector compatible with CIO-PDISO8)
Compatible cables	C50FF-x C50-37F-x (for connector compatibility with the CIO-PDISO8)
Compatible accessory products with the C50FF-x	CIO-MINI50 (requires two cable/terminal board sets)

Information on signal connections

General information regarding signal connection and configuration is available in the *Guide to Signal Connections*. This document is available on our web site at www.mccdaq.com/signals/signals.pdf.

Pin out – 50-pin I/O connectors



50-pin header connector pin out

Cabling

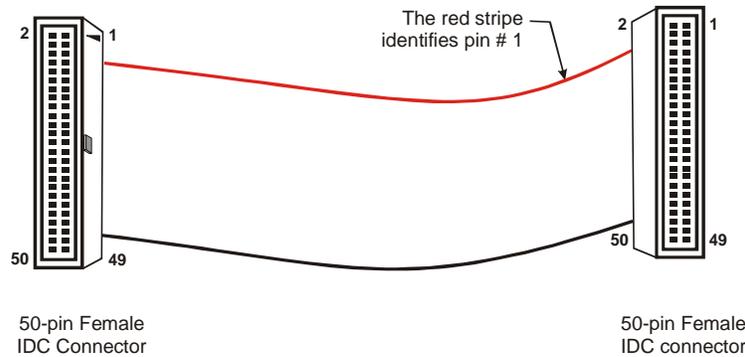


Figure 5. C50FF-x cable

Field wiring and signal termination accessories

You can connect the CIO-PDISO16 to the following accessory board using the C50FF-x cable.

- CIO-MINI50 – Universal screw terminal board, 50-pin.

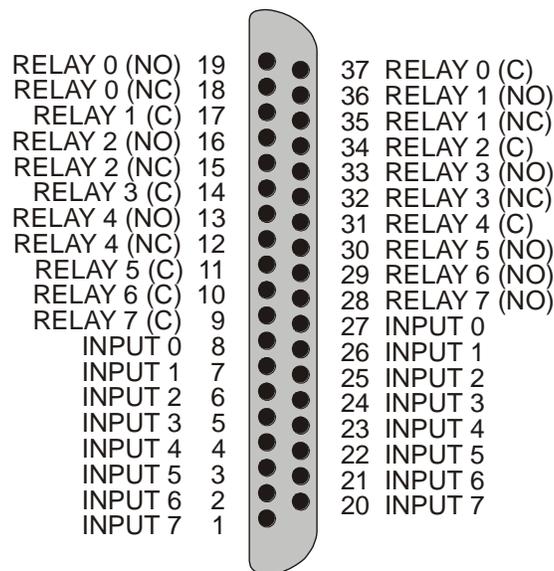
Details on this product is available on our web site at www.mccdaq.com/products/screw_terminal_bnc.aspx.

Do not use exposed-screw terminal boards if your field voltage is more than 24 volts. Using a screw terminal board with high voltage inputs or outputs exposes you and others to those high voltage signals. Construct a safe cable to carry your signals directly from your equipment to the CIO-PDISO16 connector.

Caution! High voltages are present on the CIO-PDISO16 when you have connected high voltage inputs or outputs to the CIO-PDISO16 connector. Use extreme caution! Never handle the CIO-PDISO16 when signals are connected to the board through the connector. Never remove the protective plates from the CIO-PDISO16.

CIO-PDISO8 compatibility

The C50-37F-x cable converts the CIO-PDISO16 to a CIO-PDISO8 compatible D-type connector. The C50-37F-x cable has a 50-pin header connector at one end and a 37-pin female D-sub connector at the other end.



C50-37F-x cable pin out

For additional information about digital interfacing

Detailed information regarding digital interfacing is contained in MCC's *Guide to Signal Connections*. This document is available on our web site at www.mccdaq.com/signals/signals.pdf.

Functional Details

Form C relay outputs

The Form C relay has a common, normally open (NO) and normally closed (NC) contact. Figure 6 shows the schematic for a Form C relay.

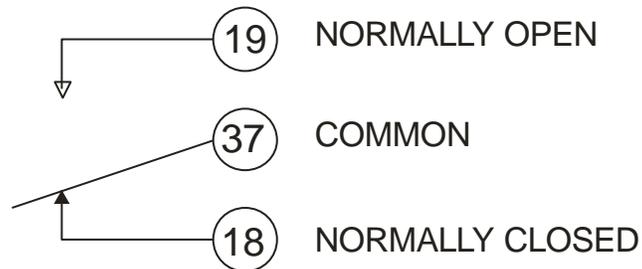


Figure 6. Form C Relay (0) contacts

- When 0 is written to the output, the common and NC are in contact.
- When 1 is written to the output, the common and NO are in contact.

Isolated inputs

The CIO-PDISO16 has sixteen isolated input channels. A schematic of a single channel is shown in Figure 7.

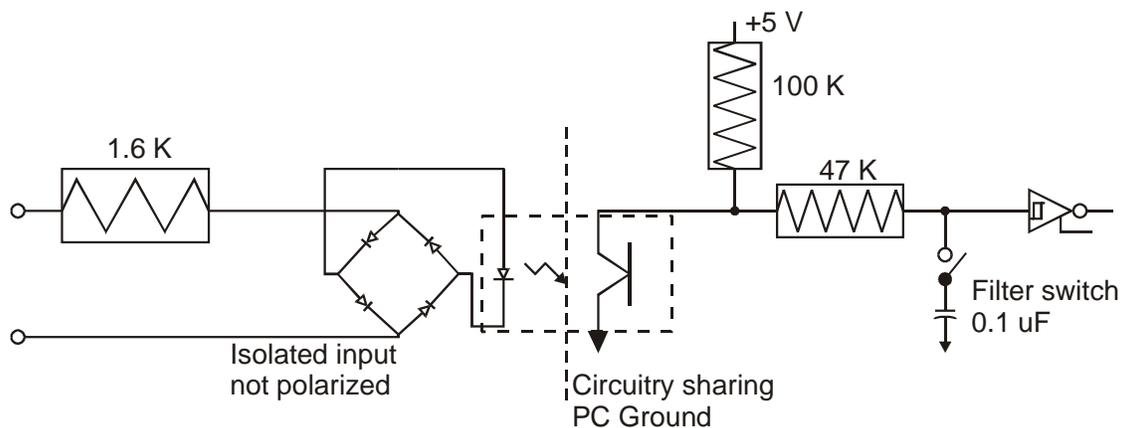
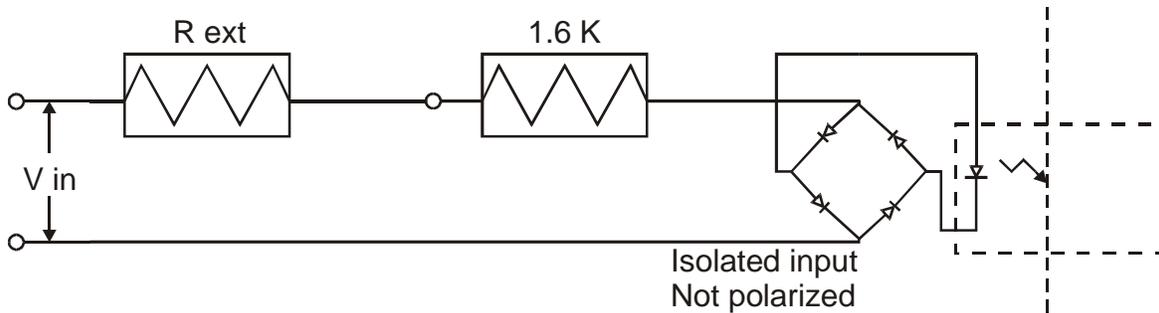


Figure 7. Isolated input schematic – simplified

The signals are routed through a bridge rectifier so that the inputs are not polarity sensitive. When a voltage is present at the input than the "input high" threshold, a logical "1" will be sensed for that input.

Extending the input range

To extend the input range beyond the $\pm 28\text{V}$ specified, add an external resistor. Figure 8 shows the placement of the external resistor (R_{ext}) and the equations used to calculate resistor values for a given V_{in} .



$$R_{\text{ext}} = 100 * (V_{\text{in}} - 28)$$

$$P_w = R_{\text{ext}} / 10,000$$

Figure 8. Input range-extending resistor

For more information on digital signal connections

For more information on digital signal connections and digital I/O techniques, refer to the *Guide to Signal Connections*. This document is available on our web site at www.mccdaq.com/signals/signals.pdf.

Specifications

All specifications are subject to change without notice.

Typical for 25°C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

Relay specifications

Table 1. Relay specifications

<i>Number of relays</i>	<i>16</i>
<i>Contact configuration</i>	<i>16 form C, SPDT</i>
<i>Contact rating (resistive load)</i>	<i>7A/30VDC or 10A/125V AC</i>
<i>Contact resistance</i>	<i>50 milliohms</i>
<i>Coil resistance</i>	<i>70 ohms</i>
<i>Isolation</i>	<i>Between open contacts: 750 VAC, 50/60 Hz, 1 min.</i>
	<i>Between coil and contacts: 1500 VAC, 50/60 Hz, 1 min.</i>
<i>Operate time</i>	<i>10 milliseconds max.</i>
<i>Release time</i>	<i>5 milliseconds max.</i>
<i>Vibration</i>	<i>10 to 55 Hz (dual amplitude 1.5 mm)</i>
<i>Shock</i>	<i>10 G (11 milliseconds)</i>
<i>Insulation resistance</i>	<i>100 M ohms min. (500 V @ 1 minute)</i>
<i>Life expectancy</i>	<i>Mechanical: 10⁷ mechanical operations, min.</i>
	<i>Electrical: 100,000 min at full load</i>

Isolated inputs

Table 2. Isolated input specifications

<i>Number</i>	<i>16</i>
<i>Type</i>	<i>Non-polarized, opto-isolated (Not TTL compatible)</i>
<i>Voltage range</i>	<i>DC: 5-28 V</i>
	<i>AC: 5-28 V (50-1000 Hz)</i>
<i>Isolation</i>	<i>500 V</i>
<i>Resistance</i>	<i>1.6 K Ohms min.</i>
<i>Response</i>	<i>without filter: 20 μs</i>
	<i>with filter: 5 ms</i>
<i>Filters</i>	<i>Time constant: 5 ms (200 Hz)</i>
	<i>Filter control: Each input individually switch selectable</i>
	<i>Power-up /reset: Filters off</i>

Power consumption

Table 3. Power consumption specifications

<i>+5 V Power</i>	<i>All relays off: 0.2 A typical</i>
	<i>All relays on: 1.2 A typical</i>

Environmental

Table 4. Environmental specifications

<i>Operating temperature range</i>	<i>0 to 50 °C</i>
<i>Storage temperature range</i>	<i>-20 to 70 °C</i>
<i>Humidity</i>	<i>0 to 90% non-condensing</i>

Main connector and pin out

Table 5. Main connector specifications

Connector type	50-pin male header x2 (optional cable available to translate 50-pin connector to 37 pin connector compatible with CIO-PDISO8)
<i>Dielectric strength</i>	<i>>1000 Vrms</i>
<i>Current rating</i>	<i>1 A</i>
Compatible cables	C50FF-x C50-37F-x (for connector compatibility with the CIO-PDISO8)
Compatible accessory products with the C50FF-x	CIO-MINI50 (requires two cable/terminal board sets)

Table 6. 50-pin Connector pin out

Pin	Signal Name	Pin	Signal Name
50	N/C	49	N/C
48	N/C	47	N/C
46	N/C	45	N/C
44	N/C	43	N/C
42	N/C	41	N/C
40	Relay 6 (NC)	39	Relay 5 (NC)
38	Relay 7 (NC)	37	Relay 0 (NO)
36	Relay 0 (C)	35	Relay 0 (NC)
34	Relay 1 (NO)	33	Relay 1 (C)
32	Relay 1 (NC)	31	Relay 2 (NO)
30	Relay 2 (C)	29	Relay 2 (NC)
28	Relay 3 (NO)	27	Relay 3 (C)
26	Relay 3 (NC)	25	Relay 4 (NO)
24	Relay 4 (C)	23	Relay 4 (NC)
22	Relay 5 (NO)	21	Relay 5 (C)
20	Relay 6 (NO)	19	Relay 6 (C)
18	Relay 7 (NO)	17	Relay 7 (C)
16	Input 0	15	Input 0
14	Input 1	13	Input 1
12	Input 2	11	Input 2
10	Input 3	9	Input 3
8	Input 4	7	Input 4
6	Input 5	5	Input 5
4	Input 6	3	Input 6
2	Input 7	1	Input 7

Table 7. C50-37F-x cable pin out

Pin	Signal Name	Pin	Signal Name
1	Input 7	20	Input 7
2	Input 6	21	Input 6
3	Input 5	22	Input 5
4	Input 4	23	Input 4
5	Input 3	24	Input 3
6	Input 2	25	Input 2
7	Input 1	26	Input 1
8	Input 0	27	Input 0
9	Relay 7 (C)	28	Relay 7 (NO)
10	Relay 6 (C)	29	Relay 6 (NO)
11	Relay 5 (C)	30	Relay 5 (NO)
12	Relay 4 (NC)	31	Relay 4 (C)
13	Relay 4 (NO)	32	Relay 3 (NC)
14	Relay 3 (C)	33	Relay 3 (NO)
15	Relay 2 (NC)	34	Relay 2 (C)
16	Relay 2 (NO)	35	Relay 1 (NC)
17	Relay 1 (C)	36	Relay 1 (NO)
18	Relay 0 (NC)	37	Relay 0 (C)
19	Relay 0 (NO)		

CE Declaration of Conformity

Manufacturer: Measurement Computing Corporation
Address: 10 Commerce Way
Suite 1008
Norton, MA 02766
USA

Category: Electrical equipment for measurement, control and laboratory use.

Measurement Computing Corporation declares under sole responsibility that the product

CIO-PDISO16

to which this declaration relates is in conformity with the relevant provisions of the following standards or other documents:

EU EMC Directive 89/336/EEC: Electromagnetic Compatibility, EN55022 (1987), EN50082-1

Emissions: Group 1, Class B

- EN55022 (1987): Radiated and Conducted emissions.

Immunity: EN50082-1

- IEC 801-2 (1987): Electrostatic Discharge immunity, Criteria A.
- IEC 801-3 (1984): Radiated Electromagnetic Field immunity Criteria A.
- IEC 801-4 (1988): Electric Fast Transient Burst immunity Criteria A.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in November, 1995. Test records are outlined in Chomerics Test Report #EMI0168A.95.

We hereby declare that the equipment specified conforms to the above Directives and Standards.



Carl Haapaoja, Director of Quality Assurance

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