CIO-DISO48

Isolated High-Voltage Inputs

User's Guide

MEASUREMENT COMPUTING™
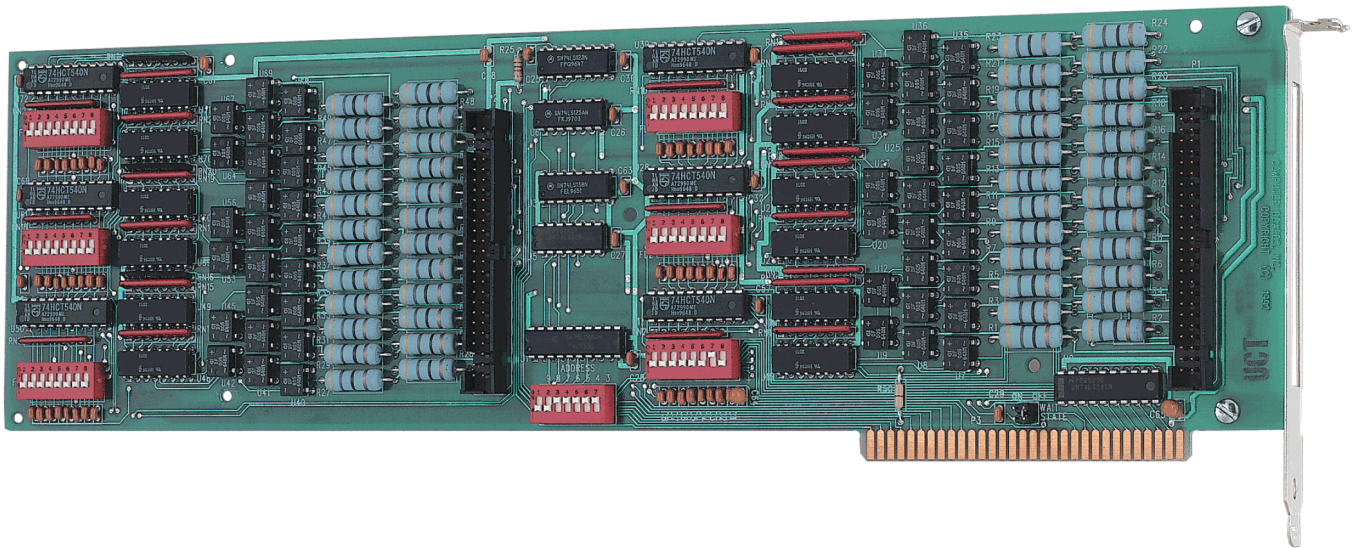
CIO-DISO48

Isolated High Voltage Digital Inputs

User's Guide

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Table of Contents

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-DISO48. 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-DISO48*. This document is available at on our web site at www.mccdaq.com/registermaps/RegMapCIO-DISO48.pdf.

Introducing the CIO-DISO48

Overview: CIO-DISO48 features

The CIO-DISO48 is a 48 channel isolated input interface board. The CIO-DISO48 is designed for applications where the presence or absence of a high voltage in the range of 5 to 28V (AC/DC) needs to be detected and read into a computer.

Caution! High voltages are present on the CIO-DISO48 when you have connected high voltage inputs or outputs to the CIO-DISO48 connector. Use extreme caution! Never handle the CIO-DISO48 when signals are connected to the board through the connector. Never remove the protective plates from the CIO-DISO48 unless all input voltages are removed first.

The CIO-DISO48 has 48 individual, optically-isolated (500V) inputs. The state of the inputs may be read from six read-only, 8-bit registers. The inputs are not polarity sensitive. Either AC voltages (50 to 1000 Hz) or DC voltages in the range 5V to 28V RMS can be sensed. Each input has a switchable low-pass filter having a time constant of 5 ms (200 Hz).

Software features

For information on the features of *Insta*Cal and the other software included with your CIO-DISO48, refer to the *Quick Start Guide* that shipped with your device.

Installing the CIO-DISO48

What comes with your CIO-DISO48 shipment?

The following items are shipped with the CIO-DISO48.

Hardware

▪ CIO-DISO48 board. Note: The board is shipped with a protective plate covering some components. The board is shown here without the protective plate.
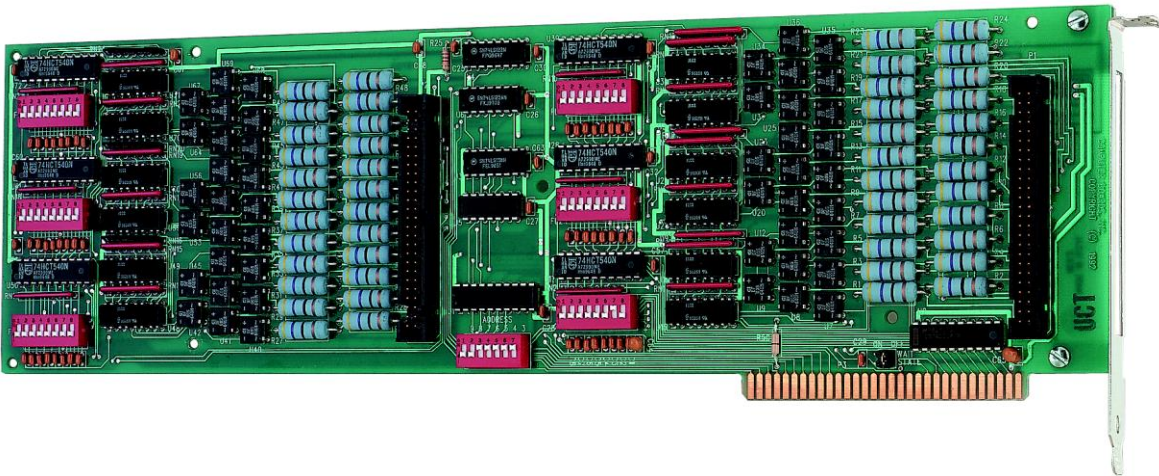
Additional documentation

For information on the features of *Insta*Cal and the other software included with your CIO-DISO48, 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

▪ C50FF-x cable
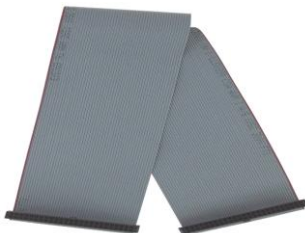
▪ Signal termination and conditioning accessories

MCC provides signal termination products for use with the CIO-DISO48. 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-DISO48 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-DISO48

The CIO-DISO48 has one base address switch, six banks of AC input filter switches, and one wait state jumper which you must set before installing the board in your computer. The *Insta*Cal calibration and test program included with the CIO-DISO48 will show you how to set the switches. Run *Insta*Cal before you open your computer and install the board. The CIO-DISO48 is shipped with the factory-default settings listed below.

Factory-configured default settings

Switch/jumper	Default setting
Base address switches	300h (768 decimal)
AC Input Filter switches	all ON
Wait State jumper	OFF position

Base address

The base address switch sets the starting I/O location where the CPU can access the registers of the CIO-DISO48. The factory default is 300h (768 decimal).

Before you install the CIO-DISO48 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 *Insta*Cal 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 1 shows the settings for the factory-default base address of 300 hex.

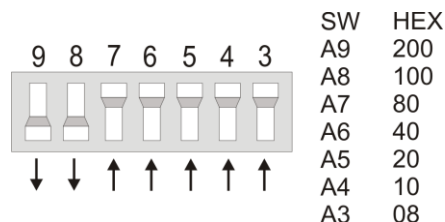| SW	HEX
A9	200
A8	100
A7	80
A6	40
A5	20
A4	10
A3	08

Figure 1. Base address switches

In the default configuration shown in Figure 1, 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-DISO48 board has a wait state jumper which you can set to enable an on-board wait state generator. 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. The Wait State jumper is shown in Figure 2 configured for OFF.
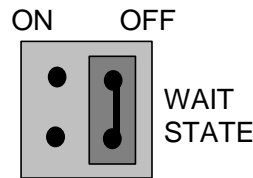
Figure 2. Wait State jumper

AC input filters

There are 48 individual, optically isolated (500V) inputs in six groups of eight each that can be read back as a single byte. The inputs are not polarity sensitive and may be driven by either AC (50 to 1000 Hz) or DC in the range 5V to 28V RMS. Each input has a switchable low-pass filter with a time constant of 5 ms (200 Hz).

Each group of eight inputs has an associated bank of eight filter-enable switches. The switches are labeled **FL1** to **FL6**. The label identifies the group of inputs controlled by the switch:

- FL1 controls inputs ISO 0 to ISO 7
- FL2 controls inputs ISO 8 to ISO 15
- FL3 controls inputs ISO 16 to ISO 23
- FL4 controls inputs ISO 24 to ISO 31
- FL5 controls inputs ISO 32 to ISO 39
- FL6 controls inputs ISO 40 to ISO 47

A typical switch used to control the filters is shown in

Figure 3. The filters must be used for AC inputs, and should be used for DC inputs.
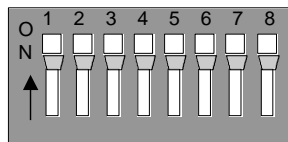
Figure 3. AC input filter switches FL1 to FL6

Unless you have reason to turn off a filter, you should enable it (switch up). With the filter on, an AC voltage within the specified frequency range present on the input produces a constant high signal to the opto-isolator.

With the filter ON, an AC voltage on the input produces a DC voltage.

Note: To change the configuration of a switch on FL1 to FL3, you need to remove the board's protective shield.

Installing the CIO-DISO48

After you configure the board's switches and jumper, you can install the CIO-DISO48 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.

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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 *Insta*Cal 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 *Insta*Cal.

Connecting the board for I/O operations

Connectors, cables – I/O connectors

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

Board connectors, cables, accessory equipment

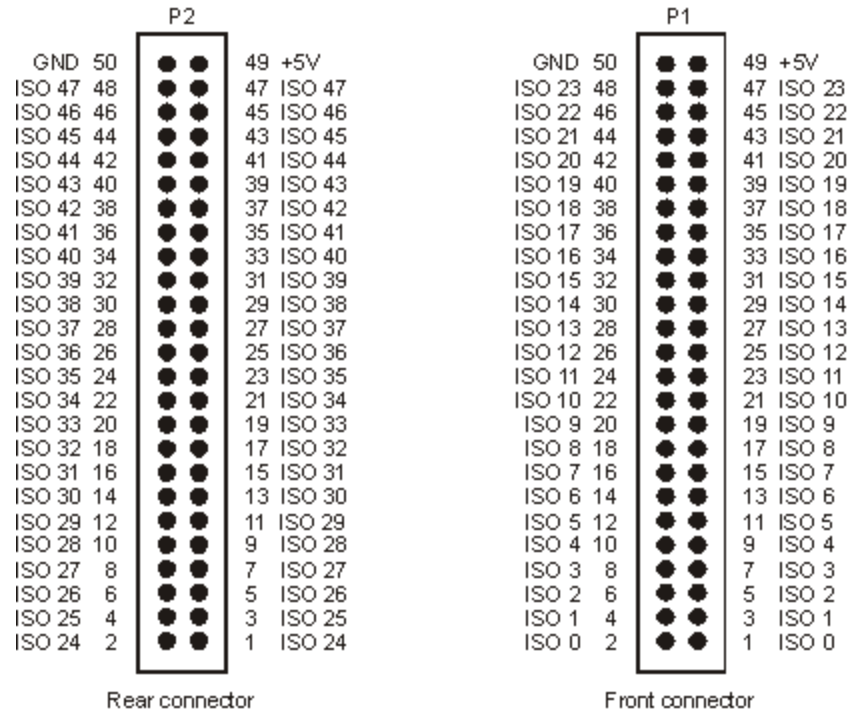| I/O connector type	P1 and P2: 50-pin header connectors
Compatible cable	C50FF-x, where x = length in feet
Compatible accessory products with the C50FF-x cable	CIO-MINI50 (two required to monitor more than 24 channels)

Pin out – I/O connectors

Figure 4. Front and rear connector pin out

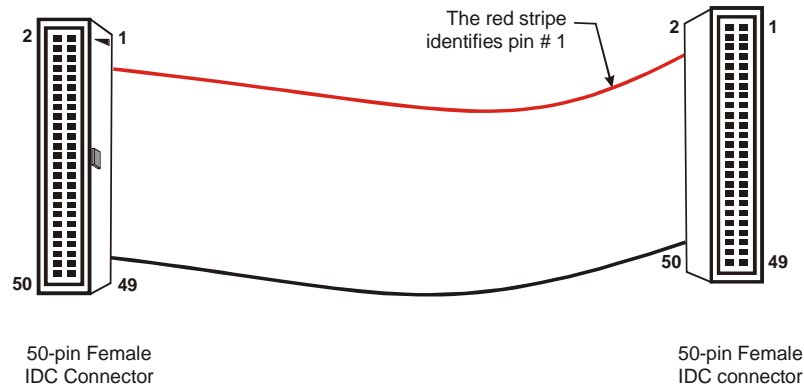| **Caution!**	High voltages are present on the CIO-DISO48 when you have connected high voltage inputs or outputs to the CIO-DISO48 connector.
	Use extreme caution! Never handle the CIO-DISO48 when signals are connected to the board through the connector. Never remove the protective plates from the CIO-DISO48 unless all input voltages are removed first.

Cabling

Figure 5. C50FF-x cable

Field wiring and signal termination accessories

You can connect the CIO-DISO48 to the following screw terminal board using the C50FF-x cable.

▪ CIO-MINI50 – 50-pin screw terminal board.

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

Caution!	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-DISO48 connector.

The CIO-DISO48 is a digital input board with signal conditioning installed. Most accessory boards are intended to provide signal conditioning or easy-to-access signal termination. In general, the CIO-DISO48 does not require additional signal conditioning unless you need to sense voltages higher than 28 V.

We recommend that you DO NOT use screw terminal boards to connect high voltage signals to the CIO-DISO48. The CIO-DISO48 is intended to read high voltages. The use of screw terminal boards would expose yourself and others to potentially dangerous high voltages.

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 available on our web site at www.mccdaq.com/signals/signals.pdf).

Functional Details

Isolated inputs

The CIO-DISO48 has 48 isolated input channels. A schematic of a single channel is shown in Figure 6.
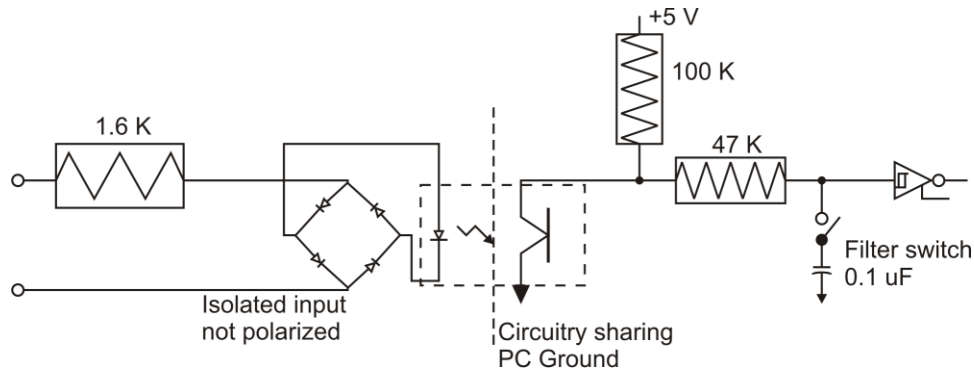
Figure 6. Isolated input schematic – simplified

AC or DC input signals are applied to a bridge rectifier so that the inputs are not polarity sensitive. On AC inputs, the bridge output is a "pulsating" DC voltage. Closing the filter switch smoothes this pulsating voltage to steady DC.

Extending the input range

To extend the input range beyond the 5-28 V specified, add an external resistor. Figure 7 shows the resistor and the equations used to calculate resistor values for a given Vin.
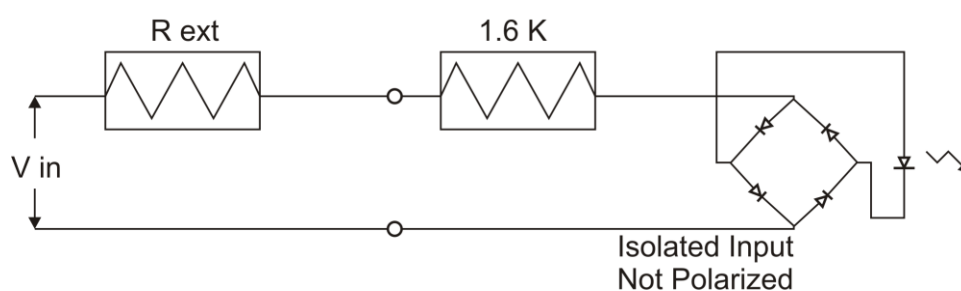
$$R \text{ ext} = 100 * (V \text{ in} - 24)$$
$$Pw = R \text{ ext} / 10{,}000$$

Figure 7. 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 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.

Isolated inputs

Table 1. Isolated input specifications

Number	48	
Range	5-28 V DC or AC (50 to 1000 Hz)	
	Not TTL compatible.	
Isolation	500 V	
Resistance	1.6 kΩ minimum	
Response	Without filter:	20 mS
	With filter switched in:	5 mS

Power consumption

Table 2. Power consumption specifications

+5 V supply	0.6 A typical, 1.0 A maximum

Environmental

Table 3. Environmental specifications

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

Mechanical

Table 4. Mechanical specifications

Weight	8 oz.
Dimensions	3 7/8" (99 mm) height, excluding gold fingers
	6 ½" (164 mm) length

Main connector and pin out

Table 5. Main connector specifications

Connector type	P1 and P2: 50-pin header connectors
Compatible cable	C50FF-x, where x = length in feet
Compatible accessory products with the C50FF-x	CIO-MINI50

P1 pin out

Table 6. Connector P1 pin out

Pin	Signal name	Pin	Signal name
50	GND	49	+5V
48	ISO 23	47	ISO 23
46	ISO 22	45	ISO 22
44	ISO 21	43	ISO 21
42	ISO 20	41	ISO 20
40	ISO 19	39	ISO 19
38	ISO 18	37	ISO 18
36	ISO 17	35	ISO 17
34	ISO 16	33	ISO 16
32	ISO 15	31	ISO 15
30	ISO 14	29	ISO 14
28	ISO 13	27	ISO 13
26	ISO 12	25	ISO 12
24	ISO 11	23	ISO 11
22	ISO 10	21	ISO 10
20	ISO 9	19	ISO 9
18	ISO 8	17	ISO 8
16	ISO 7	15	ISO 7
14	ISO 6	13	ISO 6
12	ISO 5	11	ISO 5
10	ISO 4	9	ISO 4
8	ISO 3	7	ISO 3
6	ISO 2	5	ISO 2
4	ISO 1	3	ISO 1
2	ISO 0	1	ISO 0

P2 pin out

Table 7. Connector P2 pin out

Pin	Signal name	Pin	Signal name
50	GND	49	+5V
48	ISO 47	47	ISO 47
46	ISO 46	45	ISO 46
44	ISO 45	43	ISO 45
42	ISO 44	41	ISO 44
40	ISO 43	39	ISO 43
38	ISO 42	37	ISO 42
36	ISO 41	35	ISO 41
34	ISO 40	33	ISO 40
32	ISO 39	31	ISO 39
30	ISO 38	29	ISO 38
28	ISO 37	27	ISO 37
26	ISO 36	25	ISO 36
24	ISO 35	23	ISO 35
22	ISO 34	21	ISO 34
20	ISO 33	19	ISO 33
18	ISO 32	17	ISO 32
16	ISO 31	15	ISO 31
14	ISO 30	13	ISO 30
12	ISO 29	11	ISO 29
10	ISO 28	9	ISO 28
8	ISO 27	7	ISO 27
6	ISO 26	5	ISO 26
4	ISO 25	3	ISO 25
2	ISO 24	1	ISO 24

$C\epsilon$ 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-DISO48

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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