PCI-DIO48H and PCI-DIO96H

Digital Input/Output

User's Guide

MEASUREMENT COMPUTING™

Document Revision 2, August, 2003

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Every hardware product manufactured by Measurement Computing Corp. is warranted against defects in materials or workmanship for the life of the product, to the original purchaser. Any products found to be defective will be repaired or replaced promptly.

30 Day Money Back Guarantee

Any Measurement Computing Corp. product may be returned within 30 days of purchase for a full refund of the price paid for the product being returned. If you are not satisfied, or chose the wrong product by mistake, you do not have to keep it. Please call for an RMA number first. No credits or returns accepted without a copy of the original invoice. Some software products are subject to a repackaging fee.

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Lifetime ***Harsh Environment Warranty™***

Any product manufactured by Measurement Computing Corp. that is damaged (even due to misuse) may be replaced for only 50% of the current list price. I/O boards face some tough operating conditions—some more severe than the boards are designed to withstand. When a board becomes damaged, just return the unit with an order for its replacement at only 50% of the current list price. We don't need to profit from your misfortune. By the way, we honor this warranty for any manufacturer's board that we have a replacement for!

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 PCI-DIO48H and PCI-DIO96H so that you get the most out of their digital I/O features.

This user's guide also refers you to related documents available on our web site, and to technical support resources that can also help you get the most out of these boards.

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 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 *Insta*Cal installation procedure is explained in the *Software Installation Manual*. ▪ *Never* touch the exposed pins or circuit connections on the board.

Where to find more information

The following electronic documents provide information that can help you get the most out of the PCI-DIO48H and PCI-DIO96H boards.

- MCC's *Guide to Signal Connections* is available on our web site at www.mccdaq.com/signals/signals.pdf.
- MCC's *Register Map for the PCI-DIO48H and PCI-DIO96H* is available on our web site at www.mccdaq.com/registermaps/RegMapPCI-DIOxxH.pdf.
- MCC's *Specifications: PCI-DIO48H* (the PDF version of Chapter 5 in this guide) is available on our web site at www.mccdaq.com/pdfs/PCI-DIO48H.pdf.
- MCC's *Specifications: PCI-DIO96H* (the PDF version of Chapter 6 in this guide) is available on our web site at www.mccdaq.com/pdfs/PCI-DIO96H.pdf.
- MCC's *Universal Library User's Guide* is available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-user-guide.pdf.
- MCC's *Universal Library Function Reference* is available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-functions.pdf.

This user's manual is also available on our web site at www.mccdaq.com/PDFManuals/PCI-DIOxxH.pdf.

Chapter 1

Introducing the PCI-DIO48H and PCI-DIO96H

An Overview of PCI-DIO48H and PCI-DIO96H features

This manual explains how to install and use the PCI-DIO48H and PCI-DIO96H boards. Each board is a high-density, logic-level digital I/O board designed for the PCI-bus.

The PCI-DIO96H provides 96-bits of digital I/O that are organized into four 24-bit groups. The PCI-DIO48H provides 48-bits that are organized into two 24-bit groups.

Both boards provide the I/O in 24-bit groups based on an 82C55, mode 0 emulation. Each 24-bit group is divided into three eight-bit ports labeled PORTA, PORTB and PORTC. PORTC can be split into two four-bit nibbles—port C-HI and port C-LO. Each of these ports may be individually programmed as input or output.

All of the digital inputs on the PCI-DIO48H and PCI-DIO96H are LSTTL. The output signals are buffered high output drive TTL.

The digital output drivers are 74S244 chips that can sink 64 mA and source 15 mA. The input buffers are 74LS373 chips and have standard high input impedance of the 74LS series devices.

On power up and reset, all I/O bits are set to input mode. If you are using the board to control items that must be OFF on reset, install pull-down resistors. Each board is equipped with open locations where you can install SIP resistor networks for either pull-up or pull-down.

The PCI-DIO48H and PCI-DIO96H boards are completely plug-and-play, with no jumpers or switches to set. All board addresses are set by the board's plug-and-play software. Board configuration is controlled by your system's BIOS.

A block diagram that illustrates the functionality of the PCI-DIO48H and PCI-DIO96H is shown in Figure 1-1 on page 1-2.

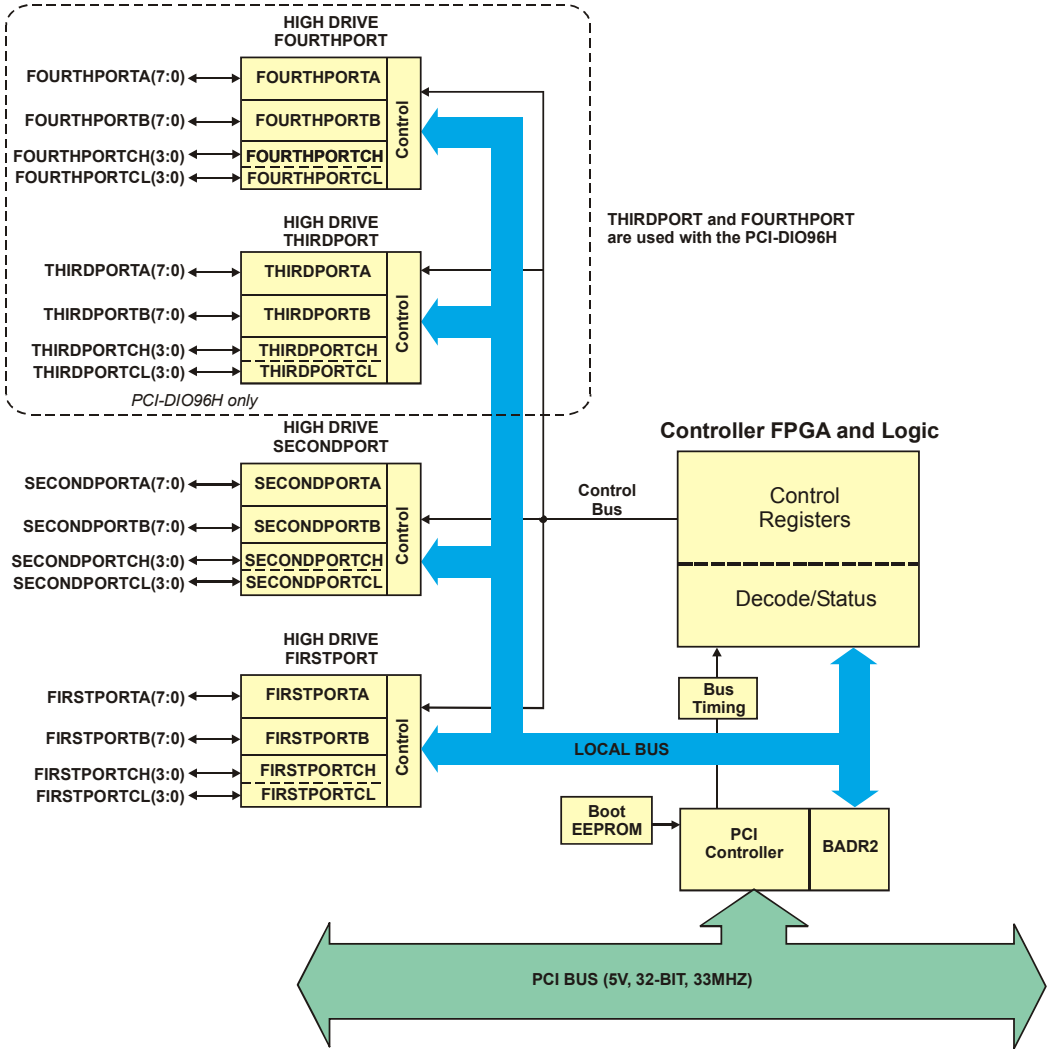


Figure 1-1. PCI-DIO96H and PCI-DIO48H Block Diagram

Software features–*Insta*Cal™ and Universal Library®

The PCI-DIO48H and PCI-DIO96H are shipped with the *Insta*Cal™ software utility package. *Insta*Cal is a complete installation, calibration, and test program for data acquisition and control boards. Complete with extensive error checking, *Insta*Cal guides you through installation and setup of your data acquisition board and creates the board configuration file for use by your program or application software package. The *Insta*Cal installation procedure is explained in MCC's *Software Installation Manual* (available at www.mccdaq.com/PDFmanuals/sm-installation.pdf).

The optional Universal Library® fully supports the PCI-DIO48H and PCI-DIO96H. The Universal Library is a complete set of I/O libraries and drivers for all MCC boards, and for all Windows-based languages. When using the Universal Library, you can switch boards or even programming languages and the syntax remains constant.

Installing the Board

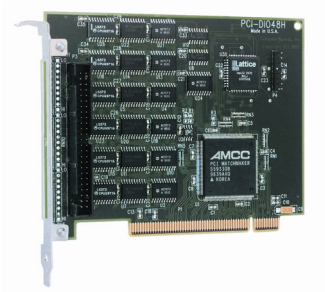
What comes with your PCI-DIO48H and PCI-DIO96H shipment

As you unpack your board shipment, verify that the following components are included.

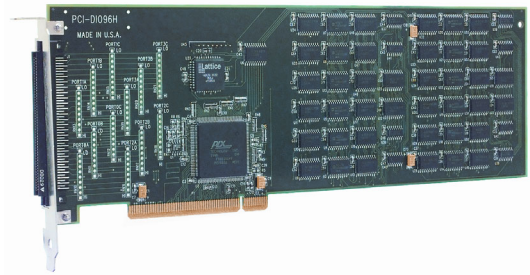
Standard shipment

The following items should be included with your shipment:

- PCI-DIO48H board or PCI-DIO96H board.



PCI-DIO48H



PCI-DIO96H

- *Insta*Cal installation CD.
- MCC's *Software Installation Manual*

Optional components

If you ordered any of the following products with your PCI-DIO48H and PCI-DIO96H board, they should be included with your shipment.

Universal Library

- Universal Library™ Data Acquisition and Control Programming Tools (the *Insta*Cal installation package is included on this CD)
- *Universal Library User's Guide* and *Universal Library Function Reference*

Cables

C50FF-*x*

C100FF-*x*

For more information on these MCC cables, refer to the "Connecting the board for I/O operations" section on page 2-5.

Signal termination panels

The following screw terminal boards can terminate field signals and route them into the PCI-DIO48H board using the C50FF-*x* cable:

- CIO-MINI50
- CIO-TERM100
- CIO-SPADE50
- SCB-50

The following boards can terminate field signals and route them into the PCI-DIO96H board using the C100FF-*x* cable:

- CIO-MINI50 (two devices are required)
- CIO-SPADE50 (two devices are required)
- CIO-TERM100
- SCB-50

MCC provides the following digital signal conditioning products to interface between high voltage/high current signals and the PCI-DIO48H and PCI-DIO96H boards:

- CIO-ERB24
- CIOSERB24/FD
- CIO-ERB48
- CIO-SERB48
- SSR-RACK48
- SSR-RACK24

For more information on these MCC products, refer to the "Field wiring and signal termination accessories" section on page 2-9.

If any items are missing or damaged, contact Measurement Computing Corp. 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@measurementcomputing.com

Unpacking the board

Each PCI-DIO48H and PCI-DIO96H board is shipped in an antistatic container to prevent damage by an electrostatic discharge. To avoid such damage, perform the following procedure when unpacking and handling your board:

1. Before opening the antistatic container, ground yourself with a wrist-grounding strap or by holding onto a grounded object (such as the computer chassis).
2. Touch the antistatic container to the computer chassis before removing the board from the container.
3. Remove the board from the container. *Never* touch the exposed pins or circuit connections on the board.

Installing the software

Install the *Insta*Cal software included with your board *before* you install the hardware. This ensures that the information required for proper board detection is installed and available at boot up. The procedure for installing *Insta*Cal is explained in the *Software Installation Manual* included with your board (and also available on our web site at www.mccdaq.com/PDFmanuals/sm-installation.pdf).

If you ordered the Universal Library…

If you ordered the optional Universal Library, use that CD to install both *Insta*Cal and the Universal Library.

Installing the hardware

PCI-DIO48H and PCI-DIO96H boards are completely plug-and-play, with no switches or jumpers to set. Configuration is controlled by your system's BIOS. To install your board, follow the steps below:

1. Turn your computer off, open it up, and insert your board into an available PCI slot.
2. Close your computer and turn it on.

   If you are using an operating system with support for plug-and-play (play (such as Windows 95 or Windows 2000), a dialog box displays as the system loads, indicating that new hardware has been detected. If the information file for this board is not already loaded onto your PC, you are prompted for the disk containing this file. The *Insta*Cal software supplied with your board contains this file. If required, insert the disk or CD and click **OK**.
3. To test your installation and configure your board, run the *Insta*Cal utility you installed in the previous section. Refer to the *Software Installation Manual* that came with your board (www.mccdaq.com/PDFmanuals/sm-installation.pdf) for information on how to initially set up and load *Insta*Cal.

Connecting the board for I/O operations

Connectors, cables – main I/O connector

Table 2-1 lists the board connectors, applicable cables and compatible accessory boards.

Table 2-1. Board connectors, cables, accessory equipment

Connector type	▪ PCI-DIO48H - 50-pin, high-density IDC male header connector. ▪ PCI-DIO96H - 100-pin, high-density connector.
Compatible cables	▪ PCI-DIO48H - C50FF-*x* (Figure 2-2) ▪ PCI-DIO96H - C100FF-*x* (Figure 2-3)
Compatible accessory products (with the C50FF-*x* cable)	CIO-MINI50 CIO-SPADE50 SCB-50
Compatible accessory products (with the C100FF-*x* cable)	CIO-MINI50* CIO-SPADE50* CIO-TERM100 SCB-50 * two devices are required

The PCI-DIO48H board has a 50-pin, high-density male header connector that is accessible through the slot in the expansion bracket. Connector pinouts are listed in Table 2-2. The optional C50FF-*x* cable can be used to connect to a screw-terminal board, such as the CIO-MINI50, CIO-TERM100, CIO-SPADE50 or SCB-50 (see Figure 2-4).

The PCI-DIO96H board has a 100-pin, high-density Robinson-Nugent male connector. Connector pinouts are listed in Table 2-3. The optional C100FF-*x* cable can be used to split the 100 I/O lines into two, 50-pin cables. Board connector pins 1 to 50 are mapped directly to pins 1 to 50 on the C100FF-*x* cable's first 50-pin connector. Board connector pins 51 to 100 are mapped directly to pins 1 to 50 on the C100FF-*x* cable's second 50-pin connector (pin 51 is mapped to pin 1, and pin 100 is mapped to pin 50.) A sample C100FF-*x* cable configuration is shown in Figure 2-4 on page 2-8.

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 http://www.measurementcomputing.com/signals/signals.pdf.

Caution! When connecting a cable to the board's I/O connector, make sure that the arrow indicating pin 1 on the board connector lines up with the arrow indicating pin 1 on the

cable connector. Incorrectly connected cables can damage the board and the I/O controller.

Pinout – PCI-DIO48H main I/O connector

Table 2-2. PCI-DIO48H main I/O connector pinout

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

PCI slot ↓

Pinout – PCI-DIO96H main I/O connector

Table 2-3. PCI-DIO96H main I/O connector pinout

Signal Name	Pin		Pin	Signal Name
GND	100	• •	50	GND
+5V	99	• •	49	+5V
THIRDPORTC Bit 0	98	• •	48	FIRSTPORTC Bit 0
THIRDPORTC Bit 1	97	• •	47	FIRSTPORTC Bit 1
THIRDPORTC Bit 2	96	• •	46	FIRSTPORTC Bit 2
THIRDPORTC Bit 3	95	• •	45	FIRSTPORTC Bit 3
THIRDPORTC Bit 4	94	• •	44	FIRSTPORTC Bit 4
THIRDPORTC Bit 5	93	• •	43	FIRSTPORTC Bit 5
THIRDPORTC Bit 6	92	• •	42	FIRSTPORTC Bit 6
THIRDPORTC Bit 7	91	• •	41	FIRSTPORTC Bit 7
THIRDPORTB Bit 0	90	• •	40	FIRSTPORTB Bit 0
THIRDPORTB Bit 1	89	• •	39	FIRSTPORTB Bit 1
THIRDPORTB Bit 2	88	• •	38	FIRSTPORTB Bit 2
THIRDPORTB Bit 3	87	• •	37	FIRSTPORTB Bit 3
THIRDPORTB Bit 4	86	• •	36	FIRSTPORTB Bit 4
THIRDPORTB Bit 5	85	• •	35	FIRSTPORTB Bit 5
THIRDPORTB Bit 6	84	• •	34	FIRSTPORTB Bit 6
THIRDPORTB Bit 7	83	• •	33	FIRSTPORTB Bit 7
THIRDPORTA Bit 0	82	• •	32	FIRSTPORTA Bit 0
THIRDPORTA Bit 1	81	• •	31	FIRSTPORTA Bit 1
THIRDPORTA Bit 2	80	• •	30	FIRSTPORTA Bit 2
THIRDPORTA Bit 3	79	• •	29	FIRSTPORTA Bit 3
THIRDPORTA Bit 4	78	• •	28	FIRSTPORTA Bit 4
THIRDPORTA Bit 5	77	• •	27	FIRSTPORTA Bit 5
THIRDPORTA Bit 6	76	• •	26	FIRSTPORTA Bit 6
THIRDPORTA Bit 7	75	• •	25	FIRSTPORTA Bit 7
FOURTHPORTC Bit 0	74	• •	24	SECONDPORTC Bit 0
FOURTHPORTC Bit 1	73	• •	23	SECONDPORTC Bit 1
FOURTHPORTC Bit 2	72	• •	22	SECONDPORTC Bit 2
FOURTHPORTC Bit 3	71	• •	21	SECONDPORTC Bit 3
FOURTHPORTC Bit 4	70	• •	20	SECONDPORTC Bit 4
FOURTHPORTC Bit 5	69	• •	19	SECONDPORTC Bit 5
FOURTHPORTC Bit 6	68	• •	18	SECONDPORTC Bit 6
FOURTHPORTC Bit 7	67	• •	17	SECONDPORTC Bit 7
FOURTHPORTB Bit 0	66	• •	16	SECONDPORTB Bit 0
FOURTHPORTB Bit 1	65	• •	15	SECONDPORTB Bit 1
FOURTHPORTB Bit 2	64	• •	14	SECONDPORTB Bit 2
FOURTHPORTB Bit 3	63	• •	13	SECONDPORTB Bit 3
FOURTHPORTB Bit 4	62	• •	12	SECONDPORTB Bit 4
FOURTHPORTB Bit 5	61	• •	11	SECONDPORTB Bit 5
FOURTHPORTB Bit 6	60	• •	10	SECONDPORTB Bit 6
FOURTHPORTB Bit 7	59	• •	9	SECONDPORTB Bit 7
FOURTHPORTA Bit 0	58	• •	8	SECONDPORTA Bit 0
FOURTHPORTA Bit 1	57	• •	7	SECONDPORTA Bit 1
FOURTHPORTA Bit 2	56	• •	6	SECONDPORTA Bit 2
FOURTHPORTA Bit 3	55	• •	5	SECONDPORTA Bit 3
FOURTHPORTA Bit 4	54	• •	4	SECONDPORTA Bit 4
FOURTHPORTA Bit 5	53	• •	3	SECONDPORTA Bit 5
FOURTHPORTA Bit 6	52	• •	2	SECONDPORTA Bit 6
FOURTHPORTA Bit 7	51	• •	1	SECONDPORTA Bit 7

PCI slot ↓

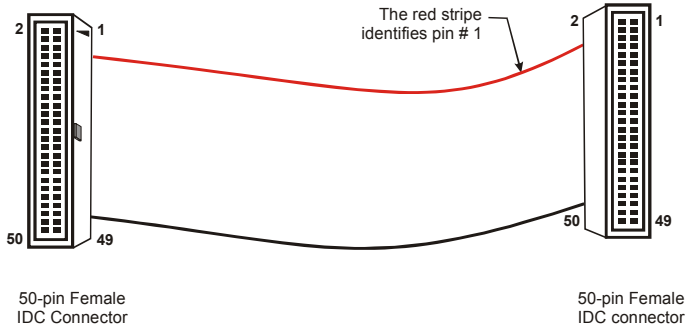


Figure 2-2. C50FF-*x* cable

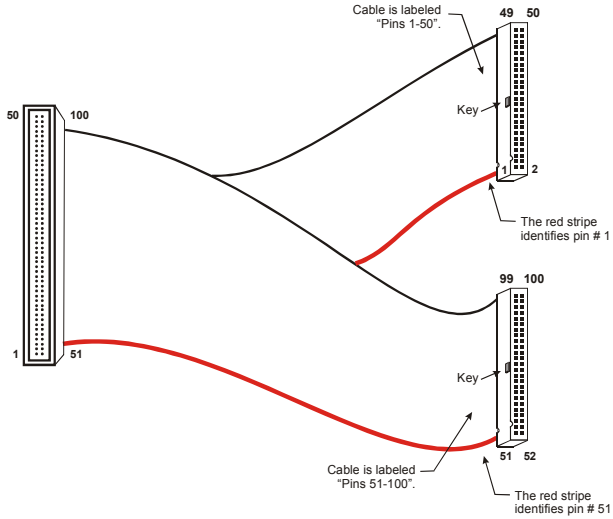


Figure 2-3. C100FF-*x* cable

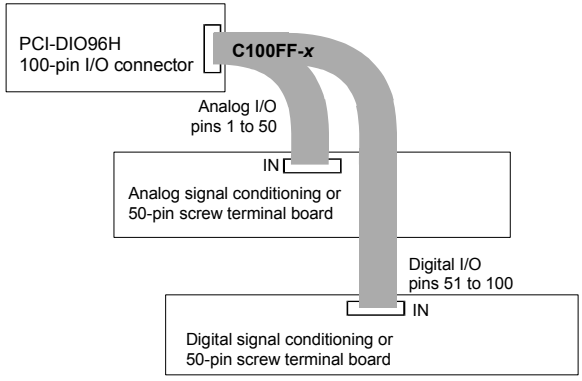


Figure 2-4. C100FF-*x* cable configuration for the PCI-DIO96H

Field wiring and signal termination accessories

You can use the following screw terminal boards to terminate field signals and route them into the PCI-DIO48H and PCI-DIO96H using the C100FF-*x* cable.

- **CIO-MINI50** – 50-pin screw terminal board. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=102&pf_id=258.
- **CIO-TERM100** – 100-pin screw terminal board (daisy-chained 50-pin IDC connectors). Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=102&pf_id=281.
- **CIO-SPADE50** – 50-pin universal screw terminal board with spade lug terminals. Details on this product are available on our web site at http://www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=102&pf_id=275.
- **SCB-50** – 50 conductor, shielded signal connection/screw terminal box provides two independent 50-pin connections. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=196&pf_id=1168.
- **CIO-ERB24** – 24 Form C relays, 6 Amp relay accessory board for digital signal conditioning. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=123&pf_id=241.
- **CIO-SERB24/FD –** 24 Form C relays, 10 Amp, fault detecting relay accessory board with socketed and field-replaceable relays. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=123&pf_id=678.
- **CIO-ERB48 –** 48 Form C relays, 6 Amp, relay, 50-pin accessory board for digital signal conditioning. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=123&pf_id=242.
- **CIO-SERB48 –** 24 Form C relays, 10 Amp relay accessory board with socketed and field-replaceable relays. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=123&pf_id=676.
- **SSR-RACK24** – 24-channel, solid-state relay mounting rack for digital signal conditioning. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=122&pf_id=1193.
- **SSR-RACK48** – 48-channel, solid-state relay mounting rack with quad-format modules. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=122&pf_id=622.

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.measurementcomputing.com/signals/signals.pdf.

Programming and Developing Applications

After following the installation instructions in Chapter 2, "Installing the Board," your board should now be installed and ready for use.

Programming languages

Measurement Computing's Universal Library provides complete access to PCI-DIO48H and PCI-DIO96H board functions from the full range of Windows® programming languages. If you are planning to write programs, or would like to run the example programs for Visual Basic® or any other language, refer to the *Universal Library User's Guide*. This document is available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-user-guide.pdf.

Packaged applications programs

Many packaged application programs, such as SoftWIRE®, Labtech Notebook™, and HP-VEE™, now have drivers for your board. If the package you own does not have drivers for the board, please fax or e-mail the package name and the revision number from the install disks. We will research the package for you and advise how to obtain drivers.

Some application drivers are included with the Universal Library package, but not with the application package. If you have purchased an application package directly from the software vendor, you may need to purchase our Universal Library and drivers. Please contact us 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@measurementcomputing.com

Register-level programming

You should use the Universal Library or one of the packaged application programs mentioned above to control your board. Only experienced programmers should try register-level programming. If you need to program at the register level in your application, refer to the *Register Map for the PCI-DIO48H and PCI-DIO96H* (available at http://www.mccdaq.com/registermaps/RegMapPCI-DIOxxH.pdf).

Functional Details

CIO-ERB24 and SSR-RACK24 daisy chain configuration

Many relay and solid-state relay (SSR) racks provide only 24-bits of digital I/O. You can configure the CIO-ERB24 relay output board and SSR-RACK24 I/O module rack in a daisy chain configuration to use all of the digital I/O bits provided by the PCI-DIO48H and PCI-DIO96H boards. An example of the daisy chain configuration scheme for each board is shown below.

PCI-DIO48H

The PCI-DIO48H board provides digital I/O in a group of 48 bits. To use all of the board's 48 digital I/O bits to monitor and control relays and/or SSRs, configure the daisy chain as shown in Figure 4-1.

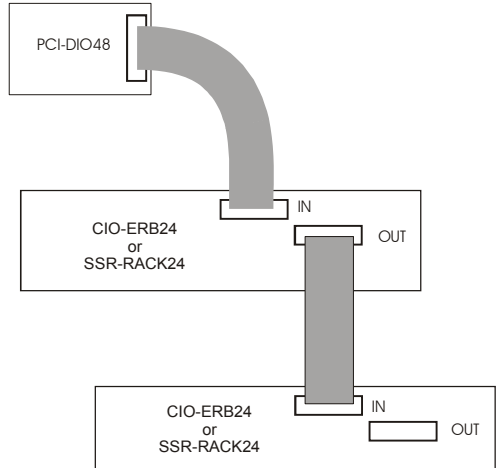


Figure 4-1. PCI-DIO48H to CIO-ERB24 or SSR-RACK24 Daisy Chain

The PCI-DIO48H board's 24 digital I/O bits on pins 1-24 control the first relay board on the chain. The 24 digital I/O bits on pins 25-50 control the second relay/SR board on the daisy chain.

PCI-DIO96H

PCI-DIO96H board provides digital I/O in a group of 96 bits. Each of the C100FF-*x* cable's 50-pin connectors provides 48 bits. To use all of the board's 96 digital I/O bits to control relays and/or SSRs, configure the daisy chain as shown in Figure 4-2.

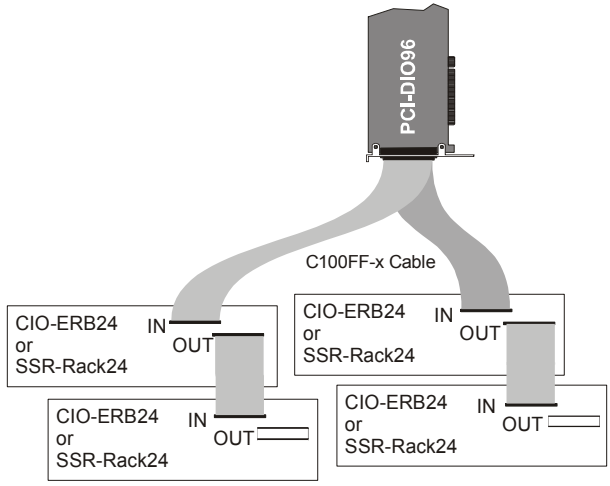


Figure 4-2. PCI-DIO96H to C100FF-*x* to Relay Rack Daisy Chain Cabling

The PCI-DIO96H board's 24 digital I/O bits on pins 1-24 control the first relay board on the chain. The 24 digital I/O bits on pins 25-50 control the second relay/SSR board on the daisy chain and so on, for up to 100 pins.

82C55 emulation

The PCI-DIO48H and PCI-DIO96H boards emulate the 82C55 chip. The 82C55 emulation initializes all ports as inputs on power-up and reset. A TTL input is a high impedance input. If you connect another TTL input device to the output, it could be turned *on* or *off* every time the board is reset.

To establish a consistent TTL level at power-up, use resistors tied to either +5V (pull-up) or ground (pull-down). There are open locations for pull-up and pull-down resistor packs on the board.

Whenever an 82C55 emulation is powered on or reset, all pins are set to high-impedance input. Based on standard TTL functionality, these inputs will typically float high, and may have enough drive current to turn on external devices.

Consequently, if you have output devices such as solid state relays, they may be switched on whenever the computer is powered on or reset. To prevent unwanted switching, and to drive all outputs to a known state after power on or reset, pull all pins either high or low through a 2.2 K resistor.

Pull-up and pull-down resistors

The PCI-DIO96H and PCI-DIO48H boards provide locations for pull-up and pull-down resistors in Single Inline Packages (SIPs).

- On the PCI-DIO96H board, the locations are marked **PORT#A**, **PORT#B** and **PORT#C** (RN10 through RN21), and are adjacent to the I/O connector.
- On the PCI-DIO48H, the locations are marked **A**, **B** or **C** in the **PORT 1** or **PORT 2** area on the board (RN6 through RN11), and are adjacent to the I/O connectors.

A 2.2K, 8-resistor SIP is made of eight 2.2K resistors, all connected with one side to a single common point and the other side of each to a pin protruding from the SIP. The common line to which all resistors are connected also protrudes from the SIP. The common line is marked with a dot and is at one end of the SIP.

The SIP may be installed as pull-up or pull-down. At each RN# location, there are 10 holes in a line. One end of the line is +5V, the other end is GND. They are marked **HI** and **LO** respectively. The eight holes in the middle are connected to the eight lines of a port.

- For a pull-up function, mount the SIP with the common pin (marked with a dot or line) in the **HI** position.
- For a pull-down function, mount the SIP with the common pin in the **LO** position.

A resistor value of 2.2K is recommended. Use other values only if you have calculated the necessity of doing so.

Unconnected inputs float

Unconnected inputs typically float high, but not reliably. If you are using a PCI-DIO96H or PCI-DIO48H board for input and have unconnected inputs, ignore the data from those lines. You do not have to tie input lines, and unconnected lines will not affect the performance of connected lines. Ensure that you mask out any unconnected bits in software.

Specifications – PCI-DIO48H

Typical for 25°C unless otherwise specified.

Digital Input / Output

Table 5-1. Digital I/O specifications

Digital Type	8255 emulation, Mode 0
Output:	74S244
Input:	74LS373
Configuration	4 banks of 8, 4 banks of 4, programmable by bank as input or output
Number of I/O	48
Output High	2.4 volts min @ -15mA
Output Low	0.5 volts max @ 64 mA
Input High	2.0 volts min, 7 volts absolute max
Input Low	0.8 volts max, -0.5 volts absolute min
Power-up / reset state	Input mode (high impedance)
Pull-Up/Pull-Down Resistors	SIP resistor locations provided for pull-up or pull-down configuration.

Power Consumption

Table 5-2. Power consumption specifications

+5V Operating	1.2A typical, 1.6A max

Environmental

Table 5-3. Environmental specifications

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

Mechanical

Table 5-4. Mechanical specifications

Card dimensions	174.7mm L x 106.6mm H x 14.5mm W

Software

Table 5-5. Software specifications

Software Support	Universal Library and *Insta*Cal

Main Connector and Pin Out

Table 5-6. Main connector specifications

Connector type	50-pin, high-density IDC male header connector.
Compatible cables	C50FF-*x*
Compatible accessory products	CIO-MINI50 CIO-SPADE50 SCB-50 CIO-ERB24 CIO-SERB24 CIO-ERB48 CIO-SERB48 SSR-RACK24 SSR-RACK48

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

Specifications – PCI-DIO96H

Typical for 25°C unless otherwise specified.

Digital Input / Output

Table 6-1. Digital I/O specifications

Digital Type	8255 emulation, Mode 0
Output:	74S244
Input:	74LS373
Configuration	8 banks of 8, 8 banks of 4, programmable by bank as input or output
Number of I/O	96
Output High	2.4 volts min @ -15mA
Output Low	0.5 volts max @ 64mA
Input High	2.0 volts min, 7 volts absolute max
Input Low	0.8 volts max, -0.5 volts absolute min
Power-up / reset state	Input mode (high impedance)
Pull-Up/Pull-Down Resistors	SIP resistor locations provided for pull-up or pull-down configuration.

Power Consumption

Table 6-2. Power consumption specifications

+5V Operating	2.1A typical, 3.4A max

Environmental

Table 6-3. Environmental specifications

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

Mechanical

Table 6-4. Mechanical specifications

Card dimensions	292.1mm L x 106.6mm H x 14.5mm W

Software

Table 6-5. Software specifications

Software Support	Universal Library and *Insta*Cal

Main Connector and Pin Out

Table 6-6. Main connector specifications

Connector type	100-pin, high-density.
Compatible cables	C100FF-*x*
Compatible accessory products	CIO-MINI50* CIO-SPADE50* CIO-TERM100 SCB-50 CIO-ERB24 CIO-SERB24 CIO-ERB48 CIO-SERB48 SSR-RACK24 SSR-RACK48 * two devices are required

Pin	Signal name	Pin	Signal name
100	GND	50	GND
99	+5V	49	+5V
98	THIRDPORTC Bit 0	48	FIRSTPORTC Bit 0
97	THIRDPORTC Bit 1	47	FIRSTPORTC Bit 1
96	THIRDPORTC Bit 2	46	FIRSTPORTC Bit 2
95	THIRDPORTC Bit 3	45	FIRSTPORTC Bit 3
94	THIRDPORTC Bit 4	44	FIRSTPORTC Bit 4
93	THIRDPORTC Bit 5	43	FIRSTPORTC Bit 5
92	THIRDPORTC Bit 6	42	FIRSTPORTC Bit 6
91	THIRDPORTC Bit 7	41	FIRSTPORTC Bit 7
90	THIRDPORTB Bit 0	40	FIRSTPORTB Bit 0
89	THIRDPORTB Bit 1	39	FIRSTPORTB Bit 1
88	THIRDPORTB Bit 2	38	FIRSTPORTB Bit 2
87	THIRDPORTB Bit 3	37	FIRSTPORTB Bit 3
86	THIRDPORTB Bit 4	36	FIRSTPORTB Bit 4
85	THIRDPORTB Bit 5	35	FIRSTPORTB Bit 5
84	THIRDPORTB Bit 6	34	FIRSTPORTB Bit 6
83	THIRDPORTB Bit 7	33	FIRSTPORTB Bit 7
82	THIRDPORTA Bit 0	32	FIRSTPORTA Bit 0
81	THIRDPORTA Bit 1	31	FIRSTPORTA Bit 1
80	THIRDPORTA Bit 2	30	FIRSTPORTA Bit 2
78	THIRDPORTA Bit 3	29	FIRSTPORTA Bit 3
78	THIRDPORTA Bit 4	28	FIRSTPORTA Bit 4
77	THIRDPORTA Bit 5	27	FIRSTPORTA Bit 5
76	THIRDPORTA Bit 6	26	FIRSTPORTA Bit 6
75	THIRDPORTA Bit 7	25	FIRSTPORTA Bit 7
74	FOURTHPORTC Bit 0	24	SECONDPORTC Bit 0
73	FOURTHPORTC Bit 1	23	SECONDPORTC Bit 1
72	FOURTHPORTC Bit 2	22	SECONDPORTC Bit 2
71	FOURTHPORTC Bit 3	21	SECONDPORTC Bit 3
70	FOURTHPORTC Bit 4	20	SECONDPORTC Bit 4
69	FOURTHPORTC Bit 5	19	SECONDPORTC Bit 5
68	FOURTHPORTC Bit 6	18	SECONDPORTC Bit 6
67	FOURTHPORTC Bit 7	17	SECONDPORTC Bit 7
66	FOURTHPORTB Bit 0	16	SECONDPORTB Bit 0
65	FOURTHPORTB Bit 1	15	SECONDPORTB Bit 1
64	FOURTHPORTB Bit 2	14	SECONDPORTB Bit 2
63	FOURTHPORTB Bit 3	13	SECONDPORTB Bit 3
62	FOURTHPORTB Bit 4	12	SECONDPORTB Bit 4
61	FOURTHPORTB Bit 5	11	SECONDPORTB Bit 5
60	FOURTHPORTB Bit 6	10	SECONDPORTB Bit 6
59	FOURTHPORTB Bit 7	9	SECONDPORTB Bit 7
58	FOURTHPORTA Bit 0	8	SECONDPORTA Bit 0
57	FOURTHPORTA Bit 1	7	SECONDPORTA Bit 1
56	FOURTHPORTA Bit 2	6	SECONDPORTA Bit 2
55	FOURTHPORTA Bit 3	5	SECONDPORTA Bit 3
54	FOURTHPORTA Bit 4	4	SECONDPORTA Bit 4
53	FOURTHPORTA Bit 5	3	SECONDPORTA Bit 5
52	FOURTHPORTA Bit 6	2	SECONDPORTA Bit 6
51	FOURTHPORTA Bit 7	1	SECONDPORTA Bit 7

EC Declaration of Conformity

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

PCI-DIO48H	48-bit digital I/O board for the PCI bus
PCI-DIO96H	96-bit digital I/O board for the PCI bus

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 informative documents:

- EU EMC Directive 89/336/EEC: Essential requirements relating to electromagnetic compatibility.
- EN 55022 Class B (1995): Radiated and conducted emission requirements for information technology equipment.
- ENV 50204 (1995): Radio-frequency electromagnetic field immunity.
- EN 55024 (1998): EC generic immunity requirements.
- EN 50082-1 (1997): EC generic immunity requirements.
- EN 61000-4-2 (1995): Electrostatic discharge immunity.
- EN 61000-4-3 (1997) ENV 50204 (1996): RF immunity.
- EN 61000-4-4 (1995): Electric fast transient burst immunity.
- EN 61000-4-5 (1995): Surge immunity.
- EN 61000-4-6 (1996): Radio frequency common mode immunity.
- EN 61000-4-8 (1994): Power frequency magnetic field immunity.
- EN 61000-4-11 (1994): Voltage dip and interrupt immunity.

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