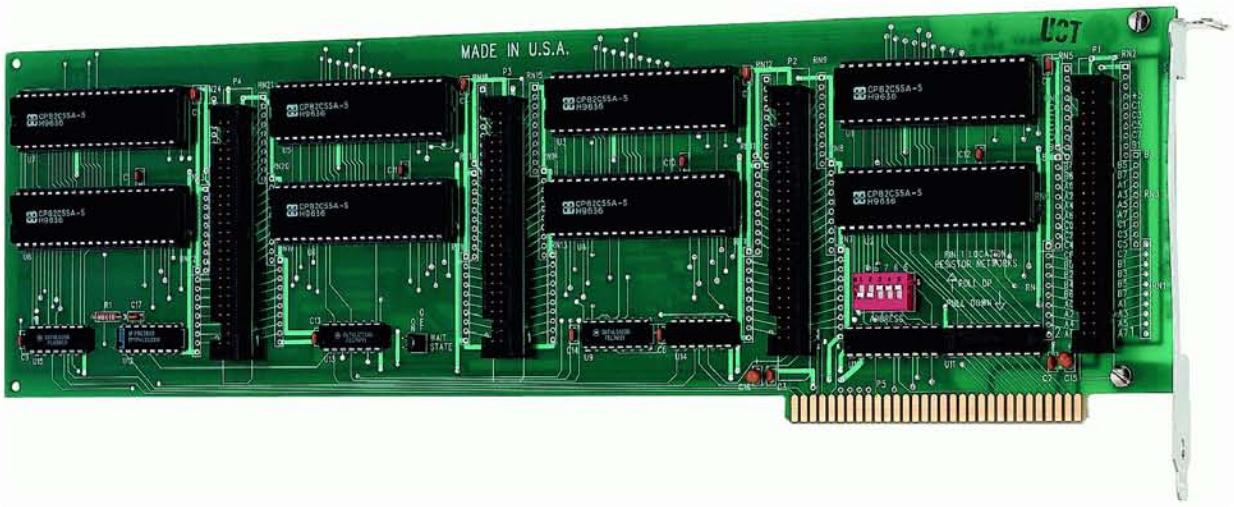
CIO-DIO192

192 Digital I/O bits, Eight 82C55 Chips

User's Guide



MEASUREMENT COMPUTING™

CIO-DIO192

Digital Input/Output Board

User's Guide

Document Revision 1A, December, 2006

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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 describes the Measurement Computing CIO-DIO192 data acquisition board and lists hardware specifications.

Conventions in this user's guide

For more information

Text presented in a box signifies additional information related to the subject matter.

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

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

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

Where to find more information

Additional information about CIO-DIO192 hardware is available on our website at www.mccdaq.com. You can also contact Measurement Computing Corporation with specific questions.

- Knowledgebase: kb.mccdaq.com
- Tech support form: www.mccdaq.com/support/support_form.aspx
- Email: techsupport@mccdaq.com
- Phone: 508-946-5100 and follow the instructions for reaching Tech Support

For international customers, contact your local distributor. Refer to the International Distributors section on our website at www.mccdaq.com/International.

Introducing the CIO-DIO192

Overview: CIO-DIO192 features

The CIO-DIO192 has 192 digital I/O connections, and eight 82C55 parallel-interface chips.

Each 82C55 chip controls 24 CMOS/TTL-compatible digital I/O pins. Each 24-bit group is divided into three eight-bit ports, or two 8-bit ports and two 4-bit ports. Each port is programmable for input or output.

All I/O bits are set to input mode (high impedance) on power up and reset. Locations are available for installing pull-up or pull-down resistors.

All signals pass through a 50-pin connector.

Software features

For information on the features of *Insta*Cal and the other software included with your CIO-DIO192, 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.

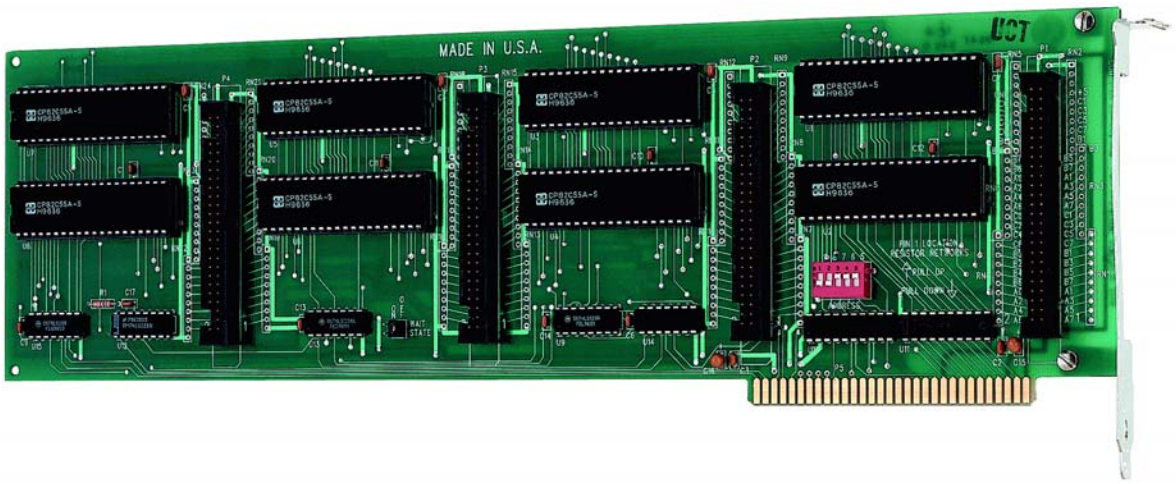
Installing the CIO-DIO192

What comes with your CIO-DIO192 shipment?

The following items are shipped with the CIO-DIO192.

Hardware

- CIO-DIO192

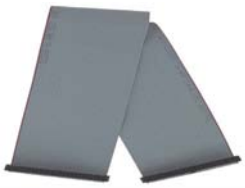


Additional documentation

In addition to this hardware user's guide, you should also receive the *Quick Start Guide* (available in PDF at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf). This booklet supplies a brief description of the software you received with your CIO-DIO192 and information regarding installation of that software. Please read this booklet completely before installing any software or hardware.

Optional components

- Cables



C50FF-x

- Signal termination and conditioning accessories

  MCC provides signal conditioning and termination products for use with the CIO-DIO192. Refer to Field wiring, signal termination, and conditioning on page 13 for a complete list of compatible accessory products.

Unpacking the CIO-DIO192

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the CIO-DIO192 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/PDFs/manuals/DAQ-Software-Quick-Start.pdf.

Configuring the base address switch

The CIO-DIO192 employs the PC bus for power, communications and data transfer. As such, it draws power from the PC, monitors the address lines and control signals, responds to its I/O address, and receives and places data on the eight data lines.

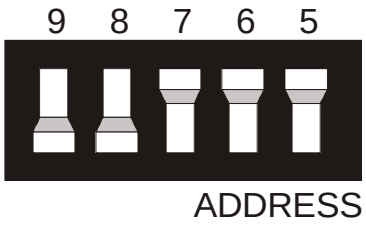
The CIO-DIO192 has one bank of base address-select switches, and one wait-state jumper. Verify their settings before installing the board in your computer.

Base address switch

The easiest way to set the base address is to let *Insta*Cal show you the correct settings. However, if you are already familiar with setting ISA base addresses, you may use the base address switch description below to guide your base address selection.

The base address is the starting location that software writes to when communicating with the CIO-DIO192. A set of DIP switches is used to set the base address. By placing the switch down, the CIO-DIO192 address decode logic is instructed to respond to that address bit. A complete address is constructed by calculating the HEX or decimal number which corresponds to all the address bits the board has been instructed to respond to.

The board is shipped with the base address set to 300 hex (see Figure 1). Unless there is already a board in your system that uses address 300 hex (768 decimal), leave the switches as they were set at the factory.



SW	HEX
A9	200
A8	100
A7	80
A6	40
A5	20

Figure 1. Base address switch

In the default configuration, 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.

PC I/O Address Summary

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

You can set the base address switch to any address in the range of 000-3F8. If you are not using IBM prototyping cards or another board which occupies these addresses, 300-31Fh are also free to use.

Addresses not specifically listed, such as 390-39Fh, are not reserved and may be available. Check your computer for other boards which may use I/O addresses.

Wait state jumper

The CIO-DIO192 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-DIO192 board, so that signals from slow devices (chips) are valid.

The jumper is shown in Figure 2 configured for OFF (wait state is disabled).

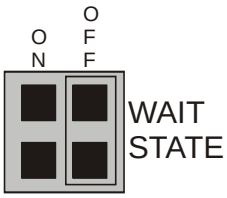


Figure 2. Wait state jumper

The wait state generator is only active when the CIO-DIO192 is being accessed. Your PC will not be slowed down in general by using the wait state.

Because all PC expansion board buses are slowed to either 8 MHz or 10 MHz, the wait state generally is not required. If you experience sporadic failures, try enabling the wait state generator.

Installing the CIO-DIO192

After you configure the base address, you can install the CIO-DIO192 into your computer. 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 *Insta*Cal utility you installed in the previous section. Refer to the *Quick Start Guide* that came with your board www.mccdaq.com/PDFs/manuals/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 – main I/O connector

The table below lists the board connector, applicable cables, and compatible accessory products.

Board connector, cables, and accessory equipment

Connector type	(4) 50-pin shrouded male header connectors: P1, P2, P3, P4
Compatible cables	C50FF-x
Compatible accessory products with the C50FF-x cable	CIO-TERM100 CIO-SPADE50 CIO-MINI50 SSR-RACK24, SSR-RACK48 CIO-ERB24, CIO-ERB48

Pinout – main I/O connectors

The CIO-DIO192 connector has four standard 50-pin header connectors (P1 - P4) that are accessible through the PC/AT expansion bracket.

Connect FIRSTPORT and SECONDPORT signals to connector P1. Connect THIRDPORT and FOURTHPORT signals to connector P2.

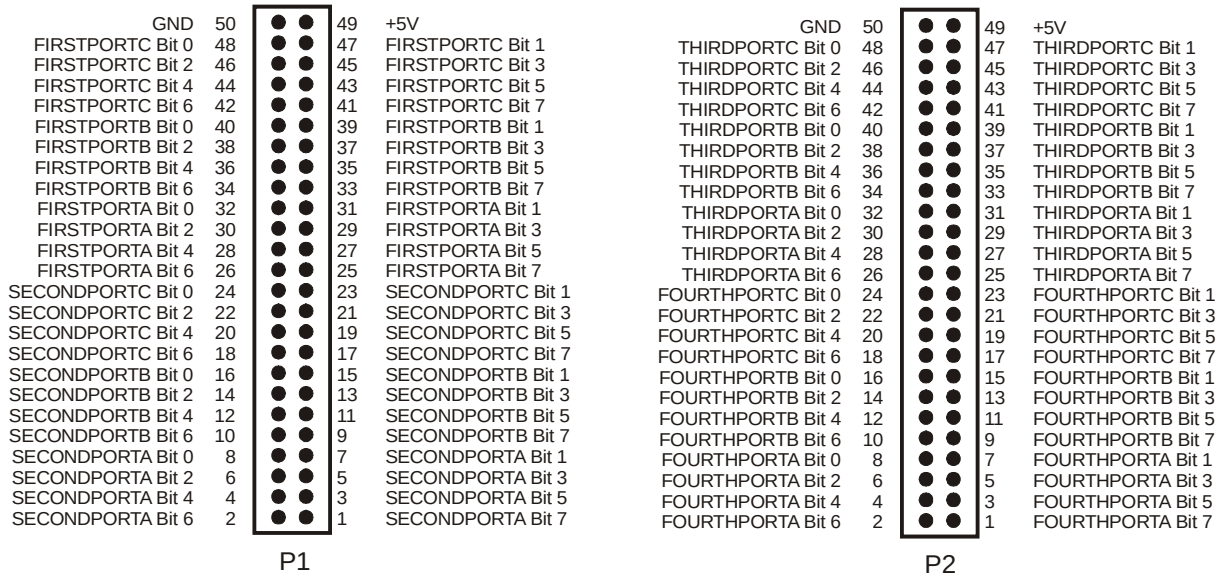


Figure 3. P1 and P2 pin out

Connect FIFTHPORT and SIXTHPORT signals to connector P3. Connect SEVENTHPORT and EIGHTHPORT signals to connector P4.

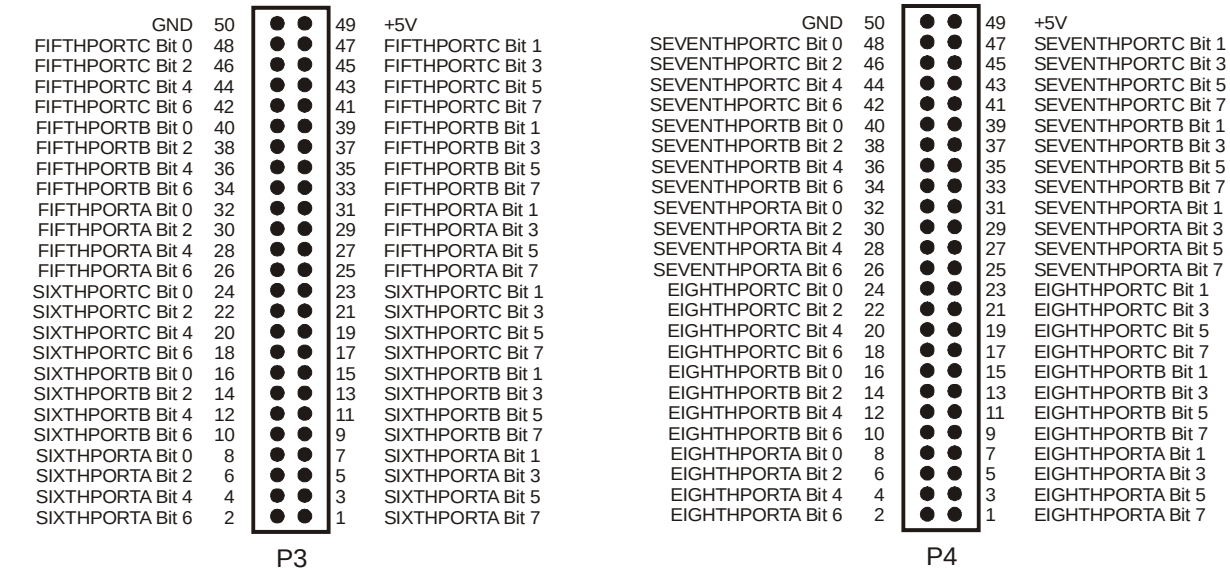


Figure 4. P3 and P4 pin out

All the digital inputs and outputs are TTL. Under normal operating conditions, the voltages on the I/O pins range from near 0 volts for the low state, to near 5 volts for the high state. The voltages and currents of external devices usually exceed these values. Because of this, external relays are usually employed to handle higher current and voltage loads.

In addition to load matching, digital signal sources often need to be filtered or "de-bounced". Refer to the *Guide to Signal Connections* for information on digital interfacing. This document is available at www.mccdaq.com/pdfs/DAQ-Signal-Connections.pdf

Cabling

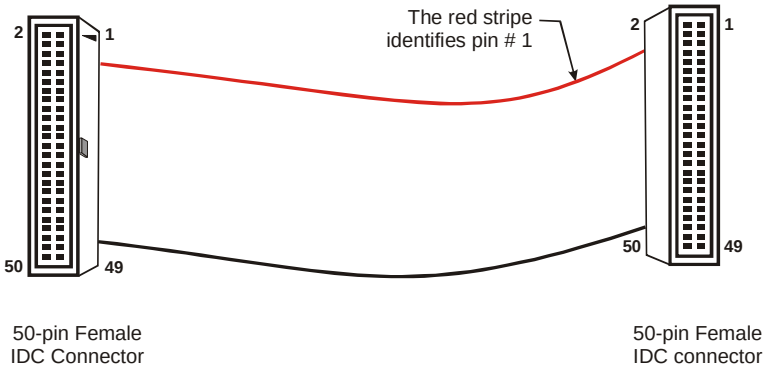


Figure 5. C50FF-x cable

Field wiring, signal termination, and conditioning

You can use the following cabling, screw termination, and signal conditioning products with the CIO-DIO192.

- CIO-TERM100 – 100-pin screw terminal board (daisy-chained 50-pin IDC connectors).
- CIO-SPADE50 – 16" X 4" termination panel which mates with both 37-pin and 50-pin connectors.
- CIO-MINI50 – 50-pin screw terminal board.
- SSR-RACK24 – 24-channel, solid-state relay mounting rack for digital signal conditioning.
- SSR-RACK48 – 48-channel, solid-state relay mounting rack with quad-format modules.
- CIO-ERB24 – 24 Form C relays, 6 Amp relay accessory board for digital signal conditioning.
- CIO-ERB48 – 48 Form C relays, 6 Amp, relay, 50-pin accessory board for digital signal conditioning.

Information on signal connections

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

Functional Details

Signal level control

The digital I/O bits on the CIO-DIO192 are 8255 CMOS TTL. The 82C55 digital I/O chip 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 82C55 it could be turned ON or OFF every time the 82C55 is reset. Remember, the 82C55 is reset to the INPUT mode.

All I/O bits are set to input mode on power up and reset. If you are using the board to control items that must be OFF on reset, install pull-down resistors. The CIO-DIO192 has open locations where you can install Single Inline Packages (SIP) resistor networks in either pull-up or pull-down configurations.

You can install pull-up and pull-down resistor SIP packs at each port. The positions are labeled **RN*n*** on the board. When installed, the SIP establishes either a high or low logic level at each of the I/O lines on the port.

To safeguard against unwanted signal levels, the devices being controlled by the CIO-DIO192 board should be tied low or high as required by a 2.2K Ω resistor. In a 2.2K eight-resistor SIP pack, one side of all of the resistors is connected to a single common point and brought out to a pin. The common line, usually marked with a dot or line, is at one end of the SIP. The remaining resistor ends are brought out to the other eight pins (refer to Figure 6).

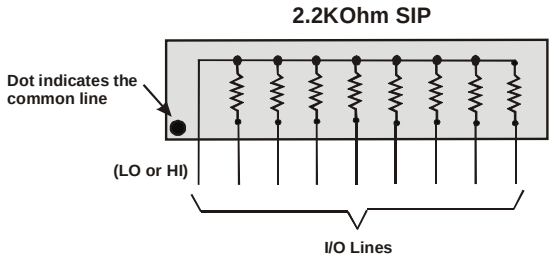


Figure 6. Eight-resistor SIP schematic

Figure 7 shows a schematic of an SIP installed in both the pull-up and pull-down positions. Each port provides 10 holes in a line. The end labeled **HI** connects to +5V. The end marked **LO** connects to GND. The eight holes in the middle (n0 –n7) connect to the eight lines of the Port, A, B or C.

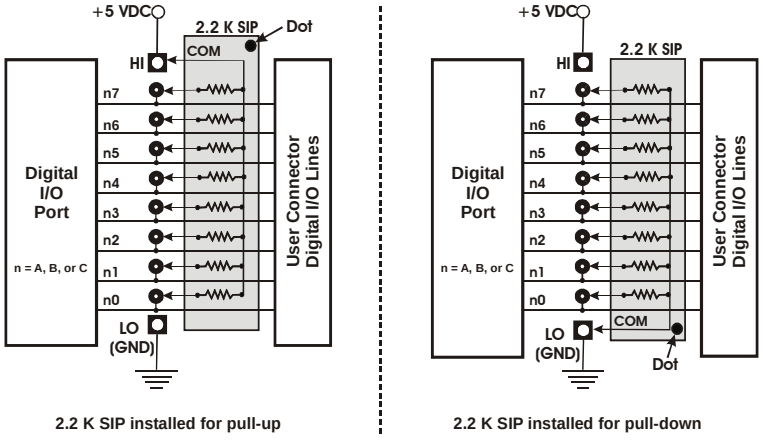


Figure 7. Pull-up and pull-down resistor SIPs schematic

To pull-up lines, orient the SIP with the common pin (dot) toward the **HI** end; to pull-down, install the resistor with the common pin in the **LO** hole.

When installing pull-up and pull-down resistor SIP packs, we recommend using 2.2K, eight-resistor Single Inline Packages (MCC part number SP-K2.29C). Use a different value only if necessary.

Unconnected inputs float

Unconnected inputs typically float high, but not reliably. If you are using a CIO-DIO48H for input and have unconnected inputs, ignore the data from those lines. You do not have to terminate input lines. Unconnected lines will not affect the performance of connected lines. Mask out any unconnected bits in software.

Digital I/O Isolation

To provide external signal conditioning and isolation, you can connect the CIO-DIO192 to a CIO-ERB24 or SSR-RACK24. The CIO-ERB24 provides 24 Form C electromechanical relays. The SSR-RACK24 is a mounting rack for 24 solid-state relays.

The CIO-DIO192 provides digital I/O in groups of 48 bits. 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 CIO-DIO192 board. An example of the daisy chain configuration scheme for each board is shown below.

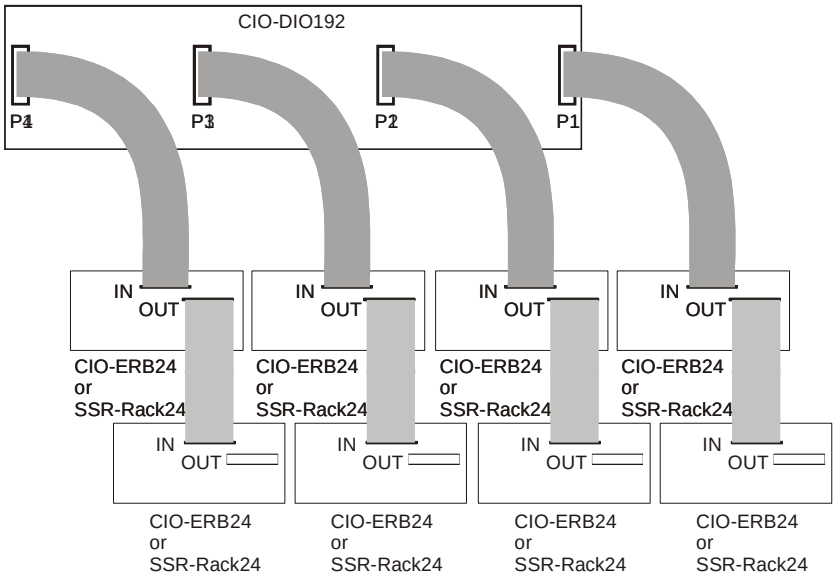


Figure 8. CIO-DIO192 to CIO-ERB24 or SSR-RACK24 daisy chain

The 24 digital I/O bits on pins 25 to 48 (base address +0 through +2) control the first relay board. The 24 digital I/O bits on pins 1 to 24 control the second relay/SSR board on the daisy chain. Use the C50FF-x cable for interconnections. You can also use SSR-RACK48 or the CIO-ERB48 series relay boards.

Programming and Developing Applications

After following the installation instructions in Chapter 2, your board should now be installed and ready for use. In general there may be no correspondence among registers for different boards. Software written at the register level for other models will not function correctly with your board.

Programming languages

Measurement Computing's Universal Library provides access to board functions from a variety 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, please refer to the *Universal Library User's Guide* (available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-user-guide.pdf).

Packaged applications programs

Many packaged application programs now have drivers for your board. If the package you own does not have drivers for your 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@mccdaq.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 CIO-DIO48, CIO-DIO48H, CIO-DIO96, and CIO-DIO192*. This document is available on our website at http://www.mccdaq.com/registermaps/RegMapCIO-DIO-Series.pdf.

Specifications

Typical for 25 °C unless otherwise specified.

Specifications in *italic* text are guaranteed by design.

Digital input / output

Table 1. DIO specifications

Digital type	82C55
Configuration	16 banks of 8, 16 banks of 4, programmable by bank as input or output
Number of channels	192 I/O
Output high	3.0 volts min @ -2.5 mA
Output low	0.4 volts max @ 2.5 mA
Input high	2.0 volts min, 5.5 volts absolute max
Input low	0.8 volts max, -0.5 volts absolute min
Power-up / reset state	Input mode (high impedance)

Power consumption

Table 2. Power consumption specifications

+5V quiescent	170 mA typical, 220 mA max

Environmental

Table 3. Environmental specifications

Operating temperature range	0 to 50 °C
Storage temperature range	-40 to +100 °C
Humidity	0 to 90% non-condensing

Main connectors and pin out

Table 4. Connector specifications

Connector type	(4) 50-pin shrouded male header connectors: P1, P2, P3, P4
Compatible cables	C50FF-x
Compatible accessory products with the C50FF-x	CIO-TERM100 CIO-SPADE50 CIO-MINI50 SSR-RACK24, SSR-RACK48 CIO-ERB24, CIO-ERB48

Table 5. P1 pin out

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

Table 6. P2 pin out

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

Table 7. P3 pin out

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

Table 8. P4 pin out

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

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-DIO192

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 B.
- IEC 801-3 (1984): Radiated Electromagnetic Field immunity Criteria A.
- IEC 801-4 (1988): Electric Fast Transient Burst immunity Criteria B.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in December, 1995. Test records are outlined in Chomerics Test Report #EMI0168B.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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