

USB-DIO96H

USB-based High-Drive Digital I/O Module

User's Guide



USB-DIO96H

Formerly USB-1096HFS

USB-based Digital I/O

User's Guide



**MEASUREMENT
COMPUTING™**

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About this User's Guide

What you will learn from this user's guide

This user's guide describes the Measurement Computing CIO-DDA06/Jr/16 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-DDA06/Jr/16 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 USB-DIO96H

Overview: USB-DIO96H features

This user's guide contains all of the information you need to connect the USB-DIO96H to your computer and to the signals you want to measure or control.

The USB-DIO96H is supported under popular Microsoft® Windows® operating systems. The USB-DIO96H is fully compatible with both USB 1.1 and USB 2.0 ports

The USB-DIO96H provides 96 digital I/O lines, high output current, and one 32-bit external event counter. The USB-DIO96H is powered by an external +9 V unregulated power supply that is shipped with the board. A USB cable is also included.

Power OUT and USB OUT connectors let you power and control multiple MCC USB Series products from one external power source and one USB port in a daisy chain fashion. Depending on your load requirement, daisy chained boards may require a separate power supply.

You can connect your field wiring directly to the board's screw terminals. The 96 digital I/O lines are available in four independent port groups. Each digital port group is divided into two 8-bit ports and two 4-bit ports, and is a discrete emulation of 82C55 mode zero operation. You can configure each port independently for either input or output.

The USB-DIO96H outputs are high-drive TTL that can source 24 mA and sink 64 mA. Additional buffering is typically not required to drive external devices.

Each digital port has an associated pull-up resistor to drive the ports high during power up and reset. You can optionally configure this resistor for a pull-down configuration. All I/O bits are set to input mode on power up and reset.

The USB-DIO96H also provides 50-pin mass termination connectors. For OEM's who wish to use the mass term connectors, the enclosure needs to be removed.

The USB-DIO96H is shipped in a rugged metal enclosure that you can mount on a DIN rail or on a bench (see Figure 1-1).

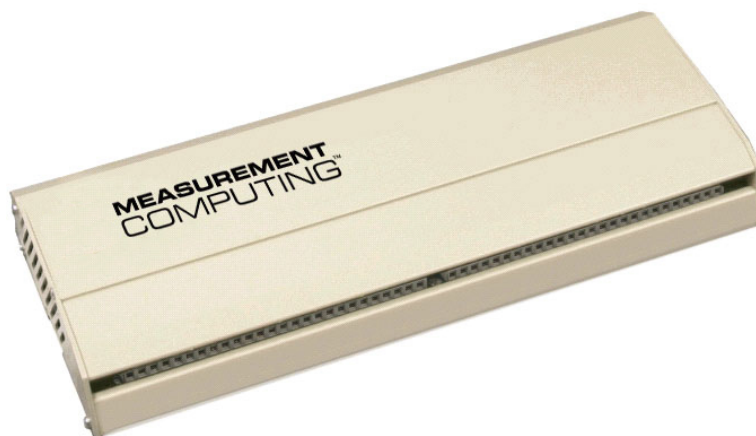


Figure 1-1. USB-DIO96H

USB-DIO96H block diagram

USB-DIO96H functions are illustrated in the block diagram shown here.

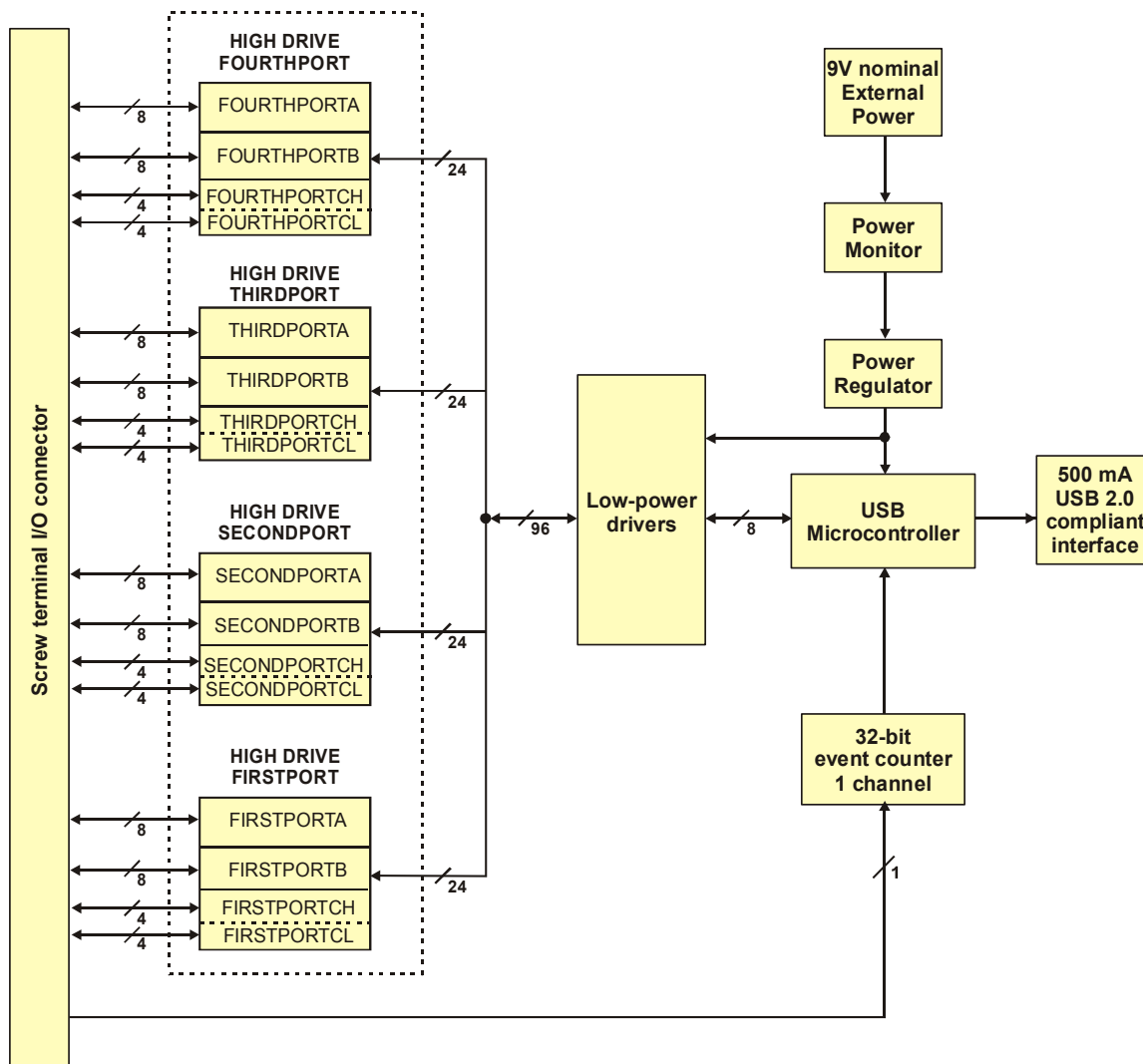


Figure 1-2. USB-DIO96H functional block diagram

Software features

For information on the features of *InstaCal* and the other software included with your USB-DIO96H, refer to the *Quick Start Guide* that shipped with your device. The *Quick Start Guide* is also available in PDF at www.mccdaq.com/PDFs/manuals/DAQ-Software-Quick-Start.pdf.

Check <http://www.mccdaq.com/download.htm> for the latest software version or versions of the software supported under less commonly used operating systems.

Connecting a USB-DIO96H to your computer is easy

Installing a data acquisition device has never been easier.

- The USB-DIO96H relies upon the Microsoft Human Interface Device (HID) class drivers. The HID class drivers ship with every copy of Windows that is designed to work with USB ports. We use the Microsoft HID because it is a standard, and its performance delivers full control and maximizes data transfer rates for your USB-DIO96H. No third-party device driver is required.
- The USB-DIO96H is plug-and-play. There are no jumpers to position, dual in-line package (DIP) switches to set, or interrupts to configure.
- You can connect the USB-DIO96H before or after you install the software, and without powering down your computer first.

When you connect an HID to your system, your computer automatically detects it and configures the necessary software. You can connect and power multiple HID peripherals to your system using a USB hub.

- You can connect your system to various devices using a standard four-wire cable. The USB connector improves upon serial and parallel port connectors with one standardized plug-and-port combination.
- Data can flow two ways between a computer and peripheral over USB connections.

Make sure that you have the latest Windows Updates installed for your USB driver, particularly "XP Hotfix KB822603."

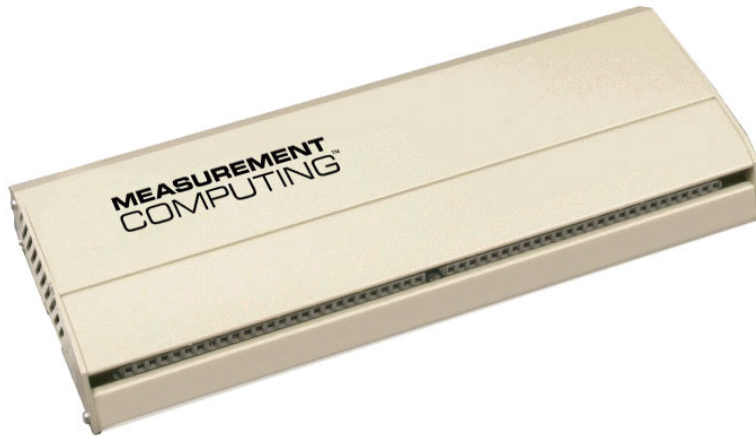
Installing the USB-DIO96H

What comes with your USB-DIO96H shipment?

As you unpack your USB-DIO96H, make sure that the following components are included.

Hardware

- USB-DIO96H



- External power supply and cord (CB-PWR-9V3A) – 9 volt, 3 amp DC power supply



- USB cable (2 meter length)



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 MCC Hardware and information regarding installation of that software. Please read this booklet completely before installing any software or hardware.

Unpacking the USB-DIO96H

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the USB-DIO96H 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.

Installing the hardware

Before you connect the USB-DIO96H to your computer, connect the external power supply that was shipped with the device.

You can connect up to four MCC USB Series products in a daisy chain configuration to a single USB 1.1 port or USB 2.0 port on your computer.

Connecting the external power supply

Power to the USB-DIO96H is provided with the +9 V external power supply (CB-PWR-9V3A). You must connect the external power supply *before* connecting the USB cable to the USB-DIO96H and your computer.

If you are connecting more than one MCC USB Series product, make sure that you provide adequate power to each device. Refer to the [Power limitations using multiple USB-DIO96H devices](#) section on page 3-6.

To connect the power supply to your USB-DIO96H, connect the external power cord to the power connector labeled **POWER IN** on the USB-DIO96H enclosure (**J3** on the board). Refer to Figure 3-1 on page 3-1 for the location of this connector.

The **PWR** LED illuminates green when +9 V power is supplied to the USB-DIO96H. If the voltage supply is less than +6.0 V or more than +12.5 V, the **PWR** LED does not light.

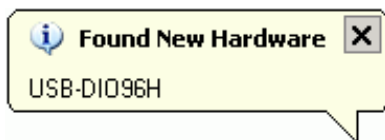
Do not connect external power to the POWER OUT connector

The power connector labeled **POWER OUT** on the enclosure (**J4** on the board) is used to provide power to an additional MCC USB Series product. If you connect the external power supply to the **POWER OUT** connector, the USB-DIO96H does not receive power, and the **PWR** LED does not illuminate.

Connecting the USB-DIO96H to your system

To connect the USB-DIO96H to your system, connect the USB cable to a USB port on your computer or to an external USB hub that is connected to your computer. The USB cable provides communication to the USB-DIO96H.

When you connect the USB-DIO96H for the first time, multiple **Found New Hardware** popup balloons (Windows XP) or dialogs (other Windows versions) appear as the USB-DIO96H is detected.



If you are running Windows XP and connect the USB-DIO96H to a USB 1.1 port, a balloon displays the message "**Your USB device can perform faster if you connect to a USB 2.0 port.**" You can ignore this message. The USB-DIO96H will function properly when connected to a USB 1.1 port, although USB bandwidth will be limited.

When installation is complete, the **USB LED** should flash and then remain lit. This indicates that communication is established between the USB-DIO96H and your computer.

If the USB LED turns off

If the USB LED is lit but then turns off, the computer has lost communication with the USB-DIO96H. To restore communication, disconnect the USB cable from the computer, and then reconnect it. This should restore communication, and the USB LED should turn back *on*.

Caution! Do not disconnect **any** device from the USB bus while the computer is communicating with the USB-DIO96H, or you may lose data and/or your ability to communicate with the USB-DIO96H.

If your system does not detect the USB-DIO96H

If a "**USB device not recognized**" message appears when you connect the USB-DIO96H, do the following.

- Unplug the USB cable from the USB-DIO96H.
- Unplug the external power cord from the **POWER IN** connector on the enclosure.
- Plug the external power cord back into the **POWER IN** connector.
- Plug the USB cable back into the USB-DIO96H.

Your system should now properly detect the USB-DIO96H hardware. Contact technical support if your system still does not detect the USB-DIO96H.

Functional Details

Internal components

These USB-DIO96H components are shown in Figure 3-1.

- Two (2) USB connectors
- Two (2) external power connectors
- USB LED
- PWR LED
- 12 pull-up/pull-down resistors
- Four (4) screw terminal banks (Port 1 through Port 4)

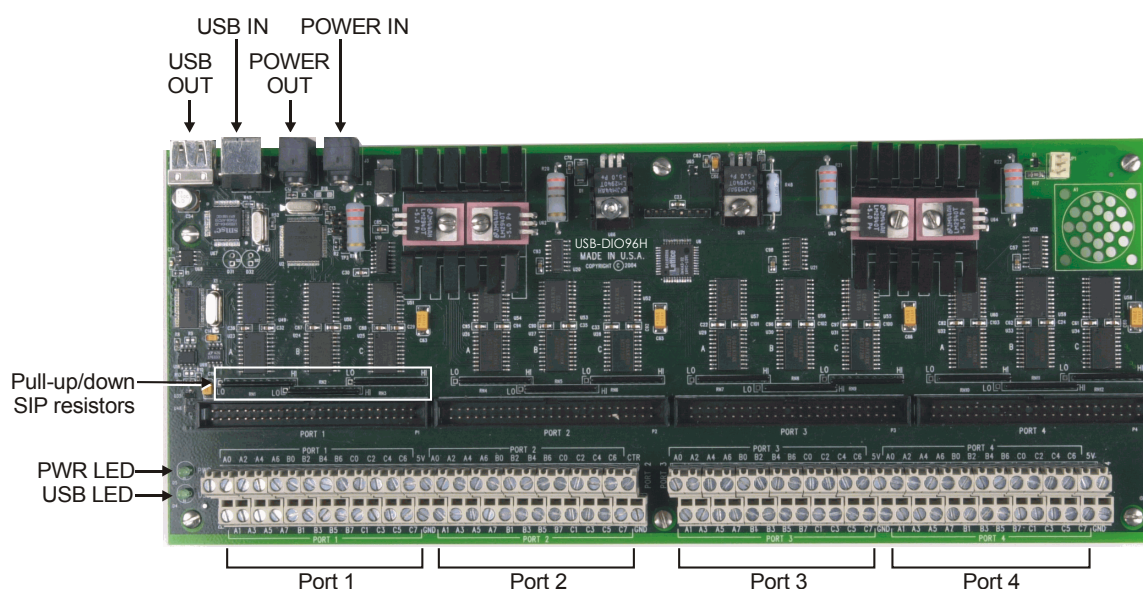


Figure 3-1. USB-DIO96H components

USB OUT connector

The **USB OUT** connector is a downstream hub output port intended for use with other MCC USB Series products only. The USB hub is self-powered, and can provide 100 mA maximum current at 5 V. The USB out connector is labeled **USB OUT** on the enclosure and **J2** on the board.

When connecting to another MCC USB Series product, connect the **USB OUT** connector on the USB-DIO96H to the **USB IN** connector on the next device in the chain. Refer to [Daisy chaining additional modules to the USB-DIO96H](#) on page 3-5 for information on how to connect multiple MCC USB Series products

USB IN connector

Connect the **USB IN** connector to the USB port on your computer (or USB hub connected to your computer) using the supplied USB cable. The USB in connector is labeled **USB IN** on the enclosure and **J1** on the board.

When connecting to another MCC USB Series product, connect the **USB IN** connector on the USB-DIO96H to the **USB OUT** connector on the next device in the chain. Refer to [Daisy chaining additional modules to the USB-DIO96H](#) on page 3-5 for more information on how to connect multiple MCC USB Series products.

External power connectors

The USB-DIO96H has two external power connectors labeled **POWER IN** and **POWER OUT** on the enclosure. The **POWER IN** connector is labeled **J3** on the board, and the **POWER OUT** connector is labeled **J4** on the board.

Connect the **POWER IN** connector to the supplied +9 V external power supply (CB-PWR-9V3A). The **POWER OUT** connector lets you power additional daisy chained MCC USB Series products from a single external power supply. When running at full load, the USB-DIO96H draws 2.6 A from the supply. When using the USB-DIO96H under full load conditions, do not daisy chain power to another MCC USB Series product. Depending on your load requirements, daisy chained products may require a separate power supply. Refer to [Power limitations using multiple USB-DIO96H devices](#) on page 3-6 for more information.

USB LED

The **USB** LED indicates the communication status of the USB-DIO96H. It uses up to 5 mA of current and cannot be disabled. Table 3-1 explains the function of the **USB** LED.

Table 3-1. USB LED Illumination

LED Illumination	Indication
Steady green	The USB-DIO96H is connected to a computer or external USB hub.
Blinks continuously	Initial communication is established between the USB-DIO96H and the computer, or data is being transferred.

PWR LED

The **PWR** LED illuminates when external power is supplied. The USB-DIO96H incorporates an on-board voltage supervisory circuit that monitors the external power supply. The **PWR** LED does not light under the following circumstances:

- when the input power falls below +6.0 V
- when the input power goes above +12.5 V
- when you connect the external power supply to the **POWER OUT** connector (**J4**)

Pull-up / pull-down resistors

Each digital port group has three associated 10 k Ω pull-up/pull-down SIP resistor locations. Each SIP resistor is shipped from the factory configured for pull-up. To configure individual ports for pull-down, de-solder the SIP resistor pin connections and install the resistor with the common line at the **LO** end. Then re-solder the SIP resistor pin connections.

Screw terminal wiring

The USB-DIO96H has four rows of screw terminals labeled **Port 1** through **Port 4**. Each row has 26 connections. The screw terminals provide the following connections:

- 96 digital I/O terminals (**A0** to **C7** for Port 1 through Port 4)
- Four (4) ground terminals (**GND**)
- Three (3) VDD power terminals (**5V**)
- One (1) external event counter terminal (**CTR**)

Use 14 AWG to 30 AWG wire for your signal connections. Each screw terminal is identified with a label on the board and on the underside of the enclosure lid. Refer to Table 3-2 for the signal name associated with each board label.

Caution! Keep the length of stripped wire at a minimum to avoid a short to the enclosure! When connecting your field wiring to the screw terminals, use the strip gage on the terminal strip, or strip to 5.5 - 7.0 mm (0.215" to 0.275") long.

Table 3-2. Board labels and associated signal names

Board label		Signal name	Board label		Signal name
Port 1	A0	P1A0 (FIRSTPORTA Bit 0)	Port 3	A0	P3A0 (THIRDPORATA Bit 0)
	A1	P1A1 (FIRSTPORTA Bit 1)		A1	P3A1 (THIRDPORATA Bit 1)
	A2	P1A2 (FIRSTPORTA Bit 2)		A2	P3A2 (THIRDPORATA Bit 2)
	A3	P1A3 (FIRSTPORTA Bit 3)		A3	P3A3 (THIRDPORATA Bit 3)
	A4	P1A4 (FIRSTPORTA Bit 4)		A4	P3A4 (THIRDPORATA Bit 4)
	A5	P1A5 (FIRSTPORTA Bit 5)		A5	P3A5 (THIRDPORATA Bit 5)
	A6	P1A6 (FIRSTPORTA Bit 6)		A6	P3A6 (THIRDPORATA Bit 6)
	A7	P1A7 (FIRSTPORTA Bit 7)		A7	P3A7 (THIRDPORATA Bit 7)
	B0	P1B0 (FIRSTPORTB Bit 0)		B0	P3B0 (THIRDPORATB Bit 0)
	B1	P1B1 (FIRSTPORTB Bit 1)		B1	P3B1 (THIRDPORATB Bit 1)
	B2	P1B2 (FIRSTPORTB Bit 2)		B2	P3B2 (THIRDPORATB Bit 2)
	B3	P1B3 (FIRSTPORTB Bit 3)		B3	P3B3 (THIRDPORATB Bit 3)
	B4	P1B4 (FIRSTPORTB Bit 4)		B4	P3B4 (THIRDPORATB Bit 4)
	B5	P1B5 (FIRSTPORTB Bit 5)		B5	P3B5 (THIRDPORATB Bit 5)
	B6	P1B6 (FIRSTPORTB Bit 6)		B6	P3B6 (THIRDPORATB Bit 6)
	B7	P1B7 (FIRSTPORTB Bit 7)		B7	P3B7 (THIRDPORATB Bit 7)
	C0	P1C0 (FIRSTPORTC Bit 0)		C0	P3C0 (THIRDPORATC Bit 0)
	C1	P1C1 (FIRSTPORTC Bit 1)		C1	P3C1 (THIRDPORATC Bit 1)
	C2	P1C2 (FIRSTPORTC Bit 2)		C2	P3C2 (THIRDPORATC Bit 2)
	C3	P1C3 (FIRSTPORTC Bit 3)		C3	P3C3 (THIRDPORATC Bit 3)
	C4	P1C4 (FIRSTPORTC Bit 4)		C4	P3C4 (THIRDPORATC Bit 4)
	C5	P1C5 (FIRSTPORTC Bit 5)		C5	P3C5 (THIRDPORATC Bit 5)
	C6	P1C6 (FIRSTPORTC Bit 6)		C6	P3C6 (THIRDPORATC Bit 6)
	C7	P1C7 (FIRSTPORTC Bit 7)		C7	P3C7 (THIRDPORATC Bit 7)
5V		5V	5V		5V
GND		GND	GND		GND
Port 2	A0	P2A0 (SECONDPORATA Bit 0)	Port 4	A0	P4A0 (FOURTHPORATA Bit 0)
	A1	P2A1 (SECONDPORATA Bit 1)		A1	P4A1 (FOURTHPORATA Bit 1)
	A2	P2A2 (SECONDPORATA Bit 2)		A2	P4A2 (FOURTHPORATA Bit 2)
	A3	P2A3 (SECONDPORATA Bit 3)		A3	P4A3 (FOURTHPORATA Bit 3)
	A4	P2A4 (SECONDPORATA Bit 4)		A4	P4A4 (FOURTHPORATA Bit 4)
	A5	P2A5 (SECONDPORATA Bit 5)		A5	P4A5 (FOURTHPORATA Bit 5)
	A6	P2A6 (SECONDPORATA Bit 6)		A6	P4A6 (FOURTHPORATA Bit 6)
	A7	P2A7 (SECONDPORATA Bit 7)		A7	P4A7 (FOURTHPORATA Bit 7)
	B0	P2B0 (SECONDPORATB Bit 0)		B0	P4B0 (FOURTHPORATB Bit 0)
	B1	P2B1 (SECONDPORATB Bit 1)		B1	P4B1 (FOURTHPORATB Bit 1)
	B2	P2B2 (SECONDPORATB Bit 2)		B2	P4B2 (FOURTHPORATB Bit 2)
	B3	P2B3 (SECONDPORATB Bit 3)		B3	P4B3 (FOURTHPORATB Bit 3)
	B4	P2B4 (SECONDPORATB Bit 4)		B4	P4B4 (FOURTHPORATB Bit 4)
	B5	P2B5 (SECONDPORATB Bit 5)		B5	P4B5 (FOURTHPORATB Bit 5)
	B6	P2B6 (SECONDPORATB Bit 6)		B6	P4B6 (FOURTHPORATB Bit 6)
	B7	P2B7 (SECONDPORATB Bit 7)		B7	P4B7 (FOURTHPORATB Bit 7)
	C0	P2C0 (SECONDPORATC Bit 0)		C0	P4C0 (FOURTHPORATC Bit 0)
	C1	P2C1 (SECONDPORATC Bit 1)		C1	P4C1 (FOURTHPORATC Bit 1)
	C2	P2C2 (SECONDPORATC Bit 2)		C2	P4C2 (FOURTHPORATC Bit 2)
	C3	P2C3 (SECONDPORATC Bit 3)		C3	P4C3 (FOURTHPORATC Bit 3)
	C4	P2C4 (SECONDPORATC Bit 4)		C4	P4C4 (FOURTHPORATC Bit 4)
	C5	P2C5 (SECONDPORATC Bit 5)		C5	P4C5 (FOURTHPORATC Bit 5)
	C6	P2C6 (SECONDPORATC Bit 6)		C6	P4C6 (FOURTHPORATC Bit 6)
	C7	P2C7 (SECONDPORATC Bit 7)		C7	P4C7 (FOURTHPORATC Bit 7)
CTR		CTR	5V		5V
GND		GND	GND		GND

Digital I/O terminals (FIRSTPORTA Bit 0 to FOURTHPORTC Bit 7)

You can connect up to 96 digital I/O lines to the four banks of screw terminals (Port 1 to Port 4). Connect up to 24 DIO lines to each screw terminal group:

- Connect up to 24 FIRSTPORT signals to the screw terminals labeled **PORT 1**.
- Connect up to 24 SECONDPORT signals to the screw terminals labeled **PORT 2**.
- Connect up to 24 THIRDPORT signals to the screw terminals labeled **PORT 3**.
- Connect up to 24 FOURTHPORT signals to the screw terminals labeled **PORT 4**.

You can configure each digital port for either input or output.

When configured for input, you can use the USB-DIO96H digital I/O terminals to detect the state of any TTL level input. Figure 3-2 shows the USB-DIO96H wired to detect the state of a switch. When you set the switch to the **+5 V** position, FIRSTPORTA Bit 0 reads *TRUE* (1). When you move the switch to the **GND** position, FIRSTPORTA Bit 0 reads *FALSE* (0).

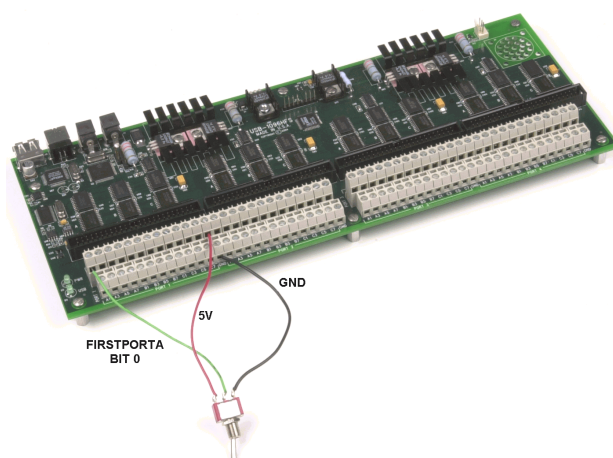


Figure 3-2. Digital connection of FIRSTPORTA Bit 0 detecting the state of a switch

A schematic drawing of this switch connection is shown here.

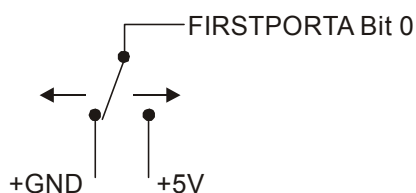


Figure 3-3. Schematic showing switch connection to digital channel FIRSTPORTA Bit 0

Output (sink) current limits

Each DIO pin can sink 64 mA maximum when configured for output.

Output (source) current limits

Each DIO pin can source 24 mA maximum when configured for output. The USB-DIO96H can source a maximum 2.6 A, total.

For more information on digital signal connections

For information on digital signal connections and I/O techniques, refer to the *Guide to Signal Connections* (available on our web site at www.mccdaq.com/pdfs/DAQ-Signal-Connections.pdf).

Power terminals

The USB-DIO96H has three +5 V power output terminals. Each power output terminal is labeled **5V**. A total of 50 mA may be drawn from the 3 terminals.

Caution! Each **5V** power terminal is an output. Do not connect to an external power supply or you may damage the USB-DIO96H and possibly the computer.

Ground terminals

The USB-DIO96H has four identical ground (**GND**) connections - one ground terminal per digital port group. The ground terminals provide a common ground for all USB-DIO96H functions.

Counter terminal

Connect an external TTL signal to the screw terminal labeled **CTR**. The internal counter increments when the TTL level transitions from low to high. The counter can count frequencies of up to 1 MHz.

Daisy chaining additional modules to the USB-DIO96H

Daisy chained MCC USB Series products connect to the USB bus through the high-speed hub on the USB-DIO96H. You can daisy chain a maximum of four MCC USB Series products to a single USB 2.0 port or USB 1.1 port on your computer. Use the supplied cable or an equivalent cable when daisy chaining MCC USB Series products.

Depending on your load requirements, you may need to supply external power to each MCC USB Series product that you want to daisy chain. Refer to the next section [Power limitations using multiple USB-DIO96H devices](#) for more information.

MCC USB Series products are USB 2.0 full-speed devices that provide a signaling bit rate of 12 Mb/s. The throughput rate is shared by all devices connected to the USB bus.

To daisy-chain two or more USB-DIO96H modules, follow the steps below. This procedure assumes you already have one USB-DIO96H connected to a computer and to the external power source. The USB-DIO96H already connected to the computer is referred to as the *connected module*. The USB-DIO96H you want to daisy-chain to the connected module is referred to as the *new module*.

1. Connect the **USB OUT** connector on the connected module to the **USB IN** connector on the new module.
2. Connect the **POWER OUT** connector on the connected module to the **POWER IN** connector on the new module.
3. For each additional module you want to add, repeat steps 1-2, with the module you just daisy chained now being the *connected module*.

A daisy chain system is shown in Figure 3-4. Note that the last board in the chain is supplied with external power.

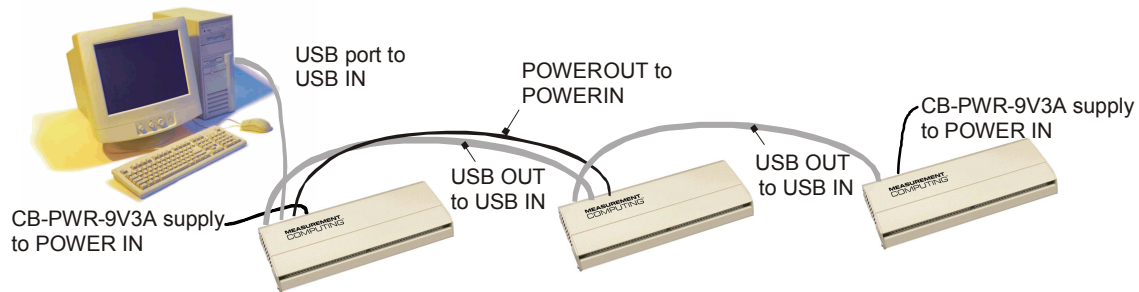


Figure 3-4. USB-DIO96H daisy-chain connections

Power limitations using multiple USB-DIO96H devices

When daisy chaining additional MCC USB Series products to the USB-DIO96H, you must ensure that you provide adequate power to each board that you connect. The USB-DIO96H is powered with a 9 VDC nominal, 3.0 A external power supply.

Supply current

Running one USB-DIO96H at full load draws 2.6 A from the 3A supply. When using the USB-DIO96H under full load conditions, you cannot daisy chain additional MCC USB Series products unless you supply external power to each board in the chain.

If you are not sure how much current your application requires, we recommend that you provide separate power to each MCC USB Series product that you connect.

Voltage drop

A drop in voltage occurs with each board connected in a daisy chain system. The voltage drop between the input of one MCC USB Series product and the output of the board it is connected to is 0.5 V maximum. Factor in this voltage drop when you configure a daisy chain system to ensure that adequate power is provided to the last board in the chain. Always provide a separate power supply when the USB-DIO96H is the last board in the chain.

Specifications

Typical for 25 °C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

Digital input / output

Table 1. Digital I/O specifications

Output	74ABT244A
Input	74ACT373
Configuration	8 banks of 8, 8 banks of 4, programmable by bank as input or output
Number of I/O	96
Output high	2.0 volts min @ -24 mA
Output low	0.5 volts max @ 64 mA
Input high	2.0 volts min, 5.5 volts max
Input low	0.8 volts max, -0.5 volts absolute min
Source current	Maximum = 24 mA per output
Sink current	Maximum = 64 mA per output
Power up / reset state	Input mode (10 K ohm pulled-up by default)

Power

Table 2. Power specifications

Parameter	Conditions	Specification
USB +5 V input voltage range		4.75V min. to 5.25V max.
USB +5 V supply current	All modes of operation	<100 mA
External power input		6.0 VDC to 12.5 VDC (9 VDC power supply provided)
External power supply (included)	MCC p/n CB-PWR-9V3A	9 V $\pm$ 10% @ 3 A
Voltage supervisor limits - PWR LED	6.0 V > Vext or Vext > 12.5 V	PWR LED = Off (power fault)
	6.0 V < Vext < 12.5 V	PWR LED = On
Power supply current		2.6 A max
User 5 V output voltage range	Available at 5 V screw terminals (25, 77 and 103)	4.0 V min., 5.25 V max.
User 5 V output current available	Total from all 5 V screw terminals	50 mA max

External power output

Table 3. External power output specifications

Parameter	Conditions	Specification
External power output - current range	Note 1	4.0 A max. @ 25 °C
External power output - voltage range	The input voltage minus the output voltage at the daisy chain output	0.5 V max
Compatible cable(s) for daisy chain	C-MAPWR-x	x = 2, 3, or 6 feet

Note 1: The daisy chain power output option allows multiple MCC USB Series boards with a USB hub output port to be powered from a single external power source in a daisy chain fashion. The voltage drop between the input of one module and its daisy chain output is 0.5 V maximum. You should plan for this voltage drop when configuring a daisy chain system to assure functionality of the last board in the chain.

Counter section

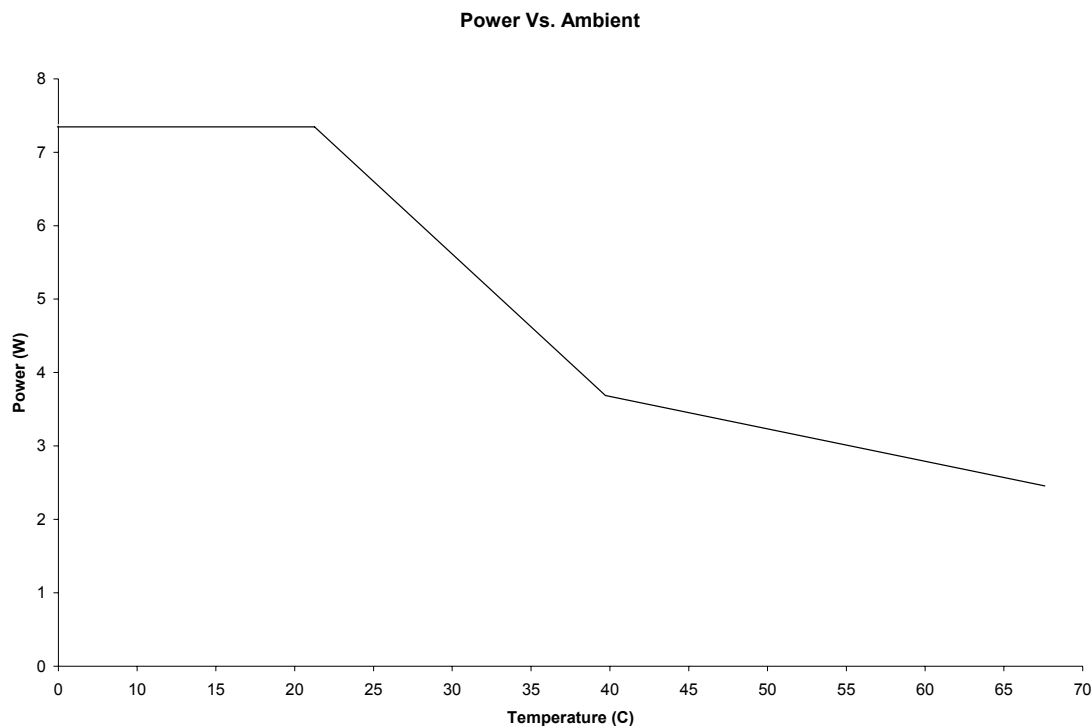
Table 4. Counter specifications

Pin name (Note 2)	CTR
Counter type	Event counter
Number of channels	1
Input source	CTR screw terminal
Input type	TTL, rising edge triggered
Resolution	32 bits
Schmitt trigger hysteresis	20 mV to 100 mV
Input leakage current	$\pm 1 \mu A$
Maximum input frequency	1 MHz
High pulse width	500 ns min
Low pulse width	500 ns min
Input high voltage	4.0 V min, 5.5 V absolute max
Input low voltage	1.0 V max, -0.5 V absolute min

Note 2: CTR is a Schmitt trigger input protected with a 1.5 K Ohm series resistor.

Environmental

Graph 1. Operating temperature de-rating curve (Note 3)



Note 3: There is a total of 24 I/O per bank (PORTA, PORTB, PORTCH, PORTCL). These specifications are for a power supply input voltage of 9 volts. Higher input voltages will increase the power dissipation and will further reduce the total current available from each port.

Table 5. Environmental specifications

Operating temperature range	0 to 70 °C (see de-rating curve in Graph 1)
Storage temperature range	-40 to 85 °C
Humidity	0 to 90% non-condensing

USB specifications

Table 6. USB specifications

USB "B" connector	Input
USB device type	USB 2.0 (full-speed)
Device compatibility	USB 1.1, USB 2.0
USB "A" connector	Downstream hub output port
USB hub type	Supports USB 2.0 high-speed, full-speed and low-speed operating points Self-powered, 100 mA max downstream VBUS capability
Compatible products	MCC USB Series products with a USB hub output port
USB cable type (upstream and downstream)	A-B cable, UL type AWM 2527 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D-)
USB cable length	3 meters max.

Data transfer rates

Table 7. Data transfer rate specifications

Digital I/O transfer rates (software paced)	System dependent, 33 to 1000 port reads/writes or single bit reads/writes per second typ.
Counter/timer read/write rates (software paced)	Counter Read – System dependent, 33 to 1000 reads per second. Counter Clear – System-dependent, 33 to 1000 writes per second.

Mechanical

Table 8. Mechanical specifications

Card dimensions	304.8 mm (L) x 121.9 mm (W) x 20.0 mm (H) 12.0" (L) x 4.8" (W) x 0.8" (H)
Enclosure dimensions	309.9 mm (L) x 132.1 mm (W) x 40.6 mm (H) 12.2" (L) x 5.2" (W) x 1.6" (H)

Main connector and pin-out

Table 9. Connector specifications

Connector type	Screw terminal
Wire gauge range	14 AWG to 30 AWG

Table 10. Screw terminal pin out

Board label		Signal name	Board label		Signal name
Port 1	A0	P1A0 (FIRSTPORTA Bit 0)	Port 3	A0	P3A0 (THIRDPORATA Bit 0)
	A1	P1A1 (FIRSTPORTA Bit 1)		A1	P3A1 (THIRDPORATA Bit 1)
	A2	P1A2 (FIRSTPORTA Bit 2)		A2	P3A2 (THIRDPORATA Bit 2)
	A3	P1A3 (FIRSTPORTA Bit 3)		A3	P3A3 (THIRDPORATA Bit 3)
	A4	P1A4 (FIRSTPORTA Bit 4)		A4	P3A4 (THIRDPORATA Bit 4)
	A5	P1A5 (FIRSTPORTA Bit 5)		A5	P3A5 (THIRDPORATA Bit 5)
	A6	P1A6 (FIRSTPORTA Bit 6)		A6	P3A6 (THIRDPORATA Bit 6)
	A7	P1A7 (FIRSTPORTA Bit 7)		A7	P3A7 (THIRDPORATA Bit 7)
	B0	P1B0 (FIRSTPORTB Bit 0)		B0	P3B0 (THIRDPORATB Bit 0)
	B1	P1B1 (FIRSTPORTB Bit 1)		B1	P3B1 (THIRDPORATB Bit 1)
	B2	P1B2 (FIRSTPORTB Bit 2)		B2	P3B2 (THIRDPORATB Bit 2)
	B3	P1B3 (FIRSTPORTB Bit 3)		B3	P3B3 (THIRDPORATB Bit 3)
	B4	P1B4 (FIRSTPORTB Bit 4)		B4	P3B4 (THIRDPORATB Bit 4)
	B5	P1B5 (FIRSTPORTB Bit 5)		B5	P3B5 (THIRDPORATB Bit 5)
	B6	P1B6 (FIRSTPORTB Bit 6)		B6	P3B6 (THIRDPORATB Bit 6)
	B7	P1B7 (FIRSTPORTB Bit 7)		B7	P3B7 (THIRDPORATB Bit 7)
	C0	P1C0 (FIRSTPORTC Bit 0)		C0	P3C0 (THIRDPORATC Bit 0)
	C1	P1C1 (FIRSTPORTC Bit 1)		C1	P3C1 (THIRDPORATC Bit 1)
	C2	P1C2 (FIRSTPORTC Bit 2)		C2	P3C2 (THIRDPORATC Bit 2)
	C3	P1C3 (FIRSTPORTC Bit 3)		C3	P3C3 (THIRDPORATC Bit 3)
	C4	P1C4 (FIRSTPORTC Bit 4)		C4	P3C4 (THIRDPORATC Bit 4)
	C5	P1C5 (FIRSTPORTC Bit 5)		C5	P3C5 (THIRDPORATC Bit 5)
	C6	P1C6 (FIRSTPORTC Bit 6)		C6	P3C6 (THIRDPORATC Bit 6)
	C7	P1C7 (FIRSTPORTC Bit 7)		C7	P3C7 (THIRDPORATC Bit 7)
5V		5V	5V		5V
GND		GND	GND		GND
Port 2	A0	P2A0 (SECONDPORTA Bit 0)	Port 4	A0	P4A0 (FOURTHPORTA Bit 0)
	A1	P2A1 (SECONDPORTA Bit 1)		A1	P4A1 (FOURTHPORTA Bit 1)
	A2	P2A2 (SECONDPORTA Bit 2)		A2	P4A2 (FOURTHPORTA Bit 2)
	A3	P2A3 (SECONDPORTA Bit 3)		A3	P4A3 (FOURTHPORTA Bit 3)
	A4	P2A4 (SECONDPORTA Bit 4)		A4	P4A4 (FOURTHPORTA Bit 4)
	A5	P2A5 (SECONDPORTA Bit 5)		A5	P4A5 (FOURTHPORTA Bit 5)
	A6	P2A6 (SECONDPORTA Bit 6)		A6	P4A6 (FOURTHPORTA Bit 6)
	A7	P2A7 (SECONDPORTA Bit 7)		A7	P4A7 (FOURTHPORTA Bit 7)
	B0	P2B0 (SECONDPORTB Bit 0)		B0	P4B0 (FOURTHPORTB Bit 0)
	B1	P2B1 (SECONDPORTB Bit 1)		B1	P4B1 (FOURTHPORTB Bit 1)
	B2	P2B2 (SECONDPORTB Bit 2)		B2	P4B2 (FOURTHPORTB Bit 2)
	B3	P2B3 (SECONDPORTB Bit 3)		B3	P4B3 (FOURTHPORTB Bit 3)
	B4	P2B4 (SECONDPORTB Bit 4)		B4	P4B4 (FOURTHPORTB Bit 4)
	B5	P2B5 (SECONDPORTB Bit 5)		B5	P4B5 (FOURTHPORTB Bit 5)
	B6	P2B6 (SECONDPORTB Bit 6)		B6	P4B6 (FOURTHPORTB Bit 6)
	B7	P2B7 (SECONDPORTB Bit 7)		B7	P4B7 (FOURTHPORTB Bit 7)
	C0	P2C0 (SECONDPORTC Bit 0)		C0	P4C0 (FOURTHPORTC Bit 0)
	C1	P2C1 (SECONDPORTC Bit 1)		C1	P4C1 (FOURTHPORTC Bit 1)
	C2	P2C2 (SECONDPORTC Bit 2)		C2	P4C2 (FOURTHPORTC Bit 2)
	C3	P2C3 (SECONDPORTC Bit 3)		C3	P4C3 (FOURTHPORTC Bit 3)
	C4	P2C4 (SECONDPORTC Bit 4)		C4	P4C4 (FOURTHPORTC Bit 4)
	C5	P2C5 (SECONDPORTC Bit 5)		C5	P4C5 (FOURTHPORTC Bit 5)
	C6	P2C6 (SECONDPORTC Bit 6)		C6	P4C6 (FOURTHPORTC Bit 6)
	C7	P2C7 (SECONDPORTC Bit 7)		C7	P4C7 (FOURTHPORTC Bit 7)
CTR		CTR	5V		5V
GND		GND	GND		GND

Ribbon connector and pin-outs

Table 11. Ribbon connector specifications

Connector	P1-P4, 50-pin 0.1" IDC type box header
Compatible cables	C-50FF-x, 50-pin ribbon cable
Compatible accessory products*	SSR-PB24

* P1-P4 connectors are not accessible within the enclosure but are available for applications where the enclosure is not required.

P1

Table 12. P1 pin-out

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

P2

Table 13. P2 pin-out

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

P3

Table 14. P3 pin-out

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

P4

Table 15. P4 pin-out

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



Declaration of Conformity

Manufacturer: Measurement Computing Corporation
Address: 16 Commerce Boulevard
Middleboro, MA 02346
USA

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

Measurement Computing Corporation declares under sole responsibility that the product

USB-DIO96H

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, EN 61326 (1997) Amendment 1 (1998)

Emissions: Group 1, Class A

- EN 55011 (1990)/CISPR 11: Radiated and Conducted emissions.

Immunity: EN61326, Annex A

- IEC 1000-4-2 (1995): Electrostatic Discharge immunity, Criteria C.
- IEC 1000-4-3 (1995): Radiated Electromagnetic Field immunity Criteria C.
- IEC 1000-4-4 (1995): Electric Fast Transient Burst immunity Criteria A.
- IEC 1000-4-5 (1995): Surge immunity Criteria C.
- IEC 1000-4-6 (1996): Radio Frequency Common Mode immunity Criteria A.
- IEC 1000-4-8 (1994): Magnetic Field immunity Criteria A.
- IEC 1000-4-11 (1994): Voltage Dip and Interrupt immunity Criteria A.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in February, 2005. Test records are outlined in Chomerics Test Report #EMI4133.05.

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

Carl Haapaoja, Director of Quality Assurance

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