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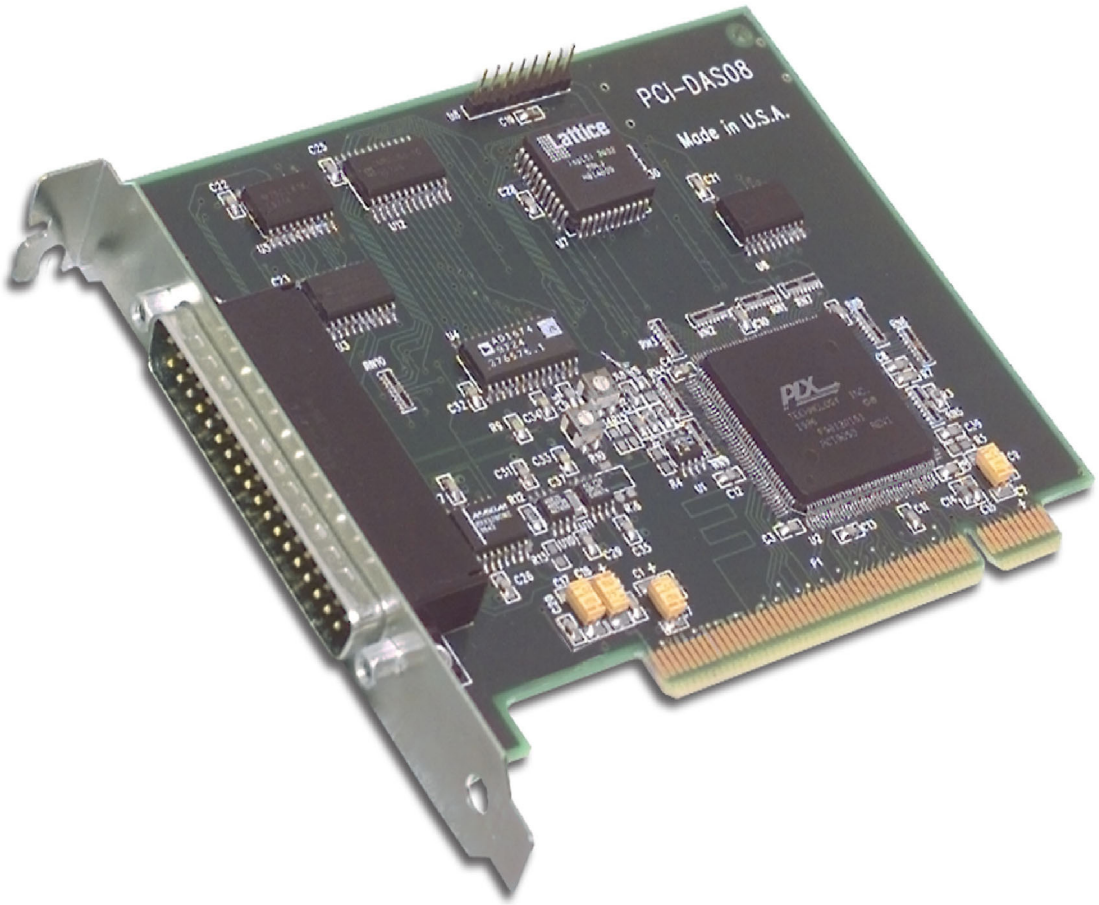
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PCI-DAS08

Analog Input and Digital I/O

User's Guide



MEASUREMENT COMPUTING™

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PCI-DAS08

Analog input and 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 explains how to install, configure, and use the PCI-DAS08 so that you get the most out of the analog input and digital I/O features.

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

Conventions in this user's guide

For more information on …

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

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

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

bold text **Bold** text is used for the names of objects on the screen, such as buttons, text boxes, and check boxes. For example:
1. Insert the disk or CD and click the **OK** button.

italic text *Italic* text is used for the names of manuals and help topic titles, and to emphasize a word or phrase. For example:
The *Insta*Cal installation procedure is explained in the *Quick Start Guide*.
Never touch the exposed pins or circuit connections on the board.

Where to find more information

The following electronic documents provide information that is relevant to the operation of the PCI-DAS08.

- MCC's *Specifications: PCI-DAS08* (the PDF version of the *Specifications* chapter in this guide) is available on our web site at www.mccdaq.com/pdfs/PCI-DAS08.pdf.
- MCC's *Quick Start Guide* is available on our web site at www.mccdaq.com/PDFmanuals/DAQ-Software-Quick-Start.pdf.
- MCC's *Guide to Signal Connections* is available on our web site at www.mccdaq.com/signals/signals.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.
- MCC's *Universal Library for LabVIEW™ User's Guide* is available on our web site at www.mccdaq.com/PDFmanuals/SM-UL-LabVIEW.pdf.

PCI-DAS08 User's Guide (this document) is also available on our web site at www.mccdaq.com/PDFmanuals/PCI-DAS08.pdf.

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Introducing the PCI-DAS08

Overview: PCI-DAS08 features

This manual explains how to configure, install, and use your PCI-DAS08 board. The PCI-DAS08 is a multifunction measurement and control board designed to operate in computers with PCI bus accessory slots.

The PCI-DAS08 board provides the following features:

- Eight single-ended 12-bit analog inputs
- 12-bit A/D resolution
- Sample rates of up to 40 kHz
- ±5V input range
- Three 16-bit counters
- Seven digital I/O bits (three input, four output)
- Connector compatible with Measurement Computing's ISA-based CIO-DAS08 board

The PCI-DAS08 board is completely plug-and-play, with no jumpers or switches to set. All board addresses are set by the board's plug-and-play software.

Software features

For information on the features of *Insta*Cal and the other software included with your PCI-DAS08, 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 or versions of the software supported under less commonly used operating systems.

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PCI-DAS08 block diagram

PCI-DAS08 functions are illustrated in the block diagram shown here.

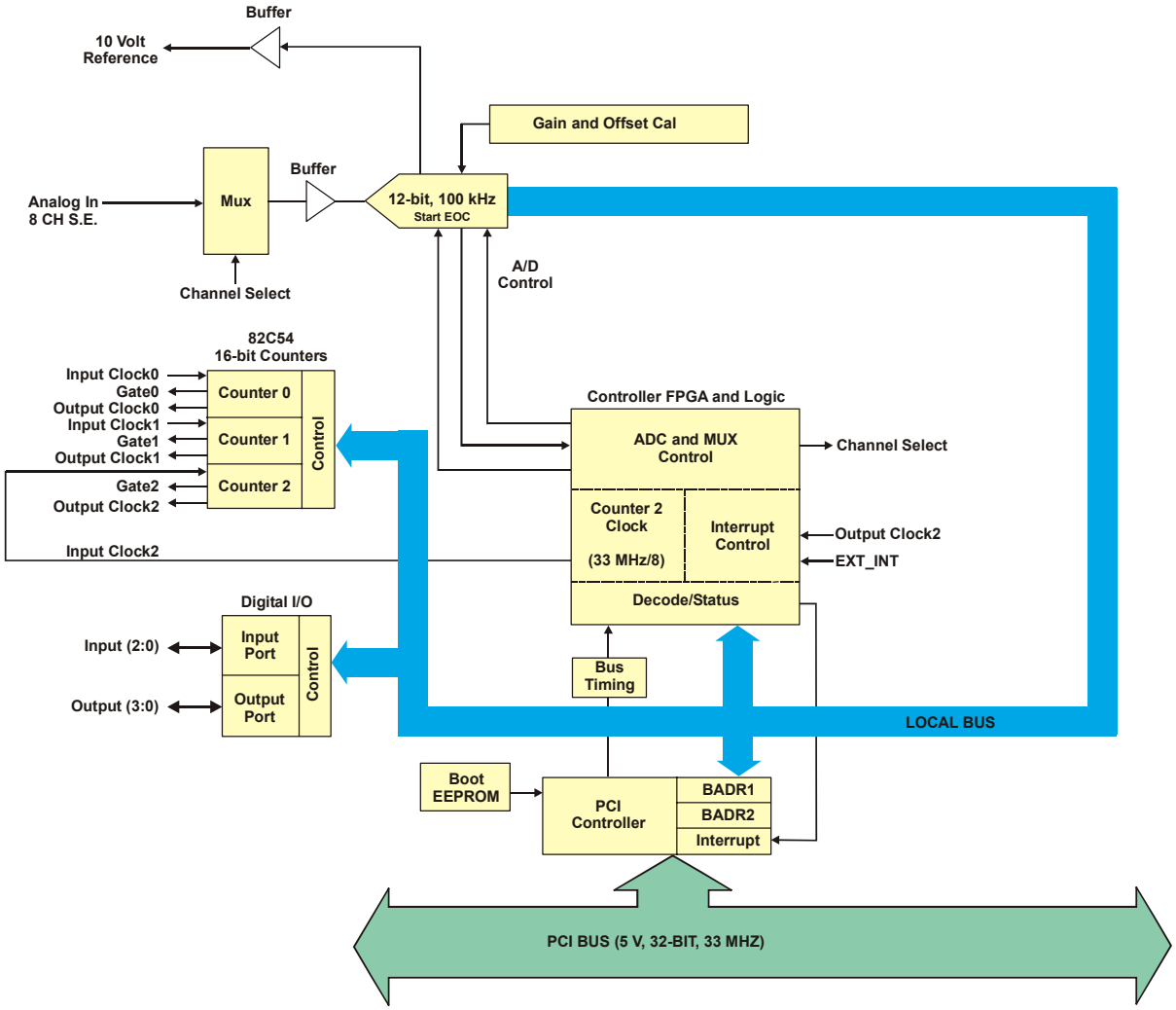


Figure 1-1. PCI-DAS08 block diagram

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Installing the PCI-DAS08

What comes with your shipment?

The following items are shipped with the PCI-DAS08:

Hardware

- PCI-DAS08

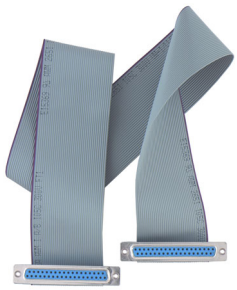


Additional documentation

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 PCI-DAS08 and information regarding installation of that software. Please read this booklet completely before installing any software or hardware.

Optional components

- Cables



C37FF-x



C37FFS-x

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- Signal termination and conditioning accessories

  MCC provides signal termination products for use with the PCI-DAS08. Refer to the "Field wiring, signal termination and signal conditioning" section for a complete list of compatible accessory products.

Unpacking the PCI-DAS08

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the PCI-DAS08 from its packaging, ground yourself using a wrist strap or by simply touching the computer chassis or other grounded object to eliminate any stored static charge.

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

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

Installing the software

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

Installing the PCI-DAS08

The PCI-DAS08 board is completely plug-and-play. There are no switches or jumpers to set. To install your board, follow the steps below.

Install the MCC DAQ software before you install your board

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

1. Turn your computer off, remove the cover, 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 (such as Windows 2000 or Windows XP), a dialog box pops up 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 will be prompted for the disk containing this file. The MCC DAQ software contains this file. If required, insert the *Measurement Computing Data Acquisition Software* CD and click **OK**.
3. To test your installation and configure your board, run the *Insta*Cal utility installed in the previous section. Refer to the *Quick Start Guide* that came with your board for information on how to initially set up and load *Insta*Cal.

If your board has been powered-off for more than 10 minutes, allow your computer to warm up for at least 15 minutes before acquiring data. This warm-up period is required for the board to achieve its rated accuracy. The high speed components used on the board generate heat, and it takes this amount of time for a board to reach steady state if it has been powered off for a significant amount of time.

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Configuring the PCI-DAS08

All hardware configuration options on the PCI-DAS08 are software controlled. There are no switches or jumpers to set.

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	37-pin male "D" connector
Compatible cables	▪ C37FF-x 37-pin cable. x = length in feet (Figure 2-2). ▪ C37FFS-x 37-pin shielded cable. x = length in feet (Figure 2-3).
Compatible accessory products (with the C37FF-x cable)	CIO-MINI37 SCB-37 ISO-RACK08
Compatible accessory products (with the C37FFS-x cable)	CIO-MINI37 SCB-37 ISO-RACK08 CIO-EXP16 CIO-EXP32 CIO-EXP-GP CIO-EXP-BRIDGE16 CIO-EXP-RTD16

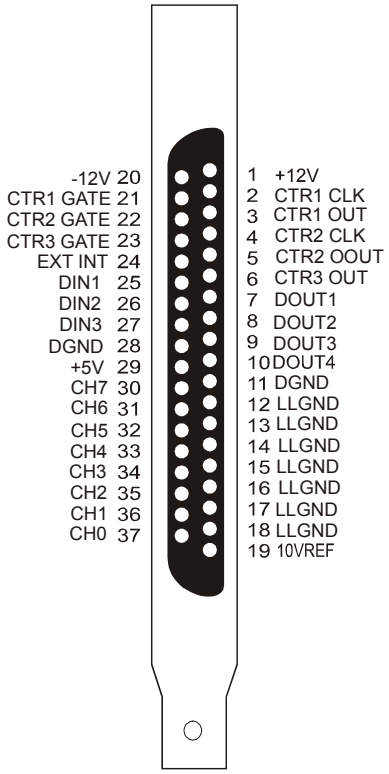


Figure 2-1. Main connector pinout

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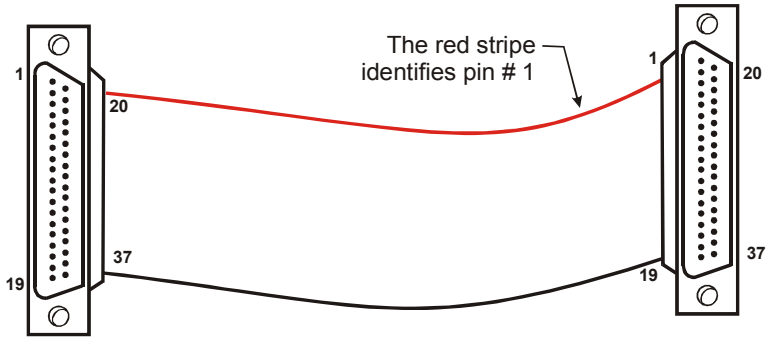


Figure 2-2. C37FF-x cable

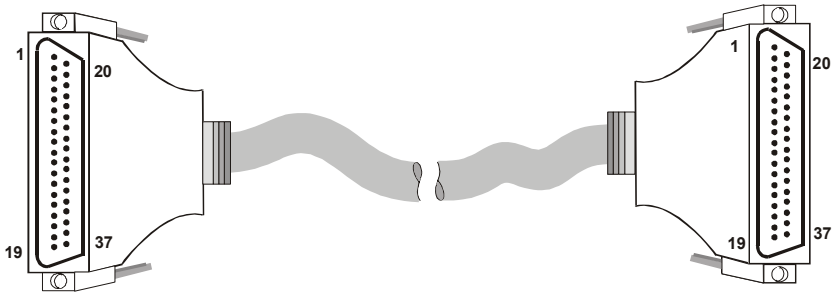


Figure 2-3. C37FFS-x cable

Caution! If either the AC or DC voltage is greater than 5 volts, do not connect the PCI-DAS08 to this signal source. You are beyond the board's usable input range and will need to either adjust your grounding system or add special isolation signal conditioning to take useful measurements. A ground offset voltage of more than 7 volts may damage the PCI-DAS08 board and possibly your computer. An offset voltage much greater than 7 volts will damage your electronics, and may be hazardous to your health.

Field wiring, signal termination and signal conditioning

You can use the following MCC screw terminal boards to terminate field signals and route them into the PCI-DAS08 board using the C37FF-x or C37FFS-x cable:

- **CIO-MINI37** – 37-pin screw terminal board. Details on this product are available at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=102&pf_id=255.
- **SCB-37** – 37 conductor, shielded signal connection/screw terminal box that provides two independent 50-pin connections. Details on this product are available at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=196&pf_id=1166.

MCC provides the following analog signal conditioning products for use with your PCI-DAS08 board:

- **ISO-RACK08** – Isolated 8-channel, 5B module rack for analog signal conditioning and expansion. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=127&pf_id=449.
- **CIO-EXP16** – 16-channel analog multiplexer board with on-board CJC sensor. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=126&pf_id=249.
- **CIO-EXP32** – 32-channel analog multiplexer board with on-board CJC sensor and 2 Gain amps. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=126&pf_id=250.

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- **CIO-EXP-GP** – 8-channel expansion multiplexer board with resistance signal conditioning. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=126&pf_id=244.
- **CIO-EXP-BRIDGE16** – 16-channel expansion multiplexer board with Wheatstone bridge signal conditioning. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=126&pf_id=243.
- **CIO-EXP-RTD16** – 16-channel expansion multiplexer board with RTD signal conditioning. Details on this product are available on our web site at www.mccdaq.com/cbicatalog/cbiproduct.asp?dept_id=126&pf_id=248.

Information on signal connections

General information regarding signal connection and configuration is available in the *Guide to Signal Connections*. This document is available at http://www.measurementcomputing.com/signals/signals.pdf.

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Programming and Developing Applications

After following the installation instructions in Chapter 2, your board should now be installed and ready for use. Although the board is part of the larger DAS family, there is no correspondence among registers for different boards. Software written at the register level for other DAS models will not function correctly with the PCI-DAS08 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, refer to the *Universal Library User's Guide* (available on our web site at www.mccdaq.com/PDFmanuals/sm-ul-user-guide.pdf).

Packaged application programs

Many packaged application programs, such as SoftWIRE® 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@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, you can find more information in the *Register Map for the PCI-DAS08 Series* (available at www.mccdaq.com/registermaps/RegMapPCI-DAS08.pdf).

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Specifications

Typical for 25 °C unless otherwise specified.

Specifications in *italic text* are guaranteed by design.

Analog input

Table 1. Analog input specifications

Parameter	Specification
A/D converter type	*AD1674J*
Resolution	12 bits
Ranges	±5 V
A/D pacing	Software polled
A/D triggering modes	*Digital: Software polling of digital input (DIN1) followed by pacer loading and configuration.*
Data transfer	Software polled
Polarity	Bipolar
Number of channels	8 single-ended
A/D conversion time	*10 µs*
Throughput	40 kHz typical, PC dependent
Relative accuracy	±1 LSB
Differential linearity error	No missing codes guaranteed
Integral linearity error	±1 LSB
Gain drift (A/D specs)	*±180 ppm/°C*
Zero drift (A/D specs)	*±60 ppm/°C*
Input leakage current	*±60 nA max over temperature*
Input impedance	*10 MegOhm min*
Absolute maximum input voltage	*±35 V*
Noise distribution	(Rate = 1-50 kHz, Average % ± 2 bins, Average % ± 1 bin, Average # bins) Bipolar (5 V): 100% / 100% / 3 bins

Digital input / output

Table 2. Digital I/O specifications

Parameter	Specification
Digital type (main connector):	*Output: 74ACT273*
	Input: 74LS244
Configuration	*3 fixed input, 4 fixed output*
Number of channels	*7*
Output high	*3.94 volts min @ -24 mA (Vcc = 4.5 V)*
Output low	*0.36 volts max @ 24 mA (Vcc = 4.5 V)*
Input high	*2.0 volts min, 7 volts absolute max*
Input low	*0.8 volts max, -0.5 volts absolute min*
Interrupts	INTA# - mapped to IRQn via PCI BIOS at boot-time
Interrupt enable	Programmable through PCI controller: 0 = disabled 1 = enabled (default)

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Interrupt sources	External source (EXT INT) Polarity programmable through PCI controller: 1 = active high 0 = active low (default)

Counter section

Table 3. Counter specifications

Parameter	Specification
Counter type	*82C54 device*
Configuration	*3 down counters, 16-bits each*
Counter 0 - User counter 1	Source: Available at user connector (CTR1CLK) Gate: Available at user connector (CTR1GATE) Output: Available at user connector (CTR1OUT)
Counter 1 - User counter 2	Source: Available at user connector (CTR2CLK) Gate: Available at user connector (CTR2GATE) Output: Available at user connector (CTR2OUT)
Counter 2 - User counter 3 or Interrupt Pacer	Source: Buffered PCI clock (33 MHz) divided by 8. Gate: Available at user connector (CTR3GATE) Output: Available at user connector (CTR3OUT) and may be software configured as Interrupt Pacer.
Clock input frequency	*10 MHz max*
High pulse width (clock input)	*30 ns min*
Low pulse width (clock input)	*50 ns min*
Gate width high	*50 ns min*
Gate width low	*50 ns min*
Input low voltage	*0.8 V max*
Input high voltage	*2.0 V min*
Output low voltage	*0.4 V max*
Output high voltage	*3.0 V min*

Power consumption

Table 4. Power consumption specifications

Parameter	Specification
+5 V operating (A/D converting to FIFO)	251 mA typical, 436 mA max
+12 V	13 mA typical, 19 mA max
-12 V	17 mA typical, 23 mA max

Environmental

Table 5. Environmental specifications

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

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Main connector and pin out

Table 6. Main connector specifications

Parameter	Specification
Connector type	37-pin male "D" connector
Compatible cables	▪ C37FF-x cable ▪ C37FFS-x cable
Compatible accessory products with the C37FF-x cable	CIO-MINI37 SCB-37 ISO-RACK08
Compatible accessory products with the C37FFS-x cable	CIO-MINI37 SCB-37 ISO-RACK08 CIO-EXP16 CIO-EXP32 CIO-EXP-GP CIO-EXP-BRIDGE16 CIO-EXP-RTD16

Table 7. Main connector pin out

Pin	Signal Name	Pin	Signal Name
1	+12V	20	-12V
2	CTR1 CLK	21	CTR1 GATE
3	CTR1 OUT	22	CTR2 GATE
4	CTR2 CLK	23	CTR3 GATE
5	CTR2 OUT	24	EXT INT
6	CTR3 OUT	25	DIN1
7	DOUT1	26	DIN2
8	DOUT2	27	DIN3
9	DOUT3	28	DGND
10	DOUT4	29	+5V
11	DGND	30	CH7
12	LLGND	31	CH6
13	LLGND	32	CH5
14	LLGND	33	CH4
15	LLGND	34	CH3
16	LLGND	35	CH2
17	LLGND	36	CH1
18	LLGND	37	CH0
19	10V REF		

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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

PCI-DAS08

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 (1995), EN55024 (1998)

Emissions: Group 1, Class B

- EN55022 (1995): Radiated and Conducted emissions.

Immunity: EN55024

- EN61000-4-2 (1995): Electrostatic Discharge immunity, Criteria A.
- EN61000-4-3 (1997): Radiated Electromagnetic Field immunity Criteria A.
- EN61000-4-4 (1995): Electric Fast Transient Burst immunity Criteria A.
- EN61000-4-5 (1995): Surge immunity Criteria A.
- EN61000-4-6 (1996): Radio Frequency Common Mode immunity Criteria A.
- EN61000-4-8 (1994): Power Frequency Magnetic Field immunity Criteria A.
- EN61000-4-11 (1994): Voltage Dip and Interrupt immunity Criteria A.

Declaration of Conformity based on tests conducted by Chomerics Test Services, Woburn, MA 01801, USA in September, 2001. Test records are outlined in Chomerics Test Report #EMI3053.01.

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



Carl Haapaoja, Director of Quality Assurance

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