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Logicbus PCI-DAS08 Analog Input and Digital I/O User Guide

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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 PCI-DAS08 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 PCI-DAS08 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 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 InstaCal 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.

PCI-DAS08 block diagram

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

Figure 1-1. PCI-DAS08 block diagram

1. Buffer
2. 10 Volt Reference
3. Analog In 8 CH S.E.
4. Channel Select
5. 82C54 16-bit Counters
6. Input Clock0
7. Gate0
8. Output Clock0
9. Input Clock1
10. Gate1
11. Output Clock1
12. Gate2
13. Output Clock2
14. Input Clock2
15. Digital I/O
16. Input (2:0)
17. Output (3:0)
18. A/D Control
19. Controller FPGA and Logic
20. EXT_INT

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
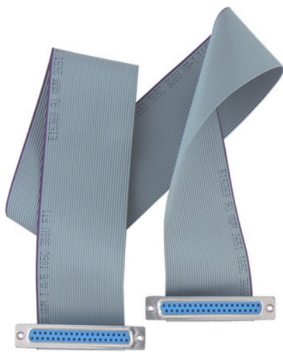
C37FF-x   C37FFS-x

- 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 InstaCal 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 InstaCal.

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.

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
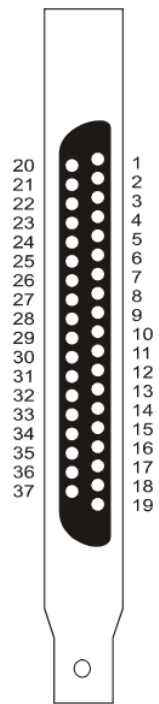
Figure 2-1. Main connector pinout

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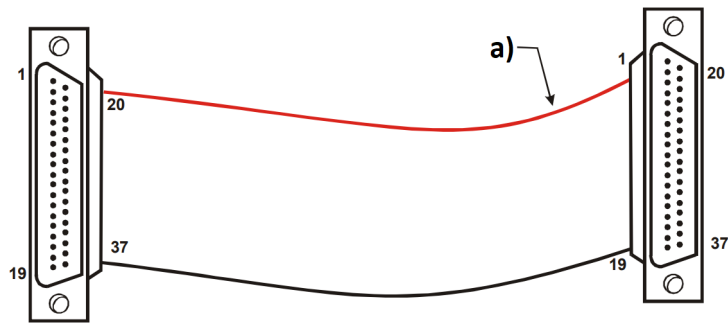35 CH2

36 CH1
37 CH0

Figure 2-2. C37FF-x cable

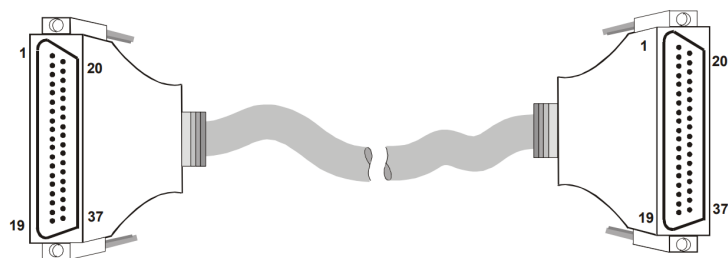**a)** The red stripe identifies pin # 1

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 PCIDAS08 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 50pin 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**.
- **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**.

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 PCIDAS08 board.

Programming languages

Measurement Computing's Universal LibraryTM 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-VEETM, 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**

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**).

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)
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

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		

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.
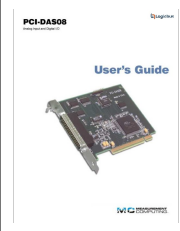- EN61000-4-11 (1994): Voltage Dip and Interrupt immunity Criteria A.

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

Documents / Resources

[**Logicbus PCI-DAS08 Analog Input and Digital I/O**](#) [pdf] User Guide
PCI-DAS08 Analog Input and Digital I O, PCI-DAS08, Analog Input and Digital IO

Manuals+,