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Find the *Measurement Computing / ComputerBoards PCI-CTR05* at our website: *Click HERE*

PCI-CTR05

9513-Based Counter/Timer

User's Guide

Document Revision 6
June 2011
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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-CTR05 so that you get the most out of its counter 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 about ...

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.

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-CTR05 hardware is available on our website at www.mccdaq.com. You can also contact Measurement Computing Corporation by phone, fax, or email with specific questions.

- 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

We recommend that you use the Universal Library for controlling your board. Only experienced programmers should attempt register level-programming. If you must use register-level programming in your application, refer to the *Register Map for the PCI-CTR05*. This document is available on our web site at www.mccdaq.com/registermaps/RegMapPCI-CTR05.pdf.

Introducing the PCI-CTR05

The PCI-CTR05 is a high-performance, low-cost counter/timer board for PCI bus-compatible computers.

The PCI-CTR05 is based on the 9513 counter/timer device. The PCI-CTR05 has one 9513 counter/timer device. The 9513 device has five independent 16-bit counters (65,536 counts). Each counter has an input source, count register, load register, hold register, alarm register, output, and gate associated with each counter.

The 9513 is software-programmable for event counting, pulse and frequency measurement, alarm comparisons, and other input functions. The 9513 can generate frequencies with either complex duty cycles, or with one-shot and continuous-output modes. You can chain up to five 9513 counters together using software to enable a 32-, 48-, 64-, or 80-bit counter that does not require hardware connections. The gate source and gating functions are software-selectable.

An eight-bit, high-current digital output port provides logic-level control, and can be used to switch solid state relays. An eight-bit digital input port can be used to sense contact closures and other TTL level signals. The PCI-CTR05 also provides access to the PCI bus interrupt assigned to the board.

Depending on the revision of your PCI-CTR05, it may support both 3.3 V and 5 V PCI signaling environments, or only 5 V PCI signaling environments. Refer to Installing the hardware to learn how to determine the PCI signaling environments your board supports.

For more information on the 9513 counter/timer, refer to the 9513 data sheet. This document is available at www.mccdaq.com/PDFs/Manuals/9513A.pdf.

PCI-CTR05 block diagram m

PCI-CTR05 functions are illustrated in the block diagram shown here

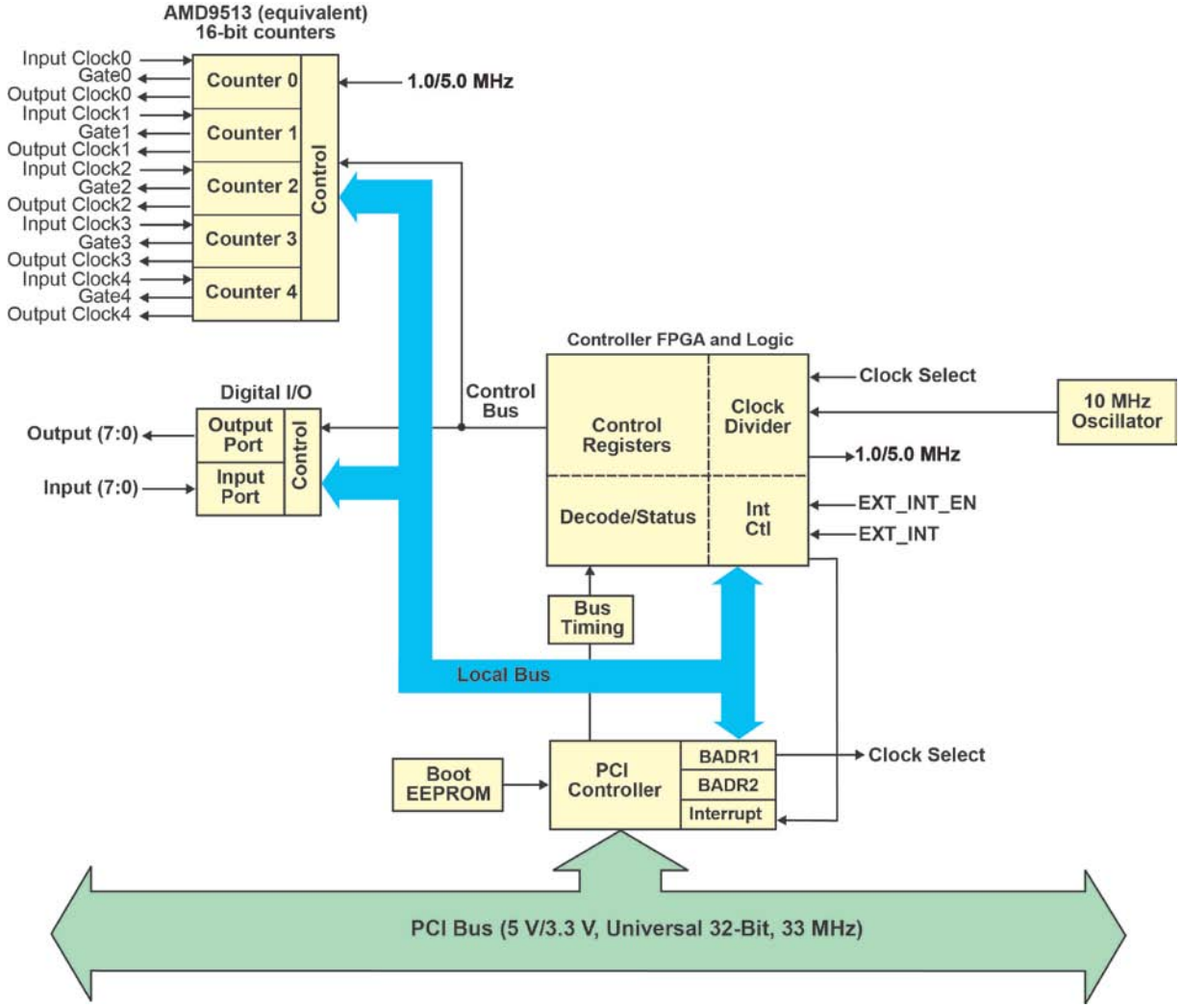


Figure 1. PCI-CTR05 functional block diagram

Installing the PCI-CTR05

What comes with your shipment?

As you unpack your board, make sure that the following components are included.

Hardware

- PCI-CTR05

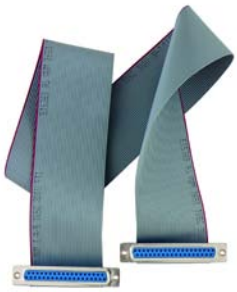


Documentation

In addition to this hardware user's guide, a *Quick Start Guide* booklet is included with the PCI-CTR05 shipment. This booklet provides an overview of the MCC DAQ software you received with the device, and includes information about installing the 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 and signal conditioning products for use with the PCI-CTR05. Refer to Field wiring, signal termination and conditioning for a complete list of compatible accessory products.

Unpacking

As with any electronic device, take care while handling to avoid damage from static electricity. Before removing thePCI-CTR05 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 the device is 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

For international customers, contact your local distributor. Refer to the "International Distributors" section on our web site at www.mccdaq.com/contact2.aspx.

Installing the software

Install Universal Library and InstaCal when you want to develop data acquisition applications using Windows programming languages. Universal Library and InstaCal software are included on the CD that ships with the board.

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

The PCI-CTR05 board is completely plug-and-play. There are no switches or jumpers to set on the board. Configuration is controlled by your system's BIOS.

Examine your board to determine it supports 3.3 V signaling environments

Before you install the board, examine it to determine if it supports both 3.3 V and 5 V PCI signaling environments.

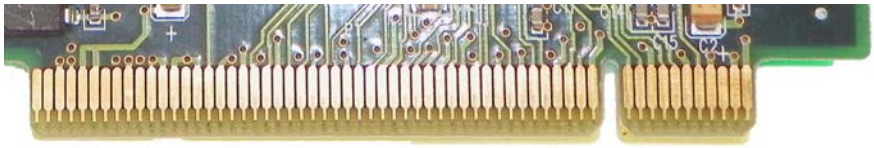
If the board has **two notches** on its PCI connector, it supports both 3.3 V or 5 V PCI signaling environments.



Supports both 3.3 V and 5 V PCI signaling environments

If the board has **one notch** on the PCI connector, it supports only 5 V PCI signaling environments.

Hardware specifications for this version of the board are available on our web site at www.mccdaq.com/PDFs/specs/PCI-CTR05r2_spec2-spec.pdf.



Supports only 5 V PCI signaling environments

To install your board, follow the steps below.

Install the software before you install your board

The driver needed to run the PCI-CTR05 is installed when you install the software. Therefore, you need to install the software before you install the hardware.

1. Power off and unplug the computer, and remove the cover to expose the expansion slots.
2. Touch any metal part of the computer to discharge static electricity. Static electricity can damage the board.
3. Insert your board into an available PCI slot.
4. Close your computer and turn it on.

   A dialog box opens as the system loads, indicating that new hardware has been detected. The information file for this board should have already been loaded onto your PC when you installed the software CD supplied with your board, and should be detected automatically by Windows. If you have not installed this software, cancel the dialog, install the software, and restart your computer.
5. Run InstaCal to test your installation and to configure the board. Refer to the *Quick Start Guide* that came with your board for information on how to initially set up InstaCal.

Allow your computer to warm up for at least 15 minutes before acquiring data. 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.

Connecting the board for I/O operations

The table below lists the board connectors, applicable cables and compatible accessory boards.

Board connectors, cables, accessory equipment

Connector type	37-pin shielded D-type, right angle (J1 – see Figure 2)
Compatible cables	C37FF-x, unshielded ribbon cable (Figure 3) C37FFS-x, shielded round cable (Figure 4)
Compatible accessory products	CIO-MINI37 CIO-MINI37-VERT CIO-TERMINAL SCB-37

Pinout – main I/O connector

The board connector is a male, 37-pin D-type connector (**J1**). Digital input, digital output, interrupt, and signals from the 9513 are all accessible on this connector.

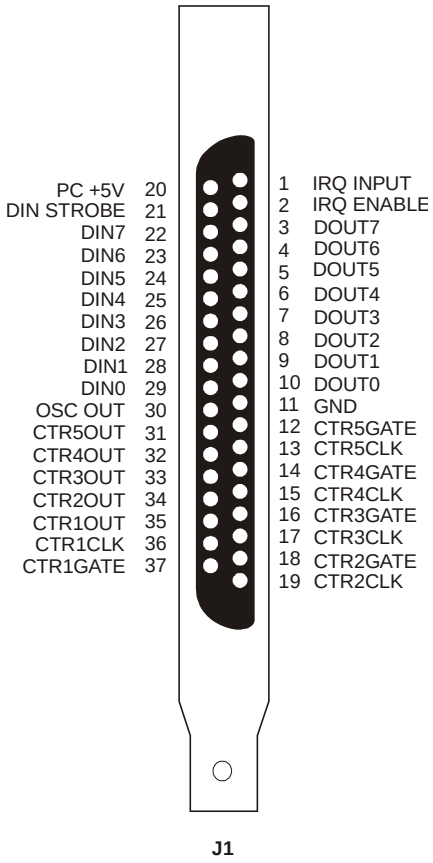


Figure 2. Board connector J1

Information on signal connections

For general information regarding digital I/O techniques, including signal conditioning and low pass filters, refer to the *Guide to Signal Connections*. This document is available on our web site at www.mccdaq.com/pdfs/signals.pdf).

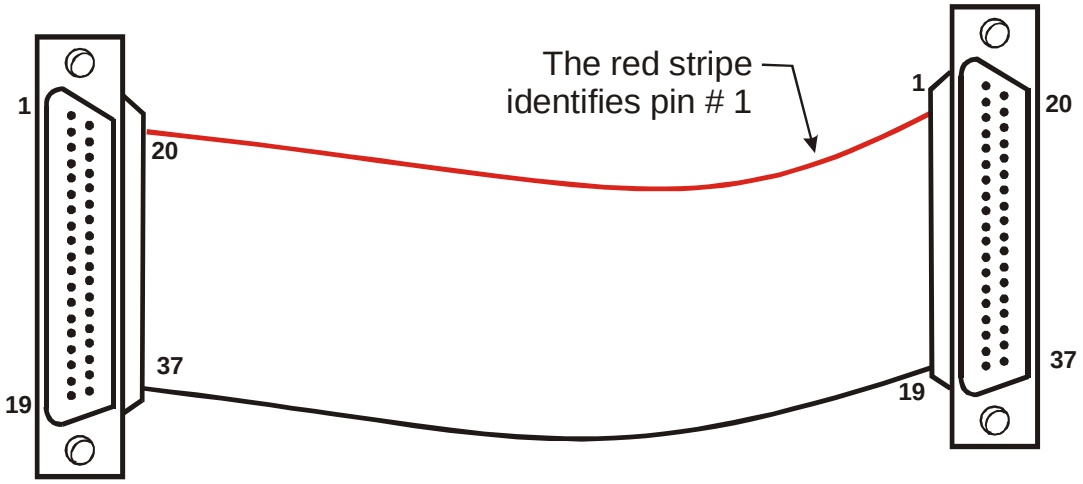


Figure 3. C37FF-x cable

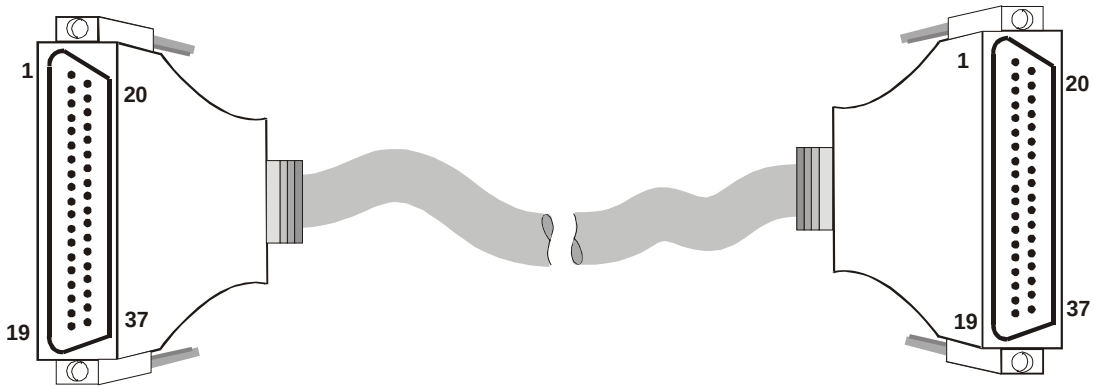


Figure 4. C37FFS-x cable

Field wiring, signal termination and conditioning

You can use the following MCC screw terminal boards with the PCI-CTR05 board using the C37FF-*x* or C37FFS-x cable.

- SCB37 — 37-conductor, shielded signal connection/screw terminal box that provides two independent 37-pin connections.
- CIO-MINI37 — 4 x 4, 37-pin screw terminal board.
- CIO-MINI37-VERT — 37-pin screw terminal accessory with vertical 37-pin male D connector.
- CIO-TERMINAL — 16 X 4 universal screw terminal board with on-board prototype area and circuitry.

Details on these products are available on our web site.

Mechanical drawing

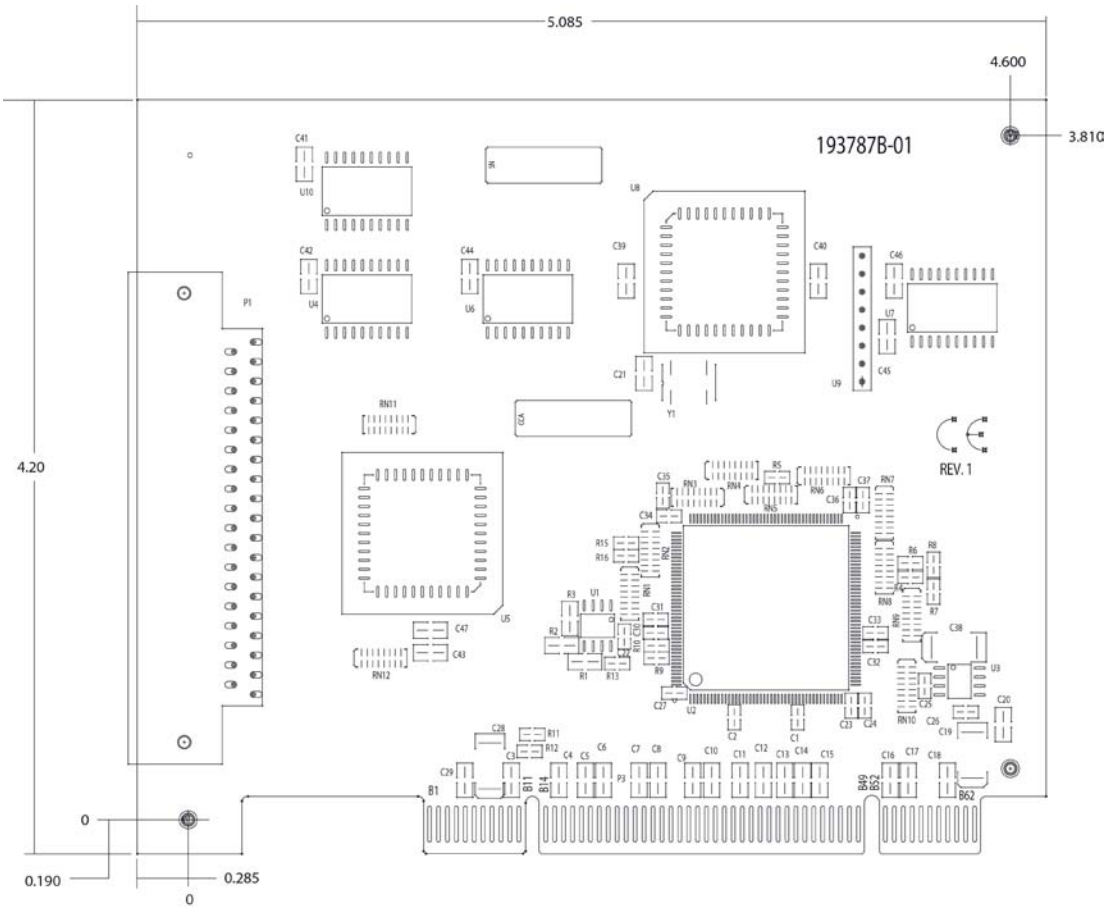


Figure 5. PCI-CTR05 circuit board dimensions

Specifications

All specifications are subject to change without notice.
Typical for 25 °C unless otherwise specified.
Specifications in *italic text* are guaranteed by design.

Digital input / output

Table 1. Digital I/O specifications

Digital type	Discrete, 5 V/TTL compatible
	Output: 74ACT273
	Input: 74LS373
Number of I/O	8 input, 8 output
Configuration	1 bank of 8 as output, 1 bank of 8 as strobed input
Input high voltage	*2.0 V min, 7.0 V absolute max*
Input low voltage	*0.8 V max, –0.5 V absolute min*
Output high voltage	*3.94 V min @ -24 mA (Vcc = 4.5 V)*
Output low voltage	*0.36 V max @ 24 mA (Vcc = 4.5 V)*
Data transfer	Programmed I/O
Power-up / reset state	Digital outputs reset to TTL low
Digital input strobe	Active low latch enable input, internally pulled high through 10 KΩ resistor
Digital input strobe pulse width high/low	15 ns min
Data setup to digital input strobe	*5 ns min*
Data hold from digital input strobe	*20 ns min*

Interrupt

Table 2. Interrupt specifications

Number of user interrupts	1
PCI interrupt	PCI INTA# - mapped to IRQn via PCI BIOS at boot-time
Interrupt enables	External: IRQ ENABLE, active low, disabled by default through internal resistor to TTL high and programmable through PCI9030-AA60PI. 0 = disabled 1 = enabled (default)
Interrupt sources	External: IRQ IN, polarity programmable through PCI9030-AA60PI. 1 = active high 0 = active low (default)
	IRQ IN maps to PLX 9030 LINT1.

Counter

Refer to the CTS9513-2 data sheet for complete 9513 specifications and operating modes. The SAVE command for the CTS9513 device does not behave predictably when using clocks which are not synchronous with the logic timing. The CTS9513-2 data sheet is available on our web site at www.mccdaq.com/PDFs/Manuals/9513A.pdf.

Table 3. Counter specifications

Parameter	**Conditions**
Counter type	9513
Configuration	One 9513 device. Five up/down counters, 16-bits each.
Compatibility	5V/TTL
The 9513 device is programmable for:	
Clock source	Software selectable: External: ▪ Counter 1-5 clock inputs ▪ Counter 1-5 gate inputs Internal: ▪ Terminal count of previous counter ▪ X2 clock frequency scaler
Gate:	Software selectable source: External (default logic high): ▪ Active high or low level or edge, counter 1 – 5 gate input ▪ Active high level previous gate or next gate ▪ All external gate signals (CTRxGATE) individually pulled up through 10 KΩ resistors to +5 V. Internal: ▪ Active high previous counter terminal count ▪ No gating.
Output:	Software selectable: ▪ Always low ▪ High pulse on terminal count ▪ Low pulse on terminal count ▪ Toggle on terminal count ▪ Inactive, high impedance at user connector counter # output.
Osc Out	Software selectable source: ▪ Counter # input ▪ Gate # input ▪ Prescaled clock source (X2 clock frequency scaler) Software selectable divider: ▪ Division by 1-16 Software selectable enable: ▪ On or low impedance to ground.
Clock input frequency	6.8 MHz max (145 ns min period)
X2 clock input sources	Software selectable: ▪ 1.0 MHz (10 MHz Xtal divided by 10) ▪ 5.0 MHz (10 MHz Xtal divided by 2)
X2 clock frequency scaler	BCD scaling (X2 divided by 10, 100, 1000 or 10000) or binary scaling (X2 divided by 16, 256, 4096 or 65536)
High pulse width (clock input)	*70 ns min*
Low pulse width (clock input)	*70 ns min*
Gate width high	*145 ns min*
Gate width low	*145 ns min*
Input low voltage	*-0.5 V to 0.8 V max*
Input high voltage	*2.2 V min, Vcc max*
Output low voltage @ IIl=3.2 mA	*0.4 V max*
Output high voltage @ IIH= -200 uA	*2.4 V min*
Crystal oscillator frequency	10 MHz
Frequency accuracy	50 ppm

Power consumption

Table 4. Power consumption specifications

+5 V	307 mA typ, 549 mA max. Does not include power consumed through the I/O connector.
+5 V available at connector	1 A max

Environmental

Table 5. Environmental specifications

Operating temperature range	0 °C to 55 °C
Storage temperature range	-20 °C to 70 °C
Humidity	0% to 90% non-condensing

Mechanical

Table 6. Mechanical specifications

Dimensions (L × W × H)	132.3 × 106.7 × 11.7 mm (5.2 × 4.2 × 0.5 in.)
Form factor	Universal PCI keying. Compatible with either 3.3 V or 5 V PCI signaling environments.

Main connector and pin out

Main connector J1 is compatible with the CIO-CTR05 and the CIO-CTR10.

Table 7. Main connector specifications

Connector type	37 pin shielded D-type, right angle
Compatible cables	▪ C37FF-x, unshielded ribbon cable ▪ C37FFS-x, shielded round cable
Compatible accessory products	CIO-MINI37 CIO-MINI37-VERT CIO-TERMINAL SCB-37

J1 pin out

Table 8. Main connector J1 pin out

Pin	Signal Name
1	IRQ INPUT
2	IRQ ENABLE
3	DOUT7
4	DOUT6
5	DOUT5
6	DOUT4
7	DOUT3
8	DOUT2
9	DOUT1
10	DOUT0
11	GND
12	CTR5GATE
13	CTR5CLK
14	CTR4GATE
15	CTR4CLK
16	CTR3GATE
17	CTR3CLK
18	CTR2GATE
19	CTR2CLK
20	PC +5V
21	DIN STROBE
22	DIN7
23	DIN6
24	DIN5
25	DIN4
26	DIN3
27	DIN2
28	DIN1
29	DIN0
30	OSC OUT
31	CTR5OUT
32	CTR4OUT
33	CTR3OUT
34	CTR2OUT
35	CTR1OUT
36	CTR1CLK
37	CTR1GATE

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-CTR05

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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