PCIM-DAS1602/16

Analog & Digital I/O

User's Guide

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MEASUREMENT COMPUTING™

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Table of Contents

About this User's Guide

This user's guide describes the Measurement Computing PCIM-DAS1602/16 data acquisition device and lists device 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 PCIM-DAS1602/16 hardware is available on our website at www.mccdaq.com. You can also contact Measurement Computing Corporation with specific questions.

- Knowledgebase: kb.mccdaq.com
- 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

If you need to program at the register level in your application, refer to the *Register Map for the PCIM-DAS1602/16* (available at www.mccdaq.com/registermaps/RegMapPCIM-DAS1602-16.pdf).

Introducing the PCIM-DAS1602/16

The PCIM-DAS1602/16 is a multifunction measurement and control board designed to operate in computers with PCI bus accessory slots. It provides the following:

- Eight differential or 16 single-ended input channels
- 16-bit A/D resolution
- 100 kHz sample rate
- Dual 12-bit analog outputs
- 32 DIO channels
- Three 16-bit counters

Functional block diagram

PCIM-DAS1602/16 functions are illustrated in the block diagram shown here.

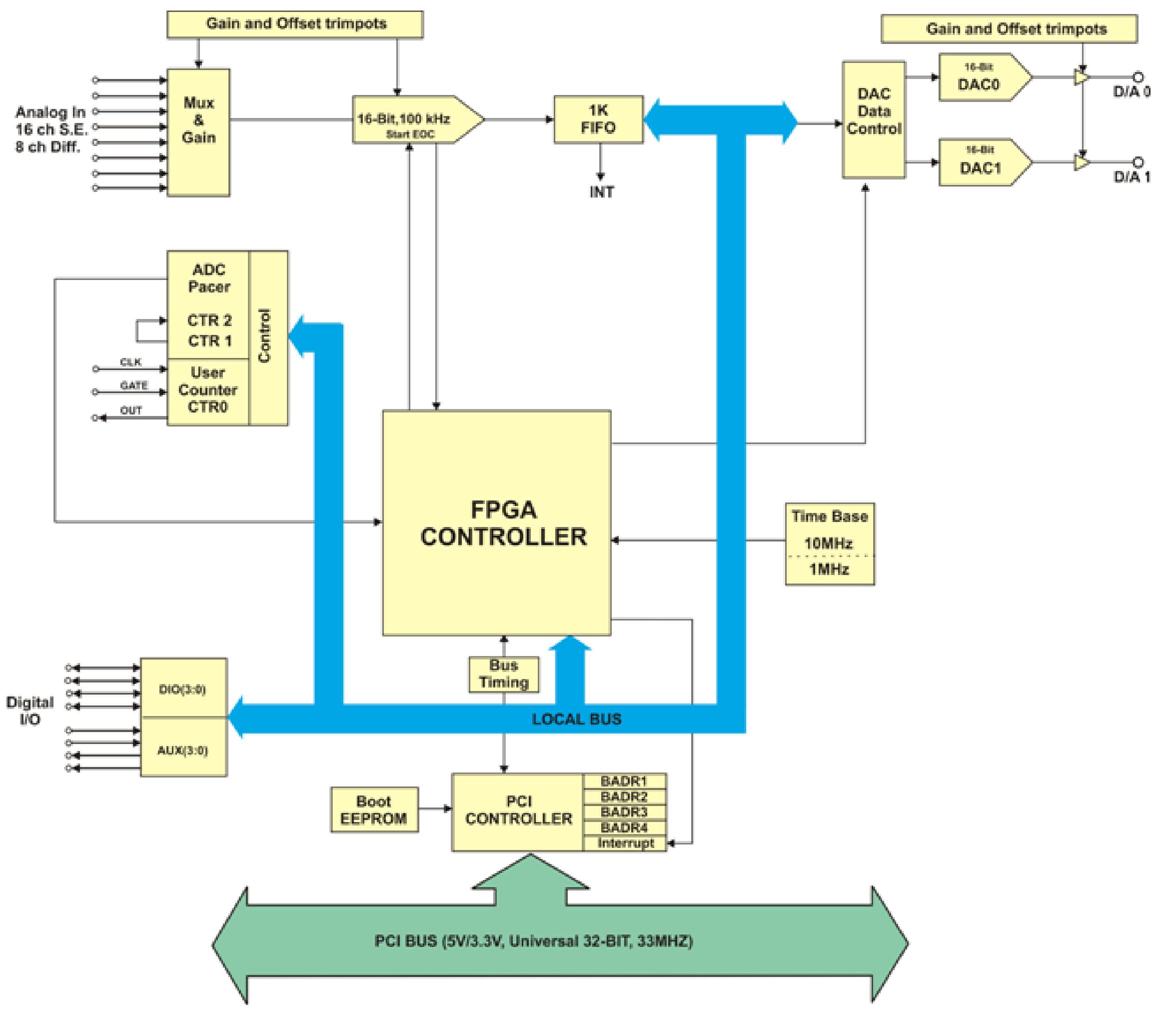

Figure 1. Functional block diagram

Installing the PCIM-DAS1602/16

What comes with your shipment?

As you unpack your PCIM-DAS1602/16, make sure that the following components are included.

Hardware

- PCIM-DAS1602/16

Software

- MCC DAQ CD

Documentation

In addition to this hardware user's guide, you should also receive the *Quick Start Guide*. 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

You can also order the following MCC products to use with your PCIM-DAS1602/16.

- Cables
  - C37FF-x
  - C37FFS-x
- Signal termination and conditioning accessories

  MCC provides signal conditioning and termination products for use with the PCIM-DAS1602/16. Refer to Field wiring, signal termination, and conditioning on page 14 for a list of compatible accessory products.

Unpacking

As with any electronic device, you should take care while handling to avoid damage from static electricity. Before removing the PCIM-DAS1602/16 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, contact us immediately using one of the following methods:

- Knowledgebase: kb.mccdaq.com
- 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 website at www.mccdaq.com/International.

Installing the software

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

Configuring the hardware

The PCIM-DAS1602/16 board has several switches and jumpers mounted on it that you must set before installing into your computer if you are not using the default settings. The factory-configured default settings are listed below. The locations of each switch and jumper are shown in Figure 2.

Switch/jumper factory-configured defaults

Board Label	Switch/Jumper description	Default Setting
S1	Channel Select switch	8
S2	A/D Range Select switch	Bipolar
P2	Clock Select jumper - 1/10 MHz XTAL jumper	1 MHz
P5 and P6	DAC0/DAC1 Bipolar/Unipolar Select jumpers	Bipolar
P7	DAC0 and DAC1 Range jumper	−5 V to +5 V
P8	Trigger Edge Select jumper	Rising Edge

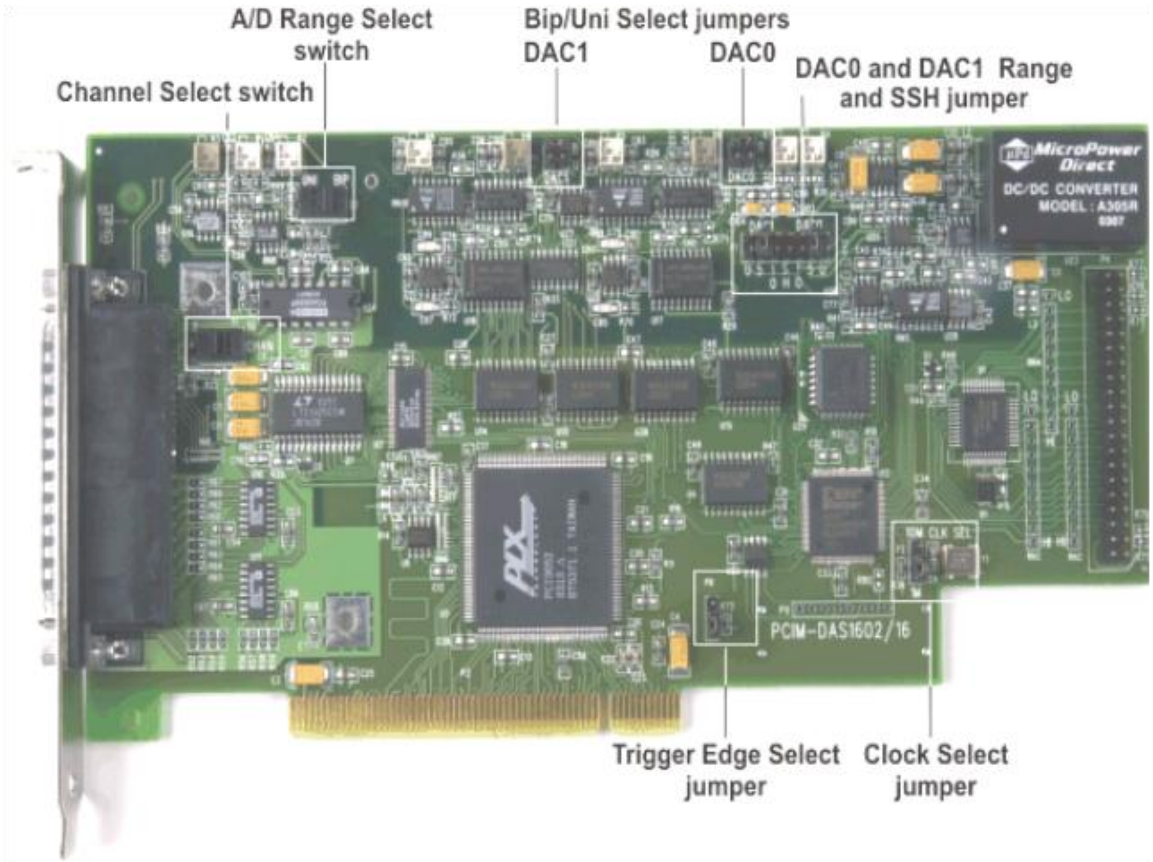

Figure 2. PCIM-DAS1602/16 switch and jumper locations

Before installing the PCIM-DAS1602/16 in the computer, verify that the board is configured with the settings that you want. Review the following information to change the default configuration of a jumper or switch on the PCIM-DAS1602/16 board.

Board switches are covered by a metal nameplate

To access the Channel Select switch and the A/D Range Select switch, remove the metal nameplate that covers them. This plate is secured to the board with two screws.

Channel Select switch

Set the channel mode configuration with switch S1. The analog inputs of the PCIM-DAS1602/16 can be configured as eight differential channels or 16 single-ended channels. Use the single-ended input mode if you have more than eight analog inputs to sample. Using the differential input mode allows up to 10 volts of common mode (ground loop) rejection and will provide better noise immunity.

This switch is factory-configured for eight differential inputs. The Channel Select switch shown in Figure 3 is set to the "8" position. To configure for 16 channels, set this switch to 16.

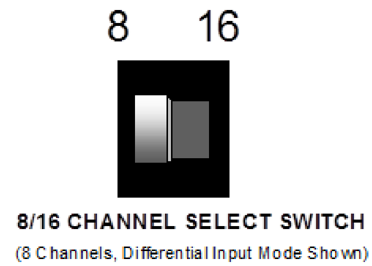

Figure 3. 8/16 Channel Select switch

A/D Range Select switch

The A/D converter range is set by switch S2. This switch controls all A/D channels.

Although you cannot run some channels bipolar and some unipolar, you can measure a unipolar input in the bipolar mode (for example, you can monitor a 0 to 5V input with a channel set to the ±5 V range). This switch is factory-configured for bipolar. The A/D Range Select switch shown in Figure 4 is configured for unipolar.

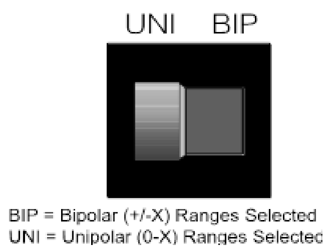

Figure 4. A/D Range Select switch

Trigger Edge Select jumper

The original Keithley MetraByte DAS-1600 was designed such that A/D conversion initiates on the falling edge of the convert signal. Neither the original DAS-16, nor any of the other DAS-16 derivative converts on the falling edge of the signal. In fact, we are not aware of any A/D board that uses the falling edge to initiate the A/D conversion.

When using the falling edge to start the conversion, the A/D may be falsely triggered by 8254 pacer clock initialization glitching. False triggering is easy to avoid, but may occur in the DAS-1600. Since initiating conversions on the falling edge is undesirable, but initiating on the rising edge may lead to timing differences if the PCIM-DAS1602/16 board is used as a replacement for an older DAS16 series board, the PCIM-DAS1602/16 is equipped with a jumper that you can use to select the edge that initiates the A/D conversion.

The Trigger Edge Select mode is configured by jumper **P8**. This jumper is factory-configured for rising edge. Figure 5 shows the edge selection options.

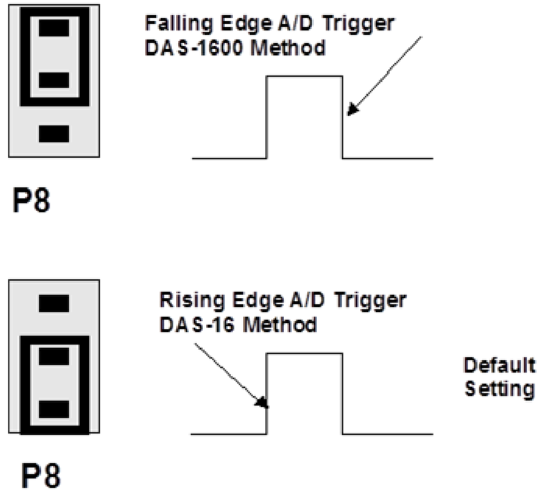

Figure 5. Trigger Edge Select jumper

For compatibility with all third party packages, with all DAS-16 software, and with PCIM-DAS1602/16 software, leave this jumper in the default rising edge position.

DAC0 and DAC1 Range Select jumper (D/A Converter Reference)

The PCIM-DAS1602/16 has an on-board precision voltage reference at jumper P7 that you can use to select the output ranges of the digital to analog converters. Both of the board's D/A outputs are factory-configured with a range of –5 to +5 volts (Figure 6.)

Analog output is provided by two 12-bit multiplying D/A converters (DAC1 and DAC). This type of converter accepts an input reference voltage, and provides an output voltage which is both inverse to the reference voltage and proportional to the digital value in the output register. The proportion is controlled by the D/A output code (0 to 4095). Each bit represents 1/4096 of full scale. For example, in unipolar mode, the supplied reference of –5 V provides a +5V output (actually 4.9988 V) when the value in the output register is 4095 (full scale at 12 bits of resolution). It provides a value of 2.5 V when the value in the output register is 2048.

A precision –5 V and –10 V reference provides onboard D/A ranges of 0 to 5 V, 0 to 10 V, ±5 V, ±10 V. Other ranges between 0V and 10V are available when you provide a precision voltage reference at pin 10 (D/A0) or pin 26 (D/A1) of the board's main connector.

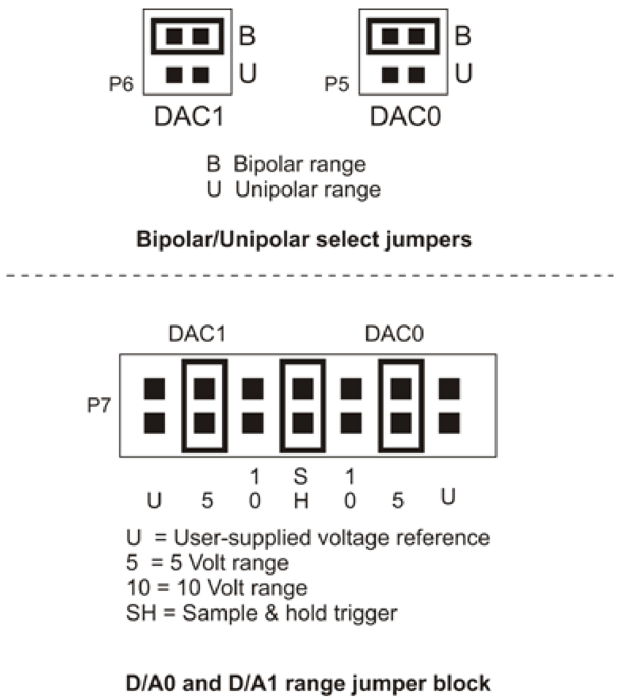

Figure 6. D/A0 and D/A1 Range jumper

Simultaneous sample and hold (SSH) trigger

When the DAC1 reference is supplied on-board, pin 26 of the 37-pin connector is unused (Figure 8). You can enable this pin as a SSH (simultaneous sample & hold) trigger for use with the CIO-SSH16 board. To configure this, place the jumper between the two pins labeled SH, as shown in Figure 6.

Clock Select jumper

Jumper P2 configures the frequency of the square wave used as a clock by the A/D pacer circuitry. This pacer circuitry controls the sample timing of the A/D.

You can configure the frequency for 10 MHz or 1 MHz. The Clock Select jumper is factory-configured for 1 MHz, as shown in Figure 7.

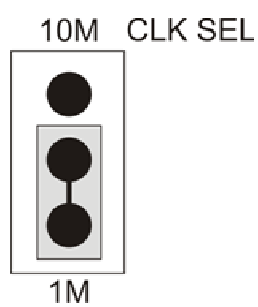

Figure 7. Clock Select jumper

Configure this jumper for 10 MHz, unless you have reason to do otherwise.

Internal pacer output is also available at pin 20

The internal pacer output driving the A/D converter is also available at pin 20 (CTR 3 OUT) on the board analog connector (see Figure 8 on page 12).

Installing the hardware

After you configure the board's switches and jumpers, install the PCIM-DAS1602/16 into your computer. 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, open it up, and insert your board into any available PCI slot.
2. Close your computer and turn it on.

   If you are using an operating system with support for plug-and-play, a dialog box notifies you 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 MCC DAQ 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.

Board configuration with InstaCal

If you change the board configuration with InstaCal, you may have to also physically change the setting of a corresponding switch or jumper on the board. Refer to Default hardware configuration on page 7 for specific jumper and switch information.

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.

Signal connections

I/O connector

The board has a 37-pin connector for analog connections and a 40-pin connector for digital I/O connections. The table below lists the board connectors, applicable cables, and compatible accessory products.

Board connectors, cables, accessory equipment

Analog connector type	37-pin male "D" connector
Digital connector type	40-pin header connector
Compatible cables	C37FF-x (Figure 11) C37FFS-x (Figure 12) BP40-37 (Figure 13)
Compatible accessory products (with the C37FF-x cable or C37FFs-x cable)	CIO-MINI37 SCB-37 ISO-RACK16 ISO-DA02
Compatible accessory products (with the C37FF-x cable or C37FFs-x cable connected to the BP40-37 cable)	CIO-ERB08 CIO-ERB24 SSR-RACK08 SSR-RACK24

Analog connector

The analog connector is a 37-pin "D" connector that is accessible from the rear of the PC on the expansion back plate. This connector accepts female 37-pin D-type connectors, such as the C37FF-x 37-pin cable (Figure 11) or the C37FFS-x 37-pin shielded cable (Figure 12).

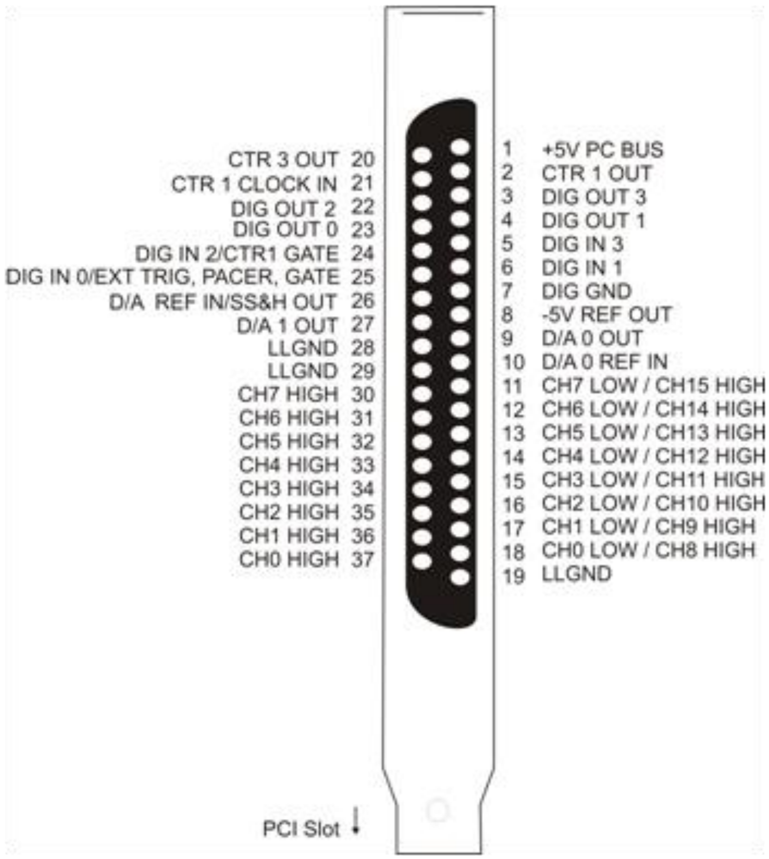

Figure 8.Analog connector pinout

An additional signal, SS&H OUT (Simultaneous Sample and Hold Output), is available at pin 26 on the analog connector. This pin is required when the CIO-SSH16 board is used with a PCIM-DAS1602/16. Refer to Simultaneous sample and hold (SSH) trigger on page 10 for information on how to configure this pin.

Digital connector

The digital I/O connector is a 40-pin connector that is mounted at the rear of the PCIM-DAS1602/16. This connector accepts a 40-pin header connector (Figure 13).

The optional BP40-37 cable assembly brings the signals to a back plate with a 37-pin male connector mounted in it. When connected through the BP40-37 cable, the PCIM-DAS1602/16 board's digital connector is identical to the CIO-DIO24 connector.

Analog and digital connections and configuration

General information on analog and digital signal connections and configuration is contained in the *Guide to Signal Connections* (available on our web site at http://www.mccdaq.com/signals/signals.pdf).

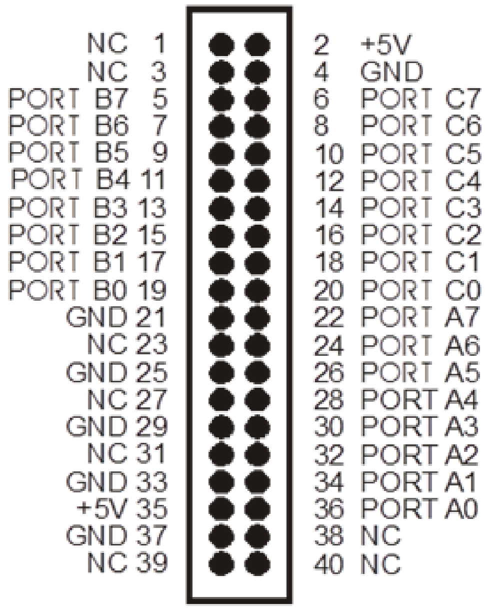

Figure 9. Digital connector pinout

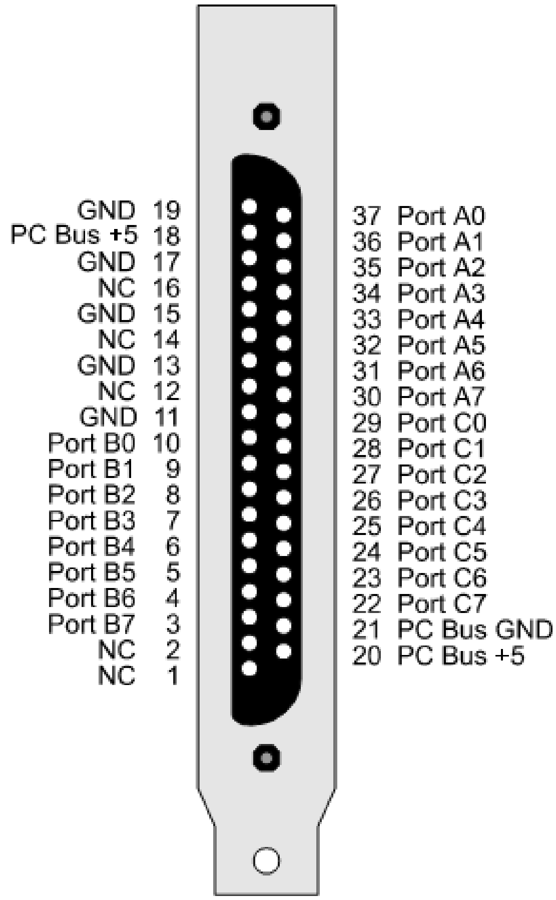

Figure 10. BP40-37 connector pinout

Cabling

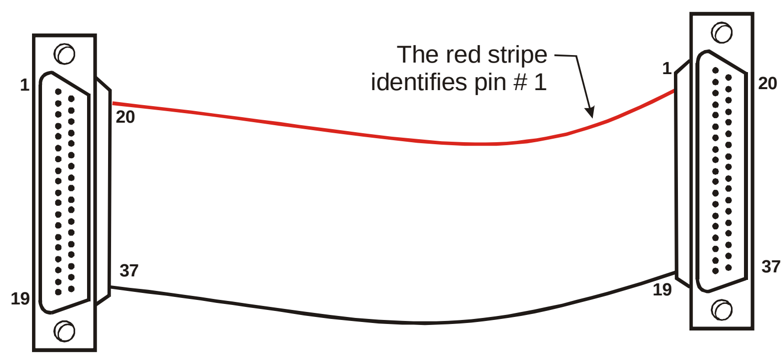

Figure 11. C37FF-x cable

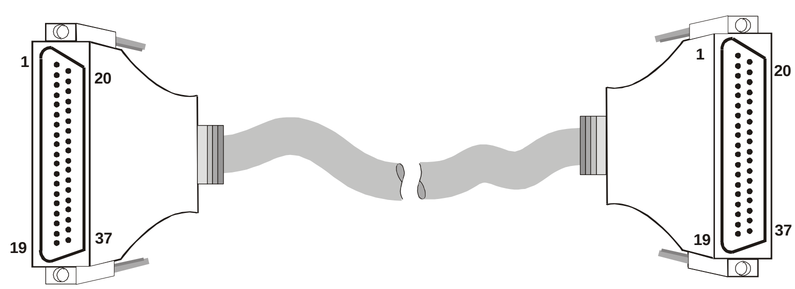

Figure 12. C37FFS-x cable

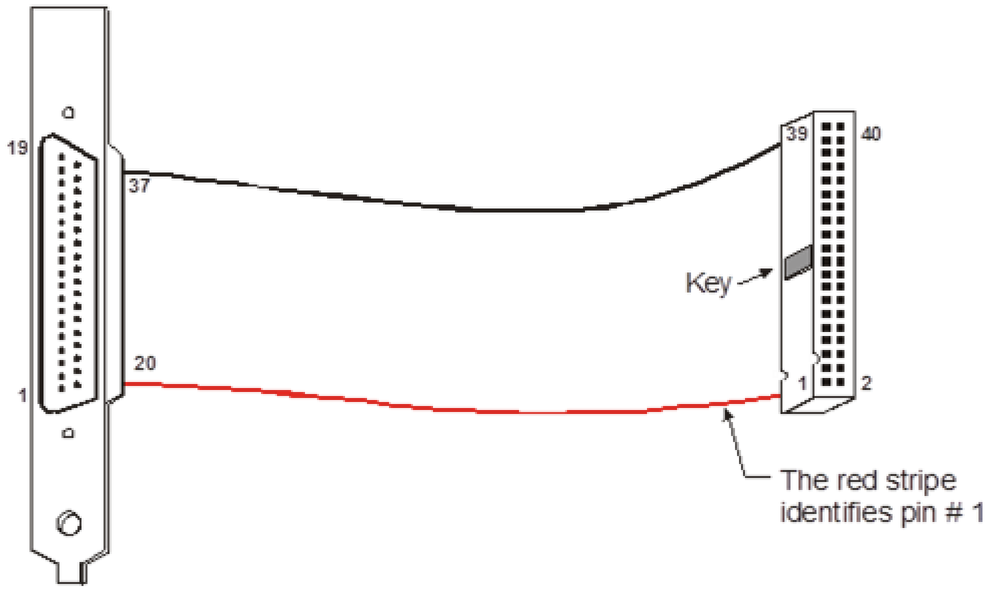

Figure 13. BP40-37 cable

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 board using the C37FF-*x* or C37FFS-*x* cable:

- CIO-MINI37 – 37-pin screw terminal board.
- SCB-37 – 37 conductor, shielded signal connection/screw terminal box that provides two independent 50-pin connections.

MCC provides the following analog signal conditioning products for use with the PCIM-DAS1602/16 board:

- ISO-RACK16 – Isolated 16-channel, 5B module rack for analog signal conditioning and expansion.
- ISO-DA02 – Isolated 2-channel, 5B module rack for analog signal conditioning and expansion.

MCC provides the following digital signal conditioning products for use with the PCIM-DAS1602/16 board:

- CIO-ERB08 – 8-channel, Form C relay accessory board for digital signal conditioning.
- CIO-ERB24 – 24-channel, Form C relay accessory board for digital signal conditioning.
- SSR-RACK08 – 8-channel, solid-state relay mounting rack for digital signal conditioning.
- SSR-RACK24 – 24-channel, solid-state relay mounting rack for digital signal conditioning.

Details on these products are available on our website.

Calibrating the PCIM-DAS1602/16

The PCIM-DAS1602/16 is shipped fully calibrated from the factory. For normal environments, you should calibrate your PCIM-DAS1602/16 board using InstaCal every six months to a year. If frequent variations in temperature or humidity are common, recalibrate at least every three months. Calibration using InstaCal requires less than 20 minutes.

Calibrating the A/D & D/A converters

InstaCal provides step-by-step on-screen instructions to guide you in calibrating your board. You calibrate the board's A/D converters by applying a known voltage to an analog input channel and adjusting trim pots for offset and gain. There are three trim pots that require adjustment to calibrate the analog input section of the board. There are also three pots associated with each of the analog output channels.

Calibrate the PCIM-DAS1602/16 for the range you intend to use it in. When the range is changed, slight variation in Zero and Full Scale may result. These variations can be measured and removed in software if necessary.

Required equipment

To calibrate the PCIM-DAS1602/16, you need a precision voltage source, or a non precision source and a 5½ digit digital voltmeter and a few pieces of wire. Use a jeweler’s screwdriver to adjust the trim pots. An extender card is not required to calibrate the board.

Specifications

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

Power consumption

Table 1. Power consumption specifications

Parameter	**Specification**
+5V quiescent	820mA typical, 1.4A max

Analog input

Table 2. Analog input specifications

Parameter	**Specification**
A/D converter type	LTC1605CSW
Resolution	16 bits
Number of channels	16 single-ended / 8 differential, switch selectable
Input ranges ■ Gain is software selectable ■ Unipolar/Bipolar polarity is switch selectable	±10V, ±5V, ±2.5V, ±1.25V 0 to 10V, 0 to 5V, 0 to 2.5V, 0 to 1.25V
A/D pacing (software programmable)	Internal counter –82C54. Positive or negative edge, jumper selectable.
	External source (pin25), positive or negative edge, software selectable.
	Software polled
A/D trigger (only available when internal pacing selected, software enable/disable)	External edge trigger (pin 25), Positive or negative edge, software selectable.
A/D gate (only available when internal pacing selected, software enable/disable)	External gate (pin 25), High or low level, software selectable.
Simultaneous sample and hold trigger	TTL output (pin 26), jumper enabled. Logic 0 = Hold, Logic 1 = Sample Compatible with CIO-SSH16
Burst mode	Software selectable option, burst interval = 10 uS
Data transfer	From 1024 sample FIFO via interrupt with REPINSW
	Interrupt
	Software polled
Interrupt	INTA# mapped to IRQn via PCI BIOS at boot-time
Interrupt enable	Programmable through PLX9052
Interrupt polarity	Active high level or active low level, programmable through PLX9052
Interrupt sources (software programmable)	End of Conversion
	FIFO not Empty
	End of Burst
	End of Acquisition
	FIFO Half Full
A/D conversion time	*10µs max*
Throughput	100 kHz
Common Mode Range	±10V min
CMRR @ 60Hz	–100dB typ, –80dB min

Parameter	Specification
Input leakage current	*±3nA max*
Input impedance	*10 MΩ min*
Absolute maximum input voltage	*+55/–40V fault protected via input mux*

Accuracy

Table 3. AI accuracy specifications

Parameter	Specification
Typical accuracy	±2.3 LSB
Absolute accuracy	±5.0 LSB
Accuracy components	
Gain Error	Trimmable by potentiometer to 0
Offset Error	Trimmable by potentiometer to 0
PGA linearity error	*±1.3 LSB typ , ±10.0 LSB max*
Integral *linearity error*	±0.5 LSB typ , ±3.0 LSB max
Differential linearity error	*±0.5 LSB typ, ±2.0 LSB max*

Each is tested at the factory to assure the board's overall error does not exceed ±5 LSB.

Total board error is a combination of gain, offset, differential linearity and integral linearity error. The theoretical absolute accuracy of the board may be calculated by summing these component errors. Worst case error is realized only in the unlikely event that each of the component errors are at their maximum level, and causing error in the same direction.

Analog input drift

Table 4. Analog input drift specifications

Range	Analog input full-scale gain drift	Analog input zero drift	Overall analog input drift
±10.00 V	2.2 LSB/°C max	1.8 LSB/°C max	4.0 LSB/°C max
±5.000 V	2.2 LSB/°C max	1.9 LSB/°C max	4.1 LSB/°C max
±2.500 V	2.2 LSB/°C max	2.0 LSB/°C max	4.2 LSB/°C max
±1.250 V	2.2 LSB/°C max	2.3 LSB/°C max	4.5 LSB/°C max
0 V to 10.00 V	4.1 LSB/°C max	1.9 LSB/°C max	6.0 LSB/°C max
0 V to 5.000 V	4.1 LSB/°C max	2.1 LSB/°C max	6.2 LSB/°C max
0 V to 2.500 V	4.1 LSB/°C max	2.4 LSB/°C max	6.5 LSB/°C max
0 V to 1.250 V	4.1 LSB/°C max	3.0 LSB/°C max	7.1 LSB/°C max

Absolute error change per °C Temperature change is a combination of the gain and offset drift of many components. The theoretical worst case error of the board may be calculated by summing these component errors. Worst case error is realized only in the unlikely event that each of the component errors are at their maximum level, and causing error in the same direction.

Noise performance

The following table summarizes the worst case noise performance for the PCIM-DAS1602/16. Noise distribution is determined by gathering 50000 samples with inputs tied to ground at the PCIM-DAS1602/16 main connector. Data is for both single-ended and differential modes of operation.

Table 5. Noise performance specifications

Range	±2 counts	±1 count	Max Counts	LSBrms*
±10.00 V	97%	80%	11	1.7
±5.000 V	97%	80%	11	1.7
±2.500 V	96%	79%	11	1.7
±1.250 V	96%	79%	11	1.7
0 V to 10.00 V	88%	65%	15	2.3
0 to 5.000V	88%	65%	15	2.3
0 to 2.500V	83%	61%	15	2.3
0 to 1.250V	83%	61%	16	2.4

* Input noise is assumed to be Gaussian. An RMS noise value from a Gaussian distribution is calculated by dividing the peak-to-peak bin spread by 6.6

Crosstalk

Crosstalk is defined here as the influence of one channel upon another when scanning two channels at the specified per channel rate for a total of 50000 samples. A full scale 100 Hz triangle wave is input on channel 1. channel 0 is tied to analog ground at the 100 pin user connector. The table below summarizes the influence of channel 1 on channel 0 and does not include the effects of noise.

Table 6. Crosstalk specifications

Range	1 kHz crosstalk (LSB pk-pk)	10 kHz crosstalk (LSB pk-pk)	50 kHz crosstalk (LSB pk-pk)
±10.000 V	4	13	24
±5.000 V	2	7	18
±2.500 V	2	5	16
±1.250 V	3	4	14
0 V to +10.000 V	4	8	23
0 V to +5.000 V	2	5	16
0 V to +2.500 V	2	4	16
0 V to +1.250 V	3	3	16

Analog output

Table 7. Analog output specifications

Parameter	**Specification**
D/A converter type	MX7548
Resolution	12 bits
Number of channels	2
Channel type	Single-ended voltage output
Output range (jumper selectable per output)	±10 V, ±5 V, 0 to 10 V, or 0 to 5 V using on-board references, or user defined using external reference
Reference voltage (jumper selectable)	On-board, –10 V and –5 V
	External; independent (D/A0 pin 10 and D/A1 pin 26)
External reference voltage range	±10 V max
External reference input impedance	*10 kΩ min*
Data transfer	Programmed I/O
Throughput	System dependent.
Monotonicity	*Guaranteed monotonic over temperature*
Slew rate	2.0 V/µs min
Settling time	30 µS max to ±½ LSB for a 20 V step
Current drive	±5 mA min
Output short-circuit duration	Indefinite @ 25 mA
Output coupling	DC
Output impedance	0.1 Ω max
Output stability	Any passive load
Coding	Offset binary Bipolar mode: 0 code = Vref 4095 code = –Vref – 1LSB, Vref < 0V –Vref + 1LSB, Vref > 0V Unipolar mode: 0 code = 0V, 4095 code = –Vref – 1LSB, Vref < 0V –Vref + 1LSB, Vref > 0V
Output voltage on power up and reset	0 V ± 10 mV

Accuracy

Table 8. AO accuracy specifications

Parameter	**Specification**
Typical accuracy	±1 LSB
Absolute accuracy	±2 LSB
Accuracy Components	
Gain error	Trimmable by potentiometer to 0
Offset error	Trimmable by potentiometer to 0
Integral linearity error	±0.5 LSB typ, ±1 LSB max
Differential linearity error	*±0.5 LSB typ, ±1 LSB max*

Total board error is a combination of gain, offset, differential linearity and integral linearity error. The theoretical absolute accuracy of the board may be calculated by summing these component errors. Worst case error is realized only in the unlikely event that each of the component errors are at their maximum level, and causing error in the same direction.

Analog output drift

Table 9. Analog output drift specifications

Parameter	Specification
Analog output full-scale gain drift	±0.22 LSB/°C max
Analog output zero drift	±0.22 LSB/°C max
Overall analog output drift	±0.44 LSB/°C max

Absolute error change per °C temperature change is a combination of the gain and offset drift of many components. The theoretical worst case error of the board may be calculated by summing these component errors. Worst case error is realized only in the unlikely event that each of the component errors are at their maximum level, and causing error in the same direction.

Digital I/O

Table 10. Digital I/O specifications

Parameter	Specification
Digital type	82C55
Number of I/O	24
Configuration per 82C55	2 banks of 8 and 2 banks of 4 or *3 banks of 8 or* *2 banks of 8 with handshake*
Input high	*2.0 volts min, 5.5 volts absolute max*
Input low	*0.8 volts max, -0.5 volts absolute min*
Output high	*3.0 volts min @ –2.5 mA*
Output low	*0.4 volts max @ 2.5 mA*
Power-up / reset state	Input mode (high impedance)
Pull-up/pull-down resistors	User installed. Dual footprint allows pull-up or pull-down configuration
Digital output type	74LS244, power up / reset to LOW logic level
Digital input type	74LS373, pulled to logic high via 10 kΩ resistors
Number of I/O	8
Configuration	4 fixed input, 4 fixed output
Output high	*2.7 volts @ –0.4 mA min*
Output low	*0.5 volts @ 8 mA max*
Input high	*2.0 volts min, 7 volts absolute max*
Input low	*0.8 volts max, –0.5 volts absolute min*

Counter

Table 11. Counter specifications

Parameter	Specification
Counter type	82C54
Configuration	3 down counters, 16 bits each
Counter 1 source (software selectable)	■ External source from main connector (pin 21*) ■ 100 kHz internal source
Counter 1 gate	External gate from analog connector (pin 24*)
Counter 1 output	Available at analog connector (pin 2)
Counter 2 source (jumper selectable)	■ Internal 1 MHz ■ Internal 10 MHz
Counter 2 gate (software enable/disable)	External source from analog connector (pin 25*)
Counter 2 output	Internal only, chained to counter 3 source
Counter 3 source	Counter 2 output
Counter 3 gate (software enable/disable)	External source from analog connector (pin 25*)
Counter 3 output	Available at analog connector (pin 20); programmable as ADC Pacer clock.
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 high	*2.0 volts min, 5.5 volts absolute max*
Input low	*0.8 volts max, –0.5 volts absolute min*
Output high	*3.0 volts min @ –2.5 mA*
Output low	*0.4 volts max @ 2.5 mA*
Crystal oscillator frequency	10 MHz
Frequency accuracy	50 ppm

* Pins 21, 24, and 25 are pulled to logic high via 10 kΩ resistors.

Environmental

Table 12. Environmental specifications

Parameter	Specification
Operating temperature range	0 °C to 70 °C
Storage temperature range	–40 °C to 100 °C
Humidity	0 to 95% non-condensing

Mechanical

Table 13. Mechanical specifications

Parameter	Specification
Card dimensions (H × W × L)	PCI custom type card: 107 × 18.5 × 216 mm

Signal connectors

Analog connector

Table 14. Analog connector specifications

Connector type	37 pin male "D" connector
Connector compatibility	Identical to CIO-DAS1602/16 connector

Table 15. 8-channel differential mode pinout

Pin	Signal Name	Pin	Signal Name
1	+5V PC BUS POWER	20	CTR 3 OUT
2	CTR 1 OUT	21	CTR 1 CLOCK IN
3	DIG OUT 3	22	DIG OUT 2
4	DIG OUT 1	23	DIG OUT 0
5	DIG IN 3	24	DIG IN 2 / CTR1 GATE
6	DIG IN 1	25	DIG IN 0 / EXT TRIG / EXT PACER / EXT GATE
7	DIG GND	26	D/A1 REF IN / SS&H OUT
8	–5V REF OUT	27	D/A 1 OUT
9	D/A 0 OUT	28	AGND
10	D/A0 REF IN	29	AGND
11	CH7 LO	30	CH7 HIGH
12	CH6 LO	31	CH6 HIGH
13	CH5 LO	32	CH5 HIGH
14	CH4 LO	33	CH4 HIGH
15	CH3 LO	34	CH3 HIGH
16	CH2 LO	35	CH2 HIGH
17	CH1 LO	36	CH1 HIGH
18	CH0 LO	37	CH0 HIGH
19	AGND		

Table 16. 16-channel single-ended mode pinout

Pin	Signal Name	Pin	Signal Name
1	+5V PC BUS POWER	20	CTR 3 OUT
2	CTR 1 OUT	21	CTR 1 CLOCK IN
3	DIG OUT 3	22	DIG OUT 2
4	DIG OUT 1	23	DIG OUT 0
5	DIG IN 3	24	DIG IN 2 / CTR1 GATE
6	DIG IN 1	25	DIG IN 0 / EXT TRIG / EXT PACER / EXT GATE
7	DIG GND	26	D/A1 REF IN / SS&H OUT
8	–5V REF OUT	27	D/A 1 OUT
9	D/A 0 OUT	28	AGND
10	D/A0 REF IN	29	AGND
11	CH15 HIGH	30	CH7 HIGH
12	CH14 HIGH	31	CH6 HIGH
13	CH13 HIGH	32	CH5 HIGH
14	CH12 HIGH	33	CH4 HIGH
15	CH11 HIGH	34	CH3 HIGH
16	CH10 HIGH	35	CH2 HIGH
17	CH9 HIGH	36	CH1 HIGH
18	CH8 HIGH	37	CHO HIGH
19	AGND		

Digital connector

Table 17. Digital connector specifications

Connector type	40 pin header
Connector compatibility	Identical to CIO-DAS1602/16 connector

Table 18. Digital connector pinout

Pin	Signal Name	Pin	Signal Name
1	NC	2	+5V PC BUS POWER
3	NC	4	DIG GND
5	PORT B 7	6	PORT C 7
7	PORT B 6	8	PORT C 6
9	PORT B 5	10	PORT C 5
11	PORT B 4	12	PORT C 4
13	PORT B 3	14	PORT C 3
15	PORT B 2	16	PORT C 2
17	PORT B 1	18	PORT C 1
19	PORT B 0	20	PORT C 0
21	DIG GND	22	PORT A 7
23	NC	24	PORT A 6
25	DIG GND	26	PORT A 5
27	NC	28	PORT A 4
29	DIG GND	30	PORT A 3
31	NC	32	PORT A 2
33	DIG GND	34	PORT A 1
35	+5V PC BUS POWER	36	PORT A 0
37	DIG GND	38	NC
39	NC	40	NC

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

PCIM-DAS1602/16

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.

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