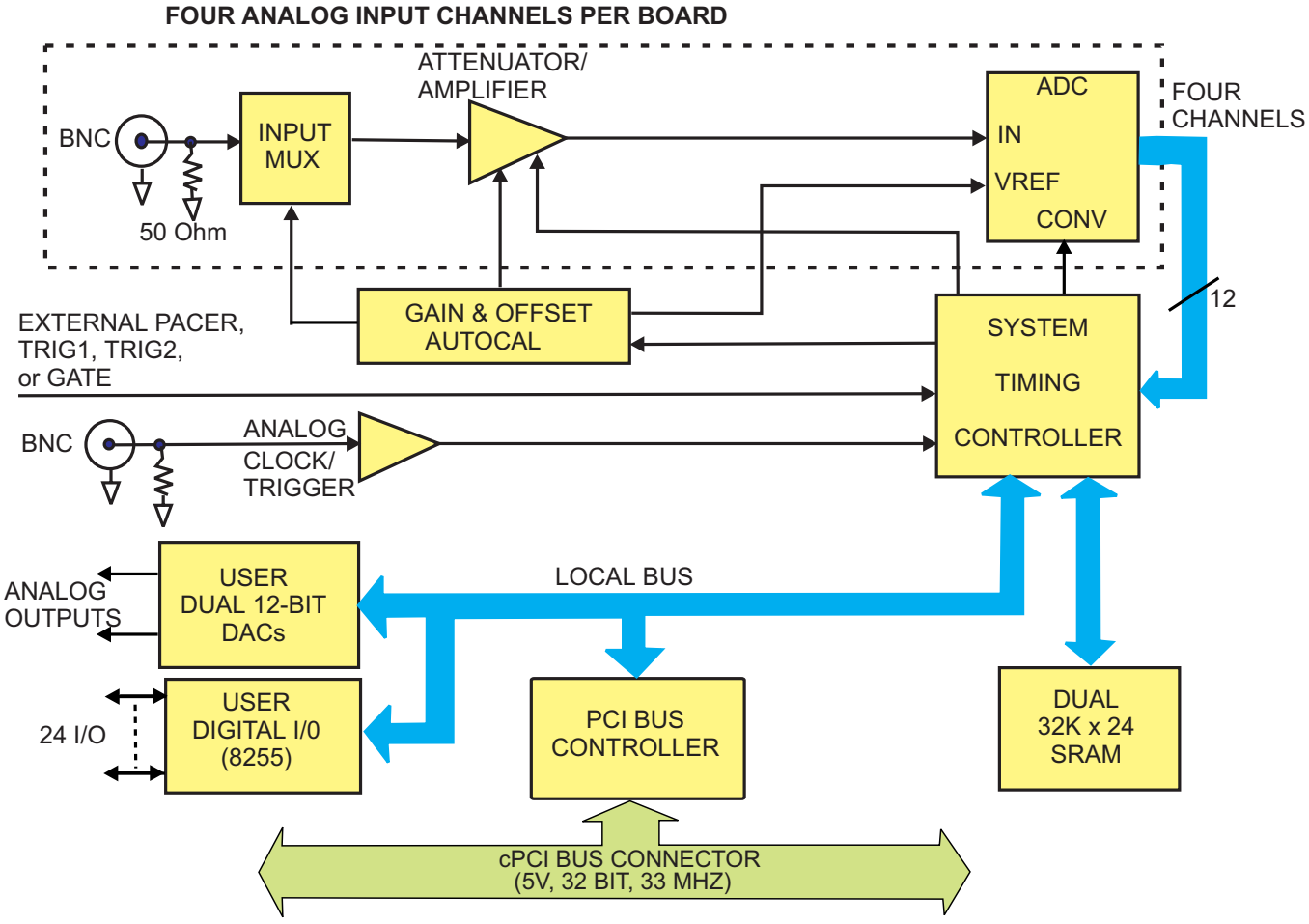
CPCI-DAS4020/12

Ultra High-Speed CompactPCI-bus Compatible, 4-Channel, 12-Bit Analog Input Board with Dual Analog Output Channels & 24 Digital I/O bits

Features

- 20 MHz sample rate
- 12-bit A/D resolution
- 4 input channels
- Software selectable input ranges
- One A/D per channel
- Bus-master & Scatter-gather capable
- Dual 12-bit D/As
- Analog and digital triggering
- 24-bits digital I/O
- Fully Plug-and-Play
- Fully Autocalibrating

Block Diagram



Functional Description

The CPCI-DAS4020/12 is an ultra high speed, analog input board for CompactPCI bus computers. Offering four 12-bit analog inputs with sample rates up to 20 MHz, 24 bits of high drive digital I/O and two 12-bit analog outputs.

At the heart of the board is a powerful System Timing Controller (STC) chip. The STC chip controls all A/D sampling as well as controlling the 64-k sample A/D FIFO. This functionality is based on the STC chip's use of an on-board 32 k x 24 SRAM. The board provides bus-mastering and scatter-gather functionality to assure the desired system timing is maintained.

The CPCI-DAS4020/12 is completely plug-and-play. There are no switches, jumpers or potentiometers on the board. All board addresses, interrupt channels, etc. are set by your computer's plug-and-play software. Even calibration is performed via software by using on-board digital potentiometers and trim D/A converters.

Analog Inputs

The CPCI-DAS4020/12 provides four 12-bit analog inputs. These inputs as well as the trigger input are provided at standard BNC connectors. Each channel on the board offers a 20 MHz maximum sample rate. CompactPCI bus bandwidth limits data transfer to 80 MByte per second. Since each 12-bit sample requires two bytes, the board's total aggregate sample rate is limited to 40 MHz. However, data may be written at full speed into the board's large 64-k Sample buffer memory. The table below shows the data transfer limitations of the board.

Inputs sampled	Sample Rate Each Channel	Total Board Sample rate	Sample duration
1	20 MHz	20 MHz	Continuous
2	20 MHz	40 MHz	Continuous
4	10 MHz	40 MHz	Continuous
4	20 MHz	80 MHz	for 64,000 samples

Software also selects between the ±5 V (2.44 mV resolution) and ±1V (0.488 mV resolution) analog input ranges.

Simultaneous Sampling

Using the CPCI-DAS4020/12's four A/D converters allows you to sample all inputs simultaneously. Channel-to-channel skew normally associated with a multiplexed A/D is not a concern on the CPCI-DAS4020/12.

Trigger & Clock Modes

The CPCI-DAS4020/12 provides great flexibility in allowing you to match your sample timing to your application. Sample rates from 20 MHz to 2 kHz may be based on the board's internal crystal controlled clock or samples may be synchronized to a user supplied clock source.

The board supports both analog and digital input triggers and gates. Triggered or gated sampling may be based on rising edges, falling edges (high or low levels for gated operation) with the analog trigger level set with 2.44 mV resolution within the ±5 V trigger input range.

The CPCI-DAS4020/12 also supports pre-trigger, post-trigger and about trigger modes.

Analog Outputs

The CPCI-DAS4020/12 provides two channels of 12-bit analog output. Software selectable output ranges of ±10 V and ±5 V are provided, and channels may be set at different ranges. The D/A outputsdrive up to ±5 mA, are short circuit protected (25 mA limit) and are cleared to 0 volts on power up or reset. The analog outputs are controlled via programmed I/O commands. On power up or system reset both analog outputs are cleared to 0 volts.

Parallel Digital I/O

The CPCI-DAS4020/12 provides 24 bits of parallel, digital I/O through the 40-pin auxilliary connector. This port is pin compatible with ComputerBoards' popular DIO-24 series boards. The digital I/O is provided in the form of two 8-bit ports, and two 4-bit ports. Each of the ports to be set independently as input or output.

This digital capability is based on the popular 82C55 interface chip. Output drive capability is 2.5 mA at 0.5 Vmax or 2.5 mA at 2.0 Vmin, which provides enough drive for many common interface requirements. For higher drive requirements you may take advantage of the wide variety of boards and products shown in the digital signal conditioning section of this catalog. All ports default to the input state on power up/reset.

Software

All CPCI-DAS4020/12 boards come complete with ComputerBoards' powerful ***Insta*Cal**™ software package. ***Insta*Cal** is a complete installation, calibration and test program for ComputerBoards data acquisition and control boards. Complete with extensive error checking, *Insta*Cal guides you through installation and setup of your data acquisition board, and creates the board configuration file for use by your program or application software package. *Insta*CAL is described in detail within the software section of this website.

Configuring your DAS-Wizard application is extremely easy. In just a few seconds you'll click *Run Task* and your data will be placed directly into your Excel spreadsheet.

The CPCI-DAS4020/12 boards are fully supported by ComputerBoards' powerful Universal Library. Universal Library is a complete set of I/O libraries and drivers for all of our boards, for all Windows based languages. When using the Universal Library you can switch boards or even programming languages and the syntax remains constant. Want to change programming languages? The Universal Library requires no relearning. For details on Universal Library, please refer to the software section of this website.

The CPCI-DAS4020/12 boards are fully supported by a wide variety of applications software packages including SoftWIRE™, DAS-Wizard™, (and DAS-Wizard Pro™), HP VEE®, HP VEE Lab and LabVIEW™. For further details on these, as well as a variety of other software packages, please refer to the software section provided earlier in this website.

CPCI-DAS4020/12 Specifications

Analog input section

Resolution	12 bits
Programmable ranges	±5V, ±1V
Number of channels	4 single-ended, 1 A/D per channel
Coupling	DC
A/D conversion time	40 nS
Input Bandwidth	10 MHz

Maximum Sample Rates

Single Channel	20 MHz continuous
Two Channels	20 MHz continuous*
Four Channels	10 MHz continuous*
	20 MHz for 64 k samples*

**each channel sampled at rate shown*

Data transfer	Via dual 32 kx24 sample FIFO, with Bus-Master DMA, scatter-gather, interrupt, or software polled
Minimum sample rate	2 kHz
Differential Linearity error	±.4 LSB typ, ±1.0 LSB max
Integral Linearity error	±1.0 LSB typ, ±2.5 LSB max
Gain drift	±0.4 ppm/°C
Reference:	±3 ppm/°C max
Zero drift (A/D specs)	±2ppm/°C
Input leakage current	2 uA typ, 10 uA max
Input Impedance	2.5 kilohms or 50 ohms, solder gap selectable
Absolute max input voltage	±15V

A/D Pacer

A/D Pacer	Programmable: Internal counter, External source or software polled
External Pacer Clock Rate	20 MHz max, 1 kHz min Duty Cycle 50% ± 5%

A/D Trigger input

A/D Trigger Sources	Internal software, External Digital or External Analog

Internal Software:

Software commands the start of a scan of conversions

External digital:

Software configurable for rising or falling edge trigger, or high or low level gate. Input is LS TTL compatible

External analog:

Software selectable trigger source can be the EXTATRIG BNC connector or any of the A/D inputs.

Input Range	±5V
Trigger level setting	2.44 mV resolution
Bandwidth	10 MHz
Coupling	DC
Hysteresis:	Programmable
Trigger/Gate Levels	Software configurable for above/ below reference levels or in/out of window

Pre- / Post-trigger:

Circular buffer allows unlimited pre-trigger conversions. 16M post-trigger conversion capability.

Analog Output

Resolution	12 bits
Number of channels	2
Output Range	±10V, ±5 software selectable
D/A pacing	Software paced
Data transfer	Programmed I/O
Offset error	±9mV max
Gain error	±2LSB max
Monotonicity	Guaranteed
D/A Gain drift	±15 ppm/°C max
D/A Bipolar offset drift	±5 ppm/°C max
Throughput	System Dependent
Settling time	5µs max (20V step to ±½LSB)
Slew Rate	7V/µs
Current Drive	±5 mA
Output short-circuit duration	25 mA indefinite
Output coupling	DC
Output impedance	0.5 ohms max
Miscellaneous	Single buffered output latch Update DAC's individually On power-up and reset, both DAC's cleared to 0 volts

Digital Input / Output

Connector type	40-pin connector header
I/O ports	24
Configuration	2 banks of 8, 2 banks of 4, 8255 Mode 0 emulation
Input Device	74LS373
Output Device	74S244
Output High	2.4 volts min @ -15mA
Output Low	0.5 volts max @ 64 mA
Input High	2.0 volts min, 7 volts abs. max
Input Low	0.8 volts max, -0.5 volts abs. min
Power-up / reset state	Input mode (high impedance)
Interrupts	INTA# - mapped to IRQn via cPCI BIOS at boot-time
Interrupt enable	Software programmable or External enable provided at AUX connector.
Interrupt sources	External, internal FIFO status

Crystal oscillator

Frequency	40 MHz
Frequency accuracy	±50 ppm
Dutu cycle	50%

Power consumption

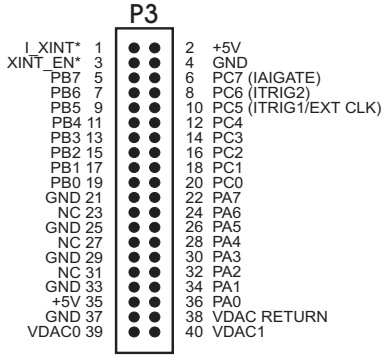
+5V	3.1 A typical, 3.6 A max

Environmental

Operating temperature range	0 to 70 °C
Storage temperature range	-40 to 100 °C
Humidity	0 to 90% non-condensing

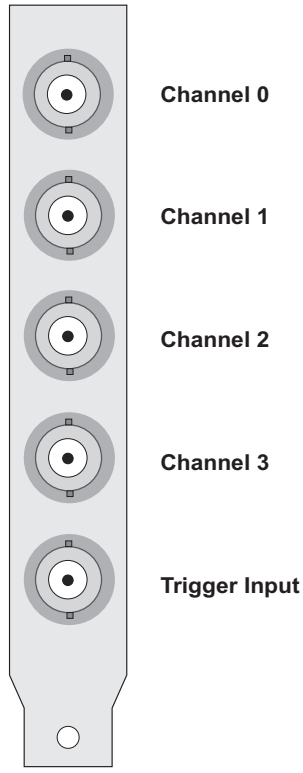
I/O Connector & Cables

All analog input signals and the analog trigger/gate signal are connected through standard BNC connectors. The digital I/O connections as well as the digital control signals are available on the auxilliary 40-pin header. The 40-pin header is compatible with the CFF40-x series cable. Users wishing to interface the board to DIO24 compatible digital signal conditioning products should use either the C4037F-2 cable or the BP40-37 adaptor. Note that since the 40-37 series interconnects to not connect to pins 38-40, the analog output pins are not available on the 37 pin connector.



*PINS 1 & 3 HAVE 10K PULL-UP RESISTORS INSTALLED.

PCI-DAS4020/12 Connector Diagram



View from rear of the PC.

Auto-Calibration / Self-Calibration

In keeping with general plug-and-play standards, the CPCI-DAS4020/12 boards have no switches, jumpers or potentiometers. *Auto-calibration* is performed with digital potentiometers and/or trim D/A converters. Unlike some boards that use software lookup tables for post-acquisition error correction, the PCI-DAS1200 boards' data is accurate when written into your computer's memory.

The calibration factors that control the digital trim components are stored in EEROM on the board. You can remove the board from one computer, install it in another, and it will still provide calibrated data.

In addition to being auto-calibrating, the CPCI-DAS4020/12 boards are also self calibrating. Standard calibration techniques require a channel to be calibrated with zero volts input (offset calibration) and with a known input voltage (gain calibration). The PCI-DAS4020/12 provides on-board circuitry that will short the inputs allowing offset calibration, and then connect the inputs to an ultra-stable, on-board voltage reference for the gain calibration. A complete PCI-DAS4020/12 calibration is as simple as issuing a single software command.

Ordering Guide

CPCI-DAS4020/12	4-channel, 20MHz, 12-bit A/D, D/A & digital I/O board for CPCI-bus computers.