64 Channel Simultaneous 24 bit Digitizer ACQ164CPCI

ACQ164CPCI Digitizer Board Specification

64 Channels Simultaneous Input
24bit Sigma-Delta converter per channel, output rate 128kS/s/channel
SD converter optimised to allow high precision industrial measurement with excellent ac and dc specifications.
Usable signal bandwidth to 90% of Nyquist.
Differential input with high order digital filter.
6U CPCI format Data Acquisition Board. Single slot width 4HP.
Intelligent module with capable of networked operation.
Flexible Digital I/O Subsystem
Support for multiple board sync, with front panel clock and trigger routing.
Integrated Gigabit Ethernet, output to front panel.
400MHz Intel XScale Microprocessor, 1 gigabyte sample memory
Embedded Linux operating system.

Description

ACQ164CPCI is a high performance multi-channel card aimed at phased array sonar, 3D seismic and system test applications. The board samples 64 input channels simultaneously with 24 bit resolution at speeds up to 128 kS/s (kilo-samples per second) per channel sustained capture to memory or streamed to gigabit Ethernet.

Differential Analog Front End.

Fully differential over-voltage protected analog front end, fixed range +/-10 input. Two high density SCSI-68 connectors are used to route input signals in a compact and economical way. The input pin-out is compatible with D-TACQ BNCPANEL, LEMOPANEL, SMAPANEL.

High Performance, Low Power Silicon.

ACQ164CPCI features new multi-channel, low power ADC devices from TI. The device combines high dynamic range audio performance with class leading DC accuracy, making ACQ164CPCI suitable for both audio and control applications.

Simultaneous Channels, Boards, Systems

ADC per channel architecture guarantees simultaneity between channels. Multiple cards in the same rack can sample simultaneously thanks to plug-in front panel synchronisation bus, and multiple chassis can be synchronised by sharing common sync input on the front panel External Clock and External Trigger inputs.

System on a Board Concept

ACQ164CPCI continues the D-TACQ Intelligent Data Acquisition concept by including a low cost by high performance micro computer system on the board itself. The card includes an extremely low jitter PLL clock source for best possible SNR, and extreme care was taken to ensure best possible channel to channel crosstalk.

Gigabit Ethernet On Board

Integrated Gigabit Ethernet with connection to front panel - the board can operate as an economical standalone networked appliance. The board uses the CPCI backplane for power and ground only, so it can either be simply retrofitted to an existing CPCI system with no effect on the existing memory map, or economical standalone systems can be created using a low cost CPCI chassis.

Software System Support

As a networked appliance ACQ164CPCI may be controlled via standard TCP/IP networking via a published interface. No device driver required!

Applications

Precision control systems
Power Supply monitoring
Automatic Test Equipment
Sonar Systems.
Aerospace Testing.
Vibration Monitoring
Seismic sensing.

Part Number	Channels	Max Sample Rates	Comment
ACQ164CPCI	64	64c x 128kS/s/channel	2 pole anti alias filter standard.
ACQ164CPCI-32	32	32c x 128kS/s/channel	2 pole anti alias filter standard.

Analog Input Performance (Typical)

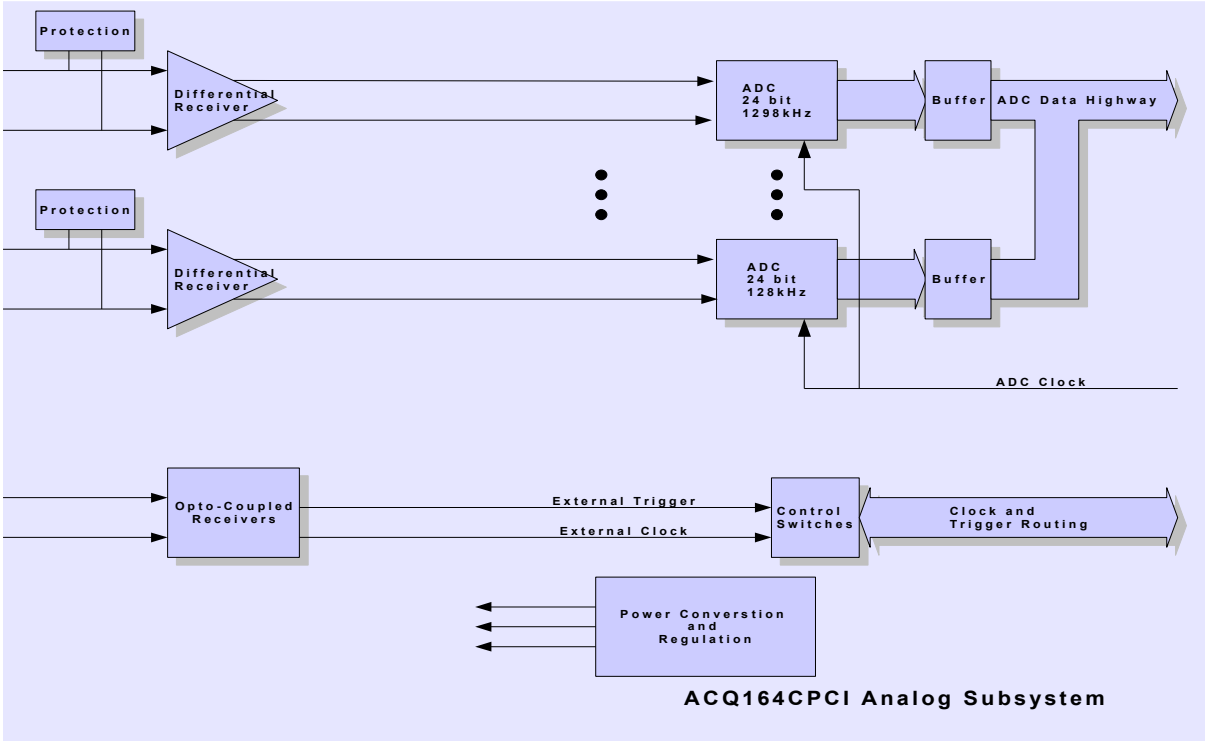
	High Speed	***High Resolution***
Number Of Channels	64/32	
Sample Rate	128 kSPS/channel	52 kSPS/channel
Resolution	24 bits	
Coupling	DC, Differential Input	
Sampling	Simultaneous	
Input Impedance	20kΩ common mode, 1 MΩ to 0V	
Voltage Range	±10V default ±5V, ±2.5V (factory fit options)	
Common Mode Range	±13V	
Input Voltage Withstand	±30V	
Offset Error	DAC Offset trim to 0.01% FS [2]	
Gain Error	Numerical adjust to 0.01% FS [3]	
INL	±0.002% FS	
CMRR	>60dB FS @ 1 kHz	
THD	-106 dB [1]	
SFDR	107 dBc [1]	
SNR	104 dB [1]	108 dB [1]
Analog Input BW (-3dB)	80 kHz	
Digital Filter Characteristics	Pass Band = 0.453 FSAMPLE -3dB = 0.49 FSAMPLE Stop Band = 0.547 FSAMPLE Stop Band Attenuation = 95dB	
Crosstalk (3 dB)	<90 dB @ 1 kHz FS Input	
Digital I/O		
External Clock, Trigger Signals	Front Panel Lemos - 2 lines Backplane PXI - 6 lines	
External Clock Input Rate	Minimum Clock Input = 600kHz Maximum Clock Input = 20 MHz [4]	
Switching Characteristics	TTL - Opto-Coupled	
Sample Clock Rate	Derived from internal or external clock source, clock multiplier is programmable, output rate controllable in 8Hz steps.	
High Time for Trigger	100 nS min	
Low Time for Trigger	100 nS min	

[1] : Typical values measured at full scale with a 9.76kHz input.
[2] : via hardware offset DAC set by calibration table
[3] : via post processing numerical adjust using on-board calibration table
[4] : Input to clock multiplier, allows Sample Rate range 9..128 kHz.

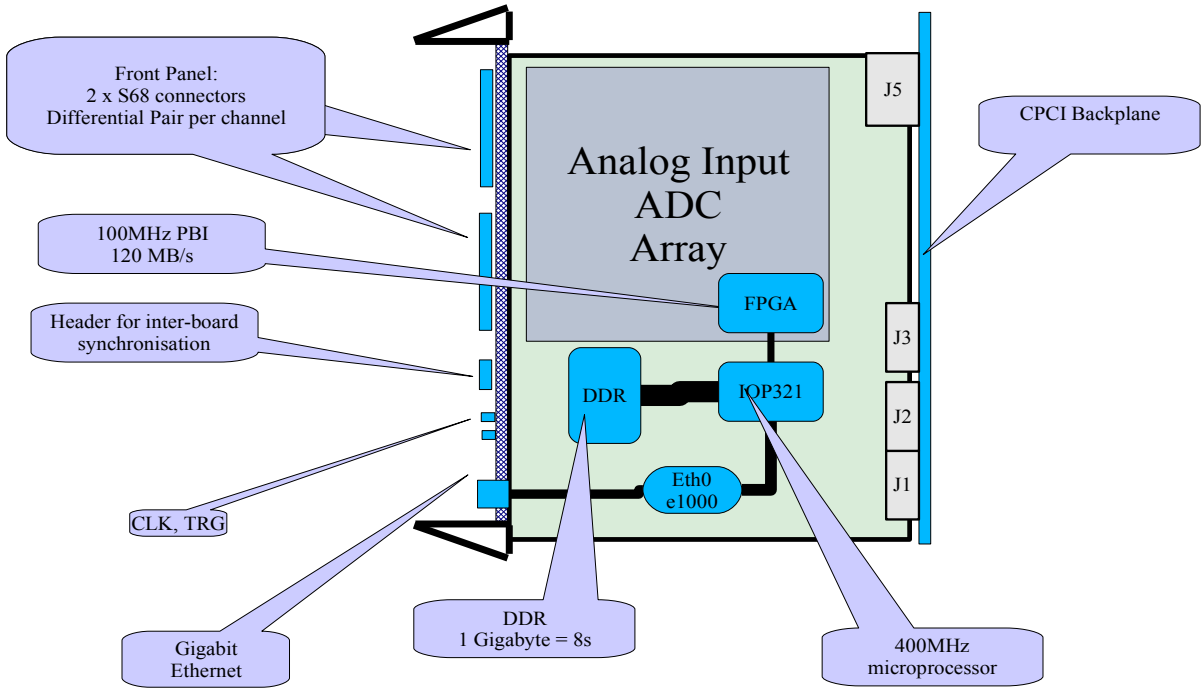
Embedded Computer Subsystem

Processor	IOP321 Intel XScale Series I/O Processor , 600MHz clock.
FLASH	16 megabyte + 16 megabyte.
SDRAM	Standard 200 pin DDRSDRAM SODIMM socket for up to 1 gigabyte of memory
Internal PCI Interface	64 bit 33 MHz
Gigabit Ethernet	RJ45 on front panel. Allows standalone operation, remote control and data upload.
Clock Synthesiser	On Board PLL Clock for creation of sample clock from External or Internal Clock source, output 0.6..40MHz with ~1kHz resolution. Clock Jitter <10ps
RS232 UART	Console function via header.

Analog Input Block Diagram.



Physical Layout Concept:



Main Operating Modes

The following paragraphs discuss many of the functions and features of the ACQ164CPCI board. For a complete discussion on the system capabilities please consult www.D−TACQ.com.

Standard Pre / Post Capture Modes

Digital and Analog threshold and edge triggers.
The transient memory is arranged in a circular buffer with data constantly being acquired until the trigger event. Full flexibility of specification of pre-trigger and post trigger data lengths are available for any length up to the limit of available memory.

Generalised Phase Event Mode for maximum flexibility

This allows the user to select a trigger event that is either
A Digital Event or a Software Event
Either Rising or Falling Edge Digital Event
The user sets up a particular event that initiates the pre-trigger phase, then selects another (or the same) event to move to the post trigger phase. This provides maximum functionality in the data acquisition process including support for initial synchronisation events and for “Gated” trigger behaviour in addition to “Edge” trigger behaviour

Sub-Sample Streaming Mode

In this mode the board acquires data to a circular buffer as per the Standard Modes but here a sub-sample of the data is passed to the host in real time to allow the host to monitor real time data. This is especially useful for mixed control/diagnostic applications and for more complex “post mortem” evaluation when the decision to move to post capture is determined by the host.

High Throughput Streaming

High Throughput Streaming is available directly over the local Ethernet or CPCI backplane.

In system upgrade

The main logic functions are contained in a FPGA (Field Programmable Gate Array) this is loaded by the Microprocessor at power up from the on-board FLASH Memory. The Microprocessor code is also stored in the FLASH Memory. D−TACQ provides utilities for field upgrade of these FLASH programs allowing feature enhancement to be made in the field without a return to base.

Customisation Potential

Most of the main functions of the ACQ164CPCI can be FLASH upgraded in the field; this allows D−TACQ to produce custom enhancements to the board at low cost without extensive NRE development. Potential areas of enhancement are Real Time signal processing with powerful microprocessor / Xilinx co-processor combination, and fast on-board control loops. Please contact D−TACQ if your application requires functionality that is not currently available.

MDSplus, EPICS, SOAP Web Service on board

ACQ164CPCI supports the MDSplus data archive system, the EPICS distributed control systems and the universal connectivity of Web Services with on-board firmware, making for simplified networked system integration, independent of site OS choices.

EPICS Application: Power Supply Monitoring : The acquisition system runs continuous at high rate (128kSPS) to local memory. The local EPICS IOC continuously exports a low-rate filtered version of the data as a PV per channel. A digital trigger causes the capture to stop, and then the IOC updates Waveform records with the full rate pre- trigger and post trigger data. During the capture, the IOC is capable of running AWG waveforms on a associated AO32CPCI card(s), and controlling DIO's on associated slave DIO card(s).

Web Services make it simple to connect, control and monitor the card remotely from any remote OS.

Example System Configuration:

1U CPCI chassis, 2 slot, 2 x ACQ164CPCI, 128 channels in networked appliance mode.

D−TACQ Solutions Ltd.
James Watt Building, Scottish Enterprise Technology Park, East Kilbride, Scotland,
G75 0QD United Kingdom.
Tel: +44 1355-272511 Fax: +44 0870-0560474, Email: info@D−TACQ.co.uk
Website: - www.D−TACQ.com