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# Reconfigurable Signal Analyzer Platforms

acqiris

## ■ AC240

8-bit
1 GHz
2 GS/s

## ■ AC210

8-bit
1 GHz
1 GS/s




**XL***Fidelity*
**Jet***Speed*
Technology

**DPU Ctrl²**

**ASBus**
Auto Synchro Bus

**Ctrl I/O**

**Data Processing Unit**

## Main Features

- **On-board reconfigurable data processing unit (DPU) for real-time operations**
- **Front-panel digital I/O connectors for real-time data processing control (DPU Ctrl²)**
- **1 GHz analog bandwidth in all FS ranges**
- **1 GS/s synchronous dual-channel (AC240) and single-channel (AC210) data acquisition with independent gain and offset on each channel**
- **Interleaved single-channel mode (AC240) on either input, software selectable, providing up to 2 GS/s sampling rate**
- **Multipurpose I/O connectors for trigger, clock, reference and status control signals (Ctrl I/O)**
- **Optional external processing memory providing 512 MB of SDRAM and 1 MB dual-port SRAM**
- **Modular, 6U CompactPCI standard (PXI compliant)**
- **Fully-featured 50 Ω mezzanine front-end design with internal calibration and input protection**
- **High-speed PCI bus for data transfer to host PC at sustained rates up to 100 MB/s**
- **Device drivers for Windows, Wind River VxWorks and Linux**
- **Auto-install software with application code examples for C/C++, Visual Basic, Lab VIEW and LabWindows/CVI**

## Reconfigurable Platforms for Real-Time Analysis

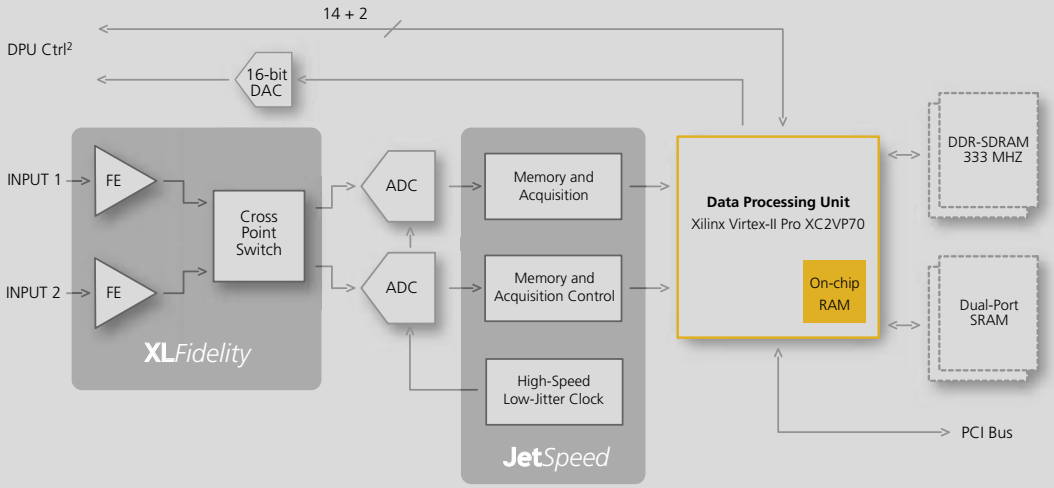



**Data Processing Unit**

### Reconfigurable On-the-Fly Processing

The AC240 and AC210 analyzer platforms are dual- and single-channel 6U CompactPCI®/PXI™ digitizers with on-board real-time data processing. Incorporating Acqiris' proprietary **XL***Fidelity* and **Jet***Speed* ADC chipsets, the platforms are designed to cover requirements encountered in real-time applications. These analyzers are particularly suited when direct sampling techniques are used and when signals must be sampled with high rates of up to 2 GS/s and an analog bandwidth of up to 1 GHz.

Each channel provides a high-speed digitizer and a separate reconfigurable Data Processing Unit (DPU) using the latest FPGA technology, which allows the analyzer platform to be easily reconfigured to perform a variety of **user defined** on-board real-time signal processing on the digitized signal. The on-board FPGA is capable of executing multiplications in less than 5 ns and offers more than 74,000 logic cells, up to 7 Mbits of on-chip RAM, and 328 dedicated 18-bit x 18-bit multipliers with 36-bit results.





DPU Ctrl²

### Extended Real-Time Data Processing Unit Control

DPU Ctrl² provides several front-panel connectors for real-time control of the DPU. The function of these connectors and LEDs is user defined through the implemented firmware.

- Two front-panel digital I/O MMCX-type connectors (I/O P1 & P2) are dedicated to the direct control of the data processing unit.
- A third MMCX front-panel coaxial connector (ANL Out) is the output of a 16-bit on-board DAC. This analog signal can be used in simple control systems.
- Two LEDs (L1 & L2) provide a visual reference.
- A front-panel µDB-15 connector (I/O EXT) provides fourteen bi-directional direct lines to the DPU, used as seven differential pairs.

### Dual-Channel Performance with Interleave

- AC240 offers dual-channel synchronicity for I/Q acquisitions with up to 1 GS/s sample rate. Interleaved single-channel mode up to 2 GS/s sample rate on either input is software selectable.
- AC210 provides a single input channel with 1 GS/s sample rate.



Ctrl I/O

### Trigger Mezzanine with I/O Ports

The trigger mezzanine includes the **XL***Fidelity* FEA102 front-end amplifier chip. The trigger processing circuit embedded in the package includes dual comparators for window triggering mode, on chip DACs for threshold adjustment, additional filters for LF and HF reject trigger coupling and a prescaler to allow a HF divide by 4 mode.

The trigger mezzanine provides access to the circuit via a standard 50 Ω terminated BNC connector and Ctrl I/O. These four front-panel MMCX connectors provide access for an external clock or 10 MHz reference signal, a trigger output and two additional I/O digital control lines (I/O A & B) for monitoring or modifying the digitizer's status and configuration or to extract a 10 MHz clock signal.



ASBus

### Auto-Synchronous Bus System

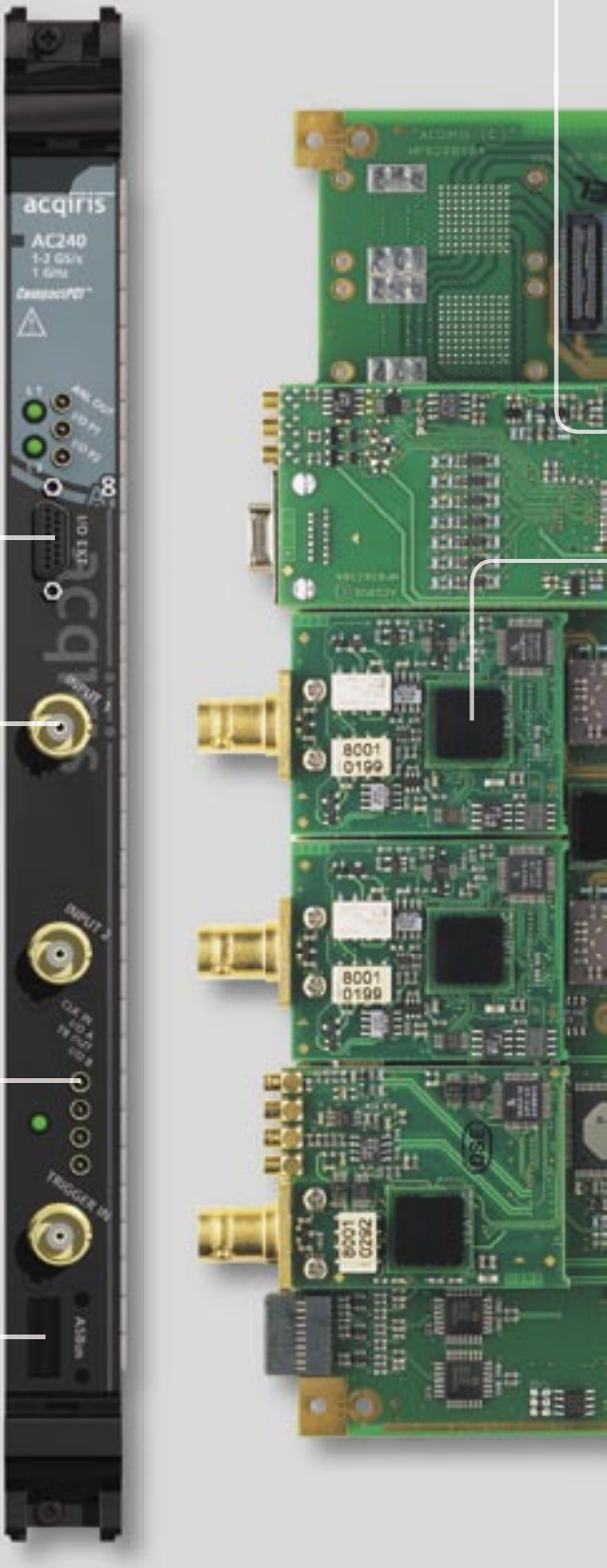
If more than two data acquisition channels are required several analyzer platforms can be combined using Acqiris' ASBus, a proprietary high-bandwidth auto-synchronous bus system. This vital tool takes care of the distribution of all necessary trigger and clock signals, to the **Jet***Speed* COS101 clock circuit.



Data Processing Unit

### Reconfigurable, On-the-Fly Processing

- On-board reconfigurable Data Processing Unit (DPU Xilinx Virtex II Pro) for real-time operations.
- The DPU is easily and quickly reconfigurable using Acqiris-supplied drivers to reload firmware under program control.

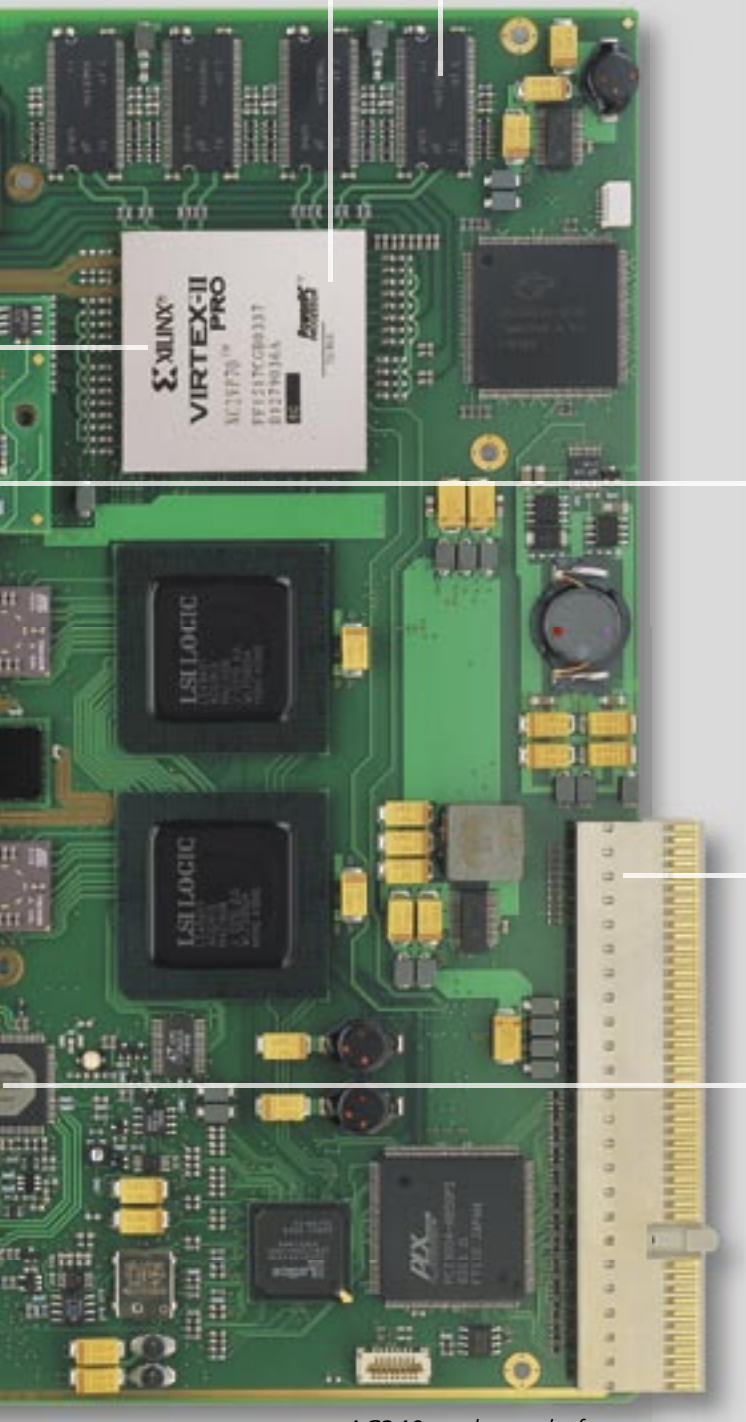


### Built-in Processing Memory

> 7 Mbits of on-chip RAM are available to the user for custom real-time algorithms.

### External Processing Memory

> Optional external processing memory providing 512 MB of DDR-SDRAM 333 MHz and 1 MB of dual-port SRAM with a read/write throughput of up to 2 GB/s to and from the DPU.




*AC240 analyzer platform.*

### GHz BW Front End with 50 mV – 5 V FS

The analyzer's channel inputs feature the **XL***Fidelity* front-end amplifier chip, FEA102. This circuit includes a programmable gain amplifier (PGA) with on-chip filtering and trigger circuitry. It provides pre-ADC signal conditioning and amplification, essential for high performance high-speed data conversion systems.

The PGA provides four global gain settings: 1.0, 2.0, 5 and 10. The filter section, which is useful for signal noise reduction, allows 2-pole Bessel bandwidth limiting at 700 MHz and 200 MHz and a single-pole filter at 20 MHz.

### High Data Throughput

The AC240/AC210 analyzer platforms can be easily integrated into any standard 6U CompactPCI or PXI chassis.

The platforms are designed to take advantage of the high-speed PCI bus connection. Processed digitized data can be transferred, in DMA mode, directly to the host PC over the bus at sustained rates of up to 100 MB/s.

### Precision Time Base

The Acqiris **Jet***Speed* COS101 crystal-controlled precision time base drives the data conversion on both channels and sample rates can be selected in a 1, 2, 2.5, 4 and 5 sequence, from 100 S/s to 2 GS/s (1 GS/s with the AC210).

In digitizer mode an internal Time-to-Digital Converter (TDC) allows accurate positioning (5 ps resolution) of the trigger signal with respect to the internal clock (sampling time).

The sample rate can also be generated externally, using the dedicated CLK IN connector, for applications where the sample rate must be synchronized with the device generating the signal.

# Reconfigurable Signal Analyzer Platforms

# Model AC240

**Dual-channel, 8-bit, 1 GHz, 1-2 GS/s, CompactPCI/PXI Analyzer Platform**

# Model AC210

**Single-channel, 8-bit, 1 GHz, 1 GS/s, CompactPCI/PXI Analyzer Platform**

## Signal Input

**Bandwidth (-3 dB)**
DC to 1 GHz, guaranteed

**Bandwidth Limit Filters**
700 MHz, 200 MHz and 20 MHz

**Full Scale (FS)**
50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V and 5 V

**VSWR (typical)**
< 1.25 from DC to 1 GHz

**Channels**
AC240: two @ 1 GS/s or one @ 2 GS/s
AC210: one @ 1 GS/s

**Offset Range**
±2 V from 50 to 500 mV FS
±5 V from 1 to 5 V FS

**Connectors**
BNC, gold-plated

**Coupling**
DC, AC, or ground coupling

**Maximum Input Voltage**
±5 V DC

**Impedance**
50 Ω ± 1% @ DC

## Digital Conversion

**Sample Rate**
AC240: 100 S/s to 2 GS/s
AC210: 100 S/s to 1 GS/s
In 1, 2, 2.5, 4 and 5 sequence

**Resolution**
8 bits (1:256)

**Differential Nonlinearity**
±0.8 LSB

**Integral Nonlinearity**
< ±1% of FS

**DC Accuracy**
< ±2.0% of FS at 0 V offset
±1% of FS typical

**Effective Bits (typical)**
7.0 @ 10 MHz, 1 GS/s
6.7 @ 100 MHz, 1 GS/s

**SFDR (typical)**
> 55 dB @ 10 MHz
> 40 dB @ 400 MHz

## Clock or Reference Input

**Input Amplitude**
> 500 mV pk-pk into 50 Ω

**Connector**
MMCX, gold-plated

**Ext. Clock/Ref. Threshold**
Variable between -2 V and +2 V

**Maximum Input Voltage**
±2 V DC

**Ext. Reference Frequency**
[9.0, 10.2] MHz

**Ext. Clock Frequency**
From 10 MHz to 2 GHz

A high-speed front-panel bus (ASBus) distributes clock and trigger to synchronize multiple modules.

## Time Base

**Clock Accuracy**
Better than ±2 ppm

**Trigger Time Interpolator**
5 ps resolution (digitizer mode)

**Sampling Jitter**
< 1 ps RMS
(for 10 µs record length)

**Acquisition Modes**
**Digitizer**
Single shot, Sequence

**Analyzer**
Streaming to DPU

## Trigger (Internal and External, Digitizer Mode)

**Internal Trigger Input**
Threshold adjust range:
same as vertical FSR

Sensitivity: up to full BW
for > 15% FSR pk-pk signals

**External Trigger Input**
BNC, gold-plated
Impedance: 50 Ω ±1 %
Threshold adjust range:
[-FS/2,+FS/2] for FS = 0.5, 1, 2, 5 V

Maximum input voltage: ±5 V DC

Sensitivity: up to full BW for > 10% FSR pk-pk signals

**Coupling**
DC
AC (50 Hz LFReject)
HFReject (50 kHz)

**Modes**
Edge, positive and negative, Window,
HF: divide by 4

## Trigger Output [1]

**Output Level**
Adjustable in range ±2.5 V (no load)
Amplitude ±0.8 V (no load)
15 mA max.

**Rise/Fall Time**
2.5 ns

**Connector**
MMCX, gold-plated

**Coupling**
DC

**Output Impedance**
50 Ω

## Control I/O (A & B) [1]

**Connectors**
2x MMCX, gold-plated

**Input**
Trigger enable

**Signals**
TTL & CMOS compatible (3.3 V)

**Output**
10 MHz reference clock
Acquisition skipping to next segment
Acquisition active
Trigger ready

[1] Contact Acqiris for details on the implementation of these signals using DPU firmware.

## Data Processing Unit and Control Signals

**DPU**
Xilinx Virtex-II Pro XC2VP70-6

**DPU Ctrl2 Signals**
TTL & CMOS compatible (3.3 V)
through I/O P1 & P2 (MMCX)
LVDS & LVPECL (2.5 V)
through I/O EXT (µDB-15)

**Analog Output Signal**
-5 to +5 V (settling time, 1 µs typical)
through ANL Out (MMCX)

**DPU Ctrl Connectors**
2x MMCX, gold-plated
1x µDB-15 (additional processing I/Os)

**DPU Processing Memory** [2]
Up to 7 Mbits on-chip RAM
Optional 512 MB DDR-SDRAM
333 MHz & 1 MB dual-port SRAM

[2] Available data point capacity of processing memory varies depending on data handling by the applied firmware.

## PC System Requirements

**Processor**
150 MHz Pentium (or higher)

**Operating System**
Windows 95/98/NT4/2000/XP
Wind River VxWorks or Linux

**CD Drive**

**Memory**
64 MB RAM (more is recommended when working with several cards with large memories)

**Hard Drive Space**
20 MB minimum

## Environmental and Physical

**Operating Temperature**
0° to 40°C

**Required Airflow**
> 2 m/s in situ

**Relative Humidity** [3]
5 to 95% (non-condensing)

**EMC Immunity**
Complies with EN61326-1
Industrial Environment

**Dimensions**
6U CompactPCI/PXI standard
233 mm x 160 mm x 20 mm

Front panel complies with IEEE1101.10

CE Certification and Compliance

**Shock** [3]
30 G, half-sine pulse

**Vibration** [3]
5 – 500 Hz, random

**Safety**
Complies with EN61010-1

**EMC Emissions**
Complies with EN61326-1 Class A for radiated emissions

[3] As defined by MIL-PRF-28800F Class 3.

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