

# DC270

250 MHz  
1 GS/s

# DC265

150 MHz  
500 MS/s



Modular Quad-Channel  
CompactPCI Digitizers  
with Oscilloscope  
Characteristics



## Main Features

- **1 GS/s Sampling Rate (DC270) simultaneously on all four channels, 500 MS/s (DC265)**
- **250 MHz Bandwidth (DC270), 150 MHz (DC265)**
- **50  $\Omega$  and 1 M $\Omega$  Input Impedance**
- **128 kpoints Acquisition Memory per Channel (1 or 2 Mpoints Optional)**
- **Up to 28 Channels in One Crate**
- **Memory Battery Backup Option**
- **Full Front-end Amplification with Internal Calibration**
- **Mezzanine Front-end with Input Protection**
- **Complete Pre and Post Triggering**
- **Low Dead-Time (<500 ns) Sequential Recording with Time Stamps**
- **Built-In High Resolution Trigger Time Interpolator (TTI) for Accurate Timing Measurements**
- **1 GHz Auto-Synchronization-Bus (ASBus) for Trigger and Clock Signal Distribution**
- **Modular, 6U CompactPCI**
- **Low Power (<40 W)**
- **Very high data transfer rate to host PC**
- **National Instruments LabVIEW and LabWindows/CVI Drivers**

## High-Density Multi-Channel Waveform Recording

**More per Module** - The Model DC270 and DC265 Digitizers provide a cost-effective solution for high-speed multi-channel data acquisition applications. The digitizers feature four independent channel inputs. The DC270 offers top of the range performance with each channel delivering 1 GS/s sampling rates, 250 MHz wide bandwidth and 128 kpoints long acquisition memories (optional to 2 Mpoints). The DC265 offers a lower cost alternative with 500 MS/s sampling rates, 150 MHz bandwidth and 128kpoints memories (optional to 1 Mpoints). Both digitizers are packaged in a single 6U CompactPCI module (measuring just 233 mm by 160 mm) that provides a breakthrough in size, density and power consumption.

**Up to 28 Channels in One Crate** – The high-density design of the DC270 and DC265 allows the modules to be used in a variety of systems where the user needs from four to hundreds of channels of high-speed data acquisition. For example, a single 6U CompactPCI 8 slots crate (Model CC108) can house up to seven modules (plus a PC interface) to make a 28 channel bench-top data acquisition system. The low power consumption of the digitizers (typically < 40 W per module) results in a 28-channel system that uses comparable power to most high-end 4 channel digital oscilloscopes. Furthermore, for high-density rack mounted applications multiple crates can be daisy-chained together. This makes it possible to build systems containing hundreds of channels of data acquisition that are totally controlled over a single bus!

The Model DC270 and DC265 include Acqiris' ASBus, a proprietary high bandwidth auto-synchronous bus system. In multi-channel applications, ASBus is a vital tool that takes care of the distribution of all necessary trigger and clock

signals. The system improves trigger flexibility by allowing any module's input to be used as the trigger source for all the digitizers. For synchronous data acquisition, ASBus allows all the digitizers to be clocked at precisely the same time. Synchronous digitizing improves the accuracy of cross-channel measurements and is essential for accurate time correlation. The ASBus can also be used to phase-synchronize all the digitizers to an external standard (such as a 10 MHz reference).

**PC Control and Convenience** – Using a DC270 or DC265 Digitizer is just like driving a familiar digital oscilloscope. Windows based software allows adjustment of the key acquisition settings such as time-base, trigger and sensitivity while state-of-the-art front-end electronics allow high fidelity recording with full control over features such as input impedance, coupling, gain and offset. Data recorded by the digitizer can be transferred directly to a host PC at rates up to 100 Mbytes/s. Combining the fast transfer rates with today's most powerful PC processors makes it possible to perform measurements and calculations hundreds of times faster than with conventional instruments.

You can also store hundreds of waveforms directly on the PC's hard disc or make hard copies instantly on your printer. Archiving important waveforms has never been easier. Furthermore, you can interface directly to your desktop PC and use the Internet (or a local network) to send important information to others anywhere and at anytime. The result is flexibility and performance that can dramatically reduce testing times, increase measurement throughput and lower overall cost. The Model DC270 and DC265 are the instruments of choice for multi-channel applications in

Telecommunications, Magnetic Media, Automotive, Chemistry, Computing, Ultrasonics, Mechanics, Physics, Military, Explosive-Weapons and Ballistic Testing.

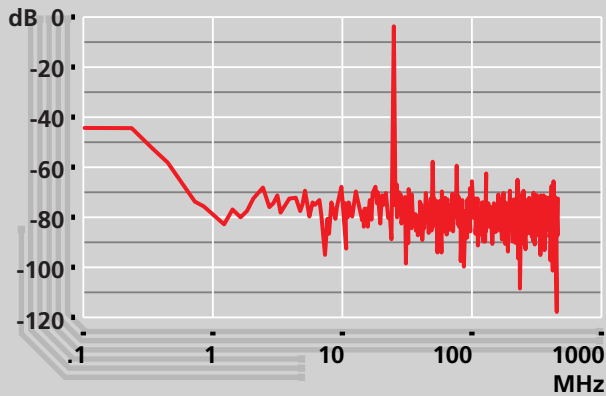
**Precision Acquisition** - The fast sampling rates of the DC270 and DC265 ensure the accurate capture of signals with frequencies up to the full bandwidth of each instrument. Waveforms are stored directly into the digitizer's large acquisition memories so that complex signals can be stored over very long periods of time. Large memories are essential for maintaining fast sampling rates and therefore timing resolution. For example, a Model

DC270 with 2 Mpoints of memory can record a signal over a 2 ms period with a sampling rate of 1 GS/s (1 ns per point). The fast sampling rate ensures all high frequency signal components, up to the full 250 MHz bandwidth of the digitizer, are accurately recorded. If the memory was reduced to 20 kpoints the sampling rate would have to fall to just 10 MS/s (20,000 points / 2 ms). Frequencies above 5 MHz would then be incorrectly digitized and important events may be missed completely. The Model DC270 and DC265 digitizers both deliver high-speed performance without having to compromise on acquisition memory.

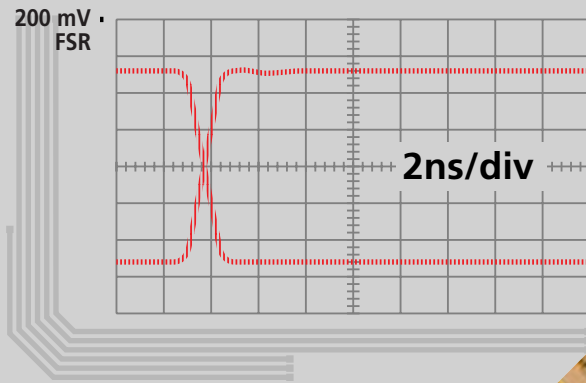
## High Fidelity Measurements

**Quality Acquisitions** - Acqiris digitizers are designed to provide superior measurement precision and accuracy. Key acquisition specifications (such as DC accuracy, integral and differential linearity) are optimized to deliver maximum measurement fidelity. Careful circuit layout, custom IC's and special packaging techniques are all used to reduce overall system noise.

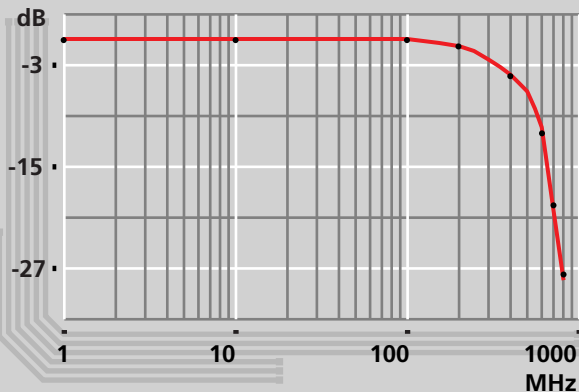
The low noise and low harmonic distortion are best demonstrated by the following Fourier Transform performed on an acquired signal. Other important qualities of the digitizer are demonstrated by its "low-overshoot" step response, flat frequency response and high effective bit score. The following figures depict typical measurements.



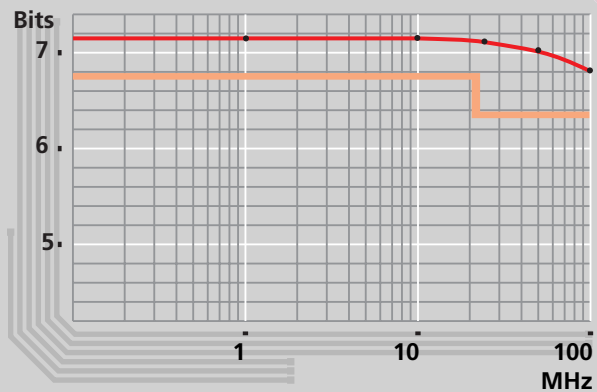
FFT analysis of a pure 25MHz sinewave, measured at 500 mV full scale, shows very low noise floor and little harmonic distortion



Positive and negative step responses show little or no overshoot or undershoot



Frequency response is very flat and system bandwidth reaches well beyond the specified 250 MHz



Effective bits (top graph) are significantly higher than the minimum guaranteed performance (bottom graph)

## Scope Like Characteristics: Amplifier, Trigger and Time Base

**Mezzanine Front-end** – Each channel input of the digitizers has programmable front-end electronics that provides a complete set of input voltage ranges (from 50 mV to 5 V full scale in a 1, 2, 5 sequence) and variable voltage offset. The inputs have selectable impedance (50  $\Omega$  or 1 M $\Omega$ ) and are fully protected against over-voltage signals. The amplifiers feature internal calibration (no need to disconnect input signals) and very fast recovery from out-of-range signals. The input buffer is mounted on a removable mezzanine card so, in the event of accidental damage or as components fatigue over time (e.g. relays in high duty cycle automated testing applications), replacement is fast and efficient.

**Flexible Trigger** - The digitizers include a precision trigger system with full pre and post trigger adjustment. User selectable coupling is combined with internal or external trigger sources for maximum flexibility. The digitizers also provide a sophisticated sequential trigger mode with less than 500 ns dead time between successive triggers. This extremely low dead time enables events, which may occur at very high repetition rates, to be captured and stored in their correct arrival sequence.

## High Reliability

**Low Parts Count** - A very high degree of integration is needed in order to achieve the level of performance obtained with the Model DC270 and DC265 digitizers. By drastically reducing the number of components the integration has clear benefits on reliability and lowers total power consumption. To maintain quality measurements the

This trigger mode is perfect for “impulse-response” type applications (RADAR, SONAR, LIDAR, Time-of-Flight, Ultrasonic, Medical & Biomedical research, etc.). The sequential trigger mode and very low dead time greatly extend the digitizers timing range and resolution. Each event can be individually time stamped and relative time measurements (between events) can be made with less than 1 ns resolution.

**Precision Time Base** - Each digitizer also has its own crystal-controlled precision time base and sample rates can be selected, in a 1, 2, 2.5, 4, 5 sequence, from 100 S/s to 1 GS/s (500 MS/s for the DC265). An internal Trigger Time Interpolator (TTI) with high timing resolution (5ps) is used to assist with timing calibration and trigger positioning. The TTI permits accurate positioning of the trigger signal with respect to the internal clock (sampling time). The sample rate can also be generated externally, using the external input connector, for applications where the sample rate must be synchronized with the signal to be acquired.

digitizers also use a proprietary-cooling scheme. This cooling method allows components to run at safe and stable operating temperatures. It helps to extend component life as well as minimizing measurement errors caused by temperature variation.

## Ease of Installation, Ease of Use

Installing and operating your data acquisition system is easy thanks to “Plug&Play” modularity and Windows based installation software (on CD). Just insert the CD in your PC's drive, run the installation program, and power down and install the digitizers.

Installation problems are quickly resolved using Acqiris' diagnostic tool-set and on-line help. Run AcqirisLive, a complimentary digitizer control and waveform display software package, and start making acquisitions immediately. Now you can leverage the power of your PC to perform rapid data analysis without paying the overhead costs associated with GPIB based stand-alone test instruments.

The installation and operation of the Model DC270 and DC265 is supported by the following software components:

- An automatic installation program (on CD) for the software components listed below

- Plug&Play drivers for Windows 95/98/NT4, capable of managing several digitizers simultaneously. The drivers work with Visual C++ as well as Visual BASIC.
- Drivers for National Instruments' LabView and LabWindows/CVI environments
- AcqirisLive, which permits the interactive operation of the digitizers 'right-out-of-the-box'. Data files can be stored in ASCII or binary format for convenient use in spreadsheet programs such as Excel

**Getting Started** - Acqiris also supplies simple application examples in source code as a starting-point for application-specific developments in C/C++ or Visual BASIC, as well as with test environment such as LabWindows/CVI and LabView. The software drivers make system integration fast and affordable. Acqiris data acquisition systems are ideal in applications (laboratory or production) where low cost and high-speed measurements are required.

# DC270 Waveform Digitizer

250 MHz, 8 bit, 1 GS/s, 128 kpoints or 2 Mpoints, Quad Channel

## Signal Input

### Bandwidth

DC to 250 MHz (-3 dB)

### Full Scale Range (FSR)

50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V and 5 V

### Impedance

1 M $\Omega$ /10 pF; 50  $\Omega$   $\pm$ 1%

### Connector

Gold plated BNC

### Offset

$\pm$ 2 V below 500 mV FSR and  $\pm$ 20 V above

### Channels

Four

### Coupling

AC, DC

### Maximum Input Voltage

100 V (DC+ peak AC < 10 kHz) at 1 M $\Omega$

$\pm$ 5 V DC (500 mW) or 5 V RMS at 50  $\Omega$

## Digital Conversion

### Conversion Rate

100 S/s to 1 GS/s

Synchronous on all channels in 1, 2, 2.5, 4, 5 sequence

### Resolution

8 bits (1:256)

### Aperture Uncertainty

$\pm$ 0.5 ps

### Differential Linearity

$\pm$ 0.7 LSB

### Acquisition Memories

128 kpoints and 2 Mpoints (optional) per channel

### Battery Backup

Holds acquisition data for up to 2 weeks without external power

## Time Base

### Range

Up to 128  $\mu$ s at 1 GS/s, (2 ms opt.)

Up to 1280 s at 100 S/s, (20 ks opt.)

### Clock Accuracy

Better than  $\pm$ 2 ppm

### Trigger Time Interpolator

5ps resolution

### Acquisition Modes

Single shot,

Sequence: 1 to 200 segments (4000 opt.)

Dead Time: < 500ns

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

## Trigger (Internal + External)

### Slope

Positive and Negative

### Coupling

AC LFReject and DC

### Connector

Gold plated BNC

### Pre-Trigger

Adjustable to 100% of full scale

### Post-Trigger

Adjustable up to 200 Mpoints

in 16 point increments

### Trigger Sensitivity

From DC to 150 MHz:

Triggers on signals

>10% FSR of channel setting

in internal

>500 mV in External

## External Input for Trigger, Clock & Reference

### Impedance

1 M $\Omega$  or 50  $\Omega$

### Maximum Input Voltage

$\pm$ 5 V DC (500 mW)

### Bandwidth

500 MHz (-3 dB)

### External Trigger Threshold

Variable between -3 V and +3 V

### External Clock Frequency

10 MHz to 500 MHz

### External Clock/Ref Threshold

Variable between -2 V and +2 V

### Minimum Clock/Ref Amplitude

750 mV pkpk

### External Reference Frequency

10 MHz

## System Performance

### DC Accuracy

$\pm$ 2% FSR

### Integral Linearity

<  $\pm$ 1% FSR

### Effective Bits (at 1 GS/s)

DC-20 MHz: > 6.8

20-100 MHz: > 6.4

## PC System Requirements

### Processor

150 MHz Pentium (or higher)

### Operating System

Windows 95/98/NT4

### Memory

32 Mbyte RAM (more is recommended when working with several cards with 2Mpoint acquisition memories)

### CD Drive

### Hard Drive Space

20 Mbyte Minimum

### Display resolution

At least 800 x 600 (for use of AcqirisLive)

## General

### Power

< 40 W

### Current Requirements

+12 V 1.2 A  
+5 V 2.9 A  
+3.3 V 1.9 A (< 5 A with M2M)

### Warranty

3 years

**High-speed PCI bus** transfers data at rates up to 100 Mbytes/s peak to local CompactPCI processor

Front Panel led indicates digitizer status

green: ready for trigger yellow: module identification red: triggered

## Environmental and Physical

### Operating Temperature

0° to 50°C

### Required Airflow

>10 l/s (2 m/s)

### Relative Humidity\*

5% to 95% (non-condensing)

### Dimensions

6U CompactPCI ® standard  
(233 mm by 160 mm x 20 mm)

### Shock\*

30 G, half-sine pulse

### Vibration\*


5-500 Hz, random

### EMC Immunity

Complies with EN50082-1

### EMC Emissions

Complies with EN50081-1,  
EN55022 Class B for radiated emissions  
Front Panel complies with  
IEEE1101.10

Certification and Compliance 

\* As defined by MIL-T-28800E Class 3

# DC265 Waveform Digitizer

150 MHz, 8 bit, 500 MS/s, 128 kpoints or 1 Mpoints, Quad Channel

## Signal Input

### Bandwidth

DC to 150 MHz (-3 dB)

### Full Scale Range (FSR)

50 mV, 100 mV, 200 mV,  
500 mV, 1 V, 2 V and 5 V

### Impedance

1 M $\Omega$ /10 pF; 50  $\Omega$   $\pm$ 1%

### Connector

Gold plated BNC

### Offset

$\pm$ 2 V at 500 mV FSR  
and below,  $\pm$ 20 V above

### Channels

Four

### Coupling

AC, DC

### Maximum Input Voltage

100 V (DC+ peak AC < 10 kHz) at  
1 M $\Omega$

$\pm$ 5 V DC (500 mW) or 5 V RMS at  
50  $\Omega$

## Digital Conversion

### Conversion Rate

100 S/s to 500 MS/s  
Synchronous on all channels  
in 1, 2, 2.5, 4, 5 sequence

### Resolution

8 bits (1:256)

### Aperture Uncertainty

$\pm$ 0.5 ps

### Differential Linearity

$\pm$ 0.7 LSB

### Acquisition Memories

128 kpoints or 1 Mpoints (optional)  
per channel

### Battery Backup

Holds acquisition data for up to  
2 weeks without external power

## Time Base

### Range

Up to 256  $\mu$ s at 500 MS/s,  
(2 ms optional)  
Up to 1280 s at 100 S/s,  
(10 ks optional)

### Clock Accuracy

Better than  $\pm$ 2 ppm

### Trigger Time Interpolator

5 ps resolution

### Acquisition Modes

Single shot,  
Sequence: 1 to 200 segments  
(2000 optional)  
Dead Time: < 500ns

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

## Trigger (Internal + External)

### Slope

Positive and Negative

### Coupling

AC LFRreject and DC

### Connector

Gold plated BNC

### Pre-Trigger

Adjustable to 100% of full scale

### Post-Trigger

Adjustable up to 200 Mpoints  
in 16 point increments

### Trigger Sensitivity

From DC to 150 MHz:

Triggers on signals  
> 10% FSR of channel setting  
in internal  
> 500 mV in External

## External Input for Trigger, Clock & Reference

### Impedance

1 M $\Omega$  or 50  $\Omega$

### Maximum Input Voltage

$\pm 5$  V DC (500 mW)

### Bandwidth

500 MHz (-3 dB)

### External Trigger Threshold

Variable between -3 V and +3 V

### External Clock Frequency

10 MHz to 500 MHz

### External Clock/Ref Threshold

Variable between -2 V and +2 V

### Minimum Clock/Ref Amplitude

750 mV pkpk

### External Reference Frequency

10 MHz

## System Performance

### DC Accuracy

$\pm 2\%$  FSR

### Integral Linearity

<  $\pm 1\%$  FSR

### Effective Bits (at 500MS/s)

DC-20 MHz: > 6.8  
20-100 MHz: > 6.4

## PC System Requirements

### Processor

150 MHz Pentium (or higher)

### Operating System

Windows 95/98 or NT4

### Memory

32 Mbytes RAM (more is  
recommended when working  
with several cards with 1Mpoint  
acquisition memories)

### Display Resolution

At least 800 x 600 (for use of  
AcqirisLive)

### Hard Drive Space

20 Mbytes Minimum

### CD Drive

## General

### Power

< 40 W

### Current Requirements

+12 V 1.2 A  
+5 V 2.9 A  
+3.3 V 1.9 A (< 3.5 A with M1M)

### Warranty

3 years

**High-speed PCI bus** transfers data at rates up to 100 Mbytes/s peak to local CompactPCI processor

Front Panel led indicates digitizer status

green: ready for trigger yellow: module identification red: triggered

## Environmental and Physical

### Operating Temperature

0° to 50°C

### Required Airflow

> 10 l/s (2 m/s)

### Relative Humidity\*

5% to 95% (non-condensing)

### Shock\*

30 G, half-sine pulse

### Vibration\*

5-500 Hz, random

### EMC Immunity

Complies with EN50082-1

### EMC Emissions

Complies with EN50081-1,  
EN55022 Class B for radiated emissions  
Front panel complies with  
IEEE1101.10

### Dimensions

6U CompactPCI @ standard  
(233 mm by 160 mm x 20 mm)

Certification and Compliance 

\* As defined by MIL-T-28800E Class 3

## Ordering Information

### DC270

Model Number	Description
DC270	Quad-channel, 250 MHz, 1 GS/s, 128 kpoints CompactPCI digitizer
DC270-M2M	2 Mpoints/channel acquisition memory option
BB200	Battery Backup for DC2XX series digitizers
P001	300 MHz 10:1 10 M $\Omega$ passive probe
DC270-5years	5 years extended warranty
DC270-Calib	Calibration certificate

### DC265

Model Number	Description
DC265	Quad-channel, 150 MHz, 500 MS/s, 128 kpoints CompactPCI digitizer
DC265-M1M	1 Mpoints/channel acquisition memory option
BB200	Battery Backup for DC2XX series digitizers
P001	300 MHz 10:1 10 M $\Omega$ passive probe
DC265-5years	5 years extended warranty
DC265-Calib	Calibration certificate

DC270

DC265

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