

# ZT431PCI & PXI Specifications

Digital Storage Oscilloscope

12-bit, 200 MS/s, 90 MHz, 2 Ch



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# Analog Input

Channels	Quantity 2
Bandwidth	DC to 90 MHz
Maximum Input (50 $\Omega$ )	$\pm 5V$ (DC + peak AC)
Maximum Input (1 M $\Omega$ )	$\pm 50V$ [DC + peak AC (<10 kHz)] Peak AC, de-rated 20 dB/decade above 10 kHz

## Full Scale Input Range & Offset Adjust

Impedance	Range	Offset
1 M $\Omega$	50 Vpp	$\pm 25V$
	25 Vpp	$\pm 12.5V$
	10 Vpp	$\pm 5V$
	5 Vpp	$\pm 2.5V$
	2.5 Vpp	$\pm 1.25V$
	1.25 Vpp	$\pm 0.625V$
	1 Vpp	$\pm 0.5V$
50 $\Omega$	0.5 Vpp	$\pm 0.25V$
	10 Vpp	$\pm 5V$
	5 Vpp	$\pm 2.5V$
	2 Vpp	$\pm 1V$
	1 Vpp	$\pm 0.5V$
	0.5 Vpp	$\pm 0.25V$
	0.25 Vpp	$\pm 0.125V$
	0.2 Vpp	$\pm 0.1V$
	0.1 Vpp	$\pm 0.05V$

DC Gain Accuracy	< $\pm 0.25\%$ full scale range (50 $\Omega$ ) < $\pm 0.25\%$ full scale range (1 M $\Omega$ )
Zero DC Offset	< $\pm (0.25\%$ full scale range + 1 mV) @ +25 $^{\circ}C$ (50 $\Omega$ ) < $\pm (0.25\%$ full scale range + 5 mV) @ +25 $^{\circ}C$ (1 M $\Omega$ )
Zero DC Offset Drift	< $\pm 0.05\%$ full scale range/ $^{\circ}C$
Offset Adjust Accuracy	< $\pm 1\%$
Impedance	1 M $\Omega$    12 pF or 50 $\Omega$
Impedance Accuracy	$\pm 1\%$
Input VSWR (50 $\Omega$ )	$\leq 1.3:1$ , DC to 90 MHz

Input Bias	$\leq \pm 25 \mu\text{A}$ (50 $\Omega$ ) $\leq \pm 1 \text{ nA}$ (1 M $\Omega$ )
Coupling	DC or AC
AC Coupling	1 MHz high pass (50 $\Omega$ ) 50 Hz high pass (1 M $\Omega$ )
Probe Attenuation	0.9 to 1000:1
RMS Noise	$\leq (0.1\% \text{ of range} + 150 \mu\text{V})$ (50 $\Omega$ ) $\leq (0.1\% \text{ of range} + 1 \text{ mV})$ (1M $\Omega$ )
Connectors	SMB

## Analog-to-Digital Converter

Resolution	12 bit
Sample Rate	25 kS/s to 100 MS/s in 1, 2.5, 5 steps 200 MS/s, 1 channel interleaved
Acquisition Time Range	Minimum: 500 ns (100 samples @ 200 MS/s) Maximum: 83.9 seconds (2M samples @ 25 kS/s)
Channel-to-Channel Skew	$\leq 100 \text{ ps}$ difference with channels at same input settings Adjustable from 10 ns to +10ns with 10 ps resolution

## Waveform Memory

Total Memory	Up to 2M samples/channel Up to 4M samples/channel (1 channel interleaved)
Waveform Size	100 samples to total memory

## Acquisition Modes

Types	Normal, Average, Envelope, and Equivalent-Time
Channels	Quantity 2, both inputs simultaneous
Waveform Size	32k samples maximum
Waveform Count	2 to 65535 waveforms

Averaging	16-bit waveform averaging resolution
Envelope	Minimum and Maximum Envelope
Equivalent-Time	High sample rate waveform reconstruction
Equivalent-Time Points	2 to 100 equivalent-time points per real-time point 2 to 100 times equivalent-time sample rate

## Trigger

Trigger Source	Channels 1 to 2, External Trigger, Pattern, Software, Star Trigger, TTL Trigger0–7 (PXI Backplane or PCI Timing Expansion Connector)
Trigger Slope/Polarity	Positive or Negative
Trigger Position	0% to 100% of waveform time + trigger delay $\pm 1$ sample interval position accuracy
Post-Trigger Delay	0 to 655 seconds
Pre-Trigger Delay	0 to waveform time
Trigger Hold Off	Programmable delay after trigger before recognizing next trigger event
Hold Off Range	0 to 655 seconds
Trigger B	Second edge trigger event qualifier
Pattern Trigger	Pattern match true or false
Pattern Sources	Channels 1 to 2, External Trigger, Star Trigger (PXI Backplane or PCI Timing Expansion Connector)
Event Trigger	Event Counter: 1 to 65535 trigger events
Trigger Modes	Edge, Pulse Width, Video
Edge Trigger Mode	Rising or Falling Edge
Pulse Width Trigger Mode	Triggers on pulse width greater than, less than, or between limits
Pulse Width Type	< limit1, > limit1, < limit1 & > limit2
Pulse Width Range	20 ns to 655 seconds

Pulse Width Resolution	10 ns
Video Trigger Mode	PAL (50 Hz), NTSC (60 Hz), SECAM (50 Hz) Standard, Field, Line selectable
Ch 1–2 Trigger Level	(offset – full scale/2) to (offset + full scale/2)
Ch 1–2 Trigger Sensitivity	5% of full scale (DC to 75 MHz)
Ch 1–2 Trigger Bandwidth	≥ 75 MHz
Ch 1–2 Trigger Hysteresis	1% of full scale (overdrive required)
Ch 1–2 Level Resolution	0.025% of full scale
Ch 1–2 Level Accuracy	±(2% setting + 2% full scale + offset accuracy)
Trigger Timestamp	100 ns resolution, 1 second rollover

## TTL Trigger Outputs

Functionality	Event Output Signals
Outputs	TTL Trigger0–7 (PXI Backplane or PCI Timing Expansion Connector)
Source	Trigger Event, Arm Event, OPC, Constant State

## External Trigger

Functionality	Trigger Input or Output
Maximum Input	0V to 5V, no damage
Trigger Input	TTL Compatible, 10 kΩ Input Impedance
Trigger Output	TTL Compatible into 50Ω
Trigger Output Source	Trigger Event, Arm Event, OPC, Constant State, 10MHz Reference Clock, 500 Hz Clock, 10 ns Pulse at 1 ms Repetition Interval
Connector	SMB

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# Arm

Functionality	Arm to qualify trigger event
Source	External Trigger, Software, Star Trigger, TTL Trigger0–7 (PXI Backplane or PCI Timing Expansion Connector)
Polarity	Positive or Negative

## External Arm Input

Maximum Input	0V to 5V, no damage
Nominal Level	TTL Compatible
Input Impedance	10 k $\Omega$ $\pm$ 2%
Connector	SMB (Shared with Trigger I/O)

## External Sampling Clock

Functionality	External Sampling Clock bypasses Phase Locked Loop
Synchronization	One or both channels synchronized to external clock
Clock Rates	1 MHz to 200 MHz 1 channel enabled: sample at external frequency 2 channels enabled: sample at half external frequency
Maximum Input	$\pm$ 5VDC, no damage
Input Signal Level	500 mVpp to 1 Vpp, sine or square wave
Input Impedance	AC coupled, 50 $\Omega$ $\pm$ 2%
Connector	SMB

## 10 MHz Time Base Reference

Clock Source	Internal TCXO, PXI Backplane or PCI Timing Expansion Connector
Internal TCXO	$\pm$ 2.5 ppm accuracy

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# Data Processing

Auto Scale Automatic adjust to input signals: Input Range, Offset, Sample Rate, Trigger Source, and Trigger Level

Self-Calibration Automatic internal calibration: Input DC Offset

## Measurements

Measurements Min, Max, Low, High, Mid, Average, Amplitude, Peak-to-Peak, DC RMS, AC RMS, +Width, -Width, Period, Frequency, +Duty, -Duty, Phase, Rise Time, Rise Overshoot, Rise Preshoot, Rise Crossing Time, Fall Time, Fall Overshoot, Fall Preshoot, Fall Crossing Time, Time of Maximum, Time of Minimum, Cycle Average, Cycle RMS, Cycle Frequency, Cycle Period, AC High-Precision, DC High-Precision

Measurement Methods Entire Waveform, Gated by Time, Gated by Points

Measurement Levels Low, Mid, High reference levels for edge measurements set in absolute voltages or relative percentages

Measurement Accuracy

Delta DC Voltage  $\pm$  (DC gain accuracy)  
Absolute DC Voltage  $\pm$  [(DC gain accuracy)+(offset accuracy)]  
Time  $\pm$  (time resolution)  
Frequency  $\pm$  [1/(time resolution)]

Note: time resolution = one sample interval or one ETS sample interval (for ETS acquisition)

## Reference Waveforms

Reference Channels Quantity 4

Reference Storage Non-volatile memory storage

Reference Size 32k maximum waveform size

## Calculations

Calculate Channels Quantity 2

Calculate Size 32k maximum waveform size

Calculate Functions Add, Subtract, Multiply, Copy, Invert, Integral, Derivative, Absolute Value, Limit Test,

	Mask Test, Frequency Transform, Time Transform
Limit Test	Measurement Limit Range Testing or Waveform Mask Testing
Limit Test Reports	Measurement maximum, minimum, average, current value, and pass/fail counts
Frequency Transform	FFT Magnitude
FFT Windowing	Rectangular, Hamming, Hanning, Blackman
Time Transform	Infinite Impulse Response (IIR) filtering
IIR Filter Count	2 to 40 data points

## Instrument Setup Storage

Reset	Non-volatile storage of default instrument setup configuration
Save & Recall	Non-volatile storage of 31 instrument setup configurations

## Data Interface

PCI Bus	33 MHz, 32 bit address, 16 bit data
PCI Voltage	Universal, +3.3V or +5V
PCI Compatibility	Version 2.2
PXI Signals	PXI_TRGn input/output selectable PXI_STAR input 10 MHz reference input Left and right side buses not used
Manufacturer ID	4172 (104C <sub>16</sub> )
Model Code	44128 (AC60 <sub>16</sub> )

## PXI J2 Trigger & Clock Pin Usage

Pin A16	PXI Trigger 1	(TTL level bidirectional)
Pin A17	PXI Trigger 2	(TTL level bidirectional)
Pin A18	PXI Trigger 3	(TTL level bidirectional)

Pin B16	PXI Trigger 0	(TTL level bidirectional)
Pin B18	PXI Trigger 4	(TTL level bidirectional)
Pin C18	PXI Trigger 5	(TTL level bidirectional)
Pin D17	PXI Star Trigger	(TTL level input)
Pin E16	PXI Trigger 7	(TTL level bidirectional)
Pin E17	PXI CLK10 In	(TTL level input)
Pin E18	PXI Trigger 6	(TTL level bidirectional)

## LED Indicators

RDY	Unit has passed power-up self-diagnostics. Toggles when unit has an error pending in error queue.
TRG	Flashes when trigger event occurs

## Physical

Physical size	Single-Wide 3U CompactPCI/PXI Instrument (PXI) Single-Slot Short PCI Card (PCI)
Weight	1 lb.

## DC Power

### Cooling & Power Consumption

Typical Cooling & Power	Maximum Cooling & Power
13.9 W	16.7 W

Note: Optional PCI Cooling Fan adds 0.12A to +5VDC current requirements and 0.6W to total power consumption.

## Power Supplies

Voltage	Typical Current	Maximum Current
+3.3V	1.6A	1.8A
+5V	1.0 A	1.2A
+12V	0.0A	0.0A
-12V	0.3A	0.4A

## Temperature Range

Operating	0 °C to +40 °C Ambient
Storage	-40 °C to +75 °C
Over-Temp Protection	Automatic shutdown if internal temperature is greater than +60 °C
Calibration Range	+20 °C to +30 °C Ambient, after a 20 minute warm-up period, to meet all calibration specification accuracies.

## Relative Humidity

Operating or Storage	10 to 90%, non-condensing, up to +40 °C
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## Altitude

Operating	Up to 2,000 m
Storage	Up to 15,000 m

## Safety

This product is designed to meet the requirements of the following standard of safety for electrical equipment for measurement, control and laboratory use:

EN 61010-1

## Electromagnetic Compatibility

CE Marking EN 61326-1:1997 with A1:1998 and A2:2001 Compliant  
FCC Part 15 (Class A) Compliant

### Emissions

EN 55011	Radiated Emissions, ISM Group 1, Class A, distance 10 m, emissions < 1 GHz
EN 55011	Conducted Emissions, Class A, emissions < 30 MHz

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## Immunity

EN 61000-4-2	Electrostatic Discharge (ESD), 4 kV by Contact, 8 kV by Air
EN 61000-4-3	RF Radiated Susceptibility, 10 V/m
EN 61000-4-4	Electrical Fast Transient Burst (EFTB), 2 kV AC Power Lines
EN 61000-4-5	Surge
EN 61000-4-6	Conducted Immunity
EN 61000-4-8	Power Frequency Magnetic Field, 30 A/m
EN 61000-4-11	Voltage Dips and Interrupts

## CE Compliance

This product meets the necessary requirements of applicable European Directives for CE Marking as follows:

73/23/EEC	Low Voltage Directive (Safety)
89/336/EEC	Electromagnetic Compatibility Directive (EMC)

See Declaration of Conformity for this product for additional regulatory compliance information.