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1 GS/s, 8-Bit Digital Storage Oscilloscope

ZT1428VXI

- 2 channels simultaneous, 8-bit resolution
- 1 GS/s, 250 MHz analog bandwidth
- 1 MS record length per channel
- Programmable range, offset, coupling, impedance, sampling rate, and analog filtering
- Real-time signal processing, waveform math, and measurement
- Limit and mask testing
- Powerful triggering
- Envelope and averaging acquisition modes

Calibration Certificate Included

Compatibility
- Drop-in replacement for Agilent HPE1428A
- Excellent replacement for Tektronix TVS621 and TVS641

Command Language
- SCPI and COMP (HPE1428A compatible)
- Register
- Advanced

Driver Software
- VXI Plug and Play
- National Instruments LabVIEW™ and LabWindows/CVI™
- Interchangeable Virtual Instrument (IVI)



Overview

Originally designed as a drop in replacement for the Agilent HPE1428A, the ZT1428VXI is a full featured digital storage oscilloscope for both legacy and next generation modular instrumentation systems.

The ZT1428VXI offers superior value and performance for mixed-signal test and high-speed signal acquisition. Programmable analog signal range, DC offset, coupling, impedance, sample rate and lowpass filtering cover a wide variety of input signal configurations. The ZT1428VXI provides precise waveform acquisition and measurement with 8-bit of vertical resolution and a low phase noise sampling clock. Extensive memory segmenting, sequencing, and triggering options provide flexible and powerful signal acquisition modes.

Compatibility

The ZT1428VXI is an identical form, fit and function replacement for the discontinued Agilent HPE1428A.

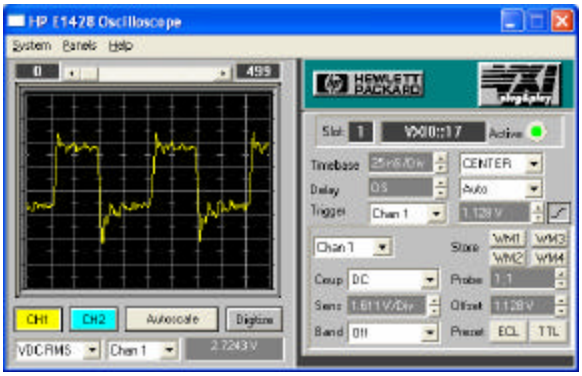


Figure 1: *ZT1428VXI running the HPE1428A VXI Plug and Play soft front panel*

By matching the HPE1428A command languages, the ZT1428VXI can often be used in legacy systems without the need to modify application source code. Even front panel connector locations have been maintained to eliminate changes to existing system cable harnesses.



Figure 2: *ZT1428VXI and HPE1428A side-by-side comparison*

In addition to HPE1428A compatibility, the easy-to-use command languages and thorough driver support make the ZT1428VXI and excellent replacement for other VXI DSOs, such as the Tektronix TVS 621/641.

Enhanced Features

Although the ZT1428VXI was designed to match the ZT1428VXI specifications, ZTEC Instruments has added many advanced features that are commonly required for next generation modular instrumentation systems.

For starters, the ZT1428VXI eliminates the record length limitation of the HPE1428A. Instead of 500 and 8,000 point record lengths, the ZT1428VXI supports 100 to 1,000,000 point records. Combined with this deep memory and multiple capture capability, designers can capture entire event sequences at high sample rates in one record.

Other advanced ZT1428VXI features not found on the legacy HPE1428A include: A32 register-based data access, an extended input range up to 50 V, slower sample rates down to 1 S/s, additional 1 MHz low-pass input filters, low and high frequency reject trigger filtering, and a programmable calibration voltage output.

Measurement Functions

Extensive processing and analysis capability provide complete measurement solutions for mixed signal test applications. The on-board 100 MHz DSP provides signal processing in hardware such as signal measurements, two-waveform math functions, waveform averaging, waveform envelope processing, limit testing and waveform mask testing.

Flexible Signal Conditioning

The ZT1428VXI provides a wide variety of input signal configurations including: analog signal ranges from 8 mV to 50 V, DC offset adjustment to ± 250 V, AC or DC coupling, 50 or 1M Ohm input impedances, sample rates from 1 S/s to 1 GS/s, and selectable low-pass and high-pass filters.

Low Noise / Large Dynamic Range

The low-noise, low distortion ZT1428VXI offers true 8-bit resolution. Even at high gain settings, the ADC exhibits less than 2 code's worth of digitizer noise.

Flexible Trigger and Arm Control

Powerful triggering and gating functions allow synchronization to external events and acquisition of waveforms at predefined time intervals. Multiple modules can be easily synchronized using the VXIbus backplane clock and trigger lines. Powerful operational modes include pre-trigger and post-trigger acquisition and delay-by-time or delay-by-events signal capture. Edge and pulse width triggering allow the instrument to trigger on unusual or intermittent events. Pattern triggering provides a method to trigger and capture a specific pattern on multiple simultaneous input signals. TV triggering enables the automatic triggering and capture of NTSC and PAL video signals.

Waveform and Instrument Setup Storage

Waveform storage is maintained under power-loss conditions using non-volatile storage of up to four reference waveforms. Rapid recall of test configurations is also enabled using non-volatile storage of up to 48 instrument setup sates. Common test configurations can be stored and recalled for instantaneous instrument configuration.

Driver Software

The ZT1428VXI uses a SCPI compatible VXIbus message-based interface. Direct A32 register-based access is provided to enable rapid download of large input and math function waveform data.

In Agilent HPE1428A mode, the ZT1428VXI supports the COMP/SCPI command sets and A24 register based data access of the HPE1428A with identical functionality. This allows the same software to be used transparently without any interface code modifications.

The ZT1428VXI is delivered with VXIbus Plug-and-Play, Interchangeable Virtual Instrument (IVI), and LabVIEW™ drivers. Source code is provided for all driver software.

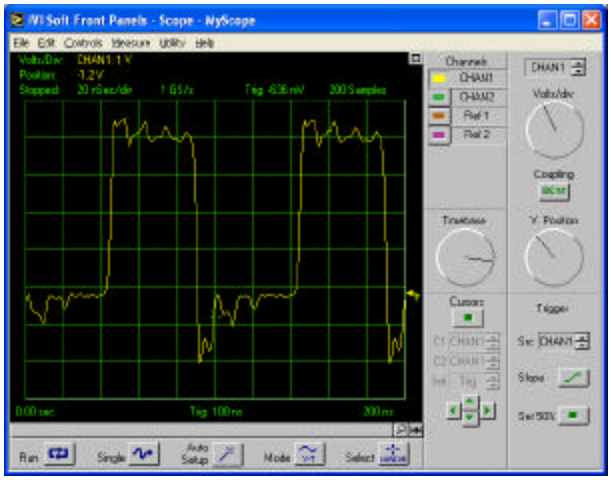


Figure 3: *ZT1428VXI running the National Instruments IVI Scope Soft Front Panel*

Ordering Information

Standard Configuration

VXI	ZT1428VXI-00

Accessories

10X Oscilloscope Probe	ZT2002PRB-00

1 GS/s, 8-Bit Digital Storage Oscilloscope

Performance Characteristics

* Advanced ZT1428VXI feature (feature not found on HPE1428A)

Input Channel Specifications

Channels	2
Bandwidth	DC to 250 MHz
Maximum Input	±250 VDC (1 MΩ) 5 Vrms (50 Ω)
Full Scale Input Range	8 mV_{pp} to 50 V_{pp} in 8 mV steps
DC Gain Accuracy	

Full-Scale	Gain Accuracy
64 mV – 50V	±1.5%
8 mV – 56 mV	±(1.5% + 1 mV)

Impedance	1 MΩ || 12 pF or 50 Ω
Input VSWR (50 Ω)	= 1.3:1 DC to 250 MHz
Connector	BNC Female
Coupling	DC, DC-50, AC, AC-LFR DC: 1 MΩ || 12 pF DC-50: 50 Ω AC: 1 MΩ || 12 pF, 10 Hz High-Pass AC-LFR: 1 MΩ || 12 pF, 450 Hz High-Pass
Probe Attenuation	0.9 to 1000 : 1
Offset Adjust	

Full-Scale	Offset Adjust
8mV – 400mV	±2V
408mV – 2V	±10V
2.008V – 10V	±50V
10.008V – 50V	±250V

DC Offset Accuracy

Full-Scale	Offset Accuracy
64mV – 50V	±(1% of offset + 2% of full-scale)
8mV – 56mV	±(1% of offset + 1.12mV)

Noise

Bandwidth	Maximum RMS Noise
DC-250 MHz	0.5% of full scale + 1 mV
DC-30 MHz	0.25% of full scale + 0.5 mV
DC-1 MHz	0.2% of full scale + 0.5 mV

Input Filtering	HF Reject, Low-pass or Bypass HF Reject: 30 MHz Low-Pass Filter Low-pass: 1 MHz Low-Pass Filter *

Analog-to-Digital Converter Specifications

Resolution	8 bit resolution
Real-Time Sampling	1 S/s to 1 GS/s (1, 2.5, 5 steps) *
Interpolated Sampling	2 GS/s to 50 GS/s
Acquisition Time Range	2 ns to 125,000 s *
Ch-to-Ch Skew	<100 ps @ same input settings
Delay Null	0 to 10 ns in 10 ps steps
Record Lengths	100 to 1,000,000 Samples (=100 kS/s) * 100 to 125,000 Samples (<100 kS/s) *

Trigger Specifications

Trigger Source	Channels 1-2, External, ECLTRG0-1
Trigger Slope/Polarity	Positive or Negative
Trigger Holdoff	40 ns to 320 ms or 2 to 65536 events
Trigger Position	0%, 50% or 100% of record time + delay
Trigger Delay	–1,000,000 sample intervals to +500 s
Trigger Accuracy	±1 sample interval
Trigger Modes	Edge, Pattern, Time-Qualified Pattern, Event-Delayed, State, TV
Trigger Sensitivity	6.25% of full scale (DC to 100 MHz) 15.625% of full scale (> 100 MHz)
Trigger Filtering	Off, Noise Reject, LF Reject or HF Reject *
Post-Trigger Delay	0 to 500 seconds
Pre-Trigger Delay	0 to (Record Size – 1,000,000) samples *
Edge Mode	Rising or Falling Edge, all sources
Pattern Mode	Pattern match true or false
Pattern Sources	Channels 1-2, External, ECLTRG0-1
Time-Qualified Pattern	< limit1, > limit1, < limit1 & > limit2
Time-Qualified Range	N to 65536 * N sample intervals
Time-Qual. Resolution	N sample intervals
Time-Qual. Accuracy	N sample intervals N = 4 for 1 GS/s N = 2 for 500 MS/s N = 1 for <500 MS/s
Event-Delayed Trigger	Event Counter: 1 to 65536
Ch1-2 Trigger Level	±1.5X full-scale range from offset
Ch1-2 Level Resolution	0.025% of full-scale
Ch1-2 Level Accuracy	±(2% setting + 3% FS + offset accuracy)
Ch1-2 Noise Reject	Adds 3X hysteresis
Ch1-2 LF Reject	AC-coupled high-pass (>50 kHz) *
Ch1-2 HF Reject	Low-pass (<50 kHz) *
Ext Trigger Level	5 Vrms maximum ±2V programmable threshold
Ext Level Accuracy	±(2% + 50 mV)
Ext Level Resolution	0.025% of full-scale
Ext Coupling/Imped.	DC/50 Ω or DC/1 MΩ
Ext Trigger Connector	BNC female
Ext Trigger/Clock	Shared connector & input characteristics
External Clock	100 MHz ±0.005%, 50% duty
VXIbus Clock	VXIbus CLK10, 10 MHz ±0.005%, ECL

Probe Comp / Cal / Trig Output

Modes	+5V voltage, ground, sample clock, probe compensation, trigger pulse, user-defined
DC Calibrator	0.0V ± 1mV or 5.0V ± 0.1%
Sample Clock	10 MHz output signal, -0.4V to 0V into 50 Ω
Probe Comp	500Hz output signal, -0.4V to 0V into 50 Ω
Trigger Pulse	-0.4V to 0V into 50 Ω Rising edge at trigger event Falling edge at end of hold-off
User-Defined	-1.5V to 4V into 50 Ω * -3.5V to 8.5V into 1 MΩ * Rate: DC, 500 Hz, or 10 MHz
Connector	BNC Female

LED Status Indicators

FAILED	unit has failed power-up self-test
ACCESS	VXIbus access is occurring
ERROR	unit has an error pending in the error queue
TRIG'D	trigger event was recognized

Signal Processing Specifications

Measurements	Min, Max, Low, High, Average, Amplitude, Peak-to-Peak, DC RMS, AC RMS, Rise Time, Fall Time, +Width, –Width, Period, Frequency, +Duty, –Duty, Overshoot, Preshoot, Delay, N^{th} Positive Crossing Time, N^{th} Negative Crossing Time, Time at Voltage, Voltage at Time, Cursor Functions
Reference Waveforms	Qty. 4 stored in non-volatile memory (32k maximum record size)
Waveforms Functions	Qty. 2: Add, Subtract, Differentiate, Integrate, Multiply, Invert
Limit Testing	Measurement Limit Range Testing
Waveform Compare	Waveform Mask Testing
Auto-Scale	Automatic adjust of input signal conditioning

VXI Interface

Command Interface	A16 message based, SCPI & COMP
Interrupt Operation	programmable interrupter, level 1 to 7
Data Interface	32 Mbytes A32 register-based, or 1 Mbytes A24 register-based
ZTEC Manufacturer ID	3712 ($E80_{16}$)
ZT1428VXI Model ID	1428 (594_{16})

Other Specifications

Timebase	Internal ±2.5 ppm TCXO, VXIbus CLK10, or Front Panel 100 MHz input
Configuration Save	Non-volatile storage of 48 instrument configurations

Power Consumption

+24 V	0.0 A	
+12 V	0.1 A,	0.1 A dynamic
+5 V	9.0 A,	0.5 A dynamic
-24 V	0.0 A	
-12 V	0.1 A,	0.1 A dynamic
-5.2 V	1.5 A,	0.1 A dynamic
-2 V	0.1 A,	0.1 A dynamic

55 W typical total power & cooling required

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