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Find the *Teradyne / LitePoint / ZTEC Instruments ZT4422* at our website: *Click HERE*

# ZT442x | Digital Storage Oscilloscope

## High Resolution Oscilloscope

The ZT442x Digital Storage Oscilloscope (DSO) Family provides high resolution of 12 bits and supports industry standards for easy integration into automated test systems. ZT442x's powerful hardware is complemented by its flexible software and Graphical User Interface (GUI) to enhance the instrument's capabilities for new and legacy test requirements. The instrument's on-board signal processing and measurement suite speeds up data acquisition and analysis. The instruments are available in PXI, LXI, and VXI.

### FEATURES

- Available in PXI, LXI & VXI platforms
- 2 channels and 4 channels
- 12 bit resolution
- Real time interleaved sample rates up to 1 GS/s
- Bandwidth up to 500 MHz
- On-board signal processing
- Compatible with third-party tools such as LabVIEW and LabWindows/CVI

### BENEFITS

- High density form factor lowers overall system size and cost
- Platform flexibility promotes integration with various designs and chassis
- On board processing speeds up data acquisition and analysis
- Backed by Teradyne's best-in-class customer support and calibration/repair services

### End Markets Served

- Defense & Aerospace
- Medical
- Automotive
- Semiconductor Test
- Telecommunication Test




### Example Applications

- High Energy Physics Applications
- Multi-Channel Capture
- Automated Testing of Electronics
- High Speed Test  Applications

| Part Number | Description |
|---|---|
| ZT4421PXI | 2 Channels in PXI |
| ZT4421LXI | 2 Channels in LXI |
| ZT4421VXI | 2 Channels in VXI |
| ZT4422LXI | 4 Channels in LXI |
| ZT4422VXI | 4 Channels in VXI |

Direct Path (DP) and Differential (DF) front end options are also available. Contact Teradyne for more information on DP and DF options.

***(For contact information, please refer to page 18.)***

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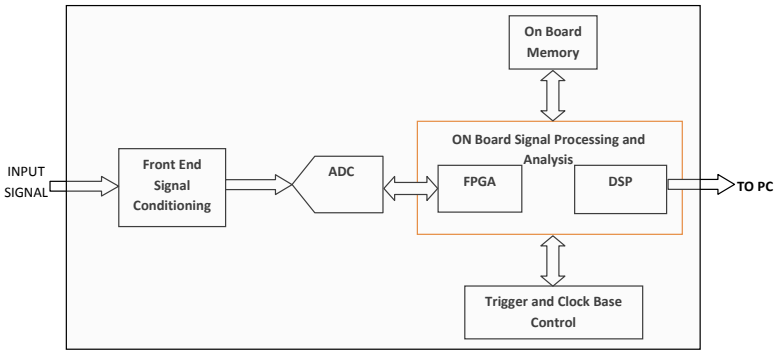
## Hardware

### On Board Signal Processing and Analysis

ZT-Series DSOs include an on-board DSP for signal processing and analysis capability that shortens test cycles and reduces the need for user developed signal processing algorithms. The on board capability is much faster than processing on a separate PC or controller. It also removes the need to transfer large amount of waveform data to an external PC or controller and thereby speeding up post capture analysis. The on board DSP and analysis capability ranges from performing basic mathematical functions to the more complex computations like Fast Fourier Transform (FFT), derivative, integration, histogram, limit testing, mask testing, waveform parameter trending.

### On Board Memory

ZT442x DSO provides a significant amount of flexible segmented on-board memory. Segmented memory allows waveforms to be saved on the DSO memory for later analysis and viewing. The memory segments can be viewed either overlaid or individually.




*ZT442x Block Diagram*

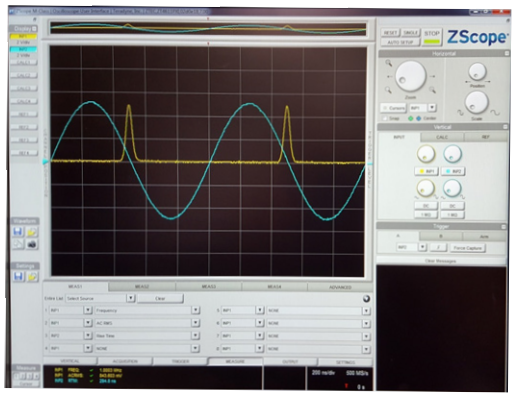
## Software

### Driver

ZT442x DSO instruments are operated with ZT-Series Driver software that includes API function calls or SCPI commands. The driver can work with the most commonly used application development environments like Microsoft Visual Studio® and LabWindows™/CVI for TPS development or be integrated with 3rd party tools like LabView™.

### Easy-to-Use Graphical User Interface

The ZT442x driver software suite includes a Graphical User Interface (GUI) called ZScope™. ZScope is an intuitive software interface that provides manual instrument control and a user experience similar to that of a benchtop oscilloscope. Using ZScope, no more than two clicks are required to access all oscilloscope functions. In addition to the standard oscilloscope measurement functions, ZScope includes built-in advanced measurements such as: limit testing, histogram, FFT, filtering, SNR, spurious free dynamic range, ENOB, total harmonic distortion, measurement trending, and SINAD to name a few.




*ZScope Graphical User Interface*



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# ZT462x Series Specifications

ZT442x Series specifications are subject to change without any notice. Unless otherwise noted, the specifications of ZT442x Series are warranted at ambient temperature range of 0°C to 50°C.

ZT442x specifications are warranted under the following conditions:

- Instrument is warmed up for 20 minutes at ambient temperature
- Instrument is in the calibration window

## Acquisition

**Sample Rate:**

- 20 kS/s to 500 MS/s, non-interleaved and real-time
- 1 GS/s, interleaved real-time or equivalent-time
- 1 GS/s to 50 GS/s, equivalent-time
- 100 GS/s, interleaved equivalent-time

Any sample rate that is an integer multiple of an available sample rate can be created using interpolation.

**Table 1 – Acquisition Mode Sample Rates**

| Mode(s) | Sample Rate |
|---|---|
| Non-Interleaved Real-Time | 20 kS/s<br>25 kS/s<br>40 kS/s<br>50 kS/s<br>100 kS/s<br>200 kS/s<br>250 kS/s<br>400 kS/s<br>500 kS/s<br>1 MS/s<br>2 MS/s<br>2.5 MS/s<br>4 MS/s<br>5 MS/s<br>10 MS/s<br>20 MS/s<br>25 MS/s<br>40 MS/s<br>50 MS/s<br>100 MS/s<br>200 MS/s<br>250 MS/s<br>400 MS/s<br>500 MS/s |
| Interleaved or Equivalent Time | 1 GS/s |



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| | |
|---|---|
| Equivalent Time | 2 GS/s<br>4 GS/s<br>5 GS/s<br>10 GS/s<br>20 GS/s<br>25 GS/s<br>40 GS/s<br>50 GS/s |
| Interleaved Equivalent-Time | 100 GS/s |

**Table 2 – Acquisition Specifications**

| Specification | Value |
|---|---|
| Non-Interleaved Real-Time | |
| **ZT4421** | 2 channels @ up to 500 MS/s real-time |
| **ZT4422** | 4 channels @ up to 500 MS/s real-time |
| Sampling Modes | Normal: single-shot acquisition<br>Average: multiple-capture acquisition<br>Envelope: multiple-capture minimum & maximum detection<br>Equivalent Time: multiple-capture, high-rate reconstruction<br>Peak Detect: single-shot 10x over-sampling envelope detection<br>High Resolution: single-shot 10x over-sampling averaging<br>Fast: Multiple acquisitions |
| Multiple-Capture Count | 2 to 65,536 waveforms in powers of 2 |
| Acquisition Re-Arm Time | ≤ 5 µs |
| Maximum Record Length Memory | |
| **Non-Interleaved** | 128 MiSamples |
| **Interleaved** | 256 MiSamples |
| Minimum Waveform Size | 10 Samples |
| Maximum Waveform Size | |
| **Normal or Fast Acquisition Mode** | Maximum Record Length (above) |
| **All Other Modes** | 512 KiSamples |
| Segmented Memory | View & compare history of previous waveforms in memory<br>View component waveforms when averaging |
| Maximum Segments | 32 Ki waveforms @ ≤ 4 KiSamples |
| Total Memory | |
| **ZT4421** | 256 MiSamples |
| **ZT4422** | 512 MiSamples |



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## Vertical Input Channels

**Table 3 – Input Channel Specifications**

| Specification | Value |
|---|---|
| Number of Channels | |
| **ZT4421 (interleaved acquisition)** | Quantity 1 |
| **ZT4421 (non-interleaved acquisition)** | Quantity 2 |
| **ZT4422 (interleaved acquisition)** | Quantity 2 |
| **ZT4422 (non-interleaved acquisition)** | Quantity 4 |
| Connectors | BNC |
| Maximum Input (50 Ω) | ± 5 V (DC + peak AC) CAT I<br>Input load protection at ±6 VDC |
| Maximum Input (1 MΩ) | ± 210 V [DC + peak AC (<100 kHz)], CAT I<br>Peak AC, de-rated 20 dB/decade above 100 kHz |

## Full Scale Input Range & Offset Adjust

**Table 4 – Full Scale Input Range & Offset Adjust Value**

| Impedance | Range | Full Scale | Offset | Maximum Range + Offset |
|---|---|---|---|---|
| 1 MΩ | 5 V/div<br>2.5 V/div<br>1 V/div<br>500 mV/div<br>200 mV/div<br>100 mV/div<br>40 mV/div<br>20 mV/div<br>10 mV/div<br>5 mV/div<br>2.5 mV/div<br>1.25 mV/div | 50 Vpp<br>25 Vpp<br>10 Vpp<br>5 Vpp<br>2 Vpp<br>1 Vpp<br>400 mVpp<br>200 mVpp<br>100 mVpp<br>50 mVpp<br>25 mVpp<br>12.5 mVpp | 0 V<br>± 12.5 V<br>± 10 V<br>± 10 V<br>± 2 V<br>± 2 V<br>± 400 mV<br>± 400 mV<br>± 400 mV<br>± 400 mV<br>± 400 mV<br>± 400 mV | ± 25 V<br>± 25 V<br>± 15 V<br>± 12.5 V<br>± 3 V<br>± 2.5 V<br>± 600 mV<br>± 500 mV<br>± 450 mV<br>± 425 mV<br>± 412.5 mV<br>± 406.25 mV |
| 50 Ω | 1 V/div<br>500 mV/div<br>200 mV/div<br>100 mV/div<br>40 mV/div<br>20 mV/div<br>8 mV/div<br>4 mV/div<br>2 mV/div<br>1 mV/div | 10 Vpp<br>5 Vpp<br>2 Vpp<br>1 Vpp<br>400 mVpp<br>200 mVpp<br>80 mVpp<br>40 mVpp<br>20 mVpp<br>10 mVpp | 0 V<br>± 2.5 V<br>± 2 V<br>± 2 V<br>± 400 mV<br>± 400 mV<br>± 80 mV<br>± 80 mV<br>± 80 mV<br>± 80 mV | ± 5 V<br>± 5 V<br>± 3 V<br>± 2.5 V<br>± 600 mV<br>± 500 mV<br>± 120 mV<br>± 100 mV<br>± 90 mV<br>± 85 mV |

Technical Notes:

- Magnification is used below 4mV/div range for 50 Ω. Full-scale range for accuracy specifications is defined as 40



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mV. Magnification is used below 20 mV/div range for 1 MΩ. Full-scale range for accuracy specification is defined as 200 mV.

- Full-scale range assumes 10 divisions.

## Inputs

**Table 5 — Input Specifications**

| Specification | Value |
|---|---|
| Analog Bandwidth | DC to 300 MHz typical, 250 MHz minimum |
| Rise Time | 1.15 ns |
| Slew Time | 2 kV/µs |
| Impedance | 1 MΩ \| \| 12 pF or 50 Ω<br>± 1% accuracy |
| Input Bias | |
| **50 Ω** | ≤ ± 10 µA |
| **1 MΩ** | ≤ ± 1 nA |
| DC Gain Accuracy | < ± 0.25% full scale range |
| DC Offset Accuracy (+25° C) | |
| **50 Ω** | < ± (0.25% full scale range + 0.5% offset + 1 mV) |
| **1 MΩ** | < ± (0.25% full scale range + 0.5% offset + 5 mV) |
| DC Offset Drift (per °C) | < ± (0.01% full scale range) |
| Input VSWR (50 MΩ) | ≤ 1.3:1, DC to 250 MHz |
| Analog Filter | 20 MHz or Bypass<br>Filter Stopband Rejection: approx. 3 dB @ 20 MHz |
| Probe Attenuation | 0.9 to 1000:1 |
| Coupling | DC or AC |
| AC Coupling | |
| **50 Ω** | 200 kHz high-pass |
| **1 MΩ** | 1 Hz high-pass |
| Channel-to-Channel Isolation | |
| **DC to 100 MHz** | ≥ 60 dB |
| **100 MHz to 250 MHz** | ≥ 50 dB |
| Typical RMS Noise (ZT4420) | |
| **50 Ω (Full Bandwidth)** | 0.05% of full scale range + 75 µV |
| **50 Ω with 20 MHz Filter** | 0.04% of full scale range |
| **1 MΩ (Full Bandwidth)** | 0.05% of full scale range + 1 mV |
| **1 MΩ with 20 MHz Filter** | 0.04% of full scale range + 500 µV |



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| | |
|---|---|
| **Digital Resolution (ZT4420)** | 12 bits (0.024% of full scale)<br>Up to 32 bits with averaging |

**Technical Notes:**

- Rise time is calculated from $t_r$ = 0.35/bandwidth.

## Dynamic Range (500 MS/s, 10.7 MHz Typical)

**Table 6 – Dynamic Range Specifications**

| 50 Ω Input Range | Signal-to-Noise Ratio (SNR) | Total Harmonic Distortion (THD) | Signal-to-Noise & Distortion (SINAD) | Spurious Free Dynamic Range (SFDR) |
|---|---|---|---|---|
| 10 Vpp | 61.2 dBc | -62.8 dBc | 58.9 dBc | 65.0 dBc |
| 5 Vpp | 59.0 dBc | -64.3 dBc | 57.9 dBc | 65.0 dBc |
| 2 Vpp | 60.0 dBc | -62.8 dBc | 58.2 dBc | 65.0 dBc |
| 1 Vpp | 58.2 dBc | -64.3 dBc | 57.3 dBc | 65.0 dBc |
| 400 mVpp | 55.7 dBc | -64.1 dBc | 55.1 dBc | 65.0 dBc |
| 200 mVpp | 50.5 dBc | -64.9 dBc | 50.4 dBc | 63.3 dBc |
| 80 mVpp | 49.4 dBc | -63.9 dBc | 49.3 dBc | 55.5 dBc |
| 40 mVpp | 43.5 dBc | -63.1 dBc | 43.4 dBc | 48.9 dBc |

## Horizontal

**Table 7 – Horizontal Specifications**

| Specification | Value |
|---|---|
| Sweep Time Range | 10 ns to 100 s (1 ns/div to 10 s/div) |
| Sweep Time Resolution | 10 ns to 10 ms dependent on sweep points and sample rate |
| Horizontal Position | |
| **Pre-Trigger** | 0 to 100% of acquisition window |
| **Post-Trigger** | 0 to 10,000*Gate Resolution |
| Channel-to-Channel Skew | Channels at same input settings |
| **Channels 1-to-2, 3-to-4** | ≤ 100 ps |
| **Channels 1-to-3, 1-to-4, 2-to-3, 2-to-4** | ≤ 200 ps |
| Skew Adjust | ± 10 µs channel-to-channel skew adjustment<br>1 sample interval resolution<br>± 1 sample interval accuracy |
| Timebase Reference | 10 MHz |
| Timebase Reference Source | Internal TCXO, External Input, Backplane (PXI/VXI) |
| Internal TCXO Timebase | ± 2.5 ppm accuracy |



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| | |
|---|---|
| **Timebase Output** | External Output |

**Technical Note:**

- Horizontal time range assumes 10 divisions for horizontal axis.

## Trigger

**Table 8 – Trigger Specifications**

| Specification | Value |
|---|---|
| **Sweep Modes** | Auto or Normal triggered |
| **Trigger Source** | Channels 1 to 4, External Input, Pattern, Software, TTL Trigger 0-7, Star Trigger (PXI), ECL Trigger 0-1 (VXI) |
| **Trigger Slope/Polarity** | Positive or Negative |
| **Trigger B** | Qualify trigger on second source for edge trigger event |
| **Trigger A Holdoff** | Programmable delay after trigger A before recognizing next trigger A event |
| **Trigger B Holdoff** | Programmable delay after trigger A before recognizing trigger B event |
| **Trigger A/B Holdoff Range** | 0 to 100 seconds |
| **Trigger A/B Event Counter** | Qualify trigger on $N_{th}$ Trigger event, N=1 to 65,536 |
| **Trigger A Modes** | Edge, Pattern, State, Pulse Width, Video |
| **Trigger B Modes** | Edge, Pattern |
| **Pattern Trigger Mode** | Pattern match true or false |
| **Pattern Sources** | Channels 1 to 4, External Input, TTL Trigger 0-7, Star Trigger (PXI), ECL Trigger 0-1 (VXI) |
| **State Trigger Mode** | Edge event when pattern match true or false. Pattern source used as Arm qualifier. |
| **Pulse Width Trigger Mode** | Trigger on pulse width greater than, less than, within, or outside limits<br>< Limit 1, > Limit 1, Limit 1 < width < Limit 2, Limit 1 > width > Limit 2 |
| **Pulse Width Limits** | 10 ns to 500 ms<br>5 ns resolution<br>± 5 ns accuracy |
| **Pulse Width Minimum** | 2 ns pulse width captured for < Limit1 |
| **Video Trigger Mode** | PAL (50 Hz), NTSC (60 Hz), SECAM (50 Hz)<br>Standard, Field, Line selectable |
| **Trigger Timestamp** | 100 ns resolution, 1 second rollover |



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## Trigger, Analog Input

**Table 9 – Analog Input Trigger Specifications**

| Specification | Value |
|---|---|
| Analog Input Triggers | Channels 1 to 4 |
| Trigger Level | (offset - full scale range/2) to (offset + full scale range/2) |
| Trigger Hysteresis | 2.5% (overdrive required) |
| Trigger Level Resolution | 0.025% of full scale range |
| Trigger Level Accuracy | ± (2% full scale range + 5 mV + offset accuracy) |
| Trigger Sensitivity | |
| **DC to 100 MHz** | 5% of full scale range |
| **> 100 MHz** | 10% of full scale range |
| Trigger Bandwidth | DC to 300 MHz typical, DC to 250 MHz minimum |
| Glitch Detection | ≥ 500 ps glitch captures in edge trigger mode |

## Arm

**Table 10 – Arm Specifications**

| Specification | Value |
|---|---|
| Functionality | Arm to qualify Trigger Event |
| Source | External Input, TTL Trigger 0-7, Star Trigger (PXI), ECL Trigger 0-1 (VXI), Software |
| Polarity | Positive or Negative |

## External Input (Front Panel)

**Table 11 – Front Panel External Input Specifications**

| Specification | Value |
|---|---|
| Functionality | Trigger Input, Timebase Reference Input, External Arm |
| Absolute Maximum Input (no damage) | ≤ ± 5 V (DC + peak AC), CAT I |
| Input Trigger Level Adjustment | -2 V to +2 V<br>0.5 mV resolution<br>≤ 20 mV accuracy<br>20 mV overdrive (input hysteresis) |
| Input Bandwidth (-3 dB) DC | ≥ 250 MHz |
| Input Impedance | 1 MΩ \| \| 30 pF or 50 Ω<br>≤ ± 2% accuracy |
| Connector | |



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| | |
|---|---|
| **PXI** | SMB |
| **VXI/LXI** | BNC |

## External Output (Front Panel)

**Table 12 – Front Panel External Output Specifications**

| Specification | Value |
|---|---|
| Functionality | Trigger Output, Timebase Reference Output, Event Output, Programmable Clock Output, Programmable Pulse Output, Constant Level, and Probe Compensation Output |
| Output Event Source | Arm Event, Trigger A Event, Trigger B Event, Trigger Complete Event, Capture Complete Event, Operation Complete Event, Master Summary Status Event, Limit Test Successful Event |
| Polarity | High or Low Truth |
| Programmable Event Pulse Width | 50 ns to 163 ms |
| Programmable Clock | Period: 26.667 ns to 100 seconds<br>50% Duty Cycle |
| Programmable Pulse | |
| **Pulse Repetition** | 26.667 ns to 100 seconds |
| **Interval Pulse Width** | 26.667 ns |
| Probe Compensation | 10 kHz Clock which can be used to compensate probes |
| Limit Test Successful | Event pulse after each capture upon limit or mask test success |
| Output Level | TTL Compatible into ≥ 200 Ω<br>≥ ± 24 mA Output Drive |
| Output Enable | Tri-State Output Capability |
| Connector | |
| **PXI** | SMB |
| **VXI/LXI** | BNC |

## Backplane Triggers

**Table 13 – Backplane Trigger Specifications**

| Specification | Value |
|---|---|
| Functionality | Multi-Instrument Synchronization Trigger, Event Output Signals |
| Triggers | TTL Trigger 0-7,<br>ECL Trigger 0-1 (VXI) |
| Direction | Input or Output |
| Source | Arm Event, Trigger A Event, Trigger B Event, Trigger Complete Event, Capture Complete Event, Operation Complete Event, Master Summary Status Event, Constant Level |



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| | |
|---|---|
| Polarity | High or Low Truth |
| Programmable Event Pulse Width | 50 ns to 163 ms |

## Measurements

**Table 14 – Measurements Specifications**

| Specification | Value |
|---|---|
| Measurements | AC RMS, Amplitude, Average, Cycle Average, Cycle Frequency, Cycle Period, Cycle RMS, DC RMS, Duty Cycle High, Duty Cycle Low, ENOB, Number of Falling Edges, Fall Crossing Time, Fall Overshoot, Fall Preshoot, Fall Time, Frequency, High, Low, Maximum, Mid, Minimum, Peak-to-Peak, Period, Phase, Pulse Width Positive, Pulse Width Negative, Number of Rising Edges, Rise Crossing Time, Rise Overshoot, Rise Preshoot, Rise Time, SFDR, SINAD, SNR, Standard Deviation, THD, Time of Maximum, Time of Minimum |
| Edge Measurements | $N_{th}$ edge selectable, N = 1 to 65,535 |
| Maximum Measurements | $N_{th}$ maximum selectable, N = 1 to 100<br>Applies to Maximum and Time of Maximum |
| Measurement Methods | Entire waveform, Gated by Time, Gated by Points, Gated by Frequency, Gated by Cursors |
| Measurement Levels | Low, Mid, High reference levels for edge measurements set in absolute voltages or relative percentages |
| Cursors | Quantity 2<br>Horizontal & vertical axis location markers<br>X, Y, ΔX, ΔY Measurements |
| Measurement Lists | Quantity 4<br>Up to 8 measurements per list that are performed upon acquisition<br>Stored for rapid measurement setup |
| Measurement Trending | Historic buffer of measurement data stored in Calculate channel (see Calculations) |
| Measurement Accuracy | |
| **Delta DC Voltage** | ± DC gain accuracy |
| **Absolute DC Voltage** | ± (DC gain accuracy + offset accuracy) |
| **Time** | ± time resolution |
| Frequency | ± (1/(period of applied signal ± time resolution)) |

Technical Note:

- Tme resolution = one sample interval, one equivalent-time sample interval, or one interpolated-time sample interval (depending upon acquisition mode.



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## Reference Waveforms

**Table 15 – Reference Waveforms Specifications**

| Specification | Value |
|---|---|
| Reference Channels | Quantity 4 |
| Reference Storage | Non-volatile memory storage |
| Reference Data | 32 KiSample maximum waveform size<br>32-bit resolution |

## Calculations

**Table 16 – Calculations Specifications**

| Specification | Value |
|---|---|
| Calculate Channels | Quantity 4 |
| Calculate Data | 512 KiSample maximum waveform size<br>32-bit resolution |
| Calculate Functions | Add, Subtract, Multiply, Copy, Invert, Integral, Derivative, Absolute Value, Limit Test, Mask Test, Frequency Transform, Time Transform, Histogram, Measurement Trending |
| Limit Test | Measurement limit range testing or waveform mask testing |
| Limit Test Reporting | Measurement maximum, minimum, average, current value, pass count and fail count |
| Frequency Transform | FFT Magnitude |
| FFT Windowing | Rectangular, Hamming, Hann, Blackman, Flattop |
| FFT Data Format | Linear Magnitude, Logarithmic Magnitude, Phase, Real, Imaginary |
| Time Transform | Digital Infinite Impulse Response (IIR) filter |
| IIR Filter Type | Auto-generate: Low-pass, 2 to 40 data point smoothing |
| Histogram | 65,536 bins for up to 16-bit histogram horizontal resolution |
| Measurement Trending | Historical waveform of measurement data. Provides trend data of 1 measurement point per capture. |

## Data Processing & Download

**Table 17 – Data Processing & Download Specifications**

| Specification | Value |
|---|---|
| Self-Calibration | Automatic internal calibration: Input DC Offset Zero, Input DC Offset Adjust Scale Factor, ADC Balance, ADC Timing |
| Auto-Scale | Automatic adjust to input signals: Input Range, Offset, Sample Rate, Trigger Source and Trigger Level |



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| | |
|---|---|
| Waveform Data Formats | 16-bit or 32-bit signed integer<br>32-bit or 64-bit floating point<br>Intel® or Motorola® Byte Order |
| Waveform Download Mode | |
| **Normal** | Every real-time data point |
| **Decimated** | Every $N_{th}$ real-time data point (N = 2 to 100,000) |
| **Interpolated** | N points for every real-time point (N = 2 to 100) |
| Waveform Interpolation Modes | None, First Order (linear), or sin(x)/x (sinc) |

## Instrument Stored States

**Table 18 – Instrument Stored States Specifications**

| Specification | Value |
|---|---|
| Functionality | Non-volatile storage of instrument setup configuration |
| Stored States | 30<br>State 0 is Reset State<br>Power-On State programmable |

## LED Indicators

**Table 19 – LED Indicators Specifications**

| Specification | Value |
|---|---|
| RDY (Ready) | OFF: Hardware Failure<br>ON: Unit has passed power-up self-diagnostics<br>TOGGLE: Unit has an error pending in error queue |
| HST/LAN (Host) | OFF: Interface fault<br>ON: Normal interface operation<br>TOGGLE: Device identify enabled |
| TRG (Trigger) | OFF: Trigger event not detected<br>ON/PULSE: Trigger complete event detected |
| ACT (Active) | OFF: Instrument Idle<br>ON/PULSE: Data acquisition initiated |
| 1588 (1588 Clock Status) (LXI only) | OFF: IEEE 1588 clock not synchronized or fault<br>ON: Clock locked as IEEE 1588 slave<br>TOGGLE @ 1 s: Clock synchronized as IEEE 1588 master<br>TOGGLE @ 2 s: Clock synchronized as IEEE 1588 grand master |
| PWR (Power) (LXI only) | ON: Unit is powered on<br>OFF: Unit is powered off |



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## PXI Interface

**Table 20 – PXI Interface Specifications**

| Specification | Value |
|---|---|
| PCI Bus Data Interface | 33 MHz, 32 bit<br>132 MByte/s burst<br>up to 120 MByte/s sustained |
| PCI Voltage | Universal, +3.3 V or +5 V |
| PCI Standard Compatibility | Version 2.2 |
| PXI Slot Compatibility | PXI Standard Slot and<br>PXIe Hybrid Slot Compatible |
| PXI Timing & Triggering Signals (XJ4 Connector) | PXI_TRIG[0:7] input/output<br>PXI_STAR input<br>PXI_CLK10 input |
| PXI Identification | |
| **Primary ID** | 3712 (0x0E80) |
| **Secondary ID** | 4400 (0x1130) |

## VXI Interface

**Table 21 – VXI Interface Specifications**

| Specification | Value |
|---|---|
| Command Interface | A16 message-based servant, SCPI compatible |
| Interrupt Operation | Programmable interrupter, Level 1-7 |
| Manufacturer ID | |
| **Primary ID** | 3712 (0x0E80) |
| **Secondary ID** | 440 (0x01B8) |

## LXI Interface

**Table 22 – LXI Interface Specifications**

| Specification | Value |
|---|---|
| Command Interface | LAN 10/100/1000, SCPI Compatible |
| Manufacturer ID | |
| **Primary ID** | 3712 (0x0E80) |
| **Secondary ID** | 440 (0x01B8) |



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## Status Reporting

**Table 23 – Status Reporting Specifications**

| Specification | Value |
|---|---|
| IEEE-488.2 Device Status | Reporting Structure including Status Byte, Standard Event Registers, Questionable Registers, Operation Registers and Self-Test Status Registers |

## AC Power (LXI)

**Table 24 – LXI AC Power Specifications**

| Specification | Value |
|---|---|
| Line Voltage | 90-264 VAC, 47-63 Hz, automatic selection |
| Input Protection | AC line fuse, 250 VAC, 2.0 A, fast-acting |
| Harmonic Distortion | Meets EN610100-3-2 |
| Surge Withstand | Meets EN61000-4 |
| EMI Filtering | Meets CISPR 11 and 22 and FCC Part 15 Class B (conducted) |

# Power & Cooling Specifications

## Power Supplies

**Table 25 – Power Supplies Specifications**

| Model | Platform | Voltage | Typical Current | Maximum Current |
|---|---|---|---|---|
| **ZT4421** | PXI | +3.3 VDC<br>+5 VDC<br>+12 VDC<br>-12 VDC | 3.31 A<br>1.19 A<br>0.02 A<br>0.01 A | 4.13 A<br>1.75 A<br>0.02 A<br>0.01 A |
| | VXI | +5 VDC<br>+12 VDC<br>+24 VDC<br>-2 VDC<br>-5.2 VDC<br>-12 VDC<br>-24 VDC | 3.88 A<br>0.02 A<br>0.00 A<br>0.07 A<br>0.32 A<br>0.01 A<br>0.00 A | 5.24 A<br>0.02 A<br>0.00 A<br>0.08 A<br>0.36 A<br>0.01 A<br>0.00 A |
| | LXI | 115 VAC | 0.34 A | 0.42 A |



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| | | | | |
|---|---|---|---|---|
| **ZT4422** | VXI | +5 VDC<br>+12 VDC<br>+24 VDC<br>-2 VDC<br>-5.2 VDC<br>-12 VDC<br>-24 VDC | 6.31 A<br>0.05 A<br>0.00 A<br>0.07 A<br>0.49 A<br>0.02 A<br>0.00 A | 8.33 A<br>0.05 A<br>0.00 A<br>0.08 A<br>0.57 A<br>0.02 A<br>0.00 A |
| | LXI | 115 VAC | 0.46 A | 0.54 A |

### Total Cooling and Power Consumption

**Table 26 – Cooling and Power Consumptions Specifications**

| Model | Platform | Typical Cooling & Power | Maximum Cooling & Power |
|---|---|---|---|
| **ZT4421** | PXI | 17.3 W | 22.8 W |
| | VXI | 21.5 W | 28.6 W |
| | LXI | 39.0 W | 48.4 W |
| **ZT4422** | VXI | 35.7 W | 44.4 W |
| | LXI | 53.2 W | 62.6 W |

## Physical & Environmental Specifications

### Size & Weight

**Table 27 – Size & Weight Specifications**

| Specification | Value |
|---|---|
| PXI Physical Size | Single-Wide 3U PXI Instrument<br>8.25" x 0.79" x 5.25" (L x W x H)<br>20.96 cm x 2.01 cm x 13.34 cm (L x W x H) |
| VXI Physical Size | Single-Wide C-size VXI bus Instrument<br>14.45" x 1.20" x 10.35" (L x W x H)<br>36.70 cm x 3.05 cm x 26.29 cm (L x W x H) |
| LXI Physical Size | Half-Width 1U LXI Instrument<br>13.35" x 7.25" x 1.75" (L x W x H)<br>33.91 cm x 18.42 cm x 4.345 cm (L x W x H) |
| PXI Weight | 12.3 oz 349 g |
| VXI Weight | |
| **ZT4421** | 2.82 lbs or 1.28 kg |
| **ZT4422** | 3.11 lbs or 1.41 kg |
| LXI Weight | |



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| | |
|---|---|
| **ZT4421** | 4.48 lbs or 2.03 kg |
| **ZT4422** | 4.77 lbs or 2.16 kg |

## Temperature Range

**Table 28 – Temperature Range Specifications**

| Specification | Value |
|---|---|
| Operating | 0°C to +50°C ambient |
| Storage | -40°C to +75°C |
| Over-Temperature | Automatic shutdown if internal temperature exceeds +70°C |
| Calibration Range | +20°C to +30°C ambient, after a 20 minute warm-up period, to meet all calibration specification accuracies |

## Relative Humidity

**Table 29 – Relative Humidity Specifications**

| Specification | Value |
|---|---|
| Operating or Storage | 10% to 90% non-condensing, up to +40°C |

## Altitude

**Table 30 – Altitude Specifications**

| Specification | Value |
|---|---|
| Operating | Up to 3 km<br>Up to 5 km with Maximum Input<br>(1 MΩ) of ± 100 V |
| Storage | Up to 15 km |



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# Safety & Compliance Information

## 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 Marketing 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 < 10 MHz 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:

- 72/23/EEC Low Voltage Directive (Safety)
- 89/336/EEC Electromagnetic Compatibility Directive (EMC)

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

## LXI Conformance

This product's LXI models are conformant to the LXI Consortium's Functional Class C.

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