

Handheld Digital Storage Oscilloscopes  
2510 Series



The 2510 Series handheld digital storage oscilloscopes provide floating measurement and recorder capabilities with a built-in digital multimeter (DMM), all in one portable and lightweight package. These versatile 60 MHz and 100 MHz bandwidth scopes offer 1 GSa/s sample rates, 2 Mpts waveform memory, 32 automatic measurements, and multiple recording functions to capture transient or long-term signal behavior.

The built-in 6000-count multimeter allows users to quickly switch over from an oscilloscope to a DMM to measure DC/AC voltage and current, resistance, and capacitance, including diode and continuity tests.

These handheld scopes feature many useful recording functions such as trend plot, which allows data logging from the scope or multimeter. Additionally, the scope recorder function offers users 7 Mpts record length on a single channel or 3.5 Mpts on dual channel.

The 2510 Series handheld oscilloscopes are ideal for industrial applications, power systems, electronics design, and field test and service.

Features and Benefits

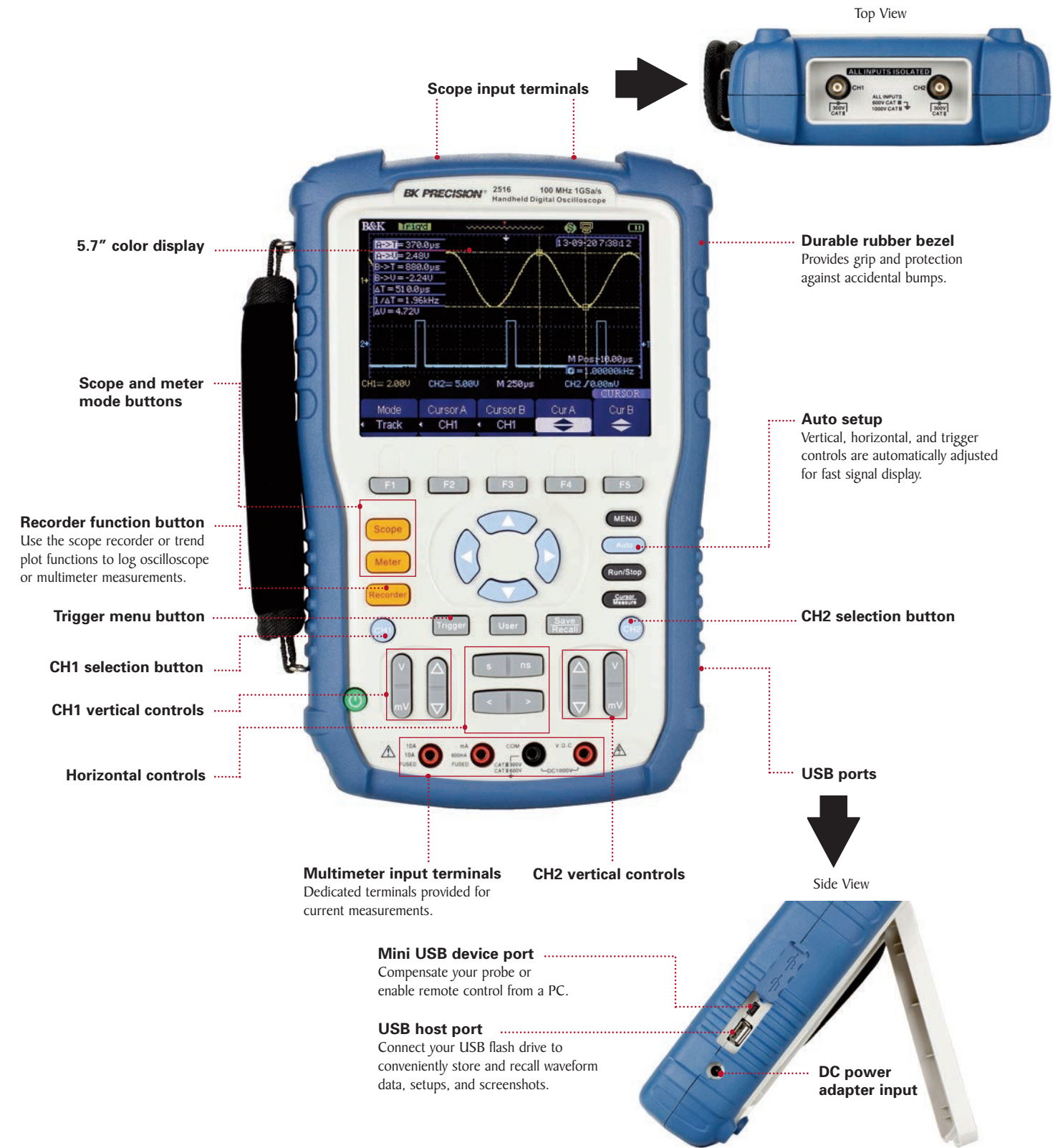
- 60 MHz (2511/2515) and 100 MHz (2512/2516) bandwidth
- 1 GSa/s sample rate
- Deep waveform memory up to 2 Mpts
- 2 fully isolated and floating 1,000 V CAT II, 600 V CAT III rated inputs (isolated models 2515 and 2516)
- 300 V CAT II rated inputs (non-isolated models 2511 and 2512)
- Built-in 6000-count DMM with dedicated terminals for current measurement
- Scope and meter trend plot functions for data logging
- Bright 5.7" color display
- Compact and lightweight – 3.4 lbs (1.54 kg)
- FFT including four additional math functions - Add, Subtract, Multiply, and Divide
- 32 automatic measurements
- USB host port for saving and recalling waveform setups, data, and screenshots on a USB flash drive
- Software provided for remote PC control
- Advanced tools include digital filters with adjustable limits, scope and waveform recorder mode
- Multi-language user interface
- Up to four hours of continuous battery operation

| Model                | 2511                | 2512    | 2515                             | 2516    |
|----------------------|---------------------|---------|----------------------------------|---------|
| Bandwidth            | 60 MHz              | 100 MHz | 60 MHz                           | 100 MHz |
| Channels             | 2 non-isolated      |         | 2 fully isolated                 |         |
| Typical Applications | General electronics |         | Power electronics and industrial |         |

Technical data subject to change  
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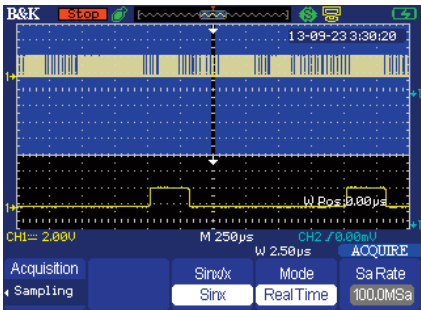


Front Panel



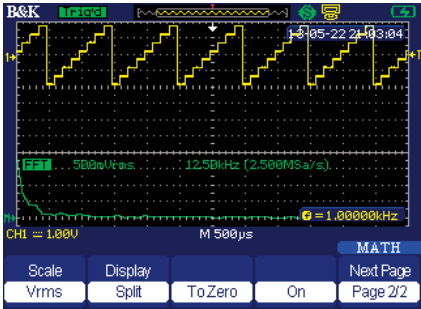
## The tools you need

### 2 Mpts Deep Memory



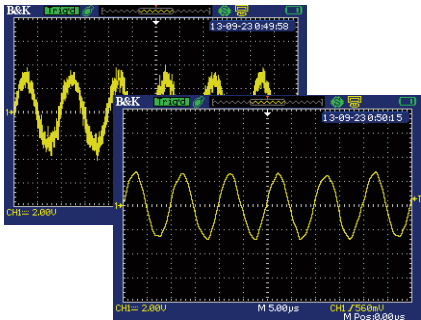
See more details in your waveform with deep memory. When enabled, waveforms can be captured in high resolution while maintaining a high sample rate over a wider period of time than other comparable scopes.

### Powerful Measurement Functions



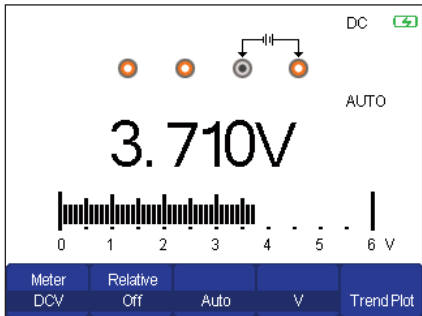
Display and measure the input signal's frequency spectrum. Select one of the 4 FFT windows: Rectangular, Hanning, Hamming, and Blackman. Use cursors to measure the spectral component's magnitude and frequency.

### Digital Filtering



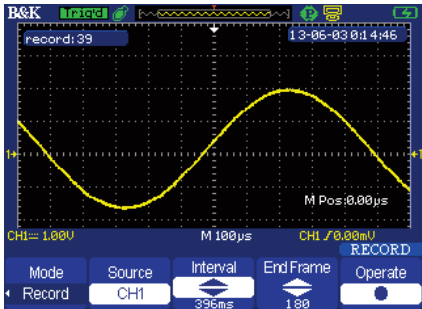
Filter out unwanted signal components such as various types of noise with built-in digital filters. Choose from Low-Pass, High-Pass, Band-Pass, and Band-Stop filters.

### Built-in Digital Multimeter



Speed up troubleshooting with the built-in 6000-count multimeter. Measurement functions include AC/DC voltage and current, resistance, capacitance, diode, and continuity test.

### Scope and Waveform Recorder Modes



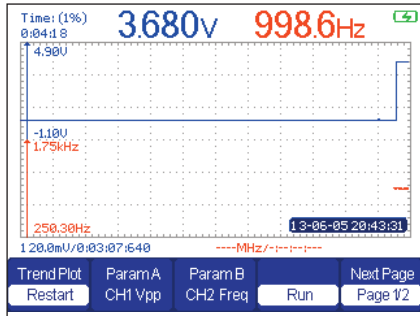
Monitor and analyze long-term signal behavior by recording data continuously over a period of time. These modes allow recorded data to be played back for post acquisition analysis.

### Portable Operation

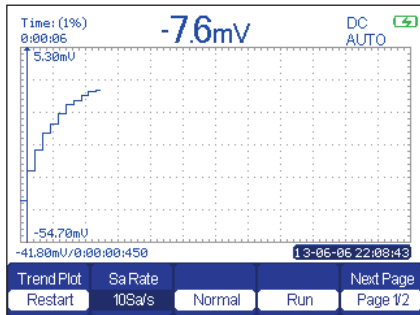


Quickly troubleshoot in the field using battery powered operation. Built for portability, the 2510 Series handheld digital oscilloscopes are rugged, compact, and lightweight. All models come standard with travel case for safe transport on the road.

### Scope and Meter Trend Plot Functions



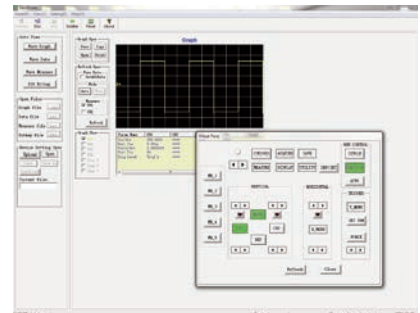
Scope Trend Plot



Meter Trend Plot

Capture intermittent errors in your system. The trend plot function can be used with the oscilloscope or built-in DMM to plot measurement values over time. Up to two voltage or time parameters can be selected by the scope, and any one of the multimeter's measurement functions can be graphed. These data points can then be exported to a CSV file for further analysis.

### PC Connectivity



PC software provided (free download from [www.bkprecision.com](http://www.bkprecision.com)) for seamless integration between the oscilloscope and PC. Capture and transfer waveforms, screen images, setups and measurement results to a Windows PC via the USB device port on the side of the instrument. A USB host port is also available for quick and easy screen saving.

Floating and Differential Measurements

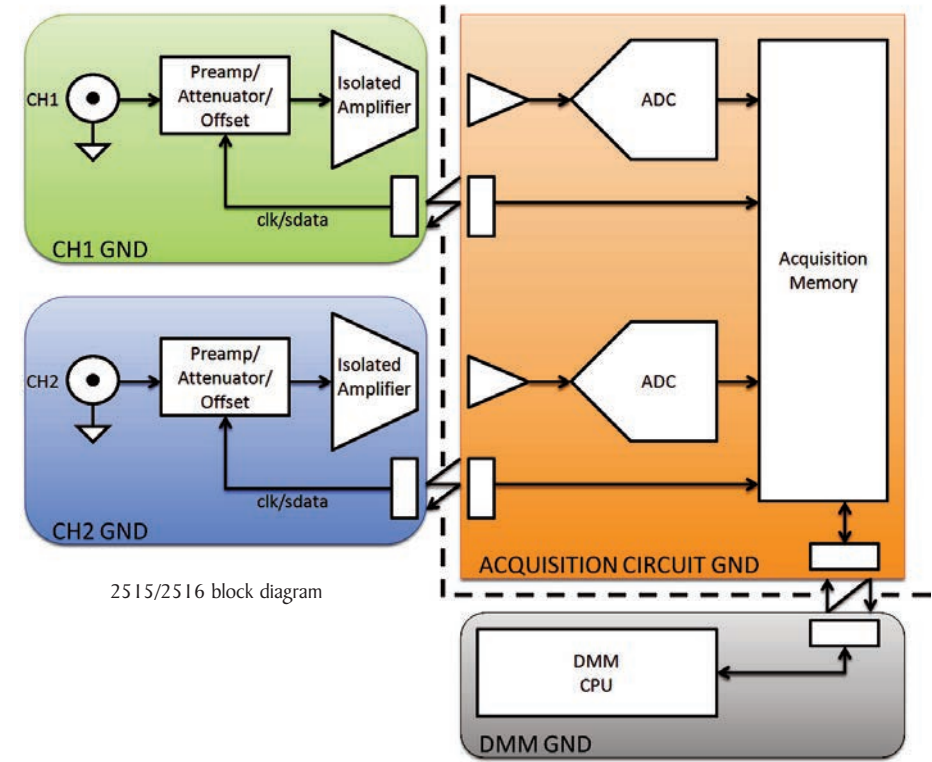
Many industrial applications such as power electronics require measurements of high voltages and currents that are not referenced to ground. This poses an issue with traditional line-powered oscilloscopes, which typically have signal common connected to the chassis of the oscilloscope. This means all measurements must be made relative to earth ground, preventing users from making differential measurements where none of the test points are referenced to ground.

As a workaround, some people choose to float an oscilloscope by removing the connection between the instrument's chassis and power line ground. Floating a scope is not recommended as it can put the user at a safety risk. Parasitic capacitance is also induced in the measurement which can cause ringing and invalidate the measurement. The 2510 Series allows engineers and technicians to make accurate and safe measurements when the signal reference is floating.

Fully Isolated Channel Design for Safe Measurements (models 2515/2516 only)

Models 2515 and 2516 offer two CAT III 600 V input channels for floating measurements and feature an electrically isolated circuit design

between inputs and the digital acquisition circuit. Isolating the ground references eliminate ground loops and help reduce channel noise and crosstalk.



2515/2516 block diagram

Safety Rated High Bandwidth Oscilloscope Probes



Probe Model PR250SA



Probe Model PR150SA

All 2510 Series models come standard with high bandwidth, safety certified passive probes (one per channel) to help you get the most out of your scope.

| Model | Included Probes                                                                                     |
|-------|-----------------------------------------------------------------------------------------------------|
| 2511  | Two 150 MHz bandwidth, x1/x10 probes rated for 300 V CATII measurements                             |
| 2512  |                                                                                                     |
| 2515  | Two touch-protected 250 MHz bandwidth, x10 probes rated for 1000 V CATII, 600 V CATIII measurements |
| 2516  |                                                                                                     |

| Input Signal and Float Voltage Safety Ratings          |                 |                                    |
|--------------------------------------------------------|-----------------|------------------------------------|
| Model                                                  | 2511 / 2512     | 2515 / 2516                        |
| Maximum signal input safety rating with included probe | 300 Vrms CAT II | 1000 Vrms CAT II, 600 Vrms CAT III |
| Maximum signal input safety rating without probe       | 300 Vrms CAT II | 300 Vrms CAT II                    |
| Maximum reference floating safety rating               | 30 Vrms         | 1000 Vrms CAT II, 600 Vrms CAT III |

## Digital Storage Oscilloscope Specifications

| Models                                                   | 2511                                                                                                                                                                 | 2512                  | 2515                                                                                      | 2516                  |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------|-----------------------|
| Performance Characteristics                              |                                                                                                                                                                      |                       |                                                                                           |                       |
| Bandwidth                                                | 60 MHz                                                                                                                                                               | 100 MHz               | 60 MHz                                                                                    | 100 MHz               |
| Real Time Sampling Rate                                  | 1 GSa/s (half-channel interleaved) <sup>(1)</sup> , 500 MSa/s (per channel)                                                                                          |                       |                                                                                           |                       |
| Channels                                                 | 2 non-isolated                                                                                                                                                       |                       | 2 isolated                                                                                |                       |
| Rise Time                                                | < 5.8 ns                                                                                                                                                             | < 3.5 ns              | < 5.8 ns                                                                                  | < 3.5 ns              |
| Ch-to-Ch Isolation (both channels at same V/div setting) | > 100:1 at 50 MHz                                                                                                                                                    |                       |                                                                                           |                       |
| Memory Depth                                             | 40 kpts (half-channel interleaved) <sup>(1)(2)</sup> , 20 kpts (per channel)                                                                                         |                       |                                                                                           |                       |
| Deep Memory <sup>(3)</sup>                               | 2 Mpts (half-channel interleaved) <sup>(1)</sup> , 1 Mpts (per channel)                                                                                              |                       |                                                                                           |                       |
| Vertical Resolution                                      | 8 bits                                                                                                                                                               |                       |                                                                                           |                       |
| Vertical Sensitivity                                     | 2 mV/div – 100 V/div (1-2-5 order)                                                                                                                                   |                       | 5 mV/div – 100 V/div (1-2-5 order)                                                        |                       |
| DC Gain Accuracy                                         | 5 mV/div-100 V/div: $\leq \pm 4 \%$                                                                                                                                  |                       |                                                                                           |                       |
| Max. BNC Input Voltage                                   | CATII 300 Vrms from BNC signal to BNC shell                                                                                                                          |                       |                                                                                           |                       |
| Max. Input Voltage for Probe                             | PR150SA <sup>(4)</sup> : 1x/10x CAT II 300 V<br>PR250SA <sup>(5)(6)</sup> : 10x CAT III 600 V, CATII 1000 V                                                          |                       |                                                                                           |                       |
| Channel Voltage Offset Range                             | 2 mV - 200 mV : $\pm 1.6$ V<br>206 mV - 10 V : $\pm 40$ V<br>10.2 V - 100 V : $\pm 400$ V                                                                            |                       | 5 mV - 200 mV : $\pm 1.6$ V<br>206 mV - 10 V : $\pm 40$ V<br>10.2 V - 100 V : $\pm 400$ V |                       |
| Bandwidth Limit                                          | 20 MHz (-3 dB)                                                                                                                                                       |                       |                                                                                           |                       |
| Horizontal Scan Range                                    | 5.0 nS/div - 50 S/div                                                                                                                                                | 2.5 nS/div - 50 S/div | 5.0 nS/div - 50 S/div                                                                     | 2.5 nS/div - 50 S/div |
| Timebase Accuracy                                        | $\pm 50$ ppm measured over 1 ms interval                                                                                                                             |                       |                                                                                           |                       |
| Input Coupling                                           | AC, DC, GND                                                                                                                                                          |                       |                                                                                           |                       |
| Input Impedance                                          | 1 M $\Omega$ +/- 2 %    18 pF $\pm 3$ pF                                                                                                                             |                       | 1 M $\Omega$ +/- 2 %    16 pF $\pm 3$ pF                                                  |                       |
| Probe Attenuation Selectable Factors                     | 1X, 5X, 10X, 50X, 100X, 500X, 1000X                                                                                                                                  |                       |                                                                                           |                       |
| Vertical and Horizontal Zoom                             | Vertically or horizontally expand or compress a live or stopped waveform                                                                                             |                       |                                                                                           |                       |
| I/O Interface                                            |                                                                                                                                                                      |                       |                                                                                           |                       |
| USB                                                      | USB host port support USB flash drives (FAT format)<br>mini-USB device port for PC connectivity and probe compensation                                               |                       |                                                                                           |                       |
| Acquisition Modes                                        |                                                                                                                                                                      |                       |                                                                                           |                       |
| Sampling                                                 | Display sample data only                                                                                                                                             |                       |                                                                                           |                       |
| Peak Detect                                              | Capture the maximum and minimum values of a signal                                                                                                                   |                       |                                                                                           |                       |
| Average                                                  | Waveform averaged, selectable from 4, 16, 32, 64, 128, 256                                                                                                           |                       |                                                                                           |                       |
| Trigger System                                           |                                                                                                                                                                      |                       |                                                                                           |                       |
| Trigger Types                                            | Edge, Pulse Width, Video*, Slope, Alternative<br><br>*Support signal formats: PAL/SECAM, NTSC<br>Trigger condition: odd field, even field, all lines, or line number |                       |                                                                                           |                       |
| Trigger Modes                                            | Auto, Normal, Single                                                                                                                                                 |                       |                                                                                           |                       |
| Trigger Coupling                                         | AC, DC, LF reject, HF reject                                                                                                                                         |                       |                                                                                           |                       |
| Trigger Source                                           | CH1, CH2                                                                                                                                                             |                       |                                                                                           |                       |
| Trigger Level Range                                      | $\pm 6$ divisions from center of display                                                                                                                             |                       |                                                                                           |                       |
| Trigger Displacement                                     | Pre-trigger: Memory depth / 2* sampling<br>Delay Trigger: 268.04 div                                                                                                 |                       |                                                                                           |                       |
| Pulse Width Trigger                                      | Positive slope (>, <, =), Negative slope (>, <, =), Time: 20 ns - 10 s                                                                                               |                       |                                                                                           |                       |
| Slope Trigger                                            | Positive slope (>, <, =), Negative slope (>, <, =), Time: 20 ns - 10 s                                                                                               |                       |                                                                                           |                       |
| Alternate Trigger                                        | CH1 trigger type: Edge, Pulse, Video, Slope<br>CH2 trigger type: Edge, Pulse, Video, Slope                                                                           |                       |                                                                                           |                       |

## Digital Storage Oscilloscope Specifications (cont.)

| Model                         | 2511                                                                                                                                                                                                    | 2512 | 2515 | 2516 |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| Hardware Frequency Counter    |                                                                                                                                                                                                         |      |      |      |
| Reading Resolution            | 1 Hz                                                                                                                                                                                                    |      |      |      |
| Range                         | DC couple, 10 Hz to MAX bandwidth                                                                                                                                                                       |      |      |      |
| Signal Types                  | Satisfying all trigger signals (except pulse width trigger and video trigger)                                                                                                                           |      |      |      |
| Waveform Math and Measure     |                                                                                                                                                                                                         |      |      |      |
| Math Operation                | Add, Subtract, Multiply, Divide, FFT                                                                                                                                                                    |      |      |      |
| FFT                           | Window mode: Hanning, Hamming, Blackman, Rectangular Sampling points: 1024                                                                                                                              |      |      |      |
| Measure                       | Vpp, Vmax, Vmin, Vamp, Vtop, Vbase, Vavg, Mean, Crms, Vrms, ROVShoot, FOVShoot, RPREShoot, FPREShoot, Rise, Fall, Freq, Prd, +Wid, -Wid, +Dut, -Dut, BWid, Phas, FRR, FRE, FFR, FFE, LRR, LRE, LFR, LFF |      |      |      |
| Cursors                       |                                                                                                                                                                                                         |      |      |      |
| Types                         | Voltage, Time                                                                                                                                                                                           |      |      |      |
| Measurements                  | ΔV, ΔT, 1/ΔT (frequency)                                                                                                                                                                                |      |      |      |
| Display System                |                                                                                                                                                                                                         |      |      |      |
| Display                       | 5.7" Color TFT, 320 x 234 resolution, 64K color                                                                                                                                                         |      |      |      |
| Display Contrast (Typical)    | 150:1                                                                                                                                                                                                   |      |      |      |
| Backlight Intensity (Typical) | 300 nits                                                                                                                                                                                                |      |      |      |
| Wave Display Range            | 8 x 12 div                                                                                                                                                                                              |      |      |      |
| Wave Display Mode             | Dots, Vector                                                                                                                                                                                            |      |      |      |
| Persistence                   | Off, 1 sec, 2 sec, 5 sec, Infinite                                                                                                                                                                      |      |      |      |
| Menu Display                  | 2 sec, 5 sec, 10 sec, 20 sec, Infinite                                                                                                                                                                  |      |      |      |
| Screen-Saver                  | Off, 1 min., 2 min., 5 min., 10 min., 15 min., 30 min., 1 hr, 2 hr, 5 hr                                                                                                                                |      |      |      |
| Waveform Interpolation        | Sin(x)/x, Linear                                                                                                                                                                                        |      |      |      |
| Measure Display Modes         | Main, Window zoom, Scan, X-Y                                                                                                                                                                            |      |      |      |
| X-Y Sampling Frequency        | Support 25 kSa/s - 250 MSa/s sampling rate (1-2.5-5 order)                                                                                                                                              |      |      |      |
| Color Mode                    | Normal, Invert                                                                                                                                                                                          |      |      |      |
| Environmental and Safety      |                                                                                                                                                                                                         |      |      |      |
| Temperature                   | Operating: 32 °F to 104 °F (0 °C to +40 °C)<br>Not operating: -4 °F to 158 °F (-20 °C to +70 °C)                                                                                                        |      |      |      |
| Humidity                      | Operating: 85% RH, 104 °F (40 °C), 24 hours                                                                                                                                                             |      |      |      |
| Altitude                      | Operating: 9,842.5 ft (3,000 m)                                                                                                                                                                         |      |      |      |
| Electromagnetic Compatibility | EMC Directive 2004/108/EC, EN61326:2006                                                                                                                                                                 |      |      |      |
| Safety                        | Low voltage directive 2006/95/EC, EN61010-1:2001                                                                                                                                                        |      |      |      |
| General                       |                                                                                                                                                                                                         |      |      |      |
| Storage Memory                | 2 reference waveforms, 20 setups, 10 waveforms                                                                                                                                                          |      |      |      |
| AC Adapter Power Requirements | Input: 100-240 VAC, 50/60 Hz<br>Output: 9V DC, 4 A                                                                                                                                                      |      |      |      |
| Battery Rating                | 5000 mAh, 7.4 VDC                                                                                                                                                                                       |      |      |      |
| Battery Charge Time           | Approx. 4 hrs                                                                                                                                                                                           |      |      |      |
| Battery Operating Time        | Approx. 4 hrs                                                                                                                                                                                           |      |      |      |
| Dimensions (W x H x D)        | 6.42" x 10.21" x 2.10" (163.2 x 259.5 x 53.3 mm)                                                                                                                                                        |      |      |      |
| Weight                        | Approx. 3.4 lbs (1.54 kg) including battery                                                                                                                                                             |      |      |      |
| Three-Year Warranty           |                                                                                                                                                                                                         |      |      |      |

(1) Half channel operation means that only Ch1 or Ch2 is active.

(2) When sampling rate is 1 GSa/s. For sampling rate  $\leq 500$  MSa/s, the maximum memory depth is 20 kpts.

(3) When sampling rate is < 500 MSa/s and maximum data depth mode is enabled.

(4) Probe included with models 2511 and 2512 only.

(5) Probe included with models 2515 and 2516 only.

(6) Refer to respective probe's manual for more information on the specification.

## Multimeter and Recorder Specifications

- All specifications are based on operating at temperatures  $23 \pm 5^{\circ}\text{C}$  and relative humidity  $< 75\%$ .
- Accuracy is based on  $\pm$  (% of reading + offset).

| Multimeter                                                       |                                                                                            |                      |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------|
| Display Resolution                                               | 6000 counts                                                                                |                      |
| Measurement Function                                             | DC voltage, AC voltage, resistance, diode, continuity, capacitance, DC current, AC current |                      |
| Max. Input Voltage                                               | AC: 750 V (30 Hz - 1 kHz)<br>DC: 1000 V                                                    |                      |
| Max. Input Current <sup>(1)</sup>                                | AC: 10 A (30 Hz - 1 kHz)<br>DC: 10 A                                                       |                      |
| Input Impedance                                                  | 10 MΩ                                                                                      |                      |
| Max. Input Voltage Between Multimeter Input Reference and Ground | CAT II 600 V<br>CAT III 300 V                                                              |                      |
| DC Voltage                                                       |                                                                                            |                      |
| Range                                                            | Resolution                                                                                 | Accuracy             |
| 60.00 mV                                                         | 10 μV                                                                                      | ± (1 % + 15 digits)  |
| 600.0 mV                                                         | 100 μV                                                                                     | ± (1 % + 5 digits)   |
| 6.000 V                                                          | 1 mV                                                                                       |                      |
| 60.00 V                                                          | 10 mV                                                                                      |                      |
| 600.0 V                                                          | 100 mV                                                                                     |                      |
| 1000 V                                                           | 1 V                                                                                        |                      |
| AC Voltage <sup>(2)</sup>                                        |                                                                                            |                      |
| Range                                                            | Resolution                                                                                 | Accuracy             |
| 60.00 mV                                                         | 10 μV                                                                                      | ± (1 % + 15 digits)  |
| 600.0 mV                                                         | 100 μV                                                                                     | ± (1 % + 5 digits)   |
| 6.000 V                                                          | 1 mV                                                                                       |                      |
| 60.00 V                                                          | 10 mV                                                                                      |                      |
| 600.0 V                                                          | 100 mV                                                                                     |                      |
| 750 V                                                            | 1 V                                                                                        |                      |
| DC and AC Current <sup>(3)(4)</sup>                              |                                                                                            |                      |
| Range                                                            | Resolution                                                                                 | Accuracy             |
| 60.00 mA                                                         | 10 μA                                                                                      | ± (1.5 % + 5 digits) |
| 600.0 mA                                                         | 100 μA                                                                                     |                      |
| 6.000 A                                                          | 1 mA                                                                                       | ± (2.5 % + 5 digits) |
| 10.00 A                                                          | 10 mA                                                                                      |                      |
| Resistance                                                       |                                                                                            |                      |
| Range                                                            | Resolution                                                                                 | Accuracy             |
| 600.0 Ω                                                          | 0.1 Ω                                                                                      | ± (1 % + 5 digits)   |
| 6.000 kΩ                                                         | 1 Ω                                                                                        |                      |
| 60.00 kΩ                                                         | 10 Ω                                                                                       |                      |
| 600.0 kΩ                                                         | 100 Ω                                                                                      |                      |
| 6.000 MΩ                                                         | 1 kΩ                                                                                       |                      |
| 60.00 MΩ                                                         | 10 kΩ                                                                                      | ± (3 % + 5 digits)   |

| Multimeter (cont.)           |              |                     |
|------------------------------|--------------|---------------------|
| Capacitance                  |              |                     |
| Range                        | Resolution   | Accuracy            |
| 40.00 nF                     | 10 pF        | ± (3 % + 10 digits) |
| 400.0 nF                     | 100 pF       | ± (4 % + 5 digits)  |
| 4.000 μF                     | 1 nF         |                     |
| 40.00 μF                     | 10 nF        |                     |
| 400.0 μF                     | 100 nF       |                     |
| Diode and Continuity Measure |              |                     |
| Diode                        | 0 – 2 V      |                     |
| Continuity                   | < 50 Ω alarm |                     |

- (1) Current input terminals protected with internal 250 V rated fuse.
- (2) For frequency range 30 Hz to 1 kHz.
- (3) For 10 A terminal, > 6 A DC or AC rms for 10 seconds ON and 15 minutes OFF.
- (4) For AC current ranges, frequency is verified for 30 Hz to 1 kHz.

| Recorder                                |                                                    |
|-----------------------------------------|----------------------------------------------------|
| Scope Trend Plot                        |                                                    |
| Display Mode                            | Full view, Normal                                  |
| Record Length                           | 800k points, > 24 hours                            |
| Number of Channels                      | 2                                                  |
| Multimeter Trend Plot                   |                                                    |
| Display Mode                            | Full view, Normal                                  |
| Record Length                           | 1.2M dots, > 24 hours                              |
| Number of Channels                      | 1                                                  |
| Scope Recorder                          |                                                    |
| Display Mode                            | Full view, Normal                                  |
| Max. Record Length                      | Single Channel: 7 M pts<br>Dual Channel: 3.5 M pts |
| Number of Channels                      | 2                                                  |
| Maximum Record Size to External Storage | 4 GB, 3000 hours                                   |

## Included Accessories

User manual, passive probes (one per channel), pair of DMM test leads, 7.4 V Li-ion battery BP2510, USB cable, probe compensation connector, AC power adapter, travel case LC2510B and certificate of calibration