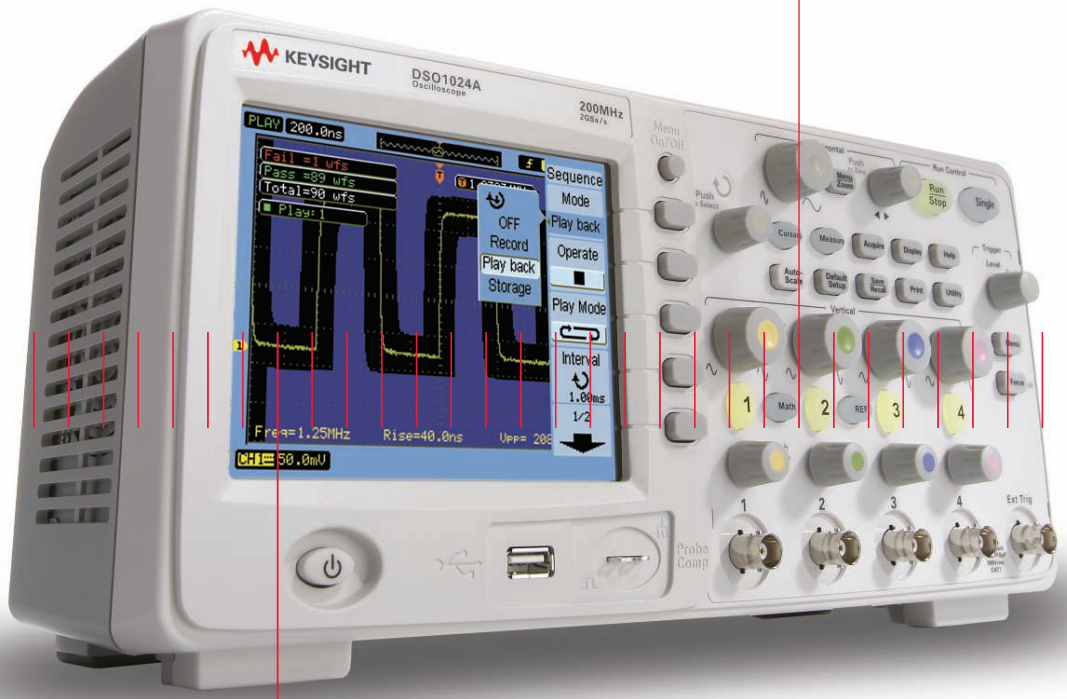
# Keysight Technologies DSO1000A/B Series Portable Oscilloscopes

Data Sheet




Engineered to give you more scope than you thought you could afford

EDN 2012 HOT 10

KEYSIGHT TECHNOLOGIES

# More scope than you thought you could afford

Keysight Technologies, Inc. 1000 Series oscilloscopes deliver the performance and features you expect in a big scope – and the portability and low price you require in a small one. We've redefined the economy scope by giving you powerful signal capture and display, advanced measurement capabilities and accelerated productivity.





Weighing less than 7 pounds with a small footprint, the 1000 Series can go anywhere with ease.

| 2-channel models | |
|---|---|
| DSO1052B | 50 MHz |
| DSO1072B | 70 MHz |
| DSO1102B | 100 MHz |
| DSO1152B | 150 MHz |
| DSO1022A | 200 MHz |

| 4-channel models | |
|---|---|
| DSO1004A | 60 MHz |
| DSO1014A | 100 MHz |
| DSO1024A | 200 MHz |

Whether your job is designing products in R&D, teaching the next generation in education, or testing in manufacturing or service, the new 1000 Series oscilloscopes can help get it done with confidence.

## R&D

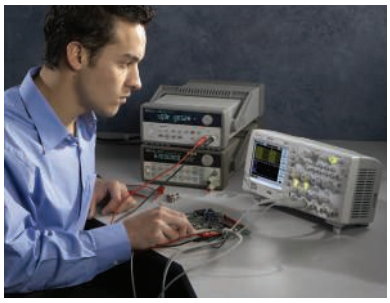


Figure 1. Features normally only found on much higher priced scopes equip the 1000 Series to be a powerful choice for R&D applications.

## Education

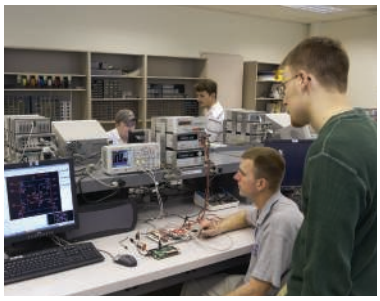


Figure 2. Economical prices make the 1000 Series ideal for teaching basic scientific and engineering measurements at lab stations in schools and universities.

## Manufacturing



Figure 3. Standard go/no-go mask testing is just one of the reasons manufacturing and service test demand 1000 Series solutions.

# Powerful signal capture and display

- Wide viewing angle, bright color display
- Up to 20 kpts memory, up to 8x more than other scope
- Up to 2 GSa/s sample rate
- Simultaneous viewing of main and zoomed waveforms
- 25% more viewing area with menus switched off

## Capture long time periods with high resolution

1000A Series models provide up to 20 kpts and 1000B models provide up to 16 kpts of acquisition memory standard. The scope will maintain high-resolutionacquisitions even at slower timebase settings so you can see the details on your signals.

## See your signals more clearly

Every 1000 Series scope incorporates a bright, crisp LCD color display (300 cd/m2). You can quickly view your signal from almost any angle. Unlike conventional scopes that always require menus to be on, the entire 5.7-inch diagonal screen is available for full waveform display as needed.

## Simultaneous viewing of main and zoomed waveforms

Dual display shows your entire signal and zoomed in waveform details at the same time.



Figure 4. The bright, crisp display on the 1000 Series oscilloscope and its wide viewing angle let you quickly identify your signal activity.

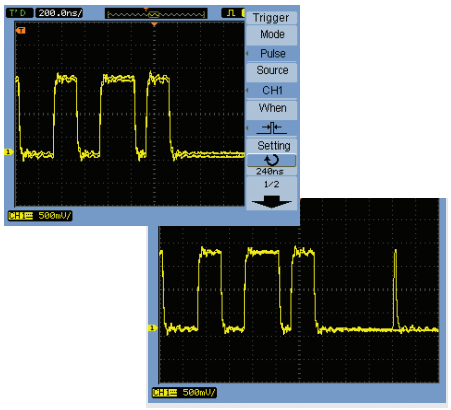



Figure 5. Turning off the menu gives almost 25% more viewing area for your signals.

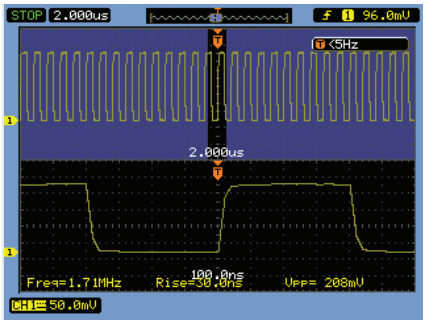



Figure 6. View a long record and the details of a zoom window simultaneously.

# Advanced measurement capability

- 23 automatic measurements
- Waveform math including FFT
- Standard go/no-go mask testing
- Sequential acquisition of up to 1000 trigger events
- Selectable high-pass, low-pass, band-pass, and band-reject digital filters

## 23 automatic measurements

All 1000 Series scopes come equipped with 23 automatic voltage, time and frequency measurements. Press the Measure key to bring up the three you use most often or display all single-channel measurements on the screen simultaneously.

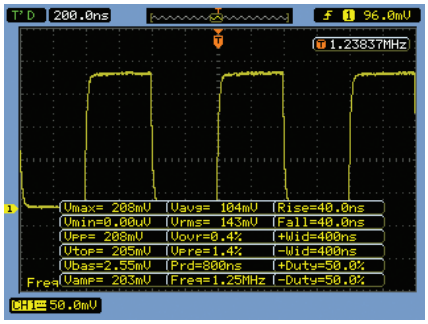



Figure 7. Display all single-channel measurements on screen simultaneously.

## Sequence mode for easier debug

Record up to 1000 occurrences of a trigger event and then play them back to easily spot glitches or other anomalies for further examination. Store the waveforms to internal or external memory (USB flash drive).

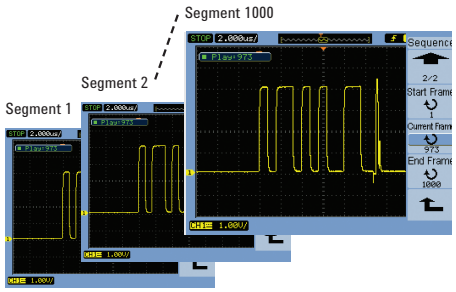



Figure 8. Use sequence mode to record up to 1000 triggers and review in playback mode for anomalies.

## Digital filtering on waveforms

Apply a real-time digital filter of your choice to the input source waveform to eliminate unwanted frequencies from your display. Digital filtering selections include Low-pass, high-pass, band-pass and band-reject filters. Frequency limits are selectable between 250 Hz and the full bandwidth of your oscilloscope.

## Advanced triggering

Triggering options for the 1000 Series include edge, pulse width, composite video, pattern (“A” models only) and alternate channel trigger modes. These modes ensure that you can capture and view hard-to-find signal conditions.

## Remote programming (Only available on “A” models)

For remote instrument control over the built-in USB device port, utilize Keysight’s I/O libraries with direct command control from Keysight VEE Pro, or National Instrument’s I/O libraries and available instrument drivers for the 1000A Series scope in your application. These NI certified drivers include Plug and Play for LabView and IVI for LabVIEW, LabWindows/CVI, and Measurement Studio for Visual Studio.

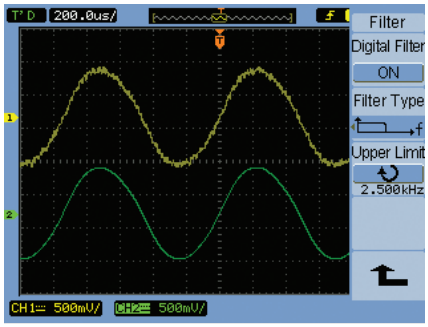



Figure 9. The Ch 1 waveform (Yellow) shows an unfiltered input and the Ch 2 waveform (Green) shows the same input signal with a low pass filter.

# Accelerated productivity

- Autoscale
- 11-Language localization of user interface, front panel controls, and manuals
- Context-sensitive built-in help menus
- USB connectivity
- Free education student lab guide and professor slide set

## Make fast go/no-go decisions

Automatic pass/fail mask testing comes as a standard feature on all 1000 Series scopes. Acquire a “golden” waveform and define tolerance limits to create a test envelope. Create custom mask’s based on XY tolerances and input those into the scope. Incoming signals will be compared to the allowable range and quickly flagged as pass or fail. This is ideal for manufacturing or service where you need to make decisions quickly.

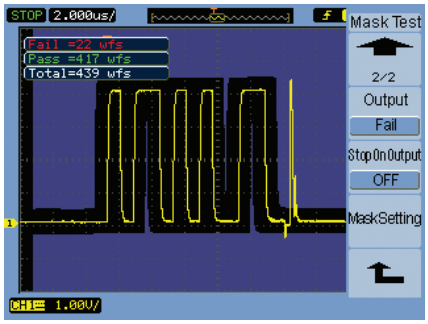



Figure 10. Mask testing provides a quick pass/fail comparison of an incoming signal to a test envelope you define.

## Waveform math and FFT

Standard math functions include addition, subtraction or multiplication of any two input channels and Fast Fourier Transform (FFT) with four user-selectable windows (Rectangle, Hanning, Hamming and Blackman).

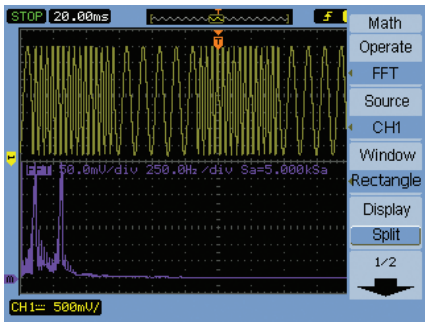



Figure 11. Built-in FFT enables easy spectral analysis on the time-domain signal.

## Multi-language interface

Operate the oscilloscope in the language most familiar to you. The built-in help system, graphical user interface, front panel overlays and user’s manual are available in eleven languages.  Choose from: English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese, and Italian.

## Autoscale

Quickly display any active signals and automatically set the vertical, horizontal and trigger controls for optimal viewing with the press of the autoscale button. (This feature can be disabled or enabled for education customers).

## Connectivity

Built-in USB host and device ports and free IntuiLink software make documentation and PC connectivity easy. Store waveforms and setups to a USB flash drive, easily update scope firmware, document directly to a connected PC running Microsoft Word or Excel, and print to any PictBridge compatible printer.



Figure 12. Choose from 11 different languages for oscilloscope interface and help.

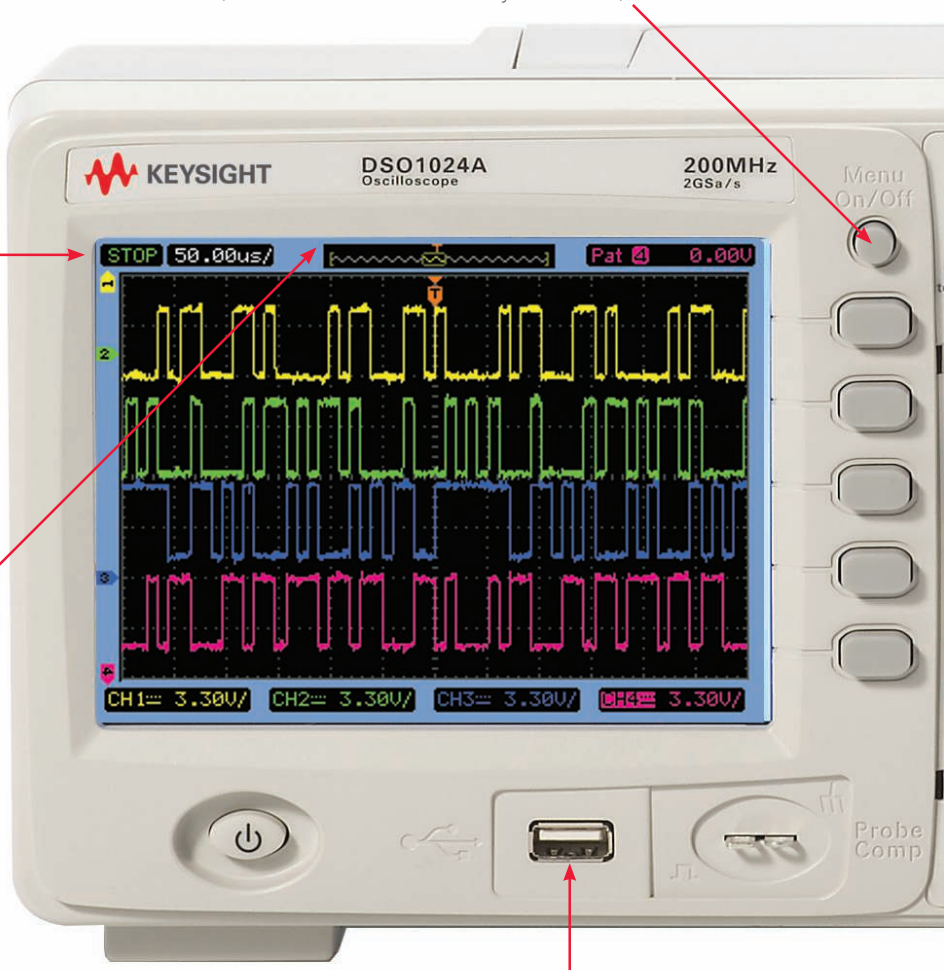
PictBridge

## Education Resource Kit

Keysight provides a variety of oscilloscope resource training tools to help your EE students come up-to-speed on what an oscilloscope is and how to use one. Downloadable resources include: EE student’s oscilloscope lab guide and tutorial, Professor’s Oscilloscope Fundamentals slide-set, probe loading experiment and oscilloscope application notes.

# Keysight 1000A Series portable oscilloscopes:
Engineered to give you more scope than you thought you could afford

## Powerful Signal Capture and Display




Turn menu off for almost 25% more viewing area (or set to turn off automatically on timeout)

Bright and crisp 5.7-inch color LCD display with wide angle viewing

Acquisition memory bar shows full 20 kpts of memory and highlights portion displayed

Sturdy snap handle for easy carrying

Two USB host ports facilitate saving data to a USB flash drive and enable quick firmware updates



Secure with cable lock

Secure with a Kensington lock or looped cable

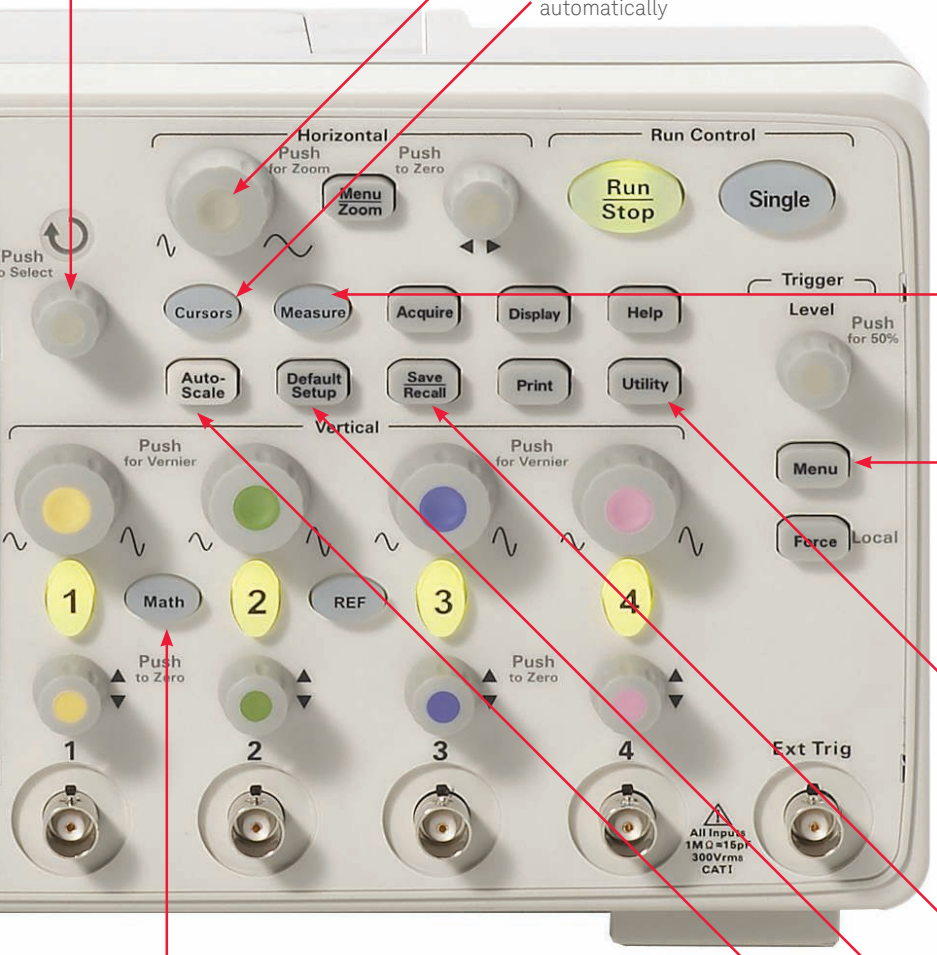
USB device port for USBTMC remote PC control also allows easy printing to all Pict-Bridge compatible printers

# Advanced Measurement Capabilities

User-friendly menu facilitates access to advanced features like mask test, sequence mode, and digital filtering

Push-button knobs enhance usability, for example, the Main/Zoom knob zooms in on a particular section of waveform. Push to toggle zoom on and off.

Measurement cursors can be placed manually or automatically




23 automatic measurements with a “measure all” feature

Comprehensive trigger functions including edge, pulse width, pattern (“A” models only), composite video and alternate channel

## Accelerated Productivity

Multi-language interface support and built-in context-sensitive help in 11 languages

Save up to 10 setups and waveform memories internally

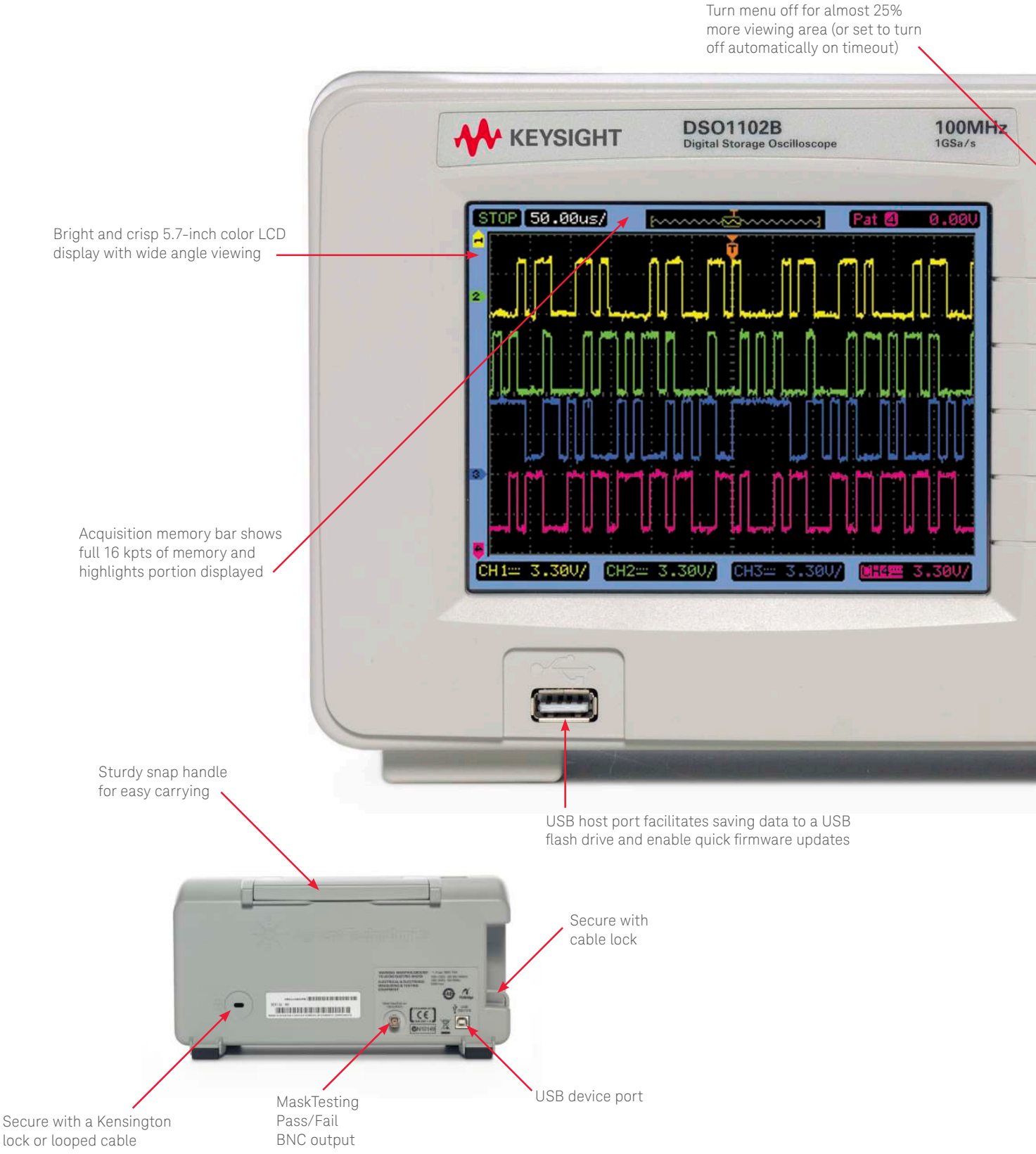
Default setup quickly returns the scope to a known starting point

Four math functions for quick display: +, -, x, FFT

AutoScale to get your signal on screen fast with vertical, horizontal, and trigger controls automatically adjusted for best signal display

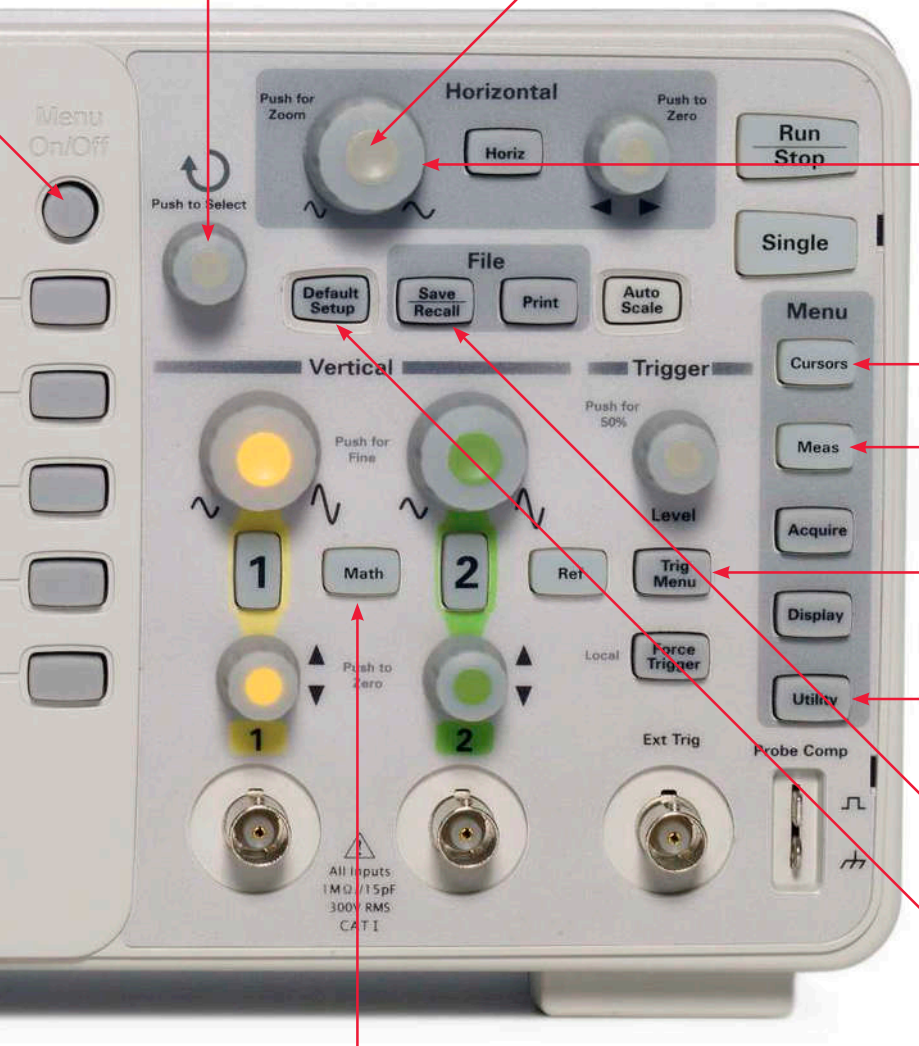
# Keysight 1000B Series portable oscilloscopes:
Engineered to give you more scope than you thought you could afford

## Powerful Signal Capture and Display



# Advanced Measurement Capabilities

User-friendly menu facilitates access to advanced features like mask test, sequence mode, and digital filtering

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Four math functions for quick display: +, -, x, FFT

# Performance characteristics

| | | |
|---|---|---|
| Bandwidth (-3dB)[1, 2] | DSO1052B: | DC to 50 MHz |
| | DSO1002A, DSO1004A: | DC to 60 MHz |
| | DSO1072B: | DC to 70 MHz |
| | DSO1102B, DSO1012A, DSO1014A: | DC to 100 MHz |
| | DSO1152B: | DC to 150 MHz |
| | DSO1022A, DSO1024A: | DC to 200 MHz |
| Real-time sample rate | 2 GSa/sec half channel interleaved, 1 GSa/sec all channels (A models) | |
| | 1 GSa/sec half channel interleaved, 500 MSa/sec all channela (B models) | |
| Memory depth | 20 kpts half channel interleaved, 10 kpts all channels (A models) | |
| | 16 kpts half channel interleaved, 8 kpts all channels (B models) | |
| Channels | DSO1052B, DSO1002A, DSO1072B, DSO1102B, DSO1012A, DSO1152B, DSO1022A : 2 channels | |
| | DSO1004A, DSO1014A, DSO1024A : 4 channels | |
| Vertical resolution | 8 bits | |
| Vertical sensitivity (range) | 2 mV/div to 10 V/div | |
| DC gain accuracy[1] | 2 mV/div to 5 mV/div: ± 4.0% full scale (A and B models) | |
| | 10 mV/div to 5 V/div: ± 3.0% full scale (A models only) | |
| | 10 mV/div to 10 V/div: ± 3.0% full scale (B models only) | |
| Vertical zoom | Vertical expand | |
| Maximum input voltage | CAT I 300 Vrms, 400 Vpk; transient overvoltage 1.6kVpk | |
| Dynamic range | +6 divisions from center screen | |
| Time-base range | DSO1022A, DSO1024A: | 1 nsec/div to 50 sec/div |
| | DSO1012A, DSO1014A, DSO1102B: | 2 nsec/div to 50 sec/div |
| | DSO1002A, DSO1004A, DSO1052B, DSO1072B:5 nsec/div to 50 sec/div | |
| Selectable BW limit | 20 MHz | |
| Horizontal modes | Main (Y-T), XY, delayed zoom and roll | |
| Input coupling | DC, AC and ground | |
| Input impedance | 1 MΩ ±1% in parallel with 18 pF ± 3 pF (A models) | |
| | 1 MΩ ±2% in parallel with 15 pF ± 3 pF (B models) | |
| Time scale accuracy[1] | ± 50 ppm from 0 °C to 30 °C, (A models) | |
| | ± 50 ppm + 2 ppm per °C from 30 °C to 45 °C + 5 ppm × (years since manufacture) (A models) | |
| | ± 50 ppm over 1 ms (B models only) | |

[1] Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10°C from firmware calibration temperature.

[2] 20 MHz (when vertical scale is set to < 5 mV)

# Performance characteristics

| | |
|---|---|
| **Acquisition modes** | |
| Normal | Displays sampled data directly to the screen in real time |
| Averaging | Selectable from 2, 4, 8,16, 32, 64, 128 or 256 |
| Sequence | Selectable 1 to 1,000 acquisition frames can be recorded, played back and stored in the scope memory or external USB memory |
| Peak Detect | Captures high-frequency glitches as narrow as 10 nsec (A models) and 20 nsec (B models) when viewing signals at slow sweep speeds |
| Roll | Waveform display rolls from right to left. minimum horizontal scale setting is 50 msec/div. |
| Interpolation | Sin (x)/x |
| Trigger coupling | AC, DC, LF reject, HF reject |
| **Trigger modes** | |
| Force | Triggers immediately when front panel button is pressed |
| Edge | Triggers on the positive and/or negative slope on any channel |
| Video | Triggers on NTSC, PAL or SECAM video signals |
| Pulse width | Triggers on pulse width greater than, equal to or less than a specific time limit, ranging from 20 nsec to 10 sec (A models) and 50ns to 10 sec (B models) |
| Alternate | Triggers on two non-synchronized active channels |
| Trigger source | Ch 1, 2, Ext, Ext/5, AC Line (edge only) (2 channel A models)<br>Ch 1, 2, Ext, AC Line (edge only) (B Models)<br>Ch 1, 2, 3, 4, Ext, Ext/5, AC Line (edge only) (4-channel A models) |
| Trigger sensitivity[1] | ≥5 mV/div: 1 div from DC to 10 MHz, 1.5 div from 10 MHz to full bandwidth<br><5 mV/div: 1 div from DC to 10 MHz, 1.5 div from 10 MHz to 20 MHz |
| Cursor measurement | Manual, track waveform or automatic measurement selections. Manual and track waveform selections provide readout of Horizontal (X, ΔX) and Vertical (Y, ΔY) |
| **Auto measurement** | |
| Voltage | Maximum, minimum, peak-to-peak, top, base, amplitude, average, RMS, overshoot, preshoot |
| Time | Period, frequency, rise time, fall time, + width, - width, +duty cycle, -duty cycle, delay A-->B (rising edge), delay A-->B (falling edge), phase A-->B (rising edge) and phase A-->B (falling edge)Integrated 6-digit |
| Counter | frequency counter on any channel. Counts up to the scope's bandwidth |
| Display all measurements | Mode to display all single-channel automatic measurements simultaneously on the display |
| Math Functions | A+B, A-B, AxB, FFT<br>Source channel selection for A and B can be any combination of oscilloscope channels 1 and 2 (or 3 and 4 on 4 channel A models). |
| Auto Scale | Finds and displays all active channels, sets edge trigger modes on highest numbered channels, sets vertical sensitivity on channels, time base to display ~2 periods. Requires minimum voltage >20 mVpp, 1% duty cycle and minimum frequency >50 Hz |
| **Display** | 5.7 inch diagonal color QVGA TFT LCD display with 300 cd/m2 backlight intensity |
| Display persistence | OFF, Infinite |
| Display types | Dots, Vectors |
| Waveform update rate | 400 waveforms/sec (A models)<br>200 wfm/sec (B models) |
| Save/Recall internal | 10 setups and 10 waveforms can be saved and recalled using internal non-volatile memory locations. 1 reference waveform can be saved and recalled using an internal volatile memory location for visual comparisons. |
| Save/Recall external | Setups: STP saved and recalled (Note: setups not transferable between A and B models)<br>Waveforms: WFM saved and recalled, CSV saved<br>Reference waveforms: REF saved and recalled for visual comparisons<br>Images: 8-bit BMP, 24-bit BMP, PNG saved |

[1] Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10°C from firmware calibration temperature.

# Performance characteristics

| I/O | |
|---|---|
| Standard ports | USB 2.0-compliant host port on front panel (A and B models) and rear panel (A models only) compatible with USB flash drives.<br>USB 2.0 device port for PictBridge compatible printing (A and B models) and USBTMC remote PC control (A models only) |
| Max transfer rate | USB 2.0 full-speed up to 12 Mb/sec |
| USB flash drive compatibility | Most FAT formatted <2 GB or FAT32 formatted <32 GB flash drives |
| Printer compatibility | PictBridge-compliant printers via USB device port |

| General characteristics | |
|---|---|
| Physical size | 12.78 inches W x 6.21 inches H x 5.08 inches D (32.46 cm W x 15.78 cm H x 12.92 cm D) (A models)<br>11.9 inches W x 6.06 inches H x 5.23 inches D (30.3 cm W X 15.4 cm H X 13.3 cm D) (B models) |
| Weight | Net: 3.03 kgs (6.68 lbs) Shipping: 4.87 kgs (10.74 lbs) (A models)<br>Net: 2.4 kgs (5.3lbs) Shipping: 3.87 kgs (8.3lbs) (B models) |
| Probe comp output | Frequency ~1 kHz; Amplitude ~3 V |
| Scope lock | Secure with a Kensington lock or looped cable through notch built into chassis |

| Power requirements | |
|---|---|
| Line range | 100-240 VAC, 50/60 Hz ± 10% |
| Power usage | ~60 W max (A models)<br>~50 W max (B models) |

| Environmental characteristics (A models) | |
|---|---|
| Ambient temperature | Operating 0°C to +40°C; non-operating -20°C to +60°C |
| Humidity | Operating 90% RH at 40°C for 24 hr; non-operating 60% RH at 60°C for 24 hr |
| Altitude | Operating to 4,400 m (15,000 ft); non-operating to 15,000 m (49,213 ft) |
| Vibration | Keysight class GP and MIL-PRF-28800F; class 3 random |
| Shock | Keysight class GP and MIL-PRF-28800F |
| Pollution degree[2] | Normally only dry non-conductive pollution occurs.<br>Occasionally a temporary conductivity caused by condensation must be expected |
| Indoor use | Rated for indoor use only |

| Environmental characteristics (B models) | |
|---|---|
| Ambient temperature | Operating 10°C to +40°C; non-operating -20°C to +60°C |
| Cooling Method | Fan force air flow |
| Humidity | Operating; +35°C or below ≤90 % relative humidity ; non-operating +40°C ≤60 % relative humidity |
| Altitude Operating | Operating to 3,000 m (9.842 ft); non-operating to 15,000 m (49,213 ft) |
| Vibration | Keysight class GP and M-PRF-28800F; class 3 random |
| Shock | Keysight class GP and M-PRF-28800F; |
| Pollution degree[2] | Normally only dry non-conductive pollution occurs.<br>Occasionally a temporary conductivity caused by condensation must be expected |
| Regulatory | Safety - UL61010-1:2003, CSA22.2 No. 61010-1:2003, EN61010-1:2001, IEC61010-1:2001.<br>EMI – Passes IEC 61236 -1:2004 / EN 61326-1:2006 Meets EU EMC Directive 2004/108/EC requirements |
| Indoor use | Rated for indoor use only |

# Ordering information

| 2 - Channel Models | Description |
|---|---|
| DSO1052B | 50 MHz, 1 GSa/s, 16 kpts, 2-ch |
| DSO1072B | 70 MHz, 1 GSa/s, 16 kpts, 2-ch |
| DSO1102B | 100 MHz, 1 GSa/s, 16 kpts, 2-ch |
| DSO1152B | 150 MHz, 1 GSa/s, 16 kpts, 2-ch |
| DSO1022A | 200 MHz, 2 GSa/s, 20 kpts, 2-ch |

| 4 - Channel Models | Description |
|---|---|
| DSO1004A | 60 MHz, 2 GSa/s, 20 kpts, 4-ch |
| DSO1014A | 100 MHz, 2 GSa/s, 20 kpts, 4-ch |
| DSO1024A | 200 MHz, 2 GSa/s, 20 kpts, 4-ch |

**Accessories included:**

- IntuiLink toolbar connectivity software downloadable free from www.keysight.com/find/intuilink
- Documentation CD
- Localized front panel overlay (if language option other than English is chosen)
- Power cord
- 10:1 passive probe for each input channel (2 or 4)
- Education student lab guide and professor slide set downloadable free from: www.Keysight.com/find/1000edu

**Optional accessories:**

- **N2738A** Soft carrying case for 1000A/B Series
- **N2739A** Rackmount kit for 1000A Series (A models only)

**Recommended probes**

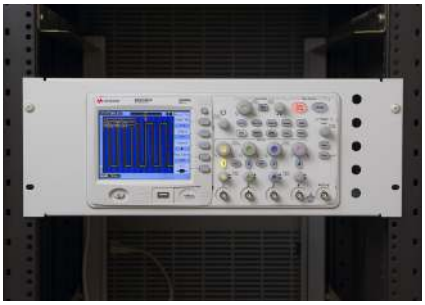
- **N2862B** 150 MHz 10:1 passive probe (standard with 50, 60, 70, 100 MHz models)
- **N2863B** 300 MHz 10:1 passive probe (standard with 150, 200 MHz models)
- **10070D** 20 MHz 1:1 passive probe
- **10076B** 250 MHz, 100:1, 4 kV passive probe
- **N2771B** 50 MHz, 1000:1 30 kV passive probe
- **N2791A** 25 MHz, 700V differential probe
- **N2891A** 70 MHz, 7 kV differential probe
- **1146A** 100 kHz, 100A AC/DC current probe (requires 9V battery)

**Software and Drivers**

- IntuiLink toolbar connectivity software downloadable free from www.keysight.com/find/intuilink



Soft carrying case for 1000 Series



Rackmount kit for 1000A Series only

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