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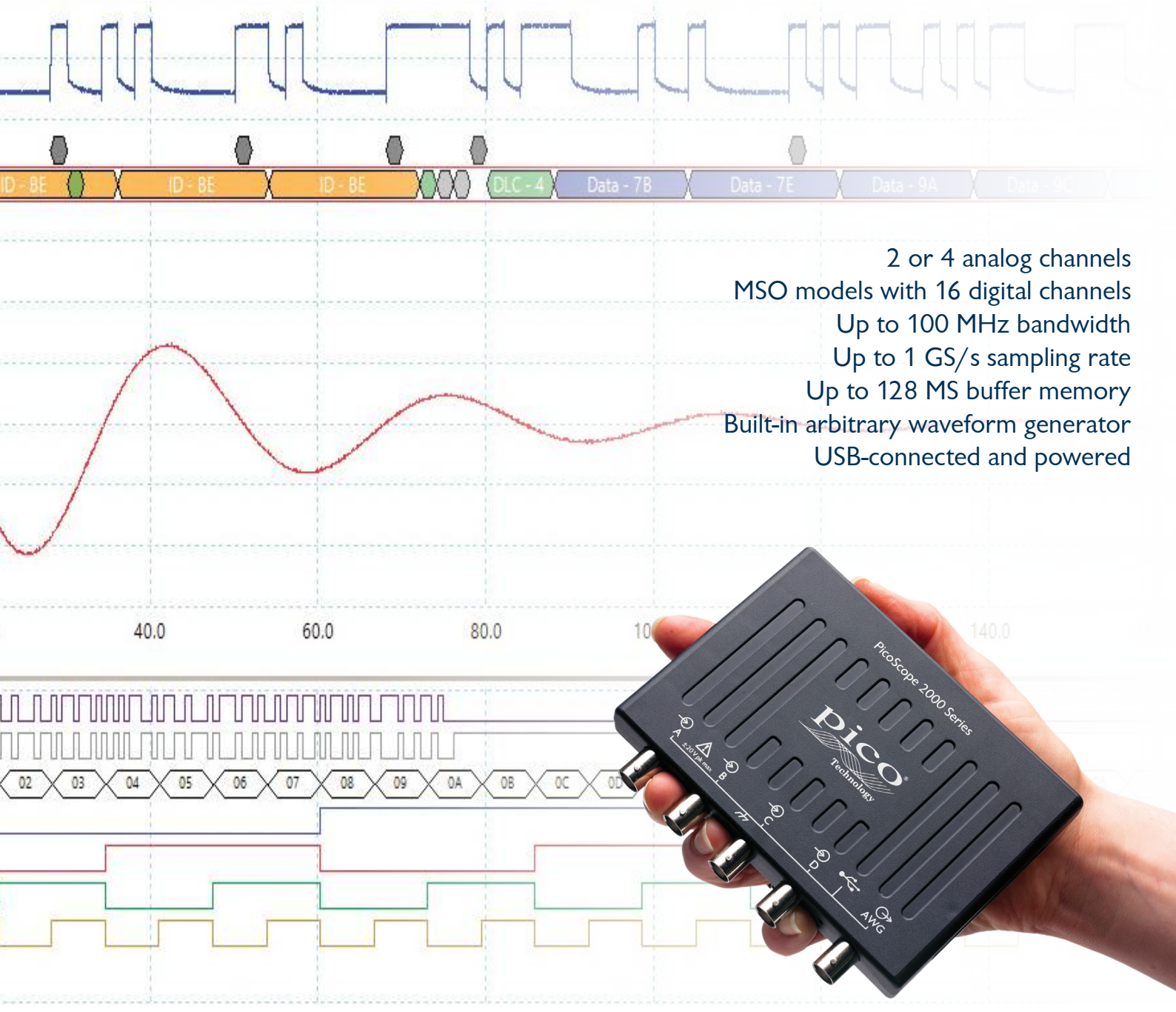
pico® Technology

PicoScope® 2000 Series

The compact alternative to a benchtop oscilloscope



- 2 or 4 analog channels
- MSO models with 16 digital channels
- Up to 100 MHz bandwidth
- Up to 1 GS/s sampling rate
- Up to 128 MS buffer memory
- Built-in arbitrary waveform generator
- USB-connected and powered

Introducing the PicoScope 2000 Series

The PicoScope 2000 Series offers you a choice of 2- and 4-channel oscilloscopes, plus mixed-signal oscilloscopes (MSOs) with 2 analog + 16 digital inputs. All models feature spectrum analyzers, function generators, arbitrary waveform generators and serial bus analyzers, and the MSO models also function as logic analyzers.

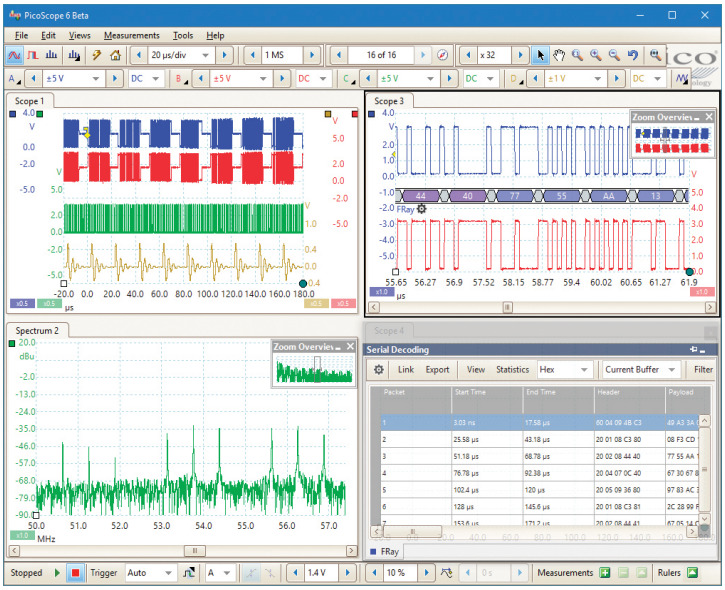
The PicoScope 2000A models all deliver unbeatable value for money, with excellent waveform visualization and measurement to 25 MHz for a range of analog and digital electronic and embedded system applications. They are ideal for education, hobby and field service use.

The PicoScope 2000B models have the added benefits of deep memory (up to 128 MS), higher bandwidth (up to 100 MHz) and faster waveform update rates, giving you the performance you need to carry out advanced analysis of your waveform, including serial decoding and plotting frequency against time.

2-channel oscilloscope: 2204A and 2205A

2-channel oscilloscope: 2206B, 2207B and 2208B

Advanced oscilloscope display



The PicoScope 6 software takes advantage of the display size and resolution and processing power of your PC – in this case displaying four analog signals, a zoomed view of two of the signals (undergoing serial decoding), and a spectrum view of a third, all at the same time. Unlike a conventional benchtop oscilloscope, the size of the display is limited only by the size of your computer monitor. The software is also easy to use on touch-screen devices – you can pinch to zoom and drag to scroll.

4-channel oscilloscope

2+16-channel mixed-signal oscilloscope (MSO)

Powerful, portable and super-small

The PicoScope 2000 Series oscilloscopes are compact enough to fit easily into your laptop bag along with all their probes and leads. These modern alternatives to bulky benchtop devices are ideal for a wide range of applications including design, test, education, service, monitoring, fault-finding and repair and are perfect for engineers on the move.

Fast sampling

The PicoScope 2000 Series oscilloscopes provide fast real-time sampling rates of up to 1 GS/s on the analog channels: this represents a timing resolution of 1 ns.

For repetitive analog signals, equivalent-time sampling (ETS) mode can boost the maximum effective sampling rate up to 10 GS/s, allowing even finer resolution down to 100 ps. All scopes support pre-trigger and post-trigger capture using the full memory depth.

High signal integrity

Here at Pico Technology, we're proud of the dynamic performance of our products. Careful front-end design and shielding reduce noise, crosstalk and harmonic distortion. Decades of oscilloscope design experience can be seen in improved pulse response and bandwidth flatness.

The result is simple: when you probe a circuit, you can trust in the waveform you see on the screen.

High-end features as standard

Buying a PicoScope is not like making a purchase from other oscilloscope companies, where increased functionality can considerably raise the price. PicoScopes are all-inclusive instruments, with no need for expensive upgrades to unlock the hardware. Other advanced features such as resolution enhancement, mask limit testing, serial decoding, advanced triggering, automatic measurements, math channels (including the ability to plot frequency and duty cycle against time), XY mode and segmented memory are all included in the price.

USB connectivity

The USB connection makes printing, copying, saving, and emailing your data from the field quick and easy. The high-speed USB interface allows fast data transfer, while USB powering removes the need to carry around a bulky external power supply.

Flexibility

The PicoScope software offers a breadth of advanced features via a user-friendly interface. As well as the standard Windows installation, PicoScope Beta software also works effectively on Linux and Mac operating systems, giving you the freedom to choose which platform you operate your PicoScope from.

Unique commitment to product support

Your PicoScope gets better the longer you use it, thanks to the regular free updates we supply for both the PC software and the oscilloscope firmware throughout the life of the product: the performance and functionality of the scope both keep improving, without you paying a penny more than the purchase price.

This level of support, combined with the personal service provided by our technical and sales support teams, is reflected in the consistently good feedback we get from users of our products, many of whom have gone on to be regular customers.

PicoScope 6 software

The PicoScope software display can be as simple or as detailed as you need. Begin with a single view of one channel, and then expand the display to include up to four live channels, plus math channels and reference waveforms.

Tools > Serial decoding: Decode multiple serial data signals and display the data alongside the physical signal or as a detailed table.
Tools > Reference waveforms: Store waveforms in memory or on disk and display them alongside live inputs. Ideal for diagnostics and production testing.
Tools > Masks: Automatically generate a test mask from a waveform or draw one by hand. PicoScope highlights any parts of the waveform that fall outside the mask and shows error statistics.

Channel options: Set axis offset and scaling, DC offset, zero offset, resolution enhancement, custom probes, and filtering here.

Trigger marker: Drag the marker to adjust trigger level and pre-trigger time.

Auto setup button: Configures the timebase and voltage ranges for stable display of signals.

Touch-screen support: Handy buttons let you make fine adjustments with a mouse or a touch screen.

Oscilloscope controls: Controls such as voltage range, channel enable, timebase and memory depth are placed on the toolbar for quick access, leaving the main display area clear for waveforms.

Waveform replay tools: PicoScope automatically records up to 10 000 of the most recent waveforms. You can quickly scan through to look for intermittent events, or use the Buffer Navigator to search visually.

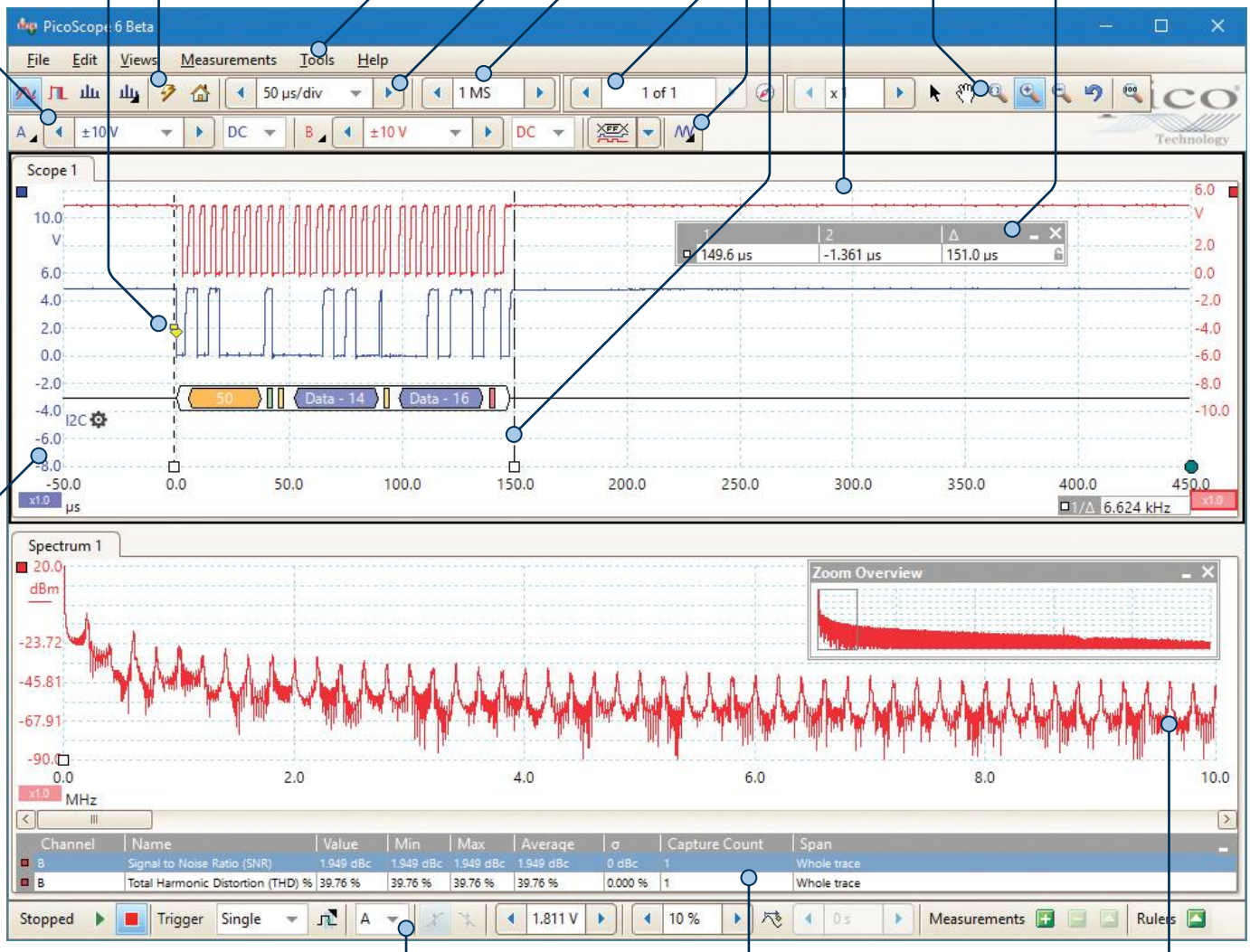
Function generator: Generates standard signals or arbitrary waveforms. Includes frequency sweep mode.

Rulers: Each axis has two rulers that can be dragged across the screen to make quick measurements of amplitude, time and frequency.

Views: PicoScope is carefully designed to make the best use of the display area. The waveform view is much bigger and higher resolution than a typical benchtop scope. You can add new scope and spectrum views with automatic or custom layouts.

Zoom and pan tools: PicoScope makes it easy to zoom into large waveforms. Either use the zoom-in, zoom-out and pan tools, or click and drag in the Zoom Overview window for fast navigation.

Ruler legend: Absolute and differential ruler measurements are listed here.



Movable axes: The vertical axes can be dragged up and down. This feature is particularly useful when one waveform is obscuring another. There's also an *Auto Arrange Axes* command.

Trigger toolbar Quick access to main controls, with advanced triggers in a pop-up window.

Automatic measurements: Display calculated measurements for troubleshooting and analysis. You can add as many measurements as you need on each view. Each measurement includes statistical parameters showing its variability.

Spectrum view: View FFT data alongside scope view or in dedicated spectrum mode.

PicoScope 6 software with mixed digital and analog signals

The flexibility of the PicoScope 6 software interface allows high-resolution viewing of all analog and digital channels at once, along with math channels and reference waveforms. You can use the whole of your PC's display to view the waveforms, ensuring you never miss a detail again.

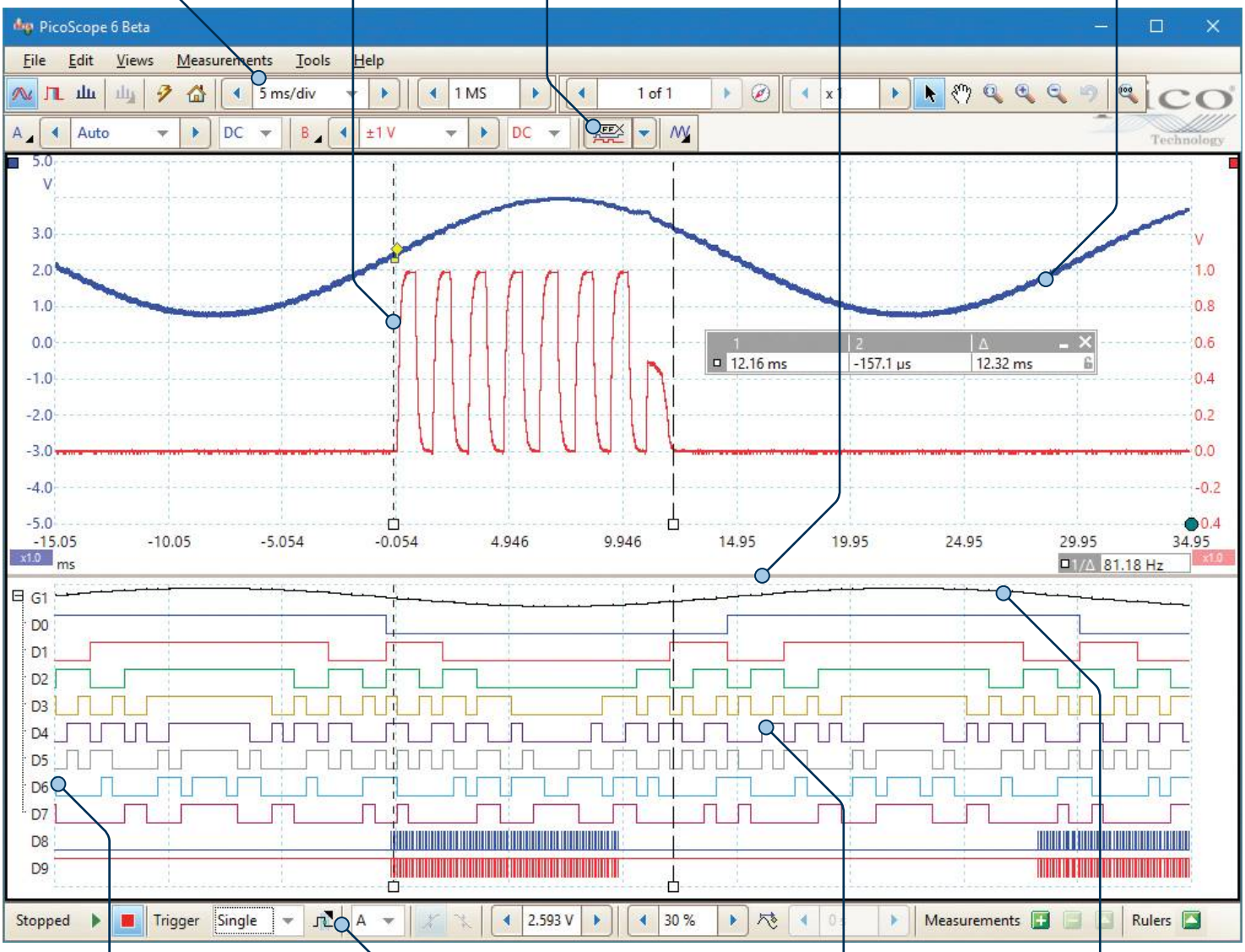
Oscilloscope controls: PicoScope's full analog-domain controls, including zoom, filtering, and function generator, are all available in MSO digital signal mode.

Digital channels button: Set up and display digital inputs. View analog and digital signals on the same timebase.

Analog waveforms: View analog waveforms time-correlated with digital inputs.

Rulers: Drawn across both analog and digital panes so signal timings can be compared.

Split-screen display: PicoScope can display both analog and digital signals at the same time. The split-screen display can be adjusted to give more or less space to the analog waveforms.



Rename: The digital channels and groups can be renamed. Groups can be expanded or collapsed in the digital view.

Advanced triggers: Additional Digital and Logic trigger options are available for digital channels.

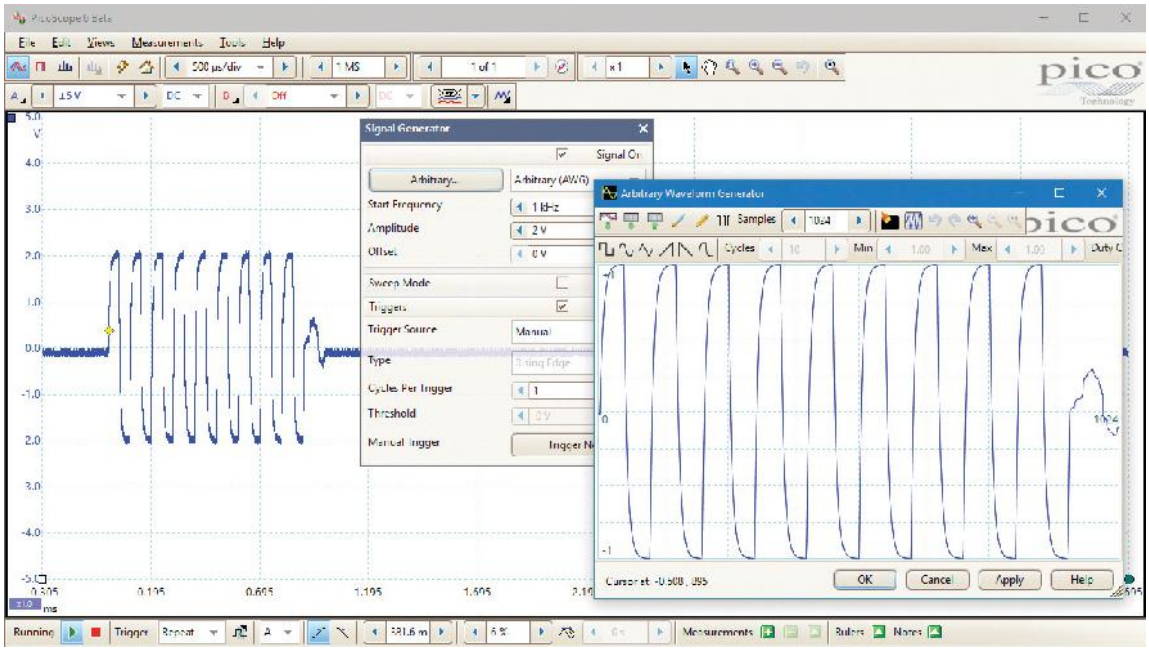
Display format: Display selected bits individually or as groups in numerical or ASCII format.

Show by level: Group bits into fields and then display as an analog level.

Arbitrary waveform and function generators

All PicoScope 2000 Series oscilloscopes have a built-in function generator and arbitrary waveform generator (AWG). The function generator can produce sine, square, triangle and DC level waveforms, and many more besides, while the AWG allows you to import waveforms from data files or create and modify them using the built-in graphical AWG editor.

As well as level, offset and frequency controls, advanced options allow you to sweep over a range of frequencies. Combined with the advanced spectrum mode, with options including peak hold, averaging and linear/log axes, this creates a powerful tool for testing amplifier and filter responses.



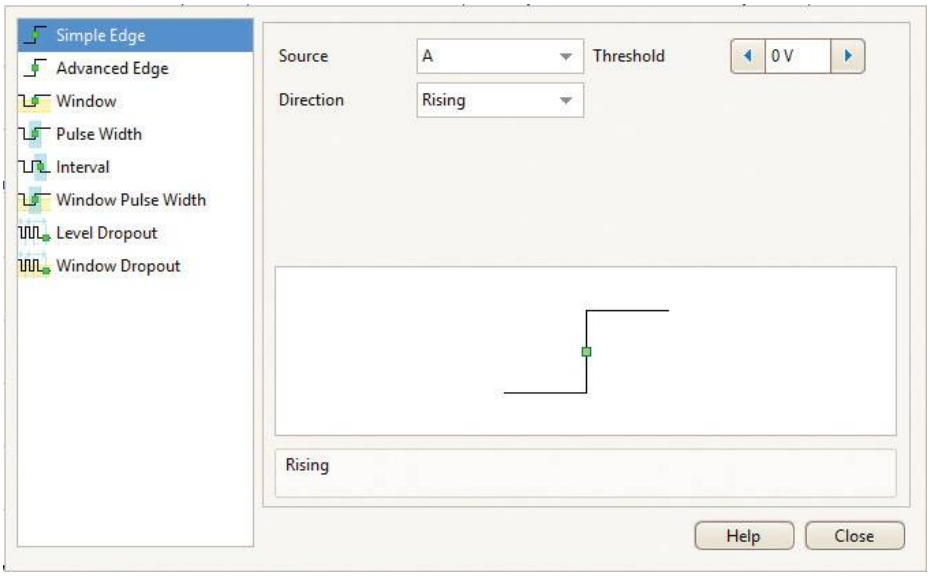
Digital triggering

Most digital oscilloscopes still use an analog trigger architecture based on comparators. This can cause time and amplitude errors that cannot always be calibrated out. The use of comparators often limits the trigger sensitivity at high bandwidths and can also create a long trigger rearm delay.

For 25 years, Pico Technology has been pioneering the use of full digital triggering using the actual digitized data. This eliminates trigger errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth. All triggering is digital, resulting in a threshold resolution equal to the digitizing resolution, with programmable hysteresis and optimal waveform stability.

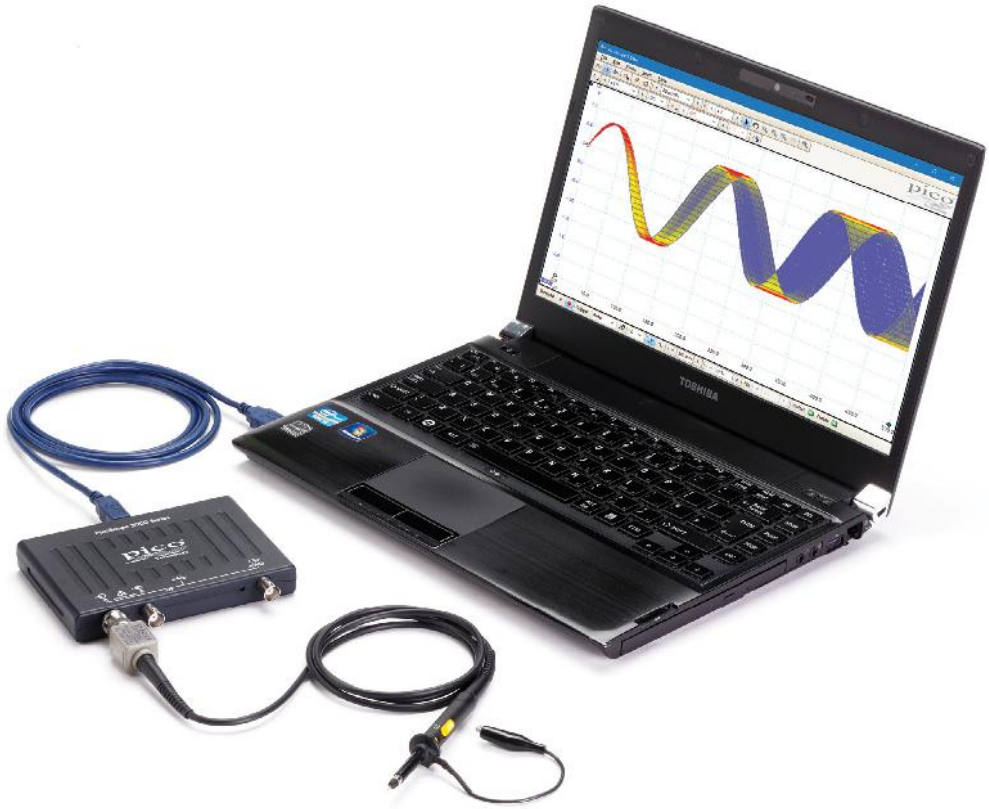
The reduced rearm delay provided by digital triggering, together with segmented memory, allows the capture of events that happen in rapid sequence. Rapid triggering, available on most models, can capture a new waveform every 1 or 2 microseconds, depending on the model, at the fastest timebase, until the buffer is full. The mask limit testing function helps to detect waveforms that fail to meet your specifications.

As well as the standard range of triggers found on most oscilloscopes, the PicoScope 2000 Series offers one of the best selections of advanced triggers available. These include pulse width, window and dropout triggers to help you find and capture your signal quickly.

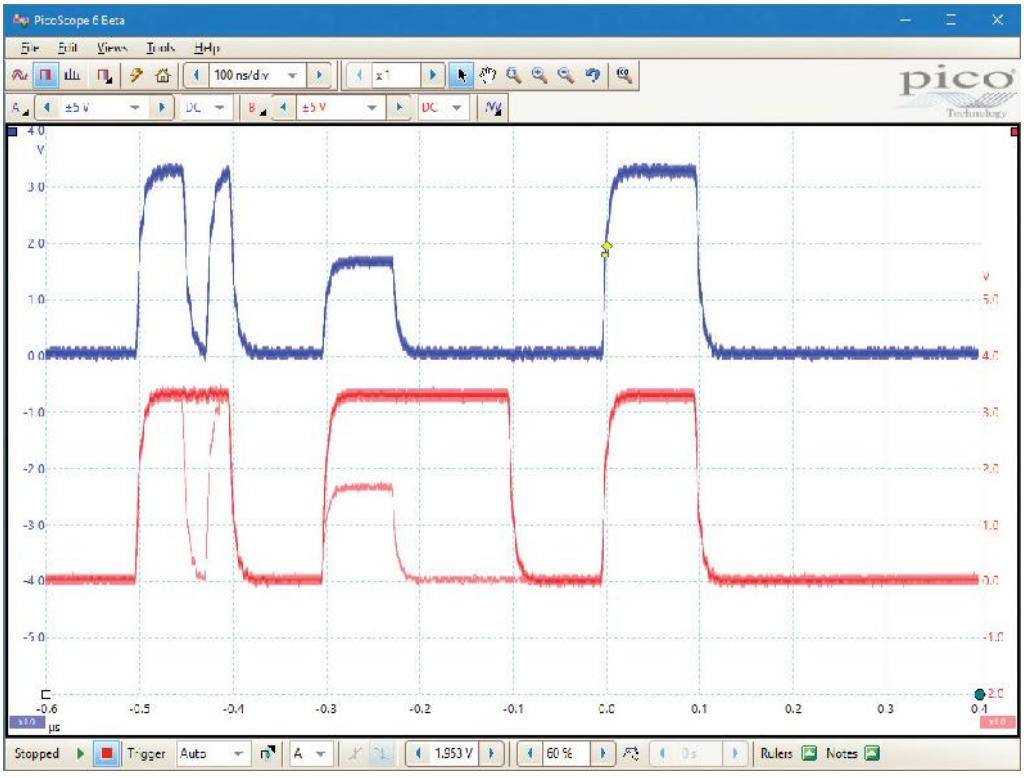


Color persistence modes

Advanced display modes allow you to see old and new data superimposed, with new data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Choose between analog persistence, digital color and fast display modes or create your own custom rules.



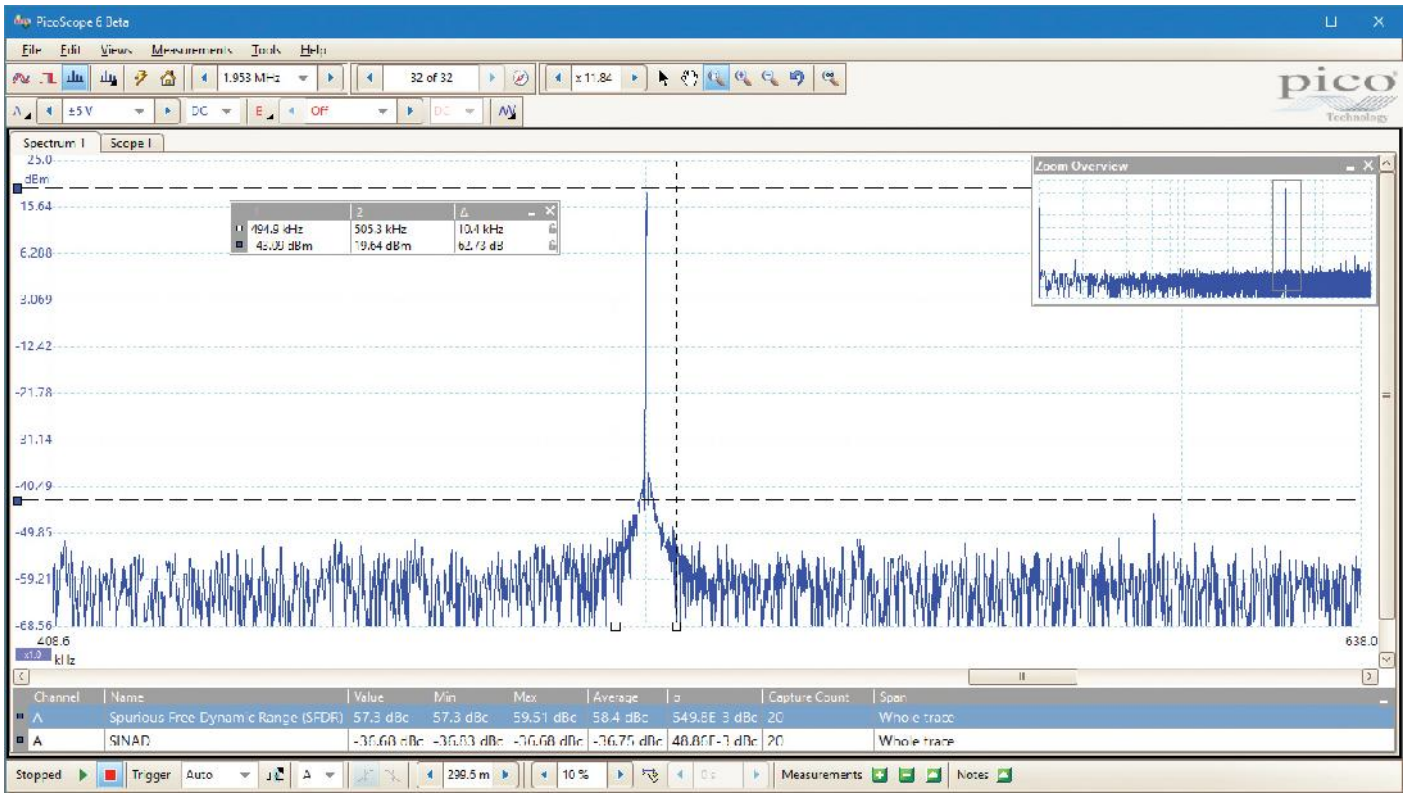
The PicoScope 2000 Series' use of hardware acceleration means that, in Fast Persistence mode, waveform update rates of up to 80 000 waveforms per second can be achieved (model-dependent), overlaying them all with color-coding or intensity-grading to show which areas are stable and which are intermittent. Faults that previously took minutes to find now appear within seconds.



Spectrum analyzer

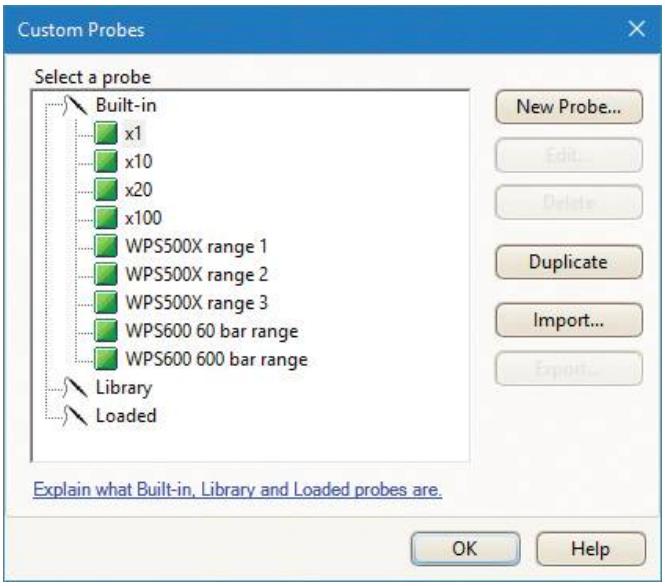
With a click of a button, you can open a new window to display a spectrum plot of selected channels up to the bandwidth of the oscilloscope. A comprehensive range of settings gives you control over the number of spectrum bands, window types and display modes.

PicoScope software allows you to display multiple spectrum views with different channel selections and zoom factors, and see these alongside time-domain waveforms of the same data. A comprehensive set of automatic frequency-domain measurements can be added to the display, including THD, THD+N, SINAD, SNR and IMD. You can even use the AWG and spectrum mode together to perform swept scalar network analysis.



Custom probe settings

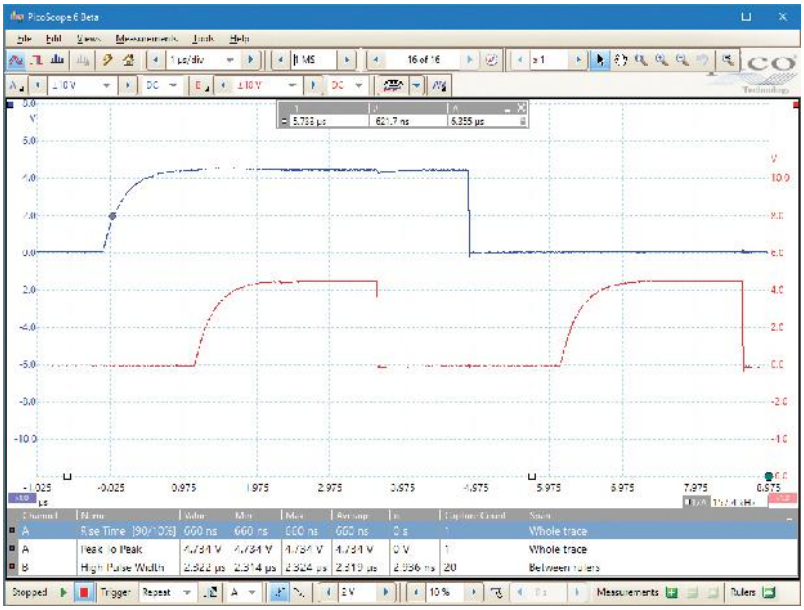
The custom probes menu allows you to correct for gain, attenuation, offsets and nonlinearities of probes and transducers, or convert your waveform data to different units such as current, scaled voltage, temperature, pressure, power or dB. Definitions can be saved to disk for later use. Definitions for standard Pico Technology oscilloscope probes are built in, and you can also create your own using linear scaling or even an interpolated data table.



Automatic measurements

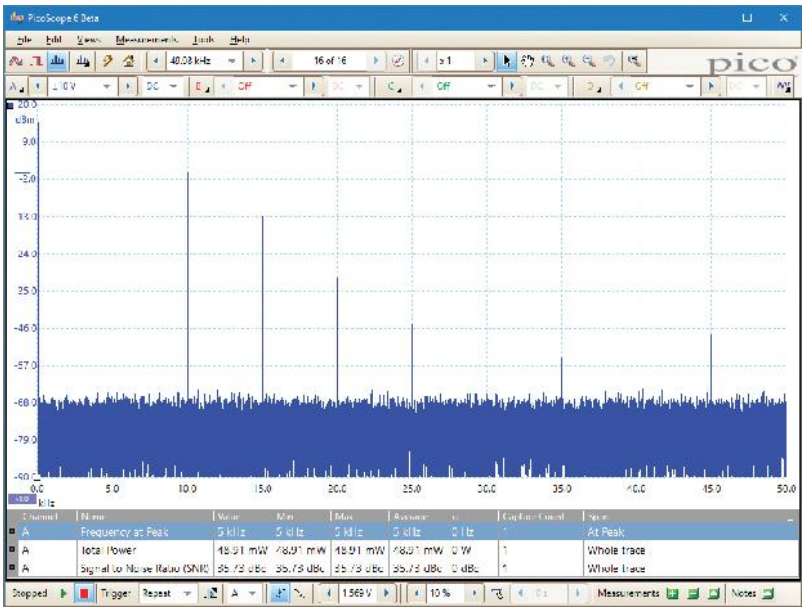
PicoScope allows you to automatically display a table of calculated measurements for troubleshooting and analysis. Using the built-in measurement statistics you can see the average, standard deviation, maximum and minimum of each measurement as well as the live value.

You can add as many measurements as you need on each view - 15 different measurements are available in scope mode, and 11 in spectrum mode. For information on these measurements, see **Automatic Measurements** in the **Specifications** table.



Channel	Name	Value	Min	Max	Average
A	Rise Time [90/10%]	660 ns	660 ns	660 ns	660 ns
A	Peak To Peak	4.734 V	4.734 V	4.734 V	4.734 V
B	High Pulse Width	2.322 µs	2.314 µs	2.324 µs	2.319 µs

Scope mode



Channel	Name	Value	Min	Max	Average
A	Frequency at Peak	5 kHz	5 kHz	5 kHz	5 kHz
A	Total Power	48.91 mW	48.91 mW	48.91 mW	48.91 mW
A	Signal to Noise Ratio (SNR)	35.73 dBc	35.73 dBc	35.73 dBc	35.73 dBc

Spectrum mode

Serial decoding

The PicoScope 2000 Series oscilloscopes include serial decoding capability as standard. Display the decoded data in the format of your choice: as a **graph**, in a **table**, or both at once.

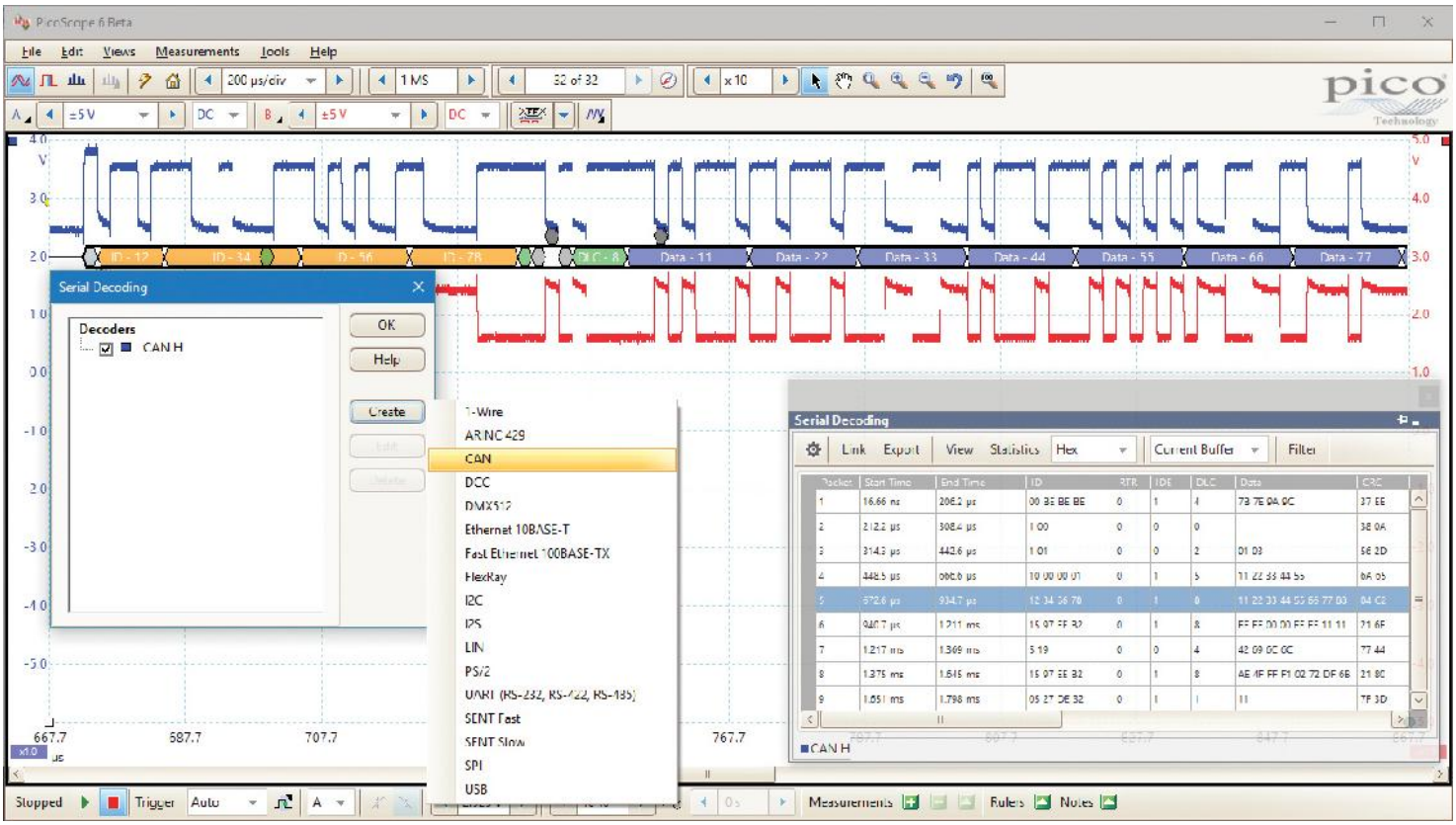
• **Graph** format shows the decoded data beneath the waveform on a common time axis, with error frames marked in red. You can zoom in on these frames to investigate noise or distortion. The data packets are broken down into their component fields, making it easier than ever to locate and identify problems signals, and each packet field is assigned a different color: in the CAN bus example below, the address is colored orange, the DLC green and the data content indigo. Color coding is available in PicoScope 6.12 or later, available for download from www.picotech.com.

• **Table** format shows a list of the decoded frames, including the data and all flags and identifiers. You can set up filtering conditions to display only the frames you are interested in, search for frames with specified properties, or define a start pattern to signal when the program should list the data.

It is also possible to link decoded numeric data to user-defined text strings, for ease of reading.

With the PicoScope 2000 Series, you can decode up to 15 serial protocols, including 1-Wire, CAN, I²C, I²S, LIN, SENT, SPI and UART/RS-232, depending on the bandwidth and sampling rate of the oscilloscope model. Please see the specification table for the full list.

PicoScope also includes options to import and export the decoded data using a Microsoft Excel spreadsheet.



Serial decoding for digital signals

The PicoScope 2000 Series MSO models bring extra power to the serial decoding features. You can decode serial data on all analog and digital inputs simultaneously, giving you up to 18 channels of data with any combination of serial protocols. For example, you can decode multiple SPI, I²C, CAN bus, LIN bus and FlexRay signals all at the same time!

Waveform buffer and navigator

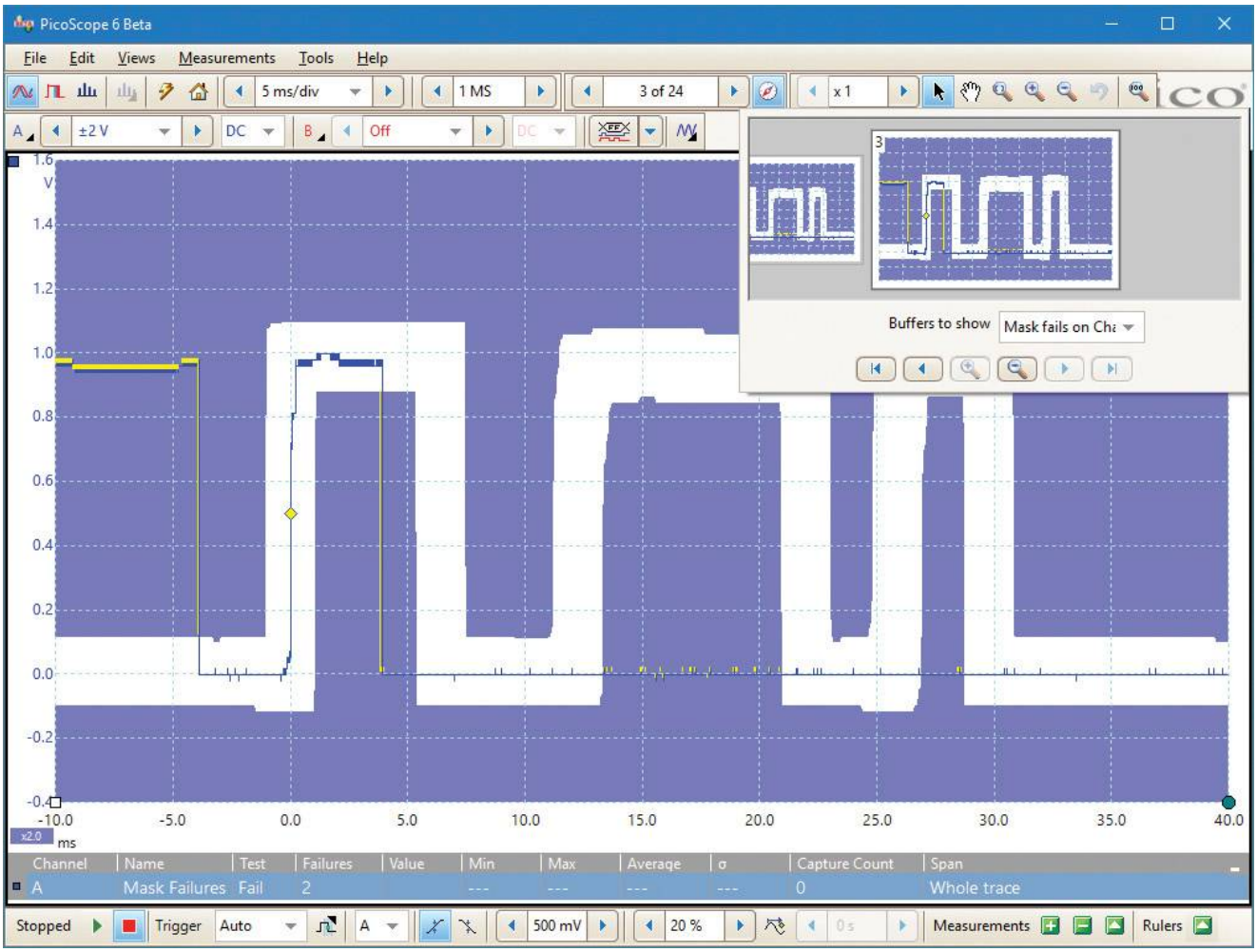
Ever spotted a glitch on a waveform, but by the time you've stopped the scope it's gone? With PicoScope you no longer need to worry about missing glitches or other transient events. PicoScope can store the last ten thousand waveforms in its circular waveform buffer.

The buffer navigator provides an efficient way of navigating and searching through waveforms, effectively letting you turn back time. Tools such as mask limit testing can also be used to scan through each waveform in the buffer looking for mask violations.

Mask limit testing

PicoScope allows you to draw a mask around any signal with user-defined tolerances. This has been designed specifically for production and debugging environments, enabling you to compare signals. Simply capture a known good signal, draw a mask around it, and then attach the system under test. PicoScope will capture any intermittent glitches and can show a failure count and other statistics in the **Measurements** window.

The numerical and graphical mask editors can be used separately or in combination, allowing you to enter accurate mask specifications, modify existing masks, and import and export masks as files.



High-speed data acquisition and digitizing

The supplied drivers and software development kit (SDK) allow you to both write your own software and interface to popular third-party software packages such as National Instruments LabVIEW and MathWorks MATLAB.

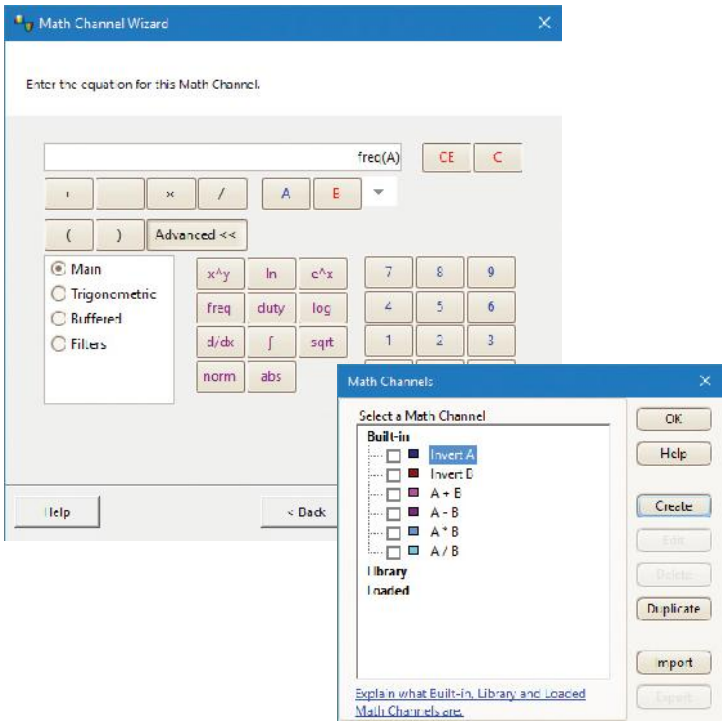
The drivers support data streaming, a mode that captures gap-free continuous data over the USB port directly to the PC's RAM or hard disk at rates of up to 1 MS/s (A models) or 9.6 MS/s (B models), so you are not limited by the size of the scope's buffer memory. Sampling rates in streaming mode are subject to PC specifications and application loading.

Beta drivers are also available for use with Raspberry Pi, BeagleBone Black, and similar ARM-powered platforms. These drivers enable you to control your PicoScope using these small, single-board Linux computers.

Math channels

With PicoScope 6 you can perform a variety of mathematical calculations on your input signals and reference waveforms.

Use the built-in list for simple functions such as add and invert, or open the wizard and create complex functions involving trigonometry, exponentials, logarithms, statistics, integrals and derivatives.

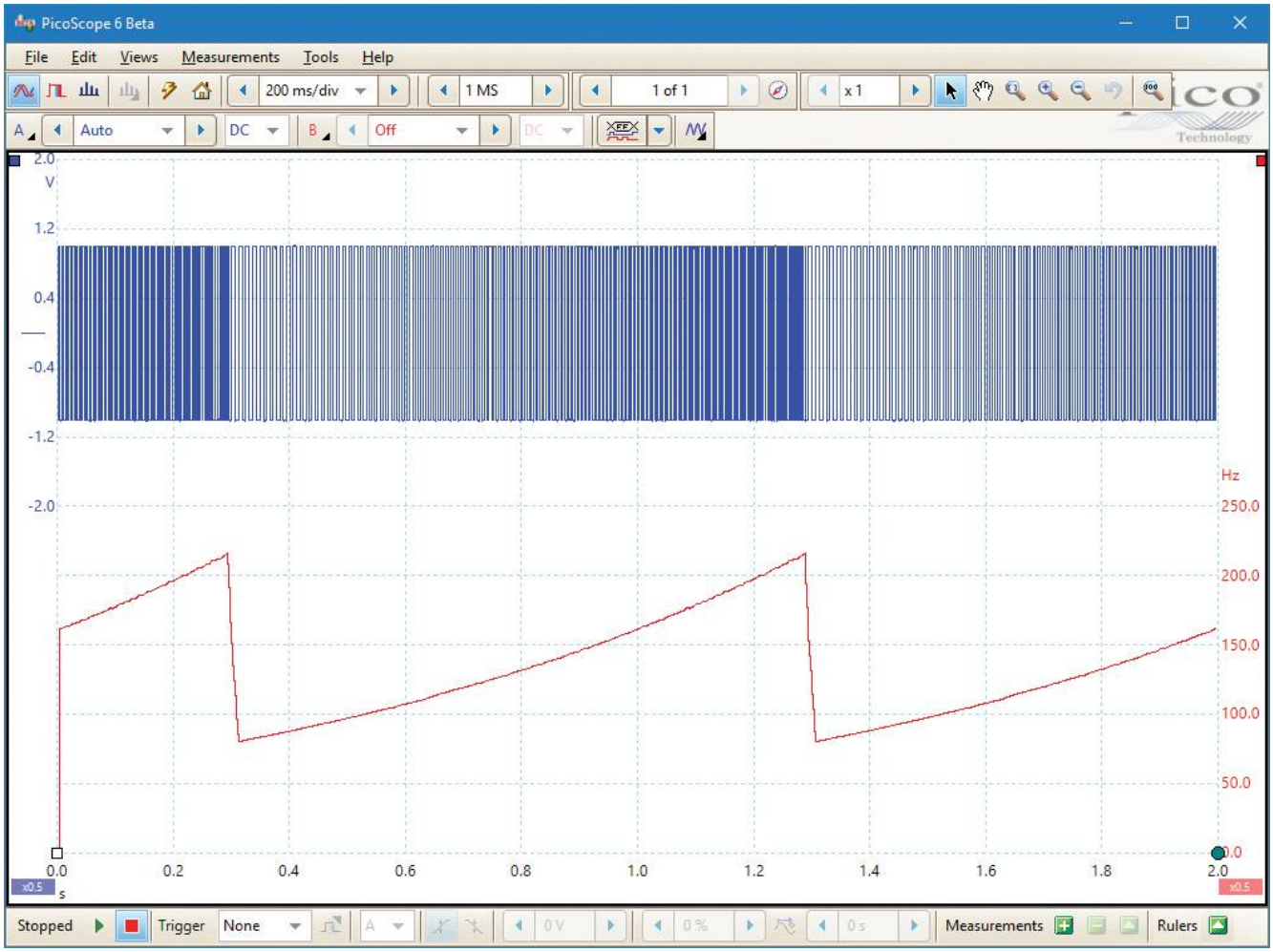


Plot frequency against time with PicoScope 6

All oscilloscopes can measure the frequency of a waveform, but often you need to know how that frequency changes over time, which is a difficult measurement to make.

The freq math function can do exactly this: in the example on the right, the top waveform's frequency is being modulated by a ramp function, as plotted in the bottom waveform.

There is an additional math function to plot duty cycle in a similar way.



Quick selector

VIEW your waveform with a low-cost USB-powered oscilloscope.

All standard PicoScope features are included: automatic measurements, serial decoding, persistence displays, mask limit testing, spectrum analysis, arbitrary waveform generator and more.

ANALYZE your waveform with a high-performance USB-powered oscilloscope.

Deep memory allows you to capture over long time periods at high sampling rates. You can then zoom in on your data without having to recapture. This is essential when you need to analyze one-off events with detailed timing resolution.

The arbitrary waveform generator can store complex waveforms in its large memory buffer, allowing you to test your design with realistic inputs.

2-channel oscilloscopes

Model	PicoScope 2204A	PicoScope 2205A	PicoScope 2206B	PicoScope 2207B	PicoScope 2208B
Bandwidth	10 MHz	25 MHz	50 MHz	70 MHz	100 MHz
Maximum sampling rate	100 MS/s	200 MS/s	500 MS/s	1 GS/s	1 GS/s
Buffer memory	8 kS	16 kS	32 MS	64 MS	128 MS
AWG bandwidth	100 kHz	100 kHz	1 MHz	1 MHz	1 MHz

4-channel oscilloscopes

Model	PicoScope 2405A	PicoScope 2406B	PicoScope 2407B	PicoScope 2408B
Bandwidth	25 MHz	50 MHz	70 MHz	100 MHz
Maximum sampling rate	500 MS/s	1 GS/s	1 GS/s	1 GS/s
Buffer memory	48 kS	32 MS	64 MS	128 MS
AWG bandwidth	1 MHz	1 MHz	1 MHz	1 MHz

Mixed-signal oscilloscopes

2 ANALOG + 16 DIGITAL INPUTS

Model	PicoScope 2205A MSO	PicoScope 2206B MSO	PicoScope 2207B MSO	PicoScope 2208B MSO
Bandwidth	25 MHz	50 MHz	70 MHz	100 MHz
Maximum sampling rate	500 MS/s	1 GS/s	1 GS/s	1 GS/s
Buffer memory	48 kS	32 MS	64 MS	128 MS
AWG bandwidth	1 MHz	1 MHz	1 MHz	1 MHz

Detailed specifications: 2-channel oscilloscopes

	PicoScope 2204A	PicoScope 2205A	PicoScope 2206B	PicoScope 2207B	PicoScope 2208B
VERTICAL					
Bandwidth (–3 dB)	10 MHz	25 MHz	50 MHz	70 MHz	100 MHz
Rise time (calculated)	35 ns	14 ns	7 ns	5 ns	3.5 ns
Vertical resolution	8 bits		8 bits		
Enhanced vertical resolution	Up to 12 bits		Up to 12 bits		
Input ranges	±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V		±20 mV, ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V		
Input sensitivity	10 mV/div to 4 V/div (10 vertical divisions)		4 mV/div to 4 V/div (10 vertical divisions)		
Input coupling	AC / DC		AC / DC		
Input connector	BNC(f)		BNC(f)		
Input characteristics	1 MΩ ± 1% ‖ 14 pF ± 2 pF		1 MΩ ± 1% ‖ 16 pF ± 1 pF		
Analog offset range (vertical position adjustment)	None		±250 mV (20 mV to 200 mV ranges) ±2.5 V (500 mV to 2 V ranges) ±25 V (5 V to 20 V ranges)		
DC accuracy	±3% of full scale ±200 µV		±3% of full scale ±200 µV		
Overvoltage protection	±100 V (DC + AC peak)		±100 V (DC + AC peak)		
HORIZONTAL (TIMEBASE)					
Maximum sampling rate (real-time) 1 ch. / 2 ch.	100 MS/s / 50 MS/s	200 MS/s (Ch. A) / 100 MS/s	500 MS/s / 250 MS/s	1 GS/s / 500 MS/s	
Equivalent sampling rate (ETS)	2 GS/s	4 GS/s	5 GS/s	10 GS/s	
Maximum sampling rate (USB streaming)	1 MS/s		9.6 MS/s (31 MS/s with SDK)		
Shortest timebase	10 ns/div	5 ns/div	2 ns/div	1 ns/div	
Longest timebase	5000 s/div		5000 s/div		
Buffer memory (block mode, shared between active channels)	8 kS	16 kS	32 MS	64 MS	128 MS
Buffer memory (USB streaming mode, PicoScope software)	100 MS (shared between active channels)		100 MS (shared between active channels)		
Buffer memory (USB streaming mode, SDK)	Up to available PC memory		Up to available PC memory		
Waveform buffers (PicoScope software)	10 000		10 000		
Maximum waveforms per second	2000		80 000		
Timebase accuracy	±100 ppm		±50 ppm		
Sample jitter	30 ps RMS typical		20 ps RMS typical	3 ps RMS typical	
DYNAMIC PERFORMANCE (typical)					
Crosstalk (full bandwidth, equal ranges)	Better than 200:1		Better than 300:1		
Harmonic distortion	< –50 dB at 100 kHz, full-scale input, typical		< –50 dB at 100 kHz, full-scale input, typical		
SFDR (100 kHz, full-scale input, typical)	> 52 dB		±20 mV range: > 44 dB ±50 mV range and higher: > 52 dB		
Noise	< 150 µV RMS (±50 mV range)		< 220 µV RMS (±20 mV range)	< 300 µV RMS (±20 mV range)	
Bandwidth flatness	(+0.3 dB, –3 dB) from DC to full bandwidth		(+0.3 dB, –3 dB) from DC to full bandwidth		
TRIGGERING					
Sources	Ch A, Ch B		Ch A, Ch B		
Trigger modes	None, auto, repeat, single		None, auto, repeat, single, rapid (segmented memory)		
Advanced triggers	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, logic		Edge, window, pulse width, window pulse width, dropout, window dropout, interval, runt pulse, logic		
Trigger types, ETS	Rising or falling edge		Rising or falling edge (available on Ch A only)		
Segmented memory buffers (SDK)	N/A		128 000	256 000	500 000
Segmented memory buffers (PicoScope software)	N/A		10 000		
Trigger sensitivity, real-time	Digital triggering provides 1 LSB accuracy up to full bandwidth		Digital triggering provides 1 LSB accuracy up to full bandwidth		
Trigger sensitivity, ETS	10 mV p-p, typical, at full bandwidth		10 mV p-p, typical, at full bandwidth		
Maximum pre-trigger capture	100% of capture size		100% of capture size		
Maximum post-trigger delay	4 billion samples		4 billion samples		
Trigger rearm time	PC-dependent		< 2 µs at 500 MS/s sampling rate	< 1 µs at 1 GS/s sampling rate	
Maximum trigger rate	PC-dependent		10 000 waveforms in a 12 ms burst, at 500 MS/s sampling rate, typical	10 000 waveforms in a 6 ms burst, at 1 GS/s sampling rate, typical	

Detailed specifications: 4-channel oscilloscopes

	PicoScope 2405A	PicoScope 2406B	PicoScope 2407B	PicoScope 2408B
VERTICAL				
Bandwidth (–3 dB)	25 MHz	50 MHz	70 MHz	100 MHz
Rise time (calculated)	14 ns	7 ns	5 ns	3.5 ns
Vertical resolution	8 bits	8 bits		
Enhanced vertical resolution	Up to 12 bits	Up to 12 bits		
Input ranges	±20 mV, ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V	±20 mV, ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V		
Input sensitivity	4 mV/div to 4 V/div (10 vertical divisions)	4 mV/div to 4 V/div (10 vertical divisions)		
Input coupling	AC / DC	AC / DC		
Input characteristics	1 MΩ ± 1% ‖ 16 pF ± 1 pF	1 MΩ ± 1% ‖ 16 pF ± 1 pF		
Input connector	BNC(f)	BNC(f)		
Analog offset range (vertical position adjustment)	±250 mV (20 mV to 200 mV ranges) ±2.5 V (500 mV to 2 V ranges) ±25 V (5 V to 20 V ranges)	±250 mV (20 mV to 200 mV ranges) ±2.5 V (500 mV to 2 V ranges) ±25 V (5 V to 20 V ranges)		
DC accuracy	±3% of full scale ±200 µV	±3% of full scale ±200 µV		
Overvoltage protection	±100 V (DC + AC peak)	±100 V (DC + AC peak)		
HORIZONTAL (TIMEBASE)				
Maximum sampling rate (real-time) 1 ch. 2 ch. 3 or 4 ch.	500 MS/s 250 MS/s 125 MS/s	1 GS/s 500 MS/s 250 MS/s		
Equivalent-time sampling rate (ETS)	5 GS/s	10 GS/s		
Maximum sampling rate (USB streaming)	1 MS/s (5 MS/s with SDK)	9.6 MS/s (31 MS/s with SDK)		
Shortest timebase	2 ns/div	2 ns/div	1 ns/div	
Longest timebase	5000 s/div	5000 s/div		
Buffer memory (block mode, shared between active channels)	48 kS	32 MS	64 MS	128 MS
Buffer memory (USB streaming mode, PicoScope software)	100 MS (shared between active channels)	100 MS (shared between active channels)		
Buffer memory (USB streaming mode, SDK)	Up to available PC memory	Up to available PC memory		
Waveform buffers (PicoScope software)	10 000	10 000		
Maximum waveforms per second	2000	80 000		
Timebase accuracy	±50 ppm	±50 ppm		
Sample jitter	20 ps RMS, typical	3 ps RMS, typical		
DYNAMIC PERFORMANCE (typical)				
Crosstalk (full bandwidth, equal ranges)	Better than 300:1	Better than 300:1		
Harmonic distortion	< –50 dB at 100 kHz, full-scale input, typical	< –50 dB at 100 kHz, full-scale input, typical		
SFDR (100 kHz, full-scale input, typical)	±20 mV range: > 44 dB ±50 mV range and higher: > 52 dB	±20 mV range: > 44 dB ±50 mV range and higher: > 52 dB		
Noise (±20 mV range)	<150 µV RMS	< 220 µV RMS	< 300 µV RMS	
Bandwidth flatness	(+0.3 dB, –3 dB) from DC to full bandwidth, typical	(+0.3 dB, –3 dB) from DC to full bandwidth, typical		

Detailed specifications: 4-channel oscilloscopes (continued)

	PicoScope 2405A	PicoScope 2406B	PicoScope 2407B	PicoScope 2408B
TRIGGERING				
Sources	Ch A, Ch B, Ch C, Ch D	Ch A, Ch B, Ch C, Ch D		
Trigger modes	None, auto, repeat, single, rapid (segmented memory)	None, auto, repeat, single, rapid (segmented memory)		
Advanced triggers	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, runt pulse, logic	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, runt pulse, logic		
Trigger types, ETS	Rising or falling edge (available on Ch A only)	Rising or falling edge (available on Ch A only)		
Segmented memory buffers (SDK)	96	128 000	256 000	500 000
Segmented memory buffers (PicoScope software)	96	10 000		
Trigger sensitivity, real-time	Digital triggering provides 1 LSB accuracy up to full bandwidth	Digital triggering provides 1 LSB accuracy up to full bandwidth		
Trigger sensitivity, ETS	10 mV p-p, typical, at full bandwidth	10 mV p-p, typical, at full bandwidth		
Maximum pre-trigger capture	100% of capture size	100% of capture size		
Maximum post-trigger delay	4 billion samples	4 billion samples		
Trigger rearm time	< 2 µs at 500 MS/s sampling rate	< 1 µs at 1 GS/s sampling rate		
Maximum trigger rate	96 waveforms in a 192 µs burst, at 500 MS/s sampling rate, typical	10 000 waveforms in a 6 ms burst, at 1 GS/s sampling rate, typical		

Detailed specifications: mixed-signal oscilloscopes

	PicoScope 2205A MSO	PicoScope 2206B MSO	PicoScope 2207B MSO	PicoScope 2208B MSO
VERTICAL (ANALOG INPUTS)				
Input channels	2	2		
Bandwidth (–3 dB)	25 MHz	50 MHz	70 MHz	100 MHz
Rise time (calculated)	14 ns	7 ns	5 ns	3.5 ns
Vertical resolution	8 bits	8 bits		
Enhanced vertical resolution	Up to 12 bits	Up to 12 bits		
Input ranges	±20 mV, ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V	±20 mV, ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V		
Input sensitivity	4 mV/div to 4 V/div (10 vertical divisions)	4 mV/div to 4 V/div (10 vertical divisions)		
Input coupling	AC / DC	AC / DC		
Input connector	BNC(f)	BNC(f)		
Input characteristics	1 MΩ ± 1% ‖ 16 pF ± 1 pF	1 MΩ ± 1% ‖ 16 pF ± 1 pF		
Analog offset range (vertical position adjustment)	±250 mV (20 mV to 200 mV ranges) ±2.5 V (500 mV to 2 V ranges) ±25 V (5 V to 20 V ranges)	±250 mV (20 mV to 200 mV ranges) ±2.5 V (500 mV to 2 V ranges) ±25 V (5 V to 20 V ranges)		
DC accuracy	±3% of full scale ±200 µV	±3% of full scale ±200 µV		
Overvoltage protection	±100 V (DC + AC peak) up to 10 kHz	±100 V (DC + AC peak) up to 10 kHz		
VERTICAL (DIGITAL INPUTS)				
Input channels	16 (two 8-bit ports)	16 (two 8-bit ports)		
Input connector	2.54 mm pitch, 10 x 2 way connector	2.54 mm pitch, 10 x 2 way connector		
Maximum input frequency	100 MHz (200 Mb/s)	100 MHz (200 Mb/s)		
Minimum detectable pulse width	5 ns	5 ns		
Input impedance	200 kΩ ±2% ‖ 8 pF ±2 pF	200 kΩ ±2% ‖ 8 pF ±2 pF		
Input dynamic range	±20 V	±20 V		
Threshold range	±5 V	±5 V		
Threshold grouping	Two independent threshold controls. Port 0: D0 to D7, Port 1: D8 to D15	Two independent threshold controls. Port 0: D0 to D7, Port 1: D8 to D15		
Threshold selection	TTL, CMOS, ECL, PECL, user-defined	TTL, CMOS, ECL, PECL, user-defined		
Port threshold accuracy	±350 mV (inclusive of hysteresis)	±350 mV (inclusive of hysteresis)		
Hysteresis	< ±250 mV	< ±250 mV		
Minimum input voltage swing	500 mV pk-pk	500 mV pk-pk		
Channel-to-channel skew	2 ns, typical	2 ns, typical		
Minimum input slew rate	10 V/µs	10 V/µs		
Overvoltage protection	±50 V	±50 V		
HORIZONTAL (TIMEBASE)				
Maximum sampling rate (real-time) 1 analog ch. 1 digital port 2 ch. Other *Each 8-bit digital port counts as 1 channel*	500 MS/s 500 MS/s 250 MS/s 250 MS/s	1 GS/s 500 MS/s 500 MS/s 250 MS/s		
Equivalent sampling rate (ETS)	5 GS/s	10 GS/s		
Maximum sampling rate (USB streaming)	1 MS/s (5 MS/s with SDK)	9.6 MS/s (31 MS/s with SDK)		
Shortest timebase	2 ns/div	2 ns/div	1 ns/div	
Longest timebase	5000 s/div	5000 s/div		
Buffer memory (block mode, shared between active channels)	48 kS	32 MS	64 MS	128 MS
Buffer memory (USB streaming mode, PicoScope software)	100 MS (shared between active channels)	100 MS (shared between active channels)		
Buffer memory (USB streaming mode, SDK)	Up to available PC memory	Up to available PC memory		
Waveform buffers (PicoScope software)	10 000	10 000		
Maximum waveforms per second	2000	80 000		
Timebase accuracy	±50 ppm	±50 ppm		
Sample jitter	20 ps RMS, typical	3 ps RMS, typical		

Detailed specifications: mixed-signal oscilloscopes (continued)

	PicoScope 2205A MSO	PicoScope 2206B MSO	PicoScope 2207B MSO	PicoScope 2208B MSO
DYNAMIC PERFORMANCE (typical)				
Crosstalk	Better than 300:1	Better than 300:1		
Harmonic distortion	< –50 dB at 100 kHz, full-scale input, typical	< –50 dB at 100 kHz, full-scale input, typical		
SFDR (100 kHz, full-scale input, typical)	±20 mV range: > 44 dB ±50 mV range and higher: > 52 dB	±20 mV range: > 44 dB ±50 mV range and higher: > 52 dB		
Noise (±20 mV range)	< 150 µV RMS	< 220 µV RMS	< 300 µV RMS	
Bandwidth flatness	(+0.3 dB, –3 dB) from DC to full bandwidth, typical	(+0.3 dB, –3 dB) from DC to full bandwidth, typical		
TRIGGERING				
Sources	Ch A, Ch B, Digital 0–15	Ch A, Ch B, Digital 0–15		
Trigger modes	None, auto, repeat, single, rapid (segmented memory)	None, auto, repeat, single, rapid (segmented memory)		
Advanced triggers (analog inputs)	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, runt pulse, logic	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, runt pulse, logic		
Advanced triggers (digital inputs)	Edge, pulse width, dropout, interval, logic, pattern, mixed signal	Edge, pulse width, dropout, interval, logic, pattern, mixed signal		
Trigger types, ETS	Rising or falling edge (available on Ch A only)	Rising or falling edge (available on Ch A only)		
Segmented memory buffers (SDK)	96	128 000	256 000	500 000
Segmented memory buffers (PicoScope software)	96	10 000		
Trigger sensitivity, real-time (analog channels)	Digital triggering provides 1 LSB accuracy up to full bandwidth	Digital triggering provides 1 LSB accuracy up to full bandwidth		
Trigger sensitivity, ETS (analog channels)	10 mV p-p, typical, at full bandwidth	10 mV p-p, typical, at full bandwidth		
Maximum pre-trigger capture	100% of capture size	100% of capture size		
Maximum post-trigger delay	4 billion samples	4 billion samples		
Trigger rearm time	< 2 µs at 500 MS/s sampling rate	< 1 µs at 1 GS/s sampling rate		
Maximum trigger rate	96 waveforms in a 192 µs burst, at 500 MS/s sampling rate, typical	10 000 waveforms in a 6 ms burst, at 1 GS/s sampling rate, typical		

Signal generator specifications: all models

	PicoScope 2204A PicoScope 2205A	PicoScope 2405A PicoScope 2205A MSO	All B models
FUNCTION GENERATOR			
Standard output signals	Sine, square, triangle, DC voltage, ramp, sinc, Gaussian, half-sine	Sine, square, triangle, DC voltage, ramp, sinc, Gaussian, half-sine	
Pseudorandom output signals	None	White noise, PRBS	
Standard signal frequency	DC to 100 kHz	DC to 1 MHz	
Sweep modes	Up, down, dual with selectable start/stop frequencies and increments	Up, down, dual with selectable start/stop frequencies and increments	
Triggering	None	Free-run or up to 1 billion waveform cycles or frequency sweeps. Triggered from scope trigger or manually.	
Output frequency accuracy	Oscilloscope timebase accuracy ± output frequency resolution	Oscilloscope timebase accuracy ± output frequency resolution	
Output frequency resolution	< 0.02 Hz	< 0.01 Hz	
Output voltage range	±2 V	±2 V	
Output adjustments	Any amplitude and offset within ±2 V range	Any amplitude and offset within ±2 V range	
Amplitude flatness (typical)	< 1 dB to 100 kHz	< 0.5 dB to 1 MHz	
DC accuracy	±1% of full scale	±1% of full scale	
SFDR (typical)	> 55 dB at 1 kHz full-scale sine wave	> 60 dB at 10 kHz full-scale sine wave	
Output characteristics	Front panel BNC, 600 Ω output impedance	Front panel BNC, 600 Ω output impedance	
Overvoltage protection	±20 V	±20 V	
ARBITRARY WAVEFORM GENERATOR			
Update rate	1.548 MHz	20 MHz	
Buffer size	4 kS	8 kS	32 kS
Resolution	12 bits	12 bits	
Bandwidth	> 100 kHz	> 1 MHz	
Rise time (10% to 90%)	< 2 µs	< 120 ns	

Common specifications

SPECTRUM ANALYZER	
Frequency range	DC to analog bandwidth of oscilloscope
Display modes	Magnitude, average, peak hold
Windowing functions	Rectangular, Gaussian, triangular, Blackman, Blackman-Harris, Hamming, Hann, flat-top
Number of FFT points	Selectable from 128 to half available buffer memory in powers of 2, up to a maximum of 1 048 576 points
MATH CHANNELS	
Functions	−x, x+y, x−y, x*y, x/y, x^y, sqrt, exp, ln, log, abs, norm, sign, sin, cos, tan, arcsin, arccos, arctan, sinh, cosh, tanh, freq, derivative, integral, min, max, average, peak, delay, duty, highpass, lowpass, bandpass, bandstop
Operands	A, B (input channels), C, D (input channels, 4-channel models only), T (time), reference waveforms, constants, pi, digital channels (MSO models only)
AUTOMATIC MEASUREMENTS	
Scope mode	AC RMS, true RMS, frequency, cycle time, duty cycle, DC average, falling rate, rising rate, low pulse width, high pulse width, fall time, rise time, minimum, maximum, peak to peak
Spectrum mode	Frequency at peak, amplitude at peak, THD dB, SNR, SINAD, SFDR, total power, average amplitude at peak, THD %, THD+N, IMD,
Statistics	Minimum, maximum, average and standard deviation
SERIAL DECODING	
Protocols	1-Wire, ARINC 429, CAN, DCC, DMX512, FlexRay, Ethernet 10Base-T, USB 1.1, I²C, I²S, LIN, PS/2, SPI, SENT, UART/RS-232 (subject to bandwidth and sampling rate of chosen oscilloscope model)
MASK LIMIT TESTING	
Statistics	Pass/fail, failure count, total count
DISPLAY	
Interpolation	Linear or sin(x)/x
Persistence modes	Digital color, analog intensity, custom, fast or none

Common specifications (continued)

GENERAL	
PC connectivity	USB 2.0 (USB 3.0 compatible). USB cable included.
Power requirements	Powered from USB port
Dimensions (including connectors and feet)	142 x 92 x 18.8 mm (PicoScope 2204A and 2205A only) 130 x 104 x 18.8 mm (all other models, including PicoScope 2205A MSO)
Weight	< 0.2 kg (7 oz)
Temperature range, operating	0 °C to 50 °C
Temperature range, operating, for stated accuracy	15 °C to 30 °C
Temperature range, storage	–20 °C to +60 °C
Humidity range, operating	5% to 80% RH non-condensing
Humidity range, storage	5% to 95% RH non-condensing
Altitude range	up to 2000 m
Pollution degree	2
Safety approvals	Designed to EN 61010-1:2010
Environmental approvals	RoHS, WEEE
EMC approvals	Tested to meet EN61326-1:2013 and FCC Part 15 Subpart B
Software included	PicoScope 6 for Microsoft Windows 7, 8 and 10; 32-bit and 64-bit SDK for Windows 7, 8 and 10; 32-bit and 64-bit Example programs (C, Microsoft Excel VBA, LabVIEW)
Free software available for download	PicoScope 6 (beta) for Linux and OS X SDK (beta) for Linux and OS X
Languages supported	Simplified Chinese, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Turkish

Your PicoScope 2000 Series oscilloscope comes with the following items:

- USB 2.0 (USB 3.0/3.1 compatible) cable
- Two or four x1/x10 passive probes (except kits specified as without probes; 150 MHz TA132 probes illustrated below)
- Digital input cable (MSO models only)
- 20 logic test clips (MSO models only)
- Quick Start Guide
- Software and reference CD

Ordering information

Oscilloscopes

ORDER CODE	DESCRIPTION
PP917	PicoScope 2204A 10 MHz 2-channel oscilloscope without probes
PP906	PicoScope 2204A 10 MHz 2-channel oscilloscope
PP966	PicoScope 2205A 25 MHz 2-channel oscilloscope without probes
PP907	PicoScope 2205A 25 MHz 2-channel oscilloscope
PQ012	PicoScope 2206B 50 MHz 2-channel oscilloscope
PQ013	PicoScope 2207B 70 MHz 2-channel oscilloscope
PQ014	PicoScope 2208B 100 MHz 2-channel oscilloscope
PQ015	PicoScope 2405A 25 MHz 4-channel oscilloscope
PQ016	PicoScope 2406B 50 MHz 4-channel oscilloscope
PQ017	PicoScope 2407B 70 MHz 4-channel oscilloscope
PQ018	PicoScope 2408B 100 MHz 4-channel oscilloscope
PQ008	PicoScope 2205A MSO 25 MHz 2+16 channel mixed-signal oscilloscope
PQ009	PicoScope 2206B MSO 50 MHz 2+16 channel mixed-signal oscilloscope
PQ010	PicoScope 2207B MSO 70 MHz 2+16 channel mixed-signal oscilloscope
PQ011	PicoScope 2208B MSO 100 MHz 2+16 channel mixed-signal oscilloscope

Replacement accessories

ORDER CODE	DESCRIPTION
MI007	60 MHz passive probe (supplied in oscilloscope kits with up to 50 MHz bandwidth)
TA132	150 MHz passive probe (supplied with 70 MHz and 100 MHz oscilloscopes)
TA136	20-way 25 cm digital cable (suitable for MSOs only)
TA139	Pack of 10 logic test clips (suitable for MSOs only)

*Prices are correct at the time of publication. Sales taxes not included. Please contact Pico Technology for the latest prices before ordering.

More oscilloscopes in the PicoScope range...

PicoScope 3000 Series
General purpose
2- and 4-channel

PicoScope 4000 Series
High precision
12 to 16 bits

PicoScope 5000 Series
Flexible resolution
8 to 16 bits

PicoScope 6000 Series
High performance
Up to 1 GHz

PicoScope 9000 Series
Sampling scopes
and TDR to 20 GHz

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