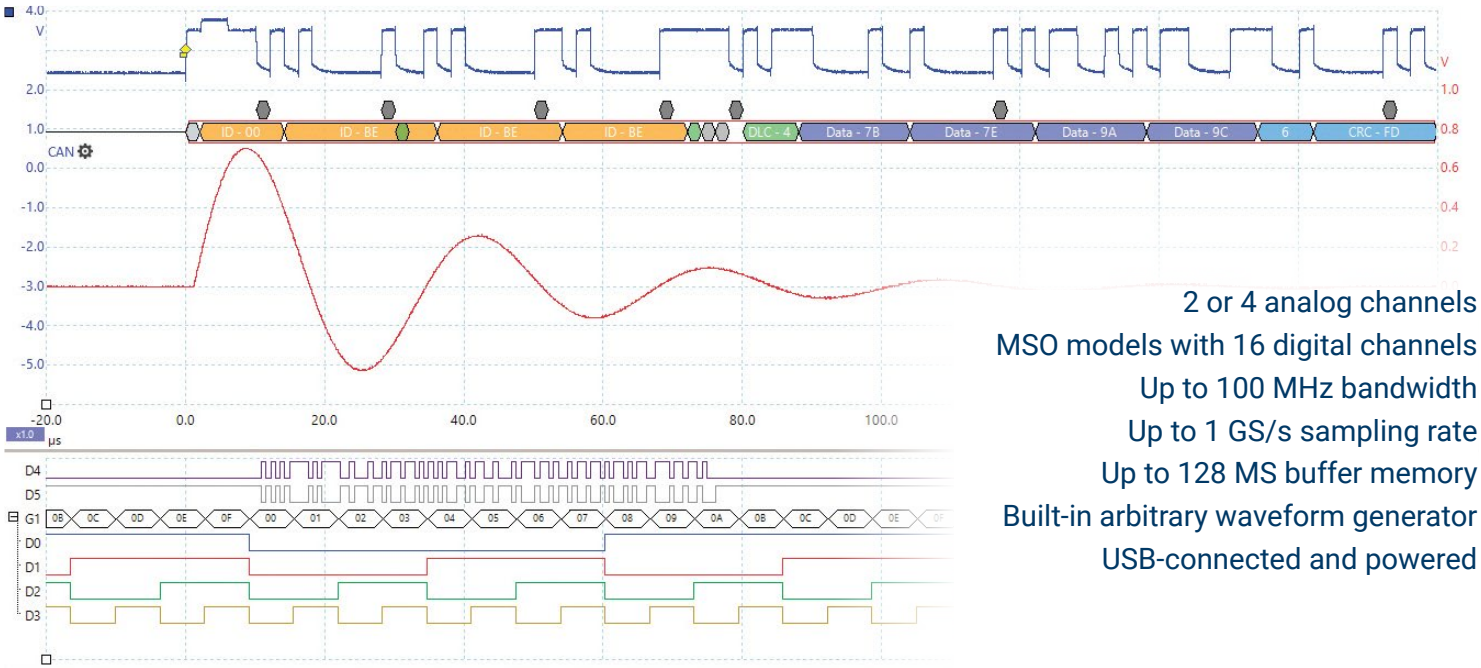
PicoScope® 2000 Series

Ultra-compact PC oscilloscopes

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

www.picotech.com

Introducing the PicoScope 2000 Series

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

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

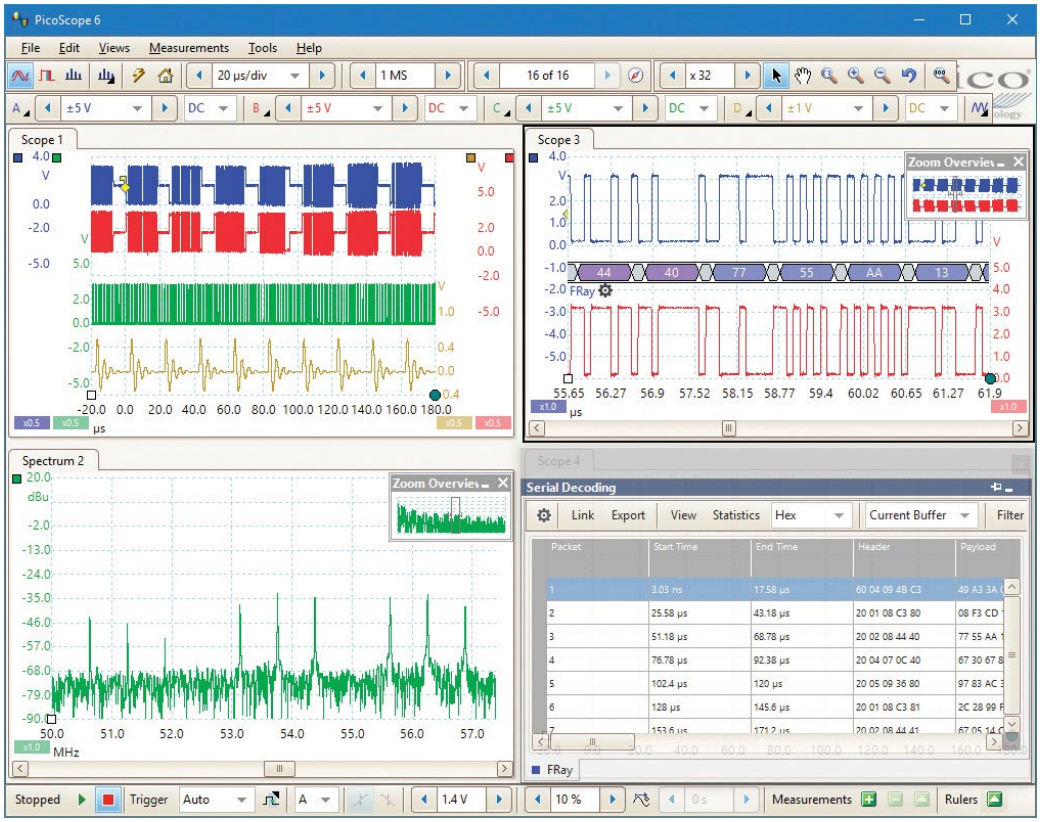
4-channel oscilloscope

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

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

Advanced oscilloscope display

The PicoScope 6 software takes advantage of the display size, 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.



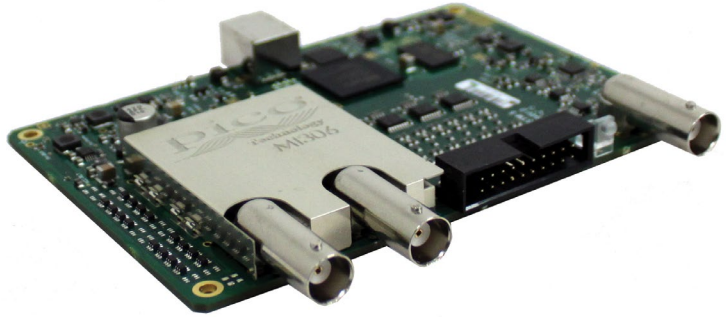
Powerful, portable and super-small

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.

High signal integrity

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.



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-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 with a user-friendly interface. As well as the standard Windows installation, PicoScope Beta software also works effectively on Linux and macOS operating systems, giving you the freedom to operate your PicoScope from your chosen platform.

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.

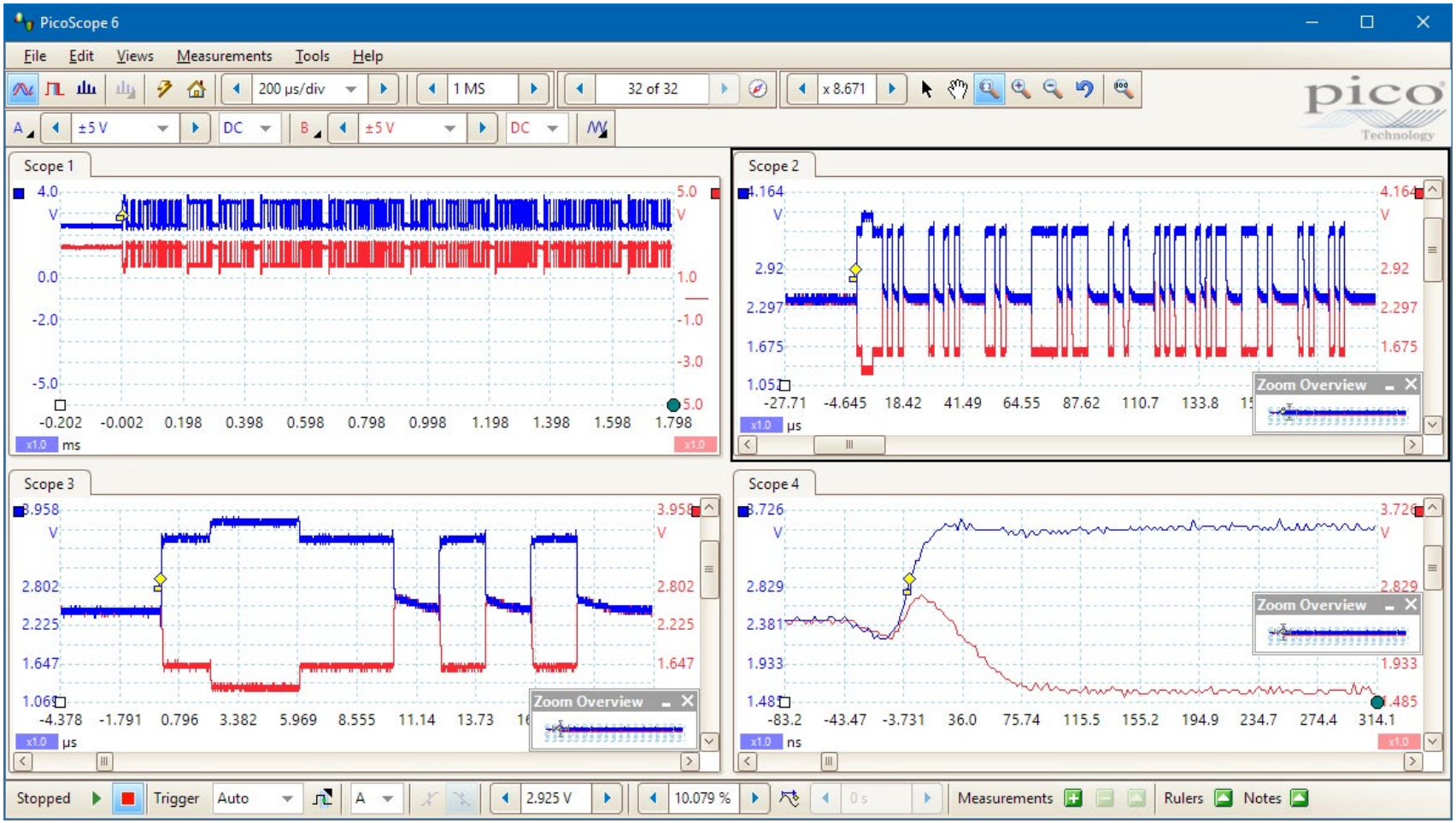
This level of support, combined with the personal service provided by our technical and sales support teams, is reflected in consistently excellent customer feedback.

Deep capture memory

PicoScope 2000 Series ‘B’ models have waveform capture buffers ranging from 32 to 128 megasamples – many times larger than competing scopes. Deep memory enables the capture of long-duration waveforms at maximum sampling speed. In fact, some PicoScope 2000 Series models can capture 100 ms waveforms with 1 ns resolution. In contrast, the same 100 ms waveform captured by an oscilloscope with a 10 megasample memory would have just 10 ns resolution.

Deep memory can be useful in other ways too: PicoScope 6 lets you divide the capture memory into a number of segments, up to a maximum of 10 000. You can set up a trigger condition to store a separate capture in each segment, with as little as 1 µs dead time between captures. Once you have acquired the data, you can step through the memory one segment at a time until you find the event you are looking for.

Powerful tools are included to allow you to manage and examine all of this data. As well as functions such as mask limit testing and color persistence mode, the PicoScope 6 software enables you to zoom into your waveform by a factor of several million. The Zoom Overview window allows you to easily control the size and location of the zoom area. Other tools, such as the waveform buffer, serial decoding and hardware acceleration work with the deep memory, making the PicoScope 2000 Series some of the best-value oscilloscopes on the market.



PicoScope 6 software

The PicoScope software display can be as basic 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 (model-dependent), plus math channels and reference waveforms. Display multiple scope and spectrum views with automatic or custom layouts and quickly access all the most frequently-used controls from the toolbars, leaving the display clear for your waveforms.

Tools menu: Set up custom probes, serial decoding, reference waveforms, mask tests, alarms and macros from the Tools menu.

Touchscreen controls: Handy buttons make fine adjustment easy on touchscreen devices.

Buffer Navigation toolbar: PicoScope can record up to 10 000 of your most recent waveforms. Click through the buffer to look for intermittent events, or use the Buffer Overview thumbnails.

Zooming and Scrolling toolbar: It's easy to zoom in on waveforms, with straightforward zoom-in, zoom-out and pan tools.

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

Auto Setup button: Let PicoScope configure the collection time and input range for a correctly scaled display.

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

Channel options: Adjust settings specific to each channel here.

Rulers: Each axis has two rulers that you can drag across the screen to make quick measurements.

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

Zoom Overview window: Click and drag for quick navigation and adjustment of zoomed views.

Adjustable axes: Move the vertical axes up and down the display and vary their scale and offset. PicoScope can also rearrange the axes automatically.

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

Spectrum view: View frequency-domain data alongside time-domain waveforms or in the dedicated spectrum mode.

Automatic measurements: Add as many calculated time- and frequency-domain measurements as you need, along with statistical parameters showing their variability.

Mixed digital and analog signals

The PicoScope 2000 MSO models add 16 digital channels to their two analog channels, enabling you to accurately time-correlate analog and digital channels. You can group digital channels together and display them as a bus, with each bus value displayed in hex, binary or decimal, or as a level (for DAC testing). You can set advanced triggers across both the analog and digital channels.

The digital inputs also bring extra power to the serial decoding options. You can decode serial data on all analog and digital channels simultaneously, giving you up to 20 channels of data – for example decoding multiple SPI, I²C, CAN bus, LIN bus and FlexRay signals all at the same time.

Oscilloscope controls: PicoScope's full analog-domain controls, including zoom, filtering, and function generatovr, 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.

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.

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

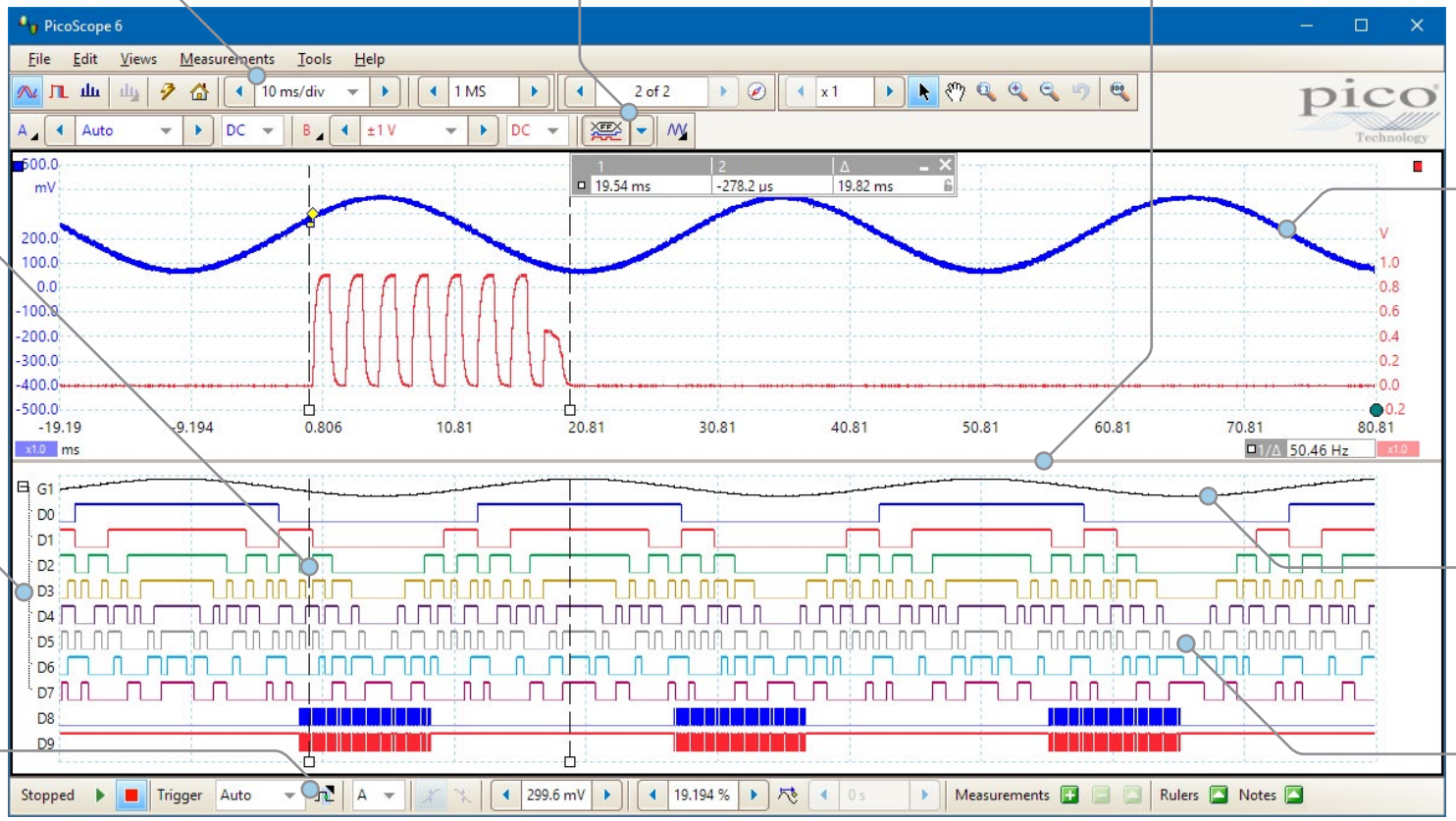
Analog waveforms: View analog waveforms time-correlated with digital inputs.

Rename: The digital channels and groups can be renamed. You can expand or collapse groups in the digital view.

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

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

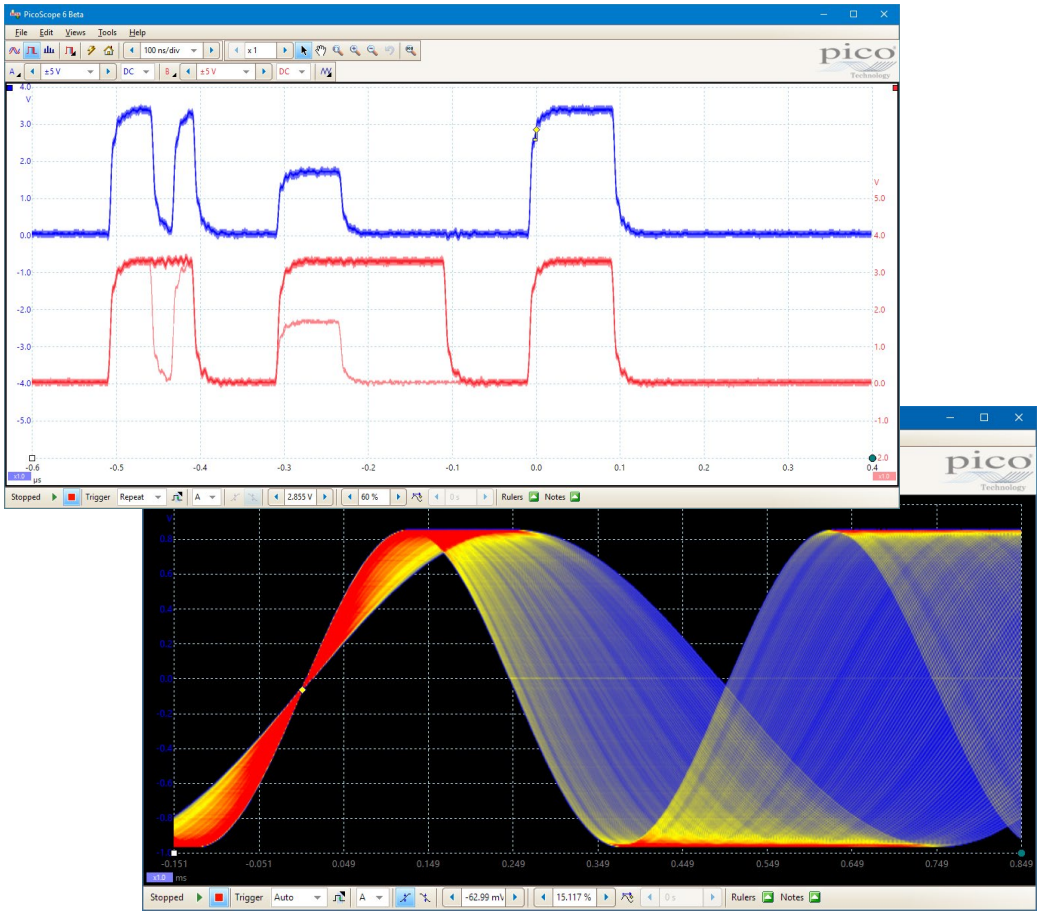
Display format: Display selected bits individually or as groups in numerical or ASCII format.



Persistence mode

PicoScope 6 persistence mode options allow you to see old and new data superimposed, with newer waveforms drawn in a brighter color or deeper shade. This makes it easy to spot glitches and dropouts and estimate their relative frequency – useful for displaying and interpreting complex analog signals such as video waveforms and analog modulation signals.

The PicoScope 2000 Series' hardware acceleration means that, in Fast Persistence mode, waveform update rates of up to 80 000 waveforms per second are achievable. Color-coding or intensity-grading shows which areas are stable and which are intermittent. Choose between analog intensity, digital color and fast display modes or create your own custom setup.

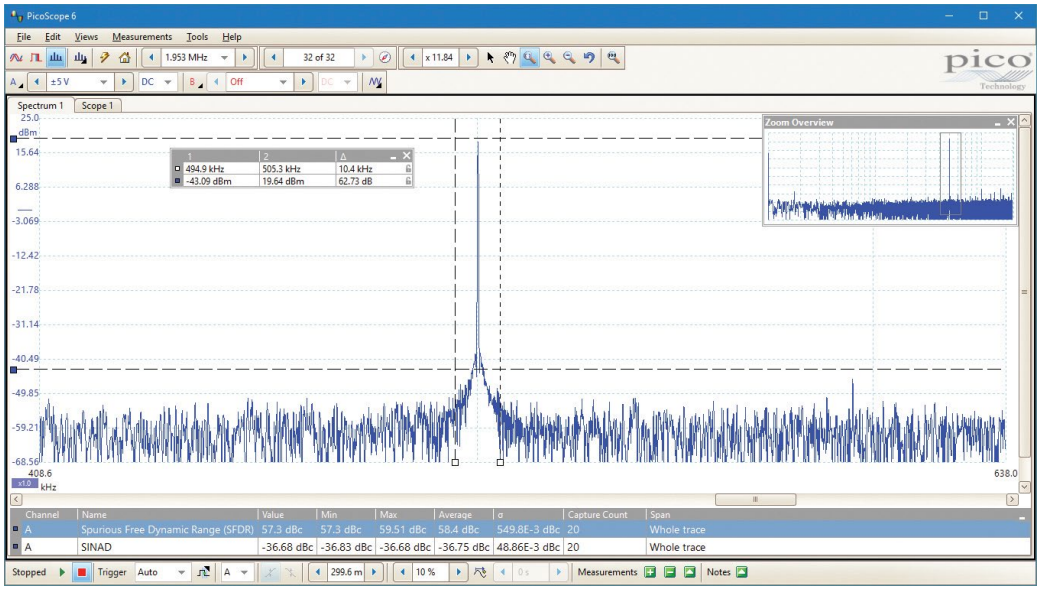


Spectrum analyzer

The spectrum view plots amplitude against frequency and is ideal for finding noise, crosstalk or distortion in signals. PicoScope 6 uses a fast Fourier transform (FFT) spectrum analyzer, which (unlike a traditional swept spectrum analyzer) can display the spectrum of a single, non-repeating waveform.

With a click of a button, you can display a spectrum plot of the active channels, with a maximum frequency of up to 200 MHz. A comprehensive range of settings gives you control over the number of spectrum bins, window functions, scaling (including log/log) and display mode (instantaneous, average or peak-hold).

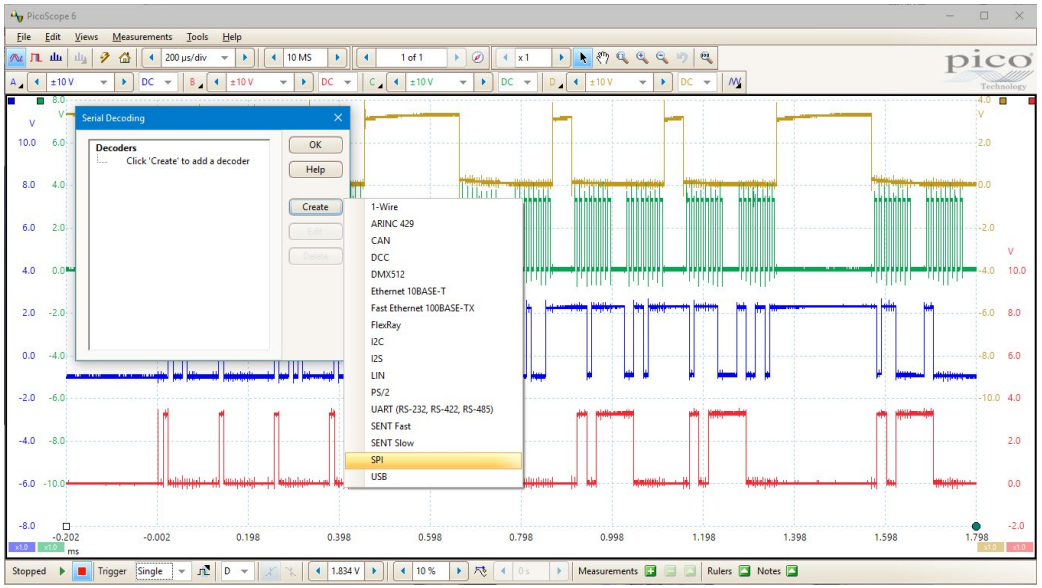
Display multiple spectrum views with different channel selections and zoom factors, and place these alongside time-domain views of the same data. Choose from a number of automatic frequency-domain measurements to add to the display, including THD, THD+N, SNR, SINAD and IMD. You can apply mask limit testing to a spectrum and can even use the AWG and spectrum mode together to perform swept scalar network analysis.



Serial decoding and analysis

The PicoScope 2000 Series oscilloscopes include serial decoding capability as standard. The PicoScope 6 software has support for 20 protocols including I²C, SPI, CAN, RS-232, Manchester and DALI. Decoding helps you see what is happening in your design to identify programming and timing errors and check for other signal integrity issues. Timing analysis tools help to show the performance of each design element, identifying parts of the design that need to be improved to optimize overall system performance.

You can capture and decode several protocols at a time, in any combination, the only limit being the number of available channels – 18 for MSO models, as you can decode serial data on all analog and digital inputs simultaneously. The ability to observe data flow across a bridge (such as CAN bus in, LIN bus out) is incredibly powerful. The deep memory of the PicoScope 2000B models makes them ideal for serial decoding, as they can handle many thousands of frames of data.



GRAPH FORMAT shows the decoded data (in hex, binary, decimal or ASCII) in a timing diagram format, 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, and each packet field is assigned a different color, so the data is easy to read.

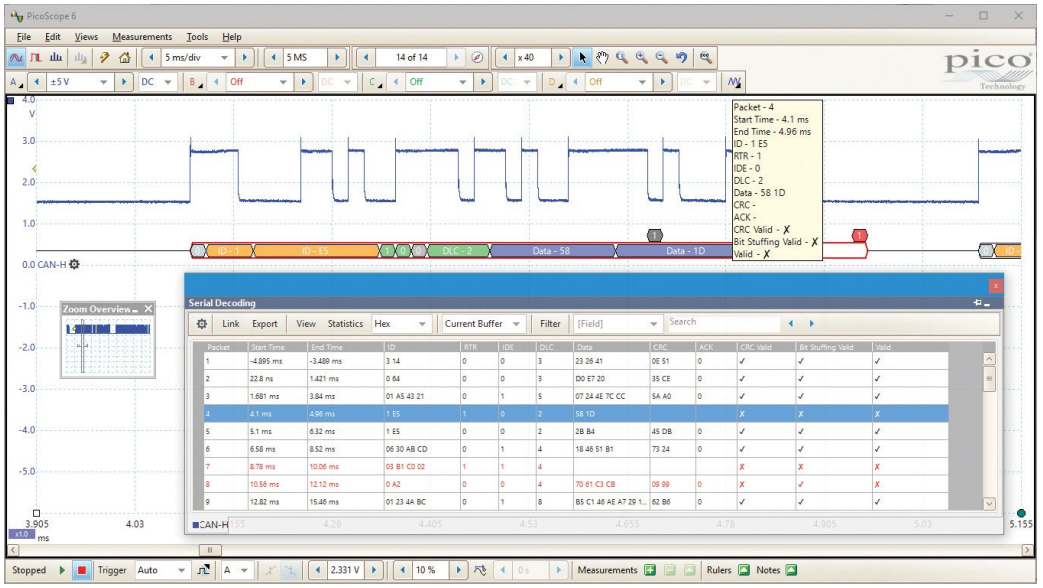


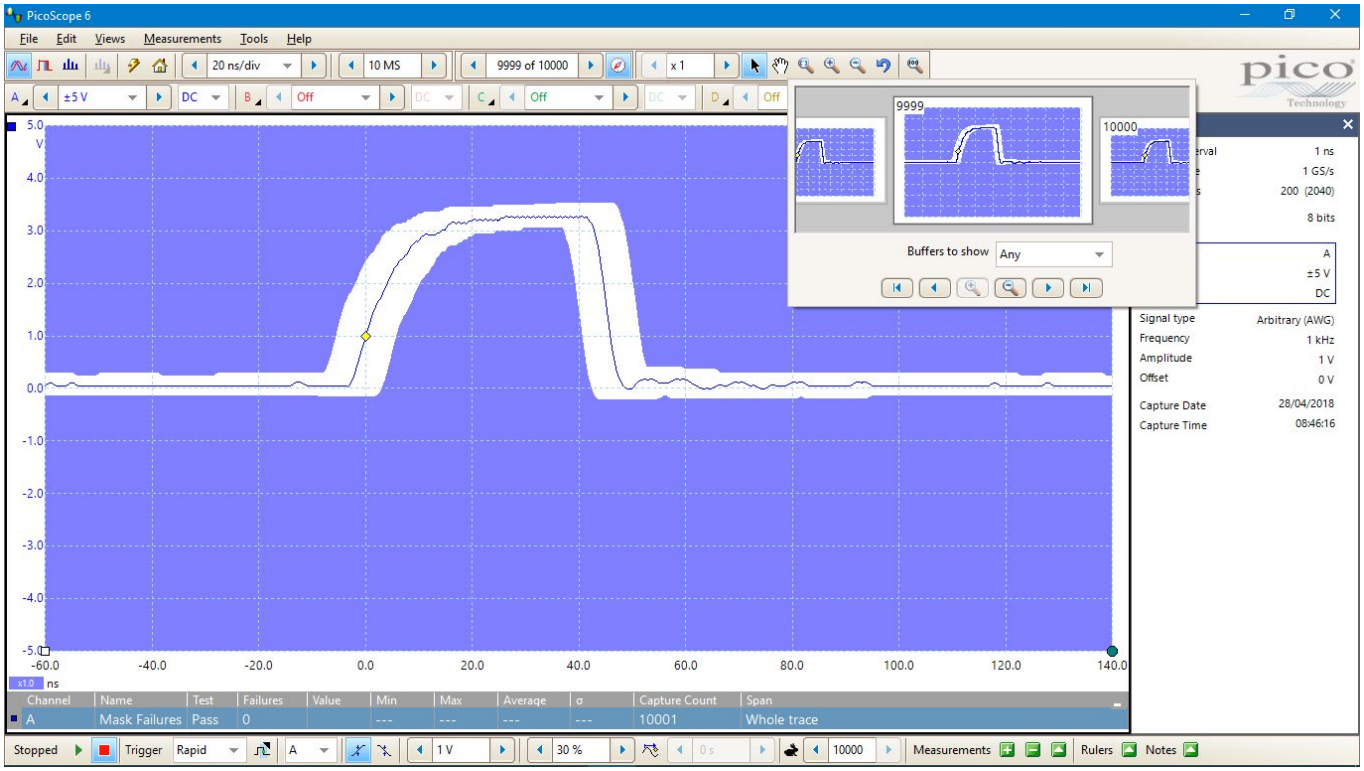
TABLE FORMAT shows a list of the decoded frames, including the data and all flags and identifiers. You can set up filtering conditions to display only the frames you are interested in or search for frames with specified properties.

The statistics option reveals more detail about the physical layer such as frame times and voltage levels. PicoScope 6 can also import a spreadsheet to decode the data into user-defined text strings.

Mask limit testing

Mask limit testing allows you to compare live signals against known good signals, and is designed for production and debugging environments. Simply capture a known good signal, generate a mask around it and then use the alarms to automatically save any waveform (complete with a time stamp) that violates the mask. PicoScope 6 will capture any intermittent glitches and show a failure count in the Measurements window (which you can still use for other measurements). You can also set the waveform buffer navigator to show only mask fails, enabling you to find any glitches quickly.

Mask files are easy to edit (numerically or graphically), import and export, and you can simultaneously run mask limit tests on multiple channels and in multiple viewports.

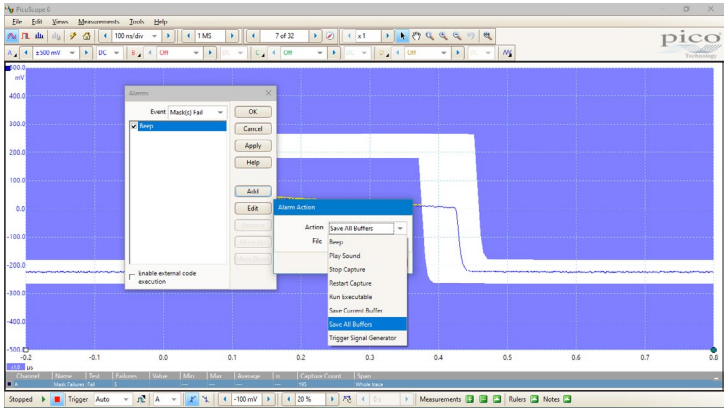


Alarms

You can program PicoScope 6 to execute actions when certain events occur.

The events that can trigger an alarm include mask limit fails, trigger events and buffers full.

PicoScope 6 actions include saving a file, playing a sound, executing a program and triggering the arbitrary waveform generator.



Waveform buffer and navigator

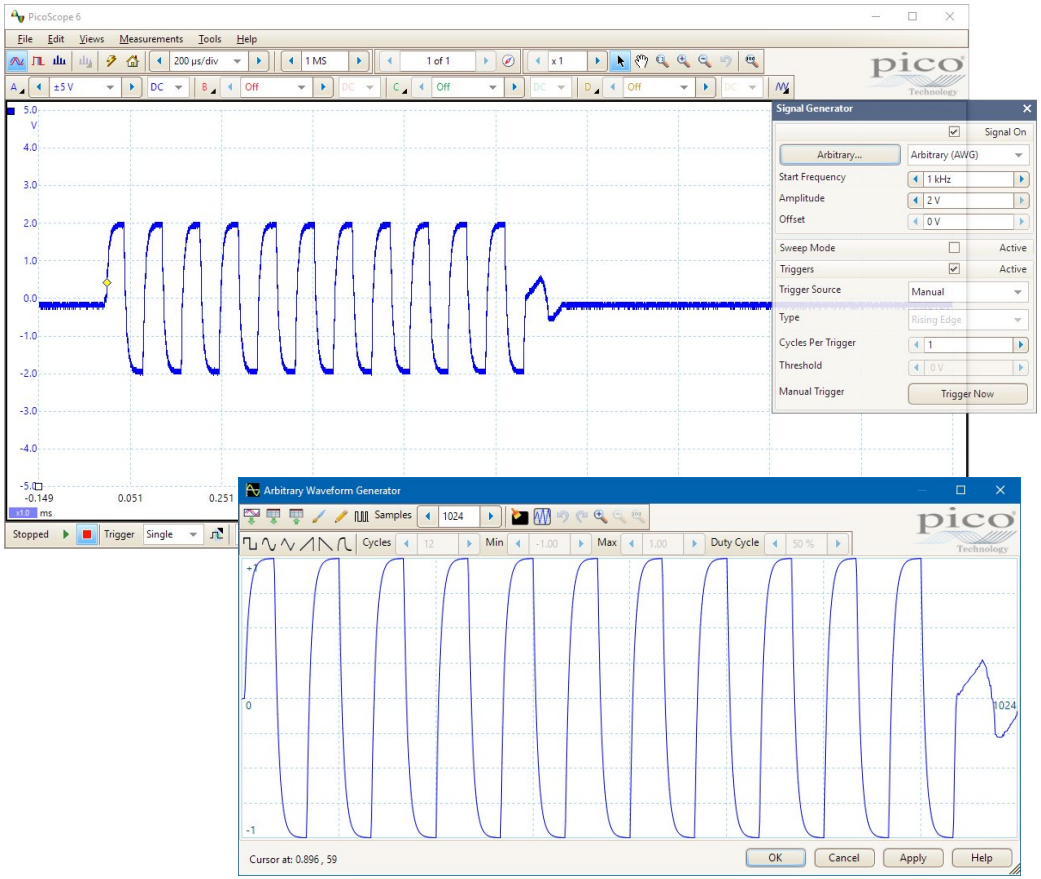
Ever spotted a glitch on a waveform, but by the time you've stopped the scope it's gone? With PicoScope you no longer need to worry about missing glitches or other transient events, as it can store the last 10 000 waveforms in its circular waveform buffer.

The buffer navigator provides an efficient way of navigating and searching through waveforms, effectively letting you turn back time. When carrying out a mask limit test, you can also set the navigator to show only mask fails, enabling you to find any glitches quickly.

Arbitrary waveform and function generator

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.

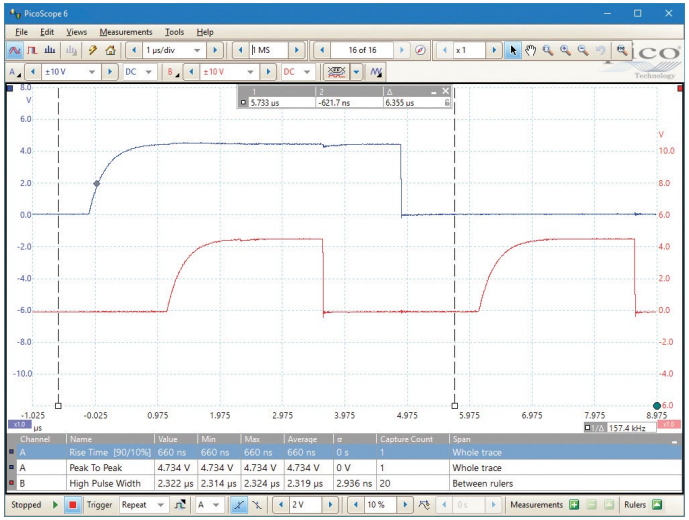
As well as level, offset and frequency controls, advanced options allow you to sweep over a range of frequencies. Combined with the advanced spectrum mode, with options including peak hold, averaging and linear/log axes, this creates a powerful tool for testing amplifier and filter responses.



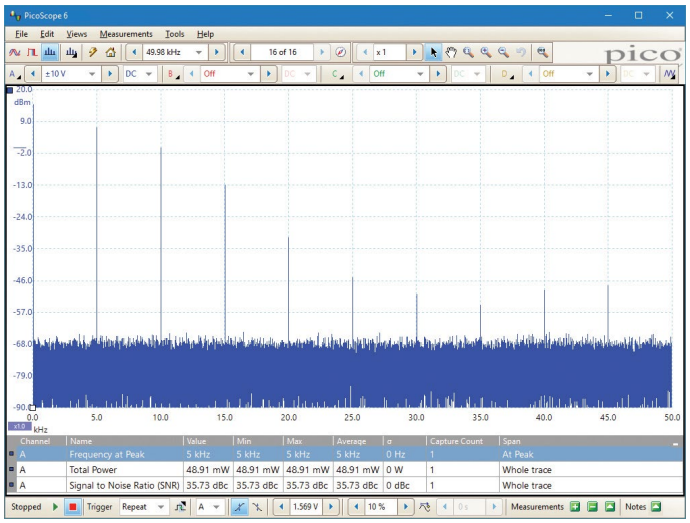
Automatic measurements

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 – 18 different measurements are available in scope mode and 11 in spectrum mode. For information on these measurements, see **Automatic Measurements** in the **Specifications** table.



Scope mode



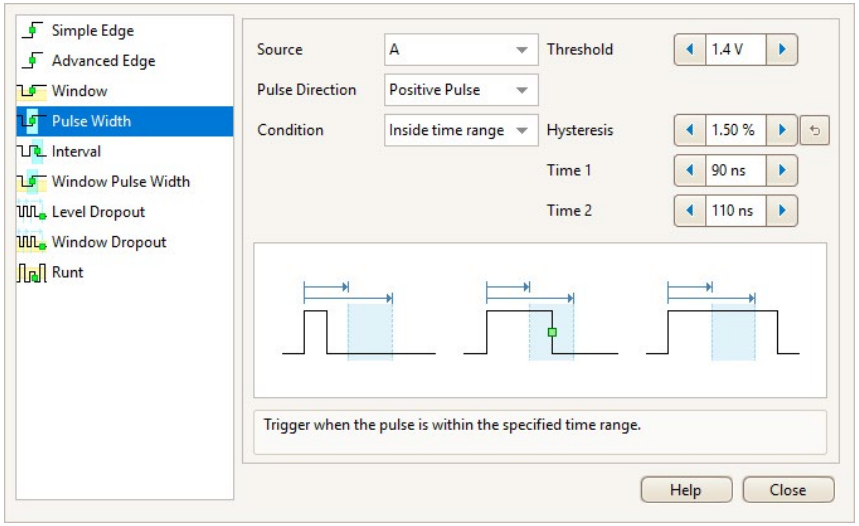
Spectrum mode

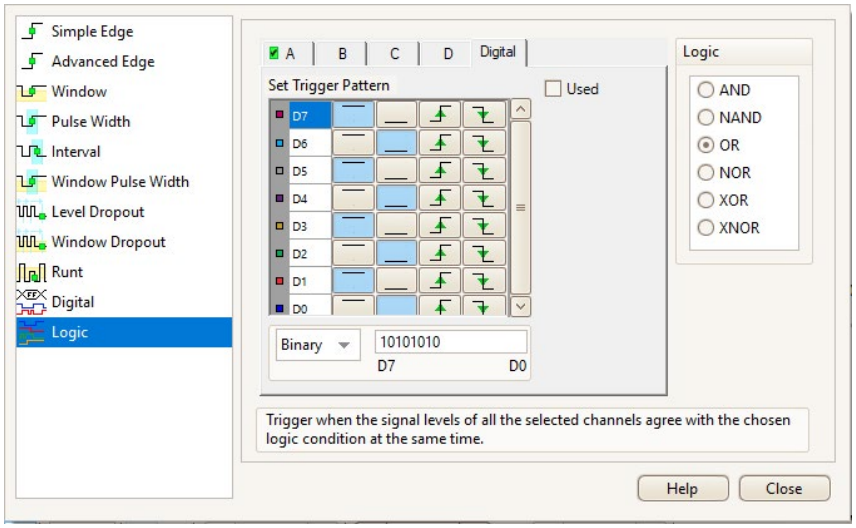
Digital triggering architecture

In 1991, Pico Technology pioneered the use of digital triggering and precision hysteresis using the actual digitized data. Traditionally, digital oscilloscopes have used an analog trigger architecture based on comparators, which can cause time and amplitude errors that cannot always be calibrated out. Additionally, the use of comparators can often limit the trigger sensitivity at high bandwidths and can create a long trigger rearm delay.

Pico's technique of fully digital triggering reduces trigger errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth, so you can set trigger levels and hysteresis with high precision and resolution.

The digital trigger architecture also reduces the rearm delay. Combined with the segmented memory, this enables you to use rapid triggering to capture 10 000 waveforms in 10 ms in 8-bit mode.





Advanced triggers

The PicoScope 2000 Series offers an industry-leading set of advanced triggers including pulse width, windowed and dropout.

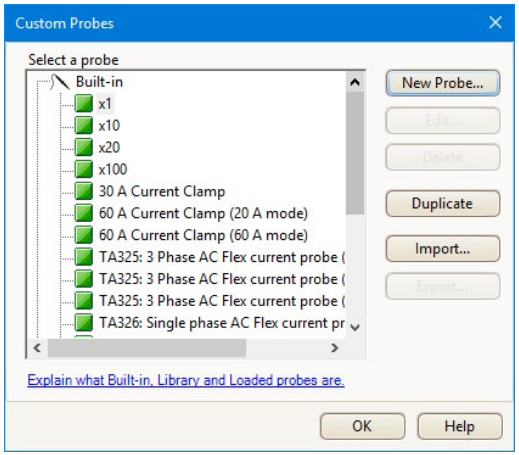
The digital trigger available on MSO models allows you to trigger the scope when any or all of the 16 digital inputs match a user-defined pattern. You can specify a condition for each channel individually, or set up a pattern for all channels at once using a hexadecimal or binary value.

You can also use the logic trigger to combine the digital trigger with an edge or window trigger on any of the analog inputs, for example to trigger on data values in a clocked parallel bus.

Custom probes

The custom probes feature allows you to correct for gain, attenuation, offsets and nonlinearities in probes, transducers and other sensors, and to measure quantities other than voltages (such as current, power or temperature).

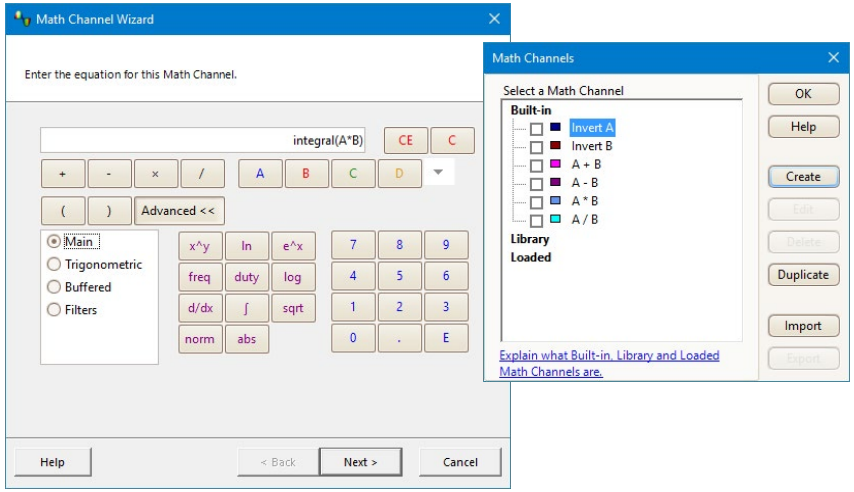
Definitions for standard Pico-supplied probes are built in, but you can also create your own using linear scaling or even an interpolated data table, and save them for later use.

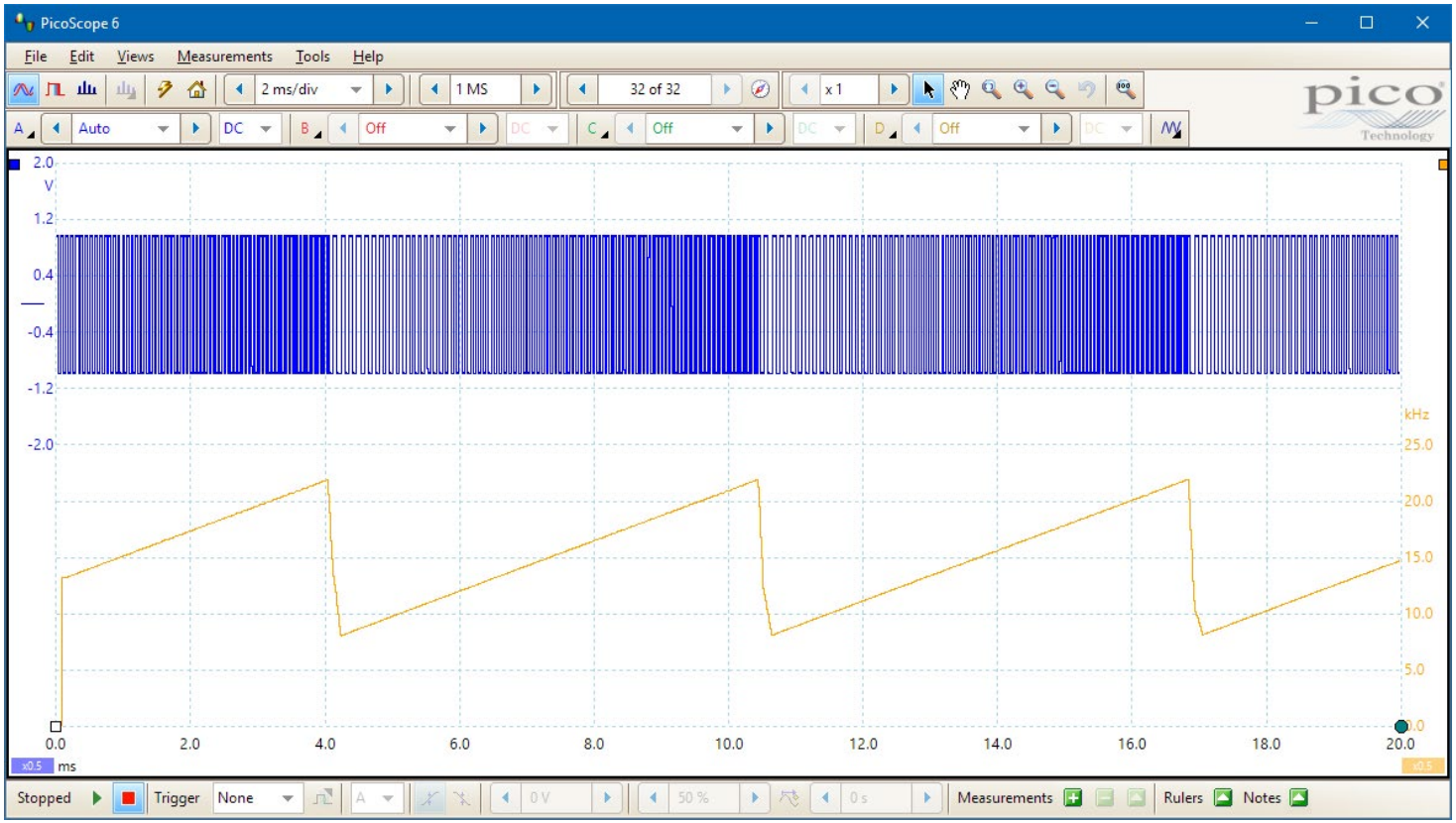


Math channels and filters

With PicoScope 6 you can perform a variety of mathematical calculations on your input signals and reference waveforms. Select simple functions such as addition and inversion, or open the equation editor to create complex functions involving filters (lowpass, highpass, bandpass and bandstop filters), trigonometry, exponentials, logarithms, statistics, integrals and derivatives.

Display up to eight real or calculated channels in each scope view. If you run out of space, just open another scope view and add more. You can also use math channels to reveal new details in complex signals, for example graphing the changing duty cycle or frequency of your signal over time.





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 this example, the top waveform's frequency is being modulated by a ramp function, as plotted in the bottom waveform.

A separate math function allows you to plot duty cycle in a similar way.

PicoLog® 6 support

All PicoScope 2000 Series oscilloscopes are now supported in PicoLog 6, allowing you to view and record signals on multiple units in one capture.

PicoLog 6 allows sample rates of up to 1 kS/s per channel, and is ideal for long-term observation of general parameters, such as voltage or current levels, on several channels at the same time. It is less suitable for waveshape or harmonic analysis: use the PicoScope 6 software for these tasks.

You can also use PicoLog 6 to view data from your oscilloscope alongside a data logger or other device. For example, you could measure voltage and current with your PicoScope and plot both against temperature using a **TC-08 thermocouple data logger**, or humidity with a **DrDAQ multipurpose data logger**.

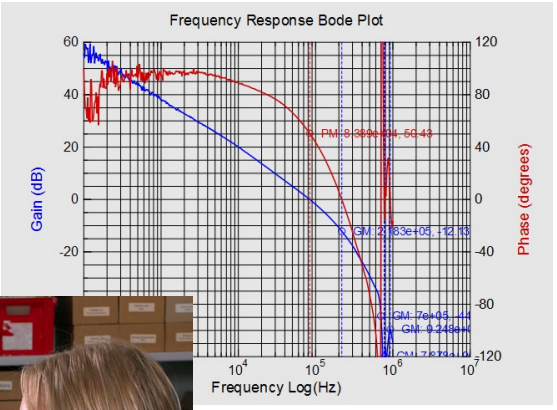
PicoLog 6 is available for Windows, macOS and Linux, including Raspbian.

PicoSDK® – write your own apps

Our software development kit, PicoSDK, allows you to write your own software and includes drivers for Windows, macOS and Linux. Example code supplied on our GitHub organization page shows how to interface to third-party software packages such as National Instruments LabVIEW and MathWorks MATLAB.

Amongst other features, the drivers support data streaming, a mode that captures continuous gap-free data directly to your PC at rates of up to 125 MS/s, so you are not limited by the size of your scope's capture memory. Sampling rates in streaming mode are subject to PC specifications and application loading.

There is also an active community of PicoScope 6 users who share both code and whole applications on our **Test and Measurement Forum** and the **PicoApps** section of the website. The Frequency Response Analyzer shown here is one of the most popular of these applications.



Kit contents and accessories

The PicoScope 2000 Series oscilloscope kit contains 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)
- Digital input cable (MSO models only)
- 20 logic test clips (MSO models only)
- Quick Start Guide

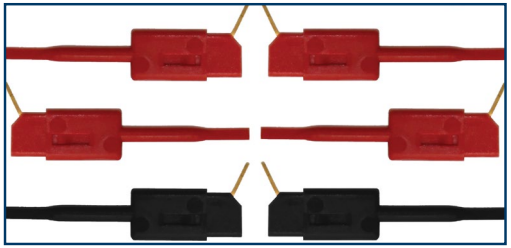
Probes, cables and clips

Your PicoScope 2000 Series oscilloscope kit comes with probes trimmed to match the performance of your oscilloscope.

MSO models are also supplied with an MSO cable and 20 test clips.

Oscilloscope probe

20-way 25 cm digital MSO cable



MSO test clips

Quick product selector

VIEW your waveform with a low-cost USB-powered and connected 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 and connected 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

PicoScope 2000 Series 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
Software lowpass filter	Not applicable		Configurable software lowpass filter		
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	Single-ended, BNC(f)		Single-ended, BNC(f)		
Input characteristics	1 MΩ ± 1% ‖ 15 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)		
Analog offset control accuracy	Not applicable		±1% of offset setting, additional to basic DC accuracy		
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		
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-time 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 PicoSDK)		
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 6)	100 MS (shared between active channels)		100 MS (shared between active channels)		
Buffer memory (USB streaming mode, PicoSDK)	Up to available PC memory		Up to available PC memory		
Waveform buffers (PicoScope 6)	10 000		10 000		
Maximum waveforms per second	2000		80 000		

PicoScope 2000 Series specifications – 2-channel oscilloscopes					
	PicoScope 2204A	PicoScope 2205A	PicoScope 2206B	PicoScope 2207B	PicoScope 2208B
Initial timebase accuracy	±100 ppm		±50 ppm		
Timebase drift	±5 ppm/year		±5 ppm/year		
Sample jitter	30 ps RMS typical		20 ps RMS typical	3 ps RMS typical	
ADC sampling	Simultaneous sampling on all enabled channels		Simultaneous sampling on all enabled channels		
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 (PicoSDK)	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	

PicoScope 2000 Series 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
Software lowpass filter	Not applicable	Configurable lowpass filter		
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	Single-ended, BNC(f)	Single-ended, 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)		
Analog offset control accuracy	±1% of offset setting, additional to basic DC accuracy	±1% of offset setting, additional to basic DC accuracy		
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		
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)	8.9 MS/s (31 MS/s with PicoSDK)	9.6 MS/s (31 MS/s with PicoSDK)		
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 6)	100 MS (shared between active channels)	100 MS (shared between active channels)		
Buffer memory (USB streaming mode, PicoSDK)	Up to available PC memory	Up to available PC memory		
Waveform buffers (PicoScope 6)	10 000	10 000		
Maximum waveforms per second	2000	80 000		

PicoScope 2000 Series specifications – 4-channel oscilloscopes				
	PicoScope 2405A	PicoScope 2406B	PicoScope 2407B	PicoScope 2408B
Initial timebase accuracy	±50 ppm	±50 ppm		
Timebase drift	±5 ppm/year	±5 ppm/year		
Sample jitter	20 ps RMS, typical	3 ps RMS, typical		
ADC sampling	Simultaneous sampling on all enabled channels	Simultaneous sampling on all enabled channels		
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		

PicoScope 2000 Series 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
Software lowpass filter	Not applicable	Configurable software lowpass filter		
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	Single-ended, BNC(f)	Single-ended, 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)		
Analog offset control accuracy	±1% of offset setting, additional to basic DC accuracy	±1% of offset setting, additional to basic DC accuracy		
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		

PicoScope 2000 Series specifications – mixed-signal oscilloscopes				
	PicoScope 2205A MSO	PicoScope 2206B MSO	PicoScope 2207B MSO	PicoScope 2208B MSO
Horizontal (timebase)				
Maximum sampling rate (real-time) 1 analog ch. 1 digital port 2 channels/ports Other	 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-time sampling rate (ETS)	5 GS/s	10 GS/s		
Maximum sampling rate (USB streaming)	8.9 MS/s (31 MS/s with PicoSDK)	9.6 MS/s (31 MS/s with PicoSDK)		
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 6)	100 MS (shared between active channels)	100 MS (shared between active channels)		
Buffer memory (USB streaming mode, PicoSDK)	Up to available PC memory	Up to available PC memory		
Waveform buffers (PicoScope 6)	10 000	10 000		
Maximum waveforms per second	2000	80 000		
Initial timebase accuracy	±50 ppm	±50 ppm		
Timebase drift	±5 ppm/year	±5 ppm/year		
Sample jitter	20 ps RMS, typical	3 ps RMS, typical		
ADC sampling	Simultaneous sampling on all enabled channels	Simultaneous sampling on all enabled channels		
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		

PicoScope 2000 Series specifications – mixed-signal oscilloscopes				
	PicoScope 2205A MSO	PicoScope 2206B MSO	PicoScope 2207B MSO	PicoScope 2208B MSO
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 (PicoSDK)	96	128 000	256 000	500 000
Segmented memory buffers (PicoScope 6)	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		

PicoScope 2000 Series specifications – signal generator			
	PicoScope 2204A & 2205A	PicoScope 2405A & 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	

PicoScope 2000 Series specifications – common features	
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
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, cycle time, DC average, duty cycle, edge count, falling edge count, falling rate, fall time, frequency, high pulse width, low pulse width, maximum, minimum, peak to peak, rise time, rising edge count, rising rate, true RMS
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, CAN-FD, DALI, DCC, DMX512, FlexRay, Ethernet 10Base-T, I²C, I²S, LIN, Manchester, Modbus ASCII, Modbus RTU, PS/2, SENT, SPI, UART/RS-232, USB 1.1 (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
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

PicoScope 2000 Series specifications – common features	
Safety approvals	Designed to EN 61010-1:2010
Environmental approvals	RoHS, WEEE
EMC approvals	Tested to meet EN 61326-1:2013 and FCC Part 15 Subpart B
Warranty period	5 years
Software availability and requirements (hardware requirements as operating system)	
Windows software	PicoScope 6, PicoLog 6, PicoSDK *See **PicoScope** and **PicoLog** release notes for supported OS versions*
macOS software	PicoScope 6 Beta (including drivers), PicoLog 6 (including drivers) *See **PicoScope** and **PicoLog** release notes for supported OS versions*
Linux software	PicoScope 6 Beta software and drivers, PicoLog 6 (including drivers) *See **PicoScope** and **PicoLog** release notes for supported distributions* *See **Linux Software and Drivers** to install drivers only*
Raspberry Pi 3B and 4B (Raspbian)	PicoLog 6 (including drivers) *See **PicoLog** release notes for supported OS versions* *See **Linux Software and Drivers** to install drivers only*
Languages supported, PicoScope 6	Simplified Chinese, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Turkish
Languages supported, PicoLog 6	Simplified Chinese, English (UK), English (US), French, German, Italian, Japanese, Korean, Russian, Spanish

Users writing their own apps can find example programs for all platforms on the Pico Technology organization page on **GitHub**.

Ordering information

Oscilloscopes

Order code	Model name	Description
PP917	PicoScope 2204A-D2	10 MHz 2-channel oscilloscope without probes
PP906	PicoScope 2204A	10 MHz 2-channel oscilloscope
PP966	PicoScope 2205A-D2	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	Model name	Description
TA375	TA375 passive probe	100 MHz 1:1/10:1 passive oscilloscope probe
TA136	TA136 logic cable	20-way 25 cm digital cable (suitable for MSOs only)
TA139	TA139 test clips	Pack of 10 logic test clips (suitable for MSOs only)

Calibration service

Order code	Model name	Description
CC017	Calibration certificate CC017	Calibration certificate for PicoScope 2000 Series oscilloscope

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

More products in the Pico Technology range...

PicoScope 3000 Series

Versatile general-purpose 2- and 4-channel oscilloscopes and MSOs, suitable for a huge range of analog and digital applications.

All models have a maximum sampling rate of 1 GS/s, USB 3.0 connectivity and access to the DeepMeasure™ tool.

Up to 200 MHz bandwidth and 512 MS capture memory.

PicoScope 4000 Series

A varied range of high-resolution oscilloscopes for a multitude of analog applications.

Models available with 2 or 4 channels plus optional IEPE interface, 2 channels at 16-bit resolution, 4 true differential channel inputs for extra-low-voltage or mains CAT III applications, or 8 channels at 12-bit resolution.

DrDAQ

Built-in sensors for light, sound and temperature, plus pH and redox input, scope input (max. sampling rate 1 MS/s), 3 sensor sockets, 4 digital I/O connections and a function generator.

This flexible data logger runs on PicoLog 6 and PicoScope 6 software and is ideal for hobby or educational applications.

TC-08

8-channel temperature data logger. Accepts all popular thermocouples to record temperatures from −270 °C to +1820 °C

Up to 10 measurements per second at 20-bit resolution. Optional terminal board for voltage and current measurement.

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