PicoScope® 3000 Series

USB oscilloscopes

60 to 250 MHz analog bandwidth
Up to 1 GS/s real-time sampling
2 or 4 analog channels
MSO models with 16 digital channels
Built-in function generator and AWG
Up to 512 MS buffer memory
Hardware-accelerated update rates
USB connected and powered

Automatic measurements
Mask limit testing
Advanced triggers
Serial decoding
Maths channels
Spectrum analyzer

Free technical support and updates
Free SDK and example programs
5 year warrranty included

www.picotech.com

Power, portability, and performance

The PicoScope 3000 Series USB-powered PC oscilloscopes are small, light, and portable, while offering a range of high-performance specifications required by engineers in the lab or on the move.

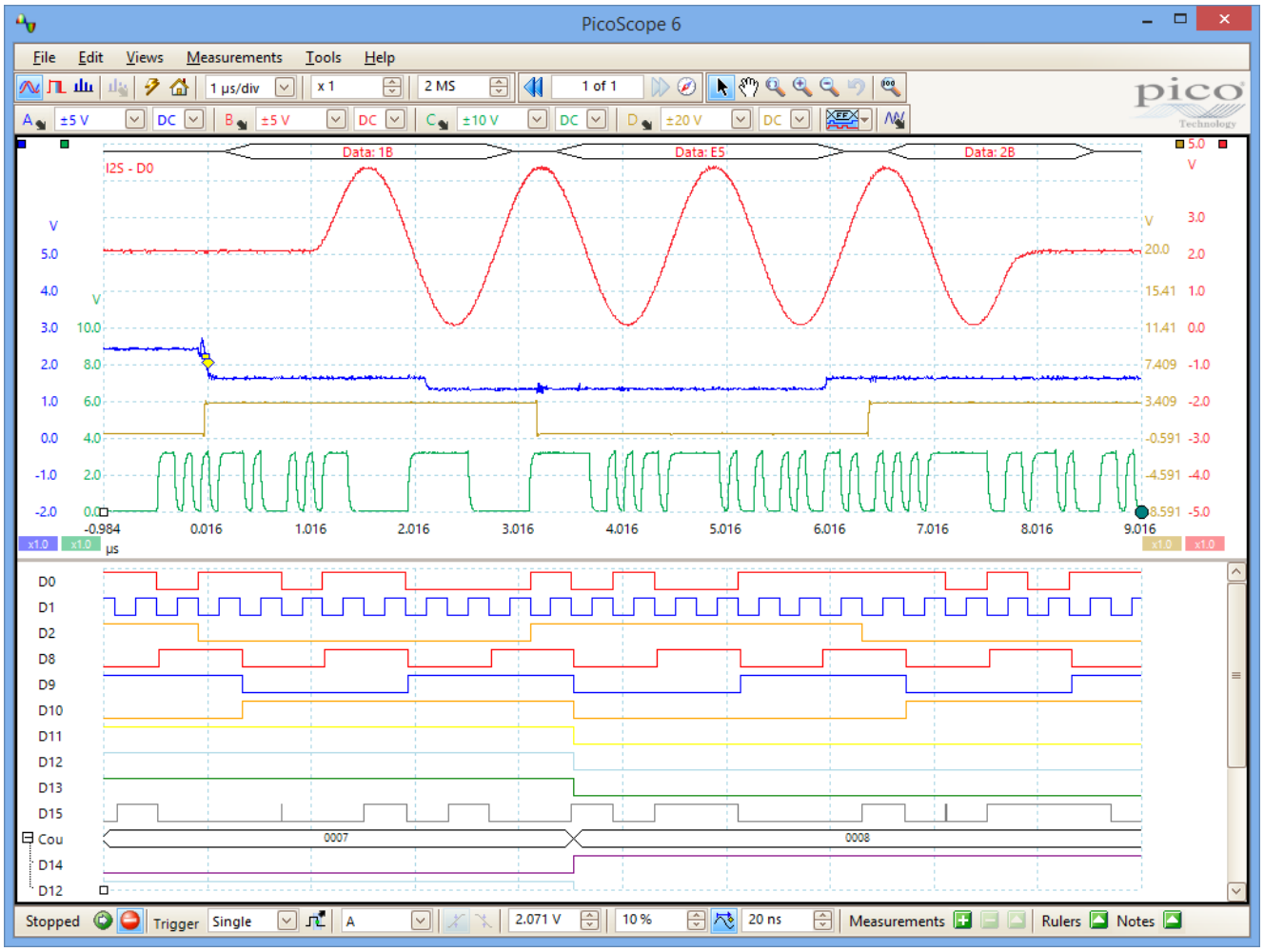
These oscilloscopes offer 2 or 4 analog channels, plus an additional 16 digital channels on the MSO models. The flexible, high-resolution display options enable you to view and analyze each signal in fine detail.

Supported by the advanced PicoScope 6 software, these devices offer an ideal, cost-effective package for many applications, including embedded systems design, research, test, education, service, and repair.

High bandwidth and sampling rate

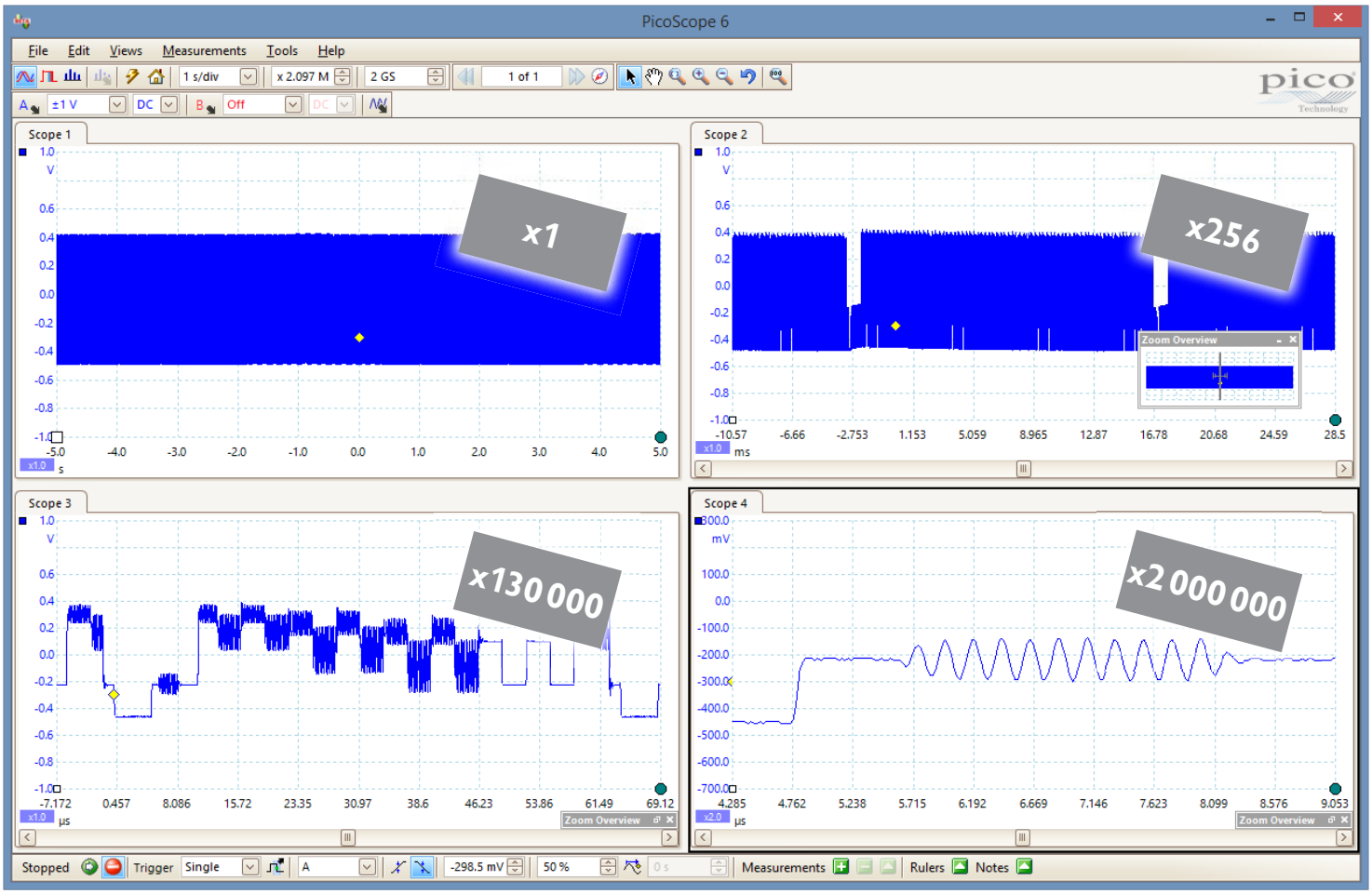
Despite a compact size and low cost, there is no compromise on performance. With input bandwidths up to 250 MHz, the PicoScope 3000 Series scopes can be used for a wide range of signal types from DC and baseband into RF and all the way up to VHF.

This is matched by a real-time sampling rate of up to 1 GS/s, allowing detailed display of high frequencies. For repetitive signals, the maximum effective sampling rate can be boosted to 10 GS/s by using Equivalent Time Sampling (ETS) mode. With a sampling rate of four or five times the input bandwidth, PicoScope 3000 Series oscilloscopes are well equipped to capture high-frequency signal detail.



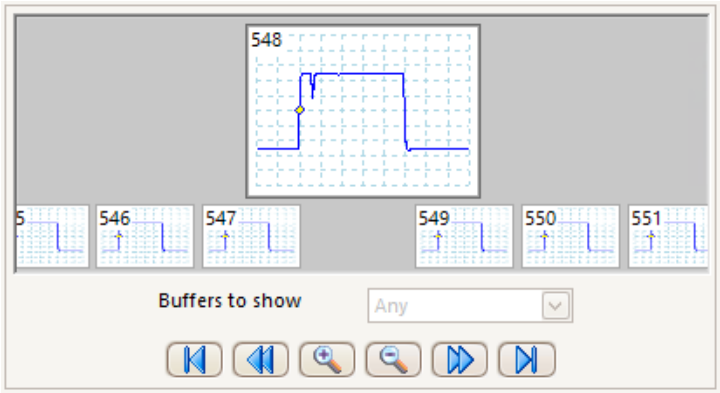
Deep memory

The PicoScope 3000 Series oscilloscopes are also market leaders in offering a huge buffer memory, allowing them to sustain their high sampling rates across long timebases. For example, using a 512 MS buffer the PicoScope 3207B can sample at 1 GS/s all the way down to 50 ms/div (a 500 ms total capture time).



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 several million times. A zoom overview window allows you to easily control the size and location of the zoom area.

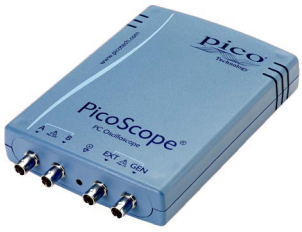
Up to 10 000 waveforms can be stored in the segmented waveform buffer. The Buffer Overview window then allows you to rewind and review the history of your waveform. No longer will you struggle to catch an infrequent glitch.



PicoScope 3000 Series oscilloscopes - overview

PicoScope model	USB 2.0	USB 3.0	AWG*	Bandwidth	Buffer memory	Max. sampling rate
3204A	•			60 MHz	4 MS	500 MS/s
3204B	•		•	60 MHz	8 MS	500 MS/s
3205A	•			100 MHz	16 MS	500 MS/s
3205B	•		•	100 MHz	32 MS	500 MS/s
3206A	•			200 MHz	64 MS	500 MS/s
3206B	•		•	200 MHz	128 MS	500 MS/s
3207A		•		250 MHz	256 MS	1 GS/s
3207B		•	•	250 MHz	512 MS	1 GS/s

* Arbitrary waveform generator



2 analog channels

PicoScope model	USB 2.0	USB 3.0	AWG*	Bandwidth	Buffer memory	Max. sampling rate
3404A	•			60 MHz	4 MS	1 GS/s
3404B	•		•	60 MHz	8 MS	1 GS/s
3405A	•			100 MHz	16 MS	1 GS/s
3405B	•		•	100 MHz	32 MS	1 GS/s
3406A	•			200 MHz	64 MS	1 GS/s
3406B	•		•	200 MHz	128 MS	1 GS/s

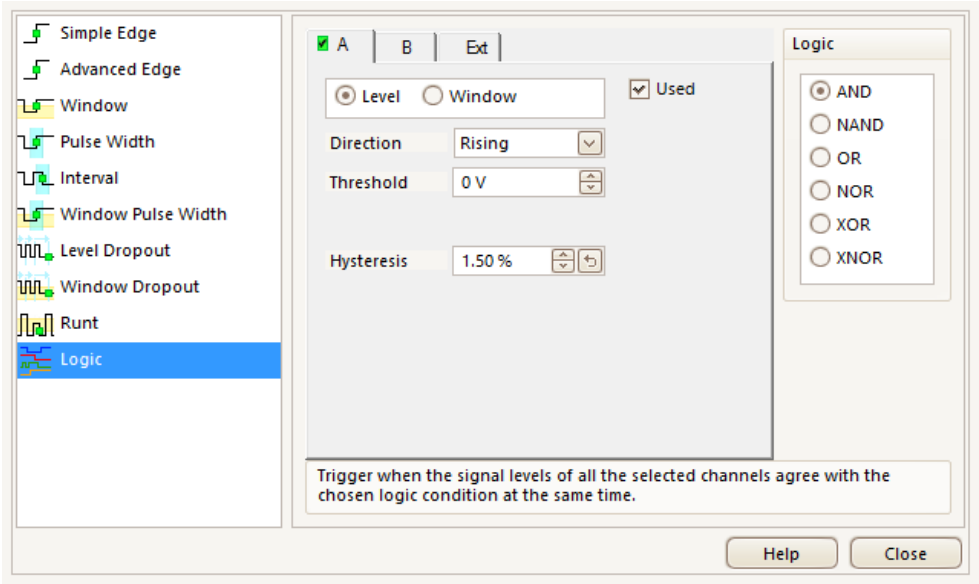
4 analog channels

PicoScope model	USB 2.0	USB 3.0	AWG*	Bandwidth	Buffer memory	Max. sampling rate
3204D MSO		•	•	60 MHz	128 MS	1 GS/s
3205D MSO		•	•	100 MHz	256 MS	1 GS/s
3206D MSO		•	•	200 MHz	512 MS	1 GS/s
3404D MSO		•	•	60 MHz	128 MS	1 GS/s
3405D MSO		•	•	100 MHz	256 MS	1 GS/s
3406D MSO		•	•	200 MHz	512 MS	1 GS/s

2 / 4 analog channels
16 digital channels

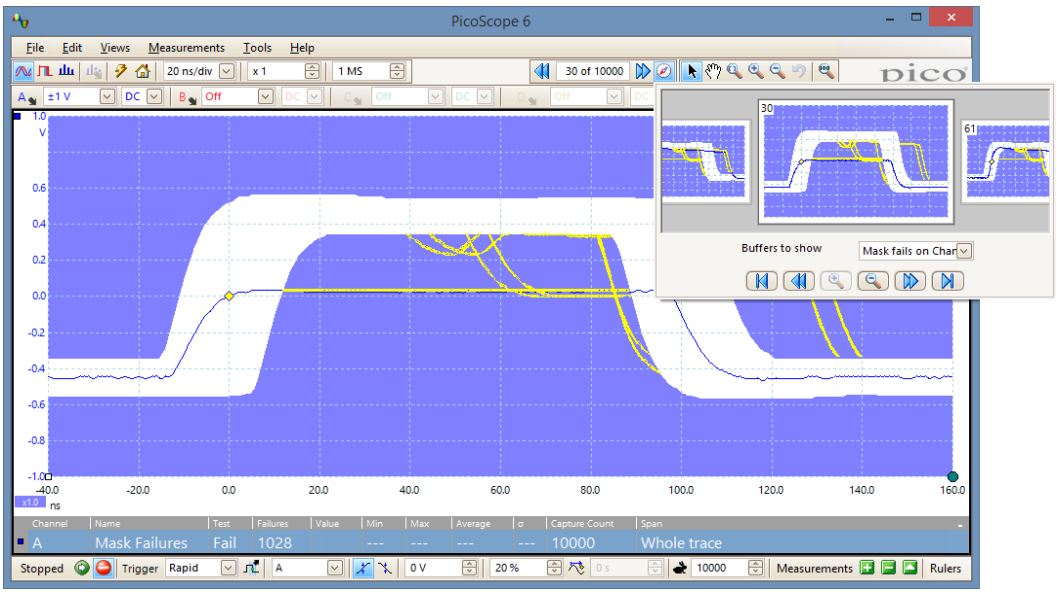
Triggers

Since 1991 Pico Technology have been pioneering 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. 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.



PicoScopes broke new ground back in 1991 by being the first to use digital triggering. This method reduces errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth. Trigger levels and hysteresis can be set with high precision and resolution.

Digital triggering also reduces rearm delay and this, combined with the segmented memory, allows the triggering and capture of events that happen in rapid sequence. At the fastest timebase you can use rapid triggering to collect 10,000 waveforms in under 20 milliseconds. The mask limit testing function can then scan through these waveforms to highlight any failed waveforms for viewing in the waveform buffer.

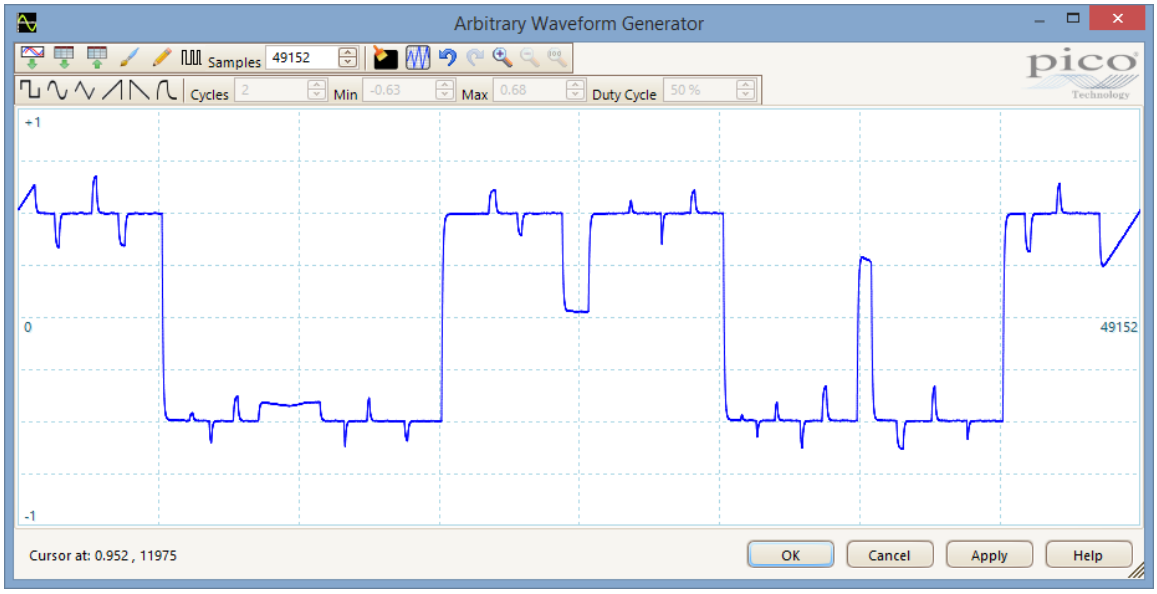


Function generator

All of the PicoScope 3000 Series oscilloscopes include a built-in function generator with sine, square, triangle, and DC modes as standard. As well as basic controls to set level, offset and frequency, more advanced controls allow you to sweep over a range of frequencies and trigger the generator from a specified event. Combined with the spectrum peak hold option, this becomes a powerful tool for testing amplifier and filter responses. The 3000 Series B and D models also include the capability to generate white noise and pseudo-random binary sequence (PRBS) outputs.

Arbitrary waveform generator

Selected PicoScope 3000 Series oscilloscopes include a built-in arbitrary waveform generator (AWG). With a majority of oscilloscopes, you would need to purchase separate hardware to gain this functionality, taking up extra space on your workbench.



The AWG can be used to emulate missing sensor signals during product development, or to stress test a design over the full intended operating range.

Waveforms can be created or modified using the AWG editor, imported from oscilloscope traces, or loaded from a spreadsheet; as the hardware is integrated, these tasks can be performed instantly and easily.

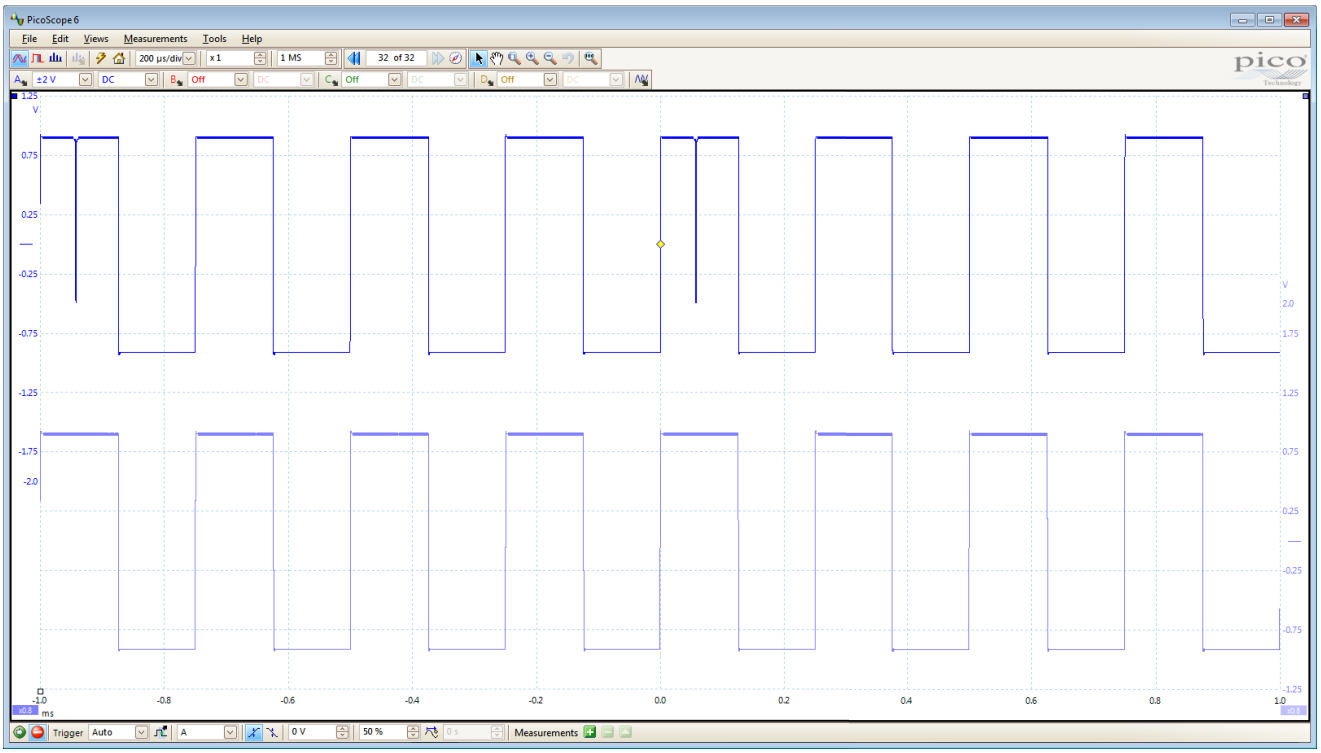
Hardware acceleration and data aggregation

For a majority of setups, the data collection speed of the PicoScope will be faster than the USB transfer rate, and so information has to be stored in high-speed memory on the device. However, even deep-memory devices are required to have fast waveform update rates. For instance, the PicoScope 3207B can sample at 1 GS/s for timebases as long as 20 ms/div, capturing 200 million samples per waveform, and still update several times per second.

To ensure these fast waveform update rates, and to prevent a bottleneck of raw data, hardware acceleration is required to avoid the PC's CPU having to process every sample. Hardware acceleration enables the oscilloscope to intelligently compress the raw ADC data stored in its memory before transferring it to the PC.

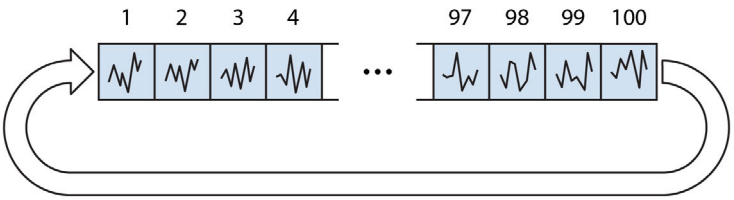
Traditionally, the oscilloscope would perform a simple decimation and only transfer every nth sample, resulting in the vast majority of data being lost (up to 99.999%) and a lack of high-frequency information.

PicoScope deep-memory oscilloscopes perform data aggregation instead. Dedicated logic divides the memory into blocks, and transfers the minimum and maximum values of each block to the PC, preserving the high-frequency data. For example, a waveform with 100 million samples may be divided into 1 000 blocks of 100 000 samples each, with only the minimum and maximum values for each block being transferred back to the PC. If a zoom is applied to the waveform, the oscilloscope will again divide the selected area into blocks and transfer the minimum and maximum data, so that fine detail is rapidly viewable.



In the example above, both waveforms show the same signal, but using different types of hardware acceleration. The top waveform has used the aggregation possible with a PicoScope, and as a result the high-frequency spikes are preserved. The bottom waveform has used traditional decimation, and shows a loss of signal data.

In parallel with the data aggregation, other data such as average values are also returned to speed up measurements and to reduce the number of occasions where we do have to use the PC's processor.



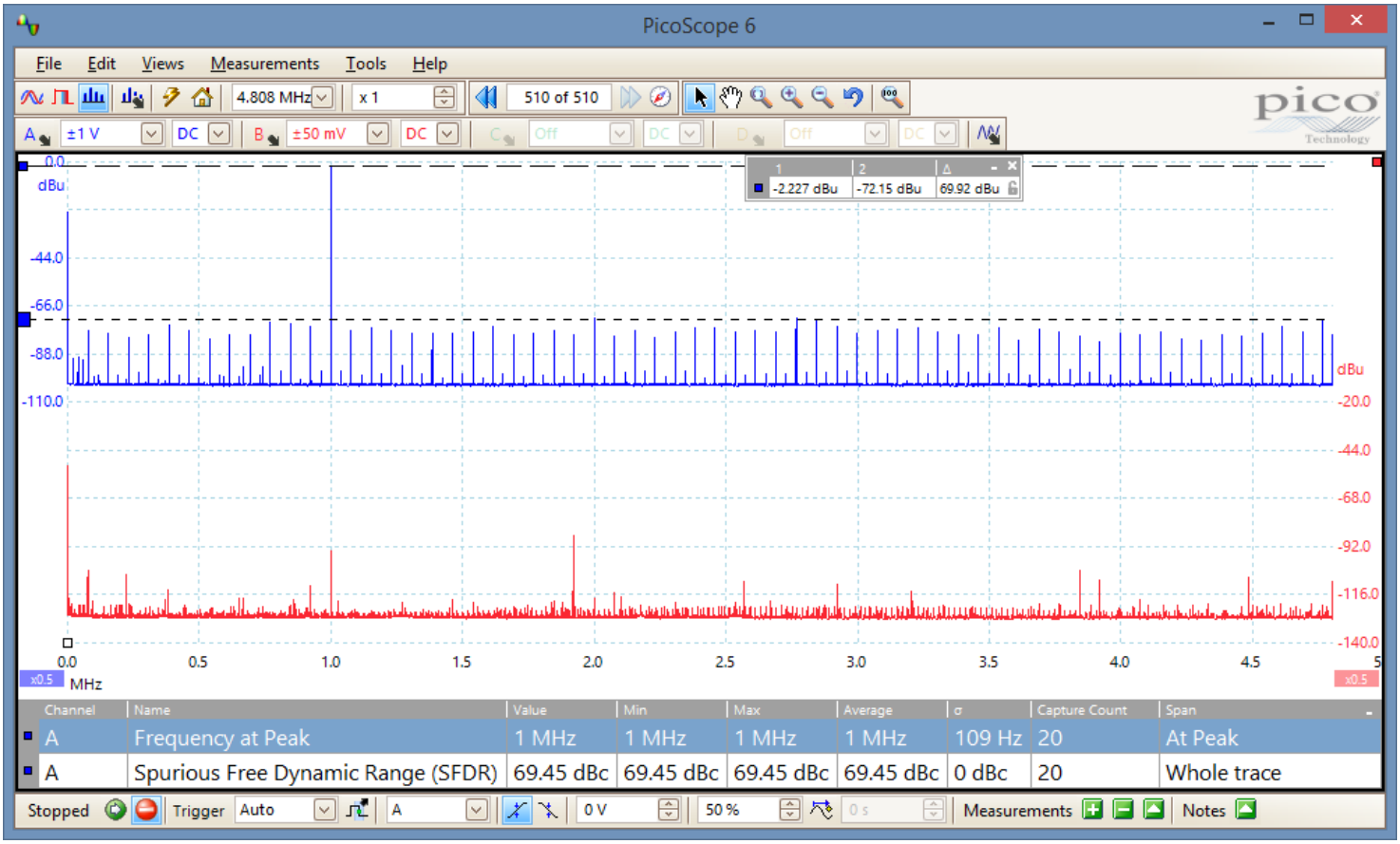
When the trace length is set to be shorter than the scope's memory, the PicoScope will automatically configure the memory as a circular buffer, recording recent waveforms for review. For example, if 1 million samples are captured, up to 500 waveforms will be stored in oscilloscope memory. Tools such as mask limit testing can then be used to scan through each waveform to identify anomalies.

Furthermore, as the hardware acceleration is performed with an FPGA, improvements to your scope's hardware can be made through regular, free software upgrades: no physical updates to your PicoScope are required.

Spectrum analyzer

With the click of a button you can display a spectrum plot of selected channels up to the full bandwidth of the oscilloscope. A full range of settings gives you control over the number of spectrum bands, window types, and display modes (instantaneous, average, or peak-hold).

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

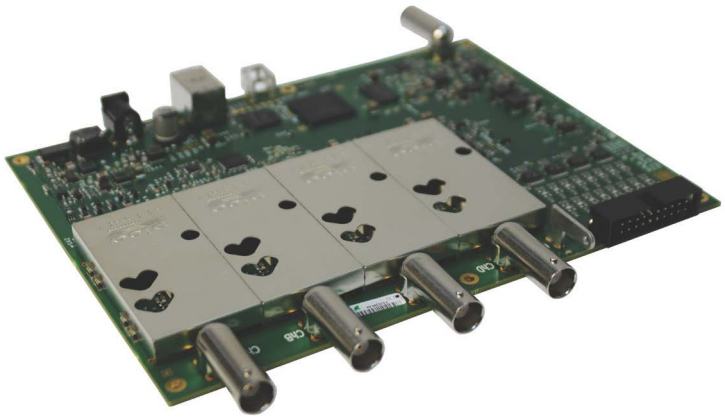


Signal integrity

Most oscilloscopes are built down to a price. PicoScopes are built up to a specification.

Careful front-end design and shielding reduces noise, crosstalk and harmonic distortion. Years of oscilloscope design experience can be seen in improved bandwidth flatness and low distortion. We are proud of the dynamic performance of our products, and publish their specifications in detail.

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



USB connectivity

The USB connection not only allows high-speed data acquisition and transfer, but also makes printing, copying, saving, and emailing your data from the field quick and easy. USB powering removes the need to carry around a bulky external power supply, making the kit even more portable for the engineer on the move.

Selected PicoScope 3000 Series oscilloscopes now also feature a SuperSpeed USB 3.0 connection, making the already-optimized process of data transfer even faster.

Further benefits of a USB 3.0 connection include faster saving of waveforms and faster gap-free continuous streaming of up to

125 MS/s when using the SDK, while the scope is still backward-compatible with older USB systems.

High-end features as standard

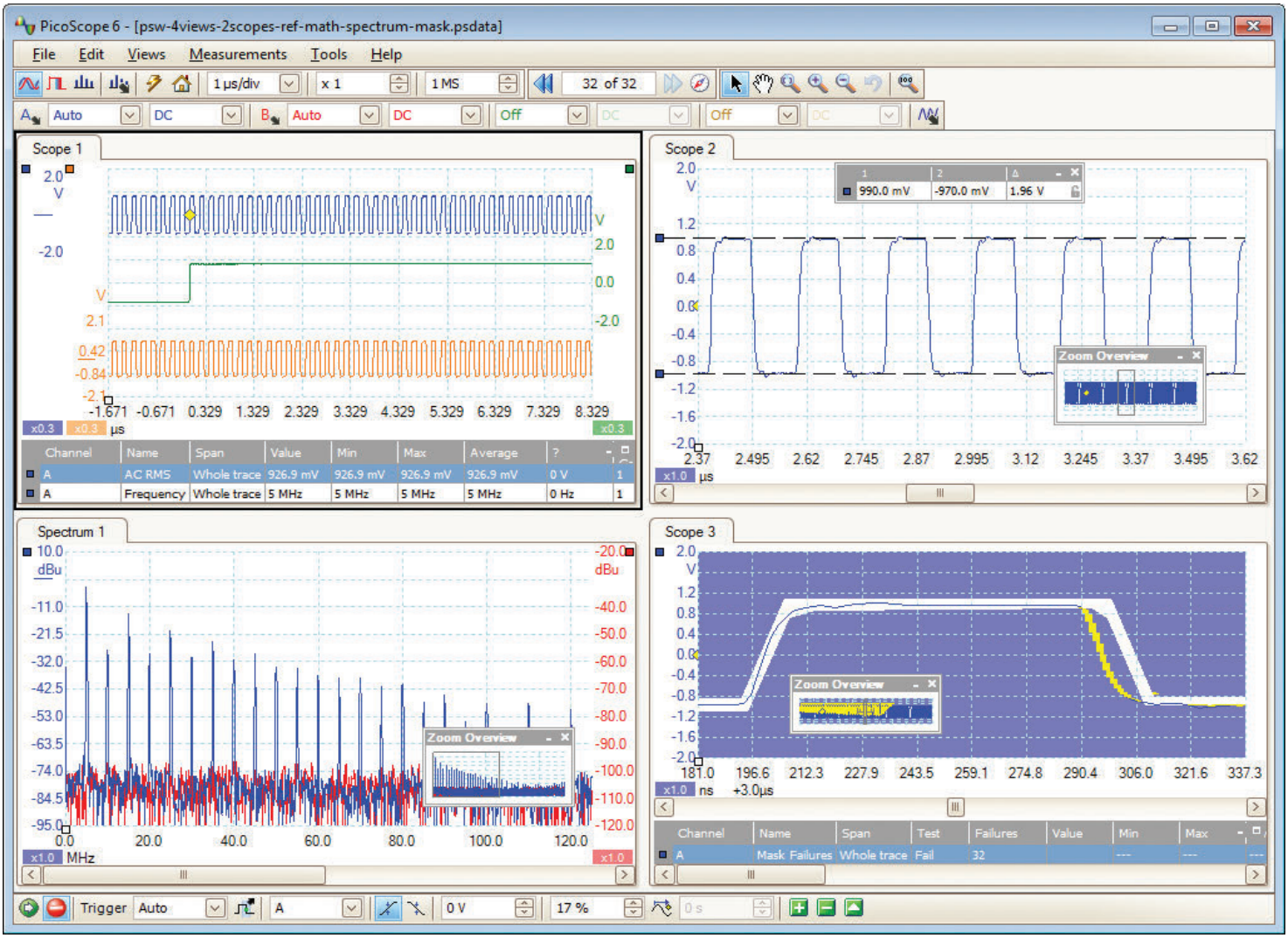
Buying a PicoScope is not like making a purchase from other oscilloscope companies, where optional extras considerably increase the price. With our scopes, high-end features such as resolution enhancement, mask limit testing, serial decoding, advanced triggering, automatic measurements, math channels, XY mode, segmented memory, and a signal generator are all included in the price.

To protect your investment, both the PC software and firmware inside the scope can be updated. Pico Technology have a long history of providing new features for free through software downloads. We deliver on our promises of future enhancements year after year, unlike many other companies in the field. Users of our products reward us by becoming lifelong customers and frequently recommending us to their colleagues.

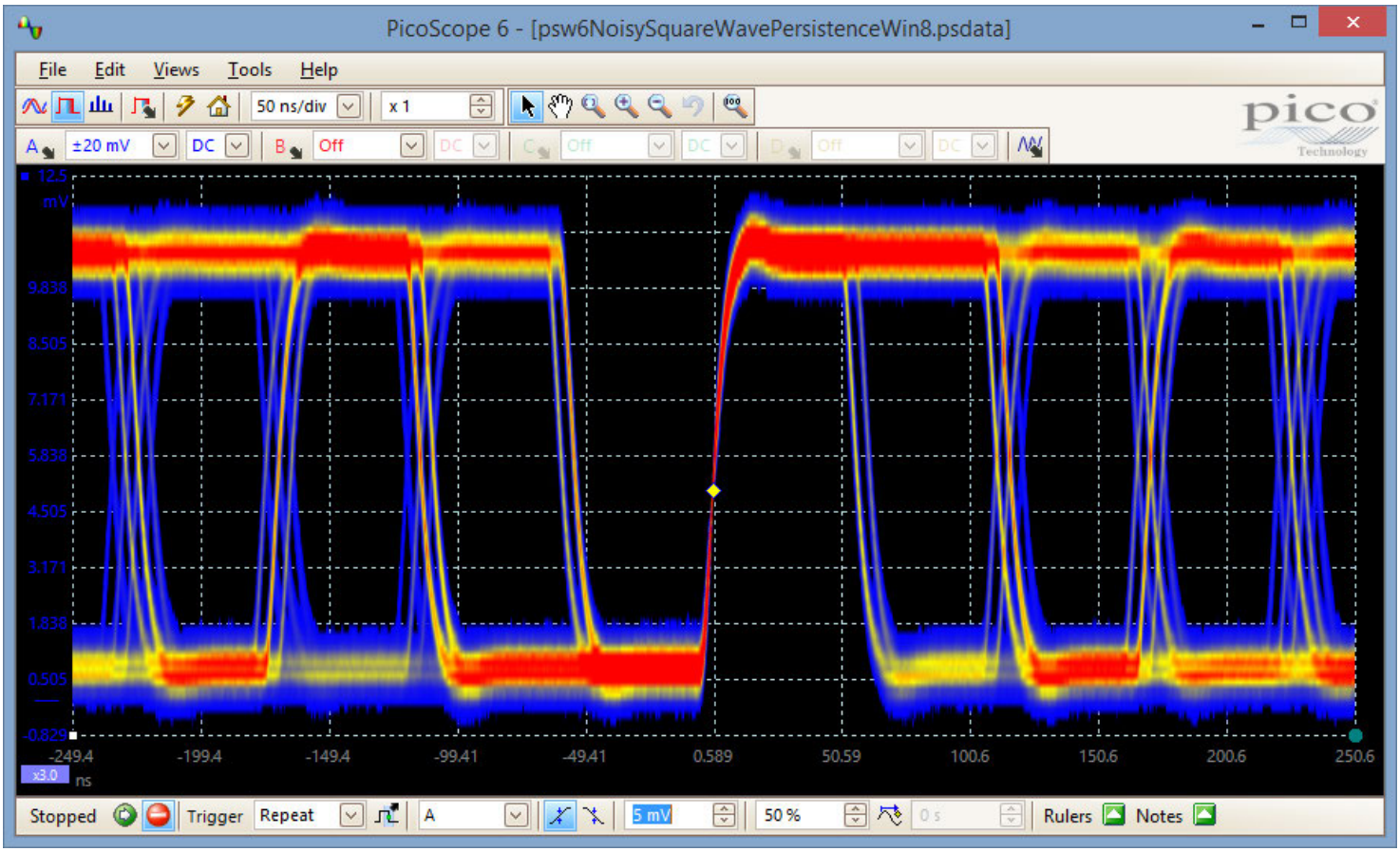
Advanced display

The PicoScope software dedicates almost all of the display area to the waveform. This ensures that the maximum amount of data is seen at once. Even with a laptop the viewing area is much bigger and of a higher resolution than with a typical benchtop scope.

With a large display area available, you can also create a customizable split-screen display, and view multiple channels or different variants of the same signal at the same time. As the example below shows, the software can even show both oscilloscope and spectrum analyzer traces at once. Additionally, each waveform shown works with individual zoom, pan, and filter settings for ultimate flexibility.



Color persistence mode

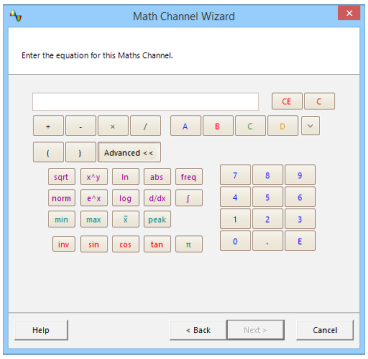


Color persistence mode allows you to see old and new data superimposed, with new data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Choose between analog persistence and digital color, or create custom display modes.

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 addition and inversion, or open the equation editor and create complex functions involving trigonometry, exponentials, logarithms, statistics, integrals and derivatives.



Custom probe settings

Custom probes allow you to correct for gain, attenuation, offsets and nonlinearities of probes and transducers, or convert to different measurement units 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.

Serial decoding

The deep-memory PicoScope 3000 Series oscilloscopes include serial decoding capability across all channels, and are ideal for this job as they can capture thousands of frames of uninterrupted data.

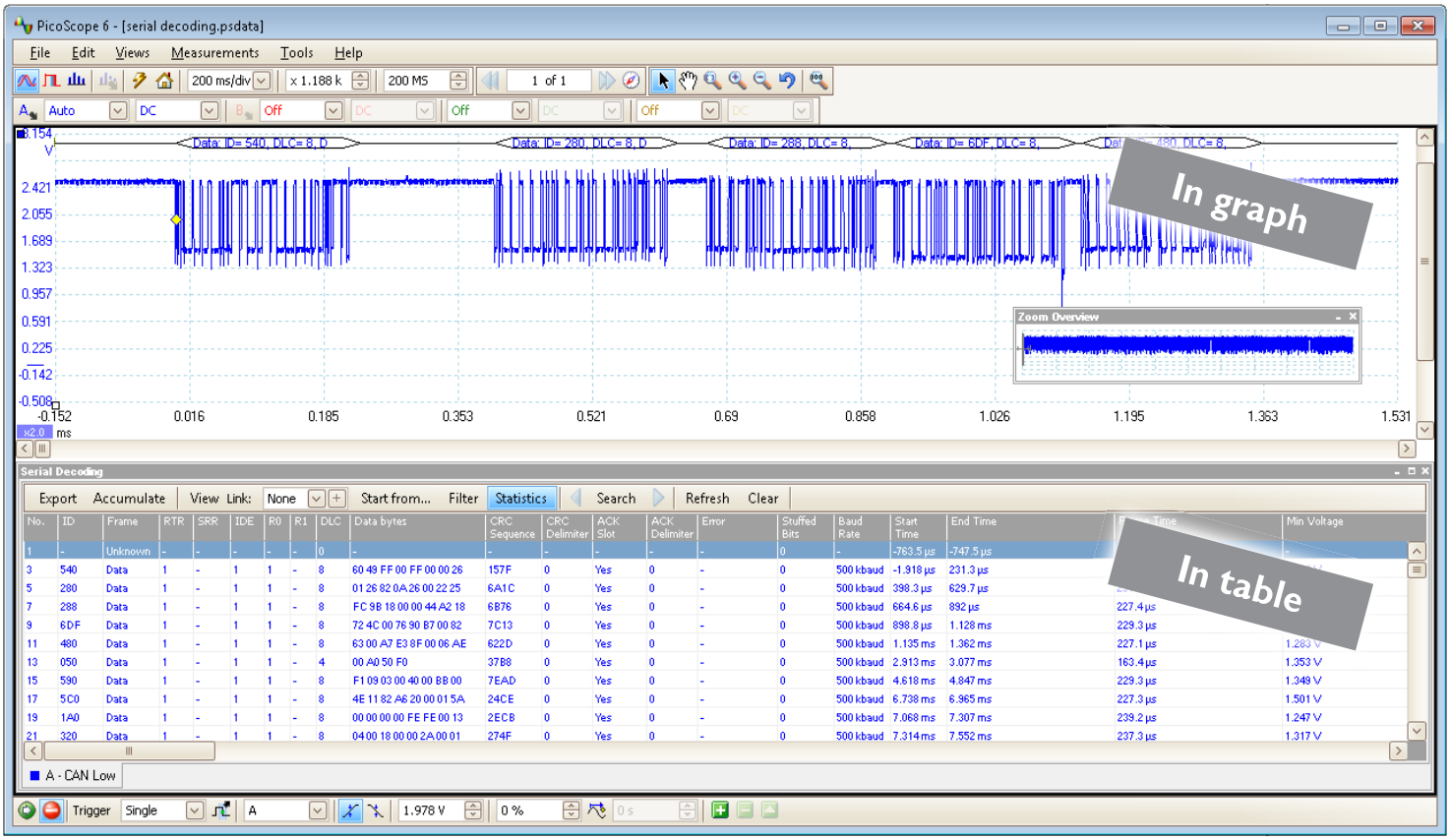
Serial protocols
UART/RS-232
SPI
I^2C
I^2S
CAN
LIN
FlexRay

The decoded data can be displayed in the format of your choice: In graph, In table, or both at once.

• *In graph* format shows the decoded data beneath the waveform on a common time axis, with error frames marked in red. These frames can be zoomed to investigate noise or distortion.

• *In 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.

PicoScope can also import a spreadsheet to decode the numerical data into user-defined text strings.



High-speed data acquisition and digitizer

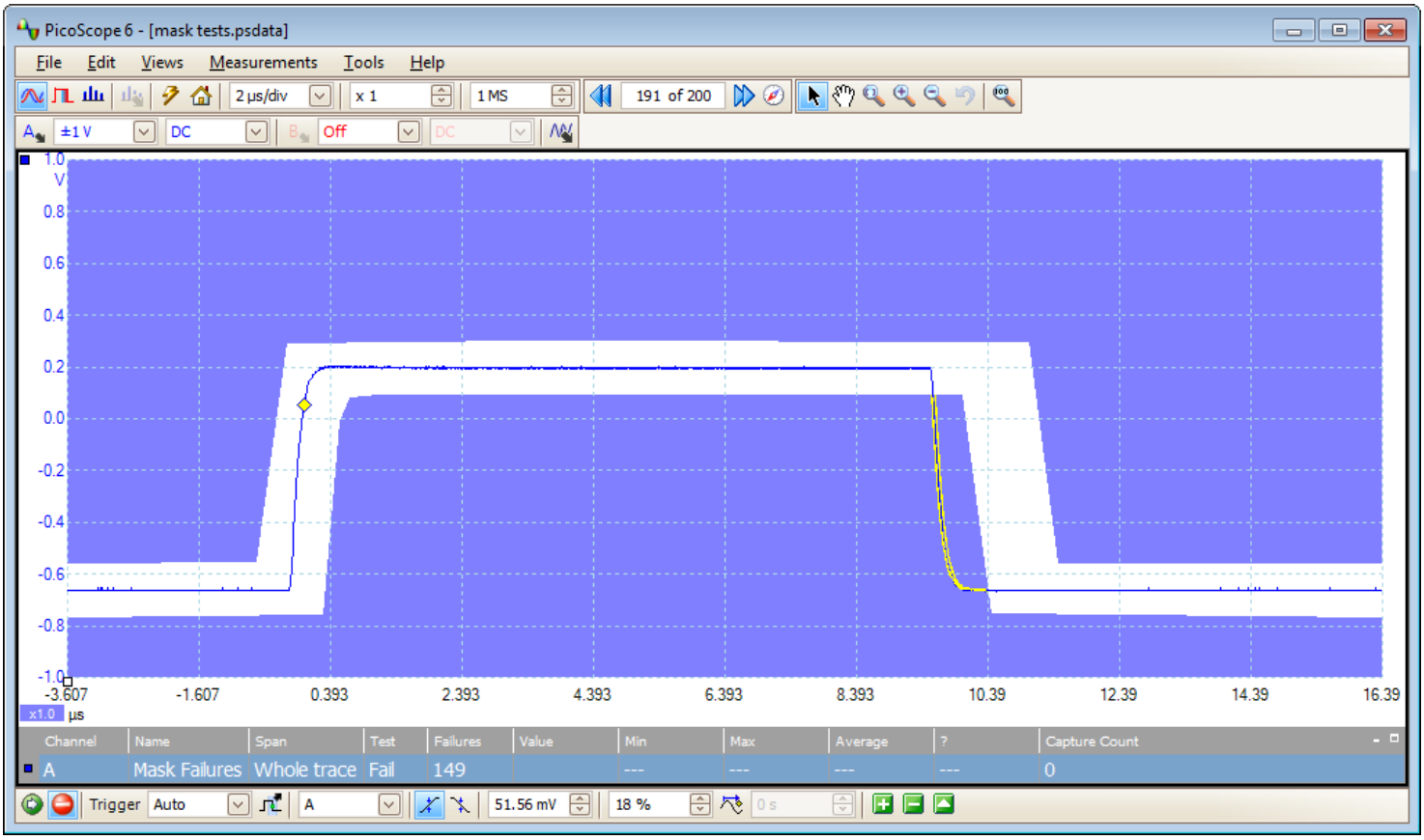
The supplied drivers and software development kit (SDK) allows you to write your own software or interface to popular third-party software packages such as National Instruments LabVIEW and MathWorks MATLAB.

The driver supports data streaming, a mode which captures gap-free continuous data over USB direct to the PC's RAM or hard disk at rates of up to 125 MS/s and capture sizes limited only by available PC storage. Sampling rates in streaming mode are subject to PC specifications and application loading.

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, 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.

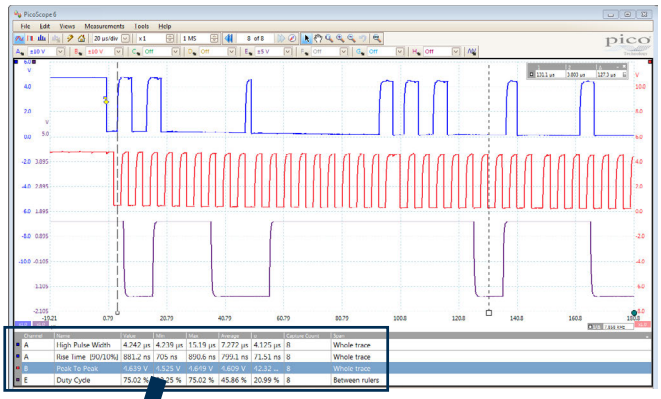
The numerical and graphical mask editors can be used separately or in combination, allowing you to enter accurate mask specifications, modify existing masks, and import and export masks as files.



Automatic measurements

PicoScope allows you to 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. For information on the measurements available in scope and spectrum modes, see *Automatic Measurements* in the *Specifications* table.



Channel	Name	Value	Min	Max	Average
A	High Pulse Width	4.242 µs	4.239 µs	15.19 µs	7.272 µs
A	Rise Time [90/10%]	881.2 ns	705 ns	890.6 ns	799.1 ns
B	Peak To Peak	4.639 V	4.525 V	4.649 V	4.609 V
E	Duty Cycle	75.02 %	22.25 %	75.02 %	45.86 %

PicoScope 6 software with analog signals

PicoScope: The 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.

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.

Tools > Serial decoding: Decode multiple serial data signals and display the data alongside the physical signal or as a detailed table.
Tools > Reference channels: 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.

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

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.

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

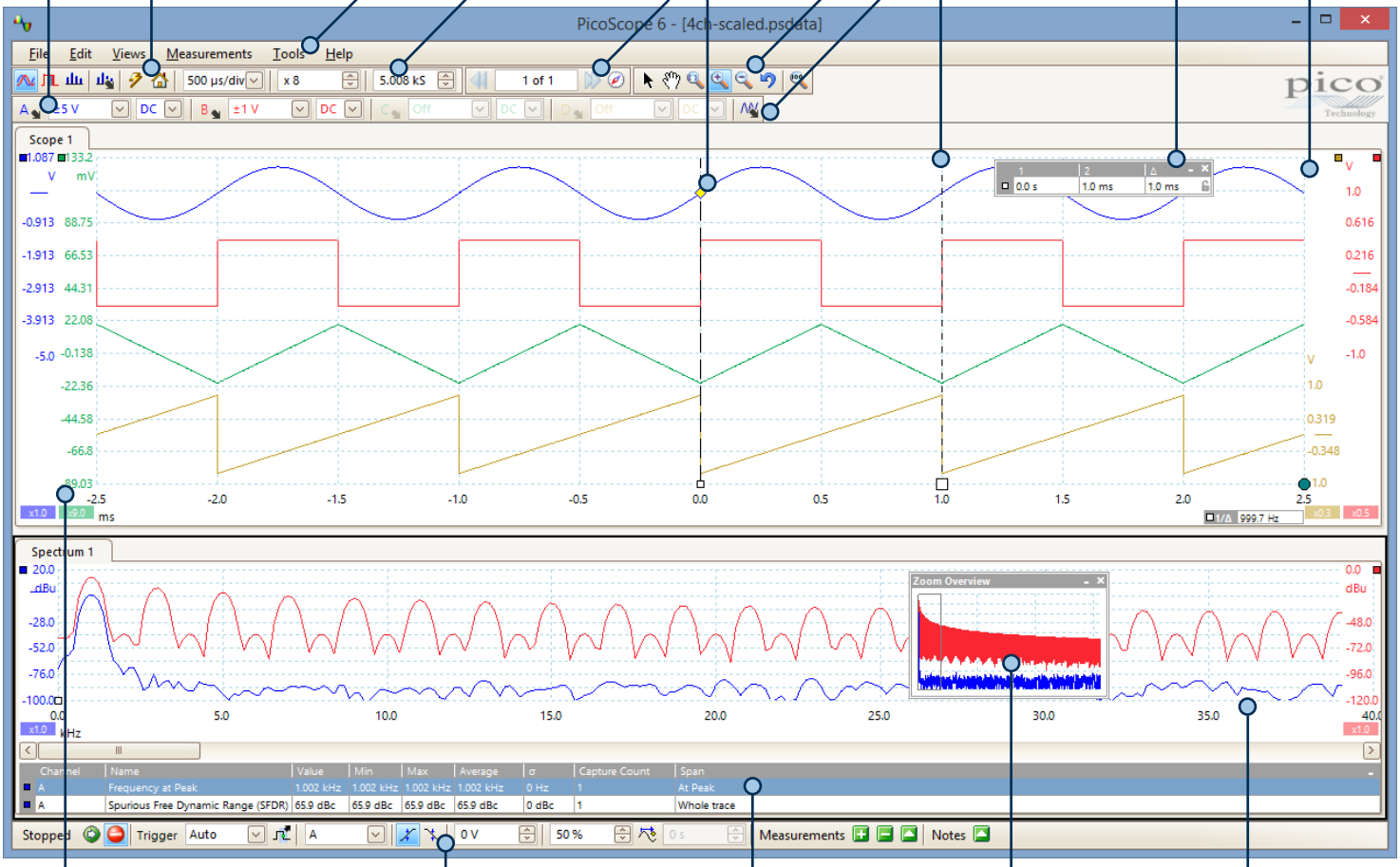
Zoom and pan tools: PicoScope makes it easy to zoom into large waveforms. Either use the zoom-in, zoom-out and pan tools, or click and drag in the Zoom Overview window for fast navigation.

Signal 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 of a higher resolution than with a typical benchtop scope. You can add new scope and spectrum views with automatic or custom layouts.

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 trouble-shooting and analysis. You can add as many measurements as you need on each view. Each measurement includes statistical parameters showing its variability.

Zoom overview: Click and drag for quick navigation in zoomed views.

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

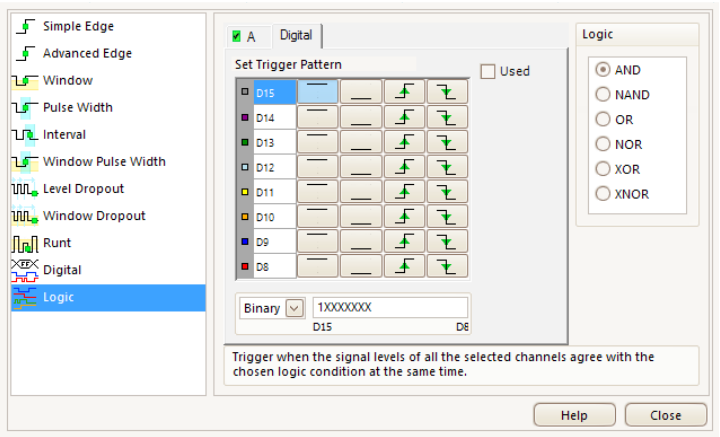
Mixed-signal oscilloscopes

The PicoScope 3000 Series Mixed-Signal Oscilloscopes (MSOs) include 16 digital inputs alongside the standard 2 or 4 analog channels, so that you can view your digital and analog signals simultaneously.

These models include the same features as other PicoScope 3000 Series oscilloscopes, such as SuperSpeed USB 3.0 connectivity, deep memory, and a built-in arbitrary waveform generator, as well as functions such as mask limit testing, math and reference channels, advanced triggers, serial decoding, and automatic measurements.

Digital triggers

The PicoScope 3000 Series MSO models offer a comprehensive set of advanced triggers covering both the analog and digital inputs, to help you capture the data you need.



As well as simple edge triggers, a selection of time-based triggers are available for both digital and analog inputs.

- The pulse-width trigger allows you to trigger on either “high” or “low” pulses, which are shorter or longer than a specified time, or which fall inside or outside a range of times.
- The interval trigger measures the time between subsequent rising or falling edges. This allows you to trigger if a clock signal falls outside of an acceptable frequency range, for example.
- The dropout trigger fires when a signal stops toggling for a defined interval of time, functioning rather like a watchdog timer.

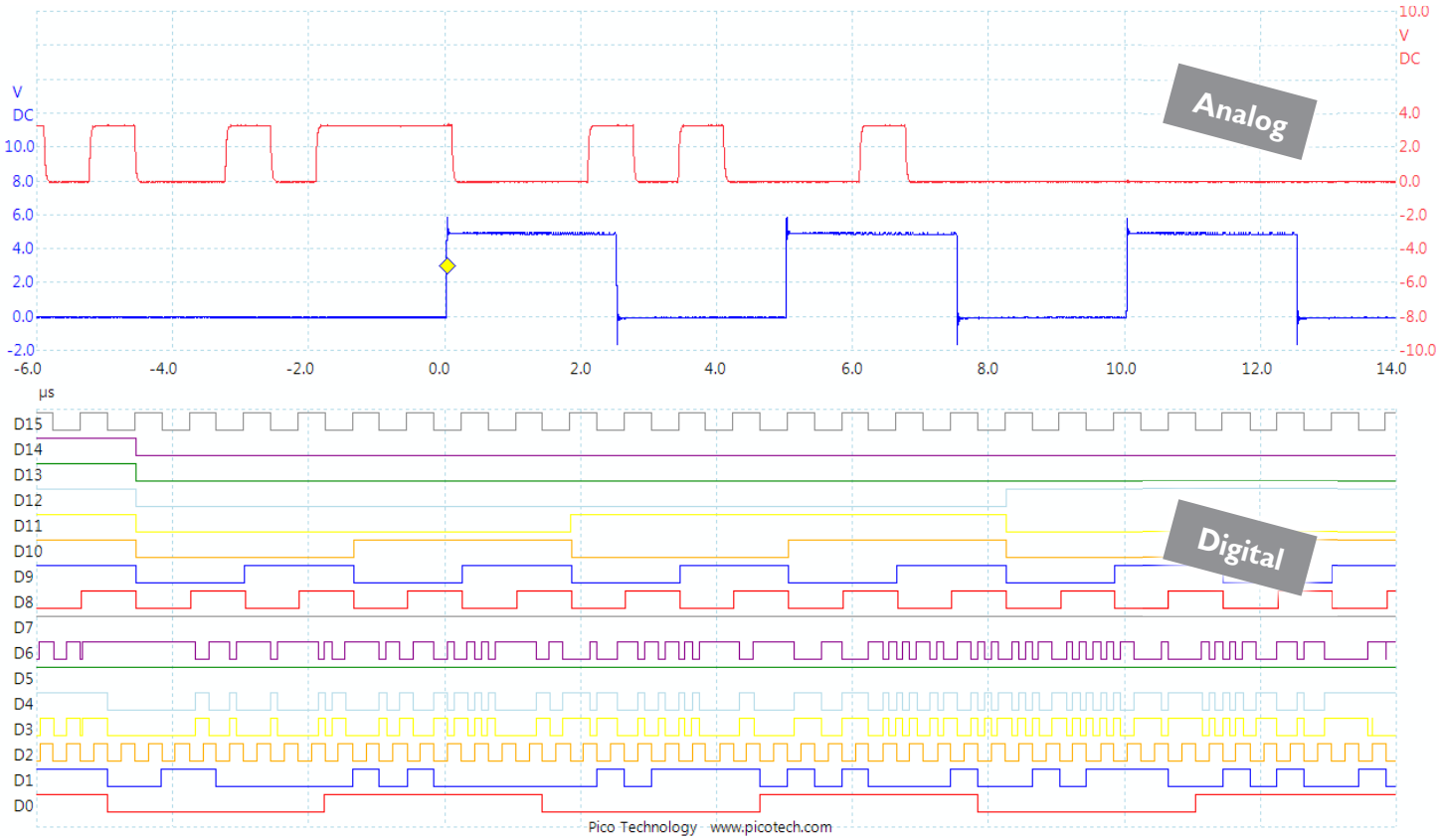
Logic triggering allows you to trigger the scope when any or all of the 16 digital inputs match a user-defined pattern. You can specify a condition for each channel individually, or set up a pattern for all channels at once using a hexadecimal or binary value. You can also combine logic triggering with an edge trigger on any one of the digital or analog inputs, to trigger on data values in a clocked parallel bus for example.

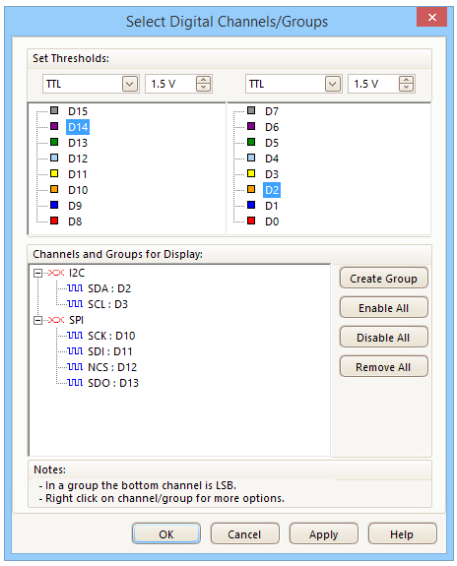
Serial decoding for digital signals

The PicoScope 3000 Series MSO models bring extra power to the serial decoding features outlined in *Serial decoding for analog signals*. You can decode serial data on all analog and digital inputs simultaneously, giving you up to 20 channels of data with any combination of serial protocols!

Digital channels

To view the digital signals in the PicoScope 6 software, simply click the digital channels button. Channels can be added to the view by dragging and dropping, and can then be reordered, grouped, and renamed.





The 16 digital inputs can be displayed individually or in arbitrary groups labelled with binary, decimal or hexadecimal values. A separate logic threshold from –5 V to +5 V can be defined for each 8-bit input port. The digital trigger can be activated by any bit pattern combined with an optional transition on any input.

Advanced logic triggers can be set on either the analog or the digital input channels, or both.

PicoScope 6 software with digital signals

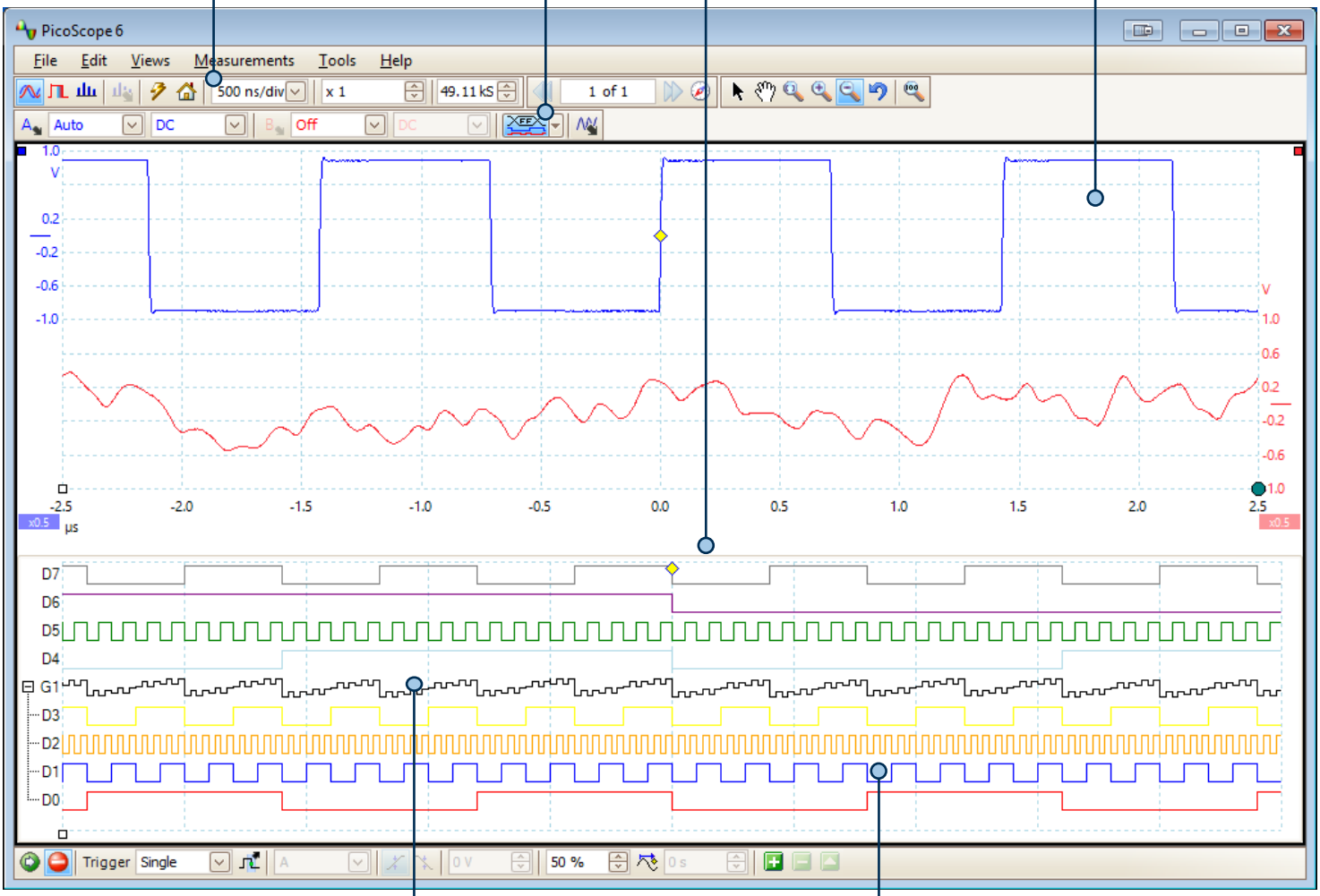
The flexibility of the PicoScope 6 software interface allows high-resolution viewing of up to 16 digital and 4 analog signals at once. You can use the whole of your PC's display to view the waveforms, ensuring you never miss a detail again.

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.

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

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



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

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

Application examples

Testing on the move

The PicoScope 3000 Series oscilloscopes slip easily into a laptop bag, so you don't need to carry bulky benchtop instruments to perform on-site troubleshooting. Being powered via a USB connection, your PicoScope can simply be plugged into your laptop and used for measuring wherever you are. The PC connection also makes saving and sharing your data quick and easy: in a matter of seconds you can save your scope traces to review later, or attach the complete data file to an email for analysis by other engineers away from the test site. As PicoScope 6 is free to download by anyone, colleagues can use the full capabilities of the software, such as serial decoding and spectrum analysis, without needing an oscilloscope themselves.

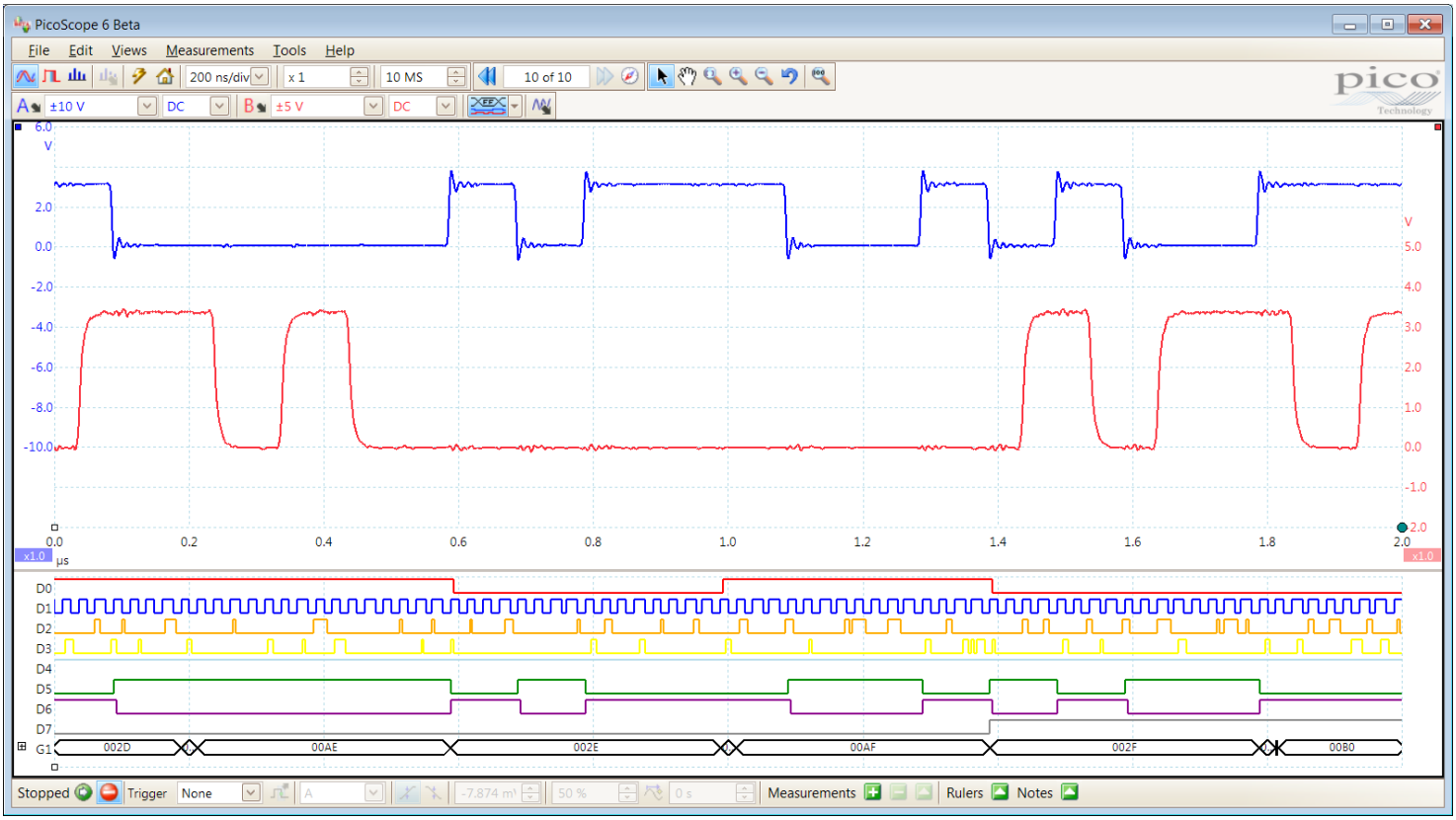
Embedded debugging

You can test and debug a complete signal-processing chain using a PicoScope 3406D MSO.

Use the built-in arbitrary waveform generator (AWG) to inject single-shot or continuous analog signals. The response of your system can then be observed in both the analog domain, using the four 200 MHz input channels, and in the digital domain with 16 digital inputs at up to 100 MHz. Follow the analog signal through the system while simultaneously using the built-in serial decoding function to view the output of an I^2C or SPI ADC.

If your system drives a DAC in response to the analog input changing, you can decode the I^2C or SPI communication to that as well as its analog output. This can all be performed simultaneously using the 16 digital and 4 analog channels.

Using the deep 512 MS buffer memory, you can capture the complete response of your system without sacrificing the sampling rate, and zoom in on the captured data to find glitches and other points of interest.



Detailed specifications for 2-channel models

	PicoScope 3204 A/B	PicoScope 3205 A/B	PicoScope 3206 A/B	PicoScope 3207 A/B
Vertical				
Input channels	2 channels, BNC single-ended			
Bandwidth (–3 dB)	60 MHz	100 MHz	200 MHz	250 MHz
Rise time (calculated)	5.8 ns	3.5 ns	1.75 ns	1.4 ns
Vertical resolution	8 bits			
Input ranges	±50 mV to ±20 V full scale in 9 ranges			
Input sensitivity	10 mV/div to 4 V/div (10 vertical divisions)			
Input coupling	AC / DC			
Input characteristics	1 MΩ ±1%, in parallel with 13 pF ±1 pF			
DC accuracy	±3% of full scale			
Analog offset range (vertical position adjust)	±250 mV (50 mV to 200 mV ranges) ±2.5 V (500 mV to 2 V ranges) ±20 V (5 V to 20 V ranges)			
Offset adjust accuracy	±1% of offset setting, additional to DC accuracy			
Overvoltage protection	±100 V (DC + AC peak)			
Horizontal				
Maximum sampling rate (real-time)	500 MS/s (1 channel in use) 250 MS/s (2 channels in use)			1 GS/s (1 ch. in use) 500 MS/s (2 chs. in use)
Maximum equivalent-time sampling rate (repetitive signals)	2.5 GS/s	5 GS/s	10 GS/s	10 GS/s
Maximum sampling rate (streaming)	10 MS/s in PicoScope software > 10 MS/s using the supplied SDK (PC-dependent)			10 MS/s in PicoScope software 125 MS/s when using supplied SDK (PC-dependent)
Timebase ranges (real-time)	2 ns/div to 5000 s/div	1 ns/div to 5000 s/div	500 ps/div to 5000 s/div	500 ps/div to 5000 s/div
Buffer memory	4 MS (A model) / 8 MS (B model)	16 MS (A model) / 32 MS (B model)	64 MS (A model) / 128 MS (B model)	256 MS (A model) / 512 MS (B model)
Buffer memory (streaming)	100 MS in PicoScope software Up to available PC memory when using supplied SDK			
Maximum buffer segments	10 000			
Timebase accuracy	±50 ppm			±2 ppm ±1 ppm/year
Sample jitter	< 5 ps RMS typical			< 3 ps RMS typical
Triggering				
Trigger modes	None, auto, repeat, single, rapid (segmented memory)			
Advanced trigger types	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, logic, runt pulse			
Trigger sensitivity	Digital triggering provides 1 LSB accuracy up to full bandwidth of scope			
Trigger types (ETS mode)	Rising edge, falling edge			
Trigger sensitivity (ETS mode)	10 mV p-p typical (at full bandwidth)			
Maximum pre-trigger capture	Up to 100% of capture size			
Maximum post-trigger delay	Up to 4 billion samples (selectable in 1 sample steps)			
Trigger rearm time	< 2 µs on fastest timebase			< 1 µs on fastest timebase
Maximum trigger rate	Up to 10 000 waveforms in a 20 ms burst			Up to 10 000 waveforms in a 10 ms burst

	PicoScope 3204 A/B	PicoScope 3205 A/B	PicoScope 3206 A/B	PicoScope 3207 A/B
External trigger input				
Trigger types	Edge, pulse width, dropout, interval, logic, delayed			
Input characteristics	Front panel BNC, 1 MΩ ±1% in parallel with 13 pF ±1 pF			
Bandwidth (–3 dB)	60 MHz	100 MHz	200 MHz	250 MHz
Threshold range	±5 V, DC coupled			
Overvoltage protection	±100 V (DC + AC peak)			
Function generator				
Standard output signals	All models: sine, square, triangle, DC voltage B models only: ramp, sinc, Gaussian, half-sine, white noise, PRBS			
Standard signal frequency	DC to 1 MHz			
Sweep modes	Up, down, dual with selectable start / stop frequencies and increments			
Output frequency accuracy	As oscilloscope			
Output frequency resolution	< 10 mHz			< 25 mHz
Output voltage range	±2 V			
Output voltage adjustments	Signal amplitude and offset adjustable in approximate 1 mV steps within overall ±2 V range			
Amplitude flatness	< 0.5 dB to 1 MHz typical			
DC accuracy	±1% of full scale			
SFDR	> 60 dB, 10 kHz full scale sine wave			
Output characteristics	Front panel BNC, 600 Ω output impedance			
Overvoltage protection	±20 V			
Arbitrary waveform generator (B models only)				
Update rate	20 MS/s			100 MS/s
Buffer size	8 kS	8 kS	16 kS	32 kS
Resolution	12 bits (output step size approximately 1 mV)			
Bandwidth	> 1 MHz			
Rise time (10% to 90%)	< 120 ns			
Physical specifications				
PC connectivity	USB 2.0			USB 3.0 (USB 2.0 compatible)
Dimensions	200 mm x 140 mm x 40 mm (including connectors)			
Weight	< 0.5 kg			
Temperature range	Operating: 0 °C to 50 °C (20 °C to 30 °C for stated accuracy) Storage: –20 °C to 60 °C			
Humidity range	Operating: 5% RH to 80% RH non-condensing Storage: 5% RH to 95% RH non-condensing			

Detailed specifications for 4-channel models

	PicoScope 3404 A/B		PicoScope 3405 A/B		PicoScope 3406 A/B	
Vertical						
Input channels	4 channels, BNC single-ended					
Bandwidth (–3 dB)	60 MHz		100 MHz		200 MHz	
Rise time (calculated)	5.8 ns		3.5 ns		1.75 ns	
Vertical resolution	8 bits					
Input ranges	±50 mV to ±20 V full scale in 9 ranges					
Input sensitivity	10 mV/div to 4 V/div (10 vertical divisions)					
Input coupling	AC / DC					
Input characteristics	1 MΩ ±1%, in parallel with 14 pF ±1 pF					
DC accuracy	±3% of full scale					
Analog offset range (vertical position adjust)	±250 mV (50 mV, 100 mV, 200 mV ranges) ±2.5 V (500 mV, 1 V, 2 V ranges) ±20 V (5 V, 10 V, 20 V ranges)					
Offset adjust accuracy	±1% of offset setting, additional to DC accuracy					
Overvoltage protection	±100 V (DC + AC Peak)					
Horizontal						
Maximum sampling rate (real-time)	1 GS/s (1 channel in use) 500 MS/s (2 channels in use) 250 MS/s (3 or 4 channels in use)					
Maximum equivalent-time sampling rate (repetitive signals)	2.5 GS/s		5 GS/s		10 GS/s	
Maximum sampling rate (streaming)	10 MS/s in PicoScope software > 10 MS/s using the supplied SDK (PC-dependent)					
Timebase ranges (real-time)	2 ns/div to 5000 s/div		1 ns/div to 5000 s/div		500 ps/div to 5000 s/div	
Buffer memory	4 MS (A model)	8 MS (B model)	16 MS (A model)	32 MS (B model)	64 MS (A model)	128 MS (B model)
Buffer memory (streaming)	100 MS in PicoScope software. Up to available PC memory when using supplied SDK.					
Maximum buffer segments	10 000					
Timebase accuracy	±50 ppm					
Sample jitter	< 3 ps RMS typical					
Triggering						
Trigger modes	Auto, none, rapid, repeat, single (segmented memory)					
Advanced trigger types	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, logic, runt pulse					
Trigger sensitivity	Digital triggering provides 1 LSB accuracy up to full bandwidth of scope					
Trigger types (ETS mode)	Rising edge, falling edge					
Trigger sensitivity (ETS mode)	10 mV p-p typical (at full bandwidth)					
Maximum pre-trigger capture	Up to 100% of capture size					
Maximum post-trigger delay	Up to 4 billion samples (selectable in 1 sample steps)					
Trigger re-arm time	< 2 µs on fastest timebase					
Maximum trigger rate	Up to 10 000 waveforms in a 20 ms burst					

	PicoScope 3404 A/B	PicoScope 3405 A/B	PicoScope 3406 A/B
External trigger input			
Trigger types	Edge, pulse width, dropout, interval, logic, delayed		
Input characteristics	Front panel BNC, 1 MΩ ±1% in parallel with 14 pF ±1 pF		
Bandwidth (–3 dB)	60 MHz	100 MHz	200 MHz
Threshold range	±5 V, DC coupled		
Overvoltage protection	±100 V (DC + AC peak)		
Function generator			
Standard output signals	All models: sine, square, triangle, DC voltage. B models only: ramp, sinc, Gaussian, half-sine, white noise, PRBS		
Standard signal frequency	DC to 1 MHz		
Sweep modes	Up, down, dual with selectable start / stop frequencies and increments		
Output frequency accuracy	As oscilloscope		
Output frequency resolution	< 10 mHz		
Output voltage range	±2 V		
Output voltage adjustments	Signal amplitude and offset adjustable in approximate 1 mV steps within overall ±2 V range		
Amplitude flatness	< 0.5 dB to 1 MHz typical		
DC accuracy	±1% of full scale		
SFDR	> 60 dB, 10 kHz full scale sine wave		
Output characteristics	Front panel BNC, 600 Ω output impedance		
Overvoltage protection	±20 V		
Arbitrary waveform generator (B models only)			
Update rate	20 MS/s		
Buffer size	8 kS	8 kS	16 kS
Resolution	12 bits (output step size approximately 1 mV)		
Bandwidth	> 1 MHz		
Rise time (10% to 90%)	< 120 ns		
Probe compensation output			
Impedance	600 Ω		
Frequency	1 kHz square wave		
Level	2 V pk-pk		
Physical specifications			
PC connectivity	USB 2.0		
Dimensions	190 mm x 170 mm x 40 mm (including connectors)		
Weight	< 0.5 kg		
Temperature range	Operating: 0 °C to 40 °C (20 °C to 30 °C for stated accuracy) Storage: –20 °C to 60 °C		
Humidity range	Operating: 5% RH to 80% RH non-condensing Storage: 5% RH to 95% RH non-condensing		

Detailed specifications for MSO models

	PicoScope 3204D MSO	PicoScope 3205D MSO	PicoScope 3206D MSO	PicoScope 3404D MSO	PicoScope 3405D MSO	PicoScope 3406D MSO
Vertical (analog)						
Input channels	2 channels, BNC single-ended			4 channels, BNC single-ended		
Bandwidth (–3 dB)	60 MHz	100 MHz	200 MHz	60 MHz	100 MHz	200 MHz
Rise time (calculated)	5.8 ns	3.5 ns	1.75 ns	5.8 ns	3.5 ns	1.75 ns
Vertical resolution	8 bits					
Input ranges	±20 mV to ±20 V full scale in 10 ranges					
Input sensitivity	4 mV/div to 4 V/div in 10 vertical divisions					
Input coupling	AC / DC					
Input characteristics	1 MΩ ±1%, in parallel with 14 pF ±1 pF					
DC accuracy	±3% of full scale ±200 µV					
Analog offset range (vertical position adjust)	±250 mV (20 mV, 50 mV, 100 mV, 200 mV ranges) ±2.5 V (500 mV, 1 V, 2 V ranges) ±20 V (5 V, 10 V, 20 V ranges)					
Offset adjust accuracy	±1% of offset setting, additional to DC accuracy					
Overvoltage protection	±100 V (DC + AC peak)					
Vertical (digital)						
Input channels	16 channels (2 ports of 8 channels each)					
Input connectors	2.54 mm pitch, 10 x 2 way connector					
Maximum input frequency	100 MHz					
Minimum detectable pulse width	5 ns					
Input impedance (with TA136 cable)	200 kΩ ±2% ‖ 8 pF ±2 pF					
Digital threshold range	±5 V					
Input dynamic range	±20 V					
Overvoltage protection	±50 V					
Threshold grouping	Two independent threshold controls: Port 0 (D0 to D7), Port 1 (D8 to D15)					
Threshold selection	TTL, CMOS, ECL, PECL, user-defined					
Threshold accuracy	±100 mV					
Minimum input voltage swing	500 mV pk-pk					
Channel-to-channel skew	< 2 ns typical					
Minimum input slew rate	10 V/µs					
Horizontal						
Maximum sampling rate (real-time)	1 GS/s (1 analog channel in use) 500 MS/s (Up to 2 analog channels or digital ports* in use) 250 MS/s (Up to 4 analog channels or digital ports* in use) 125 MS/s (5 or more analog channels or digital ports* in use) *A digital port contains 8 digital channels					
Maximum equivalent-time sampling rate (repetitive signals)*	2.5 GS/s	5 GS/s	10 GS/s	2.5 GS/s	5 GS/s	10 GS/s
Maximum sampling rate (streaming)	10 MS/s in PicoScope software 125 MS/s when using the supplied SDK (PC-dependent)					
Timebase ranges	2 ns/div to 5000 s/div	1 ns/div to 5000 s/div	500 ps/div to 5000 s/div	2 ns/div to 5000 s/div	1 ns/div to 5000 s/div	500 ps/div to 5000 s/div
Buffer memory	128 MS	256 MS	512 MS	128 MS	256 MS	512 MS
Buffer memory (streaming)	100 MS in PicoScope software. Up to available PC memory when using supplied SDK.					
Maximum buffer segments	10 000					
Timebase accuracy	±50 ppm	±2 ppm	±2 ppm	±50 ppm	±2 ppm	±2 ppm
Sample jitter	< 3 ps RMS typical					

	PicoScope 3204D MSO	PicoScope 3205D MSO	PicoScope 3206D MSO	PicoScope 3404D MSO	PicoScope 3405D MSO	PicoScope 3406D MSO
Triggering (all)						
Trigger modes	Auto, none, rapid, repeat, single (segmented memory)					
Advanced trigger types*	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, logic, runt pulse					
Trigger sensitivity*	Digital triggering provides 1 LSB accuracy up to full bandwidth of scope					
Trigger types (ETS mode)*	Rising edge, falling edge					
Trigger sensitivity (ETS mode)*	10 mV p-p typical (at full bandwidth)					
Maximum pre-trigger capture	Up to 100% of capture size					
Maximum post-trigger delay	Up to 4 billion samples (selectable in 1 sample steps)					
Trigger re-arm time	< 2 µs on fastest timebase					
Maximum trigger rate	Up to 10 000 waveforms in a 20 ms burst					
Triggering (digital)						
Source	D0 to D15					
Trigger types	Combined pattern and edge					
Advanced triggers	Edge, pulse width, dropout, interval, logic					
Function generator						
Standard output signals	Sine, square, triangle, DC voltage, ramp, sinc, Gaussian, half-sine, white noise, PRBS					
Standard signal frequency	DC to 1 MHz					
Sweep modes	Up, down, dual with selectable start / stop frequencies and increments					
Output frequency accuracy	As oscilloscope					
Output frequency resolution	< 10 mHz					
Output voltage range	±2 V					
Output voltage adjustment	Signal amplitude and offset adjustable in approximate 1 mV steps within overall ±2 V range					
Amplitude flatness	< 0.5 dB to 1 MHz typical					
DC accuracy	±1% of full scale					
SFDR	> 60 dB 10 kHz full scale sine wave					
Output characteristics	Rear panel BNC, 600 Ω output impedance					
Overvoltage protection	±20 V					
Arbitrary waveform generator (AWG)						
Update rate	20 MS/s					
Buffer size	32 kS					
Resolution	12 bits (output step size approximately 1 mV)					
Bandwidth	> 1 MHz					
Rise time (10% to 90%)	< 120 ns					
Probe compensation output						
Impedance	600 Ω					
Frequency	1 kHz					
Level	2 V pk-pk					
Physical specifications						
PC connectivity	USB 3.0 (USB 2.0 compatible)					
Dimensions	190 mm x 170 mm x 40 mm (including connectors)					
Weight	< 0.5 kg					
Temperature range	Operating: 0 °C to 40 °C (15 °C to 30 °C for stated accuracy). Storage: –20 °C to 60 °C					
Humidity range	Operating: 5% RH to 80% RH non-condensing. Storage: 5% RH to 95% RH non-condensing					

* analog channels only

Common specifications for all models

	All models
Dynamic performance	
Crosstalk	Better than 400:1 up to full bandwidth (equal voltage ranges)
Harmonic distortion	< –50 dB at 100 kHz full scale input
SFDR	52 dB typical
Noise	180 µV RMS (on most sensitive range)
Bandwidth flatness	+0.3 dB, –3 dB from DC to full bandwidth
Spectrum analyzer	
Frequency range	DC to maximum bandwidth of scope
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 1 million 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
Operands	All input channels, reference waveforms, time, constants, π
Automatic masurements (analog channels only)	
Oscilloscope mode	AC RMS, true RMS, cycle time, DC average, duty cycle, falling rate, fall time, frequency, high pulse width, low pulse width, maximum, minimum, peak to peak, rise time, rising rate.
Spectrum mode	Frequency at peak, amplitude at peak, average amplitude at peak, total power, THD %, THD dB, THD+N, SFDR, SINAD, SNR, IMD
Statistics	Minimum, maximum, average, standard deviation
Serial decoding	
Protocols	CAN, FlexRay, I²C, I²S, LIN, SPI, UART/RS-232
Mask limit testing	
Statistics	Pass/fail, failure count, total count
Display	
Interpolation	Linear or sin(x)/x
Persistence modes	Digital color, analog intensity, custom, none
General	
Power requirements	USB 2.0 models: powered from single USB port USB 3.0 models: powered from single USB 3.0 port or two USB 2.0 ports (dual cable supplied) For 4-channel models, use a USB port supplying at least 1200 mA, or use the AC adaptor supplied.
Safety approvals	Designed to EN 61010-1:2010
EMC approvals	Tested to EN 61326-1:2006 and FCC Part 15 Subpart B
Environmental approvals	RoHS and WEEE compliant
Software included	PicoScope 6 (for Windows and Linux). Windows and Linux SDK. Example programs (C, Visual Basic, Excel VBA, LabVIEW).
PC requirements	Microsoft Windows XP (SP3), Windows Vista, Windows 7 or Windows 8 (not Windows RT)
Output file formats	bmp, csv, gif, jpg, mat, pdf, png, psdata, pssettings, txt
Output functions	copy to clipboard, print
Languages	Chinese (simplified), Chinese (traditional), Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Turkish

Connections

2-channel models

Ch A
Ch B
AWG and function generator
External trigger

USB port

4-channel models

Ch A
Ch B
Ch C
Ch D
AWG and function generator
External trigger
Probe compensation pin

DC power input
USB port
Earth terminal

2-channel MSO models

Ch A
Ch B
16 digital inputs

AWG and function generator
USB port
Earth terminal

4-channel MSO models

Ch A
Ch B
Ch C
Ch D
16 digital inputs

AWG and function generator
Earth terminal
USB port
DC power input

Kit contents

All PicoScope 3000 Series oscilloscope kits contain:

- PicoScope 3000 Series oscilloscope
- Switchable x1/x10 probes (2 or 4) in carrying case
- Quick Start Guide
- Software and reference CD
- USB cable(s)*
- AC power adaptor (selected models)*

  * see table below

MSO kit contents

PicoScope 3000D MSO kits also contain:

- TA136 digital cable
- TA139 pack of 10 test clips (x2)

Probes

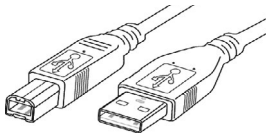
All PicoScope 3000 Series oscilloscopes are supplied with two or four probes (quantity to match the number of analog channels), which are chosen to obtain the specified system bandwidth. See the table below for more information on which probes are included and how to order additional probes.

Order code	Description	Models supplied with
MI007	60 MHz x1/x10, 1.2 m probe	3204, 3404 A, B and D MSO
TA132	150 MHz x1/x10, 1.2 m probe	3205, 3405 A, B and D MSO
TA131	250 MHz x1/x10, 1.2 m probe	3206, 3406 A, B and D MSO
TA160	250 MHz x1/x10, 1.2 m probe	3207 A and B

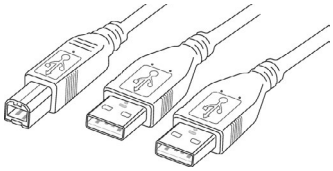
USB connectivity and power

All PicoScope 3000 Series oscilloscopes are supplied with a USB 2.0 or USB 3.0 cable to match the scope's specifications. To ensure that the USB 3.0 model scopes work effectively with older USB systems, and to supply extra power for all scopes with 4 analog channels, a double-headed USB 2.0 cable is also provided with selected models. This cable enables you to use a second USB port for additional power.

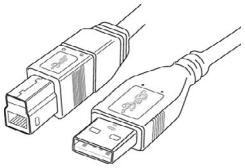
For PicoScope 3000 models with 4 analog channels, the supplied AC power adaptor may be required if the USB port(s) provide less than 1200 mA.



USB 2.0 cable



USB 2.0 cable, double-headed



USB 3.0 cable

Analog channels	Scope USB connection	USB 2.0 cable	USB 2.0 double-headed cable	USB 3.0 cable	AC power adaptor
2	2.0	•			
	3.0		•	•	
4	2.0	•	•		•
	3.0		•	•	•

Ordering information

Order code	Model number	Description
PP708	PicoScope 3204A	60 MHz 2-channel oscilloscope
PP709	PicoScope 3204B	60 MHz 2-channel oscilloscope with AWG**
PP710	PicoScope 3205A	100 MHz 2-channel oscilloscope
PP711	PicoScope 3205B	100 MHz 2-channel oscilloscope with AWG
PP712	PicoScope 3206A	200 MHz 2-channel oscilloscope
PP713	PicoScope 3206B	200 MHz 2-channel oscilloscope with AWG
PP875	PicoScope 3207A	250 MHz 2-channel USB 3.0 oscilloscope
PP876	PicoScope 3207B	250 MHz 2-channel USB 3.0 oscilloscope with AWG
PP846	PicoScope 3404A	60 MHz 4-channel oscilloscope
PP847	PicoScope 3404B	60 MHz 4-channel oscilloscope with AWG
PP848	PicoScope 3405A	100 MHz 4-channel oscilloscope
PP849	PicoScope 3405B	100 MHz 4-channel oscilloscope with AWG
PP850	PicoScope 3406A	200 MHz 4-channel oscilloscope
PP851	PicoScope 3406B	200 MHz 4-channel oscilloscope with AWG
PP931	PicoScope 3204D MSO	60 MHz 2-channel mixed-signal oscilloscope with AWG
PP932	PicoScope 3205D MSO	100 MHz 2-channel mixed-signal oscilloscope with AWG
PP933	PicoScope 3206D MSO	200 MHz 2-channel mixed-signal oscilloscope with AWG
PP934	PicoScope 3404D MSO	60 MHz 4-channel mixed-signal oscilloscope with AWG
PP935	PicoScope 3405D MSO	100 MHz 4-channel mixed-signal oscilloscope with AWG
PP936	PicoScope 3406D MSO	200 MHz 4-channel mixed-signal oscilloscope with AWG

** Arbitrary waveform generator

More oscilloscopes in the PicoScope range...

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Ultra-compact and handheld

PicoScope 3000 Series
General-purpose and MSO models

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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*Prices correct at the time of publication. Please contact Pico Technology for the latest prices before ordering.

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