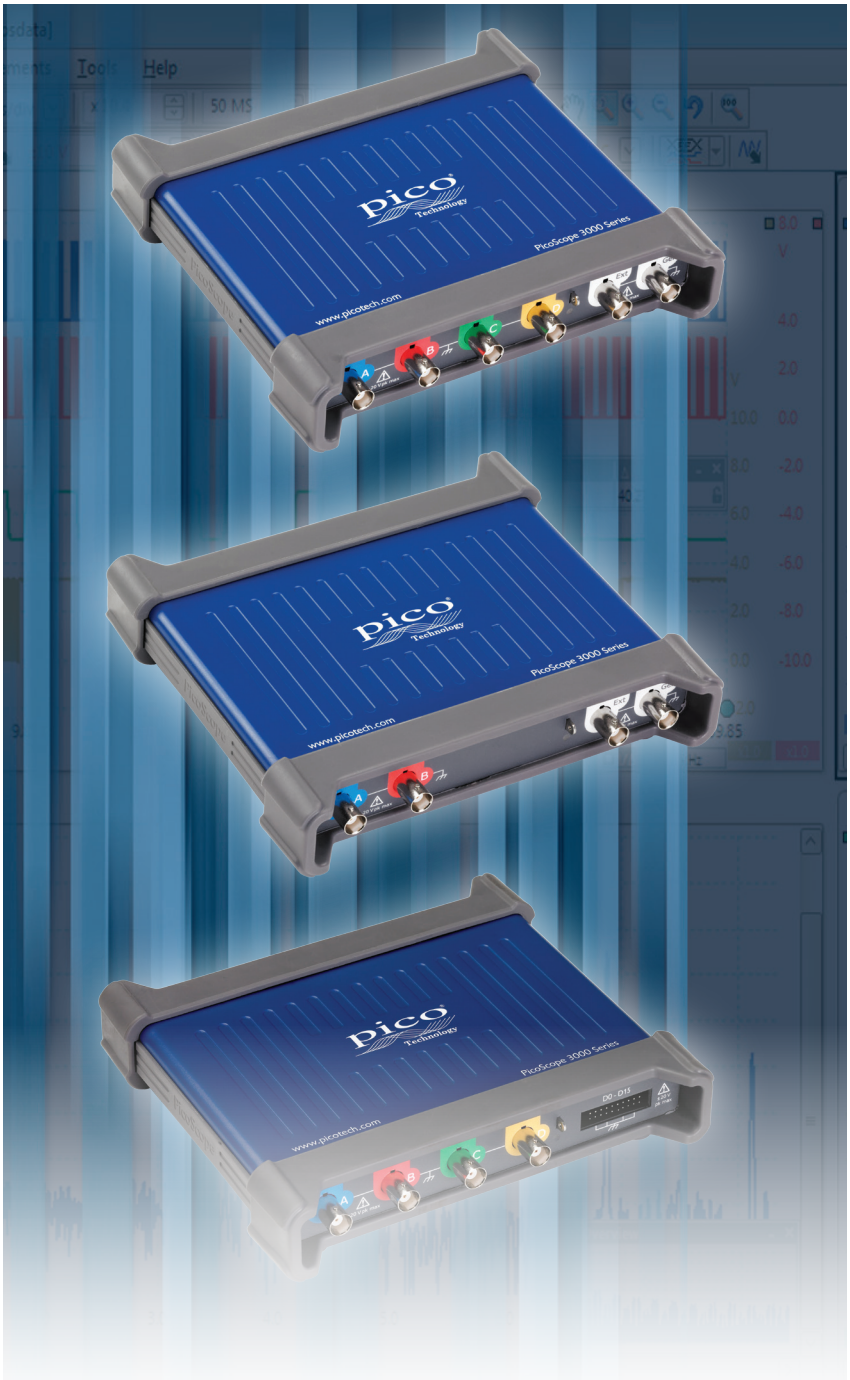
PicoScope® 3000 Series

PC oscilloscopes and MSOs



Up to 200 MHz analog bandwidth
Deep buffer memory up to 512 MS
MSO models with 16 digital channels
2 or 4 analog channels
1 GS/s real-time sampling
Fast waveform updates
Built-in arbitrary waveform generator
USB 3.0 connected and powered

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

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

www.picotech.com

Power, portability, and performance

The PicoScope 3000 Series PC oscilloscopes are small, light, and portable, while offering the 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.

Operating together with the 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-end features as standard

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

To protect your investment, both the PC software and the firmware inside the scope can be updated. Pico Technology have a long history of providing new features through free-of-charge software downloads. Users of our products reward us by becoming lifelong customers and frequently recommending PicoScopes to their colleagues.

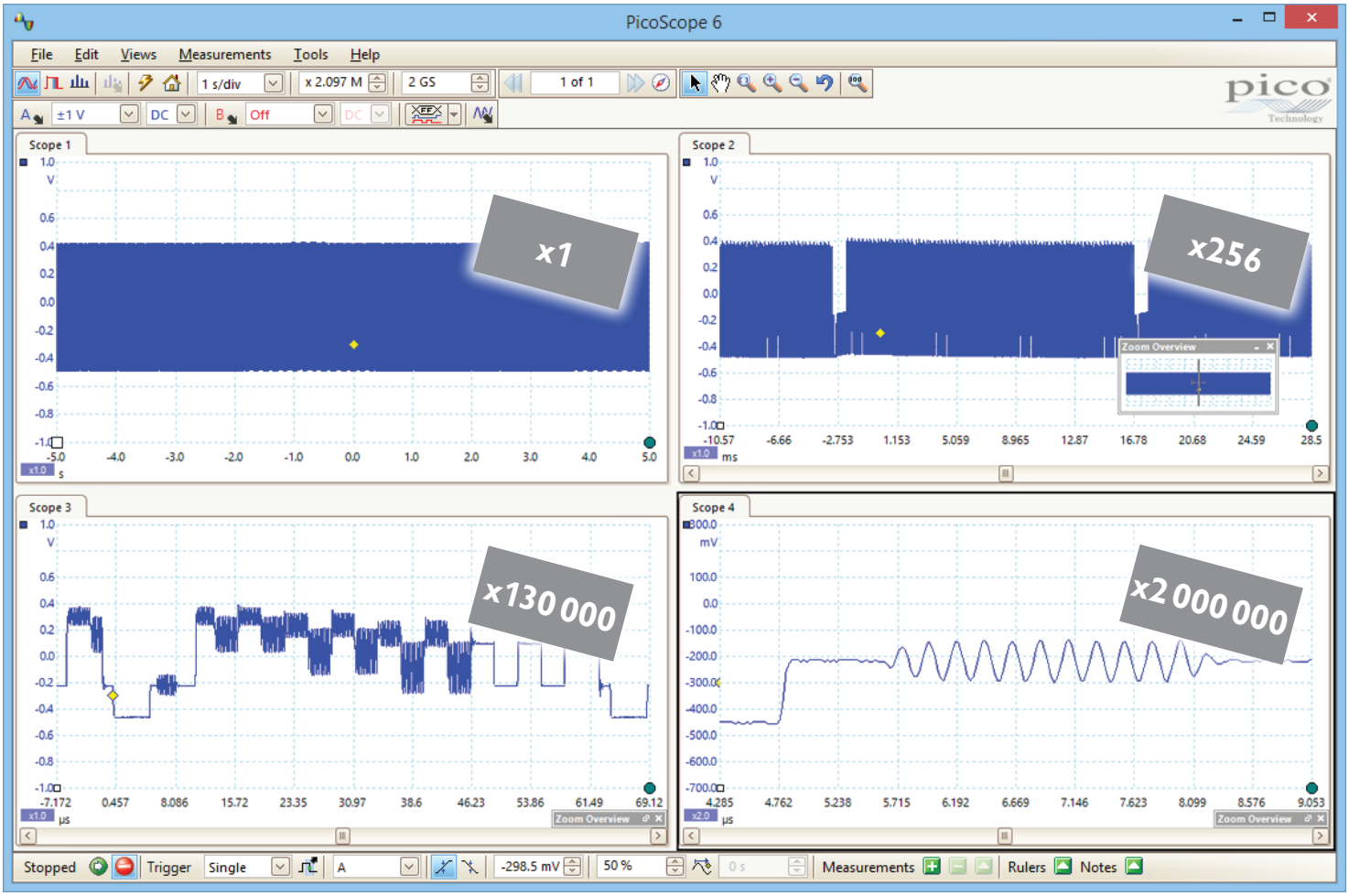
High bandwidth and sampling rate

Despite their compact size and low cost, there is no compromise on performance. With input bandwidths up to 200 MHz, the PicoScope 3000 Series scopes can measure a wide range of signal types, from DC and baseband into RF and all the way up to VHF.

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

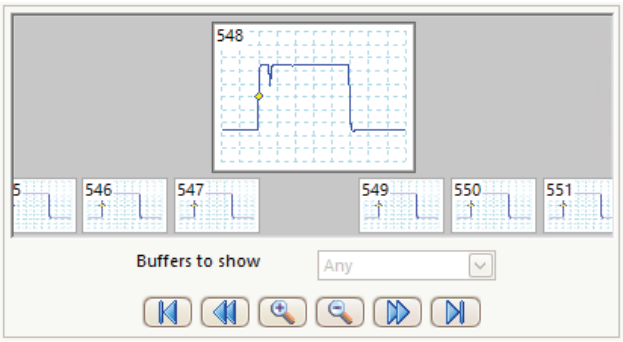
Deep memory

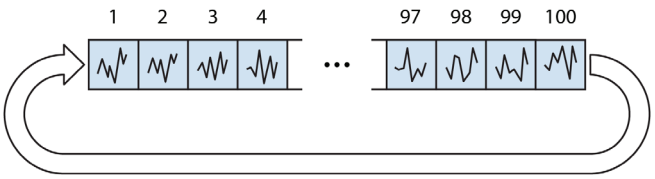
PicoScope 3000 Series oscilloscopes offer a huge buffer memory, allowing them to sustain high sampling rates across long timebases. For example, using the 512 MS buffer the PicoScope 3206 and 3406 models can sample at 1 GS/s all the way down to 50 ms/div (500 ms total capture time).



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. The 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.





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.

Advanced display

The PicoScope software provides advanced detail and clarity for viewing your signals. The majority of the display area is dedicated to the waveform, ensuring that a huge amount of data can be seen at once. Even with a laptop, the viewing area for a PicoScope USB oscilloscope is far larger than that of a typical benchtop oscilloscope.

• Size

The size of the display is only limited by the chosen PC. With a large waveform area available, you can select a customizable split-screen display to view multiple channels or different views of a signal at the same time. The software can even show multiple oscilloscope and spectrum analyzer traces at once.

• Resolution

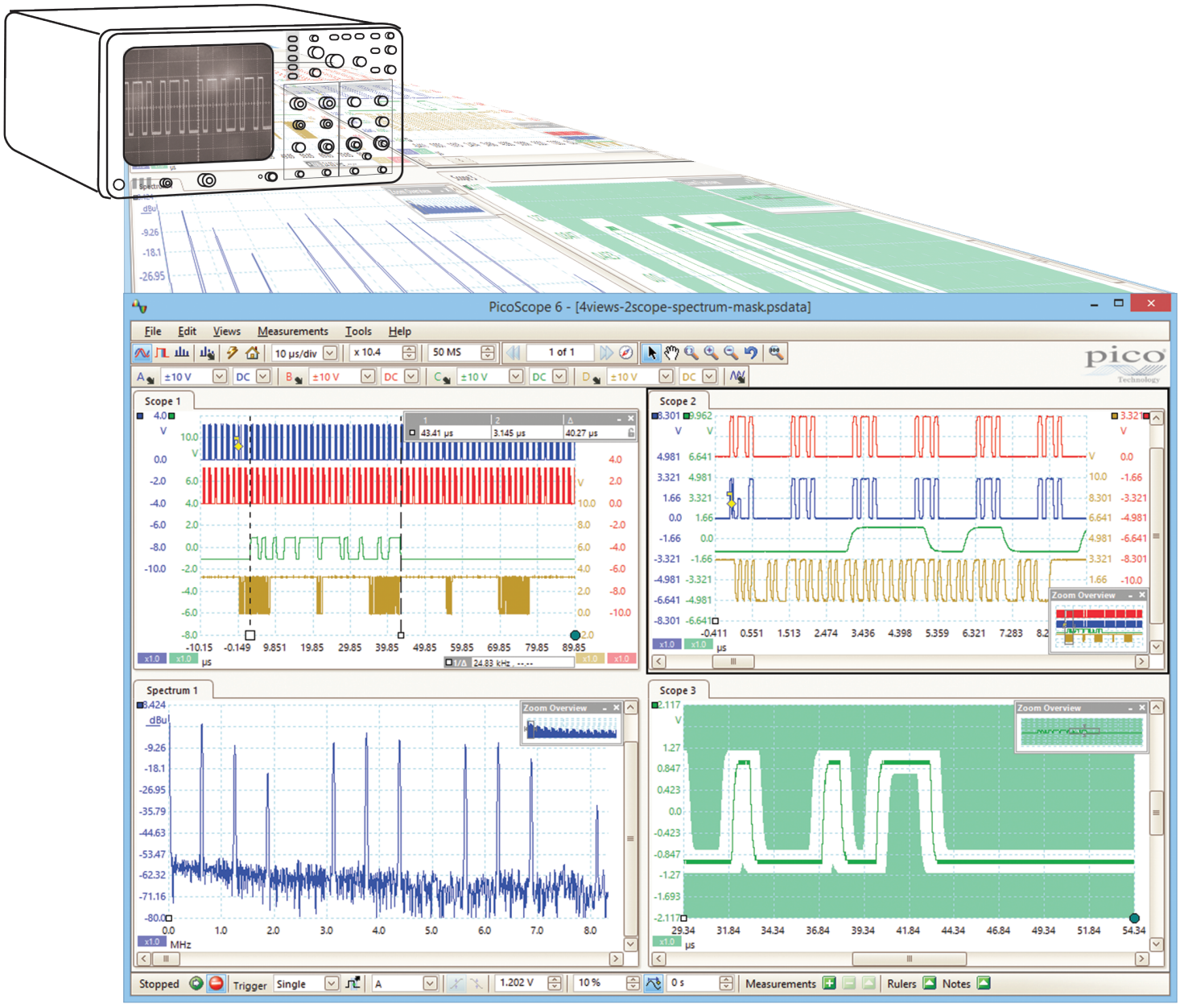
The superior resolution offered by a PC monitor means that even with multiple views or complex signals, no detail will be lost.

• Flexibility

Each waveform shown in a customized view works with individual zoom, pan, filter, and measurement tools for ultimate flexibility. The buffer overview function also allows you to quickly find rare, high-speed events in a long capture, ensuring you are always viewing the most relevant data.

• Ease of use

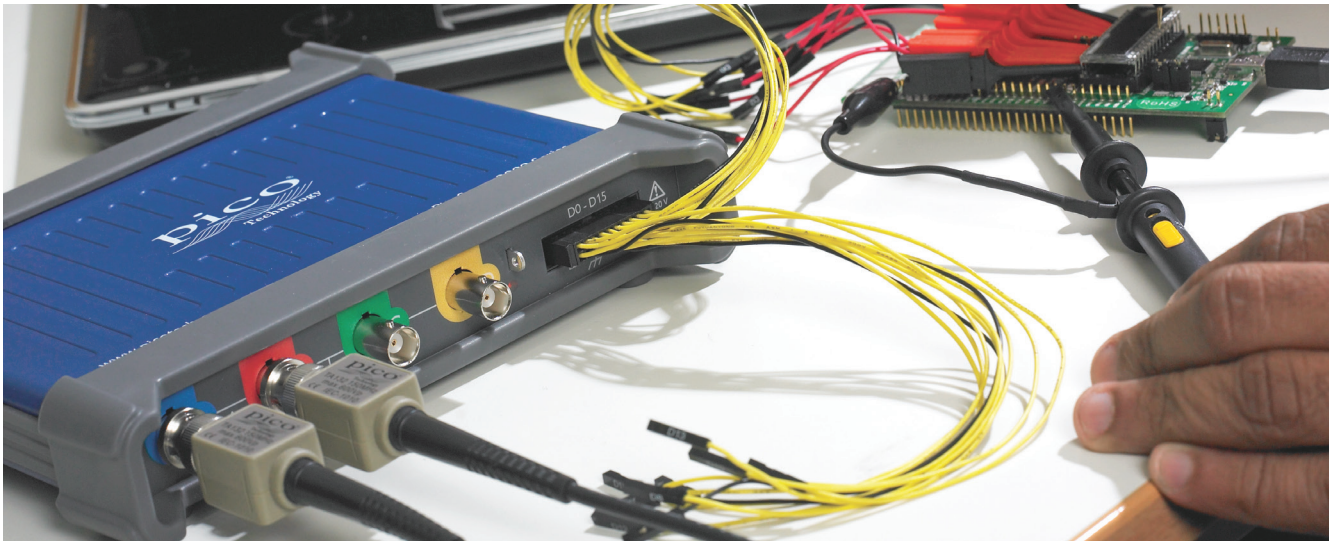
The PicoScope software controls are easy to access and use within the large display window. You can clearly read all the settings and data for your waveform.



PicoScope 3000 Series overview

All PicoScope 3000 Series oscilloscopes offer SuperSpeed USB 3.0 connectivity, a sampling rate of 1 GS/s, and a built-in arbitrary waveform generator (AWG). See the table below for further key specifications for each model.

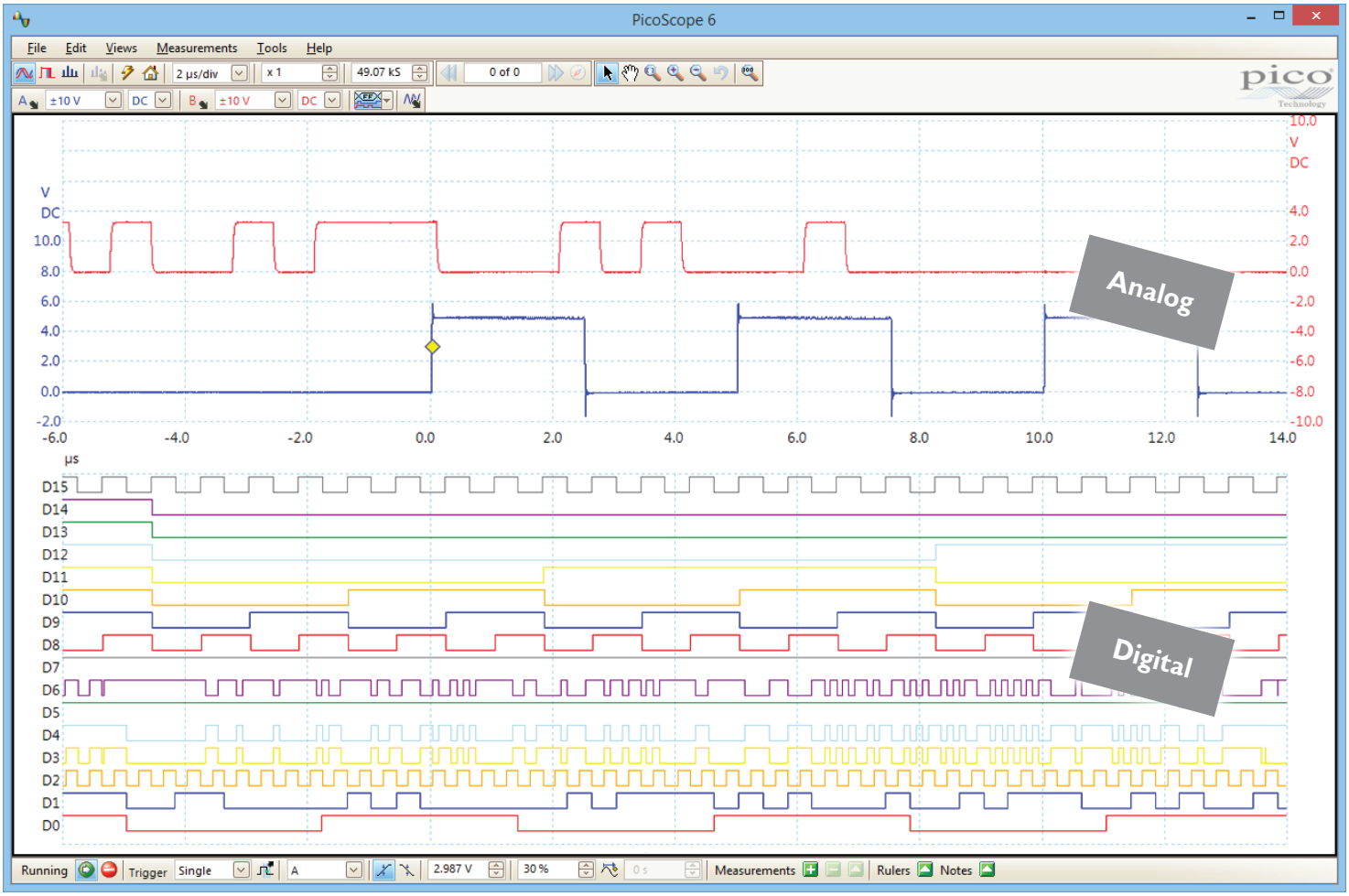
	Analog channels	Digital channels	Bandwidth	Buffer memory
3203D	2	-	50 MHz	64 MS
3203D MSO		16		
3204D	2	-	70 MHz	128 MS
3204D MSO		16		
3205D	2	-	100 MHz	256 MS
3205D MSO		16		
3206D	2	-	200 MHz	512 MS
3206D MSO		16		
3403D	4	-	50 MHz	64 MS
3403D MSO		16		
3404D	4	-	70 MHz	128 MS
3404D MSO		16		
3405D	4	-	100 MHz	256 MS
3405D MSO		16		
3406D	4	-	200 MHz	512 MS
3406D MSO		16		

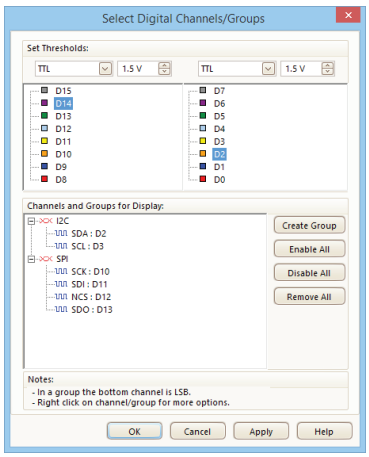


Mixed-signal oscilloscopes

The PicoScope 3000 Series MSO (Mixed-Signal Oscilloscope) models include 16 digital inputs alongside the standard 2 or 4 analog channels, enabling you to view your digital and analog signals simultaneously.

To view the digital signals in the PicoScope 6 software, simply click the digital channels button.



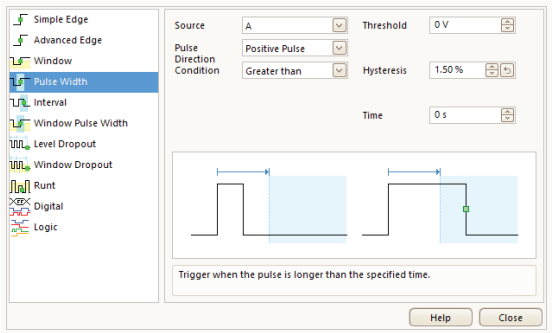


The 16 digital inputs can be added to the view by dragging and dropping, and can then be reordered, grouped, and renamed. The channels can be displayed individually or in arbitrary groups labelled with binary, decimal or hexadecimal values. A separate logic threshold from –5 V to +5 V can be defined 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.

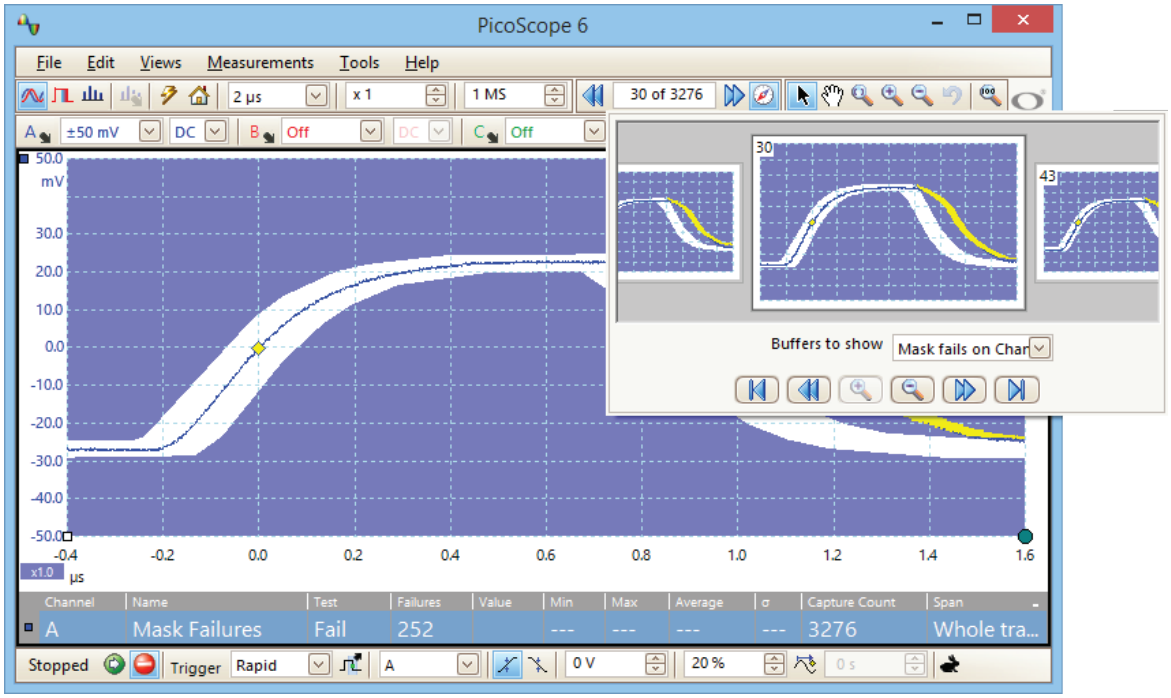
Advanced digital triggers

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, 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.



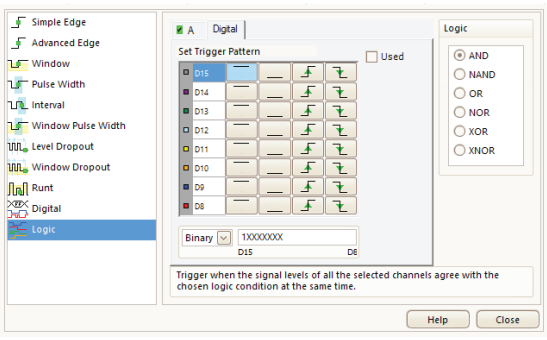
PicoScopes broke new ground by being the first to use digital triggering. This method reduces errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth. Trigger levels and hysteresis can be set with high precision and resolution.

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 6 milliseconds. The mask limit testing function can then scan through these waveforms to highlight any failed waveforms for viewing in the waveform buffer.



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 as a watchdog timer.



Triggering for digital inputs

The PicoScope 3000 Series MSO models offer a comprehensive set of advanced triggers for digital channels.

With logic triggering you can 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

The deep-memory PicoScope 3000 Series oscilloscopes include serial decoding capability across all channels, and can capture thousands of frames of uninterrupted data, making them ideal devices for the job.

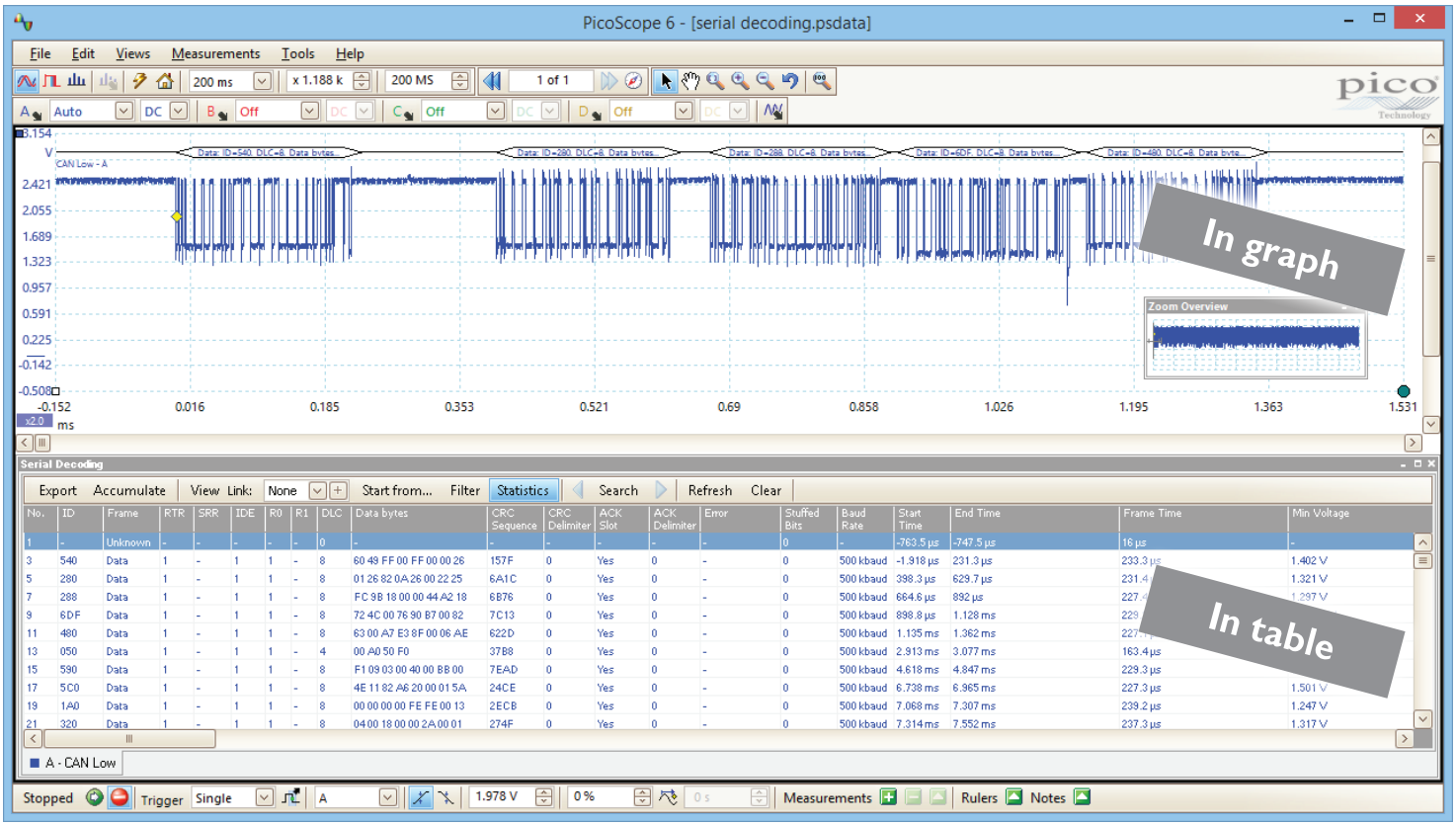
The decoded data can be displayed in the format of your choice: in graph, in table, or both at once.

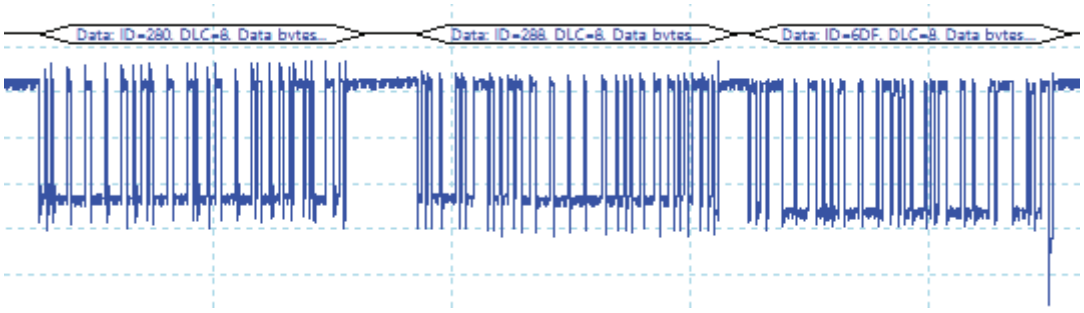
- **In graph** format shows the decoded data beneath the waveform on a common time axis, with error frames marked in red. These frames can be zoomed to investigate signal integrity (SI) issues.

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

Serial protocols
UART/RS-232
SPI
I²C
I²S
CAN
LIN
FlexRay
USB





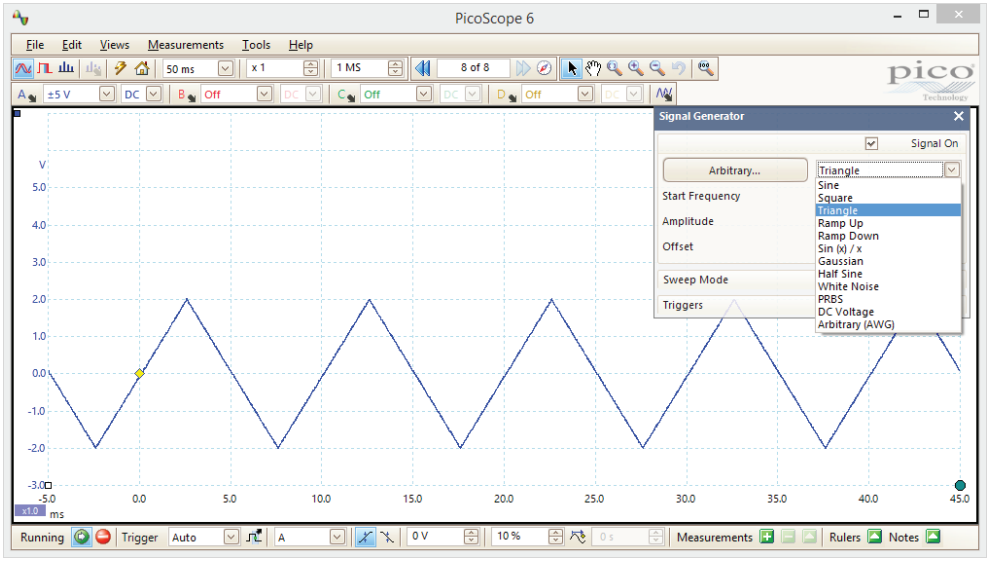
Serial decoding for digital signals

The PicoScope 3000 Series MSO models bring extra power to the serial decoding features. You can decode serial data on all analog and digital inputs simultaneously, giving you up to 20 channels of data with any combination of serial protocols. For example, you can decode multiple SPI, I²C, CAN bus, LIN bus and FlexRay signals all at the same time!

Function generator

PicoScope 3000 Series oscilloscopes all include both a built-in function generator and an arbitrary waveform generator (AWG), allowing you to create standard and custom-defined waveform outputs.

The function generator includes sine, square, triangle, DC voltage, and a number of other common modes as standard. The capability to generate white noise and pseudo-random binary sequence (PRBS) outputs is also included. In addition to 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.

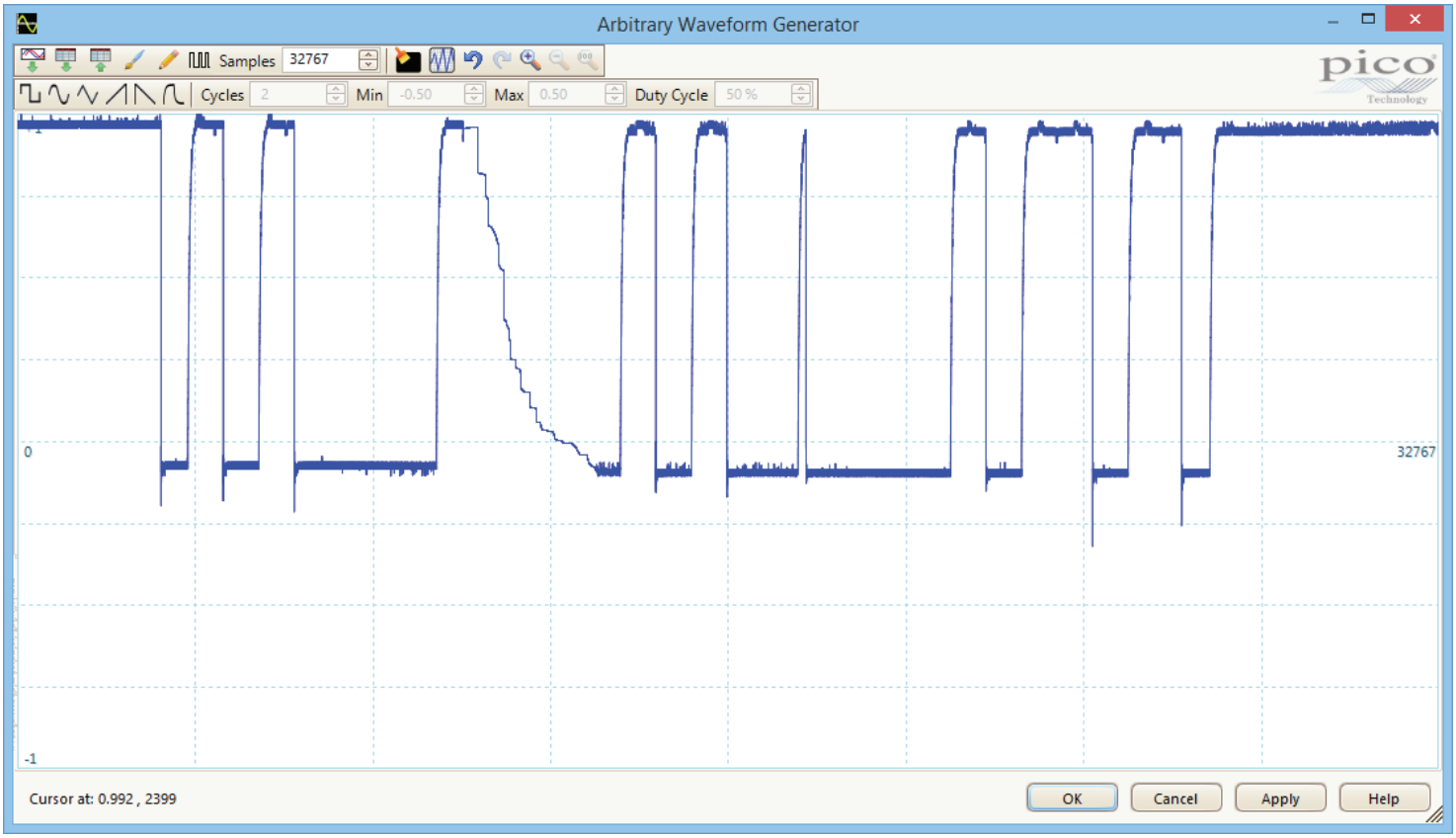


Arbitrary waveform generator

All PicoScope 3000 Series oscilloscopes also include a built-in arbitrary waveform generator (AWG). With most competing 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; with the PicoScope's integrated hardware, these tasks can be performed instantly and easily.



HAL3 hardware acceleration

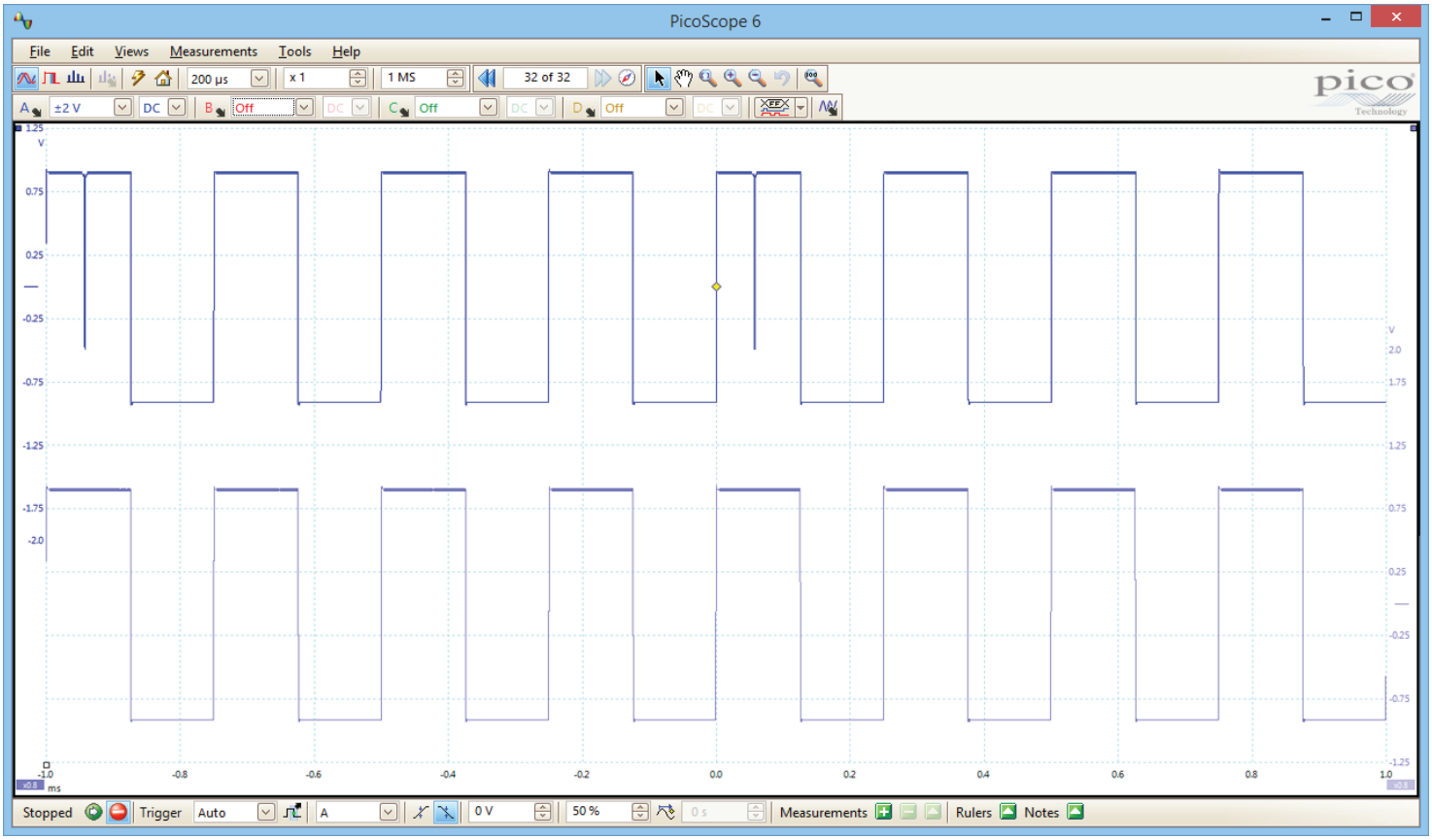
Many oscilloscopes struggle when deep memory is enabled: the screen update rates can slow and the controls can become unresponsive. The PicoScope 3000D Series oscilloscopes avoid this limitation with the use of a dedicated hardware acceleration engine. This parallel design enables the oscilloscope to intelligently compile the waveform image from the raw data stored in its memory before transferring it to the PC, so that the USB connection and PC's processor performance do not limit capture rates. This allows the continuous capture and display of over 440 000 000 samples every second. PicoScope oscilloscopes manage deep memory far more effectively than competing PC-based and benchtop models.

The PicoScope 3000D Series is fitted with third-generation hardware acceleration (HAL3), which allows high waveform update rates and faster segmented memory and rapid trigger modes. In most cases the data collection speed of the PicoScope will be faster than the USB transfer rate, so information has to be buffered in high-speed memory on the device. HAL3 allows even deep-memory PicoScopes to maintain fast waveform update rates regardless of the buffer size.

For example, the PicoScope 3206D can sample at 1 GS/s on timebases as long as 20 ms/div, capturing 200 million samples per waveform, and still update the screen several times per second. That's around 500 million sample points each second!

Less intelligent oscilloscopes attempt to reduce the amount of data transferred by using simple decimation, transferring only every nth sample. This results in the majority (up to 99.999%) of data being lost 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 detail.

For example, a waveform with 100 million samples may be divided into 1000 blocks of 100 000 samples each, with only the minimum and maximum values for each block being transferred to the PC. If you zoom into the waveform, the oscilloscope will again divide the selected area into blocks and transfer the minimum and maximum data so that fine detail is viewable without any delay.



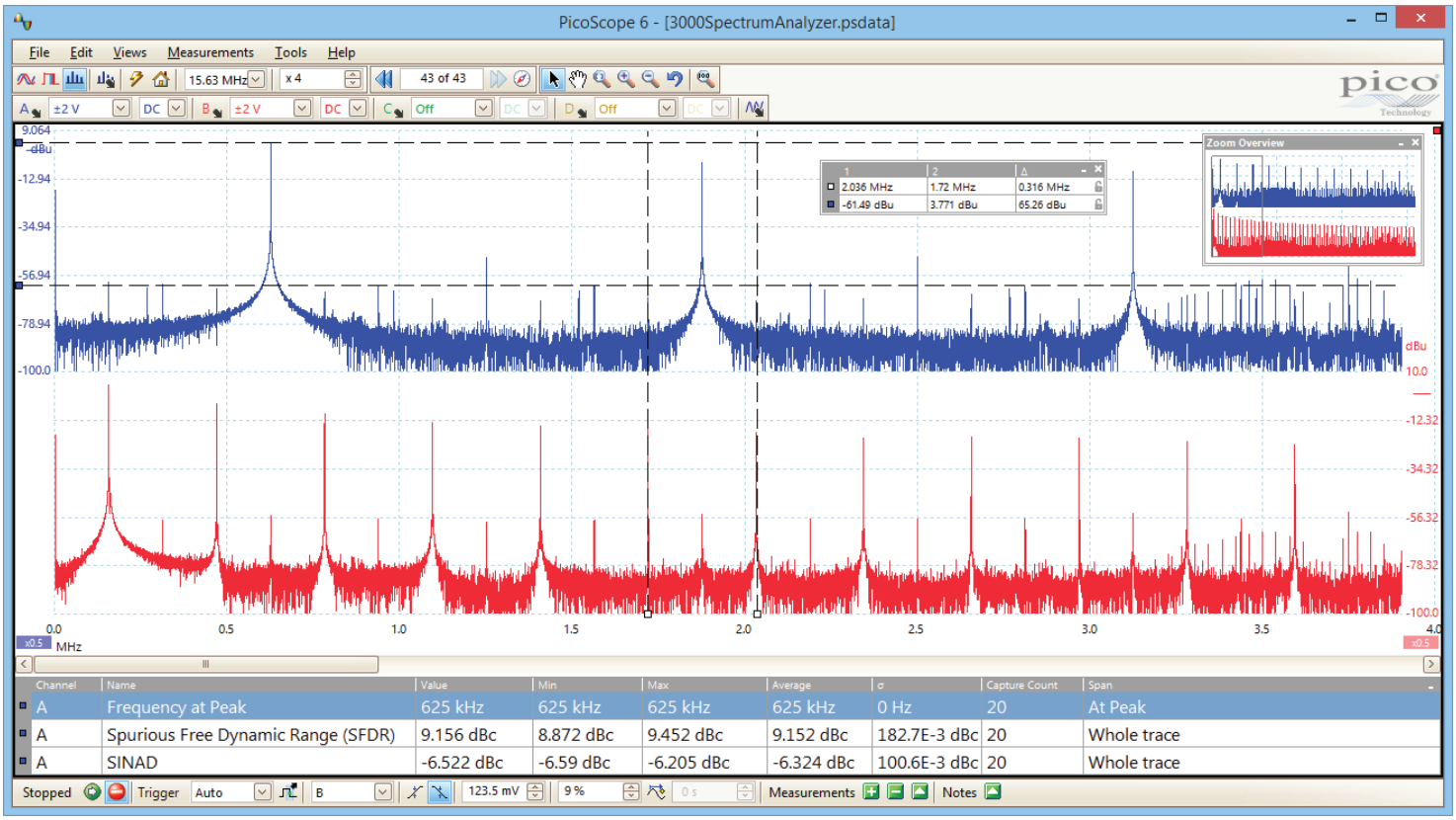
In the example above, both waveforms show the same signal using different types of hardware acceleration. The top waveform has used the aggregation possible with a PicoScope, and as a result the high-frequency spikes are preserved. The bottom waveform has used traditional decimation, showing a loss of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

In parallel with the data aggregation, other data such as average values are also returned to speed up measurements and to reduce the load on the PC's processor.

Spectrum analyzer

By simply clicking the spectrum 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.

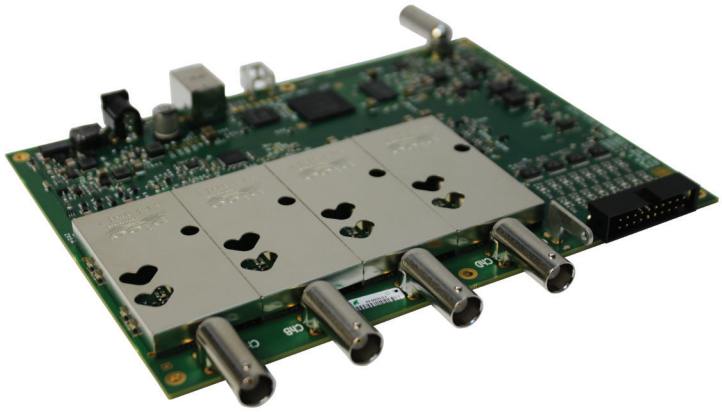


Signal integrity

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, low distortion, and excellent pulse response. 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.



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 at rates of up to 125 MS/s (subject to PC specifications). The capture size is limited only by available PC storage.

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

Benefits of USB connectivity

All PicoScope 3000D Series oscilloscopes feature a SuperSpeed USB 3.0 connection, providing high-speed data transfer whilst remaining compatible with older USB systems. A USB oscilloscope offers many benefits over a traditional benchtop device:

• Size and portability

These compact, portable scopes are ideal for use both in the lab and in the field. Unlike traditional benchtop instruments, PicoScopes take up less space on your workbench and easily fit in to your laptop bag or tool case. PicoScope 3000D Series oscilloscopes can be powered from the USB port, removing the need to carry an external power supply.

• Flexibility

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

• File sharing

PC connectivity makes printing, copying, saving and emailing your data from the field quick and easy.

• Advanced display

Laptop screens and desktop monitors offer higher resolution, larger size and greater flexibility for displaying your signal.

• Value

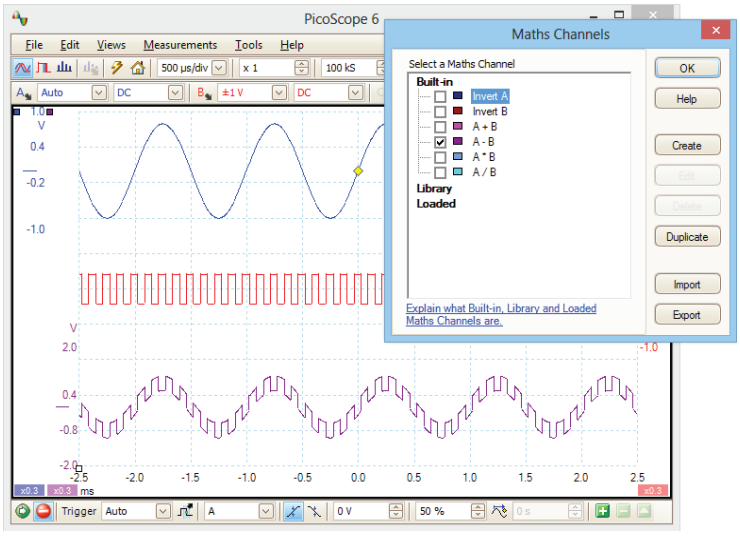
With PicoScope you only pay for the specialised scope hardware. You don't need to repurchase the hardware already available on your PC.

• Updates

As the scope is connected to your computer, both the PicoScope software and the device's firmware can be quickly updated free of charge.

• Fast transfer rates

A USB 3.0 connection provides fast saving of waveforms when using the PicoScope software, and fast gap-free continuous streaming of up to 125 MS/s when using the SDK. The quick transfer rates ensure a fast screen update speed, even when collecting large amounts of data.



Math channels

The integrated math functions of PicoScope 6 allow you to perform a variety of mathematical calculations on the input signals of your PicoScope oscilloscope. With the click of a button you can invert, add, subtract, multiply and divide channels, or create your own functions.

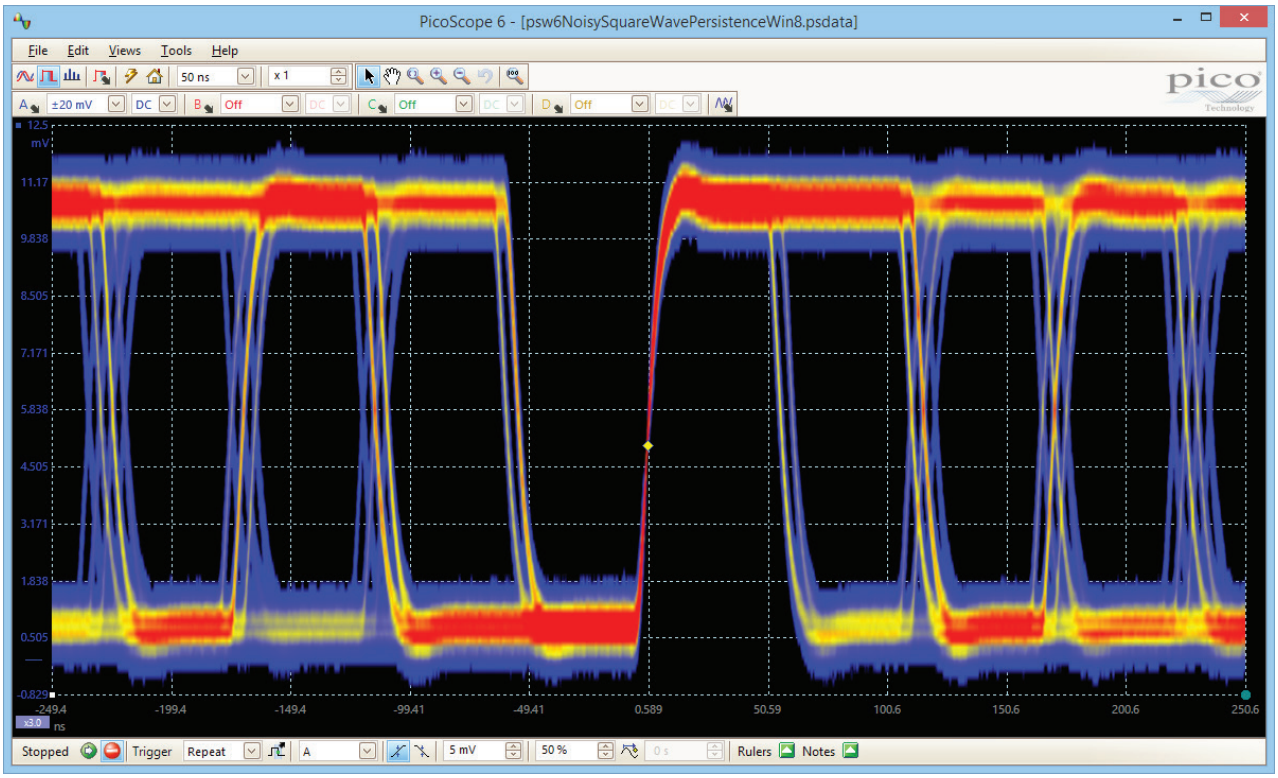
To add a math channel, just click a button and a wizard will guide you through the process. You can quickly select one of the built–in functions, such as inversion or addition, or open the equation editor to create complex functions involving filters (low pass, high pass, band pass and band stop filters), trigonometry, exponentials, logarithms, statistics, integrals and derivatives. You can control the entire process using either your mouse or keyboard.

With PicoScope math channels you can 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.

Custom probe settings

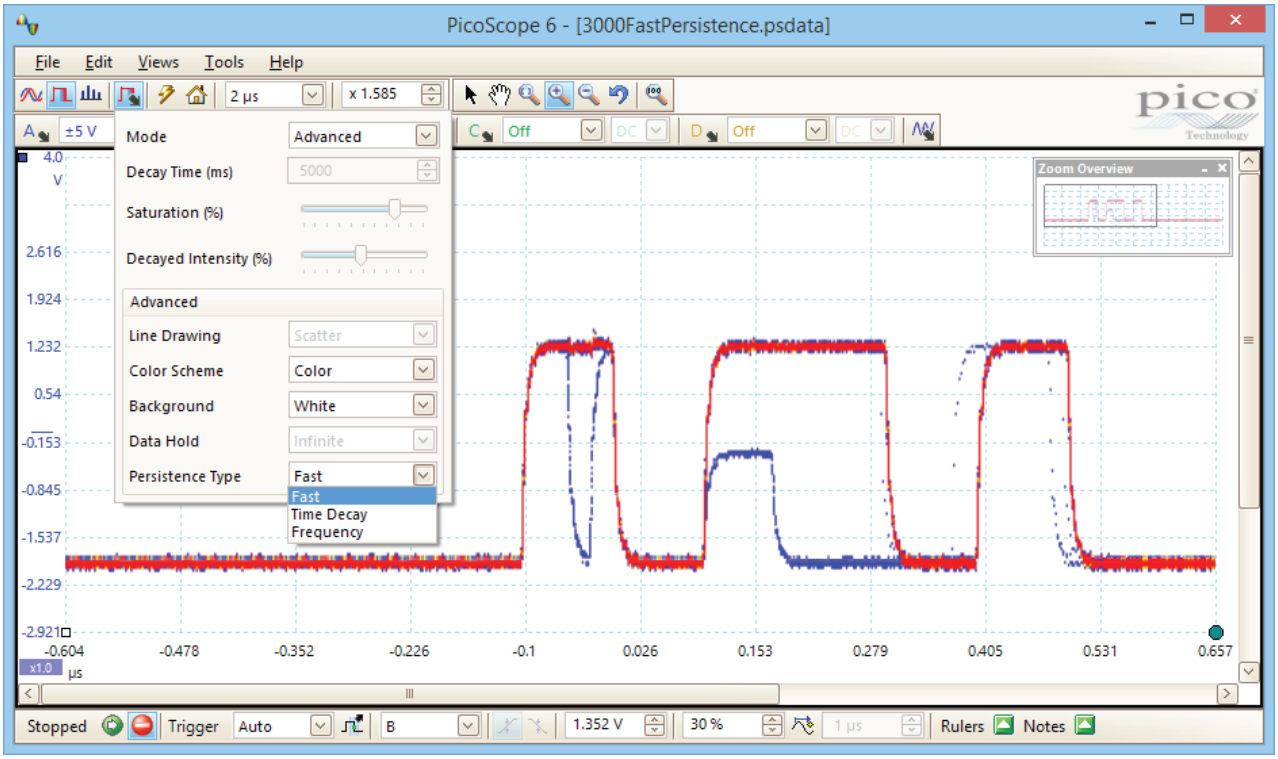
Custom probes allow you to correct for gain, attenuation, offsets and nonlinearities of probes, transducers, and other sensors, or convert to different measurement units such as current, power or temperature. Definitions for standard Pico-supplied probes are built in, but you can also create your own using linear scaling or even an interpolated data table, and save them for later use.

Color persistence mode



Color Persistence mode allows you to see old and new data superimposed, with new or more frequent data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Simply click the persistence button and choose between analog intensity, digital color, and fast display modes, or create your own custom rules.

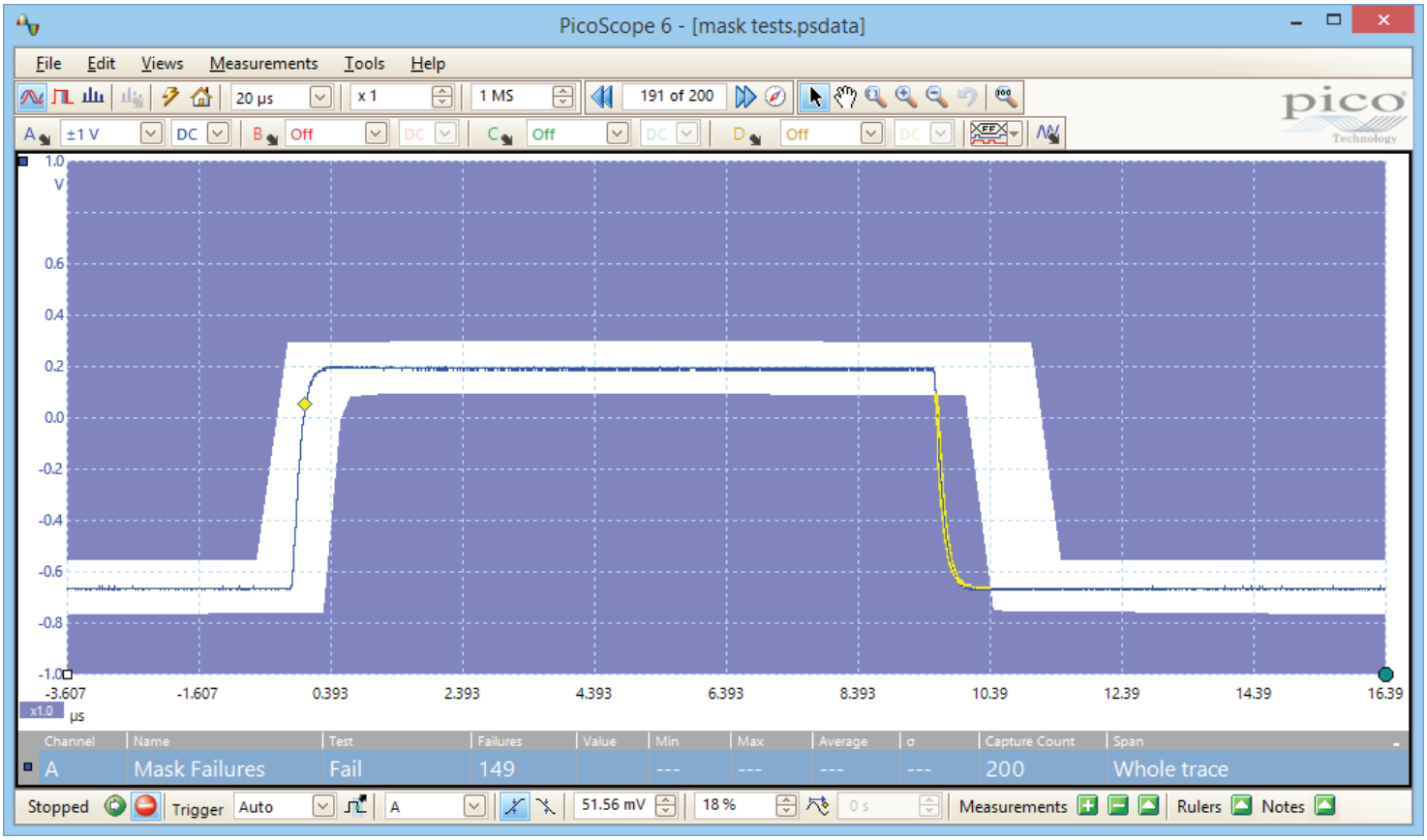
PicoScope's new Fast Persistence mode can collect over 100 000 waveforms per second, overlaying them all with color-coding or intensity-grading to show which areas are stable and which are intermittent. Faults that previously took minutes to find now appear within seconds.



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.

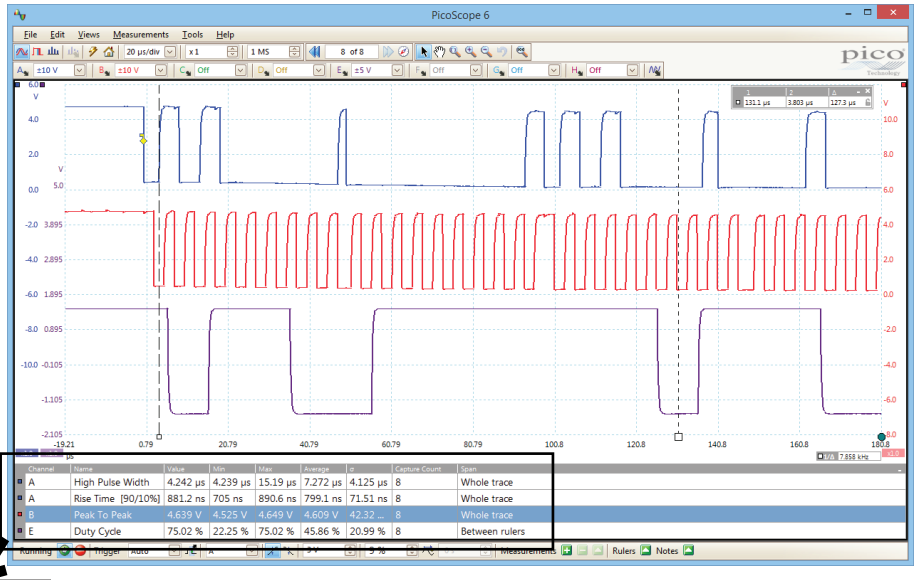
The numerical and graphical mask editors can be used separately or in combination, allowing you to enter accurate mask specifications, modify existing masks, and import and export masks as files.



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 a full list of the measurements available in both 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 %

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.

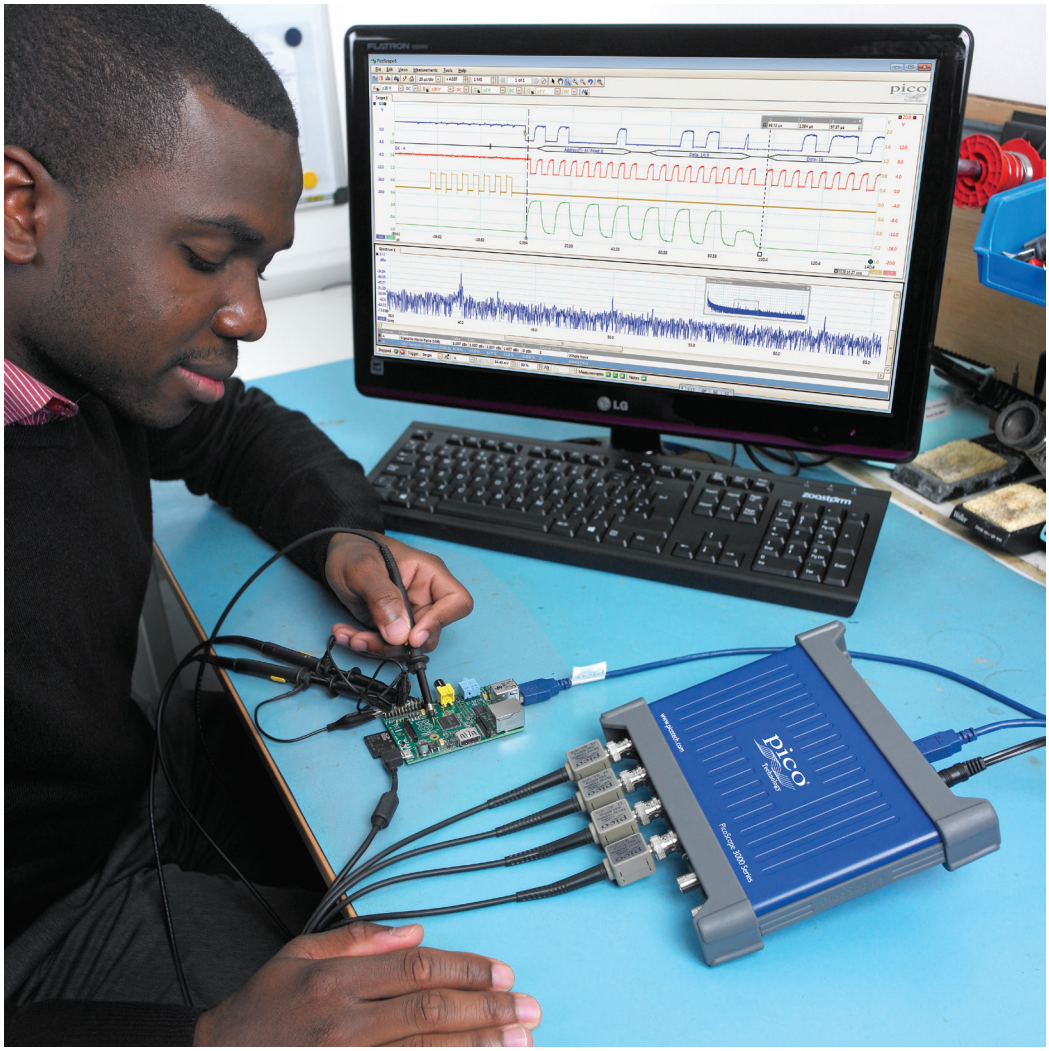
Embedded debugging

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.



PicoScope 6 software

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

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.

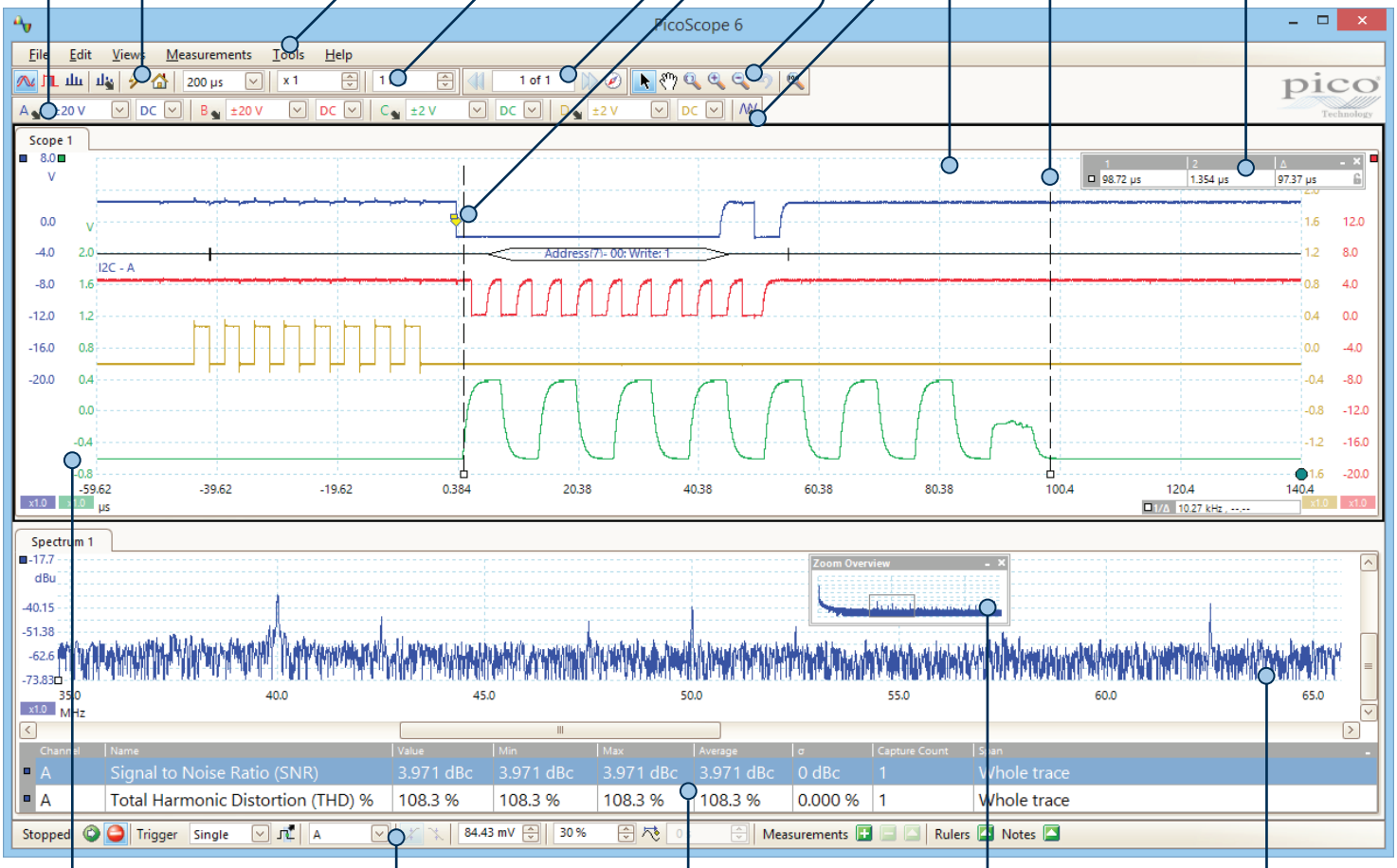
Zoom and pan tools: PicoScope makes it easy to zoom into large waveforms. Either use the zoom-in, zoom-out and pan tools, or click and drag in the Zoom Overview window for fast navigation.

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

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

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

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.

PicoScope 6 software with mixed digital and analog signals

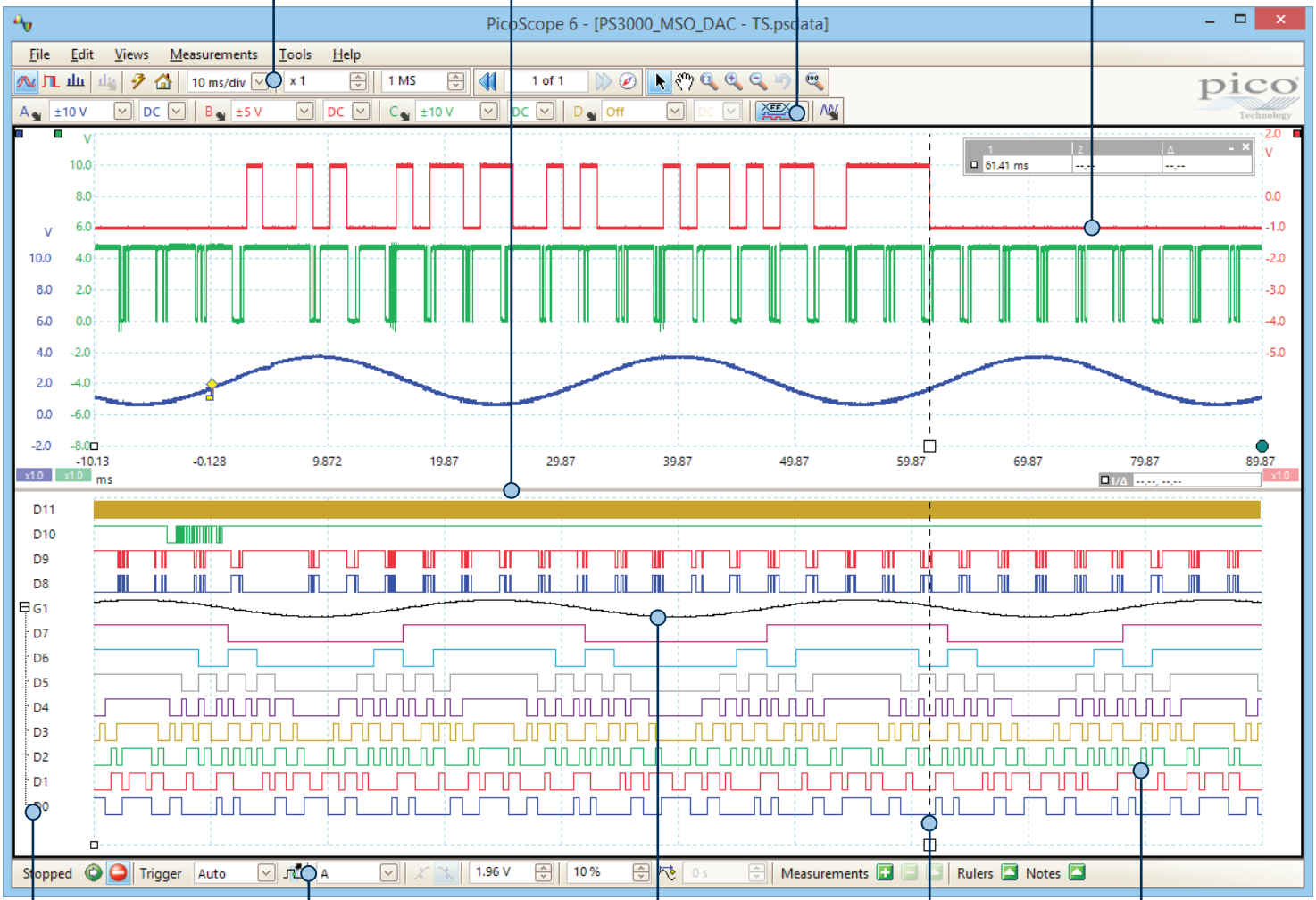
The flexibility of the PicoScope 6 software interface allows high-resolution viewing of up to 16 digital and 4 analog signals at once. You can use the whole of your PC's display to view the waveforms, ensuring you never miss a detail again.

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.

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

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

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



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

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.

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

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

	PicoScope 3203D and 3203D MSO	PicoScope 3403D and 3403D MSO	PicoScope 3204D and 3204D MSO	PicoScope 3404D and 3404D MSO	PicoScope 3205D and 3205D MSO	Pi 34 340
Vertical (analog)						
Analog input channels	2	4	2	4	2	
Input type	Single-ended, BNC connector					
Bandwidth (–3 dB)	50 MHz		70 MHz		100 MHz	
Rise time (calculated)	7.0 ns		5.0 ns		3.5 ns	
Bandwidth limiter	20 MHz, selectable					
Vertical resolution	8 bits					
Enhanced vertical resolution	12 bits in PicoScope software					
Input ranges	±20 mV to ±20 V full scale in 10 ranges					
Input sensitivity	4 mV/div to 4 V/div (10 vertical divisions)					
Input coupling	AC / DC					
Input characteristics	1 MΩ ‖ 14 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) - D MSO models only						
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 (200 Mb/s)					
Minimum detectable pulse width	5 ns					
Input impedance	200 kΩ ±2% ‖ 8 pF ±2 pF					
Input dynamic range	±20 V					
Threshold range	±5 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					

	PicoScope 3203D and 3203D MSO	PicoScope 3403D and 3403D MSO	PicoScope 3204D and 3204D MSO	PicoScope 3404D and 3404D MSO	PicoScope 3205D and 3205D MSO	Pi 34 340
Vertical (digital) continued...						
Minimum input voltage swing	500 mV pk-pk					
Channel-to-channel skew	2 ns, typical					
Minimum input slew rate	10 V/µs					
Overvoltage protection	±50 V					
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: over 4 analog channels or digital ports* in use *A digital port contains 8 digital channels					
Maximum equivalent-time sampling (ETS) rate (repetitive signals)	2.5 GS/s		2.5 GS/s		5 GS/s	
Maximum sampling rate (continuous streaming)	10 MS/s in PicoScope software, divided between active channels (PC dependent) 125 MS/s using the supplied SDK, divided between active channels (PC dependent)					
Maximum capture rate	100 000 waveforms per second (PC dependent)					
Buffer memory	64 MS		128 MS		256 MS	
Buffer memory (streaming)	100 MS in PicoScope software. Up to available PC memory when using supplied SDK.					
Maximum waveform buffer segments	10 000 in PicoScope software					
	130 000 using the supplied SDK		250 000 using the supplied SDK		500 000 using the supp	
Timebase ranges	1 ns/div to 5000 s/div		1 ns/div to 5000 s/div		1 ns/div to 5000 s	
Timebase accuracy	±50 ppm		±50 ppm		±2 ppm	
Timebase drift per year	±5 ppm		±5 ppm		±1 ppm	
Sample jitter	3 ps RMS typical					
ADC sampling	Simultaneous sampling on all enabled channels					
Dynamic performance						
Crosstalk	Better than 400:1 up to full bandwidth (equal voltage ranges), typical					
Harmonic distortion	–50 dB at 100 kHz full scale input, typical					
SFDR	52 dB at 100 kHz full scale input, typical					
Noise	110 µV RMS on 20 mV range, typical		110 µV RMS on 20 mV range, typical		160 µV RMS on 20 mV ra	
Bandwidth flatness	(+0.3 dB, –3 dB) from DC to full bandwidth, typical					

	PicoScope 3203D and 3203D MSO	PicoScope 3403D and 3403D MSO	PicoScope 3204D and 3204D MSO	PicoScope 3404D and 3404D MSO	PicoScope 3205D and 3205D MSO	Pi 34 340
Triggering						
Source	Analog channels (all models) EXT trigger (D models only) Digital channels (D MSO models only)					
Trigger modes	None, auto, repeat, single, rapid (segmented memory)					
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	< 0.7 µs at 1 GS/s sampling rate					
Maximum trigger rate	Up to 10 000 waveforms in a 6 ms burst at 1 GS/s sampling rate, typical					
Triggering for analog channels						
Advanced trigger types	Edge, window, pulse width, window pulse width, dropout, window dropout, interval, logic, runt pulse					
Trigger types (ETS mode)	Rising edge, falling edge (available on channel A only)					
Trigger sensitivity	Digital triggering provides 1 LSB accuracy up to full bandwidth of scope					
Trigger sensitivity (ETS mode)	10 mV p-p at full bandwidth, typical					
External trigger input - D models only						
Ext trigger connector type	Front panel BNC					
Trigger types	Edge, pulse width, dropout, interval, logic					
Input characteristics	1 MΩ ‖ 14 pF					
Bandwidth	50 MHz		70 MHz		100 MHz	
Threshold range	±5 V					
Coupling	DC					
Overvoltage protection	±100 V (DC + AC peak)					
Triggering for digital channels - D MSO models only						
Trigger types	Pattern, edge, combined pattern and edge, pulse width, dropout, interval, logic					

	PicoScope 3203D and 3203D MSO	PicoScope 3403D and 3403D MSO	PicoScope 3204D and 3204D MSO	PicoScope 3404D and 3404D MSO	PicoScope 3205D and 3205D MSO	Pi 34 340
Function generator						
Standard output signals	Sine, square, triangle, DC voltage, ramp up, ramp down, sinc, Gaussian, half-sine.					
Pseudorandom output signals	White noise, selectable amplitude and offset within output voltage range. Pseudorandom binary sequence (PRBS), selectable high and low levels within output voltage range, selectable bit					
Standard signal frequency	DC to 1 MHz					
Sweep modes	Up, down, dual with selectable start/stop frequencies and increments					
Triggering	Free-run, or from 1 to 1 billion counted waveform cycles or frequency sweeps. Triggered from scope trigger or m					
Output frequency accuracy	As oscilloscope					
Output frequency resolution	< 0.01 Hz					
Output voltage range	±2 V					
Output voltage adjustments	Signal amplitude and offset adjustable in approximately 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, typical					
Output resistance	600 Ω					
Connector type	Front panel BNC (**D models**) Rear panel BNC (**D MSO models**)					
Overvoltage protection	±20 V					
Arbitrary waveform generator						
Update rate	20 MHz					
Buffer size	32 kS					
Resolution	12 bits (output step size approximately 1 mV)					
Bandwidth	> 1 MHz					
Rise time (10% to 90%)	< 120 ns					
Additional AWG specifications, including sweep modes, triggering, frequency accuracy, frequency resolution, voltage range, DC accuracy, and oth						
Probe compensation pin						
Output impedance	600 Ω					
Output frequency	1 kHz					
Output level	2 V p-p, typical					

	PicoScope 3203D and 3203D MSO	PicoScope 3403D and 3403D MSO	PicoScope 3204D and 3204D MSO	PicoScope 3404D and 3404D MSO	PicoScope 3205D and 3205D MSO	Pi 34 340
Spectrum analyzer						
Frequency range	DC to maximum bandwidth of scope					
Display modes	Magnitude, average, peak hold					
Y axis	Logarithmic (dbV, dBu, dBm, arbitrary dB) or linear (volts)					
X axis	Linear or logarithmic					
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, highpass, lowpass, band					
Operands	All analog and digital input channels, reference waveforms, time, constants, π					
Automatic measurements (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,					
Statistics	Minimum, maximum, average, standard deviation					
Serial decoding						
Protocols	CAN, FlexRay, I²C, I²S, LIN, SPI, UART/RS-232, USB					
Mask limit testing						
Statistics	Pass/fail, failure count, total count					
Display						
Interpolation	Linear or sin(x)/x					
Persistence modes	Digital color, analog intensity, fast, advanced					

	PicoScope 3203D and 3203D MSO	PicoScope 3403D and 3403D MSO	PicoScope 3204D and 3204D MSO	PicoScope 3404D and 3404D MSO	PicoScope 3205D and 3205D MSO	Pi 34 340
General						
PC connectivity	USB 3.0 SuperSpeed (USB 2.0 compatible)					
PC connector type	USB 3.0 type B					
Power requirements	Powered from a single USB 3.0 port or two USB 2.0 ports (dual cable supplied). 4-channel models: AC adaptor included for use with USB ports that supply less than 1200 mA					
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					
Altitude range	Up to 2000 m					
Pollution degree	Pollution degree 2					
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 Microsoft Windows XP (SP3), Windows Vista, Windows 7 or Windows 8 (not Windows RT), 3 SDKs and example programs (C, Visual Basic, Excel VBA, LabVIEW) for Windows.					
Optional free software	PicoScope 6 Beta and SDKs for Linux and Mac OS X.					
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, Hunga 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
Probe compensation pin

USB port
Earth terminal

4-channel models

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

Earth terminal
USB port
DC power input

2-channel MSO models

Ch A
Ch B
16 digital inputs
Probe compensation pin

AWG and function generator
USB port
Earth terminal

4-channel MSO models

Ch A
Ch B
Ch C
Ch D
16 digital inputs
Probe compensation pin

AWG and function generator
Earth terminal
USB port
DC power input

Kit contents

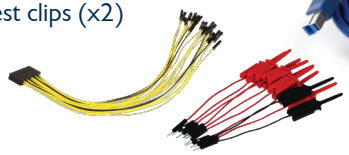
All PicoScope 3000 Series oscilloscope kits contain:

- PicoScope 3000 Series oscilloscope
- Switchable x1/x10 probes (2 or 4)
- Quick Start Guide
- Software and reference CD
- USB 3.0 cable
- Double-headed USB 2.0 cable
- AC power adaptor (4-channel models only)

MSO kit contents

PicoScope 3000D MSO kits also contain:

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



Probes

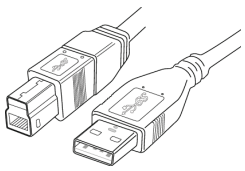
All PicoScope 3000 Series oscilloscopes are supplied with two or four probes (to match the number of analog channels), which are chosen to obtain the specified system bandwidth. See the table below for more information on which probes are included and how to order additional probes.

Order code	Description	PicoScope models supplied with
MI007	60 MHz x1/x10, 1.2 m probe	50 MHz models
TA132	150 MHz x1/x10, 1.2 m probe	70 MHz and 100 MHz models
TA131	250 MHz x1/x10, 1.2 m probe	200 MHz models

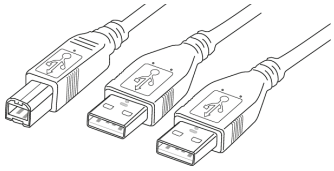
USB connectivity and power

All PicoScope 3000 Series oscilloscopes are supplied with a USB 3.0 cable for SuperSpeed connectivity. A double-headed USB 2.0 cable is also supplied, to provide additional power when using the oscilloscope with older PCs.

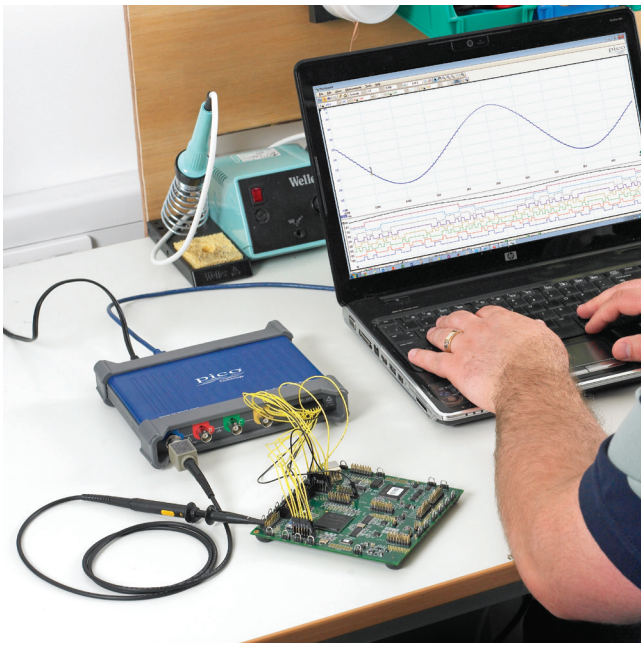
For PicoScope 3000 models with 4 analog channels, the supplied AC power adaptor may be required if the USB port(s) provide less than at total of 1200 mA to the instrument.



USB 3.0 cable



USB 2.0 cable, double-headed



Ordering information

Order code	Model number	Description
PP958	PicoScope 3203D	50 MHz 2-channel oscilloscope
PP956	PicoScope 3203D MSO	50 MHz 2-channel mixed-signal oscilloscope
PP959	PicoScope 3204D	70 MHz 2-channel oscilloscope
PP931	PicoScope 3204D MSO	70 MHz 2-channel mixed-signal oscilloscope
PP960	PicoScope 3205D	100 MHz 2-channel oscilloscope
PP932	PicoScope 3205D MSO	100 MHz 2-channel mixed-signal oscilloscope
PP961	PicoScope 3206D	200 MHz 2-channel oscilloscope
PP933	PicoScope 3206D MSO	200 MHz 2-channel mixed-signal oscilloscope
PP962	PicoScope 3403D	50 MHz 4-channel oscilloscope
PP957	PicoScope 3403D MSO	50 MHz 4-channel mixed-signal oscilloscope
PP963	PicoScope 3404D	70 MHz 4-channel oscilloscope
PP934	PicoScope 3404D MSO	70 MHz 4-channel mixed-signal oscilloscope
PP964	PicoScope 3405D	100 MHz 4-channel oscilloscope
PP935	PicoScope 3405D MSO	100 MHz 4-channel mixed-signal oscilloscope
PP965	PicoScope 3406D	200 MHz 4-channel oscilloscope
PP936	PicoScope 3406D MSO	200 MHz 4-channel mixed-signal oscilloscope

More oscilloscopes in the PicoScope range...

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Ultra-compact and handheld

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PicoScope 5000 Series
Flexible resolution 8 to 16 bits

PicoScope 6000 Series
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PicoScope 9000 Series
Sampling scopes and TDR to 20 GHz

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