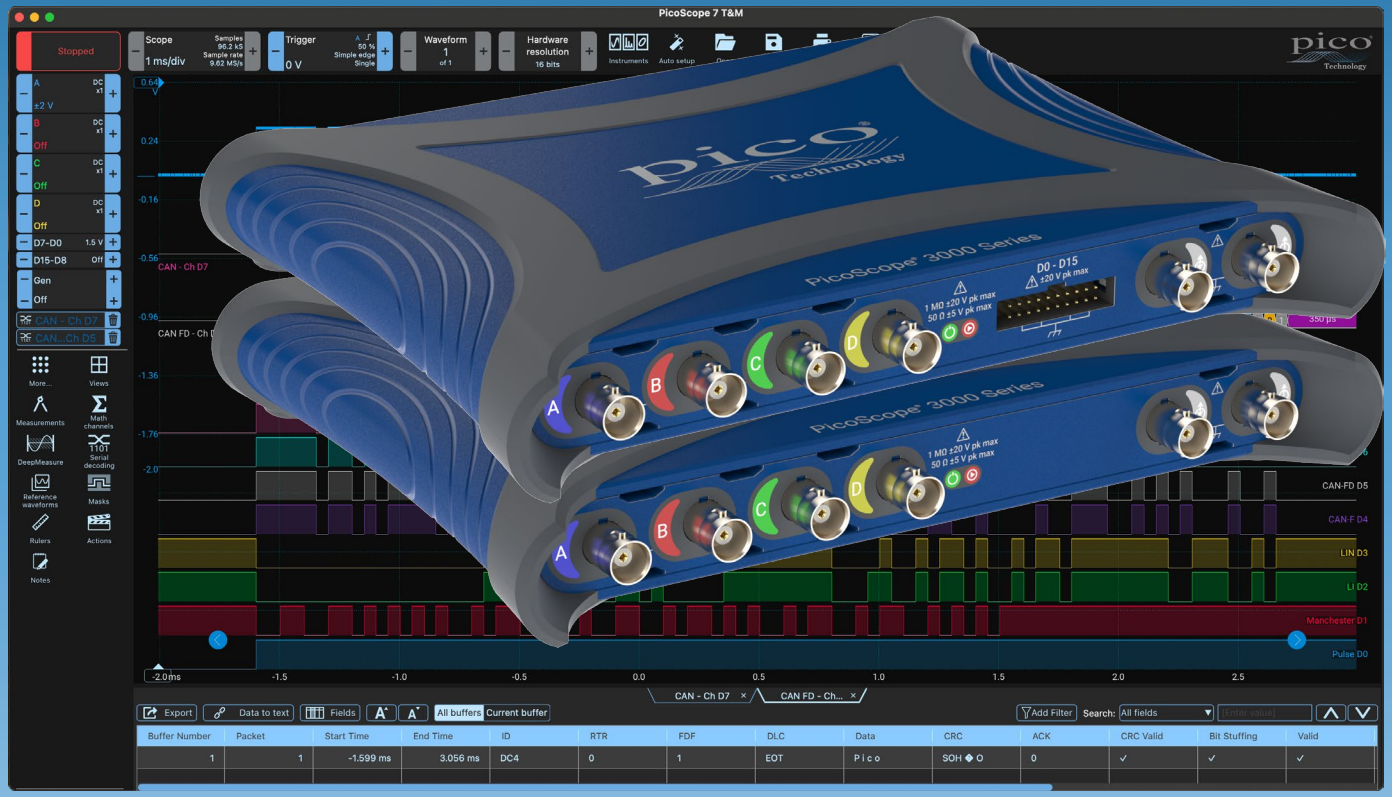
PicoScope® 3000E Series

Up to 500 MHz, 5 GS/s, USB powered PC oscilloscopes and MSOs

Where power and performance meet portability



- 100, 200, 350 or 500 MHz with 5 GS/s
- Up to 10-bit resolution (14 bits using enhanced resolution)
- 2 GS ultra-deep capture memory
- 16 digital channels (on MSO models)
- Function/arbitrary waveform generator included
- Compact, portable and USB powered
- Over 40 serial protocol decoders included as standard
- Segmented memory, persistence and fast waveform updates
- Advanced math, measurements, masks and digital triggering
- PicoScope 7 for Windows®, macOS® & Linux® with free updates
- Support for LabView®, MATLAB® and writing your own code
- 5-year warranty and free technical support

www.picotech.com

Product overview

The PicoScope 3000E Series redefines PC-based oscilloscopes with up to 500 MHz bandwidth and 5 GS/s in a compact, portable, USB-powered package.

PicoScope 3000E oscilloscopes are small, portable and deliver high-performance specifications ideal for engineers working on advanced electronics and diverse embedded system technologies, either in the laboratory or on the move. Offering four analog channels with a choice of 100 MHz, 200 MHz, 350 MHz and 500 MHz bandwidth options, plus 16 digital logic analyzer channels on MSO models, there's a model to suit every application and budget.

Supported by the advanced PicoScope 7 Test and Measurement software, the PicoScope 3000E Series enables the rapid, cost-effective debugging and performance validation of complex analog and power electronic designs. It also offers an ideal package for many other applications, including embedded systems design, research, testing, education, service and repair.

High bandwidth, high sampling rate, deep memory

With compact size, low cost and input bandwidths up to 500 MHz, there is no compromise on performance. This bandwidth is matched by a real-time sampling rate of up to 5 GS/s, enabling detailed display of high frequency signal detail.

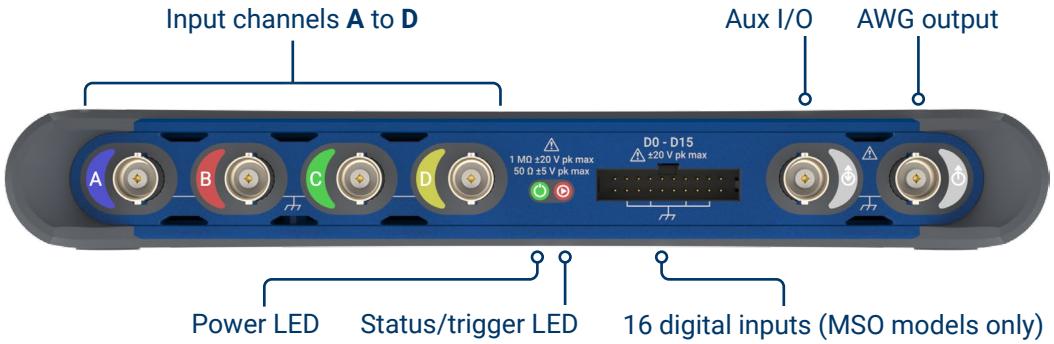
Many other oscilloscopes have high maximum sampling rates, but without deep memory they cannot sustain these rates on long timebases. The PicoScope 3000E Series offers up to 2 GS of capture memory, enabling the 500 MHz PicoScope 3418E to sample at 5 GS/s all the way down to 20 ms/div (200 ms total capture time).

The PicoScope 3000E Series includes a range of powerful tools to make the most of this huge waveform memory. Easy-to-use zoom functions let you zoom and reposition the display by simply dragging with the mouse or touchscreen. The SuperSpeed USB 3.0 interface and hardware acceleration ensure that the display is smooth and responsive while still letting you see every glitch in huge waveforms.

Memory segmentation lets you capture thousands of waveforms in quick succession and view them in the waveform buffer navigator, filtering them using criteria such as mask limit testing or measurement limits to drill down to the waveforms you need to see. More advanced tools such as serial decoding and DeepMeasure™ work to analyze data packets or events across all waveform buffers in the deep memory, making the PicoScope 3000E Series some of the most capable oscilloscopes on the market.

PicoScope 3000E Series inputs, outputs and indicators

Front panel



Rear panel

Channel trace color indicators

The colored indicators next to each BNC input channel automatically adapt when you customize trace colors displayed on the screen — aiding channel identification for error-free waveform interpretation.

SuperSpeed® USB-C® connection

PicoScope 3000E Series instruments feature a USB-C SuperSpeed connection to the host computer, providing lightning-fast saving of waveforms and power for the scope with a single USB-C cable. To retain compatibility with older USB standards a USB-A to USB-C cable is also supplied, along with an external power adaptor for use with USB ports which can't supply the full power requirements of the scope.

PicoSDK® supports continuous USB streaming to the host computer at rates of over 300 MS/s.

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.

Signal fidelity and quality

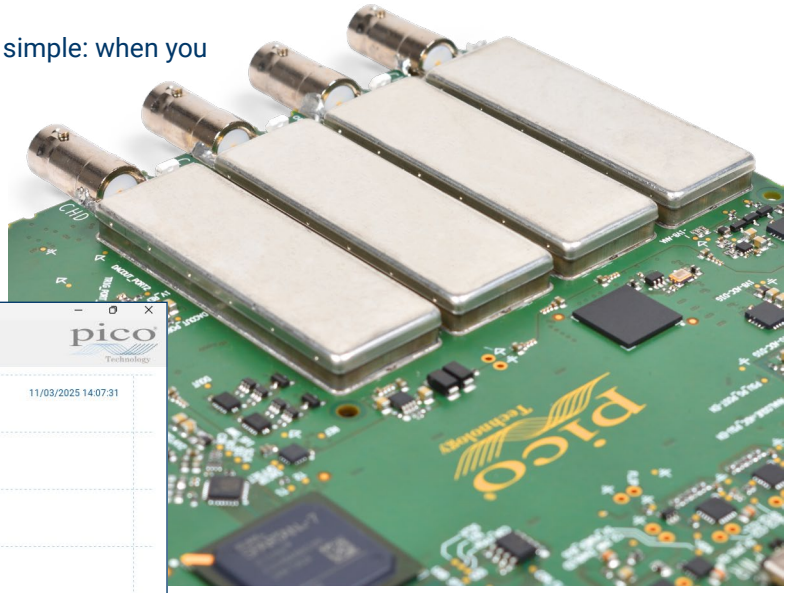
Most oscilloscopes are built down to a price. PicoScopes are built up to a specification. Careful front-end design and shielding reduces noise, crosstalk and harmonic distortion.

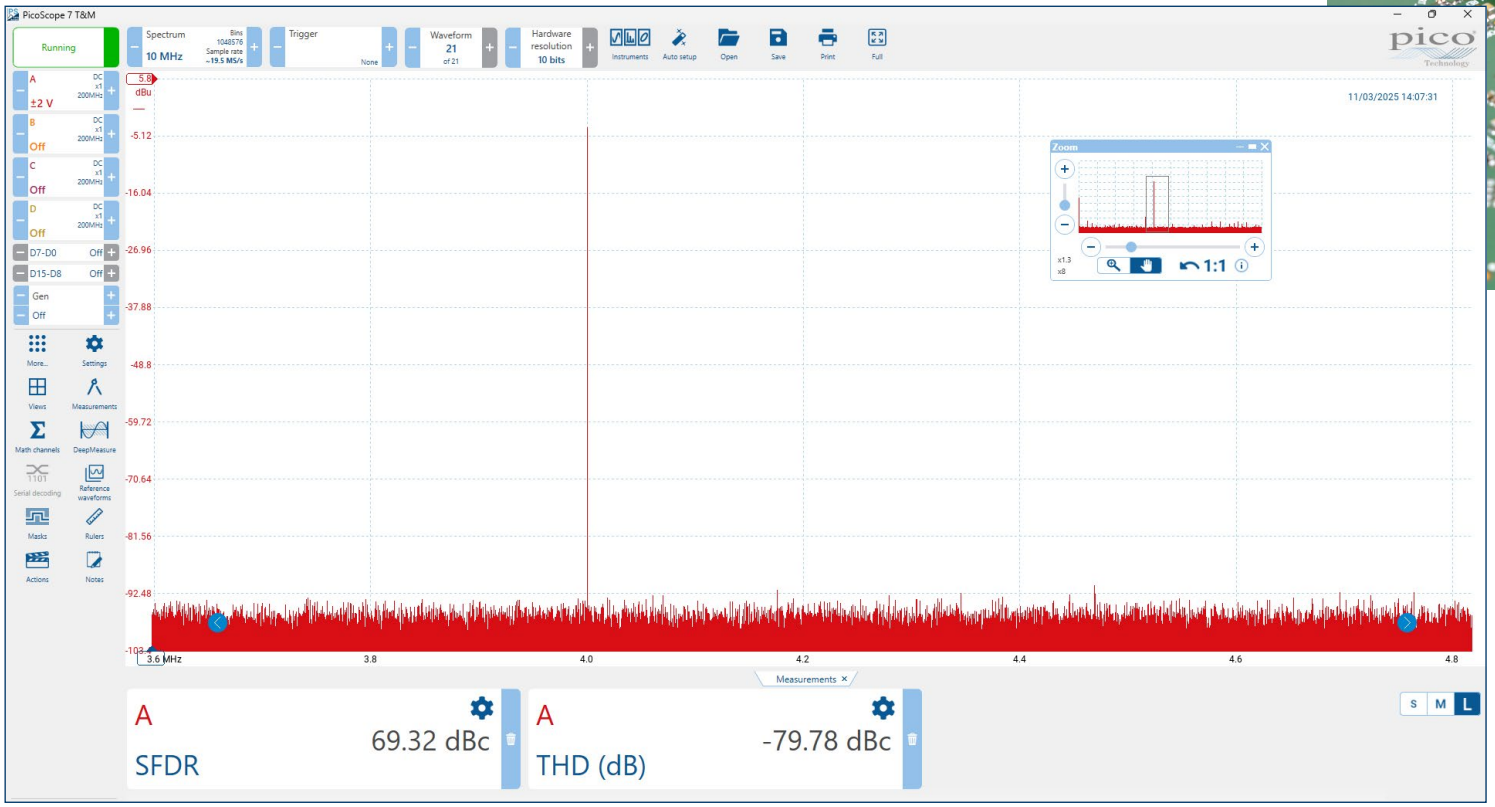
Years of oscilloscope design experience can be seen in the PicoScope 3000E Series with improved bandwidth flatness, 60 dBc SFDR, low distortion and a typical channel-to-channel isolation ratio better then 500:1 at full bandwidth. This represents a notable improvement over other oscilloscope manufacturers, who can't match these specifications, or often resort to not publishing them at all.

To ensure precision, high accuracy and repeatability, all processing of sampled data — both on-board the PicoScope 3000E and in software — is carried out with at least 16 bits resolution regardless of the ADC resolution mode in use. This means that when using functions like math channels, interpolation, filtering or resolution enhancement, you can really see the extra detail revealed in your signal.

We are proud of the dynamic performance of our products, and publish our specifications in detail. The result is simple: when you probe a circuit, you can trust in the waveform you see on the screen.

The PicoScope 3000E Series: unique performance and a 5-year warranty!



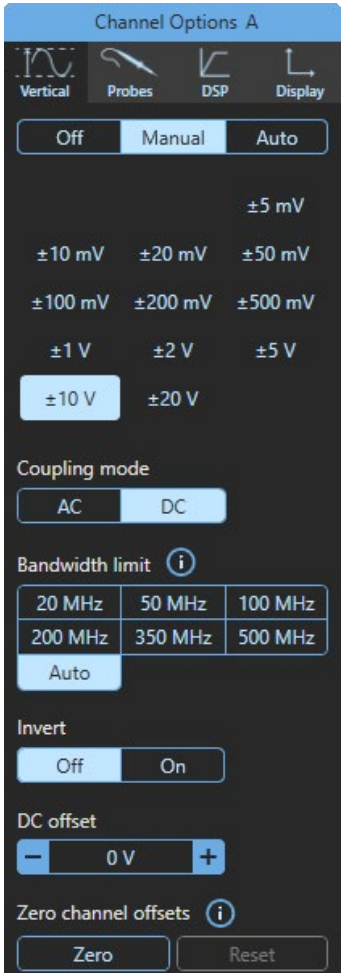


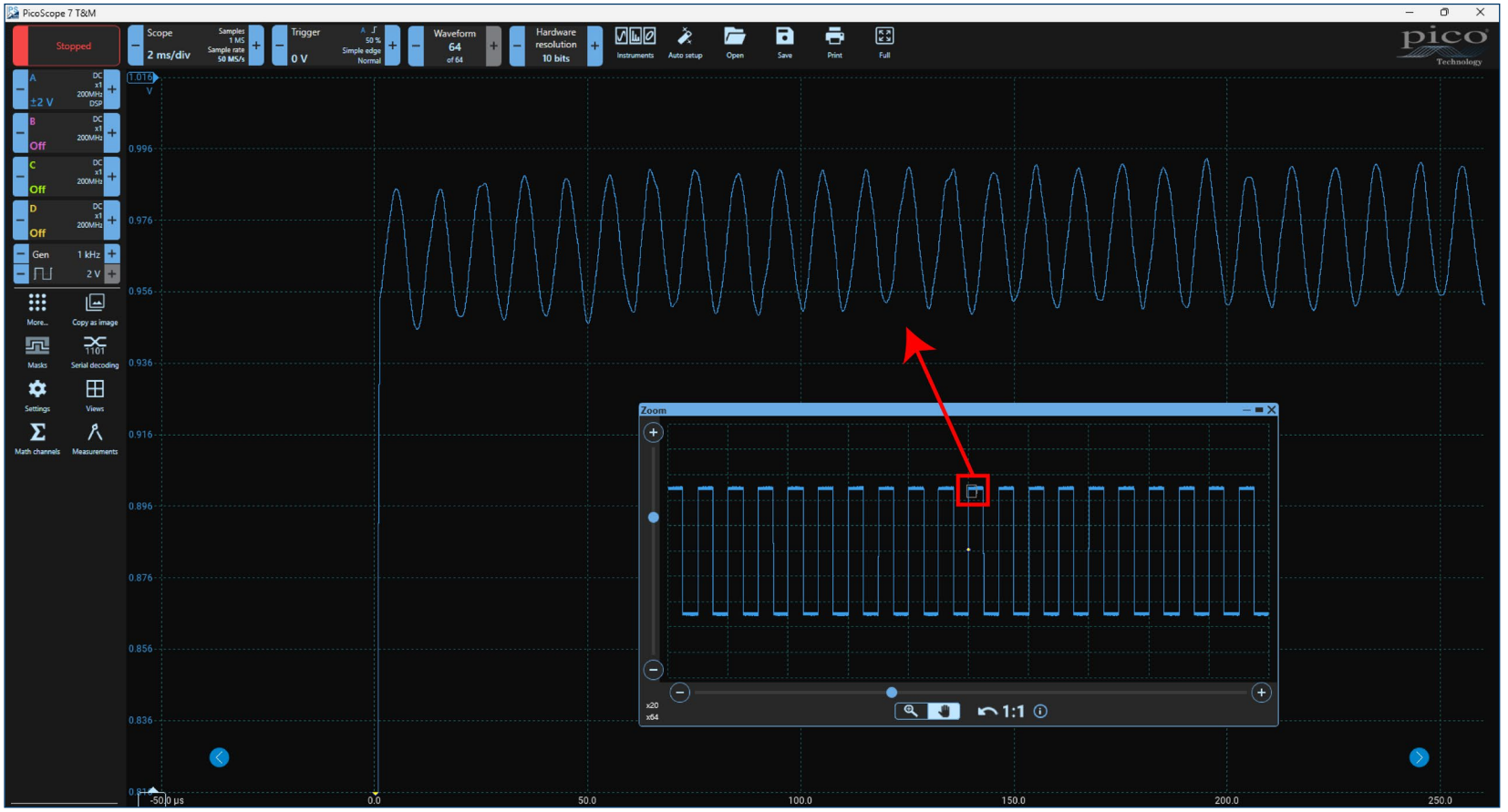
High resolution for low-level signals

With their 8- to 14-bit resolution (with resolution enhance), the PicoScope 3000E can display low-level signals at high zoom factors. This allows you to view and measure features such as noise and ripple superimposed on larger DC or low-frequency voltages, as shown in the image. It shows a 100 kHz sine wave injected onto a 1 kHz square wave, viewed with enhancement to 14-bit resolution. Although the ripple is riding on a signal that is fifty times its size, the high resolution and deep memory of the PicoScope 3000E allow you to zoom in to see, and measure, every detail.

Powerful software filters (low-pass, high-pass, band-pass and band-stop) and resolution enhance can be used on top of hardware bandwidth filters in the instrument itself to further reveal signal details. The PicoScope 3000E Series not only has a much wider set of hardware bandwidth filters than other scopes, but they're also more effective as they apply both an analog and digital filter in the device itself for optimal noise reduction.

The wide range of hardware and software filters and resolution enhancement, on top of true 10-bit hardware resolution, ensures you can always see every detail of your signal with the PicoScope 3000E Series.



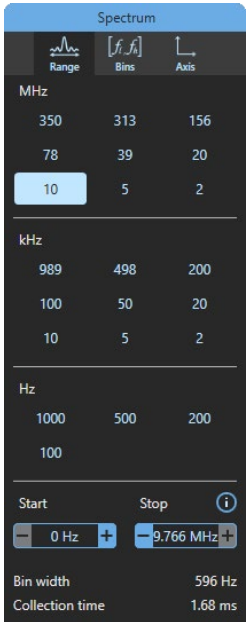


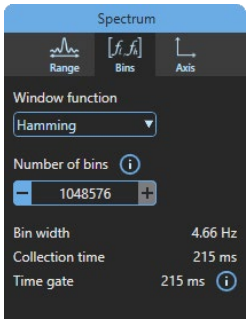
100 kHz ripple on a 1 kHz square wave, with resolution enhancement to 14 bits

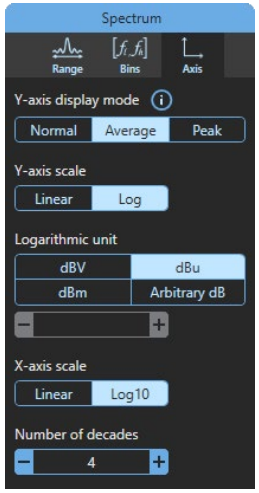
FFT spectrum analyzer

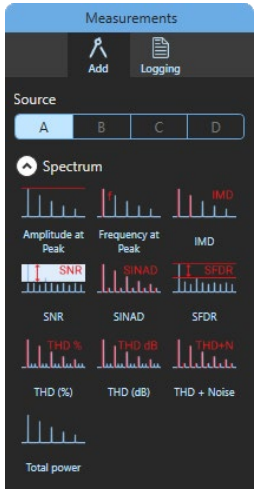
The spectrum view plots amplitude against frequency and is ideal for finding noise, crosstalk or distortion in signals. The spectrum analyzer in PicoScope is of the Fast Fourier Transform (FFT) type which, unlike a traditional swept spectrum analyzer, can display the spectrum of a single, non-repeating waveform. With up to a million points, PicoScope's FFT has excellent frequency resolution and a low noise floor.

With a click of a button, you can display a spectrum plot of the active channels, with a maximum frequency up to the bandwidth of your scope. You can display multiple spectrum views alongside oscilloscope 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. A mask limit test can be applied to a spectrum and you can even use the AWG and spectrum mode together to perform swept scalar network analysis.

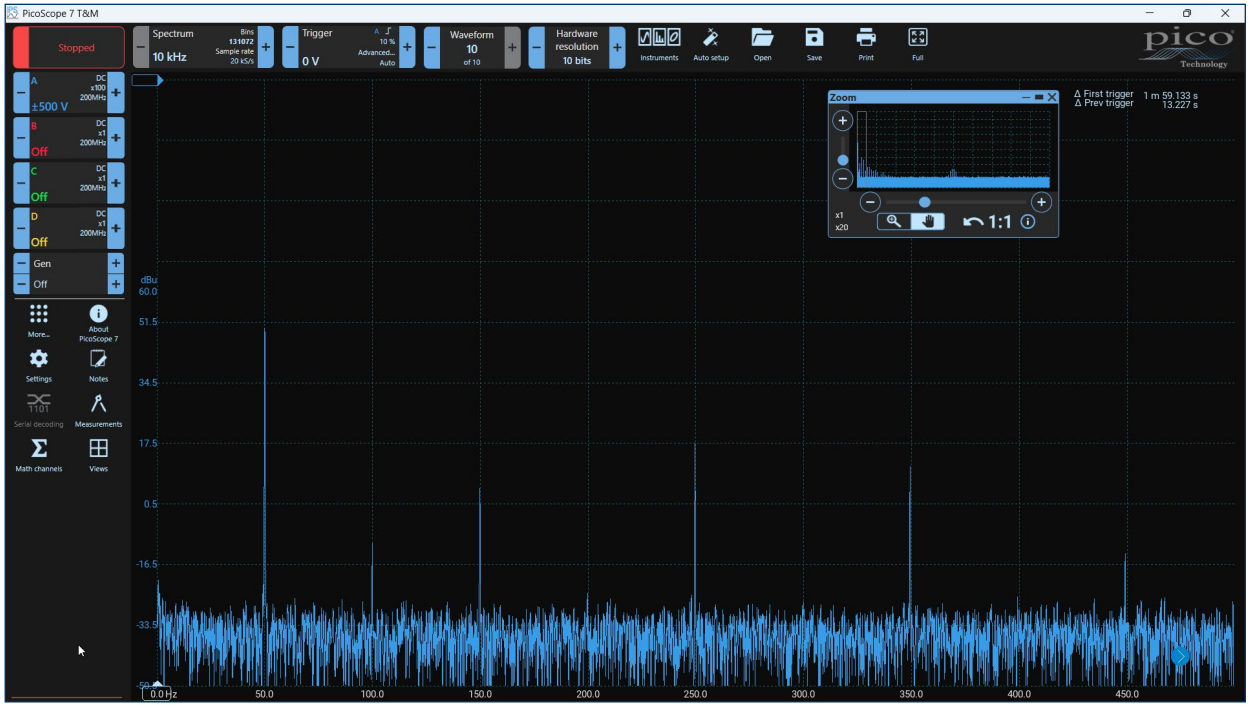








A full range of settings gives you control over the number of spectrum bands (FFT bins), scaling (including log/log) and display modes (instantaneous, average, or peak-hold). A selection of window functions allow you to optimize for selectivity, accuracy or dynamic range.

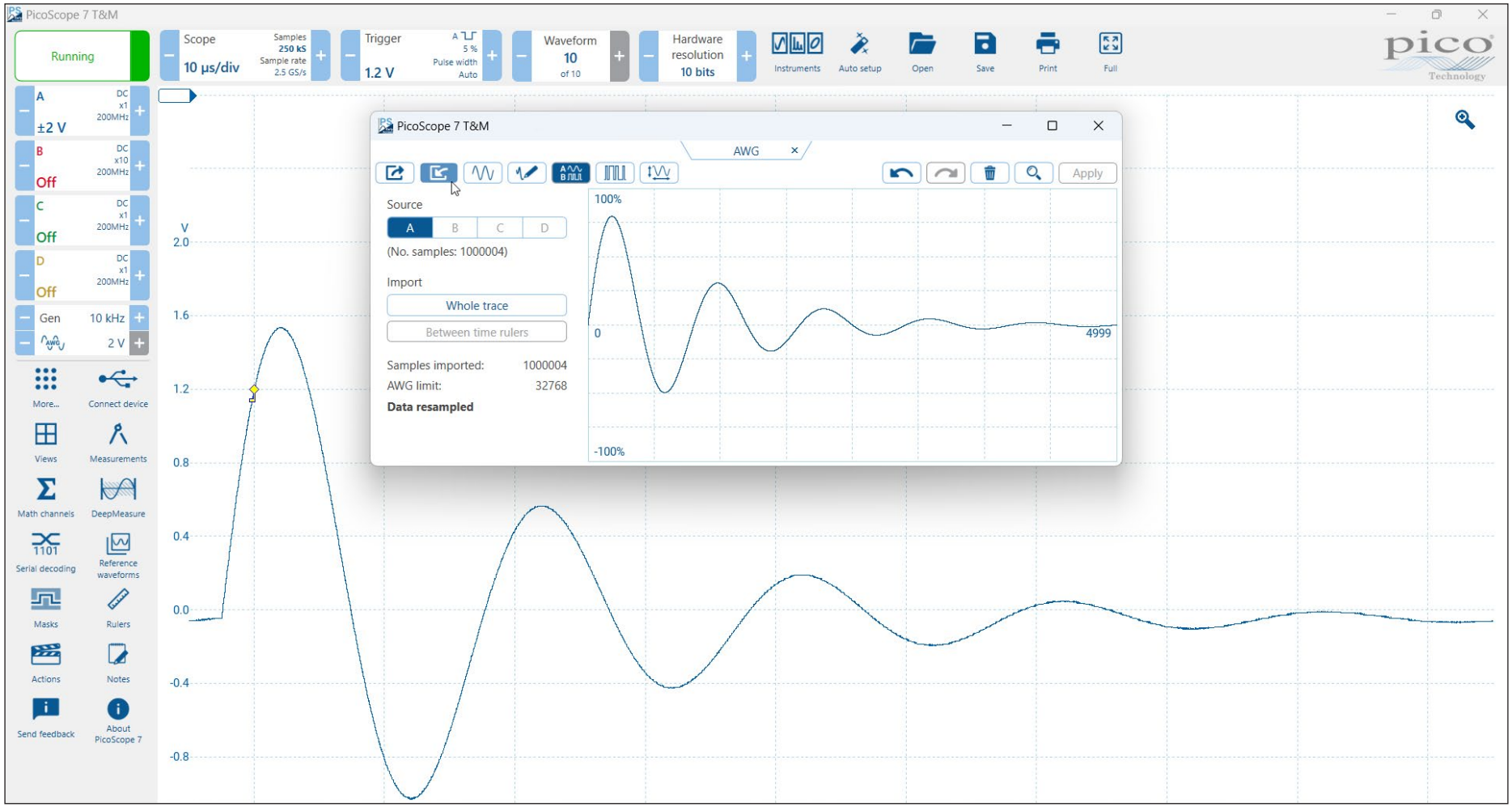


Arbitrary waveform and function generator

All PicoScope 3000E models have a built-in function generator covering the frequency range from 100 µHz to 20 MHz. As well as basic controls to set level, offset and frequency, more advanced controls allow you to sweep over a range of frequencies. Combined with the spectrum peak-hold option, this makes a powerful tool for testing amplifier and filter responses.

Trigger tools allow one or more cycles of a waveform to be output when various conditions are met, such as the scope triggering, a trigger event on the aux input, or a mask limit test failing.

All models also include a 14-bit 200 MS/s arbitrary waveform generator (AWG). AWG waveforms can be created or edited using the built-in editor, imported from oscilloscope traces, loaded from a spreadsheet or exported to a CSV file.



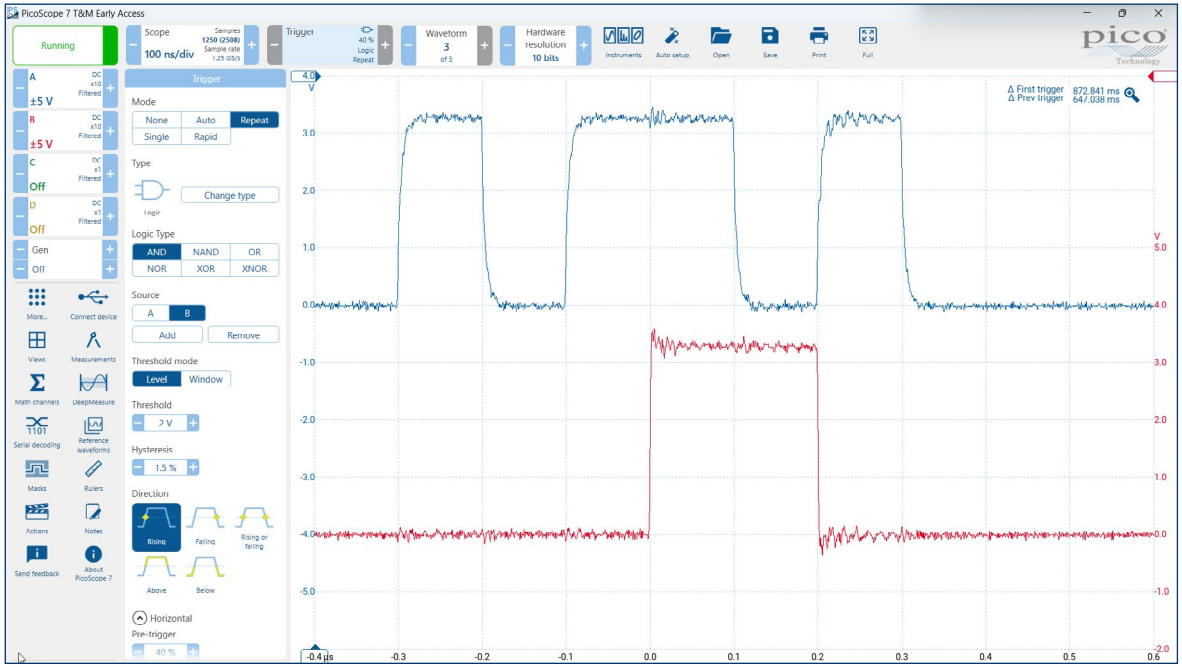
Digital triggering architecture

Many digital oscilloscopes still use a trigger architecture based on analog comparators. This causes time and amplitude errors that cannot always be calibrated out and often limits the trigger sensitivity at high bandwidths.

In 1991, Pico set an innovation milestone by pioneering full digital triggering using the actual digitized data, which reduces trigger errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth.

All real-time triggering is digital, resulting in high threshold resolution with programmable hysteresis and optimal waveform stability.

The reduced rearm delay provided by digital triggering, together with segmented memory, allows the capture of events that happen in rapid sequence. Rapid triggering can capture a new waveform at the fastest timebase every 700 nanoseconds (at an effective rate of 2 million waveforms per second) until the buffer is full.



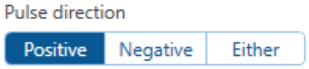
Advanced triggers

The PicoScope 3000E Series offers a set of advanced trigger types including pulse width, runt pulse, windowed, rise/fall time, logic and dropout that function across the full scope bandwidth.

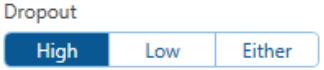
The Pulse width direction control specifies whether you want to trigger on either positive or negative pulses and the dropout trigger control specifies whether to trigger when the signal remains high, low or in either state relative to the threshold.

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

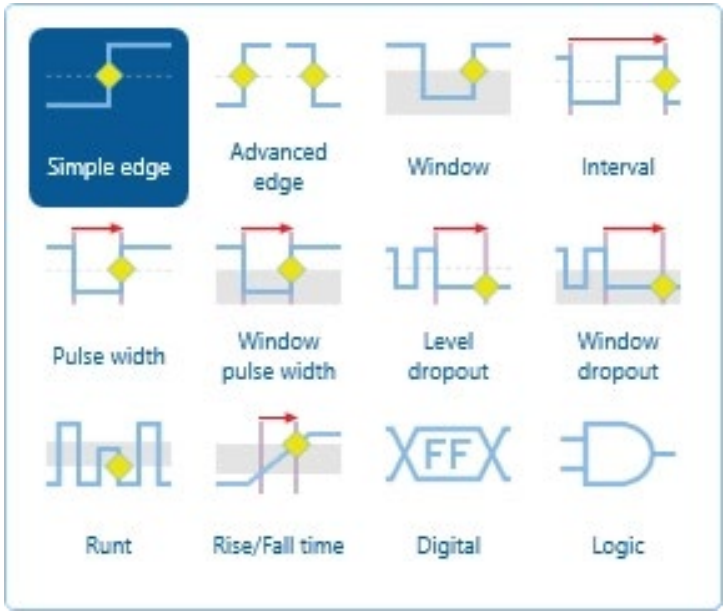
The logic trigger function also allows you to trigger on combinations of edge or window triggers on any of the analog inputs, for example to trigger on edges on channel A only when channel B is also high, or to trigger when any of the four channels goes outside a specified voltage range.



Pulse width direction control in Pulse width Trigger settings



Signal direction control in dropout trigger settings



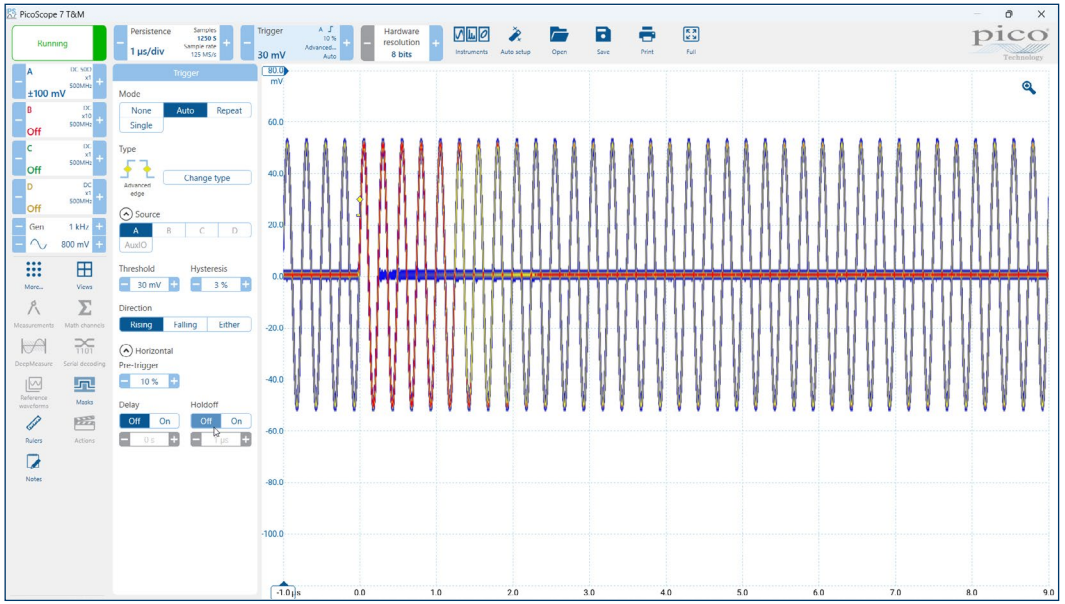
Advanced trigger trigger selection

Trigger holdoff

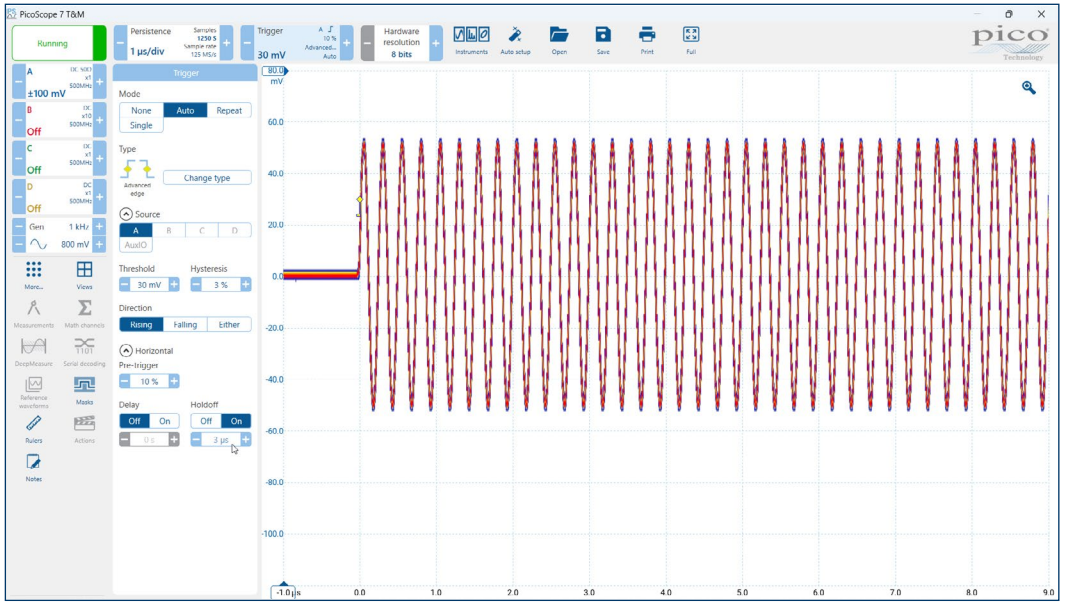
Trigger holdoff is an adjustment to set the delay period after a triggered acquisition, during which the oscilloscope cannot trigger again.

Complex waveforms can be difficult to reliably and repeatably trigger on. For example, when looking at a burst of pulses, the standard edge trigger might fire on any rising edge within the burst. This results in a flickering display of overlaid waveforms that are difficult to view and not meaningful in terms of the behavior of the device under test.

Trigger holdoff allows you to set a period when the scope won't look for further trigger events after each triggered acquisition, effectively extending the oscilloscope dead time between acquisitions. By increasing the holdoff time to greater than the length of the pulse train, you can ensure that the oscilloscope triggers correctly each time as shown below:



Without trigger holdoff, the oscilloscope falsely triggers on downstream pulses in the burst.



With trigger holdoff set appropriately, the oscilloscope triggers correctly on only the first pulse in the burst.

Persistence mode

PicoScope's persistence mode options allow you to see old and new data superimposed, making it easy to spot glitches and dropouts and estimate their relative frequency – useful for displaying and interpreting complex analog signals such as video waveforms and amplitude modulated signals. Color-coding and intensity-grading show which areas are stable and which are intermittent. Choose between **Fast**, **Time** or **Frequency Persistence** types and customizations within each.

An important specification to understand when evaluating oscilloscope performance, especially in persistence mode, is the waveform update rate, which is expressed as waveforms per second. While the sampling rate indicates how frequently the oscilloscope samples the input signal within one waveform or cycle, the waveform update rate refers to how quickly an oscilloscope acquires waveforms.

Oscilloscopes with high waveform update rates provide better visual insight into signal behavior and dramatically increase the probability that the oscilloscope will quickly capture transient anomalies such as jitter, runt pulses and glitches – that you may not even know exist.

The PicoScope 3000E Series' HAL4 hardware acceleration can achieve continuous update rates of 300 000 waveforms per second in fast persistence mode.

Ultra-deep memory

PicoScope 3000E Series oscilloscopes have waveform capture memories of up to 2 gigasamples – many times larger than competing scopes. Deep memory enables the capture of long-duration waveforms at maximum sampling speed. In fact, the PicoScope 3000E Series can capture waveforms 200 ms long with 200 ps resolution.

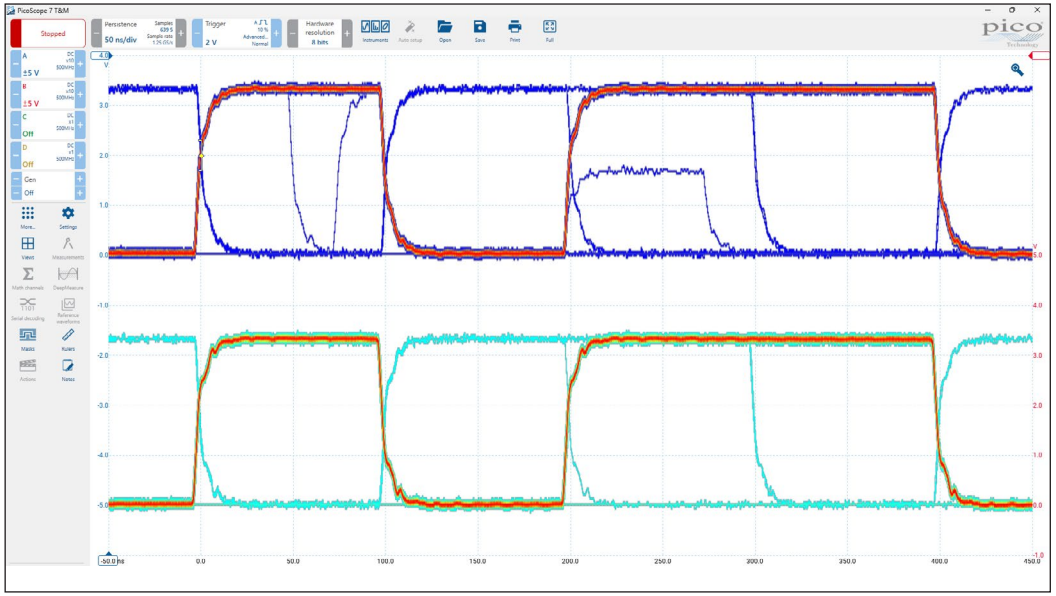
Deep memory is invaluable when you need to capture fast serial data with long gaps between packets, or nanosecond laser pulses spaced milliseconds apart, for example.

It can be useful in other ways too: PicoScope lets you divide the capture memory into a number of segments, up to 40 000. You can set up a trigger condition to store a separate capture in each segment, with as little as 700 ns dead time between captures.

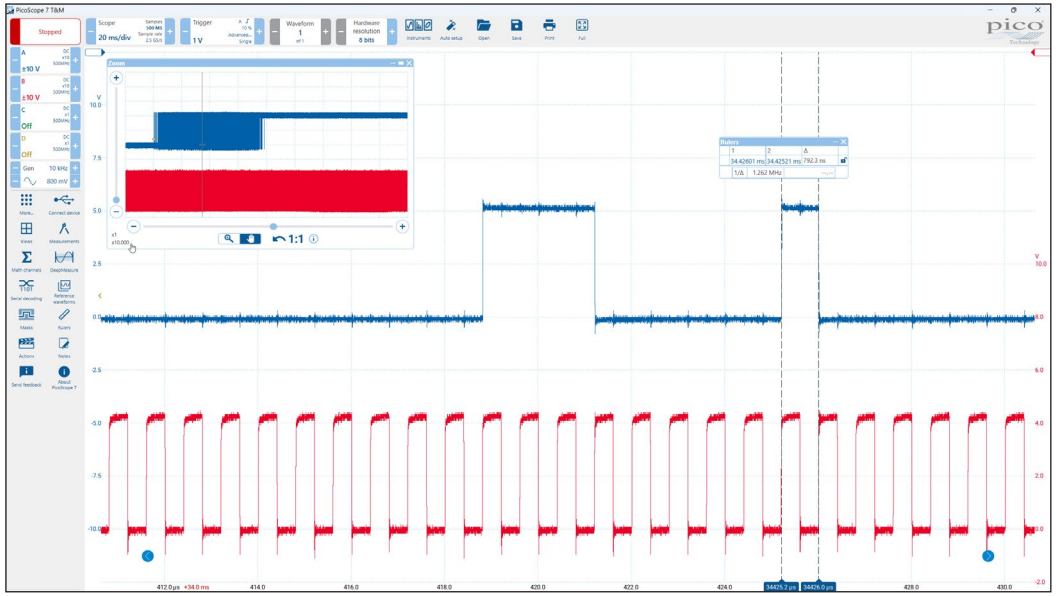
In rapid trigger mode, it is possible to capture 40 000 waveforms in 20 ms, which is an effective capture rate of **2 million waveforms per second**.

Once you have acquired the data, you can step through the memory one segment at a time until you find the event you are looking for.

Powerful tools are included to allow you to manage and examine all of this data. As well as functions such as mask limit testing and DeepMeasure, PicoScope software enables you to zoom into your waveform up to 100 million times. The **Zoom** window allows you to easily control the size and location of the zoom area. Other tools, such as the waveform buffer, serial decoding and hardware acceleration work with the deep memory, making the PicoScope 3000E Series a powerful, compact package.



HAL4 hardware acceleration persistence



Ultra-deep memory: 10000x zoom on a 500 MS capture at 2.5 GS/s

Mixed-signal models

The PicoScope 3000E MSO models add 16 digital channels, enabling you to accurately time-correlate analog and digital signals.

Digital channels may be grouped and displayed as a bus, with each bus value displayed in hex, binary or decimal or as a level (for DAC testing). You can set advanced triggers across both the analog and digital channels.

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

PicoScope 3000E MSO

All MSO models are supplied with the following additional accessories:

20-way 25 cm digital MSO cable

MSO test clips

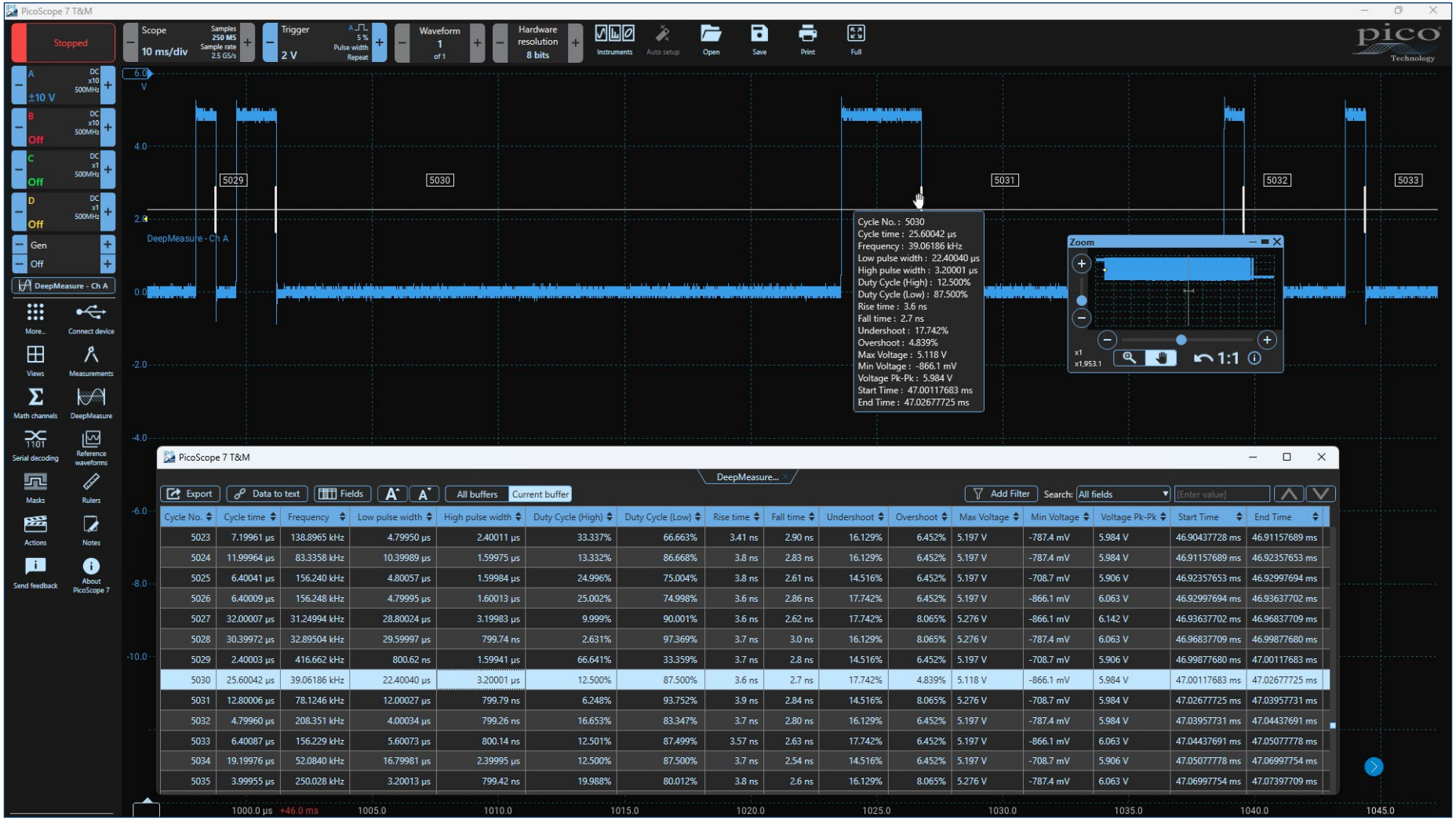
DeepMeasure

One waveform, millions of measurements.

Measurement of waveform pulses and cycles is key to verification of the performance of electrical and electronic devices.

DeepMeasure delivers automatic measurements of important waveform parameters, such as pulse width, rise time and voltage, for every individual cycle in the captured waveforms. Up to a million cycles can be displayed with each triggered acquisition or combined across multiple acquisitions. Results can be easily sorted, analyzed and correlated with the waveform display, or exported as a .CSV file or spreadsheet for further analysis.

For example, use DeepMeasure to capture 40 000 pulses and quickly find those with the largest or smallest amplitude, or use your scope's deep memory to record a million cycles of one waveform and export the rise time of every single edge for statistical analysis.



Serial bus decoding and protocol analysis

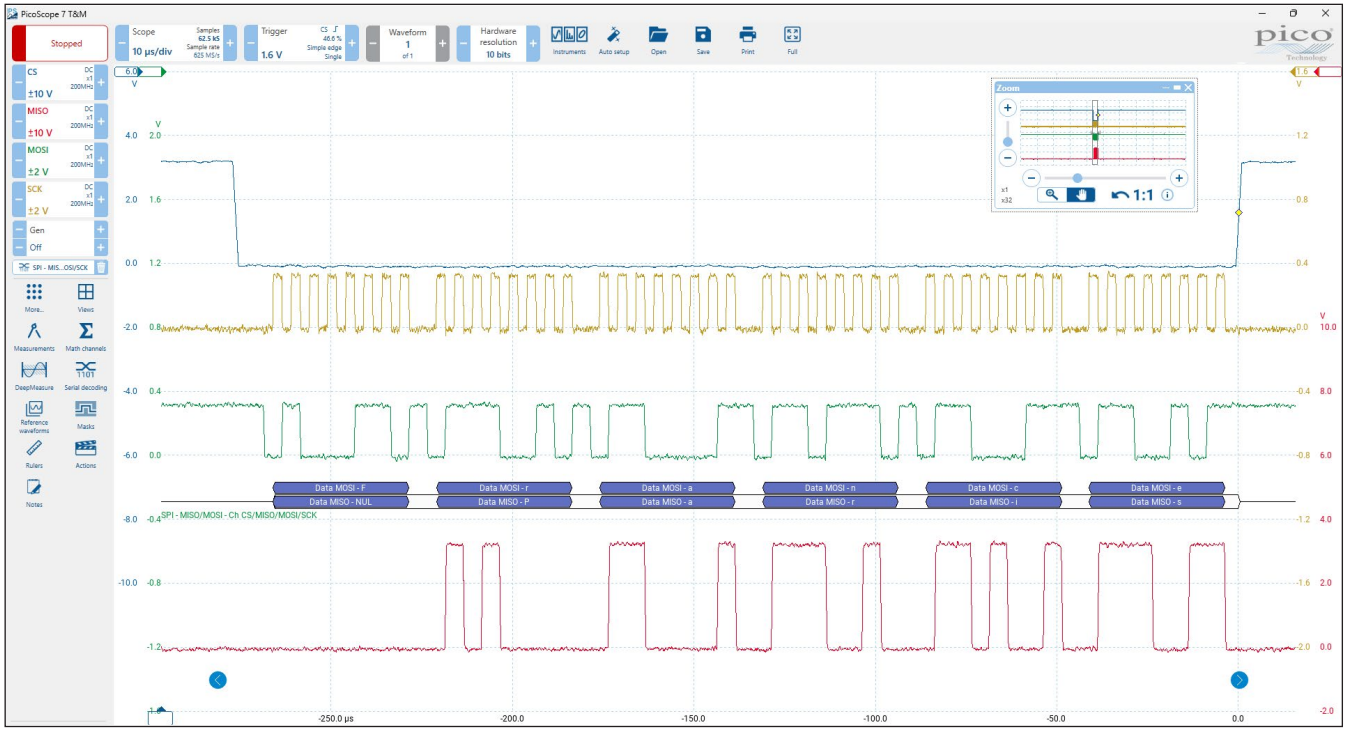
PicoScope can decode 10BASE-T1S, 1-Wire, ARINC 429, BroadRReach, CAN, CAN FD, CAN J1939, CAN XL, DALI, DCC, Differential Manchester, DMX512, Ethernet 10BASE-T, Extended UART, Fast Ethernet 100BASE-TX, FlexRay, I2C, I2S, I3C BASIC v1.0, LIN, Manchester, MIL-STD-1553, MODBUS ASCII, MODBUS RTU, NMEA-0183, Parallel Bus, PMBus, PS/2, PSI5 (Sensor), Quadrature, RS232/UART, SBS Data, SENT Fast, SENT Slow, SENT SPC, SMBus, SPI-MISO/MOSI, SPI-SDIO, USB (1.0/1.1) and Wind Sensor protocol data as standard, with more protocols in development and available in the future with free-of-charge software upgrades.

Graph format shows the decoded data (in hex, binary, decimal or ASCII) in a data-bus timing format beneath the waveform on a common time axis, with error frames marked in red. These frames can be zoomed to investigate noise or signal integrity issues.

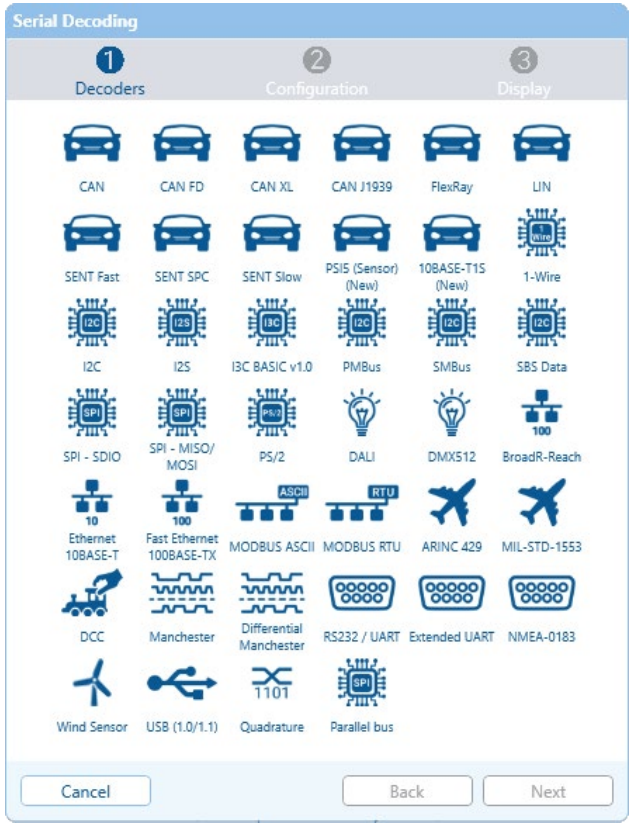
Table format shows a list of the decoded frames, including the data and all flags and identifiers. You can set up filtering conditions to display only the frames you are interested in or search for frames with specified properties. The statistics option reveals more detail about the physical layer such as frame times and voltage levels. Click on a frame in the table to zoom the oscilloscope display and show the waveform for that frame.

PicoScope can also import a "Link File" spreadsheet to decode the data into user-defined text strings. This helps to speed analysis by cross referencing hexadecimal field values into human readable form. So, for example, instead of displaying “Address: 7E” in the Table View, the corresponding text "Set Motor Speed" will be shown instead, or whatever is appropriate. The Link File template with all field headings can be created directly from the serial table toolbar and edited manually as a spreadsheet to apply the cross-reference values.

On MSO models both the analog and digital channels can be used to decode up to 20 channels of serial data, giving you the flexibility to decode multiple buses simultaneously.



SPI interface



40 serial protocol decoders, with more in development

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 and use it to auto-generate a mask and then measure the system under test.

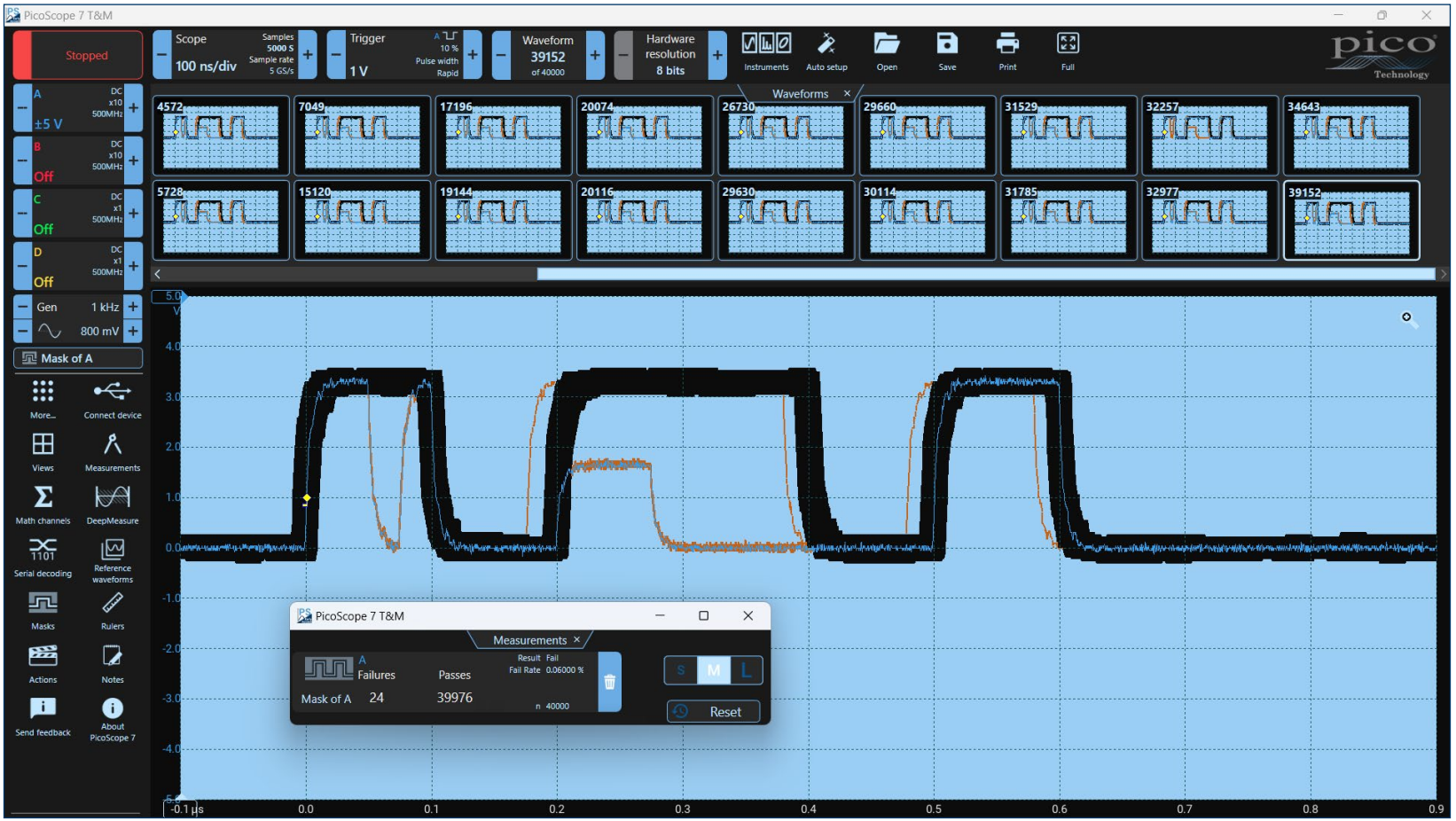
PicoScope will check for mask violations and perform pass/fail testing, capture intermittent glitches and can show a failure count and other statistics in the Measurements window. Masks can be saved in a library for future use, and exported or imported to share with other PicoScope users.

Waveform buffer and navigator

Ever spotted a glitch on a waveform, but by the time you've stopped the scope it has gone? With PicoScope you don't need to worry about missing glitches or other transient events. PicoScope can store the last 40 000 oscilloscope or spectrum waveforms in its circular waveform buffer.

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

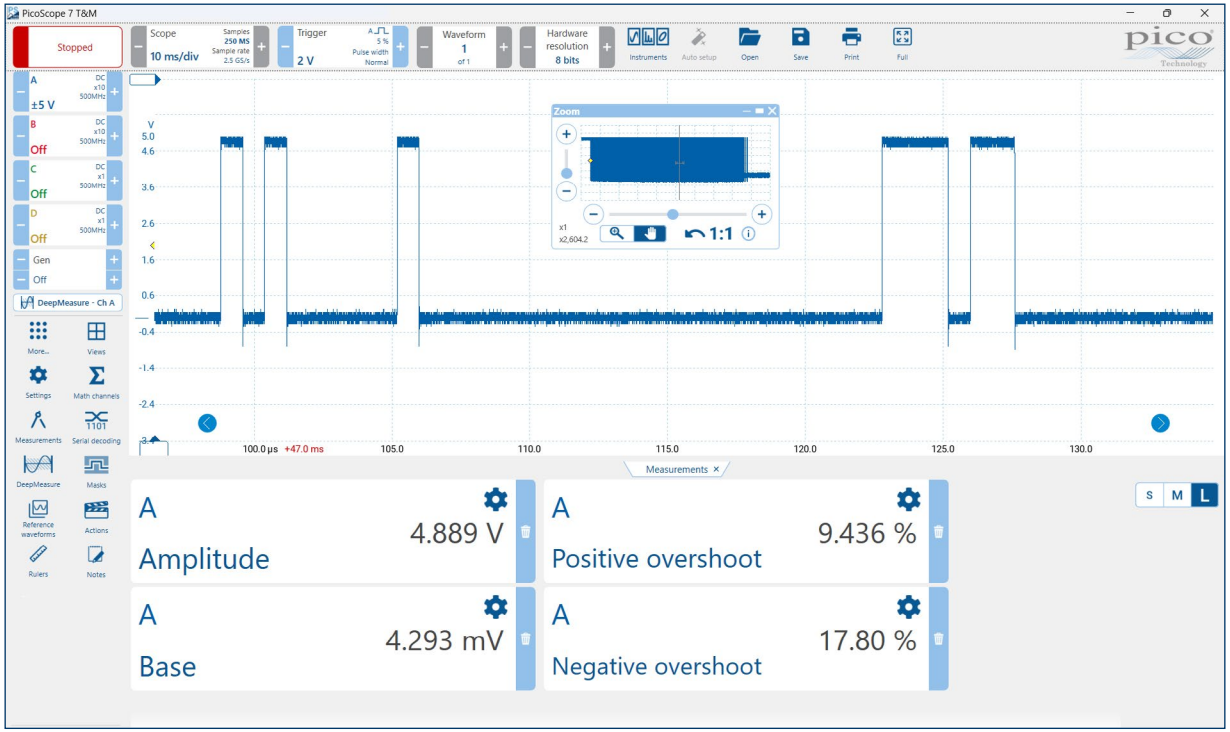
The waveform buffer is also used for rapid trigger mode, where the scope can fill the 40 000-waveform buffer in as little as 20 ms (a rate of 2 million waveforms per second). The waveforms can be processed after capture using the advanced tools included in PicoScope 7, such as mask limit testing, DeepMeasure or serial bus decoding.



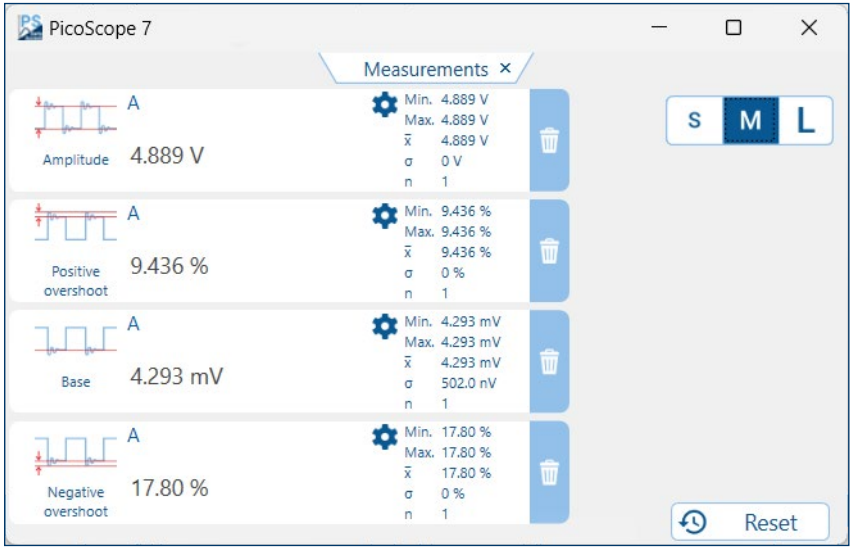
Mask limit testing, up to 40 000 waveforms

Measurements: introduction

PicoScope 7 provides many built-in, pre-defined measurements that can be applied to waveforms displayed on the graph. If the waveform characteristics change over time, the measurements track and display current results based on the live waveform. Statistics can be displayed to show Average (Mean), Maximum, Minimum and Standard Deviation values for the duration of a test.



*Large size measurements display option (**L**).*



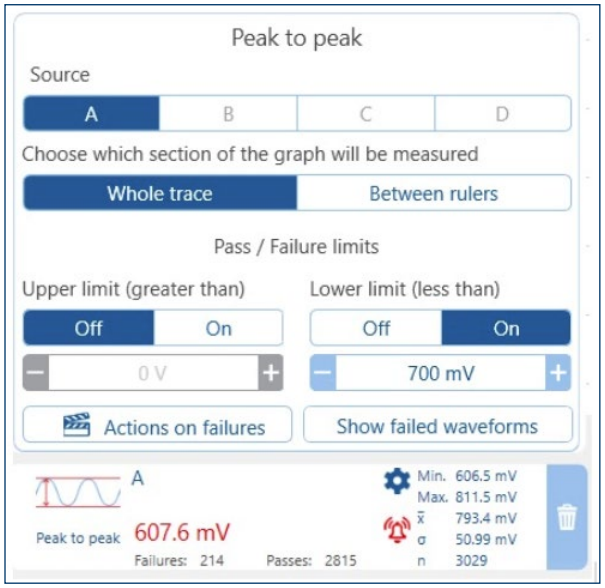
*Medium size measurements display option (**M**) which also shows statistical information.*

Measurements: pass/failure limits

PicoScope software offers pass/failure limits for any measurement. This gives a visual indication within the measurement window whenever the measurement result goes above or below specified values.

Pass/failure limits can be combined with Actions to immediately alert the user or execute other actions when a measurement threshold has been exceeded, either above or below set limits.

By filtering the waveform buffer to show only those waveforms failing a measurement limit, you can quickly identify points of interest out of the thousands of waveforms captured in the deep memory of your PicoScope.

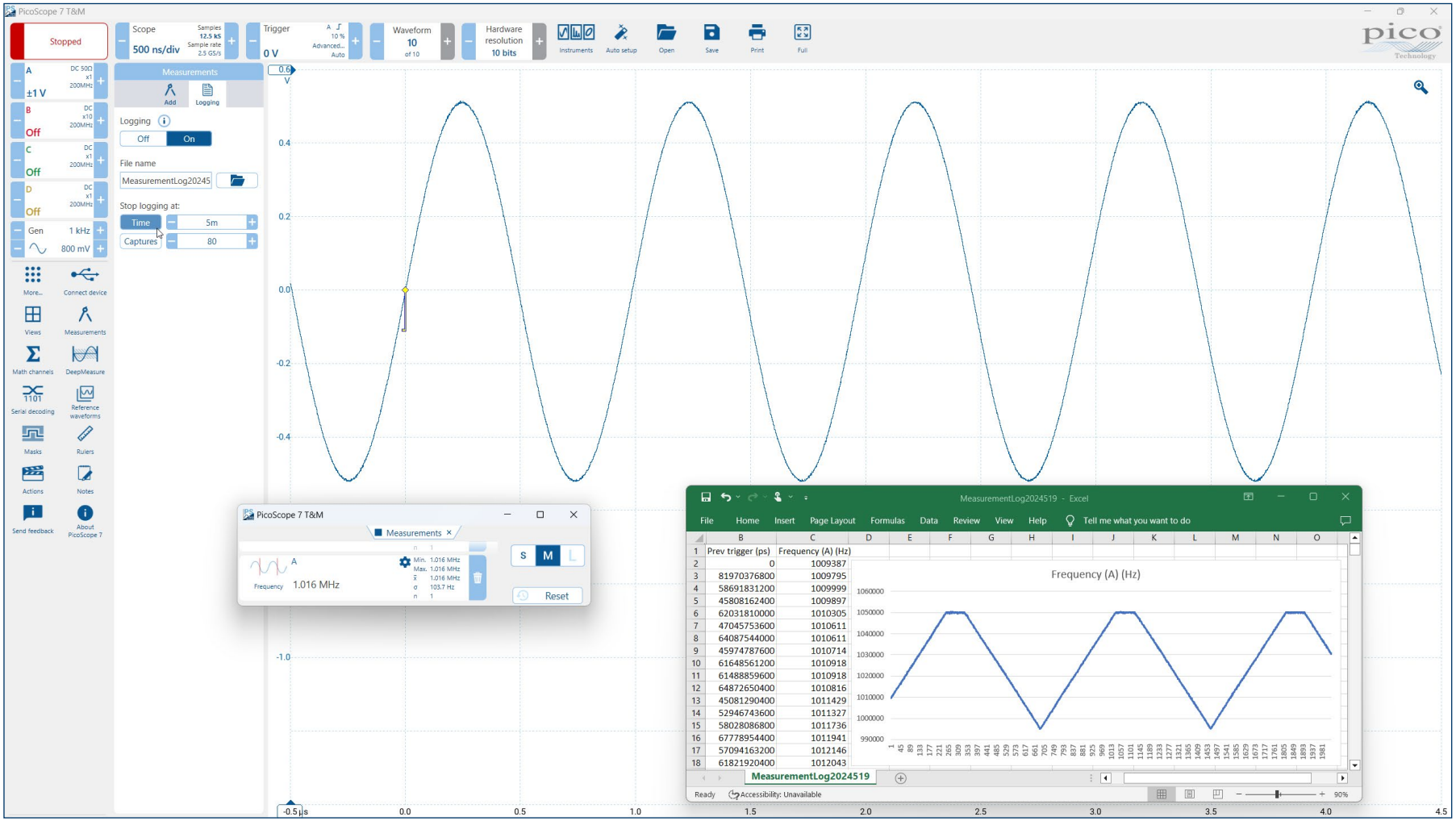


Measurements: logging (trending)

PicoScope allows results of measurements to be recorded to a file for later analysis. The resulting log can be used to characterize the performance of a circuit over medium or long-duration tests – such as when evaluating drift due to thermal and other effects – or can be used to check functionality against an externally controlled variable such as supply voltage.

The maximum number of rows recorded is limited by the user-set constraints or disk capacity.

Read more about Measurements.

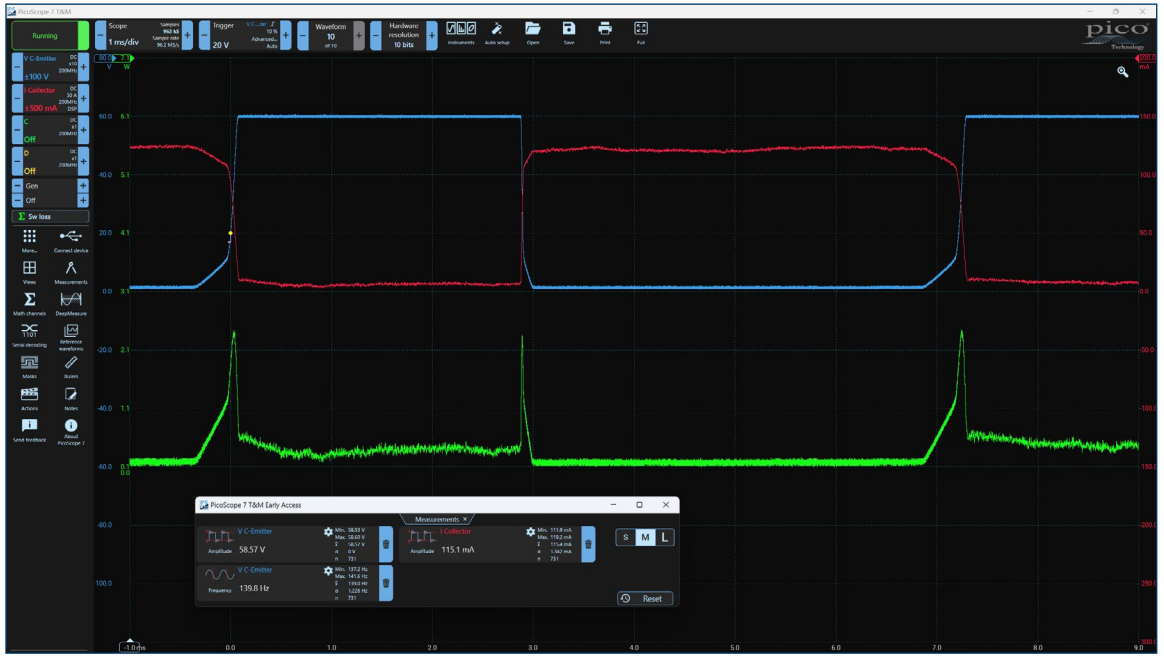


Measurements: power

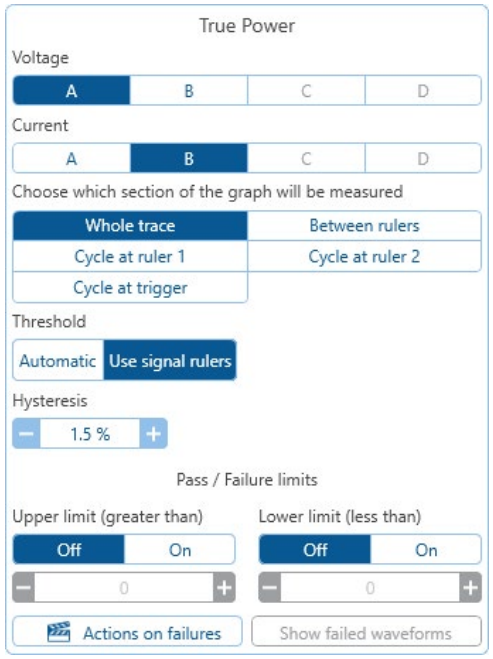
PicoScope software offers a suite of power measurements (with more in development) and associated power math channels which include:

- True power
- Apparent power
- Reactive power
- Power factor
- DC power
- Crest factor
- Area at AC
- +Area at AC
- −Area at AC
- Abs area at AC
- Area at DC
- +Area at DC
- −Area at DC
- Abs area at DC

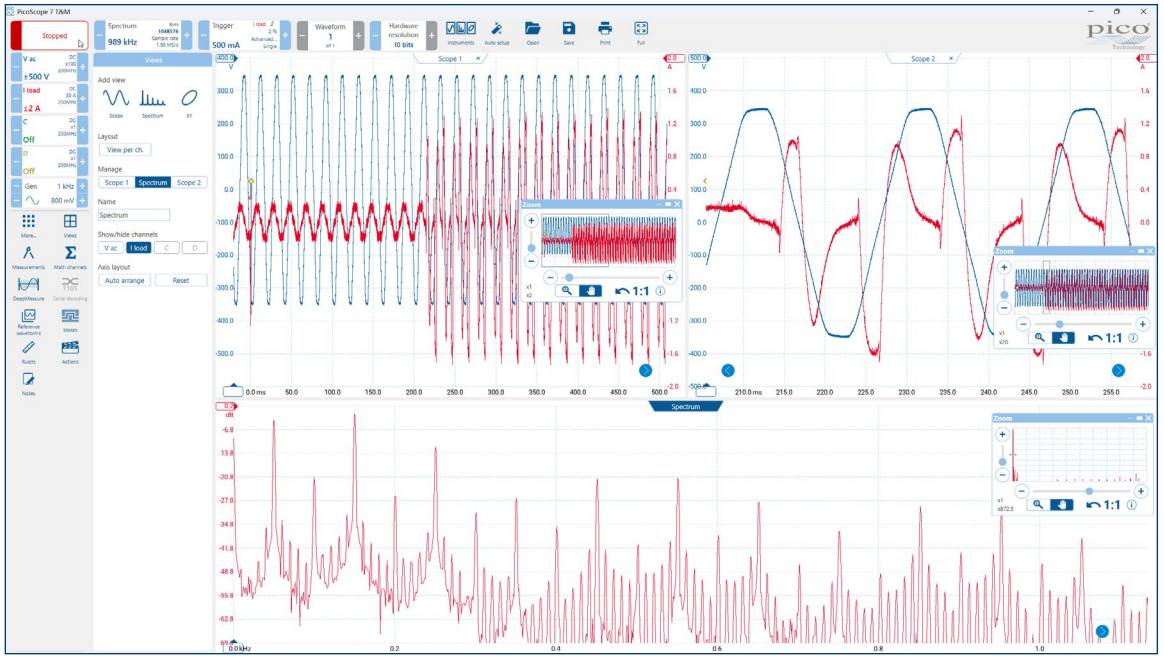
With PicoScope you can graph your power measurements using math channels or display continuous values or statistics on screen using the measurements option.



IGBT (insulated-gate bipolar transistor) switching-loss measurements



True power configuration window



Inductive load power-up sequence

Actions

PicoScope can be programmed to execute actions when certain events occur.

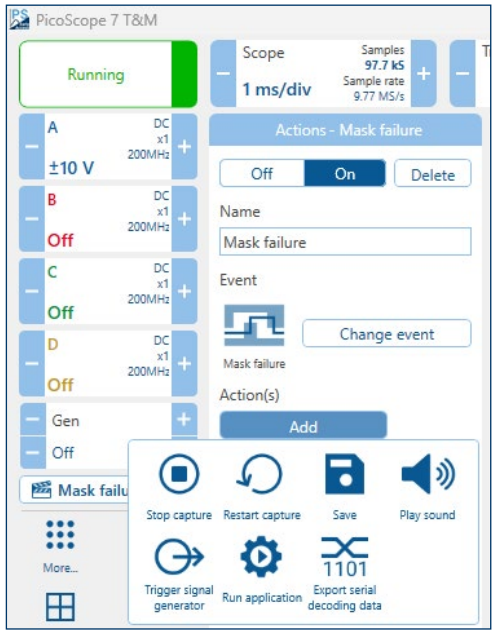
Events that can trigger an action include measurement and mask limit failures, trigger events and buffers full.

The actions that PicoScope can execute include:

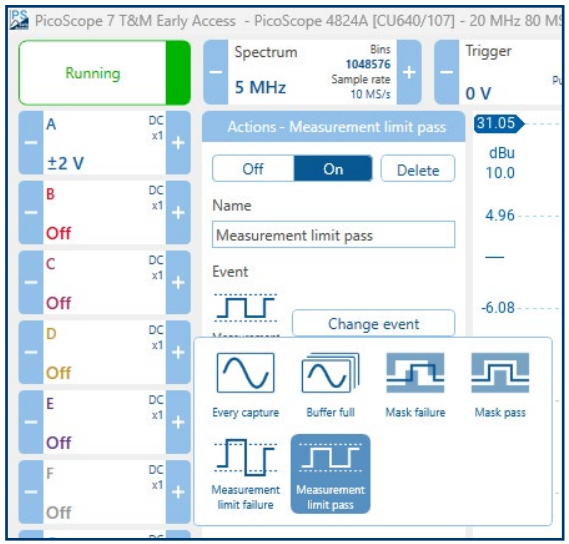
- Stop the capture
- Save waveform to disk in your choice of format including .csv, .png and .matlab
- Play a sound
- Trigger signal generator or AWG
- Run an external application or script
- Export serial-decoded data to a file on disk

Actions, coupled with mask limit testing and measurements, create a powerful and time-saving waveform monitoring tool. Capture a known good signal, autogenerate a mask around it and then use actions to automatically save any waveform (complete with a time/date stamp) that does not meet specification.

But actions aren't limited to mask violations. They can also be triggered when a measurement goes out of range, serving as an automated alarm system for any unexpected deviations. Whether it's logging data, triggering alerts or saving waveforms for further analysis, actions help ensure that no critical event goes unnoticed.



Actions selection



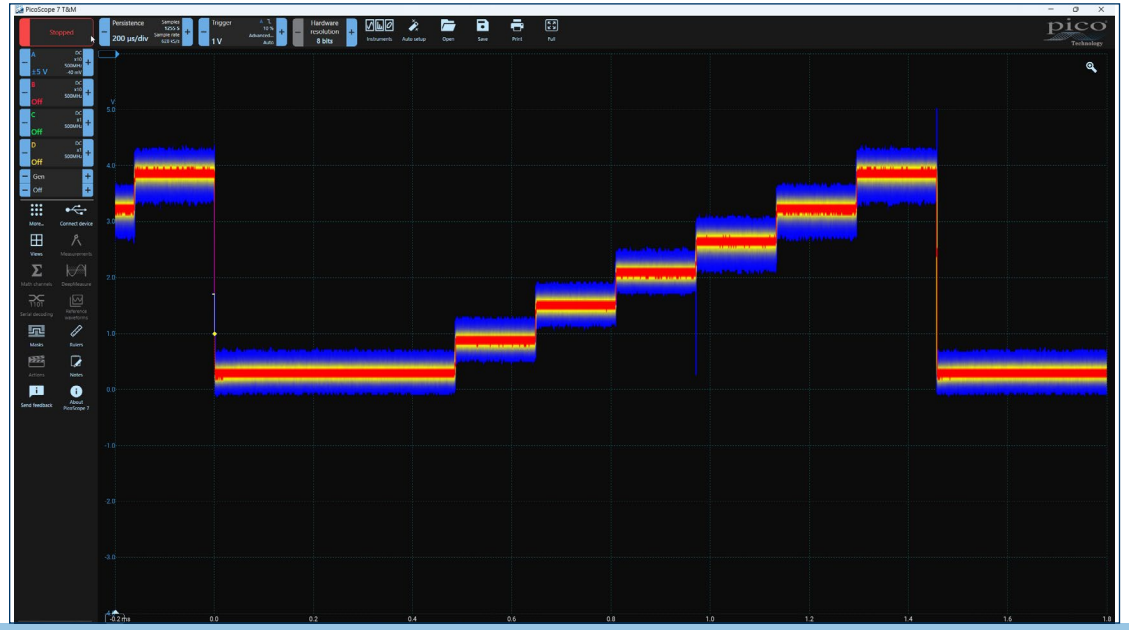
Event selection

Hardware acceleration engine (HAL4)

Some oscilloscopes struggle when you enable deep memory; the screen update rate slows and the controls become unresponsive. The PicoScope 3000E Series avoids this limitation with the use of a dedicated fourth-generation hardware acceleration (HAL4) engine inside the oscilloscope.

Its massively parallel design effectively creates the waveform image to be displayed on the PC screen and allows the continuous capture and display to the screen of up to 2 billion samples every second.

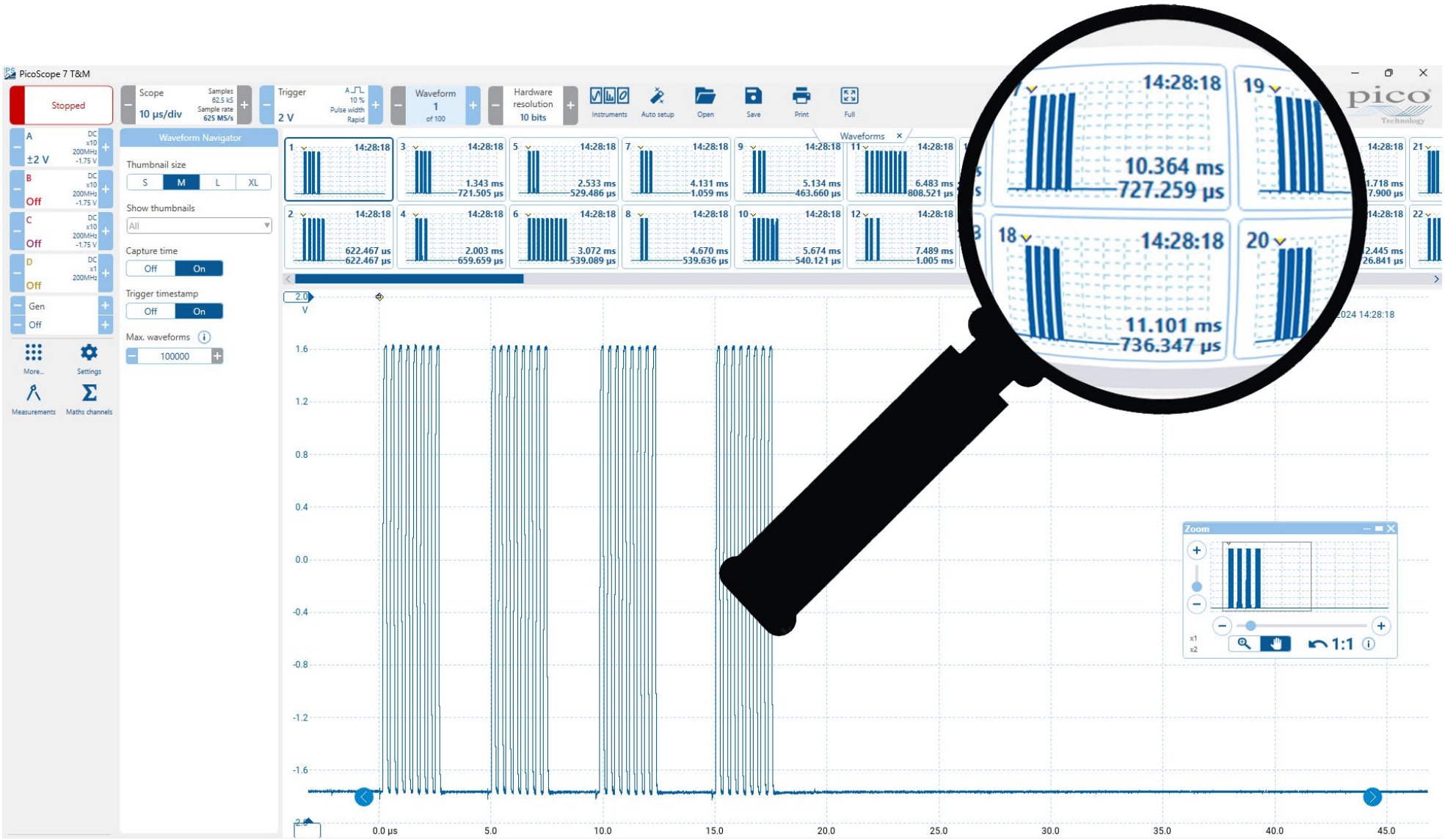
The hardware acceleration engine eliminates any concerns about the USB connection or PC processor performance being a bottleneck.



Time-stamping

The PicoScope 3000E Series features hardware-based trigger time-stamping. Each waveform can be time-stamped with the time in sample intervals from the previous waveform. Rapid trigger rearm times are possible down to < 700 ns (typical).

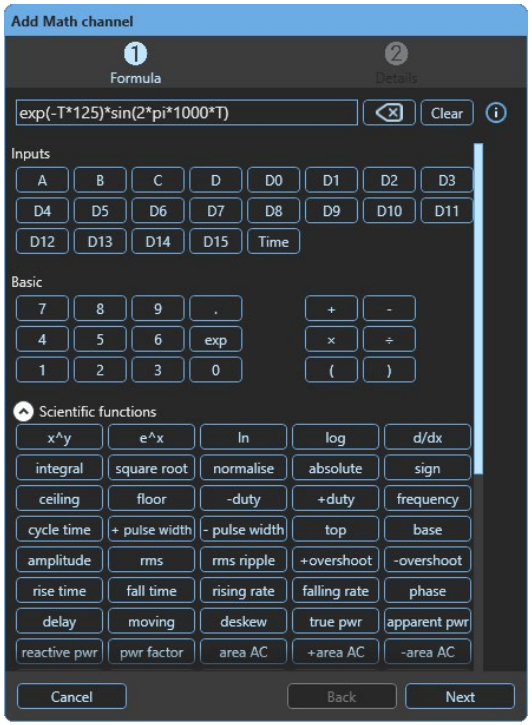
Trigger timestamp controls can be found in the **Waveform Navigator** settings panel (click or tap **Waveform** at the top of the screen).

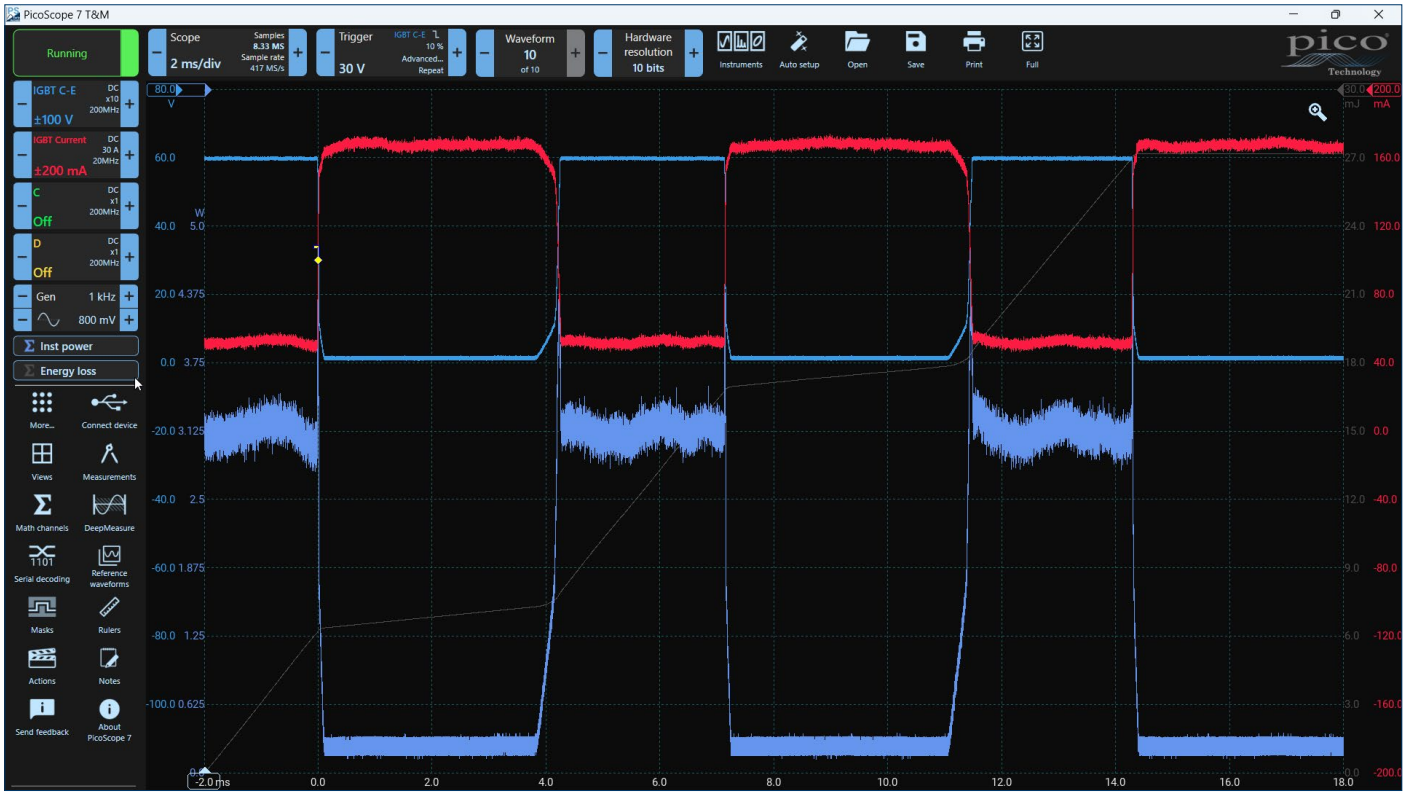


Math channels and filters

PicoScope math channels outperform the competition. You can select simple functions such as addition and inversion, or open the equation editor to create complex functions involving filters (lowpass, highpass, bandpass and bandstop filters), trigonometry, exponentials, logarithms, statistics, integrals and derivatives.

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





Custom probes in PicoScope oscilloscope software

The custom probes feature allows you to correct for gain, attenuation, offsets and nonlinearities in probes, sensors or transducers that you connect to the oscilloscope. This could be used to scale the output of a current probe so that it correctly displays amperes. A more advanced use would be to scale the output of a nonlinear temperature sensor using the table lookup function.

Definitions for standard Pico-supplied oscilloscope probes and current clamps are included. User-created probes may be saved for later use.

Ultra-high-definition display

PicoScope PC-based instruments use the host computer's display, which is typically larger and of higher resolution than the dedicated displays installed in traditional benchtop oscilloscopes. This allows room for simultaneous display of time- and frequency-domain waveforms, decoded serial bus tables, measurement results with statistics and more.

PicoScope software scales automatically to take full advantage of the improved resolution of larger display sizes, including 4K ultra-high-definition models. At 3840 x 2160 resolution — over eight million pixels — PicoScope allows engineers to get more done in less time through split-screen views of multiple channels (or different views of the same channel) from the device under test. As the example shows, the software can even show multiple oscilloscope and spectrum analyzer traces at once.

Large, high-resolution displays really come into their own when viewing high-resolution signals with the PicoScope 3000E Series. With a 4K monitor, PicoScope can display more than ten times the information of traditional scopes, solving the problem of how to match a big display and features with a small-footprint portable oscilloscope.

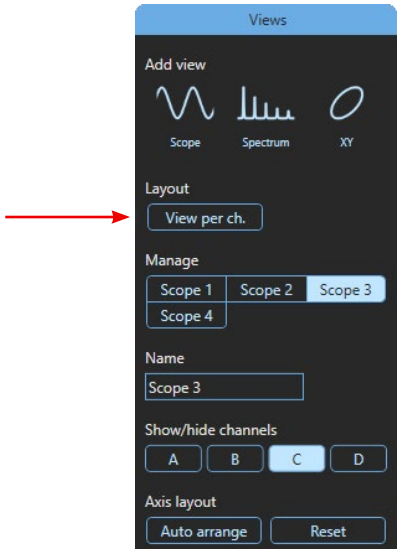
PicoScope also supports dual monitors: instrument control and waveforms displayed on the first, and large data sets from serial protocol decoders or DeepMeasure results on the second. The software can be controlled by mouse or touchscreen.

View per channel option

With view per channel, each channel has its own viewport using the full resolution for each channel.

When multiple channels are active, select the **Views** menu and then **View per ch.**

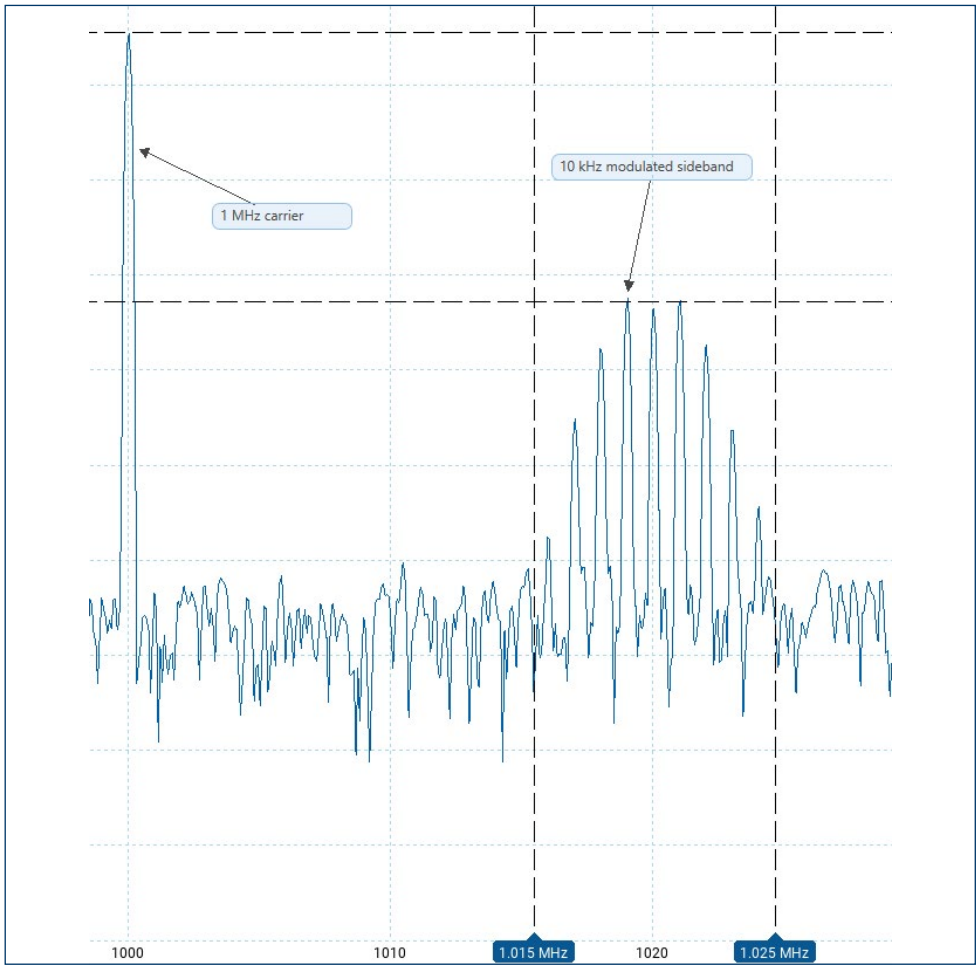
Each channel plot will be displayed in its own view which can be re-arranged to suit your display preferences by dragging each **Scope** tab into your preferred position. You can tesselate each channel view into a grid, or display channels in rows or columns, or in combination.



Waveform annotations

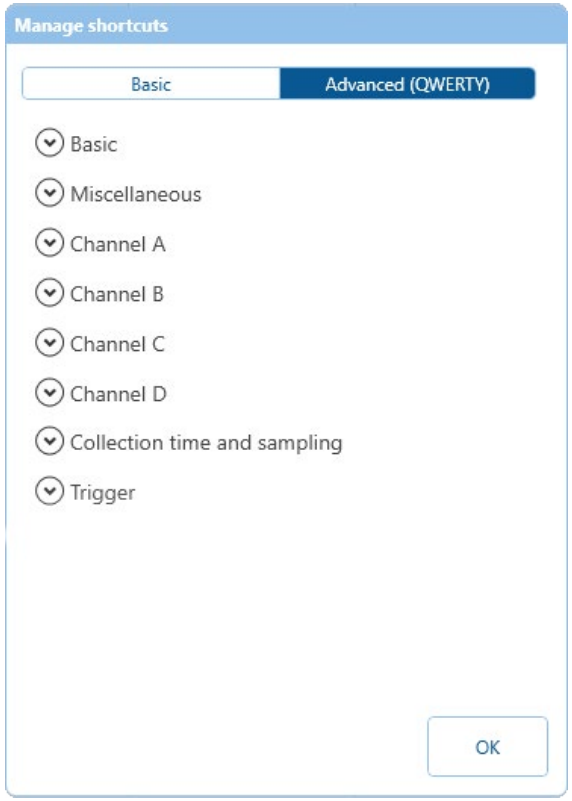
The waveform annotation tool helps design and test engineers to manage complex test scenarios involving multiple channels and events of interest that need to be displayed and communicated across project teams. Live presentation and documentation of key waveform events helps to improve understanding of circuit behaviour and expedite the development process.

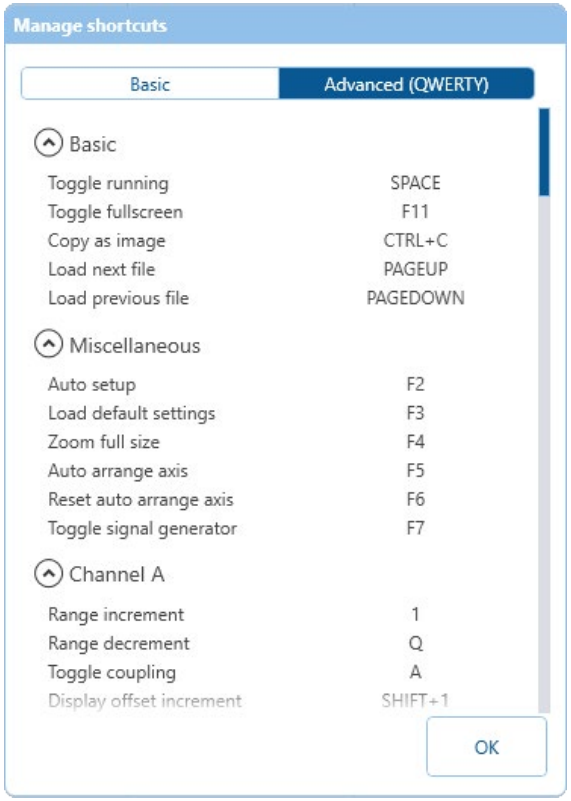
Users can add freeform text boxes onto the waveform view and edit them, as well as drag fixed pinpoint arrows to specific events or anomalies in the data to draw attention to or help explain what is shown. Additionally, these annotations are visible on print outs, image exports and saved in .psdata files for sharing and distribution.



Keyboard shortcuts

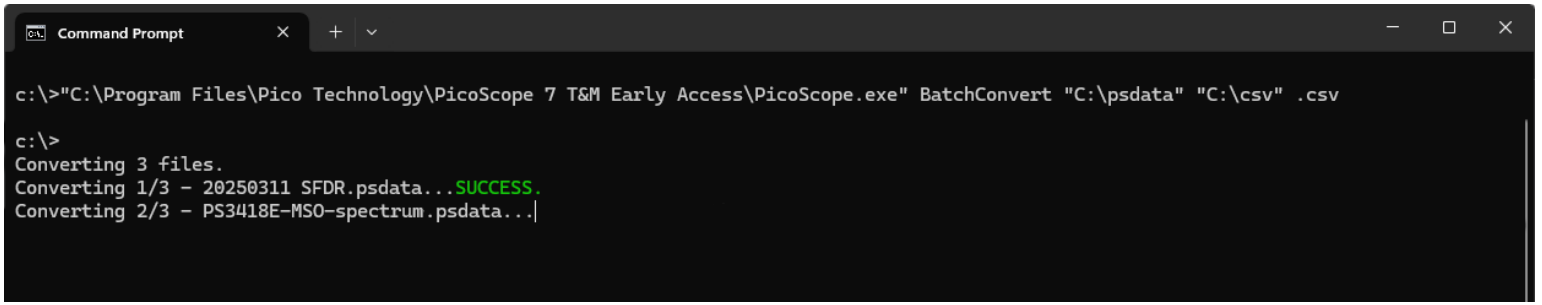
PicoScope offers a very comprehensive set of keyboard shortcuts to improve speed and usability, reducing the reliance on mouse or touch screen interactions.





Convert PicoScope files from the command line interface (CLI)

PicoScope can be invoked from the Windows, macOS or Linux command line to convert PicoScope data (.psdata) files in an input folder into CSV, text or MATLAB files in an output folder. This enables bulk conversion of saved PicoScope files into other formats for further analysis or processing in external programs.

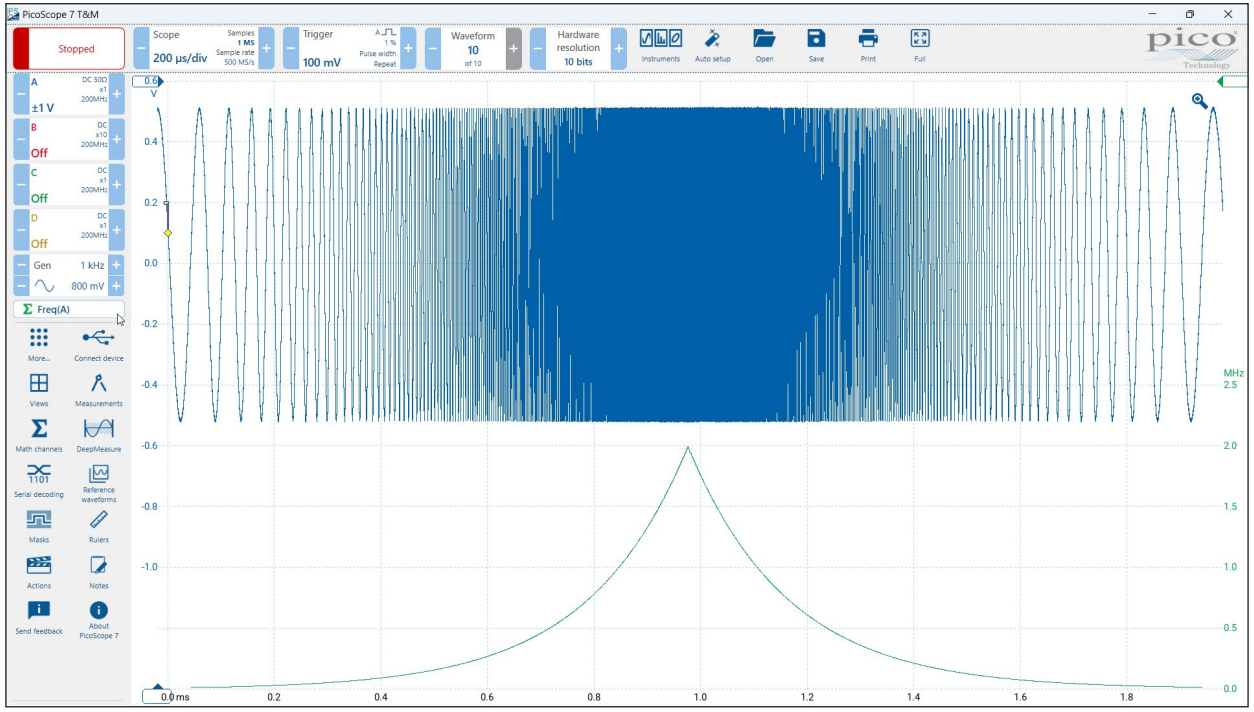


Powerful tools provide endless options

Your PicoScope is provided with many powerful tools to help you acquire and analyze waveforms. While these tools can be used on their own, the real power of PicoScope lies in the way they have been designed to work together.

As an example, the rapid trigger mode allows you to collect 40 000 waveforms in a few milliseconds with minimal dead time between them. Manually searching through these waveforms would be time-consuming, so just pick a waveform you are happy with and let the mask tools scan through for you. When done, the measurements will tell you how many have failed and the waveform navigator allows you to hide the good waveforms and just display the problem ones. Alternatively, add a measurement and set upper and lower limits, then filter within the waveform navigator to find and view only those waveforms that pass, or fail, your set limits.

The screenshot (below) shows a plot of the changing frequency of a signal on channel A versus time as a graph. Perhaps instead you want to plot changing duty cycle as a graph? How about outputting a waveform from the AWG and also automatically saving the waveform to disk when a trigger condition is met? With the power of PicoScope the possibilities are almost endless. To find out even more about the capabilities of PicoScope software, visit our online Knowledge Bases.



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 serial decoding, mask limit testing, advanced math channels, segmented memory, hardware-based time-stamping 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 has a long history of providing new features for free through software downloads. We deliver on our promises of future enhancements year after year. Users of our products reward us by becoming lifelong customers and frequently recommending us to their colleagues.

PicoScope 7 software - time domain view

Running/Stopped control: Click to start displaying waveforms. Click again to stop. The keyboard space bar has the same function.

Timebase sampling controls: Set the timing of an acquisition using the seconds/division control. **Sampling** controls provide a choice of timebase operating modes: **Buffer memory** priority adjusts the sampling rate to maintain a fixed capture memory depth. **Sample rate** priority adjusts memory depth to maintain a fixed sampling rate.

Trigger controls: Quick access to main controls and advanced triggers.

Waveform buffer navigator: PicoScope can store the last 40 000 oscilloscope or spectrum waveforms in a circular waveform buffer. The buffer navigator provides an efficient way of navigating and searching through waveforms.

Channel controls: Each channel corresponds to one of the PicoScope input connectors. Use controls to manage probe types, assign channel names, set vertical scaling, offset, input coupling and other signal conditioning parameters before making measurements on the DUT.

Bandwidth (BW) limit: Available BW-limit options depend on the selected voltage range and resolution. Auto mode selects the highest available BW based on your set-up. The BW limit in use is shown in each channel control.

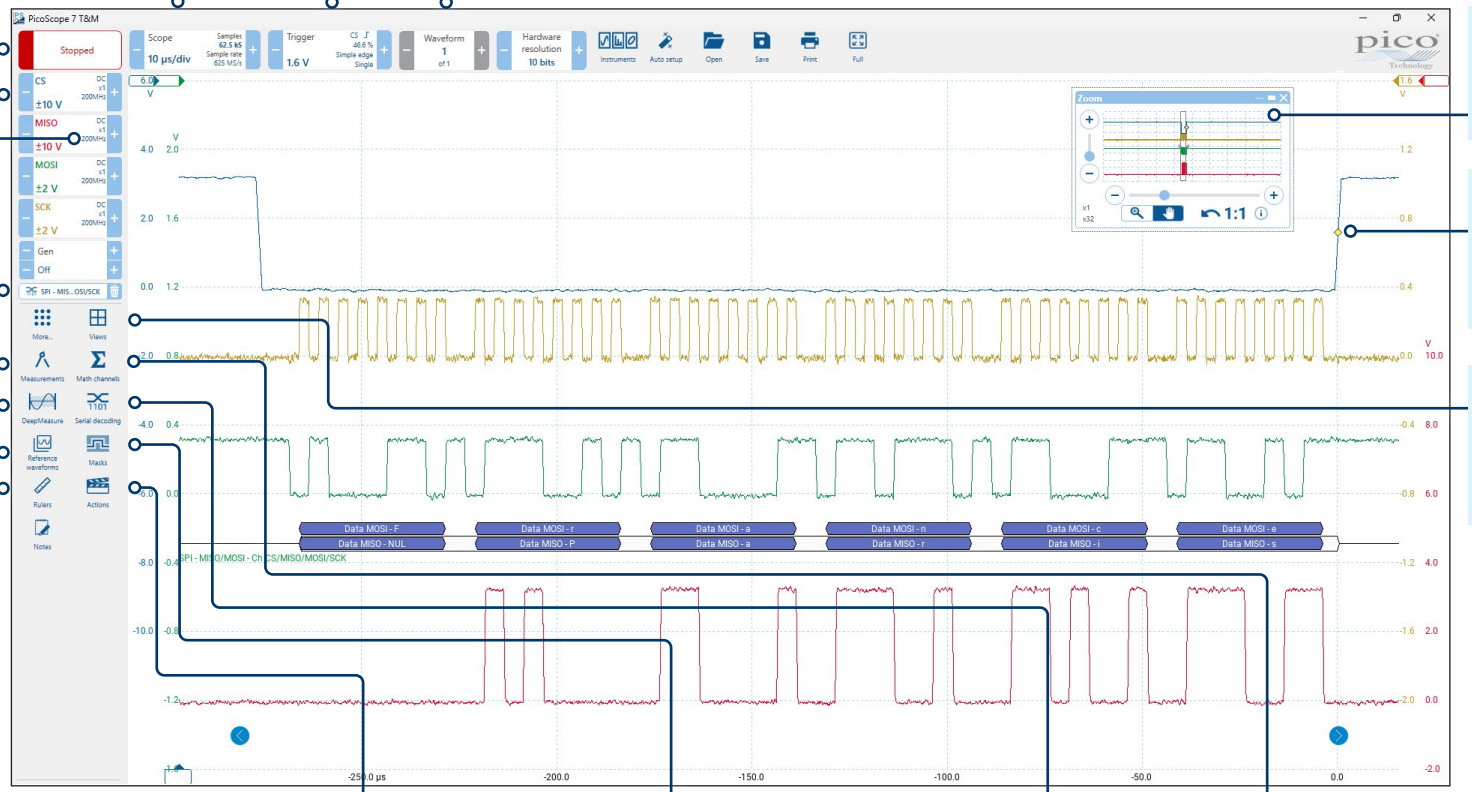
Serial protocol decoding: Serial decoders in use are listed here.

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

DeepMeasure: Delivers automatic measurement of important waveform parameters on up to a million waveform cycles on each triggered acquisition.

Reference waveforms: Waveforms can be saved and displayed for comparison with live data.

Rulers: Help to make on-screen waveform measurements without having to count graticule marks.



Zoom: Zoom-in to magnify and click or drag to pan around.

Trigger marker: Shows the channel, signal level and time of the trigger event. Drag to adjust.

Views: Display separate scope, spectrum or XY views which can also be moved to different screens.

Actions: These are things that the PicoScope can be programmed to do when certain events occur. Actions include: **Stop capture**, **Save waveform**, **Play sound**, **Trigger signal generator** and **Run application.**

Masks: Mask limit testing allows the comparison of live signals against known good signals and is designed for production and debugging environments. Simply capture a known good signal, generate a mask around it and then monitor the device under test.

Serial decoding: PicoScope has 40 built-in serial protocol decoders which are included as standard at no extra cost.

Math channels: Advanced scientific, trigonometric, buffer, filter and coupler functions as well as basic arithmetic.

PicoScope 7 software - frequency domain (spectrum analyzer) view

Spectrum controls: Set the frequency range, window functions (**Blackman**, **Gaussian**, **Triangular**, **Hamming**, **Hann**, **Blackman-Harris**, **Flat-top** or **Rectangular**), number of bins (bin width and collection time are calculated and displayed) and XY axis settings.

Trigger controls: The full advanced trigger capabilities of the scope are available in spectrum mode, to capture the frequency spectrum of a single event.

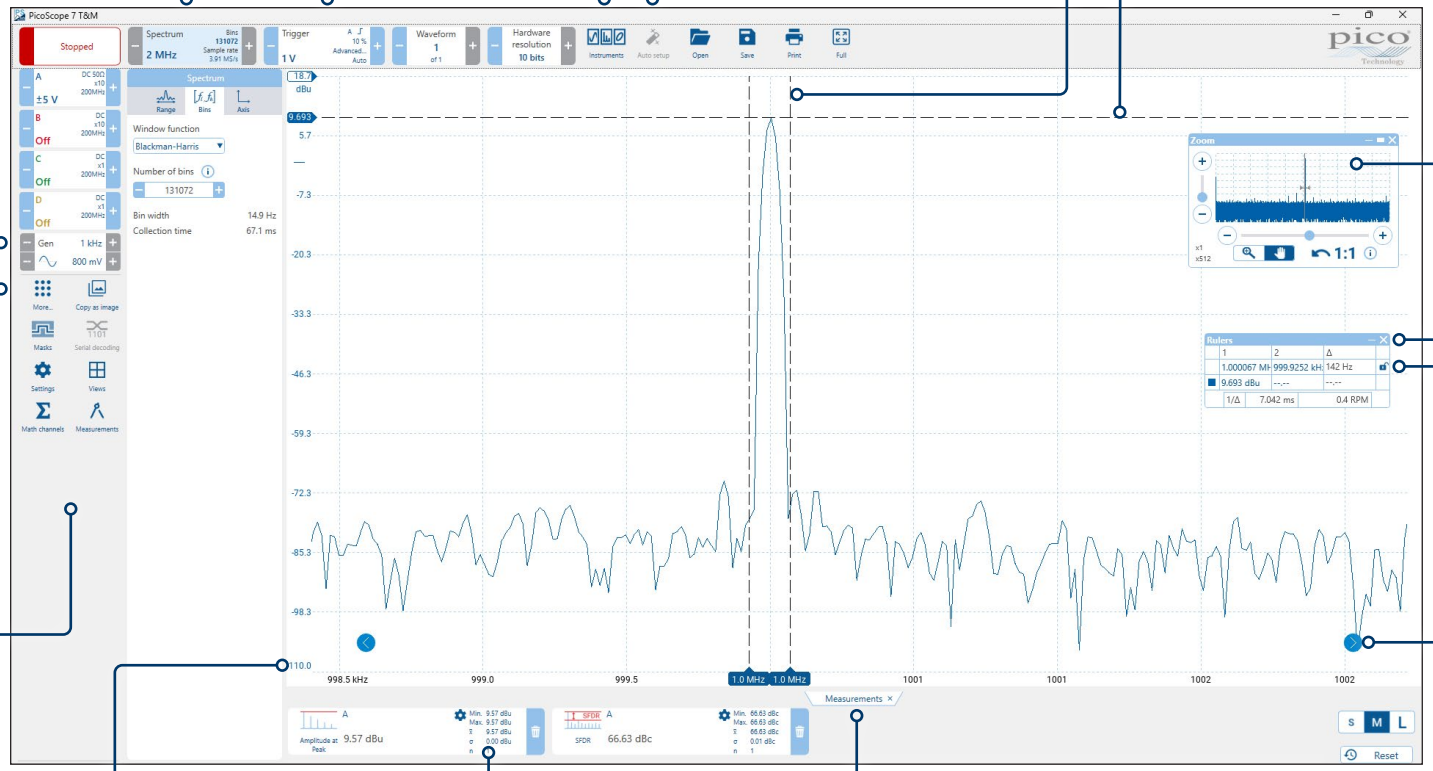
Instruments: Switches between the following modes: scope, spectrum, XY and persistence.

Auto setup: Click this first to find your signal, then adjust using the other controls.

Frequency rulers: Drag ruler from left to right to mark a point on the x-axis. The ruler legend displays the frequency at each ruler and the difference between them. **Track** option (in **Rulers** settings) allows automatic read of dB/voltage values in the **Ruler legend** without the need for a horizontal ruler.

dB/voltage rulers: Drag up or down to mark a point on the axis. The ruler legend will display the decibel/voltage value at each ruler and the difference between them.

Signal generator: For oscilloscopes with a built-in arbitrary waveform generator (AWG). Generates standard signals or arbitrary waveforms. Includes frequency sweep mode.



Zoom window: Shows the full waveforms on all active channels. The grey rectangle indicates the area that is visible in the current view.

More: Click to display all available tools to select and favorite for quick access.

Ruler legend: Displays the positions of all the rulers you have placed on the view. It appears automatically whenever you position a ruler on the view. **Track** option (in **Rulers** settings) allows automatic read of Y-axis values.

Favorite tools or functions such as **Measurements**, **Math channels**, **Serial protocol decoding**, **Rulers**, **Reference waveforms**, **Masks**, **Annotations** and **Actions** are one touch away in a custom UI panel.

Lock rulers: When two rulers have been positioned on one channel, the unlocked padlock button appears next to that ruler in the legend. Clicking this button locks the two rulers together so they track each other: dragging one causes the other to follow it, maintaining a fixed separation. The button changes to a "locked padlock" when the rulers are locked.

Channel axis: Each channel has a color-coded axis. Drag it up or down to position the channel. Selecting or dragging also brings the associated waveform to the front if it overlaps others. You can also roll your mouse scroll wheel to adjust the scaling.

Measurement statistics: The minimum, maximum, average and standard deviation of each measurement are calculated and displayed.

Measurements window: Dynamically updated automatic measurements. Choose from a rich set of time-domain and frequency-domain measurement types. The measurements window can be un-docked from the main display, and even moved to another monitor.

Navigate waveform: When zoomed-in, click to pan up or down the frequency range.

PicoScope 7 software: mixed-signal (MSO) models

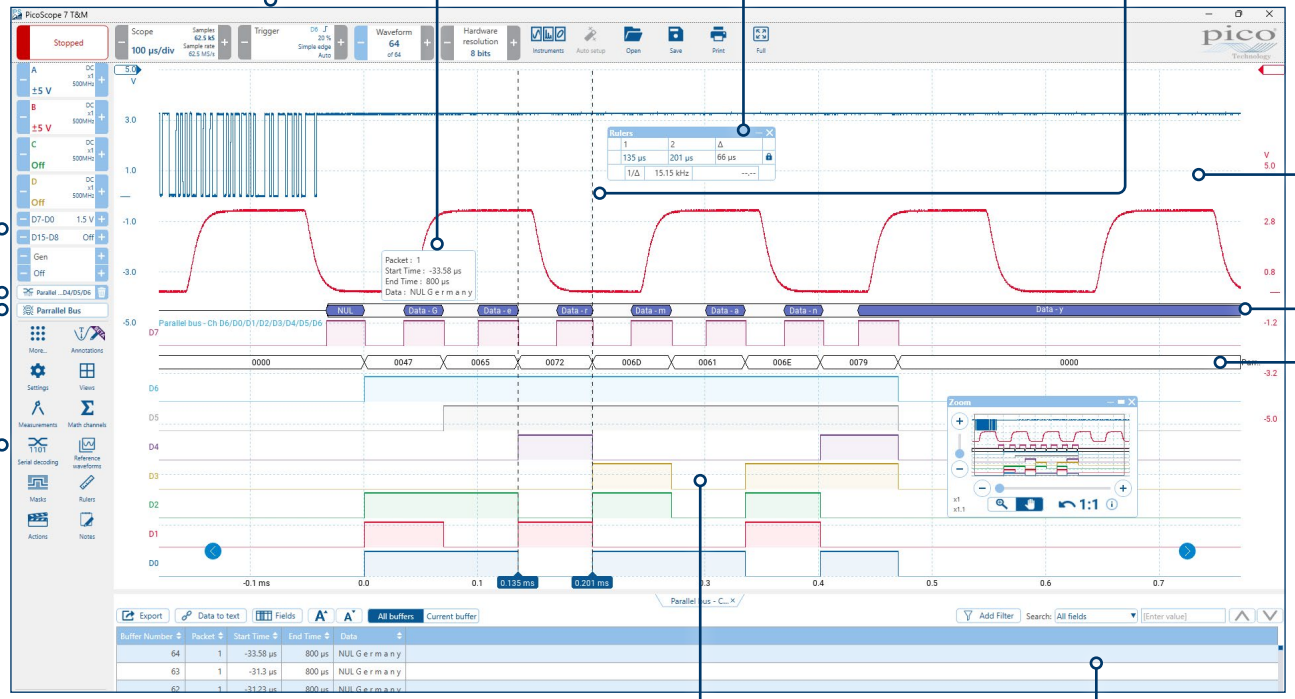
Advanced digital trigger: Triggers on a combination of the state of the digital inputs and a transition (edge) on one digital input.

Packet summary: Hover your mouse or touch-and-hold packet data to view summary.

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

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

Digital channel controls: Display a digital signal as either a logic high or logic low, depending on whether the voltage on that channel is above or below a set threshold. You can switch digital channels on and off, add and edit labels, channel names, invert the channel, change colors, set the threshold voltage, choose a waveform display size and create digital groups.



Analog waveforms: Drawn on the same time axis as digital waveforms. Waveforms can be dragged up and down to show related signals near each other, whether analog or digital.

Graph: Data packets displayed in logic-analyzer style, on the same time axis as the analog waveform. Click and drag the decoded data up or down the scope view.
If the table display is visible, double click on any packet to highlight it in the table.

Serial protocol decoding: Serial decoders currently in use are listed here. You can edit the configuration and display options for each decoder. For example, you can choose a format for the decoded data: **Hex**, **Binary**, **Decimal** or **ASCII**.

Digital channel group control: Channels added to a group are placed witht the most significant bit at the top of the list.

Digital group: Group bits into fields and optionally display as an analog level. Choose either hex, binary, decimal or signed display formats.

Serial decoding: To start decoding, select **Serial decoding** from the tools menu. PicoScope has 40 built-in serial protocol decoders (with more in development) which are included as standard at no extra cost. You can use PicoScope to decode data from a serial bus such as I2C or CAN Bus. Unlike a conventional bus analyzer, PicoScope lets you see the high-resolution electrical waveform, on analog channels, at the same time as the data. The data is integrated into the scope view, with color coded packets.

Digital channel traces: These can be arranged on-screen individually or in groups to best show the relationship between signals being measured.

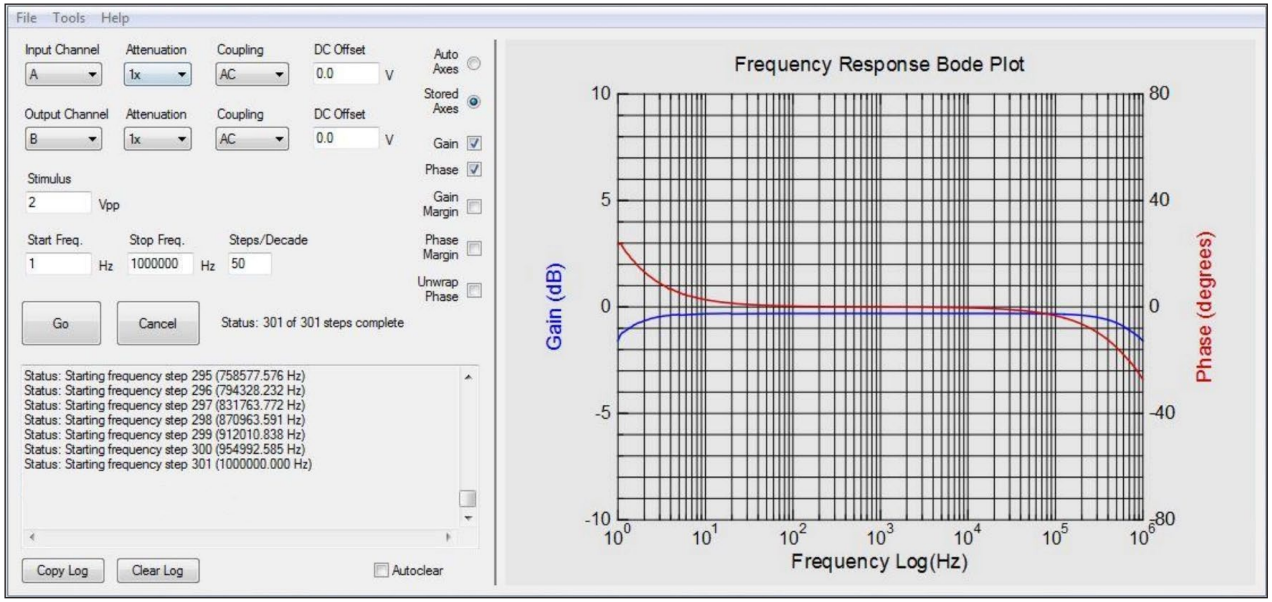
Table: Displays the decoded data in an alphanumeric format in a table with advanced search and filtering functions. You can sort the data by any of the fields and double-click a row in the table to zoom to the corresponding frame in the scope view.

PicoSDK - write your own apps

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

Among other features, the drivers support data streaming, a mode that captures continuous gap-free data directly to your PC or host computer at rates of over 300 MS/s, so you are not limited by the size of your scope's capture memory. Sampling rates in streaming mode are subject to PC specifications and application loading.

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




```
ScopeSettingsPropTree.clear();
    wstring appVersionStringW = wstring_convert<codecvt_utf8<wchar_t>>().from_bytes(appVersionString);
    ScopeSettingsPropTree.put( L"appVersion", appVersionStringW );
    ScopeSettingsPropTree.put( L"picoScope.inputChannel.name", L"A" );
    ScopeSettingsPropTree.put( L"picoScope.inputChannel.attenuation", ATTEN_1X );
    ScopeSettingsPropTree.put( L"picoScope.inputChannel.coupling",PS_AC );
    ScopeSettingsPropTree.put( L"picoScope.inputChannel.dcOffset", L"0.0" );
    ScopeSettingsPropTree.put( L"picoScope.inputChannel.startingRange", -1 ); // Base on stimulus
    ScopeSettingsPropTree.put( L"picoScope.outputChannel.name", L"B" );
    ScopeSettingsPropTree.put( L"picoScope.outputChannel.attenuation", ATTEN_1X );
    ScopeSettingsPropTree.put( L"picoScope.outputChannel.coupling", PS_AC );
    ScopeSettingsPropTree.put( L"picoScope.outputChannel.dcOffset", L"0.0" );
    ScopeSettingsPropTree.put( L"picoScope.outputChannel.startingRange", pScope->GetMinRange(PS_AC) );

    midSigGenVpp = floor((pScope->GetMinFuncGenVpp() + pScope->GetMaxFuncGenVpp()) / 2.0);

    stimulusVppSS << fixed << setprecision(1) << midSigGenVpp;
    maxStimulusVppSS << fixed << setprecision(1) << pScope->GetMaxFuncGenVpp();
    startFreqSS << fixed << setprecision(1) << (max(1.0, pScope->GetMinFuncGenFreq())); // Make frequency at least 1.0 since 0.0 (DC) makes no sense for FRA
    stopFreqSS << fixed << setprecision(1) << (pScope->GetMaxFuncGenFreq());
```

PicoLog 6 software

PicoScope 3000E Series oscilloscopes are also supported by the PicoLog 6 data logging software, allowing you to view and record signals on multiple units in one capture.

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

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

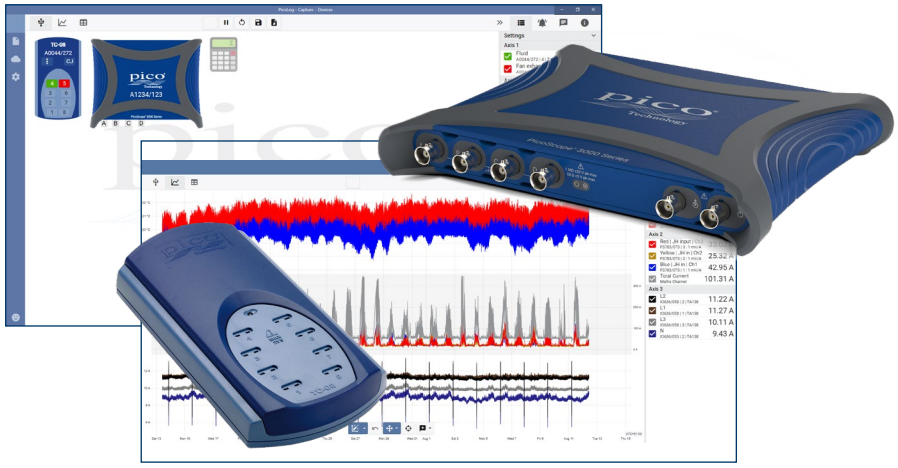
PicoLog Cloud

Your PicoScope or data logger can capture to a local disk and stream the capture directly to a secure online Cloud store, which is completely free.

This feature stays true to our vision of creating a data logging application with a simple user interface, and is equally straightforward for use by technical or non-technical users.

PicoLog Cloud (built-in to PicoLog 6) provides enhancements to send the live capture data directly to your remote PicoLog Cloud space, and in addition view saved captures stored in the Cloud.

PicoLog 6 is available for Windows, macOS, Linux and Raspberry Pi OS.



PicoLog Cloud®

Carry your electronics lab with you

Traditional benchtop oscilloscopes take up a lot of bench space.

PicoScope 3000E Series oscilloscopes are small and portable while offering the high-performance specifications required by engineers in the lab or on the move, and deliver lowest cost of ownership for this class of instrument.

PicoScope software is included in the price of your scope, available for free download, with free updates and can be installed on as many PCs as you want, allowing you to view/analyze data off-line without the scope.

Need to travel, and even take your scope on a plane?
No problem! It fits easily in your hand luggage or laptop case.

PicoScope 3000E Series specifications

PicoScope model:		3415E and 3415E MSO	3416E and 3416E MSO	3417E and 3417E MSO	3418E and 3418E MSO
Vertical (analog channels)					
Input channels		4			
Bandwidth (–3 dB)		100 MHz	200 MHz	350 MHz	500 MHz
Rise time (10% to 90%, –2 dB full scale)		3.5 ns	1.75 ns	1.2 ns	925 ps
Selectable bandwidth limits	8-bit mode	20, 50, 100 MHz	20, 50, 100, 200 MHz	20, 50, 100, 200, 350 MHz	20, 50, 100, 200, 350, 500 MHz
	10-bit mode			20, 50, 100, 200 MHz	
Vertical resolution		8 bits, 10 bits			
Enhanced vertical resolution (software)		Hardware resolution + 4 bits			
Input connector		BNC(f)			
Input characteristics	50 Ω	50 Ω ±2 %			
	1 MΩ	1 MΩ ±1 % ‖ 13 pF ±2 pF			
Input coupling	50 Ω	DC			
	1 MΩ	AC/DC			
Input sensitivity	50 Ω	1 mV/div to 1 V/div (10 vertical divisions)			
	1 MΩ	1 mV/div to 4 V/div (10 vertical divisions)			
Input ranges (full scale)	50 Ω	±5 mV[1], ±10 mV[2], ±20 mV[3], ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V			
	1 MΩ	±5 mV[1], ±10 mV[2], ±20 mV[3], ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V			
[1] ±5 mV only available up to 100 MHz [2] ±10 mV only available up to 200 MHz [3] ±20 mV only available up to 350 MHz					
DC gain accuracy		±(1% of signal + 1 LSB)			
DC offset accuracy		±(2% of full scale + 200 µV)			
		Offset accuracy can be improved by using the “zero offset” function in PicoScope.			
LSB size (quantization step size)	8-bit mode	< 0.4% of input range			
	10-bit mode	< 0.1% of input range			
Analog offset range (vertical position adjustment)		±250 mV (±5 mV to ±200 mV ranges) ±2.5 V (±500 mV to ±2 V ranges) ±5 V (±5 V range, 50 Ω input) ±20 V (±5 V to ±20 V ranges, 1 MΩ input)			
Analog offset control accuracy		±1% of offset setting, additional to DC accuracy above			
Overvoltage protection	1 MΩ	±100 V (DC + AC peak) up to 10 kHz			
	50 Ω	5.5 V RMS max, ±20 V pk max			
Vertical (digital channels) - MSO only					
Input channels		16 (2 logical ports of 8 channels each)			
Input connector		2.54 mm pitch, 10 x 2 way connector			
Maximum input frequency		100 MHz (200 Mbit/s)			
Minimum detectable pulse width		5 ns			
Threshold grouping		Two independent threshold controls. Port 0: D0 to D7, Port 1: D8 to D15			
Threshold range		±5 V			

PicoScope model:		3415E and 3415E MSO	3416E and 3416E MSO	3417E and 3417E MSO	3418E and 3418E MSO
Threshold accuracy		< ±350 mV (inclusive of hysteresis)			
Threshold hysteresis		< ±250 mV			
Input dynamic range		±20 V			
Minimum input voltage swing		500 mV peak to peak			
Input impedance		200 kΩ ± 2% || 8 pF ± 2 pF			
Channel-to-channel skew		2 ns, typical			
Minimum input slew rate		10 V/µs			
Overvoltage protection		±50 V (DC + AC peak) up to 100 kHz			
Horizontal					
Maximum sampling rate (real time)	1 channel[5]	8-bit mode, analog channels 5 GS/s	8-bit mode, digital channels[4] 1.25 GS/s	10-bit mode, analog channels 2.5 GS/s	10-bit mode, digital channels[4] 1.25 GS/s
	2 channels	2.5 GS/s	1.25 GS/s	1.25 GS/s	1.25 GS/s
	3 or 4 channels	1.25 GS/s	1.25 GS/s	625 MS/s	625 MS/s
	>4 channels	625 MS/s	625 MS/s	312.5 MS/s	312.5 MS/s
Max. sampling rate, continuous USB streaming into PC memory[6] (PicoScope 7)		On USB 3.0 port	On USB 2.0 port		
	1 channel	~50 MS/s	~10 MS/s		
	2 channels	~25 MS/s	~5 MS/s		
	3 or 4 channels	~12 MS/s	~2 MS/s		
	> 4 channels	~6 MS/s	~1 MS/s		
Max. sampling rate, continuous USB streaming into PC memory[6] (PicoSDK)		On USB 3.0 port, 8-bit resolution	On USB 3.0 port, 10-bit resolution	On USB 2.0 port, 8-bit resolution	On USB 2.0 port, 10-bit resolution
	1 channel	~300 MS/s	~150 MS/s	~30 MS/s	~15 MS/s
	2 channels	~150 MS/s	~75 MS/s	~15 MS/s	~8 MS/s
	3 or 4 channels	~75 MS/s	~38 MS/s	~8 MS/s	~4 MS/s
	> 4 channels	~38 MS/s	~18 MS/s	~4 MS/s	~2 MS/s
Max. sampling rate, USB streaming of downsampled data[7] (PicoSDK)		8-bit resolution	10-bit resolution		
	1 channel	1 GS/s	500 MS/s		
	2 channels	500 MS/s	250 MS/s		
	3 or 4 channels	250 MS/s	125 MS/s		
	> 4 channels	125 MS/s	62.5 MS/s		

[4] MSO models only
[5] *Channel* means the total number of enabled analog channels and/or 8-bit digital ports.
[6] Max. sampling rates in streaming mode are dependent on the host computer performance and workload.
[7] Downsampled (min/max/average/decimated) data returned continuously to PC during streaming at up to USB data bandwidth. Raw data available to read from device buffer after streaming is completed.

Capture memory (per channel)		8-bit resolution	10-bit resolution
	1 channel	2 GS	1 GS
	2 channels	1 GS	512 MS
	3 or 4 channels	512 MS	256 MS
	> 4 channels	256 MS	128 MS
Maximum single capture duration at maximum sampling rate	PicoScope 7	200 ms	
	PicoSDK	400 ms	
Capture memory (continuous streaming)	PicoScope 7	250 MS	
	PicoSDK	Buffering using full device memory, no limit on total duration of capture	

PicoScope model:		3415E and 3415E MSO	3416E and 3416E MSO	3417E and 3417E MSO	3418E and 3418E MSO
Waveform buffer (number of segments)	PicoScope 7	40 000			
	PicoSDK	2 000 000			
Timebase ranges		1 ns/div to 5000 s/div			
Initial timebase accuracy		±5 ppm			
Timebase drift		±1 ppm/year			
ADC sampling		Simultaneous sampling on all active channels			
Dynamic performance (typical)					
Crosstalk		Better than 500:1 (from DC to bandwidth of victim channel, equal voltage ranges)			
Harmonic distortion (10 MHz, −2 dBfs input)	8-bit	Better than −50 dB on ±50 mV to ±20 V ranges			
	10-bit	Better than −60 dB on ±50 mV to ±20 V ranges			
SFDR (10 MHz, −2 dBfs input)	8-bit	Better than 50 dB on ±50 mV to ±20 V ranges			
	10-bit	Better than 60 dB on ±50 mV to ±20 V ranges			

RMS noise

Range	/Div	Bandwidth filter					
		20 MHz 10-bit	50 MHz 10-bit	100 MHz 10-bit	200 MHz 10-bit	350 MHz 8-bit	500 MHz 8-bit
±5 mV	1 mV	0.023 mV	0.036 mV	0.051 mV	N/A	N/A	N/A
±10 mV	2 mV	0.023 mV	0.036 mV	0.051 mV	0.083 mV	N/A	N/A
±20 mV	4 mV	0.024 mV	0.036 mV	0.052 mV	0.10 mV	0.15 mV	N/A
±50 mV	10 mV	0.049 mV	0.052 mV	0.071 mV	0.13 mV	0.27 mV	0.33 mV
±100 mV	20 mV	0.098 mV	0.098 mV	0.098 mV	0.20 mV	0.46 mV	0.63 mV
±200 mV	40 mV	0.20 mV	0.20 mV	0.20 mV	0.37 mV	0.91 mV	1.30 mV
±500 mV	100 mV	0.49 mV	0.54 mV	0.72 mV	1.30 mV	2.30 mV	3.40 mV
±1 V	200 mV	0.98 mV	0.98 mV	0.98 mV	2.0 mV	4.10 mV	6.30 mV
±2 V	400 mV	2.0 mV	2.0 mV	2.0 mV	3.70 mV	8.10 mV	12 mV
±5 V	1 V	4.9 mV	5.5 mV	7.6 mV	14 mV	23 mV	34 mV
±10 V	2 V	9.8 mV	9.8 mV	9.8 mV	22 mV	41 mV	63 mV
±20 V	4 V	20 mV	20 mV	20 mV	41 mV	81 mV	125 mV

Linearity	≤ 2 LSB 8-bit mode ≤ 4 LSB 10-bit mode
Bandwidth flatness	(+0.5 dB, −3 dB) from DC to full bandwidth
Low-frequency flatness	< ±6% (or ±0.5 dB) from DC to 1 MHz

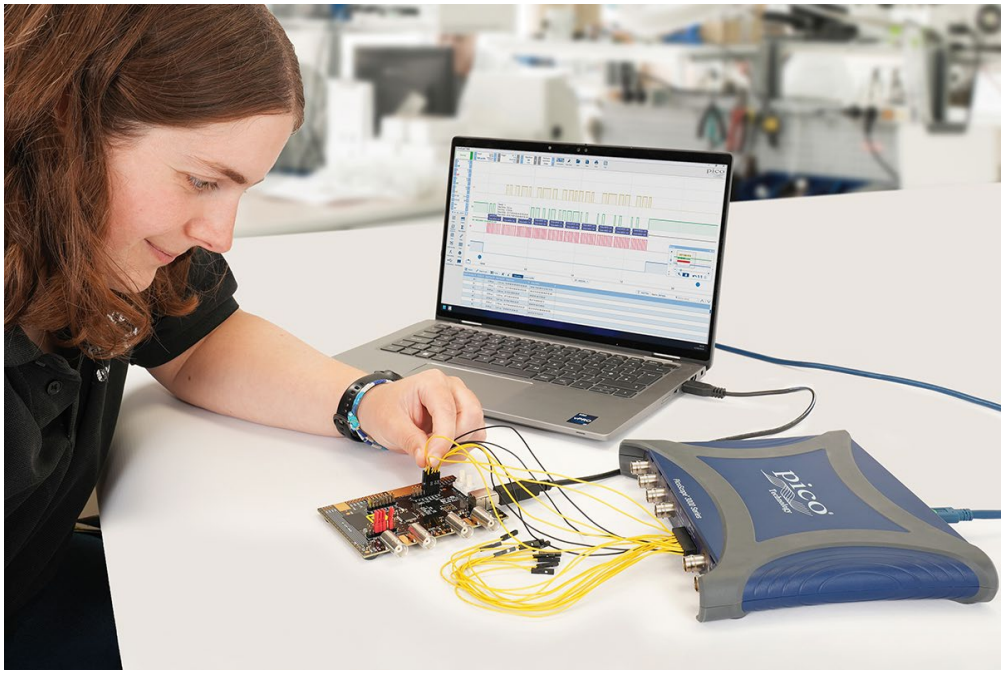
PicoScope model:		3415E and 3415E MSO	3416E and 3416E MSO	3417E and 3417E MSO	3418E and 3418E MSO
Triggering					
Source		Any analog channel, AUX I/O trigger MSO models: digital D0-D15			
Trigger modes		None, auto, repeat, single, rapid (segmented memory)			
Advanced trigger types (analog channels)		Edge (rising, falling, rising-or-falling), window (entering, exiting, entering-or-exiting), pulse width (positive or negative or either pulse), window pulse width (time inside, outside window or either), level dropout (including high/low or either), window dropout (including inside, outside or either), interval, runt (positive or negative), transition time (rise/fall), logic Logic trigger capabilities: AND or OR function of any trigger sources (analog channels plus digital pattern or aux input) NAND/NOR/XOR/XNOR of up to four analog channels or digital ports plus aux input User-defined Boolean function of up to four analog channels or digital ports plus aux input (PicoSDK only)			
Trigger sensitivity (analog channels)		Digital triggering provides 1 LSB accuracy up to full bandwidth of scope with adjustable hysteresis			
Advanced trigger types (digital channels)		Edge (rising, falling, rising-or-falling), pulse width (positive or negative or either pulse), level dropout (including high/low or either), interval, digital pattern (combination of any digital input states qualified by one edge), logic (mixed signal)			
Pre-trigger capture		Up to 100% of capture size			
Post-trigger delay	PicoScope 7	Zero to > $4x10^9$ samples, settable in 1 sample steps (delay range at 5 GS/s of 0.8 s in 200 ps steps)			
	PicoSDK	Zero to > $1x10^{12}$ samples, settable in 1 sample steps (delay range at 5 GS/s of > 200 s in 200 ps steps)			
Trigger holdoff by time		Delay re-arming the trigger after each trigger event by a user-set time up to 4 x 10^9 sample intervals.			
Rapid trigger mode rearm time		< 700 ns on fastest timebase			
Maximum trigger rate (rapid mode)	PicoScope 7	40 000 waveforms in 20 ms			
	PicoSDK	Number of waveforms up to memory segment count, at a rate of 2 million waveforms per second.			
Continuous waveform update rate		Up to 300 000 waveforms per second in PicoScope 7 fast persistence mode			
Trigger time-stamping		Each waveform is timestamped with time from previous waveform, with sample-interval resolution.			
Auxiliary trigger					
Trigger types (triggering scope)		Edge (rising, falling, rising-or-falling), pulse width (positive or negative or either pulse), level dropout (including high/low or either), interval, logic			
Trigger types (triggering AWG)		Rising edge, falling edge, gate high, gate low			
Input bandwidth		> 10 MHz			
Input characteristics		3.3 V CMOS Hi-Z input, DC coupled			
Input threshold		Fixed threshold, low < 1 V, high > 2.3 V suitable for 3.3 V CMOS			
Input hysteresis		1.3 V max (V_{IH} < 2.3 V, V_{IL} > 1 V)			
Auxiliary output function		Trigger output			
Output voltage		3.3 V CMOS (V_{OH} > 3.2 V, V_{OL} < 0.1 V into Hi-Z)			
Output impedance		Approx. 270 Ω			
Output rise time		Measured directly at BNC: < 15 ns			
Coupling		DC			
Overvoltage protection		±20 V peak max			
Connector type		BNC(f)			
Function generator					
Standard output signals		Sine, square, triangle, DC voltage, ramp up, ramp down, sinc, Gaussian, half-sine			
Output frequency range		100 µHz to 20 MHz			
Output frequency accuracy		Oscilloscope timebase accuracy ± output frequency resolution			
Output frequency resolution		< 1 µHz			
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, aux trigger or manually.			

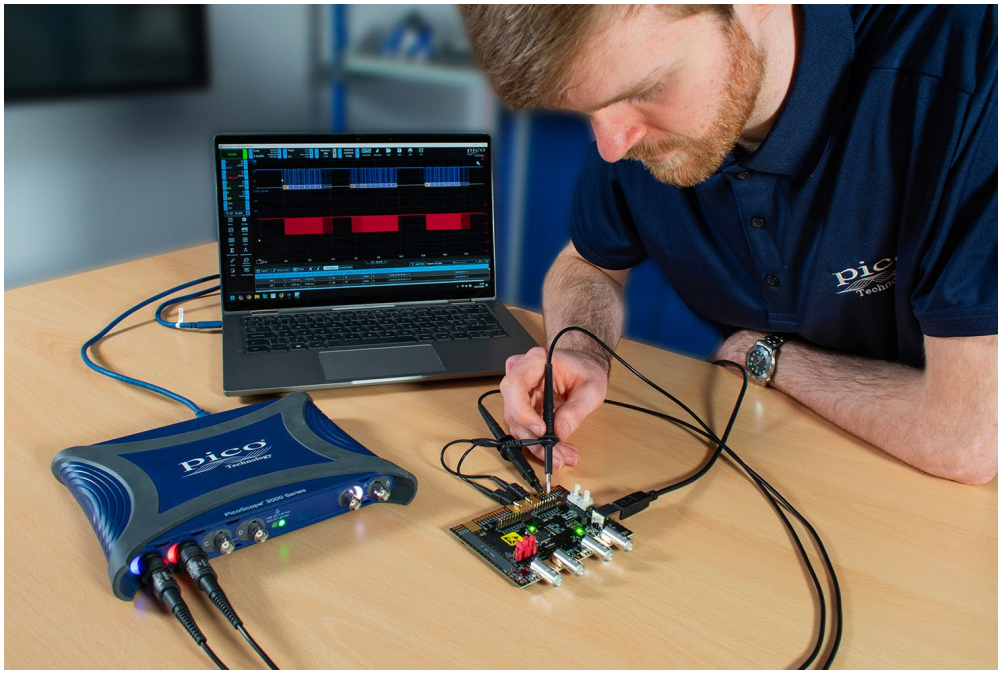
PicoScope model:	3415E and 3415E MSO	3416E and 3416E MSO	3417E and 3417E MSO	3418E and 3418E MSO
Gating	Waveform output can be gated (paused) via aux trigger input or software			
Pseudorandom output signals	White noise, selectable amplitude and offset within output voltage range Pseudorandom binary sequence (PRBS), selectable high and low levels within output voltage range, selectable bit rate up to 20 Mb/s			
Output voltage range	±2.0 V into Hi-Z (±1.0 V into 50 Ω)			
Output voltage adjustment	Signal amplitude and offset adjustable in approx. 0.3 mV steps within overall ± 2 V range			
DC accuracy	±1 % of full scale, into Hi-Z load			
Amplitude flatness	< 1.5 dB to 20 MHz, typical, sine wave into 50 Ω			
SFDR	> 70 dB, 10 kHz full scale sine wave			
Output resistance	50 Ω ±1%			
Overvoltage protection	±20 V peak max			
Connector type	BNC(f)			
Arbitrary waveform generator				
Update rate	200 MS/s			
Buffer size	32 kS			
Vertical resolution	14 bits (output step size 0.3 mV approx.)			
Bandwidth (−3 dB)	> 20 MHz			
Rise time (10% to 90%)	< 10 ns (50 Ω load)			
Sweep modes, triggering, frequency accuracy and resolution, voltage range and accuracy and output characteristics as for function generator.				
Spectrum analyzer				
Frequency range	DC to 100 MHz	DC to 200 MHz	DC to 350 MHz	DC to 500 MHz
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, delay, average, frequency, derivative, integral, min, max, peak, duty, high pass, low pass, band pass, band stop, coupler, top, base, amplitude, positive overshoot, negative overshoot, phase, delay, moving, deskew, true power, apparent power, reactive power, power factor, area AC, positive area AC, negative area AC, abs area AC, area DC, positive area DC, negative area DC, abs area DC			
Operands	A to D (input channels), D0-D15 (digital channels), T (time), reference waveforms, pi, constants			
Automatic measurements				
Scope mode	Absolute area at AC/DC, AC RMS, amplitude, apparent power, area at AC/DC, base, crest factor, cycle time, DC average, DC power, duty cycle, edge count, fall time, falling edge count, falling rate, frequency, high pulse width, low pulse width, maximum, minimum, negative area at AC, negative area at DC, negative duty cycle, negative overshoot, peak to peak, phase, positive area at AC, positive area at DC, positive overshoot, power factor, reactive power, rise time, rising edge count, rising rate, top, true power, true RMS			
Spectrum mode	Frequency at peak, amplitude at peak, average amplitude at peak, total power, THD%, THD dB, THD+N, SINAD, SNR, IMD			
Statistics	Minimum, maximum, average, standard deviation			
DeepMeasure				
Parameters	Cycle number, cycle time, frequency, low pulse width, high pulse width, duty cycle (high), duty cycle (low), rise time, fall time, undershoot, overshoot, max. voltage, min. voltage, voltage peak to peak, start time, end time			
Serial decoding				
Protocols	10BASE-T1S, 1-Wire, ARINC 429, BroadRReach, CAN, CAN FD, CAN J1939, CAN XL, DALI, DCC, Differential Manchester, DMX512, Ethernet 10BASE-T, Extended UART, Fast Ethernet 100BASE-TX, FlexRay, I2C, I2S, I3C BASIC v1.0, LIN, Manchester, MIL-STD-1553, MODBUS ASCII, MODBUS RTU, NMEA-0183, Parallel Bus, PMBus, PS/2, PSI5 (Sensor), Quadrature, RS232/UART, SBS Data, SENT Fast, SENT Slow, SENT SPC, SMBus, SPI-MISO/MOSI, SPI-SDIO, USB (1.0/1.1), Wind Sensor			

PicoScope model:		3415E and 3415E MSO	3416E and 3416E MSO	3417E and 3417E MSO	3418E and 3418E MSO
Mask limit testing					
Statistics		Pass/fail, failure count, total count			
Mask creation		Auto-generated from waveform or imported from file			
Display					
Display modes		Scope, XY scope, persistence, spectrum			
Interpolation		Linear or sin(x)/x			
Persistence modes		Time, frequency, fast			
Output file formats		csv, mat, pdf, png, psdata, pssettings, txt			
Output functions		Copy to clipboard, print			
Data transfer					
Captured waveform data USB transfer rate to PC		On USB 3.0, PC dependent: 8-bit mode: up to 360 MS/s; 10-bit mode: up to 180 MS/s On USB 2.0, PC dependent: 8-bit mode: up to 40 MS/s; 10-bit mode: up to 20 MS/s			
Hardware accelerated waveform display rate		Hardware acceleration enables over 2 GS of data to be displayed on screen per second (8-bit mode, 4 channels, 250 MS per channel at max sample rate)			
General specifications					
PC connectivity		USB 3.0 SuperSpeed (USB 2.0 compatible)			
PC connector type		USB 3.0 Type-C			
Power requirement		Powered from single USB Type-C 3 A port or from USB port plus external Type-C PSU (5 V, 3 A)			
Status indicators		RGB LED per BNC connector plus power and status			
Thermal management		Automatic fan speed control for low noise			
Dimensions		221 x 173 x 30 mm			
Weight		< 0.7 kg			
Ambient temperature range	Operating	0 to 40 °C			
	For quoted accuracy	15 to 30 °C after 20-minute warm-up			
	Storage	–20 to +60 °C			
Humidity range	Operating	5 to 80 %RH non-condensing			
	Storage	5 to 95 %RH non-condensing			
Altitude		Up to 2000 m			
Pollution degree		EN 61010 pollution degree 2: “only nonconductive pollution occurs except that occasionally a temporary conductivity caused by condensation is expected”			
Safety compliance		Designed to EN 61010-1			
EMC compliance		Tested to EN 61326-1 and FCC Part 15 Subpart B			
Environmental compliance		RoHS, REACH & WEEE			
Warranty		5 years			
Software					
Windows software (64-bit)[8]		PicoScope 7, PicoLog 6, PicoSDK (Users writing their own apps can find example programs for all platforms on the Pico Technology organization page on GitHub).			
macOS software (64-bit)[8]		PicoScope 7, PicoLog 6 and PicoSDK			
Linux software (64-bit)[8]		PicoScope 7 software and drivers, PicoLog 6 (including drivers) See Linux Software and Drivers to install drivers only			
Raspberry Pi 4B and 5 (32-bit Raspberry Pi OS)[8]		PicoLog 6 (including drivers) See Linux Software and Drivers to install drivers only			

[8] See picotech.com/downloads for more information.

PicoScope model:		3415E and 3415E MSO	3416E and 3416E MSO	3417E and 3417E MSO	3418E and 3418E MSO
Languages supported	PicoScope 7	English-US, English-UK, Bulgarian, Czech, Danish, German, Greek, Spanish, French, Korean, Croatian, Italian, Hungarian, Netherlands Dutch, Japanese, Norwegian, Polish, Portuguese-Brazil, Portuguese, Romanian, Russian, Slovene, Serbian, Finnish, Swedish, Turkish, Simplified Chinese, Traditional Chinese			
	PicoLog 6	Simplified Chinese, Dutch, English (UK), English (US), French, German, Italian, Japanese, Korean, Russian, Spanish			
PC requirements		Processor, memory and disk space: as required by the operating system Ports: USB 3.0 (recommended) or 2.0 (compatible)			





PicoScope 3000E Series oscilloscope kit contents[9]:

- PicoScope 3000E Series oscilloscope
- TA532 USB-C to USB-C cable, 1.8 m
- TA534 USB-A to USB-C cable, 0.9 m
- MSO cable and 2 x TA139 set of MSO clips (MSO models only)
- PS017 USB-C power supply, with UK, EU, US and AUS plugtops
- Probe-to-BNC adaptor (5 mm adaptor included with the 100, 200 and 350 MHz oscilloscopes, or a 3.5 mm adaptor included with the 500 MHz oscilloscope).
- User's Guide

[9] OEM and non-standard product configurations may be available without probes and/or other items. Please see www.picotech.com/tech-support

Probes (if selected when ordering):You will receive *four* probes for the scope model you choose:

5 mm probes:

- TA375, 100 MHz, 1:1/10:1 probe (for 3415E and 3415E MSO)
- TA386, 200 MHz, 1:1/10:1 probe (for 3416E and 3416E MSO)
- TA536, 350 MHz, 1:1/10:1 probe (for 3417E and 3417E MSO)

3.5 mm probe:

- TA561/P1053, 500 MHz, 10:1 probe (for 3418E and 3418E MSO)

Kits:

PicoScope 3415E, 3416E and 3417E kits, with probes selected

PicoScope 3418E kit, with probes selected

PicoScope 3415E MSO, 3416E MSO and 3417E MSO kits, with probes selected

PicoScope 3418E MSO kit, with probes selected

Optional compatible accessories and replacement items:

Order code	Description
Oscilloscope probes	
TA375	100 MHz probe (single pack)
TA386	200 MHz probe (single pack)
TA536	350 MHz probe (single pack)
TA561	500 MHz probe (single pack)
Cables	
TA532	USB Type-C to USB Type-C cable, 1.8 m
TA534	USB Type-A to USB Type-C cable, 0.9 m
MSO accessories	
TA136	20-way 25 cm digital MSO cable
TA139	Set of 12 logic test clips
Adaptor	
TA537	BNC adaptor (5 mm) for the TA375 100 MHz, TA386 200 MHz and TA536 350 MHz oscilloscope probes
TA563	BNC adaptor (3.5 mm) for the TA561 500 MHz oscilloscope probe
Power supply	
PS017	5 V, 3 A, UK/EU/US/AUS, USB-C power supply

Total cost of ownership (TCO), environmental benefits and portability

Total cost of ownership of a PicoScope 3000E Series oscilloscope is lower than traditional benchtop instruments for several reasons:

- Everything is included in the purchase price: serial protocol decoders, math channels and mask limit testing. No expensive optional upgrades or annual license fees.
- Free updates: new features and capabilities are provided throughout the lifetime of the product as we develop and release them.
- The PicoScope 3000E Series are highly portable and are very suited to home-working where desk space might be limited.
- Low power consumption — less than 15 W — saves money and is kinder to the environment.
- 5-year warranty.

PicoScope 3000E Series kit ordering information:

Description	Bandwidth	Channels	Resolution	Memory
PicoScope 3415E MSO kit	100 MHz	4 analog + 16 MSO	8- to 10-bit	2 GS (8-bit mode) 1 GS (10-bit mode)
PicoScope 3416E MSO kit	200 MHz			
PicoScope 3417E MSO kit	350 MHz			
PicoScope 3418E MSO kit	500 MHz			
PicoScope 3415E kit	100 MHz	4 analog		
PicoScope 3416E kit	200 MHz			
PicoScope 3417E kit	350 MHz			
PicoScope 3418E kit	500 MHz			

Calibration service:

Order code	Description
CC017	Calibration certificate for PicoScope 3000E Series oscilloscopes (100, 200, 350 and 500 MHz)

More instruments from Pico Technology...

PicoLog TC-08 temperature data logger
8-channel, 20-bit resolution, measures from −270 °C to +1820 °C

PicoScope 9400 SXRTO
Sampler-extended real-time oscilloscopes 5 to 16 GHz

PicoVNA
Low-cost, professional-grade 6 GHz and 8.5 GHz vector network analyzers for both lab and field use

PicoScope 6000 Series
Up to 8 channels, Ultra-deep 4 GS memory buffer, Gigabit MSO channels

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