PicoScope® 6000E Series

Smarter scopes for faster debug

Deep-memory, high-performance oscilloscopes

Up to 3 GHz bandwidth
8-bit to 12-bit FlexRes® ADC
A choice of 4 (up to 3 GHz) or 8 (up to 500 MHz) analog channels
Supports up to 16 digital MSO channels
200 ms capture time at 5 GS/s
Up to 10 GS/s with the PicoScope 6428E-D
Up to 4 GS capture memory
50 MHz 200 MS/s 14-bit AWG
300 000 waveforms per second update rate

PicoScope, PicoLog® and PicoSDK® software included
38 serial protocol decoder/analyzers included
Mask limit testing and user-definable actions
High-resolution time-stamping of waveforms
Over ten million DeepMeasure™ results per acquisition
Advanced triggers: edge, window, pulse width, window pulse width, level dropout, window dropout, interval, runt, rise/fall time and logic

www.picotech.com

Product overview

The PicoScope 6000E Series fixed-resolution and FlexRes oscilloscopes provide 8 to 12 bits of vertical resolution, 1 GHz bandwidth and 5 GS/s sampling rate. Models with four or eight analog channels have the timing and amplitude resolution you need to reveal critical signal integrity issues such as timing errors, glitches, dropouts, crosstalk and metastability issues. The 6000E Series now includes the four-channel PicoScope 6428E-D which offers 3 GHz bandwidth and 10 GS/s maximum sampling rate with 50 Ω inputs and a reduced set of input ranges.

Typical applications

These instruments are ideal for design engineers working with high-performance embedded systems, signal processing, power electronics, mechatronics and automotive designs, and for researchers and scientists working on multi-channel high-performance experiments in physics labs, particle accelerators and similar facilities.

Best-in-class bandwidth, sampling rate and memory depth

Capture time in PicoScope at maximum sampling rate: 200 ms at 5 GS/s (10 GS/s for the PicoScope 6428E-D)

The PicoScope 6000E Series oscilloscopes, with up to 1 GHz analog bandwidth complemented by a real-time sampling rate of 5 GS/s, can display single-shot pulses with 200 ps time resolution.

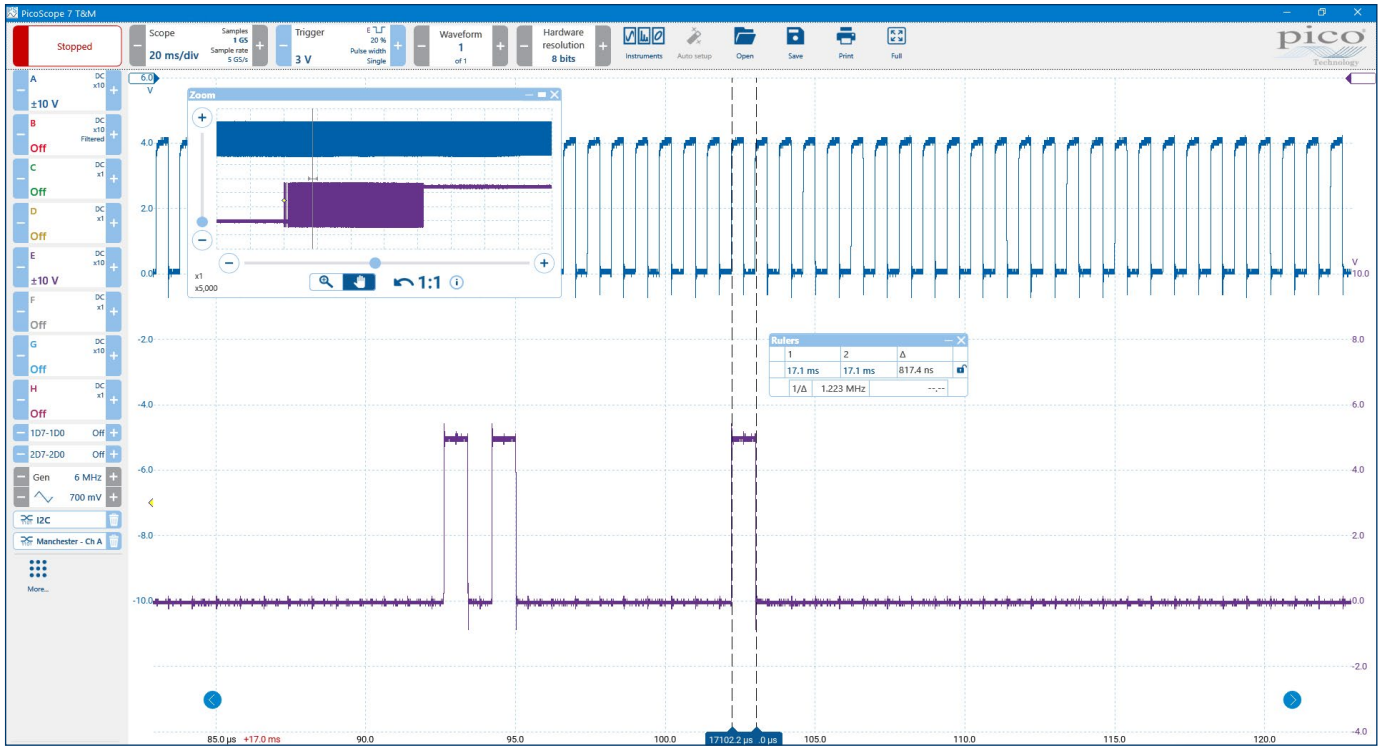
The PicoScope 6428E-D with up to 3 GHz analog bandwidth complemented by a real-time sampling rate of 10 GS/s can display single-shot pulses with 100 ps time resolution.

The PicoScope 6000E Series gives you the deepest capture memory available as standard on any oscilloscope – up to 4 GS in total.

This ultra-deep memory allows the oscilloscope to capture 200 ms waveforms at its maximum sampling rate of 5 GS/s. The PicoScope 6428E-D can capture 200 ms waveforms at 10 GS/s.

Custom applications using PicoSDK can allocate the scope's whole memory to a single waveform and sustain the maximum 5 GS/s sampling rate for even longer captures, up to 800 ms. The 6428E-D can sustain a maximum 10 GS/s sampling rate for 400 ms at 8-bit resolution.

The SuperSpeed USB 3.0 interface and hardware acceleration ensure that the display is smooth and responsive even with long captures.



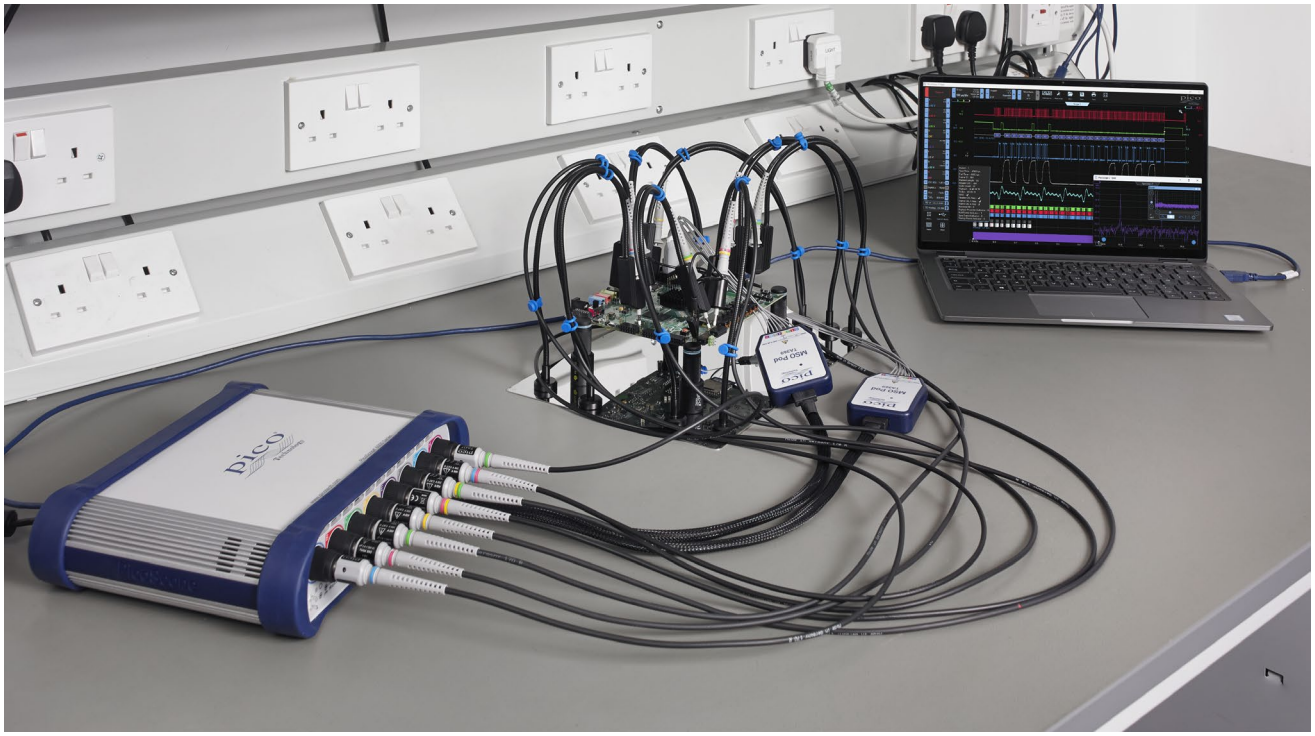
The PicoScope 6000E Series gives you the waveform memory, resolution and analysis tools that you need to perform stringent testing of today's high-performance embedded computers and next-generation embedded system designs.

Power, portability and performance

Traditional benchtop mixed-signal oscilloscopes take up a lot of bench space, and models with eight analog channels are prohibitively expensive for many engineers working on next-generation designs. PicoScope 6000E 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.

The PicoScope 6000E Series offers up to 8 analog channels, plus an optional 8 or 16 digital channels with the plug-in 8-channel TA369 MSO (mixed-signal oscilloscope) pods. The flexible high-resolution display options enable you to view and analyze each signal in detail.

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



What is FlexRes?

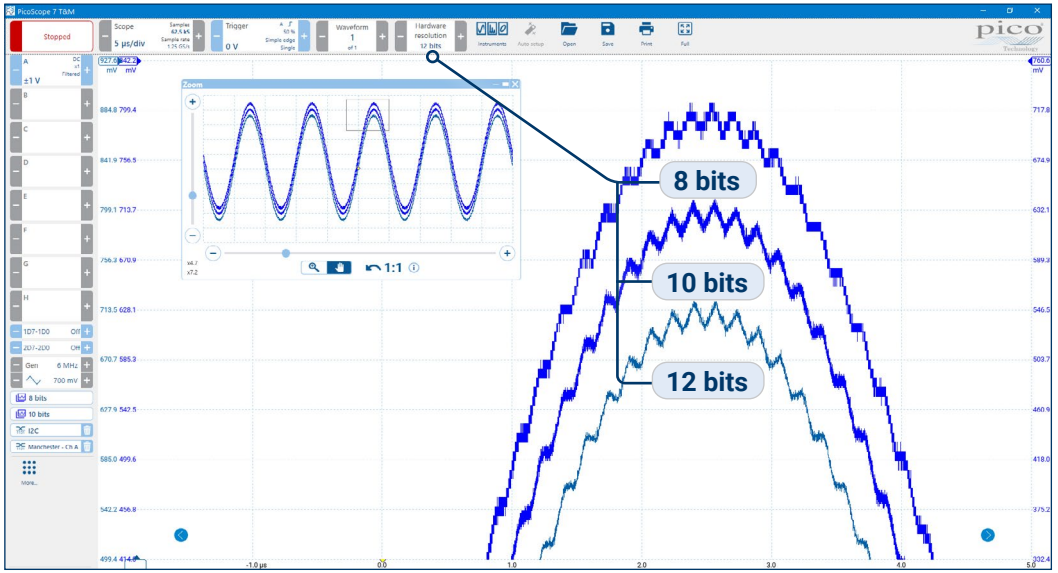
Pico FlexRes flexible-resolution oscilloscopes allow you to reconfigure the scope hardware to optimize either the sampling rate or the resolution.

This means you can reconfigure the hardware to be either a fast (5 GS/s) 8-bit oscilloscope for looking at digital signals, a 10-bit oscilloscope for general-purpose use or a high-resolution 12-bit oscilloscope for audio work and other analog applications.

Whether you're capturing and decoding fast digital signals or looking for distortion in sensitive analog signals, FlexRes oscilloscopes are the answer.

FlexRes is included on the 8-channel PicoScope 6824E and the 4-channel PicoScope 6424E, 6425E, 6426E and 6428E-D oscilloscopes.

Resolution enhancement—a digital signal processing technique built into PicoScope — can further increase the effective vertical resolution of the scope to 16 bits.



FlexRes – how we do it

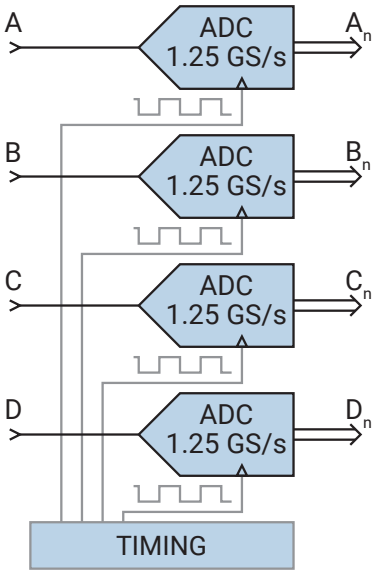
Most digital oscilloscopes gain their high sampling rates by interleaving multiple 8-bit ADCs. This interleaving process introduces errors that always make the dynamic performance worse than that of the individual ADC cores.

The FlexRes architecture employs multiple high-resolution ADCs at the input channels in different time-interleaved and parallel combinations to optimize, for example, the sampling rate to 10 GS/s at 8 bits or the resolution to 12 bits at 1.25 GS/s.

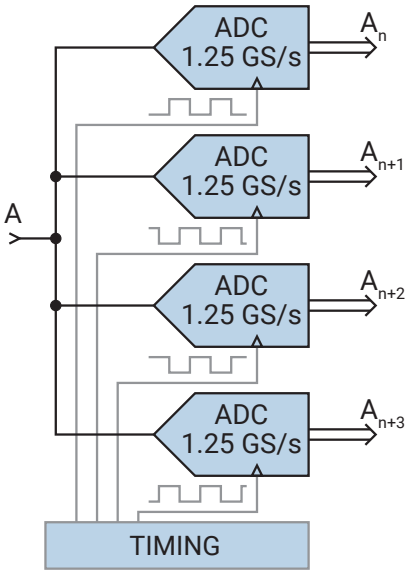
For simplicity, the diagram shows one bank of four channels; the 8-channel PicoScope 6824E has two banks. The 4-channel FlexRes models use one quad-ADC chip for each pair of analog channels.

The PicoScope 6428E-D is able to interleave a pair of quad-ADC chips at 8-bits to achieve 10 GS/s.

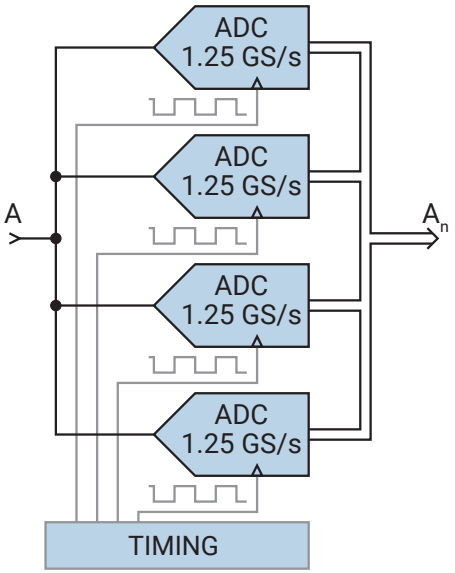
Coupled with high signal-to-noise ratio amplifiers and a low-noise system architecture, FlexRes technology can capture and display signals up to 3 GHz with a high sampling rate, or lower-speed signals with 16 times more resolution than typical 8-bit oscilloscopes.



MULTI-CHANNEL*
Independent sampling on all channels at 8-bit or 10-bit resolution.



TIME-INTERLEAVED*
Maximum sampling rate in 8 or 10-bit mode.



PARALLEL*
Simultaneous sampling in 12-bit mode at up to 1.25 GS/s on two channels.

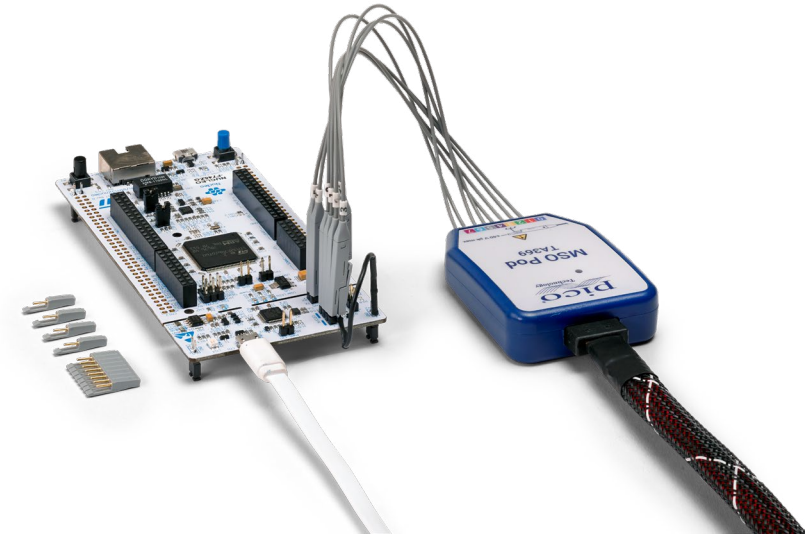
* See technical specifications for channel and sampling rate combinations.

Mixed-signal operation

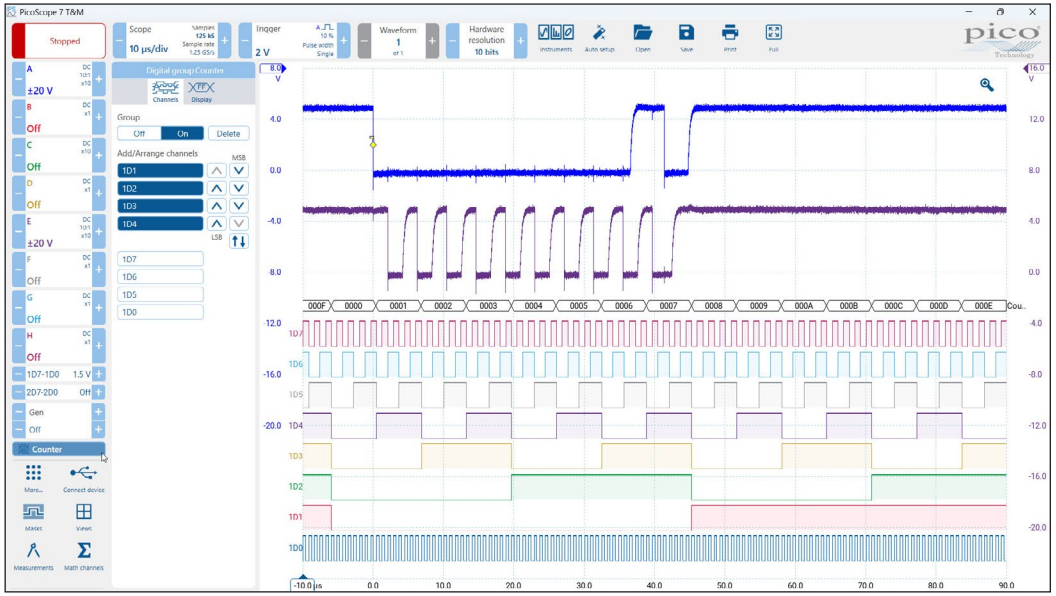
When fitted with optional 8-channel TA369 MSO pods, the PicoScope 6000E Series adds up to 16 high-performance digital channels to up to eight analog channels, enabling you to accurately time-correlate analog and digital signals. Digital channel bandwidth is 500 MHz, equivalent to 1 Gb/s with 1 ns minimum pulse width. The input capacitance of only 3.5 pF minimizes loading on the device under test.

Digital channels, captured from either parallel or multiple serial buses, 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 the analog and digital channels.

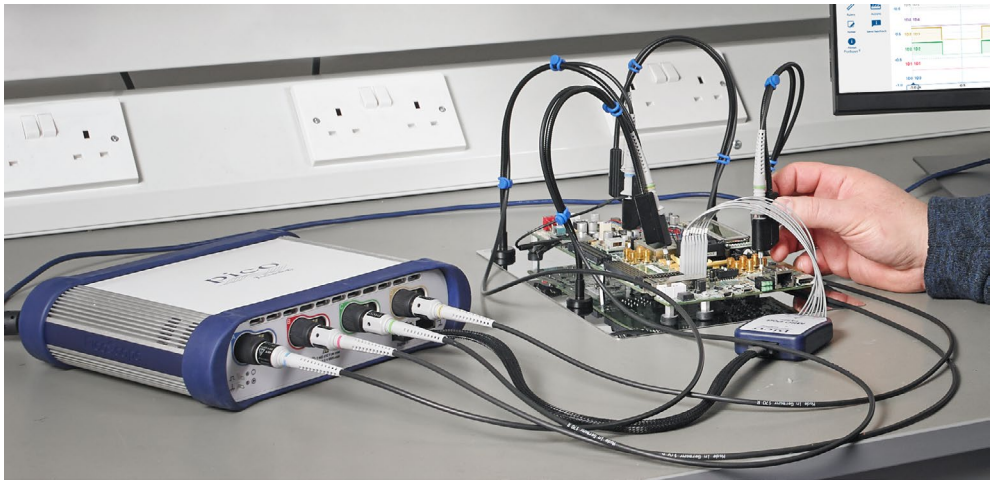
The digital inputs also bring extra power to the serial decoding feature. You can decode serial data on all analog and digital channels simultaneously, giving you up to 24 channels of data – for example, decoding multiple SPI, I²C, CAN bus, LIN bus and FlexRay signals all at the same time!



Digital channels connected to a device under test



Analog waveforms (top) and digital waveforms (bottom) shown on PicoScope display



A typical test set-up with four analogue probes (situated on the DUT using the probe positioning system) and one TA369 MSO pod with eight digital channels.

The new PicoScope 6428E-D

The PicoScope 6428E-D adds a high-speed oscilloscope to the PicoScope 6000E Series with high bandwidth 50 Ω inputs and a reduced set of input ranges. Larger input signals can be accommodated with the use of external attenuators or probes designed to be used with a 50 Ω input, such as the TA062 1.5 GHz low-impedance passive oscilloscope probe with 10:1 attenuation or the PicoConnect 900 Series of passive probes with up to 5 GHz bandwidth.

Built for speed!

With up to 3 GHz bandwidth complemented by an extremely fast, real-time sampling rate of 10 GS/s, the PicoScope 6428E-D can display single-shot pulses with 100 ps time resolution. This level of sampling rate allows you to capture very fast, high-frequency signals with precision, for detailed signal analysis.

The 4-gigasample buffer can hold up to two 200 ms captures at the maximum sampling rate of 10 GS/s. This means you can record multiple instances of a signal or capture different signal conditions.

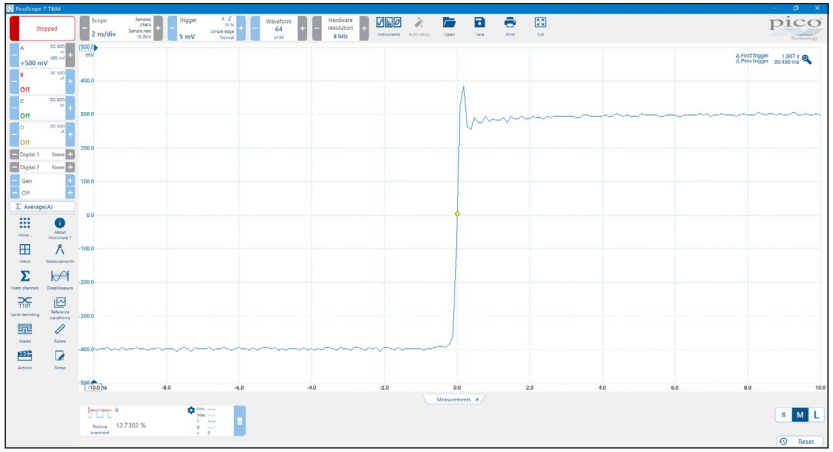
The PicoScope 6428E-D is designed for scientists, engineers and researchers working in high-speed applications who need to capture, measure and analyze sub-nanosecond waveform events – either in stand-alone applications or integrated as part of a larger system.

Typical applications:

- High energy physics
- Particle accelerators
- LIDAR (light detection and ranging)
- VISAR (velocity-interferometer system for any reflector)
- Spectroscopy
- Medical imaging
- Semiconductor test
- Non-destructive test
- Production line test

Features:

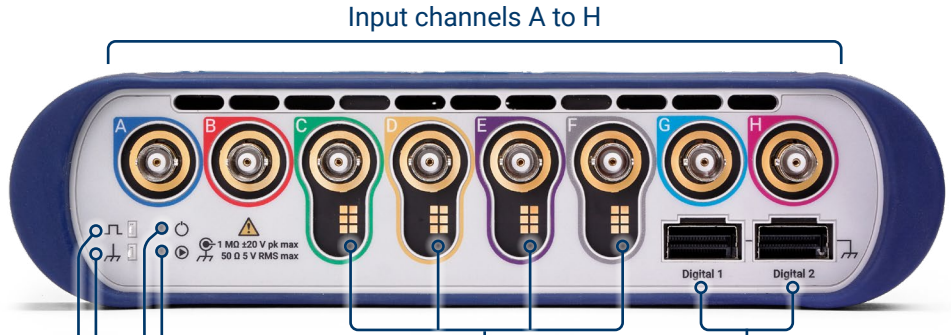
- 4 channels and four input ranges per channel (±50 mV, ±100 mV, ±200 mV, ±500 mV)
- Up to 3 GHz bandwidth
- 100 ps time resolution
- 4 GS capture memory
- Up to 10 GS/s real-time sampling
- 8-, 10-, or 12-bit flexible resolution (FlexRes)
- Segmented memory/rapid block trigger
- Built-in function generator/AWG
- Fast transfer of captured data to the host computer via the USB 3.0 SuperSpeed connection
- Drivers and SDK included (Windows, Linux, Mac)
- Programming examples for LabView, MATLAB, Python and C++
- PicoScope software included



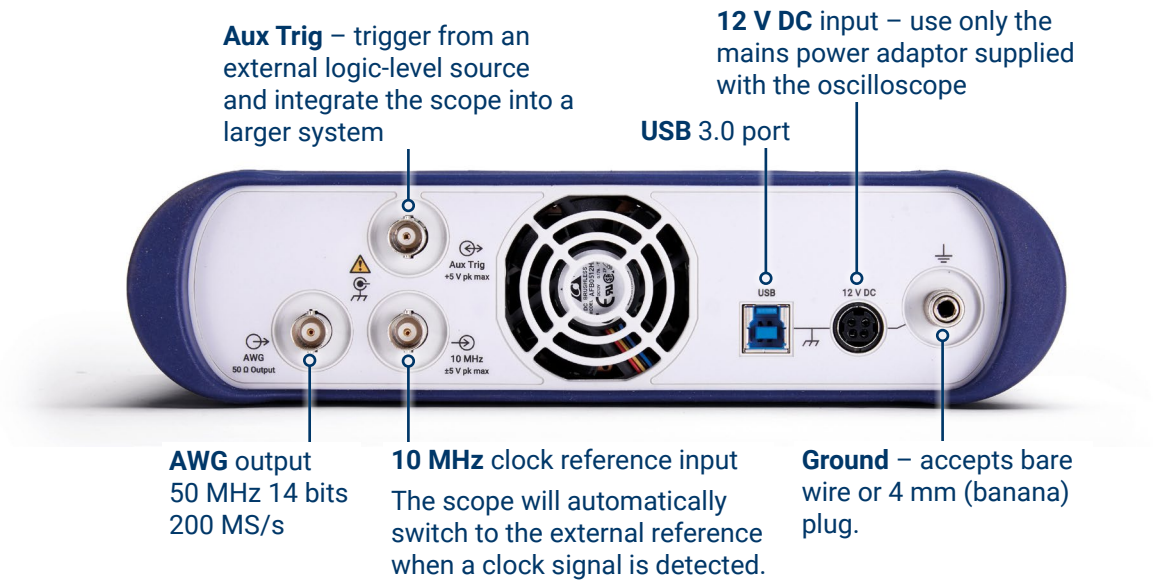
10 GS/s real-time sampling shows fast signals in detail

PicoScope 6000E Series inputs, outputs and indicators

8-channel front panel



Rear panel

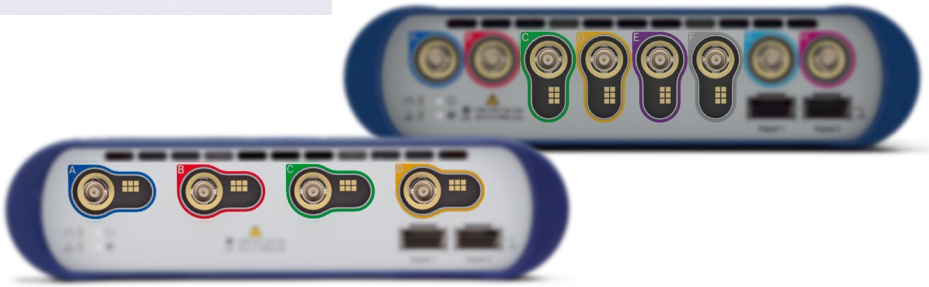


4-channel front panel

Intelligent probe interface

With an intelligent probe interface on channels C to F on 8-channel models and all channels on 4-channel models, the PicoScope 6000E Series supports innovative active probes with a low-profile mechanical design for ease of connectivity and low loading of the device under test.

See page 28 for full details of our A3000 Series active probes.



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.

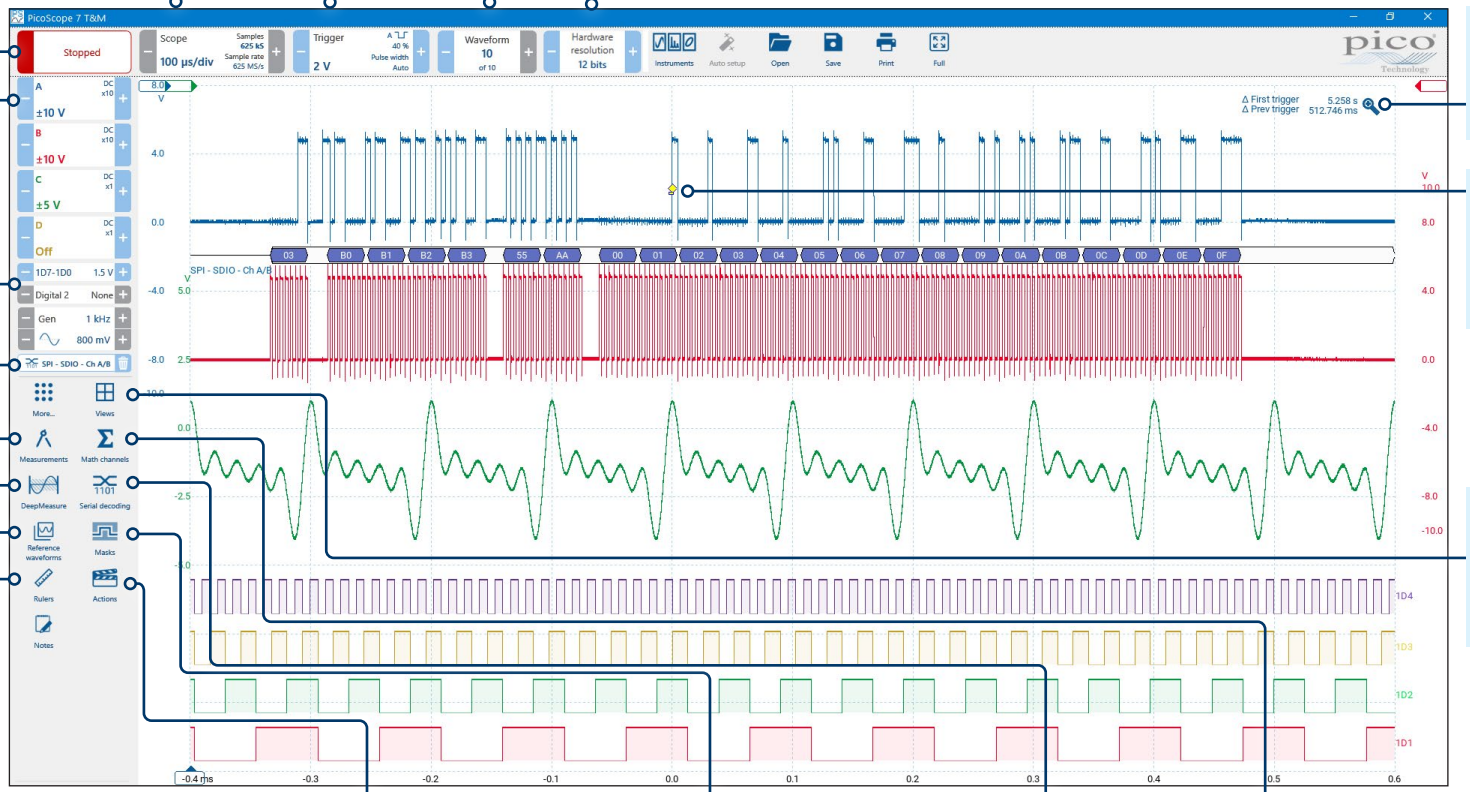
Timebase sampling controls: Set the timing of an acquisition using the seconds/division control. **Sampling** controls provide a choice of timebase operating modes: **Buffer memory** priority adjusts the sampling rate to maintain a fixed capture memory depth. **Sample rate** priority adjusts memory depth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

Flexible resolution: The FlexRes models in the 6000 Series allow you to select vertical hardware resolution.

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.



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.

Digital channel controls: 16 digital channels, with optional MSO pods, 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.

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.

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

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.

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**, **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 over 38 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 axis. The ruler legend displays the frequency at each ruler and the difference between them.

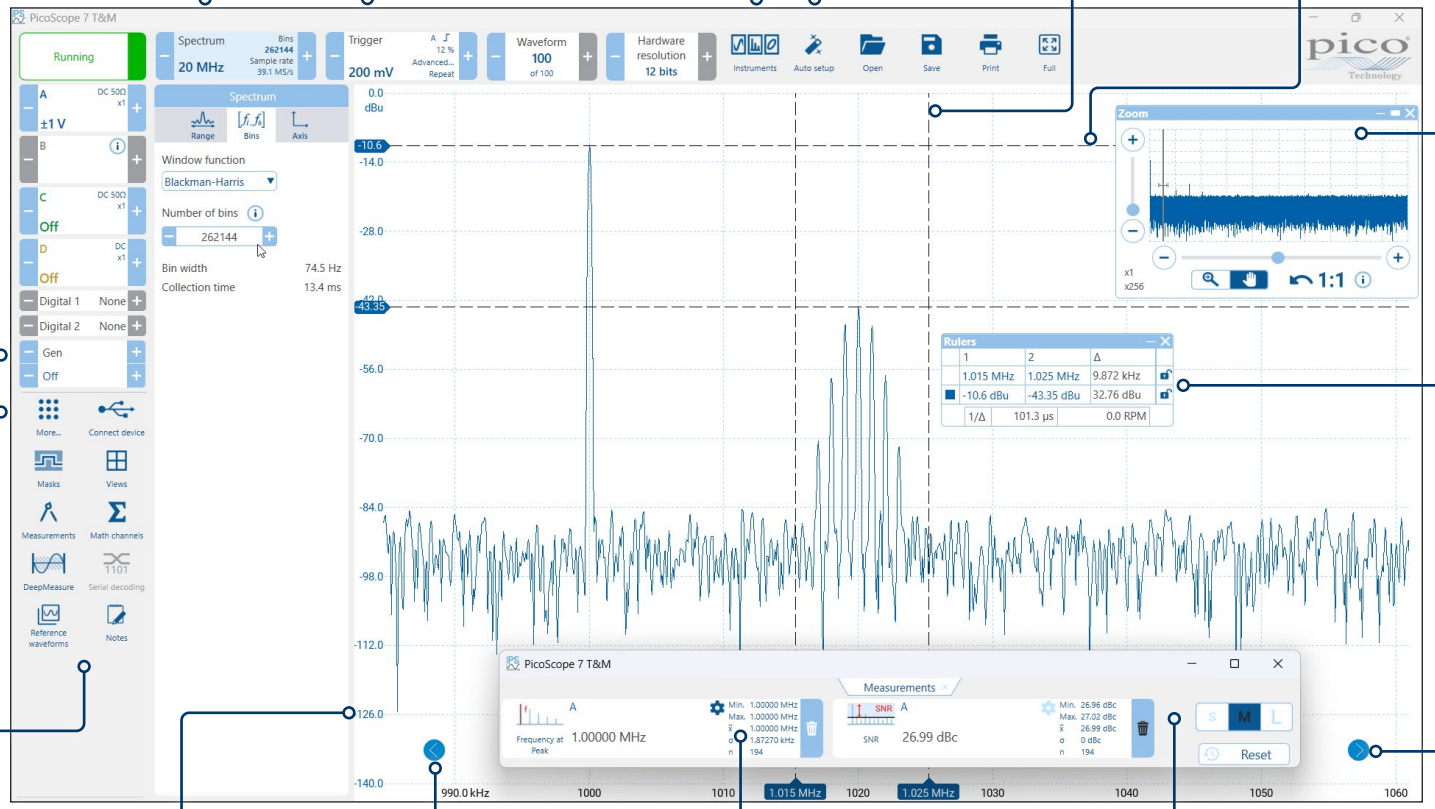
dB/voltage rulers: Drag up or down to mark a point on the axis. The ruler legend will display the decibel/voltage value at each ruler and the difference between them.

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

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

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

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



Channel axis: Each channel has a color-coded axis. Drag it up or down to position the channel.

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

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 as shown, and even moved to another monitor.

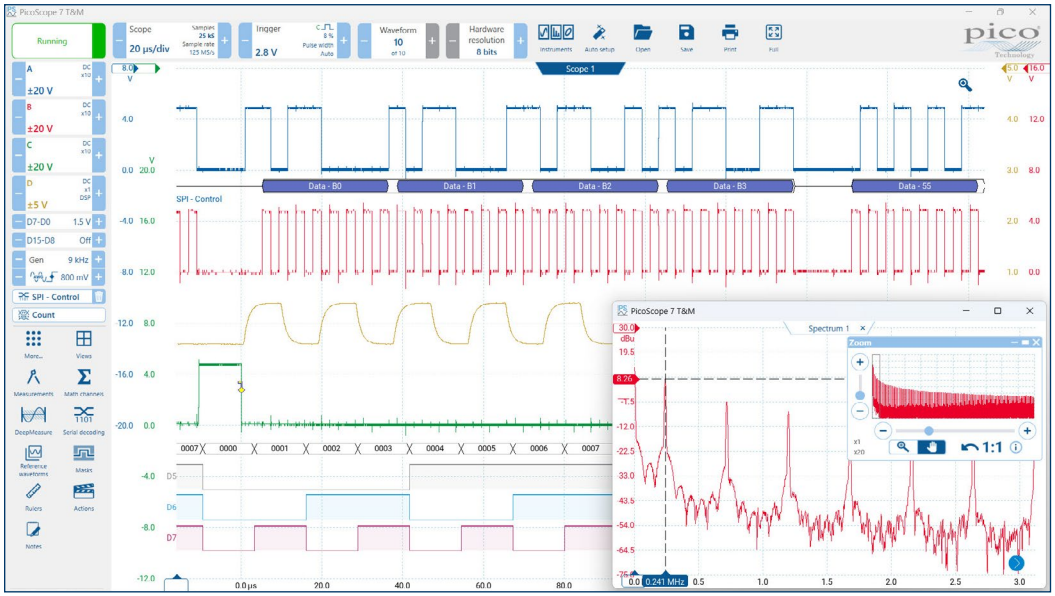
Navigate waveform right: When zoomed-in, click to pan up the frequency range.

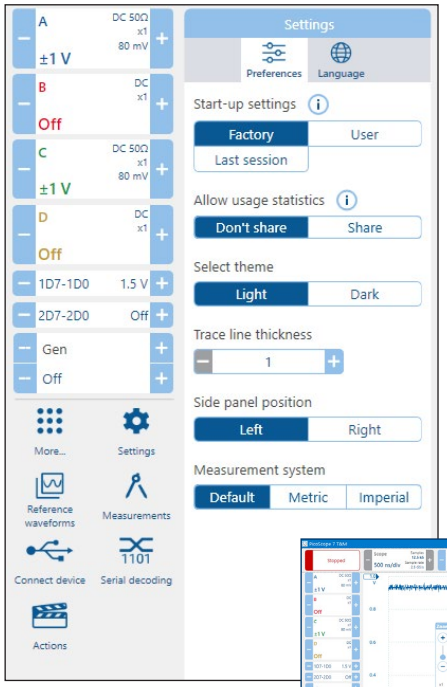
Advanced display

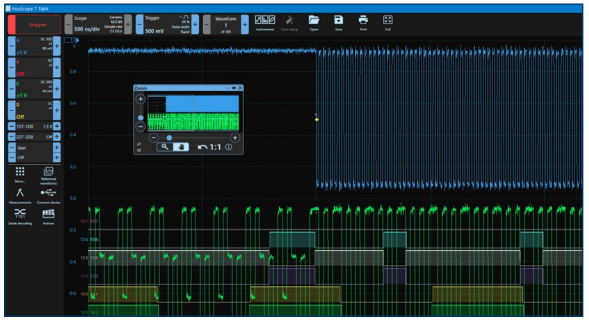
PicoScope software dedicates the majority of the display area to the waveform, ensuring that the maximum amount of data is visible at all times. The size of the display is only limited by the size of your computer's monitor, so even with a laptop, the viewing area is much bigger, with much higher resolution, than that of a benchtop scope.

With such a large display area available, you can create a customizable floating-screen display, drag views to different monitors and view multiple channels or different views of the same signal at the same time – the software can even show multiple oscilloscope and spectrum analyzer views at once. Each view has separate zoom, pan and filter settings, for ultimate flexibility.

You can control the PicoScope software using a mouse or touchscreen.

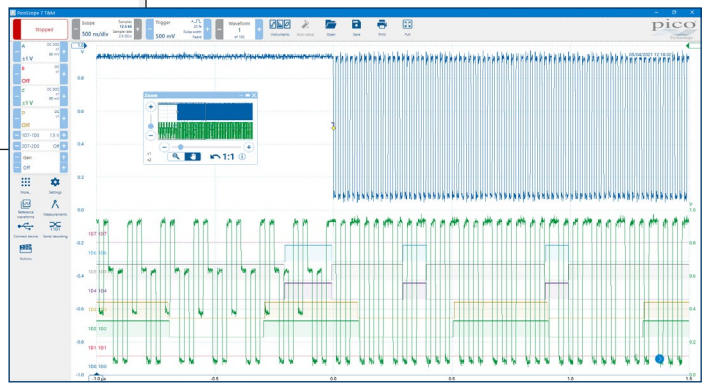






PicoScope custom colors

In PicoScope 7, you can customize the start-up settings, select a light or dark color theme, adjust the thickness of trace lines, choose a left or right side panel position and choose your measurement system units.



SuperSpeed USB 3.0 connection

PicoScope 6000E Series instruments feature a USB 3.0 connection, providing lightning-fast saving of waveforms while retaining compatibility with older USB standards.

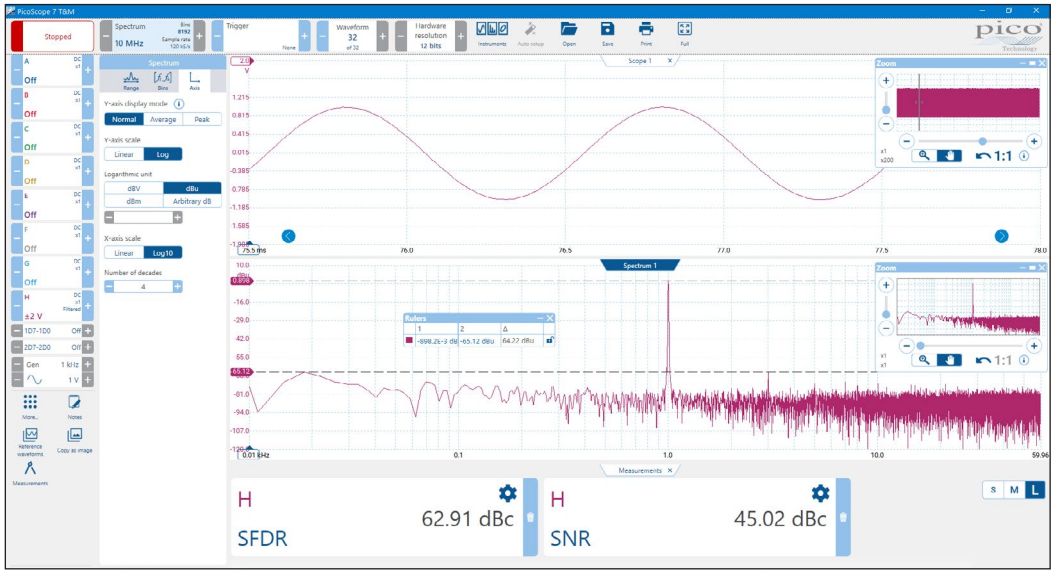
PicoSDK supports continuous streaming to the host computer at rates of over 300 MS/s.

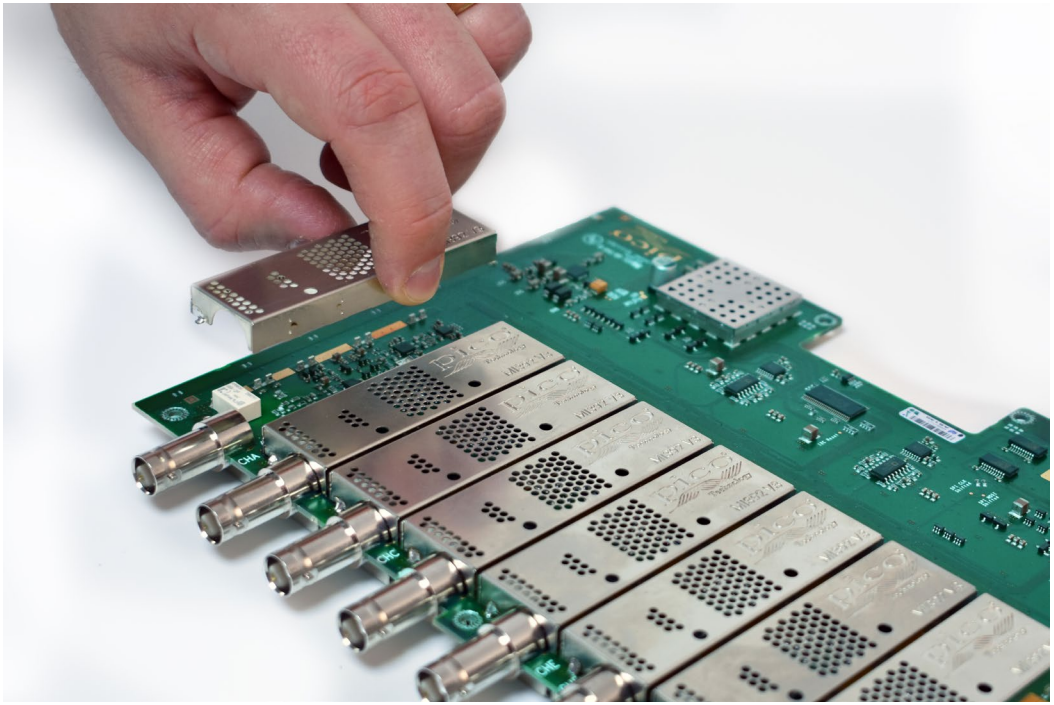
The USB connection not only allows high-speed data acquisition and transfer, but also makes printing, copying, saving and emailing your data from the field quick and easy.

Signal fidelity

Careful front-end design and shielding reduces noise, crosstalk and harmonic distortion. PicoScope 6000E Series oscilloscopes exhibit a dynamic performance of better than 60 dBc SFDR.

With PicoScope, when you probe a circuit, you can trust in the waveform you see on the screen.

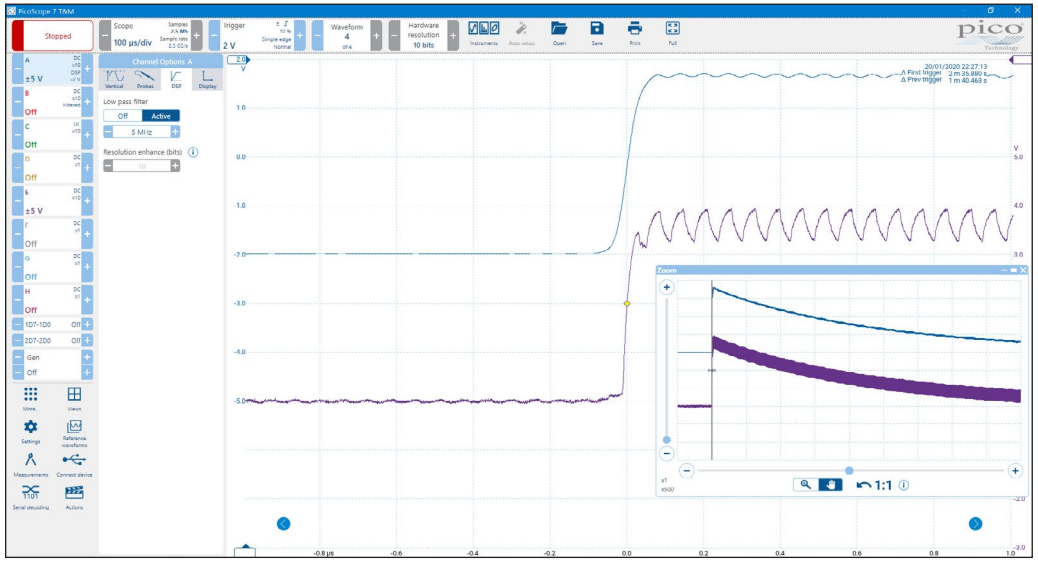




High resolution for low-level signals

With their 12-bit resolution, the PicoScope 6824E, 6424E, 6425E, 6426E and 6428E-D 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.

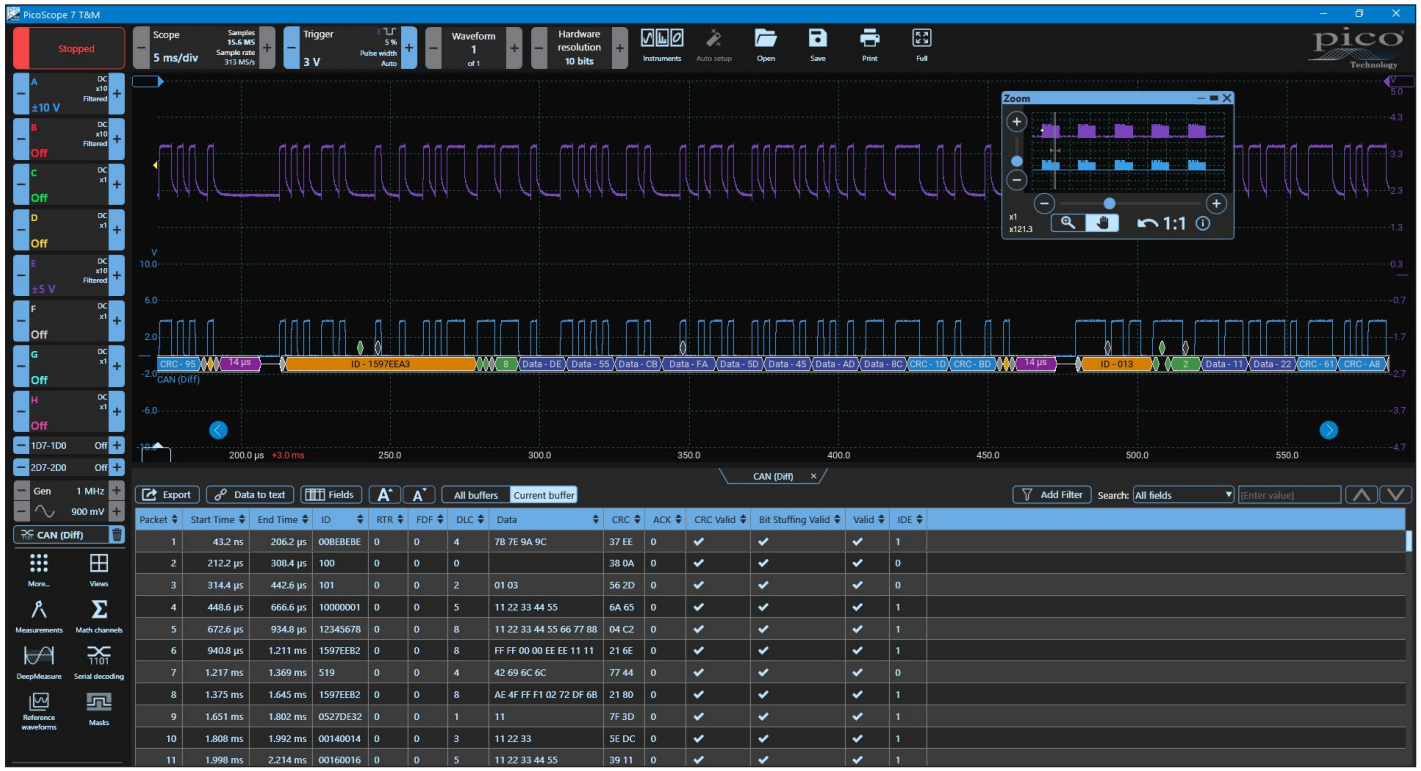
Additionally, you can use the **Low pass filter** controls on each channel independently, to hide noise and reveal the underlying signal.



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.



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

Total cost of ownership of a PicoScope 6000E is lower than traditional benchtop instruments for several reasons:

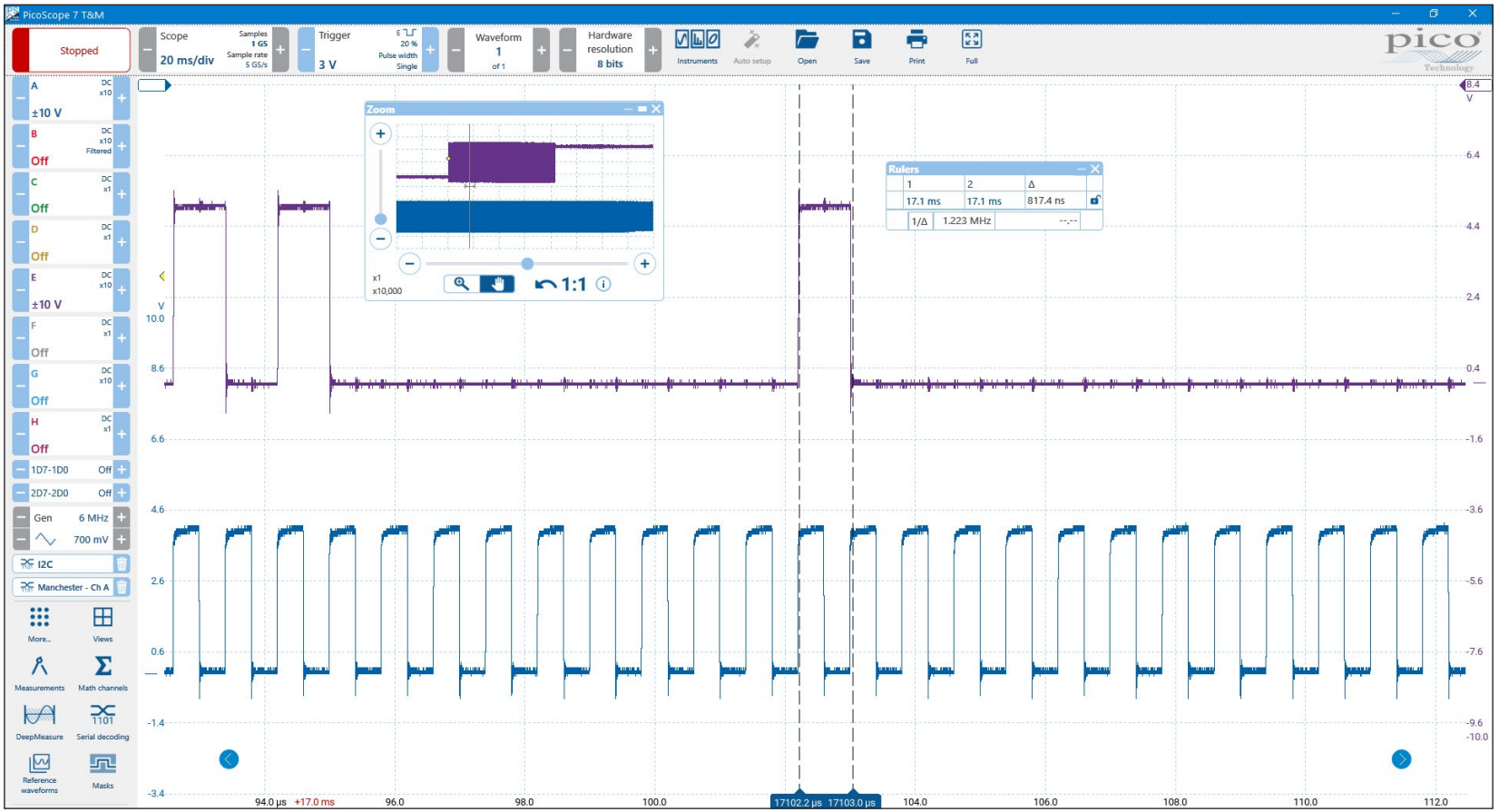
1. Low power consumption—just 60 W—saves hundreds of dollars throughout the lifetime of the product compared to benchtop instruments. It's kinder to the environment too, with lower CO_2 emissions.
2. Everything is included in the purchase price: serial protocol decoders, math channels and mask limit testing. No expensive optional upgrades or annual license fees.
3. Free updates: new features and capabilities are provided throughout the lifetime of the product as we develop and release them.
4. The PicoScope 6000E Series are highly portable and are very suited to home-working where desk space might be limited.

Ultra-deep memory

PicoScope 6000E Series oscilloscopes have waveform capture memories of up to 4 gigasamples – many times larger than competing scopes. Deep memory enables the capture of long-duration waveforms at maximum sampling speed. In fact, the PicoScope 6000E Series can capture waveforms 200 ms long with 200 ps resolution, or even 100 ps on the 10 GS/s 6428E-D. In contrast, the same 200 ms waveform captured by an oscilloscope with a 10 megasample memory would have just 20 ns resolution. The scope automatically shares the capture memory between the analog channels and MSO ports you have made active.

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

Powerful tools are included to allow you to manage and examine all of this data. As well as functions such as mask limit testing and color persistence mode, 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 6000E Series some of the most powerful oscilloscopes on the market.



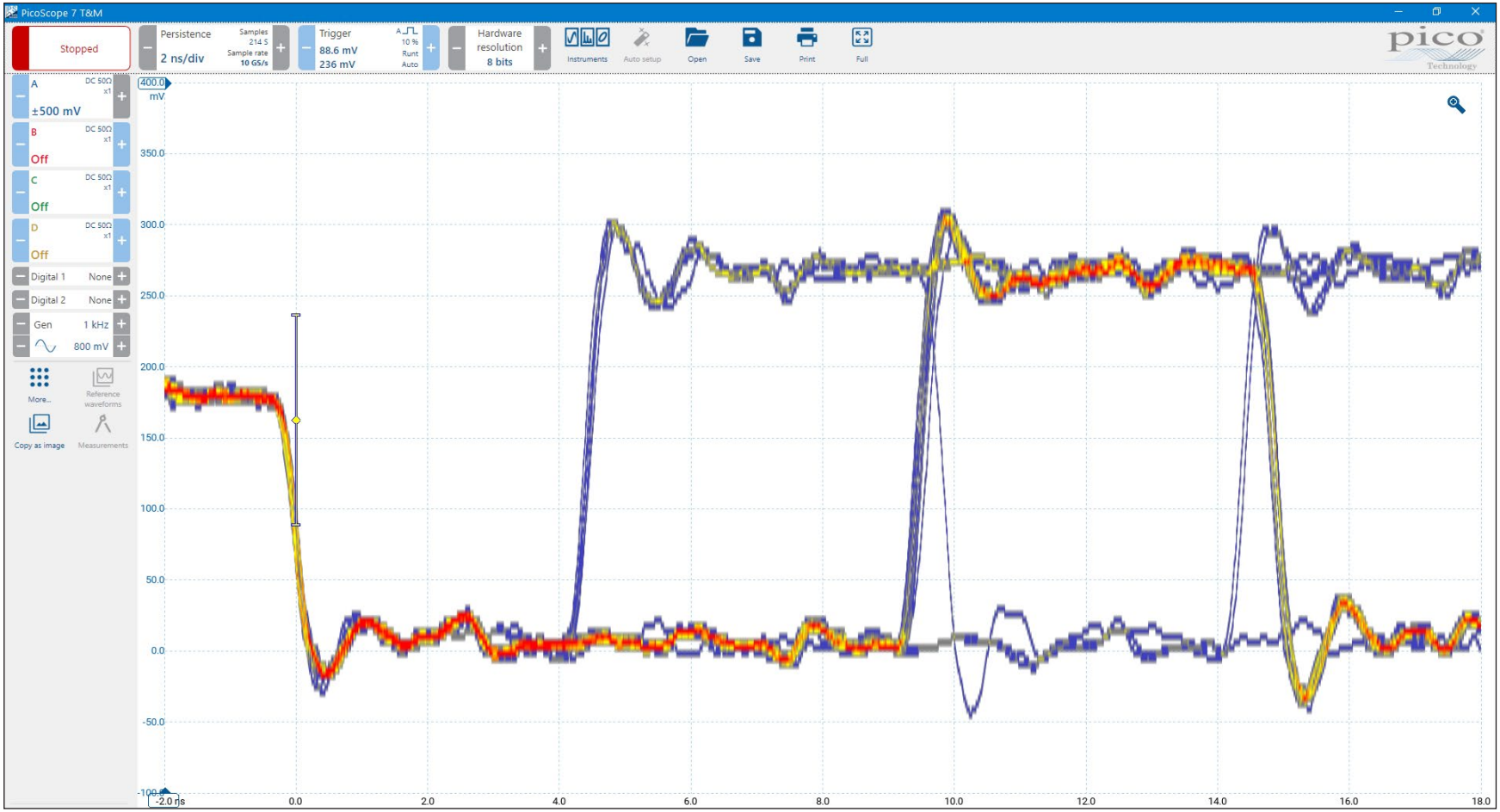
Persistence mode

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 capture rate refers to how quickly an oscilloscope acquires waveforms.

Oscilloscopes with high waveform capture 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 6000E Series' HAL4 hardware acceleration can achieve update rates of 300 000 waveforms per second in fast persistence mode.



Serial bus decoding and protocol analysis

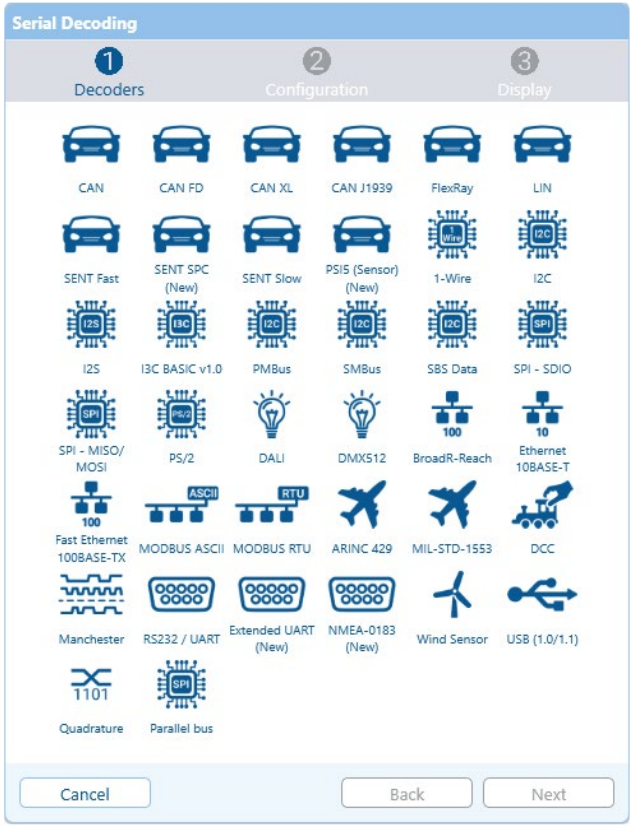
PicoScope can decode 1-Wire, ARINC 429, BroadRReach, CAN, CAN FD, CAN J1939, CAN XL, DALI, DCC, DMX512, Ethernet 10BASE-T, Extended UART, Fast Ethernet 100BASE-TX, FlexRay, I2C, I2S, I3C BASIC v1.0, LIN, Manchester, MIL-STD-1553, MODBUS ASCII, MODBUS RTU, NMEA-0183, Parallel Bus, PMBus, PS/2, PSI5 (Sensor), 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.

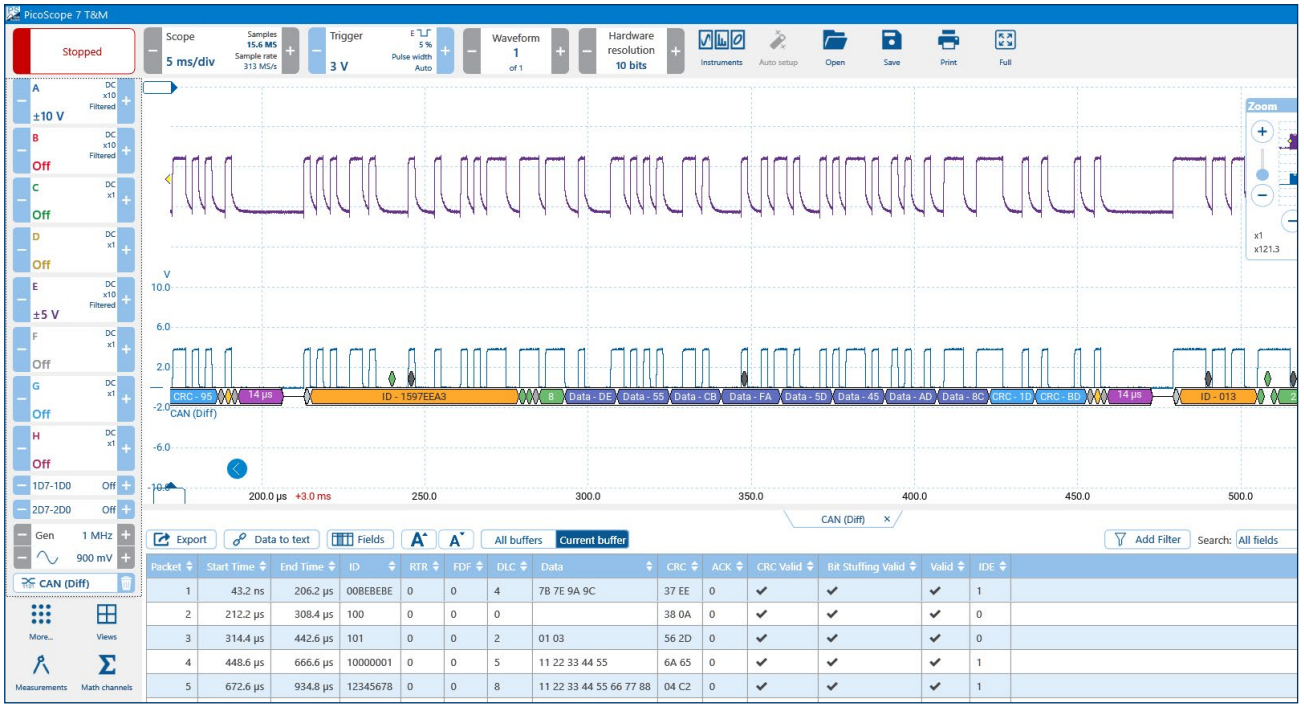
Graph format shows the decoded data (in hex, binary, decimal or ASCII) in a data-bus timing format beneath the waveform on a common time axis, with error frames marked in red. These frames can be zoomed to investigate noise or signal integrity issues.

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

Click on a frame in the table to zoom the oscilloscope display and show the waveform for that frame.

Link File 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.





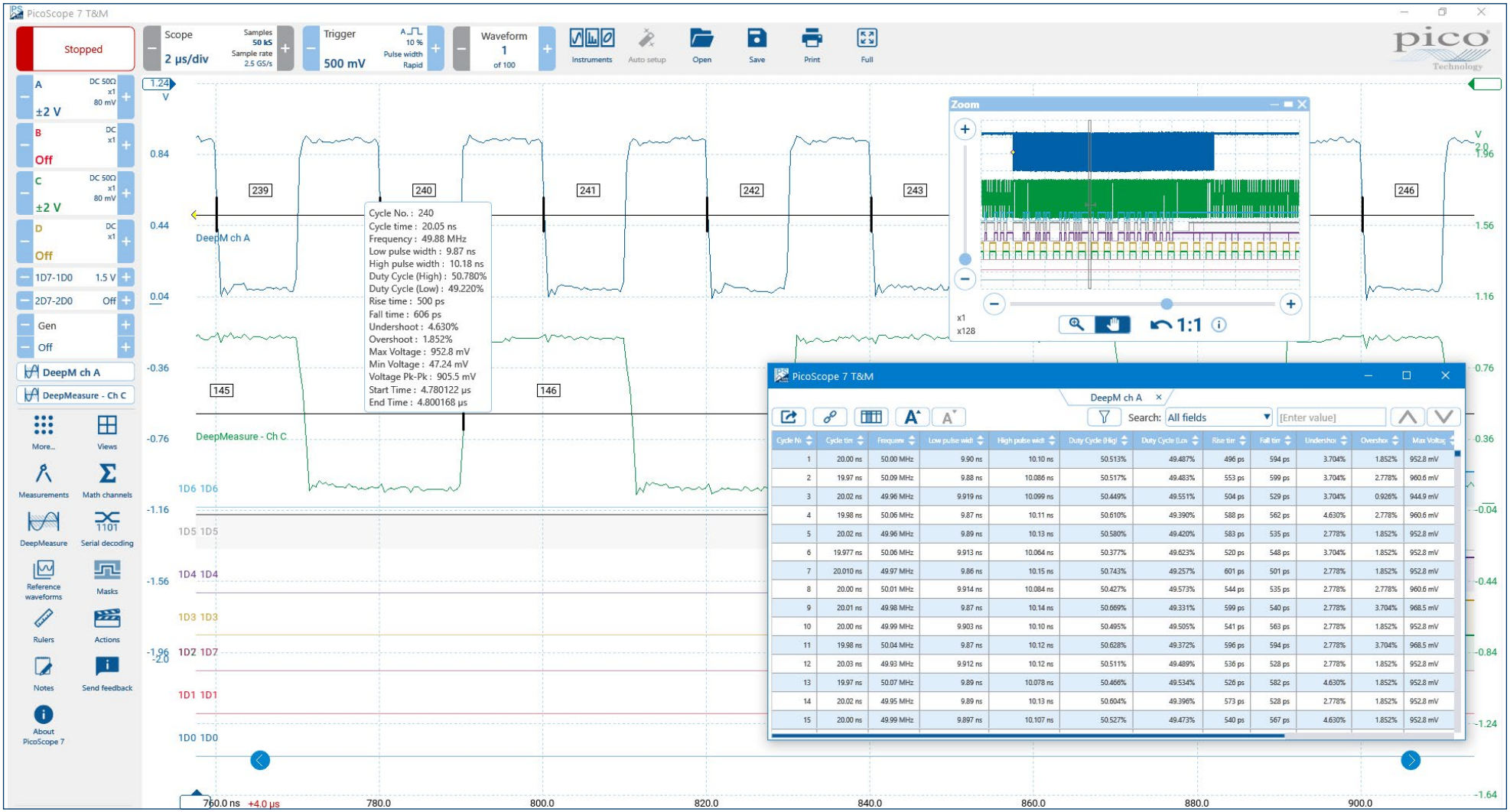
DeepMeasure

One waveform, millions of measurements.

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

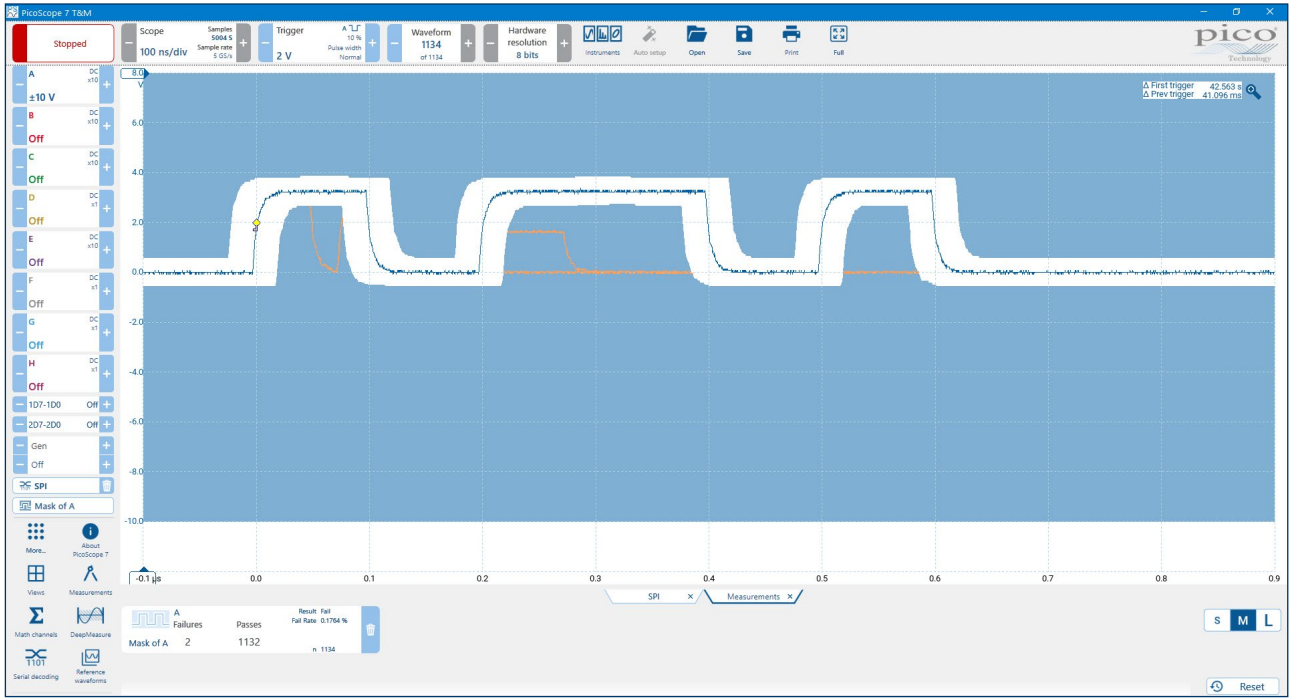
DeepMeasure delivers automatic measurements of important waveform parameters, such as pulse width, rise time and voltage, for every individual cycle in the captured waveforms. Up to a million cycles can be displayed with each triggered acquisition or combined across multiple acquisitions. Results can 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 with PicoScope's rapid trigger mode 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.



Mask limit testing

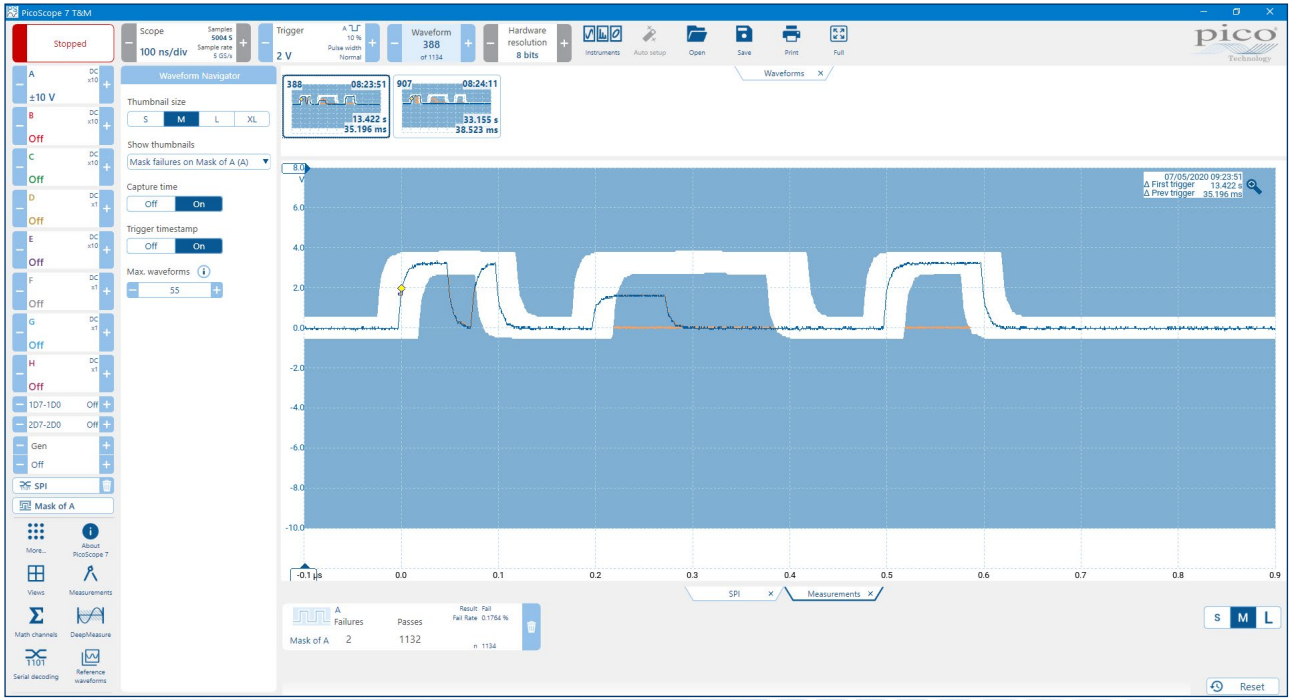
Mask limit testing allows you to compare live signals against known good signals, and is designed for production and debugging environments. Simply capture a known good signal and use it to auto-generate a mask and then measure the system under test. PicoScope will check for mask violations and perform 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/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.

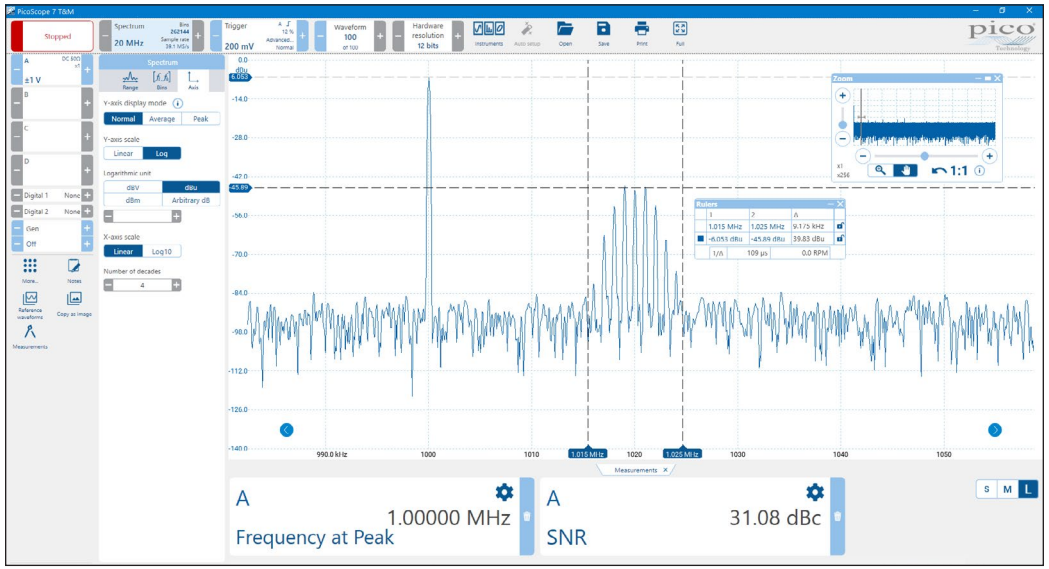


FFT spectrum analyzer

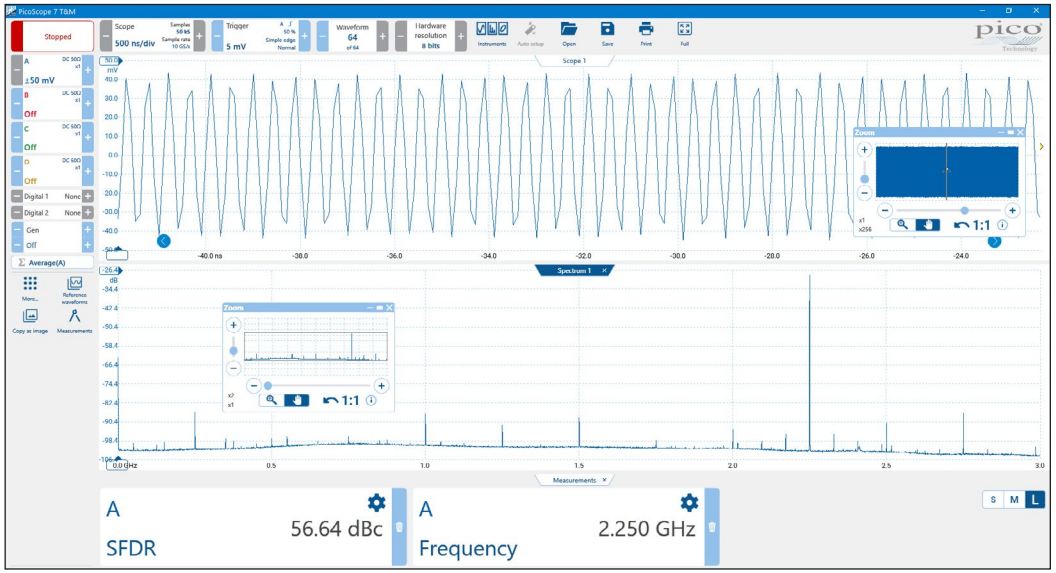
The spectrum view plots amplitude against frequency and is ideal for finding noise, crosstalk or distortion in signals. The spectrum analyzer in PicoScope is of the Fast Fourier Transform (FFT) type which, unlike a traditional swept spectrum analyzer, can display the spectrum of a single, non-repeating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

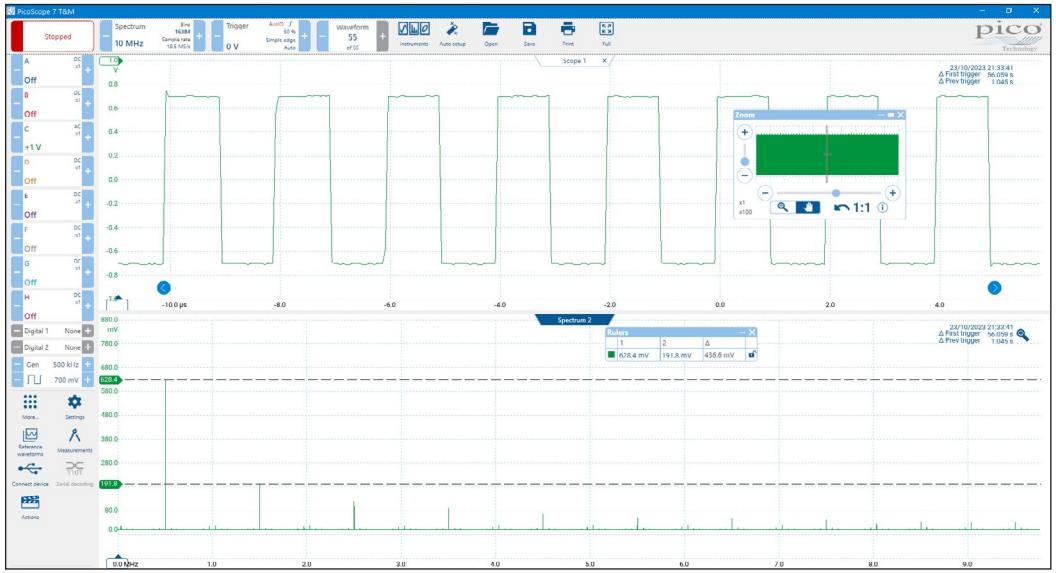
You can display multiple spectrum views alongside oscilloscope views of the same data. A comprehensive set of automatic frequency-domain measurements can be added to the display, including THD, THD+N, SNR, SINAD and IMD. A mask limit test can be applied to a spectrum and you can even use the AWG and spectrum mode together to perform swept scalar network analysis.



Frequency domain display showing 1 MHz carrier and modulated sideband



2.25 GHz spectrum with SFDR



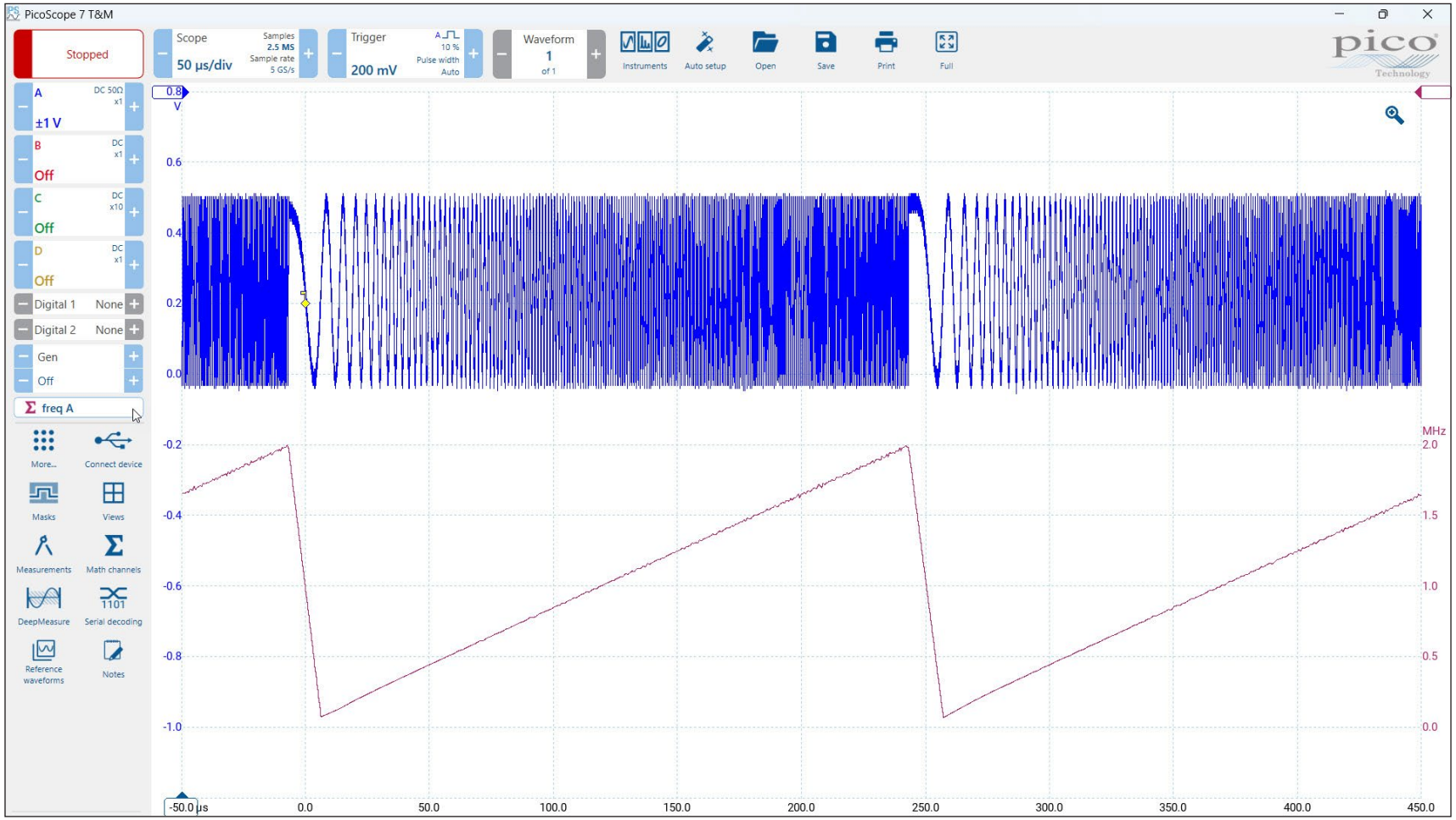
Harmonics of a square-wave signal

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. All waveforms that pass or fail your set measurement limits can be filtered within the waveform navigator to make it easier to find and view all waveforms that pass or fail your set measurement limits.

The screenshot below shows a plot of the changing frequency of the 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 A to Z of PC Oscilloscopes.

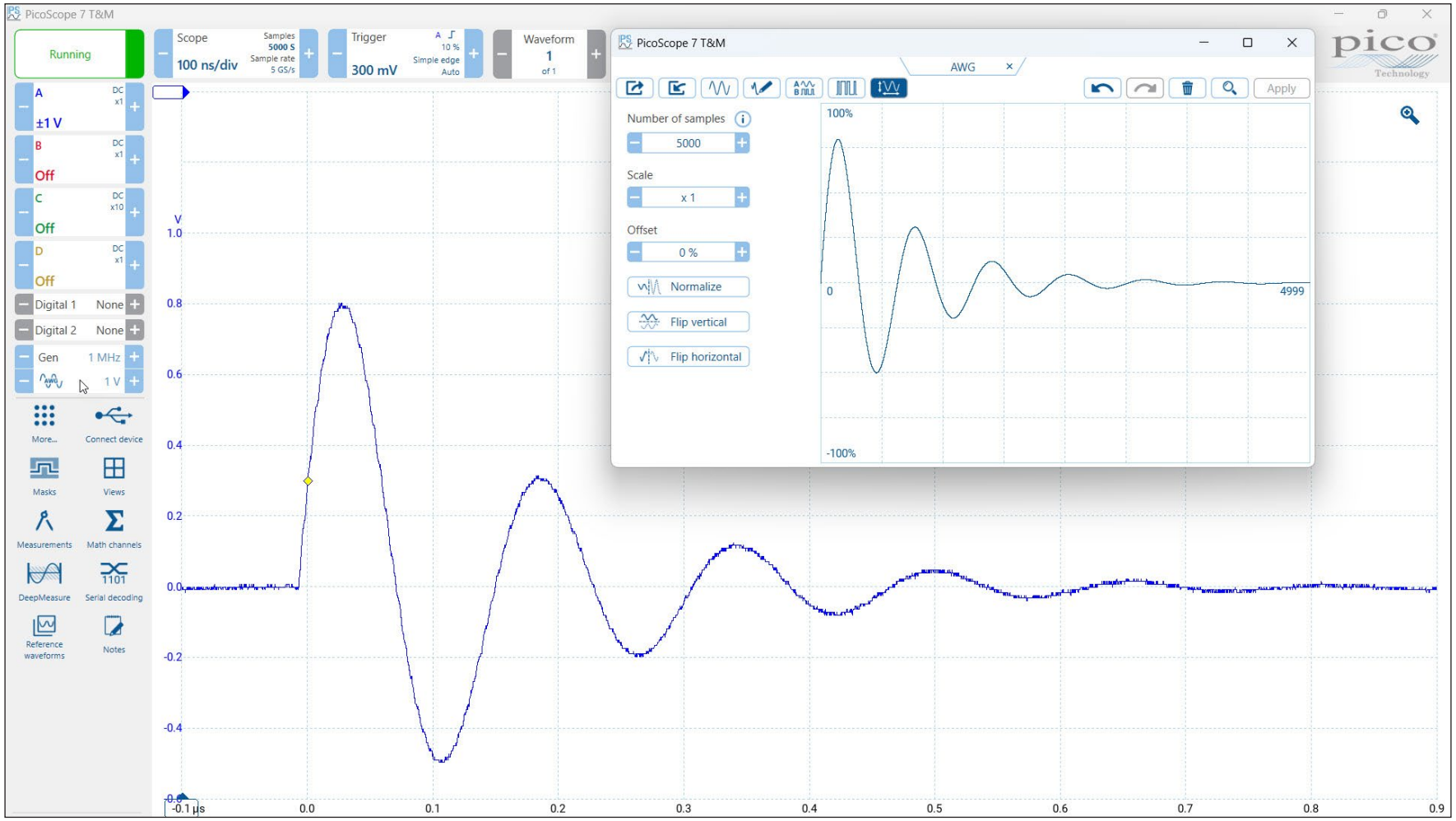


Arbitrary waveform and function generator

All PicoScope 6000E models have a built-in 50 MHz function (sine and square wave) generator, with triangle, DC level, white noise, PRBS and other waveforms possible at lower frequencies. 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.

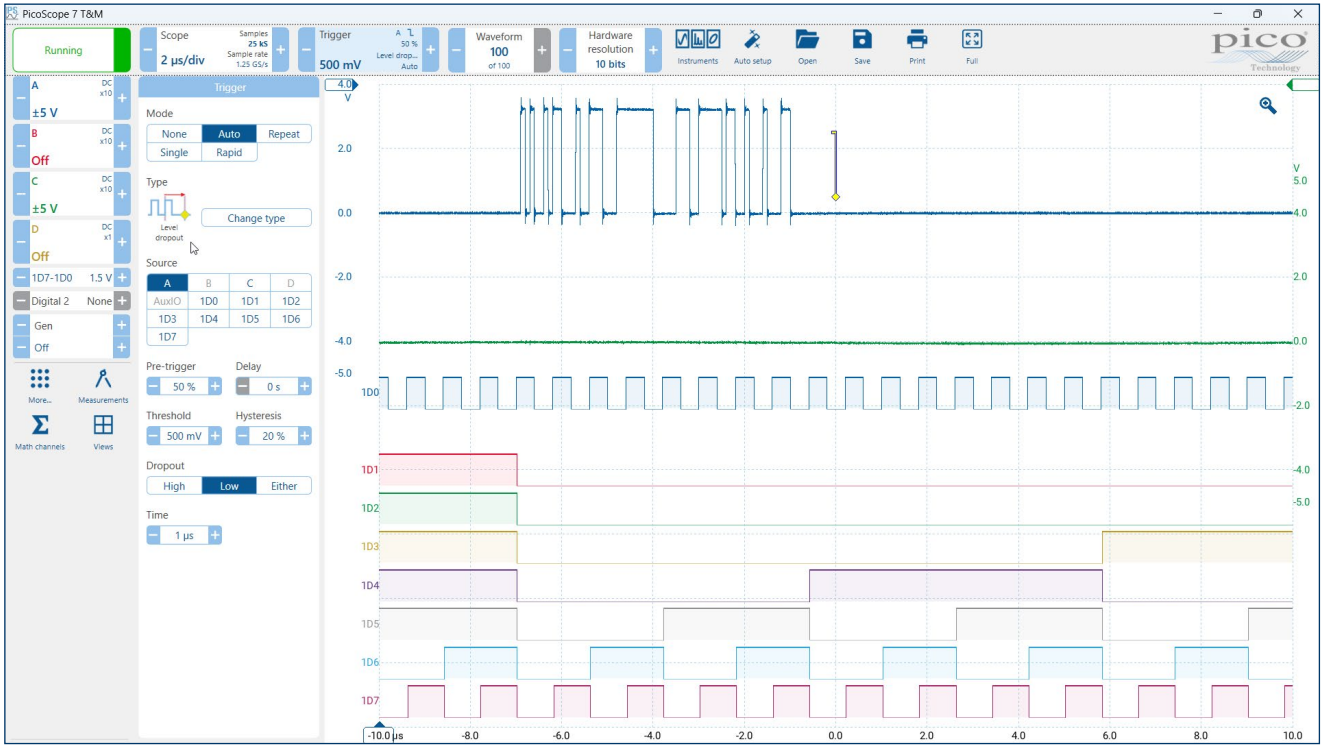
All models also include a 14-bit 200 MS/s arbitrary waveform generator (AWG). This has a variable sample clock, which avoids the jitter on waveform edges seen with fixed-clock generators and allows generation of accurate frequencies down to 100 µHz. AWG waveforms can be created or edited using the built-in editor, imported from oscilloscope traces, loaded from a spreadsheet or exported to a CSV file.



Digital triggering architecture

Many digital oscilloscopes still use an analog trigger architecture based on 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 pioneered the use of fully digital triggering using the actual digitized data. This technique reduces trigger 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.



Advanced triggers

The PicoScope 6000E Series offers a set of advanced trigger types including pulse width, runt pulse, windowed, rise/fall time, logic and dropout.

The digital trigger available during MSO operation 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 binary value.

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

Actions

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

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

The actions that PicoScope can execute include:

- Stop the capture
- Save waveform to disk
- Play a sound
- Trigger signal generator or AWG
- Run an external application or script

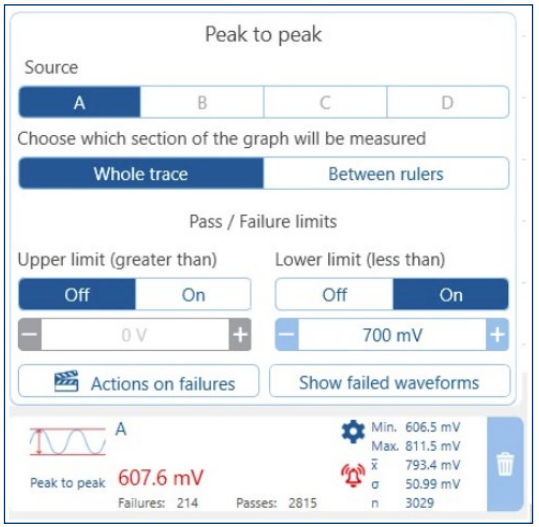
Actions, coupled with mask limit testing, help create a powerful and time-saving waveform monitoring tool. Capture a known good signal, auto-generate a mask around it and then use the actions to automatically save any waveform (complete with a time/date stamp) that does not meet specification.

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 a specified value.

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.

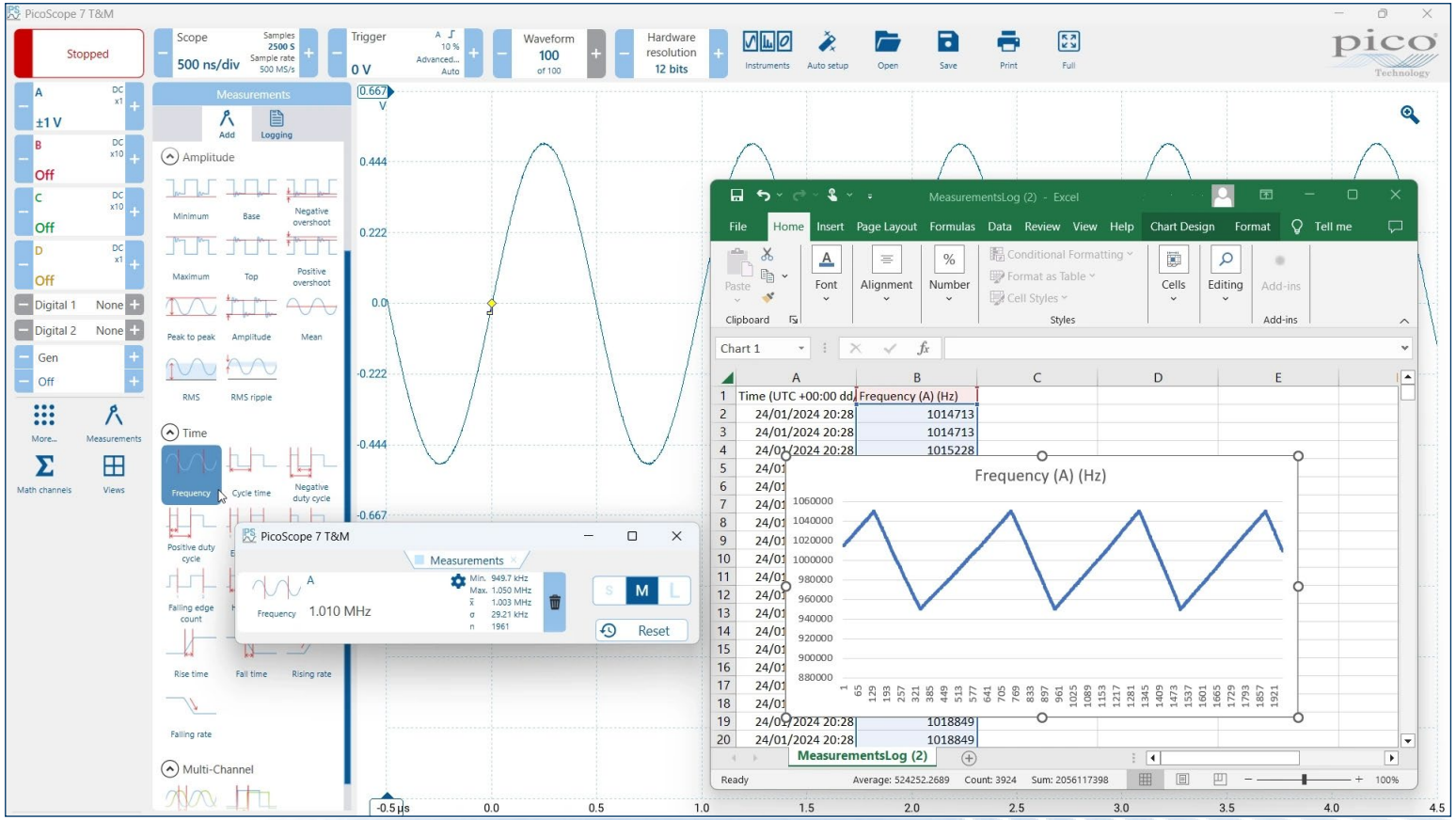


Measurements: logging

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.

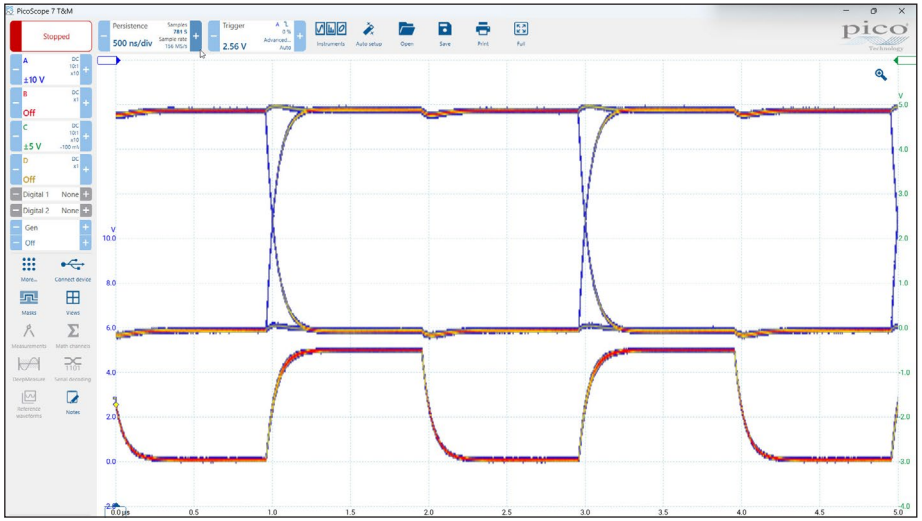


Hardware acceleration engine (HAL4)

Some oscilloscopes struggle when you enable deep memory; the screen update rate slows and the controls become unresponsive. The PicoScope 6000E 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 4 billion samples every second.

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

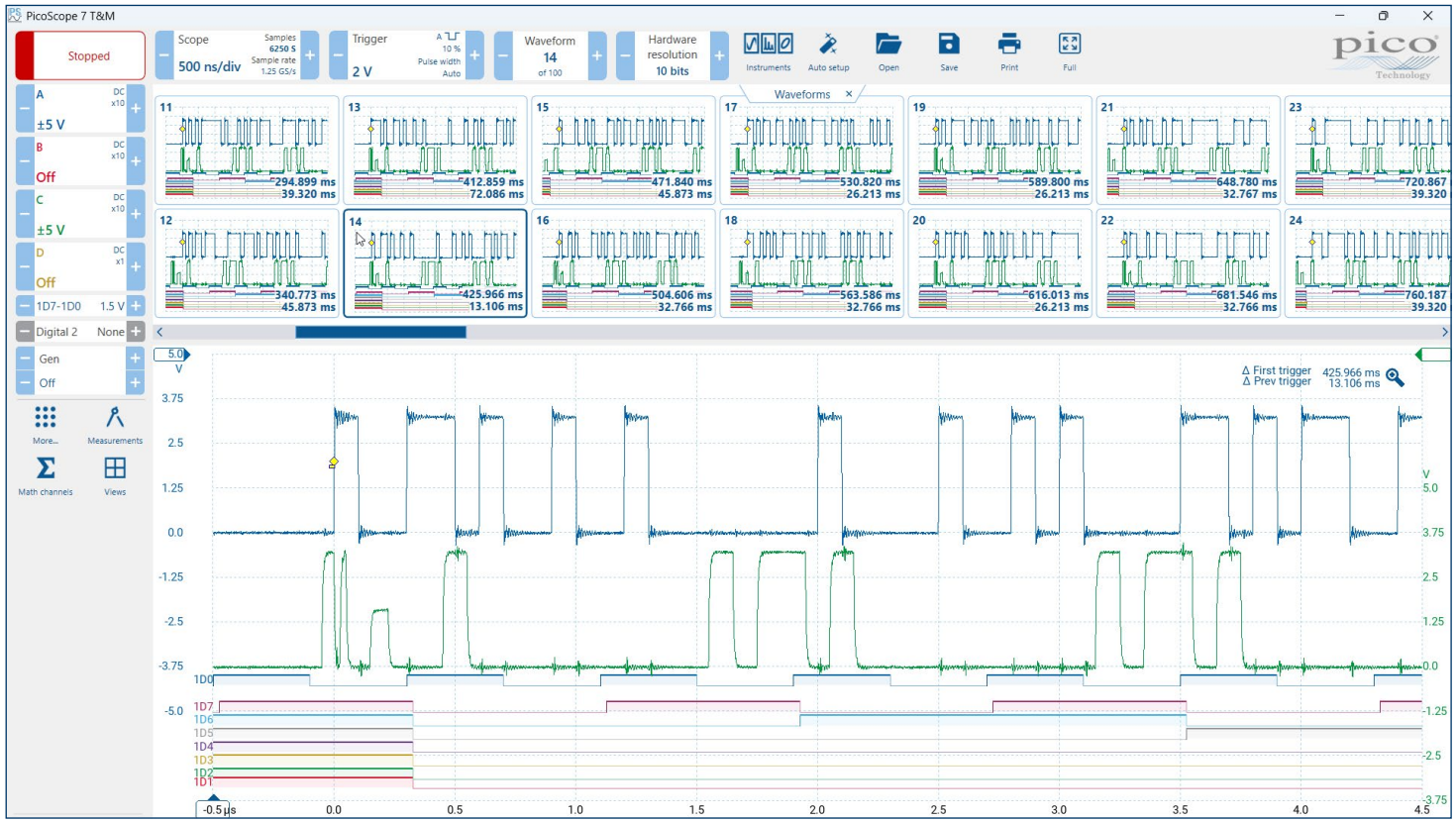


Time-stamping

The PicoScope 6000E Series features hardware-based trigger time-stamping.

Each waveform can be time-stamped with the time in sample intervals from the previous waveform.

Fast trigger rearm times are possible down to 300 ns (typical).



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.

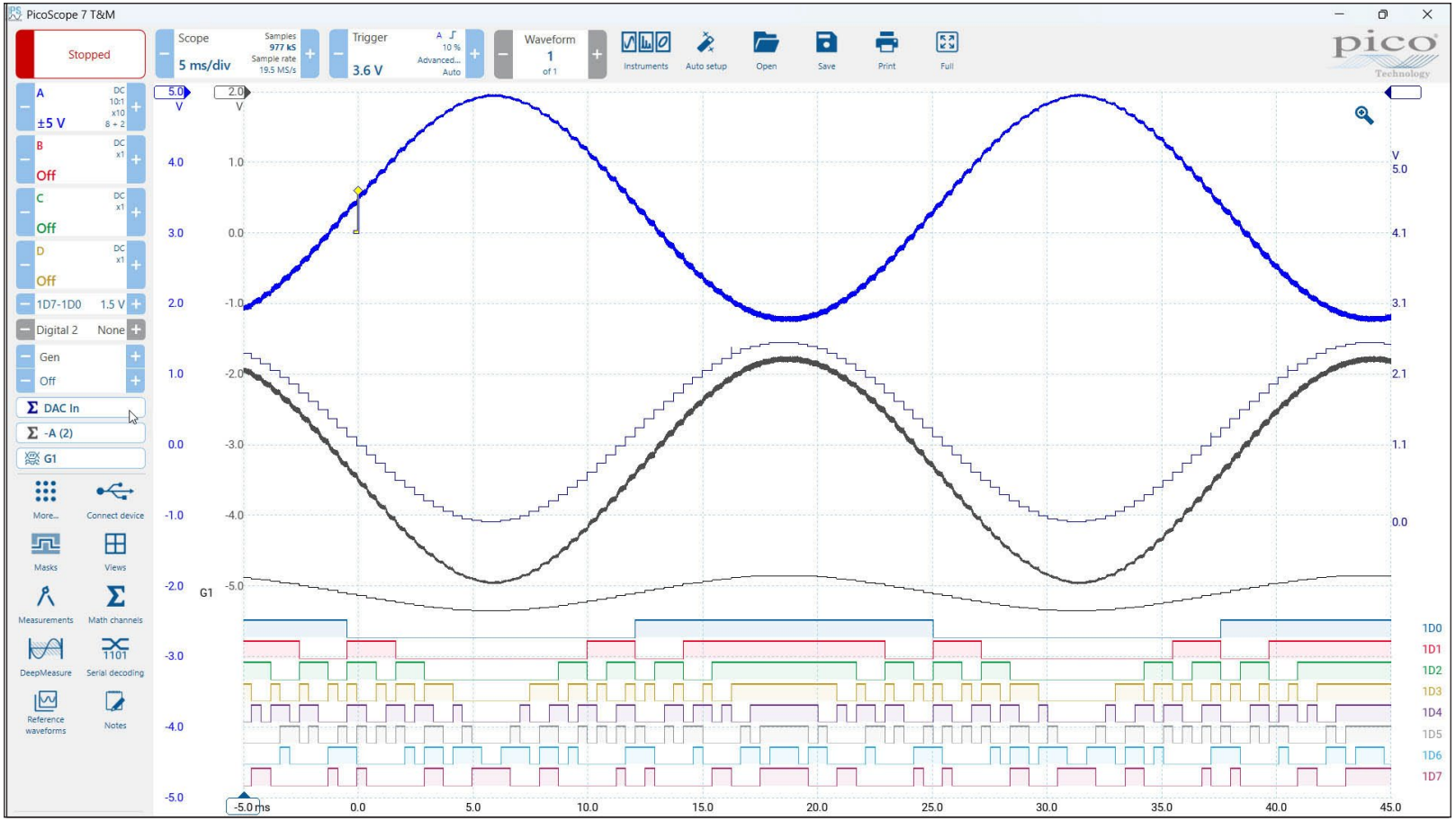
Large, high-resolution displays really come into their own when viewing high-resolution signals with the PicoScope 6000E FlexRes models. With a 4K monitor, PicoScope can display more than ten times the information of some of our competitors' scopes, solving the problem of how to match a big display and 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.

Math channels and filters

With PicoScope 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.

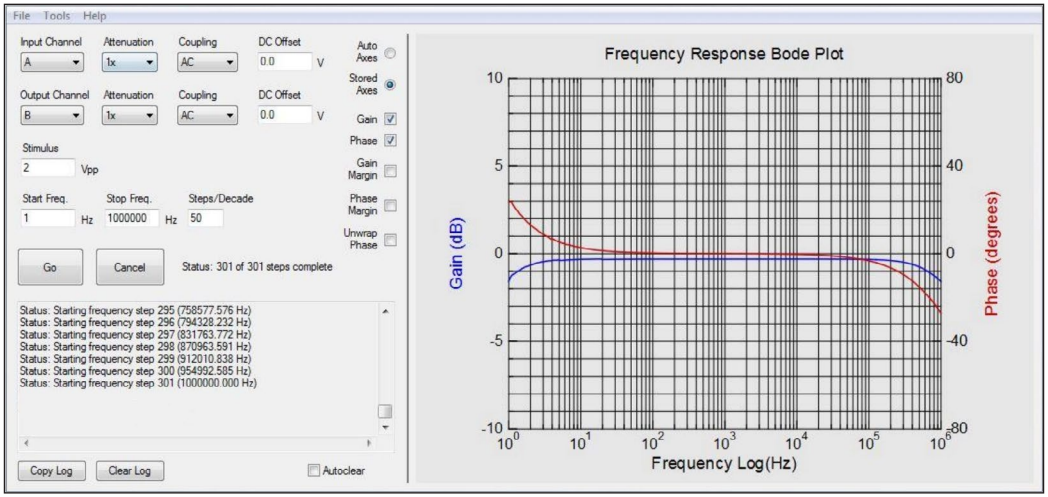
PicoSDK® - write your own apps

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.

A comprehensive PicoScope 6000E Series (ps6000a API) Programmer's Guide is available online.

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.



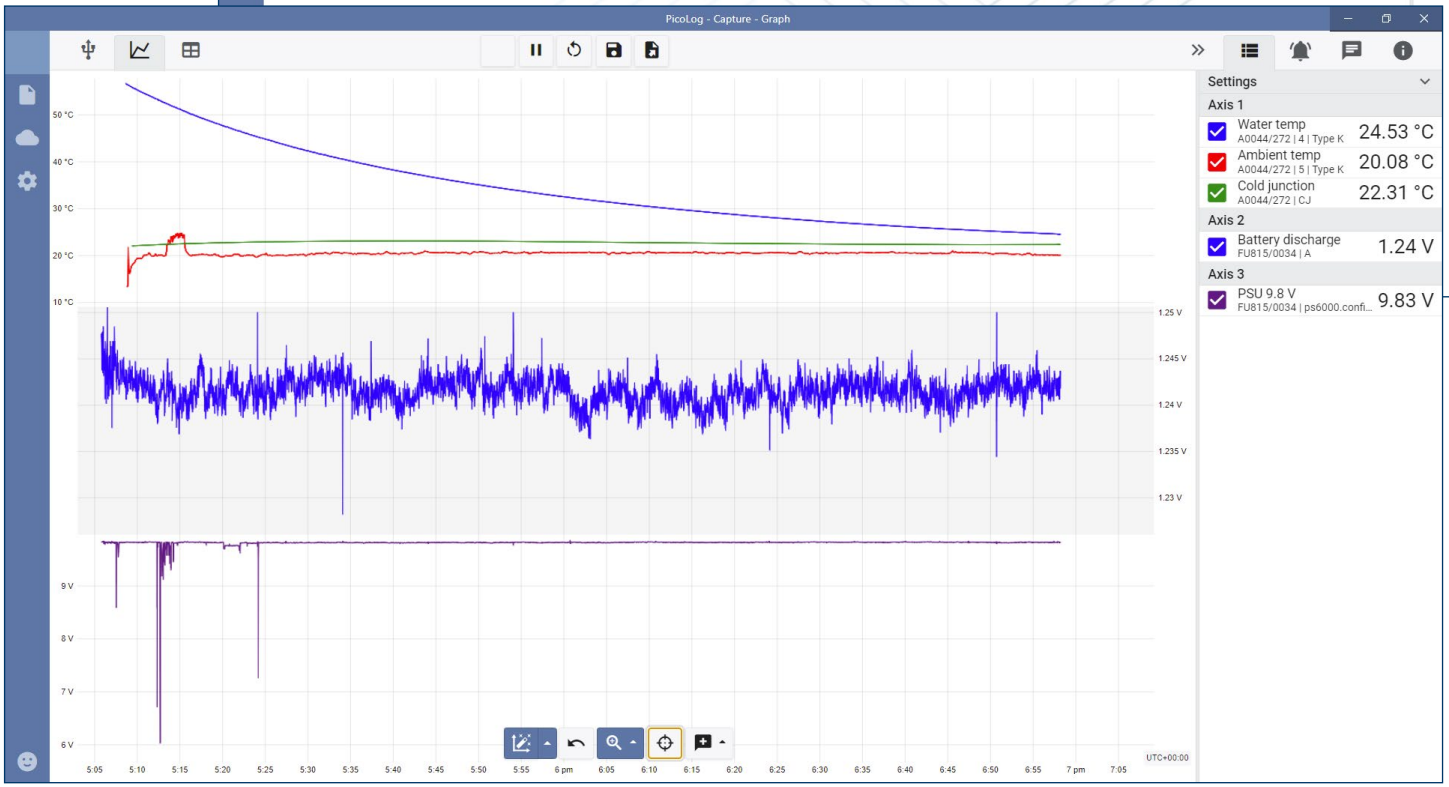

```
ScopeSettingsPropTree.clear();
    wstring appVersionStringW = wstring_convert<codecvt_utf8<wchar_t>>().from_bytes(appVersionString);
    ScopeSettingsPropTree.put( L"appVersion", appVersionStringW );
    ScopeSettingsPropTree.put( L"picoScope.inputChannel.name", L"A" );
    ScopeSettingsPropTree.put( 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 6000E 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 not only captures to a local disk, but can 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 and Linux, including Raspberry Pi OS.

A3000 Series active probes with Intelligent Probe Interface

The Pico A3000 Series are high-impedance active oscilloscope probes. They have been designed to have minimal impact on the signal being probed with optimal signal transfer to the PicoScope 6000E Series through the intelligent probe interface. Their ergonomic design allows for comfortable handheld use with the addition of a button to start and pause capturing in PicoScope.

The intelligent probe interface powers the probe from the scope and automatically sets the scope's scaling and input impedance to match the probe.

With an input resistance of 1 MΩ and capacitance of 0.9 pF, these active probes offer high input impedance up to 1 GHz. These characteristics make this probe the most versatile for many of your day-to-day measurements.

Features

- Up to 1.3 GHz probe bandwidth
- Click-to-fit convenience
- Super light flexible cable
- Control capture start and stop using a button on the probe
- Connects directly to PicoScope 6000E Series oscilloscopes with the Intelligent Probe Interface
- Powered by the oscilloscope, eliminating separate power supplies and interface boxes
- Automatic probe detection and unit scaling
- LED status indicator

Specifications	A3076	A3136
Probe bandwidth (–3 dB)	750 MHz	1.3 GHz
Nominal system bandwidth (–3 dB)	750 MHz (with 750 MHz PicoScope 6000E models)	1 GHz (with 1 to 3 GHz PicoScope 6000E models)
Input resistance	1 MΩ +3%, –0%	
Input capacitance	0.9 pF nominal	
Attenuation	10:1	
DC gain accuracy (probe)	±3% of signal	
DC gain accuracy (with PicoScope 6000E Series)	±4% of signal (nominal)	
DC offset accuracy (with PicoScope 6000E Series)	±(1% of full scale + 4 mV) (nominal) Offset accuracy can be improved by using the "zero offset" function in PicoScope.	
Input dynamic range	±5 V (DC + AC peak)	
DC offset range	±10 V	
Measurable voltage window	±15 V (DC + AC peak)	
Maximum non-destructive input voltage	±30 V (DC + AC peak) derated with frequency above 250 MHz	
Noise	2.5 mV RMS nominal referred to probe input	
Probe button	Control start/stop capture in PicoScope	
Cable length	1.2 m	

Optional accessories

TA369 MSO pod

All PicoScope 6000E Series models can be upgraded to MSO capability by adding one or two active MSO pods. Each pod features eight permanently attached flying leads terminating in MSO probes for connection to the circuit under test.

The active MSO pods bring the MSO input circuitry closer to the device under test, minimizing loading and giving the best possible performance.

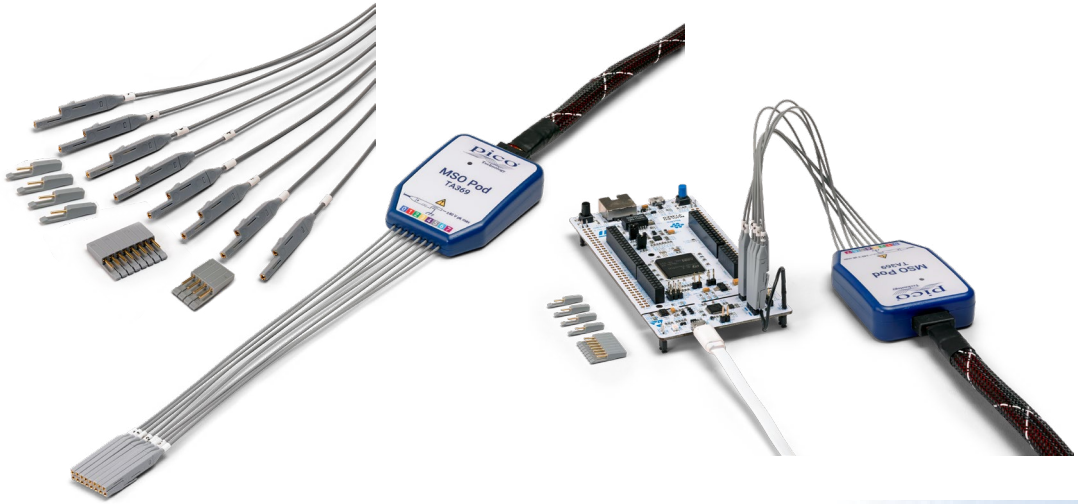
The MSO pod connects to either of two digital interface ports on the scope front panel using a 0.5 m digital interface cable and is powered by the scope. All PicoScope 6000E Series models support up to two MSO pods.

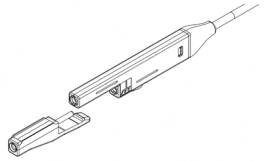
The innovative single and multi-way ground clips allow fast and flexible connection to all signal and ground pins in a double row header, regardless of where the layout engineer has placed them.

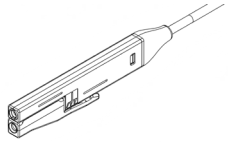
Features:

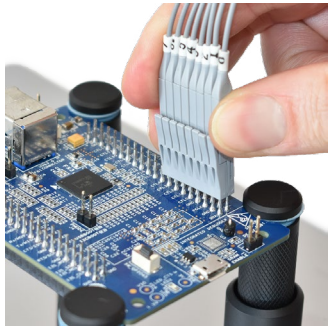
- 8 digital inputs per pod
- 500 MHz bandwidth, 1 Gb/s
- 5 GS/s sampling on 16 digital channels
- 1 ns minimum pulse width
- Minimal load on the device under test: 101 kΩ ‖ 3.5 pF
- Innovative ground clips for easy connection to 2-row, 2.54 mm-pitch headers
- 8 ground leads and 12 mini test hooks included

An MSO pod spares kit (PQ221) is also available, which contains extra 1-way, 4-way and 8-way MSO ground clips and MSO ground leads.

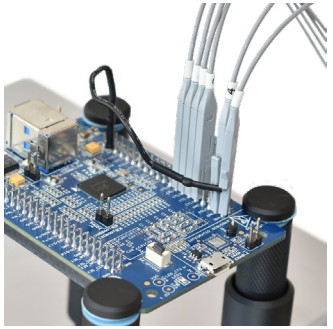




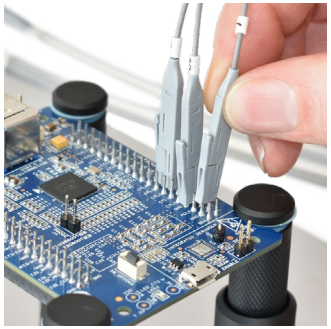




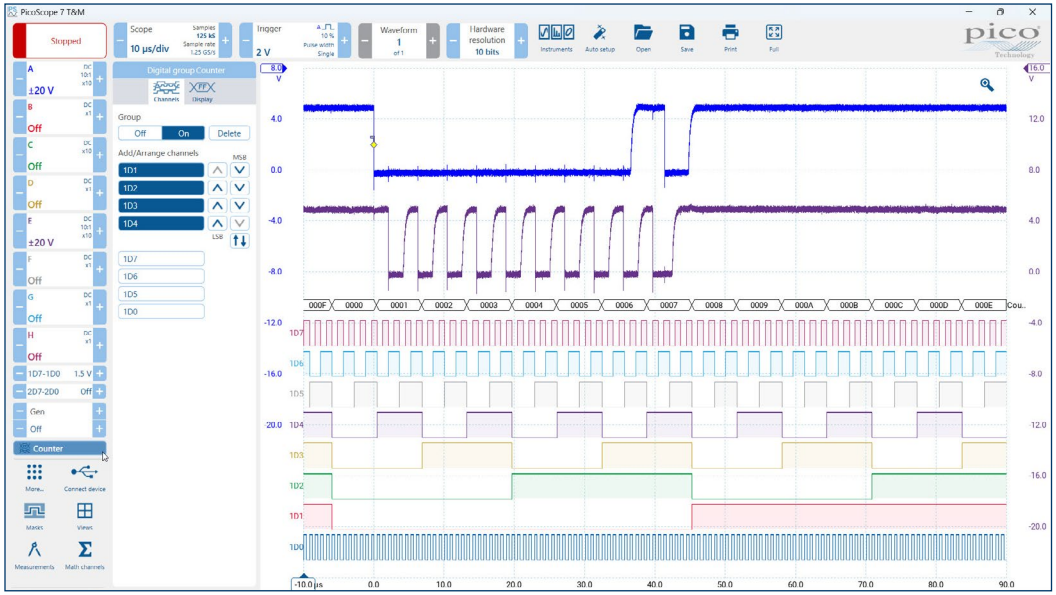
For headers with adjacent signal and ground pin rows.



For headers with adjacent signal pins but lacking sufficient grounds, utilize a ground lead to connect to a remote ground on the DUT.



For a header with a mix of non-adjacent and adjacent signal pins.



PicoScope displays analog and digital channels, selected digital inputs and groups

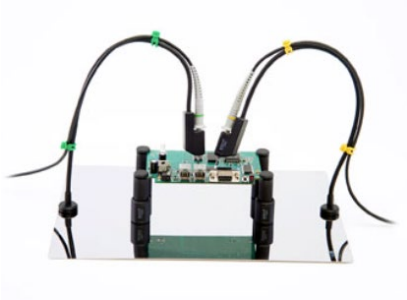
Optional accessories

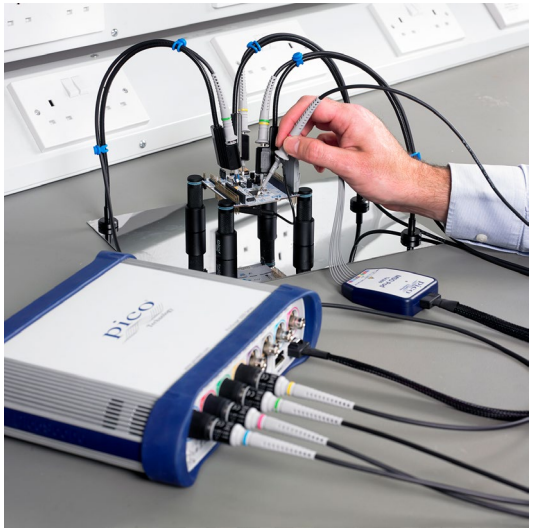
Probe positioning system

The Pico oscilloscope probe positioning system holds your circuit board firmly and keeps multiple probes positioned, hands-free, during inspection and test.

The kits include flexible probe holders with magnetic bases which secure to the steel base plate. When the probes are installed in the holders they can be positioned to make contact with test points on the circuit board and will remain situated while you take measurements in the PicoScope software.

The steel base plate is mirror-finished, reflecting any items such as status LEDs on the underside of the PCB, for easy visibility.





Probe positioning system kit contents			
Item	**PQ215 kit**	**PQ219 kit**	**PQ218 kit**
PCB holder	4	4	-
Base plate, 210 x 297 mm	1	1	-
Set of insulation washers for PCB holders	1	1	-
Pico probe holder, 2.5 mm	4	8	4
Set of cable holders channels A-D	1	1	1
Set of cable holders channels E-H	1	1	1
P2056 500 MHz 10:1 passive BNC probe		4	
	If you own a 4- or 8-channel scope with four probes, this kit is the ideal add-on.	Upgrade your 8-channel scope from four to eight probes, and add eight probe holders.	Four extra probe holders.

Passive analog high- and low-impedance probes

P2056 500 MHz and P2036 300 MHz **high-impedance** passive probes are supplied with your scope and are also available separately. The PicoScope 6428E-D is not supplied with probes.

Supplied in single or dual packs, these probes feature a probe-detect readout BNC connector allowing automatic recognition as a 10:1 attenuator by the oscilloscope. They are high frequency response trimmed to match the oscilloscope and supplied in single or dual packs.

A TA062 1.5 GHz low-impedance 10:1 passive oscilloscope probe with BNC is available separately in a single pack.

A comprehensive selection of accessories is supplied in the single probe packs and a basic selection in the dual packs. Further accessories are available as listed in the *P2056 and P2036 User's Guide*.

PicoScope 6000E Series specifications

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
Vertical (analog channels)											
Input channels		4	4	8	4	4	4	8	4	4	4
Bandwidth (–3 dB)	**50 Ω**	1 GHz	750 MHz	500 MHz		1 GHz	750 MHz	500 MHz		300 MHz	3 GHz[1]
	1 MΩ	500 MHz				500 MHz					N/A
Rise time (10% to 90%, –2 dB full scale)	**50 Ω**	< 350 ps	< 475 ps	< 850 ps		< 350 ps	< 475 ps	< 850 ps		< 1.3 ns	150 ps[1]
	1 MΩ	< 850 ps				< 850 ps					N/A
[1] *±500 mV range, 2.5 GHz/180 ps due to 3600 V/µs maximum slew rate*											
Selectable bandwidth limit		20 MHz, 200 MHz		20 MHz		20 MHz, 200 MHz		20 MHz			N/A
Vertical resolution		8, 10 or 12 bits FlexRes				8 bits fixed					8, 10 or 12 bits FlexRes
Enhanced vertical resolution (software)		Up to 4 extra bits beyond ADC resolution									
Input connector		BNC(f), x10 probe readout-pin compatible									
Input characteristics	**50 Ω**	50 Ω ±3%		50 Ω ±2%		50 Ω ±3%		50 Ω ±2%			50 Ω ±1%
	1 MΩ	1 MΩ ±0.5% ‖ 12 pF ±1 pF									N/A
Input coupling	**50 Ω**	DC									
	1 MΩ	AC/DC									N/A
Input sensitivity	**50 Ω**	2 mV/div to 1 V/div (10 vertical divisions)									10 mV/div to 100 mV/ div (10 vertical divisions)
	1 MΩ	2 mV/div to 4 V/div (10 vertical divisions)									N/A
Input ranges (full scale)	**50 Ω**	±10 mV, ±20 mV, ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V									±50 mV ±100 mV, ±200 mV, ±500 mV
	1 MΩ	±10 mV, ±20 mV, ±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10V, ±20 V									N/A
DC gain accuracy		±(1% of signal + 1 LSB)		±(0.5% of signal + 1 LSB)		±(1.5% of signal + 1 LSB)					±(2% of signal + 1 LSB)
DC offset accuracy		±(1% of full scale + 250 µV)									±(2% of full scale + 500 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				N/A					< 0.1% of input range
	12-bit mode	< 0.025% of input range									< 0.025% of input range
Analog offset range (vertical position adjustment)	**50 Ω**	±125 mV (±10 mV to ±100 mV ranges) ±1.25 V (±200 mV to ±1 V ranges) ±5 V (±2 V and ±5 V ranges)		±1.25 V (±10 mV to ±1 V ranges) ±20 V (±2 V and ±5 V ranges)		±125 mV (±10 mV to ±100 mV ranges) ±1.25 V (±200 mV to ±1 V ranges) ±5 V (±2 V and ±5 V ranges)		±1.25 V (±10 mV to ±1 V ranges) ±20 V (±2 V and ±5 V ranges)			±400 mV (±50 mV to ±500 mV ranges)
	1 MΩ	±1.25 V (±10 mV to ±1 V ranges) ±20 V (±2 V to ±20 V ranges)									N/A
Analog offset control accuracy		±0.5% of offset setting, additional to DC accuracy above									

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
Overvoltage protection	1 MΩ	±100 V (DC + AC peak) up to 10 kHz									N/A
	50 Ω	5.5 V RMS max, ±10 V pk max									3 V RMS max, ±6 V pk max
Vertical (digital channels with optional TA369 8-channel MSO pods)											
Input channels		8 channels per MSO pod. Supports up to 2 pods/16 channels.									
Maximum detectable input frequency		500 MHz (1 Gb/s)									
Minimum detectable pulse width		1 ns									
Input connector (probe tip)		Staggered signal and ground sockets for each channel, to accept 0.64 to 0.89 mm round or 0.64 mm square pin, 2.54 mm pitch									
Input characteristics		101 kΩ ±1% ‖ 3.5 pF ±0.5 pF									
Threshold range and resolution		±8 V in 5 mV steps									
Threshold accuracy		±(100 mV + 3% of threshold setting)									
Threshold grouping	PicoScope 7	Threshold control per 8-channel pod									
	PicoSDK	Individual threshold for each channel									
Threshold selection		TTL, CMOS, ECL, PECL, user-defined									
Maximum input voltage at probe tip		±40 V up to 10 MHz, derated linearly to ±5 V at 500 MHz									
Minimum input voltage swing		400 mV peak to peak at maximum frequency									
Hysteresis (at DC)		Selectable hysteresis per 8-channel pod; approx. 50 mV, 100 mV, 200 mV or 400 mV									
Minimum input slew rate		No limit									
Horizontal											
Maximum sampling rate (real time, 8-bit mode)											
1 analog channel		5 GS/s									10 GS/s
1-2 MSO pods, no analog channels											5 GS/s
1 analog channel plus 1 MSO pod											
2 analog channels, no MSO pods		5 GS/s[2]		5 GS/s[3]	5 GS/s[2]			5 GS/s[3]	5 GS/s[2]	2.5 GS/s[2]	5 GS/s[2]
2 analog channels plus 1-2 MSO pods		2.5 GS/s		2.5 GS/s[4]	2.5 GS/s			2.5 GS/s[4]	2.5 GS/s		2.5 GS/s
Up to 4 total analog channels and/or MSO pods										1.25 GS/s	
Up to 8 total analog channels and MSO pods		1.25 GS/s									
Over 8 channels and MSO pods		N/A		625 MS/s	N/A			625 MS/s	N/A		N/A

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
Maximum sampling rate (real time, 10-bit mode)											
1 analog channel or MSO pod		5 GS/s				N/A					5 GS/s
Up to 2 total analog channels and/or MSO pods		2.5 GS/s		2.5 GS/s[4]	2.5 GS/s						2.5 GS/s
Up to 4 total analog channels and/or MSO pods		1.25 GS/s									1.25 GS/s
Up to 8 total analog channels and/or MSO pods		625 MS/s									625 MS/s
Over 8 channels and MSO pods		N/A		312.5 MS/s	N/A						N/A
Maximum sampling rate (real time, 12-bit mode)											
Up to 2 analog channels plus any MSO pods		1.25 GS/s[2]		1.25 GS/s[3]	1.25 GS/s[2]	N/A					1.25 GS/s[2]
[2] *No more than one channel from each of AB and CD* [3] *No more than one channel from each of ABCD and EFGH* [4] *No more than one channel from each of AB, CD, EF and GH*											
Max. sampling rate, USB 3.0 streaming mode	PicoScope 7	~39 MS/s (split between active channels, PC dependent)									
	PicoSDK	~312 MS/s (8-bit mode) ~156 MS/s (10/12-bit modes)				~312 MS/s					~312 MS/s (8-bit mode) ~156 MS/s (10/12-bit modes)
		(split between active channels, PC dependent)									
Max. sampling rate to on-device buffer, continuous USB streaming of downsampled data, PicoSDK only		1.25 GS/s (8-bit mode) 625 MS/s (10/12-bit modes)				1.25 GS/s					1.25 GS/s (8-bit mode) 625 MS/s (10/12 bit modes)
		(split between active channels)									
Capture memory		4 GS (8-bit mode) 2 GS (10/12-bit modes)				2 GS				1 GS	4 GS (8-bit mode) 2 GS (10/12-bit modes)
		(shared between active channels)									
Maximum single capture duration at maximum sampling rate	PicoScope 7	200 ms									
	PicoSDK	800 ms (8-bit); 400 ms (10-bit); 1600 ms (12-bit)				400 ms				200 ms	400 ms (8-bit) 400 ms (10-bit) 1600 ms (12-bit)
Capture memory (continuous streaming)	PicoScope 7	250 MS									
	PicoSDK	Buffering using full device memory, no limit on total duration of capture									
Waveform buffer (number of segments)	PicoScope 7	40 000									
	PicoSDK	2 000 000								1 000 000	2 000 000
Timebase ranges		1 ns/div to 5000 s/div									500 ps/div to 5000 s/div
Initial timebase accuracy		±2 ppm									

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
Timebase drift		±1 ppm/year									
ADC sampling		Simultaneous sampling on all active analog and digital channels									
External reference clock											
Input characteristics		Hi-Z, AC coupled (> 1 kΩ at 10 MHz)									
Input frequency range		10 MHz ±50 ppm									
Input connector		Rear-panel BNC, dedicated									
Input level		200 mV to 3.3 V peak to peak									
Overvoltage protection		±5 V peak max									
The external reference clock synchronizes both the scope and the AWG.											
Dynamic performance (typical)											
Crosstalk		2500:1 (±10 mV to ±1 V ranges) 600:1 (±2 V to ±20 V ranges)		1200:1 (±10 mV to ±1 V ranges) 300:1 (±2 V to ±20 V ranges)		2500:1 (±10 mV to ±1 V ranges) 600:1 (±2 V to ±20 V ranges)		1200:1 (±10 mV to ±1 V ranges) 300:1 (±2 V to ±20 V ranges)			1000:1 up to 500 MHz 200:1 up to 3 GHz
		(from DC to bandwidth of victim channel, equal voltage ranges)									
Harmonic distortion (at 1 MHz full scale)	8-bit mode	−50 dB									
	10/12-bit mode	−60 dB				N/A					−60 dB
SFDR (at 1 MHz full scale)		> 60 dB on ±50 mV to ±20 V ranges				> 50 dB on ±50 mV to ±20 V ranges					> 60 dB on ±50 mV to ±500 mV ranges
Noise		< 150 µV RMS on most sensitive range				< 200 µV RMS on most sensitive range					< 700 µV rms, ±50 mV range
Linearity	8-bit mode	< 2 LSB									
	10-bit mode	< 4 LSB				N/A					< 4 LSB
Bandwidth flatness		(+0.3 dB, −3 dB) from DC to full bandwidth									(+1 dB, −3 dB) from DC to full bandwidth
Low frequency flatness		< ±3% (or ±0.3 dB) from DC to 1 MHz									
Triggering											
Source		Any analog channel, AUX trigger, plus digital channels with optional TA369 MSO pods									
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 number of trigger sources (analog channels, MSO ports and aux input) NAND/NOR/XOR/XNOR of up to four trigger sources plus aux input User-defined Boolean function of up to four trigger sources 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, with optional MSO pods)		Edge, pulse width, dropout, interval, pattern, logic (mixed signal)									
Pre-trigger capture		Up to 100% of capture size									

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
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)									
Rapid trigger mode rearm time		700 ns max, 300 ns typical (single channel, 5 GS/s)									
Maximum trigger rate	PicoScope 7	40 000 waveforms in 12 ms									
	PicoSDK	Number of waveforms up to memory segment count, at a rate of 6 million waveforms per second.									
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. The time resets when any settings are changed.									
Auxiliary trigger											
Connector type		Rear-panel BNC									
Trigger types (triggering scope)		Edge, pulse width, dropout, interval, logic									
Trigger types (triggering AWG)		Rising edge, falling edge, gate high, gate low									
Input bandwidth		> 10 MHz									
Input characteristics		2.5 V CMOS Hi-Z input, DC coupled									
Threshold		Fixed threshold, 1.25 V nominal to suit 2.5 V CMOS									
Hysteresis		1 V max (V_{IH} < 1.75V, V_{IL} > 0.75V)									
Overvoltage protection		±20 V peak max									
Function generator											
Standard output signals		Sine, square, triangle, DC voltage, ramp up, ramp down, sinc, Gaussian, half-sine									
Output frequency range		Sine/square waves: 100 µHz to 50 MHz Other waves: 100 µHz to 10 MHz									
Output frequency accuracy		Oscilloscope timebase accuracy ± output frequency resolution									
Output frequency resolution		0.002 ppm									
Sweep modes		Up, down, dual with selectable start/stop frequencies and increments									
Sweep frequency range		Sine/square waves: 0.075 Hz to 50 MHz Other waves: 0.075 Hz to 10 MHz Swept frequencies down to 100 µHz are possible using PicoSDK with some restrictions									
Sweep frequency resolution	PicoScope 7	0.075 Hz									
	PicoSDK	Sweep frequency resolution down to 100 µHz is possible with some restrictions									
Triggering		Free-run, or from 1 to 1 billion counted waveform cycles or frequency sweeps. Triggered from scope trigger, aux trigger or manually.									
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 50 Mb/s									
Output voltage range		±5 V into open circuit; ±2.5 V into 50 Ω									
Output voltage adjustment		Signal amplitude and offset adjustable in < 1 mV steps within overall range									
DC accuracy		±(0.5% of output voltage + 20 mV)									
Amplitude flatness		Sine wave into 50 Ω: < 2.0 dB to 50 MHz Square: < 0.5 dB to 50 MHz Other waveforms: < 1.0 dB to 1 MHz, < 2.0 dB to 10 MHz (except sinc)									

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
SFDR		70 dB (10 kHz 1 V peak to peak sine into 50 Ω)									
Output noise		< 700 µV RMS (DC output, filter enabled, into 50 Ω)									
Output resistance		50 Ω ±3%									
Connector type		Rear-panel BNC									
Overvoltage protection		±20 V peak max									
Arbitrary waveform generator											
Update rate		Variable from < 1 S/s to 200 MS/s with < 0.002 ppm resolution									
Buffer size		40 kS									
Vertical resolution		14 bits (output step size < 1 mV)									
Analog filters		50 MHz selectable filter (5-pole, 30 dB/octave)									
Bandwidth (−3 dB)	No filter	100 MHz									
	Filtered	50 MHz									
Rise time (10% to 90%)	No filter	3.5 ns									
	Filtered	6 ns									
Sweep modes, triggering, frequency accuracy and resolution, voltage range and accuracy and output characteristics as for function generator.											
Probe support											
Intelligent probe interface		Intelligent probe interface on four channels supporting A3000 Series active probes. Probe interface supplies power and controls the probe.									
Probe detection		Automatic detection of Pico P2036, P2056 x10 passive oscilloscope probes, and A3000 Series active probes.									
Probe compensation pin		1 kHz, 2 V peak to peak square wave, 600 Ω, < 50 ns rise time									
Spectrum analyzer											
Frequency range		DC to 1 GHz	DC to 750 MHz	DC to 500 MHz		DC to 1 GHz	DC to 750 MHz	DC to 500 MHz		DC to 300 MHz	DC to 3 GHz
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, highpass, lowpass, bandpass, bandstop, coupler, top, base, amplitude, positive overshoot, negative overshoot									
Operands		A to H (input channels), T (time), reference waveforms, pi, 1D0 to 2D7 (digital channels), constants									
Automatic measurements											
Scope mode		AC RMS, cycle time, DC average, duty cycle, edge count, fall time, falling edge count, falling rate, frequency, high pulse width, low pulse width, maximum, minimum, negative duty cycle, peak to peak, rise time, rising edge count, rising rate, true RMS, top, base, amplitude, positive overshoot, negative overshoot, phase									
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									

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
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		1-Wire, ARINC 429, BroadRReach, CAN, CAN FD, CAN J1939, CAN XL, DALI, DCC, 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								
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/12-bit modes: up to 180 MS/s On USB 2.0, PC-dependent: 8-bit mode: up to 40 MS/s; 10-bit/12-bit modes: up to 20 MS/s									
Hardware accelerated waveform display rate		Hardware acceleration enables up to 4 GS of data to be displayed on screen per second (8-bit mode, 4 channels, 500 MS per channel at max sample rate)									
General specifications											
PC connectivity		USB 3.0 SuperSpeed (USB 2.0 compatible)									
PC connector type		USB Type B									
Power requirement		12 V DC from supplied PSU. Up to 5 A (scope only) or 7 A including scope-powered accessories									
Ground terminal		Functional ground terminal accepting wire or 4 mm plug, rear-panel									
Thermal management		Automatic fan speed control for low noise									
Dimensions		245 x 192 x 61.5 mm									
Weight		2.2 kg (scope only) 5.6 kg (in carry case with PSU and cables)									
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 range		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 61010-1:2010 + A1:2019									
EMC compliance		Tested to EN 61326-1:2013 and FCC Part 15 Subpart B									

PicoScope model:		6426E	6425E	6824E	6424E	6406E	6405E	6804E	6404E	6403E	6428E-D
Environmental compliance		RoHS, REACH & WEEE									
Warranty		5 years									
Software											
Windows software (64-bit)[5]		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). PicoScope 6 may be available for older operating systems supporting products purchased up to 2022.									
macOS software (64-bit)[5]		PicoScope 7, PicoLog 6 and PicoSDK									
Linux software (64-bit)[5]		PicoScope 7 software and drivers, PicoLog 6 (including drivers) See Linux Software and Drivers to install drivers only									
Raspberry Pi 4B (Raspberry Pi OS)[5]		PicoLog 6 (including drivers) See Linux Software and Drivers to install drivers only									
[5] *See the picotech.com/downloads page for more information.*											
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)									
MSO pod dimensions											
Digital interface cable length		500 mm (scope to pod)									
Probe flying lead length		225 mm (pod to probe)									
Pod size		75 x 55 x 18.2 mm									
Probe size		34.5 x 2.5 x 6.7 mm (including ground clip)									

Kit contents

PicoScope 6000E Series oscilloscope kit

- PicoScope 6000E Series PC oscilloscope
- With PicoScope 6403E: P2036 300 MHz 10:1 passive probes (4)
- With PicoScope 6428E-D, no probes are supplied
- With all other models: P2056 500 MHz 10:1 passive probes (4)
- User's Guide
- 12 V power adaptor, universal input
- Localized IEC mains lead
- USB cable 1.8 m
- Storage/carry case

TA369 MSO pod kit

- TA369 8-channel MSO pod
- MSO test hooks (pack of 12)
- MSO ground lead (8)
- MSO ground clip 1-way (8)
- MSO ground clip 4-way
- MSO ground clip 8-way
- MSO digital interface cable
- Storage/carry case

PQ221 MSO pod spares kit

- MSO ground clip 8-way
- MSO ground clip 4-way
- MSO ground clip 1-way (8)
- MSO ground lead (8)

(8 off)

(8 off)

A3000 active oscilloscope probe kits:

PQ254 A3136 probe 1.3 GHz
PQ265 A3076 probe 750 MHz

Each probe is supplied in a kit containing the following parts:

- Probe tip (pack of 10)
- Spring tip (pack of 10)
- Cable pin (pack of 10)
- Ground blade (pack of 2 sizes, 2 of each)
- Ground leads (2)
- Channel color markers (8 colors, 2 of each)
- Gold plated copper wire 0.3 mm 30 SWG
- Micro SMD pincer, black
- Micro SMD pincer, red
- Joggle adaptors (2)
- Carry case
- Quick start guide

A comprehensive selection of replacement probe accessories are available on www.picotech.com.

Optional accessories

Order code	Description
MSO pods	
TA369	8-channel MSO pod kit for PicoScope 6000E Series
MSO pod replacement accessories	
PQ221	MSO pod spares kit
TA139	MSO test hooks, pack of 12
TA365	MSO digital interface cable
Probe positioning system	
TA102	Two-footed probe holder
PQ215	4-channel probe holder and PCB holder kit, no probes
PQ219	8-channel probe holder upgrade kit with 4 probes for PicoScope 6000E Series
PQ218	4 additional probe holders
Passive probes	
PQ067	PicoConnect 910 Kit: all six 4 to 5 GHz RF, microwave and pulse probe head models with cables
PQ066	PicoConnect 920 Kit: all six 6 to 9 GHz gigabit interchangeable probe head models with cables
TA274	PicoConnect 911 4 GHz ÷20 AC coupled probe
TA275	PicoConnect 912 4 GHz ÷20 DC coupled probe
TA278	PicoConnect 913 4 GHz ÷10 AC coupled probe
TA279	PicoConnect 914 4 GHz ÷10 DC coupled probe
TA282	PicoConnect 915 5 GHz ÷5 AC coupled probe
TA283	PicoConnect 916 5 GHz ÷5 DC coupled probe
TA272	PicoConnect 921 6 GHz ÷20 AC coupled probe
TA273	PicoConnect 922 6 GHz ÷20 DC coupled probe
TA276	PicoConnect 923 7 GHz ÷10 AC coupled probe
TA277	PicoConnect 924 7 GHz ÷10 DC coupled probe
TA280	PicoConnect 925 9 GHz ÷5 AC coupled probe
TA281	PicoConnect 926 9 GHz ÷5 DC coupled probe
TA062	1.5 GHz low-impedance passive oscilloscope probe 10:1 with BNC
TA437	P2056 500 MHz 10:1 passive probe
TA480	P2056 500 MHz 10:1 passive probe dual pack
TA436	P2036 300 MHz 10:1 passive probe
TA479	P2036 300 MHz 10:1 passive probe dual pack
TA065	2.5 mm oscilloscope probe advanced accessory kit

Optional accessories - continued

Order code	Description
A3000 active probes for intelligent probe interface	
PQ254	A3136 active probe 1.3 GHz
PQ265	A3076 active probe 750 MHz
A3000 probe replacement accessories	
PQ275	A3000 series active probe accessories kit
TA469	Probe signal tip (pack of 10)
TA470	Probe ground blade (pack of 2 sizes, 2 of each)
TA501	Probe spring tip (pack of 10)
High-voltage differential probes	
TA042	100 MHz 1400 V differential oscilloscope probe 100:1/1000:1 BNC
TA043	100 MHz 700 V differential oscilloscope probe 10:1/100:1 BNC
Attenuators	
TA181	Attenuator 3 dB 10 GHz 50 Ω SMA (m-f)
TA261	Attenuator 6 dB 10 GHz 50 Ω SMA (m-f)
TA262	Attenuator 10 dB 10 GHz 50 Ω SMA (m-f)
TA173	Attenuator 20 dB 10 GHz 50 Ω SMA (m-f)
SMA cables	
TA312	Precision sleeved SMA coaxial cable (60 cm)
TA265	Precision sleeved SMA coaxial cable (30 cm)
Adaptor	
TA313	Inter-series adaptor SMA(f) to BNC(m), 50 Ω, 3 GHz
Power adaptor	
PQ247	12 V, 7 A power adaptor, IEC input, DIN output and supplied with 4 IEC mains cables (UK, EU, US and Australia/China)

PicoScope 6000E Series ordering information

Order code	Description	Bandwidth	Channels	Resolution (bits)	Memory (GS)
PQ303	PicoScope 6426E	1 GHz	4	8 to 12	4
PQ302	PicoScope 6425E	750 MHz	4	8 to 12	4
PQ198	PicoScope 6824E	500 MHz	8	8 to 12	4
PQ201	PicoScope 6424E	500 MHz	4	8 to 12	4
PQ301	PicoScope 6406E	1 GHz	4	8	2
PQ300	PicoScope 6405E	750 MHz	4	8	2
PQ197	PicoScope 6804E	500 MHz	8	8	2
PQ200	PicoScope 6404E	500 MHz	4	8	2
PQ199	PicoScope 6403E	300 MHz	4	8	1
PQ344	PicoScope 6428E-D	3 GHz	4	8 to 12	4

Calibration service

Order code	Description
CC051	Calibration certificate for PicoScope 6000E Series oscilloscopes (300 and 500 MHz)
CC056	Calibration certificate for PicoScope 6000E Series oscilloscopes (750 MHz, 1 GHz and 3 GHz)

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

PicoSource AS108
8 GHz agile USB controlled vector modulating signal synthesizer

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