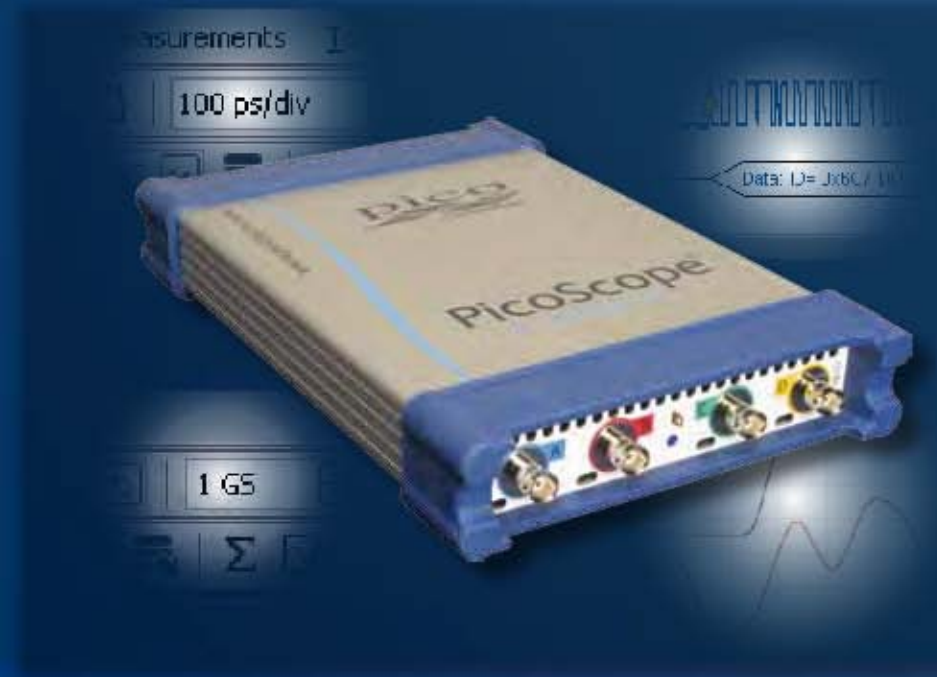
pico Technology

PicoScope 6000 Series

The highest-performance USB oscilloscopes available

4 channels | **350 MHz bandwidth** | **5 GS/s sampling** | **1 GS memory**



10,000-waveform buffer

×100,000,000 zoom

CAN bus decoding

Mask limit testing

350 MHz spectrum analyzer

Arbitrary waveform generator

Hi-Speed USB 2.0 interface

Software Development Kit

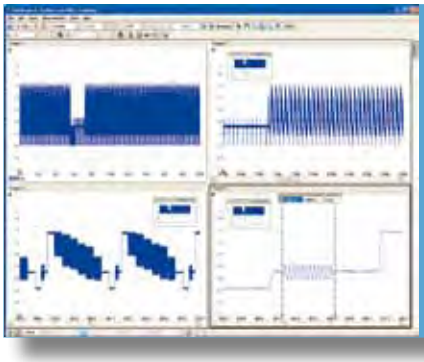
... all included!

PicoScope performance and reliability

With 18 years of experience in the test and measurement industry, we know what's important in a new oscilloscope. The PicoScope 6000 Series USB oscilloscopes have unbeatable bandwidth, sampling rate and memory depth in their class. These features are backed up by advanced software that we have developed with the help of feedback from our customers.

High bandwidth, high sampling rate

With a 350 MHz analog bandwidth complemented by a real-time sampling rate of 5 GS/s, the PicoScope 6000 Series scopes can display single-shot pulses with 200 ps time resolution. ETS mode boosts the maximum sampling rate even further, allowing more detailed display of repetitive pulses.



Deep memory allows you to zoom in... and in

Huge buffer memory

The PicoScope 6403 gives you the deepest buffer memory available as standard on any oscilloscope. Other oscilloscopes have high maximum sampling rates, but without deep memory they cannot sustain these rates on long timebases. The PicoScope 6403's huge 1-gigasample buffer allows it to capture at 5 GS/s down to 20 ms/div – that's a total duration of 200 ms. Managing all this data calls for some powerful tools, so PicoScope has a maximum zoom factor of 100 million combined with a choice of two zoom methods. There's a conventional set of zoom controls, plus an overview window that shows you the whole waveform while you zoom and reposition the display by simply dragging with the mouse.

Advanced triggers

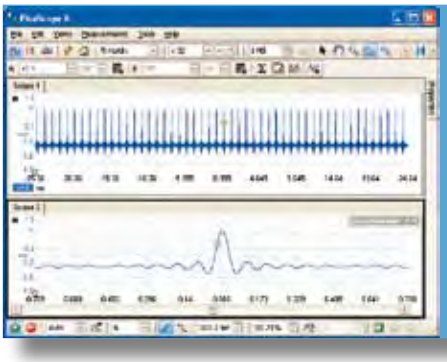
As well as the standard range of triggers found on most oscilloscopes, the PicoScope 6000 Series has a built-in set of advanced triggers to help you capture the data you need.

Custom probe settings

The custom probes feature allows you to correct for gain, attenuation, offsets and nonlinearities in special probes, or to convert to different units of measurement. You can save definitions to disk for later use. Definitions for standard Pico-supplied probes are included.

Rapid triggering

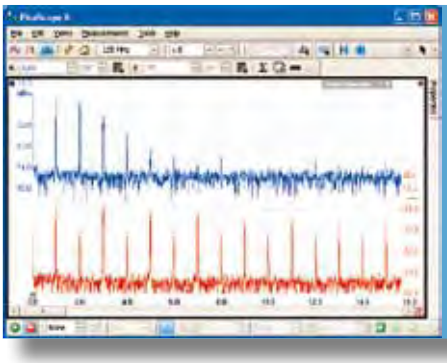
The PicoScope 6000 Series contains special triggering hardware to minimise the dead time between captures. This enables you to collect waveforms at intervals of 1 µs or less when using a short timebase, improving your chances of spotting an infrequent glitch.



Arbitrary waveform generator

Arbitrary waveform and function generator

Generate standard waveforms from DC to 20 MHz or define your own using the power of the built-in 12-bit, 200 MS/s arbitrary waveform generator. You can import arbitrary waveforms from data files or draw them using the built-in AWG editor.



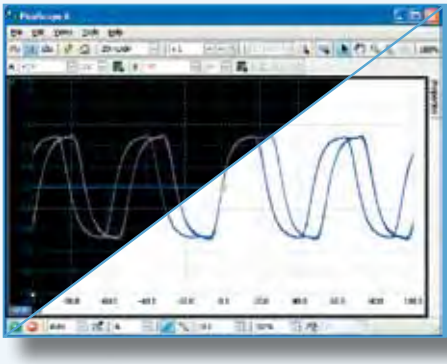
Spectrum analyzer

Spectrum analyzer

With the click of a button, you can open a new window to display a spectrum plot of the selected channels. The spectrum analyzer allows signals up to 350 MHz to be viewed in the frequency domain. A full range of settings give you control over the number of spectrum bands, window types and display modes.

Color persistence modes

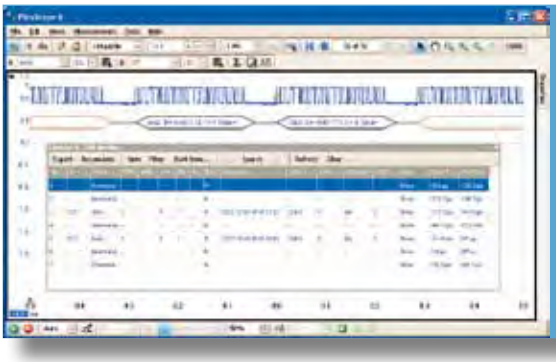
See old and new data superimposed, with new data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Choose between analog persistence and digital color, or create a custom display mode.



Color persistence modes

High-speed data acquisition

The drivers and software development kit supplied allow you to write your own software or interface to popular third-party software packages. If the 1 gigasample record length isn't enough, the drivers support data streaming, a mode that captures gap-free continuous data through the USB port directly to the PC's RAM or hard disk at a maximum (PC-dependent) rate of 13 MS/s.



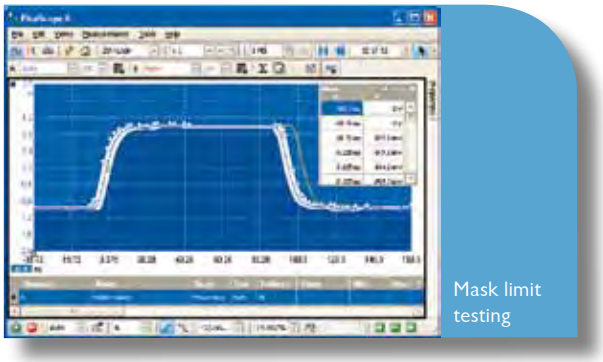
CAN bus decoding

CAN bus decoding

The PicoScope 6000 Series oscilloscopes are recommended for serial decoding as their deep memory allows them to collect long, uninterrupted sequences of data. The PicoScope 6403 can collect many thousands of frames over several seconds into its 1-billion-sample memory, and can even decode 4 buses simultaneously using its 4 channels.

PicoScope displays the decoded data in the format of your choice: "in view", "in window", or both at once. The "in view" format shows the decoded data beneath the waveform on a common time axis, with error frames marked in red. You can zoom in on these frames to look for noise or distortion on the waveform.

"In window" format shows a list of the decoded frames, including the data and all flags and identifiers. You can set up filtering conditions to display only the frames you are interested in, search for frames with specified properties, or define a start pattern that the program will wait for before listing the data.



Mask limit testing

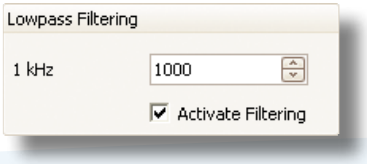
Mask limit testing

This feature is specially designed for production and debugging environments. Capture a signal from a known working system, and PicoScope will draw a mask around it with your specified tolerance. Connect the system under test, and PicoScope will highlight any parts of the waveform that fall outside the mask area. The highlighted details persist on the display, allowing the scope to catch intermittent glitches while you work on something else. The measurements window counts the number of failures, and can display other measurements and statistics at the same time.

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

Digital low-pass filtering

Each input channel has its own digital low-pass filter with independently adjustable cut-off frequency from 1 Hz to the full scope bandwidth. This enables you to reject noise on selected channels while viewing high-bandwidth signals on all the other inputs.



Optional 10:1 probes

You can buy your PicoScope 6000 Series scope complete with four TA101 10:1 probes, or you can buy the probes separately at a later date.

These probes have been designed for use with the PicoScope 6000 Series and are factory-compensated to match the input characteristics. The probes have a 500 MHz (-3 dB) bandwidth to ensure a 350 MHz system bandwidth.

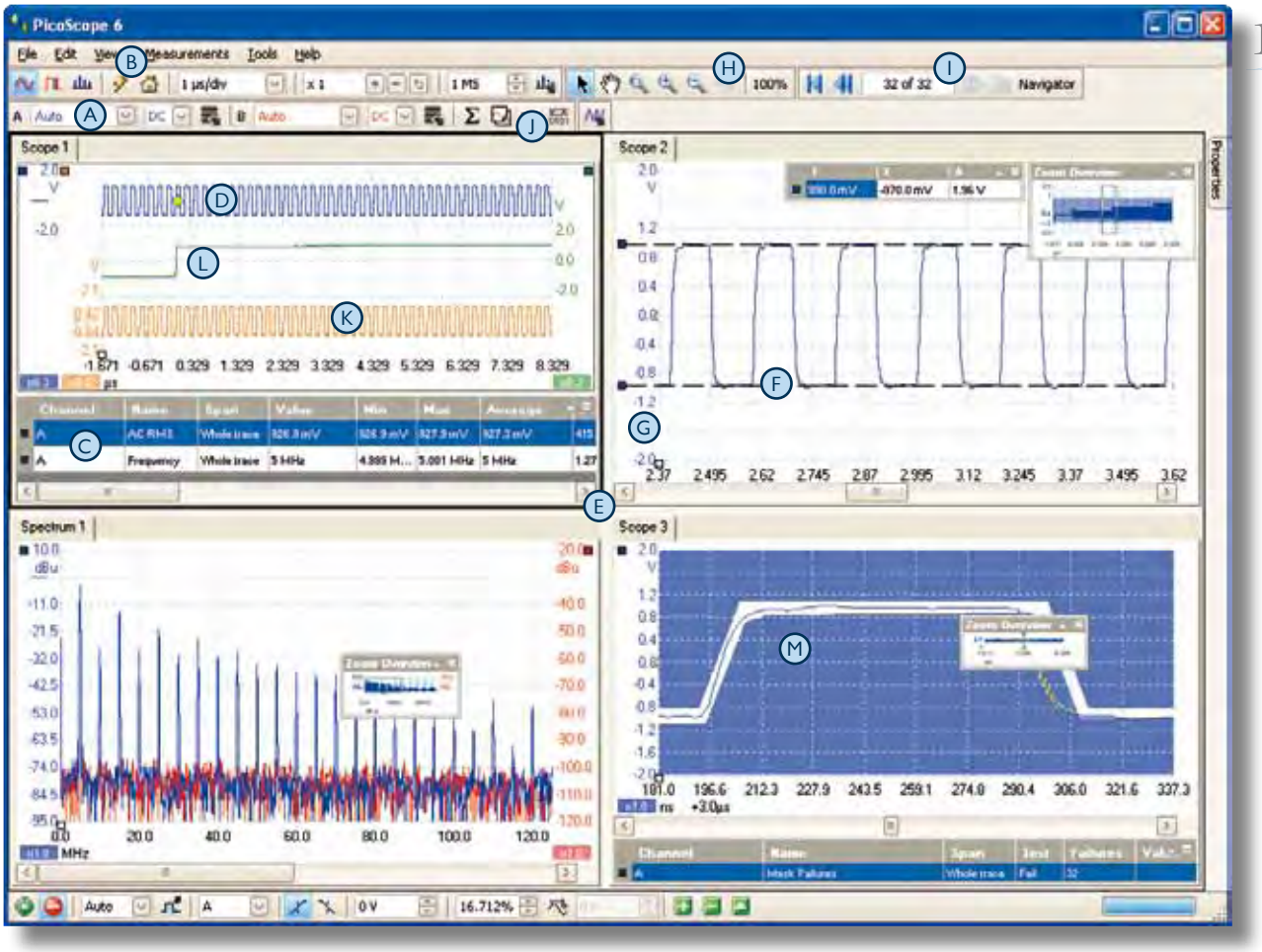
Each high-quality probe is supplied with a range of accessories for convenient and accurate high-frequency measurements.

TA101 10:1 probe specifications

Attenuation	10:1
Input impedance	10 MΩ || 9.5 pF
Compatibility	1 MΩ AC/DC at instrument input
Bandwidth	500 MHz (-3 dB)
Risetime	700 psec (10% - 90%)
Compensation range	7 to 25 pF
Safety standard	IEC/EN 61010-031
Cable length	1.2 m

Accessories included

- Instruction manual
- Spring tip 0.5 mm
- Solid tip CuBe 0.5 mm
- Coding rings, 3 x 4 colours
- Ground lead 15 cm
- Ground blade 2.5 mm
- 2 self-adhesive Cu pads
- Insulating cap 2.5 mm
- Protection cap 2.5 mm
- IC caps 0.5 to 1.27 mm pitch
- Sprung hook 2.5 mm
- PCB adapter kit 2.5 mm



Oscilloscope controls

(A) Commonly-used controls such as voltage range selection, timebase, memory depth and channel selection are placed on the toolbars for quick access, leaving the main display area clear for waveforms. More advanced controls and functions are located in the Preferences menu.

(B) **Auto setup button**: Configures the timebase and voltage ranges for a stable display of your signals.

Automatic measurements

(C) 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.

Built-in measurements:

AC RMS, True RMS, DC Average
Cycle Time, Frequency, Duty Cycle
Falling Rate, Fall Time
Rising Rate, Rise Time
High Pulse Width, Low Pulse Width
Maximum, Minimum, Peak to Peak

Powerful capture & analysis

(D) The PicoScope display can be as simple or as complex as you need. Begin with a single view of one channel, and then expand the display to include any number of live channels, math channels and reference waveforms.

(E) PicoScope is carefully designed to make the best use of the display area. You can add new scope and spectrum views, all of which are fully adjustable in size and shape.

Display tools

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

(G) **Movable axes**: The vertical axes can be dragged up and down. This feature is particularly useful when one waveform is obscuring another. There's also a command to rearrange all the axes automatically.

(H) **Zoom and pan tools**: PicoScope enables a zoom factor of up 100 million, which is necessary when working with the deep memory of the 6000 Series scopes. Use the conventional zoom-in, zoom-out and pan tools, or try the zoom overview window for fast navigation.

(I) **Waveform replay tool**: PicoScope automatically records up to 10,000 of the most recent waveforms. You can quickly scan through to look for intermittent events.

(J) **Serial decoding**: Decode a CAN bus signal and display the data alongside the physical signal or as a detailed table.

(K) **Math channels**: Combine input channels and reference waveforms using simple arithmetic or custom equations with trigonometric and other functions.

(L) **Reference channels**: Store waveforms in memory or on disk and display them alongside live inputs. Ideal for diagnostics and production testing.

(M) **Mask limit testing**: Automatically generate a testing mask from a waveform or draw one by hand. PicoScope highlights any parts of the waveform that fall outside the mask and shows error statistics.

Specifications

Channels (vertical)	
Number of channels	4 BNC inputs
Bandwidth	350 MHz (-3 dB) with TA101 probes or on 50 Ω setting; switchable 20 MHz bandwidth limiters
Rise time	1.0 ns (10% to 90%)
Voltage ranges	±50 mV to ±20 V (up to ±5 V when 50 Ω input selected)
Sensitivity	10 mV/div to 4 V/div at x1 zoom
Input coupling	AC or DC, independently switchable
Input impedance	1 MΩ || 15 pF (AC or DC) or 50 Ω (DC only), independently switchable
DC accuracy	3%
Input offset (position) adjustment	±100% of input range or greater (except for ±0.5 V adjustment on 5 V 50 Ω range)
Overload protection	±100 V to ground (1 MΩ inputs), 5.5 V RMS (50 Ω inputs)
Timebase (horizontal)	
Timebases	1 ns/div to 200 s/div (real-time)
Timebase accuracy	5 ppm
Trigger	
Trigger types	Rising, falling or dual edge; hysteresis; logic level; pulse width; runt pulse; dropout; window; delayed
Advanced triggers	Pulse width: negative or positive pulse; wider or narrower than a specified width Window: entering or leaving a voltage range Dropout: inactivity over a user-defined time interval Delay: nth event after trigger event, with optional delay Logic level: arbitrary logic state of Channels A to D and AUX Runt pulse: crosses one threshold but not the other
Trigger modes	None, Single, Repeat, Auto, Rapid
Maximum trigger rate	Up to 10,000 waveforms in a 10 ms burst
Trigger sources	Ch A to Ch D, AUX
Trigger level	Adjustable over whole of selected voltage range
Re-arm time	Less than 1 µs on fastest timebase
Maximum trigger delay	Pre-trigger: 100% of capture size; post-trigger: 4 billion samples
AUX input	
External clock input	Reference frequency 5 MHz to 25 MHz
Input type	50 Ω, BNC, ±1 V threshold adjustment range, ±5 V protection range, DC coupled
Acquisition	
ADC resolution	8 bits (up to 12 bits in resolution enhance mode)
Maximum real-time sampling rate	5 GS/s (one channel), 2.5 GS/s (two channels), 1.25 GS/s (three or four channels)
Buffer size	32 MS (PicoScope 6402), 1 GS (PicoScope 6403), shared between active channels
Maximum buffer segments	32, 768 (PicoScope 6402), 1 million (PicoScope 6403)
Maximum streaming data rate	13 MS/s (PC-dependent)
Function generator and arbitrary waveform generator (AWG)	
Function generator frequency range	DC to 20 MHz
Function generator waveforms	Sine, square, triangle, ramp, (sin x)/x, Gaussian, half-sine, white noise, DC level
ADC resolution / DC accuracy	12 bits / 1%
Amplitude range	±250 mV to ±2 V
Offset adjustment	±1 V (max. combined output ±2.5 V)
Output impedance	50 Ω
AWG buffer size	16,384 samples
AWG sample rate	200 MS/s
Probe calibration output	
Signal output type	1 kHz square wave, 2 V pk-pk, 600 Ω
Spectrum analyzer	
Frequency range	DC to 350 MHz
Display modes	Magnitude, average, peak hold
Windowing functions	Rectangular, Gaussian, triangular, Blackman, Blackman-Harris, Hamming, Hann, flat-top
Number of FFT points	Selectable from 128 to 1 million in powers of 2
Math channels	
Functions	−x, x+y, x−y, x*y, x/y, sqrt(x), x^y, exp(x), ln(x), log(x), abs(x), norm(x), sign(x), sin(x), cos(x), tan(x), arcsin(x), arccos(x), arctan(x), sinh(x), cosh(x), tanh(x), Pi
Operands	A to D (input channels), T (time), reference waveforms
CAN bus decoding	
Baud rate	10 kb/s to 1 Mb/s, auto-detect with manual override
Threshold voltage	Adjustable: auto-detect with manual override
Polarity	CAN H, CAN L
Mask limit testing	
Horizontal resolution	1000 to 10,000 points, adjustable
Statistics	Pass/fail, failure count, total count
Display	
Interpolation	Linear or (sin x)/x
Persistence modes	Digital color, analog intensity, custom, or none
General	
Dimensions	255 x 170 x 40 mm (approx. 10” x 6.7” x 1.6”) including connectors and end caps
Weight	< 1 kg (approx. 35 oz)
Operating temperature range	0 °C to 40 °C (20 °C to 30 °C for stated accuracy)
Compliance	EU: EMC, LVD, RoHS, WEEE. USA: FCC Part 15 Class A
PC connection	USB 2.0 (USB 1.1 compatible)
Power supply	AC adapter and cable (cord) supplied
Languages supported	English, French, Italian, German, Spanish

Basic kit contents

The basic PicoScope 6000 Series scope kit contains the following items:

- PicoScope 6000 Series oscilloscope
- USB cable
- Universal mains (AC) power supply
- Mains lead (power cord)
- Quick Start Guide
- Software and Reference CD
- Carrying case

Probe kit contents

The PicoScope 6000 Series kit with oscilloscope probes contains the following additional items:

- Four 500 MHz 10:1 probes (see inside for further details)
- One 2-footed probe stand for hands-free use of probes

Ordering information	GBP	USD	EUR
PP628 PicoScope 6402 PC Oscilloscope (32 MS buffer memory)	2,995	4,942	3,504
PP629 PicoScope 6402 with 4 x 10:1 probes	3,495	5,767	4,089
PP630 PicoScope 6403 PC Oscilloscope (1 GS buffer memory)	3,995	6,592	4,674
PP631 PicoScope 6403 with 4 x 10:1 probes	4,495	7,417	5,259
TA101 Single 10:1 oscilloscope probe	125	206	146
Accessory packs for TA101 probes	See website		

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