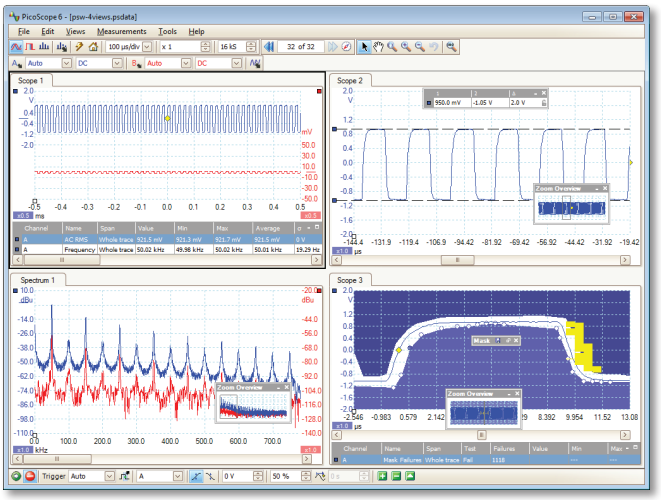
pico® Technology

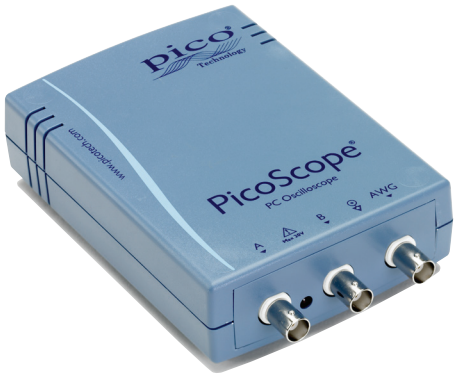
PicoScope® 2000 Series

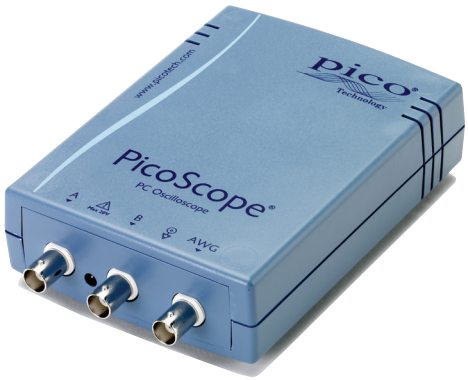
2-CHANNEL OSCILLOSCOPES WITH ARBITRARY WAVEFORM GENERATOR

High Quality from a Name You Can Trust



- 10 MHz to 200 MHz bandwidths
- Up to 1 GS/s sampling rate
- Advanced digital triggers
- Persistence display modes
- Mask limit testing
- Serial decoding
- Fast USB 2.0 interface
- USB-powered and portable
- Free software upgrades





5 YEAR WARRANTY

Supplied with a Software Development Kit including example programs • Software compatible with Windows XP, Windows Vista, Windows 7 and Windows 8 • Free technical support

www.picotech.com

PicoScope for power, portability and versatility

These handy, economical oscilloscopes have all the power you need for your application, whether it's design, research, test, education, service or repair. They are available with bandwidths from 10 MHz to 200 MHz.

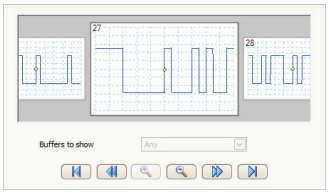
PicoScope oscilloscopes are small, light and portable. They easily slip into a laptop bag and so are ideal for the engineer on the move. They don't need an external power supply, so they are perfect for field use. The connection to your PC means that functions such as printing, copying and email are always at your fingertips.

The first USB-powered 1 GS/s oscilloscopes!

The series includes the first USB-powered oscilloscopes to offer a 1 GS/s real-time sampling rate, previously possible only with mains-powered instruments. Most other USB-powered oscilloscopes are limited to only 100 or 200 MS/s. For repetitive signals, equivalent-time sampling (ETS) mode boosts the maximum effective sampling rate even higher to 10 GS/s, allowing exceptionally fine timing resolution.

Digital triggering

Most digital oscilloscopes sold today still use an analog trigger architecture based on comparators. This can cause time and amplitude errors that cannot always be calibrated out. The use of comparators often limits the trigger sensitivity at high bandwidths and can also create a long trigger re-arm delay.



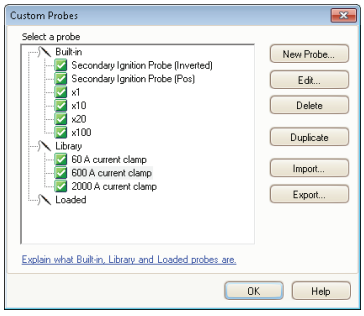
Since 1991 we have been pioneering the use of fully digital triggering using the actual digitized data. This reduces trigger errors and allows our oscilloscopes to trigger on the smallest signals, even at the full bandwidth. Trigger levels and hysteresis can be set with great precision and resolution.

The reduced re-arm delay provided by digital triggering, together with segmented memory, allows the capture of events that happen in rapid sequence. At the fastest timebase, rapid triggering can capture a new waveform every 2 microseconds until the buffer is full. The mask limit testing feature (see below) helps to detect waveforms that fail to meet your specifications.

Advanced triggers

As well as the standard range of triggers found on all oscilloscopes, the PicoScope 2000 Series offers one of the best selections of advanced triggers available, including pulse width, windowed and dropout triggers to help you find your signal quickly.

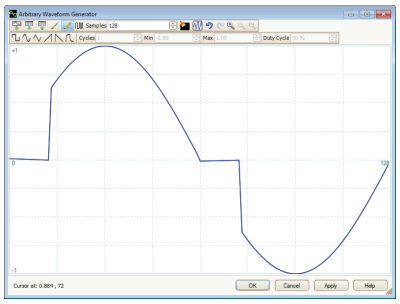
Custom probe settings



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 (such as current, power or temperature). You can save definitions to disk for later use. Definitions for standard Pico-supplied oscilloscope probes and current clamps are built in.

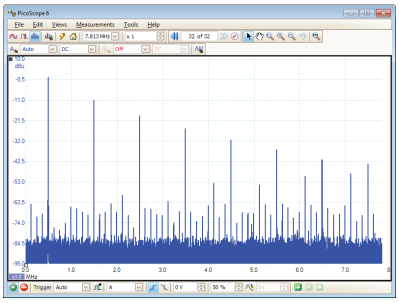
Arbitrary waveform and function generator

All units have a built-in function generator with sine, square, triangle, DC level and many more standard waveforms. As well as level, offset and frequency controls, more advanced options allow you to sweep over a range of frequencies. Combined with the spectrum peak hold option, this creates a powerful tool for testing amplifier and filter responses.



The PicoScope 2000 Series scopes also include a full arbitrary waveform generator. Waveforms can be created or edited using the built-in AWG editor, imported from oscilloscope traces, or loaded from a spreadsheet.

Spectrum analyzer

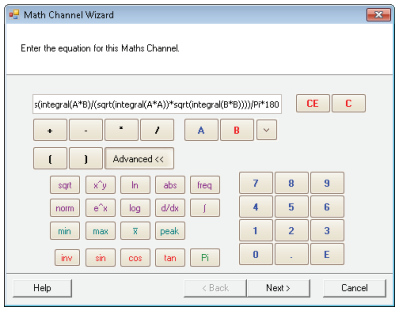


With the click of a button, you can display a spectrum plot of selected channels. The spectrum analyzer allows signals up to the full scope bandwidth to be viewed in the frequency domain. A full range of settings gives you control over the number of spectrum bands, window types and display modes: instantaneous, average, or peak-hold.

PicoScope allows you to display multiple spectrum views with different channel selections and zoom factors, and see these alongside time-domain waveforms of the same data. A comprehensive set of automatic frequency-domain measurements, including THD, THD+N, SNR, SINAD and IMD, can be added to the display.

Math channels

The PicoScope 2000 Series oscilloscopes offer a full range of math functions for processing and combining channels. The functions can also operate on reference waveforms.



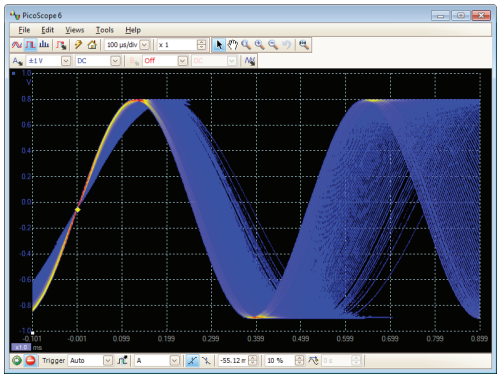
Use the built-in list for simple functions such as addition and inversion, or open the equation editor and create complex functions involving trigonometry, exponentials, logarithms, statistics, integrals and derivatives.

Measurements

Channel	Name	Span	Value	Min	Max	Average	σ	Capture Count
A	Frequency	Whole trace	100.1 kHz	99.93 kHz	100.1 kHz	100 kHz	45.61 Hz	20
A	AC RMS	Whole trace	642 mV	640.8 mV	643.6 mV	641.6 mV	680.4 µV	20
A	DC Average	Whole trace	-103 mV	-103.6 mV	-101.7 mV	-102.9 mV	503.6 µV	20

You can add any combination of automatic measurements to the display, chosen from a list of 26 scope and spectrum parameters. Every measurement includes statistics of minimum, maximum, average, standard deviation and sample size.

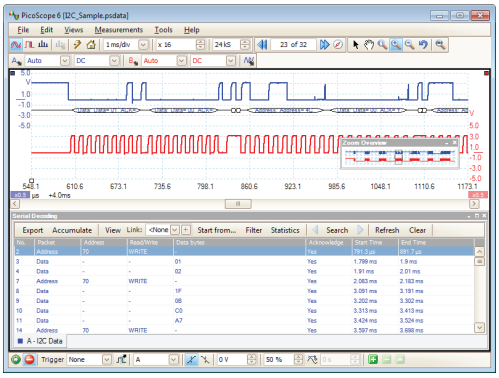
Advanced display modes



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.

The design of the PicoScope software ensures that maximum display area is available for waveform viewing. Even with a laptop you have a much bigger viewing area and higher resolution than a typical benchtop scope.

Serial decoding



The PicoScope 2000 Series includes serial decoding capability as standard. Protocols currently supported are I²C, I²S, SPI, RS232/UART, CAN Bus, LIN and FlexRay.

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.

You can also create a spreadsheet to decode the hexadecimal data into arbitrary text strings.

High-speed data acquisition and digitizing

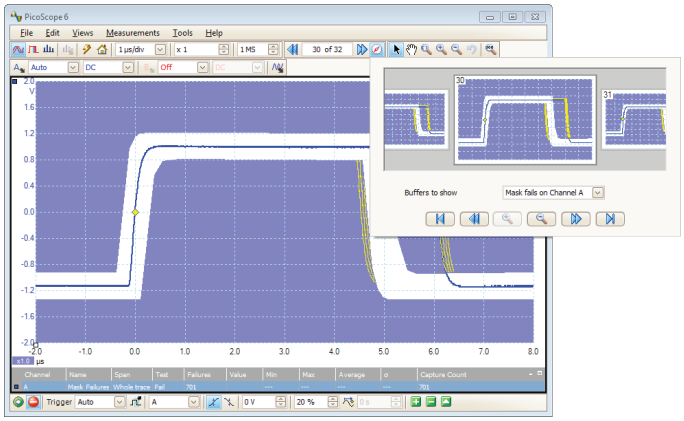
The drivers and software development kit supplied allow you to write your own software or interface to popular third-party software packages such as LabVIEW.

The driver supports 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 rate of 1 MS/s or more, so that you are not limited by the size of the device’s buffer memory. Maximum speed is PC-dependent.

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



High-end features as standard

Buying a scope from some companies is a bit like buying a car. By the time you have added all the optional extras you need, the price has gone up considerably. With the PicoScope 2000 Series, high-end features such as resolution enhancement, mask limit testing, serial decoding, advanced triggering, automatic measurements, math channels and XY mode are all included in the price.

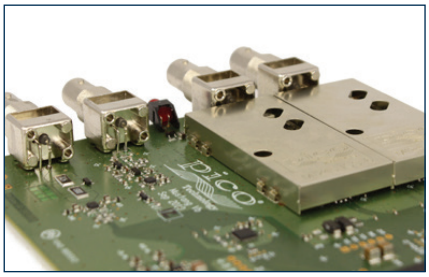
To protect your investment, both the PC software and firmware inside the unit can be updated. We have a long history of providing new features for free through software downloads. Other companies make vague promises about future enhancements but we deliver on our promises year after year. Users of our products reward us by becoming lifelong customers, frequently recommending us to their colleagues.

High signal integrity

Most oscilloscopes are built down to a price; ours are built up to a specification.

Careful front-end design and shielding reduces noise, crosstalk and harmonic distortion. Our 20 years of oscilloscope design experience can be seen in improved pulse response and bandwidth flatness.

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



PicoScope 2206 front-end screening

The PicoScope window

Oscilloscope controls: 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 Tools menu.

PicoScope: The 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.

Tools>Math channels: Combine input channels and reference waveforms using simple arithmetic, or create custom equations with trigonometric and other functions.

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

Tools>Reference channels: Store waveforms in memory or on disk and display them alongside live inputs. Ideal for diagnostics and production testing.

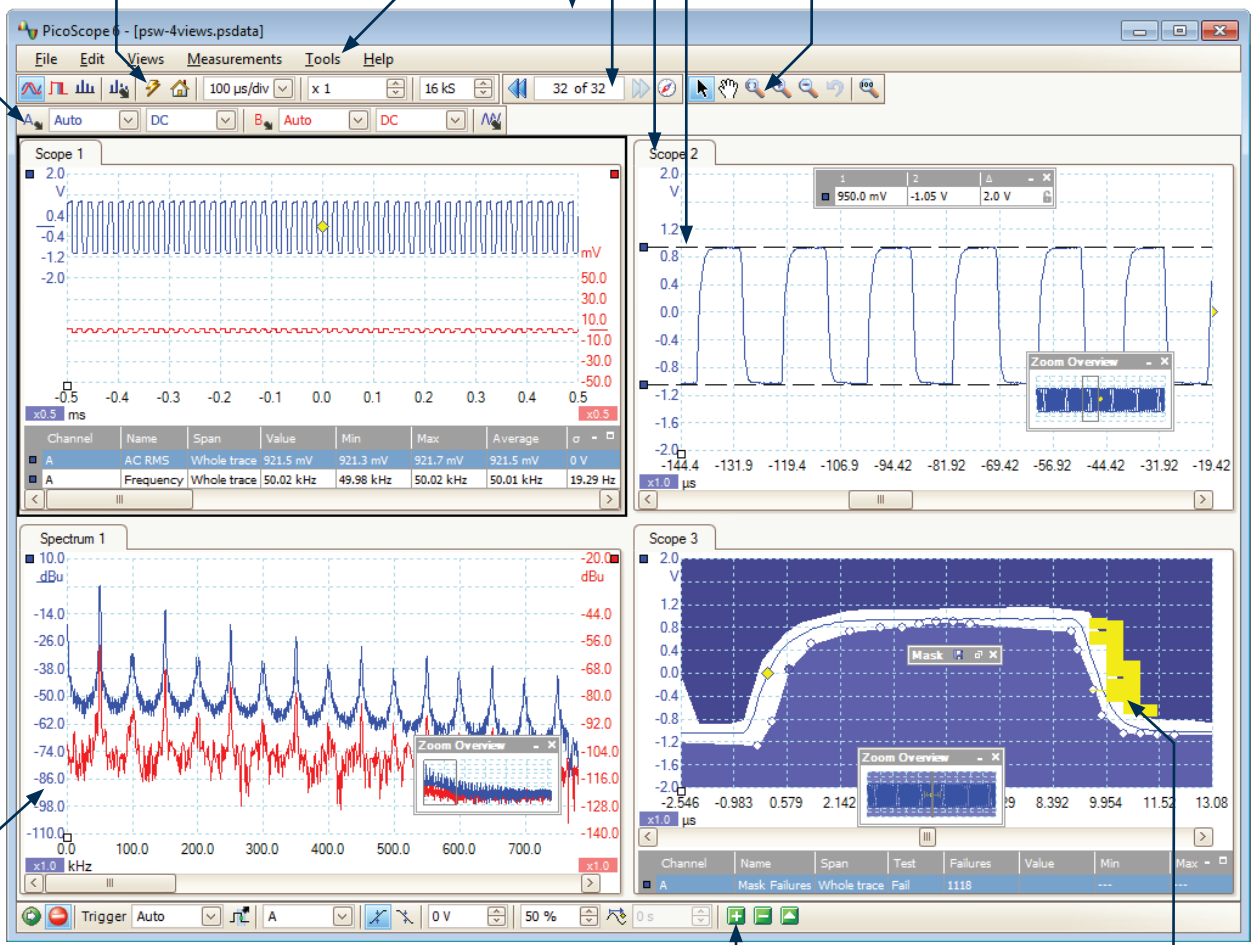
Waveform replay tool: PicoScope automatically records up to 10,000 of the most recent waveforms. You can quickly scan through to look for intermittent events.

Views: 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.

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

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

Zoom and pan tools: Use the conventional zoom buttons, or try the zoom overview window for fast navigation. No fiddly buttons and knobs: just use your mouse!



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.

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.

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

PicoScope 2000 Series Oscilloscopes - Specifications

PRODUCT SELECTOR

MODEL	PicoScope 2204	PicoScope 2205	PicoScope 2206	PicoScope 2207	PicoScope 2208
Bandwidth	10 MHz	25 MHz	50 MHz	100 MHz	200 MHz
Sampling rate	100 MS/s	200 MS/s (ChA) 100 MS/s (ChB)	500 MS/s	1 GS/s	1 GS/s
Memory	8 kS	16 kS	24 kS	32 kS	40 kS
Function generator + AWG	100 kHz	100 kHz	1 MHz	1 MHz	1 MHz
EXT trigger	No	No	Yes	Yes	Yes

DETAILED SPECIFICATIONS

VERTICAL					
Number of channels	2				
Bandwidth (-3 dB)	10 MHz	25 MHz	50 MHz	100 MHz	200 MHz
Rise time (calculated)	35 ns	14 ns	7 ns	3.5 ns	1.75 ns
Resolution	8 bits (12 bits with resolution enhancement)				
Input characteristics	BNC, 1 MΩ ‖ 20 pF		BNC, 1 MΩ ±1% ‖ 13 pF ±1 pF		
Input coupling	AC/DC				
Input sensitivity	10 mV/div to 4 V/div (10 vertical divisions)				
Input ranges	±50 mV, ±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V				
Analog offset range (vertical position adjustment)	None		±250 mV (50 mV, 100 mV, 200 mV ranges) ±2.5 V (500 mV, 1 V, 2 V ranges) ±20 V (5 V, 10 V, 20 V ranges)		
DC accuracy	±3% of full scale				
Overvoltage protection	±100 V (DC + AC peak)				

HORIZONTAL					
Max. sampling rate (real-time 1 ch.)	100 MS/s	200 MS/s (ChA only)	500 MS/s	1 GS/s	1 GS/s
Max. sampling rate (real-time 2 ch.)	50 MS/s	100 MS/s	250 MS/s	500 MS/s	500 MS/s
Max. sampling rate (repetitive/ETS)	2 GS/s	4 GS/s	5 GS/s	10 GS/s	10 GS/s
Max. sampling rate (streaming)	1 MS/s (typical) in PicoScope software. Rate using supplied SDK is PC-dependent.				
Timebase ranges	10 ns to 5000 s/div	5 ns to 5000 s/div	2 ns to 5000 s/div	1 ns to 5000 s/div	500 ps to 5000 s/div
Buffer memory size (shared)	8 k samples	16 k samples	24 k samples	32 k samples	40 k samples
Max. buffers (normal triggering)	10,000				
Max. buffers (rapid block triggering)	N/A		32		
Timebase accuracy	±100 ppm		±50 ppm		
Sample jitter	unspecified		< 5 ps RMS		

DYNAMIC PERFORMANCE (typical)		
Crosstalk (full bandwidth)	Better than 200:1 (equal ranges)	Better than 400:1 (equal ranges)
Harmonic distortion	< –50 dB at 100 kHz, full-scale input	
SFDR	> 52 dB at 100 kHz, full-scale input	
Noise	1 LSB (±1 V range)	< 180 µV RMS (±50 mV range)
Pulse response	< 7% overshoot	< 5% overshoot
Bandwidth flatness (at scope input)	(+0.3 dB, –3 dB) from DC to full bandwidth	

TRIGGERING		
Sources	Ch A, Ch B	Ch A, Ch B, Ext
Modes	None, auto, repeat, single	None, auto, repeat, single, rapid (segmented memory)
Advanced digital triggers (Ch A, B)	Rising, falling, dual, hysteresis, window, pulse width, window pulse width, window dropout, interval, logic, delayed	
Trigger types, ETS (Ch A, Ch B)	Edge	
Trigger sensitivity (Ch A, Ch B)	Digital triggering provides 1 LSB accuracy up to full bandwidth (ETS: typical 10 mV p-p at full bandwidth)	
Max. pre-trigger capture	100% of capture size	
Max. post-trigger delay	4 billion samples	
Trigger re-arm time	PC-dependent	< 2 µs on fastest timebase
Max. trigger rate	PC-dependent	Burst of 32 in 64 µs

EXTERNAL TRIGGER INPUT				
Trigger types	N/A	Edge, pulse width, dropout, interval, logic		
Input characteristics		Front-panel BNC, 1 MΩ ±1% ‖ 13 pF ±1 pF		
Bandwidth		50 MHz	100 MHz	200 MHz
Threshold range		±5 V, DC coupled		
Threshold accuracy		±3% of full scale		
Sensitivity		200 mV p-p typical, at full bandwidth		
Overvoltage protection		±100 V (DC + AC peak) up to 10 kHz		

Specifications continued...

FUNCTION GENERATOR	PicoScope 2204	PicoScope 2205	PicoScope 2206	PicoScope 2207	PicoScope 2208
Standard output signals	Sine, square, triangle, DC voltage, ramp, sin(x)/x, Gaussian, half-sine				
Pseudorandom output signals	None		White noise, PRBS		
Standard signal frequency	DC to 100 kHz		DC to 1 MHz		
Sweep modes	Up, down, dual with selectable start/stop frequencies and increments				
Output frequency accuracy	±100 ppm		±50 ppm		
Output frequency resolution	< 0.01 Hz				
Output voltage range	±2 V				
Output adjustments	±250 mV to ±2 V amplitude, ±1 V offset		Any amplitude and offset within ±2 V range		
Amplitude flatness (typical)	< 1 dB to 100 kHz		< 0.5 dB to 1 MHz		
DC accuracy	±1% of full scale				
SFDR	> 55 dB @ 1 kHz full-scale sine wave		> 60 dB @ 10 kHz full-scale sine wave		
Output characteristics	Front panel BNC, 600 Ω output impedance				
Overvoltage protection	± 10 V				

ARBITRARY WAVEFORM GENERATOR		
Update rate	2 MS/s	20 MS/s
Buffer size	4 k samples	8 k samples
Resolution	8 bits	12 bits
Bandwidth	100 kHz	> 1 MHz
Rise time (10% - 90%)	< 2 µs	< 100 ns

SPECTRUM ANALYZER					
Frequency range	DC to 10 MHz	DC to 25 MHz	DC to 50 MHz	DC to 100 MHz	DC to 200 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 half available buffer memory in powers of 2				

MATH CHANNELS	
Functions	+, −, *, /, sqrt, ^, exp, ln, log, abs, norm, sign, sin, cos, tan, asin, acos, atan, sinh, cosh, tanh, derivative, integral, freq, min, max, average, peak
Operands	A, B (input channels), T (time), reference waveforms, constants, Pi

AUTOMATIC MEASUREMENTS	
Oscilloscope	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
Spectrum	Frequency at peak, amplitude at peak, average amplitude at peak, total power, THD %, THD dB, THD plus noise, SFDR, SINAD, SNR, IMD
Statistics	Minimum, maximum, average and standard deviation

SERIAL DECODING	
Protocols	I²C, I²S, SPI, UART, CAN Bus, LIN and FlexRay.

MASK LIMIT TESTING	
Statistics	Pass/fail, failure count, total count

DISPLAY	
Interpolation	Linear or sin(x)/x
Persistence modes	Digital color, analog intensity, custom, or none

GENERAL		
PC connectivity	USB 2.0 hi-speed (full-speed compatible)	
Power requirements	Powered from USB port	
Dimensions (including connectors)	150 x 100 x 40 mm	200 x 140 x 40 mm
Weight	< 0.22 kg (7.8 oz)	< 0.5 kg (17.7 oz.)
Temperature range	Operating: 0 °C to 50 °C (20 °C to 30 °C for stated accuracy). Storage: –20 °C to +60 °C.	
Humidity range	Operating: 5% to 80% RH non-condensing. Storage: 5% to 95% RH non-condensing.	
Safety approvals	Designed to EN 61010-1:2001	Designed to EN 61010-1:2010
EMC approvals	Tested to EN61326-1:2006 and FCC Part 15 Subpart B	
Environmental approvals	RoHS and WEEE compliant	
Software included	PicoScope 6, Windows SDK, example programs (C, Visual Basic, VEE, Excel, LabVIEW, Delphi)	
PC requirements	Microsoft Windows XP, Vista, Windows 7 or Windows 8 (not Windows RT), 32 or 64-bit	
Accessories	USB cable	
Languages (UI and manual):	English, French, German, Italian, Spanish	
Languages (UI only):	Chinese (Simplified), Chinese (Traditional), Czech, Danish, Dutch, Finnish, Greek, Hungarian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Swedish, Turkish	

PicoScope 2204
PicoScope 2205

PicoScope 2206
PicoScope 2207
PicoScope 2208

Pack Contents

- PicoScope 2000 Series oscilloscope
- USB cable
- Quick Start Guide
- Software and Reference CD

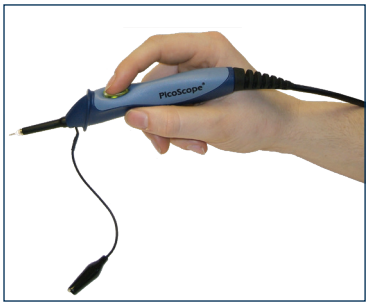
Matching Probes Available

If you don't already have suitable probes, order a set from us. A durable storage pouch is included.

Optional Case

Fitted with foam padding for your scope. A compartment in the lid holds probes and other accessories.

Hand-held Oscilloscopes



Also available in the PicoScope 2000 Series, the PicoScope 2104 and 2105 single-channel hand-held oscilloscopes are the ultimate in compact design. See our website for details.

Ordering Information

ORDER CODE	DESCRIPTION	GBP	USD*	EUR*
PP419	PicoScope 2204 10 MHz oscilloscope	159	265	195
PP420	PicoScope 2205 25 MHz oscilloscope	249	415	305
PP800	PicoScope 2206 50 MHz oscilloscope	349	575	425
PP801	PicoScope 2207 100 MHz oscilloscope	449	745	545
PP802	PicoScope 2208 200 MHz oscilloscope	599	995	725
PP787	2 x 60 MHz probes for PicoScope 2204, 2205 and 2206	30	50	36
PP821	2 x 150 MHz probes for PicoScope 2207	40	66	48
PP822	2 x 250 MHz probes for PicoScope 2208	50	83	60
MI136	Carrying case - PicoScope 2206/2207/2208	30	50	36

pico Technology

Pico Technology, James House, Colmworth Business Park,
St. Neots, Cambridgeshire, PE19 8YP, United Kingdom
T: +44 (0) 1480 396 395
F: +44 (0) 1480 396 296
E: sales@picotech.com

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

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