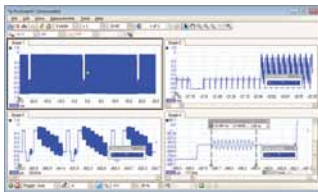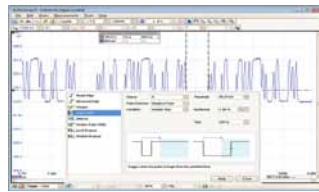pico®
Technology

PicoScope® 5000 Series
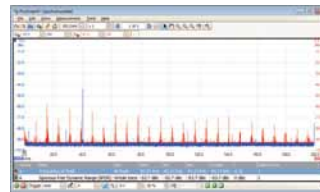
THE NO-COMPROMISE PC OSCILLOSCOPES
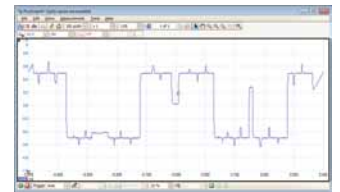
High speed, deep memory

128 MS
buffer memory

Advanced
digital triggering

250 MHz spectrum
analyzer

Arbitrary waveform
generator

250 MHz bandwidth

128 MS buffer memory

1 GS/s real-time sampling

20 GS/s repetitive sampling

Advanced digital triggering

250 MHz spectrum analyzer

125 MS/s Arbitrary Waveform Generator

USB 2.0 Hi-Speed

5 YEAR WARRANTY

PICO TECHNOLOGY 1991 – 2011
20 YEARS
LEADING THE WAY IN TEST AND MEASUREMENT

**Supplied with a full SDK including example programs • Software compatible with
Windows XP, Windows Vista and Windows 7 • Free technical support**

www.picotech.com

PicoScope: power, portability and versatility

With class–leading bandwidth, sampling rate, memory depth and a built–in arbitrary waveform generator too, a PicoScope 5000 Series PC oscilloscope has the power and performance for many applications.

Owning a PicoScope 5000 Series PC oscilloscope means you no longer have to compromise on bandwidth, sampling rate or buffer memory.

High bandwidth, high sampling rate

Unlike most USB-powered oscilloscopes, with real-time sampling rates of only 100 or 200 MS/s, the PicoScope 5000 Series delivers a market-leading 1 GS/s. ETS mode boosts the maximum effective sampling rate further to 20 GS/s, enabling even finer time resolution when used with repetitive signals.

Deep memory

The PicoScope 5000 Series offers memory depths up to 128 million samples.

Other oscilloscopes have high maximum sampling rates, but without deep memory they cannot sustain these rates on long timebases. The PicoScope 5000 Series can sample at 1 GS/s at timebases all the way down to 10 ms/div.
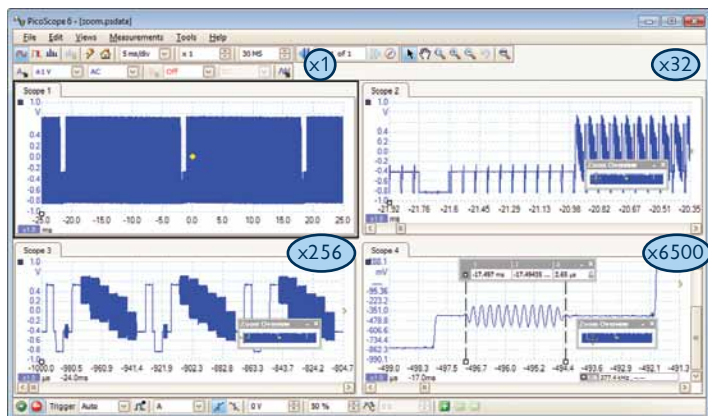

Managing all this data calls for some powerful tools, so PicoScope has a maximum zoom factor of 100 million combined with a choice of two zoom methods. There's a conventional set of zoom controls, plus an overview window that shows you the whole waveform while you zoom and reposition the display by simply dragging with the mouse.

The deep memory can be segmented to store up to 10,000 waveforms, and has navigation tools allowing you to review previous entries. No longer will you see a glitch on the screen only for it to vanish before you stop the scope. A mask can be applied to filter out waveforms of interest.

Advanced triggers

As well as the standard range of triggers found on all oscilloscopes, the PicoScope 5000 Series offers a class-leading set of advanced triggers including pulse width, windowed, dropout and logic triggers to help you capture the data you need.
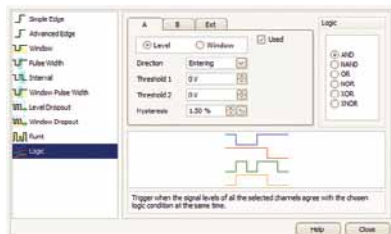
Digital triggering

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 high precision and resolution.

Digital triggering also reduces re-arm delay and this, combined with the segmented memory, allows the triggering and capture of events that happen in rapid sequence. At the fastest timebase you can use rapid triggering to collect 10,000 waveforms in under 20 milliseconds. The mask limit testing function can then scan through these waveforms to highlight any failed waveforms for viewing in the waveform buffer.

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 Pico oscilloscope probes and current clamps are built in.

Arbitrary waveform and function generator
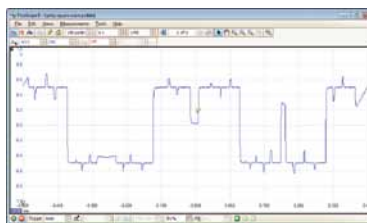
All units have a built-in function generator (sine, square, triangle, DC level and more) with frequency sweeping capability. Combined with the spectrum peak hold option, this makes a powerful tool for testing amplifier and filter responses.

The PicoScope 5000 Series includes a full arbitrary waveform generator. Waveforms can be created or modified using the built-in AWG editor, imported from oscilloscope traces, or loaded from a spreadsheet.
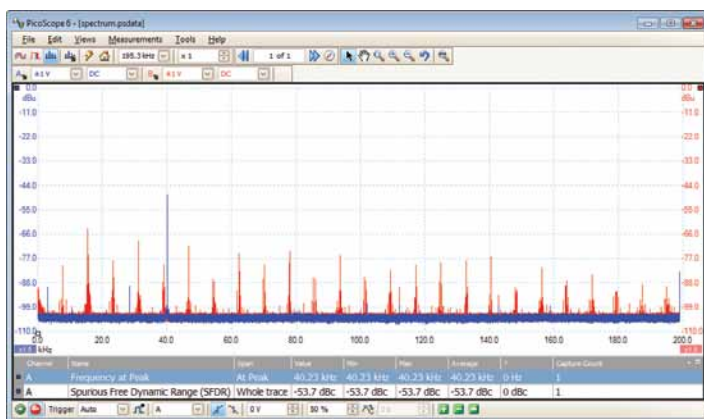
Spectrum analyzer

With the click of a button you can display a spectrum plot of the selected channels. The spectrum analyzer allows signals up to 250 MHz to be viewed in the frequency domain. A full range of settings gives you control over the number of spectrum bands, window type and display mode: instantaneous, average, or peak-hold.

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

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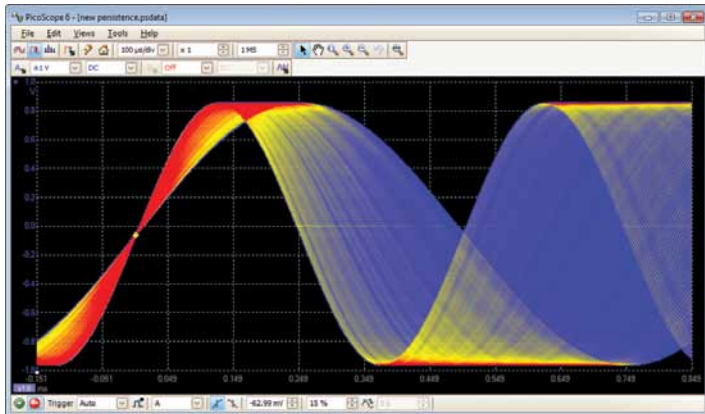
See old and new data superimposed, with new data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Choose between analog persistence and digital color, or create a custom display mode.

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
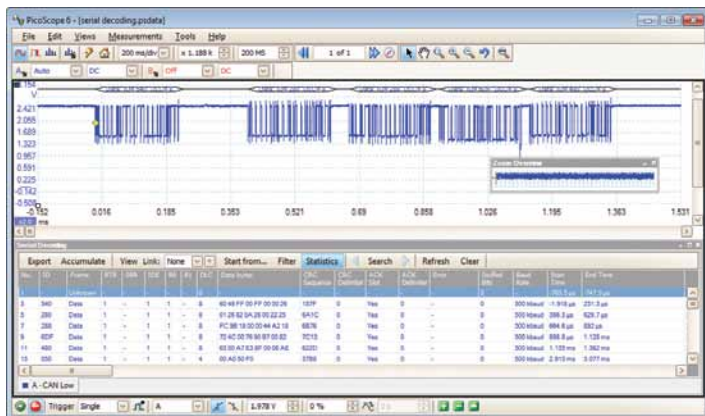
The PicoScope 5000 Series is ideal for serial decoding as it can capture thousands of frames of uninterrupted data.

Protocols currently supported are I²C, SPI, RS232/UART, CAN, LIN and FlexRay. Expect this list to grow with free software updates.

PicoScope displays the decoded data in the format of your choice: "in view", "in window", or both at once.

"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 fully decode the hex data into plain text.

High-speed data acquisition/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.

If the 128 MS record length isn't enough, the driver supports streaming mode, which captures gap-free continuous data through the USB port directly to the PC's RAM or hard disk at a rate of over 10 MS/s. Maximum speed depends on the PC's capabilities.

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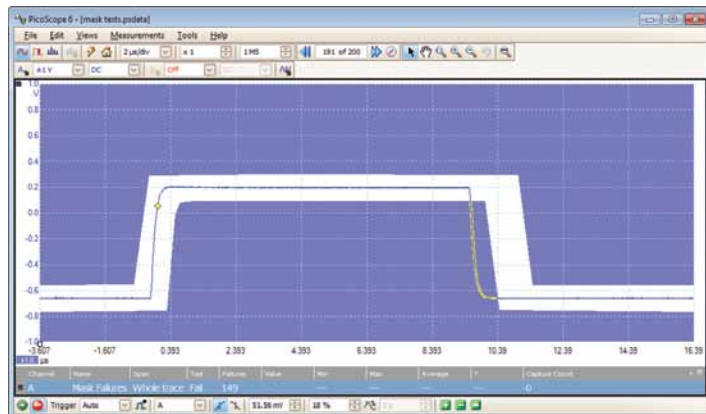
The numerical and graphical mask editors can be used separately or in combination, allowing you to enter accurate mask specifications and to modify existing masks. You can import and export masks as files.

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 5000 Series, high-end features such as mask limit testing, serial decoding, advanced triggering, measurements, math, XY, digital filtering and segmented memory 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 via 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.

Dependable 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. Years of oscilloscope experience leads to 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.

Oscilloscope controls: Commonly-used controls such as voltage range selection, timebase, memory depth and channel selection are placed on the toolbar for quick access, leaving the main display area clear for waveforms. More advanced controls and functions are located in the **Tools** menu.

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 multiple serial data signals and display the data alongside the physical signal or as a detailed table.

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

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

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.

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 with automatic or custom layouts.

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

Zoom and pan tools: PicoScope allows a zoom factor of up to 100 million, which is necessary when working with the deep memory of the 5000 Series scopes. Either use the zoom-in, zoom-out and pan tools, or click and drag in the zoom overview window for fast navigation.
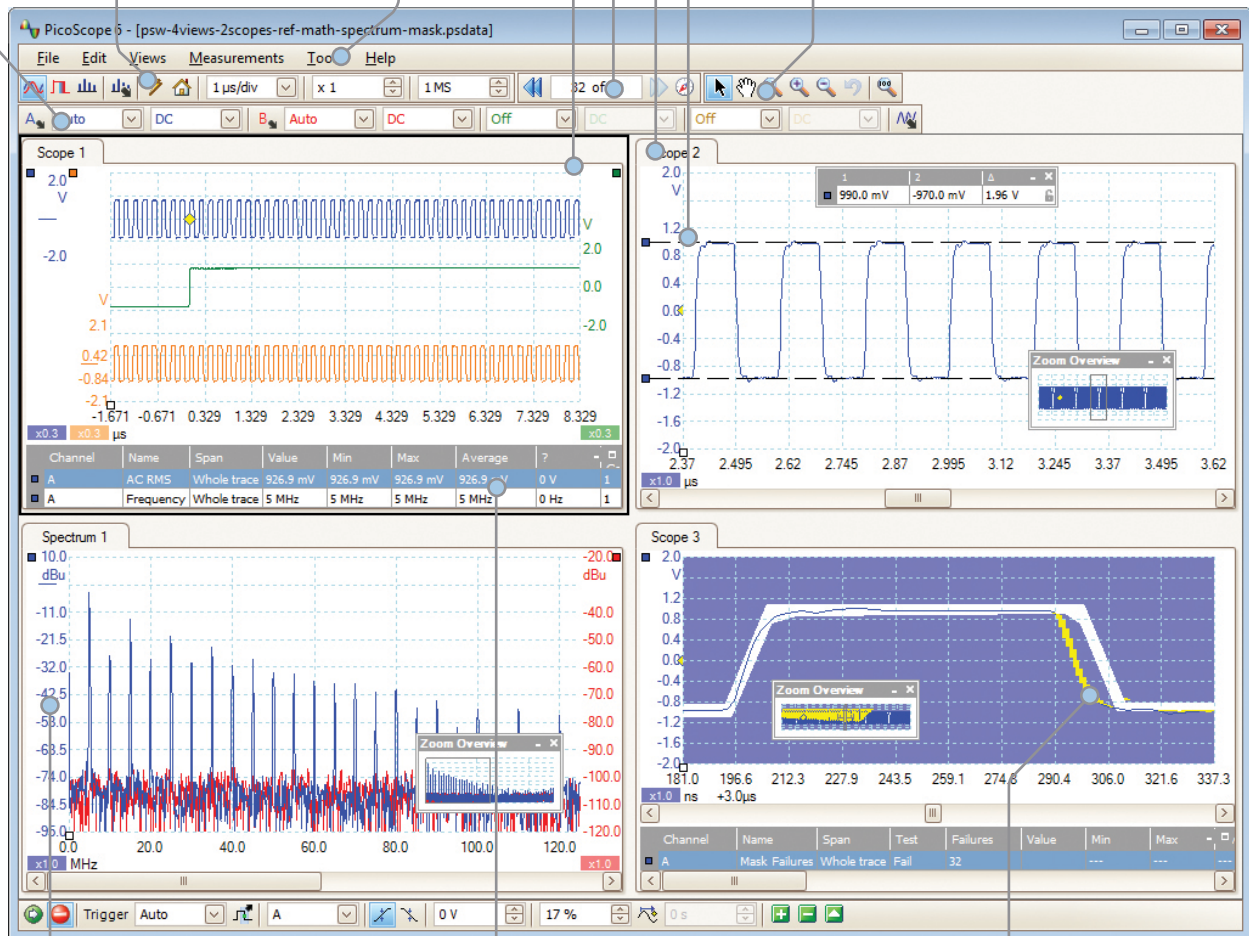
Movable axes: The vertical axes can be dragged up and down. This feature is particularly useful when one waveform is obscuring another. There's also an **Auto Arrange Axes** command.

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 5000 Series 2-Channel Oscilloscopes - Specifications

MODEL	BANDWIDTH	SAMPLING	MEMORY	AWG
PicoScope 5204	250 MHz	1 GS/s	128 MS	YES
PicoScope 5203	250 MHz	1 GS/s	32 MS	YES

MODEL	PicoScope 5203	PicoScope 5204
Number of channels	\multicolumn{2}{c}{2}	
Vertical resolution	8 bits	
Analog bandwidth	250 MHz	
Maximum sampling rate (real time)		
One channel in use	1 GS/s	
Two channels in use	500 MS/s	
Maximum sampling rate (repetitive signals)	20 GS/s	
Buffer size	32 MS	128 MS
	If two channels in use, buffer shared between channels	
Inputs		
Input characteristics	BNC, 1 MΩ in parallel with about 15 pF	
Coupling	Selectable AC/DC	
Voltage ranges	±100 mV, ±200 mV, ±500 mV, ±1 V, ±2 V, ±5 V, ±10 V, ±20 V	
Accuracy	3%	
Overvoltage protection	±100 V	
Timebase		
Range	5 ns/div to 100 s/div	
Accuracy	50 ppm	
Signal generator output		
Standard waveforms	Sine, square, triangle, ramp (up/down), sin (x)/x, gaussian, half sine, white noise	
Arbitrary waveform buffer	8192 samples	
Sample rate	125 MS/s	
Output Characteristics	BNC, 50 Ω	
Resolution	12 bits	
Amplitude	±250 mV to ±2 V	
Offset	±1 V	
Maximum range	±2.5 V	
External trigger		
Threshold	Variable up to ±20 V	
Resolution	9.8 mV	
Input characteristics	BNC, 1 MΩ	
Bandwidth	150 MHz	
Overvoltage protection	±100 V	
Auxiliary input/output		
Input impedance	100 kΩ	
Input voltage range	0 V to 10 V	
Input threshold	1.65 V (nominal)	
Output impedance	600 Ω	
Output level	0 V (low), 3.3 V (high)	
Operating environment		
Temperature range	0 °C to 40 °C for normal operation	
	20 °C to 30 °C for quoted accuracy	
Humidity	5% to 80% RH, non-condensing	
Storage environment		
Temperature range	-20 °C to +60 °C for quoted accuracy	
Humidity	5% to 95% RH, non-condensing	
PC connection	USB 2.0 (Compatible with USB 1.1)	
Power supply	6 V ± 5% @ 2.5 A max.	
Protection	Auto shutdown on excess or reverse voltage	
AC adaptor	Universal adaptor supplied	
Dimensions	170 mm x 255 mm x 40 mm (6.7" x 10.0" x 1.6")	
Weight	0.9 kg (31.7 oz)	
Compliance	European EMC and LVD standards, FCC Rules Part 15 Class A	

Connections

Kensington security slot
USB
AUXIO
DC IN

Ch A
Ch B
EXT (external trigger)
Signal Out (signal generator)

Software Development Kit

The PicoScope 5000 Series SDK is available for free download. It contains drivers and programming examples in the following languages and development environments:
• C
• C#
• Excel
• LabVIEW

Kit contents

Your PicoScope 5000 Series oscilloscope kit contains the following items:

• PicoScope 5000 Series oscilloscope
• 2 10:1 probes
• USB cable
• Universal power adapter
• Installation Guide
• Carry case
• Software and Reference CD

High-quality probes

Two high-quality 250 MHz probes are supplied to ensure that the oscilloscope achieves its specified bandwidth.

Ordering information

ORDER CODE	DESCRIPTION
PP376	PicoScope 5203 kit
PP377	PicoScope 5204 kit

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