PicoScope® 3000 Series
HIGH-PERFORMANCE 4-CHANNEL OSCILLOSCOPES

Fast, space-saving and USB-powered

Serial decoding • Mask limit testing • Segmented memory

200 MHz bandwidth
128 MS deep memory
1 GS/s real-time sampling
10 GS/s repetitive sampling
Advanced digital triggering
200 MHz spectrum analyzer
Function generator & AWG
USB 2.0 Hi-Speed
Flexible power

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

High-end features as standard
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) with frequency sweeping capability. Combined with the spectrum peak hold option, this makes a powerful tool for testing amplifier and filter responses.

The B models in the PicoScope 3000 Series also include 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 200 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.
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 3000 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.

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.

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 up to several million, which is necessary when working with the deep memory of the 3000 Series scopes. Either use the zoom-in, zoom-out and pan tools, or click and drag in the zoom overview window for fast navigation.

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: 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.
## PicoScope 3000 Series 4-Channel Oscilloscopes - Specifications

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<td>Func. gen. + AWG</td>
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### VERTICAL
- **Bandwidth (–3 dB):**
  - PicoScope 3404A: 60 MHz
  - PicoScope 3405A: 100 MHz
  - PicoScope 3406A: 200 MHz
- **Bandwidth limiting (–3 dB):**
  - 20 MHz, switchable
- **Rise time (calculated):**
  - PicoScope 3404A: 5.8 ns
  - PicoScope 3405A: 3.5 ns
  - PicoScope 3406A: 1.75 ns
- **Resolution:**
  - 8 bits
- **Input channels:**
  - 4
- **Input characteristics:**
  - 1 MΩ ±1%, in parallel with 14 pF ±1 pF
- **Input coupling:**
  - AC/DC
- **Input sensitivity:**
  - 10 mV/div to 4 V/div (10 vertical divisions)
- **Input ranges:**
  - ±50 mV to ±20 V in 9 ranges
- **Analog offset range (vertical position adjustment):**
  - ±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 GS/s (1 ch), 500 MS/s (2 ch), 250 MS/s (3 or 4 ch)
- **Max. effective sampling rate (repetitive signals):**
  - 2.5 GS/s
- **Sampling rate (cont. USB streaming):**
  - ≥10 MS/s (PC dependent)
- **Timebase ranges:**
  - 2 ns/div to 200 s/div
  - 1 ns/div to 200 s/div
  - 500 ps/div to 200 s/div
- **Buffer memory* (A models):**
  - 4 MS
  - 16 MS
  - 64 MS
- **Buffer memory* (B models):**
  - 8 MS
  - 32 MS
  - 128 MS
- **Waveform buffer (no. of segments):**
  - 1 to 10,000
- **Timebase accuracy:**
  - ±50 ppm
- **Sample jitter:**
  - < 5 ps RMS

* Shared between active channels

### DYNAMIC PERFORMANCE (typical)
- **Crosstalk:**
  - Better than 400:1 up to full bandwidth (equal voltage ranges)
- **Harmonic distortion:**
  - < −50 dB at 100 kHz full scale input
- **SFD R:**
  - 52 dB typical
- **ADC ENOB:**
  - 7.6 bits
- **Noise:**
  - 180 µV RMS (on most sensitive range)
- **Pulse response:**
  - < 5% overshoot
- **Bandwidth flatness:**
  - (+0.3 dB, −3 dB) at scope input, from DC to full bandwidth

### TRIGGER
- **Trigger modes:**
  - Auto, repeat, single, none, rapid (segmented memory)
- **Advanced digital triggers (Ch A to D):**
  - Edge, window, pulse width, window pulse width, dropout, window dropout, interval, logic, runt pulse
- **Trigger sensitivity (Ch A to D):**
  - Digital triggering provides 1 LSB accuracy up to full bandwidth of scope
- **Max. pre-trigger capture:**
  - Up to 100% of capture size
- **Max. post-trigger delay:**
  - Up to 4 billion samples
- **Trigger re-arm time:**
  - < 2 µs on fastest timebase
- **Max. trigger rate:**
  - Up to 10,000 waveforms in a 20 ms burst

### EXTERNAL TRIGGER INPUT
- **Trigger types:**
  - Edge, pulse width, dropout, interval, logic, delayed
- **Input characteristics:**
  - Front panel BNC, 1 MΩ ±1% in parallel with 14 pF ±1 pF
- **Bandwidth:**
  - 60 MHz
  - 100 MHz
  - 200 MHz
- **Voltage range:**
  - ±5 V, DC coupled
- **Overvoltage protection:**
  - ±100 V (DC + AC peak)
### Function Generator (all models)
- **Output waveforms**: All models: Sine, square, triangle, DC voltage. B models: ramp, sinc, Gaussian, half-sine, white noise, PRBS.
- **Output frequency range**: DC to 1 MHz
- **Sweep modes**: Up, down, dual with selectable start/stop frequencies and increments
- **Bandwidth**: > 1 MHz
- **Output frequency accuracy**: ±50 ppm
- **Output frequency resolution**: < 0.01 Hz
- **Output voltage range**: ±2 V with ±1% DC accuracy
- **Output voltage adjustment**: Signal amplitude and offset adjustable in approx. 1 mV steps within overall ± 2 V range
- **Amplitude flatness**: < 0.5 dB to 1 MHz, typical
- **SFDR**: > 60 dB, 10 kHz full scale sine wave
- **Connector type**: Front panel BNC with 600 Ω output impedance
- **Overvoltage protection**: ±10 V

### AWG (B models only)
- **Update rate**: 20 MS/s
- **Buffer size**: 8 kS
- **Resolution**: 12 bits (output step size approx. 1 mV)
- **Bandwidth**: > 1 MHz
- **Rise time (10% to 90%)**: < 100 ns

### Probe Compensation Output
- **Output**: 1 kHz square wave, 1.6 V pk-pk (typ.), 600 Ω

### Spectrum Analyzer
- **Frequency range**: DC to 60 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 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, freq, derivative, integral, min, max, average, peak
- **Operands**: A, B, C, D (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+N, SFDR, SINAD, SNR, IMD
- **Statistics**: Minimum, maximum, average and standard deviation

### Serial Decoding
- **Protocols**: I²C, I²S, SPI, RS232/UART, CAN, LIN and FlexRay protocols

### 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 connection**: USB 2.0 Hi-Speed
- **Power requirements**: Powered from 2 USB ports or from AC adaptor supplied (1000 mA at 5 V)
- **Dimensions**: 190 x 170 x 40 mm (including connectors)
- **Weight**: < 0.5 kg
- **Temperature range**: Operating: 0 °C to 40 °C (20 °C to 30 °C for stated accuracy)
- **Safety approvals**: 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/PC requirements**: PicoScope 6, SDK, example programs / Microsoft Windows XP SP3, Windows Vista, Windows 7 or Windows 8
- **Languages (full support)**: English, French, German, Italian, Spanish
- **Languages (UI only)**: Simplified Chinese, Traditional Chinese, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Spanish, Swedish, Turkish
### Kit contents

Your PicoScope 3000 Series oscilloscope kit contains the following items:

- PicoScope 3000 Series oscilloscope
- 4 x 10:1 probes
- Single-headed USB cable
- Double-headed USB cable
- AC power adapter
- Installation Guide
- Software and Reference CD

### Software Development Kit

The PicoScope 3000 Series SDK is available for free download. It contains drivers and programming examples in the following languages and development environments:

- C
- C#
- Excel
- LabVIEW

### High-quality probes

The probes supplied with these oscilloscopes are chosen to obtain the specified system bandwidth.

- MI007 (supplied with PicoScope 3404A/B)
- TA132 (supplied with PicoScope 3405A/B)
- TA131 (supplied with PicoScope 3406A/B)

### Ordering information

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<th>ORDER CODE</th>
<th>DESCRIPTION</th>
<th>£</th>
<th>US$*</th>
<th>€*</th>
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<tr>
<td>PP846</td>
<td>PicoScope 3404A (60 MHz, func. gen., probes)</td>
<td>599</td>
<td>988</td>
<td>725</td>
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*US$ and € prices are correct at the time of publication. Please contact Pico Technology for the latest prices before ordering.
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