

PicoScope® 6000 Series

HIGH-PERFORMANCE USB OSCILLOSCOPES

Ultra-deep memory. Fast data transfers.

4 CHANNELS • 500 MHz BANDWIDTH • 5 GS/s SAMPLING
2 GSAMPLE BUFFER MEMORY

PicoScope



SuperSpeed USB 3.0 interface

500 MHz spectrum analyzer

Arbitrary waveform generator

Advanced triggers

100 million × zoom

Mask limit testing

Serial bus decoding

... all as standard!



Compatible with Windows XP, Windows Vista, Windows 7 and Windows 8, USB 2.0 and USB 3.0 • Supplied with an SDK including example programs • Free technical support

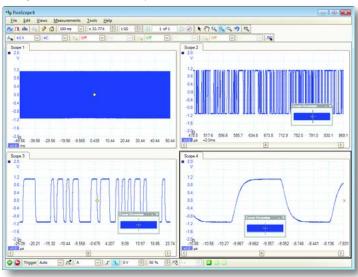
PicoScope performance and reliability

With over 20 years' experience in the test and measurement industry, we know what's important in a new oscilloscope. The PicoScope 6000 Series scopes give you the best value for money of any oscilloscope, with outstanding bandwidth, sampling rate and memory depth specifications. These features are backed up by advanced software optimized with the help of feedback from our customers.

High bandwidth, high sampling rate

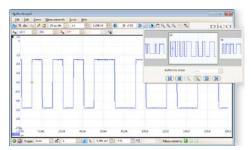
With 250 MHz to 500 MHz analog bandwidths complemented by a real-time sampling rate of 5 GS/s, the PicoScope 6000 Series scopes can display single-shot pulses with 200 ps time resolution. Equivalent time sampling (ETS) mode boosts the maximum sampling rate to 50 GS/s, giving an even finer timing resolution of 20 ps for repetitive signals.

Huge buffer memory



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

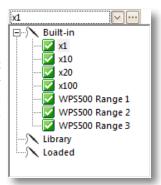
The PicoScope 6000 Series gives you the deepest buffer memory available as standard on any oscilloscope at any price. The SuperSpeed USB 3.0 interface ensures that the display is smooth and responsive even with long captures. Other oscilloscopes have high maximum sampling rates, but without deep memory they cannot sustain these rates on long timebases. The 2 gigasample buffer on the PicoScope 6404D can hold two 200 ms captures at the maximum sampling rate of 5 GS/s. To help manage all this data, PicoScope can zoom up to 100 million times using a choice of two zoom methods. There are zoom buttons as well as an overview window that lets you zoom and reposition the display by simply dragging with the mouse.



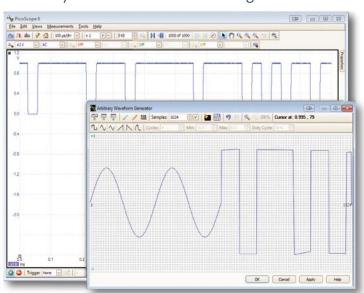
To help you find you way around the buffer memory, you can divide it into as many as 10,000 individually triggered segments. Use the visual buffer navigator to scan through the segments, or set up a mask to filter out the waveforms of interest.

Custom probe settings

The custom probes menu allows you to correct for gain, attenuation, offsets and nonlinearities of probes and transducers, or convert to different measurement units. Definitions for standard Pico-supplied probes are built in, but you can also create your own using linear scaling or even an interpolated data table.



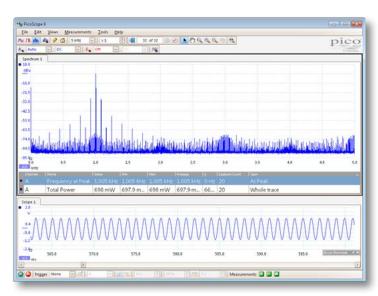
Arbitrary waveform and function generator



Every model includes a built-in DC to 20 MHz function generator with sine, square, triangle and DC waveforms. D models add a built-in 12 bit, 200 MS/s arbitrary waveform generator. You can import arbitrary waveforms from data files or create and modify them using the built-in graphical AWG editor.

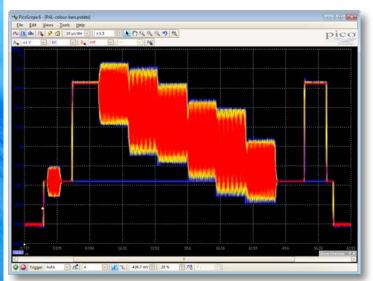
Spectrum analyzer

With the click of a button, you can open a new window to display a spectrum plot of selected channels up to the full bandwidth of the oscilloscope. The spectrum view can optionally be displayed together with a time-domain view. A comprehensive range of settings give you control over the number of spectrum bands, window types and display modes.

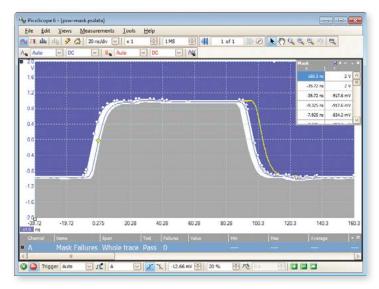


PicoScope 6000 Series PC

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, digital color or custom display modes.



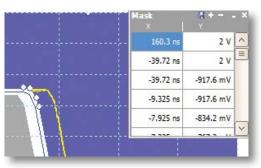
Mask limit testing



This feature is 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 vertical and horizontal tolerances. 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, so the scope can catch intermittent glitches even while your attention is elsewhere. 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 below) can be used separately

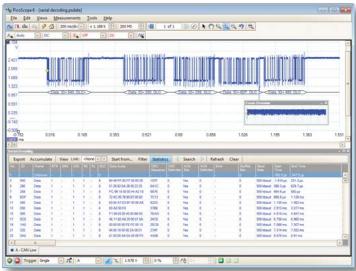
or in combination, allowing you to enter accurate mask specifications or modify existing masks. You can import and export masks as files.



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 2 GS buffer memory of the PicoScope 6404D isn't enough, the drivers support data streaming, a mode that captures gap-free continuous data over the USB 3.0 port directly to the PC's RAM at over 150 MS/s and to solid-state disk at up to 78 MS/s. Rates are subject to PC specifications and application loading.

Serial data decoding



The PicoScope 6000 Series oscilloscopes are well-suited to serial decoding, with a deep memory buffer that allows them to collect long, uninterrupted sequences of data. This allows the capture of thousands of frames or packets of data over several seconds. The scopes can decode up to four buses simultaneously with independent protocol selection for each input channel.

Serial protocols
UART (RS-232)
SPI
I^2C
I^2S
CAN
LIN
FlexRay

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

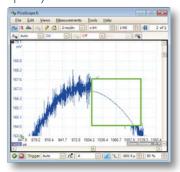
- In view format shows the decoded data beneath the waveform on a common time axis, with error frames marked in red. You can zoom in on these frames to look for noise or distortion on the waveform.
- In window format shows a list of the decoded frames, including the data and all flags and identifiers. 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 it lists the data.

Analog and 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 highbandwidth signals on the others.

An additional selectable analog bandwidth limiter on each input channel can be used to reject high frequencies that would otherwise cause aliasing.



ООО "Техэнком" Контрольно-измерительные приборы и оборудование www.tehencom.com

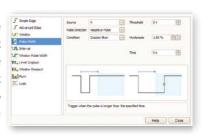
Digital triggering

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. 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.

Digital triggering also reduces rearm 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 10 milliseconds. The mask limit testing function can then scan through these waveforms to highlight any failed waveforms for viewing in the waveform buffer.

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.

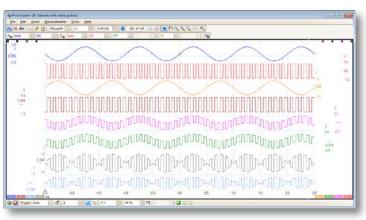


All triggering is digital, resulting in high threshold resolution with programmable hysteresis and optimal waveform stability.

Maths channels

With PicoScope 6 you can perform a variety of mathematical calculations on your input signals. You can calculate the sum, difference, product or inverse, or create your own custom function using standard arithmetic, exponential and trigonometric functions.





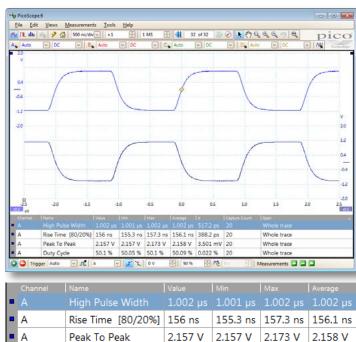
Automatic measurements

PicoScope allows you to automatically display a table of calculated measurements for troubleshooting and analysis.

Using the built-in measurement statistics you can see the average, standard deviation, maximum and minimum of each measurement as well as the live value.

You can add as many measurements as you need on each view. Each measurement includes statistical parameters showing its variability.

For information on the measurements available in scope and spectrum modes, see **Automatic Measurements** in the **Specifications** table.



50.1 %

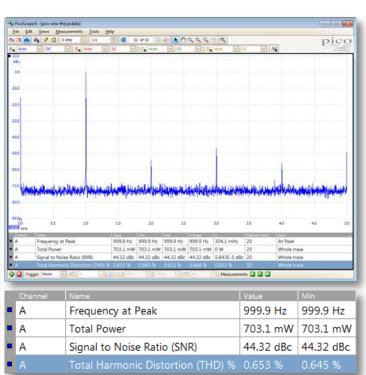
50.1 %

50.05 %

50.09 %

15 scope mode measurements

Duty Cycle



11 spectrum mode measurements

High signal integrity

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

Our engineers use careful front-end design and shielding to reduce noise, crosstalk and harmonic distortion. With decades of oscilloscope experience, we know how to design for optimal pulse response and bandwidth flatness.



Hardware acceleration

On some oscilloscopes, enabling deep memory has a penalty: the screen update rate slows down and the controls become unresponsive as the processor struggles to cope with the amount of data. Thanks to the hardware acceleration inside PicoScope deep-memory oscilloscopes, you can collect waveforms containing hundreds of millions of samples while keeping fast screen update rates and a responsive user interface. Dedicated hardware inside

the oscilloscope processes multiple streams of data in parallel to construct the waveform that will be displayed on the screen. This is done far faster than any PC processor could manage, and together with USB 3.0 SuperSpeed data transfer eliminates any bottlenecks between the oscilloscope and the PC.

For example, the scope may be set to capture 100 000 000 samples but the PicoScope display window may be only 1000 pixels wide. In this case, the scope intelligently compresses the data into 1000 blocks of 100 000 samples each. Unlike simple decimation, which throws away most of the data, PicoScope hardware acceleration guarantees that you see any high-frequency details such as narrow glitches, even when the display is zoomed out.

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 6000 Series, high-end features such as mask limit testing, serial decoding, advanced triggering, measurements, math, XY mode, digital filtering, segmented memory and even a signal generator 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 as 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.

Probes included

Your PicoScope 6000 Series scope is supplied complete with four wideband, high-impedance probes. These probes have been designed for use with individual models of the PicoScope 6000 Series and are factory-compensated to match each scope's input characteristics. Each high-quality probe is supplied with a range of accessories for convenient and accurate high-frequency measurements.

www.tehencom.com

A comprehensive range of alternative probes is also available.



Probe specifications	TA150	TA133			
Attenuation	10:1				
Resistance at probe tip	10 MΩ				
Capacitance at probe tip	9.5 pF				
Scope input impedance	1 ΜΩ				
Compatibility	PicoScope 6402C/D, PicoScope 6403C/D	PicoScope 6404C/D			
Bandwidth (3 dB)	350 MHz	500 MHz			
Rise time (10% to 90%)	1 ns 700 ps				
Compensation range	10 to 25 pF				
Safety standard	IEC/EN 61010-031				
Cable length	1.3	3 m			

Probe accessories included

TA133 and TA150

- Instruction manual
- Solid tip 0.5 mm
- Coding rings, 3 x 4 colors
- Ground lead 15 cm
- Ground spring 2.5 mm
- Trim tool
- Insulating cap 2.5 mm
- Sprung hook 2.5 mm



TA133 only

- Spring tip 0.5 mm
- Ground blade 2.5 mm
- 2 self-adhesive copper pads
- Protection cap 2.5 mm
- IC caps 0.5 to 1.27 mm pitch
- PCB adaptor kit 2.5 mm



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.

Software

PicoScope

Trigger toolbar: Quick access to main controls, with advanced triggers in a pop-up window.

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.

Zoom overview: Click and drag for quick navigation in zoomed views. **Spectrum view:**View FFT data
alongside scope view
or independently.

ООО "Техэнком" Контро	льно-измер	ительные п	риборы и о	борудование	www.teh	encom.com
	PicoScope 6402C	PicoScope 6402D	PicoScope 6403C	PicoScope 6403D	PicoScope 6404C	PicoScope 6404D
VERTICAL						
Input channels			4, BNC connect	tors, single-ended		
Analog bandwidth (-3 dB)*		MHz		MHz	500	MHz
, ,		±50 mV range)	•	±50 mV range)		
Bandwidth limiter Rise time (10% to 90%, calculated)		switchable / range 1.8 ns)		switchable V range 1.4 ns)		switchable Ill ranges)
Input ranges (full scale)				t), ±50 mV to ±5V,		
Input sensitivity), 10 mV/div to 1 V	- '	
Input coupling	10 1111/ 411	,		C (1 M Ω or 50 Ω)) air ac /	.00 22
Input characteristics		1 MΩ ± 1% 15	pF, or $50 \Omega \pm 2\%$. ,	1 MΩ ± 1% 10	pF, or $50 \Omega \pm 2\%$
Analog offset range		/ " / " V "	±2.5 V ±2.5 V ±2.5 V	0 Ω: ±0.5 V)	±2 V ±10 V (50 ±10 V (50 ±10 V (50	
DC accuracy				full scale		
Overvoltage protection				outs), 5.5 V RMS (5	0 Ω inputs)	
* Stated bandwidth is with supplied probe	s or at BNC when	50 Ω impedance s	elected			
DYNAMIC PERFORMANCE		200 -1/ DMC	(FO ma)/		220 V DMC	(FO m)/
Noise THD			(50 mV range) B typical			(50 mV range) 3 typical
SFDR			в typical В typical			typical
Crosstalk			oical at 20 MHz			cal at 20 MHz
			at full bandwidth			t full bandwidth
HORIZONTAL (TIMEBASE)		1	ns/div to 5000 s/c	liv (real-time sampli	nσ)	
Timebase ranges		50 ps/div	to 100 ns/div (eq	uivalent-time sampl	ing / ETS)	
Timebase accuracy			±2	ppm		
Timebase ageing			1 ppm	per year		
ACQUISITION						
ADC resolution		8 bits (up 1		tware resolution en	hancement)	
Maximum real-time sampling rate			1 channel 2 channels 4 channels	5 GS/s 2.5 GS/s** 1.25 GS/s		
Maximum ETS rate				mber of channels)		
Maximum streaming data rate (PicoScope 6)			10	· · · · · · · · · · · · · · · · · · ·	1 · 70 MC /	
Maximum streaming data rate (SDK)		Data transfei (USB 3.0	r > 150 MS/s, strea). PC-dependent, si	aming to SSD hard of ubject to application	arive 78 MS/s Noadings)	
Buffer size (shared between active channels)	256 MS	512 MS	512 MS	1 GS	1 GS	2 GS
Buffer size (streaming mode)	1	00 MS in PicoSco	oe software. Up to	available PC memo	ory when using SD	K.
Max. buffer segments (using PicoScope 6)			10	000		
Max. buffer segments (using SDK)	250 000	500 000	500 000	1 000 000	1 000 000	2 000 000
** To achieve 2.5 GS/s sampling rate in 2-	channel mode, use	channel A or B ar	nd channel C or D.			
TRIGGERING Sources			Channala /	A to D ALIV		
Trigger modes		None sine		A to D, AUX upid (segmented me	mory) FTS	
Advanced trigger types (real-time mode)	Edge, pulse width.		, I	out, window dropou	, ,	gic level, runt pulse
Trigger types (ETS mode)	8 / 1	,		, falling edge	, , ,	5 / I
Trigger sensitivity				full bandwidth of so		
Trigger level		Adju		of selected voltage	range	
Maximum pre-trigger capture				capture size		
Maximum post-trigger delay				n samples		
Re-arm time Maximum trigger rate		I		n fastest timebase orms in a 10 ms bu	rct	
Trigger timing resolution		0		le period	130	
AUX TRIGGER INPUT						
AUX trigger connector type		Rear	panel BNC, shared	with reference cloc	k input	
Trigger types				ropout, interval, lo		
Input characteristics			• '	DC coupled		
Bandwidth				MHz		
Threshold range				1 V		
Overvoltage protection			±5 V (DC	+ AC peak)		
REFERENCE CLOCK INPUT (SDK ONLY)						
Clock input characteristics				1 V, DC coupled		
Frequency range				Hz, user-selectable		
Connector		R	· · · · · · · · · · · · · · · · · · ·	ared with AUX trigg	ger	
Level			•	nreshold, ±1 V		
Overvoltage protection			±	5 V		

ООО "Техэнком"	Контрол	тьно-измері	ительные пр	риборы и об	борудование	e www.teh	encom.com
		PicoScope 6402C	PicoScope 6402D	PicoScope 6403C	PicoScope 6403D	PicoScope 6404C	PicoScope 6404D
FUNCTION GENERATOR							
Standard signal frequency				DC to	20 MHz		
Standard output signals	All models				, triangle, DC	DDDC	
	models only		Ramp		Ilf-sine, white noise imebase accuracy	, PRBS	
Output frequency accuracy Output frequency resolution)5 Hz		
Output frequency resolution			Amplitud	le adjustment:		4 V max. p-p)	
Output voltage adjustment			Offset ac	ljustment:	±1 V `		
DC aggregative			Maximur	n combined outpu	t voltage: $\pm 2.5 \ V$	/	
DC accuracy Connector type					nel BNC		
Output impedance				·	Ω		
Overvoltage protection					5 V		
Sweep modes			Up, down, or dua	l, with selectable s	tart/stop frequenc	ies and increments	5
Signal generator triggering			•		nable number of cy		
ARBITRARY WAVEFORM GE	ENERATOR (AWG)					
Buffer size		(* (* (*)	64 kS		64 kS		64 kS
Sample rate			200 MS/s		200 MS/s		200 MS/s
Resolution		_	12 bits	_	12 bits	_	12 bits
Bandwidth			20 MHz		20 MHz		20 MHz
PROBE COMPENSATION OU	JTPUT						
Impedance				60	0 Ω		
Frequency				1 kHz sq	uare wave		
Level				2 V	pk-pk		
Overvoltage protection				±5 V (DC	+ AC peak)		
SPECTRUM ANALYZER							
Frequency range		DC to 2	250 MHz	DC to 3	50 MHz	DC to 5	00 MHz
Display modes				Magnitude, ave	erage, peak hold		
Windowing functions		Rectan	gular, Gaussian, tr	iangular, Blackman	, Blackman-Harris,	Hamming, Hann,	flat-top
Number of FFT points			Sele	ctable power of 2	from 128 to 1 048	576	
MATH CHANNELS							
Functions		-x, :	x+y, x-y, x*y, x/y	, x^y, sqrt, exp, ln	, log, abs, norm, si	gn, sin, cos, tan, a	rcsin,
Operands		arccos,			tive, integral, min, erence waveforms		ik, delay
	ITC		input ci	iailileis A to D, l'ei	erence wavelorins,	, time, κ	
AUTOMATIC MEASUREMEN	112	∆C RM	15 true RMS cycle	time DC average	e, duty cycle, falling	rate fall time fre	dilency
Scope mode		high pulse	width, low pulse v	vidth, maximum, r	ninimum, peak-to-p	peak, rise time and	l rising rate
Spectrum mode			Frequency at ptotal power, THI	peak, amplitude at D %, THD dB, TH	peak, average amp D+N, SFDR, SINA	olitude at peak, D, SNR and IMD	
Statistics			Minimur	n, maximum, aver	age, and standard	deviation	
SERIAL BUS DECODING							
Data formats			CAN	, LIN, I ² C, I ² S, UAI	RT/RS-232, SPI, FI	exRay	
MASK LIMIT TESTING							
Statistics				Pass/fail, failure	count, total count		
DISPLAY							
Interpolation				Linear o	r sin(x)/x		
Persistence modes			Digit		ensity, custom, or	none	
GENERAL							
PC connectivity				USB 3.0 (USB	2.0 compatible)		
Exported data formats		C	Comma-separated		ed, BMP, GIF, PNG	, MATLAB 4 form	at
Power requirement					daptor and cable s		
Dimensions (inc. connectors &	& end caps)			5 x 40 mm			5 x 40 mm
Weight			1 kg (appro	x. 2 lb 3 oz)		1.3 kg (appro	ox. 2 lb 14 oz)
Temperature range		•	•		r stated accuracy).		
Humidity range		Oper			g. Storage: 5% to 9		ensing.
Compliance			EU: EMC, I		USA: FCC Part 1.	5 Subpart B	
Safety approvals			6.146		N 61010-1:2010		B-T-
PC requirements		Micros			'indows 7, or Wind	•	ows RT)
Software included		Cinculia d Cl		•	DK and example pr		Common Core I
Languages supported (softwar	re)	Hungarian, Italia	n, Japanese, Korea	n, Norwegian, Po	ish, Dutch, English, lish, Portuguese, R	omanian, Spanish,	Swedish, Turkish
Languages supported (help)			E	ngilsn, French, Ger	rman, Italian, Spani	sn	

Model selector

Model	Bandwidth	Buffer size	Signal generator	Arbitrary waveform generator
PicoScope 6402C	250 MH-	256 MS	✓	
PicoScope 6402D	250 MHz	512 MS	✓	✓
PicoScope 6403C	250 MH	512 MS	✓	
PicoScope 6403D	350 MHz	1 GS	✓	✓
PicoScope 6404C	FOO MILL	1 GS	✓	
PicoScope 6404D	500 MHz	2 GS	✓	✓

Have you seen the PicoScope 6407 Digitizer?

The PicoScope 6407 Digitizer has four 1 GHz inputs and a maximum sampling rate of 5 GS/s.

→ PicoScope 6407 Digitizer



Product pack contents

- PicoScope 6000 Series oscilloscope
- Four factory-compensated probes
- USB cable
- Universal mains (AC) power supply
- Mains lead (power cord)
- Installation Guide
- Software and Reference CD
- Carrying case



Need more bandwidth?

For repetitive signals such as serial data streams, and characterization of cables and backplanes, the PicoScope 9000 Series Sampling Oscilloscopes deliver high specifications at low prices. Choose between the 12 GHz PicoScope 9200 Series and the 20 GHz PicoScope 9300 Series. TDR/TDT and optical models are also available.

→ PicoScope 9000 Series



Ordering information

Description
PP884 PicoScope 6402C 250 MHz Oscilloscope with probes
PP885 PicoScope 6402D 250 MHz Oscilloscope with AWG and probes
PP886 PicoScope 6403C 350 MHz Oscilloscope with probes
PP887 PicoScope 6403D 350 MHz Oscilloscope with AWG and probes
PP888 PicoScope 6404C 500 MHz Oscilloscope with probes
PP889 PicoScope 6404D 500 MHz Oscilloscope with AWG and probes
TA150 Replacement ×10 probe for PicoScope 6402C/D and 6403C/D
TA133 Replacement ×10 probe for PicoScope 6404C/D
TA065, TA066 and TA067 accessory packs for TA150 and TA133 probes

UK headquarters:
Pico Technology
James House
Colmworth Business Park
St. Neots
Cambridgeshire
PE19 8YP
United Kingdom

+44 (0) 1480 396395

+44 (0) 1480 396296

USA headquarters:
Pico Technology
320 N Glenwood Blvd
Tyler
Texas 75702
United States

+1 800 591 2796

= +1 620 272 0981

Errors and omissions excepted. Windows is a registered trade mark of Microsoft Corporation in the United States and other countries. Pico Technology and PicoScope are internationally registered trade marks of Pico Technology Ltd. MM050-6. Copyright © 2011–2016 Pico Technology Ltd. All rights reserved.

