pico® Technology

PicoScope® 6000 Series

HIGH-PERFORMANCE USB OSCILLOSCOPES

Superior specifications. Great value.

4 CHANNELS • 500 MHz BANDWIDTH • 5 GS/s SAMPLING • 1 GS MEMORY

10,000-waveform buffer

x100,000,000 zoom

Up to 500 MHz spectrum analyzer

Arbitrary waveform generator

Mask limit testing

Serial bus decoding

5 YEAR WARRANTY

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

From a name you can trust...

www.picotech.com

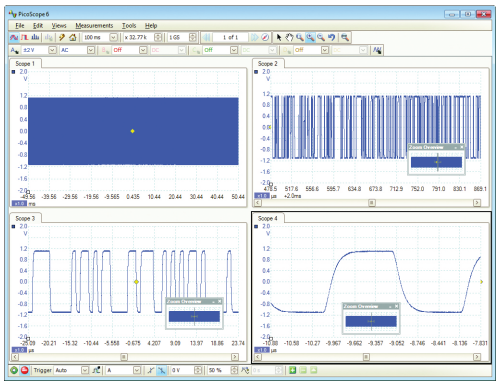
PicoScope performance and reliability

With 20 years' experience in the test and measurement industry, we know what's important in a new oscilloscope. The PicoScope 6000 Series scopes have the best bandwidth, sampling rate and memory depth of any USB oscilloscopes. These features are backed up by advanced software developed with the help of feedback from our customers.

High bandwidth, high sampling rate

With a 250 MHz to 500 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 to 50 GS/s, giving higher timing resolution for repetitive signals.

Huge buffer memory

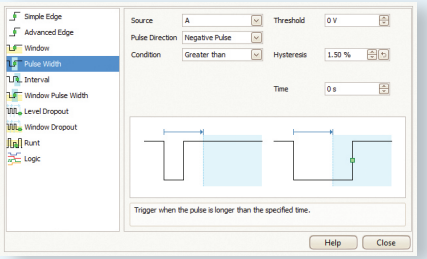


Deep memory allows you to zoom in... and in... and in...

The PicoScope 6000 Series gives you the deepest buffer memory available as standard on any oscilloscope. Other oscilloscopes have high maximum sampling rates, but without deep memory they cannot sustain these rates on long timebases. The 1-gigasample buffer on the PicoScope 6404B allows it to capture at 5 GS/s down to 20 ms/div for a total duration of 200 ms. 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.

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 and excellent waveform stability.

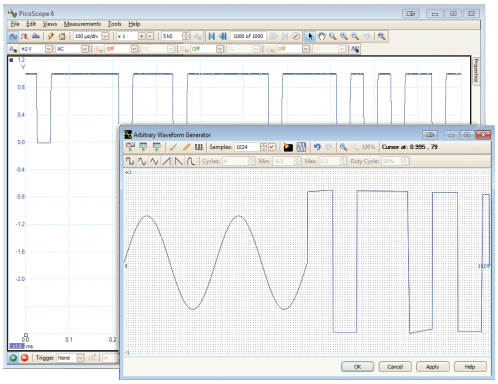
Custom probe settings

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. Definitions for standard Pico-supplied probes are built in, but you can also save your own definitions to disk for later use.

Rapid triggering

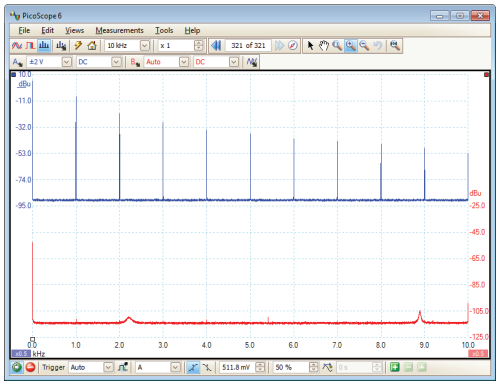
The PicoScope 6000 Series contains special triggering hardware to minimise the time between captures. This enables you to collect waveforms at intervals of 1 µs or less when using a short timebase, improving your chances of spotting an infrequent glitch.

Arbitrary waveform and function generator



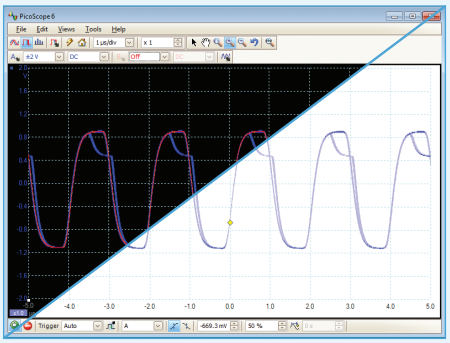
Generate standard waveforms from DC to 20 MHz (all models) or define your own using the power of the built-in 12-bit, 200 MS/s arbitrary waveform generator (B models only). You can import arbitrary waveforms from data files or draw them using the built-in AWG editor.

Spectrum analyzer



With the click of a button, you can open a new window to display a spectrum plot of selected channels. The spectrum analyzer allows signals up to 500 MHz (depending on the scope model) 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



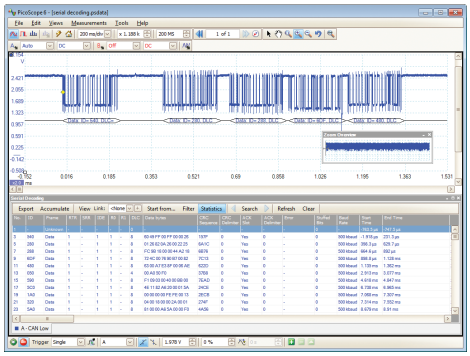
See old and new data superimposed, with new data in a brighter color or shade. This makes it easy to see glitches and dropouts and to estimate their relative frequency. Choose between analog persistence and digital color, or create a custom display mode.

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 of the PicoScope 6404B 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 (PC-dependent) rate of over 10 MS/s.

Serial data decoding:

CAN • LIN • UART • SPI • I²C • I²S • FlexRay

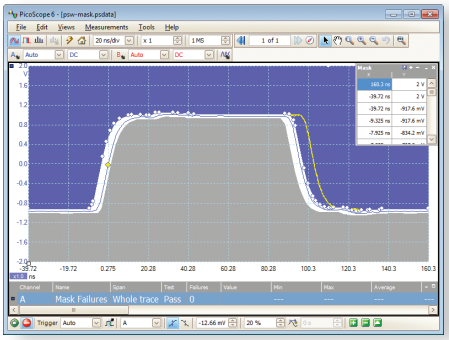


The PicoScope 6000 Series oscilloscopes are well-suited to serial decoding, with a deep memory buffer that allows them to collect long, uninterrupted sequences of data. This allows the capture of thousands of frames or packets of data over several seconds. The scopes can decode up to four buses simultaneously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

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.

Mask limit testing

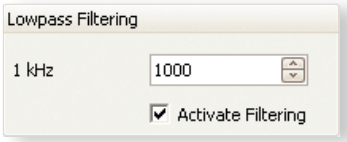


This feature is designed for production and debugging environments. Capture a signal from a known working system, and PicoScope will draw a mask around it with your specified tolerance. Connect the system under test, and PicoScope will highlight any parts of the waveform that fall outside the mask area. 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 or 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 the others.



Probes included

Your PicoScope 6000 Series scope is supplied complete with four high-impedance probes. Replacement probes are available.

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.

Probe specifications	TA150	TA133
Attenuation	10:1	
Resistance at probe tip	10 MΩ	
Capacitance at probe tip	9.5 pF	
Scope input impedance	1 MΩ	
Compatibility	PicoScope 6402A/B, 6403A/B	PicoScope 6404A/B
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 m	

Accessories included

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

- 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
- 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 adapter kit 2.5 mm

The PicoScope 6 Software

PicoScope: The display can be as simple or as detailed 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 > 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.

Tools > Masks: 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.

Channel options: Offset, scaling, resolution enhancement, custom probes.

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

Trigger marker: Drag to adjust trigger level and pre-trigger time.

Oscilloscope controls: Controls such as voltage range, scope resolution, channel enable, timebase and memory depth are placed on the toolbar for quick access, leaving the main display area clear for waveforms.

Signal generator: Generates standard signals or arbitrary waveforms. Includes frequency sweep mode.

Waveform replay tools: PicoScope automatically records up to 10,000 of the most recent waveforms. You can quickly scan through to look for intermittent events, or use the **Buffer Navigator** to search visually.

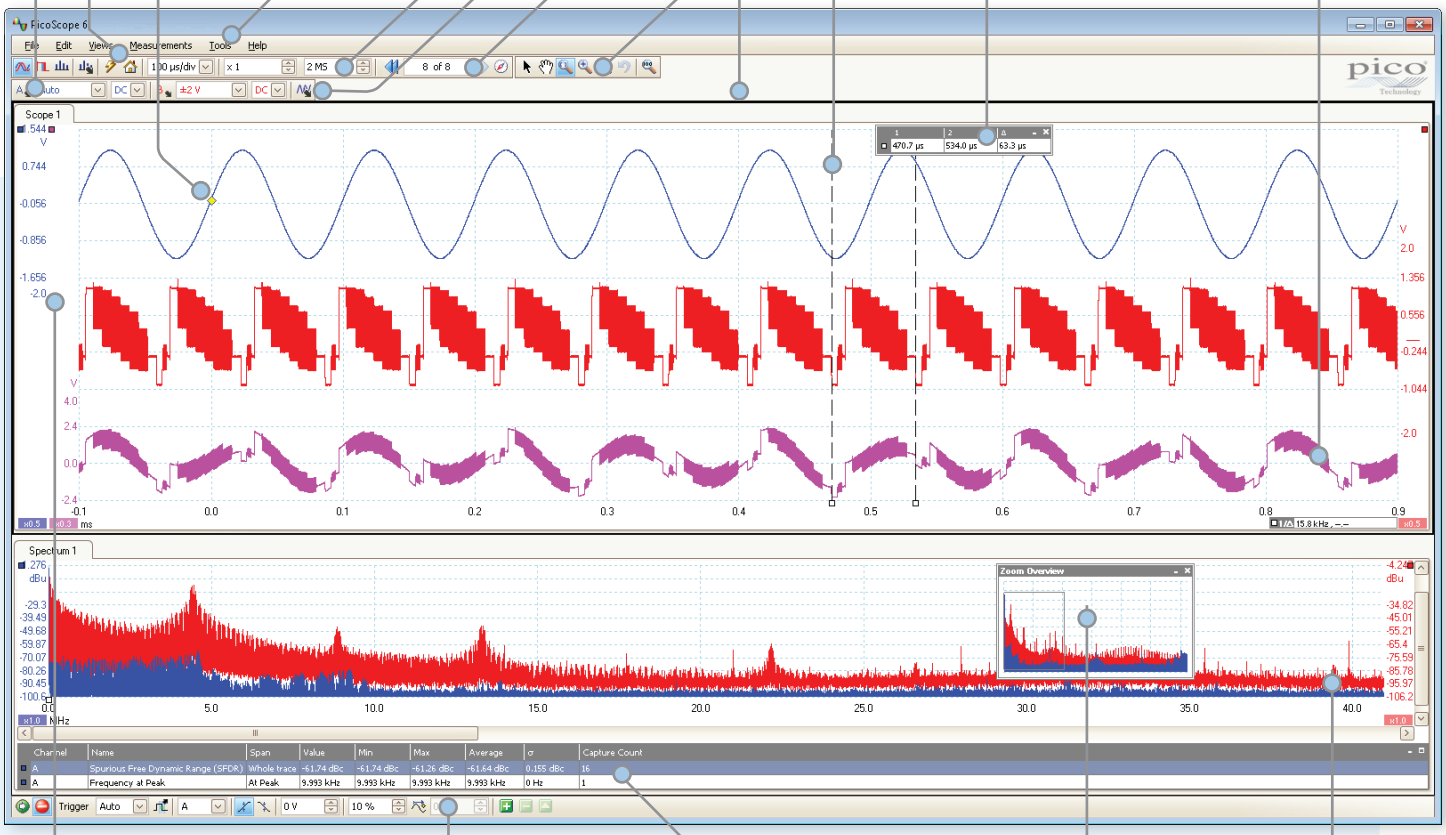
Zoom and pan tools: PicoScope makes it easy to zoom into large waveforms. Either use the zoom-in, zoom-out and pan tools, or click and drag in the Zoom Overview window for fast navigation.

Views: PicoScope is carefully designed to make the best use of the display area. The waveform view is much bigger and of a higher resolution than with a typical benchtop scope. 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.

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

Ruler legend: Absolute and differential ruler measurements are listed here.



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.

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.

PICOSCOPE MODEL	6402A	6402B	6403A	6403B	6404A	6404B
CHANNELS (VERTICAL)						
Number of channels	4 (BNC connectors)					
Bandwidth (-3 dB)	250 MHz (TA150 probes/50 Ω) 200 MHz (±50 mV range)		350 MHz (TA150 probes/50 Ω) 250 MHz (±50 mV range)		500 MHz (TA133 probes/50 Ω)	
Bandwidth limiter	Switchable, 20 MHz		Switchable, 20 MHz		Switchable, 25 MHz	
Rise time (10% to 90%, calculated)	1.4 ns		1.0 ns		0.7 ns	
Input ranges	±50 mV to ±20 V in 9 ranges (up to ±5 V when 50 Ω input selected)					
Input sensitivity	10 mV/div to 4 V/div at x1 zoom					
Input coupling	AC or DC (1 MΩ) or DC (50 Ω)					
Input impedance	1 MΩ || 15 pF, or 50 Ω				1 MΩ || 10 pF, or 50 Ω	
Input offset (position) adjustment	Input range / Offset range: 50 to 200 mV: ±0.5 V 500 mV: ±2.5 V 1 V: ±2.5 V 2 V: ±2.5 V 5 V: ±20 V (50 Ω: ±0.5 V) 10 V: ±20 V 20 V: ±20 V				Input range / Offset range: 50 to 200 mV: ±2 V 500 mV: ±10 V (50 Ω: ±5 V) 1 V: ±10 V (50 Ω: ±4.5 V) 2 V: ±10 V (50 Ω: ±3.5 V) 5 V: ±35 V (50 Ω: ±0.5 V) 10 V: ±30 V 20 V: ±20 V	
DC accuracy	3%					
Overload protection	±100 V to ground (1 MΩ inputs), 5.5 V RMS (50 Ω inputs)					
TIMEBASE (HORIZONTAL)						
Timebases (real-time sampling)	1 ns/div to 5000 s/div					
Timebases (equivalent-time sampling/ETS)	100 ps/div to 100 ns/div					
Timebase accuracy	5 ppm					
ACQUISITION						
ADC resolution	8 bits (up to 12 bits using software resolution enhancement)					
Maximum real-time sampling rate	5 GS/s (one channel enabled), 2.5 GS/s* (two channels enabled), 1.25 GS/s (three or four channels enabled) *To achieve the best sampling rate across two channels, choose one channel from A or B, and one from C or D					
Maximum equivalent-time sampling (ETS) rate	50 GS/s (any number of channels)					
Buffer size (shared between active channels)	128 MS	256 MS	256 MS	512 MS	512 MS	1 GS
Maximum buffer segments (using SDK)	125 000	250 000	250 000	500 000	500 000	1 000 000
Maximum buffer segments (using PicoScope 6)	10 000					
Maximum streaming data rate	10 MS/s in PicoScope software. >10 MS/s using supplied SDK (PC-dependent)					
TRIGGER						
Basic triggers	Rising, falling					
Advanced triggers	Edge, Pulse width, Window, Window pulse width, Dropout, Window dropout, Level, Interval, Logic level, Runt pulse					
Trigger modes	None, Single, Repeat, Auto, Rapid, ETS					
Maximum trigger rate	Up to 10,000 waveforms in a 10 ms burst					
Trigger timing resolution	1 sample period					
Trigger sources	Channels A to D, AUX					
Trigger level	Adjustable over whole of selected voltage range					
Re-arm time	Less than 1 µs on fastest timebase					
Maximum pre-trigger capture	100% of capture size					
Maximum post-trigger delay	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					
FUNCTION GENERATOR AND ARBITRARY WAVEFORM GENERATOR (AWG)						
Function generator frequency range	DC to 20 MHz					
Function generator waveforms (A models)	Sine, square, triangle, DC					
Function generator waveforms (B models)	As A models plus ramp, sin (x)/x, Gaussian, half-sine, white noise, PRBS					
DAC 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					
Signal generator triggering	Free-run or up to 1 billion counted waveform cycles or frequency sweeps. Triggered from scope trigger, aux trigger or manually.					
AWG buffer size	-	16 kS	-	16 kS	-	16 kS
AWG sample rate	-	200 MS/s	-	200 MS/s	-	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 250 MHz		DC to 350 MHz		DC to 500 MHz	
Display modes	Magnitude, average, peak hold					
Windowing functions	Rectangular, Gaussian, triangular, Blackman, Blackman-Harris, Hamming, Hann, flat-top					
Number of FFT points	Selectable power of 2 from 2^7 to 2^{20}					
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	Input channels A to D, reference waveforms, time, π					
SERIAL DECODING						
Data formats	CAN, LIN, I²C, UART/RS-232, SPI, I²S, 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 (USB 1.1 compatible)					
Power requirements	AC adapter and cable (cord) supplied					
Dimensions (inc. connectors and end caps)	255 x 170 x 40 mm				280 x 170 x 40 mm	
Weight	1 kg (approx. 2 lb 3 oz)				1.3 kg (approx. 2 lb 14 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 requirements	Windows XP (SP3), Windows Vista, Windows 7 or Windows 8, 32- or 64-bit (not Windows RT)					
PC connectivity	USB 2.0 (USB 1.1 compatible)					
Power requirements	AC adapter and cable (cord) supplied					
Languages supported	Chinese (simplified and traditional), Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Turkish					

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

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. See picotech.com for more information.

Ordering information

Description	GBP*	USD*	EUR*
PP838 PicoScope 6402A 250 MHz Oscilloscope with probes	1 995	3 292	2 414
PP839 PicoScope 6402B 250 MHz Oscilloscope with AWG and probes	2 495	4 117	3 019
PP840 PicoScope 6403A 350 MHz Oscilloscope with probes	2 995	4 942	3 624
PP841 PicoScope 6403B 350 MHz Oscilloscope with AWG and probes	3 495	5 767	4 229
PP842 PicoScope 6404A 500 MHz Oscilloscope with probes	3 995	6 592	4 834
PP843 PicoScope 6404B 500 MHz Oscilloscope with AWG and probes	4 495	7 417	5 439
TA150 Replacement x10 probe for PicoScope 6402A/B & 6403A/B	125	206	151
TA133 Replacement x10 probe for PicoScope 6404A/B	125	206	151
Accessory packs for TA150 and TA133 probes	See www.picotech.com		

*Prices are correct at the time of publication. VAT not included.
Please contact Pico Technology for the latest prices before ordering.

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