PicoScope® 9300 Series

The new face of sampling oscilloscopes

20 GHz bandwidth

17.5 ps rise time

Electrical, optical and TDR/TDT models

Industry's fastest sampling rate
NRZ and RZ eye plots and measurements
Serial data mask library and local editing
Histogramming and statistical measurements
Mathematics, FFT and custom formulas
Intuitive Microsoft Windows® user interface

Additional features*

Differential 60 ps 6 V step source
Differential 40 ps step source
Clock recovery
Optical-electrical converter
Up to 4 input channels

*See model comparison table for availability

Applications

Telecom service and manufacturing
RF and microwave measurements
Radar bands I, G, P, L, S, C, X, Ku
Precision timing and phase analysis
Digital system design and characterization
Eye-diagram, mask and limits test to 10 Gb/s
Ethernet, HDMI 1, HDMI 2, PCI, SATA, USB 2.0, USB 3.0, USB 3.1
TDR/TDT network measurement and analysis
Optical fiber, transceiver and laser test
Semiconductor characterization

• 16 bit input resolution • 2.5 GHz trigger • ±1 V input range • 40 or 60 ps TDR/TDT step • 5 ps/div dual timebase • 1 MS/s sampler • 60 dB dynamic range • 14 GHz trigger prescaler • 11.3 Gb/s clock recovery • 9.5 GHz optical bandwidth • 64 fs effective resolution

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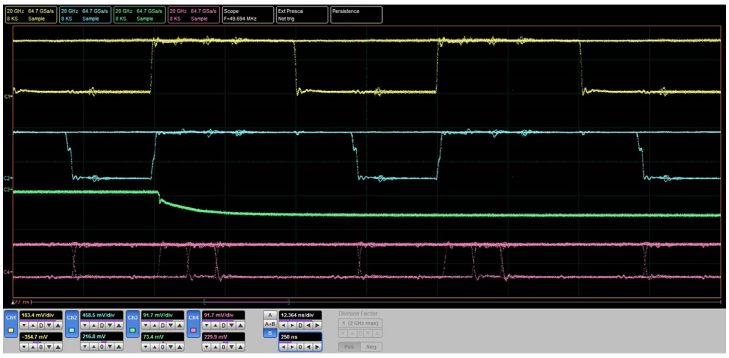
Sequential sampling oscilloscopes

The PicoScope 9300 Series oscilloscopes use triggered sequential sampling to capture high-bandwidth repetitive or clock-derived signals. Compared with very high-speed clocked sampling systems such as real-time oscilloscopes, sampling oscilloscopes cost less and achieve a lower jitter and a higher timing resolution.

20 GHz electrical bandwidth

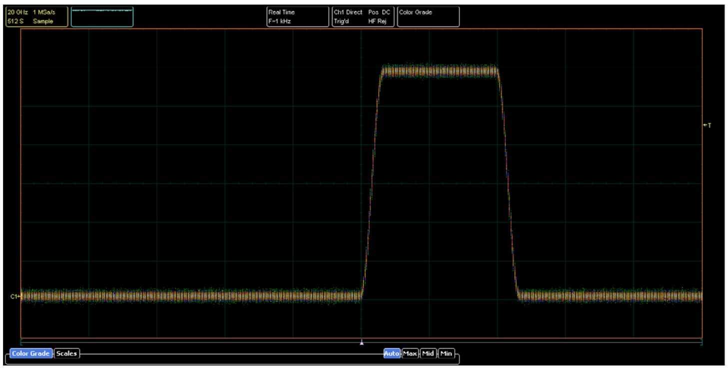
The 20 GHz bandwidth allows measurement of 17.5 ps transitions, while the very low sampling jitter supports a time resolution as short as 64 fs. The sequential sampling rate of 1 MS/s, unsurpassed by any other sampling oscilloscope, allows the fast building of waveforms, eye diagrams and histograms.



Multiple sampling modes

Sequential time sampling (STS) mode

The oscilloscope samples after each trigger event with a regularly incrementing delay derived from an internal triggerable oscillator. Jitter is 1.8 ps typical, 2.0 ps maximum. The 1 MS/s sampling rate, the highest of any sampling scope, builds waveforms and persistence displays faster.



Eye mode

A variation of STS mode in which sampling is controlled by the external prescaled trigger. Jitter is reduced, even with long time delays.

TDR/TDT mode

The oscilloscope acquires one sample per internal trigger, independent of timebase settings. The delay is generated by a precise internal clock oscillator.

Real-time, random equivalent time sampling and roll modes

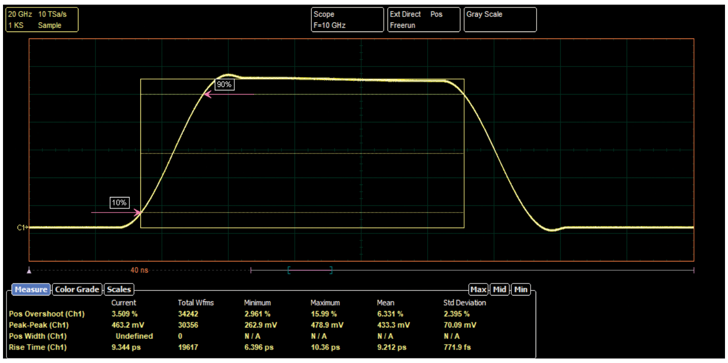
Uniquely, there is a 100 MHz bandwidth trigger pick-off within the main sampler (channels 1 and 2). The PicoScope 9300 scopes can therefore operate similarly to a traditional DSO in roll, transient capture and ETS modes. Signals up to 100 MHz are conveniently displayed without the need for a separately derived trigger signal.

2.5 GHz direct external trigger

The scopes are equipped with a built-in direct external trigger for signals up to 2.5 GHz repetition rate.

14 GHz prescaled trigger

Trigger bandwidth is extended to 14 GHz by a built-in prescaler for the external trigger.



Built-in 11.3 Gb/s clock data recovery trigger

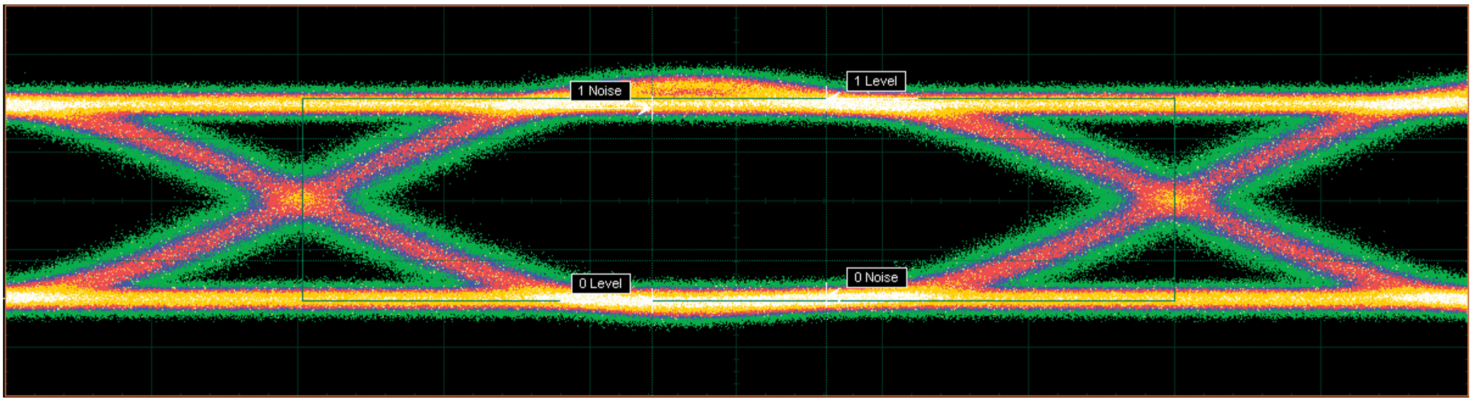
To support serial data applications in which the data clock is not available as a trigger, PicoScope 9302 and 9321 include a clock recovery module to regenerate the data clock from the incoming serial data. A divider accessory kit is included to route the signal to both the clock recovery and oscilloscope inputs.

Eye-diagram analysis

The PicoScope 9300 Series scopes quickly measure more than 30 fundamental parameters used to characterize non-return-to-zero (NRZ) signals and return-to-zero (RZ) signals. Up to ten parameters can be measured simultaneously, with comprehensive statistics also shown.

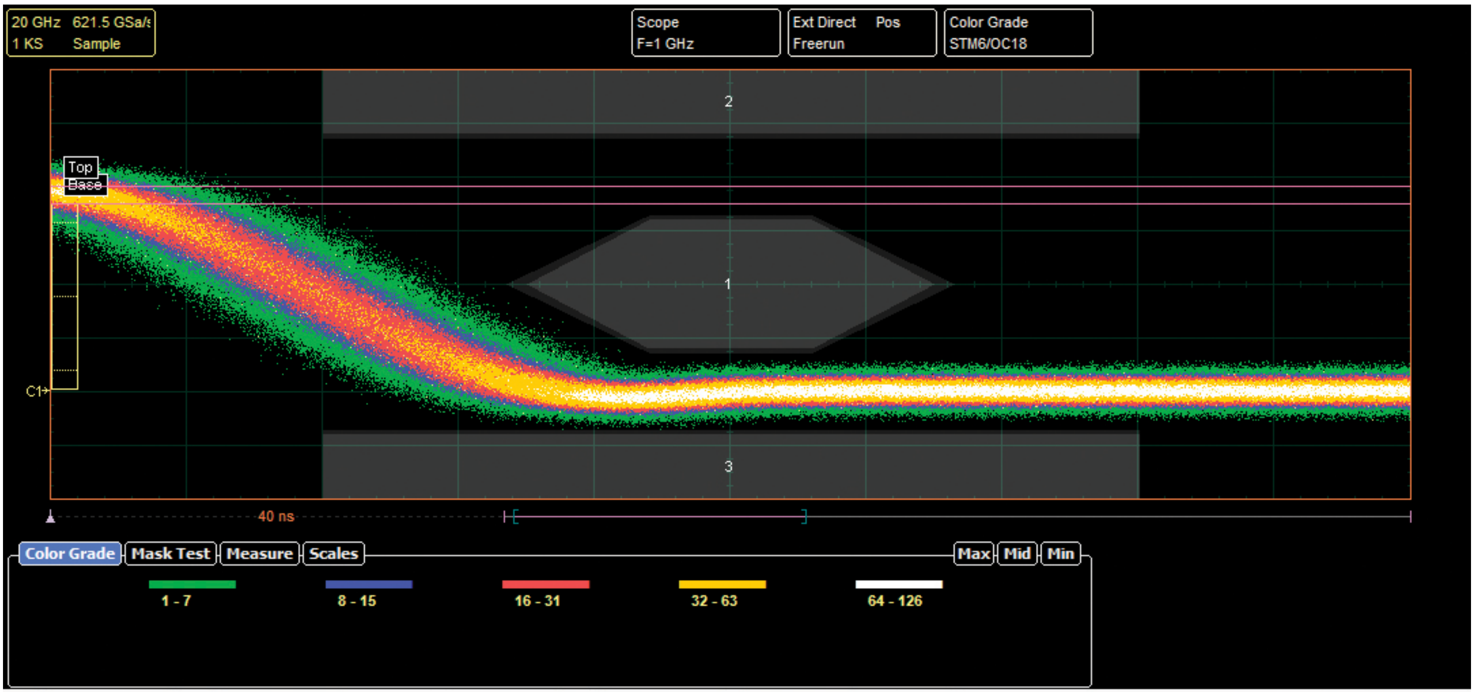
The measurement points and levels used to generate each parameter can optionally be drawn on the trace.

Eye-diagram analysis can be made even more powerful with the addition of mask testing, as described later in this guide.



Pattern sync trigger and eye line mode

The pattern sync trigger, derived from bit rate, pattern length, and trigger divide ratio can build up an eye diagram from any specified group of bits in a sequence.



Mask testing

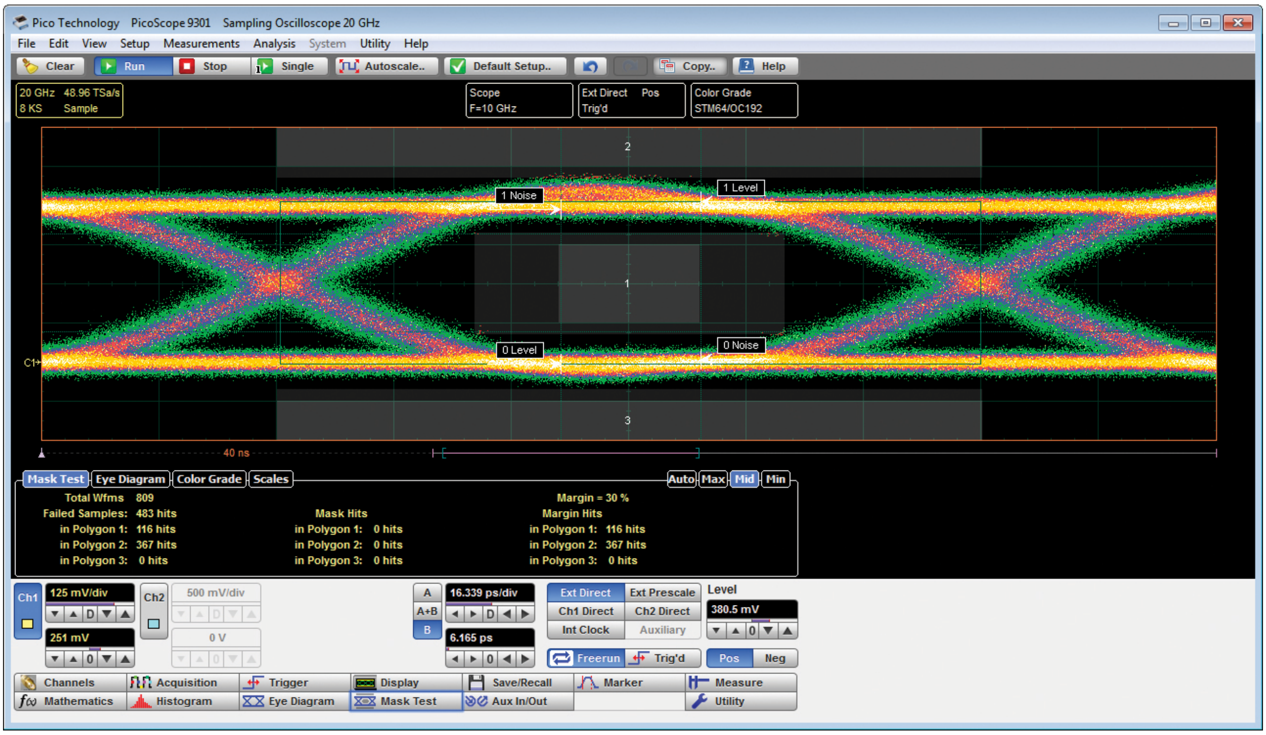
Eye-diagram masks are used to give a visual indication of deviations from a standard waveform. There is a library of over 160 built-in masks, which now includes USB 2.0, USB 3.0 and USB 3.1, and custom masks can be automatically generated and modified using the graphical editor. A specified margin can be added to any mask to enable stress-testing.

The display can be gray-scaled or color-graded to aid in analyzing noise and jitter in eye diagrams. There is also a statistical display showing a failure count for both the original mask and the margin.

The extensive menu of built-in test waveforms is invaluable for checking your mask test setup before using it on live signals.

Mask test features

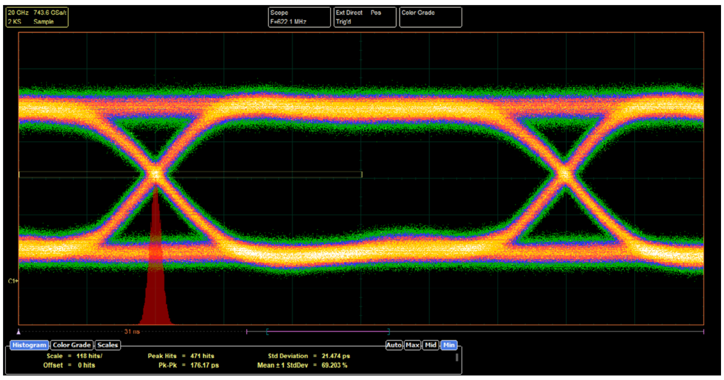
- Failure count
- User-defined margins
- Count fails
- Built-in standard test waveforms
- Stop on fail



9.5 GHz optical model

The PicoScope 9321 includes a built-in precision optical-to-electrical converter. With the converter output routed to one of the scope inputs (optionally through an SMA pulse shaping filter), the PicoScope 9321 can analyze standard optical communications signals such as OC48/STM16, 4.250 Gb/s Fibre Channel and 2xGB Ethernet. The scope can perform eye-diagram measurements with automatic measurement of optical parameters including extinction ratio, S/N ratio, eye height and eye width. With its integrated clock recovery module, the scope is usable to 11.3 Gb/s.

The converter input accepts both single-mode (SM) and multi-mode (MM) fibers and has a wavelength range of 750 to 1650 nm.

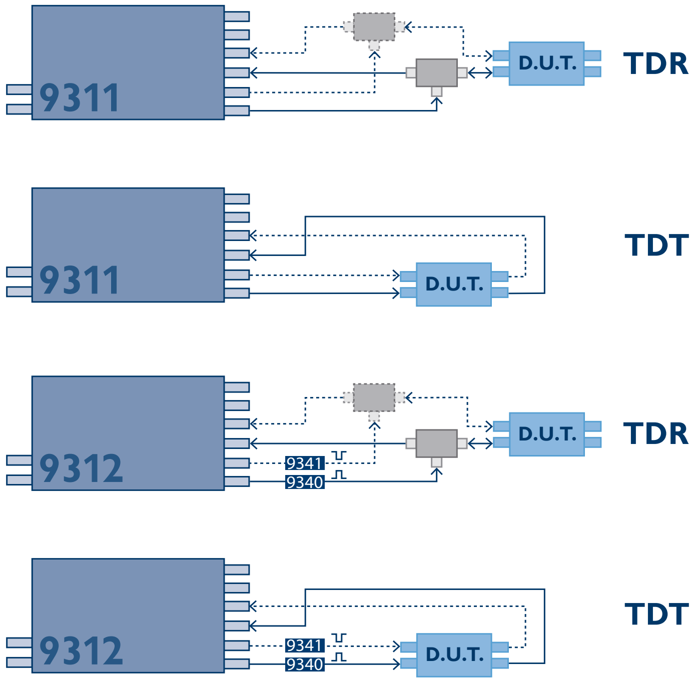


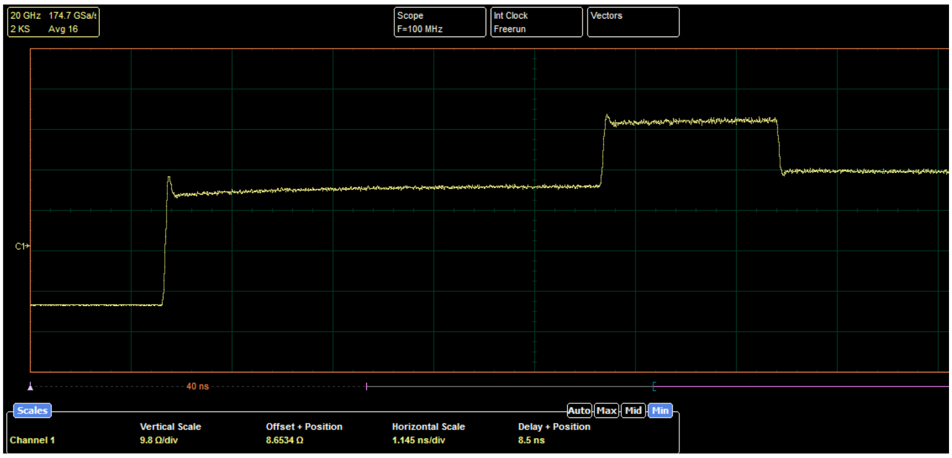
TDR/TDT analysis

The PicoScope 9311 and 9312 scopes include a built-in differential step generator for time-domain reflectometry and time-domain transmission measurements. This feature can be used to characterize transmission lines, printed circuit traces, connectors and cables with as little as 15 mm resolution.

The PicoScope 9312 is supplied with the 9040 and 9041 external tunnel diode pulse heads that generate positive and negative 200 mV steps with 40 ps rise time. The PicoScope 9311 generates large-amplitude (6 V) differential 60 ps steps with 65 ps rise time directly from its front panel and is suited to TDR/TDT applications where the reflected or transmitted signal is small.

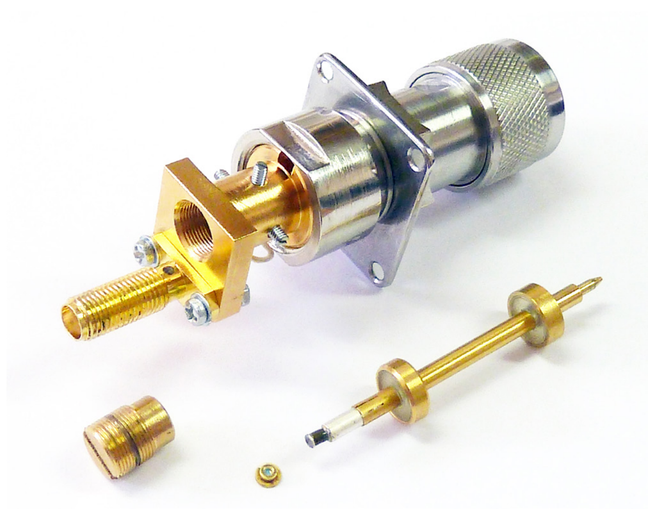
The PicoScope 9300 Series TDR/TDT models include source deskew with 1 ps resolution and comprehensive calibration, reference plane and measurement functions. Voltage, impedance or reflection coefficient (ρ) can be plotted against time or distance.





The PicoScope 9311 and 9312 are supplied with a comprehensive set of calibrated accessories to support your TDR/TDT measurements. These include cables, signal dividers, adaptors, attenuator and reference load and short. See back page for ordering details.

PicoScope 9312 with
9040 and 9041 pulse heads



Internal construction of
pulse head

Designed for ease of use

The PicoSample 3 software reserves as much space as possible for the most important information: your signal. Below that is a selection of the most important buttons. For more complex adjustments, a single mouse-click will display additional menus in left and right side panels. Most controls and numeric entry fields have keyboard shortcuts.

Hardware zoom using the dual timebase is made easy: simply use the mouse to draw a zoom box over a part of the waveform. You can still set up the timebase using manual dual-timebase controls if you prefer.

Compact, portable USB instruments

These units occupy very little space on your workbench and are small enough to carry with your laptop for on-site testing, but that's not all. Instead of using remote probe heads attached to a large bench-top unit, you can now position the scope right next to the device under test. Now all that lies between your scope and the DUT is a short, low-loss coaxial cable.

Everything you need is built into the oscilloscope, with no expensive hardware or software add-ons to worry about. Alternatively, you can use your PicoScope 9300 with a stand-alone PicoSource PG900 TDR/TDT differential fast pulse generator to gain the extra versatility or configurability of independent high-performance source and measurement instruments.

Measurement of over 100 waveform parameters with and without statistics

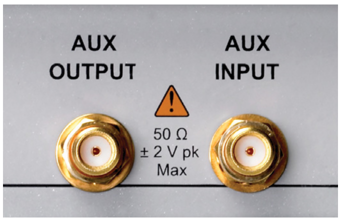
The PicoScope 9300 Series scopes quickly measure well over 100 parameters, so you don't need to count graticules or estimate the waveform's position. Up to ten simultaneous measurements or four statistics measurements are possible. The measurements conform to IEEE standard definitions.

A dedicated frequency counter shows signal frequency at all times, regardless of measurement and timebase settings.

138 automatic measurements

Built-in signal generator

The PicoScope 9300 scopes can generate industry-standard or custom signals including clock, pulse and pseudo-random binary sequence. These can be used to test the instrument's inputs, experiment with its features and verify complex setups such as mask tests. AUX OUTPUT can also be configured as a trigger output.

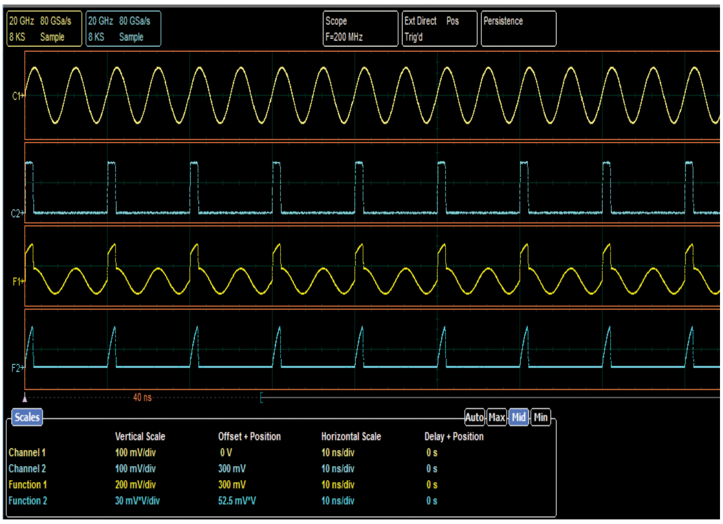


Configure with the PG900 external fast-pulse source

A more versatile option may be to separate your high-performance fast-step TDR/TDT pulse source from the 20 GHz sampling oscilloscope and utilize the two instruments either stand-alone or together as required. The PicoSource PG900 differential fast-step pulse generators re-house the PicoScope 9311 and/or 9312 pulse sources in a separate USB-controlled instrument, and are supplied with PicoSource PG900 control software.

A choice of screen formats

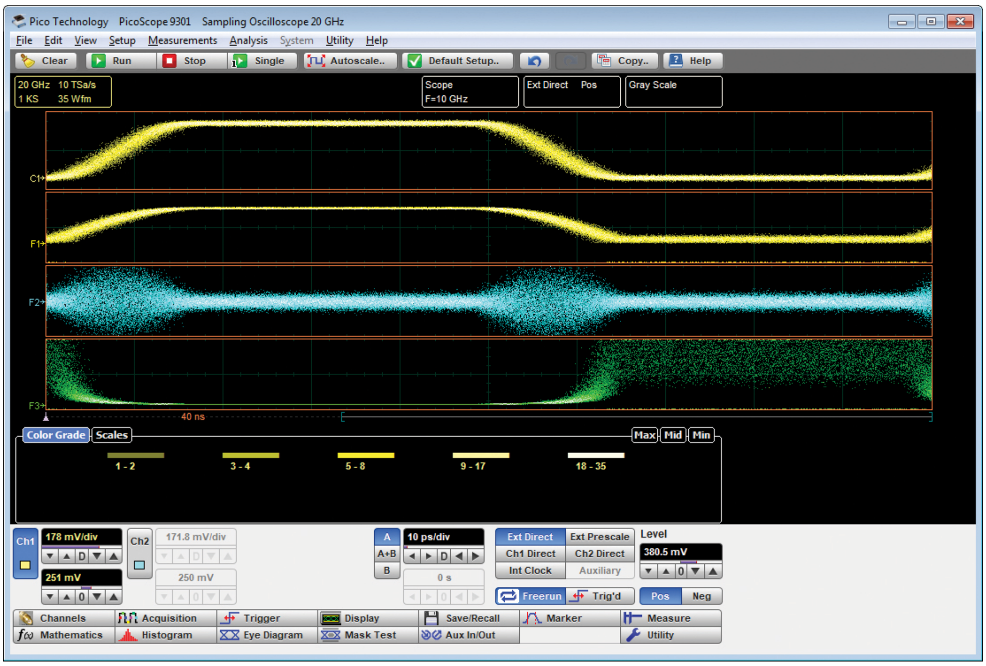
When working with multiple traces, you can display them all on one grid or separate them into two or four grids. You can also plot signals in XY mode with or without additional voltage-time grids. The persistence display modes use color-coding or shading to show statistical variations in the signal.



Powerful mathematical analysis

The PicoScope 9300 Series scopes support up to four simultaneous mathematical combinations and functional transformations of acquired waveforms.

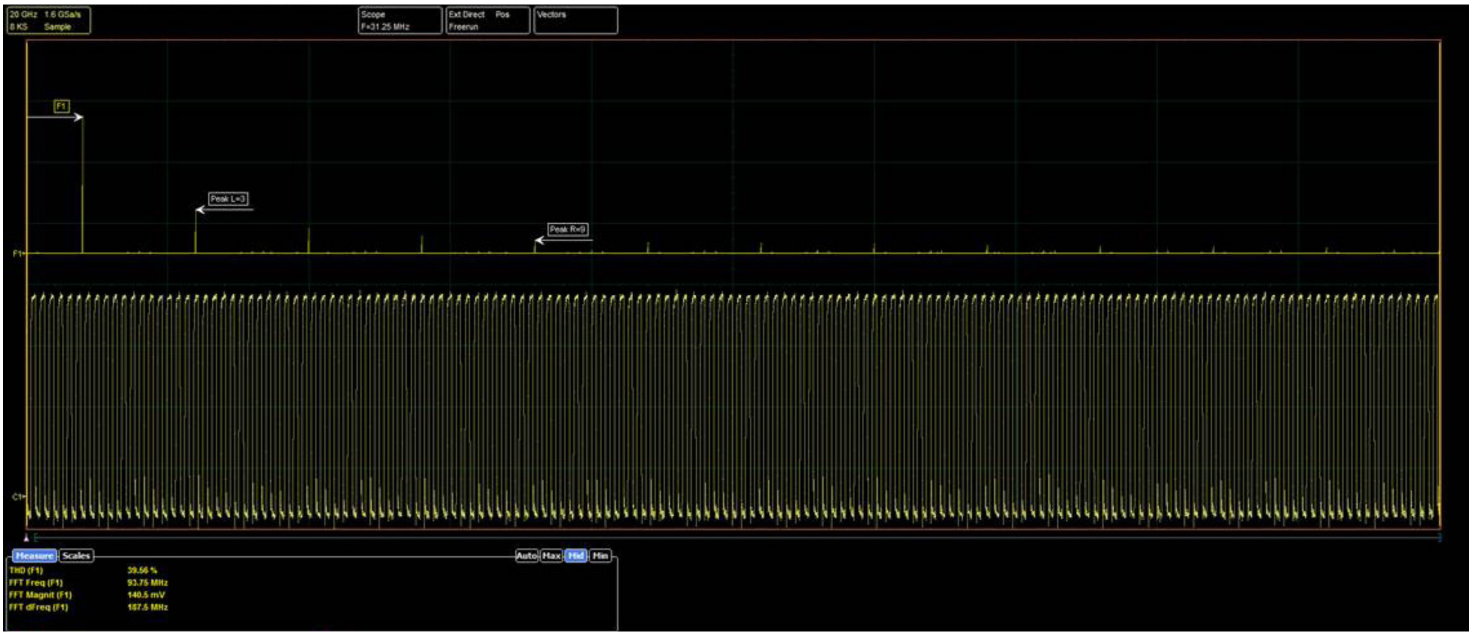
You can select any of the mathematical functions to operate on either one or two sources. All functions can operate on live waveforms, waveform memories or even other functions. There is an equation editor for creating custom functions.



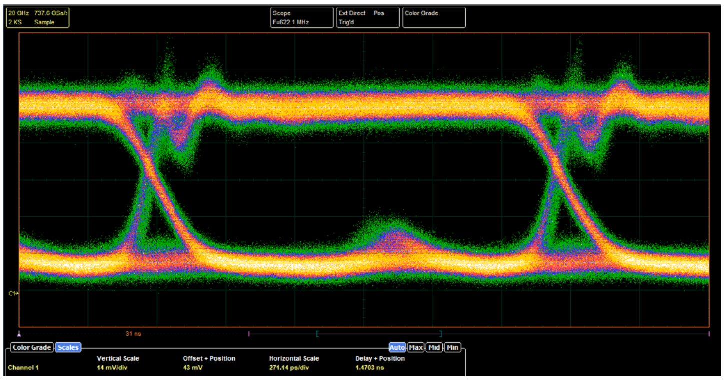
61 math functions

FFT analysis

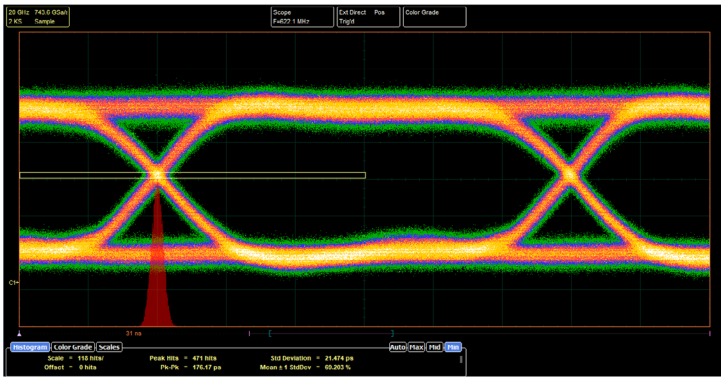
All PicoScope 9300 Series oscilloscopes can calculate real, imaginary and complex Fast Fourier Transforms of input signals using a range of windowing functions. The results can be further processed using the math functions. FFTs are useful for finding crosstalk and distortion problems, adjusting filter circuits designed to filter out certain harmonics in a waveform, testing impulse responses of systems, and identifying and locating noise and interference sources.



SMA Bessel-Thomson pulse-shaping filters



O/E converter output, raw



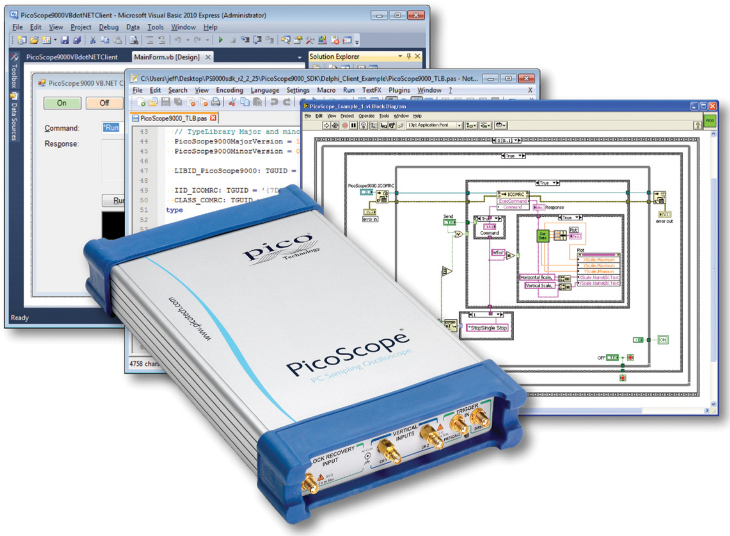
O/E converter output, filtered

A range of Bessel-Thomson filters is available for standard bit rates. These filters are essential for accurate characterization of signals emerging from an optical transmission system. The first eye diagram, above left, shows the ringing typical of an unequalized O/E converter output at 622 Mb/s. The second eye diagram, above right, shows the result of connecting the 622 Mb/s B-T filter. This is an accurate representation of the signal that an equalized optical receiver would see, enabling the PicoScope 9321 to display correct measurements.

Software Development Kit

The PicoSample 3 software can be operated as a stand-alone oscilloscope program or as an ActiveX control. The ActiveX control conforms to the Windows COM interface standard and can be embedded in your own software. Unlike more complex driver-based programming methods, ActiveX commands are text strings that can easily be created in any programming environment. Programming examples are provided in Visual Basic (VB.NET), MATLAB, LabVIEW and Delphi, but any programming language or standard that supports the COM interface can be used, including JavaScript and C. National Instruments LabVIEW drivers are also available.

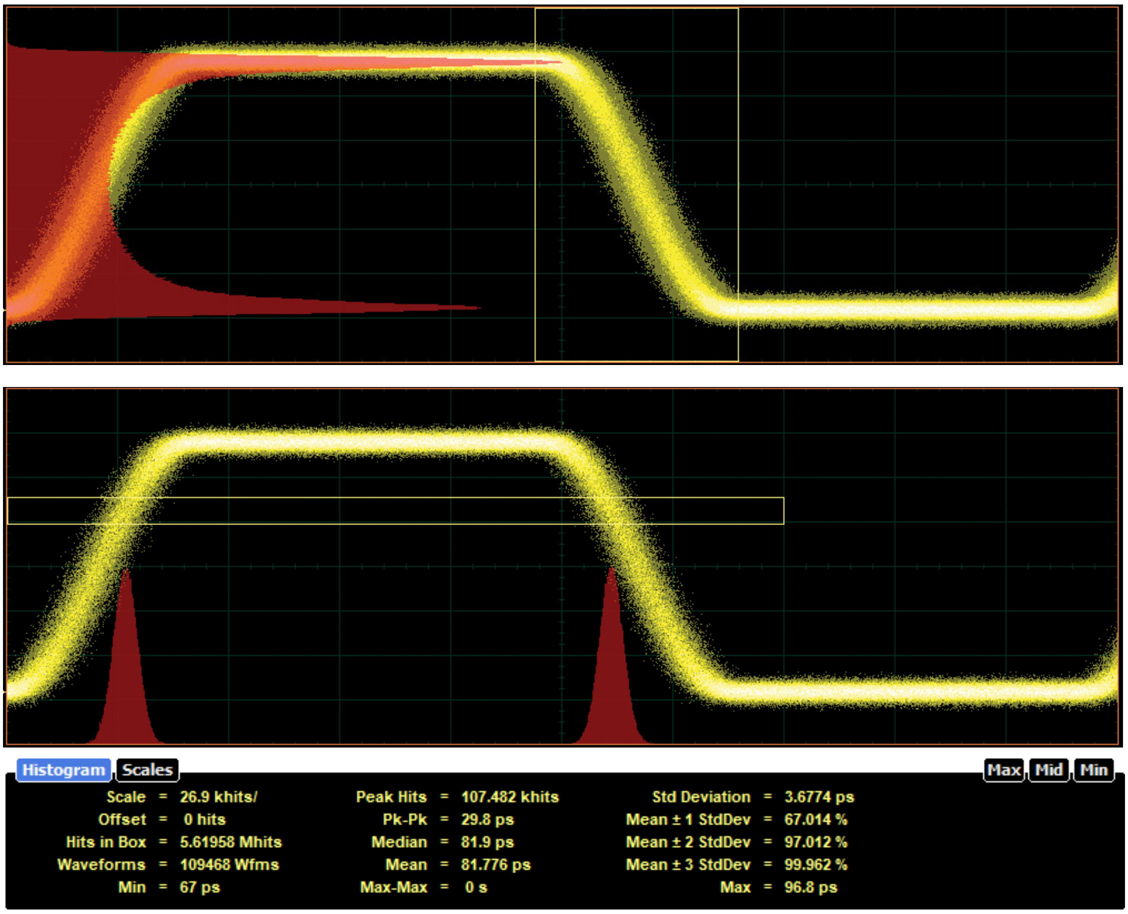
A comprehensive programmer's guide is supplied, which details every function of the ActiveX control. The SDK can control the oscilloscope over the USB or the LAN port.



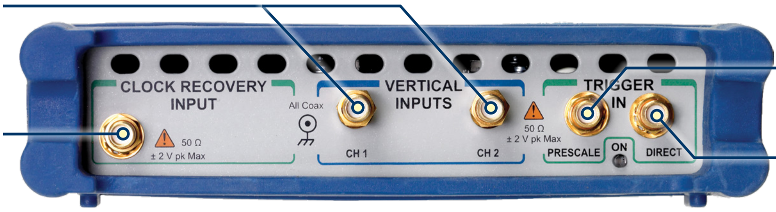
Histogram analysis

A histogram is a probability graph that shows the distribution of acquired data from a source within a user-definable window. The information gathered by the histogram is used to perform statistical analysis on the source.

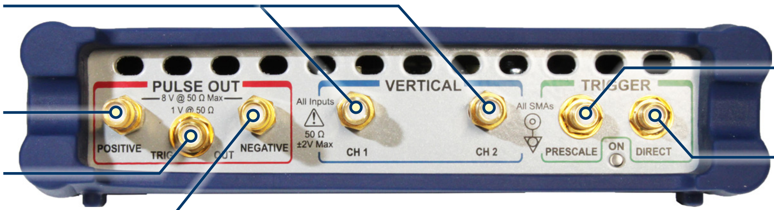
Histograms can be constructed on waveforms on either the vertical or horizontal axes. The most common use for a vertical histogram is measuring and characterizing noise and pulse parameters, while the most common use for a horizontal histogram is measuring and characterizing jitter.



PicoScope 9300 Series inputs and outputs



PicoScope 9301 and 9302



PicoScope 9311 and 9312

PicoScope 9321

PicoScope 9341

Rear panel

9300 Series specifications

VERTICAL	
Number of channels	All models: 2 Except PicoScope 9341: 4
Acquisition timing	Selectable simultaneous or alternate acquisition
Bandwidth, full	DC to 20 GHz
Bandwidth, narrow	DC to 10 GHz
Pulse response rise time, full bandwidth	17.5 ps (10% to 90%, calculated)
Pulse response rise time, narrow bandwidth	35 ps (10% to 90%, calculated)
Noise, full bandwidth	< 1.5 mV RMS typical, < 2 mV RMS maximum
Noise, narrow bandwidth	< 0.8 mV RMS typical, < 1.1 mV RMS maximum
Noise with averaging	100 µV RMS system limit, typical
Operating input voltage with digital feedback	1 V p-p with ±1 V range (single-valued)
Operating input voltage without digital feedback	±400 mV relative to channel offset (multi-valued)
Sensitivity	1 mV/div to 500 mV/div in 1-2-5 sequence with 0.5% fine increments
Resolution	16 bits, 40 µV/LSB
Accuracy	±2% of full scale ±2 mV over temperature range for stated accuracy (assuming temperature-related calibrations are performed)
Nominal input impedance	(50 ± 1) Ω
Input connectors	2.92 mm (K) female, compatible with SMA and PC3.5
TIMEBASE (SEQUENTIAL TIME SAMPLING MODE)	
Ranges	5 ps/div to 3.2 ms/div (main, intensified, delayed, or dual delayed)
Delta time interval accuracy	For > 200 ps/div: ±0.2% of delta time interval ± 12 ps For ≤ 200 ps/div: ±5% of delta time interval ± 5 ps
Time interval resolution	64 fs
Channel deskew	1 ps resolution, 100 ns max.
TRIGGERS	
Trigger sources	All models: external direct, external prescaled, internal direct and internal clock triggers. PicoScope 9302 and 9321 only: external clock recovery trigger
External direct trigger bandwidth and sensitivity	DC to 100 MHz : 100 mV p-p; to 2.5 GHz: 200 mV p-p
External direct trigger jitter	1.8 ps RMS (typ.) or 2.0 ps RMS (max.) + 20 ppm of delay setting
Internal direct trigger bandwidth and sensitivity	DC to 10 MHz: 100 mV p-p; to 100 MHz: 400 mV p-p (channels 1 and 2 only)
Internal direct trigger jitter	25 ps RMS (typ.) or 30 ps RMS (max.) + 20 ppm of delay setting (channels 1 and 2 only)
External prescaled trigger bandwidth and sensitivity	1 to 14 GHz: 200 mV p-p to 2 V p-p
External prescaled trigger jitter	1.8 ps RMS (typ.) or 2.0 ps RMS (max.) + 20 ppm of delay setting
Pattern sync trigger clock frequency	10 MHz to 11.3 GHz
Pattern sync trigger pattern length	7 to 8 388 607 ($2^{23}-1$)
CLOCK RECOVERY (PICOSCOPE 9302 AND 9321)	
Clock recovery trigger data rate and sensitivity	6.5 Mb/s to 100 Mb/s: 100 mV p-p > 100 Mb/s to 11.3 Gb/s: 20 mV p-p
Recovered clock trigger jitter	1 ps RMS (typ.) or 1.5 ps RMS (max.) + 1.0% of unit interval
Maximum safe trigger input voltage	±2 V (DC + peak AC)
Input characteristics	50 Ω, AC coupled
Input connector	SMA (f)
ACQUISITION	
ADC resolution	16 bits
Digitizing rate with digital feedback (single-valued)	DC to 1 MHz
Digitizing rate without digital feedback (multi-valued)	DC to 40 kHz
Acquisition modes	Sample (normal), average, envelope
Data record length	32 to 32 768 points (single channel) in x2 sequence

DISPLAY	
Styles	Dots, vectors, persistence, gray-scaling, color-grading
Persistence time	Variable or infinite
Screen formats	Auto, single YT, dual YT, quad YT, XY, XY + YT, XY + 2 YT
MEASUREMENTS AND ANALYSIS	
Markers	Vertical bars, horizontal bars (measure volts) or waveform markers
Automatic measurements	Up to 10 at once
Measurements, X parameters	Period, frequency, pos/neg width, rise/fall time, pos/neg duty cycle, pos/neg crossing, burst width, cycles, time at max/min, pos/neg jitter ppm/RMS
Measurements, Y parameters	Max, min, top, base, peak-peak, amplitude, middle, mean, cycle mean, AC/DC RMS, cycle AC/DC RMS, pos/neg overshoot, area, cycle area
Measurements, trace-to-trace	Delay 1R-1R, delay 1F-1R, delay 1R-nR, delay 1F-nR, delay 1R-1F, delay 1F-1F, delay 1R-nF, delay 1F-nF, phase deg/rad/%, gain, gain dB
Eye measurements, X NRZ	Area, bit rate, bit time, crossing time, cycle area, duty cycle distortion abs/%, eye width abs/%, rise/fall time, frequency, period, jitter p-p/RMS
Eye measurements, Y NRZ	AC RMS, average power lin/dB, crossing %/level, extinction ratio dB/%/lin, eye amplitude, eye height lin/dB, max/min, mean, middle, pos/neg overshoot, noise p-p/RMS one/zero level, p-p, RMS, S/N ratio lin/dB
Eye measurements, X RZ	Area, bit rate/time, cycle area, eye width abs/%, rise/fall time, jitter p-p/RMS fall/rise, neg/pos crossing, pos duty cycle, pulse symmetry, pulse width
Eye measurements, Y RZ	AC RMS, average power lin/dB, contrast ratio lin/dB/%, extinction ratio lin/dB/%, eye amplitude, eye high lin/dB, eye opening, max, min, mean, middle, noise p-p/RMS one/zero, one/zero level, peak-peak, RMS, S/N
Histogram	Vertical or horizontal
MATH FUNCTIONS	
Mathematics	Up to four math waveforms can be defined and displayed
Math functions, arithmetic	+, –, ×, ÷, ceiling, floor, fix, round, absolute, invert, (x+y)/2, ax+b
Math functions, algebraic	e^x, ln, 10^x, $\log_{10}$, a^x, $\log_a$, d/dx, $\int$, x^2, sqrt, x^3, x^a, x^{-1}, sqrt(x^2+y^2)
Math functions, trigonometric	sin, $\sin^{-1}$, cos, $\cos^{-1}$, tan, $\tan^{-1}$, cot, $\cot^{-1}$, sinh, cosh, tanh, coth
Math functions, FFT	Complex FFT, complex inverse FFT, magnitude, phase, real, imaginary
Math functions, combinatorial logic	AND, NAND, OR, NOR, XOR, NXOR, NOT
Math functions, interpolation	Linear, sin(x)/x, trend, smoothing
Math functions, other	Custom formula
FFT	Up to two FFTs simultaneously
FFT window functions	Rectangular, Hamming, Hann, Flat-top, Blackman-Harris, Kaiser-Bessel
Eye diagram	Automatically characterizes NRZ and RZ eye diagrams based on statistical analysis of waveform
MASK TESTS	
Mask geometry	Acquired signals are tested for fit outside areas defined by up to eight polygons. Standard or user-defined masks can be selected.
Built-in masks, SONET/SDH	OC1/STMO (51.84 Mb/s) to FEC 1071 (10.709 Gb/s)
Built-in masks, Ethernet	1.25 Gb/s 1000Base-CX Absolute TP2 to 10xGB Ethernet (12.5 Gb/s)
Built-in masks, Fibre Channel	FC133 (132.8 Mb/s) to 10x Fibre Channel (10.5188 Gb/s)
Built-in masks, PCI Express	R1.0a 2.5G (2.5 Gb/s) to R2.1 5.0G (5 Gb/s)
Built-in masks, InfiniBand	2.5G (2.5 Gb/s) to 5.0G (5 Gb/s)
Built-in masks, XAUI	3.125 Gb/s
Built-in masks, RapidIO	Level 1, 1.25 Gb/s to 3.125 Gb/s
Built-in masks, SATA	1.5G (1.5 Gb/s) to 3.0G (3 Gb/s)
Built-in masks, ITU G.703	DS1 (1.544 Mb/s) to 155 Mb (155.520 Mb/s)
Built-in masks, ANSI T1.102	DS1 (1.544 Mb/s) to STS3 (155.520 Mb/s)
Built-in masks, G.984.2	XAUI-E Far (3.125 Gb/s)
Built-in masks, USB	USB 2.0, USB 3.0 and USB 3.1

SIGNAL GENERATOR OUTPUT		
Modes	Pulse, PRBS (NRZ and RZ), 500 MHz clock, trigger out	
Period range, pulse mode	8 ns to 524 µs	
Bit time range, NRZ/RZ mode	4 ns to 260 µs	
NRZ/RZ pattern length	2^7–1 to 2^{15}–1	
TDR PULSE OUTPUTS	**PICOSCOPE 9311**	**PICOSCOPE 9312**
Number of output channels	2 (1 differential pair)	
Output enable	Independent or locked control for each source	
Pulse polarity	Channel 1: positive-going from zero volts Channel 2: negative-going from zero volts	Interchangeable positive and negative pulse heads
Rise time (20% to 80%)	60 ps guaranteed	40 ps guaranteed
Amplitude	2.5 V to 6 V into 50 Ω	200 mV typical into 50 Ω
Amplitude adjustment	5 mV increments	Fixed
Amplitude accuracy	±10%	
Offset		90 mV max. into 50 Ω
Output amplitude safety limit	Adjustable from 2.5 V to 8 V	–
Output pairing	Amplitudes and limit paired or independent	–
Period range	1 µs to 60 ms	
Period accuracy	±100 ppm	
Width range	200 ns to 4 µs, 0% to 50% duty cycle	
Width accuracy	±10% of width ±100 ns	
Deskew between outputs	−1 ns to 1 ns typical, in 1 ps increments	−500 ps to 500 ps typical, in 1 ps increments
Timing modes	Step, coarse timebase, pulse	
Impedance	50 Ω	
Connectors on scope	SMA (f) x 2	
Connectors on external pulse heads	–	N(m) fitted with N(f)-SMA(m) interseries adaptors
TDR PRE-TRIGGER OUTPUT	**PICOSCOPE 9311**	**PICOSCOPE 9312**
Polarity	Positive-going from zero volts	–
Amplitude	700 mV typical into 50 Ω	–
Pre-trigger	25 ns to 35 ns typical, adjustable in 5 ps steps	–
Pre-trigger to output jitter	2 ps max.	–
TDT SYSTEM	**PICOSCOPE 9311**	**PICOSCOPE 9312**
Number of TDT channels	2	
Incident rise time (combined oscilloscope and pulse generator, 10% to 90%)	60 ps or less, each polarity	40 ps or less, each polarity
Jitter	3 ps + 20 ppm of delay setting, RMS, maximum	2.2 ps + 20 ppm of delay setting, RMS, maximum
Corrected rise time	Min. 50 ps or 0.1 x time/div, whichever is greater, typical Max. 3 x time/div, typical	Min. 30 ps or 0.1 x time/div, whichever is greater, typical. Max. 3 x time/div, typical.
Corrected aberrations	≤ 0.5% typical	

TDR SYSTEM	PICOSCOPE 9311	PICOSCOPE 9312
Number of channels	2	
Incident step amplitude	50% of input pulse amplitude, typical	
Incident rise time (combined oscilloscope, step generator and TDR kit, 10% to 90%)	60 ps or less, each polarity	40 ps or less, each polarity
Reflected step amplitude, from short or open	25% of input pulse amplitude, typical	
Reflected rise time (combined oscilloscope, step generator and TDR kit, 10% to 90%)	65 ps or less @ 50 Ω termination, each polarity	45 ps or less @ 50 Ω termination, each polarity
Corrected rise time	Minimum: 50 ps or 0.1 x time/div, whichever is greater, typical. Maximum: 3 x time/div, typical.	Minimum: 30 ps or 0.1 x time/div, whichever is greater, typical. Maximum: 3 x time/div, typical.
Corrected aberration	≤ 1% typical	
Measured parameters	Propagation delay, gain, gain dB	
TDR/TDT SCALING		
TDT vertical scale	Volts, gain (10 m/div to 100 /div)	
TDR vertical scale	Volts, rho (10 mrho/div to 2 rho/div), ohm (1 ohm/div to 100 ohm/div)	
Horizontal scale	Time (200 ns/div max.) or distance (meter, foot, inch)	
Distance preset units	Propagation velocity (0.1 to 1.0) or dielectric constant (1 to 100)	
OPTICAL/ELECTRICAL CONVERTER (PICOSCOPE 9321)		
Bandwidth (−3 dB)	9.5 GHz typical	
Effective wavelength range	750 nm to 1650 nm	
Calibrated wavelengths	850 nm (MM), 1310 nm (MM/SM), 1550 nm (SM)	
Transition time	51 ps typical (10% to 90% calculated from Tr = 0.48/optical BW)	
Noise	4 μW (1310 & 1550 nm), 6 μW (850 nm) maximum @ full electrical bandwidth	
DC accuracy	±25 μW ±10% of full scale	
Maximum input peak power	+7 dBm (1310 nm)	
Fiber input	Single-mode (SM) or multi-mode (MM)	
Fiber input connector	FC/PC	
Input return loss	SM: −24 dB typical MM: −16 dB typical, −14 dB maximum	
GENERAL		
Temperature range, operating	+5 °C to +35 °C	
Temperature range for stated accuracy	Within 2 °C of last autocalibration	
Temperature range, storage	−20 °C to +50 °C	
Calibration validity period	1 year	
Power supply voltage	+12 V DC ± 5%	
Power supply current	1.7 A max.	
Mains adaptor	Universal adaptor supplied	
PC connection	USB 2.0 (compatible with USB 3.0)	
LAN connection	10/100 Mbit/s	
PC requirements	Microsoft Windows XP (SP2), Windows Vista, Windows 7, Windows 8 or Windows 10. 32-bit or 64-bit versions.	
Dimensions	170 mm x 260 mm x 40 mm (W x D x H)	
Weight	1.3 kg max. Pulse heads for PicoScope 9312: 150 g each	
Compliance	FCC (EMC), CE (EMC and LVD)	
Warranty	2 years (1 year for input sampler)	

More detailed specifications can be found in the *PicoScope 9300 Series User's Guide*, available from www.picotech.com.

PicoScope 9300 Series models compared

	PicoScope 9301	PicoScope 9302	PicoScope 9311	PicoScope 9312	PicoScope 9321	PicoScope 9341
2 x 20 GHz electrical inputs	•	•	•	•	•	
4 x 20 GHz electrical inputs						•
Signal generator output	•	•	•	•	•	•
Integrated TDR/TDT (40 ps / 200 mV)				•		
Integrated TDR/TDT (60 ps / 2.5 to 6 V)			•			
9040 external TDR/TDT positive pulse head				•		
9041 external TDR/TDT negative pulse head				•		
Add external PG900 TDR/TDT source	•	•	Optional*	Optional*	•	•
9.5 GHz optical-electrical converter					•	
Clock recovery trigger		•			•	
Pattern sync trigger	•	•	•	•	•	•
USB port	•	•	•	•	•	•
LAN port	•	•	•	•	•	•

* PG900 external source can be used in addition to the built-in TDR/TDT source.

Kit contents

All PicoScope 9300 Series oscilloscope kits contain:

Picoscope 9300 Series PC sampling oscilloscope
PicoSample™ 3 software CD
Quick Start Guide
12 V power supply, universal input
Localized mains lead (line cord)
USB cable, 1.8 m
SMA / PC3.5 / 2.92 wrench
Storage and carry case
LAN cable, 1 m

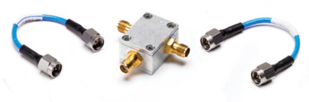
Model-dependent kit contents

	PicoScope model						Order code			
	9301	9302	9311	9312	9321	9341				
18 GHz 50 Ω SMA(m-f) connector saver adaptor (fitted to each input channel)	•	•	•	•	•	•	TA170			
30 cm precision sleeved coaxial cable			•	•			TA265			
10 dB 10 GHz SMA(m-f) attenuator (fitted to pulse outputs)		•			•		TA262			
20 dB 10 GHz SMA(m-f) attenuator (fitted to pulse outputs)			2				TA173			
40 ps tunnel diode head, rising edge				•			Not available separately	-	-	-
40 ps tunnel diode head, falling edge				•			Not available separately	-	-	-
60 cm 50 Ω coaxial SMA(m-m) pulse drive cable				2			Not available separately	-	-	-
18 GHz 50 Ω N(f) - SMA(m) interseries adaptor (fitted to tunnel diode heads)				2			TA172			
14 GHz 25 ps TDR/TDT kit (details below)			2	2			TA237			
14 GHz power divider kit (details below)		•	2	2	•		TA238			

Ordering information

	Channels	Clock recovery	Optical-to-electrical converter	TDR/TDT outputs	Order code
PicoScope 9301					PP890
PicoScope 9302		11.3 Gb/s			PP891
PicoScope 9311	2 × 50 Ω 2.92 mm (f)			6 V, 60 ps	PP892
PicoScope 9312				200 mV, 40 ps	PP893
PicoScope 9321		11.3 Gb/s	9.5 GHz		PP894
PicoScope 9341	4 x 50 Ω 2.92 mm (f)				PP895

Optional accessories

	Order code	
Tetris high-impedance 10:1 active probes		
1.5 GHz 0.9 pF probe with accessory kit 50 Ω BNC(m) output, supplied with SMA adaptor	TA222	
2.5 GHz 0.9 pF probe with accessory kit 50 Ω SMA(m) output, supplied with BNC adaptor	TA223	
Low impedance 10:1 passive probe		
1.5 GHz 2.0 pF probe 50 Ω SMA(m) output	TA061	
Bessel-Thomson reference optical receiver filters *For use with the PicoScope 9321 O/E converter, to reduce peaking and ringing. Choice of filter depends on the bit rate of the signal under analysis*		
51.8 Mb/s bit rate (OC1/STM0)	TA120	
155 Mb/s bit rate (OC3/STM1)	TA121	
622 Mb/s bit rate (OC12/STM4)	TA122	
1.250 Gb/s bit rate (GBE)	TA123	
2.488 Gb/s bit rate (OC48/STM16) / 2.500 Gb/s bit rate (Infiniband 2.5G)	TA124	
Other optional accessories		
14 GHz 25 ps TDR kit • 18 GHz 50 Ω SMA(m-m) within-series adaptor • 18 GHz SMA(f) reference short • 18 GHz SMA(f) reference load	TA237	
14 GHz power divider kit • 18 GHz 50 Ω SMA(f-f-f) 3-resistor 6 dB power divider • 2 x 10 cm precision coaxial SMA(m-m) cable	TA238	

Optional accessories

	Order code	
Attenuator 3 dB 10 GHz 50 Ω SMA (m-f)	TA181	
Attenuator 6 dB 10 GHz 50 Ω SMA (m-f)	TA261	
Attenuator 10 dB 10 GHz 50 Ω SMA (m-f)	TA262	
Attenuator 20 dB 10 GHz 50 Ω SMA (m-f)	TA173	
18 GHz, 50 Ω N(f) -SMA(m) interseries adaptor	TA172	
18 GHz 50 Ω SMA(m-f) connector saver adaptor	TA170	
60 cm precision high-flex unsleeved coaxial cable SMA(m-m) < 1.7 dB loss @ 10 GHz	TA263	
30 cm precision high-flex unsleeved coaxial cable SMA(m-m) < 1.1 dB loss @ 10 GHz	TA264	
30 cm precision sleeved coaxial cable SMA(m-m) < 1.1 dB loss @ 10 GHz	TA265	

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