

impac

PicoScope® 9200 Series

PC SAMPLING OSCILLOSCOPES

Complete sampling oscilloscope for your PC

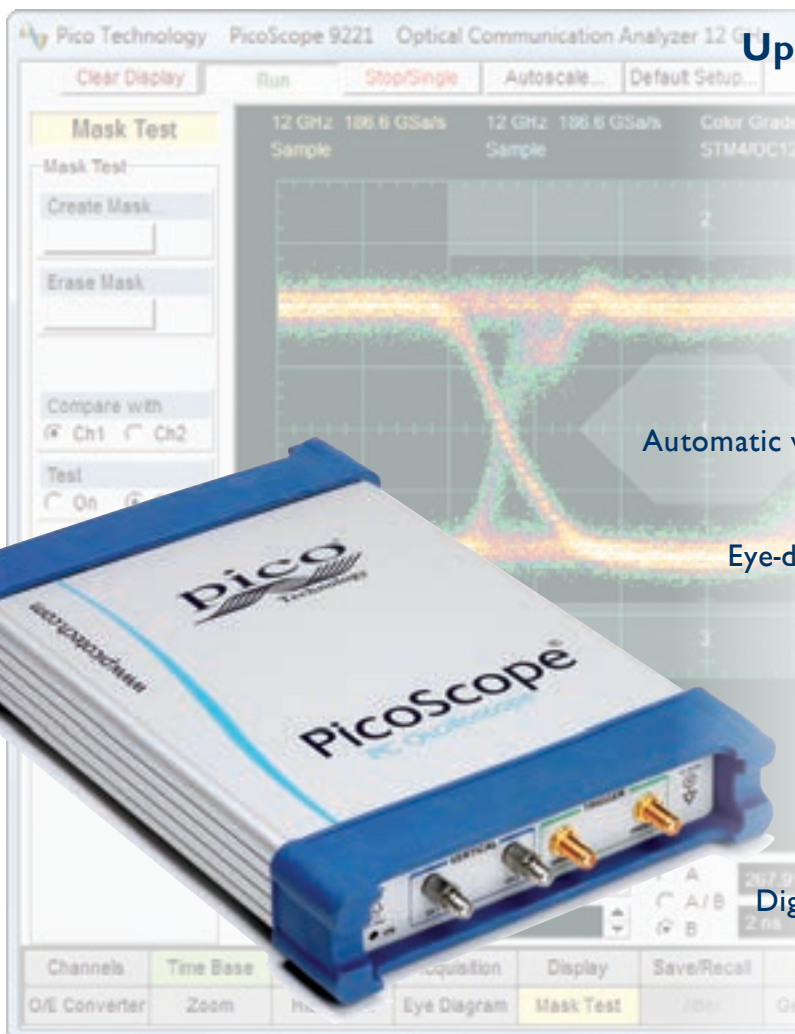
12 GHz bandwidth on 2 channels

Dual timebase from 10 ps/div

Up to 10 GHz trigger bandwidth

Optical and electrical inputs

ActiveX component included



FEATURES INCLUDED

- High-resolution cursor measurement
- Automatic waveform measurements with statistics
- Waveform processing including FFT
- Time and voltage histograms
- Eye-diagram measurements for NRZ and RZ
- Automated mask tests
- Intuitive Windows user interface

APPLICATIONS

- Standards pre-compliance testing
- IC package characterization
- Telecom service and manufacturing
- Timing analysis
- Digital system design and characterization
- Mask drawing and display
- Automatic pass/fail mask limit testing
- High-speed serial bus pulse response

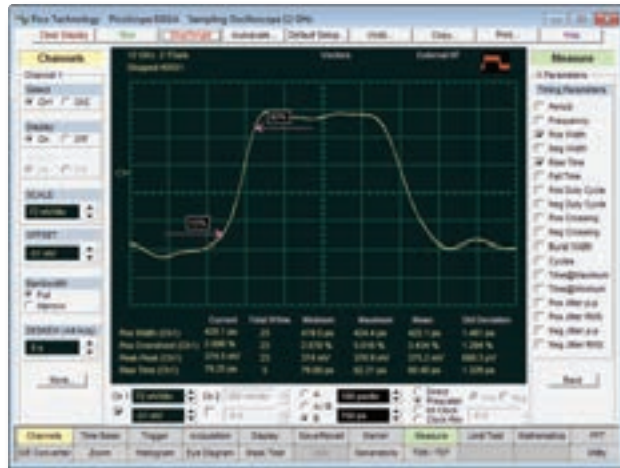
SOLICITAR ORÇAMENTO

| |
|---------------|
| SONET/SDH |
| OC1/STM0 |
| OC3/STM1 |
| OC9/STM3 |
| OC12/STM4 |
| OC18/STM6 |
| OC48/STM16 |
| FEC2666 |
| Fiber Channel |
| FC133 |
| FC266 |
| FC531 |
| FC1063 |
| FC2125 |
| FC4250 |
| Ethernet |
| 1.25 Gb/s |
| GB |
| 2XGB |
| 3.125 Gb/s |
| INFINIBAND |
| 2.5G |
| 5.0 G |
| XAUI |
| 3.125 Gb/s |
| ITU G.703 |
| DS1 |
| 2 Mb |
| DS2 |
| 8 Mb |
| 34 Mb |
| DS3 |
| 140 Mb |
| 155 Mb |
| ANSI T1/102 |
| DS1 |
| DS1C |
| DS2 |
| DS3 |
| STS1 Eye |
| STS1 Pulse |
| STS3 |
| Rapid IO |
| 1.25 Gb/s |
| 2.5 Gb/s |
| 3.125 Gb/s |
| G.984.2 |
| 3.125 Gb/s |
| PCI Express |
| 2.5G |
| 5.0G |
| Serial ATA |
| 1.5G |
| 3.0G |

12 GHz bandwidth

The PicoScope 9200A oscilloscopes uses sequential sampling technology to measure fast repetitive signals without the need for expensive real-time sampling hardware. Combined with an input bandwidth of 12 GHz, this enables acquisition of signals with rise times of 50 ps or even faster. Precise timebase stability and accuracy, and a resolution of 200 fs, allow characterization of jitter in the demanding applications.

The scopes are designed with Pico Technology's PC Oscilloscope architecture to create a compact, lightweight instrument that can be easily carried around with your laptop.



10 GHz prescaled trigger

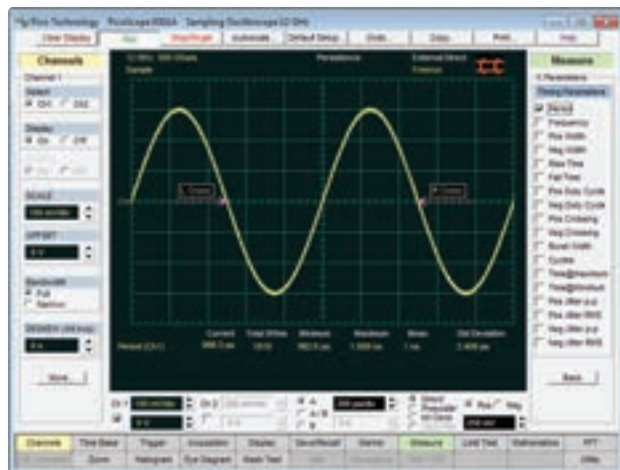
The PicoScope 9200A scopes have a built-in high-frequency trigger with frequency divider. Its typical bandwidth of up to 10 GHz allows measurements of microwave components with extremely fast data rates.

1 GHz full-function direct trigger

The scopes are equipped with a built-in direct trigger for signals up to 1 GHz repetition rate without using additional trigger units.

Built-in 2.7 Gb/s clock data recovery (CDR)

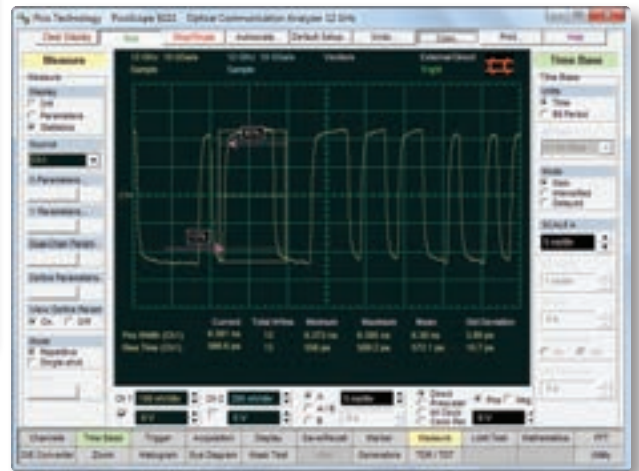
The PicoScope 9211A and 9231A have a dedicated clock-recovery trigger input for serial data from 12.3 Mb/s to 2.7 Gb/s.



Pulse parameter measurements

The PicoScope 9200A scopes quickly measure over 40 pulse 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 the IEEE standards.

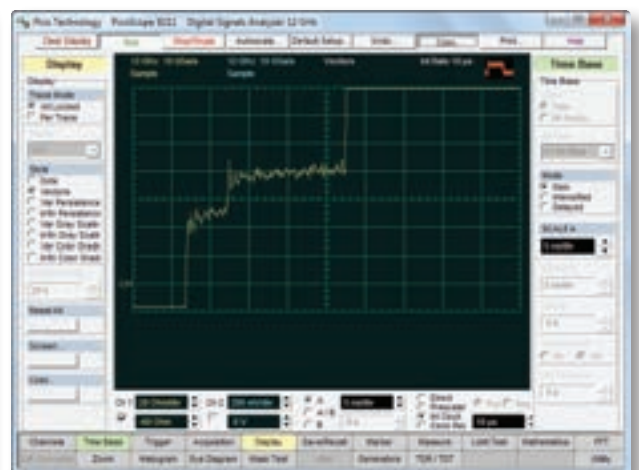
Maximum, Minimum, Peak-Peak, Top, Base, Amplitude, Middle, Mean, DC RMS, AC RMS, Area, Cycle Middle, Cycle Mean, Cycle DC RMS, Cycle AC RMS, Cycle Area, Positive/Negative Overshoot, Period, Frequency, Positive/Negative Width, Rise/Fall Time, Positive/Negative Duty Cycle, Positive/Negative Crossing, Burst Width, Cycles, Time at Maximum/Minimum, Delay, Gain, FFT Magnitude, FFT Delta Magnitude, THD, FFT Frequency, FFT Delta Frequency



TDR/TDT analysis

The PicoScope 9211A and 9231A are supplied with a calibrated time-domain reflectometry (TDR) and time-domain transmission (TDT) accessory kit. This is used with the unit's built-in step generators to measure impedance discontinuities in circuit boards, cables and transmission lines, connectors and IC packages, with a horizontal resolution of 200 fs. The results can be displayed as volts, ohms or reflection coefficient (rho) against time or distance.

The TDR/TDT scopes also include all the features of the PicoScope 9201A, such as eye diagram analysis and mask testing.

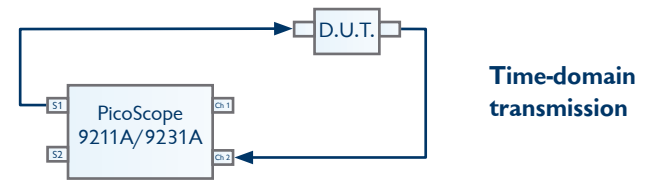
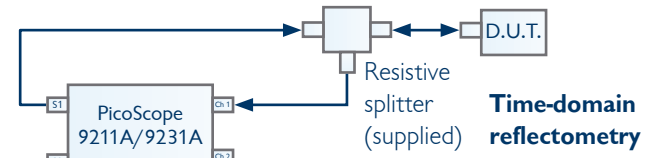


TDR/TDT analysis

Measured parameters
 Propagation delay
 Gain
 Gain dB

Step generators
 Dual outputs
 Adjustable de-skew
 Programmable polarity
 100 ps (typical) rise/fall times, 20% to 80%
 Step, coarse timebase and pulse modes
 NRZ and RZ patterns with variable length

Horizontal units
 Time
 Meter
 Foot
 Inch



Powerful mathematical analysis

The PicoScope 9200A scopes support up to four simultaneous mathematical combinations and functional transformations of acquired waveforms.

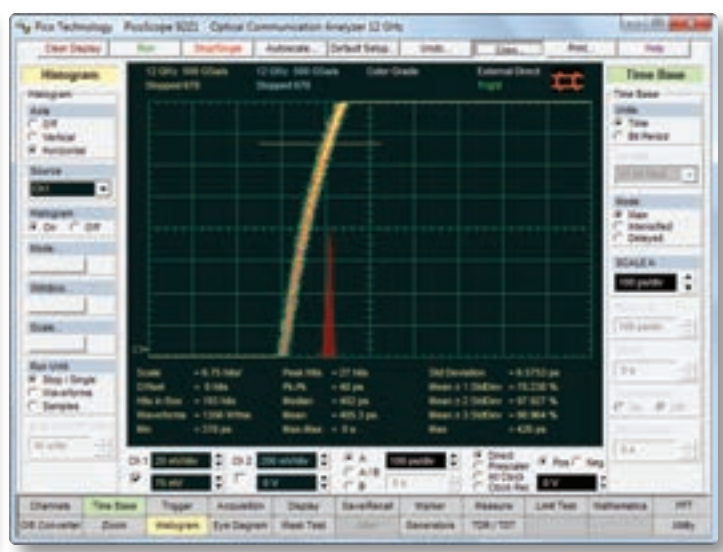
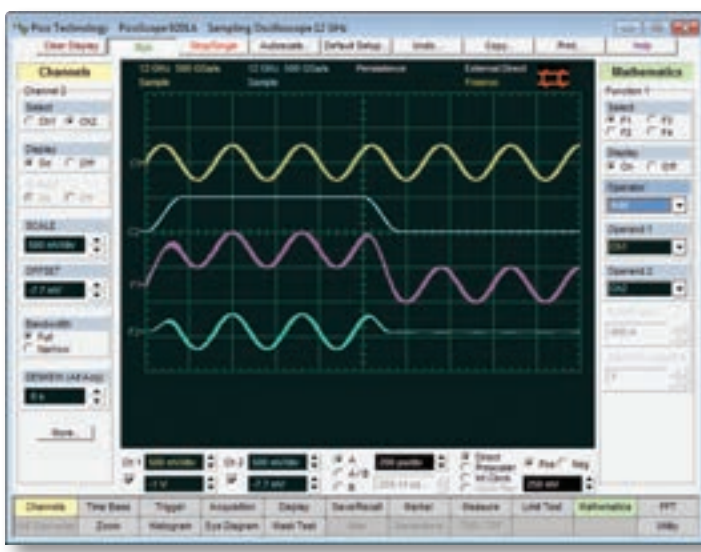
You can select any of the mathematical functions to operate on either one or two sources. All functions can operate on live waveforms, waveform memories or even other functions.

Mathematical functions
 $A + B$ $- A$
 $A - B$ $|A|$
 $A \times B$ $\log(A)$
 $A \div B$ dA/dt
 $\int A.dt$
 $interpolate(A)$
 $smooth(A)$

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 characterising noise, while the most common use for a horizontal histogram is measuring and characterizing jitter.

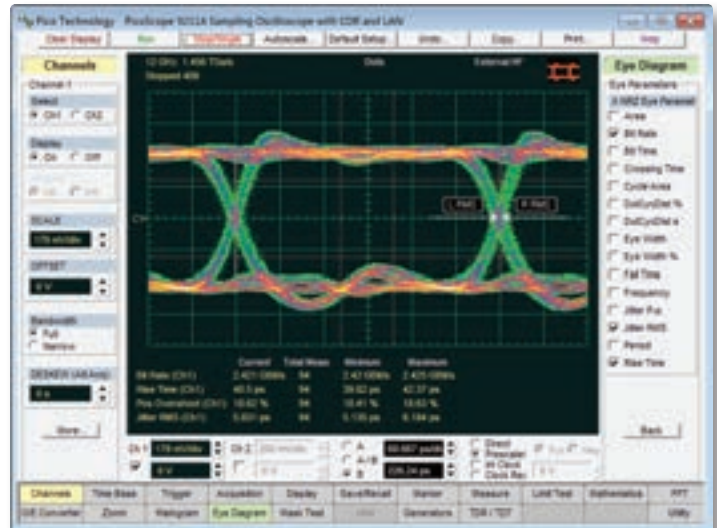


Eye-diagram analysis

The PicoScope 9200A 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 four parameters can be measured simultaneously, with statistics also shown.

The measurement points and levels used to generate each parameter can be shown dynamically.

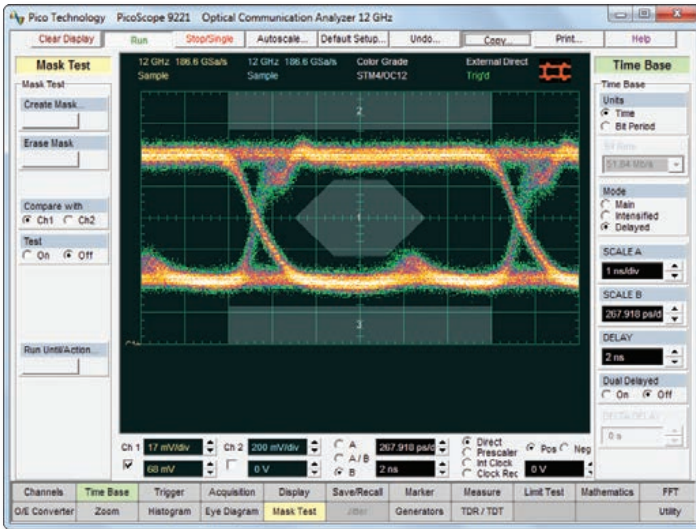
Eye diagram analysis can be made even more powerful with the addition of mask testing, as described below.



Mask testing

For eye-diagram masks, such as those specified by the SONET and SDH standards, the PicoScope 9200A scopes support on-board mask drawing for visual comparison. There is a library of built-in masks (listed in the column on the left), and custom masks can be automatically generated and modified using the graphical editor. A specified margin can be added to any mask.

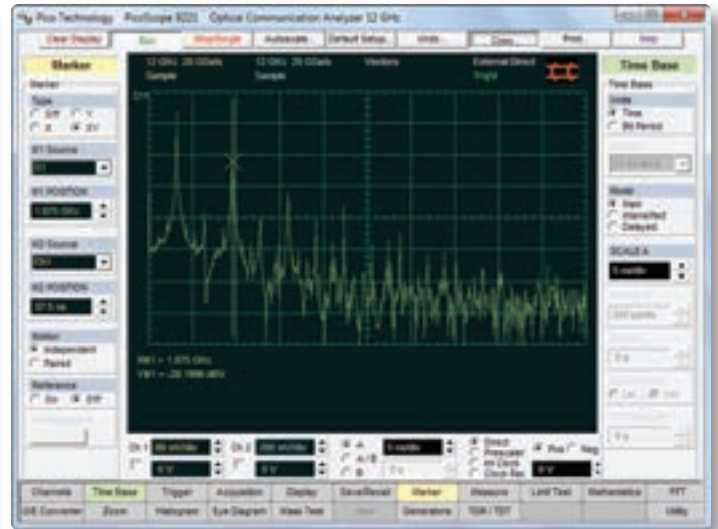
The display can be grey-scaled or colour-graded to aid in analyzing noise and jitter in eye diagrams. There is also a statistical display showing the number of failures in both the original mask and the margin.



FFT analysis

All PicoScope 9000 Series oscilloscopes can perform up to 2 Fast Fourier Transforms of input signals using a range of windowing functions. FFTs are useful for finding crosstalk problems, finding distortion problems in analog waveforms caused by non-linear amplifiers, 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.

- Windowing functions**
- Rectangular
 - Hamming
 - Hann
 - Flat-top
 - Blackman-Harris
 - Kaiser-Bessel



Optical-to-electrical converter

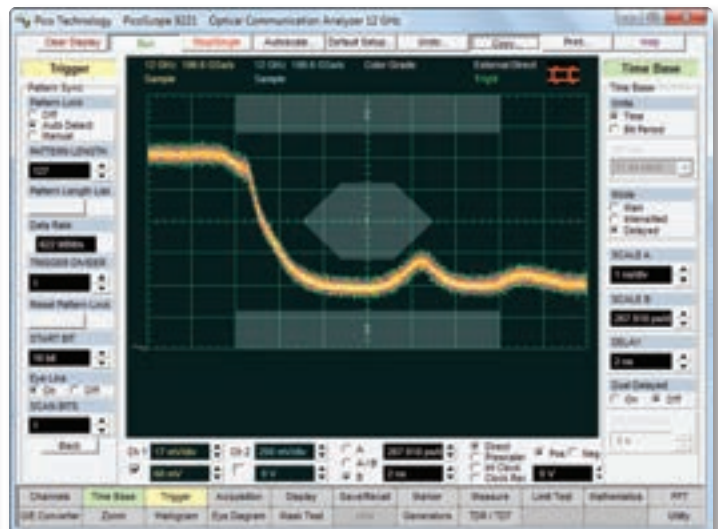
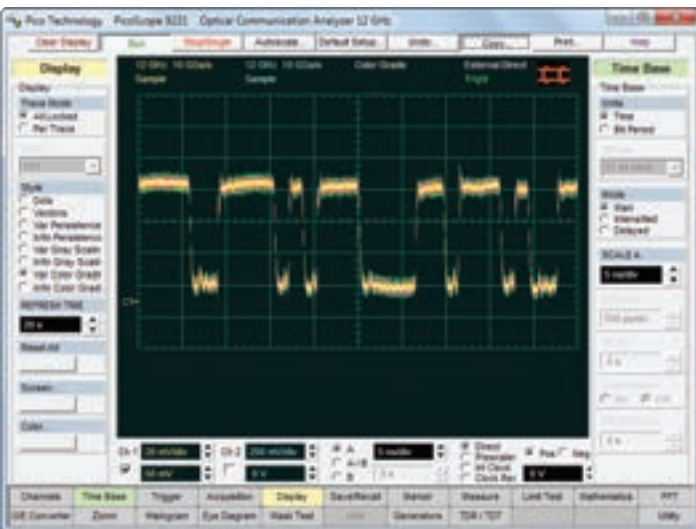
The PicoScope 9231A has a built-in 8 GHz optical electrical converter. This allows analysis of optical signals such as SONET/SDH OC1 to OC48, Fibre Channel FC133 to FC4250, and G.984.2. The converter input accepts both single-mode (SM) and multimode (MM) fibers and has a wavelength range of 750 to 1650nm.

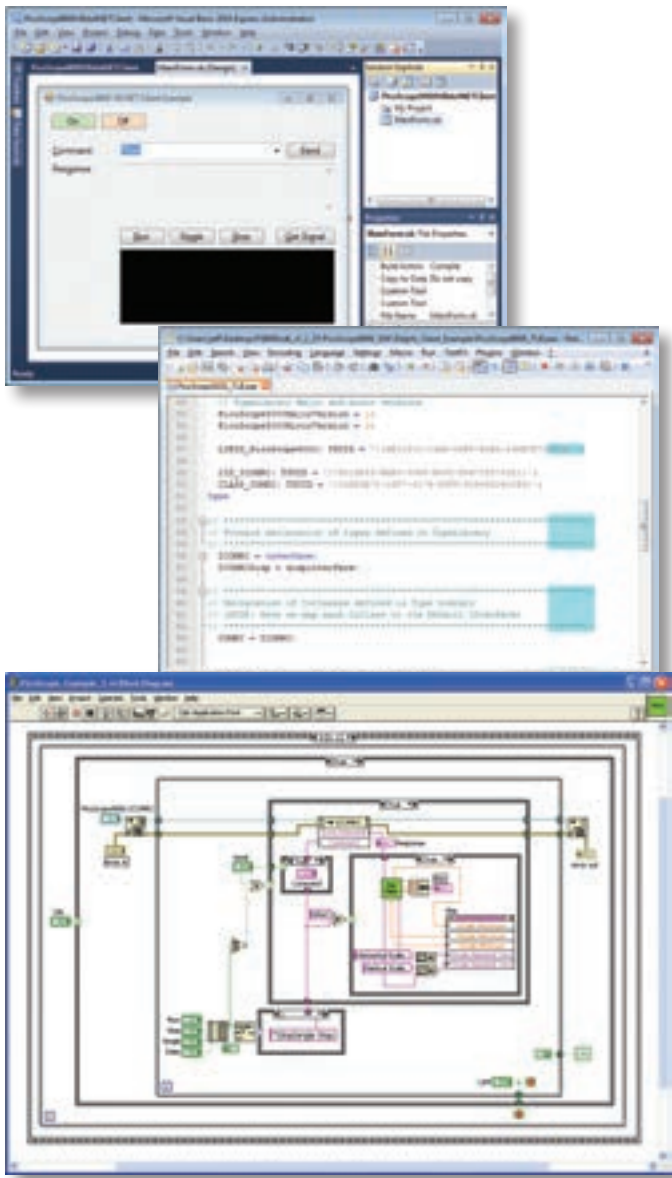
A selection of Bessel-Thomson filters can be purchased separately for use with specific optical standards (see back page).

Pattern sync trigger and eye line mode

The PicoScope 9211A and 9231A can internally generate a pattern sync trigger derived from bit rate, pattern length, and trigger divide ratio. This enables it to build up an eye pattern from any specified bit or group of bits in a sequence.

Eye line mode works with the pattern sync trigger to isolate any one of the 8 possible paths, called eye lines, that the signal can make through the eye diagram. This allows the instrument to display averaged eye diagrams showing a specified eye line.





Software Development Kit

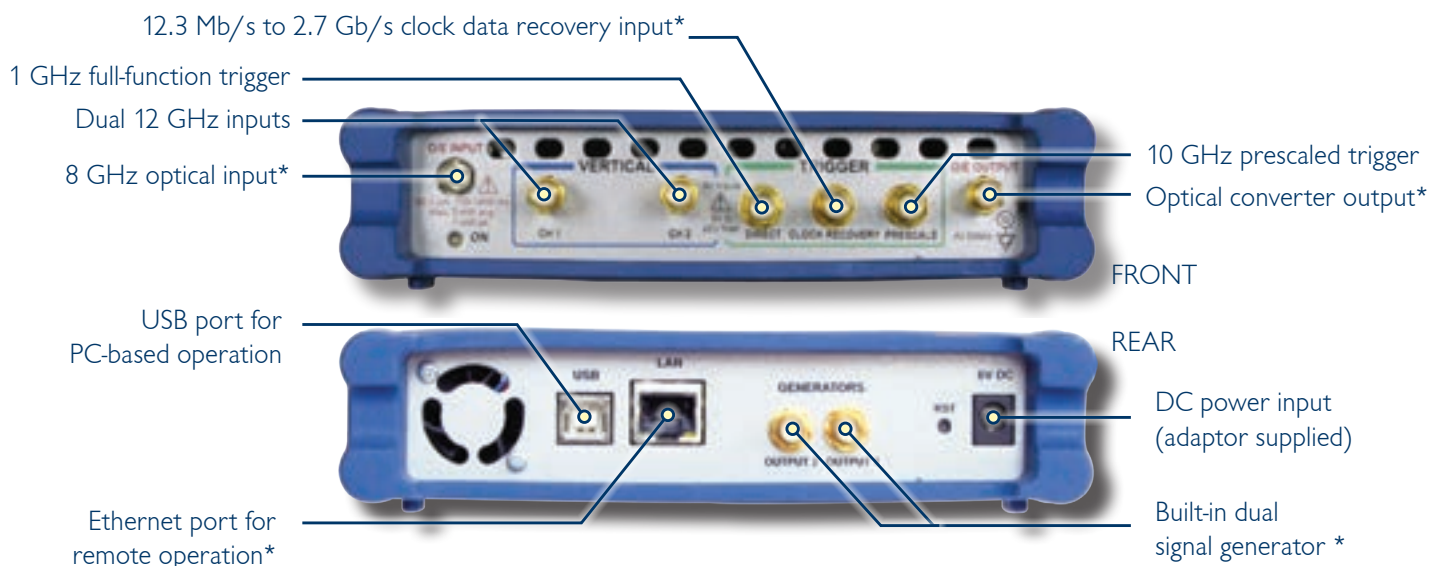
The PicoScope 9000 software can be operated as a standalone oscilloscope program and as an ActiveX control. The ActiveX control conforms to the Windows COM model and can be embedded in your own software. Programming examples are provided in Visual Basic (VB.NET), LabVIEW and Delphi, but any programming language or standard that supports the COM standard can be used, including JavaScript and C.

A comprehensive Programmer's Guide is supplied that details every function of the ActiveX control.

The SDK can control the oscilloscope over the USB or the LAN port.

| ActiveX command categories | ActiveX command types |
|----------------------------|-----------------------|
| Header | Execution |
| System | On/off |
| Channels | On/off group |
| Timebase | Selector |
| Trigger | Integer |
| Acquisition | Float |
| Display | Data |
| Save/Recall | |
| Markers | |
| Measurements (Time Domain) | |
| Measurements (Spectrum) | |
| Limit Tests | |
| Mathematics | |
| FFT | |
| Histogram | |
| Mask Testing | |
| Eye Diagrams | |
| Utilities | |
| Waveforms | |

PicoScope 9200A inputs and outputs



*Not on all models. See feature chart on back page.

PicoScope 9200 Series Specifications

VERTICAL

| | |
|-----------------------------|---|
| Number of channels | 2 (simultaneous acquisition) |
| Bandwidth | Full: DC to 12 GHz Narrow: DC to 8 GHz |
| Pulse response rise time | 10% to 90%, calculated from $T_r = 0.35/BW$ Full bandwidth: : 29.2 ps Narrow bandwidth: 43.7 ps |
| RMS noise, maximum | Full bandwidth: 2 mV Narrow bandwidth: 1.5 mV With averaging: 100 μ V system limit |
| Scale factors (sensitivity) | 2 mV/div to 500 mV/div. 1-2-5 sequence and 0.5% fine increments. |
| Nominal input impedance | (50 \pm 1) Ω |
| Input connectors | SMA (F) |

TIMEBASES

| | |
|------------------------------|--|
| Timebases | 10 ps/div to 50 ms/div (main, intensified, delayed, or dual delayed) |
| Delta time interval accuracy | $\pm 0.2\%$ of delta time interval ± 15 ps |
| Time interval resolution | 200 fs minimum |

TRIGGER

| | |
|---|--|
| Trigger sources | External direct trigger, external prescaled trigger, internal clock trigger, clock recovery trigger (not 9201A) |
| Direct trigger bandwidth and sensitivity | DC to 100 MHz : 100 mV p-p 100 MHz to 1 GHz: increasing linearly from 100 mV p-p to 200 mV p-p |
| Prescaled trigger bandwidth and sensitivity | 1 to 7 GHz: 200 mV p-p to 2 V p-p 7 to 8 GHz: 300 mV p-p to 1 V p-p 8 to 10 GHz typical: 400 mV p-p to 1 V p-p |
| Trigger RMS jitter, maximum | 4 ps + 20 ppm of delay setting |

ACQUISITION

| | |
|--------------------|--|
| ADC resolution | 16 bits |
| Digitizing rate | DC to 200 kHz maximum |
| Acquisition modes | Sample (normal), average, envelope |
| Data record length | 32 to 4096 points maximum per channel in x2 sequence |

DISPLAY

| | |
|--------------------|--|
| Display resolution | Variable |
| Display style | Dots, vectors, variable or infinite persistence, variable or infinite grey scaling, variable or infinite color grading |

MEASUREMENTS AND ANALYSIS

| | |
|------------------------|--|
| Marker | Vertical bars, horizontal bars (measure volts) or waveform markers (x and +) |
| Automatic measurements | Up to 40 automatic pulse measurements |
| Histogram | Vertical or horizontal |
| Mathematics | Up to four math waveforms can be defined and displayed |
| FFT | Up to two FFTs simultaneously, with built-in filters (rectangular, Nicolson, Hann, flat-top, Blackman-Harris and Kaiser-Bessel) |
| Eye diagram | Automatically characterizes NRZ and RZ eye patterns. Measurements are based on statistical analysis of the waveform. |
| Mask test | Acquired signals are tested for fit outside areas defined by up to eight polygons. Standard or user-defined masks can be selected. |

CLOCK RECOVERY AND PATTERN SYNC TRIGGER (PicoScope 9211A and 9231A only)

| | |
|---|--|
| Clock recovery sensitivity | 12.3 Mb/s to 1 Gb/s : 50 mV p-p 1 Gb/s to 2.7 Gb/s: 100 mV p-p Continuous rate. |
| Pattern sync trigger | 10 Mb/s to 8 Gb/s with pattern length from 7 to 65,535 max. |
| Recovered clock trigger jitter, maximum | 1 ps + 1.0% of unit interval |
| Maximum safe trigger input voltage | ± 2 V (DC + peak AC) |
| Trigger input connector | SMA (F) |

SIGNAL GENERATOR OUTPUT (9211A and 9231A)

| | |
|-----------------|---------------------------------------|
| Rise/fall times | 100 ps (20% to 80%) typical |
| Modes | Step, coarse timebase, pulse, NRZ, RZ |

OPTICAL-ELECTRICAL (O/E) CONVERTER (9231A only)

| | |
|-----------------------------|---|
| Unfiltered bandwidth | DC to 8 GHz typical. DC to 7 GHz guaranteed at full electrical bandwidth. |
| Effective wavelength range | 750 nm to 1650 nm |
| Calibrated wavelengths | 850 nm (MM), 1310 nm (MM/SM), 1550 nm (SM) |
| Transition time | 10% to 90% calculated from $T_r = 0.48 / BW$: 60 ps max. |
| RMS noise, maximum | 4 μ W (1310 & 1550 nm), 6 μ W (850 nm) |
| Scale factors (sensitivity) | 1 μ V/div to 400 μ V/div (full scale is 8 divisions) |
| DC accuracy, typical | ± 25 μ W $\pm 10\%$ of vertical scale |
| Maximum input peak power | +7 dBm (1310 nm) |
| Fiber input | Single-mode (SM) or multi-mode (MM) |
| Fiber input connectore | FC/PC |
| Input return loss | SM: -24 dB, typical MM: -16 dB, typical, -14 dB, maximum |

GENERAL

| | |
|-----------------------------|---|
| Operating temperature range | +5 $^{\circ}$ C to +35 $^{\circ}$ C (+15 $^{\circ}$ C to +25 $^{\circ}$ C for stated accuracy) |
| Power | +6 V DC $\pm 5\%$ PicoScope 9201A: 1.9 A max. PicoScope 9211A: 2.6 A max. PicoScope 9231A: 2.9 A max. Mains adaptor supplied for UK/US/EU/AUS/NZ. |
| PC connection | USB 2.0 (compatible with USB 1.1) |
| LAN connection | 10/100 Mbit/s (9211A and 9231A only) |
| PC requirements | Windows XP (SP3), Windows Vista, Windows 7 or Windows 8, 32-bit or 64-bit |
| Dimensions | W 170 mm x D 260 mm x H 40 mm |
| Weight | 1.1 kg |