LeCroy 9304A, 9304AM Digital Oscilloscopes
200 MHz Bandwidth, 100 MS/s

Main Features

- **Four Channels**
- **50k and 200k Point Records**
- **DOS Compatible Floppy Disk, PCMCIA portable hard drive and Memory Card Options**
- **Glitch, Window, Qualified, Interval, Dropout and Video Triggers**
- **8-bit vertical resolution, 11 with ERES option**
- **Fully Programmable via GPIB and RS-232-C**
- **Automatic PASS/FAIL testing**
- **Persistence, XY and Roll Modes**
- **Advanced Signal Processing**
- **Internal High Resolution Graphics Printer Option**

The 9304A and 9304AM are general purpose 200 MHz four channel digital oscilloscopes. They capture single-shot events at up to 100 MS/s, and repetitive signals at 10 GS/s. Record lengths up to 200k points provide excellent horizontal resolution, and allow fast digitizing of long-duration events. Memories can be segmented, for minimum dead time between acquisitions.

Live waveforms on the main timebase may be viewed simultaneously with up to 3 expansions, showing all of the signal detail. Expansions are shown as highlights on the main trace.

The LeCroy ProBus intelligent probe system allows automatic sensing of the probe type. For LeCroy's active FET probes it also provides variable offset at the probe tip. Offset and coupling are controlled from the scope's front panel.

SMART Trigger modes like Glitch, Window and Dropout allow you to capture precisely the events of interest.

A comprehensive range of signal processing functions, on live or stored waveforms, allows waveform manipulation without destroying the underlying data.

The 9304A and 9304AM feature the proven user-interface of LeCroy's portable scope family. A bright, high-resolution 9" CRT allows optimum waveform viewing on a high resolution 810 x 696 pixel screen under any conditions. Menus and text are arranged around the graticules - they never overwrite the waveforms. Each of the main control functions has a dedicated single knob, to keep the scope's performance at your fingertips.

DOS compatible floppy disk, PCMCIA portable hard drive and memory card options store waveforms and test setups, and make transferring data to a PC easier than ever. Hardcopies can be made on GPIB, RS-232-C or Centronics printers or plotters. An optional internal high resolution graphics printer is also available.

Optional packages provide extensive Waveform Processing including FFT and Enhanced Resolution to 11 bits.

ACQUISITION SYSTEM

Bandwidth (-3 dB)
@ 50 Ohms DC to 200 MHz
@ 1 M Ohm DC: DC to 200 MHz typical at the probe tip.
No. of Channels: 4
No. of Digitizers: 4
Maximum Sample Rate: 100 MS/s simultaneously on each channel.
Acquisition memories, per channel:
9304A   50k
9304AM   200k
Sensitivity: 2 mV/div to 5 V/div, fully variable.
Scale factors: A wide choice of probe attenuation factors are selectable.
Offset Range:
2.0 - 9.9 mV/div: ± 120 mV
10 - 199 mV/div: ± 1.2 V
0.2 - 5.0 V/div: ± 24 V
DC Accuracy: < or equal to ± 2% full scale (8 divisions) at 0 V offset.
Vertical Resolution: 8 bits.
Bandwidth Limiter: 30 MHz.
Input Coupling: AC, DC, GND.
Input Impedance: 1 M Ohm//15 pF or 50 Ohm ± 1%.
Max Input:
1 M Ohm: 250 V (DC+peak AC@ 10 kHz)
50 Ohms: ± 5 V DC (500 mW) or
5 V RMS

TIME BASE SYSTEM

Timebases: Main and up to 4 Zoom Traces.
Time/Div Range: 1 ns/div to 1000 s/div.
Clock Accuracy: < or equal to ± 0.002 %.
Interpolator Resolution: 10 ps.
Roll Mode: Ranges 500 ms to 1,000 s/div.
For > 50k points: 10 s to 1,000 s/div.
External Clock: < or equal to 100 MHz on EXT input with ECL, TTL or zero crossing levels.

TRIGGERING SYSTEM

Trigger Modes: Normal, Auto, Single, Stop.
Trigger Sources: CH1, CH2, CH3, CH4, Line, Ext, Ext/10. Slope, Level and Coupling for each can be set independently.
Slope: Positive, Negative, Window (BiSlope).
Coupling: AC, DC, HF (up to 500 MHz), LFREJ, HFREJ.
Pre-trigger recording: 0 to 100% of full scale (adjustable in 1% div increments).

Post-trigger delay: 0 to 10,000 divisions (adjustable in 0.1 div increments).
Holdoff by time: 10 ns to 20 s.
Holdoff by events: 0 to 99,999,999 events.
Internal Trigger Sensitivity Range:
± 5 div.
EXT Trigger Max. Input:
1 M Ohm//15 pF: 250 V (DC+peak AC < or equal to 10 kHz)
50 Ohms ± 1%: ± 5 V DC (500 mW) or 5 V RMS
EXT Trigger Range: ±0.5V (±5V with Ext/10).
Trigger Timing: Trigger Date and Time are listed in the Memory Status Menu.

SMART TRIGGER TYPES

Signal Width: Trigger on width between two limits selectable from 2.5ns to 20s.
Signal Interval: Trigger on interval be-tween two limits selectable from 10ns to 20s.
Dropout: Trigger if the input signal drops out for longer than a time-out from 25ns to 20s.
State/Edge Qualified: Trigger on any source only if a given state (or transition) has occurred on another source. The delay between these events can be defined as a number of events on the trigger channel or as a time interval.
TV: Allows selection of both line (up to 1500) and field number (up to 8) for PAL, SECAM, NTSC or non-standard video.

ACQUISITION MODES

Random Interleaved Sampling (RIS): for repetitive signals from 1 ns/div to 5 ms/div.
Single shot: for transient and repetitive signals from 50 ns/div.
Sequence: Stores multiple events in segmented acquisition memories.
Number of segments available:
9304A   2-200
9304AM   2-500
Dead Time between segments:
< or equal to 150 us
DISPLAY

Waveform style: Vectors connect the individual sample points, which are highlighted as dots. Vectors may be switched off.
CRT: 12.5 x 17.5 cm (9" diagonal) raster.
Resolution: 810 x 696 points.
Modes: Normal, X-Y, Variable or Infinite Persistence.
Real-time Clock: Date, hours, minutes, seconds.
Graticules: Internally generated; separate intensity control for grids and waveforms.
Grids: 1, 2 or 4 grids.
Formats: YT, XY, and both together.

Vertical Zoom: Up to 5x Vertical Expansion (50x with averaging, up to 40 mV sensitivity).
Maximum Horizontal Zoom Factors:
9304A   1,000x
9304AM   5,000x

INTERNAL MEMORY

Waveform Memory: Up to four 16-bit Memories (M1, M2, M3, M4).
Processing Memory: Up to four 16-bit Waveform Processing Memories (A,B,C,D).
Setup Memory: Four non-volatile memories. Optional Memory Cards, PCMCIA portable hard drive or Floppy Disks may also be used for high-capacity waveform and setup storage.

WAVEFORM PROCESSING

Up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity, Sin(x)/x and Summation Averaging.
Average: Summed averaging of up to 1,000 waveforms in the basic instrument. Up to 10^6 averages are possible with Option WP01.
Envelope*: Max, Min, or Max and Min values of from 1 to 10^6 waveforms.
ERES*: Low-Pass digital filter provides up to 11 bits vertical resolution. Sampled data is always available, even when trace is turned off. Any of the above modes can be invoked without destroying the data.
FFT*: Spectral Analysis with four windowing functions and FFT averaging.
* Envelope and ERES modes are provided in Math Package WP01, FFT is in WP02.

AUTOMATIC MEASUREMENTS

The following Parametric measurements are available, together with statistics of their Average, Highest, Lowest values and Standard Deviation:

amplitude	delta t at level (t=0,abs)	overshoot +
area	delta t at level (t-0%)	overshoot -
base	duty cycle	peak to peak
cmean	falltime	period
cmedian	f80-20%	risetime
crms	f@level (abs)	r20-80%

csdev	f@level (%)	r@level (abs)
cycles	frequency	r@level (%)
delay	maximum	RMS
delta delay	mean	std dev
delta t at level (abs)	median	top
delta t at level (%)	minimum	width

Parameters are calculated as defined by ANSI/IEEE Std 181-1977 "Standard on Pulse Measurement and Analysis by Objective Techniques". In addition, Rise and Fall times may be measured at 10 % and 90% levels, or 20% and 80% levels, or any other user-specified levels.

delta delay provides time between midpoint transition of two sources, for making propagation delay measurements.

delta t at level allows the same measurement to be made at any specified level. Two cursors are used to define the region over which these parameters are calculated.

Relative Time: Two cursors provide time measurements with resolution of ±0.05% full scale for unexpanded traces; up to 10 % of the sampling interval for expanded traces. The corresponding frequency value is also displayed.

Relative Voltage: Two horizontal bars measure voltage differences up to ±0.2% of fullscale in single-grid mode.

Absolute Time: A cross hair marker measures time relative to the trigger, and voltage with respect to ground.

Pass/Fail testing allow up to five of the listed parameters to be tested against selectable thresholds. Waveform Limit Testing is performed using templates which may be defined inside the instrument.

AUTOSETUP

Pressing Autosetup sets timebase, trigger and sensitivity to display a wide range of repetitive signals. (Amplitude 2mV to 40V; frequency above 50Hz; Duty cycle greater than 0.1%).

Autosetup Time: Approximately 2 seconds.
Vertical Find: Automatically sets sensitivity and offset.

PROBES

Model:
One PP002 (10:1, 10 M Ohm // 14 pF) probe supplied per channel.
The 9304A and 9304AM are fully compatible with LeCroy's range of FET Probes, which may be purchased separately.
Probe calibration: Max 1 V into 1 M Ohm,

500 mV into 50 Ohms , frequency and amplitude programmable, pulse or square wave selectable, rise and fall time 1 ns typical. Alternatively, the Calibrator output can provide a trigger output or a PASS/FAIL test output.

INTERFACING

Remote Control: Of all front-panel controls, as well as all internal functions is possible by GPIB and RS-232-C.
RS-232-C Port: Asynchronous up to 19,200 baud for computer/terminal control or printer/plotter connection.
GPIB Port: (IEEE-488.1) Configurable as talker/listener for computer control and fast data transfer.
Command Language complies with requirements of IEEE-488.2.
Centronics Port: Optional hardcopy parallel interface included with floppy disk and graphics printer options.
Hardcopy: Screen dumps are activated by a front-panel button or via remote control. TIFF and BMP formats are available for importing to Desktop Publishing programs. The following printers and plotters can be used to make hardcopies: HP DeskJet (color or B&W), HP ThinkJet, QuietJet, LaserJet, PaintJet and EPSON printers.
HP 7400 and 7500 series, or HPGL compatible plotters. An optional internal high resolution graphics printer is also available,

GENERAL

Auto-calibration ensures specified DC and timing accuracy.
Temperature:
5° to 40° C (41° to 104° F) rated 0° to 50° C (32° to 122° F) operating.
Humidity: < 80%.
Shock & Vibration:
Meets MIL-STD-810C modified to LeCroy design specifications and MIL-T-28800C.
Power: 90-250 V AC, 45-66 Hz, 150 W.
Battery Backup: Front-panel settings maintained for two years.
Dimensions: (HWD) 8.5"x14.5"x16.25", 210mm x 370mm x 410mm.
Weight: 12.5kg (27.5lbs) net,
18kg (40lbs) shipping.