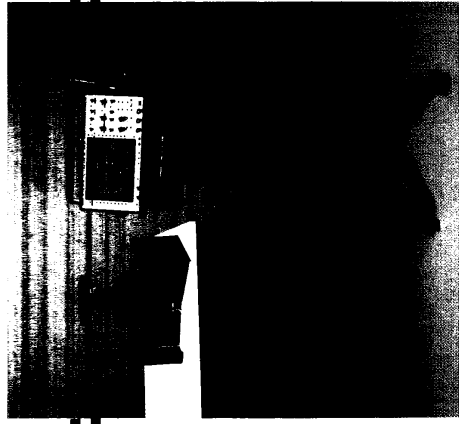


DIGITAL OSCILLOSCOPE

175 MHz BANDWIDTH, 100 Ms/s, 5 Gs/s

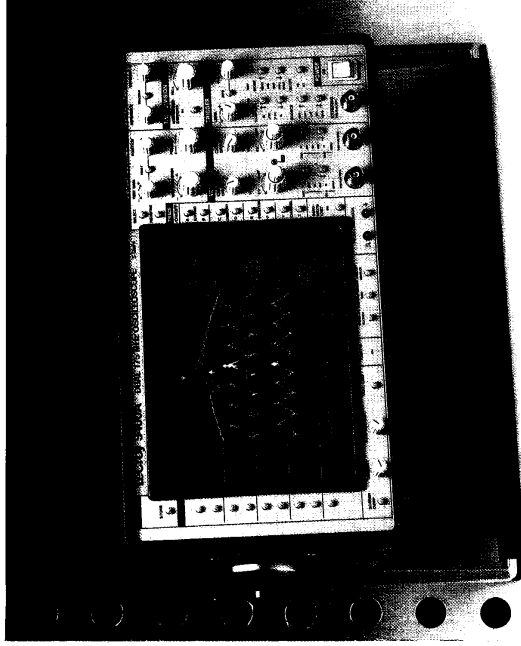


A wide range of oscilloscope accessories including cameras and a scope cart (pictured) are available for the 9400A.

MODEL 9400A PORTABLE DUAL-CHANNEL OSCILLOSCOPE

9400A

- High Bandwidth and Precision
- Long Memories
- High-resolution Display
- Signal Processing and FFT
- Mass Storage



Signal averaging improves the signal-to-noise ratio and increases sensitivity and vertical resolution. Above, a function generator signal is averaged 40 times to show the details of a perturbation (top trace).

THE COMPLETE TEST AND MEASUREMENT SYSTEM

The LeCroy 9400A Digital Oscilloscope is a powerful general-purpose tool for waveform recording and analysis. Combining ease of use with a comprehensive range of measurement and processing capabilities, it enables extremely precise measurements.

The LeCroy 9400A provides 175 MHz bandwidth, 100 megasamples/sec 8-bit ADCs, $\pm 2\%$ DC accuracy ($\pm 1\%$ optional), 32K memory per channel, and up to 192K of waveform storage memory. It is fully programmable over RS-232-C or GPIB interfaces. Plotter drivers enable color archiving via a wide range of digital plotters.

Oscilloscope Accessories (cont'd)

- CA9001 Camera (using Polaroid film) and Hood
- CA9002 Camera Adapter (35mm) with Hood
- CS9400 Certified Calibration
- DP9001 Digital Plotter, 8-pen A4 size
- 94XX-FC Front Cover
- OC9001 Oscilloscope Cart
- P9010 10:1 Oscilloscope Probe
- P9010/2 10:1 Oscilloscope Probe with 2 m cable
- P9011 10:1:1 Oscilloscope Probe
- P9100 100:1 Oscilloscope Probe
- RM9400 Adapter Kit for Rack Mounting
- SG9001 High-voltage Protector
- TC9001 Protective Cover
- TC9002 Transit Case
- TC9003 Transit Case for 9400A and Mass Storage

- Greece: Hellenic SRI Ltd., (01) 721 1140
- India: Electronic Ent., (02) 4137096
- Israel: Ammo, (03) 453157
- Italy: LeCroy Srl, Roma (06) 302-9646, Milano (02) 2940-5634
- Japan: Toyo Corp., (03) 279 0771
- Korea: Samduk Science & Ind., Ltd., (02) 468 04914
- Mexico: Nucleoelectronica SA, (905) 5693 6043
- New Zealand: E.C. Gough Ltd., (03) 798-740
- Norway: Avante AS, (02) 630620
- Portugal: M.T. Brandao, Ltd., (02) 691116
- Spain: Anding Ingenieros SA, (01) 433 24 12
- Sweden: LeCroy AB, (0764) 821 11
- Sweden: MSS AB, (0764) 821 11
- Taiwan: Toward El. Inst. Ltd., (02) 601 9801
- United Kingdom: LeCroy Ltd., (0235) 33 114

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Innovators in Instrumentation

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For instant hard copies the 9400A's screen dump feature sends data directly to the DP9001 8-pen digital plotter.

ORDERING INFORMATION Oscilloscope and Options

- | Code | Description |
|-----------|---|
| 9400A/G | Digital Oscilloscope |
| 9400ACP01 | High-precision Option |
| 9400ACP03 | Printer Option for 9400A/G |
| 9400AWP01 | Waveform Processing Option |
| 9400AWP02 | FFT Processing Option (requires 9400AWP01) |
| 9400AMS01 | Mass Storage and Remote Control. Package, including IBM lap-top controller, interface, cables and software. |
| 9400AM01 | GPIB Interface for IBM-PCC computers |
| 9400CS01 | Calibration Software |

Oscilloscope Accessories

- OM9400A Operator's Manual
- SM9400A Service Manual

US SALES OFFICES

1-800-5-LeCroy
automatically connects you to your local sales office.

WORLDWIDE

- Australia: Solent Devices Pty. Ltd. (03) 579-3622
- Austria: Dewetron Elektr. Messgeräte GmbH, (0316) 391804
- Benelux: LeCroy B.V. '31-4902-89285
- Canada: Rayonics Sol. Inc., W. Ontario, (416) 736-1600
E. Ontario/Montreal, (613) 521-4251
Quebec, (514) 335-0115
W. Canada, (604) 293-1854
- Denmark: Luitronic A/S, (45) 455764
- Finland: LeCroy Oy, (09) 425764
- France: LeCroy SA, (1) 80078897
- Germany: LeCroy GmbH, (06221) 49162, (North) (0405) 42713

FEATURES

High bandwidth and precision – Two independent channels, each with 175 MHz bandwidth and a high-performance 8-bit ADC, handle input signals with better than $\pm 2\%$ DC accuracy ($\pm 1\%$ optional). The 9400A features sampling rates of 100 megasamples/sec for transient events. Long memories and a versatile cursor system (including voltage, time and cross-hair cursors) give time measurements with an accuracy of $\pm 0.02\%$ of the time-base setting, and resolution of $\pm 0.002\%$ full scale.

High-resolution display – The 9400A's large display screen produces bright, stable, razor-sharp pictures of your signal under any repetition rate conditions. Very accurate signal comparisons are possible as up to four waveforms (live, expanded or processed) can be displayed simultaneously on the high-resolution screen (1024 x 1024 pixels).

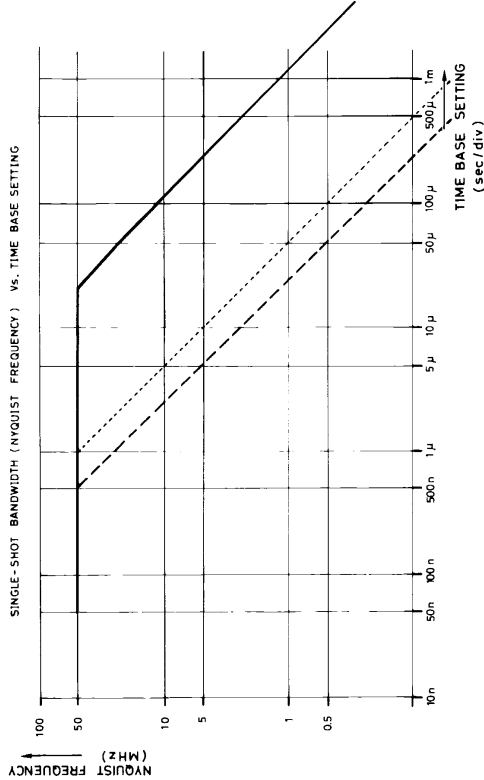
Long memories – The long 32K acquisition memories of the 9400A Digital Oscilloscope capture waveforms with high fidelity. At similar time-base settings, the 9400A's long memories allow sampling rates up to 25 times faster than that of instruments which have only 1K of acquisition memory (see graph below). Faster sampling rates ensure higher single-shot bandwidth as well as significantly reducing problems caused by undersampling and aliasing. The 9400A's long memories allow displayed waveforms to be expanded up to 100 times to show the finest signal details.

Transient recording – With a sampling rate of 100 megasamples/sec, the 9400A is an extremely powerful transient recorder. Long 32K data point acquisition memories, combined with a continuously adjustable trigger (from 100% pre-trigger to 10,000 divisions post-trigger at any time-base setting), ensure that rare events cannot be missed. Both channels are sampled simultaneously so that exact time correlation is maintained between channels.

Full programmability – All the 9400A's front-panel controls are fully programmable via the two RS-232-C interface ports or the GPIB port. A single push-button initiates a screen dump for accurate color hard copies of the display via a wide range of digital plotters. The GPIB comes complete with LeCroy "MASP" software offering computer control and mass storage on any PC compatible with the IBM[®] standard.

Signal processing – The waveform processing options extend the applications of the 9400A to high-bandwidth signal characterization, as well as mathematical and spectral analysis. The routines include averaging (summed and continuous), smoothing, integration, differentiation, square, square-root, full arithmetic, FFT spectral analysis, and Extrema monitoring.

Mass storage and remote control – A sophisticated mass storage and remote control package is available to assist users involved in automated and computer-aided testing. Convenient portability for field applications is also provided by a lap-top computer.



Single-shot bandwidth is a function of sampling rate. Long memories enable higher sampling rates at equal time-base settings. Above the 9400A's bandwidth, the 9400A's bandwidth is typically 25 times higher than in oscilloscopes with 1K memory and 50 times higher than in those with only 512 points.

SPECIFICATIONS

VERTICAL ANALOG SECTION

Bandwidth (–3 dB):

@ 50 Ω : DC – 175 MHz at 10 mV/div, up to 225 MHz at 1 V/div;
DC – 150 MHz at 5 mV/div.

@ 1 M Ω AC: < 10 Hz – 100 MHz typical.

@ 1 M Ω DC: DC – 100 MHz typical.

Single shot: DC – 50 MHz (Nyquist).

Input impedance: 1 M Ω // 50 pF and 50 Ω $\pm 1\%$.

Channels: Two; standard BNC connector inputs.

Sensitivity range: 5 mV/div to 1 V/div at 50 Ω impedance and 5 mV/div to 5 V/div at 1 M Ω impedance; detents at 1–2–5, 1:2.5 continuously variable.

Offset: ± 8 divisions in 0.04 division increments.

DC accuracy: Standard $\leq \pm 2\%$, optional $\leq \pm 1\%$.

Noise: $\leq 0.45\%$ RMS.

Bandwidth limiter (–3 dB): 30 MHz.

Max input voltage: 250 V (DC + peak AC) at 1 M Ω , 5 V DC (500 mW) or ± 10 V peak AC at 50 Ω .

VERTICAL DIGITAL SECTION

ADCs: One per channel, 8-bit flash.

Conversion rate: Up to 100 megasamples/sec for transient signals, up to 5 gigasamples/sec for repetitive signals, simultaneously on both channels.

Aperture uncertainty: ± 10 psec.

Overall dynamic accuracy (typical): Sine wave applied to the BNC input for RMS curve fit at 80% full scale. The accuracy measurement includes the front-end amplifier, sample & hold and ADC.

Input frequency (MHz)	1.0	10.0	Nyquist 50.0	100.0	175.0
Signal-to-noise ratio (dB)	41.9	41.9	41.9	37.1	29.9
Effective bits	7.0	7.0	7.0	6.2	5.0

Acquisition memories, Channels 1 and 2: Two, 32K 8-bit word memories (64K total) which can be segmented into 8, 15, 31, 62, 125 or 250 blocks.

Reference memories, C and D: Two, 32K, 16-bit word memories (64K total) which can store two acquired and/or processed waveforms.

Function memories E and F (optional): Two 32K, 16-bit word memories (64K total) for waveform processing.

Glitch detection: Permanent glitch detection for events down to 0.04% of the time-base setting, 10 nsec minimum.

HORIZONTAL SECTION

Time Base

Range: 2 nsec/div to 100 sec/div.

Accuracy: Better than $\pm 0.002\%$ of the time-base setting.

Interpolator resolution: 10 psec.

Acquisition Modes

Random Interleaved Sampling (RIS) for repetitive signals from 2 nsec/div to 2 μ sec/div.

Single shot for transient signals and repetitive signals from 50 nsec/div to 200 msec/div.

Roll for slowly-changing signals from 500 msec/div to 100 sec/div.

Sequence for capturing transients in segmented memories of 8, 15, 31, 62, 125 or 250 blocks.

Trigger

Sources: CHAN1, CHAN2, LINE, EXT, EXT1/10.

Slope: Positive, negative, window.

Coupling: AC, LF REJ, HF REJ, DC.

Modes

Sequence: stores multiple events in segmented acquisition memories.

Auto: automatically re-arms after each sweep. If no trigger occurs, one is generated at 2 Hz repetition rate.

Normal: re-arms after each sweep. If no trigger occurs after 2 sec, the display is erased.

Single (hold): holds display after a trigger occurs. Re-arms only when the "single" button is pressed again.

Pre-trigger: Adjustable in 0.2% increments, to 100%.

Post-trigger delay: Adjustable in 0.02 division increments up to 10,000 divisions.

External trigger input: 1M Ω , < 30pF, 250V max., ± 2 V in EXT, ± 20 V in EXT1/10.

Rate: > 200 MHz.

SELF TESTS

Auto-calibration: Performed every 20 minutes or whenever the gain or time-base parameters are changed; provides accuracies of:

DC gain: $\pm 2\%$ ($\pm 1\%$ optional) of full scale;

Offset: $\pm 0.5\%$ of full scale (50 Ω only);

Time: 20 psec RMS.

During the warming-up period, auto-calibration is carried out at 1 minute intervals unless the oscilloscope is in single or sequence trigger mode.

DISPLAY

CRT: 12.5 x 17.5 cm (5 x 7 inches); magnetic deflection; vector graphics system.

Resolution: 1024 x 1024 addressable points.

Grid: Internally generated; separate intensity control for grid and waveforms. Single and dual grid mode.

Expansion: Dual zoom horizontal expansion operates simultaneously on live, stored and processed waveforms, expanding up to 100 times. Vertical expansion from 0.4 up to 2 times for non-processed waveforms, up to 10 times for processed waveforms.

Screen dump: Single or multi-pen digital plotters are menu selected. The 9400A supports the HP 7400 series, as well as the Tektronix 4662, Philips PM 8151, Graphtek WX 4638/6, and compatible models. Screen dumps are activated by a front-panel push-button.

Cursors: Two time cursors give time resolution of $\pm 0.2\%$ of full scale for unexpanded traces; up to $\pm 0.002\%$ for expanded traces. The corresponding frequency information is also provided. Two voltage cursors measure voltage differences to 0.2% of full scale for each trace.

A cross-hair marker measures absolute voltage versus signal ground as well as the time relative to the trigger.