



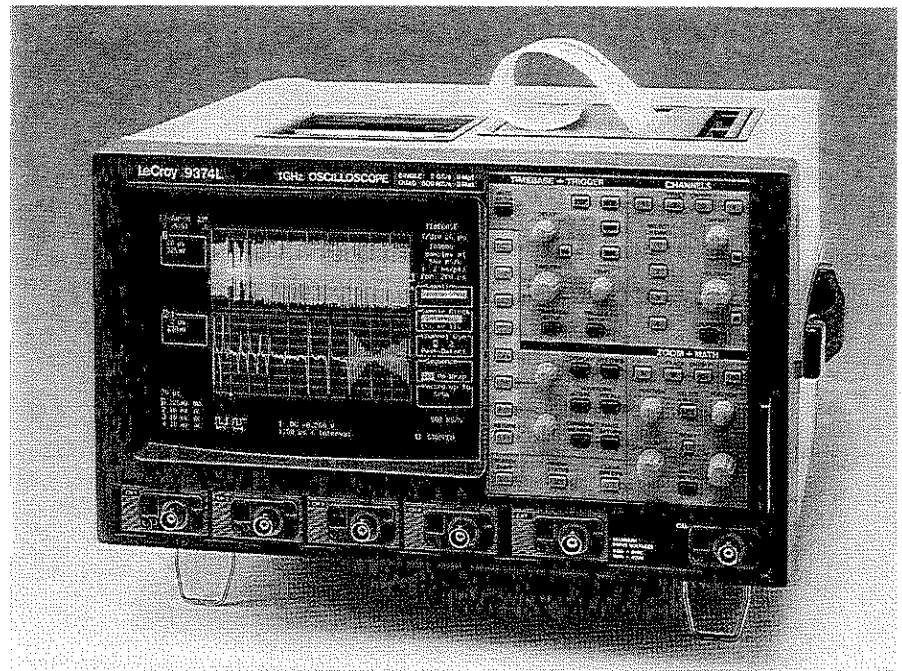
# LeCroy

Innovators in Instrumentation

## 9370 Series Digital Oscilloscopes 1 GHz Bandwidth, 2 GS/s

### Main Features

- Up to 8M-point record length
- 8-bit vertical resolution, 11-bit with ERES option
- Two- and four-channel versions
- Hard Disk (PCMCIA III), Memory Card and DOS-compatible Floppy Disk options
- Innovative Peak Detect
- Glitch, Pattern, Qualified, Interval, Dropout and TV triggers
- Fully programmable via GPIB and RS-232-C
- Internal graphics printer option
- Automatic PASS/FAIL testing
- Advanced signal processing



### 1 GHz Bandwidth

The 9370 series digital storage oscilloscope opens up new horizons for engineers and scientists at the leading edge of technological developments. With 1 GHz bandwidth and long acquisition memories, it is now possible to reveal previously hidden waveform details. Narrow glitches are more accurately defined; risetime measurements below 1 nanosecond are more precise; and high-frequency content, filtered out in lower bandwidth systems, is retained, thereby preserving signal amplitudes and overall signal integrity.

### 2 GS/s Sample Rate

The 2- and 4-channel models of the 9370 series sample simultaneously on all channels at 500 MS/s. Thus, they are ideal for demanding high speed applications. In addition, two channels can be combined to provide a sample rate of 1 GS/s. The 9374 provides 2 GS/s in single channel mode. Finer horizontal resolution and accuracy are guaranteed by high sample rates. This is especially critical in digital design where unpredictable circuit behavior has to be identified and analyzed in detail to be fully understood. Together with this excellent single-shot performance the 9370 series also provides a sample rate equivalent to 10 GS/s for repetitive signals.

### 8M Point Acquisition Memory

Channel memory lengths of 50k, 250k, 500k and 2M are available on the 9370 series 2- and 4-channel DSOs. The memory power is revealed when the user seeks to sample at the highest speed over many timebase settings. Short memory DSOs may boast a high sample rate for short waveforms, but only a long memory oscilloscope can deliver high sample rates for long waveforms. To exploit this capability to its fullest the LeCroy 9370 series combines its channel acquisition memories to give the user up to 8 million sample points, thereby providing the waveform detail required on long and complex signals. The combined capabilities of the 9370 series place it in the forefront of DSO capability.

## Features and Benefits

### WIDE BANDWIDTH

1 GHz bandwidth results in greater accuracy of amplitude measurements for high frequency signals and true representation of high speed digital signals.

### HIGH SAMPLE RATES

Sample rates of 500 MS/s, 1 GS/s and 2 GS/s provide greater waveform fidelity, excellent zoom detail, protection against aliasing, better time resolution and wider frequency spectrum.

### CHANNEL INTERLEAVING

Memory length is extended by combining the acquisition memories of multiple channels for both continuous or segmented waveform recording. Combining channels yields higher sample rates.

### ADVANCED PEAK DETECT SYSTEM

The 9370 series offers an innovative peak detect capture mode. This captures fast glitches or other signal details that might have been missed due to undersampling by running the ADC's at a high sampling rate even on slow time bases. At the same time the scope also stores the underlying data to ensure no loss of time precision - unlike other peak detect systems.

### SMART TRIGGER SYSTEM

SMART Trigger functions including Glitch, Pattern, Dropout, State- or Edge Qualified triggers are available.

Pre- and Post-trigger delay are fully variable, Time and Events Holdoff are also included.

The Smart Trigger system allows the scope to trigger on a large variety of signal types, specific signal characteristics and suspect behaviors.

### ProBus™ HIGH PERFORMANCE PROBE INTERFACE

The proprietary ProBus interface is supplied as standard on all 93XX family models. It provides a probe interconnection architecture to support the most demanding circuit probing requirements, both now and in the future.

The ProBus interface allows automatic detection of the attached probe as well as complete control, setup and calibration at the probe tip. The probe is no longer an accessory, but an integral part of the measurement solution, with ease of setup and probe-tip measurement accuracy guaranteed.

The ProBus interface supports a rapidly growing range of high-performance and custom probe solutions including high-bandwidth, low-circuit load FET probes.

### HIGH RESOLUTION DISPLAY AND EXCELLENT USER INTERFACE

A large high resolution CRT display supports uncluttered presentation of waveform data, information and control menus. Live waveforms can be viewed with up to three expansion regions showing all of the signal details.

The powerful processing capability provides a responsive feel even when extensive processing is being carried out. A proven multi-knob control panel combined with an intuitive menu system provide rapid access to the instrument's powerful capabilities.

### PERSISTENCE AND XY DISPLAY MODES

Persistence: Sample points are displayed so that they accumulate on the screen over many acquisitions. "Eye diagrams" and "Constellation displays" can be achieved using this display mode. XY mode plots any two sources against one another.

### WAVEFORM PROCESSING AND MEASUREMENT SYSTEM

Pass/Fail Testing and Waveform Limit Testing (Masks) can be performed. Measurements include Pulse Parameters, Statistics and Arithmetic functions. Any failure can cause preprogrammed actions such as Hardcopy, Save, GPIB Service Request, Pulse Out or Beep.

### OPTIONAL WAVEFORM MATH PACKAGE - WP01\*

Option WP01 provides Summed and Continuous Averaging, Waveform Math Functions, Extrema and Enhanced Resolution Modes.

Functions can be chained together, allowing complex computations. Waveform operations can be performed on live, stored, processed or expanded waveforms. The package is fully programmable over GPIB or RS-232-C. WP01 extends the processing capabilities of the 9370 and reduces the need for external computers and controllers for processing.

### OPTIONAL SPECTRAL ANALYSIS PACKAGE - WP02\*

Option WP02 provides comprehensive Spectral Analysis capabilities, permitting the system designer to identify characteristics which may not be apparent in the

time domain. WP02 provides a wide selection of windowing functions, as well as averaging in the frequency domain.

Spectral analysis can be performed on repetitive and single events. Users can obtain time and frequency values simultaneously and compare phases of the various frequency components with each other.

### OPTIONAL STATISTICAL ANALYSIS PACKAGE - WP03

Option WP03 provides extensive statistical analysis capabilities. Detailed analysis can easily be performed on difficult to measure waveform phenomena such as amplitude fluctuation and timing jitter. Live histogram displays represent the statistical distribution of selected waveform parameter measurements. Statistical information can be extracted directly from the histograms using automatic statistical measurements including max, min, average, median, std deviation, etc.

### MAGNETIC MEDIA MEASUREMENTS

The DDM/PRML disk drive firmware options provide a unique integrated tool for those developing and testing high-density storage media.

### DOS COMPATIBLE MASS STORAGE OPTIONS\*

The 9370 series offers 131MB removable hard disk (PCMCIA III), high speed memory card (PCMCIA II) and 3.5" 1.44 MB floppy disk. Traces, setups, screen graphics and Pass/Fail templates can be stored as DOS files and thus read directly by a PC for easy integration into reports.

### PRINTING FACILITIES\*

An optional internal thermal graphics printer produces full resolution screen dumps in under 10 seconds. The unique 'Strip-Chart' format expands the horizontal axis up to 2 meters per division for viewing fine waveform detail within long memory acquisitions.

A wide range of printer/plotter formats support external hardcopy via the standard GPIB, RS-232-C or optional Centronics interfaces.

### REMOTE PROGRAMMING CAPABILITY

Remote programming capability enables DSO control from PC and easy transfer of data for further analysis. The full command set is available via remote control.

# 9370 Series Specifications

## ACQUISITION SYSTEM

**Bandwidth (-3 dB):**

- @ 50 Ω: DC to 1 GHz  
10 mV/div and above
- @ 1 MΩ DC: DC to 500 MHz typ. at probe tip, with PP005 supplied standard.  
1 GHz FET probe optional.

**No. of Channels:** 4 (9374) or 2 (9370)

**No. of Digitizers:** 4 (9374) or 2 (9370)

**Maximum Sample Rate and Acquisition**

**Memories:** See table below.

**Sensitivity:**

- 2 mV/div to 1 V/div, 50Ω, fully variable
- 2 mV/div to 10 V/div, 1MΩ, fully variable.

**Scale factors:** A wide choice of probe attenuation factors are selectable.

**Offset Range:**

- 2.00 - 4.99 mV/div: ±400 mV
- 5.00 - 99 mV/div: ±1 V
- 0.1 - 1.0 V/div: ±10 V
- 1.0 - 10V/div: ± 100 V (1MΩ only)

**DC Accuracy:** Typically 1%.

**Vertical Resolution:** 8 bits.

**Bandwidth Limiter:** 25 MHz, 200 MHz.

**Input Coupling:** AC, DC, GND.

**Input Impedance:** 1 MΩ/15 pF or 50 Ω ±1%.

**Max Input:**

- 1 MΩ: 400 V (DC+ peak AC ≤10 kHz)
- 50 Ω: ±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 1,000 s/div.

**Clock Accuracy:** ≤10 ppm

**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:** ≤100 MHz on EXT input with ECL, TTL or zero crossing levels. Optional 50 MHz to 500 MHz rear panel fixed frequency clock input.

**External Reference:** Optional 10 MHz rear-panel input.

## TRIGGERING SYSTEM

**Trigger Modes:** Normal, Auto, Single, Stop.

**Trigger Sources:** CH1, CH2, Line, Ext, Ext/10 (9374: CH3, CH4). Slope, Level and Coupling for each source can be set independently.

**Slope:** Positive, Negative.

**Coupling:** AC, DC, HF, LFREJ, HFREJ.

**Pre-trigger recording:** 0 to 100% of full scale (adjustable in 1% 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 Range:** ±5 div.

**EXT Trigger Max Input:**

1 MΩ/15 pF: 400 V (DC + peak AC ≤10 kHz)  
50 Ω ±1%: ±5 V DC (500 mW) or 5 V RMS

**EXT Trigger Range:** ±0.5 V (±5 V with Ext/10)

**Trigger Timing:** Trigger Date and Time are listed in the Memory Status Menu.

**Trigger Comparator:** Optional ECL rear panel output.

## SMART TRIGGER TYPES

**Pattern:** Trigger on the logic AND of 5 inputs - CH1, CH2, CH3, CH4, and EXT Trigger, (9370: 3 inputs - CH1, CH2, EXT) where each source can be defined as High, Low or Don't Care. The Trigger can be defined as the beginning or end of the specified pattern.

**Signal or Pattern Width:** Trigger on width between two limits selectable from ≤ 2.5ns to 20s. Will typically trigger on glitches 1ns wide.

**Signal or Pattern Interval:** Trigger on interval between 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 nonstandard video.

## ACQUISITION MODES

**Random Interleaved Sampling (RIS):**

For repetitive signals from 1 ns/div to 5 μs/div.

**Single shot:** For transient and repetitive signals from 10 ns/div (all channels active).

**Peak detect:** Captures and displays 2.5 ns glitches or other high-speed events.

**Sequence:** Stores multiple events in segmented acquisition memories.

**Number of segments available:**

- 9370-9374 2-200
- 9370M-9374M 2-500
- 9370L-9374L-9374TM 2-2,000

**Max. Dead Time between segments:** 100 μs

## DISPLAY

**Waveform style:** Vectors connect the individual sample points, which are highlighted as dots. Vectors may be switched off.

**CRT:** 12.5x17.5 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 μV sensitivity, only with WP01).

**Maximum Horizontal Zoom Factors:**

- 9370-9374 2,000x
- 9370M-9374M 10,000x
- 9370L-9374L-9374TM 100,000x

Waveforms can be expanded to give 2-2.5 points/division. This allows zoom factors up to 400,000x for the 9374L when channels are combined.

## 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 Cards or Disks may also be used for high-capacity waveform and setup storage.

Channel Use	Maximum Sample rate	Memory per Channel				Active Channels
		9370 9374	9370M 9374M	9374TM	9370L 9374L	
All Peak Detect OFF	500 MS/s	50k	250k	500k	2M	All
Paired Peak Detect OFF	1 GS/s	100k	500k	1M	4M	9370: CH1 9374: CH2 & CH3
Paired + PP093 Peak Detect OFF	2 GS/s	200k	1M	2M	8M	One (PP093 input) 9374 models only
All Peak Detect ON	100 MS/s data + 400 MS/s peak	25k data + 25k peaks	100k data + 100k peaks	250k data + 250k peaks	1M data + 1M peaks	All 2.5 ns Peak Detect

**CURSOR MEASUREMENTS**

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

**Relative Voltage:** Two horizontal bars measure voltage differences up to  $\pm 0.2\%$  of full scale in single-grid mode.

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

**Absolute Voltage:** A reference bar measures voltage with respect to ground.

**WAVEFORM PROCESSING**

Up to four processing functions may be performed simultaneously. Functions available are: Add, Subtract, Multiply, Divide, Negate, Identity, Summation Averaging and Sine  $x/x$ .

**Average:** Summed averaging of up to 1,000 waveforms in the basic instrument. Up to  $10^6$  averages are possible with Option WP01.

**Extrema\*:** Roof, Floor, or Envelope values from 1 to  $10^6$  sweeps.

**ERES\*:** A selection of six Low-Pass digital filters provides up to 11 bits vertical resolution.

Sampled data is always available, even when a trace is turned off. Any of the above modes can be invoked without destroying the data.

**FFT\*:** Spectral Analysis with five windowing functions and FFT averaging.

\*Extrema and ERES modes are provided in Math Package WP01. FFT is in WP02.

**AUTOSETUP**

Pressing Autoseup sets timebase, trigger and sensitivity to display a wide range of repetitive signals. (Frequency above 50Hz; Duty Cycle greater than 0.1%).

**Autosetup Time:** Approximately 2 seconds.

**Vertical Find:** Automatically sets sensitivity and offset.

**PROBES**

**Model:** One PP005 (10:1, 10 M $\Omega$  // 11 pF) probe supplied per channel. 500 V max input. The 9370 series is fully compatible with LeCroy's range of FET probes, which may be purchased separately.

**Probe calibration:** Max 1 V into 1 M $\Omega$ , 500 mV into 50  $\Omega$ , 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.

**Ordering Information**

- Option included with instrument  
 Optional extra not included

**Oscilloscopes:**

9370/M/L	2 ch. Digital Oscilloscope
9374/M/L	4 ch. Digital Oscilloscope
9374TM	4 ch., +TP, +GP01

**Software Options:**

<input type="checkbox"/> 93XX-WP01	Waveform Math Package
<input type="checkbox"/> 93XX-WP02	FFT Processing Package
<input type="checkbox"/> 93XX-WP03	Statistical Analysis Package
<input type="checkbox"/> 93XX-DDM	Disk Drive Measurements
<input type="checkbox"/> 93XX-PRML	Supplementary Disk Drive Measurements

**Hardware Options:**

<input type="checkbox"/> 93XX-MC01/04	Memory Card Reader with 512K Memory Card
<input type="checkbox"/> 93XX-MC02	128K Memory Card
<input type="checkbox"/> 93XX-MC04	512K Memory Card
<input type="checkbox"/> 93XX-HDD	HD01/HD02 combination
<input type="checkbox"/> 93XX-HD01	Hard Disk Adapter
<input type="checkbox"/> 93XX-HD02	PCMCIA Hard Disk 131MB
<input type="checkbox"/> 93XX-DA01-110	PCMCIA type III external desktop adaptor for PC (110V)
<input type="checkbox"/> 93XX-DA01-220	PCMCIA type III external desktop adaptor for PC (220V)
<input type="checkbox"/> 93XX-FD01	Internal 3.5" Floppy Drive with Centronics interface
<input type="checkbox"/> 93XX-GP01	Internal Graphics Printer with Centronics interface
<input type="checkbox"/> 937X-CKTRIG	500MHz External Clock, 10 MHz Reference Input, Trigger Comparator Output

<input type="checkbox"/> 930X-64	64MB Processing Memory
<input type="checkbox"/> 93XX-TP	Total Performance Package WP01/WP02 + FD01

**Manuals:**

<input checked="" type="checkbox"/> 937X-OM	Operator's manual
<input checked="" type="checkbox"/> 93XX-RCM	Remote Control manual
<input type="checkbox"/> 937X-SM	Service manual
<input checked="" type="checkbox"/> 93XX-HG	Hands-On Guide

**Warranty & Calibration:**

<input type="checkbox"/> 93XX-CCMIL	US Military Standard
<input type="checkbox"/> 93XX-CCOFMET	Swiss OFMET Standard
<input type="checkbox"/> 93XX-CCNIST	US NIST Standard
<input type="checkbox"/> 93XX-W5	5 Year Warranty
<input type="checkbox"/> 93XX-C5	5 year Calibration Contract
<input type="checkbox"/> 93XX-T5	5 year Warranty and Calibration

**Probes & Accessories:**

<input type="checkbox"/> AP020	1 GHz 10:1 FET Probe
<input type="checkbox"/> AP021	800 MHz 5:1 FET Probe
<input type="checkbox"/> AP030	15 MHz Differential Probe
<input type="checkbox"/> AP082	SDH STM-1E Trigger Pick-Off
<input type="checkbox"/> AP083	SONET Trigger Pick-Off
<input type="checkbox"/> AP54701A*	2.5 GHz 0.6pF Active Probe
<input type="checkbox"/> AP1143A*	Probe Offset and Power Module
<input checked="" type="checkbox"/> PP005	500 MHz 10:1 10 M $\Omega$ Passive Probe (1 per channel)
<input type="checkbox"/> PP012	100:1 Probe
<input type="checkbox"/> PP062	1 GHz, 10:1, 500 $\Omega$ Passive Probe
<input type="checkbox"/> PP090	ProBus 75 to 50 $\Omega$ adaptor
<input checked="" type="checkbox"/> PP093	2 GS/s adaptor (only 9374/M/L/TM)

\* Normally ordered together

**INTERFACING**

**Remote Control:** Possible by GPIB and RS-232-C for all front-panel controls, as well as all internal functions.

**RS-232-C Port:** Asynchronous up to 19200 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.

**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 BW), HP ThinkJet, QuietJet, LaserJet, PaintJet and EPSON printers; HP 7470 and 7550 plotters or similar, and HPGL-compatible plotters. An 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.

**Safety:** Conforms to EN 61010-1.

**EMC:** Conforms to EN50081-1, EN 50082-1.

**Power:** 90-250 V AC, 45-66 Hz, 230 W.

**Battery Backup:** Front-panel settings maintained for two years.

**Dimensions:** (HWD) 8.5"x14.5"x16.25", 210mm x 370mm x 410mm.

**Weight:** 13 kg (28.6 lbs) net, 18.5 kg (40.7 lbs) shipping.

**Warranty:** Three years.

**Note:** The 9374TM model includes WP01/02, floppy disk and graphics printer.

**USA Direct Sales: 1 (800) 5LE-CROY****LeCroy Worldwide Sales Offices**

ASIA/PACIFIC	LeCroy Pty Ltd	61.38.90.7358
BENELUX	LeCroy BV	40.208.9285
FRANCE	LeCroy SARL	(1).69.18.83.20
GERMANY	LeCroy Europe GmbH	06221.82.700
ITALY	LeCroy SRL	06.336.797.00
JAPAN Osaka	LeCroy Japan	0816.330.0961
JAPAN Tokyo	LeCroy Japan	0813.3376.9400
SWITZERLAND	Geneva	022.719.21.11
SWITZERLAND	Lenzburg	062.885.80.50
United Kingdom	LeCroy Ltd	(01235) 533114

Copyright © February 1996. LeCroy is a registered trademark of LeCroy Corporation. All rights reserved. Information in this publication supersedes all earlier versions. Specifications subject to change without notice.