WavePro 954

LEADING FEATURES

- *1 GHz bandwidth*
- *2 GS/s sample rate*
- *8 GS/s single channel mode*
- *250 kpoints memory/ch*
- *Wavepilot toolbar*
- *10.4" TFT LCD color display*
- *GPIB, RS232 standard ethernet (optional)*

WavePro 954 scopes are feature-laden with attractive price/performance ratios.

Great Value

The WavePro 954 scope incorporates the same industry-leading 'digitizer on a chip' technology that made the WavePro series scopes a big hit with design engineers.

WavePro scopes offer faster sampling rates and longer memory in the 500 MHz to 2 GHz range, at lower prices, than other digital oscilloscopes.

Now, the model 954 at 1 GHz and with useful features like Wavepilot, Quick Zoom, and analog persistence, underscores the unique price/performance appeal of WavePro scopes.

Easy to Use & Powerful Too

The WavePro 954 is designed to get you up and running quickly. Its color-coded front panel, simple menu system, common tasks toolbar (Wavepilot) and rich analysis feature-sets, all help you easily master the scope *and* your measurements. Take shortcuts to obtain data with one button access to 26 different parameter measurements, another button links to cursor measurements, and more. Save time with dedicated keys for time/date stamping, stored custom routines and persistence mapping. Two new high frequency probes (the HFP series models 1500 & 2500) preserve the full 1 GHz bandwidth of the scope at the probe tip. Physically small and with low mass, they are perfect for working in tight spaces.

Today's leading edge designs require the capture, viewing and analysis of long, complex signals. The WavePro series is ideally suited to this critical function. And the 954 is an outstanding value when your budget is limited but your measurement challenges are abundant.

WavePro 954
Specifications

Vertical System	WavePro 954
Analog Bandwidth @ 50 Ω (-3 dB)	1 GHz
Input Channels	4
Bandwidth Limiters	20 MHz, 200 MHz
Input Impedance	50 Ω ± 1.5%; 10 MΩ // 11 pF typical (using PP005 probe)
Input Coupling	1 MΩ : AC, DC, GND; 50 Ω : DC, GND
Maximum Input	50 Ω : 5 Vrms; 1 MΩ : 100 Vmax (peak AC ≤5 kHz + DC)
Vertical Resolution	8 bits; up to 11 bits with enhanced resolution (ERES)
Sensitivity	50 Ω : 1 mV – 1 V/div fully variable ; 1 MΩ : 1 mV – 2 V/div fully variable
Offset Range	50 Ω or 1 MΩ : 1 mV – 4.99 mV/div: ±400 mV, 50 Ω : 5 mV – 99 mV/div: ±1 V; 0.1 V – 1 V/div: ±10 V 1 MΩ: 5 mV – 100 mV/div: ±1 V; 101 mV – 2 V/div: ±20 V

Timebase System	
Timebases	Main and up to four independent zoom traces simultaneously
Clock Accuracy	≤10 ppm
Interpolator Resolution	5 ps
External Clock Frequency	500 MHz maximum, 50 Ω, or 1 MΩ impedance
Roll Mode – Operating Range	time/div 500 ms – 1000 s/div or sample rate < 100 kS/s max

Acquisition System	
Single-Shot Sample Rate	8 GS
2 Channels Max.	4 GS/s
3 – 4 Channels Max.	2 GS/s
Maximum Acquisition Points/Ch	(1 Ch) / (2 Ch) / (3 – 4 Ch)
Standard	1M / 500k / 250k
M – Memory Option	4M / 2M / 1M

Acquisition Modes	
Random Interleaved Sampling (RIS)	50 GS/s for repetitive signals: 200 ps/div – 1 µs/div
Single-Shot	For transient and repetitive signals: 200 ps/div – 1000 s/div
Sequence	2 – 1000 segments
Intersegment Time	Typically 30 µs

Acquisition Processing	
Averaging	Summed averaging to 10^3 sweeps (standard). Continuous averaging up to 10^6 sweeps with weighting range from 1:1 to 1:1023 (option).
Enhanced Resolution (ERES)	From 8.5 to 11 bits vertical resolution
Envelope (Extrema)	Envelope, floor, roof for up to 10^6 sweeps

Triggering System	
Modes	Normal, Auto, Single, and Stop
Sources	Any input channel, external, Ext/5 or line; slope, level, and coupling unique to each source (except line trigger)
Coupling modes	DC, AC, HF, HFREJ, LFREJ
Pre-trigger delay	0 – 100% of horizontal time scale
Post-trigger delay	0 – 10000 divisions
Hold-off by time or events	Up to 20s or from 1 to 99 999 999 events
Internal trigger range	±5 div
Max trigger frequency	1 GHz (DC, AC), > 1 GHz (HF)
External trigger input range	±0.5 (±2.5 V with Ext/5 selected)

Automatic setup	
Auto Setup	Automatically sets timebase, trigger, and sensitivity to display a wide range of repetitive signals
Vertical Find	Automatically sets the vertical sensitivity and offset for the selected channels to display a waveform with maximum dynamic range

WavePro 954

Specifications (continued)

Probes	
Model PP005	10 : 1, 10 MΩ with autodetect (one per channel)
Probe System: Probus®	Automatically detects and supports a wide variety of differential amplifiers; active, high-voltage, current, and differential probes
Scale Factors	Up to 12 automatically or manually selected
Color Waveform Display	
Type	Color 10.4" flat-panel TFT-LCD
Resolution	VGA 640 x 480 pixels
Real Time Clock	Date, hours, minutes, and seconds displayed with waveform
Number of Traces	Display a maximum of eight traces. Simultaneously display channel, zoom, memory, and math traces.
Grid Styles	Single, Dual, Quad, Octal, XY, Single + XY, Dual + XY; Full Screen gives enlarged view of each style.
Intensity Controls	Separate intensity control for grids and waveforms
Waveform Styles	Sample dots joined or dots only — regular or bold sample point highlighting.
Trace Overlap Display	Select opaque or transparent mode with automatic waveform overlap management.
Analog Persistence Display	
Analog & Color-Graded Persistence	Variable saturation levels; stores each trace's persistence data in memory.
Trace Selection	Activate Analog Persistence on a selected trace, top 2 traces, or all traces.
Persistence Aging Time	Select from 500 ms to infinity.
Trace Display	Opaque or transparent overlap
Sweeps Displayed	All accumulated or all accumulated with last trace highlighted
Zoom Expansion Traces	
Display up to Four Zoom Traces	
	Vertical zoom up to 5X expansion, 50X with averaging
	Horizontal zoom expand to 2 pts/div, magnify to 50000X
	Auto Scroll automatically scans and displays any zoom or math trace.
Rapid Signal Processing	
Processor	PowerPC
Processing Memory	Up to 256 Mbytes
Realtime Clock	Dates, hours, minutes, seconds
Internal Waveform Memory	
Waveform	M1, M2, M3, M4 (Store full-length waveforms with 16 bits/data point)
Zoom and Math	Four traces A, B, C, D with chained trace capability
Setup Storage	
Front Panel and Instrument Status	Four non-volatile memories and floppy drive are standard. Hard drive and memory card are optional.
CustomDSO	Customize and access scope settings with up to 5 CustomDSO files stored in non-volatile Virtual Disk (VDisk).
Interface	
Remote Control	Full control of all front panel controls and internal functions via RS-232-C, GPIB, or Ethernet
RS-232-C	Asynchronous transfer rate of up to 115.2 kbaud
GPIB Port	Full control via IEEE – 4888.2; configurable as talker/listener for computer control and data transfer
Ethernet (optional)	10 BaseT Ethernet interface
Floppy Drive	Internal, DOS-format, 3.5" high-density
PC Card Slot (optional)	Supports memory and hard drive cards
External Monitor Port Standard	15-pin D-Type VGA-compatible
Centronics Port	Parallel printer interface
Internal Graphics Printer (optional)	Hard copy output in <10 seconds or strip chart mode up to 200 cm/div
Pass/Fail and Trigger Output	Front panel Cal BNC output provides choice of Cal Signal, Pass/Fail Condition, Trigger Ready, or Trigger Out signals

WavePro 954
Specifications (continued)

Outputs

Calibrator Signal	500 Hz – 2 MHz square wave or 25 ns pulse; 0.05 to +1.0 Volt into 1 MΩ output on front panel BNC
Control Signals	Trigger ready, trigger out, pass/fail status

General

Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum
Auto Calibration time	<500 ms
Power Requirements	90–132 V AC at 45–440 Hz; 180–250 V AC at 45-66 Hz; Power consumption: 350 VA max
Battery Backup	Front panel settings retained for two years minimum
Warranty and Calibration	Three years; calibration recommended yearly

Physical Dimensions

Dimensions (HWD)	264 mm x 397 mm x 453 mm; 10.4" x 15.65" x 17.85" (height excludes feet)
Weight	14 kg; 31 lbs (with internal printer)
Shipping Weight	22.2 kg; 49 lbs

Service

LeCroy service programs include unique service upgrades for LeCroy oscilloscopes, metrology modules customized for your company, and more. Whether you own one LeCroy instrument or hundreds, whether you need prompt attention from our service offices or an onsite service contract, LeCroy is committed to your success. Call your LeCroy service representative to discuss your company's specific requirements.

Math Tools (Standard)

Simultaneously perform up to four math (signal) processing functions; traces can be chained together to perform math-on-math.

absolute value
average (summed to 1000 sweeps)
difference
differentiate
enhanced resolution (to 11 bits vertical)
envelope
exp (base e)
exp (base 10)
FFT of 50 kpoint waveforms
floor
histogram of 200 events
identity
integrate
log (base e)
log (base 10)
negate
parameter trackview
product
ratio
reciprocal (invert)
resample (deskew)
rescale (with units)
roof
sin x/x
square
square root
sum
trend (datalog)

Measure Tools (Standard)

Dashboard displays up to 26 parameters; Display any five parameters together with their average, high, low, and standard deviations.

Automated Measure Tools

amplitude
area
base
cycle std. deviation
cycle mean
cycle rms
cycles
delay
fall 90-10%
fall 80-20%
frequency
maximum
mean
minimum
+overshoot
–overshoot
peak-to-peak
period
rise 10-90%
rise 20-80%
rms
std. deviation
top
width
xamn
xamx

Δ delay
Δ time @ level; % and volts
Δ time @ level from trigger
Δ time from clock to data + (setup time)
Δ time from clock to data - (hold time)
cycle median
data
duration
duty cycle
fall @ level; % and volts
first point
last point
median
number of points
phase
rise @ level; % and volts
time @ minimum (min)
time @ maximum (max)

Pass/Fail

Test any five parameters against selectable thresholds. Limit testing is performed using masks created on the scope or PC. Set up a pass or fail condition to initiate actions such as hard-copy output, saving waveform to memory, GPIB SRQ, or pulse out.

WAVEANALYZER PRO (WAVAPRO)

This package provides the most comprehensive set of signal analysis tools for expanding the capability of WavePro oscilloscopes. It includes:

- Histograms with 18 histogram parameters on 2 billion events
- Summed averaging to one million sweeps
- Continuous weighted averaging
- FFT capability expands the basic FFT to include:
  - FFT power averaging
  - FFT power density – real and imaginary
  - FFT on all acquisition points up to 25 Mpts
- Jitter and Timing Analysis (JTA)
- Digital Filter Package (DFP)

WavePro 954
Specifications (continued)

Other Application Solutions Available

JitterPro (JPRO)
Clock Certification and Test Module—for Rambus clock generator (CCTM)
Jitter and Timing Analysis (JTA)
WaveAnalyzer Package (WAVA)
Polymask Mask Testing (PMSK)
Advanced Optical Recording Measurements (AORM)
Disk Drive Measurements (DDM)
PRML Analysis (PRML)
PowerMeasure Analysis (PMA)

Software Utilities

ScopeExplorer
Easy-to-use utility that provides a simple but powerful way to control your scope remotely over RS-232-C, GPIB, or Ethernet.

ActiveDSO
ActiveX controls for flexible Windows applications programming with remote control.

MaskMaker
Create your tolerance mask offline with this graphic tool.

DSO Filter
Specify a set of filter coefficients offline and load them into the scope.

Basic Triggers

Edge/Slope/Window/Line	Triggers when signal meets slope and level condition

SMART Triggers

State or Edge Qualified	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between sources is selectable by time or events.
Dropout	Triggers if signal drops out for longer than selected time between 2 ns and 20 s
Pattern	Logic combination of 5 inputs (4 channels and external trigger input); Each source can be high, low, or don't care. Trigger at start or end of the pattern.

SMART Triggers with Exclusion Technology

Signal or Pattern Width	Triggers on glitches or on pulse widths selectable from 600 ps to 20 s or on intermittent faults.
Signal or Pattern Interval	Triggers on intervals selectable between 2 ns and 20 s
Slew Rate	Triggers on edge rates; select limits for dV, dt, and slope
Runt	Positive or negative runts defined by two voltage limits and two time limits selectable between 600 ps and 20 ns

Ordering Information

WavePro 954 Digital Oscilloscope	Product Code
1 GHz, 4 GS/s, 250 kpts/ch, 4 Channel Color DSO	WAVEPRO 954
Included with Standard Configuration:	
10:1 10 MΩ Passive Probe (1 per channel)	PP005
Operator's Manual, Quick Reference Guide, CD-ROM with OM/RCM PDF manuals, and utility software	WAVEPRO-OPDOCS
Remote Control Manual	WP-RCM
Floppy Disk Drive	
GPIB, RS-232-C, Centronics Parallel Port, VGA Video Output Port	
Protective Front Cover	
Performance Certificate	
Three-Year Warranty	
Memory Option	
M 4 Mpts max, 1 Mpts/ch	Option-M
Hardware Options	
Internal Graphics Printer	WAVEPRO-GP02
10 BaseT Ethernet LAN option	WAVEPRO-LAN10BT
PC Card Slot	PCSLOT
PC Card Slot including 1 hard drive card and 1 memory card	PCMEDIA
Software Options	
WaveAnalyzer Pro Analysis Package (includes WAVA, JTA, and DFP)	WAVAPRO
WaveAnalyzer Analysis Package	WAVA
ITU G.703 Fully Automated Mask Tester	MT01
ANSI T1.102 Fully Automated Mask Tester	MT02
ITU G.957 STM-1 and STM-4 Fully Automated Mask Tester with O/E converter and reference receiver	MT03
Jitter and Timing Analysis Package	JTA
JitterPro	JPRO
Digital Filter Package	DFP
Disk Drive Measurements	DDM
Supplementary Disk Drive Measurements	PRML
Advanced Optical Recording Measurements	AORM
PowerMeasure Analysis Software	PMA1
Selected Accessories	
Graphic Printer Paper/10 Rolls	GPR10
Oscilloscope Carts	OC-1021 & OC-1024
I GHz Active Voltage Probe	HFP 1000
I.5 GHz Active Voltage Probe	HFP 1500
2.5 GHz Active Voltage Probe	HFP 2500
Warranty & Calibration	
NIST Calibration Certificate	CCNIST
MIL STD Calibration	CCMIL
Swiss OFMET Standard	CCOFMET
5-Year Repair Warranty	W5
5-Year NIST Calibration Contract	C5
5-Year Warranty & NIST Calibration	T5

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