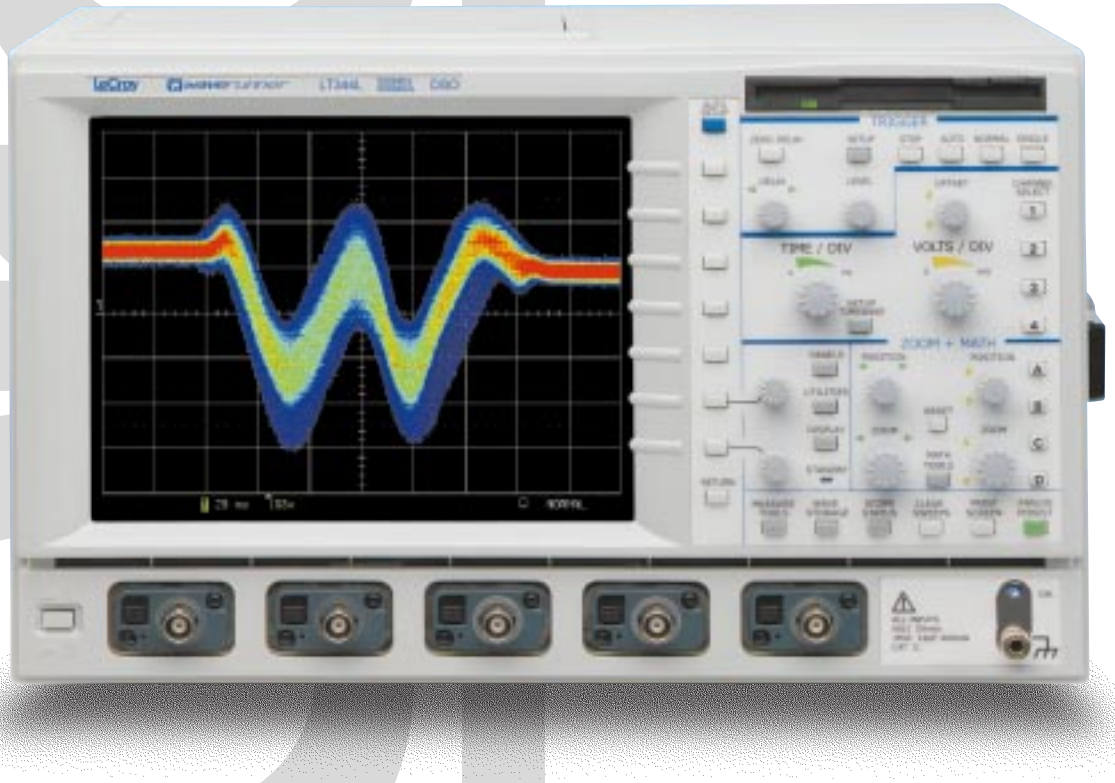
waverunner™

LeCroy
Digital Oscilloscopes

Get the Complete Picture

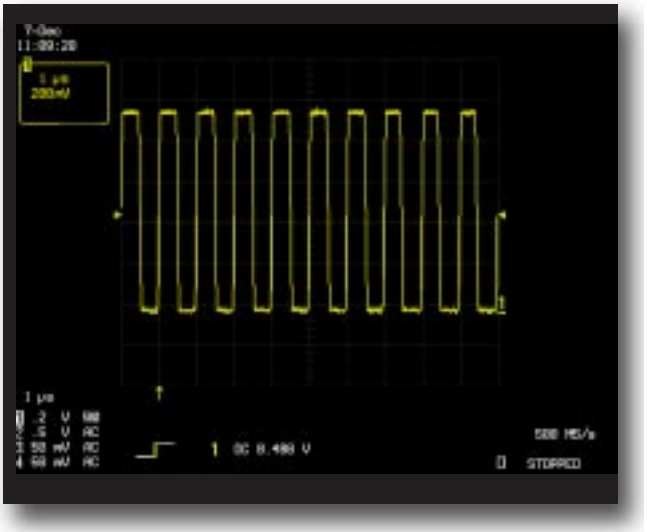


Quick Reference Guide

LeCroy

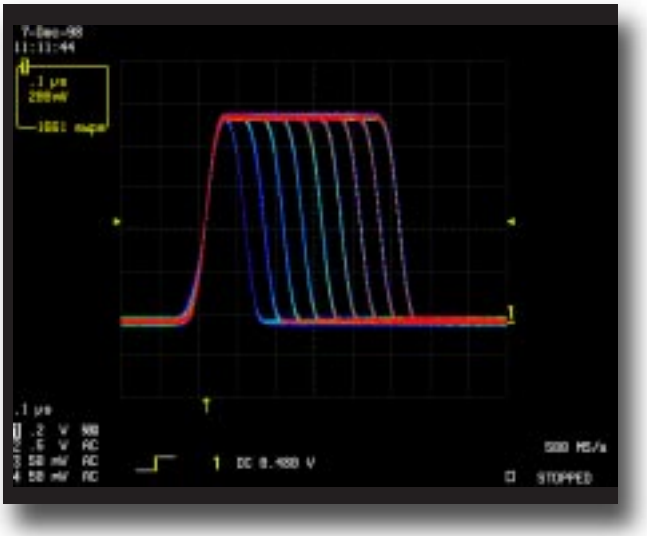
QUICKSTART TO SIGNAL VIEWING

Quickly display a signal



1. Connect your signal. When you use a probe, Probus automatically sets the vertical scale factor.
2. Press **Autosetup** , and view.

View with Analog Persistence



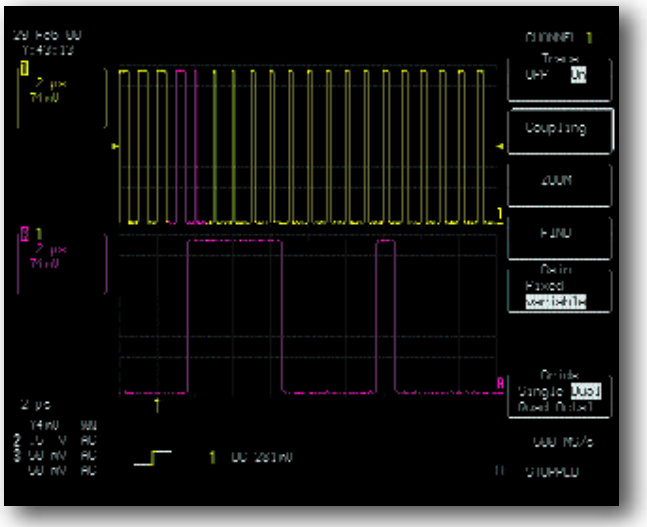
Press **Analog Persist** to access the power of Analog Persistence. The three-dimensional view shows variations in a waveform as intensity or color-graded variations.
Press **Display** to customize the display.

Press a **Channel Select** button and use the control knobs to adjust that channel's Volts/Div and offset settings. Press twice to toggle the channel between on and off.

Adjust the **Time/Div** and SMARTMemory automatically assures the maximum resolution for each timebase setting.

Press **Setup Timebase** to setup the scope's timebase and acquisition system.

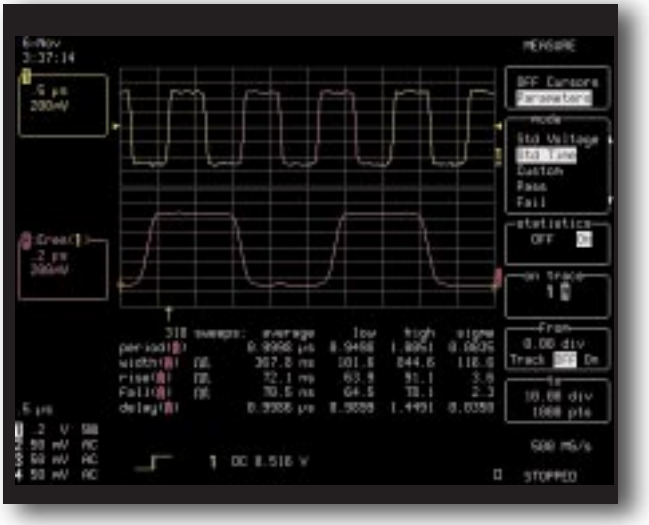
Quickly zoom on signal details



1. Use **Channel Select** for signal selection. (TIP - choose a grid style - single, dual, quad, or octal for maximum signal fidelity.)
2. Select **ZOOM** and view - Use the zoom controls to magnify and inspect.

QUICKLY MEASURE AND ANALYZE

Measure with parameters and cursors



Press **Measure Tools** to choose measurements with cursors or automatic parameter measurements with statistics for multiple sweeps.

1. Select standard **Time** or **Voltage** measurements.
2. Turn parameter statistics on and off.
3. Select **Custom** to establish your own set of measurements. Press **Panels** to save for later.

Waveform math for enhanced resolution

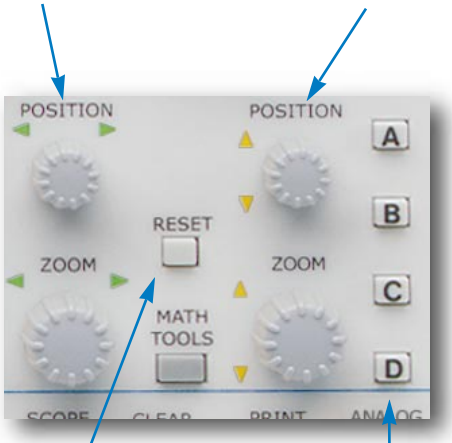
Press button **A**, **B**, **C**, or **D** to setup a zoom trace for math processing.

1. Select **Setup**
2. Select **Use Math**
3. Choose a function to set up.

Math and analysis can be performed on any trace. The result is displayed on trace A, B, C, or D.

Rotary controls adjust the horizontal position and magnification of the selected zoom trace.

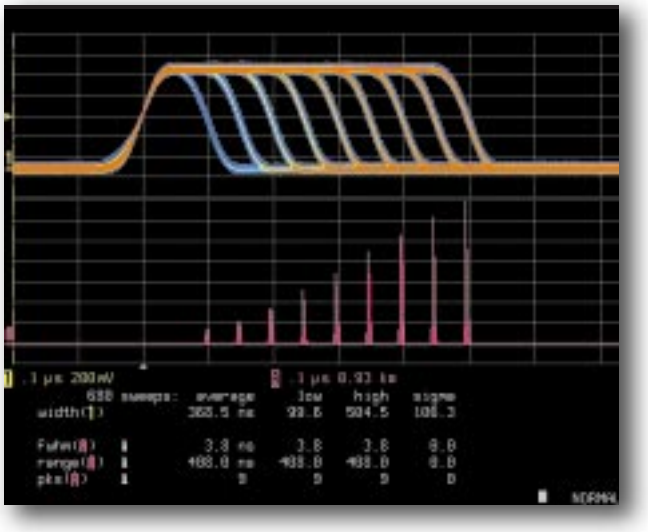
Rotary controls adjust the vertical position and magnification of the selected zoom trace.



Press to reset the zoom magnification to 1:1. Also used to reset math and analysis functions.

Buttons **A**, **B**, **C**, **D**, select a zoom trace for setup and control. Press twice to toggle between on and off.

Parameter analysis with histograms



Histograms are math functions which are displayed on traces A, B, C, or D.

1. Press button **A**, **B**, **C**, or **D**.
2. Select **Setup**
3. Select **Use Math** and select a **Parameter**.

Histograms show the graphical result of multiple measurements. Histogram parameters quantify the graphical result.

MATH-MEASUREMENTS-ANALYSIS

Standard Math in all Waverunner Oscilloscopes

Arithmetic: Sum (add), Difference (subtract), Product (multiply), Ratio (divide).
Averaging: Summed, or linear, average of up to 1000 sweeps.
Extrema: Display trace envelope, floor, and roof.
FFT: Fast Fourier Transform to 50 000 points; Power Spectrum, Phase, Magnitude; FFT Windows include Flat Top, Rectangular, Blackman Harris, Von Hann, Hamming.
Other Functions: Identity, Negation (Invert), Sine x/x.
Resample: To deskew as well as resample signals.
Rescale: Assign new physical units or rescale.
ERES: Enhanced Resolution for up to 11 bits of vertical resolution.
Trending: Plot a parameter versus time or versus another parameter.

Standard Measurements in all Waverunner Oscilloscopes

ampl	Amplitude
area	Integral of waveform data
base	Lower of two most probable states
cycles	Number of cycles of a periodic waveform
cmean	Cyclic mean: The average of waveform data
Crms	Cyclic root mean square
delay	Time from trigger to transition
Δdly	Time between 50% level of two sources
duty	Duty cycle: Width as percentage of period
f80-20%	Fall time from 80-20%
fall	Fall time from 90-10%
freq	Frequency
maximum	The highest point in waveform
mean	Average of data for time domain waveform
minimum	Measures the lowest point in a waveform
over-	Overshoot negative
over+	Overshoot positive
period	Period of a cyclic signal
pkpk	Peak-to-peak
phase	Phase difference between signal analyzed and signal used as reference
r20-80%	Rise time from 20% to 80%
rise	Rise time from 10% to 90%
rms	Root Mean Square of data between the cursors
top	Higher of two most probable states
width	Width of cyclic signal: all waveform pulses are averaged then displayed

Waveanalyzer Option (WAVA)

All standard math and measurement tools plus...

Extended Averaging
Summed, or linear, Average of up to one million waveforms; Continuous Average.

Extended FFT
Fast Fourier Transform to one million points; FFT Average; Power Averaging, Power Density, Real, Real + Imaginary.

Histograms
Graphical analysis with Histograms and Histogram Analysis Parameters.

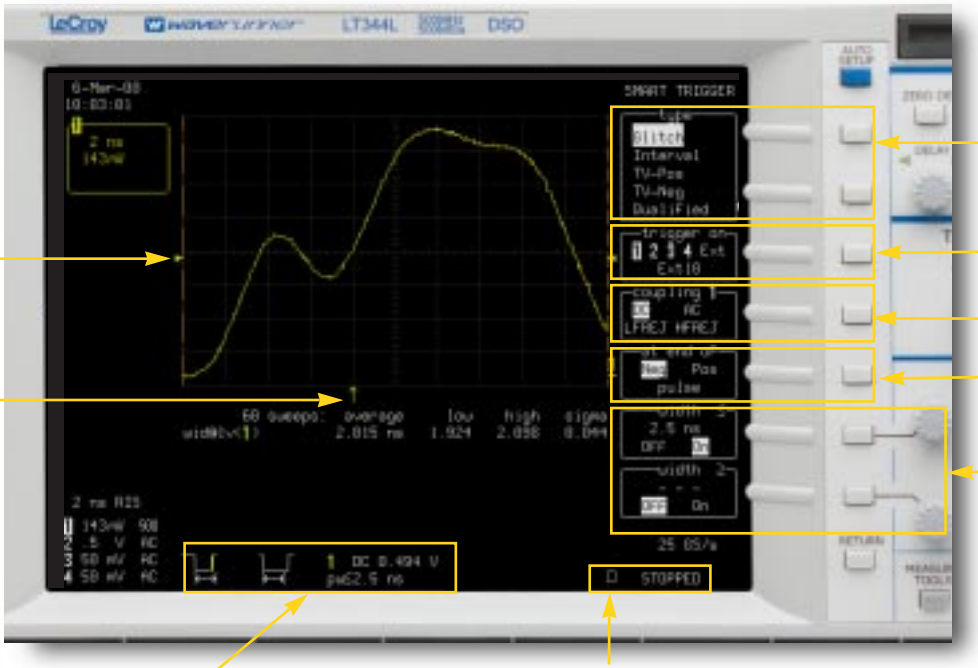
Math Functions*
Absolute Value, Derivative, Exp (base e), Exp (base 10), Integral, Log (base e), Log (base 10), Reciprocal (1/x), Square, Square Root.

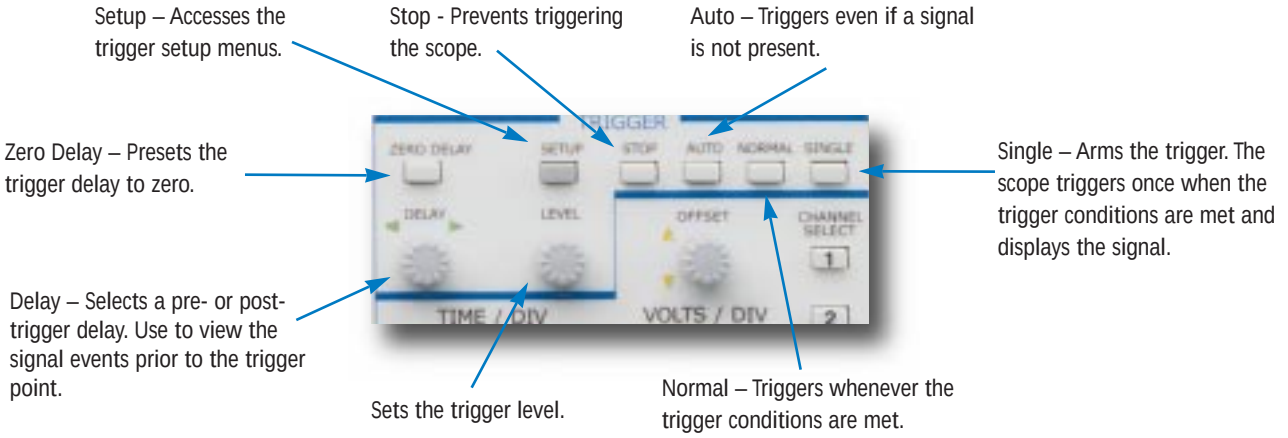
Parameter Measurements*

Cmedian	Cyclic median: average of base and top values over an integral number of cycles.
Csdev	Cyclic standard deviation.
Δc2d±	Δ clock to data ± (setup and hold time)
Δt@lv	The transition time between selected levels on a single trace or between two traces.
first	Indicates value of horizontal axis at left cursor.
last	Time from trigger to last (rightmost) cursor.
median	The average of base and top values.
r@level	Rise time between selected voltage levels.
Points	Number of points in the waveform between the cursors.
sdev	Standard deviation of data between the cursors.
t@level	Time from trigger (t=0) to crossing at a level.
f@level	Fall time between selected voltage levels.
Dur	The time between triggers in segment or other history modes.

**** Also included with EMM***

TRIGGERING





WAVERUNNER BASIC TRIGGERS

Name	Description
Edge	Select positive or negative slope and holdoff by time or events.
Window	Set a window around the trigger level. Trigger whenever the signal crosses outside the window in either direction.

WAVERUNNER SMART TRIGGERS®

Name	Description
Glitch	Triggers at end of positive or negative pulses down to 2 ns. Trigger when pulse is > or < or within a range (< and >) or outside a range.
Interval	Triggers on intervals between positive or negative edges. Trigger when interval is > or < or within a range (< and >) or outside a range.
Qualified	Qualify by edge or state. Triggers on one channel after a defined state or edge has occurred on another channel. Set a time that the second must occur within to trigger or a wait time or number events before triggering.
Dropout	Triggers if the input signal drops out for longer than selected time.
TV	Triggers on line (up to 1500) in odd or even fields for PAL, NTSC, or non-standard video.

GENERAL CONTROLS

Two rotary controls are multipurpose, including menu item selection, cursor movement, and setting memory length.

Utilities – Functions include setup of hardcopy printing, Cal Out signal, GPIB, and I/O interfaces, as well as other functions.

Setup display characteristics and functions, including color schemes, and persistence conditions. Toggling Analog Persist on shows a second menu.

Print to the hardcopy device setup in the utilities menu (hard-copy selection).

Store and recall waveforms to/from internal scope memory, floppy disk, or PC cards.

Clear data acquired in persistence displays, sweep averaging, and measurement statistics.

Check the status of the scope's systems, and setup conditions; add software options, and free up memory.

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REAR PANEL