



# J-250 and J-260 Jitter and Timing Analyzers

The Jitter and Timing Analyzers are premium jitter and timing analysis systems for design and test engineers who regularly perform high-speed clock or datastream measurements and circuit timing analysis. The *Smart Jitter* software in Jitter and Timing Analyzers is an enhanced version of LeCroy's original JTA and JPRO packages. It has an easy-to-use Jitter Setup Wizard that configures the system for measurement type, input, and acquisition. This means that jitter measurement, viewing, and analysis can proceed easily and quickly with a minimum of additional operations.

## Overview

### Note:

**J-250 or J-260 Jitter and Timing Analyzer** – the name of the complete hardware and software package.

**Smart Jitter** – the name of the software package in the Jitter and Timing Analyzers.

**Setup Wizard** – the part of the software that guides you through the process of setting up jitter or timing measurements.

Both analyzers contain a unique assortment of hardware and software features to maximize jitter measurement accuracy and repeatability, and to minimize the time spent in measurement setup. The optional AP-265 Differential and Single-Ended Edge Conditioner provides more accurate and repeatable measurements on a wide range of signals. The Jitter Setup Wizard permits fast, easy setup of the measurement so that viewing and analysis can proceed quickly. Setup is fast and flexible — at no point are you “locked out” from setting or changing any front panel controls. Advanced statistical, time, and numerical views of jitter are quickly available at the push of just one button. Jitter and timing measurements are conveniently grouped and displayed, also at the press of a single button.

Further spectral views or other analyses of jitter can also be easily selected and set up in the **Analysis** menu. The fast processing speed of the unit ensures minimum wait time, even when you're analyzing hundreds of thousands of clock edges with multiple jitter views displayed. In addition, the Jitter and Timing analyzers can also be used as regular digital storage oscilloscopes to view and analyze a wide variety of signals (reference the *WavePro Operator's Manual* for more information on its operation and capabilities as a DSO).



### Viewing Capabilities

The *Smart Jitter* software package in the Jitter and Timing Analyzer provides views of jitter in three domains: statistical, time, and frequency. Numerical measurements are also calculated.

You'll get a much more complete picture of the signal because histograms are based on a statistically significant number of measurements (more than 700k, depending on clock rate) on larger samples (up to 32M).

Measurement parameters can be displayed in a number of different groupings, depending on whether you wish to perform statistical analysis on multiple acquisitions (Jitter Stat), jitter measurement on a single acquisition (Jitter Data), or analysis of the raw clock or data signal (Signal Integrity). It is easy to view 14 different clock, jitter, and statistical parameters with the push of a button. User defined parameters can also be set up in a "Custom" group.

The unique JitterTrack function is a time-vs.-time display of jitter. It clearly demonstrates the nature of jitter, and helps locate its source by making possible time-synchronized correspondences between jitter patterns and clock or data signals. These visible correspondences take the guesswork out of troubleshooting and debugging, and can be displayed on the screen with the push of two buttons.

The JitterFFT is an FFT (Fast Fourier Transform) of the JitterTrack. It provides a spectral view of frequency that isolates jitter from the rest of the signal to give an accurate picture of the problem. By determining and correcting the causes of timing variations at observed spectral values, peak jitter can be substantially lowered.

In addition to the above capabilities, you can phase-demodulate a clock signal to determine whether there is any amplitude, frequency, or phase modulation present (Phase Demod). You can also analyze a vertical or horizontal slice of a persistence map of multiple waveforms (Persistence Histogram), display data acquired from multiple sweeps of a waveform (Persistence Trace), or represent the evolution of timing parameters in line graphs (Trends).

## New Capabilities

The analyzer includes new capabilities to measure half period jitter per JEDEC JESD-82.

## Measurement Capability

The *Smart Jitter* software in the Jitter and Timing Analyzers provides measurement readout, jitter track, and histogram displays of the following measurement types:

### Measurement parameters available

Single-Signal Measurements
<i><b>Clock</b></i>
Duty Cycle
Cycle-to-Cycle
N-Cycle
N-Cycle w/Start Selection
Frequency
Period
Half Period
Width
Duty Cycle Error (Delta width)*
Time Interval Error (TIE)
<i><b>Data Stream</b></i>
Cycle-to-Cycle
Frequency
Period
Time Interval Error (TIE)
<i><b>Two-Signal Measurements</b></i>
Clock Skew
Setup
Hold

\* No JitterTrack provided.

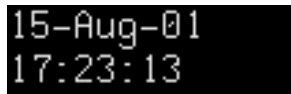
# Getting Started

## Finding Your Way Around

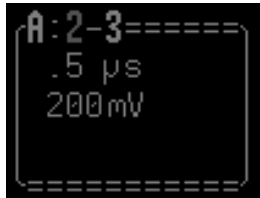


## Jitter and Timing Analyzers

### The Display

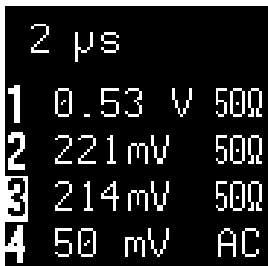


15-Aug-01  
17:23:13




A:2-3=====

.5 $\mu$ s
200mV



2  $\mu$ s

1	0.53 V	50 $\Omega$
2	221mV	50 $\Omega$
3	214mV	50 $\Omega$
4	50 mV	AC



← 20.0  $\mu$ s



8 GS/s

□ STOPPED

Upon initial boot-up, (or any time the default setup is recalled by pressing the front panel **PANELS** button and choosing **From Default Setup**), the screen of the Jitter and Timing Analyzer will appear.

**Real-time Clock field** – Powered by a battery-backed real-time clock, it displays the current date and time.

**Displayed Trace Label** – Indicates for each channel displayed the time/div and volts/div settings and cursor readings, where appropriate. In the analyzer, the Setup Wizard will automatically create a math Trace A that is the current acquisition, so that further zooming and other processing is easily enabled.

**Acquisition Summary field** – timebase, volts/div, probe attenuation, and coupling for each channel, with the selected channel highlighted. If the Setup Wizard was used to set up and perform the acquisition, the selected channel is the source channel in the Setup Wizard.

**Trigger Point** – an arrow indicating trigger time relative to the trace. If the Setup Wizard was used to set up and perform the acquisition, the trigger time is defaulted to 20  $\mu$ s before the display.

**Trigger Status field** – Shows sample rate and trigger re-arming status (AUTO, NORMAL, SINGLE, STOPPED). The small square icon flashes to indicate that an acquisition has been made. If the Jitter Setup Wizard was used to set up and perform a single acquisition, this will read STOPPED after the acquisition has been performed. If the Jitter Setup Wizard was used to set up and perform continuous acquisitions, this will read NORMAL and the square icon will flash each time a new acquisition occurs.



**Trigger Configuration field** – contains an icon indicating the type of trigger, and information on the trigger's source, slope, level, and coupling; and other information where appropriate. If the Setup Wizard was used to set up and perform the acquisition(s), the edge trigger type symbol with positive edge triggering (shown) will be displayed.



**Trace and Ground Level** – Shows the trace number or letter, and ground level marker. If the Setup Wizard was used to set up and perform the acquisition, the clock/data signal will be displayed as Trace A.

Other display areas include the Time and Frequency field (located below the grid) stating time and frequency relative to cursors, and a Message field placed above the grid and reserved for special messages.

For more about the display, reference the separate WavePro Operator's Manual.

### Finding your Way Around The Front Panel

The Jitter and Timing Analyzer's front panel is very similar to that of any other Digital Storage Oscilloscope (DSO). Anyone familiar with the operation of a regular DSO will be familiar with many of the controls of the analyzer. However, the *Setup Wizard* simplifies many of the setup operations for acquiring and displaying the clock/data signal(s) so that you do not have to be familiar with a DSO in order to quickly acquire and display many different views of the clock/data signals, jitter, or analysis.

In the top half of the analyzer's front panel are typical setup and adjustment controls for Trigger, Horizontal, and Vertical settings. When the *Setup Wizard* is used to set up the acquisition and display of the desired clock/data signals, there is nothing in this panel that needs to be adjusted further in order to take jitter measurements, although you are not prevented from making any necessary adjustments. Reference the separate *WavePro Operator's Manual* for more information on these controls.



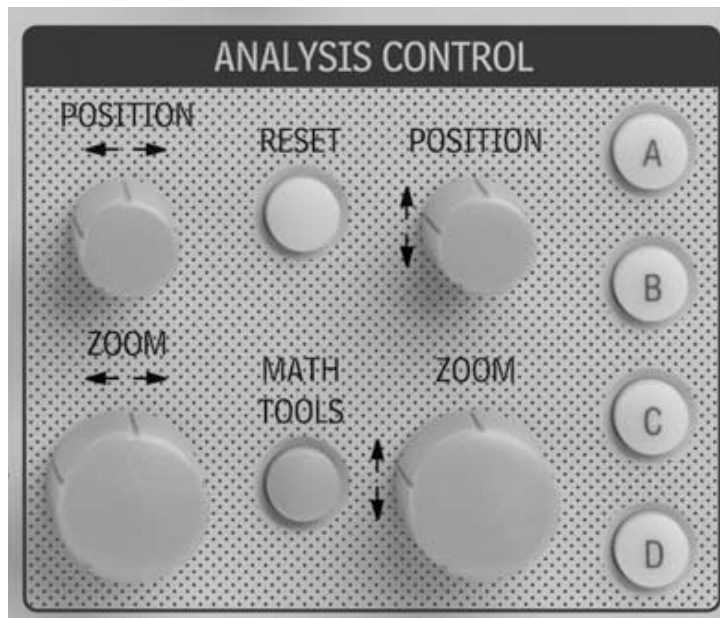
Next to the Vertical controls are the Channel pushbuttons. For any channel you would like to use for data acquisition, set the proper coupling by pressing the **CHANNEL** button, then selecting the **Coupling** menu with the soft key. There is no need to modify anything else in this menu. All other adjustments are done through the Setup Wizard.

In the bottom half of the front panel are various general control buttons. If you are using the Setup Wizard to set up and perform your acquisition, there will be little need to ever use the **PANELS**, **UTILITY**, **DISPLAY** or **CUSTOM DSO** buttons. (Reference your WavePro *Operator's Manual* for more information on these buttons.) However, the **WAVE STORAGE**, **SCOPE STATUS**, **CLEAR SWEEPS**, and **PRINT SCREEN** buttons will be used more often. Familiarize yourself with these buttons and their menus.



The Analysis Control section allows you to control the full power of the LeCroy Jitter and Timing Analyzer. The **ZOOM** and **POSITION** knobs allow you to zoom in vertically or horizontally to see waveform detail, or to position waveforms in ways that allow easy analysis. For instance, the analyzer allows the clock signal and JitterTrack of the clock signal to be displayed at the same time. The **ZOOM** knobs permit you to zoom horizontally and vertically to view the detail you

want. The **POSITION** knobs permit you to overlay the waveforms and look at a time-synchronized display of the clock/data signal and the jitter from edge to edge to more easily find the source of errors. The **RESET** button allows you to quickly reset all zoom and position controls to the default values. Get familiar with the **ZOOM** and **POSITION** knobs and the **RESET** button, and you will enjoy the full power of the LeCroy analyzer. The **A**, **B**, **C**, and **D** trace buttons are not needed unless you wish to use the analyzer for advanced setups or analysis.



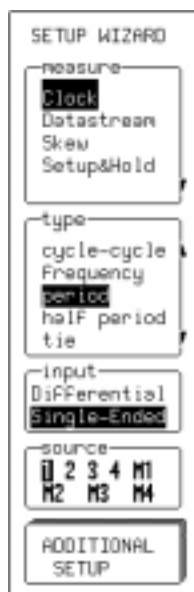




The Jitter and Timing **SETUP**, **CLOCK** and **JITTERVIEWS** buttons on the right-hand side of the analyzer permit you to quickly and easily access powerful analyzer capabilities. The exact functions of the buttons are defined in the next chapter. Note that the **JITTERTRACK**, **HISTOGRAM**, and **MEASURE** buttons in the Jitter Views grouping permit you to quickly display an advanced view of jitter with the push of one button once the clock/data acquisition is completed.

In summary, as a Jitter and Timing Analyzer user performing jitter timing and analysis measurements, you should spend most of your time using knobs and buttons in the Analysis Control section, and using Jitter and Timing **SETUP**, **CLOCK ZOOM**, and **JITTERVIEWS** buttons as well as another grouping of “special features” buttons comprising **AUTO SETUP**, **CURSORS** and **ANALOG PERSIST**. The most data and analysis with the least amount of setup will be available in these sections.

## Using the Jitter Setup Wizard



Taking your first measurements using the Setup Wizard in the analyzer is easy. The Setup Wizard is configured so that *every adjustment that must be made to ensure accurate, repeatable measurements is done automatically by the software*. You need only input what type of measurement you wish to perform, the type of input signal, the source of the input, and the type and length of the acquisition. All analyzer setup and display of clock/data information is performed automatically when you select **Additional Setup** → **Start Acquisition**.

First, press the **SETUP** button on the front panel. Then, connect your signal(s) to the appropriate inputs on the analyzer. If you are measuring jitter on a single signal, you may connect it to any channel. If you are measuring jitter on multiple signals (for instance, Skew, Setup, or Hold between two signals, or you are measuring a differential clock without using a differential probe or the optional AP-265 Differential and Single-ended Edge Conditioner box), follow the instructions in the Setup Wizard menu for connecting your signals to the analyzer.

The first of two Setup Wizard menus appears as shown at left. This first menu allows you to select the signal type and desired jitter measurement in the **Measure** and **Type** menus, and allows



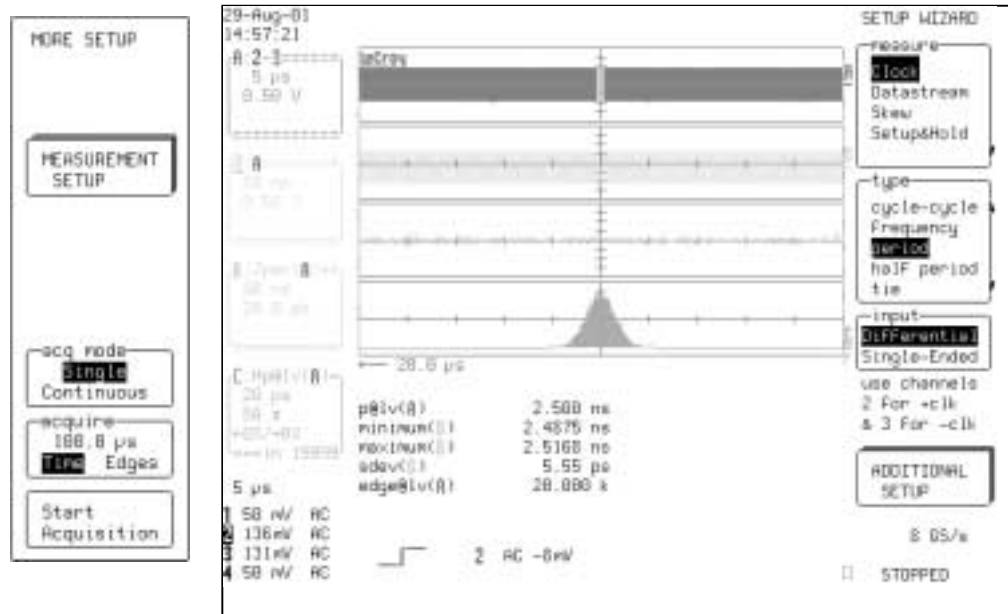
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you to select the type and source of the input signals. The second of the two Setup Wizard menus is accessed when you press the **Additional Setup** soft key.

This menu allows you to modify the default measurement setup (if desired) and also permits you to set the acquisition mode and length. The **Start Acquisition** soft key initiates acquisitions, which then permits additional statistical, measurement, time, or frequency analysis.

Once the signal is acquired, it is assumed that additional jitter measurements or views are desired. These views are easily accessed by pressing the **JITTERTRACK**, **HISTOGRAM**, or **MEASURE** buttons in the Jitter Views button group. Additional analysis capability to allow debugging or tracking of jitter problems can be accessed by pressing the **ANALYSIS** button.

An example of a display that you can quickly create is shown below:



The top trace, Trace A (orange), is the raw clock trace that was acquired after the Setup Wizard **Start Acquisition** soft key was pressed.

Trace D (light green) is a zoom of the raw clock trace that was displayed after the **CLOCK ZOOM** button was pressed.

Trace B (rose) is a JitterTrack measuring the Period jitter of the raw clock trace. This display is time synchronized with the zoom of the clock trace to allow easier location of clock/data edges with high jitter.

Trace C (blue) is a Histogram showing the statistical distribution of the Period values in the raw clock acquisition.

Below all the traces are measurement values for Jitter Data, displayed with statistics.

More information on creating these displays and interpreting the results is contained in the chapters that follow.

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