WaveScan in WaveSurfer 3000 Oscilloscopes

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Summary

The WaveScan tool built into the WaveSurfer 3000 oscilloscopes enables the instruments use more than 20 different search criteria to find anomalies in a captured waveform, or to scan live acquisitions for anywhere from a second to a day.

Introduction

Teledyne LeCroy's WaveSurfer 3000 oscilloscopes offer a large complement of powerful hardware triggers, but even the most advanced hardware triggers carry limitations in that they can find an event predetermined by the user. Thus, the WaveSurfer 3000 oscilloscopes are augmented with WaveScan Search and Find technology. WaveScan is an advanced search and analysis tool that provides the ability to quickly locate and characterize unusual events. WaveScan can detect anomalies within a single capture and can also operate in continuous scanning mode, constantly monitoring incoming waveforms. There are many search criteria to choose from, including non-monotonic edge detection, runt mode, and a large number of parametric measurement criteria, including rise time, fall time, frequency, pulse width, duty cycle, and many others.

Getting Started with WaveScan

The WaveScan feature can be accessed from the front panel or through the Analysis pull-down menu. Using Teledyne LeCroy's WaveSource 100 evaluation source to input a signal with a slow rise time, the screen will look similar to Figure 1.

Figure 1: The initial setup screen for WaveScan is the starting point for deep signal exploration

In Figure 1, WaveScan is still in its default state, which is edge mode. Edge settings are for a positive slope where the edge threshold is 50% of the signal amplitude. Note that all such edges in the input signal are highlighted in red. The first edge in the signal trace is brighter, indicating highlighting, and that highlighted section appears in the WaveScan zoom view below.

Dig Deeper Into Waveforms

When using WaveScan, note that the zoomed area of the signal trace may be manipulated using the WaveSurfer 3000's zoom controls. In addition, WaveScan's powerful controls enable searching for a wide range of anomalies within the signal. Opening the Mode menu within the WaveScan dialog reveals numerous options, including searching for edges, runts, non-monotonic edges, serial or bus patterns, and measurements. Each mode can be further customized to specify the precise nature of the anomaly.

With the Table option enabled, WaveScan will display all occurrences of the condition being searched for. The WaveScan table shows the times at which each of the edges in the trace occurred relative to the trigger point. Tapping any of the lines in the table changes the zoom view to the corresponding event in the signal trace.

Measurement Filters

To further refine searches for signal anomalies, WaveScan's measurement mode provides a measurement filter. This allows for measurement criteria to include attributes such as less than, greater than, within or outside of a limit, plus or minus a delta, plus or minus a percentage, or the rarest events. Users may also invoke a filter wizard, which can establish limits based on statistical distributions of the data set (such as ±1 sigma).

One may direct WaveScan to find specific events in the signal trace, and define what event is being sought. In this example, WaveScan is looking for a glitch in the input signal from Figure 1. WaveScan is put in Measurement mode, with the measurement being rise time. The filter method is "greater than" with a filter limit of 100 ns. The glitch is shown in Figure 2.

Figure 2: Here, WaveScan has found the glitch it was seeking in the input signal

WaveScan can also direct the WaveSurfer 3000 to take specific actions upon finding the sought-after event, including stopping acquisitions, saving waveform(s), printing the screen, beeping, or saving to a LabNotebook entry.

Conclusion

WaveScan adds considerable functionality to the WaveSurfer 3000 oscilloscopes beyond what is offered by any hardware trigger. While a hardware trigger only finds one event per acquisition, WaveScan identifies all events which meet the criteria. Also, the types of waveform activity that can be found by WaveScan are more in-depth than that offered by hardware triggers. This allows users to accumulate a data set of unusual events that are separated by hours, minutes, or even days, enabling comprehensive debugging.