Selective Averaging

Automatically Selecting Waveforms to be Averaged

In some applications oscilloscope users would like to separate pulses based on waveshape or some parametric value and average only those pulses meeting a desired criteria. LeCroy oscilloscopes allow the use of pass/fail testing, using masks and/or parameter readings, to qualify waveforms before they are added into an average or other processing function.

To setup a selective average based on waveshape, a tolerance mask is created using the Pass/Fail set up dialog box for condition Q1. The example in Figure 1 shows the waveform C2 being tested against such a tolerance mask. If all points of the trace are inside the mask the waveform is saved to memory M2. The trace F1, shown in the lower grid of Figure 1, is defined using the Math setup, to be the average of M2. Only waveforms that match the shape of the mask are added into the average. The converse function, all traces that have at least one point outside the mask, can be averaged by changing the pass/fail "If" state from Pass, as shown in Figure 1, to Fail. A comparison of the average of pulses which lie inside the mask to the average of pulses with at least one point outside the mask is shown in Figure 2. The trace M3 is the average of waveforms that fit the mask and F1 is the average of waveforms

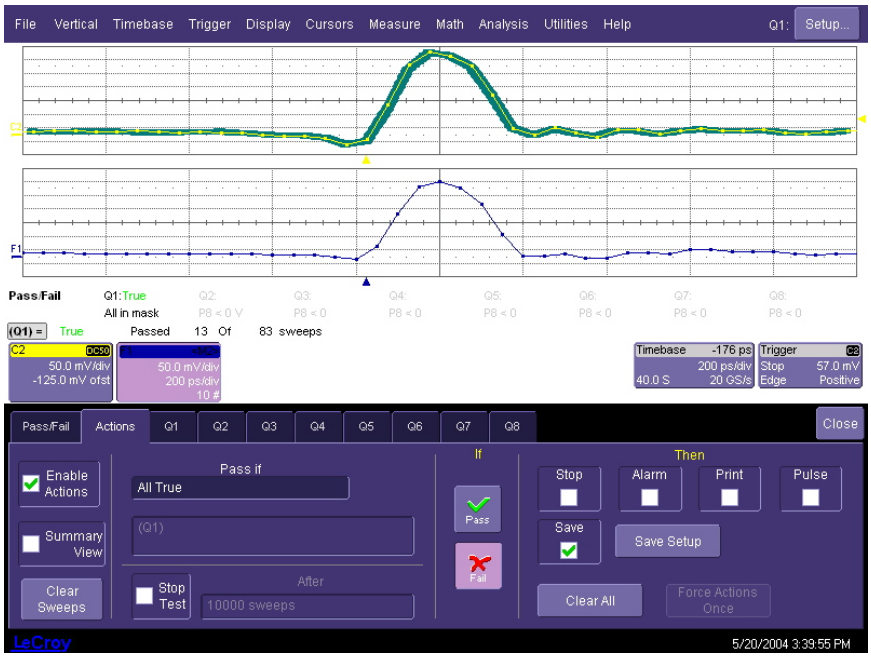

Figure 1: The Pass/Fail action setup for averaging only pulses that fit within the tolerance mask.

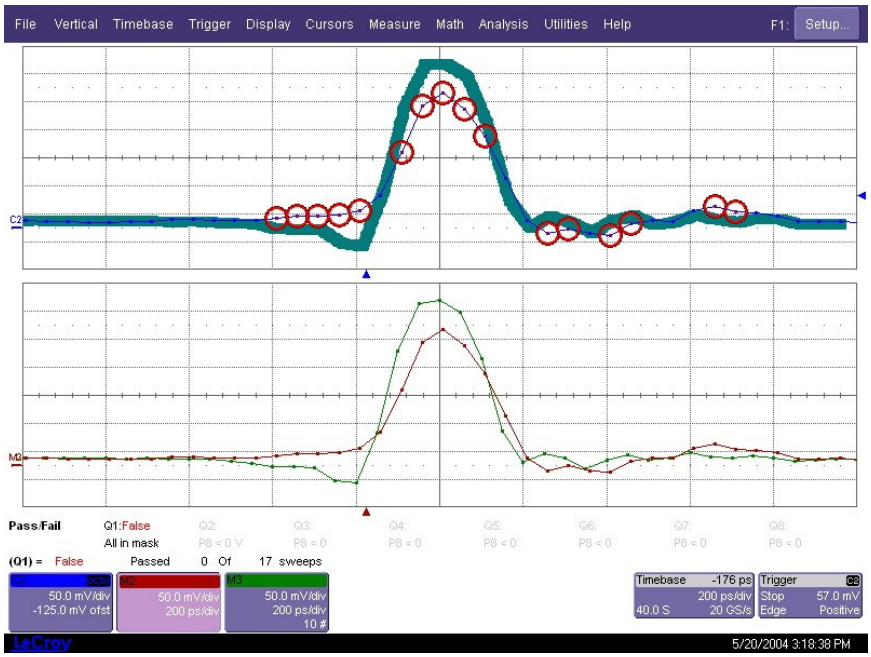

Figure 2: A comparison of the average of pulses that fit within the tolerance mask (M3) to the average of those pulses with at least one point outside the mask (F1).

that have at least one point outside the mask

This principle can be expanded to average only pulses meeting the mask criteria as well as satisfying specific parameter limits. This is illustrated in Figure 3 where only pulses that fit within the mask, have an amplitude of greater than 275 mV and an area greater than 3 pVs are averaged.
While this example shows an "ANDed" logic condition for pulse acceptance the user can select AND, OR, NAND, or NOR logic along with several mixed combinations.

These examples illustrate the flexibility and high level of integration built into every LeCroy oscilloscope allowing diverse features to be integrated into a powerful analysis tool.

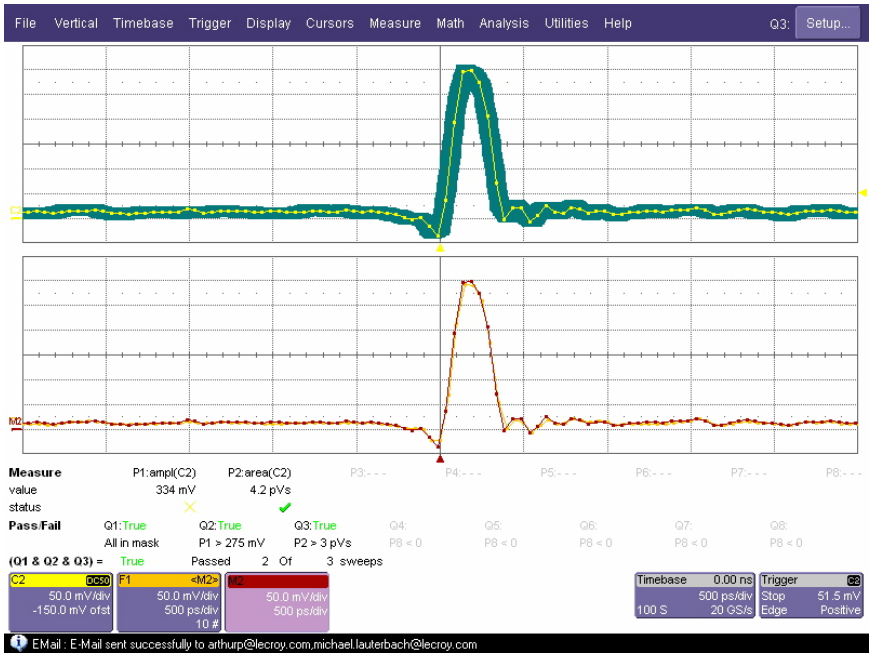

Figure 3; An example of using a combination of mask and parametric criteria to select waveforms to be added to an average.