Oscilloscope/Logic Timing Analyzer Synergy

Logic analyzers determine whether an input is high or low based on comparison of the input voltage with a reference or threshold voltage. The logic analyzer looks at the input signals the same way digital hardware in the device under test does. What is displayed on the logic analyzer screen, in theory, is what the digital hardware in the system sees. One technique that can be applied when using a logic analyzer is to take the same measurement several times with slightly different threshold voltages and compare the timing diagrams captured by the logic analyzer. Different integrated circuits see the logic transitions (0 to 1 or 1 to 0) at different voltage levels. For example, a TTL gate may switch anywhere between 0.8 volts and 2.0 volts. By taking the measurement with slightly different logic analyzer thresholds, the user can often identify signals that are not being driven to the correct voltage level. The user can also get a feel for what the system timing would be at different temperatures and across different production runs. This gives some insight into timing variances that may cause problems down the road.

Companion to an Oscilloscope

Users often mistrust the logic analyzer because they feel it doesn't give the "real" picture of their waveforms. In this case, the user is referring to the lack of analog content in the waveform displayed by the logic analyzer. On the other hand, the oscilloscope can show the waveform's analog content but the user can't trigger on the event of interest. Ideally, the solution is logic analyzer triggering with oscilloscope waveform viewing. The HP 54620 logic timing analyzer is optimized to be a companion to the user's oscilloscope, not to replace it. This analyzer has both a trigger input and a trigger output on the front panel. The user can trigger it from an oscilloscope or use the HP 54620 as a trigger source to an analog or digital oscilloscope. Fig. 1 shows the HP 54620 triggering on a complex set of digital signals that combine to form a complex analog signal. This is common in mixed-signal embedded systems that contain either a digital-to-analog converter or an analog-to-digital converter. Often, the analog signal is difficult to trigger on with an oscilloscope. This problem is solved by looking at the digital side of the signal and triggering on a specific pattern. By using the two instruments together, the user can be more productive by getting a view of the situation that neither instrument alone can provide.
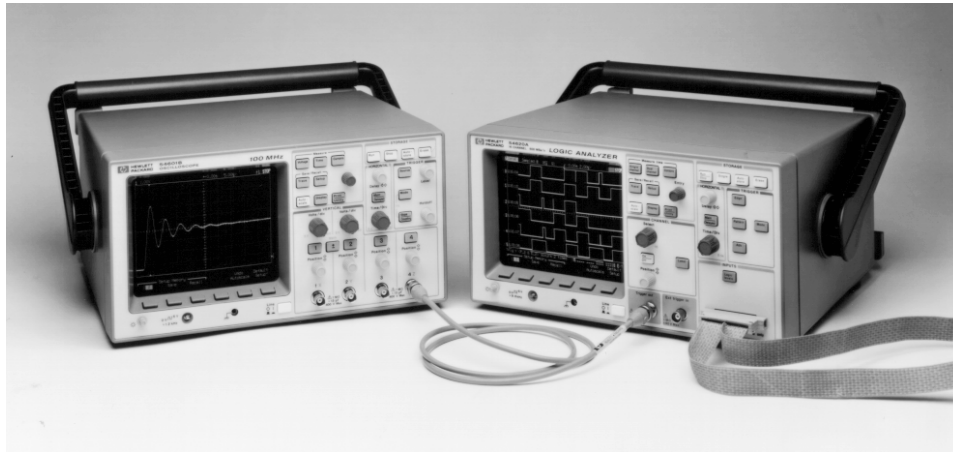

Fig. 1. The HP 54620 logic timing analyzer can trigger on a complex set of digital signals and provide its trigger signal to an oscilloscope to display a resulting analog signal.