Small Logic Analyzers Pack in the Bits

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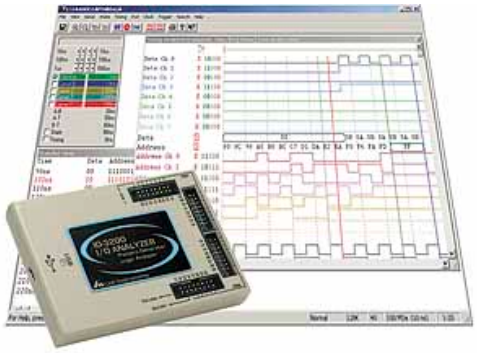
Small logic analyzers put many digital channels, trigger options and I/O capabilities in an instrument that engineers can consider as their own. These small analyzers connect through a USB port to a host PC that controls functions and displays, and saves information.

Small Instruments Offer a "Pocket"-ful of Fetaures



Most engineers use these “pocket” instruments for general-purpose work. “Some customers have high-end logic analyzers available, but they prefer our LA1034 LogicPort because they find it easier to use 90 to 95 percent of the time,” commented Harrison Young, CEO of Intronix. “When they need a feature we don’t offer, they pull out a Tektronix or an Agilent analyzer.” Young noted he targeted the LA1034 for engineers who work with programmable logic, development boards and microprocessor buses.
The Intronix LA1034 connects to 34 digital lines, and each probe wire has a female contact that mates with a square header pin that simplifies connections to development and prototype boards. Optional connector types include individual grabbers and Mictor connectors. Although Mictor connectors get expensive, many logic analyzers use them since they offer a high-fidelity connection between an analyzer and a circuit.

Young explained that some engineers miss the significance of triggering and think of small logic analyzers as simply 1s and 0s data loggers. “But like its larger counterparts, the LA0134 captures specific information and events,” he said. “If a microprocessor has an intermittent problem that sends the CPU off to a block of memory, you monitor the address bus and trigger only when an address appears within that block’s span. Then you analyze the pre-trigger data to determine what caused the CPU to address that memory block.”

Make Sure Connections are Well-grounded

Engineers also might not recognize the importance of grounding. “On occasion, someone tells me that our logic analyzer shows them only noise or signals ‘stuck’ at logic 1 or 0,” said Young. “I ask them how many ground leads they have connected and they reply, ‘Ground leads?’” On a logic analyzer — small or large — you must have good ground connections. Unlike a scope, a logic analyzer often needs more than one ground, particularly when you acquire high-speed signals.

At Link Instruments, president John Yeh stressed that the inputs on the company’s IO-3200 family of logic analyzers also can serve as outputs, selected in groups of eight lines. “You can set up the instrument to input data for period X, output data for the next period, and so on,” said Yeh. “In a single capture, you can send data to a device and see how it responds.”

To help engineers create output test patterns, Link includes an editor that sets up I/O ports, generates I2C and SPI patterns, creates counters and selects output files. “You can capture a pattern of bits, edit the patterns and output it to the device you want to test,” explained Yeh. “You can choose a portion of a file and have the IO-3200 loop through that section continuously.” Yeh also noted that engineers can use trigger conditions to start the output of a pattern, an I2C communication, and so on.

When a design includes FPGAs, engineers can “move” trigger conditions into their HDL code and use a spare FPGA pin to trigger an external analyzer. “You establish a complex trigger condition within the FPGAs circuits,” said Yeh. “Then if you have an internal FPGA state machine to test, the trigger lets you capture digital information about what the state machine has done at a specific time. When you finish development work, you deactivate the trigger pin and any others used to output or input test signals.”

A Full Featured Mixed-Signal Scope May Not Be Necessary

Sometimes when you need to measure an analog signal or two along with digital signals, you might not need a full-blown mixed-signal scope. BitScope’s BS100U and BS50U instruments include analog and digital inputs. The company’s PC-based software analyzes analog signals in either the time or frequency domain. “You also can use the analog inputs and software to analyze narrow-band RF signals,” said Bruce Tulloch, technical director of software at BitScope. “We haven’t just strapped two analog scope channels on the side of our logic analyzers. The analog and digital inputs can work together, and they can trigger each other.”

Both the BS100U and BS50U can generate waveforms and the BS100U has a sample-replay function. “You can create a waveform in software and replay it into your circuit by loading a waveform as digital values into the logic buffer, but that deactivates waveform capture,” explained Tulloch. “The BS100U, on the other hand, offers an optional DSP-based waveform generator that synthesizes an analog signal independent of other instrument functions. That capability simplifies tests, such as transfer-function analyses, which need an excitation signal on channel B and simultaneous analog measurements on channel A.

Both instruments use a USB port to communicate with a host PC. The BS50U draws power from a USB port while the BS100U remains electrically isolated from the PC, operating from a separate power supply. Tulloch explained that the potential of a PCs ground may differ from that of the ground in other electronics. “Even though notebook PCs are isolated from ground, they can float 20 to 40 volts above ground potential.” That condition can spell trouble for electronic devices. So, if engineers or technicians plan to work at customers’ sites and do not know about local power conditions, Tulloch recommends they use the isolated BS100U analyzer.

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