



High Channel Simultaneous Monitoring and Acquisition System for Rocket Booster Testing

As a leading supplier of booster electronics for space exploration for nearly half a century, this manufacturer has been responsible for providing products that are capable of performing under the harshest environments for the entirety of their lives. To ensure that their product is capable of performing with the intended accuracy when in action, this manufacturer must make use of the most precise testing equipment.

Recently the manufacturer was awarded a production contract for rocket booster electronics which required the constant monitoring of over one thousand analog signals during a validation test. Two methodologies were considered in which the monitoring against threshold limits would be done either through hardware or software. The initial plan was to compare all of the acquired data against tolerance limits within a software application. It was quickly determined however, that the volume of data produced, given the channel count, and sample rate would result in a very complex and high-risk implementation. The decision was then made to design the test system using LXI-based [EX1200 series](#) hardware comparator modules supplied by [VTI Instruments](#) to constantly monitor the input signals for fault conditions without the need to generate large amounts of data.



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CHALLENGES

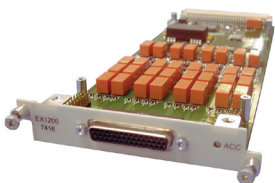
- "Constant Monitoring" required
- >1000 channel system
- Acquire pre and post trigger data of all samples
- Extremely low latency required
- Incorporate LabVIEW™ software

BENEFITS

- Drastically improved response times
- LabVIEW™ drivers available with solutions
- Flexible configurations
- Can be used as a time stamp module
- Obsolescence protection and long-term support
- Debounce circuitry prevents erroneous readings



EX1208A



EX1200-7416

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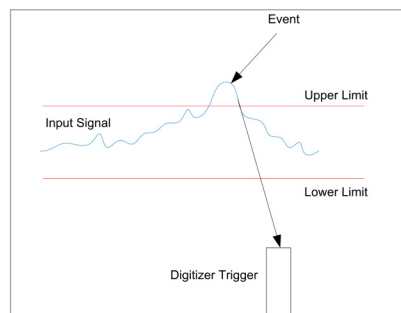
VTI's focus on providing customers with unique test solutions that meet their specific needs gave this manufacturer a path to a lower risk solution. VTI's extensive experience within the defense and aerospace industry as well as their attention to detail gave the company confidence in the proposed solution.

THE CHALLENGE—"CONSTANT MONITORING" OF LARGE CHANNEL COUNT

As is the case for many defense and aerospace test systems, the need for simultaneous monitoring and acquisition over a long period of time was present in the product validation requirements. The original plan was to make use of a PXI digitizer to acquire the data and then compare the acquired data against pre-determined threshold limits. If a data point on any channel exceeded a threshold, the test was to be stopped. A snapshot of the acquired data on all channels, pre and post failure was all that was required for analysis, however, since the comparison was done in software, the digitizers needed to be continuously sending data to the host. The amount of processing time required to compare each data point against a threshold and then respond to an out of tolerance condition resulted in excessive latency that did not meet the test requirements and presented too much risk to the program. The company had also requested LabVIEW™ as their software of choice.

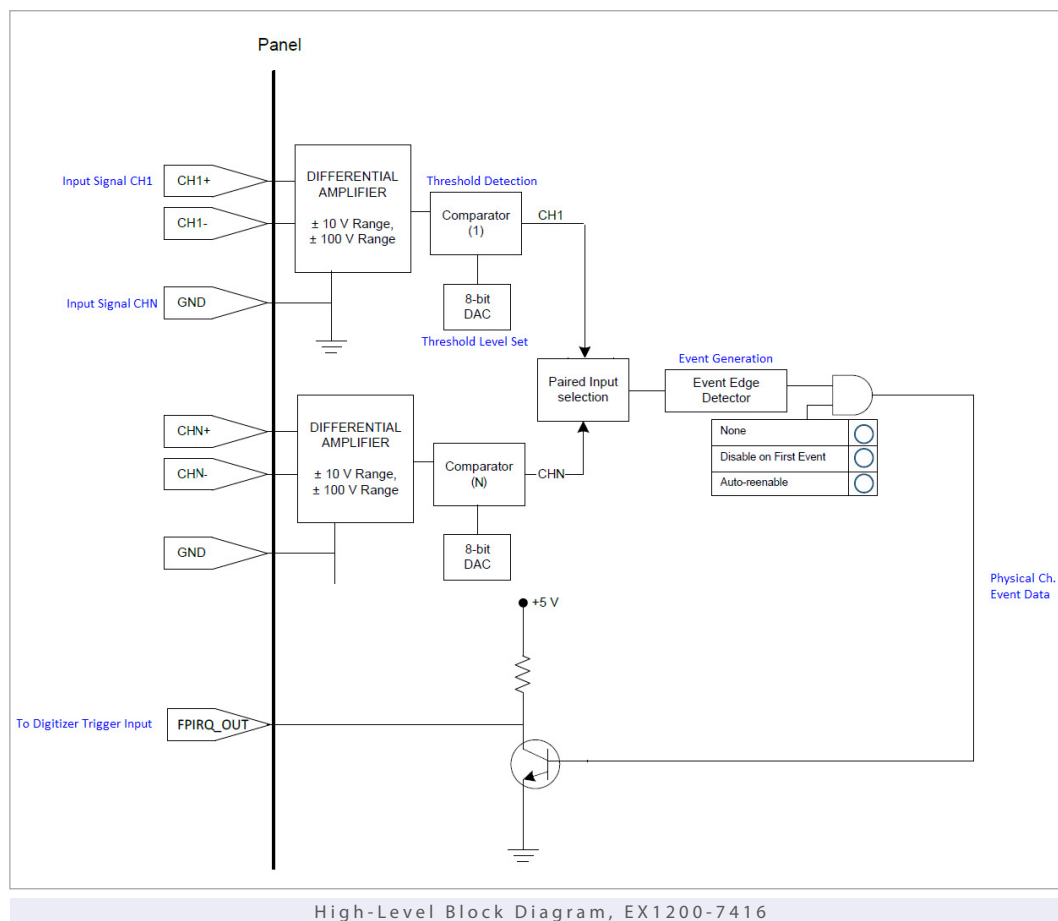
THE SOLUTION—TEST IN UNIT TO REDUCE LATENCY AND INCREASE ACCURACY

With the recognition that sampling in excess of 1000 channels would place a tremendous burden on the host controller, VTI developed a high-channel-count COTS solution that was capable of performing all comparisons in hardware to minimize any latency between an out of tolerance event and the system shutdown. Making use of the [EX1208A](#) mainframe and [EX1200-7416](#) multi-channel level comparator module, the comparison is accomplished using a hardware level detector with programmable thresholds for each of the channels, and any fault detection on any channel would immediately generate a trigger out of the EX1200 mainframe that was received by the PXI digitizer system as the acquisition trigger source. The PXI digitizers were configured to acquire a finite amount of pre and post-trigger data once the event occurred. Since the digitizer is only sending a snapshot of data back to the host, the burden of data processing is relieved from the host controller.



Input Signal Crosses Threshold and Triggers Acquisition System

The EX1208A is a high density 16-slot, 3U LXI Switching and Data Acquisition Mainframe, and was designed to be scalable, allowing it to satisfy the high channel count test requirements in this application. The EX1200-7416 is an ideal device for “go/no-go” testing, where a device fails if the voltage outputs exceed a threshold or window. By using the analog comparator/interrupter as opposed to the previous planned approach of scanning, VTI was able to drastically improve overall response times of the system, providing the ability to “constantly monitor” signals of interest for fault conditions.



As LabVIEW™ drivers are available for all VTI products, integrating the software into the solution was not an issue.

Key features include:

- Constant monitoring of input signals for fault conditions
- Flexible configurations for detecting edges, out-of-bounds conditions and measuring pulse widths
- Ability to create Boolean event conditions on multiple input channels

- Ability to capture >40,000 events with IEEE-1588 time stamps
- Can be used as a time stamp module and as a digital I/O
- Programmable debounce circuitry prevents erroneous readings

THE RESULT—A HIGH SPEED, RELIABLE DATA ACQUISITION SOLUTION

With a high channel, low latency solution, this booster electronics manufacturer was able to achieve “constant monitoring” of their unit under test, ensuring accurate results and the survival of their product during testing. The in-hardware closed loop system allowed the company to have confidence in their testing, knowing that in the occurrence of a channel falling out of spec, the unit was able to shutdown instantaneously with no damage done. This level of speed and precision is necessary when testing the most advanced and valuable equipment.

VTI Instruments delivers precision instrumentation for electronic signal distribution, data acquisition, and monitoring. The company continues to lead in the development of open standards for test and measurement along with scalable, modular products that maximize performance in a small footprint. With nearly two decades of experience primarily in the aerospace, defense and power generation markets, VTI helps customers maintain a competitive edge and preserve the integrity of their brand.

