



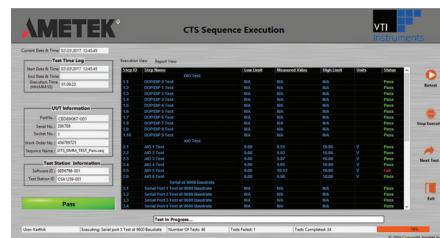
VTI Instruments

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# Flexible ATE Core Results in Rapid Development for Mil/Aero Contractor

APPLICATION BRIEF



RELIABLE DATA FIRST TIME EVERY TIME

## Overview

A large private defense contractor in India developed a plan to automate Environmental Stress Screening (ESS) of a broad range of products including Electronic Warfare Systems, Missile/Launcher Interface and Control units and general Ground Support Equipment. To avoid multiple bespoke development cycles for each product type, the contractor's strategy envisioned a test platform that would be flexible enough to address a wide-range of ground support electronics. To increase the value of the investment in the test platform, they wanted to be able to provide for the testing of multiple devices in parallel while creating a common hardware platform that could be easily configured to support new test requirements in the future. As this was a test platform that would have wide usage throughout their organization across multiple projects, a standard software platform including a common operator interface and report generation tools was desirable in order to create a common infrastructure that could be easily supported.

With limited experience in test development and a lack of resource bandwidth, the contractor reached out to AMETEK to assist in assessing the project objectives. Working as an extension to the prime's engineering team, AMETEK provided detail to the plan which included the generation of a test requirements document from which a core system architecture was defined. By utilizing a common hardware framework based on AMETEK Programmable Power and VTI Instruments as the foundation for the development, AMETEK was able to deliver the first system within nine months, one month in advance of the contractor's deadline.

## Project Scope

The broad level system requirements included the delivery of an Automated Environmental test system with a high power rack that could directly interface with a customer-supplied environmental chamber, capable of testing up to 12 devices-under-test (DUTs) in parallel. Additionally, the system needed to integrate the following capabilities:

- Remote monitoring of testing using a video camera capable of zooming, capturing and storing videos of the test process. This allowed customers to witness the testing in real-time while being able to view and analyze data without needing to visit the test lab
- Ability to expand the system to test more than multiple units in parallel to increase production throughput as demand increases
- An input/output interface (mass interconnect assembly) that could be configured to test different DUT types by changing a single test adapter or cable harness
- Customizable report generation in which the DUT test results were combined with the environmental profile
- Simple configuration of temperature profiles through an intuitive graphical user interface
- A test architecture that was capable of exercising a wide-range of test articles including but not limited to Power and Computation modules, and preferably a modular architecture that could be scaled to adapt other module types
- A robust software framework with tools that could be easily configured by operators to choose different test program sets as needed
- The ability to execute a system self-test with fault isolation identification

To develop the Acceptance Test Procedure (ATP) for each DUT, the current manual test infrastructure was analyzed along with the typical list of I/O for the DUTs.



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## System Overview

AMETEK's FlexSys™ core ATE system was used as the foundation for the test platform to reduce time to production readiness. FlexSys makes use of common, pre-engineered building blocks to jump start the development cycle. A FlexSys system is a fully documented platform that includes the test instrumentation required to simulate and acquire DUT signals and wiring to a mass interconnect. A standard configuration includes the following:

- Integrated 19" rack
- Power distribution and management
- 6.5 digit DMM
- 8 channel, 500 kSa/s AWG DAC
- 256 channel 2-wire multiplexer switch
- 40 Form A, 16 Amp relays
- 320 Form A, 2 Amp relays
- 4 channel, 200 MHz oscilloscope
- 1.5 kVA AC source
- 850 W DC source
- 18-slot mass interconnect with system wiring harnesses
- Industrial PC with 8-port serial interface
- AMETEK Common Test Software executive

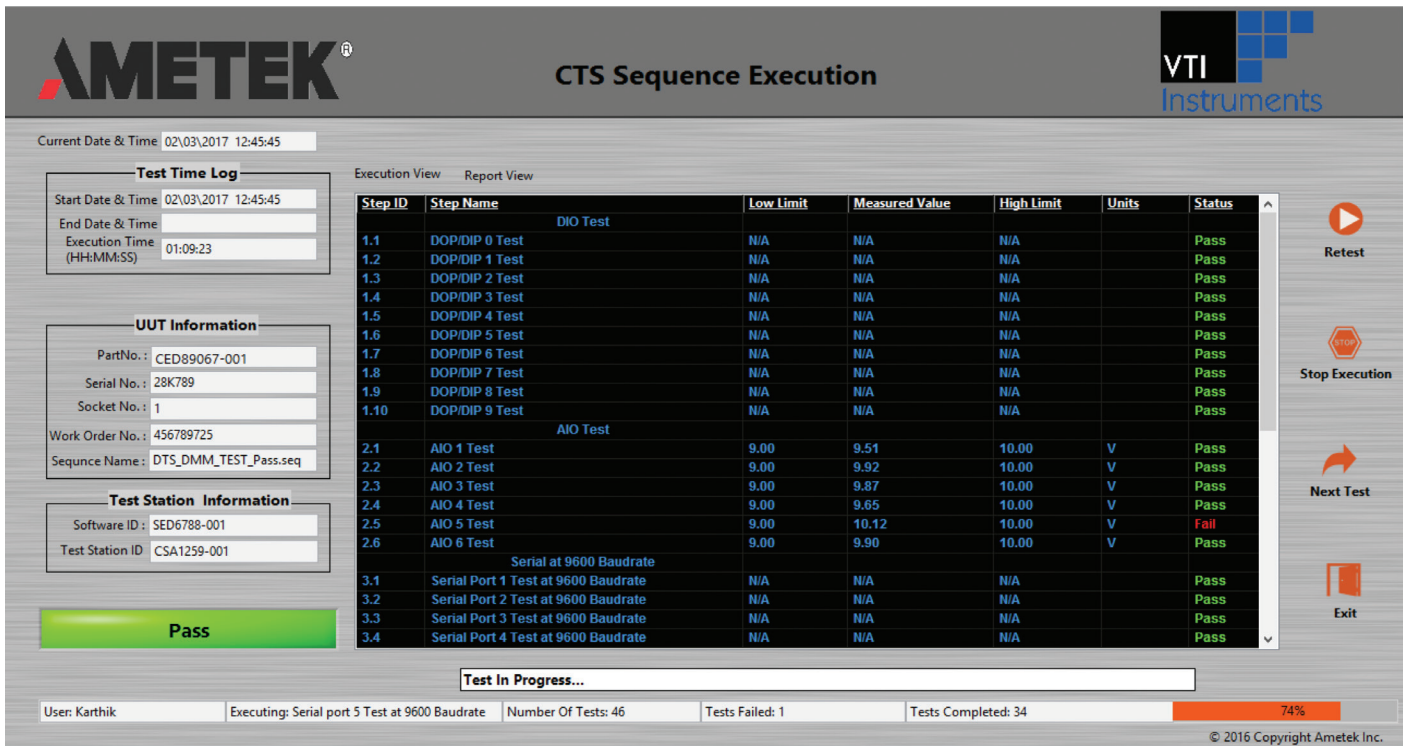


The FlexSys core makes extensive use of industry standards such as LAN Extensions for Instrumentation (LXI) and is modular, scalable and can be easily modified, providing the path for growth and expansion desired by the contractor. AMETEK VTI Instruments EX1200 series provided the core signal switching and instrumentation. The ESS configuration added a high power rack option with an AMETEK Sorenson 10 kW DC source and load and AMETEK California Instruments 5 kVA AC source used to provide power to the DUTs.

## Software Overview - AMETEK Common Test Software (ACTS)

Since the test system was intended for use in a production environment, the contractor required a software platform and graphical user interface that was intuitive and easy-to-use for operators and technicians. Furthermore, the platform needed to be extensible, accommodating the near-term target of testing 12 DUTs, with the ability to expand to additional types and numbers of devices.

ACTS is a ready-to-run test management environment for organizing, controlling, and executing automated tests for prototype and production hardware validation, and ESS cycling. Built on a high-speed, multithreaded execution engine, ACTS delivers the performance to meet your most rigorous test throughput requirements. ACTS is also completely customizable, and can be easily modified and enhanced to match specific needs, including customizing the operator interface, generating custom reports, and modifying sequence execution requirements. Using ACTS, you can focus your engineering efforts on more important initiatives, while ACTS manages the common test management tasks.



ACTS includes pre-configured measurement specific steps for many common test requirements such as measuring a voltage through a specified switch path. By using this architecture as a common test platform, the contractor was able to reduce the time spent on operator training improving overall manufacturing efficiency.

The contractor intended to use this system architecture as the basis for future production requirements and thus required a platform that could sustain a long-life cycle. The ACTS platform implements a Hardware Abstraction Layer (HAL) is a dynamic database that resides between the application code and the physical hardware/instrumentation. The code implemented for the HAL has complete flexibility on how the test step behaves with pre-defined measurement-specific steps for building many standard test sequences, such as measure voltage along a specified switch path.

Figure 1 describes the ACTS framework. The test operator has access to the GUI that starts/stops the test. The sequence editor is only accessible by authorized developers. System configuration files, application code and device configuration files are contained in libraries resident on the host controller, only accessible by anyone with administrator access.

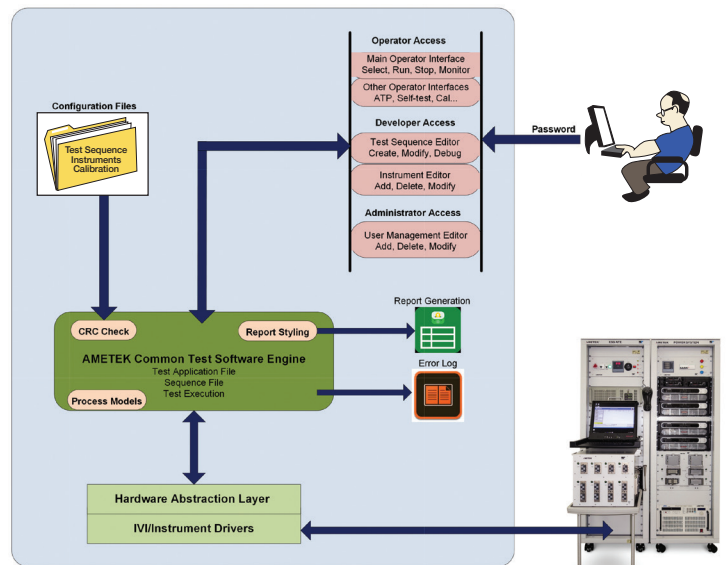
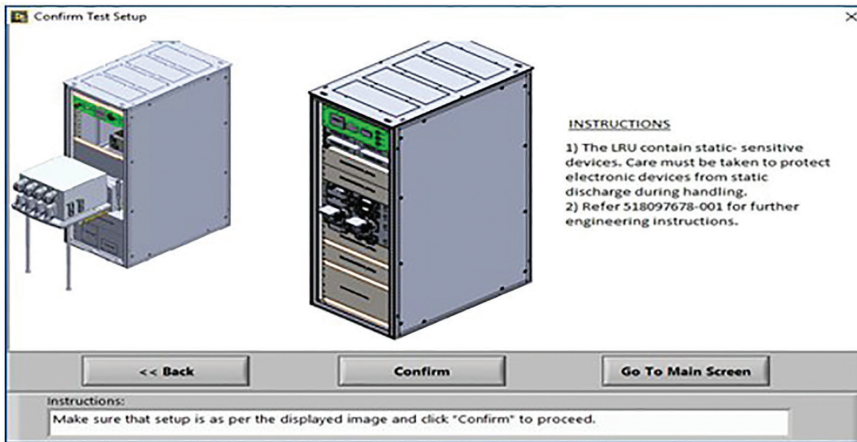
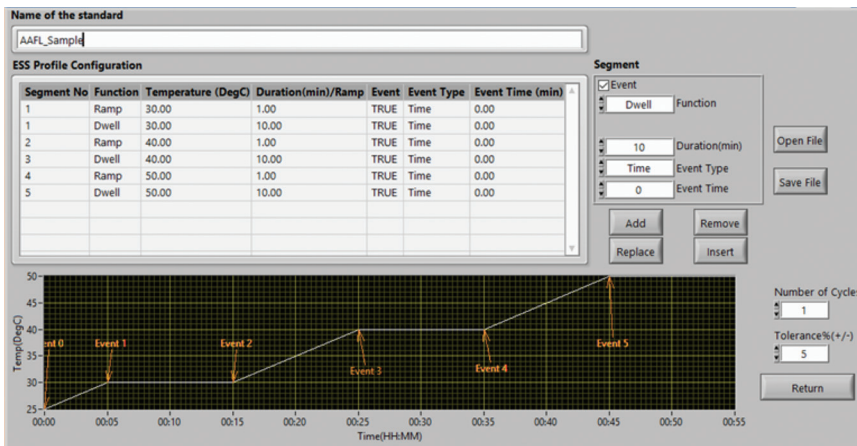
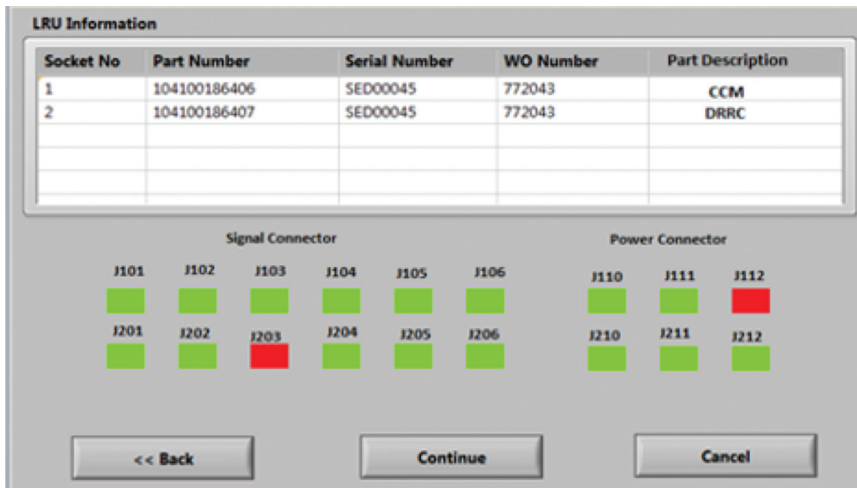


FIGURE 1



ACTS also provides the following features that were required for a successful installation at the contractor's site.

- Test results stored in a generic file format, which can be integrated with any DBMS software
- Statistical analysis of sequence IDs which allows for detailed review of historical test data
- File integrity check preventing the execution of unauthorized altered test code
- Automatic check of calibration status preventing tests from executing if any test instrument is past due for calibration
- Interactive paperless work instructions that can be referenced by an operator during test setup
- Visual indication and directions to make necessary connections. Automatic check of required connections to DUT. If any connection is not properly made, the test will be prevented from starting
- Environmental Stress Screen profile definition and execution
- Video camera plug-in utility supporting live remote viewing and playback of test operation



## Results

The contractor did not have internal resources available to complete the system, which included the test program sets for the various LRUs and turned to AMETEK to supply the turnkey system. A disciplined approach to the project, in accordance with AS9100 standards, included monthly reviews of the project dashboard with the contractor's Quality team. Significant milestones were reviewed, and any actions/decisions required to keep the project on track were routinely conducted.

AMETEK's deep and well-vetted supply chain was tasked to meet the aggressive schedule.

AMETEK's manufacturing team completed the delivery of the first system within nine months of receiving the order, which was one month ahead of schedule. The acceptance inspection and testing at the contractor's facility yielded zero defects. The contractor commented that they "observed very good team coordination from AMETEK and the speed with which your team was able to grasp the requirements was excellent. Our CEO has appreciated the system provided by the AMETEK team and has given the go-ahead for quick implementation (at another site)."

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- Quality Mgr



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**AMETEK®**  
AMETEK Instruments India (P) Ltd

Divyasree, NR Enclave,  
Block-A 4th Floor  
EPIP Phase II, Whitefield  
Bengaluru - 560066  
+91 (80) 6782 3200  
[www.ametek.in](http://www.ametek.in)