

UEI Application Notes:

Rocket Test Stand

App Note #025



***United
Electronic
Industries***

Rocket Test Stand — Application:

A large military research facility needed to acquire high speed dynamic data from a rocket test stand. The types of measurements were pressures, pressure differentials, temperature, strain, fluid flow, force, and mechanical strain. The application presented several significant design challenges, starting with a very tight budget, plus stringent requirements for simultaneous sampling of all measurement sensors.

Wide physical separation of sensors and long cable runs to the host computer system also made the use of multiple PowerDNA cubes mounted directly on the test stand — and interconnected via Ethernet — a very attractive option.

The need for simultaneous sampling and for running at different scan rates for two classes of sensors were met by using the standard UEI DNA-AI-225 Analog Input Layer. The requirement for per-channel signal conditioning hardware was met by the use of standard UEI accessory panels with individual bridge completion resistors (for strain gauge sensors) and with automatic CJC/Open TC detection for thermocouple inputs. The specification for automatic thermocouple linearization was easily met by the standard UEI Framework software supplied with each Cube.

System Description

The system was designed as an Ethernet distributed network with three multi-layer PowerDNA Cubes, each with up to 6 25-channel Analog Input

boards. Each I/O board accepts voltage or millivolt signals from up to 25 strain gauge type sensors and/or thermocouples mounted at various locations throughout the test stand — a total capability of up to 375 inputs. Mounting the Cubes directly on the test stand and using Ethernet for Cube-host communication reduced the need for expensive front-end wiring by almost 80%.

The half-bridge strain gauge sensors are used for measuring pressures, pressure differentials, fluid flow, and mechanical strain. Excitation voltage is provided by a user-supplied power source, the output of which is continuously monitored as a separate analog input.

Product	Description / Usage
DNA-PPC8	Ethernet PowerDNA Cubes, each with up to 6 I/O slots. Includes UEIDAQ Framework Software Suite.
DNA-AI-225	25-channel, 24-bit simultaneous sampling A/D I/O boards monitor strain gauge sensors and thermocouples.
DNA-STP-AI-U	Universal Screw Terminal Panels provide cold junction compensation/open TC detection for thermocouple inputs and bridge completion resistors/excitation voltage connections for strain gauge sensors.

Rocket Test Stand — UEI Products Used:



DNA-PPC8

Each Cube handles up to six I/O layers, selected from as many as 25 standard types, has an SD card, external sync input/output connector, serial comm port, and standard Ethernet In/Out connections. Each cube also includes a powerful data acquisition software suite compatible with all popular data acquisition application packages.



DNA-AI-225:

The DNA-AI-225 Analog Input Layers each have 25 independent A/D converters, one for each channel, that provide simultaneous sampling of 25 analog inputs at scan rates as high as 1000 samples/second. They accept differential voltage or millivolt signals in the range of -1.25V to +1.25VDC.

Software:

The UEIDAQ Framework Software Suite comes with bindings for all major programming languages and test-programming environments including C, C++, C#, VB.NET as well as Excel, OPC, MATLAB, DASYLab, TestPoint, Agilent VEE, LabVIEW for Windows, LabVIEW Realtime and LabWindows/CVI.



DNA-STP-AI-U:

These accessory panels have a facility for adding bridge completion resistors for strain gauge sensors, and are also designed with built-in isothermal block/cold junction temperature sensors for thermocouple inputs. The panels also provide open TC detection for thermocouples.

About UEI:

Founded in 1990, UEI is a leader in the computer based data acquisition and control industry. Serving customers world-wide, UEI products based upon PCI, PXI, ISA and Ethernet interfaces offer unequaled performance as well as flexibility. We are committed to providing the highest quality hardware, software and services, enabling engineers and scientists to interface data-acquisition and control hardware to the real world. Through our state-of-the-art technologies we serve the needs of individual researchers and developers as well as OEMs.



***United
Electronic
Industries***

27 Renmar Avenue
Walpole, MA 02081
Local: (508) 921-4600
Fax: (508) 668-2350
www.UEIDAQ.com