ueidaq 5200 Nuclear Power Instrumentation and Control System Instruction Manual

Contents

United Electronic Industries
AMETEK

ueidaq 5200 Nuclear Power Instrumentation and Control System

Specifications:

- Product Name: UEI Data Acquisition and Control Hardware
- Model: 2024
- Panel I/O: Zynq
- Applications: Aerospace, Energy, Defense Industries
- Supported Industries: Aerospace, Energy, Defense
- Contact: **508-921-4600**, Email: **uei.info@ametek.com**

Product Usage Instructions

- **Step 1: Choose Your Chassis**
  Select from Cube & Rack Chassis, 5200, 8347 & 8347E options.
- **Step 2: Choose Your Processor**
  Choose from SOLOX/I.MX6 ARM or Zynq Ultrascale + Quad-Core ARM processors.
- **Step 3: Choose Your I/O**
  Select from a range of Analog Inputs, Analog Outputs, Logic Level DIO, Industrial & High Voltage DIO, DMM, Avionics, Serial COM, RVDT/LVDT Synchro/Resolver, Quadrature/Frequency/Speed/PWM, IRIG/GPS/1588, CAN-BUS, WiFi & GSM, Function Generator Outputs, and more.
- **Step 4: Set Up & Deploy Your System**
  Follow the provided instructions to set up and deploy your chosen configuration.
- **Step 5: Enhance Your System**
  Explore system enhancement options to optimize the performance of your configuration.

FAQ:

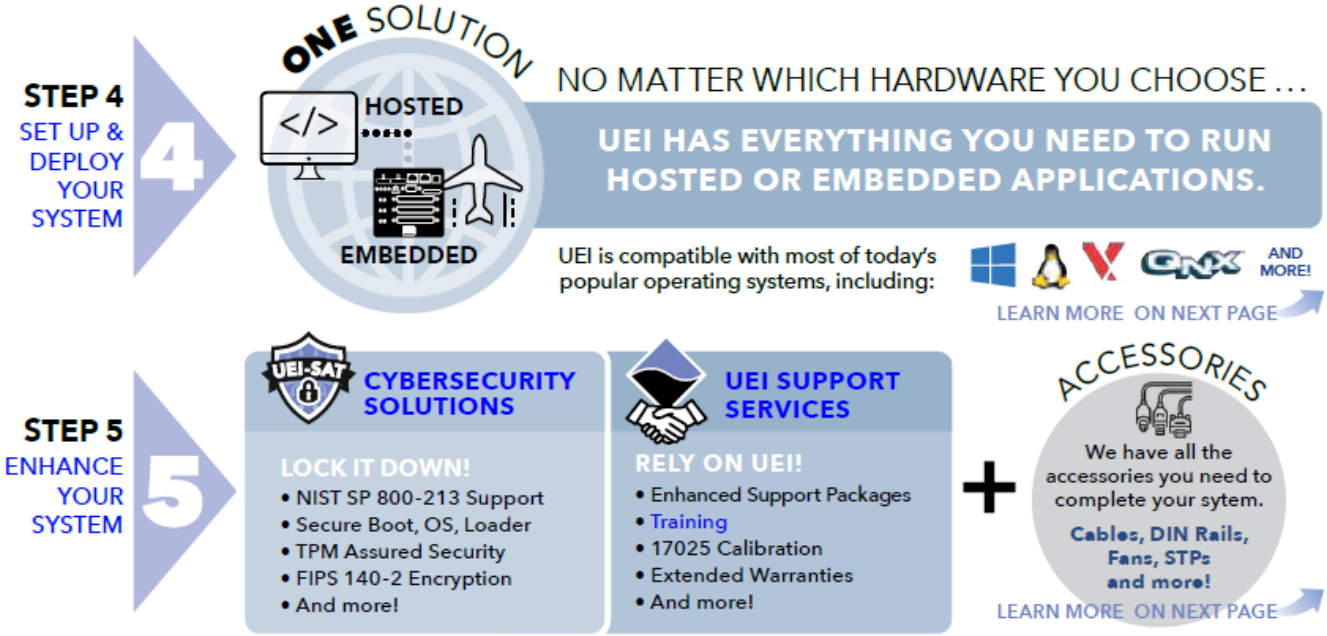
- **Q: What operating systems are compatible with UEI?**
  A: UEI is compatible with most popular operating systems including embedded systems.
- **Q: What industries can benefit from UEI products?**
  A: UEI products are beneficial for industries such as Aerospace, Energy, and Defense for data acquisition and control purposes.

WE HAVE PRODUCT NOW—ASK HOW WE CAN GET YOU UEI PRODUCTS FAST! • GLOBAL SUPPORT

ueidaq.com
uei.info@ametek.com

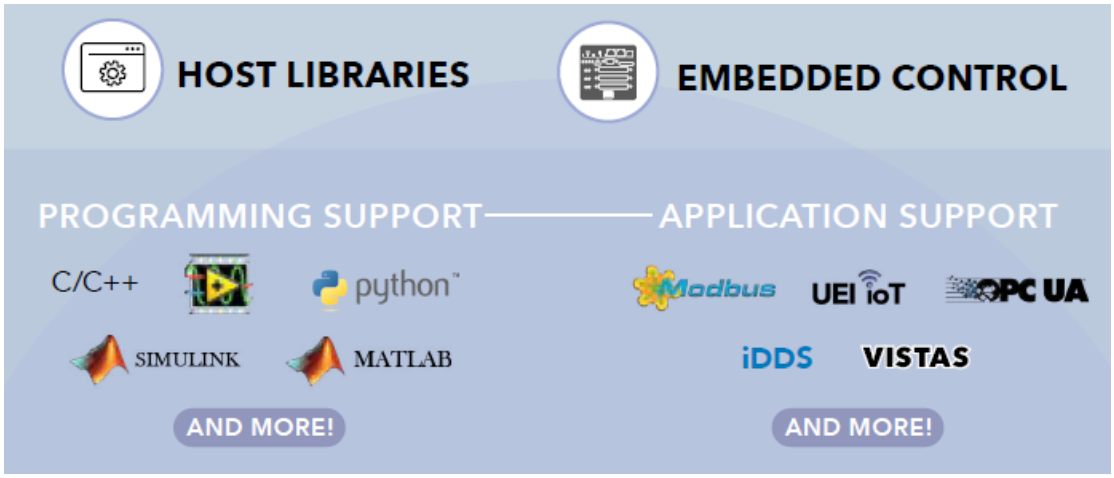
BUILD YOUR PERFECT SYSTEM

UEI has created a quick and easy way to build your perfect I/O system. We have identified 5 segments—chassis, processor, I/O selection, software/programming options and system enhancement—that allow you to assemble an ideal system for your application. Below is a graphical overview of each segment and what is included in the build process.

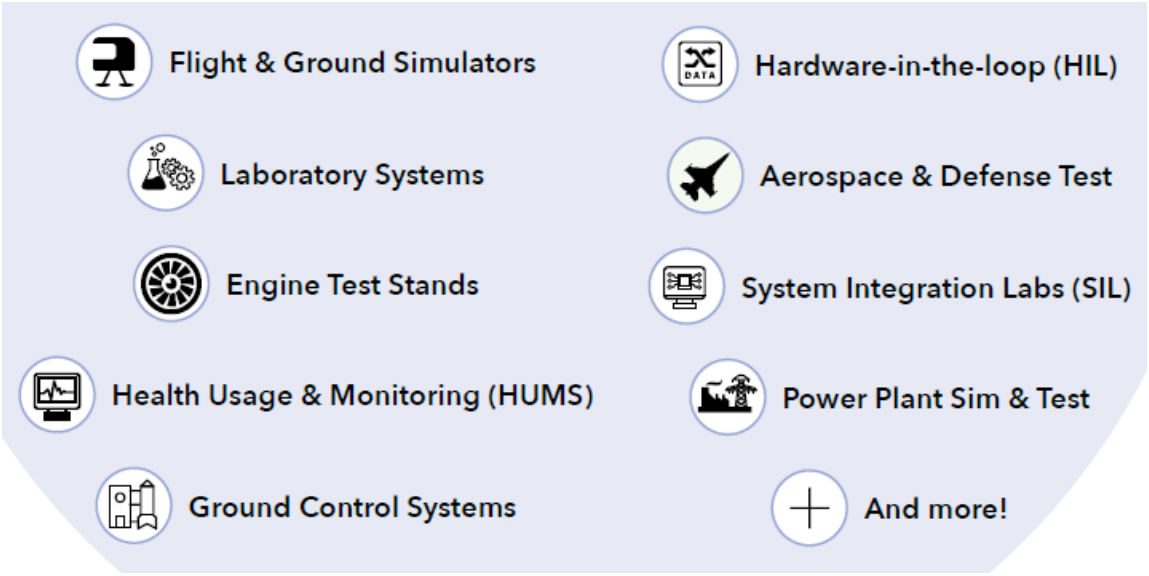


ONE I/O SYSTEM SOLUTION

- UEI HAS ALL THE LIBRARIES AND CONNECTORS NEEDED FOR YOUR APPLICATIONS, INCLUDING:



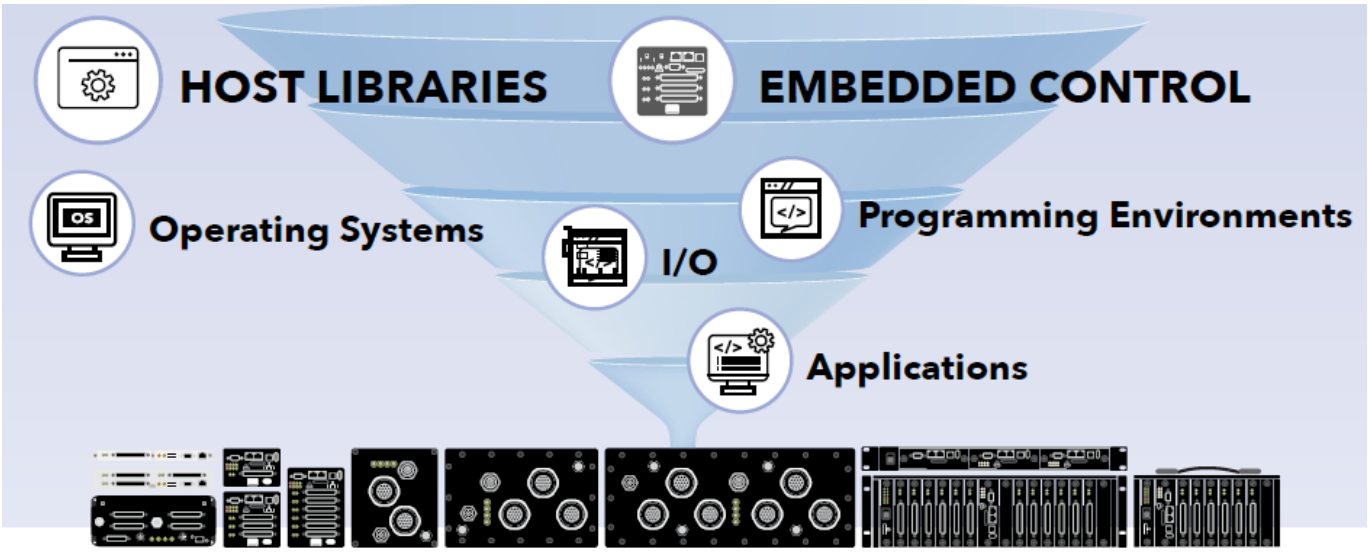
- UEI data aquisition, test and control systems can help support a wide array of critical applications, such as:



UEI & FACE™

The FACE™ (Future Airborne Capability Environment) Consortium is a government/industry partnership that aims to define an open avionics environment, the FACE™ technical standard, for military avionics platforms. UEI COTS products are aligned with the FACE™ technical standard, and within the FACE boundary, UEI utilizes RTI technology to participate in FACE systems via TSS —the transport services segment.

BUILD WITH FULL FLEXIBILITY



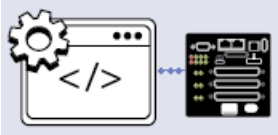
No matter how you need to build and launch your system, UEI's system flexibility gets you your perfect configuration. No matter the chassis, OS and programming, we have a deployment configuration for you.

CONFIGURE UEI'S HARDWARE TO RUN YOUR WAY

POPULAR OPERATIONAL CONFIGURATIONS INCLUDE:

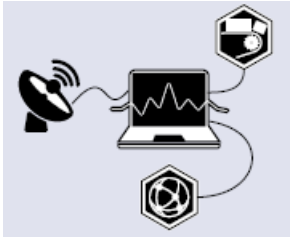
- **PowerDNA Distributed Network Automation**

  Host libraries to support your development on any OS in almost any language. The API is the same across all, making your software design that much more portable. Synchronization via IEEE-1588 PTP, as well as full control of the hardware. Example code is included to get you up and running instantly.



- **INTERNET OF THINGS UEI IoT**

  Internet of Things (IoT) is a networked system of interconnected physical objects that can share data with each other via cloud services for archiving and analysis. UEI's Linux-based PACs support Eclipse Mosquitto and Microsoft Azure.



- **MODBUS UEIModbus Series**

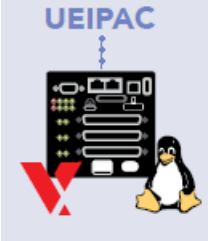
  UEIModbus is compatible with all popular Modbus client applications and software. Communicate to your PLC over Modbus TCP using any of our I/O, and even bridge to ARINC 429.

- **VISTAS Virtual Interoperable Simulation Tests of Avionics**

  VISTAS enables avionics equipment to be easily accessed, controlled, or simulated remotely through Ethernet. Our VISTAS implementation runs on virtual or hybrid test benches, improving schedules and quality while reducing overall cost. The physical hardware can be remote to the bench using VISTAS as a virtual bridge.

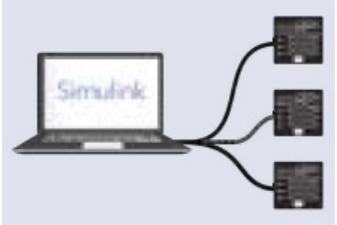
- **Embedded Control UEIPAC**

  Run your application directly on our hardware, taking advantage of the rugged standalone operation. We support Real-Time Linux and VxWorks directly for our entire product line. TSN and cybersecurity is all supported out of the box. Perfect for embedded control and monitoring applications.



- **SIMULINK UEISIM Series**

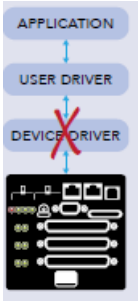
  Easily run your Simulink models on real I/O. Run your models standalone or under supervisory control of the host PC. UEISIM creates a powerful solution for developing and tuning real-time (and non-real-time) applications, including model verification, rapid prototyping, and HIL testing.



- **OPC-UA UEIOPC-UA Series**

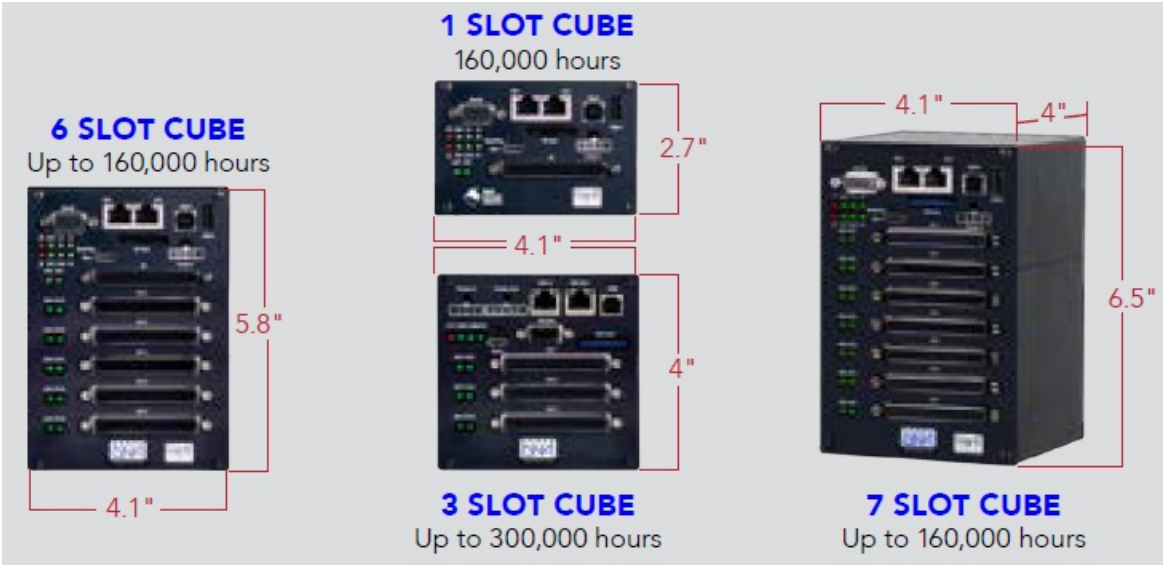
  Run as a standard OPC-Unified Architecture server as defined in IEC 62541. As such, it is supported by a huge number of currently available applications packages, written in-house and by third party developers. UEIOPC-UA is an ideal solution in a wide variety of oil & gas, HVAC, machine health monitoring as well as host of other industrial control and monitoring functions. Support included for Data Access, Alarms and Historians.

- **iDDS Instrumentation Data Distribution Service**
  iDDS is an embedded common application protocol for ”plug and play” DAQ instruments. iDDS allows lower cost and shorter integration cycles, because publishers/subscribers share a common framework and code is written in a common interface definition language. Our wide array of I/O and avionics boards and extensive software support make your testing safer, faster, easier and more cost-effective.



CHASSIS OVERVIEW

PowerDNA
CUBE ARCHITECTURE



Wireless Ready (GSM, CDMA, WiFi)
All UEI Chassis are wireless-ready, except for MIL Series. Inquire further with your UEI representative.

Common Features

- 1, 3, 6 or 7 available I/O slots
- 9–36 V DC input
- Diagnostic serial port
- SYNC port, 1588 (board-to-board and cube-to-cube)
- -40 to 85 ºC
- 5 g vibration,100 g shock, 120,000 ft
- SSD, encryption hardware
- LED health / status indicators

- USB
- 10/100/GigE or Fiber
- Fan options available

THE CUBE IS THE IDEAL SOLUTION WHEN YOUR APPLICATION CALLS FOR MAXIMUM RUGGEDNESS IN THE SMALLEST POSSIBLE PACKAGE.

PowerDNR
RACKtangle® ARCHITECTURE

Common Features

- 4, 6 or 12 I/O boards
- Passive backplane with temperature sensors
- Extensive built-in test & diagnostics
- 3 g vibration, 50 g shock, 70,000 ft
- -40 to 70 ºC
- USB
- 2 independent GigE NICs
- SSD, encryption hardware

UEI's Cube, RACKtangle® and FLATRACK™ I/O chassis are compact and rugged data acquisition (DAQ) interfaces, ideally suited for a wide variety of industrial, military, aerospace, energy, laboratory DAQ and control applications. Each Cube/RACKtangle chassis includes a CPU, a real-time OS, Ethernet interface and slots allowing the installation of I/O boards. All our boards are compatible with all of our chassis options. With more than 90 I/O boards available, we're sure to have just what you need. UEI supports all popular Windows, Linux and real-time operating systems. Our software suite provides a simple, universal API, and supports all common

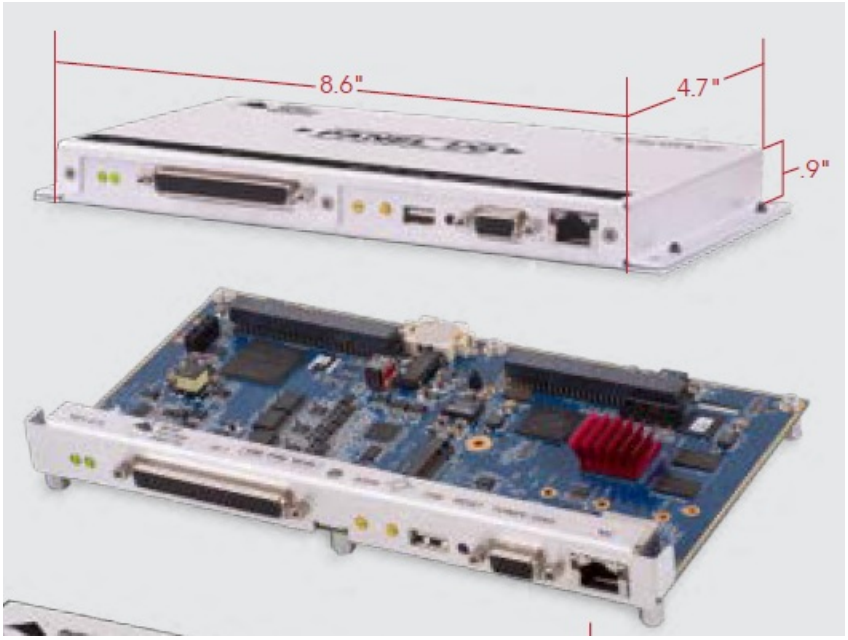
programming languages. Our Cube/RACKtangle chassis fully support an extensive array of application packages, including LabVIEW, MATLAB, Simulink and more.
Please note that PowerDNA® (Distributed Networked Automation) refers to our unique chassis. Cubes are designated with a “DNA” prefix, RACKtangles a “DNR” prefix, and FLATRACK a “DNF” prefix. UEINet™ is our single slot cube. “MIL” designates a chassis designed to meet military-grade specifications MIL-STD-704/1275/461/810.

Rugged/Sealed Chassis
RACKtangle® ARCHITECTURE

- Military/rugged 38999 connectivity
- 100% COTS solution
- Supported by over 90 standard DNA series I/O boards
- 5 g vibration, 100 g shock, sealed to IP66
- GigE ports (control and diagnostic)
- Designed for MIL-STD-461/1275/704/810 compliance
- Extensive built-in system diagnostics
- Compatible with all PowerDNA and PowerDNR boards & software
- Extensive software support including Windows, Linux, QNX, INtime and more
- VxWorks support available in embedded or hosted configurations

Multifunction Panel I/O Interface (UEI-PIO-1010)
40-Channel Fully Integrated I/O System

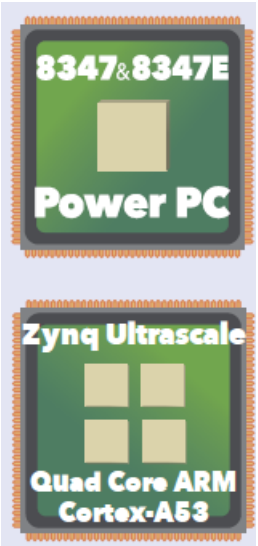
- Compact all-in-one I/O system—designed to be placed close to your signals
- Easily embed in equipment—ideal for instruments and control panels
- Integrated SoloX/i.MX ARM A9 processor
- Rugged—5 g Vibe, 100 g Shock, -40 to 70 °C
- 16 analog inputs, 2 analog outputs, 20 DIO, 2 frequency I/O, RS-232/422/485 and I²C ports
- Single board control, or distributed acquisition and control
- 100% compatible with UEI’s entire product line
- Designed for aerospace and industrial voltage levels, up to 80 V
- Can add 2 additional boards



PROCESSOR OVERVIEW

- **5200 Processor**
  - On all DNA-PPCx Cube products
  - Fiber 10/100Base-T Ethernet
  - Lowest power
  - Same software API
- **SoloX Processor**
  - SoloX / i.MX6 A9
  - 2 independent 1000Base-T Ethernet
  - RS-232, USB 2.0, HDMI, M.2 PCIe
  - 1 GByte RAM, 8 GByte Flash
  - MicroSD to 32 GByte, SSD, M.2 SSD up to 320 GByte*

- **8347 & 8347E Processors**
  - Available for all chassis
  - 2 independent 1000Base-T Ethernet
  - Options for 256 MB RAM, 128 MB Flash
  - 8, 32 GByte SD cards*
  - 8, 16 GByte SSD options*
  - IEEE 1588 synchronization
- **Zynq Ultrascale Processor**
  - Available on all UEIPAC systems
  - Quad-core ARM Cortex-A53, 64-bit processor
  - User programmable Xilinx FPGA
  - 4 GByte 64-bit DDR, 8 GByte Flash
  - 3 GigE ports, supports IEEE-1588
  - Full HD video output
  - M.2 slot for NVMe SS drives up to 512 GByte



* The SD cards and SSD devices used are not built by UEI. As we do not control the source, we cannot offer our 10-year availability guarantee on these devices.

CYBERSECURITY — NIST SP 800-213

- **Secure Boot**

  Extension of Root of Trust
- **Secure OS**

  STIG/NIST SP 800-213 compliance
- **Secure Tools**
  - Security automation tools make configuration easy
  - FIPS 140-2 encryption

TPM Hardware Secured Protection

UEI & TIME SENSITIVE NETWORKING (TSN)
Reliable networking capable of running critical systems reliably and determinisitically

- Zynq UltraScale+ will support 802.1Qbv, 802.1bu/802.3br, 802.1AS, 802.1Q, 802.1Qav, 802.1CB (this is an end-node, no switch inside)
- SoloX/ARM I.MX6 will support 802.1Qav, 802.1Qbv, 802.1AS, 802.1Q, 802.1Qci (there is a switch inside)

SPECIFICATIONS

Processor	Part Number (DNx-)	Memory	Connectivity	Non-volatile Memory	Notes	MTBF	TSN-Ready
5200 Power PC	DNA-FPPCx	128 MB RAM, 4 MB Flash	Fiber 10/100Base-T, Switch	SD: 8 GByte, 32 GByte	3.5 Watts	>300,000	–
8347 PowerPC	-1G-02	256 MB RAM, 32 MB Flash	USB 2.0 2 GigE (Independent)	SD: 8 GByte, 32 GByte SSD: 8 GByte, 16 GByte, 32 GByte	7 Watts, IEEE 1588	>160,000	–
Encrypted 8347	-1G-03	256 MB RAM, 128 MB Flash	USB 2.0 2 GigE (Independent)	SD: 8 GByte, 32 GByte SSD: 8 GByte, 16 GByte, 32 GByte	7 Watts, IEEE 1588, Hardware Encryption	>160,000	–
SoloX / i.MX6 Cortex A9 ARM	-1G-11 -1G-12	1 GByte RAM, 8 GByte Flash	2 GigE (Independent), USB 2.0, HDMI, M.2 PCIe	µSD: 8 GByte, 32 GByte SSD: 8 GByte, 16 GByte, 32 GByte M.2 SSD: 40 GByte, 320 GByte	5 Watts, IEEE 1588, Wireless via M.2 card	>160,000	✓
Quad Core ARM Cortex-A53 Zynq	-1G-33	4 GByte 64-bit DDR, 8 GByte Flash	3 GigE (Independent), USB 3.0, Display Port (DP), M.2 PCIe	M.2 SSD: 40 GByte, 320 GByte	12 Watts, IEEE 1588	>140,000	✓
	-1G-3A	2 GByte 64-bit DDR, 8 GByte Flash					

CYBERSECURITY

UEI & NIST SP 800-213 COMPLIANCE PATH

- Secure Key Management
- Published Security Technical Implementation Guide (STIG)
- Trusted Platform Module (TPM) On Board

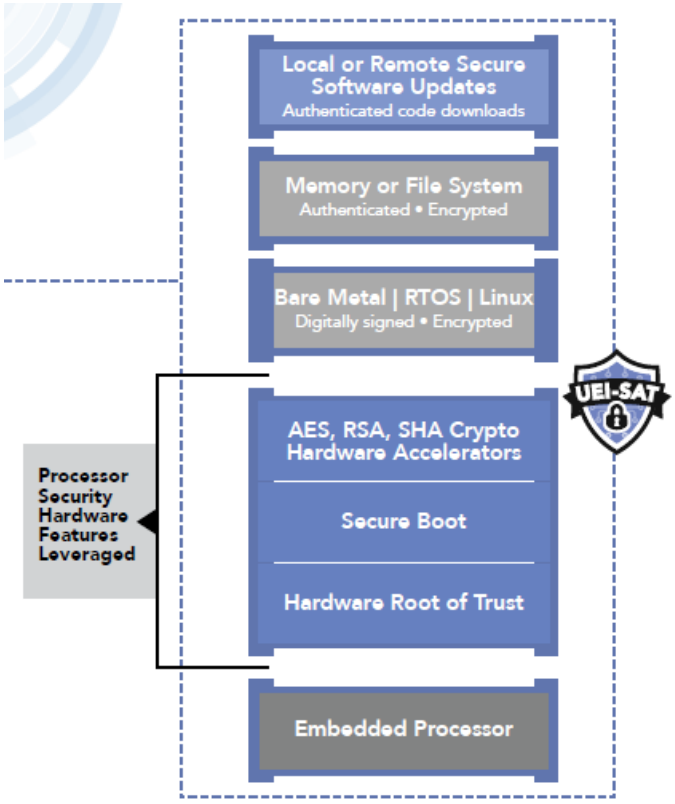
- Secure Boot of Applications, OS, and Boot Loader
- Secured Linux with Subscription
- FIPS 140-2 Encryption

UEI-SAT Security Automation Tool

- Customized GUI
- Key Generation
- Uboot/Linux Authentication
- Linux Kernel and Rootfs Encryption
- Trust Zone via Open, Portable Trusted Execution Environment (OP-TEE)
- Peripheral and Code Execution Security
- FIPS 140-2 Encryption
- Trusted Platform Module (TPM) On Board

The Right Features For System Control and Lockdown

- Authenticated and encrypted boot for RTOSes or Linux
- Generation of public and private keys for RSA digital signatures
- Support for up to 4096-bit keys for resilience against quantum computing attacks
- Signing of application binaries with RSA signatures
- SHA-256 hashing for authentication of public keys
- Generation of AES keys up to 256 bits in length
- AES-CCM encryption for bootable code stored in flash memory
- Use of immutable Hardware Assisted Boot (HAB) stored in ROM
- Use of AES and SHA-256 hardware accelerators
- Secure UART, USB, JTAG interfaces, and other I/O ports
- Download the secure binaries to flash memory



UEI-SAT ALLOWS FOR:

Cybersecurity is easily transitioned from engineering to deployment

STEP-BY-STEP TOOL MAKES IT EASY: UEI-SAT is easy to implement, with no need to trade off product schedules for cybersecurity. Quickly deploy with confidence that security is done right with no need to hire additional experts. All security features provide necessary and important protection.

SUPPORT SERVICES

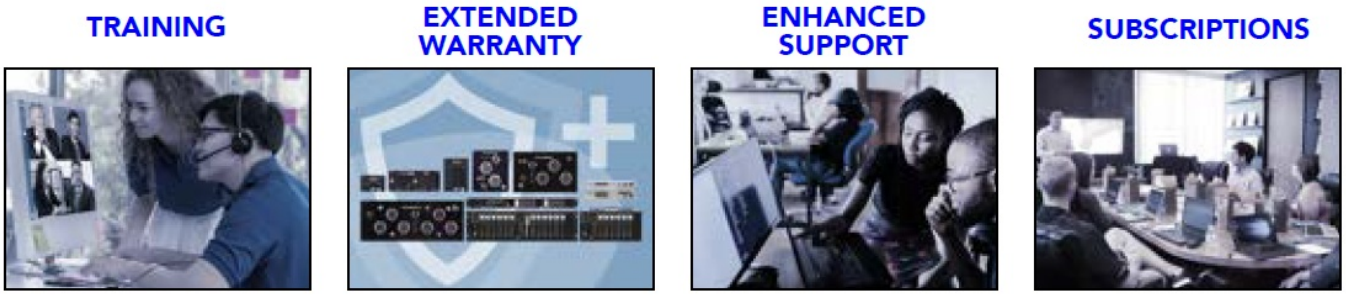
UEI HAS YOU COVERED.
ENHANCE YOUR APPLICATIONS WITH UEI SUPPORT

United Electronic Industries (UEI) not only manufactures industry-leading data acquisition (DAQ), test, and control I/O systems, but we also offer first-class service and support solutions for the life of your application. Our hardware is designed for maximum flexibility and to be easy to set up and operate, but every application has its unexpected challenges. When you partner with our experienced customer service team, you gain access to a wealth of masterful system insight that will bolster operational efficiencies, increase uptime, reduce cost and time to deployment, and help support critical application goals. UEI stands by our customers, and we have comprehensive support offerings for all the needs of your program.

IMPACTFUL SERVICE. REAL RESULTS.

- "…nice to work with a company that actually supports their products. That's becoming rare these days." — Sr. Software Engineer, SAIC
- "Your willingness and ability to support our urgent request and the support we have received so far from your support team has completely sold our entire team on your products."
  — Real-Time Test and Simulation Engineer, Honda Aircraft
- "Your technical support is phenomenal. It's so great to quickly get in touch with you guys rather than being routed through 30 different switchboards. It's a big help."
  — Thermal Engineer, NASA

Learn more about our diverse service package offerings.



- Get up to speed fast. Schedule a UEI Applications Engineer to streamline your startup.
- Extend our already best in class warranty to gain peace of mind through the life of your project.
- Secure elevated resources dedicated to the needs of your program, with full cost control.
- Gain access to tools to further strengthen and secure your development.

UEI service and support packages help ensure your continued success with our commitment to service excellence. With our variety of packages and subscriptions, we aim to meet the various budget needs that address diverse coverage as a well as financial and administrative requirements.
For up-to-date licensing information and product-specific disclaimers, contact UEI Technical Services.

I/O BOARD SPECIFICATIONS

GUARDIAN SERIES ADVANTAGE On-Board I/O Monitoring System

- Open/Broken Sensor Detection • Channel Self-Test without Field Wiring Disconnection • Current/Voltage

Monitoring • Circuit Breaker Functionality

- **COMPLETE SELF-CHECK**

  From the Chassis to the Board to the Channel

- **ELIMINATE HEADACHES**

  Save Time • Reduce Monitoring Complexity • Lower Costs (No External Test Equipment)

ANALOG INPUT

Board Type	Part Number (DNx-)	Number of Channels	Resolution (Bits)	Maximum Sample Rate (Channel) kS/sec	Maximum Sample Rate (Board) kS/sec	Simultaneous Sampling (No MUX)	Maximum Input Range	Minimum Input Range	Channel-to- Channel Isolation	MTBF
General Purpose, Low Noise	AI-207	16	18	16	16	–	±10 V	±12.5 mV	–	>600,000
High Speed, Simultaneous Sampling	AI-217	16	24	120	1600	✓	±10 V	±156 mV	–	275,000
High Density	AI-248-230	24	18	0.25	6	–	+ 32 /-2 V	± 32 mV	–	550,000
High Density, High Speed	AI-201-100	24/12	16	100	100	–	±15 V	±1.5 V	–	600,000
High Speed, High Voltage	AI-205	4	18	250	1000	✓	±100 V	±100 mV	✓	>600,000
High Speed, Fully Isolated	AI-218	8	24	120	480	✓	±10 V	±156 mV	✓	290,000
High Voltage, Fully Isolated	AI-228-300	8	24	120	480	✓	± 300 V	± 37.5 V	✓	290,000

Current Input	AI-202	12	16	16	16	–	±150 mA	±1.5 mA	–	>600,000
0-20 /4-20 mA Input	AI-204	24	18	1	24	–	0 –20 mA	0 – 0.2 mA	–	>500,000
Thermocouple, Fully Isolated	AI-212	12	24	1.5	18	✓	± 2.048 V	± 32 mV	✓	230,000
Thermocouple, High Resolution, High Density	AI-225	25	24	1	25	✓	±1.25 V	–	–	520,000
RTD / Resistance	AI-222	12	24	0.150	1.8	✓	40k Ω	100 Ω	✓	230,000
Strain/Bridge Input, Low Cost	AI-208	8	18	8	8	–	±10 V	±12.5 mV	–	>600,000
Strain/Bridge Input, High Performance	AI-224	4	18	100	400	✓	±10 V	± 78 mV	✓	260,000
ICP/ IEPE Accelerometers	AI-211	4	24	125	500	✓	+ 25 / -13 V	± 2.5 V	✓	250,000
LVDT/ RVDT	AI-254*	4	16	5	20	✓	28 Vrms	2 Vrms	✓	275,000
Synchro /Resolver	AI-255*	2	16	4	8	✓	28 Vrms	2 Vrms	✓	275,000
Synchro /Resolver	AI-255-815*	2	16	4	8	✓	115 Vrms	5 Vrms	✓	275,000

LVDT/ RVDT, Synchro / Resolver, High Drive	AI-256*	2	16	10	20	✓	28 Vrms	5 Vrms	✓	275,000
Digital Multimeter (DMM)	DMM-261	1	6.5 digit	Range Dependent	Range Dependent	n/a	300 V DC 3 ADC 100 MΩ	30 mV DC 1.5 m ADC 10 Ω	✓	300,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.
*Also functions as simulated output

WE HAVE PRODUCT NOW! UEI IS AVERAGING 4 WEEK LEAD TIMES. CALL AND ASK HOW WE CAN GET YOU UEI PRODUCTS FAST!

ANALOG OUTPUT–GENERAL PURPOSE

Board Type	Part Number (DNx-)	Number of Channels	Update Rate (Channel) kS/sec	Update Rate (Board) kS/sec	Output Range (Volts)	Output Current Drive (mA)	Channel-to-Channel Isolation	MTBF
General Purpose	AO-308	8	100	500	+/-10	+/- 5	–	480,000
Fully Isolated With Readback	AO-318	8	10	80	+/-10	+/-10	✓	480,000
High Current	AO-308-350	8	100	800	+/-10	+/- 50	–	480,000
High Density	AO-332	32	10	320	+/-10	+/-10	–	400,000
High Density	AO-332-828	28	10	280	+/-10	+/-10	–	400,000
High Density With Readback	AO-333	32	10	320	+/-10	+/-10	–	400,000
Medium Voltage/Current	AO-308-352	8	100	800	+/-13.5	+/-13.5	–	480,000
High Voltage	AO-308-353	8	100	800	+/- 40	+/- 5	–	480,000
High Voltage	AO-308-354	4	50	200	+/- 60	+/- 5	–	480,000
Current Output (0 – 20 mA)	AO-308-020	8	100	800	–	0 – 20	–	480,000
Current Output (Sourcing) Isolated with Readback	AO-318-020	8	10	80	–	0 – 20	✓	480,000
Current Output (Sourcing) Isolated with Readback	AO-318-024	8	10	80	–	0 – 24	✓	480,000
Current Output (Sinking) Isolated with Readback	AO-319-420	8	10	80	–	4 – 20	✓	480,000
Current Output (4 – 20 mA)	AO-308-420	8	100	800	–	4 – 20	–	480,000
Function Generator /AWFG	AO-364	4	150	600	+/-12	+/-10	✓	290,000
High Current Buffer (External)	UEI-STP-AO-200	8	–	–	+/-10	+/- 250	–	200,000
High Current, High Voltage (External)	DNA-STP-AO-250	4	–	–	0 – 35	+/- 250	–	200,000
High Voltage Amplifier (External)	PD-AO-AMP-115	16	–	–	+/- 115	+/- 10	–	100,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.

ANALOG OUTPUT–SIMULATION

Board Type	Part Number (DNx-)	Number of Channels	Update Rate (Channel) kS/sec	Update Rate (Board) kS/sec	Output Range (Volts)	Output Current Drive (mA)	Channel-to-Channel Isolation	MTBF
SIMULATED DEVICE/SENSOR								
Strain Gage Simulator, 350 Ω	AO-358-350	8 Bridges	5	40	N/A	N/A	–	300,000
Strain Gage Simulator, 1 kΩ	AO-358-102	8 Bridges	5	40	N/A	N/A	–	300,000
Simulated LVDT/ RVDT	AI-254	4	5 kHz exc	–	0 – 6.7 Vrms	65 mA	✓	275,000
Simulated Synchro / Resolver	AI-255	2	4 kHz exc	–	0 – 28 Vrms	1.2 VA	✓	275,000
Simulated S/R & LVDT/ RVDT, High Drive	AI-256	2	10 kHz exc	–	0 –19.8 Vrms	2.4 VA	✓	275,000
Transformer Coupler for AI-254	TRF-254-447	4	5 kHz	–	4.47:1 ratio	4.47:1 ratio	–	–
Transformer Coupler for AI-254	TRF-254-122	4	5 kHz	–	1. 22: 1 ratio	1.22 :1 ratio	–	–
Simulated Thermocouple with CJC	TC-378	8	1 kHz	8 kHz	+/-100 mV 16 bits	+/- 10 mA	✓	250,000
Simulated RTD 100 Ω	RTD-388-100	8	200 Hz	200 Hz	23 – 390 Ω, 7500 steps	+/- 4 mA Input	✓	>400,000
Simulated RTD 1 kΩ	RTD-388	8	200 Hz	200 Hz	180 – 3900 Ω, 7500 steps	+/- 4 mA Input	✓	>400,000

DIGITAL I/O

Board Type	Part Number (DNx-)	Number of Channels	Input (kHz)	Output kS/sec	Drive Capacity (Continuous / Peak)	Range (Min V)	Range (Max V)	Change of State	MTBF
DISCRETE I/O									
Logic Level	DIO-403	48	10	20	16 mA	2.5	5.5	✓	>600,000

Sourcing Outputs, 3.3 – 36 VDC Inputs	DIO-404	12 in /12 out	100	100	350 mA / 500 mA	3.3	36	✓	375,000
Sourcing Darlington Outputs, 5 – 36 VDC Inputs	DIO-405	12 in /12 out	1	1	80 mA /200 mA	5	36	✓	>600,000
Sinking Outputs, 3.3 – 36 VDC Inputs	DIO-406	12 in /12 out	100	100	1 A /1.5 A	3.3	36	✓	375,000
Universal Sink/Source, In/Out	DIO-480	32 in /32 out	100	1	500 mA / 1 A	3.3	55	✓	140,000
DISCRETE INPUTS									
5 – 36 VDC Inputs	DIO-401	24	1	–	–	5	36	✓	>600,000
0 – 32 VDC Inputs	DIO-448	48	1	–	–	-1	32	–	550,000
0 –150 V AC/DC Inputs	DIO-449	48	1	–	–	-150	150	✓	500,000
Board Type	**Part Number (DNx-)**	**Number of Channels**	**Input (kHz)**	**Output (kS/sec)**	**Drive Capacity (Continuous/ Peak)**	**Range (Min V)**	**Range (Max V)**	**PWM**	**MTBF**
DISCRETE OUTPUTS									
Sourcing Darlington Outputs	DIO-402	24	–	1	80 mA /200 mA	7	36	–	>600,000
Solenoid Drive (Source/Sink), 3.3 – 36 VDC	DIO-416-32	32	–	0.125	500 mA / 3.5 A	3.3	48	–	130,000
Sinking Outputs, 3 – 36 VDC	DIO-432	32	–	1	600 mA / 3.5 A	3.3	36	✓	260,000
Low-leakage, Sinking Outputs, 3 – 36 VDC	DIO-432-800	32	–	1	600 mA / 3.5 A	3.3	36	✓	260,000
Sourcing Outputs, 3 – 36 VDC	DIO-433	32	–	1	600 mA / 3.5 A	3.3	36	✓	260,000
Low-leakage, Sourcing Outputs, 3 – 36 VDC	DIO-433-800	32	–	1	600 mA / 3.5 A	3.3	36	✓	260,000
RELAY OUTPUTS									

Solid State Relay Outputs, Form A	DIO-430	30	–	1	400 mA / 2 A	0	55 VDC / 55 VAC	–	600,000
Relay Outputs, Form C	DIO-452	12	–	0.125	2 A	0	220 VDC / 250 VAC	–	275,000
Relay Outputs, Form C	DIO-462	12	–	0 .125	2 A	0	220 VDC / 250 VAC	–	260,000
Solid State Relay Outputs, Form A (NO)	DIO-463	12	–	0.125	2 A	0	51 VDC / 51 VAC	–	260,000
High Current Relay Outputs, Form C	DIO-470	10	–	0.125	5 A	0	140 VDC / 150 VAC	–	275,000
Board Type	**Part Number (DNx-)**	**Number of Channels**	**Relay Type**	**Output**	**Drive Capacity Continuous / Peak**	**Maximum On/Off Resistance**	**Range (Max V)**	**Channel-to- Channel Isolation**	**MTBF**
MULTIPLEXERS									
3 to 1 Routing Board	MUX-414/418	14/18	SSR	300 Hz	2 A / 3 A	200 mΩ / 10^8 Ω	60 VDC	✓	> 400,000
Multiplexer for the DMM-261	MUX-461	26/13 – 2/4 wire	Reed	500 Hz	0.5 A	500 mΩ /10^10 Ω	170 Vrms	✓	180,000
High Voltage Multiplexer for the DMM-261	MUX-461-350	24/12 – 2/4 wire	SSR	500 Hz	0.5 A	4 Ω/10^6 Ω	+/- 350 V	✓	180,000

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MULTIFUNCTION I/O MultiFunction Analog and Digital Board DNx-MF-101

ANALOG INPUT Type	Number of Channels	Resolution (Bits)	Maximum Sample Rate	Maximum Sample Rate (Board)	Minimum Input Range	Maximum Input Range	MTBF (Channel)	kS/sec	kS/sec
General Purpose, Medium Voltage	16 SE, 8 diff	18	2	16	80 V	0.156 V	300,000		

ANALOG OUTPUT Type	Number of Channels	Resolution (Bits)	Update Rate (Channel) kS/sec	Update Rate (Board) kS/sec	Voltage Output Mode Range	Current Output Mode Range (mA)	MTBF
General Purpose Voltage or Current	2	16	2	4	+/- 10 V, +/- 5 V @ 5 mA	0 –20, 4 –20, -1–22	300,000

DIGITAL I/O Type	Number of Channels	Input (kHz)	Output (kS/sec)	Drive Capacity	Range (Min V)	Range (Max V)	Notes	MTBF
Industrial Voltage	16	1	1	500 mA	3.3	55	Inputs: Programmable PU/PD, thresholds Outputs: Sink or Source, PWM control	300,000
Logic Level	4	1	1	5 mA	3.3	5	Direction set in groups of 2	300,000

SERIAL/CAN BUS Type	Number of Transfer Channels	Rate	Notes	MTBF
RS – 232/422/485	1	2 Mbaud	2048 word FIFO, Interrogation Scheduler	300,000
I²C	1	100k, 400k, 1 Mbit	Master, Slave, Bus Monitor	300,000

COUNTER/TIMER Type	Number of Clock Channels	Rate	Notes	MTBF
32 Bit	2	66 MHz	Counter In/Out can be connected to any Digital In/Out	300,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.

PIO-1010 40-Channel, Fully Integrated I/O System

ANALOG INPUT Type Number of Channels		**Resolution Maximum Maximum (Bits) Sample Rate Sample Rate (Channel) kS/sec (Board) kS/sec**			**Maximum Input Range**	**Minimum Input Range**	**MTBF**
General Purpose, Medium Voltage	16 SE, 8 diff	18	2	16	80 V	0.156 V	300,000

ANALOG OUTPUT Type Number of Channels		**Resolution Update Rate Update Rate (Bits) (Channel) ks/sec (Board) ks/sec**			**Voltage Output Mode Range**	**Current Output Mode Range (mA)**	**MTBF**
General Purpose Voltage or Current	2	16	2	4	+/- 10 V, +/- 5 V @ 5 mA	0 –20, 4 –20, -1–22	300,000

DIGITAL I/O Type	**Number of Channels**	**Input (kHz) Output Drive (kS/sec) Capacity**			**Range (Min V)**	**Range (Max V)**	**Notes**	**MTBF**
Industrial Voltage	16	1	1	500 mA	3.3	55	Inputs: Programmable PU/PD, thresholds Outputs: Sink or Source, PWM control	300,000
Logic Level	4	1	1	5 mA	3.3	5	Direction set in groups of 2	300,000

SERIAL/CAN BUS Type	**Number of Channels Transfer Rate**		**Notes**	**MTBF**
RS – 232/422 /485	1	2 Mbaud	2048 word FIFO, Interrogation Scheduler	300,000
I²C	1	100k, 400k, 1 Mbit	Master, Slave, Bus Monitor	300,000

COUNTER/TIMER Type	**Number of Channels Clock Rate**		**Notes**	**MTBF**
32 Bit	2	66 MHz	Counter In/Out can be connected to any Digital In/Out	300,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.

SERIAL / CAN BUS

Communications Bus Protocol	Part Number (DNx-)	Physical Interface	Number of Channels	Transfer Rate	Notes	Channel-to-Channel Isolation	MTBF
High Speed CAN	CAN-503	CAN 2.0	4	1 Mbit	J1939 and CAN .DBC support	✓	350,000
I²C/SMBus	I2C-534	I²C	4	100k, 400k, 1 Mbit	Guardian read-back of master transmissions confirms validity of transmit data	✓	350,000
4-port Serial	SL-501	RS-232 /422 /485	4	4 Mbaud	J1587/J1708, Interrogation Scheduler	✓	350,000
4-port High Speed Serial	SL-501-804	RS-232 /422 /485	4	4 Mbaud	J1587/J1708, Interrogation Scheduler	✓	350,000
8-port Serial	SL-508	RS-232 /422 /485	8	4 Mbaud	J1587/J1708, Interrogation Scheduler	✓	290,000
HDLC/SDLC Synchronous	SL-504	RS-232/422 / 423/485	4	4 Mbaud	HDLC /SDLC TX /RX Synch.	✓	350,000
Synchronous Serial Interface (SSI)	SL-514	RS-485/422	4	2.5 MHz	Master, Slave 3-32 bits, FIFO onboard	✓	350,000
GP Synchronous Serial Communications	CT-602-804	RS-485/422	4	16 Mbaud	General Purpose	✓	350,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.
Remote Serial Server available for all RS232/422/485 boards on Linux & Windows.

COUNTER / TIMERS

Counter/Timer Function	Part Number (DNx-)	Type	Number of Channels	Clock Rate	Notes	Channel -to- Channel Isolation	MTBF
High Speed Counter/Timer	CT-601	32 Bits	8	66 MHz	Debouncing on Clock & Gate Inputs	–	350,000
Differential Counter/Timer	CT-602	32 Bits	4	66 MHz	RS-422/485 Logic Levels	✓	350,000
Quadrature Encoder Input	QUAD-604	A,B, & Z inputs	4	16.5 MHz	Buffered or Single Point Readings	–	350,000
Universal Speed Input	VR-608	50 mV – 250 V p-p	8	300 kHz	4 Freq Out, Double/Low Tooth	✓	180,000
IRIG Timing Generation and Synchronization	IRIG-650	A/B/E/G type	1	1, 5, 10 MHz	On-board GPS Receiver	✓	240,000
Precision Timing Interface	CT-651	ICD-GPS-060	4	1 PPS	Slaved or Free Run/Fix Wheel	✓	350,000

INSTRUMENTS

Board Type	Part Number (DNx-)	Number of Channels	Update Rate (Channel)	Ranges	Type	Current	Channel-to-Channel Isolation	MTBF
6.5 Digit DMM	DMM-261	1	100 Hz	+/- 300 VDC, +/- 30 mVDC, +/- 300 Vrms, +/- 500 mVrms, 100 MΩ to 10 Ω	VDC, VAC, IDC, IAC and Resistance	+/- 3 A AC/DC +/- 1.5 mA AC/DC	✓	300,000
Multiplexer for the DMM-261	MUX-461	26/13 – 2/4 wire	500 Hz	170 Vrms	2-wire voltage 2-wire current 2 or 4-wire resistance	+/- 0.5 A	✓	180,000
High Voltage Multiplexer for the DMM-261	MUX-461-350	24/12 – 2/4 wire	500 Hz	+/- 350 V	2-wire voltage 2-wire current 2 or 4-wire resistance	+/- 0.5 A	✓	180,000
Function /Arbitrary Waveform Generator	AO-364	4	150 kHz	+/- 12 V	Sine, Square, Triangle, Trapezoid, AWFG	+/- 10 mA	✓	290,000

Board Type	Part Number (DNx-)	Number of Channels	Relay Type	Output	Drive Capacity Continuous/ Peak	Maximum On/Off Resistance	Range (Max V)	Channel-to-Channel Isolation	MTBF
3 to 1 Routing Board	MUX-414/418	14 /18	SSR	300 Hz	2 A / 3 A	200 mΩ / 10^8 Ω	60 VDC	✓	> 400,000

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AVIONICS I/O

Protocol	Part Number (DNx-)	Type	Number of Channels	Transfer Rate	Notes	Channel-to-Channel Isolation	MTBF
1553 (Dual Redundant)	1553-553	2 Ports	2	1 Mbaud	Bus Cont, Remote Term, or BM	✓	275,000
ARINC-429	429-566	6 TX /6 RX	12	12.5/100 kb	Williamsburg V1 Support	–	470,000

ARINC-429	429-512	12 RX	12	12.5/100 kb	Williamsburg V1 Support	–	470,000
ARINC-429	429-516	16 TX /24 RX	24	12.5/100 kb	256 labels/ch on-board scheduler, 2k I/O FIFO/Channel	✓	470,000
ARINC-615	429-XXX	Up to 16	16	12.5 /100k baud	Williamsburg for Airborne & Portable Data Loader	✓	470,000
ARINC-708/453	708-453	2 TX /2 RX	4	1 Mbaud	Weather or Ground Prox Radar, WXPD	✓	275,000
ARINC-825	CAN-503	4 Ports	4	83.3–1000 kb	Sensors, Actuators, Software Timing – Transport Only	✓	350,000
ARINC-664 Part 7	ARINC-664	2 Ports	2	100 Mbaud	Dual Redundant or Independent	–	130,000
ARINC-615A	ARINC-664	2 Ports	2	100 Mbaud	Airborne & Portable Data Loader for Ethernet	–	130,000
CSDB	CSDB-509	8 TX / 8 RX	8	12.5/100 kHz	11 bit, Character and Frame Clocks	✓	290,000

Guardian Series – Includes a variety of powerful diagnostic and BIT functionality.

POWER SUPPLIES

Output Voltage	Part Number (DNx-)	Number of Channels	Output V	Current (Max)	Notes	Fully Isolated	MTBF
10 V	PC-910	1	±10	1.5 A	Isolation Current /Voltage Feedback	✓	150,000
15 V	PC-911	1	±15	1.2 A	Isolation Current /Voltage Feedback	✓	150,000
24 V	PC-912	1	± 24	1.6 A	Isolation Current /Voltage Feedback	✓	150,000
45 V	PC-913	1	± 45	0.4 A	Isolation Current /Voltage Feedback	✓	150,000
63 V	PC-914	1	± 63	0.4 A	Isolation Current /Voltage Feedback	✓	150,000
MIL-704/1275	PC-921-D	Internal	–	–	MIL-STD-704 /1275 /461 Power Conditioner	✓	150,000

RECONFIGURABLE

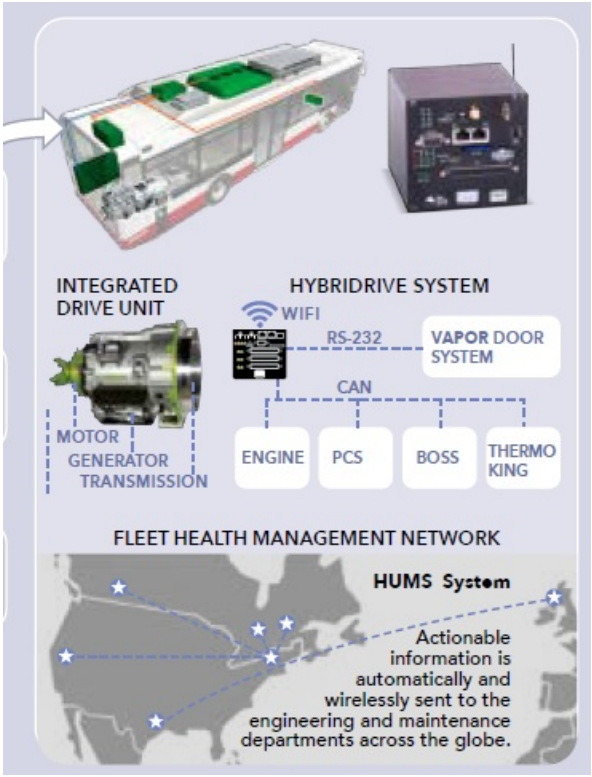
Board Type	Part Number (DNx-)	Connection	Notes	FPGA
Reconfigurable FPGA	PL-820	2x 62 Pin	104 DIO Pins, JTAG Connections	MAX10 / Cyclone II

APPLICATION BRIEFS

Bae System HYBRID BUS ENGINE MONITORING

- **CHALLENGE**
  Provide real-time streaming of vehicle data for preventative maintenance in order to maximize fleet efficiency.
- **SOLUTION**
  Rugged and compact in-vehicle data acquisition system, wirelessly connected to Fleet Health Management Network.
- **RESULTS**
  Improved vehicle uptime and reduced maintenance costs of up to 13%.

BONUS
BAE has sold thousands of these buses across the world, expanding their business globally.



U.S. AIR FORCE **ENGINE TEST CELL**

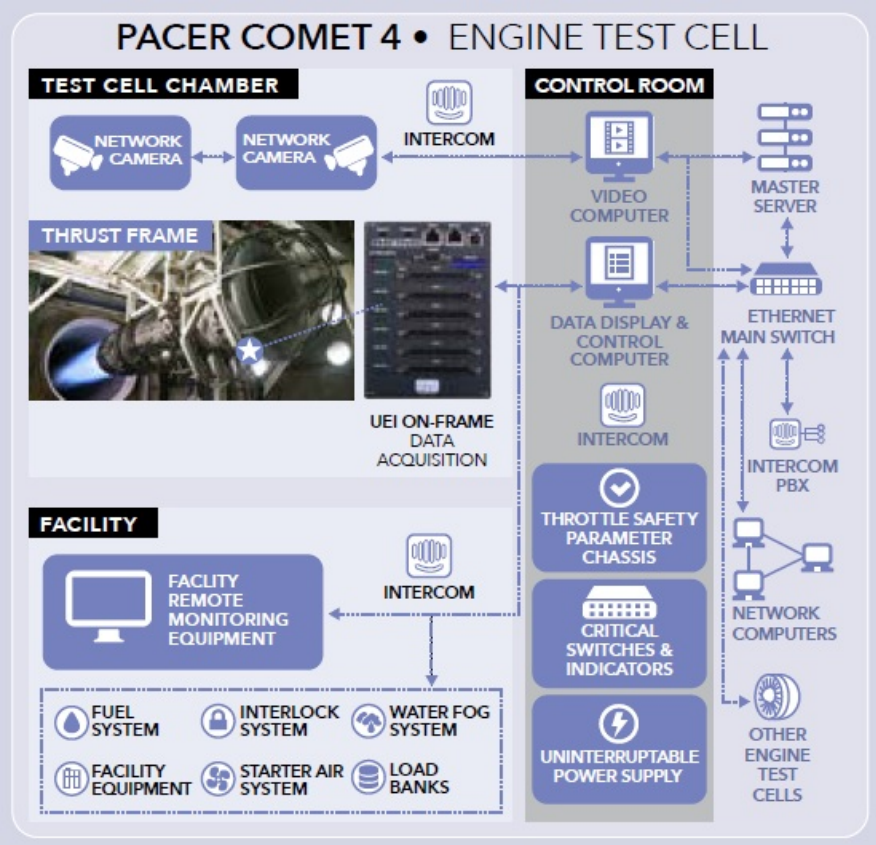
- **CHALLENGE**

  Improve reliability and maintainability of engine test cell to meet rising demand and reduced budget.
- **SOLUTION**

  Modular, rugged, Ethernet-based remote DAQ system.
- **RESULTS**

  Maximized test cell uptime, simplified maintenance, and reduced failures, thus meeting schedules and containing costs.
- **BONUS**

  The maintenance and repair operation became much more streamlined. No more re-wiring the engine for each test — the hardware travels with the engine!



UEI COLLECTS REAL-WORLD DATA FOR THE AEROSPACE, ENERGY AND DEFENSE INDUSTRIES, ALLOWING OUR CUSTOMERS TO BUILD SMART SYSTEMS THAT ARE RELIABLE, FLEXIBLE AND RUGGED.

FLIGHT SIMULATORS

- **CHALLENGE**
  Alleviate supply chain headaches of building commercial and military simulators due to product obsolescence and too many suppliers, all while improving the efficiency of their engineering team.
- **SOLUTION**
  Co-designed over a dozen products on standardized UEI reliable, rugged, flexible platform, consolidated three systems into one (combined DAQ and avionics) while significantly reducing cabling/wiring and costly system inspections.
- **RESULTS**
  Saved 10’s of millions of dollars through greater production and operational efficiencies. Use of our Guardian solution kept them up 99% of the time.
- **BONUS**
  Saved 1000’s of hours to install and maintain, simplified procurement process, increased system reliability, mitigated obsolescence, increased uptime, and improved time to market.

LAUNCH PAD CONTROL

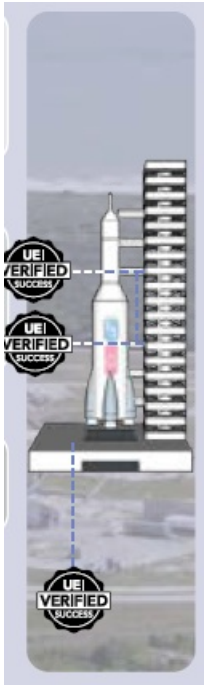
- **CHALLENGE**

  Replace ground support equipment with more robust, reliable, scalable solutions, and remove obsolescence issues. Eliminate backlog in commercial business and risks of losing the space race.
- **SOLUTION**

  UEI changed the architecture of their launch pads, moving from a centralized control system to a distributed system with self-diagnostic capabilities from each node to the control valves.
- **RESULTS**

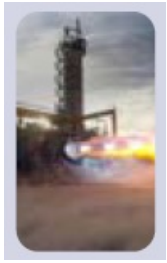
  With these highly distributed, self-checking systems, U.S. based manned flight is a reality!
- **BONUS**

  SpaceX is back leading the private space race, from satellite constellations to manned flight.

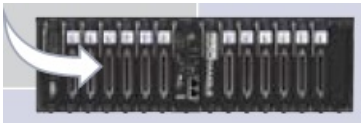


ROCKET ENGINE & LAUNCH VEHICLE TEST

- **CHALLENGE**
  Consolidating custom and COTS DAQ and Control hardware into one platform to accelerate development, minimize maintenance, and deliver programs on time.



- **SOLUTION**
  Co-developed COTS hardware based on standardized UEI modular, embedded platform, with a single software API, for HIL/SIL/ Engine Test applications.



- **RESULTS**
  Offloaded obsolescence management, improved test capability, and reduced development time critical to winning the Space Race.

- **BONUS**
  3 New COTS I/O Boards Developed! Including the RTD Simulator and Thermocouple Simulator.

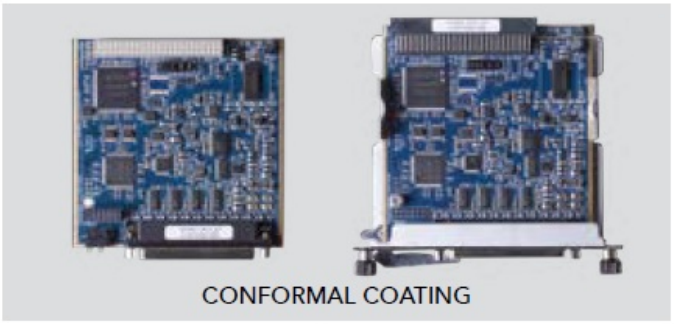
All the Accessories You Need to

CUBE, RACK & MIL CHASSIS: AVAILABLE OPTIONS


DIN RAILS, BRACKETS/CLIPS


FLANGES


EXTENDER BRACKETS


CONFORMAL COATING


FANLESS RACKS


SPECIALIZED COTS


CHROMATE


FANLESS CUBES

CABLES, PANEL ADAPTERS & MORE: ADDITIONAL ACCESSORIES


1553 Cables


Cables


SSD & SD Cards


Screw Terminal Boards


Power Supplies


Universal Screw Terminal Panels


Test Adapters


Interconnect Boards

DON'T SEE WHAT YOU NEED?

We most likely have it! Contact your UEI representative today.

Complete Your Perfect I/O System

SCREW TERMINAL ACCESSORY PANEL

Board Type	Part #	Board Specific	Number of Channels	Connection	Included With Board
37-channel Input Panel	DNA-STP-37	Any 37 pin connections	–	37	–
37-channel Input Panel – DIN Rail Mount	DNA-STP-37-DR	Any 37 pin connections	–	37	–
62-channel Input Panel	DNA-STP-62	Any 62 pin connections	–	62	–
62-channel Input Panel – DIN Rail Mount	DNA-STP-62-DR	Any 62 pin connections	–	62	–
Universal 37/62 Channel	DNA-STP-3762	37/62 pin connections	–	37/62	–
78-channel Input Panel – DIN Rail Mount	DNA-STP-78-DR	Any 78 pin connections	–	78	–
Universal Analog Input Panel	DNA-STP-AI-U	DNx-AI-207/ 217, DNx-AI-225	16 and 25	37/62	–
37-way Terminal Panel with CJC Sensor	DNA-STP-37CJC	DNx-AI-207	16	37	–
Thermocouple Input Panel	DNA-STP-AI-207TC	DNx-AI-207	16	37	–
Strain Gage Input Panel	DNA-STP-AI-208	DNx-AI-208	8	37	–
Thermocouple Input Panel	DNA-STP-AI-212	DNx-AI-212	12	37	✓
High Current Input Panel	DNA-STP-37HC	DNx-DIO-470	10	37	–
Serial 8-port Input Panel	DNA-STP-508	DNx-SL-508	8	62	–
Accelerometer Input Panel	DNA-STP-211	DNx-AI-211	4	37	✓
Screw Terminal Board	DNA-STP-MF-101	UEI-PIO-1010, DNx-MF-101	–	37/62	–
Sync Connection Panel	DNA-STP-SYNC-1G	All	Up to 6 chassis	STP, BNC, DNA-CBL-SYNC-RJ	–
Screw Terminal /Interconnect with CJC Compensation	DNA-STP-TC-378	DNx-TC-378	–	37	–
Debug Adapter for 37 pin Boards	DNA-TADP-37	All	–	37	–
Debug Adapter for 62 pin Boards	DNA-TADP-62	All	–	62	–

Loop Back Test Adaptors: Call UEI

CABLES

Cable Description	Part #	Shielded	Lengths (Ft)	For Use With
RS-232 Port to Female DB-9 Connector	CBL-SX6-DIAG	✓	3	-11/-12 (SoloX) & -33/-3A (Zynq) CPU boards
37-way, Round Cable (Male-Female)	DNA-CBL-37S	✓	1, 3, 5, 10, 20	All I/O boards with 37-pin connectors
37-way, Flat Ribbon Cable (Male-Female)	DNA-CBL-37	–	3	All I/O boards with 37-pin connectors
Right Angle 37- way, Round Cable (Male-Female)	DNA-CBL-37RA	✓	3	All I/O boards with 37-pin connectors
Special 37-way, High Current (5 A) cable	DNA-CBL-37HC	✓	3, 6, 12	DNx-DIO-470
DMM and MUX Cable Accessory	DNA-CBL-461	✓	1	DNR Chassis, DNx-DMM-261, DNx-MUX-461, – 461-350
62-way, Round Shielded Cable (Male-Male)	DNA-CBL-62	✓	2.5, 6, 10, 20, 40	All I/O boards with 62-pin connectors
Right Angle 62-way, Round Shielded Cable (Male-Male)	DNA-CBL-62RA	✓	3	All I/O boards with 62-pin connectors
78-way, Round Shielded Cable (Male-Female)	DNA-CBL-78	✓	5	All I/O boards with 78-pin connectors
MIL Male 128-pin 38999 to 1x DB-37F	DNA-CBL-37M-03	✓	3	DNx-MIL chassis
MIL Male 128-pin 38999 to 1x DB-62M	DNA-CBL-62M-03	✓	3	DNx-MIL chassis
MIL Male 128-pin 38999 to 1x DB-37F and 1x DB-62M	DNA-CBL-6237M-3	✓	3	DNx-MIL chassis
MIL Male 128-pin 38999 to 2x DB-37F 38999	DNA-CBL-12837-5	✓	5	DNx-MIL chassis
MIL Male 128-pin 38999 to 2x DB-62M 38999	DNA-CBL-12862-5	✓	5	DNx-MIL chassis
MIL Power Connector Cable	DNA-CBL-1315-03	✓	3	DNx-MIL chassis
MIL LAN/Serial/Sync Connector Cable	DNA-CBL-LAN-06	✓	6	DNx-MIL chassis
BNC Connections for Clock/IRIG & 1553	DNA-CBL-650	✓	2	DNx-IRIG-650 (Included with board)
Male 62-pin to four MIL-STD-1553 Connectors	DNA-CBL-1553-553	✓	1	DNx-1553-553 (Included with board)

10-32 UNF Coaxial to Std Full-Size BNC Cable/Adaptor	DNA-CBL-BNC	✓	3	DNx-AI-211
37-way to 4 Single Serial Ports, Round Shielded Cable	DNA-CBL-COM	✓	1.5	DNx-SL-501, DNx-CAN-503, DNx-I2C-534
UEI-PIO-1010 Debugging Cable Breaks Out Power, Serial and Sync	CBL-PIO-DBG	✓	4.5	UEI-PIO-1010
62-pin Male to 62-pin Female and 32-pin Female, Shielded Cable	DNA-CBL-MF-101	✓	3	DNx-MF-101 I/O, UEI-PIO-1010, DNA-STP-MF-101
Cube Synchronization Cable	DNA-CBL-SYNC-10	✓	10	DNR/DNF series racks and PPCx-1G Cubes

Typical Products Lead Time Is 4 Weeks with UEI

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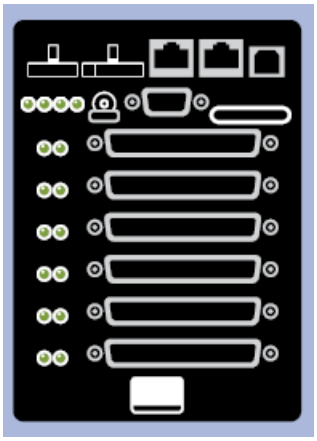

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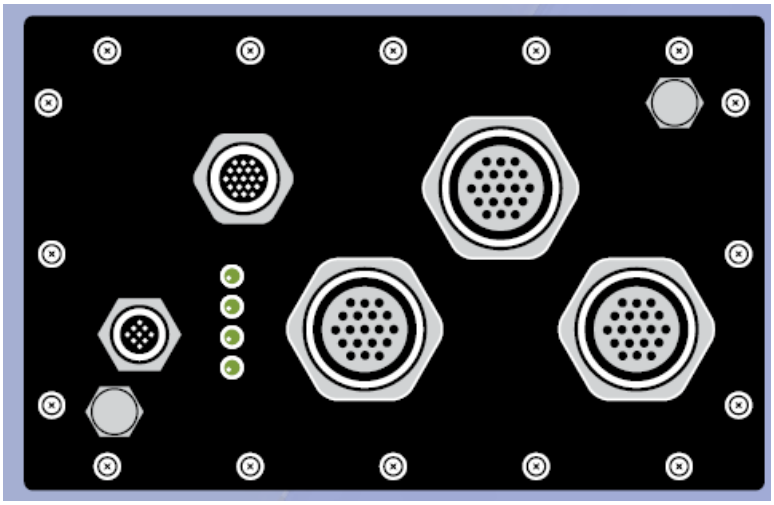
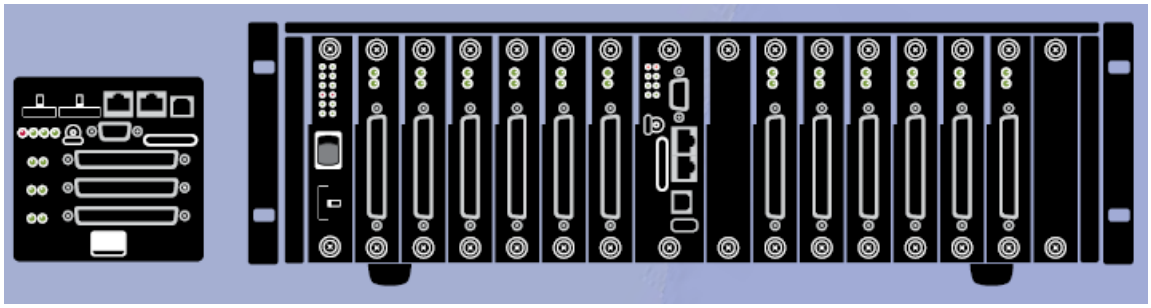
- TSN implemented in hardware



- Vetronics— GCIA-ready
- Cybersecurity solutions—supports NIST compliance
- And much more for your applications!



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Documents / Resources

	ueidaq 5200 Nuclear Power Instrumentation and Control System [pdf] Instruction Manual 5200 Nuclear Power Instrumentation and Control System, 5200, Nuclear Power Instrumentation and Control System, Power Instrumentation and Control System, Instrumentation and Control System, Control System

References

- User Manual