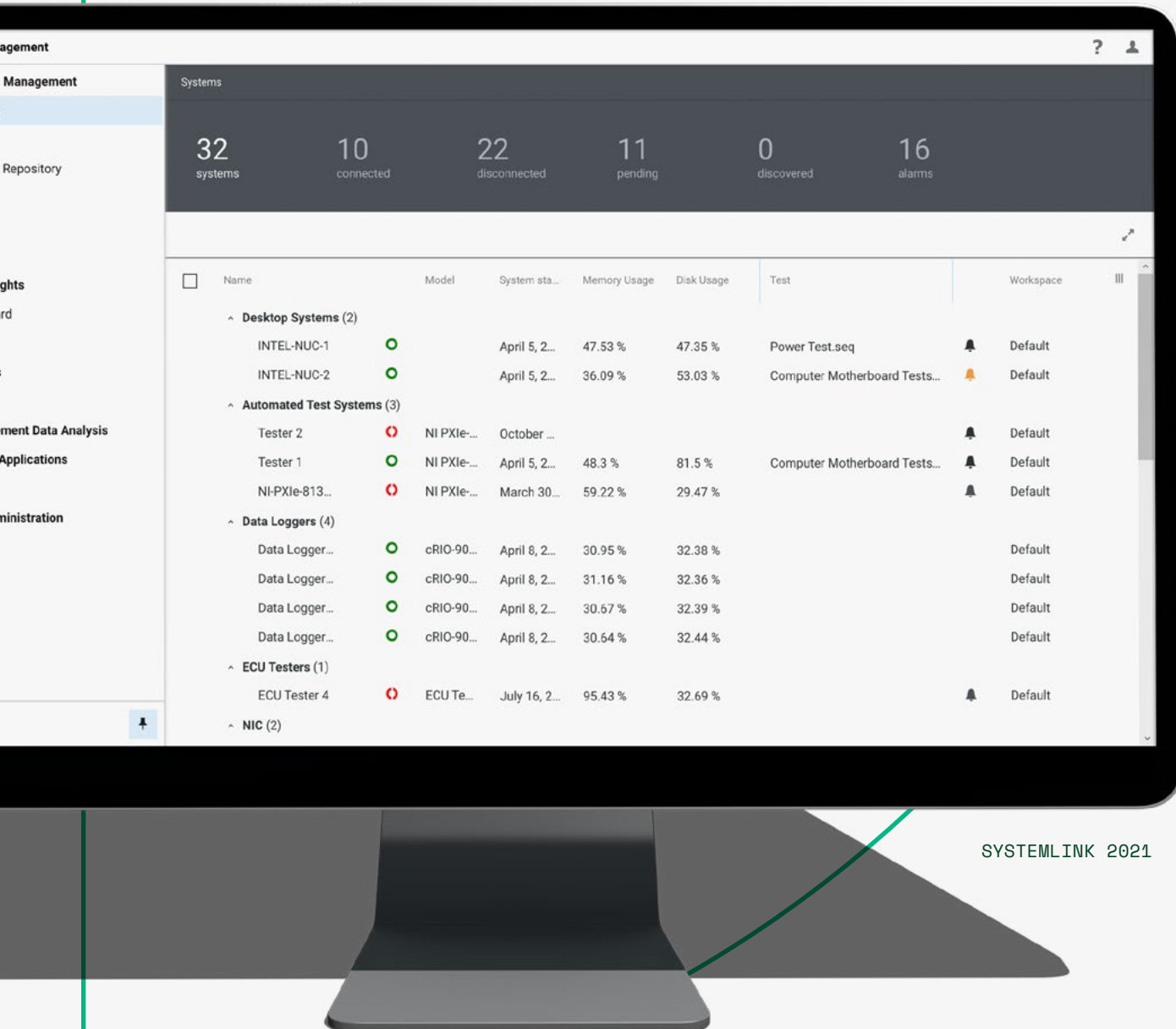


# New Product Guide



SYSTEMLINK 2021

JANUARY-JULY 2021

ni.com



JANUARY–JULY 2021

# New Product Guide

NI offers hardware, software, and services that help you turn real-world data into insights that drive your business decisions. Check out the new products we have launched so far this year to help you test faster, design better, improve reliability, and maximize your test data.

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LDO Validation Solution  
NI Wafer-Level Reliability Software 21.0

### Aerospace, Defense, and Government

Novator Solutions Hugin 2000 Multichannel Receiver  
Digital Avionics Interfacing Solution for Manufacturing and Depot Test

### Transportation

ECU Test System 2.0  
Data Record System AD  
PXI Automotive Camera Interface Modules (FPD-Link III and GMSL2)  
Body and Chassis HiL Solution  
Battery Test System 2.0  
Noffz A²B Network Simulation and Testing  
MonoDrive Simulator  
MonoDrive Digital Twin Creator  
System-Level HiL Solution

“The software and hardware environment need for fast, convenient, and stable system development is indispensable, and NI has it all.”

Dr. Zhizhong Wang  
China Steel Corporation



Our world is getting more complex by the minute: The incredible events of the last 18 months have certainly made that clear for all of us. Facing a pandemic, a sudden shift to working remotely, and a global supply shortage—we've all had to adapt, adjust, and innovate.

But those are the best parts of engineering! Engineering Ambitiously™ means meeting challenges and innovating to solve the most difficult problems—sometimes even as you're navigating through them yourself.

That's why I'm so proud of the hardware, software, and services we've launched so far in 2021. These products highlight how much we achieved in the face of truly global challenges. And they demonstrate NI's commitment to ensuring you're able to harness the power of your data to drive business decisions.

Looking at our new products featured here, it's really exciting to see the latest data acquisition and control products, which are close to my heart (I started my NI career as an engineer working on our DAQ product line). Also, it's inspiring to see all the ways we're meeting a broad spectrum of customer requirements. The products we're highlighting span from “no programming required” solutions to customizable tools that you can adapt to meet your specific challenge or condition.

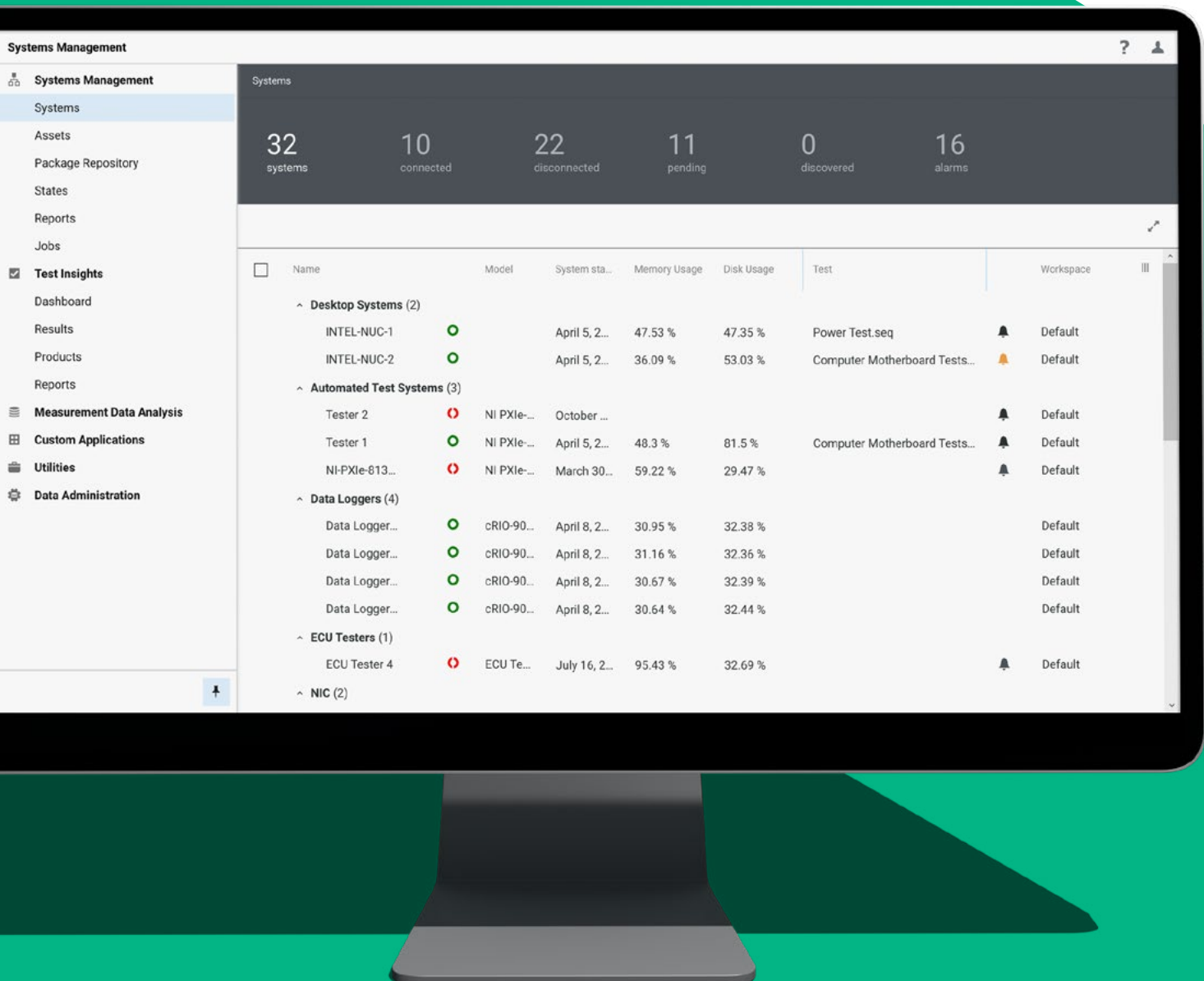
I look forward to hearing how you're using these products! Let's keep rising together to meet whatever comes next.



**STEFANIE BREYER**  
SENIOR VICE PRESIDENT  
OF PRODUCT PLANNING, NI

# SOFTWARE

From interactive exploration and test development to systems and data management, NI's software portfolio helps you drive actionable insights at scale while proactively improving product performance.



## SystemLink 2021 R1

SystemLink™ software centralizes system and data management in a single, unified environment for a holistic view of your organization. Remotely view, configure, and monitor all of your assets to prevent test reruns and unplanned downtime. Quickly pinpoint actionable insights with real-time dashboards and proactive alerts. Access and find measurement data to identify root causes and receive automatic reports to monitor trends. SystemLink software equips enterprises to utilize test and measurement data for removing operational inefficiencies and uncovering meaningful findings to improve overall performance across your test workflows. This exciting release includes the following enhancements:

- **UNIVERSAL LEFT NAVIGATION**—Access applications across modules to streamline movement throughout SystemLink software.
- **SYSTEMS AND ASSET MANAGEMENT**—Utilize a unified systems grid to access system information, monitor test operations, and manage test data for automatic operations visibility. Display tag data (disk and memory usage, test information, alarms) and custom properties for all assets and group systems by any attribute.
- **TEST MONITOR**—From TestStand, use additional data-logging capabilities to send data to the SystemLink Server.
- **MEASUREMENT DATA MANAGEMENT**—Achieve improved granularity for data access and analysis execution with workspace-defined indexing rules and user-based analysis automation and execution privileges.

[Learn More](#)

[Read the Release Notes](#)

“I love SystemLink because it enables our production floor to step into the future of doing business. We keep approaching a “new normal” every day, and SystemLink enables us to visualize what that new normal looks like for teams supporting development and production efforts all around the world. I spend less time managing deployments and postprocessing data and more time using the built-in tools to attack low-hanging opportunities and improve efficiency for my team.”

Ian Yeager  
Cree Lighting





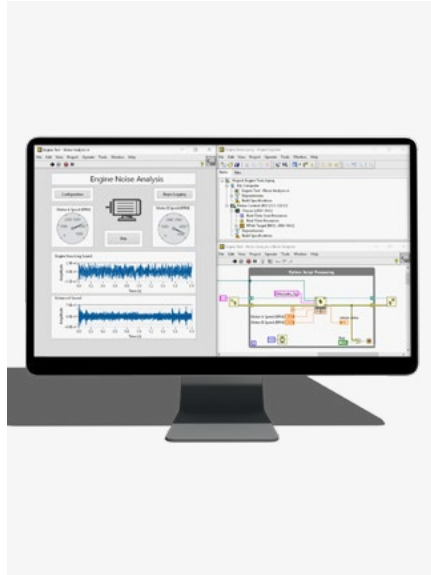
## VeriStand 2020 R5

VeriStand application software helps you configure I/O channels, data logging, stimulus generation, and host communication for NI real-time hardware. VeriStand helps test engineers reduce the time they need to test their products with a wide range of functionality, including configurable data acquisition, simulation model integration, test sequencing, and logging. This release includes several key enhancements, which include:

- Improvements to the VeriStand editor, such as the ability to customize and extend the editor using C#
- Using a scripting API to turn FPGA bitfiles into flexible and reusable system-definition files
- Monitoring system memory usage with the new Telemetry Custom Device

[Learn More](#)

[Read the Release Notes](#)



## LabVIEW 2020 SP1

LabVIEW is systems-engineering software for applications that require test, measurement, and control with rapid access to hardware and data insights. LabVIEW offers a graphical programming approach that helps you visualize every aspect of your application, including hardware configuration, measurement data, and debugging. New features available with this release include:

- Bug fixes
- LabVIEW command-line interface error logging if LabVIEW isn't licensed
- The ability to generate a VI Analyzer report at the same time that an error report is generated
- Multiple parallel test efficiency improvements for semiconductor applications
- Additional keyboard shortcuts for adding and removing array elements

[Learn More](#)

[Read the Release Notes](#)



## LabVIEW NXG 5.1

LabVIEW NXG gives you the ability to configure, automate, and visualize your test results, all within a single tool. New features available with this release include:

- The ability to save VI panel and control images
- New options for configuring graphs, charts, and VI window position
- Programmatically reading and writing to additional control and indicator properties

Version 5.1 will be the last release of LabVIEW NXG.

[Learn More](#)

[Read the Release Notes](#)



## DIAdem 2021

DIAdem helps engineers accelerate root-cause analysis through efficient data postprocessing. With more than 200 DataPlugins, DIAdem indexes your directory for targeted search and retrieval of any data type. Through predefined and customizable dashboards and reports, you can synchronize data across map, video, and waveform data to see multiple points and get the full picture. Automate the entire process from import to insight with scripting routines in Python and VBS. This update focuses on new and improved usability, including:

- Python 3.8 support and the ability to select an external Python integrated development environment so that you easily can use an external debugger for troubleshooting
- New Bird's Eye View display type in VIEW to display radar data (road course, lane, object list, and sensor fields) from a "bird's eye" perspective
- Create video channels in the Data Portal to easily add display panels in VIEW and set frame rate and start time
- Design dialog boxes with new slider controls for user input

[Learn More](#)

[Read the Release Notes](#)

**"We have reduced our reporting and analysis time by 95 percent and achieved our goal of replacing the current multistep process with a one-button DIAdem solution."**

**Jim Knuff**  
Raytheon Missile Systems







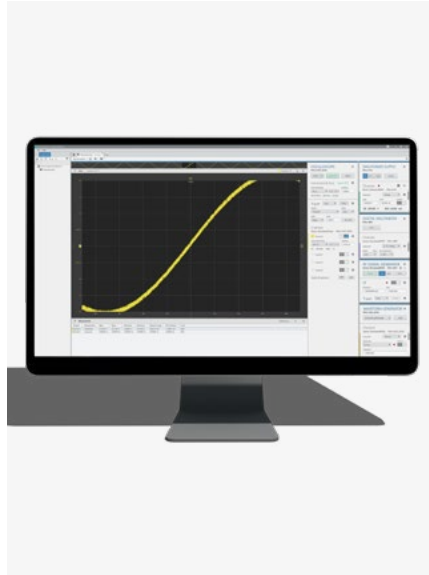
## FlexLogger 2021 R2

FlexLogger™ software helps you build flexible, scalable data-logging systems with NI DAQ hardware—no programming required. This revision includes additional hardware support and new usability features for access control and project management:

- Expanded PXI support with the addition of two analog output modules (PXIe-6738 and PXIe-6739) and a C Series Frequency Module (NI-9326)
- The ability to pause a test and utilize increased user-experience permissions to prevent unauthorized changes and updates

[Learn More](#)

[Read the Release Notes](#)



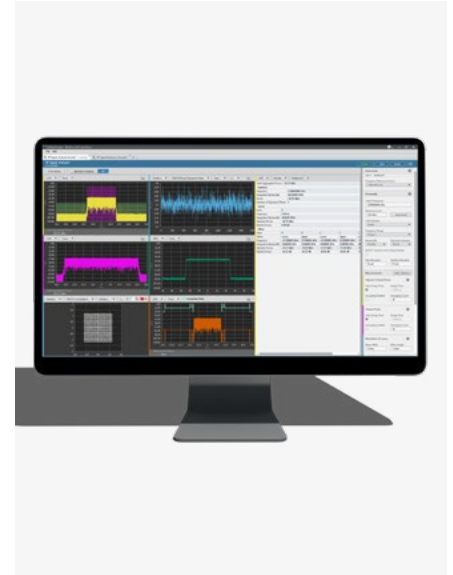
## InstrumentStudio 2021

InstrumentStudio™ free application software provides an integrated approach to interactive PXI measurements. Feature updates in this release include:

- An RF signal generator soft front panel
  - Debug & Monitor mode
  - STS pin map support
  - Configuration export
  - Continuous and arbitrary waveform support
- Plugins for InstrumentStudio software
- New device support for select source measure units and RF signal generators

[Learn More](#)

[Read the Release Notes](#)



## RFmx 20.7

The 20.7 release of NI's measurement-oriented RF software (RFmx) features faster execution and expanded coverage of the latest 5G New Radio and Wi-Fi 7 wireless standards.

[Learn More](#)

[Read the Release Notes](#)



# Q&A with Research & Development

## WHAT IS MOST EXCITING ABOUT THIS PRODUCT?

The most exciting thing about SystemLink™ 2021 R1 is how it unites product features into a more cohesive overall experience. From the ability to pull in more types of data from TestStand, to the unified Systems grid, to the new navigation structure, 2021 R1 is about giving customers the data they expect where they expect it.

## WHAT IS THE FEATURE YOU'RE MOST PROUD OF?

The feature I'm most proud of in this release is our new Universal Left Navigation experience. For a long time, SystemLink used a plug-in browser page that made navigation across different parts of the product disjointed and unintuitive. From a user perspective, the new navigation is an exciting, modern visual refresh; from a developer perspective, it's more fun to work on, easier to test, and faster to add new features.

## HOW IS THE SYSTEMLINK SOFTWARE TEAM EMBODYING NI BRAND VALUES?

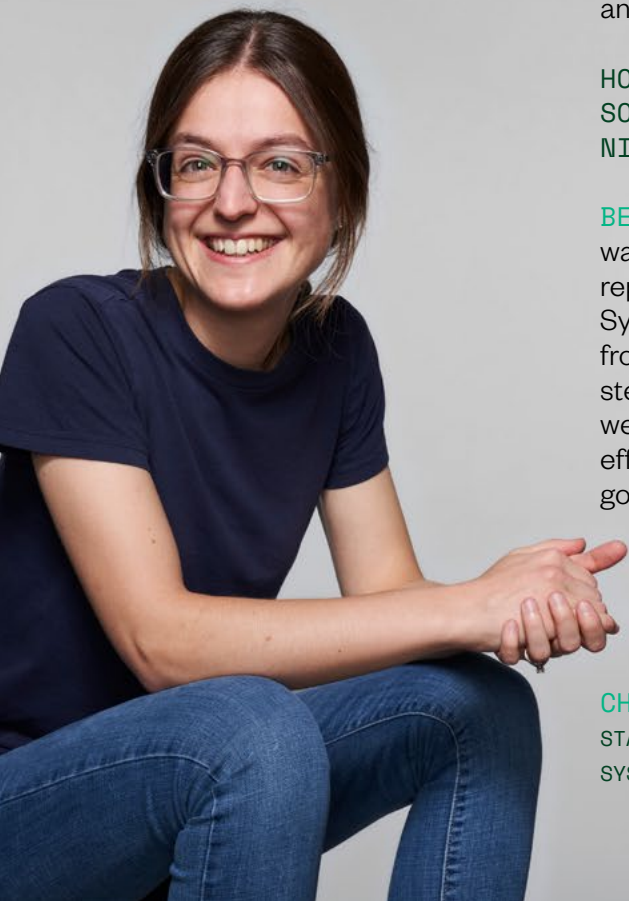
**BE BOLD**—The new navigation was a risky feature because it replaced the visual platform SystemLink software has used from the beginning. This is a big step towards modernizing our web UIs, and I'm proud of the bold effort we put into making sure we got it right in one release.

**BE KIND**—Because SystemLink still is a relatively new product, we get to work more closely with individual customers. This release, we implemented several customer requests for our TestStand plug-in, and we have more in the pipeline.

**BE CONNECTORS**—SystemLink is all about connections—from pulling in test results from TestStand or LabVIEW to hosting a JupyterHub install that connects to our Python APIs. Within our teams, we are learning how to work collaboratively even though we're not in the office together, share innovation ideas across teams, and support other groups throughout the company.

## WHAT WAS SOMETHING THAT YOU LEARNED IN THE DEVELOPMENT PROCESS?

Something I learned while working on SystemLink is the value of fresh ideas and mindsets. About half of my team was new to the product for this release, and it was both refreshing and challenging to have influence from other areas of R&D helping us avoid becoming stuck in our ways.



### CHRISTINE KARAS

STAFF SOFTWARE ENGINEER,  
SYSTEMS AND DATA MANAGEMENT, NI

# HARDWARE

## Data Acquisition and Control

Data acquisition and control products are designed for a specific sensor or measurement type. They include products that help you control and monitor external hardware.



“We consider NI DAQ hardware the industry standard for production test applications. The close integration with NI software ensures ready access to our coverage requirements.”

Christian Wolf  
Global Manufacturing Test Manager, GN Audio



## Ultrarugged Data Acquisition System

No programming required—this complete system configuration based on FieldDAQ hardware comes with everything you need (including software and accessories) to acquire data in rugged environments, configure a real-time UI, alarm on preset conditions, and log data to an open file format with included metadata:

- Configuration-based software ready to log right out of the box
- 1  $\mu$ s synchronization between measurement channels
- Open, compatible data formats such as .csv and .tdms
- Support for line, star, and ring network topologies

[Learn More](#)



## Acoustic Functional Test Solution

As Internet of Things (IoT) devices experience worldwide growth, many electronic products are adopting a voice-command user interface, bringing new acoustic and audio functional test challenges. Using an FPGA-based NI DAQ card, you directly can input and demodulate digital signals with hardware-level speed and reliability. The LabVIEW PDM Acquisition Toolkit ensures that you rapidly can develop custom measurements or test steps:

- Confidently meet stringent test coverage specifications with high-accuracy hardware
- Insulate station investment from specification changes by updating test steps with device under test (DUT)-specific parameters in software
- Increase throughput with fast measurement speed and built-in parallel testing
- Free up budget with a lower cost per channel

[Learn More](#)



No programming required—these complete system configurations based on CompactDAQ come with everything you need (including software and accessories) to acquire data from your specific sensor.

## Expandable Thermocouple Data Acquisition System

Acquire data from up to 16 thermocouples, configure a real-time UI, alarm on preset conditions, and log data to an open file format with included metadata:

- Reduce setup time with turnkey, configuration-based software that's ready to log right out of the box.
- Optimize your system for cost, performance, and future expansion with modular hardware.
- Keep sensor wires short, with rugged hardware installed close to the test fixture.
- Improve data management and collaboration with open and compatible data formats such as .csv and .tdms.
- Increase confidence in test repeatability and quality using hardware with multiple levels of calibration available worldwide.

[Learn More](#)

## Load, Pressure, Force, and Strain Test System

Acquire data from up to eight dynamic load or pressure cells, configure a real-time UI, alarm on preset conditions, and log data to an open file format with included metadata:

- Configuration-based software ready to log right out of the box
- Modular, expandable hardware
- Built-in or external sensor excitation options
- Open, compatible data formats such as .csv and .tdms

[Learn More](#)

## Sound and Vibration Data Acquisition System

Acquire data from up to eight accelerometers or microphones, configure a real-time UI, alarm on preset conditions, and log data to an open file format with included metadata:

- Configuration-based software ready to log right out of the box
- Modular, expandable hardware
- Open, compatible data formats such as .csv and .tdms
- Built-in Integrated Electronic Piezoelectric Excitation

[Learn More](#)

## Mixed-Sensor Electromechanical Test System

Acquire data from  $\pm 10$  V signals, thermocouples, and digital I/O lines; configure a real-time UI; alarm on preset conditions; and log data to an open file format with included metadata:

- Configuration-based software ready to log right out of the box
- Modular, expandable hardware
- Open, compatible data formats such as .csv and .tdms
- Adjustable gain settings for voltage input channels

[Learn More](#)





## PXIe-1090 Two-Slot Chassis

NI's new two-slot chassis is designed for lab desk or benchtop use.


### Highlights

- MXI-Express over Thunderbolt 3 with daisy-chain support
- Designed for lab desk/benchtop use
- Acoustics optimized for benchtop use case
- Vertical or horizontal orientation

### Specifications

- 2 PXI Express (Gen3 x1) slots with 58 W/slot cooling support 1 PXI Express hybrid slot, 1 PXI Express slot
- 2 GB/s system bandwidth
- ~190 mm wide x 270 mm deep x 70 mm high (2U tall)
- Universal AC input: 100 VAC to 240 VAC, 50/60 Hz
- Temperature range: 0 °C to 50 °C

[Learn More](#)



SUCCESS SPOTLIGHT:

# Delivering Wireless Services from the Sky with USRP

[Learn More](#)

## Challenge

The University of York needed to implement a cost-effective low-altitude aerial testbed that could verify novel wireless-communications applications between the airborne node and ground terminals while meeting tight constraints for payload weight, volume, and power consumption.

## Solution

Combining the rapid prototyping capabilities of the LabVIEW Communications System Design Suite with the processing power of USRP RIO directly drove tailored antenna elements in a highly flexible wireless testbed. The testbed is carried onboard a tethered aerial platform Helikite that can be deployed for hours, at up to 400 meters in altitude, which allows multiple trials.

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“By offloading intensive processing tasks, such as fast Fourier transform (FFT) and modulation/coding, to USRP’s built-in FPGA, we increased the determinism, signal integrity, and reliability of the system whilst freeing up the host processor for data logging and simpler processing tasks such as visualizing power spectrum and constellation diagrams.”

**David Grace**  
University of York, Professor

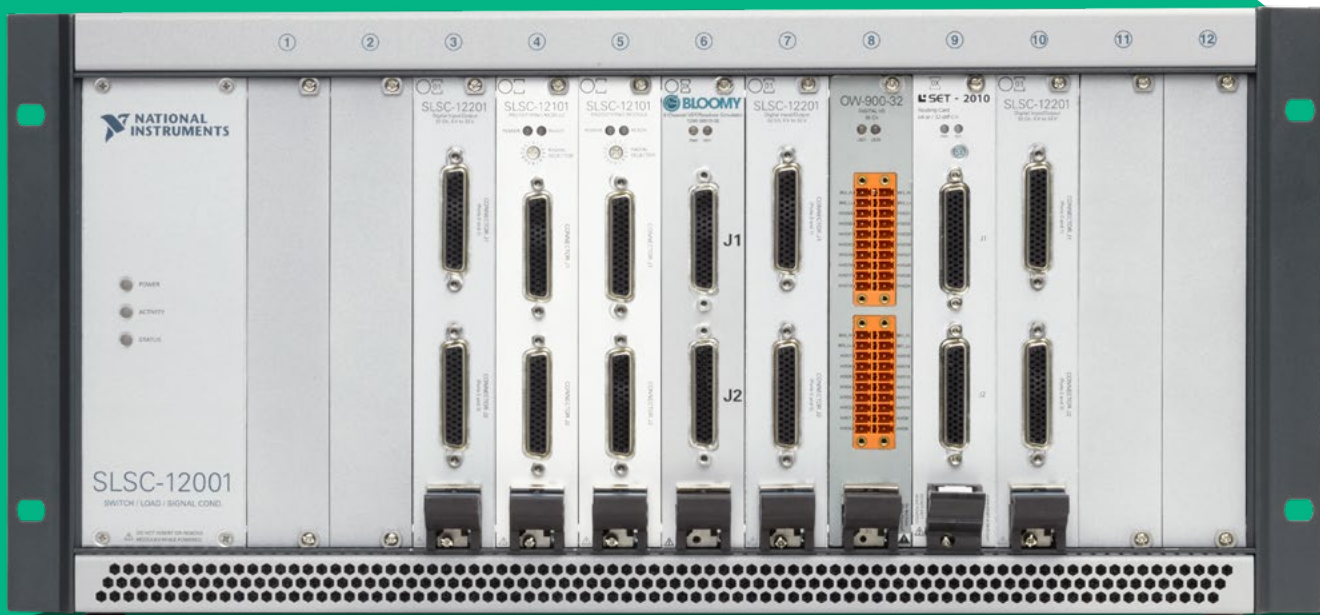
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# HARDWARE

## Electronic Test and Instrumentation

NI's electronic test and instrumentation products feature specialized synchronization and key software features for high-performance automated test, design, and device validation.



“Without SLSC, we may have needed to spend thousands of work hours and many thousands of Euros in materials to develop the system ourselves.”

Anders Tunströmer  
SAAB Aeronautics

## SET-1215 RTD Simulation SLSC Module

The SET-1215 RTD simulation card is a high-precision 16-channel resistance temperature detector simulator now available for purchase through NI. The simulation ranges from 90  $\Omega$  to 410  $\Omega$  and 900  $\Omega$  to 4,100  $\Omega$ , with an accuracy up to 1 °C. It contains 16 galvanic isolated channels which you can connect in two-terminal sensing and four-terminal sensing. Each channel of the SET-1215 card can simulate common short-circuit and open-circuit conditions that a system could experience due to faulty wiring or sensors. To maximize customizability, the SET-1215 has two plug-in module slots that can provide features such as line fault insertion and instrument connections. Additionally, the SET-1215 RTD card comes with a high-current fault-injection bus.

### Absolute Maximum Ratings

PARAMETER	CONDITION	VALUE	COMMENT
Maximum Input Voltage	Any Pin-to-Chassis Ground	60 VDC	Transient 65 V, Limited by Connector
Minimum Input Voltage	Any Pin-to-Chassis Ground	-60 VDC	
Maximum Input Voltage	Between CHx_F+ and ChxF-	15 V	
Minimum Input Voltage	Between CHx_F+ and ChxF-	-0.3 V	
Maximum Short-Circuit Current		1.5 A	
Maximum Simulation Current		10 mA	
Minimum Simulation Current		100 $\mu$ A	
Maximum Switching Power	DC, Resistive Load	60 W	
Maximum Simulation Power		400 mW	

### Technical Data

PARAMETER	CONDITION	VALUE	COMMENT
Maximum Simulation Voltage	Between CHx_F+ and ChxF-	10 V	
Minimum Simulation Voltage	Between CHx_F+ and ChxF-	0 V	
Resistor Value Update Time		50 $\mu$ s	SLSC Communication Delay Not Included
Simulation Resolution	PT100 Configuration	0.1 $\Omega$	
	PT1000 Configuration	1 $\Omega$	
Initial Resistance		< 10 M	
Expected Electrical Relay Lifetime	1 A, 30 VDC Resistive	Minimum 10 <sup>6</sup> operations	
	2 A, 30 VDC Resistive	Minimum 10 <sup>4</sup> operations	

[Learn More](#)

## Aliaro AL-1010 Multifunction SLSC Module

The AL-1010 is now available for purchase through NI. Connect this 12-channel multifunction board between the DUT and the instrumentation part of the test system. The board provides signal conditioning and switching capabilities on each channel. Each pin can route either AI/AO/DI/DO/PWM and, by default, fault injection on all pins.

The board interfaces with NI PXI and/or CompactRIO instrumentation devices for developing, verifying, and validating electronic control unit software and hardware. It's recommended for systems requiring high flexibility. Using the Aliaro Configurator software, you easily can configure the pins and deploy them with NI VeriStand, so that you can update the hardware-in-the-loop (HIL) system setup without changing hardware and saving test-development time. The AL-1010 features:

- 60 V, 10 A per channel
- 12 independent and isolated channels in three banks
- Two common buses per bank, with switches to each channel
- A brake up switch for each channel
- A programmable level threshold on each channel
- A parallel connection possibility for high-current signals
- An included LabVIEW driver
- NI VeriStand compatibility

### General Specifications

PARAMETER	CONDITION	VALUE
Power Supply		24 VDC, +/-5%
Channel-to-Channel Isolation	(50 $\Omega$ /100 kHz)	40 dB
Maximum Operating Voltage	Any Pin	+ 60 V
Minimum Operating Voltage	Any Pin	- 60 V
Calibration	Not Required, Recommended on System Level	

### Fault-Insertion Specifications

PARAMETER	CONDITION	VALUE
Maximum Continuous Current	DUT to Load	10 A (40 A using parallel channels)
	DUT to AUX 1 and 2	10 A (40 A using parallel channels)
	All Other Pins	100 mA
Maximum Peak Current (<100 ms, 25°C)	DUT to Load	40 A/50 ms
	DUT to AUX 1 and 2	40 A/50 ms

Learn More



## Aliaro AL-3011 SLSC Resistor Emulation Module

The AL-3011 is now available for purchase through NI. You can use this resistor emulation module for switch load signal conditioning (SLSC) systems in HIL simulators. You can use this module for applications requiring simulation of resistive sensors with multifunctionality. The AL-3011 supports 10  $\Omega$  to 8 M $\Omega$  resistance (RES) for each channel and features fault insertion (FIU) on each channel, providing short to FI+ or FI-.

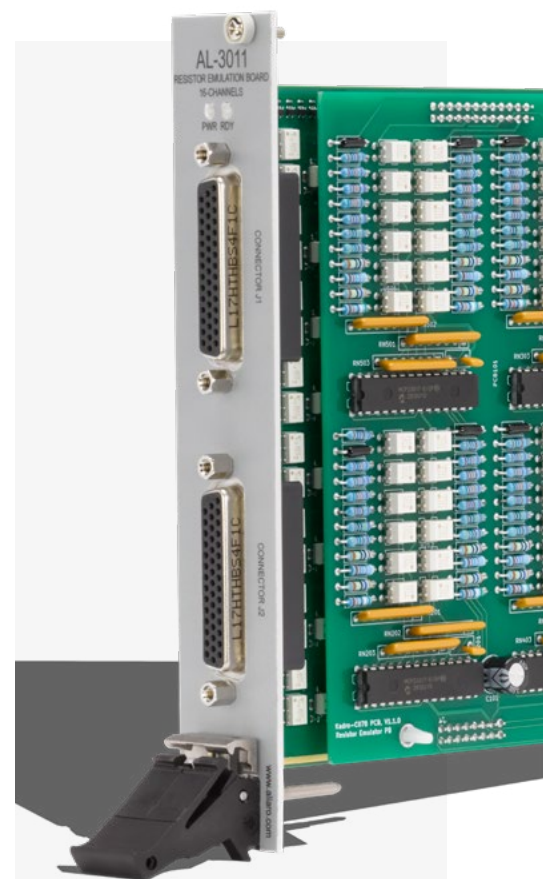
The board interfaces with NI PXI and/or CompactRIO instrumentation devices for developing, verifying, and validating electronic control unit software and hardware. Using software such as Aliaro Configurator, you easily can configure the pins and deploy them with NI VeriStand, saving test-development time. The AL-3011 features:

- 16 independent and isolated channels
- 16 programmable channels for resistor emulation
- 50 s programming resistance sequence
- Two expansion slots for add-on boards
- Two common buses per bank with switches to each channel
- A brake up switch for each channel
- Pull up and pull down on each channel
- An included LabVIEW driver
- A custom VeriStand device driver

### AL-3011 Specifications

PARAMETER	RANGE	VALUE
Maximum Voltage		60 V
Maximum Current		100 mA
Maximum Power		400 mW
Range		10 $\Omega$ - 8M $\Omega$
Resolution		0.5 $\Omega$
Overall Accuracy at 20 °C - 40 °C	10 - 100 $\Omega$	<5%
	100 - 2k $\Omega$	<0.5%
	2k $\Omega$ - 100k $\Omega$	<0.2%
	100k $\Omega$ - 1.5M $\Omega$	<0.5%
	1.5M $\Omega$ - 8M $\Omega$	<2%
Calibration	The card has an open calibration feature, meaning that the customer has access to this feature and can use it for system calibration, as well.	

[Learn More](#)



# SET-1240 xVDT Emulation SLSC Module

The SET-1240 xVDT card can emulate four-, five-, or six-wire linear variable-differential transformers, rotary variable-differential transformers, and resolvers, and is now available for purchase through NI. The card offers eight independent, galvanically isolated channels. In addition to a wide excitation frequency range from 400 Hz to 10 kHz, the card also offers various self-test options. The transformers are located on exchangeable subcards (SET-1241 or SET-1242) which you easily can exchange or request.

## Absolute Maximum Ratings

PARAMETER	CONDITION		VALUE
Maximum Excitation Voltage	Recommended Operation Range	Daughterboard: SET-1241	$400\text{ Hz} \leq f_{Exc} \leq 1\text{ kHz}$ : 3 Vrms
		Daughterboard: SET-1242	$1\text{ kHz} < f_{Exc} \leq 10\text{ kHz}$ : 7 Vrms
	Operation without Damage		10 Vrms
Minimum Input Voltage	Between CHx_F+ and CHx_F-		-0.3 V
Maximum Common Mode Excitation Voltage			45 VDC
Minimum Common Mode Excitation Voltage			-45 VDC
Maximum RTI Control Voltage			+10 V
Minimum RTI Control Voltage			-10 V
Excitation Frequency	Recommended Operation Range		400 Hz to 10 kHz

## Technical Data

PARAMETER	CONDITION	VALUE	COMMENT
Update Time		10 ms	SLSC Commit CMD Duration
Expected Electrical Relay Lifetime	1 A, 30 VDC Resistive	105 Operations	
DC Resistance of Transformers		$115\ \Omega \pm 15\%$	

Learn More



## SET-2110 Fault-Insertion SLSC Module

The SET-2110 fault-insertion card is a large-scale, high-density switching matrix now available for purchase through NI.

You can connect each line of the 32 single-ended or 16 differential channels individually and flexibly to the high-current fault injection bus. You can select one or both fault bus signal pairs dynamically for every channel. The SET-2110 fault-insertion card also generates short circuits between a channel's positive and negative signal.

Unlike traditional routing matrix cards, the SET-2110 is designed specifically for the challenges of signal routing in HIL systems. To maximize customizability, the SET-2110 features two plug-in module slots that offer additional features, such as instrument connectivity.

### Absolute Maximum Ratings

PARAMETER	CONDITION	VALUE
Maximum Input Voltage	Any Pin	60 VDC
Minimum Input Voltage	Any Pin	-60 VDC
Maximum Switching Power	DC, Resistive load	60 W
Maximum Current Rating		1.5 A

### Technical Data

PARAMETER	CONDITION	VALUE	COMMENT
Update Time		10 ms	SLSC Commit CMD Duration
Maximum Initial Contact Resistance	J1 → XJ2, J2 → XJ2, J1 → J2	500 mΩ	
Expected Electrical Lifetime	1 A, 30 VDC Resistive	105 Operations	
Expected Electrical Lifetime	1,5 A, 30 VDC Resistive	104 Operations	
Bandwidth	-3 dB, 50 Ω Termination	≤ 20 MHz	

[Learn More](#)

# HARDWARE

## Wireless Design and Test

Wireless technology is constantly evolving. NI creates fast and cost-effective wireless test solutions that help you design innovative and high-quality products.





## USRP X410 Software Defined Radio

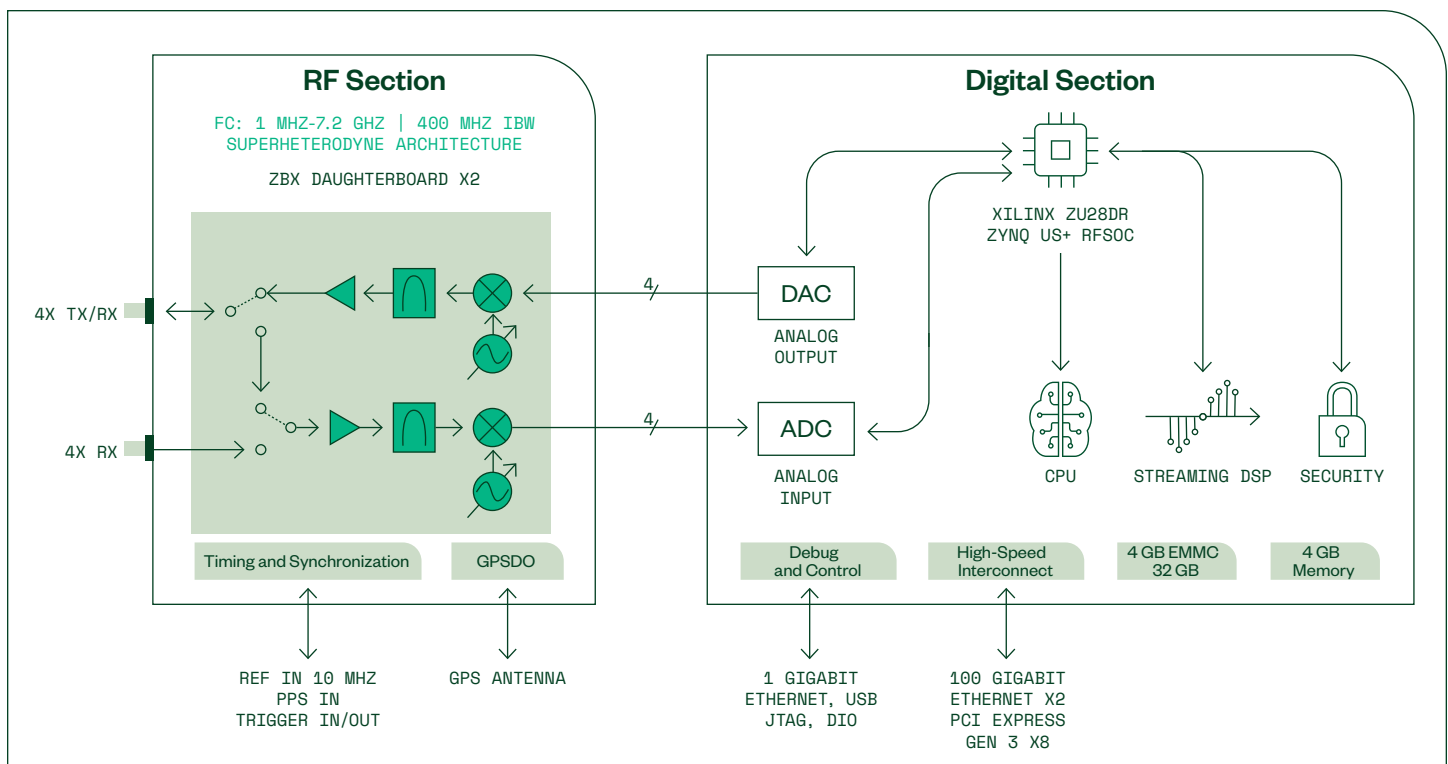
Introducing the next leap in software defined radio from NI: The NI Ettus USRP X410. Ready for advanced signal-processing applications such as 5G research test beds and wideband signal intelligence applications, and built on the powerful Xilinx Radio Frequency System-on-Chip (RFSoc) technology, the USRP X410 is the most powerful software defined radio on the market.

### Key RF capabilities include:

- 1 MHz to 7.2 GHz frequency range
- 400 MHz signal bandwidth
- Four RX and four TX channels
- Up to 22 dBm TX and 0 dBm RX maximum power

### Key digital capabilities include:

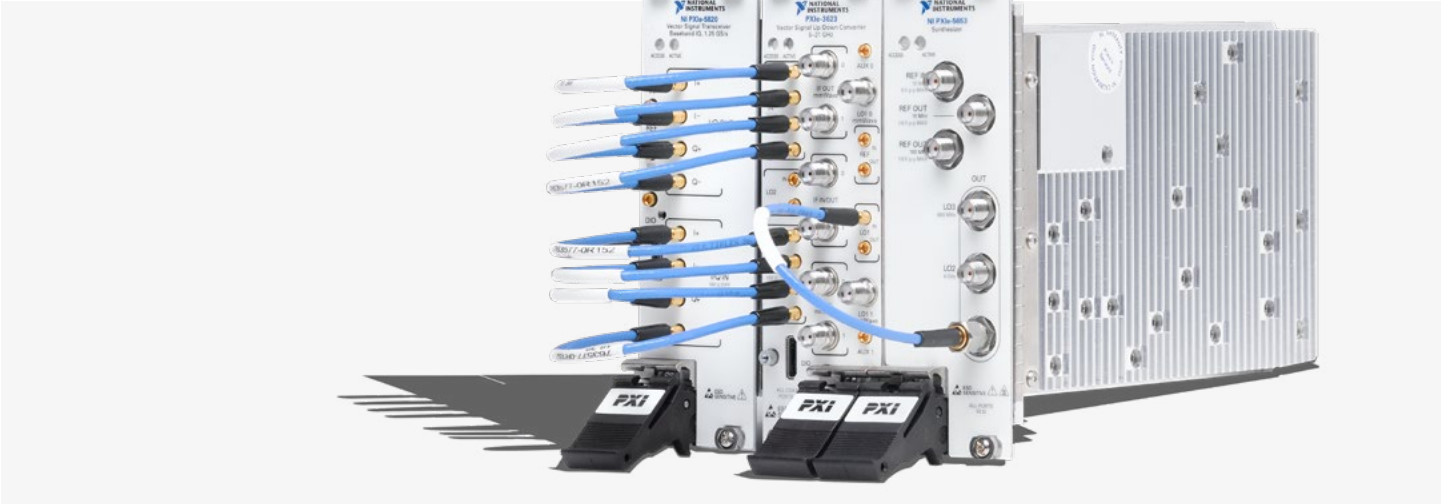
- Zynq UltraScale+ RFSoc FPGA technology
- Dual QSFP28, PCI Express Gen 3 x8 interfaces
- SD-FEC, DDC, DUC onboard IP
- UHD, GNU Radio, and LabVIEW software support
- Onboard GPS disciplined oscillator (DO) synchronization



[Learn More](#)

Pick the Right USRP for Your Application





## PXIe-5832 mmWave Vector Signal Transceiver

The PXIe-5832 extends the capabilities of the mmWave vector signal transceiver (VST) to have continuous frequency generation from 22.5 GHz to 44 GHz. With the procurement of appropriate export licenses for end use, you now can operate with full functionality in the 31.3 GHz to 37 GHz frequency range.

PXIe-5832		
Frequency Range	5 GHz to 21 GHz 22.5 GHz to 44 GHz	
Instantaneous Bandwidth	1 GHz	
RF Channels	Up to 32	
EVM (5G NR 100 MHz, Loopback)	0.65% @ 28 GHz	
VSG Maximum Output Power (CW @ 1 GHz)	+15 dBm @ 6 GHz to 10 GHz +15 dBm @ 28 GHz	
Tuning Time	0.75 ms	0.80 ms (Including Frequency Lock Time)
Excitation Frequency	400 Hz - 10 kHz	
Phase Noise (Typical, Onboard LO, 31.3 GHz to 40 GHz, 20 kHz Offset)	-99 dBc/Hz	
Output Frequency Response (0 dBm Reference, 31.3 GHz to 37 GHz)	2.0 dB	
Slots	6 (4 without mmWave Configurations)	
Supports mmWave Test Heads	Yes	
Digital I/O	8 Channels at 60 MHz, 4 Channels High-Speed Serial up to 12 Gb/s	

Learn More



# Q&A with Research & Development



## WHAT IS MOST EXCITING ABOUT THIS PRODUCT?

The most exciting part of the USRP X410 project for me was pushing the product line to next level of performance and capability. Seeing the product do things that none of its predecessors could do is my favorite part of the job.

## WHAT IS THE FEATURE YOU'RE MOST PROUD OF?

The latest USRP has the ability to reconfigure its data path depending on the throughput requirements of the application. This allows us to use the resources of its FPGA more efficiently by only using what is needed for each application.

## WHAT WAS A CHALLENGE YOU OVERCAME OR SOMETHING YOU LEARNED IN THE DEVELOPMENT PROCESS?

Pushing beyond the limits of our existing products always uncovers interesting challenges that are difficult to predict. This makes finding the right balance between product features, development schedules, and R&D resources especially difficult. It requires us to be flexible and capable of adapting quickly to shifting priorities.

## WADE FIFE

PRINCIPAL DIGITAL  
HARDWARE ENGINEER, NI

# INDUSTRY-SPECIFIC SOLUTIONS

## Semiconductor

As devices get smarter, so do our semiconductor test solutions. We know that semiconductor technology requirements outpace traditional test coverage approaches. That's why we prioritize investments in software and systems that help you build solutions that meet your evolving needs at every step of the process.



## RF Front-End Validation Solution

NI's RF front-end validation reference architecture simplifies wideband RF power amplifier (PA) validation workflows for demanding applications such as 5G and Wi-Fi 6. The RF front-end validation reference architecture includes powerful new benefits:

- Accurate measurements with pathloss and fixture calibration using S-parameter de-embedding
- Greater understanding of PA performance through load pull with Focus Microwave tuners
- Precise output power set points every time with power-sensor supported power servo (power leveling)

### Use the new key features to:

- Control your PA validation bench and visualize measurement results with the integrated, cockpit-like RFIC Test Software application.
- Easily configure power, frequency, and impedance sweeps, taking advantage of built-in Focus Microwave tuner control for validating PA performance under non-50  $\Omega$  conditions.
- Run cutting-edge digital predistortion linearization algorithms and compare linearized versus nonlinearized performance with detailed graphs and results for gain, AM/AM, AM/PM, error vector magnitude (EVM), adjacent channel leakage power ratio (ACLR), PAE, and loading conditions (gamma and voltage standing wave ratio).
- Deploy extensive automated validation sequences with ease thanks to the Automation Wizard and a large collection of ready-to-run code modules and test sequences.
- Calibrate and adjust pathlosses with S2P de-embedding.
- Achieve precise output power levels with power-sensor-based output power servo.

[Learn More](#)

“Our engineering teams looked at all the things that were slowing down our characterization process in the lab, and RF measurements using traditional instruments were the most time-consuming. By adopting PXI, we were able to significantly improve test throughput without sacrificing measurement quality.”

**Ben Thomas**  
Director, Mobile 5G  
Business Development, Qorvo





## 5G mmWave Over-the-Air Validation Reference Architecture

With NI's fast and accurate mmWave over-the-air (OTA) validation reference architecture, you spatially can validate the latest 5G mmWave beamforming devices 5X to 10X faster—from ultraportable antenna-in-module devices to UE system-level designs. It introduces compact antenna test range capabilities in the same chamber for direct and indirect far-field (DFF and IFF) characterization. This validation reference architecture includes a thermal enclosure for validating OTA device performance over a wide temperature range from -40 °C to 85 °C.

NI's OTA software gives you detailed 3D results and visualization of wideband 5G new radio beam characteristics, such as channel power, EVM, ACLR, SEM, and OBW. With an intuitive user experience, you can configure, run, and visualize measurement results with ease.

[Learn More](#)

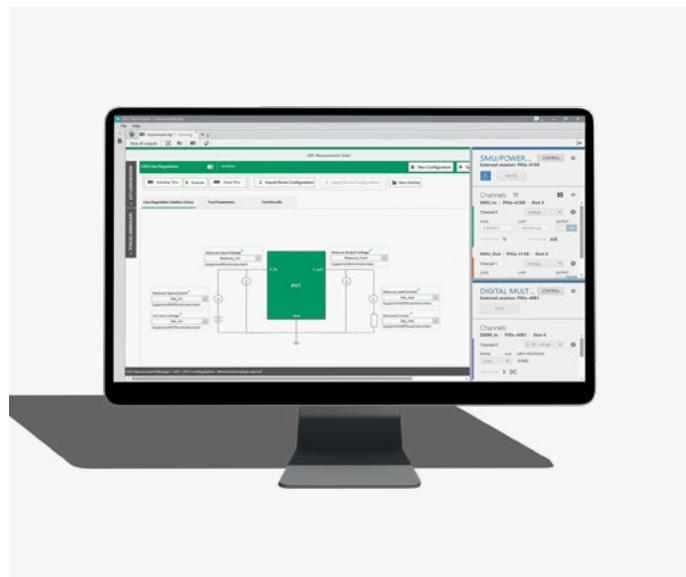
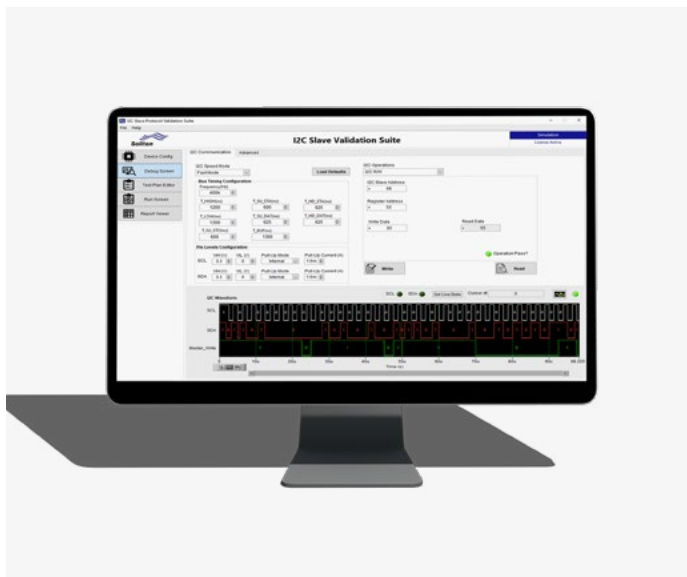
## Semiconductor Device Control Add-On 20.0 for InstrumentStudio

The Semiconductor Device Control Add-On for InstrumentStudio software is an add-on that helps you perform interactive register read/write operations using standard or custom digital protocols. You can save your InstrumentStudio software projects or export setups for automated validation in LabVIEW, Python, .NET, or TestStand. You can use InstrumentStudio software in parallel with automated applications to monitor and debug device control tasks in real time.

The 20.0 release adds RFFE protocol support, powerful scripting capabilities, various usability improvements, and InstrumentStudio 2020 support.

[Learn More](#)





## Soliton Protocol Validation Solution for I2C, I3C, SPI, and SPMI Semiconductor Devices

The Soliton Protocol Validation Solution is an off-the-shelf validation tool that uses NI PXI digital instruments and helps chip designers perform protocol validation in as little as a few hours, significantly reducing time to market. The PXI-based validation suite helps validate the device's compliance with timing and electrical specifications of the I2C/I3C/SPI/SPMI protocols and also can validate the device's tolerance to and recovery from a variety of faults and exceptions, providing a comprehensive set of test reports.

[Learn More](#)

## LDO Validation Solution

NI's LDO Validation Solution combines high-performance PXI instrumentation with the Soliton LDO Measurement Suite to help you validate new LDO designs—from interactive configuration and measurements to fully automated validation. This solution includes prebuilt, configurable LDO measurements, such as line/load regulation, line/load transient, dropout voltage, and power supply rejection ratio (PSRR). You can use an intuitive InstrumentStudio software panel to interactively configure and run LDO measurements, and then you can export those measurement configurations for a simplified path to automation with either prebuilt, drag-and-drop TestStand step types or integrate LDO measurements into your own automated application with a LabVIEW programming API.

[Learn More](#)





## NI Wafer-Level Reliability Software 21.0

NI's wafer-level reliability (WLR) solutions provide a scalable, flexible, and future-proof software and hardware architecture with which you can optimize how you would gather the data required to execute your device or process qualification efforts. Through our parallelism, source measure unit (SMU) density, and performance, we can provide throughput improvements and help you gather more insights and statistics in the same amount of time, or provide you with the same amount of data in less time:

- Leverage parallel SMUs to increase your reliability data velocity between 5X and 10X with custom software
- Easily evaluate our SMU and software capabilities with our WLR examples based on LabVIEW, including:
  - Time-dependent dialectic breakdown
  - Hot carrier
  - Bias temperature instability
- Use a WLR demo box for packaged devices
- Configure, run, and review your stress tests easily within our reference examples
- Build highly synchronized and flexible systems with our SMU-per-pin system architecture and scalability
- Deploy your own custom reliability algorithms leveraging our WLR 21.0 API based on LabVIEW
- Engage more easily with customers on benchmarks

[Learn More](#)

A technician wearing a white cleanroom suit, a hood, and safety glasses is carefully examining a large, circular semiconductor wafer. The wafer has a colorful, iridescent pattern. The background is a blurred cleanroom environment with bright lights.

SUCCESS SPOTLIGHT:

# Next-Generation Semiconductor Technology Parametric Test

[Learn More](#)

## Challenge

imec Semiconductor needed to perform accurate electrical wafer-level tests in the semiconductor R&D fabrication (fab) process flow to detect process-related issues at an early stage. This helps to rework the wafers at the right time to manage yield drops and optimize the R&D process flow, reduce costs, and decrease the time-to-market of the newest chip-manufacturing techniques.

## Solution

Using the NI PXI platform with PXIe-4135 SMUs, imec built a highly parallel measurement system to use inside the wafer fab and programmed this setup with LabVIEW so that they could keep all of the wafers inside and test them, process the results, and make much faster adjustments to the semiconductor process flow.

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“The test-time reduction using this SMU-per-pin method is nothing short of spectacular, and wouldn’t be possible with large, traditional box SMUs. Our method eliminated switching and serialized-measurement time, reducing total test time to that of testing a single test point.”

**Bart De Wachter**

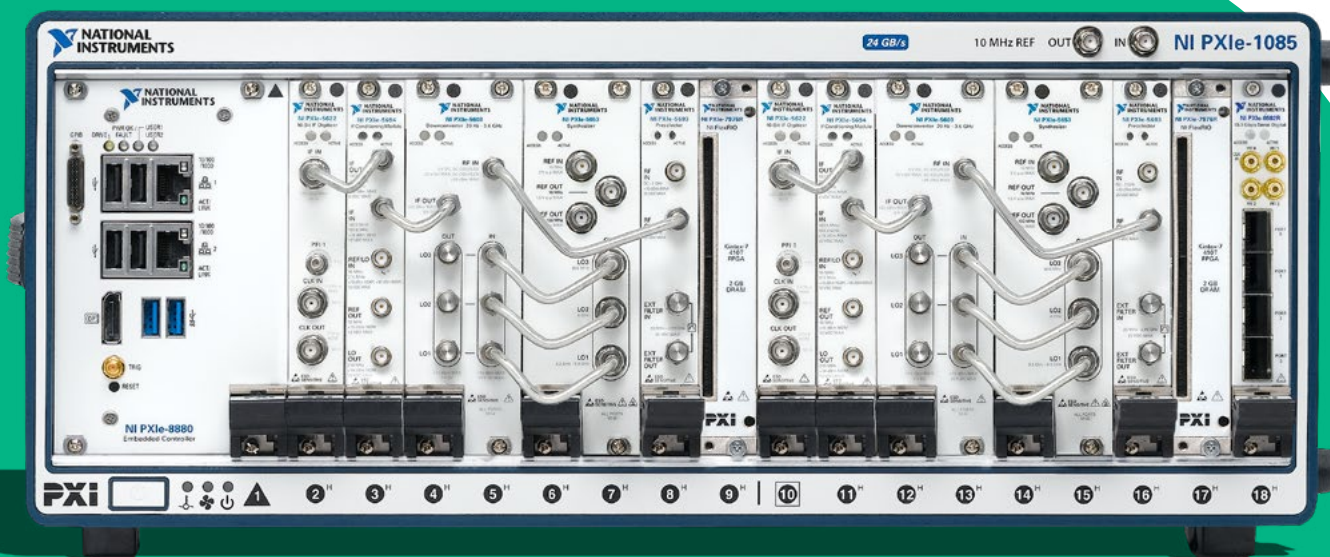
imec Semiconductor Technology and Systems Group Researcher

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# INDUSTRY-SPECIFIC SOLUTIONS

## Aerospace, Defense, and Government

When you're working on mission-critical assets, quality and reliability are imperative. From early-stage research to the sustainment of long life-cycle programs, NI can help you address your most significant challenges across design, test, deployment, and maintenance.



"NI systems allow us to stay on the aggressive timelines that we set for ourselves. They give us the agility to innovate rapidly and adapt quickly."

Omar Mussa  
Virgin Orbit

## Novator Solutions Hugin 2000 Multichannel Receiver

Engineers and project leaders responsible for installing and deploying signals intelligence sensor sites typically need to use multiple narrowband radios for capturing all signals in the surroundings. However, it's complex to install and maintain multiple radios, especially at remote sensor sites. Using many radios creates a significant volume of data that must be streamed and managed. And as more radios are deployed to cover additional frequency bands, costs escalate. Together with NI Partner Novator Solutions, we offer a solution to:

- Maximize the likelihood of capturing critical electromagnetic signals
- Minimize extraneous data processing and storage
- Reduce the need for scanning and replace traditional narrowband receivers

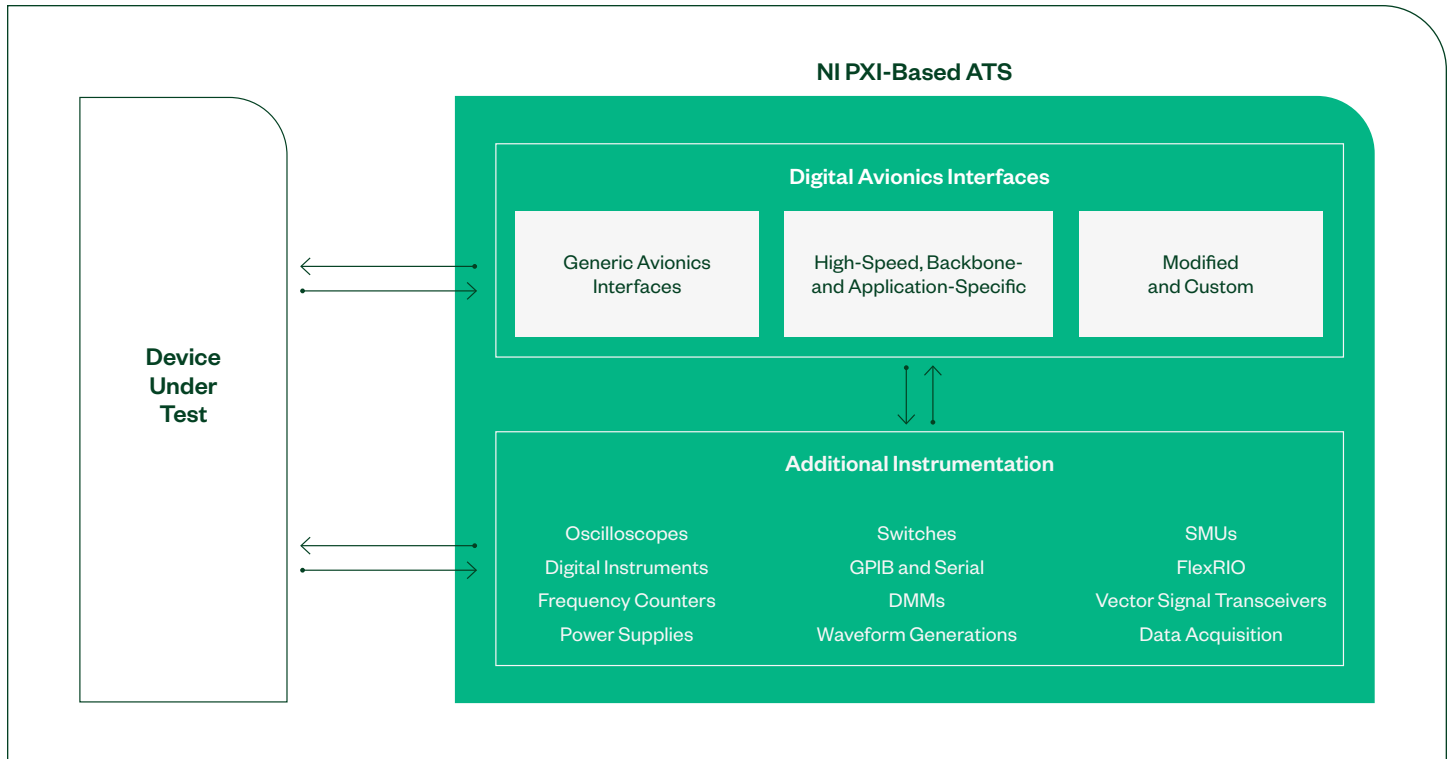
### Key Specifications

Hugin 2000 Processing	TCP/IP-controlled server software runs on PXI controller CPU, and signal processing runs on FPGAs	
RF Tuner	PXIe-5667 and PXIe-5668	
Number of Narrowband Channels	1,024 per RF tuner with aggregated output rate of 125 MS/s to 250 MS/s	
Data Movement	SFP+ 10 Gb network for narrowband channel stream	
Data Output per Channel	CW, AM, LSB, USB, FM, WFM, or IQ data (no demodulation)	

### RF Specifications

V/UHF Characteristics	50 MHz Tuner	200 MHz Tuner
Maximum Input Power	+10 dBm	+30 dBm
Analog Bandwidth	50 MHz	200 MHz
Dynamic Range	100 dB to 112 dB	119 dB
Phase Noise	-129 dBc	-126 dBc
Sensitivity	-160 dBm/Hz @ 3.6 GHz	-150 dBm Worst Case

[Learn More](#)




## Digital Avionics Interfacing Solution for Manufacturing and Depot Test

Using the Digital Avionics Interfacing Solution for Manufacturing and Depot Test, test engineers can communicate with their DUTs through industry-standard protocols as part of their overall production or maintenance test application. The offering includes network interface cards for common general protocols sold by NI, partner IP for high-speed and application-specific protocols that runs on NI hardware, and an NI tool-based workflow for modifying standard protocols or creating custom interfaces. Unlike the competition, NI provides the broadest spectrum of protocol support with the flexibility to select the exact functionality that you need:

- In addition to traditional instrumentation, NI offers digital avionics interfaces both directly and through trusted partners.
- The solution supports generic interfaces, including MIL-STD-1533, ARINC 429, RS232/RS422/RS482, and CANbus.
- High-speed interfaces include Fibre Channel, Serial RapidIO, ARINC 664p7/AFDX, IEEE 1394b, and Ethernet (up to 40 Gigabit Ethernet).
- Application-specific interfaces include ARINC 708, ARINC 717, ARINC 818, SpaceWire, and DVI.
- For modified or custom protocol applications, NI tools incorporate a user-programmable FPGA for maximum customization.

[Learn More](#)





SUCCESS SPOTLIGHT:

# Saab Elevates Testing of the World's Most Cost-Effective Fighter Plane

[Learn More](#)

## Challenge

Saab needed to find a commercial off-the-shelf (COTS) solution to replace their custom system for interfacing to line-replaceable units (LRUs) in Saab Aeronautics simulators.

## Solution

Saab reduced cost and ensured maximum flexibility by joining NI in piloting its SLSC system, rather than developing a custom system to interface to the preferred CompactRIO and PXI-based systems.

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“Having a COTS product means we can contain development and maintenance costs, promoting the Saab initiative to break the cost curve. Using the SLSC system further promotes our goal to focus the attention on building HIL test systems and rigs, not developing advanced hardware.”

**Anders Tunströmer**  
SAAB Aeronautics

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# INDUSTRY-SPECIFIC SOLUTIONS

## Transportation

Together, we can create a more sustainable future for mobility—without shortcuts. NI can help you ensure quality and accelerate time to market. Let's turn test into your enabler of performance and strategic advantage.





## ECU Test System 2.0

The NI ECU Test System (ECUTS) is a configurable, out-of-the-box functional test solution that combines NI software, hardware, and services to ensure your success. Designed to help you focus on value-added production test tasks, this system helps you reduce time and resource waste during implementation as well as move faster to meet your deadlines and time-to-market goals.

### Advantages include:

- Faster deployment
- Leaner operation
- Scalability for any test need
- Sustainable execution

This release enhances capabilities to improve adaptability and maintainability.

**SOFTWARE**—The new software suite and maintenance software directly improve development, debugging, maintenance time, cost, and experience. Paired with the Field Diagnostic Tester (FDT), the new maintenance software increases system configuration, instrumentation, calibration, and diagnostic coverage. Additionally, the new software suite includes InstrumentStudio software integration and new TestStand steps for interactive debugging and faster test-plan development. The TestStand ECU Toolkit also provides a nonprogramming and graphical instrument debug experience, reducing test software development effort. In addition, it supports SLSC load switch modules (SLSC-1225x) in Switch Executive and current measurement steps in TestStand for a consistent user experience across PXI and SLSC switch products.

**SYSTEM**—More instrumentation options and available 24U and 40U form factors make ECUTS more adaptable to a variety of ECUs, test plans, and manufacturing requirements. The 40U option provides extra rack space for more instrumentation to accommodate your test needs.

“NI’s ECUTS is the only system we could find in the market that met our aggressive schedule for deploying production testers for our ECUs. Everything—from the initial configuration, to delivery at our site, to the bring-up service—was significantly faster, so we had more time to focus on our test plan implementation and make our project successful.”

Wenfeng Wu

Site Industrial TDE  
Valeo Interior Controls (Shenzhen) Co. Ltd.

Learn More





## Data Record System AD

Data Record System AD is an NI PXI-based system that includes application software designed for high-bandwidth advanced driver-assistance system (ADAS) and autonomous driving (AD) in-vehicle data-logging applications. The combination of PXI instrumentation, timing, and synchronization, paired with out-of-the-box application software, provides a high-performance (raw) sensor data and vehicle network bus recorder with unrivaled customization to address the specific data-logging needs of today and tomorrow.

### The system is:

- **FUTURE-PROOF**—Utilize hardware and software customization, flexibility, and third-party openness
- **MORE THAN JUST A LOGGER**—It offers single unified toolchain for data record and replay, and hardware in the loop
- **RICH WITH INCREASED DATA QUALITY**—Instrument-grade I/O, throughput, timing and synchronization, and edge-computing capabilities translate to smart data reduction
- **MINIMALLY COMPLEX**—A single system means a reduced footprint and power consumption
- **EQUIPPED FOR SYSTEM INTEGRATION AND EVOLUTION**—NI Certified Solution Partner Konrad Technologies and a vast ADAS ecosystem of IT and cloud subject matter experts provide support

### System components include:

- **SOFTWARE**—Data Record AD application software offers high-bandwidth data recording, including an out-of-the-box experience and full customization options
- **PXI MODULE DATA THROUGHPUT, TIMING, AND SYNCHRONIZATION**—PCI Express Gen 3 throughput up to 24 GB/s, P2P streaming, subnanosecond latency, and integrated triggering
- **PXI MODULE AUTOMOTIVE CAMERA INTERFACES**—FPD-Link III and GMSL2 I/O configurations of four-in/four-out, eight-in/eight-out; user-programmable FPGA for inline processing
- **PXI MODULE STORAGE**—In-chassis RAID and external storage options, including storage as a service at more than 200 TB at >6 GB/s
- **PXI EMBEDDED CONTROLLER COMPUTER**—Windows and NI Linux Real-Time OS options, Intel Xeon processing, peripheral ports, display output, and an integrated hard drive
- **PXI MODULE AUTOMOTIVE NETWORK INTERFACES**—CAN (Low-Speed, High-Speed, and Flexible Data-Rate [FD]), FlexRay, automotive Ethernet 100/1000BASE-T1; standard Ethernet up to 40 Gb/s

[Learn More](#)



## PXI Automotive Camera Interface Modules (FPD-Link III and GMSL2)

The PXIe-1486 and PXIe-1487 represent a key technology for NI in ADAS and AD hardware and software test applications. Using these six variants, you can connect FPD-Link III and GMSL2 PXI interfaces to modern high-bandwidth ADAS/AD camera sensors and ECUs—critical for recording and playing back data to and from DUTs. Using the PXIe-1486 and PXIe-1487, which are built upon NI FlexRIO technology, you can process information in real time, synchronize multiple ADAS sensors, and stream data to the PXI backplane with PCI Express x8 Gen 3 speeds.

These modules include FlexRIO 20.7 driver support, with prerequisites of LabVIEW 2020 and LabVIEW FPGA Module 2020.

[Learn More](#)

## Body and Chassis HIL Solution

For validation engineers who have continually changing test requirements with less time and fewer resources to address them, NI offers body and chassis HIL test solutions comprised of high-performance modular hardware with a wide breadth of I/O and FPGAs, simplified load switching, and fault insertion.

### Use these solutions to:

- Minimize cost and ensure reliability with HIL simulation, reducing the need for expensive real-world tests.
- Reduce test development time and enjoy quick start-up with a system built with modular NI hardware along with our HIL partner ecosystem.
- Maximize system reuse with a flexible tester designed to be extended and customized to meet changing requirements.

### HIL test system component benefits include:

- NI SLSC hardware that standardizes connectivity and simplifies overall system integration by reducing system point-to-point wiring through signal accumulation and standard cable use.
- A custom PXI or CompactRIO system with a broad range of modular I/O connected directly to the FPGA for testing with higher fidelity through high-speed deterministic execution.
- VeriStand, which includes features to configure real-time I/O, import and simulate models, and automate real-time tests.

[Learn More](#)





## Battery Test System 2.0

NI developed the Battery Test System (BTS) to optimize battery test workflows and give test teams the access and flexibility they need to respond to rapidly changing test requirements. The BTS features robust test automation, remote asset management, and pre-existing test scripts along with flexible, vendor-agnostic equipment integration (chamber, chiller, cycler) so that you can reuse existing test team assets. The BTS can help you stay ahead of requirements churn and drive test efficiency improvements to accelerate schedules, increase test coverage and quality, and reduce the total cost of test.

The 2.0 release is an iteration of the original BTS that launched in 2020, and adds functionality that includes:

- Multi-DUT Support—Test up to four battery packs/modules at one time (per DUT RT control plus additional I/O)
- Accessibility Improvements—Use instrumentation drawers for integrator/technician access
- User Interface Configuration Scripting—Script operator state, configuration, or test panels

[Learn More](#)



## Noffz A²B Network Simulation and Testing

Road noise cancellation, personal audio zones, telematics systems, and A/V conference room systems are some of the most common audio challenges faced by infotainment test engineers. These demand more expensive microcontrollers and external memory, increasing system complexity and test time. The ITD 1024 is an off-the-shelf infotainment test device for A²B, an emerging automotive audio bus. In combination with a comprehensive set of software tools, you can use ITD 1024 to rapidly test various A²B components such as audio speakers, amplifiers, microphone arrays, sensors, and actuators.

[Learn More](#)



## monoDrive Simulator

The monoDrive Simulator is a powerful simulation software for testing ADAS and autonomous driving perception algorithms. Focused on ultrahigh-fidelity sensor simulation, it features real-world tuned physics-based sensor models, realistic driving scenarios, and diverse environments. You can use the simulator in a desktop environment for development, run it in closed-loop real-time for HIL, and deploy it as a cloud-based application to test at scale.

### Advantages include:

- **SIMULATION REALISM**—monoDrive's simulator and sensor models are focused on creating high-fidelity sensor data for camera, radar, lidar, ultrasonics, and GPS/GNSS so that your simulation results match what you'll see in the real world.
- **REAL-TIME PERFORMANCE**—Sensor models have been optimized for running natively on GPUs to achieve real-time performance for HIL applications without sacrificing fidelity.
- **PARALLEL TEST**—Use the Kubernetes-native application to deploy easily to any private or public cloud for testing at scale.

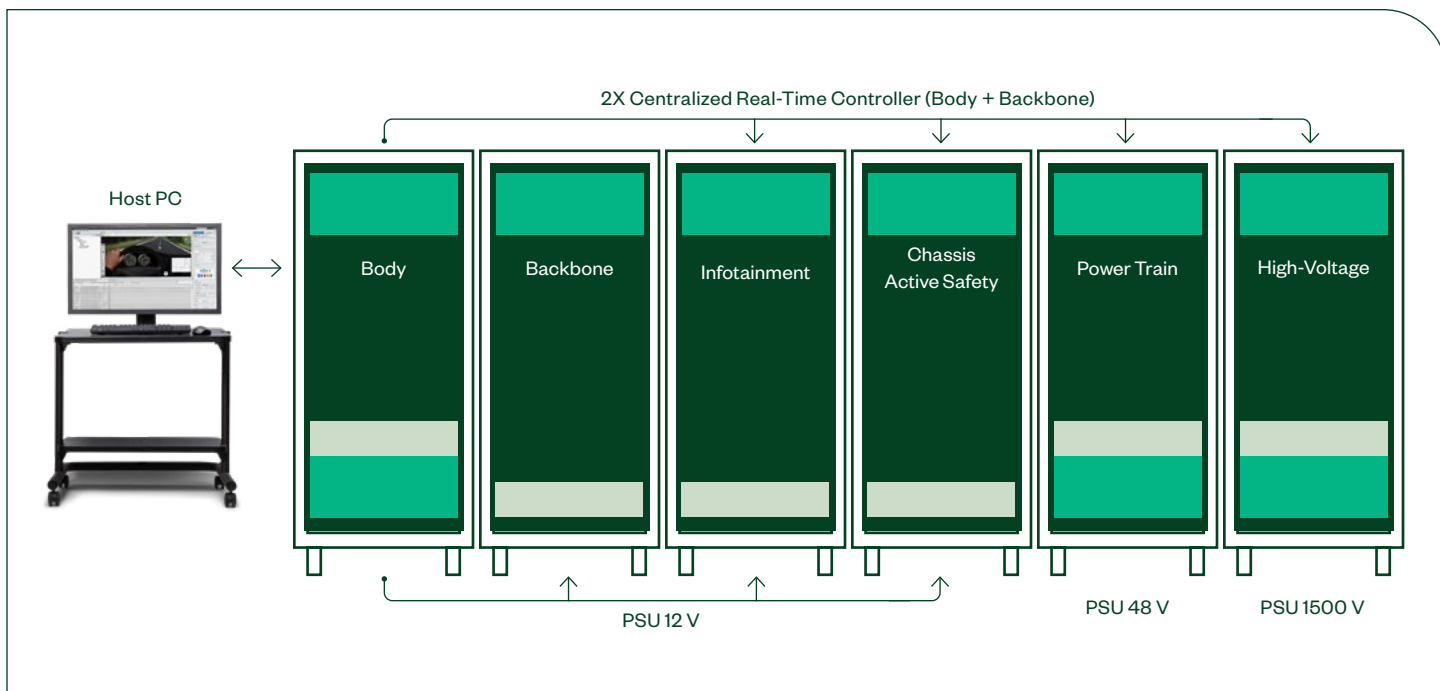
[Learn More](#)

## monoDrive Digital Twin Creator

The monoDrive Digital Twin Creator provides an end-to-end solution for creating high-fidelity assets and maps for simulation and testing. Sensor fusion and machine-learning algorithms construct 3D meshes from lidar and image data that capture both static and dynamic objects. Direct texturing is then overlaid to produce more realistic maps than human artists or procedural algorithms can. Use this solution to take advantage of:

- **INCREASED TEST COVERAGE**—Create digital twins of real drives that you can modify in simulation to test thousands of scenarios.
- **HIGH FIDELITY**—Using real data as the basis for simulations creates more realistic drive scenarios for better test fidelity.
- **FASTER SCENARIO CREATION**—Automate scenario creation from real data without hand-labeling

[Learn More](#)



## System-Level HIL Solution

As vehicles grow more complicated, systems-integration testing is more important than ever. Rigorous systems-integration HIL testing ensures that ECUs across the vehicle—in different systems, developed by different teams—all function correctly and safely together.

Use this solution to take advantage of:

- **AN OPEN AND FLEXIBLE APPROACH**
  - With PXI, you can extend your current test capabilities with a wide range of modules to meet different system-integration testing needs as you add new ECUs to the system.
  - VeriStand supports new and existing models in an HIL test system.
  - Comply with standards—including ASAM, AUTOSAR, and FMI—so that you can incorporate additional suppliers' offerings in the future as your requirements change.
- **TEST REUSE**—Selecting a modular, open ecosystem means that you can reuse hardware and software as testing scales from component level to system level to full vehicle-system testing.
- **A SCALABLE AND RECONFIGURABLE SOLUTION**—Swiftly reconfigure complex, multichannel systems.
- **FULLY AUTOMATED COMPLETE VEHICLE FUNCTIONAL TEST**—Incorporating HIL testing to perform this validation moves test earlier in the design cycle, so that you can make adjustments before requiring a full prototype vehicle.

[Learn More](#)





SUCCESS SPOTLIGHT:

# BMW Designs and Develops a Digital Twin for Low-Voltage Vehicular Power Systems

[Learn More](#)

## Challenge

Vehicle electrification and automation greatly impact safety-relevant and functional power system requirements because interferences to those can cause fatalities. Critical situations should be discovered in the early concept phase through simulation, and countermeasures such as harness redesign, component modifications, and anti-interference solutions can help. Virtual designs reduce development time and preserve financial resources, but they require a closed measurement feedback loop to validate models against the real physical systems and system-inherent retroactive effects.

## Solution

The BMW Group designed and developed a digital twin for low-voltage vehicular power systems. With a newly defined validation approach and the development of a system-level physical and digital twin, BMW simulated and emulated highly dynamic processes to fully stress the low-voltage power system and identify weaknesses quickly, which reduced development time and costs.

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“High-performance modular instruments allow us to do testbench-based development of future vehicular fail-operational low-voltage power systems. Through communication with selected measurement and control components, the system under test can be stressed electrically with an automated validation test process. Highly dynamic and accurate measurements are immediately evaluated. Results from these physical tests help us to significantly improve our models deployed in our digital twin.”

**Martin Baumann**

Simulation Electrical Power Supply, BMW

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