

SOLUTION BROCHURE

Data-Logging Test System

Electromechanical Component Validation for Industrial and Electronic Equipment

Solution Overview

Logging data is a key requirement for tests such as component characterization and prolonged endurance testing. Good data-logging equipment should minimize the impact of change as you validate different design revisions, components, or entirely new programs. The NI data-logging and analysis system highlights the hardware and software technology that tens of thousands of validation teams trust today for their test and measurement needs.

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Solution Architecture

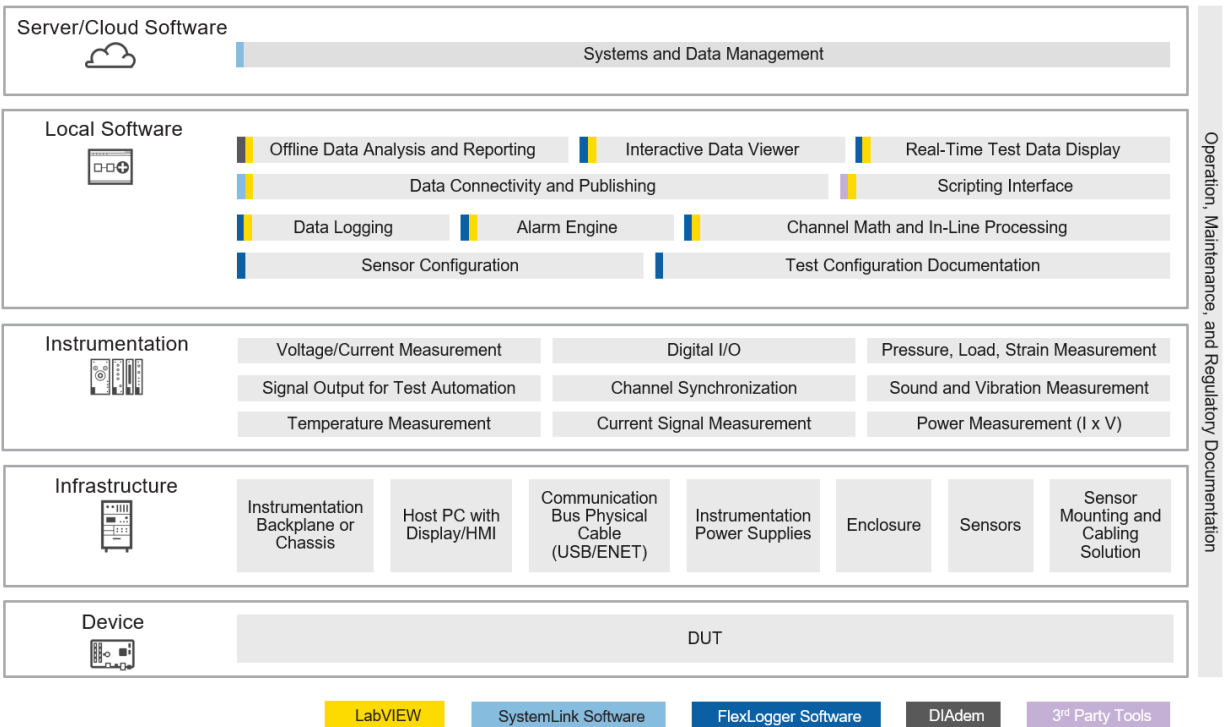


Figure 1. Solution Architecture

NI data-logging systems are software-centric and modular to focus on flexibility. Customize your data-logging system according to your project (and budget) needs with modular hardware and a growing list of features, such as the ability to:

- Mix and match more than 100 C Series modules in a CompactDAQ chassis
- Synchronize channels to within 1 μ s
- Connect to a PC over standard USB or Ethernet
- Distribute large-channel-count systems by daisy-chaining multiple CompactDAQ chassis and FieldDAQ devices

“We used FlexLogger data-logging software with CompactDAQ I/O modules for direct sensor connectivity to thermocouples, load cells, pressure and displacement analog sensors, and CAN buses. Easier setup equips more engineers to build customized DAQ systems, which helps us respond quicker to gathering the requested data and provide more comprehensive test coverage.”

– Cameron Knights, Design Assurance Test Engineer, Altec

Key Features

- Configure, visualize, and synchronize a mix of I/O with a CompactDAQ modular measurement system
- Configure alarms, triggers, and file formats in FlexLogger ready-to-run data-logging software
- Examine data with interactive viewers for quick insights into test results

- Connect to data from a variety of communication protocols
- Install instrumentation close to the action with rugged FieldDAQ measurement hardware
- Export data from FlexLogger software to programs such as Microsoft Excel, MathWorks MATLAB® software, or NI DIAdem engineering data-analysis software

NI Data-Logging System Benefits

- Maximize your investment by learning one toolchain for testing, logging, and analyzing data
- Modify your data-logging system as you move between projects or requirements changes
- Quickly visualize and analyze test data with automated report generation

NI Data-Logging Hardware Overview

CompactDAQ Systems

Platform-Based Approach to Conditioned Measurements

CompactDAQ is a portable, rugged data acquisition platform. It combines signal connectors, integrated signal conditioning, and converters in a single package to deliver higher-accuracy measurements by eliminating error-prone cabling and connectors and reducing the number of components in a measurement system. With more than 60 C Series I/O modules for nearly any sensor type, quickly design a custom hardware setup optimized for size, cost, and performance. The breadth of bus, chassis, and I/O conditioning options, combined with rapid FlexLogger software setup, provides the best solution to meet changing application needs.



Figure 2. CompactDAQ System

A CompactDAQ system includes a 1, 4, or 8-slot CompactDAQ chassis, and up to eight C Series Modules. Certain Ethernet CompactDAQ systems can be synchronized together with other CompactDAQ systems or FieldDAQ devices, with $<1 \mu\text{s}$ synchronization over regular Ethernet cables.



Figure 3. Insert Caption Here

Key Benefits:

- Meet any test needs with 60+ I/O modules supporting a variety analog, digital, counter, and industrial communication input and output types
- Customize quickly with hot-swappable modules
- Synchronize your data—sync modules over the CompactDAQ chassis backplane and sync multiple chassis together over Ethernet
- Simplify setup with a wide range of sensor and signal connections such as D-SUB, screw terminal, RJ50, spring terminals, and more

C Series I/O Modules for CompactDAQ

Mix and Match More Than 60 Sensor-Specific Modules

Each C Series module contains measurement-specific signal conditioning to connect directly to an array of sensors and signals. Meet your data-logging requirements by customizing your system with a wide variety of modules for the I/O you need.

Signal Type	Channel Counts	Measurement Types	Max Sample Rate	Special Features
Analog Input¹				
Voltage	2, 3, 4, 8, 16, 32	± 200 mV, ± 500 mV, ± 1 V, ± 5 V, ± 10 V, ± 60 V, 3 V _{rms} , 400 V _{rms} , 800 V _{rms} , 300 V _{rms}	20 MS/s/ch	Up to channel-channel isolation, antialiasing and configurable filtering
Current	3, 4, 8, 16	± 20 mA, 0-5 A _{rms} , 0-20 A _{rms} , 0-50 A _{rms}	200 kS/s	Up to channel-channel isolation, built-in channel diagnostics
Voltage and Current	16	± 20 mA and ± 10 V	500 S/s	Channel-earth isolation, built-in noise rejection
Universal	2, 4	V, mA, TC, RTD, strain, Ω , IEPE	51.2 kS/s/ch	Up to channel-channel isolation, bridge completion, antialiasing filters, built-in shunt resistors, amplification
Thermocouple	4, 8, 16	J, K, T, E, N, B, R, and S types	95 S/s/ch	Up to channel-channel isolation, amplification, filtering, CJC
RTD	4, 8	100 Ω , 1000 Ω	400 S/s	50/60 Hz filtering, bank isolation
Strain/Bridge-Based	4, 8	$\frac{1}{4}$, $\frac{1}{2}$, full bridge (120 or 350 Ω)	50 kS/s/ch	External excitation, bridge completion, antialiasing filters
Sound and Vibration	2, 3, 4, 8	± 5 V, ± 30 V	102.4 kS/s/ch	IEPE, antialiasing filters
Analog Output				
Voltage ¹	2, 4, 6, 16	3 V _{rms} , ± 10 V, ± 40 V (stacked)	1 MS/s/ch	Bank isolation
Current ²	4, 8	± 20 mA	100 kS/s/ch	Channel-earth isolation, built-in open-loop detection
Digital I/O				
Input/Output	4, 6, 8, 16, 32	TTL (3.3 V or 5 V) RS-422, 5 V, 12 V, 24 V, 48 V, 72 V, 96 V, 120 V AC, 120 V DC, 240 V AC, 240 V DC	55 ns	Up to channel-channel isolation, sinking or sourcing input, bidirectional channel options, proportional valve control
Relay Output	4, 8	60 V DC, 30 V _{rms} , 250 V _{rms}	1 op/s	Up to channel-channel isolation, SPST or SSR relays
Other				
Counter	8	5 V differential, 24 V single-ended	1 MHz	Encoder support, channel-earth isolation
Digitizer	4	± 10 V	20 MS/s	Built-in analog reference trigger
CAN	1	HS/FD, LS/FT CAN	1 Mb/s	—
LIN	1	LIN	20 kb/s	—

¹Up to 24-bit resolution

²Up to 16-bit resolution

FieldDAQ Devices

IP65/67-Rated for Superior Measurements in Severe Environments



Figure 4. FieldDAQ Device

- Test anywhere with IP65/67-rated design, -40 to 85°C range, and 100 g/10g_{rms} shock/vibration resistance
- Make voltage, strain/bridge, accelerometer, microphone, and thermocouple measurements
- Synchronize multiple devices within one microsecond over Ethernet

As demand for field and test-cell measurements increases, so does test engineers' reliance on rugged, distributed instrumentation that can be mounted close to the sensor in harsh environments.

FieldDAQ devices feature IP65/67-rated ingress protection and incorporate standard industrial M12 connectors to prevent cable disconnections in vibration-heavy environments. These devices use sensor-specific signal conditioning and filtering to reduce measurement noise, along with a thermally stable design, so you can minimize accuracy drift over the entire -40 °C to 85°C operating range. With 24 bits of resolution and sample rates of up to 100 kS/s, FieldDAQ accurately can measure a wide variety of signals. FieldDAQ devices can be daisy-chained together over Ethernet with other FieldDAQ devices or CompactDAQ chassis and maintain <1 μs synchronization between devices thanks to time-sensitive networking technology.

“Our new technologies make our systems less susceptible to temperature fluctuations...FieldDAQ provides the flexibility to keep our devices closer to our DUT.”

—Automotive Validation Test Manager

Data-Logging Application Software

FlexLogger Software

Quick Sensor Configuration and Mixed-Signal Data Logging—All Without Programming

FlexLogger provides a configuration-based workflow and verification tasks. Build flexible, scalable data-logging systems with NI CompactDAQ, FieldDAQ, and PXI DAQ hardware. You can use sensor-specific configuration workflows to quickly set up, visualize, and log mixed synchronized measurements from analog sensors, digital signals, and vehicle communication buses. You also can generate voltage, current, or digital signals to drive actuators or control set points.



Figure 5. Configuration-based software, like FlexLogger, reduces time to first measurement, so you can focus on getting the data you need.

FlexLogger automatically saves metadata, documenting your test configuration so that you quickly can trace test results and make comparisons across multiple tests. Interactively review test results in the integrated data viewer to visually inspect your data and draw conclusions.

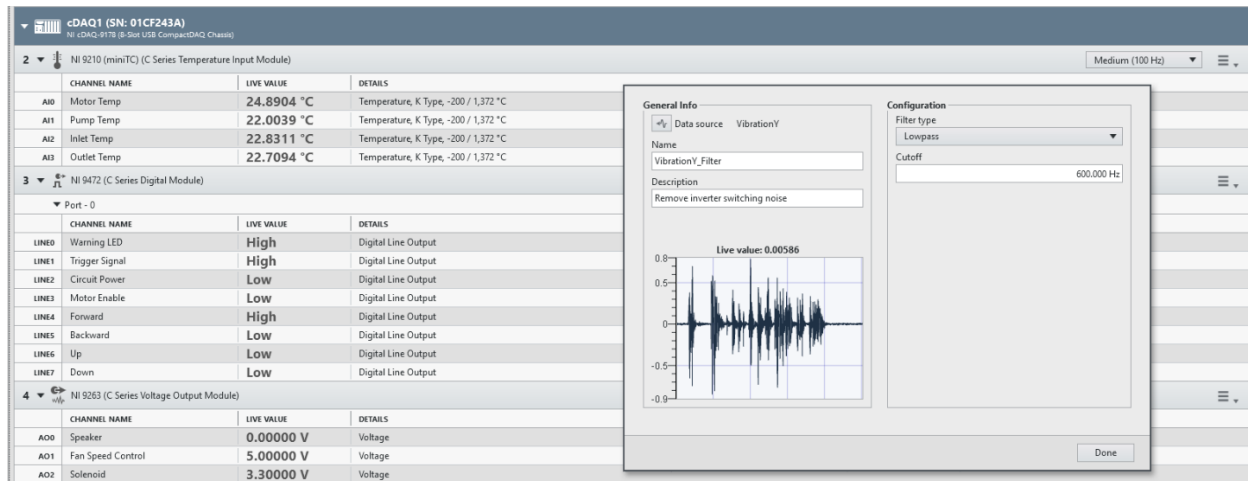


Figure 6. Interactive test panels in FlexLogger help verify sensor connectivity.

“Quick test turnaround is essential to keeping up with fast design iterations. The workflow in FlexLogger allows us to focus on the physical sensors at hand instead of dealing with ADCs and programming architectures. I can configure and visualize sensor data with a few clicks, which helps me quickly add new measurements to adapt and evolve to the design process.”

DIAdem

Locate, Inspect, and Analyze FlexLogger Data, and Generate Automated Reports

NI recommends using DIAdem with FlexLogger software to quickly locate, inspect, analyze, and report your recorded data to gain wider insight and repeat fewer tests.

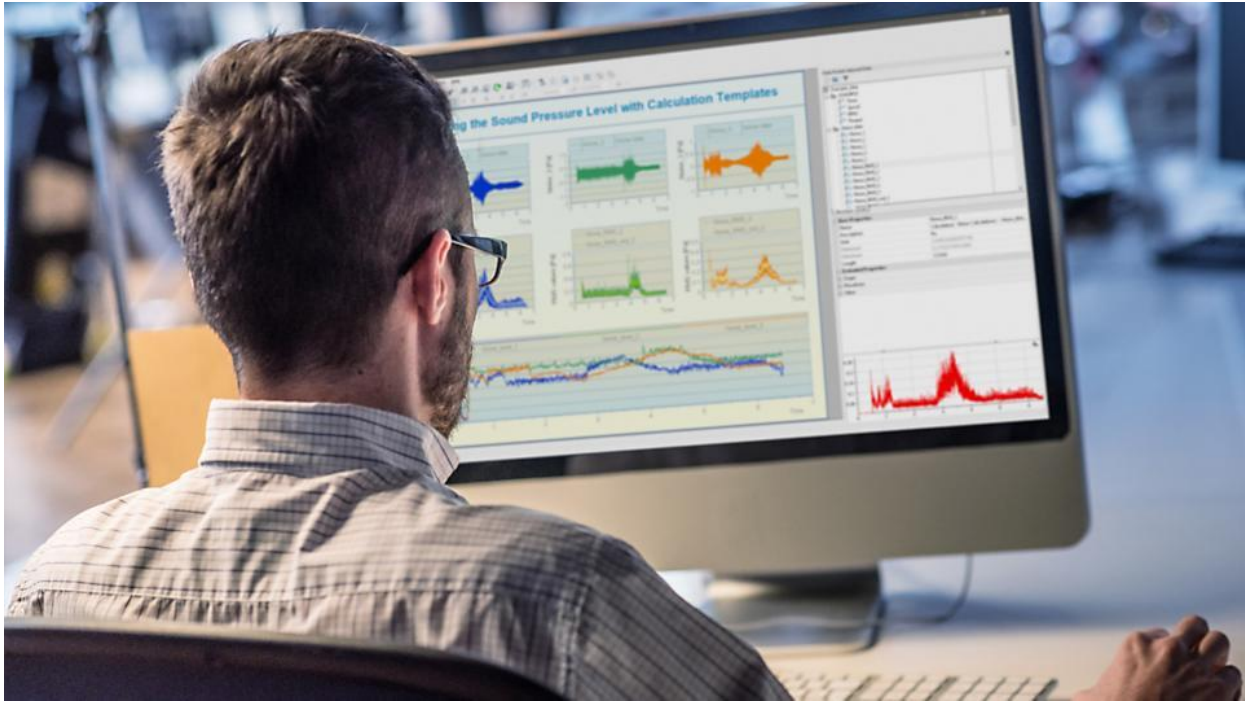


Figure 7. Use DIAdem to analyze large sets of engineering data across multiple test runs

Key Benefits:

- Quickly find data anywhere on a disk or network with metadata search queries
- Customize your analysis using hundreds of configurable engineering calculations
- Communicate results clearly and concisely using custom, professional reports
- Save time by capturing steps you interactively perform in a script to automate repetitive tasks

Hardware Services

All NI hardware features a one-year warranty for basic repair coverage and includes calibration in adherence to NI specifications prior to shipment. PXI systems also include basic assembly and a functional test. NI offers additional entitlements to improve uptime and lower maintenance costs with service programs for hardware. Learn more at ni.com/services/hardware.

	Standard	Premium	Description
Program Duration	1, 3, or 5 years	1, 3, or 5 years	NI offers three service program lengths.
Extended Repair Coverage	•	•	NI restores your device's functionality and includes firmware updates and factory calibration.
System Configuration, Assembly, and Test ¹	•	•	NI technicians assemble, install software in, and test your system per your custom configuration prior to shipment.
Advanced Replacement ²		•	NI stocks replacement hardware that can be shipped immediately if a repair is needed.
System Return Material Authorization ¹		•	NI accepts the delivery of fully assembled systems when performing repair services.
Calibration Plan (Optional)	Standard	Expedited ³	NI performs the requested level of calibration at the specified calibration interval for the duration of the service program.

¹This option is available only for PXI, CompactRIO, and CompactDAQ systems.

²This option is not available for all products in all countries. Contact your local NI sales engineer to confirm availability.

³Expedited calibration includes only traceable levels.

PremiumPlus Service Program

NI can customize the offerings listed above or provide additional entitlements such as on-site calibration, custom sparing, and life-cycle services through a PremiumPlus Service Program. Contact your NI sales engineer to learn more.

Technical Support

Every NI system includes a 30-day trial for phone and email support from NI engineers that can be extended through a **Standard Service Program (SSP)** membership. NI has more than 400 support engineers around the globe to provide local support in more than 30 languages. You also can take advantage of NI's award-winning [online resources](#) and [communities](#).

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