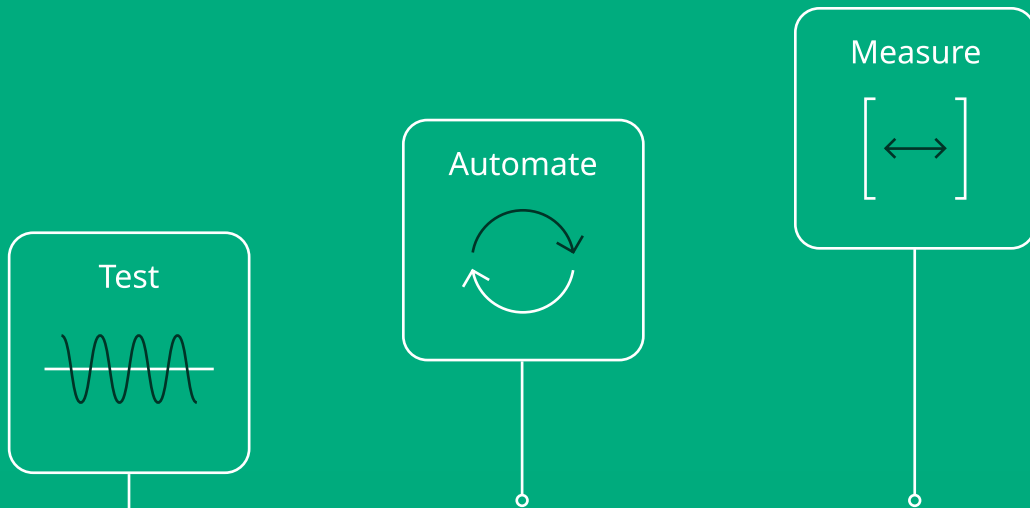


# NI Data Acquisition Product Catalog



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# What Makes NI Different for Test and Measurement

At our core, we're passionate about test technology and improving product performance. We know your research or latest product design will move markets and improve the world we live in. We're here to help you.

## We Are Software-Obsessed

NI products are designed for software. From simple USB devices to advanced RF testbeds, engineers working with NI systems see software as a defining element of test.

## Our Hardware Is Modular

You may be used to purpose-built boxed instruments; when you need a new measurement or more channels, you buy a whole new box. With NI hardware, you change or add measurements by adding new modules. Just like you upgrade your PC with a new graphics card, you can upgrade your NI test system with a new oscilloscope module.

## The NI Ecosystem Is Open

Test engineers benefit most when they combine NI software with NI hardware, but NI hardware works with other (non-LabVIEW) popular programming languages and NI software connects to non-NI hardware. Choose the tools that work for you.

## Why NI for Test

Every company says they save you time and money. Here are the challenges NI solves to do it.



### Flexibility

Changing designs, market needs, and supply chains challenge product development. Use NI tools to adapt and stay on schedule.



### Standardization

Don't spend time and money repeating work. Lower your cost of test by sharing code libraries and hardware architectures amongst all of your test teams.



### Quality

NI is known for data throughput, acquisition rates, synchronization, and measurement quality. Better products need better test.


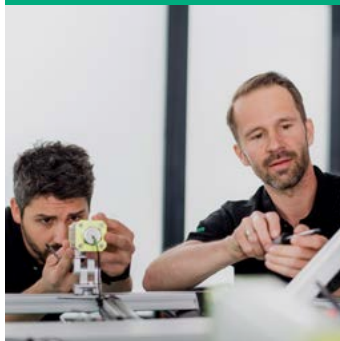
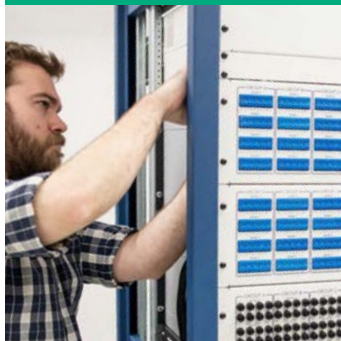



### Productivity

You are a critical part of test. NI improves your productivity, so you focus more on what matters to you, your team, and your business.

# Find NI Anywhere There Is Test

NI works with more than 40,000 customers each year to deliver the test and measurement technology engineers use to create better products, on time, while driving down the cost of test. Find NI anywhere there is test, including:

<p>Quick desktop measurements to test design assumptions</p>	<p>Mechanical and sensor-based tests to validate specifications</p>	<p>Automated software (HIL) test racks to cover the whole test envelope in less time</p>	<p>Manufacturing test systems to improve test quality and throughput</p>
			

## Industries Served

- Semiconductor
- Electronics (consumer and industrial)
- Electrical components (motors, switches)
- White goods and appliances
- Automotive
- Aerospace
- Military and defense
- Life sciences
- Academic (teaching and research)
- Heavy equipment, industrial, and off-highway
- Commercial and government research labs
- Energy: Smart grid
- Energy: Renewables research
- Energy: O&G mid/downstream and well-servicing

## Companies and Engineers Seeing Success with NI Today

**Qorvo**

**2x**

test throughput and prepared for 5G

**Hyundai**

**83%**

lower development time for new test systems per variant

**Honeywell**

**40%**

reduction in cost of each test station

**Philips**

**\$2M+**

reduction in OpEx per project

## Philips Rethinks Functional Test, Shortening Time to Market

---

“The move to a COTS approach using PXI and LabVIEW was critical to this production-test success at Philips. The combination of best-in-class modular hardware along with industry-standard software was pivotal to millions of dollars and hundreds of hours saved in production test engineering.”

Neil Evans  
Senior Manager, Philips

---

## Productivity Boost in Post-Silicon Validation

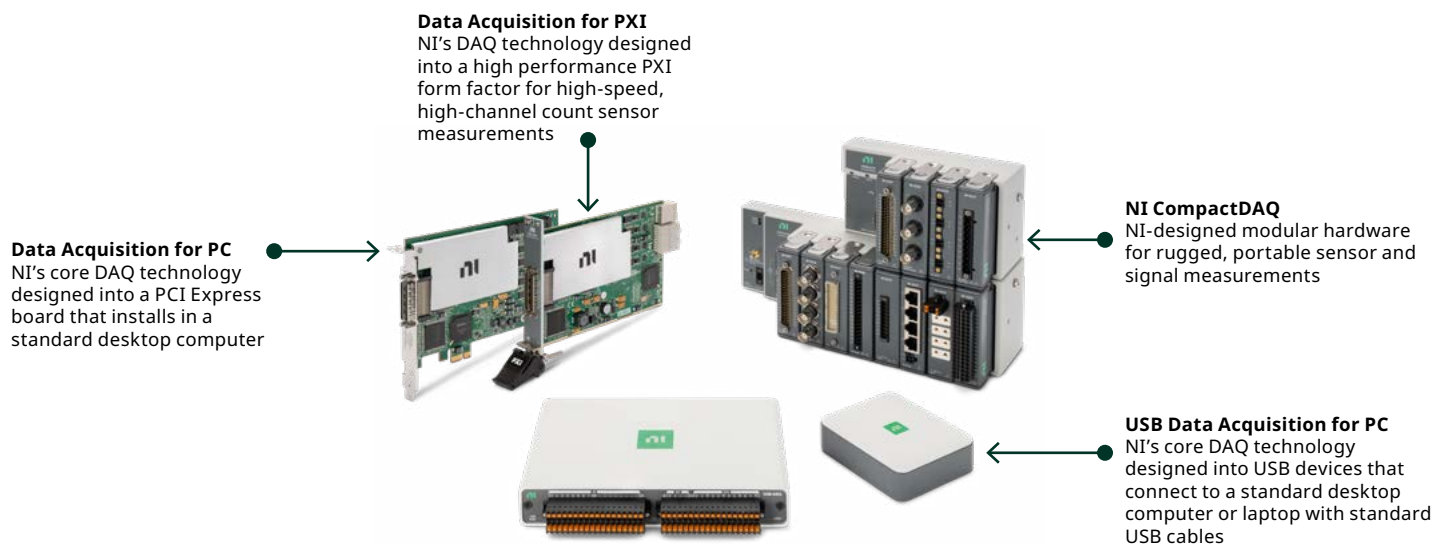
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“It was never easier to configure the PXI instruments and run automated measurement without much coding in a few minutes of setup time. I believe the powerful combination between InstrumentStudio™ software and TestStand with the sweep loop is an incredible feature that (will) boost our productivity for debugging activities in postsilicon validation.”

Wolfgang Rominger  
NXF

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## NI Hardware Is Modular



Mix and match NI's modular hardware with a PC to build a custom test and measurement solution for the desktop, lab bench, or production floor.



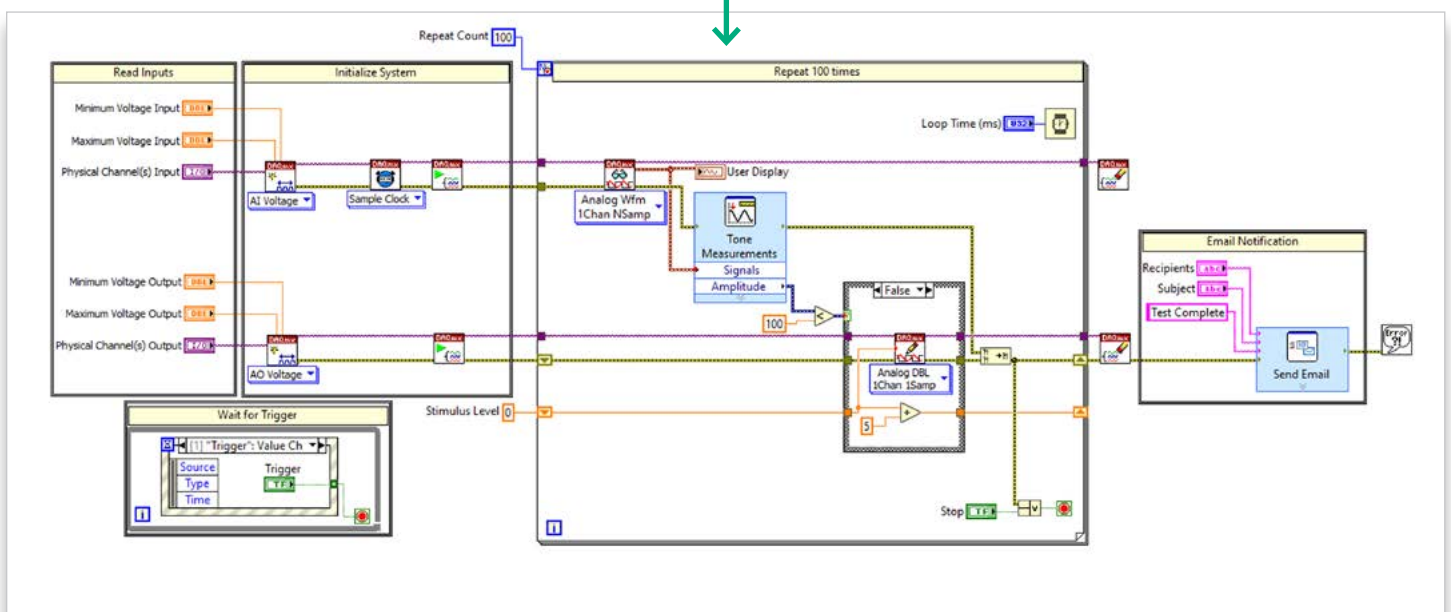
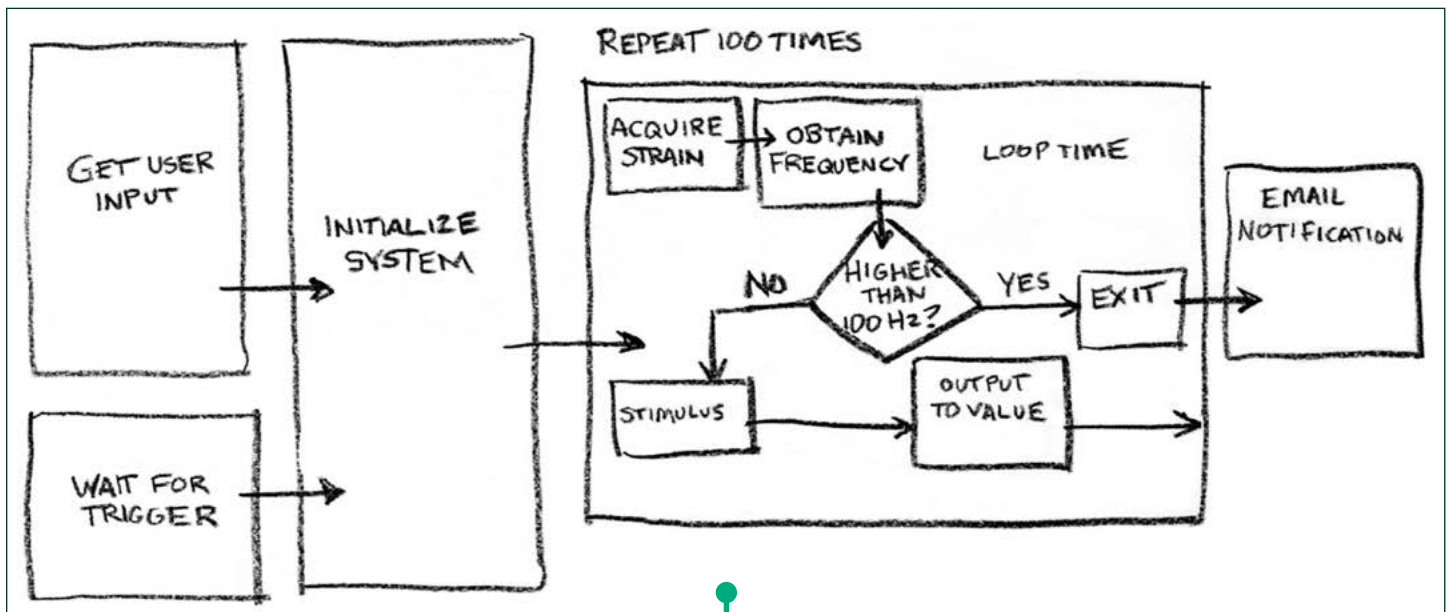
# Why Choose LabVIEW for Test

Our comprehensive software portfolio scales from the instrument to the enterprise, allowing us to serve a complete range of needs, from performing a simple measurement to managing test systems across the globe.

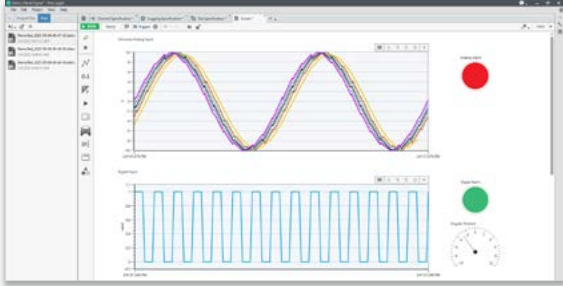
In 1986, we released LabVIEW and have been the leaders in automated test since. From performing a simple voltage measurement to advancing space missions, LabVIEW has been engineers' tool of choice. Let's take a look at why engineers choose LabVIEW:

## Program Like You Think

Graphical data flow in LabVIEW (bottom) is like flowchart logic (top) and considered easier by many to interpret and debug.

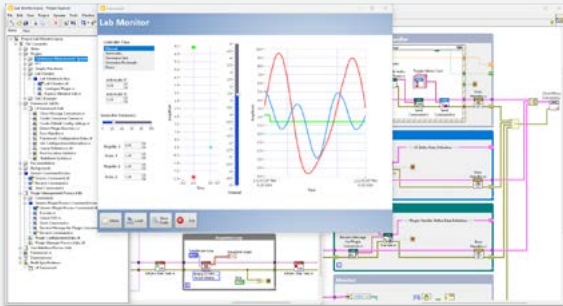


# NI Data Acquisition Software



## FlexLogger Lite (Free Download)

- Configure measurements
- Create real-time displays
- Log results

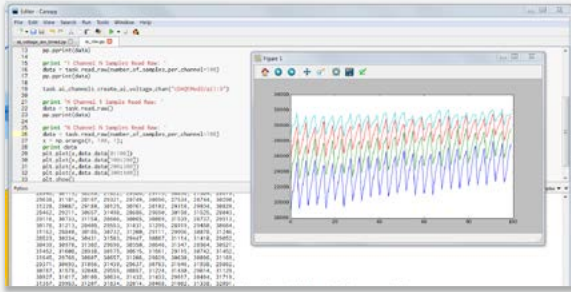


## LabVIEW

- Create a professional UI
- Integrate all of your instruments
- Program like you think
- Integrate code from Python, C, or MathWorks® MATLAB® software

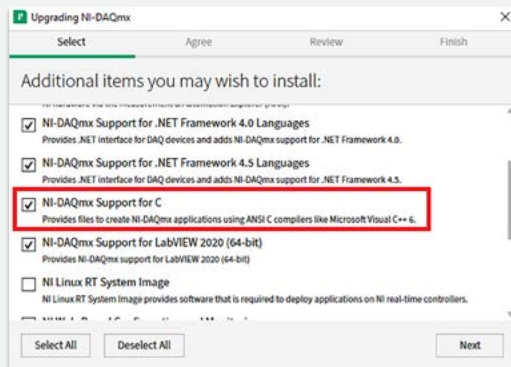


# Programming Language Support



## Python

- nidaqmx package available on GitHub
- Support for Cpython 3.8 and PyPy3
- Example programs included



## C/C++, VB 6.0, VB.NET, and C#

- API installs with the NI-DAQmx driver
- Libraries of functions for all DAQ operations
- Example programs included

# Get Access to All the Software You Need in the LabVIEW+ Suite



788509-35

It's LabVIEW, plus whole lot more. The LabVIEW+ Suite brings together the best of NI test software that saves engineers time by optimizing every part of their workflow. Each software includes features and capabilities designed to accelerate test:

- NI LabVIEW is the industry-leading environment for automated test system development.
- NI TestStand is used in validation labs and on manufacturing floors across the world to automate and sequence tests.
- NI DIAdem saves engineers hundreds of hours of manual data analysis and report creation with automation.
- NI FlexLogger and InstrumentStudio software make measurement and instrument configuration a quicker and interactive process.

The suite provides purpose-built tools for automating measurement, analysis, and test that work together to save you time.

## Measure

### Take a Quick Measurement

- Configure NI hardware channels for sensor, analog, and digital signals
- Interactively set up PXI instruments and debug unexpected behavior

Powered by:



## Test

### Optimize Test for Validation and Production

- Create test sequences with code from LabVIEW, Python, C/C++, and .NET
- Track units and automatically store test results to your database

Powered by:



## Analyze

### Interactively Analyze Data

- Use built-in engineering analysis functions for calculations
- View any type of data, quickly and all at once, with segmented displays

Powered by:



### Create and Share Reports

- Drag-and-drop to graphics to create shareable reports for your team or organization
- Automate your post-processing routine with VBS or Python

Powered by:



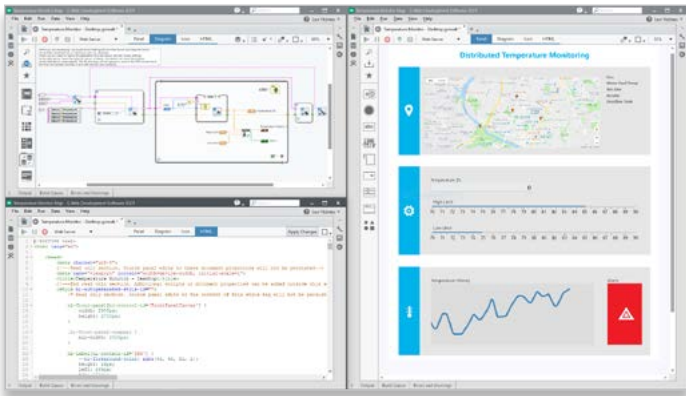
# NI Test Software Overview

NI software can be purchased individually or as part of LabVIEW+; short descriptions of the software follow. More information on applications and key features can be found in this section.



## NI LabVIEW

A graphical programming environment for developing automated test systems with rapid access to hardware and data insights.



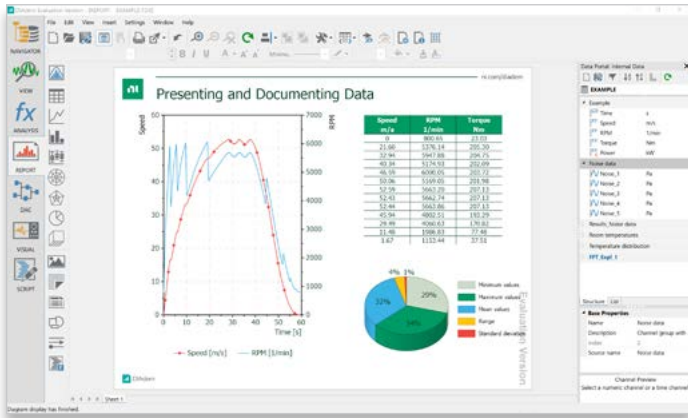
## NI G Web Development Software

A graphical programming environment optimized for developing web applications for test systems.



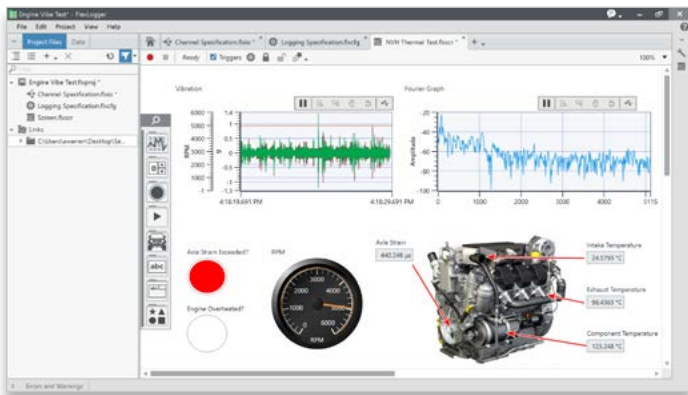
## NI TestStand

Test executive software for developing test sequences for validation and production testers.



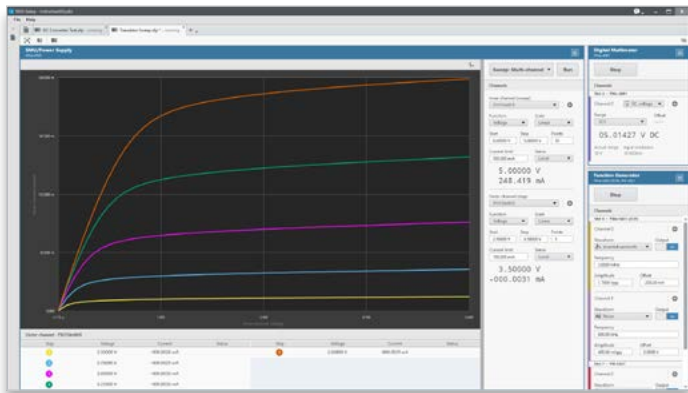
## NI DIAdem

Data analytics software for measurement data search, inspection, analysis, and automated reporting.



## NI FlexLogger Software

No-code software that accelerates measurement configuration and logging with NI DAQ hardware.



## NI InstrumentStudio Software

Software to configure NI PXI instruments and automate and sequence measurements.

# NI DAQ Hardware



DAQ hardware measures electrical signals and sensors with a computer. The measured signals could be high-speed waveforms, similar to what you would capture with a scope, or they could be low-speed temperature readings with no pattern. Engineers and researchers combine data acquisition hardware with software to get data for product validation, manufacturing test, academic or commercial research, and test beds. The software could be off-the-shelf (and thus, vendor-defined), or developed with NI LabVIEW, or languages such as Python or C/C++.

## Why Choose NI DAQ Hardware?

NI DAQ hardware is designed and tested to deliver high-quality data from sensors and electrical signals. Only NI combines quality measurement hardware with a complete selection of test and measurement software so that engineers can dominate their measurement tasks. NI hardware is:

**Software-Defined**—From free logging software to development support using LabVIEW, Python, or C/C++, with NI DAQ hardware, you decide which method is best for obtaining the data you need.

**Quality**—Don't worry about repeating expensive tests or slowing manufacturing. With NI quality inherent in every device, you can have complete confidence in datasheets, calibration cycles, and measurement accuracy.

**Leading DAQ Technology**—Complex designs need high-speed measurements, synchronization, streaming data, and more to ensure product quality while innovating.

**Future-Proof and Flexible**—Support thousands of measurement combinations and incorporate more than 100 PXI instruments to solve your test challenges. NI helps you scale your test to keep up with change and growth.

## What Can You Do with NI DAQ Products?

### Measure

- Voltage input ranges from  $\pm 0.25$  VDC up to 480 VAC
  - 12-bit, 16-bit, 24-bit options
- High-speed transient capture at up to 1 MS/s/ch
- Dynamic voltage (waveform) signals with 24-bit resolution
- Current inputs (0–20 mA, 5 A<sub>RMS</sub> direct or from CT secondaries)
- Temperature (thermocouples and RTDs)
- Load, pressure, and torque sensors
- Strain gages (1/4-, 1/2-, and full-bridge)
- Accelerometers (IEPE)
- Microphones (IEPE)
- Pulse and event counting
- Galvanically isolated measurements
- Digital (TTL, 24 VDC, sinking/sourcing)
- Quadrature encoder
- Resolvers
- Proximity probes
- Tachometers (analog/digital pulse)
- String pots, line pots

### Generate and Control

- Voltage output ( $\pm 10$  V)
- Current output (0–20 mA)
- Digital output (TTL/24 VDC)
- Relay module (250 V<sub>RMS</sub> @ 2 A, 60 VDC @ 1 A)
- External relay (control with digital lines)
- Generate pulse-width modulated signals
- Simulate sensors/signals

# How to Choose NI DAQ Hardware

## Multifunction (All-in-One) Devices



If your measurement needs fit within  $\pm 10$  VDC input,  $\pm 10$  VDC output, and TTL digital, a multifunction I/O device will provide the best measurement performance-to-cost ratio. These all-in-one devices connect to a computer over USB, or are installed in a computer or PXI chassis. Select from several options that vary by number of channels, sample rate, resolution, and how the device connects to your computer (USB, PCI Express, or PXI).

**See the “Multifunction I/O” section on page 20** for more information.

Capabilities include:

- $\pm 10$  V input measurements
- $\pm 10$  V output channels
- TTL digital lines
- Counter/timer circuitry for pulse-width modulation, pulse event counting, quadrature encoder measurements, and other counter/timer functions
- Clock routing to sync with other devices



## NI CompactDAQ



Upgrade to an NI CompactDAQ modular system for:

- More measurement options—select from more than 70 measurement modules that cover different voltage and digital input ranges, a variety of sensors, and options for isolated measurements
- Rugged operating specs for instrumentation that may not always be in an HVAC-controlled lab
- Ethernet connections that can synchronize over the same Ethernet cable for daisy-chained system expansion
- Modularity to mix and match measurements to meet your specific needs or to expand your system in the future

[See NI CompactDAQ Hardware on Page 26](#)

# PXI DAQ Systems

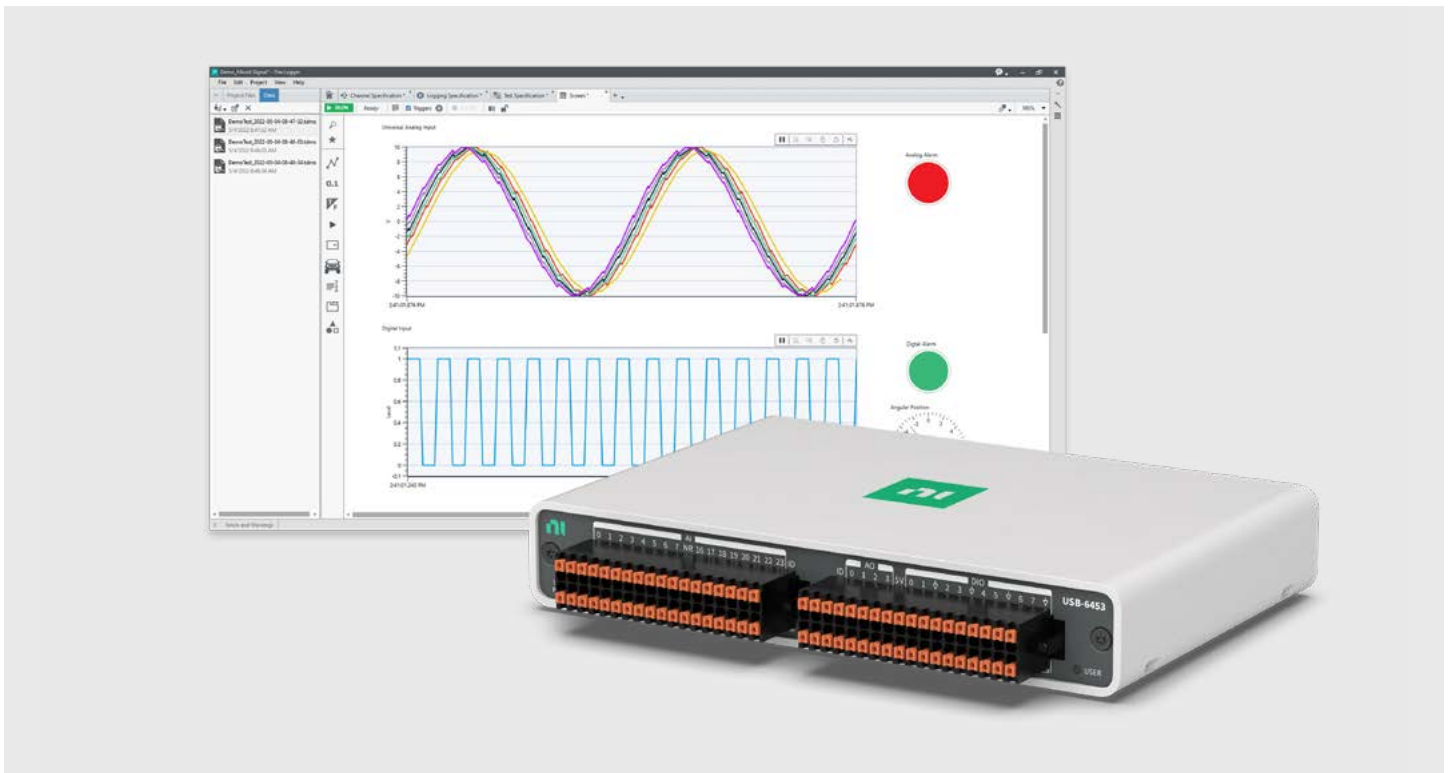


Select data acquisition for PXI if you need:

- A measurement system with instruments such as digital multimeters, scopes, waveform generators, or source-measurement units
- A production test system
- The best possible measurement capabilities in terms of accuracy, synchronization, and data throughput

[See PXI Catalog for PXI DAQ Devices](#)

# NI mioDAQ



mioDAQ is NI's latest USB DAQ device that combines modern measurement technology with a simplified user experience. Use mioDAQ to take  $\pm 10$  V measurements, build electromechanical test systems, and validate complex electronic designs. Pair mioDAQ with your favorite software, including NI's free logging software, or APIs and example programs for NI LabVIEW, Python, and C/C++. See USB-64xx model numbers in the [MIO Devices table on page 22](#).

**Up to 20-bit, 1 MS/s/ch.  $\pm 10$  Volt Inputs**

- Multiplexed or simultaneous
- Multiple gain settings ( $\pm 0.2$  V,  $\pm 1$  V,  $\pm 5$  V,  $\pm 10$  V)

**$\pm 10$  Volt Outputs**  
200 kS/s/ch. update rate

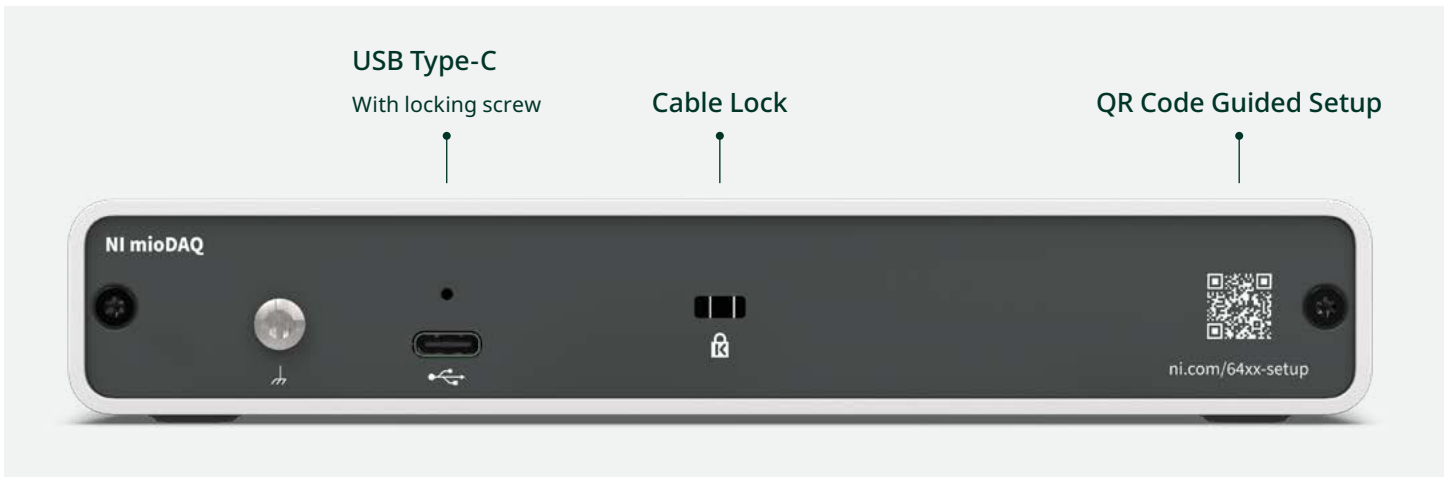
**CJC for Thermocouple Measurements**

**Smart ID Pins**

**+5 V Pin**

**Flexible Digital Lines**

**User LED**



## Industry-Leading Software

NI has decades of experience as an industry leader for test and measurement software. Options for DAQ software include:



Developing custom software with drivers and example programs for:

- LabVIEW
- Python, C/C++, VB.NET, and C#



Logging data with a real-time display using NI FlexLogger™ Lite, free data acquisition software.



Modernizing your lab and standardizing your test frameworks with the NI LabVIEW+ Suite.



Recommended software (sold separately):

 LabVIEW

Additional resources for software development:

C/C++, C#, Python

 LabWindows/CVI

 FlexLogger Lite

# Multifunction I/O

MIO family hardware installs either inside your computer on the motherboard, as with a new graphics card, or as an external device you connect with a USB cable. Use MIO data acquisition to turn your Windows PC or laptop into a measurement system. Desktop systems are common for validation test. They can be deployed to manufacturing lines, though many companies prefer to upgrade to PXI for the reliability and easier integration with test racks. MIO devices are cost-optimized for  $\pm 10$  V inputs/outputs, TTL digital lines, and counter/timer functionality. They are highly versatile and ideal for measuring sensors with a voltage output,  $\pm 10$  V electrical signals, current measurements over a shunt resistor, pulse and event signals from meters, quadrature encoders, simple TTL digital lines, and more. Turn your PC into a custom measurement system by selecting the right device.

MIO devices include a mix of I/O with varying channels, sample rates, output rates, and other features to meet common measurement requirements.

- 16-bit to 20-bit analog input resolution
- Up to 32 analog input channels, four analog output channels, and 48 bidirectional channels
- Up to 1 MS/s/ch analog sample rate

## Key Features:

### Built for Accuracy and Reliability

Analog signal paths have been meticulously designed, tested, and calibrated to ensure the highest possible accuracy is achieved across all input channels.

### Advanced Timing

Technology in onboard timing circuitry controls analog, digital, and counter I/O lines, providing up to four enhanced counters, a 100 MHz timebase, and additional options for I/O timing and triggering.

### System Flexibility

Choose from a variety of channel combinations of analog I/O, digital I/O, and counter/timer functionality in a single device.

Turn your PC into a custom measurement system by selecting the right device.

## Popular MIO Devices

### MIO Devices

Model	Part Number	Analog Input Resolution	Sample Rate	Analog Output Update Rate	Differential-Ended Analog Input	Single-Ended Analog Input	Analog Output	Bidirectional Digital	Counters/Timers	Simultaneous Sampling	
<a href="#">PCIe-6320</a>	781043-01	16 bits	250 kS/s	—	8	16	—	24	4	—	
<a href="#">PCIe-6321</a>	781044-01			900 kS/s			2				
<a href="#">PCIe-6323</a>	781045-01		1.25 MS/s	2.86 MS/s	16	32	4	48			
<a href="#">PCIe-6351</a>	781048-01				8	16	2	24			
<a href="#">PCIe-6363</a>	781051-01		2 MS/s	16	32	4	48				
<a href="#">USB-6000</a>	782602-01		10 kS/s	—	0	8	0	4			1
<a href="#">USB-6001</a>	782604-01		20 kS/s	5 kS/s	4	8	2	13			
<a href="#">USB-6002</a>	782606-01		50 kS/s								
<a href="#">USB-6003</a>	782608-01		100 kS/s	250 kS/s	250 kS/s	8	16	2	16		4
<a href="#">USB-6421 (mioDAQ)</a>	789887-01		250 kS/s			250 kS/s	16	32			
<a href="#">USB-6423 (mioDAQ)</a>	789882-01	8					16	2			
<a href="#">USB-6451 (mioDAQ)</a>	789888-01	20 bits	1 MS/s/ ch <sup>1</sup>	250 kS/s	8	16	2	16	4	✓	
<a href="#">USB-6453 (mioDAQ)</a>	789884-01				16	32	4				

<sup>1</sup> USB-6451/53 sample at 250 kS/s/ch when measuring on more than 8/16 channels, respectively. Visit [ni.com/64xx-setup](http://ni.com/64xx-setup) to see manual for details.

For legacy products (PCI) or other MIO options, contact your NI product expert or authorized reseller. See the following section for required accessories

# MIO Accessories

The accessories are organized by connector type. Choose a connector block to go with the cable (shielded/unshielded).



Example configuration of a PCI Express MIO device with cable and connector block. The PCI Express MIO device would be installed in a desktop computer.

All PCI Express devices listed in this catalog have a VHDCI connector and require separate purchase of a cable and connector block. Legacy devices found on ni.com may use different connectors.

## VHDCI

### MIO Products with VHDCI Connectivity


Model	Part Number
<a href="#">PCIe-6320</a>	781043-01
<a href="#">PCIe-6321</a>	781044-01
<a href="#">PCIe-6323</a>	781045-01
<a href="#">PCIe-6351</a>	781048-01
<a href="#">PCIe-6363</a>	781051-01

Shielded accessories improve measurement quality by reducing cross-talk between channels and electromagnetic interference. NI recommends shielded accessories for the best quality measurement.




## Shielded Accessories

### Shielded MIO Cables

Select a cable to connect your PCI Express DAQ device to one of the shielded MIO connector blocks from the table on [page 24](#).

Description	Length	Part Number	
VHDCI Shielded Cables	0.5 m	192061-0R5	
	1 m	192061-01	
	2 m	192061-02	
	5 m	192061-05	


### Shielded MIO Connector Blocks

Description	Part Number	Selection Criteria	
Shielded Connector Blocks	782536-01	Screw termination connector block	
	777643-01	BNC termination connector block	
	779556-01	Rack-mount connector block with BNC termination	

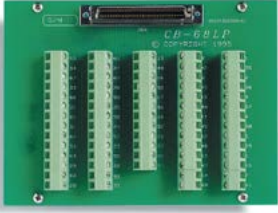
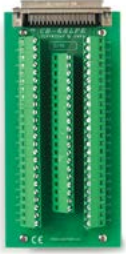


## Unshielded Accessories

### Unshielded MIO Cables

Description	Length	Part Number	
Unshielded Cables	0.25 m	187252-0R25	
	0.5 m	187252-0R5	
	1 m	187252-01	

### Unshielded Connector Blocks

Description	Part Number	Selection Criteria	
Unshielded Connector Blocks	777145-01	Vertically mounted 68-pin connector	
	777145-02	Right-angle-mounted 68-pin connector	




## USB

### mioDAQ Device Part Numbers

All USB MIO DAQ devices in this catalog have direct signal connection by either screw-terminals or spring-terminals. No accessories are required.



Model	Part Number
<b>USB-6421 (mioDAQ)</b>	789887-01
<b>USB-6423 (mioDAQ)</b>	789882-01
<b>USB-6451 (mioDAQ)</b>	789888-01
<b>USB-6453 (mioDAQ)</b>	789884-01

## mioDAQ Mounting Kits

Description	Part Number	Selection Criteria	
mioDAQ Mounting Kits (Not Required)	789986-01	USB-64xx Mounting Kit for DIN Rail	
	789955-01	USB-64xx Mounting Kit for DIN Rail, Wall- or Panel-Mount	
	789953-01	USB-64xx Rack-Mount Shelf, 1 U, 19 in.	


## USB Type-C Cables

NI mioDAQ ships with a USB-C to USB-C with locking screw cable. Purchase a cable below as a spare or replacement.

Description	Part Number	Selection Criteria	
USB-C Cables	789956-02	USB-C to USB-C with top screw lock, 2 m	
	789957-02	USB-C to USB-C right-angle, 2 m	



Recommended software (sold separately):

 LabVIEW

Additional resources for software development:

C/C++, C#, Python

 LabWindows/CVI

 FlexLogger Lite

# CompactDAQ

CompactDAQ is rugged, modular hardware that connects sensors and electrical signals to a PC over Ethernet or USB. The available measurement modules, expandability, and software support make CompactDAQ an ideal “universal test instrument” for teams trying to do more with less. Use CompactDAQ for vibration analysis, motor and bearing tests, thermal tests, power quality measurements, reading industrial digital lines, impact/strain tests, and many more test applications.

- High-speed sensor measurements
- Portable or benchtop validation systems
- Combining sensors and electrical measurements

## Key Features:

### Variety of Electrical and Sensor Measurement Modules

Choose from more than 70 modules with built-in sensor or signal-specific conditioning. Mix and match to build a customized system that meets your measurement needs.

### System Scalability

Expand your system with Ethernet-compatible CompactDAQ chassis to take  $\mu$ s-synchronized measurements across multiple chassis.

### Compact, Rugged Design

Pack it up and take it with you between labs, to field tests, or to a customer site to validate in-situ data with your test equipment.

# How to Build a CompactDAQ System

## 1. Modules

Use the [Measurement Modules \(C Series Modules\) section on page 30](#) to select your modules.



## 2. Chassis

Use the [CompactDAQ Chassis Table on page 36](#) to select your chassis.



# Measurement Modules (C Series Modules)

Install C Series modules in a CompactDAQ or CompactRIO chassis for a custom measurement system that meets your needs. The following table is an overview of all C Series module specifications. See the Module Selection Table for module specifications.

## C Series Module Specification Overview

### Analog Input

Signal Type	Channel Count	Measurement Types	Max. Sample Rate	Special Features
Voltage	Up to 32	Options for $\pm 200$ mV, $\pm 500$ mV, $\pm 1$ V, $\pm 5$ V, $\pm 10$ V, $\pm 60$ V, $3 V_{rms}$ , $400 V_{rms}$ , $800 V_{rms}$ , $300 V_{rms}$	1 MS/s/ch	Up to channel-channel isolation, antialiasing, and configurable filtering
Current	Up to 16	Options for $\pm 20$ 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	Options for $\pm 20$ mA and $\pm 10$ V	500 S/s	Channel-Earth isolation, built-in noise rejection
Universal	Up to 4	V, mA, TC, RTD, Strain, $\Omega$ , IEPE	51.2 kS/s/ch	Up to channel-channel isolation, bridge completion, antialiasing filters, built-in shunt resistors, amplification
Thermocouple	Up to 16	J, K, T, E, N, B, R, and S types	95 S/s/ch	Up to channel-channel isolation, amplification, filtering, CJC
RTD	Up to 8	100 $\Omega$ , 1000 $\Omega$	400 S/s	50/60 Hz filtering, bank isolation
Strain/ Bridge Based	Up to 8	$\frac{1}{4}$ , $\frac{1}{2}$ , full bridge (120 or 350 $\Omega$ )	50 kS/s/ch	External excitation, bridge completion, antialiasing filters
Sound and Vibration	Up to 8	$\pm 5$ V, $\pm 30$ V	102.4 kS/s/ch	IEPE, antialiasing filters

### Analog Output

Signal Type	Channel Count	Measurement Types	Max. Sample Rate	Special Features
Voltage	Up to 16	Options for $3 V_{rms}$ , $\pm 10$ V, $\pm 40$ V (stacked)	1 MS/s/ch	Up to bank-isolation
Current	Up to 8	$\pm 20$ mA	100 kS/s/ch	Channel-Earth isolation, built-in open-loop detection

### Digital I/O

Signal Type	Channel Count	Measurement Types	Max. Sample Rate	Special Features
Input/Output	Up to 32	Options for TTL (3.3 V or 5 V) RS422, 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
Relay Output	Up to 8	Options for 60 V DC, $30 V_{rms}$ , $250 V_{rms}$	1 operation/s	Up to channel-channel isolation, SPST, or SSR relays

### Communication Buses

Signal Type	Channel Count	Measurement Types	Max. Sample Rate	Special Features
CAN	1	HS/FD, LS/FT CAN	1 Mb/s	—
LIN	1	LIN	20 kb/s	—
Serial Interface	4 ports	RS232, RS485/RS422	921.6 kb/s	—

# Module Selection

The following table lists C Series modules by category. Use the individual tables to match your need to a part number. Can't find exactly what you're looking for? There are more than 70 C Series modules; contact your NI Product Expert or authorized reseller for help.

## Module Selection Tables

Module Type	Page
Voltage Input	<a href="#">31</a>
Voltage Output	<a href="#">32</a>
Thermocouple	<a href="#">32</a>
Accelerometer and Microphone	<a href="#">33</a>
Bridge, Strain, Load, Pressure, Torque	<a href="#">33</a>
RTD Temperature	<a href="#">33</a>
Universal Input	<a href="#">33</a>
Current Input	<a href="#">34</a>
Digital Input and Output	<a href="#">35</a>
Power (Current and 120+ VAC)	<a href="#">36</a>

This catalog groups module accessories by connector type. Use the “**Front Connector Type**” column from the module tables to find the matching accessory table in the accessories section starting on [page 37](#).

## Voltage Input Modules

Selection Criteria	Model	Part Number	Front Connector Type	Analog Input Resolution	Max. Sample Rate	Differential Channels	Single-Ended Channels	Analog Input Voltage Range	Simultaneous Sampling
General Purpose	NI-9205	779357-01	D-SUB	16 Bits	250 kS/s	16	32	±10 V, ±5 V, ±1 V, ±200 mV	—
		785184-01	Spring-Terminal						
Faster Rate, High Density	NI-9220	782615-01	D-SUB	16 Bits	100 kS/s/ ch	16	32	±10 V	—
		785188-01	Spring-Terminal						
24-Bit Resolution, 250 V Channel-Channel Isolation	NI-9239	779593-01	Screw-Terminal	24 Bits	50 kS/s/ ch	16	32	±10 V	—
		780181-01	BNC						
60 V Input Range	NI-9229	779785-01	Screw-Terminal	24 Bits	50 kS/s/ ch	16	32	±60 V	—
		780180-01	BNC						
Lowest Cost, Simultaneous Sampling	NI-9215	779011-01	Screw-Terminal	16 bits	100 kS/s/ ch	4	0	±10 V	✓
		779138-01	BNC						
		783739-01	Spring-Terminal						
Highest Speed, Simultaneous Sampling	NI-9223	781398-01	Screw-Terminal	16 bits	1 MS/s/ ch	4	0	±10 V	—
		783284-01	BNC						
Medium Speed, Medium Cost	NI-9222	781397-01	Screw-Terminal	16 bits	500 kS/s/ ch	4	0	±10 V	—
		783283-01	BNC						
Selectable Filter, Noise Rejection	NI-9202	784399-01	D-SUB	24 Bits	10 kS/s/ ch	16	32	±10 V	—
		784400-01	Spring-Terminal						
Digitizer Functionality	NI-9775	784539-01	BNC	14 Bits	20 MS/s/ ch	16	4	±10 V	—
Low Cost, High-Speed, 12-Bit	NI-9201	779013-01	Screw-Terminal	12 Bits	500 kS/s	0	8	±10 V	—
		779372-01	D-SUB						
		783730-01	Spring-Terminal						

## Voltage Output Modules

Selection Criteria	Model	Part Number	Front Connector Type	Analog Output Resolution	Max. Update Rate	Analog Output Channels	Analog Output Voltage Range	Max. Current Drive	Analog Output Isolation
General Purpose	NI-9264	780927-01	D-SUB	16 Bits	25 kS/s/ch	16	±10 V	4 mA	60 VDC Channel-Earth Ground Isolation
		785190-01	Spring-Terminal						250 V <sub>rms</sub> Bank Isolation
Lower Cost, Fewer Channels, Faster	NI-9263	779012-01	Screw-Terminal		100 kS/s/ch	4		1 mA	250 V <sub>rms</sub> Channel-Earth Ground Isolation
		783740-01	Spring-Terminal						250 V <sub>rms</sub> Channel-Earth Ground Isolation
Channel-Channel Isolated Output, 40 V Range	NI-9269	781098-01	Screw-Terminal		10 mA	250 V <sub>rms</sub> Channel-Channel Isolation			

## Thermocouple

### Thermocouple Modules

Selection Criteria	Model	Part Number	Front Connector Type	Channel Count	Input Range	Max. Sample Rate
General Purpose	NI-9213	785185-01	Spring-Terminal	16	±78 mV	75 S/s
More Accuracy (0.37 °C Benchmark)	NI-9214	781510-01	Screw-Terminal			68 S/s
Channel-Channel isolation or TC Minijack Connectors	NI-9212	782975-01	Screw-Terminal	8		95 S/s/ch
		785259-01	Miniature Thermocouple (mini-TC)			



## Accelerometer and Microphone Modules

Selection Criteria	Model	Part Number	Front Connector Type	Channel Count	Input Voltage Range	IEPE Excitation	Max. Sample Rate
General Purpose	<b>NI-9234</b>	779680-01	BNC	4	±5 V	2 mA	51.2 kS/s/ch
2X Faster Sample Rate, 30 V Range	<b>NI-9232</b>	782000-01	Screw-Terminal	3	±30 V	4 mA	102.4 kS/s/ch
		784397-01	BNC				
More Channels per Module	<b>NI-9231</b>	783610-01	10-32 Coaxial	8	±5 V	2 mA	51.2 kS/s/ch
Lower Cost	<b>NI-9230</b>	783824-01	Screw-Terminal	3	±30 V	4 mA	12.8 kS/s/ch
		784396-01	BNC				

## Bridge, Strain, Load, Pressure, and Torque Modules

Selection Criteria	Model	Part Number	Front Connector Type	Channel Count	Analog Input Voltage Range	Bridge Configurations	Max. Sample Rate
General Purpose	<b>NI-9237</b>	779521-01	RJ50	4	±25 mV/V	Quarter-Bridge Half-Bridge Full-Bridge	50 kS/s/ch
		780264-01	D-SUB			Full-Bridge Quarter-Bridge Half-Bridge	
More Than 2X 120 Ω Quarter-Bridge Sensors	<b>NI-9235</b>	785995-01	Spring-Terminal	8	±29.4 mV/V	Quarter-Bridge	10 kS/s/ch

## RTD Temperature Modules

Selection Criteria	Model	Part Number	Front Connector Type	Channel Count	Input Range	Max. Sample Rate
General Purpose	<b>NI-9216</b>	783863-01	D-SUB	8	0-400 mΩ	400 S/s
		785186-01	Spring-Terminal			

## Universal Input Modules

Selection Criteria	Model	Part Number	Front Connection Type	Max. Sample Rate	Channel Count	Analog Input Isolation	Electrical Signal Measured	Supported Sensor Type
General Purpose	<b>NI-9219</b>	785994-01	Spring-Terminal	100 S/s/ch	4	250 V <sub>rms</sub> Channel-Channel Isolation	Voltage, Current, Temperature, Strain (V, mA, TC, RTD, Strain, Ω, IEPE)	Bridge, RTD, Thermocouple

## Current Input Modules

Selection Criteria	Model	Part Number	Front Connector Type	Channel Count	Analog Input Resolution	Input Current	Max. Sample Rate	Analog Input Isolation
General Purpose	NI-9203	779516-01	Screw-Terminal	8	16 Bits		200 kS/s	250 V <sub>rms</sub> Channel-Earth Ground Isolation
		783731-01	Spring-Terminal					
More Channels per Module, 24-Bit, 50/60 Hz Rejection	NI-9208	780968-01	D-SUB	16	24 Bits	±20 mA	500 S/s	60 VDC Channel-Earth Ground Isolation
		785041-01	Spring-Terminal					250 V <sub>rms</sub> Channel-Earth Ground Isolation

## Digital Input and Output Modules

Selection Criteria	Model	Part Number	Front Connector Type	DIO Isolation	DIO Logic Levels	Max. Update Rate	Bidirectional Digital Channels	Digital Input-Only Channels	Digital Input-Only Channels
Industrial DIO	NI-9375	781030-01	D-SUB	60 VDC Channel-Earth Ground Isolation	12 V	7 $\mu$ s	0	16	16
		785192-01	Spring-Terminal	250 V <sub>rms</sub> Channel-Earth Ground Isolation					
High-Channel-Count 24 V DO	NI-9401	779351-01	D-SUB	60 VDC Channel-Earth Ground Isolation	5 V TTL	100 ns	8	0	
High-Channel-Count TTL	NI-9403	779787-01				7 $\mu$ s			
Industrial DI	NI-9421	779002-01	Screw-Terminal	250 V <sub>rms</sub> Channel-Earth Ground Isolation	12 V 24 V	100 $\mu$ s	0	8	0
		779136-01	D-SUB	60 VDC Channel-Earth Ground Isolation					
		783734-01	Spring-Terminal	25 V <sub>rms</sub> Channel-Earth Ground Isolation					
High-Channel-Count 24 V DI	NI-9425	779139-01	D-SUB	60 VDC Channel-Earth Ground Isolation	12 V 24 V	7 $\mu$ s	0	32	
		785044-01	Spring-Terminal	250 V <sub>rms</sub> Channel-Earth Ground Isolation					
Industrial DO	NI-9472	779004-01	Screw-Terminal	250 V <sub>rms</sub> Channel-Earth Ground Isolation	12 V 24 V	100 $\mu$ s	0	8	0
		779137-01	D-SUB	60 VDC Channel-Earth Ground Isolation					
		783907-01	Spring-Terminal	250 V <sub>rms</sub> Channel-Earth Ground Isolation					
High-Channel-Count 24 V DO	NI-9476	779140-01	D-SUB	60 VDC Channel-Earth Ground Isolation	500 $\mu$ s			32	
		785045-01	Spring-Terminal	250 V <sub>rms</sub> Channel-Earth Ground Isolation					

## Power (Current and 120+ VAC) Modules

### Power (Voltage Input) Modules

Selection Criteria	Model	Part Number	Front Connector Type	Analog Input Isolation	Analog Input Resolution	Analog Input Voltage Range	Max. Differential Analog	Max. Single-Ended Analog	Max. Sample Rate	Simultaneous Sampling
240 VAC	<a href="#">NI-9242</a>	783107-01	Screw-Terminal	250 V <sub>rms</sub> Channel-Earth Ground Isolation	24 Bits	400 V <sub>rms</sub>	0	3	50 kS/s/ch	✓
480 VAC	<a href="#">NI-9244</a>	783106-01		400 V <sub>rms</sub> Channel-Earth Ground Isolation						
Channel-Channel ISO Voltage	<a href="#">NI-9225</a>	780159-01		600 V <sub>rms</sub> Channel-Channel Isolation		300 V <sub>rms</sub>	3	0		
Connects to 0.33 V CTs	<a href="#">NI-9238</a>	783311-01		250 V <sub>rms</sub> Channel-Channel Isolation		-500 mV to 500 mV	4			

### Power (Current Input) Modules

Selection Criteria	Model	Part Number	Front Connector Type	Analog Input Isolation	Analog Input Resolution	Measure Current	Max. Differential Analog	Max. Single-Ended Analog	Max. Sample Rate
Connects to 5 A CTs (20 A Range)	<a href="#">NI-9246</a>	783920-01	Ring-Terminal	480 V <sub>rms</sub> Channel-Channel Isolation	24 Bits	0 A <sub>rms</sub> to 20 A <sub>rms</sub>	3	0	50 kS/s/ch
High Accuracy, Low Range	<a href="#">NI-9227</a>	781099-01	Screw-Terminal						

## CompactDAQ Chassis

### CompactDAQ Chassis

Model	Part Number	Connection to PC	Number of Modules Chassis Can Hold	Synchronized Measurements Between Chassis	Built-In Digital Trigger	Operating Temperature
<a href="#">cDAQ-9171</a>	781425-01	USB 2.0	1	—	—	-20 °C to 55 °C
<a href="#">cDAQ-9174</a>	781157-01		4			
<a href="#">cDAQ-9178</a>	781156-01		8			
<a href="#">cDAQ-9179</a>	783597-01	USB 3.0	14	✓	✓	0 °C to 55 °C
<a href="#">cDAQ-9181</a>	781496-01	Ethernet	1		—	
<a href="#">cDAQ-9185</a>	785064-01		4		✓	
<a href="#">cDAQ-9189</a>	785065-01		8	-40 °C to 70 °C		

## CompactDAQ Chassis Power Cords<sup>1</sup>




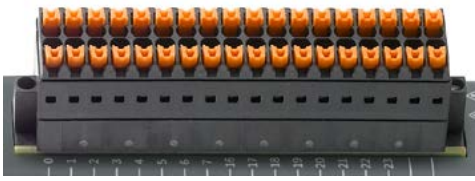

Power Cord	Length (m)	Max. Current (A)	Part Number
United States 120 VAC	2.3	10	763000-01
United Kingdom 240 VAC	2.5		763064-01
Swiss 220 VAC			763065-01
Australia 240 VAC			763066-01
European 240 VAC, Right Angle			763067-01
North America 240 VAC	3		763068-01
Japan 125 VAC	2.3	15	763634-01
India 250 VAC	2.5	10	763072-01
Korea 220 VAC			784685-01
China 220 VAC			784686-01
Brazil 127/220VAC			785626-01

<sup>1</sup> Power cords are required if you're using a desktop power supply. If using an industrial power supply, the CompactDAQ chassis does not need a power cord. Instead, wire it directly to the power supply.

## C Series Module Accessories

Accessories are organized by front connector type.


### Front Connector Types

Module Connector Type	Description	
BNC	BNC connectors have two signal pins and secure the cable to the module with a quarter-turn coupling nut. It is ideal for single-ended measurements. Because the BNC connector has two pins, it doesn't provide a true differential measurement, which requires three pins.	
Screw-Terminal	Screw-terminal connection options require a flat-bladed screwdriver to close a metal gate that clamps down on exposed signal wire.	
10-32 Coaxial	The 10-32 coaxial jack, or "Microdot," uses two pins for the connection with a threaded collar to screw the cable in place. This is a common connector for accelerometers and microphones with space constraints.	
Spring-Terminal	Spring-terminal connections use a spring mechanism inside the connector to clamp down on exposed signal wires. Use a small, flat-bladed precision screwdriver to open the cage clamp. Remove the screwdriver after inserting the exposed signal wire.	
D-SUB	D-SUB connections, named for the D-shaped metal shell, are a mass termination option that uses a pin-and-socket connection.	

The table below provides general descriptions and images of accessories for C Series modules.

## Accessories

Term	Definition	
Backshell	This component surrounds the male or female cable connector to protect the cable connections and provide cable strain relief.	
EMI Suppression Ferrite	This passive electrical component clamps around a cable to reduce electromagnetic interference on the line.	
DIN-Rail-Mount Terminal Block	This mounts a connector block to a DIN rail.	
Front-Mount Terminal Block	This connector block connects to the front of the module.	
Screw-Terminal Block	This type of connector block uses screw terminals as the method for connecting wires to a sensor. (included with module)	

Spring-Terminal Block	This connector block uses spring terminals to connect wires to a sensor. (included with module)	
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## D-SUB Accessories

D-SUB connectors are an industry-standard connector with cables and accessories readily available from a variety of distributors. NI C Series modules use 37-, 25-, and 15-pin versions of the D-SUB connector. All D-SUB module accessories are sold separately. You must purchase accessories to connect to a module.






37-Pin D-SUB Connector on C Series Module NI-9205 (Male Connection)

## C Series Modules with D-SUB Connectivity

25-Pin D-SUB		37-Pin D-SUB	
Model	Part Number	Model	Part Number
<b>NI-9421</b>	779136-01	<b>NI-9425</b>	779139-01
<b>NI-9472</b>	779137-01	<b>NI-9205</b>	779357-01
<b>NI-9401</b>	779351-01	<b>NI-9403</b>	779787-01
<b>NI-9201</b>	779372-01	<b>NI-9264</b>	780927-01
<b>NI-9221</b>	779373-01	<b>NI-9208</b>	780968-01
		<b>NI-9375</b>	781030-01
		<b>NI-9220</b>	782615-01
		<b>NI-9216</b>	783863-01
		<b>NI-9202</b>	784399-01

## 25-Pin D-SUB Accessories

D-SUB modules require purchase of either a front mount terminal block or a cable and terminal block for signal connections.

Description	Part Number	Selection Criteria	
Front-Mount Terminal Block	781922-01	Disconnect multiple wires at once (recommended)	
Cable	192568-01	1 m	
	192568-02	2 m	
Mounting	781081-01	DIN rail-mount terminal block	



### 37-Pin D-SUB Accessories

D-SUB modules require purchase of either a front mount terminal block or a cable and terminal block for signal connections.

Description	Part Number	Selection Criteria	
Front-Mount Terminal Block	781503-01	Disconnect multiple wires at once (recommended)	
	778621-01	1 m	
	778621-02	2 m	
Cable	782316-04	Shielded, low-profile D-SUB-to-pigtail, 4 m	
	778620-04	D-SUB-to-pigtail, 12 ft.	
	154302-01	Low-profile, 1 m	

## 37-Pin D-SUB Accessories (continued)

Description	Part Number	Selection Criteria	
Mounting	778673-01	Screw-terminal block with horizontal DIN rail mount	
	778676-01	Spring-terminal block with horizontal DIN rail mount	

## Screw-Terminal Accessories

### C Series Modules with Screw-Terminal Connectivity



Modules with screw-terminal connectivity ship with everything needed to connect a signal wire. Purchase terminals as spares or replacements. Purchase the back shell as an optional accessory for strain relief.

Two-Position	
Model	Part Number
<b>NI-9239</b>	779593-01
<b>NI-9229</b>	779785-01
<b>NI-9225</b>	780159-01
<b>NI-9269</b>	781098-01
<b>NI-9227</b>	781099-01
<b>NI-9222</b>	781397-01
<b>NI-9223</b>	781398-01
<b>NI-9232</b>	782000-01
<b>NI-9238</b>	783311-01
<b>NI-9230</b>	783824-01


Four-Position	
Model	Part Number
<b>NI-9244</b>	783106-01
<b>NI-9242</b>	783107-01

10-Position	
Model	Part Number
<b>NI-9421</b>	779002-01
<b>NI-9472</b>	779004-01
<b>NI-9215</b>	779011-01
<b>NI-9263</b>	779012-01
<b>NI-9201</b>	779013-01
<b>NI-9203</b>	779516-01



## Two-Position Screw-Terminal Accessories

Part Number	Selection Criteria	
196375-01	Backshell for strain relief (Quantity 4)	
196739-01	Extra connectors (Quantity 10)	

## Accessories for the NI 9242/44 High-Voltage Modules

Part Number	Selection Criteria	
783094-01	Backshell ships with the NI-9242, purchase as spare or replacement (included in shipping kit)	
783154-01	Backshell ships with the NI-9244, purchase as spare or replacement (included in shipping kit)	

## 10-Position Screw-Terminal Accessories

Part Number	Selection Criteria	
782715-01	Backshell for strain relief (Quantity 1)	
779105-01	Extra connectors (Quantity 10)	

## Spring-Terminal Accessories

### C Series Modules with Spring-Terminal Connectivity

Modules with screw-terminal connectivity ship with everything needed to connect a signal wire. Purchase terminals as spares or replacements. Purchase the back shell as an optional accessory for strain relief.

Six-Position	
Model	Part Number
<b>NI-9219</b>	785994-01

10-Position	
Model	Part Number
<b>NI-9201</b>	783730-01
<b>NI-9203</b>	783731-01
<b>NI-9421</b>	783734-01
<b>NI-9215</b>	783739-01
<b>NI-9263</b>	783740-01
<b>NI-9482</b>	783906-01
<b>NI-9472</b>	783907-01

24-Position	
Model	Part Number
<b>NI-9235</b>	785995-01

36-Position	
Model	Part Number
<b>NI-9202</b>	784400-01
<b>NI-9208</b>	785041-01
<b>NI-9425</b>	785044-01
<b>NI-9476</b>	785045-01
<b>NI-9205</b>	785184-01
<b>NI-9213</b>	785185-01
<b>NI-9216</b>	785186-01
<b>NI-9220</b>	785188-01
<b>NI-9264</b>	785190-01
<b>NI-9375</b>	785192-01

## Six-Position Spring-Terminal Accessories

(NI-9219 Universal Module only)



Part Number	Selection Criteria	
786162-01	Backshell for strain relief (Quantity 4)	
785993-01	Extra connectors (Quantity 4)	

## 10-Position Spring-Terminal Accessories



Part Number	Selection Criteria	
783787-01	Backshell for strain relief and operator protection (Quantity 1)	
197991-01	Extra connectors (Quantity 10)	

## Recommended 24-Position Spring-Terminal Accessories with Mini-TC

(NI-9235 strain gage module only)

Part Number	Selection Criteria	
786217-01	Backshell for strain relief (recommended)	
785992-01	Extra connectors (Quantity 1)	

## 36-Position Spring-Terminal Accessories


Part Number	Selection Criteria	
785080-01	Backshell for strain relief (Quantity 1)	
785502-01	Extra connectors (Quantity 1)	

## BNC Accessories

### C Series Modules with BNC Connectivity

Model	Part Number
<b>NI-9234</b>	779680-01
<b>NI-9229</b>	780180-01
<b>NI-9239</b>	780181-01
<b>NI-9222</b>	783283-01
<b>NI-9223</b>	783284-01
<b>NI-9215</b>	779138-01
<b>NI-9230</b>	784396-01
<b>NI-9232</b>	784397-01
<b>NI-9775</b>	784539-01

## BNC Accessories

Part Number	Selection Criteria	
159103-02	50 Ω BNC-BNC Cable, 2 m	
779697-02	75 Ω BNC-BNC Cable, 2 m	
782802-01	Ferrite For EMI Suppression <sup>1</sup>	



<sup>1</sup> This accessory is required for the NI-9230/9232.

## Specialty Connector Accessories—Mini-TC, DIN, Ring, RJ50


### C Series Modules with Specialty Connectors

Mini-TC	Part Number	DIN	Part Number	RJ50	Part Number	Ring	Part Number
<b>NI-9212</b>	785259-01	<b>NI-9214</b>	781510-01	<b>NI-9237</b>	779521-01	<b>NI-9246</b>	783920-01

## Accessories for NI-9212 Thermocouple Module

Part Number	Selection Criteria	
784486-01	Extra mini-TC front-mount terminal block for NI-9212	
783643-01	Extra screw-terminal front mount terminal block for NI-9212	

## Accessories for NI-9214 Thermocouple Module with Screw Terminals

Part Number	Selection Criteria	
781511-01	Purchase terminal block for NI-9214 as spare/ replacement	




## RJ50 Accessories

Note: The RJ50 connector is NOT compatible with standard Ethernet cables.

Part Number	Selection Criteria	
196809-01	RJ50 (female)-to screw-terminal adaptor (Quantity 4)	
194738-01	120 Ω quarter-bridge completion terminal block (Quantity 4)	
194739-01	350 Ω quarter-bridge completion terminal block (Quantity 4)	
194611-01	Connector and terminal kit for four-position micro-fit plug than you can use with the NI-9237	
194612-02	RJ50 cable, 2 m (Quantity 4)	
194612-10	RJ50 cable, 10 m (Quantity 1)	

## Accessories for the NI-9246/47 Current Transformer Modules

Part Number	Selection Criteria	
784300-01	Backshell for strain relief and operator protection for NI-9246/9247 (qty 1). Included in shipping kit. Purchase as replacement.	

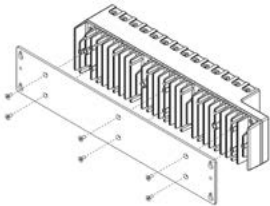
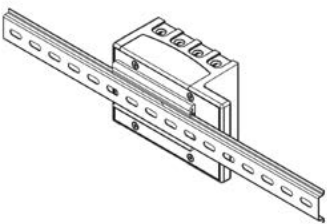
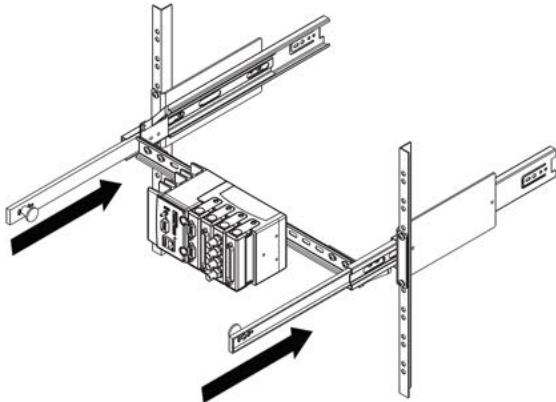
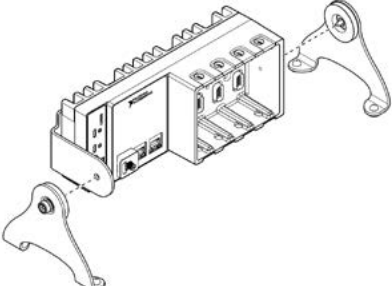
<sup>1</sup> Power cords are required if you're using a desktop power supply. If using an industrial power supply, the CompactDAQ chassis does not need a power cord. Instead, wire it directly to the power supply.

# CompactDAQ Chassis Accessories

Mechanical mounting and fixturing is a critical element of a design validation test system. Use the following tables to select a mounting kit as you work through the physical design of your system.

## Mounting Kits

### Types of Mounting Kits

Type	Selection Criteria and Considerations	
Panel	<p>Use to mount CompactDAQ chassis on flat surfaces</p> <p>Recommended for high shock and vibration applications</p>	
DIN Rail	<p>Mount CompactDAQ chassis and controllers to any standard 35 mm DIN rail</p> <p>Industrial power supplies have DIN mounting options</p> <p>Don't ship systems on DIN rail without considering shock impacts of traditional shipping methods</p>	
Rack-Mount	<p>Use to mount a CompactDAQ chassis on a standard 19-inch rack</p> <p>I/O cables for CompactDAQ systems all come out the same direction</p> <p>Consider space for terminal blocks, power supplies, and cable management</p>	
Desktop	<p>Use for easier access to I/O terminals when working on a desk or benchtop</p>	

## Mounting Kits for CompactDAQ Chassis

Type	Part Number	Selection Criteria
Panel	781722-01	Horizontal Panel Mounting Kit for 9181/91 Chassis
	779097-01	Horizontal Panel Mounting Kit for 4-slot Chassis
	779558-01	Horizontal Panel Mounting Kit for 8-slot Chassis
	784303-01	Horizontal Panel Mounting Kit for 14-slot Chassis
DIN Rail	779019-01	For 4-Slot cRIO-910x/911x/906x/907x and cDAQ-917x/918x
	781740-01	For NI 9181/9191 Chassis
	779018-01	For 8-Slot cRIO-910x/911x/906x/907x and cDAQ-917x/918x
	157254-01	For 4-Slot cRIO-903x/904x/905x and cDAQ-9132/34/36
Rack	786411-01	Industrial Rack-Mount Kit for CompactRIO and CompactDAQ
Desktop	779473-01	For Any CompactDAQ Chassis

## Power Supplies

CompactDAQ chassis must be purchased with a 9–30 VDC output power supply (refer to page [37](#)). This section contains alternate power supplies.

### Power Supplies for CompactDAQ Chassis

Type	Part Number	Selection Criteria
Industrial	783167-01	24 VDC, 3.3 A, 100-240 VAC/110-300 VDC Input
	781094-01	24 VDC, 10 A, 100-120/200-240 VAC Input
Desktop	782698-01	24 VDC, 5 A, 100-240 VAC Input

# Reconfigurable I/O Systems



Select a reconfigurable I/O (RIO) system if you are controlling lasers or galvo mirrors; want to offload processing for real-time data analysis; or are running HIL simulations, developing custom digital protocols, prototyping control systems, or other input/output applications where timing is critical. These systems are more advanced. There are two types of reconfigurable devices—RIO and CompactRIO (cRIO).



Recommended software (sold separately):

 LabVIEW

Additional resources for software development:

C/C++, Python

 LabWindows/CVI

## Reconfigurable I/O Devices—PCI Express, USB

Reconfigurable I/O devices have an onboard coprocessor (FPGA) that's directly connected to the measurement pins. Unlike a multifunction I/O board on which the data takes time to move through the PCI Express bus or USB to the processor, RIO boards connect data from the measurement pins directly to the FPGA running your code. This direct connection takes less time and is great for low-latency applications where timing is critical. Purchase the LabVIEW FPGA Module, a LabVIEW add-on, to develop code for RIO devices.

- 8 analog input channels, 8 analog output channels, and up to 128 bidirectional channels
- 16-bit analog input resolution, up to 1 MS/s/ch sampling rate
- 16-bit analog output resolution, up to 1 MS/s/ch update rate

### Key Features:

#### Flexible Functionality

Match requirements and mimic the functionality of fixed I/O devices with software in timing and triggering applications, such as control and hardware-in-the-loop (HIL) simulations.

#### Embed Logic and Processing

Implement LabVIEW logic and processing in the FPGA including basics such as Boolean operations, comparisons, and basic mathematical operations or complex algorithms such as control loops.

#### Define I/O Resources

Create custom measurements using the fixed I/O resources.

## RIO Devices

Model	Part Number	LabVIEW Programmable FPGA	Analog Input Channels	Analog Input Sample Rate	Analog Input Ranges	Analog Output Channels	Analog Output Update Rate	Bidirectional Digital Channels	Digital I/O Logic Levels	Maximum Digital I/O Rate
<b>PCIe-7820</b>	785361-01	Kintex-7 160T			—			128	1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V	80 MHz
<b>PCIe-7841</b>	781100-01	Virtex-5 LX30	8	200 kS/s/ ch	±10 V ±10 V	8	1 MS/s/ ch	96	3.3 V, 5 V	40 MHz
<b>PCIe-7842</b>	781101-01	Virtex-5 LX50								
<b>PCIe-7846</b>	786456-01	Kintex-7 160T						48	1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V	80 MHz
<b>PCIe-7852</b>	781103-01	Virtex-5 LX50						96	3.3 V, 5 V	40 MHz
<b>USB-7845</b> <sup>1</sup>	783200-01	Kintex-7 70T						500 kS/s/ ch	±10 V, ±5 V, ±2 V, ±1 V	80 MHz
<b>USB-7856</b> <sup>1</sup>	782916-01	Kintex-7 160T						1 MS/s/ ch	±10 V, ±5 V, ±2 V, ±1 V	

<sup>1</sup> Requires power cord.

## Required Power Cords for USB RIO Devices

Power Cord	Length (m)	Max. Current (A)	Part Number
United States 120 VAC	2.3	10	763000-01
United Kingdom 240 VAC			763064-01
Swiss 220 VAC	2.5		763065-01
Australia 240 VAC			763066-01
European 240 VAC, Right Angle			763067-01
North America 240 VAC	3		763068-01
Japan 125 VAC	2.3	15	763634-01
India 250 VAC	2.5	10	763072-01
Korea 220 VAC			784685-01
China 220 VAC			784686-01
Brazil 127/220VAC			785626-01

Shielded accessories improve measurement quality by reducing cross-talk between channels and electromagnetic interference. NI recommends shielded accessories for the best quality measurement. The RMIO cable is specifically shielded for the analog I/O connector and the RDIO cable is for a digital I/O connector.

## Reconfigurable I/O Shielded Accessories

### Shielded RIO Cables<sup>1</sup>


Description	Length	Part Number	
RMIO Shielded Cables	0.5 M	189588-0R5	
	1 M	189588-01	
	2 M	189588-02	
RDIO Shielded Cables	0.5 M	191667-0R5	
	1 M	191667-01	
RDIO2 High-Speed 80 MHz Shielded Cables	1 M	156166-01	
	2 M	156166-02	

<sup>1</sup> See the table below for compatibility by model.

### RIO Cable Compatibility Guide

Model	RMIO	RDIO	RDIO (High-Speed, 80 MHz)
PCIe-7820	—	—	✓
PCIe-7841	✓	✓	—
PCIe-7842	✓	✓	—
PCIe-7846	✓	—	✓
PCIe-7852	✓	✓	—
USB-7845	✓	—	✓
USB-7856	✓	—	✓

## Shielded RIO Connector Blocks<sup>1</sup>

Description	Part Number	Selection Criteria	
Shielded Connector Block	782536-01	MIO screw termination connector block	
	782914-01	High-speed DIO screw termination connector block	

<sup>1</sup> See the table below for connector block compatibility by model.

## RIO Connector Block Compatibility

Model	MIO Screw Termination Connector Block	High-Speed DIO Screw Termination Connector Block
PCIe-7820	—	✓
PCIe-7841	✓	—
PCIe-7842	✓	—
PCIe-7846	✓	✓
PCIe-7852	✓	—
USB-7845	✓	✓
USB-7856	✓	✓





Recommended software (sold separately):

 LabVIEW

 LabVIEW FPGA

Additional resources for software development:

C/C++, C#, Python

 LabWindows/CVI

## CompactRIO

CompactRIO is a rugged, modular data acquisition and control system that includes a built-in computer and programmable FPGA. The FPGA connects to the measurement modules for a shorter data processing path and better control over I/O timing. CompactRIO is great for rapid control prototyping, high-speed data logging applications in rugged environments, and advanced control where a PLC doesn't have the required performance capability.

- Rugged monitoring and control applications
- High-speed signal and sensor data-logging
- Rapid control prototyping

### Key Features:

#### Program with LabVIEW

Use one software environment—LabVIEW—to build and deploy time-critical applications. Program both the processor and user-programmable FPGA without having to program in HDL/VHDL.

#### Combined Control and Instrumentation-Grade Measurements

Integrate high-speed waveform measurements for voltage, vibration, strain, and more with analog and digital control signals for a fully custom test and control system.

#### Linux Real-Time Operating System

Harness the openness and reliability of the NI Linux Real-Time OS through thousands of open-source applications, IP, and examples, while collaborating with an active community of users and developers.

#### Rugged Specifications

Deploy in harsh environments with confidence. CompactRIO operates in temperatures from -40 °C to 70 °C and withstands shocks/vibration of 50 g/5 g.

# How to Build a CompactRIO System

## 1. Modules

Use the [Measurement Modules \(C Series Modules\) section on page 30](#) to select your modules.



## 2. Controller

Choose your controller from the [CompactRIO Controller Selection Table on page 59](#).



## CompactRIO Controllers

Model	Part Number	Slots	Programmable with LabVIEW and NI-DAQmx Driver (Easier)	Programmable with LabVIEW FPGA (Advanced)	Processor	FPGA Coprocessor	TSN-Enabled (Synchronization, Deterministic Communication)
<b>cRIO-9030</b>	783450-01	4	—		1.33 GHz Dual-Core Intel Atom	Good	—
<b>cRIO-9035</b>	783848-01	8					✓
	784774-01						
<b>cRIO-9038</b>	783850-01	8			—	1.91 GHz Quad-Core Intel Atom	Better
<b>cRIO-9039</b>	783851-01		Best				
	784775-01						
<b>cRIO-9040</b>	785624-01	4	✓	✓	1.30 GHz Dual-Core Intel Atom	Good	✓
<b>cRIO-9045</b>	785623-01	8					
<b>cRIO-9047</b>	785621-01				1.60 GHz Quad-Core Intel Atom	Best	
<b>cRIO-9049</b>	785618-01						
<b>cRIO-9053</b>	786424-01	4			1.33 GHz Dual-Core Intel Atom	Good	
<b>cRIO-9056</b>	786426-01	8					

## Power Cords for CompactRIO Controllers (Required)<sup>1</sup>

Power Cord	Length (m)	Max. Current (A)	Part Number
United States 120 VAC	2.3	10	763000-01
United Kingdom 240 VAC	2.5		763064-01
Swiss 220 VAC			763065-01
Australia 240 VAC			763066-01
European 240 VAC, Right Angle			763067-01
North America 240 VAC	3		763068-01
Japan 125 VAC	2.3	15	763634-01
India 250 VAC	2.5	10	763072-01
Korea 220 VAC			784685-01
China 220 VAC			784686-01
Brazil 127/220VAC			785626-01

<sup>1</sup> Power cords are required with a desktop power supply. If using an industrial power supply, the CompactRIO controllers do not need a power cord. Instead, wire them directly to the power supply.

# NI Partner Network

The NI Partner Program offers domain, application, and overall test development expertise to help your team get ahead and stay ahead:

- Innovate faster with proven scalable solutions
- Reduce development time and cost through integration and consulting assistance

## Types of Partners



### Solution Partners

- Experts in delivering products and solutions to solve your specific automated test or automated measurement application challenges.



### System Integrators

- Specialists in integrating and deploying test and measurement systems, based on your specific requirements and their mature industry capabilities.



### Consultants

- Experts in project services in areas such as software development, engineering, science, analytics, regulatory compliance, or other specialized skills to support complex systems.



### Distributors

- Globally and regionally accessible, authorized distributors with local knowledge and an understanding of the available NI product portfolio, providing a one-stop option for configuring and sourcing your project needs.

Connect with our global community of trusted NI Partners ready to give your business a competitive edge. Find a partner or solution at [ni.com/findapartner](https://ni.com/findapartner).





# Services

NI offers a variety of services to ensure you can be successful throughout the lifecycle of your application. With global solution centers, NI engineers in more than 40 countries, and a vast network of more than 900 NI Partners, NI service programs help you mitigate risks, develop faster, and reduce costs to achieve your goals.

## Hardware Services

From the moment you unbox your hardware to deployment and maintenance, NI hardware services help you get started quickly and operate efficiently throughout the lifecycle of your test system.

Entitlement	Hardware Warranty	Standard	Premium	Description
Duration at Point of Sale	1 Year; Included	3 Years; Optional	3 Years; Optional	NI enhances warranty coverage with additional service benefits provided with a hardware service program.
Maximum Duration with Renewal	≤5 Years with Service Program	≤5 Years	≤5 Years	NI maintains high performance and availability of your hardware for up to 5 years with a hardware service program. For coverage beyond 5 years, NI provides lifecycle service options.
Extended Repair Coverage (3 or 5 years)	✓	✓	✓	NI restores your device's functionality and includes firmware updates and factory calibration.
System Configuration, Assembly, and Test	—	✓	✓	NI technicians assemble, install software on, and test your system per your custom configuration prior to shipment.
Advanced Replacement	—	—	✓	NI stocks replacement hardware that can be shipped immediately if a repair is needed.
System RMA	—	—	✓	NI accepts the delivery of fully assembled systems when performing repair services.
Technical Support	✓	✓	✓	NI provides access to support resources for your hardware.
Calibration Plan (Optional)	—	Standard	Expedited	NI performs the requested level of calibration at a specified calibration interval for the duration of the service program.

## Education Services

Education Services incorporate courses and certification programs from NI to help you proficiently develop applications, work with NI hardware, and more. You can apply your knowledge to reduce development time and increase productivity.



### Customer Education Courses

Attending on-location or in virtual classrooms and labs, gain knowledge on everything from fundamentals to advanced specifics and become familiar with NI hardware and software.



### Training Entitlements

You can gain unique and unlimited access to all NI training courses and certification programs using credits or a training membership.



### Certification Program

With certifications from associate developer to architect for LabVIEW and NI TestStand software, you can join the ranks of the thousands of engineers with NI professional certifications.

NI provides flexible options for purchasing training and certification. Whether you want to make an upfront investment or pay as you go, NI has offerings to meet a variety of budgetary needs.

#### Save money with a training membership

A training membership is a cost-effective way to take multiple instructor-led training courses. This program provides one year of unlimited access to instructor-led training and certification.

#### Buy credits now, schedule later

Purchase Education Services Credits now and redeem later for any training or certification offering. Education Services Credits expire after one year.

#### Secure a seat in a public course

View NI's global training calendar and secure a seat in an upcoming virtual or classroom instructor-led course.

#### Take advantage of on-demand learning

NI software licenses include one-year access to introductory on-demand learning content so you can onboard quickly. Additional on-demand courses are available for purchase.

#### Organize a private training event

NI offers private training events for teams of up to 12 students. Private training events can leverage standard NI training courses and include custom materials tailored to your needs.

## Technical Support Services

With the knowledge, experience, and responsiveness of NI applications engineers in more than 30 languages and 40 countries, NI has the technical support resources to ensure your success.

### Access Your NI Standard Technical Support:

#### Included with Software

- Technical support included with your software subscription license

#### Included with NI Hardware Warranty

- One year of standard technical support is included with all NI hardware through your hardware warranty

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NI  
11500 N Mopac Expwy  
Austin, TX 78759-3504

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