PRODUCT FLYER

Digital Multimeters

CONTENTS

PXI Digital Multimeters

PXI-4065, PXIe-4080, PXIe-4081, and PXIe-4082

- **Software:** Includes interactive soft front panel, API support for LabVIEW and text-based languages, shipping examples, and detailed help files

- Voltage measurements up to 1,000 VDC (700 VAC)

- Current measurements up to 3 A

- Resistance measurements up to 5 GΩ

- Up to ±500 VDC/V$_{RMS}$ common-mode isolation

- Up to 1.8 MS/s isolated, 1,000 V waveform acquisition

Built for Automated Test and Measurement

PXI Digital Multimeters (DMMs) range from low-cost 6½-digit devices to high-performance 7½-digit models, including the most accurate 7½-digit DMM on the market, the PXIe-4081. Some models include specialized features such as extended measurement ranges, an isolated digitizer mode with sample rates up to 1.8 MS/s, extended calibration cycles, and basic inductance and capacitance measurements. Combined in a single instrument, these features provide a solution to the measurement challenges inherent in traditional precision instruments: limited measurement throughput and flexibility. These DMMs deliver a smarter way to tackle difficult applications in industries ranging from consumer electronics to aerospace and defense.
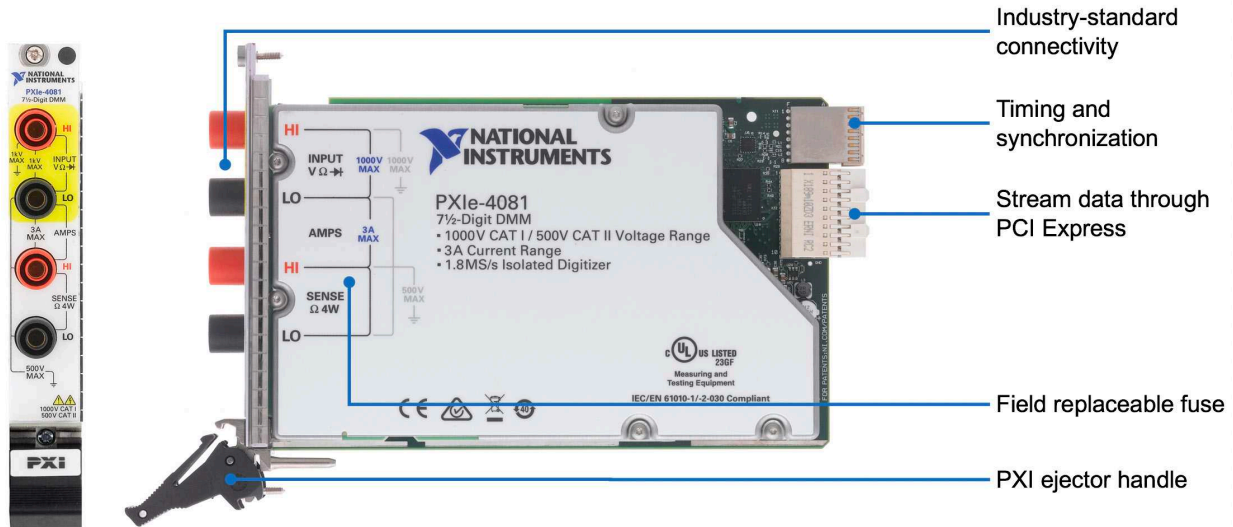
NI's DMM portfolio is highlighted by the PXIe-4081, the industry's most accurate 7½-digit DMM. The PXIe-4081 provides 26 bits of resolution and high-stability, metrology-class voltage measurements that range from 10 nV to 1,000 V, current measurements that range from 1 pA to 3 A, and resistance measurements that range from 10 μΩ to 5 GΩ.

Table 1. NI offers DMMs ranging from low-cost 6½-digit options to the most accurate 7½-digit DMM on the market.

	PXI-4065	PXIe-4080	PXIe-4081	PXIe-4082
Description	Basic 6½-digit DMM	High-Performance 6½-digit DMM	High-Performance 7½-digit DMM	High-Performance 6½-digit DMM
Maximum Voltage (V)	300	300	1,000	300
Maximum Current (A)	3	1	3	1
Maximum Sample Rate	3 kS/s	1.8 MS/s	1.8 MS/s	1.8 MS/s
Basic Accuracy (10 VDC, 2-year)	90 ppm[1]	25 ppm	12 ppm	25 ppm
Maximum Calibration Cycle	1-year	2-year	2-year	2-year
DC and AC Voltage	●	●	●	●
DC and AC Current	●	●	●	●
2-Wire and 4-Wire Resistance	●	●	●	●
Frequency/Period	-	●	●	●
Basic Inductance/Capacitance	-	-	-	●

[1]One-year calibration specifications are shown for the PXI-4065, because it doesn't include a 2-year calibration option.

Detailed View of PXIe-4081 7½ Digit DMM

Industry-standard connectivity

Timing and synchronization

Stream data through PCI Express

Field replaceable fuse

PXI ejector handle

Key Features

High-Precision Measurements

The analog-to-digital converter (ADC) is the backbone of high-performance PXIe-408x DMMs. A unique combination of off-the-shelf high-speed ADC technology and a custom-designed sigma-delta converter provides the noise, linearity, and speed performance required to achieve high-speed and high-precision measurements.
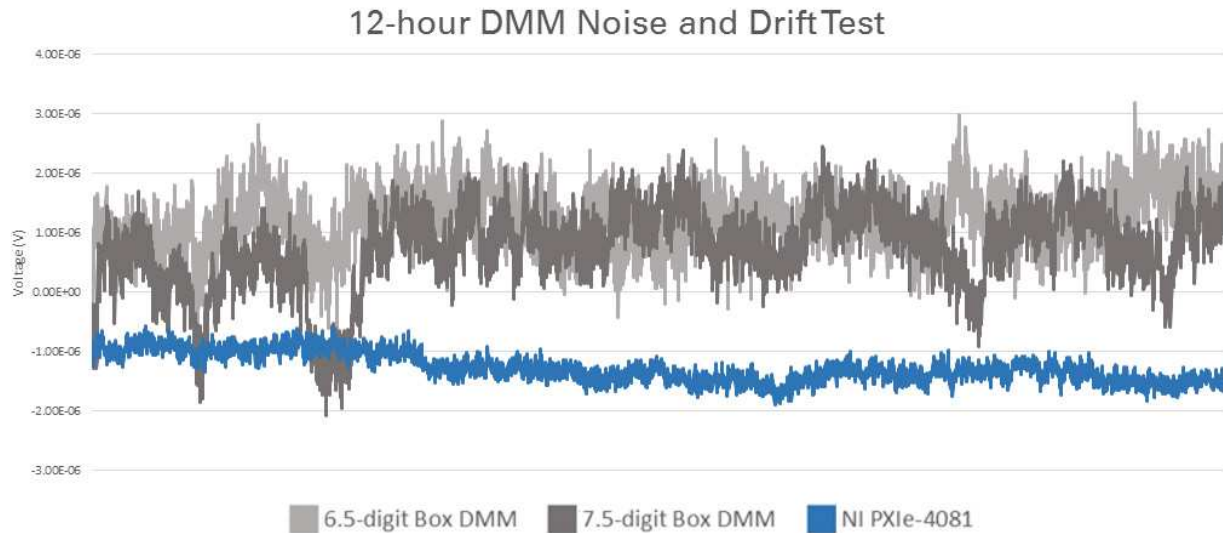

Figure 1. Over a 12-hour noise and drift test of 0 VDC with each DMM set to 100 mV input range with 10 PLC aperture time, the PXIe-4081(blue) outperforms both the leading 6½-digit (light grey) and 7½-digit (dark grey) benchtop DMMs.

The PXIe-4081 uses one of the most stable onboard voltage references available to provide stable performance across temperature and time. No other DMM in this price range offers this reference source and its accompanying stability, which is why the PXIe-4081 includes a two-year guaranteed accuracy of 12 ppm to further reduce the cost of test by minimizing downtime for instrument calibration. This beats the one-year accuracy specifications of most traditional benchtop DMMs, providing you more accurate measurements with lower cost of ownership and less downtime. The PXIe-4081 also uses advanced DMM measurement techniques such as offset compensated ohms, high-order DC noise rejection, and self-calibration to ensure accurate measurements.

Flexible Measurement Rate with an Isolated Digitizer

Traditional DMMs are designed to provide high resolution and precision, with little regard to acquisition speed. The unique architecture of the PXIe-408x DMMs offers a continuously variable reading rate that ranges from 7 S/s to 10 kS/s, so you can choose the sample rate and resolution you need for your application.
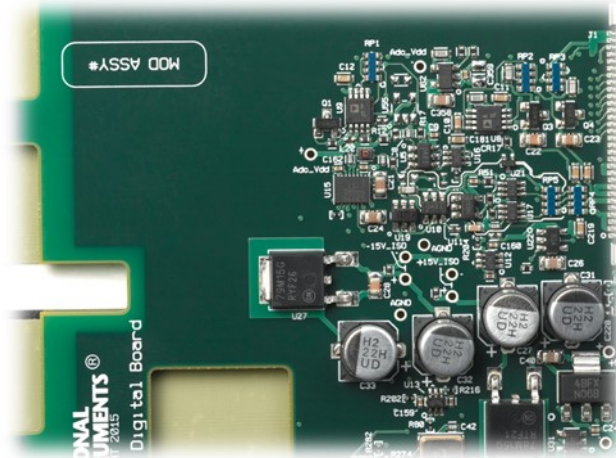

Figure 2. The unique combination of off-the-shelf high-speed ADC technology and a custom-designed sigma-delta converter optimizes linearity and noise for up to 7½-digit precision and stability, while offering digitizer sample rates up to 1.8 MS/s.

When you require higher sample rates, you can use PXIe-408x DMMs in the high-voltage, isolated digitizer mode to achieve sample rates of up to 1.8 MS/s while acquiring at the maximum voltage range. Compared with traditional benchtop DMMs, which sample at a maximum rate of 50 kS/s, The PXIe-4081 DMM can sample 36 times faster. This can reduce the need for separate instruments to make high-precision and high-speed measurements.
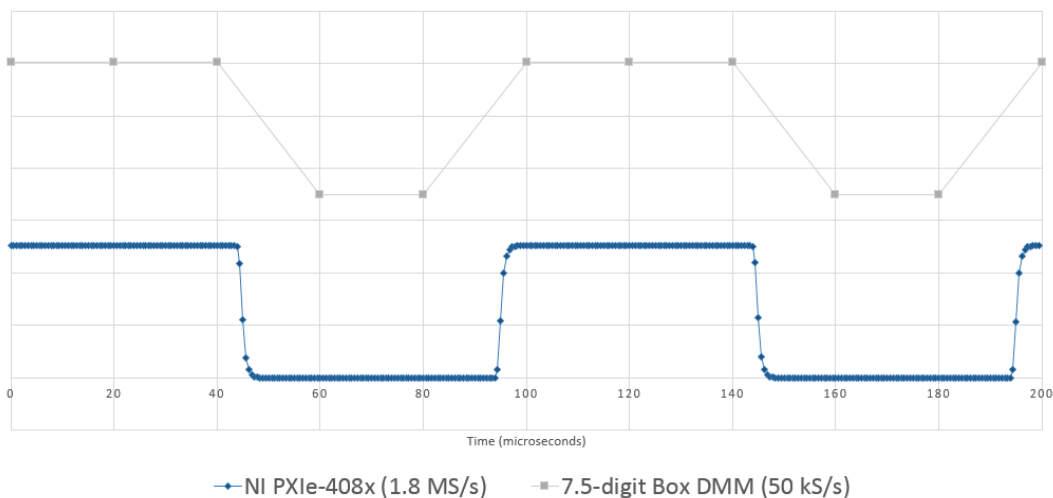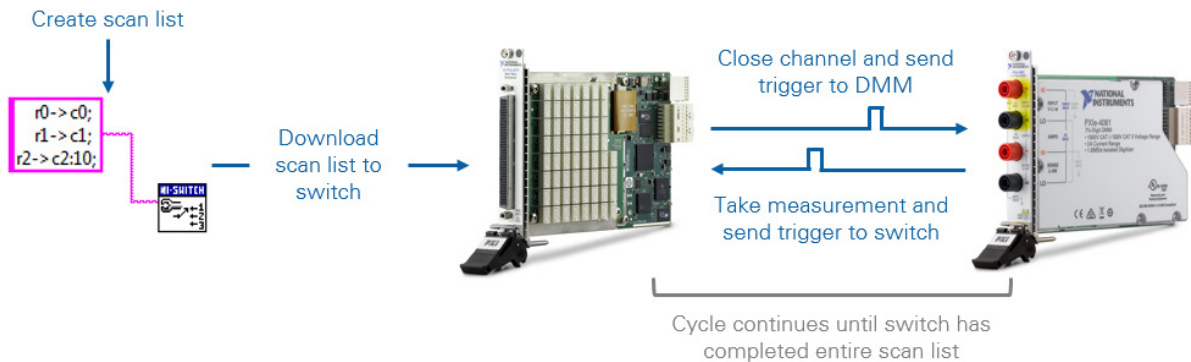

Figure 3. PXIe-408x DMMs can acquire 36X faster than traditional benchtop DMMs, which gives you increased insight into your device under test.
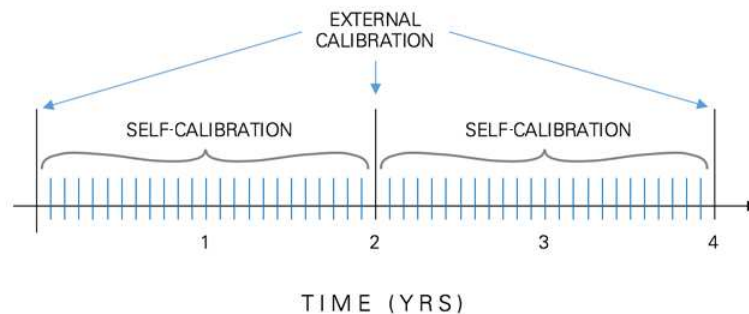
Synchronization and Integration

NI DMMs use the inherent timing and synchronization capabilities of the PXI platform to communicate with switches and other instruments within the PXI chassis. You can use switches with a DMM to expand the instrument's measurement capability to hundreds or thousands of test points. NI DMMs "handshake" with NI switches by sending and receiving hardware-timed triggers over the PXI backplane, scanning through a list of switch connections stored in memory onboard the switch module. This method of scanning removes the software overhead associated with traditional scan lists and can create a deterministic scan list for faster test execution with more repeatable timing.

Self-Calibration and Two-Year Guaranteed Specifications
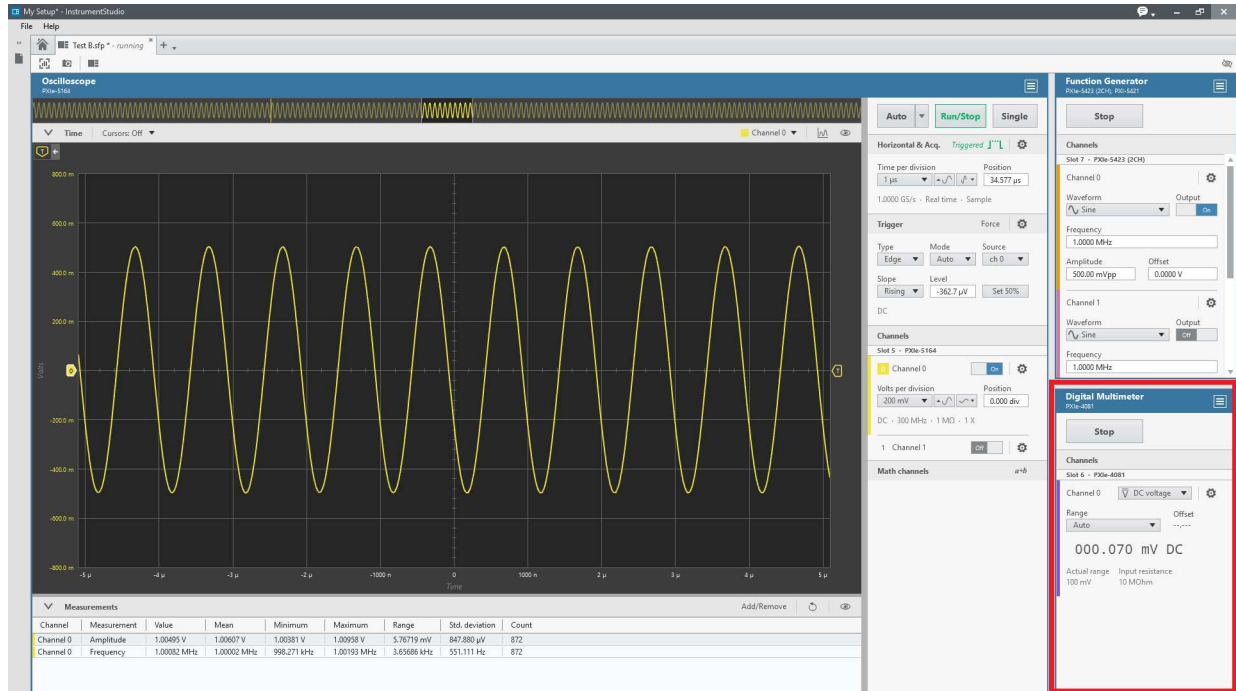
NI DMMs offer self-calibration, which is traditionally found in only the highest resolution DMMs. Self-calibration corrects for all DC gain and offset drifts within the DMM using a precision, high-stability internal voltage reference that has an outstanding temperature coefficient and time drift, accounting for all resistance and current source drifts. Using the self-calibration feature makes NI DMMs highly accurate and stable at any operating temperature—well outside the traditional 18 °C to 28 °C range.

This operation takes less than a minute to complete and requires no external calibrator, minimizing the maintenance burden of deployed systems. PXIe-408x DMMs have a two-year external calibration cycle thanks to the self-calibration precision circuitry that minimizes the maintenance burden of deployed systems. Visit ni.com to learn more about NI's calibration services.
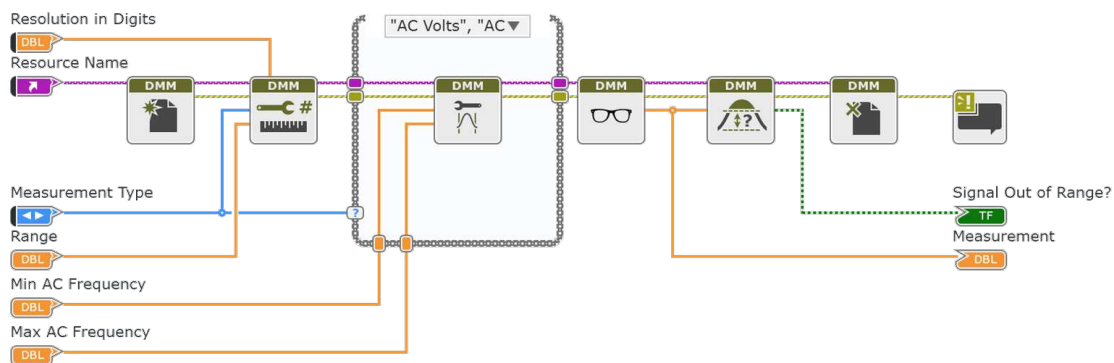
InstrumentStudio Software for Interactive Measurements

InstrumentStudio helps you to unify your display, export instrument configurations to code, and monitor and debug your automated test system. You can view data on unified displays with large, high-resolution monitors, and then capture multi-instrument screenshots and measurement results. Save project-level configurations for easier test repeatability with specific devices under test, or export instrument configurations to programming environments to simplify your code and guarantee measurement correlation. You can also use InstrumentStudio in parallel with your code to monitor and debug running test applications. InstrumentStudio is free software included with NI-SCOPE, NI-FGEN, NI-DMM, and NI-DCPower driver downloads 18.1 and later.

NI-DMM Application Programming Interface (API)

In addition to the soft front panel, the NI-DMM driver includes a best-in-class API that works with a variety of development options such as LabVIEW, C, C#, and others. To ensure long-term interoperability of DMMs, the NI-DMM driver API is the same API used for all past and current NI DMMs. The driver also provides access to help files, documentation, and dozens of ready-to-run shipping examples you can use as a starting point for your application.

Digital Multimeter Devices

USB-4065, PCI-4065, PCIe-4065, and PCI-4070

- **Software:** Includes interactive soft front panel, API support for LabVIEW and text-based languages, shipping examples, and detailed help files

- Voltage measurements up to 300 V

- Current measurements up to 3 A

- 2-wire and 4-wire resistance measurements up to 100 MΩ

- Up to ±300 VDC/V_{RMS} common-mode isolation

- Up to 1.8 MS/s isolated, 300 V waveform acquisition

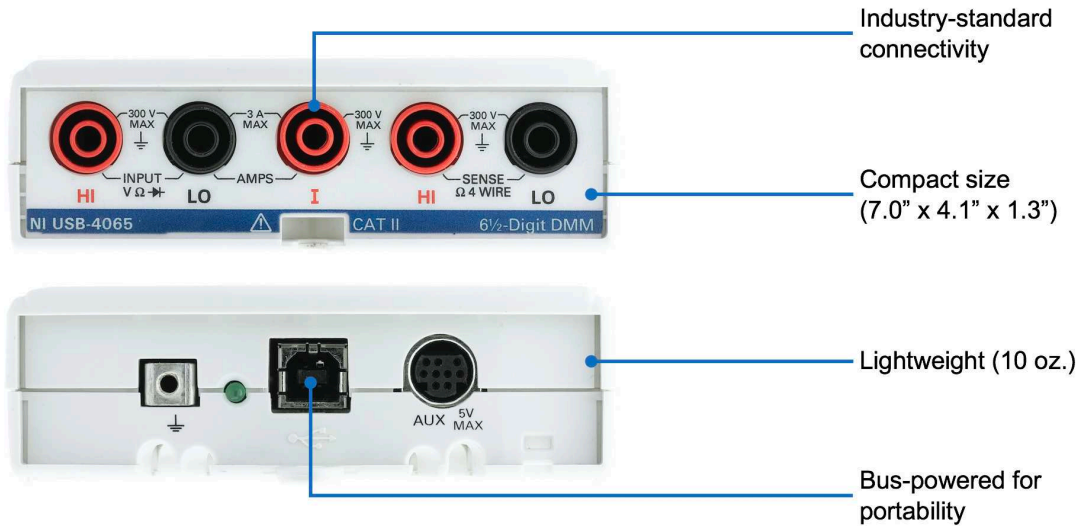## Built for Automated Test and Measurement

NI's PC-based DMMs perform AC/DC voltage, AC/DC current, and 2- or 4-wire resistance measurements, as well as diode tests. Some models include specialized features such as extended calibration cycles and an isolated, high-voltage digitizer mode with sample rates up to 1.8 MS/s. Combined in a single instrument, these features provide a solution to the measurement challenges inherent in traditional precision instruments: limited measurement throughput and flexibility. These DMMs deliver a smarter way to tackle difficult applications in industries ranging from consumer electronics to aerospace and defense.

For higher-performance applications, consider a PXI Digital Multimeter, such as the PXIe-4081, the industry's most accurate 7½-digit DMM. The PXIe-4081 provides 26 bits of resolution and high-stability, metrology-class voltage measurements that range from 10 nV to 1,000 V, current measurements that range from 1 pA to 3 A, and resistance measurements that range from 10 µΩ to 5 GΩ.

Table 2. NI offers DMMs ranging from low-cost USB-powered devices to high-performance PCI-based devices.

	USB-4065 PCI-4065 PCIe-4065	PCI-4070
Description	Basic 6½-digit DMM	High-Performance 6½-digit DMM
Maximum Voltage (V)	300	300
Maximum Current (A)	3	1
Maximum Sample Rate	3 kS/s	1.8 MS/s
Voltage Accuracy (10 VDC, 2-year)	*90 + 12 ppm	25 + 6 ppm
Maximum Calibration Cycle	1-year	2-year
DC and AC Voltage	●	●
DC and AC Current	●	●
2-Wire and 4-Wire Resistance	●	●
Frequency/Period	-	●

Detailed View of USB-4065 6½ Digit DMM

Industry-standard connectivity

Compact size (7.0" x 4.1" x 1.3")

Lightweight (10 oz.)

Bus-powered for portability

Key Features

Flexible Measurement Rate with an Isolated Digitizer

Traditional DMMs are designed to provide high resolution and precision, with little regard to acquisition speed. The unique architecture of the PCI-4070 DMM offers a continuously variable reading rate that ranges from 7 S/s to 10 kS/s, so you can choose the sample rate and resolution you need for your application.
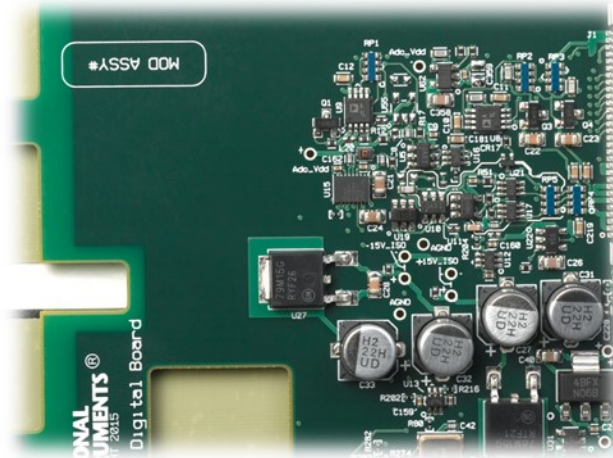

Figure 4. The unique combination of off-the-shelf high-speed ADC technology and a custom-designed sigma-delta converter optimizes linearity and noise for up to 7½-digit precision and stability, while offering digitizer sample rates up to 1.8 MS/s.

When you require higher sample rates, you can use the PCI-4070 DMM in the high-voltage, isolated digitizer mode to achieve sample rates of up to 1.8 MS/s while acquiring at the maximum voltage range. Compared with traditional benchtop DMMs, which sample at a maximum rate of 50 kS/s, the PCI-4070 DMM can sample 36 times faster. This can reduce the need for separate instruments to make high-precision and high-speed measurements.
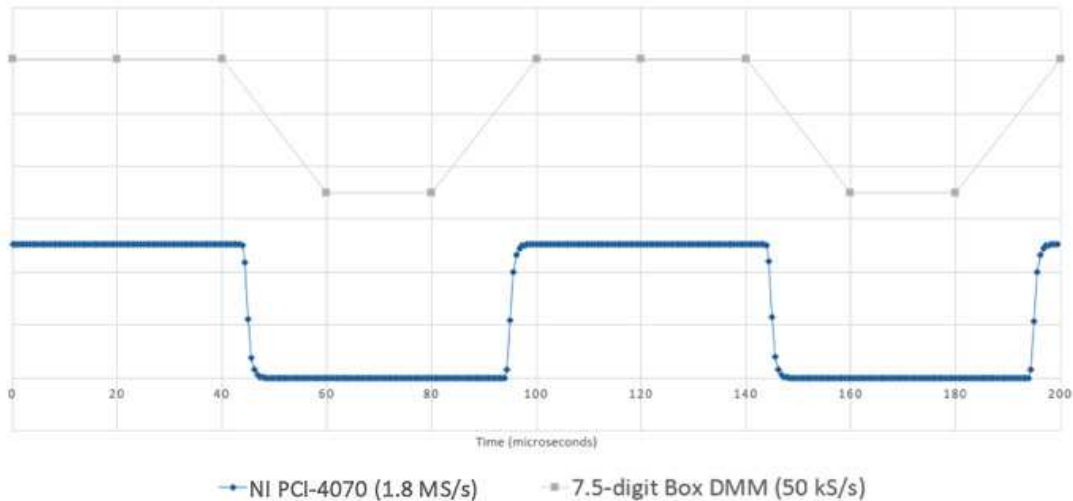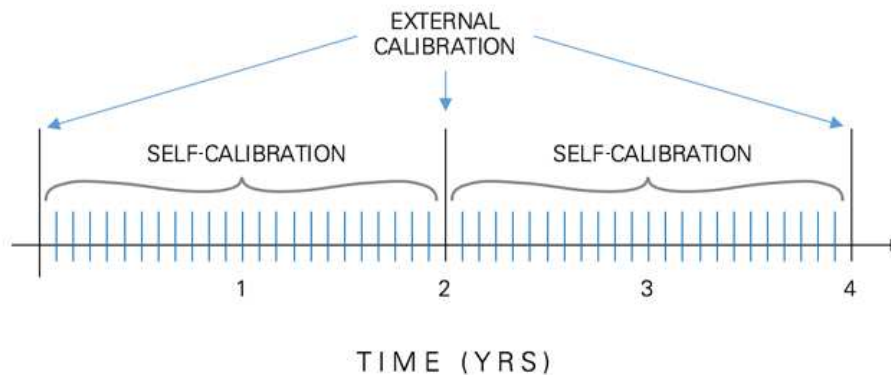

Figure 5. PCI-4070 DMM can acquire 36X faster than traditional benchtop DMMs, which gives you increased insight into your device under test.

High-Precision Measurements

The analog-to-digital converter (ADC) is the backbone of the high-performance PCI-4070 DMM. A unique combination of off-the-shelf high-speed ADC technology and a custom-designed sigma-delta converter provides the noise, linearity, and speed performance required to achieve high-speed and high-precision measurements.

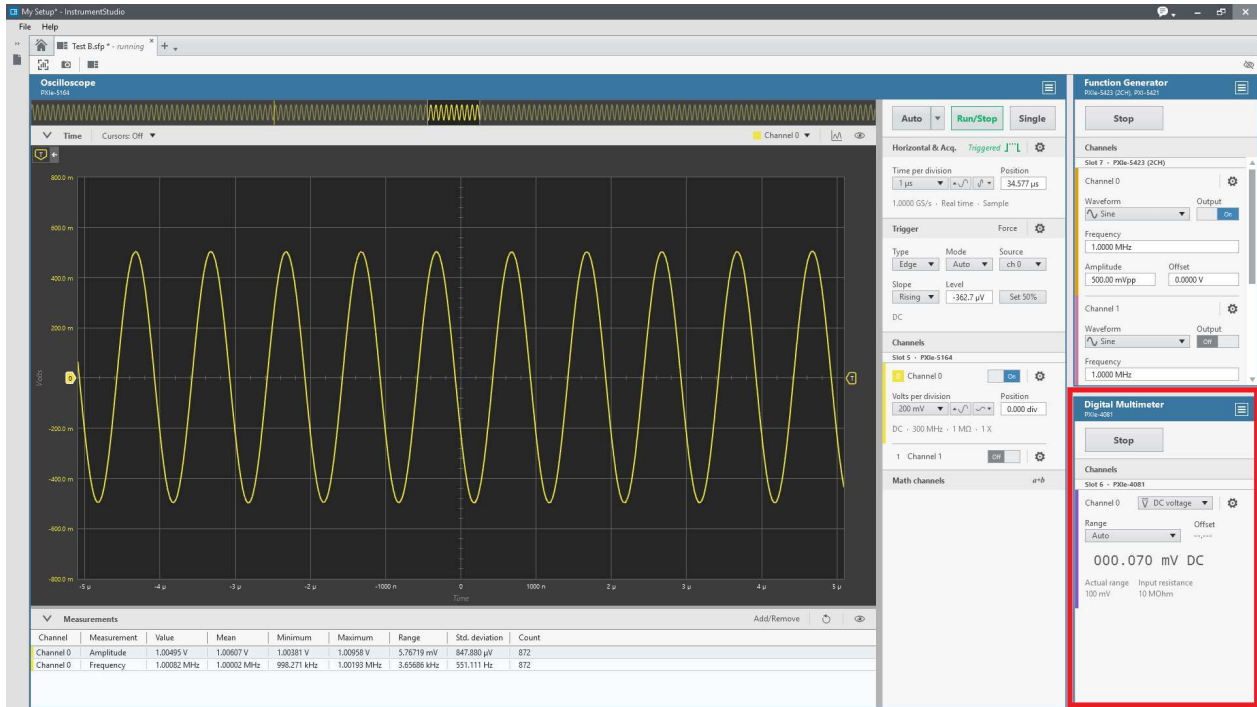## Self-Calibration and Two-Year Guaranteed Specifications

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This operation takes less than a minute to complete and requires no external calibrator, minimizing the maintenance burden of deployed systems. PCI-4070 DMM have a two-year external calibration cycle thanks to the self-calibration precision circuitry that minimizes the maintenance burden of deployed systems. Visit ni.com to learn more about NI's calibration services.
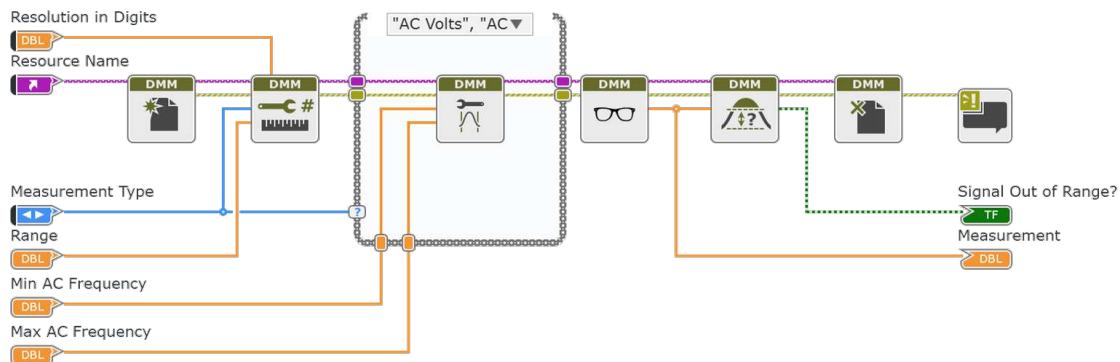
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Platform-Based Approach to Test and Measurement

What Is PXI?

Powered by software, PXI is a rugged PC-based platform for measurement and automation systems. PXI combines PCI electrical-bus features with the modular, Eurocard packaging of CompactPCI and then adds specialized synchronization buses and key software features. PXI is both a high-performance and low-cost deployment platform for applications such as manufacturing test, military and aerospace, machine monitoring, automotive, and industrial test. Developed in 1997 and launched in 1998, PXI is an open industry standard governed by the PXI Systems Alliance (PXISA), a group of more than 70 companies chartered to promote the PXI standard, ensure interoperability, and maintain the PXI specification.

Software
Test Management and Code Development
Code sequencing, database reporting, user management, operator interface, parallel execution, signal processing. LabVIEW, C/C++, .NET, Python

Timing & Synchronization
PXI Chassis
PCI Express Gen 3 throughput up to 24 GB/s, sub-nanosecond latency, P2P streaming, integrated triggering

Computer
PXI Embedded Controller
Windows and Real-Time OS options, Intel Xeon processing, peripheral ports, display output, integrated hard drive

Instrumentation
PXI Modules
DC to mmWave, oscilloscope, programmable power supply, switch/MUX, DMM, VSA, VSG, VST, AWG, SMU, DAQ

Integrating the Latest Commercial Technology

By leveraging the latest commercial technology for our products, we can continually deliver high-performance and high-quality products to our users at a competitive price. The latest PCI Express Gen 3 switches deliver higher data throughput, the latest Intel multicore processors facilitate faster and more efficient parallel (multisite) testing, the latest FPGAs from Xilinx help to push signal processing algorithms to the edge to accelerate measurements, and the latest data converters from TI and ADI continually increase the measurement range and performance of our instrumentation.

HIGHER DATA THROUGHPUT	PARALLEL TEST EXECUTION	MEASUREMENT ACCELERATION	INCREASED MEASUREMENT RANGE
PCI Express Gen 3	Multicore Processors	FPGAs	Data Converters

NATIONAL INSTRUMENTS

PXI Instrumentation

NI offers more than 600 different PXI modules ranging from DC to mmWave. Because PXI is an open industry standard, nearly 1,500 products are available from more than 70 different instrument vendors. With standard processing and control functions designated to a controller, PXI instruments need to contain only the actual instrumentation circuitry, which provides effective performance in a small footprint. Combined with a chassis and controller, PXI systems feature high-throughput data movement using PCI Express bus interfaces and sub-nanosecond synchronization with integrated timing and triggering.

Oscilloscopes
Sample at speeds up to 12.5 GS/s with 5 GHz of analog bandwidth, featuring numerous triggering modes and deep onboard memory

Digital Multimeters
Perform voltage (up to 1000 V), current (up to 3A), resistance, inductance, capacitance, and frequency/period measurements, as well as diode tests

Digital Instruments
Perform characterization and production test of semiconductor devices with timing sets and per channel pin parametric measurement unit (PPMU)

Waveform Generators
Generate standard functions including sine, square, triangle, and ramp as well as user-defined, arbitrary waveforms

Frequency Counters
Perform counter timer tasks such as event counting and encoder position, period, pulse, and frequency measurements

Source Measure Units
Combine high-precision source and measure capability with high channel density, deterministic hardware sequencing, and SourceAdapt transient optimization

Power Supplies & Loads
Supply programmable DC power, with some modules including isolated channels, output disconnect functionality, and remote sense

FlexRIO Custom Instruments & Processing
Provide high-performance I/O and powerful FPGAs for applications that require more than standard instruments can offer

Switches (Matrix & MUX)
Feature a variety of relay types and row/column configurations to simplify wiring in automated test systems

Vector Signal Transceivers
Combine a vector signal generator and vector signal analyzer with FPGA-based, real-time signal processing and control

GPIB, Serial, & Ethernet
Integrate non-PXI instruments into a PXI system through various instrument control interfaces

Data Acquisition Modules
Provide a mix of analog I/O, digital I/O, counter/timer, and trigger functionality for measuring electrical or physical phenomena

NATIONAL INSTRUMENTS

Hardware Services

All NI hardware includes a one-year warranty for basic repair coverage, and 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	Length of service program
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 (RMA)[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.

[1]This option is only available for PXI, CompactRIO, and CompactDAQ systems.
[2]This option is not available for all products in all countries. Contact your local NI sales engineer to confirm availability.
[3]Expedited calibration only includes traceable levels.

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

Technical Support
Every NI system includes a 30-day trial for phone and e-mail support from NI engineers, which can be extended through a Software Service Program (SSP) membership. NI has more than 400 support engineers available around the globe to provide local support in more than 30 languages. Additionally, take advantage of NI's award winning online resources and communities.

10 December 2019

NATIONAL INSTRUMENTS