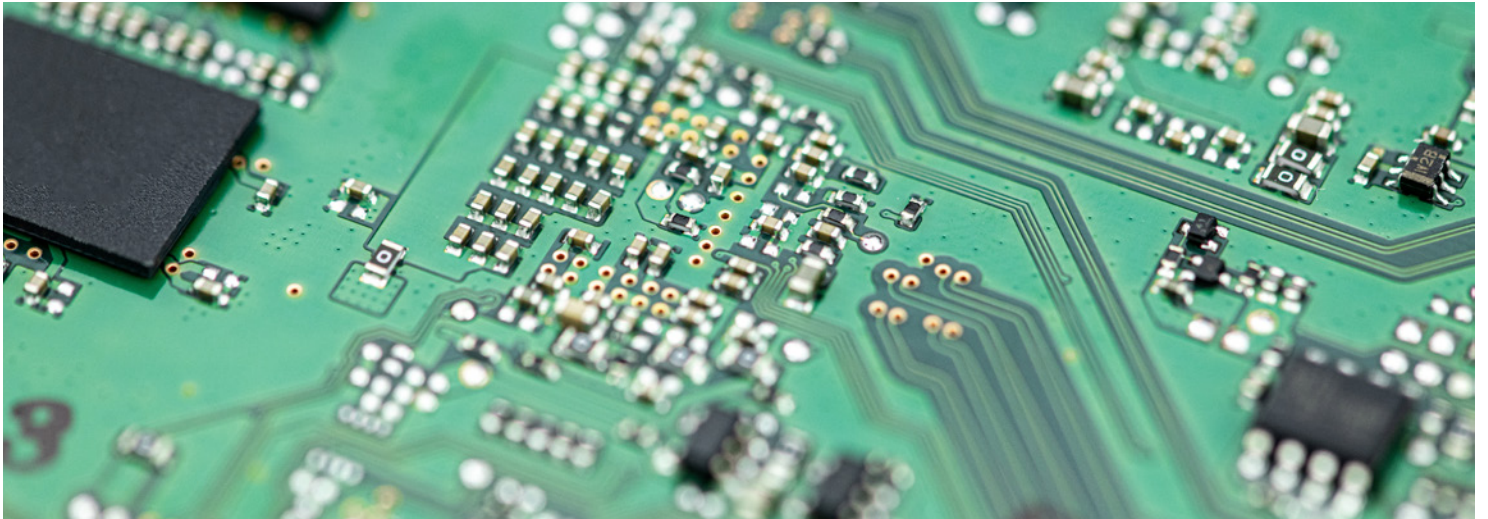




NI is now part of Emerson.



EMERSON™



Solution Brochure

General Electrical Functional Test

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Trend in Consumer Electronics Testing

The usage of consumer electronics has become an integral part of our daily life; thus, the reliability of these devices is vital. However, with constant market changes and shifts at rapid speed, meeting product development schedules and throughput demand brings extra challenges in the product testing process.

One pattern among the market changes is that some of the market shifts are not siloed but interactive and overlapped.

On the one hand, test schedule is further compressed due to components' increasing lead time, diversity of supply chain and the increase in complexity of DUTs.

On the other hand, test throughput also faces challenges throughout different times of the year with multiple peaks of "busier" times, those periods when the market demands higher volumes of devices.

Test Station Architecture and Requirement

Traditional architectures for this use case come in two forms:

01

Filling a rack with box instruments, switches, and power supplies is one solution. But it has drawbacks in the large floor space requirement, high instrument and physical infrastructure costs, and long signal path creating multiple sources of error.

02

Creating a custom instrumentation board lowers the price per station but only pays off for large deployments due to the initial design cost. Beyond costs, this solution also faces concerns with measurement quality and high maintenance costs.

Test engineers looking to optimize a solution for electrical functional test define requirements as:

01

Meet test coverage with stable reliable instrumentation

02

Minimize equipment cost and replication cost

03

Integrate easily with industry standard software

These challenges are best addressed by adopting modular commercial-off-the-shelf (COTS) hardware and open and productive software. Modular hardware allows each system to be customized to meet specific application requirements, while the COTS option reduces development time and sustaining cost.

When closely integrated (high-quality drivers and configuration tools) with industry standard software development and deployment tools, time and money is saved throughout the development lifecycle.



Traditional, Box Instrument Test System	
✗	One instrument for each function
✗	Varying form factors
✗	Different interfaces
✗	Difficult to synchronize
✗	Difficult to fuse data
✗	No system-level support

PXI and CompactDAQ Test Platform	
✓	Low cost
✓	Smaller size
✓	Flexible
✓	Easily upgraded
✓	User defined
✓	Integrated synchronization
✓	Low power consumption
✓	Software integration

FIGURE 1
Different Test Station Architectures

NI Tool Architecture

The NI test platform includes a complete set of products, including modular hardware, development software, and management applications to help you develop and operate functional test stations. NI and its global network of partners offer technical services to ensure customer success in designing, developing, and sustaining test stations.

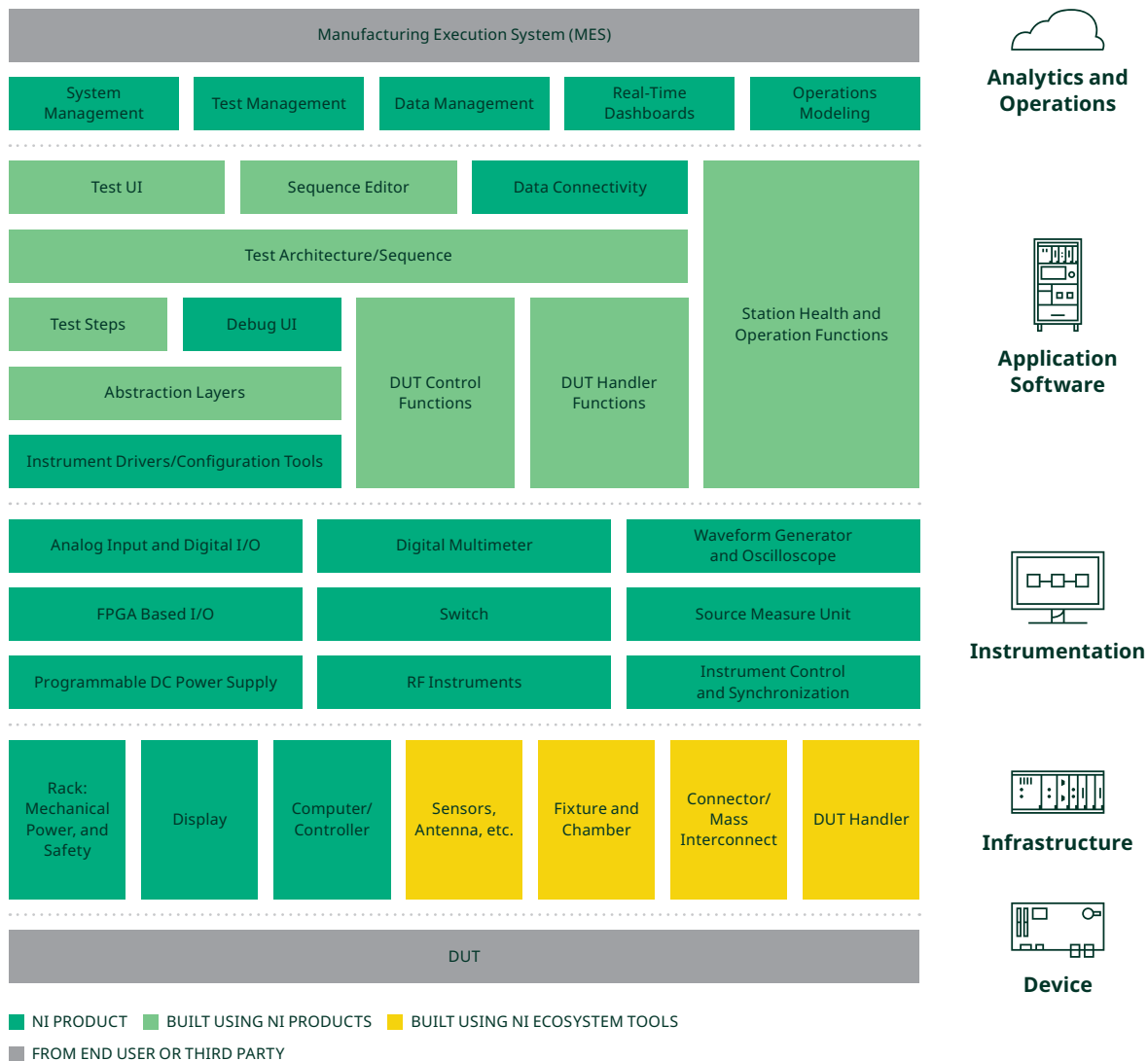
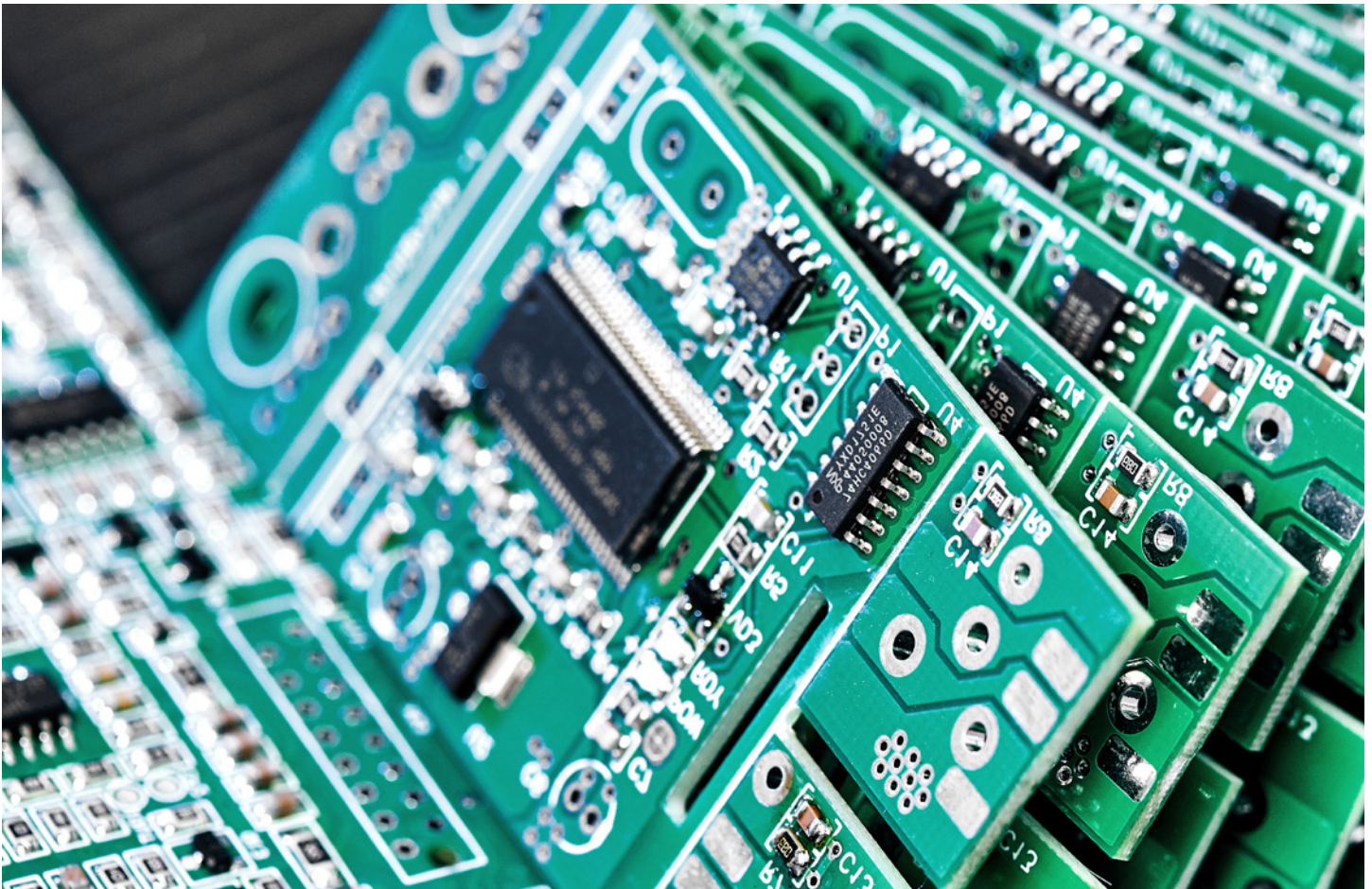


FIGURE 2
Test Station Software



NI PCI Express DAQ – Hardware Solution for High- Volume Production Testing

PCI Express

- Hardware in the PC-based data acquisition family either installs inside your computer on the motherboard, like you would install a new graphics card, or are external devices you connect with a USB cable.
- Use PC-based 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.

Multifunction I/O: PCIe

- Multifunction I/O devices have a mix of I/O with varying channels, sample rates, output rates, and other features to meet common measurement requirements.
- Multifunction devices are highly versatile and ideal for measuring sensors with a voltage output, ± 10 V electrical signals, current measurements over a shunt resistor, pulse and event signals from meters, quadrature encoders, simple TTL digital lines, and more.

Specifications include:

- 12-bit to 18-bit analog input resolution
- Up to 80 analog channels and 48 bidirectional digital channels
- Up to 5 MS/s/ch analog

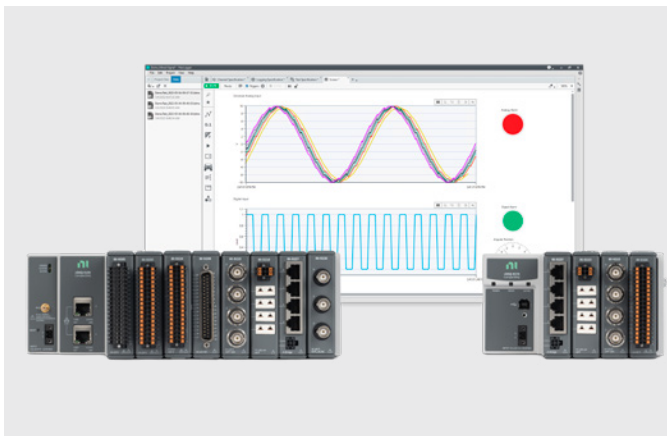
Key features:

- Built for accuracy
- Advanced timing
- System flexibility

Model	Part Number	Sample Rate	Analog Input Resolution	I/O Channel Counts				
				Single-Ended Analog Input	Differential Analog Input	Analog Output	Bidirectional Digital	Counters/Timers
PCIe-6320	781043-01	250 kS/s	16 bits	16	8	–	24	4
PCIe-6321	781044-01	250 kS/s	16 bits	16	8	2	24	4
PCIe-6323	781045-01	250 kS/s	16 bits	32	16	4	48	4
PCIe-6351	781048-01	1.25 MS/s	16 bits	16	8	2	24	4
PCIe-6353	781049-01	1.25 MS/s	16 bits	32	16	4	48	4
PCIe-6363	781051-01	2 MS/s	16 bits	32	16	4	48	4

NI CompactDAQ – Hardware Solution for High-Volume Production Testing

A modular data acquisition system for analog, digital, and sensor-based measurements



The image shows a collection of NI CompactDAQ modules, including a chassis with multiple slots for modules, and a software interface displaying a waveform graph and a digital signal plot. The software interface includes a red stop button and a green start button.

Use CompactDAQ for:

- Benchtop test and measurement
- Tests that need synchronization
- System-level validation tests that combine sensors and electrical signals
- Field tests that need rugged instrumentation

POPULAR FEATURES

01

Rugged

-40 to 70 °C temperature range
50 g shock

02

Synchronized

<1 μ s between chassis (optional feature)

03

Measurements

More than 70 modules available

What Is CompactDAQ?

CompactDAQ is a rugged, modular, data acquisition system that combines signal-based measurement circuitry, data acquisition technology, and test-centric software with standard Ethernet and USB connectivity. CompactDAQ has several features to simplify your instrumentation whether you use it for quick ad-hoc tests, or more sophisticated, automated test stands.



01

Precise Measurements

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.

03

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.

Chassis



02

System Scalability

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

04

Develop or Don't

Program a custom data acquisition test application with .NET, C#, Python, MathWorks® MATLAB® software or NI LabVIEW—or use FlexLogger™ no-code application software to configure your system to log and view real-time data with alarms.

Options

- Ethernet: 1, 4, and 8-slot chassis
- USB: 1, 4, 8, 14-slot chassis
- Wi-Fi: 1-slot chassis

Features

- -40 – 70 °C operating temperature
- 50 g/5 g RMS operational shock and vibration
- DC powered -9 VDC – 30 VDC (AC supply included)
- 1-slot USB chassis are bus powered

Modules



Measurement Options

- Voltage input/output
- Digital input/output
- Thermocouples and RTDs
- Accelerometers and microphones
- Strain gages
- Load cells, pressure transducers, torque cells
- More than 70 modules available

Chassis Selection



Model	Connection to PC	Number of Modules Chassis Can Hold	Synchronize Measurements Between Chassis?	Digital Trigger Built Into Chassis?	Operating Temperature	Part Number
NI cDAQ-9171	USB 2.0	1	No	No	-20 °C to 55 °C	781425-01
NI cDAQ-9174	USB 2.0	4	No	No	-20 °C to 55 °C	781157-01
NI cDAQ-9178	USB 2.0	8	No	Yes	-20 °C to 55 °C	781156-01
NI cDAQ-9179	USB 3.0	14	No	Yes	-20 °C to 55 °C	783597-01
NI cDAQ-9181	Ethernet	1	No	No	0 °C to 55 °C	781496-01
NI cDAQ-9185	Ethernet	4	Yes	Yes	-40 °C to 70 °C	785064-01
NI cDAQ-9189	Ethernet	8	Yes	Yes	-40 °C to 70 °C	785065-01

cDAQ Module Selection

Model	Category	Description	Part Number
NI-9205	AI Isolated	C series voltage input module, spring terminal, 16 AI differential/32 AI single-ended, ± 200 mV to ± 10 V, 16-bit, 250 kS/s aggregate, 250 V RMS isolated ch-earth ground	785184-01
NI-9263	Analog Output	Spring term, ± 10 V, 16-bit, 100 kS/s/ch, 4-ch AO module	783740-01
NI-9403	Digital I/O	5 V/TTL, 32 bidirectional channels, 7 μ s C series digital module	780179-01
NI-9477	Digital Output	32-ch 60 V, 8 μ s, sinking digital out, conformal coat	780174-01
NI-9211	Thermocouple	4-ch ± 80 mV, 14 S/s, 24-bit thermocouple and diff AI	779001-01
NI-9217	RTD/PT100	4-ch PT100 RTD 24-bit, 100 S/s/ch, analog input module	779592-01
NI-9482	SPST Relay	4-channel, SPST relay, 60 VDC (1 A)/250 VAC (1.5 A)	782999-01

Software/Driver Compatibility for NI DAQ Products

Including all CompactDAQ, PCIe DAQ, and PXIe DAQ.

Software	Value
NI LabVIEW	Create a module channel, create tasks, read your DAQmx measurement, and visualize/graph data.
Python: PyPI nidaqmx	The PyPI nidaqmx package contains an API for interacting with the NI-DAQmx driver and allows users to use data acquisition hardware with Python
C, C++, Visual Basic .NET, and Visual C# .NET	The C API or Microsoft .NET Framework DAQmx library allows users to perform all data acquisition operations.

NI PXIe – Hardware Solution for High-Mix Complex Testing

PXIe Instrumentation

NI offers more than 600 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 contain only the actual instrumentation circuitry, achieving 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.

Key benefits of choosing PXI platform for PCBA functional test:

01

High measurement quality to ensure no compromise on data accuracy.

02

Scalable and flexible to adapt quickly to your evolving test and measurement needs.

03

Compact form factor to fit high channel count systems into operationally efficient spaces.

The Hardware Selection Guide for PCBA Functional Test Solution

Step One: Choose the base configuration: Multifunction or High Speed.

Multifunction Configuration



Configuration	Part Number	Description
Chassis + MXI Controller	781161-01	NI PXIe-1073 integrated MXIe, 5Periph slots, PCIe-8363, 3 m cable
Multifunction I/O	781056-01	NI PXIe-6363, X Series DAQ (32 AI, 48 DIO, 4 AO)
Digital Multimeter	780011-01	PXI-4065 6.5 digit DMM

High-Speed Configuration



Configuration	Part Number	Description
Chassis + MXI Controller	781161-01	NI PXIe-1073 integrated MXIe, 5Periph slots, PCIe-8363, 3 m cable
Scope	783590-02	PXIe-5105 PXI oscilloscope, 60 MHz, 12 bits, 60 MS/s, 8 channels, 128 MB
Digital Multimeter	780011-01	PXI-4065 6.5 digit DMM

Step Two: Choose the modules that suit your test needs from the Common Add-On Modules table

Common Add-On Modules

Configuration	Part Number	Description
Power Supply	782857-01	NI PXIe-4112 2-channel power supply, 60 V, 1 A
DIO	787358-01	NI PXIe-6509, 96-channel 5 V/TTL/CMOS (24 mA) digital I/O module
Waveform Generator	785114-01	NI PXIe-5413 PXI waveform generator, 20 MHz, 16 bits, 800 MS/s, 2 channels, 128 MB
Multiplexer	780587-27	NI PXIe-2527 64-channel 300 V CAT I multiplexer
Multifunction IO	781056-01	NI PXIe-6363, X Series DAQ (32 AI, 48 DIO, 4 AO)
Serial Interface	781472-01	NI PXIe-8430/8, 8-port, RS232 serial interface for PXI Express
Accessory	785024-01	SCB-100A noise rejecting, shielded I/O connector block
	185095-02	Cable assembly, type SH100-100-FLEX, 2 m
	763444-01	SMA male to SMA male cable, 50 Ohm, 38.1 cm
	779358-01	NI TB-2627 screw terminal block for NI PXI-2527
	782536-01	SCB-68A noise rejecting, shielded I/O connector block
	191945-02	SHC68-68, twisted pair cable with basic shielding, 2 m
	192061-02	SHC68-68-EPM shielded cable, 68-D-type to 68 VHDCI offset, 2 m

PCB Assembly Test Toolkit

The **PCB assembly test toolkit** helps you streamline the test process with automation-ready templates and a customizable library for measurements and analysis, using data acquisition devices. Moreover, the toolkit supports multiple programming environments, including LabVIEW, .NET, C#, and Python to help achieve faster execution, shorten time to market, and effortlessly customize test cases.

Functional Test Coverage

01

Firmware check

Validate firmware versions using I2C and RS232.

02

Power diagnostics

Monitor power consumption, regulator lines, and CPU clock performance.

03

Reset and self-test

Test push reset buttons, status LED animations, and communication.

04

User interface and sound tests

Evaluate push action buttons, digital states/patterns, duty cycle LED analysis, and audio electrical path or sound check (Twitter frequency).

05

Audio line check

Assess electrical paths and conduct basic filter tests using multitone signals.

06

Temperature tests

Measure onboard and ambient temperatures with I2C, TC, RTD, and Rth sensors.

Key Benefits of the PCB Assembly Test Toolkit

01

Save development time by reusing existing examples and templates: development time could be less than one week for functional test software

02

Well developed and tested architecture: adapt and customize solutions with fully documented and commented code

03

Save maintenance effort

04

Standardized test steps for reusability

05

Default values selected according to experience, but also open for modification with customizable options

06

Optimization of test execution speed by a structure of three functions

Measurement Library

01

The library consists of a set of measurement or generation functions and templates sequences examples, to save development time for a PCBA functional tester.

02

Every function source code or sequence can be opened and is fully documented to help you customize and adapt to your solution.

03

This library is optimized and simplified to be configuration-based and used immediately with physical hardware.

04

The hardware supports the NI DAQ hardware platform, including NI CompactDAQ.

05

The measurement functions are used to create NI TestStand automation tests or dedicated to being used by your custom sequencer, in LabVIEW, C# .NET, or Python.

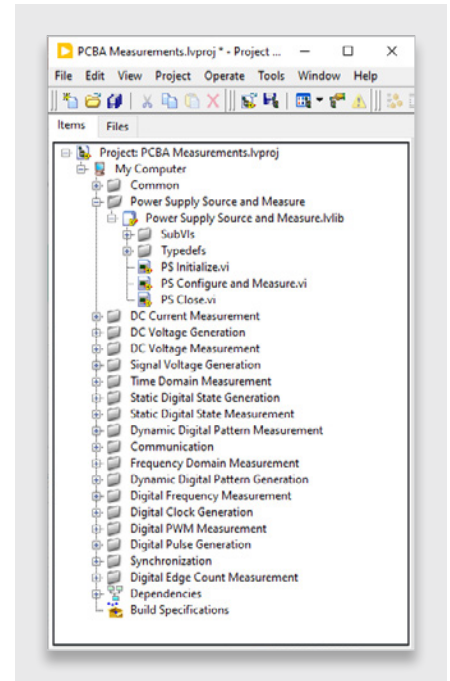


FIGURE 3
PCBA Measurement Library in LabVIEW

Automation Examples Availability



Action button tests



Audio tests



Communication tests



Digital I/O tests



LEDs tests



Microphone tests



Power supply tests



Synchronization example

TestStand Functional Test Demo Example Availability



Power diagnostics



Reset and self-test



Animation and sound user input test



Audio filter test

NI LabVIEW

LabVIEW offers a graphical programming approach that helps you visualize every aspect of your application, including hardware configuration, measurement data, and debugging. This visualization makes it simple to integrate measurement hardware from any vendor, represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces.

KEY BENEFITS

- Reduce system setup with access to thousands of instrument drivers, example programs, and documentation to connect to virtually any instrument.
- Use hundreds of instrument-specific example code modules and included measurement libraries to reduce development time.
- Reuse existing code libraries from languages including C/C++/C#, .NET, Python, and MathWorks® MATLAB® software.
- Quickly create professional user interfaces to visualize test outcomes.
- Build proficiency with extensive online and in-person training options for both new users and certified NI tool architects.

“Our team uses a common hardware platform across testing of numerous products. Reusability of common hardware configurations and utilization of common LabVIEW code simplifies development of new test systems.”

Brian Teschendorf
Software Engineer, Boston Scientific Corporation



NI TestStand

TestStand ready-to-run test management software is designed to help you quickly develop and execute transaction processing system (TPS) software. You can extend TPS functionality by developing TestStand test sequences that integrate code modules written in a variety of programming languages, including G in LabVIEW, C/C++, .NET, and Python. TestStand also provides extensible plug-ins for reporting, database logging, and connectivity to other enterprise systems. You can deploy test systems to production with easy-to-use operator interfaces.

KEY BENEFITS

- Customize test sequences to meet every requirement
- Automate saving and reporting test data
- Increase test throughput with parallel testing
- Efficiently replicate and deploy test systems
- Troubleshoot test systems with integrated debugging tools
- Customize user interfaces to meet testing needs

“TestStand has helped to decrease the time spent testing product and gets it to the market faster.”

Jared Smith
Test Engineer, Schneider Electric



Instrumentation Hardware Services

Test station development and deployment is only half of the story. Best practice dictates that you consider station sustaining and maintenance from day one.

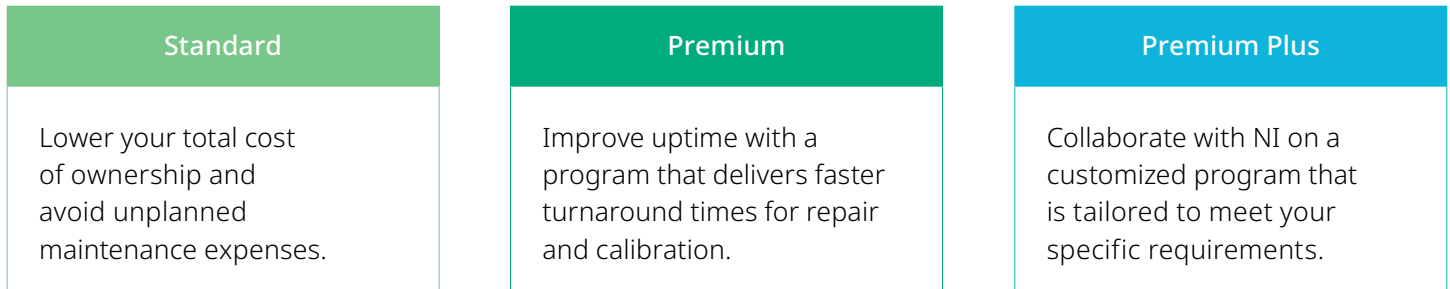


FIGURE 4
Instrumentation Hardware Service Levels

01

Budget control

Predict operational costs and avoid unforeseen maintenance expenses.

02

Minimize downtime

Get your systems back up and running within days, hours, or minutes with sparing programs, advance replacement services, and repair contracts.

03

Manage lifecycle changes

Manage technology refreshes and product obsolescence with roadmap consulting and lifecycle services programs encompassing one to twenty years.

04

Maintain standards

Utilize ISO 9001-traceable calibration and ISO/IEC 17025-accredited calibration services delivered on-site and through expedited shipping for confidence and convenience.

05

Speed deployment

Get up and running with custom installation that includes app software, custom documentation generation, individual logo/labeling, and system recovery images.

06

Quickly troubleshoot

Minimize development delays by consulting with experienced applications engineers based in more than 40 countries to meet your local needs in your local language.

“In the 25+ years I’ve been dealing with NI, I’ve always found their personnel to be uniformly bright, enthusiastic, and genuinely concerned with helping their customers succeed.”

Cary Long
Software Engineer

Featured NI Partners

Best-in-class test engineering teams realize that there is seldom a simple question of in-house development versus outsourced development. Instead, they realize how complex it is to decide how to balance development teams to optimize for deployment schedule, bandwidth, domain specific expertise, proficiency development, and available budget.

NI Partners are uniquely positioned to support your business with the service that it requires, including strategic design, system integration, specialist tools, software IP, and ongoing support. More than 1,000 NI Partners, each certified and vouched for by NI and positioned globally, stand ready to consult with you on projects and provide complete solutions based on NI's productive software and modular hardware.



FIGURE 5
NI Partners Can Help Ensure Your Success

Partnering in Your Success

01

Integrators

These NI Partner integration companies offer certified production test specialists to help reduce development time and cost by providing expertise and complete solutions.

02

Consultants

These hourly consultants help mitigate risk and shorten design cycles through software architecture design, code review, and individual or team training.

03

Tools and apps

Build specialist IP into your solution to add functionality or reduce development time. The LabVIEW Tools Network offers hundreds of add-ons, toolkits, and reference applications compatible with NI and industry platforms.

Featured NI Partner: AIMFLEX

Malaysia-based AIMFLEX is the leader in customized test and measurement solutions provider in Southeast Asia with local presences and offices. Focusing on testing and test automation in consumer electronics, life sciences, automotive, semiconductor, and other industries.

With more than 15 years of experience in working with customers from design, prototyping, and NPI to mass production, helping them to shorten time to market, and ensure excellent test coverage and quality with their product. With a team of around 100 experienced and certified engineers in different discipline, electrical and electronics, mechanical engineering, software development.

Capabilities and Solutions

01

Automated PCBA and electronics assemblies testing

02

Parts and assemblies automated inspection and testing

03

Product characterization and lifecycle testing

Building on NI Platforms

NI Hardware Platforms

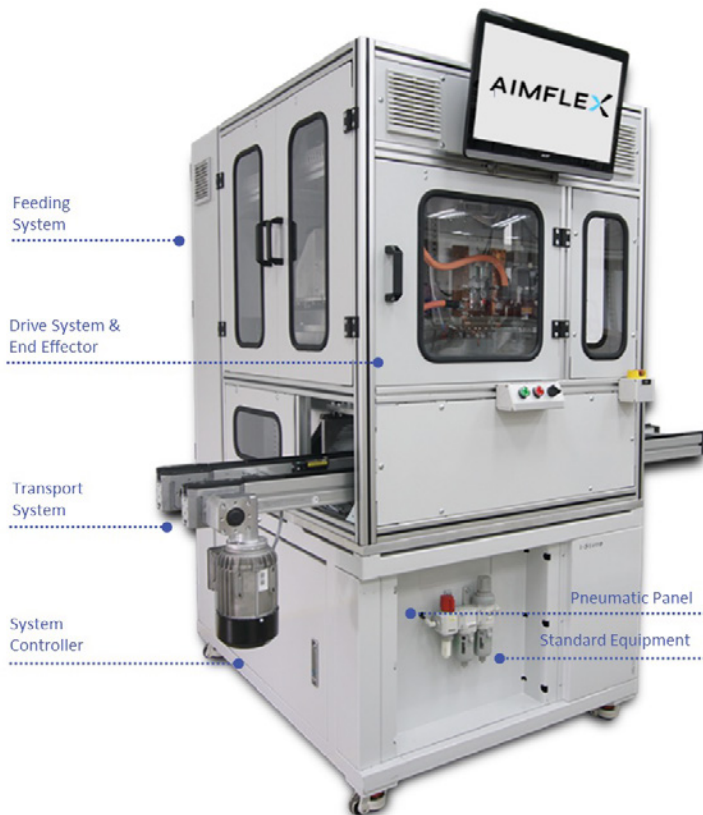


NI Software Platforms

▶ LabVIEW™ ✓ TestStand™ □ LabWindows/CVI™



Customized Test Platforms



AIMFLEX

Visit aimflex.com.my to learn more.

Email: sl.ong@aimflex.com.sg

Sales email: sales@aimflex.com.my

Mobile: +65 8206 2868 / +6012 2999 254

Featured NI Partner: Avera

Avera is a premier test-solutions provider for technology innovators worldwide whose test expertise spreads from consumer electronics, telecom, and life sciences to aerospace, defense, and automotive.

With more than 20 years in business, Avera has a proven record in helping clients accelerate product development, reduce manufacturing costs, achieve uncompromising test coverage, and solve supply-chain issues.

01

Undertake projects of any size with the support of more than 240 globally located engineers and software experts—including more than 140 NI-certified architects, developers, and instructors.

03

Solve complex problems with accredited specialty product support for NI tools, including RF/wireless and SystemLink software.

General Electric named Booster one of only three WW Certified Test Development Systems Integrators based on quality of service and international presence.

02

Build with confidence assured by Avera's track record of more than 6,000 successful projects.

04

Meet production volume requirements with mechanical design that scales from simple manual fixtures to fully automated inline installations.



FIGURE 6

Deployed Automated Test Solution



Learn more at insight.avera.com/request-for-information-avera.

Featured NI Partner: Booster

Booster is a professional and dedicated manufacturing test development and test automation solutions provider based in China with a worldwide service and support network.

01

Scale to any size project with more than 110 test development and design engineers who cover most of the product catalog test development, design knowledge base, and required capabilities.

02

Minimize costs and lead times with in-house high-quality fixture design and fabrication, including RF and audio/acoustic chamber expertise.

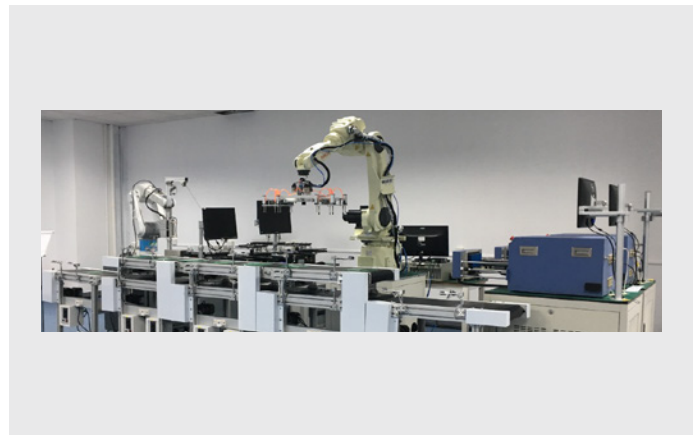
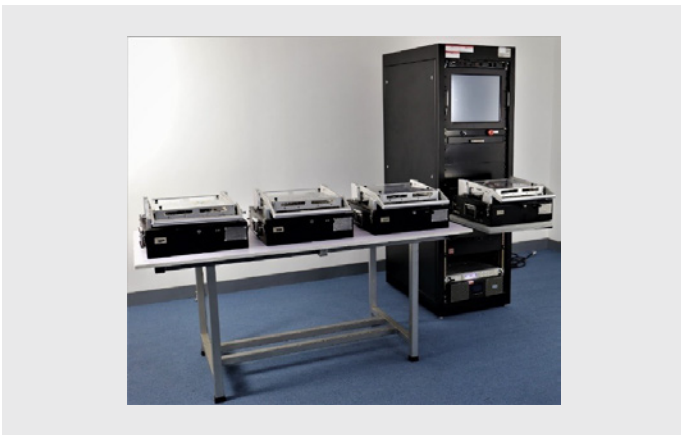
General Electric named Booster one of only three WW Certified Test Development Systems Integrators based on quality of service and international presence.

03

Receive support for your entire test line—from DFT and early-stage test-strategy consultation, through development, to sustaining.

04

Take advantage of timely worldwide service and support.



Visit boostertech.cn/m/en to learn more.

Email: andy.zhang@bcd-autotest.com

Sales Email: sales@bcd-autotest.com

Mobile: +86 18688150629

Featured NI Partner: iBtest

Developing Stressless

Mass Production Environments

Test stations, assembly services, automated cells, and data management for your production line. Meet the demand of your end customer and minimize risks and repetitive tasks through industrial automation.

High Bandwidth

01

Strong Partnerships

The benefits are the best lead times and prices with the manufacturing industry's most prestigious and high-quality global brands. As systems integrators with different skills, talents, and labors, together with our partners, we give you a more appropriate solution.

02

Flexibility

We understand the urgency of breakdowns and downtimes in the production line, and we're always ready to adapt in different ways to provide a quick response.

03

Local Support

We have facilities and talented engineers in key regions where electronic manufacturing is thriving.

Industries



Automotive



Telecommunications



Consumer Electronics



Industrial



Medical

Our Areas of Specialization

Testing

- In-Circuit Test
- Functional Test

Industrial Automation

- Mechanical Design
- Automation

iBtest Records

+1,300 completed successful projects and have a portfolio of more than 80 satisfied clients.



Learn more at ibtest.com.

USA: +1 (815) 529 4640

MX: +52 (33) 3185 8977

Featured NI Partner: NOFFZ Technologies

NOFFZ Technologies develops and produces industry-leading test systems and automation solutions for the entire product development process, from prototyping to validation and production. The company's systems are established in the transportation, telecommunications, and aerospace, defense & government sectors as well as in consumer electronics, smart home, and medical use cases.

01

Longstanding track record

In 35 years, the company has grown from a basement office to more than 250 employees worldwide. More than 25 years as an NI partner with countless projects using NI hardware and software in NOFFZ turnkey solutions and products.

03

Mixed-Signal & RF expertise

With long-term support and extensive RF knowledge, NOFFZ is one of the top system integrators for complex RF and wireless applications in combination with mixed-signal testing - from parameter/monitoring tests in validation department to flashers, board level and end-of-line tests in production.

Examples of turnkey systems are NOFFZ Universal Tester Platforms (UTP), starting from small single functional tests up to complex automated turntable machines or test cells. At the NOFFZ R&D centers niche products like the software UTP Suite based on NI TestStand or a Base Station Emulator or Universal Wireless Tester (based on NI PXI) are released to ensure a wide coverage for almost all RF interfaces. With the easy go/no-go RF test product line IoT Test Node BT and WLAN testing for consumer products are simplified.

The NOFFZ experts find the right answer for every testing need - from simple tests to extensive, highly complex high-channel tests.

02

All from one source

The NOFFZ project & product business supports customers from consulting to design & development, manufacturing, service & support. This is why many customers come back for multiple projects, applications and locations over many years.

04

Proven success

NOFFZ has deployed 7,000+ UTP testers worldwide and shipped 5,000+ products.



Learn more at noffz.com.

info@noffz.com

+49 2151 99878-0



System Integration on Your Terms

NI offers a variety of solution integration options customized to your application-specific requirements. You can use your own internal integration teams for full system control or leverage the expertise of our worldwide network of NI Partners to obtain a turnkey system.

Contact your account manager or call or email us to learn more about how NI can help you increase product quality and accelerate test timelines at (888) 280-7645 or info@ni.com.

NI Services and Support



Consulting and Integration



Global Support



Turnkey Solution Delivery and Support



Prototyping and Feasibility Analysis



Repair and Calibration



Training and Certification

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