Keysight M9037A
PXI and AXIe Modular Products and Solutions

KEYSIGHT TECHNOLOGIES

Introduction to the Modular Advantage

High performance and easy test system design...

For your data acquisition or automated test applications, your range of choices is getting bigger and better.

Keysight Technologies, Inc. modular instrumentation is an extension of Keysight's measurement expertise into modular form factors, such as PXI and AXIe. In these form factors, Keysight helps you benefit from a large portfolio of chassis and measurement modules integrated with world-class software applications to get the most trusted measurements in the DC, analog, digital, RF, microwave and lightwave domains.

Our offering includes the industry's fastest PXI vector signal generator, first single-vendor modular microwave vector signal analyzer enhanced by Keysight's widely used 89600 VSA software, digitizers, waveform generators, digital multimeters, voltage/current sources (V/I), and a broad range of multiplexers, matrices and general purpose switching products that cover from DC to 26.5 GHz and up to 300 V.

Architecture

High performance, flexible architecture

To ensure that you get the best performance from your test platform, the entire path from the controller to the instrument has been designed for speed.

- PCI Express® IO path from the controller to the instrument enables high-speed connectivity from faster, less-expensive remote controllers.
- High-speed memory-mapped registers reduce firmware overhead and communication latency.
- Optimized software drivers.

Software

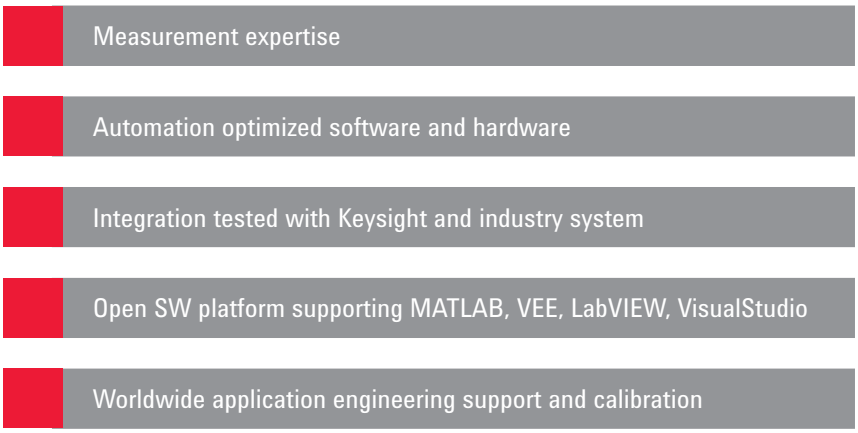
Open development software platform

Because a single software platform is rarely the right answer for every test scenario, Keysight provides modules with a comprehensive portfolio of instrument drivers, documentation, examples, and software tools to help you quickly develop test systems with your software platform of choice.

Another important concept is enabling measurement and analysis capabilities that are independent of the underlying hardware. For example, applications such as the Keysight 89600 VSA software and MATLAB support a wide range of Keysight modular products.

Why choose Keysight modular products?

Keysight has been a pioneer in developing and supporting advanced modular platforms. From the early days of leveraging VMEbus and integrating timing and synchronization to create VXI to the popular 34970 and 34980 switching and data acquisition platforms, Keysight is taking its modular expertise to furthering advancements in PXI and AXIe.



Measurement expertise

As the premier test and measurement company, Keysight invests heavily in advanced research not only at a product level but at the foundation of the measurement science with Keysight's Technology Leadership Organization and Keysight Research Labs. As a consequence, products integrate decades of signal and measurement optimizations to bring you the most advanced solutions. You benefit from this expertise from the early stages of product design through manufacturing.

Automation optimized software and hardware

With PXI a natural platform for heavily automated environments, Keysight has optimized the measurement hardware, firmware and drivers to give users the lowest latency solutions. This translates directly to lower measurement times and consequently higher test throughput.

Integration tested with Keysight and industry systems

Every product Keysight releases goes through heavy integration testing with common internal hardware and software products and platforms to ensure smooth and seamless operation. As a further step, Keysight has engineered its products to integrate with common industry products for complete system operation.

Open software platform supporting MATLAB, VEE, LabVIEW, VisualStudio

With Keysight's modular open software platform, you have the largest choice of software applications and programming environments with complete support of MATLAB, VEE, LabVIEW, and Microsoft VisualStudio software. Furthermore, Keysight provides IVI-COM and IVI-C support for integration into almost any software environment.

Worldwide application engineering support and calibration

With deep domain and application knowledge, our global application engineering team provides the expertise to help you solve your most challenging applications. Keysight's global support centers also ensures that repair and calibration services meet your needs.

Is PXI the right choice for your application?

To better understand if PXI is the right choice for your applications, let's take a quick look at some of the benefits that a modular platform such as PXI has versus a standalone box instrument platform.

Discover...	
Modular Platforms	**Standalone Box Platforms**
Higher measurement throughput	Interactive measurements
Greater flexibility/scalability	Time to first measurements
Integrated system	Predictable system performance
Smaller footprint	Lower software investment
Lower power	No infrastructure investment
The PXI Difference	

Modular platform benefits

Higher measurement throughput

Several technical features of PXI allow it to perform tests and measurements quicker. By virtue of leveraging computer-based technology, PXI takes advantage of the latest advances in processors, reducing post-processing time. The PXIe backplane bus also leverages the PC industry's PCI Express® Gen2 technology, greatly increasing throughput and reducing latency. This technology helps transfer information between modules and controller at higher speeds, and will reduce test time, especially for data and transaction intensive test applications. In addition, Keysight PXI systems include a built-in streamlined driver architecture with direct memory access, and the measurement science used to take the measurement.

Greater flexibility and scalability

PXI is an open, multi-vendor standard that is governed by the PXI Systems Alliance (www.pxisa.org). This ensures that modules and infrastructure from different vendors plays well together and also opens the measurement possibilities. In addition, by integrating the bus into the backplane of the chassis, it is possible to continue scaling systems indefinitely using PXI timing and synchronization methods.

Integrated systems

PXI easily integrates into hybrid systems where a test platform is a combination of standalone box, proprietary modular, GPIB, USB, VXI, LXI or even the new AXIe modular form factor. Keysight's IO library suite makes the integration faster, by offering easy connection to both PXI and traditional instruments and reducing system setup and configuration time to mere minutes.

Smaller footprint

The biggest contributing factor aside from taking advantage of Moore's Law of integration and miniaturization is the removal of redundant functions in a integrated system. By abstracting the measurement technology from the processing and user interface functions, PXI removes redundancy and can save up to 80% of the space of a traditional system.

Lower power consumption

By virtue of taking advantage of advances in miniaturization and integration, PXI can limit slot power to 30W and still meet many of the needs of higher-end measurements. This means that a fully loaded 18-slot chassis still uses less than 1000W.

Is AXIe the right choice for your application?

What is AXIe?

AXIe is a next-generation open standard based on Advanced Telecom Computing Architecture (AdvancedTCA) with extensions for instrumentation and test. This standard is governed by the AXIe Consortium, a group of leading organizations in the test and measurement industry and is designed to provide users with popular PC interfaces such as TCP/IP and PCI Express to modular configuration slots which provide resources for advanced instrumentation (www.axiestandard.org).

AXIe's key attributes

As a standard, AXIe shares many characteristics with PXI but was designed to supplement the automated test platform standard.

A quick look at a few details reveals the underlying similarities and differences offered by AXIe. As the table shows, AXIe and PXI offer similar latency and transfer speeds because both use PCI Express as the backplane fabric.

Discover the Keysight...		
Feature	**AXIe**	**PXIe**
Chassis base	AdvancedTCA	cPCI, cPCIe
PCIe maximum data bandwidth (Gen2) Single peripheral slot to backplane All peripheral slots to system slot	 2 GB/s 10 GB/s (5-slot chassis)	 4 GB/s 8 GB/s
PCIe fabric	Yes	Yes
LAN backplane	Yes	No
Local bus	18 pairs required 62 pairs optional	1 line (13 PXI)
Triggers	Bi-directional star trigger 13-signal MLVDS bus	Star trigger (1x TTL, 3x diff per slot) Eight-signal TTL bus
Frequency reference and sync	100 MHz; Yes	10 MHz, 100 MHz; Yes
Power per slot	200 W	30 W
Board space per slot	900 cm²	160 cm²
Modules available	Dozens and growing	>1,000
AXIe and PXI Difference		

Is AXIe the right choice for your application?

How is AXIe different than PXI?

While PXI has made a name for itself in automated validation and manufacturing test applications on the strengths of its compact size, low power draw, and best in low-cost commercial off-the-shelf ASICs and technologies, AXIe balances PXI by providing the complement of these aforementioned features.

Powerful

Truly advanced and cutting edge measurement technologies previously unavailable to modular instrumentation

By increasing the power available to each slot from 30 W to 200 W, loosening board space constraints from 160 cm^2 to 900 cm^2, and increasing the headroom of each slot, leading test and measurement providers can now use AXIe as a platform for truly advanced and cutting edge measurement technologies previously unavailable to modular instrumentation. The additional power now supports extreme ASICs with switching speeds in the tens of gigahertz and power draws greater than 30 W. The additional board space will allow the development of complex measurement architectures with their supporting circuits all on a single card. Additionally, the extra slot headroom will allow mezzanine circuits for increased densities per slot or additional shielding to support very sensitive circuits. In brief, AXIe finally supports the development of cutting edge instrumentation in a modular form factor.

Interconnected

Systems designers are now limited only by their imagination

Another subtle difference between the two platforms is the augmented local bus which allows communications and synchronization between instrumentation slots. With over 600 GB/s of throughput, local bus now facilitates complex multi-instrument configurations for channel expansion and MIMO, data storage and co-processing as well as internal synchronization and triggering. System designers are now limited only by their imagination.

AXIe Interoperability

AXIe is built on the same PCI Express backplane fabric as PXI and the same LAN connectivity as LXI. This allows the three platforms to co-exist in the same system quite seamlessly.

In addition, the PXI and AXIe platforms will share the same software architecture both taking advantage of IVI and other elements of the driver software stack. AXIe also supports embedded controllers running user familiar operating systems such as Windows. All of this makes AXIe seamless to develop for and integrate into an advanced measurement platform.

Seamless

PXI and AXIe share the same software architecture and familiar operating systems

AXIe Products

The AXIe product portfolio includes mainframes, a controller and new modules that offer leading performance in their categories.

Keysight M8190A Arbitrary Waveform Generator

Achieve Lower Cost of Ownership

Calibration and repair can significantly influence the cost of owning a system. Keysight modular products are designed to maximize uptime through easy module exchange for maintenance, repair and calibration that helps keep your test systems operational.

Fast Repair Times

Core Exchange Program

Benefit from fast repair times, whether your repair strategy is return to Keysight, on-site repair, or self-maintainer.

For selected modular products, Keysight's replacement Core Exchange program allows fast and easy module repairs. A replacement core assembly is a fully functioning pre-calibrated module replacement that is updated with the defective module serial number, allowing the replacement module to retain the original serial number.

Express Warranty

For selected modular products, reduce downtime with the fastest repair service in the industry. The express warranty upgrades the global warranty to provide:

- 5 day typical turnaround repair service in the US, Japan, China and many EU countries or up to a 10 day improvement in turnaround time in the rest of the world.
- Priority return shipment.

Fast Repair

Reduce downtime with the fastest repair service in the industry

Calibration and Traceability

Keysight's modular products are factory calibrated and most modules are shipped with an ISO-9002, NIST-traceable calibration certificate. A one year calibration cycle is recommended.

Calibration can be performed:

- At Keysight Worldwide Service Centers
- On-site
- By self-maintainers

The Keysight N7800A Calibration Software performs calibration that tests all product specifications and is compliant with ISO 17025:2005, ANSI/NCSL Z540.3-2006, and Measurement Uncertainty per ISO Guide to Expression of Measurement Uncertainty, 1995.

- The Keysight Calibration Status utility helps ensure your module is calibrated by managing the calibration interval and providing messages regarding instrument and module calibration status. Multi-Module Instrument level Calibration Certificates contain each individual module model and serial number.

Accelerated Upgradability

With selected modular products, purchase what you need today, and as your needs change, upgrade without changing the hardware or shipping your module back to the factory. Keysight modules include a utility to upgrade the module options with a license key.

Self Test

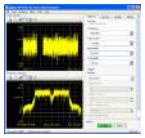
A self test utility runs a set of internal tests which verifies the health of the modules and reports their status.

Software

Instrument Connection Software

	Keysight IO Librtary	The Suite offers a single entry point for connection to the most common instruments including AXIe, PXI, GPIB, USB, Ethernet/LAN, RS-232, and VXI test instruments from Keysight and other vendors. It automatically discovers interfaces, chassis, and instruments. The graphical user interface allows you to search for, verify and update IVI instrument and soft front panel drivers for modular and traditional instruments. The Suite safely installs in side-by-side mode with NI I/O software.	Free software Download at www.keysight.com/find/iosuite

Module Setup and Usage

	Keysight Soft Front Panel	The PXI module includes a Soft Front Panel (SFP), a software-based Graphical User Interface (GUI) which enables the instrument's capabilities from your PC.	Included on CD-ROM shipped with module

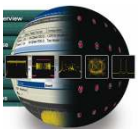
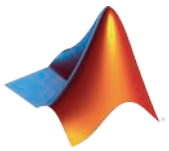
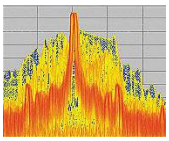
Programming

Driver	Development environments	
IVI-COM IVI-C LabVIEW MATLAB	Visual Studio (VB.NET, C#, C/C++) VEE LabVIEW, LabWindows/CVI, MATLAB	Included on CD-ROM shipped with module

Programming Assitance

	Command Expert	Assists in finding the right instrument commands and setting correct parameters. A simple interface includes documentation, examples, syntax checking, command execution and debug tools to build sequences for integration in Excel, MATLAB, Visual Studio, LabVIEW, VEE, SystemVue.	Free software download at www.keysight.com/find/commandexpert
	Programming Examples	Each module includes programming examples for LabVIEW, LabWindows/CVI, Visual Studio C, C++, C#, Visual Basic, MATLAB, and Keysight VEE Pro.	Included on CD-ROM shipped with module

Signal Generation Software

	Signal Studio	Suite of flexible, easy-to-use, signal creation tools that provides Keysight validated and performance optimized reference signals for commonly used communications standards. It configures signals in an easy-to-use, application-specific graphical interface and enables you to scale the capability and performance to meet your specific test needs.	Licensed software. For more information, visit www.keysight.com/find/signalstudio
	SystemVue	A system--level EDA that accelerates design and verification at the physical layer where advanced digital signal processing meets RF.	Licensed software. For more information, visit www.keysight.com/find/eesof-systemvue
	MATLAB	Interactive tools and command-line functions for instrument control and data analysis tasks such as signal processing, signal modulation, digital filtering and curve fitting.	Licensed software. For more information, visit www.keysight.com/find/matlab
	Vector Signal Analysis	89600 VSA software sees through the complexity of emerging and existing industry standards serving as your window into complex signal interactions.	Licensed software (www.keysight.com/find/vsa)

Keysight Support and Services

Warranty	
Global warranty *(included)*	Keysight's warranty service provides standard coverage for the country where product is used. – All parts and labor necessary to return to full specified performance – Recalibration for products supplied originally with a calibration certificate – Return shipment
R-51B-001-3C *(included)*	Return to Keysight Warranty—3 Years – 15 days typical turnaround repair service
R-51B-001-5C *(optional)*	Return to Keysight Warranty—5 Years - 15 days typical turnaround repair service
R1603-A-003 Express Warranty upgrade *(optional)*	The express warranty upgrades the global warranty to provide, for 3 years, a 5 day typical turnaround repair service in the US, Japan, China and many EU countries.
R1603-A-005 Express Warranty upgrade *(optional)*	The express warranty upgrades the global warranty to provide, for 5 years, a 5 day typical turnaround repair service in the US, Japan, China and many EU countries
Support	
Core Exchange Program *(for qualified self-maintainers in US only)*	Keysight's replacement Core Exchange program allows fast and easy module repairs. A replacement core assembly is a fully functioning pre-calibrated module replacement that is updated with the defective module serial number, allowing the replacement module to retain the original serial number.
Self-Test Utility *(included)*	A self-test utility runs a set of internal tests which verifies the health of the modules and reports their status.
Startup Assistance	
One day startup assistance *(included)*	A Keysight applications engineer will help you get started and install the modules in a chassis, configure the controller, load software and make first measurements.
Calibration and Traceability	
Factory Calibration *(included)*	Keysight's modular products are factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate.
R1282A Annual Calibration Service *(optional)*	– Keysight Calibration – Keysight Calibration + Uncertainties – Keysight Calibration + Uncertainties + Guardbanding – Standards Compliance – ANSI Z540.3-2006, ISO 17025:2005, ANSI Z540-1-1994, ISO 9001:2008
Calibration Cycle *(optional)*	A one year calibration cycle is recommended.
Calibration Sites *www.keysight.com/find/infoline*	– At Keysight Worldwide Service Centers – On-site by Keysight – By self-maintainers

Modular System Requirements

System requirements		
Topic	**Windows 7 and Vista Requirements**	**Windows XP Requirements**
Operating systems	Windows 7 (32-bit and 64-bit) Windows Vista, SP1 and SP2 (32-bit and 64-bit)	Windows XP, Service Pack 3
Processor speed	1 GHz 32-bit (x86), 1 GHz 64-bit (x64) (no support for Itanium 64)	600 MHz or higher required 800 MHz recommended
Available memory	4 GB minimum 8 GB or greater recommended	3 GB minimum
Available disk space [1]	1.5 GB available hard disk space, includes: – 1 GB available for Microsoft .NET Framework 3.5 SP1 [2] – 100 MB for Keysight IO Libraries Suite	1.5 GB available hard disk space, includes: – 1 GB available for Microsoft .NET Framework 3.5 SP1 [2] – 100 MB for Keysight IO Libraries Suite
Video	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics is supported)	Super VGA (800 x 600) 256 colors or more
Browser	Microsoft Internet Explorer 7.0 or greater	Microsoft Internet Explorer 6.0 or greater

1. Because of the installation procedure, less memory may be required for operation than is required for installation.
2.NET Framework Runtime Components are installed by default with Windows Vista and Windows 7. Therefore, you may not need this amount of available disk space.

Modular Instruments

Chassis and Controllers

PXI 18-slot chassis (M9018A) with PCI Express® Gen 2 performance, 16 PXI hybrid slots, and an innovative cooling design that saves rack space and has lower maintenance cost (PXIe controller, M9036A).

Bit Error Testers

PXI 18-slot chassis (M9018A) with PCI Express® Gen 2 performance, 16 PXI hybrid slots, and an innovative cooling design that saves rack space and has lower maintenance cost (PXIe controller, M9036A).

Data Acquisition and Switching

The PXI data acquisition and switch modules deliver high-performance signal connections with high-speed, 500 µs multiplexers, 300 W GP switches and high-density 256 2-wire matrix modules. RF and microwave switches also deliver low insertion loss and VSWR for excellent RF signal integrity and dynamic range.

Digital I/O

PXI digital IO modules are designed for digital sensing and control of simple devices, digital functional testing.

Digital Multimeters

PXI DMMs deliver market-leading speed at their price points, measure common parameters such as DCV, DCI, ACV, ACI, 2- and 4-wire resistance, capacitance, temperature and frequency.

Digitizing Scopes and Digitizers

PXI modular digitizers offer analog-to-digital converters that are easy to integrate and are designed to provide very high-speed measurements on wideband signals while keeping high acquisition quality.

Digital to Analog Converters

PXI D/A converters and V/I sources are capable of supplying high and low voltage levels and source currents on one or multiple channels.

Function and AWGs

PXI AWGs deliver unprecedented performance for creation of complex wideband waveforms. High-sampling rate and high-bit resolution provided in a single instrument enable designers to create ideal waveforms for accurate test of radar, satellite and frequency agile systems.

Pulse Pattern Generators

PXI Pulse Pattern Generator instruments are capable of generating a number of low jitter patterns at rates up to 10.3125 Gb/s for transceiver and telecommunications equipment test.

Spectrum and Signal Analyzers

PXI family of vector signal analyzer modules offer complete solutions including software and programming examples for communications, radar and avionics signals. Product offering includes vector signal analyzer solutions in single, dual and wideband MIMO configurations.

Vector Signal Generator

The new PXIe VSG provides exclusive baseband tuning technology innovation that combines switching speed as low as 10 µs with excellent RF parametric performance.

AXIe Modular Products

AXIe modular products are designed for high-performance, scalable instrumentation and offer fast data transfers to the host controller. AXIe's product portfolio includes: chassis and controllers, multi-channel digitizers, arbitrary waveform generators, logic analyzers, PCI Express protocol analyzers, HDMI protocol analyzers, MIPI D-PHY protocol analyzer/exerciser.

myKeysight

www.keysight.com/find/mykeysight
A personalized view into the information most relevant to you.

www.axiestandard.org
AdvancedTCA® Extensions for Instrumentation and Test (AXIe) is an open standard that extends the AdvancedTCA for general purpose and semiconductor test. Keysight is a founding member of the AXIe consortium.

www.pxisa.org
PCI eXtensions for Instrumentation (PXI) modular instrumentation delivers a rugged, PC-based high-performance measurement and automation system.

Three-Year Warranty
www.keysight.com/find/ThreeYearWarranty
Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.

Keysight Assurance Plans
www.keysight.com/find/AssurancePlans
Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.

www.keysight.com/quality
Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2008
Quality Management System

Keysight Channel Partners
www.keysight.com/find/channelpartners
Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

www.keysight.com/find/modular

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:
www.keysight.com/find/contactus

Americas

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Belgium	0800 58580
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For other unlisted countries:
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