Keysight Technologies

M9381A PXIe Vector Signal Generator & M9391A PXIe Vector Signal Analyzer

1 MHz to 3 GHz or 6 GHz

Configuration Guide

KEYSIGHT TECHNOLOGIES

Overview

This configuration guide contains information to help you configure your M9391A PXIe vector signal analyzer (PXIe VSA), M9381A PXIe vector signal generator (PXIe VSG) and combine them into solutions to meet your requirements.

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HARDWARE

A. Select Options for M9381A PXIe VSG

Step 1. Start with **M9381A PXIe VSG base configuration**			
◉	The M9381A PXIe VSG (occupies 4 slots) includes:		
	M9301A	PXIe synthesizer	Frequency range 1 MHz – 3 GHz
	M9310A	PXIe source output	Modulation bandwidth 40 MHz
	M9311A	PXIe digital vector modulator	Memory 32 MSa
			One day start up assistance
			Modular interconnect cables
			Software, example programs and product information on CD

Step 2. Choose a frequency range			
◉	M9381A-F03	1 MHz – 3 GHz	Included in base configuration
○	M9381A-F06	1 MHz – 6 GHz	

Step 3. Choose a modulation bandwidth			
◉	M9381A-B04	40 MHz	Included in base configuration
○	M9381A-B10	100 MHz	
○	M9381A-B16	160 MHz	

Step 4. Choose memory size			
◉	M9381A-M01	32 MSa	Included in base configuration
○	M9381A-M05	512 MSa	
○	M9381A-M10	1024 MSa	

Step 5. Add high output power (optional) Minimizes need for external amplification to overcome power loss			
○	M9381A-1EA	High output power	Max output power +18 dBm across the frequency range

Step 6. Add fast switching speed (optional) Accelerates test throughput			
○	M9381A-UNZ	Fast switching	240 µs RF tuning and 10 µs baseband tuning in list mode

Step 7. Add analog modulation (optional)			
○	M9381A-UNT	Analog modulation	AM, FM, phase, pulse & multitone modulation

Step 8. Add phase coherency (optional)			
○	M9381A-012	LO sharing for phase coherency	Needed on each VSG channel sharing M9301A synthesizer

B. Select Options for M9391A PXIe VSA

Step 1. Start with **M9391A PXIe VSA base configuration**			
◉		The M9391A PXIe VSA base configuration (occupies 3 slots) includes:	
	M9301A	PXIe synthesizer	Frequency range 1 MHz – 3 GHz
	M9350A	PXIe downconverter	Analysis bandwidth 40 MHz
	M9214A	PXIe IF digitizer	Memory 128 MSa (512 MB)
			One day start up assistance
			Modular interconnect cables
			Software, example programs and product information on CD

Step 2. Choose a frequency range			
◉	M9391A-F03	1 MHz – 3 GHz	Included in base configuration
○	M9391A-F06	1 MHz – 6 GHz	

Step 3. Choose an analysis bandwidth			
◉	M9391A-B04	40 MHz	Included in base configuration
○	M9391A-B10	100 MHz	
○	M9391A-B16	160 MHz	

Step 4. Choose memory size			
◉	M9391A-M01	128 MSa	Included in base configuration
○	M9391A-M05	512 MSa	
○	M9391A-M10	1024 MSa	

Step 5. Add fast switching speed (optional) Accelerates test throughput			
○	M9391A-UNZ	Fast switching	320 μs RF frequency tuning in list mode

Step 6. Add phase coherency (optional)			
○	M9391A-012	LO sharing for phase coherency	Needed on each VSA channel sharing M9301A synthesizer

C. Add M9300A PXIe Frequency Reference(s)

Required to meet data sheet specifications

Step 1. Add a M9300A PXIe frequency reference (occupies 1 slot) One frequency reference required per chassis. It can support multiple VSGs or VSAs			
○	M9391A-300	Adds M9300A PXIe frequency reference	Five 100 MHz outputs One 10 MHz output Internal 10 MHz OCXO timebase output

D. Select Controller (either embedded controller or via PC)

Step 1. If selecting an embedded controller, select either M9036A or M9037A [1]

○   M9036A Mid-performance embedded controller
Intel i5-520E dual-core, 2.4 GHz, 4 thread, 4GB RAM

            Select the M9036A for mid-performance, lower cost or,
if your application requires XP operating system

○   M9037A High-performance embedded controller
Intel i7-4700EQ quad-core processor, 2.4 GHz, 8 thread,
4 GB RAM

            Select M9037A for the best performance if you have memory
intensive applications, multiple applications running in parallel or
if a lot of data is sent to the PC from the PXIe chassis. Features
removable SSD drive for security and x8 PCIe® connector on
front for connection to second chassis

Step 2. Upgrade from standard memory size (optional)

For M9036A		
○	M9036A-M08	Memory upgrade from 4 GB to 8 GB RAM
For M9037A		
○	M9037A-M08	Memory upgrade from 4 GB to 8 GB RAM
○	M9037A-M16	Memory upgrade from 4 GB to 16 GB RAM

Step 3. Select an operating system

For M9036A		
○	M9036A-WE3	Microsoft Windows Embedded Standard 7 (32-bit)
○	M9036A-WE6	Microsoft Windows Embedded Standard 7 (64-bit)
○	M9036A-WXP	Downgrade to Microsoft Windows XP (32-bit)
For M9037A		
○	M9037A-WE3	Microsoft Windows Embedded Standard 7 (32-bit)
○	M9037A-WE6	Microsoft Windows Embedded Standard 7 (64-bit)

1. The M9018A 18-slot chassis includes empty space to the left of the 1st functional slot. The embedded controller occupies that empty space and the 1st functional slot.

D. Select Controller (either embedded controller or via PC) (continued)

To use your laptop PC as a controller [1]

○	M9045B	PCIe ExpressCard adaptor
○	Y1200B	PCIe cable
○	M9021A	PCIe cable interface[2] : 1 slot

To use your desktop PC as a controller [1]

○	M9048A	PCIe desktop adaptor
○	Y1202A	PCIe cable
○	M9021A	PCIe cable interface[2] : 1 slot

Multi-chassis configurations

Quantity of components required depends on controller selected and number of chassis supported. The M9037A embedded controller is recommended for multi-chassis configurations. The M9036A embedded controller or standalone PC are both supported.

Quantity required	2-chassis configurations with			4-chassis configurations with		
	M9037A	M9036A	PC	M9037A	M9036A	PC
M9021A PCIe cable interface	1	2	3	5	6	7
Y1202A PCIe cable	1	1	2 [3]	3	3	4 [3]

1. For list of qualified external controllers, please see Test Computer List Technical Note literature no. 5990-7632EN.
    See physical connections diagram on page 8.
2. The M9021A is used for either PC control option and can only be used with the Keysight M9018A 18-slot chassis.
3. Depending on the PC used, one of the PCIe cables may be Y1200B.

E. Select a Chassis and Accessories

Step 1. Select a chassis

○ M9018A   18-slot PXIe chassis

Step 2. Choose enough slot blocker kits and EMC filler panels to fill every open slot
Recommended to achieve data sheet specifications

○ Y1212A   Slot blocker kit: 5 slots

○ Y1213A   PXI EMC filler panel kit: 5 slots
Non-EMC filler panels are included with the M9018A PXIe
18-slot chassis.

Step 3. Choose a rack mount kit (optional)

○ Y1215B   Rack mount kit for M9018A 18-slot PXIe chassis
For more information on the rack mount kit, see the M9018A
data sheet, literature number **5990-6583EN**.

Step 4. Choose an air inlet kit[1] (optional)
Recommended for rack mounted systems with less than 1U space below chassis.

○ Y1214A   Air inlet kit: M9018A 18-slot chassis [1]

Step 5. Choose cable kits for advanced configurations (optional)

○	Y1243A	Cable kit for M9301A LO distribution for phase coherency	4 phase coherent channels also requires -012 option on M9381A or M9391A
○	Y1244A	Cable kit for synchronizing two M9018A chassis	

1. Available in 1-slot, 2-slot or 3-slot options depending on the chassis configuration. For more information, please visit www.keysight.com/find/m9018a.

Physical Connection Diagram for Controllers

Embedded controller

M9036A
or M9037A
embedded
controller

M9381A PXIe VSG and M9391A VSA
placed inside the M9018A PXIe chassis
with the M9037A embedded controller

External laptop PC control options

M9045B PCIe
ExpressCard
adaptor

Y1200B
PCIe cable

M9021A
PXIe cable
interface

Y1202A
PCIe cable

M9048A PCIe
adapter

External desktop PC control options
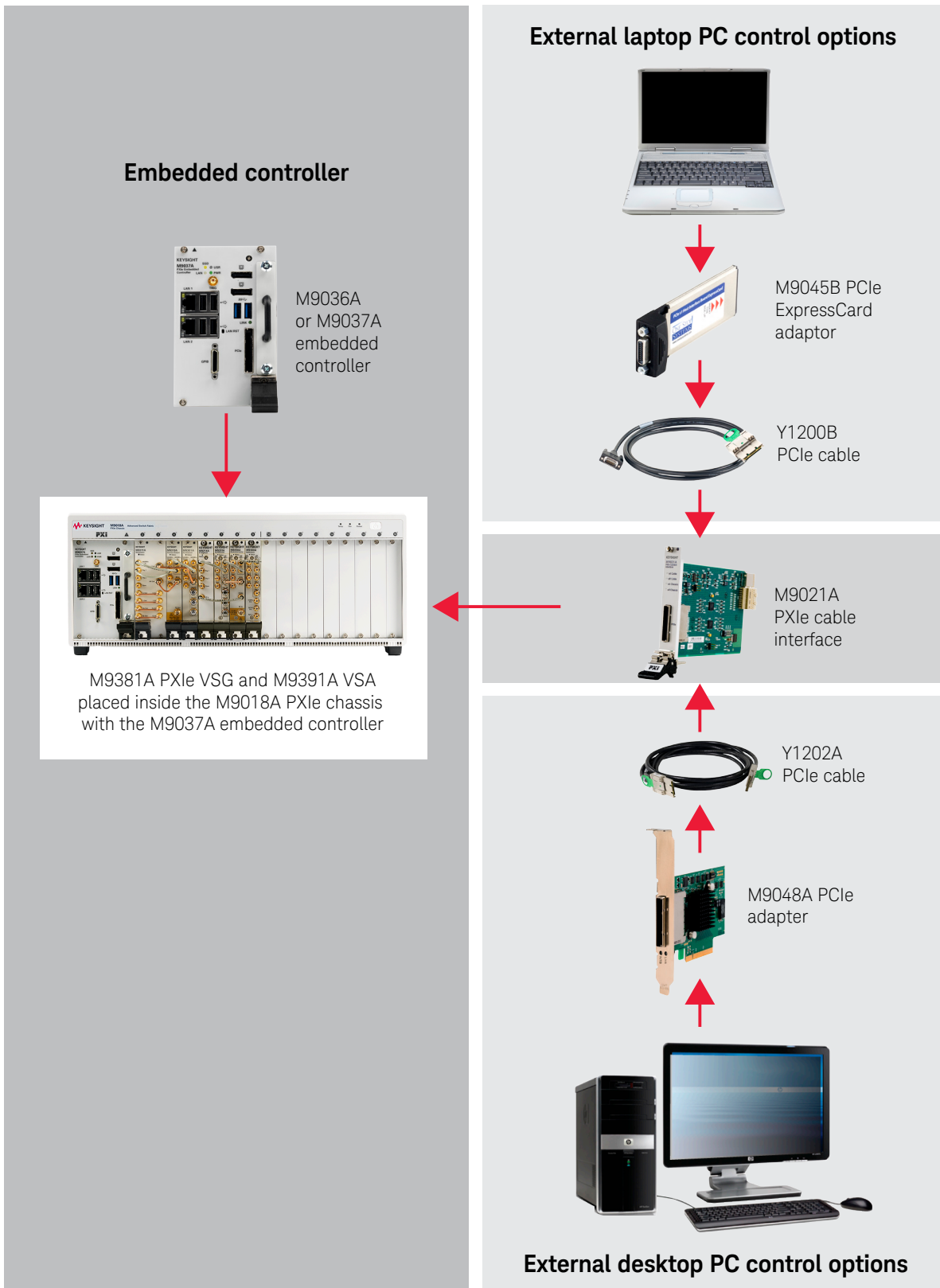
SOFTWARE

F. Select Software for M9381A PXIe VSG

Step 1. Start with M9381A base configuration

◉ The M9381A comes standard with the following software:
– Keysight IO Libraries Suite including Connection Expert [1]
– Soft front panel, drivers for use with Matlab, LabVIEW, Visual Studio (including VB Net, C#, C/C++), Keysight VEE [2]
– Sample waveforms and programming examples

Step 2. Download free Keysight Command Expert software [3] (optional)
FREE software that provides fast and easy instrument control for the PC. Command Expert combines instrument command sets, command sequences, documentation, syntax checking and command execution in one simple interface. Command Expert helps you to:

– Find instrument commands
– Access command documentation
– Verify command syntax
– Build instrument command sequences
– Execute instrument command sequences
– Integrate sequences in MATLAB, Visual Studio, Excel, LabVIEW, Keysight VEE or Keysight SystemVue PC application environment
– Generate code for command sequences in MATLAB, Visual C#, Visual Basic.NET and Visual C/C++
– Profile command execution time
– Debug command sequences using breakpoints and single stepping

Step 3. Add Signal Studio software [4] (optional)
Generate standard-compliant test signals validated by Keysight for receiver and component test.
Perpetual licenses available in fixed (option 9FP), transportable (option 9TP), 5 pack or 50 pack waveforms

Cellular communications

○	N7600B	W-CDMA / HSPA+
○	N7601B	cdma2000® / 1xEV-DO
○	N7602B	GSM / EDGE / EVO
○	N7612B	TD-SCDMA / HSDPA
○	N7624B	LTE / LTE-Advanced FDD
○	N7625B	LTE / LTE-Advanced TDD

Wireless connectivity

○	N7606B	*Bluetooth*®
○	N7615B	Mobile WiMAX™
○	N7617B	WLAN 802.11a/b/g/n/ac

Audio/video broadcasting

○	N7611B	Broadcast radio
○	N7623B	Digital video

Step 4. Add software extension license (optional)
Software extension license for Signal Studio

○	M9950A-1TP	Extend Signal Studio software from 4 to 8 channels

1. Both IO library (version 17.0 or newer) and Connection Expert software need to be installed on the PC controlling the PXI instruments. To download, visit www.keysight.com/find/iosuite.
2. Find latest versions of this software at www.keysight.com/find/m9381a.
3. To download or get more information on Command Expert, visit www.keysight.com/find/commandexpert.
4. For more information, see Signal Studio brochure, literature number 5989-6448EN or Signal Studio configuration assistant at http://rfmw.em.keysight.com/wireless/helpfiles/all-in-one_config_asst/ssconfig.html.

F. Select Software for M9381A PXIe VSG (continued)

Step 5. Add Waveform Creator Application software [1] (optional)		
○	M9099T	Waveform Creator Application
○	M9099T-LIC	Waveform Creator core with utility and multi-tone plug-ins (required)
○	M9099T-AYA	Digital modulation plug-in
○	M9099T-SVM	SystemVue plug-in (requires SystemVue v2013.08 or later)
○	M9099T-DFW	File based write unencrypted waveform license
○	M9099T-xxx-12M	Adds premium support for the above licenses for one year
Step 6. Add SystemVue software [2] (optional) Provides baseband libraries and applications to validate design concepts in prototypes or manufactured units		
○	W1461	SystemVue architect
Baseband Libraries and Applications		
○	W1918	LTE - Advanced
○	W1910	LTE
○	W1916	3G - GSM/EDGE/CDMA/cdma2000/W-CDMA/HSPA+
○	W1911	WiMAX 802.16e
○	W1917	WLAN 802.11a/b/g/n/ac
○	W1915	mmWave WPN 802.15c/802.11ad
○	W1919	Global navigation satellite system
○	W1914	DVB-x2
○	W1905	Radar
○	W1716	Digital Predistortion Builder
Step 7. Add MATLAB software [3] (optional) Create arbitrary waveforms, customize measurement and data analysis routines, create your own instruments applications and test systems, automate measurements, signal generation, and report generation		
○	N6171A-M01	MATLAB basic package
○	N6171A-M02	MATLAB standard package
○	N6171A-M03	MATLAB advanced package

1. For more information, see Waveform Creator Application Software Technical Overview, literature number 5991-3153EN.
2. For more information, see Wideband Digital Pre-Distortion with SystemVue and PXI Modular Instruments, literature number 5990-8883EN.
3. For more information on MATLAB software, visit www.keysight.com/find/n6171a.

G. Select Software for M9391A PXIe VSA

Step 1. Start with M9391A base configuration

◉ The M9391A comes standard with the following software:
  – Keysight IO Libraries Suite including Connection Expert [1]
  – Soft front panel, drivers for use with Matlab, LabVIEW, Visual Studio (including VB Net, C#, C/C++), Keysight VEE [2]
  – Sample waveforms and programming examples

Step 2. Download free Keysight Command Expert software [3] (optional)
FREE software that provides fast and easy instrument control for the PC. Command Expert combines instrument command sets, command sequences, documentation, syntax checking and command execution in one simple interface. Command Expert helps you to:

– Find instrument commands
– Access command documentation
– Verify command syntax
– Build instrument command sequences
– Execute instrument command sequences
– Integrate sequences in MATLAB, Visual Studio, Excel, LabVIEW, Keysight VEE or Keysight SystemVue PC application environment
– Generate code for command sequences in MATLAB, Visual C#, Visual Basic.NET and Visual C/C++
– Profile command execution time
– Debug command sequences using breakpoints and single stepping

Step 3. Add X-Series measurement applications for modular instruments [4] (optional)
Provides essential RF conformance measurements and analysis for specific communications standards and formats.
Transportable, perpetual licenses support up to 4 modular VSAs in one chassis.

○	M9080B	LTE/LTE-Advanced FDD
○	M9082B	LTE/LTE-Advanced TDD
○	M9073A	W-CDMA/HSPA+
○	M9071A	GSM/EDGE/EVO
○	M9079A	TD-SCDMA/HSPA
○	M9076A	1xEV-DO
○	M9072A	cdma2000/cdmaOne
○	M9077A	WLAN 802.11a/b/g/n/ac
○	M9063A	Analog demodulation
○	M9064A	VXA vector signal analysis
○	M9068A	Phase noise
○	M9081A	*Bluetooth*

1. Both IO library (version 17.0 or newer) and Connection Expert software need to be installed on the PC controlling the PXI instruments.
   To download, visit www.keysight.com/find/iosuite.
2. Find latest versions of this software at www.keysight.com/find/m9391a.
3. To download or get more information on Command Expert, visit www.keysight.com/find/commandexpert.
4. For more information, see "Accelerate PXI VSA Measurements with X-Series Measurement Applications," literature number 5991-2604EN.

G. Select Software for M9391A PXIe VSA (continued)

Step 4. Add 89600 VSA software [1] (optional)
Provides time and spectrum measurements, powerful displays, data recording and playback, links to Matlab and more

○	89601B-200	Basic 89600 VSA software
○	89601B-300	Hardware connectivity to over 40 Keysight instruments, including the M9391A PXIe VSA
Measurement options		
○	89601B-AYA	General purpose vector modulation analysis of over 30 types of presets
○	89601B-BHF	Custom OFDM modulation analysis of proprietary and pre-standard OFDM formats
○	89601B-B7R	WLAN 802.11a/b/g/j/p
○	89601B-B7Z	WLAN 802.11n MIMO
○	89601B-BHJ	WLAN 802.11ac MIMO (requires option B7Z)
○	89601B-BHD	LTE FDD
○	89601B-BHG	LTE-Advanced FDD (requires option BHD)
○	89601B-BHE	LTE TDD
○	89601B-BHH	LTE-Advanced TDD (requires option BHE)
○	89601B-B7T	cdma2000/cdmaOne
○	89601B-B7U	W-CDMA/HSPA+
○	89601B-B7W	1xEV-DO
○	89601B-B7X	TD-SCDMA
○	89601B-B7R	3G bundle (includes cdma2000, W-CDMA/HSPA+, 1xEV-DO & TD-SCDMA options)
○	89601B-BHC	RFID
○	89601B-BHK	Custom IQ modulation analysis
○	89601B-BHL	Channel quality measurements
○	89601B-BHP	FMCW radar analysis
○	89601B-BHQ	Pulse analysis
○	89601B-SSA	Spectrum analysis

1. For more information, see 89600 VSA software brochure literature number 5990-6553EN.

H. Select a Solution Start-Up Kit

Choose a solution level start-up kit (optional)
Includes documentation, configuration software and example programs

○	Y1299A-001	PXI multi-channel MIMO, reference solution kit [2]
○	Y1299A-002	RF power amplifier test, reference solution kit
○	Y1299A-004	RF PA/FEM characterization and test, reference solution kit

2. Keysight M9018A PXIe chassis required for multi-channel synchronization.

SERVICES

I. Calibration, Start-Up Assistance

◉		One day start-up assistance	Included in base configuration
○	M9381A-UK6	Commercial calibration certificate with test data for M9381A (M9301A, M9310A, M9311A)	Calibration certificate with measurement results available only at time of purchase.
○	M9391A-UK6	Commercial calibration certificate with test data for M9391A (M9301A, M9350A, M9214A)	Calibration certificate with measurement results available only at time of purchase.
○	M9300A-UK6	Commercial calibration certificate with test data for M9300A	Calibration certificate with measurement results available only at time of purchase.
○	N7800A	Calibration and adjustment software	

One day start-up assistance

A Keysight Technologies applications engineer will get you started quickly by helping you install the modules in a chassis, configure the controller, load software and start making measurements.

Calibration services

The modular products are factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate. A one year calibration cycle is recommended. The M9381A PXIe VSG and M9391A PXIe VSA are supported by the Keysight N7800A Calibration Software to perform calibrations that test 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.

N7800A calibration & adjustment software

The M9381A PXIe VSG and M9391A PXIe VSA are supported by Keysight's calibration and adjustment software. This is the same software used at Keysight's service centers to automate calibration. The software offers compliance tests for ISO 17025:2005, ANSI/NCSL Z540.3-2006, and measurement uncertainty per ISO Guide to Expression of Measurement Uncertainty.

Product Information: www.keysight.com/find/contactus
       Or call: 1 800 829-4444 US
Repair and Calibration: www.keysight.com/find/infoline
For all modular products: www.keysight.com/find/modular

CONFIGURATIONS

Typical configurations including the M9381A PXIe VSG and M9391A PXIe VSA are shown in this section. One M9300A frequency reference module is required per chassis to meet specifications and can be ordered standalone (M9300A) or as an option to the PXIe VSG or VSA (M9381A-300 or M9391A-300). Configurations which include a chassis can be ordered pre-assembled, with modules installed, cables connected and software installed. Please contact your Keysight Sales Representative to order these assembled M9018AC PXI Modular Solutions Configurations.

For detailed information on cabling connections, PXI module installation and PXIe VSG and VSA operation, please see the M9391A/M9381A Startup Guide literature number M9300-90090.

Standalone M9381A PXIe VSG & M9391A PXIe VSA

The M9381A PXIe VSG and M9391A PXIe VSA may be ordered as individual, standalone instruments. Base instrument configuration includes module interconnect cables for standard module configuration. For phase coherency between channels, or multi-chassis configurations, see additional cable kit options in Accessories section.

Single M9381A PXIe VSG
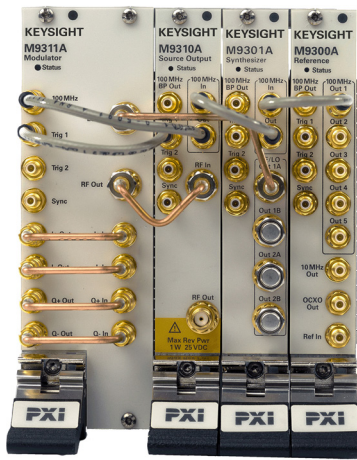
Figure 1. Standalone M9381A PXIe VSG with M9300A frequency reference and standard module interconnect cables

Single M9391A PXIe VSA
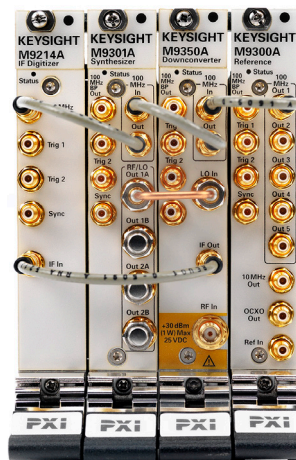
Figure 2. Standalone M9391A PXIe VSA with M9300A frequency reference and standard module interconnect cables

Single PXIe VSG & VSA in a Chassis

This configuration includes an M9381A PXIe VSG, M9391A PXIe VSA and one M9300A frequency reference in a M9018A 18-slot chassis with embedded controller, slot blockers and EMC filler panels. This solution is ideal for high-speed test of RF components in design validation and manufacturing.
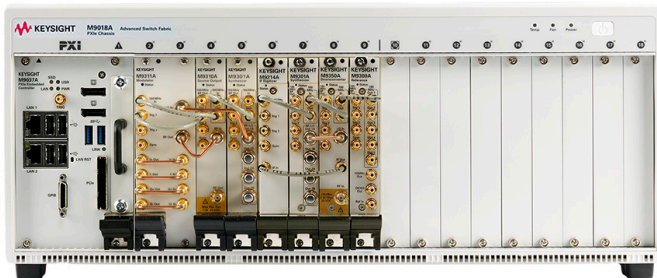
Figure 3. PXIe VSG and VSA in a chassis with embedded controller, slot blockers and filler panels

Multiple M9381A PXIe VSGs in a Chassis

Up to four M9381A PXIe VSGs can be installed in a single M9018A 18-slot PXIe chassis, sharing a single embedded controller, as shown here. These VSGs share one M9300A frequency reference and can be time-synchronized with backplane triggering to generate test stimulus for multi-channel receivers and MIMO devices. The VSGs can also be configured to be phase coherent with Option 012 and cabling all channels to use a single M9301A synthesizer module with Y1243A cable kit.
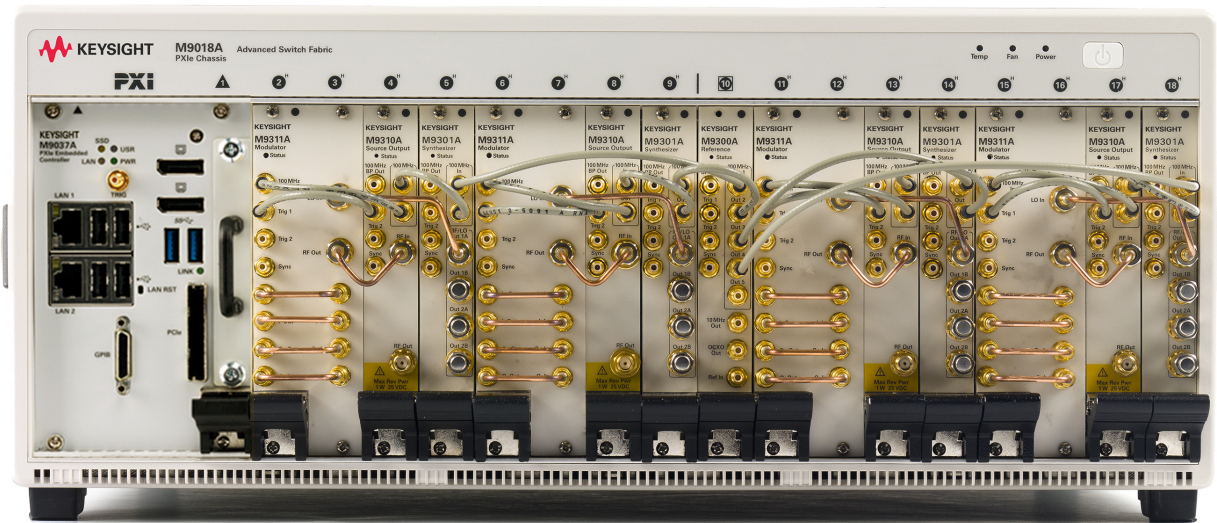
Figure 4. 4-channel M9381A PXIe VSG with chassis & controller

Multiple M9391A PXIe VSAs in a Chassis

Up to four M9391A PXIe VSAs can be installed in a single M9018A 18-slot PXIe chassis, sharing a single embedded controller as shown here. These VSAs share one M9300A frequency reference and can be time-synchronized with backplane triggering to measure multi-channel transmitters and analyze MIMO devices. The VSAs can also be configured to be phase coherent with Option 012 and cabling all channels to use a single M9301A synthesizer module with Y1243A cable kit. Slot blockers and EMC filler panels are installed in the empty slots.

Figure 5. 4-channel M9391A PXIe VSA with chassis & controller, slot blockers and filler panels

2x2 PXIe VSG and VSA Configuration

Two M9381A PXIe VSGs and two M9391A PXIe VSAs can be installed together in a single M9018A 18-slot PXIe chassis, sharing a single embedded controller, as shown here. The VSGs and VSAs share one M9300A frequency reference and backplane triggering is used to create a 2-channel source and a 2-channel analyzer for testing 2x2 MIMO devices. For phase coherency, the VSG channels can be configured with Option 012 and both channels cabled to use one M9301A synthesizer module. The VSAs can similarly be configured for phase coherence with Option 012 and both channels cabled with the Y1243A cable kit to use one M9301A synthesizer. Slot blockers and EMC filler panels are installed in the empty slots.
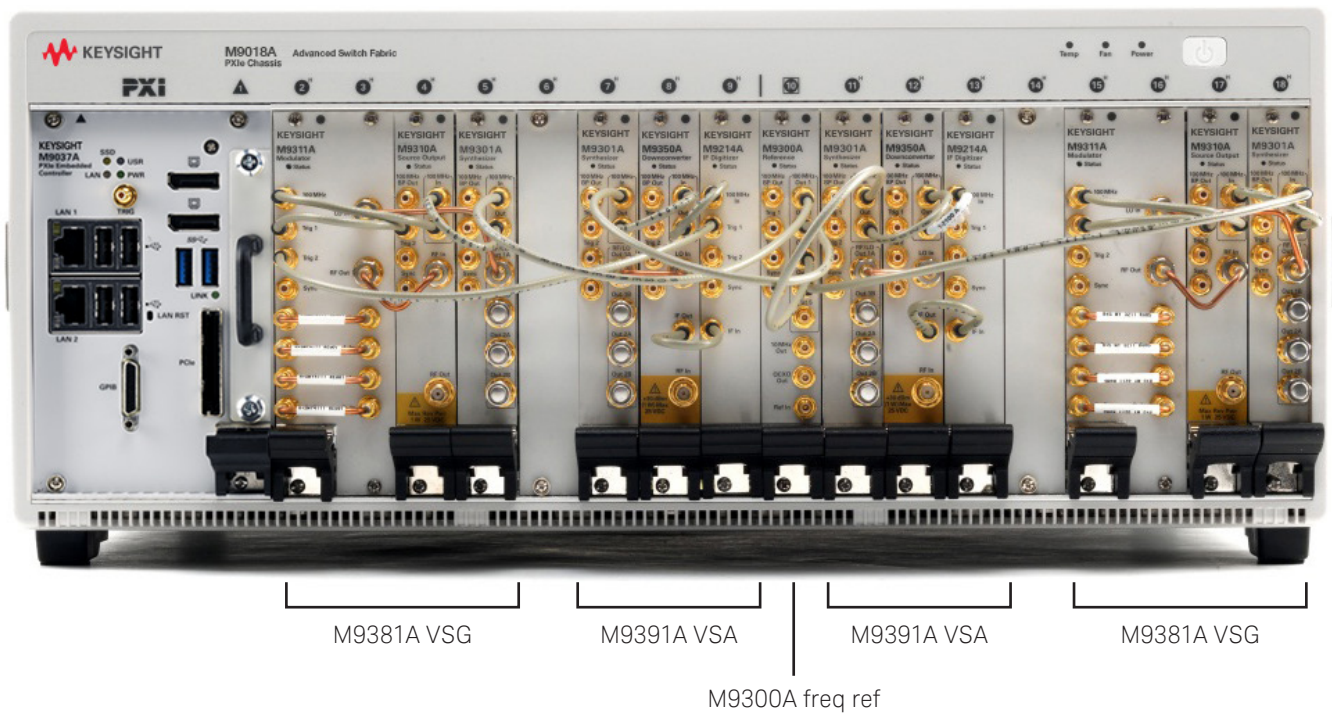
Figure 6. 2-channel PXIe VSG and 2-channel PXIe VSA with chassis, embedded controller, slot blockers and filler panels

4x4 PXIe VSG and VSA Configuration

A 4-channel M9381A PXIe VSG and 4-channel M9391A PXIe VSA can be configured using a single (M9036A or M9037A) embedded controller, M9021A PCIe cable interface modules (2 with M9036A and 1 with M9037A) and PCIe cable to connect the two M9018A 18-slot PXIe chassis. One M9300A frequency reference is installed per chassis and shared between all instruments in that chassis. All channels within a chassis are synchronized with backplane triggering and phase coherency is enabled with Option 012 and Y1243A cable kit to use one M9301A synthesizer module for the VSAs and one for the VSGs. Slot blockers and EMC filler panels are installed in the empty slots.
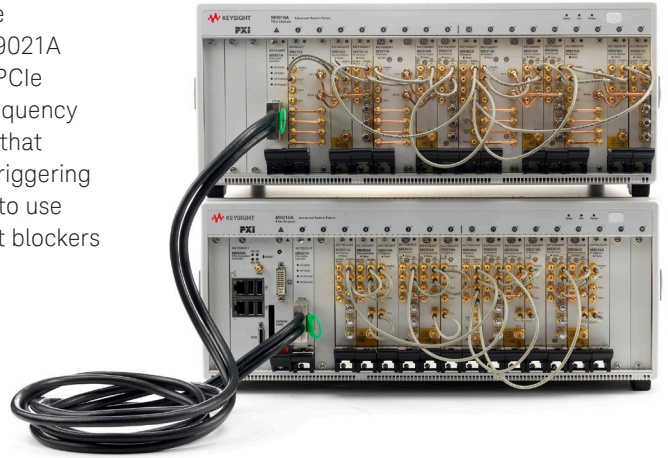
8x8 PXIe VSG and VSA Configuration

An 8-channel M9381A PXIe VSG and 8-channel M9391A PXIe VSA can be configured using a single (M9036A or M9037A) embedded controller, M9021A PCIe cable interface modules (5 with M9037A and 6 with M9036A) and 3 PCIe cables to connect the 4 M9018A 18-slot PXIe chassis. One M9300A frequency reference is installed per chassis and shared between all instruments in that chassis. Slot blockers and EMC filler panels are installed in the empty slots.
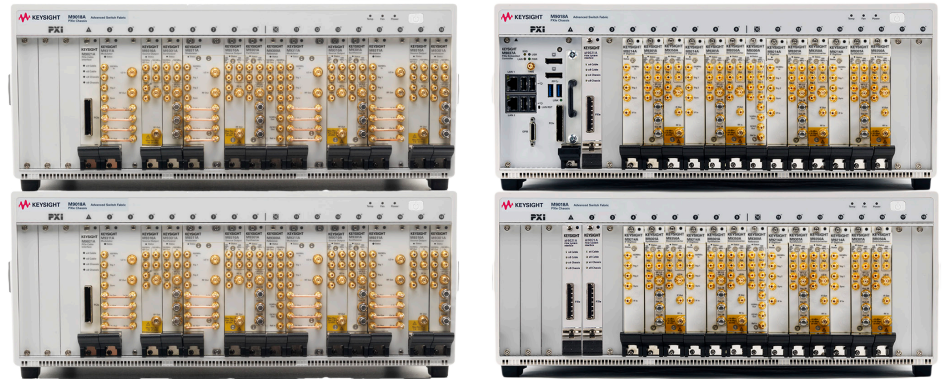
Figure 8. Time-synchronous 8-channel PXIe VSG and 8-channel PXIe VSA

8x8 phase coherency is available with Option 012 and 2 V2802A LO distribution networks. The V2802A extends the M9301A synthesizer LO signal to up to 8 outputs. Contact your Keysight Sales Representative for more information on the V2802A LO distribution network.

Figure 9. 8-channel PXIe VSG and 8-channel PXIe VSA with two V2802A LO distribution networks for phase coherency beyond 4 channels

REFERENCE SOLUTION RECOMMENDED CONFIGURATIONS

A reference solution is a combination of hardware and software enabling users to more rapidly evaluate a test configuration for a specific test application. Reference solution designs facilitate rapid evaluation and integration of the test configuration into your test environment, and reduces time to first measurement.

LTE/LTE–Advanced Multi–Channel Reference Solution Typical Configurations

This reference solution addresses LTE/LTE-A test challenges including the ability to validate critical multi-antenna techniques such as diversity, carrier aggregation, 8x8 MIMO spatial multiplexing and beamforming. In addition to the hardware and software configurations which enable you to gain deeper insight into LTE/LTE-A designs, the Reference Solution also comes with multi-channel configuration and calibration tools to help you quickly configure complex multi-channel PXI test systems.

Hardware

Recommended hardware based on channel configuration indicated with an embedded controller.

Product number/option	Short description	(# of sources) x (# of analyzers)				
		2x2	0x4	4x0	4x4	8x8
M9381A	**PXIe VSG**	**2**	**0**	**4**	**4**	**8**
M9381A-F06	6 GHz	*		*	*	*
M9381A-B10	100 MHz BW	*		*	*	*
M9381A-M05	512 MSa	*		*	*	
M9381A-M10	1024 MSa					*
M9391A	**PXIe VSA**	**2**	**4**	**0**	**4**	**8**
M9391A-F06	6 GHz	*	*		*	*
M9391A-B10	100 MHz BW	*	*		*	*
M9391A-M01	128 MSa	*	*		*	
M9391A-M10	1024 MSa					*
M9300A	**Frequency reference – one per chassis**	**1**	**1**	**1**	**2**	**4**
M9037A	**I7 embedded controller**	**1**	**1**	**1**	**1**	**1**
M9037A-M08	Memory upgrade 4 to 8 G RAM	*	*	*	*	
M9037A-M16	Memory upgrade 4 to 16 G RAM					*
M9037A-WE6	Microsoft Windows embedded 7 – 64-bit	*	*	*	*	*
M9021A	**PCIe cable interface multi-chassis extension**	**0**	**0**	**0**	**1**	**5**
Y1202A	PCIe cable for connecting multiple chassis	0	0	0	1	3
M9018A	**18-slot PXIe chassis**	**1**	**1**	**1**	**2**	**4**
Y1212A	Slot blocker kit: 5 slots	1	1	0	1	2
Y1213A	EMC filler panels: 5 slots	1	1	0	2	3
Y1244A	Cable kit for synchronizing two M9018A chassis	0	0	0	0	2
Y1299A-001	**Multi-channel MIMO toolkit**	**1**	**1**	**1**	**1**	**1**
Optional phase coherency						
M9381A-012	PXI VSG phase coherent channels	2	0	4	4	8
M9391A-012	PXI VSA phase coherent channels	2	4	0	4	8
Y1243A	Cable kit for M9301A LO distribution	1	1	1	2	0
V2802A	LO distribution unit across chassis	0	0	0	0	2

Signal Generation and Analysis Software

Product number/option	Short description	(# of sources) x (# of analyzers)				
		2x2	0x4	4x0	4x4	8x8
N7624B	**Signal Studio for LTE / LTE-Advanced FDD**	1	0	1	1	1
N7624B-HFP	Basic LTE FDD R9, fixed perpetual license	*		*	*	*
N7624B-SFP	Advanced LTE FDD R9, fixed perpetual license	*		*	*	*
N7624B-JFP	Basic LTE-Advanced FDD R10, fixed perpetual license	*		*	*	*
N7624B-TFP	Advanced LTE-Advanced FDD R10, fixed perpetual license	*		*	*	*
N7624B-9FP	Connect to M9381A/M9252A fixed perpetual license	*		*	*	*
M9950A	**Software extension license for modular instruments**	0	0	0	0	1
M9950A-1TP	Signal Studio software extension from 4 to 8 channels					*
89601B	**89600 VSA software**	1	1		1	1
89601B-200	Basic 89600 VSA software, transportable license	*	*		*	*
89601B-300	Hardware connectivity, transportable license	*	*		*	*
89601B-BHD	LTE FDD, transportable license	*	*		*	*
89601B-BHG	LTE-Advanced FDD, transportable license	*	*		*	*
89601B-SSA	Spectrum analysis	*	*		*	*

Optional software

89620B	89600 WLA software
89620B-001	Basic 89600 wireless link analysis (WLA) software, transportable license
89620B-002	LTE analysis, transportable license
89620B-003	LTE-Advanced analysis, transportable license
M9080B	**X-Series measurement apps for LTE/LTE-Advanced FDD for single channel measurement**
M9080B-1TP	LTE FDD
M9080B-2TP	LTE-Advanced FDD

For LTE-A TDD:

– Replace N7624B-xxx above with N7625B with options –EFP, -GFP, -JFP, -TFP, -9FP
– Replace 89601B-BHD, -BHG with 89601B–BHE, BHH

RF Power Amplifier Test Reference Solution
Typical Configurations

This reference solution addresses two key test challenges: reducing cost and increasing data throughput for RF power amplifier (PA) test. Both must be done despite the addition of more complex test techniques such as digital predistortion (DPD) and envelope tracking (ET). Control software enables tight synchronization between the signal source and the arbitrary waveform generator (AWG), resulting in optimal alignment between input signal and envelope. Test code examples that have been designed to optimize test throughput without compromising performance.

Hardware

Recommended hardware based on functionality required. See configuration guide 5992-0072EN for additional product options and more advanced configurations.

Product number/option	Short description	Basic PA measurements	With DPD	With ET
M9381A	**PXIe VSG**	1	1	1
M9381A-F06	6 GHz	*	*	*
M9381A-B10	100 MHz BW	*	*	*
M9381A-M01	32 MSa	*		*
M9381A-M05	512 MSa		*	
M9381A-UNZ	Fast switching	*	*	*
M9391A	**PXIe VSA**	1	1	1
M9391A-F06	6 GHz	*	*	*
M9391A-B10	100 MHz BW	*	*	*
M9391A-M01	128 MSa	*	*	*
M9391A-UNZ	Fast switching	*	*	*
M9300A	**Frequency reference – one per chassis**	1	1	1
M937XA	**PXIe VNA**	1	1	1
M9371A	300 kHz to 6.5 GHz	*	*	*
SD AOU-H3353	**Signadyne AWG**	-	-	1
M9037A	**I7 embedded controller**	1	1	1
M9037A-M08	Memory upgrade 4 to 8 G RAM	*	*	*
M9037A-WE6	Microsoft Windows embedded 7 – 64-bit	*	*	*
M9018A	**18-slot PXIe chassis**	1	1	1
Y1212A	Slot blocker kit: 5 slots	2	2	2
Y1213A	EMC filler panels: 5 slots	2	2	2
Y1299A-004	**RF PA/FEM toolkit**	1	1	1

Signal Generation and Analysis Software

Product number/option	Short description	Basic PA measurements	With DPD	With ET
N7624B	**Signal Studio for LTE / LTE-Advanced FDD**	**1**	**1**	**1**
N7624B-HFP	Basic LTE FDD R9, fixed perpetual license	*	*	*
N7624B-SFP	Advanced LTE FDD R9, fixed perpetual license	*	*	*
N7624B-JFP	Basic LTE-Advanced FDD R10, fixed perpetual license	*	*	*
N7624B-TFP	Advanced LTE-Advanced FDD R10, fixed perpetual license	*	*	*
N7624B-9FP	Connect to M9381A/M9252A fixed perpetual license	*	*	*
N7614B	**Signal Studio for PA Test**	**0**	**1**	**1**
N7614B-EFP	Envelope tracking			*
N7614B-FFP	Digital pre-distortion		*	
N7614B-9FP	Connect to M9381A/M9252A fixed perpetual license		*	*
M9080B	**X-Series measurement apps for LTE/LTE-Advanced FDD**	**1**	**1**	**1**
M9080B-1FP	Fixed perpetual license	*	*	*

Satellite Signal Monitoring Reference Solution Typical Configurations

This reference solution provides a fast, effective solution for monitoring large blocks of spectrum combined with precise digital modulation analysis to validate satellite signal integrity.

Hardware

Recommended hardware is based on functionality required. Sequential scanning and parallel scanning configurations up to 27 GHz are also available. Please see 5991-4580EN or www.keysight.com/find/solution-satsigmon for more information.

Product number/option	Short description	4-channel parallel scanning to 6 GHz
M9391A	**PXIe VSA**	**4**
M9391A-F06	6 GHz	*
M9391A-B16	160 MHz BW	*
M9391A-M10	1024 MSa	*
M9391A-UNZ	Fast switching	*
M9300A	**Frequency reference**	**1**
M9037A	**I7 embedded controller**	**1**
M9037A-M16	Memory upgrade 4 to 16 G RAM	*
M9037A-WE6	Microsoft Windows embedded 7 – 64-bit	*
M9018A	**18-slot PXIe chassis**	**1**
Y1212A	Slot blocker kit: 5 slots	1
Y1213A	EMC filler panels: 5 slots	1

Signal Analysis Software

Product number/option	Short description	4-channel parallel scanning to 6 GHz
89601B	**89600 VSA software**	**1**
89601B-200	Basic 89600 VSA software, transportable license	*
89601B-300	Hardware connectivity, transportable license	*
89601B-AYA	Vector modulation analysis, transportable license	*
89601B-SSA	Spectrum analysis, transportable license	*

Upgrading Your System

Your product can be easily upgraded after the initial purchase. All PXIe VSA and PXIe VSG options are controlled by a licensing key and can be quickly installed by the user. How to upgrade your M9391A PXIe VSA or M9381A PXIe VSG:

1. Contact your Keysight representative to place an order for an option upgrade.
2. You will receive your hardware entitlement certificate via email.
3. Redeem the certificate online by following the instructions provided to receive a license key file.
4. Install the license key file using the Keysight License Manager.
5. Begin using the new capability.

Using a Non-Keysight Chassis

The M9381A and M9391A (with M9300A frequency reference) can be successfully installed in a non-Keysight PXI chassis. Please use the following guidelines.

– Ensure that the chassis has enough consecutive PXIe or PXI-H slots to accommodate the M9381A or M9391A and M9300A.
– Ensure that the chassis and controller supports peer-to-peer PXI Express I/O switch topology.
– Ensure that controller selected is compatible with chassis.

The Keysight M9018A PXIe chassis is required for channel synchronization capability.

Please contact your Keysight representative for more detailed information. For technical assistance with non-Keysight equipment, please refer to the equipment manufacturer's website.

PC Requirements for M9381A PXIe VSG and M9391A PXIe VSA Control [1]

	Windows 7
Operating system	Windows 7 (32 & 64 bit)
Processor speed	1.5 GHz dual core (x86 or x64) minimum, 2.4 GHz recommended No support for Itanium64
Available memory	4 GB minimum 8 GB recommended
Available disk space [1]	1.5 GB available hard disk space includes: 1 GB for Microsoft.NET framework 3.5 SPI [2] 100 MB for Keysight IO libraries suite
Video	Support for DirectX 9 graphics with 128 MB graphics recommended (SuperVGA supported)
Browser	Microsoft Internet Explorer 7.0 or greater

1. For a list of computers compatible with Keysight Technologies PXIe M9018A chassis, refer to Tested Computer Technical Note (literature no. 5990-7632EN).
2. NET framework runtime components are installed by default with Windows 7. Therefore, you may not need this amount of available disk space.
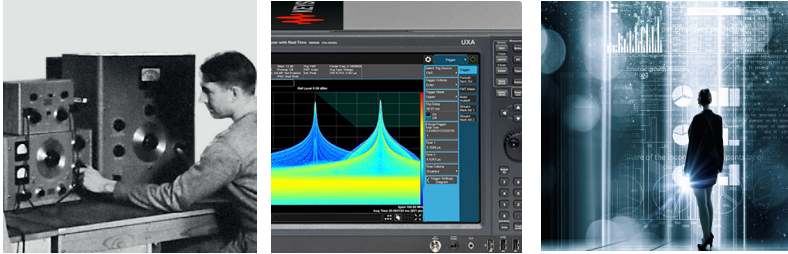
Related Literature

For more detailed product and specification information refer to the following literature and web pages:

- M9381A PXIe VSG, Data Sheet (literature no. 5991-0279EN)
- M9391A PXIe VSA, Data Sheet (literature no. 5991-2603EN)
- M9391A PXIe VSA and M9381A PXIe VSG, Startup Guide (literature no. M9300-90090).
- M9018A PXIe 18 slot Chassis Data Sheet (literature no. 5990-6583EN)
- M9037A PXIe High Performance Embedded Controller, Data Sheet (literature no. 5991-3661EN)
- X-Series Measurement Applications for Modular Instruments, Brochure (literature no. 5991-2604EN)
- 89600 VSA Software Brochure (literature no. 5990-6553EN)
- Signal Studio Software Brochure (literature no. 5989-6448EN)

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