Keysight Technologies

PXI Matrix Switch Modules

M9120A, M9121A, M9122A

Data Sheet



KEYSIGHT TECHNOLOGIES

Overview

Product Description

The Keysight Technologies, Inc. PXI matrix switch modules activate multiple channels in a single instance. Select a switch row to connect to any column and create routing for multiple signals between instruments and the device under test. Choose from high-speed, long-life reed relays capable of switching up to 100 Vrms with up to 20 W of power, or the higher power armature relays capable of switching up to 60W of power. Multiple switch matrices offer a variety of power and switch density options.

Installation and configuration is fast and easy with standard cable connections or an optional connector block, soft front panels, and Keysight Connection Expert. In addition, software drivers support the most common programming environments such as Visual Studio, C, C++, Visual Basic, MATLAB, and LabVIEW.

Applications

- Aerospace and defense
- Automotive
- Electronic test
- Medical
- Semiconductor

Features

- Quickly connect multiple high-voltage points
- High-density modules provide more connections in a smaller area
- Up to 256 2-wire crosspoints
- High-speed, long-life reed relays or higher power armature relays
- Software drivers support the most common programming environment
- Optional connector blocks offer reliable measurement from robust, high-pincount interconnects
- Easy programming and control with soft front panels and Keysight Command Expert

Customer Values

- Connect multiple points for high-pin-count applications
- Get the performance you need with high-speed 1000 µs reed relay switches or up to 60 W per channel
- Work in your programming environment of choice and reduce development time
- Fast and easy module installation and configuration

Easy Setup ... Test ... and Maintenance

Hardware Platform

Compliance

The matrix switch modules are PXI compliant with a J1 connector and can be used in PXI chassis with cPCI (J1), PXI-1 (J1 only), or PXIe hybrid slot connectors.

The PXI format offers high performance in a small, rugged package. It is an ideal deployment platform for many automated test systems. In addition, a wide array of complementary PXI products are currently available, such as multimeters, waveform generators, local oscillators, digitizers, and RF switch modules.

Software Platform

IO Libraries

Keysight IO Libraries Suite offers fast and easy instrument connections and now extends to modular instruments. IO Libraries Suite 16 adds support for PXI, helping you display all of the modules in your system, whether they are PXI, PXIe, or AXIe, as well as view information about installed software. In addition, the new version allows you to more easily find the right driver and start module soft front panels directly with Keysight Connection Expert.

Drivers

Keysight provides instrument drivers that work with your choice of software, saving time and preserving software and hardware investments. Keysight modular instruments come with IVI-COM, IVI-C, and LabVIEW software drivers that work in the most popular test and measurement development environments including LabVIEW, MATLAB, LabWindows/CVI, Visual Studio C, C++, C#, VEE, and Visual Basic.

With a broad selection of drivers already included, any Keysight PXI matrix switch can be swapped out, replaced, or upgraded with the latest version, requiring only minimal software adjustments.

Easy software integration

In addition, application code examples are included for LabVIEW, LabWindows/CVI, Visual Studio C, C++, C#, Visual Basic, and MATLAB, providing switch set-up and basic functionality. These application code examples are easily modified to quickly integrate the switch module into your measurement system.

Software Applications

Keysight soft front panels provide easy-to-use instrument communications. The PXI matrix switch graphical user interface guides developers through module setup so users can quickly configure the switch states. Switch control is also possible through the wide selection of instrument program interfaces.

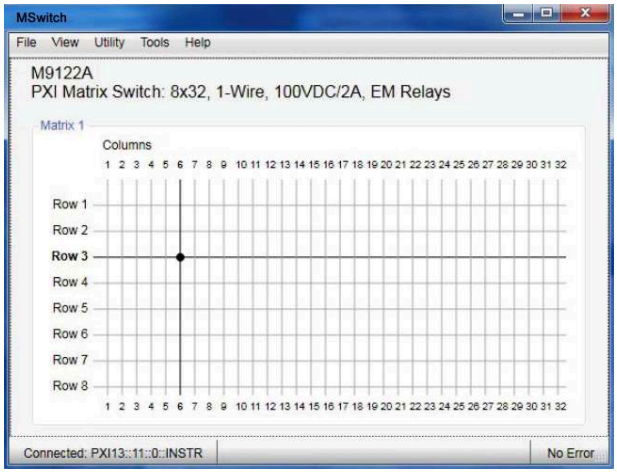


Figure 1. Matrix switch soft front panel

Specifications and Characteristics



Specification and Characteristic Summary

Following is a summary of specifications and characteristics for the Keysight PXI matrix switches. More detailed specifications and characteristics for each module are featured later in this document.

Matrix switch specification and characteristic summary

Multiplexer switches	Description	Type # slots	Channels	Switch speed (typical)	Max voltage	Current switch and carry	Relay type	Connectors
M9120A	Matrix switch	PXI 1-slot	4x32, 2-wire	3 msec	100 Vrms[1]	2 A/2 A	Armature	78 Dsub connector block or cable
M9121A	High density matrix switch	PXI 1-slot	4x64, 2-wire	< 1 msec[2]	100 Vrms[1]	0.5 A/0.5 A	0.5 A/0.5 A	200 LFH connector block or cable
M9122A	Matrix switch	PXI 1-slot	8x32, 1-wire	3 msec	100 Vrms[1]	2 A/2 A	Armature	50 Dsub connector block or cable

1. Not for connection to mains

Specifications and Characteristics (continued)

M9120A 4x32, 2-wire PXI matrix switch

The M9120A high-density matrix is designed to switch medium voltage/power signals. The 128, 2-wire armature relays offer higher voltage switching and up to 60W per channel. This module is ideal for telecom applications that need to simultaneously send and return signals.

The matrix module includes a 4-wire-wide bus to route signals between test instruments and your device under test. To create larger matrices, multiple modules can be linked together, for example, four rows of two M9120A modules can be joined to create a 4x64 matrix. Easily connect to the matrix with a 78-pin Dsub female connector or cable.

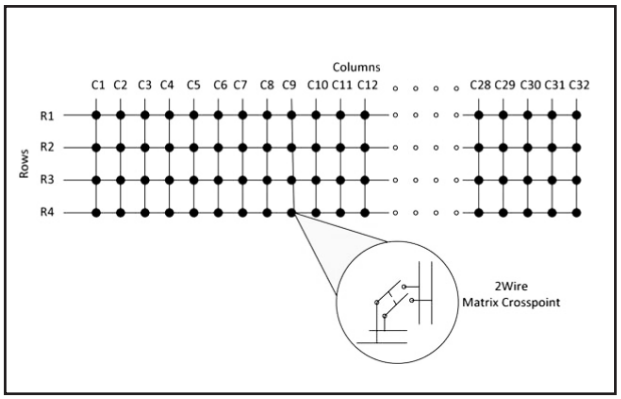


Figure 2. M9120A 4x32, 2-wire, armature relays

M9120A specifications and characteristics

General specifications	
Channels	4x32
Switch type	Medium power, 2-wire armature
Max volts[1]	100 Vrms
Max switch rating/carry rating	2.0 A
Switching characteristics *(nominal)*	
Max power	60 W
Switch speed ***(typical)***	*3 msec*
Inital path resistance, differential *(typical)*	*500 mΩ*
Connectors	78 Dsub connector block or cable
Bandwidth	7.5 MHz
DC isolation, Ch-Ch, Ch-Gnd 25C / 40%RH *(typical)* 25C / 80%RH *(typical)* 40C / 80%RH *(typical)*	 *$1x10^{10}$ Ω* *$1x10^{8}$ Ω* *$1x10^{7}$ Ω*
Thermal offset, single-ended *(typical)*	*8 µV*
Relay life, operations[2] Low power load *(typical)* Rated power load *(typical)*	 *> $1x10^{7}$* *> $1x10^{5}$*

1. Not for connection to mains
2. Relay life is defined as path resistance <1.4 Ω

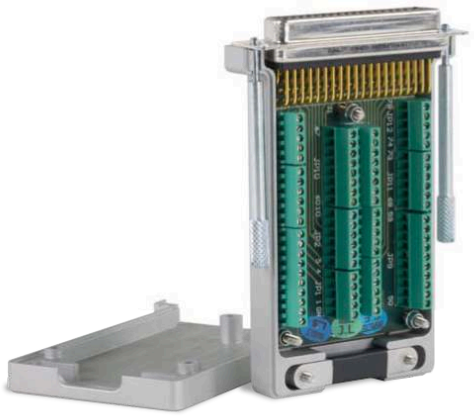


Figure 3. 78-pin Dsub connector block

Specifications and Characteristics (continued)

M9121A 4x64, 2-wire PXI high-density matrix switch

The M9121A ultra-high-density 4x64, full-crosspoint switch matrix, offers high-speed reed relay signal switching in a single PXI module. The crosspoints of the high-speed, 2-wire, long-life reed switches can be rapidy activated to route signals in your test system. The matrix relays support signal switching up to 100 Vrms with 10 W maximum power. The module includes a 4-wire-wide bus to route signals between test instruments and your device under test. To create larger matrices, multiple modules can be linked together. For example, four rows of two M9121A modules can be joined to create a 4x128 matrix. Easily connect to the matrix with a high-density, 200-pin low force helix (LFH) connector or cable.

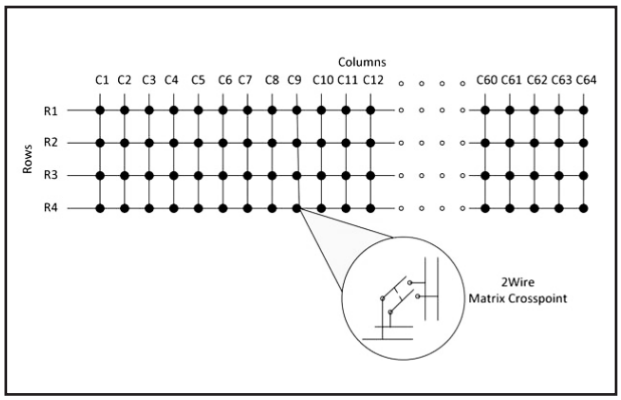


Figure 4. M9121A 4x64, 2-wire, reed relays

M9121A specifications and characteristics

General specifications	
Channels	4x64
Switch type	Ultra-high-density, 2-wire reed
Max volts[1]	100 Vrms
Max switch rating/carry rating	0.5 A
Switching characteristics *(nominal)*	
Max power	10 W
Switch speed *(typical)*	*< 1 ms*
Inital path resistance, differential *(typical)*	*900 mΩ*
Connectors	200 LFH connector block or cable
Bandwidth	10 MHz
DC isolation, Ch-Ch, Ch-Gnd, typical per channel 25C / 40%RH 25C / 80%RH 40C / 80%RH	 *$1x10^{10}$ Ω* *$1x10^{7}$ Ω* *$1x10^{6}$ Ω*
Thermal offset, differential *(typical)*	*6 µV*
Relay life, operations[2] Low power load (< 10 V) load *(typical)* Up to 100 V *(typical)*	 *$1x10^{9}$* *$1x10^{6}$*

1. Not for connection to mains
2. Relay life is defined as path resistance <1.4 Ω



Figure 5. 200-pin LFH connector block

M9122A 8x32, 1-wire, PXI Matrix Switch

The M9122A high-density, full 8x32 crosspoint switch matrix offers high-voltage switching in a PXI module. The matrix is designed with durable electromechanical switches that are capable of switching up to 100 Vrms, with up to 60 W of power.

Choose from crosspoints arranged in eight rows and 32 columns that can be activated instantaneously to route signals in your test system. The module includes an 8-wire-wide bus to easily route signals between test instruments and the device under test. To create larger matrices, multiple modules can be linked together. For example, create a larger matrix by joining eight rows of two M9122A modules to create a 16x32 matrix. Easily connect to the matrix with a 50-pin Dsub connector or cable.

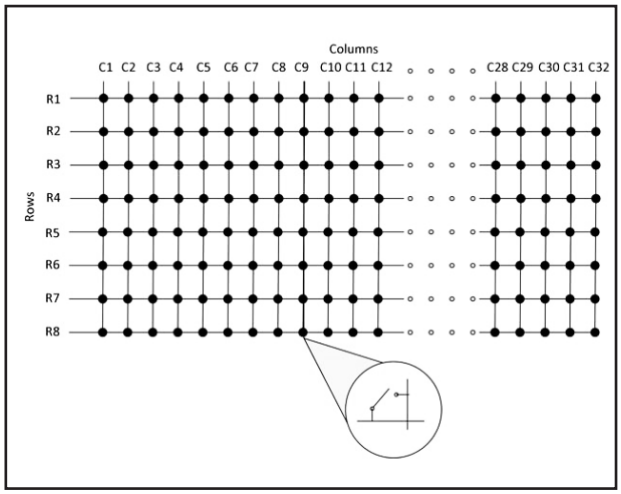


Figure 6. M9122A 8x32, 1-wire, armature relays

M9122A specifications and characteristics

General specifications	
Channels	8x32
Switch type	1-wire, armature
Max volts[1]	100 Vrms
Max switch rating/carry rating	2.0 A
Switching characteristics *(nominal)*	
Max power	60 W
Switch speed *(typical)*	*3 msec*
Inital path resistance, single ended *(typical)*	*250 mΩ*
Connectors	50 Dsub connector block or cable
Bandwidth	5 MHz
DC isolation, Ch-Ch, Ch-Gnd	
25C / 40%RH *(typical)*	*$1x10^{10}$ Ω*
25C / 80%RH *(typical)*	*$1x10^{8}$ Ω*
40C / 80%RH *(typical)*	*$1x10^{7}$ Ω*
Thermal offset, single-ended *(typical)*	*6 µV*
Relay life, operations[2]	
Low power load *(typical)*	*$1x10^{7}$*
Rated power load *(typical)*	*$1x10^{5}$*

1. Not for connection to mains
2. Relay life is defined as path resistance <1.4 Ω

Specifications and Characteristics

General specifications			
Slot type	PXI 1-slot		
Connector type	M9120A	M9121A	M9122A
	78 Dsub connector block or cable	200 LFH connector block or cable	50 Dsub connector block or cable

Environmental characteristics [1, 2]	
Temperature	Operating: 0° to 55°C Non-operating: -40° to +70°C
Relative humidity	Relative humidity: Up to 95% R.H. at 40° C, non-condensing, pollution degree 1
EMC	European EMC Directive 2004/108/EC – IEC/EN 61326-1 – CISPR Pub 11 Group 1, Class A – AS/NZS CISPR 11 – ICES/NMB-001 Canadian ISM device ICS-001
Safety	European Low Voltage Directive 2006/95/EC – ETL, UL/IEC/EN 61010-1, 2nd Edition
Altitude under relative humidity	Altitude: up to 4.6 km (15,000 ft)
Warm-up time	15 minutes, max

1. Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to temperature, humidity, shock, vibration, altitude, and power line conditions.
2. Test methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F class 3

Physical characteristics			
Dimensions	– 3U/1-slot PXI/CompactPCI standard – Connector slot compatibility: cPCI (J1), PXI-1, PXIe hybrid slot – Front panel complies with IEEE1101.10 certification and compliance		
Weight	M9120A	M9121A	M9122A
	260 g (.57 lbs)	400 g (.88 lbs)	380 g (.87 lbs)

Power requirements			
	M9120A	M9121A	M9122A
+3.3V	0	0	100 mA (typ)
+5V	400 mA (typ)	400 mA (280 mA) (typ)	400 mA (typ), 1.3 A max
+12V	0	0	50 mA (typ)

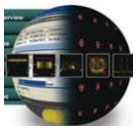
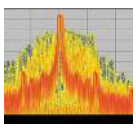
Specifications and Characteristics (continued)

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
1 GHz 32-bit (x86), 1 GHz 64-bit (x64) (no support for Itanium 64)	1 GHz 32-bit (x86), 1 GHz 64-bit (x64) (no support for Itanium 64)	600 MHz or higher required 800 MHz recommended
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.

Specifications and Characteristics (continued)

Instrument Connection Software			
	Keysight IO Library	Keysight IO Libraries Suite offers a single entry point for a connection to modular and traditional instruments. It automatically discovers interfaces, chassis, instruments, and identifies updates to IVI instrument drivers. IO Libraries Suite safely installs in side-by-side mode with NI I/O software.	Free software Download from A.com (**www.keysight.com/find/iosuite**)
Module Management			
	Keysight Connection Expert	The Keysight Connection Expert is the Graphical User interface included in the IO Libraries Suite that allows you to search for, verify and update IVI instrument and soft front panel drivers for modular and traditional instruments.	Free software Included in the IO Libraries (**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 with module
Programming			
	Driver	Development environments	
Drivers	IVI-COM IVI-C LabVIEW	Visual Basic Visual Studio (VB.NET, C#, C/C++) VEE LabVIEW, LabWindows/CVI, MATLAB	Included on CD-Rom with module or Download from **www.keysight.com**
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 from **www.keysight.com** (**www.keysight.com/find/commandexpert**)
Programming examples		Each module includes programming Program examples available for LabVIEW, LabWindows/CVI, Visual Studio C, C++, C#, Visual Basic, and MATLAB	Download from **www.keysight.com**
Signal Generation Software			
	Signal Studio	Suite of signal-creation tools which provides performanceopti-mized reference signals for: W-CDMA/HSPA+, cdma2000/1xEV-DO, GSM/EDGE/Evo, LTE/LTE-Advanced FDD, LTE/LTE-Advanced TDD, TD-SCDMA/HSDPA, WLAN 802.11a/b/g/n/ac, and Bluetooth.	Licensed software (**www.keysight.com/find/signalstudio**)
	System View	A system–level EDA that accelerates design and verification at the physical layer where advanced digital signal processing meets RF.	Licensed software (**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
Signal Analysis Software			
	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**)

Setup and Calibration Services

Assistance		
On day startup assistance	An Keysight Technologies applications engineer will help you get started and install the modules in a chassis, configure the controller, load software and make first measurements.	Included in base configuration
Calibration and Traceability		
Factory Calibration	Keysight's modular products M9120A, M9121A, M9122A are factory calibrated and shipped with an ISO-9002, NIST-traceable calibration certificate.	Included in base configuration
Calibration Cycle	A one year calibration cycle is recommended	Included in base configuration
Calibration Sites	– At Keysight Worldwide Service Centers – On-site by Keysight – By self-maintainers	More information on **www.keysight.com/find/info-line**
R1282A Annual Calibration Service	– 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	Additional service, not included in the warranty

Configuration and Ordering

Hardware

Model	Description
Each switch includes:	Getting started guide, software drivers, and Keysight I/O libraries
M9120A	PXI matrix switch: 4x32, 2-wire, 100V/2A, EM relays
M9121A	PXI high-density matrix switch: 4x64, 2-wire, 100V/0.5A, reed relays
M9122A	PXI matrix switch: 8x32, 1-wire, 100V/2A, armature relays

Accessories

M9120A	Description
Y1181A	PXI connector block: 78-pin, shielded, female DSub
Y1187A	PXI connector cable: 78-pin, male-to female, 1 meter
Y1188A	PXI connector cable: 78-pin, male-to female, 2 meter

M9121A	Description
Y1182A	PXI connector block: 200-pin, shielded, male
Y1189A	PXI connector cable: 200-pin, LFH male to four 50 pin Dtype female connectors, 1 meter
Y1190A	PXI connector cable: 200-pin, LFH male to four 50 pin Dtype female connectors, 2 meter

M9122A	Description
Y1180A	PXI connector block: 50-pin, female DSub
Y1185A	PXI connector cable: 50-pin, male-tofemale, 1 meter
Y1186A	PXI connector cable: 50 pin, male-tofemale, 2 meter

Related Products

Model	Description
M9018A	Getting started guide, software drivers, and Keysight I/O libraries
M9021A	PXI matrix switch: 4x32, 2-wire, 100V/2A, EM relays
M9045B	PXI high-density matrix switch: 4x64, 2-wire, 100V/0.5A, reed relays
Y1200B	PXI matrix switch: 8x32, 1-wire, 100V/2A, armature relays
M9048A	PCIe PC adapter
Y1202A	PCIe cable: x8, 2.0m (used with M9047B)

Software

Model	Description
Supported operating systems	Microsoft Windows XP (32-bit), Microsoft Windows Vista (32/64-bit) Microsoft Windows 7 (32/64-bit)
Standard compliant drivers	IVI-COM, IVI-C, LabVIEW, MATLAB
Supported application development environments (ADE)	VisualStudio (VB.NET, C#, C/C++), LabVIEW, LabWindows/CVI, MATLAB
Keysight IO Libraries	Includes: VISA Libraries, Keysight Connection Expert, IO Monitor

Recommended Chassis Configuration

For the ultimate in speed and flexibility, combine your switches with other PXI modules in the Keysight M9018A PXIe chassis as follows:

- Select a PXIe system module, PCIe cable interface,or embedded controller (the Keysight M9021A is recommended)
- If an external computer is being used, select an appropriate PC interface card (the Keysight M9047A is recommended with an external PC)
- Select an appropriate cable to connect the computer interface board to the system module (the Y1202A is recommended to connect the M9047A and M9021A)
- Select rack mount and EMC filler panel kits as required

Definitions for specifications

Specifications describe the warranted performance of calibrated instruments that have been stored for a minimum of 2 hours within the operating temperature range of 0 to 55°C, unless otherwise stated, and after a 45 minute warm-up period. Data represented in this document are specifications unless other wise noted.

Characteristics describe product performance that is useful in the application of the product, but that is not covered by the product warranty. Characteristics are often referred to as Typical or Nominal values.

- Typical describes characteristic performance, which 80% of the instruments will meet when operated over a 20 to 30°C temperature range. Typical performance is not warranted.
- Nominal describes representative performance that is useful in the application of the product when operated over a 20 to 30°C temperature range. Nominal performance is not warranted.

Note: All graphs contain measured data from several units at room temperature unless otherwise noted.

Warranty and Calibration

Advantage Services: Calibration and Warranty
Keysight Advantage Services is committed to your success throughout your equipment's lifetime

Warranty	
	Standard warranty is 1 year[1]
R-51B-001-3C	1 year return-to-Keysight warranty extended to 3 years

1. Excludes relay wear-out.

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Three-Year Warranty
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Published in USA, August 3, 2014
5990-7182EN
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