

# Agilent PXI Matrix Switch Modules



Data Sheet

M9120A, M9121A, M9122A

- Connect multiple high-voltage points in a signal instance
- Easier and faster PXI test system development
- High-density modules provide more connections in a smaller area
- Reliable measurements from robust, high-pin-count interconnects



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## OVERVIEW

### Product description

The 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 Agilent 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

- Up to 256 2-wire crosspoints
- High-speed, long-life reed relays or higher power armature relays
- Durable connection options
- Software drivers support the most common programming environment
- Optional connector block, soft front panels, and Agilent Connection Expert

### Customer values

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

Agilent IO Libraries Suite offers fast and easy instrument connections and now extends to modular instruments. IO Libraries Suite 16.0 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 Agilent Connection Expert.

### Drivers

Agilent provides instrument drivers that work with your choice of software, saving time and preserving software and hardware investments. Agilent 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 Agilent 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

Agilent 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.

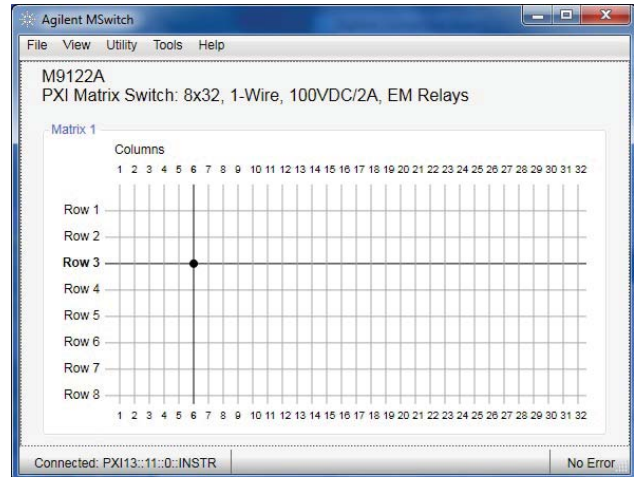


Figure 1. Matrix switch soft front panel

# SPECIFICATIONS AND CHARACTERISTICS



## Specification and characteristic summary

Following is a summary of specifications and characteristics for the Agilent 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 <sup>1</sup>	2A/2A	Armature	78 Dsub connector block or cable
M9121A	High-density matrix switch	PXI 1 slot	4x64, 2-wire	< 1 msec <sup>2</sup>	100 Vrms <sup>1</sup>	0.5A/0.5A	Reed	200 LFH connector block or cable
M9122A	Matrix switch	PXI 1 slot	8x32, 1-wire	3 msec	100 Vrms <sup>1</sup>	2A/2A	Armature	50 Dsub connector block or cable

1. Not for connection to mains.

2. Preliminary, contact factory for more information.

# 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.

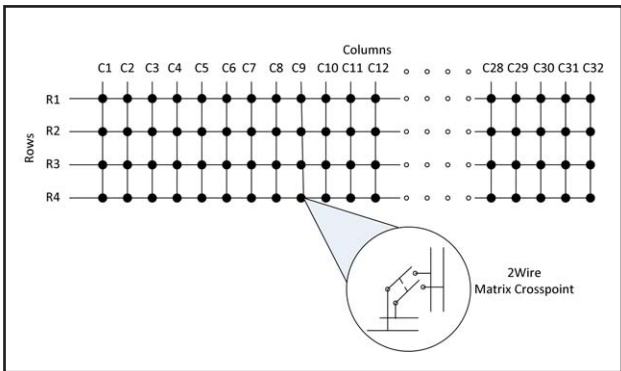


Figure 2. M9120A 4x32, 2-wire, armature relays

## M9120A specifications and characteristics

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

- 1. Not for connection to mains.
- 2. Switch modules are considered a “wear-out” item, and it is normal for relay performance to degrade over time; life expectancy and performance depends on the specific application and use model.

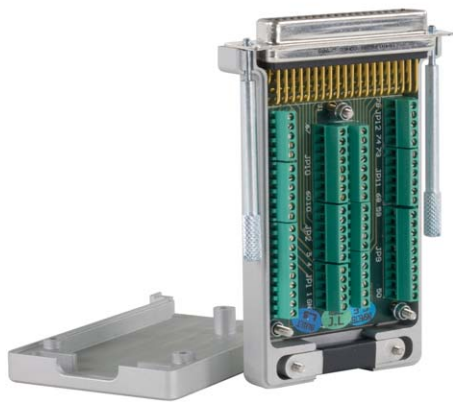


Figure 3. 78-pin Dsub connector block



# 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 instantaneously 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.

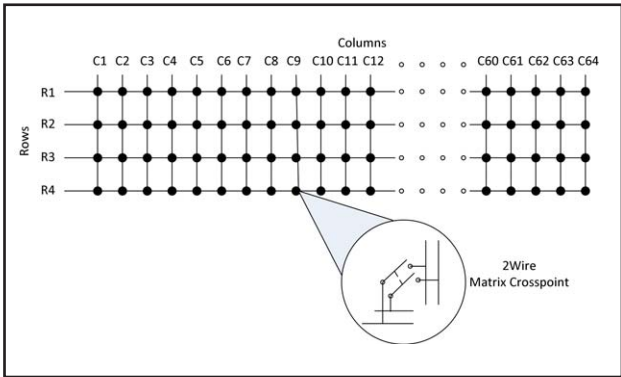


Figure 4. M9121A 4x64, 2-wire, reed relays

## M9121A specifications and characteristics

General specifications	
Channels	4x64
Switch type	Ultra-high-density, 2-wire reed
Max volts <sup>1</sup>	100 Vrms
Max switch rating/carry rating	0.5A
Switching characteristics, nominal	
Max power	10W
Switch speed ( <i>typical</i> )	< 1 ms <sup>2</sup>
Initial path resistance, differential ( <i>typical</i> )	800 mΩ
Connectors	200 LFH connector block or cable
Bandwidth	10 MHz
DC isolation, Ch-Ch, Ch-Gnd	
25C / 40%RH ( <i>typical</i> )	1x10 <sup>10</sup> Ω
25C / 80%RH ( <i>typical</i> )	1x10 <sup>7</sup> Ω
40C / 80%RH ( <i>typical</i> )	1x10 <sup>5</sup> Ω
Thermal offset, single ended ( <i>typical</i> )	6 μV
Relay life, operations <sup>3</sup>	
Low power load ( <i>typical</i> )	1x10 <sup>9</sup>
Rated power load ( <i>typical</i> )	> 5x10 <sup>6</sup>

1. Not for connection to mains.
2. Preliminary. Contact factory for latest data.
3. Switch modules are considered a “wear-out” item, and it is normal for relay performance to degrade over time; life expectancy and performance depends on the specific application and use model.



Figure 5. 200-pin LFH connector block

# SPECIFICATIONS AND CHARACTERISTICS, CONTINUED

## 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.

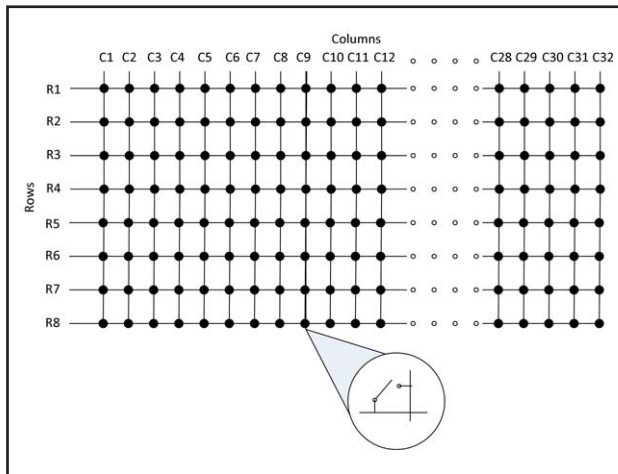


Figure 6. M9122A 8x32, 1-wire, armature relays

## M9122A specifications and characteristics

### General specifications

Channels	8x32
Switch type	1-wire, armature
Max volts <sup>1</sup>	100 Vrms
Max switch rating/carry rating	2.0A

### Switching characteristics, nominal

Max power	60W
Switch speed ( <i>typical</i> )	3 msec
Initial path resistance, single ended ( <i>typical</i> )	250 mΩ
Connectors	50 Dsub connector block or cable
Bandwidth	5 MHz

DC isolation, Ch-Ch, Ch-Gnd	
25C / 40%RH ( <i>typical</i> )	1x10 <sup>10</sup> Ω
25C / 80%RH ( <i>typical</i> )	1x10 <sup>8</sup> Ω
40C / 80%RH ( <i>typical</i> )	1x10 <sup>7</sup> Ω
Thermal offset, differential ( <i>typical</i> )	6 μV
Relay life, operations <sup>2</sup>	
Low power load ( <i>typical</i> )	> 1x10 <sup>7</sup>
Rated power load ( <i>typical</i> )	> 1x10 <sup>5</sup>

1. Not for connection to mains.
2. Switch modules are considered a "wear-out" item, and it is normal for relay performance to degrade over time; life expectancy and performance depends on the specific application and use model.

## SPECIFICATIONS AND CHARACTERISTICS, CONTINUED

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 specifications			
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, IEC 60664-1 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		
Physical characteristics			
Dimensions	<ul style="list-style-type: none"><li>3U/1-slot PXI/CompactPCI standard</li><li>Connector slot compatibility: cPCI (J1), PXI-1, PXIe hybrid slot</li><li>Front panel complies with IEEE1101.10 certification and compliance</li></ul>		
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 ( <i>typ</i> )
+5V	400 mA ( <i>typ</i> )	400 mA (280 mA) ( <i>typ</i> )	400 mA ( <i>typ</i> ), 1.3 A max
+12V	0	0	50 mA ( <i>typ</i> )



## SPECIFICATIONS AND CHARACTERISTICS, CONTINUED

System requirements			
Operating systems	Windows® XP, Service Pack 3 or later (32-bit)	Windows® Vista, SP1 and SP2 (32-bit and 64-bit), Business, Ultimate, Enterprise, Home Basic, and Home Premium	Windows® 7 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional, Ultimate, Enterprise
Processor speed	600 MHz or higher required 800 MHz recommended	1Ghz 32-bit (x86), 1GHz 64-bit (x64), no support for Itanium64	1GHz 32-bit (x86), 1GHz 64-bit (x64), no support for Itanium 64
Available memory	256 MB minimum (1 GB or greater recommended)	1 GB minimum	1 GB minimum
Available disk space <sup>1</sup>	1.5 GB available hard disk space, includes: · 1GB available for Microsoft .NET Framework 3.5 SP1 <sup>2</sup> · 100MB for Agilent IO Libraries Suite	1.5 GB available hard disk space, includes: · 1GB available for Microsoft .NET Framework 3.5 SP1 <sup>2</sup> · 100MB for Agilent IO Libraries Suite	1.5 GB available hard disk space, includes: · 1GB available for Microsoft .NET Framework 3.5 SP1 <sup>2</sup> · 100MB for Agilent IO Libraries Suite
Video	Super VGA (800x600) 256 colors or more	Support for DirectX 9 graphics with 128MB graphics memory recommended (Super VGA graphics is supported)	Support for DirectX 9 graphics with 128MB graphics memory recommended (Super VGA graphics is supported)
Browser	Microsoft® Internet Explorer 6.0 or greater	Microsoft® Internet Explorer 7 or greater	Microsoft® Internet Explorer 7 or greater

1. Because of the installation procedure, less memory may 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.

# CONFIGURATION AND ORDERING

## Hardware

Model	Description
Each switch includes:	Getting started guide, software drivers, and Agilent 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, male-to-female, 1 meter
Y1190A	PXI connector cable: 200-pin, male-to-female, 2 meter
M9122A	Description
Y1180A	PXI connector block: 50-pin, female DSub
Y1185A	PXI connector cable: 50-pin, male-to-female, 1 meter
Y1186A	PXI connector cable: 50 pin, male-to-female, 2 meter

## Related products

Model	Description
M9018A	18-slot PXIe chassis: 18-slot, 3U, 8GB/s
M9021A	PCIe® cable interface: Gen 2, x8
M9045A	PCIe ExpressCard adaptor: Gen 1
Y1200A	PCIe cable: x4 to x8, 2.0m (used with M9045A)
M9047A	PCIe desktop PC adapter: Gen 2, x8
Y1202A	PCIe cable: x8, 2.0m (used with M9047A)

## 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
Agilent IO Libraries	Includes: VISA Libraries, Agilent Connection Expert, IO Monitor

## Recommended chassis configuration

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

- Select a PXIe system module, PCIe cable interface, or embedded controller (the Agilent M9021A is recommended)
- If an external computer is being used, select an appropriate PC interface card (the Agilent 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 otherwise 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

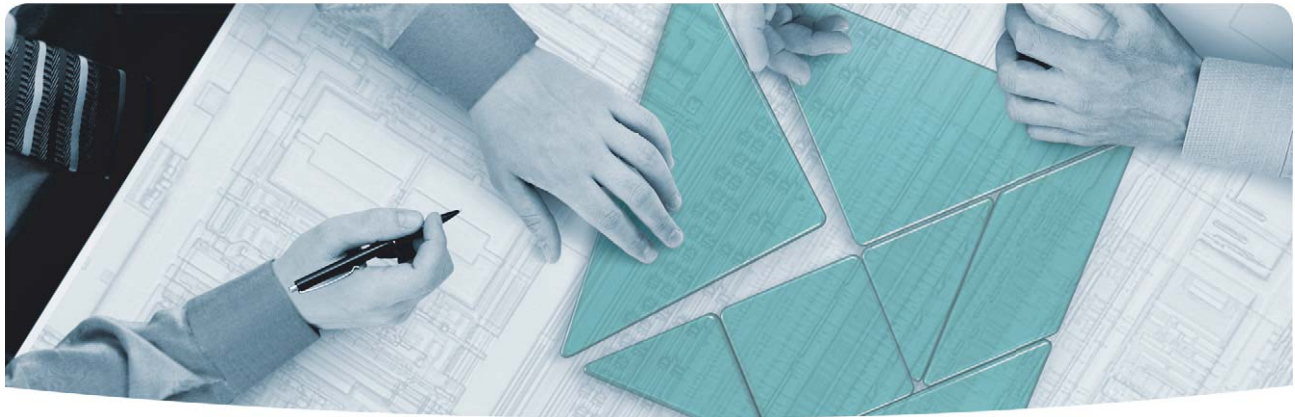
### Advantage Services: Calibration and Warranty

Agilent Advantage Services is committed to your success throughout your equipment's lifetime.

### Warranty

	Standard warranty is 1 year <sup>1</sup>
R-51B-001-3C	1 year return-to-Agilent warranty extended to 3 years

1. Excludes relay wear-out.



## The Modular Tangram

The four-sided geometric symbol that appears throughout this document is called a tangram. This seven-piece puzzle originated in China a few centuries ago. The goal is to create shapes—from simple to complex—that form an identifiable silhouette. As with a tangram, the possibilities may seem infinite as you begin to create a new test system. With a set of clearly defined elements—architecture, hardware, software—Agilent can help you create the system you need, from simple to complex.



## DISCOVER the Alternatives ... ... Agilent **MODULAR** Products



Agilent Advantage Services is committed to your success throughout your equipment's lifetime. We share measurement and service expertise to help you create the products that change our world. To keep you competitive, we continually invest in tools and processes that speed up calibration and repair, reduce your cost of ownership, and move us ahead of your development curve.

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