Keysight Technologies
PXI Multiplexer Switch Modules

M9101A, M9102A, M9103A

Data Sheet



KEYSIGHT TECHNOLOGIES

Unlocking Measurement Insights

Overview

Product description

The PXI multiplexer switch modules deliver high-speed signal routing of many different channels to a single point, and are ideal for routing multiple analog signals to a measurement device in Automated Test Environments (ATE) or data acquisition systems.

These switches can operate in a break-before-make mode, ensuring no two points are connected at the same time, or, when needed, allowing multiple channels to be connected simultaneously. The modules include an isolation switch that connects the closed channels to a module common, which minimizes the capacitive loading and leakage currents in larger multiplexer systems. You can also expand multiplexers by linking the common connections of multiple PXI cards.

Installation and configuration is fast and easy with standard cable connections or an optional connector block, soft front panels, and Keysight Technologies, Inc. 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

- Delivers high-speed signal routing of many different channels to a single point
- High-speed, long-life reed relays or higher power armature relays
- Modules operate in break-before-make mode ensuring only one channel is connected at a time
- Software drivers support the most common programming environments
- Optional connector blocks offer reliable measurements from robust, high-pincount interconnects
- PXI Chassis connector compatibility: cPCI (J1), PXI-1 (J1 only), PXIe hybrid slot
- Easy programming and control with soft front panels and Keysight's Command Expert

Customer values

- Get the performance you need with 500 µsec switches or up to 60 W per channel
- Ensure no two points are connected at the same time
- Scan many points in a compact space
- 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 multiplexer 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 Multiplexer 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 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.

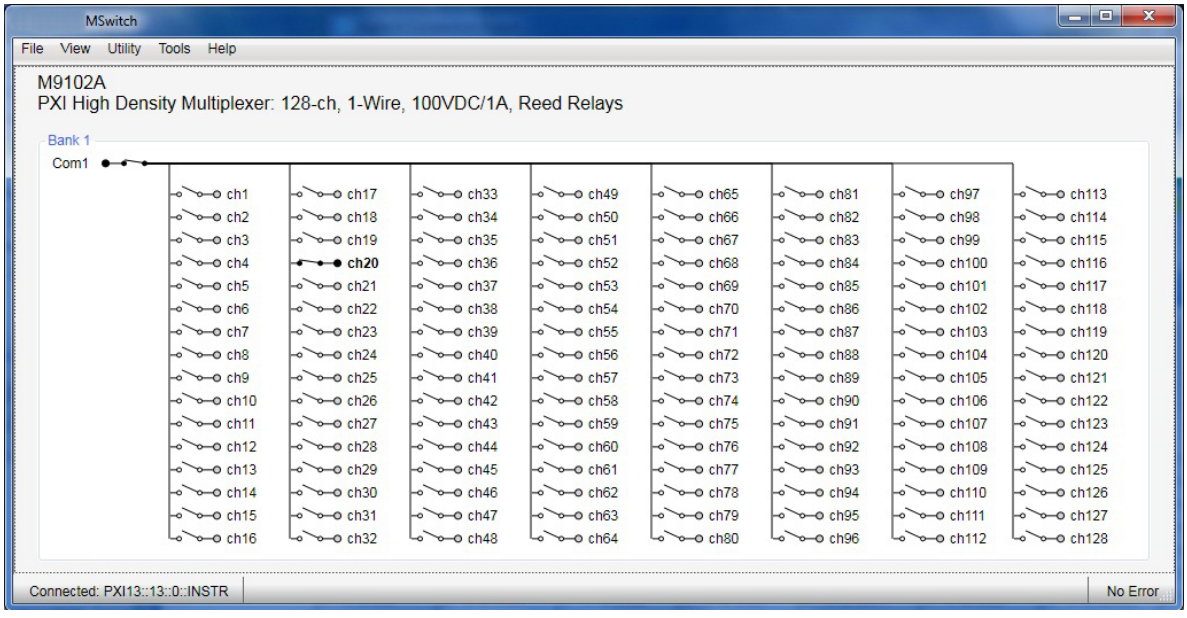


Figure 1. Multiplexer switch soft front panel

Specifications and Characteristics



Specification and characteristic summary

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

Multiplexer switch specification and characteristic summary

Multiplexer switches	Description	Type # slots	Channels	Switch speed (*typical*)	Max voltage (*typical*)	Current switch/ carry (*typical*)	Relay type	Connectors
M9101A	High-density multiplexer	PXI 1-slot	64 channels 2-wire	*1000 µsec*[1]	*100 Vrms*[2]	*0.5 A/1.0 A*	Reed	200 LFH connector block or cable
M9102A	High-density multiplexer	PXI 1-slot	128 channels 1-wire	*1000 µsec*[1]	*100 Vrms*[2]	*0.5 A/1.0 A*	Reed	200 LFH connector block or cable
M9103A	High-density multiplexer	PXI 1-slot	99 channels 1-wire	*4.5 msec*[1]	*100 Vrms*[2]	*1.0 A/1.0 A*	Armature	200 LFH connector block or cable

1. Contact factory for more information.
2. Not for connection to mains.

Specifications and Characteristics

M9101A PXI high-density multiplexer

The M9101A high-density, 64-channel multiplexer has been designed to route many different channels to a single point. The relays are capable of switching up to 100 Vrms, with up to 20 W of power, and are ideal for routing analog signals to test instruments in automated test environments (ATE) or data acquisition systems. Each channel has a high and a low connection for 2-wire switching, while an isolation switch connects all closed channels to the module common to minimize capacitive loading and leakage currents in large multiplexer configurations. Easily connect the multiplexer with a high-density, 200-pin low force helix (LFH) connector or cable.

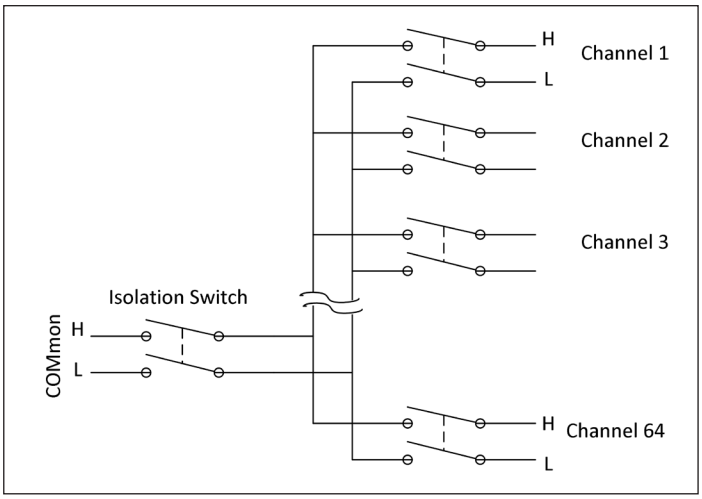


Figure 2. M9101A 64-ch, 2-wire, reed relays

M9101A specifications and characteristics

General specifications	
Channels	64
Switch type	High-density, 2-wire reed
Max volts[1]	100 Vrms
Max current switch/carry	0.5 A/1.0 A
Switching characteristics, nominal	
Max power	10 W
Switch speed (*typical*)[2]	*1000 usec*
Initial path resistance, differential *(typical)*	*800 mΩ*
Connectors	200 LFH connector block or cable
Bandwidth	5 MHz
DC isolation, Ch-Ch, Ch-Gnd	
25C/40%RH (*typical*)	$1x10^9$ Ω
25C/80%RH (*typical*)	$1x10^8$ Ω
40C/80%RH (*typical*)	$1x10^6$ Ω
Thermal offset	Contact factory
Relay life, operations[2]	
Low power load (*typical*)	$1x10^9$
Rated power load (*typical*)	> $5x10^6$

1. Not for connection to mains.
2. Relay life is defined as path resistance < 1.5 Ω.



Figure 3. 200 LFH connector block

Specifications and Characteristics

M9102A PXI high-density multiplexer

The M9102A high-density, 128-channel multiplexer features 1-wire, high-speed, long-life reed relays capable of switching up to 100 Vrms, with up to 20 W of power. The modules' isolation switch connects the closed channels to the module common. Create a larger multiplexer by linking the common connections on multiple PXI cards. Easily connect the multiplexer with a high-density, 200-pin low force helix (LFH) connector or cable.

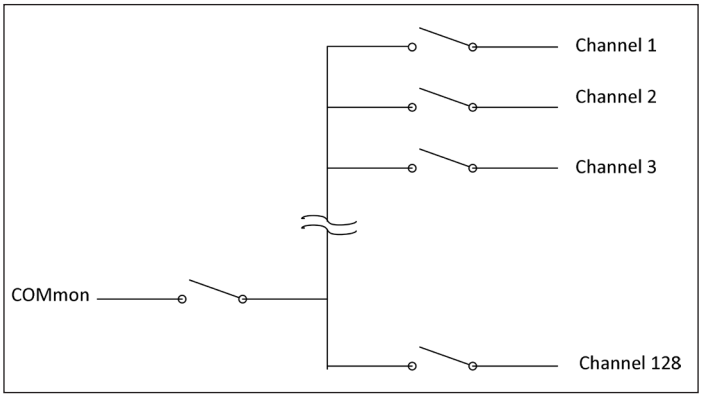


Figure 4. M9102A 128-ch, 1-wire, reed relays

M9102A specifications and characteristics

General specifications	
Channels	128
Switch type	High-density, 1-wire reed
Max volts[1]	100 Vrms
Max current switch/carry	0.5 A/1.0 A
Switching characteristics, nominal	
Max power	10 W
Switch speed (*typical*)	*1000 usec*
Initial path resistance, single ended (*typical*)	*400 mΩ*
Connectors	200 LFH connector block or cable
Bandwidth	5 MHz
DC isolation, Ch-Ch, Ch-Gnd	
25C/40%RH (*typical*)	*$1x10^9$ Ω*
25C/0%RH (*typical*)	*$1x10^8$ Ω*
40C/0%RH (*typical*)	*$1x10^6$ Ω*
Thermal offset	Contact factory
Relay life, operations[2]	
Low power load (*typical*)	*$1x10^9$*
Rated power load (*typical*)	*> $5x10^6$*

1. Not for connection to mains.
2. Relay life is defined as path resistance < 1.5 Ω.

Specifications and Characteristics

M9103A PXI high-density multiplexer

The M9103A is a high-density, 99-channel, high-powered armature relay multiplexer. Each channel has a high and low for 2-wire switching and can switch up to 100 Vrms, with up to 60 W of power. The modules' isolation switch connects the closed channels to the module common. Easily connect to the multiplexer with a high-density, 200-pin low force helix (LFH) connector or cable.

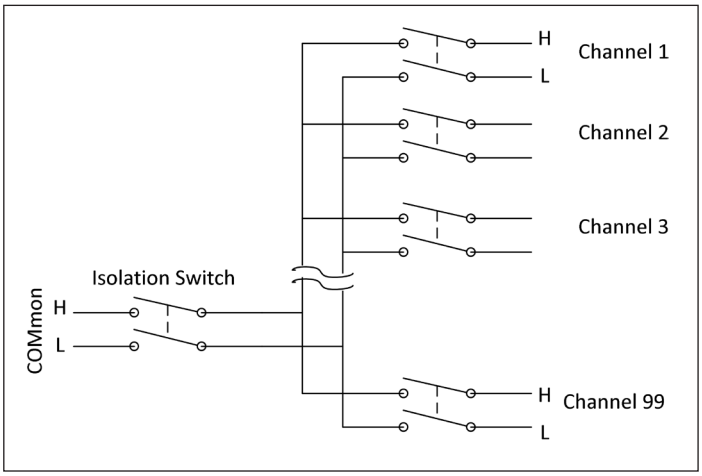


Figure 5. M9103A 99-ch, 2-wire, EM relays

M9103A specifications and characteristics

General specifications	
Channels	99
Switch type	2-wire armature
Max volts[1]	100 Vrms
Max current switch/carry	1 A
Switching characteristics, nominal	
Max power	60 W
Switch speed (*typical*)	*4.5 msec*
Initial path resistance, differential (*typical*)[2]	*< 500 mΩ*
Connectors	200 LFH connector block or cable
Bandwidth	1 MHz
DC isolation, Ch-Ch, Ch-Gnd 25C/40%RH (*typical*) 25C/80%RH (*typical*) 40C/80%RH (*typical*)	 *$1x10^9$ Ω* *$1x10^7$ Ω* *$1x10^5$ Ω*
Thermal offset, differential (*typical*)	*5 µV*
Relay life, operations Low power load (*typical*) Rated power load (typical)	 *> $2.5x10^6$* *> $1x10^5$*

1. Not for connection to mains.
2. Channel resistance is typically < 1.5 Ω but can go as high as 50 Ω when a channel is used in measurement applications with < 10 mA load current. Increased relay channel resistance for measurements with load currents below 10 mA can occur on cards that have been out of service or following relay inactivity for periods greater than 1 week. Switching relays for 2K cycles prior to use may reduce the variation in channel resistance. Keysight recommends the use of 4-wire Ohms for resistance measurements. For high accuracy voltage measurements, select the DMM input resistance setting of >10 G ohms to minimize the impact of relay contact resistance.

Specifications and Characteristics

General specifications	
Slot type	PXI 1-slot
Connector type	200 LFH 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	*M9101A*	*M9102A*	*M9103A*
	220 g (0.49 lbs)	220 g (0.49 lbs)	230 g (0.51 lbs)

Power requirements			
	M9101A	*M9102A*	*M9103A*
+3.3 V	0	0	0
+5 V	134 mA (280 mA) (*typ*)	134 mA (280 mA) (*typ*)	300 mA (*typ*)
+12 V	0	0	0

Specifications and Characteristics

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.

Software

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 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		
Drivers	**Development environments**	
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
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 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	

Configuration and Ordering

Hardware

Model	Description
Each switch includes:	Getting started guide, software drivers, and Keysight I/O libraries
M9101A	PXI high-density multiplexer: 64-ch, 2-wire, 100 Vrms/1 A, reed relays
M9102A	PXI high-density multiplexer: 128-ch, 1-wire, 100 Vrms/1 A, reed relays
M9103A	PXI high-density multiplexer: 99-ch, 2-wire, 100 Vrms/1 A, armature relays

Accessories

Model	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

Recommended chassis configuration

For the ultimate inw 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

Related products

Model	Description
M9018A	18-slot PXIe chassis: 18-slot, 3U, 8 GB/s
M9021A	PCIe® cable interface: Gen 2, x8
M9045B	PCIe ExpressCard adaptor: Gen 1
Y1200B	PCIe cable: x4 to x8, 2.0 m (used with M9045B)
M9048A	PCIe desktop PC adapter: Gen 2, x8
Y1202A	PCIe cable: x8, 2.0 m (used with M9048A)

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)	Visual Studio (VB.NET, C#, C/C++), LabVIEW, LabWindows/CVI, MATLAB
Keysight IO Libraries	Includes: VISA Libraries, Keysight Connection Expert, IO Monitor

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. 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.

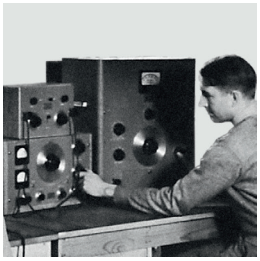
Calibration

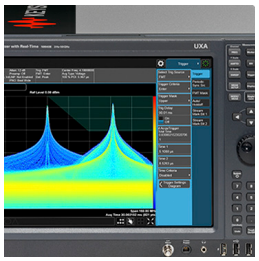
Advantage services: Calibration

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

Evolving Since 1939

Our unique combination of hardware, software, services, and people can help you reach your next breakthrough. We are unlocking the future of technology.
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Keysight Services can help from acquisition to renewal across your instrument's lifecycle. Our comprehensive service offerings—one-stop calibration, repair, asset management, technology refresh, consulting, training and more—helps you improve product quality and lower costs.

CALIBRATION UP TO 10 YEARS WARRANTY
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Singapore	1 800 375 8100
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Published in USA, December 1, 2017
5990-7181EN
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