

Agilent PXI RF Switches



**M9128A, M9146A, M9147A,
M9148A, M9149A, M9150A,
M9151A, M9152A, M9153A**

Startup Guide



Agilent Technologies

Notices

© Agilent Technologies, Inc. 2011

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Agilent Technologies, Inc. as governed by United States and international copyright laws.

Manual Part Number

M9128-90001

Edition

Edition 2. March 2011
Printed in Malaysia

Agilent Technologies, Inc.
5301 Stevens Creek Blvd.
Santa Clara, CA 95052 USA

Microsoft® and Windows® are U.S. registered trademarks of Microsoft Corporation.

MATLAB is a U.S registered Trademark of The MathWorks, Inc.

PXI is a registered trademark of the PXI Systems Alliance.

Visual Studio is a registered trademark of Microsoft Corporation in the United States

LabView is a registered trademark of National Instruments

Sales and Technical Support

To contact Agilent for sales and technical support, refer to the “support” links on the following Agilent web resources:

www.agilent.com/find/<model number> (product-specific information and support, software and documentation updates)

www.agilent.com/find/assist (worldwide contact information for repair and service)

Information on preventing damage to your Agilent equipment can be found at www.agilent.com/find/tips.

Declaration of Conformity

Declarations of Conformity for this product and for other Agilent products may be downloaded from the Web. Go to <http://regulations.corporate.agilent.com/DoC/search.htm> and click on “Declarations of Conformity.” You can then search by product number to find the latest Declaration of Conformity.

Warranty

The material contained in this document is provided “as is,” and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this manual and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Restricted Rights Legend

U.S. Government Restricted Rights. Software and technical data rights granted to the federal government include only those rights customarily provided to end user customers. Agilent provides this customary commercial license in Software and technical data pursuant to FAR 12.211 (Technical Data) and 12.212 (Computer Software) and, for the Department of Defense, DFARS 252.227-7015 (Technical Data - Commercial Items) and DFARS 227.7202-3 (Rights in Commercial Computer Software or Computer Software Documentation).

Safety Information

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings or operating instructions in the product manuals violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product must not be impaired if it is used in a manner specified in the operation instructions.

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the module before applying power. Note the instrument's external markings described under "Safety Symbols".

Ground the Chassis

Agilent chassis are provided with a grounding-type power plug. The instrument chassis and cover must be connected to an electrical ground to minimize shock hazard. The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate the Agilent module/chassis in the presence of flammable gases or fumes.

Do Not Operate Near Flammable Liquids

Do not operate the Agilent module/chassis in the presence of flammable liquids or near containers of such liquids.

Cleaning

Clean the outside of the Agilent module, chassis, or accessory with a soft, lint-free, slightly dampened cloth. Do not use detergent or chemical solvents.

Keep away from live circuits

Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers and shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment

Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to an Agilent Technologies Sales and Service Office for service and repair to ensure the safety features are maintained.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office to ensure that safety features are maintained.

In Case of Damage

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure or practice, that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Safety Symbols

Products display the following symbols:



Refer to manual for additional safety information.



Earth Ground.



Chassis Ground.



Alternating Current (AC).



Direct Current (DC).



Indicates that antistatic precautions should be taken.



Notice for European Community: This product complies with the relevant European legal Directives: EMC Directive (2004/108/EC) and Low Voltage Directive (2006/95/EC).

ISM

This is the symbol for an Industrial, Scientific, and Medical Group 1 Class A product.

ICES/NMB-001

ICES/NMB-001 indicates that this ISM device complies with the Canadian ICES-001.



N10149

The C-tick mark is a registered trademark of the Spectrum Management Agency of Australia. This signifies compliance with the Australia EMC Framework regulations under the terms of the Radio Communication Act of 1992.

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This product complies with the WEEE Directive (2002/96/EC) marking requirement. The affixed product label (see below) indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

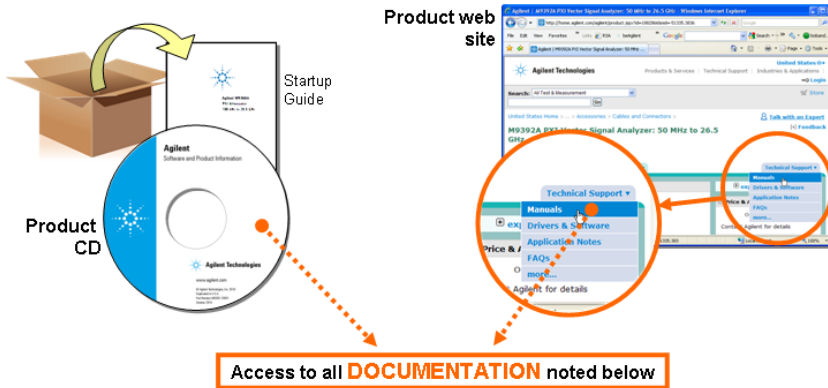
To return unwanted products, contact your local Agilent office, or see www.agilent.com/environment/<product> for more information.



Contents

Documentation Map	viii
Agilent PXI RF Switch Modules Introduction	1
Related documentation	1
Step 1: Unpack and inspect the module	2
ESD	2
Inspect for damage	2
Return the module for service	3
Step 2: Verify shipment contents	4
Step 3: Install the software on the system controller	4
System requirements	5
PXIe System	5
Power the controller	6
Install Agilent IO Libraries Suite	6
Install instrument drivers	7
Step 4. Connect the PC to the PXI chassis	8
Using a remote PC	8
Using an embedded computer	8
Step 5: Install the switch modules in the PXI chassis	9
Step 6. Verify operation of the module	11
Run Agilent IO Libraries Connection Expert	11
Verify operation	12
Characteristics	13
Default path settings	13
Module functional description	14
Module programming	15
Identifying channel numbers	15
Module front panel connectors and system connections	16
M9128A PXI RF Matrix Switch: 300 MHz, 8x12, 50Ω	17
M9146A PXI RF Multiplexer Module: 3 GHz, Dual 1x4, 50Ω Terminated	19
M9147A PXI RF Multiplexer: 3 GHz, Quad 1x4, 50Ω Terminated Common	20
M9148A PXI RF Multiplexer: 3 GHz, 1x8, 50Ω	21
M9149A PXI High Density RF Multiplexer: 3 GHz, 1x16, 50Ω	22
M9150A PXI RF Multiplexer: 3 GHz, Dual 1X4, 75Ω	23
M9151A PXI RF Multiplexer: 3 GHz, Quad 1X4, 75Ω	24
M9152A PXI RF Multiplexer: 3 GHz, 1X8, 75Ω	25
M9153A PXI RF Multiplexer: 3 GHz, 1X16, 75Ω	26

Documentation Map



Startup Guide



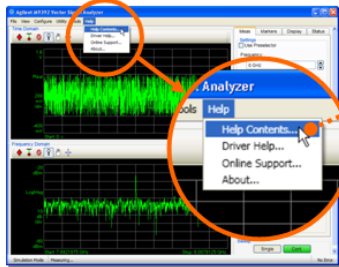
- Unpack product
- Verify shipment
- Install software
- Install & connect hardware
- Verify operation

Data Sheet



- Product description
- Technical specifications

Soft Front Panel (SFP) user interface

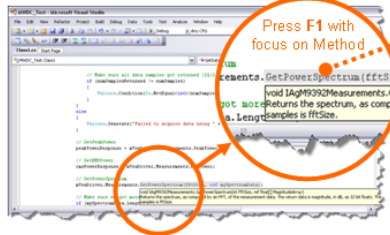


SFP help system



- Product theory of operation
- Configuration
- Self test

Visual Studio

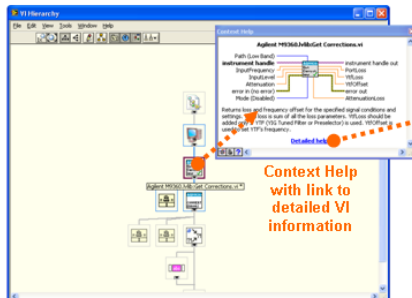


IVI Driver help system

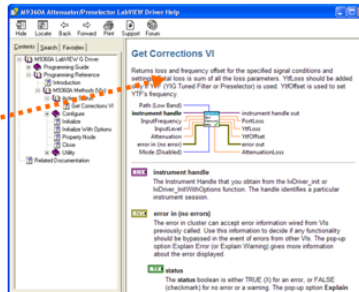


- IVI-COM and IVI-C driver programmer's reference

LabVIEW



LabVIEW Driver help system



- LabVIEW driver programmer's reference



Agilent PXI RF Switch Modules Introduction

The Agilent RF switch modules deliver high-performance switching with fast, easy installation and configuration. They provide for switching frequencies beyond 300 MHz (for the M9128A Matrix module) and 3 GHz (for the Multiplexer modules). All modules exhibit low insertion loss and Voltage Standing Wave Ratio (VSWR).

Agilent PXI RF 50 Ω Matrix and Multiplexer Modules

- M9128A PXI RF Matrix Switch: 300 MHz, 8x12, 50 Ω
- M9146A PXI RF Multiplexer Module: 3 GHz, Dual 1x4, 50 Ω Terminated
- M9147A PXI RF Multiplexer: 3 GHz, Quad 1x4, 50 Ω Terminated Common
- M9148A PXI RF Multiplexer: 3 GHz, 1x8, 50 Ω
- M9149A PXI High Density RF Multiplexer: 3 GHz, 1x16, 50 Ω

Agilent PXI RF 75 Ω Multiplexer Modules

- M9150A PXI RF Multiplexer: 3 GHz, Dual 1X4, 75 Ω
- M9151A PXI RF Multiplexer: 3 GHz, Quad 1X4, 75 Ω
- M9152A PXI RF Multiplexer: 3 GHz, 1X8, 75 Ω
- M9153A PXI RF Multiplexer: 3GHz, 1X16, 75 Ω

Agilent also supplies software drivers that allow you to support the modules in all popular PXI chassis' and programming environments. Soft Front Panel software allows you to exercise the channels for test purposes.

NOTE

Agilent AgMSwitch driver version 1.1.x or later or the Agilent LabVIEW G driver version 1.1.x or later is required for programmatic control of these switch modules.

Related documentation

This Startup Guide, and the documentation listed below, are on the **Switch Module Software and Product Information CD**.

- Help file for the PXI Switch Modules Soft Front Panel
- Help file for the PXI Switch Modules IVI-C/IVI-COM device drivers
- Help file for the PXI Switch Modules LabVIEW G device drivers
- Agilent PXI RF Switch Modules Data Sheet. For detailed specifications, check the Agilent web site at: www.agilent.com/find/pxiswitch.



Step 1: Unpack and inspect the module

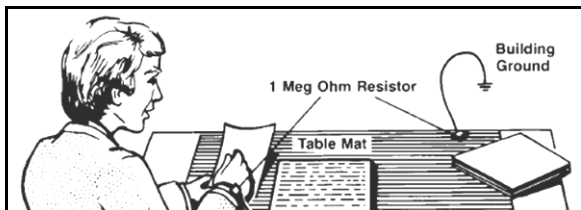
CAUTION

Agilent's PXI RF Switch Modules are shipped in materials that prevent static electricity damage. The modules should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken. Store all modules in anti-static envelopes when not in use.

ESD

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station. The following figure shows an example of a static-safe work station using two types of ESD protection. Purchase acceptable ESD accessories from your local supplier.

- Conductive table-mat and wrist-strap combination.
- Conductive floor-mat and heel-strap combination.



Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, the static-safe accessories must provide at least 1 M Ω of isolation from ground.

Inspect for damage

After unpacking the RF Switch Module, carefully inspect it for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty.

CAUTION

To avoid damage when handling a module; do not touch exposed connector pins.

NOTE

Information on preventing damage to your Agilent equipment can be found at www.agilent.com/find/tips.

Return the module for service

Should it become necessary to return an Agilent RF Switch module for repair or service, follow the steps below:

- 1 Review the warranty information shipped with your product.
- 2 Contact Agilent to obtain a return authorization and return address. If you need assistance finding Agilent contact information go to www.agilent.com/find/assist (worldwide contact information for repair and service) or refer to the **Support** information on the product web page at: www.agilent.com/find/pxiswitch.
- 3 Write the following information on a tag and attach it to the malfunctioning equipment.
 - Name and address of owner. A Post Office box is not acceptable as a return address.
 - Product model number (for example, M9028A)
 - Product serial number (for example, MYXXXXXXXX). The serial number label is located on the side of the module.
 - A description of failure or service required.
- 4 Carefully pack the module in its original ESD bag and carton. If the original carton is not available, use bubble wrap or packing peanuts, place the instrument in a sealed container and mark the container “FRAGILE”.
- 5 On the shipping label, write ATTENTION REPAIR DEPARTMENT and the service order number (if known).

NOTE

If any correspondence is required, refer to the product by serial number and model number.

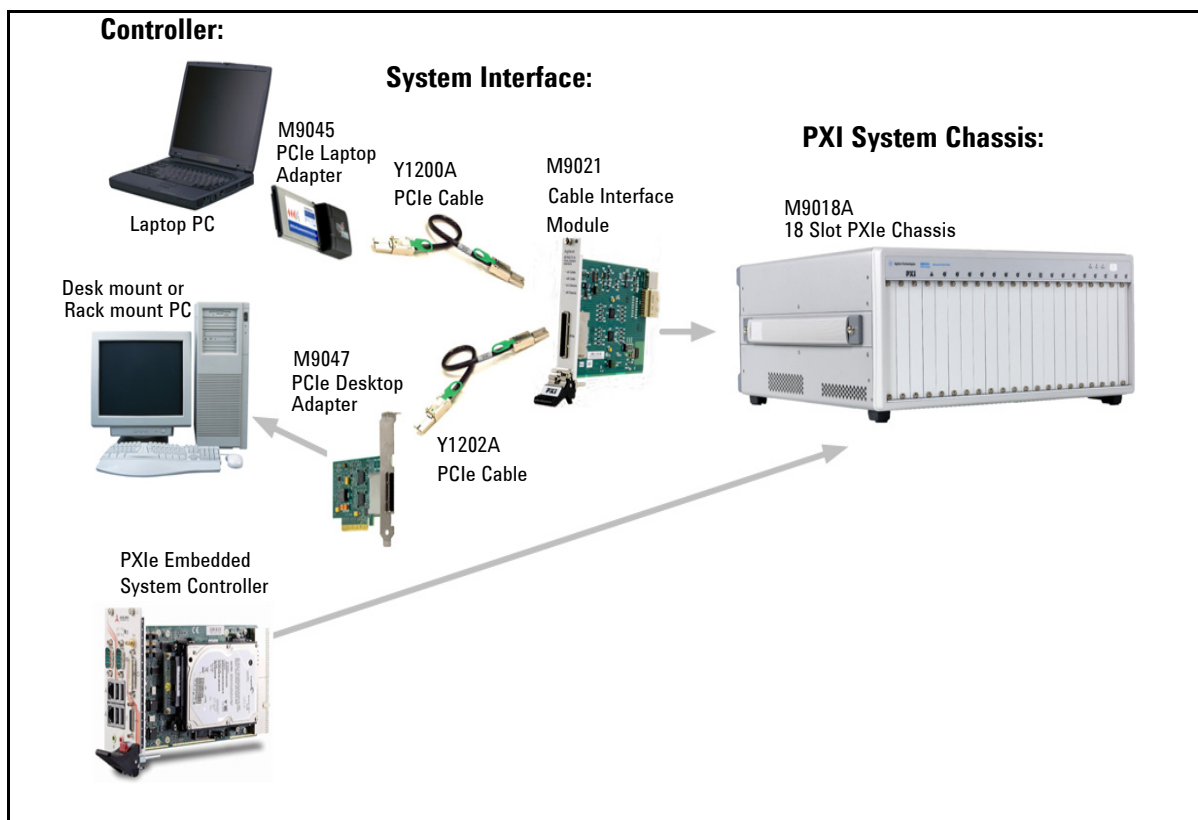
Step 2: Verify shipment contents

Your shipment should have included the following:

- The Agilent PXI RF module that you ordered.
- This document (Agilent PXI RF Switch Modules Startup Guide).
- A *Switch Module Software and Product Information* CD (M9128-10001). This CD contains software, drivers and all product printed documentation in PDF format for the PXI RF Switch modules.
- An *Automation-Ready CD with Agilent IO Libraries Suite* (version 16.0 or later).
- Any other accessories that you ordered (cables, connectors, etc.).

Step 3: Install the software on the system controller

The following illustration shows typical system installations.



NOTE

Do not install the PXI modules in the PXI chassis yet! You must install the software prior to installing the modules in the chassis so that Agilent IO Libraries Connection Expert finds them.

Step 3: Install the software on the system controller

System requirements

The following table lists the minimum system requirements for Agilent IO Libraries Suite 16. In general, any x86 or x64 (except Itanium) should work but there may be a significant decrease in performance.

Operating System	Windows XP Service Pack 3 or later	Windows Vista SP1 and SP2 (32-bit and 64-bit), Business, Ultimate, Enterprise, Home Basic, and Home Premium	Windows 7 (32- 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 Itanium64
Available memory	256 MB minimum (1 GB or greater recommended)	1 GB minimum	1 GB minimum
Available hard disk space*	1.5 GB available hard disk space, includes: <ul style="list-style-type: none">• 1GB available for Microsoft .NET Framework 3.5 SP1[†]• 100MB for Agilent IO Libraries Suite	1.5 GB available hard disk space, includes: <ul style="list-style-type: none">• 1GB available for Microsoft .NET Framework 3.5 SP1²• 100MB for Agilent IO Libraries Suite	1.5 GB available hard disk space, includes: <ul style="list-style-type: none">• 1GB available for Microsoft .NET Framework 3.5 SP1²• 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

* Because of the installation procedure, less memory may be required for operation than is required for installation.

[†] .NET Framework Runtime Components are installed by default with Windows Vista. Therefore you may not need this amount of available disk space.

PXIe System

PXI system/ host controller	A PXI or PXI Express embedded controller or PC host controller is required.
-----------------------------	---

Power the controller

- If you are using a desktop, laptop, or rack mount PC as remote controller:
 - 1 Install any peripheral devices in the PC (e.g., PCIe Interface adapters, etc.). Follow the manufacturers instructions.
 - 2 Power up the controller. Do not apply power to the PXI chassis yet.
 - 3 Choose the default option for any “Found Hardware” dialogs.
- If you are using a PXI embedded computer as the host computer:
 - 1 Install the embedded computer module into the PXI chassis following the manufacturers instructions.
 - 2 Connect peripherals such as a mouse, keyboard, monitor, CD drive, etc.
 - 3 Power up the chassis.
 - 4 Choose the default option for any “Found Hardware” dialogs

Install Agilent IO Libraries Suite

Agilent IO Libraries Suite 16.0 (or later) is required for the PXI modules. It includes the Agilent Connection Expert, the IVI Shared Components, and the VISA Shared Components.

NOTE

Agilent IO Libraries version 16.0 (or later) must be installed prior to installing and running any other software and prior to powering the chassis. The latest version can be downloaded from:
www.agilent.com/find/iosuite.

- 1 Insert the *Automation-Ready CD with Agilent IO Libraries Suite* into the CD-ROM drive of your system controller. Wait a few seconds for the auto-run window to appear. If the auto-run window does not appear automatically:
 - Click **Start > Run...**
 - **Type:** <drive>:Autorun\IOLibraries.hta
where <drive> is your CD drive letter.
- 2 Follow the installation instructions that came with the IO Libraries Suite.

NOTE

If the **IVI Shared Components** and **VISA Shared Components** are not already installed on your PC, Agilent IO Libraries Suite installs them in the default locations. If they are already installed, the installer upgrades them to the latest version, using the same location used by the older version. If this is a first-time installation, you can select installation locations for these components by choosing a Custom Installation.

Install instrument drivers

- 1 Insert the *Switch Module Software and Product Information* CD into the CD-ROM drive of your PC.

Wait a few seconds for the auto-run window to appear. If the auto-run window does not appear automatically:

- Click **Start > Run...**
 - **Type:** <drive>:Autorun.exe where <drive> is your CD drive letter.
- 2 Select the **Install Software** link. Follow the installer prompts. Accept all of the default directories specified during installation if prompted.
 - 3 After the Welcome screen, you will be prompted three times for license agreements. The software installer installs the following drivers:
 - **Agilent Modular Software License Agreement.** The installer program installs the Soft Front Panel (SFP) application and other object code to connect to the switches. Accept the license terms and click **Next**.
 - **Agilent IVI Driver Source Code License Agreement.** The Interchangeable Virtual Instrument (IVI) driver is available for programming the Agilent switch modules using Microsoft® development environments (e.g., Visual Studio®, C, C++, C#, Visual Basic), Agilent VEE, MATLAB®, or National Instruments® Labview™. Accept the license terms and click **Next**.
 - **Agilent Software License Agreement for drivers for use with LabVIEW Software.** The LABVIEW driver provides access to the functionality of the switches through LabVIEW VIs. This driver works in National Instruments LabVIEW development environments. Before this driver can be installed, your computer must already have the IVI Shared Components installed. Accept the license terms and click **Next**.

NOTE

Installing Agilent IO Libraries also installs the IVI Shared Components. The IVI Shared Components are required before IVI drivers (e.g., IVI-COM, IVI-C) can be installed from the product reference CD.

- 4 Next, the installer indicates the LabVIEW installations found on your host computer. Click **Next**
- 5 After accepting the licenses, the driver software is ready to be installed on your host computer. Click **Install**.
- 6 When the installation wizard is finished, you will be prompted to reboot your host computer. Do not reboot the host computer at this time! Select **“No, I will restart my computer later.”** Power down the host computer. Proceed to **“Step 4. Connect the PC to the PXI chassis”** on the next page.

Step 4. Connect the PC to the PXI chassis

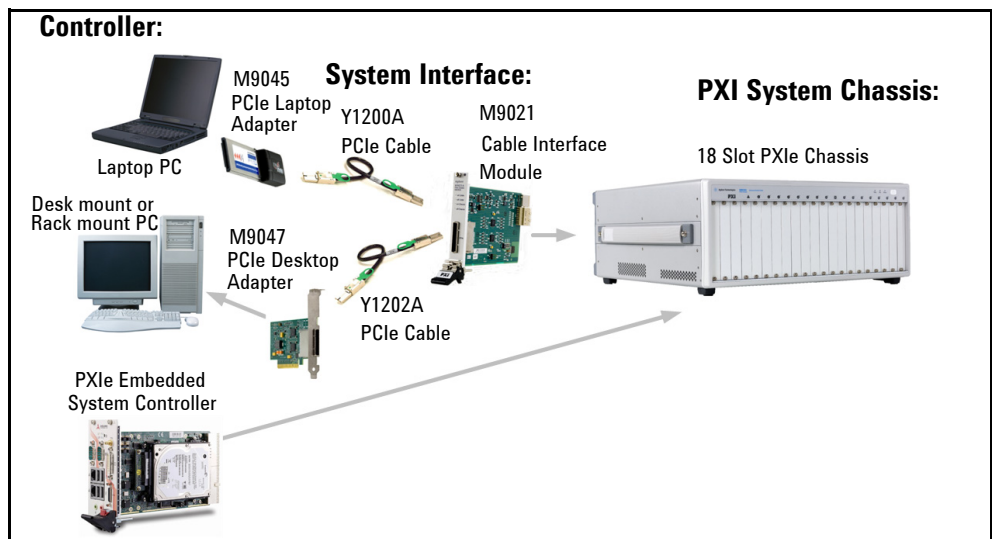
NOTE

To ensure proper system operation and the PC's ability to enumerate all of the PXI modules, you must use an approved embedded PC, desktop PC, or laptop PC along with approved PCIe adaptor and cable.

Using a remote PC

Refer to the following figure. Make certain that both the Remote Controller and the PXI chassis are turned off. Unplug the chassis from the ac power mains. If you are using the M9018A 18 Slot PXIe chassis, install the Agilent M9021A PCIe Cable Interface module in the chassis.

- If you are using a desktop or rack mount PC, install the M9047A PCIe Desktop Adapter in the PC. With an Agilent Y1202A cable, connect the adapter to the System Interface module.
- If you are using a laptop PC, install the M9045A PCIe ExpressCard Adapter in the laptop. With an Agilent Y1200A cable, connect the adapter to the System Interface module on the PXI chassis.



Using an embedded computer

Refer to the figure above. If you are using an embedded controller in the PXI chassis, you should have installed it prior to installing the Agilent IO Libraries and instrument drivers. No cables or other adapters are required. After installation, proceed to [“Step 5: Install the switch modules in the PXI chassis”](#)

Step 5: Install the switch modules in the PXI chassis

WARNING

- **PXI hardware does not support “hot-swap” capabilities (changing modules while power is applied to the chassis).**
- **Before installing Agilent PXI Modules into the chassis, the chassis must be powered off to prevent damage to the PXI module. Remove all cables/terminal blocks from the module prior to installing or removing the module.**

NOTE

These modules can be used in a chassis with a cPCI, PXI-1, or PXIh chassis peripheral slot.

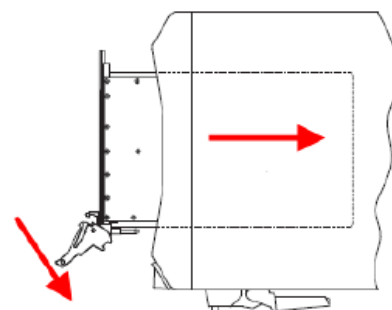
3

The modules can be installed in any standard PXI slot marked with a peripheral slot compatibility image (a circle containing the slot number).

7^H

The modules can also be installed in any hybrid PXI slot marked with a peripheral slot compatibility image (the letter “H” and a solid circle containing the slot number).

- 1 Make sure the PXI chassis power is turned off.
- 2 If the chassis has multiple fan speed settings, ensure that the fans are set to automatic. Do not set the fan speed to low or turn them off.
- 3 Position the chassis so that there is ample space between the chassis fan intake and exhaust vents. Blockage by walls or obstructions affects the air flow needed for cooling. (Refer to the chassis documentation for cooling information).
- 4 The modules are shipped with thread protectors over the mounting screws. These must be removed before installing the modules in a chassis.
- 5 Holding the PXI module by the injector/ejector handle, slide it into an available PXI (or hybrid) slot, as shown in the following figure.
 - Install the module in the PXI slot by placing the module card edges into the front module guides (top and bottom).
 - Slide the module to the rear of the chassis and assure that the injector/ejector handle is pushed down in the unlatched (downward) position.
 - Slide the module completely into the chassis. When you begin to feel resistance, push up on the injector/ejector handle to fully seat the module into the chassis.



- 6 Latch the module by pulling up on the injector/ejector handle and secure the front panel to the chassis using the module mounting screws.
- 7 Tighten the screws on the module (or remote controller) front panel. Performance may suffer if the screws are not securely tightened.
- 8 Install all chassis covers, filler panels, and air inlet modules after installing the module. Missing filler panels may disrupt necessary air circulation in the chassis.
- 9 If you are using a remote controller, connect the cable interface module in the chassis to the host computer.
- 10 Plug in and power up the PXI chassis. Verify that the chassis fans are operating and free of obstructions that may restrict airflow.

CAUTION

If you are using a remote controller linked to the M9021A Cable Interface, you must power up the chassis BEFORE you power up the PC. When you power down your system, you must Shut Down the PC BEFORE you power down the chassis.

NOTE

If you are using MXI-3 to connect a desktop PC to a PXI chassis or link to multiple chassis, power up the system as follows:

- For a system with a PC and one chassis, power up the chassis before powering the PC.
 - For a system with more than one chassis, power on the last chassis in the system followed by the penultimate, etc. Finally, turn on the PC or chassis containing the system controller.
-

- 11 If you are using a remote host computer (rack mount, desktop, or laptop PC), power-on the computer. Choose the default option for any “Found New Hardware” dialogs.

NOTE

After all of the “Found New Hardware” dialogs are complete, you must reboot the host computer.

Chassis Power Down Process


CAUTION

If you are using a remote controller linked to the M9021A Cable Interface, you must Shut Down the PC BEFORE you power down the chassis. When you restore power, you must power up the chassis BEFORE you power up the PC.

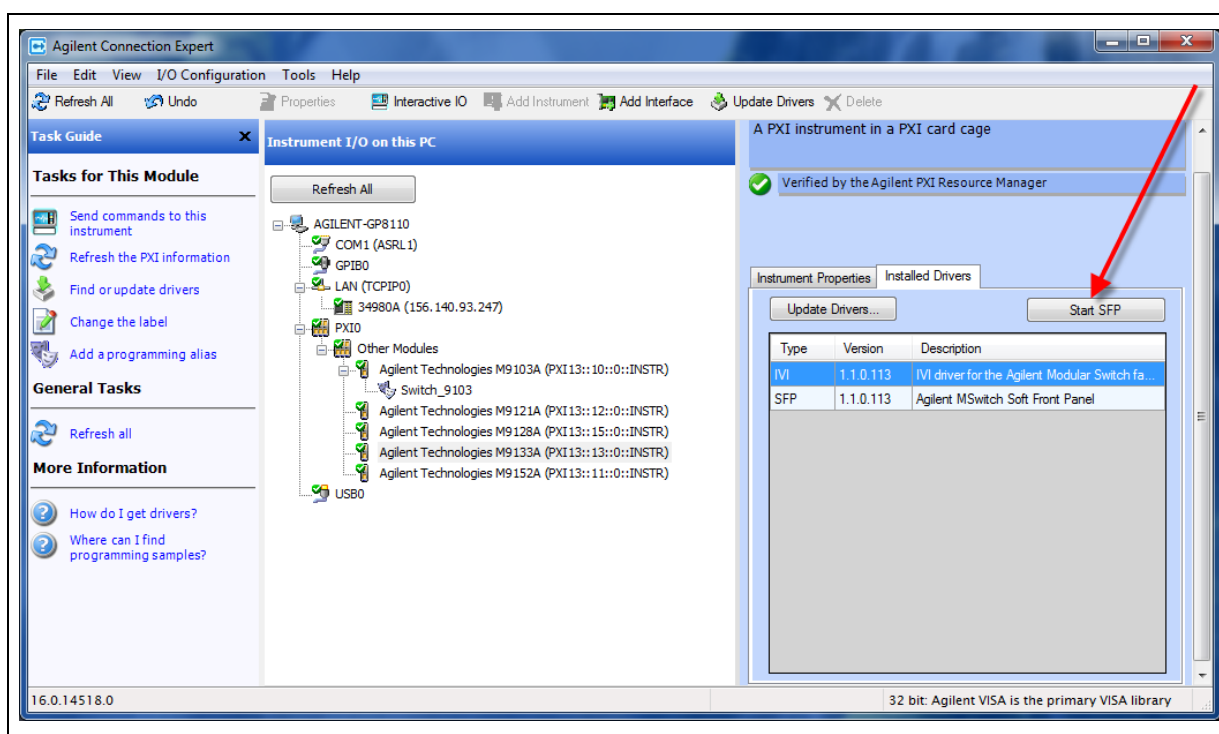
Step 6. Verify operation of the module

Run Agilent IO Libraries Connection Expert

If Agilent Connection Expert is already running on the system controller, click the **Refresh All** button to identify any hardware you have just installed or re-connected.

If Connection Expert is not already running, run it now to verify your I/O configuration. In the Windows Notification Area, click the **IO** icon (), then click **Agilent Connection Expert**.

Locate your interfaces and instruments in the Agilent Connection Expert Explorer Pane. The following graphic shows the Connection Expert screen.

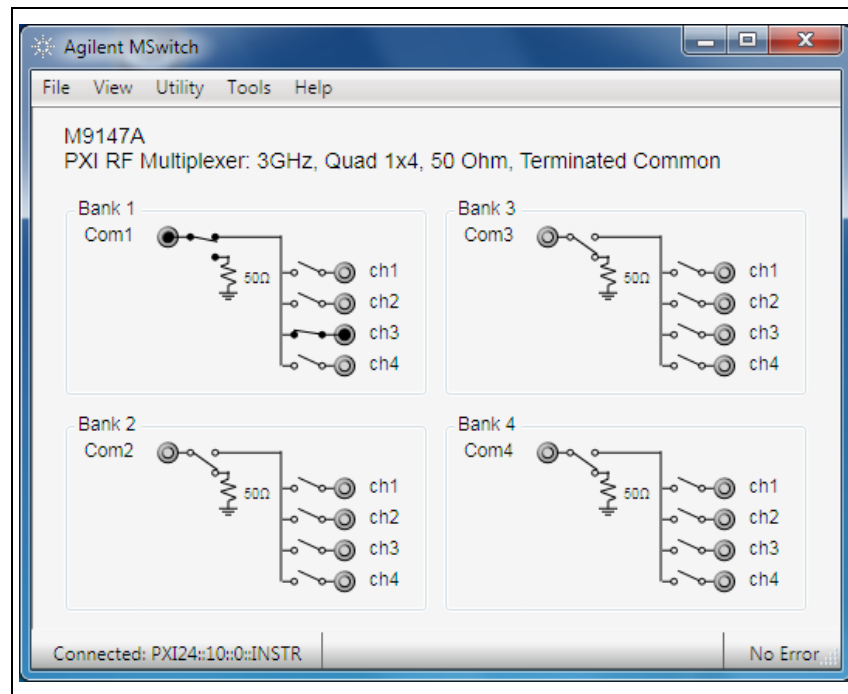


Select a module in the center pane (Instrument I/O on this PC). The right-hand Pane shows the instrument properties. Select the **Installed Drivers** tab then click the **Start SFP** button.

Step 6. Verify operation of the module

You can use the Soft Front Panel (SFP) software to open and close the relays and verify operation of the switch modules. The Soft Front Panel Software was installed as part of the Software installation process.

Refer to the SFP help file on the *Switch Module Software and Product Information CD* for specific detailed information on the SFP. The following graphic shows an example of the SFP for the M9147A PXI RF Switch module.



Beginning with SFP Version 1.1.x, if you have another application, either your own program or another instance of the SFP interface, that has initialized the switch module, then the SFP enters its “monitor” mode. In this mode, you cannot change relay state and the menu buttons are grayed-out. However, as the other application controls the channels, the SFP interface monitors and displays the state of the individual relays. Refer to the SFP help file for additional information.

Verify operation

There are no specific operational verification or self test procedures. However, you can use the Soft Front Panel software to open and close individual channels. Module specifications are guaranteed by design.

Step 6. Verify operation of the module

Characteristics

For detailed specifications, refer to the module Data Sheet on the *Switch Module Software and Product Information CD*.

Default path settings

The RF switch multiplexer modules always have a signal path closed -- common to one of the channels. Even when the module is in the powered down state, one signal path is always closed. The table below lists the default signal path for the RF Switch modules. This default switch path is also shown in the following diagrams.

Switch Model	Bank	Default Path
M9128A 50Ω RF Matrix Switch	N/A	All relays are open when power is removed.
M9146A, Dual 1x4, 50Ω Terminated	1	All input terminals are terminated to the 50Ω resistor. Com1 is open circuit.
	2	All input terminals are terminated to the 50Ω resistor. Com2 is open circuit.
M9147A, Quad 1x4, 50Ω Terminated Common	1	Com1 terminated to 50Ω, channels open circuit
	2	Com2 terminated to 50Ω, channels open circuit
	3	Com3 terminated to 50Ω, channels open circuit
	4	Com4 terminated to 50Ω, channels open circuit
M9148A, 1x8, 50Ω	1	Com to channel 4
M9149A, 1x16, 50Ω	1	Com to channel 13
M9150A, Dual 1X4, 75Ω	1	Com1 to Bank 1, Channel 4
	2	Com 2 to Bank 2, Channel 4
M9151A, Quad 1X4, 75Ω	1	Com1 to Bank 1, Channel 4
	2	Com2 to Bank 2, Channel 4
	3	Com3 to Bank 3, Channel 4
	4	Com4 to Bank 4, Channel 4
M9152A, 1X8, 75Ω	1	Com to Channel 4
M9153A, 1X16, 75Ω	1	Com to Channel 13

Module functional description

The Agilent PXI RF 50 Ω and 75 Ω switch modules conform to the single slot, 3U form factor (100mm by 160mm / 3.94 in. by 6.3 in.) Eurocard standard. These modules meet PXI Specification 2.2. Local bus, trigger bus, and star trigger are not included. The modules also include:

- CPCI Ejector Handle
- Front panel SMB connectors
- The front panel secures to the chassis by two M2.5 x 6mm pan-head Posi-drive screws.

Figure 1 shows a functional block diagram for the modules. The PCI connector (J1) provides +3.3Vdc (not all modules use this supply), +5Vdc, +12Vdc, ground, as well as the control signals from the chassis backplane. The relay drivers are activated by the PCI Bridge (U1) via output registers.

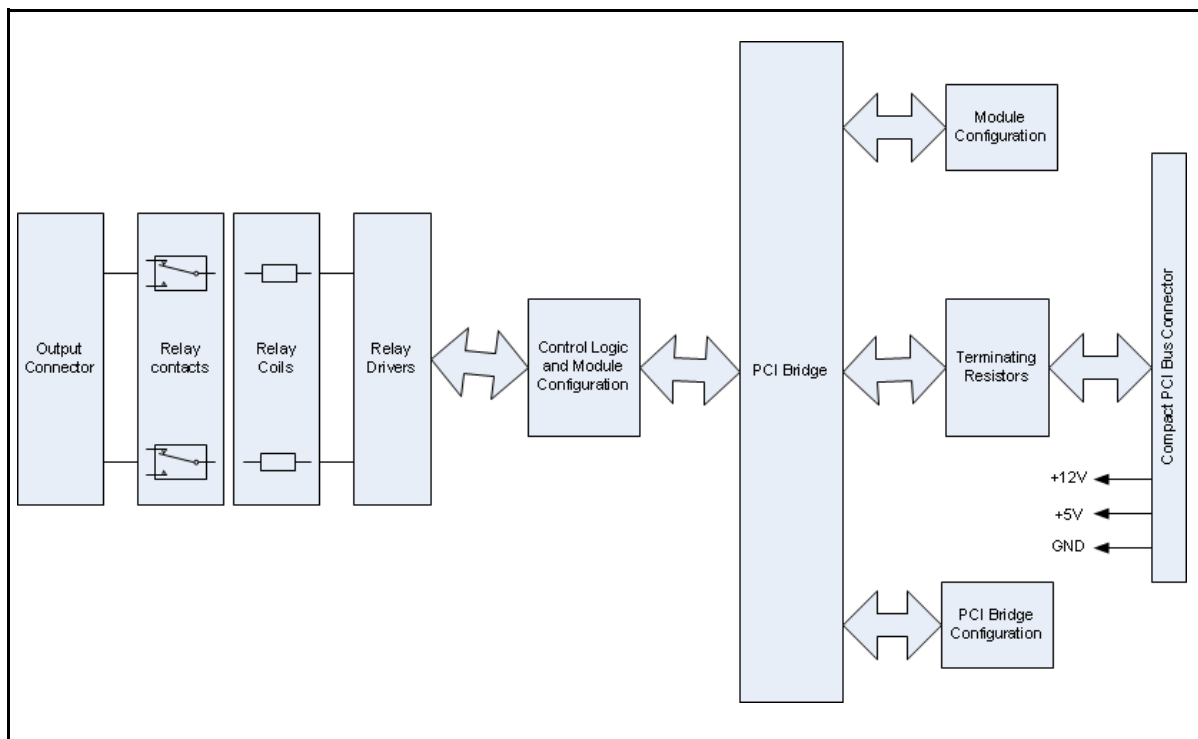


Figure 1 RF Switch Functional Block Diagram

There are no user serviceable or field replaceable components on these modules.

Module programming

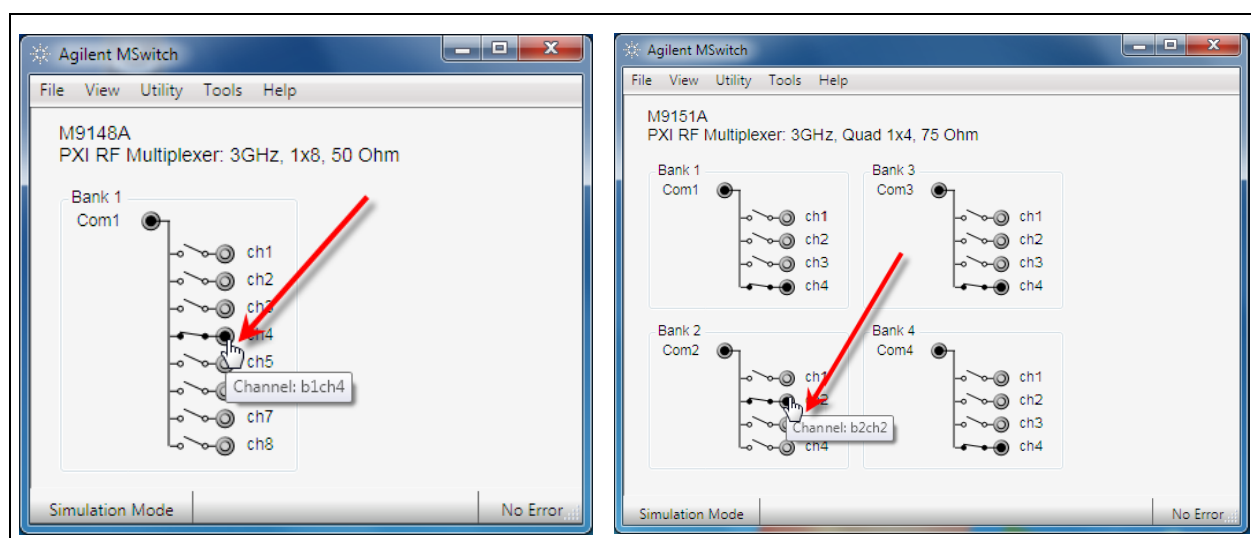
Refer to the Soft Front Panel help file for detailed operation of the module. For programming information, refer to the Ivi C and LabVIEW driver help files. These help files are located on the Switch Module Software and Product Information CD.

Many methods in the IviSwch interfaces accept a channel string parameter. The channel names supported by the AgMSwitch driver depend upon the specific switch module to which the driver is connected.

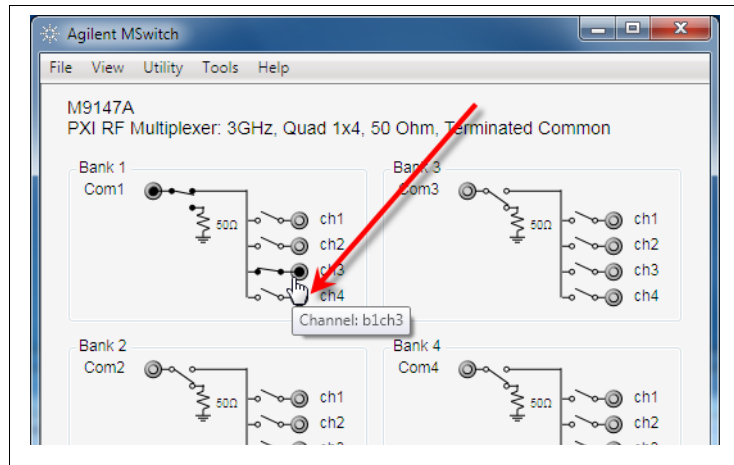
Identifying channel numbers

In the Soft Front Panel interface, when you mouse over a specific channel or crosspoint (M9128A Matrix) the cursor changes to a hand cursor, and a popup tool tip shows the Instrument Specific Syntax for the channel number as shown in the following graphics. The Instrument Specific Syntax for channel numbers is used by the Ivi and Labview driver open/close commands.

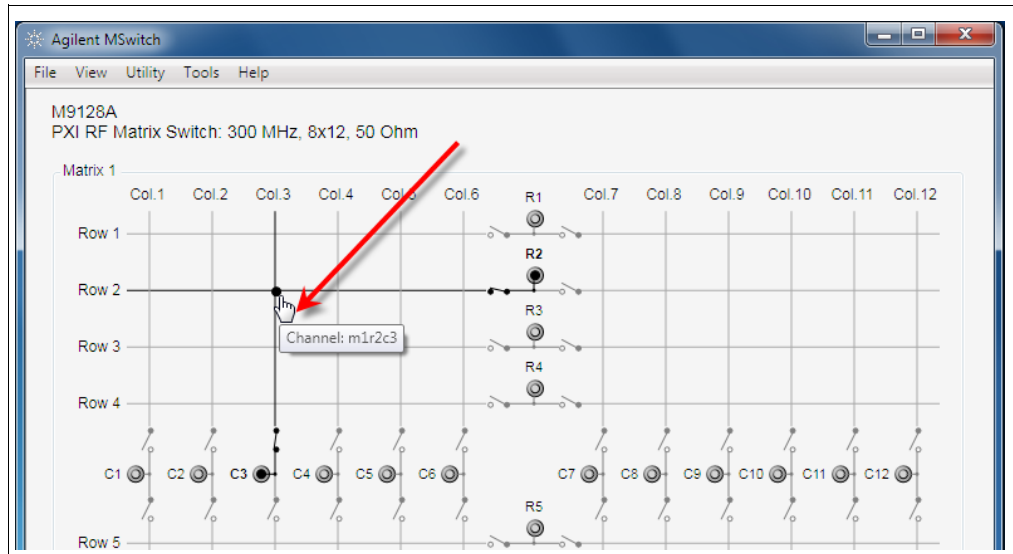
For multiplexer modules, the Instrument Specific Syntax for channel numbers is in the form: **b n ch n** where **b n** is the bank number and **ch n** is the actual channel number. For example, **RouteCloseChannel("b2ch2")** will close the relay that connects channel 2 of bank 2 to the common. For 1-of-n modules, the previously closed channel is opened as a result of this closure. The following graphics show the Soft Front Panel interface and illustrate the channel numbering scheme:



Note that modules without separate, distinct banks still use the same format where the bank number is always 1:



For the M9128A Matrix module, the Instrument Specific Syntax for channel numbers uses the form: **mnrncn** where **m** indicates a matrix module, **rn** is the row and **cn** is the column. For example, **RouteCloseChannel("m1r2c3")** will close the relays to connect row 2 to column 3 of matrix 1. See the example below:



Module front panel connectors and system connections

The following pages show the topology diagrams and front panels for the individual PXI RF 50Ω and 75Ω Switching Modules.

M9128A PXI RF Matrix Switch: 300 MHz, 8x12, 50Ω

The M9128A Matrix module provides isolation switches, located on all coaxial connectors, to disconnect the matrix crosspoint switches. Only the signal is switched, all grounds are common. While the module is an 8X12 matrix, it is formed by joining four separate 4X6 matrices using isolation relays (see the figure below). The module is a true 8X12 matrix where any combination of crosspoints may be selected. Multiple crosspoints may be closed on any row or column but this will significantly degrade RF performance. All relays are open when power is removed.

To connect Row-to-Row or Column-to-Column, you must use two crosspoint channels. For example, to connect Row 2 to Row 4, you might use column 12, closing Row2 Column 12 and Row 4 Column12.

The IVI-C and Labview drivers automatically close the appropriate isolation relays. You specify a row and column and the drivers automatically select the appropriate relays to close.

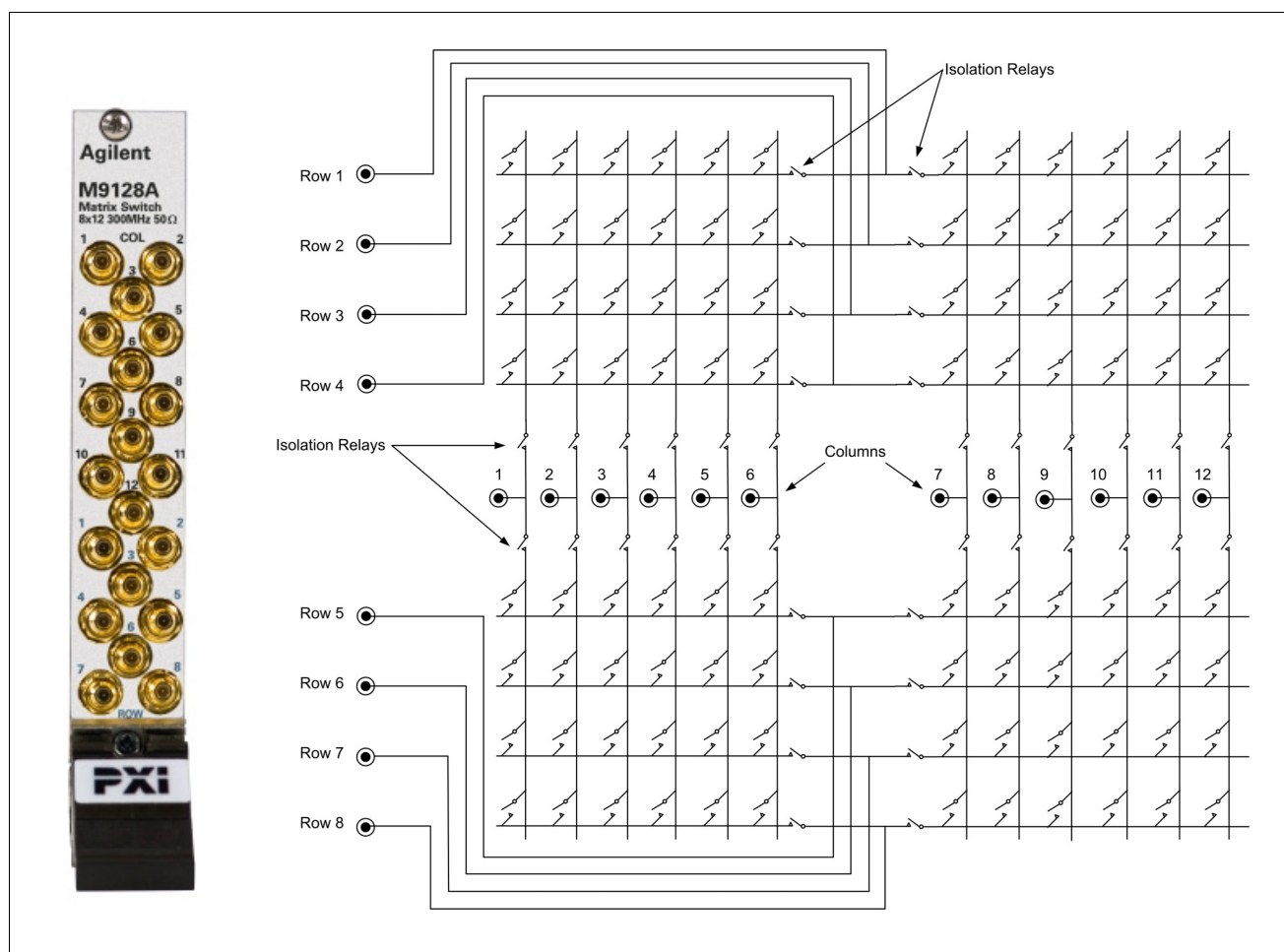
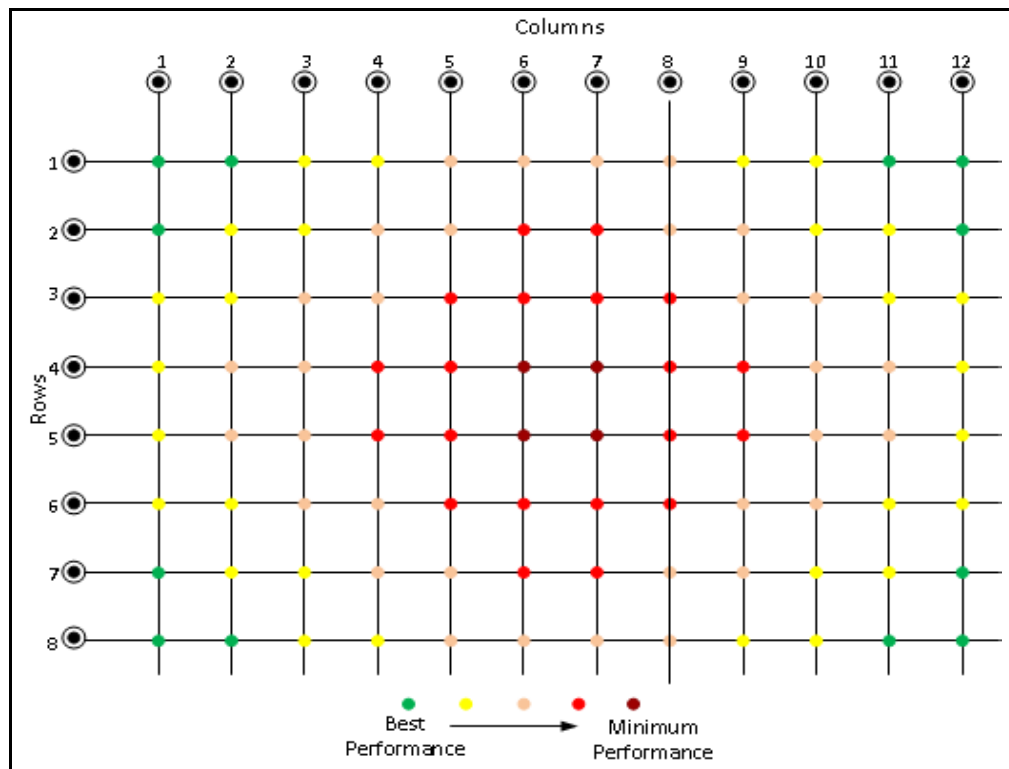


Figure 2 M9128A Front Panel and Simplified Schematic

RF Performance of the M9128A Matrix Module. RF performance depends on the specific combination of crosspoints closed. For optimum RF performance, close only one crosspoint relay in any one row or column. Performance also depends on the area of the matrix where the crosspoint relay is closed. The following graphic shows the relative performance of different crosspoints. To achieve the best performance of the module -- minimum Voltage Standing Wave Ratio (VSWR), crosstalk, insertion loss, etc. -- route signals through the perimeter of the matrix (for example, Row1/Column1 or Row 8, column 11). Performance diminishes near the center of the matrix (e.g. R4/C6).



For optimum performance, only one crosspoint should be closed per row/column. Note that while multiple crosspoints may be closed in any row or column, significant RF performance degradation will occur.

For detailed specifications, refer to the M9128A flyer on the *Switch Module Software and Product Information CD* or the RF Switch data sheet online at www.agilent.com/find/pxiswitch.

M9146A PXI RF Multiplexer Module: 3 GHz, Dual 1x4, 50Ω Terminated

Agilent's M9146A Dual 1x4 50Ω Multiplexer Module exhibits low insertion loss and VSWR. The module is constructed as two separate 1X4 RF switch multiplexers. It offers 50Ω inputs with bi-directional switching up to 3 GHz. This module features excellent insertion loss and VSWR for better RF signal integrity as well as outstanding dynamic range for routing RF signals into your measurement equipment. In addition, each path is carefully designed to ensure repeatable RF performance. Connections are made through easy, snap-on SMB front panel connectors. The default channel relay is terminated in a 50Ω resistor as shown in the diagram below.

With the IVI drivers or Soft Front Panels, you specify a bank and a channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

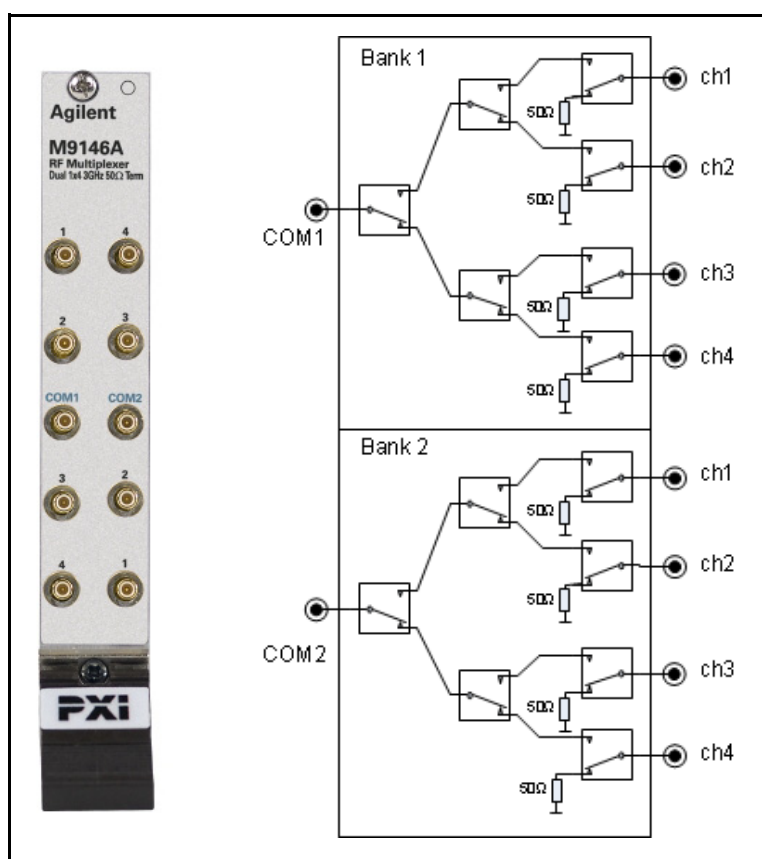


Figure 3 M9146A Front Panel and Simplified Schematic

M9147A PXI RF Multiplexer: 3 GHz, Quad 1x4, 50Ω Terminated Common

Agilent's M9147A Dual 1x4 50Ω Multiplexer Module exhibit low insertion loss and VSWR. The module is constructed as four separate 1X4 multiplexers. The default state of the common relay is terminated in a 50Ω resistor as shown in the diagram below. It offers 50Ω inputs with bi-directional switching up to 3 GHz. This module features excellent insertion loss and VSWR for better RF signal integrity as well as outstanding dynamic range for routing RF signals into your measurement equipment. In addition, each path is carefully designed to ensure repeatable RF performance. Connections are made through easy, snap-on SMB front panel connectors.

With the IVI drivers or Soft Front Panels, you specify a bank and a channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

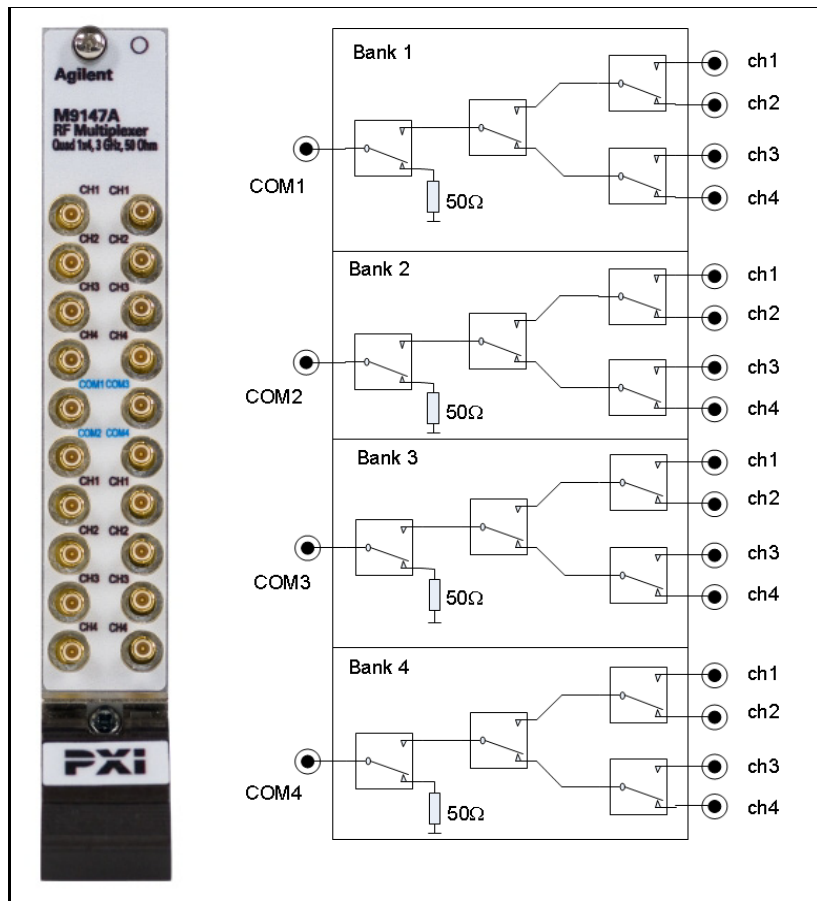


Figure 4 M9147A Front Panel and Simplified Schematic

M9148A PXI RF Multiplexer: 3 GHz, 1x8, 50Ω

Agilent's M9148A 1x8 50Ω Multiplexer Module exhibits low insertion loss and VSWR. This module features excellent insertion loss and VSWR for better RF signal integrity as well as outstanding dynamic range for routing RF signals into your measurement equipment. In addition, each path is carefully designed to ensure repeatable RF performance. Connections are made through easy, snap-on SMB front panel connectors. The diagram below shows the simplified schematic of the module.

With the IVI drivers or Soft Front Panels, you specify a channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

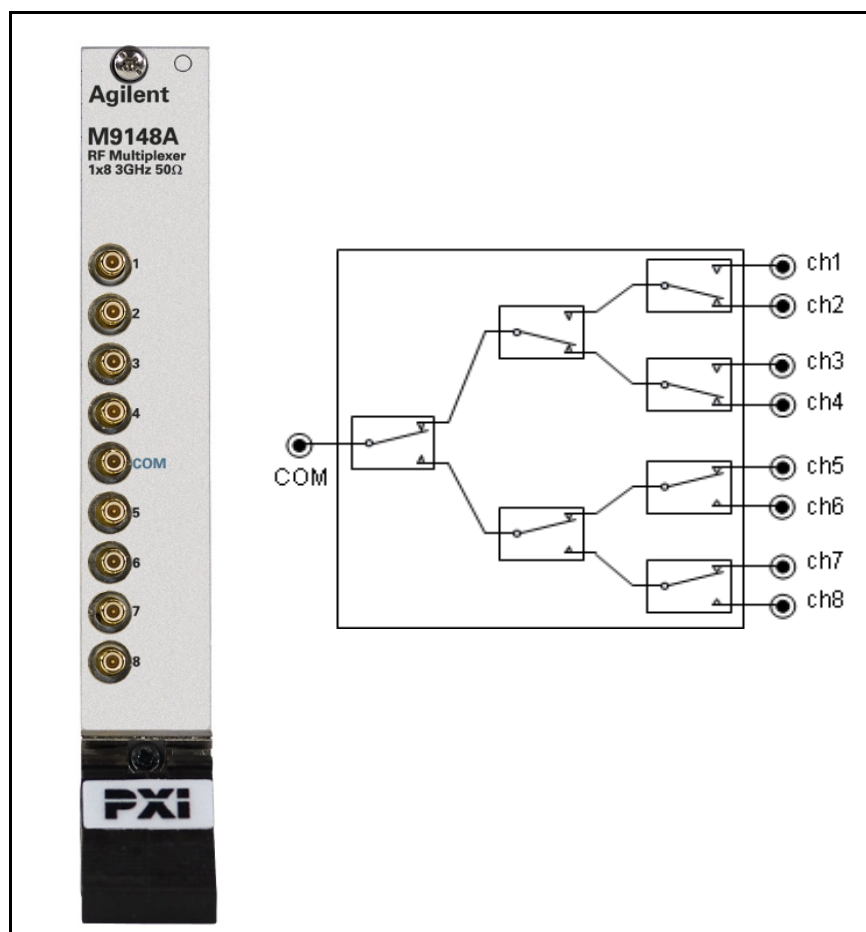


Figure 5 M9148A Front Panel and Simplified Schematic

M9149A PXI High Density RF Multiplexer: 3 GHz, 1x16, 50Ω

Agilent's M9149A 1x16 50Ω Multiplexer Module exhibits low insertion loss and VSWR. This module features excellent insertion loss and VSWR for better RF signal integrity as well as outstanding dynamic range for routing RF signals into your measurement equipment. In addition, each path is carefully designed to ensure repeatable RF performance. Connections are made through easy, snap-on SMB front panel connectors. The diagram below shows the simplified schematic of the module.

With the IVI drivers or Soft Front Panels, you specify a channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

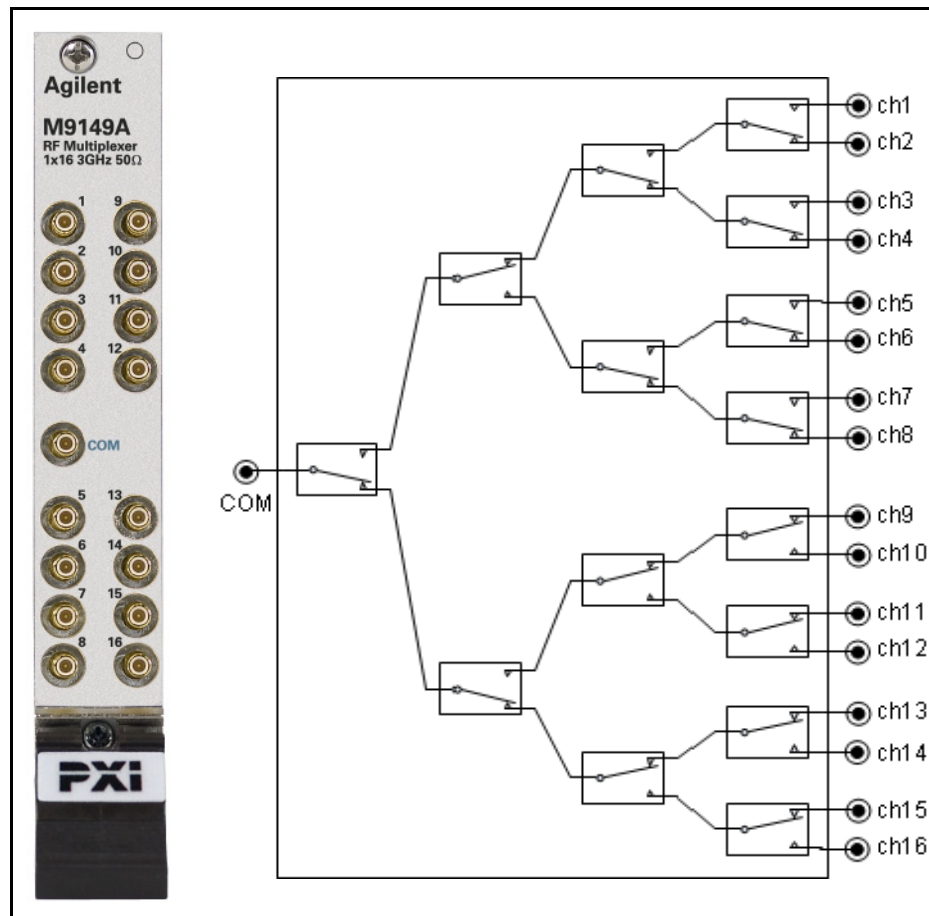


Figure 6 M9149A Front Panel and Simplified Schematic

M9150A PXI RF Multiplexer: 3 GHz, Dual 1X4, 75Ω

Agilent's M9150A Dual 1x4 75Ω Multiplexer Module exhibit low insertion loss and VSWR. The module is constructed as four separate 1X4 multiplexers. The 75Ω inputs make it ideal for routing video RF signals. Each path is carefully designed to ensure repeatable RF performance. It also features easy, snap-on SMB front panel connectors. The diagram below shows the simplified schematic for the module.

With the IVI drivers or Soft Front Panels, you specify a bank and channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

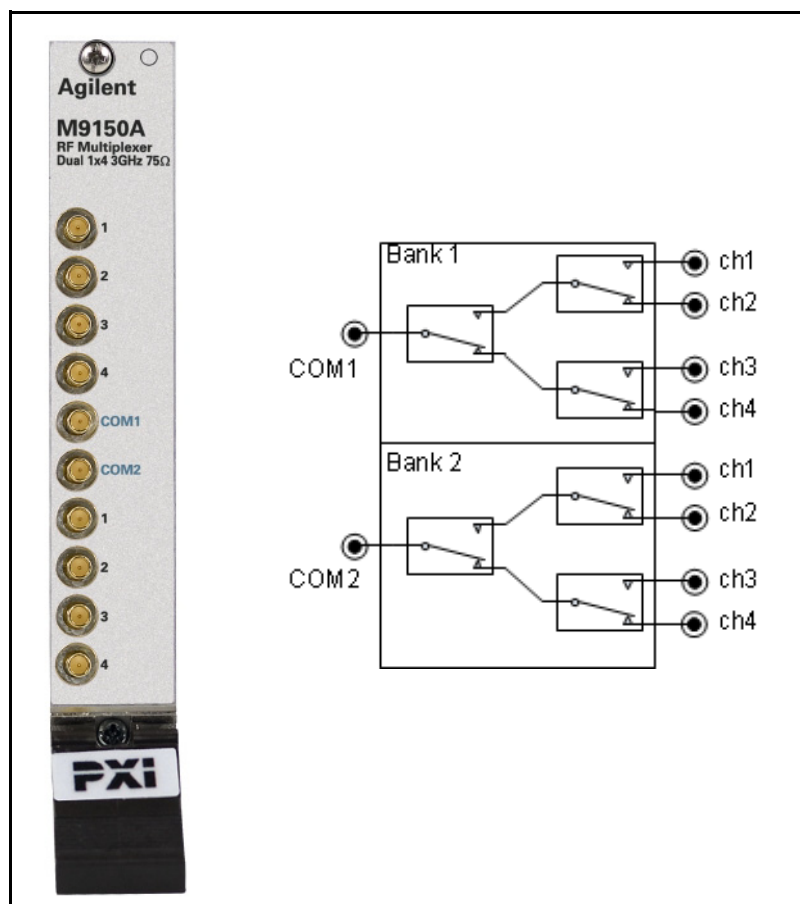


Figure 7 M9150A Front Panel and Simplified Schematic

M9151A PXI RF Multiplexer: 3 GHz, Quad 1X4, 75Ω

Agilent's M9151A quad 1x4 75Ω Multiplexer Module exhibit low insertion loss and VSWR. The module is constructed as four separate 1X4 multiplexers as shown in the diagram below. The 75Ω inputs make it ideal for routing video RF signals. Each path is carefully designed to ensure repeatable RF performance. It also features easy, snap-on SMB front panel connectors.

With the IVI drivers or Soft Front Panels, you specify a bank and channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

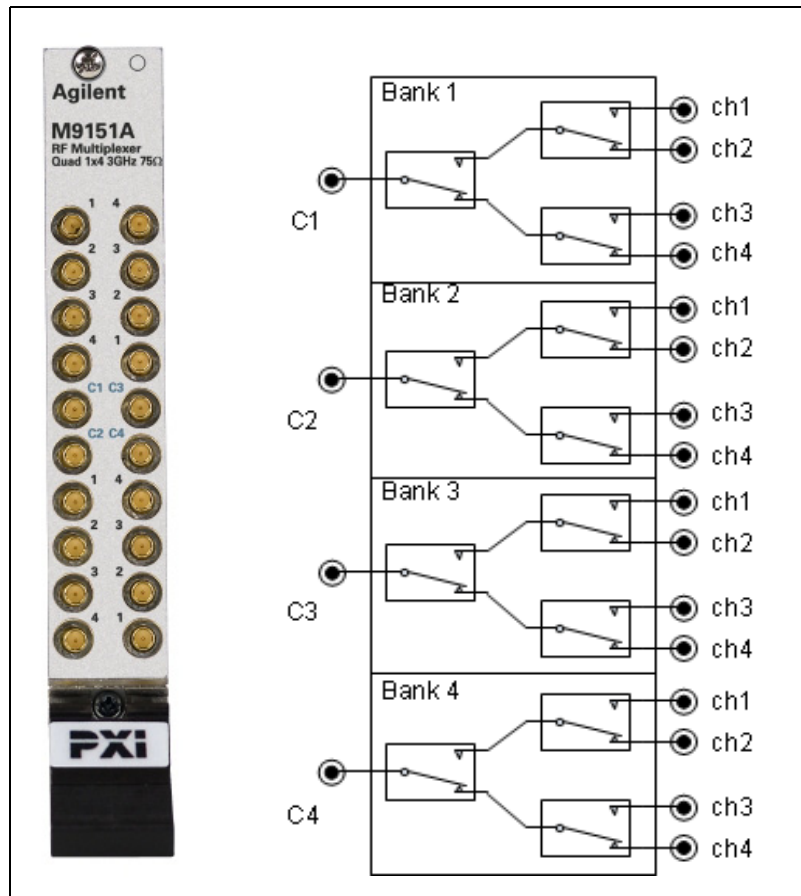


Figure 8 M9151A Front Panel and Simplified Schematic

M9152A PXI RF Multiplexer: 3 GHz, 1X8, 75Ω

Agilent's M9152A 1x8 75Ω Multiplexer Module exhibits low insertion loss and VSWR. The 75Ω inputs make it ideal for routing video RF signals. Each path is carefully designed to ensure repeatable RF performance. It also features easy, snap-on SMB front panel connectors. The diagram below shows the simplified schematic of the module.

With the IVI drivers or Soft Front Panels, you specify a bank and channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

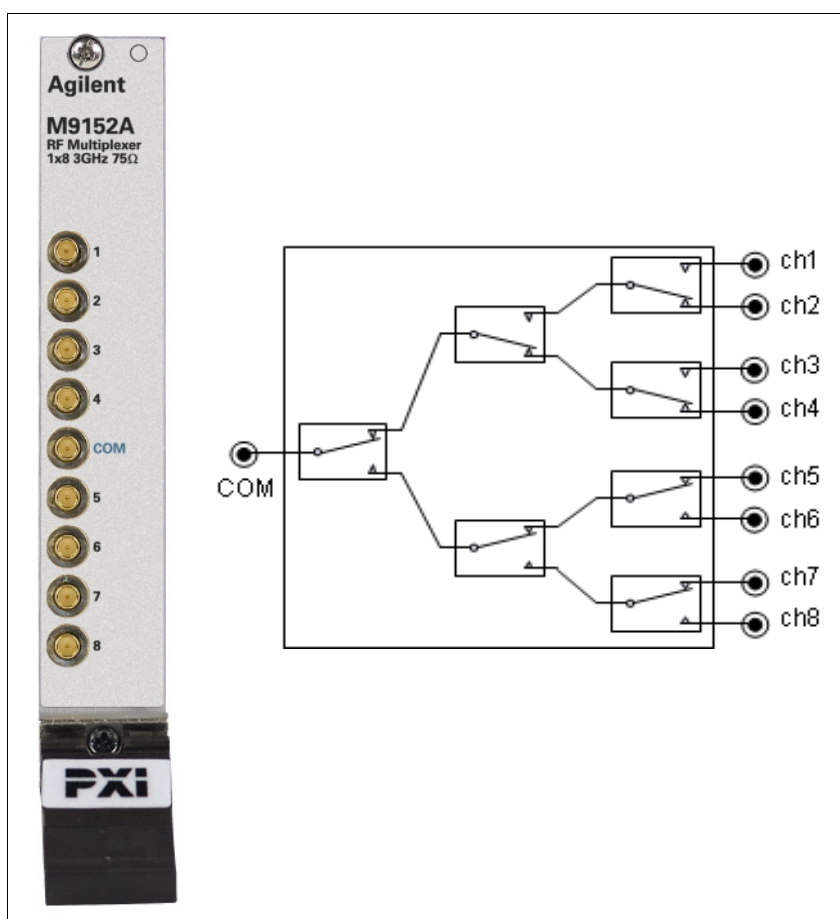


Figure 9 M9152A Front Panel and Simplified Schematic

M9153A PXI RF Multiplexer: 3 GHz, 1X16, 75Ω

Agilent's M9153A 1x16 75Ω Multiplexer Module exhibits low insertion loss and VSWR. The 75Ω inputs make it ideal for routing video RF signals. Each path is carefully designed to ensure repeatable RF performance. It also features easy, snap-on SMB front panel connectors. The diagram below shows the simplified schematic of the module.

With the IVI drivers or Soft Front Panels, you specify a channel to connect to the common and the drivers automatically set the appropriate relays. Refer to “[Module programming](#)” on page 15 for more information.

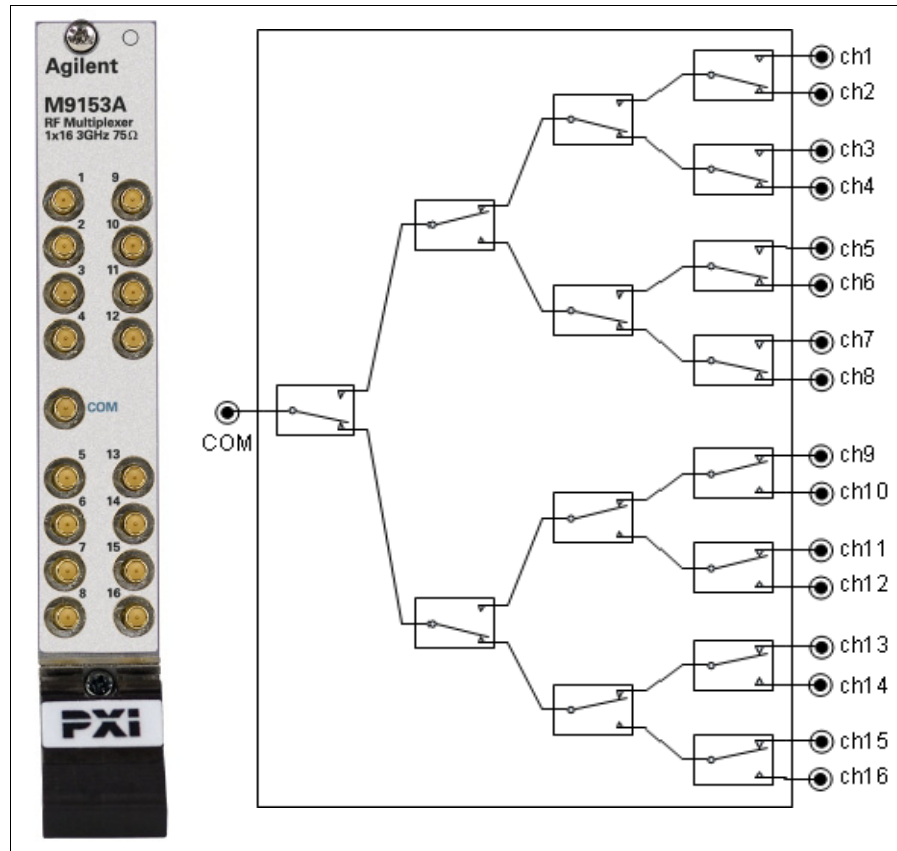


Figure 10 M9153A Front Panel and Simplified Schematic



The Modular Tangram

The four-sided geometric symbol that appears in Agilent modular product literature is called a tangram. The goal of this seven-piece puzzle is to create shapes — from simple to complex. 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

PXI™ www.pxisa.org

AXIe www.axistandard.org

Agilent Channel Partners

www.agilent.com/find/channelpartners



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

www.agilent.com/find/advantageservices

PXI is registered U.S. trademark of PXI Systems Alliance. Visual Studio, Visual C, C++, and C#, and Visual Basic are registered trademarks of Microsoft Corporation. Windows and MS Windows are U.S. registered trademarks of Microsoft Corporation. MATLAB is a U.S. registered trademark of The Math Works, Inc.

Product specifications and descriptions are subject to change without notice.

© Agilent Technologies, Inc. 2011

www.agilent.com

www.agilent.com/find/modular

www.agilent.com/find/pxi-switch

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

Americas

Canada	(877) 894 4414
Brazil	(11) 4197 3500
Mexico	01800 5064 800
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Thailand	1 800 226 008
Other AP Countries	(65) 375 8100

Europe & Middle East

Austria	43 (0) 1 360 277 1571
Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700 (0.125 €/minute)
Germany	49 (0) 7031 464 6333
Ireland	1890 924 204
Israel	972 3 9288 504 / 544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200 88 22 55
Switzerland	0800 80 53 53
United Kingdom	44 (0) 118 9276201
Other Countries:	www.agilent.com/find/contactus

© Agilent Technologies, Inc. 2011
Printed in Malaysia
Edition 2 March 2011



M9128-90001