Keysight M9164A/B/C and M9165A/B/C PXIe Solid State Switch Module



KEYSIGHT TECHNOLOGIES

Startup and Service Guide

Notices

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CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like 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, practice, or the like 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.

General Safety Information

The following safety precautions should be observed before using this product and any associated instrumentation.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid any possible injury. Read and follow all installation, operation, and maintenance information carefully before using this product. Refer to the user documentation for complete product specifications.

WARNING **If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**

The types of product users are:

- Responsible body who is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.
- Operators who use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.
- Maintenance personnel who perform routine procedures on the product to keep it operating properly (for example, setting the line voltage or replacing consumable materials). Maintenance procedures are described in the user documentation. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.
- Service personnel who are trained to work on live circuits, perform safe installations, and repair products. Only properly trained service personnel may perform installation and service procedures.

Keysight products are designed for use with electrical signals that are rated Measurement Category I and Measurement Category II, as described in the International Electrotechnical Commission (IEC) Standard IEC 60664.

Most measurement, control, and data I/O signals are rated Measurement Category I and must not be directly connected to mains voltage or to voltage sources with high transient over-voltages. Measurement Category II connections require protection for high transient over-voltages often associated with local AC mains connections. Assume all measurement, control, and data I/O connections are for connection to Category I sources unless otherwise marked or described in the user documentation.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30 Vrms, 42.4 Vpeak, or 60 VDC are present. A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.

Operators of this product must be protected from electric shock at all times. The responsible body must ensure that operators are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product operators in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 V, no conductive part of the circuit may be exposed.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance-limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, ensure that the line cord is connected to a properly-grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

When installing equipment where access to the main power cord is restricted, such as rack mounting, a separate main input power disconnect device must be provided in close proximity to the equipment and within easy reach of the operator.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit-under-test. ALWAYS remove power from the entire test system and discharge any capacitors before connecting or disconnecting cables or jumpers, installing or removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit-under-test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions, or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with the same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device-under-test. Safe operation requires the use of a lid interlock.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits — including the power transformer, test leads, and input jacks — must be purchased from Keysight. Standard fuses with applicable national safety approvals may be used if the rating and type are the same. Other components that are not safety-related may be purchased from other suppliers as long as they are equivalent to the original component (note that selected parts should be purchased only through Keysight to maintain accuracy and functionality of the product).

If you are unsure about the applicability of a replacement component, call a Keysight office for information.

WARNING **No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electric shock, do not remove covers.**

Front and Rear Panel Symbols

	The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.		The CE mark is a registered trademark of the European Community. The CE mark shows that the product complies with all the relevant European Legal Directives. ICES/NMB-001 indicates that this ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada. ISM GRP.1 Class A indicates that this is an Industrial Scientific and Medical Group 1 Class A product.
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.		This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.
	This symbol indicates the time period during which no hazardous or toxic substance elements are expected to leak or deteriorate during normal use. Forty years is the expected useful life of the product.		This symbol indicates that PXI is a U.S. registered trademark of the PXI System Alliance.
 **R-R-Kst-WN19621** **R-R-Kst-WN18534**	This symbol is a South Korean Class A EMC Declaration. This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home. 이 기기는 업무용 (A 급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주 의하시기 바라 며 , 가정외의 지역에서 사용하는 것을 목적으 로 합니다.		

South Korean Class A EMC Declaration

Information to the user:

This instrument has been conformity assessed for use in business environments. In a residential environment, this equipment may cause radio interference.

– This EMC statement applies to the equipment only for use in business environment.

사 용 자 안 내 문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

– 사용자 안내문은 "업무용 방송통신기자재"에만 적용한다.

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

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

Product Category

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a "Monitoring and Control Instrument" product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit http://about.keysight.com/en/companyinfo/environment/takeback.shtml for more information.

Cleaning Precautions

WARNING To prevent electric shock, disconnect the instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally. To clean the connectors, use alcohol in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

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Introduction

The scope of this Startup and Service Guide is to detail the processes of receiving and installing the M9164x/M9165x PXIe Solid State Switch Module (300 kHz to 18 GHz), installing the required software, and verifying basic module operations. If you have any inquiries after reviewing these information, contact your local Keysight Technologies representative or contact us through our website at www.keysight.com/find/PXIswitch.

Product Model Description

Table 1-1 Product Model Description

Model	Description
M9164A	PXIe Solid State 2x16 Switch Module, 300 kHz - 6.5 GHz
M9164B	PXIe Solid State 2x16 Switch Module, 300 kHz - 9 GHz
M9164C	PXIe Solid State 2x16 Switch Module, 300 kHz - 18 GHz
M9165A	PXIe Solid State 2x8 Switch Module, 300 kHz - 6.5 GHz
M9165B	PXIe Solid State 2x8 Switch Module, 300 kHz - 9 GHz
M9165C	PXIe Solid State 2x8 Switch Module, 300 kHz - 18 GHz

Step 1: Unpack and Inspect the M9164x/M9165x Module

CAUTION The module is shipped in material that prevents static damage to the module. The module should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken. Store the module in an anti-static envelope 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.

Two types of ESD protection are listed below. 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, static-safe accessories must provide at least 1 MΩ of isolation from ground.

WARNING These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

Inspect for Damage

After unpacking the module, carefully inspect the module for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty (warranty information can be found at the beginning of this manual).

CAUTION To avoid damage when handling a module, do not touch the exposed connector pins.

NOTE Information on preventing damage to your Keysight equipment can be found at www.keysight.com/find/tips.

Return for Service

Should it become necessary to return the module for repair or service, follow these steps:

1. Review the warranty information shipped with your module.
2. Contact Keysight to obtain a Return Material Authorization (RMA) and return address. If you need assistance in finding Keysight contact information, go to www.keysight.com/find/assist (worldwide contact information for repair and service) or refer to the Support information on the product Web page at www.keysight.com/find/PXIswitch.
3. Write the following information on a tag and attach it to the malfunctioning module.
   - Name and address of owner. A P.O. box is not acceptable as a return address.
   - Product model number (for example, M9164A)
   - Product serial number (for example, MYXXXXXXXX). The serial number label is located on the side panel of the module. The serial number can also be viewed from the Soft Front Panel interface, but only after the software is installed.
   - Description of failure or service required
4. Carefully pack the module in its original ESD bag and packing carton. If the original carton is not available, use bubble wrap or packing peanuts and place the module in a sealed container and mark the container as "FRAGILE".
5. On the shipping label, write ATTENTION REPAIR DEPARTMENT and the RMA number.

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

Step 2: Install the Software

System Requirements

Prior to any installation or configuration, ensure that the following system requirements are met:

Table 1-2 System Requirements

Operating System	Windows 7 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional, Ultimate, Enterprise Windows 10 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional
Processor Speed	1 GHz 32-bit (x86), 1 GHz 64-bit (x64), no support for Itanium 64
Available Memory	1 GB minimum
Available Hard-Disk Space[a]	1.5 GB, includes: – 1 GB for Microsoft .NET Framework 3.5 SP1[b] – 100 MB for Keysight IO Libraries Suite[c]
Video	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA graphics supported)
Browser	Microsoft Internet Explorer 7 or higher

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

[b] .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.

[c] Version 2019 U1 (or later) of the Keysight IO Libraries Suite is required.

Power Up the Host PC

Power up the host PC to install the M9164x/M9165x software.

Install the Software

The M9164x/M9165x software is available for download at www.keysight.com/find/PXIswitch.

NOTE

The latest version of Keysight IO Libraries Suite (which includes the Keysight Connection Expert) can be downloaded from

www.keysight.com/find/iosuitedownload. The Keysight Instrument Control DVD, with the above software, is no longer shipped with Keysight instruments. If you require a Keysight Instrument Control DVD, it can be ordered by contacting your local Keysight Customer Contact Center.

The software installation includes the following items:

- Keysight IO Libraries Suite
- Soft front panel (SFP) software, device drivers (IVI-C and IVI-COM, and LabVIEW G), and related user documentation for the module.

Step 3: Install the M9164x/M9165x Module

NOTE The module can be used in a chassis with a cPCI, PXI-1, or PXI-H chassis peripheral slot.



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



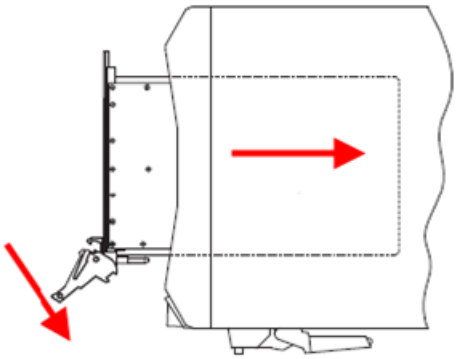
The module can also be installed in any hybrid PXI slot marked with a peripheral slot compatibility image (the letter "H" and a solid circle containing the slot number).

CAUTION PXI hardware does not support "hot-swap" capabilities (changing modules while power is applied to the chassis).

Before installing a module into the chassis, the chassis must be powered off and unplugged to prevent damage to the module.

1. Ensure that the PXI chassis power switch is in the Off (Standby) position; then unplug the chassis.
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 it 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 more information about cooling).
4. Holding the module by the injector/ejector handle, slide it into an available PXI (or hybrid) slot as shown in the figure below.
   - Install the module into the PXI slot of the chassis by placing the module card edges into the front module guides (top and bottom).

- Slide the module to the rear of the chassis and ensure 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 inject the M9164x/M9165x into the chassis.



5 Latch the module by pulling up on the injector/ejector handle, and secure the front panel to the chassis using the module front-panel mounting screws.

6 Tighten the screws on the module front panel. Performance may suffer if the screws are not tightened properly.

7 Install the System Interface Card in the chassis. (Refer to the System Interface Card documentation for more information about the installation).

8 Verify that the PXI chassis fans are operable and free of dust and other contaminants that may restrict air flow.

9 Install all chassis covers and filler panels after installing the M9164x/M9165x. Missing filler panels may disrupt necessary air circulation in the chassis.

10 Connect the System Interface Card in the chassis to the host PC.

11 Plug in and power up the PXI chassis.

12 Power up the host PC.

NOTE **Warm up time of 5 minutes is recommended, after cold turn-on and after power cycle.**

Step 4: Verify the M9164x/M9165x Operation

The following procedure guides you to verify that the newly installed M9164x/M9165x is operating correctly.

1 Run Keysight Connection Expert (from the desktop icon, or from **Start > All Programs > Keysight IO Libraries Suite > Keysight Connection Expert**). It displays the installed module (M9165x as shown below).

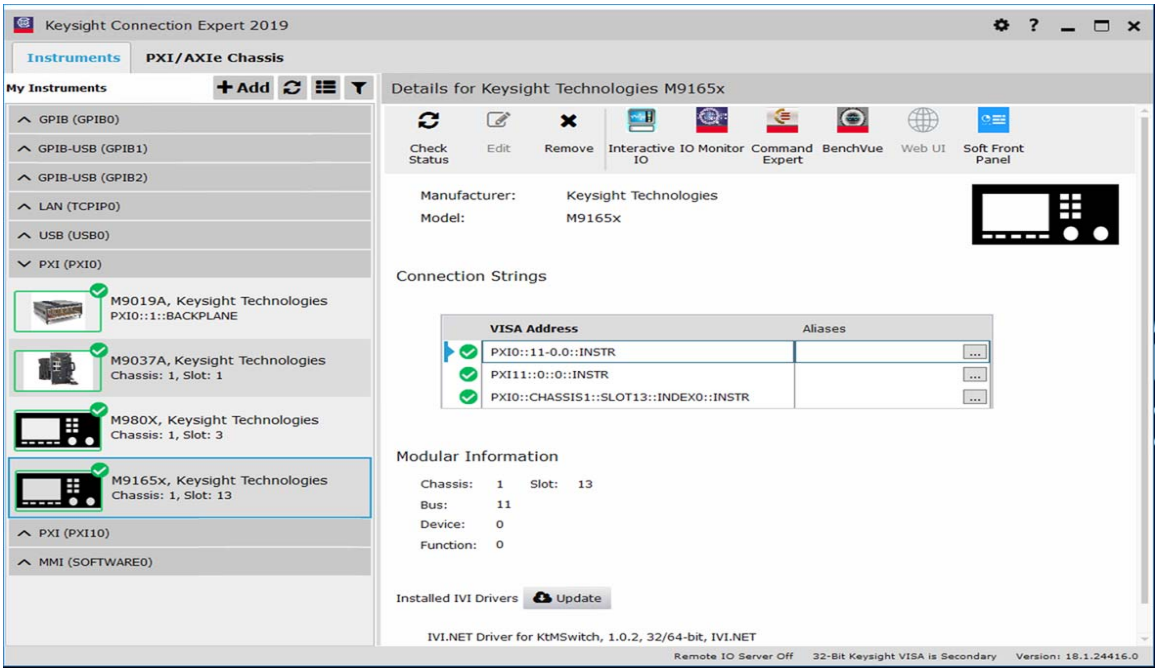


Figure 1-1 Keysight Connection Expert Interface

2 Launch the soft front panel (SFP) software from **Start > All Programs > Keysight > KtMSwitch > KtMSwitch SFP** or from the Keysight Connection Expert. On the Keysight Connection Expert, select the module (for example, M9165x) and click **Soft Front Panel** to launch the SFP as shown in Figure 1-2.

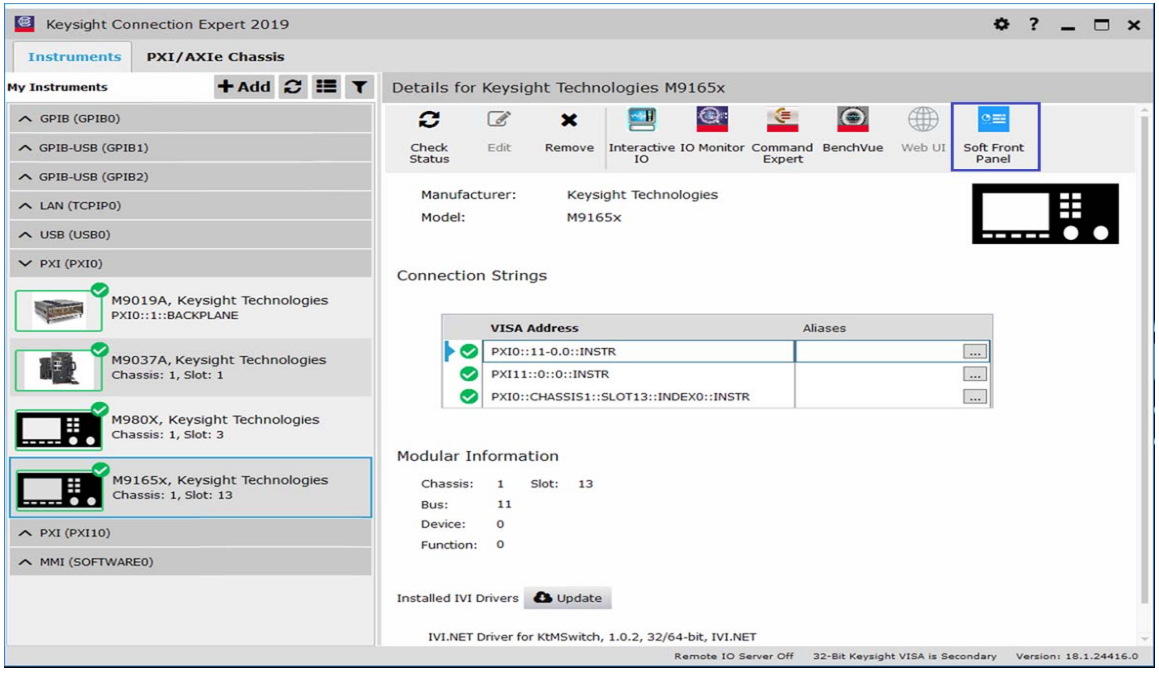


Figure 1-2 Launching the SFP from Keysight Connection Expert

3 Click **Connect** to connect to the module.

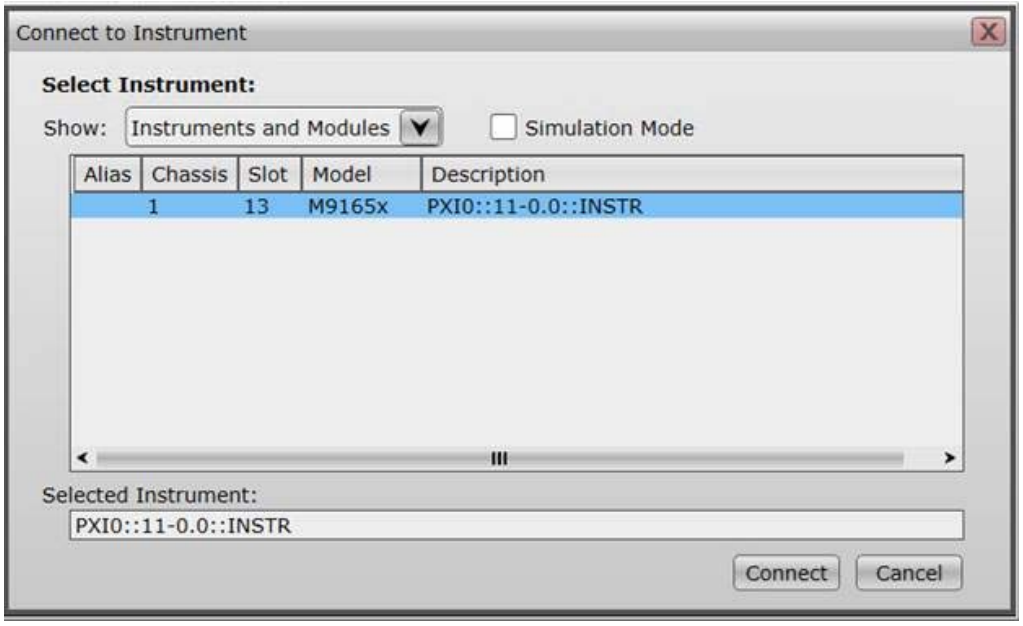


Figure 1-3 Connect to Instrument Dialog

To verify that the module is working properly, click the desired port as shown in Figure 1-4.

You can further verify the module to check if a port is connected using a network analyzer to perform RF measurement.

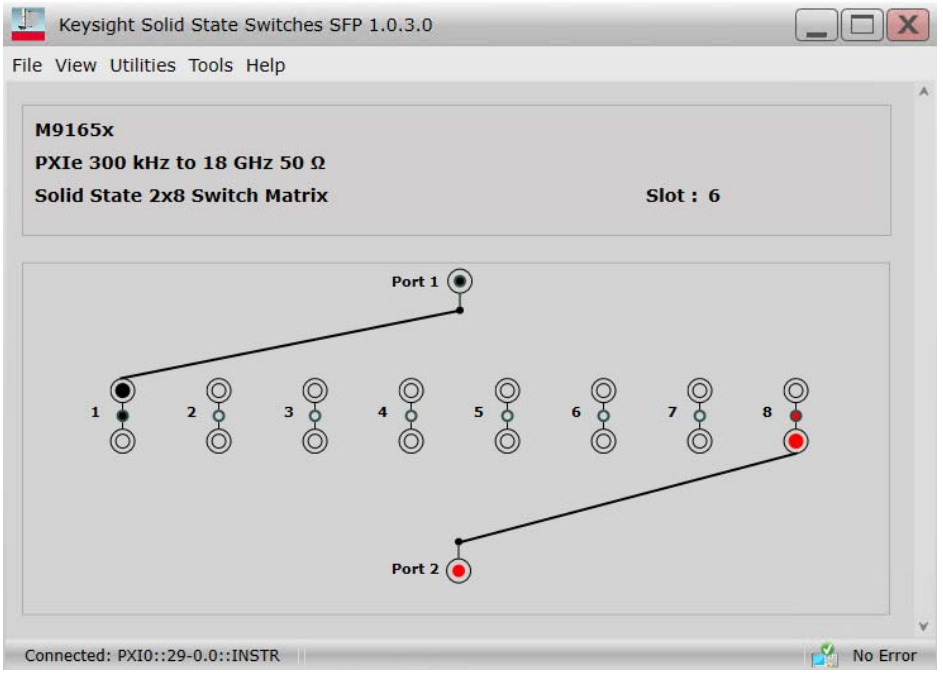


Figure 1-4 SFP Verification

2 Service and Maintenance

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Service

The M9164x/M9165x module does not have internal adjustments and should only be repaired by service-trained personnel. Should it become necessary to return the module for repair or service, contact your nearest Keysight Service Center.

Maintenance

The connectors of the module must be kept clean. Keysight recommends that the connectors be periodically inspected and cleaned if necessary.

Clean the Connectors

Clean connectors are essential for ensuring the integrity of RF and microwave coaxial connectors.

1 Use compressed air or nitrogen.

WARNING **Always use protective eyewear when using compressed air or nitrogen.**

Use compressed air (or nitrogen) to loosen particles on the connector mating plane surfaces.

You can use any source of clean, dry, low-pressure compressed air or nitrogen that has an effective oil-vapor filter and liquid condensation trap placed just before the outlet hose.

Ground the hose nozzle to prevent electrostatic discharge, and set the air pressure to less than 414 kPa (60 psi) to control the velocity of the air stream. High-velocity streams of compressed air can cause electrostatic effects when directed into a connector. These electrostatic effects can damage the device.

2 Clean the connector threads.

WARNING Keep isopropyl alcohol away from heat, sparks, and flame. Store it in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemicals, or carbon dioxide; water may be ineffective.

Use isopropyl alcohol with adequate ventilation and avoid contact with eyes, skin, and clothing. It causes skin irritation, may cause eye damage, and is harmful if swallowed or inhaled. It may be harmful if absorbed through the skin. Wash thoroughly after handling. In case of spill, soak up with sand or earth. Flush spill with water.

Dispose of isopropyl alcohol in accordance with all applicable federal, state, and local environmental regulations.

Use a lint-free swab or cleaning cloth moistened with isopropyl alcohol to remove any dirt or stubborn contaminants on a connector that cannot be removed with compressed air or nitrogen.

a Apply a small amount of isopropyl alcohol to a lint-free swab.

b Clean the connector threads.

c Let the alcohol evaporate, and then blow the threads dry with a gentle stream of clean, low-pressure compressed air or nitrogen. Always completely dry a connector before you re-assemble or use it.

3 Clean the mating plane surfaces.

a Apply a small amount of isopropyl alcohol to a lint-free swab.

b Clean the center and outer conductor mating plane surfaces. When cleaning a female connector, avoid snagging the swab on the center conductor contact fingers by using short strokes.

c Let the alcohol evaporate, then blow the connector dry with a gentle stream of clean, low-pressure compressed air or nitrogen. Always completely dry a connector before you re-assemble or use it.

4 Re-inspect

Inspect the connector again to make sure that no particles or residue are present.

Make Good Connections

Good connections require a skilled operator. The most common cause of measurement error is bad connections. The following procedures explain how to make good connections.

Make a Preliminary Connection

1. Ground yourself and all devices. Wear a grounded wrist strap and work on a grounded, conductive table mat. Wear a heel strap when working in an area with conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
2. Visually inspect the connectors.
3. If necessary, clean the connectors.
4. Carefully align the connectors. The male connector center pin must slip concentrically into the contact finger of the female connector.
5. Push the connectors straight together.

CAUTION **Do not turn the device body. Only turn the connector nut. Damage to the center conductor and outer conductor can occur if the device body is twisted.**

6. The preliminary connection is tight enough when the mating plane surfaces make uniform, light contact. Do not overtighten this connection. A connection in which the outer conductors make gentle at all points on both mating surfaces is sufficient. Very light finger pressure is enough to accomplish this.
7. Ensure that the connectors are properly supported. Relieve any side pressure on the connection from long or heavy devices or cables.

Make the Final Connection Using a Torque Wrench

1 Use a torque wrench to make the final connection. The table below provides information about the torque wrench. Using the torque wrench guarantees that the connection is not too tight, preventing possible connector damage. It also ensures that all connections are equally tight each time.

Connector Type	Torque Setting	Keysight Torque Wrench Part Number
3.5 mm	90 N-cm (8 in-lb)	8710-1765
SMA	90 N-cm (8 in-lb)	8710-1765

2 Prevent the rotation of anything other than the connector nut that you are tightening. It may be possible to do this by hand if one of the connectors is fixed (as on a test port). In all situations, however, it is recommended that you use an open-end wrench to keep the body of the device from turning.

3 Position both wrenches within 90 degrees of each other before applying force. Refer to Figure 2-1. Wrenches opposing each other (greater than 90 degrees apart) will cause a lifting action which can misalign and stress the connections of the devices involved. This is especially true when several devices are connected together.

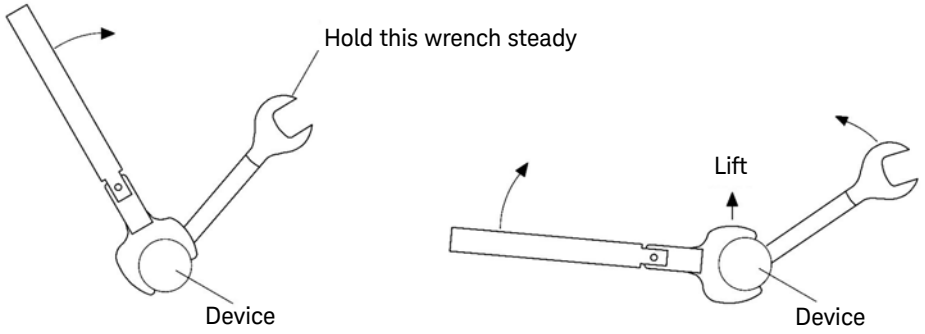


Figure 2-1 Wrench Positions

4 Hold the torque wrench lightly, at the end of the handle only (beyond the groove). Refer to Figure 2-2 below.

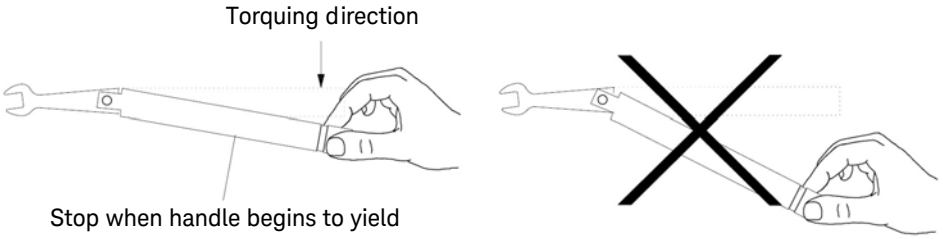


Figure 2-2 Using the Torque Wrench

5 Apply downward force perpendicular to the wrench handle. Refer to Figure 2-2. This applies torque to the connection through the wrench.

Do not hold the wrench so tightly that you push the handle straight down along its length rather than pivoting it, otherwise you apply an unknown amount of torque.

6 Tighten the connection just to the torque wrench break point. The wrench handle gives way at its internal pivot point. Refer to Figure 2-2. Do not tighten the connection further.

CAUTION **You do not need to fully break the handle of the torque wrench to reach the specified torque; doing so can cause the handle to kick back and loosen the connection. Any give at all in the handle is sufficient torque.**

Do not pivot the wrench handle on your thumb or other fingers, otherwise you apply an unknown amount of torque to the connection when the wrench reaches its break point.

Do not twist the head of the wrench relative to the outer conductor mating plane. If you do, you apply more than the recommended torque.

Separate a Connection

To avoid lateral (bending) force on the connector mating plane surface, always support the devices and connections.

CAUTION **Turn the connector nut, not the device body. Major damage to the center conductor can occur if the device is twisted.**

1. Use an open-end wrench to prevent the device body from turning.
2. Use another open-end wrench to loosen the connector nut.
3. Complete the separation by hand, turning only the connector nut.
4. Pull the connectors straight apart without twisting, rocking, or bending either of the connectors.

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