

Keysight Technologies M9405B PXIe Amplifier Module



User's 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.

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M9405B PXIe Amplifier Module



Introduction

The scope of this User's and Service Guide is to detail the processes of receiving and installing the M9405B module, installing the required software, and verifying basic module operations. If you have any inquiries after reviewing this information, contact your local Keysight Technologies representative or refer to ["Service and Support Options" on page 30](#).

Description

Congratulations on your purchase from Keysight Technologies, Inc.

The standard M9405B is a 2-slot, 2U PXIe amplifier module. Frequency and power of the module will vary depending on the option selected. See Figure 1 "Reflectometer Module Simplified Block Diagram" below.

To get the most out of your purchase, it is recommended that this User's and Service guide be read carefully and completely.

Figure 1 Reflectometer Module Simplified Block Diagram

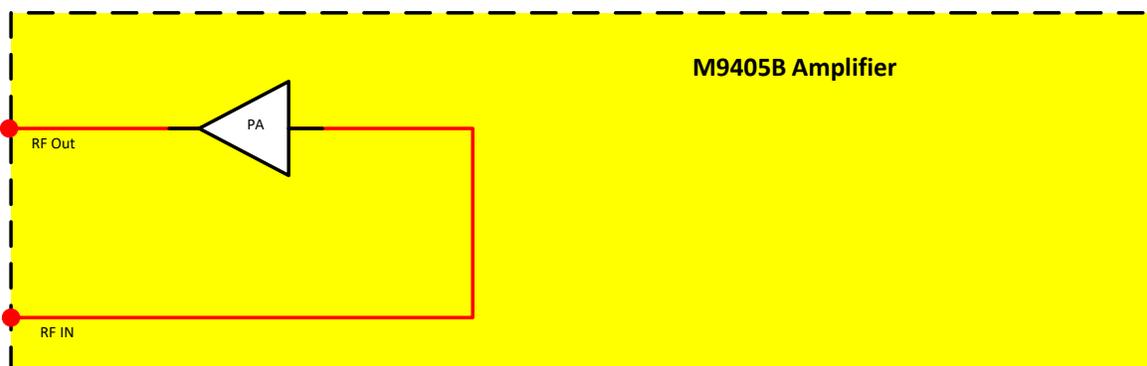


Table 1 Current Options

Module	Option	Description
M9405B	708	Single amplifier, 2-20 GHz, 30 dB Gain, +27 dBm

NOTE

Only Keysight approved accessories shall be used.

Verifying the Shipment

To verify the contents shipped with your product, refer to the “Box Content List” included with the shipment.

Inspect the shipping container. If the container or packing material is damaged, it should be kept until the contents of the shipment have been checked mechanically and electrically. If there is physical damage refer to **“Keysight Support, Services, and Assistance” on page 30**. Keep the damaged shipping materials (if any) for inspection by the carrier and an Keysight Technologies representative.

Electrostatic Discharge Protection

Electrostatic discharge (ESD) can damage or destroy electronic components. The instrument is shipped in materials that prevent damage from static, and should only be removed from the packaging in an anti-static area ensuring that the correct anti-static precautions are taken.

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. To ensure user safety, static-safe accessories must provide at least 1 Meg Ohm 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.

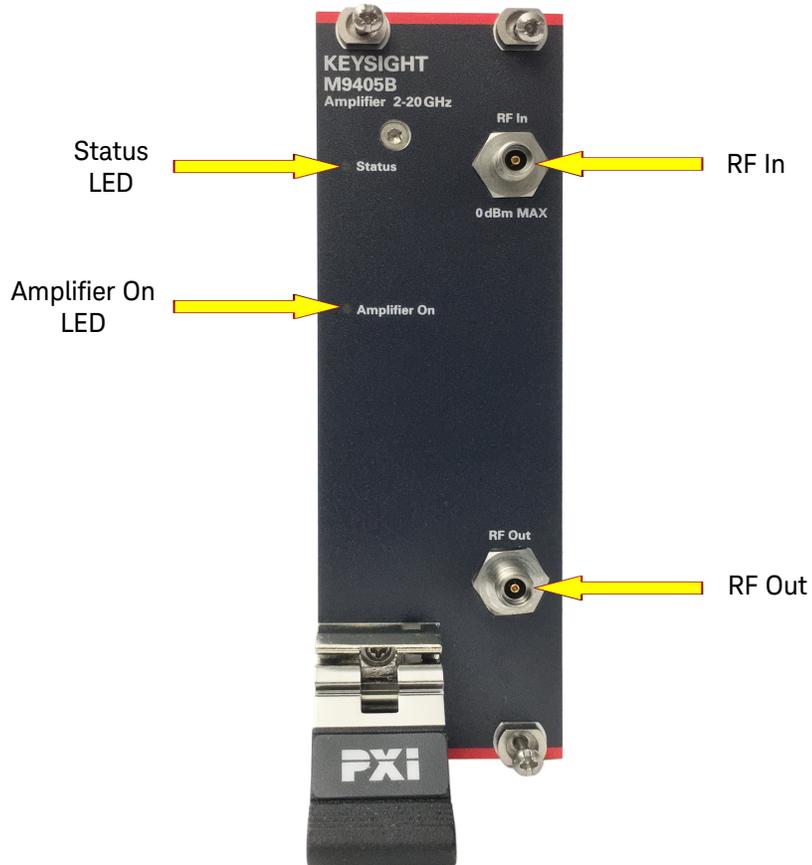
General Characteristics

Table 2 Module Performance

Frequency Range	2 GHz to 20 GHz
Small Signal Gain	30 dB
Gain Flatness	± 5 dB
P1B	25 dBm
NF	5 dB

M9405B Front Panel Features (Option 708)

Figure 2 M9405B Amplifier Front Panel



Front Panel Status LEDs

Status

- Module is active in chassis when Status LED is ON.

Amplifier On

- When Amplifier On LED is lit, amplifier bias is ON.

Access Port Connectors

RF In

- 3.5 mm Female

RF Out

- 3.5 mm Female

Install the M9405B

NOTE

The M9405B can be used in a chassis with a PXIh chassis peripheral slot.

7

The M9405B 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).

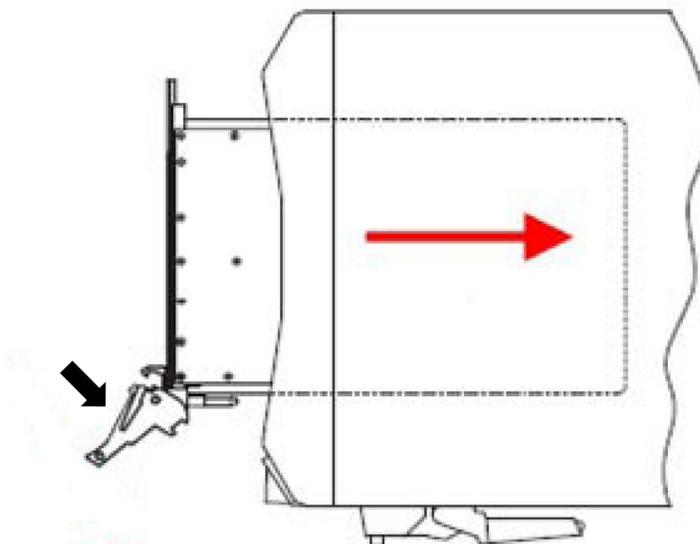
CAUTION

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 to prevent damage to the module.

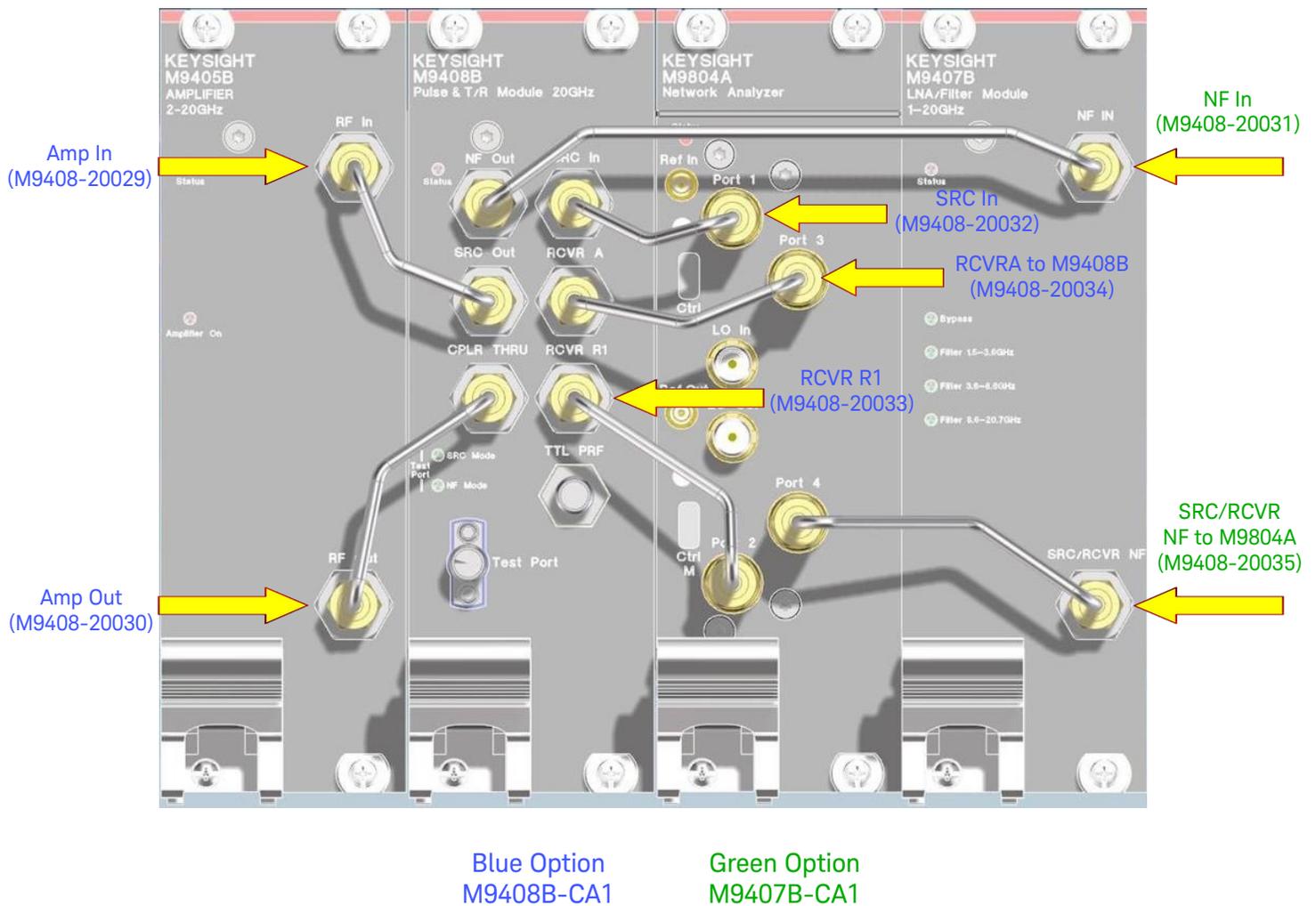
1. Ensure that the PXI chassis power switch is in the off (Standby) position.
2. If the chassis has multiple fan speed settings, ensure that the fans are set to automatic. Do not set the fan speed to low or turn it off.
3. Position the chassis so that there is ample space between the chassis fan intake 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 the card edges on the guide slot (top and bottom) as shown in Figure 3.
 - a. Slide the module to the rear of the chassis and ensure that the injector/ejector handle is pushed down in the unlatched (downward) position.
 - b. Slide the module completely into the chassis. When you begin to feel resistance, push up on the injector/ejector handle to fully insert the module into the chassis.

Figure 3 Installing the Module



5. Secure the front panel to the chassis using the front panel mounting screws. Performance may suffer if the screws are not tightened properly.
6. Verify that the PXI chassis fans are operable and free of dust and other contaminants that may restrict air flow.
7. Install all chassis covers and filler panels. Missing filler panels may disrupt necessary air circulation in the chassis.
8. Power up the PXI chassis.

Figure 4 RF Interconnect Cables for the M9408B and M9804A Modules



Power Up the Controller

CAUTION

If you are using a remote controller and you have installed the interface cable, you must power up the chassis *before* you power up the PC. As well, you must power down the PC *before* you power down the chassis.

If you are using an embedded controller, complete the following steps:

1. Install the embedded controller module into the compatible chassis. The Keysight M9037A PXIe Embedded Controller and Keysight M9019A PXIe Chassis are recommended. Please refer to the embedded controller and chassis documentation for further details.
2. Connect peripherals (mouse, keyboard, and monitor).
3. Turn ON the chassis.

Install the Software

Table 3 System and Hardware Requirements

Topic	Requirements
System Requirements	
Operating System	Windows 7 (32-bit and 64-bit), Windows 10 (32-bit and 64-bit).
Processor Speed	1 GHz 32-bit (x86), 1 GHz 64-bit (x64); no support for Itanium64.
Available Memory	1 GB or greater recommended.
Available Disk Space ¹	3 GB available hard disk space.
Hardware Requirements	
Chassis	PXIe system/ host controller A PXIe embedded controller or remote controller (external PC connected to the chassis via a PCIe-to-PXIe interface) is required.
PXIe System/ Host Controller	A PXIe embedded controller or remote controller (external PC connected to the chassis via a PCIe-to-PXIe interface) is required.
Embedded Controller	Keysight M9036A/M9037A or an embedded controller that meets the following requirements: <ul style="list-style-type: none"> - PXIe system controller (PXI-1 embedded controllers are not compatible). - Utilize a 2x8, 4x4, or 1x4 PXIe system slot link configuration. - Run one of the operating systems listed in System Requirements (above).
Remote Controller	(for Keysight M9018A chassis use only) Keysight M9021 Cable Interface x8 with one of the following PC interface options: <ul style="list-style-type: none"> - Keysight M9045B PCIe ExpressCard Adapter x1, with cable (for a laptop PC). - Keysight M9048A PCIe Desktop Adapter x8, with cable (for desktop PCs) or an equivalent remote controller using a PC running one of the operating systems listed in System Requirements (above).

1. This is the required disk space for installation. Typically, less disk space is required for operation than is required for installation.

Software Installation Information

NOTE

Administrator privileges will be needed for software and hardware installation. This includes first-time installation of a module in a different chassis slot.

The software installation requires the following:

NOTE

Version 18.1.24130.0 (or later) of the Keysight IO Libraries Suite.

Installation

The Keysight IO Libraries Suite includes the Keysight Connection Expert. It is available at www.keysight.com/find/iosuite

Instrument software, which includes the soft front panel (SFP, device drivers (IVI-C and IVI.NET, and documentation for the M9405B, must be downloaded from Keysight's website. Contact Keysight Support at www.keysight.com/find/assist

Use the following procedure to install the software (Figure 5):

1. Launch the Keysight IO Libraries Suite installer and follow the prompts.
2. Launch the Keysight M940x installer and follow the prompts.
3. Restart the host PC.

Figure 5 M9405B Setup

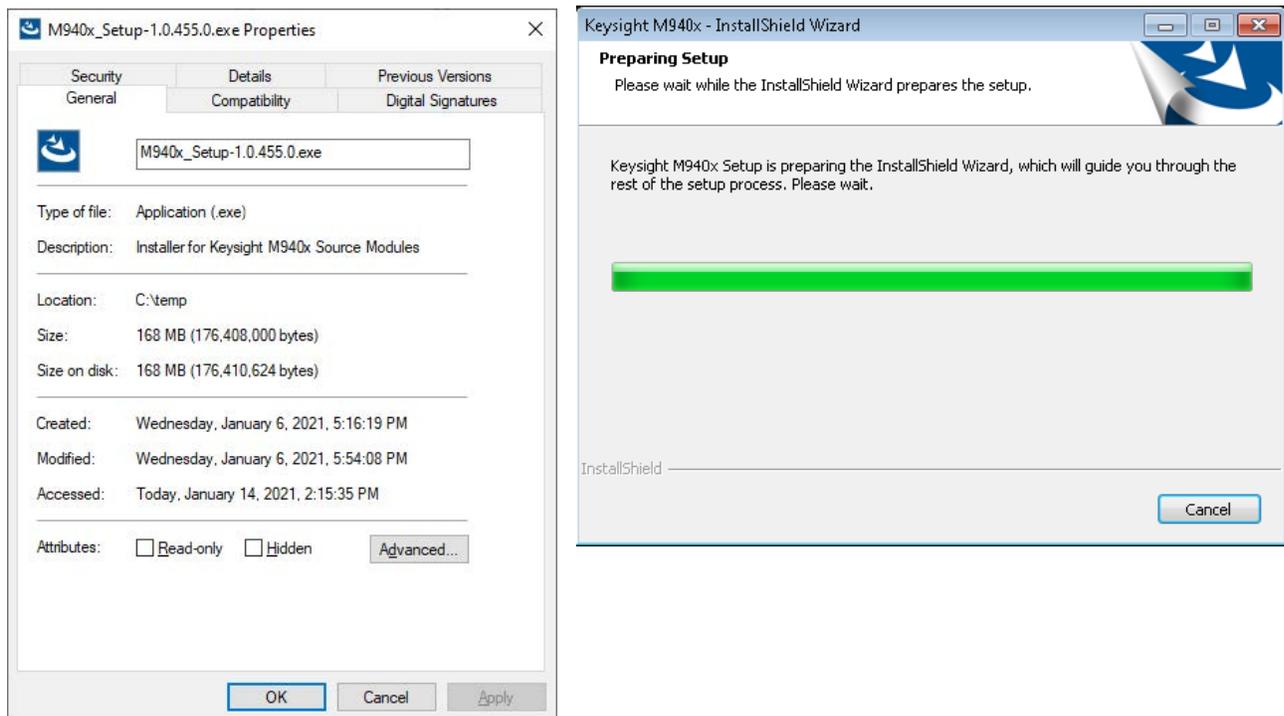
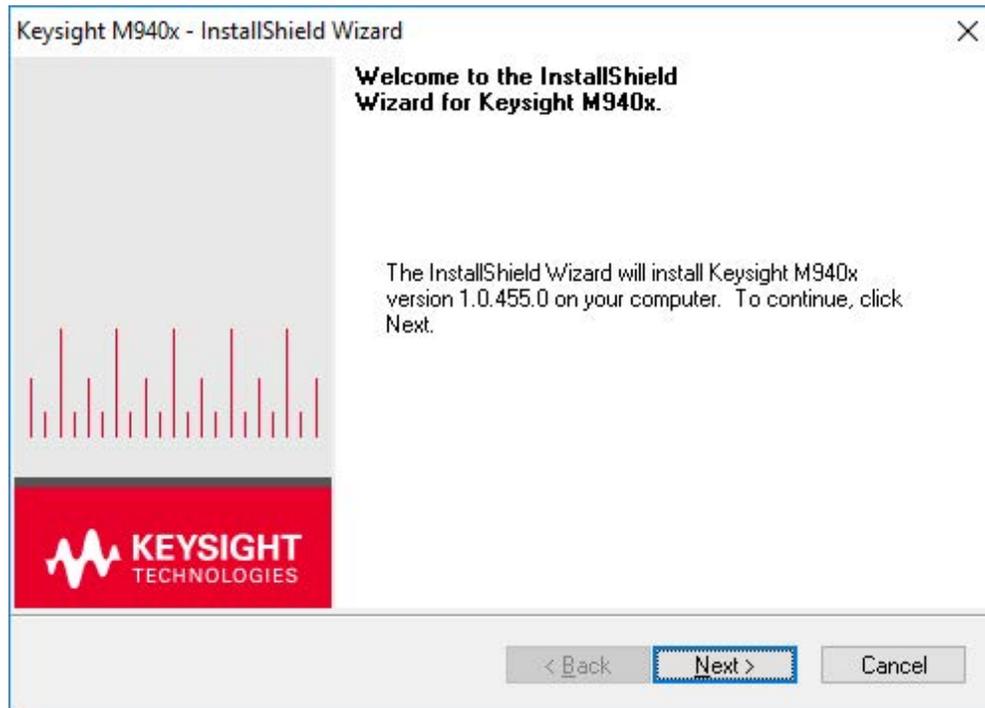
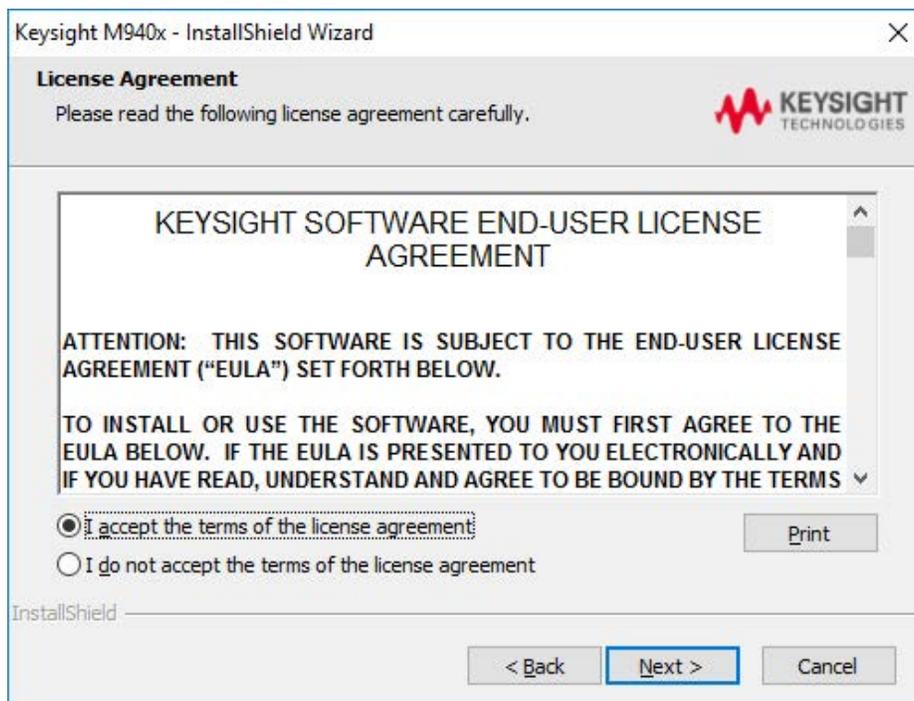


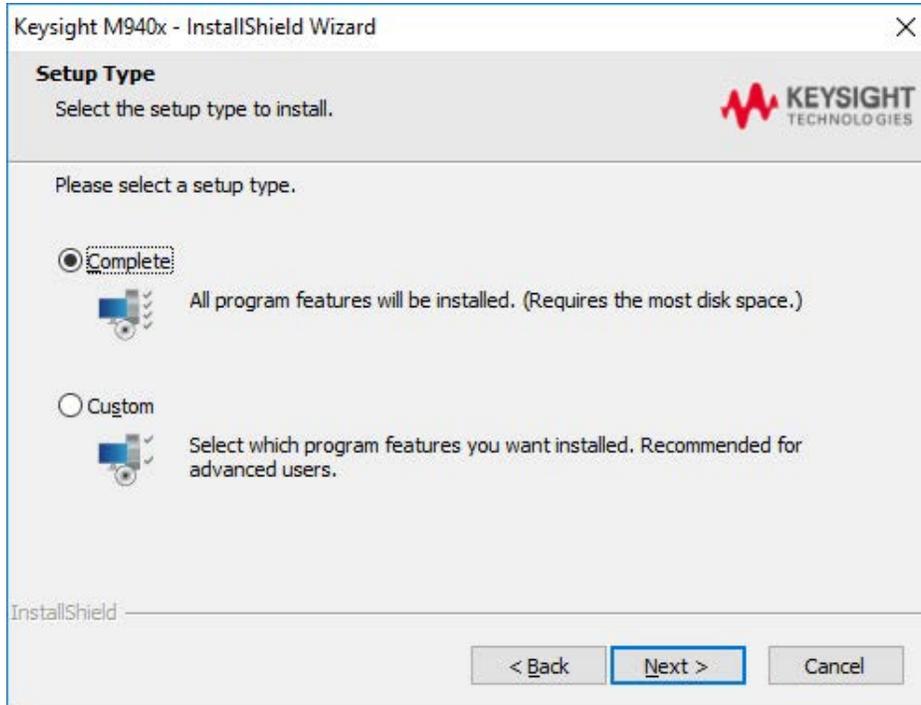
Figure 6 InstallShield Wizard



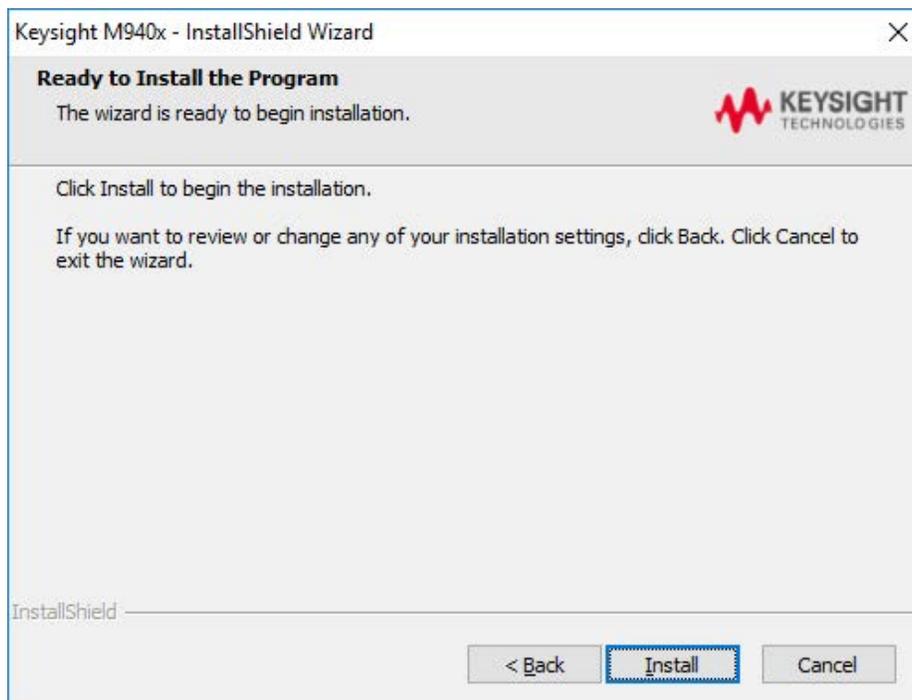
Click “Next >”.



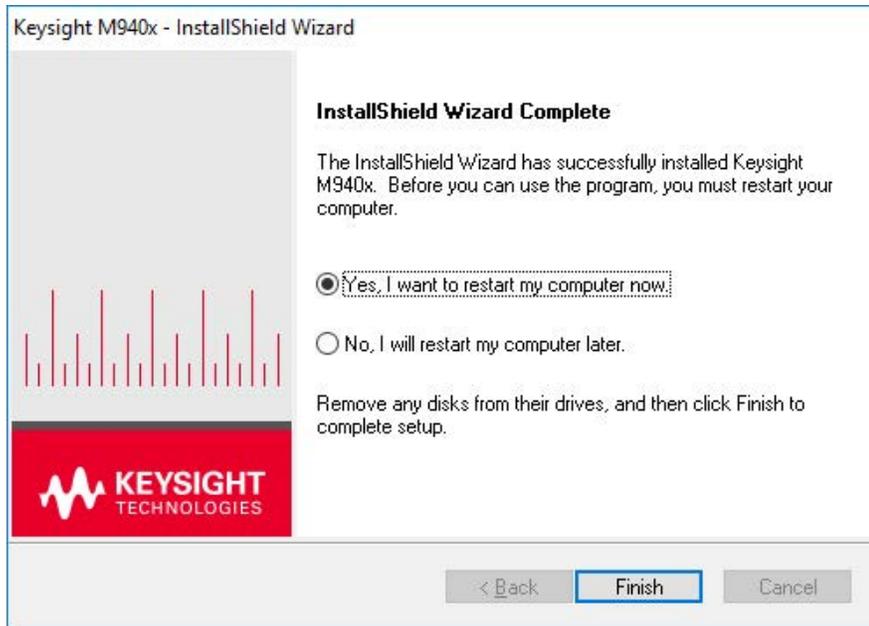
Select “Next >”.



Click “Next >”.



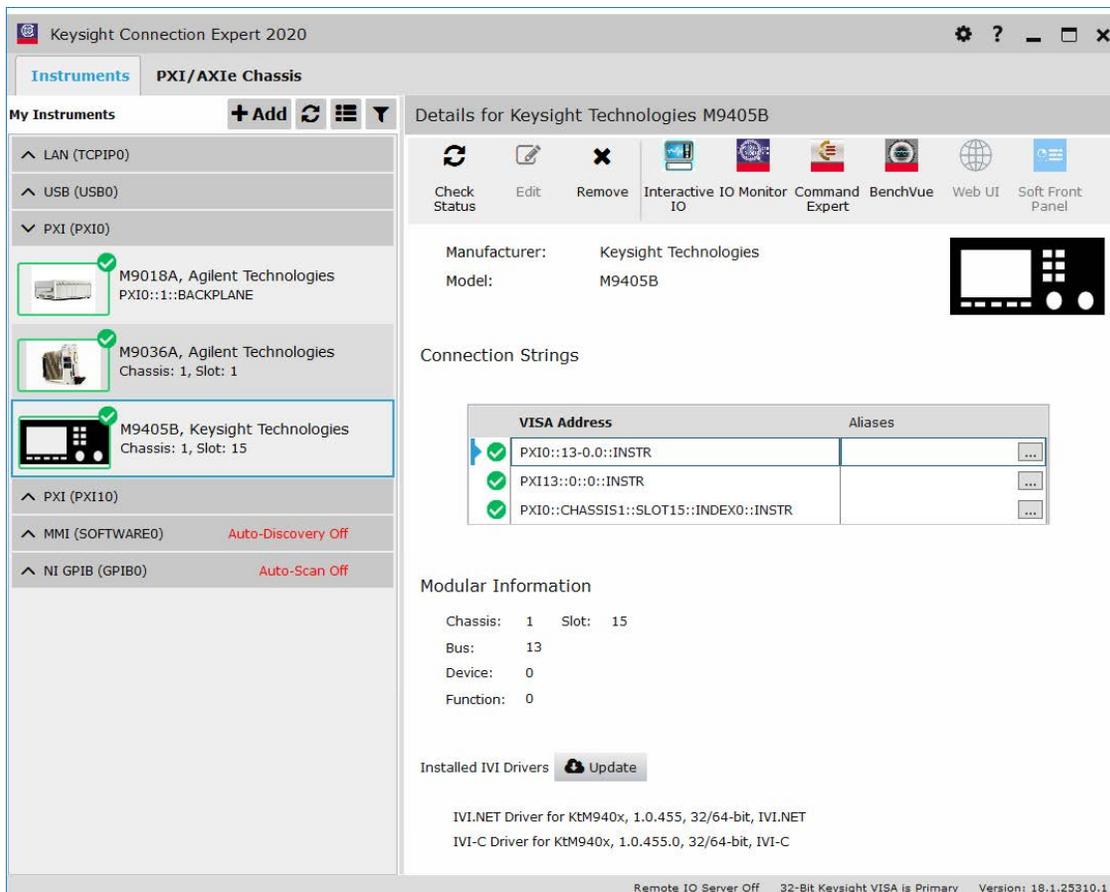
Click “Install.” The software installation will take some time. You will need to restart your computer before you can use the program. Once the restart is complete, the software is installed and ready to use.



Click “Finish”.

After restarting your computer, check the Keysight Connection Expert screen (Figure 7) to ensure the module is recognized by the system.

Figure 7 Keysight Connection Expert



Keysight M940x SCPI Service

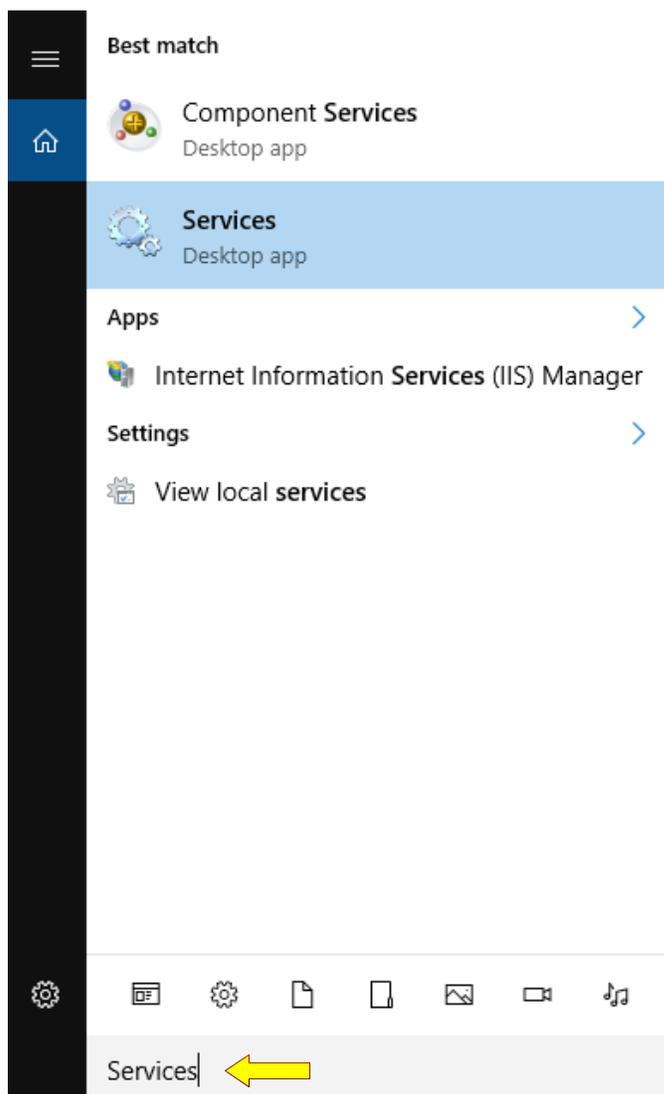
The Keysight M940x SCPI Service will be set to start automatically when Windows boots by default. The service will automatically discover and initialize SCPI servers for M9405B, M9407B, and M9408B modules. All discovered modules will be assigned a unique HiSlip device name in the form of hislip_PXI<interface number>_CHASSIS<chassis number>_SLOT<slot number>.

Example: hislip_PXI0_CHASSIS1_SLOT15

While the service is running, the SFP will be unable to open for these modules. The M940x SCPI Service can be managed in Windows Services.

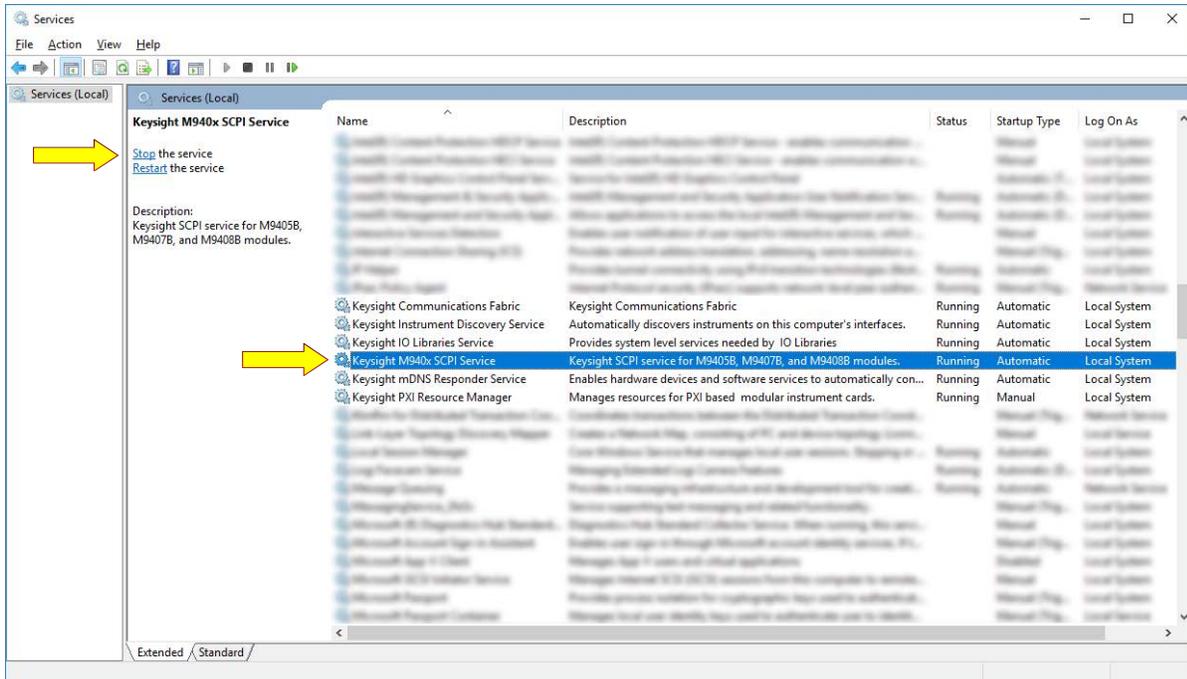
To open Services, type “Services” in the Windows search bar (Figure 8).

Figure 8 Finding Services



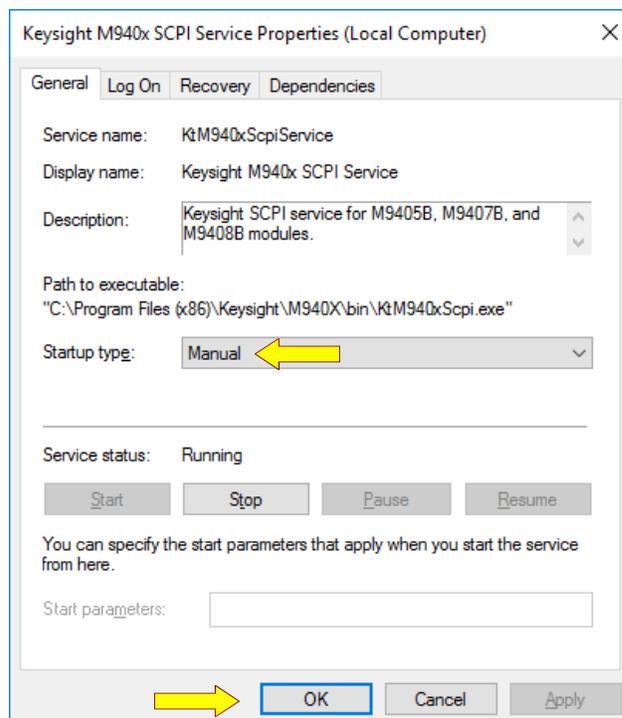
To stop the SCPI Service, select “Keysight M940x SCPI Service” from the list of services, then click “Stop” on the panel to the left or the square stop button on the tool bar at the top (Figure 9).

Figure 9 Stopping SCPI Service



To prevent the SCPI service from starting automatically, right click on “Keysight M940x SCPI Service” and select “Properties”. From the properties window select “Manual” from the “Startup type” drop down menu and click “OK” (Figure 10).

Figure 10 SCPI Service Properties Window



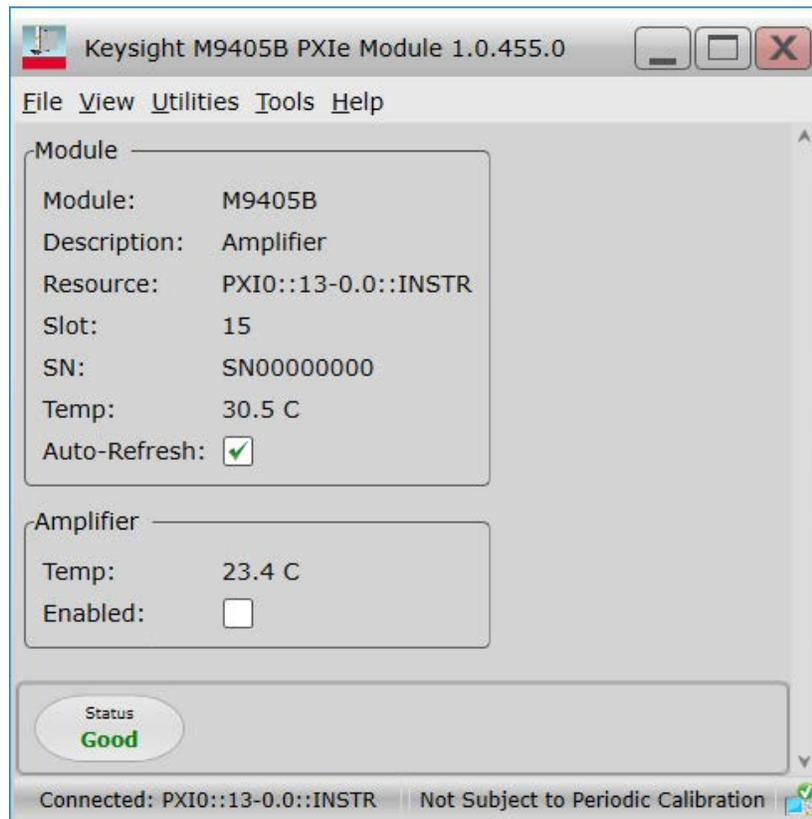
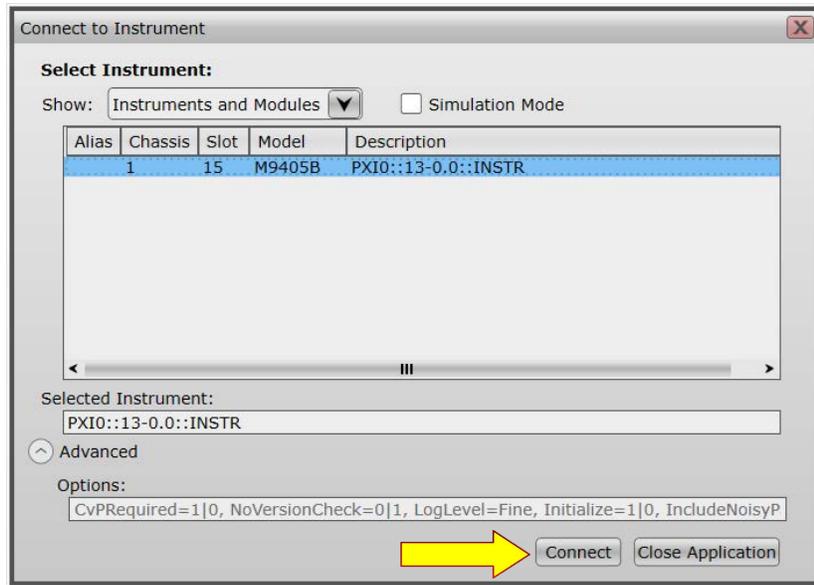
Starting the Soft Front Panel

Search for the M940xB program on your computer and run the application (x64 version if your computer is able). The following screen should appear:



Select the M9405B and click “Connect” Button.

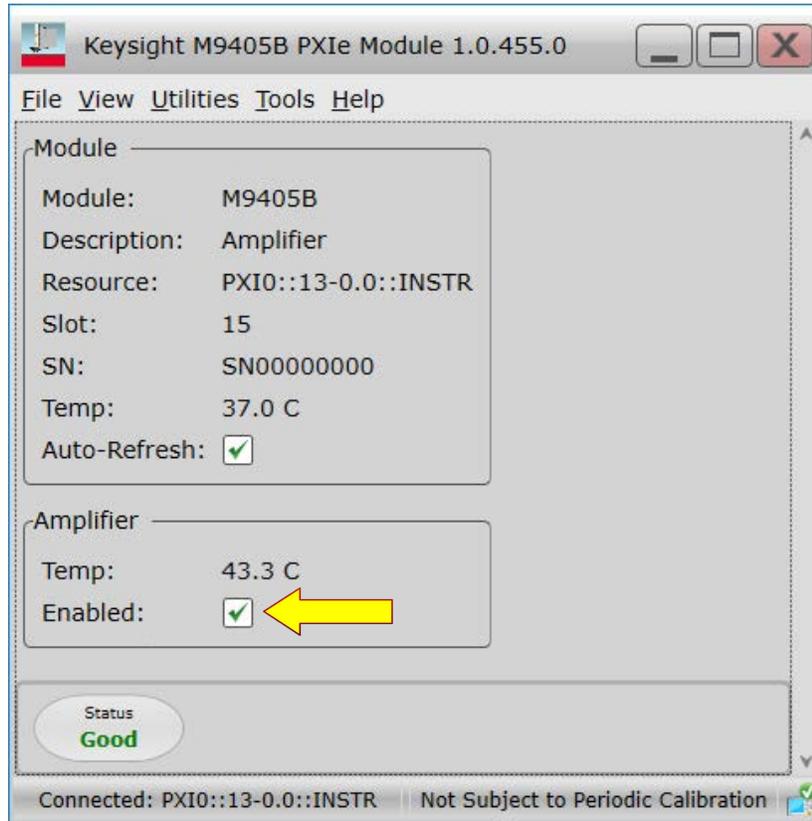
Figure 11 Connect to Instrument



Power Up Selection (M9405B)

Check “Enabled” button to power up or turn off the module’s internal amplifier (Figure 12). Allow 30 minutes minimum warm up time to thermally acclimate.

Figure 12 Power Up or Turn Off Internal Amplifier



M9405B Module Control

Control of the module is through the SFP (soft front panel) that is either installed in the PXIe chassis or external controller. The SFP provides the necessary remote control provided by the module's driver. Control can also be accessed through the SCPI server.

The instrument software, which includes the soft front panel (SFP), must be downloaded from Keysight's website.

Contact Keysight Support at www.keysight.com/find/assist.

M9405B SCPI Commands

***IDN?** – Identify

***OPC?** – Operation complete query

***RST** – Reset

***TST?** – Result of self-test query

***OPT?** – Returns the module's option

SYSTEM:ERROR[:NEXT]? – Returns the next error in the error queue.
Return Type String (<Error Number>,<Error>)

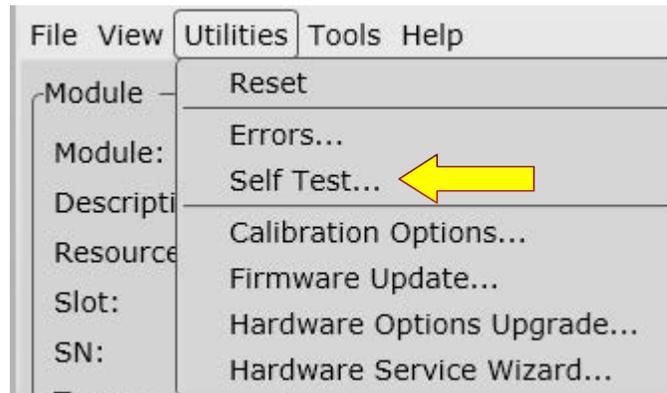
OUTPut[:STATe] <ON | OFF | 0 | 1> – Turns amplifier power on or off

OUTPut[:STATe]? – Returns amplifier power state.
Return Type Boolean (1= ON, 0 = OFF)
Default OFF

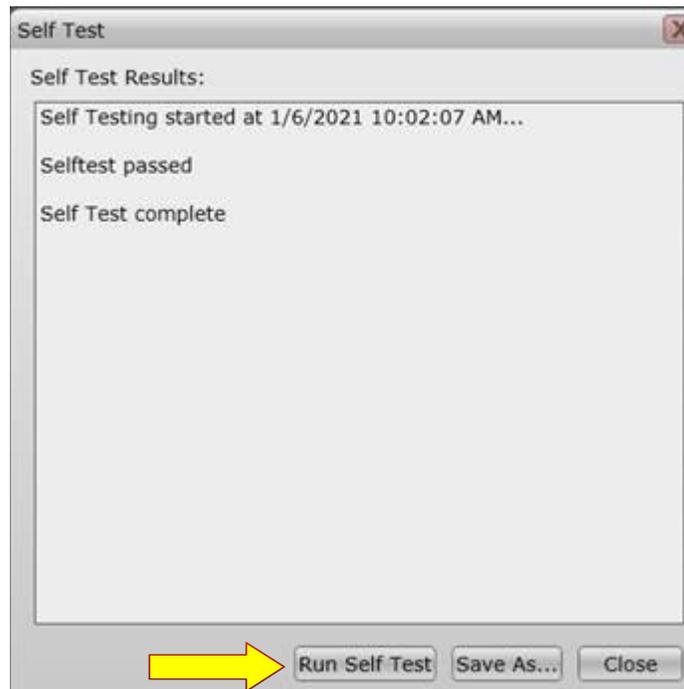
Troubleshooting

If something goes wrong, make sure the firmware version of the cards is the most current version. If the firmware is current, run the Self-Test, located in Utilities > Self-Test. See Figure 13.

Figure 13 Run Self Test



The Self-Test Dialog Box will appear. Click “Run Self Test” to start a self-test.



If Self Test does not pass, call the Keysight Expert Help Hot-Line toll-free: 1 800 829- 4444 Press #, then 2.

M9405B Operational Check Procedure

The operational check measures the signal paths from the RF Input of the M9405B module to the RF Output of the M9405B module. The following procedure verifies that the connectors and circuitry are operating correctly.

CAUTION

Do not exceed the damage power level. Refer to [Table 2 on page 7](#).

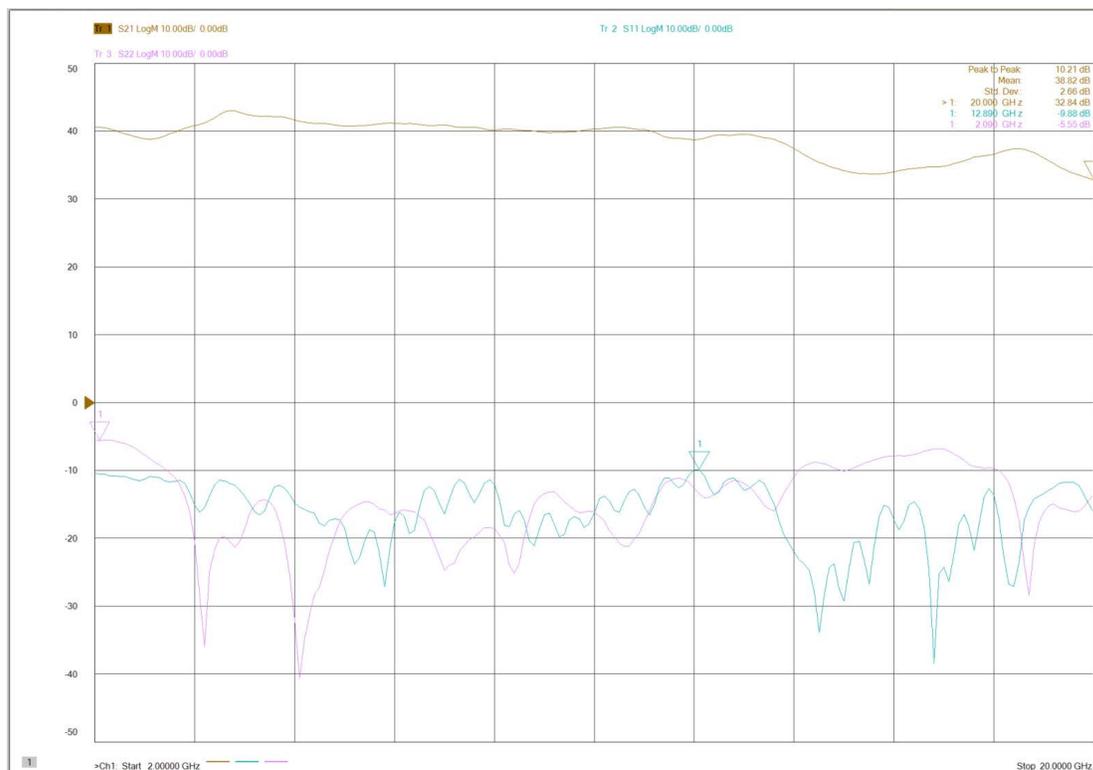
Equipment Required

To demonstrate that the module works properly requires external equipment with an operating frequency range of 2 GHz to 20 GHz.

Equipment Test Configuration - Network Analyzer

1. Adjust the Network Analyzer Stimulus Power for the M9405B to -30 dBm.
2. Set the Frequency Sweep from 2 GHz to 20 GHz.
3. Perform a 2-Port Network Analyzer calibration (normalization response is adequate).
4. Connect the Stimulus Source (Network Analyzer Port 1) to the M9405B RF In Port.
5. Connect Port 2 of the Network Analyzer to the M9405B RF Out Port.
6. Measure the Return Loss (S11 and S22) and Gain (S21). Compare it to the typical performance in [Table 2 on page 7](#). Nominal performance should look similar to Figure 14 below.

Figure 14 M9405B Option 708 - Nominal Performance



Service

Before Beginning Service

Please read the following important information:

WARNING

No user serviceable parts. The opening of covers or removal of parts is likely to expose the user to hazardous voltages. Refer all servicing to qualified personnel.

If a Problem is Found

If a problem is found, complete the following procedures:

1. Verify that the relevant hardware is turned on.
2. Verify that the stimulus signal is set to the proper power/frequency and that all cables are properly connected.
3. Verify that all connectors are clean.

General Safety and Information

Introduction

Review this product and related documentation to familiarize yourself with safety markings and instructions before you operate the instrument.

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

WARNING

To ensure mandatory safety requirements are being met, the module must be installed in a chassis which has been certified and marked by a Nationally Recognized Test Lab (such as CSA, UL, TUV, ETL, etc.) in which all the means of protection are properly implemented. NOTE: CE marking alone is not adequate.

WARNING

Safety of any system incorporating the equipment is the responsibility of the assembler of the system.

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.

NOTE

The input terminals for this product are classified as Measurement Category None.

Safety Earth Ground

WARNING

This is a Safety Class I Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

CAUTION

Always use the three prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage and the risk of electrical shock.

Statement of Compliance

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Cleaning Precautions

Remove the power cord to the instrument. To clean the connectors use alcohol in a well ventilated area. Allow all residual alcohol moisture to evaporate, and fumes to dissipate prior to energizing the instrument.

WARNING

To prevent electrical shock, remove the module from the chassis 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.

WARNING

If flammable cleaning materials are used, the material shall not be stored, or left open in the area of the equipment. Adequate ventilation shall be assured to prevent the combustion of fumes, or vapors.

Regulatory Information

Listed below are definitions for the markings that may be found on the product.

Instrument Markings



South Korean Certification (KC) mark; includes the marking's identifier code which follows the format: R-R-Kst-ZZZZZZZZ.



The WEEE symbol indicates separate collection for electrical and electronic equipment, mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal.



The CE marking is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven). It indicates that the product complies with all relevant directives.

ccr.keysight@keysight.com

The Keysight email address is required by EU directives applicable to our product.

ICES/NMB-001

This is a marking to indicate product compliance with the Industry Canada Interference-Causing Equipment Standard (ICES-001); Cet appareil ISM est conforme a la norme NMB du Canada.



The RCM mark is a registered trademark of the Australian Communications and Media Authority.



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.

EMC Compliance

Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates editions are cited in the Declaration of Conformity):

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, Class A
- AS/NZS CISPR 11
- ICES/NMB-001
This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme a la norme NMB-001 du Canada.

South Korean Class A EMC Declaration

Information to the user: If this instrument is equipped with a "KC" label, it 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 a business environment.

사용자 안내문
이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

※ 사용자 안내문은 “업무용 방송통신기자재”에만 적용한다.

Safety

Complies with the following standard (dates and editions are cited in the **Declaration of Conformity**): IEC/EN 61010-1.

Acoustic Statement (Compliance with German Noise Requirements):

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrrerordnung-3.GSGV Deutschland).

Acoustical Noise Emission/ Geraeuschemission	
LpA <70 dB	LpA <70 dB
Operator position	am Arbeitsplatz normaler
Normal operation mode Per ISO 7779	Betrieb nach DIN 45635 t.19

To find a current Declaration of Conformity for a specific Keysight product, go to: <http://regulations.about.keysight.com/DoC/search.htm>

Keysight Support, Services, and Assistance

Service and Support Options

There are many other repair and calibration options available from the Keysight Technologies support organization. These options cover a range of service agreements with varying response times. Contact Keysight (<http://www.keysight.com/find/assist>) for additional information on available service agreements for this product.

Return a Module for Service

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

1. Review the warranty information shipped with your product.
2. Contact Keysight to obtain a Return Material Authorization (RMA) and return address. If you need assistance finding Keysight contact information go to <http://www.keysight.com/find/assist> (worldwide contact information for repair and service) or refer to the “Support” information on the product web page.
3. Write the following information on a tag and attach it to the malfunctioning equipment:
 - Name and address of owner. P.O. boxes are not acceptable as return addresses.
 - Product model number (for example, M9403B).
 - Product serial number (for example, MYXXXXXXXX). The serial number label is located on the side panel of the module.
 - 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 instrument in a sealed container and mark the container “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.



This information is subject to change without notice.

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