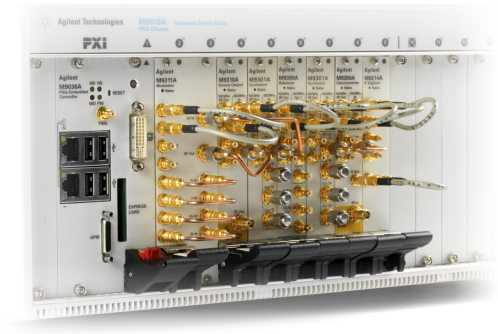
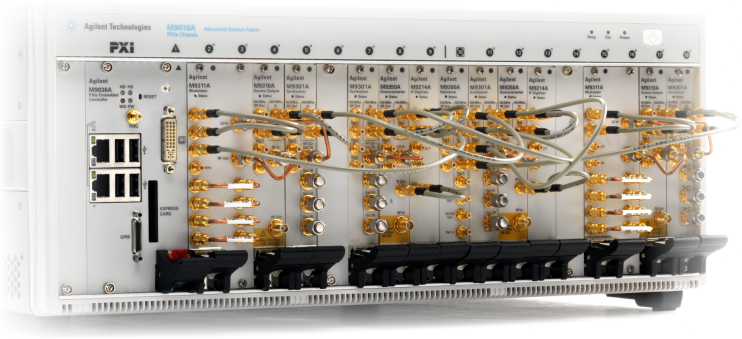
Startup Guide

Keysight RF Device PXI Test Solution



single-channel solution



two-channel solution

Notice: This document contains references to Agilent. Please note that Agilent's Test and Measurement business has become Keysight Technologies. For more information, go to www.keysight.com.

KEYSIGHT TECHNOLOGIES

Notices

Manual Part Number

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Sales and Technical Support

To contact Keysight for sales and technical support, refer to the "support" links on the following Keysight web resources:

- www.keysight.com/find/pxi-vsag (product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist (worldwide contact information for repair and service)

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

Regulatory Compliance

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. To review the Declaration of Conformity, go to http://regulations.products.keysight.com/DoC/search.htm.

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, Keysight 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. Keysight 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 Keysight 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.

Keysight Technologies does not warrant third-party system-level (combination of chassis, controllers, modules, etc.) performance, safety, or regulatory compliance, unless specifically stated.

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Safety Notices

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 possible injury. Read and follow all installation, operation, and maintenance information carefully before using the product.

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** 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 operators are adequately trained.
- **Operators** 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** 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** are trained to work on live circuits, perform safe installations, and repair products. Only properly trained service personnel may perform installation and service procedures.

WARNING

Operator is responsible to maintain safe operating conditions. To ensure safe operating conditions, modules should not be operated beyond the full temperature range specified in the Environmental and physical specification. Exceeding safe operating conditions can result in shorter lifespans, improper module performance and user safety issues. When the modules are in use and operation within the specified full temperature range is not maintained, module surface temperatures may exceed safe handling conditions which can cause discomfort or burns if touched. In the event of a module exceeding the full temperature range, always allow the module to cool before touching or removing modules from chassis.

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 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 30V RMS, 42.4V peak, or 60VDC 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 1000V, 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.

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.

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 electrical shock do not remove covers. For continued protection against fire hazard, replace fuse with same type and rating.

PRODUCT MARKINGS:

The CE mark is a registered trademark of the European Community.

Australian Communication and Media Authority mark to indicate regulatory compliance as a registered supplier.

This symbol indicates product compliance with the Canadian Interference-Causing Equipment Standard (ICES-001). It also identifies the product is an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).

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. A급 기기 (업무용 방송통신기자재)이 기기는 업무용 (A급)전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

This 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 (Reference WEEE Directive, 2002/96/EC).

This symbol on an instrument means caution, risk of danger. You should refer to the operating instructions located in the user documentation in all cases where the symbol is marked on the instrument.

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 the instrument is sensitive to electrostatic discharge (ESD). ESD can damage the highly sensitive components in your instrument. ESD damage is most likely to occur as the module is being installed or when cables are connected or disconnected. Protect the circuits from ESD damage by wearing a grounding strap that provides a high resistance path to ground. Alternatively, ground yourself to discharge any built-up static charge by touching the outer shell of any grounded instrument chassis before touching the port connectors.

CLEANING PRECAUTIONS:

WARNING

To prevent electrical shock, disconnect the Keysight Technologies 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.

Table of Contents

Introduction

The scope of this Startup Guide is to present the processes of receiving and verifying operation of the assembled Keysight RF Device PXI Test Solution. The overall process is:

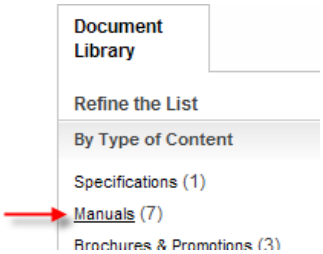
1. Unpack and inspect your solution and verify box contents (see page 10).
2. Finish configuring your solution and verify operation. The steps required depends upon if your solution contains an M9036A or M9037A embedded controller, or an M9021A PCIe cable interface.
3. Make a measurement. Produce a signal on the M9381A VSG and view it on the M9391A VSA. See Step 3: Make a Measurement (page 31).
4. Redeem your optional software licenses (if ordered).

If you have any questions after reviewing this information, please contact your local Keysight Technologies Inc. representative or contact us through our website at www.keysight.com/find/assist.

NOTE Refer to the Keysight M9381A PXIe Vector Signal Generator and M9391A PXIe Vector Signal Analyzer Startup Guide and M9393A Vector Signal Analyzer Startup Guide that accompanied your shipment for further details on configuring and verifying the performance of your solution. Further documentation is included with your solution, including startup guides for the Keysight M9018A 18 Slot PXIe Chassis, the Keysight M9036A Embedded Controller (optional)o the Keysight M9037A Embedded Controller (optional) and the Keysight M9021A PCIe Cable Interface (optional).

Related Documentation

The documentation associated with this solution is available at the respective product pages on keysight.com (go to **Document Library > Manuals**).



M9381A Vector Signal Generator (see www.keysight.com/find/M9381A)

- M9381A VSG and M9391A VSA Startup Guide
- M9381A VSG and M9391A VSA Programming Guide
- M9381A Soft Front Panel help system
- M9381A device driver API references (IVI-C/IVI-COM and LabVIEW G)
- M9381A Data Sheet
- M9381A Specifications Guide

M9391A Vector Signal Analyzer (see www.keysight.com/find/M9391A)

- M9391A Soft Front Panel help system
- M9391A device driver API references (IVI-C/IVI-COM and LabVIEW G)
- M9391A Data Sheet
- M9391A Specifications Guide

M9018A PXIe Chassis (see www.keysight.com/find/M9018A)

- M9018A PXIe Chassis Startup Guide

M9036A or M9037A PXIe Embedded Controller

- M9036A PXIe Embedded Controller Startup Guide (optional) – see www.keysight.com/find/M9036A
- M9037A PXIe Embedded Controller Startup Guide (optional) – see www.keysight.com/find/M9037A

M9021A PCIe Cable Interface – *optional* (see www.keysight.com/find/M9021A)

- keysight M9021A PCIe Cable Interface Module Installation Guide

Step 1: Unpack and Inspect Your Solution

Your solution is shipped in two boxes:

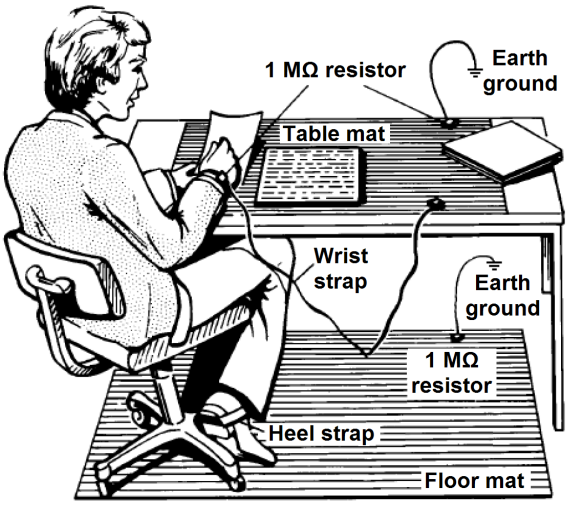
- Box 1 of 2 contains the assembled chassis with modules installed and cabled, an AC line cord, a Box Contents List, this document and the Keysight RF Device PXI Test Solution Startup Quick Reference. Also included is an accessory box with DVI-to-VGA adaptor, or a Display Port to VGA adaptor, Certificates of Calibration, Software Entitlement Certificates, an SMA wrench socket extension, and an SMB/MMCX cable removal tool.
- Box 2 of 2 contains a Box Contents List, documentation, software CDs and accessories for all the components that comprise the assembled solution. If you ordered an M9021A in your configuration, in the top of Box 2 you will find:
    - For a laptop you get an M9045B PCIe ExpressCard Adaptor and a Y1200B PCIe Cable (if ordered).
    - For a desktop PC you get an M9048A PCIe Adaptor and a Y1202A PCIe Cable (if ordered).

CAUTION To avoid physical injury use two persons to remove the populated chassis from the box.

Verify Shipment Contents

Use the Box Content List for each box of your shipment to verify that all required content is included.

ESD



Electrostatic discharge (ESD) can damage or destroy electronic components. Use a static-safe work station to perform all work on electronic assemblies. The figure (left) shows a static-safe work station using two types of ESD protection: conductive table-mat and wrist-strap combination, and 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 MΩ of isolation from ground.

Items That You Will Need

To complete the unpacking and begin to use the solution you will need the following items:

- A Pozidriv P2 screwdriver to remove the protective cover from the front of the chassis.
- A monitor - If your solution contains an M9036A Embedded Controller use the DVI-to-VGA adaptor (found in Box 1 of 2) if necessary. If your solution contains an M9037A Embedded Controller use the Display Port to VGA adaptor (found in Box 1 of 2) if necessary.
- A USB compatible keyboard (if your solution contains an M9036A Embedded Controller).
- A USB compatible mouse (if your solution contains an M9036A Embedded Controller).
- A high-quality SMA (male) to SMA (male) cable at least 10 inches (25.4 cm) long.

Remove the Solution from the Packaging

1. Use two persons to remove the solution from the packaging and lift the populated chassis to the work bench.
2. Use a Pozidriv P2 screwdriver to remove the protective cover from the front of the chassis.
3. Do not dispose of the eight screws that secure the protective cover. Install them into the eight threaded holes in the top of the protective cover for possible later use.

Inspect for Damage

After unpacking a solution, inspect it for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty (see warranty information at beginning of this document).

NOTE See www.keysight.com/find/tips for information on preventing damage to your keysight equipment.

Return an Instrument for Service

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

NOTE It is recommended that you return all modules and cables of the M9381A or M9391A instrument for repair and calibration. If your Keysight M9300A PXIe Frequency Reference is operating properly, you need not send it in with the other modules because your instrument may be repaired and calibrated without your M9300A. Doing so, however, will effect your calibration schedule, since repairs are followed by calibration. The Calibration Due Date for your M9300A will not match the date of your other modules.

1. Review the warranty information shipped with your product.

2. Contact Keysight to obtain a Return Material Authorization (RMA) and return address. For assistance finding Keysight contact information, go to www.keysight.com/find/assist.
3. Write the following information on a tag and attach it to the malfunctioning equipment:
    - Name and address of owner. A P.O. box is not acceptable as a return address.
    - Description of failure or service required.
4. Pack the instrument in its original packaging. Include all cables. If the original packaging material is not available, use anti-static 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 In your correspondence, refer to the modules by serial number and the instrument by model number.

Step 2: Finish Configuring Your Solution

The process to finish configuring your solution varies depending upon:

- If your solution contains a Keysight M9036A or M9037A Embedded Controller, see If your Solution contains a Keysight M9036A or M9037A Embedded Controller (page 14).
- If your solution contains a Keysight M9021A Cable Interface, see If Your Solution Contains a Keysight M9021A PCIe Cable Interface (page 22)

Recommended best practices to ensure proper and safe module operating conditions

- Ensure proper chassis air flow is maintained
- Select a chassis that provides thermal protection if fans become inoperable or forced air cooling is obstructed
- Use slot blockers (Keysight model Y1212A, 5 per kit) and EMC filler panels in empty module slots to ensure proper operating temperatures. Keysight chassis Keysight M9018A chassis and slot blockers optimize module temperature performance and reliability of test.
- Set chassis fans to high or auto. Do not disable fans.
- Position chassis to allow plenty of space around chassis air intake and fan exhaust.
- At environment temperatures above 45 °C, set chassis fan speed to high.

M9018A Chassis Air Flow

The M9018A has multiple air intakes. They are located on the lower sides, lower front and bottom of the chassis.

If your Solution contains a Keysight M9036A or M9037A Embedded Controller

NOTE If your solution includes a Keysight M9036A or M9037A Embedded Controller, your software has been installed on the controller. A backup partition on your controller also contains the software that was loaded as part of your solution. If your solid state drive (SSD) fails and is replaced, you will need to install all of the software.

1. Connect Peripheral Components

a. Connect a monitor to the M9036A or M9037A Embedded Controller. A DVI-to-VGA adaptor or a Display Port to VGA adaptor are provided.

b. Connect a USB compatible mouse to any USB connector on the M9036A or M9037A.

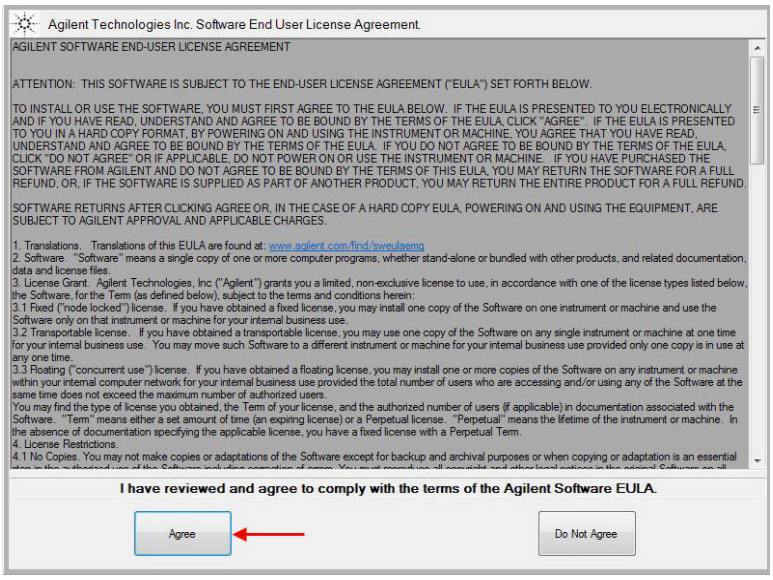
c. Connect a USB compatible keyboard to any USB connector on the M9036A or M9037A.

2. Power up Your Solution

a. Remove the line cord from Box 1 of 2 and connect your solution to AC power.

b. Press the power button on the front of the M9018A Chassis to power up the chassis.

c. If you ordered WES7® on the M9036A or M9037A controller, the first screen that you see on first power up is the Software End User License Agreement. Select **Agree**. This will bring you to your Windows desktop. If you select **Do Not Agree** the controller will power down.



If you ordered Win7 Pro®, upon first power up it will prompt you to create a user name.

3. Verify Operation

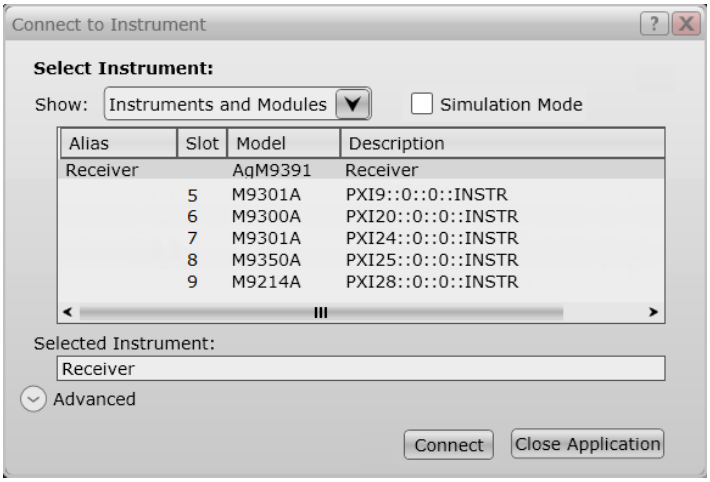
- If you have a single channel solution, go to Verify Operation of Your Single Channel Solution (page 15).
- If you have a two channel solution, go to Verify Operation of Your Two-Channel Solution (page 19).

Verify Operation of Your Single Channel Solution

In this step you will verify single channel operation by conducting two Self Tests. At the end of this step you will have two soft front panels (SFPs) open.

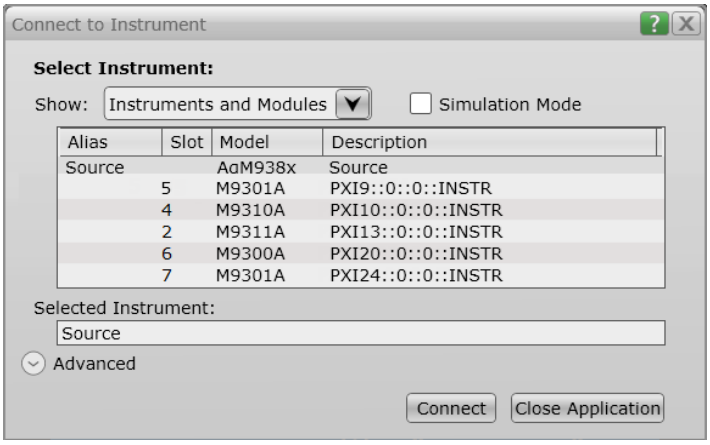
1. The first step in this process is to configure connections to both the M9391A and the M9381A instruments.
    a. Open the M9391A SFP by selecting **Start > All Programs > Keysight > M9391 > M9391 SFP**.
    b. Open the M9381A SFP by selecting **Start > All Programs > Keysight > M938x > M9381 SFP**.
    c. For each SFP, you are presented with the "Connect to Instrument" dialog. For the M9391A SFP select the installed alias "**Receiver**" and press **Connect**. Leave the SFP open. For the M9381A SFP select the installed alias "**Source**" and press **Connect**. Leave the SFP open.
    d. Proceed to Step 2.

    M9391A VSA



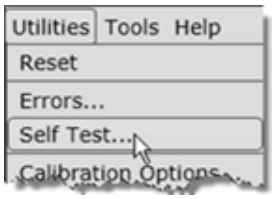
To understand the behavior of shared M9300 Reference modules, see Sharing the M9300A Frequency Reference (page 30).

M9381A VSG

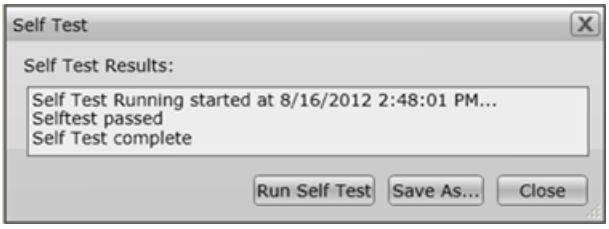


CAUTION It is important that no signal is present at the RF Input of the Keysight M9350A PXIe Downconverter when doing a Self Test. If a signal is present, it may result in a false failure.

2. Conduct a Self Test on the M9391A (alias "**Receiver**") and the M9381A (alias "**Source**") by selecting **Utilities > Self Test... > Run Self Test**) in each SFP.

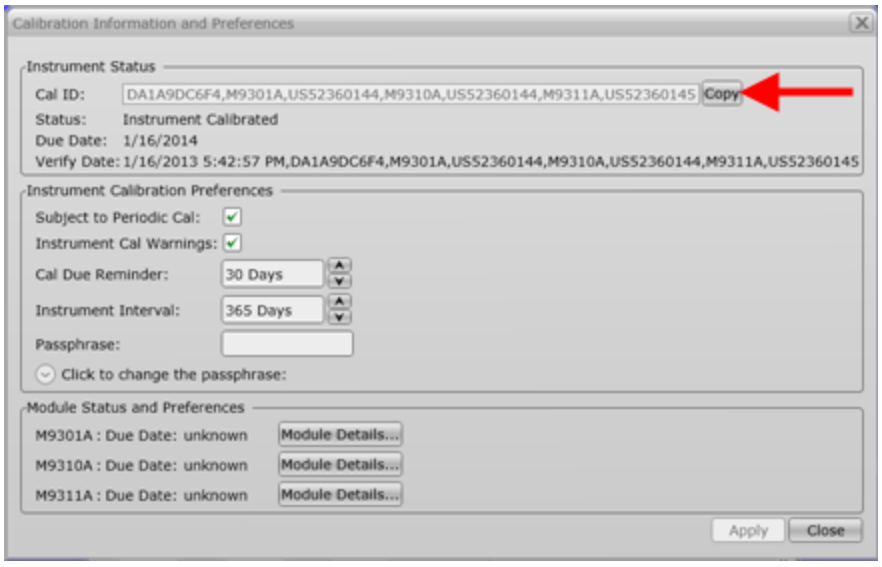


If the Self Test passes (see results below), go to Step 3: Make a Measurement (page 31).



If the Self Test does not pass for any of the instruments, the test results indicate which module is likely to need service. However, you should return all modules (except the M9300A) and all cables for that particular instrument.

To ensure that you send in the group of modules that was reported in a Self Test failure, go to **Utilities > Calibration Options...** to view this screen:



The string pointed out in this image is the Cal ID. The first 10 characters represent the Unique ID and the remaining characters show the modules (and their serial numbers) that constitute the M9381A or M9391A instrument. Match the modules and serial numbers of the failed instrument to send them in for repairs. A Certificate of Calibration for that instrument contains the same information. Additionally, you may see this same information from the SFP by using **Help > About**.

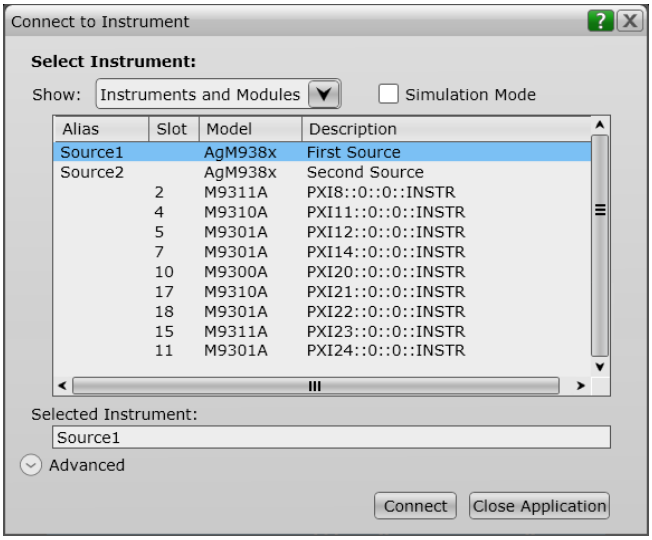
For further details about returning your instrument, see Return an Instrument for Service (page 12).

Verify Operation of Your Two-Channel Solution

In this step you will verify two-channel operation by conducting four Self Tests. At the end of this step you will have four SFPs open.

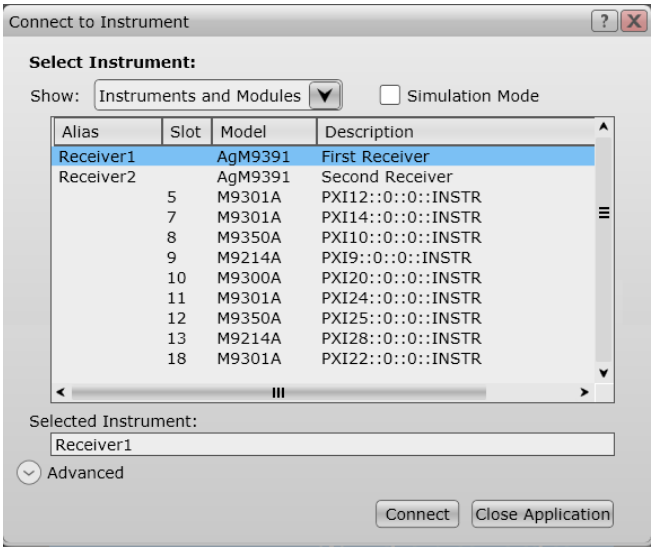
1. The first step in this process is to configure connections to each of the two M9391A and each of the two M9381A instruments.
    a. Open the M9381A SFP by selecting **Start > All Programs > Keysight > M938x > M9381 SFP**. This opens the **Connect to Instrument** dialog.
    b. Select installed alias **Source1,** and select **Connect**. Leave the SFP open.
    c. Select installed alias **Source2,** and select **Connect**. Leave the SFP open.
    d. Open the M9391A SFP by selecting **Start > All Programs > Keysight > M9391 > M9391 SFP**.
    e. Select installed alias **Receiver1,** and select **Connect**. Leave the SFP open.
    f. Select installed alias **Receiver2,** and select **Connect**. Leave the SFP open.
    g. Proceed to Step 2.

M9381A VSG



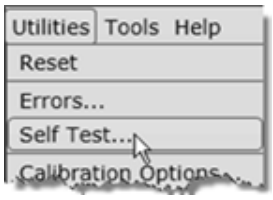
M9391A VSA

To understand the behavior of shared M9300 Reference modules, see Sharing the M9300A Frequency Reference (page 30).

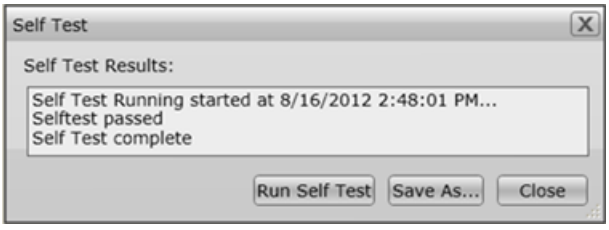


CAUTION It is important that no signal is present at the RF Input of the Keysight M9350A PXIe Downconverter when doing a Self Test. If a signal is present, it may result in a false failure.

2. Conduct a Self Test on the M9391A and also the M9381A instrument (**Utilities > Self Test... > Run Self Test**). Since your configuration contains two M9381As and two M9391As you must do a Self Test on all four instruments.

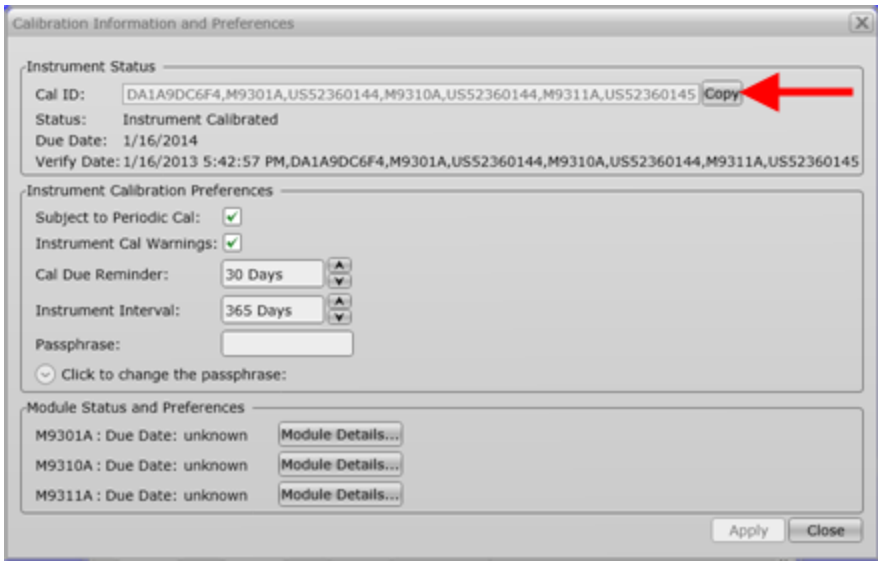


If the Self Test passes (see results below), go to Step 3: Make a Measurement (page 31).



If the Self Test does not pass for any of the instruments, the test indicates which module is likely to need service. However, you should return all modules (except the M9300A) and all cables for that particular instrument.

To ensure that you send in the group of modules that was reported in a Self Test failure, go to **Utilities > Calibration Options...** to view this screen:



The string pointed out in this image is the Cal ID. The first 10 characters represent the Unique ID and the remaining characters show the modules (and their serial numbers) that constitute the M9381A or M9391A instrument. Match the modules and serial numbers of the failed instrument to send them in for repairs. A Certificate of Calibration for that instrument contains the same information. Additionally, you may see this same information from the SFP by using **Help > About**.

For further details about returning your instrument. see Return an Instrument for Service (page 12).

If Your Solution Contains a Keysight M9021A PCIe Cable Interface

NOTE If your solution includes the M9021A Cable Interface, you will need to install your software.

Requirements

System	Requirements
Operating system	Windows 7 (32- & 64-bit), Windows Embedded Standard 7
Processor speed	1 GHz 32-bit (x86), 1 GHz 64-bit (x64), no support for Itanium64
Available memory	4 GB minimum (8 GB recommended for 64-bit operating systems)
Available disk space 3	1.5 GB available hard disk space (includes 1 GB for Microsoft .NET Framework 3.5 SP1 4, and 100 MB for Keysight IO Libraries Suite)
Video	Support for DirectX 9 graphics with 128 MB graphics memory recommended (Super VGA is supported)
Browser	Microsoft Internet Explorer 7.0 or greater

Hardware	Requirements
Controllers	A PXI or PXI Express embedded controller or remote controller (external PC connected to the chassis by a PCI-to-PXI interface) is required.
Embedded controller	Keysight M9036A or M9037A or an embedded controller that meets the following requirements: • PXIe system controller (PXI-1 embedded controllers are not compatible) • Utilize a 2x8, or 4x4, PXIe system slot link configuration. • Run one of the operating systems listed in System Requirements (above).
Remote con-troller	(Keysight M9018A chassis only) A PC running one of the operating systems listed in System Requirements above and a Keysight M9021A Cable Interface x8 with one of the following PC interface options: • Keysight M9045B PCIe ExpressCard Adaptor x1, with cable (for a laptop PC) • Keysight M9048A PCIe Desktop Adaptor x8, with cable (for desktop PCs)

1. Install the Software

Install the software in the order indicated in the following table into the laptop/desktop PC to be used with this solution.

Order	Software	Where To Get the Software
1	Keysight IO Libraries Suite version 16.3.16603.3 or newer / includes Keysight Connection Expert	CD in Box 2 (part number E2004-60003) or online at www.keysight.com/find/iosuite
2	M9018A 18 Slot PXIe Chassis Drivers	CD in Box 2 or online at www.keysight.com/find/M9018A
3	Keysight 89600 VSA Software (optional, install before M9391A software) The minimum version is 16.01.254.0 or newer.	CD in Box 2 or online at www.keysight.com/find/89600
4	M9381A PXIe Vector Signal Generator	CD in Box 2 (part number M9300-10002) or online at www.keysight.com/find/m9381a

Order	Software	Where To Get the Software
5	M9391A PXIe Vector Signal Analyzer	CD in Box 2 (part number M9300-10002) or online at www.keysight.com/find/m9391a
6	Keysight M9099 Waveform Creator Application Software	CD in Box 2 (part number M9099-10002) or online at www.keysight.com/find/m9099
7	Signal Studio (optional)	CD in Box 2 or online at www.keysight.com/find/signalstudio
8	Keysight X-Series Measurement Applications for Modular Instruments (optional)	CD in Box 2 or online at www.keysight.com/find/pxi-X-series_apps

2. Power Down the PC and Chassis

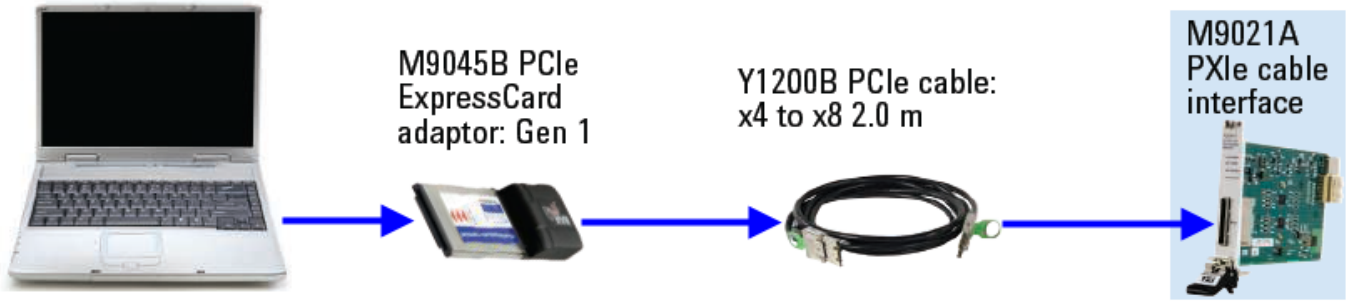
Make sure that both your chassis and PC are powered down before you connect them.

3. Connect Your M9021A to your Laptop or Desktop PC

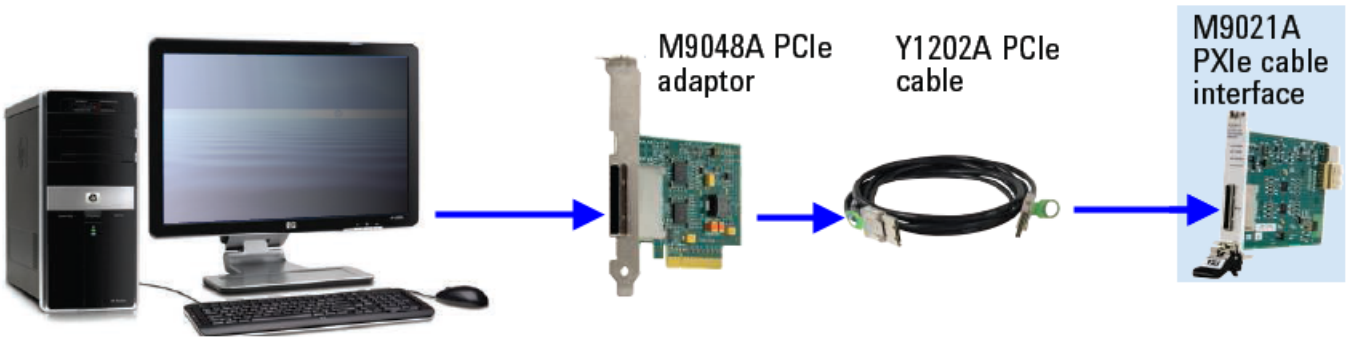
If your solution contains an M9021A PXIe Cable Interface, you will find your adaptor and cable in the top of Box 2 of 2.

If you are using a **laptop** as your controller, connect to your M9021A using the following components:

NOTE Keysight does not support the use of a laptop computer for controlling multiple PXIe chassis.



If you are using a **desktop** PC as your controller, connect to the M9021A using the following components:



4. Power up Your Solution

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. When you power down your chassis, shut down the PC BEFORE you power down the chassis.

a. Remove the power cord from box 1 of 2 and connect your solution to AC power.

b. Press the power button on the front of the M9018A Chassis to power it up.

5. Verify Operation

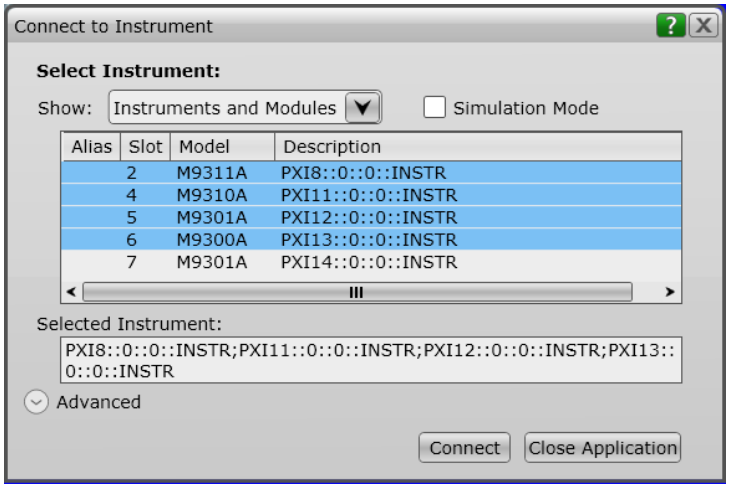
- If you have a single channel solution, go to Verify Operation of Your Single-Channel Solution (page 25)
- If you have a two channel solution, go to Verify Operation of Your Two-Channel Solution (page 28)

Verify Operation of Your Single-Channel Solution

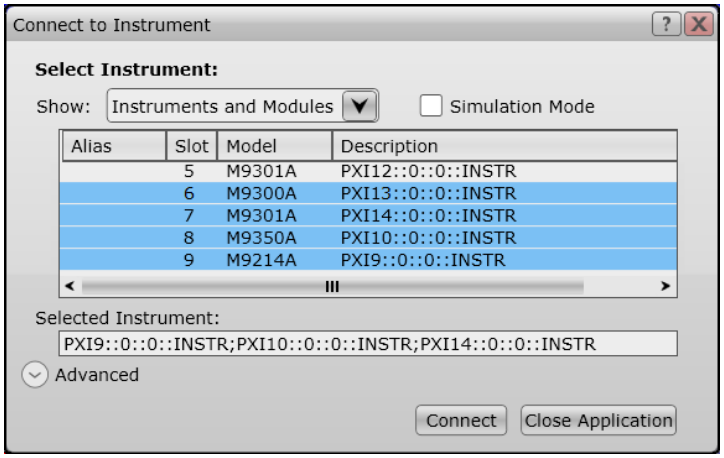
In this process you will verify correct operation by conducting two Self Tests. At the end of this step you will have two SFPs open

1. The first step in this process is to configure connections to both the M9381A and the M9391A instruments.
   a. Open the M9381A SFP by selecting **Start > All Programs > Keysight > M938x > M9381 SFP**.
   b. Open the M9391A SFP by selecting **Start > All Programs > Keysight > M9391 > M9391 SFP**.
   c. For each SFP, you are presented with the "Connect to Instrument" dialog. Use **Ctrl/Select** to select all of the modules that are components of the M9381A and the M9391A (see Cabling Reference on page 35) and press **Connect**. Leave the SFP open. For example:

M9381A



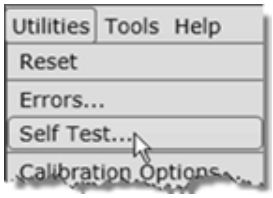
M9391A



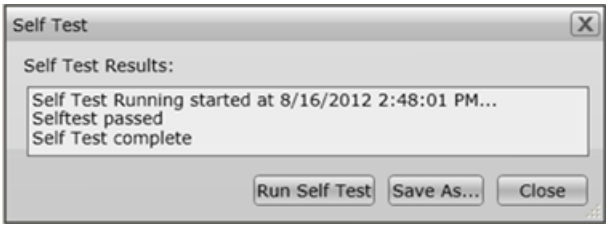
To understand the behavior of shared M9300 Reference modules, see Sharing the M9300A Frequency Reference (page 30).

CAUTION It is important that no signal is present at the RF Input of the Keysight M9350A PXIe Downconverter when doing a Self Test. If a signal is present, it may result in a false failure.

2. Conduct a Self Test on the M9391A and also the M9381A (**Utilities > Self Test... > Run Self Test**).

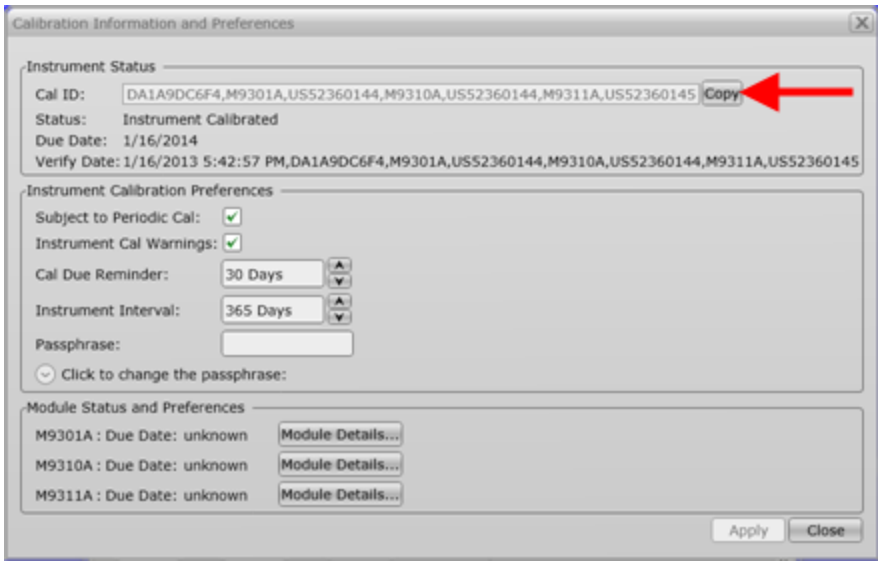


If the Self Test passes (see results below), go to Step 3: Make a Measurement (page 31).



If the Self Test does not pass for any of the instruments, the test indicates which module is likely to need service. However, you should return all modules (except the M9300A) and all cables for that particular instrument.

To ensure that you send in the group of modules that was reported in a Self Test failure, go to **Utilities > Calibration Options...** to view this screen:



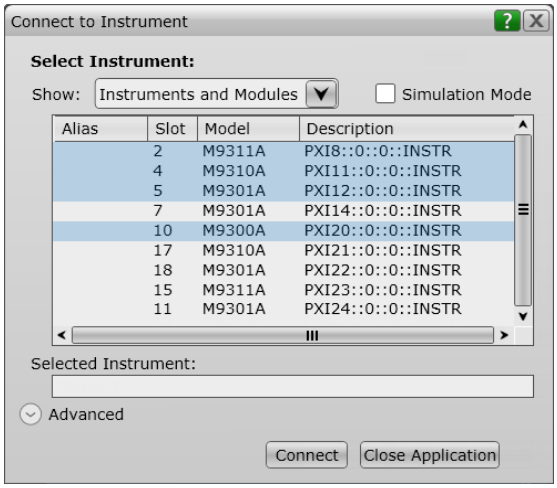
The string pointed out in this image is the Cal ID. The first 10 characters represent the Unique ID and the remaining characters show the modules (and their serial numbers) that constitute the M9381A or M9391A instrument. Match the modules and serial numbers of the failed instrument to send them in for repairs.A Certificate of Calibration for that instrument contains the same information. Additionally, you may see this same information from the SFP by using **Help > About**.

For further details about returning your instrument. see Return an Instrument for Service (page 12).

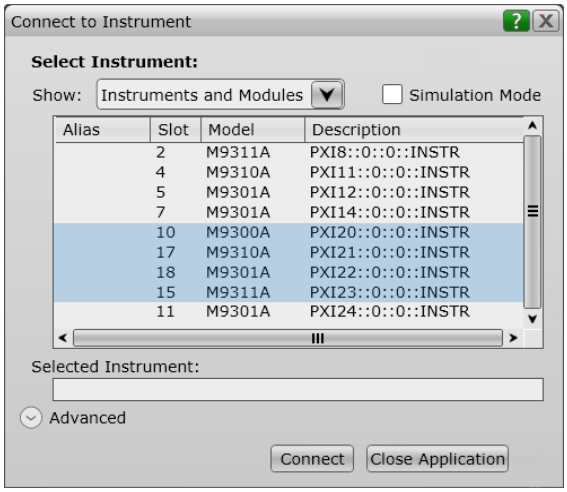
Verify Operation of Your Two-Channel Solution

In this step you will verify two-channel operation by conducting four Self Tests. At the end of this step you will have four SFPs open.

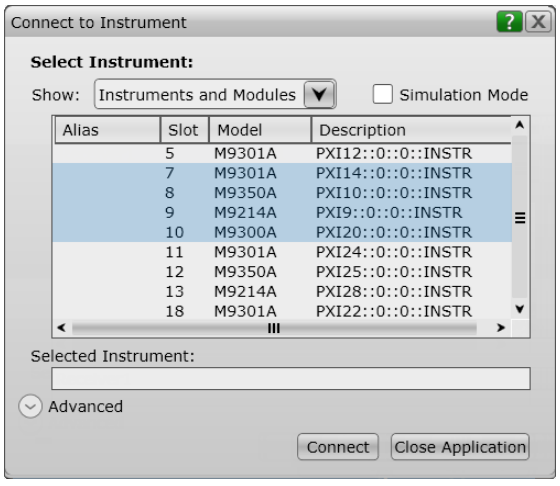
1. The first step in this process is to configure connections to each of two of the M9391A and the M9381A instruments.
    a. Open the M9381A SFP by selecting **Start > All Programs > Keysight > M938x > M9381 SFP**. This opens the **Connect to Instrument** dialog.
    b. Highlight the modules shown in *Source1* below and select **Connect** and leave the SFP open.
    c. Highlight the modules shown in *Source2* below and select **Connect** and leave the SFP open.
    d. Open the M9391A SFP by selecting **Start > All Programs > Keysight > M9391 > M9391 SFP**.
    e. Highlight the modules shown in *Receiver1* below and select **Connect** and leave the SFP open.
    f. Highlight the modules shown in *Receiver2* below and select **Connect** and leave the SFP open.
    g. Proceed to Step 2.



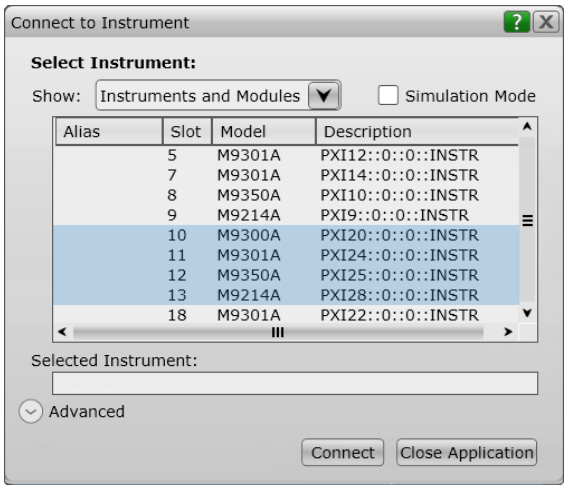
Source1



Source2



Receiver1

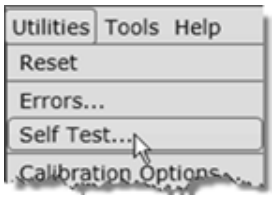


Receiver2

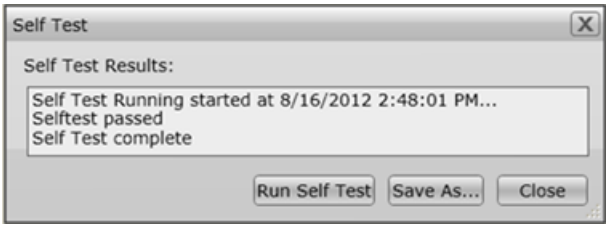
To understand the behavior of shared M9300 Reference modules, see Sharing the M9300A Frequency Reference (page 30).

CAUTION It is important that no signal is present at the RF Input of the Keysight M9350A PXIe Downconverter when doing a Self Test. If a signal is present, it may result in a false failure.

2. Conduct a Self Test on the M9391A and also the M9381A (**Utilities > Self Test... > Run Self Test**)

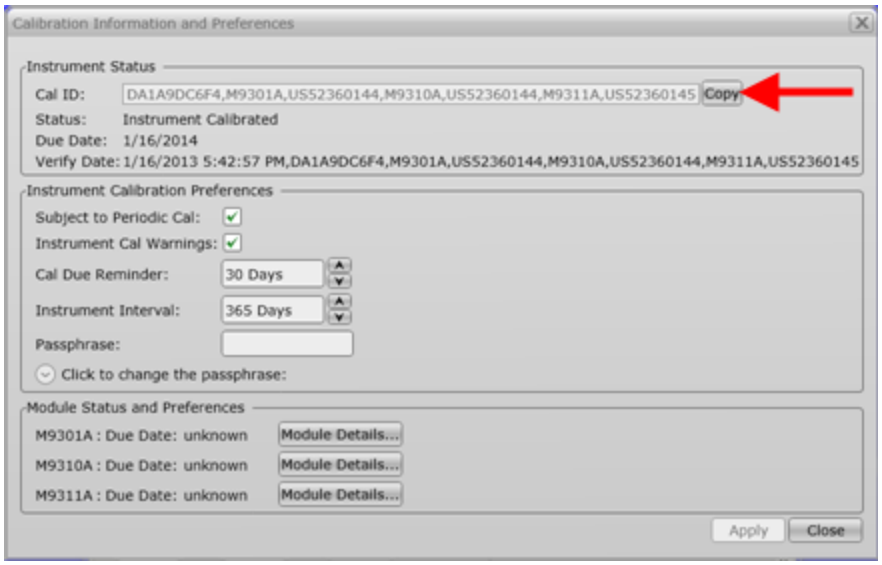


If the Self Test passes (see results below), go to Step 3: Make a Measurement (page 31).



If the Self Test does not pass for any of the instruments, the test indicates which module is likely to need service. However, you should return all modules (except the M9300A) and all cables for that particular instrument.

To ensure that you send in the group of modules that was reported in a Self Test failure, go to **Utilities > Calibration Options...** to view this screen:



The string pointed out in this image is the Cal ID. The first 10 characters represent the Unique ID and the remaining characters show the modules (and their serial numbers) that constitute the M9381A or M9391A instrument. Match the modules and serial numbers of the failed instrument to send them in for repairs. A Certificate of Calibration for that instrument contains the same information. Additionally, you may see this same information from the SFP by using **Help > About**.

For further details about returning your instrument. see Return an Instrument for Service (page 12).

Sharing the M9300A Frequency Reference

The M9300A Frequency Reference module can be shared by the all M9391A and M9381A instruments in your solution. If you connect to a hardware configuration that includes a currently connected M9300A (either independently or as part of another hardware configuration) the latest instance of the SFP will take control of the M9300A. You will see no warning or error message.

CAUTION While the M9300A module is being shared, any of the configurations that share this reference can control it fully, including setting the reference to use an external frequency reference source. If the external frequency reference setting does not match that of the supplied frequency, the reference will be unlocked, as expected. However, only the instance of the SFP that creates the reference unlock condition can correct the problem. This is done by either correcting the frequency or by setting the reference back to internal, so that a subsequent instance will not take control of the reference module unintentionally.

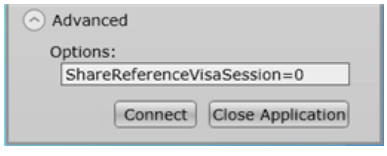
CAUTION The Reference module can also be shared among multiple measurement applications, such as the Keysight 89600 VSA software. The Reference module must be initialized before use, so including it in all configurations allows applications to be started in any order. However, when sharing a module the user interface of some applications may not reflect M9300A settings made by other applications. For example, the Keysight 89600 software can control the Reference module internal/external setting, but the changes made by other applications will not be reflected in the Keysight 89600.

NOTE FPGA updates are not allowed on a Keysight M9300A PXIe Frequency Reference while it is being shared. To perform M9300A FPGA updates, reserve the Reference.

Reserving the Reference for a Configuration

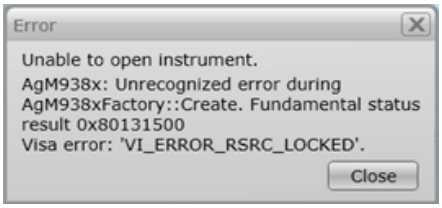
If you are running a test in the background with a certain M9300A setting and then connect a hardware configuration that also contains the same M9300A, you may alter the test setup that is already running.

If you would prefer to be keep the reference control with the first instance of the hardware configuration so that a subsequent instance will not take control of the reference module unintentionally:



1. On the SFP Connect to Instrument screen, click the **Advanced** control to open the **Options:** dialog.
2. Type the following string: `ShareReferenceVisaSession=0`

   This configuration will retain control of the M9300A if you try to open a new configuration. If you connect a new configuration, that includes the same M9300A, you will see the following error:

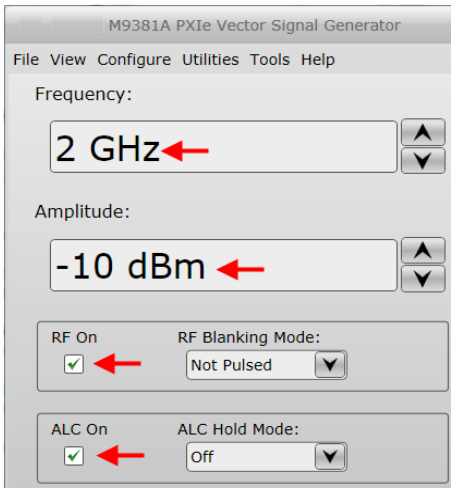


CAUTION If an existing instance of the SFP is connected to the reference module in a shared (default) mode, and you try to connect a second instance of the SFP to the same reference with `ShareReferenceVisaSession=0` Advanced Option, you will get the resource locked error shown above.

Step 3: Make a Measurement

NOTE If your solution has more than one channel, repeat this process for each channel.

2. Connect a high quality SMA (male) to SMA (male) cable between the RF Out connector on the Keysight M9310A PXIe Source Output and the RF In connector on the .
3. Torque the connectors to 8 Lb-In (0.904 Nm).
4. On the M9381A SFP make the following settings:
   a. Frequency: 2 GHz
   b. Amplitude: -10 dBm
   c. RF On: checked
   d. ALC On: checked.

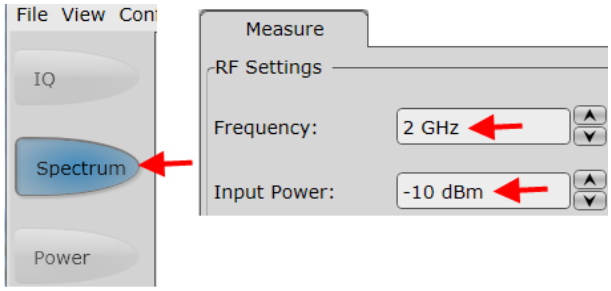


5. On the SFP Measure Tab, make the following settings:

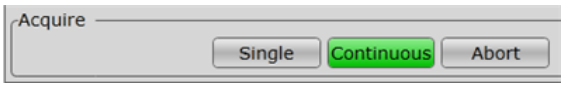
a. Frequency: 2 GHz

b. Input Power: -10 dBm

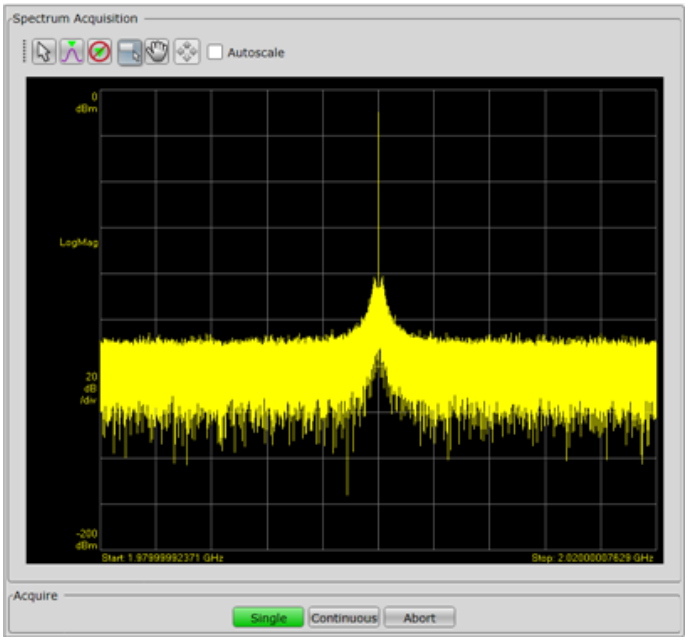
c. Acquisition: Spectrum



6. Below the display, select Continuous for a sustained sweep of the analyzer.



You should see the following display on your SFP. The frequency of the signal is 2 GHz and the amplitude is -10 dBm.



7. Proceed to Installation is Complete (page 34).

Step 4: Redeem Your Software Licenses

The basic software required to operate your solution requires no license. This includes:

- Keysight IO Libraries Suite
- Keysight M9381A VSG Software
- Keysight M9391A VSA Software
- Keysight M9018A 18 Slot PXIe Chassis Drivers

Additional software may be included with your solution that requires licensing. For any additional licensed software products that you include in your solution you receive a Software Entitlement Certificate, (in Box 1 of 2) for example:

- Keysight 89600 VSA Software (if you are using M9391A VSAs)
- Keysight Signal Studio Applications Software
- Keysight Waveform 5 or 50 packs (optional)
- Keysight X-Series Measurement Applications for Modular Instruments (optional)

For each of these licensed products, whether pre-installed on your M9036A Embedded Controller, or self-installed on your PC, you must redeem your license. Follow the instructions on your Software Entitlement Certificate to license and enable your new software.

Installation is Complete

Proceed to program your product by means of the applications programming interface (API) for the supplied drivers.

API Overview

IVI Drivers

Keysight's IVI drivers simplify the creation and maintenance of instrument control applications in a variety of development environments; they allow programmatic control of instrumentation while providing a greater degree of instrument interchangeability and code reuse. IVI drivers currently come in two basic types: IVI-COM and IVI-C. Although the functionality offered by both types of drivers is often very similar, the fundamental differences in interface technology results in a very different end-user experience. The IVI drivers support compiling application programs for 32- or 64-bit platforms.

Supported ADEs (application development environments) Arguably the most important consideration in comparing IVI-COM and IVI-C drivers is the end user experience in various ADEs. Since IVI-COM drivers are based on Microsoft COM technology, it's not surprising that IVI-COM drivers offer the richest user experience in Microsoft ADEs. Users working in Visual C++, Visual C#, Visual Basic.NET, and Visual Basic 6 enjoy a host of features, such as object browsers, IntelliSense, and context-sensitive help.

When you install the product software, the IVI driver files are installed in the standard IVI Foundation directories (for example, C:\Program Files\IVI Foundation\IVI\Drivers\). Example programs are provided to demonstrate most driver functionality (for example, C:\Program Files\IVI Foundation\IVI\Drivers\\Examples). The reference material for the driver functions (a Microsoft HTML Help .chm file) is installed with the IVI driver and is available for Microsoft Visual Studio's IntelliSense context linking. In addition, you can directly access the .chm file (for example, AgM9391.chm) from this Start menu location: Start > All Programs > Keysight IVI Drivers > AgM9391 VSA > Documentation.

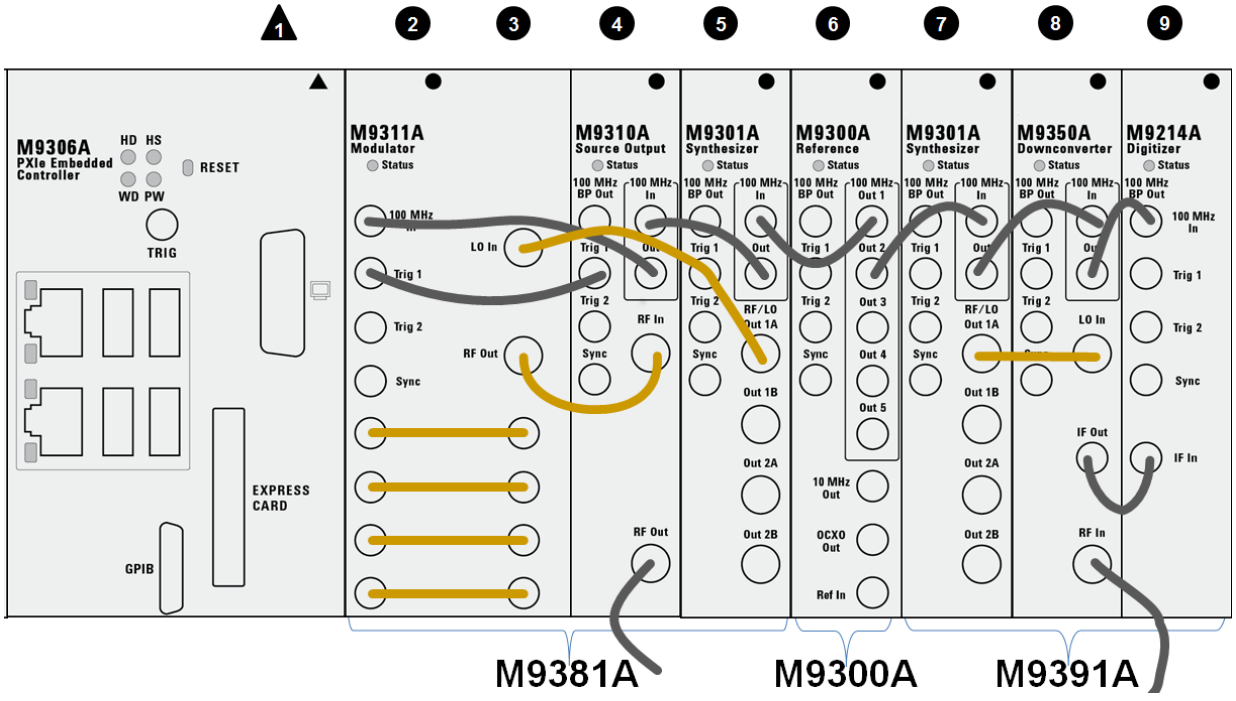
LabVIEW Driver

In addition to the IVI drivers, Keysight provides a LabVIEW driver that includes all the functionality of the IVI-C driver. When you install the product software, the LabVIEW driver is installed to each LabVIEW instr.lib directory for each version of LabVIEW you have on your computer (for example, C:\Program Files (x86)\National Instruments\<LabVIEW version>\instr.lib\<Agilent product model>). If you install LabVIEW drivers before you install LabVIEW itself, drivers will be installed in the Agilent directory instead of the National Instruments directory (for example, C:\Program Files (x86)\Agilent\<Agilent product model>\LabVIEW Driver-\<LabVIEW version>\...). Example programs are provided to demonstrate most driver functionality. The reference information for the driver (a Microsoft HTML Help .chm file) is also installed with the driver and the content is available from LabVIEW's Context Help window. In addition, you can directly access the chm file (for example, AgM9391 LabVIEW_Help) from this Start menu location: **Start > All Programs > Keysight > AgM9391 LabVIEW Help**.

Cabling Reference

Single-Channel Configuration: M9391A VSA and M9381A VSG

This section contains a cabling diagram for the Keysight M9391A PXIe Vector Signal Analyzer with a Keysight M9381A PXIe Vector Signal Generator and cable and module association tables.



Part Number	Connection	Cable Description
1250-23161	M9350A RF In connector saver	Adaptor, coaxial straight SMA (male) - SMA (female)

Part Number	Connection	Cable Description
8121-20631	This cable can be used to direct an External Reference into the M9300A Ref In connector.	Cable, coaxial, BNC (male) - SMB (female) 1200 mm
8120-5091	M9300A 100 MHz Out 1 to M9301A 100 MHz In	Cable, coaxial, SMB (female) - SMB (female) 120 mm
8120-5091	M9301A 100 MHz Out to M9350A 100 MHz In	Cable, coaxial, SMB (female) - SMB (female) 120 mm
8120-5091	M9350A 100 MHz Out to M9214A 100 MHz In	Cable, coaxial, SMB (female) - SMB (female) 120 mm
8120-5091	M9350A IF Out to M9214A IF In	Cable, coaxial, SMB (female) - SMB (female) 120 mm
W1312-20237	M9301A RF/LO Out 1A to M9350A LO In	Cable, semi-rigid, SMA (male) - SMA (male)

[1] This component is not shown in the cabling diagram, but is included in the M9391A VSA shipment.

Torque specification for all SMA connectors is 8 Lb-In (0.904 Nm).

M9381A Cable and Module Table

Part Number	Connection	Cable Description
8121-2063	This cable can be used to direct an External Reference into the M9300A Ref In connector.	Cable, coaxial, BNC (male) - SMB (female), 1200 mm
8120-5091	M9300A 100 MHz Out 1 to M9301A 100 MHz In	Cable, coaxial, SMB (female) - SMB (female)
8120-5091	M9301A 100 MHz Out to M9310A 100 MHz In	Cable, coaxial, SMB (female) - SMB (female)
8120-5091	M9310A 100 MHz Out to M9311A 100 MHz In	Cable, coaxial, SMB (female) - SMB (female)
8120-5091	M9310A Trig 1 to M9311A Trig 1 for Pulse Mod.	Cable, coaxial, SMB (female) - SMB (female)
W1312-20266	M9301A RF/LO Out 1A to M9311A LO In	Cable, semi-rigid, SMA (male) - SMA (male)
W1312-20267	M9311A RF Out to M9310A RF In	Cable, semi-rigid, SMA (male) - SMA (male)

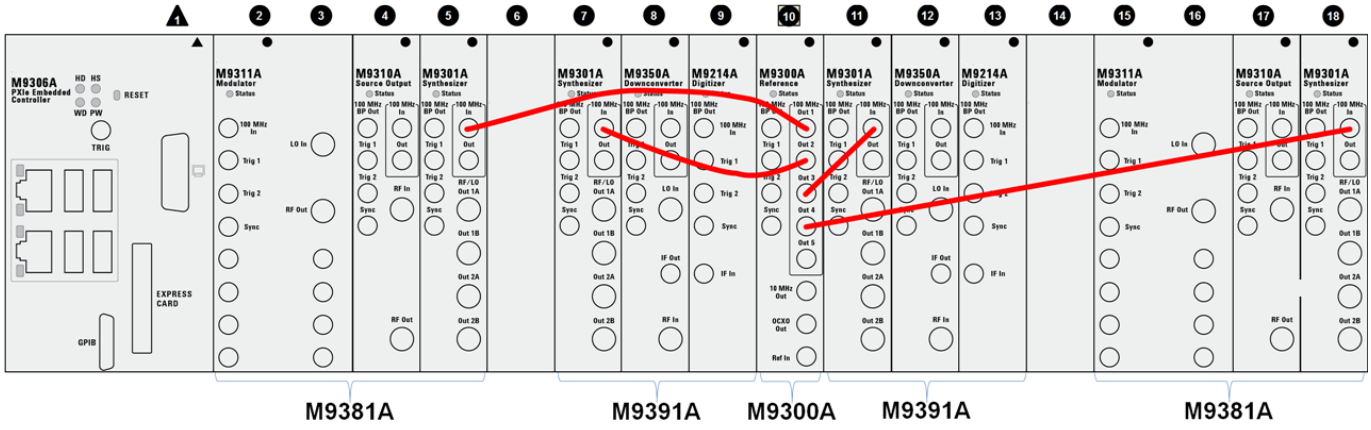
Two-Channel (2x2) Configuration in a Single PXIe Chassis

The main difference between the 2x2 configuration and the single-channel configuration (page 35), is the placement of the core modules that comprise each M9381A and M9391A instrument, and locating the M9300A Reference in the timing slot (slot 10).

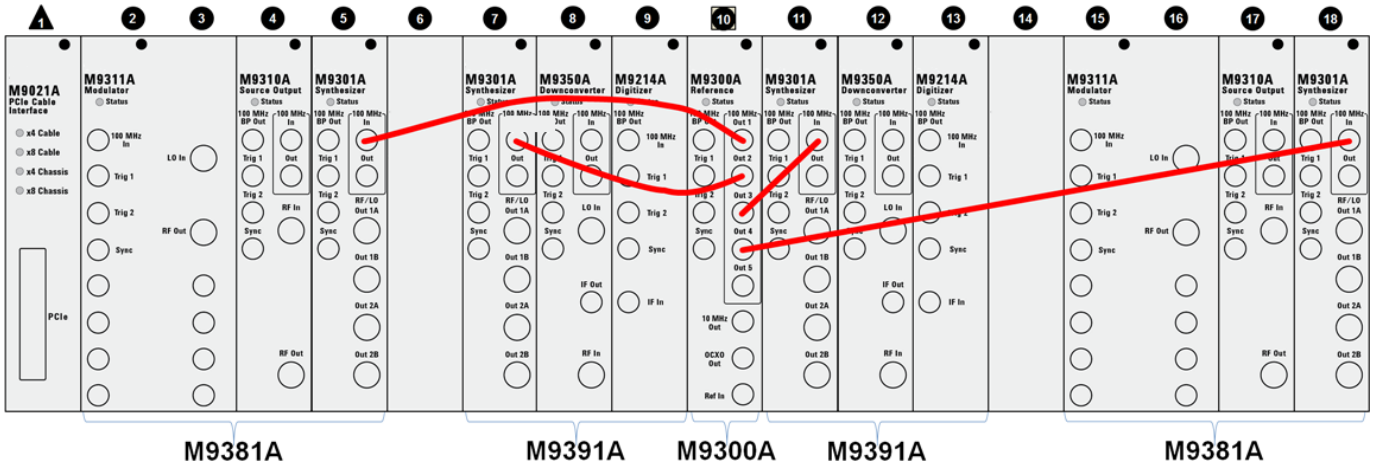
Cabling details for the M9381A and M9391A instruments are provided in the cabling diagram and tables on page 35. The shared M9300A Reference in slot 10 is cabled to the four instruments using four 8121-2175 cables, as follows:

- 100 MHz Out 1 to M9301A 100 MHz In (slot 5)
- 100 MHz Out 2 to M9301A 100 MHz In (slot 7)
- 100 MHz Out 3 to M9301A 100 MHz In (slot 11)
- 100 MHz Out 4 to M9301A 100 MHz In (slot 18)

2x2 Configuration with M9036A Embedded Controller



2x2 Configuration with External Controller and M9021A Cable Interface

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