Keysight M9383B VXG-m Microwave Signal Generator

Startup Guide

KEYSIGHT TECHNOLOGIES

Notices

Trademark Acknowledgments

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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.

Where to Find the Latest Information

Documentation is updated periodically. For the latest information about this product, including instrument software upgrades, application information, and product information, browse to the following URL:

https://www.keysight.com/find/m9383b

To receive the latest updates by email, subscribe to Keysight Email Updates at the following URL:

http://www.keysight.com/find/MyKeysight

Information on preventing instrument damage can be found at:

http://keysight.com/find/PreventingInstrumentRepair

Is your product software up-to-date?

Periodically, Keysight releases software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, go to the Keysight Technical Support website at:

http://www.keysight.com/find/techsupport

Table of Contents

1 Quick Start

Use this guide to unpack and set up the M9383B VXG-m Microwave Signal Generator.

The following topics can be found in this section:

Unpack and Inspect the Instrument

Before unpacking your instrument, inspect the packaging container for evidence of mishandling during transit. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty (refer to the warranty information at the beginning of this document).

Remove the instrument from the packaging container and ensure that all accessories are included. Inspect the instrument and accessories for damage. If the contents appear damaged, notify your local Keysight Technologies Inc. representative.

CAUTION

The instrument is shipped in a container which prevents damage from static. The instrument should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken. Store the instrument in an anti-static envelope when not in use. See more about electrostatic discharge on page 22.

NOTE

Visit www.keysight.com/find/tips for information on preventing damage to your Keysight equipment.

Verify M9383B Shipment Contents

The M9383B VXG-m comes in two configurations: Single Channel and Dual Channel.

The single channel configuration consists of:

- one M9043A 18-slot PXIe chassis
- one M9037A high-performance embedded controller, Gen3
- one M9347A direct digital synthesizer
- one M9343A digital vector modulator
- one M9312A source output
- one M9314B upconverter
- one M9323A amplifier

The dual channel configuration consists of:

- one M9043A 18-slot PXIe chassis
- one M9037A high-performance embedded controller, Gen3
- one M9347A direct digital synthesizer
- two M9343A digital vector modulators
- two M9312A source outputs
- two M9314B upconverters
- two M9323A amplifiers

Qty	Keysight Part Number	Description
1	M9383B	M9383B VXG-m Microwave Signal Generator
1	M9383-90020	Keysight M9383B VXG-m Microwave Signal Generator Flyer
1	5061-7383	South Korean Class A EMC Declaration
1	5002-3361	Cable Removal Tool, SMB/SMP/MMCX
1	11904C[a]	Adapter, 2.4 mm (m) to 2.92 mm (f), DC to 40 GHz
1	8710-1761	Open End Wrench, 7 mm

a. One 11904C adapter is included with each channel of your M9383B VXG-m order to help interface with the 2.4 mm (f) RF output.

Instrument Dimensions

H x W x L: 190 mm x 445 mm x 465 mm (approximate measurement without bottom feet).

Shipping Problems?

If the shipping materials are damaged or the contents of the container are incomplete:

- Contact the nearest Keysight Technologies office.
- Keep the shipping materials for the carrier's inspection.
- If you must return the M9383B VXG-m to Keysight Technologies, use the original (or comparable) shipping materials. See "Returning an Instrument for Service" on page 71.

Before Applying Power

Verify that all safety precautions are taken. Refer to Chapter 5, “Safety and Maintenance Information”, on page 63 for Caution and Warning information. Make all connections to the unit before applying power. Note the external markings described in the Instrument Markings section on page 68.

Power Requirements

100/120 VAC, 50/60 Hz, 1200 W Max

220/240 VAC, 50/60 Hz, 1300 W Max

Environmental Conditions (Operating)

For indoor use only.

Environmental Condition	Requirement
Temperature Range	0 to 40 °C
Maximum Relative Humidity	Maximum Relative Humidity (non-condescending): 95% RH
Altitude (m)	3000 m

Instrument Cooling

The following are the recommended best practices to ensure proper and safe operating conditions:

- Ensure that adequate clearance is provided around all instrument vents, both air intake vents, and air exhaust vents, including any vents at the bottom of the instrument.
- Ensure that all the fan filters are clean and unobstructed.
- To the extent possible, install the instrument in a location with lower ambient temperatures. For example, avoid the situation where the exhaust air from another instrument feeds into the air intake for this instrument.

The M9043A chassis has multiple air intakes. They are located at the lower sides, lower front and bottom of the instrument.

Prepare and Power Up the Instrument

1. Use a Phillips screw driver to remove the protective cover from the M9383B (four screws on each side).

   Refer to "Single and Dual Channel Cabling Configurations" on page 25 for cabling configurations.

CAUTION

When you need to disconnect push-on cables from the module's front panel connectors, use the cable removal tool (Keysight part number 5002-3361). To avoid damage to the cable and connectors, pull the cable straight away from the connector. Do not use the tool as a pry bar.

2. Connect the peripherals (mouse, keyboard, and monitor).
3. Make sure that the line cord is plugged into a grounded outlet to establish earth ground.

4. Press the power button to power up the instrument.

5. Allow the VXG-m to warm up for at least 30 minutes before using.
6. Verify the status of each module's LED state are green.

Module	Green	Red	Off
M9323A M9312B M9314B M9343A M9347A	The software has initialized the connection to the module.	Error condition.	Not connected by the application.

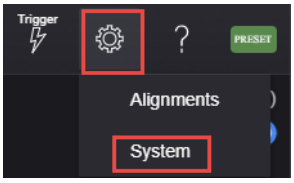
Verify Operation of the Signal Generator

To verify the operation of the M9383B VXG-m, run a Self Test and Internal Alignments.

Run a Self Test

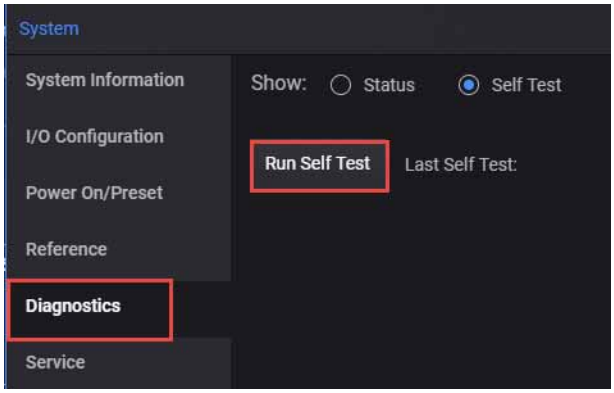
Refer to the Data Sheet for a description of the front and rear panel connectors.

1. Select the **Gear** icon on the top right corner, and then select **System**.

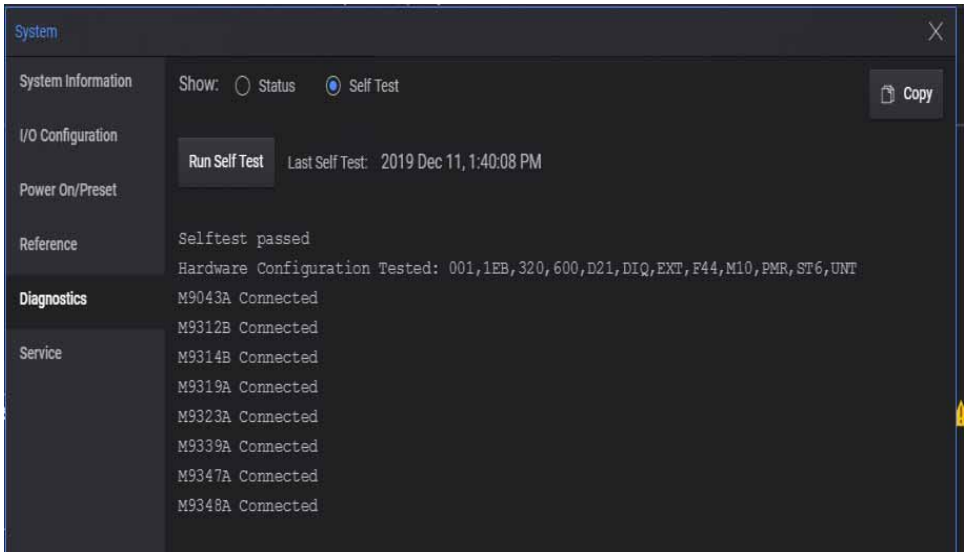


2. Select the **Diagnostics** tab, then **Run Self Test**.

   The self test takes 5 to 10 minutes to complete.



If the Self Test passes (see results below), continue on with "Run Alignments" and "Generate and View an Output Signal".

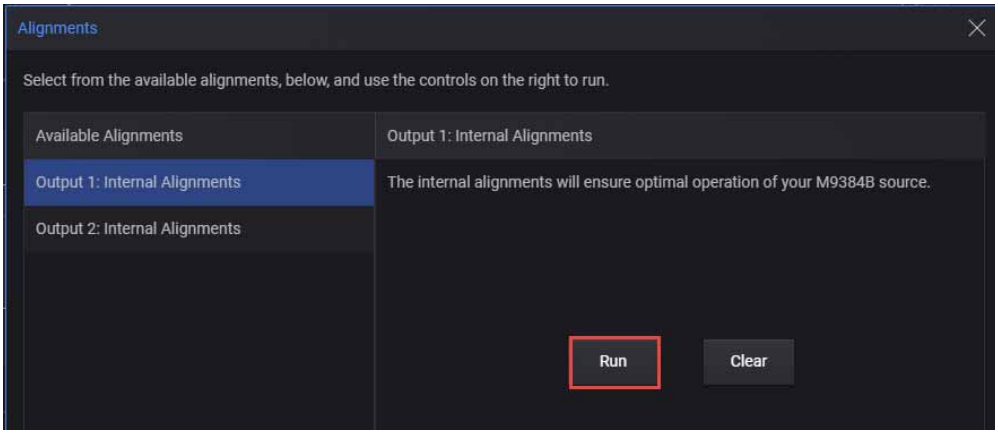


If the Self Test fails, run Alignments (below), then run the Self Test again. If it continues to fail, contact Keysight at https://www.keysight.com/find/assist for help resolving your issue.

Run Alignments

1. Select the **Gear** icon > **Alignments** > **Run**.

   The internal alignments calibration will ensure optimal operation of the VXG-m. It takes approximately 4 minutes per channel to complete.



Generate and View an Output Signal

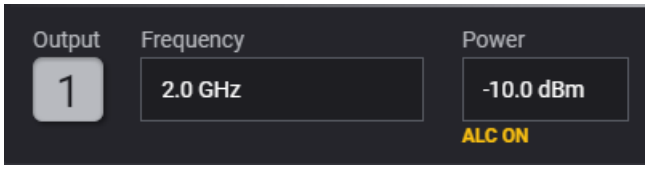
After verifying the operation of the M9383B VXG-m, you are ready to make a measurement.

NOTE The following measurement uses a M9383B VXG-m to generate the 2 GHz signal and Keysight Signal Analyzer to analyze it. You may use any frequency depending upon the signal analyzer used.

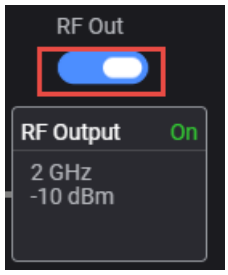
1. Turn on the Keysight signal analyzer.
2. Connect a cable between the M9312A RF Out connector and the RF In connector on the Keysight signal analyzer.

NOTE For an accurate frequency measurement, connect a 10 MHz cable between the M9043A (chassis) rear panel 10 MHz Ref Out connector and the signal analyzer 10 MHz input connector.

3. On the M9383B VXG-m, set the following parameters:
   a. **Frequency**: 2 GHz
   b. **Power**: -10 dBm

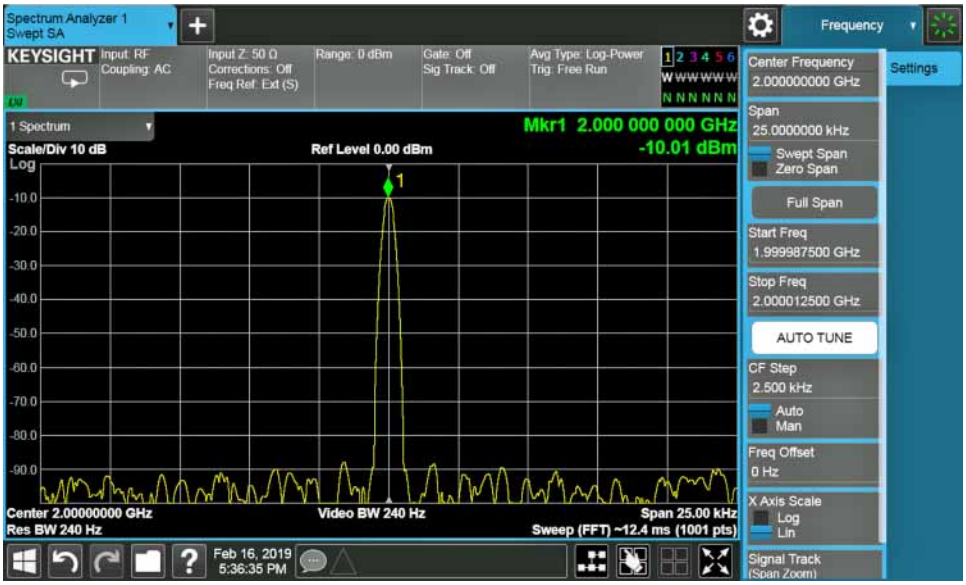


   c. Set the **RF Out** switch to **On** by selecting the **RF Out** switch. This enables the RF Out for the indicated channels, in this case Channel 1 if using a 2-channel VXG-m.



d. For two channel instruments only: In the top right corner of the display, set **RF Out (All)** to **On** by selecting the switch.

4. On the Keysight signal analyzer, select **Frequency** in the menu panel, then **AUTO TUNE**. Verify that you have a 2 GHz, -10 dBm signal as shown below.



NOTE Repeat the above steps for a M9383B VXG-m with dual channel configuration, for Channel 2.

NOTE Refer to the Measurement Guide for information on making basic and 5G NR measurements.

http://literature.cdn.keysight.com/litweb/pdf/M9384-90008.pdf

Shutting Down the Instrument

Power down the instrument using the front panel power button. Press briefly to shut down, press and hold to force a shutdown. Do not power down by removing the power cord. For software controlled shutdown, refer to the **SYSTem:PDOWn** SCPI commands.

Protecting Against Electrostatic Discharge

Electrostatic discharge (ESD) can damage or destroy electronic components (the possibility of unseen damage caused by ESD is present whenever components are transported, stored, or used).

Test equipment and ESD

To help reduce ESD damage that can occur while using test equipment:

WARNING **Do not use these first three techniques when working on circuitry with a voltage potential greater than 500 volts.**

- Before connecting any coaxial cable to an instrument connector for the first time each day, momentarily short the center and outer conductors of the cable together.
- Personnel should be grounded with a 1 MΩ resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the instrument.
- Be sure that all instruments are properly earth-grounded to prevent build-up of static charge.
- Perform work on all components or assemblies at a static-safe workstation.
- Keep static-generating materials at least one meter away from all components.
- Store or transport components in static-shielding containers.
- Always handle printed circuit board assemblies by the edges. This reduces the possibility of ESD damage to components and prevent contamination of exposed plating.

Additional information about ESD

For more information about ESD and how to prevent ESD damage, contact the Electrostatic Discharge Association (http://www.esda.org). The ESD standards developed by this agency are sanctioned by the American National Standards Institute (ANSI).

Related Documentation

The table below provides the list of documentation available for the M9383B VXG-m.

Documentation is updated periodically. For the latest documentation, browse to the following URL:

https://www.keysight.com/find/m9383b

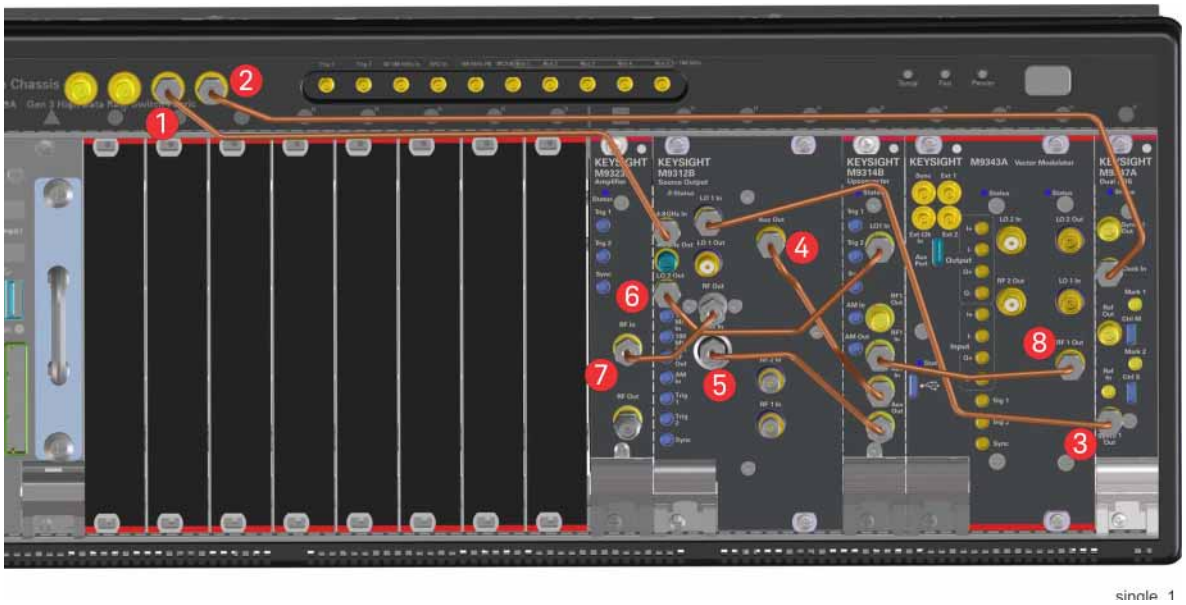
Document	Description	Format
Startup Guide (this document)	Includes procedures to help you to unpack, inspect, install (software and hardware), perform instrument connections, verify operability, and troubleshoot your product. Also includes an annotated block diagram.	PDF
Embedded Help	Provides user-interface descriptions, programming information, tutorials, SCPI commands and more.	HTML5
Data Sheet	Provides key features and specifications.	PDF
Configuration Guide	Includes standard configurations, options, accessories, and compatible peripherals.	PDF
Measurement Guide	Includes step-by-step procedures to configure the M9383B VXG-m and perform measurements using the instrument. Also, includes programming examples to help you get started with using SCPI in your application development environment.	PDF

2 Single and Dual Channel Cabling Configurations

The images below show the recommended cabling configurations for the M9383B in the M9043A chassis.

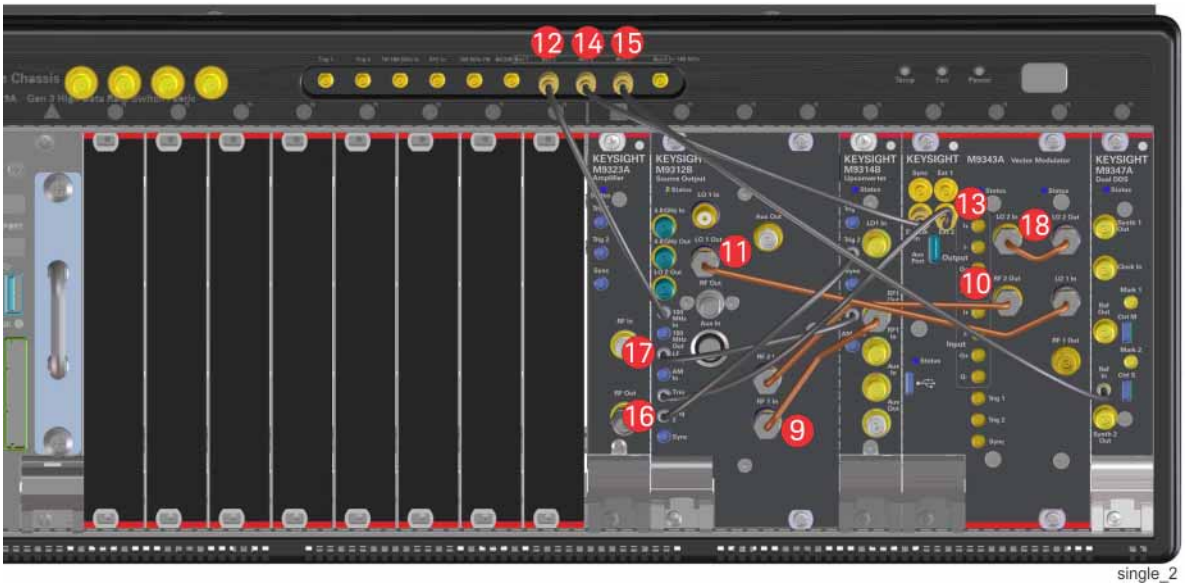
Single Channel

Figure 2-1 Single Channel Cables Group 1



Number	Cable Part Number	From	To
1	M9383-20045	M9312B, 4.8 GHz In	M9043A Chassis, HF Out 3
2	M9383-20047	M9347A, Clock In	M9043A Chassis, HF Out 4
3	M9383-20038	M9312B, LO 1 In	M9347A, Synth 1 Out
4	M9383-20041	M9314B, Aux In	M9312B, Aux Out
5	M9383-20042	M9312B, Aux In	M9314B, Aux Out
6	M9383-20040	M9314B, LO 1 In	M9312B, LO 2 Out
7	M9383-20044	M9323A, RF In	M9312B, RF Out
8	M9383-20036	M9314B, RF 1 In	M9343A, RF 1 Out

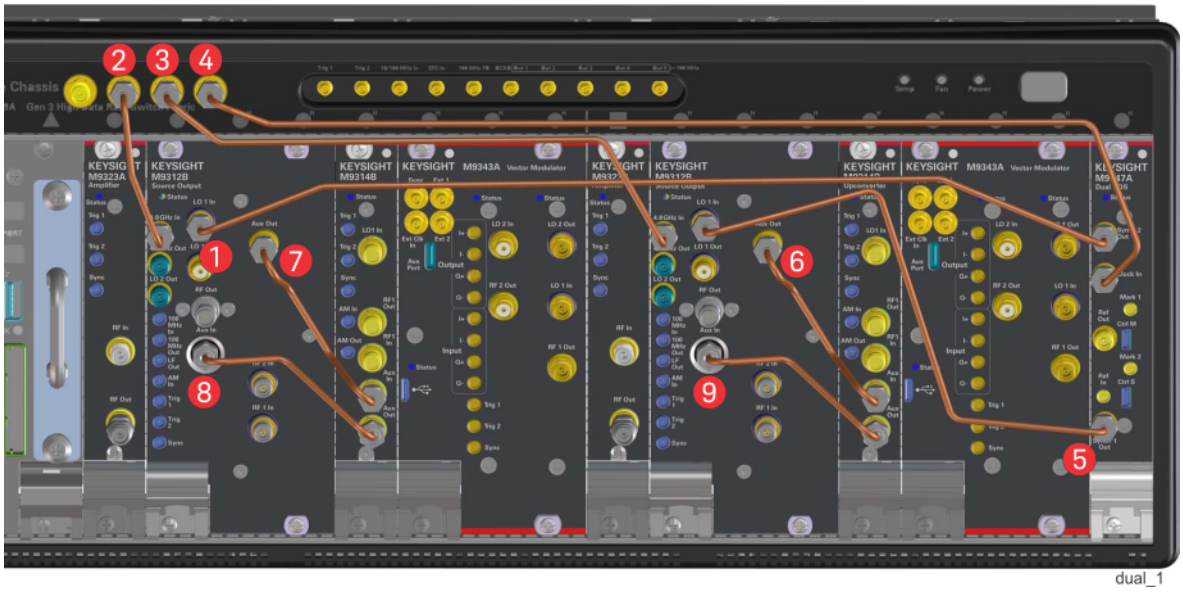
Figure 2-2 Single Channel Cables Group 2



Number	Cable Part Number	From	To
9	M9383-20043	M9312B, RF 1 In	M9314B, RF 1 Out
10	M9383-20035	M9312B, RF 2 In	M9343A, RF 2 Out
11	M9383-20037	M9343A, LO 1 In	M9312B, LO 1 Out
12	8121-2827	M9312B, 100 MHz In	M9043A Chassis, 100 MHz Out 2
13	8121-2827	M9312B, Trig 1	M9343A, Ext 2
14	8121-2170	M9343A, Ext Clk In	M9043A Chassis, 100 MHz Out 3
15	8121-3083	M9347A, Ref In	M9043A Chassis, 100 MHz Out 4
16	8121-2554	M9312B, Trig 2	M9314B, Trig 2
17	8121-2554	M9312B, LF Out	M9314B, AM In
18	M9318-20009	M9343A, LO 2 In	M9343A, LO 2 Out

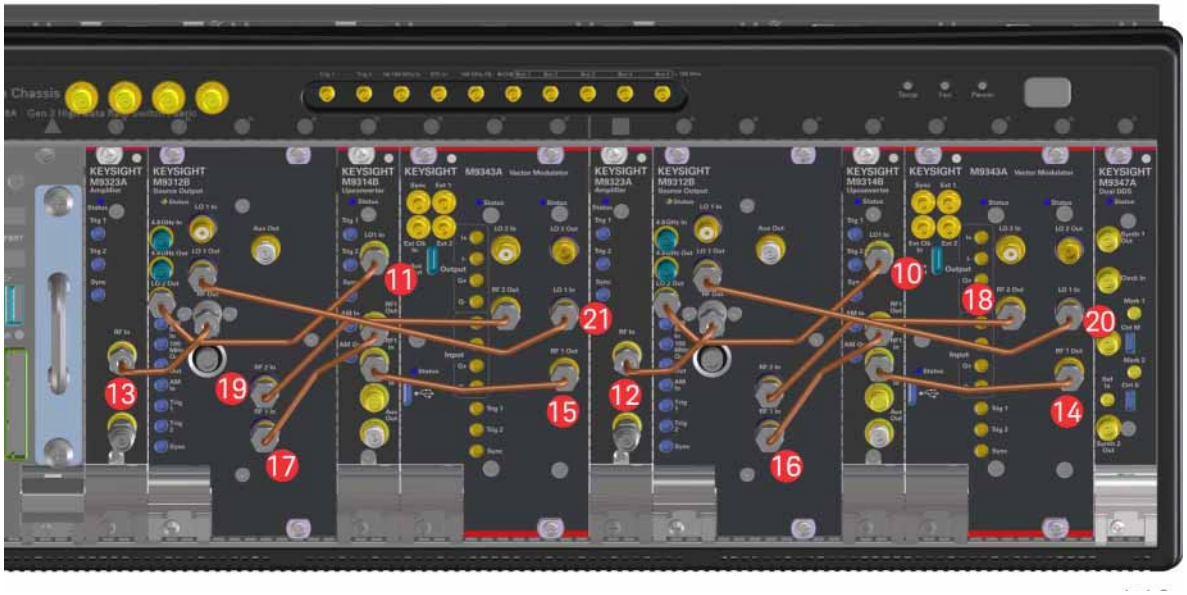
Dual Channel

Figure 2-3 Dual Channel Cables Group 1



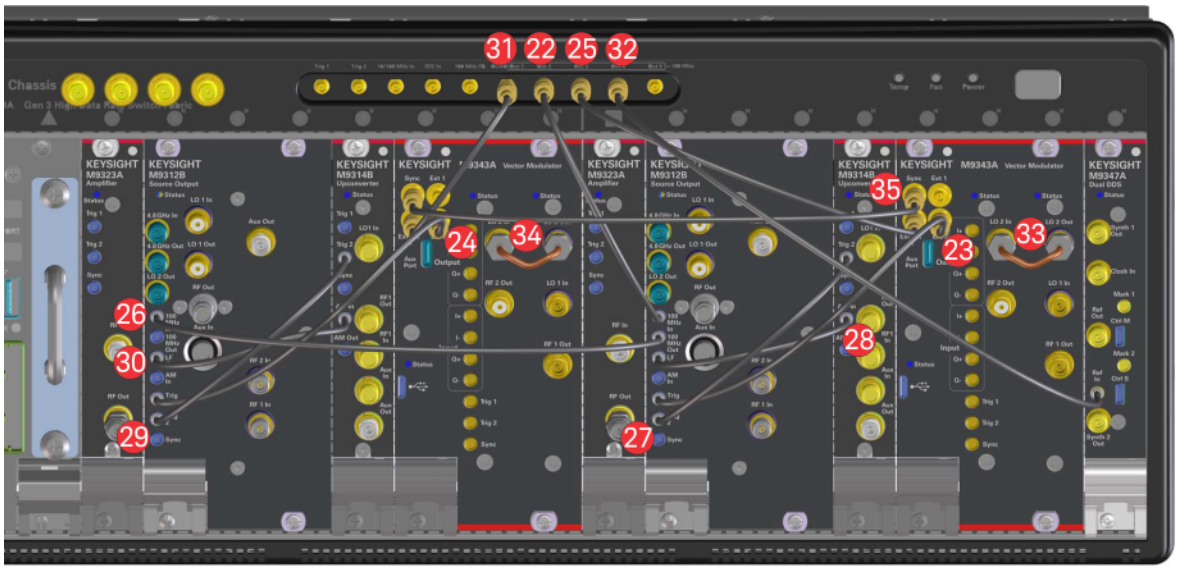
Number	Cable Part Number	From	To
1	M9383-20039	M9312B, LO 1 In	M9347A, Synth 2 Out
2	M9383-20046	M9312B, 4.8 GHz In	M9043A Chassis, HF Out 2
3	M9383-20045	M9312B, 4.8 GHz In	M9043A Chassis, HF Out 3
4	M9383-20047	M9347A, Clock In	M9043A Chassis, HF Out 4
5	M9383-20038	M9312B, LO 1 In	M9347A, Synth 1 Out
6	M9383-20041	M9314B, Aux In	M9312B, Aux Out
7	M9383-20041	M9314B, Aux In	M9312B, Aux Out
8	M9383-20042	M9312B, Aux In	M9314B, Aux Out
9	M9383-20042	M9312B, Aux In	M9314B, Aux Out

Figure 2-4 Dual Channel Cables Group 2



Number	Cable Part Number	From	To
10	M9383-20040	M9314B, LO 1 In	M9312B, LO 2 Out
11	M9383-20040	M9314B, LO 1 In	M9312B, LO 2 Out
12	M9383-20044	M9323A, RF In	M9312B, RF Out
13	M9383-20044	M9323A, RF In	M9312B, RF Out
14	M9383-20036	M9314B, RF 1 In	M9343A, RF 1 Out
15	M9383-20036	M9314B, RF 1 In	M9343A, RF 1 Out
16	M9383-20043	M9312B, RF 1 In	M9314B, RF 1 Out
17	M9383-20043	M9312B, RF 1 In	M9314B, RF 1 Out
18	M9383-20035	M9312B, RF 2 In	M9343A, RF 2 Out
19	M9383-20035	M9312B, RF 2 In	M9343A, RF 2 Out
20	M9383-20037	M9343A, LO 1 In	M9312B, LO 1 Out
21	M9383-20037	M9343A, LO 1 In	M9312B, LO 1 Out

Figure 2-5 Dual Channel Cables Group 3



dual_3

Number	Cable Part Number	From	To
22	8121-2827	M9312B, 100 MHz In	M9043A Chassis, 100 MHz Out 2
23	8121-2827	M9312B, Trig 1	M9343A, Ext 2
24	8121-2827	M9312B, Trig 1	M9343A, Ext 2
25	8121-2170	M9343A, Ext Clk In	M9043A Chassis, 100 MHz Out 3
26	8121-2664	M9312B, 100 MHz In	M9312B, 100 MHz Out
27	8121-2554	M9312B, Trig 2	M9314B, Trig 2
28	8121-2554	M9312B, LF Out	M9314B, AM In
29	8121-2554	M9312B, Trig 2	M9314B, Trig 2
30	8121-2554	M9312B, LF Out	M9314B, AM In
31	8120-5091	M9343A, Ext Clk In	M9043A Chassis, 100 MHz Out 1
32	8121-3083	M9347A, Ref In	M9043A Chassis, 100 MHz Out 4
33	M9318-20009	M9343A, LO 2 In	M9343A, LO 2 Out
34	M9318-20009	M9343A, LO 2 In	M9343A, LO 2 Out
35	8121-2175	M9343A, Sync	M9343A, Sync

3 Instrument Operating System

This chapter describes the Microsoft Windows configuration and settings used with the Keysight instrument software. It includes information about changing some of the system settings.

The following topics can be found in this chapter:

Installed Software

Microsoft Windows

Your instrument has Microsoft Windows installed at the factory. Keysight has already configured many of the settings in Microsoft Windows for optimal behavior in your instrument. This chapter contains details about many of these settings.

Instrument software

The instrument software is factory installed in the M9383B VXG Microwave Signal Generator. For optional software and capabilities, you may purchase the license at a later date.

Is your product software up-to-date?

Periodically, Keysight releases software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, visit
www.keysight.com/find/M9383B

User installation of software

Installation of other 3rd Party Software

The M9383B VXG platform is an Open Windows environment, so you can install software on the instrument. However, installation of non-approved software may affect instrument performance. Keysight does not warrant the performance of the instruments with non-approved software installed.

If you install programs other than those that Keysight has tested, it could cause problems with the instrument's applications. If this happens, you should try uninstalling the program that has caused the problem, or try changing the program's configuration. If this does not correct the problem, you may have to use the Instrument Recovery system to reinstall the instrument's system software.

User Accounts

The instrument ships with a number of different accounts already set up. In addition you can create your own accounts if you desire. The privileges associated with each account determine what you can and cannot do from that account.

Administrator account

The default Administrator password that ships from the factory is "Keysight4u!".

Using the Administrator account you can perform the following operations:

- Install software
- Configure network and printer access
- Access all files on the instrument
- Add or change user accounts and passwords
- Change Firewall settings
- Change Windows settings (e.g., using Device Manager)
- Change the time and date
- Run any application

Instrument accounts

The default user account that ships from the factory is “Instrument” with the password “measure4u”. This user is a member of the standard Users group. Using the Instrument account, you may perform the following operations:

- Configure network and printer access (although not local printer access)
- Access files on the instrument that are accessible to the Users group
- Run applications that are accessible to the Users group

User creation of accounts

You can create additional user accounts and decide on the level of security granted to any new user accounts created. For example, the level of security can be assigned as Administrator, power user, standard user, backup operators. User names are not case sensitive but passwords are case sensitive.

It is Keysight’s expectation that each user’s My Documents folder is mapped to the D: drive. This is to avoid overwriting the user’s data in the event the Instrument Recovery must be performed. Also, this facilitates convenient backup by copying the contents of the D: drive to external media. All user accounts created by the factory already have My Documents mapped to the D: drive. It is recommended to map all new users’ My Documents folders to the D: drive.

Windows Configuration

The Windows settings have been optimized for the best measurement performance. Any modifications to these settings may degrade instrument performance and measurement speed. In general, most Windows System settings (typically set through the Windows Control Panel) should not be modified. Those that can be safely modified are listed below.

CAUTION To recover from problems caused by changing Windows Systems settings, you may have to reinstall the Windows system and instrument applications using the Instrument Recovery process.

Settings that can be changed

You may change the following Windows settings or administrative tasks (available from the Windows Control Panel) to suit your own personal preferences. It is recommended that you document any changes to the instrument's configuration in case an Instrument Recovery is performed and the configuration is reset.

NOTE Some of these actions can only be performed with Administrator privileges.

You May Use This Feature:	To Do This...
Windows Update	Configure Microsoft Windows Automatic Updates. Microsoft recommends that you always get the latest critical Windows updates to ensure that the instrument's Windows operating system is protected. If the instrument has Internet access, the instrument default is set to automatically check for critical Windows Updates and notify you.
Network and Sharing Center	Add the instrument to a network
Devices and Printers	Install and configure a printer
Date and Time	Set the time and date

You May Use This Feature:	To Do This...
 System	If you click on “Advanced System Settings” a dialog will open called “System Properties.” On this dialog there is an “Advanced” tab, which opens up a dialog with a number of settings options. One of these is “Performance”, and if you click on the “Settings” button under “Performance”, you will see another dialog with a number of settings options. The default is “Let Windows choose what’s best for my computer.” You can also select “Adjust for best performance.” You should leave the remaining selections unchanged.

Settings that must not be changed

Avoid changing the settings described below (available from the Windows Control Panel). Changes to these settings may degrade instrument performance, screen displays, and measurement speed.

Do NOT Use This Feature:	To Do This...
 Power Options	Do not change Power Options.
 System	If you click on “Advanced System Settings” a dialog will open called “System Properties.” On this dialog there is a tab called “Hardware.” You should not modify any settings under the “Hardware” tab. On this dialog there is also a tab called “Advanced.” You should not modify any settings under the “Advanced” tab except as described above under “Settings that can be changed”.
 Fonts	Do not remove installed Fonts
 Display	Do not change the following Display Settings: –Screen Saver settings (under “Personalization) –Screen resolution (under “Adjust Resolution”) –DPI setting (under “Set custom text size”)
 Region and Language	Do not change any settings under “Region and Language” or the instrument keyboard and display may not operate properly
 User Accounts	Do not delete or modify the "KeysightOnly" user account.

In addition, do not:

- Add, delete, or modify disk drive partitions.
- Delete or modify Keysight registry entries.
- Change the contents of any directories containing the name "Keysight".
- Stop the IIS server
- Tamper with any virtual directories (or their contents) that came configured with the instrument.
- Uninstall these libraries, interfaces, or programs:
  - The I/O Libraries
  - The .NET Framework or any Hotfixes or Service Packs for the .NET Framework
  - The “Microsoft Visual J# .NET Redistributable Package 1.1”
  - Programs that begin with "Keysight"
  - The Adobe Acrobat reader
- Modify:
  - The I/O Library “GPIB27”, “GPIB28” interfaces shown as configured Instrument I/O in the Connection Expert or I/O Config

Autoplay/Autorun

Since the introduction of Windows XP, the term Autoplay (sometimes also called Autorun) has come to be associated with the feature which assists users in selecting appropriate actions when new media and devices are detected. The Autoplay/Autorun feature is turned off in the instrument, by default, for heightened security, unless the Administrator account is running.

If you wish to re-enable Autoplay/Autorun, you may use the Auto Play function in the Control Panel. However, be aware that if you do this you may be more subject to virus attack from portable media such as USB flash drives.

Configuring LAN

Hostname

The Computer Name, or Hostname, is preconfigured from the factory. It must be a unique name such that it does not conflict with other equipment on your LAN. The preconfigured Computer Name is K-<model number>-xxxxx, where xxxxx is the last 5 digits of the instrument's serial number.

IP Address & Gateway

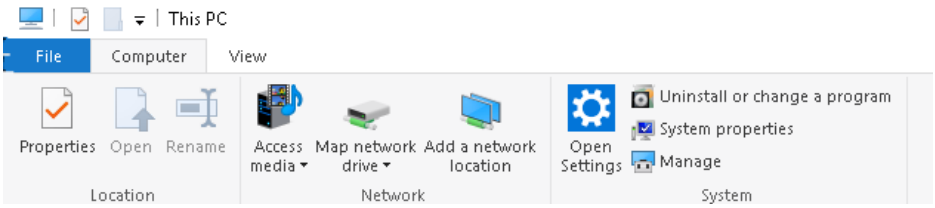
The instrument is preconfigured to obtain an IP Address via DHCP. You can change the IP Address and Gateway as you desire.

You must be logged in as an "Administrator" (default password:"Keysight4u!") to make changes.

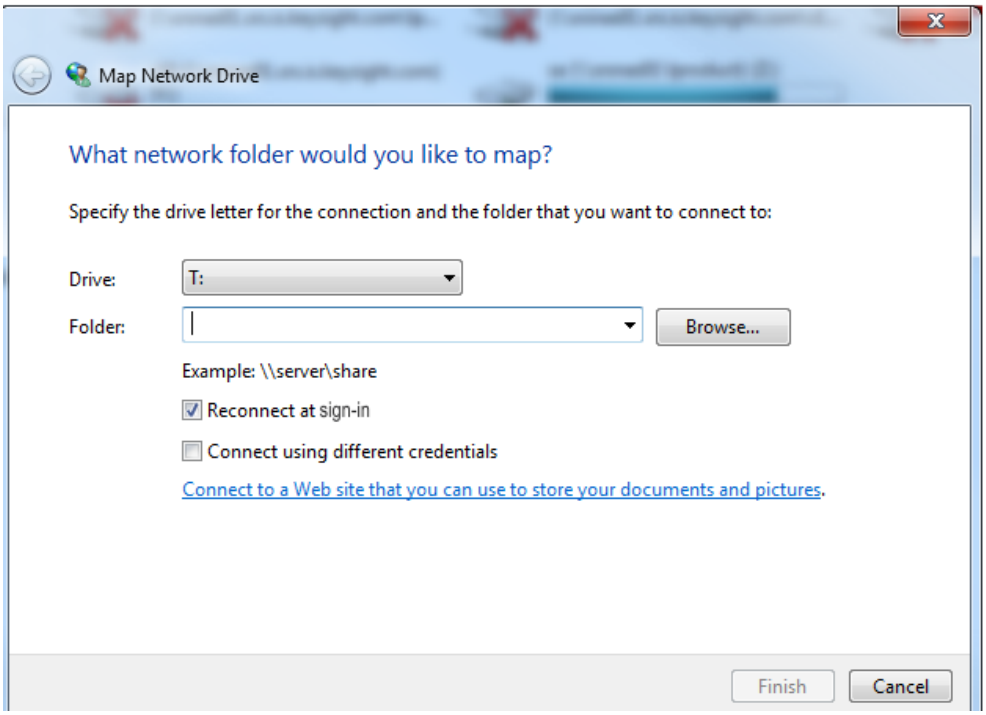
Connecting to a Network Shared Folder

The instrument contains standard Windows networking. The time required to authenticate is dependent on your LAN infrastructure. You may have improved performance by mapping a network drive to the shared folder that you need to access.

1. To map a network drive, Select the **Start** icon , **System Tools**, **Computer**.
2. Select the **Computer** tab, and select **Map Network Drive** from the dropdown menu.



3. Browse to the correct folder, and select **Finish**.



NOTE In Windows 10 there is no visual indication that authentication is in progress.

Windows Security

Microsoft recommends the following to ensure the instrument's Windows operating system is protected:

- Use an Internet firewall.
- Get the latest critical Windows updates.
- Use up-to-date anti-virus software.

Windows Firewall

The instrument is shipped with the Windows Firewall enabled. You can verify the status of Windows Firewall by going to the Control Panel and selecting Windows Firewall.

Windows Firewall Exceptions for programs and ports have been added to allow proper operation of the instrument over a network. Modifying these settings may cause the instrument to not operate properly.

Automatic Updates

Microsoft recommends that you always get the latest critical Windows updates to ensure that the instrument's Windows operating system is protected. If the instrument has Internet access, the instrument default is set to automatically check for critical Windows Updates and notify you.

You can change the configuration of the Microsoft Automatic Updates. You can choose not to have automatic updates. However, if you do this then you should manually update Windows periodically.

NOTE

Be aware that downloading and installing Windows Updates can be network and CPU usage intensive (impacting the instrument performance), and some Windows Updates automatically reboot the instrument. It is recommended that Windows Updates be performed when the instrument is not in normal use.

Virus Protection

There is no anti-virus software included with your instrument. It is recommended that users work with their own IT departments to determine what software should be installed.

NOTE Having anti-virus software installed may have a slight impact on the instrument performance.

Spyware Protection

There is no anti-Spyware software installed on the instrument. This should not be a problem if you do not use the instrument for a lot of Internet browsing. Having Spyware in the instrument could have an impact on the instrument performance.

System Maintenance

Backup

It is recommended that you have a regular backup strategy. Your IT department may already have a backup strategy in place that is suitable for the instrument and its data. Using the Instrument Recovery system in conjunction with a regular backup strategy should allow full recovery of the instrument data.

Windows has a Backup utility that you can use to archive files and folders in case of a disk drive failure. You can also use third party backup utilities. However, you must ensure that this third party software is compatible with the instrument's system software. See “User installation of software” on page 33 for more information.

When performing backups, we recommend that you backup the data to an external storage device connected to the network or one of the instrument's USB connectors. Also, you should perform backups at times when the instrument is not being used for normal operations, as it may impact the instrument's overall performance.

System Restore

Windows contains the capability to restore the system to a previous point in time. System Restore is enabled with default settings as provided by Microsoft. However, System Restore is not always 100% successful. Therefore, it is not recommended that you rely on System Restore to protect your instrument. System Restore has not been tested to verify successful restoring.

Disk Defragmenting

The instrument has a solid state drive. Disk defragmenting is not recommended.

USB Connections

Al USB ports are compatible with the USB 2.0/3.0 and 1.1 specification. The USB ports on the front panel are USB Series “A” ports. These ports can be used to connect USB mass storage devices and printers. The instrument USB Host support includes the standard Microsoft Windows USB drivers for human interface, mass storage, printing, scanning, and imaging devices. A complete up-to-date list of the Windows USB class driver support is available on the Microsoft website.

Figure 3-1 Location of USB Ports

The instrument USB device driver included in the instrument software supports the test and measurement industry standard USBTMC-USB488 device class.

Keysight Technologies does not support or warrant correct instrument operation if additional USB drivers from third parties are installed in the instrument. It is possible that additional drivers could break the normal USB operation. If USB operation is broken, recovery would require reinstalling the instrument application using the Instrument recovery process.

Disk Drive Partitioning and Use

The drive is partitioned into 3 sections: C:, D: and E:

- The **C: partition** contains the Windows 10 operating system and software installed by Keysight. This is an Open System which means you can install additional software, and these should be installed on the C: drive. However, only a limited set of software applications are tested for use with the Keysight measurement software. The installation and/or use of other software is not warranted and could interfere with the operation of the measurement software. If instrument repair is ever needed, the Keysight version of the C: drive is the only part of the instrument software that is restored by the Instrument Recovery process. You must reload any other software that you have added in the instrument.
- The **D: partition** is reserved for data storage. The User Accounts that are configured by Keysight have their My Documents folder mapped to the D: drive. This is for the convenience of backing-up the measurement data. You should always back-up the data on the D: drive to an external device. This allows you to restore the data if you ever need to replace the disk drive.
- The **E: partition** is reserved for Keysight's use. The primary use of the E: drive is for housing the Calibration and Alignment data. Do not change or overwrite the files on this drive. This could cause your instrument to not meet specifications, or even to stop functioning correctly. Do not use this drive for data storage. It is also recommended that you back up the contents of this drive by using the factory calibration data backup utility.

Disk Drive Recovery Process

The Instrument Recovery System can be used to repair errors on the instrument's C: drive partition or to restore the original factory configuration of the system software on the disk drive. The Instrument Recovery System is stored in a separate hidden disk drive partition.

Restoring the original factory system software does not restore any of the following items:

- Additional software that has been installed after the instrument was shipped from the factory. (Thus, following an Instrument Recovery any software installed after the instrument was shipped from the factory will need to be re-installed.)
- System configurations (for example user accounts, windows configurations) that have been made after the instrument was shipped from the factory. (Thus, following an Instrument Recovery configuration changes will have to be performed.)
- The Instrument Recovery overwrites the contents of the C: partition. It does not affect the D: or E: partitions.

It is recommended that the user use a regular back up strategy. Your IT department may already have a backup strategy in place that is suitable for the instrument and its data. Using the Instrument Recovery System in conjunction with a regular back up strategy should allow you to fully recover the instrument's software and data.

Table 3-1 Recovery Process

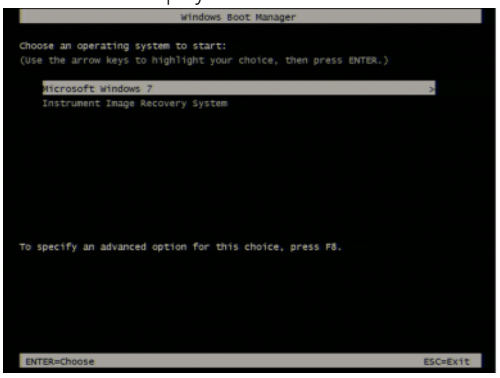
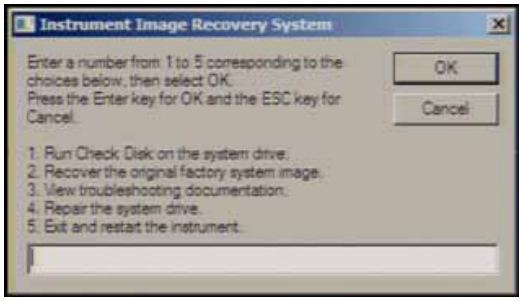
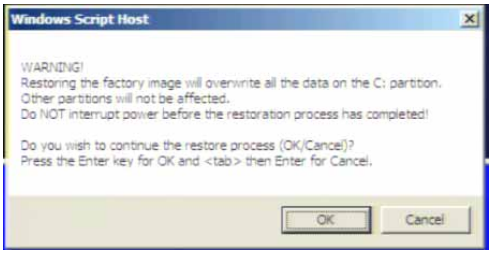
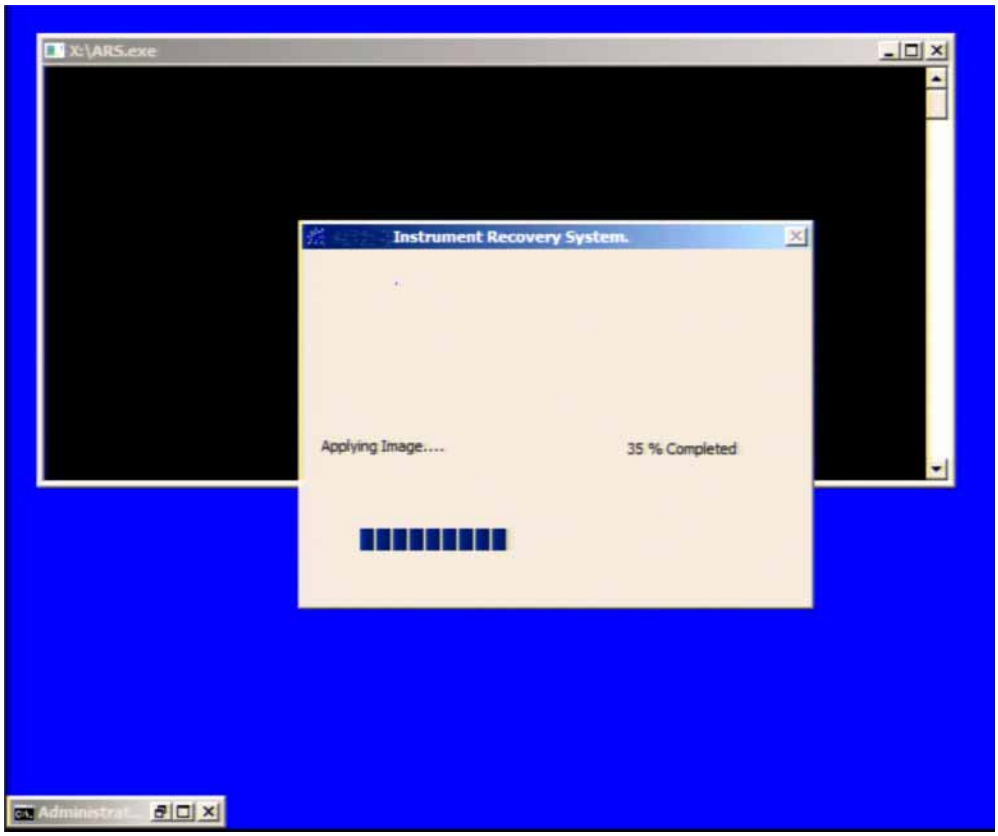
Step	Notes
1. Make sure the instrument is turned off.	
2. Turn on the instrument. –Press the down arrow key to move the highlight to **Instrument Recovery System**, then press **Enter**.	After the Keysight Technologies screen is displayed, This screen is displayed for five seconds. 

Table 3-1 Recovery Process

Step	Notes
3. When the Instrument Recovery System has booted, follow the on-screen instructions to recover the image of the C: drive. – Press **2**, then press **Enter** to select the recovery.	
4. A warning message appears. –Press **Enter** to start the recovery, which may take up to 25 minutes to complete.	
	
5. Press **Enter** to exit and reboot the instrument once this portion of the recovery has completed.	

NOTE Additional recovery steps may be required to fully recover the system to a more current working state. This could involve restoring your own backups of the instrument information or re-installing applications, data and performing system customizations.

Updating the software (required after a recovery)

To install the latest software version, the software and installation instructions are available at:
http://www.keysight.com/find/xseries_software

Table 3-2 Installing the Software

Step
1. Log out of the default user (instrument): – Select the Start icon  , select the **Change account settings icon**  ., **Sign out**.
2. At the log in prompt enter: – User Name: **Administrator** –Password: **Keysight4u!**
3. Follow the instructions on the software update web page.

WARNING When you see the message `Programming FPGAs...Do NOT turn off power to the instrument`, be sure to do as it says and **DO NOT** turn off the instrument power at this time for ANY reason. If this process is interrupted the instrument most likely will need to be sent back to an Keysight Service Center for servicing before it will be usable again.

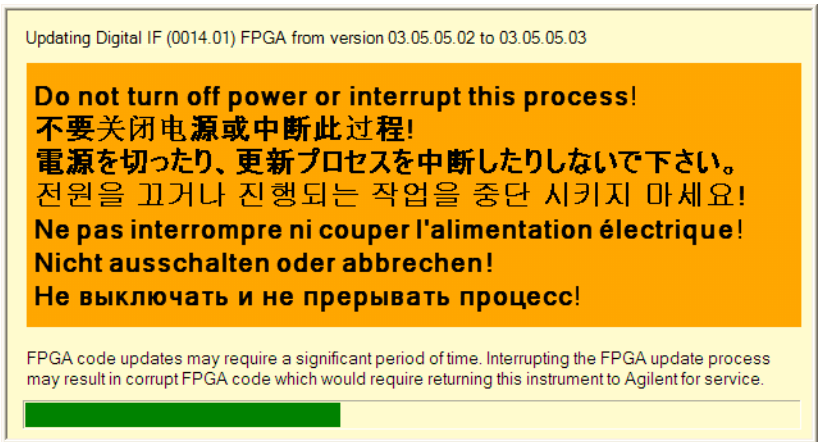


Table 3-2 Installing the Software

Step	
NOTE	The installation process can take up to 45 minutes. **Do not** turn the instrument power off or serious damage may occur. If any pop up windows appear, click **OK** or **Ignore** to proceed.
4. When the installation has finished, select **Yes, I want to restart my computer now**, **Finish**.	
5. After the instrument restarts, the newly installed version of the software will run.	

4 Using Windows Tools

NOTE

The capabilities described in this section are Microsoft Windows 10 features. The discussion provided here gives some guidelines for using the capabilities with the instrument. You need to refer to the Windows 10 help documentation for more information. Your version of Windows may not match these instructions exactly.

You need an external keyboard and mouse to fully use these features.

Navigating Windows Without a Mouse

Key Presses	Actions
F1	Displays the Application Help.
Esc	Exits/closes a Windows dialog box (does not exit an Application window)
Enter	Does the current default action. If a menu item or a button is currently highlighted, then the Enter key activates that menu item or button.
Alt	Moves focus/control to the pull down menus bar in the active Window
Right Arrow	In pull-down menu: opens the next menu to the right, or opens a submenu In a dialog box: selects an option button
Left Arrow	In pull-down menu: opens the next menu to the left, or opens a submenu In dialog box: selects an option button
Up Arrow	In pull-down menu: Moves to next selection up in the menu In dialog box: selects an option button
Down Arrow	In pull-down menu: Moves to next selection down in the menu In dialog box: selects an option button
Tab	In dialog box: moves to the next/previous field
Del	Deletes the currently selected item
Alt + Tab	Switches between the next/previous application
Alt + Enter	Shows the Properties of the currently selected item
Alt + Esc	Cycles through items in the order that they had been opened
Backspace	In My Computer or Windows Explorer: move up one level In Internet Explorer: works like the BACK arrow key
Ctrl + Left arrow	Moves to the left one word at a time
Ctrl + Right arrow	Moves to the right one word at a time
Ctrl + Tab	In dialog box: moves to the next/previous Tab location
Ctrl + Esc	Opens the Windows Start Menu
Ctrl + Alt + Delete	Opens a window that enables you to select the Windows Task Manager

Remote Desktop: Using the Signal Generator Remotely

Windows Remote Desktop is recommended for remote control of the instrument. It offers fully-interactive control that is almost identical to direct face-to-face control of the instrument.

NOTE

The Remote Desktop functionality is a Microsoft Windows 10 capability. The following discussion provides some guidelines for using this capability with the instrument. You need to refer to the Windows 10 help documentation for more information. As Windows evolves, these instructions may no longer be exact.

You need an external keyboard and mouse to fully use this functionality.

Overview of Remote Desktop operation

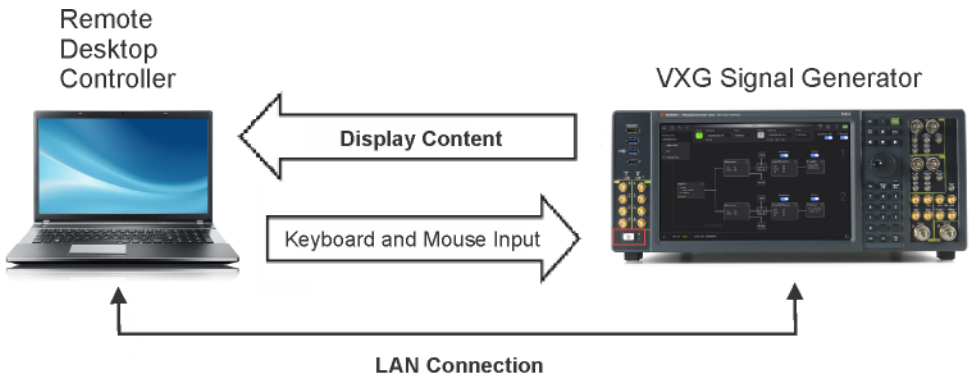
Using the Remote Desktop functionality of the instrument allows you to control and interact with the instrument from a remote computer as though you were sitting in front of the instrument.

When you have configured the instrument for remote connectivity, and configured a separate computer to act as a Remote Desktop Host, you can send commands to the instrument from the remote computer, and you can see the instrument display on the screen of the remote computer.

This section provides full details of how to set up the instrument for remote connectivity, and also how to set up a computer running any version of Microsoft Windows as a Remote Desktop Host.

Setting up Remote Desktop operation

Figure 4-1 Basic setup for remote desktop operation



NOTE

To perform this operation successfully, you must have Administrator level access to the instrument.

Table 4-1 Setting up a remote desktop connection

Step	Action
1. On the instrument, open the Windows Control Panel	From the instrument application, select **System** > **Control Panel,**
2. Select System functions	From the **Adjust your computers settings** menu, click **System**.
3. Access Remote setting	In the **Control Panel Home** window, select **Remote settings**
4. Select the Remote option	On the **Remote** tab, in the **Remote Desktop** section, select the appropriate checkbox.
5. To add users	Choose **Select Users**> **Add**.
6. Follow the on screen instructions.	

Setting up the remote computer

The procedure depends on whether the Remote Computer to be set up is running Windows 10, or another version of Microsoft Windows.

Remote computer running Windows 10

Windows 10 includes the Remote Desktop Connectivity Client software, so no additional setup is required.

Remote computer running another version of Windows

You can use any version of Windows to install and run the Client software for Remote Desktop Connectivity. However, you need to have available a Windows installation CD-ROM, because that contains the Client software.

NOTE

The following instructions relate to software provided by Microsoft Corporation. Keysight offers no warranty regarding the operation of such software. The procedure described here may be changed by Microsoft at some future time.

Table 4-2 Installing the Client software

Step	Notes
1. When the Welcome Screen appears, select **Perform additional tasks**	
2. From the **What do you want to do?** screen, select **Set up Remote Desktop Connection**.	The Remote Desktop Connection InstallShield Wizard appears.

Table 4-2 Installing the Client software

Step	Notes
3. Select **Next**.	Follow the on screen instructions provided by the Wizard.
4. To access the installed software, select **Start** > **All Programs** > **Accessories** > **Communications** > **Remote Desktop Connection**.	

How to locate the computer name of the instrument

To connect a remote computer to the instrument, you need to know its Computer Name. The Computer Name can be displayed as follows:

Table 4-3 Locating the name from the Keysight application

Step	Notes
On the instrument front panel, select **System** > **Show** > **System**.	A page listing various parameters appears.The instrument's computer name is shown in the list next to the title Computer Name.

Table 4-4 Locating the name from the Windows desktop (using a mouse)

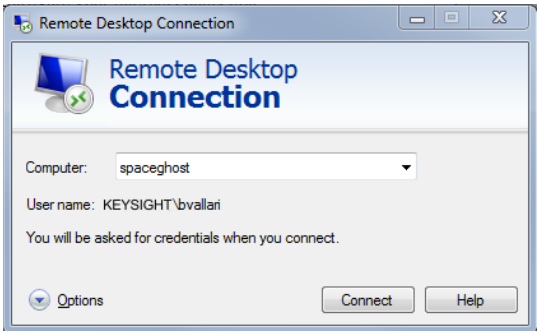
Step	Notes
Select **Start** > **Control Panel** > **System**	The Computer name is listed in the Computer name, domain, and workgroup settings section.

Running a Remote Desktop session

Initializing a Remote Desktop session

NOTE To initialize a Remote Desktop Session, you need to know the Computer Name of the instrument.

Table 4-5 Starting a session

Step	Notes
1. Select the Windows **Start** menu and type `Remote Desktop Connection` to locate the application.	A Remote Desktop Connection dialog appears: 
2. Enter the computer name of the instrument.	
3. Select **Connect**.	A login dialog box appears.
4. Enter the login account name and password.	The default account name is **Instrument** and the default password is **measure4u**, but these parameters may be changed by instrument users.

NOTE

Only the current User or an Administrator can remotely log into the instrument. To see who the current user of the instrument is, press **Ctrl**+**Esc** on the instrument until you can view the current user name on the Start menu. If no one is currently logged into the instrument, any valid instrument user can remotely log in.

The instrument display appears on the screen of the remote computer. Because the instrument front-panel keys are not available when using the instrument remotely, three alternative methods are available to perform the functions of the front-panel keys.

Windows Remote Desktop Options

Table 4-6 Setting Remote Desktop options

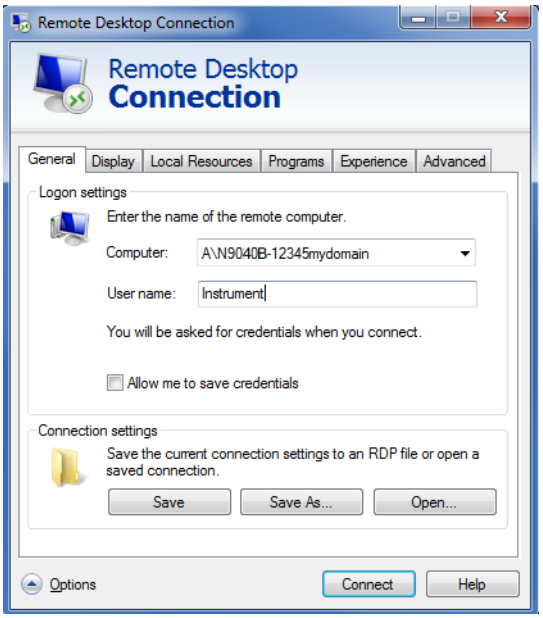
Step	Notes
1. On the Remote Desktop Connection menu, select **Options**.	 The Options dialog has several tabs. Generally, the default settings are correct.
2. Under the **General** tab, ensure that the Computer name, User name and Domain name are set correctly.	You may choose to enter the password and save it for future sessions, by selecting the **Save my password** box.

Table 4-6 Setting Remote Desktop options

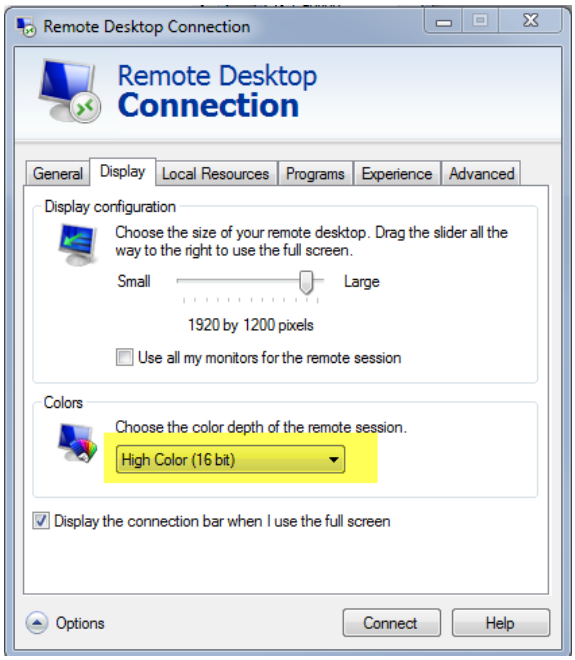
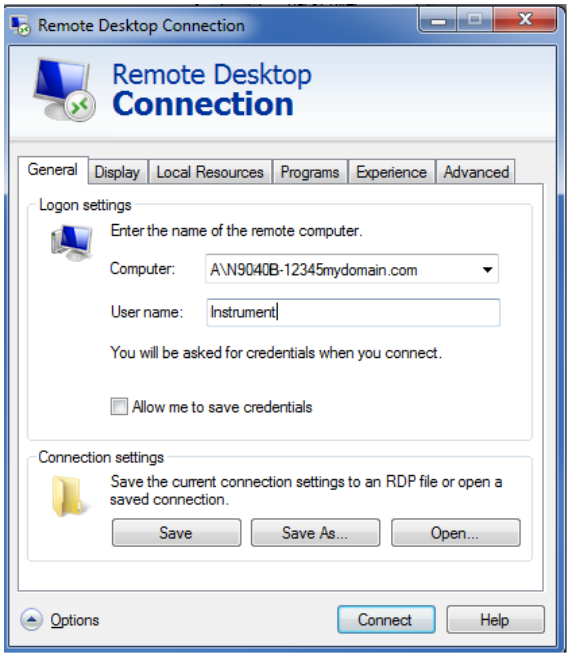
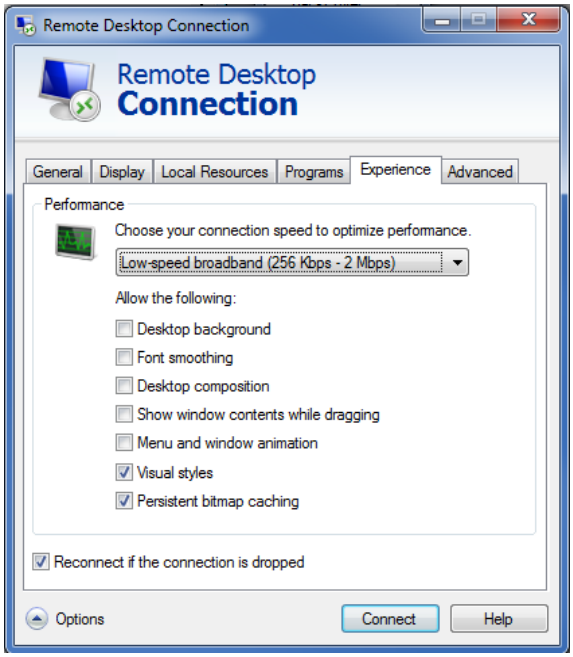
Step	Notes
3. Select the **Display** tab. – Under **Remote desktop size**, you may select the size of the window in which the instrument display appears. Do **not** select any size smaller than the instrument's front panel display. Selecting a remote desktop size smaller than the instrument's front panel display results in some of the items on the instrument display not being fully visible. In such circumstances, scroll bars do not appear, so portions of the display are not accessible. – Under **Colors**, set this to 16 bits. If you operate Remote Desktop with greater color depth (e.g., 32-bit) your windows may have a different appearance than they do on the instrument display because transparency becomes enabled.	

Table 4-6 Setting Remote Desktop options

Step	Notes
4. Select the **Local Resources** tab. –Selecting the **Disk Drives** checkbox enables you to transfer data between the remote desktop and the local PC. – To transfer data, select **Start** on the task bar of the remote computer, then select **My Computer**. Explorer opens on the remote computer and displays the drives of both the remote computer and the local computer. You can now copy and paste between the two disk drives.	
5. Select the **Experience** tab.	To Optimize the performance of the Remote Desktop session, choose the appropriate connection format from the drop-down list. 

Ending a Remote Desktop session

There are two ways to disconnect the remote computer from the instrument: ending the session:

Table 4-7 Ending a session

Step	Notes
1. Select the **X**, then **OK**.	For full-screen, the X appears at the top center of the window. For non full-screen, the X appears in a red box at the right of the window's title bar.
or	
2. When the remote desktop is full screen, move the cursor to the bottom left of the window: —Select **Start** > **Disconnect**. —Select **Disconnect**.	You are asked to confirm that you want to disconnect.

Windows Shortcuts and Miscellaneous Tasks

This section provides a list of windows shortcuts (key combinations) that are useful when you operate the instrument without an attached mouse and keyboard. See also “Navigating Windows Without a Mouse”.

Although these shortcuts are available in any Windows 10 system, they are not commonly used when a mouse and keyboard are attached.

Windows shortcuts (key combinations)

You can use the following combinations of front panel keys to perform basic windows tasks when using the instrument without an attached mouse and keyboard.

Table 4-8 Windows shortcut key combinations

To do the following:	Press:
Display the Windows Start Menu	**Ctrl**+**Esc**
Cycle through all open applications	**Alt**+**Tab**
Select the first menu of a menu bar	**Alt**
Move through menu headings	**Left Arrow**, **Right Arrow**
Open (drop down) a menu	**Down Arrow**
Move through items in an expanded menu	**Up Arrow**, **Down Arrow**
Close the current menu selection	**Esc**
Cancel the current menu bar selection	**Alt**
Open an application's control menu (usually the left-most menu on the menu bar, starting with `File`)	**Alt**+**Down Arrow**
In a dialog: move between tabs	**Ctrl**+**Tab**
In a dialog: move forward through dialog box items	**Tab**
In a dialog: move backward through dialog box items	**Shift**+**Tab**
In a dialog: open a list box	**Alt**+**Down Arrow**
In a dialog list box or check box: select or clear one item at a time	**Shift**+**Up Arrow**, **Shift**+**Down Arrow**
In `My Computer`, expand a selected folder	**Enter**
In `My Computer`, open a folder one level up from the current folder	**Bk Sp**

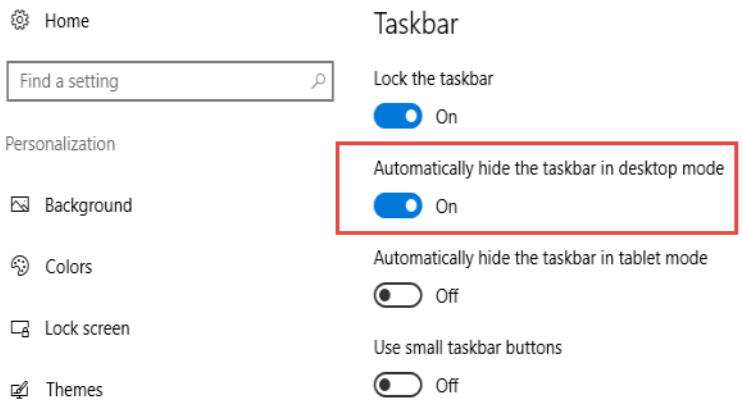
Windows taskbar auto-hide feature

The Windows taskbar should always be in the auto-hide mode when using the instrument application. If the taskbar is not set to auto-hide, the lower part of the instrument display is obscured by the taskbar.

If at any time the Windows taskbar is inadvertently set to the non-auto-hide mode, you can restore the auto-hide behavior by doing the following:

Table 4-9 Restoring taskbar auto-hide mode

Step	Notes
1. Select **Start** > **Control Panel**	If not using a mouse, press **Ctrl**+**Esc.**
2. Select **Taskbar and Navigation**	If you are not using a mouse, use the shortcut key combinations specified in the Section "Windows shortcuts (key combinations)" on page 60 to make these selections.
3. Select **Auto-hide the taskbar in desktop mode**	If you are not using a mouse, press **Tab** repeatedly until the auto-hide option is selected, then press **Select** to toggle the checkbox state.



5 Safety and Maintenance Information

The following topics can be found in this section:

Safety Information

IMPORTANT The safety of any system incorporating the equipment is the responsibility of the assembler of the system.

IMPORTANT Proper Ergonomics should be considered when using accessories such as a keyboard or a mouse.

IMPORTANT When installing the instrument(s) into a cabinet, consideration shall be given to the convection flow into and out of the cabinet. Consideration shall also be given to the individual instruments to avoid having the heated discharge of one instrument, now becoming the cooling intake air for another instrument. Another area of concern is verification that the maximum ambient operating temperature of the instrument(s) is not exceeded by cabinet installation. Keysight recommends forced air convection whenever an instrument(s) are installed in a cabinet and further recommends that the maximum operating temperature of the cabinet be reduced 10°C from the lowest, of the maximum operating temperature of a single instrument. If there are any concerns or special requirements a Keysight Field Engineer should be consulted to assure instrument(s) temperature compliance and performance.

Warnings, Cautions, and Notes

The documentation for this product uses the following safety notations. Familiarize yourself with each notation and its meaning before operating the signal generator.

WARNING

Warning denotes a hazard. It calls attention to a condition or situation that could result in personal injury or loss of life. Do not proceed beyond a warning until you fully understand the indicated conditions or situations.

CAUTION

Caution calls attention to a condition or situation that could result in damage to or destruction of the signal generator, or in the loss of a user's settings or data. Do not proceed beyond a caution until you fully understand the indicated conditions.

NOTE

Note calls the user's attention to an important point or special information in the text.

General Safety Considerations

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.

WARNING The M9383B VXG is heavy and requires two people to lift and carry it. Do not attempt to lift or carry it on your own.

NOTE 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 conditions.

Before Applying Power

WARNING Use a Keysight supplied power cord that has the same or better electrical rating.

WARNING Capable of rendering an electrical shock or burn.

WARNING Install the instrument so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the instrument disconnecting device. It disconnects the mains circuits from the mains supply before other parts of the instrument. The front panel switch is only a standby switch and is not a LINE switch. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

WARNING This is a Safety Protection 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.

WARNING Cleaning connectors with alcohol shall only be done with the instruments power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate and the fumes to dissipate prior to energizing the instrument.

CAUTION The instrument has an auto–ranging line voltage input – be sure the supply voltage is within the specified range and the voltage fluctuations do not exceed 10 percent of the nominal supply voltage.

CAUTION The measuring terminals on this instrument are designed to be used with external signals described in Measurement Category I, but NOT with external signals described in Categories II, III, and IV. The input of this instrument cannot be connected to the mains.

CAUTION The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.

NOTE The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply.

Servicing

WARNING These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing unless you are qualified to do so.

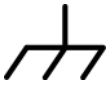
WARNING No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

Operating Conditions

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 environment.

Instrument Markings

The signal generator has the following markings. Familiarize yourself with each marking and its meaning before operating the signal generator.

Marking	Description
	This symbol marks the standby position of the power line switch.
	This symbol indicates chassis ground.
	This symbol indicates that the input power required is AC.
	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.
	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 CSA mark is a registered trademark of the CSA International.
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
ICES / NMB-001	This is a marking to indicate product compliance with the Industry Canada Interference-Causing Equipment Standard (ICES-001)
ISM GRP. 1 CLASS A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 5)
	Korean Certification (KC) mark; includes the markings identifier code which follows the format: R-R-Kst-ZZZZZZZ"
	This 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.
	China Restricted Substance Product Label. The EPUP (environmental protection use period) number in the center indicates the time period during which no hazardous or toxic substances or elements are expected to leak or deteriorate during normal use and generally reflects the expected useful life of the product.

Marking	Description
	Universal recycling symbol. This symbol indicates compliance with the China standard GB 18455-2001 as required by the China RoHS regulations for paper/fiberboard packaging.
ccr.keysight@keysight.com	The Keysight email address is required by EU directives applicable to our product.

Instrument Maintenance

Cleaning the instrument

To remove dirt or dust from the external case of the M9383B VXG, clean the case using a dry or slightly-dampened cloth only.

Cleaning Connectors

Cleaning connectors with alcohol shall only be done with the instrument power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

WARNING

Keep isopropyl alcohol away from heat, sparks, and flame. Store in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemical, 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 area with water.

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

Returning an Instrument for Service

Calling Keysight Technologies

Keysight Technologies has offices around the world to provide you with complete support for your instrument. To obtain servicing information or to order replacement parts, contact the nearest Keysight Technologies office listed below. In any correspondence or telephone conversations, refer to your instrument by its product number, full serial number, and software revision.

Locations for Keysight Technologies

Online assistance: http://www.keysight.com/find/assist

Americas

Canada 1 877 894 4414	Latin America (305) 269 7500	United States 1 800 829 4444

Asia Pacific

Australia 1 800 629 485	China 800 810 0189	Hong Kong 800 938 693
India 1 800 112 929	Japan 0 120 (421) 345	Korea 080 769 0800
Malaysia 1 800 888 848	Singapore 1 800 375 8100	Taiwan 0800 047 866
Thailand 1 800226 008		

Europe & Middle East

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

Other European Countries: http://www.keysight.com/find/contactus

Service Options

Keysight Technologies offers several optional maintenance plans to service your instrument after the warranty has expired. Call your Keysight Technologies office for full details.

If you want to service the instrument yourself after the warranty expires, you can download the service documentation that provides all necessary troubleshooting and maintenance information from the Keysight web page.

Packaging the Instrument

Use original packaging or comparable. It is best to pack the unit in the original factory packaging materials if they are available.

WARNING Instrument damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the equipment or prevent it from shifting in the carton. They cause equipment damage by generating static electricity and by lodging in the analyzer louvers, blocking airflow.

NOTE M9383B Rear Panel and Front Panel jumper cables (PN: W1312-20511 and W1312-20516) come with protective caps to protect them from impact damage during shipping. When returning an instrument for service, reinsert the protective caps (if available) or remove the cables and place them in a separate protective bag.

You can repackage the instrument with commercially available materials, as follows:

Table 5-1

Step	Notes
1. Wrap the analyzer in anti-static plastic to reduce the possibility of damage caused by electrostatic discharge	
2. Use a strong shipping container.	The carton must be both large enough and strong enough to accommodate the analyzer. A double-walled, corrugated cardboard carton with 159 kg (350 lb) bursting strength is adequate. Allow at least 3 to 4 inches on all sides of the analyzer for packing material.

Table 5-1

Step	Notes
3. Surround the equipment with three to four inches of packing material and prevent the equipment from moving in the carton.	If packing foam is not available, the best alternative is plastic bubble-pack. This material looks like a plastic sheet filled with 1-1/4 inch air bubbles. Use the pink-colored bubble which reduces static electricity. Wrapping the equipment several times in this material should both protect the equipment and prevent it from moving in the carton.
4. Seal the shipping container securely with strong nylon adhesive tape.	
5. Mark the shipping container "**FRAGILE, HANDLE WITH CARE**" to assure careful handling.	
6. Retain copies of all shipping papers.	

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