
NFA X-Series Noise Figure Analyzers and USB Preamplifiers

This manual provides documentation for the following:

NFA X-Series Noise Figure Analyzers
using the U7227A, C, or F USB Preamplifiers for making
noise figure measurements

Notices

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Where to Find the Latest Information

Documentation is updated periodically. For the latest information about these products, including instrument software upgrades, application information, and product information, browse to one of the following URLs, according to the name of your product:

<http://www.keysight.com/find/nfa>

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:

www.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/sa_software

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1 Quick Start

This section explains how to initialize the Analyzer and view a signal.

The following topics can be found in this section:

[“Initial Inspection” on page 10](#)

[“Instrument Location and Rack Mounting Requirements” on page 11](#)

[“Turning on the Analyzer the First Time” on page 12](#)

[“Anti-Virus Software and Firewalls” on page 16](#)

[“Instrument Information” on page 17](#)

[“Using the U7227-Series USB Preamplifiers in Noise Figure Measurements” on page 21](#)

Initial Inspection

Inspect the shipping container and the cushioning material for signs of stress. Retain the shipping materials for future use, as you may wish to ship the analyzer to another location or to Keysight Technologies for service.

Verify the Contents

Verify the shipping container contents using the box contents list.

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 an analyzer to Keysight Technologies, use the original (or comparable) shipping materials. See **“Returning an Analyzer for Service” on page 93**.

Instrument Location and Rack Mounting Requirements

Locating the analyzer

Make sure that the fan inlet and exhaust vent areas on the sides of the analyzer are not obstructed. The minimal required clearance is 2 inches. Airflow restrictions cause additional airflow noise and cause the fans to speed up so they can draw in enough air for the required cooling. This results in excessive audible noise.

Cooling and rack mounting

Do not rack mount the analyzer side-by-side with any other instrument with side-by-side ventilation. Make sure the exhaust air from the first instrument is directed away from the inlet of the second unit. If the pre-heated air from the first instrument is directed into the second instrument, it can cause excessive operating temperatures in the second unit and can cause instrument failures. The analyzer draws air in from the left side and exhausts air from the right side.

CAUTION

When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4° C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

Turning on the Analyzer the First Time

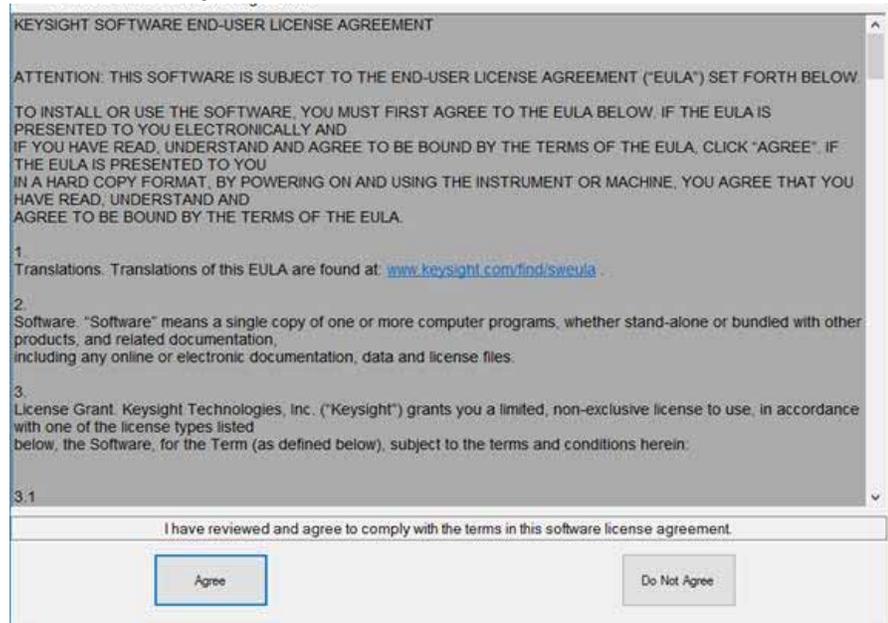
Initial power-on of the analyzer can be accomplished using the following methods:

NOTE

During the initial power-on process, the instrument turns off and restarts several times. This only happens during the initial installation process.

Initializing the analyzer

Steps	Actions	Notes
1. Power on the analyzer	<p>a. Position the analyzer so you have easy access to the power cord and plug it in.</p> <p>b. Press the power switch (located next to the lower right corner of the display) to turn the analyzer on.</p>	<p>See “Instrument Location and Rack Mounting Requirements” and “Power requirements” on page 17 for more details.</p> <p>The analyzer can require more than 5 minutes to power-on. The Keysight Technologies screen appears followed by a screen that allows you to select Windows7 or the Recovery option.</p>
2. Viewing the End-User License Agreement	After a brief startup, the following window appears giving you information about the End-User License Agreement.	



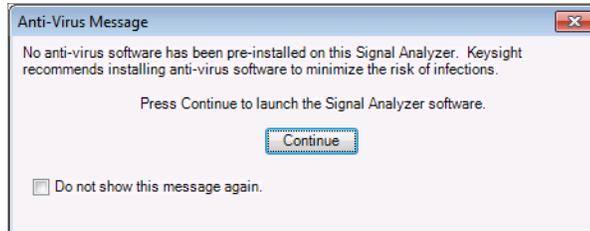
At this time, it is safe to turn off the instrument before initializing the software.

Quick Start
Turning on the Analyzer the First Time

Steps	Actions	Notes
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3. Reboot and logon – Click **OK**

When the instrument restarts, the following message window appears:



This window appears and covers the Launch window.

NOTE If you do not check the “Do not show this message again” check box, this message will be displayed each time the analyzer is turned on. No application will start while this message is displayed. Before continuing, make sure that you carefully read the Anti-Virus message and determine what action is appropriate.

4. Disable the Anti-Virus message – Select the check box and click **Continue**.

Messages similar to the following continue to appear:



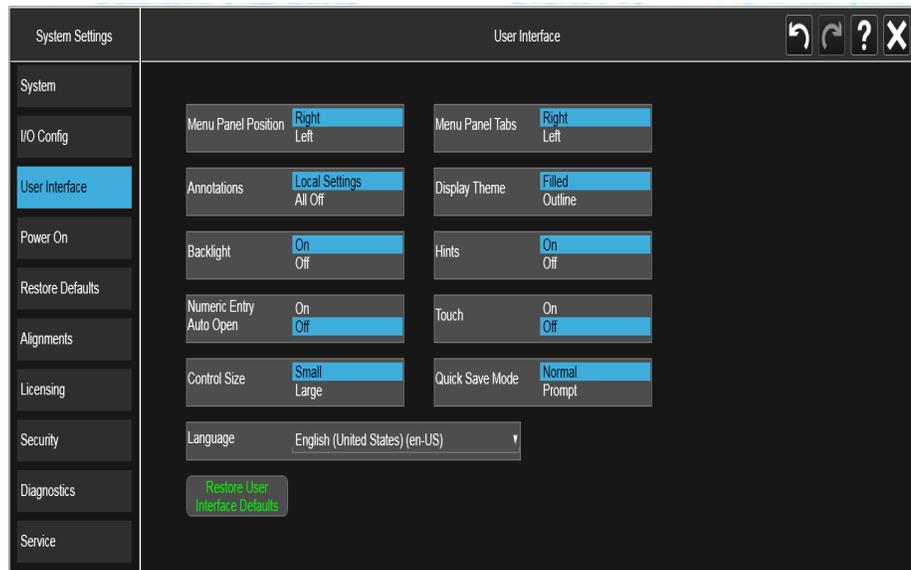
Several required processes continue.
The application initializes

5. When the installation is complete, you should see a display like this:



Quick Start
Turning on the Analyzer the First Time

Steps	Actions	Notes
6. Set user interface language	<ol style="list-style-type: none"> On the instrument, press System, User Interface tab. Choose the desired language from the Language drop-down menu. 	



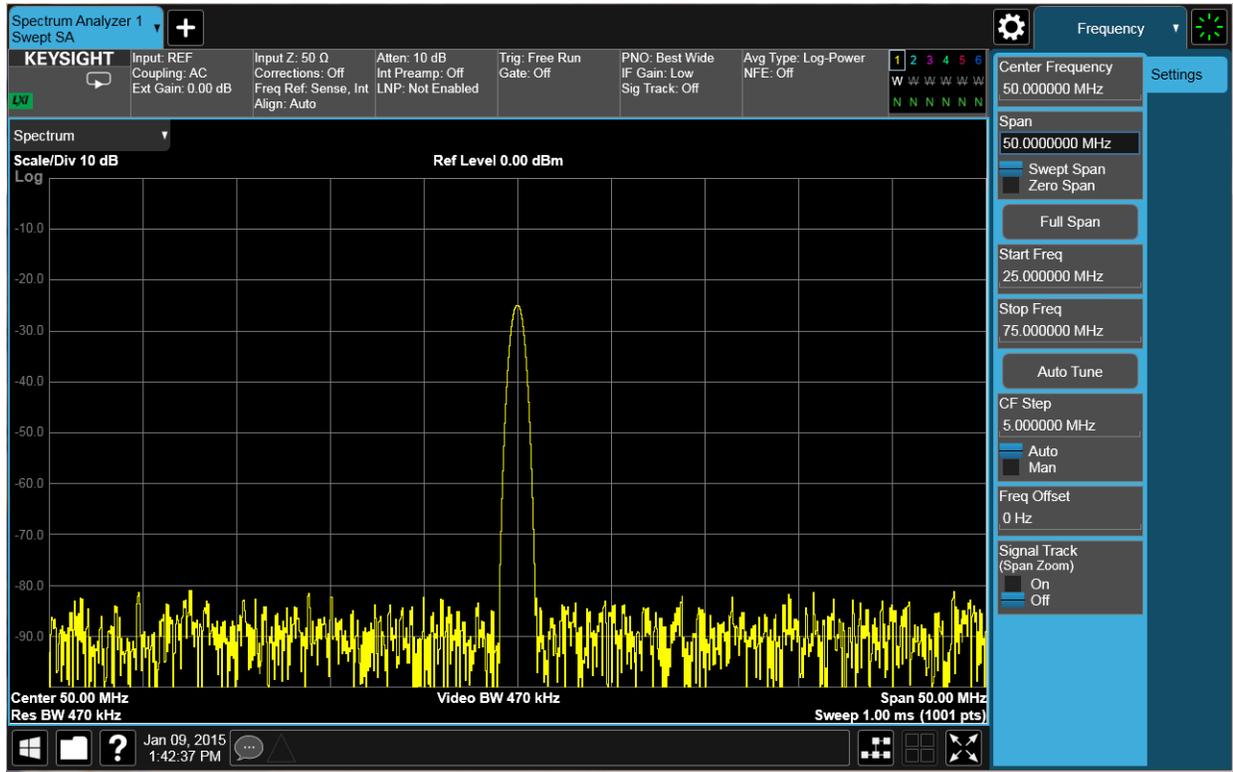
7. Verify the installation	<ol style="list-style-type: none"> On the instrument, press System, Show System. Verify that the purchased application(s) appear in the list or have an entitlement certificate. 	<p>If you require further assistance, contact the Keysight support team. Online assistance: http://www.keysight.com/find/assist</p>
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8. View a signal	<ol style="list-style-type: none"> Press the Noise Figure 1 tab, select Spectrum Analyzer, OK. Press Input/Output, RF Calibrator, 50 MHz. Press FREQ, Center Freq, 50, MHz. Press SPAN, 50, MHz. 	<p>This selects the Spectrum Analyzer mode where you can view a reference signal.</p> <p>This routes the internal 50 MHz signal to the analyzer input.</p>
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Quick Start
Turning on the Analyzer the First Time

Steps	Actions	Notes
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The 50 MHz reference signal appears on the display.



- Return to the Noise Figure measurement — Press the Spectrum Analyzer 1 tab, select Noise Figure, OK.

Anti-Virus Software and Firewalls

No anti-virus software is shipped with the analyzer. It is recommended that you install anti-virus software if your analyzer is connected to the LAN. Check with your IT department to see what they recommend.

The analyzer is shipped with the Windows 10 firewall enabled.

Do not modify the default network settings as this may cause problems with the operating system of the analyzer.

Instrument Information

Power requirements

The only physical installation of your Keysight signal analyzer is a connection to a power source. Line voltage does **not** need to be selected.

This analyzer does **not** contain customer serviceable fuses.

NOTE

The instruments can operate with mains supply voltage fluctuations up to $\pm 10\%$ of the nominal voltage.

WARNING

This is a Safety Class 1 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. (IEC 348 clauses 17.3.3c & 17.3.4)

Failure to ground the analyzer properly can result in personal injury. Before turning on the analyzer, you must connect its protective earth terminals to the protective conductor of the main power cable. Insert the main power cable plug into a socket outlet that has a protective earth contact only. DO NOT defeat the earth-grounding protection by using an extension cable, power cable, or autotransformer without a protective ground conductor.

CAUTION

This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 61010 Second Edition and IEC 664 respectively. This instrument has autoranging line voltage input. Be sure the supply voltage is within the specified range.

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.

AC power cord

The analyzer is equipped with a three-wire power cord, in accordance with international safety standards. This cable grounds the analyzer cabinet when connected to an appropriate power line outlet. The cable appropriate to the original shipping location is included with the analyzer.

CAUTION

Always use the three-prong AC power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord can cause product damage.

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. Install the instrument so that the detachable power cord is readily identifiable and 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.

Protecting Against Overpowering

The input circuitry of the analyzer can be damaged by applying signals that exceed the maximum safe input level of +30 dBm average total power or +/- 0.2 Vdc (when DC coupled) or +/- 70 Vdc (when AC coupled). Refer to the analyzer's specification guide for more details regarding the Maximum Safe Input Level. Repairing damage to the input circuitry can be expensive.

If the analyzer will be used to measure signals which might be near the maximum safe input level, use external attenuators and/or limiters to help protect the analyzer input. The External Gain, amplitude Corrections, and/or Ref Lvl Offset features may be used to compensate for the gains and losses of external devices. External Gain and Corrections are under the Input/Output menu and Ref Lvl Offset is under the AMPTD Y-Scale menu.

Instrument Maintenance

Cleaning the instrument

WARNING

To prevent electrical shock, disconnect the signal analyzer 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.

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.

Battery Information

The analyzer uses a lithium battery located on the CPU board. This is not an operator replaceable part. See **“Returning an Analyzer for Service” on page 93**. Replaceable parts must be approved or supplied by Keysight Technologies.

You can order the service documentation for the instrument through your Keysight Sales and Service office.

WARNING

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended. Discard used batteries according to the manufacturer’s instructions.

Do not throw batteries away but collect as small chemical waste.



**DO NOT THROW BATTERIES AWAY BUT
COLLECT AS SMALL CHEMICAL WASTE.**

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 analyzer 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 M Ω resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the analyzer.
- 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.

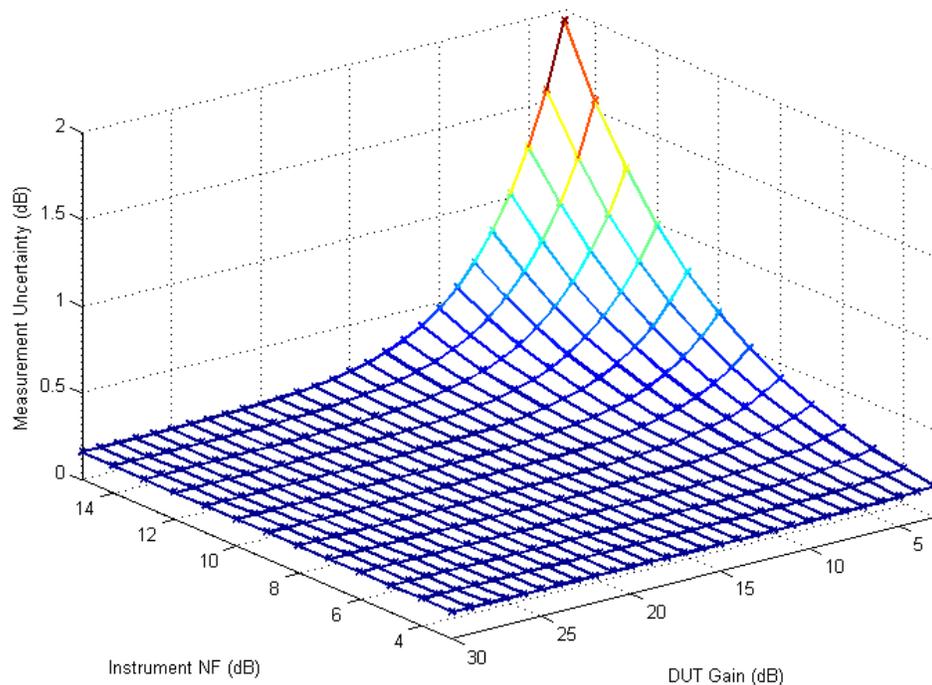
Additional information about ESD

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).

Using the U7227-Series USB Preamplifiers in Noise Figure Measurements

The U7227-Series USB Preamplifiers turn the overall X-Series noise figure analyzers into better noise figure analyzers by reducing instrument noise figure. Reducing instrument noise figure is necessary when the device under test (DUT) is lossy or has low gain. This is because the instrument noise figure contributes more to the final measurement uncertainty when the gain of the DUT is low. **Figure 1-1** shows how the measurement uncertainty of a typical noise figure measurement depends on the DUT gain and instrument noise figure. The data is derived using the Uncertainty Calculator in the N9069C noise figure measurement application. It can be seen that the measurement uncertainty increases when the DUT gain is low and instrument noise figure is high. In optimal noise figure measurements, these regions should be avoided. Therefore adding preamplifier correction data is not necessary.

Figure 1-1 3-D Plot of Measurement Uncertainty versus DUT Gain and Instrument Noise Figure (DUT Noise Figure: 3 dB)



This section first introduces how to connect the U7227-Series USB Preamplifier to the signal analyzer and then provides a rough guide about using the USB preamplifier and the internal preamplifier inside the signal analyzer.

“Initial Connection to the Signal Analyzer” on page 22

“Guide for Using U7227-Series USB Preamplifier and the Internal Preamplifier inside X-Series Signal Analyzer” on page 25

Initial Connection to the Signal Analyzer

The U7227-Series USB Preamplifier is powered via a USB connection from the signal analyzer. To connect it to the analyzer, follow the steps below.

CAUTION

Before connecting a signal to the input port of the U7227-Series USB Preamplifier, make sure the USB preamplifier can safely accept the signal level provided. The signal level limits are marked next to the Input connectors of the USB preamplifier.

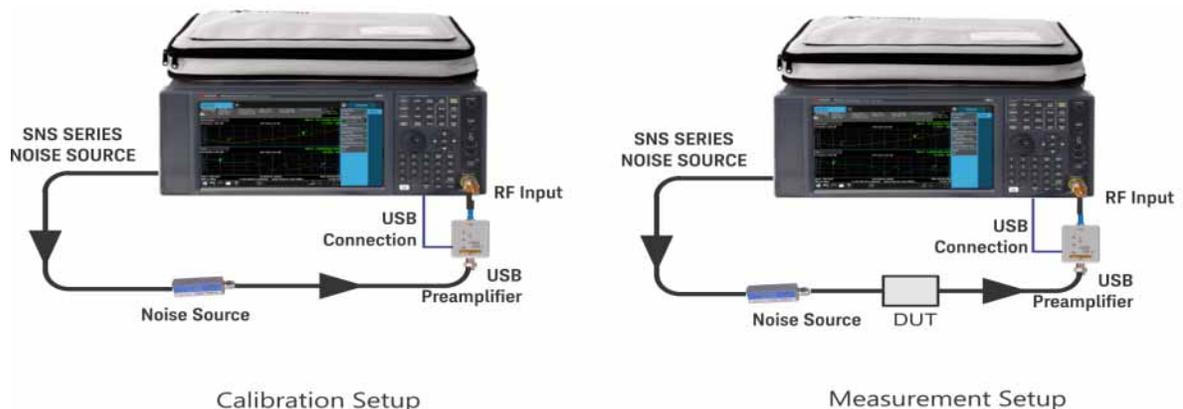
1. Connect the Output port of the USB preamplifier to the RF Input port of the signal analyzer.
2. Connect the USB port (Type-B) of the USB preamplifier to the USB port (Type-A) of the signal analyzer either in the front panel or in the rear panel using a USB cable. You can “hot plug” the USB preamplifier into the analyzer’s USB port at any time.

NOTE

The USB connections of the U7227-Series USB Preamplifier and the keyboard to the signal analyzer must be separated from each other; for example, the USB preamplifier connects through the front panel while the keyboard connects through the back panel.

Figure 1-2 shows the U7227-Series USB Preamplifier connection in the two stages of the noise figure measurement. While the USB preamplifier is plugged into one of the analyzer’s USB ports, the analyzer will consider it to be in the RF input signal path and will apply the gain settings and other calibration data of the USB preamplifier to the measurements.

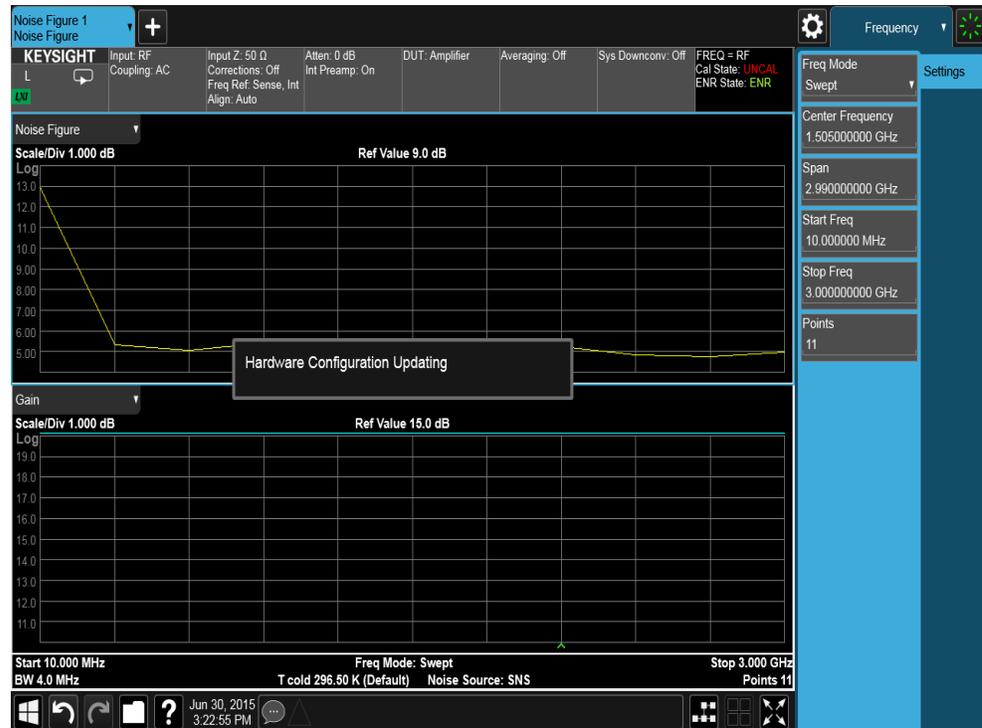
Figure 1-2 U7227-Series USB Preamplifier and Analyzer Connection in the Two Stages of Noise Figure Measurement



In the noise figure measurement application, the signal analyzer will respond in the following manner when the USB cable of the U7227-Series USB Preamplifier is plugged into one of the analyzer's ports:

1. The sweep will pause momentarily while the “Hardware Configuration Updating” message appears on the signal analyzer display. See [Figure 1-3](#).

Figure 1-3 “Hardware Configuration Updating” Message



2. The USB preamplifier's calibration data, such as gain, noise figure, and S-parameters, will be automatically downloaded into the analyzer.

NOTE

The USB preamplifier's RF output cable, connector loss, and frequency response are accounted for in the data that is automatically downloaded into the analyzer's memory. The calibration data is not user accessible.

3. The “Ready” LED is lit on the USB preamplifier.
4. The USB preamplifier's model and serial number will be displayed. See [Figure 1-4](#).

Figure 1-4 Signal Analyzer Display after USB Preamplifier is Ready For Use



5. The USB preamplifier is ready for use.

Guide for Using U7227-Series USB Preamplifier and the Internal Preamplifier inside X-Series Signal Analyzer

This section provides a rough guide for using the U7227-Series USB Preamplifier, the internal preamplifier, and the internal attenuator together to make accurate noise figure measurements.

Amplitude Concerns in the Noise Figure Test System

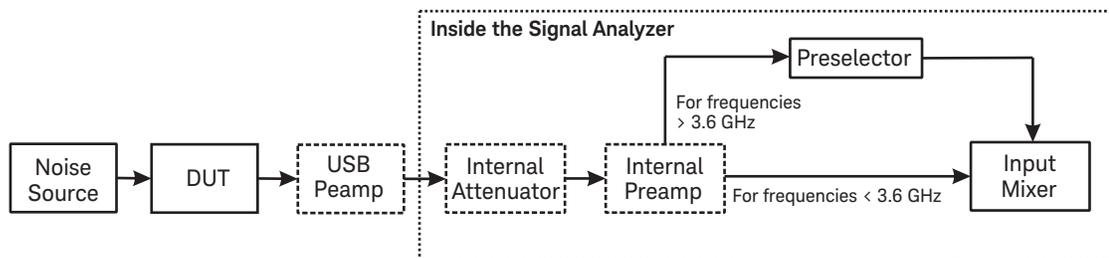
Before talking about the guide, let us look at some signal amplitude concerns in the test system. **Figure 1-5** shows all the possible blocks in the signal path of the noise signal in the noise figure measurement. The blocks with dotted lines indicate that you can choose whether to use them or not. The USB preamplifier, the internal preamplifier and input mixer inside the signal analyzer are non-linear components and have a limit on the largest signal that can be processed. The power limits of the noise signal are for the following places:

- before the USB preamplifier
- before the internal preamplifier
- before the input mixer

To make an accurate noise figure measurement, the noise power should be below the maximum allowable power at all these three places. You can refer to the technical overview of the U7227-Series USB Preamplifier and the specification guide of the X-Series signal analyzer to check the maximum allowable powers. For power levels before the internal preamplifier and before the input mixer, the internal attenuator inside the signal analyzer can be applied to reduce the power level. But at the same time, the instrument noise figure will increase with using the internal attenuator.

The rough guide for the noise figure test system configuration in the following section is based on the noise power calculation before the non-linear components.

Figure 1-5 Blocks in the Signal Path of the Noise Signal in the Noise Figure Measurement



Rough Guide for the Noise Figure Test System Configuration

To configure the test system for accurate noise figure measurements, the first priority is to make the instrument noise figure (USB preamplifier + signal analyzer) as low as possible. To reduce the instrument noise figure, the USB preamplifier and internal preamplifier should be used whenever possible. If an overload or compression exists in the test system, removing or turning off the preamplifier (USB preamplifier or internal preamplifier) or adding internal attenuation can eliminate the problem. On the signal analyzer,

- To turn on/off the internal preamplifier, press **AMPTD, Signal Path** tab, **Internal Preamp, On/Off**.
- To set the internal attenuator, press **AMPTD, Attenuation** tab, and set the attenuation.

Figure 1-6 and **Figure 1-7** show the supported DUT characteristics (noise figure and gain) of different system configurations for different frequency ranges up to 26.5 GHz. The X-axis is for the DUT noise figure, the Y-axis is for DUT gain, and the different colors on the figures indicate the recommended test system configurations. This rough guide is based on the noise power calculation before the non-linear components.

Before using **Figure 1-6** and **Figure 1-7** to find a proper test system configuration, you need to pay attention to the following points:

- The DUT reference bandwidth used to calculate the noise power is 3.59 GHz, which is the worst case for the lower band (10 MHz to 3.6 GHz). To maintain consistency between the lower band and higher band, the same DUT reference bandwidth is used in the calculation for frequency ranges above 3.6 GHz. Then the reference bandwidths (Ref_BW) for both below 3.6 GHz and above 3.6 GHz are both 3.59 GHz.

If the DUT has a narrower bandwidth, the DUT characteristics can be increased accordingly. For example, if the DUT has a bandwidth of 100 MHz, the supported DUT gain can be increased by a factor of

$$10 \times \log(3.59 \times 10^9 / 100 \times 10^6) \quad , \text{ that is by } 15.6 \text{ dB.}$$

- The noise figure and gain for the U7227C USB Preamplifier are used in the calculation. If you are using the U7227A or U7227F, the supported DUT characteristics should be different.
- A 6 dB ENR noise source is used in the calculation. If you are using a noise source with higher ENR, the supported DUT gain will be lower.
- For different instruments and for a wide frequency range, the data for the USB preamplifier and the X-Series signal analyzer differs considerably, the most precise data is used in most cases.

Below is the procedure for using [Figure 1-6](#) and [Figure 1-7](#) to find the proper system configuration. See “[Examples for Using the Guide to Find the Test System Configuration](#)” on page 30 for examples of using this procedure.

1. Check the DUT and get the rough data for the DUT bandwidth (BW), noise figure (NF), and gain.
2. Calculate the bandwidth adjust factor (AF) using the following equation.

$$AF = 10 \times \log(\text{Ref_BW}/\text{DUT_BW}) = 10 \times \log(3.59 \times 10^9 / \text{DUT_BW})^1$$

Then subtract the AF from the DUT_Gain. The resultant value is called DUT_Gain_Modified.

$$\text{DUT_Gain_Modified} = \text{DUT_Gain} - \text{AF}$$

3. Use the DUT_NF and DUT_Gain_Modified values to search in [Figure 1-6](#) or [Figure 1-7](#) from bottom to top and find an approximate place for them.
4. Find the corresponding system configuration. If the system configuration includes the internal attenuation, do the following to find the proper attenuation level:
 - a. Set the attenuation to 0 dB and note the noise figure of your DUT.
 - b. Increase the attenuation by one step (4 dB). If the noise figure changes too much, such as 0.3 dB, this attenuation is required for accurate measurement.
 - c. Repeat step (b) until you find the proper value.

NOTE

As in the calculation of the supported DUT characteristics in [Figure 1-6](#) and [Figure 1-7](#), the most precise data is used in most cases, it is recommended to try the system configuration below the one you find using DUT_NF and DUT_Gain_Modified first.

1. The Ref_BW is the bandwidth used in [Figure 1-6](#) or [Figure 1-7](#) to calculate the noise power, which is 3.59 GHz.

Figure 1-6

Supported DUT Characteristics and Recommended Test System Configuration for Frequency Ranges below 3.6 GHz

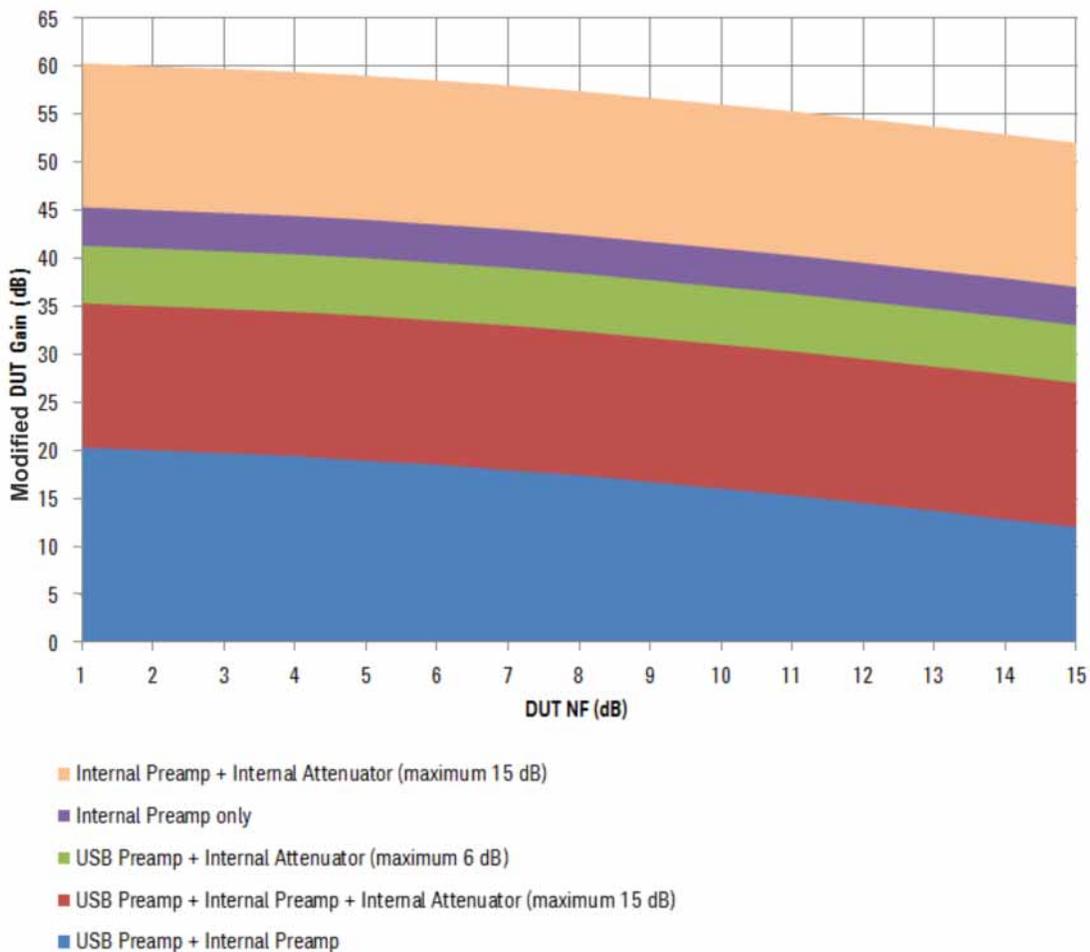
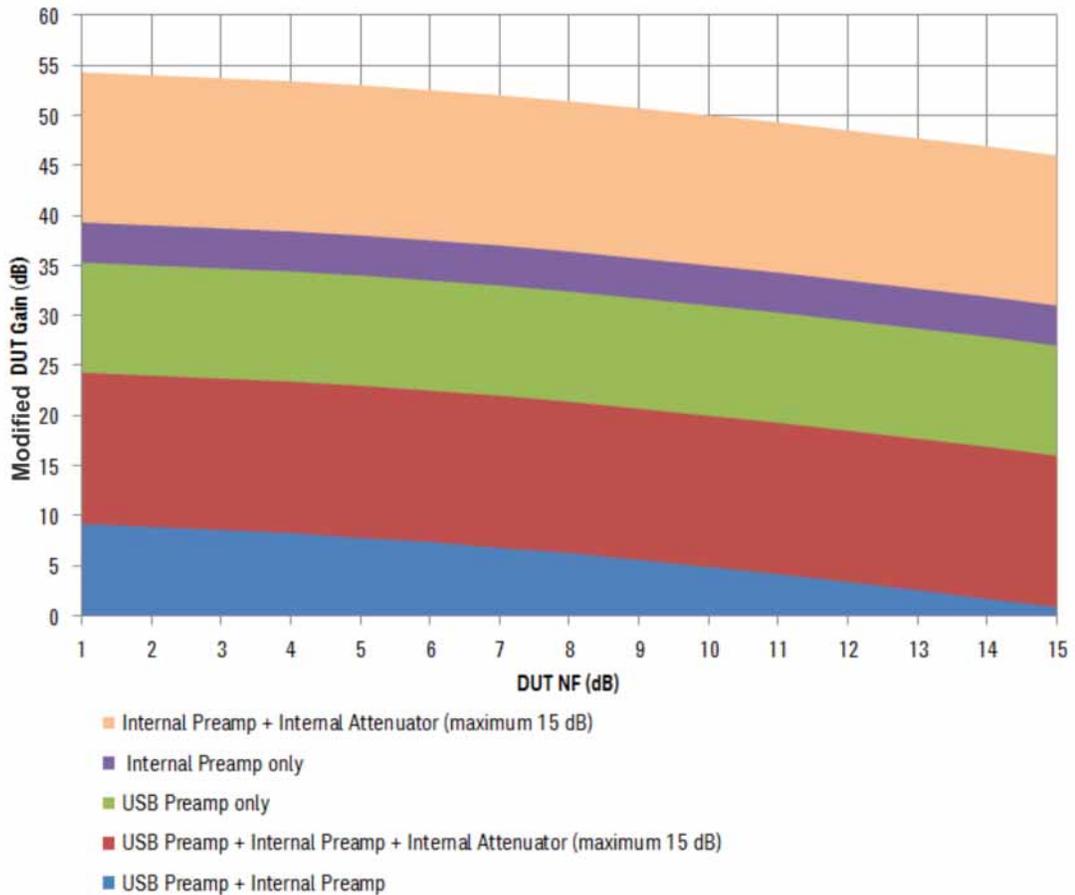


Figure 1-7

Supported DUT Characteristics and Recommended Test System Configuration for Frequency Ranges above 3.6 GHz



NOTE

For frequency ranges above 3.6 GHz, if no preamplifier is used in the signal analyzer, the major noise power concern will be the noise power before the mixer. In this case, the input noise outside the preselector bandwidth (less than 80 MHz) will be filtered. This may affect the supported DUT characteristics.

Figure 1-6 and Figure 1-7 provide a rough guide for frequency ranges up to 26.5 GHz. For the frequency ranges above, the U7227F USB Preamplifier used together with the X-Series can support up to 50 GHz. The calculation method for frequency ranges above 26.5 GHz is similar to the “3.6 GHz to 26.5 GHz” frequency range. The supported DUT gain will decrease because of the increase of the noise figure and gain for both the USB preamplifier and the internal preamplifier. Refer to Table 1-1 and Table 1-2.

Table 1-1 Noise Figure and Gain Specification of the U7227-Series USB Preamplifier^a

Specification	U7227A	U7227C	U7227F
Frequency	10 MHz to 4 GHz	100 MHz to 26.5 GHz	2 to 50 GHz
Gain (dB) ^b	> 16 (10 to 100 MHz) > 0.5 F + 17 (100 MHz to 4 GHz)	> 0.26F + 16.1 (100 MHz to 26.5 GHz)	> 0.23F + 16.5 (2 to 50 GHz)
Noise Figure	< 5.5 dB (10 to 100 MHz) < 5 dB (100 MHz to 4 GHz)	< 6 dB (100 MHz to 4 GHz) < 5 dB (4 to 6 GHz) < 4 dB (6 to 18 GHz) < 5 dB (18 to 26.5 GHz)	< 10 dB (2 to 4 GHz) < 8 dB (4 to 40 GHz) < 9 dB (40 to 44 GHz) < 10 dB (44 to 50 GHz)

a. Specifications are tested and measured on an operating temperature of 23 °C.

b. "F" signifies frequency in GHz.

Table 1-2 Noise Figure and Gain Specification of the X-Series Signal Analyzer

Spec (nominal)	NFA X-Series Noise Figure Analyzers
Gain (dB) (.Max)	20 dB (100 kHz to 3.6 GHz) 35 dB (3.6 to 26.5 GHz) 40 dB (26.5 to 50 GHz)
Noise Figure	13 to 14.5 dB (100 kHz to 3.6 GHz) 9 dB (3.6 to 8.4 GHz) 10 dB (8.4 to 13.6 GHz) 11 to 18 dB (DANL+176.24 dB) (>13.6 GHz)

Examples for Using the Guide to Find the Test System Configuration

This section gives an example of using the **“Rough Guide for the Noise Figure Test System Configuration” on page 26** to find a proper test system configuration

DUT with Frequency Ranges below 3.6 GHz

The DUT characteristic is as below:

DUT NF: 5 dB

DUT gain: 30 dB

Frequency range: 1 to 2 GHz

The DUT bandwidth is:

$$\text{DUT_BW} = 1 \times 10^9 \text{ Hz}$$

The bandwidth adjust factor is:

$$F = 10 \times \log(3.59 \times 10^9 / (\text{DUT_BW})) = 5.55$$

The modified DUT gain is:

$$UT_Gain_Modified = DUT_Gain - AF = 24.45 \text{ dB}$$

Use DUT NF and DUT Gain Modified values to search in [Figure 1-6](#) from bottom to top. The test system configuration should be USB Preamp + Internal Preamp + Internal Attenuator.

DUT with Frequency Ranges above 3.6 GHz

The DUT characteristic is as below:

DUT NF: 4 dB

DUT gain: 25 dB

Frequency range: 3 to 10 GHz

The DUT bandwidth is:

$$\text{DUT_BW} = 7 \times 10^9 \text{ Hz}$$

The bandwidth adjust factor is:

$$F = 10 \times \log(3.59 \times 10^9 / (\text{DUT_BW})) = -2.9$$

The modified DUT gain is:

$$UT_Gain_Modified = DUT_Gain - AF = 27.9 \text{ dB}$$

Use DUT NF and DUT Gain Modified values to search in [Figure 1-7](#) from bottom to top. The test system configuration should be USB Preamp only.

Quick Start
Using the U7227-Series USB Preamplifiers in Noise Figure Measurements

2 Front and Rear Panel Features

This section describes the following features:

[“Front-Panel Features” on page 34](#)

[“Display Features” on page 37](#)

[“Rear-Panel Features” on page 44](#)

[“Front and Rear Panel Symbols” on page 46](#)

Front-Panel Features



Item		Description
#	Name	
1	Pouch	
2	Measurement Keys	These keys (in the shaded area) enable you to set the parameters used for making measurements in the current Mode and Measurement.
3	Mode/Measurement Key	This key enables you to select the desired Mode (measurement application), Measurement, and/or View.
4	Preset Keys	<p>Mode Preset - local to the current mode, global to all measurements in the mode, affects most but not all parameters in the mode, does not affect Input/Output or System variables</p> <p>User Preset - local to the current mode, global to all measurements in the mode, affects all parameters in the mode as well as the Input/Output variables. Does not affect System variables.</p>

Front and Rear Panel Features
 Front-Panel Features

Item		Description
#	Name	
5	Save/Recall Keys	<p>Save - enables you to save states, traces, screen images and other items from the analyzer to files on the analyzer's internal storage, to removable devices, and to directories on the network.</p> <p>Recall - enables you to recall previously saved states, traces and other items to the analyzer from files on the analyzer's internal storage, from removable devices, and from directories on the network.</p> <p>Quick Save - repeats the previous Save at the touch of a single button. Whatever you saved before gets saved again to the same directory, and with a filename derived from the previous filename.</p>
6	Sweep Keys	<p>Single/Cont - toggles between single and continuous measurement sweeps.</p> <p>Restart - restarts the measurement.</p>
7	Knob	Increments and decrements the value of the current active function.
8	Enter and Arrow Keys	<p>The Enter key terminates data entry when either no unit of measure is needed, or you want to use the current unit.</p> <p>The arrow keys:</p> <ul style="list-style-type: none"> – Increment and decrement the value of the current measurement selection. (up/down = big increment, left/right = small increment) – Navigate help topics. – Navigate or make selections within Windows dialogs. – Navigate within forms used for setting up measurements. – Navigate within tables.
9	Headphones Output	Headphones can be used to hear any available audio output.
10	USB Connectors	Standard USB 3.0 ports, Type A. Connect to external peripherals such as a mouse, keyboard, DVD drive, or hard drive.
11	Utility Keys	<p>The following keys are available in the Utility section:</p> <p>Numeric key pad System Help Local/Cancel/(Esc) Back-space Delete Control Alt Undo Touch On/Off Onscreen Keyboard Tab</p>
12	RF Input	Connector for inputting an external signal. Make sure that the total power of all signals at the analyzer input does not exceed +30 dBm (1 watt).

Front and Rear Panel Features
Front-Panel Features

Item		Description
#	Name	
13	Power Standby/ On	<p>Turns the analyzer on. A green light indicates power on. A yellow light indicates standby mode.</p> <p>NOTE The front-panel switch is a standby switch, not a LINE switch (disconnecting device). The analyzer continues to draw power even when the line switch is in standby.</p> <p>The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply.</p>

Display Features

This section describes the regions of the display.



Invalid Data Indicator

 The invalid data indicator is displayed whenever the data on the display does not match the settings of the analyzer. The most common example of this is when instrument settings have changed in the time since the data in the traces on the display was taken. This means that the screen annotation cannot be guaranteed to match the trace data. For example, if you change Center Frequency, the invalid data indicator will display until a new sweep has completed.

If any Trace is in View mode (displaying but not updating) and analyzer settings are changed, the invalid data indicator will display as long as that trace remains in View. Traces that are blanked do not turn on the invalid data indicator.

Not all analyzer settings require display of the invalid data indicator when they change, only changes that require a new acquisition will cause it to display. For example, changing the Y-Axis scale of the analyzer does not cause the invalid data indicator to display, unless the attenuation changes.

Also, the invalid data indicator is turned on:

- When the counter is turned on, until the completion of the first count

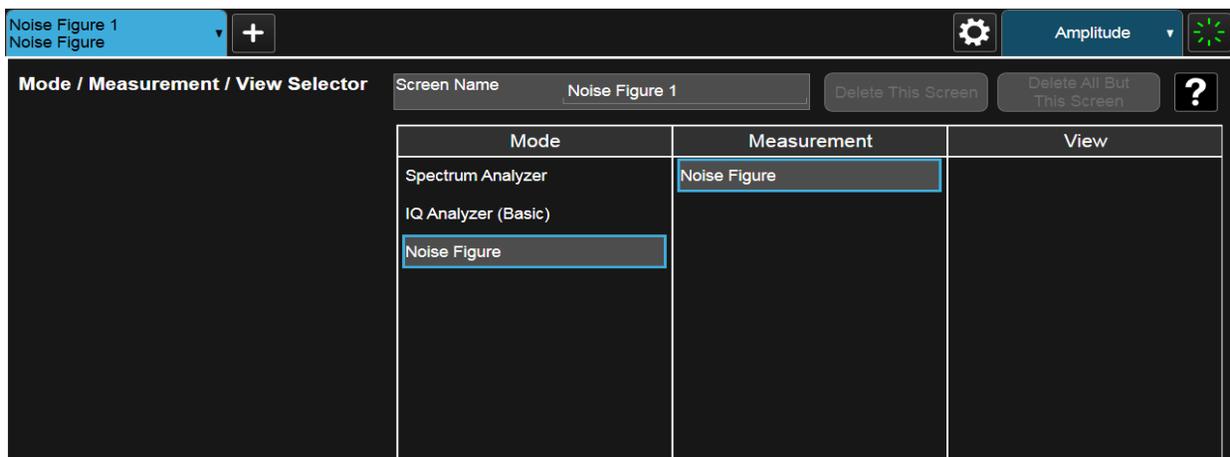
- When a trace is imported from mass storage and the trace's parameters do not match the current analyzer settings
- When a trace is sent to the analyzer from a remote interface (since there is no way to know if its settings match)

NOTE

The Data Invalid Indicator has an associated status bit that can be checked at any time to see if it is on.

Screen Tabs

Along the top of the display are tabs, one for each measurement screen you have defined. Tap the + sign to "clone" the current measurement, which can be changed once it is created. Tap the current screen tab (or press the Mode/Meas hardkey) to display the following dialog:



This dialog allows you to choose a Mode, Measurement and View.

When you select a mode, the measurements that are available in the mode are displayed in the Measurement column.

When you select the desired measurement, the views available for the measurement are displayed under the View column.

You can have up to 16 measurement tabs, but only 6 can be viewed at one time. If the tabs overflow the top bar, they scroll left and right using the arrows to the left and right of the tabs.

You switch screens by touching the tabs. To view multiple screens, press the

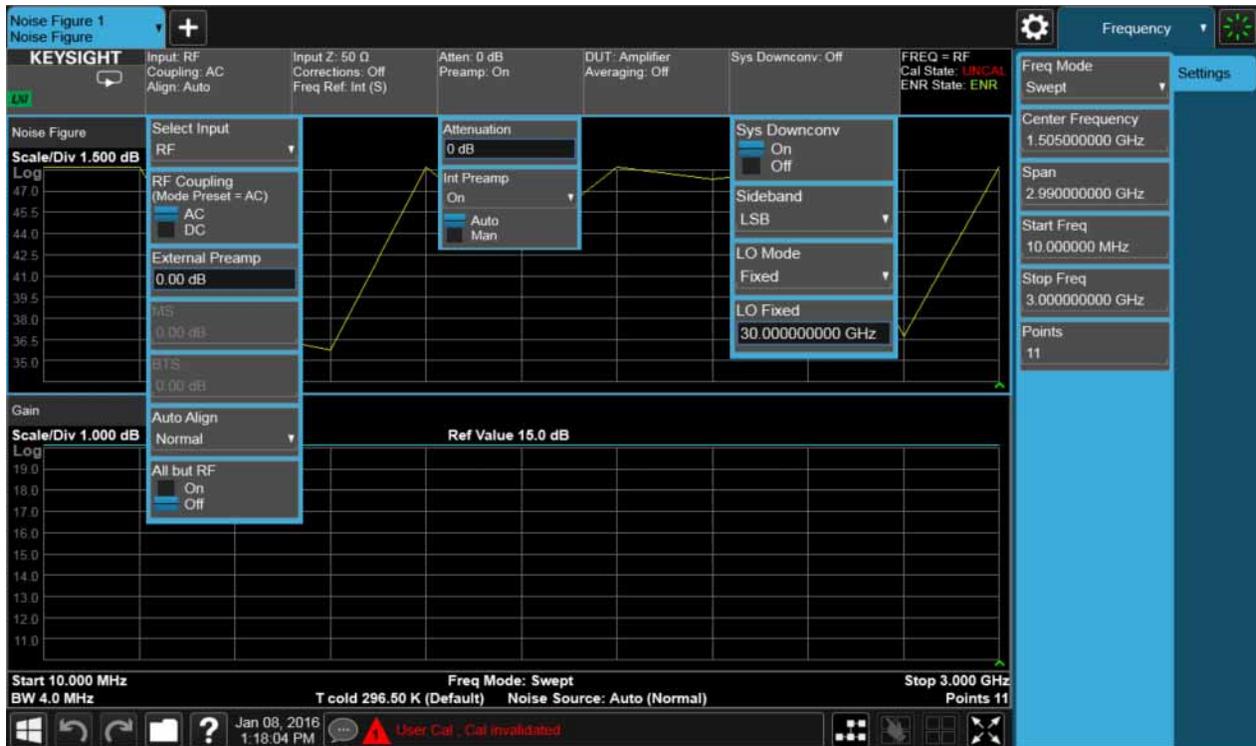


icon on the Bottom Bar.

Front and Rear Panel Features Display Features

Meas Bar

The Meas Bar shows general measurement settings and information. The annotations on this bar can be used to change settings. Tap anywhere in the annotation box to access the drop-down panel that contains relevant parameters. The following graphic shows some of the drop-down menus and the parameters they contain.



  Indicates single/continuous measurement.

Measurement Display

This area shows the measurement results in graphical and tabular form. You can interact with this area using pinch, drag, scroll and tap gestures.

On the signal:

Horizontal pinch - changes the span of the analyzer

Horizontal drag - changes the center frequency

Vertical pinch - changes the vertical scaling

Vertical drag - changes the reference level

Markers may be moved by dragging them to the desired location

Touch and hold - simulates a right click

Swipe scroll - allows you to view information that extends beyond the window area. When you begin to scroll, the scroll bar appears and fades once you stop scrolling.

For demonstrations on these gestures and how they can be used, go to:

<http://www.youtube.com/playlist?list=PLmqzNmmPZGY9sgctxx5dP6hyZoUxNp4lC>

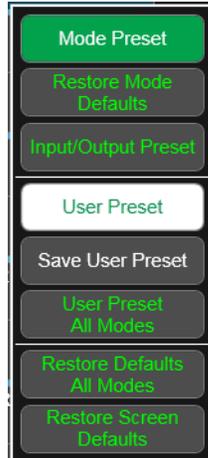
The annotation drop-downs in the window area allow you to change parameters. The window title drop-down allows you to resize the windows in the multi-window format. When you tap in those areas, the drop-down control menus appear as shown in the following graphic.



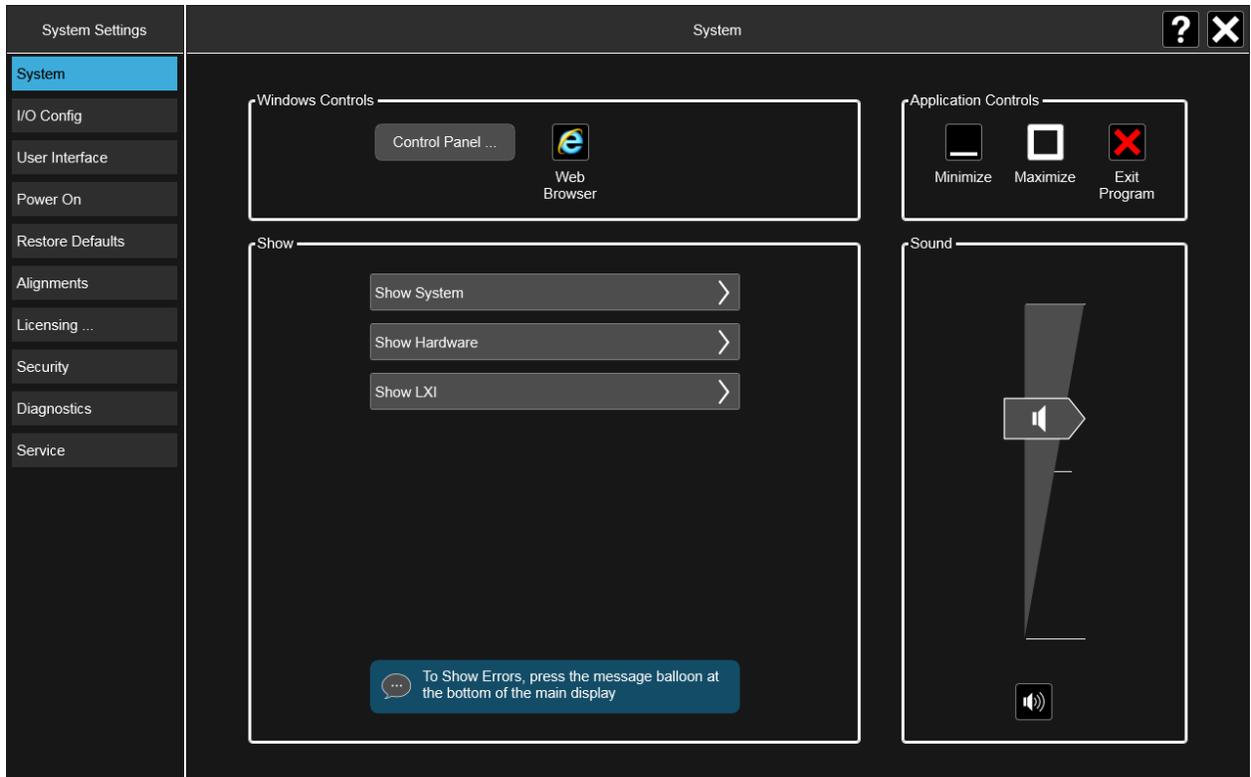
Menu Panel

At the top of the menu panels are two icons:

The Preset icon  accesses the following control menu:

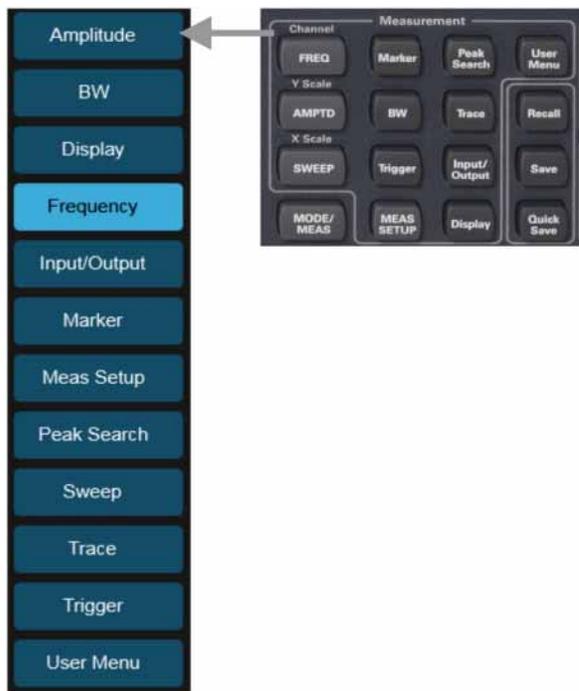


The System icon  accesses the following dialog:

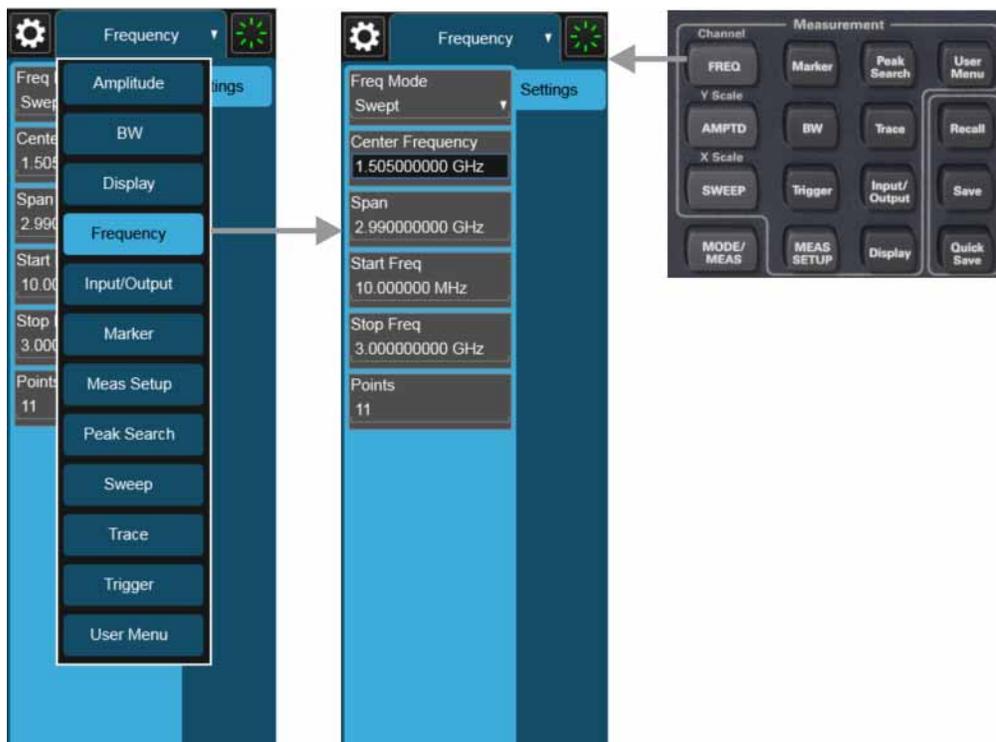


Front and Rear Panel Features Display Features

The hardkey dropdown panel contains the measurement controls. These are the same as the hardkeys in the shaded area of the keypad:

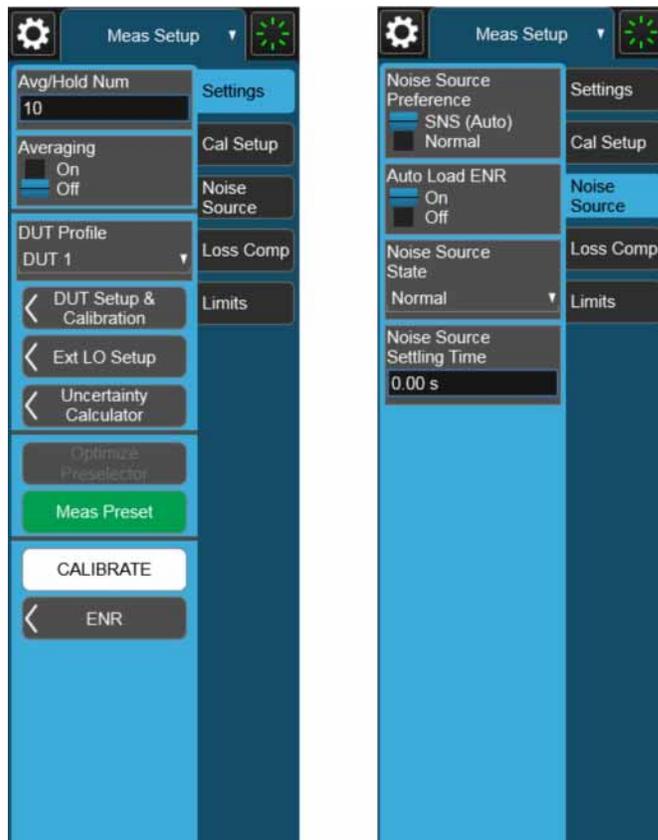


You can select functions using either the keypad or the drop-down menu.



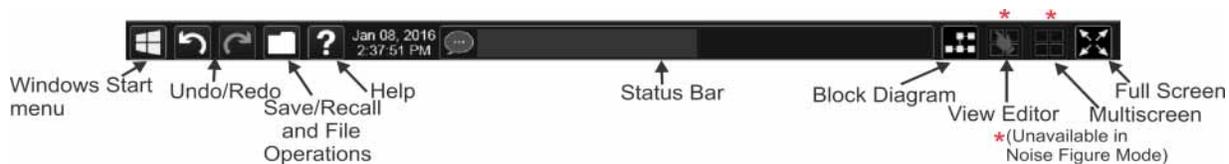
Front and Rear Panel Features Display Features

Notice that the Frequency panel has a Settings tab on the right side. Other panels may have multiple tabs. The tabs access controls for the particular parameter noted on the tab.



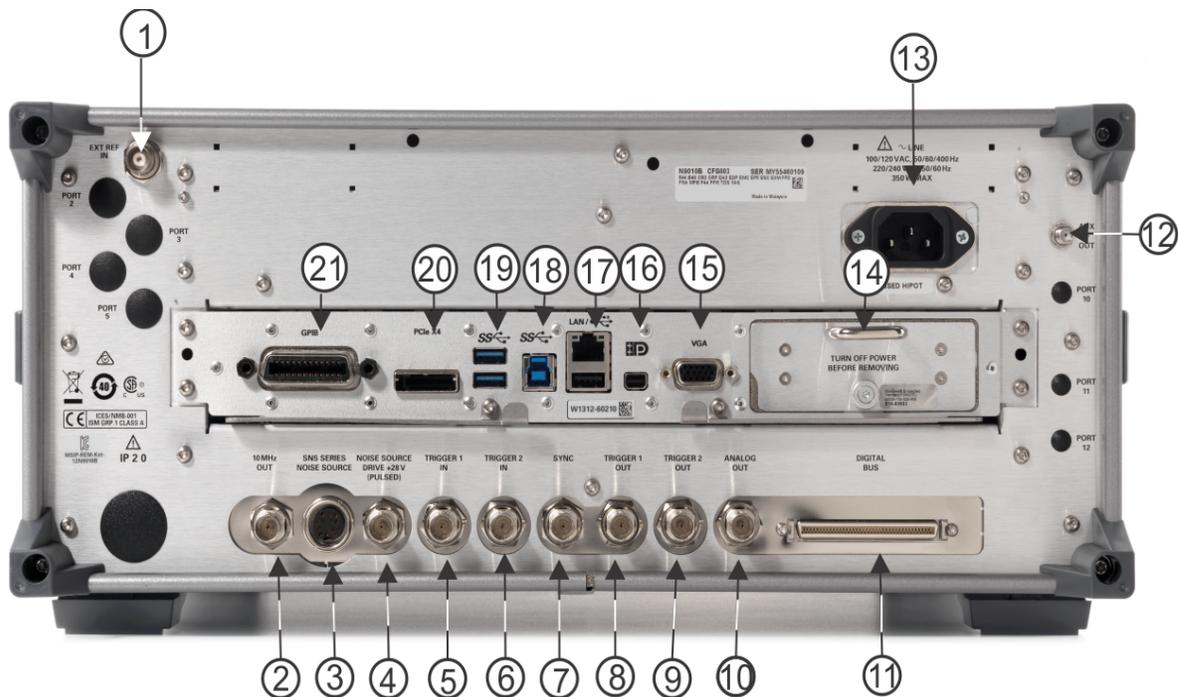
Bottom Bar

The bottom bar contains several icons that access various controls.



Front and Rear Panel Features
Rear-Panel Features

Rear-Panel Features

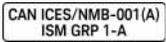


Item		Description
#	Name	
1	EXT REF IN	Input for an external frequency reference signal:
2	10 MHz OUT	An output of the analyzer internal 10 MHz frequency reference signal. It is used to lock the frequency reference of other test equipment to the analyzer.
3	SNS Series Noise Source	For use with Keysight N4000A, N4001A, N4002A Smart Noise Sources (SNS).
4	Noise Source Drive +28 V (Pulsed)	For use with Keysight 346A, 346B, and 346C Noise Sources.
5	TRIGGER 1 IN	Allows external triggering of measurements.
6	TRIGGER 2 IN	Allows external triggering of measurements.
7	Sync	Reserved for future use.
8	TRIGGER 1 OUT	A trigger output used to synchronize other test equipment with the analyzer. Configurable from the Input/Output keys.
9	TRIGGER 2 OUT	A trigger output used to synchronize other test equipment with the analyzer. Configurable from the Input/Output keys.

Front and Rear Panel Features
Rear-Panel Features

Item		Description
#	Name	
10	Analog Out	For Option YAV: Screen Video Log Video Linear Video
11	Digital Bus	Reserved for future use
12	Aux IF Out	CR3 Second IF Out CRP Arbitrary IF Out
13	Line power input	The AC power connection. See the product specifications for more details.
14	Removable Disk Drive	Standard on current analyzers.
15	VGA	Allows connection of an external VGA monitor.
16	DisplayPort	Used for video output. Accepts a standard mini-displayport connector, or adaptor for connection of an external monitor.
17	LAN/USB	A TCP/IP Interface that is used for remote analyzer operation. USB 2.0 port, Type A Connect to external peripherals such as a mouse, keyboard, printer, DVD drive, or hard drive.
18	USB Connector	USB 3.0 port, Type B. USB TMC (test and measurement class) connects to an external pc controller to control the instrument and for data transfers over a 480 Mbps link.
19	USB Connectors	Standard USB 3.0 ports, Type A. Connect to external peripherals such as a mouse, keyboard, printer, DVD drive, or hard drive.
20	PCIe X4	Reserved for future use
21	GPIB	A General Purpose Interface Bus (GPIB, IEEE 488.1) connection that can be used for remote analyzer operation.

Front and Rear Panel Symbols

	This symbol is used to indicate power ON (green LED).
	This symbol is used to indicate power STANDBY mode (yellow LED).
	This symbol indicates the input power required is AC.
	The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to instructions in the documentation.
	The CE mark is a registered trademark of the European Community.
	The UK conformity mark is a UK government owned mark. Products showing this mark comply with all applicable UK regulations.
	The RCM mark is a registered trademark of the Australian Spectrum Management Agency.
	This is a marking of a product in compliance with the Canadian Interference-Causing Equipment Standard (ICES-001). This is also a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 4).
	The CSA mark is a registered trademark of the Canadian Standards Association International.
	The crossed-out wheeled bin symbol indicates that separate collection for waste electric and electronic equipment (WEEE) is required, as obligated by the EU DIRECTIVE and other National legislation. Please refer to www.keysight.com/go/takeback to understand your trade-in options with Keysight, in addition to product takeback instructions.
	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 on all primary and secondary packaging indicates compliance to China standard GB 18455-2001.
	South Korean Certification (KC) mark; includes the marking's identifier code which follows this format: MSIP-REM-YYY- <u>ZZZZZZZZZZZZZZ</u> . This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home. To return unwanted products, contact your local Keysight office.

3 Instrument Operating System

This chapter describes the Microsoft Windows 10, configuration and the settings used with the Keysight instrument software. It includes information about changing some of the system settings. And it describes the Windows operating system configuration and the software installations that are present on the Disk Drive when the instrument leaves the factory.

It is possible to use the front panel and touchscreen for changing operating system configuration items, but it is easier to perform these tasks with a USB mouse and external keyboard. For more useful shortcuts, see [“Navigating Windows Without a Mouse” on page 70](#).

The following topics can be found in this chapter:

- [“Microsoft Windows” on page 48](#)
- [“Keysight Software Installed” on page 48](#)
- [“User Accounts” on page 49](#)
- [“Windows Configuration” on page 51](#)
- [“Configuring Printers” on page 54](#)
- [“Configuring LAN” on page 55](#)
- [“Windows Security” on page 57](#)
- [“System Maintenance” on page 59](#)
- [“USB Connections” on page 60](#)
- [“Disk Drive Partitioning and Use” on page 61](#)
- [“Disk Drive Recovery Process” on page 63](#)

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.

Keysight Software Installed

Keysight Noise Figure Analyzer software

The N9069C Keysight Noise Figure Measurement Application software is installed in the analyzer. The instrument comes preconfigured with full featured Spectrum Analyzer and IQ Analyzer (Basic) modes preinstalled.

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 Keysight 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

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

The default password is "Keysight4u!".

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

KeysightOnly user account

The instrument contains a user account called "KeysightOnly" that can be used by Customer Support in the event that the customer has changed the Administrator password and has forgotten the password. You must not remove or modify the KeysightOnly account.

Service user accounts

There are user accounts defined in the instrument for servicing the instrument.

Customer 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.

Keysight NFA X-Series Noise Figure Analyzer Options

The following measurement applications are preinstalled and licensed in the noise figure analyzer:

- 1. Noise Figure**
- 2. Spectrum Analyzer**
- 3. IQ Analyzer (Basic)**

The licenses for these measurement applications are fixed perpetual.

Fixed Perpetual

Fixed Perpetual licenses are the traditional license type (Fixed) with the same duration (Perpetual) that have been available for all features since the introduction of the X-Series analyzers. Fixed Perpetual licenses are identified by the "F" in the second character and "P" in the third character of the option designator:

Example: N9069EM0E-1FP

A license key is instrument model and serial number dependent. You can only install the license key on the specific instrument for which it was created.

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.

Table 3-1

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.
 User Accounts	Setup new user accounts. CAUTION Do not delete or modify the "KeysightOnly" user account. Doing so may prevent Keysight from servicing the instrument.
 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

Table 3-1

You May Use This Feature:	To Do This...
 System	<p>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.”</p> <p>You should leave the remaining selections unchanged.</p>

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.

Table 3-2

Do NOT Use This Feature:	To Do This...
 Power Options	<p>Do not change Power Options.</p>
 System	<p>If you click on “Advanced System Settings” a dialog will open called “System Properties.”</p> <p>On this dialog there is a tab called “Hardware.” You should not modify any settings under the “Hardware” tab.</p> <p>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”.</p>
 Fonts	<p>Do not remove installed Fonts</p>
 Display	<p>Do not change the following Display Settings:</p> <ul style="list-style-type: none"> – Screen Saver settings (under “Personalization) – Screen resolution, 1024 x 768 (under “Adjust Resolution”) – DPI setting (under “Set custom text size”)
 Region and Language	<p>Do not change any settings under “Region and Language” or the instrument keyboard and display may not operate properly</p>
 User Accounts	<p>Do not delete or modify the "KeysightOnly" user account.</p>

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 Printers

Printers are configured using the Microsoft Windows Control Panel. It is easily accessed from the Windows Start menu or from under the front panel System key. This setup process can be done using the touch screen and front-panel keys. See **“Navigating Windows Without a Mouse” on page 70**.

When setting up a new printer, you may need to load the printer driver (unless you are using a network printer that your IT department has set up to include the driver). The manufacturer of the printer supplies the driver software and process. That may require that you attach an external USB disk drive. An alternative is to connect the instrument to the LAN and download the driver from the printer manufacturer’s internet site.

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 A-N8973B-xxxxx, where xxxxx is the last 5 digits of the instrument's serial number.

IP Address & Gateway

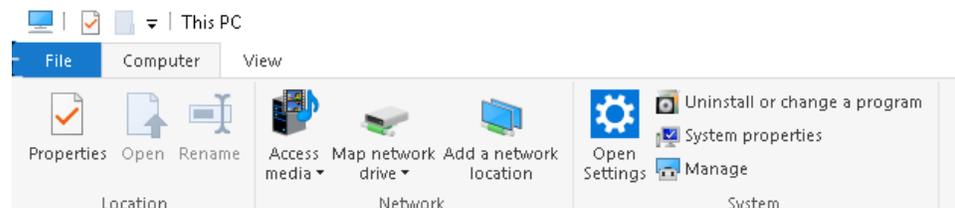
The instrument is preconfigured to obtain an IP Address via DHCP. You can change the IP Address and Gateway as you desire.

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

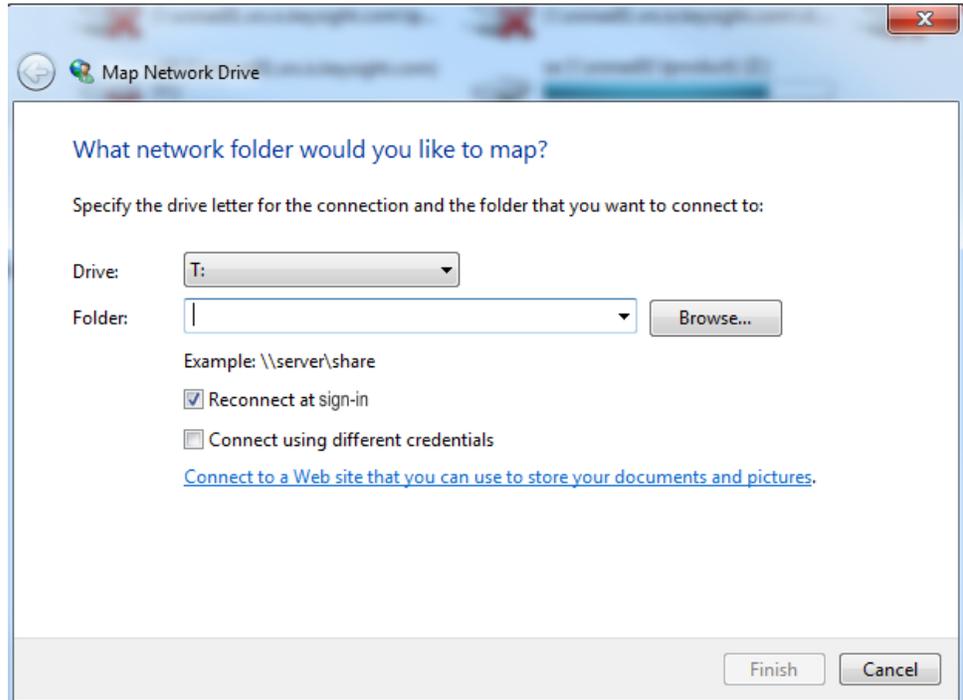
Connecting to a Network Shared Folder

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.

To map a network drive, click the Start icon  , **System Tools, Computer**. Select the **Computer** Tab, and select **Map Network Drive** from the drop down menu:



When the Map Network Drive window appears, browse to the correct folder, and click **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 antivirus 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 clicking on System and Security, 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, by accessing Internet Explorer and selecting Windows Update from the Tools menu.

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 antivirus software included with your instrument. To find information regarding recommended antivirus software, visit the NFA website:

<http://www.keysight.com/find/nfa>

and select FAQs under Technical Support.

NOTE

Having antivirus 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 which 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. See the Windows Help and Support Center for more information on this utility. 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.

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

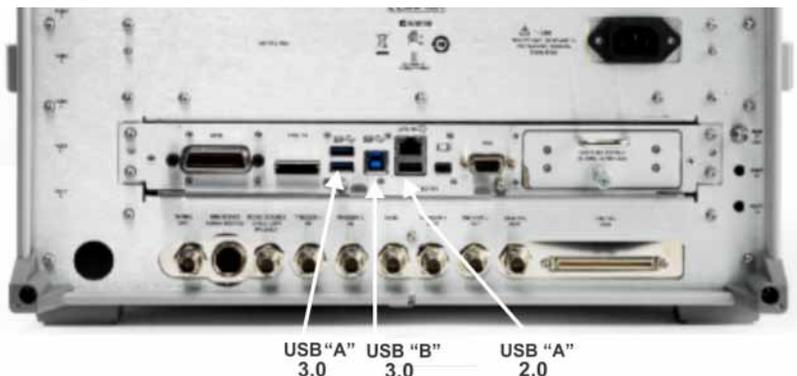
The instrument has a solid state drive. Disk defragmenting is not recommended.

USB Connections

All of the USB ports are compatible with the USB 2.0/3.0 and 1.1 specification. The three USB ports on the front panel (see graphic below) and three of the USB ports on the rear panel are USB Series “A” ports. These are ports to which you can 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.



The square USB port (see graphic below) on the rear panel is a USB 3.0 Series “B” port and is used for controlling the instrument over USB. Information to help you program your instrument is documented in the X-Series Programmer’s Guide. The instrument USB device driver included in the instrument software supports the test and measurement industry standard USBTMC-USB488 device class.



In addition, the Keysight IO Libraries Suite contains the USB host driver for this and other instruments connected to USB ports. To access these libraries visit:

<https://www.keysight.com/us/en/lib/software-detail/computer-software/io-libraries-suite-downloads-2175637.html>

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.

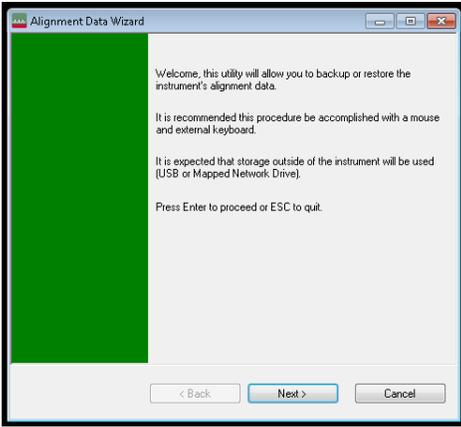
Backing-up the factory calibration data

To back-up the factory calibration data you will need a USB storage device.

Table 3-3

Step	Notes
1. Press System, Alignments, Backup/Restore Align Data...	An information window appears that informs you that the instrument must shut down to complete the backup: "Press OK to force shut down and proceed. Press Cancel to exit."

Table 3-3

Step	Notes
2. Select OK.	<p>The Alignment Data Wizard will appear:</p> 
3. Follow the on screen instructions to backup the calibration data to the USB drive and save the file.	<p>NOTE The default location is an internal flash SD card, if present, but you can choose another location.</p>

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.

Repairing errors on the disk drive may result in loss of data or files. If you require more information, see the "chkdsk" documentation in the Windows Help and Support Center.

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

Table 3-4 Recovery Process

Step	Notes
1. Make sure the instrument is turned off.	

Table 3-4 Recovery Process

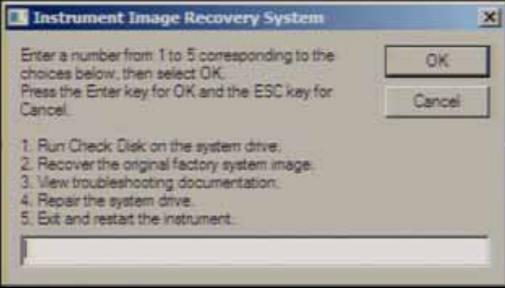
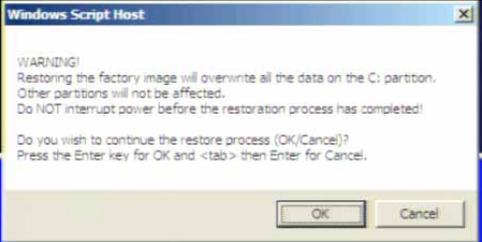
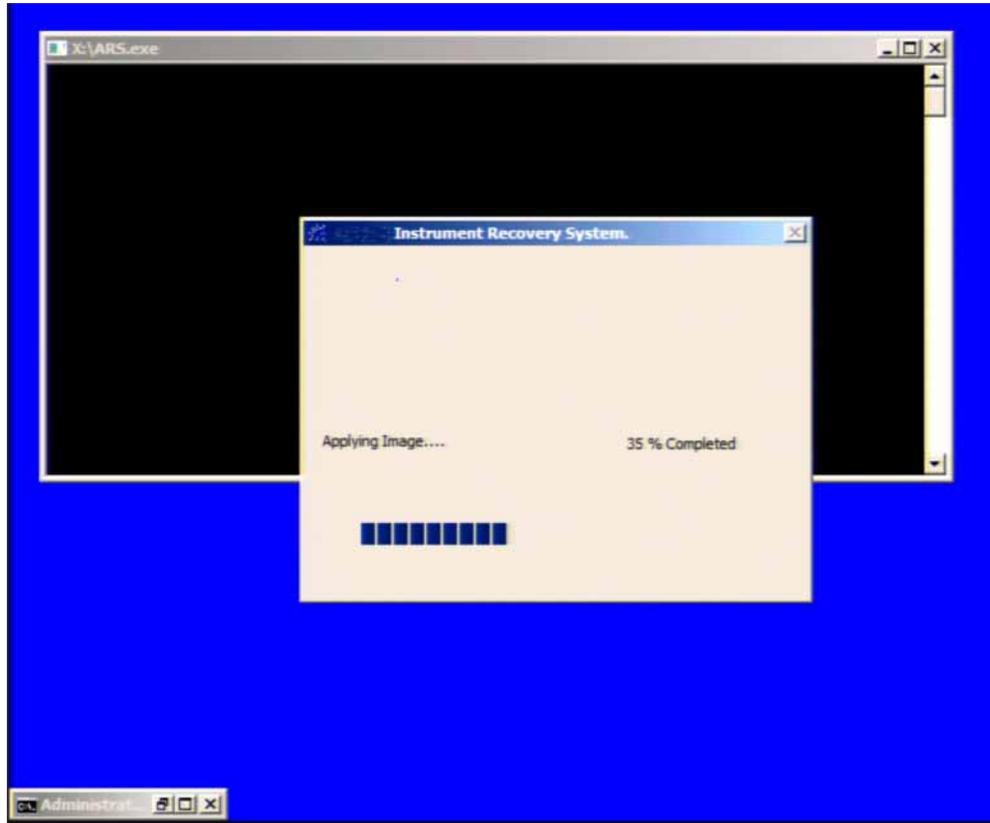
Step	Notes
<p>2. Turn on the instrument.</p> <ul style="list-style-type: none">– Press the down arrow key to move the highlight to Instrument Recovery System, then press Enter.	<p>After the Keysight Technologies screen is displayed, This screen is displayed for five seconds.</p>  <p>The screenshot shows the Windows Boot Manager interface. At the top, it says 'Windows Boot Manager'. Below that, it asks to 'Choose an operating system to start:' and provides instructions to use arrow keys and press ENTER. Two options are listed: 'Microsoft Windows 10' and 'Instrument Image Recovery System'. The second option is highlighted with a white bar. At the bottom, it says 'To specify an advanced option for this choice, press F8.' and 'ENTER=Choice' and 'ESC=EXIT'.</p>
<p>3. When the Instrument Recovery System has booted, follow the on-screen instructions to recover the image of the C: drive.</p> <ul style="list-style-type: none">– Press 2, then press Enter to select the recovery.	 <p>The screenshot shows a dialog box titled 'Instrument Image Recovery System'. It contains the following text: 'Enter a number from 1 to 5 corresponding to the choices below, then select OK. Press the Enter key for OK and the ESC key for Cancel.' Below the text is a list of five numbered options: 1. Run Check Disk on the system drive; 2. Recover the original factory system image; 3. View troubleshooting documentation; 4. Repair the system drive; 5. Exit and restart the instrument. There are 'OK' and 'Cancel' buttons on the right side.</p>
<p>4. A warning message appears.</p> <ul style="list-style-type: none">– Press Enter to start the recovery, which may take up to 25 minutes to complete.	 <p>The screenshot shows a 'Windows Script Host' dialog box with a 'WARNING!' message. The text reads: 'Restoring the factory image will overwrite all the data on the C: partition. Other partitions will not be affected. Do NOT interrupt power before the restoration process has completed! Do you wish to continue the restore process (OK/Cancel)? Press the Enter key for OK and <tab> then Enter for Cancel.' There are 'OK' and 'Cancel' buttons at the bottom.</p>

Table 3-4 Recovery Process

Step	Notes
------	-------



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 3-5 Installing the Software

Step
<p>1. Exit the program</p>
<p>2. Log out of the default user (instrument):</p> <ul style="list-style-type: none">– Select the Start icon , select the Change account settings icon , Sign out.
<p>3. At the log in prompt enter:</p> <ul style="list-style-type: none">– User Name: administrator– Password: Keysight4u!
<p>4. Follow the instructions on the software update web page.</p> <div>WARNING</div> <p>When you see the message <code>Programming FPGAs...</code> 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.</p> <div><p>Updating Digital IF (0014.01) FPGA from version 03.05.05.02 to 03.05.05.03</p><p>Do not turn off power or interrupt this process! 不要关闭电源或中断此过程! 電源を切ったり、更新プロセスを中断したりしないで下さい。 전원을 끄거나 진행되는 작업을 중단 시키지 마세요! Ne pas interrompre ni couper l'alimentation électrique! Nicht ausschalten oder abbrechen! Не выключать и не прерывать процесс!</p><p>FPGA code updates may require a significant period of time. Interrupting the FPGA update process may result in corrupt FPGA code which would require returning this instrument to Agilent for service.</p></div>
<div>NOTE</div> <p>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.</p>
<p>5. When the installation has finished, select Yes, I want to restart my computer now, Finish.</p>

Table 3-5 Installing the Software

Step
6. After the instrument restarts, the newly installed version of the X-Series instrument software will run.

Instrument Operating System
Disk Drive Recovery Process

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” on page 70](#)

[“Remote Desktop: Using the X-Series Instruments Remotely” on page 71](#)

[“Embedded Web Server: Using the X-Series Signal Analyzers Remotely” on page 80](#)

[“Windows Shortcuts and Miscellaneous Tasks” on page 86](#)

Navigating Windows Without a Mouse

Table 4-1

Key Presses	Actions
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 X-Series Instruments 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. You can also remotely control the instrument using the Embedded Web Server interface. The Embedded Web Server functionality provides a communications method that does not require login to the instrument. However, due to its slower response time, it is only recommended for setup and data exchanges that do not involve instrument control.

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

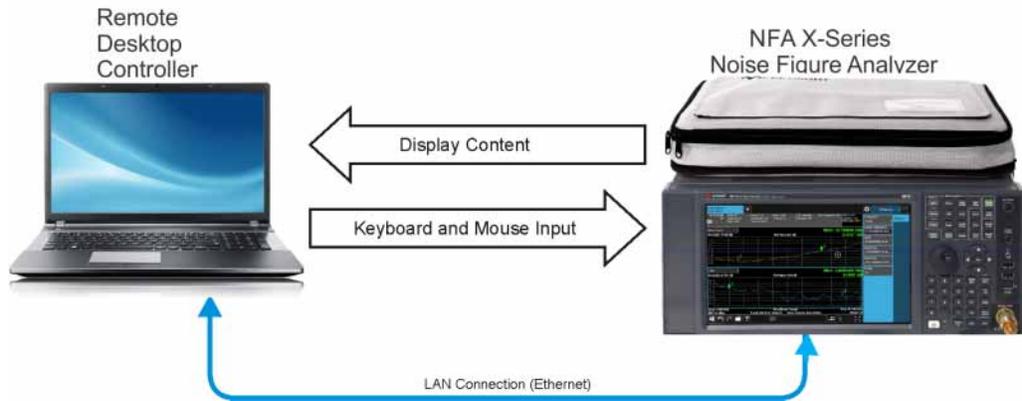
Using the Remote Desktop functionality of the instrument allows you to control and interact with the instrument from a remote computer as though you were sitting in front of the instrument.

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 4-2 Setting up a remote desktop connection

Step	Action
1. On the instrument, open the Windows Control Panel	– From the instrument application, press 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, click the appropriate checkbox.
5. To add users	– Click 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 4-3 Installing the Client software

Step	Notes
1. When the Welcome Screen appears, click Perform additional tasks	
2. From the What do you want to do? screen, click Set up Remote Desktop Connection .	The Remote Desktop Connection InstallShield Wizard appears.
3. Click Next .	Follow the on screen instructions provided by the Wizard.
4. To access the installed software, click 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 4-4 Locating the name from the Keysight application

Step	Notes
On the instrument front panel, press 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 4-5 Locating the name from the Windows desktop (with a mouse):

Step	Notes
1. Click Start, Control Panel.	
2. Double-click 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.

After setting up the remote computer for Remote Desktop Connectivity, as described in “**Setting up Remote Desktop operation**” on page 72, you are ready to start a Remote Desktop session.

Table 4-6 Starting a session

Step	Notes
1. Click Start > All Programs > Accessories > Communications > Remote Desktop Connection .	A Remote Desktop Connection dialog appears: 
2. Enter the computer name of the instrument.	
3. Click 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.

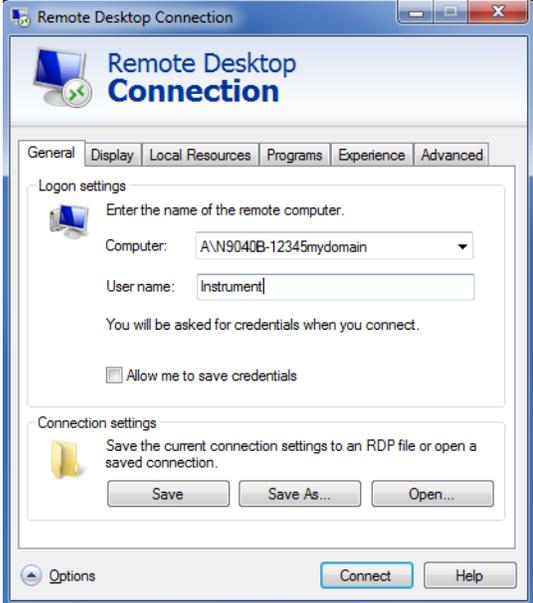
NOTE

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 4-7 Setting Remote Desktop options

Step	Notes
1. On the Remote Desktop Connection menu, click Options .	
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 checking the Save my password box.

The Options dialog has several tabs. Generally, the default settings are correct.

Table 4-7 Setting Remote Desktop options

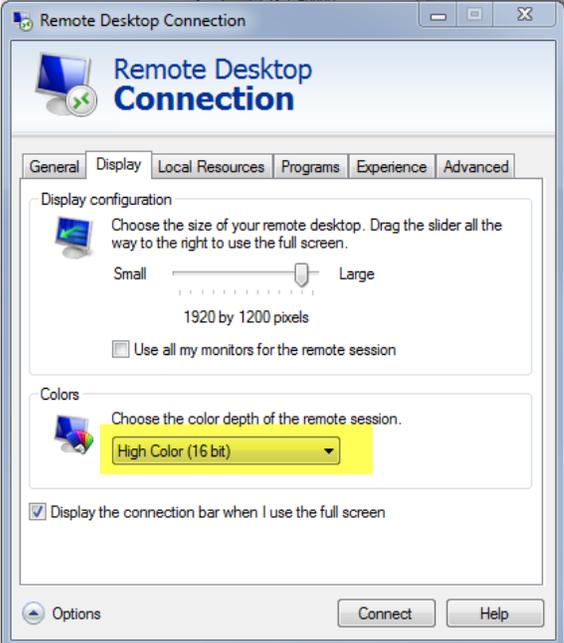
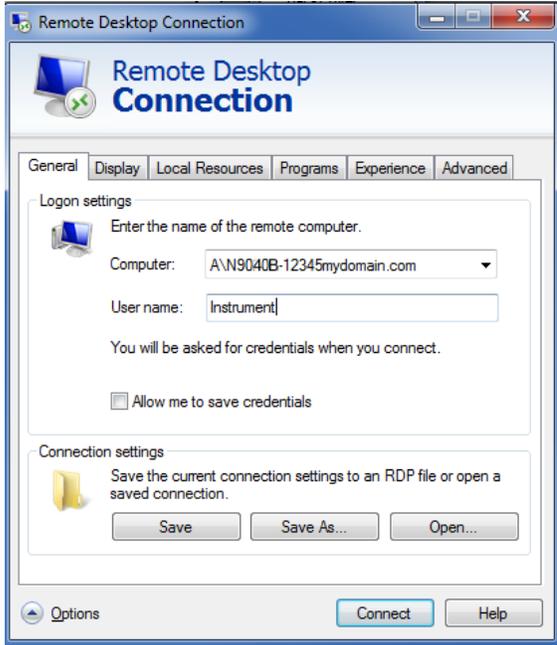
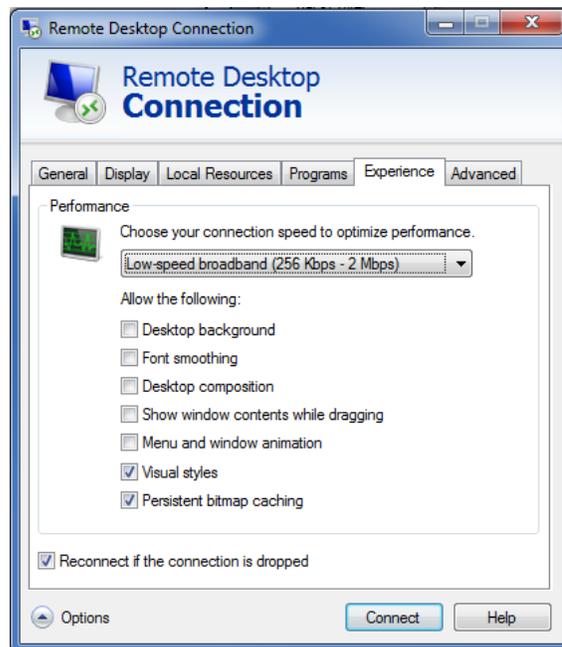
Step	Notes
<p>3. Click the Display tab.</p> <ul style="list-style-type: none"><li>– Under Remote desktop size, you may select the size of the window in which the instrument display appears. Do not select any size smaller than 1280 x 800 pixels. Selecting a remote desktop size smaller than 1280 x 800 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.<li>– 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 4-7 Setting Remote Desktop options

Step	Notes
<p>4. Click the Local Resources tab.</p> <ul style="list-style-type: none">– Selecting the Disk Drives checkbox enables you to transfer data between the remote desktop and the local PC.– To transfer data, click Start on the task bar of the remote computer, then click 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.	 <p>The screenshot shows the 'Remote Desktop Connection' dialog box with the 'Local Resources' tab selected. Under 'Logon settings', the 'Computer' dropdown is set to 'A\N9040B-12345mydomain.com' and the 'User name' is 'Instrument'. Under 'Connection settings', there are 'Save', 'Save As...', and 'Open...' buttons. At the bottom, there are 'Options', 'Connect', and 'Help' buttons.</p>

5. Click 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 4-8

Step	Notes
1. Click the X , then click 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: <ul style="list-style-type: none"><li>– Click Start, Disconnect.<li>– Click Disconnect.	You are asked to confirm that you want to disconnect.

Embedded Web Server: Using the X-Series Signal Analyzers Remotely

The instrument can be controlled using either the Embedded Web Server or Windows Remote Desktop. The Embedded Web Server is a good solution when you do not want to log into the instrument's user account. This allows you to view the display or control the instrument, without logging the current user off. Multiple users can connect at the same time.

The web server in the X-Series instrument updates many times per second and it has the advantage over Remote Desktop that it does not lock out the front panel.

NOTE

Drag gestures do not work in web control, whereas they do in Remote Desktop.

Browsers that support X-Series Embedded Web Server
(these versions or later)

IE	Chrome	Safari	FireFox	iOS Safari	Chrome for Android
11	35	8	34	8	39

Accessing the instrument through the Internet

It is possible to access and control the instrument through the Internet and World Wide Web, or a local internet, using the built-in Embedded Server functionality. This section provides details of how to use this functionality.

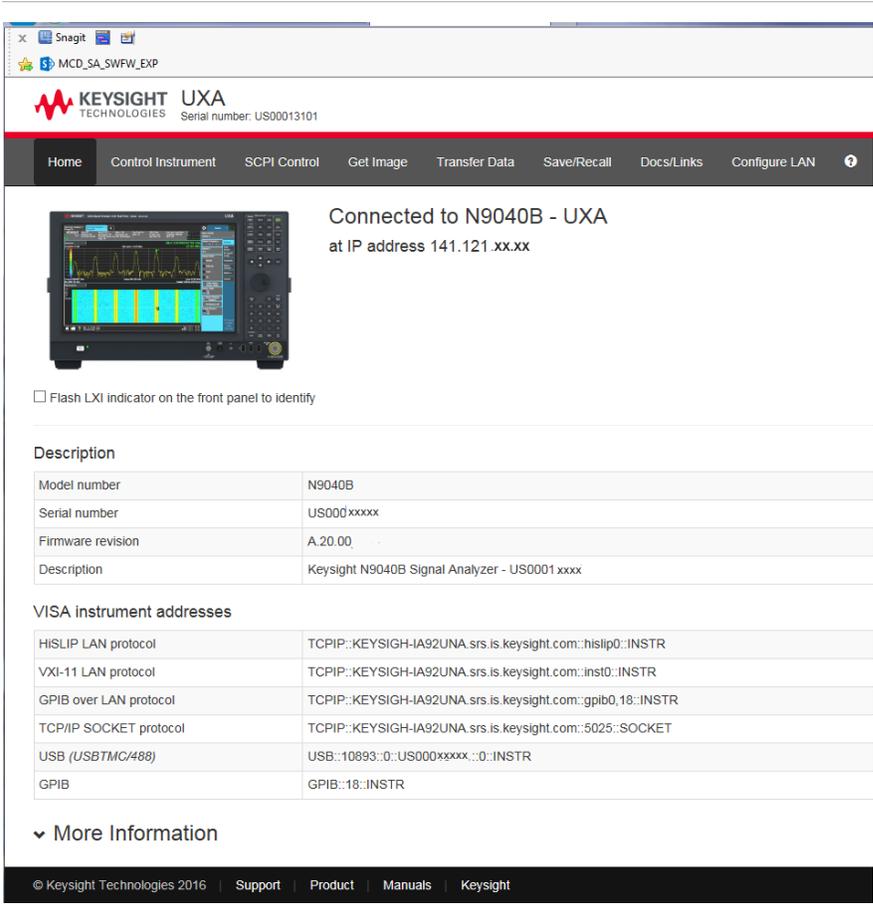
The instrument may also be accessed and controlled using the Windows Remote Desktop functionality (see the section **“Remote Desktop: Using the X-Series Instruments Remotely” on page 71**, for details).

The instrument Embedded Server capabilities are fully compliant with the LXI (LAN eXtensions for Instrumentation) standard.

NOTE

To gain access to the instrument from the LAN, you need to know its hostname (or IP Address). For details of how to locate this information using the instrument Display, see “How to locate the computer name of the instrument” on page 74.

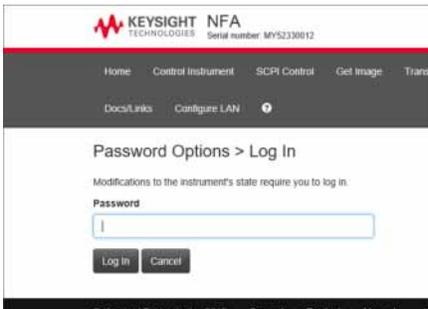
Table 4-9 Accessing the instrument

Step	Notes
<p>1. Enter a URL corresponding to the instrument hostname or IP Address.</p>	<div style="display: flex; align-items: flex-start;"> <div style="background-color: #cccccc; padding: 5px; margin-right: 10px; text-align: center; width: 100px;">NOTE</div> <div> <p>This functionality is only fully supported when using Internet Explorer.</p> <p>In this example, the host name is “a-n8973b-00104”.</p> <p>When the connection is made, the welcome page appears.</p> </div> </div>
	
<p>2. Click More Information</p>	<p>This displays further settings and configuration information.</p>

Controlling the Instrument

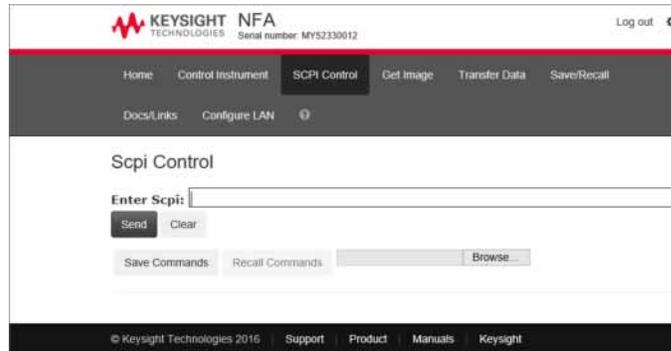
Selecting this tab enables you to view, control and interact with the instrument through the web server.

Table 4-10 Selecting the Control Instrument tab

Step	Notes
<p>1. Select Control Instrument</p>	<p>A password entry dialog appears.</p>
	<p>By default, this password is set at the factory as “measure4u”. However, you may subsequently change the password. (Select System, I/O Config, Web Password Reset on the instrument front panel to change the password.)</p> <p>When the correct password has been entered, the Control Instrument web page appears.</p>
	<p>2. You can now enter new settings as required.</p>

Enabling SCPI Control of the instrument

Selecting this tab enables you to control the instrument via SCPI.



Selecting the Get Image tab

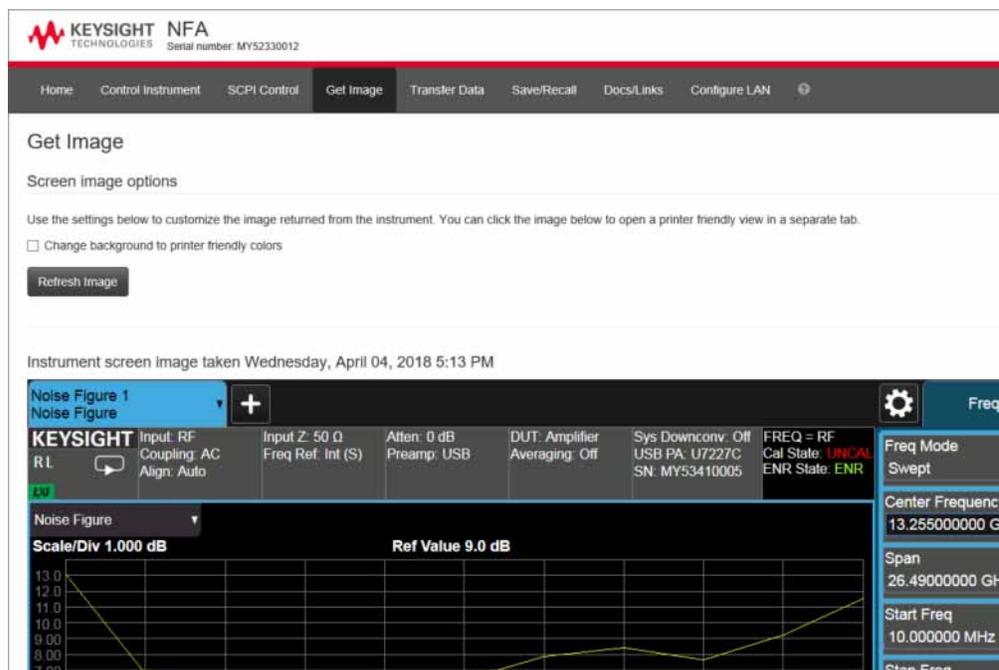
Selecting the Get Image tab captures a screen image from the Instrument display.

NOTE

To capture a screen image using the web server, the Instrument Application must be running.

The image is captured as a Portable Network Graphics (PNG) file, to the default file name `Screen.png`. The image file can be saved to the client computer disk drive, or copied to the Windows clipboard.

A typical screen capture image appears as follows:



Selecting the Transfer Data tab

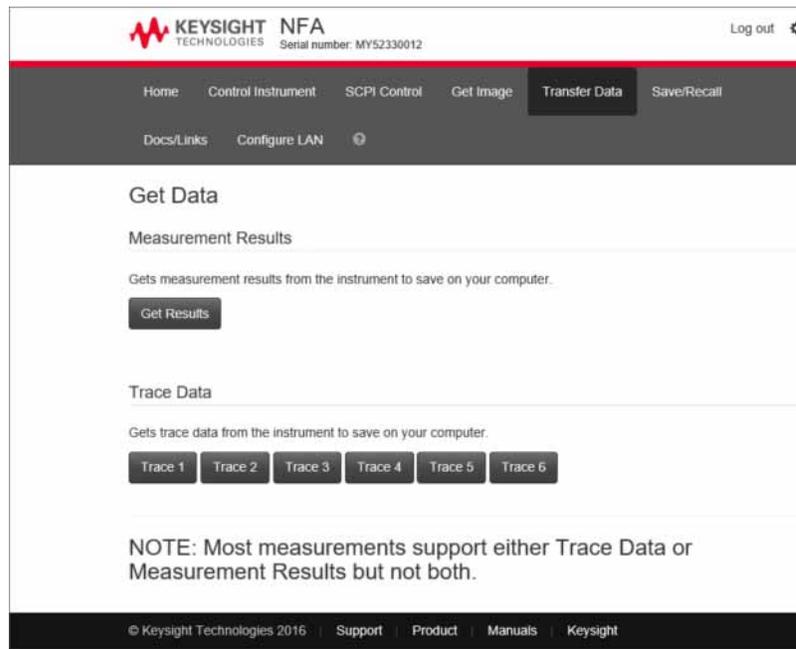
Selecting the Transfer Data tab enables you to capture results from the instrument's currently active measurement. Depending on the current measurement type, captured results consist of either Trace Data or Measurement Results.

NOTE

To capture data using the web server, the instrument application must be running.

The captured data is formatted as a Comma Separated Value (CSV) file, which may be saved on the client computer's disk drive, or opened with a spreadsheet application such as Microsoft Excel, or imported into a database application such as Microsoft Access.

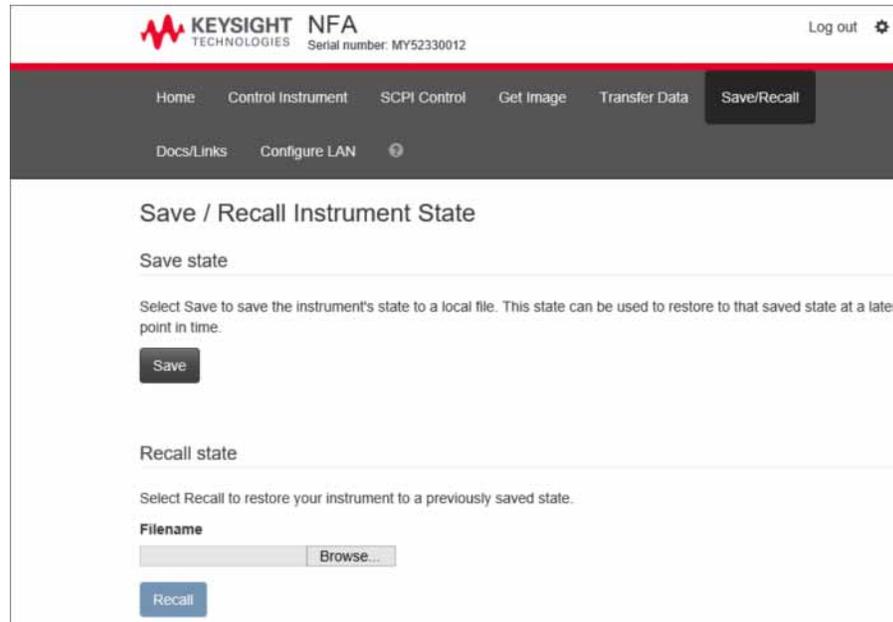
A typical Transfer Data web page display is shown below:



Selecting the Save/Recall tab

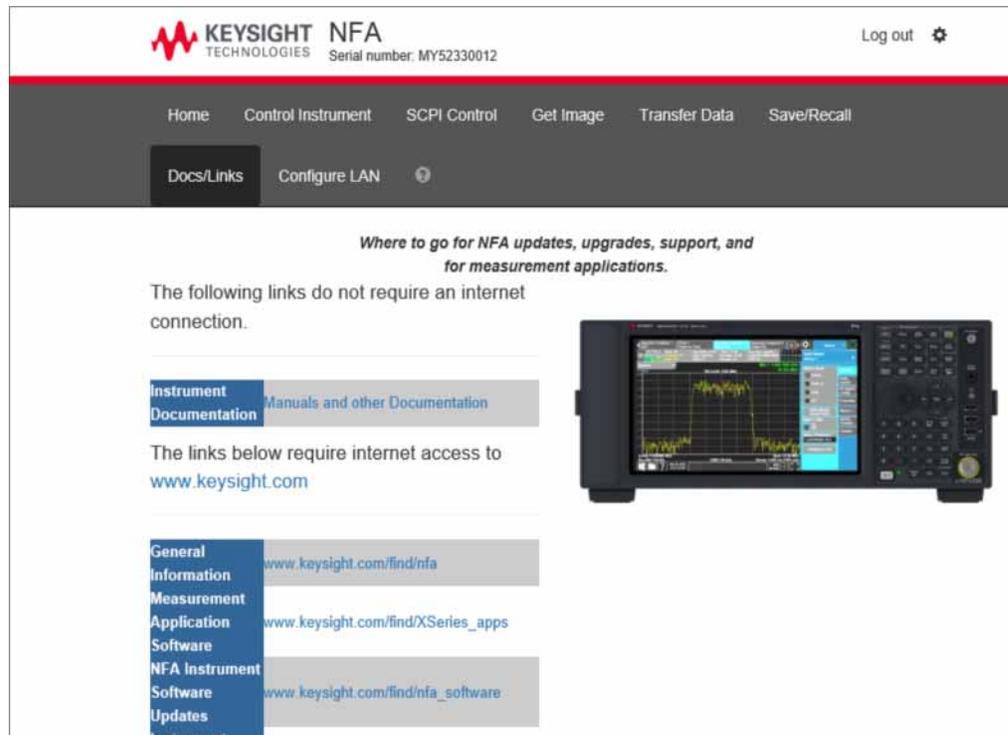
Selecting this tab enables you to save and recall data from the instrument.

Using Windows Tools
Embedded Web Server: Using the X-Series Signal Analyzers Remotely



Selecting the Docs/Links tab

Selecting this tab enables access links to the instrument documentation and application software.



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” on page 70.**) 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 4-11 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 F ile)	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 deselect 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

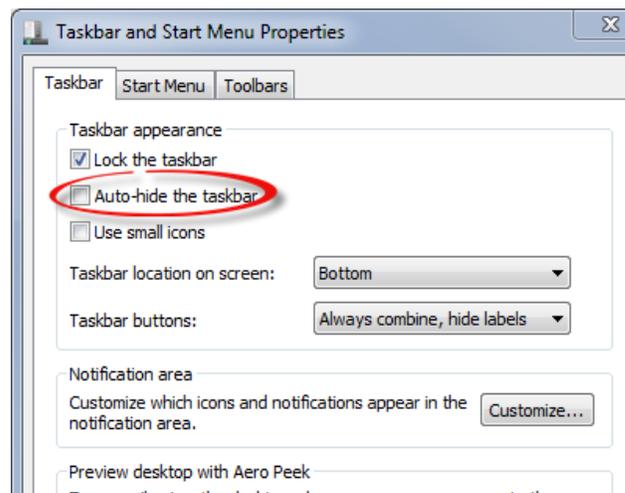
Windows taskbar auto-hide feature

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 4-12 Restoring taskbar auto-hide mode

Step	Notes
1. Click Start > Control Panel	If not using a mouse, press Ctrl+Esc .
2. Click Taskbar and Start Menu	If you are not using a mouse, use the shortcut key combinations specified in the Section “Windows shortcuts (key combinations)” on page 86 to make these selections.
3. Click the Taskbar tab	The Taskbar and Start Menu Properties dialog appears.
4. Select the Auto-hide the taskbar check box	If you are not using a mouse, press Tab repeatedly until the auto-hide option is selected, then press Select to toggle the check box state.



5. Click **OK**. This applies the change and closes the dialog box.

Using Windows Tools
Windows Shortcuts and Miscellaneous Tasks

5 Troubleshooting

[“Check the Basics” on page 90](#)

[“Problems with Microsoft Windows 10” on page 92](#)

[“Returning an Analyzer for Service” on page 93](#)

WARNING

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

Check the Basics

- Is there power at the receptacle?
- Is the analyzer turned on? Check to see if the green LED beside the power switch is on. Also, listen for internal fan noise to determine if the analyzer cooling fans are running.
- If other equipment, cables, and connectors are being used with your signal analyzer, make sure they are connected properly and operating correctly.

If the analyzer cannot completely load or run the operating system, or the instrument application is not successfully launched, the problem could be a corrupt disk drive. If the analyzer gets far enough along in the boot process to run the "Instrument Recovery System", perform the **"Disk Drive Recovery Process"** as described on page 60.

- Is the Measurement Application running? If not, there is a software launch shortcut/icon on the desktop.
- Does the instrument application have the focus? If not, move focus to the application with Alt-Tab.
- Review the measurement procedures being performed when the problem first appeared. Are all of the settings correct?
- If the analyzer is not functioning as expected, return the analyzer to a known state by pressing **Mode Preset**.

NOTE

Some analyzer settings are not affected by a Preset. If you wish to reset the analyzer settings, press **System, Power On, Restore Power On Defaults**.

-
- Is the measurement being performed, and the results that are expected, within the specifications and capabilities of the analyzer?

Refer to the specifications guide for your analyzer.

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

Technical manual pdf files are available on the Keysight website:

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

- If the analyzer is not communicating via the LAN connection, check for the presence of blinking yellow LEDs on the rear panel LAN connector. If the ACT LED is not blinking, check the LAN cable and LAN integrity.
- To meet specifications, the analyzer must be aligned. Either the Auto Align (On) feature must be selected (press **System, Alignments, Auto Align**, and select **Normal**), or the analyzer must be manually aligned.
- Perform an Alignment. Press **System, Alignments, Align Now All**.

- If the previously performed alignments did not resolve the problem, press **System, Alignments, Restore Align Defaults**. Then press **System, Alignments, Align Now All**.
- If the analyzer exhibits large amplitude errors (> 10 dB) especially at frequencies above 10 GHz, the RF preselector might not be properly centered. Press **Peak Search, AMPTD Signal Path, Presel Center**. If the signal amplitude error is corrected, the preselector characterization should be performed. Press **System, Alignments, Advanced, Characterize Preselector**. The characterization will take several minutes and the analyzer must not be interrupted during this time. If the analyzer is interrupted during the characterization process, the characterization data will be destroyed and it will be necessary to perform the entire process again.
- Is the analyzer displaying an error message? If so, refer to the Instrument Messages Guide.
- Check if the external frequency reference is selected but not available. Verify that it is selected by pressing **Input/Output, Freq Ref In**. If **External** is selected, changing the setting to **Sense** allows the analyzer to sense the presence of an external reference and use it only if it is available. The frequency of the reference should be set correctly.
- If you are using a Windows program other than the instrument application, you may notice it running slow. Place the instrument application in single sweep/measurement.

TIP

You can get automatic electronic notification of new software releases and other product updates/information by subscribing to the *Keysight Technologies Test & Measurement E-Mail Notification Service* for your signal analyzer at:

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

Problems with Microsoft Windows 10

The Microsoft Windows 10 operating system settings have been optimized for the best performance. Modification of these settings may degrade instrument performance and measurement speed. Those that can be safely modified are described in **“Settings that can be changed” on page 51**

The X-Series Signal Analyzers operate in 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 with non-approved software installed.

Returning an Analyzer for Service

Calling Keysight Technologies

Keysight Technologies has offices around the world to provide you with complete support for your analyzer. 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 analyzer by its product number, full serial number, and software revision.

Press **System**, **Show System**, and the product number, serial number, and software revision information will be displayed on your analyzer screen. A serial number label is also attached to the rear panel of the analyzer.

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>

Read the Warranty

The warranty for your analyzer is in the front of your Specifications Guide. Please read it and become familiar with its terms.

If your analyzer is covered by a separate maintenance agreement, please be familiar with its terms.

Service Options

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

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

Performance Verification and Adjustment tests require the N7881A X-Series Signal Analyzer Calibration Application Software. Information regarding the N7881A X-Series Signal Analyzer Calibration Application Software can be found at:

<http://www.keysight.com/find/calibrationsoftware>

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.

CAUTION

Analyzer 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.

You can repackage the analyzer 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.
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-pak. 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.	

Troubleshooting
Returning an Analyzer for Service

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